The Drive & Control Company

Rexroth
Bosch Group

Product catalog
Industrial hydraulics

Part 4: On/off valves











Product catalog Industrial hydraulics

Part 4: On/off valves

Product catalogs Industrial hydraulics of Bosch Rexroth at a glance:

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General product information on hydraulic products

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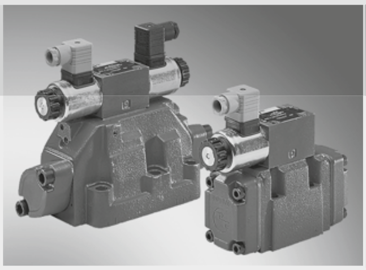

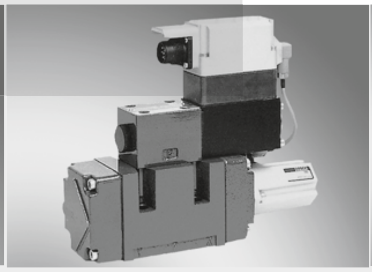

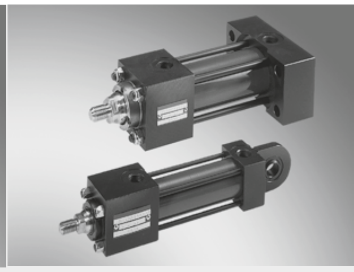

DE	Ihre Sprache? – Siehe Rückseite!
EN	Your language? – See back page!
FR	Votre langue ? – Voir au dos !
IT	La vostra lingua? – Vedi retro!
FI	Kohdekielet? – Katso takankatta!
ES	¿Su idioma? – ¡Vea al dorso!
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1 Important basic information

1.1 Conventions used in this product information

Cross-references are printed in *italics*.

⚠ DANGER

This symbol indicates a threat of danger which will result directly in death or very serious injury if not avoided.

⚠ WARNING

This symbol indicates a threat of danger which may result in death or very serious injury if not avoided.

⚠ CAUTION

This symbol indicates possible danger which may lead to minor or serious injury and/or to material damage.

IMPORTANT

This symbol indicates additional information.

1.2 What you need to know about this product information

This product information applies to the following types of hydraulic products:

- Hydraulic components
- Hydraulic power units
- Hydraulic systems.

This product information applies exclusively to hydraulic products that are operated with mineral-oil-based pressure fluids, if the *Operating Instructions* do not expressly permit the use of other pressure fluids.

IMPORTANT

As this product information for Rexroth hydraulic products applies in a general sense, some of the content may not necessarily apply to the hydraulic product you have purchased.

However, only by strictly observing this product information and the Operating Instructions can accidents be prevented and problem-free operation of your Rexroth hydraulic product be guaranteed.

Observing the product information and Operating Instructions

- reduces downtimes and maintenance costs
- increases the service life of your hydraulic products.

The Operating Instructions must be directly accessible to one of the personnel at the hydraulic product and kept readily available at all times in a place known to the personnel.

The Operating Instructions must be read and understood and all its provisions observed by those responsible and by the operative personnel. We recommend that a record is made in writing of the employees' familiarisation with all the relevant parts.

The cross-references to directives, standards and regulations contained in this product information refer to the versions current at the time of writing of this product information, which can be obtained from the title page of this product information.

1.3 The contents of this product information

In addition to this document, product information for Rexroth hydraulic products normally includes Operating Instructions consisting of three parts:

- **Part I**, the general Operating Instructions for the relevant class of products
- **Part II**, the Technical Datasheet
- **Part III**, the Product- and Application-specific Operating Instructions.

If you do not have all three parts, please request the missing part from Bosch Rexroth. Only if all the information contained in all parts of the three-part Operating Instructions is observed can safe operation of Rexroth hydraulic products be ensured.

Specific cross-references are used to draw your attention to information that you can find in the Operating Instructions.

The Operating Instructions contain detailed information about the product, including

- Information about the scope of delivery
- Safety instructions
- Technical data and operating limits
- Information about bringing into (first) use and maintenance
- Information about the mode of operation
- Layouts, drawings
- Parts lists if appropriate
- Information about replacement parts and accessories.

2 Scope of delivery and responsibilities

2.1 Scope of delivery and responsibilities of Bosch Rexroth

Rexroth hydraulic products fulfil all safety requirements applicable to fluid power systems and their components.

IMPORTANT

For the scope of delivery and the responsibilities of Bosch Rexroth with respect to the product, please refer to the *Product-specific Operating Instructions*.

2.2 Responsibilities of the plant operator

⚠ CAUTION

If Rexroth hydraulic products are positioned in the vicinity of sources of ignition or strong radiators of heat, protection must be put in place that would prevent any escaping pressure fluid from igniting and the hose lines from aging prematurely.

Mineral-oil-based pressure fluid is hazardous to water and flammable. It may only be used if the relevant safety datasheet from the manufacturer is available and all the measures stipulated therein have been implemented.

If there is a risk of fluid leaking from the hydraulic product and contaminating water or the ground, the hydraulic product in question must be placed in a suitable collecting trough. In connection with this, the applicable statutory regulations must be observed.

You must also observe the EU directives for the use of work equipment (Directive 89/391/EC) and the associated individual directives, especially Directive 1999/92/EC for the protection from the danger arising from potentially explosive atmospheres and their implementations in national legislation. The legislation contains minimum requirements with respect to the making available by the employer of work equipment and for the use of work equipment by employees at work, including the regulations for operating equipment requiring supervision and the obligation to produce explosion protection documentation. This involves, for example, dividing areas endangered by potentially explosive atmospheres into zones and specifying suitable work equipment and procedures for these areas.

2.2.1 Noise protection

The A-weighted equivalent continuous sound power level of Rexroth hydraulic products can be obtained from the relevant *Operating Instructions*. If no values are documented then it can be taken that the value is less than 70 dB(A).

Installation of Rexroth hydraulic products in a machine or system may increase this value, and if so, the manufacturer of the machine/system must document this.

At or above 85 dB(A), the plant operator must make suitable hearing protection available to the personnel.

2.2.2 Special points concerning the installation of certain products

A Rexroth hydraulic product is intended above all for installation in machines, systems and power units as a part machine or a component for installation into another machine or system and is not a complete machine in the sense of the EU directive. In addition to the Machinery Directive, still further directives may apply, such as the Pressure Equipment Directive or the Explosion Protection Directive.

A wide range of dangers can arise from the combined actions of the hydraulic product and the machine or system in which the hydraulic product is installed. Therefore you must always make sure that the hydraulic product is also suitable without restriction for the proposed application at the installation location. The interfaces with the overall machine and the operating conditions are also of the greatest importance. We recommend that the results of the hazard analysis (risk assessment) of the overall machine are taken into account in the design of the hydraulic product.

The functioning of the hydraulic product is also influenced by the machine or system in which it is installed.

For this reason, you must also always observe the Operating Instructions of the overall system in which your hydraulic product is installed. It is most important for you to also consider the possible use of the hydraulic product in a potentially explosive atmosphere (see 94/9/EC).

IMPORTANT

Bosch Rexroth points out that, at the time of their first introduction on to the market, hydraulic products comply with the requirements of all relevant EU directives and/or their implementation into national legislation in Germany. If the scope of delivery is intended to be installed in a machine or system, then the Machinery Directive applies as appropriate – including the then currently applicable amendments – in that the scope of delivery does not necessarily comply with the requirements of the Machinery Directive because the scope of delivery is intended for installation in a machine or because the scope of delivery is intended for combination with other machines into a machine or a hydraulic system.

The bringing into use of the scope of delivery shall therefore not be permitted until the machine or system in which the scope of delivery is to be installed or of which it represents a component complies with the requirements of all relevant EU directives.

Details of further responsibilities can be found in *3 Important basic safety instructions* and in the *Operating Instructions*.

2.3 Liability, guarantee, warranty

Bosch Rexroth shall not be liable for damages that result from non-compliance with or disregard of these and other parts of the Operating Instructions.

Unauthorised tampering shall render the warranty null and void.

Bosch Rexroth shall only be liable if the scope of delivery was shown to be defective. Bosch Rexroth shall not be liable if a deficiency occurs that involves parts having been replaced by the customer with equivalent but not identical parts as specified by the manufacturer.

Please refer to our general terms of supply or your contract for details of the guarantee and manufacturer's warranty.

2.4 Copyright

This product information may only be reproduced – electronically or mechanically, in whole or in part – with the express written permission of Bosch Rexroth. It may likewise not be distributed, amended, transmitted, translated into another language or employed or copied for other purposes or by other parties without such consent.

3 Important basic safety instructions

3.1 What to do in an emergency

In the event of an emergency, fault or other abnormal occurrences:

1. Switch off the hydraulic system.
2. Secure the main switch against being unintentionally switched on again.
3. Secure the danger area so that no one can enter the danger area unknowingly or uncontrolled.
4. Notify the relevant specialist personnel immediately.
5. In the event of fire, observe the provisions of the safety datasheets issued by the manufacturer of the pressure fluid and the fire precautions specifically applicable to your place of work, which must be documented in the plant operator's operating manual.

⚠ WARNING

Fighting fires with materials other than those permitted can lead to explosions and/or more rapid spread of the fire!
Danger to life from smoke inhalation!

3.2 Safety labelling on the hydraulic product

IMPORTANT

- The meanings of the safety labelling on the Rexroth product are explained in the *Operating Instructions*.
- For a diagram of the nameplate and an explanation of the information on it please refer to the *Operating Instructions*.

3.3 Proper use

Rexroth hydraulic products are designed and constructed for the provision, transmission, control or regulation of energy and signals using the flow of oil.

Unless otherwise agreed, the Rexroth hydraulic product satisfies at least safety category B in accordance with EN 954-1.

If the hazard analysis/risk assessment of the overall machine in which the Rexroth hydraulic product is to be installed indicates that a safety category higher than category B in accordance with EN 954-1 is required for the Rexroth hydraulic product, then a correspondingly higher rated hydraulic product can be supplied and installed only after special agreement with Bosch Rexroth.

IMPORTANT

The hydraulic product shall be operated exclusively with pressure fluids complying with DIN 51524. Where other pressure fluids are permitted, for example brake fluids for brake valves, this is specially mentioned in the *Operating Instructions*.

For details on proper use see *4 Technical data and ambient conditions*.

The following information can be found in the *Operating Instructions*:

- the proper use, specific to the hydraulic product
- where applicable, the safety category in accordance with EN 954-1
- non-permitted and improper use.

3.3.1 Proper use, requirements before operation

- Rexroth hydraulic products may only be operated if they are in perfect technical condition.
  - In the event of disturbances in the power supply and/or damage to the electrical equipment, switch off immediately and secure the main switch against being switched on again without authorisation.
  - Report and rectify all faults and damage indicated by the system or discovered by other means.
- The connections, operating conditions and performance data specified in the *Operating Instructions* must be observed and never changed.
- Rexroth hydraulic products shall not be converted or otherwise modified without prior consultation with Bosch Rexroth.
- The plant operator shall not modify the program code of programmable control systems.
- Dependencies and time factors shall not be modified without prior consultation.
- The safety devices fitted by Rexroth must be present, properly installed and in full working order – except when this is impractical during setting up or maintenance work. They shall not be relocated, bypassed or rendered ineffective.
- Safety components such as limit switches, valves and other control components shall not be rendered inoperative.
- Tamperproof lead seals installed by the manufacturer shall not be removed or damaged except when this is necessary in the course of maintenance tasks defined in the *Operating Instructions.*
- The specified maintenance tasks in the *Operating Instructions* shall be carried out at the intervals stated in the *Operating Instructions*.

- Uncontrolled access by persons unfamiliar with the system to the immediate operating zone of Rexroth hydraulic products is prohibited (even if the product in question has been shut down).
- Rexroth hydraulic products must never be assembled, operated or maintained by persons under the influence of alcohol, drugs or other medication which affect one's ability to react.

3.4 Requirements for personnel, duty of care

3.4.1 Qualifications of specialist personnel

A specialist person is someone who, using his specialist training, knowledge and experience as well as familiarity with the relevant conditions, can

- safely carry out the tasks allocated to him and correctly assess the scope and implications of his work
- recognise possible dangers
- undertake the necessary measures to eliminate possible accidents.

3.4.2 Requirements for hydraulics maintenance personnel

In accordance with DIN 31051, maintenance comprises the individual activities of **inspection**, **servicing** and **repair**. All personnel involved in maintenance shall be familiar with and observe all parts of the Operating Instructions and this product information.

Inspection personnel shall fulfil the following requirements:

- They have been instructed in the relevant activity.
- Specialist knowledge of hydraulics is not required for purely inspection activities but the personnel must be aware of the particular dangers associated with hydraulic products.

Servicing personnel (who carry out filter and oil changes, for example) shall fulfil the following requirements:

- They have been instructed in the relevant activity.
- Specialist knowledge of hydraulics is not required to carry out servicing work.

Repair personnel shall fulfil the following requirements:

- The personnel must be hydraulics experts, who have been instructed and meet the definition given above,
- Repair personnel must be familiar with the function of the hydraulic system as a whole, from subsystems to their interaction with the function of the entire machine.
- Repair personnel must be able to read hydraulic circuit diagrams, interpret individual functions from their symbols and understand function diagrams.
- Repair personnel must possess knowledge of the function and construction of hydraulic elements.

3.4.3 Requirements for electrical maintenance personnel

All work on electrical equipment shall only be carried out by an authorised, qualified electrician, or by instructed persons under the guidance and supervision of a qualified electrician, in accordance with the rules applicable to electrotechnical products.

3.4.4 Minimum age

Persons under the age of 18 who are currently receiving instruction or training or are working under supervision may not work on Rexroth hydraulic products.

This does not apply to young persons of 16 or over if

- working on Rexroth hydraulic products is necessary in order for them to accomplish a training objective
- their protection is guaranteed by the supervision of an experienced, competent person
- they are allowed to use only tools, work implements and protective gear that preclude the risk of injury.

3.4.5 Training

The plant operator using Bosch Rexroth hydraulic products shall train his personnel regularly in the following subjects:

- Observation and use of the Operating Instructions and legal requirements
- Proper operation of the Rexroth hydraulic product
- Observation of the instructions of safety officers and the plant operator's operating manual
- What to do in an emergency.

IMPORTANT

Bosch Rexroth can provide you with training support in specialist areas.

An overview of the training can be found on the Internet at **http://www.boschrexroth.de/didactic**.

3.5 General ancillary dangers and protective measures when operating hydraulic products

⚠ DANGER

In the interests of your safety, all safety instructions shall be carefully observed, especially those in the Operating Instructions.

In spite of the high intrinsic safety of Rexroth hydraulic products, the risk of personal injury or damage to the environment cannot be excluded, even when the equipment is properly used.

New, additional dangers may arise if the hydraulic product is installed in another machine or installed with other machines in a system. This shall apply in particular to mechanical movements generated by the hydraulic product.

Information on these additional dangers can be found in the overall operating manual of the supplier of the overall system in which the hydraulic product is installed.

3.5.1 Dangers from pressure fluid

⚠ CAUTION

Handling pressure fluid without protection is **hazardous to health**.

Please observe the manufacturer's safety instructions and the safety datasheets for the pressure fluid that you are using.

⚠ DANGER

Serious damage to health or death may result if pressure fluid enters the blood stream or is swallowed. If this occurs, contact a doctor immediately!

3.5.2 Malfunctions due to contamination of pressure fluid

Contamination of the pressure fluid can be caused by:

- Wear during operation of the machine/system (metallic and non-metallic abrasion)
- Leaks of the hydraulic product
- Contaminants introduced during servicing/repair
- The use of dirty (unfiltered) pressure fluid when the pressure fluid is changed.

Contaminants lead to malfunctions, increased wear and shorter service life of the hydraulic product. This can have negative effects on the safety and reliability of the hydraulic product.

Therefore the maintenance tasks specified in the *Operating Instructions* shall be carried out at regular intervals and the utmost cleanliness is required during work on the hydraulic product.

⚠ CAUTION

When changing the pressure fluid, always use factory-fresh pressure fluid and filter it before filling to remove any contaminants in the pressure fluid that it often contains from the packaging container (drum). Flush out lines and hoses before installation.

The cleanliness class of a pressure fluid is specified in accordance with ISO 4406. Detailed information can be obtained from the relevant datasheet or the *Operating Instructions*.

In older datasheets, the cleanliness class is sometimes specified in accordance with NAS 1638. The following table can be used to convert this to an equivalent ISO 4406 cleanliness class:

Comparison table for cleanliness classes

Earlier class to NAS 1638	Current class to ISO 4406 (c)
Class 7	Class 18/16/13
Class 9	Class 20/18/15

3.5.3 Electrical dangers

When working on electrical systems:

- De-energise the hydraulic system before beginning any maintenance work.
- Cordon off the working area with red-white safety chain and warning signs.
- Lock the main switch, remove the key and keep it in a safe place until the work is completed.
- Attach a warning sign to the main switch.
- Check that there is no voltage using a **two-pole** voltage detector.
- Earth and short-circuit the point where you are working.
- Cover neighbouring live parts.
- Clear your workplace to prevent contact with live parts as a result of tripping or slipping. Wear safety footwear.
- Always use electrically insulated tools.
- Disconnect plugs at sensors and valves – even those with low voltages – after the system has been de-energised.

⚠ DANGER

Even after disconnection of the electrical supply (main switch OFF) the following supply systems/danger areas can still give rise to life-threatening voltages:

➢ Electrics, electronics, hydraulics (e.g. accumulators, rechargeable batteries)

➢ Main switch

➢ Power supply cables

➢ Points identified with an electric shock warning sign.

3.5.4 Product-specific ancillary dangers

All product-specific ancillary dangers and precautions can be found in the relevant *Operating Instructions*.

3.5.5 Disposal

➢ Take metal, cable and plastic ducts to a recycling materials collection centre.

➢ Dispose of electronic components as electronic waste.

➢ Dispose of back-up batteries as special waste.

➢ Cleaning agents, operating fluids and other materials:

⚠ CAUTION

Please observe the disposal regulations specified in the appropriate *Safety Datasheets.*

4 Technical data and ambient conditions

IMPORTANT

The product-specific technical data, operating limits and ambient conditions for the operation of your Rexroth hydraulic product can be found in the *Operating Instructions*.

This includes the following information:

- Minimum flow rate for adequate cooling
- Permissible maximum temperature of the coolant
- Performance data
- Type of control and regulation functions
- Permissible pressures, flow rates
- Connections.

4.1 Information about pressure fluids

Unless otherwise indicated in the Operating Instructions, the following specification applies to the pressure fluid to be used:

- Mineral-oil-based pressure fluid complying with the requirements of DIN 51524.
- Operating temperature range 0 °C…+80 °C (in tank < 72 °C).

Any deviations from this can be found in the *Operating Instructions*.

IMPORTANT

Bosch Rexroth recommends a maximum operating temperature of 55 °C, because the rate of ageing of the pressure fluid increases and the service life of the seals and hoses is reduced at higher temperatures.

- Viscosity ranges:
  see RE 07075 and RE 90220
- Max. permissible contamination class of the pressure fluid in accordance with ISO 4406: see *3.5.2 Malfunctions due to contamination of pressure fluid*.

The maximum permissible cleanliness class can be found in the *Operating Instructions*. The following types of pressure fluids shall be used.

IMPORTANT

Rexroth hydraulic components are tested with test oil MZ45 manufactured by ESSO (class ISO VG 46 at 40 °C), (Viscosity η = approx. 46 mm²/s).

4.2 Ambient conditions

4.2.1 Use in potentially explosive atmospheres

⚠ DANGER

Rexroth hydraulic products shall be used in potentially explosive atmospheres only if they are designed for this purpose and this is expressly stated in the *Operating Instructions*.

IMPORTANT

Directive 1999/92/EC of the European Parliament and Council dated 16 December 1999 concerning the minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres governs protection from danger from potentially explosive atmospheres. Observe the requirements contained in the regulations for operating equipment requiring supervision and the obligation to produce explosion protection documentation.
This involves, for example, dividing areas endangered by potentially explosive atmospheres into zones and specifying suitable work equipment and procedures for these areas.

Observe the requirements of *Directive 94/9/EC of the European Parliament and Council dated 23 March 1994 on the approximation of laws of the member states concerning equipment and protective systems intended for use in potentially explosive atmospheres* (ATEX Product Directive) and/or the corresponding national legislation by means of which the Directive was implemented in law in the EU member states. The directive contains requirements for the use of equipment and protective systems in potentially explosive atmospheres.

4.2.2 Climatic operating conditions

Unless otherwise indicated in the Operating Instructions, the permissible ambient temperature

- for control units: 0 °C…+50 °C
- for drive units with electric motors without heat exchangers, surface-cooled by free air circulation: 0 °C…+30 °C
- for drive units with heat exchangers: < +40 °C.

Unless otherwise specified, Rexroth hydraulic products are designed for use in temperate climate zones and in covered areas (not in the open air) at relative air humidities of < 70 % and at room temperatures of 22 °C.

IMPORTANT

For systems with oil-air heat exchangers:
Observe the information given in the circuit diagram in the *Operating Instructions*.

In relation to the electronic equipment, the permissible ambient conditions apply to installed and protected electrical connections of class IP 55.

- Ambient temperature +5 °C…+40 °C
  assuming that the average air temperature over a 24 hour period does not exceed +35 °C.
- Relative air humidity: 23…95 %, non-condensing.
- Altitude: up to 1000 m above national datum.

⚠ DANGER

Rexroth hydraulic products shall not be used in aeronautical equipment, except where they have been specially approved and appropriately labelled to this effect.

5 What you need to know about pressure fluids

5.1 How to handle pressure fluids safely

⚠ DANGER

Mineral-oil-based pressure fluid is hazardous to water and flammable.
It may only be used if the relevant safety datasheet from the manufacturer is present and all the measures stipulated therein have been implemented.

5.2 Functions and effectiveness

Due to the many tasks of pressure fluid, its selection, inspection and maintenance are of vital importance for:

- proper functioning
- operating safety
- service life
- and the cost effectiveness of the hydraulic product.

The tasks of pressure fluid:

- to transmit hydraulic energy from the pump to the hydraulic cylinder/motor
- to lubricate parts moving against one another
- corrosion protection
- to remove contaminants
- to remove locally accumulated heat.

5.2.1 Reduced function due to ageing

The effectiveness of pressure fluid diminishes as it ages (undergoes chemical changes). Acids and resinous residues form, which may cause valve spools to stick.

The following factors accelerate the ageing process:

- high temperatures
- oxygen in the pressure fluid
- air humidity
- water
- metallic catalysers
- operating pressure
- contaminants.

IMPORTANT

Observe the following rules of thumb:
At pressure fluid temperatures >70 °C, the rate of ageing doubles for each 10 °C.

5.3 Viscosity

5.3.1 Viscosity grades

The most important characteristic of a pressure fluid is its viscosity, i.e. stickiness. Viscosity range always plays a priority role in the selection of a pressure fluid.

Viscosity is measured in the SI unit [mm^2/s]. Many manufacturers still provide their information in centiStoke [cSt], the equivalent of [mm^2/s].

The viscosity grades (VG = viscosity grade) in accordance with ISO 3448 relate to the viscosity at 40 °C. The viscosity grade is appended to the type designation or the commercial name of the pressure fluid.
Example: A pressure fluid with a viscosity grade of ISO VG 46 has a viscosity of 46 mm^2/s at 40 °C.

The relationship between medium temperature and viscosity for hydraulic oil (example)

Medium temperature	Viscosity
3 °C	800 mm^2/s
8 °C	500 mm^2/s
25 °C	100 mm^2/s
60 °C	20 mm^2/s
77 °C	12 mm^2/s

Too high a viscosity leads to the formation of air and vapour bubbles as a result of low pressure (cavitation). Too low a viscosity leads to increased leakage losses. Increased leakage losses cause the pressure fluid to heat up more, leading in turn to a further reduction in viscosity. The pressure fluid then loses its ability to lubricate.

Valves, pumps and hydraulic motors, in particular, require exact compliance with the defined viscosity ranges.

For certain ambient and operating temperatures, not all the requirements can always be covered with the available ranges of the viscosity grades.

In order to comply with all the requirements, high viscosity pressure fluids with viscosity index improvers or a pressure fluid cooler/heater may be used.

5.4 Leakage fluid

Clearances and play mean that some leakage fluid escapes from all hydraulic products. Leakage fluid can be lead away internally or externally, depending on the component. It can be fed back into the tank or must be disposed of.

⚠ CAUTION

Make sure that the leakage fluid is fed back into the tank in a proper manner.
Dispose of leakage fluid that is not fed back into the tank properly, in compliance with the applicable environmental protection regulations.

5.5 Topping up/refilling

⚠ CAUTION

When topping up/refilling your hydraulic system, make sure that you use pressure fluid of the same sort and type and from the same manufacturer.

If the fluid is heavily contaminated or prematurely aged, then the system, including the tank must be cleaned and flushed before refilling. New pressure fluid must always be filtered in accordance with the required cleanliness class, as it does not normally meet the required cleanliness class in the as-supplied state.

6 Construction and mode of operation of a hydraulic system

6.1 Definitions of terms

Hydraulics (fluid technology)

Transmission, control and distribution of energy and signals using a pressurised fluid medium.

Hydraulic system

Arrangement of interconnected components for transferring and controlling hydraulic energy.

Component

A single unit (e.g. a valve, filter, cylinder, motor) that consists of one or more parts and which is a functional constituent of a hydraulic system.

Drive

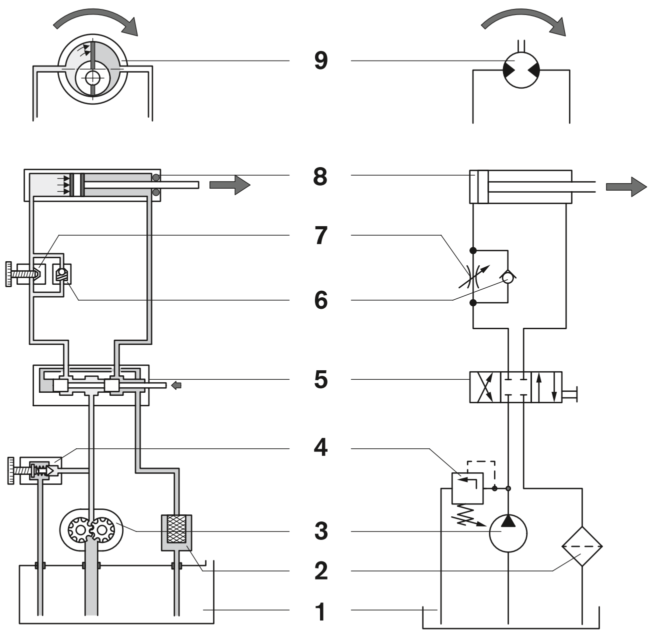
A component that converts the energy of the hydraulic fluid into mechanical energy (e.g. motor, cylinder).

6.2 Schematic

In a system operated with hydraulic oil, first of all mechanical energy is converted into hydraulic energy, transported and controlled in this form, to finally be converted once more into mechanical work.

The hydraulic elements are arranged in accordance with these functions. The following diagram shows a schematic representation of the elements of a complete hydraulic system.

To demonstrate their operating principle, standardised symbols (ISO 1219) are used instead of sectional diagrams of the various devices. Line connections are represented by simple lines, as can be seen in the example.



1	Tank	Oil preparation
2	Filter	
3	Pump	Energy conversion
4	Pressure limiting valve	Energy control
5	Directional valve	
6	Check valve	
7	Throttle valve	
8	Hydraulic cylinder	Energy conversion
9	Hydraulic motor	

6.3 Safety concept

Hydraulic products contain sensors and actuators, the interaction of which is particularly important with regard to the fulfilment of technical safety functions.

Individual hydraulic products form part of an overall safety concept.

Applications required to perform safety functions are designed using special hydraulic components that satisfy the requirements of the relevant directives, such as the Pressure Equipment Directive and other standards.

The manufacturer of the overall machine or system defines and bears responsibility for the safety category to EN 954-1 to be fulfilled.

IMPORTANT

A more detailed description of the safety concept and the specific safety components installed can be found in the *Operating Instructions* and the *Operating Instructions of the supplier of the overall system* in which the hydraulic product is installed.

7 Moving hydraulic units/components

Hydraulic units or components may be moved by a fork-lift truck or a hoist, depending on their size and the local conditions.

IMPORTANT

For details see the *Operating Instructions*.

⚠ CAUTION

Always ensure hydraulic products are empty of pressure fluid for transportation.

Rexroth hydraulic products are delivered empty of pressure fluid. However, products may contain oil residues left over from the final inspection at our factory.

8 Storage and longer standstills

8.1 Hydraulic systems - subsequent bringing into use after storage

Corrosion, especially oxidation, can cause metal surfaces to lose the standard of surface finish required for the hydraulic system to function properly.

Rust and other metallic and non-metallic particles lead to abrasive wear (erosion), which detrimentally affects the functioning of the hydraulic system.

⚠ CAUTION

If a hydraulic system is to be brought into use again following a long standstill, it must first be flushed clean.

8.1.1 Factory-applied corrosion protection

Rexroth hydraulic products are tested in accordance with Class III using a hydraulic oil that has additional anti-corrosive properties. The film of oil that remains in the product after the test provides sufficient internal corrosion protection.

This factory lubrication ensures that valves do not stick during subsequent use of the hydraulic product, and guarantees compatibility with seals and the pressure fluid to be used.

IMPORTANT

The factory-applied corrosion protection is adequate provided that

- ➢ no condensation or leakage water can enter the system
- ➢ long standstills are avoided.

Contact Bosch Rexroth if you are not clear about the consequences of long standstills on the state of the hydraulic product.

8.1.2 Storage times in relation to the ambient conditions

Delays in bringing into use, long shipping and storage times or long periods of non-use can lead to rust formation in Rexroth hydraulic products. Additional corrosion protection measures must be implemented to prevent this.

IMPORTANT

If all the openings on the hydraulic products are not sealed so as to be air-tight, this will reduce the storage life of the hydraulic product by nine months.
After the specified storage time has expired, in any event not longer than 24 months, the corrosion protection must be checked and further conservation measures applied if necessary.

8.2 Seals, hoses and hose lines

⚠ CAUTION

Seals:
Observe the requirements of ISO 2230 and/or DIN 7716 and the specific manufacturer's data on seals.

Hoses and hose lines:
In the Federal Republic of Germany, please observe the requirements of *DIN 20066, ZH 1/74 Safety rules for hydraulic hose lines* and the specific manufacturer's data on hoses and hose lines.

In addition, the following conditions shall be observed:

- Seals, hoses and hose lines are stored in cool, dry and dust-free conditions.

The hoses and hose lines can be enclosed in plastic foil to ensure low-dust storage conditions. Ideal storage conditions for hoses and hose lines are temperatures from +15 °C to +25 °C and a relative humidity of below 65 %.

- Do not store elastomers below –10 °C. The ideal storage conditions for seals are temperatures from +10 °C to +20 °C and a relative humidity of between 65 % and 75 %.
- Store hoses and hose lines in the original packaging if possible. Prevent the entry of air.
- Avoid direct sunlight and UV radiation and shield from nearby sources of heat.
- Darkened storage locations are preferred.
- Do not use ozone-forming light sources or equipment (e.g. fluorescent lamps, mercury-vapour lamps, copiers, laser printers) or electrical spark-forming devices in the vicinity of hoses and hose lines.
- Seals, hoses and hose lines must not come into contact in particular with materials or vapours that could damage them (e.g. acids, alkalis, solvents).
- Store seals, hoses and hose lines lying down and free from tension. If the hoses and hose lines are coiled, take care not to bend them to less than the smallest bending radius specified by the manufacturer.

Maximum storage times

- NBR seals: 4 years
- FKM seals: 10 years
- Hoses: 4 years
- Hose lines: 2 years

For reasons of safety, seals, hoses/hose lines shall not be used once these permissible storage times are reached or exceeded. Permissible storage times could be considerably reduced if the permissible storage conditions are not maintained. If you are not clear about the storage times and/or storage conditions then you should not use the product.

9 Assembly and bringing into first use

IMPORTANT

Only the permissible pressure fluids given in the Operating Instructions are to be used. Information on other pressure fluids can be found in the *Operating Instructions* or are available on request.

Filling the pressure fluid tank must always take place through a suitable filter unit. Experience has shown that even new pressure fluid can often have more than the maximum permissible level of contamination.

All information specific to assembly and bringing into first use can be found in the *Operating Instructions*.

Pay attention to cleanliness:

- ➢ Do not use cleaning wool or cloths containing fibres for cleaning.

  Depending on the condition of the system or machine, cleaning with fibre-free cloths may be sufficient. Use suitable liquid cleaning agents to remove lubricants and other stronger contaminants. Make sure that cleaning agent does not get into the hydraulic system.
- ➢ Never use hemp and putty as sealants.

The functional or failure behaviour of identical hydraulic products may vary due to conditions specific to the machine or system in which the hydraulic product is installed (mass, speed, electrical triggering at setpoint values, etc.), see also Section *11 Trouble-shooting*.

9.1 Safety advice for assembly and bringing into first use

⚠ DANGER

Hydraulic products are generally intended for installation in machines/systems or devices.

The function of the hydraulic product must therefore always be seen in relation to the function of this machine – i.e. seemingly identical hydraulic products may demonstrate different functional behaviours as a result of the function of the machine in which they are installed.

For this reason, a hydraulic drive must not be brought into use until it has been determined that the machine in which it is installed conforms to EU standards.

Do not bring hydraulic drives into use until you have familiarised yourself completely, firstly with the function of the hydraulic product and hydraulic equipment and secondly with the hydraulically powered machine functions, and have clarified and dealt with any possible dangers.

Bringing into (first) use shall only be done by an instructed, authorised hydraulics expert who has the required specialist knowledge.

Specialist hydraulics knowledge means, among other things, that the person can read and fully understand hydraulics drawings. In particular, he must fully comprehend the range of functions of the integrated safety components as part of the overall safety concept.

9.2 Before bringing into first use

1. Check the scope of delivery for transport damage.
2. Check that the Operating Instructions for the Rexroth hydraulic product are present and complete.
   Contact us if the Operating Instructions are not there or are incomplete.
3. Assemble the hydraulic product.
   - Observe the *Operating Instructions* and this product information.
   - Assemble the hydraulic components, so that they are mounted strain-free on even surfaces.
   - Tighten the fastening bolts evenly using the specified tightening torque.
4. Ensure that the interfaces of the system/machine and the installation conditions provide for safe operation of the hydraulic product. If in doubt, consult the people responsible for the overall system/functional machine.
5. Check the construction of the hydraulic product against the circuit diagrams, lists of equipment and assembly drawings. If there are any differences, draw this to the attention of the people responsible. If important documents are missing, they can be requested from Bosch Rexroth. Only documents issued by the bodies authorised to do so shall be used.
6. Based on the *Operating Instructions* for the system or machine in which the hydraulic product is installed, check whether bringing the hydraulic system into use could lead to uncontrolled, dangerous movements. Where appropriate, take into account the hazard analysis/risk assessment for the system or machine.
7. Take the precautions appropriate to the anticipated dangers, e.g.
   - Ensure that the cylinder piston rod can move out without danger.
   - Use a hoist or other lifting device to additionally secure lifted loads.

8. As part of bringing into (first) use, check whether the electric motors and valve solenoids can be switched manually using the electrical controls of the system/machine. If they cannot be switched manually – or can but with difficulty – you must provide a remote control (e.g. test boxes for Rexroth proportional valves) for the internal function test of the hydraulic system.

IMPORTANT

Starting up the hydraulics solely by means of emergency manual operation is not recommended, as several valves at once cannot be switched as required in the correct sequence.

9. Draw up a sequential program for bringing into (first) use and store it with the technical documentation as an appendix to the Operating Instructions.
   For this you should consider the following:
   Hydraulic drives basically consist of the following functional groups
   - Pump circuit (generation of pressurised oil flow); pump, electric motor, oil tank, filters, monitoring devices, etc.
   - Control system for at least one hydraulic consumer (cylinder, motor); directional control valves, pressure and flow control valves, check valves
   - Hydraulic consumers (cylinders, motors) with specially assigned valves, e.g. braking valve.

10. Divide the functional circuit diagram into separate mini-circuits that can each be started up in succession.
11. Read the functional circuit diagram and seek clarification of any unclear text or diagrams. More information about the functioning of components, e.g. a pump regulator, is available in the *Technical Datasheet*.
12. Establish into which position valves are to be switched, or how valves are to be set.
13. Put up any necessary directional, prohibitive or informative signs and check whether the meaning of these signs are explained in the *Operating Instructions*.
14. Follow this sequence for bringing into (first) use
   - Pump circuit
   - Parts of control system:
     e.g. pressure cut-off and switchover,
     open centre,
     pressure reduction etc.
   - Cylinder and motor circuits:
     First move,
     fill and bleed,
     then finally optimise all settings.

9.3 Bringing into first use, subsequent bringing into use

⚠ DANGER

Before bringing into (first) use, have all pressure accumulators and safety systems checked by an expert or specialist in accordance with national regulations.

1. Clean the lock on the transport and storage container before opening.
2. Clean the hydraulic unit and all other component groups, so that no dirt can get into the hydraulic system during bringing into (first) use.
3. Check the paint on the tank for integrity.
4. Flush the connection lines to remove dirt, scale, chips etc.
5. Pickle and flush welded pipes.

   ⚠ CAUTION

   Remove all residues of water and cleaning agents before performing further work.

6. Clean the interior of the hydraulic components to get rid of contaminants:
   - Clean the filler plug of the pressure fluid tank.
   - Remove dust and chips using an industrial vacuum cleaner, by rinsing parts or similar cleaning method.
   - Completely remove any oil residues left over from the factory test.
   - Remove any gummed oil which may have formed due to incorrect storage.

7. Connect up all connection lines.

   ## IMPORTANT

   Observe the installation instructions from the manufacturer of the connection components.

   ⚠ DANGER

   Make sure that pipes and hoses are connected at all ports or that the ports are sealed with screw plugs.

8. Carry out a special check to make sure that the union nuts and flanges are correctly tightened at the pipe connections and flanges.

IMPORTANT

Mark all the checked connections, e.g. with paint.

Make sure that all pipes and hoses and every combination of connection pieces, couplings or connection points with hoses or pipes are checked for their operational safety by someone who has the appropriate knowledge and experience.

9. Connect the hydraulic consumers. Dimension the connection lines in accordance with the performance data in the *Circuit Diagram* and the *Operating Instructions*.
10. Install the electrical system for the drive and control system:
    - Check the connected loads.
    - Connect coolant water if necessary.
    - Check the direction of rotation of the pumps (e.g. as indicated by attached arrow markings).
11. Check the pressure fluid to ensure that no water has entered it.
12. Before filling the pressure fluid tank, please observe the following requirements:
    - ➢ The pressure fluid must conform to the specification in the *Operating Instructions*.

⚠ CAUTION

Never fill new hydraulic products with used pressure fluid.

➢ The drums of pressure fluid must be sealed and clean on the outside.

IMPORTANT

If the pressure fluid has a high level of initial contamination (see *4 Technical data and ambient conditions*):

Use a filter unit to fill the pressure fluid tank. Ensure that the filter element is clean.

IMPORTANT

The fineness of the filter shall correspond to the cleanliness class required by the overall system and if possible be even finer.
The filter unit used shall fulfil the requirements for functional safety and service life.

- If possible, fill the pressure fluid tank via a filling coupling, using a return filter if possible.

⚠ CAUTION

Use oil filler units (filter units) suitable for pressure fluids.

- Do not remove the filter strainers from filler necks or the filter element from filters before filling the pressure fluid tank.

13. Fill the pressure fluid tank up to the upper mark on the inspection window. Observe the maximum fluid level, taking into consideration the volume in the connection lines and hydraulic consumers.
14. Set the pressure and flow control valves, pump regulator, signalling elements such as pressure switches, limit switches and temperature regulators to the settings and values defined in the sequential program (see *9.2 Before bringing into first use*).

⚠ DANGER

Do not change the settings of valves with a safety function, valves with a position switch or valves with preset electronics.

- Set operating-pressure valves and flow control valves to the lowest possible values.
- Set directional control valves to their basic setting.
- Reduce the setpoint values of proportional valves to minimum values.
- Do not remove the tamperproof lead seals. Damaged or removed tamperproof lead seals indicate improper use of the hydraulic product.

15. If applicable:
    Fill the pressure accumulator to the specified gas pre-charge pressure and then check the pressure, see *Operating Instructions*.
16. Fill the pump body:
    Use the leakage oil port to fill pump bodies that have this feature, see *Operating Instructions*.
17. If applicable:
    Open the cocks in the suction line.
18. Start the drive motors:
    - With electric motor in jogging mode, allow to start briefly
    - Combustion engines in idle
    - Pay attention to the direction of rotation.

19. Bleed the hydraulics (valve, pump, motor, line, cylinder).

IMPORTANT

Details on bleeding can be found in the *Operating Instructions*.

- Operate the hydraulic product at low pressure until it is fully bled.
- Bleed the hydraulics lines to consumers or measuring points at the highest point, if possible.
- Operate the directional valves in jogging mode.
- Next, advance and retract all hydraulic consumers several times.
- Increase the load slowly. Check the pressure fluid level in the pressure fluid tank. If necessary, top it up with pressure fluid.

Bleeding has been accomplished fully and correctly if the pressure fluid in the tank does not foam, if the hydraulic consumers do not make any jerky movements and if no abnormal noises can be heard.

20. Set the valves and sensors and start up the machine:
    - Set the switching operations of valves with a switching time adjustment/ramp in accordance with the dynamic conditions, see *Operating Instructions*.
    - Finely adjust and optimise the setting of proportional valves without on-board electronics (OBE).

Manufacturing tolerances mean that valves and amplifiers have to be adjusted in line with one another. Valves with in-built electronics (OBE, On Board Electronics) have the valve and amplifiers adjusted in line with one another at the factory.

Amplifiers for valves without OBE are supplied from the factory with a basic setting. Depending on the type of valve and amplifier, you may have to fine-tune the null point and sensitivity before bringing the valve into use.

IMPORTANT

Details on fine-tuning can be found in the *Operating Instructions*.

21. Check the operating temperature after the machine has been running continuously for several hours. Too high an operating temperature indicates that there are faults that need to be analysed and rectified.
22. Rectify any leakages, e.g. by relieving couplings from pressure and then retightening.

IMPORTANT

Apart from moisture, which should not be sufficient to form one drop, no measurable, unintentional leakage shall be found.

23. After bringing the machine into first use, have a sample of the pressure fluid analysed to ensure that it achieves the required cleanliness class. Change the pressure fluid if the required cleanliness class is not achieved.
    If the pressure fluid is not tested in the laboratory after bringing the machine into first use:
    Change the pressure fluid.
24. Replace the pressure fluid filter.
25. Document and file all set values.

⚠ DANGER

26. To ensure the safety of persons and the system, after bringing the machine into first use, perform the following tests using the defined maximum values:
    - Function test
    - Pressure test.

    Prepare a record of the bringing into (first) use or acceptance and have it signed by the plant operator. This record is an important document and requires to be filed.

IMPORTANT

Information on how to perform the function test and pressure test can be found in the *Operating Instructions*.

10 Operation

IMPORTANT

Please refer to the *Operating Instructions* for all information on how to operate the Rexroth hydraulic product.

11 Trouble-shooting

11.1 What to do in the event of a fault

⚠ DANGER

In the event of abnormal occurrences or malfunctions, stop all work on the Rexroth hydraulic product immediately and inform the responsible personnel.

IMPORTANT

A table for product-specific trouble-shooting can be found in the *Operating Instructions*.

If the responsible personnel are unable to rectify the problem immediately:

- Switch off the main switch. If applicable, turn off any combustion engines used as drive motors.
- Secure the main switch against being unintentionally switched on again.
- Inform the machine manufacturer.

11.2 The basic approach to trouble-shooting

The information in this section is intended to help you create the ideal conditions for carrying out trouble-shooting as efficiently as possible.

11.2.1 General conditions

➢ Is all the necessary technical documentation to hand?

➢ If no hydraulic circuit diagram is available:
Can a hydraulic circuit diagram be drawn using the structure, signs and labelling of the equipment?

➢ Are there enough measuring points?

➢ Has the customer provided useful information about how the malfunction manifests itself and about the functional behaviour of the system/component prior to the malfunction?

➢ Is there a machine record book that may document similar malfunctions in the past?

11.2.2 Recommended way of working when trouble-shooting

Successful trouble-shooting for a hydraulic product requires precise knowledge about the structure and method of operation of the individual components.
Where hydraulics are combined with electrics/electronics, in particular, trouble-shooting is rendered more difficult and co-operation between electricians and hydraulic specialists is required.

- Even if you are under time pressure, proceed systematically and methodically.
  Indiscriminate, hasty dismantling and readjustments may, in the worst case, result in the original cause of failure being impossible to determine.
- Make sure that you gain an overview of the function of the hydraulics in respect of the overall system in which the hydraulics are installed.
- Try to find out whether the hydraulics performed the required function in the overall system prior to the occurrence of the fault.
- Try to determine any modifications to the overall system in which the hydraulics are installed:

  ➢ Have the operating conditions or operating range of the hydraulics been changed?

  ➢ Have modifications (e.g. retrofitted equipment) or repairs been carried out on the overall system (machine/system, electrics, control system) or on the hydraulics? If yes: What were they?

  ➢ Have the set values of the hydraulics been changed?

  ➢ Have the hydraulics recently undergone maintenance?

  ➢ Has the hydraulic product/machine been operated improperly?

  ➢ How does the malfunction manifest itself?

- Form a clear picture of the cause of the fault. Ask the machine operators directly, if necessary.
- Document any work undertaken, changed set values, etc.
- Document any amendments/additional information that should be included in the *Operating Instructions*.

11.2.3 Systematic trouble-shooting procedure

- ➢ Is there an inspection and maintenance book which might provide information about the trend of test parameters (e.g. temperature of hydraulic fluid, replacement intervals of filter elements, noises)?
- ➢ Have there been any identical or similar failures in the past?
    - Make a note of causes of failures with a low probability. Only investigate the failure causes you have noted down if all failure causes with a high probability have been proven to be inapplicable.
    - Draw up a list of priorities of the most probable failure causes.
    - Verify these listed failure causes one after the other (by means of theoretical conclusions, disassembly, measurements or tests).
    - Document the causes of failure you have discovered, and note down how you discovered them.

11.3 Trouble-shooting tables

IMPORTANT

The causes of failure in hydraulic systems can be extremely complex. Therefore, general rules for trouble-shooting can only be laid down to a limited degree.

Please refer to the relevant *Operating Instructions* for product specific information about trouble-shooting the Rexroth hydraulic product.

12 Maintenance

12.1 Definitions of terms

The term **Maintenance** as defined in DIN 31051 encompasses all measures to maintain and restore the desired conditions and to determine and assess the actual condition of the technical devices of a system .

These measures are divided into the following categories:

- ➢ Inspection (determining the actual condition)
- ➢ Servicing (maintaining the desired condition)
- ➢ Repair (restoring the desired condition).

The above measures include:

- ➢ Adapting maintenance objectives to suit company objectives
- ➢ Determining appropriate maintenance strategies.

12.2 Safety during maintenance tasks

⚠ DANGER

In the interests of safety, please observe all the following safety instructions carefully and at all times.

- Check safety devices regularly to see that they are working properly.
- Perform all maintenance work properly, completely and within the stipulated periods and make a record of the work.
- Inform all personnel before commencing maintenance work.
- Generously cordon off the maintenance zone before commencing work.
- Inform all persons of ongoing maintenance work by means of the appropriate signs.
  In particular, attach warning signs to the control cabinet, main switch, actuators and points of access.

If you have to switch off the hydraulic product, secure it against being unintentionally switched on again as follows:

- Switch off all drives, disconnect the hydraulics from the mains at the main switch.
- Depressurise the hydraulic product (relieve any pressure accumulators of pressure).
- Secure the main switch against being unintentionally switched on again.

Before undertaking any manual intervention in the Rexroth hydraulic product:

⚠ DANGER

Please refer to the *Operating Instructions* for all the necessary information on depressurisation and on those parts of the Rexroth hydraulic product that are not depressurised automatically.

- **Advance all cylinders to their safe end position.**
- **Lower all loads.**
- **Switch off all pumps.**
- **Mechanically support vertical cylinders so that they cannot drop. Never perform any maintenance work on raised units without external support.**
- **Relieve any accumulators of pressure in the proper manner.**
- **Switch off the pressure supply and secure the hydraulic product against being inadvertently switched on again.**
- **Ensure that only authorised personnel remain in the work zone.**
- **Wear safety glasses, gloves and boots.**
- **Allow pressure lines and sections of the system which have to be opened to cool down before commencing maintenance work.**
- **Open with care any segments that have to remain under pressure.**

Since check valves are located in the pressure lines above the pumps, the hydraulic system may still be under pressure even after it has been disconnected from the actual pressure supply.

Certain segments, such as servo cylinders, also continue to remain under pressure because the proportional valves remain in the closed position (all valves are illustrated in their basic position in the hydraulics diagram).

Observe the following:

- ➢ Only new, interchangeable and tested components, replacement parts and lubricants in original-equipment quality are approved for use/replacement.
- ➢ For reasons of safety, the installation of used and/or untested components is strictly prohibited and leads to loss of EU Conformity.

Exercise extreme vigilance when operating the hydraulic product in maintenance mode, which may in certain circumstances necessitate the temporary removal of certain safety devices.

Make sure that all safety devices are properly installed and have undergone a function test before bringing the system (back) into use.

- Perform welding, burning or grinding work on the hydraulic unit or its attachments only with the approval of local safety authorities/fire brigade and with suitable protective covering to prevent ingress of contaminants.
- When performing assembly work above your height, use the steps and platforms provided by the plant operator. Do not climb on any parts of the system.
- Remove all tools and materials needed for maintenance from the hydraulic product.
- Always rectify any leakage from the hydraulic product immediately.
- Always inform personnel before (re)starting the hydraulic product.

12.3 Inspection and servicing

The objective of inspection and servicing is

- ➢ To maintain all system functions along with the initial parameters of the system
- ➢ To ensure continual availability of the system
- ➢ To detect weak points
- ➢ To ensure that the system attains the required service life.

IMPORTANT

The following general specifications are based on use of the hydraulic product in central Europe and under the usual operating conditions of commercial and industrial plants.

We strongly recommend the use of an inspection and servicing book, in which all work specific to that site, and all inspection and servicing intervals should be defined and documented.

An inspection and servicing book is also helpful in that

- ➢ It provides comparison values to aid with early detection of malfunctions
- ➢ It allows warranty claims to be dealt with more easily.

⚠ CAUTION

Ensure cleanliness during all work.

- Please observe the requirements for pressure fluids mentioned in Section *9 Assembly and bringing into first use*.
- Clean the external environment of couplings/joints and devices before disassembly. Do not use cleaning wool or cloths containing fibres for cleaning.
- Seal all openings using protective caps.
- Bleed the hydraulic product after each item of servicing work.
- Document and file details of any work undertaken, changed set values, etc.
- Document and file details of any amendments/additional information that should be included in the Operating Instructions.
- Modifications and additions could affect the validity of the EU Conformity Declaration/Manufacturer's Declaration. Always consult Bosch Rexroth about any proposed modifications or additions.

12.3.1 Inspection procedures and test equipment, general

The following are some of the typical inspection and testing procedures that are regularly used in connection with hydraulic systems and components.

IMPORTANT

Keep the indicated typical test equipment ready for this type of work.

Type of test	Typical test equipment	Typical testing activities
Pressure measurement	Pressure gauge or sensor with suitable measuring range and connection pipe and connection coupling	Checking of • specified pressure • opening pressure • pressure difference before and after the object under test
Visual inspection	–	Checks for • all components securely seated • damage • wear • leakage (formation of oil droplets) • presence of all warning and informative signs
Touch inspection	–	Checks for • unusual local vibrations
Temperature inspection	Temperature measuring instrument	Checks for • unusual local temperature zones
Acoustic inspection	–	Checks for • changes in running noise of the unit • changes in flow noise • changes in operating noise in the unit and valve control.

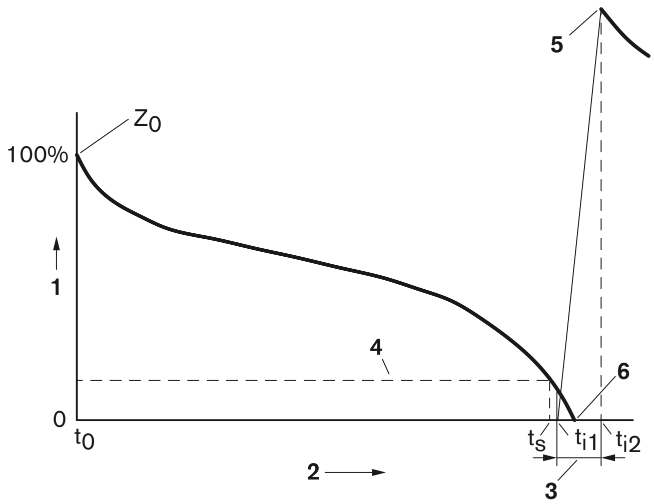
12.3.2 Location of testing and measuring points

IMPORTANT

Please refer to the *Operating Instructions* for the installation location of filling level indicators, filling points, drainage points, filters, testing points, strainers, solenoids, etc. that require regular inspection and servicing.

12.3.3 Inspection and servicing plan, hydraulic products, general

The graph illustrates the concept of wear/wear margin.
The wear margin is a characteristic feature used to describe the condition of the system for the purpose of maintenance.



1 Wear margin Z_0
2 Time t
3 Repair (corrective maintenance) time ($t_{i2} - t_{i1}$)
4 Damage threshold (damage time t_S)
5 Desired condition after corrective maintenance
6 Failure

The reduction in the wear margin reflects wear. The curve represents one possible form of the wear profile during the period of use. It is determined during inspection and varies depending, firstly, on the system itself (e.g. material selection, surface treatment, quality) and secondly on external influences or boundary conditions such as servicing levels, corrosive circulating air and dust. Thirdly, it depends on how the system is operated; whether with partial load or partially with excess load, whether it is subject to surge loads or steady load, etc. Where hydraulic systems are concerned, the curve is also influenced by the cleanliness class and degree of fouling of the pressure fluid, the number of cycles and the ambient conditions.

All the factors mentioned above can exert an influence on the curve but this need not necessarily adversely affect the quality of its information, as wear always signifies the reduction in the wear margin, which is understood to be the primary initial variable before wear commences.

Consequently, this means that a sudden change in the wear margin must also count as wear, and that the element of time on its own is not of decisive importance for wear, but is of considerable interest in the assessment and evaluation of such wear.

An increase in the wear margin to over 100 % above its baseline may be achieved through corrective maintenance, if such measures entail an improvement and this increase is established as the new desired condition for future corrective maintenance.

Certain system parts may be subject to a wear margin which diminishes in such a way that the time available for use is insufficient for the requirements of the plant or operation. In this case, investigations must be carried out to ascertain whether the introduction of suitable technical measures might counter this reduction in the wear margin to a satisfactory extent. The time and expenditure required for such measures must naturally be kept in reasonable proportion to the expected degree of success.

If such conditions arise, we refer to these parts as weak points. Since their elimination may provide economic and safety advantages, weak points require to be rectified immediately.

IMPORTANT

The inspection and servicing plan for your particular product can be found in the *Operating Instructions*.

12.3.4 Inspection and servicing plan, electrohydraulic systems

Electrohydraulic systems with proportional valves must be serviced in accordance with hydraulic requirements and strategies. However, technical control components must also be incorporated in these servicing cycles.

On this basis, an overall strategy for system servicing must be developed and documented.

IMPORTANT

The appropriate component characteristics relevant to servicing can be found in the *Operating Instructions*.

12.3.5 Inspection and servicing plan: electrics and control system

IMPORTANT

The product-specific inspection and servicing plan for electrics and control systems can be found in the *Operating Instructions*.

12.3.6 Lubrication points, lubricants, intervals

IMPORTANT

The details of the specified lubricants, lubrication points and associated lubrication cycles can be found in the *Operating Instructions*.

12.3.7 Set values of valves, regulators and signalling elements

Pressure and flow control valves, pump regulators and signalling elements such as pressure sensors, pressure switches, limit switches and temperature regulators are given their optimum setting when the system is brought into first use.

Check regularly whether all values are correctly set with the aid of the hydraulics diagram and the documented values.

⚠ DANGER

The set values of valves with position switches shall only be calibrated or readjusted at the factory.
The set values of safety valves shall not be altered by the user. Any readjustment shall be performed by authorised testing bodies only.

Too low a pressure difference between the operating pressure and the opening pressure can lead to frequent opening of safety valves. This leads to increased power losses and an unacceptable increase in temperature of the pressure fluid. In this event, select a lower operating pressure.

12.3.8 Replacement of pressure fluid filters and ventilation filters

⚠ CAUTION

Unfiltered pressure fluid filters lead to increased wear of all the system's hydraulic products and can cause functional failures with dangerous effects. Therefore, always replace contaminated oil filters immediately.

Clogged ventilation filters result in inadequate cooling and can therefore cause excessive heating up and malfunctions of the hydraulic system. Therefore, always replace contaminated ventilation filters immediately.

- Clogged filters must always be replaced immediately. Do not clean clogged filters.
- Allow the contents of the replaced oil filter to drip and fully drain.
- Dispose of the filter in accordance with the applicable regulations.

Exact instructions on how to replace a filter can be found in the *Filter manufacturer's instructions for use.*

12.3.9 Checking filters with a contamination indicator

Filters with contamination indicators continuously measure the degree of fouling. The dirt-retention capacity of the filter is utilized to the full.

IMPORTANT

Check the contamination indicator when the pressure fluid is warm (during or immediately after operation).

If the ambient temperature is low or the pressure fluid is cold, its high viscosity may cause clogging to be indicated, although the pressure fluid is in fact clean.

Procedure:

1. Wait until the hydraulic product has reached operating temperature.
2. Press the indicator button (check function):
   If the indicator button pops out again immediately, the filter must be replaced by the end of the shift at the latest.

Due to the progressive loss in pressure as the filter becomes increasingly contaminated, the indicator point has a certain reserve capacity, i.e. generally sufficient for a work shift of 8 h.

If the filter is not replaced after 8 h, dirt may penetrate the system, resulting in contamination of the hydraulic product.

⚠ CAUTION

In certain circumstances the contamination indicator does not show a required filter replacement.

If the check function never indicates filter replacement and the contamination indicator is functioning correctly, this may have the following causes:

- ➢ Faulty filter
- ➢ A bypass valve may have been installed and is not closing correctly, e.g. due to the entry of dirt particles.

12.4 Service and storage lives of hose lines

IMPORTANT

In terms of the service life of hydraulic hose lines in these Operating Instructions, replacement and storage lives are measured from the date of manufacture of the hose line.

Even when properly stored and subjected to permissible loads, seals, hoses and hose lines undergo a natural ageing process.

The replacement and storage lives of seals, hoses and hose lines are therefore limited (see *8.2 Seals, hoses and hose lines*).

⚠ DANGER

Hose lines must be replaced in accordance with the provisions of the servicing plan, even if there are no detectable technical defects in the hose line.

Hoses that have already been used as part of a hose line shall not be reused in a hose line.

The first use may have changed the properties of the hose material to such an extent that reuse of the hose represents a very high risk.

12.5 Topping up the pressure fluid

IMPORTANT

Only pressure fluids specified in the *Operating Instructions* are to be used.

When changing or topping up the pressure fluid, fill the pressure fluid tank on the hydraulic product as follows:

1. Fill the pressure fluid tank using a special filling unit with an integral filter (min. 10 µm).
2. Drop the system pressure right down by resetting the pump. Set the pressure setting value on the pump pressure control to minimum or zero pressure.
3. Fill and bleed the line system of the hydraulic product from the unit to the cylinder. To do this actuate the cylinder in both directions, see *Operating Instructions*.
4. Top up the pressure fluid volume to the specified quantity.
5. Raise the pump pressure to the system pressure.

The hydraulic product is ready for operation.

6. Carry out a test run.
7. Check the level of the fluid after the hydraulic product has warmed up to the operating temperature and adjust if necessary.

IMPORTANT

Check the contamination indicator when the pressure fluid is warm (during or immediately after operation).

If the ambient temperature is low or the pressure fluid is cold, its high viscosity may cause clogging to be apparently indicated.

12.6 Servicing pressure accumulators

⚠ DANGER

Pressure accumulators are subject to the national legislation on safety requirements for pressure vessels applicable in the place of installation.

Observe the Pressure Equipment Directive 97/23/EC.

IMPORTANT

The gas precharge pressure is measured with a testing and filling device.

Details of the procedure can be found in the *Operating Instructions*.

Inspection and servicing

- Carry out the tests required by law.
- Test and monitor the gas precharge pressure regularly.

12.7 Repair

IMPORTANT

Repair (corrective maintenance) is the restoring of the desired condition.

In addition, observe the special safety instructions in *12 Maintenance* and the safety instructions in the *Operating Instructions*.

⚠ DANGER

Ensure cleanliness during all work.

- Clean the external environment of couplings/joints and devices before disassembly. Do not use cleaning wool or cloths containing fibres for cleaning.
- Seal all openings using protective caps.
- Bleed the hydraulic product after each item of repair work.
- If appropriate, follow the procedure for bringing into first use, see *9.3 Bringing into first use, subsequent bringing into use*.
- Document any amendments/additional information that should be included in the Operating Instructions.

12.7.1 General safety instructions for repair work

⚠ DANGER

Repair work shall only be done by an authorised hydraulics expert who has the required specialist hydraulics knowledge.

Specialist hydraulics knowledge means, among other things, that the person can read and fully understand hydraulics drawings. In particular, he must fully comprehend the range of functions of the integrated safety components.

Components may only be dismantled for the purpose of repair to the extent described in the *Operating Instructions*.

Never repair a defective safety valve. It must be completely replaced.

Faulty parts may only be replaced by new, interchangeable, tested components in original-equipment quality. Any deviations from this can be found in the *Operating Instructions*.

Before each subsequent bringing into use after repair work, the hydraulic product shall be accepted by a hydraulics expert.

The operator of the hydraulic product is required to check by means of a servicing record that the inspection and servicing plan as been complied with.

Pressure vessels have to be pressure tested every 10 years and the information recorded in accordance with the Pressure Equipment Directive 97/23/EC or its implementation in national legislation.

13 General information about hydraulic pressure accumulators

13.1 General

The regulations applicable at the place of installation concerning hydraulic pressure accumulators (hydrostatic accumulators) must be observed before bringing into use and during operation.

The plant operator bears sole responsibility for compliance with the existing regulations.

Hydrostatic accumulators are subject to the national implementation of the EU Pressure Equipment Directive 97/23/EC.

Documents supplied with accumulators must be preserved with care; they will be required during recurring inspections by specialists.

The bringing into use of hydrostatic accumulators shall be carried out by trained expert personnel only.

⚠ WARNING

Do not perform any welding, soldering or mechanical work on accumulator vessels.

Welding and soldering carry a risk of explosion!

Mechanical tampering may cause the vessel to burst and the operating permit will be withdrawn.

Do not charge hydrostatic accumulators with oxygen or air. Risk of explosion!

Depressurise the system before working on hydraulic installations.

Improper installation can lead to serious damage to persons and property.

13.2 Safety devices relating to hydraulic pressure accumulators

The equipping, installation and operation of hydrostatic accumulators is regulated by the national implementation of the EU Pressure Equipment Directive 97/23/EC and additionally in the Federal Republic of Germany by the *Technical Regulations for Pressure Vessels (TRB)*. This legislation requires the following safety equipment:

- Device to protect against excessive pressure (prototype-tested)
- Pressure relief device
- Pressure measuring device
- Test gauge connection
- Shut-off device
- Optional: electromagnetically operated pressure relief device
- Safety device to protect against overheating.

IMPORTANT

See the *Operating Instructions*.

14 Hydraulic systems

Hydraulic systems are generally intended for installation in machines or systems. In addition to the basic information about the installed components, the information contained in the Operating Instructions made available for each hydraulic system by Bosch Rexroth also applies to hydraulic systems.

By installing the hydraulic system in a machine or system, the interaction of the hydraulic system with the overall machine may give rise to changes in the potential dangers. In particular the effect of hydraulic and electrical control of hydraulic drives that create mechanical movement are to be considered.

This information shall be included in the hazard analysis/risk assessment of the overall machine carried out by its supplier and in the *Operating Instructions of the overall machine*. This also applies to the specification of the interfaces between the hydraulic system and the overall machine.

Hydraulic systems are subject to legislation including the Pressure Equipment Directive and other relevant EU directives that have been implemented in national legislation. Exact information can be found in the EU Conformity Declaration or Manufacturer's Declaration that is supplied with the hydraulic system or the hydraulic product.

⚠ WARNING

Before installing a hydraulic system in a machine or modifying an existing hydraulic system in a machine, satisfy yourself that

- the hydraulic system is suitable for its application in the machine
- the ambient conditions in the machine are suitable and/or permissible for the use of the hydraulic system
- other installed items on or in the machine cannot disturb or endanger the functioning or the safe operation of the hydraulic system.

If the overall machine is to be used in a potentially explosive atmosphere, then it must be ensured that the hydraulic system has been designed and is suitable for this use.

14.1 Effects of leaks in the hydraulic system on the machine

If pressure fluid escapes from the hydraulic system and comes into contact with hot surfaces on the machine, this can lead to the generation of life-threatening smoke, fire and/or other dangerous operating conditions.

These risks shall be determined by the machine manufacturer by means of a hazard analysis and if necessary provision made for the appropriate safety devices.

DE	Bestellinformation für deutsche Produktinformation:	RD 07008
EN	Ordering Information for Product Information in English:	RE 07008
FR	Information de commande pour la notice française Informations générales sur les produits :	RF 07008
IT	Informazioni d'ordine per le informazioni tedesche sul prodotto:	RI 07008
ES	Información para el pedido de la información del producto en español:	RS 07008
FI	Tilaustiedot - suomenkieliset tuotetiedot:	RSF 07008
NL	Bestelinformatie voor Nederlandse productinformatie:	RNL 07008
SV	Beställningsnummer för svensk produktinformation:	RSK 07008
PT	Informação dos dados de encomenda para informação de produto alemã:	RP 07008
DA	Bestillingsinformationer vedr. dansk produktinformation:	RDK 07008
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Installation, commissioning and maintenance of industrial valves

RE 07300/12.02 1/2
Replaces: 02.01

1. General

Before commissioning industrial valves, observe the notes in the following data sheets:

– Related data sheet
– German standard DIN 24 346
– ISO standard ISO 4413

2. System flushing

With external pilot oil supply, ensure that this connection is also flushed.

The hydraulic fluid volume contained in the system should be flushed through the filter at least 150 to 300 times.

As a rule, the recommended flushing time can be calculated as follows:

$$\boldsymbol{t} = \frac{\boldsymbol{V}}{\boldsymbol{q}_V} \text{ x 2,5 bis 5}$$

Where:

$\boldsymbol{t}$ = flushing time in hours

$\boldsymbol{V}$ = tank capacity in litres

$\boldsymbol{q}_V$ = pump flow in l/min

A decisive factor for the flushing time is the degree of contamination of the hydraulic fluid according to section 4.3. To achieve the required minimum cleanliness the hydraulic system must be flushed sufficiently long. This can be ensured only through continuous monitoring using a particle counter.

If the hydraulic fluid is changed over to special fluids that are not compatible or miscible with the hydraulic fluids used before, considerably longer flushing times may be required.

During the flushing process, all filters must be checked at short intervals and the filter elements replaced as required.

3. Installation

3.1 Rules for the installation

Before installing the valve on the system, compare the type designation of the valve with the order data.

Make sure that the connection surfaces of the valve and the subplate are dry and free from oil.

– Cleanliness:
  • When installing the component, make sure that the industrial valve and the surroundings are clean
  • The tank must be sealed against external contamination
  • Pipes and tank must be freed from contamination, scale, sand, chips, etc. prior to the installation.
  • Warm-bent or welded pipes must be pickled, flushed and oiled.
  • For cleaning use only lint-free cloth or special paper.
– Sealing materials such as hemp, putty or sealing tape are not permitted.
– For pipework use seamless precision steel pipes to DIN 2391/parts 1 and 2.
– The mounting face must feature a surface quality of $R_{t\,max} \leq 4\ \mu m$ and a flatness of ≤ 0.01 mm/100 mm length.
– Fixing screws must comply with the dimensions and the strength class specified in the data sheet and must be tightened at the specified tightening torque.
– As filler/breather filter we recommend a filter with the same mesh width as the filter in the hydraulic system!

3.2 Valve installation

When installing the valve, make sure that the mounting face and the subplates are dry and free from oil. If the presence of oil on the connecting faces cannot be avoided, the fixing screws must be tightened manually, not with the aid of power tools. In the case of more than 4 fixing screws, care should be taken that the central screws are tightened first.

This measure ensures that the seal rings seal properly against the valve connection face.

3.3 Installation position

Optional, preferably horizontal for directional valves!

For valve versions such as, for example,

– without spring centring of the spool

– or with solenoids hanging downwards, other installation positions can lead to malfunction or restrictions with regard to the specified technical data.

In the case of pressure switches with drain port the installation position must be selected so that the max. permissible pressure of 2 bar is not exceeded.

3.4 Electrical connection

For circuit examples and pin assignments, see the relevant data sheet.

4. Commissioning

4.1 Hydraulic fluid

Observe the recommendations given in the data sheet!

Observe pressure and temperature ranges!

In general, the following fluids can be used:

– Mineral oil (HL; HLP) to DIN 51524 [1)]

Fast bio-degradable fluids to VDMA 24568
(see also RE 90221)

– HETG (rape seed oil) [1)]

– HEPG (polyglycols) [2)]

– HEES (synthetic esters) [2)]

(other hydraulic fluids on enquiry)

The maximum temperatures recommended by the fluid supplier should not be exceeded. To ensure constant response characteristics it is recommended that the hydraulic fluid temperature be kept constant (±5 °C).

4.2 Is the sealing material used suitable?

For hydraulic fluids (e.g. HEPG and HEES) and in the case of temperatures > 80 °C FKM seals must be used (identified with “V” in the type code).

4.3 Filtration

– Reliable filtration prolongs the service life of valves.

  Please also observe the recommendations with regard to the max. permissible degree of contamination of the hydraulic fluid according to NAS 1638 in our data sheet.

– The max. permissible differential pressure across the filter element must not be exceeded.

– We recommend the use of filters with clogging indicator.

– Observe strict cleanliness when changing the filter.

  Contamination on the outlet side of the filter is flushed into the system and causes malfunction.

  Contamination on the inlet side reduces the useful life of the filter element.

4.4 Bleeding

– Bleeding of the valves is not necessary!

– However, to ensure proper operation of the valves, draining of the tank line must be avoided (installation of a precharge valve).

5. Maintenance

5.1 The valves are basically maintenance-free; since seals are subject to natural wear and aging, they must be replaced as required.

6. Storage

Storage requirements:

– Dry, dust-free room, free of corrosive substances and vapours

When storing for periods of more than 6 months:

– Fill the valve with preserving oils and seal it.

[1)] Suitable for NBR and FKM seals

[2)] Suitable for FKM seals only

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Bosch Group

Reliability characteristics $MTTF_d$ for functional safety according to EN ISO 13849

$MTTF_d$ values

RE 08012
Edition: 2012-03
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Contents

Determination $MTTF_d$ values according to EN ISO 13849-1:2006

Using reliability characteristics $MTTF_d$ (mean time to dangerous failure) of components, the probability of a dangerous failure per hour PFH_d of a machine or system is calculated and kept low, to a justifiable degree.
For hydraulic components, the standard
EN ISO 13849-1:2006 specifies an $MTTF_d$ value of 150 years if the "basic" and "well-tried" safety principles are complied with. The following is, for example, demanded for hydraulic valves used in safety-related parts of control systems:

- Automatic reaching of the safe position in case of energy failure
- Reliable keeping of the safe position
- Sufficient overlap with spool valves in safe position

Hydraulic components not satisfying the relevant safety principles are not suitable to be used in safety-related parts of control systems.
Rexroth has carefully tested their products with regard to all relevant "basic" and "well-tried" safety principles according to a method acknowledged by IFA (Institute for Occupational Safety and Health of the German Social Accident Insurance).

Compliance with safety principles, application notes

The products listed in the following are suitable to be used in safety-related parts of a control system according to EN ISO 13849-1:2006.

According to EN ISO 13849-2:2008, these products satisfy the
- **basic** safety principles
- **well-tried** safety principles.

For evaluating and interpreting the control system's reliability, use the following characteristics for the products:
$MTTF_d$ = see table page 4 to 9
T_M = 20 years (maximum mission time according to EN ISO 13849-1:2006)
In this use, please ensure compliance with the subsequently specified application notes!

Application notes:
The additional basic safety principles according to EN ISO 13849-2:2008 for the implementation and the operation of the products are to be complied with.
- For operation and handling of the products, comply with the information in the data sheet and the operating instructions.
- Only use the hydraulic fluids specified in the data sheets and comply with the oil cleanliness class for the whole mission time.
- If on/off spool valves are not actuated for a longer period of time, the spool may get stuck. We therefore recommend switching the valve regularly, at reasonable time intervals.
- If you use the product for safety-related structures with higher categories (2 to 14) according to EN ISO 13849-1:2006 section 6, consider the requirements (e. g. CCF, DC, PLr, software, systematic failures) specified there.
- According to EN ISO 13849-1:2006, the maximum mission time - complying with the oil cleanliness according to ISO 4406:1999, T_M = 20 years. In terms of preventive maintenance, it is recommended replacing the components already before expiry of the maximum mission time.
- Industrial valves are usually designed for 10 million switching cycles. If the maximum number of switching cycles is exceeded within the mission time, accordingly shorter replacement intervals are to be determined.

Conversion of $MTTF_d$ into B_{10d}
according to EN ISO 13849-1:2006**:**

$$MTTF_d = \frac{B_{10d}}{0.1 \times n_{op}}$$

B_{10d} = Mean number of cycles in which up to 10 % of the components have failed in a dangerous manner.

n_{op} = Mean number of annual actuations.

Use of valves and components with spool position monitoring:
- The signal of the position switch must not be used for direct activation of a safety-related control function!

Use of valves with integrated electronics as safety-related parts of control systems:
- In case the safety function is required, the voltage supply of the valve electronics is to be switched off by a suitable switching element with appropriate reliability. In the table (page 5 and 8), these valves are marked with the comment "Switch off OBE voltage supply".
- If persons have to enter the hazard zone with activated valve electronics, additional measures for guaranteeing their safety have to be taken for the reasons specified above.

Directional on/off valves

Type	Size	Data sheet	MTTFd value according to EN ISO 13849 in years / (in switching cycles)	Spool position monitoring [1]	Admissible spool types [2]; maximum longitudinal spool acceleration	Exceptions/ limitations
.WE 6 .6X/.EG...	6	23178	300 (B_{10} = 20 million B_{10d} = 40 million)	Optional QM,QR	A, C, D, B, Y, E, F, G, J, L, M, P, Q, R, T, U, W, A9, B9, E67, U10, Y11, J2, X7, X34, X139, L42; < 15 g/11 ms [3]	Impulse spool design "O" and valves for alternating voltage "W" [4]
.WE . .73-3X/...A12...; .WE . .73-6X/...A12...	6, 10	23183	150	Optional QM	A73, D73, B73, Y73, E73, G73, J73, R73, W73; < 10 g/11 ms [3]	–
.WE 10 .3X/.C...; .WE 10 .4X/.C...	10	23327	150	Optional QM	A, C, D, B, Y, E, F, G, J, L, M, P, Q, R, T, U, W, U10; < 15 g/11 ms [3]	Impulse spool design "O" and valves for alternating voltage "W" [4]
.WE 10 .-5X/.E...	10	23340	300 (B_{10} = 20 million B_{10d} = 40 million)	–	A, C, D, B, Y, E, F, G, J, L, M, P, Q, R, T, U, W, U10; < 15 g/11 ms [3]	
5-.WE 10 .3X/.C...	10	23351	150	Optional QM	A, C, D, B, Y, E, F, G, J, L, M, P, Q, R, T, U, W, J2, X84, E67; < 15 g/11 ms [3]	
Z4WE 6 .-3X/E...	6	23193	150	Optional QM	D24, D27, E51, E53, E56, E63, E68, E127, E129, E130, E131, E132, E134, E135, E136, E137, E141, E144, E145, E146, E166, X188; < 15 g/11 ms [3]	Valves for alternating voltage "W" [4]
.SEC 6 .1X/.C...	6	22035	150	–	E69A, E35, E100, E13, E22, EA, EB, E, E61, E40, E89, E18	
M-.SED 6 .-1X...	6	22049	150	Optional QMA, QMB	PK, NK, UK, CK	
M-.SED 10 .1X...	10	22045	150	Optional QMA, QMB	UK, CK	
M-.SEW 6 .-3X...	6	22058	150	Optional QMA, QMB	P, N, U, C	630 bar version
M-.SEW 10 .1X...	10	22075	150	Optional QMA, QMB	U, C	
Z4SE 10 .-1X/C	10	[5]	150	–	A, B, E	
.WEH . ../.6E...; .WH ...	10 to 32	24751	100 150	Optional QM	A, B, C, D, E, F, G, H, J, K, L, M, P, Q, R, S, T, U, V, W, Y, Z, U10; < 15 g/11 ms [3]	Impulse spool design type O"; hydraulic spool return
Z4WEH ...; Z4WH ...	10 to 22	24753, 24761, 24768	100 150	Optional QM	E62, E63, E68, E50, E51, E52; < 15 g/11 ms [3]	Valves for alternating voltage "W" [4]

Explanation of the footnotes see page 9.
Further MTTFd values for products and special versions not listed here upon request!

Proportional directional valves

Type	Size	Data sheet	MTTFd value according to EN ISO 13849 in years	Spool position monitoring [1]	Admissible spool types [2]; maximum longitudinal spool acceleration	Exceptions/ limitations
4WRA(E) . ..-2X...	6, 10	29055	150	–	E, W; in case of shock load, the spool overlap can be left for a short period	Switch off "OBE" voltage supply
4WRE(E) . ..-2X...	6, 10	29061	150	–	E, W; in case of shock load, the spool overlap can be left for a short period	
4WREEM . ...-2X...	6, 10	29064	150	Yes	E, W; in case of shock load, the spool overlap can be left for a short period	Analysis of the zero position upon request; switch off "OBE" voltage supply
4WRPE . ...-2X...	6, 10	29024, 29025	150	–	EA, E, W; < 15 g [3]	Switch off "OBE" voltage supply; size 10: max. operating pressure 210 bar
4WRPH . ...-2X...	6, 10	29028, 29032	150	–	C1, C3, C4, C5; < 10 g [3]	Size 6: except q_V = 40 l/min Size 10: max. operating pressure 250 bar
4WRPEH . ...-2X...	6, 10	29035, 29037	150	–	C1, C3, C4, C5; < 10 g [3]	Switch off "OBE" voltage supply; size 6: except q_V = 40 l/min size 10: max. operating pressure 250 bar
4WRPNH ...-2X...	6, 10	29191	150	–	C1, C3, C4, C5; < 10 g [3]	
4WRKE . ...-3X...	10 to 35	29075	75	–	E, R, W; < 15 g [3]	Switch off "OBE" voltage supply
4WRZ(E)M . ..-1X...; 4WRHM . ..-1X...	10 to 25	29117	75 150	Yes	E, W; < 9 g [3]	Switch off "OBE" voltage supply
4WRZ(E) 32 ..-7X...402, 4WRH 32 ..-7X...402	32	[6]	75 150	Yes	E, W; < 9 g [3]	
4WRL(E)...-3X...	10 to 27	29087, 29089	75	–	E, E1, E(Z), E1(Z),E4, W, W1, W(Z),W1(Z)R, W2, W3, W4, R3, R5; size 10 and 16: < 15 g [3] size 25 and 27: < 10 g [3]	Switch off "OBE" voltage supply
4WRTE...-4X...	10 to 35	29083	150	–	E, E1,W6, W8, Q2, R;	Switch off "OBE" voltage supply

Explanation of the footnotes see page 9.
Further MTTFd values for products and special versions not listed here upon request!

2-way cartridge valves: Directional function

Type	Size	Data sheet	MTTFd value according to EN ISO 13849 in years	Spool position monitoring [1]	Admissible spool types [2]; maximum longitudinal spool acceleration	Exceptions/ limitations
LC . A...7X...; LC . B...7X...	16 to 63	21010	150	–		Cracking pressure "00" (without spring)
LC . A...6X...; LC . B...6X...	80 to 100		150	–		
LFA . D-7X...; LFA . H-7X...	16 to 63	21010	Not relevant	–		Observe the reliability characteristic of the pilot control valve
LFA . D-6X...; LFA . H-6X...	80 to 100					
LFA . G-7X...; LFA . GW.-7X...; LFA . KW.-7X...	16 to 63	21010	Not relevant	–		
LFA . G-6X...; LFA . GW.-6X...; LFA . KW.-6X...	80 to 100					
LFA . WE.-7X...; LFA . WEM.-7X...; LFA . WECA-7X...	16 to 63	21010	Not relevant	–		
LFA . WE.-6X...; LFA . WE.8-6X...; LFA . WEA9-6X...	80 to 100					
LFA . E-7X...QM...; LFA . EH2-7X...QM...; LFA . EW.-7X...QM...	16 to 63	21010	150	QM	CA, CB	The closed position is the safe spool position

2-way cartridge valves: Active logics

Type	Size	Data sheet	MTTFd value according to EN ISO 13849 in years	Spool position monitoring [1]	Admissible spool types [2]; maximum longitudinal spool acceleration	Exceptions/ limitations
LC2A . D.-1X...; LC2A . A.-1X...; LC2A . B.-1X...	16 to 100	21040	150	Optional Q7		Cracking pressure "00" (without spring)

Explanation of the footnotes see page 9.
Further MTTFd values for products and special versions not listed here upon request!

2-way cartridge valves: Pressure function

Type	**Size**	**Data sheet**	**MTTFd value according to EN ISO 13849** in years	**Spool position monitoring** [1]	**Admissible spool types** [2]**; maximum longitudinal spool acceleration**	**Exceptions/ limitations**
LC . DB ..7X...	16 to 63	21050	150	–		Cracking pressure "00" (without spring)
LC . DB ..6X...	80 to 100	21050	150	–		
LC . DR ..7X...	16 to 63	21050	150	–		
LFA . DB.-7X...; LFA . DBW.-7X...; LFA . DBWD.-7X...	16 to 63	21050	150	–		With pressure relief valve type DBD
LFA . DBS.-7X...	40 to 63	21050	150	–		
LFA . DBEM-7X...	16 to 40	21050	–	–		Observe the reliability characteristic of the pilot control valve
LFA . DB.-6X...; LFA . DBW.-6X...; LFA . DBWD.-6X...; LFA . DBS.-7X...	80 to 100	21050	150	–		With pressure relief valve type DBD
LFA . DBE-7X...	16 to 40	21050	–	–		Observe the reliability characteristic of the pilot control valve
LFA . DR.-7X...; LFA . DRW.-7X...	16 to 50	21050	150	–		With pressure relief valve type DBD

Explanation of the footnotes see page 9.

Further MTTFd values for products and special versions not listed here upon request!

Isolator valves

Type	Size	Data sheet	MTTFd value according to EN ISO 13849 in years	Spool position monitoring [1]	Admissible spool types [2]; maximum longitudinal spool acceleration	Exceptions/ limitations
Z2S 6 ..6X...	6	21548	150	–		Only mutual load of channel A and B with max. operating pressure 315 bar
SV 6 ..-6X...; SL 6 ..-6X...	6	21460	150	–		–
SV . ...-4X...; SL . ...-4X	10 to 32	21468	150	Optional		–

Pressure valves

Type	Size	Data sheet	MTTFd value according to EN ISO 13849 in years	Spool position monitoring [1]	Admissible spool types [2]; maximum longitudinal spool acceleration	Exceptions/ limitations
DBD...1X...	6 to 30	25402	150	–		–
DR 6 DP.-5X...	6	26564	150	–		–
ZDR 6 D..-4X...	6	26570	150	–		–
3DREP(E) 6 .-2X...	6	29184	150	–	< 9 g [3]	Switch off "OBE" voltage supply
DBET(E)-6X...	6	29162	150	–		Switch off "OBE" voltage supply
(Z)DRE 6 ..-1X...	6	29175	150	–		–
ZDRE(E) 10 VP2-2X...	10	29279	150	–		Switch off "OBE" voltage supply

Explanation of the footnotes see page 9.
Further MTTFd values for products and special versions not listed here upon request!

Pressure switches and sensors

Type	Size	Data sheet	MTTFd value according to EN ISO 13849 in years / (in switching cycles)	Spool position monitoring [1]	Admissible spool types [2]; maximum longitudinal spool acceleration	Exceptions/ limitations
HED 5 .-3X...	–	50056	(B_{10d} = 8 million)	–	–	For max. 24 V and max. 5 mA, otherwise B_{10d} = 3 million switching cycles
HED 8 .-2X...	–	50061	(B_{10d} = 10 million)	–	–	For max. 24 V and max. 5 mA, otherwise B_{10d} = 4 million switching cycles
HEDE 10 A1-2X...	–	30278	380	–	–	At 40 °C
HEDE 11 A1-1X...	–	30279	1000	–	–	
HM 20 -1X/.C...		30270	3150			At 40 °C; unfavorable case according to EN ISO 13849: $MTTF_d$ = 315 years
HM 20 -1X/.H...		30270	2150			At 40 °C; unfavorable case according to EN ISO 13849: $MTTF_d$ = 215 years
DSM1-10-1X...	–	30267	75	–	–	–

Explanation of the footnotes see below.
Further MTTFd values for products and special versions not listed here upon request!

Explanation of the footnotes

1) Reliability of the position switch upon request. The signal at the position switch must not be used for direct activation of a safety-related control function!
2) Spool types specified here are suitable to be used in safety-related parts of a control system. Spool types not specified here upon request.
3) Adequate spool overlap according to EN ISO 13849-2:2008 available under sine-shaped shock and vibration load according to EN 60068-2-27:2009. Observe installation position!
4) Use mating connector with installed rectifier!
5) Installation drawing R900270193, upon request
6) Installation drawing R900277922, upon request

Notes

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Rexroth
Bosch Group

Hydraulic fluids based on mineral oils and related hydrocarbons

RE 90220/05.12 1/16
Replaces: 05.10

Application notes and requirements for Rexroth hydraulic components

Hydraulic fluids

Title	**Hydraulic fluids based on mineral oils and related hydrocarbons**	Environmentally acceptable hydraulic fluids	Fire-resistant, water-free hydraulic fluids	Fire-resistant, water-containing hydraulic fluids
Standard	**DIN 51524**	ISO 15380	ISO 12922	ISO 12922
Data sheets	**RE 90220**	RE 90221	RE 90222	RE 90223 (in preparation)
Classification	**HL HLP HLPD HVLP HLPD and more**	HEPG HEES partially saturated HEES saturated HEPR HETG	HFDR HFDU (ester base) HFDU (glycol base) and more	HFC HFB HFAE HFAS

Contents

1 Basic information

1.1 General instructions

The hydraulic fluid is the common element in any hydraulic component and must be selected very carefully. Quality and cleanliness of the hydraulic fluid are decisive factors for the operational reliability, efficiency and service life of a system.

Hydraulic fluids must conform, be selected and used in accordance with the generally acknowledged rules of technology and safety provisions. Reference is made to the country-specific standards and directives (in Germany the directive of the Employer's Liability Insurance Association BGR 137).

This data sheet includes recommendations and regulations concerning the selection, operation and disposal of hydraulic fluids based on mineral oils and related hydrocarbons in the application of Rexroth hydraulic components.

The individual selection of hydraulic fluid or the choice of classification are the responsibility of the operator.

It is the responsibility of the user to ensure that appropriate measures are taken for safety and health protection and to ensure compliance with statutory regulations. The recommendations of the lubricant manufacturer and the specifications given in the safety data sheet are to be observed when using hydraulic fluid.

This data sheet does not absolve the operator from verifying the conformity and suitability of the respective hydraulic fluid for his system. He is to ensure that the selected fluid meets the minimum requirements of the relevant fluid standard during the whole of the period of use.

Other regulations and legal provisions may also apply. The operator is responsible for their observance, e.g. EU directive 2004/35/EG and their national implementations. In Germany the Water Resources Act (WHG) is also to be observed.

We recommend that you maintain constant, close contact with lubricant manufacturers to support you in the selection, maintenance, care and analyses.

When disposing of used hydraulic fluids, apply the same care as during use.

1.2 Scope

This data sheet must be observed when using hydraulic fluids based on mineral oils and related hydrocarbons in Bosch Rexroth hydraulic components.

Please note that the specifications of this data sheet may be restricted further by the specifications given in the product data sheets for the individual components.

The use of the individual hydraulic fluids in accordance with the intended purpose can be found in the safety data sheets or other product description documents of the lubricant manufacturers. In addition, each use is to be individually considered.

Rexroth hydraulic components may only be operated with hydraulic fluids based on mineral oils and related hydrocarbons according to DIN 51524 if specified in the respective component data sheet or if Rexroth approval for use is furnished.

Notes:
In the market overview RE 90220-01, hydraulic fluid based on mineral oil are described which, according to the information of the lubricant manufacturer, feature the respective parameters of the current requirements standard DIN 51524 and other parameters which are of relevance for suitability in connection with Rexroth components.

These specifications are not checked or monitored by Bosch Rexroth. The list in the market overview does not therefore represent a recommendation on the part of Rexroth or approval of the respective hydraulic fluid for use with Rexroth components and does not release the operator from his responsibility regarding selection of the hydraulic fluid.

Bosch Rexroth will accept no liability for its components for any damage resulting from failure to comply with the notes below.

1.3 Safety instructions

Hydraulic fluids can constitute a risk for persons and the environment. These risks are described in the hydraulic fluid safety data sheets. The operator is to ensure that a current safety data sheet for the hydraulic fluid used is available and that the measures stipulated therein are complied with.

2 Solid particle contamination and cleanliness levels

Solid particle contamination is the major reason for faults occurring in hydraulic systems. It may lead to a number of effects in the hydraulic system. Firstly, single large solid particles may lead directly to a system malfunction, and secondly small particles cause continuous elevated wear.

For hydraulic fluids, the cleanliness level is given as a three-digit numerical code in accordance with ISO 4406. This numerical code denotes the number of particles present in a hydraulic fluid for a defined quantity. Moreover, foreign solid matter is not to exceed a mass of 50 mg/kg (gravimetric examination according to ISO 4405).

In general, compliance with a minimum cleanliness level of 20/18/15 in accordance with ISO 4406 or better is to be maintained in operation. Special servo valves demand improved cleanliness levels of at least 18/16/13. A reduction in cleanliness level by one level means half of the quantity of particles and thus greater cleanliness. Lower numbers in cleanliness levels should always be striven for and extend the service life of hydraulic components. The component with the highest cleanliness requirements determines the required cleanliness of the overall system. Please also observe the specifications in table 1: "Cleanliness levels according to ISO 4406" and in the respective data sheets of the various hydraulic components.

Hydraulic fluids frequently fail to meet these cleanliness requirements on delivery. Careful filtering is therefore required during operation and in particular, during filling in order to ensure the required cleanliness levels. Your lubricant manufacturer can tell you the cleanliness level of hydraulic fluids as delivered. To maintain the required cleanliness level over the operating period, you must use a reservoir breather filter. If the environment is humid, take appropriate measures, such as a breather filter with air drying or permanent off-line water separation.

Note: the specifications of the lubricant manufacturer relating to cleanliness levels are based on the time at which the container concerned is filled and not on the conditions during transport and storage.

Further information about contamination with solid matter and cleanliness levels can be found in brochure RE 08016.

Table 1: Cleanliness levels according to ISO 4406

Particles per 100 ml		Scale number
More than	Up to and including	
8,000,000	16,000,000	24
4,000,000	8,000,000	23
2,000,000	4,000,000	22
1,000,000	2,000,000	21
500,000	1,000,000	20
250,000	500,000	19
130,000	250,000	18
64000	130,000	17
32000	64000	16
16000	32000	15
8000	16000	14
4000	8000	13
2000	4000	12
1000	2000	11
500	1000	10
250	500	9
130	250	8
64	130	7
32	64	6

20 / **18** / **15**
> 4 µm > 6 µm > 14 µm

3 Selection of the hydraulic fluid

The use of hydraulic fluids based on mineral oils for Rexroth hydraulic components is based on compliance with the minimum requirements of DIN 51524.

3.1 Selection criteria for the hydraulic fluid

The specified limit values for all components employed in the hydraulic system, for example viscosity and cleanliness level, must be observed with the hydraulic fluid used, taking into account the specified operating conditions.

Hydraulic fluid suitability depends, amongst others, on the following factors:

3.1.1 Viscosity

Viscosity is a basic property of hydraulic fluids. The permissible viscosity range of complete systems needs to be determined taking account of the permissible viscosity of all components and it is to be observed for each individual component.

The viscosity at operating temperature determines the response characteristics of closed control loops, stability and damping of systems, the efficiency factor and the degree of wear.

We recommend that the optimum operating viscosity range of each component be kept within the permissible temperature range. This usually requires either cooling or heating, or both. The permissible viscosity range and the necessary cleanliness level can be found in the product data sheet for the component concerned.

If the viscosity of a hydraulic fluid used is above the permitted operating viscosity, this will result in increased hydraulic-mechanical losses. In return, there will be lower internal leakage losses. If the pressure level is lower, lubrication gaps may not be filled up, which can lead to increased wear. For hydraulic pumps, the permitted suction pressure may not be reached, which may lead to cavitation damage.

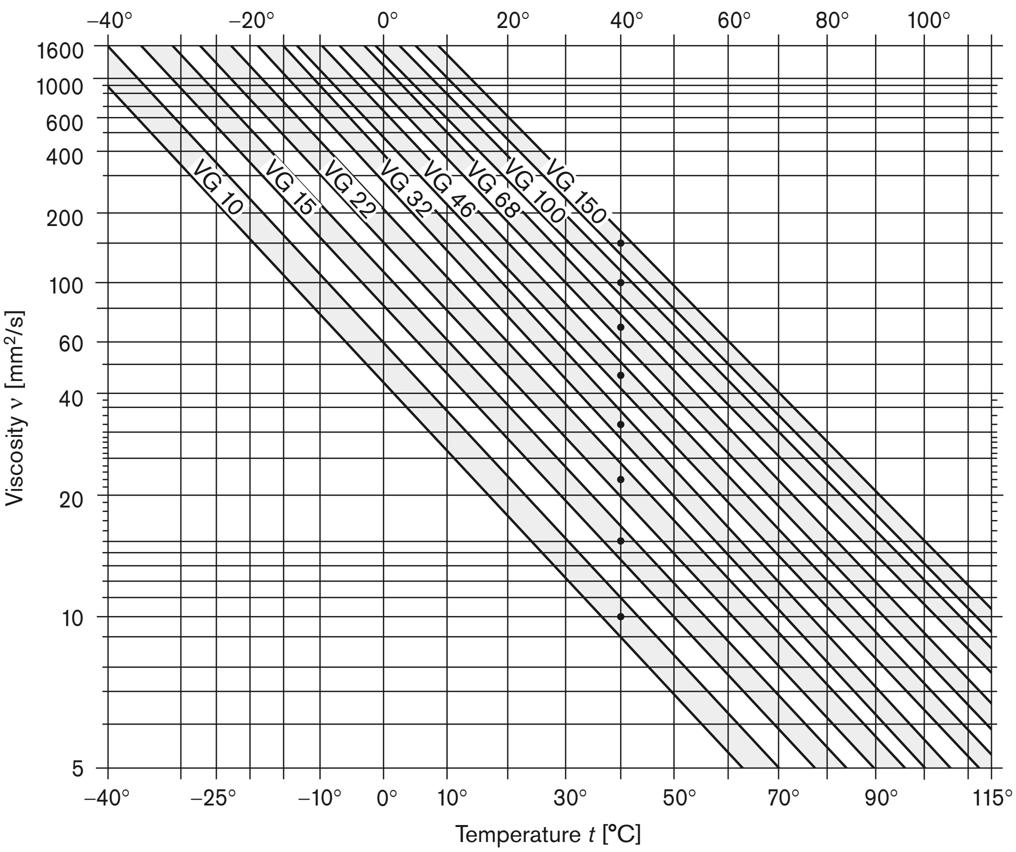
If the viscosity of a hydraulic fluid is below the permitted operating viscosity, increased leakage, wear, susceptibility to contamination and a shorter component life cycle will result.

3.1.2 Viscosity-temperature behavior

For hydraulic fluids, the viscosity temperature behavior (V-T behavior) is of particular importance. Viscosity is characterized in that it drops when the temperature increases and rises when the temperature drops; see Fig. 1 "Viscosity temperature chart for HL, HLP, HLPD (VI 100)". The interrelation between viscosity and temperature is described by the viscosity index (VI).

The viscosity temperature diagram in Fig. 1 is extrapolated in the < 40 °C range. This idealized diagram is for reference purposes only. Measured values can be obtained from your lubricant manufacturer and are to be preferred for design purposes.

Fig. 1: Viscosity-temperature chart for HL, HLP, HLPD (VI 100, double logarithmic representation)



3.1.3 Wear protection capability

Wear protection capability describes the property of hydraulic fluids to prevent or minimize wear within the components. The wear protection capability is described in DIN 51524-2,-3 via test procedures "FZG gear test rig" (ISO 14635-1) and "Mechanical test in the vane pump" (ISO 20763). From ISO VG 32 DIN 51524-2,-3 prescribes a rating of at least 10 (FZG test). At present, the FZG test cannot be applied to viscosity classes < ISO VG 32.

3.1.4 Material compatibility

The hydraulic fluid must not negatively affect the materials used in the components. Compatibility with coatings, seals, hoses, metals and plastics is to be observed in particular. The fluid classifications specified in the respective component data sheets are tested by the manufacturer with regard to material compatibility. Parts and components not supplied by us are to be checked by the user.

Table 2: Known material incompatibilities

Classification	Incompatible with:
HLxx classifications	with EPDM seals
Zinc- and ash/free hydraulic fluids	with bronze-filled PTFE seals

3.1.5 Aging resistance

The way a hydraulic fluid ages depends on the thermal, chemical and mechanical stress to which it is subjected. Aging resistance can be greatly influenced by the chemical composition of the hydraulic fluids.

High fluid temperatures (e.g. over 80 °C) result in a approximate halving of the fluid service life for every 10 °C temperature increase and should therefore by avoided. The halving of the fluid service life results from the application of the Arrhenius equation (see Glossary).

Table 3: Reference values for temperature-dependent aging of the hydraulic fluid

Reservoir temperature	Fluid life cycle
80 °C	100 %
90 °C	50 %
100 °C	25 %

Hydraulic fluids based on mineral oils and related hydrocarbons are tested with 20% water additive during testing of aging resistance according to ISO 4263-1.

The calculated fluid service life is derived from the results of tests in which the long-term characteristics are simulated in a short period of time by applying more arduous conditions (condensed testing). This calculated fluid service life is not to be equated to the fluid service life in real-life applications.

Table 3 is a practical indicator for hydraulic fluids with water content < 0.1%, cf. chapter 4.10. "Water".

3.1.6 Air separation ability (ASA)

The air separation ability (ASA) describes the property of a hydraulic fluid to separate undissolved air. Hydraulic fluids contain approx. 7 to 13 percent by volume of dissolved air (with atmospheric pressure and 50 °C). Hydraulic fluids always contain dissolved air. During operation, dissolved air may be transformed into undissolved air, leading to cavitation damages. Fluid classification, fluid product, reservoir size and design must be coordinated to take into account the dwell time and ASA value of the hydraulic fluid. The air separation capacity depends on the viscosity, temperature, basic fluid and aging.
It cannot be improved by additives.

According to DIN 51524 for instance, an ASA value ≤ 10 minutes is required for viscosity class ISO VG 46, 6 minutes are typical, lower values are preferable.

3.1.7 Demulsifying ability and water solubility

The capacity of a hydraulic fluid to separate water at a defined temperature is known as the demulsifying ability. ISO 6614 defines the demulsifying properties of hydraulic fluids.

For larger systems with permanent monitoring, a demulsifying fluid with good water separation capability (WSC) is recommended. The water can be drained from the bottom of the reservoir. In smaller systems (e.g. in mobile machines), whose fluid is less closely monitored and where water contamination into the hydraulic fluid, for instance through air condensation, cannot be ruled out completely, an HLPD fluid is recommended.

The demulsifying ability up to ISO-VG 100 is given at 54 °C, and at 82 °C for fluids with higher viscosity.

Water emulsifying HLPD hydraulic fluids have no, or a very poor, demulsifying ability.

3.1.8 Filterability

Filterability describes the ability of a hydraulic fluid to pass through a filter, removing solid contaminants. The hydraulic fluids used require a good filterability, not just when new, but also during the whole of their service life. Depending on the basic fluid used and the additives (VI enhancers) there are great differences here.

The filterability is a basic prerequisite for cleanliness, servicing and filtration of hydraulic fluids. Filterability is tested with the new hydraulic fluid and after the addition of 0.2 % water. The underlying standard (ISO 13357-1/-2) stipulates that filterability must have no negative effects on the filters or the hydraulic fluid, see chapter 4 "Hydraulic fluids in operation".

3.1.9 Corrosion protection

Hydraulic fluids should not just prevent corrosion formation on steel components, they must also be compatible with non-ferrous metals and alloys. Corrosion protection tests on different metals and metal alloys are described in DIN 51524. Hydraulic fluids that are not compatible with the materials listed above must not be used, even if they are compliant with ISO 51524.

Rexroth components are usually tested with HLP hydraulic fluids or corrosion protection oils based on mineral oils before they are delivered.

3.1.10 Additivation

The properties described above can be modified with the help of suitable additives. A general distinction is made for fluids between heavy metal-free and heavy metal-containing (generally zinc) additive systems. Both additive systems are most often incompatible with each other. The mixing of these fluids must be avoided even if the mixing ratio is very low. See chapter 4, "Hydraulic fluids in operation".

Increasing additivation generally leads to deteriorated air separation ability (ASA) and water separation capability (WSC) of the hydraulic fluid. According to the present state of knowledge, all hydraulic fluids described in this document, independently of the actual additivation, can be filtered using all filter materials with all known filtration ratings ≥ 1 μm without filtering out effective additives at the same time.

Bosch Rexroth does not prescribe any specific additive system.

3.2 Classification and fields of application

Table 4: Classification and fields of application

Classification	Features	Typical field of application	Notes
HL fluids according to DIN 51524-1 VI = 100	Hydraulic fluids predominantly only with additives for oxidation and corrosion protection, but no specific additives for wear protection in case of mixed friction	HL fluids can be used in hydraulic systems that do not pose any requirements as to wear protection.	HL fluids may be used only for components whose product data sheet specifically allows HL fluids. For components which have not been approved according to the product data sheet, please consult your Bosch Rexroth sales partner. Hydraulic fluids that only comply with the requirements of classes HL and HR in accordance with ISO 11158 without proving that DIN 51524-1 is also met may be used only with written approval of Bosch Rexroth AG. Observe restrictions as to pressure, rotation speed etc.
HLP fluids according to DIN 51524-2 VI = 100	Hydraulic fluid with corrosion, oxidation and verified wear protection additives	HLP fluids are suitable for most fields of application and components provided the temperature and viscosity provisions are observed.	For information on approved components, please refer to the respective product data sheet. For components which have not been approved according to the product data sheet, please consult your Bosch Rexroth sales partner. For the viscosity classes VG10, VG15 and VG22, DIN 51524 defines no requirements as to wear protection (DIN 51354 part 2 and DIN 51389 part 2). Beyond the requirements of DIN 51524 part 2, we require the same base oil type, identical refining procedure, identical additivation and identical additivation level across all viscosity classes.

Continued on page 8

Table 4: Classification and fields of application (continued from page 7)

Classification	Features	Typical field of application	Notes
HVLP fluids according to DIN 51524-3 VI > 140	HLP hydraulic fluid with additional improved viscosity temperature behavior	HVLP fluids are used in systems operated over a wide temperature range.	For information on approved components, please refer to the respective product data sheet. For components which have not been approved according to the product data sheet, please consult your Bosch Rexroth sales partner. The same notes and restrictions as defined for HLP fluids apply accordingly. The effect on Rexroth components (e.g. compatibility with material seals, wear resistance capacity) may differ when using related hydrocarbons instead of mineral oils, cf. Table 6, line 8. When using HVLP fluids, the viscosity may change on account of the shear of the long-chain VI enhancers. The viscosity index, high at the start, decreases during operation. This needs to be taken into account when selecting the hydraulic fluid. The only value at present that can be used to assess viscosity changes in operation is the result of the test in accordance with DIN 51350 part 6. Please note that there are practical applications that create a much higher shear load on such fluids than can be achieved by this test. Up to VI < 160, we recommend a maximum permitted viscosity drop of 15 %, viscosity at 100 °C. The viscosity limits given by Bosch Rexroth for its components are to be observed for all operating conditions, even after the hydraulic fluids have sheared. HVLP fluids should be used only if required by the temperature ranges of the application.
HLPD fluids according to DIN 51524-2, HVLPD fluids in accordance with DIN 51524-3	HLP and HVLP hydraulic fluid with additional detergent and or dispersant additives	HLPD and HVLPD fluids are used in systems where deposits as well as solid or liquid contamination need to be kept temporarily suspended	For information on approved components, please refer to the respective product data sheet. For components which have not been approved according to the product data sheet, please consult your Bosch Rexroth sales partner. Some of these fluids are able to absorb significant quantities of water (> 0.1 %). This may have negative implications for the wear protection and the aging properties of the fluid. The wetting ability of these fluids varies largely depending on the product. Therefore it is not correct to say that they are generally all very well able to prevent stick-slip. In individual cases where higher water contamination is to be expected (such as in steelworks or under humid conditions), the use of HLPD/HVLPD fluids cannot be recommended as the emulsified water does not settle in the reservoir but is evaporated in heavily loaded positions. For such cases, we recommend using HLP hydraulic fluids with particularly good demulsifying ability. The water collected at the reservoir bottom is to be drained regularly. If HLPD/HVLPD fluids are used, contamination does not settle. It rather remains suspended and needs to be filtered out or removed by appropriate draining systems. For this reason, the filter area must be increased. HLPD/HVLPD fluids may contain additives that in the long run are incompatible with plastics, elastomers and non-ferrous metals. Furthermore, these additives may lead to the premature clogging of hydraulic filters. Therefore, test the filterability and the selection of the filter material in consultation with the filter manufacturer.

4 Hydraulic fluids in operation

4.1 General

The properties of hydraulic fluids can change continually during storage and operation.

Please note that the fluid standard DIN 51524 merely describes minimum requirements for hydraulic fluids in new condition at the time of filling into the bins. The operator of a hydraulic system must ensure that the hydraulic fluid remains in a utilizable condition throughout its entire period of use.

Deviations from the characteristic values are to be clarified with the lubricant manufacturer, the test labs or Bosch Rexroth.

Please note the following aspects in operation.

4.2 Storage and handling

Hydraulic fluids must be stored correctly in accordance with the instructions of the lubricant manufacturer. Avoid exposing the containers to lengthy periods of direct heat. Containers are to be stored in such a way that the risk of any foreign liquid or solid matter (e.g. water, foreign fluids or dust) ingression into the inside of the container can be ruled out. After taking hydraulic fluids from the containers, these are immediately to be properly resealed.

Recommendation:

– Store containers in a dry, roofed place

– Store barrels on their sides

– Clean reservoir systems and machine reservoirs regularly

4.3 Filling of new systems

Usually, the cleanliness levels of the hydraulic fluids as delivered do not meet the requirements of our components. Hydraulic fluids must be filtered using an appropriate filter system to minimize solid particle contamination and water in the system.

As early as possible during test operation, new systems should be filled with the selected hydraulic fluid so as to reduce the risk of accidentally mixing the fluids (see chapter 4.5 "Mixing and compatibility of different hydraulic fluids"). Changing the hydraulic medium at a later point represents significant additional costs (see following chapter).

4.4 Hydraulic fluid changeover

Changeovers, in particular between hydraulic fluids with heavy metal-free and heavy metal-containing (generally zinc) additives, frequently lead to malfunctions, see chapter 3.1.10 "Additivation".

In the case of changeovers of the fluid in hydraulic systems, it is important to ensure compatibility of the new hydraulic fluid with the remainder of the previous hydraulic fluid. We recommend obtaining a written performance guarantee from the manufacturer or supplier of the new hydraulic fluid. The quantity of old fluid remaining should be minimized. Mixing hydraulic fluids should be avoided, see following chapter.

For information on changing over hydraulic fluids with different classifications please refer to VDMA 24314, VDMA 24569 and ISO 15380 appendix A.

Bosch Rexroth will not accept liability for any damage to its components resulting from inadequate hydraulic fluid changeovers!

4.5 Mixing and compatibility of different hydraulic fluids

If hydraulic fluids from different manufacturers or different types from the same manufacturer are mixed, gelling, silting and deposits may occur. These, in turn, may cause foaming, impaired air separation ability, malfunctions and damage to the hydraulic system.

If the fluid contains more than 2 % of another fluid then it is considered to be a mixture. Exceptions apply for water, see chapter 4.10 "Water".

Mixing with other hydraulic fluids is not generally permitted. This also includes hydraulic fluids with the same classification and from the market overview RE 90220-01. If individual lubricant manufacturers advertise miscibility and/or compatibility, this is entirely the responsibility of the lubricant manufacturer.

Bosch Rexroth customarily tests all components with mineral oil HLP before they are delivered.

Note: With connectible accessory units and mobile filtering systems, there is a considerable risk of non-permitted mixing of the hydraulic fluids!

Rexroth will not accept liability for any damage to its components resulting from mixing hydraulic fluids!

4.6 Re-additivation

Additives added at a later point in time such as colors, wear reducers, VI enhancers or anti-foam additives, may negatively affect the performance properties of the hydraulic fluid and the compatibility with our components and therefore are not permissible.

Rexroth will not accept liability for any damage to its components resulting from re-additivation!

4.7 Foaming behavior

Foam is created by rising air bubbles at the surface of hydraulic fluids in the reservoir. Foam that develops should collapse as quickly as possible.

Common hydraulic fluids in accordance with DIN 51524 are sufficiently inhibited against foam formation in new condition. On account of aging and adsorption onto surfaces, the defoamer concentration may decrease over time, leading to a stable foam.

Defoamers may be re-dosed only after consultation with the lubricant manufacturer and with his written approval.

Defoamers may affect the air separation ability.

4.8 Corrosion

The hydraulic fluid is to guarantee sufficient corrosion protection of components under all operating conditions, even in the event of impermissible water contamination.

During storage and operation, hydraulic fluid based on mineral oils with anti-corrosion additives protect components against water and "acidic" oil degradation products.

4.9 Air

Under atmospheric conditions, the hydraulic fluid contains dissolved air. In the negative pressure range, for instance in the suction pipe of the pump or downstream of control edges, this dissolved air may transform into undissolved air. The undissolved air content represents a risk of cavitation and of the diesel effect. This results in material erosion of components and increased hydraulic fluid aging.

With the correct measures, such as suction pipe and reservoir design, and an appropriate hydraulic fluid, air intake and separation can be positively influenced.

See also chapter 3.1.7 "Air separation ability (ASA)".

4.10 Water

Water contamination in hydraulic fluids can result from direct ingress or indirectly through condensation of water from the air due to temperature variations.

Water in the hydraulic fluid may result in wear or direct failure of hydraulic components. Furthermore, a high water content in the hydraulic fluid negatively affects aging and filterability and increases susceptibility to cavitation.

Undissolved water can be drained from the bottom of the reservoir. Dissolved water can be removed only by using appropriate measures. If the hydraulic system is used in humid conditions, preventive measures need to be taken, such as an air dehumidifier at the reservoir vent. During operation, the water content in all hydraulic fluids, determined according to the "Karl Fischer method" (see chapter 6 "Glossary") for all hydraulic fluids must constantly be kept below 0.1% (1000 ppm). To ensure a long service life of both hydraulic fluids and components, Bosch Rexroth recommends that values below 0.05% (500 ppm) are permanently maintained.

To ensure a long service life for the hydraulic fluids and the components, we recommend that values below 0.05 % (500 ppm) are permanently maintained. Detergent and or dispersant hydraulic fluids (HLPD / HVLPD) are able to absorb (and keep suspended) more water. Prior to using these hydraulic fluids, please contact the lubricant manufacturer.

4.11 Fluid servicing, fluid analysis and filtration

Air, water, operating temperature influences and solid matter contamination will change the performance characteristics of hydraulic fluids and cause them to age.

To preserve the usage properties and ensure a long service life for hydraulic fluid and components, the monitoring of the fluid condition and a filtration adapted to the application requirements (draining and degassing if required) are indispensable.

The effort is higher in the case of unfavorable usage conditions, increased stress for the hydraulic system or high expectations as to availability and service life, see chapter 2 "Solid particle contamination and cleanliness level".

When commissioning a system, please note that the required minimum cleanliness level can frequently be attained only by flushing the system. Due to severe start-up contamination, it may be possible that a fluid and/or filter replacement becomes necessary after a short operating period (< 50 operating hours).

The hydraulic fluid must be replaced in regular intervals and tested by the lubricant manufacturer or recognized, accredited test labs. **We recommend a reference analysis after commissioning.**

The minimum data to be tested for analyses are:

- Viscosity at 40 °C and 100 °C
- Neutralization number NN (acid number AN)
- Water content (Karl-Fischer method)
- Particle measurement with evaluation according to ISO 4406 or mass of solid foreign substances with evaluation to EN 12662
- Element analysis (RFA (EDX) / ICP, specify test method)
- Comparison with new product or available trend analyses
- Assessment / evaluation for further use
- Also recommended: IR spectrum

Compared to the pure unused hydraulic fluid, the changed neutralization number NN (acid number AN) indicates how many aging products are contained in the hydraulic fluid. This value must be kept as low as possible. As soon as the trend analysis notes a significant increase in the acid number, the lubricant manufacturer should be contacted.

In case of warranty, liability or guarantee claims to Bosch Rexroth, service verification and/or the results of fluid analyses are to be provided.

5 Disposal and environmental protection

Hydraulic fluids based on mineral oil and related hydrocarbons are hazardous for the environment. They are subject to a special disposal obligation.

The respective lubricant manufacturers provide specifications on environmentally acceptable handling and storage. Please ensure that spilt or splashed fluids are absorbed with appropriate adsorbents or by a technique that prevents it contaminating water courses, the ground or sewerage systems.

It is also not permitted to mix fluids when disposing of hydraulic fluids. Regulations governing the handing of used oils stipulate that used oils are not to mixed with other products, e.g. substances containing halogen. Non-compliance will increase disposal costs. Comply with the national legal provisions concerning the disposal of the corresponding hydraulic fluid. Comply with the local safety data sheet of the lubricant manufacturer for the country concerned.

6 Other hydraulic fluids based on mineral oil and related hydrocarbons

Table 6: Other hydraulic fluids based on mineral oils and related hydrocarbons

Serial number	Hydraulic fluids	Features / Typical field of application / Notes
1	Hydraulic fluids with classification HL, HM, HV according to ISO 11158	– Can be used without confirmation provided they are listed in the respective product data sheet and are compliant with DIN 51524. Conformity with DIN 51524 must be verified in the technical data sheet of the fluid concerned. For classification see Table 4: "Hydraulic fluid classification". – Fluids **only** classified in accordance with ISO 11158 may be used only with prior written approval of Bosch Rexroth AG.
2	Hydraulic fluids with classification HH, HR, HS, HG according to ISO 11158	– May not be used.
3	Hydraulic fluids with classification HL, HLP, HLPD, HVLP, HVLPD to DIN 51502	– DIN 51502 merely describes how fluids are classified / designated on a national level. – It contains no information on minimum requirements for hydraulic fluids. – Hydraulic fluids standardized according to DIN 51502 can be used without confirmation provided they are listed in the respective product data sheet and are compliant with DIN 51524. Conformity with DIN 51524 must be verified in the technical data sheet of the fluid concerned. For classification see Table 4: "Hydraulic fluid classification".
4	Hydraulic fluids with classification HH, HL, HM, HR, HV, HS, HG according to ISO 6743-4	– ISO 6743-4 merely describes how fluids are classified / designated on an international level. It contains no information on minimum requirements for hydraulic fluids. – Hydraulic fluids standardized according to ISO 6743 -4 can be used without confirmation provided they are listed in the respective product data sheet and are compliant with DIN 51524. Conformity with DIN 51524 must be verified in the technical data sheet of the fluid concerned. For classification see table 4: "Classification and fields of application".
5	Lubricants and regulator fluids for turbines to DIN 51515-1 and -2	– Turbine oils can be used after confirmation and with limited performance data. – They usually offer lower wear protection than mineral oil HLP. Classification of turbine oils to DIN 51515-1 comparable to HL, turbine oils to DIN 51515-2 comparable to HLP. – Particular attention must be paid to material compatibility!
6	Lube oils C, CL, CLP in accordance with DIN 51517	– Lube oils in acc. with DIN 51517 can be used after confirmation and with limited performance data. They are mostly higher-viscosity fluids with low wear protection. Classification: CL similar to HL fluids and CLP similar to HLP fluids. – Particular attention must be paid to material compatibility, specifically with non-ferrous metals!
7	Fluids to be used in pharmaceutical and foodstuff industries, in acc. with FDA / USDA / NSF H1	– There are medical white oils and synthetic hydrocarbons (PAO). – Can only be used after consultation and approval for use in the specific application, even if they are compliant with DIN 51524. – May be used only with FKM seals. – Other fluids used in pharmaceutical and foodstuff industries may be used only after confirmation. – Attention is to be paid to material compatibility in accordance with the applicable food law. **Caution!** Fluids used in pharmaceutical and foodstuff industries should not be confused with environmentally acceptable fluids!

Continued on page 13

Table 6: Other hydraulic fluids based on mineral oils and related hydrocarbons
(continued from page 12)

Serial number	Hydraulic fluids	Features / Typical field of application / Notes
8	Hydraulic fluids of classes HVLP and HVLPD based on related hydrocarbons	– Can only be used after consultation and approval for use in the specific application, even if they are compliant with DIN 51524. – Lower pour point than HLP – Other wetting (polarity)
9	Automatic Transmission Fluids (ATF)	– ATF are operating fluids for automatic gearboxes in vehicles and machines. In special cases, ATFs are also used for certain synchronous gearboxes and hydraulic systems comprising gearboxes. – To be used only after confirmation! – Some of these fluids have poor air separation abilities and modified wear properties. – Check material compatibility and filterability!
10	Multi-purpose oil (MFO) – Industry	– Multi-purpose oils (industry) combine at least two requirements for a fluid, for instance metal machining and hydraulics. – To be used only after confirmation! – Please pay particular attention to air separation ability, modified wear properties and the reduced material life cycle. – Check material compatibility and filterability!
11	Multi-purpose oils (MFO) – Mobil UTTO, STOU	– Multi-purpose oils combine requirements for wet brakes, gearboxes, motor oil (STOU only) and hydraulics. – Fluids of the types: – UTTO (= universal tractor transmission oil) and – STOU (= Super Tractor super tractor universal oil) – To be used only after confirmation! – Please pay particular attention to shear stability, air separation ability and modified wear properties. – Check material compatibility and filterability!
12	Single-grade engine oils 10W, 20W, 30W	– To be used only after confirmation! – Please pay particular attention to the air separation ability and filtering ability.
13	Multi-grade engine oils 0Wx-30Wx	– To be used only after confirmation! – Please pay particular attention to air separation ability, changes in wear protection capability, viscosity changes during operation, material compatibility, dispersant and detergent properties and filterability. **Caution!** Multi-grade engine oils have been adapted to specific requirements in combustion engines and are suitable for use in hydraulic systems only to a limited extent.
14	Hydraulic fluids for military applications to MIL 13919 or H 540, MIL 46170 or H 544, MIL 5606 or H 515, MIL 83282 or H 537, MIL 87257	– To be used only after confirmation! – Please pay particular attention to air separation ability, changes in wear protection capability, viscosity changes during operation, material compatibility, water separation capability and filterability. **Caution!** Hydraulic fluids for military applications do not meet the current requirements for high-quality hydraulic fluids and are suitable for use only to a limited degree.
15	Motor vehicle transmission oils	– Motor vehicle transmission oil can be used after confirmation and with limited performance data. – Pay particular attention to wear protection, material compatibility, specifically with non-ferrous metals, as well as viscosity!

Continued on page 14

Table 6: Other hydraulic fluids based on mineral oils and related hydrocarbons
(continued from page 13)

Serial number	Hydraulic fluids	Features / Typical field of application / Notes
16	Diesel, test diesel in acc. with DIN 4113	– Diesel / test diesel has poorer wear protection capabilities and a very low viscosity (< 3 mm²/s). – May be used only with FKM seals – Please note their low flash point! – To be used only after confirmation and with limited performance data!
17	Hydraulic fluids for roller processes	– Hydraulic fluids for roller processes have lower wear protection capabilities than mineral oil HLP and a lower viscosity – Please note their low flash point! – Hydraulic fluids for roller processes with limited performance data can be used only after confirmation.
18	Fluids for power steering, hydro-pneumatic suspension, active chassis etc.	– Can only be used after consultation and approval for use in the specific application, even if they are compliant with DIN 51524. – Please note the low viscosity! – In most cases they have poor water separation capability – Check the material compatibility!

7 Glossary

Additivation
Additives are chemical substances added to the basic fluids to achieve or improve specific properties.

Aging
Hydraulic fluids age due to oxidation (see chapter 3.1.5 "Aging resistance"). Liquid and solid contamination acts as a catalyzer for aging, meaning that it needs to be minimized as far as possible by careful filtration.

API classification
Classification of basic fluids by the **A**merican **P**etroleum **I**nstitute (API) – the largest association representing the US oil and gas industry.

Arrhenius equation
The quantitative relation between reaction rate and temperature is described by an exponential function, the Arrhenius equation. This function is usually visualized within the typical temperature range of the hydraulic system. For a practical example, see chapter 3.1.5 "Aging resistance".

Related hydrocarbons
Related hydrocarbons are hydrocarbon compounds that are not classified as API class 1, 2 or 5.

Basic fluids
In general, a hydraulic fluid is made up of a basic fluid, or base oil, and chemical substances, the so-called additives. The proportion of basic fluid is generally greater than 90%.

Demulsifying
Ability of a fluid to separate water contamination quickly; achieved with careful selection of base oil and additives.

Detergent
Ability of certain additives to emulsify part of the water contamination in the oil or to hold it in suspension until it has evaporated with increasing temperature. Larger water quantities, in contrast (above approx. 2 %), are separated immediately.

Dispersant
Ability of certain additives to keep insoluble liquid and solid contamination in suspension in the fluid.

Diesel effect
If hydraulic fluid that contains air bubbles is compressed quickly, the bubbles are heated to such a degree that a self-ignition of the air-gas mix may occur. The resultant temperature increase may lead to seal damage and increased aging of the hydraulic fluid.

Hydraulic fluids based on mineral oils
Hydraulic fluids based on mineral oils are made from petroleum (crude oil).

ICP (atomic emission spectroscopy)
The ICP procedure can be used to determine various wear metals, contamination types and additives. Practically all elements in the periodic system can be detected with this method.

Karl Fischer method
Method to determine the water content in fluids. Indirect coulometric determination procedure in accordance with DIN EN ISO 12937 in connection with DIN 51777-2. Only the combination of both standards will assure adequately accurate measured values.

Cavitation
Cavitation is the creation of cavities in fluids due to pressure reduction below the saturated vapour pressure and subsequent implosion when the pressure increases. When the cavities implode, extremely high acceleration, temperatures and pressure may occur temporarily, which may damage the component surfaces.

Neutralization number (NN)
The neutralization number (NN) or acid number (AN) specifies the amount of caustic potash required to neutralize the acid contained in one gram of fluid.

Pour point
The lowest temperature at which the fluid still just flows when cooled down under set conditions. The pour point is specified in the lubricant manufacturers' technical data sheets as a reference value for achieving this flow limit.

RFA (wavelength dispersive x-ray fluorescence analysis)
Is a procedure to determine nearly all elements in liquid and solid samples with nearly any composition. This analysis method is suitable for examining additives and contamination, delivering fast results.

Shearing/shear loss
Shearing of molecule chains during operation can change the viscosity of hydraulic fluids with long chain VI enhancers. The initially high viscosity index drops. This needs to be taken into account when selecting the hydraulic fluid.

The only value at present that can be used to assess viscosity changes in operation is the result of the test in accordance with DIN 51350 part -6. Please note that there are practical applications that create a much higher shear load on such hydraulic fluids than can be achieved by this test.

Stick-slip effect (sliding)
Interaction between a resilient mass system involving friction (such as cylinder + oil column + load) and the pressure increase at very low sliding speeds. The static friction of the system is a decisive value here. The lower it is, the lower the speed that can still be maintained without sticking. Depending on the tribologic system, the stick-slip effect may lead to vibrations generated and sometimes also to significant noise emission. In many cases, the effect can be attenuated by replacing the lubricant.

Viscosity
Viscosity is the measure of the internal friction of a fluid to flow. It is defined as the property of a substance to flow under tension. Viscosity is the most important characteristic for describing the load-bearing capacity of a hydraulic fluid.

Kinematic viscosity is the ratio of the dynamic viscosity and the density of the fluid; the unit is mm^2/s. Hydraulic fluids are classified by their kinematic viscosity into ISO viscosity classes. The reference temperature for this is 40 °C.

Viscosity index (VI)
Refers to the viscosity temperature behavior of a fluid.
The lower the change of viscosity in relation the temperature, the higher the VI.

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Environmentally acceptable hydraulic fluids

RE 90221/05.12 1/14
Replaces: 05.10

Application notes and requirements for Rexroth hydraulic components

Hydraulic fluids

Title	Hydraulic fluids based on mineral oils and related hydrocarbons	**Environmentally acceptable hydraulic fluids**	Fire-resistant, water-free hydraulic fluids	Fire-resistant, water-containing hydraulic fluids
Standard	DIN 51524	**ISO 15380**	ISO 12922	ISO 12922
Data sheets	RE 90220	**RE 90221**	RE 90222	RE 90223 (in preparation)
Classification	HL HLP HLPD HVLP HLPD and more	**HEPG** **HEES partially saturated** **HEES saturated** **HEPR** **HETG**	HFDR HFDU (ester base) HFDU (glycol base) and more	HFC HFB HFAE HFAS

Contents

1 Basic information

1.1 General instructions

The hydraulic fluid is the common element in any hydraulic component and must be selected very carefully. Quality and cleanliness of the hydraulic fluid are decisive factors for the operational reliability, efficiency and service life of a system.

Hydraulic fluids must conform, be selected and used in accordance with the generally acknowledged rules of technology and safety provisions. Reference is made to the country-specific standards and directives (in Germany the directive of the Employer's Liability Insurance Association BGR 137).

This data sheet includes recommendations and regulations concerning the selection, operation and disposal of environmentally compatible hydraulic fluids in the application of Rexroth hydraulic components.

The individual selection of hydraulic fluid or the choice of classification are the responsibility of the operator.

It is the responsibility of the user to ensure that appropriate measures are taken for safety and health protection and to ensure compliance with statutory regulations. The recommendations of the lubricant manufacturer and the specifications given in the safety data sheet are to be observed when using hydraulic fluid.

This data sheet does not absolve the operator from verifying the conformity and suitability of the respective hydraulic fluid for his system. He is to ensure that the selected fluid meets the minimum requirements of the relevant fluid standard during the whole of the period of use.

Other regulations and legal provisions may also apply. The operator is responsible for their observance, e.g. EU directive 2004/35/EG, 2005/360/EG and their national implementation. In Germany the Water Resources Act (WHG) is also to be observed.

We recommend that you maintain constant, close contact with lubricant manufacturers to support you in the selection, maintenance, care and analyses.

When disposing of used hydraulic fluids, apply the same care as during use.

Environmentally acceptable hydraulic fluids have been used successfully for many years. In some countries, the use of environmentally acceptable hydraulic fluids is already prescribed in ecologically sensitive areas (e.g. forestry, locks, weirs).

Environmentally acceptable hydraulic fluids may only be used in the pharmaceutical and food industry subject to required certification to FDA/USDA/NSF **H1**.

1.2 Environmental compatibility

There is no unambiguous legal definition for environmentally acceptable hydraulic fluids as different testing procedures can be applied for biological degradation and toxicity.

According to ISO 15380 the definition of "environmentally acceptable" is as follows: Humans, animals, plants, air and soil must not be endangered. With regard to hydraulic fluids in an unused condition in the bin this mainly means:

- biological degradation at least 60 % (according to ISO 14593 or ISO 9439)
- acute fish toxicity at least 100 mg/l (according to ISO 7346-2)
- acute daphnia toxicity at least 100 mg/l (according to ISO 5341)
- acute bacteria toxicity at least 100 mg/l (according to ISO 8192)

The same amount of care should be taken when handling environmentally acceptable hydraulic fluids as for mineral oils, leakage from the hydraulic system should be avoided. Environmentally acceptable hydraulic fluids are designed so that in the event of accidents and leakage,less permanent environmental damage is caused than by mineral oils, see also chapter 5 "Disposal and environmental protection".

In comparison to mineral oil HLP/HVLP , the biological degradation of environmentally acceptable hydraulic fluids may change fluid aging, see chapter 3.1.5 "Aging resistance", 3.1.6. "Biological degradation" and 4 "Hydraulic fluids in operation".

1.3 Scope

This data sheet must be applied when using environmentally acceptable hydraulic fluids with Rexroth hydraulic components. The specifications of this data sheet may be further restricted by the specification given in the data sheets for the individual components.

The use of the individual environmentally acceptable hydraulic fluids in accordance with the intended purpose can be found in the safety data sheets or other product description documents of the lubricant manufacturers. In addition, each use is to be individually considered.

Rexroth hydraulic components may only be operated with environmentally acceptable hydraulic fluids according to ISO 15380 if specified in the respective component data sheet or if a Rexroth approval for use is furnished.

The manufacturers of hydraulic systems must adjust their systems and operating instructions to the environmentally acceptable hydraulic fluids.

Notes:
In the market overview RE 90221-01, environmentally acceptable hydraulic fluids based on mineral oil are described which, according to the information of the lubricant manufacturer, feature the respective parameters of the current requirements standard ISO 15380 and other parameters which are of relevance for suitability in connection with Rexroth components.

These specifications are not checked or monitored by Bosch Rexroth. The list in the market overview does not therefore represent a recommendation on the part of Rexroth or approval of the respective hydraulic fluid for use with Rexroth components and does not release the operator from his responsibility regarding selection of the hydraulic fluid.

Bosch Rexroth will accept no liability for its components for any damage resulting from failure to comply with the notes below.

1.4 Safety instructions

Hydraulic fluids can constitute a risk for persons and the environment. These risks are described in the hydraulic fluid safety data sheets. The operator is to ensure that a current safety data sheet for the hydraulic fluid used is available and that the measures stipulated therein are complied with.

2 Solid particle contamination and cleanliness levels

Solid particle contamination is the major reason for faults occurring in hydraulic systems. It may lead to a number of effects in the hydraulic system. Firstly, single large solid particles may lead directly to a system malfunction, and secondly small particles cause continuous elevated wear.

For mineral oils, the cleanliness level of environmentally acceptable hydraulic fluids is given as a three-digit numerical code in accordance with ISO 4406. This numerical code denotes the number of particles present in a hydraulic fluid for a defined quantity. Moreover, foreign solid matter is not to exceed a mass of 50 mg/kg (gravimetric examination according to ISO 4405).

In general, compliance with a minimum cleanliness level of 20/18/15 in accordance with ISO 4406 or better is to be maintained in operation. Special servo valves demand improved cleanliness levels of at least 18/16/13. A reduction in cleanliness level by one level means half of the quantity of particles and thus greater cleanliness. Lower numbers in cleanliness levels should always be striven for and extend the service life of hydraulic components. The component with the highest cleanliness requirements determines the required cleanliness of the overall system. Please also observe the specifications in table 1: "Cleanliness levels according to ISO 4406" and in the respective data sheets of the various hydraulic components.

Hydraulic fluids frequently fail to meet these cleanliness requirements on delivery. Careful filtering is therefore required during operation and in particular, during filling in order to ensure the required cleanliness levels. Your lubricant manufacturer can tell you the cleanliness level of hydraulic fluids as delivered. To maintain the required cleanliness level over the operating period, you must use a reservoir breather filter. If the environment is humid, take appropriate measures, such as a breather filter with air drying or permanent off-line water separation.

Note: the specifications of the lubricant manufacturer relating to cleanliness levels are based on the time at which the container concerned is filled and not on the conditions during transport and storage.

Further information about contamination with solid matter and cleanliness levels can be found in brochure RE 08016.

Table 1: Cleanliness levels according to ISO 4406

Particles per 100 ml		Scale number
More than	Up to and including	
8,000,000	16,000,000	24
4,000,000	8,000,000	23
2,000,000	4,000,000	22
1,000,000	2,000,000	21
500,000	1,000,000	20
250,000	500,000	19
130,000	250,000	18
64000	130,000	17
32000	64000	16
16000	32000	15
8000	16000	14
4000	8000	13
2000	4000	12
1000	2000	11
500	1000	10
250	500	9
130	250	8
64	130	7
32	64	6

20 / 18 / 15

> 4 µm > 6 µm > 14 µm

3 Selection of the hydraulic fluid

Environmentally acceptable hydraulic fluids for Bosch Rexroth hydraulic components are assessed on the basis of their fulfillment of the minimum requirements of ISO 15380.

3.1 Selection criteria for the hydraulic fluid

The specified limit values for all components employed in the hydraulic system, for example viscosity and cleanliness level, must be observed with the hydraulic fluid used, taking into account the specified operating conditions.

Hydraulic fluid suitability depends, amongst others, on the following factors:

3.1.1 Viscosity

Viscosity is a basic property of hydraulic fluids. The permissible viscosity range of complete systems needs to be determined taking account of the permissible viscosity of all components and it is to be observed for each individual component.

The viscosity at operating temperature determines the response characteristics of closed control loops, stability and damping of systems, the efficiency factor and the degree of wear.

We recommend that the optimum operating viscosity range of each component be kept within the permissible temperature range. This usually requires either cooling or heating, or both. The permissible viscosity range and the necessary cleanliness level can be found in the product data sheet for the component concerned.

If the viscosity of a hydraulic fluid used is above the permitted operating viscosity, this will result in increased hydraulic-mechanical losses. In return, there will be lower internal leakage losses. If the pressure level is lower, lubrication gaps may not be filled up, which can lead to increased wear. For hydraulic pumps, the permitted suction pressure may not be reached, which may lead to cavitation damage.

If the viscosity of a hydraulic fluid is below the permitted operating viscosity, increased leakage, wear, susceptibility to contamination and a shorter life cycle will result.

Please ensure that the permissible temperature and viscosity limits are observed for the respective components. This usually requires either cooling or heating, or both.

3.1.2 Viscosity-temperature behavior

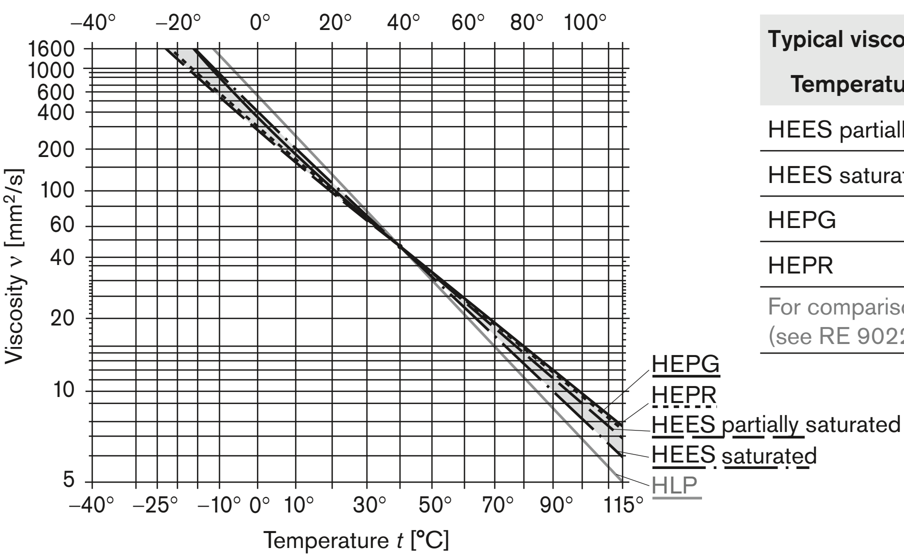
For hydraulic fluids, the viscosity temperature behavior (V-T behavior) is of particular importance. Viscosity is characterized in that it drops when the temperature increases and rises when the temperature drops. The interrelation between viscosity and temperature is described by the viscosity index (VI).

If exposed to the cold for several days, viscosity may rise significantly (HETG and HEES). After heating, the characteristic values as specified on the data sheet are restored. Please ask your lubricant manufacturer for the " Flow capacity after 7 days at low temperature" (ASTM D 2532) of fluid classifications HETG and partially saturated HEES.

All known environmentally acceptable hydraulic fluids have better viscosity temperature behavior than mineral oil HLP and generally feature greater shear stability than HVLP mineral oils. This should be taken into consideration when selecting hydraulic fluid for the required temperature range. A lower viscosity level can frequently be used to save any drive power during a cold start and avoid viscosity being too low at higher temperatures. The required viscosity and temperature limits in the product data sheets are to be observed in all operating conditions.

Depending on the basic fluid types/classes, VI indices can be achieved of 140–220, see Fig. 1: "Examples: V-T diagrams in comparison to HLP (reference values)" and Table 4: "Classification and fields of application of environmentally acceptable hydraulic fluids".

Fig. 1: Examples V-T diagrams in comparison to HLP (reference values, double-logarithmic representation)



Typical viscosity data [mm²/s]			
Temperature	**–20 °C**	**40 °C**	**100 °C**
HEES partially saturated	1250	46	9
HEES saturated	2500	46	8
HEPG	2500	46	10
HEPR	1400	46	10
For comparison HLP (see RE 90220)	4500	46	7

Detailed V-T diagrams may be obtained from your lubricant manufacturer for their specific products.

3.1.3 Wear protection capability

Wear protection capability describes the property of hydraulic fluids to prevent or minimize wear within the components. The wear protection capability is described in ISO 15380 via test procedures"FZG gear test rig" (ISO 14635-1) and "Mechanical test in the vane pump" (ISO 20763). From ISO VG 32, ISO 15380 prescribes a rating of at least 10 (FZG test). At present, the FZG test cannot be applied to viscosity classes < ISO VG 32. The wear protection capability of environmentally acceptable hydraulic fluids in relation to the two test procedures is comparable to that of mineral oil HLP/HVLP.

3.1.4 Material compatibility

The hydraulic fluid must not negatively affect the materials used in the components. Compatibility with coatings, seals, hoses, metals and plastics is to be observed in particular. The fluid classifications specified in the respective component data sheets are tested by the manufacturer with regard to material compatibility. Parts and components not supplied by us are to be checked by the user.

Table 2: Known material incompatibilities

Classification	Incompatible with:
HE... general	One-component color coatings, lead, galvanized zinc coatings, some non-ferrous metals, seals made of NBR. In some cases, the latter show major increases in volume when impermissibly aged hydraulic fluids come into contact with the material. NBR is only permitted by prior consent, please observe the customary seal and tube replacement intervals. Do not use any hydrolysis/susceptible polyurethane qualities. **Note** Please check seals and coatings of control cabinets, outer coatings of hydraulic components and accessories (connectors, cables, control cabinets) for resistance to vapors issuing from hydraulic fluids.
HETG/HEES	Zinc, some non-ferrous alloys with zinc
HEPG	Steel/aluminum tribocontacts, paper filters, polymethylmethacrylate (PMMA), NBR **Note** Check plastics for resistance

The material incompatibilities mentioned here do not automatically result in function problems. However the elements of the materials are found in the hydraulic fluids after use. The biological degradation of hydraulic fluids is negatively influenced.

3.1.5 Aging resistance

The way an environmentally acceptable hydraulic fluids ages depends on the thermal, chemical and mechanical stress to which it is subjected. The influence of water, air, temperature and contamination may be significantly greater than for mineral oils HLP/HVLP. Aging resistance can be greatly influenced by the chemical composition of the hydraulic fluids .

High fluid temperatures (e.g. over 80 °C) result in a approximate halving of the fluid service life for every 10 °C temperature increase and should therefore by avoided. The halving of the fluid service life results from the application of the Arrhenius equation (see Glossary).

Table 3: Reference values for temperature-dependent aging of the hydraulic fluid

Reservoir temperature	Fluid life cycle
80 °C	100 %
90 °C	50 %
100 °C	25 %

A modified aging test (without adding water) is prescribed for fluid classifications HETG and HEES. Hydraulic fluids with HEPG and HEPR classification are subjected to the identical test procedure as mineral oils (with 20 % water added). The calculated fluid service life is derived from the results of tests in which the long-term characteristics are simulated in a short period of time by applying more arduous conditions (condensed testing). This calculated fluid service life is not to be equated to the fluid service life in real-life applications.

Table 3 is a practical indicator for hydraulic fluids with water content < 0.1%, cf. chapter 4.10. "Water".

3.1.6 Biological degradation

Environmentally acceptable hydraulic fluids are ones which degrade biologically much faster than mineral oils. Biological degradation is a biochemical transformation effected by micro-organisms resulting in mineralization. For environmentally acceptable hydraulic fluids that make reference to ISO 15380, biological degradation according to ISO 14593 or ISO 9439 must be verified. 60% minimum degradation is defined as limit value. Proof of biological degradation is furnished for the new, unmixed, ready-formulated hydraulic fluids. Aged or mixed hydraulic fluids are less able to degrade biologically. Biological degradation outside the defined test procedure is subject to a variety of natural influences. The key factors are temperature, humidity, contamination, fluid concentration, type and quantity of micro-organisms. Environmentally acceptable hydraulic fluids require no extended maintenance in comparison to mineral oils, please observe chapter 4 "Hydraulic fluids in operation".

3.1.7 Air separation ability (ASA)

The air separation ability (ASA) describes the property of a hydraulic fluid to separate undissolved air. Hydraulic fluids always contain dissolved air. During operation, dissolved air may be transformed into undissolved air, leading to cavitation damages. Fluid classification, fluid product, reservoir size and design must be coordinated to take into account the dwell time and ASA value of the hydraulic fluid. The air separation capacity depends on the viscosity, temperature, basic fluid and aging. It cannot be improved by additives.

According to ISO 15380, for instance, an ASA value ≤ 10 minutes is required for viscosity class ISO VG 46, 6 minutes are typical, lower values are preferable.

3.1.8 Demulsifying ability and water solubility

The capacity of a hydraulic fluid to separate water at a defined temperature is known as the demulsifying ability. ISO 6614 defines the demulsifying properties of hydraulic fluids.

Fluids classified HETG, HEES and HEPR separate from water. HETG and HEES hydraulic fluids have a different water separation ability to mineral oil HLP/HVLP. At 20 °C, in comparison to mineral oil HLP/HVLP, a multiple (> factor 3) of water can separate in the hydraulic fluid. Water solubility is also more temperature-dependent than for mineral oils. With regard to water solubility, HEPR hydraulic fluids behave like HVLP hydraulic fluids (see RE 90220). In the majority of cases, HEPG-classified fluids HEPG dissolve water completely , see chapter "4.10 Water".

3.1.9 Filterability

Filterability describes the ability of a hydraulic fluid to pass through a filter, removing solid contaminants. The hydraulic fluids used require a good filterability, not just when new, but also during the whole of their service life. Depending on the different basic fluids (glycols, saturated and partially saturated ester oils, hydrocrack oils, polyalpha olefins, triglycerides) and additives (VI enhancers), there are great differences here.

The filterability is a basic prerequisite for cleanliness, servicing and filtration of hydraulic fluids. Rexroth therefore requires the same degree of filterability of environmentally acceptable hydraulic fluids as for mineral oils HLP/HVLP to DIN 51524. As ISO 15380 does not comment on the filterability of hydraulic fluids, filterability comparable to that of mineral oils HLP/HVLP must be requested of lubricant manufacturers.

Filterability is tested with the new hydraulic fluid and after the addition of 0.2 % water. The underlying standard (ISO 13357-1/-2) stipulates that filterability must have no negative effects on the filters or the hydraulic fluid, see chapter 4 "Hydraulic fluids in operation".

3.1.10 Corrosion protection

Hydraulic fluids should not just prevent corrosion formation on steel components, they must also be compatible with non-ferrous metals and alloys. Corrosion protection tests on different metals and metal alloys are described in ISO 15380. Hydraulic fluids that are not compatible with the materials listed above must not be used, even if they are compliant with ISO 15380.

Rexroth components are usually tested with HLP hydraulic fluids or corrosion protection oils based on mineral oils before they are delivered.

3.1.11 Additivation

The properties described above can be modified with the help of suitable additives. Environmentally acceptable hydraulic fluids should never contain heavy metals. According to the present state of knowledge, all hydraulic fluids, regardless of additivation, can be filtered with all customary filter materials in all known filtration ratings (≥ 0.8 μm), without filtering out effective additives at the same time.

Bosch Rexroth does not prescribe any specific additive system.

3.2 Classification and fields of application

Table 4: Classification and fields of application

Classification	Features	Typical field of application	Notes
HEPG according to ISO 15380 Density at 15 °C: typically > 0.97 kg/dm³ VI: typical > 170	Basic fluid, glycols	Systems on exposed water courses (locks, weirs, dredgers)	For information on approved components, please refer to the respective product data sheet. For components which have not been approved according to the product data sheet, please consult your Bosch Rexroth sales partner. – Very good viscosity/temperature characteristics, shear stability – Resistant to aging – Incompatible with mineral oil (exceptions must be confirmed by the lubricant manufacturer) – Can be water-soluble – Can be mixed with water – Very good wear protection properties – A higher implementation temperature with the same viscosity in comparison to mineral oil is to be expected – Due to the higher density in comparison to HLP, lower suction pressures are to be anticipated for pumps. Reduce the maximum speed as required and optimize suction conditions. – Classified as insignificantly water-endangering (water hazard class WGK 1) – Prior to commissioning, contact the lubricant manufacturer, as the components are tested with mineral oil HLP/corrosion protection oil.
HEES partially saturated according to ISO 15380 Density at 15 °C: typically 0.90–0.93 kg/dm³ VI: typical > 160 Iodine count < 90	Basic fluid: Ester based on renewable raw materials, synthetic esters, mixtures of various esters, mixtures with polyalphaolefines (< 30%)	Suitable for most fields of application and components.	For information on approved components, please refer to the respective product data sheet. For components which have not been approved according to the product data sheet, please consult your Bosch Rexroth sales partner. – Preferred use of FKM seals. Please enquire for shaft seal rings and implementation temperatures under –15 °C. – In operation, a higher temperature in comparison to mineral oil HLP/HVLP is to be expected given identical design and viscosity – Limit lower (depending on viscosity class) and upper implementation temperatures (maximum 80 °C due to aging) – Good viscosity/temperature characteristics, shear stability. – Good corrosion protection, if correspondingly additivized – Mostly classed as insignificantly water-endangering (water hazard class WGK 1), in some cases as not water-endangering – High dirt dissolving capacity on fluid changeovers – In unfavorable operating conditions (high water content, high temperature), HEES on ester basis have a tendency to hydrolysis. The acidic organic decomposition products can chemically attack materials and components.

Continued on page 9

Table 4: Classification and fields of application (continued from page 8)

Classification	Features	Typical field of application	Notes
HEES saturated according to ISO 15380 Density at 15 °C: typically 0.90–0.93 kg/dm³ VI: typical 140–160 Iodine count <15	Basic fluid: Ester based on renewable raw materials, synthetic esters, mixtures of various esters, mixtures with polyalphaolefines (< 30%)	Suitable for most fields of application and components. Saturated HEES should be preferred over partially saturated HEES and HETG for components and systems exposed to high stress levels.	For information on approved components, please refer to the respective product data sheet. For components which have not been approved according to the product data sheet, please consult your Bosch Rexroth sales partner. – Preferred use of FKM seals. Please enquire for shaft seal rings and implementation temperatures under −15 °C. – In operation, a higher temperature in comparison to mineral oil HLP/HVLP is to be expected given identical design and viscosity – Good viscosity/temperature characteristics, shear stability – Good corrosion protection, if correspondingly additivized – Mostly classed as insignificantly water-endangering (water hazard class WGK 1), in the case of low viscosity classes (up to ISO VG 32) also classed as not water-endangering – High dirt dissolving capacity on fluid changeovers
HEPR according to ISO 15380 Density at 15 °C: typically 0.87 kg/dm³ VI : typical 140–160	Basic fluid: synthetically manufactured hydrocarbons (polyalpha olefins PAO) partly mixed with esters (< 30 %)	Suitable for most fields of application and components. HEPR should be preferred over partially saturated HEES and HETG for components and systems exposed to high stress levels.	For information on approved components, please refer to the respective product data sheet. For components which have not been approved according to the product data sheet, please consult your Bosch Rexroth sales partner. – Behaves similarly to HVLP- hydraulic fluids, individual products comply with ISO 15380 HEPR and DIN 51524-3 HVLP – Preferred use of FKM seals. Please enquire for shaft seal rings and implementation temperatures under −15 °C. – Good viscosity-temperature behavior – Classified as insignificantly water-endangering (water hazard class WGK 1) **Note:** Note shear stability (see chapter 4.11 "Fluid servicing, fluid analysis and filtration" and chapter 6 "Glossary")
HETG according to ISO 15380 Density at 15 °C: typically 0.90-0.93 kg/dm³ VI: typical > 200 Iodine count > 90	Basic fluid: vegetable oils and triglycerides	Not recommended for Rexroth components!	Practical requirements are frequently not fulfilled by hydraulic fluids in this classification. Use only permissible after consultation. – Viscosity is not stable over time – Very fast fluid aging, very hydrolysis-susceptible (please observe neutralization number) – Tendency to gumming, gelling and setting. – Limit the lower (depending on viscosity class) and upper implementation temperatures (see chapter 3.1.5) – Only limited material compatibility – Filterability problems at water ingress – High dirt dissolving capacity on fluid changeovers – Mostly classed as not water-endangering

4 Hydraulic fluids in operation

4.1 General

The properties of hydraulic fluids can change continually during storage and operation.

Please note that the fluid standard ISO 15380 merely describes minimum requirements for hydraulic fluids in new condition at the time of filling into the bins. The operator of a hydraulic system must ensure that the hydraulic fluid remains in a utilizable condition throughout its entire period of use.

Deviations from the characteristic values are to be clarified with the lubricant manufacturer, the test labs or Bosch Rexroth.

Bosch Rexroth will accept no liability for damage to its components within the framework of the applicable liability legislation insofar as the latter is due to non-observance of the following instructions.

Please note the following aspects in operation.

4.2 Storage and handling

Hydraulic fluids must be stored correctly in accordance with the instructions of the lubricant manufacturer. Avoid exposing the containers to lengthy periods of direct heat. Containers are to be stored in such a way that the risk of any foreign liquid or solid matter (e.g. water, foreign fluids or dust) ingression into the inside of the container can be ruled out. After taking hydraulic fluids from the containers, these are immediately to be properly resealed.

Recommendation:

– Store containers in a dry, roofed place

– Store barrels on their sides

– Clean reservoir systems and machine reservoirs regularly

4.3 Filling of new systems

Usually, the cleanliness levels of the hydraulic fluids as delivered do not meet the requirements of our components. Hydraulic fluids must be filtered using an appropriate filter system to minimize solid particle contamination and water in the system.

As early as possible during test operation, new systems should be filled with the selected hydraulic fluid so as to reduce the risk of accidentally mixing fluids (see chapter 4.5 "Mixing and compatibility of different hydraulic fluids"). Changing the hydraulic medium at a later point represents significant additional costs (see following chapter).

4.4 Hydraulic fluid changeover

In particular with the changeover from mineral oils to environmentally acceptable hydraulic fluids, but also from one environmentally acceptable hydraulic fluids to another, there may be interference (e.g. incompatibility in the form of gelling, silting, stable foam or reduced filterability or filter blockage).

In the case of changeovers of the fluid in hydraulic systems, it is important to ensure compatibility of the new hydraulic fluid with the remains of the previous hydraulic fluid. Bosch Rexroth recommends obtaining verification of compatibility from the manufacturer or supplier of the new hydraulic fluid. The quantity of old fluid remaining should be minimized. Mixing hydraulic fluids should be avoided, see following chapter.

For information on changing over hydraulic fluids with different classifications, please refer to VDMA 24314, VDMA 24569 and ISO 15380 appendix A.

Bosch Rexroth will not accept liability for any damage to its components resulting from inadequate hydraulic fluid changeovers!

4.5 Mixing and compatibility of different hydraulic fluids

If hydraulic fluids from different manufacturers or different types from the same manufacturer are mixed, gelling, silting and deposits may occur. These, in turn, may cause foaming, impaired air separation ability, malfunctions and damage to the hydraulic system.

If the fluid contains more than 2 % of another fluid then it is considered to be a mixture. Exceptions apply for water, see chapter 4.10 "Water".

Mixing with other hydraulic fluids is not generally permitted. This also includes hydraulic fluids with the same classification and from the market overview RE 90221-01. If individual lubricant manufacturers advertise miscibility and/or compatibility, this is entirely the responsibility of the lubricant manufacturer.

Bosch Rexroth customarily tests all components with mineral oil HLP before they are delivered.

Note: With connectible accessory units and mobile filtering systems, there is a considerable risk of non-permitted mixing of the hydraulic fluids!

Rexroth will not accept liability for any damage to its components resulting from mixing hydraulic fluids!

4.6 Re-additivation

Additives added at a later point in time such as colors, wear reducers, VI enhancers or anti-foam additives, may negatively affect the performance properties of the hydraulic fluid and the compatibility with our components and therefore are not permissible.

Rexroth will not accept liability for any damage to its components resulting from re-additivation!

4.7 Foaming behavior

Foam is created by rising air bubbles at the surface of hydraulic fluids in the reservoir. Foam that develops should collapse as quickly as possible.

Common hydraulic fluids in accordance with ISO 15380 are sufficiently inhibited against foam formation in new condition. On account of aging and adsorption onto surfaces, the defoamer concentration may decrease over time, leading to a stable foam.

Defoamers may be re-dosed only after consultation with the lubricant manufacturer and with his written approval.

Defoamers may affect the air separation ability.

4.8 Corrosion

The hydraulic fluid is to guarantee sufficient corrosion protection of components under all operating conditions, even in the event of impermissible water contamination.

Environmentally acceptable hydraulic fluids are tested for corrosion protection in the same way as mineral oil HLP/HVLP. When used in practice other corrosion mechanisms are revealed in detail and in individual cases, for the most part in contact with non-ferrous and white alloys.

4.9 Air

Under atmospheric conditions the hydraulic fluid contains dissolved air. In the negative pressure range, for instance in the suction pipe of the pump or downstream of control edges, this dissolved air may transform into undissolved air. The undissolved air content represents a risk of cavitation and of the diesel effect. This results in material erosion of components and increased hydraulic fluid aging.

With the correct measures, such as suction pipe and reservoir design, and an appropriate hydraulic fluid, air intake and separation can be positively influenced.

See also chapter 3.1.7 "Air separation ability (ASA)".

4.10 Water

Water contamination in hydraulic fluids can result from direct ingress or indirectly through condensation of water from the air due to temperature variations.

HEPG dissolves water completely. This means that any water that has ingressed into the system cannot be drained off in the sump of the reservoir.

In the case of hydraulic fluids classed HETG, HEES and HEPR undissolved water can be drained off from the reservoir sump, the remaining water content is however too high to ensure that the maximum permissible water limit values are observed in the long term.

Water in the hydraulic fluid can result in wear or direct failure of hydraulic components. Furthermore, a high water content in the hydraulic fluid negatively affects aging and filterability and increases susceptibility to cavitation. During operation, the water content in all hydraulic fluids, determined according to the "Karl Fischer method" (see chapter 6 "Glossary") for all environmentally acceptable hydraulic fluids must constantly be kept below 0.1% (1000 ppm). To ensure a long service life of both hydraulic fluids and components, Bosch Rexroth recommends that values below 0.05% (500 ppm) are permanently maintained.

Due to the higher water solubility (except for HEPR) in comparison to mineral oil HLP/HVLP it is urgently advised that precautions be taken when using environmentally acceptable hydraulic fluids, such as a dehumidifier on the reservoir ventilation.

Water content has an affect particularly in the case of HETG and partially saturated HEES in that it accelerates aging (hydrolysis) of the hydraulic fluid and biological degradation, see chapter 4.11 "Fluid servicing, fluid analysis and filtration".

4.11 Fluid servicing, fluid analysis and filtration

Air, water, operating temperature influences and solid matter contamination will change the performance characteristics of hydraulic fluids and cause them to age.

To preserve the usage properties and ensure a long service life for hydraulic fluid and components, the monitoring of the fluid condition and a filtration adapted to the application requirements (draining and degassing if required) are indispensable.

The effort is higher in the case of unfavorable usage conditions, increased stress for the hydraulic system or high expectations as to availability and service life, see chapter 2 "Solid particle contamination and cleanliness levels".

When commissioning a system, please note that the required minimum cleanliness level can frequently be attained only by flushing the system. Due to severe start-up contamination, it may be possible that a fluid and/or filter replacement becomes necessary after a short operating period (< 50 operating hours).

The hydraulic fluid must be replaced at regular intervals and tested by the lubricant manufacturer or recognized accredited test labs. **We recommend a reference analysis after commissioning.**

The minimum data to be tested for analyses are:

- Viscosity at 40 °C and 100 °C
- Neutralization number NN (acid number AN)
- Water content (Karl-Fischer method)
- Particle measurement with evaluation according to ISO 4406 or mass of solid foreign substances with evaluation to EN 12662
- Element analysis (RFA (EDX) / ICP, specify test method)
- Comparison with new product or available trend analyses
- Assessment / evaluation for further use
- Also recommended: IR spectrum"

Differences in the maintenance and upkeep of environmentally acceptable hydraulic fluids with the corresponding suitability characteristics (as required in market overview RE 90221-01) in comparison to mineral oil HLP/HVLP are not necessary. Attention is however drawn to the note in chapter 1.3.

After changing over hydraulic fluids it is recommended that the filters be replaced again after 50 operating hours as fluid aging products may have detached themselves ("self-cleaning effect").

Compared to the pure unused hydraulic fluid the changed neutralization number NN (acid number AN) indicates how many aging products are contained in the hydraulic fluid. This difference must be kept as low as possible. As soon as the trend analysis notes a significant increase in the values, the lubricant manufacturer should be contacted.

A higher viscosity than that of new materials indicates that the hydraulic fluid has aged. Evaluation by the test lab or lubricant manufacturers is however authoritative, whose recommendation should be urgently observed.

On systems where the possibility of water contamination cannot be completely ruled out (also condensation), it should be ensured via the hydraulic system circuit that fluid aging products are not accumulating in individual areas of the hydraulic system, but are being removed from the system in a controlled manner via the filtration system. This should be ensured via suitable hydraulic circuits (e.g. flushing circuit) or system manufacturer's operating instructions/specifications.

In case of warranty, liability or guarantee claims to Bosch Rexroth, service verification and/or the results of fluid analyses are to be provided.

5 Disposal and environmental protection

All environmentally acceptable hydraulic fluids, are like mineral oil-based hydraulic fluids, subject to special disposal obligations.

The respective lubricant manufacturers provide specifications on environmentally acceptable handling and storage. Please ensure that spilt or splashed fluids are absorbed with appropriate adsorbents or by a technique that prevents it contaminating water courses, the ground or sewerage systems.

It is also not permitted to mix fluids when disposing of hydraulic fluids. Regulations governing the handing of used oils stipulate that used oils are not to mixed with other products, e.g. substances containing halogen. Non-compliance will increase disposal costs. Comply with the national legal provisions concerning the disposal of the corresponding hydraulic fluid. Comply with the local safety data sheet of the lubricant manufacturer for the country concerned.

6 Glossary

Additivation
Additives are chemical substances added to the basic fluids to achieve or improve specific properties.

Aging
Hydraulic fluids age due to oxidation (see chapter 3.1.5 "Aging resistance"). Liquid and solid contamination acts as a catalyzer for aging, meaning that it needs to be minimized as far as possible by careful filtration. Please refer to Hydrolysis.

Arrhenius equation
The quantitative relation between reaction rate and temperature is described by an exponential function, the Arrhenius equation. This function is usually visualized within the typical temperature range of the hydraulic system. For a practical example, see chapter 3.1.5 "Aging resistance".

Basic fluids
In general, a hydraulic fluid is made up of a basic fluid, or base oil, and chemical substances, the so-called additives. The proportion of basic fluid is generally greater than 90%.

Diesel effect
If hydraulic fluid that contains air bubbles is compressed quickly, the bubbles are heated to such a degree that a self-ignition of the air-gas mix may occur. The resultant temperature increase may lead to seal damage and increased aging of the hydraulic fluid.

Saturated esters
Esters differ by the number of C atoms (chain length) and position of the bonds between the C atoms. Saturated esters do not have double/multiple bonds between C atoms and are therefore more resistant to aging than partially saturated esters.

Partially saturated esters
In contrast to saturated esters, partially saturated esters have double/multiple bonds between C atoms. Rexroth defines partially saturated esters as unsaturated bonds and mixtures of esters with unsaturated and saturated bonds. Esters with unsaturated bonds are produced on the basis of renewable raw materials.

Depending on their number and position, these unsaturated bonds between the C atoms are instable. These bonds can detach themselves and form new bonds, thus changing the properties of those liquids (an aging mechanism). One of the underlying requirements for inclusion in the market overview RE 90221-01 is an aging stability characteristic. Attention is however drawn to the note in chapter 1.3.

Hydrolysis
Hydrolysis is the splitting of a chemical bond through the reaction with water under the influence of temperature.

ICP (atomic emission spectroscopy)
The ICP procedure can be used to determine various wear metals, contamination types and additives. Practically all elements in the periodic system can be detected with this method..

Iodine count
The iodine count is a yardstick for the quantity of single and multiple unsaturated bonds between C atoms in the basic fluid. A low iodine count indicates that the hydraulic fluid contains few unsaturated bonds and is thus considerably more resistant to aging than a hydraulic fluid with a high iodine count. A statement about the position at which these multiple bonds are located and about how "stable" they are against influencing factors cannot be derived simply by stating the iodine count.

Karl Fischer method
Method to determine the water content in fluids. Indirect coulometric determination procedure in accordance with DIN EN ISO 12937 in connection with DIN 51777-2. Only the combination of both standards will assure adequately accurate measured values. For hydraulic fluids based on glycol, DIN EN ISO 12937 is to be applied in conjunction with DIN 51777-1.

Cavitation
Cavitation is the creation of cavities in fluids due to pressure reduction below the saturated vapour pressure and subsequent implosion when the pressure increases. When the cavities implode, extremely high acceleration, temperatures and pressure may occur temporarily, which may damage the component surfaces.

Neutralization number (NN)
The neutralization number (NN) or acid number (AN) specifies the amount of caustic potash required to neutralize the acid contained in one gram of fluid.

Pour point
The lowest temperature at which the fluid still just flows when cooled down under set conditions. The pour point is specified in the lubricant manufacturers' technical data sheets as a reference value for achieving this flow limit.

RFA (wavelength dispersive x-ray fluorescence analysis)
Is a procedure to determine nearly all elements in liquid and solid samples with nearly any composition. This analysis method is suitable for examining additives and contamination, delivering fast results.

Shearing/shear loss
Shearing of molecule chains during operation can change the viscosity of hydraulic fluids with long chain VI enhancers. The initially high viscosity index drops. This needs to be taken into account when selecting the hydraulic fluid.

The only value at present that can be used to assess viscosity changes in operation is the result of the test in accordance with DIN 51350 part -6. Please note that there are practical applications that create a much higher shear load on such hydraulic fluids than can be achieved by this test.

Stick-slip
Interaction between a resilient mass system involving friction (such as cylinder + oil column + load) and the pressure increase at very low sliding speeds. The static friction of the system is a decisive value here. The lower it is, the lower the speed that can still be maintained without sticking. Depending on the tribologic system, the stick-slip effect may lead to vibrations generated and sometimes also to significant noise emission. In many cases, the effect can be attenuated by replacing the lubricant.

Viscosity
Viscosity is the measure of the internal friction of a fluid to flow. It is defined as the property of a substance to flow under tension. Viscosity is the most important characteristic for describing the load-bearing capacity of a hydraulic fluid.

Kinematic viscosity is the ratio of the dynamic viscosity and the density of the fluid; the unit is mm^2/s. Hydraulic fluids are classified by their kinematic viscosity into ISO viscosity classes. The reference temperature for this is 40 °C.

Viscosity index (VI)
Refers to the viscosity temperature behavior of a fluid. The lower the change of viscosity in relation the temperature, the higher the VI.

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Fire-resistant, water-free hydraulic fluids (HFDR/HFDU)

Application notes and requirements for Rexroth hydraulic components

Hydraulic fluids

Title	Hydraulic fluids based on mineral oils and related hydrocarbons	Environmentally acceptable hydraulic fluids	**Fire-resistant, water-free hydraulic fluids**	Fire-resistant, water-containing hydraulic fluids
Standard	DIN 51524	ISO 15380	**ISO 12922**	ISO 12922
Data sheets	RE 90220	RE 90221	**RE 90222**	RE 90223 (in preparation)
Classification	HL HLP HLPD HVLP HLPD and more	HEPG HEES partially saturated HEES saturated HEPR HETG	**HFDR HFDU (ester base) HFDU (glycol base) and more**	HFC HFB HFAE HFAS

Contents

1 Basic information

1.1 General instructions

The hydraulic fluid is the common element in any hydraulic component and must be selected very carefully. Quality and cleanliness of the hydraulic fluid are decisive factors for the operational reliability, efficiency and service life of a system.

Hydraulic fluids must conform, be selected and used in accordance with the generally acknowledged rules of technology and safety provisions. Reference is made to the country-specific standards and directives (in Germany the directive of the Employer's Liability Insurance Association BGR 137).

This data sheet includes recommendations and regulations concerning the selection, operation and disposal of fire-resistant, water-free hydraulic fluids in the application of Rexroth hydraulic components.

The individual selection of hydraulic fluid or the choice of classification are the responsibility of the operator.

It is the responsibility of the user to ensure that appropriate measures are taken for safety and health protection and to ensure compliance with statutory regulations. The recommendations of the lubricant manufacturer and the specifications given in the safety data sheet are to be observed when using hydraulic fluid.

This data sheet does not absolve the operator from verifying the conformity and suitability of the respective hydraulic fluid for his system. He is to ensure that the selected fluid meets the minimum requirements of the relevant hydraulic fluid standard during the whole of the period of use.

The currently valid standard for fire-resistant hydraulic fluids is the ISO 12922. In addition, other, more detailed documents, guidelines, specifications and legislation may also be valid. The operator is responsible for ensuring that such regulations are observed, for example:

- 7th Luxembourg Report: Luxembourg, April 1994, Doc. No. 4746/10/91 EN "Requirements and tests applicable to fire-resistant hydraulic fluids for hydrostatic and hydrokinetic power transmission and control"
- VDMA 24314 (1981-11): "Changing hydraulic fluids – guidelines"
- VDMA 24317 (2005-11): "Fire-resistant hydraulic fluids – minimum technical requirements"
- FM Approval Standard 6930 (2009-04): "Flammability Classification of Industrial Fluids" (only available in English)
- DIN Technical Report CEN/TR 14489 (2006-01): "Selection guidelines for protecting safety, health and the environment"

We recommend that you maintain constant, close contact with lubricant manufacturers to support you in the selection, maintenance, care and analyses.

When disposing of used hydraulic fluids, apply the same care as during use.

1.2 Fire resistance

There is no clear legal definition of fire-resistant hydraulic fluids. There are great differences regarding fire resistance. The selection is the sole responsibility of the system operator with respect to requirements (application, construction and design of the system, hottest source in the system, necessary fire protection).

Different test procedures are applied for evaluating fire resistance.

Fire resistance test procedure according to ISO 12922:

- Ignition properties of spray according to ISO 15029-1 (Spray flame persistence – hollow-cone nozzle method)
- Ignition properties of spray according to ISO 15029-2 (Stabilized flame heat release)
- Wick flame persistence of fluids according to ISO 14935 (average flame persistence)
- Determination of the flammability characteristics of fluids in contact with hot surfaces, ignition process according to ISO 20823 (ignition temperature, flame spread)

In general, fire-resistant hydraulic fluids are distinguished between **water-containing** fire-resistant and **water-free** fire-resistant hydraulic fluids. Water-containing fire-resistant hydraulic fluids are described in RE 90223.

Water-free, fire-resistant hydraulic fluid means hydraulic fluids with a water-proportion of 0.1% by volume ("Karl Fischer method", see chapter 6 "Glossary"), measured at the time of filling in the transport container.

In Europe water-free, fire-resistant hydraulic fluids are not approved for use in underground coal mining. The classification HFDU is no longer included in the VDMA 24317: 2005.

Note
In contrast to water-containing fluids, all water-free, fire-resistant hydraulic fluids have a flash point and a fire point. Specific parameters for flash point and fire point can be found in the technical and/or safety data sheet for the hydraulic fluid concerned.

Just as much care should be taken when working with fire-resistant hydraulic fluids are with other hydraulic fluids, e.g. mineral oils. A leak from the hydraulic system must be avoided. The best and most cost-effective protection against fire and explosion is to prevent leakage with meticulous service, maintenance and care of the hydraulic system.

1.3 Scope

This data sheet must be applied when using water-free, fire-resistant hydraulic fluids with Rexroth hydraulic components. The specifications of this data sheet may be further restricted by the specifications given in data sheets for the individual components concerned.

The use of the individual water-free, fire-resistant hydraulic fluids in accordance with the intended purpose can be found in the safety data sheets or other product description documents of the lubricant manufacturers. In addition, each use is to be individually considered.

Rexroth hydraulic components may only be operated with water-free, fire-resistant hydraulic fluids according to ISO 12922 if specified in the respective component data sheet or if a Rexroth approval for use is furnished.

The manufacturers of hydraulic systems must adjust their systems and operating instructions to the water-free, fire-resistant hydraulic fluids.

Bosch Rexroth will accept no liability for its components for any damage resulting from failure to comply with the notes below.

1.4 Safety instructions

Hydraulic fluids can constitute a risk for persons and the environment. These risks are described in the hydraulic fluid safety data sheets. The operator is to ensure that a current safety data sheet for the hydraulic fluid used is available and that the measures stipulated therein are complied with.

2 Solid particle contamination and cleanliness levels

Solid particle contamination is the major reason for faults occurring in hydraulic systems. It may lead to a number of effects in the hydraulic system. Firstly, single large solid particles may lead directly to a system malfunction, and secondly small particles cause continuous elevated wear.

For mineral oils, the cleanliness level of water-free, fire-resistant hydraulic fluids is given as a three-digit numerical code in accordance with ISO 4406. This numerical code denotes the number of particles present in a hydraulic fluid for a defined quantity. Moreover, foreign solid matter is not to exceed a mass of 50 mg/kg (gravimetric examination according to ISO 4405).

In general, compliance with a minimum cleanliness level of 20/18/15 in accordance with ISO 4406 or better is to be maintained in operation. Special servo valves demand improved cleanliness levels of at least 18/16/13. A reduction in cleanliness level by one level means half of the quantity of particles and thus greater cleanliness. Lower numbers in cleanliness levels should always be striven for and extend the service life of hydraulic components. The component with the highest cleanliness requirements determines the required cleanliness of the overall system. Please also observe the specifications in table 1: "Cleanliness levels according to ISO 4406" and in the respective data sheets of the various hydraulic components.

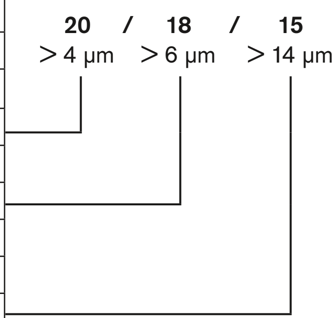
Hydraulic fluids frequently fail to meet these cleanliness requirements on delivery. Careful filtering is therefore required during operation and in particular, during filling in order to ensure the required cleanliness levels. Your lubricant manufacturer can tell you the cleanliness level of hydraulic fluids as delivered. To maintain the required cleanliness level over the operating period, you must use a reservoir breather filter. If the environment is humid, take appropriate measures, such as a breather filter with air drying or permanent off-line water separation.

Note: the specifications of the lubricant manufacturer relating to cleanliness levels are based on the time at which the container concerned is filled and not on the conditions during transport and storage.

Further information about contamination with solid matter and cleanliness levels can be found in brochure RE 08016.

Table 1: Cleanliness levels according to ISO 4406

Particles per 100 ml		Scale number
More than	Up to and including	
8,000,000	16,000,000	24
4,000,000	8,000,000	23
2,000,000	4,000,000	22
1,000,000	2,000,000	21
500,000	1,000,000	20
250,000	500,000	19
130,000	250,000	18
64000	130,000	17
32000	64000	16
16000	32000	15
8000	16000	14
4000	8000	13
2000	4000	12
1000	2000	11
500	1000	10
250	500	9
130	250	8
64	130	7
32	64	6



3 Selection of the hydraulic fluid

Water-free, fire-resistant hydraulic fluids for Bosch Rexroth hydraulic components are assessed on the basis of their fulfillment of the minimum requirements of ISO 12922.

3.1 Selection criteria for the hydraulic fluid

The specified limit values for all components employed in the hydraulic system, for example viscosity and cleanliness level, must be observed with the hydraulic fluid used, taking into account the specified operating conditions.

Hydraulic fluid suitability depends, amongst others, on the following factors:

3.1.1 Viscosity

Viscosity is a basic property of hydraulic fluids. The permissible viscosity range of complete systems needs to be determined taking account of the permissible viscosity of all components and it is to be observed for each individual component.

The viscosity at operating temperature determines the response characteristics of closed control loops, stability and damping of systems, the efficiency factor and the degree of wear.

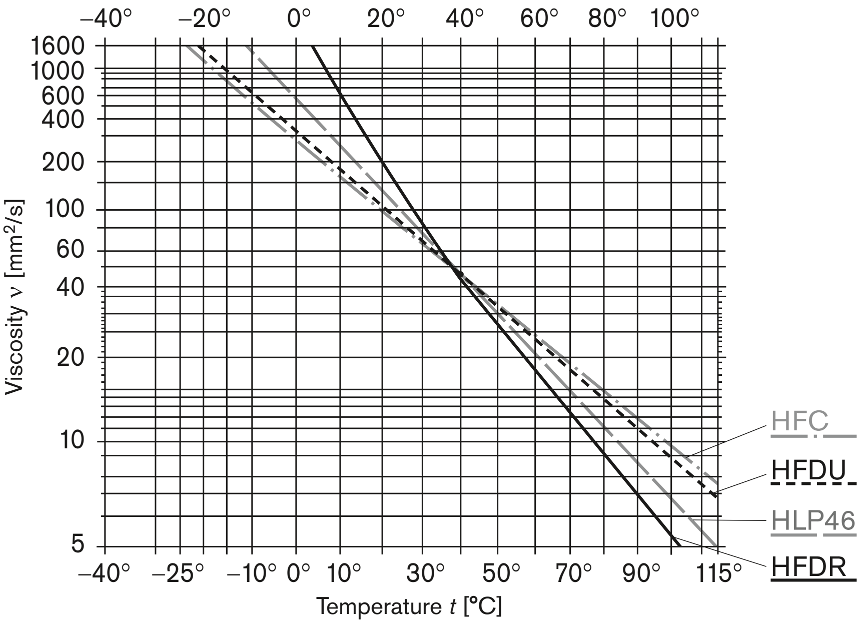
We recommend that the optimum operating viscosity range of each component be kept within the permissible temperature range. This usually requires either cooling or heating, or both. The permissible viscosity range and the necessary cleanliness level can be found in the product data sheet for the component concerned.

If the viscosity of a hydraulic fluid used is above the permitted operating viscosity, this will result in increased hydraulic-mechanical losses. In return, there will be lower internal leakage losses. If the pressure level is lower, lubrication gaps may not be filled up, which can lead to increased wear. For hydraulic pumps, the permitted suction pressure may not be reached, which may lead to cavitation damage.

If the viscosity of a hydraulic fluid is below the permitted operating viscosity, increased leakage, wear, susceptibility to contamination and a shorter component life cycle will result.

Please ensure that the permissible temperature and viscosity limits are observed for the respective components. This usually requires either cooling or heating, or both.

Fig. 1: Examples V-T diagrams for water-free, fire-resistant hydraulic fluids in comparison to HLP and HFC (reference values, double-logarithmic representation)



Typical viscosity data [mm²/s] at temperature	0 °C	40 °C	100 °C
HFDR	2500	43	5,3
HFDU (ester base)	330	46	9,2
HFDU (glycol base)	350	46	8,7
For comparison HLP (see RE 90220)	610	46	7
For comparison HFC (see RE 90223)	280	46	

Detailed V-T diagrams may be obtained from your lubricant manufacturer for their specific products. Descriptions of the individual classifications can be found in chapter 3.2 and in Table 4.

3.1.2 Viscosity-temperature behavior

For hydraulic fluids, the viscosity temperature behavior (V-T behavior) is of particular importance. Viscosity is characterized in that it drops when the temperature increases and rises when the temperature drops. The interrelation between viscosity and temperature is described by the viscosity index (VI).

For cold testing over a period of several days, the viscosity of ester-based HFDU can increase greatly. After heating, the characteristic values as specified on the data sheet are restored. Please ask your lubricant manufacturer for the "Flow capacity after seven days at low temperature" (ASTM D 2532) for the fluid classification ester-based HFDU .

HFDU fluid based on ester and glycol have better viscosity/temperature characteristics than mineral oil HLP (see Fig. 1). This should be taken into consideration when selecting hydraulic fluid for the required temperature range. The viscosity and temperature limits required in the product data sheets are to be observed in all operating conditions.

Note
For ambient temperatures below 0 °C, fire-resistant, **water-containing** hydraulic fluids of classification HFC are to be preferred because they observe the component-related viscosity ranges and because the have better pour points (see RE 90223).

3.1.3 Wear protection capability

Wear protection capability describes the property of hydraulic fluids to prevent or minimize wear within the components. The wear protection capability is described in ISO 12922 via test procedures"FZG gear test rig" (ISO 14635-1) and "Mechanical test in the vane pump" (ISO 20763). The wear protection capability of water-free, fire-resistant hydraulic fluids in relation to the two test procedures is comparable to that of mineral oil HLP/HVLP.

3.1.4 Material compatibility

The hydraulic fluid must not negatively affect the materials used in the components. Compatibility with coatings, seals, hoses, metals and plastics is to be observed in particular. The fluid classifications specified in the respective component data sheets are tested by the manufacturer with regard to material compatibility. Parts and components not supplied by us are to be checked by the user.

Table 2: Known material incompatibilities

Classification	Incompatible with:
HFD in general	Seals, plastics and coatings of control cabinets, outer coatings of hydraulic components and accessory components (connectors, wiring harnesses, control cabinets) are to be tested for stability. **Note:** hydraulic fluid vapors can also lead to incompatibility!
HFDR	Individual component color coating, lead, galvanic zinc-plating, in part non-ferrous metals with zinc, tin and aluminum in a tribological system. Sealing elements made of NBR. In some cases, the latter show major increases in volume when impermissibly aged hydraulic fluids come into contact with the material. Do not use any hydrolysis/susceptible polyurethane qualities.
HFDU based on ester	Single-component color coatings, lead, galvanized zinc coatings, in part non-ferrous metals with zinc, tin, seals made of NBR. In some cases, the latter show major increases in volume when impermissibly aged hydraulic fluids come into contact with the material. Do not use any hydrolysis/susceptible polyurethane qualities.
HFDU based on glycol	Single-component color coatings, steel/aluminum tribocontacts, paper filters, polymethylmethacrylate (PMMA). The compatibility of NBR is to be examined for individual case.

The material incompatibilities mentioned here do not automatically result in function problems. However the elements of the materials are found in the hydraulic fluids after use. The material incompatibilities described here may lead to accelerated aging of the hydraulic fluid and to reduced fire resistance.

3.1.5 Aging resistance

The way a water-free, fire-resistant hydraulic fluid ages depends on the thermal, chemical and mechanical stress to which it is subjected. The influence of water, air, temperature and contamination may be significantly greater than for mineral oils HLP/HVLP. Aging resistance can be greatly influenced by the chemical composition of the hydraulic fluids.

High fluid temperatures (e.g. over 80 °C) result in a approximate halving of the fluid service life for every 10 °C temperature increase and should therefore by avoided. The halving of the fluid service life results from the application of the Arrhenius equation (see Glossary).

Table 3: Reference values for temperature-dependent aging of the hydraulic fluid

Reservoir temperature	Fluid life cycle
80 °C	100 %
90 °C	50 %
100 °C	25 %

A modified aging test (ISO 4263-3 or ASTM D943 – without the addition of water) is specified for fluid classification HFDU. Fluid classification HFDR is described with a special procedure with respect to oxidation stability (EN 14832) and oxidation service life (ISO 4263-3). The calculated fluid service life is derived from the results of tests in which the long-term characteristics are simulated in a short period of time by applying more arduous conditions (condensed testing). This calculated fluid service life is not to be equated to the fluid service life in real-life applications.

Table 3 is a practical indicator for hydraulic fluids with water content < 0.1%, cf. chapter 4.10. "Water".

3.1.6 Environmentally acceptable

HFDU fluids based on ester and glycol are hydraulic fluids which may also be classified as environmentally acceptable. The main criteria for fire-resistant, water-free hydraulic fluids are the leak-free, technically problem-free use and the necessary fire resistance. Environmentally acceptable is merely a supplementary criterion. Notes on environmentally compatible hydraulic fluids can be found in RE 90221.

3.1.7 Air separation ability (ASA)

The air separation ability (ASA) describes the property of a hydraulic fluid to separate undissolved air. Hydraulic fluids always contain dissolved air. During operation, dissolved air may be transformed into undissolved air, leading to cavitation damages. Fluid classification, fluid product, reservoir size and design must be coordinated to take into account the dwell time and ASA value of the hydraulic fluid. The air separation capacity depends on the viscosity, temperature, basic fluid and aging. It cannot be improved by additives.

According to ISO 12922 for instance, an ASA value ≤ 15 minutes is required for viscosity class ISO VG 46, practical values on delivery are < 10 minutes, lower values are preferable.

3.1.8 Demulsifying ability and water solubility

The capacity of a hydraulic fluid to separate water at a defined temperature is known as the demulsifying ability. ISO 6614 defines the demulsifying properties of hydraulic fluids.

The fluid classifications HFDU based on ester and HFDR separate water, but HFD hydraulic fluids have a different water separation ability to mineral oil HLP/HVLP. At 20 °C, in comparison to mineral oil HLP/HVLP, a multiple (> factor 3) of water can separate in the hydraulic fluid. Water solubility is also more temperature-dependent than for mineral oils. The fluid classification HFDU based on glycol usually dissolves water completely, see chapter "4.10 Water".

3.1.9 Filterability

Filterability describes the ability of a hydraulic fluid to pass through a filter, removing solid contaminants. The hydraulic fluids used require a good filterability, not just when new, but also during the whole of their service life. This can differ greatly depending on the different basic fluids (glycols, esters) and additives (VI enhancers, anti-fogging additives).

The filterability is a basic prerequisite for cleanliness, servicing and filtration of hydraulic fluids. Rexroth therefore requires the same degree of filterability of water-free, fire-resistant hydraulic fluids as for mineral oils HLP/HVLP to DIN 51524.
As ISO 12922 does not comment on the filterability of hydraulic fluids, filterability comparable to that of mineral oils HLP/HVLP must be requested of lubricant manufacturers.

Filterability is tested with the new hydraulic fluid and after the addition of 0.2 % water. The underlying standard (ISO 13357-1/-2) stipulates that filterability must have no negative effects on the filters or the hydraulic fluid, see chapter 4 "Hydraulic fluids in operation".

3.1.10 Corrosion protection

Hydraulic fluids should not just prevent corrosion formation on steel components, they must also be compatible with non-ferrous metals and alloys. Corrosion protection tests on different metals and metal alloys are described in ISO 12922.

Rexroth components are usually tested with HLP hydraulic fluids or corrosion protection oils based on mineral oils before they are delivered.

3.1.11 Additivation

The properties described above can be modified with the help of suitable additives.
Bosch Rexroth does not prescribe any specific additive system.

3.2 Classification and fields of application

Table 4: Classification and fields of application

Classification	Features	Typical field of application	Notes
HFDU (glycol-based) according to ISO 12922 Density at 15 °C: typically > 0.97 kg/dm³ VI: typical > 170 The classification "HFDU" is no longer listed in the current standard sheet VDMA 24317.	Base fluid: Glycols	Mobile systems with high thermal loading	For information on approved components, please refer to the respective product data sheet. For components which have not been approved according to the product data sheet, please consult your Bosch Rexroth sales partner. – Very good viscosity/temperature characteristics, shear stability – Resistant to aging – Can be water-soluble – Can be mixed with water – Very good wear protection properties – A higher implementation temperature with the same viscosity in comparison to mineral oil is to be expected – Due to the higher density in comparison to HLP, lower suction pressures are to be anticipated for pumps. Reduce the maximum speed as required and optimize suction conditions. – Prior to commissioning, contact the lubricant manufacturer, as the components are tested with mineral oil HLP/corrosion protection oil. – Incompatible with mineral oil (exceptions must be confirmed by the lubricant manufacturer).
HFDU (ester-based) according to ISO 12922 Density at 15 °C: typically 0.90-0.93 kg/dm³ VI: typical > 160 Iodine count < 90 The classification "HFDU" is no longer listed in the current standard sheet VDMA 24317.	Base fluid: Ester based on regenerative raw materials, synthetic ester and mixtures of different esters Because of the fire resistance, HFDU hydraulic fluids based on ester are usually partially saturated esters	Suitable for most fields of application and components.	For information on approved components, please refer to the respective product data sheet. For components which have not been approved according to the product data sheet, please consult your Bosch Rexroth sales partner. – Preferred use of FKM seals. Please enquire about shaft seal rings and implementation temperatures under −15 °C. – Note shear stability (see chapter 4.11 "Fluid servicing, fluid analysis and filtration" and chapter 6 "Glossary") – Fire resistance is not stable over time – In operation, a higher temperature in comparison to mineral oil HLP/HVLP is to be expected given identical design and viscosity. Please check ATEX approvals for hydraulic components. – Limit the lower (see chapter 3.1.2) and upper implementation temperatures (see chapter 3.1.5) – Good viscosity-temperature behavior – Usually classified as insignificantly water-endangering (water hazard class WGK 1) – High dirt dissolving capacity on fluid changeovers – In unfavorable operating conditions (high water content, high temperature), HFDU on ester basis have a tendency to hydrolysis. The acidic organic decomposition products can chemically attack materials and components.

Classification	Features	Typical field of application	Notes
HFDR according to ISO 12922 Density at 15 °C: typically 1.1 kg/dm³ VI : typical 140–160	Base fluid: phosphoric acid ester	Turbine control systems	For information on approved components, please refer to the respective product data sheet. For components which have not been approved according to the product data sheet, please consult your Bosch Rexroth sales partner. – Classified as hazardous materials (for transportation and storage) – Hazardous working material – Water-endangering (Water hazard class 2 – WGK2) – Develops toxic vapors in case of fire – Preferred use of FKM, and possibly PTFE seals. Please enquire for shaft seal rings and implementation temperatures under −15 °C. – In operation, a higher temperature in comparison to mineral oil HLP/HVLP is to be expected given identical design and viscosity – Phosphoric acid esters display a tendency to hydrolysis when they come into contact with moisture. Under the influence of water/moisture, they become unstable or form highly aggressive, acidic components which could damage the hydraulic fluid and component beyond repair. – Poor viscosity/temperature characteristics – Due to the higher density in comparison to HLP, lower suction pressures are to be anticipated for pumps. Reduce the maximum speed as required and optimize suction conditions. – In unfavorable operating conditions (high water content, high temperature), HFDR have a tendency to hydrolysis. The acidic inorganic decomposition products chemically attack materials and components.
HFDU (continued)	Based on triglycerides, mineral oils or related hydrocarbons	Not recommended for Rexroth components!	Hydraulic fluids based on polyalphaolefines are not recommended on account of their poor fire resistance. This classification can usually be identified from: density $<$ 0.89; VI $<$ 140 to 160 Hydraulic fluids based on triglycerides are not recommended on account of their aging resistance. This classification can usually be identified from: density $>$ 0.92; VI $>$ 190; iodine count $>$ 90 Consult your lubricant manufacturer or your Bosch Rexroth sales partner if the classification of a hydraulic fluid is not clear.
HFDS HFDT	Based on halogenated hydrocarbons or mixtures with halogenated hydrocarbons	Not approved for Rexroth components!	HFDS and HFDT have not been permitted to be manufactured or used since 1989 for environmental reasons.

4 Hydraulic fluids in operation

4.1 General

The properties of hydraulic fluids can change continually during storage and operation.

Please note that the fluid standard ISO 12922 merely describes minimum requirements for hydraulic fluids in new condition at the time of filling into the bins. The operator of a hydraulic system must ensure that the hydraulic fluid remains in a utilizable condition throughout its entire period of use.

Deviations from the characteristic values are to be clarified with the lubricant manufacturer, the test labs or Bosch Rexroth.

Bosch Rexroth will accept no liability for damage to its components within the framework of the applicable liability legislation insofar as the latter is due to non-observance of the following instructions.

Please note the following aspects in operation.

4.2 Storage and handling

Hydraulic fluids must be stored correctly in accordance with the instructions of the lubricant manufacturer. Avoid exposing the containers to lengthy periods of direct heat. Containers are to be stored in such a way that the risk of any foreign liquid or solid matter (e.g. water, foreign fluids or dust) ingression into the inside of the container can be ruled out. After taking hydraulic fluids from the containers, these are immediately to be properly resealed.

Recommendation:

– Store containers in a dry, roofed place

– Store barrels on their sides

– Clean reservoir systems and machine reservoirs regularly

4.3 Filling of new systems

Usually, the cleanliness levels of the hydraulic fluids as delivered do not meet the requirements of our components. Hydraulic fluids must be filtered using an appropriate filter system to minimize solid particle contamination and water in the system.

As early as possible during test operation, new systems should be filled with the selected hydraulic fluid so as to reduce the risk of accidentally mixing fluids (see chapter 4.5 "Mixing and compatibility of different hydraulic fluids"). Changing the hydraulic medium at a later point represents significant additional costs (see following chapter).

4.4 Hydraulic fluid changeover

Problems may be encountered in particular when changing over from water-containing, fire-resistant hydraulic fluid or mineral oils to water-free, fire-resistant hydraulic fluids (e.g. incompatibilities in the form of gelling, silting, stable foam, reduced filterability or filter blockage). This may also happen when changing products within the same classification.

In the case of changeovers of the fluid in hydraulic systems, it is important to ensure compatibility of the new hydraulic fluid with the remains of the previous hydraulic fluid. Bosch Rexroth recommends obtaining verification of compatibility from the manufacturer or supplier of the new hydraulic fluid. The quantity of old fluid remaining should be minimized. Mixing hydraulic fluids should be avoided, see following chapter.

Information about changing to a hydraulic fluid of a different classification can be found, for example, in VDMA 24314 and in ISO 7745. In addition, the information given in chapter 3.1.4 "Material compatibility" is also to be observed.

Bosch Rexroth will not accept liability for any damage to its components resulting from inadequate hydraulic fluid changeovers!

4.5 Mixing and compatibility of different hydraulic fluids

If hydraulic fluids from different manufacturers or different types from the same manufacturer are mixed, gelling, silting and deposits may occur. These, in turn, may cause foaming, impaired air separation ability, malfunctions and damage to the hydraulic system.

If the fluid contains more than 2 % of another fluid then it is considered to be a mixture. Exceptions apply for water, see chapter 4.10 "Water".

Mixing with other hydraulic fluids is not generally permitted. This includes hydraulic fluids with the same classification. If individual lubricant manufacturers advertise miscibility and/or compatibility, this is entirely the responsibility of the lubricant manufacturer.

Bosch Rexroth customarily tests all components with mineral oil HLP before they are delivered.

Note: With connectible accessory units and mobile filtering systems, there is a considerable risk of non-permitted mixing of the hydraulic fluids!

Rexroth will not accept liability for any damage to its components resulting from mixing hydraulic fluids!

4.6 Re-additivation

Additives added at a later point in time such as colors, wear reducers, VI enhancers or anti-foam additives, may negatively affect the performance properties of the hydraulic fluid and the compatibility with our components and therefore are not permissible.

Rexroth will not accept liability for any damage to its components resulting from re-additivation!

4.7 Foaming behavior

Foam is created by rising air bubbles at the surface of hydraulic fluids in the reservoir. Foam that develops should collapse as quickly as possible.

Common hydraulic fluids in accordance with ISO 12922 are sufficiently inhibited against foam formation in new condition. On account of aging and adsorption onto surfaces, the defoamer concentration may decrease over time, leading to a stable foam.

Defoamers may be re-dosed only after consultation with the lubricant manufacturer and with his written approval.

Defoamers may affect the air separation ability.

4.8 Corrosion

The hydraulic fluid is to guarantee sufficient corrosion protection of components under all operating conditions, even in the event of impermissible water contamination.

Water-free, fire-resistant hydraulic fluids are tested for corrosion protection in the same way as mineral oil HLP/HVLP. When used in practice other corrosion mechanisms are revealed in detail and in individual cases, for the most part in contact with non-ferrous and white alloys.

4.9 Air

Under atmospheric conditions the hydraulic fluid contains dissolved air. In the negative pressure range, for instance in the suction pipe of the pump or downstream of control edges, this dissolved air may transform into undissolved air. The undissolved air content represents a risk of cavitation and of the diesel effect. This results in material erosion of components and increased hydraulic fluid aging.

With the correct measures, such as suction pipe and reservoir design, and an appropriate hydraulic fluid, air intake and separation can be positively influenced.

See also chapter 3.1.7 "Air separation ability (ASA)”.

4.10 Water

Water contamination in hydraulic fluids can result from direct ingress or indirectly through condensation of water from the air due to temperature variations.

HFDU hydraulic fluids on glycol basis are water-soluble or can be mixed with water. This means that any water that has ingressed into the system cannot be drained off in the sump of the reservoir.

In the case of HDFU hydraulic fluids on ester basis, undissolved water can be drained off from the reservoir sump, the remaining water content is however too high to ensure that the maximum permissible water limit values are observed in the long term.

With the fluid classification HFDR, the greater density of the ester means that the any water that has ingressed will be on the surface of the hydraulic fluid. This means that any water that has ingressed into the system cannot be drained off in the sump of the reservoir.

Water in the hydraulic fluid can result in wear or direct failure of hydraulic components. Furthermore, a high water content in the hydraulic fluid negatively affects aging and filterability and increases susceptibility to cavitation. During operation, the water content in all hydraulic fluids, determined according to the "Karl Fischer method" (see chapter 6 "Glossary") for all water-free, fire-resistant hydraulic fluids must constantly be kept below 0.1% (1000 ppm). To ensure a long service life of both hydraulic fluids and components, Bosch Rexroth recommends that values below 0.05% (500 ppm) are permanently maintained.

Due to the higher water solubility in comparison to mineral oil HLP/HVLP it is urgently advised that precautions be taken when using water-free, fire-resistant hydraulic fluids, such as a dehumidifier on the reservoir ventilation.

Water content has an affect particularly in the case of HEDU hydraulic fluid on ester basis and HFDR in that it accelerates aging (hydrolysis) of the hydraulic fluid and biological degradation, see chapter 4.11 "Fluid servicing, fluid analysis and filtration".

4.11 Fluid servicing, fluid analysis and filtration

Air, water, operating temperature influences and solid matter contamination will change the performance characteristics of hydraulic fluids and cause them to age.

To preserve the usage properties and ensure a long service life for hydraulic fluid and components, the monitoring of the fluid condition and a filtration adapted to the application requirements (draining and degassing if required) are indispensable.

The effort is higher in the case of unfavorable usage conditions, increased stress for the hydraulic system or high expectations as to availability and service life, see chapter 2 "Solid particle contamination and cleanliness levels".

When commissioning a system, please note that the required minimum cleanliness level can frequently be attained only by flushing the system. Due to severe start-up contamination, it may be possible that a fluid and/or filter replacement becomes necessary after a short operating period (< 50 operating hours).

The hydraulic fluid must be replaced at regular intervals and tested by the lubricant manufacturer or recognized accredited test labs. **We recommend a reference analysis after commissioning.**

The minimum data to be tested for analyses are:

- Viscosity at 40 °C and 100 °C
- Neutralization number NN (acid number AN)
- Water content (Karl-Fischer method)
- Particle measurement with evaluation according to ISO 4406 or mass of solid foreign substances with evaluation to EN 12662
- Element analysis (RFA (EDX) / ICP, specify test method)
- Comparison with new product or available trend analyses
- Assessment / evaluation for further use
- Also recommended: IR spectrum

No differences are needed in the maintenance and care of water-free, fire-resistant hydraulic fluids with the appropriate suitability parameters compared to HLP/HVLP mineral oils. Attention is however drawn to the note in chapter 1.3.

After changing over hydraulic fluids it is recommended that the filters be replaced again after 50 operating hours as fluid aging products may have detached themselves ("self-cleaning effect").

Compared to the pure unused hydraulic fluid the changed neutralization number NN (acid number AN) indicates how many aging products are contained in the hydraulic fluid. This difference must be kept as small as possible. The lubricant manufacturer should be contacted as soon as the trend analysis notes a significant increase in values.

A higher viscosity than that of new materials indicates that the hydraulic fluid has aged. Evaluation by the test lab or lubricant manufacturers is however authoritative, whose recommendation should be urgently observed.

On systems where the possibility of water contamination cannot be completely ruled out (also condensation), it should be ensured via the hydraulic system circuit that fluid aging products are not accumulating in individual areas of the hydraulic system, but are being removed from the system in a controlled manner via the filtration system. This should be ensured via suitable hydraulic circuits (e.g. flushing circuit) or system manufacturer's operating instructions/specifications.

In case of warranty, liability or guarantee claims to Bosch Rexroth, service verification and/or the results of fluid analyses are to be provided.

5 Disposal and environmental protection

All water-free, fire-resistant hydraulic fluids, are, like mineral oil-based hydraulic fluids, subject to special disposal obligations.

The respective lubricant manufacturers provide specifications on environmentally acceptable handling and storage. Please ensure that spilt or splashed fluids are absorbed with appropriate adsorbents or by a technique that prevents it contaminating water courses, the ground or sewerage systems.

It is also not permitted to mix fluids when disposing of hydraulic fluids. Regulations governing the handing of used oils stipulate that used oils are not to mixed with other products, e.g. substances containing halogen. Non-compliance will increase disposal costs. Comply with the national legal provisions concerning the disposal of the corresponding hydraulic fluid. Comply with the local safety data sheet of the lubricant manufacturer for the country concerned.

6 Glossary

Additivation
Additives are chemical substances added to the basic fluids to achieve or improve specific properties.

Aging
Hydraulic fluids age due to oxidation (see chapter 3.1.5 "Aging resistance"). Liquid and solid contamination acts as a catalyzer for aging, meaning that it needs to be minimized as far as possible by careful filtration. Please refer to Hydrolysis.

Arrhenius equation
The quantitative relation between reaction rate and temperature is described by an exponential function, the Arrhenius equation. This function is usually visualized within the typical temperature range of the hydraulic system. For a practical example, see chapter 3.1.5 "Aging resistance".

Basic fluids
In general, a hydraulic fluid is made up of a basic fluid, or base oil, and chemical substances, the so-called additives. The proportion of basic fluid is generally greater than 90%.

Diesel effect

If hydraulic fluid that contains air bubbles is compressed quickly, the bubbles are heated to such a degree that a self-ignition of the air-gas mix may occur. The resultant temperature increase may lead to seal damage and increased aging of the hydraulic fluid.

Partially saturated esters
In contrast to saturated esters, partially saturated esters have double/multiple bonds between C atoms. Rexroth defines partially saturated esters as unsaturated bonds and mixtures of esters with unsaturated and saturated bonds. Esters with unsaturated bonds are produced on the basis of renewable raw materials.

Depending on their number and position, these unsaturated bonds between the C atoms are instable. These bonds can detach themselves and form new bonds, thus changing the properties of those liquids (an aging mechanism). Attention is however drawn to the note in chapter 1.3.

Hydrolysis
Hydrolysis is the splitting of a chemical bond through the reaction with water under the influence of temperature.

ICP (atomic emission spectroscopy)
The ICP procedure can be used to determine various wear metals, contamination types and additives. Practically all elements in the periodic system can be detected with this method.

Iodine count
The iodine count is a yardstick for the quantity of single and multiple unsaturated bonds between C atoms in the basic fluid. A low iodine count indicates that the hydraulic fluid contains few unsaturated bonds and is thus considerably more resistant to aging than a hydraulic fluid with a high iodine count. A statement about the position at which these multiple bonds are located and about how "stable" they are against influencing factors cannot be derived simply by stating the iodine count.

Karl Fischer method
Method to determine the water content in fluids. Indirect coulometric determination procedure in accordance with DIN EN ISO 12937 in connection with DIN 51777-2. Only the combination of both standards will assure adequately accurate measured values. For hydraulic fluids based on glycol, DIN EN ISO 12937 is to be applied in conjunction with DIN 51777-1.

Cavitation
Cavitation is the creation of cavities in fluids due to pressure reduction below the saturated vapour pressure and subsequent implosion when the pressure increases. When the cavities implode, extremely high acceleration, temperatures and pressure may occur temporarily, which may damage the component surfaces.

Neutralization number (NN)
The neutralization number (NN) or acid number (AN) specifies the amount of caustic potash required to neutralize the acid contained in one gram of fluid.

Pour point
The lowest temperature at which the fluid still just flows when cooled down under set conditions. The pour point is specified in the lubricant manufacturers' technical data sheets as a reference value for achieving this flow limit.

RFA (wavelength dispersive x-ray fluorescence analysis)
Is a procedure to determine nearly all elements in liquid and solid samples with nearly any composition. This analysis method is suitable for examining additives and contamination, delivering fast results.

Shearing/shear loss
Shearing of molecule chains during operation can change the viscosity of hydraulic fluids with long chain VI enhancers and anti-fogging additives. The initially high viscosity index drops. This needs to be taken into account when selecting the hydraulic fluid.

The only value at present that can be used to assess viscosity changes in operation is the result of the test in accordance with DIN 51350 part -6. Please note that there are practical applications that create a much higher shear load on such hydraulic fluids than can be achieved by this test.

Viscosity
Viscosity is the measure of the internal friction of a fluid to flow. It is defined as the property of a substance to flow under tension. Viscosity is the most important characteristic for describing the load-bearing capacity of a hydraulic fluid.

Kinematic viscosity is the ratio of the dynamic viscosity and the density of the fluid; the unit is mm^2/s. Hydraulic fluids are classified by their kinematic viscosity into ISO viscosity classes. The reference temperature for this is 40 °C.

Viscosity index (VI)
Refers to the viscosity temperature behavior of a fluid. The lower the change of viscosity in relation the temperature, the higher the VI.

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The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification.

It must be remembered that our products are subject to a natural process of wear and aging.

Subject to change.

On/off valves

Directional valves
Valves controlling the flow direction and thus the direction of movement or rotation of hydraulic actuators (directional seat valves or spool valves, direct operated or pilot operated).

Isolator valves
Valves that block the flow in one direction safely and leakage-free, thus allowing for free flow in the opposite direction (check valves and prefill valves).

Pressure valves
Valves having a pre-determined effect on the operating pressure in a system or a part of a system (pressure relief valves, pressure sequence valves, pressure cut-off valves and pressure reducing valves).

Flow control valves
Valves controlling the flow and thus the speed of hydraulic actuators (throttle valves and flow control valves).

2-way cartridge valves
2-way cartridge valves are elements that have been designed for a compact block design. The power part is installed in a receiving hole of the manifold according to ISO 7368 and closed with a control cover.

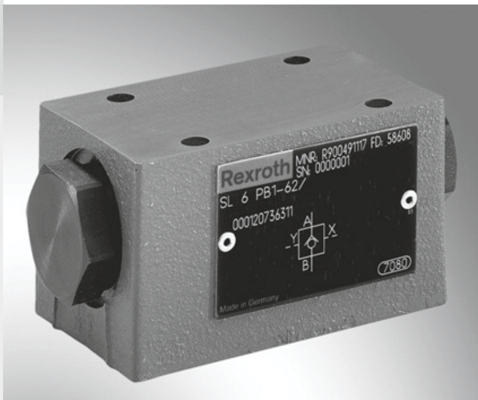
Isolator valves

Rexroth
Bosch Group

Check valve, pilot operated

RE 21460/08.11
Replaces: 07.05

Type SV and SL



H6090

Size 6
Component series 6X
Maximum operating pressure 315 bar
Maximum flow 60 l/min

Table of contents

Features

– For subplate mounting
– Porting pattern according to ISO 4401-03-02-0-05 and ISO 5781-03-04-0-00
– For the leak-free blocking of one actuator port
– With internal or external pilot oil return, optional
– Various cracking pressures, optional
– With or without pre-opening, optional
– Check valve installation separately available
– Corrosion-resistant design, optional

– More information:

• Subplates	Data sheet 45052
• Hydraulic fluids on mineral oil basis	Data sheet 90220
• Reliability characteristics according to EN ISO 13849	Data sheet 08012

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

S		6	P		–6X/		*

Pilot oil return internal **= V**
Pilot oil return external **= L**

Size 6 **= 6**

For subplate mounting **= P**

With pre-opening **= A**
Without pre-opening **= B**

Cracking pressure **= 1**
See page 5 **= 2**
= 3
= 4 1)

6X = Component series 60 to 69
(60 to 69: Unchanged installation and connection dimensions)

Corrosion resistance (outside)
No code = None
J50 = Galvanic coating
DIN 50979 - Fe//Zn8//Cn//T0
(thick-layer passivation)

Seal material 2)
No code = NBR seals
V = FKM seals
(other seals upon request)

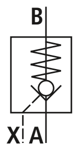
Further details in the plain text

1) Only version "B"

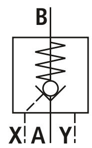
2) The selection of the seal material depends on the operating parameters (fluid, temperature, etc.)

Symbols

Type SV (pilot oil return internal)



Type SL (pilot oil return external)



Function, section

The isolator valve type SV/SL is a pilot operated check valve for subplate mounting. It is used for the leak-free blocking of one actuator port, also in case of longer standstill times.

The valve basically consists of a housing (1), a seat poppet (2), a compression spring (3), a control spool (4) as well as of a pre-opening as ball seat valve (7), which is optional.

The seat valve can be flown through from A to B without external pilot pressure.

Condition: $\boldsymbol{p}_A > \boldsymbol{p}_B$ + cracking pressure (compression spring). In the opposite direction, the seat valve closes hydraulically tight.

A sufficiently high pilot pressure at port X moves the control spool (4) in the direction of the seat valve and pushes the seat poppet (2) out of its seat. This allows for a free flow in both directions (active keeping open).

In order to ensure that the seat valve actively opens, the pressure conditions on both sides of the control spool (4) are just as important as the area ratio at the seat poppet (2) or (7).

This results in the following available options for the types

– SV (large spool face $\boldsymbol{A}_2$ (6) connected with $\boldsymbol{p}_A$) or
– SL (small front face $\boldsymbol{A}_4$ (8) connected with $\boldsymbol{p}_A$)

as well as for the versions with pre-opening "A" and without pre-opening "B".

Version "A" (with pre-opening)

This valve is provided with an additional pre-opening. By pressurization at the X port, the control spool (4) is moved to the right. As a result, the ball (7) is pushed off the seat first and the seat poppet (2) afterwards.

☞ **Notices!**

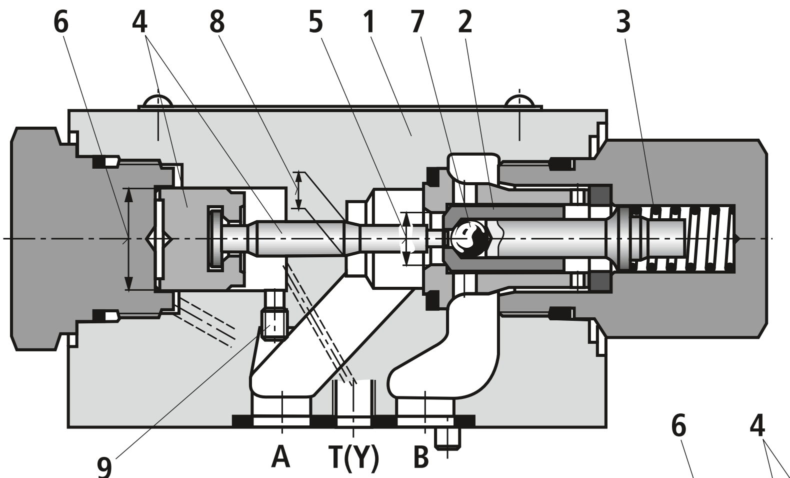
Version "A":

– Due to the two-stage structure with enlarged control open ratio, safe unloading is also possible with lower pilot pressure.
– Avoidance of switching shocks due to dampened decompression of the pressure volume on the actuator side.

Version "B":

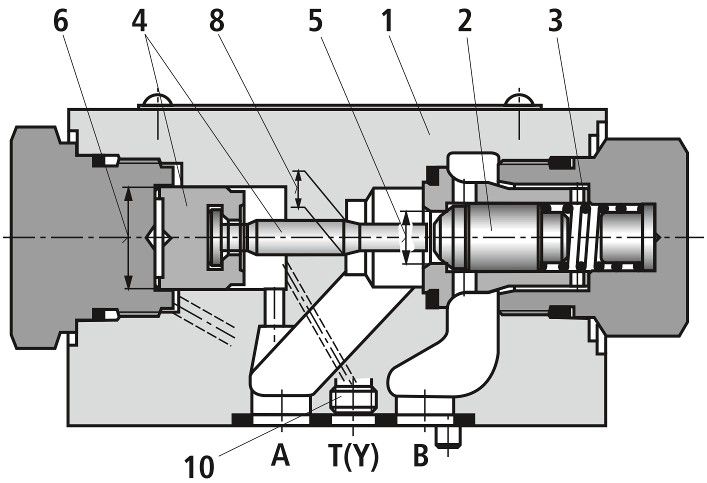
– In case of valves without pre-opening, the included pressure volume may be unloaded suddenly. Resulting switching shocks may not only lead to noise formation but also to early wear at installed components.

The conversion of type SV to type SL is possible by replacing the plugs (9) and (10). One of the both plugs must always be installed!



Type SL 6 PB.–6X/…

Type	Plug (9)	Plug (10)
SV	M3 (open)	M6 x 1 (closed)
SL	M3 (closed)	M6 x 1 (open)



Type SV 6 PB.–6X/…

5 Area $\boldsymbol{A}_1$ (seat poppet)
6 Area $\boldsymbol{A}_2$ (control spool)
7 Area $\boldsymbol{A}_3$ (ball)
8 Area $\boldsymbol{A}_4$ (control spool)

Technical data (For applications outside these parameters, please consult us!)

general

Weight	kg	Approx. 0.8
Installation position		Any
Ambient temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
MTTFd values according to EN ISO 13849	Years	150 (for further details see data sheet 08012)

hydraulic

Maximum operating pressure		bar	315
Maximum flow		l/min	60
Pilot pressure		bar	5 to 315
Hydraulic fluid		°C	See table below
Hydraulic fluid temperature range (at the valve's working ports)			–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	2.8 to 500
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]
Direction of flow			See Symbols on page 2
Pilot volume	– Port X	cm^3	0.68
	– Port Y (only type SL)	cm^3	0.58
Control area ratio (For areas, see sectional drawing on page 3)	– Version "A"		$\boldsymbol{A}_3/\boldsymbol{A}_2$ ~ 1/13
	– Version "B"		$\boldsymbol{A}_1/\boldsymbol{A}_2$ ~ 1/3
			$\boldsymbol{A}_4/\boldsymbol{A}_2$ ~ 1/7

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils and related hydrocarbons		HL, HLP, HVLP	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HEES	NBR, FKM	ISO 15380
		HEPR	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFC	NBR	ISO 12922

Important information on hydraulic fluids!

– For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!

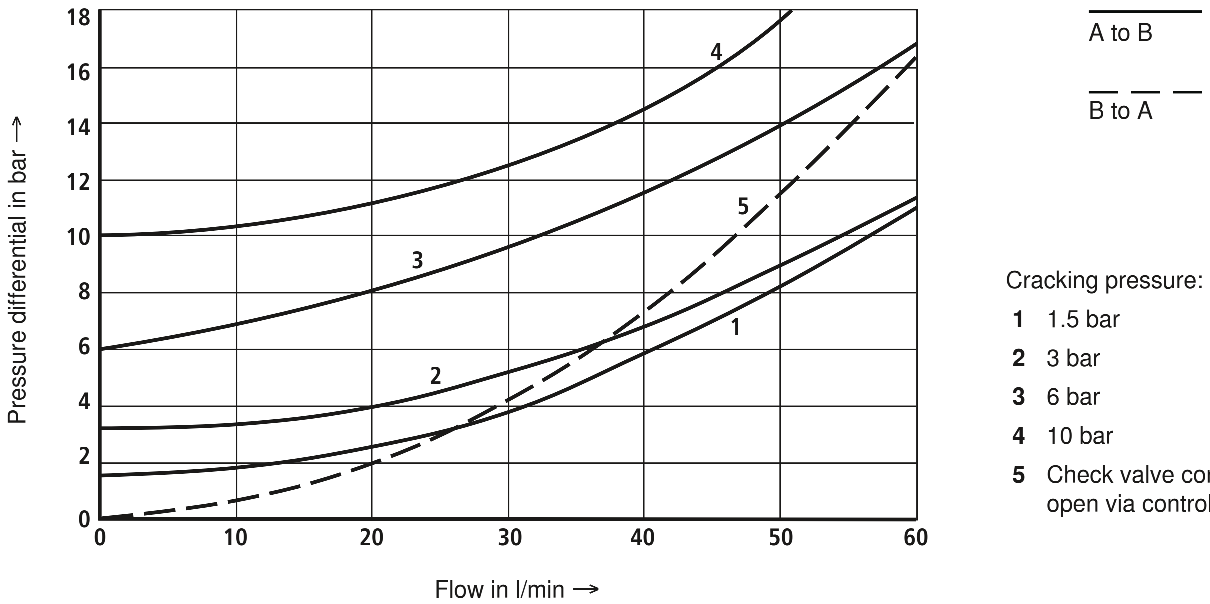
– There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For selecting the filters, see www.boschrexroth.com/filter.

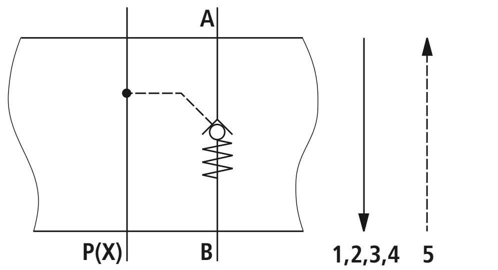
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Δp-q_V characteristic curves



Cracking pressure:

1 1.5 bar
2 3 bar
3 6 bar
4 10 bar
5 Check valve controlled open via control spool



Calculation of the pilot pressure p_{St} depending on p_A and p_B

Version "A" (with pre-opening)

Balance of forces:

$p_{St} \cdot A_2 - p_A^* \cdot (A_2 - A_4) - p_A \cdot A_4 - p_F \cdot A_1 + p_A \cdot A_1 - p_B \cdot A_3 = 0$

Assumption: $p_A = 0$

$$\boxed{p_{St} = \frac{1}{3} \cdot p_F + \frac{1}{13} \cdot p_B}$$

Version "B" (without pre-opening)

Balance of forces:

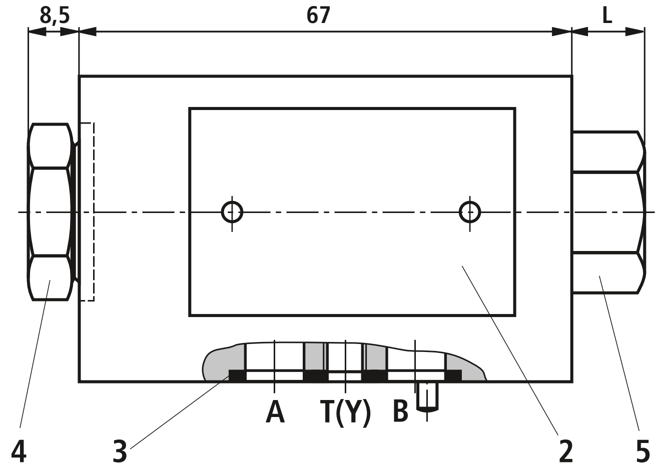
$p_{St} \cdot A_2 - p_A^* \cdot (A_2 - A_4) - p_A \cdot A_4 - p_F \cdot A_1 + p_A \cdot A_1 - p_B \cdot A_1 = 0$

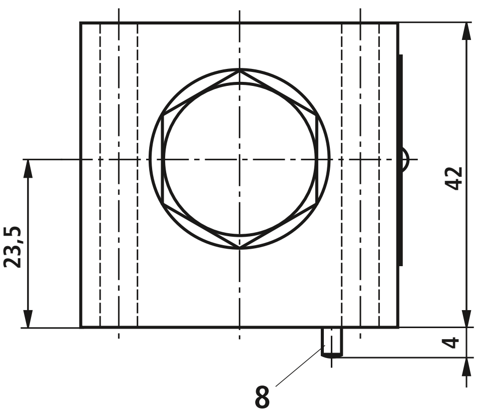
Assumption: $p_A = 0$

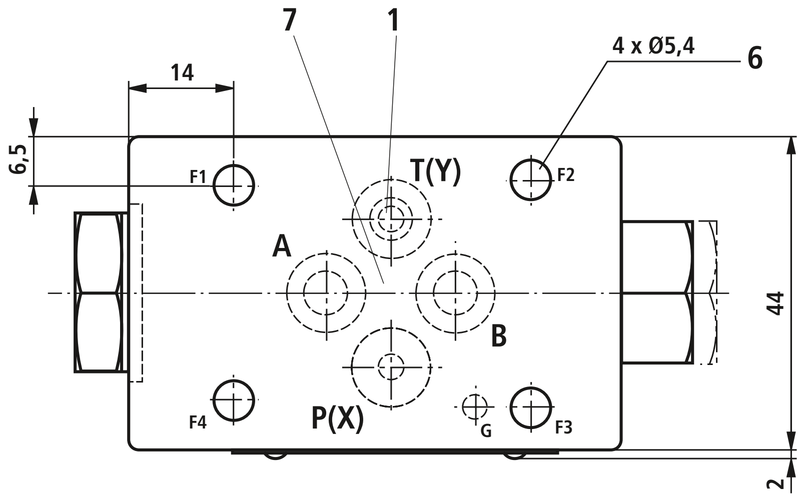
$$\boxed{p_{St} = \frac{1}{3} \cdot p_F + \frac{1}{13} \cdot p_B}$$

p_A^*	Depending on the type (for type SL: $p_A^* = 0$)
p_{St}	Pilot pressure
p_A	Working pressure in A
p_B	Working pressure in B
p_F	Cracking pressure (spring)
$A_1 - A_4$	For areas, see sectional drawing on page 3; Control area ratios, see page 4

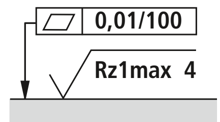
Unit dimensions (dimensions in mm)







	L in mm	
Version	without pre-opening "B"	with pre-opening "A"
"1", "2", "3"	11	21.5
"4"	14	–



Required surface quality of the valve mounting face

1 Port Y (M6 x1; closed for type SV)
2 Name plate
3 Identical seal rings for ports A, B, P(X), (T)Y
4 Plug screw SW24 (pilot spool), tightening torque $M_A = 80^{+5}$ Nm
5 Plug screw SW22 (check valve uses), tightening torque $M_A = 25^{+5}$ Nm
6 Through hole for valve mounting screws
7 Porting pattern according to ISO 4401-03-02-0-05 and ISO 5781-03-04-0-00 (with locating hole and locating pin ISO 8752-3x8-St)
8 Locating pin ISO 8752-3x8-St

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M5 x 50 - 10.9
(with friction coefficient μ_{total} = 0,14);
tightening torque M_A = 8,9 Nm ±10 %
(please adjust in case of modified surfaces; use torque power screwdriver!)

Notes

Notes

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documentation@boschrexroth.de
www.boschrexroth.de

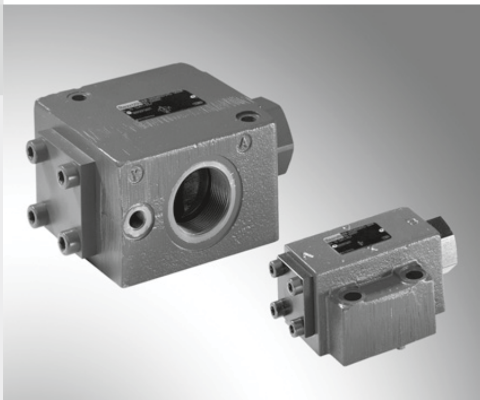
Rexroth
Bosch Group

Check valve hydraulically pilot operated

RE 21468/07.05
Replaces: 02.03

Types SV and SL

Nominal sizes 10 to 32
Component series 4X
Maximum operating pressure 315 bar
Maximum flow 550 l/min



H5558

Overview of contents

Features

– For subplate mounting
– Connection location to ISO 5781
– Subplates to data sheet RE 45062 (separate order)
– For threaded connections
– With internal or external pilot oil drain, optional
– With or without decompression feature, optional
– Version with decompression feature for dampened decompression (minimising possible pressure shocks)
– 4 opening pressures, optional

Information on available spare parts:
www.boschrexroth.com/spc

Ordering details

S ☐ ☐ ☐ ☐ **–4X/** ☐ *

Internal pilot oil drain = **V**
External pilot oil drain = **L**

	Type SV		Type SL	
Connection type	G	P	G	P
	Ordering details			
Nom. size 10	**= 10**	**= 10**	**= 10**	**= 10**
Nom. size 16	**= 15**	**–**	**= 15**	**–**
Nom. size 20	**= 20**	**= 20**	**= 20**	**= 20**
Nom. size 25	**= 25**	**–**	**= 25**	**–**
Nom. size 32	**= 30**	**= 30**	**= 30**	**= 30**

For subplate mounting = **P**
For threaded connections = **G**

With decompression feature = **A**
Without decompression feature = **B**

Further details in clear text

Seal material
No code = NBR seals
V = FKM seals

⚠ **Attention!**
The compatibility of the seals and pressure fluid used has to be taken into account!

4X = Component series 40 to 49 (40 to 49: unchanged installation and connection dimensions)

Opening pressure
1 =
2 = See Δp-q_V-characteristic curves
3 = A to B,
4 = Pages 5 and 6

Preferred types

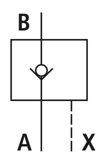
Type SL	Material No.
SL 10 GA1-4X/	R900483370
SL 10 GB1-4X/	R900451135
SL 10 PA1-4X/	R900483371
SL 10 PB1-4X/	R900443419
SL 15 GA1-4X/	R900587553
SL 20 PA1-4X/	R900587559
SL 20 PB1-4X/	R900599586
SL 25 GA1-4X/	R900587555
SL 30 GA1-4X/	R900587556
SL 30 PA1-4X/	R900587560

Type SV	Material No.
SV 10 GA1-4X/	R900483368
SV 10 GB1-4X/	R900453511
SV 10 PA1-4X/	R900483369
SV 10 PB1-4X/	R900467724
SV 15 GA1-4X/	R900587549
SV 20 GA1-4X/	R900587550
SV 20 PA1-4X/	R900587557
SV 25 GA1-4X/	R900587551
SV 30 GA1-4X/	R900587552
SV 30 PA1-4X/	R900587558

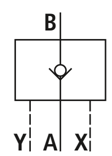
Further preferred types and standard units can be found within the EPS (Standard Price List).

Symbols

Version SV (internal pilot oil drain)



Version SL (external pilot oil drain)



Function, section

The SV and SL valves are hydraulic pilot operated check valves of poppet type design which may be opened to permit flow in the reverse direction.

These valves are used for the isolation of operating circuits which are under pressure, i.e. as a safe guard against the lowering of a load when a line break occurs or against creeping movements of hydraulically locked actuators.

The valve basically comprises of the housing (1), the poppet (2), a compression spring (3), the control spool (4) as well as an optional decompression feature as a ball poppet valve (5).

Type SV…

The valve permits free-flow from A to B. In the reverse direction, the poppet (2) is held firmly on to its seat in addition to the spring force by the system pressure.

By applying pressure to connection X, the control spool (4) is moved to the right. This lifts poppet (2) off its seat. Now the valve also permits free-flow from B to A.

In order to ensure that the valve opens due to the pressure applied to the control spool (4), a certain minimum pilot pressure is required (see page 4).

Types SV..A.. and SL..A.. (with decompression)

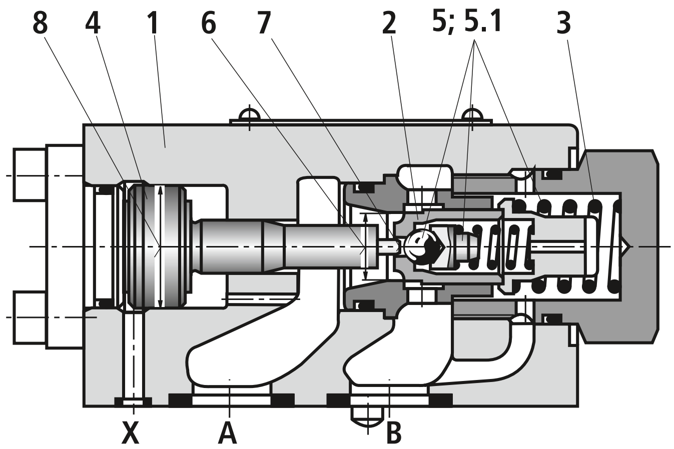
This valve is fitted with an additional decompression feature. When pressure is applied to port X, the control spool (4) is moved to the right. This firstly lifts the ball (5.1) and then the poppet (2) off their seats. The valve now permits flow from B to A.

Because of the decompression feature there is a dampened decompression of the pressurised fluid. Due to this possible pressure shocks are avoided.

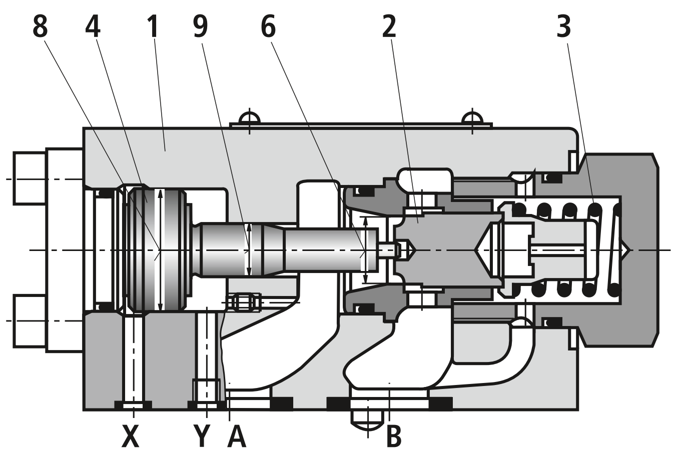
Type SL...

The function of this valve corresponds to that of the type SV.

The difference is the external Y connection. Here, the annular area of the control spool (4) is separated from the port A. Pressure present in port A only acts on area $\boldsymbol{A_4}$ (9) of the control spool (4).



Type SV..PA.-4X/... (without pilot oil drain, with decompression)



Type SL..PB.-4X/... (with pilot oil drain, without decompression)

6 Area $\boldsymbol{A_1}$
7 Area $\boldsymbol{A_2}$
8 Area $\boldsymbol{A_3}$
9 Area $\boldsymbol{A_4}$

Technical data (for applications outside these parameters, please consult us!)

General

			NS10	NS16	NS20	NS25	NS32
Nominal sizes			NS10	NS16	NS20	NS25	NS32
Weight	– Subplate mounting	kg	1.8		4.7		7.8
	– Threaded connections	kg	2.1	5.4	5.4	10	10
Installation			Optional				
Ambient temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)				

Hydraulic

Maximum operating pressure		bar	315				
Maximum flow		l/min	See characteristic curves, pages 5 and 6				
Control pressure		bar	5 to 315				
Pressure fluid			Mineral oil (HL, HLP) to DIN 51524 1); fast bio-degradable pressure fluids to VDMA 24568 (also see RE 90221); HETG (rape seed oil) 1); HEPG (polyglycoles) 2); HEES (synthetic ester) 2); other pressure fluids on request				
Pressure fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)				
Viscosity range		mm^2/s	2.8 to 500				
Maximum permissible degree of contamination of the pressure fluid. Cleanliness class ISO 4406 (c)			Class 20/18/15 3)				
Flow direction			Free-flow from A to B, from B to A when opened				
Control volume	– Port X	cm^3	2.5	10.8	10.8	19.27	19.27
	– Port Y (only type SL)	cm^3	2.0	9.6	9.6	17.5	17.5
Control areas (areas according to sectional drawing, see page 3)	– Area A_1	cm^2	1.33	3.46	3.46	5.72	5.72
	– Area A_2	cm^2	0.33	0.7	0.7	1.33	1.33
	– Area A_3	cm^2	3.8	10.17	10.17	16.61	16.61
	– Area A_4	cm^2	0.79	1.13	1.13	1.54	1.54

1) Suitable for NBR and FKM seals

2) Only suitable for FKM seals

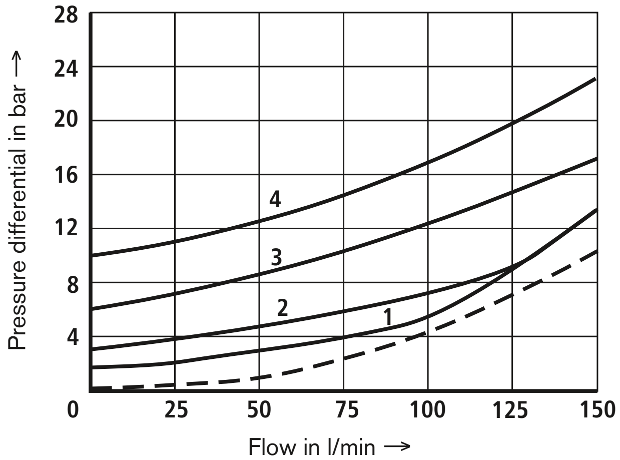
3) The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.

For the selection of filters see catalogue sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

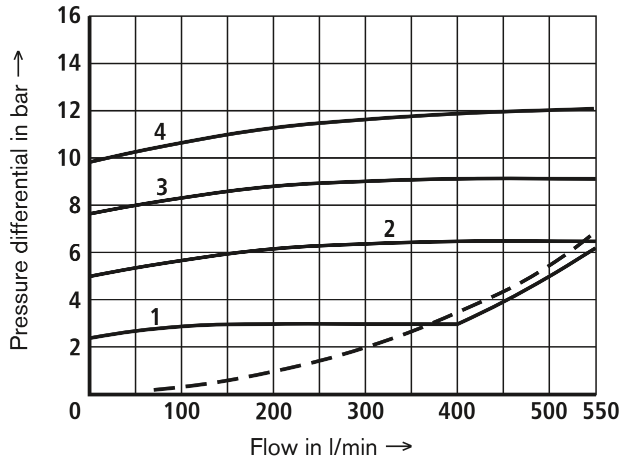
Characteristic curves: subplate mounting (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Δp-q_V-characteristic curves

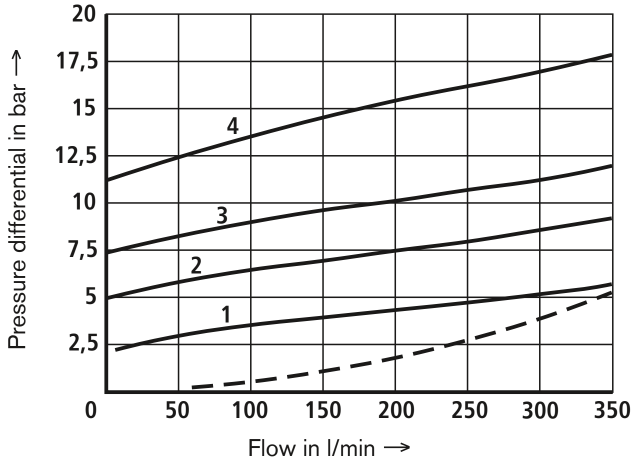
NS10



NS32



NS20



A to B

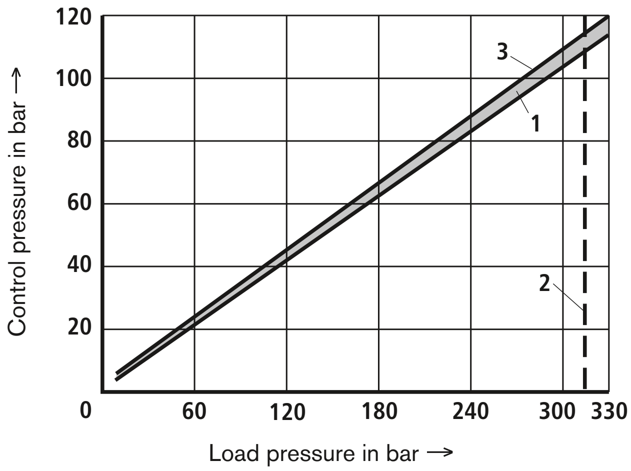
B to A

Opening pressure in bar

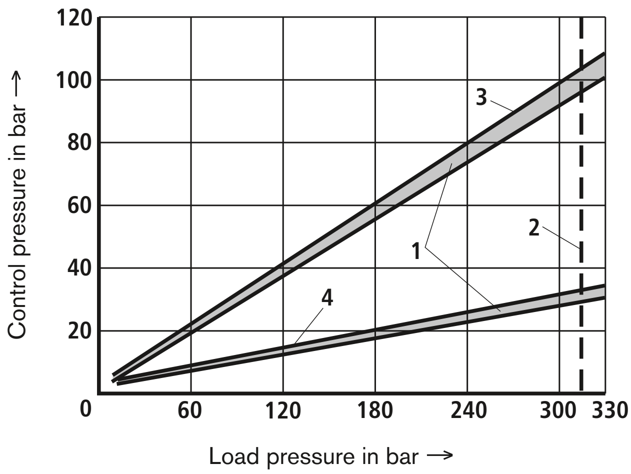
	NS10	NS20	NS32
1	1.5	2.5	2.5
2	3	5	5
3	6	7.5	8
4	10	10	10

Control pressure-load pressure-characteristic curves

Without decompression



With decompression

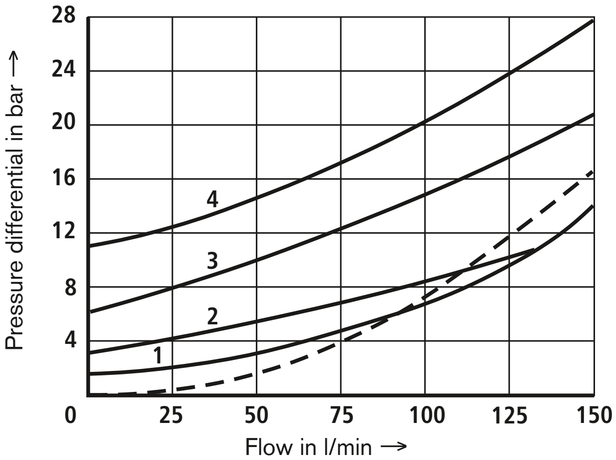


1 Scatter range **2** Limiting value **3** Valve poppet **4** Decompression

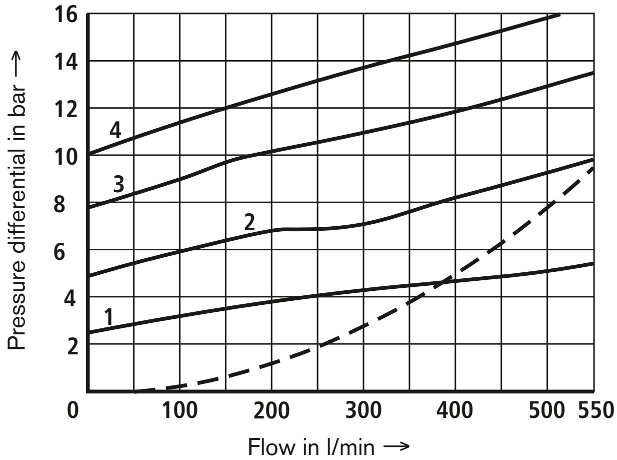
Characteristic curves: threaded connections (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Δp-q_V-characteristic curves

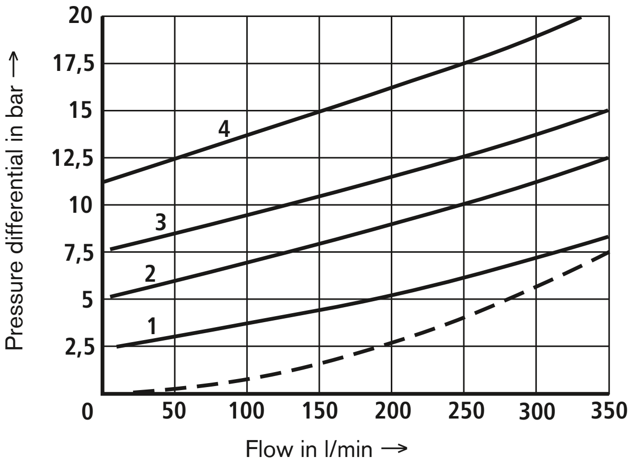
NS10



NS25 and 32



NS16 and 20



——— A to B

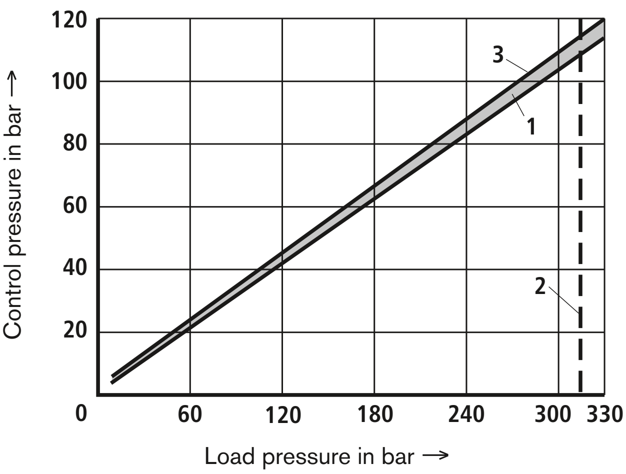
– – – B to A

Opening pressure in bar

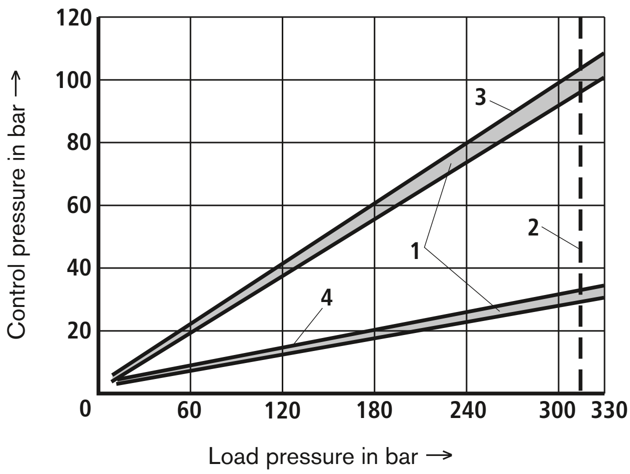
	NS10	NS16 and 20	NS25 and 32
1	1.5	2.5	2.5
2	3	5	5
3	6	7.5	8
4	10	10	10

Control pressure-load pressure-characteristic curves

Without decompression

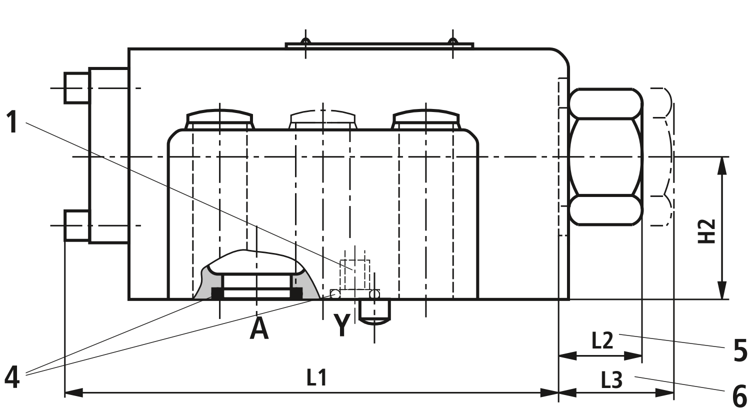


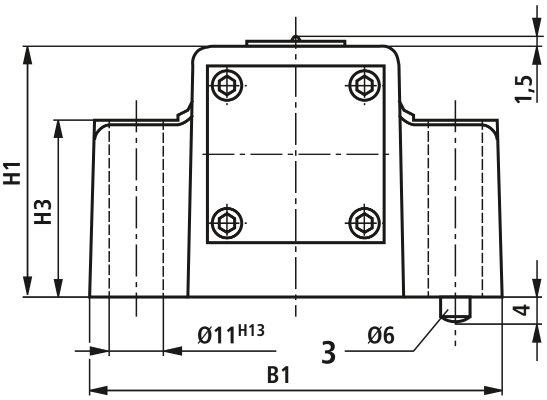
With decompression

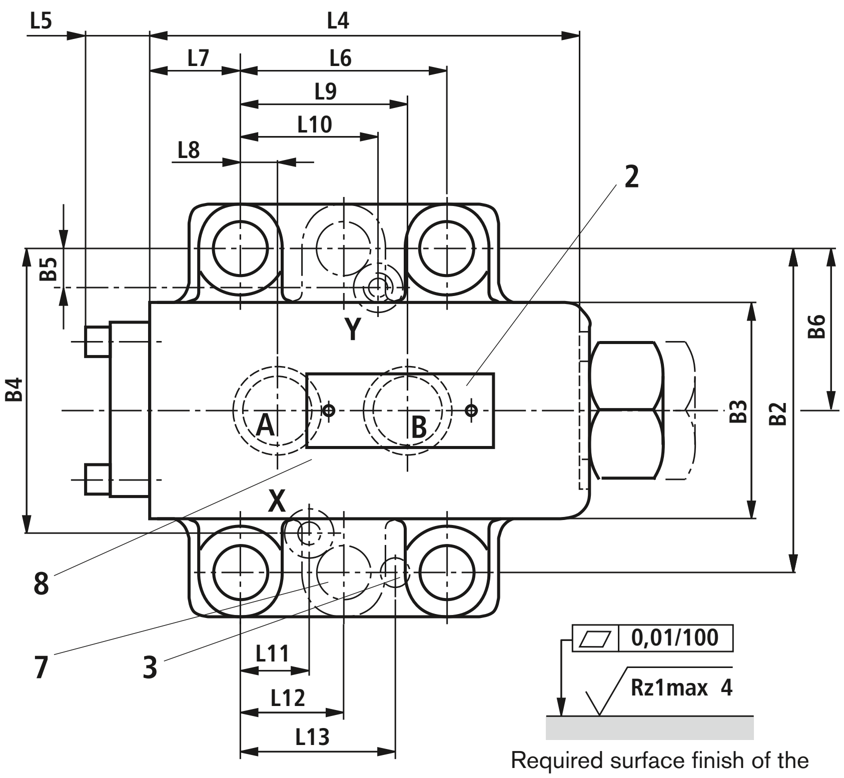


1 Scatter range **2** Limiting value **3** Valve poppet **4** Decompression

Unit dimensions: subplate mounting (nominal dimensions in mm)







Required surface finish of the valve mounting surface

1 Port Y with valve type "SL" (with valve type "SV" this port is plugged)
2 Name plate
3 Locating pin
4 Identical seal rings
– for ports A and B
– for ports X and Y
5 Valve with opening pressure versions “1” and “2” (dim. L2)
6 Valve with opening pressure versions “3” and “4” (dim. L3)
7 6 valve fixing holes for type SV/SL 30
8 Connection location to ISO 5781

Type	NS	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11
SV	10	100,8	15,5	15,5	87,8	13	42,9	18,5	7,2	35,8	–	21,5
	20	135	17,7	47,7	117	18	60,3	27,5	11,1	49,2	–	20,6
	32	156,1	36,1	46,1	134	22,1	84,2	39	16,7	67,5	–	24,6
SL	10	100,8	15,5	15,5	87,8	13	42,9	18,5	7,2	35,8	21,5	21,5
	20	135	17,7	47,7	117	18	60,3	27,5	11,1	49,2	39,5	20,6
	32	156,1	36,1	46,1	134	22,1	84,2	39	16,7	67,5	59,5	24,6

Type	NS	L12	L13	B1	B2	B3	B4	B5	H1	H2	H3	B6
SV	10	–	31,8	84	66,7	44	58,8	–	51	29	36	33,3
	20	–	44,5	100	79,4	61	73	–	70	37	55	39,7
	32	42,1	62,7	118	96,8	75	92,8	–	85	42,5	70	48,4
SL	10	–	31,8	84	66,7	44	58,8	7,9	51	29	36	33,3
	20	–	44,5	100	79,4	61	73	6,4	70	37	55	39,7
	32	42,1	62,7	118	96,8	75	92,8	3,8	85	42,5	70	48,4

Subplates

– NS10 G 460/01 (G3/8)
G 461/01 (G1/2)
– NS20 G 412/01 (G3/4)
G 413/01 (G1)
– NS32 G 414/01 (G1 1/4)
G 415/01 (G1 1/2)

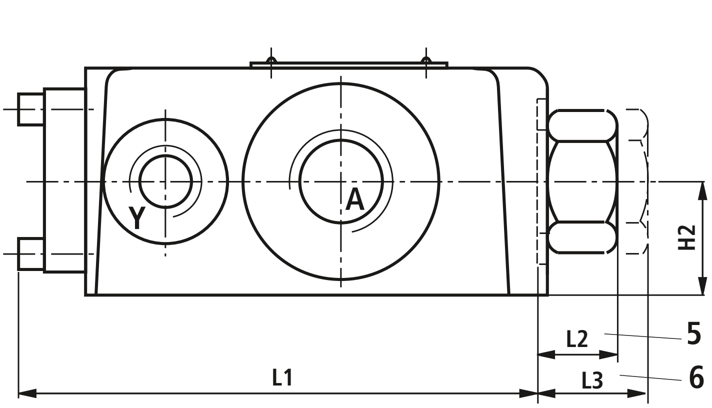
to data sheet RE 45062 (separate order)

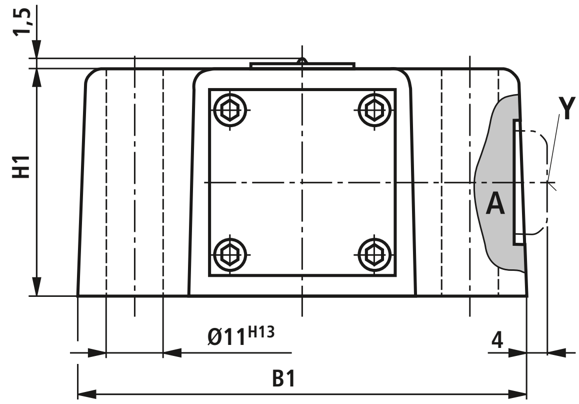
Valve fixing screws
(separate order)

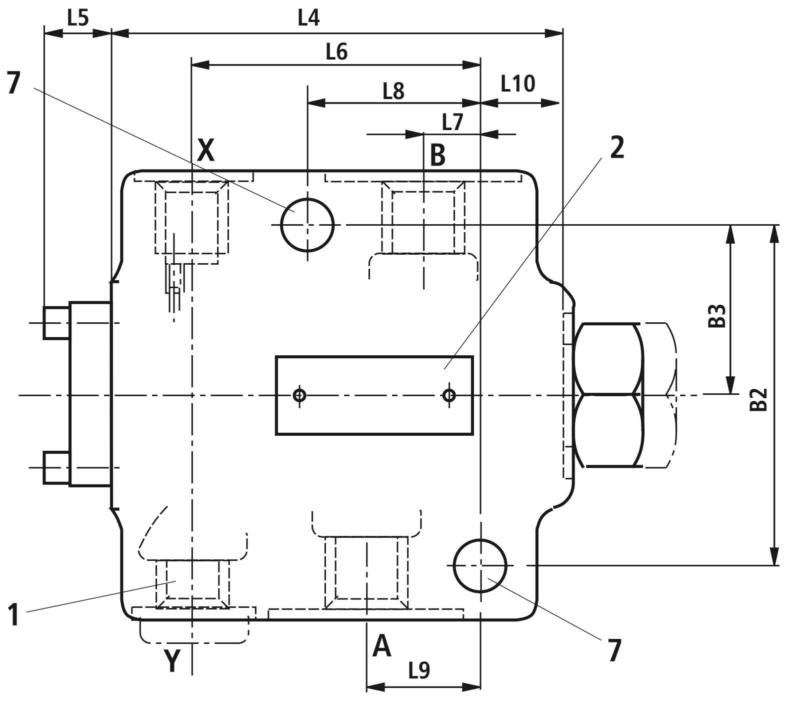
– NS10
4 off ISO 4762 - M10 x 50 - 10.9
– NS20
4 off ISO 4762 - M10 x 70 - 10.9
– NS32
6 off ISO 4762 - M10 x 85 - 10.9

(friction value $\mu_{ges} = 0.14$);
Tightening torque M_A = 75 Nm ± 10%
(with changed surfaces please adapt)

Unit dimensions: threaded connections (nominal dimensions in mm)







1 Port Y for valve type "SL" (for valve type "SV" this port is plugged)

2 Name plate

5 Valve with opening pressure versions “1” and “2” (dim. L2)

6 Valve with opening pressure versions “3” and “4” (dim. L3)

7 2 valve fixing holes

Type	Ports		
	NS	A, B	X, Y
SV	10	G1/2	G1/4
	16	G3/4	
	20	G1	
	25	G1 1/4	
	32	G1 1/2	
SL	10	G1/2	G1/4
	16	G3/4	
	20	G1	
	25	G1 1/4	
	32	G1 1/2	

Type	NS	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	B1	B2	B3	H1	H2
SV	10	100,8	15,5	15,5	87,8	13	56,5	10,5	33,5	22,5	17,3	87	66,7	33,4	44	22
	16, 20	133	17,7	47,7	115	18	74,5	17	50,5	36	27	105	79,4	39,7	68	34
	25, 32	156,1	35,7	45,7	134	22,1	101	24	84	49	18	130	96,8	48,4	85	42,5
SL	10	100,8	15,5	15,5	87,8	13	56,5	10,5	33,5	22,5	17,3	87	66,7	33,4	44	22
	16, 20	133	17,7	47,7	115	18	74,5	17	50,5	36	27	105	79,4	39,7	68	34
	25, 32	156,1	35,7	45,7	134	22,1	101	24	84	49	18	130	96,8	48,4	85	42,5

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Rexroth
Bosch Group

Check valve

RE 20375/12.06
Replaces: 01.05

Type S

Sizes 6 to 30
Maximum operating pressure 315 bar
Maximum flow 450 l/min

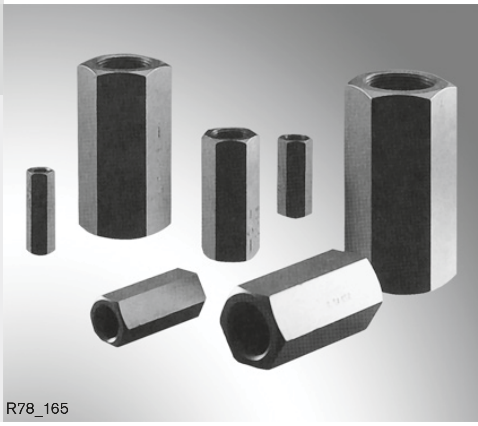

R78_165

Table of contents

Contents	page

Features

– For threaded connection (screw-in connection)
– Leak-free closure in one direction
– Various cracking pressures, optional (see ordering code)

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

S		A	•	/	*

Check valve	= S		Further details in clear text
Size 6	= 6	0 =	Revision index (is entered in the factory)
Size 8	= 8		**Cracking pressure** (see curves on pages 3 and 4)
Size 10	= 10	0 =	Without spring
Size 15	= 15	1 =	Standard
Size 20	= 20	2 =	
Size 25	= 25	3 =	
Size 30	= 30	5 =	
For threaded connection	= A	8 =	(Sizes 25 and 30 only)

Preferred types

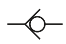
Type	Material no.
S 6 A0.0/	R900422880
S 6 A1.0/	R900422881
S 6 A5.0/	R900375858
S 8 A0.0/	R900422885
S 8 A1.0/	R900422886
S 8 A3.0/	R900422888
S 8 A5.0/	R900358268
S 10 A0.0/	R900420530
S 10 A1.0/	R900420531
S 10 A2.0/	R900420532
S 10 A3.0/	R900420534
S 10 A5.0/	R900446476
S 15 A0.0/	R900420536
S 15 A1.0/	R900420537
S 15 A2.0/	R900420520
S 15 A3.0/	R900420521
S 15 A5.0/	R900446477

Type	Material no.
S 20 A0.0/	R900420524
S 20 A1.0/	R900420525
S 20 A2.0/	R900420528
S 20 A3.0/	R900420529
S 20 A5.0/	R900446369
S 25 A1.0/	R900420511
S 25 A3.0/	R900420515
S 25 A5.0/	R900451778
S 30 A0.0/	R900420517
S 30 A1.0/	R900420519
S 30 A2.0/	R900420502
S 30 A3.0/	R900420504
S 30 A5.0/	R900446709

Further preferred types and standard components are listed in the EPS (standard price list).

Symbols

With spring



Without spring

Technical data (for applications outside these parameters, please consult us!)

General								
Sizes	Size	6	8	10	15	20	25	30
Weight	kg	0.1	0.2	0.3	0.5	1.0	2.0	2.5

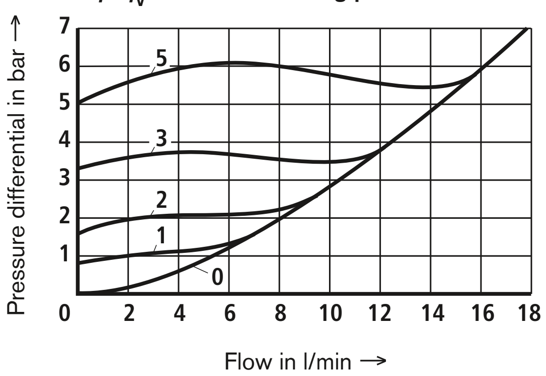
Hydraulic		
Maximum operating pressure	bar	315
Cracking pressure	bar	See characteristic curves below and on page 4
Maximum flow		See characteristic curves below and on page 4
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524; fast bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids on inquiry
Hydraulic fluid temperature range	°C	–30 to +80
Viscosity range	mm^2/s	2.8 to 500
Max. permissible degree of contamination of the hydraulic fluid, cleanliness class to ISO 4406 (c)		Class 20/18/15 [1]

[1] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, increases the service life of components.

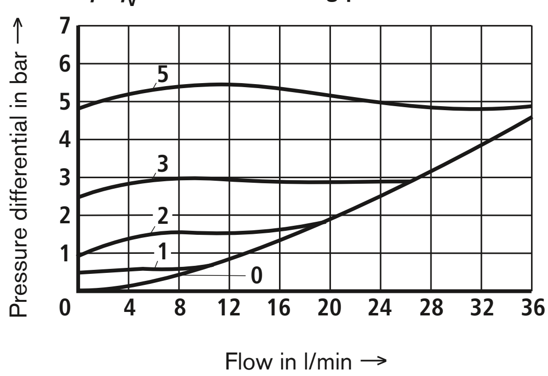
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

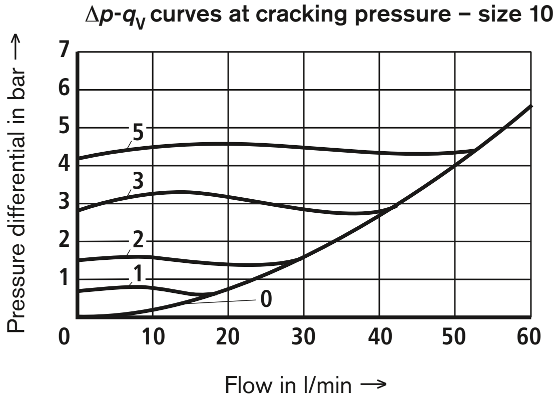
Δp-q_V curves at cracking pressure – size 6



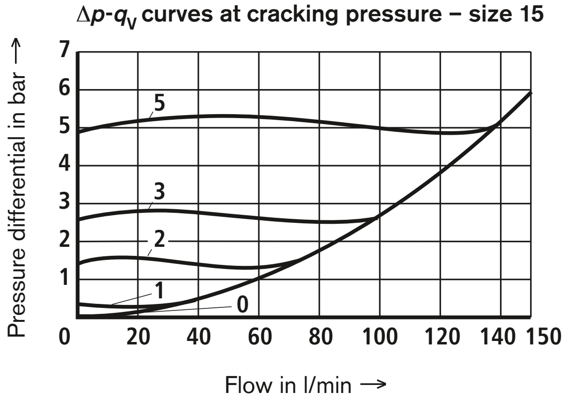
Δp-q_V curves at cracking pressure – size 8



Δp-q_V curves at cracking pressure – size 10

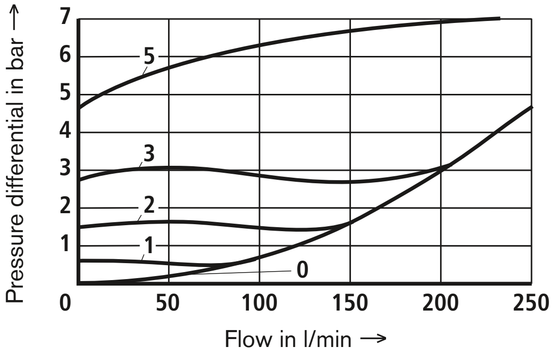


Δp-q_V curves at cracking pressure – size 15

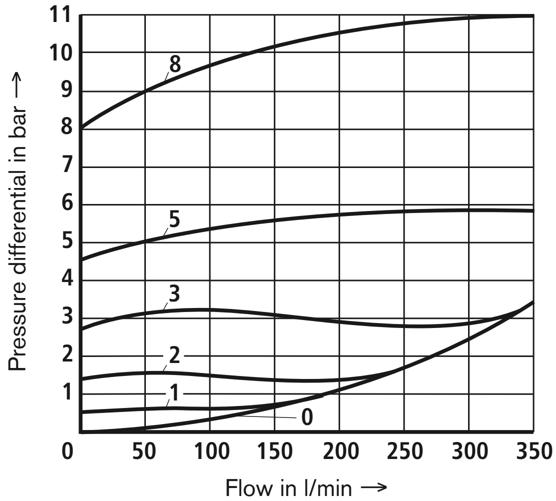


Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

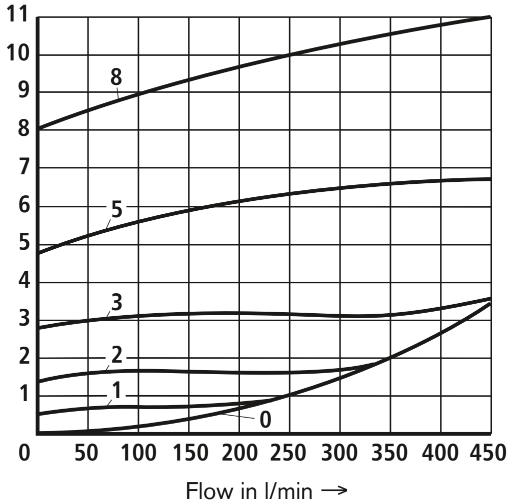
Δp-q_V curves at cracking pressure – size 20



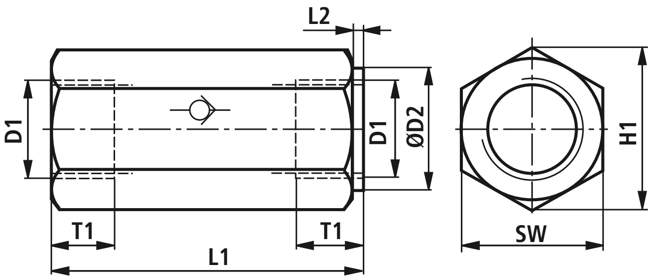
Δp-q_V curves at cracking pressure – size 25



Δp-q_V curves at cracking pressure – size 30



Unit dimensions (nominal dimensions in mm)



Pipe thread "G" to ISO 228-1

	Size						
	6	8	10	15	20	25	30
D1	G1/4	G3/8	G1/2	G3/4	G1	G1 1/4	G1 1/2
ØD2	19	24	30	36	46	60	65
H1	22	28	34,5	41,5	53	69	75
L1	58	58	72	85	98	120	132
L1 [1]	–	–	–	–	–	160 [1]	168 [1]
L2	2	2	2	2	2	2	2
T1	12	12	14	16	18	20	22
SW	19	24	30	36	46	60	65

[1] Option **„A8.0“**

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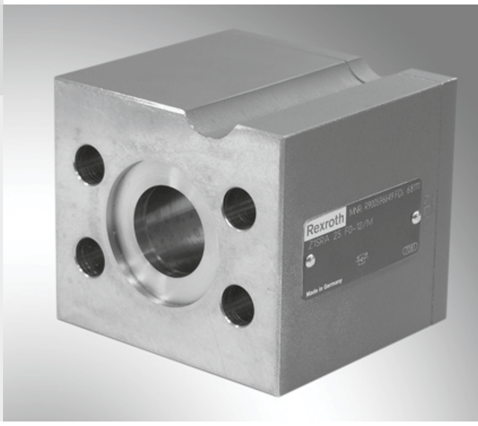
Check valve

RE 21515/02.06
Replaces: 07.93

Type Z1SRA



Sizes16 to 52
Component series 1X
Maximum operating pressure 315 bar
Maximum flow 2000 l/min

Table of contents

Features

– For SAE flange connections as standard or high-pressure version
– Through valve
– Leak-free checking in one direction
– Various cracking pressures, optional

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z1SRA			–1X / M	*

Check valve

Size 16	= **15**
Size 25	= **25**
Size 32	= **30**
Size 40	= **40**
Size 52	= **52**

SAE flange connection

Standard pressure series	= **F**
High-pressure series	= **H**

Cracking pressure

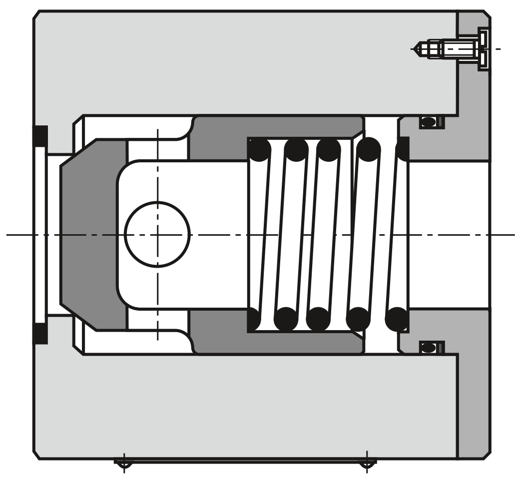
0 =	Without spring
1 =	See characteristic curves on page 4
2 =	See characteristic curves on page 4
3 =	See characteristic curves on page 4
5 =	See characteristic curves on page 4 (not for sizes 40 and 52)

1X = Component series 10 to19
(10 to19: unchanged installation and connection dimensions)

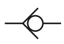
M = NBR seals
(other seals on enquiry)
Caution!
Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

Section, symbols



With spring



Without spring

Technical data (for applications outside these parameters, please consult us!)

General

Sizes		Size 16	Size 25	Size 32	Size 40	Size 52
Weight	kg	2.0	2.6	4.0	7.4	12.6
Installation orientation		Optional				
Ambient temperature range	°C	–30 to +80				

Hydraulic

Maximum operating pressure	bar	315 [1)]
Cracking pressure	bar	See characteristic curve on page 4
Maximum flow	l/min	See characteristic curve on page 4
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil); other hydraulic fluids on enquiry
Hydraulic fluid temperature range	°C	–30 to +80
Viscosity range	mm^2/s	2.8 to 500
Max. permissible degree of contamination of the hydraulic fluid; cleanliness class to ISO 4406 (c)		Class 20/18/15 [2)]

1) Observe permissible pressures for flange connections (see page 5)!

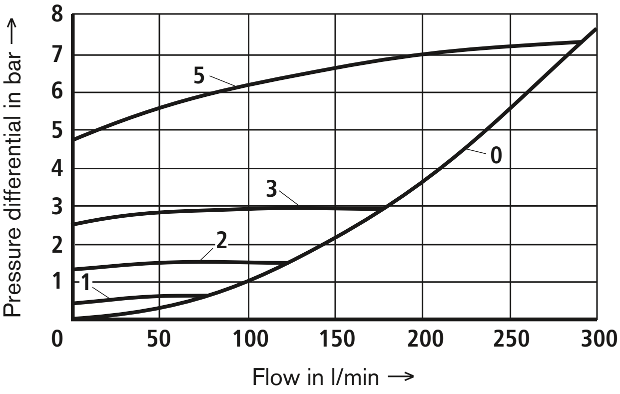
2) The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

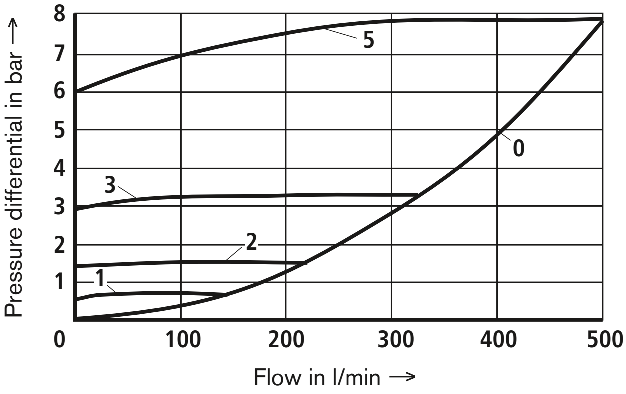
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Δp-q_V **characteri**stic curves at cracking pressure

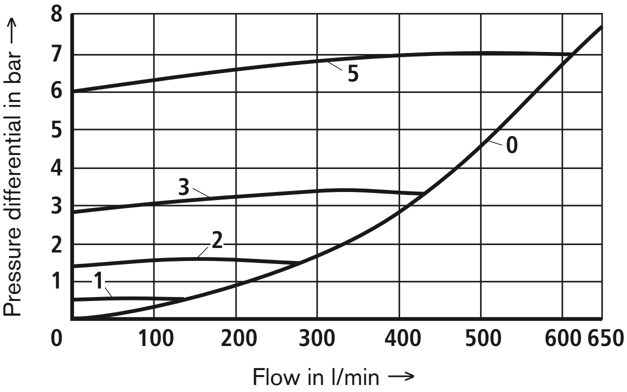
Size 16



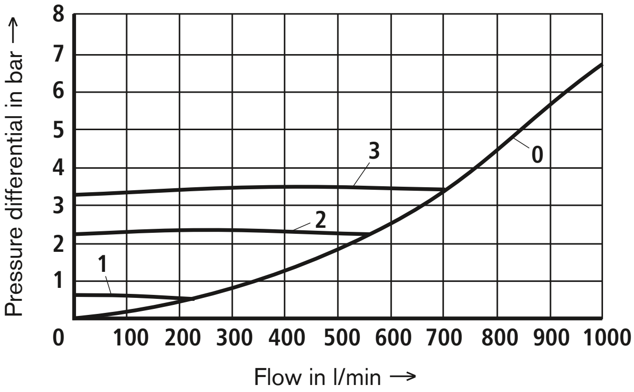
Size 25



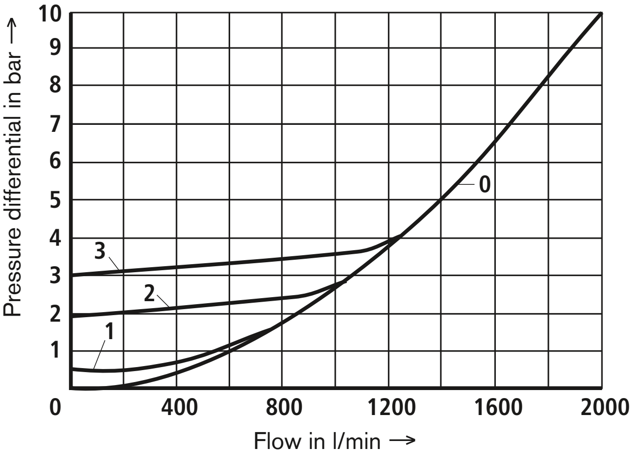
Size 32



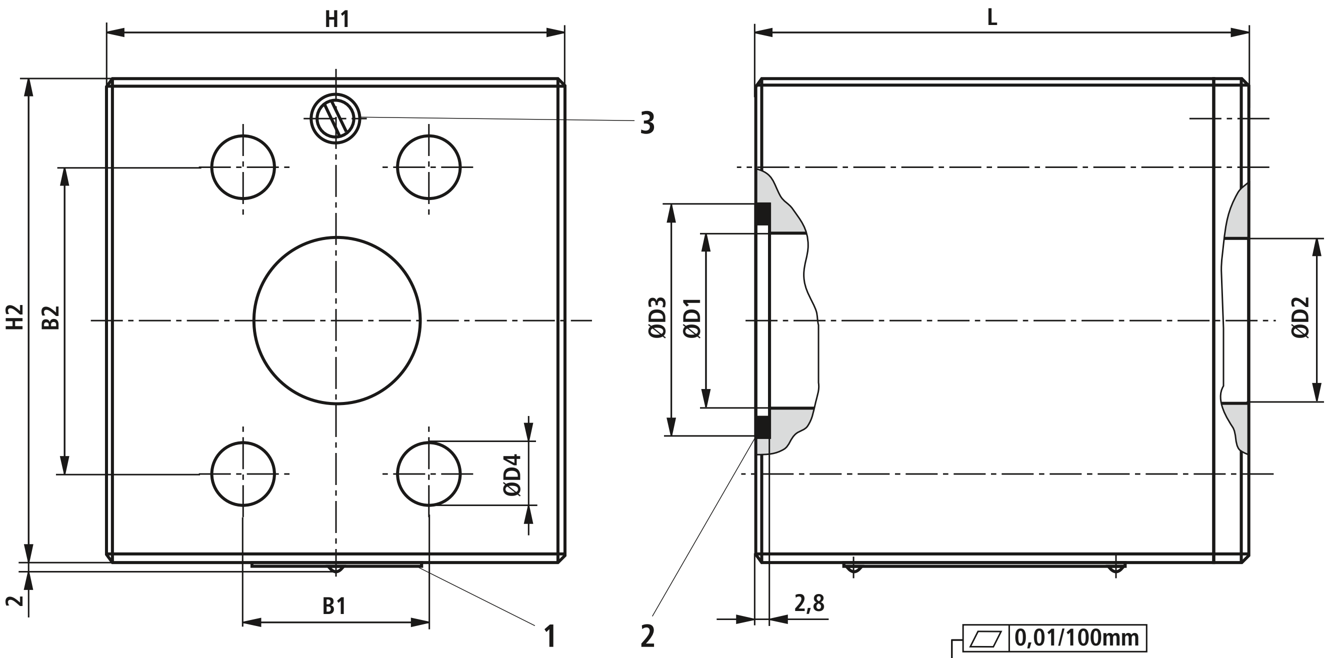
Size 40

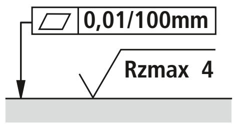


Size 52



Unit dimensions (nominal dimensions in mm)





Required surface quality of the valve mounting face

1 Nameplate

2 O-ring

3 Countersunk screw ISO 1580 - M4 x 10 - 4.8-A2C

Type	Size	B1	B2	H1	H2	L	ØD1	ØD2	ØD3	ØD4	SAE connection
Z1SRA...**F**...	**16**	22.2	47.6	60	70	67.5	20	18.5	31.8	11	SAE 3/4"
	25	26.2	52.4	70	80	75	25	21.5	39.7	11	SAE 1"
	32	30.2	58.7	80	95	85	30	26	44.6	11	SAE 1 1/4"
	40	35.8	69.9	95	110	114.5	40	37	54	13	SAE 1 1/2"
	52	42.9	77.8	114	135	129	50	45	63.5	13	SAE 2"
Z1SRA...**H**...	**16**	23.8	50.8	60	70	66.5	20	18.5	31.8	11	SAE 3/4"
	25	27.8	57.2	70	80	75	25	21.5	39.7	13	SAE 1"
	32	31.8	66.7	80	95	85	30	26	44.6	15	SAE 1 1/4"
	40	36.6	79.4	95	110	114.5	40	37	54	17	SAE 1 1/2"
	52	44.4	96.8	114	135	129	50	45	63.5	21	SAE 2"

Type	**Size**	**Valve fixing screws** (separate order) [1]	Tightening torque M_T in Nm [2]	**Permissible pressures for flange connections according to**			
				ISO 6162/1		**ISO 6162/2**	
Z1SRA...**F**...	**16**	M10	70	5000 psi	350 bar	–	
	25	M10	70	4500 psi	315 bar		
	32	M10	70	3600 psi	250 bar		
	40	M12	130	2900 psi	200 bar		
	52	M12	130	2900 psi	200 bar		
Z1SRA...**H**...	**16**	M10	70	–		6000 psi	400 bar
	25	M12	130				
	32	M14	180				
	40	M16	295				
	52	M20	550				

[1] 4 hexagon socket head cap screws ISO 4762 - 10.9

[2] Data in accordance with ISO 6162, with friction coefficient μ_{total}= 0.14 (please adjust in the case of changed surfaces)

Notes

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Rexroth
Bosch Group

Check valve, cartridge type

RE 20380/03.11 1/8
Replaces: 11.10

Type M-SR

Sizes 6 to 30
Component series 1X
Maximum operating pressure 315 bar
Maximum flow 400 l/min

H7004

Table of contents

Features

- For installation in manifold blocks
  - as angle valve
  - as straight valve
- Leak-free closure in one direction
- Various cracking pressures, optional (see ordering code)

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

M-SR			–1X/	*

Check valve, cartridge design = **M-SR**

Size 6 (not as angle valve)	= **6**
Size 8	= **8**
Size 10	= **10**
Size 15	= **15**
Size 20	= **20**
Size 25	= **25**
Size 30	= **30**

Component design

Angle valve	= **KE**
Straight valve	= **KD**

Cracking pressure (see characteristic curves on pages 4 and 5)

00 =	Without spring (not for straight valve)
02 =	
05 =	(Standard)
15 =	
30 =	
50 =	

1X = Component series 10 to 19
(10 to 19: unchanged installation and connection dimensions)

Seal material

No code =	NBR seals
V =	FKM seals (with angle valve only)

Important!
Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

Standard types

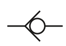
Type	Material number
M-SR 6 KD05-1X/	R900301889
M-SR 8 KE02-1X/	R900357438
M-SR 8 KE05-1X/	R900346083
M-SR 10 KE05-1X/	R900344549
M-SR 15 KE02-1X/	R900348943
M-SR 15 KE05-1X/	R900345372

Type	Material number
M-SR 20 KE02-1X/	R900345744
M-SR 20 KE05-1X/	R900340979
M-SR 25 KE05-1X/	R900344778
M-SR 30 KE05-1X/	R900344919

Further standard types and components can be found in the EPS (standard price list).

Symbols

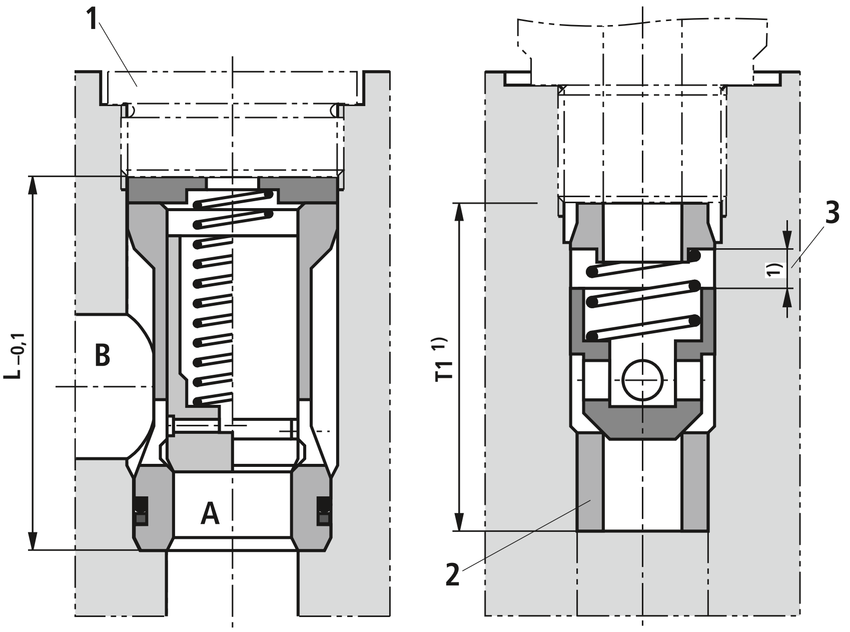
With spring



Without spring

Sections

Angle valve **Straight valve**



Size	$L_{-0,1}$
8	36,3
10	39,3
15	45,8
20	55,3
25	74,3
30	83,3

1 Plug screws, separate order, see page 6 and 7

2 Seat, shrink-fit at –60 °C

3 Poppet stroke

1) For dimensions, see installation drawing

Technical data (for applications outside these parameters, please consult us!)

General

Sizes		Size	6	8	10	15	20	25	30
Weight	– Angle valve	kg	–	0.03	0.05	0.08	0.14	0.32	0.47
	– Straight valve	kg	0.05	0.05	0.05	0.1	0.2	0.25	0.3
Installation orientation			Optional						
Ambeint temperature range		°C	–20 to +80 (NBR seals) –20 to +80 (FKM seals)						

Hydraulic

Maximum operating pressure	bar	315
Cracking pressure	bar	See characteristic curves on pages 4 and 5
Maximum flow	l/min	See characteristic curves on pages 4 and 5
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524 1); fast bio-degradable hydraulic fluids to VDMA 24568 (see also data sheet 90221); HETG (rape seed oil) 1); HEPG (polyglycols) 2); HEES (synthetic esters) 2); other hydraulic fluids on enquiry
Hydraulic fluid temperature range	°C	–30 to +80 (for NBR seals) –20 to +80 (for FKM seals)
Viscosity range	mm^2/s	2.8 to 500
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 3)

1) Suitable for NBR and FKM seals

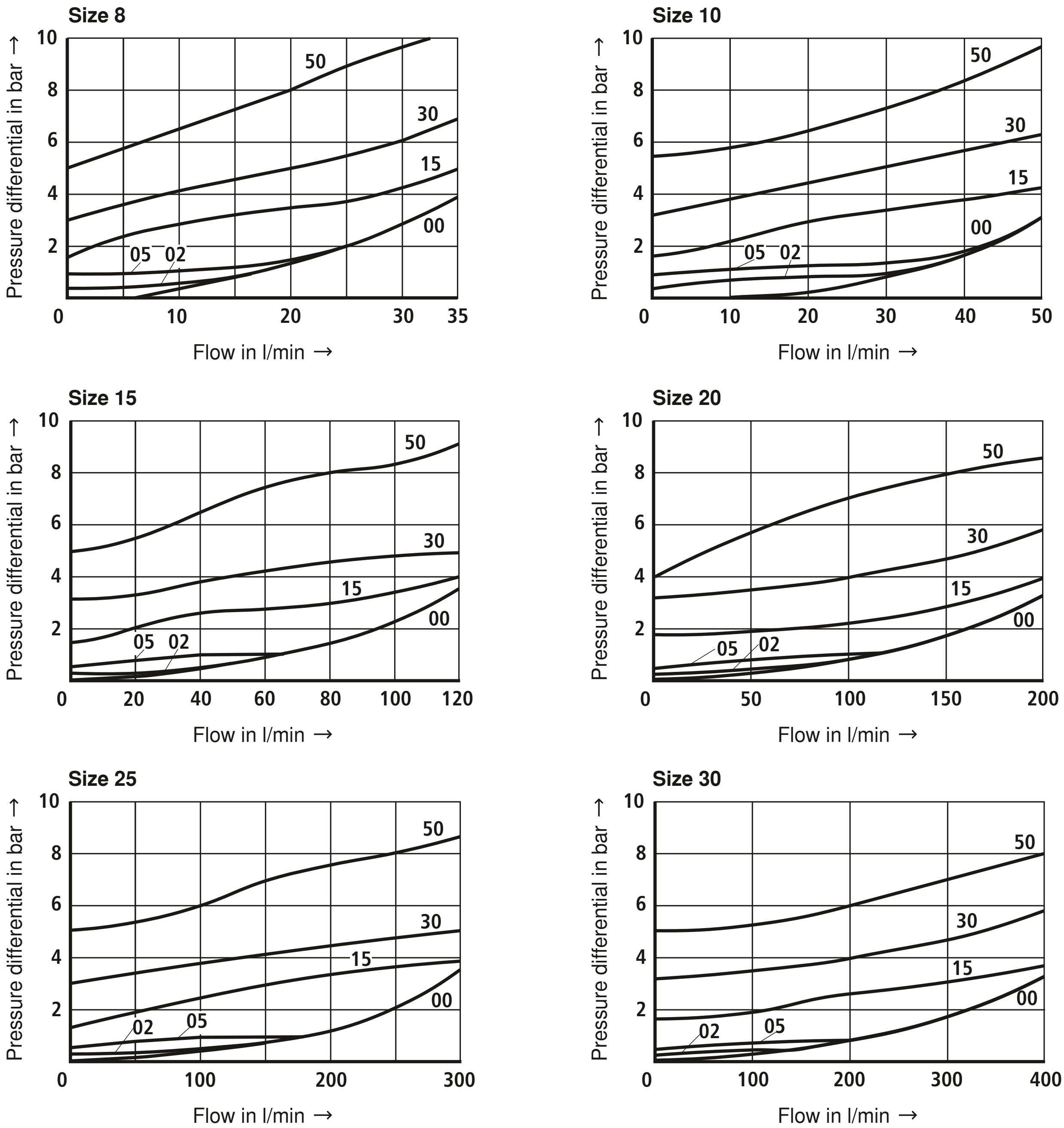
2) Suitable only for FKM seals

3) The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.

For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C) – angle valve

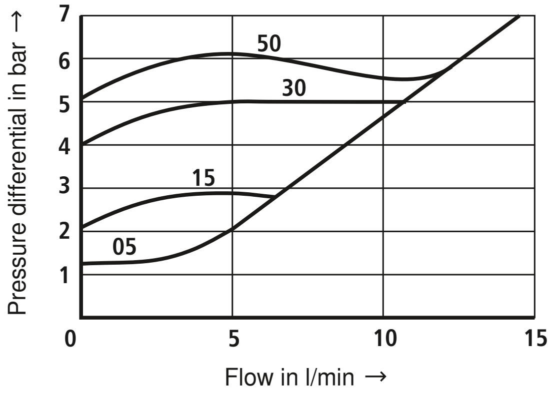
Pressure differential Δp in dependence upon flow q_V at cracking pressure



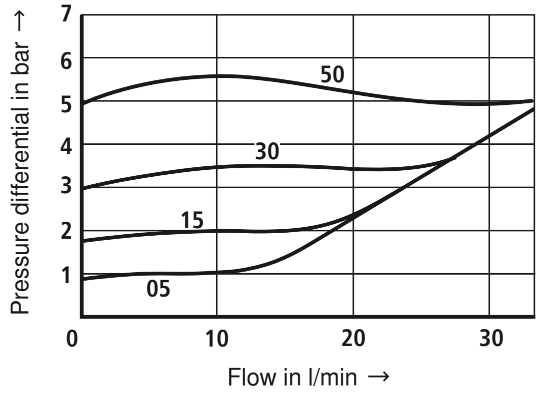
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C) – straight valve

Pressure differential Δp in dependence upon flow q_V at cracking pressure

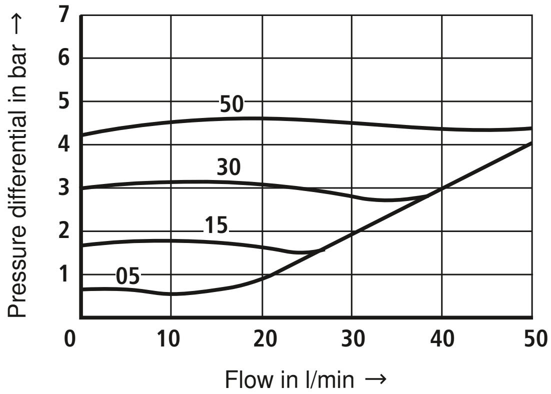
Size 6



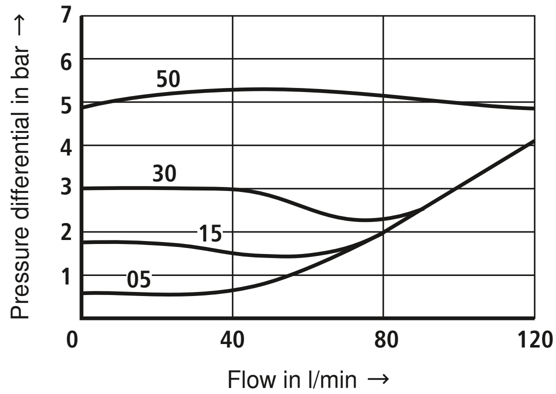
Size 8



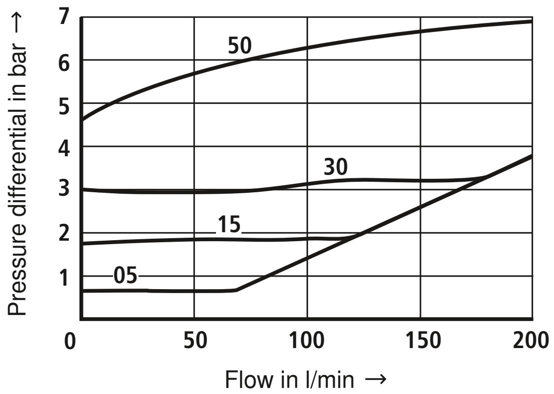
Size 10



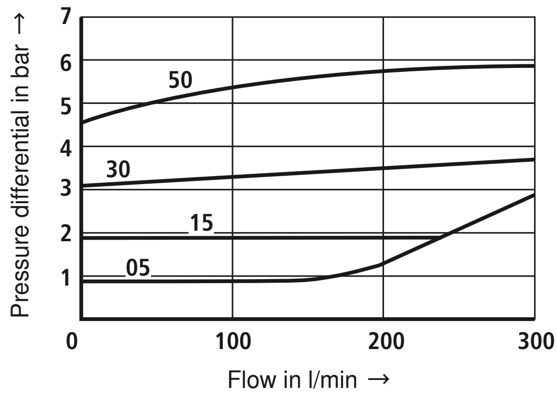
Size 15



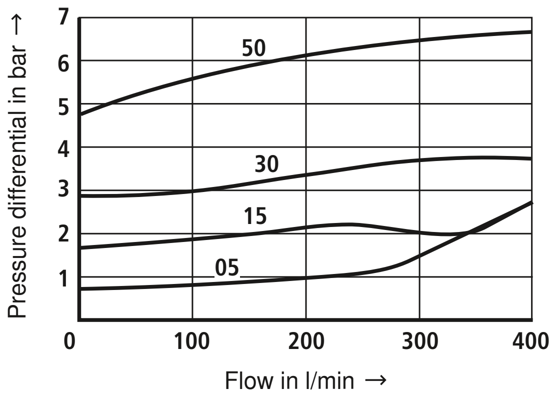
Size 20



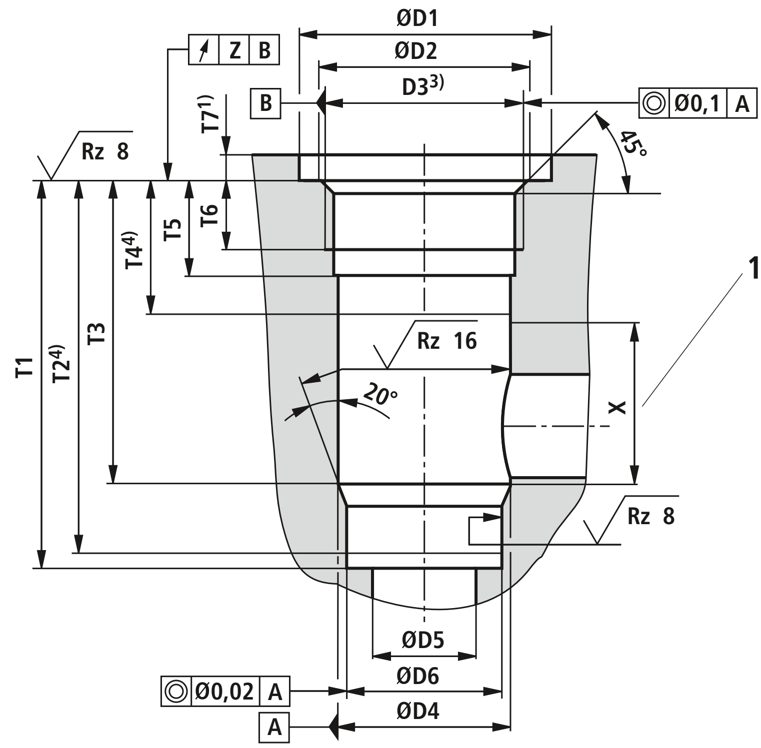
Size 25



Size 30



Mounting cavity: Angle valve **for plug screw to RN 143.21** (dimensions in mm)



1 Area for drain bore

Size	Plug screws [2] Material no.	p_N in bar	ØD1	ØD2	D3	ØD4H8	ØD5	ØD6H7
8	R900002423	315	23	17.1	G3/8 [3]	14	8	13
10	R900002422	315	28	21.4	G1/2 [3]	18	10	17
15	R900012091	315	33	26.8	G3/4 [3]	24	15	22
20	R900002424	315	41	33.8	G1 [3]	30	20	28
25	R900012411	250	51	42.5	G1 1/4 [3]	38	25	36
30	R900012412	250	56	48.5	G1 1/2 [3]	44	30	42

Size	T1$^{+0.1}$	T2	T3	T4	T5	T6	T7$^{+0.5}$	T8$^{+0.2}$	X	Z
8	48.5	47.5	38.5	20	15	12	6	–	18	0.05
10	53.5	52.5	43.5	24	18	14	6	–	19	0.05
15	62	60.5	50	26	20.5	16	6	–	24	0.05
20	71.5	70	56.5	26	20.5	16	7	–	30	0.05
25	90.5	88	72.5	28	22	16	7	–	43	0.1
30	99.5	96.5	79.5	31	22	16	7	–	48	0.1

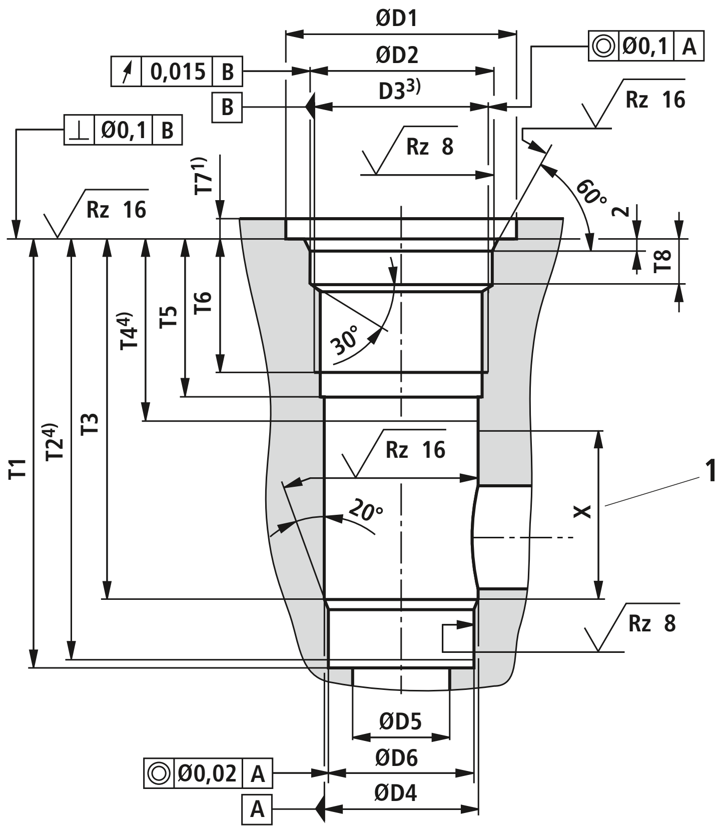
[1] Dimension for countersinking the screw head. When installing the cartridge more deeply, extend dimension T7 accordingly.

[2] Order separately, with NBR seal

[3] Pipe thread "G…" to ISO 228/1

[4] Depth of fit

Mounting cavity: Angle valve **for plug screw to RN 143.28** (dimensions in mm)



1 Area for drain bore

Size	Plug scews [2)] Material no.	p_N in bar	ØD1	ØD2H8	D3	ØD4H8	ØD5	ØD6H7
25	R900323609	315	$56^{+0.5}$	44	M42 x 1.5 [3)]	38	25	36
30	R900323610	315	$62^{+0.5}$	50	M48 x 1.5 [3)]	44	30	42

Size	$T1^{+0.1}$	T2	T3	T4	T5	T6	$T7^{+0.5}$	$T8^{+0.2}$	X	Z
25	106.5	104	88.5	45	39	33	5	12	43	–
30	115.5	112.5	95.5	48	39	33	5	12	48	–

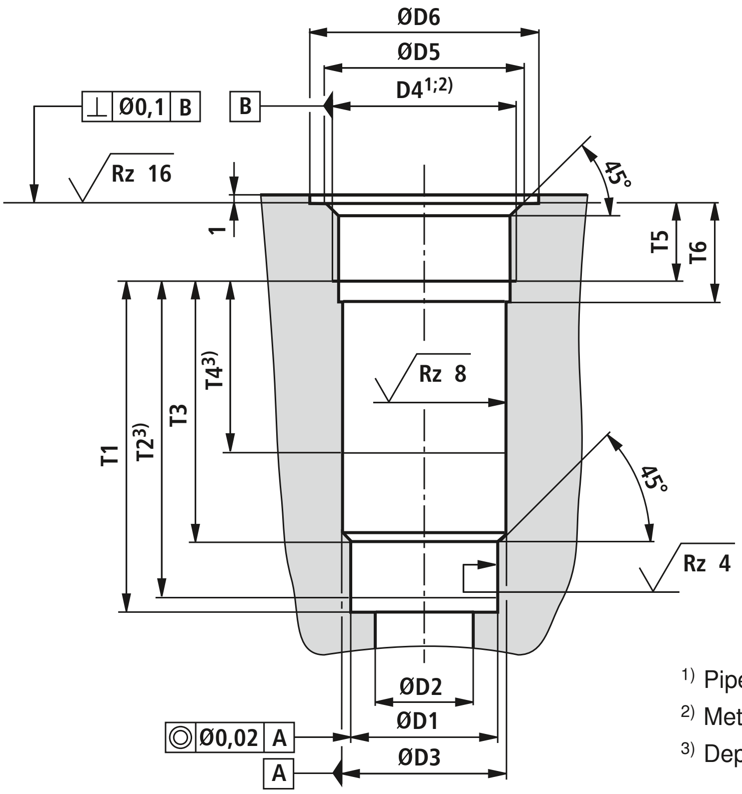
[1)] Dimension for countersinking the screw head. When installing the cartridge more deeply, extend dimension T7 accordingly.

[2)] Order separately, with NBR seal

[3)] Metric ISO fine thread to DIN 13

[4)] Depth of fit

Mounting cavity: Straight valve (dimensions in mm)



1) Pipe thread "G…" to ISO 228/1
2) Metric ISO fine thread to DIN 13
3) Depth of fit

Size	ØD1H7	ØD2	ØD3H8	D4 1)	ØD5 ±0.1 1)	D4 2)	ØD5 ±0.1 2)	ØD6
6	10	6	11	G1/4	13.6	M14 x 1.5	14.4	25
8	13	8	14	G3/8	17.1	M18 x 1.5	18.4	28
10	17	10	18	G1/2	21.4	M22 x 1.5	22.4	34
15	22	15	24	G3/4	26.8	M27 x 2	27.4	42
20	28	20	30	G1	33.8	M33 x 2	33.5	47
25	36	25	38	G1 1/4	42.5	M42 x 2	42.5	58
30	42	30	44	G1 1/2	48.5	M48 x 2	48.5	65

Size	$T1_{-0.1}$	T2	T3	T4	T5	T6	Z	Poppet stroke
6	29.8	27.8	21.8	19	12	16	0.05	4
8	32.8	30.8	22.8	18	12	16	0.05	4
10	38.8	36.8	28.8	21	14	19	0.05	4
15	48.4	46.4	36.4	27	16	21	0.05	5
20	59	57	44	29	18	24	0.05	5
25	73	71	55	39	20	26	0.1	7
30	83	81	63	42	22	28	0.1	7

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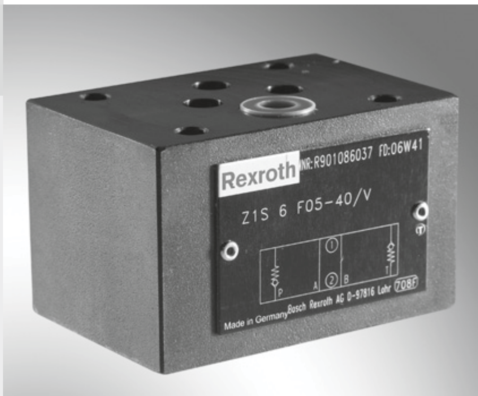
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Check valve

Type Z1S

Size 6
Component series 4X
Maximum operating pressure 350 bar *[5076 psi]*
Maximum flow 40 l/min *[10.6 US gpm]*



H7601

Table of contents

Features

– Sandwich plate valve for use in vertical stacking assemblies
  • As angled valve
  • As through valve
– Position of ports to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03
– Various checking functions in one or two channels
– Optimum freedom from leakage through poppet made of heavy-duty plastic
– Corrosion-resistant surface on request
– Simple adjustment to special hydraulic fluids by changing the external seal rings
– With measuring points, optional
– As throttle check valve on request
– Supplementary documentation:
  • Sandwich plates NG6, see RE 48050
  • Hydraulic fluids on mineral oil basis see RE 90220

Notes on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z1S	6		–4X/	V /		*

Check valve, sandwich plate

Size 6 **= 6**

Through valve
Direction of flow in channel:

A (A2 → A1)	**= A**
B (B2 → B1)	**= B**
A (A1 → A2)	**= C**
B (B1 → B2)	**= D**
A and B (A1 → A2) and (B1 → B2)	**= E**
P and T (P2 → P1) and (T1 → T2)	**= F**
P (P2 → P1)	**= P**
T (T1 → T2)	**= T**

Angled valve:
Direction of flow:

B → A	**= B-A**
T → P	**= T-P**
AB → P	**= AB-P**

(For symbols, see page 3)

Cracking pressure

0.5 bar *[7.25 psi]*	**= 05**
1.5 bar *[21.76 psi]*	**= 15**
3.0 bar *[43.51 psi]*	**= 30**
5.0 bar *[72.52 psi]*	**= 50**

4X = Component series 40 to 49
(40 to 49: unchanged installation and connection dimensions)

No code = Surface not resistant to corrosion [1)]

Seal material

V = FKM seals
(other seals on request)

Note!
In the selection, observe the dependency of the operating parameters (fluid, temperature, etc.)!

No code = With locating bore [2)]
62 = With locating bore and locating pin ISO 8752-3x8-St

Special version

No code =	Without
SO68 =	Measuring port P (G1/4)
SO90 =	Measuring ports A and B (G1/4)
SO2 =	Measuring port T (G1/4)

Symbols (example), see page 4

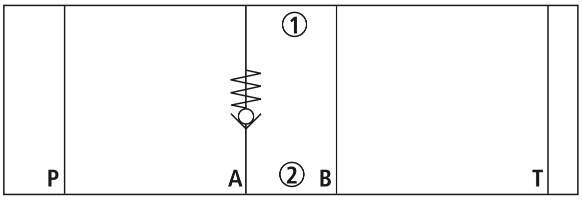
Further details in clear text

1) Corrosion-resistant surface on request.

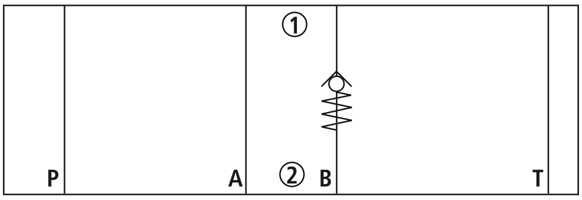
2) Locating pin ISO 8752-3x8-St,
Material no. **R900005694** (separate order)

Symbols: Through valve (① = component side, ② = plate side)

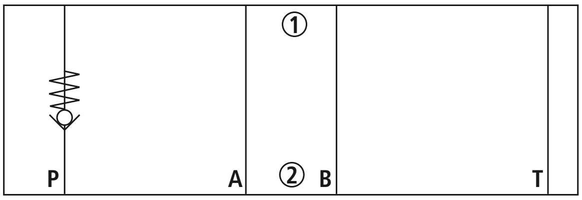
Type Z1S 6 **A**…



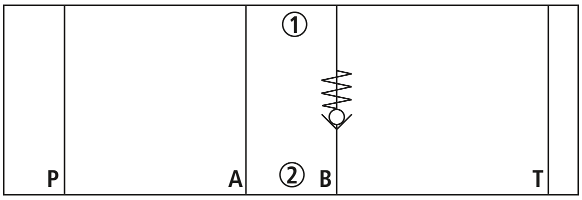
Type Z1S 6 **D**…



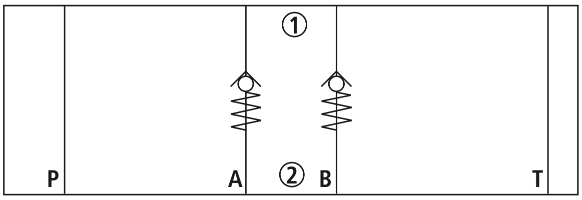
Type Z1S 6 **P**…



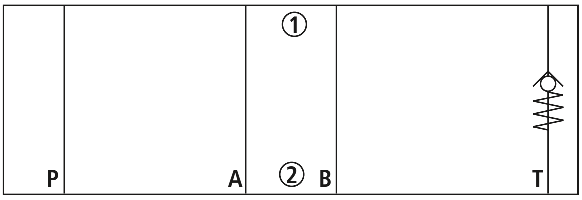
Type Z1S 6 **B**…



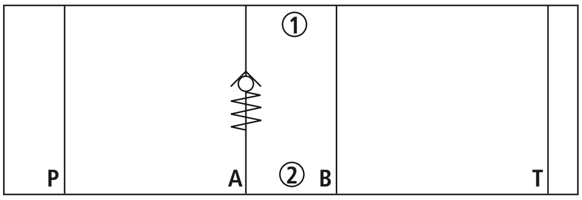
Type Z1S 6 **E**…



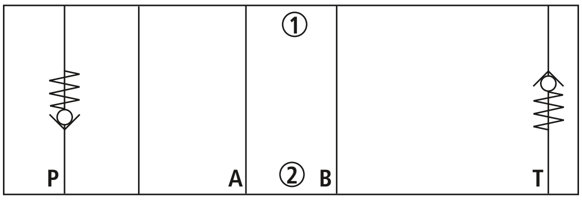
Type Z1S 6 **T**…



Type Z1S 6 **C**…

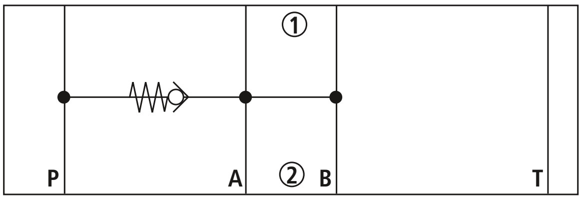


Type Z1S 6 **F**…

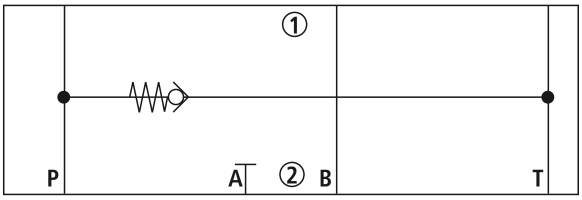


Symbols: Angled valve (① = component side, ② = plate side)

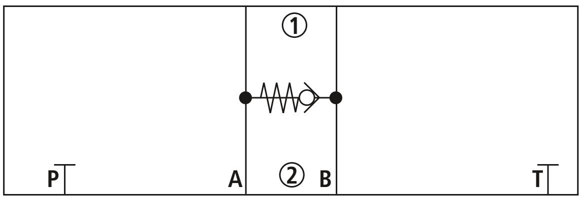
Type Z1S 6 **AB-P**…



Type Z1S 6 **T-P**…

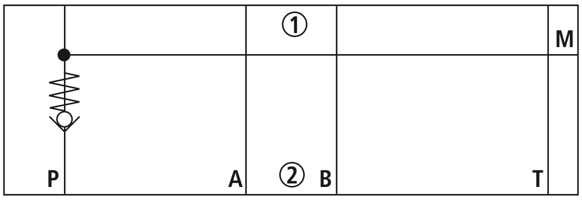


Type Z1S 6 **B-A**…

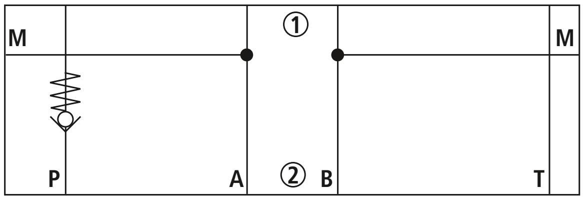


Symbols: Examples of special versions (① = component side, ② = plate side)

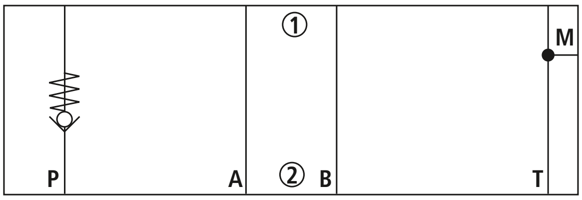
Type Z1S 6 **P**.-4X/…**SO68**
(Check valve in channel P, measuring port P Out G1/4)



Type Z1S 6 **P**.-4X/…**SO90**
(Check valve in channel P, measuring ports A and B G1/4)



Type Z1S 6 **P**.-4X/…**SO2**
(Check valve in channel P, measuring port T G1/4)



Function, sections

Valves of type Z1S are direct operated check valves of sandwich plate design.

They block the flow leak-free in one direction and allow free flow in the opposite direction.

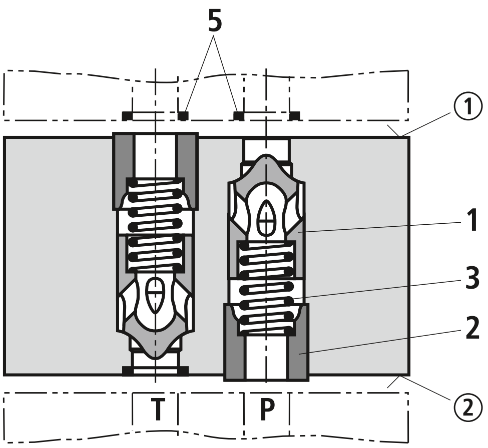
The stroke of poppet (1) is limited by plastic bushing (2). Integrated spring (3) supports the closing movement. When no fluid flows through the valve, spring (3) holds poppet (1) in the closed position.

In contrast to the through valve (section 1), the angled valve (section 2) checks up to three internal channels. Plug screw (4) serves as positive stop and provides the sealing function.

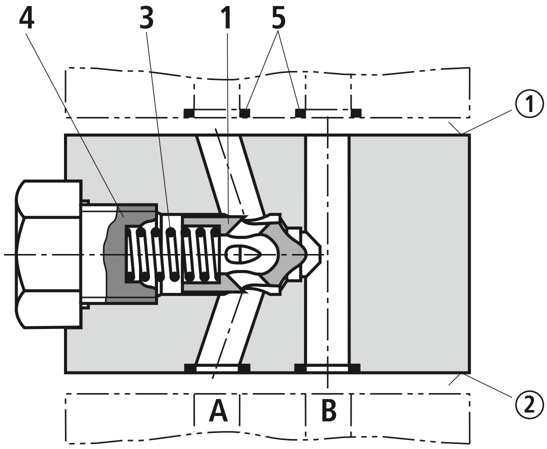
Attention!

In all installation positions, in which the blue plastic bushing (2) is mounted on the plate side ②, no additional seal ring may be at this place! On the component side ① sealing is achieved (as usual) by means of seal ring (5) of the assembly mounted next.

Integrated plastic bushing (2) assumes a sealing function and must therefore not be removed or damaged!



Section 1: Type Z1S 6 F (through valve)



Section 2: Type Z1S 6 BA (angled valve)

Technical data (for applications outside these parameters, please consult us!)

General

Weight	kg *[lbs]*	ca. 0.8 *[1.76]*
Installation position		Optional
Ambient temperature range	°C *[°F]*	–20 to +80 *[–4 to +176]*

Hydraulic

Maximum operating pressure	bar *[psi]*	350 *[5076]*
Cracking pressure	bar *[psi]*	0.5; 1.5; 3; 5 *[7.25; 21.76; 43.51; 72.52]*
Maximum flow	l/min *[US gpm]*	40 *[10.57]*
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524; other hydraulic fluids on request
Hydraulic fluid temperature range	°C *[°F]*	–20 to +80 *[–4 to +176]*
Viscosity range	mm^2/s *[SUS]*	2.8 to 500 *[35 to 2320]*
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [1)]

[1)] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

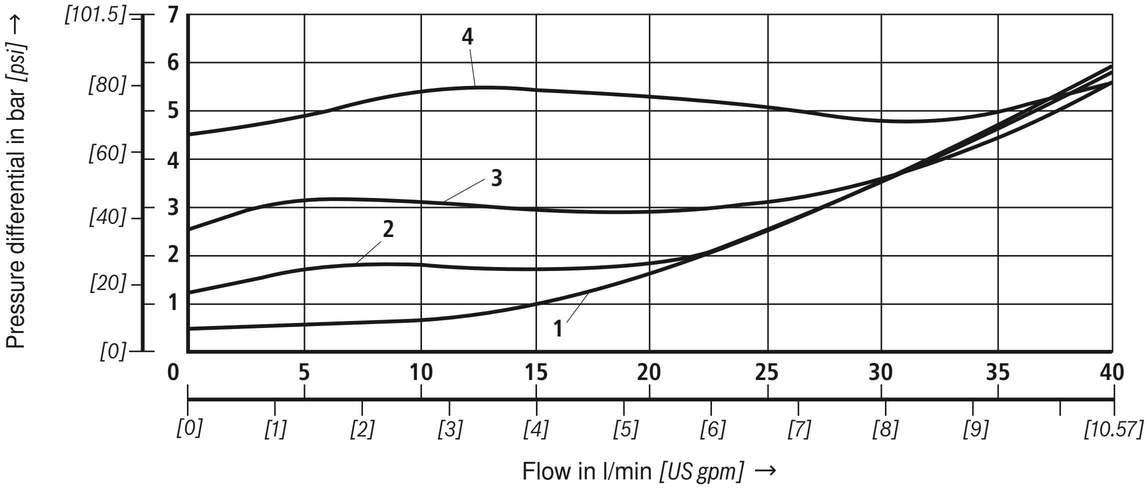
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Notes

- The valve housing (steel) and piston with sealing bushing (plastic bushing) can be disassembled to ensure proper waste disposal.
- The integrated plastic bushing (blue) assumes a sealing function and must therefore not be removed or damaged!
- The check valve inset cannot be ordered separately. In the case of a defect, the valve must therefore be replaced completely.

Characteristic curves: Through valve
(measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

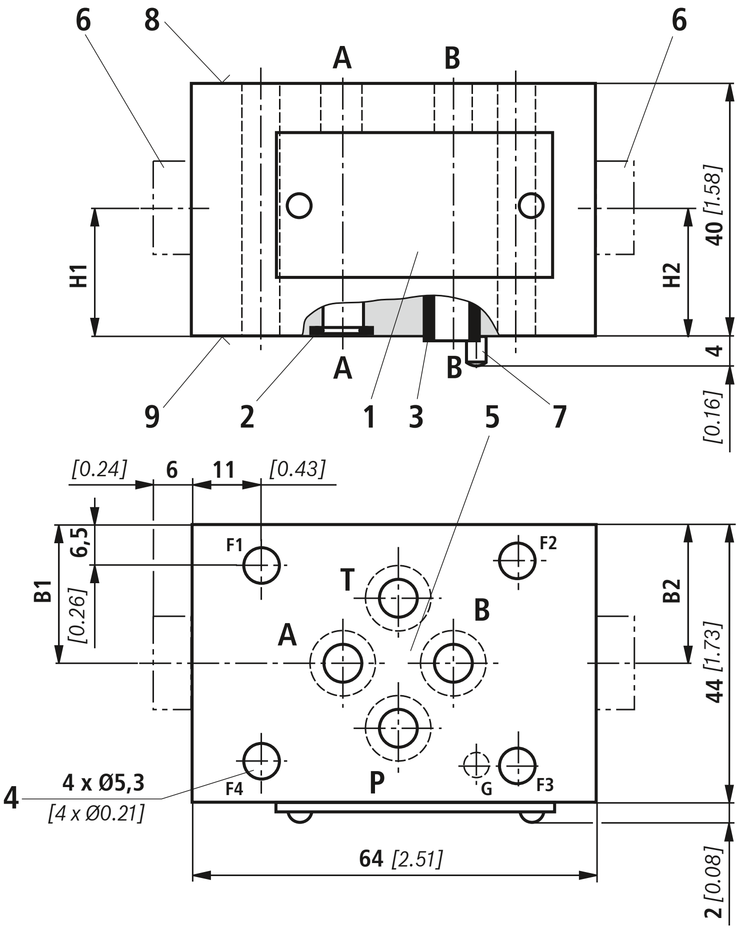
***Δp-q*$_V$ characteristic curves (A2 to A1)**

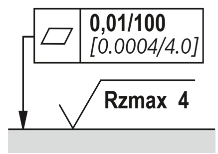


1 Cracking pressure 0.5 bar
2 Cracking pressure 1.5 bar
3 Cracking pressure 3 bar
4 Cracking pressure 5 bar

Characteristic curves for angled valve on request**.**

Unit dimensions: Through valve (dimensions in mm *[inch]*)





Required surface quality of valve mounting face

Type	B1	B2	H1	H2
Z1S 6 **C**…**SO68**	22 *[0.87]*	–	13.5 *[0.53]*	–
Z1S 6 **P**…**SO68**	26.5 *[1.04]*	–	13 *[0.51]*	–
Z1S 6 **P**…**SO90**	22 *[0.87]*	22 *[0.87]*	20 *[0.79]*	20 *[0.79]*
Z1S 6 **P**…**SO2**	–	17.5 *[0.69]*	–	20 *[0.79]*

1 Nameplate

2 Identical seal rings for ports A, B, P, T (plate side)

3 Plastic bushing, blue (plate side)

4 Valve mounting bores

5 Position of ports to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03

6 Plug screw for measuring port, tightening torque M_T = 30 Nm *[22.1 ft-lbs]* +10%

7 Locating pin ISO 8752-3x8-St (version “62“ only)

8 Component side

9 Plate side

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

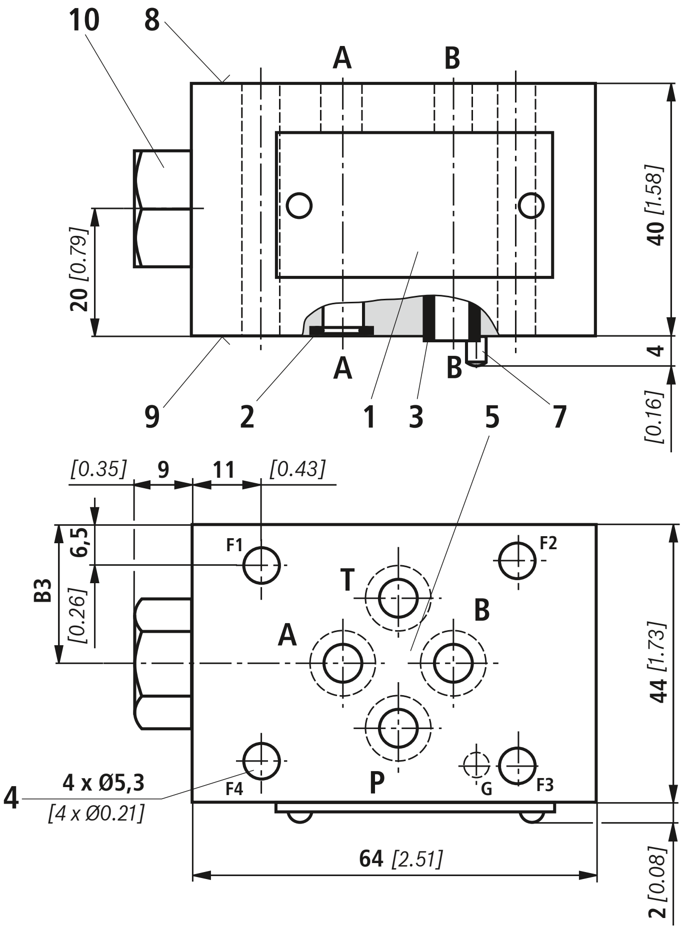
☞ **Note!**

The length of the valve mounting screws of the sandwich plate valve (length of engagement ≥ 10 mm *[0.39 inch]*) must be selected to suit the components mounted above and below the check valve.

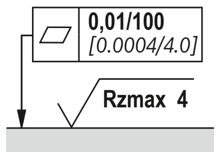
The type of screws and the tightening torque must be selected according to the application and individual conditions.

Please consult Rexroth with regard to screws of the required length.

Unit dimensions: Angled valve (dimensions in mm *[inch]*)



Version	B3
"AB-P"	24.5 *[0.96]*
"T-P"	24.5 *[0.96]*
"B-A"	22 *[0.87]*



Required surface quality of valve mounting face

1. **1** Nameplate
2. **2** Identical seal rings for ports A, B, P, T (plate side)
3. **3** Plastic bushing, blue (plate side)
4. **4** Valve mounting bores
5. **5** Position of ports to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03
6. **7** Locating pin ISO 8752-3x8-St (version "62" only)
7. **8** Component side
8. **9** Plate side
9. **10** Plug screw, tightening torque M_T = 55 Nm *[40.6 ft-lbs]* +10%

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

☞ **Note!**

The length of the valve mounting screws of the sandwich plate valve (length of engagement ≥ 10 mm *[0.39 inch])* must be selected to suit the components mounted above and below the check valve.

The type of screws and the tightening torque must be selected acording to the application and individual conditions.

Please consult Rexroth with regard to screws of the required length.

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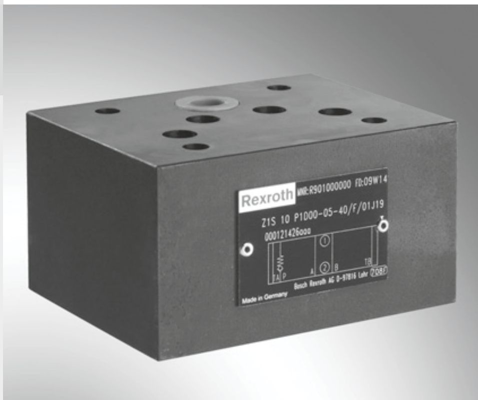
www.boschrexroth.de

Check valve

RE 21537/09.10
Replaces: 21536

Type Z1S

Size 10
Component series 4X
Maximum operating pressure 350 bar *[5076 psi]*
Maximum flow 100 l/min *[26.4 US gpm]*



H7647

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

– Sandwich plate valve for use in vertical stackings
– Porting pattern according to ISO 4401-05-04-0-05, ISO 4401-05-05-0-05 and NFPA T3.5.1 R2-2002 D05
– Diverse blocking functions, one- and two-channel
– Perfect leak-proofness due to poppet of high-performance plastic
– Corrosion-resistant housing design, optional
– Suitable for different hydraulic fluids by simply exchanging the external seal rings (can be retrofitted)
– Cheap exchange of the wear parts as the check valve installation kit can be ordered separately
– With measuring ports, optional
– Throttle check valve, optional
– Amending documentation:
  • "Sandwich plates size 10", data sheet 48052
  • "Hydraulic fluids on a mineral oil basis", data sheet 90220
  • "Project planning information on HFC", upon request
  • "Manifolds", data sheet 48107

Ordering code

Z1S	10		–				–		

Check valve, sandwich plate		
Size 10		**= 10**
Check valve 1 [1)]	in channel A	**= A**
	in channel B	**= B**
	in channel P	**= P**
	in channel TA	**= TA**
	in channel TB	**= TB**
	Cracking pressure	
	without spring	**= 00**
	0.5 bar *[7.25 psi]*	**= 05**
	3.0 bar *[43.51 psi]*	**= 30**
	5.0 bar *[72.52 psi]*	**= 50**
	Installation direction	
	component side ① (direction of flow ② → ①)	**= 1**
	plate side ② (direction of flow ① → ②)	**= 2**
	Orifice diameter (in case of use as throttle check valve)	
	without throttle	**= no code**
	Ø0.5 mm *[0.0197 inch]*	**= D05**
	Ø1.0 mm *[0.0394 inch]*	**= D10**
	Ø1.5 mm *[0.0591 inch]*	**= D15**
Check valve 2 - optional [1)]	without check valve 2	**= no code**
	in channel B	**= B**
	in channel P	**= P**
	in channel TA	**= TA**
	in channel TB	**= TB**
	Cracking pressure	
	without check valve 2	**= no code**
	without spring	**= 00**
	0.5 bar *[7.25 psi]*	**= 05**
	3.0 bar *[43.51 psi]*	**= 30**
	5.0 bar *[72.52 psi]*	**= 50**
	Installation direction	
	without check valve 2	**= no code**
	component side ① (direction of flow ② → ①)	**= 1**
	plate side ② (direction of flow ① → ②)	**= 2**
	Orifice diameter (in case of use as throttle check valve)	
	without throttle	**= no code**
	Ø0.5 mm *[0.0197 inch]*	**= D05**
	Ø1.0 mm *[0.0394 inch]*	**= D10**
	Ø1.5 mm *[0.0591 inch]*	**= D15**

	–4X / F /				–	*

Further details in the plain text

Special version [2]

068 = Measuring port in P (G1/2)
120 = With tank bracket

Corrosion resistance housing (outside)

no code = None
J50 = Galvanic coating DIN 50979 - Fe//Zn8//Cn//T0 (thick-layer passivation)

no code = Without measuring port
A = Measuring port input
B = Measuring port output

Measuring port G1/4

no code = without measuring port
MA = in channel A
MB = in channel B
MP = in channel P
MTA = in channel TA

Additional pilot oil ports X and Y

no code = Without X and Y
XY = With X and Y

Seal material [3]

F = FKM seals
(other seals upon request)

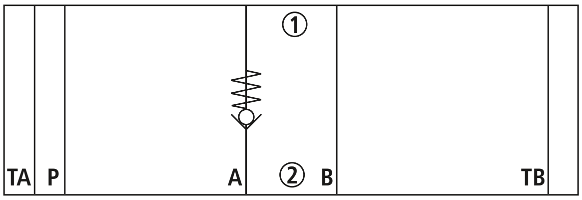
4X = Component series 40 to 49
(40 to 49: Unchanged installation and connection dimensions)

no code = Channels TA and TB free-flowing
TA9 = Channel TA locked
TB9 = Channel TB locked

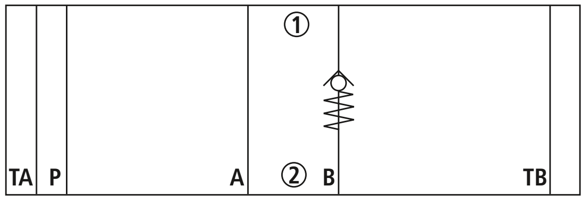
[1] Symbols (examples) see page 4
[2] Symbols see page 5
[3] Depending on the hydraulic fluid used

Symbols: Examples (① = component side, ② = plate side)

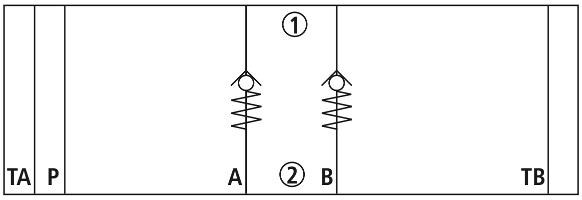
Type Z1S 10 **A**.-1-4X/…
(check valve in channel A)



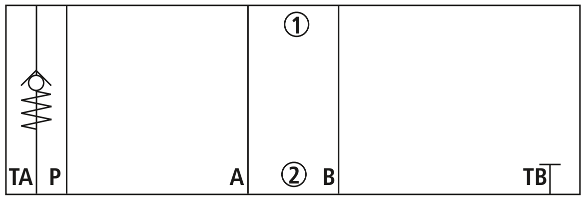
Type Z1S 10 **B**.-2-4X/…
(check valve in channel B)



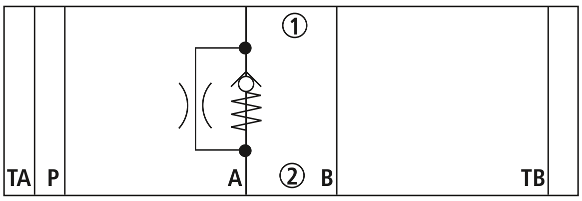
Type Z1S 10 **A**.-2B.-2-4X/…
(Check valve in channel A and B)



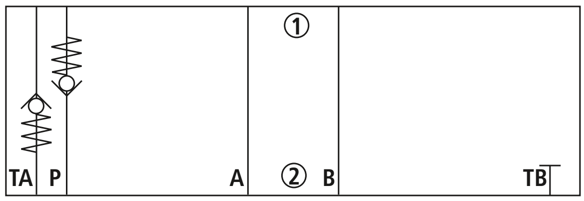
Type Z1S 10 **TA**.-2-**TB9**-4X/…
(check valve in channel TA, TB locked)



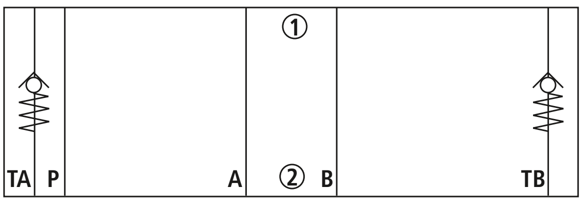
Type Z1S 10 **A**.-2D10-4X/…
(check valve in channel A with orifice Ø 1.0 mm)



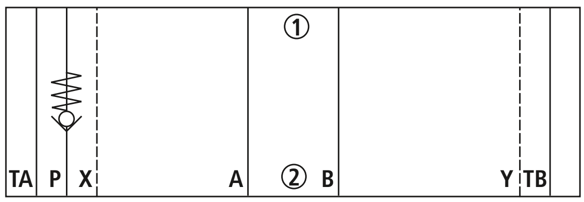
Type Z1S 10 **P**.-1**TA**-2**TB9**-4X/…
(check valve in channel TA and P, TB locked)



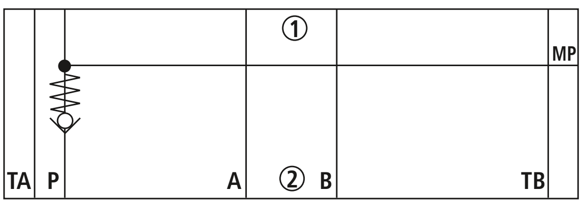
Type Z1S 10 **TA**.-2**TB**-2-4X/…
(check valve in channel TA and TB)



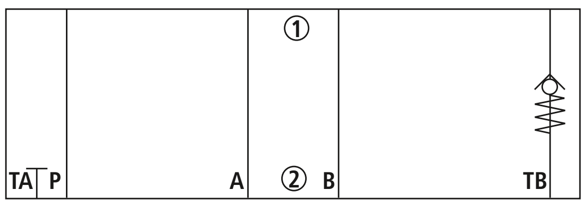
Type Z1S 10 **P**.-1-4X/F/**XY**…
(check valve in channel P, additionally channel X and Y)



Type Z1S 10 **P**.-1-4X/F/.**MP**B…
(check valve in channel P, measuring port P Out G1/4)

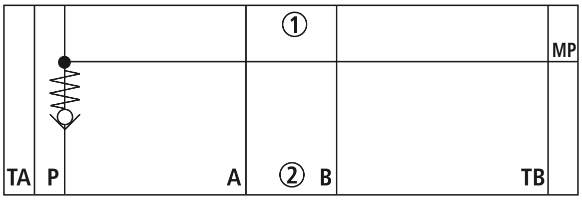


Type Z1S 10 **TB**.-2-**TA9**-4X/…
(check valve in channel TB, TA locked)

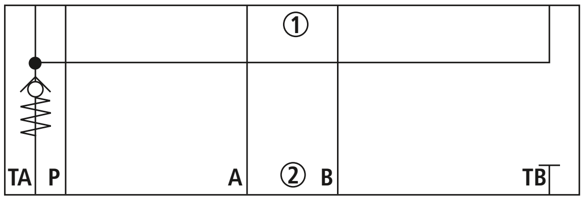


Symbols: Special versions (① = component side, ② = plate side)

Type Z1S 10 **P**.-1-4X/…-**068**
(check valve in channel P, measuring port in P (**G1/2**)



Type Z1S 10 **TA**.-2-**TB9**-4X/…-**120**
(check valve in channel TA, with tank bracket



Function, section

The valve Type Z1S is a direct operated check valve in sandwich plate design.

It is used for the leak-free blocking in one direction and allows for free flow in the opposite direction.

The stroke of the plastic poppet (1) is limited by the plastic socket. The installed spring (3) supports the closing movement. If the valve is not flown through, the spring (3) holds the plastic poppet (1) in closed position. Perfect leak-proofness is already achieved with low pressures (0.1 x p_{max}).

☞ **Note!**

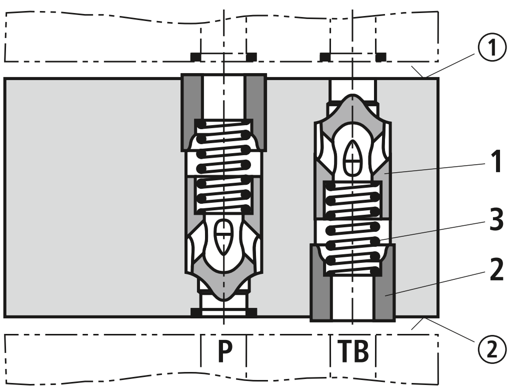
In all installation positions, in which the plastic socket (2) is mounted on the plate side ②, no additional seal ring must be used in this position! On the component side ①, sealing is (as usual) ensured by the seal ring of the subsequently mounted assembly.

The installed plastic socket (2) has a sealing function and must therefore not be removed or damaged!

The protrusion of the plastic socket (2) is necessary for construction reasons (preload).

Depending on the included hydraulic fluid volume and its temperature fluctuations, static pressure changes may result that are not attributable to leakage at the seat area.

Example:



Type Z1S 10 P.-1.TB.-2-4X/…

① = Component side
② = Plate side

Technical Data (For applications outside these parameters, please consult us!)

general

Weight	kg *[lbs]*	approx. 2.3 *[5.1]*
Installation position		Any
Ambient temperature range	°C *[°F]*	–20 to +80 *[–4 to +176]*

hydraulic

Maximum operating pressure	bar *[psi]*	350 *[5076]*
Cracking pressure	bar *[psi]*	0.5; 3; 5 *[7.25; 43.51; 72.52]*
Maximum flow	l/min *[US gpm]*	100 *[26.4]*
Hydraulic fluid		– On mineral oil basis and related hydrocarbons (HL, HLP, HVLP, HVLPD, etc.) according to DIN 51524 – Flame-resistant (HFC, HFDU, HFDR) according to ISO 12922 1) – Environmentally compatible (HETG, HEES, HEPG, HEPR) according to ISO 15380 1) Other hydraulic fluids upon request
Hydraulic fluid temperature range (at the valve working ports)	°C *[°F]*	–20 to +80 *[–4 to +176]*
Viscosity range	mm^2/s *[SUS]*	2.8 to 500 *[35 to 2320]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 2)

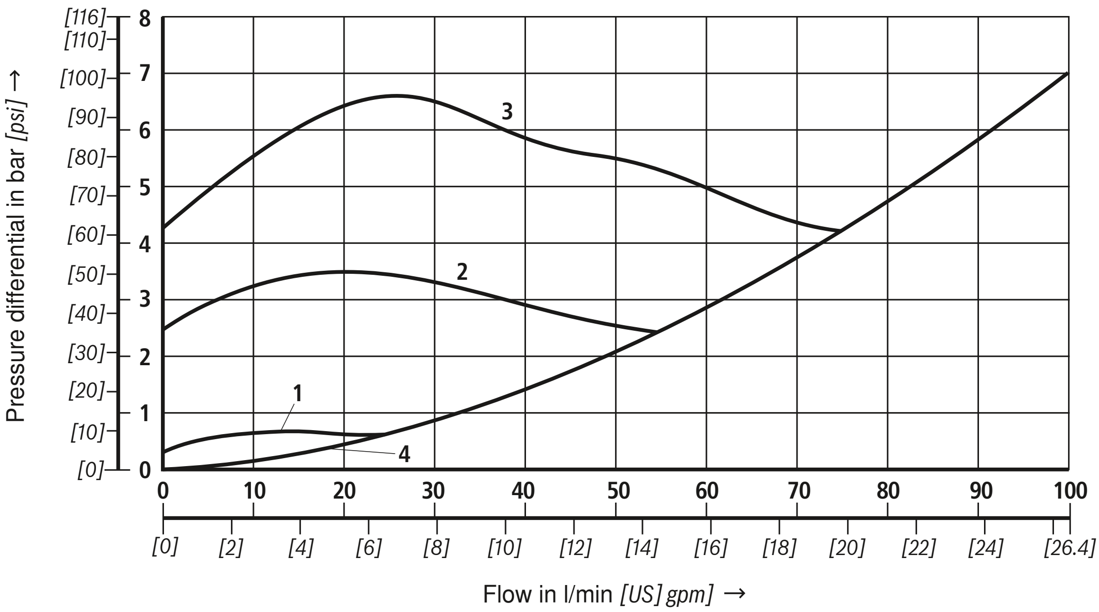
1) When using flame-resistant or environmentally compatible hydraulic fluids, restrictions with regard to the technical data may be applicable (temperature, pressure range, life time, maintenance intervals, etc.).

2) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Δ*p*-q_V characteristic curves



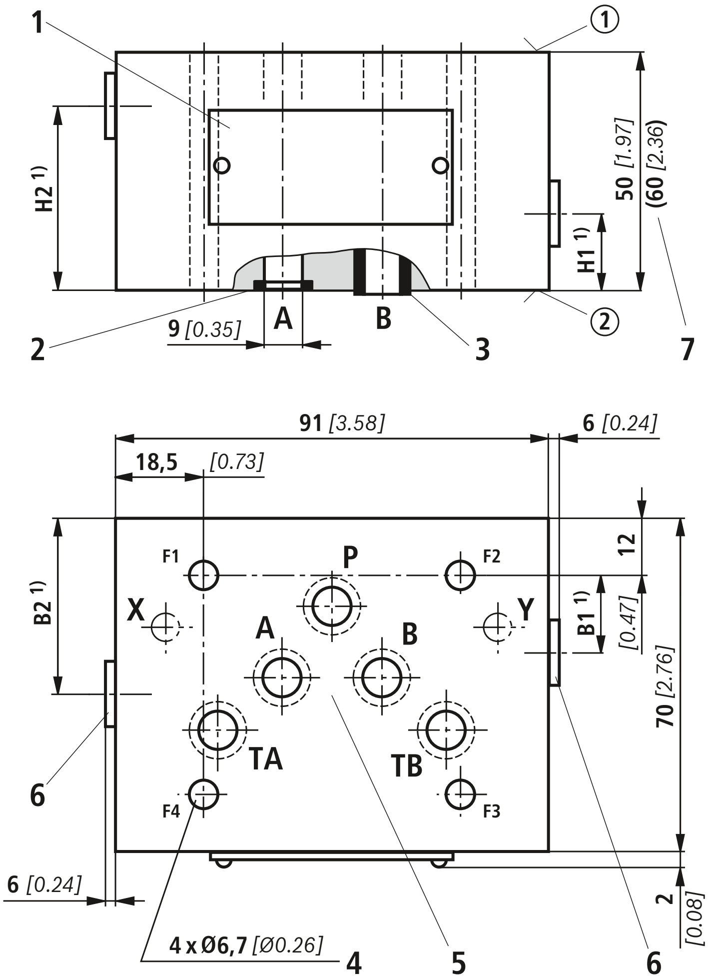
1 Cracking pressure 0.5 bar *[7.25 psi]*

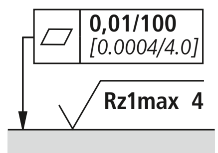
2 Cracking pressure 3.0 bar *[43.51 psi]*

3 Cracking pressure 5.0 bar *[72.52 psi]*

4 Without check valve

Unit dimensions (dimensions in mm *[inch]*)





Required surface quality of the valve mounting face

1 Name plate
2 Identical seal rings for ports A, B, P, TA, and TB; identical seal rings for ports X and Y (plate side)
3 Plastic socket (position and quantity depend on order option)
4 Valve mounting bores
5 Porting pattern according to ISO 4401-05-04-0-05, ISO 4401-05-05-0-05 and NFPA T3.5.1 R2-2002 D05
6 Plug screw for measuring port (position and quantity depend on order option)
   – Port G1/4:
     Tightening torque $\boldsymbol{M}_A$ = 30 Nm *[22.1 ft-lbs]* +10 %
   – Port G1/2 ("068" version):
     Tightening torque $\boldsymbol{M}_A$ = 80 Nm *[59 ft-lbs]* +10 %
7 Dimension with model "120"

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M6 - 10.9

4 hexagon socket head cap screws 1/4-20 UNC

☞ **Note!**

The length of the valve mounting screws of the sandwich plate valve must be selected according to the components mounted under and over the isolator valve.

Depending on the application, screw type and tightening torque must be adjusted to the circumstances.

Please ask Rexroth for screws with the required length.

① = component side
② = plate side

1) On request (depending on the order option)

Notes

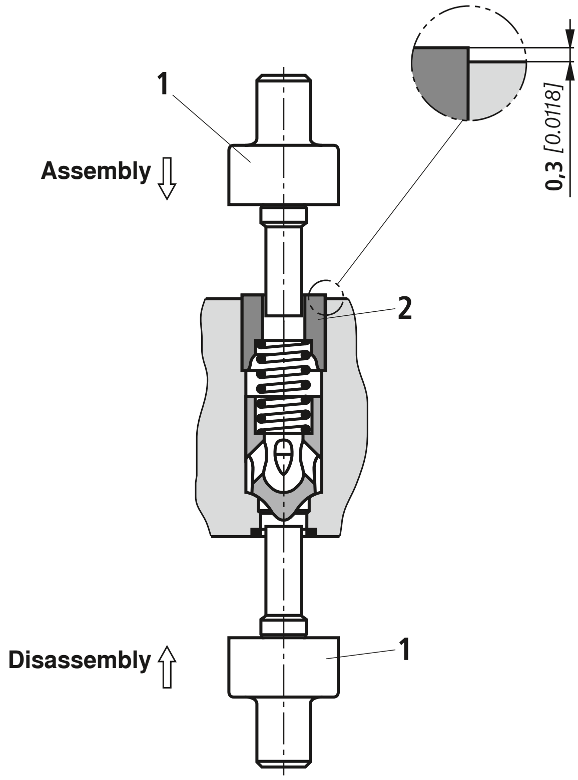
- Valve housing (steel) and plastic spool with plastic socket can be dismantled into individual parts for proper disposal.
- Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.
- The check valve installation kit is separately available (plastic socket, plastic spool, spring):
  Email: spare.parts@boschrexroth.de
- The plastic socket has a sealing function and must therefore not be damaged!
- For assembly and disassembly of the check valve installation kit, a special multi-purpose tool has to be used, see page 10.

Troubleshooting

External leakage at the through channels	Seal ring defective.	Replace seal rings (seal kit).
	Lip of the plastic socket is damaged.	Replace the check valve installation kit. [1]
	The mounting screws have been tightened unevenly.	Loosen the screws and re-tighten them crosswise, applying the recommended tightening torque.
Internal leakage at the check valve installation kit	Contamination parts on poppet surface.	From the outside, check poppet surface for contamination parts and remove them, if necessary.
	Poppet not freely moving.	Check freedom of movement of the poppet from the outside using a suitable mandrel. Attention - Don't push the plastic socket out of the housing!
	Leakage due to downstream assembly.	Find out whether the check valve installation kit is the cause of the leakage.
	Hydraulic fluid quality does not comply with the specification.	Check the hydraulic fluid quality and ensure compliance with the specification.
	Depending on the included hydraulic fluid volume and its temperature fluctuations, pressure changes may occur that are not attributable to leakage.	
	The measures described above have not been successful.	Completely replace the check valve installation kit. [1]
External leakage at measuring points	Seal is defective.	Replace the profile seal.
	Plug screw or fitting has not been tightened correctly.	Tighten the plug screw or fitting with the specified tightening torque.

[1] Attention - use special multi-purpose tool in order to prevent damage at the plastic socket, see page 10!

Check valve installation kit: Disassembly and assembly



Disassembly/assembly without any damage is ensured by using the special multi-purpose tool (1) (Material no. **R901182853**, separate order).

Disassembly:

Press the check valve installation kit out.

Assembly:

Insert the check valve installation kit and press the plastic socket (2) in.

In case of correct assembly by using the special multi-purpose tool (1), the protrusion of the plastic socket (2) is approx. 0.3 mm *[0.0118 inch]*.

☞ **Note!**

Disassembled plastic sockets must not be re-used!

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

The Drive & Control Company

Check valve, pilot operated

Type Z2S

RE 21548
Edition: 2013-06
Replaces: 07.10

tb0256

- Size 6
- Component series 6X
- Maximum operating pressure 315 bar *[4568 psi]*
- Maximum flow 60 l/min *[15.8 US gpm]*

Features

- Sandwich plate valve for use in vertical stackings
- Porting pattern according to DIN 24340 form A (**without** locating hole)
- Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole)
- For the leakage-free blocking of one or two actuator ports, optional
- Various cracking pressures, optional
- With pre-opening, optional
- Check valve installation sets available individually
- Special versions upon request

Contents

Ordering code

01	02	03	04		05		06	07	08	09	10
Z2S	**6**			**–**	**6X**	**/**					*****

01	Check valve, sandwich plate	**Z2S**

02	Size 6	**6**

Leakage-free blocking

03	In channel A and B	**–**
	In channel A	**A**
	In channel B	**B**

Cracking pressure

04	1.5 bar *[21.7 psi]*	**1**
	3 bar *[43.5 psi]*	**2**
	6 bar *[86.0 psi]*	**3**

05	Component series 60 to 69 (60 to 69: Unchanged installation and connection dimensions)	**6X**

06	Surface without corrosion resistance [1)]	**no code**

Seal material

07	NBR seals	**no code**
	FKM seals	**V**
	The selection is dependent on the operating parameters (hydraulic fluid, temperature, etc).	

Locating hole

08	**Without** locating hole	**no code**
	With locating hole	**/60**
	With locating hole and locking pin ISO 8752-3x8-St	**/62**

Special versions

09	**Without** special version	**no code**
	Control open by external port G1/4 (only version "A" and "B")	**SO40**
	With pre-opening	**SO55**
	Control spool unloaded to port T	**SO60**
	With pre-opening and control open from channel P	**SO150**
	Symbols (examples) see page 3	

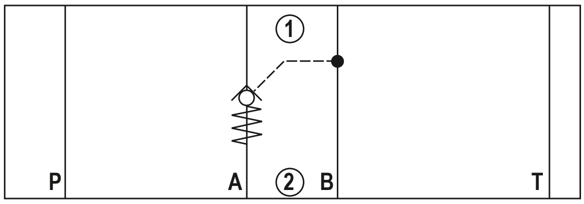
10	Further details in the plain text	

1) Corrosion-resistant surface upon request:
e.g. "J50" thick film passivated (DIN 50979 Fe//Zn8//Cn//T0)

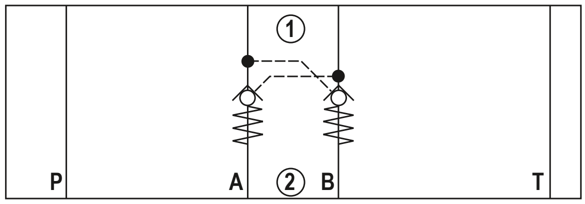
2) Locking pin ISO 8752-3x8-St, material no. **R900005694**
(separate order)

Symbols (① = component side, ② = plate side)

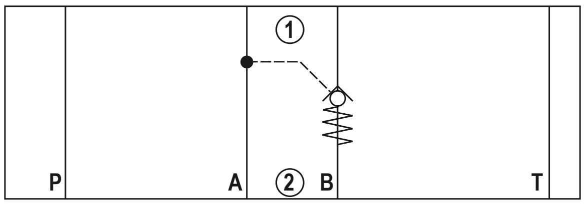
Type Z2S 6 A…



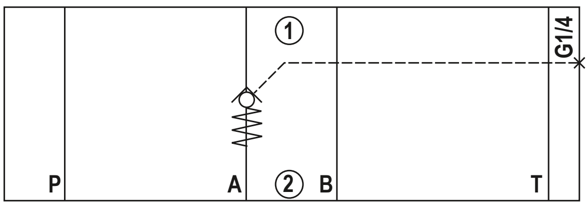
Type Z2S 6 –… and Z2S 6 –…SO55



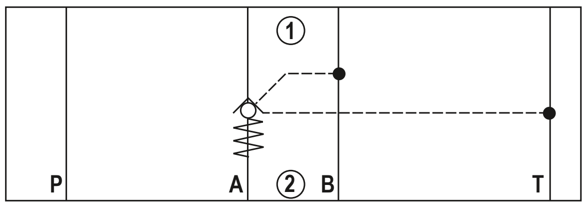
Type Z2S 6 B…



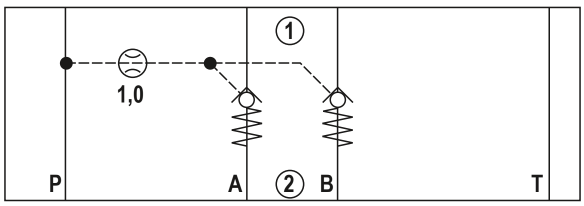
Type Z2S 6 A…SO40



Type Z2S 6 A…SO60



Type Z2S 6 –…SO150

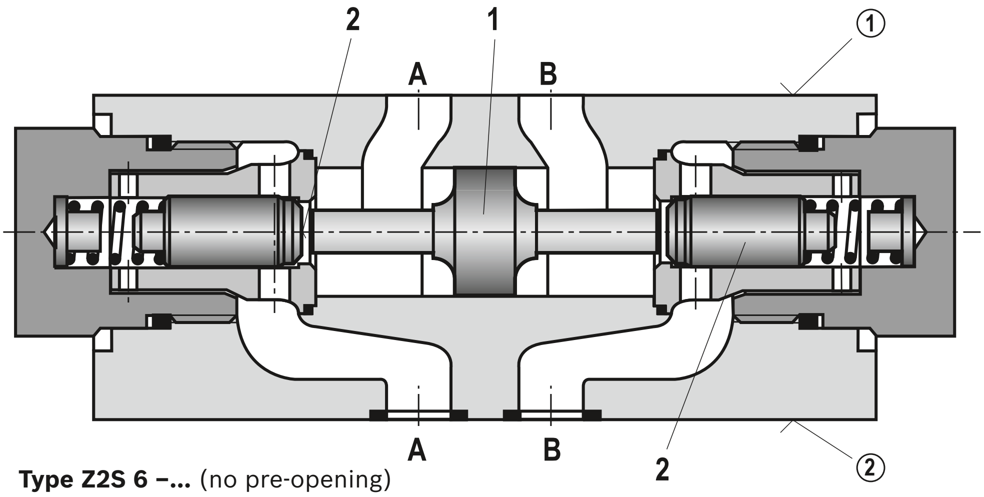


Function, sections, circuit example

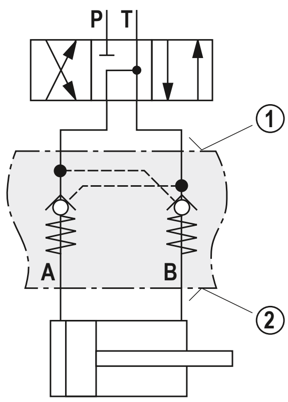
The isolator valve type Z2S is a releasable check valve in sandwich plate design.
It is used for the leakage-free blocking of one or two actuator ports, even for long standstill times.
In direction A① to A② or B① to B②, there is a free flow; in the opposite direction, the flow is blocked.
If, for example, there is a flow through the valve in direction A① to A②, control spool (1) is moved in direction B side and pushes the poppet (2) off its seat. Hydraulic fluid can now flow from B② to B①.

In order to allow the poppets to be safely closed (2), the control spool (1) must be hydraulically unloaded (see circuit example).

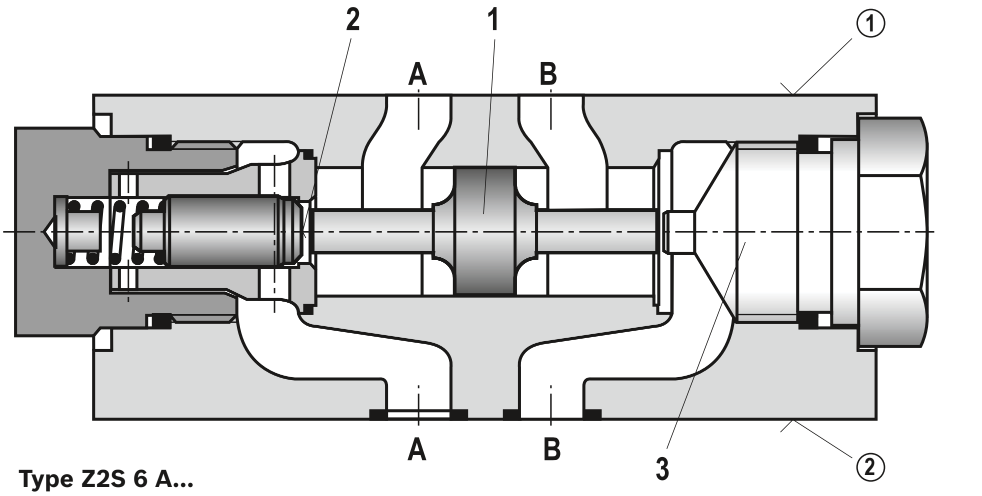
Pre-opening
- The two-stage set-up with an increased control open ratio means even low pilot pressure can be released securely.
- Avoidance of switching shocks due to dampened decompression of the pressure volume on the actuator side.



Type Z2S 6 –... (no pre-opening)



Circuit example, schematic



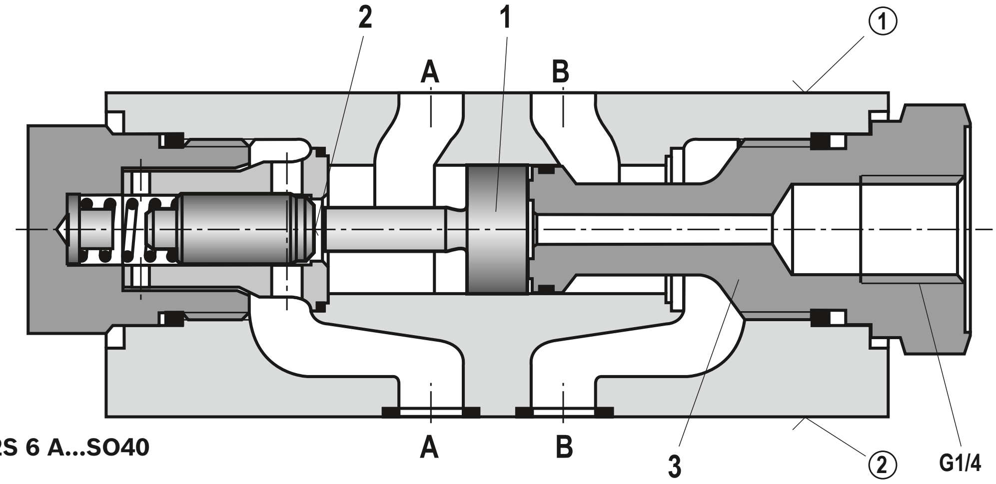
Type Z2S 6 A...

① = component side
② = plate side

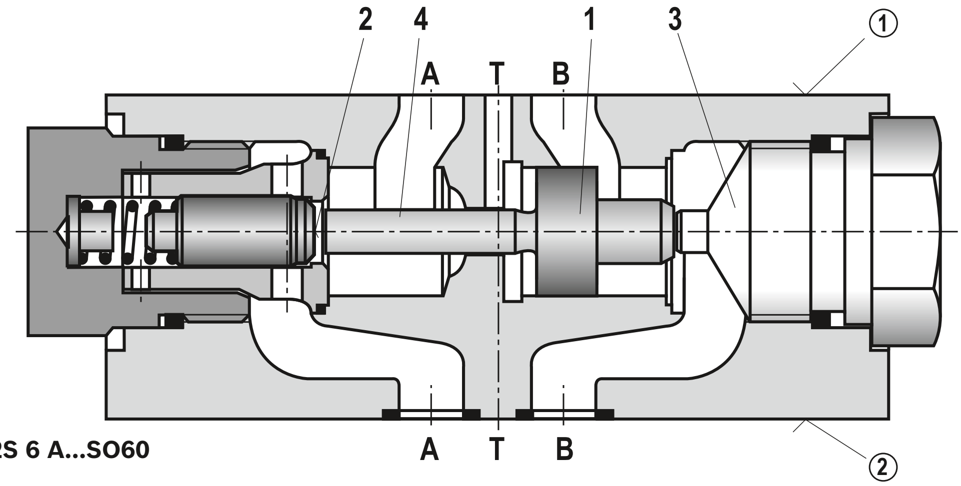
1 Control spool, area $\boldsymbol{A}_2$
2 Poppet, area $\boldsymbol{A}_1$
3 Stop

> ☞ **Notices!**
> In valves without pre-opening, sudden release of pent-up pressure volume may occur. Resulting switching shocks may lead to premature wear on installed components, as well as noise.

Function, sections

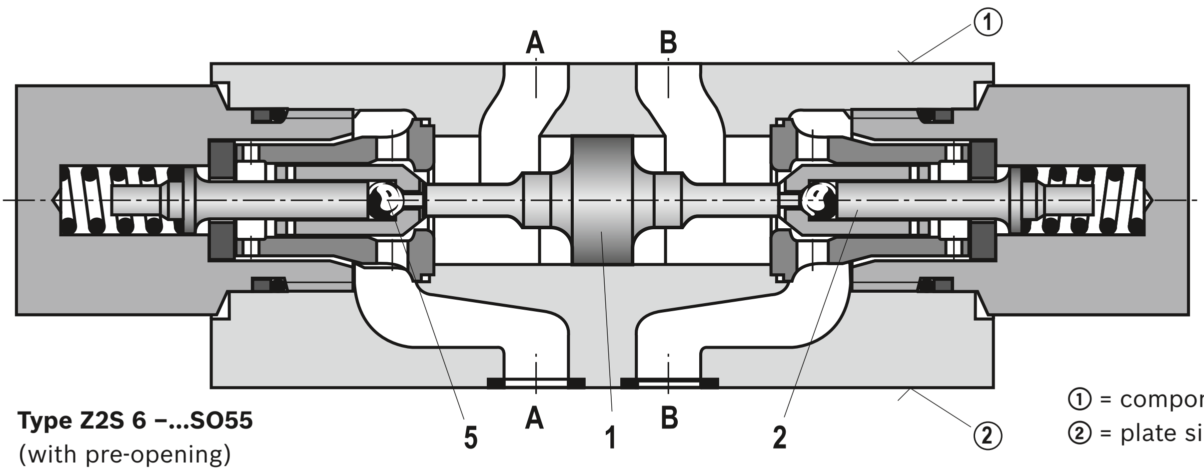


Type Z2S 6 A...SO40



Type Z2S 6 A...SO60

1 Control spool, area $\boldsymbol{A}_2$
2 Poppet, area $\boldsymbol{A}_1$
3 Stop
4 Control spool, area $\boldsymbol{A}_4$
5 Pre-opening, area $\boldsymbol{A}_3$



Type Z2S 6 –...SO55
(with pre-opening)

① = component side
② = plate side

Technical data
(for applications outside these parameters, please consult us!)

general		
Weight	kg *[lbs]*	Approx. 0.8 *[1.76]*
Installation position		Any
Ambient temperature range	°C *[°F]*	–30 ... +80 *[–22 ... +176]* (NBR seals) –20 ... +80 *[–4 ... +176]* (FKM seals)

hydraulic			
Maximum operating pressure		bar *[psi]*	315 *[4568]*
Cracking pressure in free direction			See Characteristic curves page 7
Maximum flow		l/min *[US gpm]*	60 *[15.8]*
Direction of flow			See Symbols page 3
Hydraulic fluid			See table below
Hydraulic fluid temperature range (at the valve service ports)		°C *[°F]*	–30 ... +80 *[–22 ... +176]* (NBR seals) –20 ... +80 *[–4 ... +176]* (FKM seals)
Viscosity range		mm²/s *[SUS]*	2.8 ... 500 *[35 ... 2320]*
Maximum permitted degree of contamination of the hydraulic fluid – cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]
Area ratio	– Without pre-opening		$\boldsymbol{A}_1/\boldsymbol{A}_2$ ~ 1/3.5 (see sectional drawing page 4)
	– With pre-opening		$\boldsymbol{A}_3/\boldsymbol{A}_2$ ~ 1/12.5 (see sectional drawing page 5)
	– "SO60" version		$\boldsymbol{A}_1/\boldsymbol{A}_4$ ~ 1/7 (see sectional drawing page 5)

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils		HL, HLP, HLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids
- See data sheet 90220 or make an inquiry for further information and details concerning use of other hydraulic fluids.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.

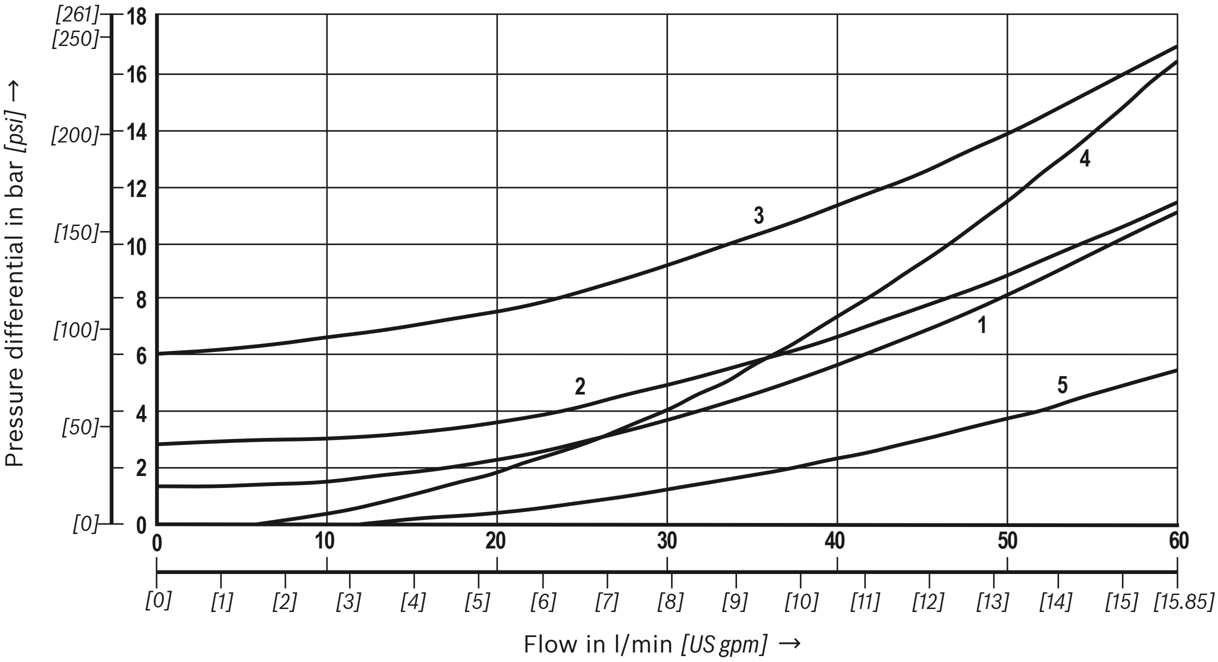
- **Flame-resistant – containing water**:
  - Maximum operating pressure of 210 bar
  - Maximum hydraulic fluid temperature of 60 °C
  - Life cycle compared to operation with mineral oil HL, HLP 30 to 100 %

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components. Available filters can be found at www.boschrexroth.com/filter.

Notice!
Selection of optimal sealing material (see ordering code page 2) also depends on the type of hydraulic fluid used.

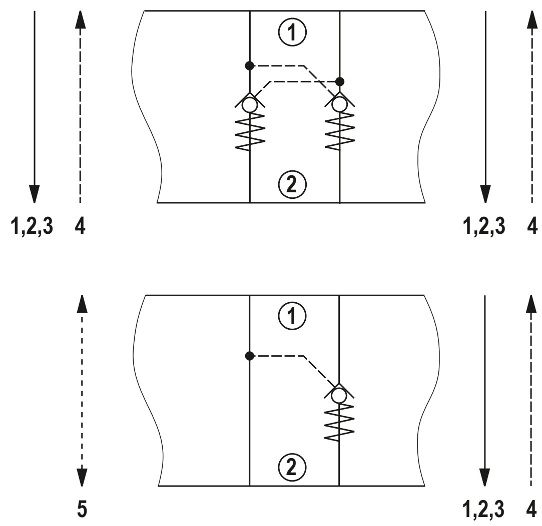
Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

***Δp-q*$_V$ characteristic curves**

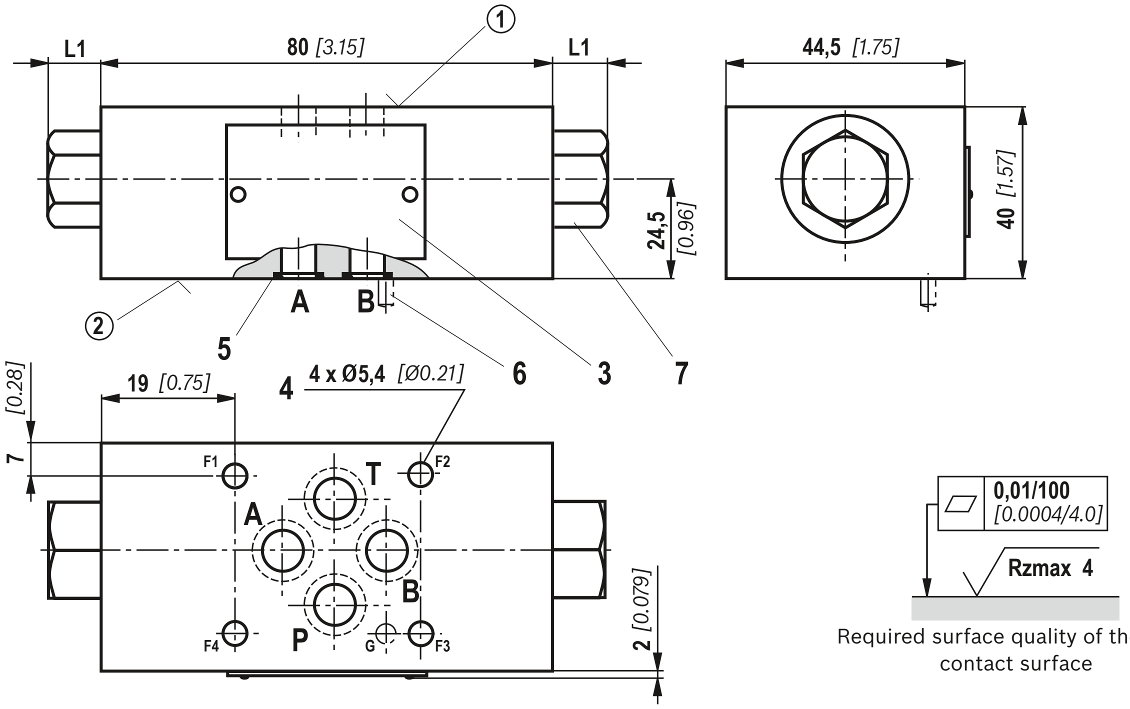


Cracking pressure:

1 1.5 bar *[21.7 psi]*
2 3 bar *[43.5 psi]*
3 6 bar *[87.0 psi]*
4 Check valve controlled open via control spool
5 Free flow (without check valve use), version "A" and "B"



Unit dimensions
(dimensions in mm *[inch]*)



Required surface quality of the valve contact surface

		L1 in mm *[inch]*			
"no code"	**"SO40"**	**"SO55"**		**"SO60"**	**"SO150"**
11 *[0.43]*	11 *[0.43]*	11 *[0.43]*	21.5 1) *[0.85]*	11 *[0.43]*	21.5 *[0.85]*

1) Maximum dimension on the side of the check valve use

1. Component side – porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 (**with** locating hole Ø4 x 4 mm deep) and NFPA T3.5.1 R2-2002 D03
2. Plate side – porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 (**with** locating hole for locking pin ISO 8752-3x8-St; version "/60" and "/62") and NFPA T3.5.1 R2-2002 D03
3. Name plate
4. Through hole for valve mounting
5. Identical seal rings for ports A, B, P, T
6. Locking pin ISO 8752-3x8-St (only version "/62")
7. Plug screw SW22

Valve mounting screws (separate order)
4 hexagon socket head cap screws ISO 4762 - M5 - 10.9
4 hexagon socket head cap screws N10-24 UNC

☞ **Notice:**
The length of the valve mounting screws of the sandwich plate valve must be selected according to the components mounted under and over the isolator valve.
Depending on the application, screw type and tightening torque must be adjusted to the circumstances.
Please ask Rexroth for screws with the required length.

More information

▶ Sandwich plates, size 6	Data sheet 48050
▶ Mineral oil-based hydraulic fluids	Data sheet 90220
▶ General product information on hydraulic products	Data sheet 07008
▶ Installation, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Hydraulic valves for industrial applications	Data sheet 07600-B
▶ Selection of the filters	www.boschrexroth.com/filter

Notes

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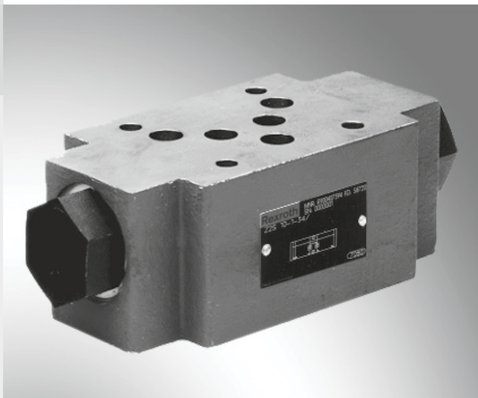
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Check valve, pilot operated

RE 21553/07.10
Replacies: 08.05

Type Z2S

Size 10
Component series 3X
Maximum operating pressure 315 bar *[4568 psi]*
Maximum flow 120 l/min *[31.7 US gpm]*



K4258/1

Table of contents

Features

– Sandwich plate valve for use in vertical stackings
– Porting pattern according to ISO 4401-05-04-0-05, ISO 4401-05-05-0-05 and NFPA T3.5.1 R2-2002 D05
– For the leak-free blocking of one or two actuator ports, optionally
– Different cracking pressures
– With pre-opening (standard); without pre-opening optional
– Check valve installation sets separately available
– Special versions upon request
– Amending documentation:
  • "Sandwich plates size 10", data sheet 48052
  • "Hydraulic fluids on a mineral oil basis", data sheet 90220

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2S	10		–3X/				*

Check valve, sandwich plate

Size 10 **= 10**

Leak-free blocking in channel A and B **= –**
Leak-free blocking in channel A **= A**
Leak-free blocking in channel B **= B**

Cracking pressure
1.5 bar *[21.7 psi]* **= 1**
3 bar *[43.5 psi]* **= 2**
6 bar *[87.0 psi]* **= 3**
10 bar *[145.0 psi]* **= 4**

Component series 30 to 39 **= 3X**
(30 to 39: Unchanged installation and connection dimensions)

Surface without corrosion resistance [1)] **= no code**

Seal material
NBR seals **= no code**
FKM seals **= V**

☞ **Note!**
The selection depends on the operating parameters (fluid, temperature, etc.)!

Further details in the plain text

Special version
no code = Without
SO14 = Check valve with stroke limitation
SO40 = Control open by external port G1/4 (only version "A" or "B")
SO41 = Without pre-opening
SO60 = Control spool to "T" port unloaded
SO150 = With pre-opening and control open from channel “P”

Symbols (examples) see page 3

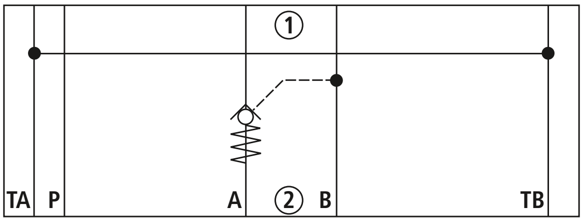
Additional pilot oil ports X and Y [2)]
no code = Without X and Y
XY = With X and Y

1) Corrosion-resistant surface upon request:
e.g. "J50" thick layer passivated
(DIN 50979 Fe//Zn8//Cn//T0)

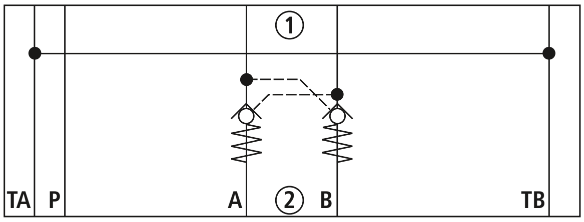
2) With version "SO150", ports X and Y are already available.
(No ordering code required)

Symbols: Examples (① = component side, ② = plate side)

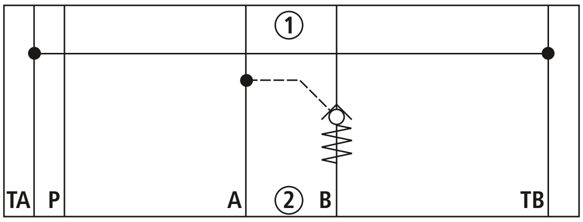
Type Z2S 10 A…



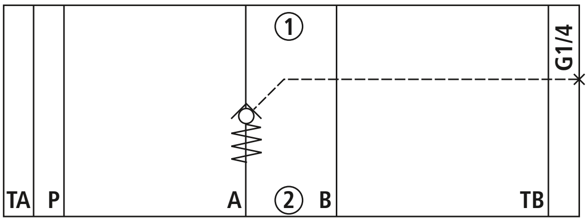
Type Z2S 10 –…, Z2S 10 –…SO41 and **Z2S 10 –…SO14**



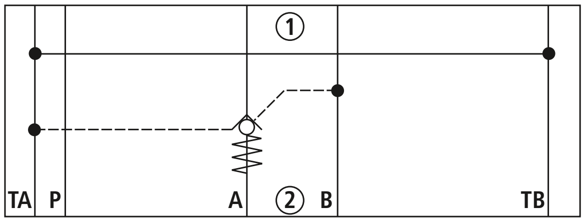
Type Z2S 10 B…



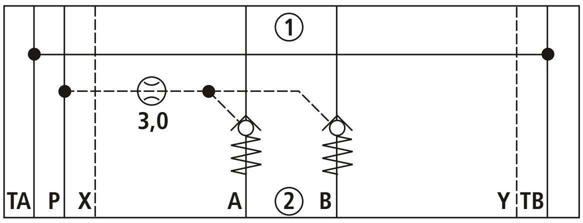
Type Z2S 10 A…SO40



Type Z2S 10 A…SO60



Type Z2S 10 –…SO150



Function, sections, circuit example

The isolator valve Type Z2S is a releasable check valve in sandwich plate design.

It is used for the leak-free blocking of one or two actuator ports, also in case of longer standstill times.

In the direction A① to A② or B① to B②, there is a free flow, in the opposite direction, the flow is blocked.

If the valve is, for example, flown through in the direction A① to A②, the control spool (1) is moved in the direction B side, opens the ball seat valve (2) and then pushes the poppet (3) off its seat. Now, hydraulic fluid can flow from B② to B①.

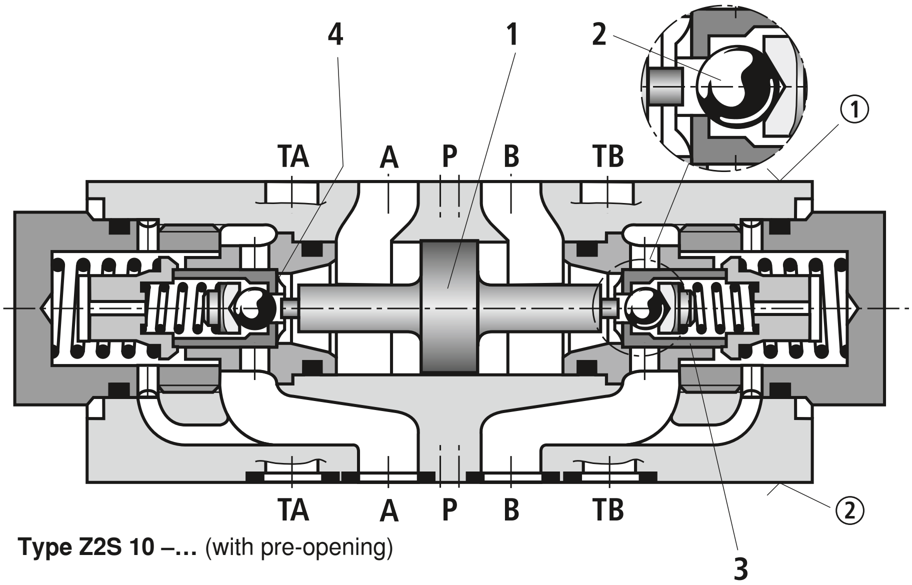
In order to allow for safe closing of the ball seat valve (2), the control spool (1) must be hydraulically unloaded (see circuit example).

Due to the pre-opening, there is a damped decompression of the pressurized liquid. Thus, possible switching shocks are avoided.

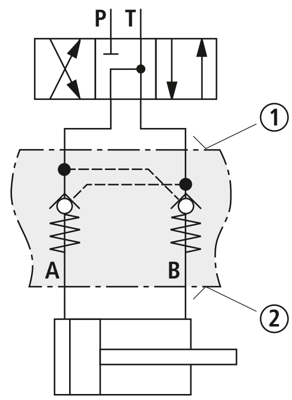
Pre-opening

– Due to the two-stage structure with enlarged control open ratio, safe unloading is also possible with lower pilot pressure.

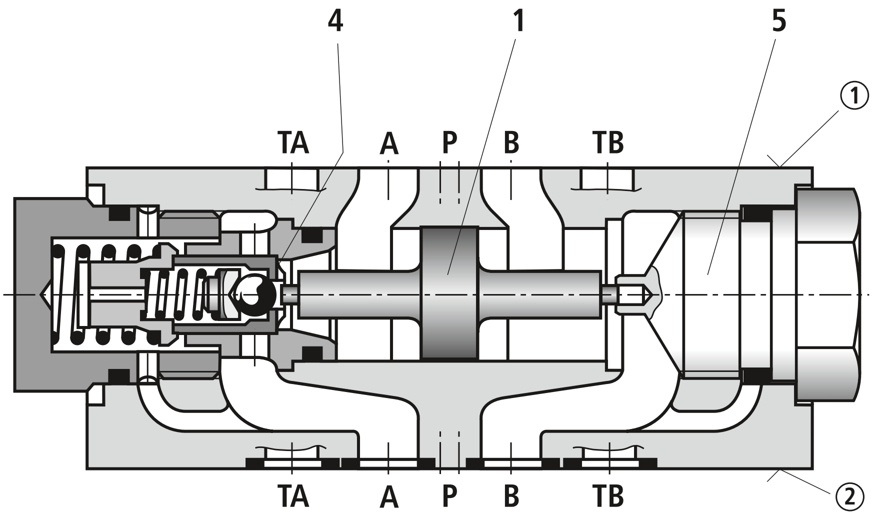
– Avoidance of switching shocks due to dampened decompression of the pressure volume on the actuator side.



Type Z2S 10 –… (with pre-opening)



Circuit example, schematic

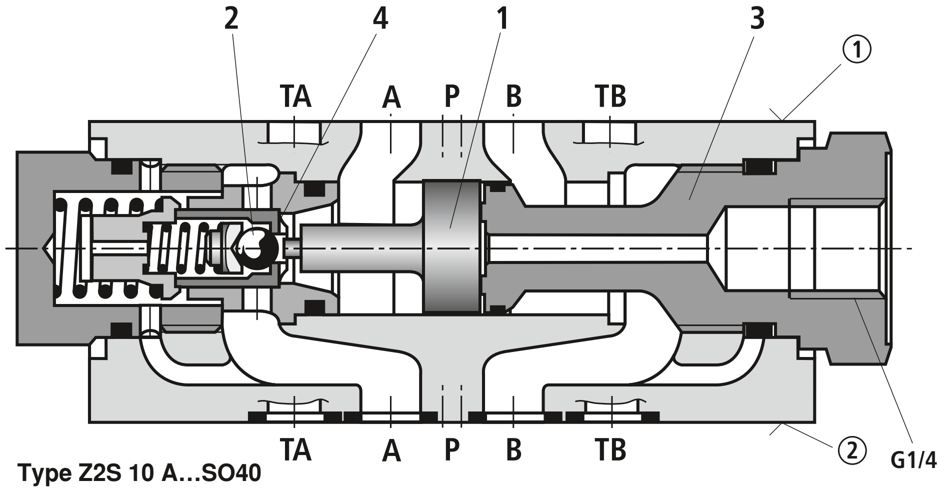


Type Z2S 10 A…

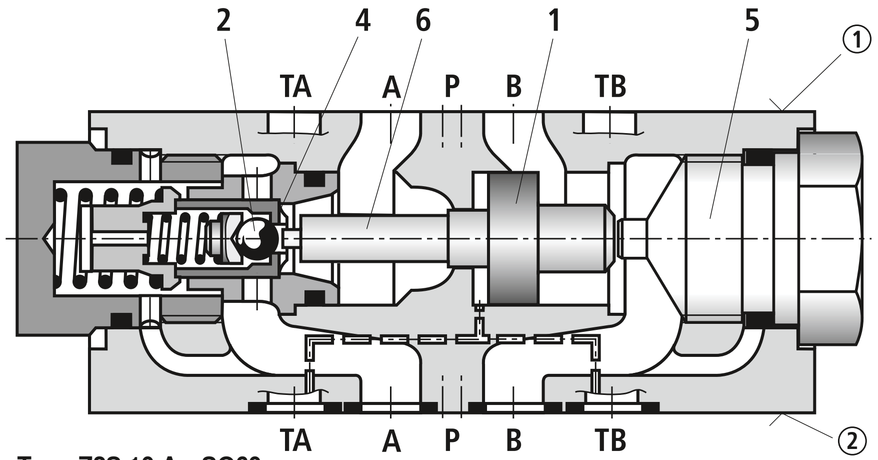
① = component side
② = plate side

1 Control spool, area $\boldsymbol{A}_2$
2 Ball, area $\boldsymbol{A}_3$
4 Poppet, area $\boldsymbol{A}_1$
5 Positive stop

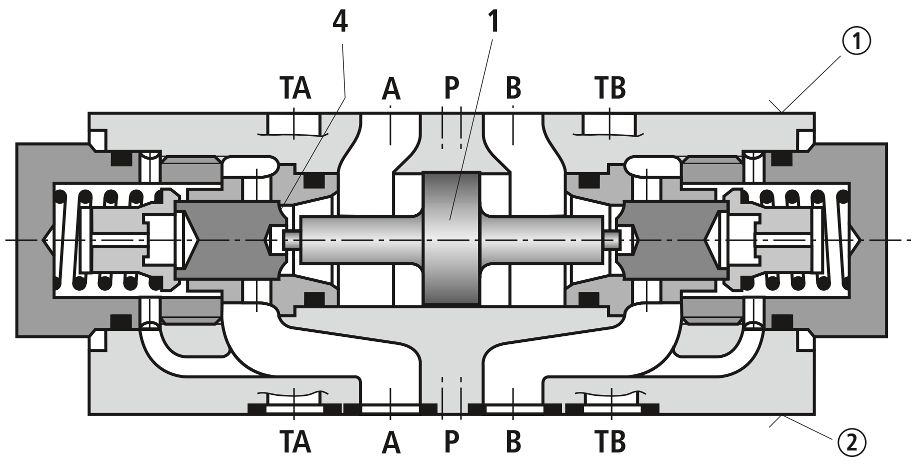
Function, sections



Type Z2S 10 A…SO40



Type Z2S 10 A…SO60



Type Z2S 10 –…SO41 (without pre-opening)

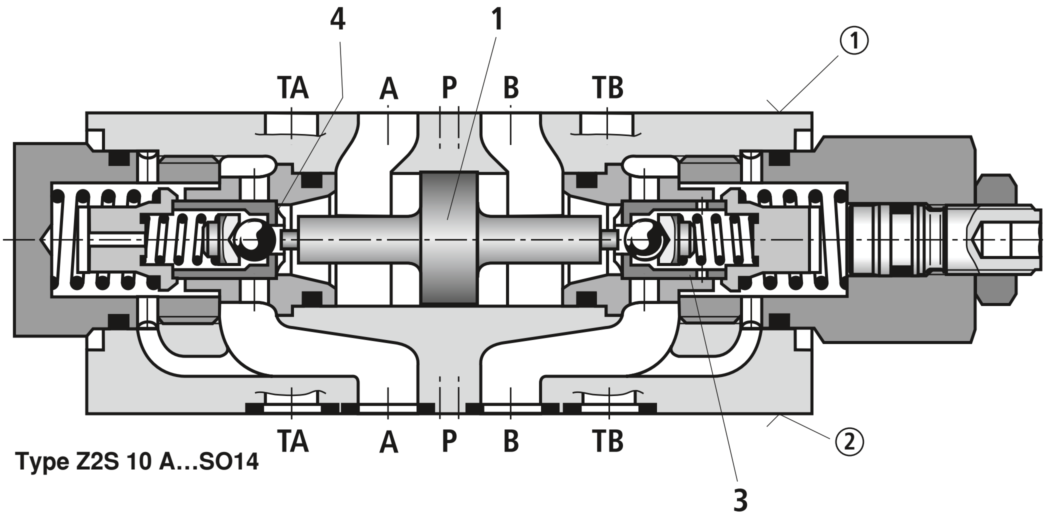
① = component side
② = plate side

1 Control spool, area A_2
2 Ball, area A_3
4 Poppet, area A_1
5 Positive stop
6 Control spool, area A_4

☞ **Note!**

In case of valves without pre-opening, the included pressure volume may be unloaded suddenly. Resulting switching shocks may not only lead to noise formation but also to early wear at installed components.

Function, sections



Type Z2S 10 A…SO14

① = component side
② = plate side

1 Control spool, area $\boldsymbol{A}_2$
4 Poppet, area $\boldsymbol{A}_1$

Technical data (For applications outside these parameters, please consult us!)

general

Weight	kg *[lbs]*	Approx. 3 *[6.6]*
Installation position		Any
Ambient temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)

hydraulic

Maximum operating pressure	bar *[psi]*	315 *[4568]*
Cracking pressure in free direction		See characteristic curves page 7
Maximum flow	l/min *[US gpm]*	120 *[31.7]*
Direction of flow		See symbols page 3
Hydraulic fluid		– On mineral oil basis and related hydrocarbons (HL, HLP, HVLP, HVLPD, etc.) according to DIN 51524 – Flame-resistant (HFC, HFDU, HFDR) according to ISO 12922 1) – Environmentally compatible (HETG, HEES, HEPG, HEPR) according to ISO 15380 1) Other hydraulic fluids upon request
Hydraulic fluid temperature range (at the valve working ports)	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 500 *[35 to 2320]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 2)
Area ratio	– without pre-opening	$\boldsymbol{A}_1/\boldsymbol{A}_2$ ~ 1/3 (see sectional drawing pages 4 to 6)
	– with pre-opening	$\boldsymbol{A}_3/\boldsymbol{A}_2$ ~ 1/11.5 (see sectional drawing pages 4 and 5)
	– Version "SO60"	$\boldsymbol{A}_1/\boldsymbol{A}_4$ ~ 1/6 (see sectional drawing page 5)

Footnotes see page 7!

Technical data (For applications outside these parameters, please consult us!)

1) When using flame-resistant or environmentally compatible hydraulic fluids, restrictions with regard to the technical data may be applicable (temperature, pressure range, life time, maintenance intervals, etc.).

2) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

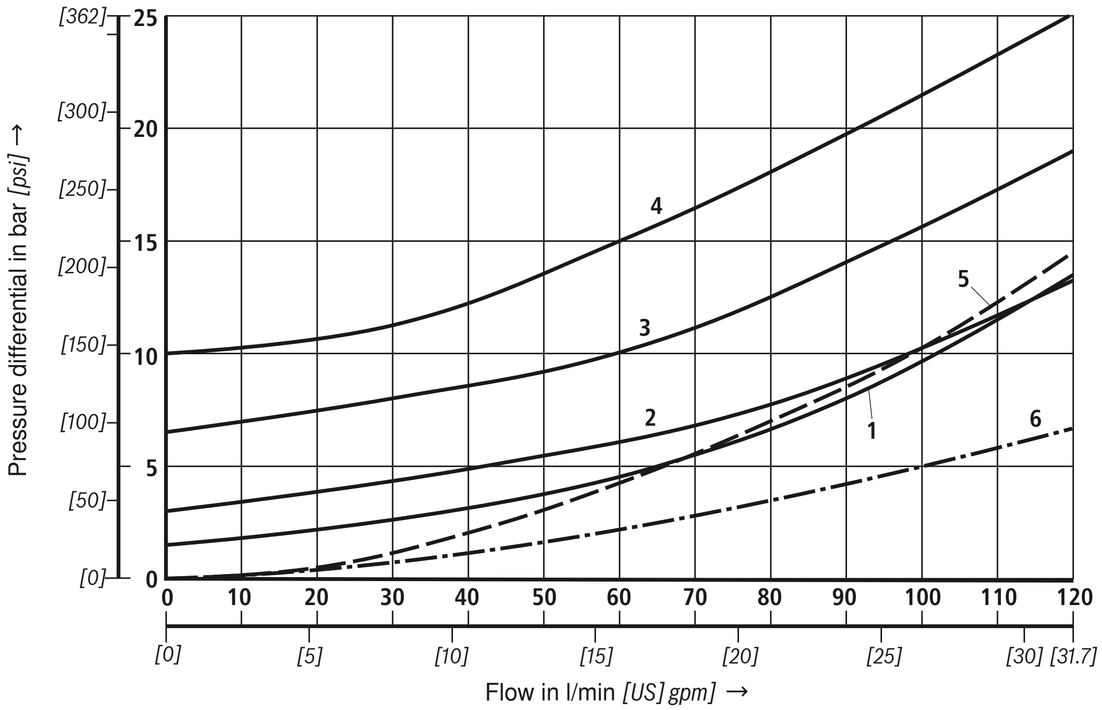
For the selection of the filters see www.boschrexroth.com/filter.

Note!

Selection of the perfect sealing material (see ordering code page 2) also depends on the hydraulic fluid used.

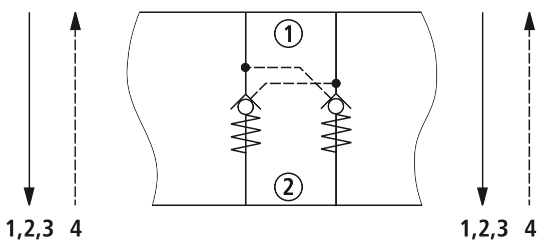
Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

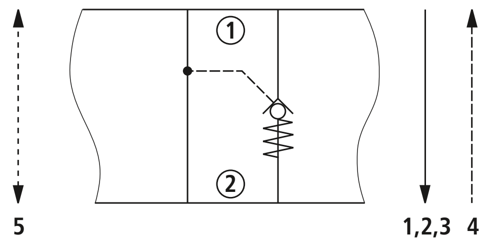
Δ*p*-*q*$_V$ characteristic curves



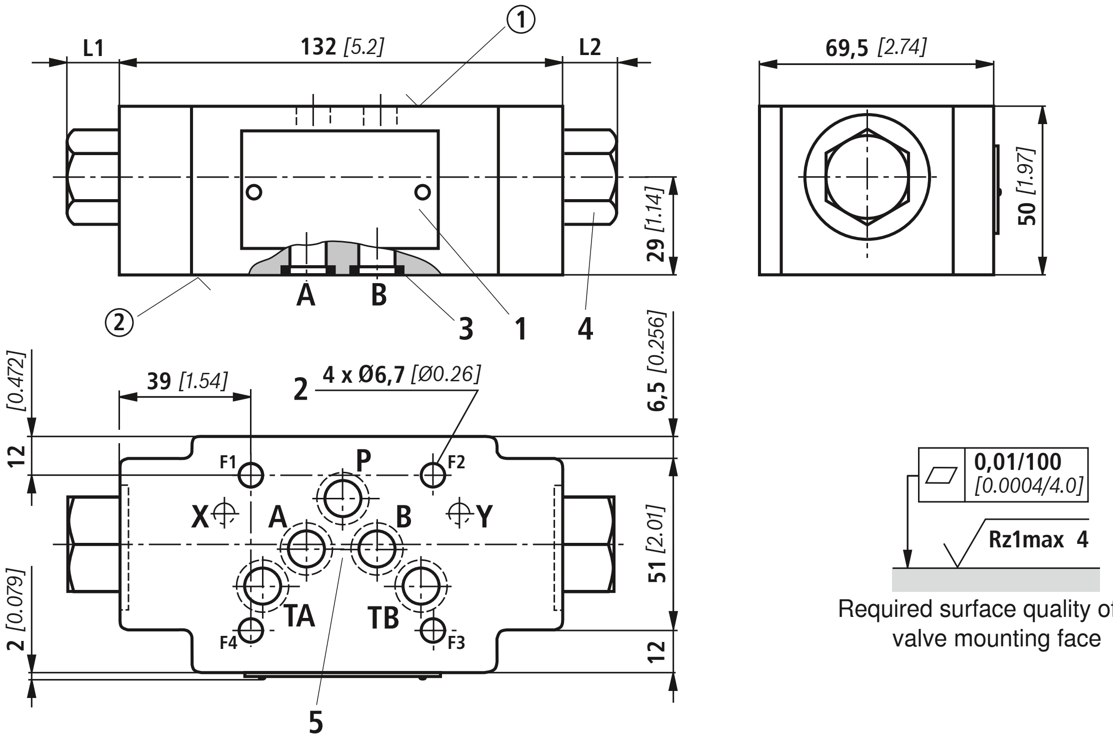
Cracking pressure:

1 1.5 bar *[21.7 psi]*
2 3 bar *[43.5 psi]*
3 6 bar *[87.0 psi]*
4 10 bar *[145.0 psi]*
5 Check valve controlled open via control spool
6 Free flow (without check valve use), version "A" or "B"





Unit dimensions (dimensions in mm *[inch]*)



Required surface quality of the valve mounting face

	"SO14"	"no code"	"SO40"		"SO41"	"SO60"	"SO150"
			Version “A”	Version “B”			
L1 in mm *[inch]*	13.5 *[0.53]*	13.5 *[0.53]*	6.5 *[0.26]*	13.5 *[0.53]*	13.5 *[0.53]*	13.5 *[0.53]*	13.5 *[0.53]*
L2 in mm *[inch]*	38.5 *[1.52]*	13.5 *[0.53]*	13.5 *[0.53]*	6.5 *[0.26]*	13.5 *[0.53]*	13.5 *[0.53]*	13.5 *[0.53]*

① component side

② plate side

1 Name plate

2 Through hole for valve mounting

3 Identical seal rings for ports A, B, P, TA and TB

4 Plug screw SW30,
tightening torque $M_A = 40^{+5}$ Nm *[29.5$^{+3.7}$ ft-lbs]*

5 Porting pattern according to ISO 4401-05-04-0-05, ISO 4401-05-05-0-05 and NFPA T3.5.1 R2-2002 D05; deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M6 - 10.9

4 hexagon socket head cap screws 1/4-20 UNC

☞ **Note!**

The length of the valve mounting screws of the sandwich plate valve must be selected according to the components mounted under and over the isolator valve.

Depending on the application, screw type and tightening torque must be adjusted to the circumstances.

Please ask Rexroth for screws with the required length.

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Check valve, pilot operated

RE 21558/07.10
Replaces: 08.05

Type Z2S

Size 16
Component series 5X
Maximum operating pressure 315 bar *[4568 psi]*
Maximum flow 300 l/min *[79.2 US gpm]*

K4340/4

Table of contents

Features

– Sandwich plate valve for use in vertical stackings
– Porting pattern according to ISO 4401-07-07-0-05 and NFPA T3.5.1 R2-2002 D07
– For the leak-free blocking of one or two actuator ports, optionally
– Different cracking pressures
– With pre-opening
– Check valve installation sets separately available
– Special versions upon request
– Amending documentation:
  • "Sandwich plates size 16", data sheet 48054
  • "Hydraulic fluids on a mineral oil basis", data sheet 90220

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2S	16		–5X/			*

Check valve, sandwich plate

Size 16 **= 16**

Leak-free blocking in channel A and B **= –**
Leak-free blocking in channel A **= A**
Leak-free blocking in channel B **= B**

Cracking pressure
3 bar *[43.5 psi]* **= 1**
5 bar *[72.5 psi]* **= 2**
7.5 bar *[108.8 psi]* **= 3**
10 bar *[145.0 psi]* **= 4**

Component series 50 to 59 **= 5X**
(50 to 59: unchanged installation and connection dimensions)

Surface without corrosion resistance [1] **= no code**

Further details in the plain text

Special version
no code = Without
SO40 = Control open by external port G1/4 (only version "A" or "B")
SO60 = Control spool to "T" port unloaded

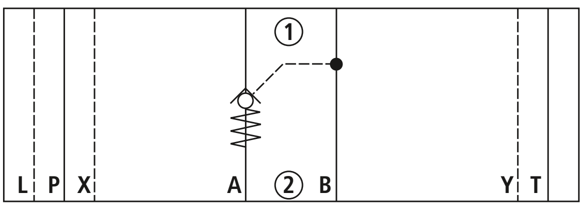
Seal material
no code = NBR seals
V = FKM seals

Note!
The selection depends on the operating parameters (fluid, temperature, etc.)!

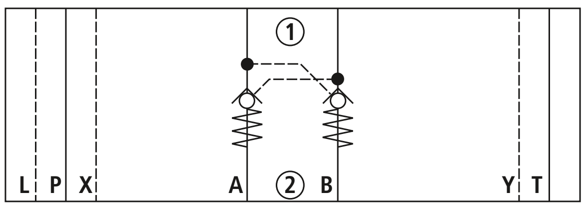
[1] Corrosion-resistant surface upon request:
e.g. "J50" thick layer passivated
(DIN 50979 Fe//Zn8//Cn//T0)

Symbols: Examples (① = component side, ② = plate side)

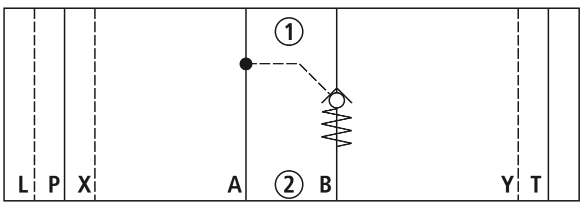
Type Z2S 16 A…



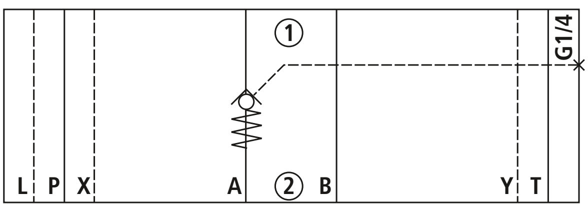
Type Z2S 16 –… and Z2S 16 –…SO55



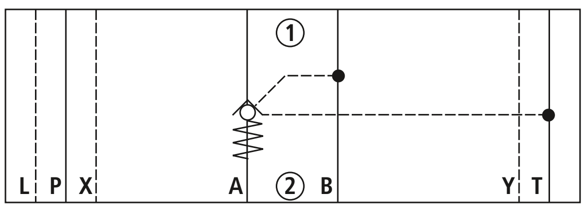
Type Z2S 16 B…



Type Z2S 16 A…SO40



Type Z2S 16 A…SO60



Function, sections, circuit example

The isolator valve Type Z2S is a releasable check valve in sandwich plate design.

It is used for the leak-free blocking of one or two actuator ports, also in case of longer standstill times.

In the direction A① to A② or B① to B②, there is a free flow, in the opposite direction, the flow is blocked.

If the valve is, for example, flown through in the direction A① to A②, the control spool (1) is moved in the direction B side, opens the ball seat valve (2) and then pushes the poppet (3) off its seat. Now, hydraulic fluid can flow from B② to B①.

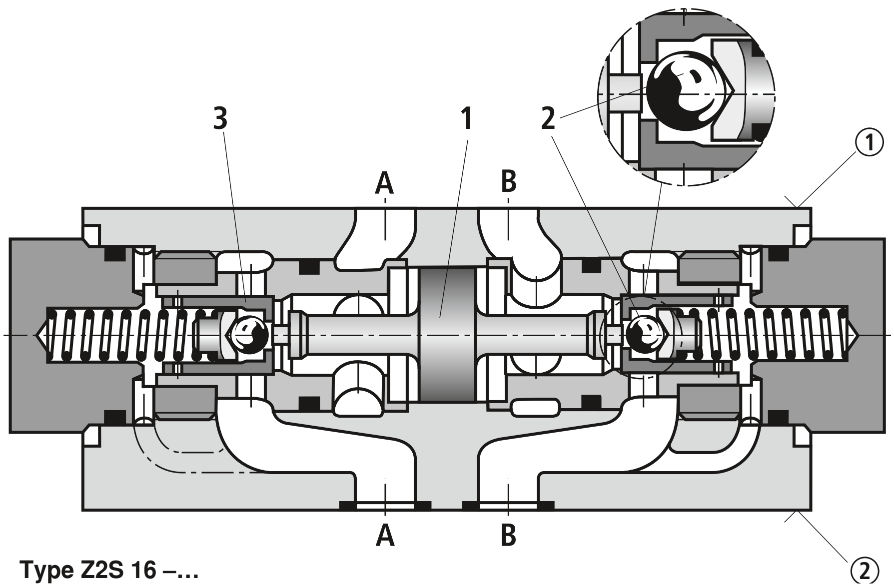
In order to allow for safe closing of the ball seat valve (2), the control spool (1) must be hydraulically unloaded (see circuit example).

Due to the pre-opening, there is a damped decompression of the pressurized liquid. Thus, possible switching shocks are avoided.

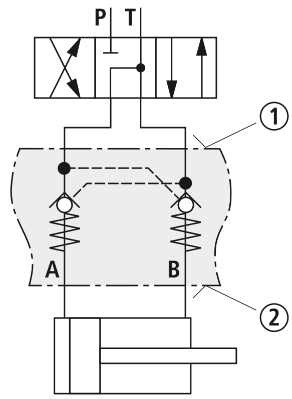
Pre-opening

– Due to the two-stage structure with enlarged control open ratio, safe unloading is also possible with lower pilot pressure.

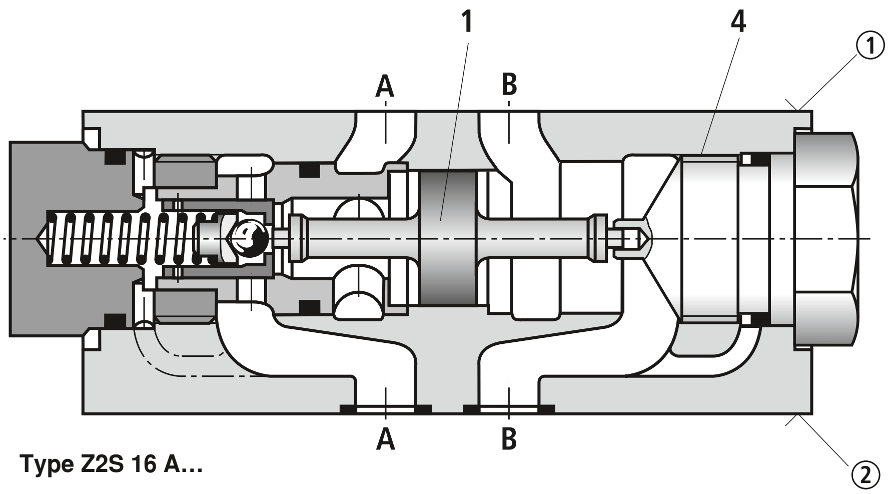
– Avoidance of switching shocks due to dampened decompression of the pressure volume on the actuator side.



Type Z2S 16 –…



Circuit example, schematic



Type Z2S 16 A…

① = component side

② = plate side

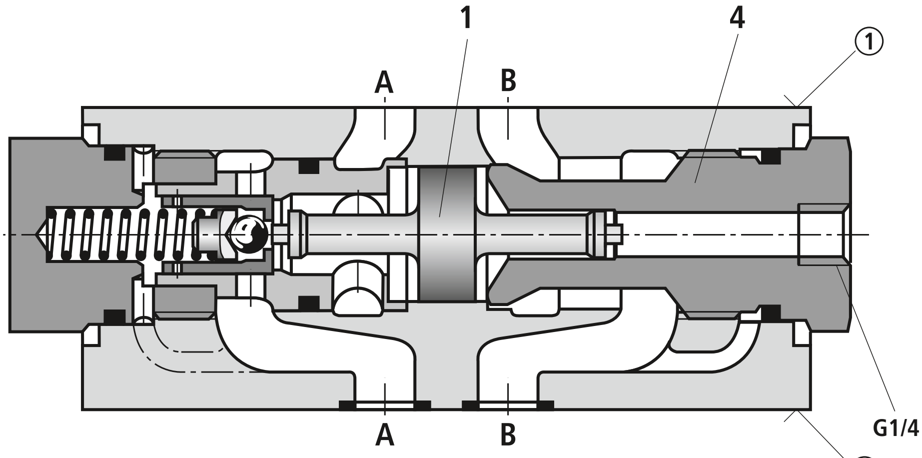
1 Control spool, area $\boldsymbol{A}_2$

2 Ball, area $\boldsymbol{A}_3$

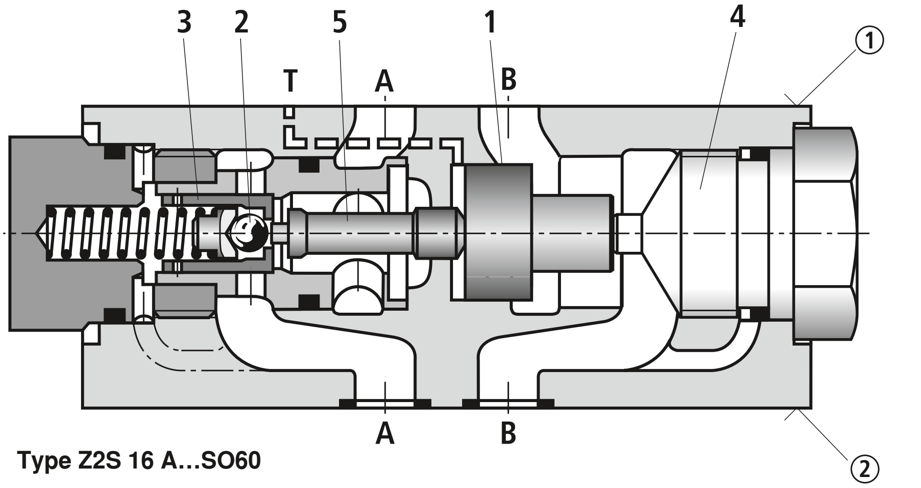
3 Poppet, area $\boldsymbol{A}_1$

4 Positive stop

Function, sections



Type Z2S 16 A…SO40



Type Z2S 16 A…SO60

① = component side
② = plate side

1 Control spool, area $\boldsymbol{A}_2$
2 Ball, area $\boldsymbol{A}_3$
3 Poppet, area $\boldsymbol{A}_1$
4 Positive stop
5 Control spool, area $\boldsymbol{A}_4$

Technical data (For applications outside these parameters, please consult us!)

general

Weight	kg *[lbs]*	Approx. 6.5 *[14.3]*
Installation position		Any
Ambient temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)

hydraulic

Maximum operating pressure	bar *[psi]*	315 *[4568]*
Cracking pressure in free direction		See characteristic curves page 6
Maximum flow	l/min *[US gpm]*	300 *[79.2]*
Direction of flow		See symbols page 2
Hydraulic fluid		– On mineral oil basis and related hydrocarbons (HL, HLP, HVLP, HVLPD, etc.) according to DIN 51524 – Flame-resistant (HFC, HFDU, HFDR) according to ISO 12922 [1)] – Environmentally compatible (HETG, HEES, HEPG, HEPR) according to ISO 15380 [1)] Other hydraulic fluids upon request
Hydraulic fluid temperature range (at the valve working ports)	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 500 *[35 to 2320]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [2)]
Area ratio	– with pre-opening	$\boldsymbol{A}_3/\boldsymbol{A}_2$ ~ 1/12 (see sectional drawing pages 3 and 4)
	– Version "SO60"	$\boldsymbol{A}_1/\boldsymbol{A}_4$ ~ 1/7 (see sectional drawing page 4)

1) When using flame-resistant or environmentally compatible hydraulic fluids, restrictions with regard to the technical data may be applicable (temperature, pressure range, life time, maintenance intervals, etc.).

2) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

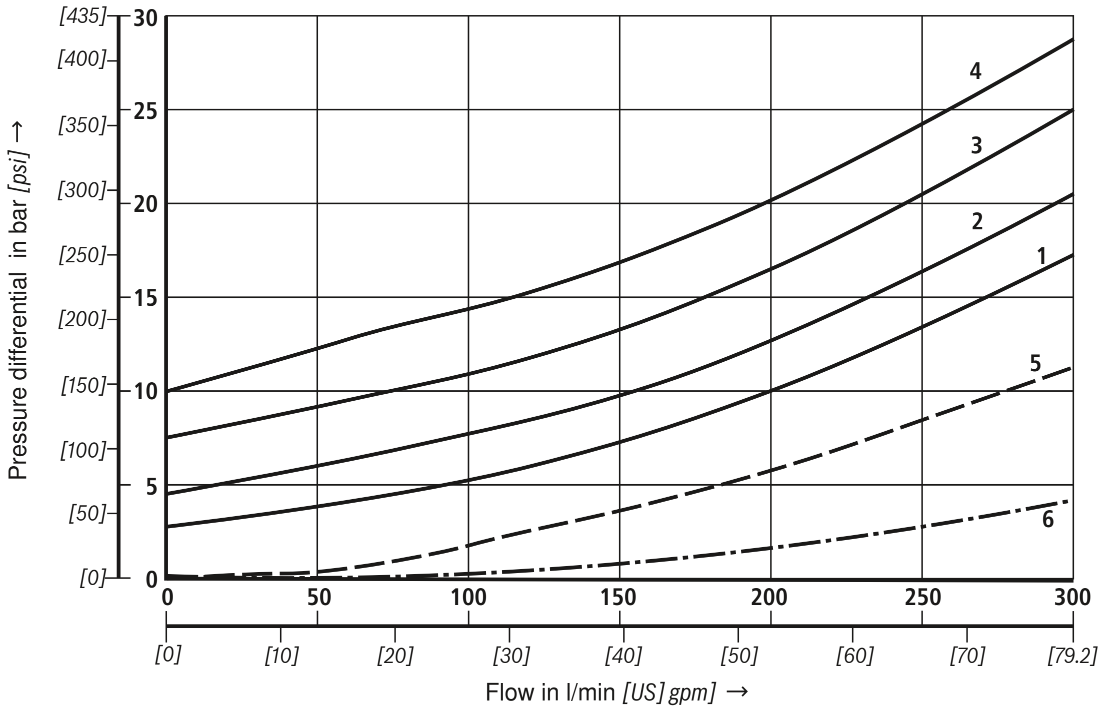
For the selection of the filters see www.boschrexroth.com/filter.

☞ **Note!**

Selection of the perfect sealing material (see ordering code page 2) also depends on the hydraulic fluid used.

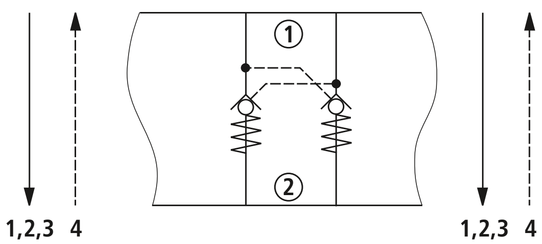
Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

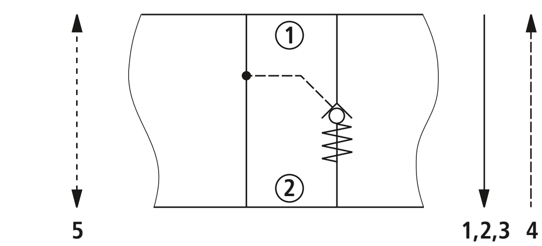
Δp-q_V characteristic curves



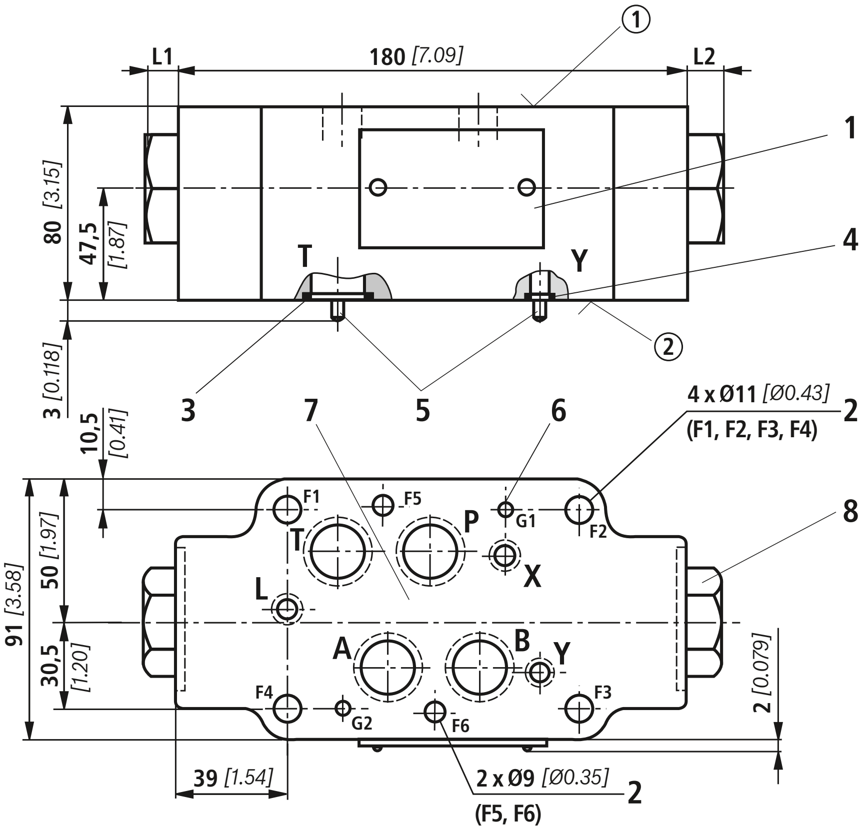
Cracking pressure:

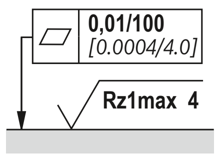
1 3 bar *[43.5 psi]*
2 5 bar *[72.5 psi]*
3 7.5 bar *[108.8 psi]*
4 10 bar *[145.0 psi]*
5 Free flow (without check valve use), version "A" or "B"
6 Only housing





Unit dimensions (dimensions in mm *[inch]*)





Required surface quality of the valve mounting face

① component side
② plate side

Item explanations and valve mounting screws see page 8.

Special version	**Cracking pressure**	**Leak-free blocking in channel**	**L1** in mm *[inch]*	**L2** in mm *[inch]*
"no code"	1 + 2	"–"	10 *[0.39]*	10 *[0.39]*
	3 + 4	"–"	36.5 *[1.44]*	36.5 *[1.44]*
	1 + 2	A	10 *[0.39]*	8.5 *[0.33]*
	1 + 2	B	8.5 *[0.33]*	10 *[0.39]*
	3 + 4	A	36.5 *[1.44]*	8.5 *[0.33]*
	3 + 4	B	8.5 *[0.33]*	36.5 *[1.44]*
"SO40"	1 + 2	A, B	10 *[0.39]*	10 *[0.39]*
	3 + 4	A	36.5 *[1.44]*	10 *[0.39]*
	3 + 4	B	10 *[0.39]*	36.5 *[1.44]*
"SO60"	1 + 2	A	10 *[0.39]*	8.5 *[0.33]*
	1 + 2	B	8.5 *[0.33]*	10 *[0.39]*
	3 + 4	A	36.5 *[1.44]*	8.5 *[0.33]*
	3 + 4	B	8.5 *[0.33]*	36.5 *[1.44]*

Unit dimensions

1 Name plate

2 Through hole for valve mounting

3 Identical seal rings for ports A, B, P, T

4 Identical seal rings for ports X, Y, L

5 Locating pins

6 Locating holes

7 Porting pattern according to ISO 4401-07-07-0-05 and NFPA T3.5.1 R2-2002 D07

8 Plug screw SW41, tightening torque M_A = 70 Nm *[51.6 ft-lbs]*

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M10 - 10.9

2 hexagon socket head cap screws ISO 4762 - M6 - 10.9

4 hexagon socket head cap screws 3/8"-16 UNC

2 hexagon socket head cap screws 1/4"-20 UNC

☞ **Note!**

The length of the valve mounting screws of the sandwich plate valve must be selected according to the components mounted under and over the isolator valve.

Depending on the application, screw type and tightening torque must be adjusted to the circumstances.

Please ask Rexroth for screws with the required length.

Bosch Rexroth AG
Hydraulics
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97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

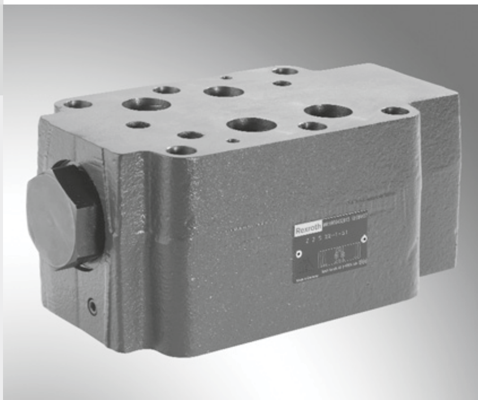
Rexroth
Bosch Group

Check valve, pilot operated

RE 21564/07.10
Replaces: 08.05

Type Z2S

Size 25
Component series 5X
Maximum operating pressure 315 bar *[4568 psi]*
Maximum flow 450 l/min *[118.9 US gpm]*



H7685

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– Sandwich plate valve for use in vertical stackings
– Porting pattern according to ISO 4401-08-08-0-05 and NFPA T3.5.1 R2-2002 D08
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– Different cracking pressures
– Pre-opening standard
– Check valve installation sets separately available
– Special versions upon request
– Amending documentation:
  • "Sandwich plates size 25", data sheet 48056
  • "Hydraulic fluids on a mineral oil basis", data sheet 90220

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2S	22		–5X /			*

Check valve, sandwich plate

Size 25 = 22

Leak-free blocking in channel A and B = –
Leak-free blocking in channel A = A
Leak-free blocking in channel B = B

Cracking pressure
3 bar *[43.5 psi]* = 1
5 bar *[72.5 psi]* = 2
7.5 bar *[108.8 psi]* = 3
10 bar *[145.0 psi]* = 4

Component series 50 to 59 = 5X
(50 to 59: unchanged installation and connection dimensions)

Surface without corrosion resistance [1)] = no code

Further details in the plain text

Special version
no code = Without
SO40 = Control open by external port G1/4 (only version "A" or "B")
SO60 = Control valve to "T" port unloaded

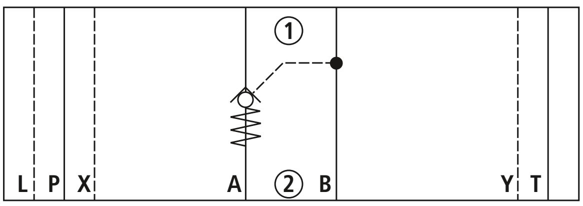
Seal material
no code = NBR seals
V = FKM seals

☞ **Note!**
The selection depends on the operating parameters (fluid, temperature, etc.)!

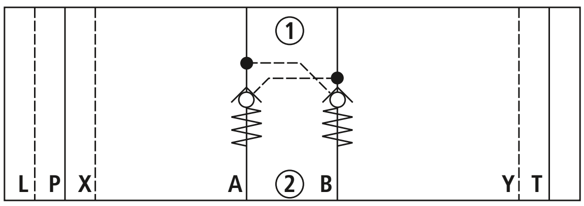
[1)] Corrosion-resistant surface upon request:
e.g. "J50" thick layer passivated
(DIN 50979 Fe//Zn8//Cn//T0)

Symbols: Examples (① = component side, ② = plate side)

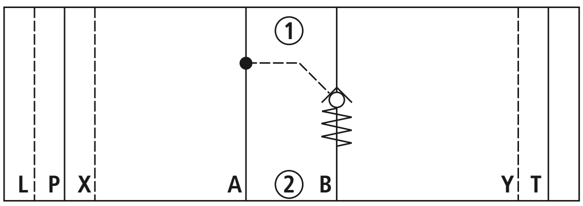
Type Z2S 22 A…



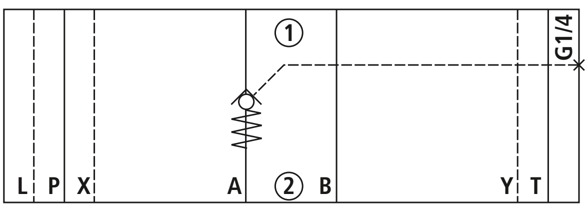
Type Z2S 22 –…



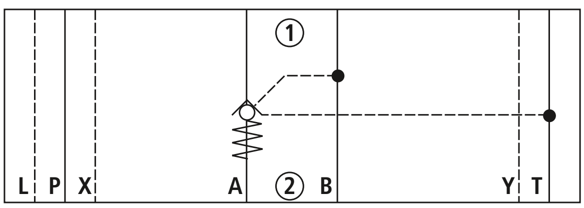
Type Z2S 22 B…



Type Z2S 22 A…SO40



Type Z2S 22 A…SO60



Function, sections, sample circuit

The isolator valve Type Z2S is a releasable check valve in sandwich plate design.

It is used for the leak-free blocking of one or two actuator ports, also in case of longer standstill times.

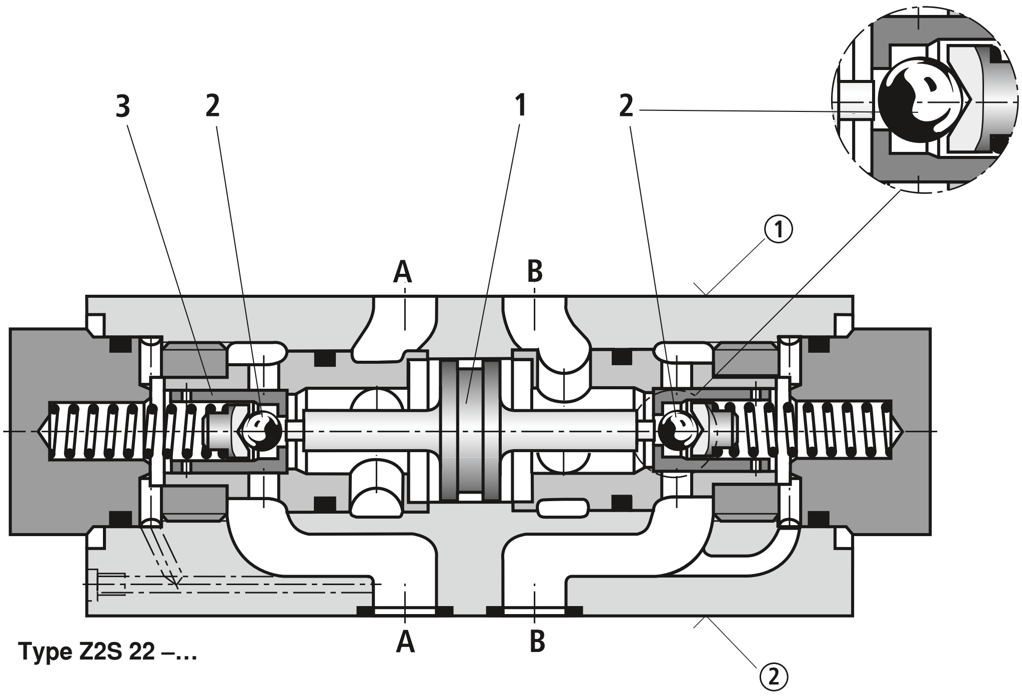
In the direction A① to A② or B① to B②, there is a free flow, in the opposite direction, the flow is blocked.

If the valve is, for example, flown through in the direction A① to A②, the control spool (1) is moved in the direction B side, opens the ball seat valve (2) and then pushes the poppet (3) off its seat. Now, hydraulic fluid can flow from B② to B①.

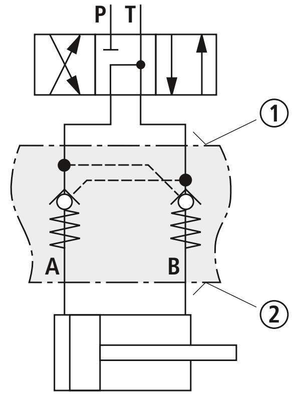
In order to allow for safe closing of the ball seat valve (2), the control spool (1) must be hydraulically unloaded (see circuit example).

Pre-opening

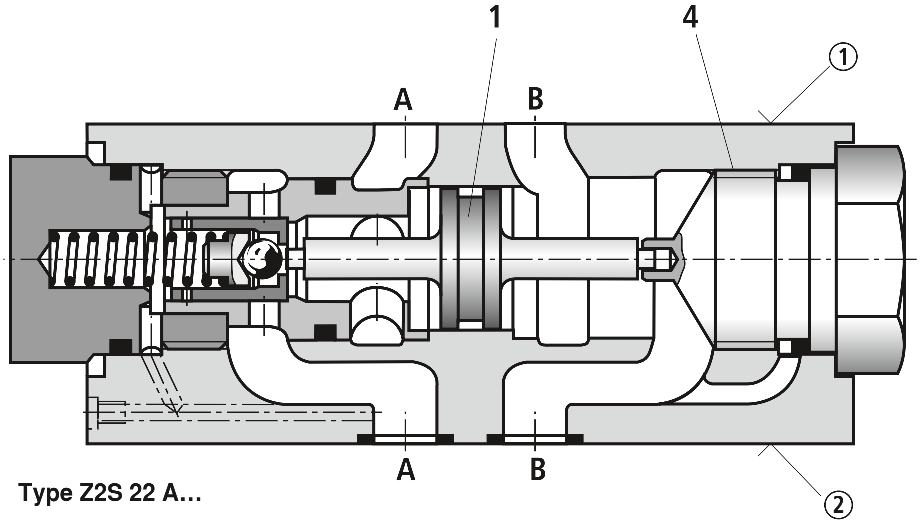
- Due to the two-stage structure with enlarged control open ratio, safe unloading is also possible with lower pilot pressure.
- Avoidance of switching shocks due to dampened decompression of the pressure volume on the actuator side.



Type Z2S 22 –…



Circuit example, schematic



Type Z2S 22 A…

① = component side

② = plate side

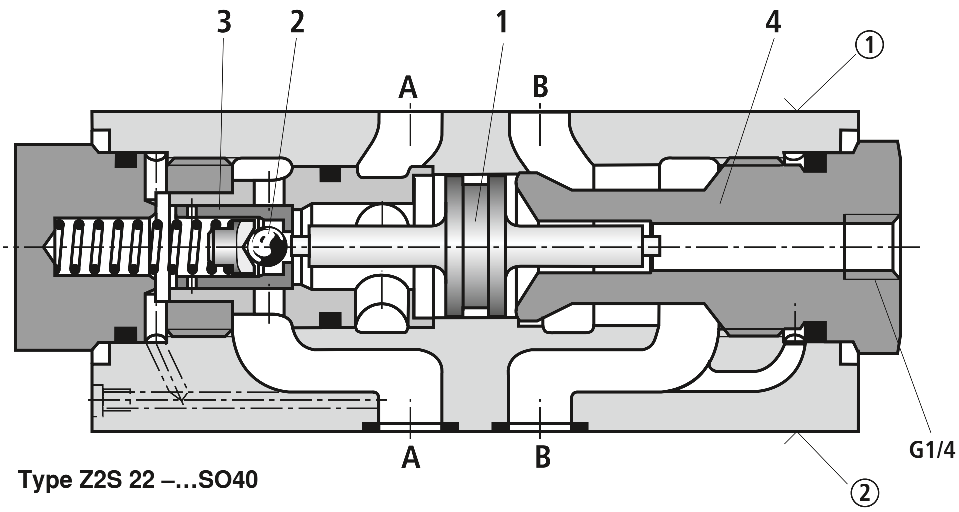
1 Control spool, area $\boldsymbol{A}_2$

2 Ball, area $\boldsymbol{A}_3$

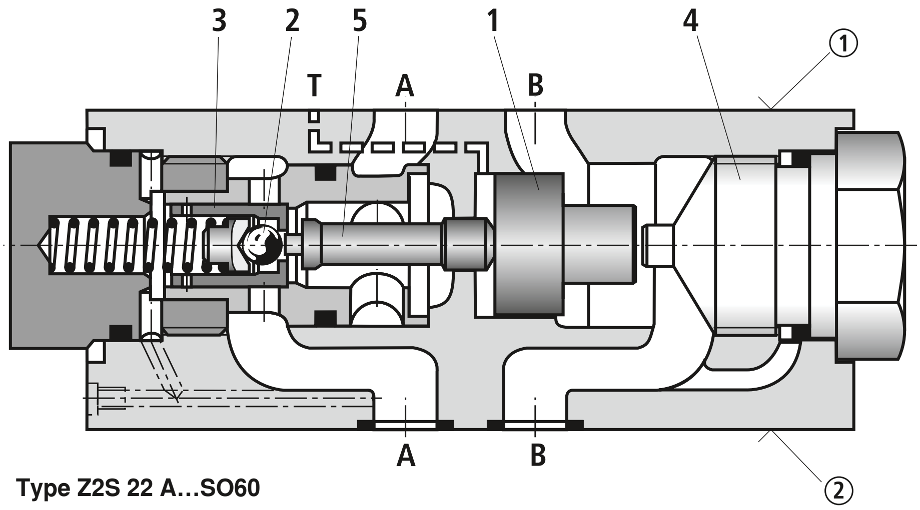
3 Poppet, area $\boldsymbol{A}_1$

4 Stop

Function, sections



Type Z2S 22 –…SO40



Type Z2S 22 A…SO60

① = component side

② = plate side

1 Control spool, area $\boldsymbol{A}_2$

2 Ball, area $\boldsymbol{A}_3$

3 Poppet, area $\boldsymbol{A}_1$

4 Stop

5 Control spool, area $\boldsymbol{A}_4$

Technical data (For applications outside these parameters, please consult us!)

general

Weight	kg *[lbs]*	Approx. 12 *[26.5]*
Installation position		Any
Ambient temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)

hydraulic

Maximum operating pressure	bar *[psi]*	315 *[4568]*
Cracking pressure in free direction		See characteristic curves page 6
Maximum flow	l/min *[US gpm]*	450 *[118.9]*
Direction of flow		See symbols page 2
Hydraulic fluid		– On mineral oil basis and related hydrocarbons (HL, HLP, HVLP, HVLPD, etc.) according to DIN 51524 – Flame-resistant (HFC, HFDU, HFDR) according to ISO 12922 1) – Environmentally compatible (HETG, HEES, HEPG, HEPR) according to ISO 15380 1) Other hydraulic fluids upon request
Hydraulic fluid temperature range (at the valve working ports)	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 500 *[35 to 2320]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 2)
Area ratio	– with pre-opening	A_3/A_2 ~ 1/12.5 (see sectional drawing pages 3 and 4)
	– Version "SO60"	A_1/A_4 ~ 1/9 (see sectional drawing page 4)

1) When using flame-resistant or environmentally compatible hydraulic fluids, restrictions with regard to the technical data may be applicable (temperature, pressure range, life time, maintenance intervals, etc.).

2) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

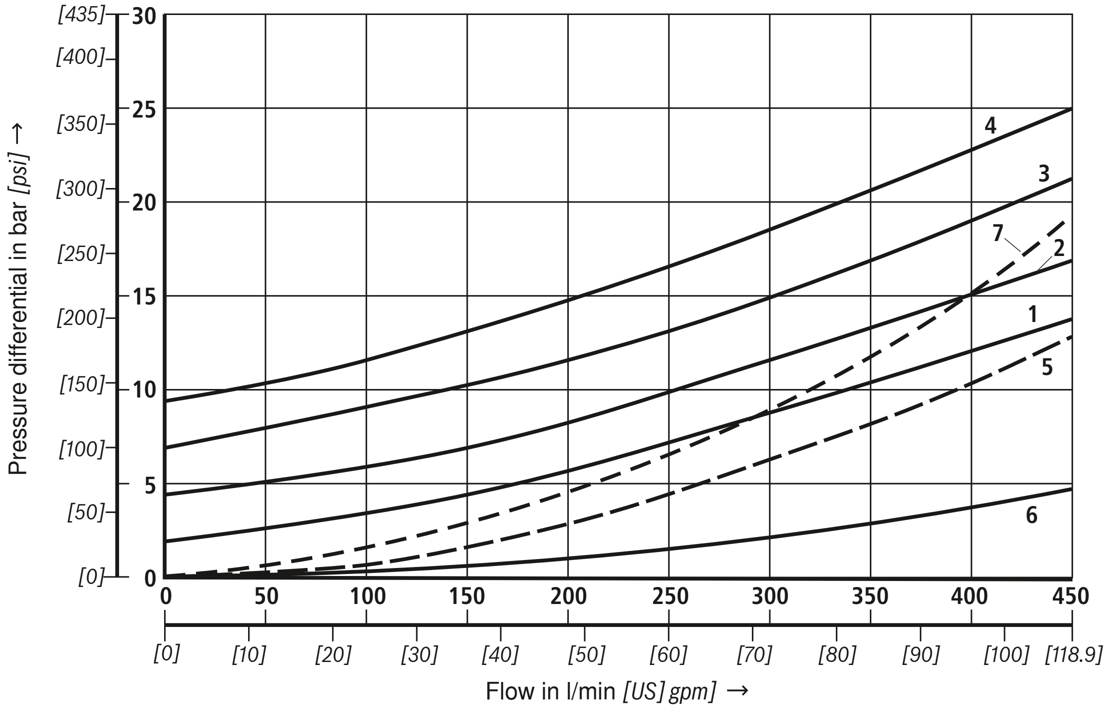
For the selection of the filters see www.boschrexroth.com/filter.

Note!

Selection of the perfect sealing material (see ordering code page 2) also depends on the hydraulic fluid used.

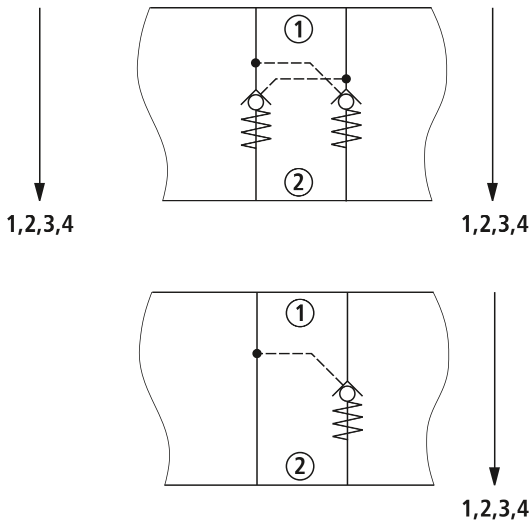
Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

Δ*p*-*q*$_V$ characteristic curves

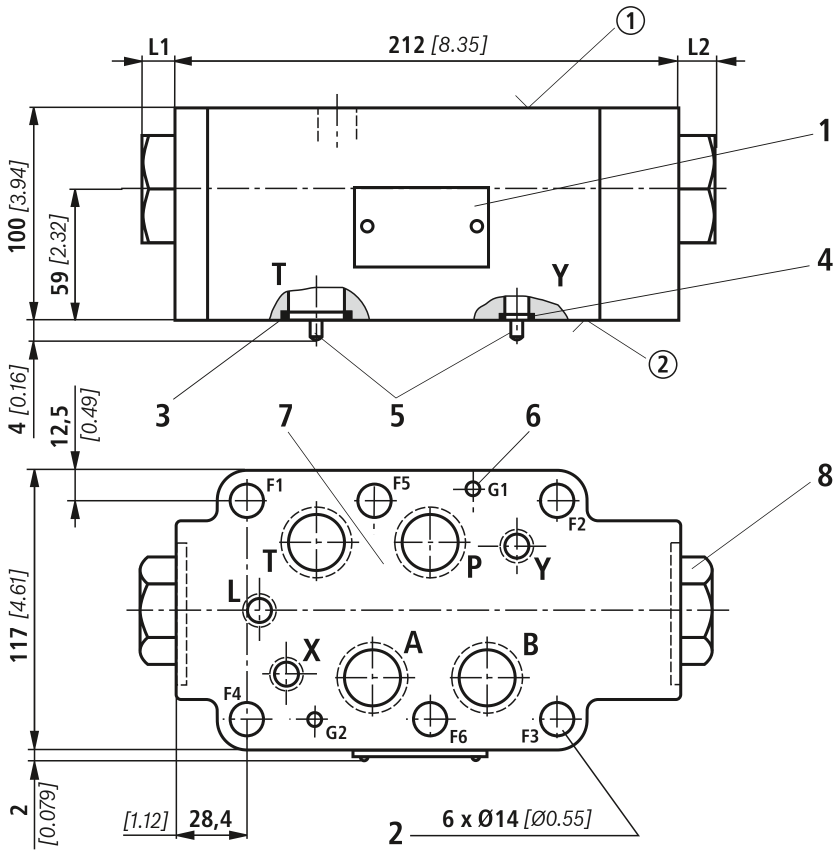


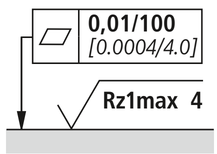
Cracking pressure:

1 3 bar *[43.5 psi]*
2 5 bar *[72.5 psi]*
3 7.5 bar *[108.8 psi]*
4 10 bar *[145.0 psi]*
5 Free flow (without check valve use), version "A" or "B"
6 Only housing
7 Check valve controlled open via control spool



Unit dimensions (dimensions in mm *[inch]*)





Required surface quality of the valve mounting face

① component side
② plate side

Item explanations and valve mounting screws see page 8.

Special version	Cracking pressure	leak-free blocking in channel	**L1** in mm *[inch]*	**L2** in mm *[inch]*
"**No code**"	1 + 2	"–"	14 *[0.55]*	14 *[0.55]*
	3 + 4	"–"	44 *[1.73]*	44 *[1.73]*
	1 + 2	A, B	14 *[0.55]*	14 *[0.55]*
	3 + 4	A	44 *[1.73]*	14 *[0.55]*
		B	14 *[0.55]*	44 *[1.73]*
"**SO40**"	1 + 2	A, B	14 *[0.55]*	14 *[0.55]*
	3 + 4	A	44 *[1.73]*	14 *[0.55]*
		B	14 *[0.55]*	44 *[1.73]*
"**SO60**"	1 + 2	A, B	14 *[0.55]*	14 *[0.55]*
	3 + 4	A	44 *[1.73]*	14 *[0.55]*
		B	14 *[0.55]*	44 *[1.73]*

Unit dimensions

1 Name plate

2 Through hole for valve mounting

3 Identical seal rings for ports A, B, P, T

4 Identical seal rings for ports X, Y, L

5 Locating pins

6 Locating holes

7 Porting pattern according to ISO 4401-08-08-0-05 and NFPA T3.5.1 R2-2002 D08

8 Plug screw SW46,
tightening torque M_A = 70 Nm *[51.6 ft-lbs]*

Valve mounting screws (separate order)

6 hexagon socket head cap screws ISO 4762 - M12 - 10.9

6 hexagon socket head cap screws 1/2”-13 UNC

Note!

The length of the valve mounting screws of the sandwich plate valve must be selected according to the components mounted under and over the isolator valve.

Depending on the application, screw type and tightening torque must be adjusted to the circumstances.

Please ask Rexroth for screws with the required length.

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documentation@boschrexroth.de
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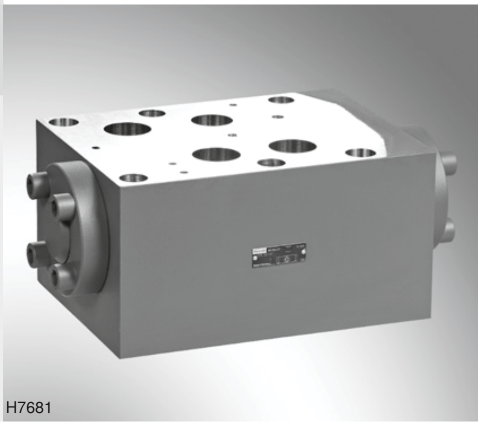
Rexroth
Bosch Group

Check valve, pilot operated

RE 21566/07.10

Type Z2S

Size 32
Component series 1X
Maximum operating pressure 315 bar *[4568 psi]*
Maximum flow 900 l/min *[237.7 US gpm]*



H7681

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– Porting pattern according to ISO 4401-10-09-0-05 and NFPA T3.5.1 R2-2002 D10
– For the leak-free blocking of one or two actuator ports, optionally
– Pre-opening standard
– Check valve installation sets separately available
– Amending documentation:
  • "Hydraulic fluids on a mineral oil basis", data sheet 90220

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2S	32		–1X /		*

Check valve, sandwich plate

Size 32 **= 32**

Leak-free blocking in channel A and B **= –**
Leak-free blocking in channel A **= A**
Leak-free blocking in channel B **= B**

Cracking pressure
1 bar *[14.5 psi]* **= no code**

Component series 50 to 59 **= 1X**
(50 to 59: unchanged installation and connection dimensions)

Surface without corrosion resistance [1] **= no code**

[1] Corrosion-resistant surface upon request:
e.g. "J50" thick layer passivated
(DIN 50979 Fe//Zn8//Cn//T0)

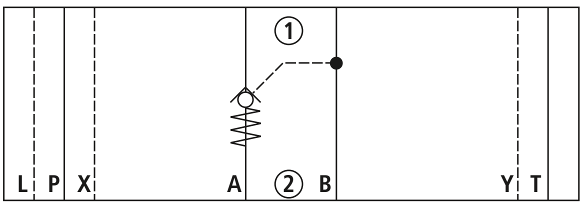
Further details in the plain text

Seal material
no code = NBR seals
V = FKM seals

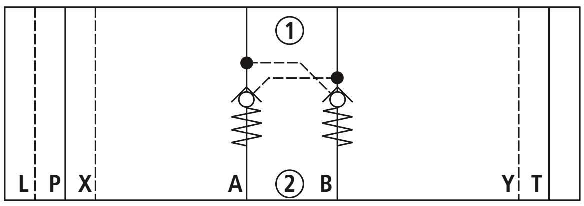
☞ **Note!**
The selection depends on the operating parameters (fluid, temperature, etc.)!

Symbols: Examples (① = component side, ② = plate side)

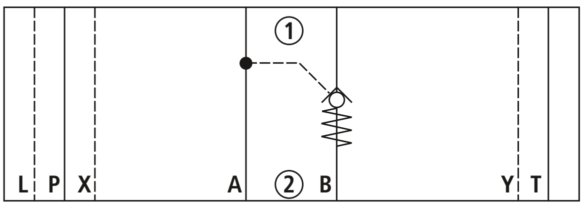
Type Z2S 32 A…



Type Z2S 32 –…



Type Z2S 32 B…



Function, sections, sample circuit

The isolator valve Type Z2S is a releasable check valve in sandwich plate design.

It is used for the leak-free blocking of one or two actuator ports, also in case of longer standstill times.

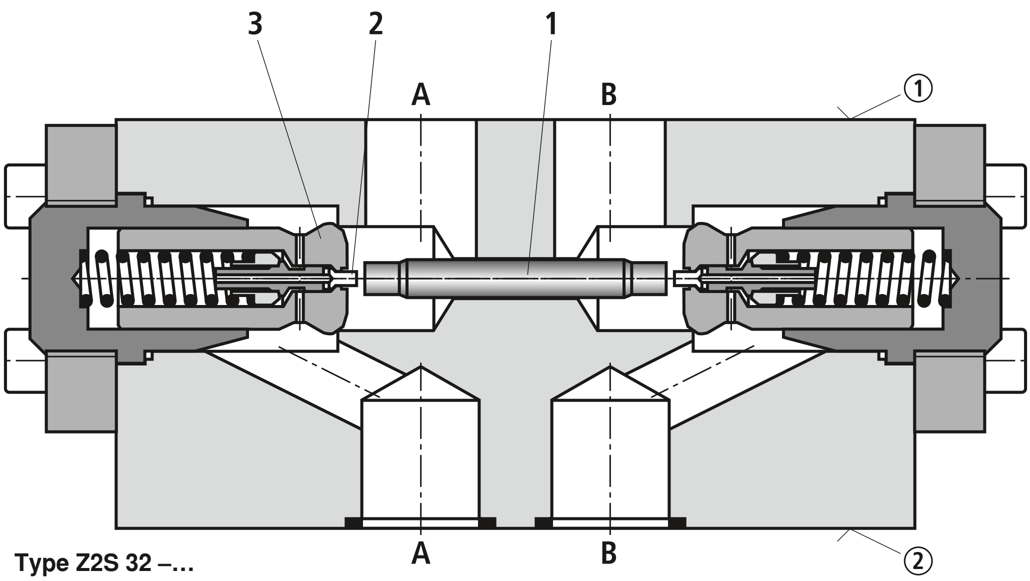
In the direction A① to A② or B① to B②, there is a free flow, in the opposite direction, the flow is blocked.

If the valve is, for example, flown through in the direction A① to A②, the control spool (1) is moved in the direction B side, opens the pilot poppet (2) and then pushes the poppet (3) off its seat. Now, hydraulic fluid can flow from B② to B①.

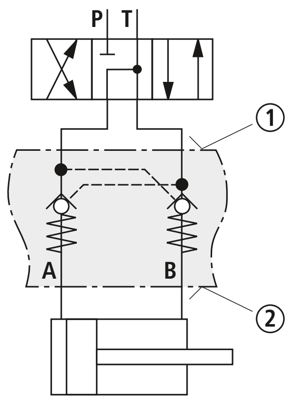
In order to allow for safe closing of the seat valve (3), the control spool (1) must be hydraulically unloaded (see circuit example).

Pre-opening

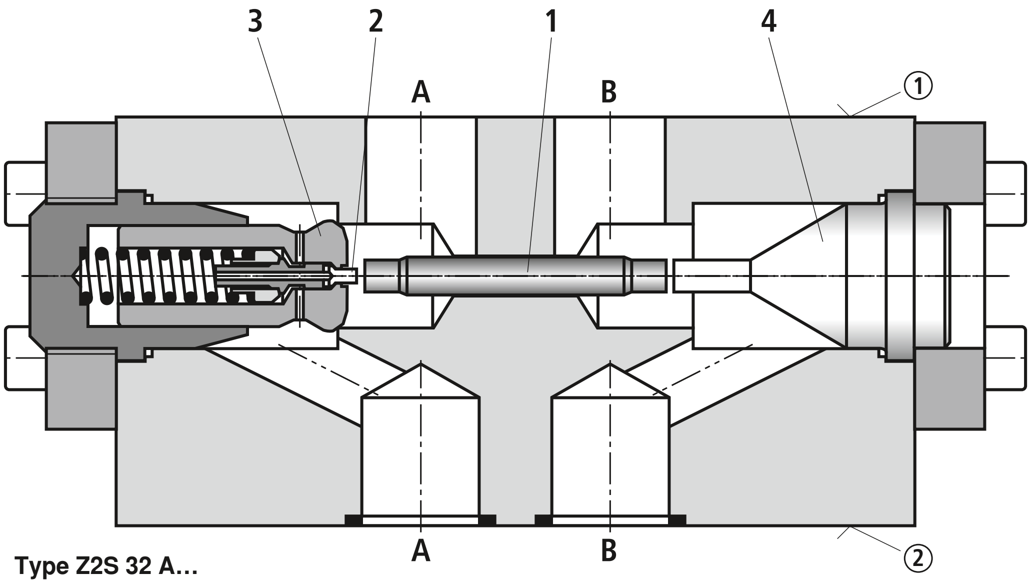
- Due to the two-stage structure with enlarged control open ratio, safe unloading is also possible with lower pilot pressure.
- Avoidance of switching shocks due to dampened decompression of the pressure volume on the actuator side.



Type Z2S 32 –...



Circuit example, schematic



Type Z2S 32 A...

① = Component side

② = Plate side

1 Control spool, area $\boldsymbol{A}_2$

2 Pilot poppet, area $\boldsymbol{A}_3$

3 Poppet, area $\boldsymbol{A}_1$

4 Stop

Technical data (For applications outside these parameters, please consult us!)

general

Weight	kg *[lbs]*	approx. 56 *[123.5]*
Installation position		Any
Ambient temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)

hydraulic

Maximum operating pressure	bar *[psi]*	315 *[4568]*
Cracking pressure in free direction		See characteristic curves page 5
Maximum flow	l/min *[US gpm]*	900 *[237.7]*
Direction of flow		See symbols page 2
Hydraulic fluid		– On mineral oil basis and related hydrocarbons (HL, HLP, HVLP, HVLPD, etc.) according to DIN 51524 – Flame-resistant (HFC, HFDU, HFDR) according to ISO 12922 [1)] – Environmentally compatible (HETG, HEES, HEPG, HEPR) according to ISO 15380 [1)] Other hydraulic fluids upon request
Hydraulic fluid temperature range (at the valve working ports)	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 500 *[35 to 2320]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [2)]
Area ratio		A_1/A_2 ~ 1/4 (see sectional drawing page 3)

1) When using flame-resistant or environmentally compatible hydraulic fluids, restrictions with regard to the technical data may be applicable (temperature, pressure range, life time, maintenance intervals, etc.).

2) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

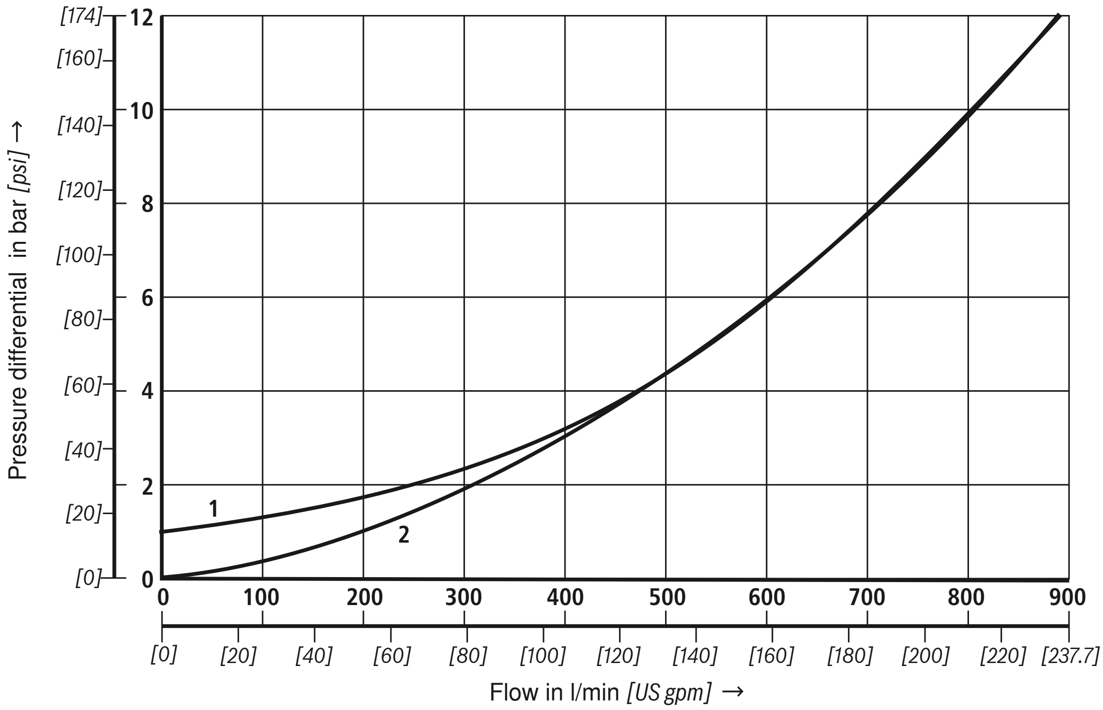
For the selection of the filters see www.boschrexroth.com/filter.

Note!

Selection of the perfect sealing material (see ordering code page 2) also depends on the hydraulic fluid used.

Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

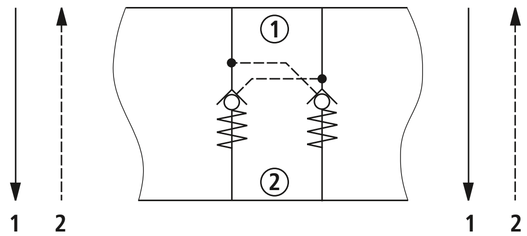
Δp-q_V characteristic curves

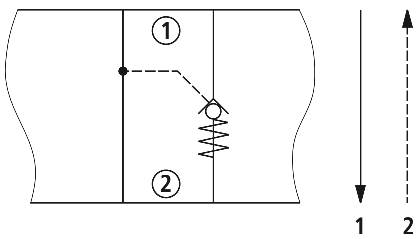


Cracking pressure:

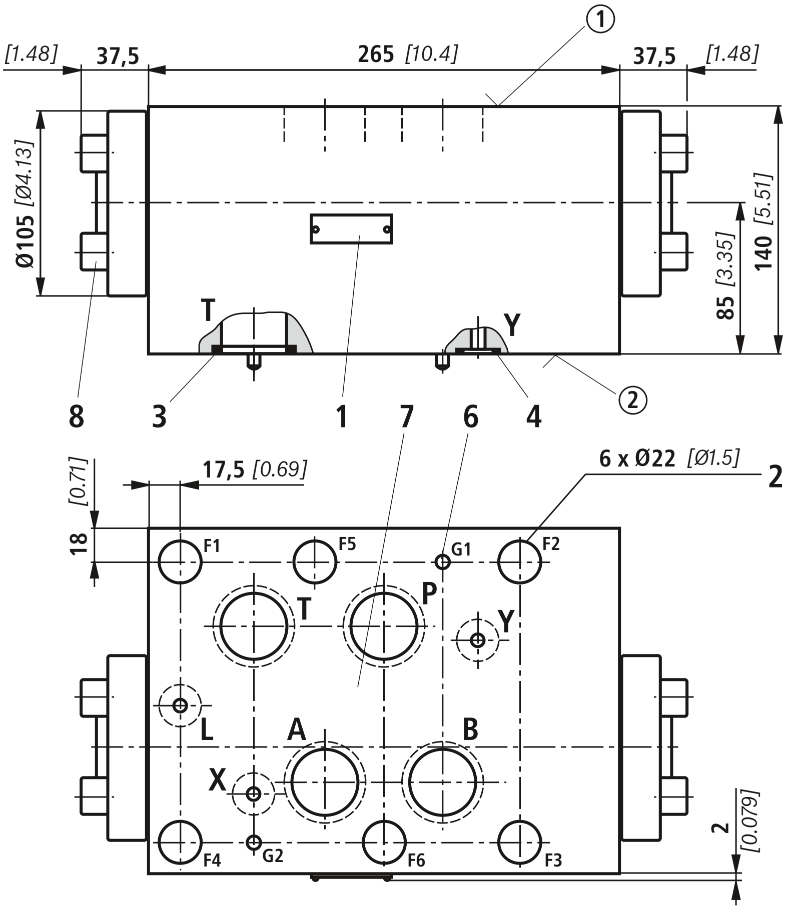
1 1 bar *[14.5 psi]*

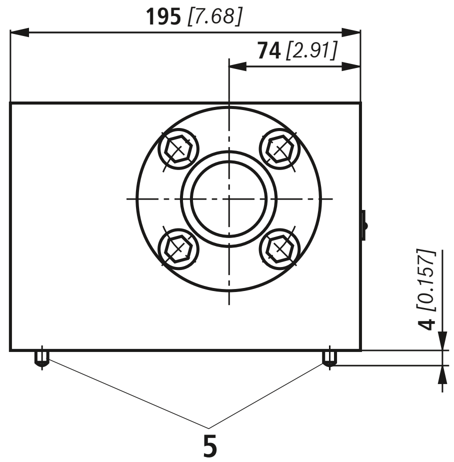
2 Check valve controlled open via control spool





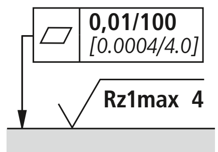
Unit dimensions (dimensions in mm *[inch]*)





① Component side

② Plate side



Required surface quality of the valve mounting face

1 Name plate
2 Through hole for valve mounting
3 Identical seal rings for ports A, B, P, T
4 Identical seal rings for ports X, Y, L
5 Locating pins
6 Locating holes
7 Porting pattern according to ISO 4401-10-09-0-05 and NFPA T3.5.1 R2-2002 D10
8 Cover fastening, tightening torque M_A = 170 Nm *[125.4 ft-lbs]*

Valve mounting screws (separate order)

6 hexagon socket head cap screws ISO 4762 - M20 - 10.9

6 hexagon socket head cap screws 3/4"-10 UNC

Note!

The length of the valve mounting screws of the sandwich plate valve must be selected according to the components mounted under and over the isolator valve.

Depending on the application, screw type and tightening torque must be adjusted to the circumstances.

Please ask Rexroth for screws with the required length.

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

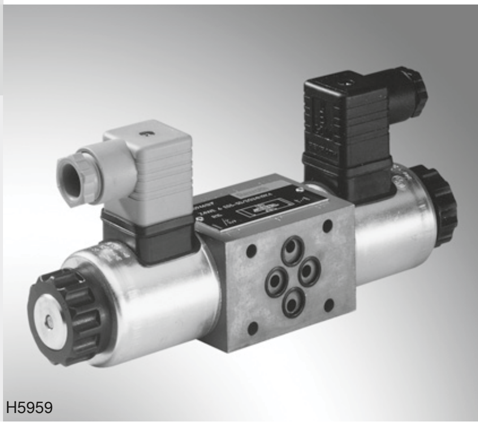
Rexroth
Bosch Group

4/2 and 4/3 directional isolator valve

RE 23193/07.11
Replaces: 08.06

Type Z4WE

Size 6
Component series 3X
Maximum operating pressure 315 bar
Maximum flow 50 l/min



H5959

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

- Direct operated directional spool valve with solenoid actuation
- Sandwich plate valve
- As stop straight-through valve or as stop straight-through short circuit valve
- Porting pattern according to DIN 24340 form A (**without** locating hole), (standard)
- Porting pattern according to ISO 4401-03-02-0-05 (**with** locating hole)
- Wet-pin DC or AC solenoids
- Manual override, optional

– More information:	Data sheet
• Subplates	45052
• Inductive position switch and proximity sensors (contactless)	24830
• Reliability characteristics according to EN ISO 13849	08012
• General product information on hydraulic products	07008
• Installation, commissioning and maintenance of industrial valves	07300

Ordering code

Z4WE	6		–3X /	E			K4				*

Isolator valve, sandwich plate

Size 6 **= 6**

Spool symbols
e. g. D24, E51, E53, …; with DC or AC solenoids; see page 3 to 5
e. g. X250, X252, …; only with DC solenoids; see page 6 (alternating voltage upon request)

Component series 30 to 39 **= 3X**
(30 to 39: unchanged installation and connection dimensions)

High-power solenoid, wet-pin with detachable coil **= E**

Direct voltage 24 V **= G24**
AC voltage 230 V 50/60 Hz **= W230**
Direct voltage 205 V **= G205** [1)]

With concealed manual override (standard) **= N9**
With manual override **= N**
Without manual override **= no code**

Electrical connection
K4 [2)] **=** without mating connector wit connector DIN EN 175301-803

Spool position monitoring
No code = without position switch
QMAG24 = Monitored spool position "a"
QMBG24 = Monitored spool position "b"
QM0G24 = Monitored rest position
For more information see data sheet 24830

Seal material
No code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

No code = **without** locating hole
/60 [3)] **=** **with** locating hole
/62 = **with** locating hole and locating pin ISO 8752-3x8-St

Further details in the plain text

1) For connection to the AC voltage mains, a DC solenoid **must** be used, which is controlled via a rectifier (see table on the right).
Electrical control is realized via a mating connector with integrated rectifier (separate order, see below).

2) Mating connectors, separate order, see below

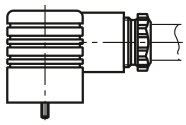
3) Locating pin ISO 8752-3x8-St,
Material no. **R900005694** (separate order)

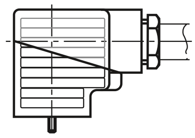
AC voltage mains (permissible voltage tolerance ±10 %)	**Nominal voltage of the DC solenoid in case of operation with alternating voltage**	**Ordering code**
110 V - 50/60 Hz	96 V	**G96**
230 V - 50/60 Hz	205 V	**G205**

Preferred types and standard units are contained in the EPS (standard price list).

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006

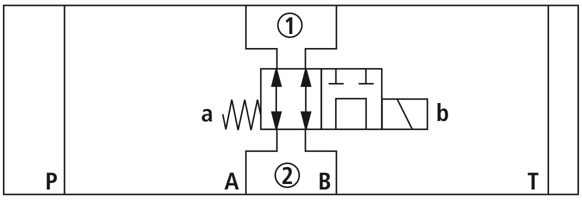




Valve side	Color	Material no. without circuitry	with indicator light 12 ... 240 V	with rectifier 12 ... 240 V	with indicator light and Z diode suppression circuit 24 V
a	Gray	**R901017010**	–	–	–
b	Black	**R901017011**	–	–	–
a/b	Black	–	**R901017022**	**R901017025**	**R901017026**

Spool symbols: Direct or alternating voltage (① = component side, ② = plate side)

D24



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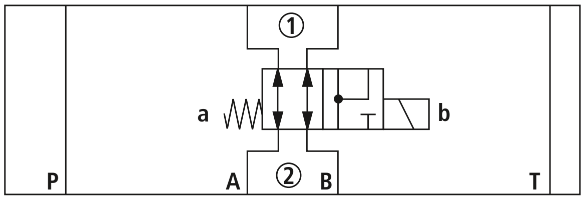

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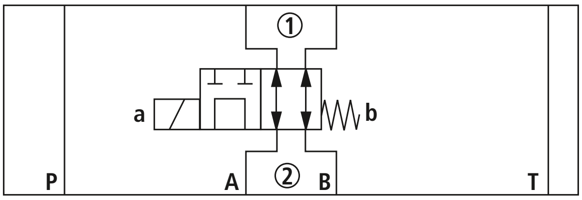

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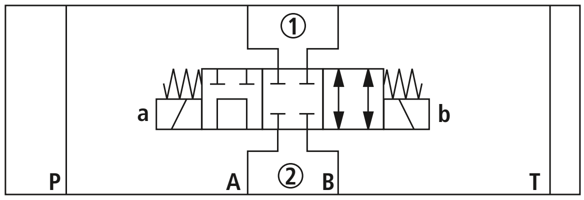

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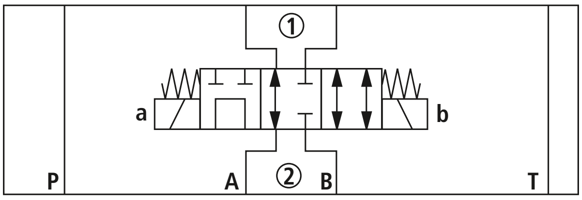

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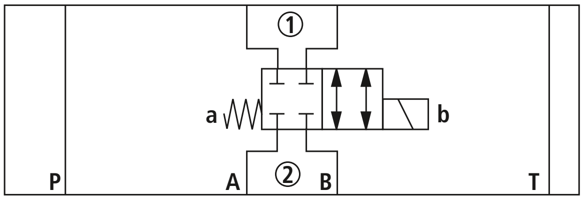

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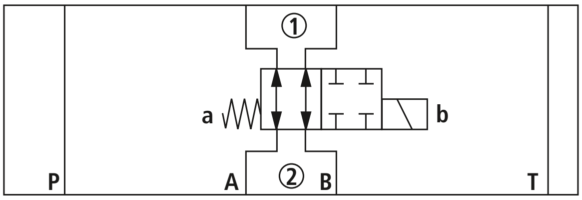

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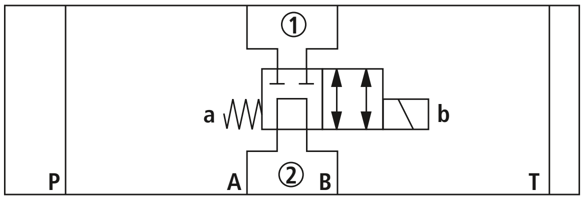

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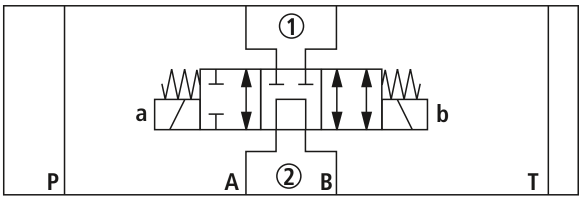

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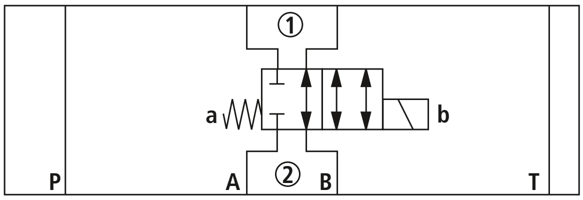

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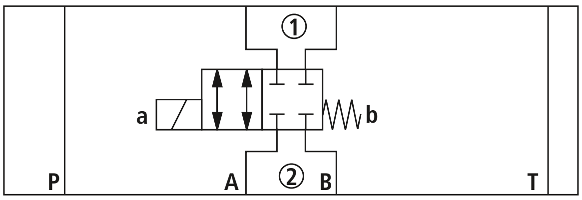

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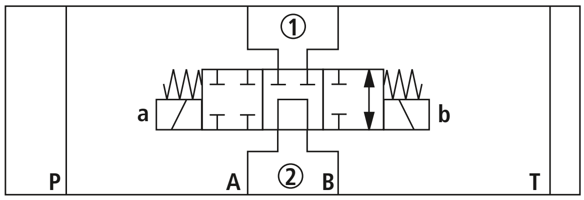

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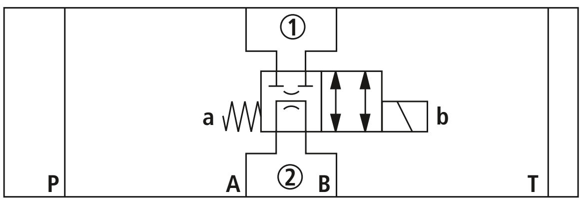

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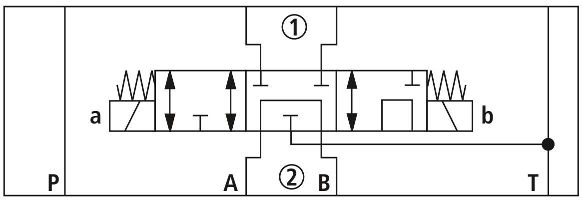

Spool symbols: Direct or alternating voltage (① = component side, ② = plate side)

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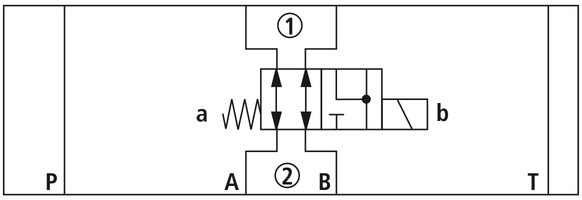

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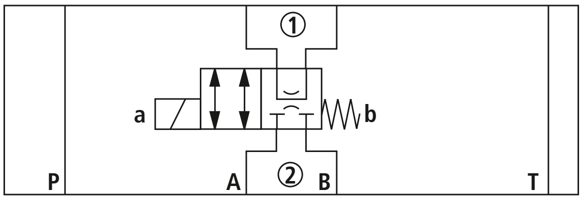

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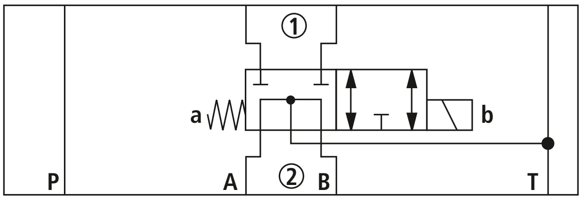

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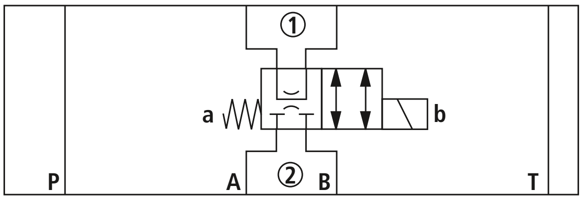

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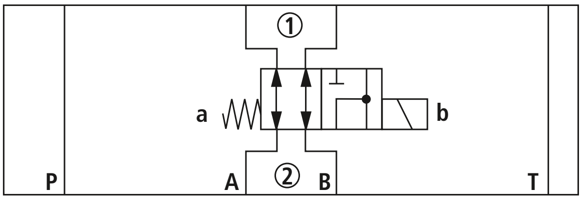

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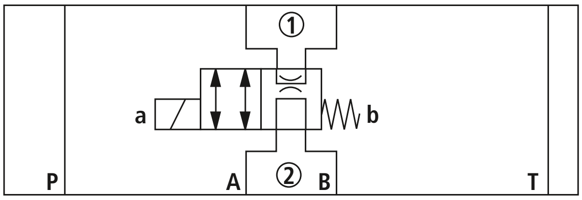

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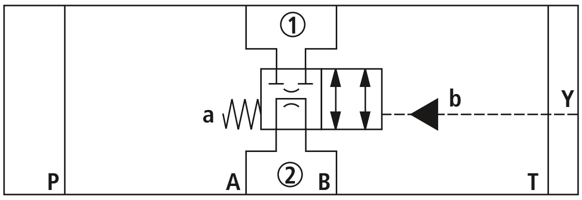

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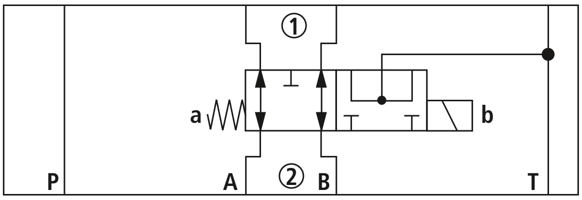

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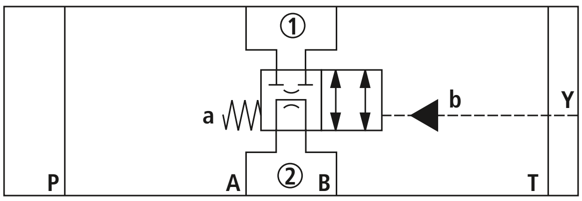

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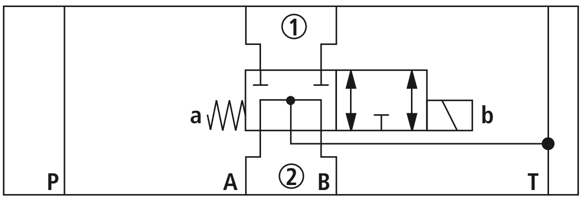

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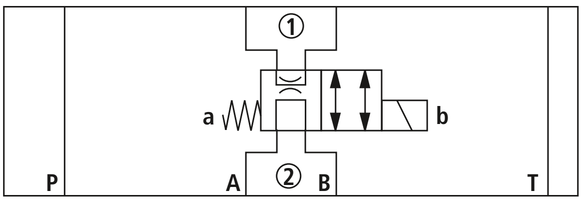

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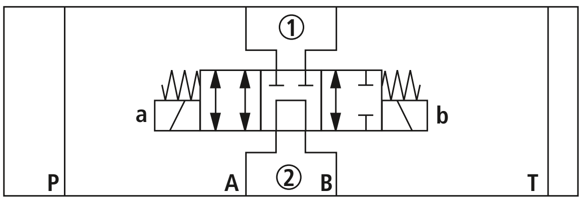
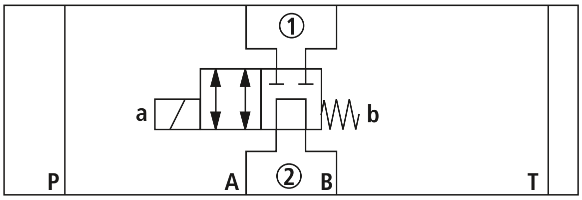


[1)] Throttle can be installed, upon request

Spool symbols: Direct or alternating voltage (① = component side, ② = plate side)

E145A



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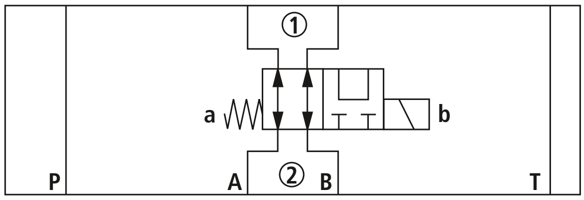

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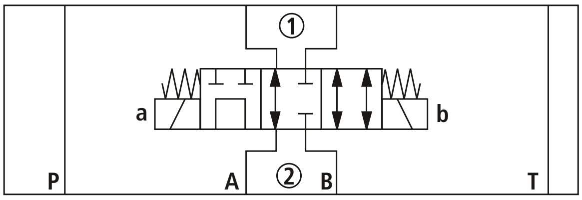

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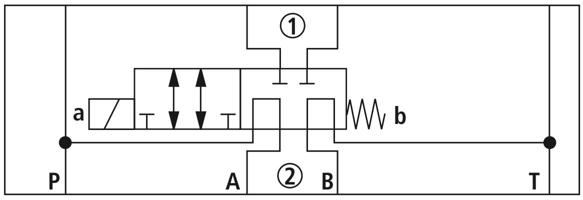

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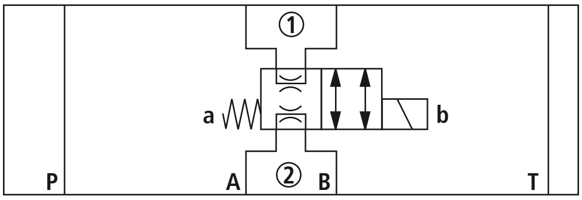

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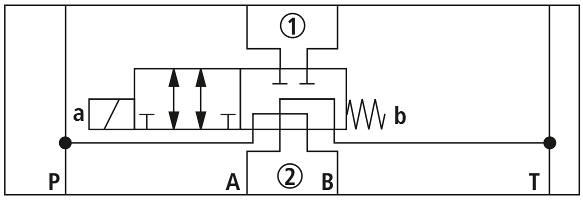

Spool symbols: Direct voltage (① = component side, ② = plate side)

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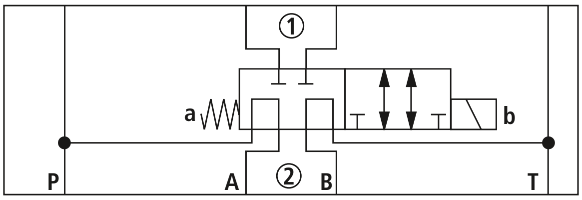

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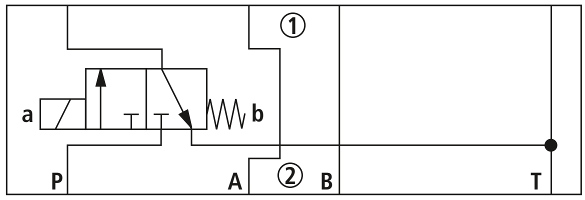

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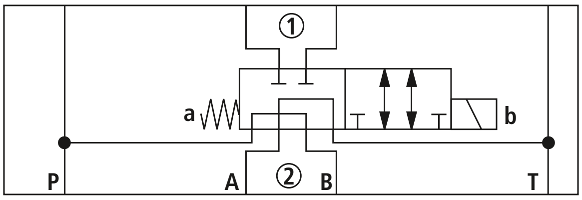

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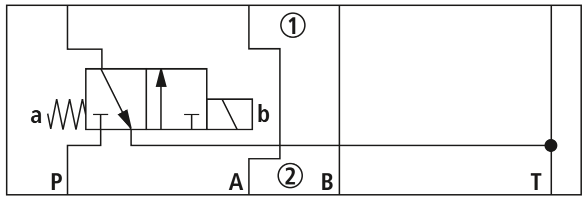

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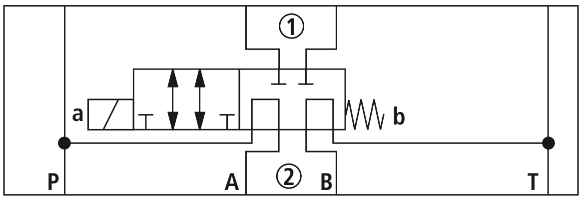

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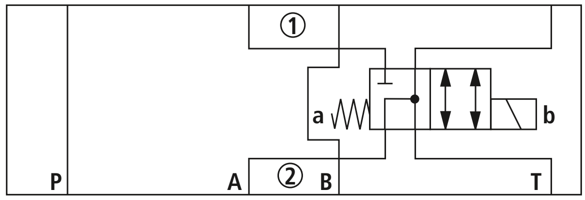

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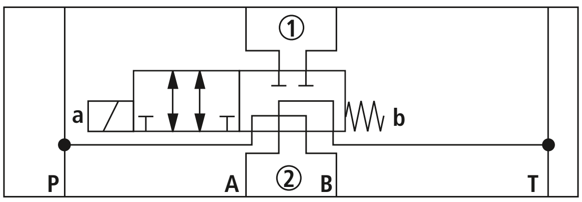

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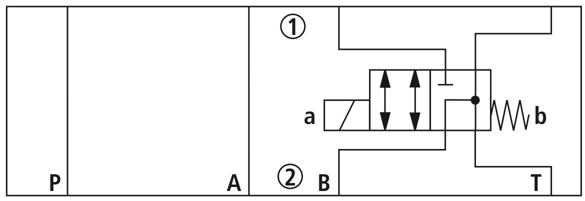

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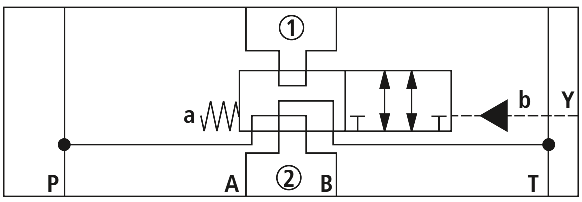

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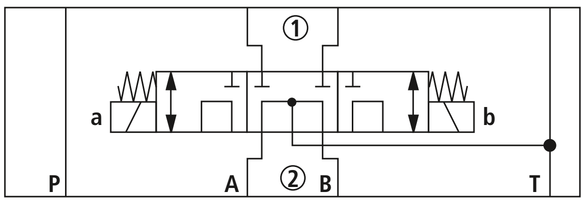

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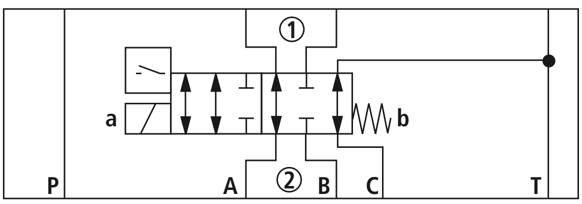

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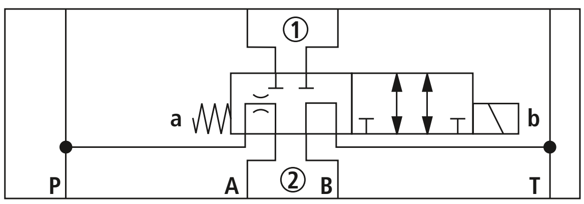

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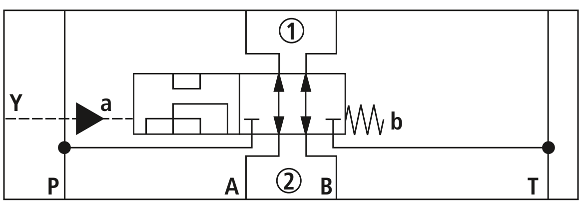

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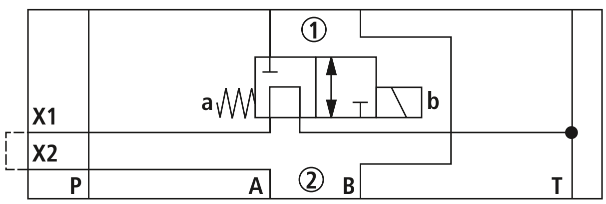


Function, section

The directional valve type Z4WE is a solenoid-operated directional spool valve. It controls the start, stop and direction of a flow.

The directional valve basically consists of housing (1), one or two solenoids (2), control spool (3), as well as two return springs (4).

In the de-energized condition, control spool (3) is held in the central position or in the initial position by the return springs (4). The control spool (3) is actuated by wet-pin solenoids (2).

To ensure proper functioning, care must be taken that the pressure chamber of the solenoid is filled with oil.

The force of solenoid (2) acts via plunger (5) on control spool (3) and pushes the latter from its rest position to the required end position. This opens up the required flow direction A② to A① and B② to B①.

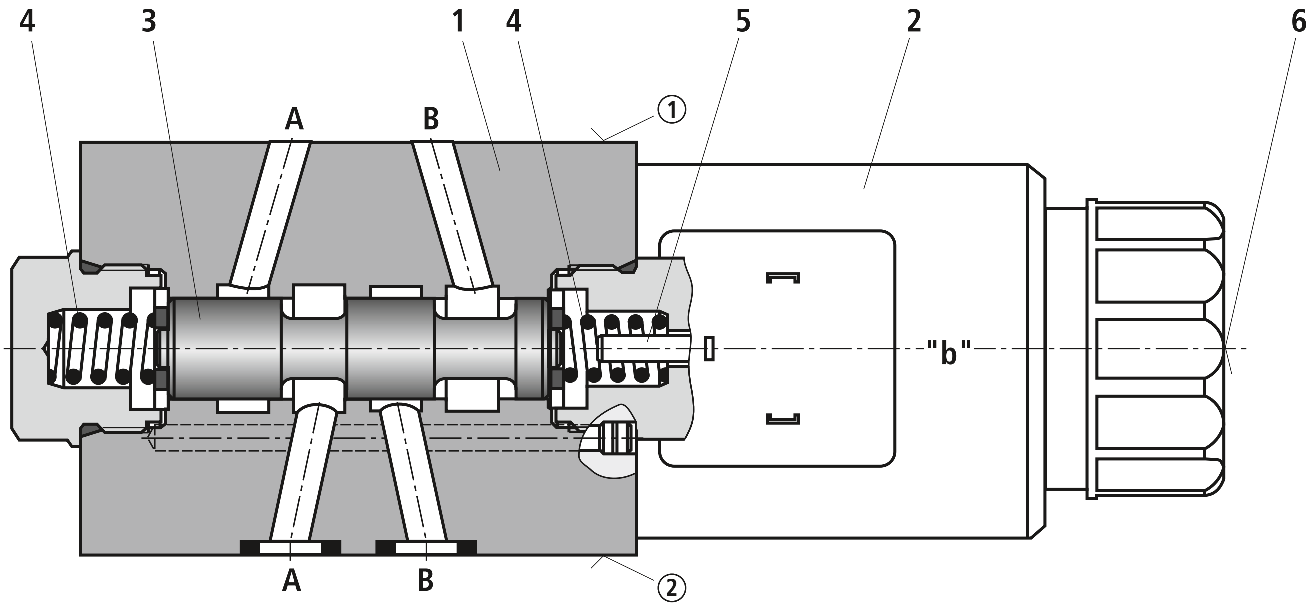
After solenoid (2) was de-energized, return spring (4) pushes control spool (3) again back to its rest position.

An optional manual override (6) allows control spool (3) to be moved without energization of the solenoid.

☞ **Notice!**

Due to the design principle, internal leakage is inherent to the valves, which may increase over the service life.

Admissible shock and vibration loads see data sheet 08012.



Type Z4WE 6 …

① = component side

② = plate side

Technical data (For applications outside these parameters, please consult us!)

general

Weight	– Valve with one solenoid	kg	1.2
	– Valve with two solenoids	kg	1.6
Installation position			Any
Ambient temperature range		°C	–30 to +50 (NBR seals) –20 to +70 (FKM seals)
$MTTF_d$ values according to EN ISO 13849		Years	150 (for further details see data sheet 08012)
Admissible shock and vibration loads			See data sheet 08012

hydraulic

Maximum operating pressure	– Port P, A, B	bar	315
	– Port T	bar	210 with direct voltage 160 with alternating voltage
Maximum flow		l/min	50
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	2.8 to 500
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
	– Water-containing	HFC	NBR	ISO 12922

Important information on hydraulic fluids!

- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- The flash point of the process and operating medium used must be 15 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – water-containing**: Maximum pressure differential per control edge 175 bar; otherwise, increased cavitation erosion! Tank pre-loading < 1 bar or > 20 % of the pressure differential. The pressure peaks should not exceed the maximum operating pressures!
- **Environmentally compatible:** When using environmentally compatible hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the medium (700 mg zinc per pole tube).

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For selecting the filters, see www.boschrexroth.com/filter.

Technical data (For applications outside these parameters, please consult us!)

electric

Voltage type			Direct voltage	Alternating voltage 50/60 Hz
Available voltages [2]		V	12, 24, 96, 205	110, 230
Voltage tolerance (nominal voltage)		%	±10	±10
Power consumption		W	30	–
Holding power		VA	–	50
Switch-on power		VA	–	220
Duty cycle (ED)		%	100	100
Switching time according to ISO 6403 [3]	– ON	ms	20 to 45	10 to 20
	– OFF	ms	10 to 25	15 to 40
Maximum switching frequency		1/h	15000	7200
Maximum coil temperature [4]		°C	150	180
Protection class according to DIN EN 60529			IP 65 (with mating connector mounted and locked)	

[2] Special voltages upon request

[3] The switching times have been determined at a hydraulic fluid temperature of 40 °C and 46 cSt. Deviating hydraulic fluid temperatures can result in different switching times! Switching times change depending on operating time and application conditions.

[4] Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!
The specified surface temperature in AC voltage solenoids is valid for the faultless operation. In case of failure (e. g. blocking of the control spool), the surface temperature may rise to above 180 °C. Considering the flash point (see page 8), the system must therefore be checked for possible risks.
As fuse protection, circuit breakers (see table on the right) must be used unless the creation of an ignitable atmosphere can be excluded in a different way. Thus, the surface temperature can - in case of failure - be limited to maximally 220 °C. The tripping current must lie within a time interval of 0.6 s with 8 to 10 times the nominal power consumption. (Tripping characteristics "K").
The necessary non-tripping current of the fuse must not fall below the value I_1 (see table page 16). The maximum tripping current of the fuse must not exceed the value I_2 (see table page 16).
The temperature dependence of the tripping behavior of the circuit breakers has to be considered according to the manufacturer's specifications.

Notices!

- Actuation of the manual override is only possible up to a tank pressure of ca. 50 bar. Avoid damage to the bore for the manual override! (Special tool for the operation, separate order, Material no. **R900024943**). When the manual override is blocked, the operation of the solenoid must be ruled out!
- The simultaneous operation of the solenoids must be ruled out!

In the electrical connection, the protective earthing conductor (PE ⏚) is to be connected properly.

Circuit breaker with tripping characteristic K according to EN 60898-1 (VDE 0641-11), EN 60947-2 (VDE 0660-101), IEC 60898 and IEC 60947-2:

Nominal voltage valve	Nominal current consumption		Recommended rated current fuse
	50 Hz	60 Hz	
24	2	1.5	3
42	1.26	0.98	2
48	1	0.95	1.6
100	0.56	0.5	1
110	0.52	0.45	0.75
115	0.45	0.37	0.75
127	0.42	0.32	0.75
200	0.29	0.26	0.5
220	0.27	0.23	0.5
230	0.23	0.17	0.5
240	0.23	0.19	0.5

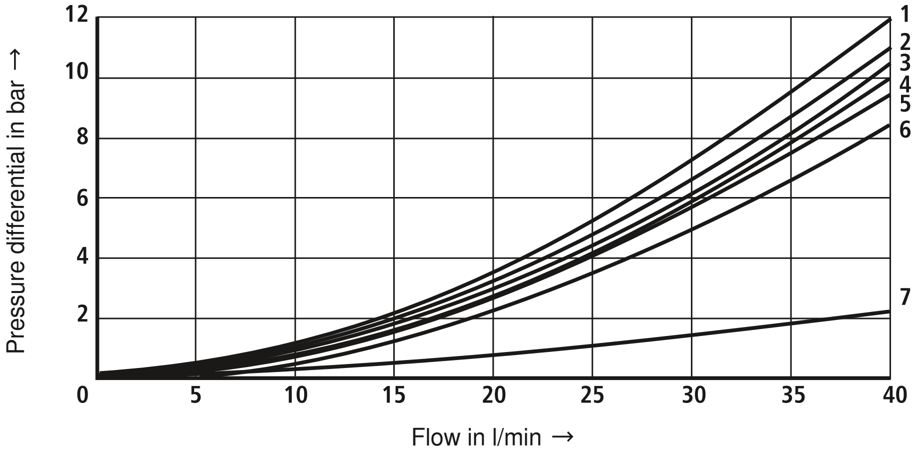
Notice!

AC solenoids can be used for 2 or 3 mains,
e.g. solenoid type **W110** for:
110 V, 50 Hz; 110 V, 60 Hz; 120 V, 60 Hz

Ordering code	Mains
W110	110 V, 50 Hz 110 V, 60 Hz 120 V, 60 Hz
W230	230 V, 50 Hz 230 V, 60 Hz

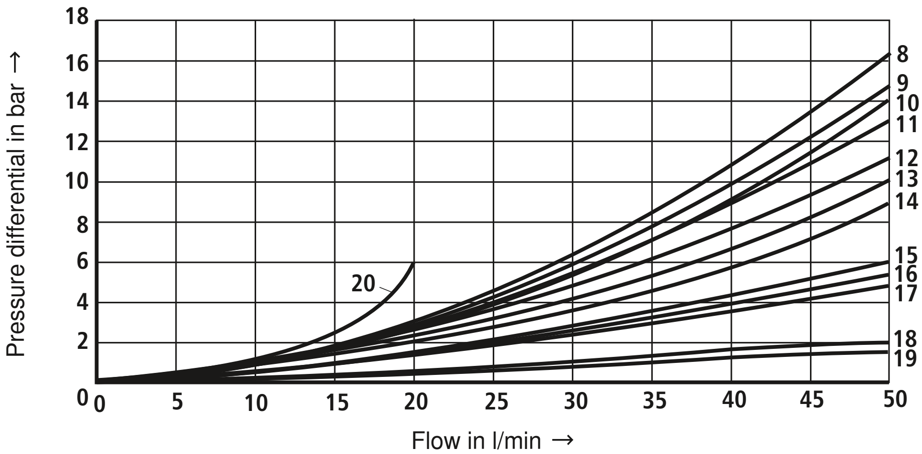
Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C)

Δp-q_V characteristic curves



Spool symbols D27, E46, E54, E56, E57, E62, E115, E127, E129, E130, E131, E132, E135, E136, E138, E139, E140, E141, E144, E145, E145A, E146, E147, E166, E181 and E183 upon request.

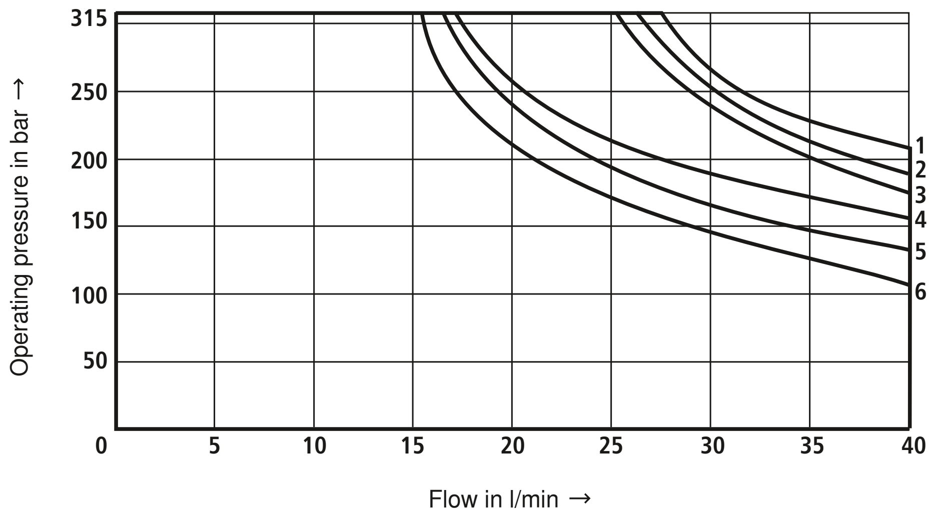
Spool symbol	A②–A①	A①–A②	B②–B①	B①–B②	A②–B②	B②–A②	T②–T①	P②–P①
D24	4	1	2	4	3	2	7	7
E51	3	1	1	3	–	–	7	7
E53	2	2	2	2	5	2	7	7
E63	2	5	5	3	–	–	7	7
E68	4	4	6	5	4	5	7	7
E137	1	4	3	2	5	6	7	7



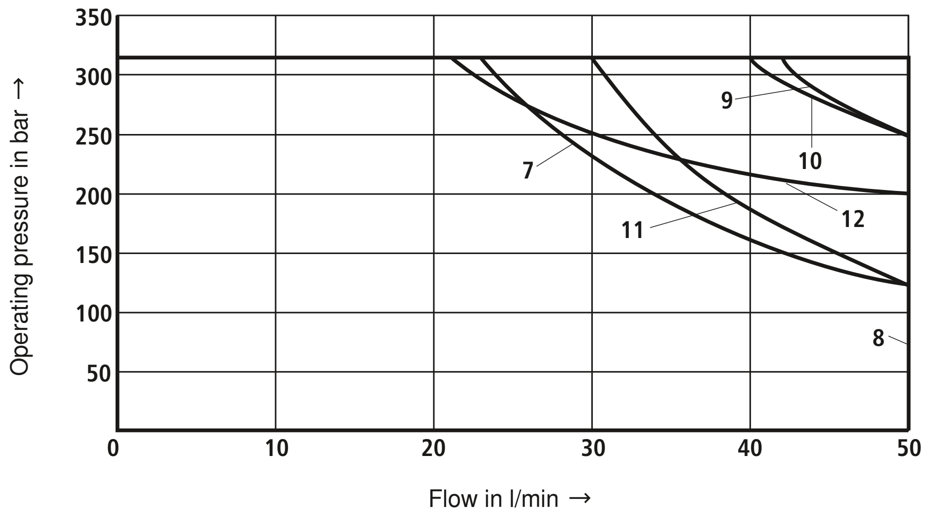
Spool symbols X161, X163, X181, X183, X187, X188, X193 and X157 upon request.

Spool symbol	Spool position	A①–A② A②–A①	B①–B②	B②–B①	T②–T①	P②–P①	P①–T②	B②–T②	P②–P①	A②–T②	P②–A② B②–T②
X250		16	17	17	18	13	11	–	–	–	–
X252		16	17	17	18	9	10	–	–	–	–
X253		13	14	14	19	18	–	–	–	8	–
X254		16	12	13	18	18	–	12	–	–	–
X255	0	–	–	–	15	–	–	8	–	8	–
	a	12	–	–	–	–	–	13	–	–	–
	b	–	12	12	–	–	–	–	–	13	–
X256		12	9	9	18	–	–	–	18	–	20

Performance limits (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C and 24 V direct voltage)



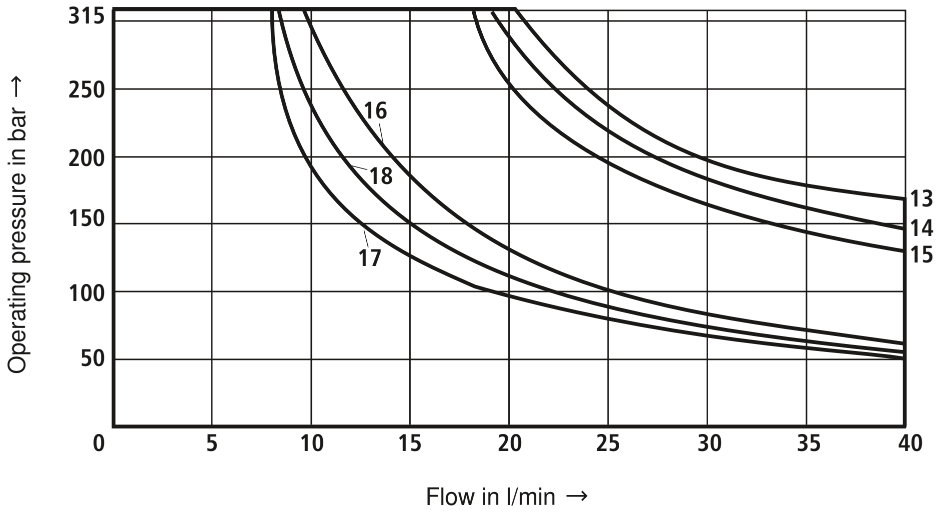
1 E63
2 E68
3 E53
4 E51
5 E137
6 D24



7 X250
8 X252
9 X253
10 X254
11 X255
12 X256

Spool symbols D27, E46, E54, E56, E57, E62, E115, E127, E129, E130, E131, E132, E133, E134, E135, E136, E138, E139, E140, E141, E144, E145, E145A, E146, E147, E166, E181, E183, X161, X163, X181, X183, X187, X188, X193 and X157 upon request.

Performance limits (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C and 230 V alternating voltage)

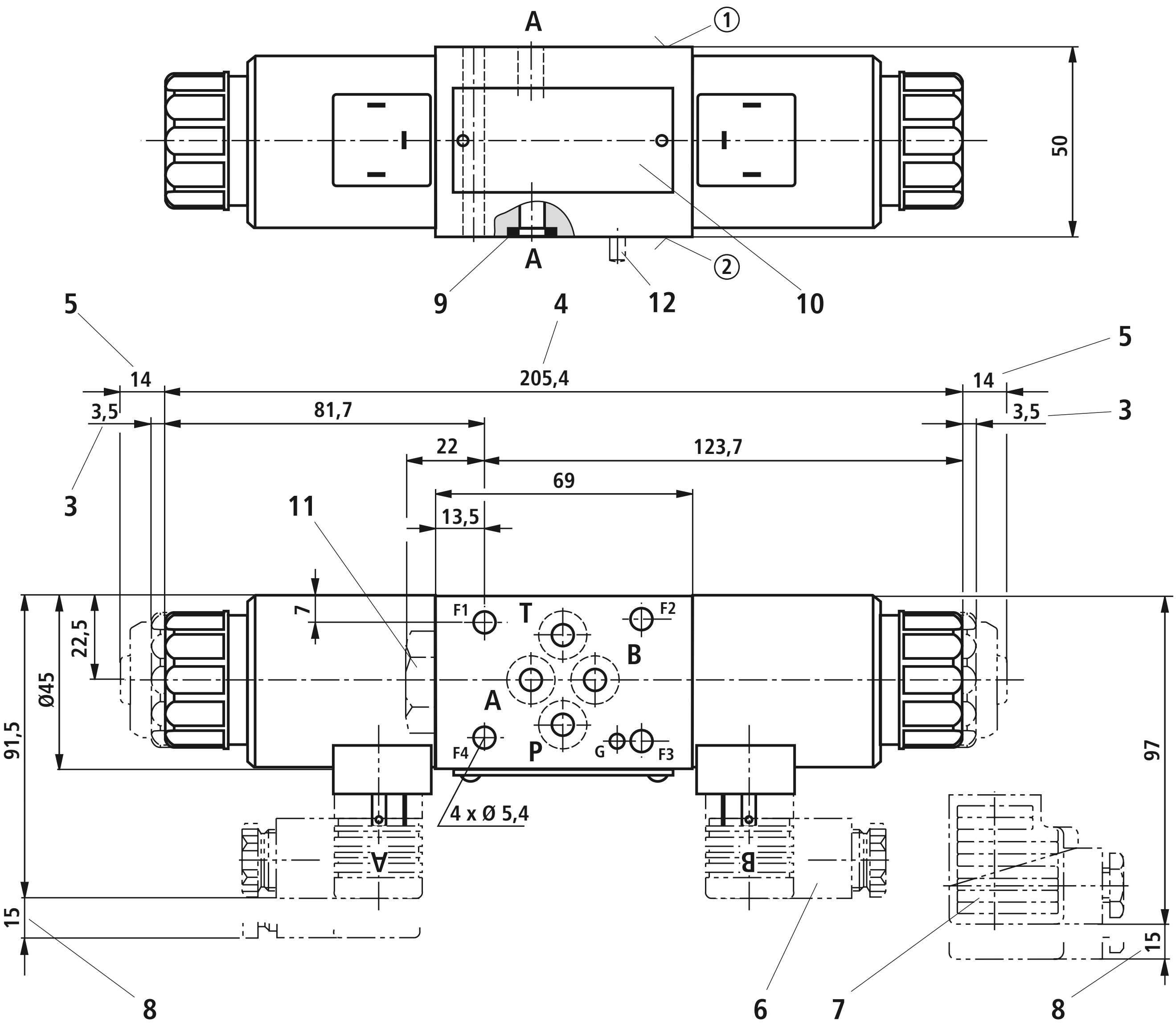


Spool symbol	W230-**50 Hz**	W230-**60 Hz**
E63	13	16
E68	14	18
E53	15	18
E137	17	17
E51	17	17
D24	17	17

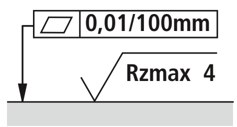
Spool symbols D27, E46, E54, E56, E57, E62, E115, E127, E129, E130, E131, E132, E135, E136, E138, E139, E140, E141, E144, E145, E145A, E146, E147, E166, E181 and E183 upon request.

Unit dimensions: With DC solenoid (dimensions in mm)

Spool symbols D24, E51, E53, E63, E68, E137, ...



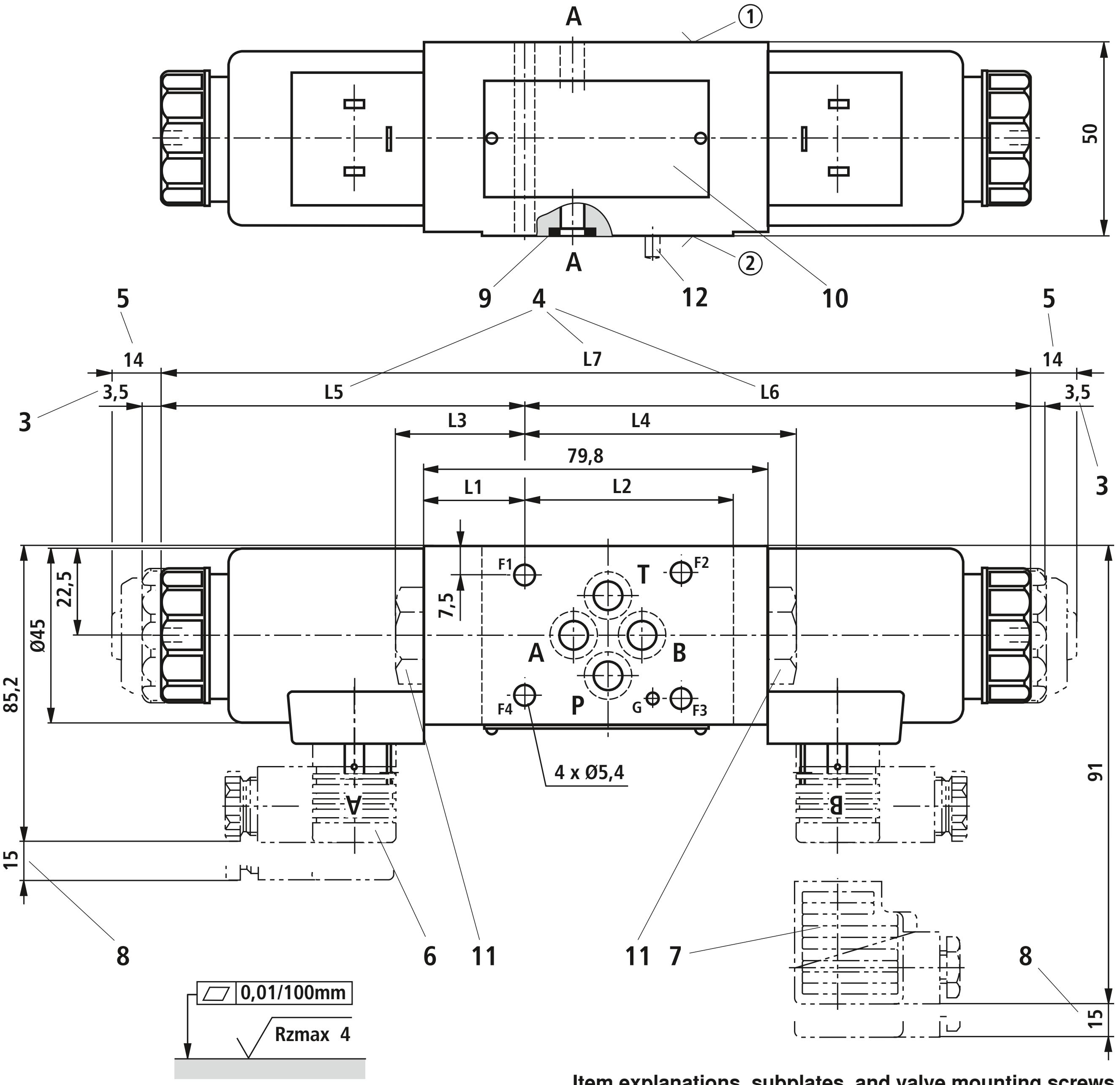
Item explanations, subplates, and valve mounting screws
see page 16.



Required surface quality of the valve mounting face

Unit dimensions: With DC solenoid (dimensions in mm)

Spool symbols X250, X252, X253, X254, X255, X256, …



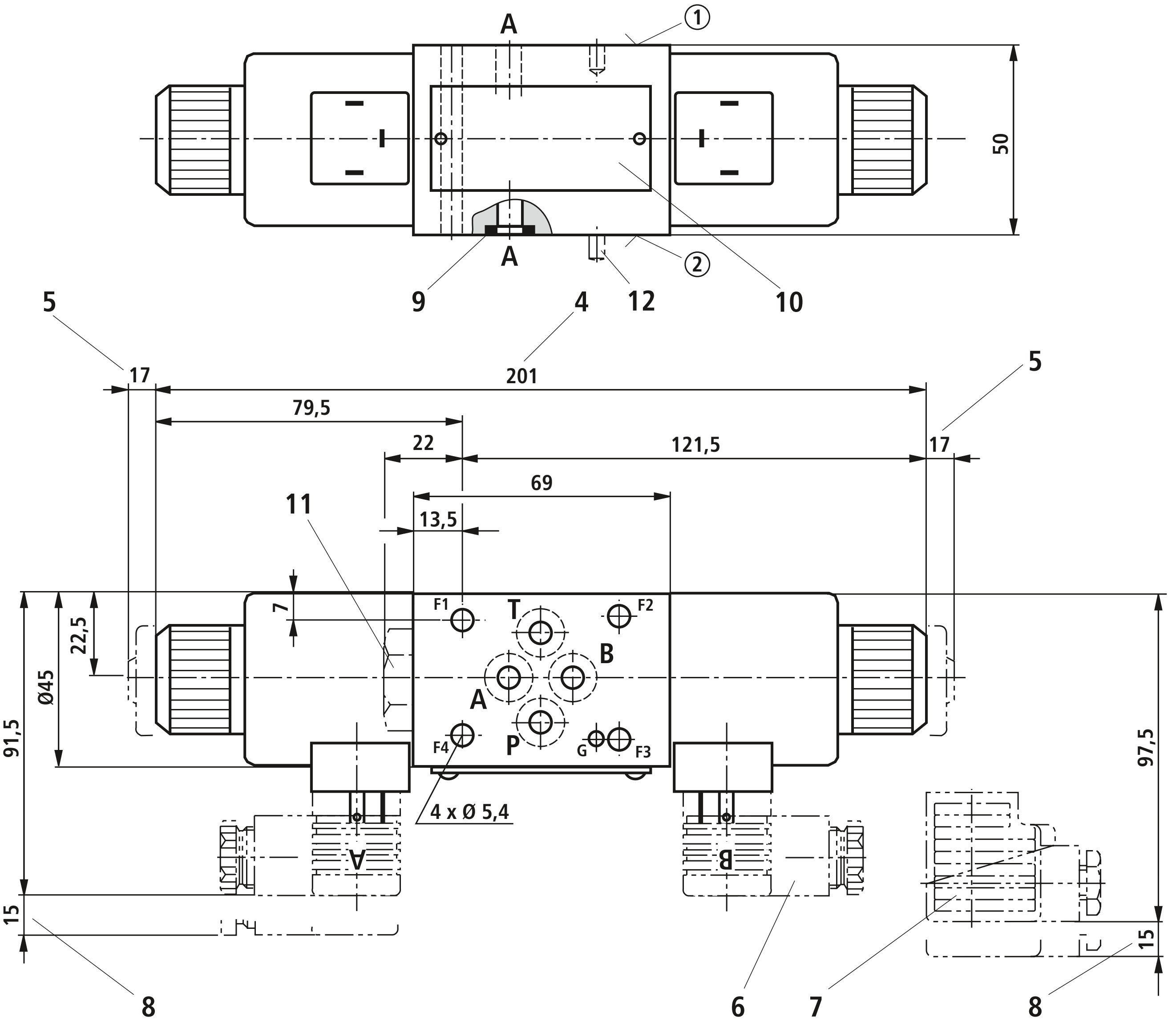
Required surface quality of the valve mounting face

Item explanations, subplates, and valve mounting screws see page 16.

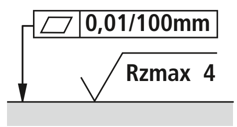
Spool symbol	Solenoid side a	Solenoid side b	L1	L2	L3	L4	L5	L6	L7
X250	X		24.9	54.9	–	63.3	93.3	–	–
X252		X	24.9	54.9	33.5	–	–	123.1	–
X253		X	18.3	54.3	26.9	–	–	129.7	–
X254	X		18.3	54.3	–	69.9	86.7	–	–
X255	X	X	25.9	53.9	–	–	94.3	131.1	225.4
X256		X	12	54.8	20.6	–	–	136	–

Spool symbols X161, X163, X181, X183, X187, X188, X193 and X157 upon request.

Unit dimensions: With AC solenoid (dimensions in mm)



Item explanations, subplates, and valve mounting screws see page 16.



Required surface quality of the valve mounting face

Unit dimensions

① Component side – porting pattern according to DIN 24340 form A (without locating hole), or ISO 4401-03-02-0-05 (with locating hole Ø3 x 5 mm deep)

② Plate side – porting pattern according to ISO 4401-03-02-0-05 (with locating hole for locating pin ISO 8752-3x8-St, version "/60" and "/62")

3 Dimension for valve without manual override

4 Dimension for solenoid **with concealed** manual override "**N9**" (standard)

5 Dimension for valve with manual override "N"

6 Mating connector **without** circuitry (separate order, see page 2 and data sheet 08006)

7 Mating connector **with** circuitry (separate order, see page 2 and data sheet 08006)

8 Space required for removing the mating connector

9 Identical seal rings for ports A, B, P, T (plate side)

10 Name plate

11 Plug screw for valve with one solenoid

12 Locating pin ISO 8752-3x8-St; only version "/62"

Subplates according to data sheet 45052 (separate order)

(**without** locating hole)	G 341/01 (G1/4)
	G 342/01 (G3/8)
	G 502/01 (G1/2)
(**with** locating hole)	G 341/60 (G1/4)
	G 342/60 (G3/8)
	G 502/60 (G1/2)

Valve mounting screws (separate order)

– **4 hexagon socket head cap screws ISO 4762 - M5 - 10.9-flZn-240h-L**
friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_A = 7 Nm ±10 %
or

– **4 hexagon socket head cap screws ISO 4762 - M5 - 10.9**
with friction coefficient μ_{total} = 0.12 to 0.17,
tightening torque M_A = 8.1 Nm ±10 %

Notice!

Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Circuit breaker with tripping characteristics "K"

according to EN 60898-1 (VDE 0641-11), EN 60947-2 (VDE 0660-101), IEC 60898 and IEC 60947-2

AC solenoid 50 Hz	Lower rated current I_1 in A	Upper rated current I_2 in A
W24	2.30	3.60
W42	1.45	1.92
W48	1.15	1.92
W100	0.64	0.90
W110	0.60	0.90
W115	0.52	0.90
W127	0.48	0.60
W200	0.33	0.60
W220	0.31	0.60
W230	0.26	0.36
W240	0.26	0.36

AC solenoid 60 Hz	Lower rated current I_1 in A	Upper rated current I_2 in A
W24	1.73	2.40
W42	1.13	1.92
W48	1.09	1.92
W100	0.58	0.90
W110	0.52	0.90
W115	0.43	0.90
W127	0.37	0.60
W200	0.30	0.60
W220	0.26	0.36
W230	0.20	0.36
W240	0.22	0.36

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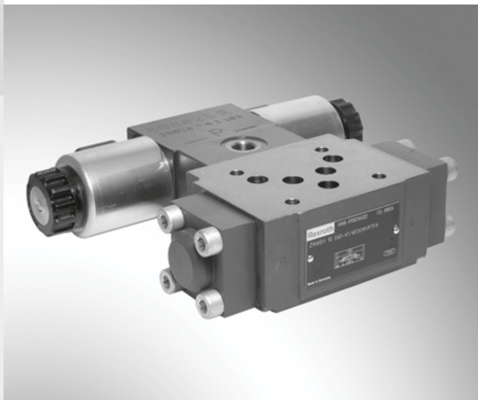
documentation@boschrexroth.de
www.boschrexroth.de

4/2 and 4/3 directional shut-off valves, internally pilot operated, externally pilot operated

RE 24753/08.08
Replaces: 04.93

Types Z4WEH and Z4WH

Size 10
Component series 4X
Maximum operating pressure 315 bar
Maximum flow 160 l/min



tb0255

Table of contents

Features

– Directional spool valve, pilot operated
– 2 types of actuation:
  • Electrohydraulic (type WEH)
  • Hydraulic (type WH)
– Function as shut-off through-valve or shut-off/through valve/short-circuit valve
– Free flow in P and T in every spool position
– Porting pattern to ISO 4401-05-04-0-05
– Wet-pin DC or AC voltage solenoids, optional
– Manual override, optional
– Electrical connection as individual or central connection, see RE 23178 and RE 08010
– Switching time adjustment, optional
– Stroke adjustment of main spool, optional
– Inductive position switch and proximity sensors (contactless), see RE 24830

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z4		10		–4X/					

Types of actuation
Electrohydraulic = **WEH**
Hydraulic = **WH**

Size
NG10 = **10**

Spool symbols, see pages 4 and 5

Component series 40 to 49 = **4X**
(40 to 49: unchanged installation and connection dimensions)

Pilot valve
High-performance valve (RE 23178) = **6E** [1]

DC voltage 24 V = **G24** [1]
AC voltage 230 V 50/60 Hz = **W230** [1]
DC voltage 205 V 50/60 Hz = **G205** [1; 2]
For further voltages, frequencies and electrical data, see data sheet RE 23178

Without manual override = **No code**
With manual override = **N** [1]
With concealed manual override (standard) = **N9** [1]

External pilot oil supply, external pilot oil drain = **No code**
Internal pilot oil supply, internal pilot oil drain (standard) = **ET**
External pilot oil supply, internal pilot oil drain = **T**
(with type Z4WH… **only “No code“** possible!)

Without switching time adjustment = **No code**
Switching time adjustment as meter-in control = **S**
Switching time adjustment as meter-out control = **S2**

[1] Only with electrohydraulic actuation, version “WEH“

[2] For connection to the AC voltage mains, a DC voltage solenoid **must** be used, which is to be controlled via a rectifier (see table on the right-hand side).
In the case of individual connection, a mating connector with integrated rectifier can be used (separate order, see page 3).

[3] Mating connectors, separate order, see page 3.

[4] On version “D3“, a throttle insert “B08“ must be installed in port P of the pilot valve!

AC voltage mains (permissible voltage tolerance ±10%)	**Nominal voltage of the DC voltage solenoid when operated with AC voltage**	**Ordering code**
110 V - 50/60 Hz 120 V - 60 Hz	96 V	**G96**
230 V - 50/60 Hz	205 V	**G205**

Standard types and components are shown in the EPS (standard price list).

K4							*

Further details in clear text

Seal material
No code = NBR seals
V = FKM seals
(other seals on request)
⚠ **Attention!**
Observe compatibility of seals with hydraulic fluid used!

No code = **Without** pressure reducing valve
D3 1; 4) **=** **With** pressure reducing valve (to be used, if pilot pressure > 250 bar)

Throttle insert 1)
No code = Without throttle insert
B08 = Throttle Ø 0.8 mm
B10 = Throttle Ø 1.0 mm

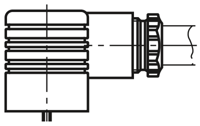
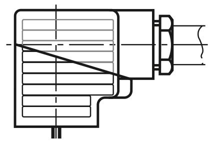
Stroke adjustment
No code = Without stroke adjustment
10 = Stroke adjustment on sides A and B
11 = Stroke adjustment on side A
12 = Stroke adjustment on side B
For further details, see page 12

Without slash = No further details
/ = Further details

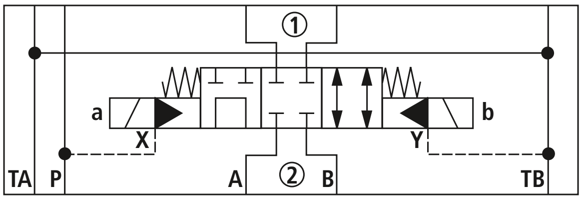
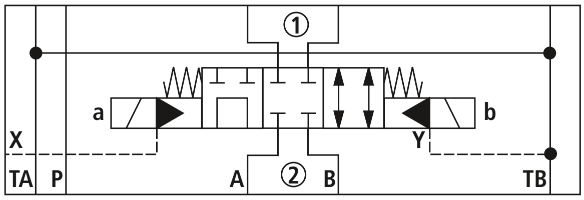
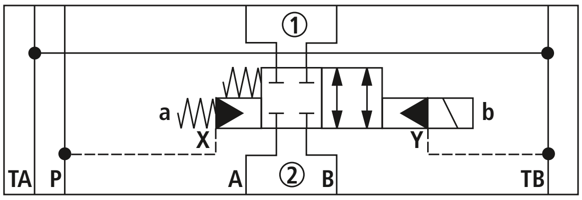
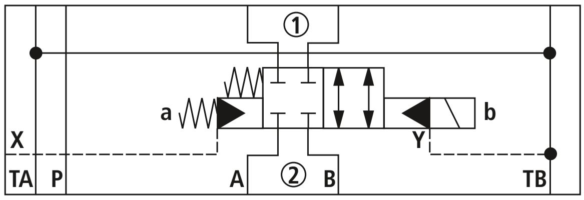
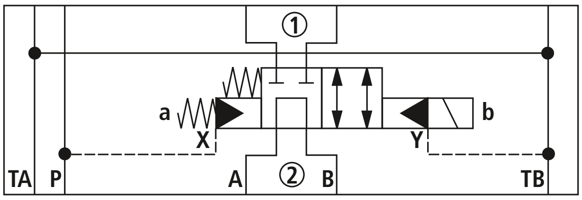
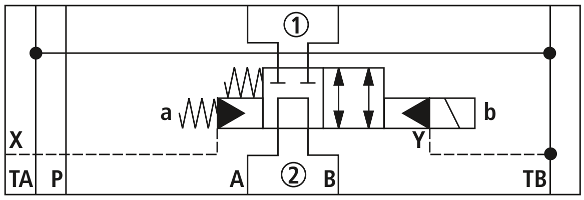
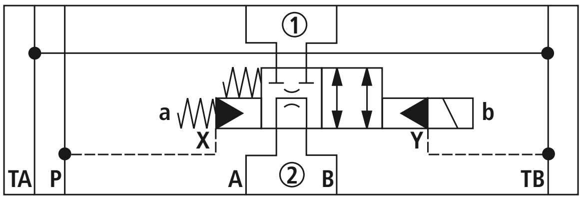
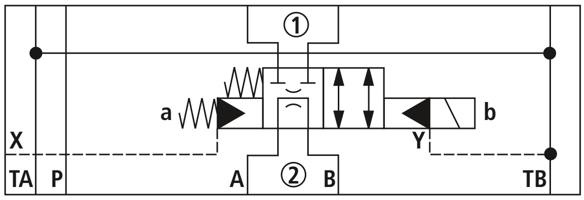
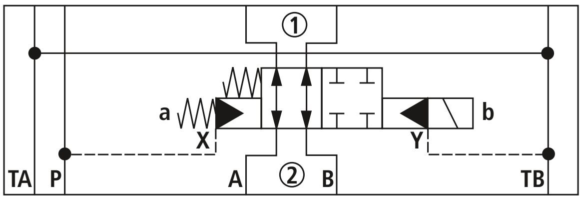
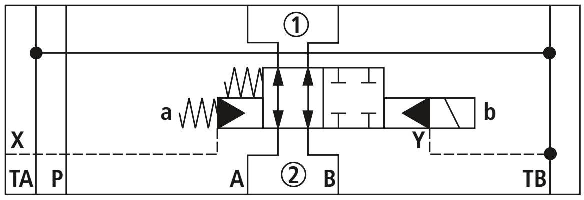
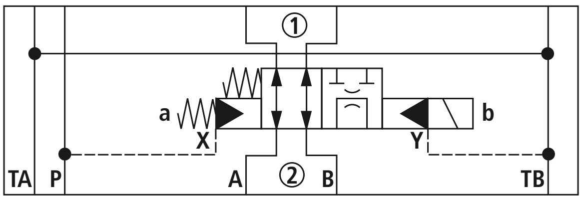
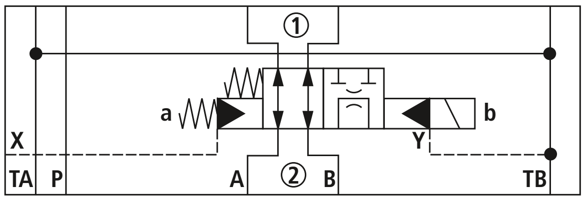
Spool position monitoring
No code = Without position switch
QMAG24 = Monitored spool position “a“
QMBG24 = Monitored spool position “b“
QMABG24 = Monitored spool positions “a“ and “b“
QM0G24 = Monitored rest position
For further details, see RE 24830

Electrical connection 1)
K4 3) **=** Without mating connector, individual connection with component plug to DIN EN 175301-803
For further electrical connections, see RE 23178 and RE 08010

Mating connectors to DIN EN 175301-803

For details and further mating connectors, see RE 08006						
		Material no.				
Valve side	**Color**	Without circuitry	With indicator lamp 12 … 240 V	With rectifier 12 … 240 V	With indicator lamp and Zener-diode suppressor circuit 24 V
a	Gray	**R901017010**	–	–	–
b	Black	**R901017011**	–	–	–
a/b	Black	–	**R901017022**	**R901017025**	**R901017026**

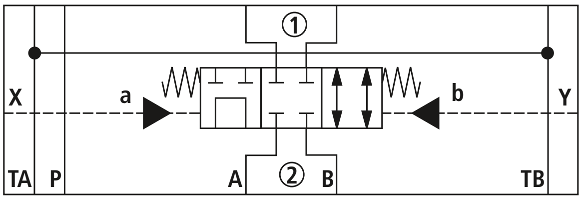
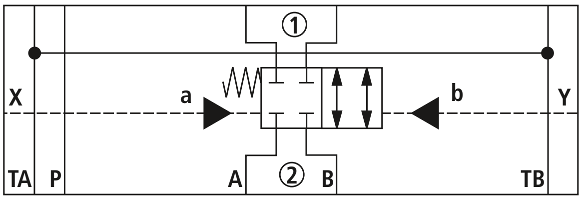
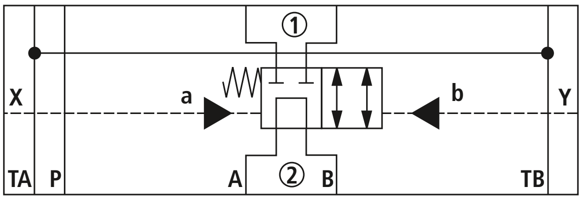
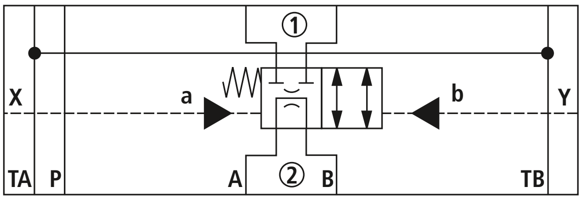
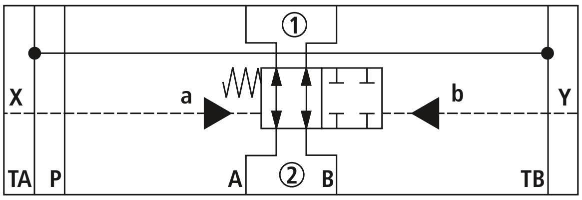
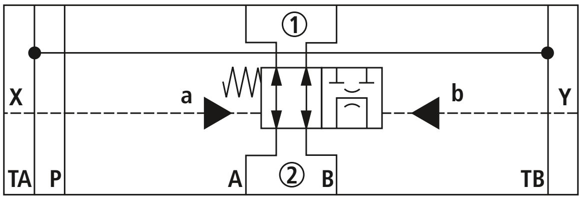
Symbols: Type Z4WEH (① = component side, ② = plate side)

Order-ing code	Version "ET"	Version "T"
E62		
E63		
E68		
E50 [1]		
E51		
E52 [2]		

[1] Opening cross-section in spool position "a" (A2 → B2) = 50 mm^2

[2] Opening cross-section in spool position "b" (A2 → B2) = 35 mm^2

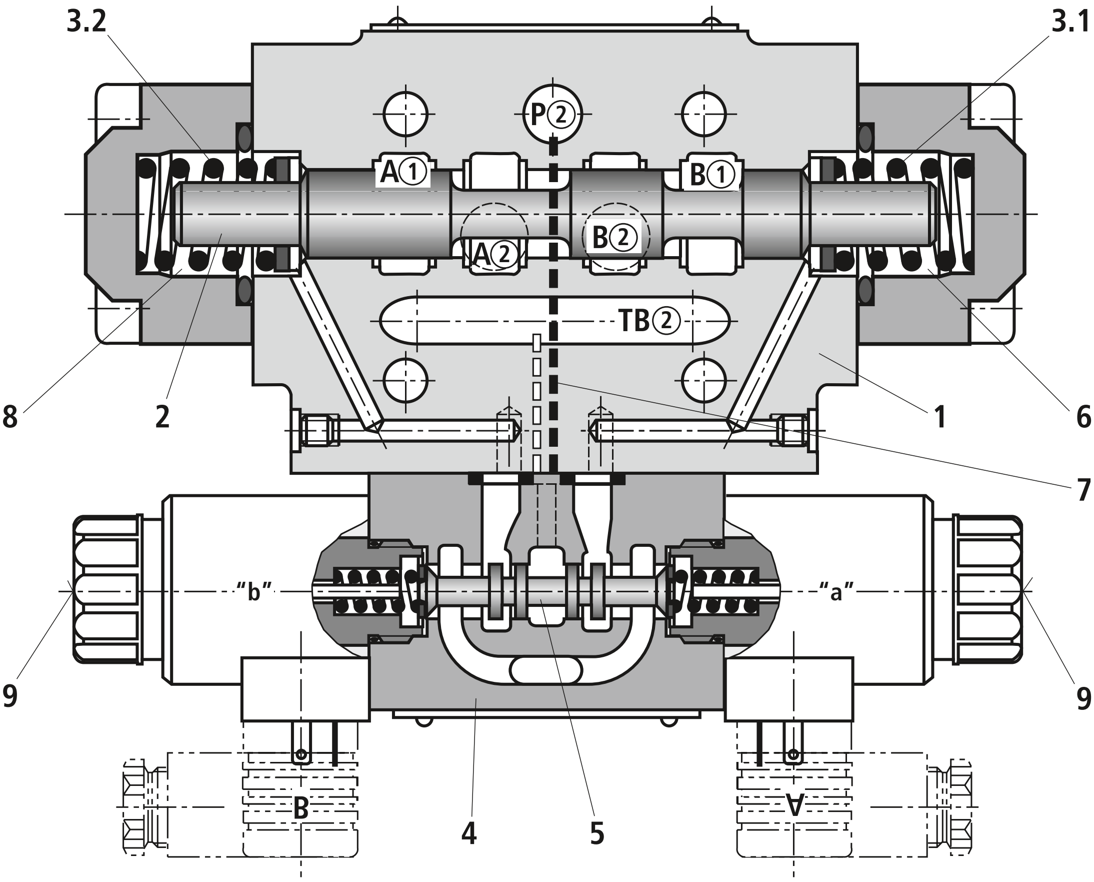
Symbols: Type Z4WH (① = component side, ② = plate side)

Order-ing code	Version "No code"
E62	
E63	
E68	
E50 [1)]	
E51	
E52 [2)]	

1) Opening cross-section in spool position "a" (A2 → B2) = 50 mm^2

2) Opening cross-section in spool position "b" (A2 → B2) = 35 mm^2

Function, section: Type Z4WEH



① = component side
② = plate side

Valves of type Z4WEH are directional spool valves with electrohydraulic actuation. They control the start and stop of a flow.

These directional valves basically consist of the main valve with housing (1), main control spool (2), one or two return springs (3.1 and 3.2), and pilot valve (4).

Main control spool (2) in the main valve is held by the springs in the zero or initial position. In the initial position, the two spring chambers (6) and (8) are connected pressureless to tank via pilot valve (4). The pilot valve is supplied with pilot oil via pilot channel (7). The pilot oil supply can be provided internally or externally (externally via port X in the sandwich plate, see page 10).

When the pilot valve is operated, e.g. solenoid "a", pilot spool (5) is pushed to the left, and consequently spring chamber (8) is pressurized to pilot pressure. Spring chamber (6) remains pressureless.

The pilot pressure acts on the left side of main control spool (2) and pushes it against spring (3.1). As a result of this, the connections on the component side and on the plate side are opened according to the relevant symbols.

When the solenoid is de-energized, pilot spool (5) returns to the initial position. Pressure chamber (8) is unloaded to the tank.

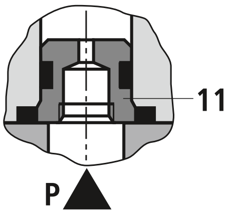
The pilot oil is drained from spring chamber (8) internally via pilot valve (4) into channel T (Y).

An optional manual override (9) allows pilot spool (5) to be moved without energization of the solenoid.

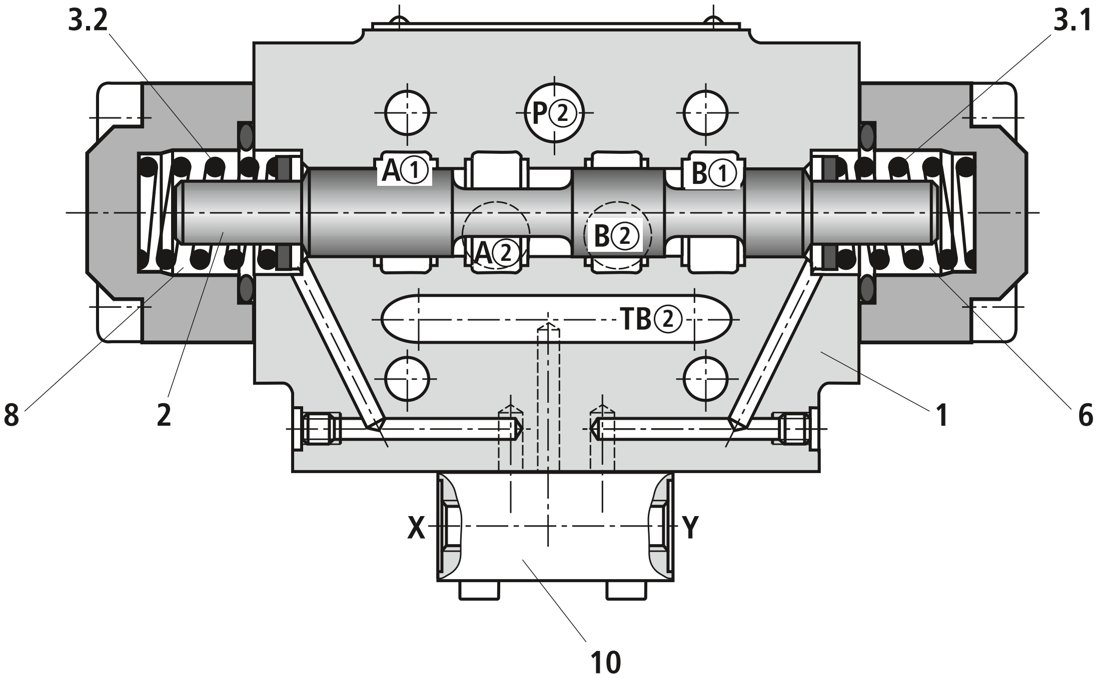
Throttle insert

The use of throttle insert (11) is required, if the pilot oil supply in channel P of the pilot valve is to be limited.

Throttle insert (11) is to be installed in channel P of the pilot valve.



Function, section: Type Z4WH



Valves of type Z4WH are directional spool valves with hydraulic actuation. They control the start and stop of a flow.

These directional valves basically consist of valve housing (1), main control spool (2), one or two return springs (3.1) and (3.2) in the case of valves with spring return or spring centering, as well as pilot oil subplate (10).

Main control spool (2) is operated directly by pressurization.

Main control spool (2) is held by springs in the zero or initial position. The pilot oil is supplied and drained externally (see page 12).

Technical data (for applications outside these parameters, please consult us!)

General

Weight	– Valve with 1 solenoid	kg	4.2
	– Valve with 2 solenoids	kg	4.6
	– Valve with hydraulic actuation (type 4WH…)	kg	3.5
	– Switching time adjustment	kg	0.8
	– Pressure reducing valve	kg	0.4
	– Plate for version "T"	kg	0.5
Installation position			Optional
Ambient temperature range		°C	–30 to +50 (NBR seals) –20 to +50 (FKM seals)

Hydraulic

Maximum operating pressure	– Ports A and B	bar	315
	– Port P		
	External pilot oil supply	bar	315
	Internal pilot oil supply	bar	250 (without pressure reducing valve) 315 (with pressure reducing valve)
	– Port T (Pilot oil drain only internal)	bar	210 (with DC solenoid) 160 (with AC solenoid)
Minimum pilot pressure		bar	12
Maximum flow		l/min	160
Pilot volume for operation		cm^3	1.3
Hydraulic fluid [1]			Mineral oil (HL, HLP) to DIN 51524 [2]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [2]; HEPG (polyglycols) [3]; HEES (synthetic esters) [3]; other hydraulic fluids on request
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	2.8 to 500
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [4]

Electrical

Switching time to ISO 6403	at pilot pressure	bar	70		140		210	
			~	=	~	=	~	=
	– ON	ms	30	65	25	60	20	55
	– OFF	ms	30					

[1] The ignition temperature of the process and operating medium used must be higher than the maximum solenoid surface temperature.

[2] Suitable for NBR and FKM seals

[3] Suitable only for FKM seals

[4] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

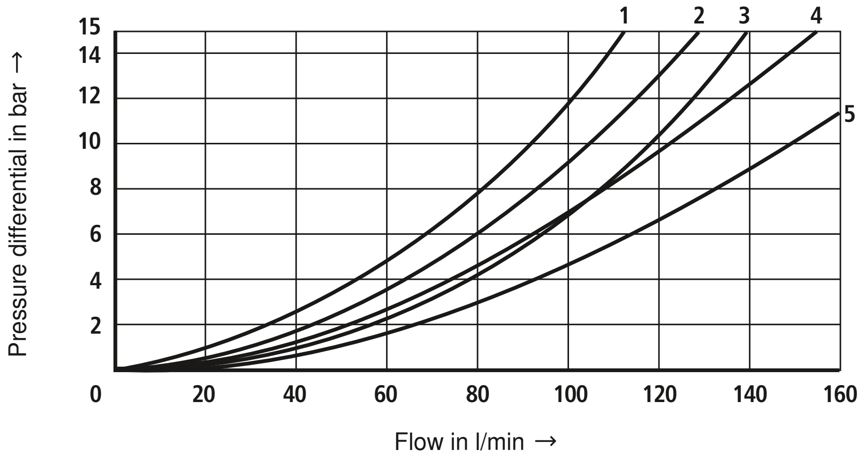
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

☞ **Notes!**

- The manual override can only be actuated up to a tank pressure of ca. 50 bar. Avoid damage to the bore for the manual override! (Special tool for operation, separate order, Material no. **R900024943**). When the manual override is blocked, operation of the solenoids must be ruled out!
- The simultaneous operation of the solenoids must be ruled out!

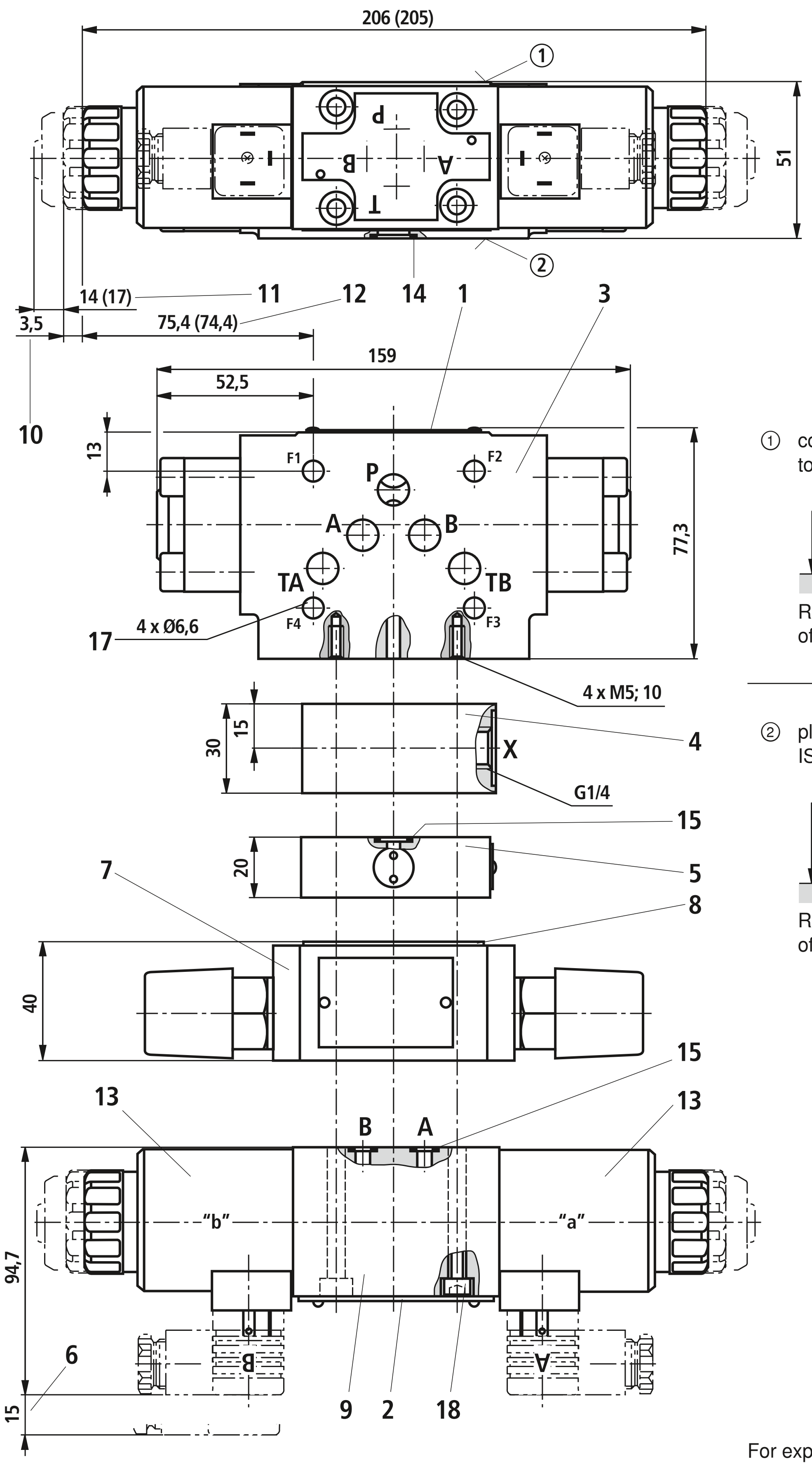
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Δp-q_V characteristic curves



1 A1 → A2; B1 → B2
2 A2 → A1
3 A2 → B2
4 B2 → B1
5 B2 → A2

Unit dimensions: Type Z4WEH10 (dimensions in mm)



① component side - porting pattern to ISO 4401-05-04-0-05

0,01/100

Rzmax 4

Required surface quality of the valve mounting face

② plate side - porting pattern to ISO 4401-05-04-0-05

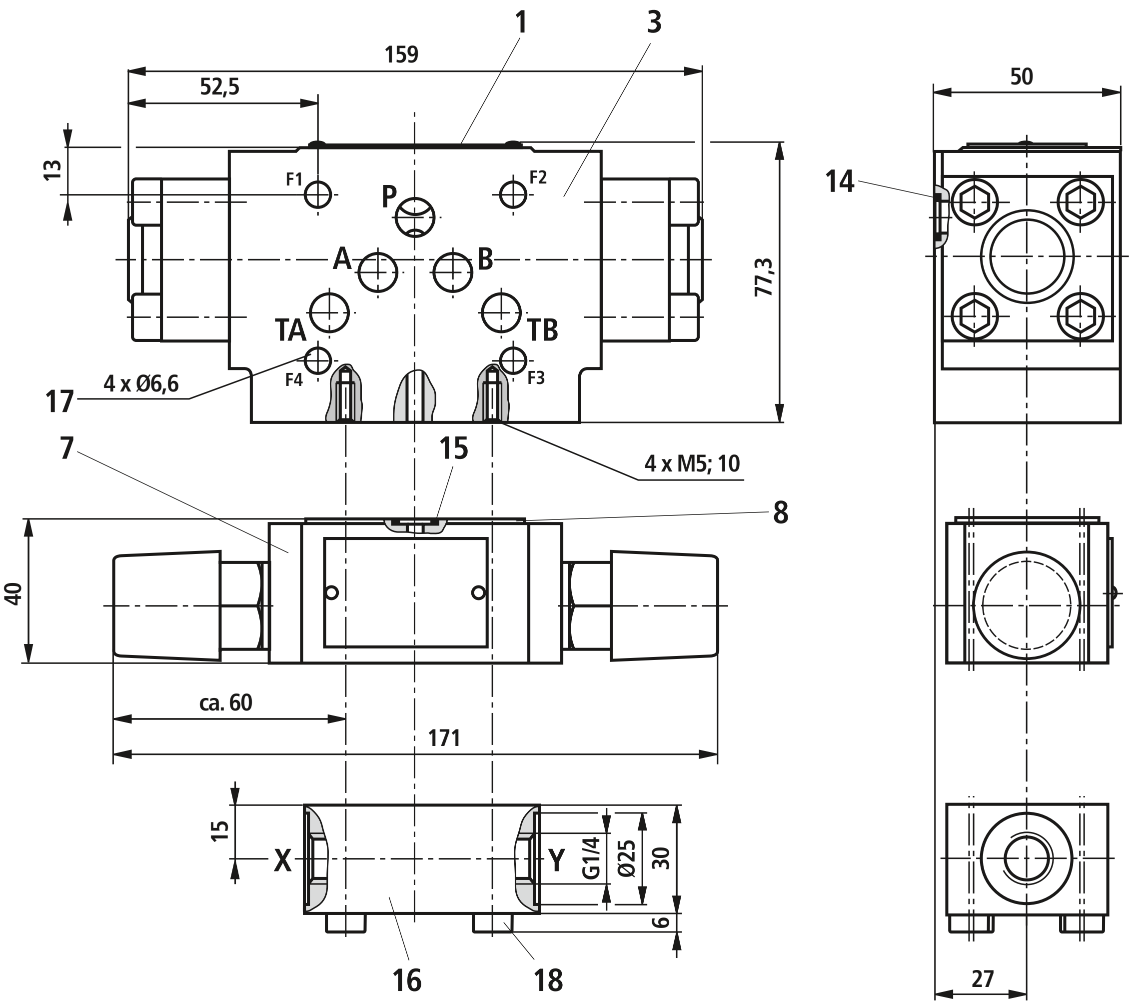
0,01/100

Rz 20
Rz 12

Required surface quality of the valve mounting face

For explanations of items, see page 11.

Unit dimensions: Type Z4WH10 (dimensions in mm)



1 Nameplate of complete valve

2 Nameplate of pilot valve

3 Main valve

4 Sandwich plate for external pilot control (to be used at operating pressure > 210 bar)

5 Pressure reducing valve “D3”
(must be used in the case of pilot pressures above 250 bar; only with version “Z4WEH“)

Material no.:
NBR seals: **R900323180**
FKM seals: **R900323664**

6 Space required to remove mating connector

7 Switching time adjustment (for throttle check valve, see data sheet RE 27506); depending on the installation position, meter-in or meter-out control (illustration: meter-in control)

8 R-ring plate

9 Pilot valve (see data sheet RE 23178)
– Type 4WE 6 **J**.. for symbol E62
– Type 4WE 6 **Y**.. for symbol E50, E51, E52, E63, E68
Dimensions () for valve with AC solenoid

10 Dimension for valve without manual override

11 Dimension for valve with manual override “N“; dimensions () for valve with AC solenoid

12 Dimension for valve with concealed manual override “N9“; dimensions () for valve with AC solenoid without manual override

13 Solenoids “a” and “b” (can be rotated 90°)

14 Identical seal rings for ports A, B, P, TA and TB

15 Identical seal rings for ports A, B, P and T

16 Pilot oil subplate

17 Valve mounting bores
Valve mounting screws (separate order)
4 hexagon socket head cap screws ISO 4762 - M6 - 10.9

18 **Valve mounting screws** (separate order)
4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

☞ **Note!**

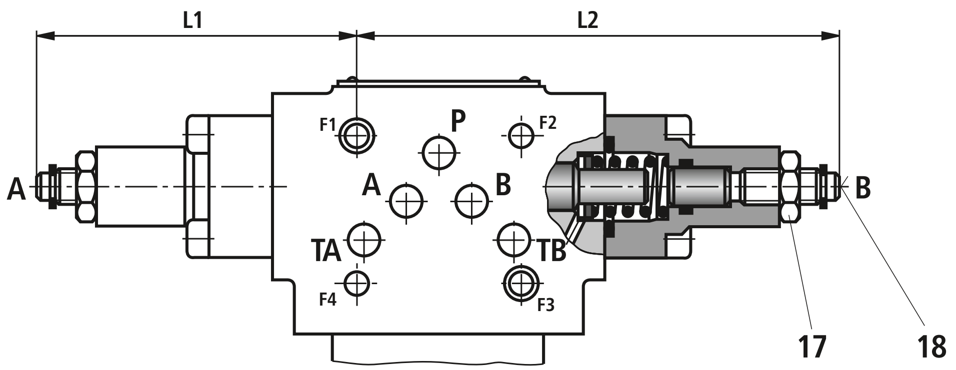
The length and tightening torque of the valve mounting screws must be calculated taking account of the components mounted.

Stroke adjustment, attachment options (dimensions in mm)

Attachment options	Ordering code	L1	L2
Stroke adjustment on sides A and B	**10**	95	149
Stroke adjustment on side A	**11**	95	
Stroke adjustment on side B	**12**		149

The stroke adjustment feature limits the stroke of the main spool. The spool stroke can be reduced by loosening locknut (17) and turning adjustment spindle (18) clockwise. The control chamber must be pressureless during this process.

Stroke 6 mm (1 turn = 1 mm stroke)



17 Locknut 27 A/F

18 Adjustment spindle, hexagon socket 5 A/F

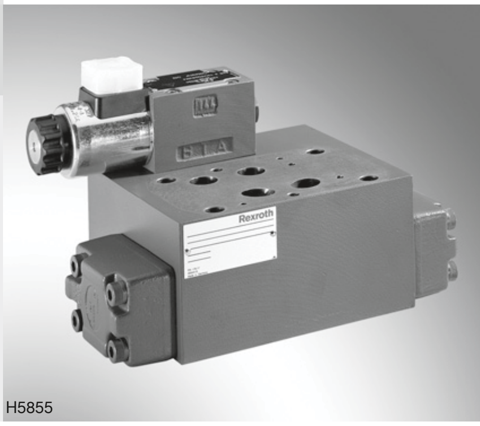
Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

4/2 and 4/3 directional shut-off valves, internally pilot operated, externally pilot operated

RE 24761/08.08
Replaces: 10.97

Types Z4WEH and Z4WH

Size 16
Component series 5X
Maximum operating pressure 315 bar
Maximum flow 300 l/min



H5855

Table of contents

Features

– Directional spool valve, pilot operated
– 2 types of actuation:
  • Electrohydraulic (type WEH)
  • Hydraulic (type WH)
– Function as shut-off through valve or shut-off/through valve/short-circuit valve
– Free flow in P and T in every spool position
– Porting pattern to ISO 4401-07-07-0-05
– Wet-pin DC or AC voltage solenoids, optional
– Manual override, optional
– Electrical connection as individual connection, see RE 23178 and RE 08010 (central connection on request)
– Switching time adjustment, optional
– Stroke adjustment on main spool, optional
– Inductive position switch and proximity sensors (contactless), see RE 24830

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z4		16		–5X/					

Types of actuation

Electrohydraulic	= **WEH**
Hydraulic	= **WH**
Size 16	= **16**
Spool symbols, see pages 4 and 5	
Component series 50 to 59 (50 to 59: unchanged installation and connection dimensions)	= **5X**
Pilot valve High-performance valve (RE 23178)	= **6E** 1)
DC voltage 24 V	= **G24** 1)
AC voltage 230 V 50/60 Hz	= **W230** 1)
DC voltage 205 V 50/60 Hz	= **G205** 1; 2)
For further voltages, frequencies and electrical data, see data sheet RE 23178	
Without manual override	= **No code**
With manual override	= **N** 1)
With concealed manual override (standard)	= **N9** 1)
External pilot oil supply, external pilot oil drain	= **No code**
Internal pilot oil supply, internal pilot oil drain (standard)	= **ET** 3)
External pilot oil supply, internal pilot oil drain	= **T**
(with type Z4WH… **only “No code“** possible!)	
Without Switching time adjustment	= **No code**
Switching time adjustment as meter-in control	= **S**
Switching time adjustment as meter-out control	= **S2**

1) Only with electrohydraulic actuation, version “WEH“

2) For connection to the AC voltage mains, a DC solenoid **must** be used, which is controlled via a rectifier (see table on the right-hand side).

In the case of individual connection, a mating connector with integrated rectifier can be used (separate order, see page 3).

3) Internal pilot oil **supply**:

– Minimum pilot pressure: Please read page 7!

– To prevent impermissibly high pressure peaks, a **throttle insert “B10“** must be provided in the P port of the pilot valve (see page 6).

4) Mating connectors, separate order, see page 3.

5) For version “D3“ a throttle insert “B10“ must be installed in port P of the pilot valve!

AC voltage mains (permissible voltage tolerance ±10%)	**Nominal voltage of the DC voltage solenoid when operated with AC voltage**	**Ordering code**
110 V - 50/60 Hz 120 V - 60 Hz	96 V	**G96**
230 V - 50/60 Hz	205 V	**G205**

Standard types and components are shown in the EPS (standard price list).

K4							*

* = Further details in clear text

Seal material

No code = NBR seals
V = FKM seals
(other seals on request)

⚠ **Attention!**
Observe compatibility of seals with hydraulic fluid used!

No code = **Without** pressure reducing valve
D3 [1; 5] **=** **With** pressure reducing valve (to be used, if pilot pressure > 250 bar)

Throttle insert [1]

No code = Without throttle insert
B08 = Throttle Ø 0.8 mm
B10 = Throttle Ø 1.0 mm

Stroke adjustment

No code = Without stroke adjustment
10 = Stroke adjustment on sides A and B
11 = Stroke adjustment on side A
12 = Stroke adjustment on side B
For further details, see page 13

Without slash = No further details
/ = Further details

Spool position monitoring

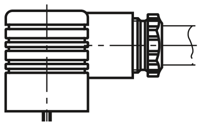
No code = Without position switch
QMAG24 = Monitored spool position “a“
QMBG24 = Monitored spool position “b“
QMABG24 = Monitored spool positions “a“ and “b“
QM0G24 = Monitored rest position (not for valve with 2 spool positions)
For further details, see RE 24830

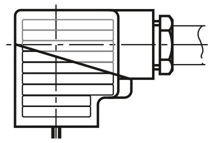
Electrical connection [1]

K4 [4] **=** Without mating connector, individual connection with component plug to DIN EN 175301-803
For further electrical connections, see RE 23178 and RE 08010

Mating connectors to DIN EN 175301-803

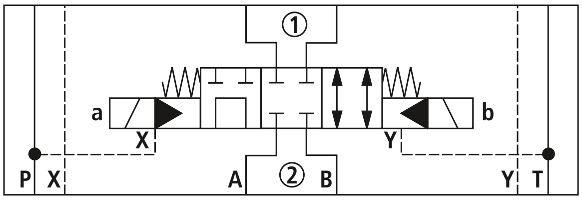
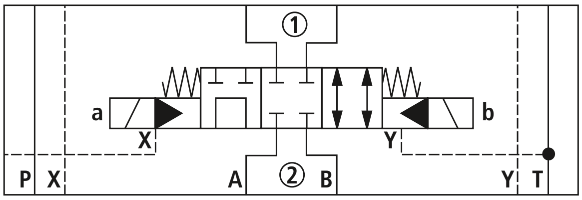
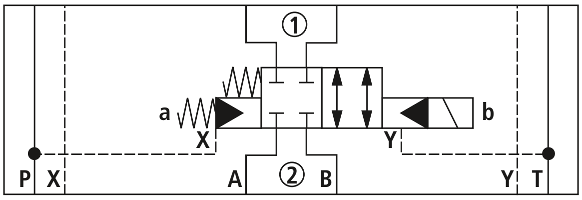
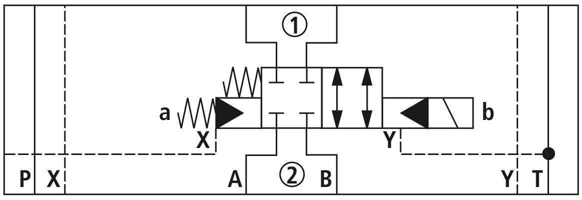
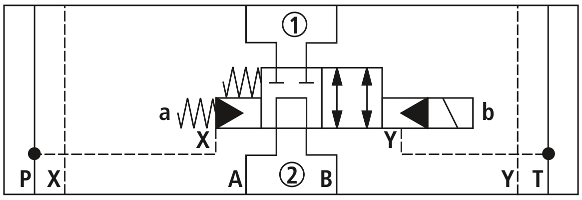
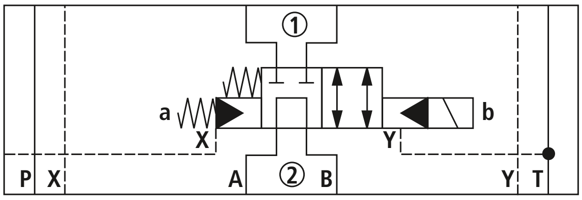
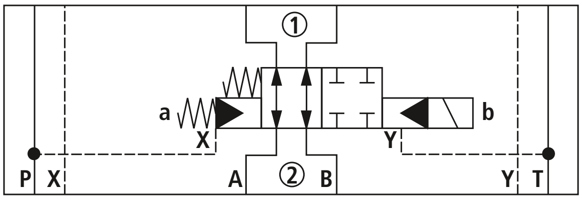
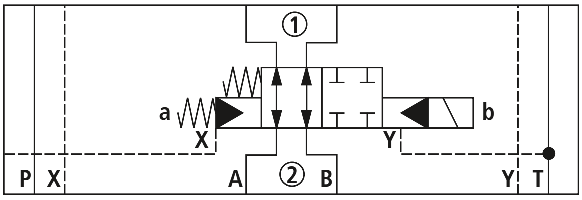
For details and further mating connectors, see RE 08006



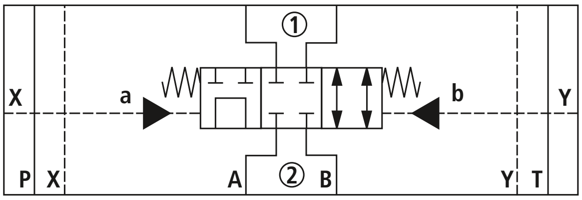
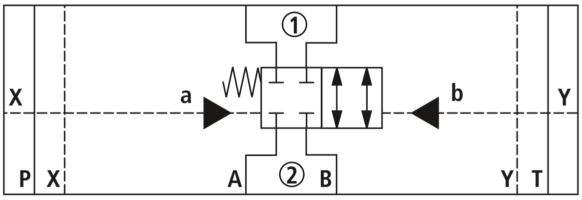
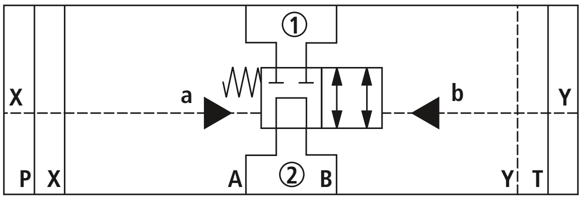
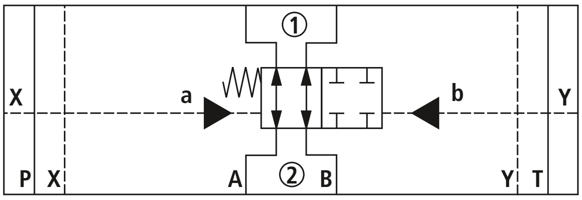


Valve side	Color	Material no. Without circuitry	With indicator lamp 12 … 240 V	With rectifier 12 … 240 V	With indicator lamp and Zener-diode suppressor circuit 24 V
a	Gray	**R901017010**	–	–	–
b	Black	**R901017011**	–	–	–
a/b	Black	–	**R901017022**	**R901017025**	**R901017026**

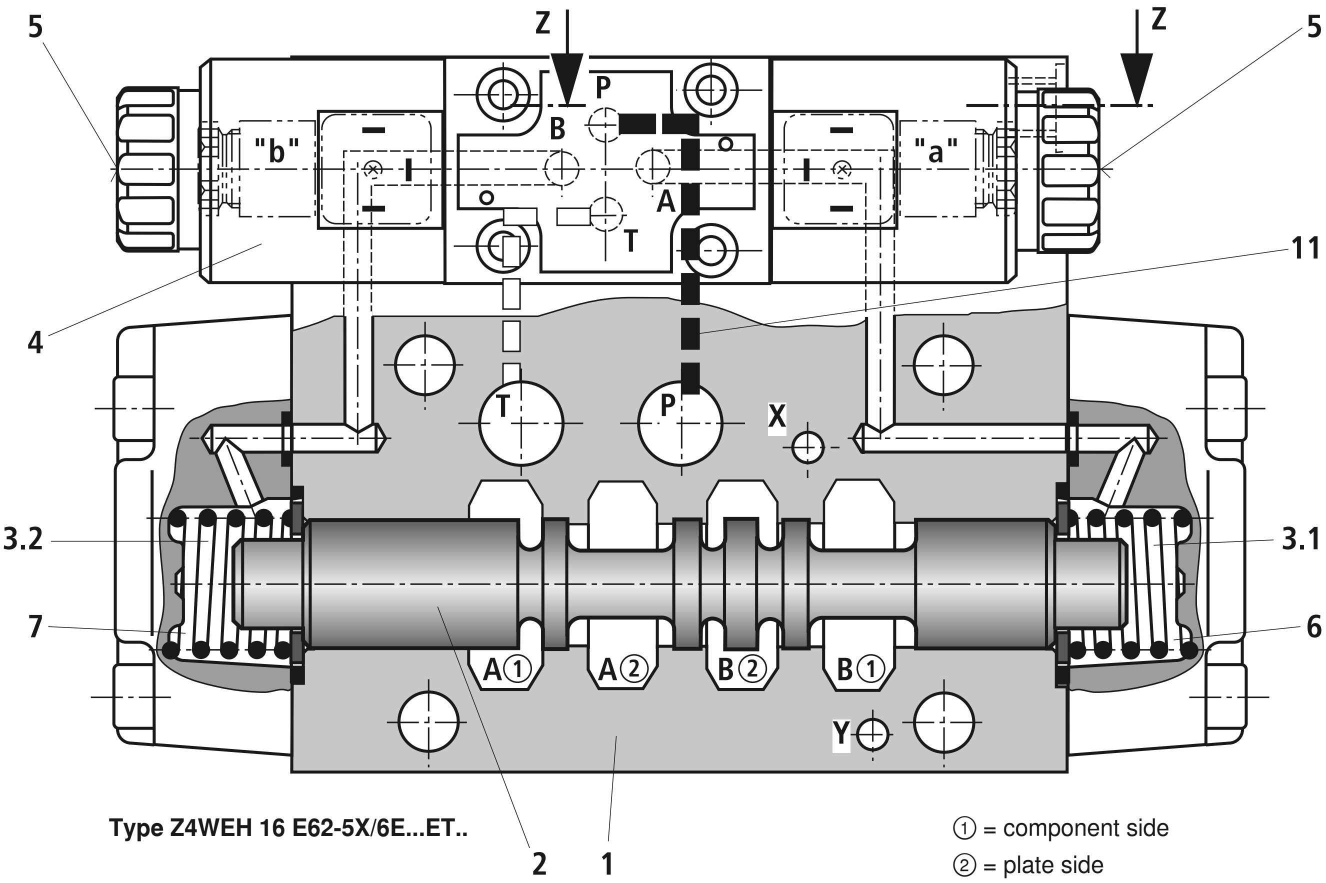
Symbols: Type Z4WEH (① = component side, ② = plate side)

Order-ing code	Version "ET"	Version "T"
E62		
E63		
E68		
E51		

Symbols: Type Z4WH (① = component side, ② = plate side)

Order-ing code	Version **"No code"**
E62	
E63	
E68	
E51	

Function, section



Type Z4WEH 16 E62-5X/6E...ET..

① = component side
② = plate side

Valves of type Z4WEH are directional spool valve with electrohydraulic actuation. They control the start and stop of a flow.

These directional valves basically consist of the main valve with housing (1), main control spool (2), one or two return springs (3.1 and 3.2), as well as the pilot valve (4).

Main control spool (2) in the main valve is held by the springs in the zero or initial position. In the initial position, the two spring chambers (6) and (7) are connected pressureless to tank via pilot valve (4). The pilot valve is supplied with pilot oil via pilot channel (11).The pilot oil supply can be provided internally or externally (externally via port X in the sandwich plate, see page 7).

When the pilot valve is operated, e.g. solenoid “a“, the pilot spool (not shown on the drawing) is pushed to the left, and consequently spring chamber (7) is pressurized to pilot pressure. Spring chamber (6) remains pressureless.

The pilot pressure acts on the left side of main control spool (2) and pushes it against spring (3.1). As a result of this, the connections on the component side and on the plate side are opened according to the relevant symbols.

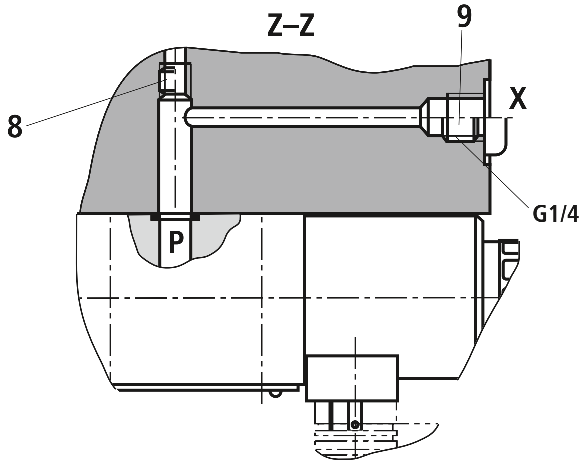
When the solenoid is de-energized, the pilot spool returns to the initial position. Pressure chamber (7) is unloaded to the tank.

The pilot oil is drained from spring chamber (7) internally via pilot valve (4) into channel T (Y).

An optional manual override (5) allows the pilot spool to be moved without energization of the solenoid.

Pilot oil supply (section Z – Z), **see page 7.**

Pilot oil supply



Pilot oil supply

External: **8** closed
9 open

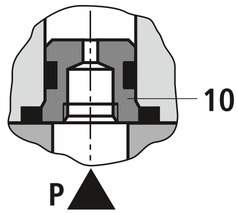
Internal: **8** open
9 closed

Pilot oil port “X“ only possible with Z4WEH 16 ... .

Throttle insert

The use of throttle insert (10) is required, if the pilot oil supply in channel P of the pilot valve is to be limited.

Throttle insert (10) is to be installed in channel P of the pilot valve.



Technical data (for applications outside these parameters, please consult us!)

General

Weight	– Valve with 1 solenoid	kg	14.1
	– Ventil with 2 solenoids	kg	14.4
	– Valve with hydraulic actuation (type 4WH…)	kg	13.3
	– Switching time adjustment	kg	0.8
	– Pressure reducing valve	kg	0.4
	– Plate for version "T"	kg	0.5
Installation position			Optional
Ambient temperature range		°C	–30 to +50 (NBR seals) –20 to +50 (FKM seals)

Hydraulic

Maximum operating pressure	– Ports A, B, X and Y	bar	315
	– Port P		
	External pilot oil supply	bar	315
	Internal pilot oil supply	bar	250 (without pressure reducing valve) 315 (with pressure reducing valve)
	– Port T (Pilot oil drain only internal)	bar	210 (version "WEH" with DC solenoid) 160 (version "WEH" with AC solenoid) 315 (version "WH")
Minimum pilot pressure		bar	12
Maximum pilot pressure		bar	250
Maximum flow		l/min	300
Pilot volume for operation		cm^3	4.9
Hydraulic fluid [1]			Mineral oil (HL, HLP) to DIN 51524 [2]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [2]; HEPG (polyglycols) [3]; HEES (synthetic esters) [3]; other hydraulic fluids on request
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	2.8 to 500
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [4]

[1] The ignition temperature of the process and operating medium used must be higher than the maximum solenoid surface temperature.

[2] Suitable for NBR and FKM seals

[3] Suitable only for FKM seals

[4] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Notes!

- The manual override can only be actuated up to a tank pressure of ca. 50 bar. Avoid damage to the bore for the manual override! (Special tool for operation, separate order, Material no. **R900024943**). When the manual override is blocked, operation of the solenoids must be ruled out!
- The simultaneous operation of the solenoids must be ruled out!

Switching times (= making contact on the pilot valve until the control land starts to open in the main valve and change of the pressure value by 5%)

ON – AC voltage (~) and DC voltage (=)

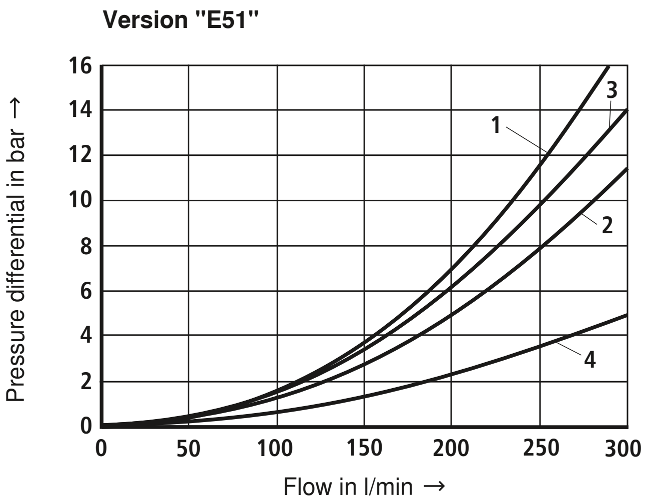
Pilot pressure	bar	70		140		210		250	
Type of voltage		~	=	~	=	~	=	~	=
3-position valve (spring-centered)									
– Version “ET“ (with throttle insert “B10“)	ms	60	85	55	70	45	60	45	55
– Version “ET“ (with pressure reducing valve “D3; 45 bar“)	ms	110	115	55	65	60	55	55	60
– Version “T“	ms	35	50	30	40	20	40	20	40
2-position valve (spring end position)									
– Version “ET“ (with throttle insert “B10“)	ms	80	105	65	85	50	80	50	80
– Version “ET“ (with pressure reducing valve “D3; 45 bar“)	ms	100	125	90	90	75	75	55	80
– Version “T“	ms	30	80	30	80	25	75	25	75

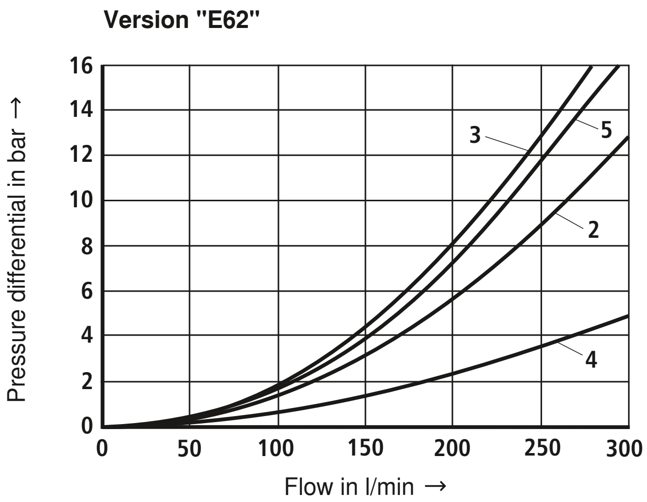
OFF – AC voltage (~) and DC voltage (=)

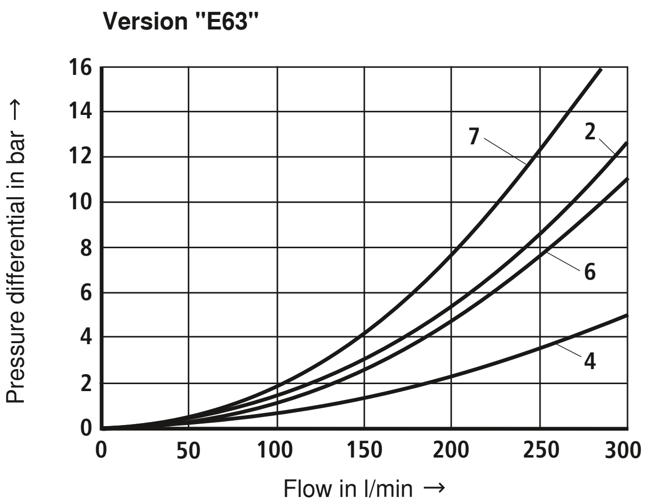
Pilot pressure	bar	70		140		210		250	
Type of voltage		~	=	~	=	~	=	~	=
3-position valve (spring-centered)									
– Version “ET“ (with throttle insert “B10“)	ms	40	30	40	30	40	30	40	30
– Version “ET“ (with pressure reducing valve “D3; 45 bar“)	ms	40	35	40	35	40	35	40	35
– Version “T“	ms	45	35	45	35	45	35	45	35
2-position valve (spring end position)									
– Version “ET“ (with throttle insert “B10“)	ms	45	30	45	30	45	30	45	30
– Version “ET“ (with pressure reducing valve “D3; 45 bar“)	ms	55	35	55	35	55	35	55	35
– Version “T“	ms	35	35	35	35	35	35	35	35

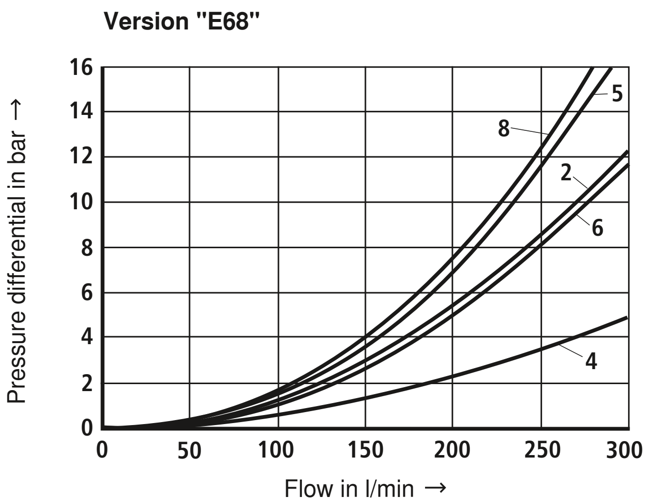
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Δp-q_V characteristic curves



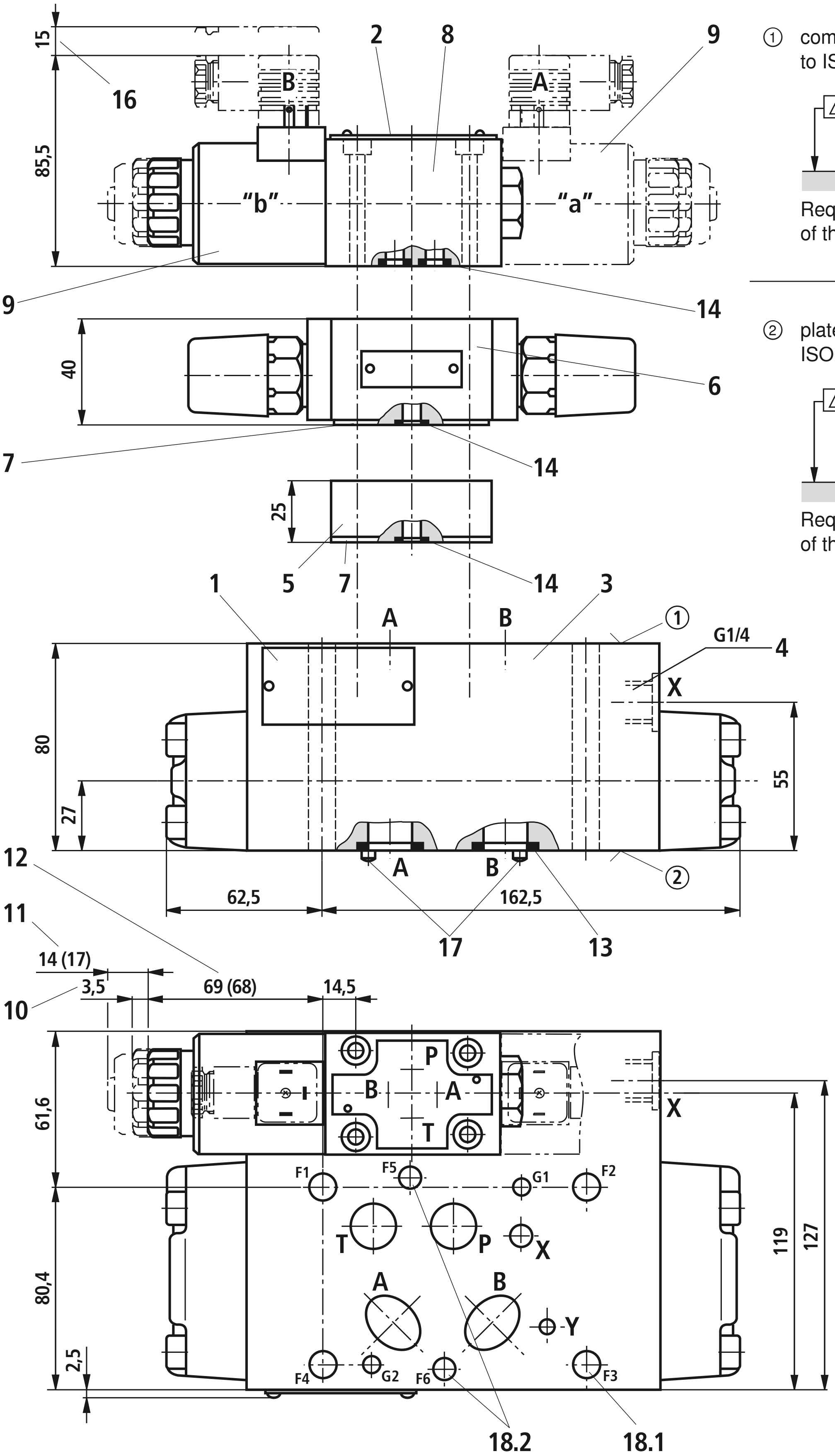




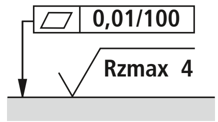


1 A2 → A1
2 B1 → B2
3 A1 → A2; B2 → B1
4 P1 → P2; T1 → T2
5 A2 → B2; A2 → A1
6 A1 → A2
7 A2 → A1; B2 → B1
8 B2 → B1

Unit dimensions: Type Z4WEH16 (dimensions in mm)

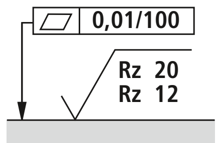


① component side - porting pattern to ISO 4401-07-07-0-05



Required surface quality of the valve mounting face

② plate side - porting pattern to ISO 4401-07-07-0-05

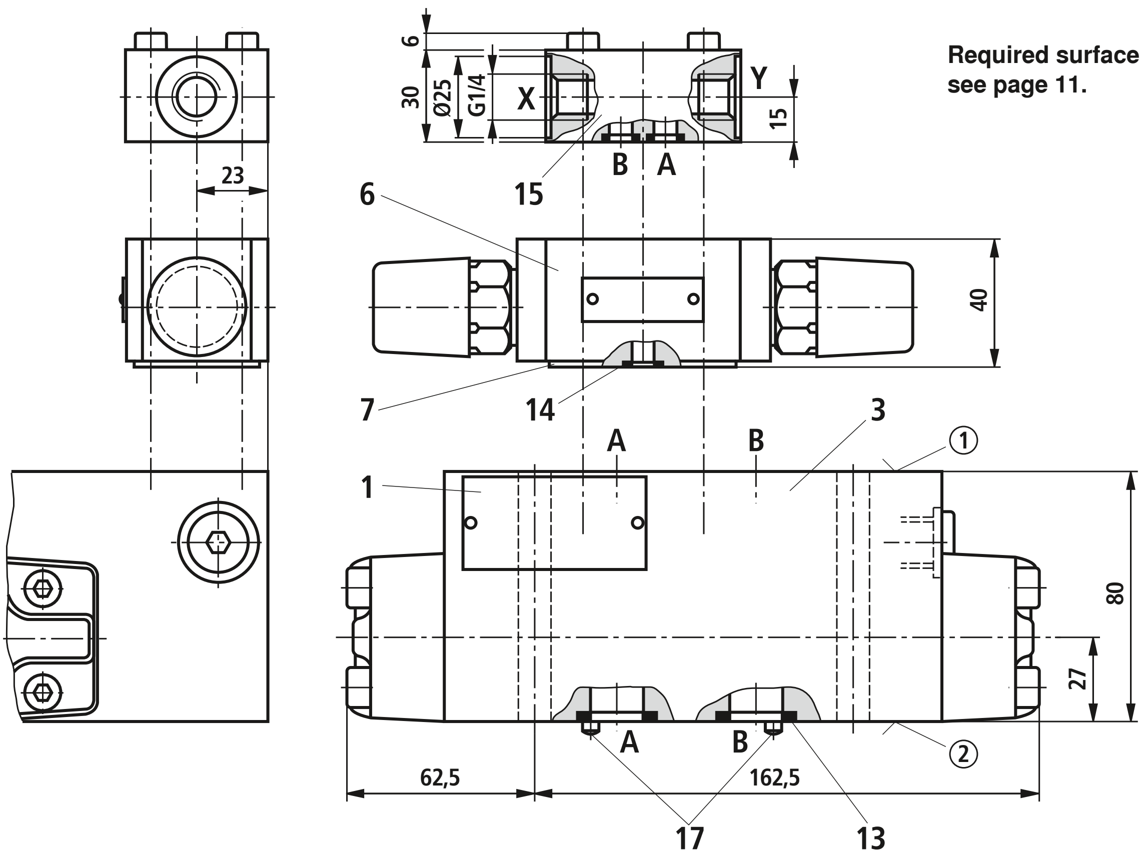


Required surface quality of the valve mounting face

For explanations of items, see page 12.

Unit dimensions: Type Z4WH16 (dimensions in mm)

Required surface quality (①, ②), see page 11.



1 Nameplate of complete valve

2 Nameplate of pilot valve

3 Main valve

① = component side – porting pattern to ISO 4401-07-07-0-05

② = plate side – porting pattern to ISO 4401-07-07-0-05

4 Port X (G1/4) for external pilot control

5 Pressure reducing valve “D3”
(must be used in the case of pilot pressure above 250 bar; only for version “Z4WEH“)

Material no.:
NBR seals: **R900323180**
FKM seals: **R900323664**

⚠ **Attention!**
If a pressure reducing valve “D3“ is used, a throttle insert “B10“ must be installed in port P of the pilot valve!

6 Switching time adjustment (throttle check valve, see data sheet RE 27506); depending on the installation position, meter-in or meter-out control (illustration: meter-in control)

7 R-ring plate

8 Pilot valve (see data sheet RE 23178)
- Type 4WE 6 **J**.. with symbol E62
- Type 4WE 6 **Y**.. with symbol E51, E63, E68

9 Solenoids “a” and “b” (can be rotated 90°)

10 Dimension for valve without manual override

11 Dimension for valve with manual override “N“; dimensions () for valve with AC solenoid

12 Dimension for valve with concealed manual override “N9“; dimensions () for valve with AC solenoid without manual override

13 Identical seal rings for ports A, B, P, T (main valve)

14 Identical seal rings for ports A, B, P, T

15 Pilot oil subplate

16 Space required to remove mating connector

17 Locating pin

18.1 Valve mounting bores

Valve mounting screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M10 - 10.9

18.2 Valve mounting bores

Valve mounting screws (separate order)

2 hexagon socket head cap screws
ISO 4762 - M6 - 10.9

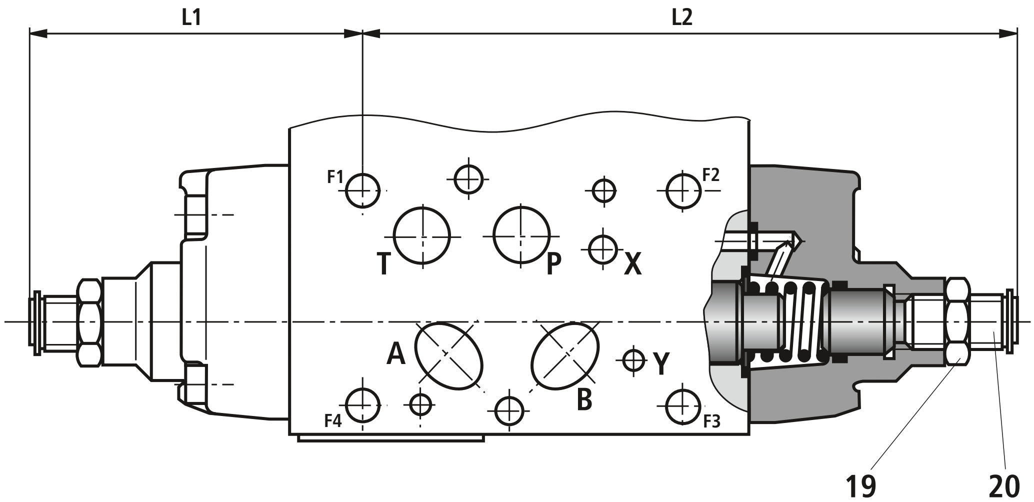
☞ **Note!**
The length and tightening torque of the valve mounting screws must be calculated taking account of the components mounted.

Stroke adjustment, attachment options (dimensions in mm)

Attachment options	Ordering code	L1	L2
Stroke adjustment on sides A and B	**10**	108	208
Stroke adjustment on side A	**11**	108	
Stroke adjustment on side B	**12**		208

The stroke adjustment feature limits the stroke of the main spool. The spool stroke can be reduced by loosening locknut (19) and turning adjustment spindle (20) clockwise. The control chamber must be pressureless during this process.

Stroke 10 mm (1 turn = 1.5 mm stroke)



19 Locknut 24 A/F

20 Adjustment spindle, hexagon socket 6 A/F

Notes

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97816 Lohr am Main, Germany
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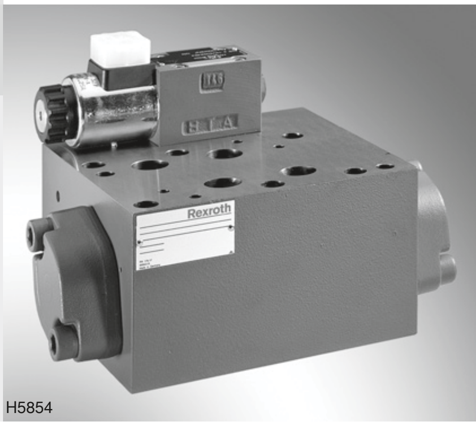
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

4/2 and 4/3 directional shut-off valves, internally pilot operated, externally pilot operated

RE 24768/08.08
Replaces: 10.97

Types Z4WEH and Z4WH

Size 25
Component series 5X
Maximum operating pressure 315 bar
Maximum flow 650 l/min



H5854

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

- Directional spool valve, pilot operated
- 2 types of actuation:
  - Electrohydraulic (type WEH)
  - Hydraulic (type WH)
- Function as shut-off through valve or shut-off/through valve/short-circuit valve
- Free flow in P and T in every spool position
- Porting pattern to ISO 4401-08-08-0-05
- Wet-pin DC or AC voltage solenoids, optional
- Manual override, optional
- Electrical connection as individual connection, see RE 23178 and RE 08010 (central connection on request)
- Switching time adjustment, optional
- Stroke adjustment am main spool, optional
- Inductive position switches and proximity sensors (contactless), see RE 24830

Ordering code

Z4		22		–5X/				

Types of actuation	
Electrohydraulic	= **WEH**
Hydraulic	= **WH**
Size 25	= **22**
Spool symbols see page 4	
Component series 50 to 59 (50 to 59: unchanged installation and connection dimensions)	= **5X**
Pilot valve	
High-performance valve (RE 23178)	= **6E** [1]
DC voltage 24 V	= **G24** [1]
AC voltage 230 V 50/60 Hz	= **W230** [1]
DC voltage 205 V 50/60 Hz	= **G205** [1; 2]
For further voltages, frequencies and electrical data, see data sheet RE 23178	
Without manual override	= **No code**
With manual override	= **N** [1]
With concealed manual override (standard)	= **N9** [1]
External pilot oil supply, external pilot oil drain	= **No code**
Internal pilot oil supply, internal pilot oil drain (standard)	= **ET** [3]
External pilot oil supply, internal pilot oil drain	= **T**
(with type Z4WH… **only "No code"** possible!)	
Without switching time adjustment	= **No code**
Switching time adjustment as meter-in control	= **S**
Switching time adjustment as meter-out control	= **S2**

[1] Only in the case of electrohydraulic actuation, version "WEH"

[2] For connection to the AC voltage mains, a DC solenoid **must** be used, which is controlled via a rectifier (see table on the right-hand side).

In the case of individual connection, a mating connector with integrated rectifier can be used (separate order, see page 3.

[3] Internal pilot oil **supply**:

- Minimum pilot pressure: Please read page 6!
- To prevent impermissibly high pressure peaks, a **throttle insert "B10"** must be provided in the P port of the pilot valve (see page 5).

[4] Mating connectors, separate order, see page 3.

[5] On version "D3", a throttle insert "B10" must be installed in port P of the pilot valve!

AC voltage mains (permissible voltage tolerance ±10%)	**Nominal voltage of the DC voltage solenoid when operated with AC voltage**	**Ordering code**
110 V - 50/60 Hz 120 V - 60 Hz	96 V	**G96**
230 V - 50/60 Hz	205 V	**G205**

Standard types and components are shown in the EPS (standard price list).

K4							*

Further details in clear text

Seal material
- **No code =** NBR seals
- **V =** FKM seals
  (other seals on request)

⚠ **Attention!**
Observe compatibility of seals with hydraulic fluid used!

- **No code =** **Without** pressure reducing valve
- **D3** [1; 5] **=** **With** pressure reducing valve (to be used, if pilot pressure > 210 bar)

Throttle insert [1)]
- **No code =** Without throttle insert
- **B08 =** Throttle Ø 0.8 mm
- **B10 =** Throttle Ø 1.0 mm

Stroke adjustment
- **No code =** Without stroke adjustment
- **10 =** Stroke adjustment on sides A and B
- **11 =** Stroke adjustment on side A
- **12 =** Stroke adjustment on side B

For further details, see page 11

- **Without slash =** No further details
- **/ =** Further details

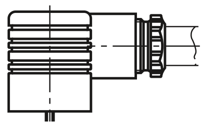
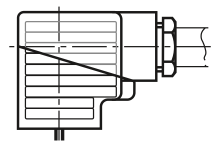
Spool position monitoring
- **No code =** Without position switch
- **QMAG24 =** Monitored spool position “a“
- **QMBG24 =** Monitored spool position “b“
- **QMABG24 =** Monitored spool positions “a“ and “b“
- **QM0G24 =** Monitored rest position (not for valves with 2 spool positions)

For further details, see RE 24830

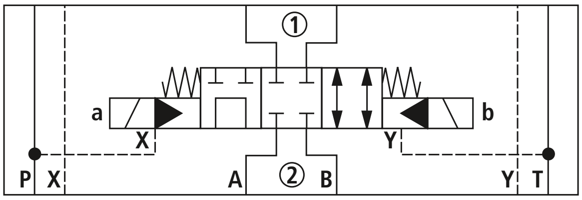
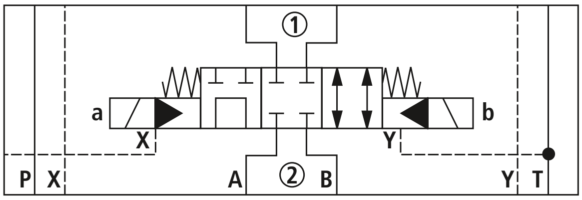
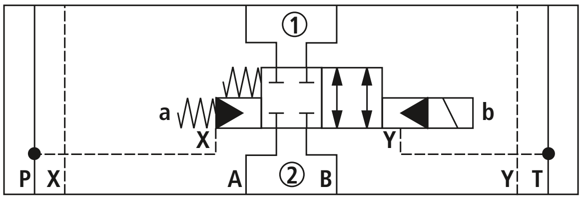
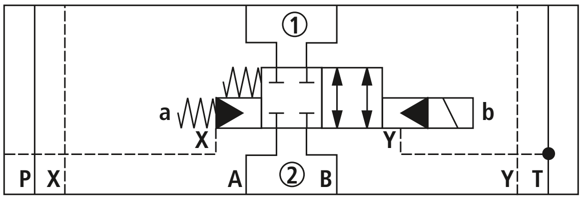
Electrical connection [1)]
- **K4** [4)] **=** Without mating connector, individual connection with component plug to DIN EN 175301-803

For further electrical connections, see RE 23178 and RE 08010

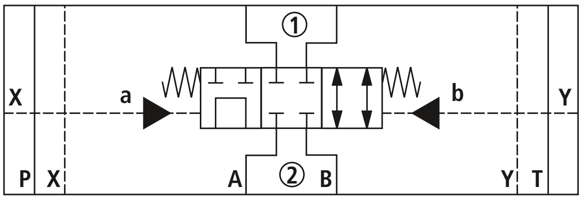
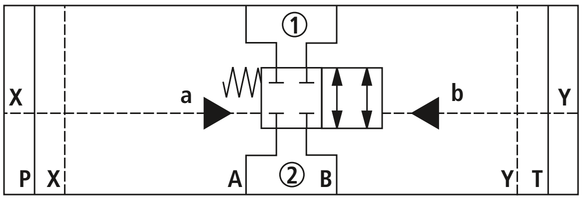
Mating connectors to DIN EN 175301-803

For details and further mating connectors, see RE 08006					
		Material no.			
Valve side	**Color**	Without circuitry	With indicator lamp 12 … 240 V	With rectifier 12 … 240 V	With indicator lamp and Zener-diode suppressor circuit 24 V
a	Gray	**R901017010**	–	–	–
b	Black	**R901017011**	–	–	–
a/b	Black	–	**R901017022**	**R901017025**	**R901017026**

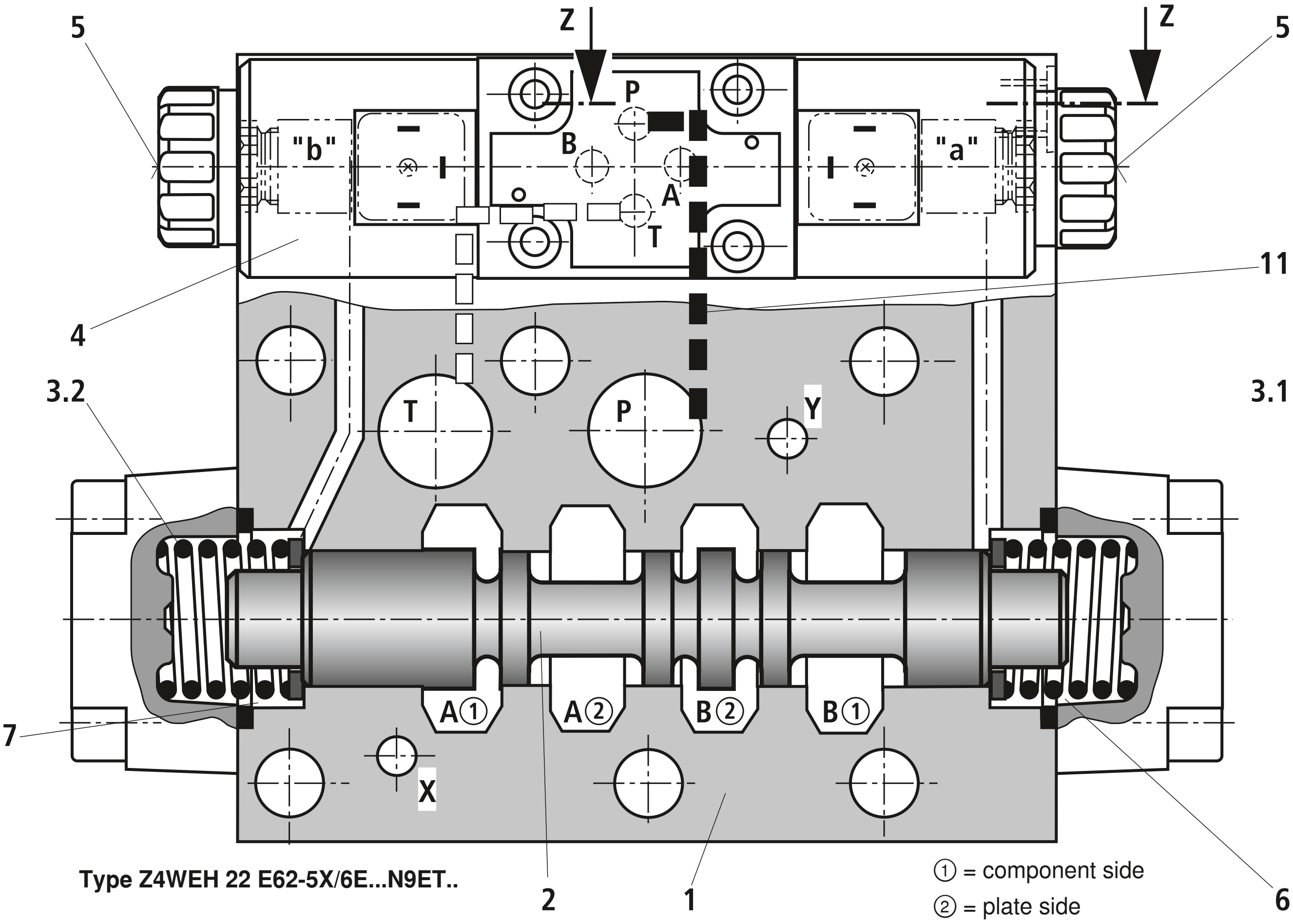
Symbols: Type Z4WEH (① = component side, ② = plate side)

Ordering code	Version "ET"	Version "T"
E62		
E63		

Symbols: Type Z4WH (① = component side, ② = plate side)

Ordering code	Version "No code"
E62	
E63	

Function, section



Type Z4WEH 22 E62-5X/6E...N9ET..

Valves of type Z4WEH are directional spool valves with electrohydraulic actuation. They control the start and stop of a flow.

These directional valves basically consist of the main valve with housing (1), main control spool (2), one or two return springs (3.1 and 3.2), as well as pilot valve (4).

Main control spool (2) in the main valve is held by springs or through pressurization in the zero or initial position. In the initial position, the two spring chambers (6) and (7) are connected pressureless to tank via pilot channel (4). The pilot valve is supplied with pilot oil via pilot line (11). The supply can be provided internally or externally (externally via port X in the sandwich plate, see page 6).

When the pilot valve is operated, e.g. solenoid “a“, the pilot spool (not shown on the drawing) is pushed to the left and spring chamber (7) is consequently pressurized to pilot pressure. Spring chamber (6) remains pressureless.

The pilot pressure acts on the left side of main control spool (2) and pushes it against spring (3.1). In the main valve the ports are connected on the component side and on the plate side depending on the symbol.

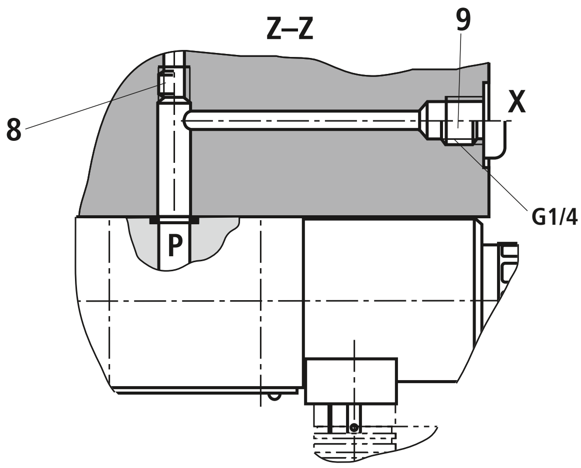
When the solenoid is de-energized, the pilot spool returns to its initial position. Spring chamber (7) is unloaded to tank.

The pilot oil is drained internally from spring chamber (7) via pilot valve (4) into channel T (Y).

An optional manual override (5) allows the pilot spool to be moved without energization of the solenoid.

Pilot oil supply (section Z – Z), **see page 6.**

Pilot oil supply



Pilot oil supply

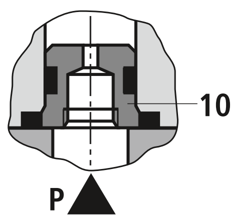
External:	**8** closed
	9 open
internal:	**8** open
	9 closed

Pilot oil port “X“ only possible with Z4WEH 22 ... .

Throttle insert

The use of throttle insert (10) is required, if the pilot oil supply is to be limited in channel P of the pilot valve.

Throttle insert (10) is to be installed in channel P of the pilot valve.



Technical data (for applications outside these parameters, please consult us!)

General

Masse	– Valve with 1 solenoid	kg	20.8
	– Valve with 2 solenoids	kg	21.1
	– Valve with hydraulic actuation (type 4WH…)	kg	20.0
	– Switching time adjustment	kg	0.8
	– Pressure reducing valve	kg	0.4
	– Plate for version “T“	kg	0.5
Installation position			Optional
Ambient temperature range		°C	–30 to +50 (NBR seals) –20 to +50 (FKM seals)

Hydraulic

Maximum operating pressure	– Ports A, B, X and Y	bar	315
	– Port P		
	External pilot oil supply	bar	315
	Internal pilot oil supply	bar	210 (without pressure reducing valve) 315 (with pressure reducing valve)
	– Port T (Only internal pilot oil drain)	bar	210 (version “WEH“ with DC solenoid) 160 (version “WEH“ with AC solenoid) 315 (version “WH“)
Minimum pilot pressure		bar	12
Maximum pilot pressure		bar	210
Maximum flow		l/min	650
Pilot volume for operation		cm^3	7,7
Hydraulic fluid [1]			Mineral oil (HL, HLP) to DIN 51524 [2]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [2]; HEPG (polyglycols) [3]; HEES (synthetic esters) [3]; other hydraulic fluids on request
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	2.8 to 500
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [4]

[1] The ignition temperature of the process and operating medium used must be higher than the maximum solenoid surface temperature.

[2] Suitable for NBR and FKM seals

[3] Suitable only for FKM seals

[4] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Notes!

- The manual override can only be actuated up to a tank pressure of ca. 50 bar. Avoid damage to the bore for the manual override! (Special tool for operation, separate order, Material no. **R900024943**). When the manual override is blocked, operation of the solenoids must be ruled out!
- The simultaneous operation of the solenoids must be ruled out!

Switching times (= making contact on the pilot valve until the control land starts to open in the main valve and change of the pressure value by 5%)

ON – AC voltage (~) and DC voltage (=)

Pilot pressure	bar	70		140		210	
Type of voltage		~	=	~	=	~	=
3-position valve (spring-centered)							
– Version "ET" (with throttle insert "B10")	ms	80	115	60	85	50	75
– Version "ET" (with pressure reducing valve "D3; 45 bar")	ms	80	80	65	75	50	65
– Version "T"	ms	30	50	20	50	20	50
2-position valve (spring end position)							
– Version "ET" (with throttle insert "B10")	ms	100	140	70	100	50	75
– Version "ET" (with pressure reducing valve "D3; 45 bar")	ms	110	125	65	95	50	75
– Version "T"	ms	45	65	40	60	55	85

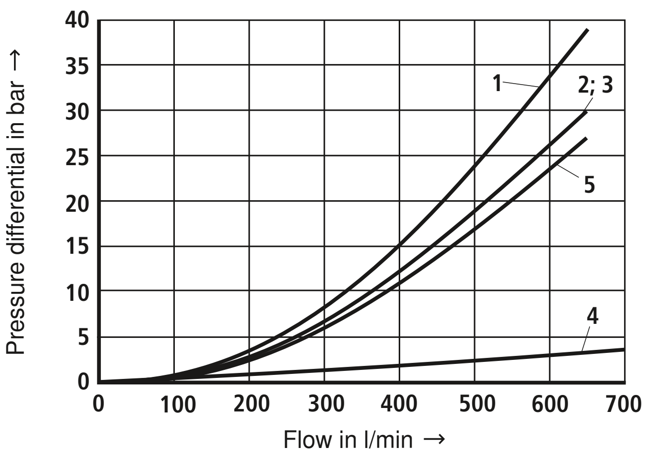
OFF – AC voltage (~) and DC voltage (=)

Pilot pressure	bar	70		140		210	
Type of voltage		~	=	~	=	~	=
3-position valve (spring-centered)							
– Version "ET" (with throttle insert "B10")	ms	60	50	60	50	60	50
– Version "ET" (with pressure reducing valve "D3; 45 bar")	ms	85	50	85	50	85	50
– version "T"	ms	55	50	55	50	55	50
2-position valve (spring end position)							
– Version "ET" (with throttle insert "B10")	ms	175	160	160	140	150	130
– Version "ET" (with pressure reducing valve "D3; 45 bar")	ms	175	150	150	120	140	110
– Version "T"	ms	110	55	100	45	95	40

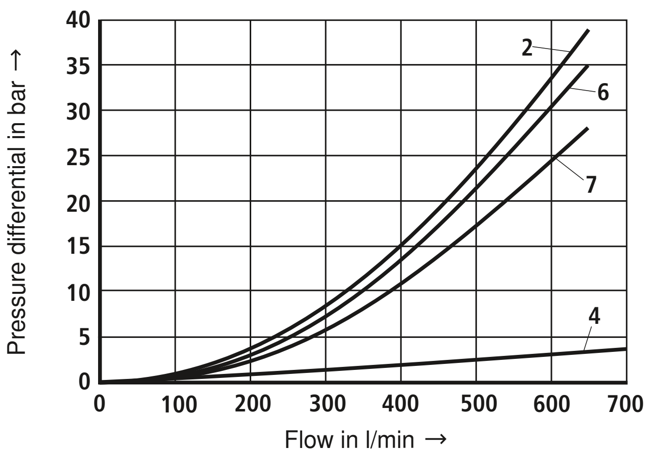
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Δp-q_V characteristic curves

Version "E62"

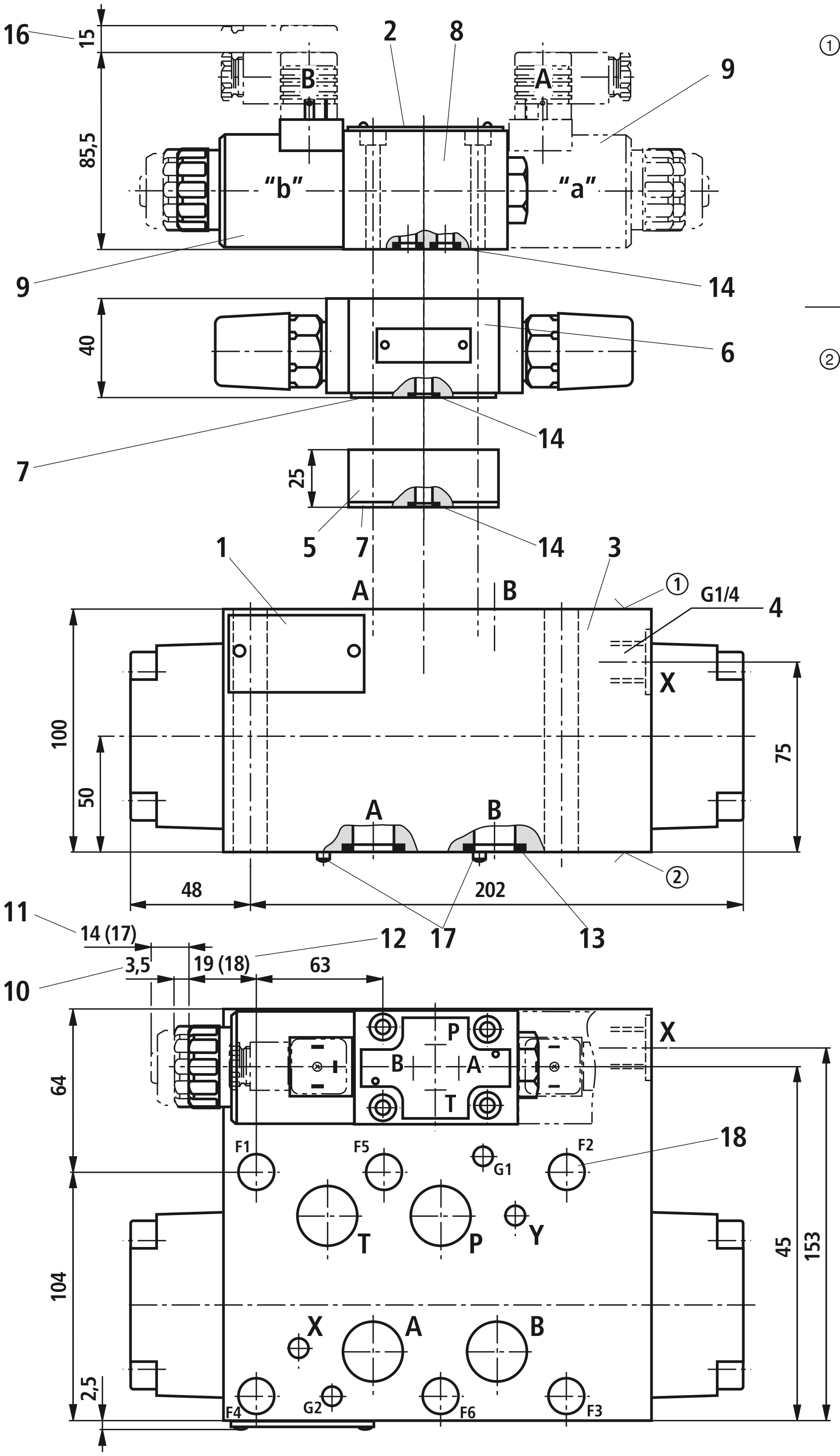


Version "E63"

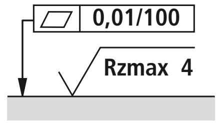


1 A2 → A1
2 B2 → B1
3 B1 → B2; B2 → A2
4 P2 → P1; T2 → T1
5 A1 → A2; A2 → B2
6 A1 → A2
7 A2 → A1; B1 → B2

Unit dimensions: Type Z4WEH22 (dimensions in mm)

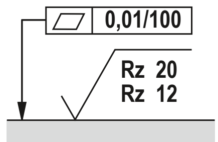


① component side - porting pattern to ISO 4401-08-08-0-05



Required surface quality of the valve mounting face

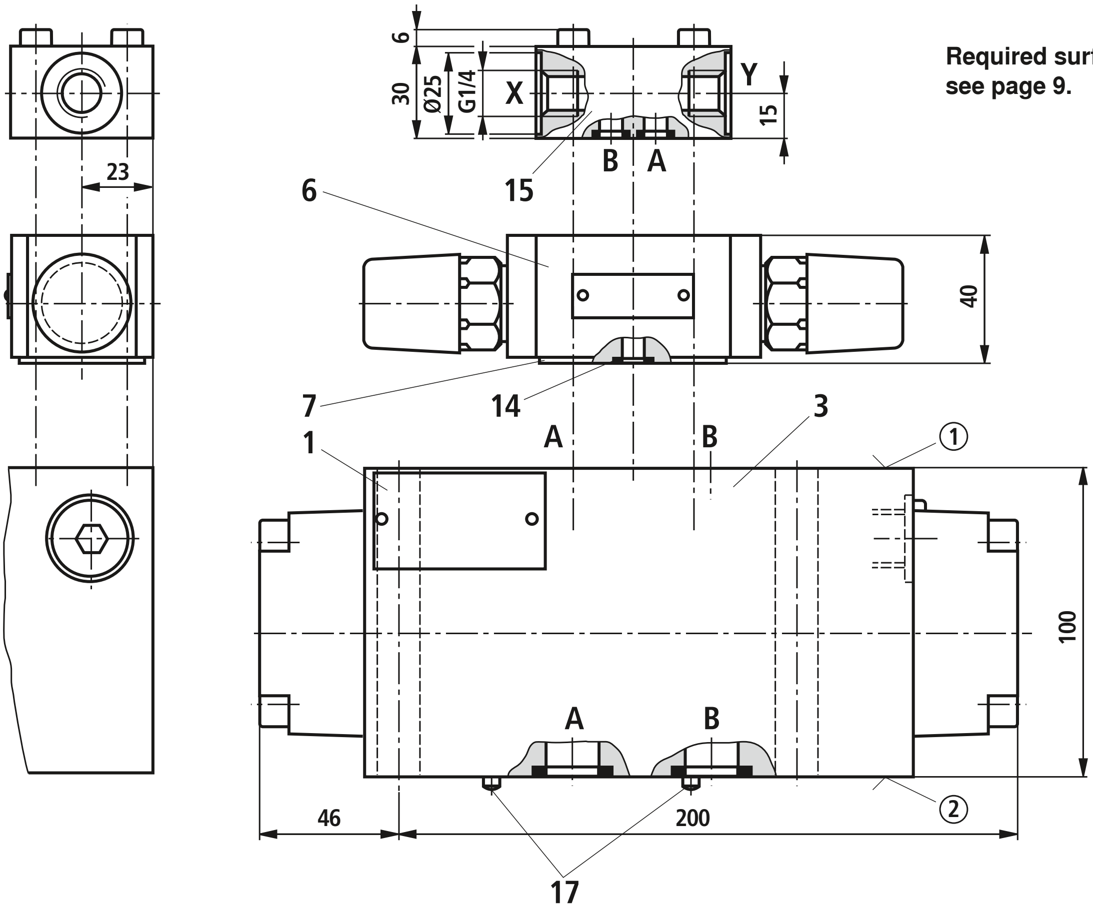
② plate side - porting pattern to ISO 4401-08-08-0-05



Required surface quality of the valve mounting face

For explanations of items, see page 10.

Unit dimensions: Type Z4WH22 (dimensions in mm)



Required surface quality (①, ②) **see page 9.**

1 Nameplate of complete valve

2 Nameplate of pilot valve

3 Main valve

① = component side – porting pattern to ISO 4401-08-08-0-05

② = plate side – porting pattern to ISO 4401-08-08-0-05

4 Port X (G1/4) for external pilot control

5 Pressure reducing valve “D3” (must be used in the case of pilot pressures above 210 bar; only for version “Z4WEH“)

Material no.:
NBR seals: **R900323180**
FKM seals: **R900323664**

⚠ **Attention!**
If a pressure reducing valve “D3“ is used, a throttle insert “B10“ must be installed in port P of the pilot valve!

6 Switching time adjustment (throttle check valve, see data sheet RE 27506); depending on the installation position, meter-in or meter-out control (illustration: meter-in control)

7 R-ring plate

8 Pilot valve (see data sheet RE 23178)
– Type 4WE 6 **J**.. with symbol E62
– Type 4WE 6 **Y**.. with symbol E63

9 Solenoids “a” and “b” (can be rotated 90°)

10 Dimension for valve without manual override

11 Dimension for valve with manual override “N“; dimensions () for valve with AC solenoid

12 Dimension for valve with concealed manual override “N9“; dimensions () for valve with AC solenoid without manual override

13 Identical seal rings for ports A, B, P, T (main valve)

14 Identical seal rings for ports A, B, P, T

15 Pilot oil subplate

16 Space required to remove mating connector

17 Locating pin

18 Valve mounting bores

Valve mounting screws (separate order)

6 hexagon socket head cap screws
ISO 4762 - M12 - 10.9

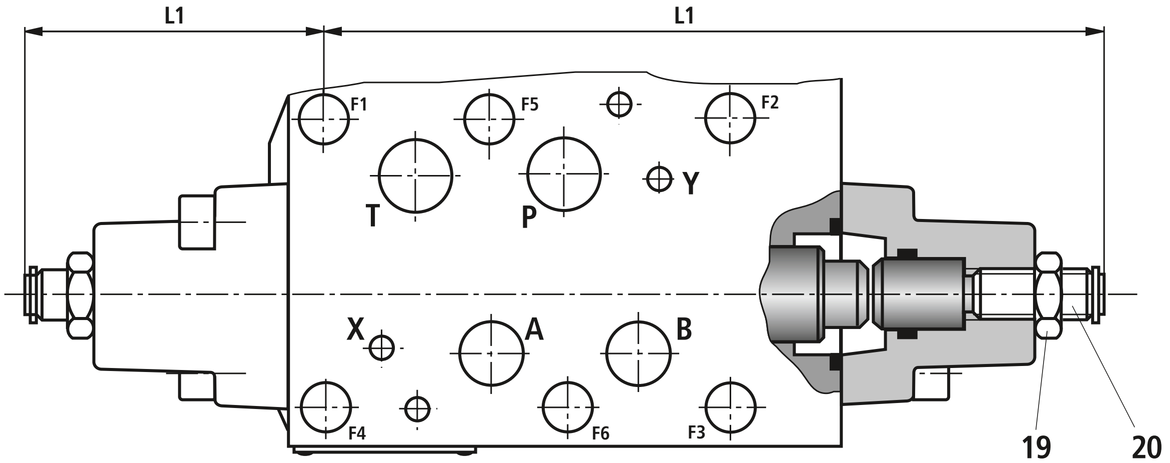
☞ **Note!**
The length and tightening torque of the valve mounting screws must be calculated taking account of the components mounted.

Stroke adjustment, attachment options (dimensions in mm)

Attachment options	Ordering code	L1	L2
Stroke adjustment on sides A and B	**10**	94	248
Stroke adjustment on side A	**11**	94	
Stroke adjustment on side B	**12**		248

The stroke adjustment feature limits the stroke of the main spool. The spool stroke can be reduced by loosening locknut (19) and turning adjustment spindle (20) clockwise. The control chamber must be pressureless during this process.

Stroke 9.5 mm (1 turn = 1.5 mm stroke)



19 Locknut 24 A/F

20 Adjustment spindle, hexagon socket 6 A/F

Notes

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The Drive & Control Company

Rexroth
Bosch Group

Prefill valve

Type SF

RE 20482
Edition: 2012-09
Replaces: 09.07

K4917

- Size 125 ... 500
- Component series 4X
- Maximum operating pressure 350 bar *[5076 psi]*
- Flow up to 50000 l/min *[13209 US gpm]* (***Δp*** = 0.3 bar)

Features

- Pilot operated check valve, with or without pre-decompression
- Flange connection
- Tank installation
- Cartridge valve without control open spool (check valve)
- Reduced switching noises due to damping measures
- Rotatable low-pressure connection (housing)
- Inductive position switch, optional
- Higher operating pressures, upon request

Contents

Ordering code

01	02	03	04		05		06		07	08	09	10	11
SF				**–**	**1**	**–**	**4X**	**/**					*****

01	Prefill valve	**SF**
02	Size 125	**125**
	Size 150	**150**
	Size 200	**200**
	Size 250	**250**
	Size 300	**300**
	Size 350	**350**
	Size 400	**400**
	Size 500 (only version "A" and "B")	**500**

Type of connection

03	Flange connection	**A**
	Tank installation	**B**
	Screw-in cartridge valve without control spool (check valve)	**K**
04	**Without** pre-decompression	**0**
	With pre-decompression	**1**

Spring feedback of the main poppet

05	Cracking pressure ≈0.2 bar *[≈2.9 psi]*	**1**
06	Component series 40 to 49 (40 to 49: unchanged installation and connection dimensions)	**4X**

Spool position monitoring

07	**Without** position switch	**no code**
	With inductive position switch, position monitoring "open", with connector plug (only version "A0")	**Q2G24Z**

Seal material

08	NBR seals	**no code**
	(Other seals upon request)	

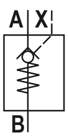
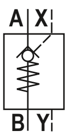
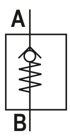
Connection thread

09	Pipe thread according to ISO 228/1	**no code**

Special version

10	Standard	**no code**
	Operating pressure 420 bar (restricted size selection, please contact us)	**SO102**
	Operating pressure 500 bar (restricted size selection, please contact us)	**SO104**
11	Further details in the plain text	

Symbols

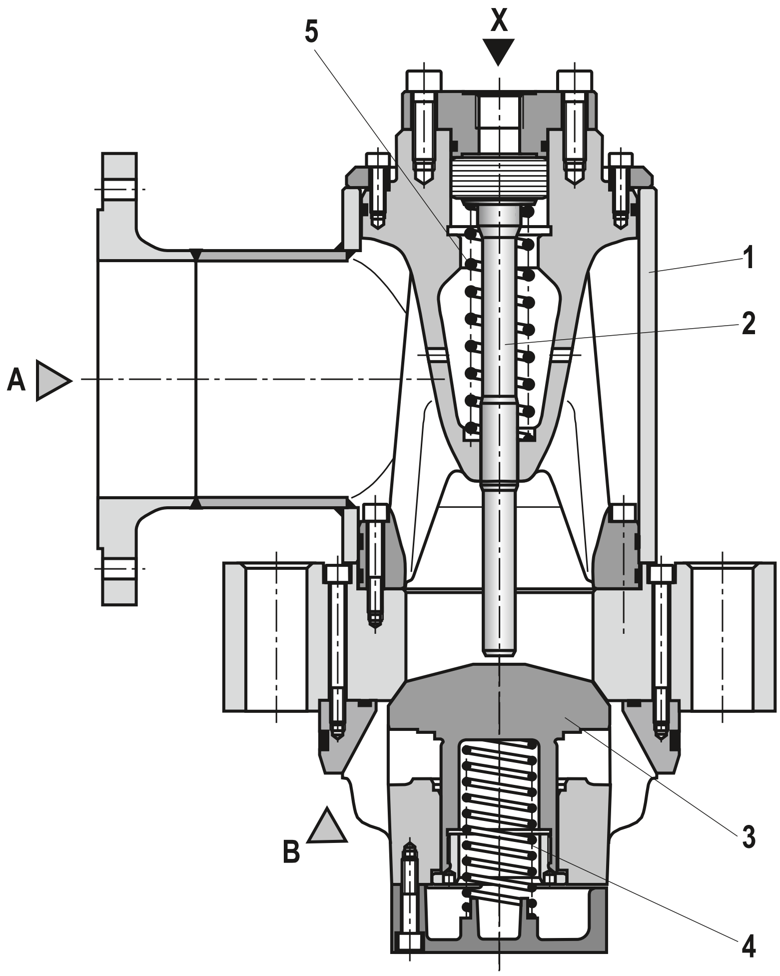
Version "**A**" and **"B"** (size 125 to 400)	Version "**A**" and **"B"** (size 500)	Version "**K**" (size 125 to 400)
		

Function, sections: without pre-decompression "0"

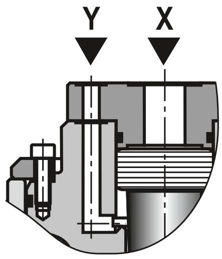
The valve of type SF is a pilot operated check valve. It is used for the leakage oil-free isolation of pressurized working circuits, primarily pressing cylinders. Due to its aerodynamic design and the relatively low amount of closing force of the compression spring (4) at the main poppet, it is particularly suitable for the pulling function and for filling e.g. the main cylinder at presses during the fast closing movement.
The valve basically comprises of a continuously rotatable housing (1), control spool (2), main poppet (3) and the compression springs (4) and (5).

The valve allows for free flow from A to B. In the opposite direction, the main poppet (3) is held on the seat by the compression spring (4) and the pressure available at port B. The pressure at the control port X pushes the control spool (2) downwards, against the compression spring (5), and pushes the main poppet (3) off the seat. Now, the valve can also be flown through in the opposite direction. The opening time can be influenced by throttling the pilot oil supply.
The structural set-up corresponds to the principle of modular systems, i.e. all versions are based on the basic valve.

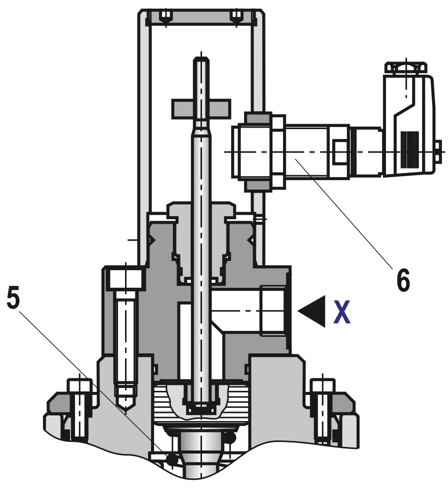
Inductive position switch (only version "A0")
The position switch (6) reports the opened position of the prefill valve (switching point: cracking pressure > 40 %).



Type SF . .0-1-4X/...



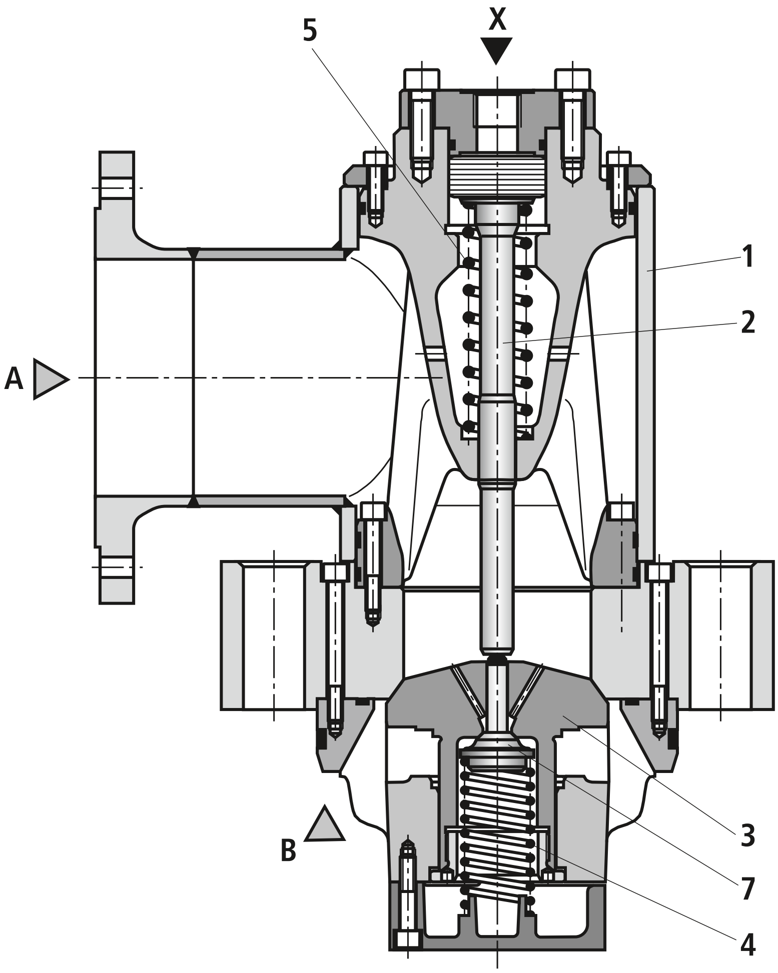
Type SF 500 .0-1-4X/...



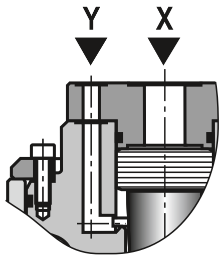
Type SF . A0-1-4X/Q2G24Z

Function, sections: with pre-decompression "1"

The function of this version basically corresponds to the version without pre-decompression.
The valve basically comprises of a continuously rotatable housing (1), control spool (2), main poppet (3), pilot poppet (7) and the compression springs (4) and (5).
In case of pressure at the control port X, the control spool (2) only opens the pilot poppet (7) first. This guarantees shock-free decompression of the compressed hydraulic fluid.
The opening time can be influenced by throttling the pilot oil supply.
The structural set-up corresponds to the principle of modular systems, i.e. all versions are based on the basic valve.



Type SF . .1-1-4X/...



Type SF 500 .1-1-4X/...

Technical data

(For applications outside these parameters, please consult us!)

general										
Size		Size	125	150	200	250	300	350	400	500
Weight	– Version "A"	kg *[lbs]*	75 *[165]*	135 *[298]*	185 *[408]*	365 *[805]*	625 *[1377]*	1200 *[2646]*	1580 *[3483]*	3400 *[7496]*
	– Version "B"	kg *[lbs]*	60 *[132]*	105 *[231]*	145 *[320]*	295 *[650]*	545 *[1202]*	1000 *[2205]*	1400 *[3087]*	3100 *[6834]*
	– Version "K"	kg *[lbs]*	45 *[99]*	90 *[198]*	105 *[231]*	205 *[452]*	355 *[783]*	670 *[1477]*	950 *[2094]*	–
Installation position			any							

hydraulic			
Maximum operating pressure	– Port A	bar *[psi]*	16 *[232]*
	– Port B, X and Y	bar *[psi]*	350 *[5076]*
Cracking pressure [1]		bar *[psi]*	≈0.2 *[≈2.9]*
Hydraulic fluid			see table below
Hydraulic fluid temperature range (at the valve working ports)		°C *[°F]*	–30 ... +80 *[–22 ... +176]*
Viscosity range		mm²/s *[SUS]*	10 ... 800 *[45 ... 3720]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [2]

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils and related hydrocarbons		HL, HLP, HVLP	NBR, FKM [3]	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM [3]	VDMA 24568
		HEES	FKM [3]	
	– soluble in water	HEPG	FKM [3]	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM [3]	ISO 12922
		HFC	NBR	ISO 12922

☞ **Important information on hydraulic fluids!**

- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- **Flame-resistant and bio-degradable:** There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!

1) Pressure differential at the main poppet for overcoming the spring force.

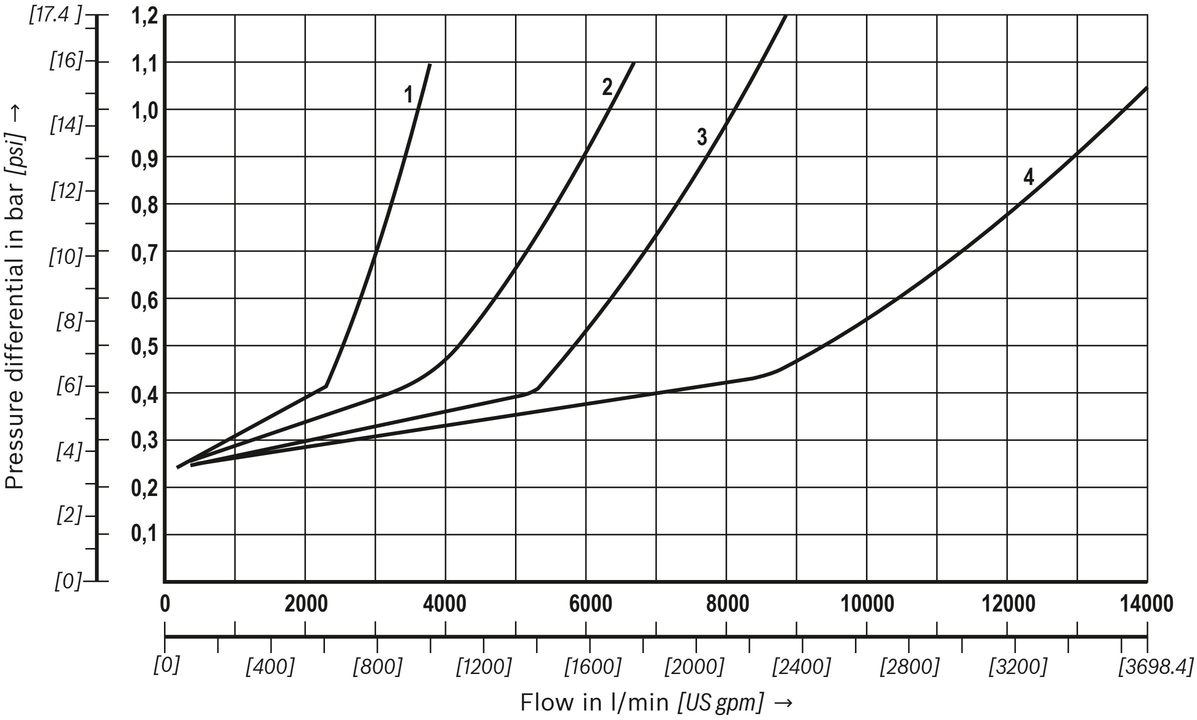
2) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter.

3) Upon request

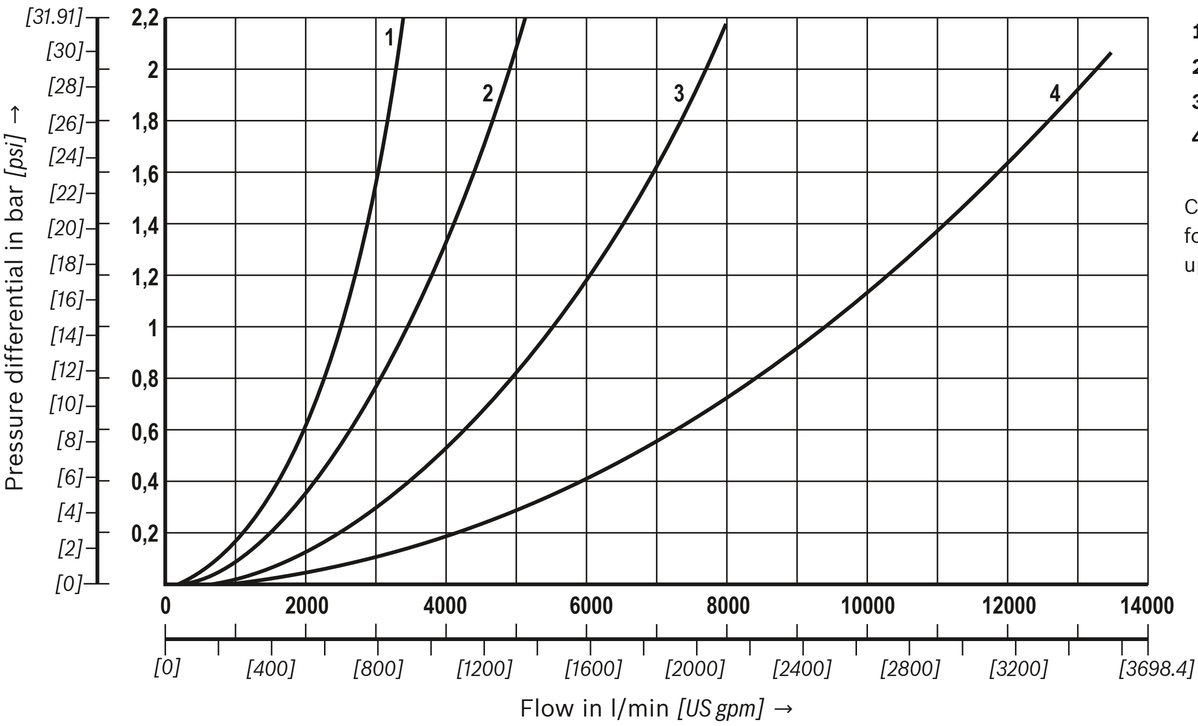
Characteristic curves

(measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Δp-q_V characteristic curves – size 125 ... 250 (A → B)



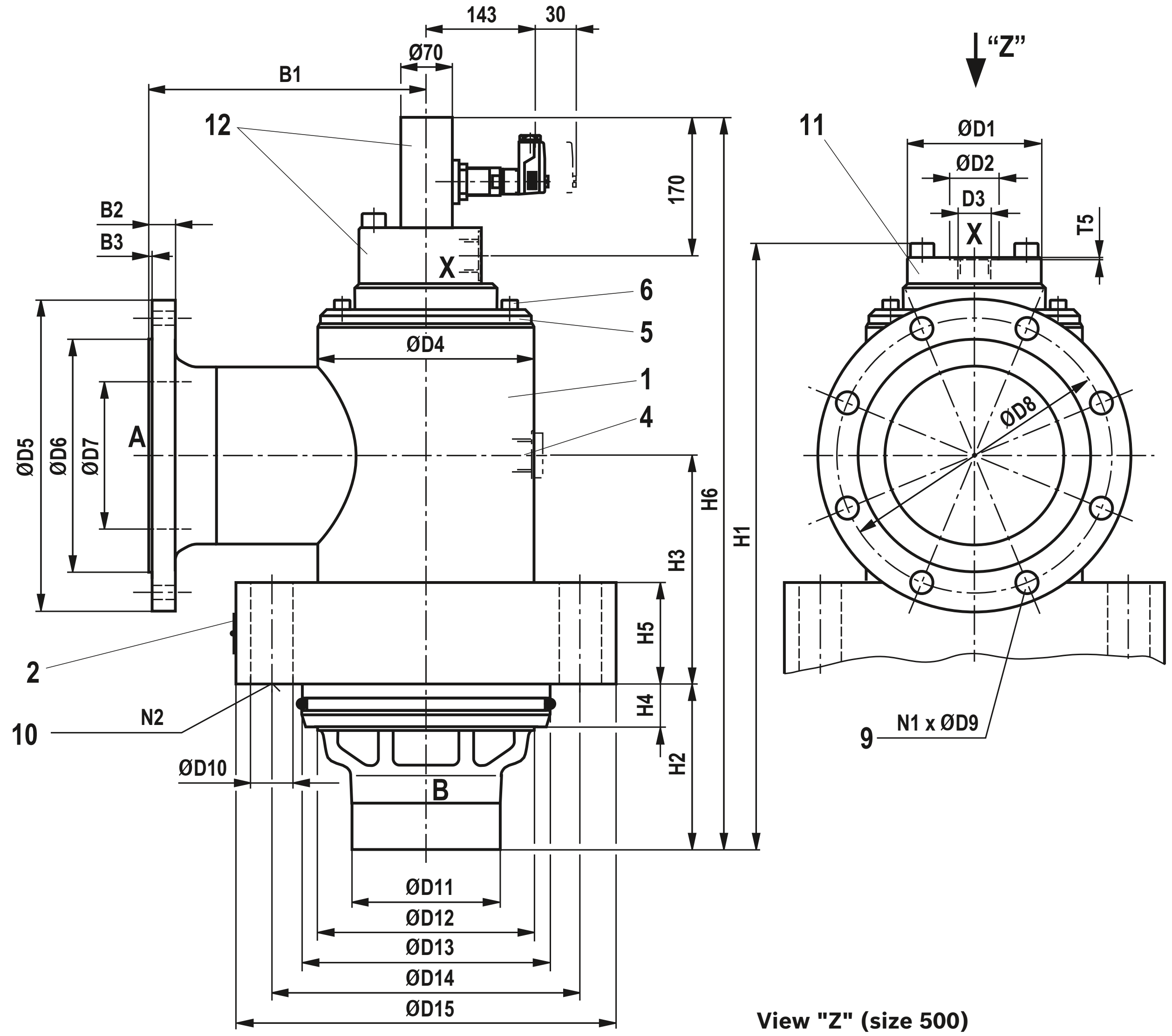
Δp-q_V characteristic curves – size 125 ... 250 (B → A)



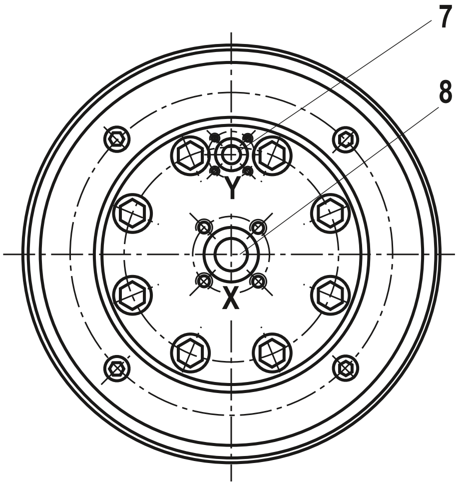
1 Size 125
2 Size 150
3 Size 200
4 Size 250

Characteristic curves for size 300 to 500 upon request!

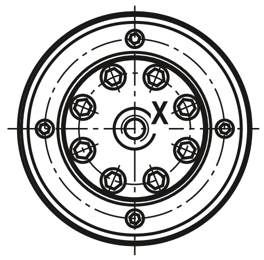
Unit dimensions: Version "A", flange connection
(dimensions in mm *[inch]*)



View "Z" (size 500)



View "Z" (size 125 ... 400)



Modification of the type of connection from "A" into "B"

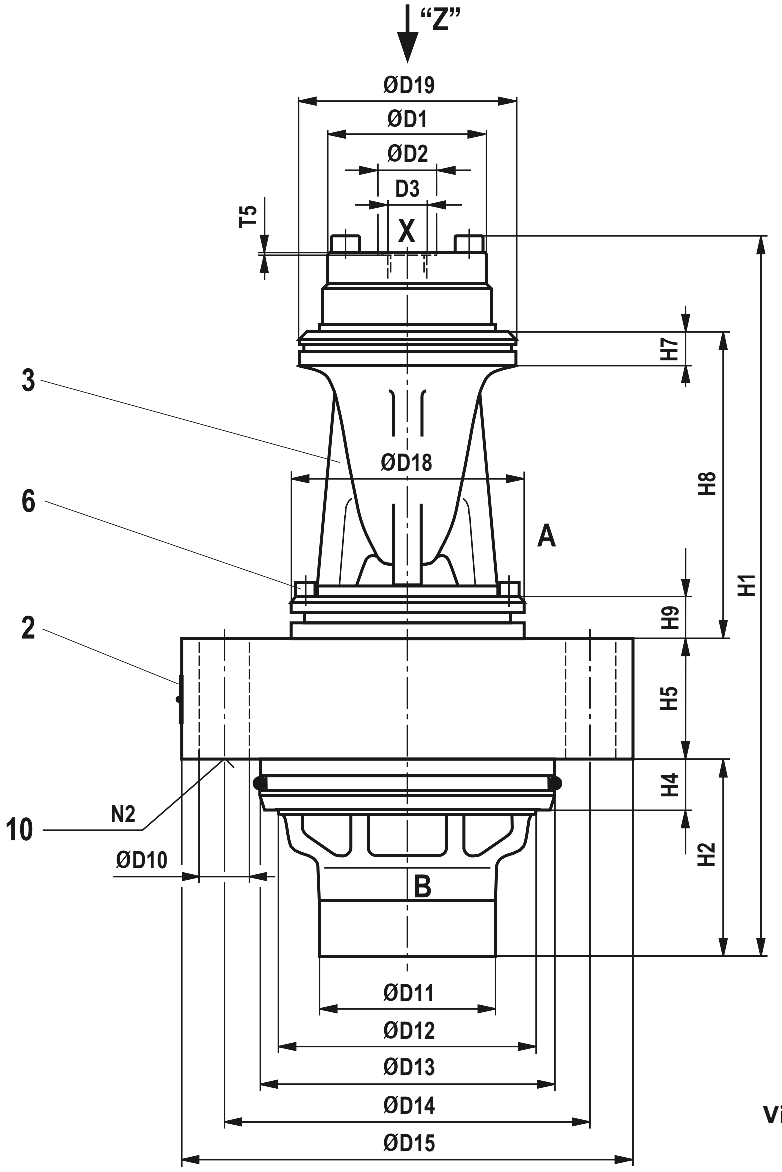
- ▶ 1. Loosen the mounting screws (6)
- ▶ 2. Remove the ring (5)
- ▶ 3. Remove the housing (1)

Rotating the housing (1)

- ▶ 1. Loosen the mounting screws (6)
- ▶ 2. Rotating the housing (1)
- ▶ 3. Tighten the mounting screws (6)

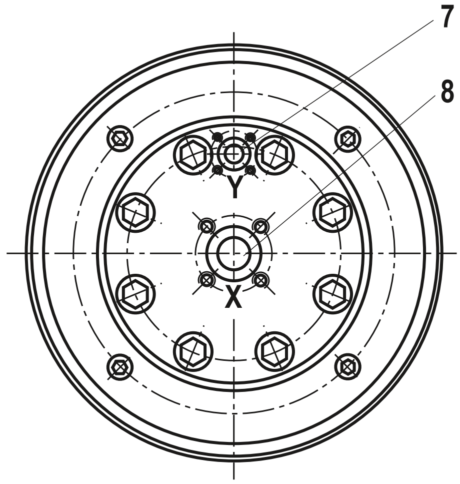
Dimensional tables see page 9.
Installation bore see page 11.
Item explanations and valve mounting screws see page 12.

Unit dimensions: Version "B", tank installation
(dimensions in mm *[inch]*)



View "Z" (size 125 ... 400)

View "Z" (size 500)



Dimensional tables see page 9.
Installation bore see page 11.
Item explanations and valve mounting screws see page 12.

Modification from type of connection "B" into type of connection "K"

- 1. Loosen the mounting screws (6)
- 2. Remove the control cylinder (3)

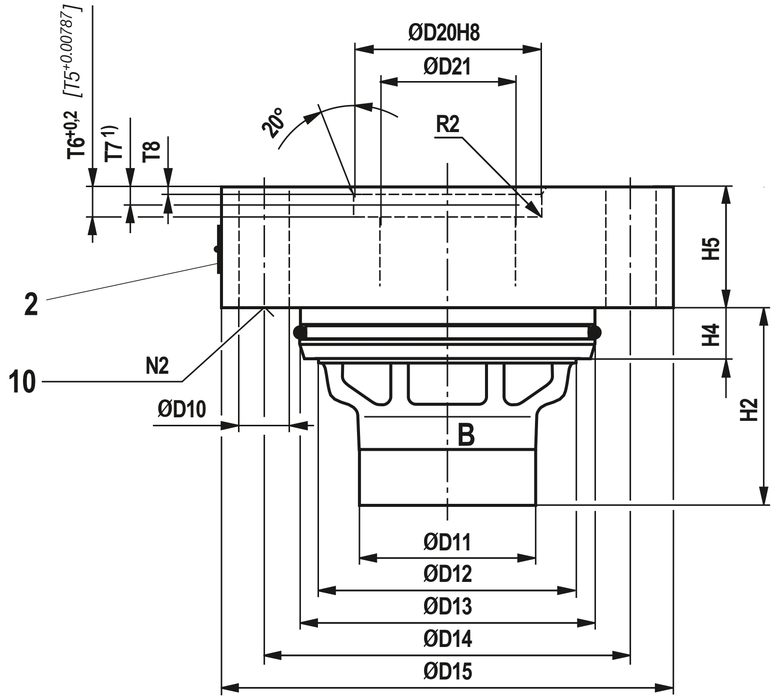
Unit dimensions: Version "A" and "B"
(dimensions in mm [inch])

Size	B1	B2	B3	ØD1	ØD2	D3	ØD4	ØD5	ØD6	ØD7
125	210 [8.27]	22 [0.87]	3 [0.118]	110 [4.33]	42 [1.65]	G3/4	178 [7.01]	250 [9.84]	188 [7.40]	132 [5.2]
150	250 [9.84]	22 [0.87]	3 [0.118]	130 [5.12]	42 [1.65]	G3/4	229 [9.02]	285 [11.22]	212 [8.35]	159 [6.26]
200	275 [10.83]	24 [0.95]	3 [0.118]	150 [5.91]	47 [1.85]	G1	273 [10.75]	340 [13.39]	268 [10.55]	207 [8.15]
250	330 [12.99]	26 [1.02]	3 [0.118]	190 [7.48]	58 [2.28]	G1 1/4	356 [14.02]	405 [15.94]	320 [12.6]	260 [10.24]
300	380 [14.96]	28 [1.10]	4 [0.158]	225 [8.86]	58 [2.28]	G1 1/4	419 [16.5]	460 [18.11]	378 [14.88]	310 [12.2]
350	440 [17.32]	30 [1.18]	4 [0.158]	275 [10.83]	65 [2.56]	G1 1/2	508 [20]	520 [20.47]	438 [17.24]	340 [13.39]
400	530 [20.87]	32 [1.26]	4 [0.158]	320 [12.6]	65 [2.56]	G1 1/2	572 [22.52]	580 [22.83]	490 [19.29]	390 [15.35]
500	620 [24.41]	34 [1.34]	4 [0.158]	398 [15.67]	–	–	802 [31.57]	715 [28.15]	610 [24.02]	492 [19.37]

Size	ØD8	ØD9	ØD10	ØD11	ØD12	ØD13	ØD14	ØD15	ØD18	ØD19
125	210 [8.27]	18 [0.71]	33 [1.3]	120 [4.72]	175 [6.89]	200 [7.87]	250 [9.84]	310 [12.2]	159 [6.26]	156 [6.14]
150	240 [9.45]	22 [0.87]	40 [1.58]	145 [5.71]	220 [8.66]	250 [9.84]	310 [12.2]	380 [14.96]	200 [7.87]	195 [7.68]
200	295 [11.61]	22 [0.87]	40 [1.58]	155 [6.1]	265 [10.43]	290 [11.42]	350 [13.78]	420 [16.54]	235 [9.25]	230 [9.06]
250	355 [13.98]	26 [1.02]	46 [1.81]	180 [7.09]	350 [13.78]	380 [14.96]	445 [17.52]	530 [20.87]	315 [12.4]	310 [12.2]
300	410 [16.14]	26 [1.02]	46 [1.81]	220 [8.66]	420 [16.54]	450 [17.72]	525 [20.67]	610 [24.02]	375 [14.76]	370 [14.57]
350	470 [18.5]	26 [1.02]	55 [2.17]	295 [11.61]	515 [20.28]	550 [21.65]	640 [25.2]	750 [29.53]	455 [17.91]	450 [17.72]
400	525 [20.67]	30 [1.18]	68 [2.68]	345 [13.58]	600 [23.62]	625 [24.61]	720 [28.35]	850 [33.46]	530 [20.87]	525 [20.67]
500	650 [25.59]	33 [1.3]	68 [2.68]	450 [17.72]	770 [30.31]	800 [31.5]	940 [37.01]	1070 [42.13]	750 [29.53]	745 [29.33]

Size	H1	H2	H3	H4	H5	H6	H7	H8	H9	T5	N1	N2
125	490 [19.29]	136 [5.35]	185 [7.28]	35 [1.38]	80 [3.15]	*515* [20.28]	25 [0.98]	207 [8.15]	28 [1.10]	1 [0.0394]	8	12
150	604 [23.78]	160 [6.3]	220 [8.66]	35 [1.38]	90 [3.54]	*603* [23.74]	26 [1.02]	248 [9.76]	31 [1.22]	1 [0.0394]	8	12
200	695 [27.36]	180 [7.09]	255 [10.04]	35 [1.38]	100 [3.94]	*671* [26.42]	27 [1.06]	298 [11.73]	36 [1.42]	1 [0.0394]	12	15
250	835 [32.87]	240 [9.45]	320 [12.6]	55 [2.16]	120 [4.72]	*756* [29.76]	38 [1.5]	379 [14.92]	44 [1.73]	1 [0.0394]	12	18
300	1085 [42.72]	305 [12.01]	390 [15.35]	55 [2.16]	160 [6.3]	*935* [36.81]	38 [1.5]	442 [17.4]	59 [2.32]	1 [0.0394]	12	24
350	1259 [49.57]	360 [14.17]	460 [18.11]	55 [2.16]	200 [7.87]	*1045* [41.14]	50 [1.97]	500 [19.69]	60 [2.36]	1 [0.0394]	16	24
400	1463 [57.6]	423 [16.65]	510 [20.08]	55 [2.16]	210 [8.27]	*1195* [47.05]	63 [2.48]	577 [22.72]	80 [3.15]	1 [0.0394]	16	20
500	1750 [68.9]	700 [27.56]	600 [23.62]	55 [2.16]	250 [9.84]	*1290* [50.79]	70 [2.76]	686 [27.01]	90 [3.54]	2 [0.0787]	20	24

Unit dimensions: Version "K", cartridge valve without control spool (dimensions in mm *[inch]*)



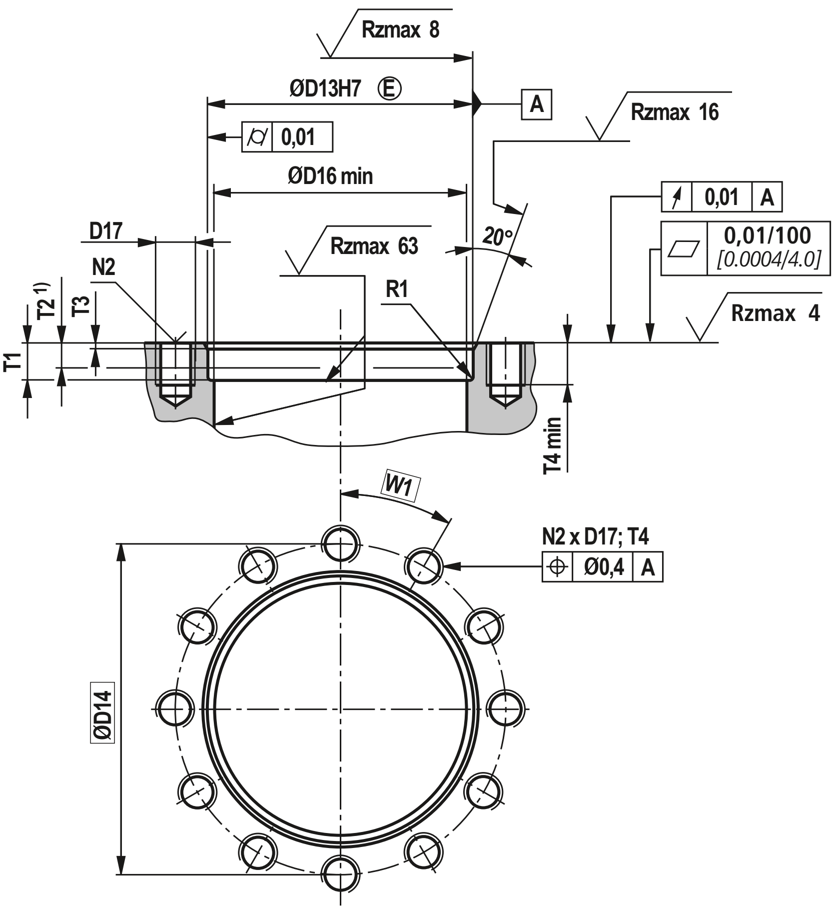
1) Depth of fit

Dimensional tables see page 9.
Installation bore see page 11.
Item explanations and valve mounting screws see page 12.

Size	ØD10	ØD11	ØD12	ØD13	ØD14	ØD15	ØD20	ØD21
125	33 *[1.3]*	120 *[4.72]*	175 *[6.89]*	200 *[7.87]*	250 *[9.84]*	310 *[12.2]*	130 *[5.12]*	105 *[4.13]*
150	40 *[1.58]*	145 *[5.71]*	220 *[8.66]*	250 *[9.84]*	310 *[12.2]*	380 *[14.96]*	160 *[6.3]*	130 *[5.12]*
200	40 *[1.58]*	155 *[6.1]*	265 *[10.43]*	290 *[11.42]*	350 *[13.78]*	420 *[16.54]*	185 *[7.28]*	155 *[6.1]*
250	46 *[1.81]*	180 *[7.09]*	350 *[13.78]*	380 *[14.96]*	445 *[17.52]*	530 *[20.87]*	250 *[9.84]*	206 *[8.11]*
300	46 *[1.81]*	220 *[8.66]*	420 *[16.54]*	450 *[17.72]*	525 *[20.67]*	610 *[24.02]*	300 *[11.81]*	255 *[10.04]*
350	55 *[2.17]*	295 *[11.61]*	515 *[20.28]*	550 *[21.65]*	640 *[25.2]*	750 *[29.53]*	350 *[13.78]*	305 *[12.01]*
400	68 *[2.68]*	345 *[13.58]*	600 *[23.62]*	625 *[24.61]*	720 *[28.35]*	850 *[33.46]*	400 *[15.75]*	355 *[13.98]*

Size	H2	H4	H5	T6	T7	T8	R2	N2
125	136 *[5.35]*	35 *[1.38]*	80 *[3.15]*	14 *[0.551]*	12 *[0.472]*	3 *[0.118]*	0.5 *[0.0197]*	12
150	160 *[6.3]*	35 *[1.38]*	90 *[3.54]*	14 *[0.551]*	12 *[0.472]*	3 *[0.118]*	0.5 *[0.0197]*	12
200	180 *[7.09]*	35 *[1.38]*	100 *[3.94]*	14 *[0.551]*	12 *[0.472]*	3 *[0.118]*	0.5 *[0.0197]*	15
250	240 *[9.45]*	55 *[2.16]*	120 *[4.72]*	21 *[0.827]*	19 *[0.748]*	4.5 *[0.177]*	1.6 *[0.063]*	18
300	305 *[12.01]*	55 *[2.16]*	160 *[6.3]*	21 *[0.827]*	19 *[0.748]*	4.5 *[0.177]*	1.6 *[0.063]*	24
350	360 *[14.17]*	55 *[2.16]*	200 *[7.87]*	30 *[1.181]*	27 *[1.063]*	8 *[0.315]*	1.6 *[0.063]*	24
400	423 *[16.65]*	55 *[2.16]*	210 *[8.27]*	30 *[1.181]*	27 *[1.063]*	6 *[0.236]*	1.6 *[0.063]*	20

Installation bore
(dimensions in mm *[inch]*)



Size	ØD13	ØD14	ØD16	D17 2)	R1	T1	T2	T3	T4	N2	W1
125	200 *[7.87]*	250 *[9.84]*	180 *[7.09]*	M30	3 *[0.118]*	37 *[1.46]*	26 *[1.02]*	5 *[0.196]*	40 *[1.58]*	12	30°
150	250 *[9.84]*	310 *[12.2]*	230 *[9.06]*	M36	3 *[0.118]*	37 *[1.46]*	26 *[1.02]*	5 *[0.196]*	60 *[2.36]*	12	30°
200	290 *[11.42]*	350 *[13.78]*	270 *[10.63]*	M36	3 *[0.118]*	37 *[1.46]*	26 *[1.02]*	5 *[0.196]*	50 *[1.97]*	15	24°
250	380 *[14.96]*	445 *[17.52]*	355 *[13.98]*	M42	5 *[0.197]*	57 *[2.24]*	42 *[1.65]*	8 *[0.315]*	60 *[2.36]*	18	20°
300	450 *[17.72]*	525 *[20.67]*	425 *[16.73]*	M42	5 *[0.197]*	57 *[2.24]*	42 *[1.65]*	8 *[0.315]*	75 *[2.95]*	24	15°
350	550 *[21.65]*	640 *[25.2]*	520 *[20.47]*	M52	5 *[0.197]*	57 *[2.24]*	42 *[1.65]*	8 *[0.315]*	80 *[3.15]*	24	15°
400	625 *[24.61]*	720 *[28.35]*	605 *[23.82]*	M64	5 *[0.197]*	57 *[2.24]*	42 *[1.65]*	8 *[0.315]*	95 *[3.74]*	20	18°
500	800 *[31.5]*	940 *[37.01]*	785 *[30.91]*	M64	5 *[0.197]*	60 *[2.36]*	45 *[1.77]*	10 *[0.394]*	110 *[4.33]*	24	15°

1) Depth of fit

2) In earlier data sheet versions, fine threads were moreover specified. Please note when selecting the mounting screws!

☞ **Notice!**
Design of the valve mounting face (e. g. pressing cylinders, bearing structures, etc.) must be sufficiently rigid! The prefill valve must not be loaded by bending!

Unit dimensions

1 Housing with low-pressure flange, continuously rotatable
2 Name plate
3 Control cylinder
4 Connection G1 1/2 (draining, only size 500); tightening torque M_A = 300 Nm ±10 %
5 Ring
6 Mounting screws; tightening torque see table on the right
7 Port Y; connection flange upon request
8 Port X; connection flange upon request
9 **N1** Number of the flange mounting screens evenly arranged at the circumference (type of connection "A")
10 **N2** Number of the valve mounting screws evenly arranged at the circumference (see below)
11 Version "without position switch"
12 Version "Q2G24Z"

Size	Tightening torques M_A in Nm ±10 % (6)
125	25
150	51
200	51
250	87
300	215
350	215
400	430
500	110

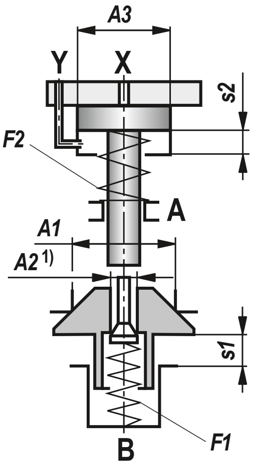
Valve mounting screws (separate order)
For reasons of stability, exclusively use the following valve mounting screws:

Size	Quantity (N2)	Dimension [2)]	Tightening torque M_A in Nm *[ft-lbs]* ±5 % **Hexagon socket head cap screw ISO 4762 - 10.9-flZn-...** (or DIN 912 - 10.9) [1)]
125	12	M30 x 120	1400 *[1033]*
150	12	M36 x 150	2600 *[1918]*
200	15	M36 x 150	2600 *[1918]*
250	18	M42 x 180	4500 *[3319]*
300	24	M42 x 220	4500 *[3319]*
350	24	M52 x 280	8500 *[6269]*
400	20	M64 x 300	16000 *[11801]*
500	24	M64 x 350 [3)]	20000 *[14751]*

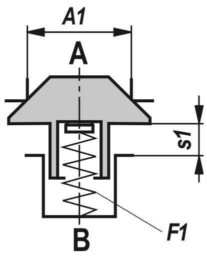
1) Friction coefficient μ_{total} = 0.09 to 0.14
2) In earlier data sheet versions, fine threads were moreover specified. Please note when designing the mounting bores or when revising existing constructions!
3) Assembly with washers (washer ISO 7089-64-300 HV, not included in the scope of delivery).

Poppet geometry and determination of the minimum pilot pressure

Version "A" and "B"



Version "K"



A1 = Effective area of the main poppet
A2 = Effective area of the pilot poppet
A3 = Effective area of the control spool
s1 = Stroke of the main poppet
s2 = Stroke of the control spool
F1 = Spring force of the valve spring
F2 = Spring force of the compression spring of the control spool

$V_{st\,X}$ = Pilot oil volume for opening the valve
$V_{st\,Y}$ = Pilot oil volume for closing the valve
p_{St} = Pilot pressure at port X
p_B = System pressure at port B

$$\text{Unchecking ratio} = \frac{\text{Pilot pressure } p_{St}}{\text{System pressure } p_B}$$

Size	*A1* in cm² *[inch²]*	*A2* 1) in cm² *[inch²]*	*A3* in cm² *[inch²]*	*s1* in mm *[inch]*	*s2* in mm *[inch]*	*F1* in N *[lbs]*	*F2* in N *[lbs]*	$V_{st\,X}$ in cm³ *[inch³]*	$V_{st\,Y}$ in cm³ *[inch³]*	Unchecking ratio 2)	Unchecking ratio 3)
125	101.0 *[15.66]*	2.5 *[0.388]*	24.6 *[3.81]*	28 *[1.10]*	25 *[0.98]*	220 – 360 *[49.5 – 80.9]*	780 – 2340 *[175 – 526]*	62 *[3.78]*	–	4.1	0.1
150	153.9 *[23.86]*	3.8 *[0.589]*	38.5 *[5.97]*	35 *[1.38]*	29 *[1.14]*	350 – 570 *[78.7 – 128]*	1530 – 3550 *[344 – 798]*	112 *[6.83]*	–	4.0	0.1
200	216.4 *[33.54]*	4.9 *[0.759]*	50.3 *[7.8]*	42 *[1.66]*	34 *[1.34]*	490 – 760 *[110.2 – 170.8]*	1920 – 4540 *[432 – 1021]*	171 *[10.44]*	–	4.3	0.1
250	373.3 *[57.86]*	9.6 *[1.488]*	95.0 *[14.73]*	53 *[2.09]*	41 *[1.61]*	870 – 1430 *[87 – 143]*	4160 – 7260 *[935 – 1632]*	390 *[23.8]*	–	3.9	0.1
300	572.6 *[88.75]*	13.9 *[2.16]*	143.1 *[22.18]*	63 *[2.48]*	48 *[1.89]*	1490 – 2630 *[335 – 591]*	6080 – 11040 *[1367 – 2482]*	687 *[41.92]*	–	4.0	0.1
350	826.6 *[128.12]*	21.2 *[3.29]*	213.8 *[33.14]*	78 *[3.07]*	58 *[2.28]*	2180 – 3880 *[490 – 872]*	9490 – 15600 *[2133 – 3507]*	1240 *[75.67]*	–	3.9	0.1
400	1158.0 *[179.49]*	32.2 *[4.99]*	314.2 *[48.7]*	93 *[3.66]*	68 *[2.68]*	3310 – 6230 *[744 – 1401]*	13900 – 22570 *[3125 – 5074]*	2136 *[130.4]*	–	3.7	0.1
500	1948.0 *[301.94]*	49.0 *[7.59]*	490.9 *[76.09]*	140 *[5.51]*	100 *[3.94]*	6520 – 13800 *[1466 – 3102]*	–	4909 *[299.6]*	1767 *[107.8]*	4.0	0.1

1) Is omitted for version "without pre-decompression" (SF ...0...)
2) Without pre-decompression
3) With pre-decompression

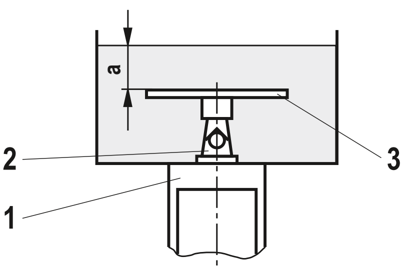
Calculation example type SF 300 ...;
p_B = 30 bar
p_{St} = 4.0 x 30 bar = 120 bar

Flow in l/min *[US gpm]* (A to B) for the different cases of application (***Δp*** = 0.3 bar)

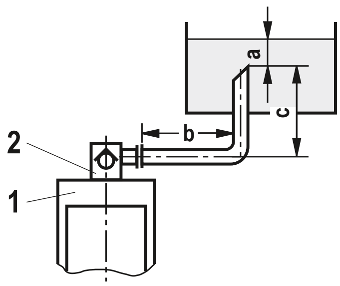
Size	**125**	**150**	**200**	**250**	**300**	**350**	**400**	**500**
Case of application 1	2500 *[660]*	3900 *[1030]*	5600 *[1479]*	10000 *[2642]*	15600 *[4121]*	22480 *[5939]*	30600 *[8084]*	50000 *[13209]*
Case of application 2	2500 *[660]*	3900 *[1030]*	5600 *[1479]*	10000 *[2642]*	14000 *[3698]*	19050 *[5033]*	24880 *[6573]*	40000 *[10567]*
Case of application 3	1700 *[449]*	2440 *[645]*	4340 *[1147]*	6775 *[1790]*	9750 *[2576]*	13280 *[3508]*	17340 *[4581]*	28000 *[7397]*
Case of application 4	1470 *[388]*	2120 *[560]*	3770 *[996]*	5890 *[1556]*	8480 *[2240]*	11540 *[3049]*	15080 *[3984]*	25000 *[6604]*
Case of application 5	590 *[156]*	850 *[1910]*	1510 *[399]*	2360 *[624]*	3400 *[898]*	4620 *[1221]*	6050 *[1598]*	upon request

☞ **Notice!**
An underdimensioned prefill valve and/or an underdimensioned line leads to gas leaks from the hydraulic fluid with corresponding consequences and often to long-term damage at the cylinder seals. For boundary areas, please ask us!

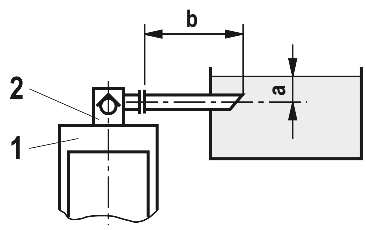
Case of application 1



Case of application 2

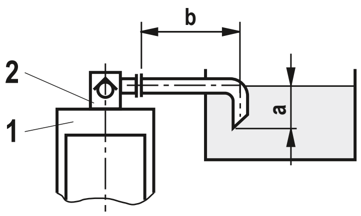


Case of application 3

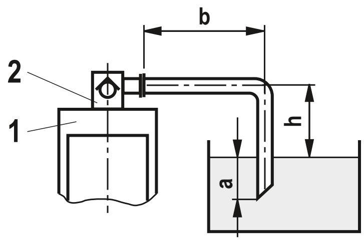


Size of the filling tank
at least 1.5 x cylinder content

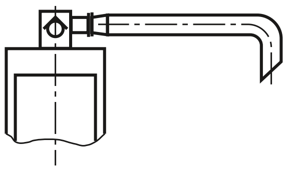
Case of application 4



Case of application 5



Information on case of application 1 to 5



For limit areas, please ask us.
It is often enough, to select a pipeline which is one size larger.

- **1** Cylinder
- **2** Prefill valve
- **3** This sheet is not included in the scope of delivery. With smaller tank dimensions and minimum hydraulic fluid level (a), it prevents the formation of tunnels.
- **a** Min. 300 mm *[11.81 inch]* with extended cylinder
- **b** up to 1000 mm *[39.37 inch]* with the specified maximum flows
- **c** h ≤ 500 mm *[19.69 inch]*
- **h** 300 mm *[11.81 inch]* ≤ h < 500 mm *[19.69 inch]*

More information

▶ Prefill valve, actively switchable	Data sheet 20473
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ Sales information – Serial overview of the prefill valves	Data sheet 20482-01-V
▶ General product information on hydraulic products	Data sheet 07008
▶ Assembly, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Inductive position switch, type Q2	Data sheet upon request
▶ Selection of the filters	www.boschrexroth.com/filter

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Notes

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The Drive & Control Company

Rexroth
Bosch Group

Prefill valve

Type SFA

RE 20485
Edition: 2012-09
Replaces: 04.08


H6714

- Size 25 ... 80
- Component series 1X
- Maximum operating pressure 350 bar

Features

- Pilot operated check valve
- For threaded connection (size 25 and 32)
- For flange connection according to ISO 6162-1 (from size 40)
- For direct attachment to the working cylinder
- With and without pre-decompression, optional
- Integrated high-pressure connection

Contents

Ordering code

01	02	03	04	05		06		07		08	09
SFA					**–**		**/**	**M**	**/**	**01**	*****

01	Prefill valve	**SFA**

02	Size 25	**25**
	Size 32	**32**
	Size 40	**40**
	Size 50	**50**
	Size 63	**63**
	Size 80	**80**

Type of connection (connection A)

03	Threaded connection (only size 25 and 32)	**G**
	Flange connection (from size 40)	**F**

04	**Without** tank bore	**no code**
	With tank bore (from size 32)	**T**

05	**With** pre-decompression (from size 32)	**1**
	Without pre-decompression	**0**

06	Component series 10 ... 19 (10 ... 19: Unchanged installation and connection dimensions)	**1X**

Seal material

07	NBR seals	**M**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

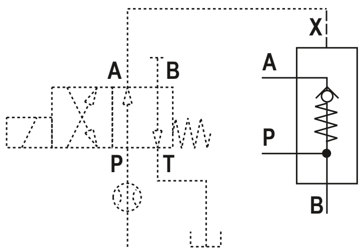
Connection version

08	Threaded holes with pipe thread according to DIN 3852 part 2	**01**

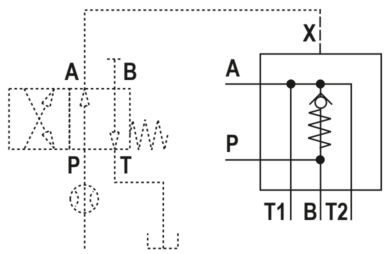
09	Further details in the plain text	

Symbols

Type SFA... (from size 25)



Type SFA...T... (from size 32)

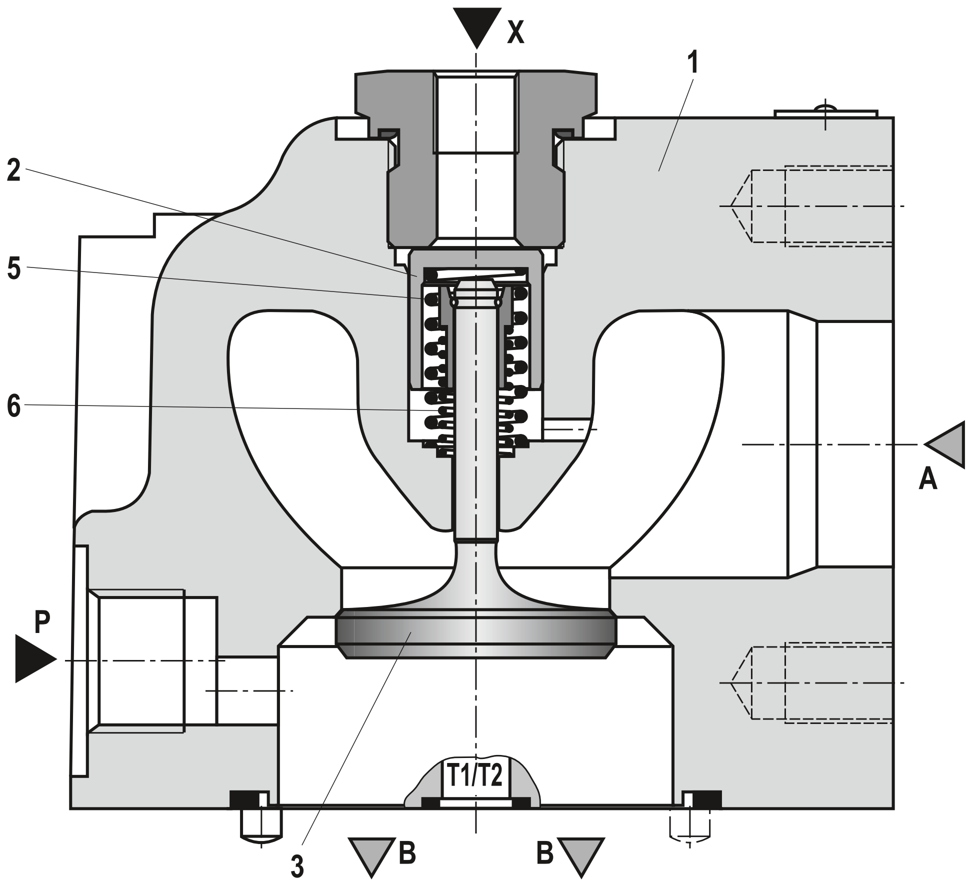


Notice!
Possible circuit with directional valve and nozzle in channel P for one individual prefill valve.
For the parallel connection of prefill valves, the nozzle is to be individually provided for every control line!

Function, sections: without pre-decompression

Valves of type SFA are pilot operated check valves. They are used for the leakage-free isolation of pressurized working circuits (e. g. pressing cylinders). Due to their aerodynamic design and the relatively little closing force of the compression spring (6) at the main poppet, they are particularly suitable for the pulling function and for filling e.g. the main cylinder at presses during the fast closing movement. The integrated pressure connection P allows for the high pressure build-up in the pressing cylinder!
The valves basically comprise of a housing (1), control spool (2), main poppet (3), pilot poppet (4) and the compression springs (5) and (6).

In channel P of the directional valve, a nozzle insert is to be provided. The nozzle diameter is to be designed according to the prefill valve size (see below).
The valve allows for free flow from A to B. In the opposite direction, the main poppet (3) is held on the seat by the compression spring (6) and the pressure available at port B. The pressure at the control port X pushes the control spool (2) downwards, against the compression spring (5), and pushes the main poppet (3) off the seat. Now, the valve can also be flown through in the opposite direction.



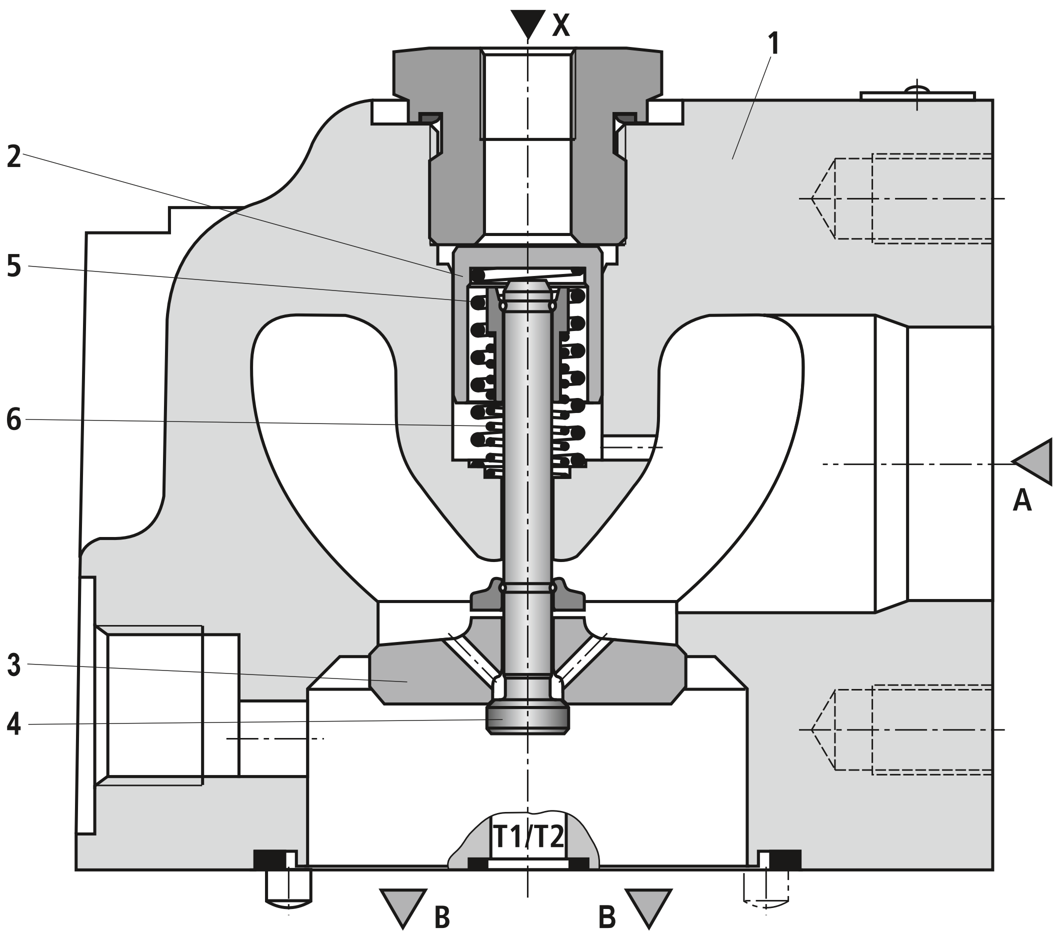
Type SFA..GT0-1X/M/01 (without pre-decompression)

Nozzle insert [1]	
Size	Nozzle Ø in mm
25	0.8
32	0.8
40	0.8
50	0.8
63	0.8
80	1.0

[1] Not included in the scope of delivery

Function, sections: with pre-decompression

The function of this version basically corresponds to the version without pre-decompression.
In case of pressure at the control port X, the control spool (2) only opens the pilot poppet (4) first. This guarantees shock-free decompression of the compressed hydraulic fluid.



Type SFA..FT1-1X/M/01 (with pre-decompression)

Nozzle insert 1)	
Size	Nozzle Ø in mm
25	0.8
32	0.8
40	0.8
50	0.8
63	0.8
80	1.0

1) Not included in the scope of delivery

Technical data
(For applications outside these parameters, please consult us!)

general								
Size			25	32	40	50	63	80
Weight		kg	approx. 4.5	approx. 6	approx. 7	approx. 10.5	approx. 16	approx. 23
Installation position			any					
Ambient temperature range		°C	−30 ... +80					

hydraulic			
Maximum operating pressure	– Port B, P	bar	350
	– Port X	bar	150
	– Port A	bar	16
Cracking pressure [1]		bar	~0.12
Maximum flow		l/min	see cases of application page 11
Hydraulic fluid			see table below
Hydraulic fluid temperature range (at the valve working ports)		°C	−30 ... +80
Viscosity range		mm^2/s	10 ... 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [2]

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils and related hydrocarbons		HL, HLP, HVLP	NBR, FKM [3]	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM [3]	VDMA 24568
		HEES	FKM [3]	
	– soluble in water	HEPG	FKM [3]	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM [3]	ISO 12922
		HFC	NBR	ISO 12922

Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- **Flame-resistant and bio-degradable:** There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!

[1] Pressure differential at the main poppet for overcoming the spring force

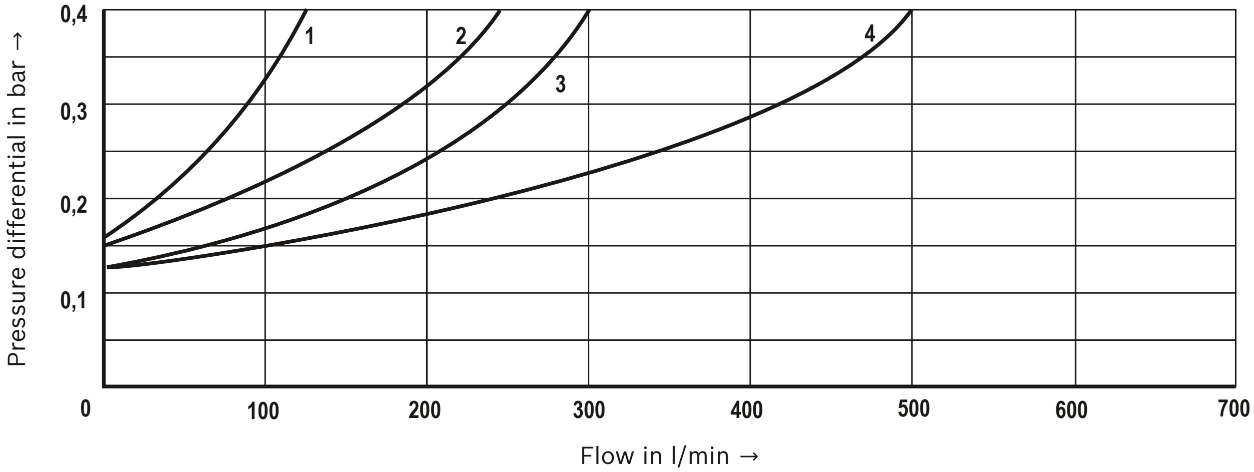
[2] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components. For the selection of the filters see www.boschrexroth.com/filter.

[3] Upon request

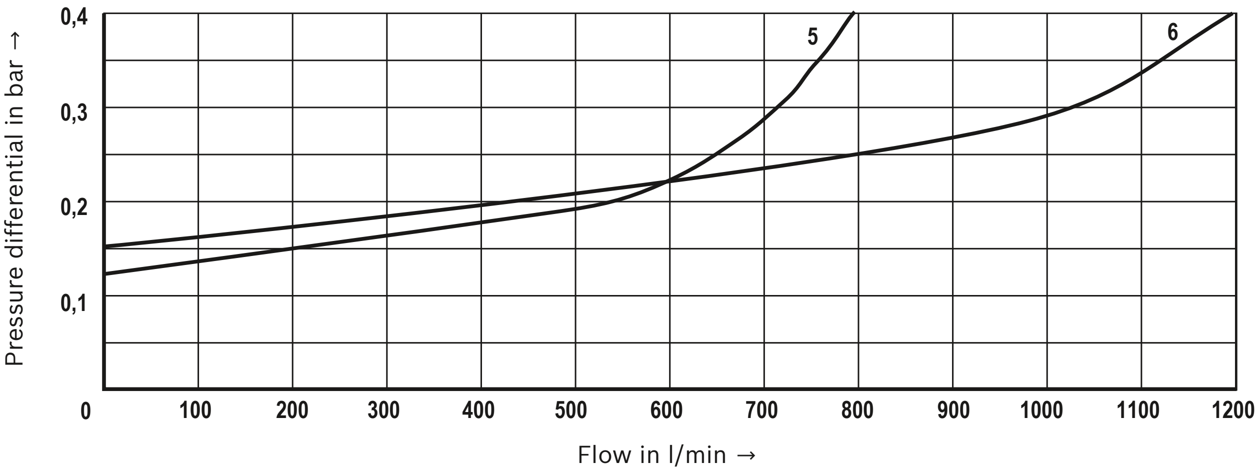
Characteristic curves
(measured with HLP46, ϑ_{Oil} = 40 ± 5 °C)

Pressure differential ***Δp*** between ports A and B against the flow $\boldsymbol{q}_V$ in case of flow in suction direction A to B.

Size 25 ... 50

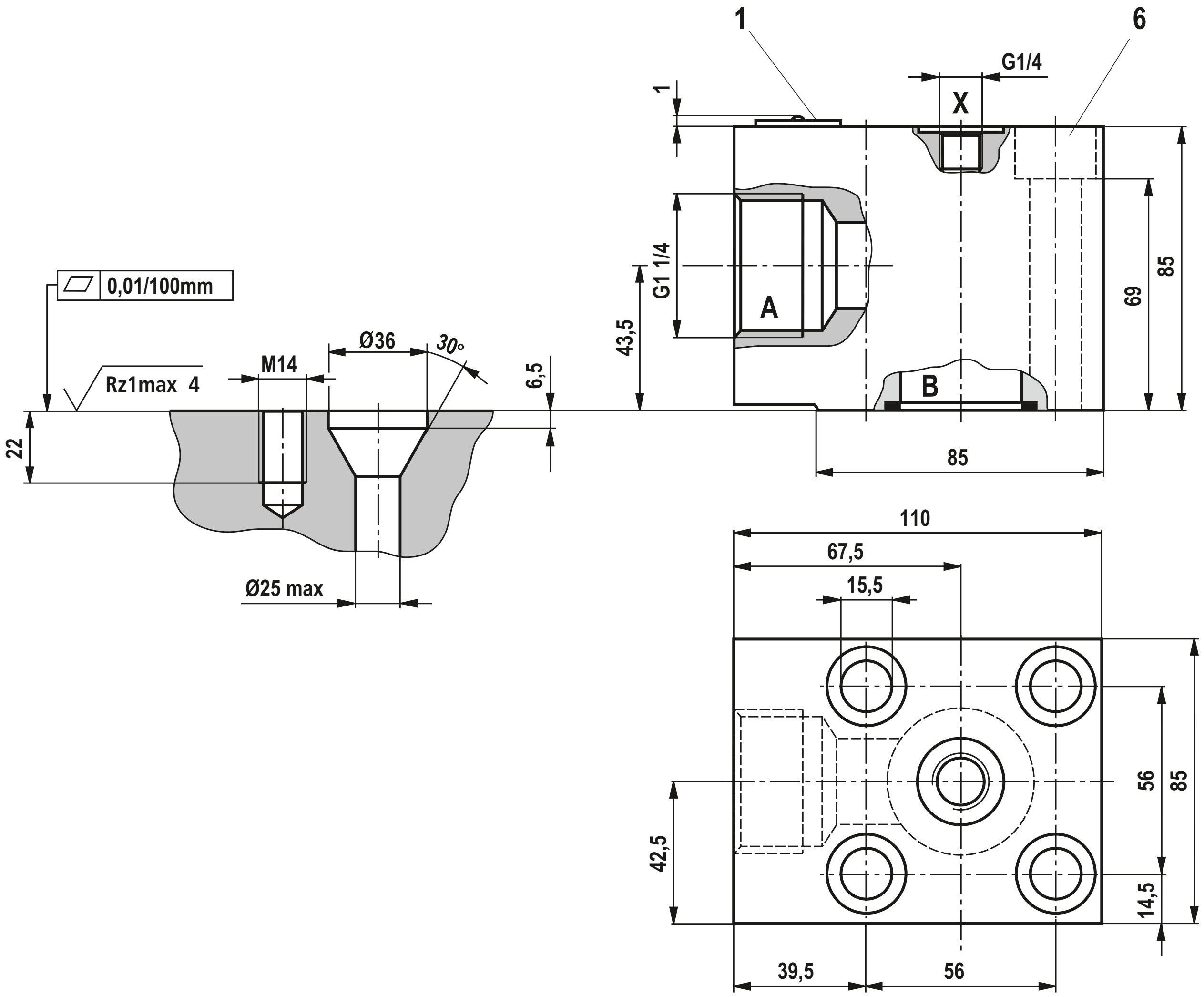


Size 63 and 80



1 Size 25
2 Size 32
3 Size 40
4 Size 50
5 Size 63
6 Size 80

Unit dimensions: Threaded connection (only size 25)
(dimensions in mm)

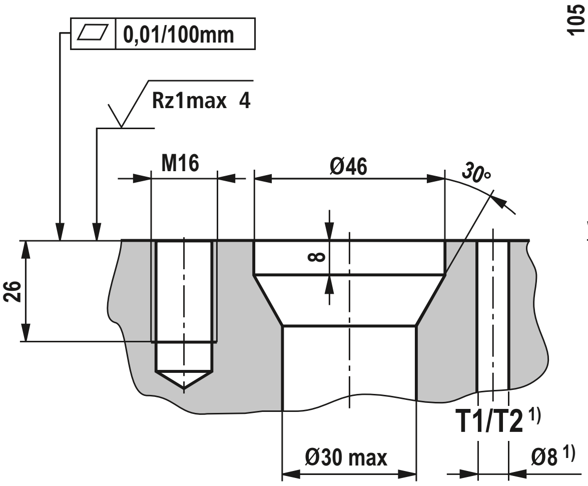


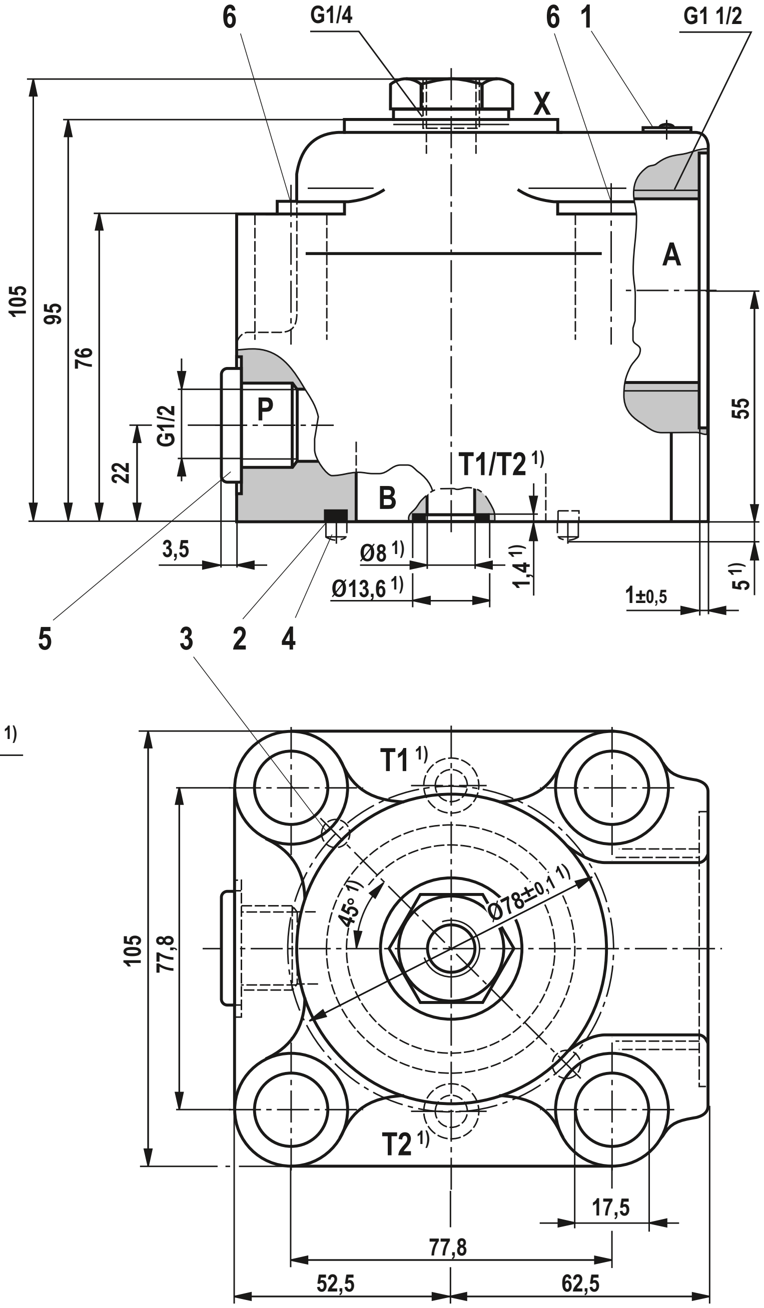
1 Name plate

6 4 valve mounting bores

Valve mounting screws see page 10.

Unit dimensions: Threaded connection (only size 32) (dimensions in mm)



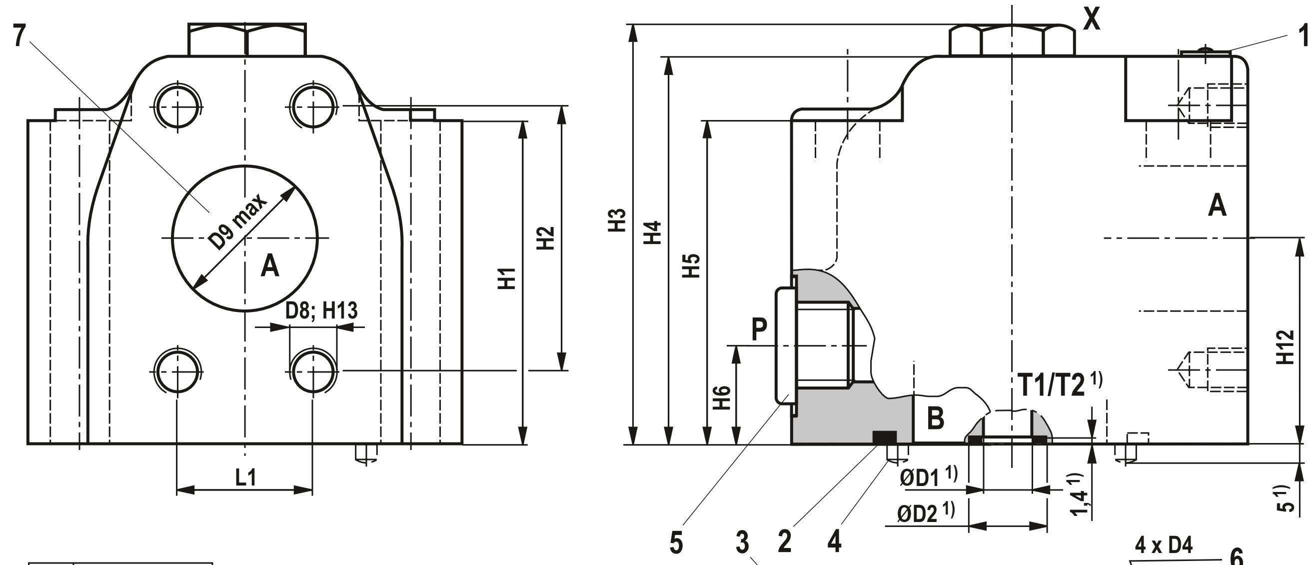


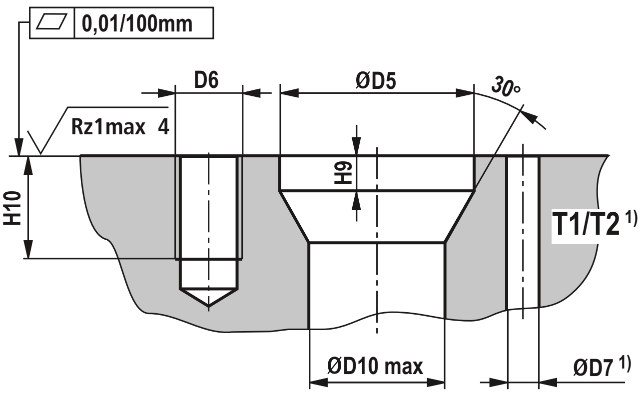
1. **1** Name plate
2. **2** Seal ring
3. **3** Provide bore Ø6.5 x 6 deep for the valve centering in the connection surface!
4. **4** 2 grooved dowel pins 6 x 12
5. **5** Plug screw
6. **6** 4 valve mounting bores

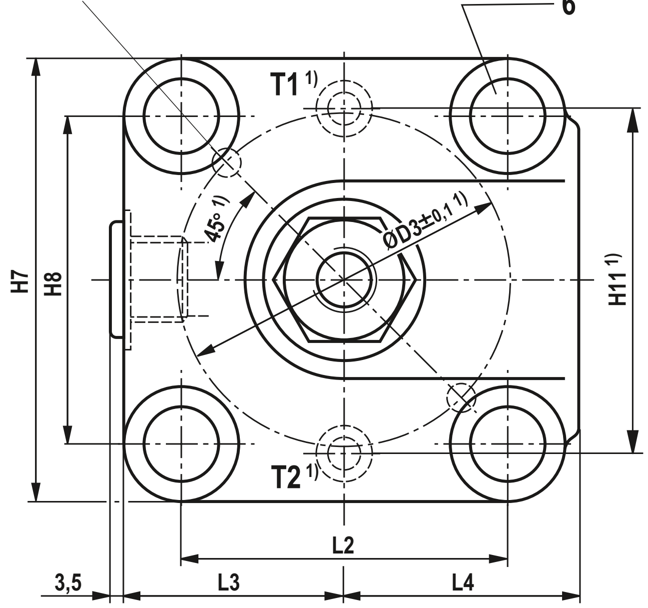
1) Only version "T"

Valve mounting screws see page 10.

Unit dimensions: Flange connections (size 40 ... size 80) (dimensions in mm)







1 Name plate

2 Seal ring

3 Provide bore Ø6.5 x 6 deep for the valve centering in the connection surface!

4 2 grooved dowel pins 6 x 12

5 Plug screw (only version "T")

6 4 valve mounting bores

7 Flange connection according to ISO 6162-1

Valve mounting screws and connections see page 10.

1) Only version "T"

Size	L1±0.2	L2	L3	L4	ØD1	ØD2	ØD3±0.1	ØD4	ØD5	D6	ØD7	D8	D9 max	ØD10 max
40	35.7	88.4±0.2	58	62	10	15.7	90	17.5	58	M16	10	M12	38	40
50	42.9	102.5±0.2	70	72	13	19	104	22	71	M20	13	M12	51	50
63	50.8	113.15±0.2	80	82	13	19	120	26	90	M24	13	M12	64	63
80	61.9	134+0.3	92	95	13	19	140	30	107	M27	13	M16	76	78.5

Size	H1	H2±0.2	H3	H4	H5	H6	H7	H8	H9	H10	H11±0.1	H12	H13
40	85	69.9	109	102	85	22	116	88.4±0.2	10	26	92	54	18
50	101	77.8	132	124	101	22	141	102.5±0.2	12	32	108	66	18
63	125	88.9	152	144	125	30	160	113.15±0.2	14	38	130	83	18
80	140	106.4	170	158	140	30	185	134+0.3	16	43	150	90	21

Valve mounting screws and connections

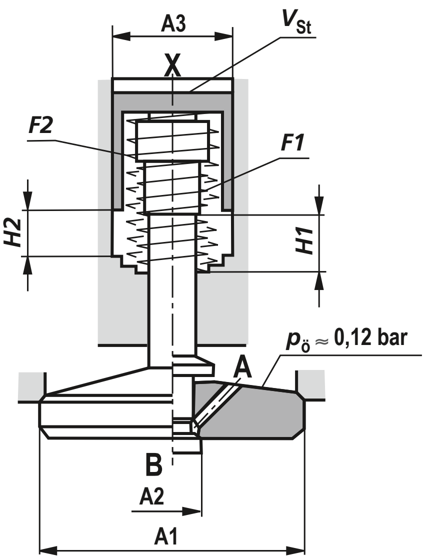
Valve mounting screws (separate order)
For reasons of stability, exclusively use the following valve mounting screws:

4 hexagon socket head cap screws ISO 4762 - 10.9 or DIN 912 - 10.9
Friction coefficient μ_{total} = 0.09 ... 0.14

Size	Valve mounting screws			Connections		
	Dimension	Tightening torque M_A in Nm (±4 %)				
		Hexagon socket head cap screws ISO 4762 - 10.9	Hexagon socket head cap screws DIN 912 - 10.9	A	P	X
25	M14 x 90	170	–	G1 1/4	–	G1/4
32	M16 x 100	280	–	G1 1/2	G1/2	G1/4
40	M16 x 110	280	–	DN38 1)	G1/2	G1/4
50	M20 x 130	560	–	DN51 1)	G1/2	G1/4
63	M24 x 160	960	–	DN64 1)	G3/4	G1/4
80	M27 x 180	–	1400	DN76 1)	G3/4	G1/2

1) According to ISO 6162-1

Poppet geometry and determination of the minimum pilot pressure



without pre-decompression | **with** pre-decompression

A1 = Effective area of the main poppet
A2 = Effective area of the pilot poppet
A3 = Effective area of the control spool
H1 = Stroke of the main poppet
H2 = Stroke of the control spool
F1 = Spring force of the valve spring
F2 = Spring force of the control spool compression spring
V_{st} = Pilot volume for opening the valve
$p_{Ö}$ = Cracking pressure (pressure differential at the main poppet for overcoming the spring force ***F1***)
p_{St} = Pilot pressure at port X
p_B = System pressure at port B

$$\text{Unchecking ratio} = \frac{\text{Pilot pressure } p_{St}}{\text{System pressure } p_B}$$

Size	*A1* in cm²	*A2* 1) in cm²	*A3* in cm²	*H1* in mm	*H2* in mm	*F1* in N	*F2* in N	V_{st} in cm³	Unchecking ratio	
									2) in bar	3) in bar
25	5.31	–	1.33	6.2	5	6 ... 14	38 ... 70	0.66	4.0	–
32	8.04	0.5	2.01	8.5	6.5	9 ... 22	58 ... 109	1.30	4.0	0.3
40	13.52	0.78	3.14	10	7	14 ... 29	93 ... 162	2.20	4.3	0.3
50	21.24	1.13	4.71	12.5	9	23 ... 49	149 ... 261	4.20	4.5	0.3
63	32.67	1.77	7.07	14.5	11	35 ... 63	206 ... 348	7.80	4.6	0.3
80	49.02	2.54	10.18	17	13	57 ... 127	310 ... 579	13.20	4.8	0.3

1) Is omitted for version "without pre-decompression" (SFA...**0**...)
2) Without pre-decompression
3) With pre-decompression

Example: Type SFA**32**...G**0**; p_B = 30 bar
p_{St} = 4.0 x 30 bar = 120 bar

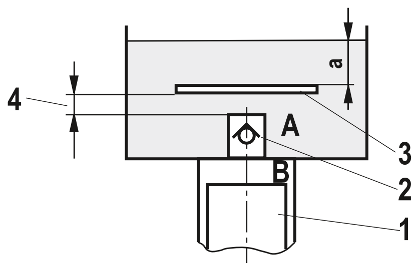
Flow in l/min (A to B) for the different cases of application

Size	25	32	40	50	63	80
Case of application 1	125	200	300	500	800	1200
Case of application 2	90	170	250	400	650	1000
Case of application 3	60	140	220	360	560	900
Case of application 4	40	100	150	240	380	620
Case of application 5	20	70	110	170	280	450

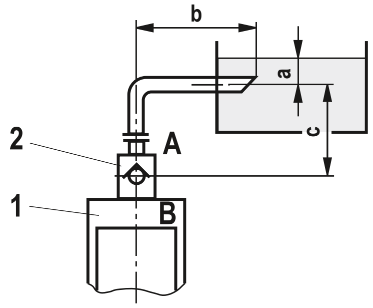
Notice!
An underdimensioned prefill valve and/or an underdimensioned line leads to gas leaks from the hydraulic fluid with corresponding consequences and often to long-term damage at the cylinder seals.

Cases of application

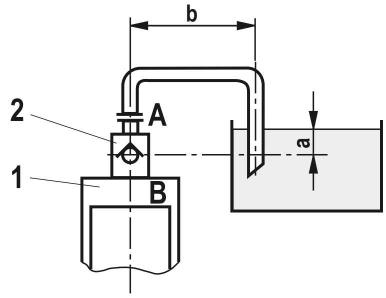
Case of application 1



Case of application 2

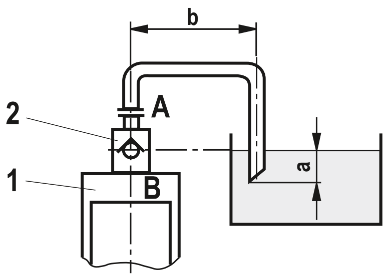


Case of application 3

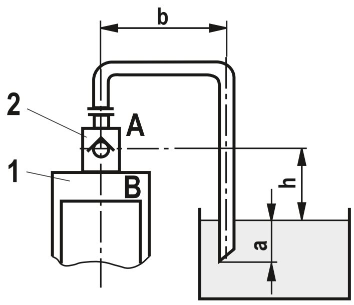


Size of the filling tank at least 1.5 x cylinder content

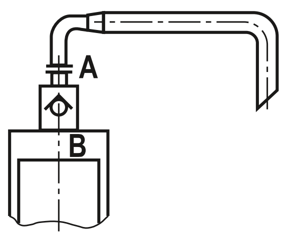
Case of application 4



Case of application 5



Information on case of application 2 to 5



For limit areas, please ask us.
It is often enough, to select a pipeline which is one size larger.

1 Cylinder

2 Prefill valve

3 This sheet is not included in the scope of delivery. With smaller tank dimensions and minimum hydraulic fluid level (a), it prevents the formation of tunnels.

4 Observe the supply cross-section – differs depending on the size!

a Min. 300 mm with extended cylinder

b Max. 1000 mm with the specified maximum flows

c ≥ 500 mm

h ~300 mm to max. 500 mm

More information

▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ General product information on hydraulic products	Data sheet 07008
▶ Assembly, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Selection of the filters	www.boschrexroth.com/filter

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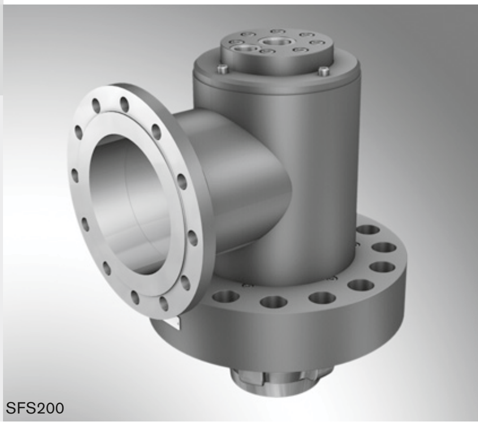
Rexroth
Bosch Group

Prefill valve, actively operatable

RE 20473/12.06
Replaces: 06.06

Type SFS



SFS200

Sizes 200 to 300
Component series 4X
Maximum operating pressure 350 bar

Table of contents

Features

– Hydraulically, actively switchable prefill valve (check valve) for flanged connection
– Reduced switching noise due to end position cushioning effective on both sides
– Optimised switching time characteristics

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

SFS		A	0 – 1 –4X /	*

Prefill valve

Size 200 = **200**
Size 250 = **250**
Size 300 = **300**

Type of connection
Flanged connection = **A**

Without pre-compression feature = **0**

1 = Main piston can be actively controlled

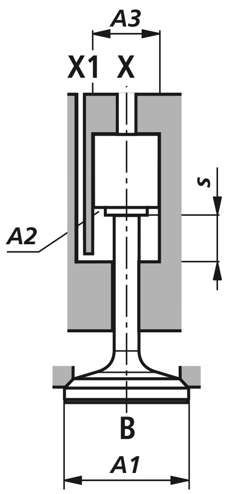
4X = Component series 40 to 49 (40 to 49: unchanged installation and connection dimensions)

Seal material
No code = NBR seals

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

Poppet geometry and determination of minimum pilot pressure



***A1* =** Effective area of main poppet
***A2* =** Effective area of pilot piston for “closing“
***A3* =** Effective area of pilot piston for “opening“
***s* =** Piston stroke
***V1* =** Pilot oil flow for opening the valve
***V2* =** Pilot oil flow for closing the valve
p_{St} = Pilot pressure in port X
p_B = Operating pressure in port B

$$\text{Unchecking ratio} = \frac{\text{Pilot pressure } p_p}{\text{System pressure } p_B}$$

Size	A_1 in cm^2	A_2 in cm^2	A_3 in cm^2	*s* in mm	V_1 in cm^3	V_2 in cm^3	Unchecking ratio in bar
200	216.4	36.4	50.3	42.0	211.0	153.0	4.3
250	373.2	67.4	95.0	52.5	503.7	353.8	3.9
300	572.6	92.86	143.1	63.0	901.8	585.0	4.0

Example (type SFS 200 A0…):
p_B = 30 bar; p_p = 4.3 x 30 bar = 129 bar

Function, section, symbol

Valves of type SFS are hydraulically, actively operatable prefill valves (check valves). They are used for the leak-free isolation of pressurised working circuits, mainly in press cylinders. The possibility of actively influencing the opening and closing process results in a reduction in switching times when compared with a conventional prefill valve.

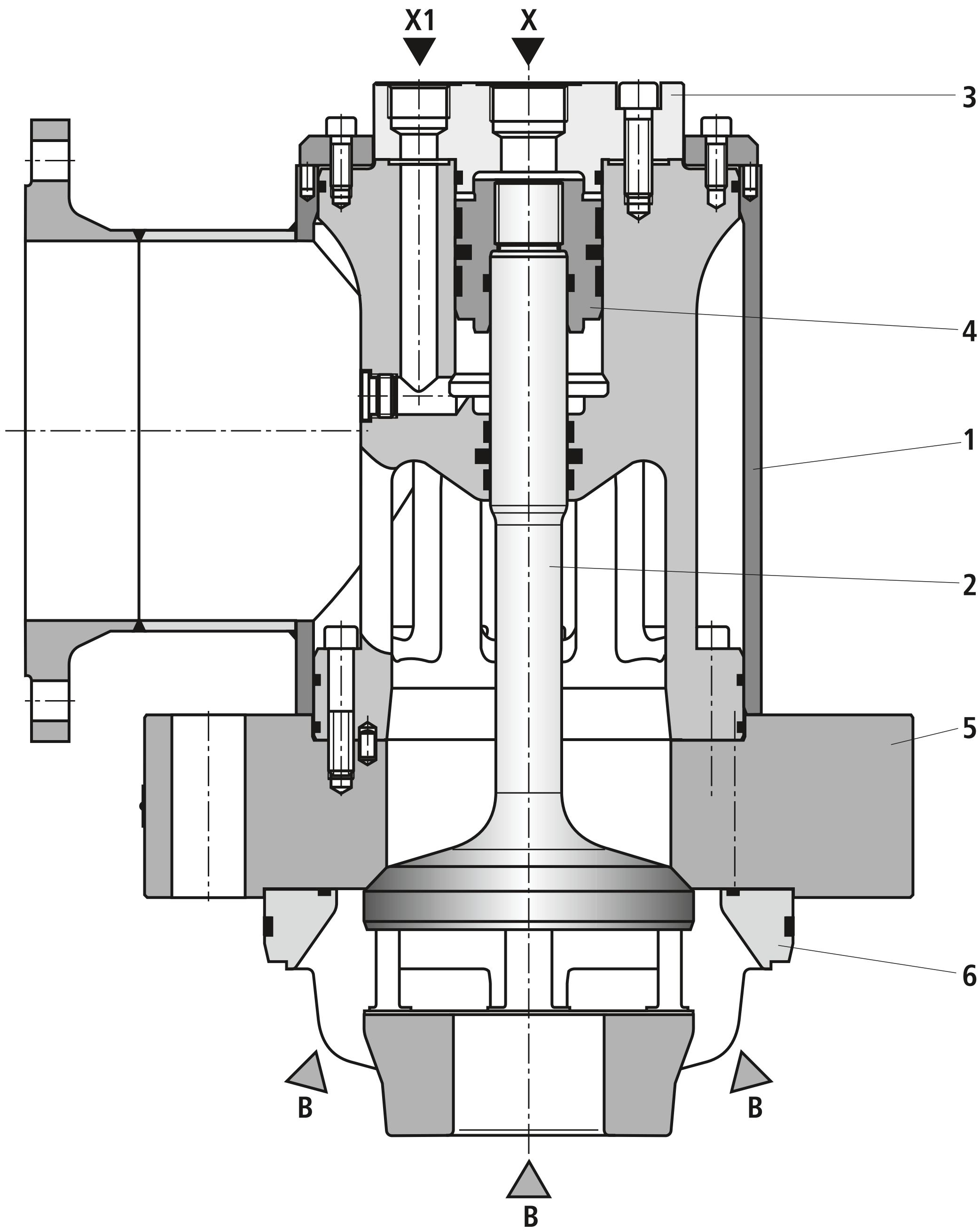
The valves basically consist of housing (1), poppet (2), connection cover (3), pilot piston (4), mounting flange (5) and guide (6).

The valves allow free flow from A to B while pilot port X1 is depressurised. In the opposite direction, poppet (2) is held on its seat by the pressure acting in port B. Due to pressure present in pilot port X, poppet (2) is pushed off its seat. This allows a free flow through the valve also in the opposite direction. Closing of the piston can be initiated via pilot port X1.

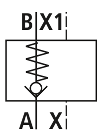
The opening and closing time can be influenced by means of the pilot oil flow (throttling).

For technical data for the calculation of the required pilot pressure, see page 2.

Pilot port X: “opening“
Pilot port X1: “closing“



Symbol



Technical data (for applications outside these parameters, please consult us!)

General

Size		200	250	300
Weight	kg	190	380	655
Installation orientation		Optional		
Port A (flange to EN 1092-1/11…/ PN16)	DN	200	250	300
Port X1		G1	G1 1/4	G1 1/4
Port X		G1 1/4	G1 1/2	G1 1/2

Hydraulic

Maximum operating pressure	– Port A	bar	16
	– Port B	bar	350
	– Ports X and X1	bar	150
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil); other hydraulic fluids on enquiry
Hydraulic fluid temperature range		°C	–30 to +80
Viscosity range		mm^2/s	10 to 800
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [1)]

[1)] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, increases the service life of components.

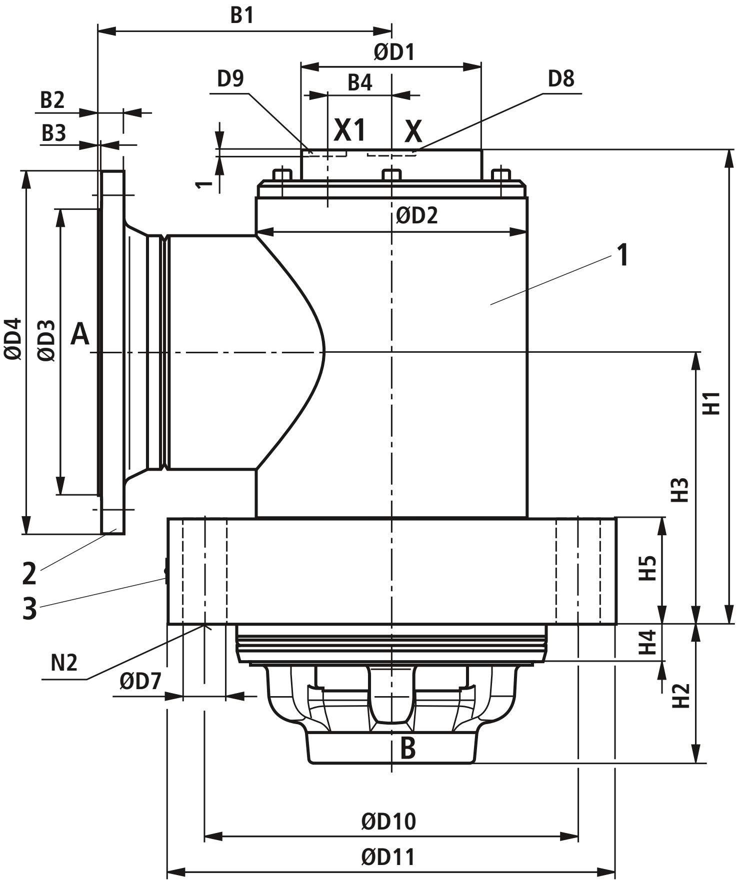
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

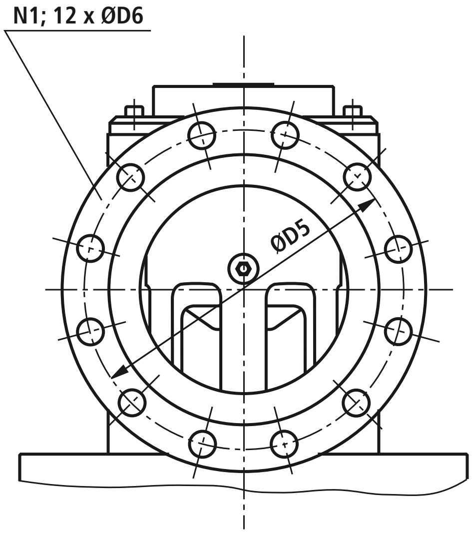
Maximum switching times

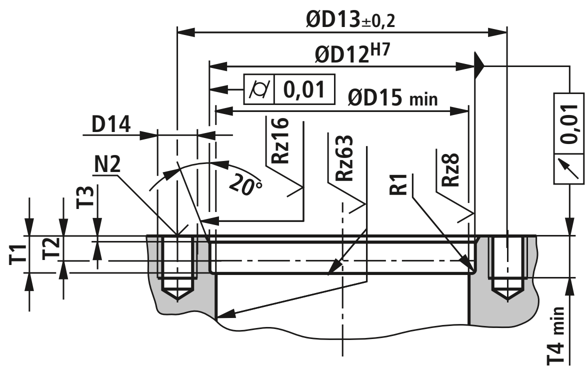
Size	Maximum switching time in ms (at X, X1 = 150 bar)	
	Closing	Opening
200	60	70
250	70	80
300	110	90

The switching time depends on the line resistance, pilot valve and pilot oil flow.

Unit dimensions (nominal dimensions in mm)







1 Housing can be mounted steplessly rotated through 360°

2 Flange to EN 1092-1/11…/PN16

3 Nameplate

T2 Depth of fit

N2 Number of **valve fixing screws** arranged at equally spaced intervalls on the bolt circle (separate order)

The following valve fixing screws are recommended:

Hexagon socket head cap screws ISO 21269 - 10.9
Friction coefficent μ_{total} = 0.12 to 0.17

Size	Dimensions in mm	Tightening torque M_T in Nm
200	M36 x 3 x 150	3100
250	M42 x 3 x 180	5100
300	M42 x 3 x 220	5100

Size	B1	B2	B3	B4	ØD1	ØD2	ØD3	ØD4	ØD5	ØD6	ØD7	D8	D9	ØD10
200	275	24	3	60	168	273	268	340	295	22	40	G1 1/4	G1	350
250	330	26	3	80	225	356	320	405	355	26	46	G1 1/2	G1 1/4	445
300	380	28	4	94	250	419	378	460	410	26	46	G1 1/2	G1 1/4	525

Size	ØD11	ØD12	ØD13	ØD14	D15	H1	H2	H3	H4	H5	N1	N2	T1	T2	T3	T4	R1
200	420	290	350	M36 x 3	270	445	180	255	35	100	12	15	37	26	5	50	3
250	530	380	445	M42 x 3	355	571	240	320	55	120	12	18	57	42	8	60	5
300	610	450	525	M42 x 3	425	684	305	390	55	160	12	24	57	42	8	75	5

Maximum flow q_V in l/min (A to B) for various applications

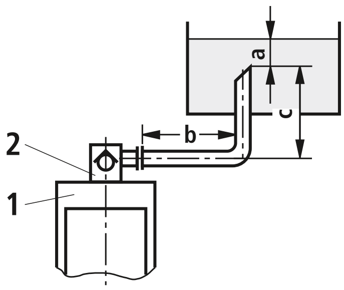
Size	**200**	**250**	**300**
Application 1	5600	10000	14000
Application 2	4340	6775	9750
Application 3	3770	5890	8480
Application 4	1510	2360	3400

⚠ **Caution!**

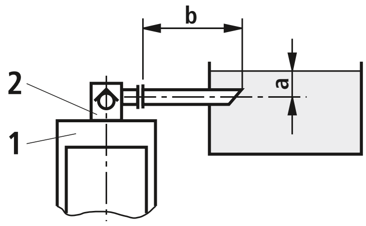
Too small a prefill valve or an insufficiently dimensioned pipe results in gas escaping from the hydraulic fluid with the associated consequences and frequently to long-term damage to cylinder seals.

Applications

Application 1

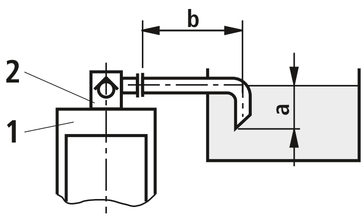


Application 2

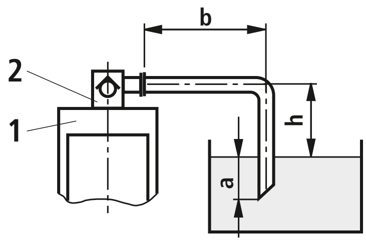


Size of the prefill tank
min. 1 .5 x cylinder volume

Application 3



Application 4



1 Cylinder

2 Prefill valve

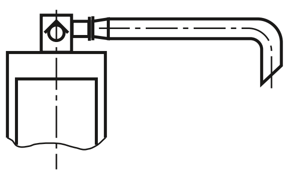
a Min. 300 mm with extended cylinder

b Up to 1000 mm with specified maximum flows

c ≤ 500 mm

h 300 mm ≤ h < 500 mm

Note on applications 1 to 4



For applications close to the limiting parameters, please consult us. It is, however, often sufficient to select the pipe one size larger.

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documentation@boschrexroth.de
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Pre-fill valve

RE 20745/07.07
Replaces: 05.07

Type SFE

Size 25 to 100
Component series 1X
Maximum operating pressure 350 bar *[5076 psi]*
Maximum flow 2000 l/min *[528 US gpm]*

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

– Cartridge valve
– Hydraulically piloted-to-open pre-fill valve (check valve)
– Installation in blocks or cylinders

Ordering code

SFE			0	– 1X	/ M	*

Pre-fill valve

Size 25	**= 25**
Size 32	**= 32**
Size 40	**= 40**
Size 50	**= 50**
Size 63	**= 63**
Size 80	**= 80**
Size 100	**= 100**

Type of connection

Block installation	**= P**
Cylinder installation [1]	**= Z**
Without pre-decompression	**= 0**

Further details in clear text

Seal material

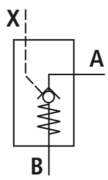
M = NBR seals
(other seals on request)
⚠ Attention!
Oberve compatibility of seals with hydraulic fluid used!

1X = Component series 10 to 19
(10 to 19: unchanged installation and connection dimensions)

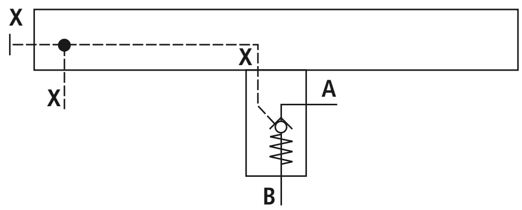
[1] Control cover of type “LFF“, incl. matched mounting kit (separate order, see page 8):
For sizes 25 and 32 control covers of type “LFA.D-7X/....F…“ (see RE 21010) can be used alternatively.

Symbols

Pre-fill valve type SFE



Pre-fill valve type SFE with control cover type LFF



Function, section

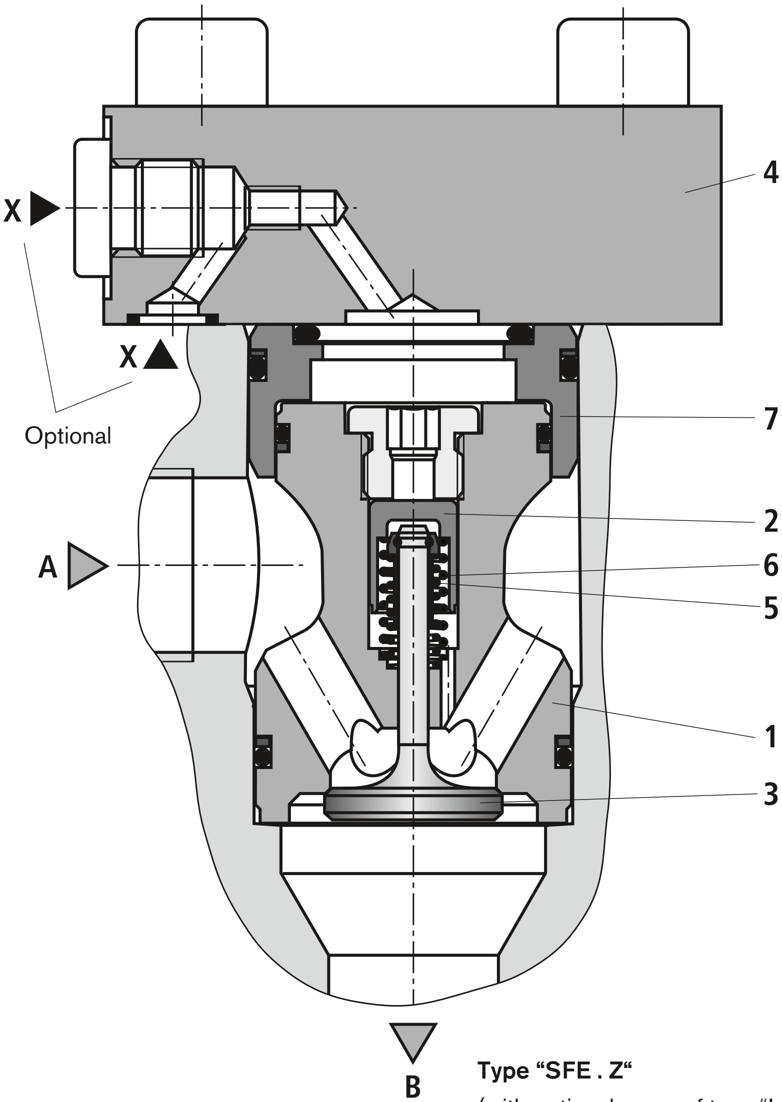
Valves of type SFE are hydraulically piloted to open check valves for installation in blocks or cylinders. They are used to leak-free isolate pressurised working circuits (e.g. press cylinder). Due to the favourable flow characteristics and low closing force of compression spring (5) at the main poppet, it is ideal for, among others, re-feed functions and filling the main cylinders on presses during fast closing movements.

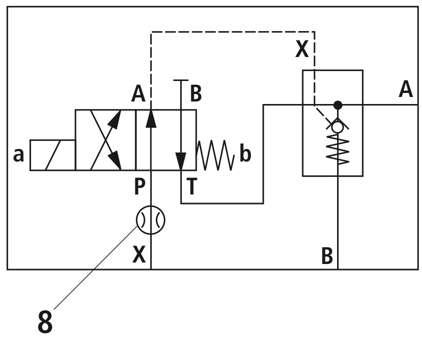
The valves basically consist of housing (1), pilot piston (2), main poppet (3), compression springs (5 and 6) and ring (7). Cover (4) must be ordered separately.

The valves allow a free flow from A to B. In the opposite direction, main poppet (3) is held on the seat by compression spring (5) and the pressure effective in port B. The pressure in pilot port X pushes pilot piston (2) downwards against compression spring (6), which causes main poppet (3) to be pushed off its seat. The fluid can now also flow through the valve in the opposite direction.

⚠ Attention!
For the opening process, a nozzle insert (8) must be installed in the assigned pressure channel of the upstream directional valve (see table and symbol):

Size	Nozzle Ø in mm *[inch]*
25	0.5 *[0.0197]*
32	0.8 *[0.0315]*
40	0.8 *[0.0315]*
50	0.8 *[0.0315]*
63	0.8 *[0.0315]*
80	1.0 *[0.0394]*
100	1.0 *[0.0394]*





Type "SFE . Z"
(with optional cover of type "LFF")

Technical data (for applications outside these parameters, please consult us!)

General

Size		25	32	40	50	63	80	100
Weight	kg *[lbs]*	0.53 *[1.17]*	1.05 *[2.31]*	1.94 *[4.28]*	3.20 *[7.06]*	6.48 *[14.29]*	10.30 *[22.71]*	22.15 *[48.83]*
Installation position		Optional						
Ambient temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals)						

Hydraulic

Maximum operating pressure	– Ports B, P	bar *[psi]*	350 *[5076]*
	– Port X	bar *[psi]*	150 *[2175]*
	– Port A	bar *[psi]*	16 *[232]*
Cracking pressure [1)		bar *[psi]*	approx. 0.2 *[1.74]*
Maximum flow		l/min *[US gpm]*	See Applications on page 11
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil); other hydraulic fluids on request
Hydraulic fluid temperature range		°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals)
Viscosity range		mm^2/s *[SUS]*	10 to 800 *[45 to 3720]*
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [2)

1) Pressure differential across the main poppet to overcome the spring force.

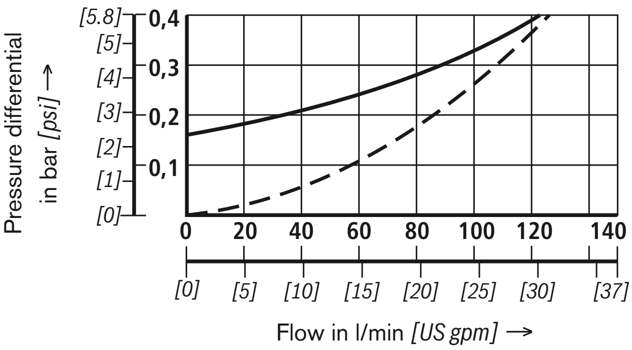
2) The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

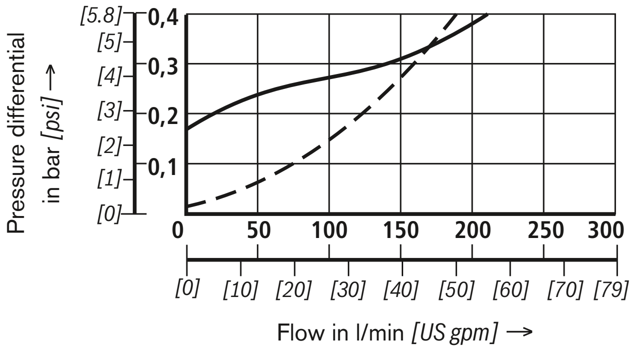
Characteristic curves (measured with HLP46, $\vartheta_{oil\ (\nu = 190\ SUS)} = 40\ °C \pm 5\ °C$ *[104 °F ± 9 °F]*)

Pressure differential Δp between ports A and B in dependence on flow q_V when the fluid flows in the suction direction.

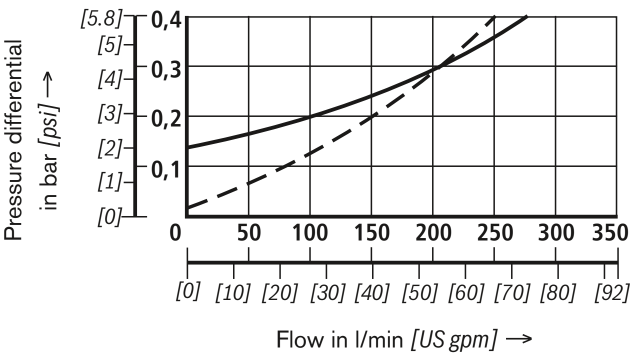
Size 25



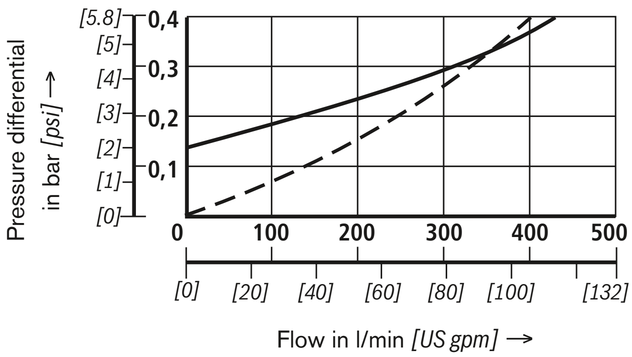
Size 32



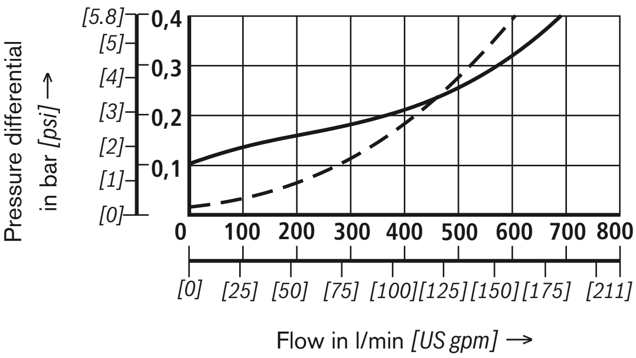
Size 40



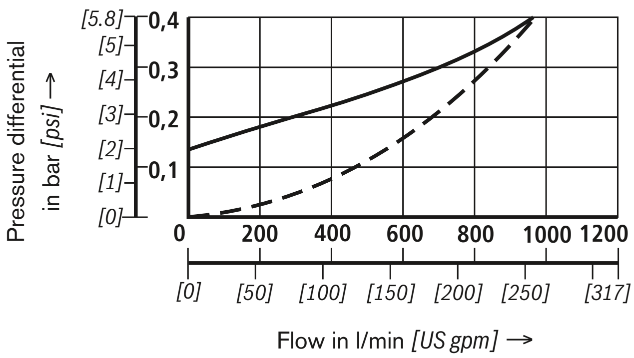
Size 50



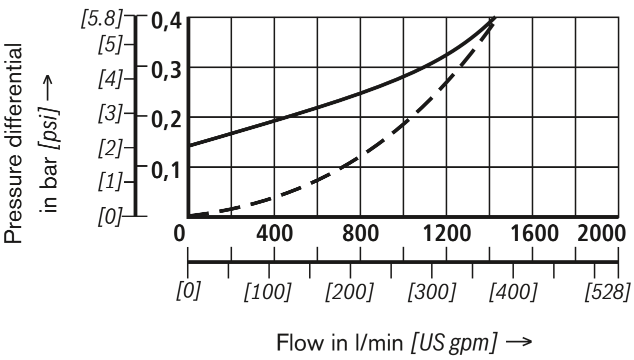
Size 63



Size 80



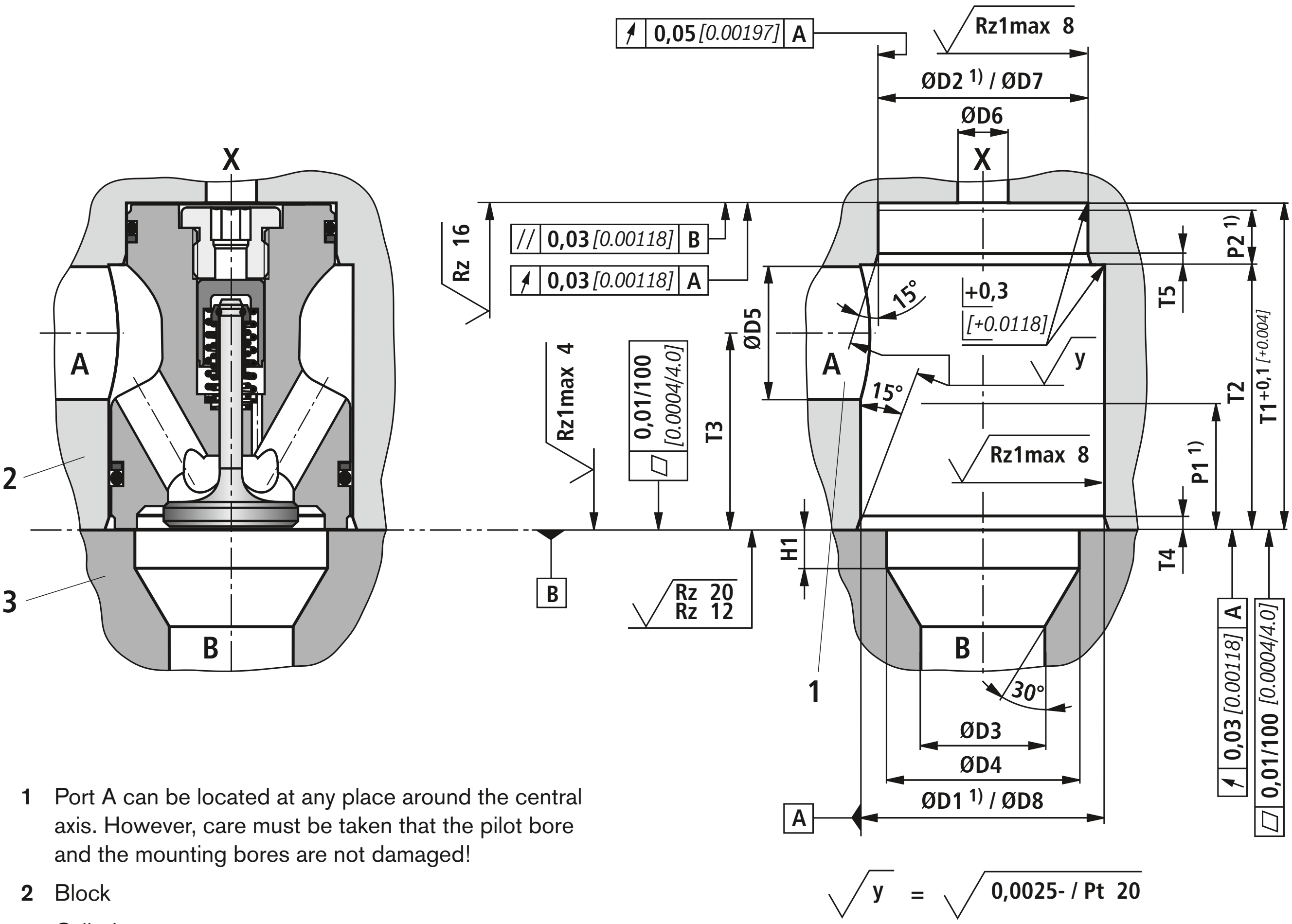
Size 100



A to B ———

B to A — — —

Mounting cavity for block installation, type SFE . P (dimensions in mm *[inch]*)



1 Port A can be located at any place around the central axis. However, care must be taken that the pilot bore and the mounting bores are not damaged!

2 Block

3 Cylinder

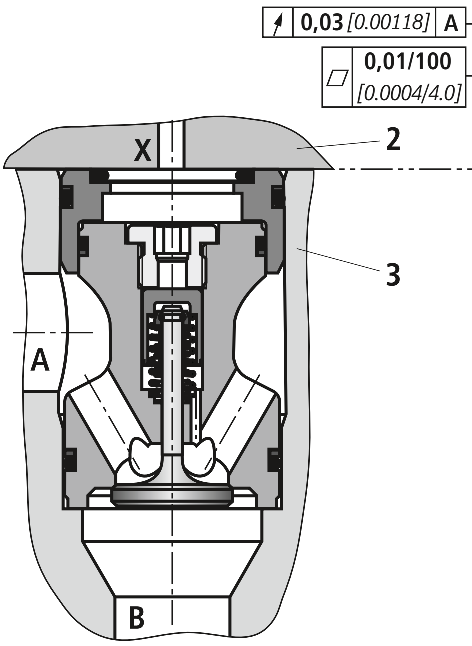
For connection dimensions, see page 8.

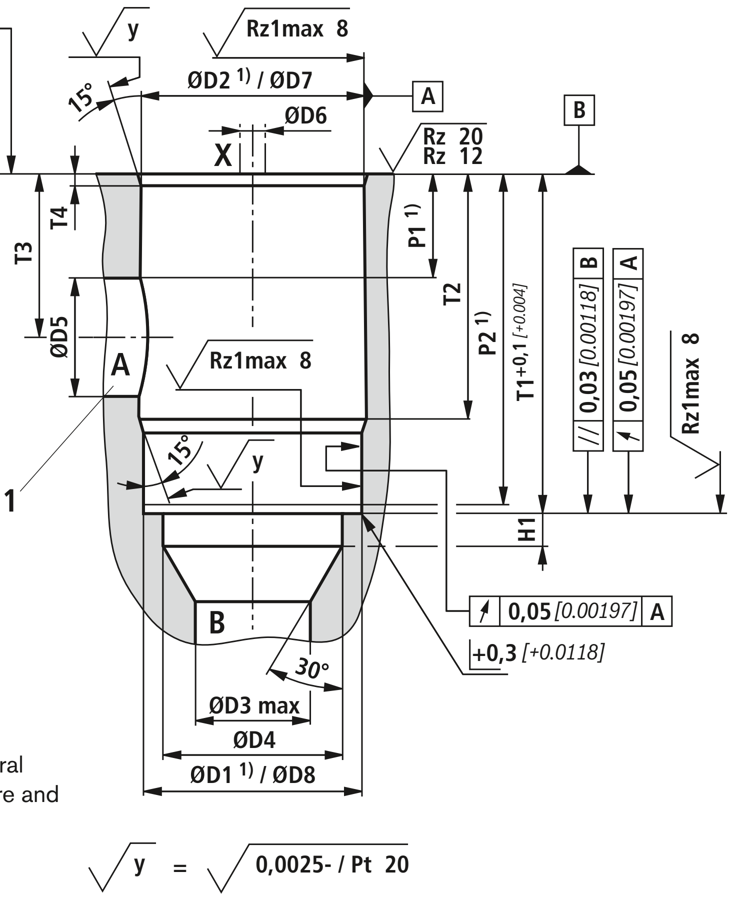
Tolerances:
- General tolerances ISO 2768-mK
- Tolerancing principle ISO 8015

Size	ØD1H7 ØD8	ØD2H7 ØD7	ØD3$_{-5}$ *[–0.197]*	ØD4	ØD5	ØD6	H1	P1 1)	P2 1)	T1$^{+0,1}$ *[+0.004]*	T2	T3	T4	T5
25	43 *[1.69]*	37 *[1.46]*	25 *[0.984]*	36 *[1.42]*	25 *[0.984]*	7 *[0.276]*	7 *[0.276]*	30 *[1.18]*	13 *[0.512]*	70 *[2.76]*	56 *[2.20]*	43,5 *[1.71]*	2,5 *[0.098]*	2,5 *[0.098]*
32	58 *[2.28]*	50 *[1.97]*	31 *[1.22]*	46 *[1.81]*	32 *[1.26]*	7 *[0.276]*	9 *[0.354]*	30 *[1.18]*	13 *[0.512]*	78 *[3.07]*	63 *[2.48]*	47 *[1.85]*	2,5 *[0.098]*	2,5 *[0.098]*
40	75 *[2.95]*	55 *[2.17]*	40 *[1.57]*	58 *[2.28]*	40 *[1.57]*	7 *[0.276]*	11 *[0.433]*	26 *[1.02]*	16 *[0.63]*	81 *[3.19]*	63 *[2.48]*	43 *[1.69]*	3 *[0.118]*	3 *[0.118]*
50	90 *[3.54]*	68 *[2.68]*	50 *[1.97]*	71 *[2.79]*	50 *[1.97]*	7 *[0.276]*	14 *[0.551]*	31 *[1.22]*	20 *[0.787]*	100 *[3.94]*	78 *[3.07]*	53 *[2.09]*	4 *[0.157]*	3 *[0.118]*
63	120 *[4.72]*	90 *[3.54]*	63 *[2.48]*	90 *[3.54]*	60 *[2.36]*	7 *[0.276]*	16 *[0.629]*	32 *[1.26]*	23 *[0.906]*	114 *[4.49]*	89 *[3.50]*	59 *[2.32]*	4 *[0.157]*	4 *[0.157]*
80	145 *[5.71]*	110 *[4.33]*	78,5 *[3.09]*	107 *[4.21]*	76 *[2.99]*	7 *[0.276]*	18 *[0.709]*	36 *[1.42]*	23 *[0.906]*	134 *[5.28]*	109 *[4.29]*	71 *[2.79]*	5 *[0.197]*	5 *[0.197]*
100	180 *[7.09]*	135 *[5.31]*	95 *[3.74]*	132 *[5.19]*	93 *[3.66]*	7 *[0.276]*	30 *[1.18]*	60 *[2.36]*	30 *[1.18]*	180 *[7.09]*	148 *[5.83]*	101 *[3.98]*	8 *[0.315]*	8 *[0.315]*

1) Fit

Mounting cavity for cylinder installation, type SFE . Z (dimensions in mm *[inch]*)





1 Port A can be located at any place around the central axis. However, care must be taken that the pilot bore and the mounting bores are not damaged!

2 Cover

3 Cylinder

Tolerances:

– General tolerances ISO 2768-mK

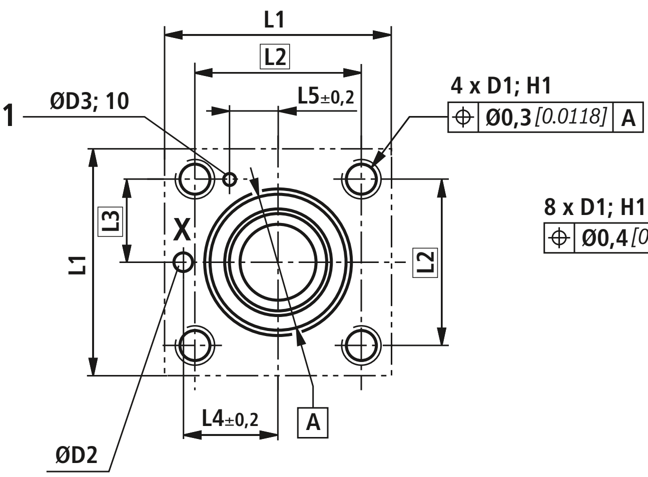
– Tolerancing principle ISO 8015

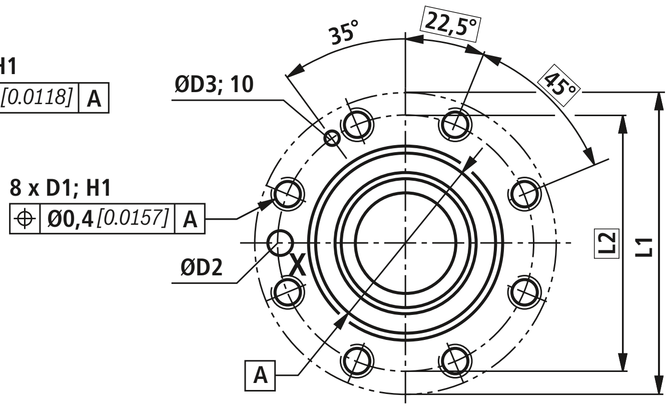
For connection dimensions, see page 8.

Size	ØD1H7 ØD8	ØD2H7 ØD7	$ØD3_{-5}$ *[–0.197]*	ØD4	ØD5	ØD6	H1	P1 1)	P2 1)	$T1^{+0,1}$ *[+0.004]*	T2	T3	T4
25	43 *[1.69]*	45 *[1.77]*	25 *[0.984]*	36 *[1.42]*	25 *[0.984]*	7 *[0.276]*	7 *[0.276]*	27 *[1.06]*	83 *[3.27]*	85 *[3.35]*	60 *[2.36]*	41 *[1.61]*	2,5 *[0.098]*
32	58 *[2.28]*	60 *[2.36]*	31 *[1.22]*	46 *[1.81]*	32 *[1.26]*	7 *[0.276]*	9 *[0.354]*	28 *[1.10]*	89,5 *[3.50]*	91,5 *[3.60]*	66 *[2.60]*	44 *[1.73]*	2,5 *[0.098]*
40	75 *[2.95]*	78 *[3.07]*	40 *[1.57]*	58 *[2.28]*	40 *[1.57]*	7 *[0.276]*	11 *[0.433]*	30 *[1.18]*	91 *[3.58]*	93 *[3.66]*	71 *[2.80]*	50 *[1.97]*	3 *[0.118]*
50	90 *[3.54]*	93 *[3.66]*	50 *[1.97]*	71 *[2.79]*	50 *[1.97]*	7 *[0.276]*	14 *[0.551]*	34 *[1.34]*	110 *[4.33]*	112 *[4.41]*	85 *[3.35]*	59 *[2.32]*	4 *[0.157]*
63	120 *[4.72]*	123 *[4.84]*	63 *[2.48]*	90 *[3.54]*	60 *[2.36]*	7 *[0.276]*	16 *[0.629]*	40 *[1.57]*	128 *[5.04]*	130 *[5.12]*	101 *[3.98]*	71 *[2.80]*	4 *[0.157]*
80	145 *[5.71]*	150 *[5.91]*	78,5 *[3.09]*	107 *[4.21]*	76 *[2.99]*	7 *[0.276]*	18 *[0.709]*	40 *[1.57]*	148 *[5.83]*	150 *[5.91]*	117 *[4.61]*	79 *[3.11]*	5 *[0.197]*
100	180 *[7.09]*	185 *[7.28]*	95 *[3.74]*	132 *[5.19]*	100 *[3.94]*	7 *[0.276]*	30 *[1.18]*	50 *[1.97]*	188 *[7.40]*	200 *[7.87]*	152 *[5.98]*	101 *[3.98]*	8 *[0.315]*

1) Fit

Mounting cavity and connection dimensions to DIN ISO 7368 (dimensions in mm *[inch]*)





1 Bore for locating pin

Tolerances:
- General tolerances ISO 2768-mK
- Tolerancing principle ISO 8015

Size	25	32	40	50	63	80	100
ØD1	M12	M16	M20	M20	M30	M24	M30
ØD2$_{-0,5}$ *[−0.0196]*	6 *[0.236]*	8 *[0.315]*	10 *[0.394]*	10 *[0.394]*	12 *[0.472]*	16 *[0.63]*	20 *[0.787]*
ØD3H13	5 *[0.197]*	5 *[0.197]*	5 *[0.197]*	8 *[0.315]*	8 *[0.315]*	10 *[0.394]*	10 *[0.394]*
H1	25 *[0.984]*	35 *[1.38]*	45 *[1.77]*	45 *[1.77]*	65 *[2.56]*	50 *[1.97]*	63 *[2.48]*
L1	85 *[3.35]*	102 *[4.02]*	125 *[4.92]*	140 *[5.51]*	180 *[7.09]*	250 *[9.84]*	300 *[11.8]*
L2	58 *[2.28]*	70 *[2.76]*	85 *[3.35]*	100 *[3.94]*	125 *[4.92]*	200 *[7.87]*	245 *[9.65]*
L3	29 *[1.14]*	35 *[1.38]*	42,5 *[1.65]*	50 *[1.97]*	62,5 *[2.44]*	–	–
L4	33 *[1.30]*	41 *[1.61]*	50 *[1.97]*	58 *[2.28]*	75 *[2.95]*	–	–
L5	16 *[0.63]*	17 *[0.669]*	23 *[0.906]*	30 *[1.18]*	38 *[1.50]*	–	–

Ordering code: Control cover with remote control connection

LFF		D	– 1X	/ F		M

Size 25	**= 25** [1)]
Size 32	**= 32** [1)]
Size 40	**= 40**
Size 50	**= 50**
Size 63	**= 63**
Size 80	**= 80**
Size 100	**= 100**
Control cover	**= D**
Component series 10 to 19 = **1X** (10 to 19: unchanged installation and connection dimensions)	
Remote control connection	**= F**

Seal material

M = NBR seals
(other seals on request)

⚠ Attention!
Observe compatbility of seals with hydraulic fluid used

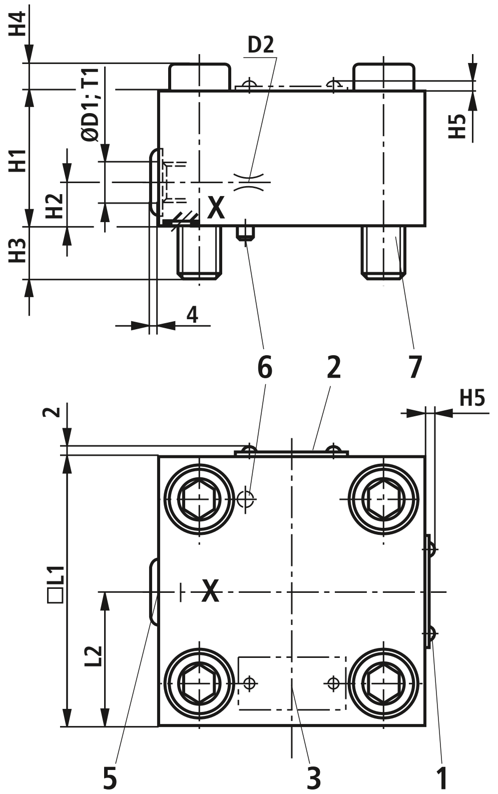
X[2)] **=** Nozzle in channel (Ø in 1/10 mm)

1) Alternatively, control covers of type “LFA.D-7X/....F…“ (see RE 21010) may be used.

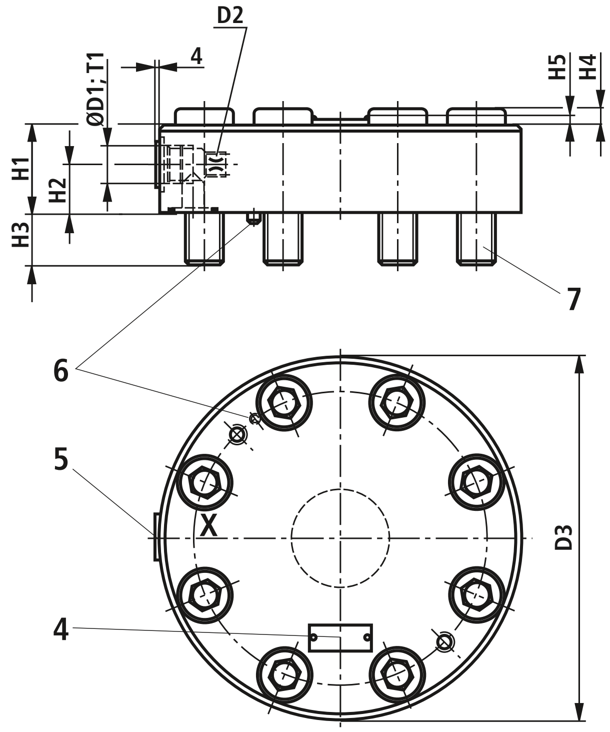
2) Nozzle possible; if required, specify details (e.g. “…X10“ for ***d*** = 1.0 mm)

Unit dimensions: Control cover with remote control connection (dimensions in mm *[inch]*)

Sizes 25 to 63



Sizes 80 and 100



1 Nameplate for size 25
2 Nameplate for size 32
3 Nameplate for sizes 40, 50, 63
4 Nameplate for sizes 80, 100
5 Port X optionally as threaded connection
6 Locating pin
7 Fixing screws, see page 10

Tolerances:
– General tolerances ISO 2768-mK
– Tolerancing principle ISO 8015

Size	25	32	40	50	63	80	100
ØD1	G1/4	G1/4	G1/2	G1/2	G3/4	G3/4	G1
D2	M6	M6	M8 x 1	M8 x 1	G3/8	G3/8	G1/2
D3	–	–	–	–	–	250 *[9.84]*	300 *[11.8]*
H1	30 *[1.18]*	35 *[1.38]*	60 *[2.36]*	68 *[2.68]*	82 *[3.23]*	70 *[2.76]*	75 *[2.95]*
H2	16 *[0.63]*	16 *[0.63]*	30 *[1.18]*	32 *[1.26]*	40 *[1.57]*	35 *[1.38]*	40 *[1.57]*
H3	24 *[0.945]*	28 *[1.10]*	32 *[1.26]*	34 *[1.34]*	50 *[1.97]*	34 *[1.34]*	38 *[1.50]*
H4	12 *[0.472]*	16 *[0.63]*	0	0	0	10 *[0.394]*	28 *[1.10]*
H5	2 *[0.079]*	2 *[0.079]*	0	0	0	0	2 *[0.079]*
□ L1	85 *[3.35]*	100 *[3.94]*	125 *[4.92]*	140 *[140]*	180 *[7.09]*	–	–
L2	42,5 *[1.65]*	50 *[1.97]*	72 *[2.83]*	80 *[3.15]*	90 *[3.54]*	–	–
T1	12 *[0.472]*	12 *[0.472]*	14 *[0.551]*	14 *[0.551]*	16 *[0.63]*	16 *[0.63]*	18 *[0.709]*

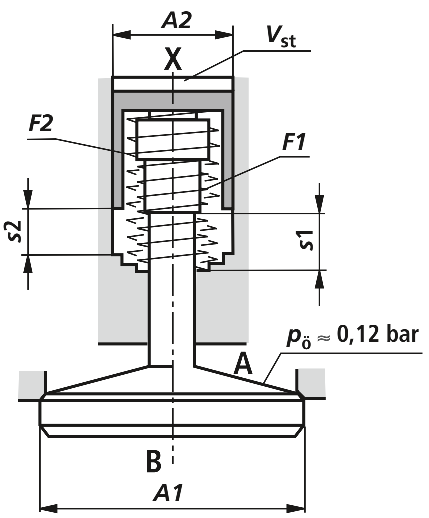
Fixing screws: Control cover with remote control connection [1)]

Size	Qty	Dimensions	Tightening torque M_T in Nm *[ft-lbs]*
25	4	M12 x 50	110 *[81.1]*
32	4	M16 x 60	270 *[199.1]*
40	4	M20 x 70	520 *[383.5]*
50	4	M20 x 80	520 *[383.5]*
63	4	M30 x 100	1800 *[1327.6]*
80	8	M24 x 90	900 *[663.8]*
100	8	M30 x 100	1800 *[1327.6]*

[1)] (included in the scope of supply)

Hexagon socket head cap screws, metric ISO 4762 - 10.9
Friction coefficient $\mu_{total} = 0.14$
(adjust in the case of differing surfaces)

Poppet geometry and determination of the minimum pilot pressure



A1 = Effective area of the main poppet
A2 = Effective area of the pilot piston
s1 = Stroke of main poppet
s2 = Stroke of pilot piston
F1 = Spring force of valve spring
F2 = Spring force of pilot piston compression spring
V_{st} = Pilot flow for opening the valve
$p_ö$ = Cracking pressure (pressure differential across the main poppet for overcoming spring force ***F1***)
p_{St} = Pilot pressure in port X
p_B = System pressure in port B

$$\text{Opening ratio} = \frac{\text{Pilot pressure } p_{St}}{\text{System pressure } p_B}$$

Size	*A1* in cm² *[inch²]*	*A2* in cm² *[inch²]*	*s1* in mm *[inch]*	*s2* in mm *[inch]*	*F1* in N *[lbs]*	*F2* in N *[lbs]*	V_{st} in cm³ *[inch³]*	Opening ratio
25	5.31 *[0.823]*	1.33 *[0.206]*	6.2 *[0.244]*	5 *[0.197]*	6 to 14 *[1.35 to 3.15]*	38 to 70 *[8.54 to 15.74]*	0.66 *[0.0403]*	4.0
32	8.04 *[1.246]*	2.01 *[0.312]*	8.5 *[0.335]*	6.5 *[0.256]*	9 to 22 *[2.02 to 4.95]*	58 to 109 *[13.04 to 24.50]*	1.30 *[0.0793]*	4.0
40	13.52 *[2.096]*	3.14 *[0.487]*	10 *[0.394]*	7 *[0.276]*	14 to 29 *[3.15 to 6.52]*	93 to 162 *[20.91 to 36.42]*	2.20 *[0.1343]*	4.3
50	21.24 *[3.292]*	4.71 *[0.730]*	12.5 *[0.492]*	9 *[0.354]*	23 to 49 *[5.17 to 11.01]*	149 to 261 *[33.49 to 58.68]*	4.20 *[0.2563]*	4.5
63	32.67 *[5.064]*	7.07 *[1.096]*	14.5 *[0.571]*	11 *[0.433]*	35 to 63 *[7.87 to 14.16]*	206 to 348 *[46.31 to 78.23]*	7.80 *[0.4759]*	4.6
80	49.02 *[7.598]*	10.18 *[1.578]*	17 *[0.669]*	13 *[0.512]*	57 to 127 *[12.81 to 28.55]*	310 to 579 *[69.69 to 130.16]*	13.20 *[0.8055]*	4.8
100	73.13 *[11.335]*	15.90 *[2.465]*	22 *[0.866]*	16 *[0.63]*	81 to 193 *[18.21 to 43.39]*	476 to 952 *[107.01 to 214.02]*	25.5 *[1.5561]*	4.6

Example: Type SFE**32**…; p_B = 30 bar *[435 psi]*
p_{St} = 4.0 x 30 bar *[435 psi]* = 120 bar *[1740 psi]*

Maximum flow q_V in l/min *[US gpm]* for re-feed function (A to B)

Size	25	32	40	50	63	80	100
Application 1	100 *[26.42]*	170 *[44.91]*	240 *[63.40]*	360 *[95.10]*	580 *[153.22]*	810 *[213.98]*	1210 *[319.65]*
Application 2	90 *[23.78]*	140 *[36.98]*	200 *[52.83]*	320 *[84.54]*	510 *[134.73]*	710 *[187.56]*	1070 *[282.66]*
Application 3	60 *[15.85]*	100 *[26.42]*	140 *[36.98]*	220 *[58.12]*	350 *[92.46]*	480 *[126.80]*	730 *[192.85]*
Application 4	50 *[13.21]*	70 *[18.49]*	100 *[26.42]*	160 *[42.27]*	260 *[68.69]*	360 *[95.102]*	540 *[142.65]*

⚠ **Attention!**

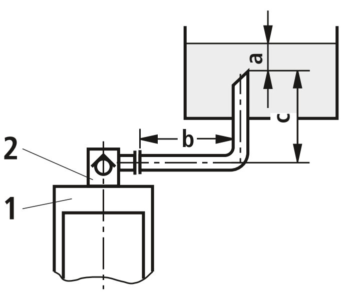
Improper dimensioning of the pre-fill valve and connection lines can cause cavitation effects. As a consequence, the reliability and service life of products may be affected!

⚠ **Attention!**

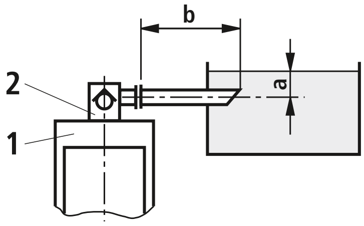
Too small a pre-fill valve or too small lines lead to the release of gases from hydraulic fluids with the associated consequences, and often to long-term damage on cylinder seals!

Applications

Application 1

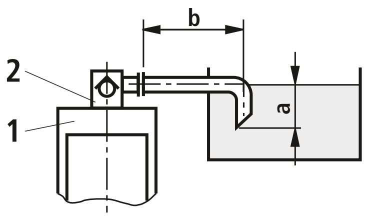


Application 2

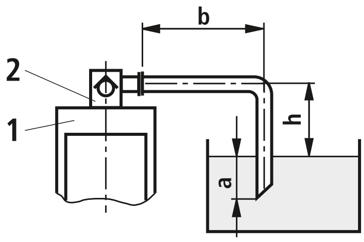


Size of the filling tank
min. 1.5 x cylinder volume

Application 3



Application 4



- **1** Cylinder
- **2** Pre-fill valve
- **a** Min. 300 mm *[11.8 inch]* when the cylinder is extended
- **b** Up to 1000 mm *[39.4 inch]* at specified maximum flow rates
- **c** ≤ 500 *[19.7 inch]* mm
- **h** 300 mm *[11.8 inch]* ≤ h ≤ 500 mm *[19.7 inch]*

☞ **Note!**

When in doubt, please consult us! It is often sufficient to select the pipe one size larger.

Notes

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Zum Eisengießer 1
97816 Lohr am Main, Germany
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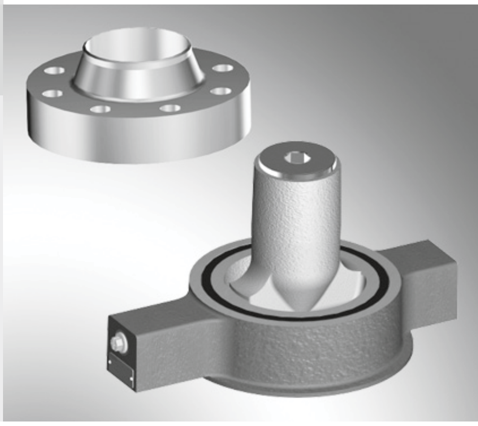
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Filling valve – sandwich plate

RE 20478/08.11
Replaces: 06.06

Type ZSF and ZSFW



Size 32 to 200
Component series 1X; 2X
Maximum operating pressure 350 bar
Flow up to 7000 l/min (Δ***p*** = 0.3 bar)

Table of contents

Features

– Pilot operated check valve in sandwich plate design
– with or without pre-opening, optional
– Control by built-on directional spool valve or directional seat valve, optional
– Integrated high-pressure connection (size 32 to 160)
– Integrated throttle check valve (size 200)

– More information:	Data sheet
• High-power directional valves	23178, 22058
• Hydraulic fluids on mineral oil basis	90220

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

ZSF			F	0 – 1 –	/ M / 01		*

Filling valve – sandwich plate

For directional valve set-up [1] = **W**

Size 32	= **32**
Size 40	= **40**
Size 50	= **50**
Size 63	= **63**
Size 80	= **80**
Size 100	= **100**
Size 125	= **125**
Size 160	= **160**
Size 200	= **200**

Type of connection

For flange connection = **F**

Without pre-decompression = **0**

With pre-decompression upon request

Cracking pressure main poppet

1 = $p_C \approx 0.12$ bar

Size 32 to 100 and size 160

1X = Component series 10 to 19 (10 to 19: Unchanged installation and connection dimensions)

Size 125 and 200 [2]

2X = Component series 20 to 29 (20 to 29: Unchanged installation and connection dimensions)

Seal material

M = NBR seals (other seals upon request)

Attention!

Observe compatibility of seals with hydraulic fluid used!

Connection version

01 = Mounting cavities with pipe thread according to ISO 228, DIN EN 3852-part 2

Nozzle bore

No code = Size 32 to 160

D40 = Size 200 (Ø4 mm)

Further details in the plain text

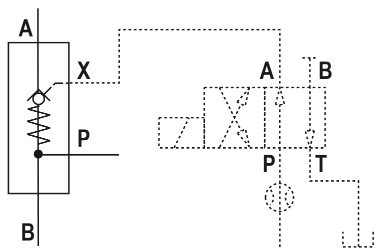
[1] Ordering code "W" only necessary with version for directional valve set-up. Directional spool valve type 4WE 6 D… (data sheet 23178) or directional seat valve type M-.SEW 6… (data sheet 22058), separate order

[2] Compatible with series 1X

Symbols

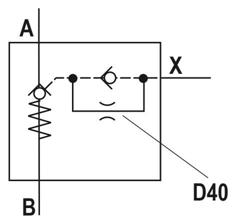
Filling valve type ZSF

Size 32 to 160, with remote control port (port X)



Separate, external nozzle fitting necessary!

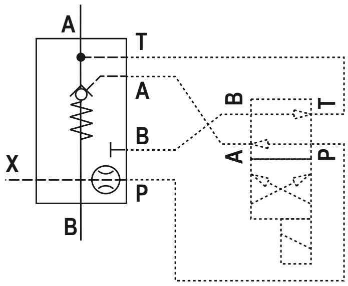
Size 200



Throttle check valve installed in the factory

Filling valve type ZSFW

Size 32 to 200, with built-on directional valve size 6 (separate order)



Nozzle in channel P installed in the factory

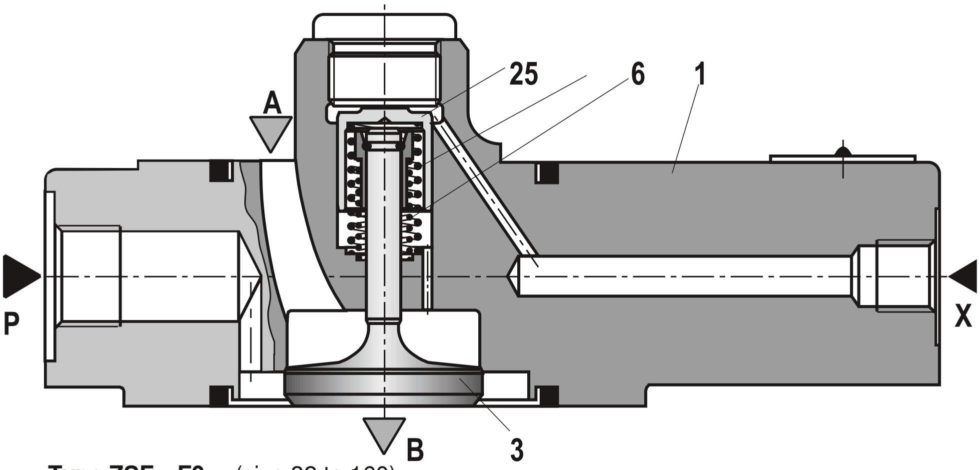
Function, section: Type ZSF …

The valve type ZSF is a pilot operated check valve in sandwich plate design. It is used for the leakage-free isolation of pressurized working circuits (e. g. pressing cylinders). Due to its favorable flow characteristics and the low cracking pressure of the main poppet (3), it is particularly suitable for the pulling function and for filling e.g. the main cylinders at presses. The integrated pressure port P (not for size 200) reduces the piping necessary for the high-pressure build-up.

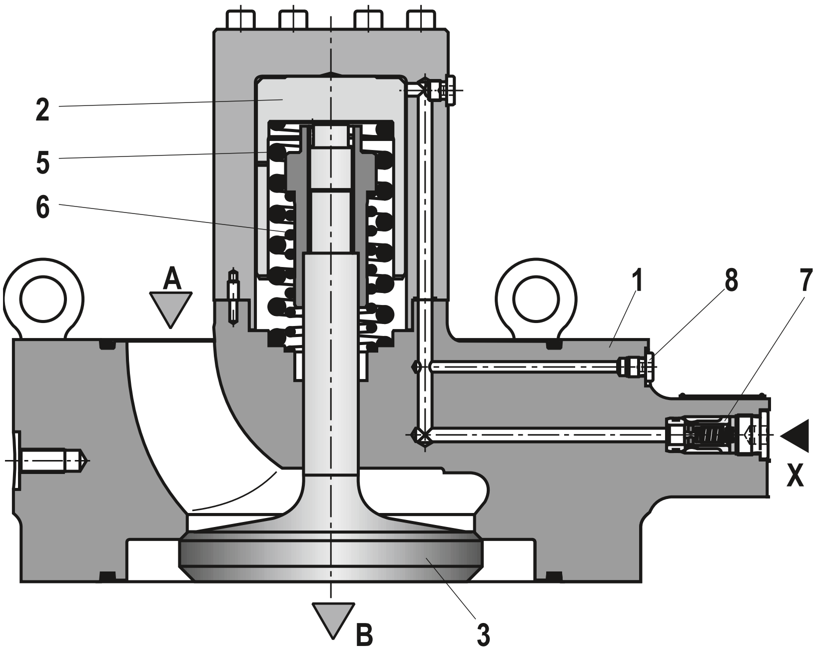
The valve basically comprises of a housing (1), control spool (2), main poppet (3), and the compression springs (5) and (6).

The valve allows for free flow from A to B. In the opposite direction, the main poppet (3) is held on the seat by the compression spring (5) and the pressure available at port B. The pressure at the control port X pushes the control spool (2) downwards, against the compression spring (6), and pushes the main poppet (3) off the seat. Now, the valve can also be flown through in the opposite direction.

In order to dampen the opening velocity and to limit the dynamic load, a throttle check valve (7) is installed in size 200. The measuring point (8) allows for the recording of pressure developments.



Type ZSF…F0… (size 32 to 160)



Type ZSF … (size 200)

In general:

In channel P of the upstream directional valve, you must **imperatively** provide a nozzle (separate order) (not for size 200). The nozzle Ø is to be designed according to the filling valve size (see below).

In case of non-compliance, increased dynamic loads may occur having detrimental effects on the operating time.

Nozzle fitting

Size	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200** [1]
Nozzle Ø in mm	0.8	0.8	0.8	0.8	1.0	1.0	1.2	1.5	4.0

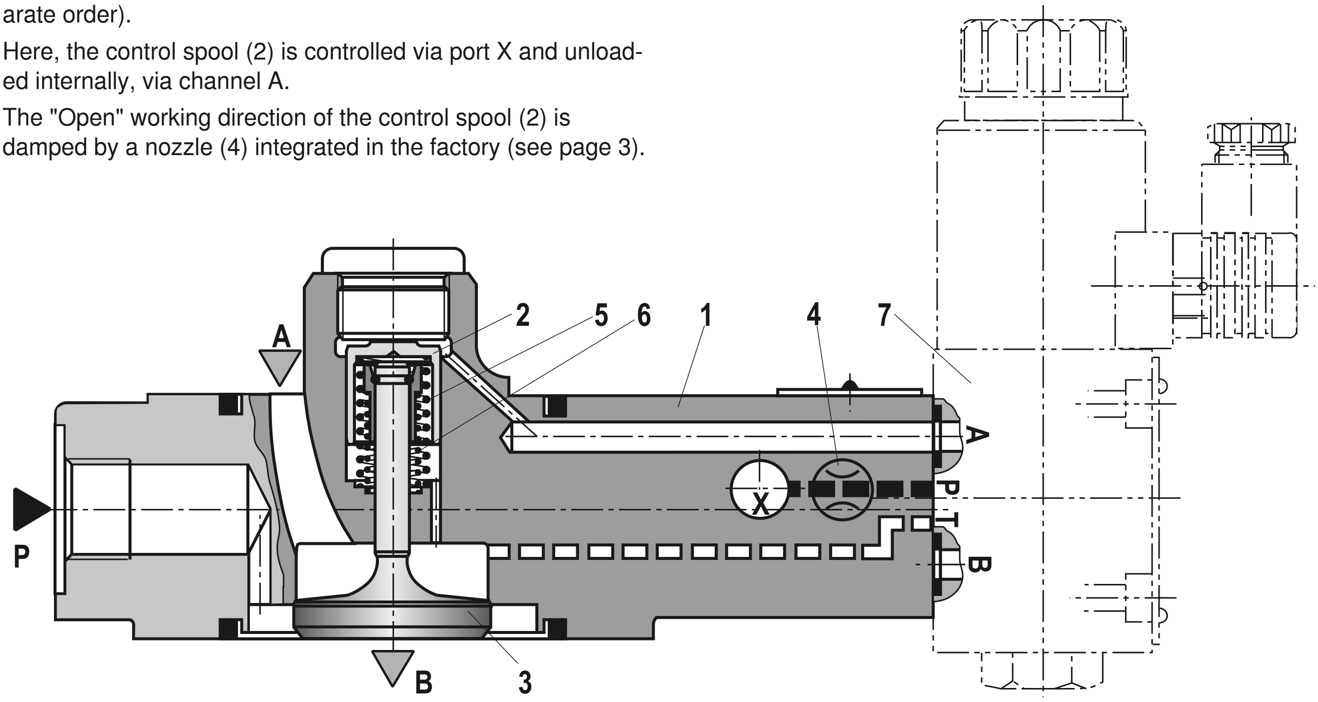
[1] Only for version "W"

Function, section: Type ZSFW …

The function of valve type ZSFW basically corresponds to that of type ZSF, however with built-on directional valve (separate order).

Here, the control spool (2) is controlled via port X and unloaded internally, via channel A.

The "Open" working direction of the control spool (2) is damped by a nozzle (4) integrated in the factory (see page 3).

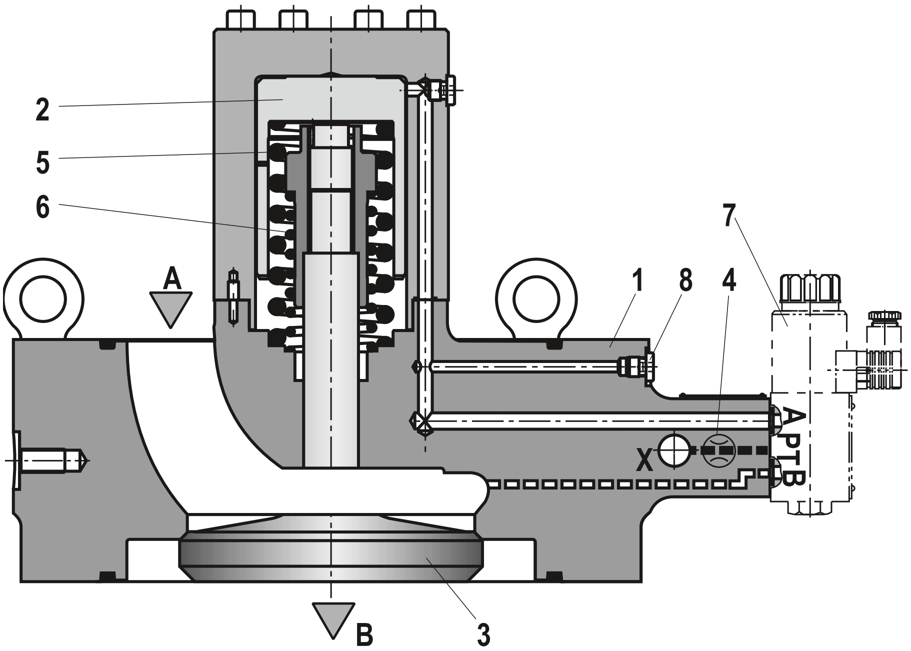


Type ZSFW…F0… (size 32 to 160)
(without pre-decompression and built-on directional valve, vertical working direction of the control spool)

In general:

The nozzle (4) has been installed in channel P of the directional valve port in the factory.

In case of changes in the nozzle fitting, there may be increased dynamic loads which may have detrimental effects on the operating time.



Type ZSFW…F0… (size 200)
(without pre-decompression and built-on directional valve, vertical working direction of the control spool)

7 Directional valve type 4WE 6 D (separate order)
– Simplified representation (installation orientation and size ratio)!

Technical data (For applications outside these parameters, please consult us!)

general

Size		32	40	50	63	80	100	125	160	200
Weight	kg	3.5	4.2	5.5	7	10	15	26	47	150
Installation position (working direction of the control spool)		Any								
Ambient temperature range	°C	–30 to +80 [1]								
Porting pattern – Version "W"		DIN 24340 form A								

hydraulic

Maximum operating pressure	– Port B, P	bar	350 [1]
	– Port X	bar	150
	– Port A	bar	16
Cracking pressure [2]		bar	≈ 0.12
Flow (Δp = 0.3 bar)		l/min	Depending on the case of application, see page 14
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C	–30 to +70
Viscosity range		mm²/s	10 to 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [3]
Technical data of the directional valve	– Directional spool valve		See data sheet 23178
	– Directional seat valve		See data sheet 22058

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HVLP	NBR	DIN 51524
Environmentally compatible	– Insoluble in water	HEES	NBR	ISO 15380
Flame-resistant	– Water-containing	HFC	NBR	ISO 12922

☞ **Important information on hydraulic fluids!**
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

[1] Observe the technical data of the directional valve, see data sheet 23178 (type 4WE 6 D…) or 22058 (type M-.SEW 6…)

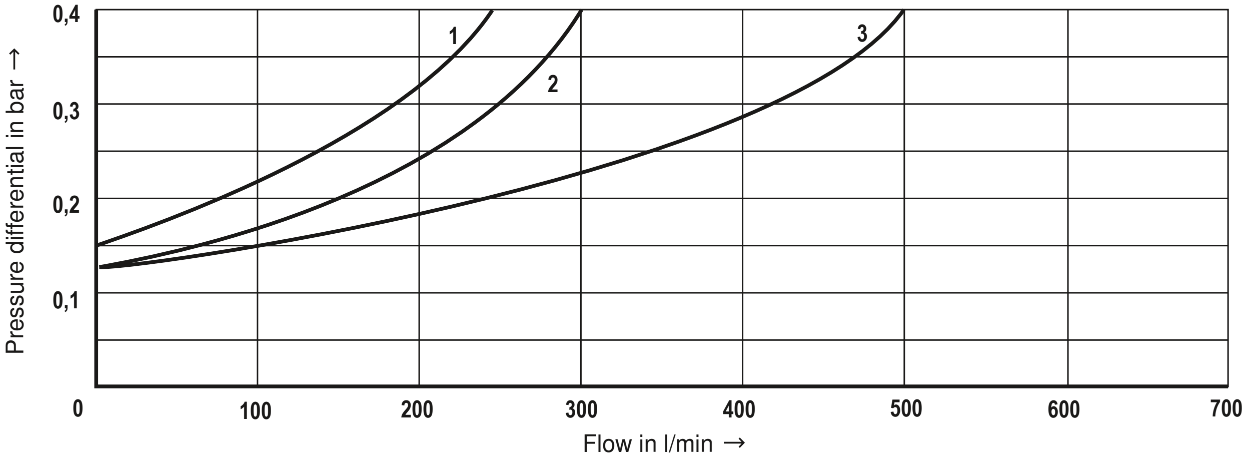
[2] Pressure differential at the main poppet for overcoming the spring force.

[3] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.
For selecting the filters, see www.boschrexroth.com/filter.

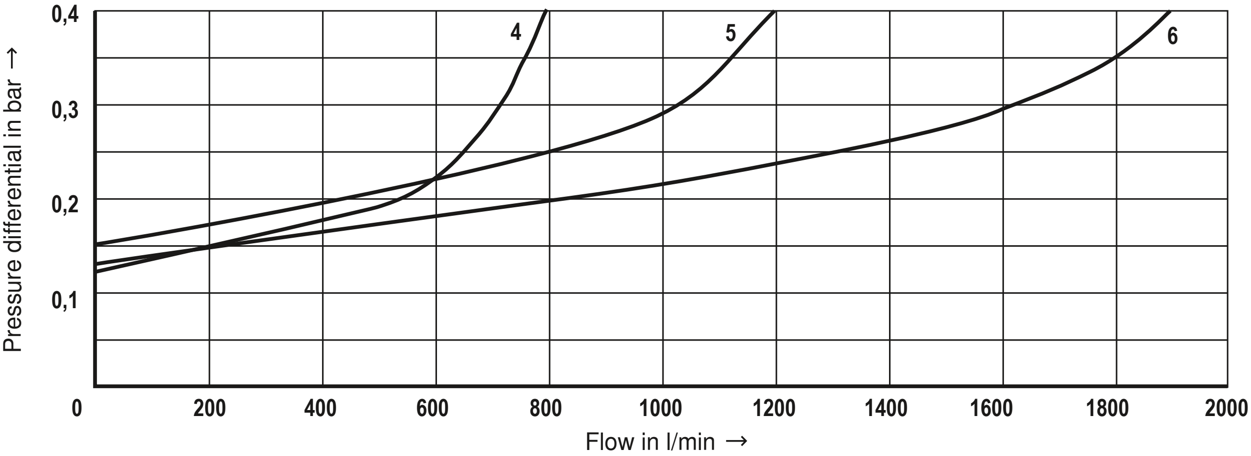
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Pressure differential Δ***p*** between ports A and B against the flow q_V (A to B).

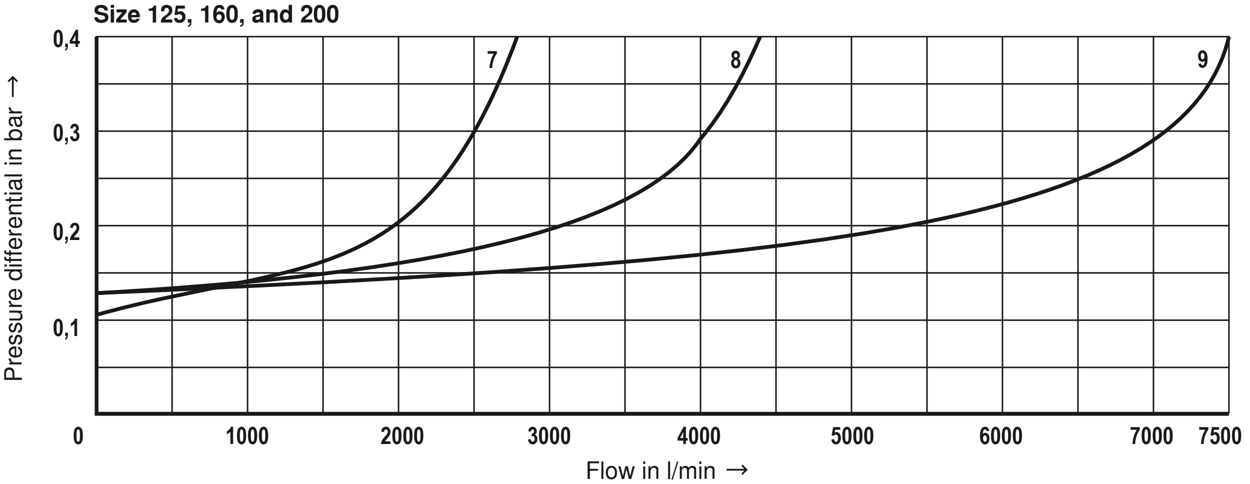
Size 32, 40, and 50



Size 63, 80, and 100

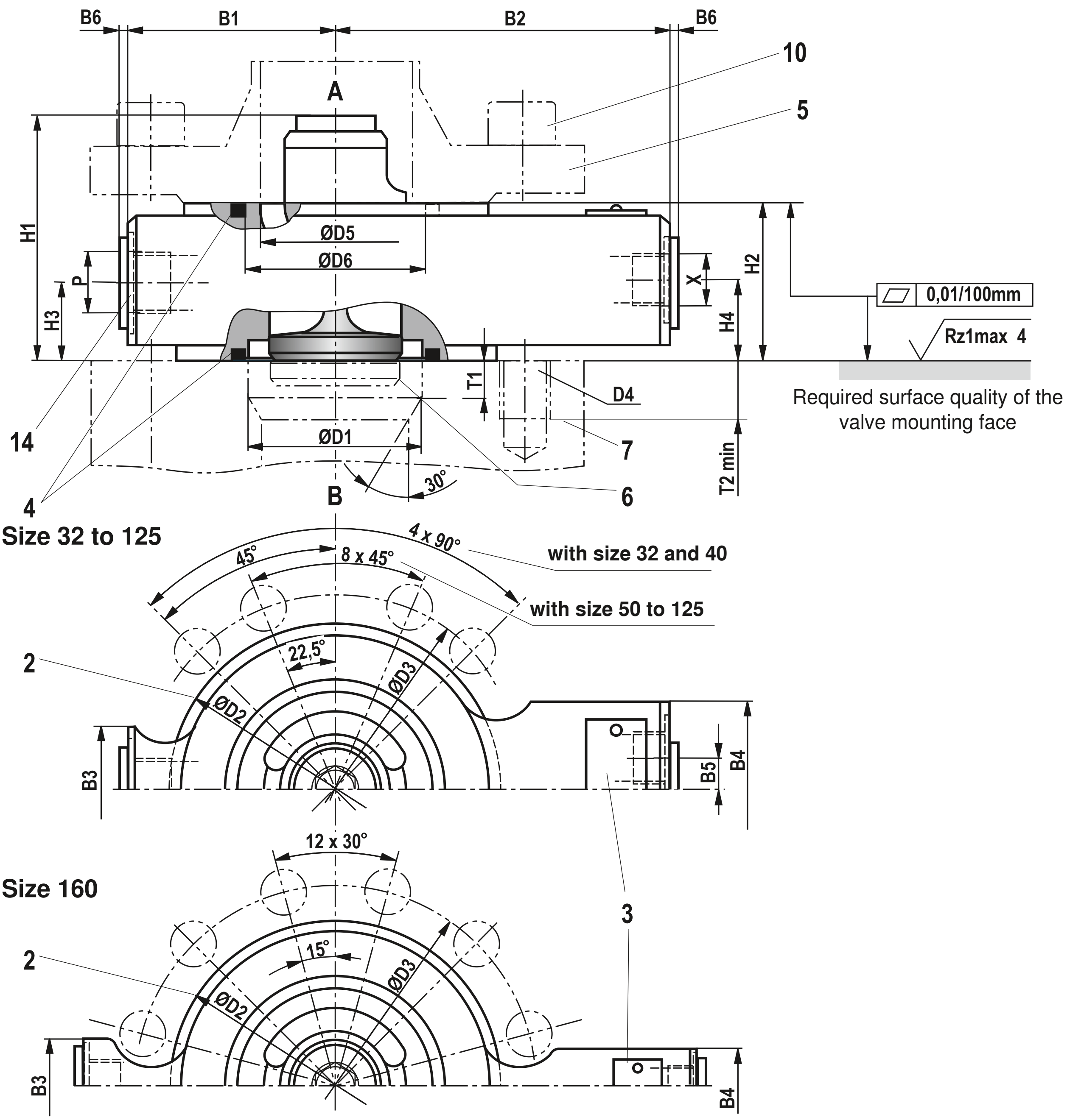


Size 125, 160, and 200



1 Size 32
2 Size 40
3 Size 50
4 Size 63
5 Size 80
6 Size 100
7 Size 125
8 Size 160
9 Size 200

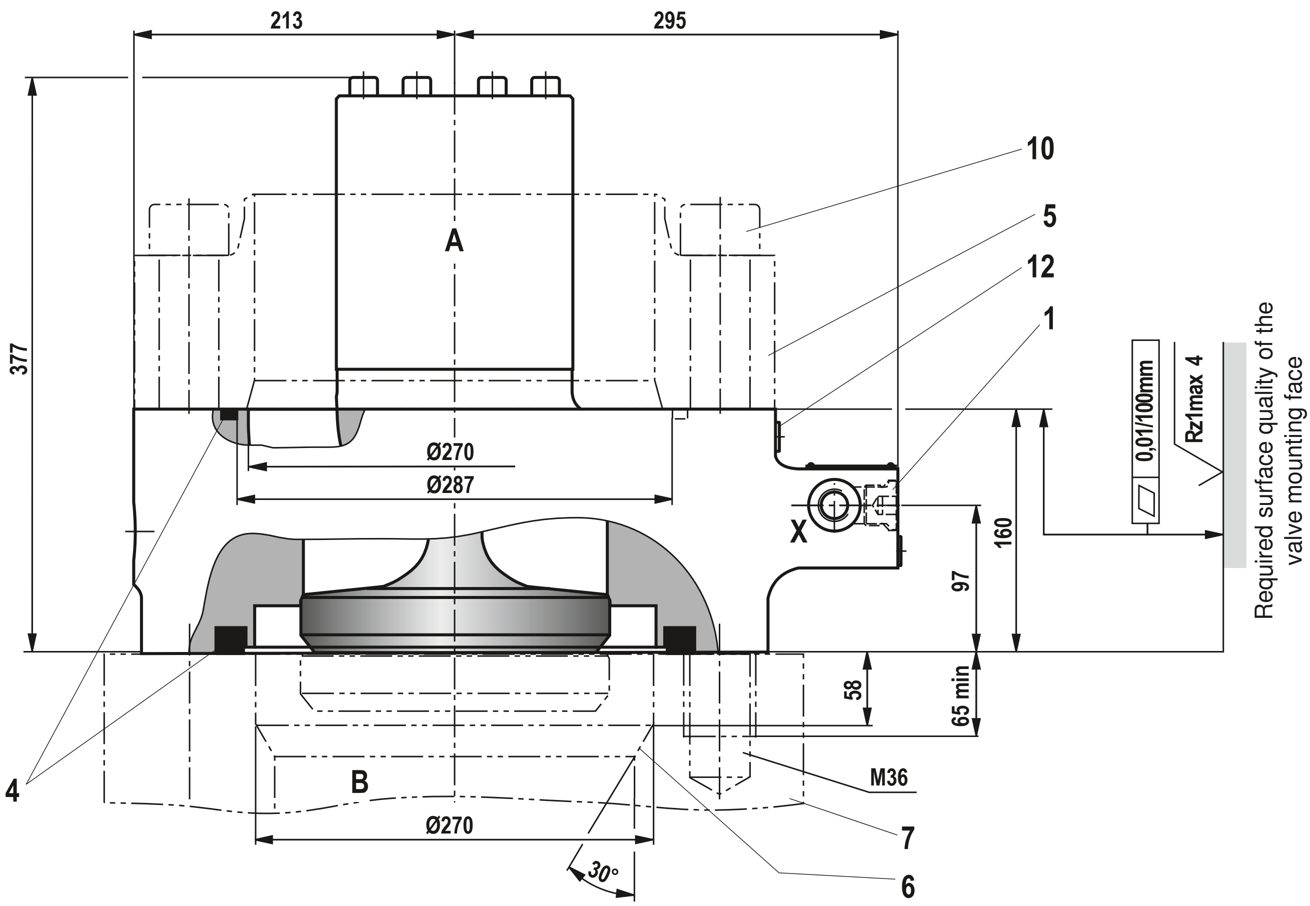
Unit dimensions: Type ZSF, size 32 to 160 (dimensions in mm)

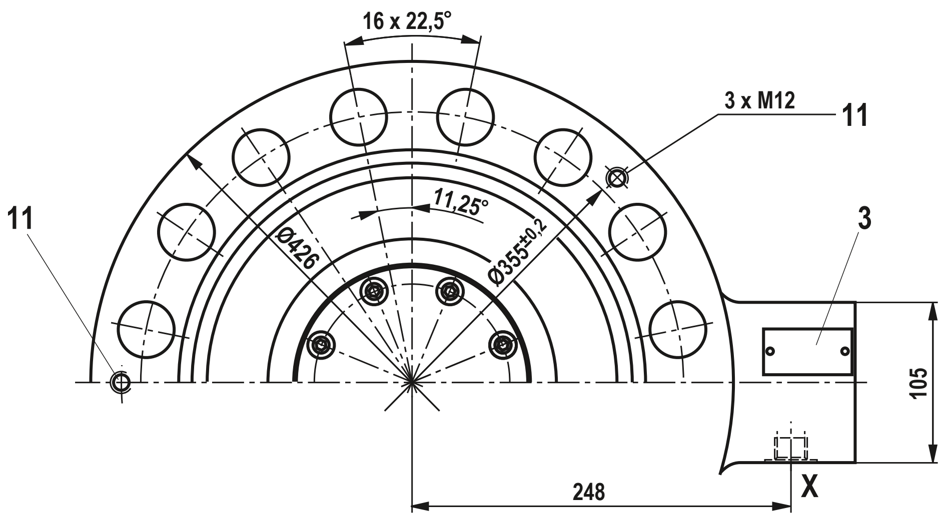


Item explanations see page 12

Size	B1	B2	B3	B4	B5	B6 max	ØD1	ØD2	ØD3 ±0.2	D4	ØD5	ØD6	H1	H2	H3	H4	P	T1	T2 min	X
32	65	110	40	55	7.5	1.5	46	93	110	M16	42	49.5	77	50	26.5	26.5	G1/2	8	30	G1/4
40	70	115	40	55	7.5	1.5	58	108	125	M16	52	61.5	80	50	26.5	26.5	G1/2	10	35	G1/4
50	110	140	40	55	7.5	1.5	71	128	145	M16	70	75.7	97	50	26.5	26.5	G1/2	12	30	G1/4
63	115	145	45	55	7.5	1.5	90	143	160	M16	83	97.7	110	55	27.5	27.5	G3/4	14	35	G1/4
80	125	160	45	55	7.5	1.5	107	169	190	M20	100	112	123	60	30	30	G3/4	16	30	G1/4
100	140	190	55	55	7.5	1.5	132	212	240	M27	124	138.5	145	65	32.5	40	G1	25	55	G3/8
125	180	210	65	60	0	1.5	170	248	280	M30	148	176	215	75	37.5	50	G1	33	50	G3/8
160	220	255	70	60	0	1.5	220	310	345	M33	200	233	279	95	48.5	68	G1 1/4	55	50	G1/2

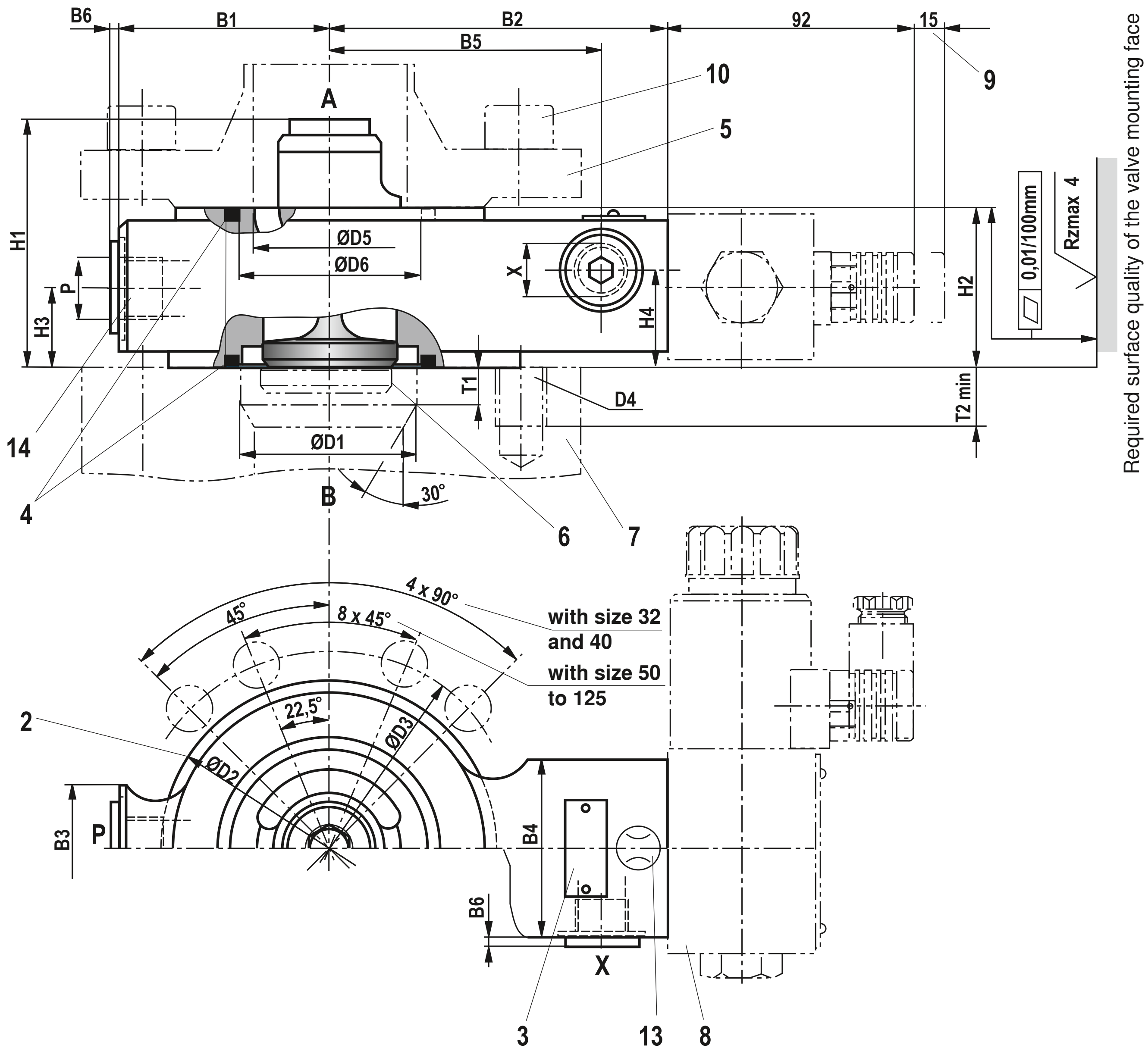
Unit dimensions: Type ZSF, size 200 (dimensions in mm)





Item explanations see page 12

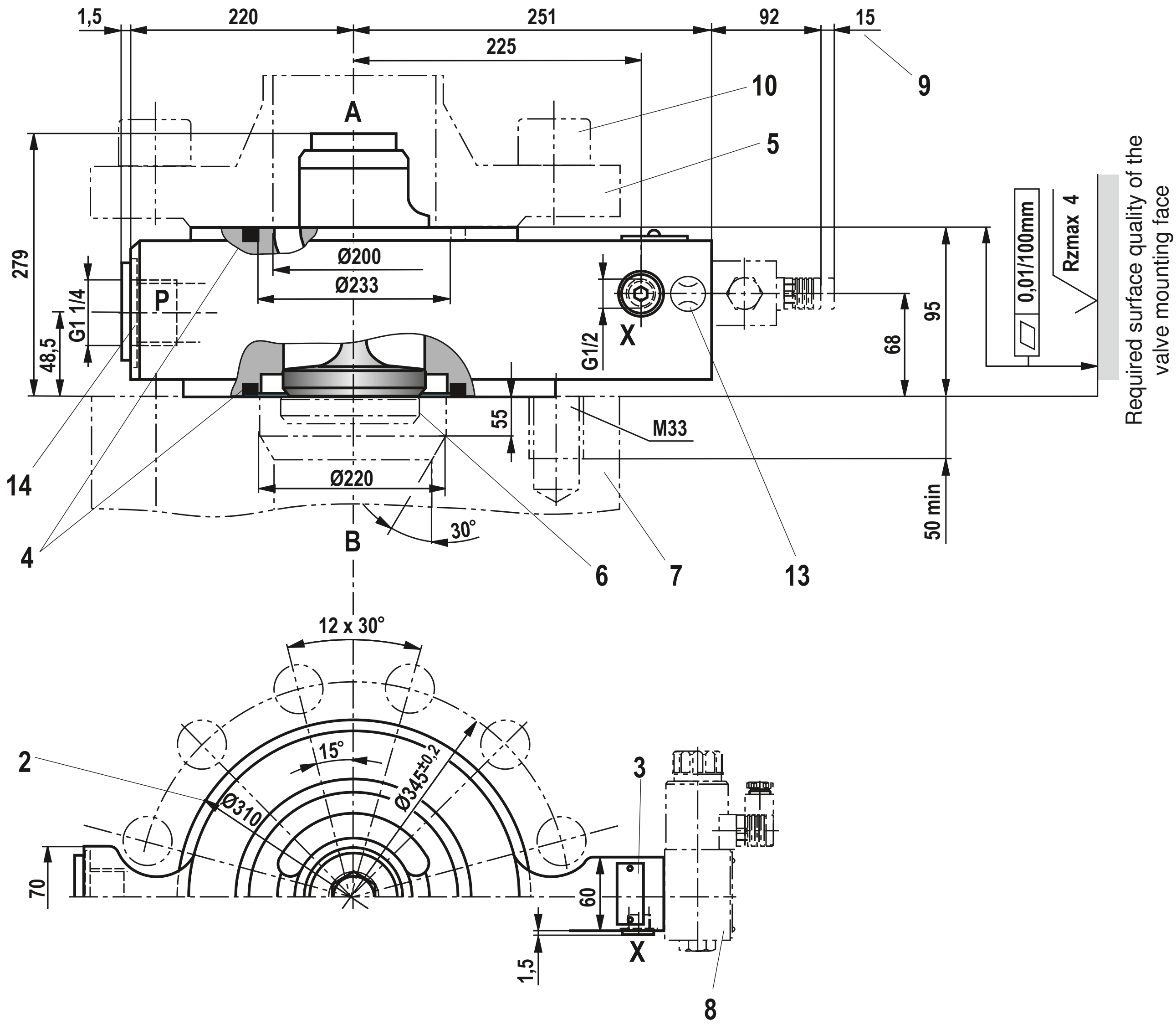
Unit dimensions: Type ZSFW, size 32 to 125 (dimensions in mm)



Item explanations see page 12

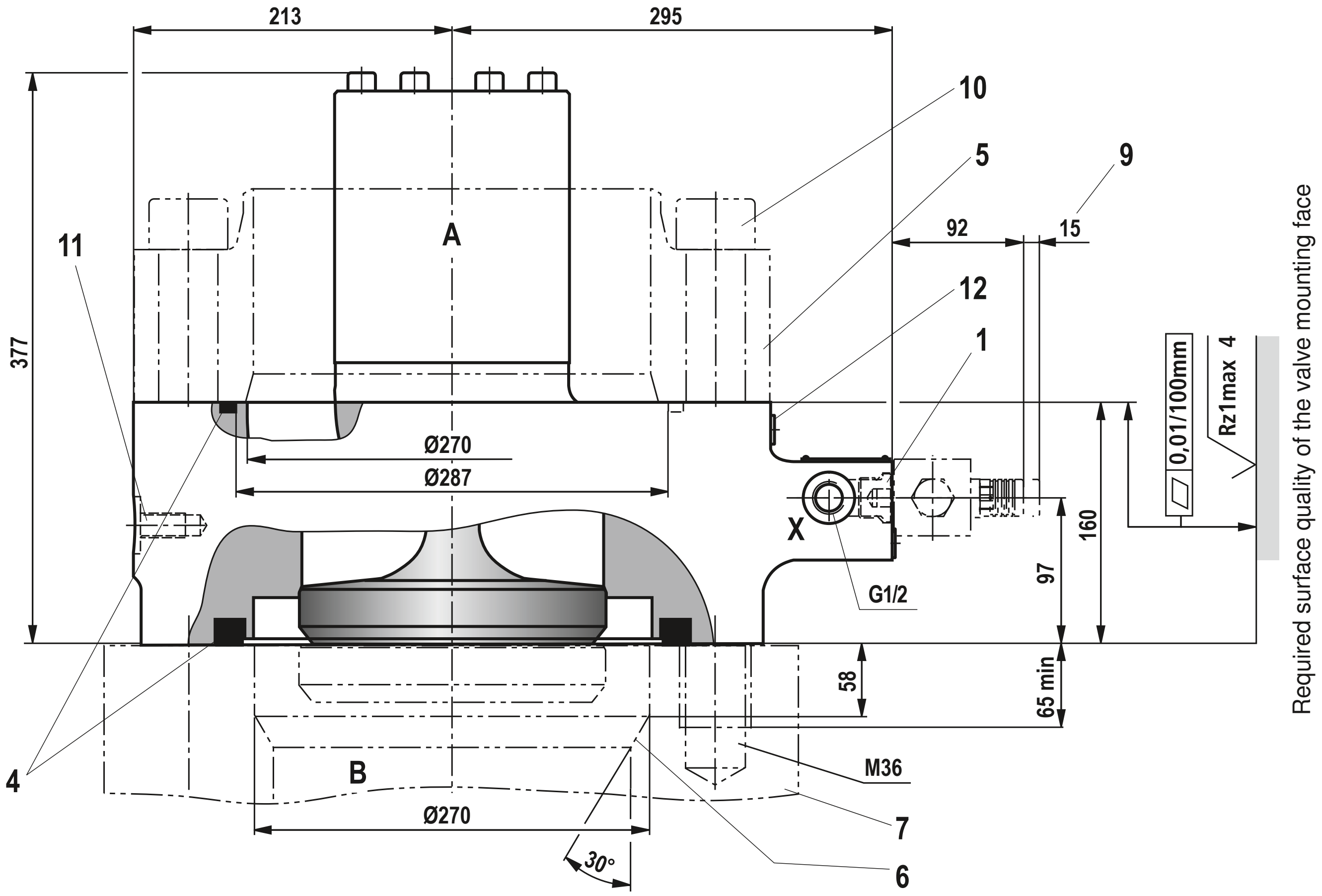
Size	B1	B2	B3	B4	B5	B6 max	ØD1	ØD2	ØD3 ±0.2	D4	ØD6	ØD7	H1	H2	H3	H4	P	T1	T2 min	X
32	65	107	40	55	85	1.5	46	93	110	M16	42	49.5	77	50	26.5	34	G1/2	8	30	G1/4
40	70	112	40	55	90	1.5	58	108	125	M16	52	61.5	80	50	26.5	34	G1/2	10	35	G1/4
50	110	137	40	55	115	1.5	71	128	145	M16	70	75.7	97	50	26.5	34	G1/2	12	30	G1/4
63	115	142	45	55	120	1.5	90	143	160	M16	83	97.7	110	55	27.5	34.5	G3/4	14	35	G1/4
80	125	157	45	55	135	1.5	107	169	190	M20	100	112	123	60	30	37.5	G3/4	16	30	G1/4
100	140	186	55	55	165	1.5	132	212	240	M27	124	138.5	145	65	32.5	40	G1	25	55	G3/8
125	180	206	65	60	184	1.5	170	248	280	M30	148	176	215	75	37.5	50	G1	33	50	G3/8

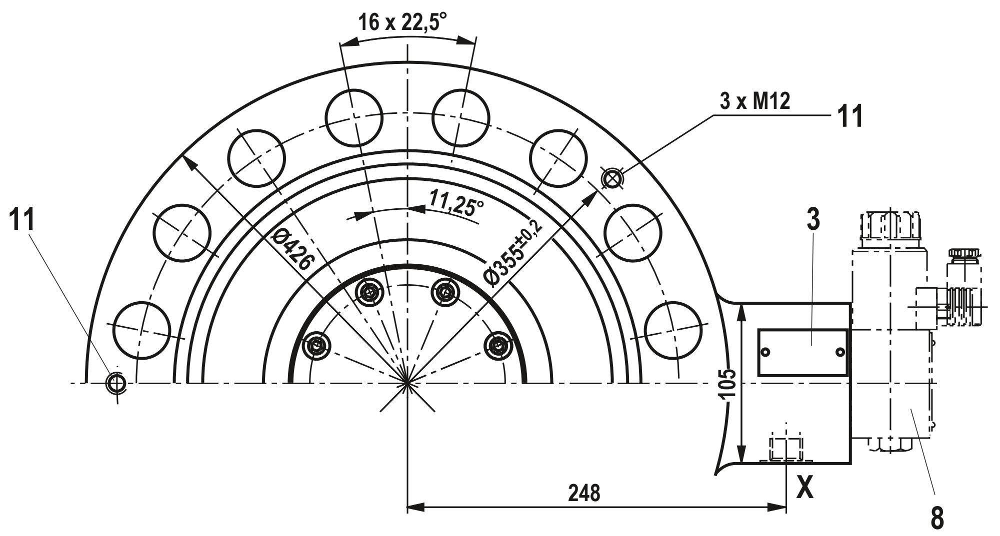
Unit dimensions: Type ZSFW, size 160 (dimensions in mm)



Item explanations see page 12

Unit dimensions: Type ZSFW, size 200 (dimensions in mm)



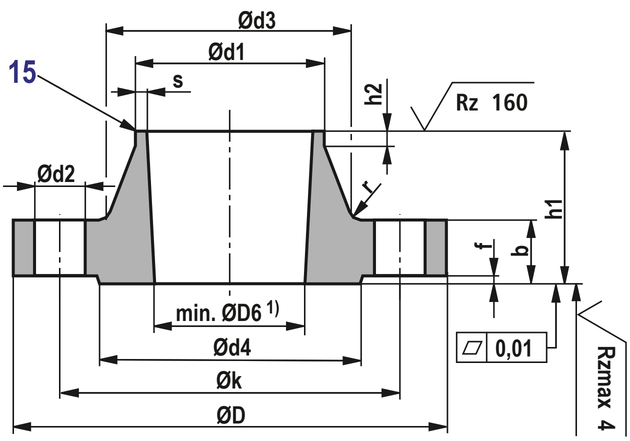


Item explanations see page 12

Unit dimensions

1 Throttle check valve, tightening torque M_A = 135 Nm ±5 %
2 Centering diameter
3 Name plate
4 Seal rings
5 Counterflange (separate order; dimensional proposal see below)
6 Main poppet stroke (see page 11)
7 **Attention!**
Design of the valve mounting face (e. g. press cylinders, bearing structures, etc.) must be sufficiently rigid!
The filling valve must not be loaded by bending!
8 Directional valve (separate order); dimensions see data sheet 23178 (type 4WE 6 D…) or 22058 (type M-.SEW 6…)
9 Space required for removing the mating connector
10 Valve mounting screws (separate order, see page 13)
11 Threads for transport device (ring bolts), evenly distributed to circumference
12 Measuring point, tightening torque M_A = 30 Nm ±10 %
13 Cushioning nozzle M8 x 1
14 Additional pressure port; if not used, seal in a hydraulically tight way by means of suitable plug screws!

Dimensional proposal for counterflange (item 5) (dimensions in mm)



Maximum operating pressure p_{max}		350 bar 3)
Recommended flange material	– Size 32 to 160	C22
	– Size 200	S355J2G3

Form of the welding gap:
Standard version
s ≤ 16 gap form 22 DIN 2559
s > 16 gap form 3 DIN 2559
Special version see DIN 2559

Size		Flange					Neck				Raised face	
	Ød1 2)	Ød2	ØD	b	Øk	h1	Ød3	s 2)	r	h2	Ød4	f
32	48.3	18	150	22	110	49	64	3.2	6	7	88	3
40	60.3	18	165	29	125	57	75	3.6	6	8	102	3
50	76.1	18	185	34	145	64	90	3.6	6	10	122	3
63	88.9	18	200	43	160	77	105	3.6	8	12	138	3
80	114.3	22	235	51	190	95	134	3.6	8	12	162	3
100	139.7	30	295	62	240	116	168	4.0	8	12	188	3
125	168.3	33	345	79	280	138	202	4.5	10	12	218	3
160	219.1	36	415	118	345	186	256	5.9	10	16	285	3
200	273	39	420	100	355	140	292	6.5	6	16	–	–

1) See drawing and dimensional table page 7 to 12
2) For seamless steel tubes wall thickness 16 according to DIN EN 10220
3) When using other counterflanges than the ones specified here, it may be necessary to reduce the operating pressure.

Valve mounting screws and ordering codes for counterflange see page 13.

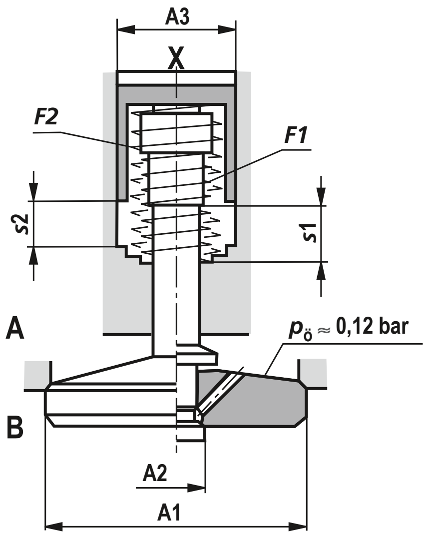
Valve mounting screws, counterflange (separate order)

	Hexagon socket head cap screws ISO 4762 - 10.9 (or DIN 912 - 10.9)				Counterflange
Size	**Quantity**	**Dimension**	**Tightening torque M_A in Nm** (±5 %), friction coefficient μ_{min} = 0.14 [1)]	**Material no.**	**Material no.**
32	4	M16 x 100	280	R900008843	R900842693
40	4	M16 x 110	280	R900003271	R900825610
50	8	M16 x 110	280	R900003271	R900826441
63	8	M16 x 130	280	R900017028	R900849622
80	8	M20 x 140	560	R900006624	R900862915
100	8	M27 x 180	1400	On request	R900834583
125	8	M30 x 200	1900	On request	R900861508
160	12	M33 x 260	2600	On request	R900846478
200	16	M36 x 320	2600	On request	R901205467

The information on the hexagon socket head cap screws (type, length, tightening torque) refer exclusively to the use with the counterflanges listed below!

1) Please adjust in case of changed surfaces; use a torque wrench!

Poppet geometry and determination of the minimum pilot pressure



without pre-decompression | **with** pre-decompression

***A1* =** Effective area of the main poppet
***A2* =** Effective area of the pilot poppet
***A3* =** Effective area of the control spool
***s1* =** Stroke of the main poppet
***s2* =** Stroke of the control spool
***F1* =** Spring force of the valve spring
***F2* =** Spring force of the control spool compression spring
V_{st} = Pilot volume for opening the valve
$p_ö$ = Cracking pressure (pressure differential at the main poppet for overcoming the spring force ***F1***)
p_{St} = Pilot pressure at port X
p_B = System pressure at port B

$$\text{Unchecking ratio} = \frac{\text{Pilot pressure } p_{St}}{\text{System pressure } p_B}$$

Size	*A1* in cm²	*A2* [1)] in cm²	*A3* in cm²	*s1* in mm	*s2* in mm	*F1* in N	*F2* in N	V_{st} in cm³	Unchecking ratio [2)] in bar	Unchecking ratio [3)] in bar
32	8.04	0.50	2.01	8.5	6.5	9 to 22	58 to 109	1.3	4.0	0.3
40	13.52	0.79	3.14	10.0	7.0	14 to 29	93 to 162	2.2	4.3	0.3
50	21.24	1.13	4.71	12.5	9.0	23 to 49	149 to 261	4.2	4.5	0.3
63	32.67	1.77	7.07	14.5	11.0	35 to 63	206 to 348	7.8	4.6	0.3
80	49.02	2.54	10.18	17.0	13.0	57 to 127	310 to 579	13.2	4.8	0.3
100	73.13	3.80	15.90	22.0	16.0	81 to 193	476 to 952	25.5	4.6	0.2
125	120.76	5.72	28.27	30.0	22.5	135 to 319	878 to 1667	59.4	4.3	0.2
160	196.07	9.08	45.36	40.0	27.0	241 to 516	1335 to 2395	122.0	4.3	0.2
200	314.16	–	78.54	48.0	34.0	425 to 850	2389 to 3822	267.0	4.0	–

1) Is omitted for version "without pre-decompression" (ZSF ...**0**...)

2) **Without** pre-decompression

3) **With** pre-decompression (on request)

Example: Type ZSF**32**…F**0**; p_B **= 30 bar**

p_{St} = 4.0 x 30 bar = 120 bar

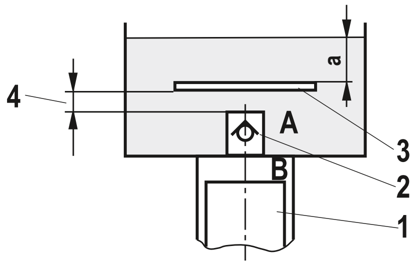
Flow q_V in l/min (A to B) for different cases of application (Δp = 0.3 bar)

Size	32	40	50	63	80	100	125	160	200
Case of application 1	200	300	500	800	1200	1900	3000	4200	7000
Case of application 2	170	250	400	650	1000	1600	2600	3900	6510
Case of application 3	140	220	360	560	900	1400	2200	3400	5670
Case of application 4	100	150	240	380	620	950	1500	2300	3850
Case of application 5	70	110	170	280	450	700	1100	1690	2800

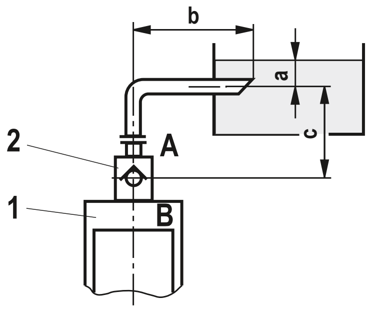
Attention!
Wrong dimensioning of filling valve and suction line may cause cavitation and consequential damage!

Cases of application

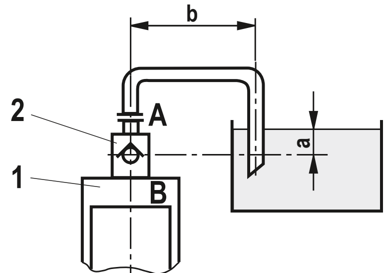
Case of application 1



Case of application 2

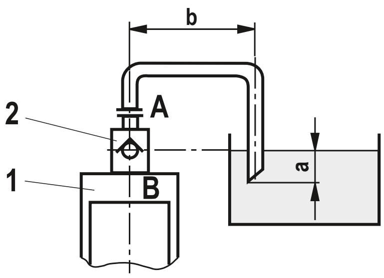


Case of application 3

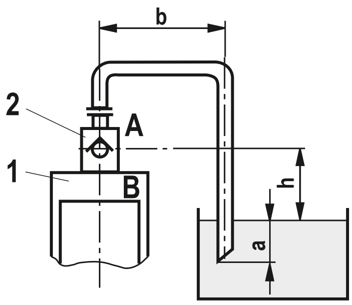


Size of the filling tank at least 1.5 x cylinder capacity

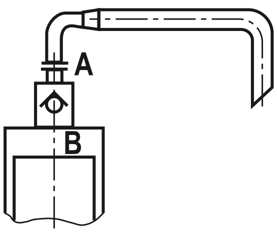
Case of application 4



Case of application 5



Information on case of application 2 to 5



For limit areas, please ask us. It is often enough, to select a pipeline which is one size larger.

- **1** Cylinder
- **2** Filling valve
- **3** This sheet is not included in the scope of delivery. With smaller tank dimensions and minimum hydraulic fluid level (a), it prevents the formation of tunnels.
- **4** Observe the supply cross-section!
- **a** Min. 300 mm with extended cylinder
- **b** up to 1000 mm with the specified maximum flows
- **c** h ≤ 500 mm
- **h** 300 mm ≤ h < 500 mm

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Directional valves

Continued on next page

Directional valves

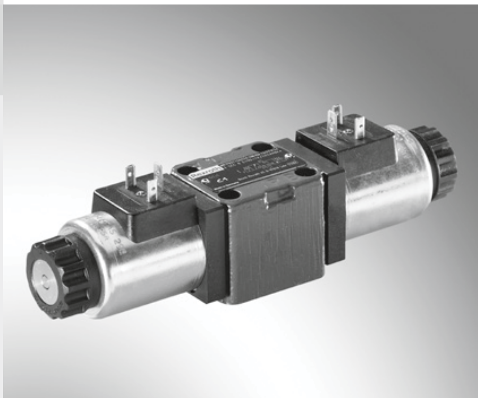
Designation	Type	Size	Component series	p_{max} in bar	Data sheet	Page
Additional equipment						
Directional spool and seat valves with electrical actuation and M12x1 plug-in connection	WE, SED, SEW	6/10			08010	757
On/off valves with spool position monitoring		6 … 32	0		24830	775

3/3, 4/2 and 4/3 directional poppet valve with solenoid actuation

RE 22035/06.10
Replaces: 12.08

Type SEC

Size 6
Component series 1X
Maximum operating pressure 420 bar *[6100 psi]*
Maximum flow 25 l/min *[6.6 US gpm]*



H7562

Table of contents

Features

- Direct operated directional poppet valve with solenoid actuation
- Porting pattern according to ISO 4401-03-02-05 and NFPA T3.5.1 R2-D03
- Blocked connection tight
- Safe switching also with longer standstill periods under pressure
- Wet-pin DC voltage solenoids with detachable coil (AC voltage possible by means of a rectifier)
- Solenoid coil can be rotated by 90°
- Electrical connection as individual connection
- Central connection possible via double valve mating connector
- With concealed manual override, optional
- Classification according to DIN EN ISO 13849 category 1

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

	SEC	6		1X / C			/			*

Main ports
2 **= 2**
3 **= 3**
4 **= 4**

Poppet valve

Size 6 **= 6**

Symbol e.g. E, etc.
possible design see page 3

Component series 10 to 19 **= 1X**
(10 to 19: Unchanged installation and connection dimensions)

Solenoid with detachable coil **= C**

DC voltage 12 V **= G12**
DC voltage 24 V **= G24**
DC voltage 26 V **= G26**
DC voltage 48 V **= G48**
DC voltage 96 V **= G96**
DC voltage 110 V **= G110**
DC voltage 125 V **= G125**
DC voltage 205 V **= G205**
DC voltage 220 V **= G220**

without manual override **= no code**
with manual override **= N**
with concealed manual override **= N9**

AC voltage mains (permissible voltage tolerance ±10 %)	**Nominal voltage of the DC solenoid in case of operation with alternating voltage**	**Ordering code**
110 V - 50/60 Hz	96 V	G96
120 V - 60 Hz	110 V	G110
230 V - 50/60 Hz	205 V	G205

Electrical connection

K4 [2; 3; 4] = **without** mating connector, single connection with connector according to DIN EN 175301-803

K72L [2] = **without** mating connector, single connection 4-pin with connector M12x1, integrated interference protection circuit, operating display LED

K73L [2] = **without** mating connector, single connection 4-pin with connector M12x1 (no connection pin 1 to pin 2), integrated interference protection circuit, operating display LED

C4 [2] = **without** mating connector, with connector AMP Junior-Timer

no code = without check valve insert, without throttle insert, without orifice insert
P... = with check valve insert, with throttle insert, with orifice insert (for more information and selection table see page 11 to 15)

Seal material
no code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

no code = **with** locating hole [1]
/62 = **with** locating hole and locating pin ISO 8752-3x8-St

Further details in the plain text

Coil connection combinations:

	K4	K72L	K73L	C4
G12	✓	–	–	✓
G24	✓	✓	✓	✓
G26	✓	–	–	✓
G48	✓	–	–	–
G96	✓	–	–	–
G110	✓	–	–	–
G125	✓	–	–	–
G205	✓	–	–	–
G220	✓	–	–	–

[1] Locating pin ISO 8752-3x8-St, Material no. **R900005694** (separate order)

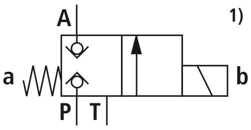
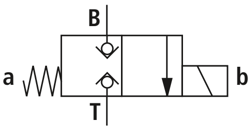
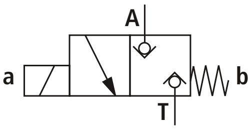
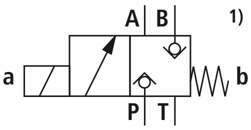
[2] Mating connectors, separate order, see page 11 and data sheet 08006.

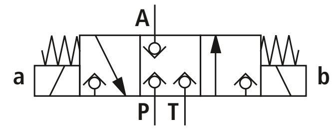
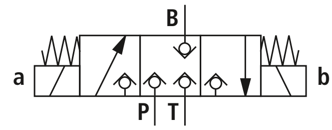
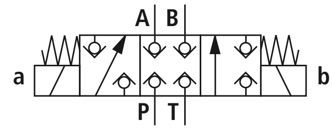
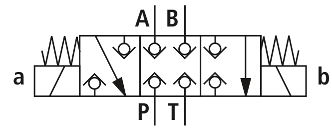
[3] For the connection to AC voltage mains, a DC voltage solenoid **must** be used, which is controlled via a rectifier (see table above).
With an individual connection, a mating connector with integrated rectifier can be used (separate order, see page 11 and data sheet 08006).

[4] Double valve mating connector for central connection, separate order, see data sheet 08006.

Standard types and standard units are contained in the EPS (standard price list).

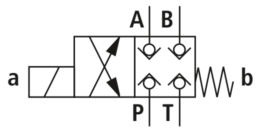
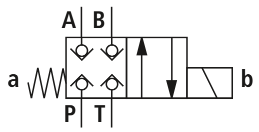
Spool symbols

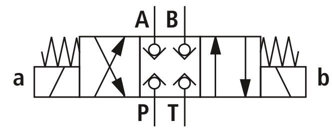
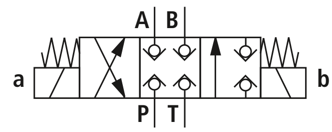
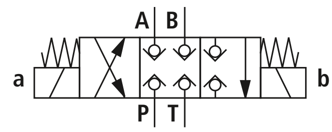
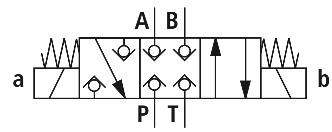
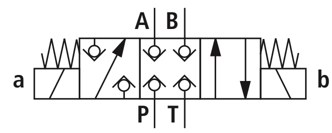
2/2 directional poppet valve	
Ordering code	**Symbol**
E61B	 [1]
E40B	
E69A	
E18A	 [1]

3/3 directional poppet valve	
Ordering code	**Symbol**
E35	
E100	
E13	
E22 [2]	

[1] Port T must be connected for pressure compensation.

[2] Port P doesn't have to be be connected.

4/2 directional poppet valve	
Ordering code	**Symbol**
EA	
EB	

4/3 directional poppet valve	
Ordering code	**Symbol**
E	
E61	
E40	
E89	
E18	

Function, section

General

The directional valve Type SEC is a directional poppet valve with solenoid actuation. It controls start, stop and direction of the flow and basically comprises a housing (1), the solenoid (2) as well as the hardened valve system (3).

The manual override allows for the the switching of the valve without solenoid energization.

Basic principle

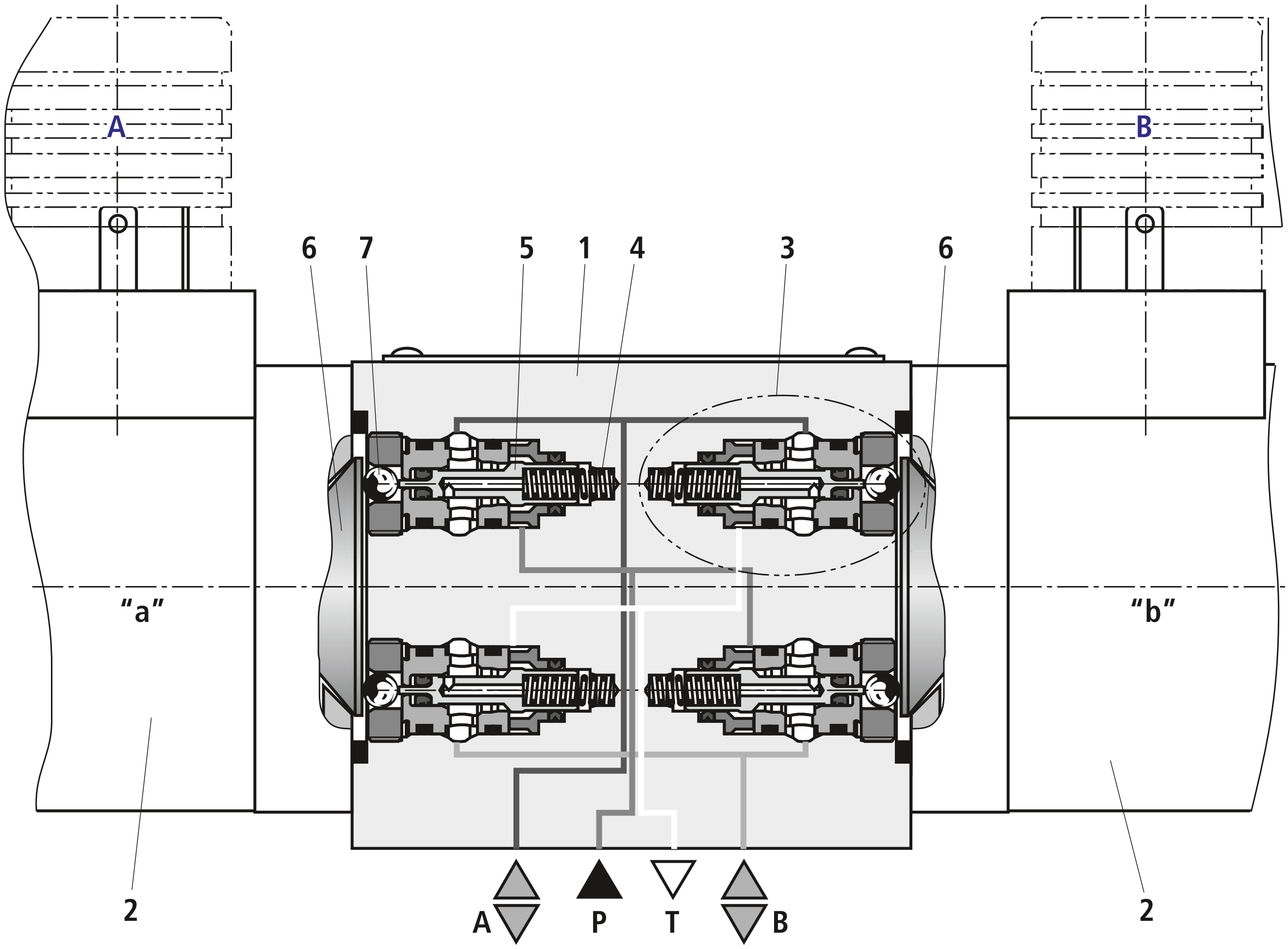
In the initial position, the control spool (5) is pushed onto the seat by the spring (4). The force of the solenoid (2) acts via an actuating element (6) and the ball (7) on the control spool (5). Depending on the spool, up to four valve systems (3) are installed in the housing that can be connected in different ways.

Attention!

It has to be made sure that the specified maximum flow is not exceeded! An orifice insert must be used for limiting the flow, if necessary (see page 11).

Depending on the production tolerances, a pump or tank pre-opening of the valve results. That is why different pressure courses may result during the switching process in valves of the same type.

One valve alone must never be used for holding loads or for positioning.



Technical data (For applications outside these parameters, please consult us!)

general

Weight	– 3/3 directional poppet valve	kg *[lbs]*	2.14 *[4.72]*
	– 4/2 directional poppet valve	kg *[lbs]*	1.8 *[3.97]*
	– 4/3 directional poppet valve	kg *[lbs]*	2.14 *[4.72]*
Installation position			Any
Ambient temperature range		°C *[°F]*	–30 to +50 *[–22 to +122]* (NBR seals) –20 to +50 *[–4 to +122]* (FKM seals)
Vibration test according to IEC 68-2-36			10 g RMS, 20 to 2000 Hz, test time 60 min per axis

hydraulic

Maximum operating pressure	– Port A, B, P	bar *[psi]*	420 *[6100]*
	– Port T	bar *[psi]*	$p_T < p_P$, however max. 100 *[1450]* (energized) $p_T < 20$ *[290]*, if $p_A / p_B = 0$ (de-energized)
Maximum flow		l/min *[US gpm]*	25 *[6.6]*
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524 1); fast biodegradable hydraulic fluids according to VDMA 24568 (see also data sheet 90221); HETG (rape seed oil) 1); HEPG (polyglycols) 2); HEES (synthetic esters) 2); other hydraulic fluids upon request
Hydraulic fluid temperature range		°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range		mm^2/s *[SUS]*	2.8 to 500 *[35 to 2320]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 3)

1) Suitable for NBR and FKM seals

2) Only suitable for FKM seals

3) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of filters see www.boschrexroth.com/filter.

Technical data (For applications outside these parameters, please consult us!)

electrical

Type of voltage			Direct voltage	Alternating voltage
Available voltages (special voltages upon request)		V	12, 24, 26, 48, 96, 110, 125, 205, 220	Only possible with rectifier [4]
Voltage tolerance (nominal voltage)		%	±10	
Power consumption		W	30	
Duty cycle (ED)		%	100	
Switching time according to ISO 6403 [5]	– ON	ms	max. 70	
	– OFF	ms	max. 45	
Maximum switching frequency		1/h	3600	
Protection class according to DIN EN 60529	– Version “K4”, “K72L”, “K73L”		IP 65 (with mating connector mounted and locked)	
	– Version “C4”		IP 66 (with mating connector mounted and locked)	
Maximum coil temperature [6]		°C *[°F]*	120 *[248]*	

[4] – Mating connectors with rectifier see page 11
– Possible voltages see page 2
– Rectifiers from the customer must comply with the relevant standards as well as the coil performance data!

[5] The switching times are measured according to ISO 6403 with HLP46, ϑ_{Oil} = 40 °C ± 5 °C *[104 °F ± 9 °F]* and refer to a pressure change of 5 %. With other oil temperatures, deviations are possible!

[6] Due to the surface temperatures of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

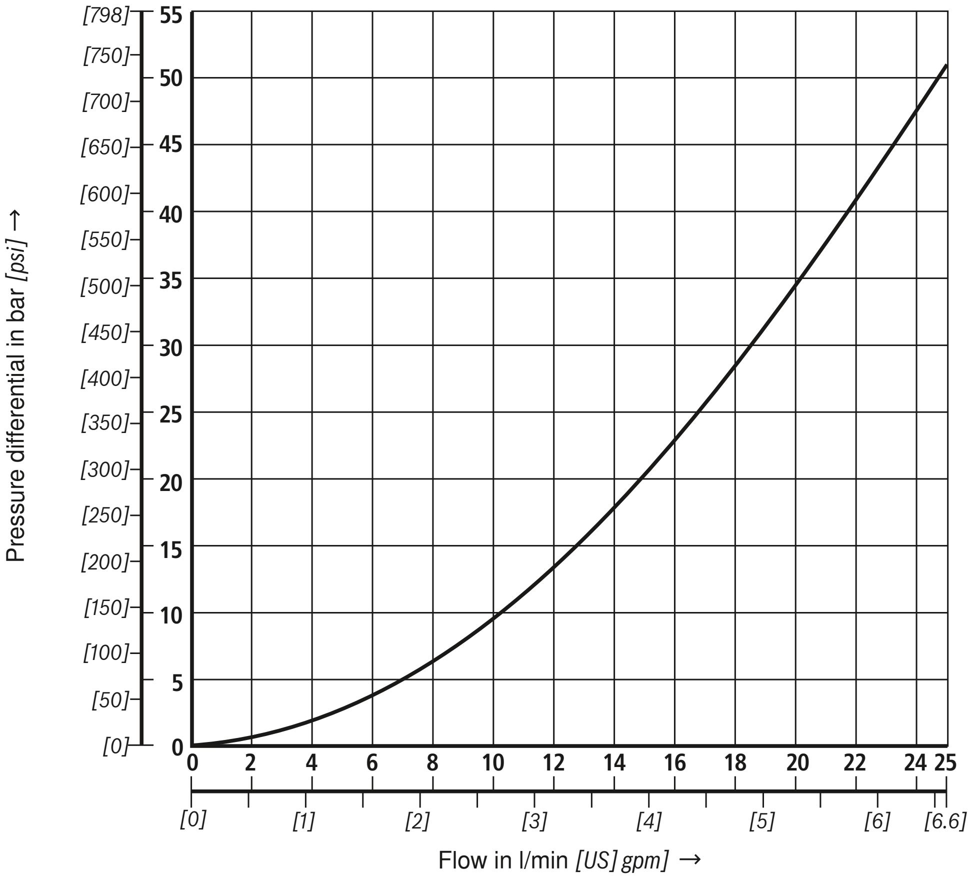
When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected properly.

Notes!

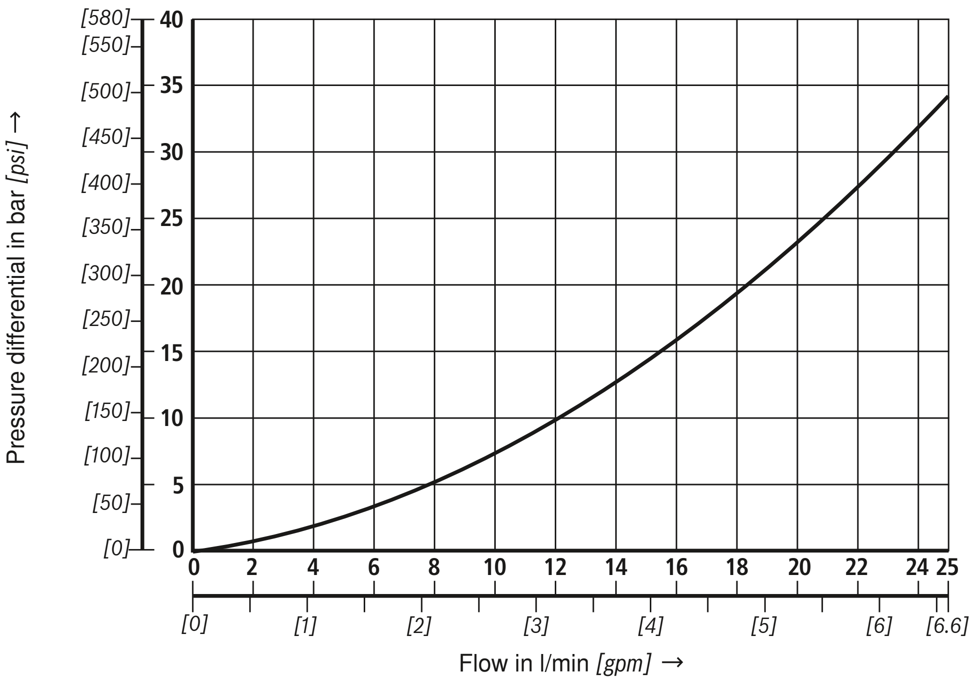
- Operation of the manual override is only possible up to a tank pressure of ca. 50 bar *[725 psi]*. Avoid damage to the bore for the manual override! (Special tool for actuation, separate order, Material no. **R900024943**). The simultaneous operation of both solenoids with 100 % duty cycle is not possible. If both solenoids are operated, a maximum duty cycle of 10 % is admissible.
- The solenoids shut-off generates voltage peaks that can be reduced by using suitable diodes.
- Assembly, commissioning and maintenance see data sheet 07300
- In set-up mode, an H position can be achieved by actuating both coils (only with 4/3 directional poppet valve with spool symbol “E”). In order to avoid overheating of the coil, the duty cycle must in intermittent operation S3 (according to VDE 0580) not exceed 10 % or 50 % with a game duration of 5 minutes or 70 seconds respectively!
- Operation with reduced power:
After interconnection and achieving of the spool position (ca. 200 ms), the electrical power can be reduced to 8 W (e.g. by means of PWM technology).

Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

Δp-q_V characteristic curves



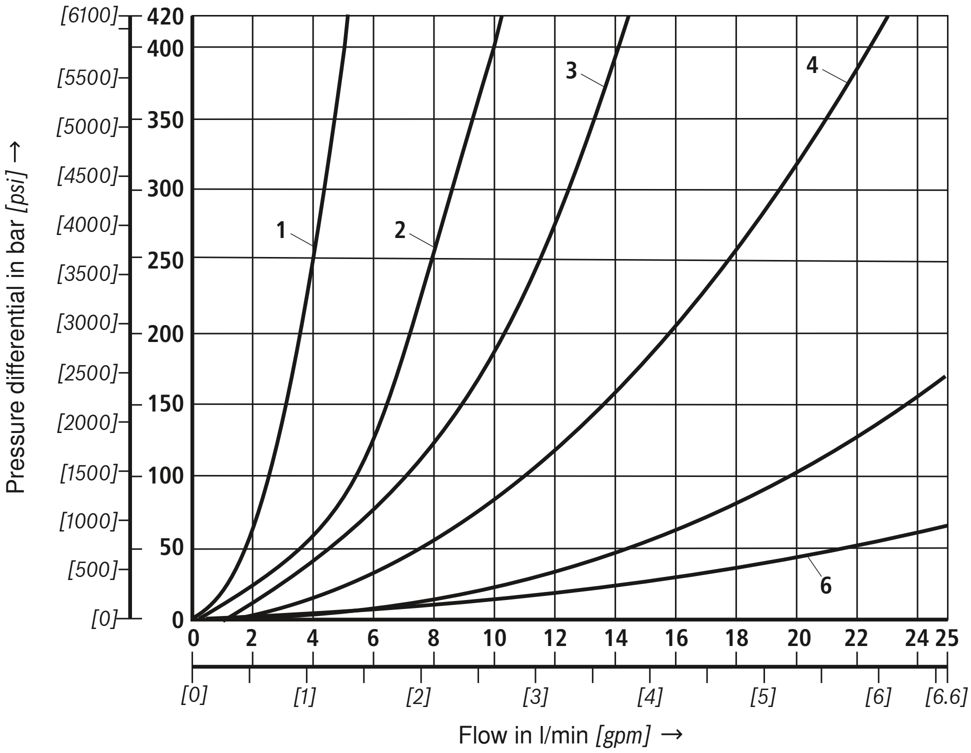
Δp-q_V characteristic curves
Check valve insert



☞ **Note!**
Check valve inserts generally create pressure drops.

Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

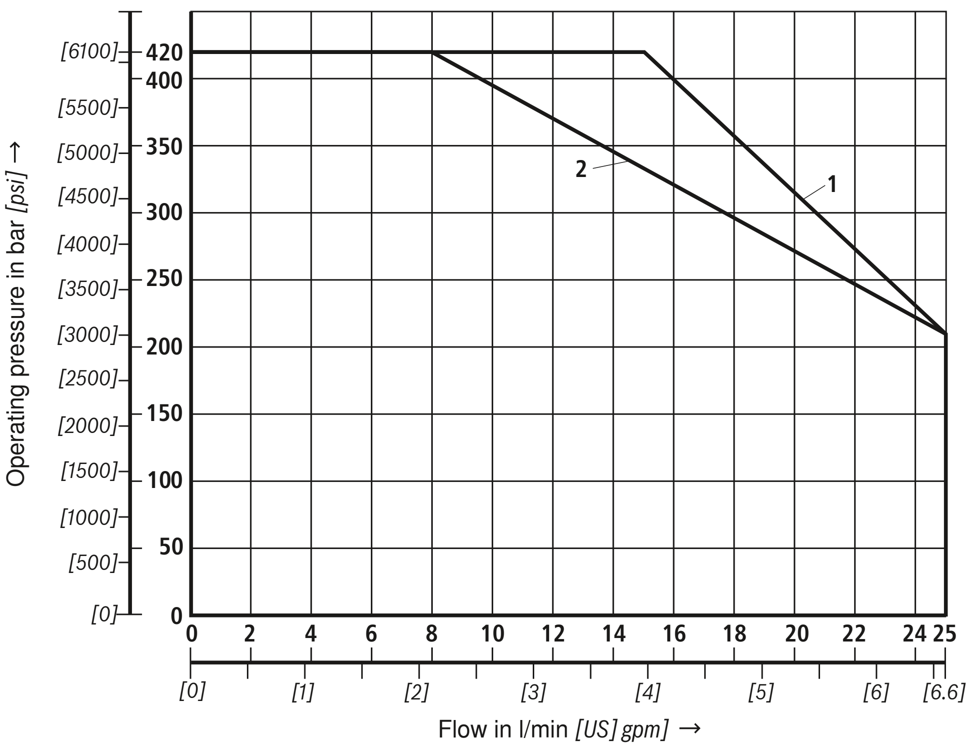
Δp-q_V characteristic curves
Orifice inserts, throttle inserts



Charac-teristic curve	Ø in mm *[inch]*
1	0.7
2	1.0
3	1.2
4	1.5
5	2.0
6	2.5

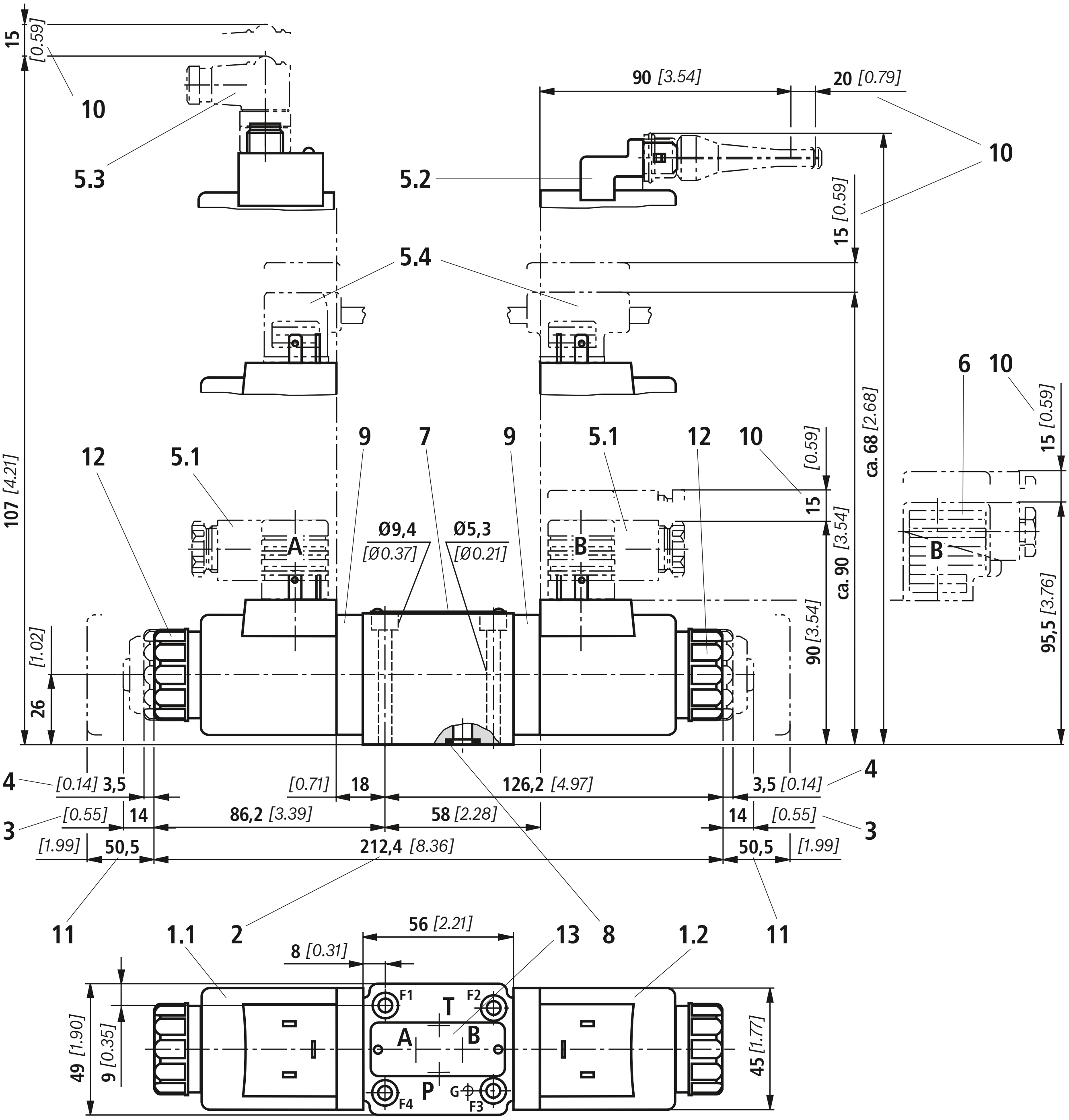
☞ **Note!**
Orifice and throttle inserts generally create pressure drops.

Performance limits (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

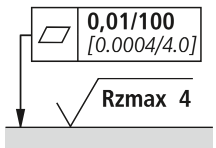


Charac-teristic curve	Spool symbols
1	E35, E100, E18A, E40B, E69A, E61B, E22, E13
2	E, E61,E89, E40, E18, EA, EB

Unit dimensions (dimensions in mm *[inch]*)



Item explanations and **valve mounting screws** see page 10.



Required surface quality
of the valve mounting face

Attention!

Maximum diameter for more far reaching connection bores in the block (A, B, P, and T) 6.8 mm *[0.268 inch]*!
With larger diameters, there is the risk that the additional elements (component inserts) do not stay in the intended position.

Unit dimensions: Item explanations

1.1 Solenoid “a”

1.2 Solenoid “b”

2 Dimension for solenoid **with concealed** manual override “**N9**”

3 Dimension for solenoid **with** manual override “**N9**”

4 Dimension for solenoid **without** manual override

5.1 Mating connector **without** circuitry for connector “K4” (separate order, see page 11 and data sheet 08006)

5.2 Mating connector (AMP Junior Timer) with connector “C4” (separate order, see data sheet 08006)

5.3 Mating connector angled with M12x1 plug-in connection with operating display LED “K72L” and “K73L” (separate order, see data sheet 08006)

5.4 Double valve mating connector **without**/**with** circuitry for connector “K4” (separate order, see data sheet 08006)

6 Mating connector **with** circuitry for connector “K4” (separate order, see page 11 and data sheet 08006)

7 Name plate

8 Identical seal rings for ports A, B, P, T

9 Intermediate flange

10 Space required for removing the mating connector

11 Space required for removing the coil

12 Lock nut, tightening torque M_A = 4^{+1} Nm *[2.95$^{+0.74}$ ft-lbs]*

13 Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-D03 (**with** locating hole for locating pin ISO 8752-3x8-St; see ordering code page 2)

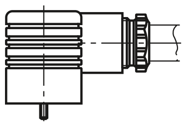
Valve mounting screws (separate order)

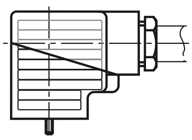
– Clamping length 42 mm:
  4 hexagon socket head cap screws metric
  ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  Tightening torque M_A = 7 Nm *[5.2 ft-lbs]* ±10 %,
  Material no. **R913000064**
  or
  4 hexagon socket head cap screws
  ISO 4762 - M5 x 50 - 10.9 (own procurement)
  (friction coefficient μ_{total} = 0.12 to 0.17);
  Tightening torque M_A = 8.1 Nm *[6 ft-lbs]* ±10 %

  4 hexagon socket head cap screws UNC
  10-24 UNC x 2” ASTM-A574
  (friction coefficient μ_{total} = 0.19 to 0.24);
  Tightening torque M_A = 11 Nm *[8.2 ft-lbs]* ±15 %,
  (friction coefficient μ_{total} = 0.12 to 0.17);
  Tightening torque M_A = 8 Nm *[5.9 ft-lbs]* ±10 %,
  Material no. **R978800693**

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006





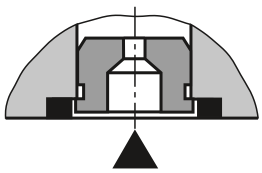
Valve side	Color	Material no. without circuitry	with indicator light 12 … 240 V	with rectifier 12 … 240 V	with indicator light and Zener diode suppression circuit 24 V
a	Gray	**R901017010**	–	–	–
b	Black	**R901017011**	–	–	–
a/b	Black	–	**R901017022**	**R901017025**	**R901017026**

Orifice insert

The use of an orifice insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

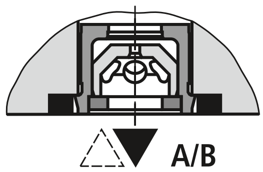
Examples:

- Accumulator operation,
- Use as pilot control valve with internal pilot fluid tapping.

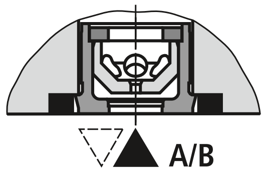


Throttle insert

The throttle insert is used to control the consumption rate (e.g. for workpiece clamping). Depending on the single case, supply or discharge control is possible.



(Supply)

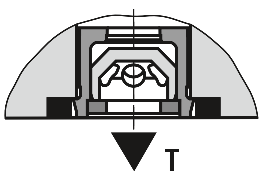


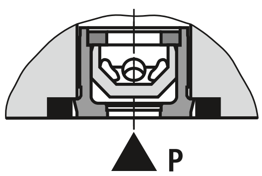
(Discharge)

Check valve insert

The check valve insert in P allows a free flow from P to A/B and closes from A/B to P.

The check valve insert in T allows a free flow from A/B to P and closes from T to A/B.





Project planning information

- **Classification according to DIN EN 13849**

  Due to the evaluation according to table C.1 and C.2 of DIN EN ISO 13849-2.2000-12, the valve can be classified in category 1.
- Machine directive 2006/42/EC is to be observed.
- Please also observe the data sheets 07008 and 07300.
- **Estimates of the $MTTF_d$ value according to DIN EN ISO 13849-1.2007-02**

  Due to the evaluation according to attachment C.3 of DIN EN ISO 13849-1, an $MTTF_d$ of 150 years can be indicated for the valve.
- Due to casting tolerances, a manifold with a depth gauge of 55 mm is to be used in case manifolds are used.

Selection table: Orifice insert, throttle insert and check valve insert

Order example:

- Orifice insert Ø 0.6 mm *[Ø 0.0236 inch]* in channel P
- Orifice insert Ø 0.6 mm *[Ø 0.0236 inch]* in channel A
- Check valve in channel T

→ Ordering code “**P069**”

Ordering code	Orifice insert in channel P	Orifice insert in channel A	Orifice insert in channel B	Throttle insert (discharge) in channel A	Throttle insert (discharge) in channel B	Throttle insert (supply) in channel A	Throttle insert (supply) in channel B	Check valve in channel P	Check valve in channel T
P001	0.6	–	–	–	–	–	–	–	–
P002	0.7	–	–	–	–	–	–	–	–
P003	0.8	–	–	–	–	–	–	–	–
P004	1.0	–	–	–	–	–	–	–	–
P005	1.2	–	–	–	–	–	–	–	–
P006	1.5	–	–	–	–	–	–	–	–
P007	1.8	–	–	–	–	–	–	–	–
P008	2.0	–	–	–	–	–	–	–	–
P009	2.2	–	–	–	–	–	–	–	–
P010	3.0	–	–	–	–	–	–	–	–
P011	3.5	–	–	–	–	–	–	–	–
P012	–	–	–	–	–	–	–	✓	–
P013	–	–	–	–	–	–	–	✓	✓
P014	0.6	–	–	–	–	–	–	–	✓
P015	0.7	–	–	–	–	–	–	–	✓
P016	0.8	–	–	–	–	–	–	–	✓
P017	1.0	–	–	–	–	–	–	–	✓
P018	1.2	–	–	–	–	–	–	–	✓
P019	1.5	–	–	–	–	–	–	–	✓
P020	1.8	–	–	–	–	–	–	–	✓
P021	2.0	–	–	–	–	–	–	–	✓
P022	2.2	–	–	–	–	–	–	–	✓
P023	3.0	–	–	–	–	–	–	–	✓
P024	3.5	–	–	–	–	–	–	–	✓
P025	–	0.6	–	–	–	–	–	–	–
P026	–	0.7	–	–	–	–	–	–	–
P027	–	0.8	–	–	–	–	–	–	–
P028	–	1.0	–	–	–	–	–	–	–
P029	–	1.2	–	–	–	–	–	–	–
P030	–	1.5	–	–	–	–	–	–	–
P031	–	1.8	–	–	–	–	–	–	–
P032	–	2.0	–	–	–	–	–	–	–
P033	–	2.2	–	–	–	–	–	–	–
P034	–	3.0	–	–	–	–	–	–	–
P035	–	3.5	–	–	–	–	–	–	–
P036	–	–	0.6	–	–	–	–	–	–
P037	–	–	0.7	–	–	–	–	–	–
P038	–	–	0.8	–	–	–	–	–	–
P039	–	–	1.0	–	–	–	–	–	–
P040	–	–	1.2	–	–	–	–	–	–
P041	–	–	1.5	–	–	–	–	–	–
P042	–	–	1.8	–	–	–	–	–	–
P043	–	–	2.0	–	–	–	–	–	–
P044	–	–	2.2	–	–	–	–	–	–
P045	–	–	3.0	–	–	–	–	–	–
P046	–	–	3.5	–	–	–	–	–	–
P047	–	0.6	0.6	–	–	–	–	–	–
P048	–	0.7	0.7	–	–	–	–	–	–
P049	–	0.8	0.8	–	–	–	–	–	–
P050	–	1.0	1.0	–	–	–	–	–	–
P051	–	1.2	1.2	–	–	–	–	–	–
P052	–	1.5	1.5	–	–	–	–	–	–
P053	–	1.8	1.8	–	–	–	–	–	–
P054	–	2.0	2.0	–	–	–	–	–	–
P055	–	2.2	2.2	–	–	–	–	–	–
P056	–	3.0	3.0	–	–	–	–	–	–
P057	–	3.5	3.5	–	–	–	–	–	–
P058	0.6	0.6	–	–	–	–	–	–	–
P059	0.7	0.7	–	–	–	–	–	–	–
P060	0.8	0.8	–	–	–	–	–	–	–
P061	1.0	1.0	–	–	–	–	–	–	–
P062	1.2	1.2	–	–	–	–	–	–	–
P063	1.5	1.5	–	–	–	–	–	–	–
P064	1.8	1.8	–	–	–	–	–	–	–
P065	2.0	2.0	–	–	–	–	–	–	–
P066	2.2	2.2	–	–	–	–	–	–	–
P067	3.0	3.0	–	–	–	–	–	–	–
P068	3.5	3.5	–	–	–	–	–	–	–
P069	0.6	0.6	–	–	–	–	–	–	✓
P070	0.7	0.7	–	–	–	–	–	–	✓
P071	0.8	0.8	–	–	–	–	–	–	✓
P072	1.0	1.0	–	–	–	–	–	–	✓
P073	1.2	1.2	–	–	–	–	–	–	✓
P074	1.5	1.5	–	–	–	–	–	–	✓
P075	1.8	1.8	–	–	–	–	–	–	✓
P076	2.0	2.0	–	–	–	–	–	–	✓
P077	2.2	2.2	–	–	–	–	–	–	✓
P078	3.0	3.0	–	–	–	–	–	–	✓
P079	3.5	3.5	–	–	–	–	–	–	✓
P080	0.6	–	0.6	–	–	–	–	–	–
P081	0.7	–	0.7	–	–	–	–	–	–
P082	0.8	–	0.8	–	–	–	–	–	–
P083	1.0	–	1.0	–	–	–	–	–	–
P084	1.2	–	1.2	–	–	–	–	–	–
P085	1.5	–	1.5	–	–	–	–	–	–
P086	1.8	–	1.8	–	–	–	–	–	–
P087	2.0	–	2.0	–	–	–	–	–	–
P088	2.2	–	2.2	–	–	–	–	–	–

Selection table: Orifice insert, throttle insert and check valve insert

Ordering code	Orifice insert in channel P	Orifice insert in channel A	Orifice insert in channel B	Throttle insert (discharge) in channel A	Throttle insert (discharge) in channel B	Throttle insert (supply) in channel A	Throttle insert (supply) in channel B	Check valve in channel P	Check valve in channel T
P089	3.0	–	3.0	–	–	–	–	–	–
P090	3.5	–	3.5	–	–	–	–	–	–
P091	0.6	–	0.6	–	–	–	–	–	✓
P092	0.7	–	0.7	–	–	–	–	–	✓
P093	0.8	–	0.8	–	–	–	–	–	✓
P094	1.0	–	1.0	–	–	–	–	–	✓
P095	1.2	–	1.2	–	–	–	–	–	✓
P096	1.5	–	1.5	–	–	–	–	–	✓
P097	1.8	–	1.8	–	–	–	–	–	✓
P098	2.0	–	2.0	–	–	–	–	–	✓
P099	2.2	–	2.2	–	–	–	–	–	✓
P100	3.0	–	3.0	–	–	–	–	–	✓
P101	3.5	–	3.5	–	–	–	–	–	✓
P102	–	–	–	0.7	–	–	–	–	–
P103	–	–	–	–	0.7	–	–	–	–
P104	–	–	–	–	–	0.7	–	–	–
P105	–	–	–	–	–	–	0.7	–	–
P106	–	–	–	0.7	0.7	–	–	–	–
P107	–	–	–	–	–	0.7	0.7	–	–
P108	–	–	–	0.7	–	–	–	✓	–
P109	–	–	–		0.7	–	–	✓	–
P110	–	–	–	–	–	0.7		✓	–
P111	–	–	–	–	–	–	0.7	✓	–
P112	–	–	–	0.7	0.7	–	–	✓	–
P113	–	–	–	–	–	0.7	0.7	✓	–
P114	–	–	–	0.7	–	–	–	✓	✓
P115	–	–	–	–	0.7	–	–	✓	✓
P116	–	–	–	–	–	0.7	–	✓	✓
P117	–	–	–	–	–	–	0.7	✓	✓
P118	–	–	–	0.7	0.7	–	–	✓	✓
P119	–	–	–	–	–	0.7	0.7	✓	✓
P120	–	–	–	1.0	–	–	–	–	–
P121	–	–	–	–	1.0	–	–	–	–
P122	–	–	–	–	–	1.0	–	–	–
P123	–	–	–	–	–	–	1.0	–	–
P124	–	–	–	1.0	1.0	–	–	–	–
P125	–	–	–	–	–	1.0	1.0	–	–
P126	–	–	–	1.0	–	–	–	✓	–
P127	–	–	–	–	1.0	–	–	✓	–
P128	–	–	–	–	–	1.0	–	✓	–
P129	–	–	–	–	–	–	1.0	✓	–
P130	–	–	–	1.0	1.0	–	–	✓	–
P131	–	–	–	–	–	1.0	1.0	✓	–
P132	–	–	–	1.0	–	–	–	✓	✓
P133	–	–	–	–	1.0		–	✓	✓
P134	–	–	–	–	–	1.0	–	✓	✓
P135	–	–	–	–	–	–	1.0	✓	✓
P136	–	–	–	1.0	1.0	–	–	✓	✓
P137	–	–	–	–	–	1.0	1.0	✓	✓
P138	–	–	–	1.2	–	–	–	–	–
P139	–	–	–	–	1.2	–	–	–	–
P140	–	–	–	–	–	1.2	–	–	–
P141	–	–	–	–	–	–	1.2	–	–
P142	–	–	–	1.2	1.2	–	–	–	–
P143	–	–	–	–	–	1.2	1.2	–	–
P144	–	–	–	1.2	–	–	–	✓	–
P145	–	–	–	–	1.2	–	–	✓	–
P146	–	–	–	–	–	1.2	–	✓	–
P147	–	–	–	–	–	–	1.2	✓	–
P148	–	–	–	1.2	1.2	–	–	✓	–
P149	–	–	–	–	–	1.2	1.2	✓	–
P150	–	–	–	1.2	–	–	–	✓	✓
P151	–	–	–	–	1.2	–	–	✓	✓
P152	–	–	–	–	–	1.2	–	✓	✓
P153	–	–	–	–	–	–	1.2	✓	✓
P154	–	–	–	1.2	1.2	–	–	✓	✓
P155	–	–	–	–	–	1.2	1.2	✓	✓
P156	–	–	–	1.5	–	–	–	–	–
P157	–	–	–	–	1.5	–	–	–	–
P158	–	–	–	–	–	1.5	–	–	–
P159	–	–	–	–	–	–	1.5	–	–
P160	–	–	–	1.5	1.5	–	–	–	–
P161	–	–	–	–	–	1.5	1.5	–	–
P162	–	–	–	1.5	–	–	–	✓	–
P163	–	–	–	–	1.5	–	–	✓	–
P164	–	–	–	–	–	1.5	–	✓	–
P165	–	–	–	–	–	–	1.5	✓	–
P166	–	–	–	1.5	1.5	–	–	✓	–
P167	–	–	–	–	–	1.5	1.5	✓	–
P168	–	–	–	1.5	–	–	–	✓	✓
P169	–	–	–	–	1.5	–	–	✓	✓
P170	–	–	–	–	–	1.5	–	✓	✓
P171	–	–	–	–	–	–	1.5	✓	✓
P172	–	–	–	1.5	1.5	–	–	✓	✓
P173	–	–	–	–	–	1.5	1.5	✓	✓
P174	–	–	–	2.0	–	–	–	–	–
P175	–	–	–	–	2.0	–	–	–	–
P176	–	–	–	–	–	2.0	–	–	–
P177	–	–	–	–	–	–	2.0	–	–
P178	–	–	–	2.0	2.0	–	–	–	–
P179	–	–	–	–	–	2.0	2.0	–	–
P180	–	–	–	2.0	–	–	–	✓	–
P181	–	–	–	–	2.0	–	–	✓	–
P182	–	–	–	–	–	2.0	–	✓	–

Selection table: Orifice insert, throttle insert and check valve insert

Ordering code	Orifice insert in channel P	Orifice insert in channel A	Orifice insert in channel B	Throttle insert (discharge) in channel A	Throttle insert (discharge) in channel B	Throttle insert (supply) in channel A	Throttle insert (supply) in channel B	Check valve in channel P	Check valve in channel T
P183	–	–	–	–	–	–	2.0	✓	–
P184	–	–	–	2.0	2.0	–	–	✓	–
P185	–	–	–	–	–	2.0	2.0	✓	–
P186	–	–	–	2.0	–	–	–	✓	✓
P187	–	–	–	–	2.0	–	–	✓	✓
P188	–	–	–	–	–	2.0	–	✓	✓
P189	–	–	–	–	–	–	2.0	✓	✓
P190	–	–	–	2.0	2.0	–	–	✓	✓
P191	–	–	–	–	–	2.0	2.0	✓	✓
P192	–	–	–	2.5	–	–	–	–	–
P193	–	–	–	–	2.5	–	–	–	–
P194	–	–	–	–	–	2.5	–	–	–
P195	–	–	–	–	–	–	2.5	–	–
P196	–	–	–	2.5	2.5	–	–	–	–
P197	–	–	–	–	–	2.5	2.5	–	–
P198	–	–	–	2.5	–	–	–	✓	–
P199	–	–	–	–	2.5	–	–	✓	–
P200	–	–	–	–	–	2.5	–	✓	–
P201	–	–	–	–	–	–	2.5	✓	–
P202	–	–	–	2.5	2.5	–	–	✓	–
P203	–	–	–	–	–	2.5	2.5	✓	–
P204	–	–	–	2.5	–	–	–	✓	✓
P205	–	–	–	–	2.5	–	–	✓	✓
P206	–	–	–	–	–	2.5	–	✓	✓
P207	–	–	–	–	–	–	2.5	✓	✓
P208	–	–	–	2.5	2.5	–	–	✓	✓
P209	–	–	–	–	–	2.5	2.5	✓	✓
P210	–	–	–	0.7	1.0	–	–	–	–
P211	–	–	–	0.7	1.2	–	–	–	–
P212	–	–	–	0.7	1.5	–	–	–	–
P213	–	–	–	0.7	2.0	–	–	–	–
P214	–	–	–	0.7	2.5	–	–	–	–
P215	–	–	–	0.7	1.0	–	–	✓	–
P216	–	–	–	0.7	1.2	–	–	✓	–
P217	–	–	–	0.7	1.5	–	–	✓	–
P218	–	–	–	0.7	2.0	–	–	✓	–
P219	–	–	–	0.7	2.5	–	–	✓	–
P220	–	–	–	0.7	1.0	–	–	✓	✓
P221	–	–	–	0.7	1.2	–	–	✓	✓
P222	–	–	–	0.7	1.5	–	–	✓	✓
P223	–	–	–	0.7	2.0	–	–	✓	✓
P224	–	–	–	0.7	2.5	–	–	✓	✓
P225	–	–	–	–	–	0.7	1.0	–	–
P226	–	–	–	–	–	0.7	1.2	–	–
P227	–	–	–	–	–	0.7	1.5	–	–
P228	–	–	–	–	–	0.7	2.0	–	–
P229	–	–	–	–	–	0.7	2.5	–	–
P230	–	–	–	–	–	0.7	1.0	✓	–
P231	–	–	–	–	–	0.7	1.2	✓	–
P232	–	–	–	–	–	0.7	1.5	✓	–
P233	–	–	–	–	–	0.7	2.0	✓	–
P234	–	–	–	–	–	0.7	2.5	✓	–
P235	–	–	–	–	–	0.7	1.0	✓	✓
P236	–	–	–	–	–	0.7	1.2	✓	✓
P237	–	–	–	–	–	0.7	1.5	✓	✓
P238	–	–	–	–	–	0.7	2.0	✓	✓
P239	–	–	–	–	–	0.7	2.5	✓	✓
P240	–	–	–	1.0	1.2	–	–	–	–
P241	–	–	–	1.0	1.5	–	–	–	–
P242	–	–	–	1.0	2.0	–	–	–	–
P243	–	–	–	1.0	2.5	–	–	–	–
P244	–	–	–	1.0	1.2	–	–	✓	–
P245	–	–	–	1.0	1.5	–	–	✓	–
P246	–	–	–	1.0	2.0	–	–	✓	–
P247	–	–	–	1.0	2.5	–	–	✓	–
P248	–	–	–	1.0	1.2	–	–	✓	✓
P249	–	–	–	1.0	1.5	–	–	✓	✓
P250	–	–	–	1.0	2.0	–	–	✓	✓
P251	–	–	–	1.0	2.5	–	–	✓	✓
P252	–	–	–	–	–	1.0	1.2	–	–
P253	–	–	–	–	–	1.0	1.5	–	–
P254	–	–	–	–	–	1.0	2.0	–	–
P255	–	–	–	–	–	1.0	2.5	–	–
P256	–	–	–	–	–	1.0	1.2	✓	–
P257	–	–	–	–	–	1.0	1.5	✓	–
P258	–	–	–	–	–	1.0	2.0	✓	–
P259	–	–	–	–	–	1.0	2.5	✓	–
P260	–	–	–	–	–	1.0	1.2	✓	✓
P261	–	–	–	–	–	1.0	1.5	✓	✓
P262	–	–	–	–	–	1.0	2.0	✓	✓
P263	–	–	–	–	–	1.0	2.5	✓	✓
P264	–	–	–	1.2	1.0	–	–	–	–
P265	–	–	–	1.2	1.5	–	–	–	–
P266	–	–	–	1.2	2.0	–	–	–	–
P267	–	–	–	1.2	2.5	–	–	–	–
P268	–	–	–	1.2	1.0	–	–	✓	–
P269	–	–	–	1.2	1.5	–	–	✓	–
P270	–	–	–	1.2	2.0	–	–	✓	–
P271	–	–	–	1.2	2.5	–	–	✓	–
P272	–	–	–	1.2	1.0	–	–	✓	✓
P273	–	–	–	1.2	1.5	–	–	✓	✓
P274	–	–	–	1.2	2.0	–	–	✓	✓
P275	–	–	–	1.2	2.5	–	–	✓	✓
P276	–	–	–	–	–	1.2	1.0	–	–

Selection table: Orifice insert, throttle insert and check valve insert

Ordering code	Orifice insert in channel P	Orifice insert in channel A	Orifice insert in channel B	Throttle insert (discharge) in channel A	Throttle insert (discharge) in channel B	Throttle insert (supply) in channel A	Throttle insert (supply) in channel B	Check valve in channel P	Check valve in channel T
P277	–	–	–	–	–	1.2	1.5	–	–
P278	–	–	–	–	–	1.2	2.0	–	–
P279	–	–	–	–	–	1.2	2.5	–	–
P280	–	–	–	–	–	1.2	1.0	✓	–
P281	–	–	–	–	–	1.2	1.5	✓	–
P282	–	–	–	–	–	1.2	2.0	✓	–
P283	–	–	–	–	–	1.2	2.5	✓	–
P284	–	–	–	–	–	1.2	1.0	✓	✓
P285	–	–	–	–	–	1.2	1.5	✓	✓
P286	–	–	–	–	–	1.2	2.0	✓	✓
P287	–	–	–	–	–	1.2	2.5	✓	✓
P288	–	–	–	1.5	0.7	–	–	–	–
P289	–	–	–	1.5	1.0	–	–	–	–
P290	–	–	–	1.5	2.0	–	–	–	–
P291	–	–	–	1.5	2.5	–	–	–	–
P292	–	–	–	1.5	0.7	–	–	✓	–
P293	–	–	–	1.5	1.2	–	–	✓	–
P294	–	–	–	1.5	2.0	–	–	✓	–
P295	–	–	–	1.5	2.5	–	–	✓	–
P296	–	–	–	1.5	0.7	–	–	✓	✓
P297	–	–	–	1.5	1.2	–	–	✓	✓
P298	–	–	–	1.5	2.0	–	–	✓	✓
P299	–	–	–	1.5	2.5	–	–	✓	✓
P300	–	–	–	–	–	1.5	0.7	–	–
P301	–	–	–	–	–	1.5	1.0	–	–
P302	–	–	–	–	–	1.5	2.0	–	–
P303	–	–	–	–	–	1.5	2.5	–	–
P304	–	–	–	–	–	1.5	0.7	✓	–
P305	–	–	–	–	–	1.5	1.2	✓	–
P306	–	–	–	–	–	1.5	2.0	✓	–
P307	–	–	–	–	–	1.5	2.5	✓	–
P308	–	–	–	–	–	1.5	0.7	✓	✓
P309	–	–	–	–	–	1.5	1.2	✓	✓
P310	–	–	–	–	–	1.5	2.0	✓	✓
P311	–	–	–	–	–	1.5	2.5	✓	✓
P312	–	–	–	2.0	0.7	–	–	–	–
P313	–	–	–	2.0	1.0	–	–	–	–
P314	–	–	–	2.0	1.5	–	–	–	–
P315	–	–	–	2.0	2.5	–	–	–	–
P316	–	–	–	2.0	0.7	–	–	✓	–
P317	–	–	–	2.0	1.2	–	–	✓	–
P318	–	–	–	2.0	1.5	–	–	✓	–
P319	–	–	–	2.0	2.5	–	–	✓	–
P320	–	–	–	2.0	0.7	–	–	✓	✓
P321	–	–	–	2.0	1.2	–	–	✓	✓
P322	–	–	–	2.0	1.5	–	–	✓	✓
P323	–	–	–	2.0	2.5	–	–	✓	✓
P324	–	–	–	–	–	2.0	0.7	–	–
P325	–	–	–	–	–	2.0	1.0	–	–
P326	–	–	–	–	–	2.0	1.5	–	–
P327	–	–	–	–	–	2.0	2.5	–	–
P328	–	–	–	–	–	2.0	0.7	✓	–
P329	–	–	–	–	–	2.0	1.2	✓	–
P330	–	–	–	–	–	2.0	1.5	✓	–
P331	–	–	–	–	–	2.0	2.5	✓	–
P332	–	–	–	–	–	2.0	0.7	✓	✓
P333	–	–	–	–	–	2.0	1.2	✓	✓
P334	–	–	–	–	–	2.0	1.5	✓	✓
P335	–	–	–	–	–	2.0	2.5	✓	✓
P336	–	–	–	2.5	0.7	–	–	–	–
P337	–	–	–	2.5	1.0	–	–	–	–
P338	–	–	–	2.5	1.5	–	–	–	–
P339	–	–	–	2.5	2.0	–	–	–	–
P340	–	–	–	2.5	0.7	–	–	✓	–
P341	–	–	–	2.5	1.2	–	–	✓	–
P342	–	–	–	2.5	1.5	–	–	✓	–
P343	–	–	–	2.5	2.0	–	–	✓	–
P344	–	–	–	2.5	0.7	–	–	✓	✓
P345	–	–	–	2.5	1.2	–	–	✓	✓
P346	–	–	–	2.5	1.5	–	–	✓	✓
P347	–	–	–	2.5	2.0	–	–	✓	✓
P348	–	–	–	–	–	2.5	0.7	–	–
P349	–	–	–	–	–	2.5	1.0	–	–
P350	–	–	–	–	–	2.5	1.5	–	–
P351	–	–	–	–	–	2.5	2.0	–	–
P352	–	–	–	–	–	2.5	0.7	✓	–
P353	–	–	–	–	–	2.5	1.2	✓	–
P354	–	–	–	–	–	2.5	1.5	✓	–
P355	–	–	–	–	–	2.5	2.0	✓	–
P356	–	–	–	–	–	2.5	0.7	✓	✓
P357	–	–	–	–	–	2.5	1.2	✓	✓
P358	–	–	–	–	–	2.5	1.5	✓	✓
P359	–	–	–	–	–	2.5	2.0	✓	✓

Notes

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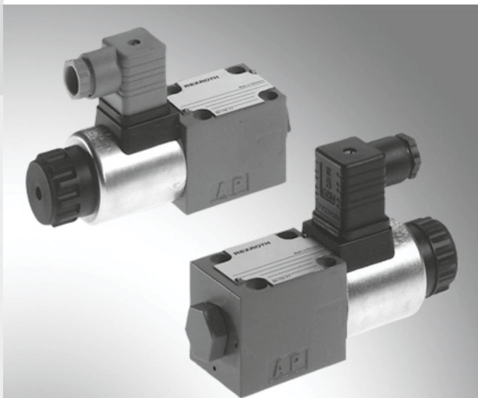
2/2, 3/2 and 4/2 directional seat valve with solenoid actuation

RE 22049/07.09
Replaces: 07.06

Type M-.SED

Size 6
Component series 1X
Maximum operating pressure 350 bar *[5100 psi]*
Maximum flow 25 l/min *[6.6 gpm]*



H4243

Table of contents

Features

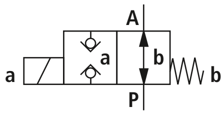
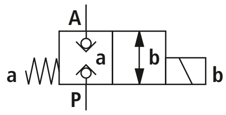
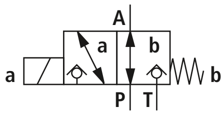
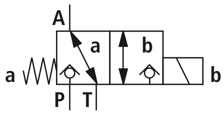
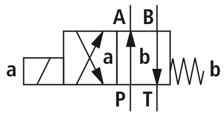
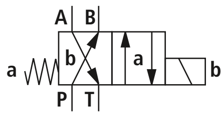
– Direct operated directional seat valve with solenoid actuation
– Porting pattern according to DIN 24340 form A (**without** locating hole)
– Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole)
– Safe switching also with longer standstill periods under pressure
– Wet-pin DC voltage solenoids with detachable coil (AC voltage possible by means of a rectifier)
– Solenoid coil can be rotated by 90°
– The coil can be changed without having to open the pressure-tight chamber
– Electrical connection as individual connection (for more electrical connections, see RE 08010)
– With concealed manual override, optional
– Inductive position switch (contactless), see RE 24830

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

M –		SED	6		– 1X / 350	C		*

2 main ports	= 2
3 main ports	= 3
4 main ports	= 4
Seat valve	
Size 6	= 6

Symbols	Main ports 2	3	4	
	●	–	–	= PK
	●	–	–	= NK
	–	●	–	= UK
	–	●	–	= CK
	–	–	●	= D
	–	–	●	= Y

● = Available

Component series 10 to 19 (10 to 19: unchanged installation and connection dimensions)	= 1X
Operating pressure 350 bar *[5100 psi]*	= 350
Solenoid, wet-pin with detachable coil	= C
DC voltage 24 V	= G24
DC voltage 205 V	= G205 [1)]
DC voltage 96 V	= G96
For further ordering codes for other voltages, see page 6	

AC voltage mains (permissible voltage tolerance ± 10%)	**Nominal voltage of the DC voltage solenoid in case of operation with AC voltage**	**Ordering code**
110 V - 50/60 Hz 120 V - 60 Hz	96 V	**G96**
	110 V	**G110**
230 V - 50/60 Hz	205 V	**G205**

	K4	/				*

Further details in the plain text

No code = **without** locating hole
/62 = **with** locating hole and locating pin ISO 8752-3x8-St

No code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

No code = without check valve insert, without throttle insert
P = with check valve insert
B12 = Throttle Ø 1.2 mm *[0.047 inch]*
B15 = Throttle Ø 1.5 mm *[0.059 inch]*
B18 = Throttle Ø 1.8 mm *[0.071 inch]*
B20 = Throttle Ø 2.0 mm *[0.079 inch]*
B22 = Throttle Ø 2.2 mm *[0.087 inch]*
Other orifices upon request

Spool position monitoring
No code = without position switch
QMAG24 = Monitored spool position "a"
QMBG24 = Monitored spool position "b"
For further details see RE 24830

Electrical connection
K4 [2] **=** without mating connector, individual connection with connector according to DIN EN 175301-803

N9 = **with** concealed manual override
No code = **without** manual override

[1] For connection to the AC voltage mains, a DC voltage solenoid **must** be used, which is controlled via a rectifier (see table page 2).
A mating connector with integrated rectifier can be used (separate order, see page 13).

[2] Mating connectors, separate order, see page 13.

Standard types and units are contained in the EPS (standard price list).

Function, section, symbols: 2/2 and 3/2 directional seat valve

General

The directional valve type M-.SED is a direct operated directional seat valve with solenoid actuation. It controls start, stop and direction of the flow and basically comprises a housing (1), solenoid (2), valve seats (7) and (11) and closing element (4).

The manual override (6) allows for the operation of the valve without solenoid energization.

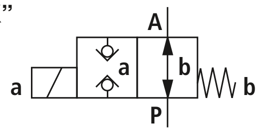
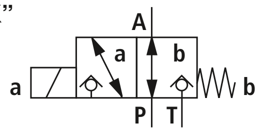
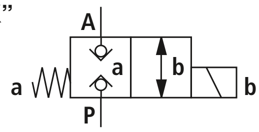
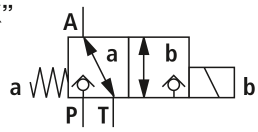
Basic principle (3/2 directional seat valve)

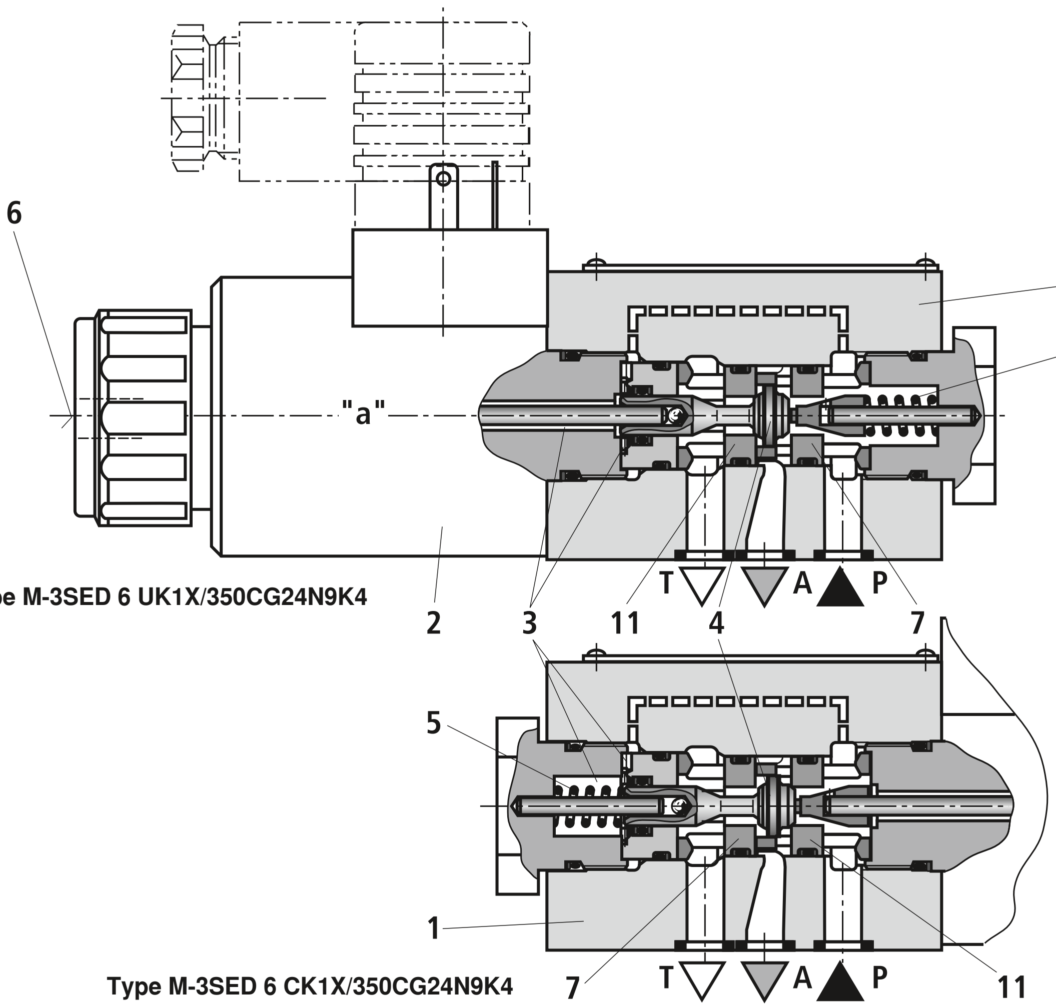
The initial position of the valve (normally open "UK" or normally closed "CK") is determined by the arrangement of the spring (5). The chamber (3) behind the closing element (4) is connected to port P and sealed against port T. Thus, the valve is pressure-compensated in relation to the actuating forces (solenoid and spring).

Due to the special closing element (4), ports P, A, and T can be loaded with the maximum operating pressure (350 bar) and the flow can be directed into both directions (see symbols)!

In the initial position, the closing element (4) is pressed onto the seat (11) by the spring (5), in operated position onto the seat (7) by the solenoid (2). The flow is blocked.

With the 2/2 directional seat valve, the tank port is blocked internally.

2/2 directional seat valve	3/2 directional seat valve
"PK" 	**"UK"** 
"NK" 	**"CK"** 



Type M-3SED 6 UK1X/350CG24N9K4

Type M-3SED 6 CK1X/350CG24N9K4

Function, section, symbols, schematic illustration: 4/2 directional seat valve

With a sandwich plate, the **Plus-1 plate** under the 3/2 directional seat valve, the function of a 4/2 directional seat valve is achieved.

Function of the Plus-1 plate

– Initial position:
The main valve is not operated. The spring (5) holds the closing element (4) on the seat (11). Port P is blocked and A connected to T. One pilot line is connected from A to the large area of the pilot spool (8), which is thus unloaded to the tank. The pressure applied via P now pushes the ball (9) onto the seat (10). Thus, P is connected to B, and A to T.

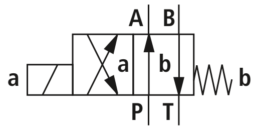
– Transition position:
When the main valve is operated, the closing element (4) is shifted against the spring (5) and pressed onto the seat (7). During this, port T is closed, P, A, and B are briefly connected to each other.

– Spool position:
P is connected to A. Because the pump pressure acts via A on the large area of the pilot spool (8), the ball (9) is pressed onto the seat (12). Thus, B is connected to T, and P to A. The ball (9) in the Plus-1 plate has a "positive spool overlap".

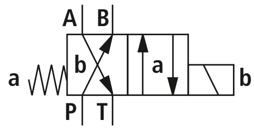
Attention!
To prevent pressure intensification in conjunction with single-rod cylinders, the annulus area of the cylinder must be connected to A.

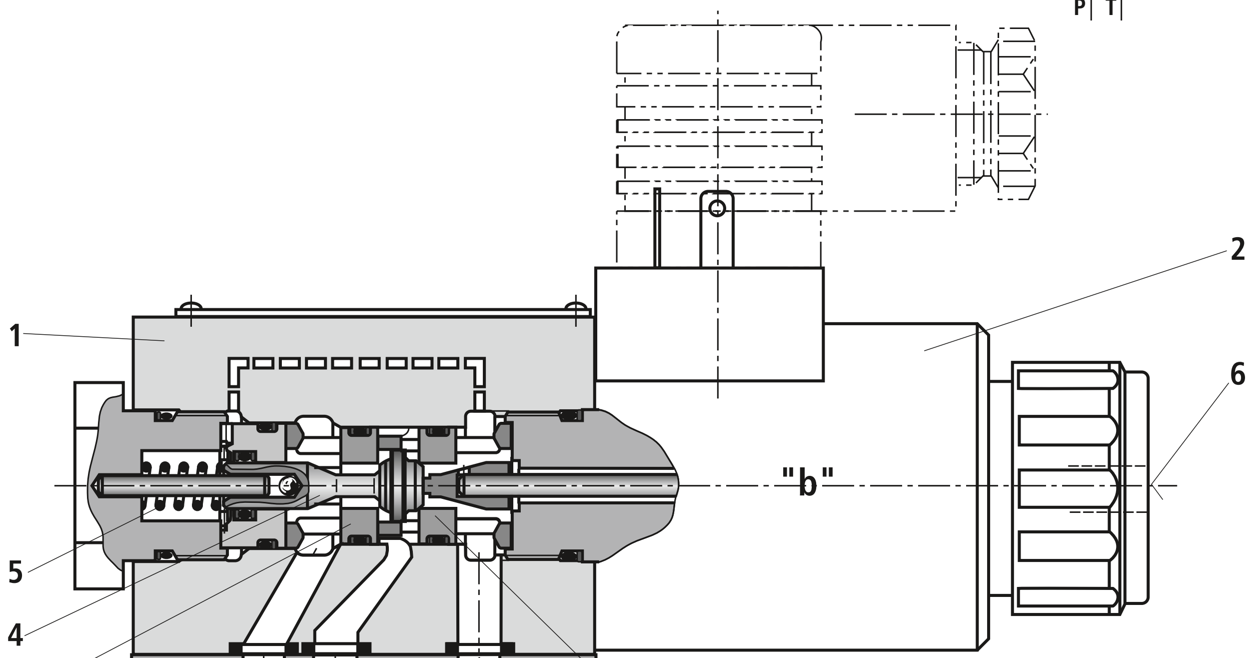
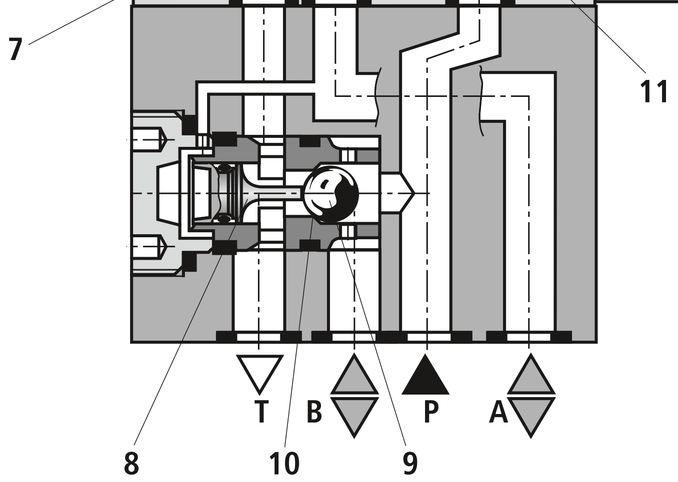
The use of the Plus-1 plate and the seat arrangement offer the following options:

Symbol "D":



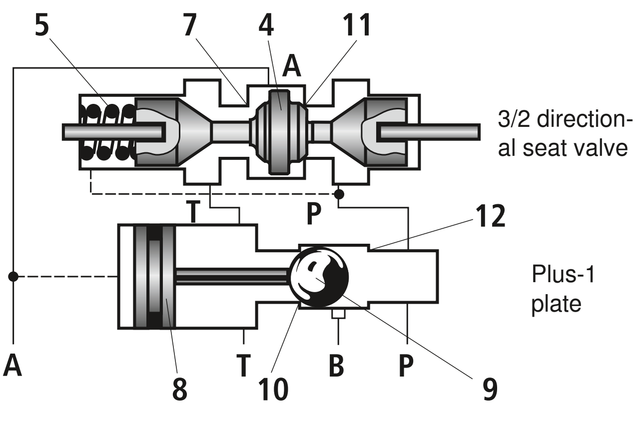
Symbol "Y":



Type M-4SED 6 Y1X/350CG24N9K4

Schematic illustration:
Initial position



Technical data (For applications outside these parameters, please consult us!)

general

Weight	– 2/2 directional seat valve	kg *[lbs]*	1.5 *[3.3]*
	– 3/2 directional seat valve	kg *[lbs]*	1.5 *[3.3]*
	– 4/2 directional seat valve	kg *[lbs]*	2.3 *[5.1]*
Installation position			Any
Ambient temperature range		°C *[°F]*	–30 to +50 *[–22 to +122]* (NBR seals) –20 to +50 *[–4 to +122]* (FKM seals)

hydraulic

Maximum operating pressure	bar *[psi]*	See performance limit page 8
Maximum flow	l/min *[gpm]*	25 *[6.6]*
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524 [1]); fast biodegradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]); HEPG (polyglycols) [2]); HEES (synthetic esters) [2]); other hydraulic fluids upon request
Hydraulic fluid temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 500 *[35 to 2320]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [3])

electrical

Type of voltage			Direct voltage	Alternate voltage
Available voltages [4])		V	12, **24**, 42, 96, 110, 205, 220	Only possible via rectifier (see page 13)
Voltage tolerance (nominal voltage)		%	±10	
Power consumption		W	30	
Duty cycle		%	100	
Switching time according to ISO 6403	– ON	ms	40 to 70	
	– OFF	ms	10 to 20 (without rectifier) 30 to 45 (with rectifier)	
Maximum switching frequency	– Operating pressure ≤ 350 bar	1/h	15000	
	– Operating pressure > 350 bar	1/h	3600	
Type of protection according to DIN EN 60529			IP 65 with mating connector mounted and locked	
Maximum surface temperature of the spool [5])		°C *[°F]*	120 *[248]*	

1) Suitable for NBR and FKM seals

2) Only suitable for FKM seals

3) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and at the same time increases the service life of the components.

For selecting the filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

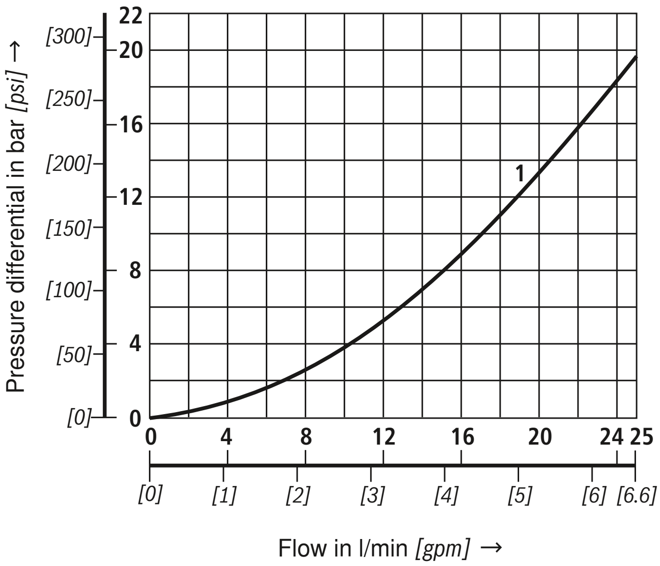
4) Special voltages upon request

5) Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

When establishing the electrical connection, the protective earth conductor (PE ⏚) has to be connected properly.

Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

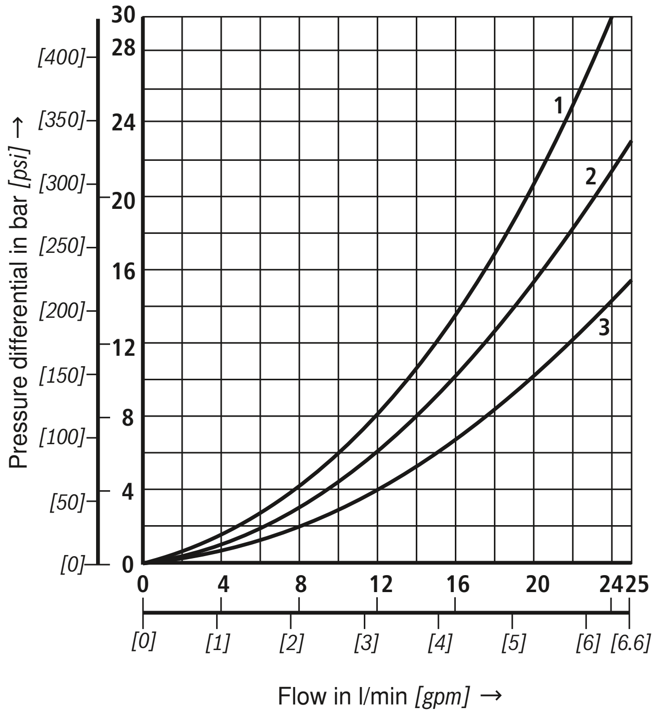
Δp-q_V characteristic curves
2/2 and 3/2 directional seat valve



1 M-2SED 6 **PK** / **NK** …, P to A

1 M-3SED 6 **UK** / **CK** …, P to A and A to T

Δp-q_V characteristic curves
4/2 directional seat valve

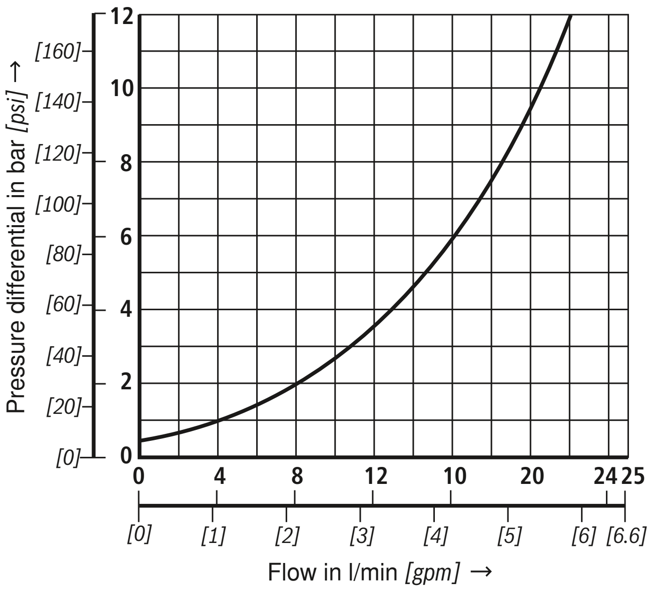


1 M-4SED 6 **D** / **Y** …, A to T

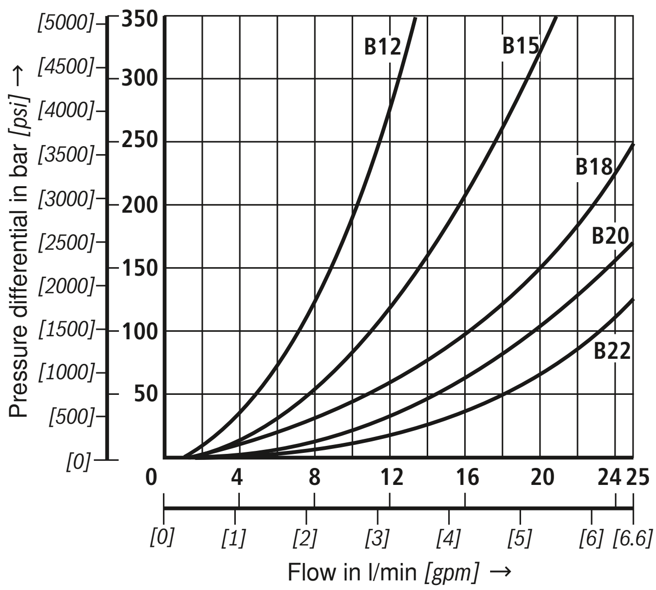
2 M-4SED 6 **D** / **Y** …, P to A

3 M-4SED 6 **D** / **Y** …, B to T and P to B

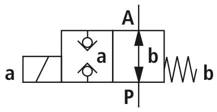
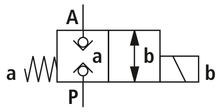
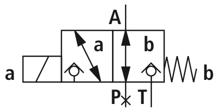
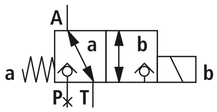
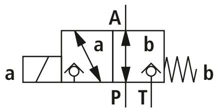
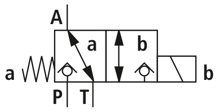
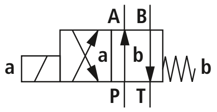
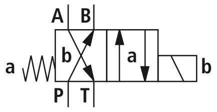
Δp-q_V characteristic curves
Check valve insert



Δp-q_V characteristic curves
Throttle insert



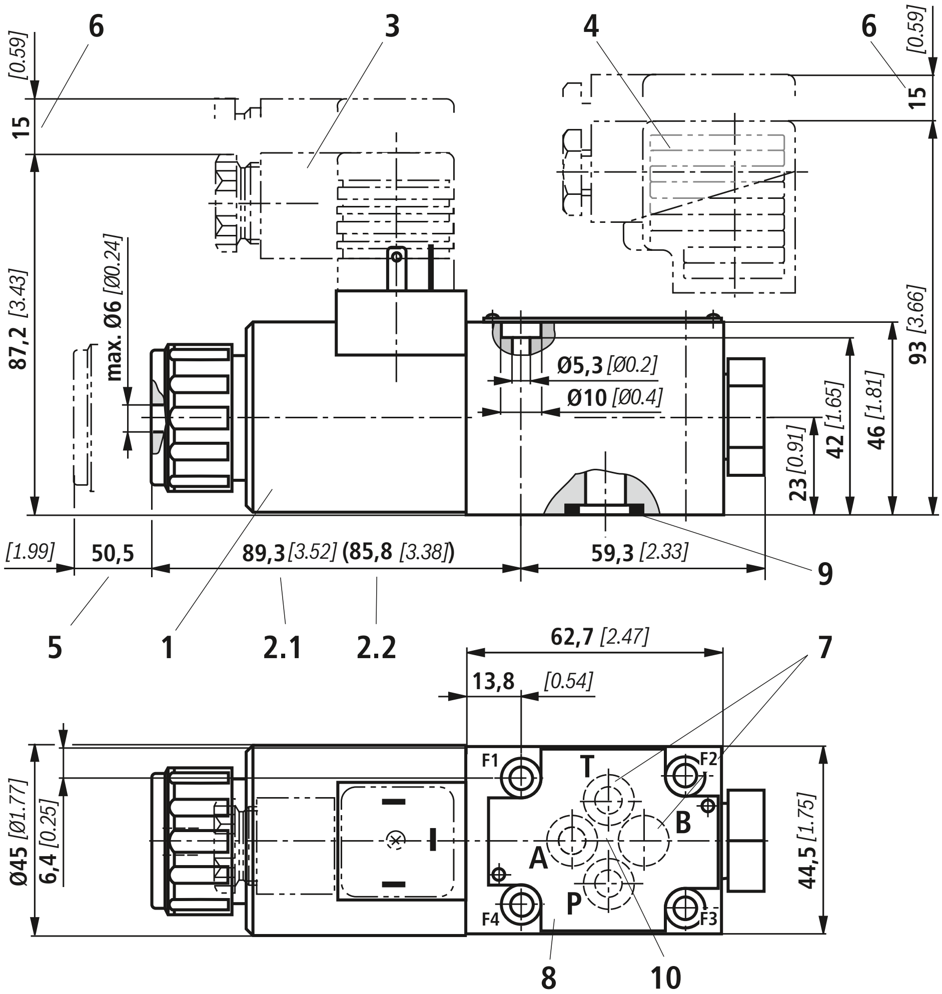
Performance limit (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

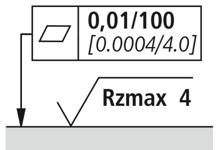
	Symbol		Comment	Operating pressure in bar *[psi]* P	A	B	T	Flow in l/min *[gpm]*
2-way circuit (2/2 directional seat valve)	**PK**			350 *[5100]*	350 *[5100]*			25 *[6.6]*
	NK			350 *[5100]*	350 *[5100]*			25 *[6.6]*
2-way circuit (3/2 directional seat valve)	**UK**		With 2/2 directional circuit, port P or T has to be closed on the customer side!	350 *[5100]*	350 *[5100]*		350 *[5100]*	25 *[6.6]*
	CK			350 *[5100]*	350 *[5100]*		350 *[5100]*	25 *[6.6]*
3-way circuit	**UK**			350 *[5100]*	350 *[5100]*		350 *[5100]*	25 *[6.6]*
	CK			350 *[5100]*	350 *[5100]*		350 *[5100]*	25 *[6.6]*
4-way circuit (flow only possible in the direction of the arrow!)	**D**		3/2 directional valve (symbol "UK") in connection with Plus-1 plate: $p_P > p_A \geq p_B > p_T$	350 *[5100]*	350 *[5100]*	350 *[5100]*	p_P – 40 *[580]*	25 *[6.6]*
	Y		3/2 directional valve (symbol "CK") in connection with Plus-1 plate: $p_P > p_A \geq p_B > p_T$	350 *[5100]*	350 *[5100]*	350 *[5100]*	p_P – 40 *[580]*	25 *[6.6]*

Attention!

The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank pre-loading.

Unit dimensions: 2/2 directional seat valve ("PK") and 3/2 way seat valve ("UK") (dimensions in mm *[inch]*)





Required surface quality of the valve mounting face

1 Solenoid "a"

2.1 Dimension of valve with concealed manual override "N9"

2.2 Dimension of valve without manual override

3 Mating connector **without** circuitry (separate order, see page 13)

4 Mating connector **with** circuitry (separate order, see page 13)

5 Space required for removing the coil

6 Space required for removing the mating connector

7 **Attention!**
Port B is provided as blind counterbore on 2/2 and 3/2 directional seat valves. With 2/2 directional seat valves, port T is blocked internally.

8 Nameplate

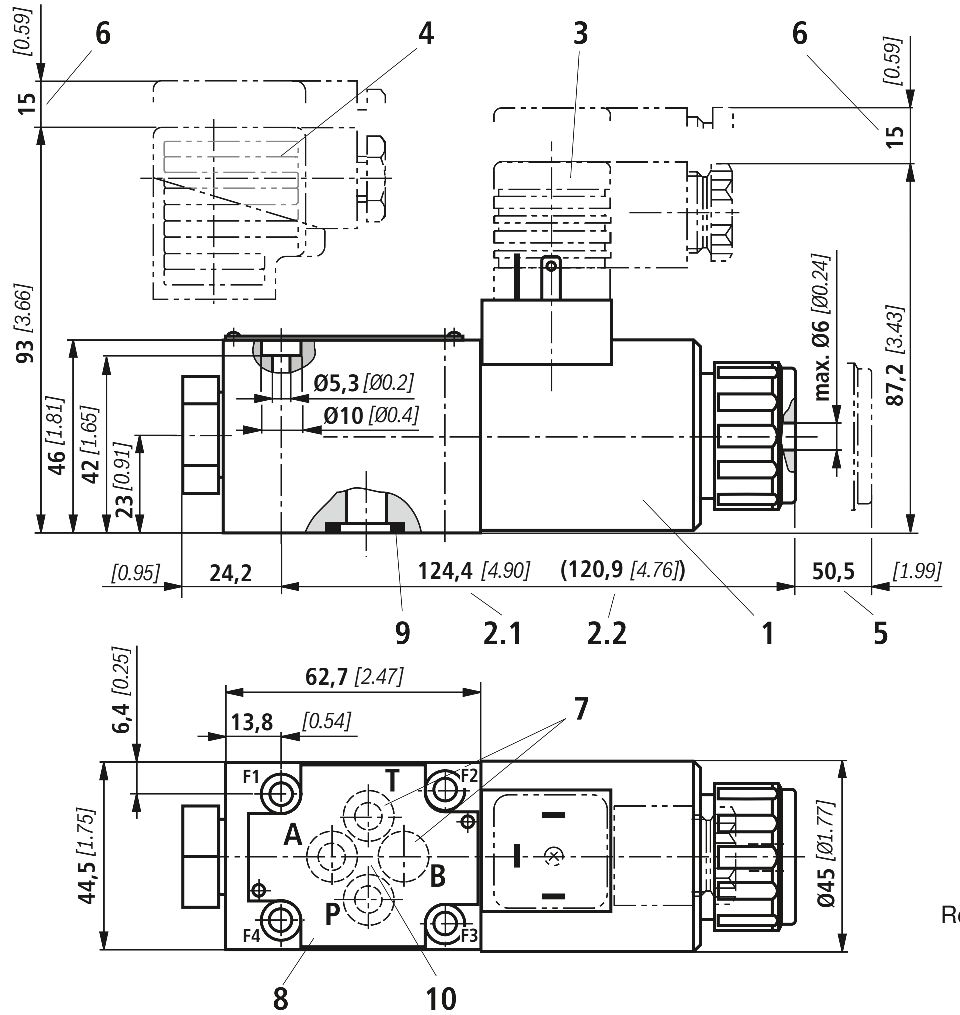
9 Identical seal rings for ports A, B and T; seal ring for port P

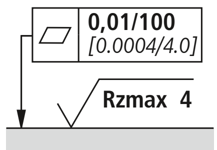
10 Porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locating pin ISO 8752-3x8-St, material no. **R900005694**, included in scope of delivery)

Subplates see RE 45052.

Valve mounting screws see page 13.

Unit dimensions: 2/2 directional seat valve (“NK”) and 3/2 directional seat valve (“CK”) (dimensions in mm *[inch]*)





Required surface quality of the valve mounting face

1 Solenoid “b”

2.1 Dimension for valve with concealed manual override “N9”

2.2 Dimension of valve without manual override

3 Mating connector **without** circuitry (separate order, see page 13)

4 Mating connector **with** circuitry (separate order, see page 13)

5 Space required for removing the coil

6 Space required for removing the mating connector

7 **Attention!**
Port B is provided as blind counterbore on 2/2 and 3/2 directional seat valves. With 2/2 directional seat valves, port T is blocked internally.

8 Nameplate

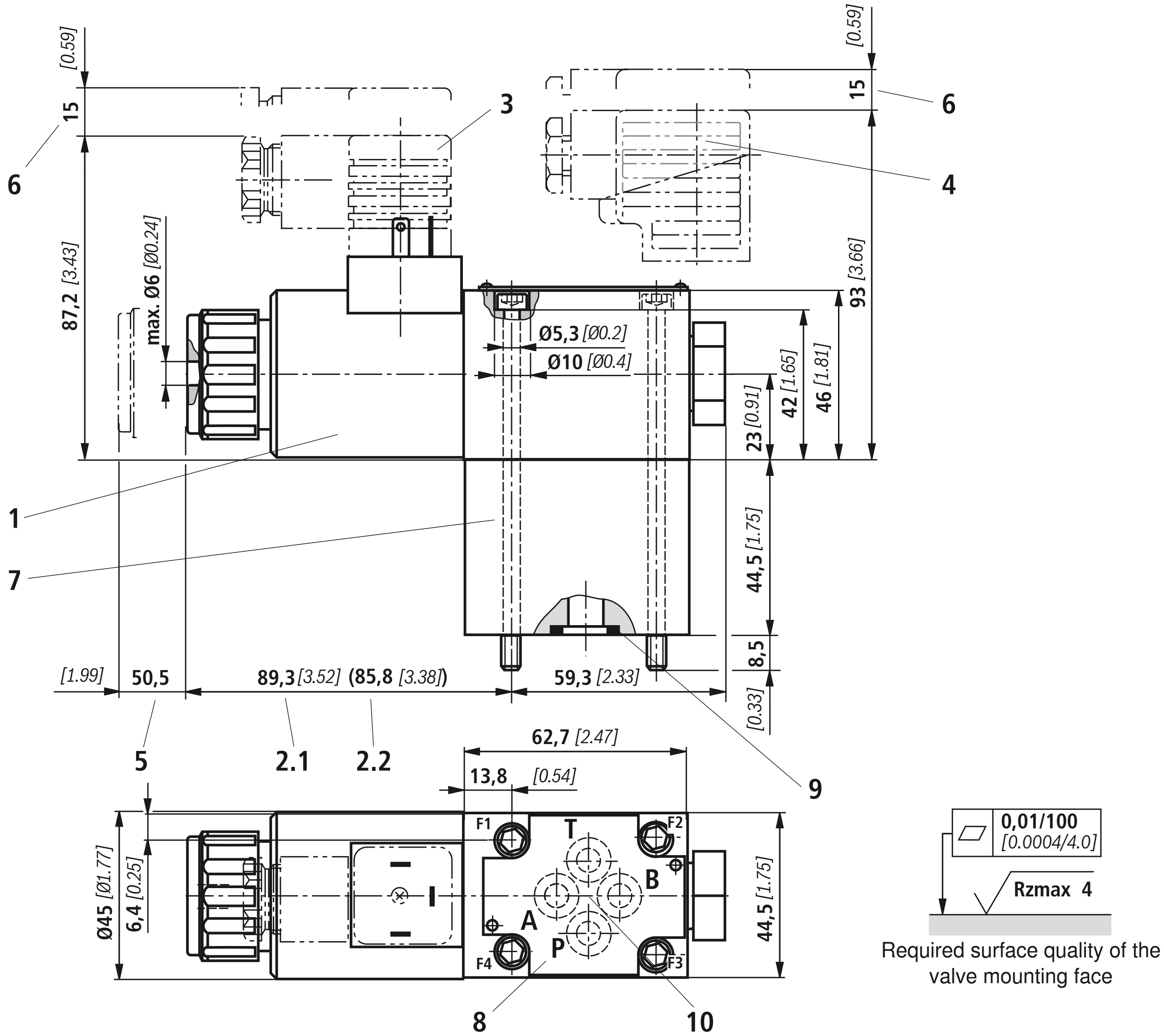
9 Identical seal rings for ports A, B and T;
seal ring for port P

10 Porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locating pin ISO 8752-3x8-St,
material no. **R900005694**, included in scope of delivery)

Subplates see RE 45052.

Valve mounting screws see page 13.

Unit dimensions: 4/2 directional seat valve ("D") (dimensions in mm *[inch]*)



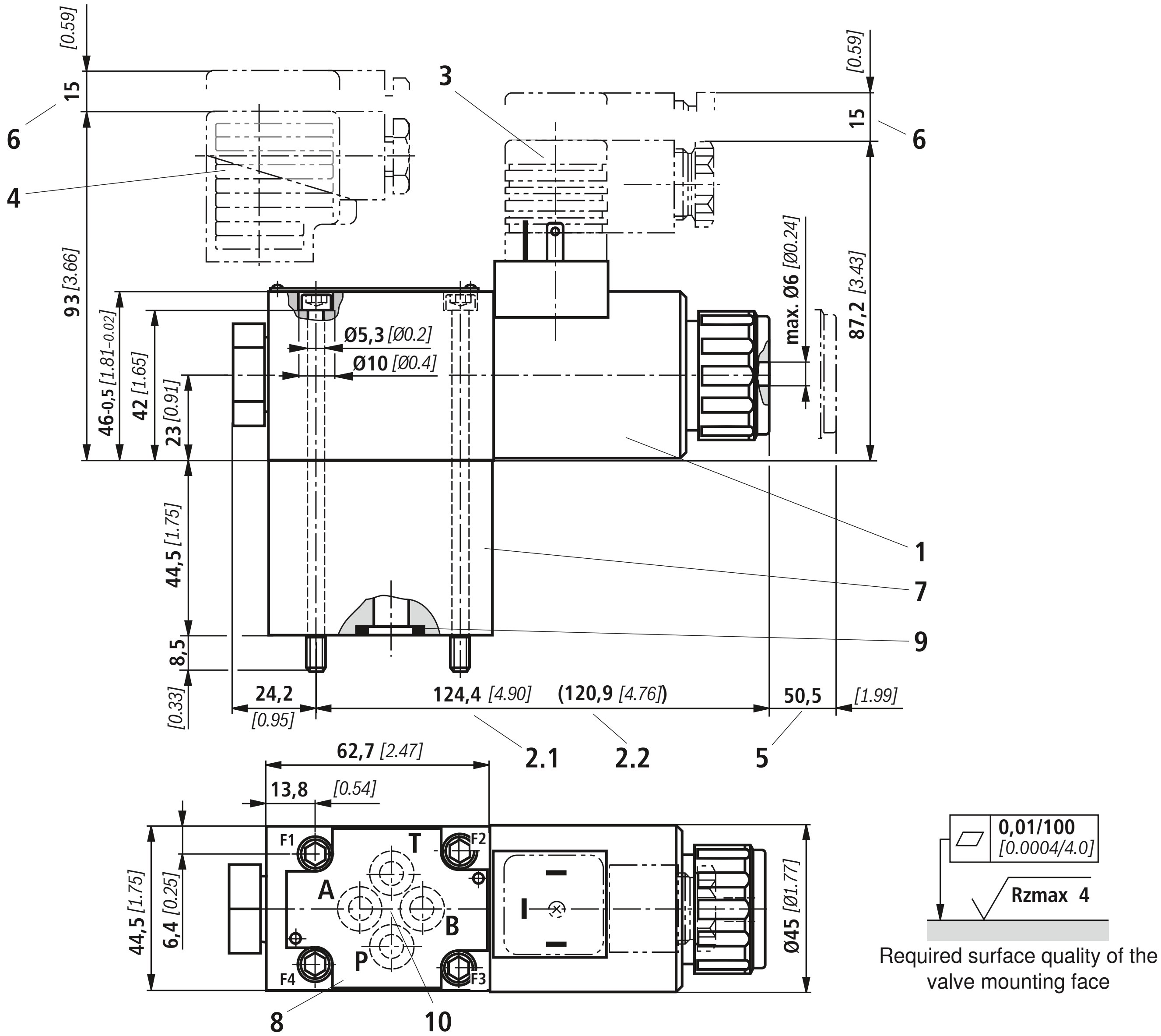
Required surface quality of the valve mounting face

- **1** Solenoid "a"
- **2.1** Dimension for valve with concealed manual override "N9"
- **2.2** Dimension for valve without manual override
- **3** Mating connector **without** circuitry (separate order, see page 13)
- **4** Mating connector **with** circuitry (separate order, see page 13)
- **5** Space required for removing the coil
- **6** Space required for removing the mating connector
- **7** Plus-1 plate
- **8** Nameplate
- **9** Identical seal rings for ports A, B and T; seal ring for port P
- **10** Porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locating pin ISO 8752-3x8-St, material no. **R900005694**, included in scope of delivery)

Subplates see RE 45052.

Valve mounting screws see page 13.

Unit dimensions: 4/2 directional seat valve (“Y”) (dimensions in mm *[inch]*)



Required surface quality of the valve mounting face

1 Solenoid “b”

2.1 Dimension for valve with concealed manual override “N9”

2.2 Dimension for valve without manual override

3 Mating connector **without** circuitry (separate order, see page 13)

4 Mating connector **with** circuitry (separate order, see page 13)

5 Space required for removing the coil

6 Space required for removing the mating connector

7 Plus-1 plate

8 Nameplate

9 Identical seal rings for ports A, B and T; Seal ring for port P

10 Porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locating pin ISO 8752-3x8-St, Material no. **R900005694**, included in scope of delivery)

Subplates see RE 45052.

Valve mounting screws see page 13.

Valve mounting screws

2/2 and 3/2 directional seat valve

4 hexagon socket head cap screws metric
ISO 4762 - M5 x 50 - 10.9-flZn-240h-L (separate order)
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque M_A = 7 Nm *[5.2 ft-lbs]* ±10 %,
Material no. **R913000064**
or
4 hexagon socket head cap screws
ISO 4762 - M5 x 50 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 8.1 Nm *[6 ft-lbs]* ±10 %

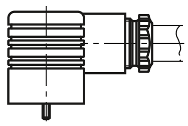
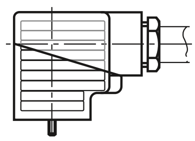
4 hexagon socket head cap screws UNC
10-24 UNC x 2” (self procurement)
(friction coefficient μ_{total} = 0.19 to 0.24 according to ASTM-574);
Tightening torque M_A = 11 Nm *[8.1 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17 according to ISO 4762);
Tightening torque M_A = 8 Nm *[5.9 ft-lbs]* ±10 %,
Material no. **R978833365**

4/2 directional seat valve

4 hexagon socket head cap screws metric
ISO 4762 - M5 x 95 - 10.9-flZn-240h-L (included in scope of delivery)
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque M_A = 7 Nm *[5.2 ft-lbs]* ±10 %,
Material no. **R913000223**
or
4 hexagon socket head cap screws
ISO 4762 - M5 x 95 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 8.1 Nm *[6 ft-lbs]* ±10 %

4 hexagon socket head cap screws UNC
10-24 UNC x 3 3/4” (self procurement)
(friction coefficient μ_{total} = 0.19 to 0.24 according to ASTM-574);
Tightening torque M_A = 11 Nm *[8.1 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17 according to ISO 4762);
Tightening torque M_A = 8 Nm *[5.9 ft-lbs]* ±10 %,
Material no. **R978881682**

Mating connectors according to DIN EN 175301-803

Details and more mating connectors see RE 08006						
			Material no.			
Connection	**Valve side**	**Color**	without circuitry	with indicator light 12 … 240 V	with rectifier 12 … 240 V	with indicator light and Zener diode suppression circuit 24 V
M16 x 1.5	a	Gray	**R901017010**	–	–	–
	b	Black	**R901017011**	–	–	–
	a/b	Black	–	**R901017022**	**R901017025**	**R901017026**
1/2” NPT (Pg16)	a	Red/brown	**R900004823**	–	–	–
	b	Black	**R900011039**	–	–	–
	a/b	Black	–	**R900057453**	**R900842566**	–

Throttle insert

The use of a throttle insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

Examples:

– Accumulator operation,

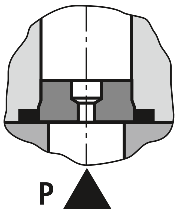
– Use as pilot control valve with internal pilot fluid tapping.

2/2 and 3/2 directional seat valve

The throttle insert is inserted in port P of the seat valve.

4/2 directional seat valve

The throttle insert is inserted in port P of the Plus-1 plate.



Check valve insert

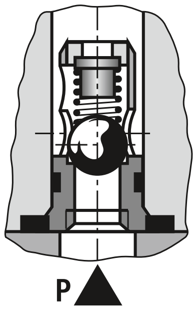
The check valve insert allows a free flow from P to A and closes A to P leak-free.

2/2 and 3/2 directional seat valve

The check valve insert is inserted in port P of the seat valve.

4/2 directional seat valve

The check valve insert is inserted in port P of the Plus-1 plate.



General notes

Seat valves can be used according to the spool symbols as well as the assigned operating pressures and flows (see performance limits page 8).

In order to ensure safe functioning, it is absolutely necessary to observe the following points:

– In order to switch the valve safely or maintain it in its spool position, the pressure situation must be as follows: $\boldsymbol{p}_P \geq \boldsymbol{p}_A \geq \boldsymbol{p}_T$ (for design reasons).

– Seat valves have a negative spool overlap, i.e. during the switching process, leakage oil accrues. This process takes, however, place within such a short time that it is irrelevant in nearly all applications.

– The specified maximum flow must not be exceeded (use a throttle insert for limiting the flow, if necessary)!

Plus-1 plate:

– When the Plus-1 plate (4/2-directional function) is used, the following lower operating values must be taken into account: $\boldsymbol{p}_{min}$ = 8 bar; $\boldsymbol{q}_V$ > 3 l/min.

– The ports P, A, B and T are clearly determined according to the tasks. They must not be optionally exchanged or closed.

– With 3- and 4-way spool positions, port T must always be connected.

– Pressure level and pressure distribution must be observed!

– The flow is only permitted in the direction of the arrow!

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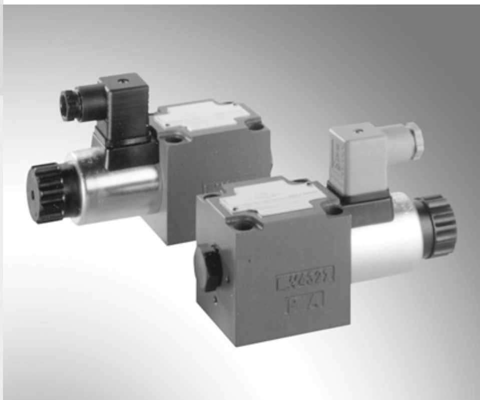
Rexroth
Bosch Group

3/2 and 4/2 directional poppet valve with solenoid actuation

RE 22045/05.08
Replaces: 02.03

Type M-.SED



H4666

Size 10
Component series 1X
Maximum operating pressure 350 bar *[5076 psi]*
Maximum flow 40 l/min *[10.6 US gpm]*

Table of contents

Features

- Direct operated directional poppet valve with solenoid actuation
- Porting pattern to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-D05
- Subplates to data sheet RE 45054 (separate order)
- Blocked port is leak-free closed
- Reliable operation also after longer periods of standstill under pressure
- Wet-pin DC solenoids with detachable coil (AC voltage possible with rectifier)
- Solenoid coil can be rotated around 90°
- For changing the coil, the pressure-tight chamber needs not to be opened
- Electrical connection as individual connection
- With concealed manual override, optional
- Inductive position switches and proximity sensors (contact-free and floating), see RE 24830
- For further electrical connections, see RE 08010

Information on available spare parts:
www.boschrexroth.com/spc

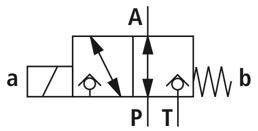
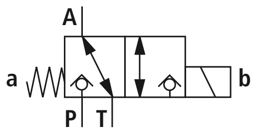
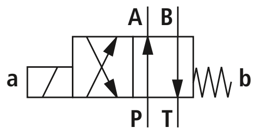
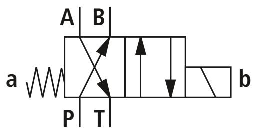
Ordering code

M	–	SED	10		1X	/	350	C	

3 main ports **= 3**
4 main ports **= 4**

Poppet valve

Size 10 **= 10**

	Main ports	3	4	
Symbols		●	–	**= UK**
		●	–	**= CK**
		–	●	**= D**
		–	●	**= Y**

● = available

Component series 10 to 19 **= 1X**
(10 to 19: unchanged installation and connection dimensions)

Operating pressure 350 bar *[5076 psi]* **= 350**

Solenoid, wet-pin (oil), with detachable coil **= C**

DC voltage 24 V **= G24**
DC voltage 205 V **= G205** [1)]
DC voltage 96 V **= G96**
For further ordering code for other voltages, see page 6

AC voltage mains (permissible voltage tolerance ± 10%)	**Nominal voltage of DC voltage solenoid when operated with AC voltage**	**Ordering code**
110 V - 50/60 Hz	96 V	**G96**
120 V - 60 Hz	110 V	**G110**
230 V - 50/60 Hz	205 V	**G205**

Standard types and devices are shown in the EPS (standard price list).

1) For connection to the AC voltage mains, a DC voltage solenoid **must** be used, which is controlled via a rectifier (see table above).

In the case of an individual connection, a large mating connector with integrated rectifier may be used (separate order).

2) For mating connectors, separate order, see page 3.

	K4	/			*

Further details in clear text

Seal material

No code = NBR seals

V = FKM seals

(other seals on request)

⚠ **Attention!**

Observe compatibility of seals with hydraulic fluid used!

No code = Without check valve insert, without throttle insert

P = With check valve insert

B12 = Throttle Ø1.2 mm *[0.0472 inch]*

B15 = Throttle Ø1.5 mm *[0.0591 inch]*

B18 = Throttle Ø1.8 mm *[0.0709 inch]*

B20 = Throttle Ø2.0 mm *[0.0787 inch]*

B22 = Throttle Ø2.2 mm *[0.0866 inch]*

Spool position monitoring

No code = Without position switch

QMAG24 = Monitored spool position "a"

QMBG24 = Monitored spool position "b"

For further details, see RE 24830

Electrical connection

K4 [2)] **=** Without mating connector

Individual connection with component plug to DIN EN 175301-803

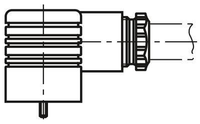
For further electrical connections, see RE 08010

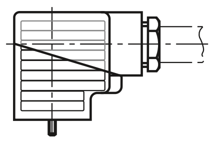
N9 = **With** concealed manual override

No code = **Without** manual override

Mating connectors to DIN EN 175301-803

For details and further mating connectors, see RE 08006





Valve side	Color	Material no. Without circuitry	With indicator lamp 12 … 240 V	With rectifier 12 … 240 V	With indicator lamp and Zener diode suppressor circuit 24 V
a	Grey	**R901017010**	–	–	–
b	Black	**R901017011**	–	–	–
a/b	Black	–	**R901017022**	**R901017025**	**R901017026**

Function, section, symbols: 3/2 directional poppet valve

General

Directional valves of type M-.SED are direct operated directional poppet valves with solenoid actuation. They control the start, stop and direction of flow and basically consist of housing (1), solenoid (2), valve seats (7) and (11) and closing element (4).

Manual override (6) allows the valve to be operated without energization of the solenoid.

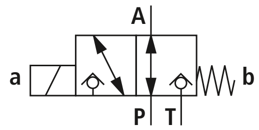
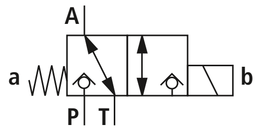
Basic principle

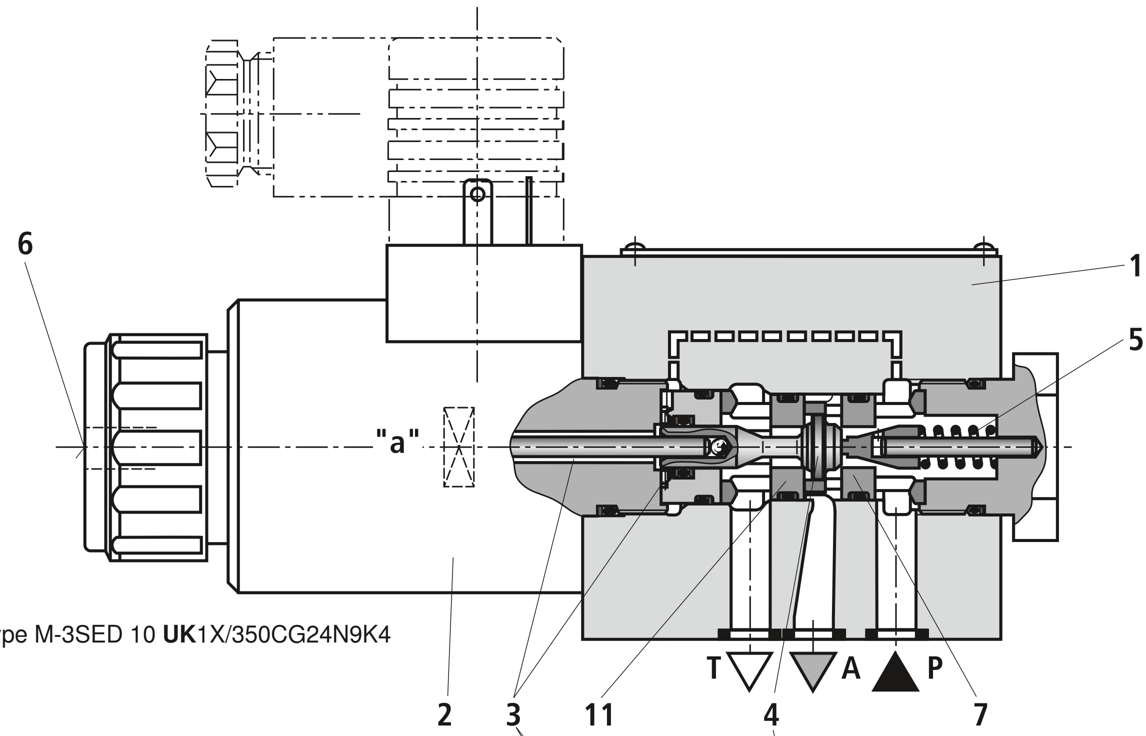
The starting position of the valve (normally open “UK“ or normally closed “CK“) is determined by the arrangement of spring (5). Chamber (3) behind closing element (4) is connected to port P and closed against port T. The valves are therefore pressure-balanced in relation to the actuating forces (solenoid and spring).

Due to the special closing element (4) ports P, A and T can be loaded up to a maximum operating pressure (350 bar *[5076 psi]*) and the flow directed in both directions (see symbols)!

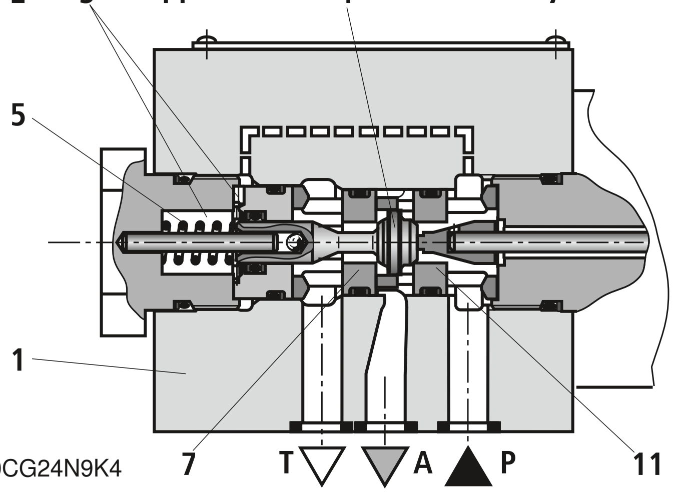
In the starting position, closing element (4) is pressed by spring (5) onto seat (11), and in the operated position, it is pressed by solenoid (2) onto seat (7). The flow is leak-free blocked.

Symbols

Variant “UK“	Variant “CK“
	



Type M-3SED 10 **UK**1X/350CG24N9K4



Type M-3SED 10 **CK**1X/350CG24N9K4

Function, section, symbols: 4/2 directional poppet valve

With the help of a sandwich plate, the **Plus-1-Plate**, under the 3/2 directional poppet valve, the function of a 4/2 directional poppet valve can be realized.

Function of the Plus-1-Plate

– Starting position:
  The main valve is not operated. Spring (5) holds closing element (4) on seat (11). Port P is closed, and A connected to T. In addition, a pilot line connects A to the large area of control spool (8), which is thus unloaded to the tank. The pressure applied via P now shifts ball (9) onto seat (10). P is now connected to B, and A to T.

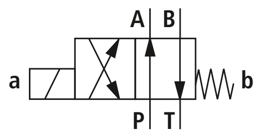
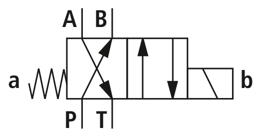
– Transitional position:
  When the main valve is operated, closing element (4) is shifted against spring (5) and pressed onto seat (7). This closes port T, while P, A and B are briefly connected.

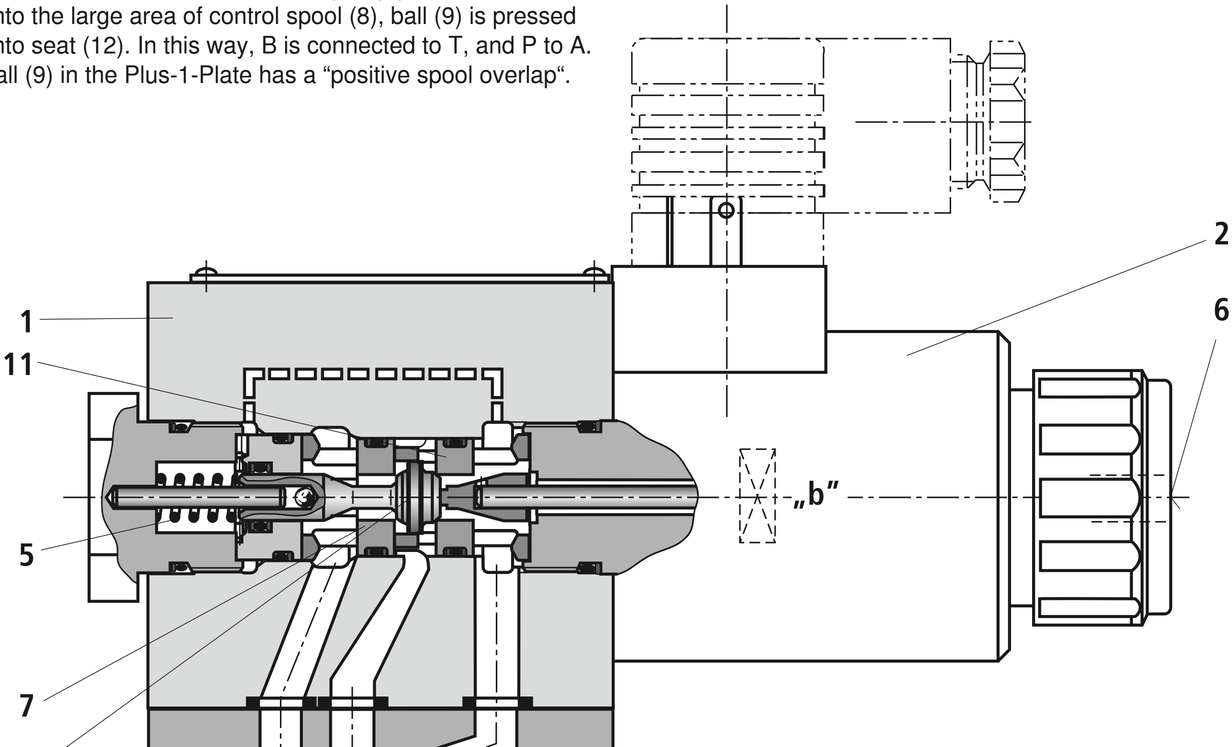
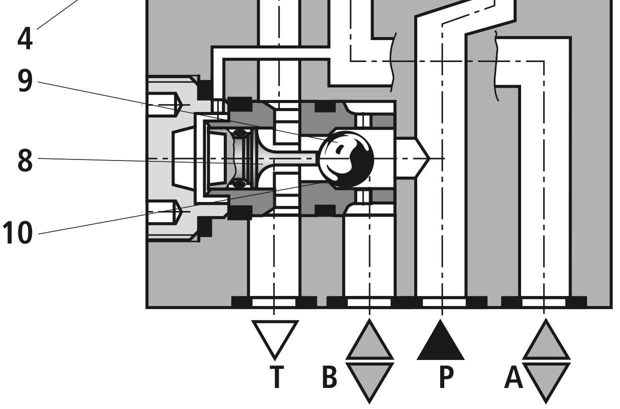
– Operated position:
  P is connected to A. Because the pump pressure acts via A onto the large area of control spool (8), ball (9) is pressed onto seat (12). In this way, B is connected to T, and P to A. Ball (9) in the Plus-1-Plate has a "positive spool overlap".

⚠ **Attention!**

To avoid pressure intensification when single-rod cylinders are used, the annulus area of the cylinders must be connected to A.

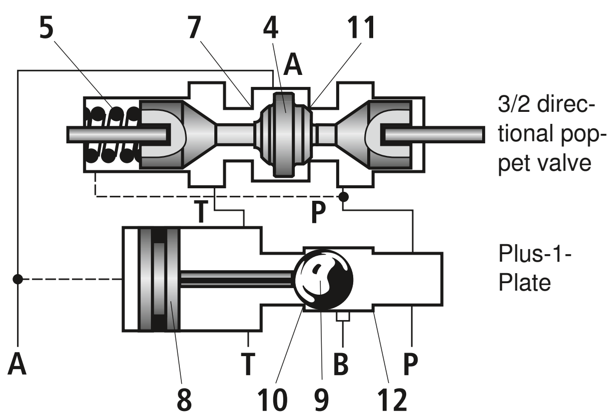
The use of the Plus-1-Plate and the seat arrangement offer the following options:

Variant "D"	Variant "Y"
	

Type M-4SED 10 **Y**1X/350CG24N9K4

Schematic illustration (starting position)



Technical data (for applications outside these parameters, please consult us!)

General

Weight	– 3/2 directional poppet valve	kg *[lbs]*	2.6 *[5.7]*
	– 4/2 directional poppet valve	kg *[lbs]*	3.9 *[8.6]*
Installation orientation			Optional
Ambient temperature range		°C *[°F]*	–30 to +50 *[–22 to +122]* (NBR seals) –20 to +50 *[–4 to +122]* (FKM seals)

Hydraulic

Maximum operating pressure	bar *[psi]*	See Performance limit on page 8
Maximum flow	l/min *[US gpm]*	40 *[10.6]*
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on request
Hydraulic fluid temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 500 *[35 to 2320]*
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [3]

Electrical

Type of voltage			DC voltage	AC voltage
Available voltages [4]		V	12, **24**, 42, 96, 110, 205, 220	Only possible via rectifier (see page 3)
Voltage tolerance (nominal voltage)		%	±10	
Power consumption		W	30	
Duty cycle		%	100	
Switching time to ISO 6403	– ON	ms	20 to 50	
	– OFF		5 to 25 (without rectifier) 30 to 50 (with rectifier)	
Maximum switching frequency		1/h	15000	
Type of protection to DIN EN 60529			IP 65 with mating connector mounted and locked	
Maximum coil temperature [5]		°C *[°F]*	150 *[302]*	

[1] Suitable for NBR and FKM seals

[2] Suitable only for FKM seals

[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

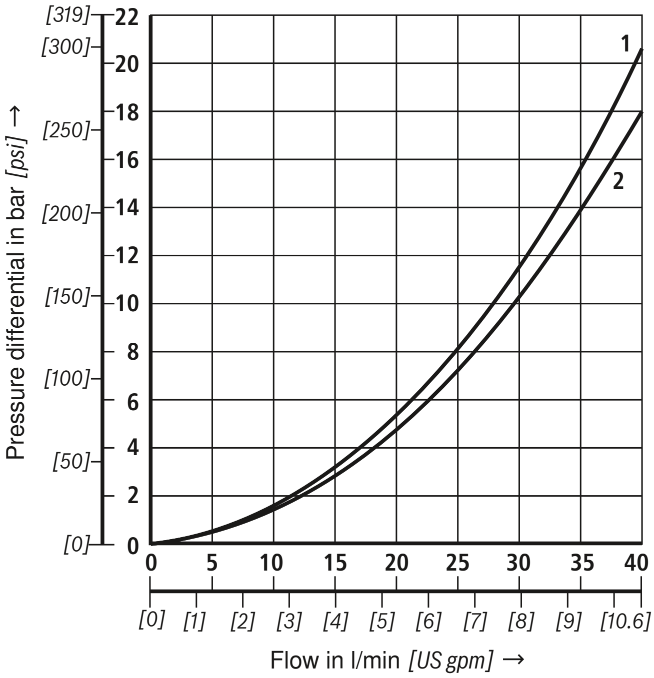
[4] Special voltages on request

[5] Due to the surface temperatures of solenoid coils, observe standards ISO 13732-1 and EN 982!

When establishing the electrical conection, properly connect the protective earth conductor (PE ⏚).

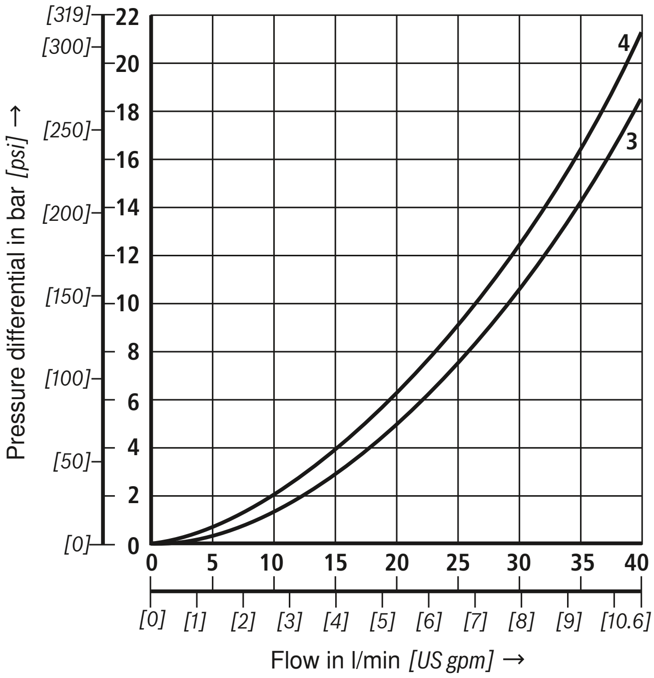
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

Δp-q_V characteristic curves
3/2 directional poppet valve



1 P to A
2 A to T

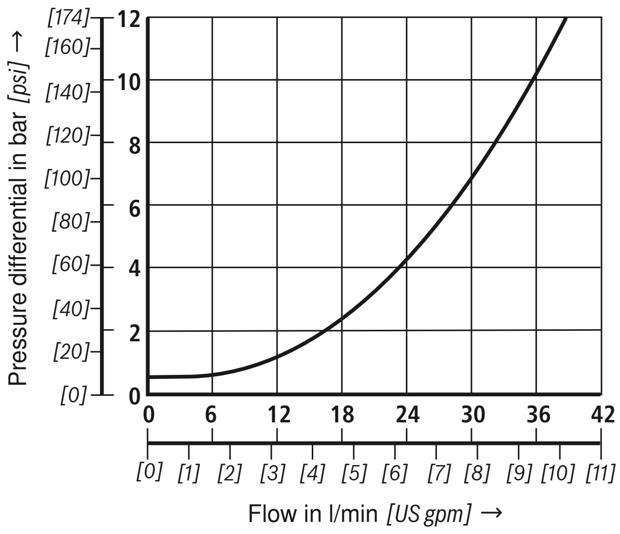
Δp-q_V characteristic curves
4/2 directional poppet valve



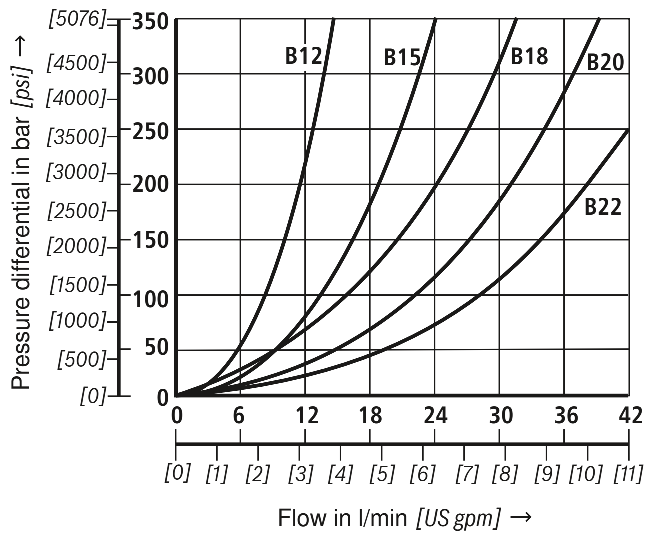
3 A to T
P to B

4 B to T
P to A

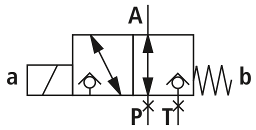
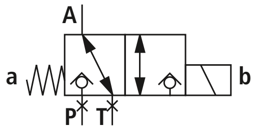
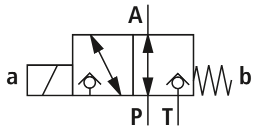
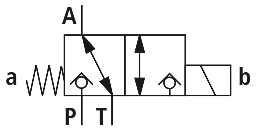
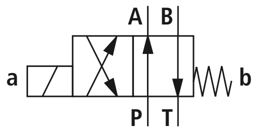
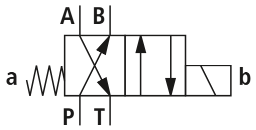
Δp-q_V characteristic curves
Check valve insert



Δp-q_V characteristic curves
Throttle insert



Performance limit (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

		Symbol	Remark	Maximum operating pressure in bar *[psi]* P	A	B	T	Flow in l/min *[US gpm]*
2-way circuit	**UK**		With a 2/2-way circuit, port P **or** T must be plugged by the customer!	350 *[5076]*	350 *[5076]*		350 *[5076]*	40 *[10.6]*
2-way circuit	**CK**			350 *[5076]*	350 *[5076]*		350 *[5076]*	40 *[10.6]*
3-way circuit	**UK**			350 *[5076]*	350 *[5076]*		350 *[5076]*	40 *[10.6]*
3-way circuit	**CK**			350 *[5076]*	350 *[5076]*		350 *[5076]*	40 *[10.6]*
4-way circuit (flow only possible in the direction of the arrow!)	**D**		3/2 directional valve (symbol "UK") in conjunction with Plus-1-Plate: $p_P \geq p_A \geq p_B \geq p_T$	350 *[5076]*	350 *[5076]*	350 *[5076]*	$p_P/p_A/p_B$ –40 *[10.6]*	40 *[10.6]*
4-way circuit (flow only possible in the direction of the arrow!)	**Y**		3/2 directional valve (symbol "CK") in conjunction with Plus-1-Plate: $p_P \geq p_A \geq p_B \geq p_T$	350 *[5076]*	350 *[5076]*	350 *[5076]*	$p_P/p_A/p_B$ –40 *[10.6]*	40 *[10.6]*

⚠ **Attention!**

Please observe the general notes below!

The performance limit was established when the solenoid had reached the operating temperature, at 10% undervoltage and no precharging of the tank.

General notes

Poppet valves can be used according to the symbols and the assigned operating pressures and flows (see Performance limits above).

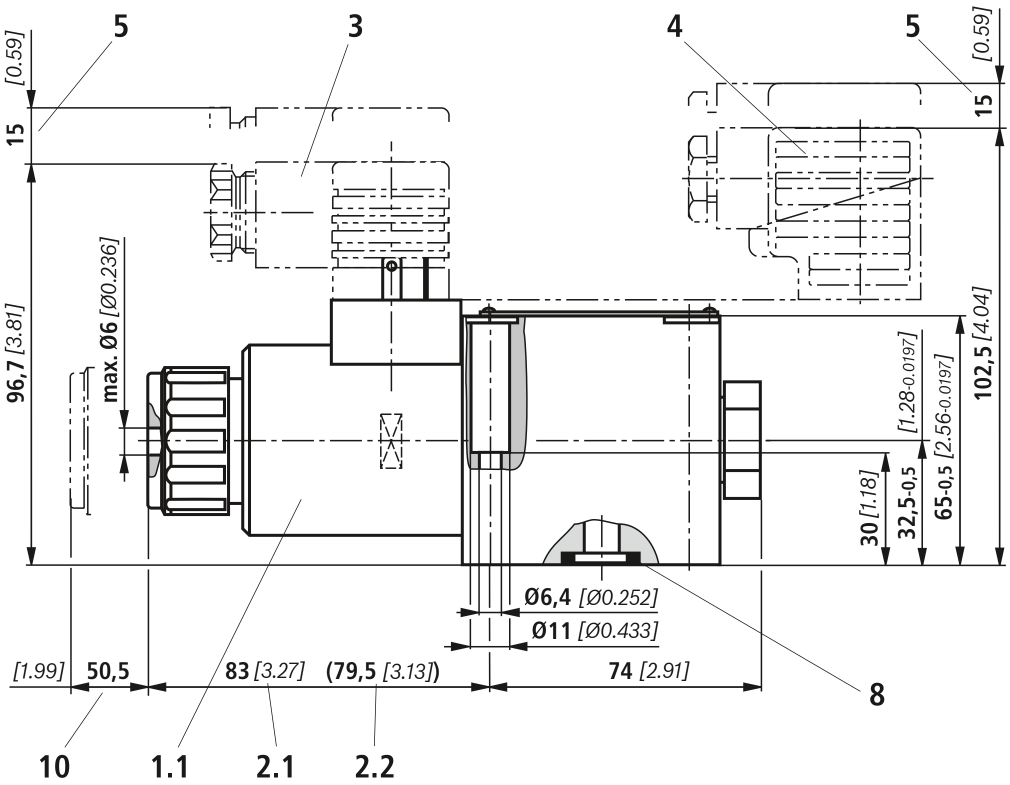
To ensure reliable operation, the following points must strictly be observed:

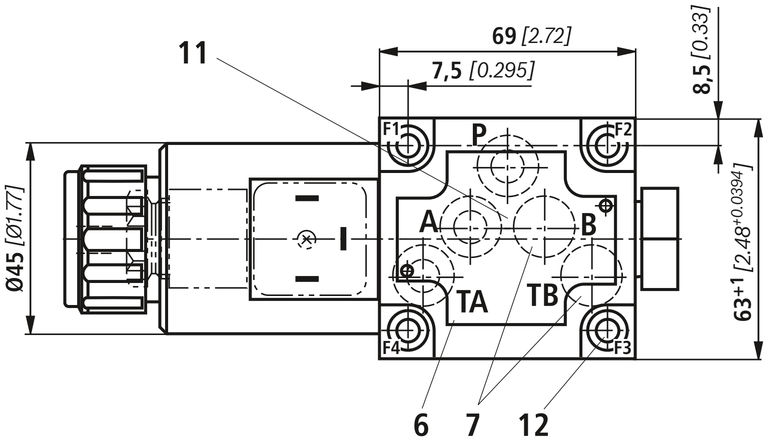
- Poppet valves feature a negative spool overlap, that is, during the switching process, a certain amount of leakage oil is produced. However, this process takes place within such a short time so that it is irrelevant in nearly all applications.
- The specified maximum flow must not be exceeded (if required, install throttle insert for limiting the flow, see page 13)!

Plus-1-Plate:

- When using the Plus-1-Plate (4/2 directional function), observe the following lower operating values: p_{min} = 8 bar *[116 psi]*, q_V > 3 l/min *[0.8 US gpm]*.
- Ports P, A, B and T are clearly assigned in accordance with their tasks. They must not be freely interchanged or plugged!
- Port T must always be connected.
- Observe the pressure level and pressure distribution!
- The fluid may only flow in the direction of the arrow!

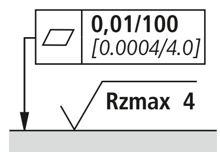
Unit dimensions: 3/2 directional poppet valve, variant “UK“ (dimensions in mm)





For explanation of items, see 13.

Valve mounting screws (separate order)
4 hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 12.5 Nm *[9.2 ft-lbs]* Nm ±10%,
Material no. **R913000058**

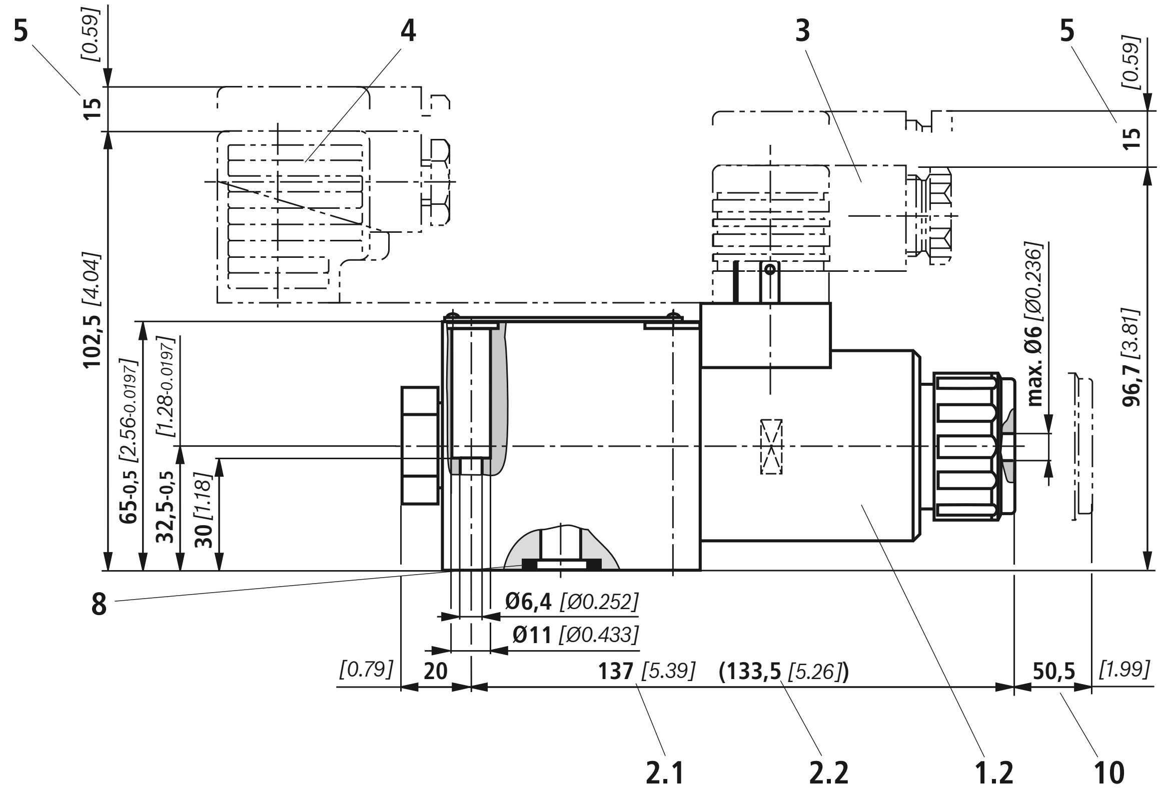


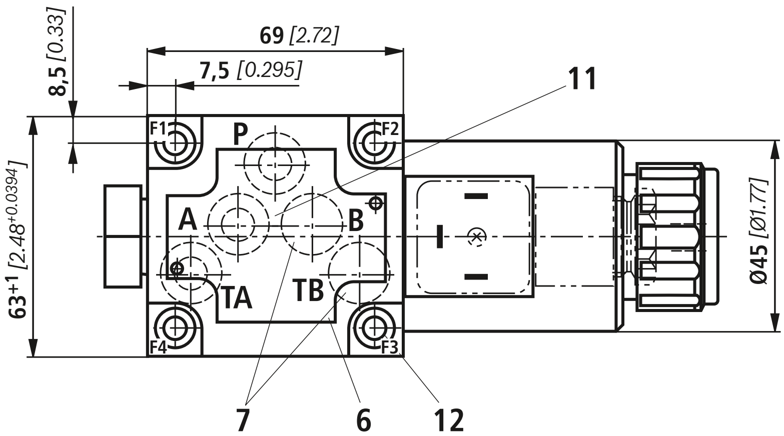
Required surface quality of valve mounting face

Subplates to data sheet RE 45054
(separate order)

G 66/01 (G3/8)
G 67/01 (G1/2)

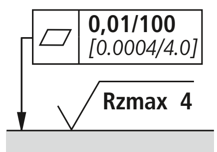
Unit dimensions: 3/2 directional poppet valve, variant “CK“ (dimensions in mm)





For explanation of items, see 13.

Valve mounting screws (separate order)
4 hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 12.5 Nm *[9.2 ft-lbs]* Nm ±10%,
Material no. **R913000058**

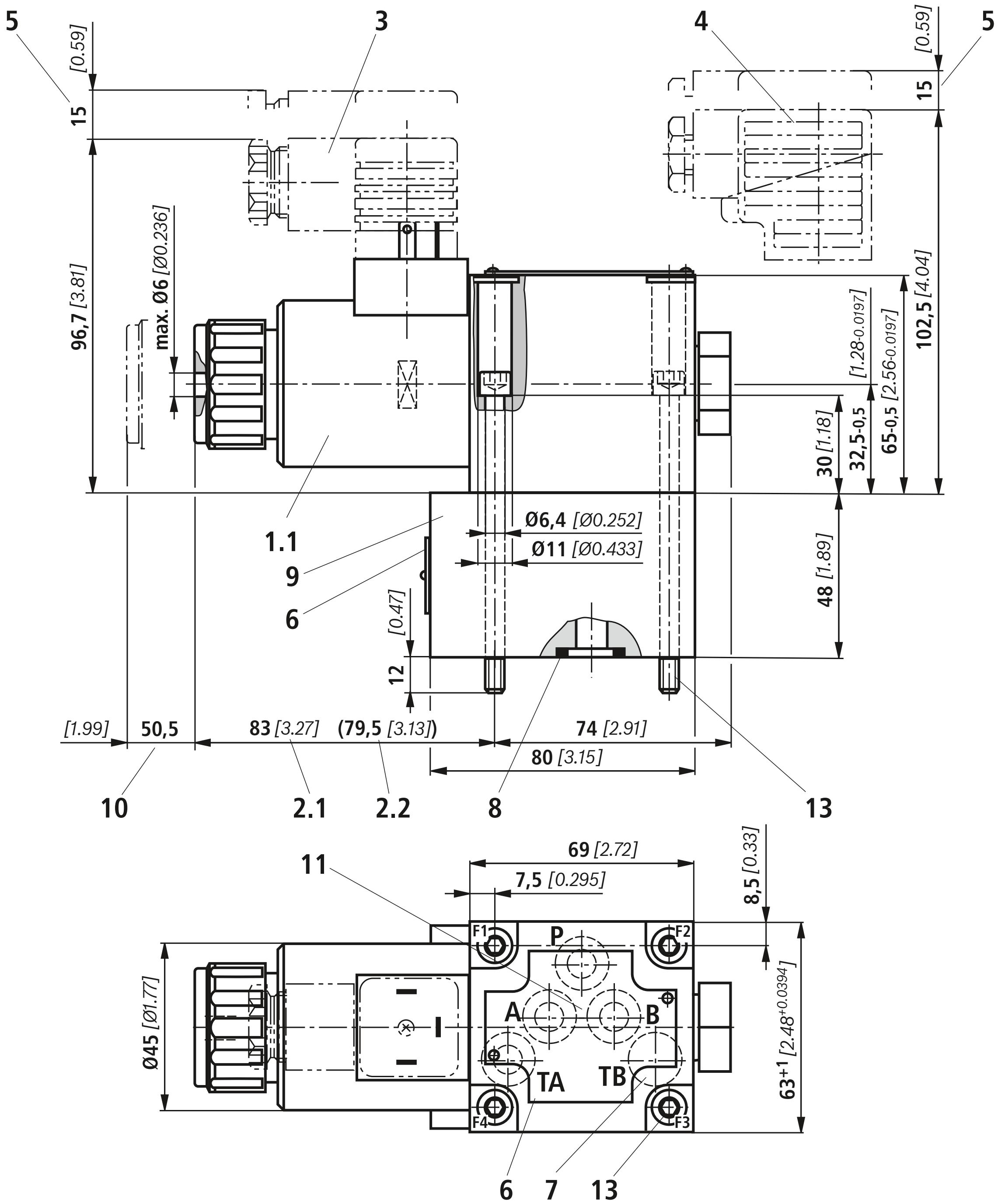


Required surface quality
of valve mounting face

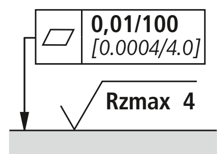
Subplates to data sheet RE 45054
(separate order)

G 66/01 (G3/8)
G 67/01 (G1/2)

Unit dimensions: 4/2 directional poppet valve, variant “D“ (dimensions in mm)



For explanation of items, see 13.



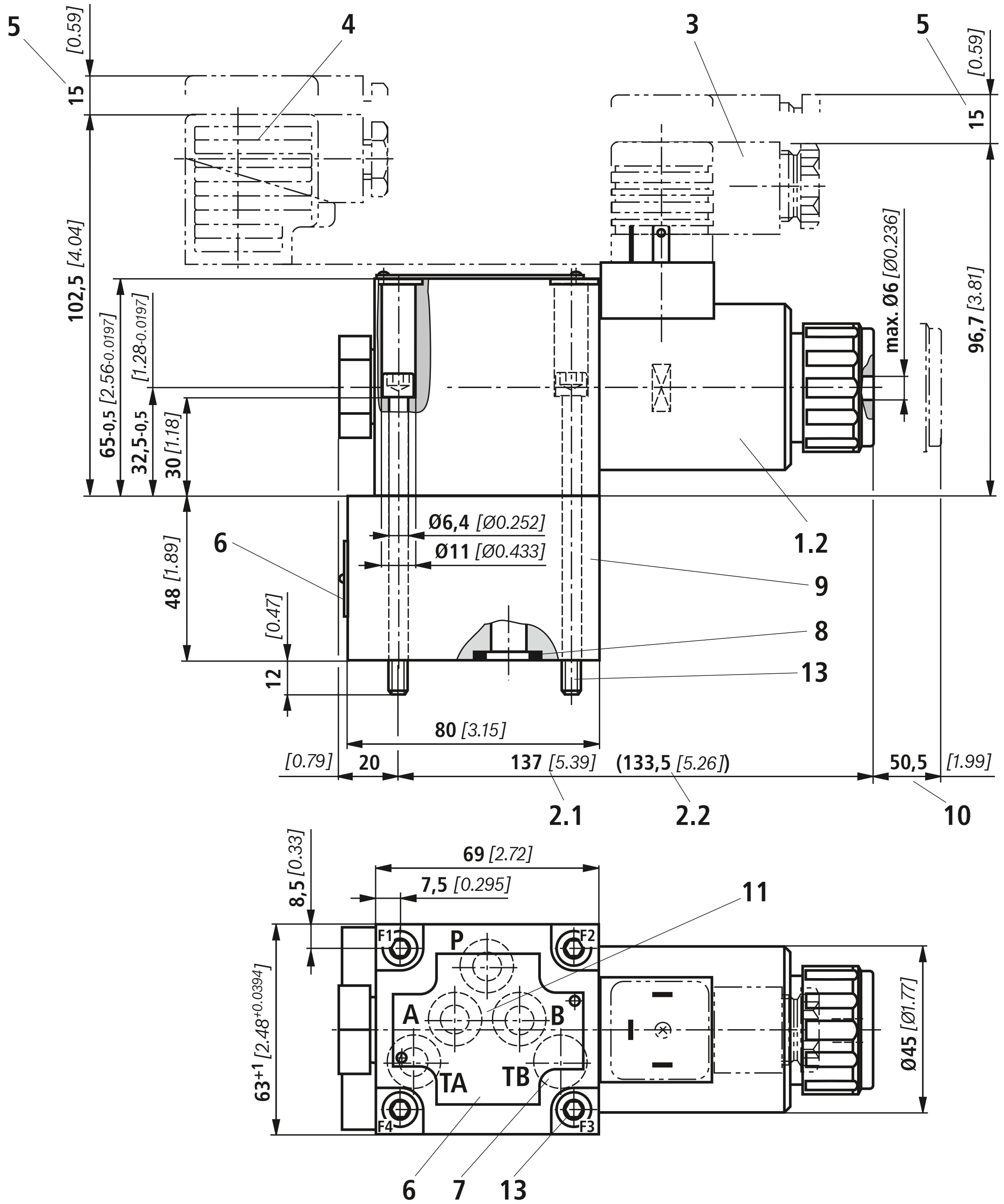
Required surface quality
of valve mounting face

Valve mounting screws (included in scope of supply)
4 hexagon socket head cap screws
ISO 4762 - M6 x 90 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque $\boldsymbol{M}_A$ = 12.5 Nm *[9.2 ft-lbs]* Nm ±10%,
Material no. **R913000259**

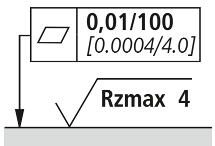
Subplates to data sheet RE 45054
(separate order)

G 66/01 (G3/8)
G 67/01 (G1/2)

Unit dimensions: 4/2 directional poppet valve, variant “Y“ (dimensions in mm)



For explanation of items, see 13.



Required surface quality of valve mounting face

Valve mounting screws (included in scope of supply)
4 hexagon socket head cap screws
ISO 4762 - M6 x 90 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 12.5 Nm *[9.2 ft-lbs]* Nm ±10%,
Material no. **R913000259**

Subplates to data sheet RE 45054
(separate order)

G 66/01 (G3/8)
G 67/01 (G1/2)

Unit dimensions: Explanation of items

1.1 Solenoid “a“ (for further electrical connections, see RE 08010)

1.2 Solenoid “b“ (for further electrical connections, see RE 08010)

2.1 Dimension for solenoid **with concealed** manual override “**N9**“

2.2 Dimension for solenoid **without** manual override

3 Mating connector without circuitry (separate order, see page 3)

4 Mating connector with circuitry (separate order, see page 3)

5 Space required to remove mating connector

6 Nameplate

7 ⚠ **Attention!**
- On 3/2 directional poppet valves, ports B and TB are provided as blind countersink.
- On 4/2 directional poppet valves, port TB is provided as blind countersink.

8 Identical seal rings for ports A, B and T; seal ring for port P

9 Plus-1-Plate

10 Space required to remove coil

11 Porting pattern to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-D05

12 Valve mounting bores

13 Valve mounting screws, see pages 11 and 12

Throttle insert

The use of a throttle insert is required when, due to the given operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

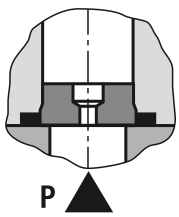
Examples:
- Accumulator operation,
- Use as pilot control valve with internal pilot oil tapping.

3/2 directional poppet valve

The throttle insert is to be inserted into port P of the poppet valve.

4/2 directional poppet valve

The throttle insert is to be inserted into port P of the Plus-1-Plate.



Check valve insert

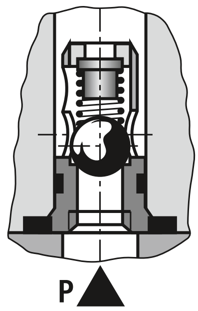
The check valve insert allows free flow from P to A and closes leak-free from A to P.

3/2 directional poppet valve

The check valve insert is to be inserted in port P of the poppet valve.

4/2 directional poppet valve

The check valve insert is to be inserted in port P of the Plus-1-Plate.



Notes

Bosch Rexroth AG
Hydraulics
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Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

The Drive & Control Company

Rexroth
Bosch Group

Directional seat valves, direct operated, with solenoid actuation

Type SEW

RE 22058
Edition: 2013-06
Replaces: 07.09

H7383

- Size 6
- Component series 3X
- Maximum operating pressure 420/630 bar *[6100/9150 psi]*
- Maximum flow 25 l/min *[6.6 gpm]*

Features

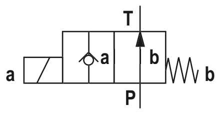
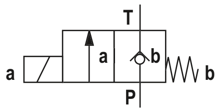
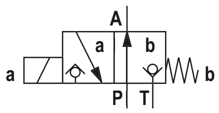
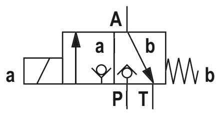
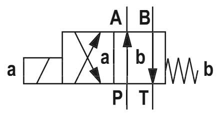
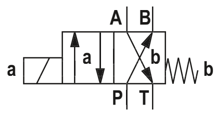
- 2/2, 3/2 or 4/2 directional design
- Porting pattern according to DIN 24340 form A
- Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03
- Air-gap DC solenoids with detachable coil
- Solenoid coil can be rotated by 90°
- The coil can be changed without having to open the pressure-tight chamber
- Electrical connection as individual connection
- Manual override, optional
- Inductive position switch and proximity sensors (contactless)

Contents

Ordering code

01	02	03	04	05		06	07	08	09	10	11		12	13	14	15	16
M	**–**	**SEW**	**6**		**3X**	**/**		**M**			**K4**		**/**				*****

01	Mineral oil	**M**
02	2 main ports	**2**
	3 main ports	**3**
	4 main ports	**4**
03	Seat valve, direct operated	**SEW**
04	Size 6	**6**

05	**Symbols**	Main ports 2	Main ports 3	Main ports 4	● = available
		●	–	–	**P**
		●	–	–	**N**
		–	●	–	**U**
		–	●	–	**C**
		–	–	●	**D**
		–	–	●	**Y**

06	Component series 30 to 39 (30 to 39: Unchanged installation and connection dimensions)	**3X**
07	Operating pressure 420 bar *[6100 psi]*	**420**
	Operating pressure 630 bar *[9150 psi]*	**630**

AC voltage mains (admissible voltage tolerance ±10%)	**Nominal voltage of the DC solenoid in case of operation with alternating voltage**	**Ordering code**
110 V - 50/60 Hz 120 V - 60 Hz	96 V	**G96**
	110 V	**G110**
230 V - 50/60 Hz	205 V	**G205**

☞ **Notice!** Preferred types and standard units are contained in the EPS (standard price list).

Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
M	**–**	**SEW**	**6**		**3X**	**/**		**M**			**K4**		**/**				*****

08	High-power (air-gap) solenoid with detachable coil	**M**
09	Direct voltage 24 V	**G24**
	Direct voltage 205 V	**G205**
	Direct voltage 96 V	**G96**
	Connection to AC voltage mains via control with rectifier (see pages 2 and 13). For further ordering codes for other voltages, see page 7	
10	**With** concealed manual override (standard)	**N9**
	Without manual override	**no code**

Electrical connection

11	**Without** mating connector; connector DIN EN 175301-803	**K4** 1)

Spool position monitoring

12	**Without** position switch	**no code**
	– Inductive position switch type QM	
	Monitored spool position "a"	**QMAG24** 2)
	Monitored spool position "b"	**QMBG24** 2)
	For more information, see data sheet 24830	
13	**Without** check valve insert, **without** throttle insert	**no code**
	With check valve insert	**P**
	Throttle Ø: 1.2 mm *[0.047 inch]*	**B12**
	Throttle Ø: 1.5 mm *[0.059 inch]*	**B15**
	Throttle Ø: 1.8 mm *[0.071 inch]*	**B18**
	Throttle Ø: 2.0 mm *[0.079 inch]*	**B20**
	Throttle Ø: 2.2 mm *[0.087 inch]*	**B22**
	Other orifices on request	

Seal material

14	NBR seals	**no code**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals on request)	
15	**Without** locating hole	**no code**
	With locating hole and locking pin ISO 8752-3x8-St	**/62**
16	Further details in the plain text	

1) For mating connectors, separate order, see page 13.
2) Only version "420"

Notice!
For other types of actuation (e.g. pneumatic, hydraulic, rotary knob, rotary knob with lock, stylus, hand lever, roller actuation), see data sheet 22340 or inquire with us.

Function, sections, symbols: 2/2 and 3/2 directional seat valve

General

The SEW type directional valve is a directional seat valve with solenoid actuation. It controls start, stop and flow direction.

The valve basically consists of the housing (1), the solenoid (2), the hardened valve system (3) as well as the ball/the spool (4) as closing element.

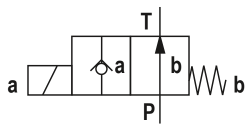
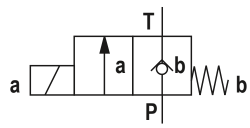
Basic principle

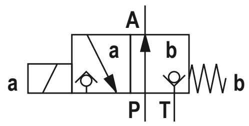
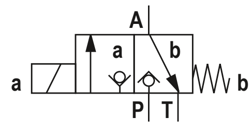
In the initial position, the ball/the spool (4) is pressed onto the seat by the spring (9) and in the switching position by the solenoid (2). The force of the solenoid (2) acts via the angled lever (6) and the ball (7) on the actuating plunger (8) that is sealed on two sides. The chamber between the two sealing elements is connected to port P. Therefore, the valve system (3) is pressure-compensated in relation to the actuating forces (solenoid or return spring). This means the valves can be used up to 630 bar.

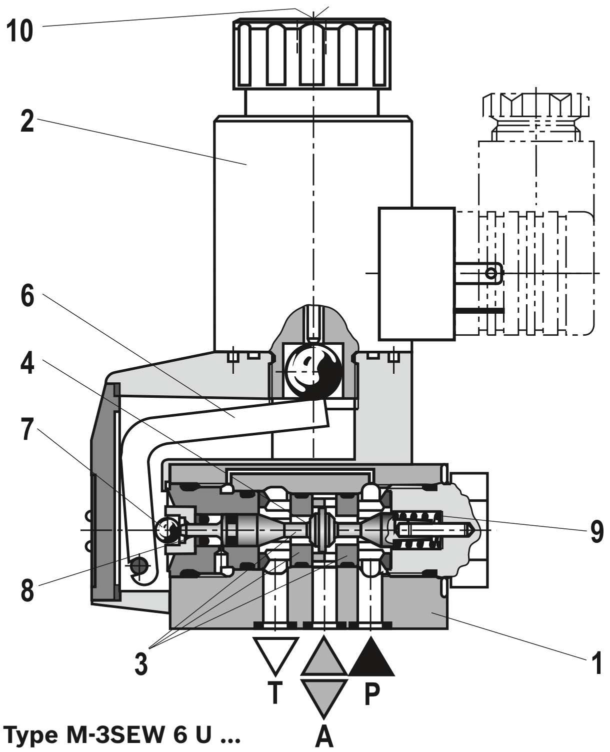
Notices!

- 3/2 directional seat valves feature "negative spool overlap". Therefore, port T must always be connected. That means that during the switching process – from the starting of the opening of one valve seat to the closing of the other valve seat – ports P–A–T are connected with each other. However, this process takes place within such a short time that it is irrelevant in nearly all applications.
- The manual override (10) allows for the switching of the valve without solenoid energization.
- **Make sure that the specified maximum flow is not exceeded! Use a throttle insert for limiting the flow, if necessary (see page 13).**

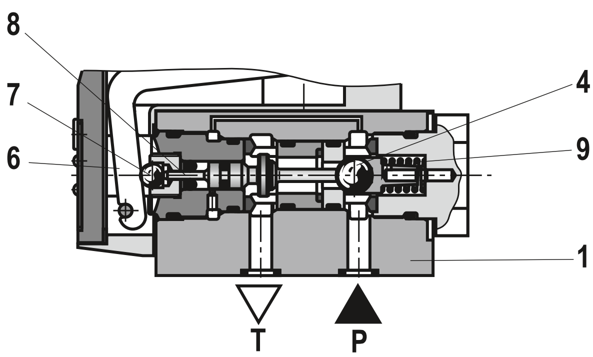
Symbols

2/2 directional seat valve	
P	N
	

3/2 directional seat valve	
U	C
	



Type M-3SEW 6 U ...



Type M-2SEW 6 N ...

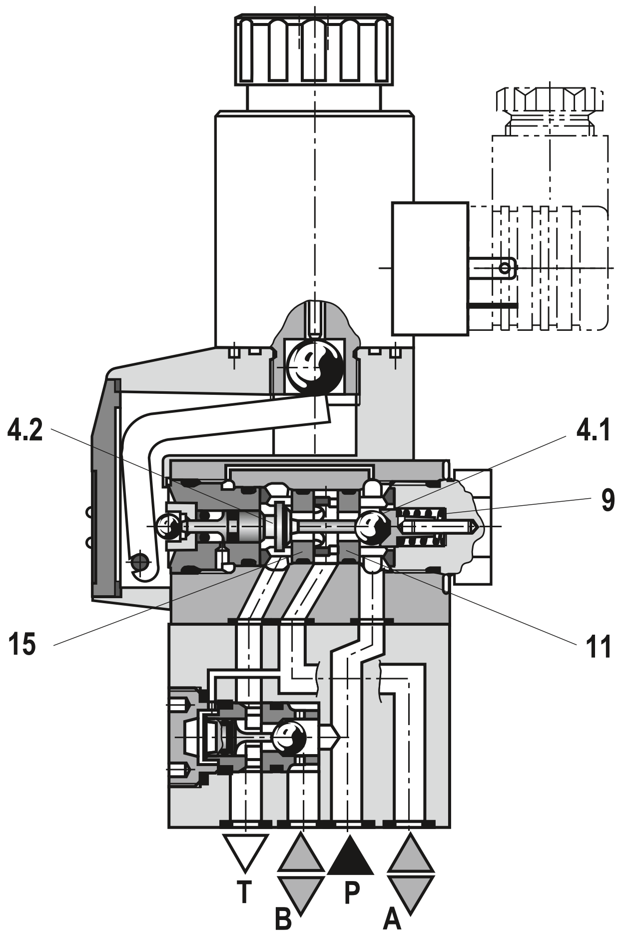
Function, section, symbols, schematic illustration: 4/2 directional seat valve

With a sandwich plate, the **Plus-1 plate**, under the 3/2 directional seat valve, the function of a 4/2 directional seat valve is achieved.

Function of the Plus-1 plate

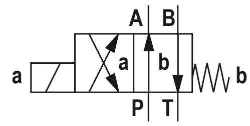
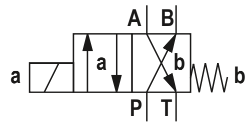
- Initial position:
  The main valve is not actuated. The spring (9) holds the ball (4.1) on the seat (11). Port P is blocked and A is connected to T. Apart from that, one pilot line is connected from A to the large area of the control spool (12), which is thus unloaded to the tank. The pressure applied via P now pushes the ball (13) onto the seat (14). Now, P is connected to B, and A to T.
- Transition position:
  When the main valve is actuated, the spool (4.2) is shifted against the spring (9) and pressed onto the seat (15). Port T is closed; P, A, and B are briefly connected to each other.
- Spool position:
  P is connected to A. As the pump pressure acts via A on the large area of the control spool (12), the ball (13) is pressed onto the seat (16). Therefore, B is connected to T, and P to A. The ball (13) in the Plus-1 plate has a "positive spool overlap".

☞ **Notice!**
If the annulus area of differential cylinders is not connected to port A, a pressure peak is created in port B during the switching process due to the pressure intensification. This pressure peak may exceed the maximum operating pressure over the permissible limit.

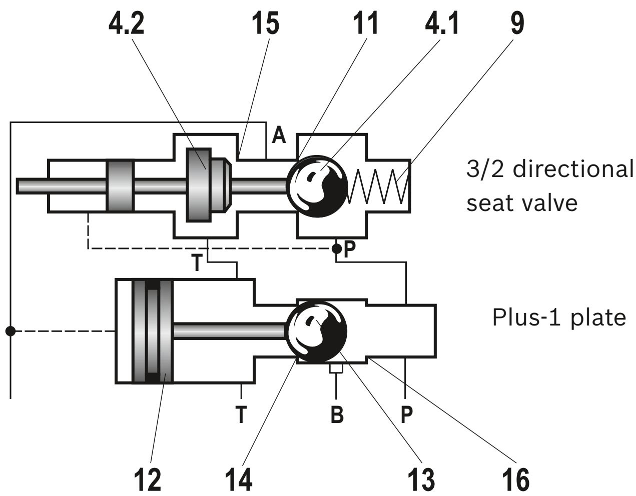


Type M-4SEW 6 Y ...

Symbols

4/2 directional seat valve	
D	**Y**
	

Schematic illustration: Initial position



Technical data
(for applications outside these parameters, please consult us!)

general			
Weight	– 2/2 directional seat valve	kg *[lbs]*	1.5 *[3.3]*
	– 3/2 directional seat valve	kg *[lbs]*	1.5 *[3.3]*
	– 4/2 directional seat valve	kg *[lbs]*	2.3 *[5.1]*
Installation position			Any
Ambient temperature range		°C *[°F]*	–30 ... +50 *[–22 ... +122]* (NBR seals) –20 ... +50 *[–4 ... +122]* (FKM seals)

hydraulic		
Maximum operating pressure	bar *[psi]*	See performance limit on page 9
Maximum flow	l/min *[gpm]*	25 *[6.6]*
Hydraulic fluid		See table below
Hydraulic fluid temperature range	°C *[°F]*	–30 ... +80 *[–22 ... +176]* (NBR seals) –20 ... +80 *[–4 ...+176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 ... 500 *[35 ... 2320]*
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids, refer to data sheet 90220 or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.

- **Flame-resistant – containing water**:
  - Maximum pressure difference per control edge 50 bar
  - Pressure pre-loading at the tank port > 20% of the pressure differential, otherwise increased cavitation
  - Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter.

Technical data
(for applications outside these parameters, please consult us!)

electric				
Voltage type			Direct voltage	Alternating voltage
Available voltages [2]		V	12, **24**, 42, 96, 110, 205, 220	Only possible with rectifier (see page 13)
Voltage tolerance (nominal voltage)		%	±10	
Power consumption		W	30	
Duty cycle		%	100	
Switching time according to ISO 6403	– ON	ms	25 to 40 (without rectifier) 30 to 55 (with rectifier)	
	– OFF		10 to 15 (without rectifier) 35 to 55 (with rectifier)	
Maximum switching frequency	– Operating pressure ≤ 350 bar	1/h	15000	
	– Operating pressure > 350 bar	1/h	3600	
Protection class according to DIN EN 60529			IP 65 (with mating connector mounted and locked)	
Maximum surface temperature of the coil [3]		°C *[°F]*	120 *[248]*	

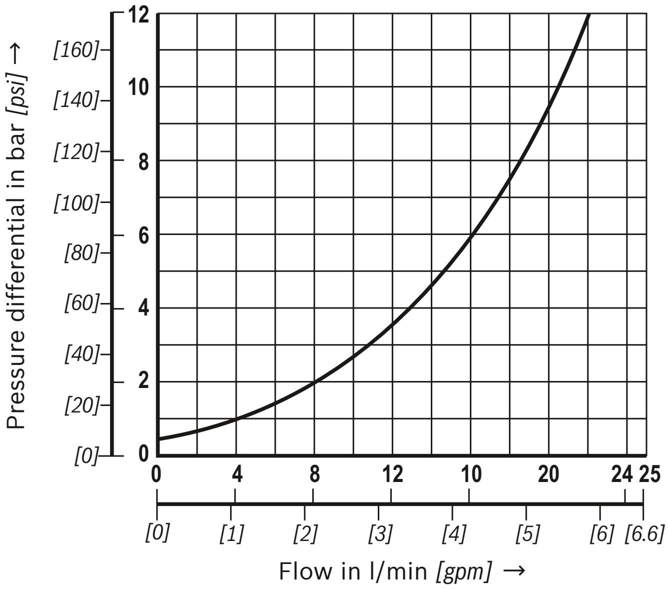
[2] Special voltages on request

[3] Possible surface temperature > 50 °C, provide contact protection.

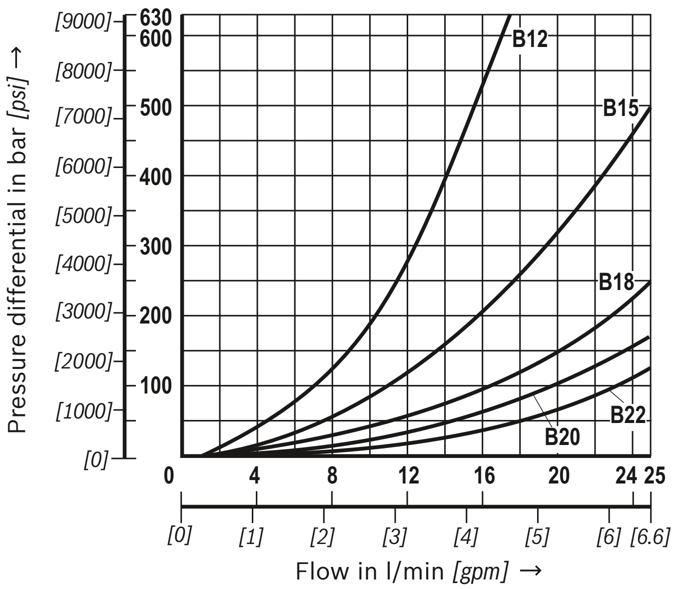
When establishing the electrical connection, the protective grounding conductor (PE ⏚) has to be connected correctly.

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

***Δp-q**$_V$* **characteristic curves**
Check valve insert

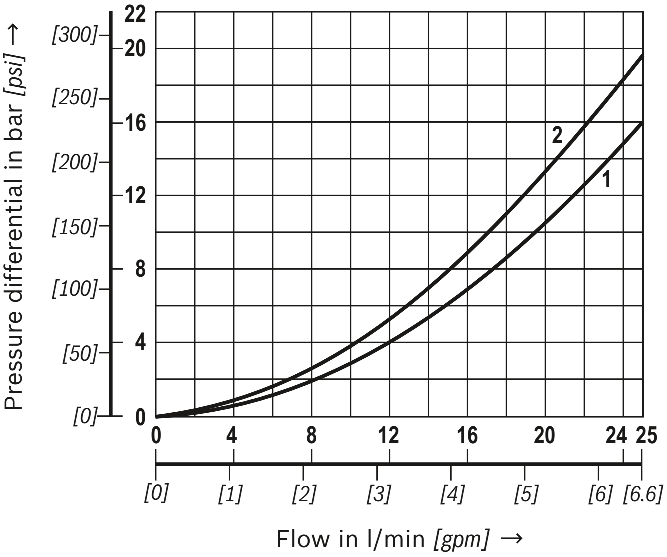


***Δp-q**$_V$* **characteristic curves**
Throttle insert



Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

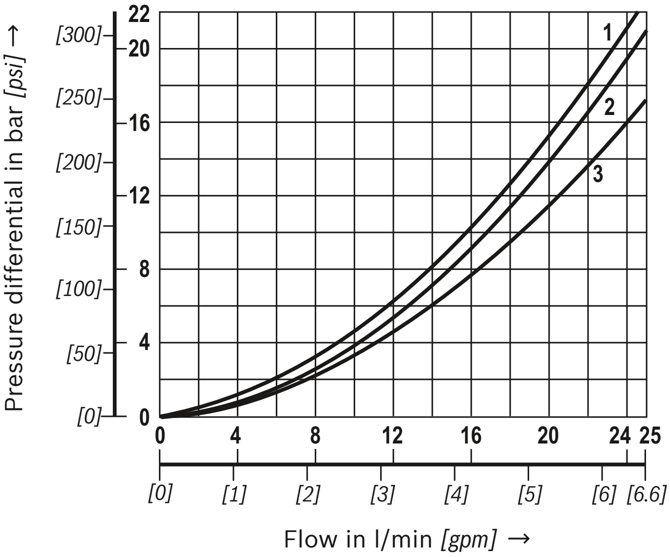
***Δp-q*$_V$ characteristic curves**
2/2 directional seat valve



1 M-2SEW 6 **N** ..., P to T

2 M-3SEW 6 **P** ..., P to T

***Δp-q*$_V$ characteristic curves**
3/2 directional seat valve

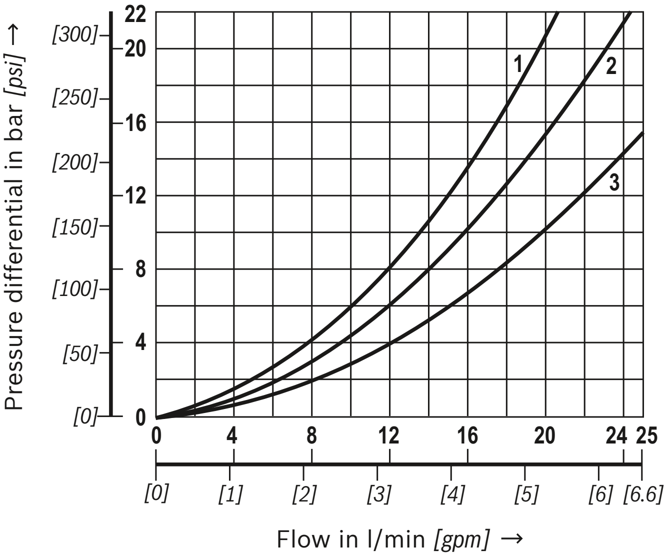


1 M-3SEW 6 **U** / **C** ..., A to T

2 M-3SEW 6 **U** ..., P to A

3 M-3SEW 6 **C** ..., P to A

***Δp-q*$_V$ characteristic curves**
4/2 directional seat valve

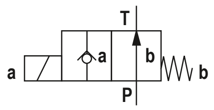
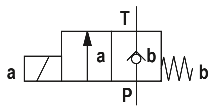
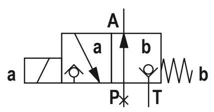
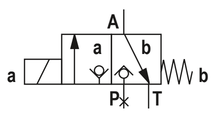
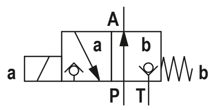
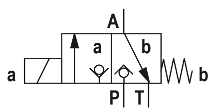
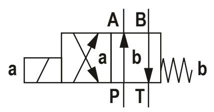
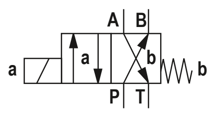


1 M-4SEW 6 **D** / **Y** ..., A to T

2 M-4SEW 6 **D** / **Y** ..., P to A

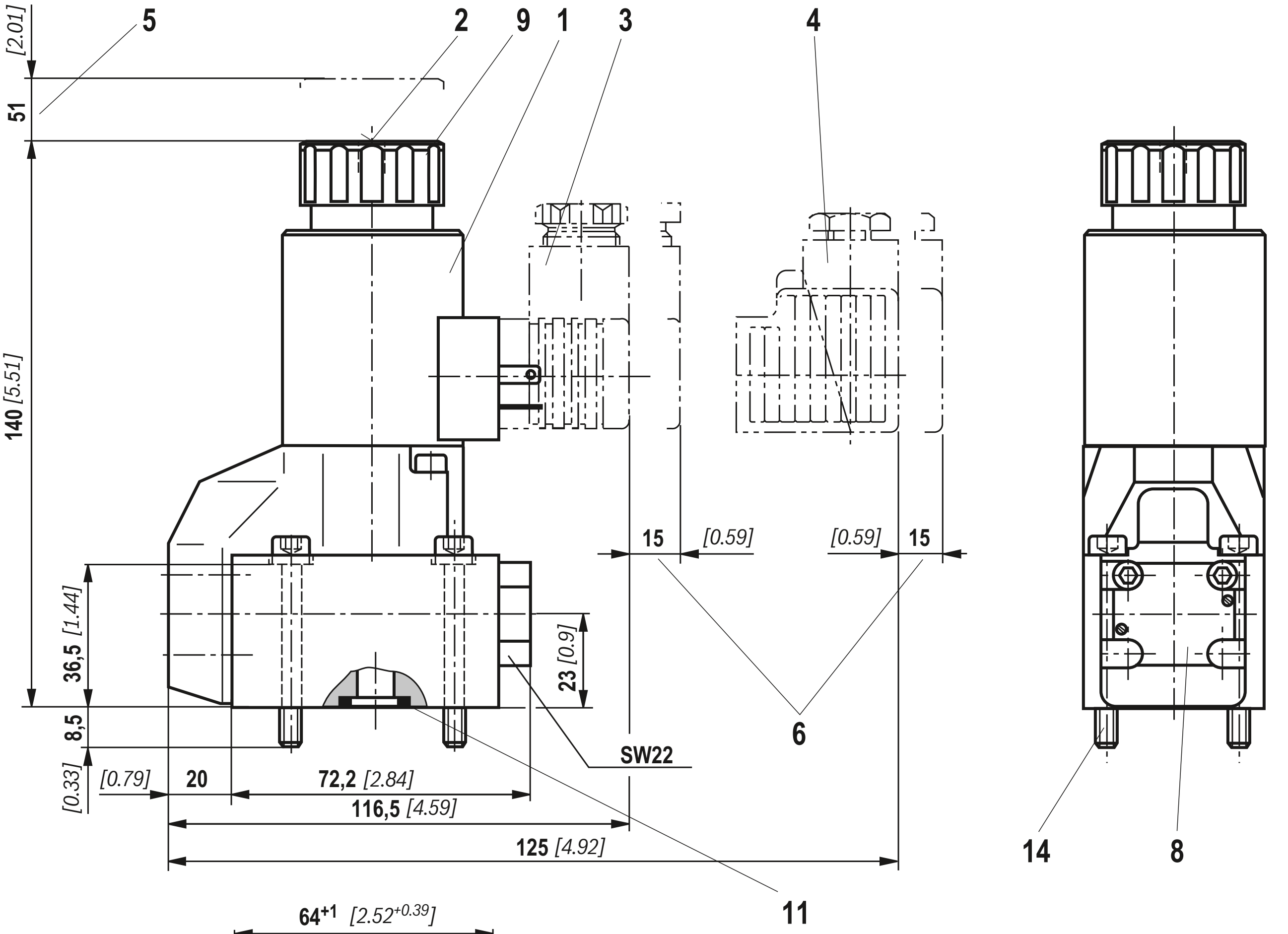
3 M-4SEW 6 **D** / **Y** ..., P to B and B to T

Performance limit
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

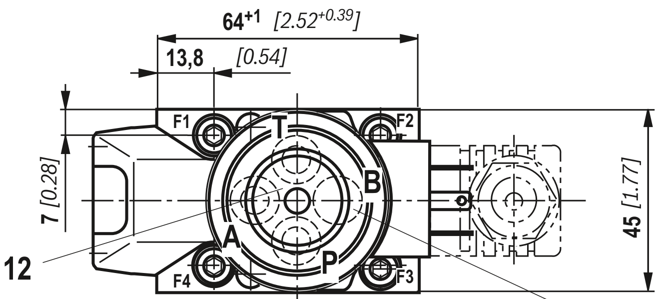
		Symbol	Comment	**Maximum operating pressure** in bar *[psi]* P	A	B	T	**Flow** in l/min *[gpm]*
2-way circuit (2/2 directional seat valve)	**P**		$p_P \geq p_T$	420/630 *[6100/ 9150]*			100 *[1450]*	25 *[6.6]*
	N			420/630 *[6100/ 9150]*			100 *[1450]*	25 *[6.6]*
2-way circuit (3/2 directional seat valve) only for unloading	**U**		Before switching from the initial position to the spool position, pressure must be applied to port A. $p_A \geq p_T$		420/630 *[6100/ 9150]*		100 *[1450]*	25 *[6.6]*
	C		$p_A \geq p_T$		420/630 *[6100/ 9150]*		100 *[1450]*	25 *[6.6]*
3-way circuit	**U**		$p_P \geq p_A \geq p_T$	420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*		100 *[1450]*	25 *[6.6]*
	C			420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*		100 *[1450]*	25 *[6.6]*
4-way circuit (flow only possible in the direction of arrow)	**D**		3/2 directional valve (symbol "U") in connection with Plus-1 plate: $p_P > p_A \geq p_B > p_T$	420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*	100 *[1450]*	25 *[6.6]*
	Y		3/2 directional valve (symbol "C") in connection with Plus-1 plate: $p_P > p_A \geq p_B > p_T$	420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*	100 *[1450]*	25 *[6.6]*

Notice!
- Please observe the general information on page 14.
- The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank pre-loading.

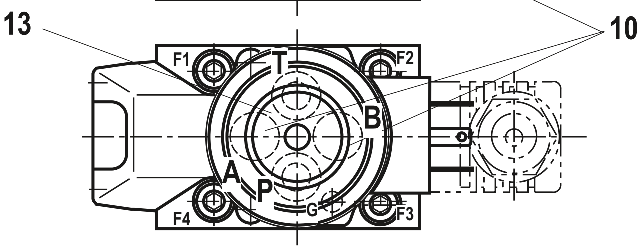
Dimensions: 2/2 directional seat valve and 3/2 directional seat valve
(dimensions in mm *[inch]*)

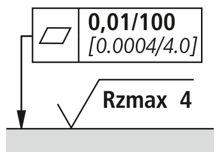


3/2 directional seat valve



2/2 directional seat valve

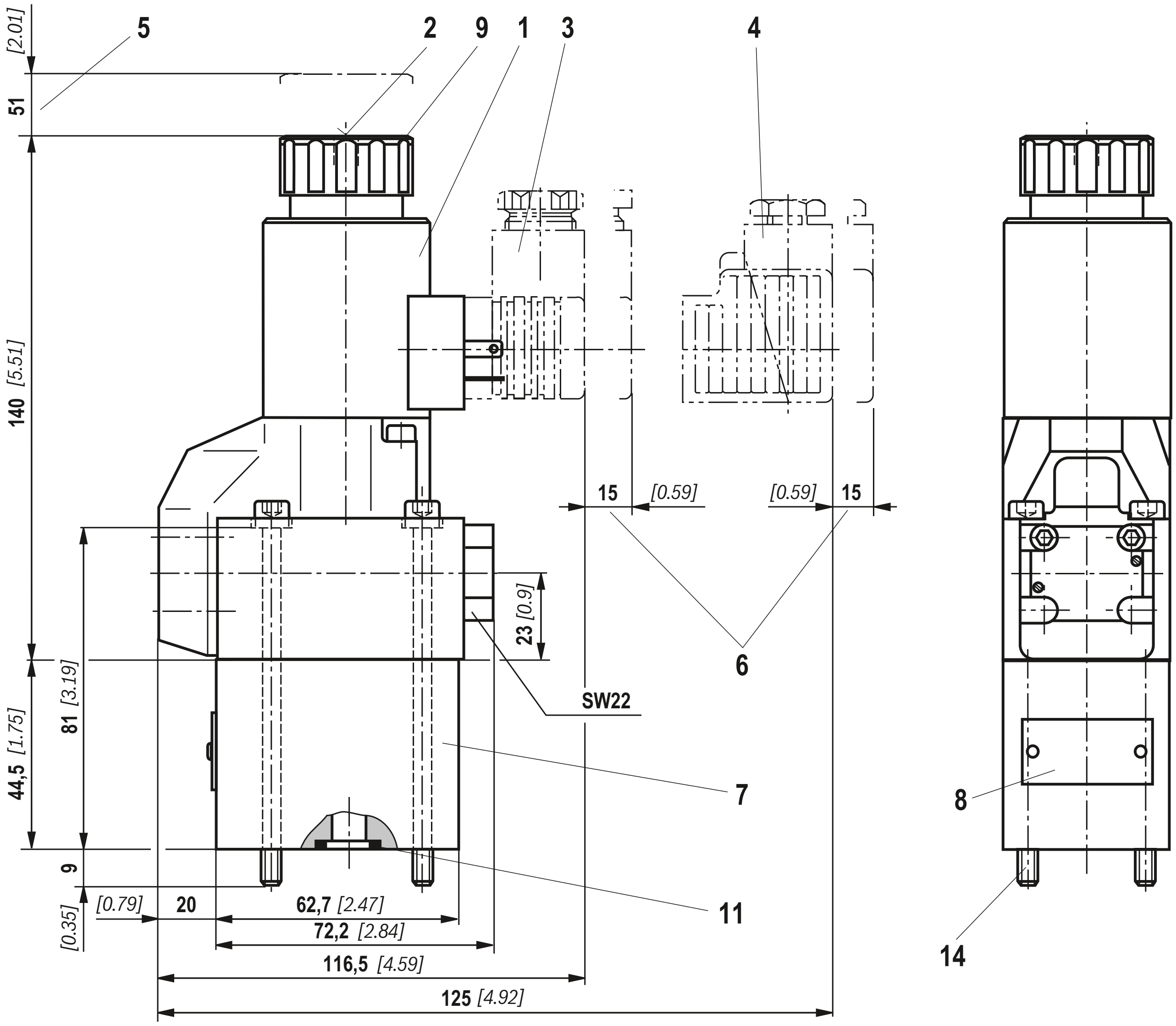


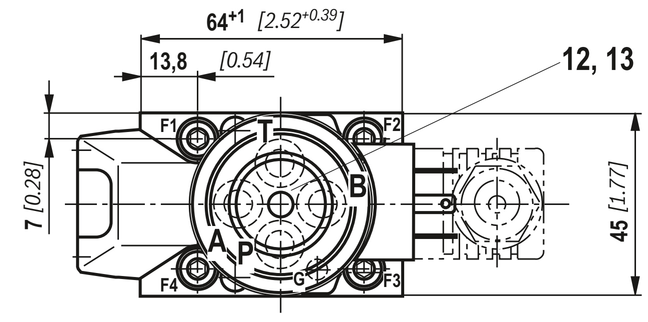


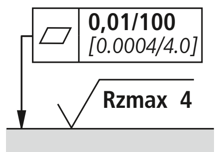
Required surface quality of the valve contact surface

For item explanations and **valve mounting screws,**
see page 12**.**

Dimensions: 4/2 directional seat valve
(dimensions in mm *[inch]*)







Required surface quality of the valve contact surface

For item explanations and **valve mounting screws,**
see page 12**.**

Dimensions

1 Solenoid "a"

2 Concealed manual override "N9"

3 Mating connector **without** circuitry (separate order, see page 13)

4 Mating connector **with** circuitry (separate order, see page 13)

5 Space required to remove the coil

6 Space required for removing the mating connector

7 Plus-1 plate

8 Name plate

9 Mounting nut, tightening torque $\boldsymbol{M}_A$ = 4 Nm *[2.95 ft-lbs]*

10
- With 3/2 directional seat valves version "420", port B is designed as blind counterbore, in version "630", it is not available.
- With 2/2 directional seat valves version "420", ports A and B are available as blind counterbores.

11 Identical seal rings for ports A, B, and T; seal ring for port P

12 Porting pattern according to DIN 24340 form A

13 Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locking pin ISO 8752-3x8-St, material no. **R900005694**, included in the scope of delivery)

14 For valve mounting screws, see below

Valve mounting screws (separate order)

2/2 and 3/2 directional seat valve

- Version "420":
  4 metric hexagon socket head cap screws
  ISO 4762 - M5 x 45 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  tightening torque $\boldsymbol{M}_A$ = 7 Nm *[5.2 ft-lbs]* ± 10%,
  material no. **R913000140**
  or
  4 hexagon socket head cap screws
  ISO 4762 - M5 x 45 - 10.9 [1)]
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 8.1 Nm *[6 ft-lbs]* ± 10%

  4 UNC hexagon socket head cap screws
  10-24 UNC x 1 3/4" ASTM-574 [1)]
  (friction coefficient μ_{total} = 0.19 to 0.24 according to ASTM-574);
  tightening torque $\boldsymbol{M}_A$ = 11 Nm *[8.1 ft-lbs]* ± 15%,
  (friction coefficient μ_{total} = 0.12 to 0.17 according to ISO 4762);
  tightening torque $\boldsymbol{M}_A$ = 8 Nm *[5.9 ft-lbs]* ± 10%,
  material no. **R978802649**

- Version "630":
  4 metric hexagon socket head cap screws
  ISO 4762 - M6 x 45 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  tightening torque $\boldsymbol{M}_A$ = 12.5 Nm *[9.2 ft-lbs]* ± 10%,
  material no. metric **R913000258**
  or
  4 hexagon socket head cap screws
  ISO 4762 - M6 x 45 - 10.9 [1)]
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 15.5 Nm *[11.5 ft-lbs]* ± 10%

  4 UNC hexagon socket head cap screws
  1/4-20 UNC x 1 3/4" ASTM-574 [1)]
  (friction coefficient μ_{total} = 0.19 to 0.24 according to ASTM-574);
  tightening torque $\boldsymbol{M}_A$ = 20 Nm *[14.8 ft-lbs]* ± 15%,
  (friction coefficient μ_{total} = 0.12 to 0.17 according to ISO 4762);
  tightening torque $\boldsymbol{M}_A$ = 14 Nm *[10.4 ft-lbs]* ± 10%,
  material no. **R978800711**

4/2 directional seat valve

- Version "420":
  4 metric hexagon socket head cap screws
  ISO 4762 - M5 x 90 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  tightening torque $\boldsymbol{M}_A$ = 7 Nm *[5.2 ft-lbs]* ± 10%,
  material no. **R913000222**
  or
  4 hexagon socket head cap screws
  ISO 4762 - M5 x 90 - 10.9 [1)]
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 8.1 Nm *[6 ft-lbs]* ± 10%

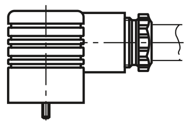
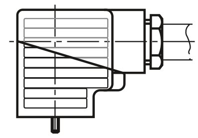
  4 UNC hexagon socket head cap screws
  10-24 UNC x 3 1/2" [1)]
  (friction coefficient μ_{total} = 0.19 to 0.24 according to ASTM-574);
  tightening torque $\boldsymbol{M}_A$ = 11 Nm *[8.1 ft-lbs]* ± 15%,
  (friction coefficient μ_{total} = 0.12 to 0.17 according to ISO 4762);
  tightening torque $\boldsymbol{M}_A$ = 8 Nm *[5.9 ft-lbs]* ± 10%,
  material no **R978800696**

- Version "630":
  4 metric hexagon socket head cap screws
  ISO 4762 - M6 x 90 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  tightening torque $\boldsymbol{M}_A$ = 12.5 Nm *[9.2 ft-lbs]* ± 10%,
  material no. **R913000259**
  or
  4 hexagon socket head cap screws
  ISO 4762 - M6 x 90 - 10.9 [1)]
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 15.5 Nm *[11.4 ft-lbs]* ± 10%

  4 UNC hexagon socket head cap screws
  1/4-20 UNC x 3 1/2" [1)]
  (friction coefficient μ_{total} = 0.19 to 0.24);
  tightening torque $\boldsymbol{M}_A$ = 20 Nm *[14.8 ft-lbs]* ± 15%,
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 14 Nm *[10.4 ft-lbs]* ± 10%,
  material no. **R978800717**

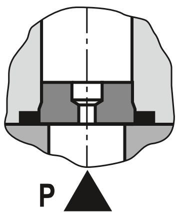
[1)] Not included in the Rexroth product range

Mating connectors according to DIN EN 175301-803

For details and more mating connectors, see data sheet 08006						
			Material no.			
Port	**Valve side**	Color	Without circuitry	With indicator light 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Zener diode suppression circuit 24 V
M16 x 1.5	a	Gray	**R901017010**	**–**	**–**	**–**
	a/b	Black	**R901017011**	**R901017022**	**R901017025**	**R901017026**
1/2" NPT (Pg16)	a	Red/Brown	**R900004823**	**–**	**–**	**–**
	a/b	Black	**R900011039**	**R900057453**	**R900842566**	**–**

Throttle insert

The use of a throttle insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

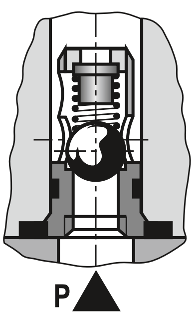


Examples:
- Accumulator operation
- Use as pilot control valve with internal pilot fluid tapping

2/2 and 3/2 directional seat valve
The throttle insert is inserted in port P of the seat valve.
4/2 directional seat valve (see page 5)
The throttle insert is inserted in port P of the Plus-1 plate.

Check valve insert

The check valve insert allows a free flow from P to A and closes A to P in a leak-free form.



2/2 and 3/2 directional seat valve (see page 4)
The check valve insert is inserted in port P of the seat valve.
4/2 directional seat valve (see page 5)
The check valve insert is inserted in port P of the Plus-1 plate.

General notes

Seat valves can be used according to the spool symbols as well as the assigned operating pressures and flows (see performance limits on page 9).
In order to ensure safe functioning, it is absolutely necessary to observe the following:

- In order to switch the valve safely or maintain it in its spool position, the pressure must be $p_P \geq p_A \geq p_T$ (for design reasons).
- Seat valves have a negative spool overlap, i.e. during the switching process, there is leakage oil. However, this process takes place within such a short time that it is irrelevant in nearly all applications.
- The specified maximum flow must not be exceeded (use a throttle insert for limiting the flow, if necessary)!

Plus-1 plate:

- If the Plus-1 plate (4/2 directional function) is used, the following lower operating values have to be observed: p_{min} = 8 bar; q_V > 3 l/min.
- The ports P, A, B and T are clearly specified according to their tasks. They must not be arbitrarily exchanged or closed!
- With 3- and 4-way spool position, port T must always be connected.
- Observe the pressure level and pressure distribution!
- The flow is only permitted in the direction of the arrow!

More information

▶ Directional spool and seat valves with electrical actuation and M12x1 plug-in connection	Data sheet 08010
▶ Inductive position switch and proximity sensors (contactless)	Data sheet 24830
▶ Mineral oil-based hydraulic fluids	Data sheet 90220
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ General product information on hydraulic products	Data sheet 07008
▶ Installation, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Hydraulic valves for industrial applications	Data sheet 07600-B
▶ Selection of the filters	www.boschrexroth.com/filter

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Hydraulics
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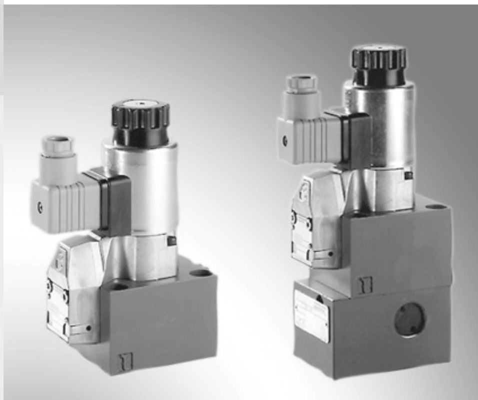
documentation@boschrexroth.de
www.boschrexroth.de

3/2 and 4/2 directional seat valve with solenoid actuation

RE 22075/07.09
Replaces: 04.07

Type M-.SEW

Size 10
Component series 1X
Maximum operating pressure 420/630 bar *[6100/9150 psi]*
Maximum flow 40 l/min *[10.6 US gpm]*



H4663 + 4664

Table of contents

Features

– Direct operated directional seat valve with solenoid actuation
– Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
– Blocked connection tight
– Safe switching also with longer standstill periods under pressure
– Air-gap DC voltage solenoids with detachable coil (AC voltage possible by means of a rectifier)
– Solenoid coil can be rotated by 90°
– Electrical connection as individual connection (for more electrical connections see RE 08010)
– with concealed manual override, optional
– Inductive position switch (contactless), optional, see RE 24830.

Information on available spare parts:
www.boschrexroth.com/spc

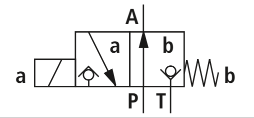
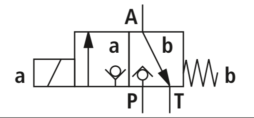
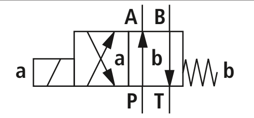
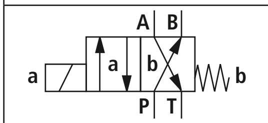
Ordering code

M –	SEW	10		1X /	M			K4	/		*

3 main ports = **3**
4 main ports = **4**

Seat valve

Size 10 = **10**

	Main ports	3	4	
Symbols		●	–	**= U**
		●	–	**= C**
		–	●	**= D**
		–	●	**= Y**

● = Available

Component series 10 to 19 = **1X**
(10 to 19: unchanged installation and connection dimensions)

Operating pressure 420 bar *[6100 psi]* = **420**
(Mounting screws M6)
Operating pressure 630 bar *[9150 psi]* = **630**
(Mounting screws M8)

Solenoid (air-gap) with detachable coil = **M**

DC voltage 24 V = **G24**
DC voltage 205 V = **G205** 2)

AC voltage mains (permissible voltage tolerance ±10 %)	**Nominal voltage of the DC voltage solenoid in case of operation with AC voltage)**	**Ordering code**
110 V - 50/60 Hz	96 V	**G96**
120 V - 60 Hz	110 V	**G110**
230 V - 50/60 Hz	205 V	**G205**

Further details in the plain text

Seal material
No code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

No code = without check valve insert, without throttle insert
P = with check valve insert
B12 = Throttle Ø 1.2 mm *[0.047 inch]*
B15 = Throttle Ø 1.5 mm *[0.059 inch]*
B18 = Throttle Ø 1.8 mm *[0.071 inch]*
B20 = Throttle Ø 2.0 mm *[0.079 inch]*
B22 = Throttle Ø 2.2 mm *[0.087 inch]*

Spool position monitoring
No code = without position switch
QMAG24 = Monitored spool position "a"
QMBG24 = Monitored spool position "b"
For further details see RE 24830

Electrical connection
K4 1;2) **=** without mating connector, individual connection with connector DIN EN 175301-803

N9 = **with** concealed manual override
No code = **without** manual override

1) Mating connectors, separate order, see page 12.

2) For connection to the AC voltage mains, a DC voltage solenoid **must** be used, which is controlled via a rectifier (see table above).
In case of individual connections, a mating connector with integrated rectifier can be used (separate order, see page 12).

Standard types and units are contained in the EPS (standard price list).

Function, section, symbols: 3/2-directional seat valve

General
The directional valve type M-.SEW is a directional seat valve with solenoid actuation. It controls start, stop and direction of the flow.

It basically comprises a housing (1), the solenoid (2), the hardened valve system (3) and the spool (8) as closing element.

Basic principle
In the initial position, the spool (8) is pressed onto the seat by the spring (9), in spool position by the solenoid (2). The force of the solenoid (2) acts via the angled lever (6) and the ball (7) on the spool (8) which is sealed on two sides. The space between the two sealing elements is connected to port P. Thus, the valve system (3) is pressure-compensated in relation to the actuating forces (solenoid or return spring). The valves can therefore be used up to 630 bar *[9150 psi]*.

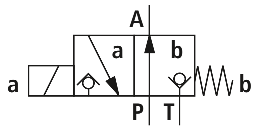
☞ **Note!**
- 3/2-directional seat valves feature a “negative spool underlap”. For this reason, port T must always be connected. This means that during the switching process - when one valve seat starts to open until the other valve seat is closed - ports P-A-T are connected to each other. This process takes, however, place within such a short time that it is irrelevant in nearly all applications.
- The manual override (10) allows for the switching of the valve without solenoid energization.

Attention!

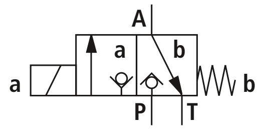
Care must moreover be taken that the specified maximum flow is not exceeded! If required, a throttle insert must be used to limit the flow (see page 12).

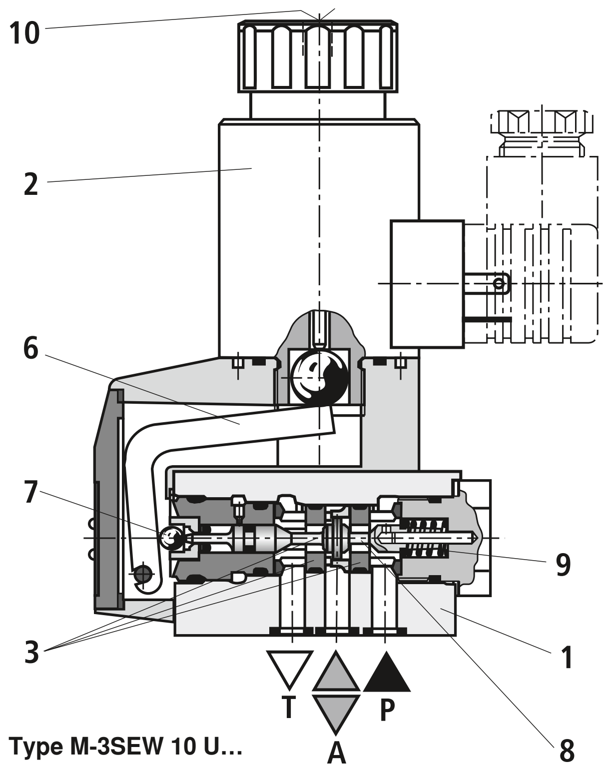
The seat arrangement offers the following options:

Symbol “U”:



Symbol “C”:





Type M-3SEW 10 U…

Function, section, symbols: 4/2 directional seat valve

With a sandwich plate, the Plus-1 plate, under the 3/2 directional seat valve, the function of the 4/2 directional seat valve can be achieved.

Function of the Plus-1 plate:

Initial position
The main valve is not operated. The spring (9) holds the ball (4) on the seat (11). Port P is blocked and A connected to T. Moreover, one pilot line is connected from A to the large area of the control spool (12), which is thus unloaded to the tank. The pressure applied via P now pushes the ball (13) onto the seat (14). P is now connected to B, and A to T.

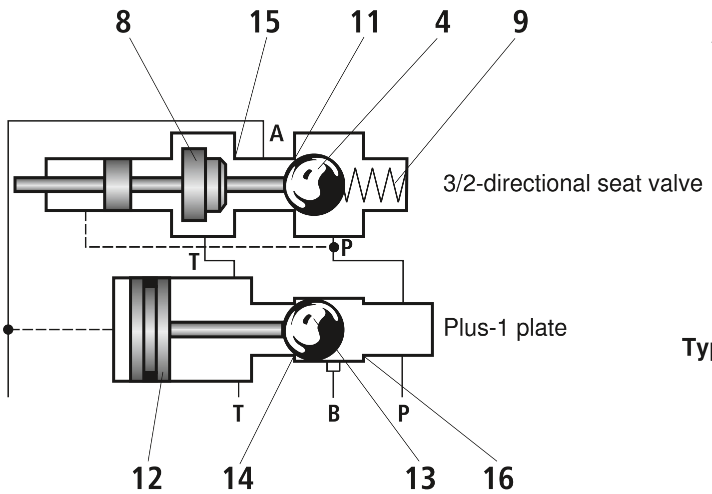
Transition position
When the main valve is operated, the spool (8) is shifted against the spring (9) and pressed onto the seat (15). During this, port T is closed, P, A, and B are briefly connected to each other.

Spool position 0
P is connected to A. Because the pump pressure acts via A on the large area of the control spool (12), the ball (13) is pressed onto the seat (16). Thus, B is connected to T, and P to A. The ball (13) in the Plus-1 plate has a "positive spool underlap".

Attention!

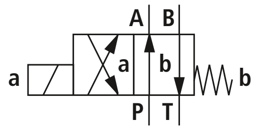
To prevent pressure intensification in conjunction with single-rod cylinders, the annulus area of the cylinder must be connected to A.

Schematic illustration: Initial position

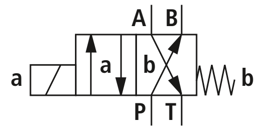


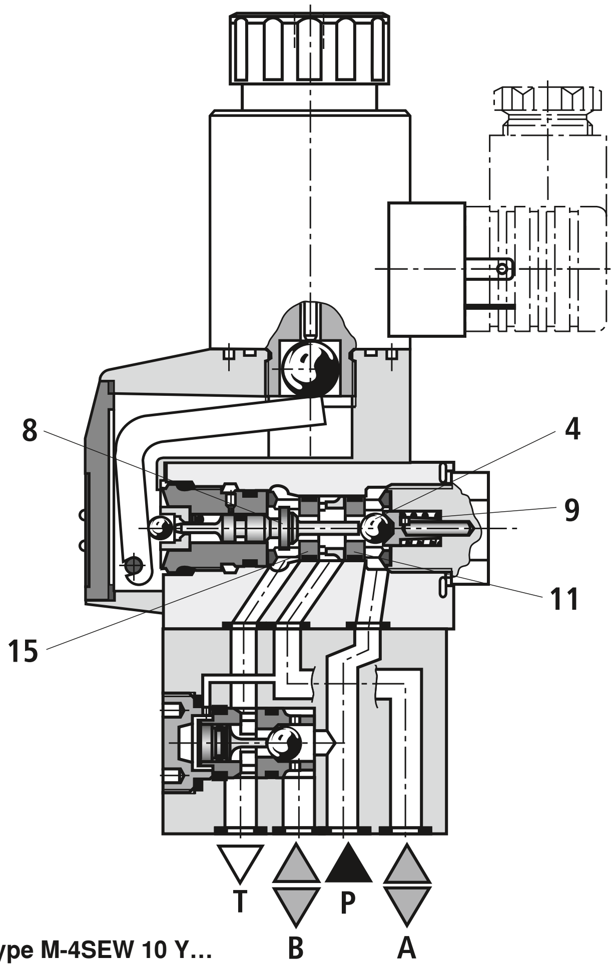
The use of the Plus-1 plate and the seat arrangement offer the following options:

Symbol "D":



Symbol "Y":





Type M-4SEW 10 Y…

Technical data (For applications outside these parameters, please consult us!)

general

Weight	– 3/2-directional seat valve	kg *[lbs]*	2.0 *[4.41]*
	– 4/2 directional seat valve	kg *[lbs]*	3.5 *[7.72]*
Installation position			Any
Ambient temperature range		°C *[°F]*	–30 to +50 *[–22 to +122]* (NBR seals) –20 to +50 *[–4 to +122]* (FKM seals)

hydraulic

Maximum operating pressure	bar *[psi]*	See performance limit page 7
Maximum flow	l/min *[US gpm]*	40 *[10.6]*
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524 1); Fast biodegradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) 1); HEPG (polyglycols) 2); HEES (synthetic esters) 2); other hydraulic fluids upon request
Hydraulic fluid temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 500 *[15 to 2300]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 3)

electrical

Type of voltage			Direct voltage	Alternate voltage
Available voltages 4)		V	12, **24**, 42, 96, 110, 205, 220	Only possible via rectifier (see page 12)
Voltage tolerance (nominal voltage)		%	±10	
Power consumption		W	30	
Duty cycle		%	100	
Switching time according to ISO 6403	– ON	ms	25 to 60 (without rectifier) 30 to 70 (with rectifier)	
	– OFF		10 to 20 (without rectifier) 30 to 70 (with rectifier)	
Maximum switching frequency	– Operating pressure ≤ 350 bar	1/h	15000	
	– Operating pressure > 350 bar	1/h	3600	
Protection class according to DIN EN 60529			IP 65 (with mating connector mounted and locked)	
Maximum surface temperature of the spool 5)		°C *[°F]*	120 *[248]*	

1) Suitable for NBR and FKM seals

2) Only suitable for FKM seals

3) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For selecting the filters, see datasheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

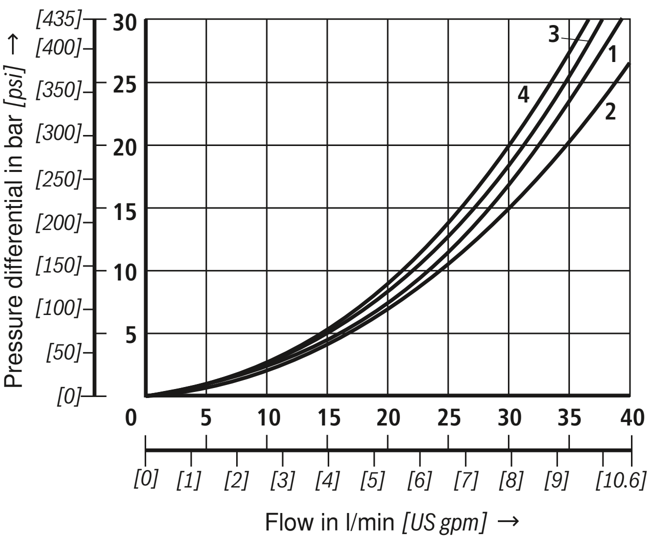
4) Special voltages upon request

5) Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

When establishing the electrical connection, the protective earthing conductor (PE ⏚) must be properly connected.

Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Δp-q_V characteristic curves
3/2-directional seat valve



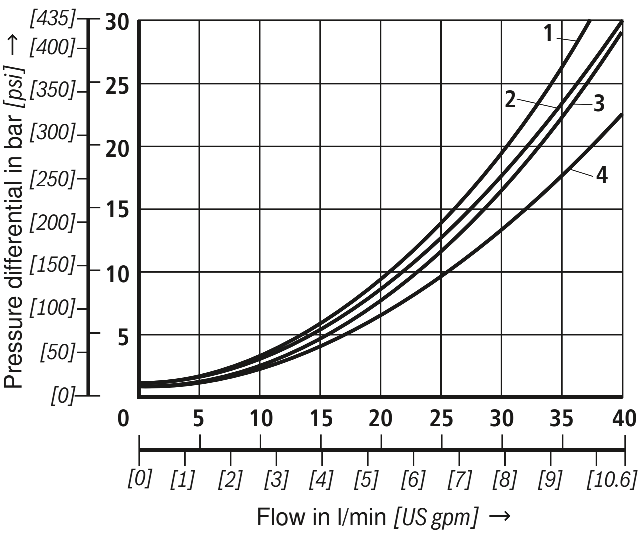
1 M-3SEW 10 **C** …, P to A

2 M-3SEW 10 **C** …, A to T

3 M-3SEW 10 **U** …, P to A

4 M-3SEW 10 **U** …, A to T

Δp-q_V characteristic curves
4/2-directional seat valve



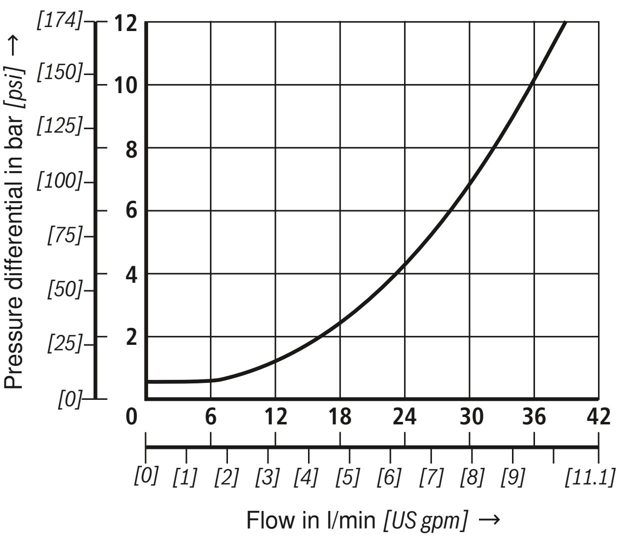
1 M-4SEW 10 **D**/**Y** …, A to T

2 M-4SEW 10 **D**/**Y** …, P to A

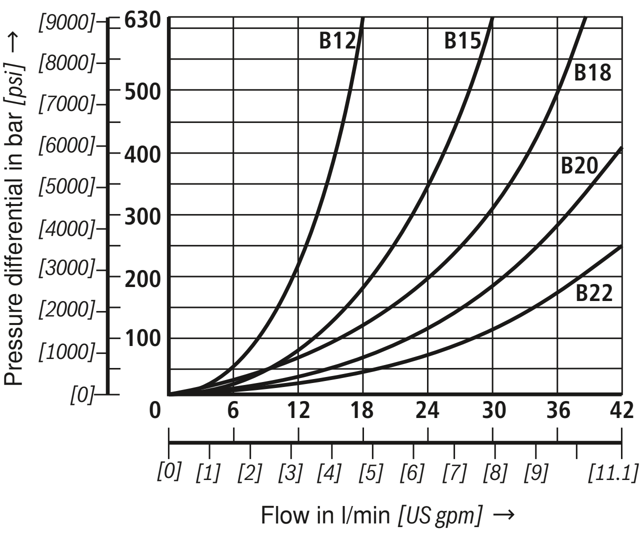
3 M-4SEW 10 **D**/**Y** …, P to B

4 M-4SEW 10 **D**/**Y** …, B to T

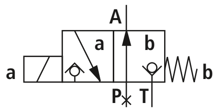
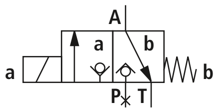
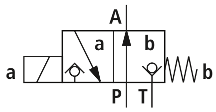
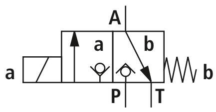
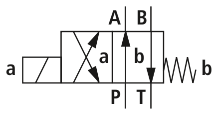
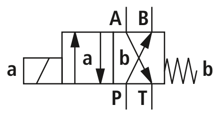
Δp-q_V characteristic curves
Check valve insert



Δp-q_V characteristic curves
Throttle insert



Performance limit (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

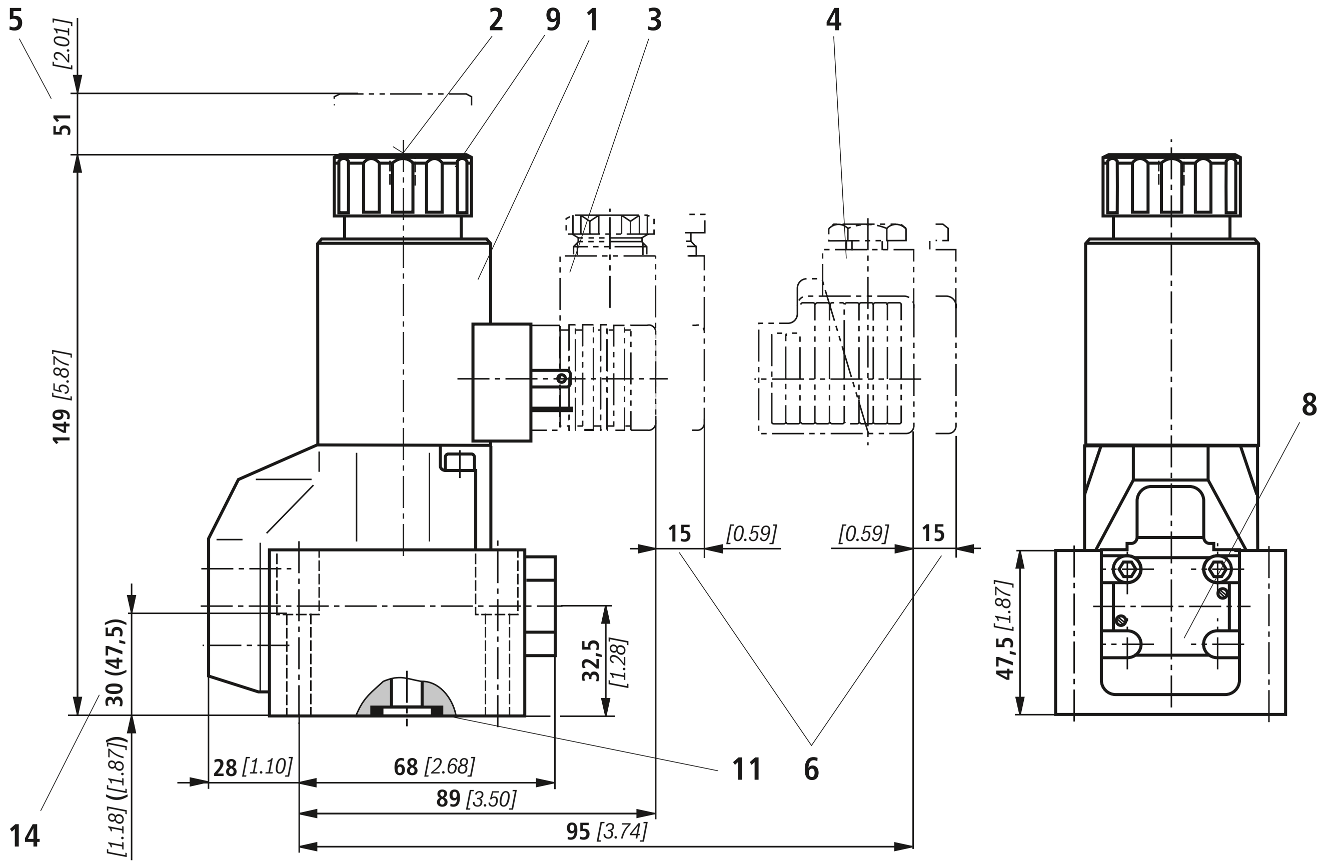
		Symbol	Comment	Maximum operating pressure in bar *[psi]* P	A	B	T	Flow in l/min *[US gpm]*
2-way circuit (3/2-directional seat valve) Only as unloading function	**U**		Before switching from the initial position to the spool position, pressure must be applied in port A. $\boldsymbol{p}_A \geq \boldsymbol{p}_T$		420/630 *[6100/ 9150]*		100 *[1450]*	40 *[10.6]*
	C		$\boldsymbol{p}_A \geq \boldsymbol{p}_T$		420/630 *[6100/ 9150]*		100 *[1450]*	40 *[10.6]*
3-way circuit	**U**		$\boldsymbol{p}_P \geq \boldsymbol{p}_A \geq \boldsymbol{p}_T$	420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*		100 *[1450]*	40 *[10.6]*
	C			420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*		100 *[1450]*	40 *[10.6]*
4-way circuit (flow only possible in the direction of arrow!)	**D**		3/2-directional valve (symbol “U”) in connection with Plus-1 plate: $\boldsymbol{p}_P > \boldsymbol{p}_A \geq \boldsymbol{p}_B > \boldsymbol{p}_T$	420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*	100 *[1450]*	40 *[10.6]*
	Y		3/2-directional valve (symbol “C”) in connection with Plus-1 plate: $\boldsymbol{p}_P > \boldsymbol{p}_A \geq \boldsymbol{p}_B > \boldsymbol{p}_T$	420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*	420/630 *[6100/ 9150]*	100 *[1450]*	40 *[10.6]*

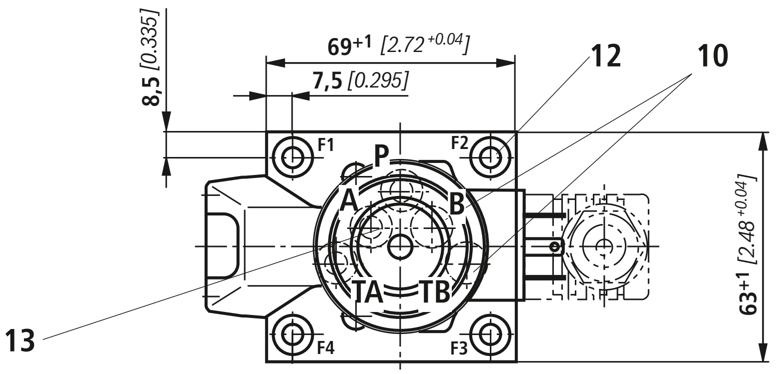
Attention!

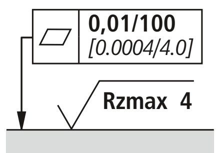
Please observe the general notes on page 12!

The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank pre-loading.

Unit dimensions: 3/2-directional seat valve (dimensions in mm *[inch]*)



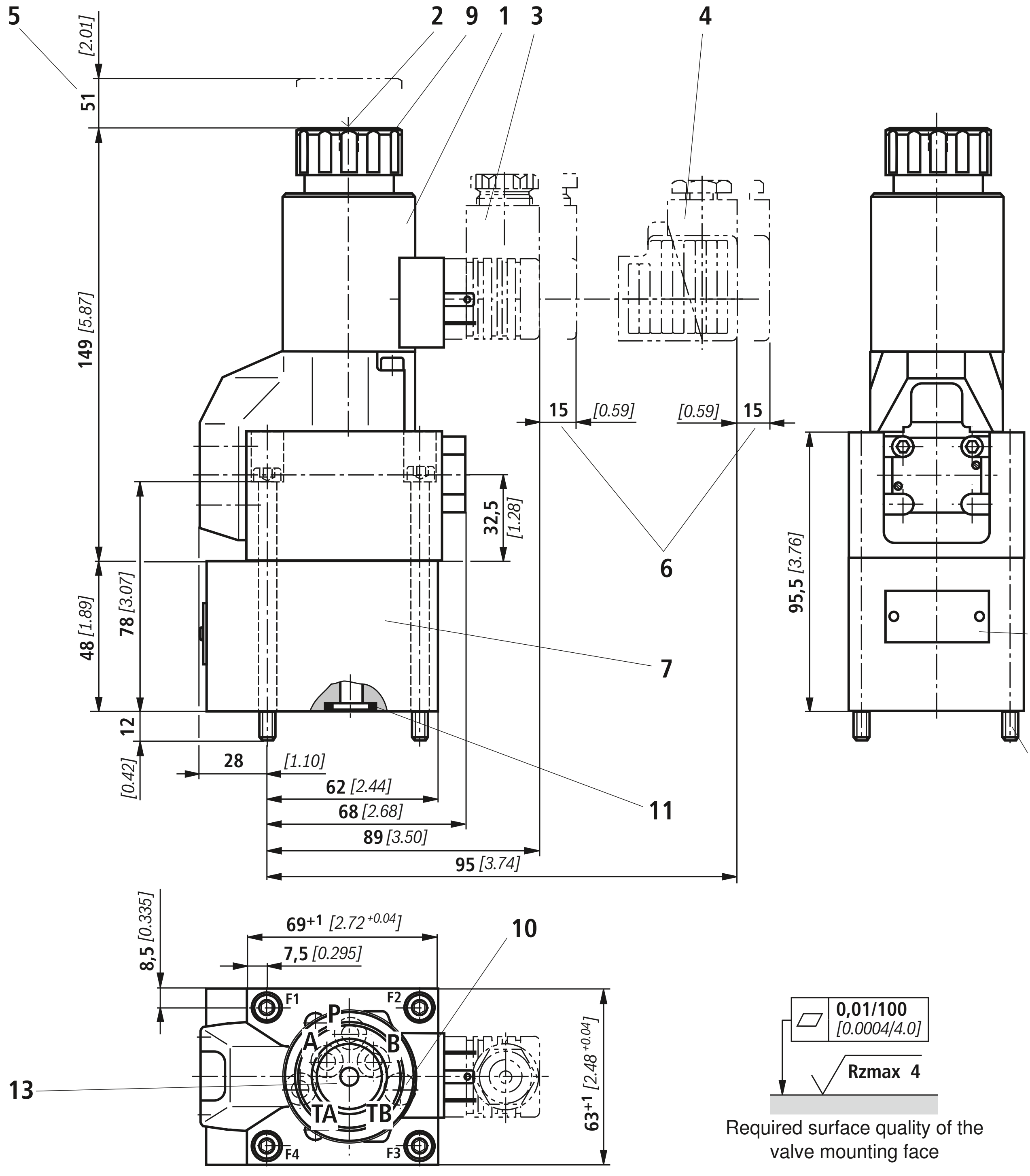




Required surface quality of the valve mounting face

Position explanations and valve mounting screws see page 11.

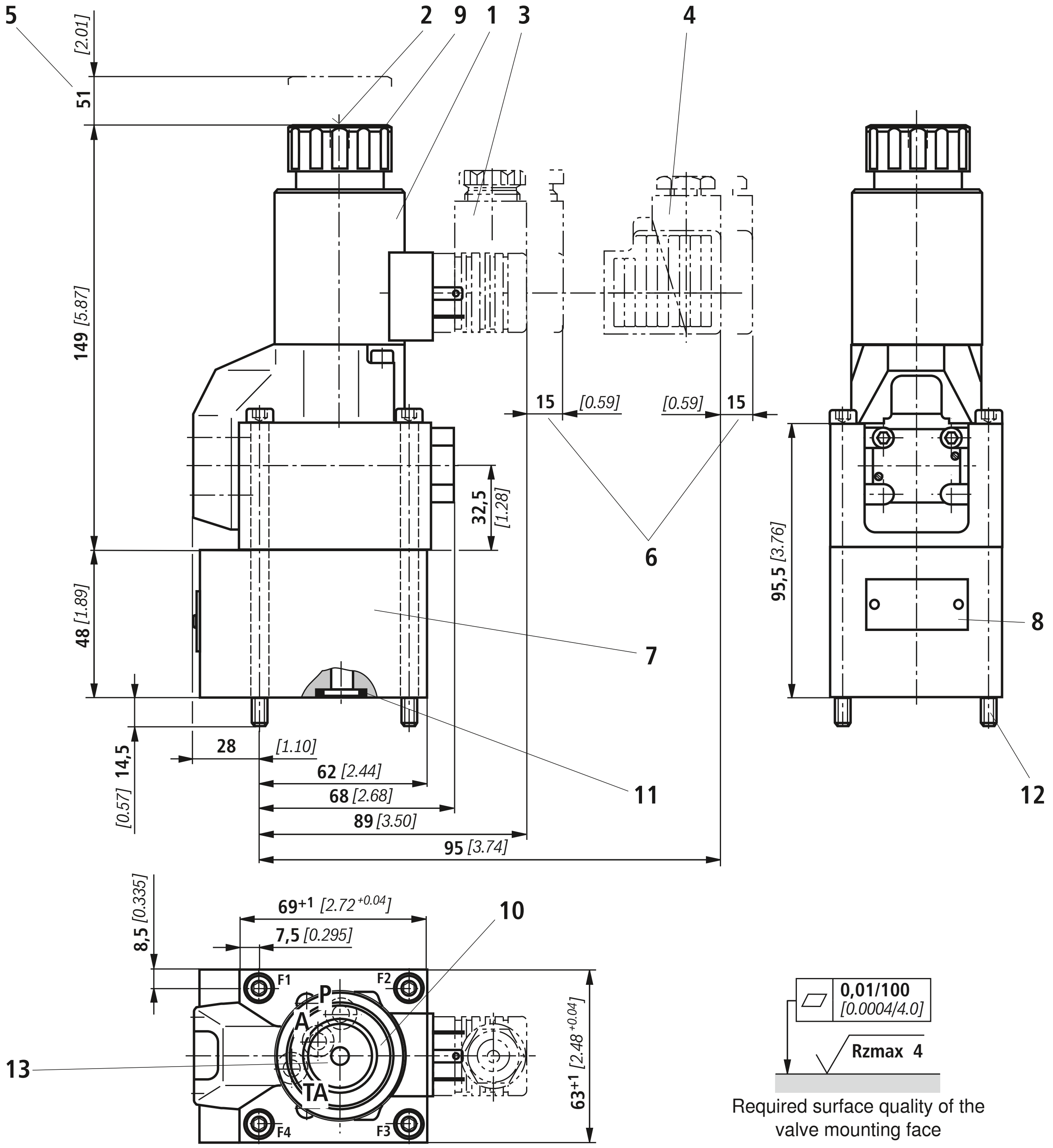
Unit dimensions: 4/2 directional seat valve, version "420" (dimensions in mm *[inch]*)



Required surface quality of the valve mounting face

Position explanations and valve mounting screws see page 11.

Unit dimensions: 4/2 directional seat valve, version “630” (dimensions in mm *[inch]*)



Required surface quality of the valve mounting face

Position explanations and valve mounting screws see page 11.

Unit dimensions

1 Solenoid “a”

2 Concealed manual override “N9”

3 Mating connector **without** circuitry (separate order, see page 12)

4 Mating connector **with** circuitry (separate order, see page 12)

5 Space required for removing the coil

6 Space required for removing the mating connector

7 Plus-1 plate

8 Nameplate

9 Lock nut, tightening torque M_A = 4^{+1} Nm *[$2.95^{+0.74}$ ft-lbs]*

10 **Attention!**
- Ports B and TB are provided on 3/2-directional seat valves in version “420” as blind counterbore, and not provided for version “630”.
- Port TB is provided as blind counterbore on 4/2 directional seat valves in version “420”.
- Ports B and TB are not provided on 4/2 directional seat valves in version “630”.

11 Identical seal rings for ports A, B, TA, and TB; seal ring for port P

12 Valve mounting screws see below

13 Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05

14 30 (420 bar); 47.5 (630 bar)

Valve mounting screws

3/2-directional seat valve (separate order)

– 420 bar *[6100 psi]* version:
4 hexagon socket head cap screws metric
ISO 4762 - M6 x 40 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque M_A = 12.5 Nm *[9.2 ft-lbs]* ±10 %,
Material no. **R9130001058**
or
4 hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 15.5 Nm *[11.4 ft-lbs]* ±10 %

4 hexagon socket head cap screws UNC
1/4-20 UNC x 1 1/2” (self procurement)
(friction coefficient μ_{total} = 0.19 to 0.24 according to ASTM-574);
Tightening torque M_A = 20 Nm *[14.8 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17 according to ISO 4762);
Tightening torque M_A = 14 Nm *[10.3 ft-lbs]* ±15 %,
Material no. **R978800710**

– 630 bar *[9150 psi]* version:
4 hexagon socket head cap screws metric
ISO 4762 - M8 x 60 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque M_A = 30 Nm *[22.1 ft-lbs]* ±10 %,
Material no. metric **R913000217**
or
4 hexagon socket head cap screws
ISO 4762 - M8 x 60 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 37 Nm *[27.3 ft-lbs]* ±10 %

4 hexagon socket head cap screws UNC
5/16-18 UNC x 2” (self procurement)
(friction coefficient μ_{total} = 0.19 to 0.24 according to ASTM-574);
Tightening torque M_A = 40 Nm *[29.5 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17 according to ISO 4762);
Tightening torque M_A = 28 Nm *[20.7 ft-lbs]* ±15 %,
Material no. **R978800730**

4/2 directional seat valve (included in scope of delivery)

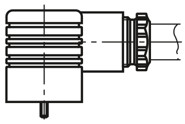
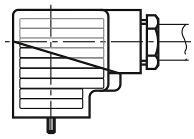
– 420 bar *[6100 psi]* version:
4 hexagon socket head cap screws metric
ISO 4762 - M6 x 90 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque M_A = 12.5 Nm *[9.2 ft-lbs]* ±10 %,
Material no. **R913000259**
or
4 hexagon socket head cap screws
ISO 4762 - M6 x 90 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 15.5 Nm *[11.4 ft-lbs]* ±10 %

4 hexagon socket head cap screws UNC
1/4-20 UNC x 3 1/2” (self procurement)
(friction coefficient μ_{total} = 0.19 to 0.24 according to ASTM-574);
Tightening torque M_A = 20 Nm *[14.8 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17 according to ISO 4762);
Tightening torque M_A = 14 Nm *[10.3 ft-lbs]* ±15 %,
Material no. **R978800717**

– 630 bar *[9150 psi]* version:
4 hexagon socket head cap screws metric
ISO 4762 - M8 x 110 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque M_A = 30 Nm *[22.1 ft-lbs]* ±10 %,
Material no. **R913000260**
or
4 hexagon socket head cap screws
ISO 4762 - M8 x 110 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 37 Nm *[27.3 ft-lbs]* ±10 %

4 hexagon socket head cap screws UNC
5/16-18 UNC x 4 1/4” (self procurement)
(friction coefficient μ_{total} = 0.19 to 0.24);
Tightening torque M_A = 40 Nm *[29.5 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 28 Nm *[20.7 ft-lbs]* ±15 %

Mating connectors according to DIN EN 175301-803

Details and more mating connectors see RE 08006						
			Material no.			
Connection	**Valve side**	**Color**	without circuitry	with indicator light 12 … 240 V	with rectifier 12 … 240 V	with indicator light and Zener diode suppression circuit 24 V
M16 x 1.5	a	Gray	**R901017010**	–	–	–
	a/b	Black	**R901017011**	**R901017022**	**R901017025**	**R901017026**
1/2” NPT (Pg16)	a	Red/brown	**R900004823**	–	–	–
	a/b	Black	**R900011039**	**R900057453**	**R900842566**	–

Throttle insert

The use of a throttle insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

Examples:

– Accumulator operation,

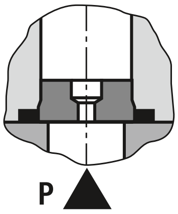
– Use as pilot control valve with internal pilot fluid tapping.

3/2-directional seat valve (see page 3)

The throttle insert is inserted in port P of the seat valve.

4/2 directional seat valve (see page 4)

The throttle insert is inserted in port P of the Plus-1 plate.



Check valve insert

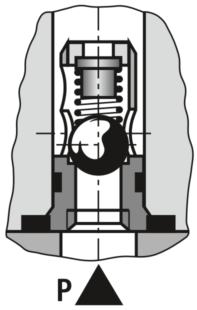
The check valve insert allows a free flow from P to A and closes A to P in a leak-free form.

3/2-directional seat valve (see page 3)

The check valve insert is inserted in port P of the seat valve.

4/2 directional seat valve (see page 4)

The check valve insert is inserted in port P of the Plus-1 plate.



General Notes

– In order to switch the valve safely or maintain it in its spool position, the pressure situation must be as follows: P ≥ A ≥ T (for design reasons).

– Ports P, A and TA (3/2 directional seat valve) as well as P, A, B and TA (4/2 directional seat valve) are clearly assigned according to their function. They must not be exchanged or closed. The flow is only permitted in the direction of arrow.

– When the Plus-1 plate (4/2-directional function) is used, the following lower operating values must be taken into account: p_{min} = 8 bar; q_V > 3 l/min.

– The total flow of the valve must not be exceeded.

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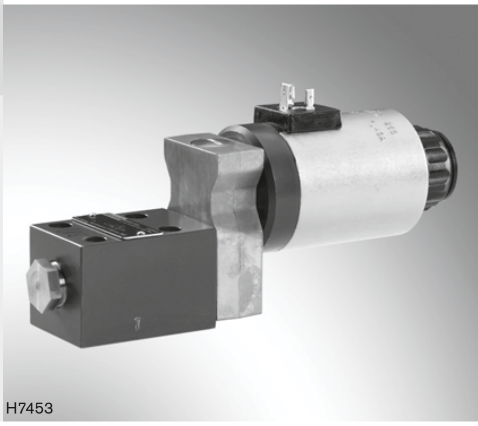
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

3/2 and 4/2 directional poppet valve, with solenoid operation, for water emulsions and water

RE 22042/03.07
Replaces: 22048

Type .-.SE

Size 6
Component series 7X
Maximum operating pressue 630 bar
Maximum flow 25 l/min



H7453

Table of contents

Contents	**Page**

Features

– Direct operated directional poppet valve with solenoid operation
– Porting pattern to ISO 4401-03-02-0-05 (**with** locating bore)
– Air gap DC solenoid
– Electrical connection as individual connection
– Port is leak-free closed
– Reliable operation even when under pressure over longer periods of time

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

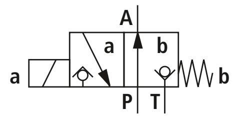
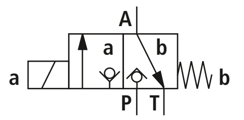
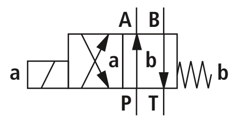
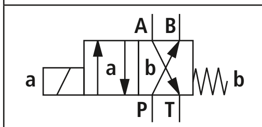
–	SE	6		7X/				K4			*

Oil-in-water emulsion, water glycol, mineral oil = **E**
Water = **W**

3 main ports = **3**
4 main ports = **4**

Poppet valve, electrically operated

Size 6 = **6**

	Main ports	3	4	
Symbols		●	–	= **U**
		●	–	= **C**
		–	●	= **D**
		–	●	= **Y**
		● = available		

Component series 70 to 79 (70 to 79: unchanged installation and connection dimensions) = **7X**

With spring return = **No code**
With detent = **F**

Operating pressure up to 420 bar = **420**
Operating pressure up to 630 bar = **630**

G24 = 24 V DC
G205 [2] **=** 205 V DC
G96 = 96 V DC
For further ordering codes for other voltages, see page 7

N9 = With concealed manual override (standard)
No code = Without manual override

Electrical connection
K4 [1] **=** Without mating connector
Individual connection with component plug to DIN EN 175301-803

No code = Without check valve insert, without throttle insert
P = With check valve insert
B08 = Throttle Ø0.8 mm
B10 = Throttle Ø1.0 mm
B12 = Throttle Ø1.2 mm
B15 = Throttle Ø1.5 mm
B18 = Throttle Ø1.8 mm
B20 = Throttle Ø2.0 mm

Seal material
No code = NBR seals
V = FKM seals
(other seals on request)
⚠ **Important!**
Observe compatibility of seals with hydraulic fluid used!

No code = Without locating bore
/62 = With locating bore and locating pin ISO 8752-3x8-St

Further details in clear text

AC mains (permissible voltage tolerance ± 10%)	**Nominal voltage of the DC solenoid when operated with AC voltage**	**Order-ing code**
110 V - 50/60 Hz	96 V	**G96**
120 V - 60 Hz	110 V	**G110**
230 V - 50/60 Hz	205 V	**G205**

[1] Mating connectors must be ordered separately (see page 14).

[2] For connection to AC mains, a DC solenoid **must** be used, which is controlled via a rectifier (see table on the left).

A mating connector with integrated rectifier may be used (separate order, see page 14).

For standard types, see page 6!

Function, section, symbols: 3/2 directional poppet valve

General

Directional valves of type .-.SE are directional poppet valves with solenoid operation. They control the start, stop and direction of a flow.
They basically consist of a housing (1), solenoid (2), a hardened valve system (3), and ball (4) as closing element.

Basic principle

In the starting position, ball (4) is pressed by spring (8) onto the seat, in the operated condition by solenoid (2). The force of solenoid (2) acts via angled lever (5) and ball (6) on the sealed actuating plunger (7). The chamber between the two sealing elements is connected to port P. This ensures that the valve system is pressure-compensated in relation to the actuating forces (solenoid or return spring). The valves can therefore be operated up to 630 bar.

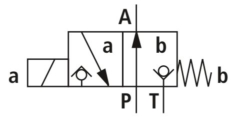
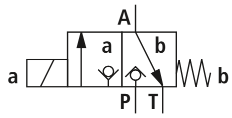
☞ **Note!**

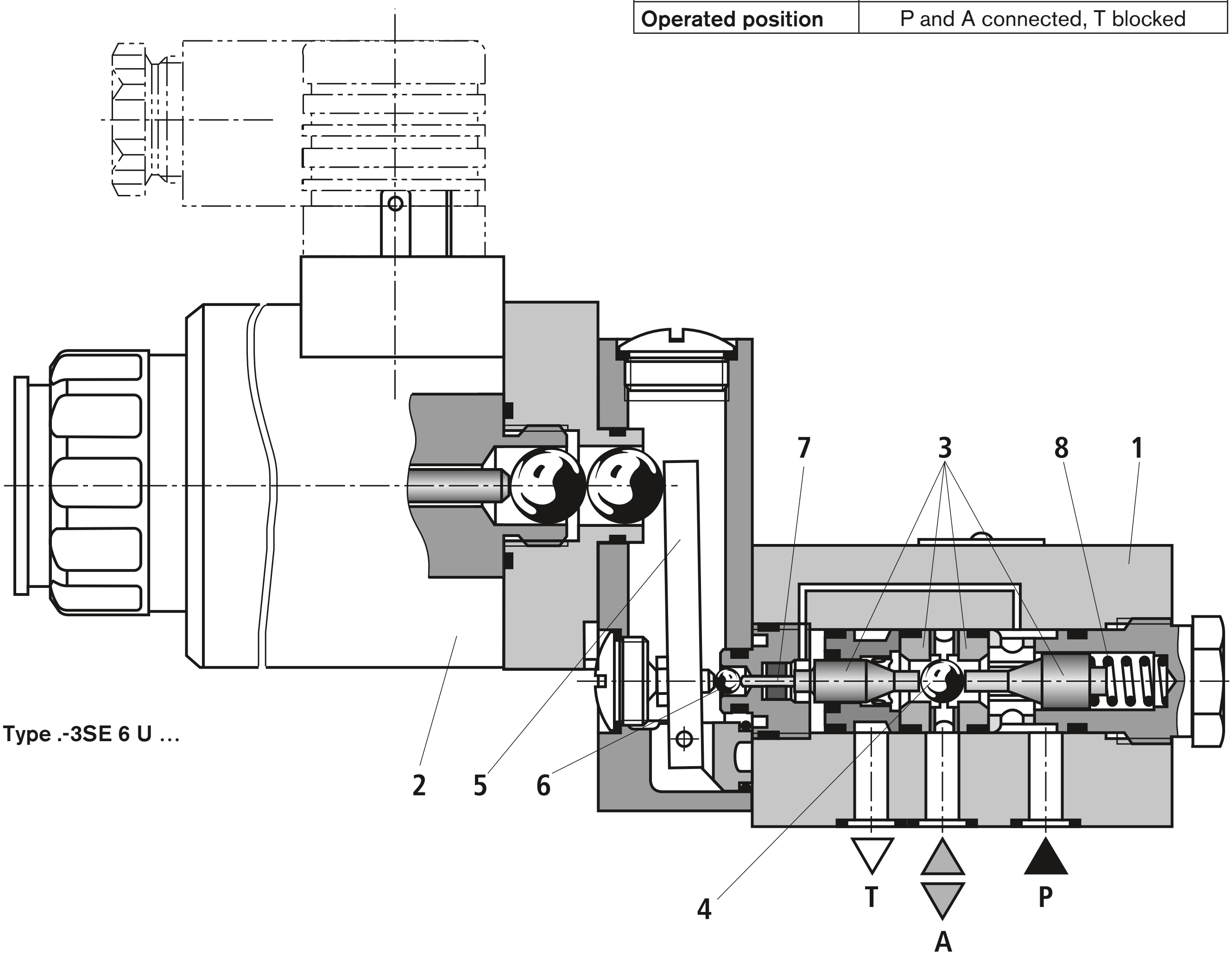
– 3/2 directional seat valves feature a "negative overlap". For this reason, port T must always be connected. This means that during the switching process – when one of the valve seats starts to open until the other valve seat is closed – ports P–A–T are connected to each other. This process takes, however, place in such a short time that it is irrelevant in nearly all applications.
– A manual override allows the valve to be operated without energisation of the solenoid.

⚠ **Important!**

Care must be taken that the specified maximum flow is not exceeded! If required, a throttle insert must be used for limiting the flow (see page 14).

The seat arrangement offers the following options:

Symbol	"U"
	
Starting position	P and A connected, T blocked
Operated position	P blocked, A and T connected
Symbol	"C"
	
Starting position	P blocked, A and T connected
Operated position	P and A connected, T blocked



Type .-3SE 6 U ...

Function, sections, symbols: 3/2 directional poppet valve – with detent

In principle, the function of this valve corresponds to that of the variant without detent.

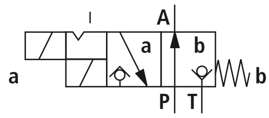
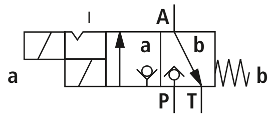
The detent allows the valve to remain in the operated position, even when no solenoid is energised. Due to this, it is possible that the valve dwells independently at both positions.

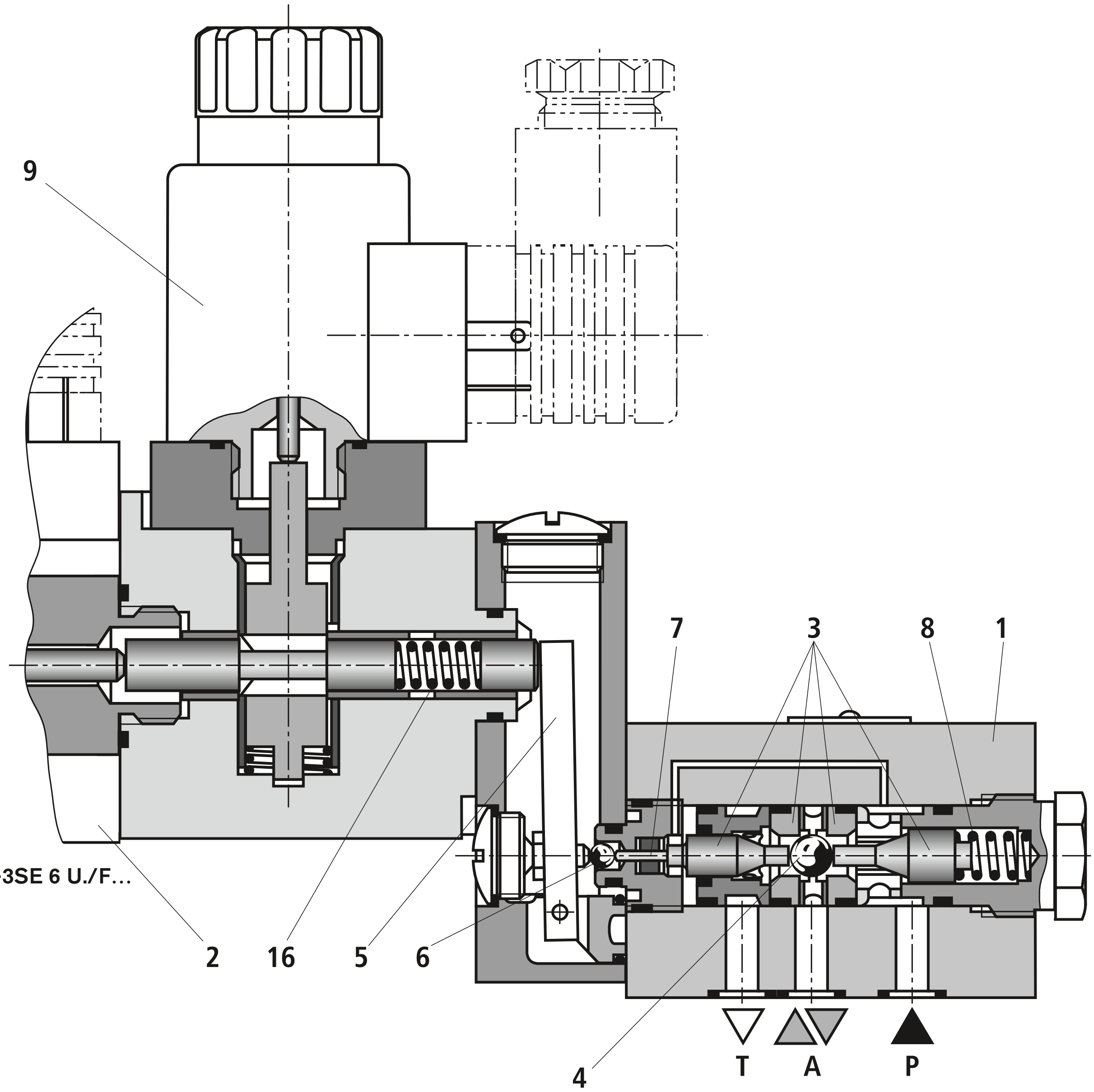
Function of the detent:

Solenoid (2) switches the valve to the position, which is automatically detented. After the switching process was completed, the switching solenoid can be deactivated.

To leave the detented position solenoid (9) must be energised for at least 100 ms. The integrated spring (16) returns the valve to its starting position.

The seat arrangement offers the following options:

Symbol	"U"
	
Starting position	P and A connected, T blocked
Operated position	P blocked, A and T connected
Symbol	"C"
	
Starting position	P blocked, A and T connected
Operated position	P and A connected, T blocked



Type .-3SE 6 U./F…

Function, section, symbols: 4/2 directional poppet valve

With the help of a sandwich plate, the **Plus-1 plate**, under the 3/2 directional poppet valve, the function of a 4/2 directional poppet valve can be realised.

Function of the Plus-1 plate:

– Starting position:
The main valve is not operated. Spring (8) holds ball (4.2) on seat (11). Port P is blocked, and A is connected to T. In addition, a pilot line is connected from A to the large area of pilot piston (12), which is hence unloaded to the tank. The pressure applied via P now pushes ball (13) onto seat (14). P is now connected to B, and A to T.

– Transitional position:
When the main valve is operated, ball (4.1) is shifted against spring (8) and pushed onto seat (15). This causes blocking of port T; P, A, and B are briefly connected.

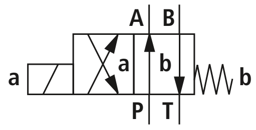
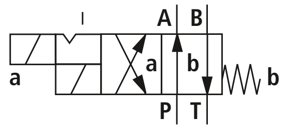
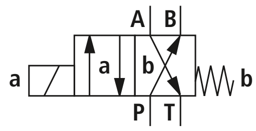
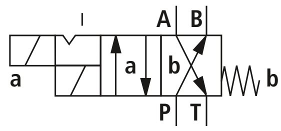
– Operated position:
P is connected to A. Because the pump pressure acts via the large area of pilot piston (12), ball (13) is pushed onto seat (10). Consequently, B is connected to T, and P to A. Ball (13) in the Plus-1 plate has a "positive overlap".

⚠ **Important!**

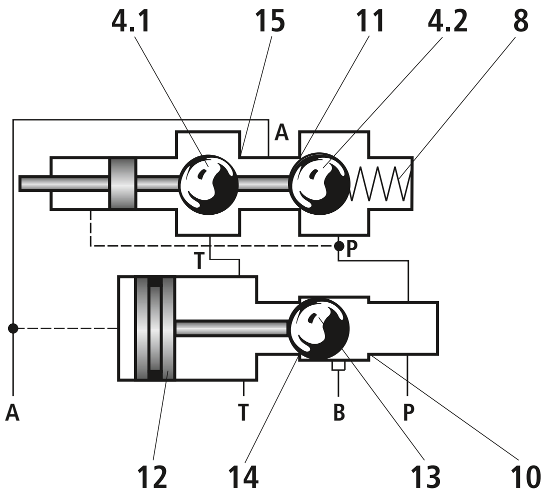
In order to prevent pressure intensification when using single-rod cylinders, the annulus area of the cylinder must be connected to A.

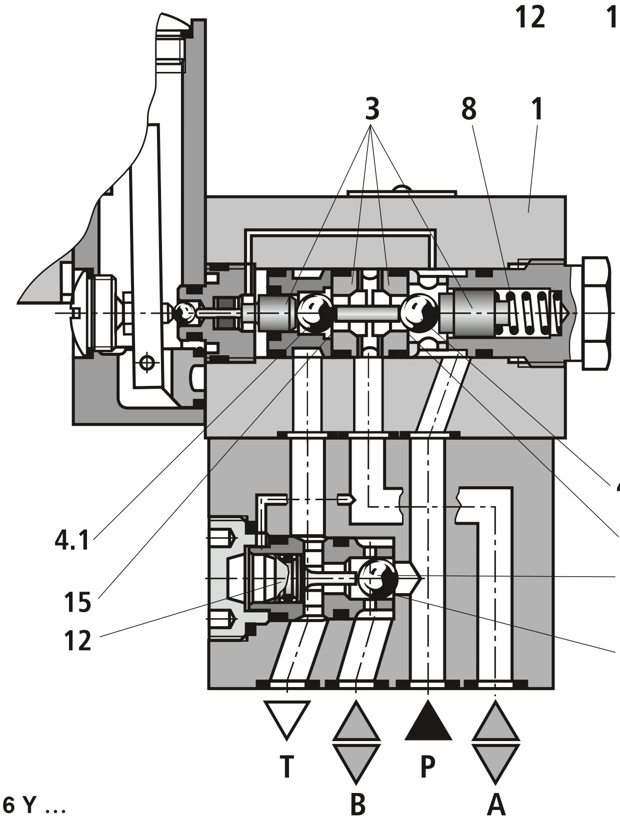
4/2 directional seat valves with detent analogously to 3/2 directional poppet valve (see page 4).

The use of the Plus-1 plate and the seat arrangement offer the following options:

	Without detent	With detent
Symbol "D"		
Symbol "Y"		

Schematic drawing: Starting position





Type .-4SE 6 Y …

Standard types

Type	Material number
W-3SE 6 C7X/420G24N9K4	R901138504
W-3SE 6 U7X/420G24N9K4	R901138702

Type	Material number
E-3SE 6 C7X/420G24N9K4	R901138718
E-3SE 6 C7X/630G24N9K4	R901138758
E-3SE 6 U7X/630G24N9K4	R901138401

Further standard types and components are shown in the EPS (standard price list).

Technical data (for applications outside these parameters, please consult us!)

General

Weight	– 3/2 directional poppet valve	• without detent	kg	3.8
		• with detent	kg	5.6
	– 4/2 directional poppet valve	• without detent	kg	4.6
		• with detent	kg	6.4
Installation position				Optional
Ambient temperature range			°C	5 to 50 (with water, oil-in-water emulsion and water glycol)
			°C	–15 to +50 (with mineral oil)

Hydraulic

Maximum operating pressure		bar	see table "Performance limit" on page 9
Maximum flow		l/min	25
Hydraulic fluid	– Type **W**-.SE 6 …		Water
	– Type **E**-.SE 6 …		Oil-in-water emulsion, water glycol, mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on request
Hydraulic fluid temperature range		°C	5 to 55 (with water, oil-in-water emulsion and water glycol)
		°C	–15 to +80 (with mineral oil)
Viscosity range		mm^2/s	0.6 to 500
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [3]

[1] Suitable for NBR and FKM seals

[2] Suitable only for FKM seals

[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Technical data (for applications outside these parameters, please consult us!)

Electrical

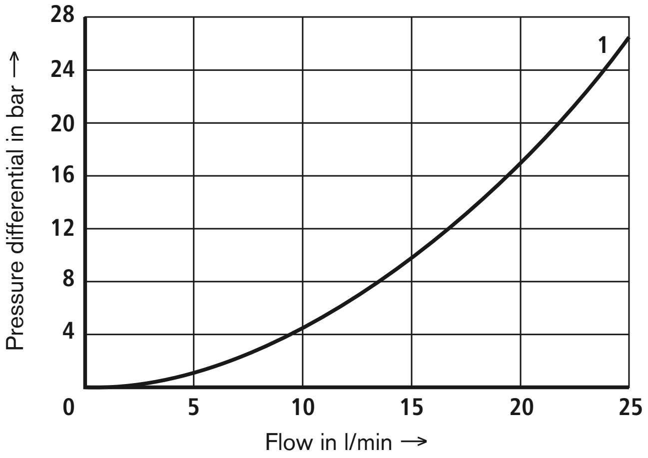
Type of voltage			DC voltage	AC voltage
Available voltages		V	12; 24; 42; 48; 96; 110; 205 (further voltages on request)	Only possible via rectifier (see page 14)
Voltage tolerance (nominal voltage)		%	±10	
Power consumption	– Valve solenoid	W	35	
	– Detent solenoid	W	30	
Duty cycle			S1 (continuous operation)	
Switching time to ISO 6403	ON	ms	40 to 70 (420 bar); 50 to 80 (630 bar)	
	OFF	ms	20 to 30 (420 bar); 15 to 40 (630 bar)	
Maximum switching frequency		1/h	3600	
Maximum coil temperature [4]		°C	150	
Type of protection to EN 60529			IP 65 with mating connector mounted and locked	

[4] Due to the surface temperatures of solenoid coils, European standards EN 563 and EN 982 must be observed!

For the electrical connection, the protective earth conductor (PE ⏚) must be properly connected.

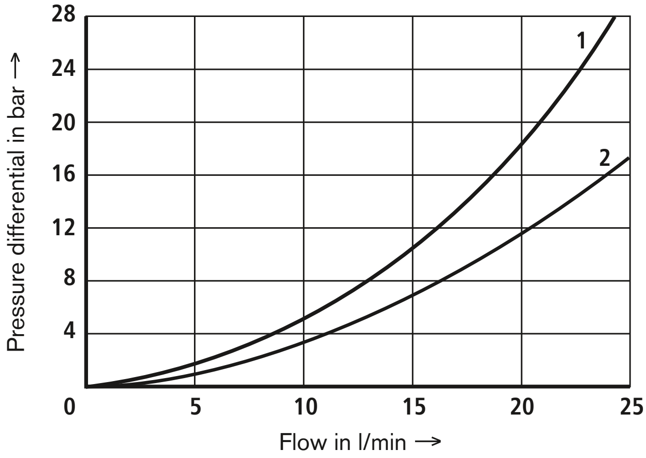
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Δp-q_V characteristic curve
3/2 directional poppet valve



1 A to T
P to A

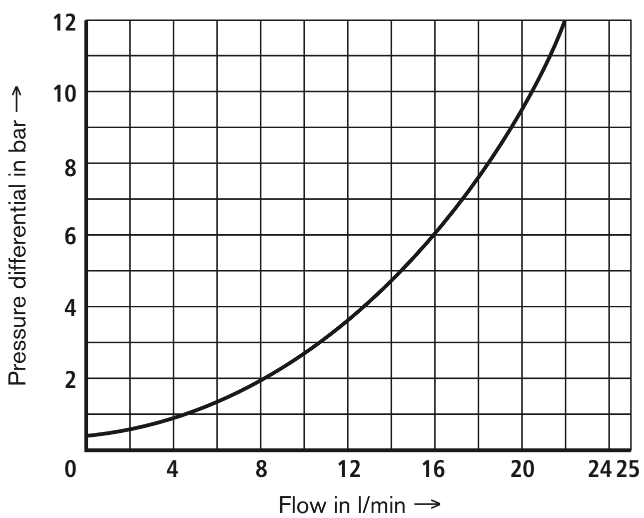
Δp-q_V characteristic curves
4/2 directional poppet valve



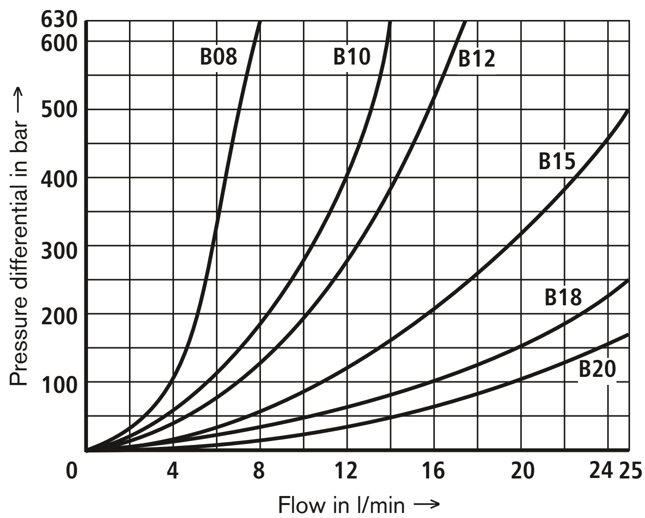
1 A to T
P to A

2 B to T
P to B

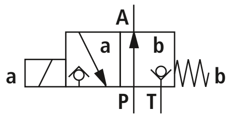
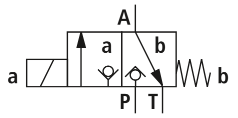
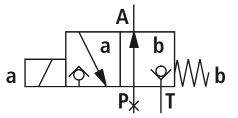
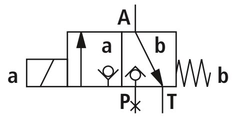
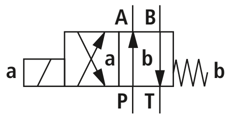
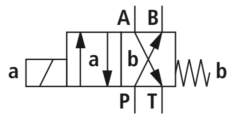
Δp-q_V characteristic curve
Check valve insert



Δp-q_V characteristic curves
Throttle insert



Performance limit (measured with HLP46, $\vartheta_{oill} = 40\ °C \pm 5\ °C$)

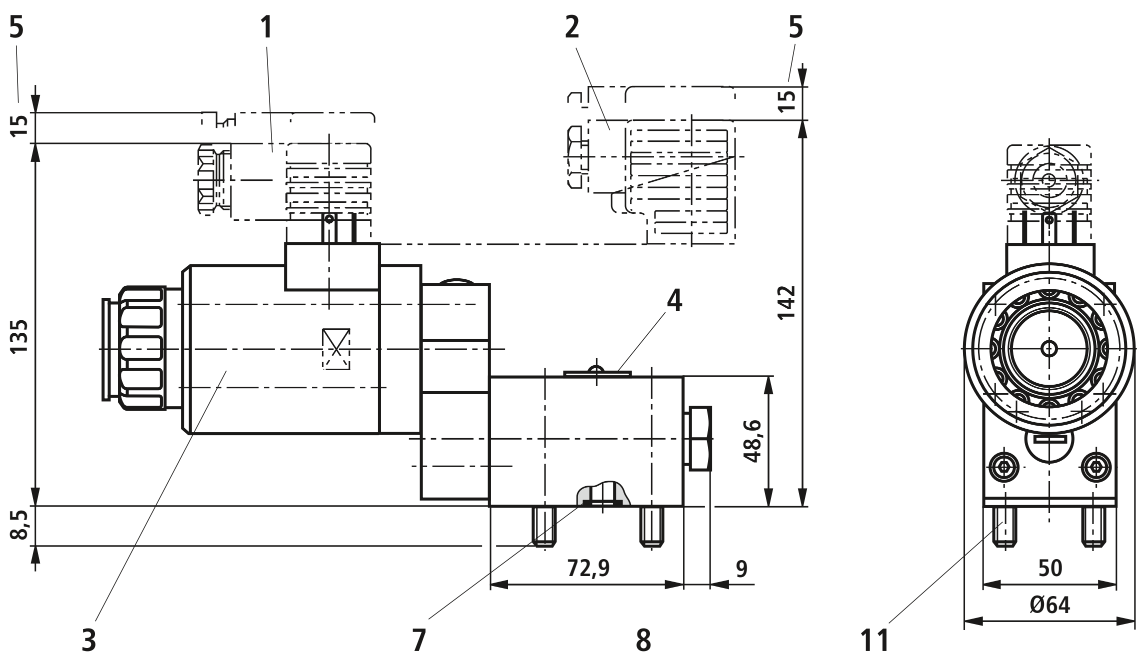
		Symbol	Remark	Operating pressure in bar				Flow in l/min
				P	A	B	T	
3-way circuit	U		Pressure $p_P \geq p_A \geq p_T$	420/630	420/630		200	25
	C			420/630	420/630		200	25
2-way circuit (only as unloading function)	U		Before switching from the starting position to the operated position is possible, pressure must be applied in port A. Pressure $p_A \geq p_T$		420/630		200	25
	C		Pressure $p_A \geq p_T$		420/630		200	25
4-way circuit (flow only possible in the direction of the arrow!)	D		Valve (symbol "U") in conjunction with Plus-1 plate $p_P > p_A \geq p_B > p_T$	420/630	420/630	420/630	200	25
	Y		Valve (symbol "C") in conjunction with Plus-1 plate $p_P > p_A \geq p_B > p_T$	420/630	420/630	420/630	200	25

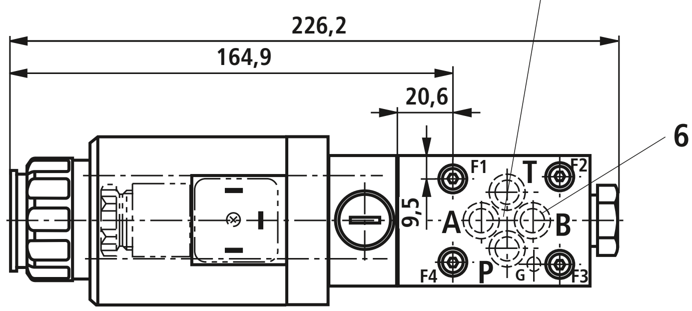
⚠ **Attention!** Please observe the "General notes" below!

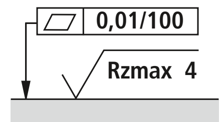
General notes

- In order to reliably operate and hold the valve in its operated position, the pressures must be: P ≥ A ≥ T (for design reasons).
- Ports P, A and T (3/2 directional poppet valve) and P, A, B and T (4/2 directional poppet valve) are clearly assigned according to their task. They must not be exchanged or plugged. Flow is only permitted in the direction of the arrow.
- When using the Plus-1 plate (4/2 directional function) observe the following lower operating values: $p_{min} = 8$ bar; $q_V > 3$ l/min.
- The total flow of the valve must not be exceeded.

Unit dimensions: 3/2 directional poppet valve (nominal dimensions in mm)







Required surfact quality
of the valve mounting face

1 Mating connector **without** circuitry (separate order, see page 14)

2 Mating connector **with** circuitry (separate order, see page 14)

3 DC solenoid

4 Nameplate

5 Space required to remove mating connector

6 ⚠ **Attention!**
Port B is provided as blind countersunk hole on 3/2 directional poppet valves in the 420 bar variant, and not provided for the 630 bar variant.

7 Identical seal rings for ports A, B, P and T

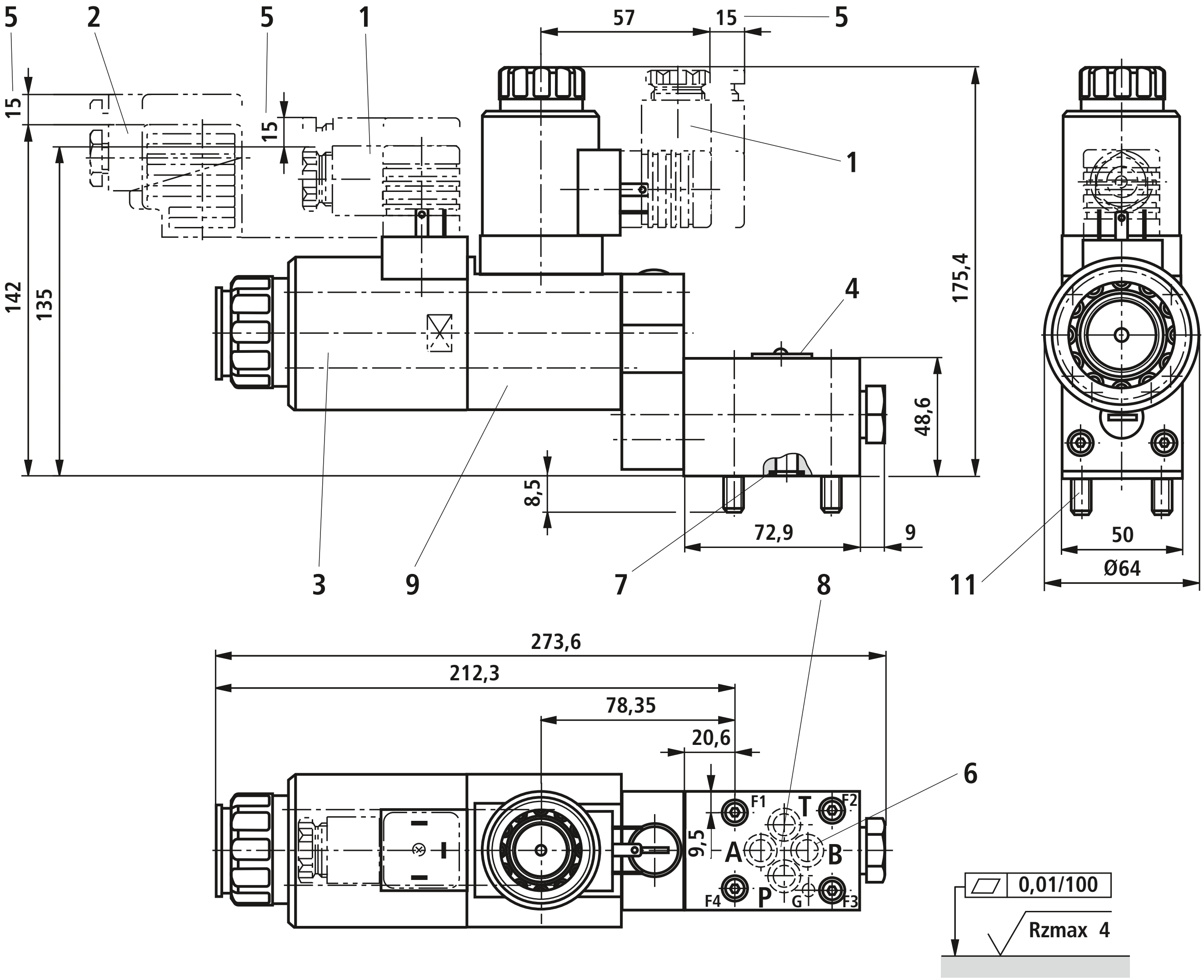
8 Porting pattern to ISO 4401-03-02-0-05
(**with** locating bore and locating pin ISO 8752-3x8-St);
deviating from standard: Variant “630“

11 **Valve fixing screws**
(included in the scope of supply)

– 420 bar variant:
4 hexagon socket head cap screws
ISO 4762 M5 x 50 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque $\boldsymbol{M}_T$ = 7 Nm ± 10%,

– 630 bar variant (not to ISO 4401):
4 hexagon socket head cap screws
ISO 4762 M6 x 50 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque $\boldsymbol{M}_T$ = 12.5 Nm ± 10%

Unit dimensions: 3/2 directional poppet valve – with detent (nominal dimensions in mm)



Required surfact quality
of the valve mounting face

1 Mating connector **without** circuitry (separate order, see page 14)

2 Mating connector **with** circuitry (separate order, see page 14)

3 DC solenoid

4 Nameplate

5 Space required to remove mating connector

6 ⚠ **Attention!**
Port B is provided as blind countersunk hole on 3/2 directional poppet valves in the 420 bar variant, and not provided for the 630 bar variant.

7 Identical seal rings for ports A, B, P and T

8 Porting pattern to ISO 4401-03-02-0-05
(**with** locating bore and locating pin ISO 8752-3x8-St); deviating from standard: Variant “630“

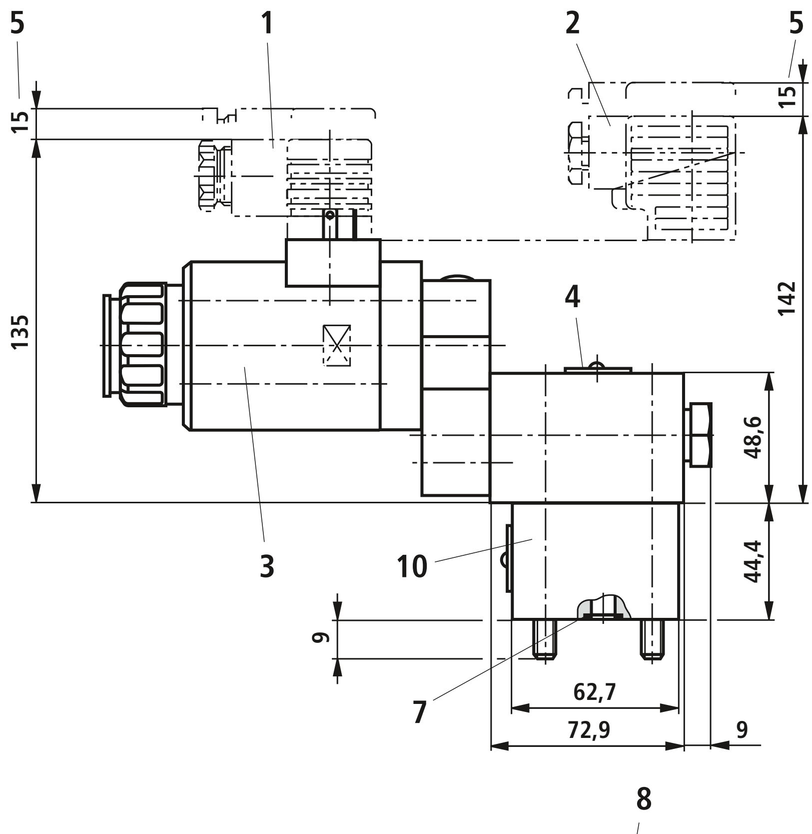
9 Detent with DC solenoid

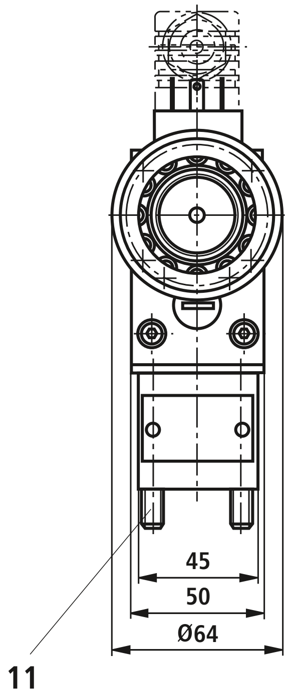
11 **Valve fixing screws**
(included in the scope of supply)

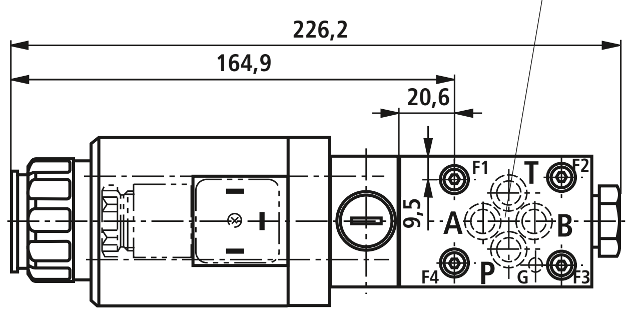
– 420 bar variant:
4 hexagon socket head cap screws
ISO 4762 M5 x 50 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14); tightening torque M_A = 7 Nm ± 10%,

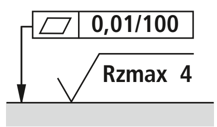
– 630 bar variant (not to ISO 4401):
4 hexagon socket head cap screws
ISO 4762 M6 x 50 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14); tightening torque M_T = 12.5 Nm ± 10%

Unit dimensions: 4/2 directional poppet valve (nominal dimensions in mm)









Required surfact quality
of the valve mounting face

1 Mating connector **without** circuitry (separate order, see page 14)

2 Mating connector **with** circuitry (separate order, see page 14)

3 DC solenoid

4 Nameplate

5 Space required to remove mating connector

7 Identical seal rings for ports A, B, P and T

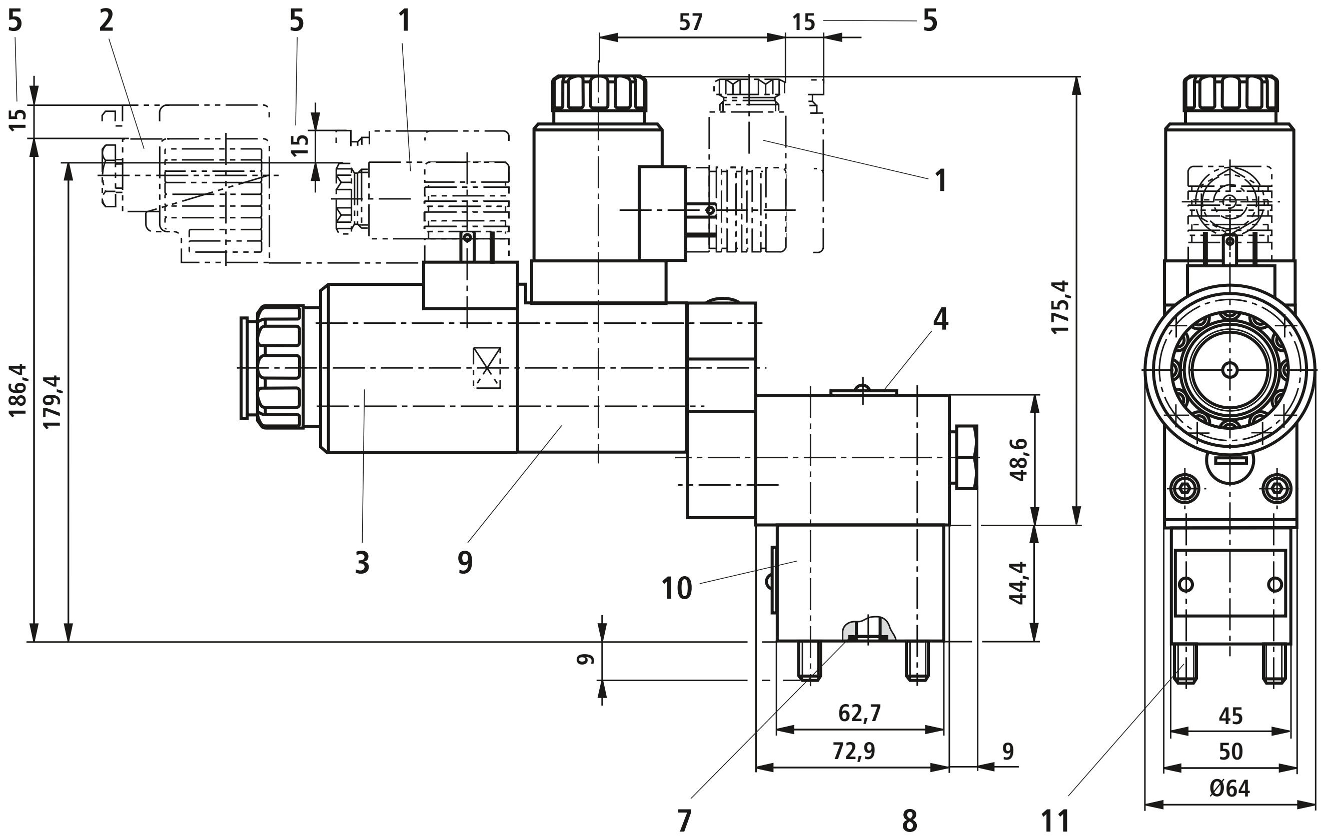
8 Porting pattern to ISO 4401-03-02-0-05 (**with** locating bore and locating pin ISO 8752-3x8-St); deviating from standard: Variant "630"

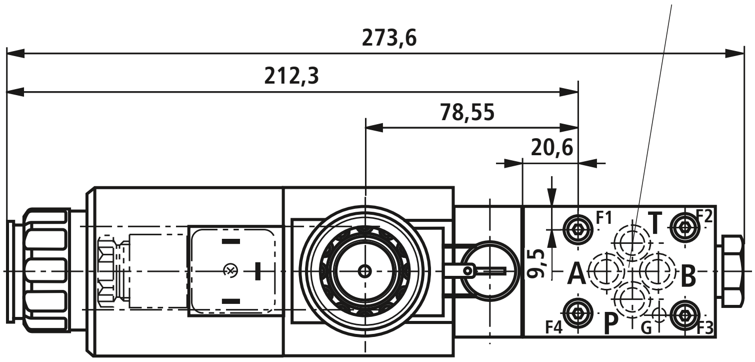
10 Plus-1 plate

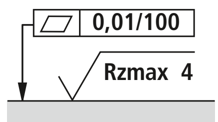
11 **Valve fixing screws**
(included in the scope of supply)
– 420 bar variant:
4 hexagon socket head cap screws
ISO 4762 M5 x 95 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 7 Nm ± 10%,

– 630 bar variant (not to ISO 4401):
4 hexagon socket head cap screws
ISO 4762 M6 x 95 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 12.5 Nm ± 10%

Unit dimensions: 4/2 directional poppet valve – with detent (nominal dimensions in mm)







Required surfact quality of the valve mounting face

1 Mating connector **without** circuitry (separate order, see page 14)

2 Mating connector **with** circuitry (separate order, see page 14)

3 DC solenoid

4 Nameplate

5 Space required to remove mating connector

7 Identical seal rings for ports A, B, P and T

8 Porting pattern to ISO 4401-03-02-0-05 (**with** locating bore and locating pin ISO 8752-3x8-St); deviating from standard: Variant "630"

9 Detent with DC solenoid

10 Plus-1 plate

11 **Valve fixing screws**
(included in the scope of supply)

– 420 bar variant:
4 hexagon socket head cap screws
ISO 4762 M5 x 95 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 7 Nm ± 10%,

– 630 bar variant (not to ISO 4401):
4 hexagon socket head cap screws
ISO 4762 M6 x 95 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 12.5 Nm ± 10%

Throttle insert

The use of a throttle insert is required, if, due to given operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

Example:

– Accumulator operation,

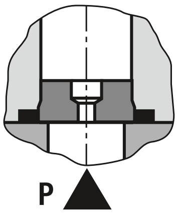
– use as pilot control valve with internal pilot oil tapping.

3/2 directional poppet valve

The throttle insert is plugged in port P of the poppet valve.

4/2 directional poppet valve

The throttle insert is plugged in port P of the Plus-1 plate.



Check valve insert

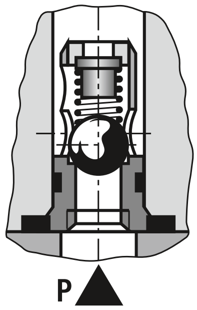
The check valve insert allows a free flow from P to A and closes A to P leak-free.

3/2 directional poppet valve

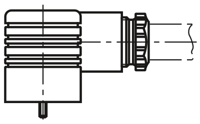
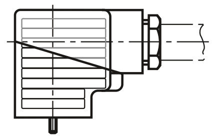
The check valve throttle is plugged in port P of the poppet valve.

4/2 directional poppet valve

The check valve throttle is plugged in port P of the Plus-1 plate



Mating connectors to DIN EN 175301-803

For details and further mating connectors, see RE 08006					
		Material no.			
Valve side	Colour	Without circuitry	With indicator lamp 12 … 240 V	With rectifier 12 … 240 V	With indicator lamp and Zener diode suppressor circuit 24 V
a	Grey	**R901017010**	–	–	–
a	Black	–	**R901017022**	**R901017025**	**R901017026**

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Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

2/2, 3/2 and 4/2 directional seat valve with mechanical, manual or fluidic operation

Type M-.S..

Sizes 6 and 10
Component series 3X
Maximum operating pressure 420/630 bar
Maximum flow 40 l/min

H7401+7402+7403

Table of contents

Features

– Direct operated directional seat valve with mechanical, manual or fluidic operation
– Porting pattern according to DIN 24340 form A (**without** locating bore)
– Reliable operation even after longer time under pressure
– Types of actuation:
  • Mechanical (roller plunger)
  • Manual (hand lever)
  • Hydraulic
  • Pneumatic
– Inductive position switch (contact-free), optional, see RE 24830.

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

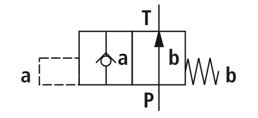
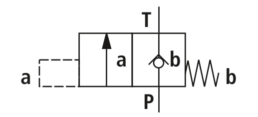
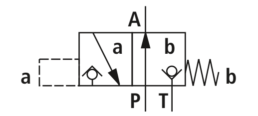
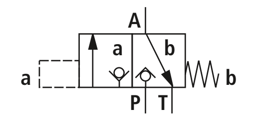
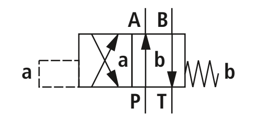
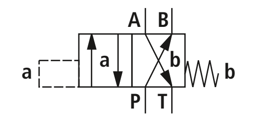
M –				3X /					*

2 main ports (size 6 only)	= **2**
3 main ports	= **3**
4 main ports	= **4**

Seat valve, direct operated

Hydraulically operated	= **SH**
Pneumatcally operated	= **SP**
Manually operated (hand lever)	= **SMM**
Mechanically operated (roller plunger)	= **SMR**

Size 6	= **6**
Size 10	= **10**

Main ports	2 1)	3	4	
Symbols 	■	–	–	= **P**
	■	–	–	= **N**
	–	■	–	= **U**
	–	■	–	= **C**
	–	–	■	= **D**
	–	–	■	= **Y**

■ = Available

Further details in clear text

Seal material

No code =	NBR seals
V =	FKM seals
	(other seals on enquiry)

⚠ **Important!**
Observe compatibility of seals with hydraulic fluid used!

No code =	Without check valve insert, without throttle insert
P =	With check valve insert
B12 =	Throttle Ø1.2 mm
B15 =	Throttle Ø1.5 mm
B18 =	Throttle Ø1.8 mm
B20 =	Throttle Ø2.0 mm
B22 =	Throttle Ø2.2 mm
	Further orifices on enquiry

Additional equipment

Inductive position switch, see RE 24830

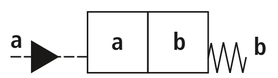
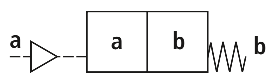
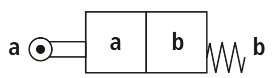
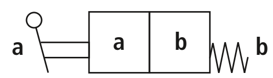
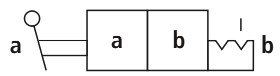
No code =	Without position switch
QMAG24 =	Monitored position “a“
QMBG24 =	Monitored position “b“

420 =	Operating pressure 420 bar
630 =	Operating pressure 630 bar

No code =	Without detent
F =	With detent (type SMM only)

3X =	Component series 30 to 39 (30 to 39: unchanged installation and connection dimensions)

Types of actuation

Hydraulic “SH“	**Pneumatic** “SP“	**Roller plunger** “SMR“	**Hand lever** “SMM“
			
			“SMM…F“ 

Function, section, symbols: 2/2 and 3/2 directional seat valve

General

Directional valves of type M-.S are directional seat valves with manual, mechanical or fluidic operation. They control the start, stop and direction of a flow and basically consist of housing (1), actuator (2), a hardened valve system (3) as well as ball/spool (4) as closing body.

Basic principle

In the initial position, ball/spool (4) is pressed by spring (7) onto the seat, and in the operated position by the relevant actuator (2). The force of the actuator acts via ball (5) onto the actuating plunger (6), which is sealed on two sides. The chamber between the two seal elements is connected to port P. In this way, valve system (3) is pressure-compensated with regard to the actuating forces (actuator or return spring). The valves can therefore be used for pressures up to 630 bar.

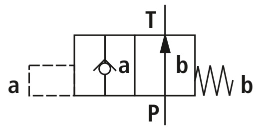
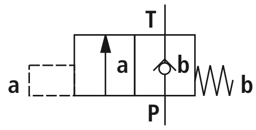
Note!

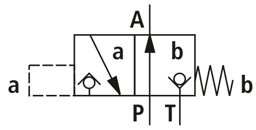
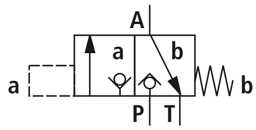
These 3/2 directional seat valves feature a “negative overlap”. Port T must therefore always be connected. This means that during switching - from the start of opening of one valve seat to closing of the other valve seat - ports P-A-T are interconnected. However, this process takes place so quickly that is irrelevant in nearly all applications.

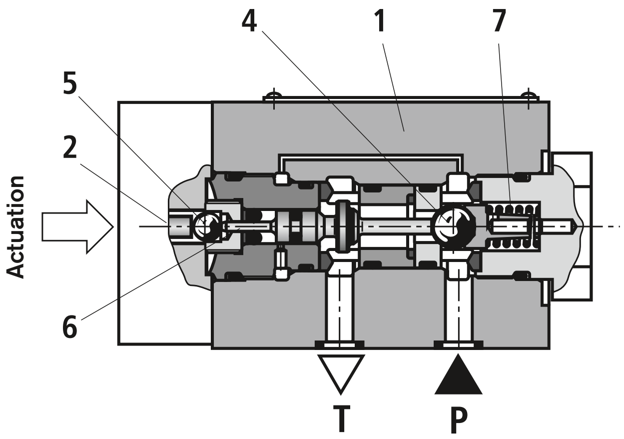
⚠ Important!

Care must be taken that the specified maximum flow is not exceeded! If required, a throttle insert must be used to limit the flow (see page 14)

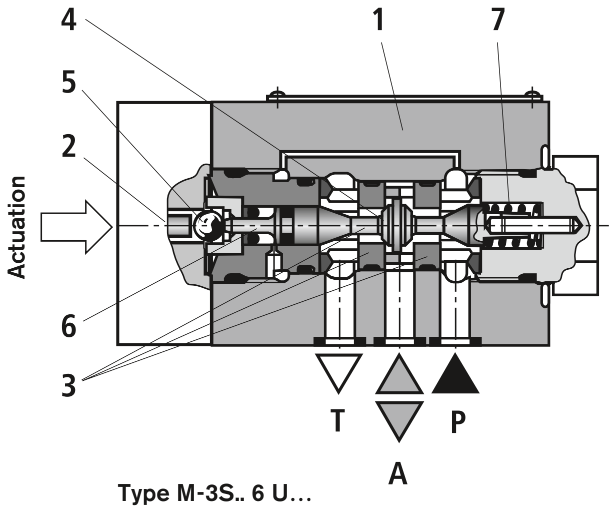
The seat arrangement offers the following possibilities:

2/2 directional seat valve	
Symbol “**P**“	
Initial position	P and T connected
Operated position	P blocked
Symbol “**N**“	
Initial position	P blocked
Operated position	P and T connected

3/2 directional seat valve	
Symbol “**U**“	
Initial position	P and A connected, T blocked
Operated position	P blocked, A and T connected
Symbol “**C**“	
Initial position	P blocked A and T connected
Operated position	P and A connected, T blocked



Type M-2S.. 6 N…



Type M-3S.. 6 U…

For types of actuation, see page 2 and page 13

Function, section, symbols, schematic illustration: 4/2 directional seat valve

A sandwich plate, a **Plus-1-plate**, installed under the 3/2 directional seat valve can be used to realize the function of a 4/2 directional seat valve.

Function of the Plus-1-plate:

Initial position

The main valve is not operated. Spring (9) holds ball (4.1) on seat (11). Port P is blocked and A connected to T. Moreover, the pilot line from A is connected to the large area of pilot piston (12) and is therefore relieved to tank. The pressure applied via P now shifts ball (13) onto seat (14). Now, P is connected to B and A to T.

Transitional position

When the main valve is operated, spool (4.2) is shifted against spring (9) and pressed onto seat (15). This causes port T to be closed, whereas P, A and B are briefly connected.

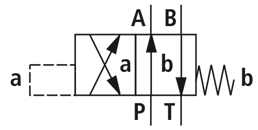
Operated position

P is connected to A. Because the pump pressure acts via A on the large area of pilot piston (12) , ball (13) is pressed onto seat (16). B is therefore connected to T and P to A. Ball (13) in the Plus-1-plate has a "positive overlap".

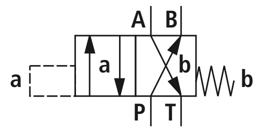
In order to prevent pressure intensification when single-rod cylinders are used, the annulus chamber of the cylinder must be connected to A.

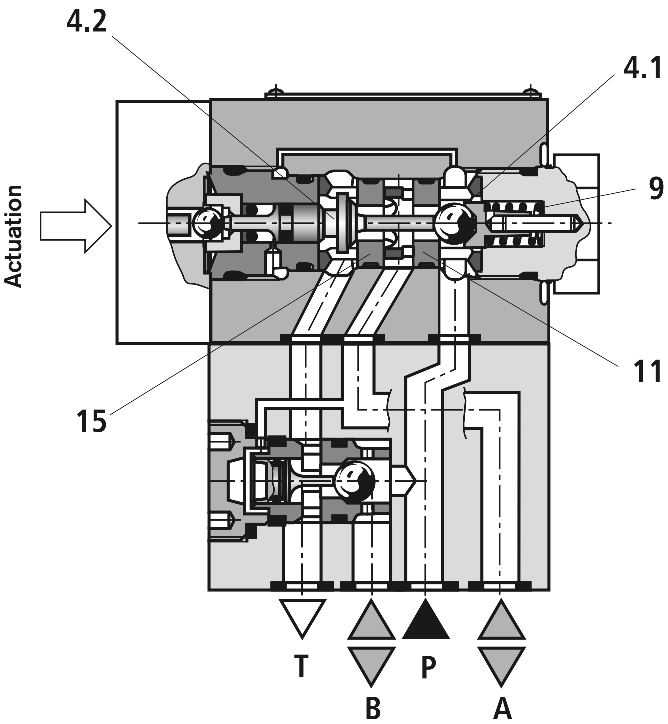
The use of a Plus-1-plate in conjunction with the seat arrangement offers the following possibilities:

Symbol "D":



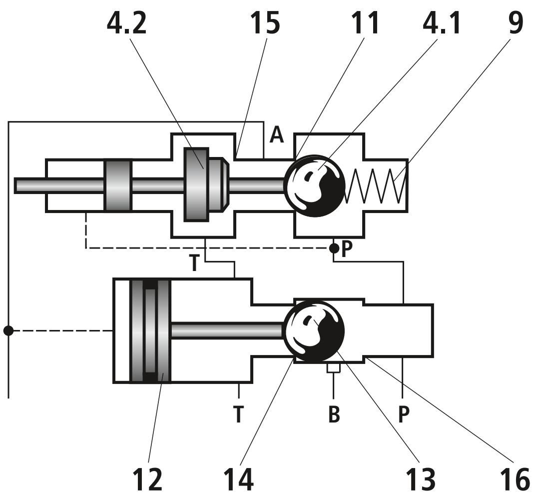
Symbol "Y":





Type M-4S.. 6 Y…

Schematic illustration: Initial position



For types of actuation, see page 2 and page 13

Technical data (for applications outside these parameters, please consult us!)

General

Size		Size	6				10			
Type			SH	SP	SMR	SMM	SH	SP	SMR	SMM
Weight	– 2/2 directional seat valve	kg	1.5	1.5	1.5	1.5	–	–	–	–
	– 3/2 directional seat valve	kg	1.5	1.5	1.5	1.5	2.45	2.45	2.45	2.45
	– 4/2 directional seat valve	kg	2.2	2.2	2.2	2.2	3.3	3.3	3.3	3.3
Installation orientation			Optional							
Ambient temperature range		°C	–30 to +50 (NBR seals) –20 to +50 (FKM seals)							
Pilot pressure	– Minimum	bar	5	3	–	–	5	3	–	–
	– Maximum	bar	210	12	–	–	210	12	–	–
Actuating force	– Maximum	N	–	–	250	50	–	–	250	50

Hydraulic

Maximum operating pressure	bar	See table on page 8	
Maximum flow	l/min	25	40
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524 1); fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) 1); HEPG (polyglycols) 2); HEES (synthetic esters) 2); other hydraulic fluids in enquiry	
Hydraulic fluid temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)	
Viscosity range	mm^2/s	2.8 to 500	
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 3)	

1) Suitable for NBR and FKM seals

2) Suitable only for FKM seals

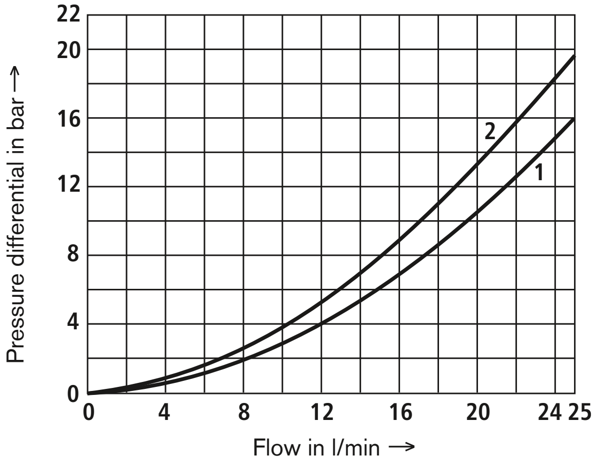
3) The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

Characteristic curves: Size 6 (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Δp-q_V characteristic curves

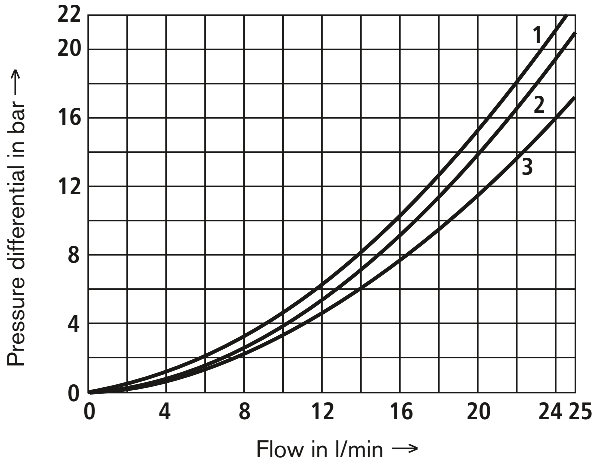
2/2 directional seat valve



1 M-2S.. 6 **N** …, P to T

2 M-3S.. 6 **P** …, P to T

3/2 directional seat valve

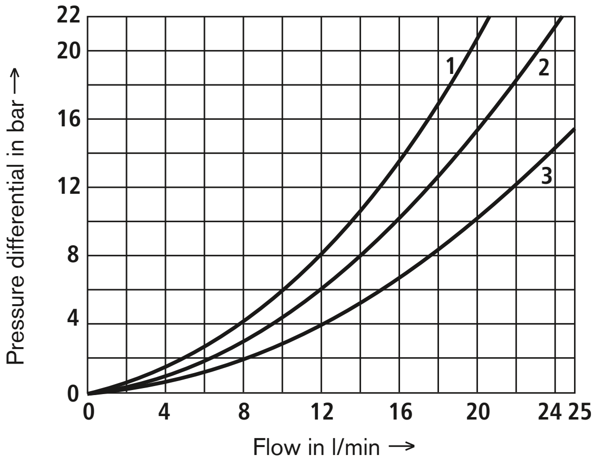


1 M-3S.. 6 **U** / **C** …, A to T

2 M-3S.. 6 **U** …, P to A

3 M-3S.. 6 **C** …, P to A

4/2 directional seat valve

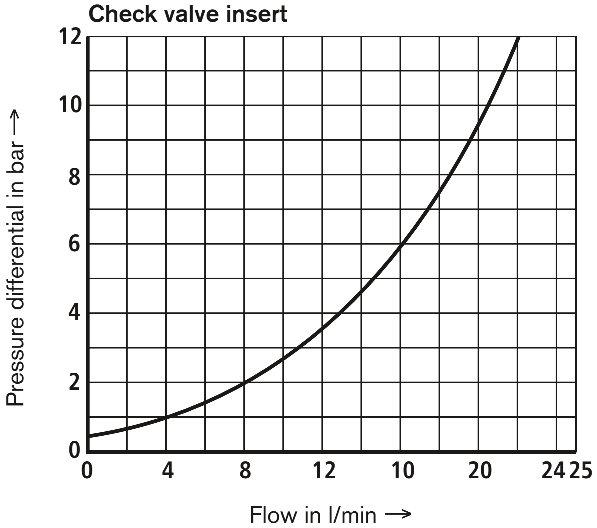


1 M-4S.. 6 **D** / **Y** …, A to T

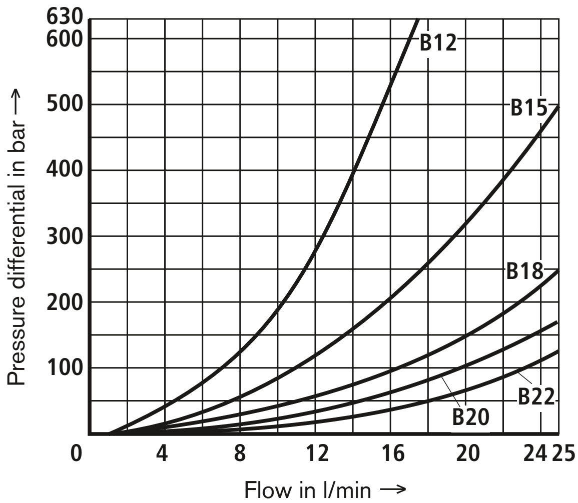
2 M-4S.. 6 **D** / **Y** …, P to A

3 M-4S.. 6 **D** / **Y** …, P to B and B to T

Check valve insert



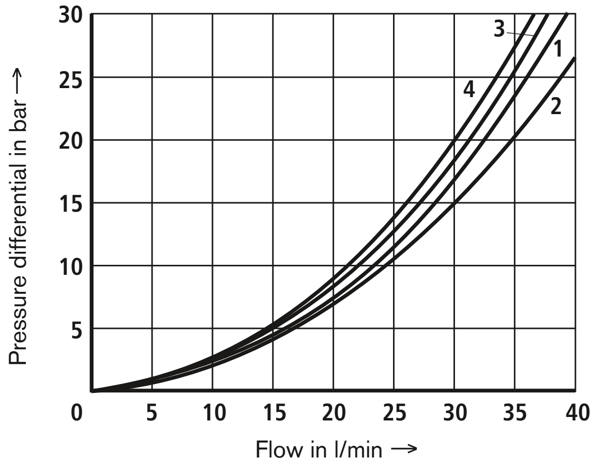
Throttle insert



Characteristic curves: Size 10 (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

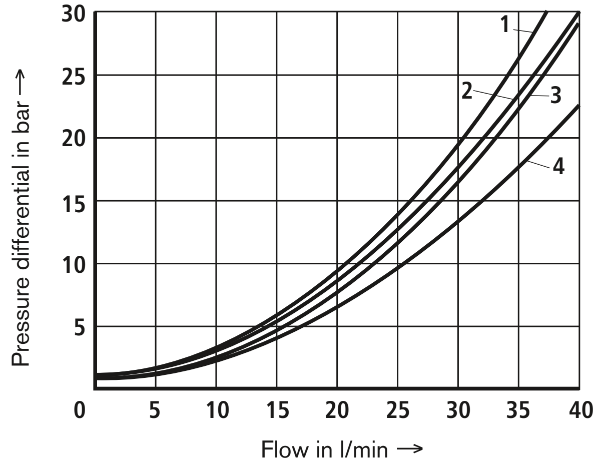
Δp-q_V characteristic curves

3/2 directional seat valve



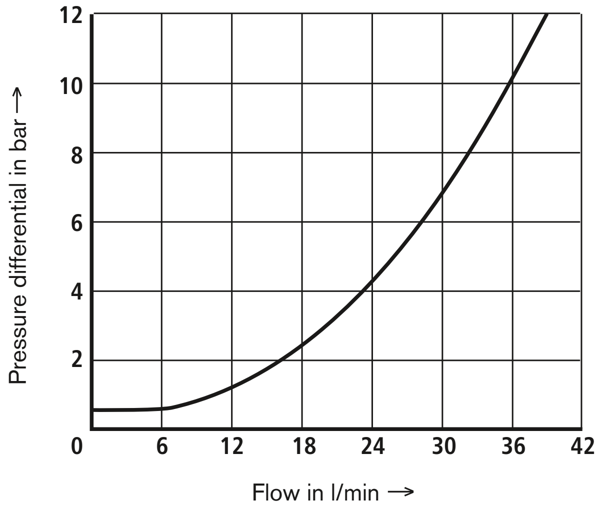
1	M-3S.. 10	**C**	…, P to A
2	M-3S.. 10	**C**	…, A to T
3	M-3S.. 10	**U**	…, P to A
4	M-3S.. 10	**U**	…, A to T

4/2 directional seat valve

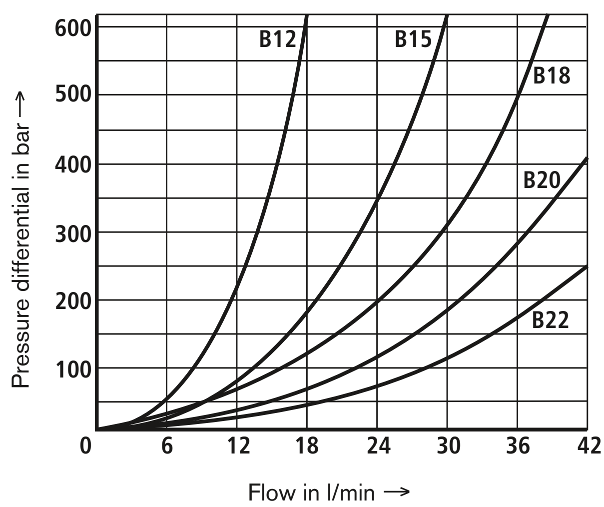


1	M-4S.. 10	**D** **Y**	…, A to T
2	M-4S.. 10	**D** **Y**	…, P to A
3	M-4S.. 10	**D** **Y**	…, P to B
4	M-4S.. 10	**D** **Y**	…, B to T

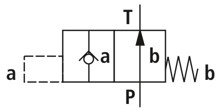
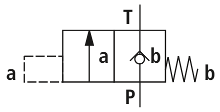
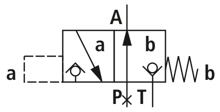
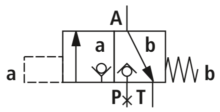
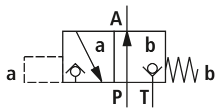
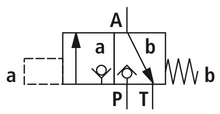
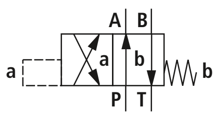
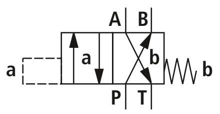
Check valve insert



Throttle insert



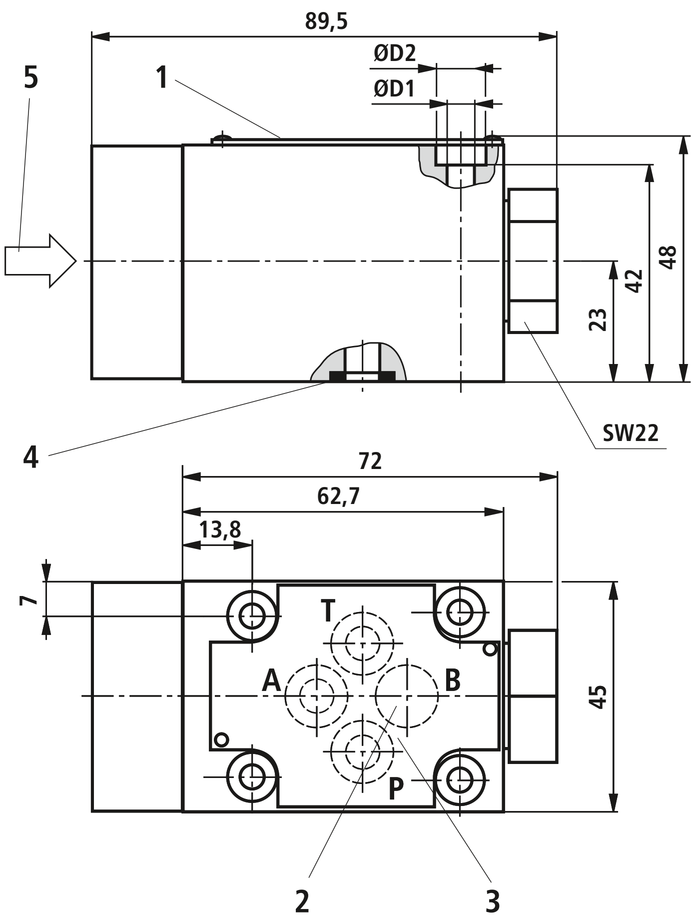
Performance limit (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

		Symbol	Remark	Maximum operating pressure in bar				Flow in l/min	
				P	**A**	**B**	**T**	**Size 6**	**Size 10**
2-way circuit (2/2 directional seat valve)	**P**		$p_P \geq p_T$	420/630			100	25	40
	N			420/630			100	25	40
2-way circuit (3/2 directional seat valve) only as unloding function	**U**		Before switching from the initial position to the operated position, pressure must be applied in port A. $p_A \geq p_T$		420/630		100	25	40
	C		$p_A \geq p_T$		420/630		100	25	40
3-way circuit	**U**		$p_P \geq p_A \geq p_T$	420/630	420/630		100	25	40
	C			420/630	420/630		100	25	40
4-way circuit (flow possible only in the direction of the arrow!)	**D**		3/2 directional valve (symbol "U") in conjunction with Plus-1-plate: $p_P > p_A \geq p_B > p_T$	420/630	420/630	420/630	100	25	40
	Y		3/2 directional valve (symbol "C") in conjunction with Plus-1-plate: $p_P > p_A \geq p_B > p_T$	420/630	420/630	420/630	100	25	40

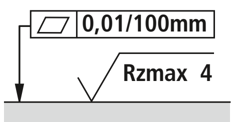
⚠ **Important!**

Please observe the general notes on page 14!

Unit dimensions: 2/2, 3/2 directional seat valve – size 6 (nominal dimensions in mm)



Operating pressure in bar	**ØD1**	**ØD2**
420	5,3	10
630	6,5	11



Required surface quality of the valve mounting face

1 Nameplate

2 ⚠ **Important!**

– With 3/2 and 4/2 directional seat valves, port B is provided as blind bore on the 420-bar version, and not provided on the 630-bar variant.

3 Porting pattern to DIN 24340 form A

4 Seal rings

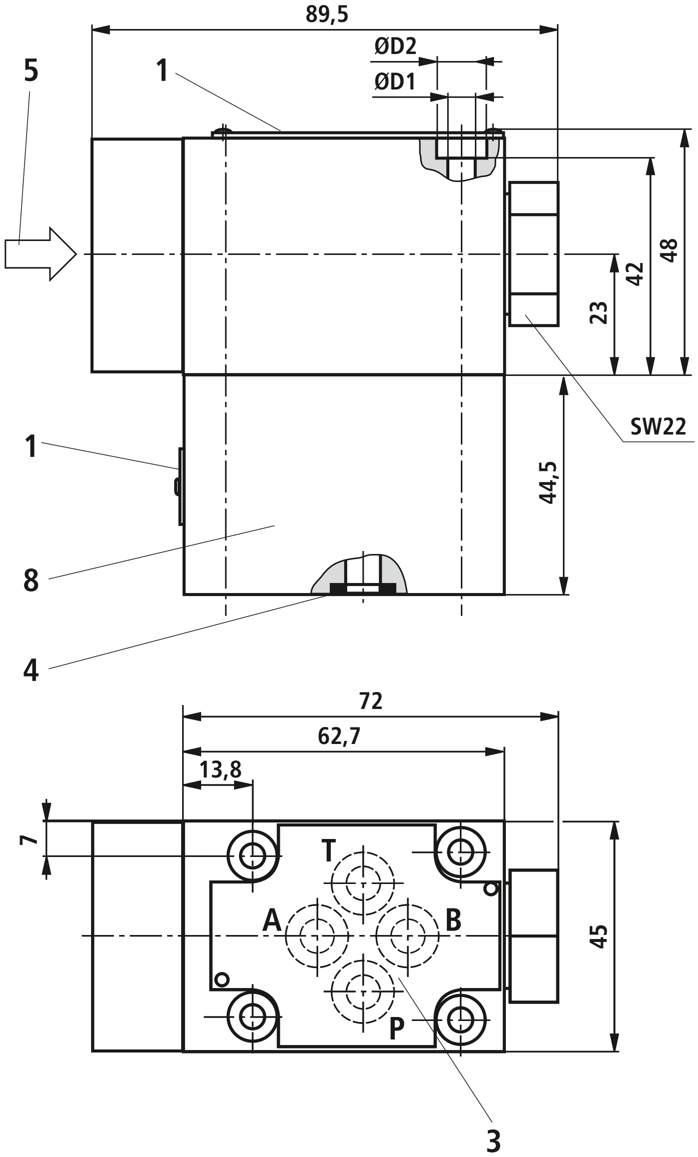
5 For types of actuation, see page 13

Valve fixing screws (separate order)

– 420 bar version:
4 hexagon socket head cap screws ISO 4762 M5 x 50 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 7 Nm ± 10%,
Material no. **R913000064**

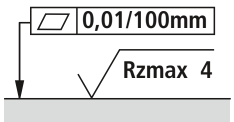
– 630 bar version:
4 hexagon socket head cap screws ISO 4762 M6 x 50 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 12.5 Nm ± 10%,
Material no. **R913000151**

Unit dimensions: 4/2 directional seat valve – size 6 (nominal dimensions in mm)



1 Nameplate
3 Porting pattern to DIN 24340 form A
4 Seal rings
5 For types of actuation, see page 13
8 Plus-1-plate

Operating pressure in bar	**ØD1**	**ØD2**
420	5,3	10
630	6,5	11



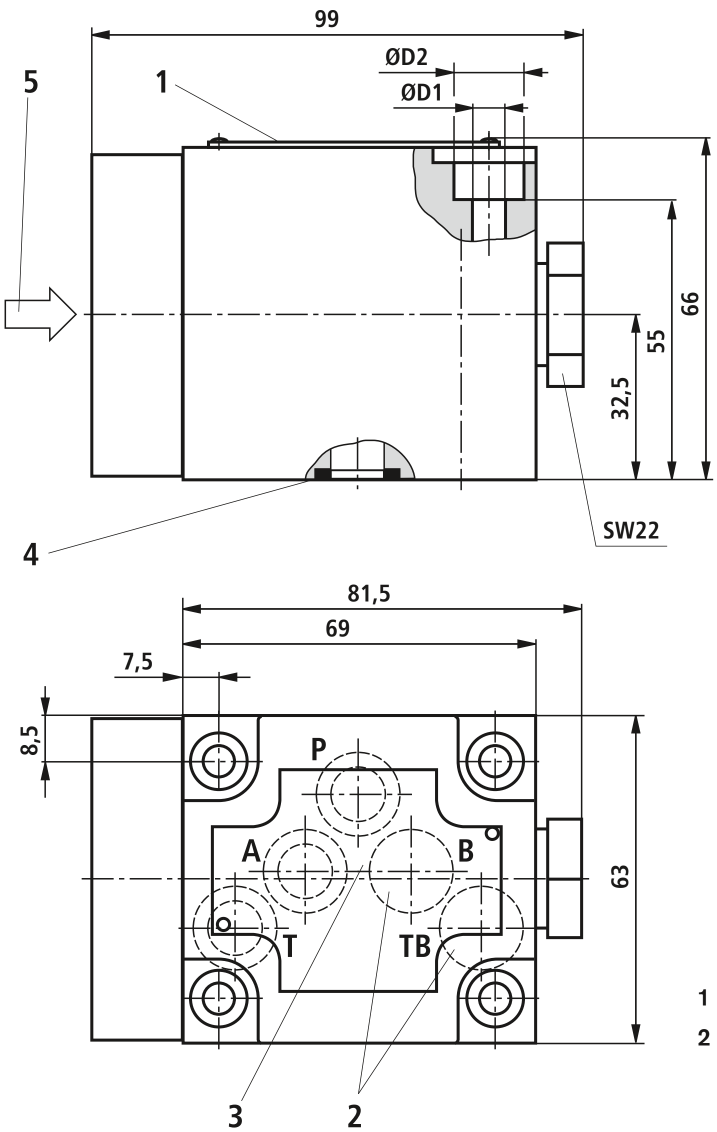
Required surface quality of the valve mounting face

Valve fixing screws (included in the scope of supply)

– 420 bar version:
4 hexagon socket head cap screws
ISO 4762 M5 x 95 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 7 Nm ± 10%,
Material no. **R913000223**

– 630 bar version:
4 hexagon socket head cap screws
ISO 4762 M6 x 95 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 12.5 Nm ± 10%,
Material no. **R913000549**

Unit dimensions: 3/2 directional seat valve – size 10 (nominal dimensions in mm)



1 Nameplate

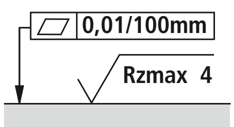
2 ⚠ **Important!**
On 3/2 directional seat valves, ports B and TB are provided as blind holes.

3 Porting pattern to DIN 24340 form A

4 Seal rings

5 For types of actuation, see page 13

Operating pressure in bar	**ØD1**	**ØD2**
420	6.4	14
630	8.4	14



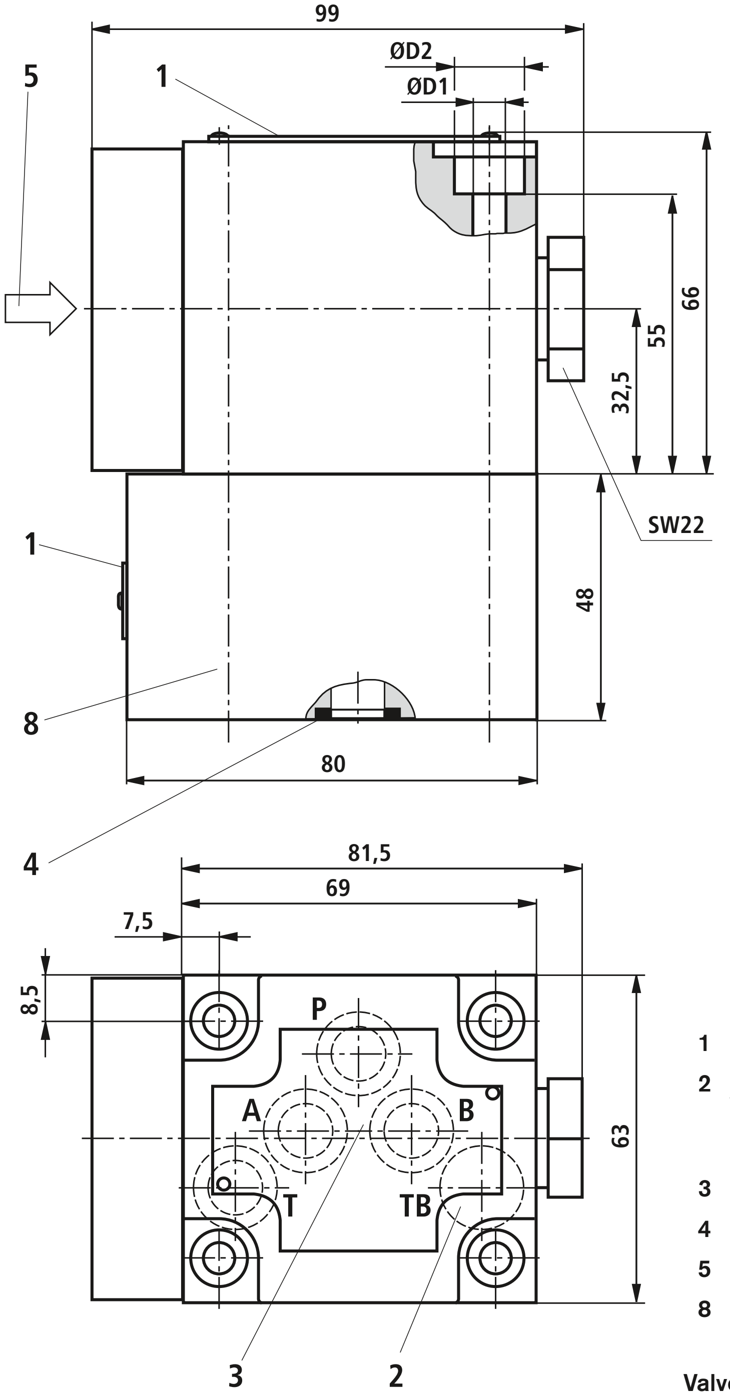
Required surface quality of the valve mounting face

Valve fixing screws (separate order)

– 420 bar version:
4 hexagon socket head cap screws
ISO 4762 M6 x 65 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 12.5 Nm ± 10%,
Material no. **R913000127**

– 630 bar version:
4 hexagon socket head cap screws
ISO 4762 M8 x 65 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 30 Nm ± 10%,
Material no. **R913000368**

Unit dimensions: 4/2 directional seat valve – size 10 (nominal dimensions in mm)



1 Nameplate

2 ⚠ **Important!**
On 4/2 directional seat valves, port TB is provided as blind hole.

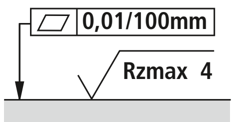
3 Porting patter to DIN 24340 form A

4 Seal rings

5 For types of actuation, see page 13

8 Plus-1-plate

Operating pressure in bar	**ØD1**	**ØD2**
420	6.4	14
630	8.5	14



Required surface quality of the valve mounting face

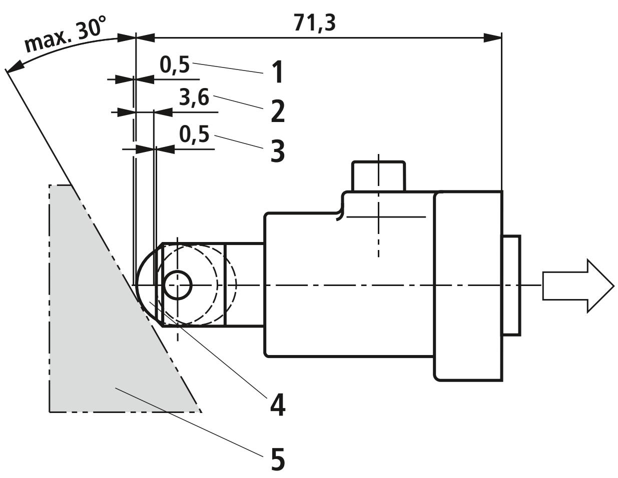
Valve fixing screws (included in the scope of supply)

– 420-bar version:
4 hexagon socket head cap screws
ISO 4762 M6 x 115 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 12.5 Nm ± 10%,
Material no. **R900018811**

– 630 bar version:
4 hexagon socket head cap screws
ISO 4762 M8 x 115 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 30 Nm ± 10%,
Material no. **R913000368**

Unit dimensions: Types of actuation (nominal dimensions in mm)

Type M-.SMR…



1 Idle stroke

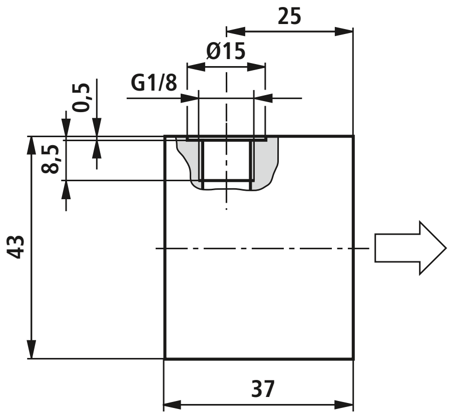
2 Working stroke

3 Overtravel

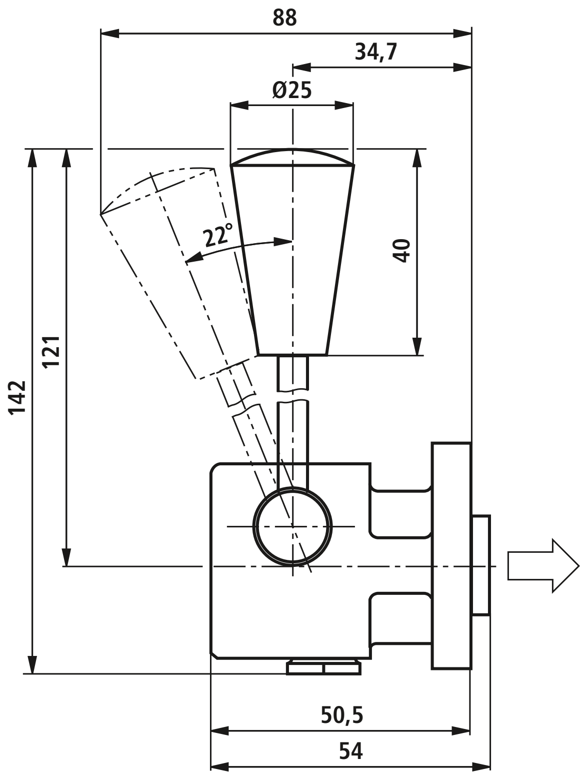
4 Roller width 6 mm

5 Start-up angle in both directions

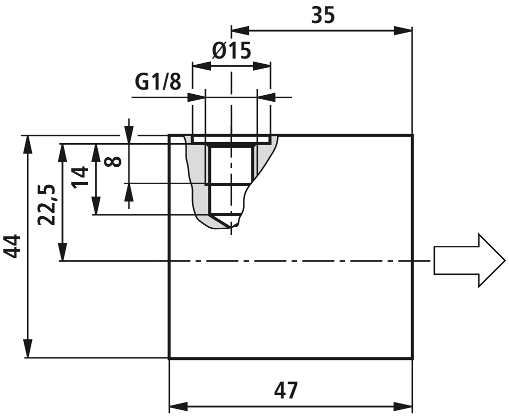
Type M-.SH…



Type M-.SMM…



Type M-.SP…



Throttle insert

The use of a throttle insert is required, if, due to given operating conditions, flows can occur during switching operations, which exceed the performance limit of the valve.

Examples:

– Accumulator operation,

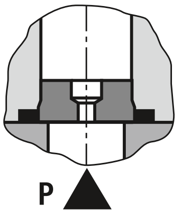
– Use as pilot valve with internal pilot oil tapping.

2/2 and 3/2 directional seat valve (see page 3)

The throttle insert must be plugged into port P of the directional seat valve.

4/2 directional seat valve (see page 4)

The throttle insert must be plugged into port P of the Plus-1-plate.



Check valve insert

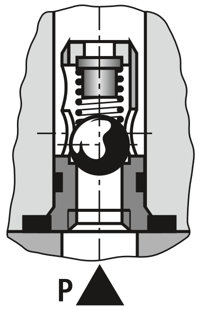
The check valve insert allows a free fluid flow from P to A and provides leak-free closure from A to P.

2/2 and 3/2 directional seat valve (see page 3)

The check valve insert must be plugged into port A of the seat valve.

4/2 directional seat valve (see page 4)

The check valve insert must be plugged into port P of the Plus-1-plate.



General notes

Seat valves can be used according to the spool symbols and the assigned operating pressures and flows (see performance limits on page 8).

To ensure proper functioning, the points below must in any case be observed:

– To allow the reliable operation of the valve or holding it in the operated position, the pressure must be $p_P \geq p_A \geq p_T$ (for design reasons).

– Seat valves feature a negative overlap, i.e. during the switching operation, leakage oil incurs. This process takes place within such a short time that it is irrelevant in nearly all applications.

– The specified maximum flow must not be exceeded (if required, install a throttle insert to limit the flow)!

Plus-1-plate:

– When using the Plus-1-plate (4/2 directional function) the following lower operating values must be observed: p_{min} = 8 bar; q_V > 3 l/min.

– Ports P, A, B and T are clearly determined according to their functions. They must not be exchanged or plugged!

– In the 3- and 4-way position, port T must always be connected.

– The fluid flow is only permitted in the direction of the arrow!

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2/2 directional poppet valve, direct operated with solenoid actuation

RE 18136-23/06.12 1/8
Replaces: 07.10

Type KSDE (High Performance)

H7739

Component size 0
Component series A
Maximum operating pressure 350 bar
Maximum flow 20 l/min

Table of contents

Features

– Two different mounting cavities R/B or R/C
– Direct operated directional poppet valve with solenoid actuation, tight on both sides
– Blocked connection tight in a leak-free form
– Safe switching also with longer standstill periods
– Wet-pin DC solenoids
– Rotatable solenoid coil

Information on available spare parts:
www.boschrexroth.com/spc

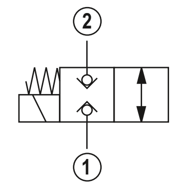
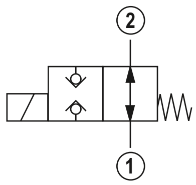
Ordering code (Valve without coil) 1)

KSDE	R	0		A /		V	*

Directional poppet valve, direct operated, electrically operated

Maximum operating pressure 350 bar **= R**

Component size **= 0**

2 main ports			
Symbols		Normally closed	**= N**
		Normally open	**= P**

Further details in the plain text

Seal material

V = FKM seals (other seals upon request)

Attention! Observe compatibility of seals with hydraulic fluid used!

N0 = **Without** manual override
N9 = **With** concealed manual override
N11 = **With** screwable manual override

Symbol N			**Symbol P**		
N0	**N9**	**N11**	**N0**	**N9**	**N11**
X	–	X	X	X 2)	–

B = High Performance and mounting cavity R/B (see page 7)
C = High Performance and mounting cavity R/C (see page 7)

A = Component series

Valve types (without coil) 1)

Operating pressure 350 bar		
Spool symbol	**Type**	**Material no.**
N	KSDER0NA/BN0V	R901252718
	KSDER0NA/CN0V	R901252717
P	KSDER0PA/BN0V	R901252713
	KSDER0PA/CN0V	R901252712

Available coils (separate order) 1)

Direct voltage DC 4)	**Material no. for coil with connector** 3)		
	"K4" 03pol (2+PE) DIN EN 175301-803	**"K40"** 02pol K40 DT 04-2PA, make: Deutsch	**"C4"** 02pol C4/Z30 AMP Junior-Timer
12 V	R900991678	R900729189	R900315818
24 V	R900991121	R900729190	R900315819

1) Complete valves with mounted coil upon request

2) Screwable manual override "N10" (actuation by means of internal hexagon with lock nut), possible as separate order, Material no. **R901051231**; ordering code "**N9**"!

3) Mating connectors (order separately), see data sheet 08006

4) Other voltages upon request

Function, section, symbols

General

The 2/2 directional poppet valves are direct operated, pressure compensated cartridge valves. They basically comprises of screw-in section (4) with valve seat (1), solenoid (5), as well as closing element (3) and compression spring (2).

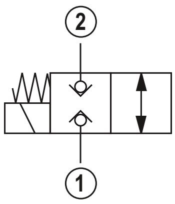
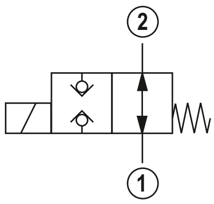
Function

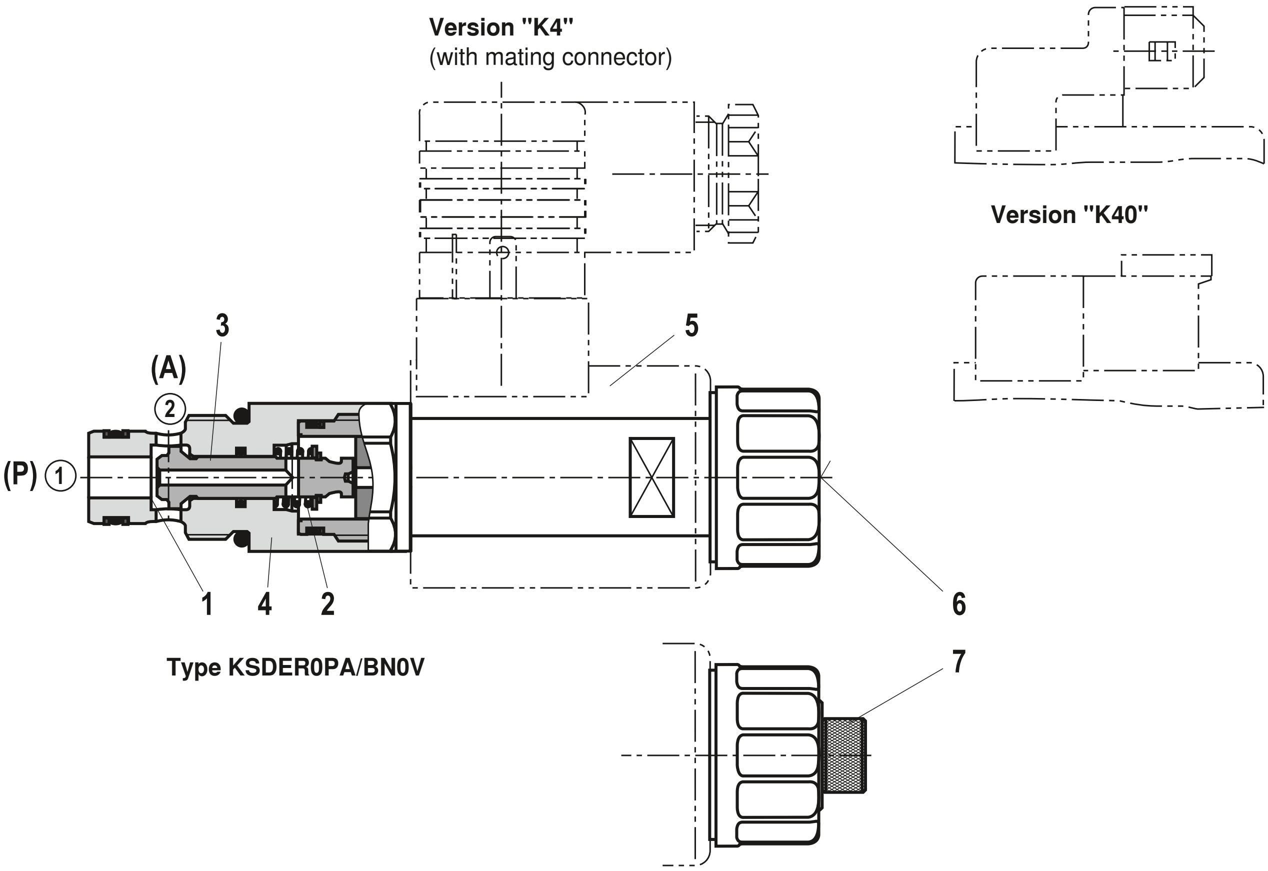
The initial position of the valve (normally open "P" or normally closed "N") is determined by the position of the closing element (3) and the arrangement of the compression spring (2). Due to the structural design, the 2/2 directional poppet valves are always pressure-compensated in relation to the actuating forces. The main ports ① and ② can be loaded with an operating pressure of 350 bar (see Technical Data, page 4).

With symbol "P", the closing element (3) is pressed onto the seat by the solenoid (5), with symbol "N" by the compression spring (2). The flow is blocked in a leak-free form.

The manual override allows for the the switching of the valve without solenoid energization. It is available in concealed version "N9" (6) or in screwable version "N11" (7) (see page 2).

The screwable manual override (7) must be screwed back into the initial position after actuation.

Symbol "N" Normally closed	**Symbol "P"** Normally open
	



Type KSDER0PA/BN0V

Technical data (For applications outside these parameters, please consult us!)

general

Weight	– Valve	kg	0.30
	– Coil	kg	0.25
Installation position			Any
Ambient temperature range		°C	–40 to +110

hydraulic

Maximum operating pressure		bar	350
Maximum flow		l/min	20 (see performance limits page 5)
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524; fast biodegradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids upon request
Hydraulic fluid temperature range		°C	–40 to +80
Viscosity range	– Minimum	mm^2/s	5
	– Optimum		10 to 100
	– Mmaximum		1000
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]
Load cycles			10 million

electrical

Voltage type			Direct voltage
Supply voltage [2)]		V	12 DC; 24 DC
Voltage tolerance against ambient temperature			See characteristic curve page 5
Power consumption		W	22
Duty cycle		%	See characteristic curve page 5
Maximum coil temperature [3)]		°C	150
Switching time according to ISO 6403 (solenoid horizontal)	– ON (① → ②)	ms	≤ 95
	– OFF (② → ①)	ms	≤ 95
Maximum switching frequency		1/h	9000
Protection class according to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version "K4"		IP 65 with mating connector mounted and locked
	– Version "C4"		IP 66 with mating connector mounted and locked
			IP 69K with Rexroth mating connector (Material no. R901022127)
	– Version "K40"		IP 69K with mating connector mounted and locked

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

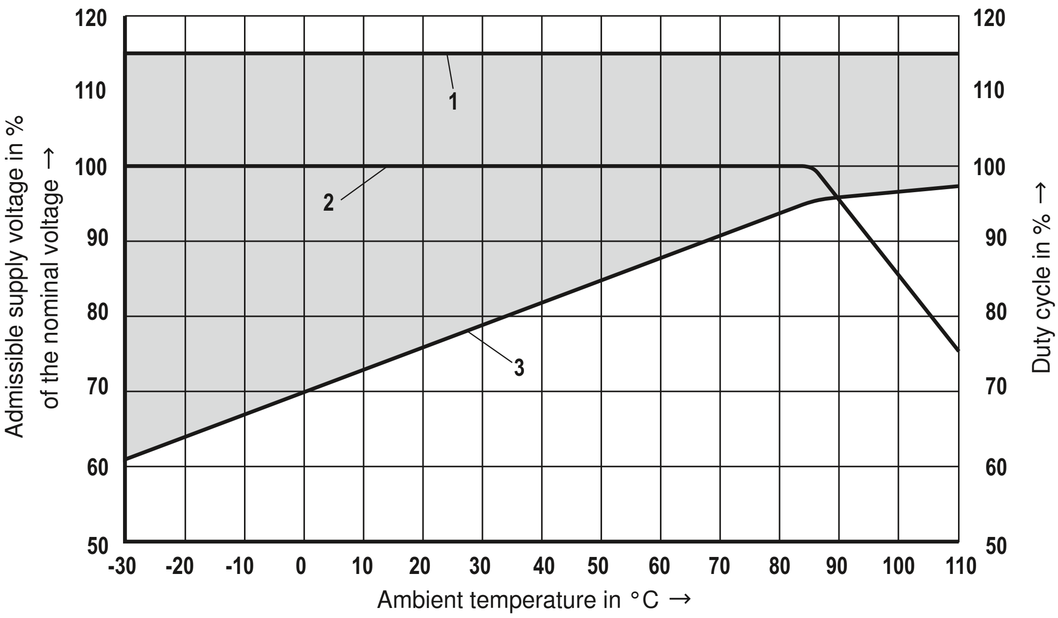
For the selection of the filters see www.boschrexroth.com/filter.

2) Other voltages upon request

3) Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

At the electrical connection "K4", the protective earthing conductor (PE ⏚) has to be connected properly.

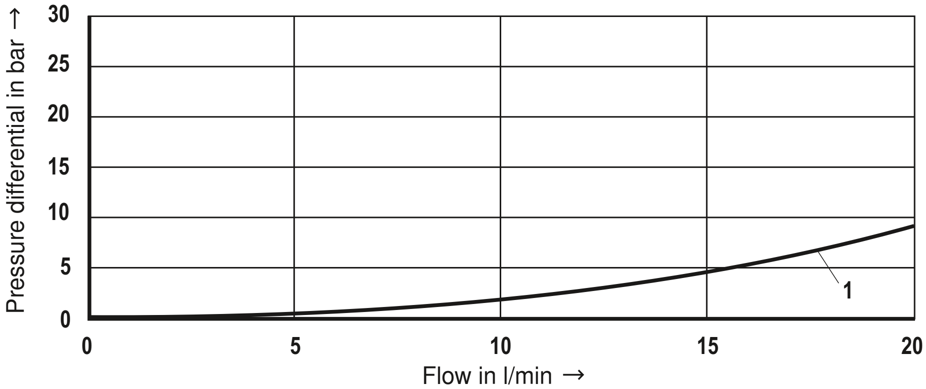
Voltage tolerance against ambient temperature; duty cycle



1 Maximum voltage
2 Duty cycle
3 Minimum response voltage
Admissible supply voltage range

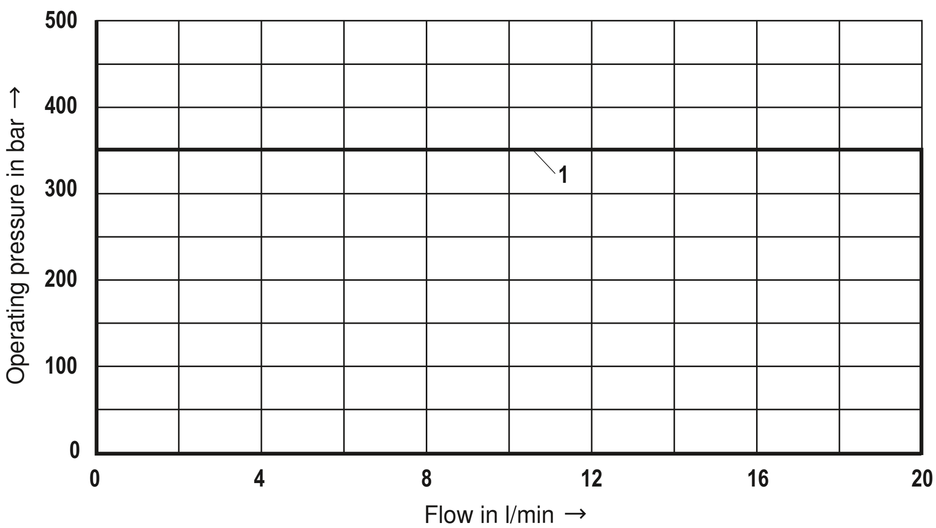
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Δp-q_V characteristic curves



1	① → ② ② → ①

Performance limits (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

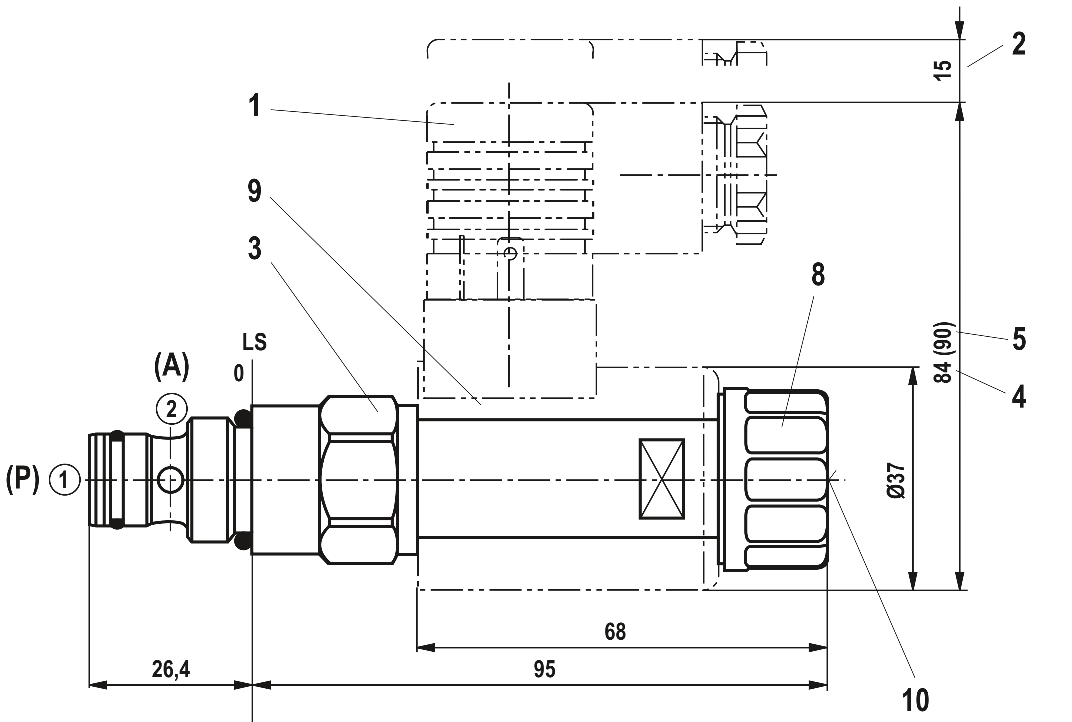


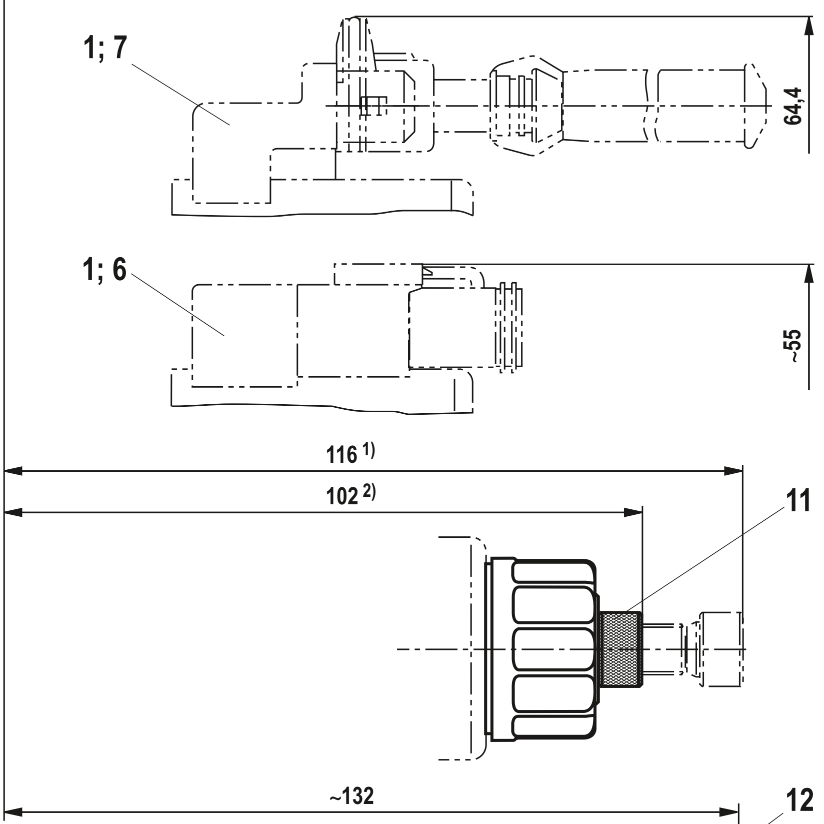
Attention!

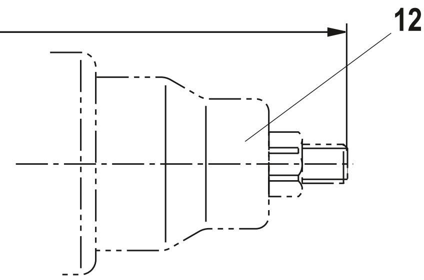
The performance limits were determined when the solenoids were at operating temperature and at 10 % undervoltage.

1	① → ② ② → ①

Unit dimensions (dimensions in mm)





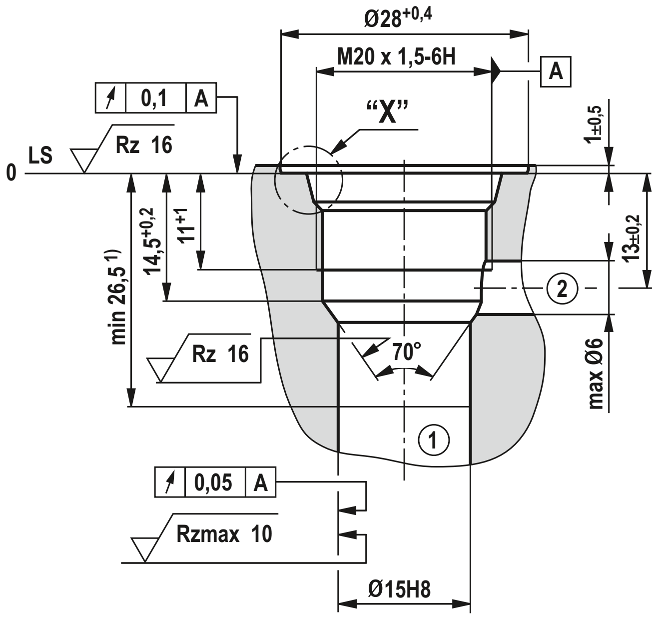


- **1** Mating connector (order separately, see data sheet 08006)
- **2** Space required for removing the mating connector
- **3** SW24, tightening torque $M_A = 25^{+5}$ Nm
- **4** Dimension for "K4" mating connector, without circuitry
- **5** Dimension () for "K4" mating connector, with circuitry
- **6** Version "K40"
- **7** Version "C4"
- **8** Nut, tightening torque $M_A = 5^{+1}$ Nm
- **9** Coil (separate order, see page 2)
- **10** Concealed manual override "N9", optional
- **11** Screwable manual override "N11", optional
- **12** Screwable manual override "N10" (separate order, see page 2)

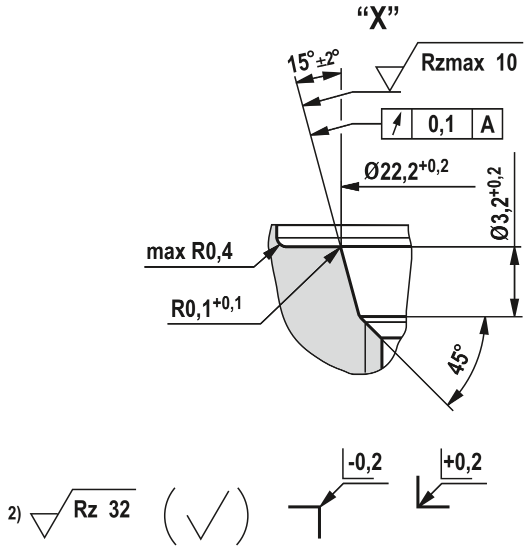
① = Main port 1, pump P [3]
② = Main port 2, actuator A [3]
LS = Location shoulder

[1] Actuated
[2] Screwed in
[3] **Attention!**
Unambiguous pinout. P and A must not be exchanged or closed!

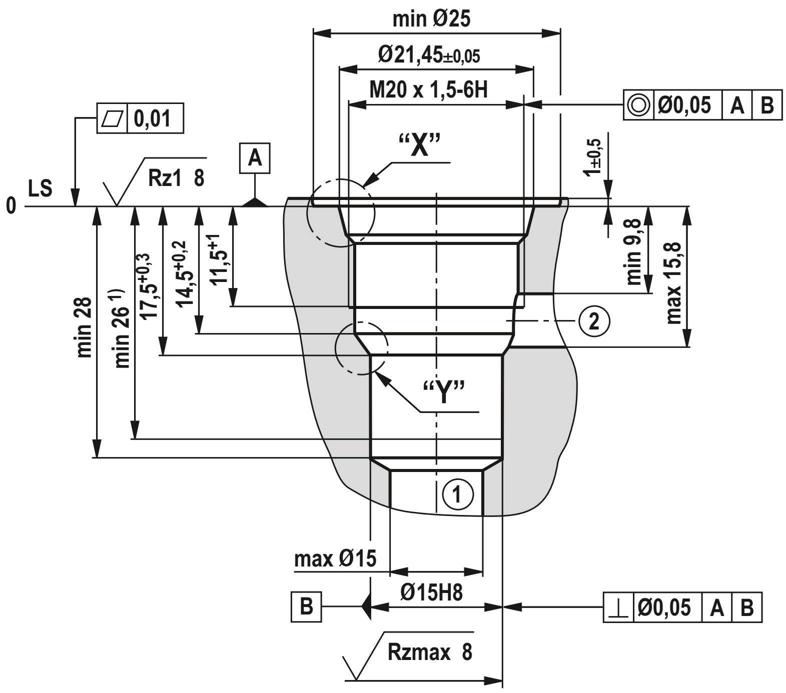
Mounting cavity, 2 main ports; thread M20 x 1.5 (dimensions in mm)

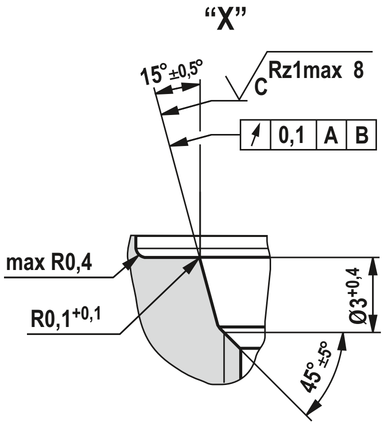


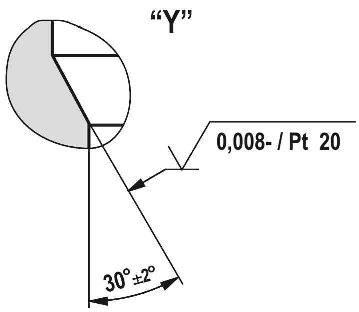
Version "B"

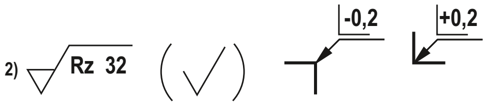


Version "C"









[1] Depth of fit

[2] Visual inspection

① = Main port 1

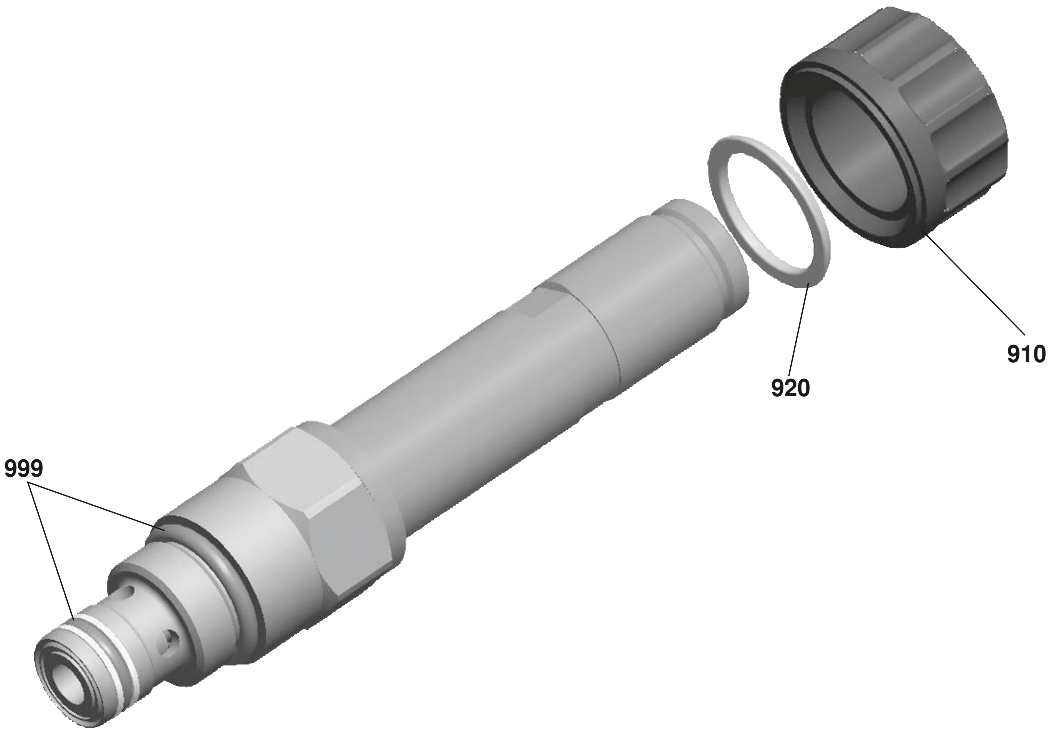
② = Main port 2

LS = Location Shoulder

All seal ring insertion faces are rounded and free of burrs

Tolerance for all angles ±0.5°

Available individual components



Item	Denomination	Material no.
910	Nut	R900991453
920	O-ring for pole tube	R900007769
999	Seal kit of the valve (version "B")	R961005311
	Seal kit of the valve (version "C")	R961005312

Coils, separate order, see page 2

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2/2 directional seat valve, direct operated with solenoid actuation

RE 18136-20/06.12 1/8
Replaces: 08.09

Type KSDE (high-performance)

H6804

Component size 1
Component series B
Maximum operating pressure 500 bar
Maximum flow 20 l/min

Table of contents

Features

– Mounting cavity R/T-13A
– Direct operated directional seat valve with solenoid actuation, tight on both sides
– Blocked connection tight in a leak-free form
– Safe switching also with longer standstill periods
– Wet-pin DC solenoids
– Rotatable solenoid coil

Information on available spare parts:
www.boschrexroth.com/spc

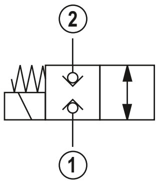
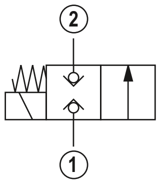
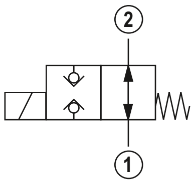
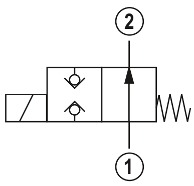
Ordering code (Valve without coil) 1)

KSDE		1		B / H		V		*

Directional seat valve, direct operated, electrically operated

Maximum operating pressure 500 bar = U
Maximum operating pressure 350 bar = R

Component size = 1

2 main ports			
	"R" (350 bar)	"U" (500 bar) "R… -17" (350 bar)	
Symbols			= N
Symbols			= P

Further details in the plain text

no code = Standard
–17 = Flow-optimized 3)

Seal material
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

N0 = **without** manual override
N9 = **with** concealed manual override
N11 = **with** screwable manual override

	Symbol N			Symbol P		
Version	**N0**	**N9**	**N11**	**N0**	**N9**	**N11**
R (350 bar)	X	–	X	X	X 2)	–
U (500 bar)	X	–	–	X	–	–

H = High-performance and mounting cavity R/T-13A (see page 7)

B = Component series

Valve types (without coil) 1)

Operating pressure 350 bar		
Spool symbol	**Type**	**Material no.**
N	KSDER1NB/HN0V	R901083194
	KSDER1NB/HN0V-17	R901176259
	KSDER1NB/HN11V	R901151293
	KSDER1NB/HN11V-17	R901206914
P	KSDER1PB/HN0V	R901083196
	KSDER1PB/HN0V-17	R901176247
	KSDER1PB/HN9V	R901151294
	KSDER1PB/HN9V-17	R901206911

Operating pressure 500 bar		
Spool symbol	**Type**	**Material no.**
N	KSDEU1NB/HN0V	R901083202
P	KSDEU1PB/HN0V	R901083203

Available coils (separate order) 1)

Direct voltage DC 5)	**Material no. for coil with connector 4)**		
	"K4" 03pol (2+PE) DIN EN 175301-803	**"K40"** 02pol K40 DT 04-2PA, make: Deutsch	**"C4"** 02pol C4/Z30 AMP Junior Timer
12 V	R900991678	R900729189	R900315818
24 V	R900991121	R900729190	R900315819

1) Complete valves with mounted coil upon request

2) Screwable manual override "N10" (actuation by means of internal hexagon with lock nut), possible as separate order, material no. **R901051231**; ordering code **"N9"**!

3) Only version "R" (free-flowing on one side!)

4) Mating connectors (separate order), see RE 08006

5) Other voltages upon request

Function, section, symbols

General

The 2/2 directional seat valves are direct operated, pressure compensated cartridge valves. They basically comprises of screw-in section (4) with valve seat (1), solenoid (5), as well as closing element (3) and compression spring (2).

Function

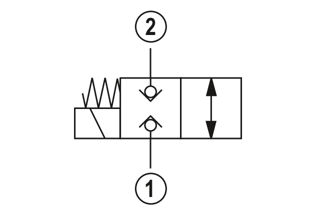
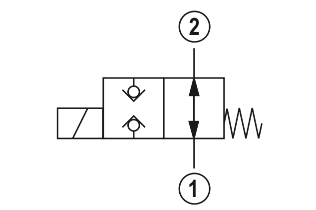
The initial position of the valve (normally open "P" or normally closed "N") is determined by the position of the closing element (3) and the arrangement of the compression spring (2). Due to the structural design, the 2/2 directional seat valves are always pressure-compensated in relation to the actuating forces. The main ports ① and ② can be loaded with an operating pressure of 350 bar/500 bar (see Technical Data, page 4).

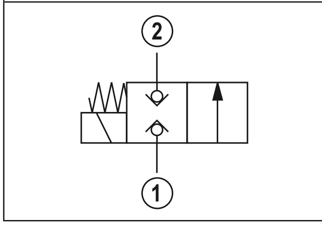
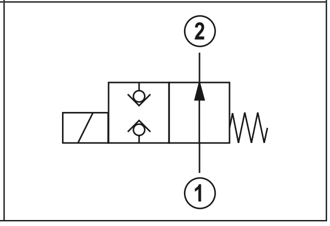
Attention!

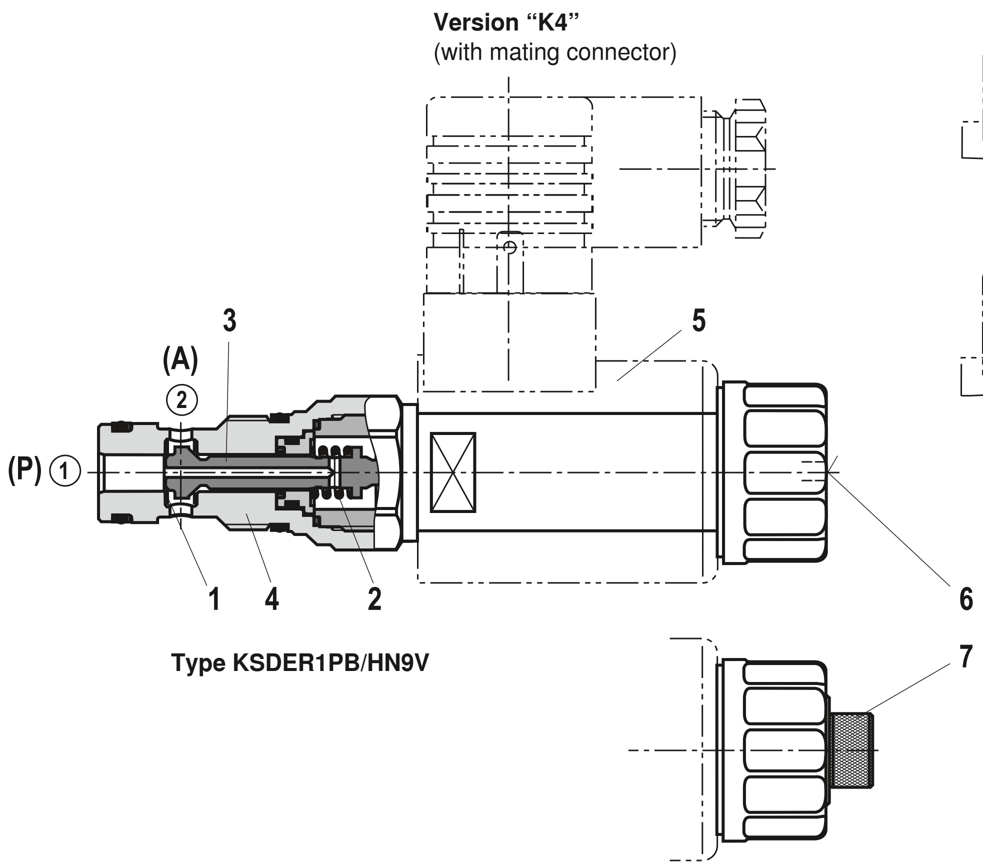
The flow is only permitted in the direction of arrow (see symbols)! With version "U" (operating pressure 500 bar) as well as with version "R…-17", main port ① must be connected with pump connection P! Valves with version "R…-17" are flow-optimized and thus achieve a higher pressure differential.

With symbol "P", the closing element (3) is pressed onto the seat by the solenoid (5), with symbol "N" by the compression spring (2). The flow is blocked in a leak-free form.

The manual override allows for the the switching of the valve without solenoid energization. It is available in concealed version "N9" (6) or in screwable version "N11" (7) (see page 2).

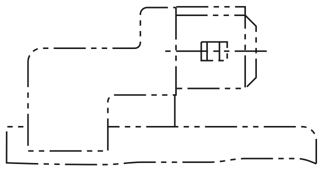
Version **"R"** (350 bar)	
Symbol "N" normally closed	**Symbol "P"** normally open
	

Version **"U"** (500 bar) and **"R…-17"** (350 bar)	
Symbol "N" normally closed	**Symbol "P"** normally open
	

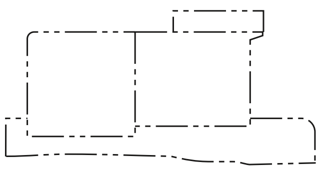


Type KSDER1PB/HN9V

Version "C4"



Version "K40"



Technical data (For applications outside these parameters, please consult us!)

general

Weight	– Valve	kg	0.30
	– Coil	kg	0.25
Installation position			Any
Ambient temperature range		°C	–40 to +110

hydraulic

Maximum operating pressure	– Version “U”	bar	500 (at all ports if P ≥ A; for design reasons)
	– Version “R”	bar	350 (at all ports)
	– Version “R…-17”	bar	350 (at all ports if P ≥ A; for design reasons)
Maximum flow	– Version “U”	l/min	12 (see performance limits page 5)
	– Version “R”	l/min	20 (see performance limits page 5)
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524; quickly bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids upon request
Hydraulic fluid temperature range		°C	–40 to +80
Viscosity range		mm^2/s	4 to 500
Maximum permitted degree of contamination of the hydraulic fluid – cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1]
Load cycles	– Version “R” (350 bar)		10 million
	– Version “U” (500 bar)		5 million

electrical

Type of voltage			Direct voltage
Supply voltage [2]		V	12 DC; 24 DC
Voltage tolerance against ambient temperature			See characteristic curve page 5
Power consumption		W	22
Duty cycle		%	See characteristic curve page 5
Maximum coil temperature [3]		°C	150
Switching time according to ISO 6403 (solenoid horizontal)	– ON (① → ②)	ms	≤ 60 (≤ 95 with version “R…-17”)
	– OFF (② → ①)	ms	≤ 60 (≤ 95 with version “R…-17”)
Maximum switching frequency	– Version “R”	1/h	9000
	– Version “U”	1/h	3600
Protection class according to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version “K4”		IP 65 with mating connector mounted and locked
	– Version “C4”		IP 66 with mating connector mounted and locked
			IP 69K with Rexroth mating connector (Material no. R901022127)
	– Version “K40”		IP 69K with mating connector mounted and locked

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

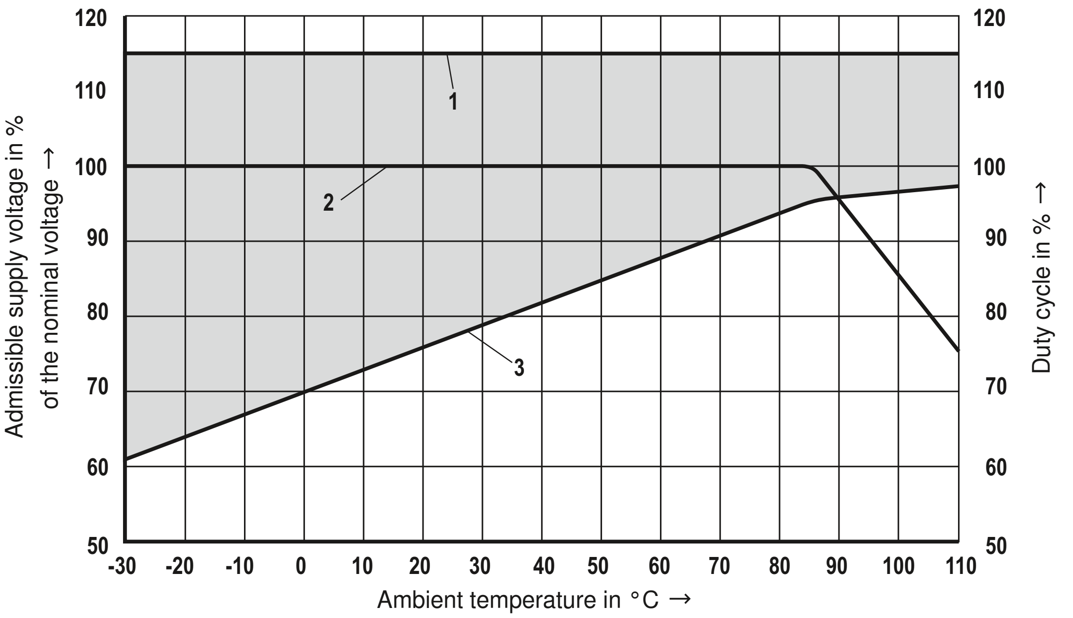
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

[2] Other voltages upon request

[3] Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

At the electrical connection “K4”, the protective earthing conductor (PE ⏚) has to be connected properly.

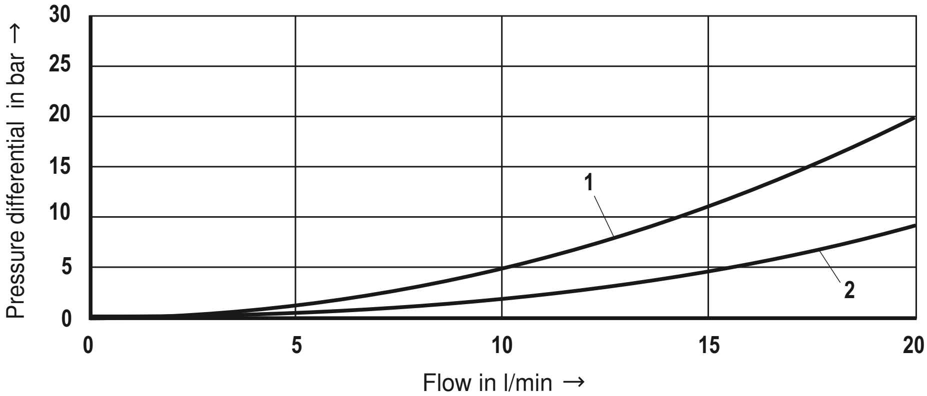
Voltage tolerance against ambient temperature; duty cycle



1 Maximum voltage
2 Duty cycle
3 Minimum response voltage
Admissible supply voltage range

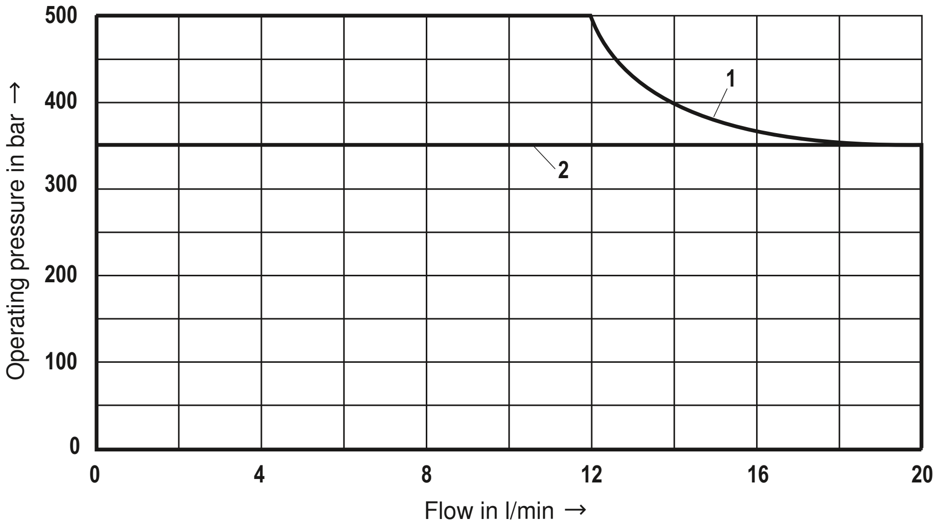
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Δp-q_V characteristic curves



1 Version "R" and "U"	① → ② ② → ①
2 Version "R…-17"	① → ② ② → ①

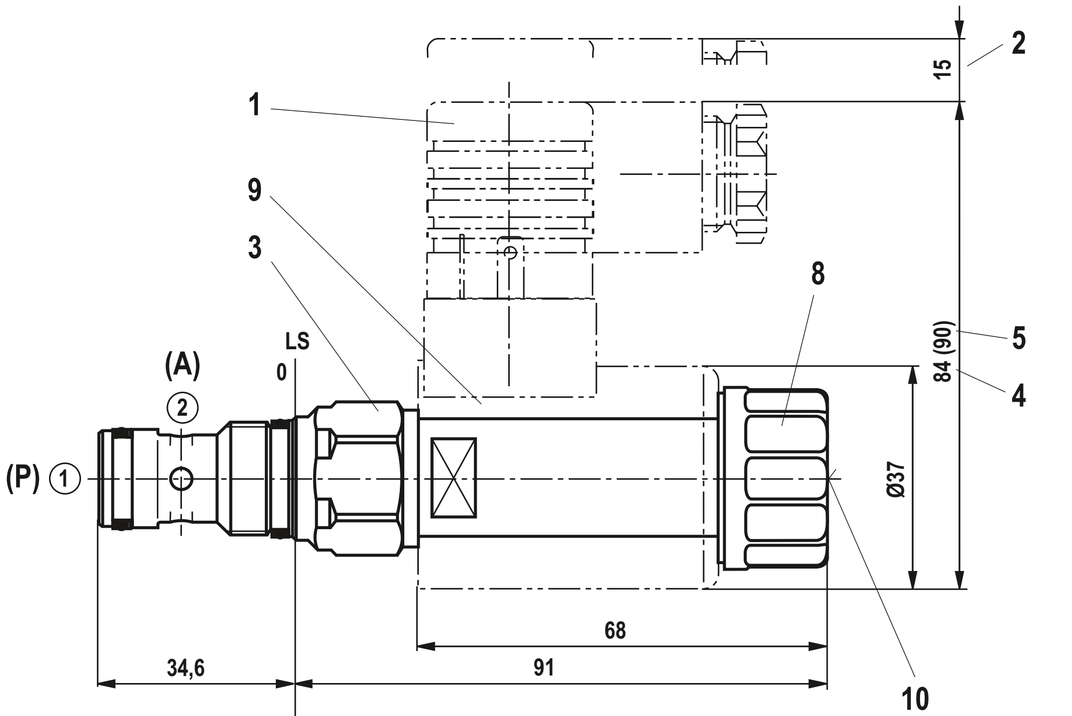
Performance limits (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

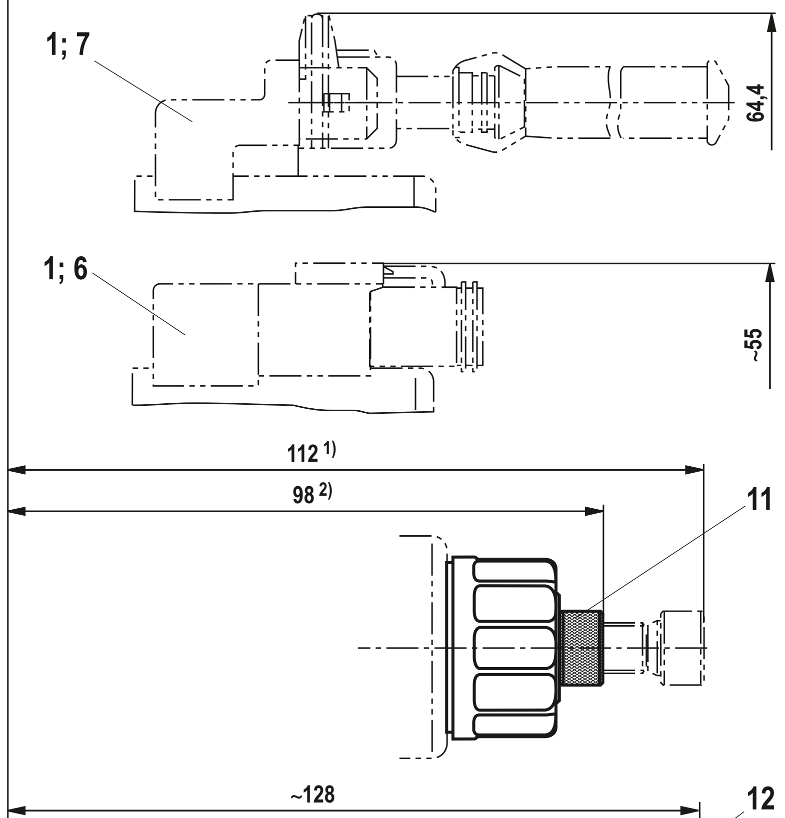


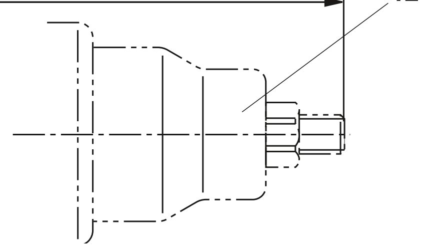
Attention!
The performance limits were determined when the solenoids were at operating temperature and at 10% undervoltage.

1 Version "U"	① → ②
2 Version "R"	① → ② ② → ①
2 Version "R…-17"	① → ②

Unit dimensions (dimensions in mm)







1 Mating connector (separate order, see RE 08006)

2 Space required to remove the mating connector

3 SW24, tightening torque $M_A = 60^{+5}$ Nm

4 Dimension for “K4” mating connector, without circuitry

5 Dimension () for “K4” mating connector, with circuitry

6 Version “K40”

7 Version “C4”

8 Nut, tightening torque $M_A = 5^{+1}$ Nm

9 Coil (separate order, see page 2)

10 Concealed manual override “N9”, optional

11 Screwable manual override “N11”, optional

12 Screwable manual override “N10” (separate order, see page 2)

① = Main port 1, pump P [3]

② = Main port 2, actuator A [3]

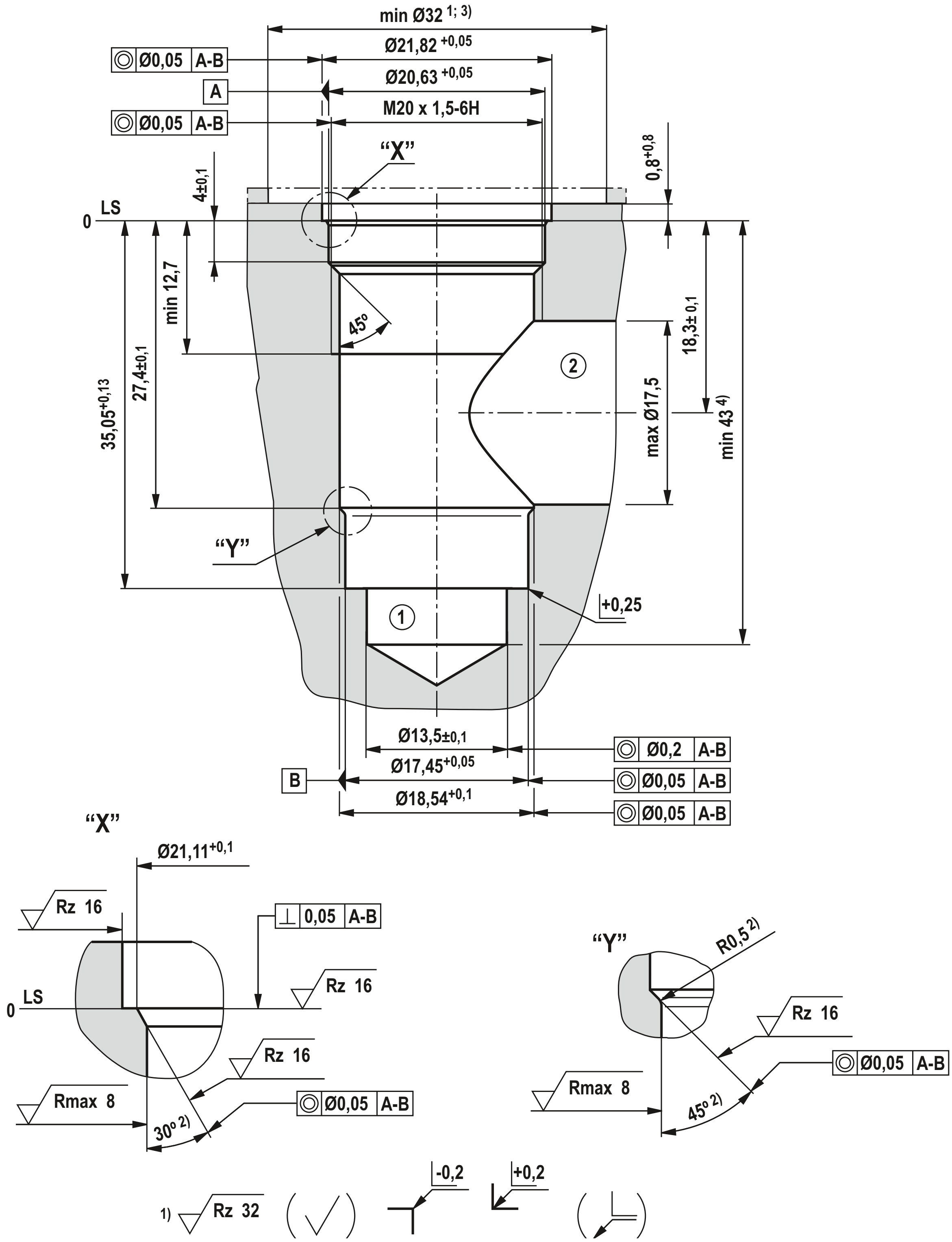
LS = Positive stop shoulder (location shoulder)

[1] Actuated

[2] Screwed in

[3] **Attention!**
Unambiguous pinout. P and A must not be exchanged or closed!

Mounting cavity R/T-13A; 2 main ports; thread M20 x 1.5 (dimensions in mm)



1) Differing from T-13A

2) All seal ring insertion chamfers are rounded and free of burrs

3) with counterbore

4) Depth for moving parts

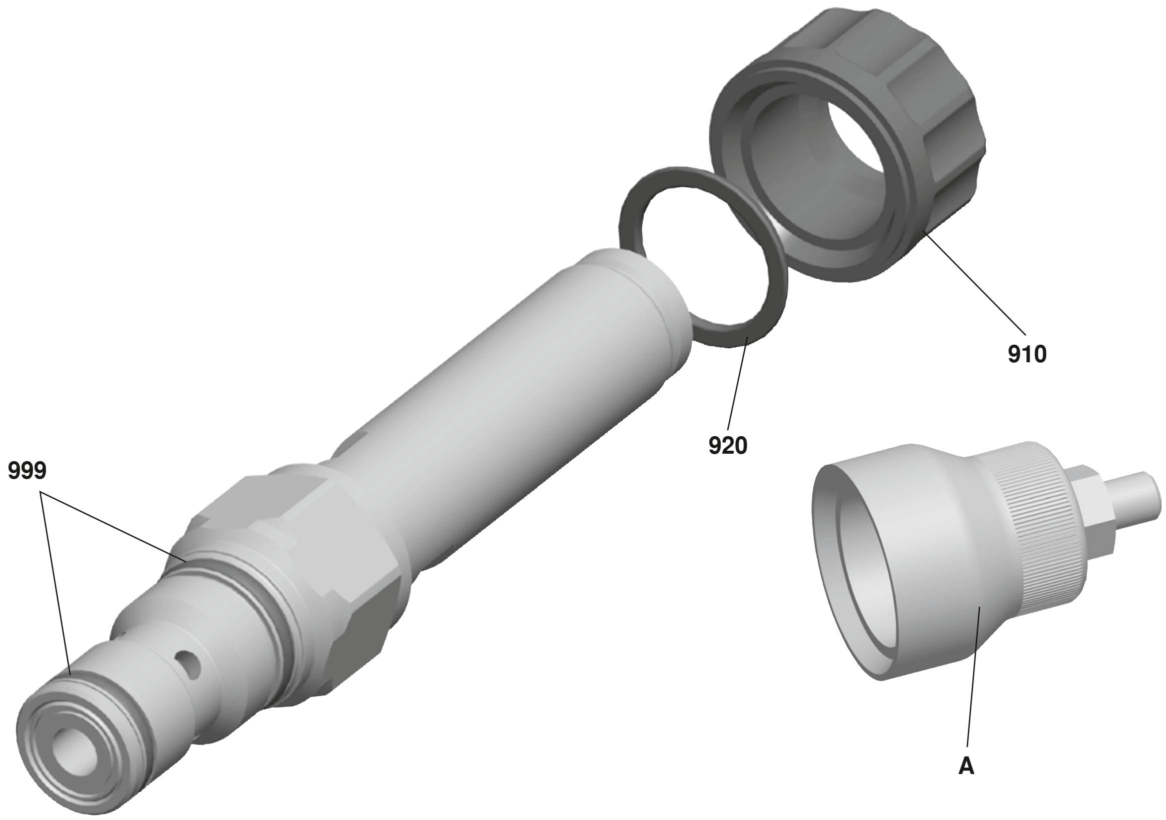
① = Main port 1

② = Main port 2

LS = Positive stop shoulder (location shoulder)

Tolerance for all angles ±0.5°

Available individual components



Item	Description	Material no.
910	Nut	R900991453
920	O-ring for pole tube	R900004280
999	Seal kit of the valve	R961003236
A	Manual override “N10” [1)	R901051231

Coils, separate order, see page 2

[1) Only with ordering code “N9”, see page 2

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

3/2 directional seat valve, direct operated with solenoid actuation

RE 18136-21/06.12 1/8
Replaces: 08.09

Type KSDE (high-performance)

Component size 1
Component series B
Maximum operating pressure 500 bar
Maximum flow 20 l/min

H6805

Table of contents

Features

- Mounting cavity R/T-11A
- Direct operated directional seat valve with solenoid actuation, tight on both sides
- Blocked connection tight in a leak-free form
- Safe switching also with longer standstill periods
- Wet-pin DC solenoids
- Rotatable solenoid coil

Information on available spare parts:
www.boschrexroth.com/spc

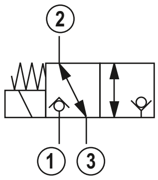
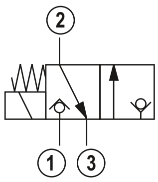
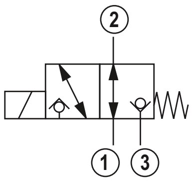
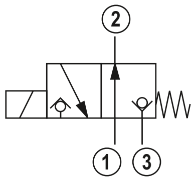
Ordering code (Valve without coil) 1)

KSDE		1		B / H		V		*

Directional seat valve, direct operated, electrically operated

Maximum operating pressure 500 bar **= U**
Maximum operating pressure 350 bar **= R**

Component size **= 1**

3 main ports			
	"R" (350 bar)	**"U"** (500 bar) **"R…-17"** (350 bar)	
Symbols			**= C**
			**= U**

Further details in the plain text

no code = Standard
–17 = Flow-optimized 3)

Seal material
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

N0 = **without** manual override
N9 = **with** concealed manual override
N11 = **with** screwable manual override (operation by means of knurled screw)

	Symbol C			Symbol U		
Version	**N0**	**N9**	**N11**	**N0**	**N9**	**N11**
R (350 bar)	X	–	X	X	X 2)	–
U (500 bar)	X	–	–	X	–	–

H = High-performance and mounting cavity R/T-11A (see page 7)

B = Component series

Valve types (without coil) 1)

Operating pressure 350 bar		
Spool symbol	**Type**	**Material no.**
C	KSDER1CB/HN0V	R901083205
	KSDER1CB/HN0V-17	R901176263
	KSDER1CB/HN11V	R901151279
	KSDER1CB/HN11V-17	R901206917
U	KSDER1UB/HN0V	R901083191
	KSDER1UB/HN0V-17	R901176251
	KSDER1UB/HN9V	R901151288
	KSDER1UB/HN9V-17	R901206909

Operating pressure 500 bar		
Spool symbol	**Type**	**Material no.**
C	KSDEU1CB/HN0V	R901083198
U	KSDEU1UB/HN0V	R901083200

Available coils (separate order) 1)

Direct voltage DC 5)	Material no. for coil with connector 4)		
	"K4" 03pol (2+PE) DIN EN 175301-803	**"K40"** 02pol K40 DT 04-2PA, make: Deutsch	**"C4"** 02pol C4/Z30 AMP Junior Timer
12 V	R900991678	R900729189	R900315818
24 V	R900991121	R900729190	R900315819

1) Complete valves with mounted coil upon request

2) Screwable manual override "N10" (actuation by means of internal hexagon with lock nut), possible as separate order, material no. R901051231; ordering code "N9"!

3) Only version "R" (free-flowing on one side!)

4) Mating connectors (separate order), see RE 08006

5) Other voltages upon request

Function, section, symbols

General

The 3/2 directional seat valves are direct operated, pressure compensated cartridge valves. They basically comprises of screw-in section (4) with valve seat (1), solenoid (5), as well as closing element (3) and compression spring (2).

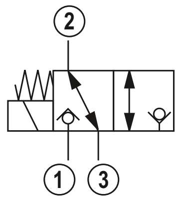
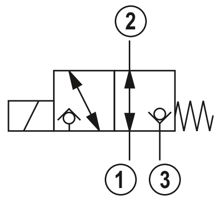
Function

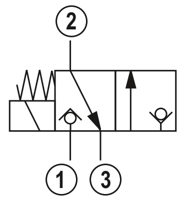
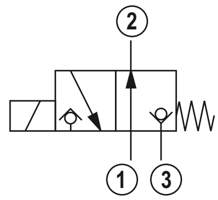
The initial position of the valve (normally open “U” or normally closed “C”) is determined by the position of the closing element (3) and the arrangement of the compression spring (2). Due to the structural design, the 3/2 directional seat valves are always pressure-compensated in relation to the actuating forces. The main ports ① and ② can be loaded with an operating pressure of 350 bar/500 bar (see Technical Data, page 4) and are blocked in a leak-free form in the respective end position. During switching, the main ports are shortly connected (negative overlap).

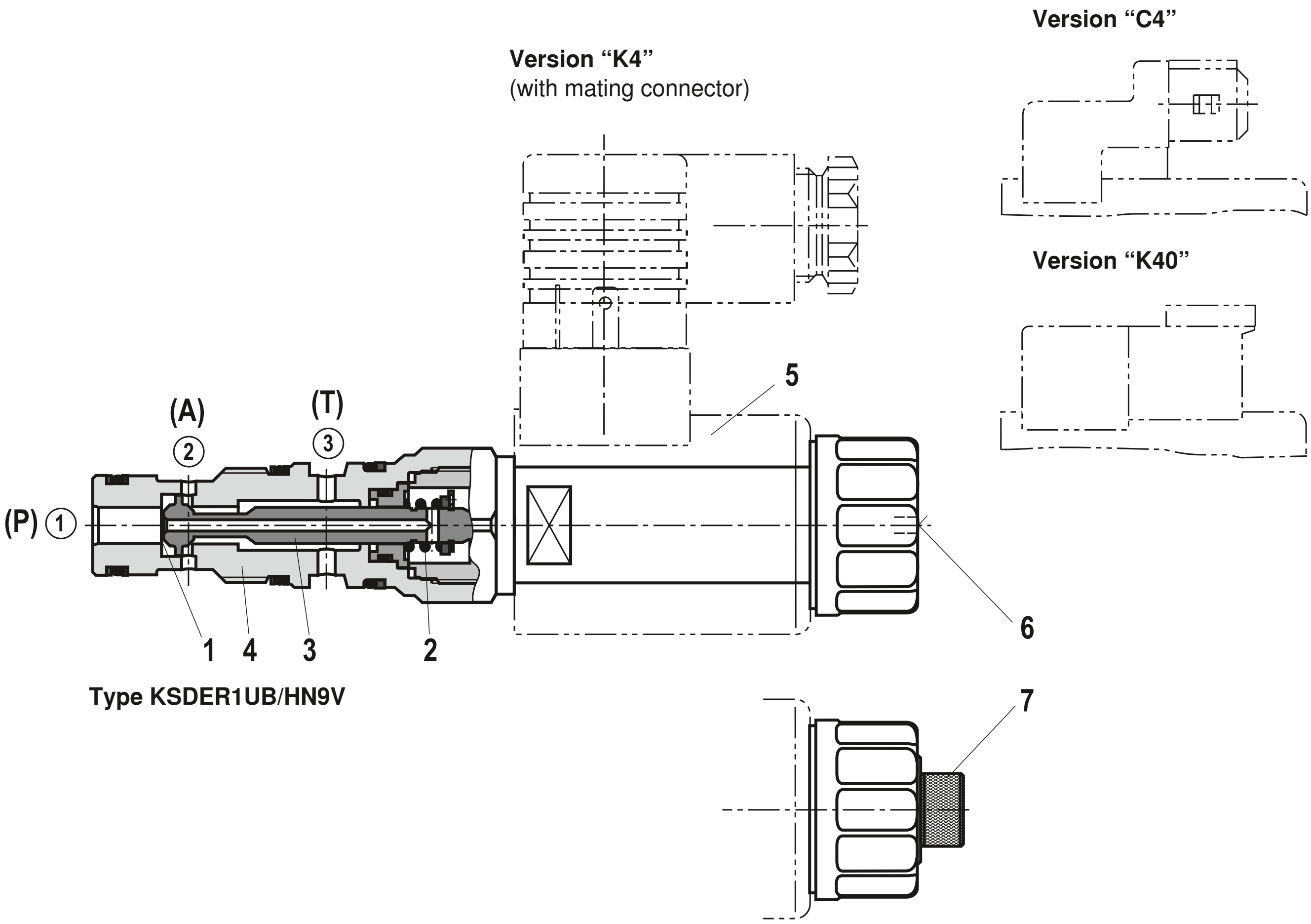
Attention!

The flow is only permitted in the direction of arrow (see symbols)! With version “U” (operating pressure 500 bar) as well as with version “R…-17”, main port ① must be connected with pump connection P! Valves with version “R…-17” are flow-optimized and thus achieve a higher switching power.

The manual override allows for the the switching of the valve without solenoid energization. It is available in concealed version “N9” (6) or in screwable version “N11” (7) (see page 2).

Version **“R”** (350 bar)	
Symbol “C” normally closed	**Symbol “U”** normally open
	

Version **“U”** (500 bar) and **“R…-17”** (350 bar)	
Symbol “C” normally closed	**Symbol “U”** normally open
	



Type KSDER1UB/HN9V

Technical data (For applications outside these parameters, please consult us!)

general

Weight	– Valve	kg	0.30
	– Coil	kg	0.25
Installation position			Any
Ambient temperature range		°C	–40 to +110

hydraulic

Maximum operating pressure	– Version “U”	bar	500 (at main port ① and ②, if P ≥ A ≥ T; for design reasons)
	– Version “R”	bar	350 (at main port ① and ②)
	– Version “R…-17”		350 (at main port ① and ②, if P ≥ A ≥ T; for design reasons)
Maximum tank pressure		bar	≤ 50 (at main port ③)
Maximum flow	– Version “U”	l/min	6 (see performance limits page 5)
	– Version “R”	l/min	12 (see performance limits page 5)
	– Version “R…-17”	l/min	20 (see performance limits page 5)
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524; quickly bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids upon request
Hydraulic fluid temperature range		°C	–40 to +80
Viscosity range		mm^2/s	4 to 500
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1]
Load cycles	– Version “R”(350 bar)		10 million
	– Version “U” (500 bar)		5 million

electrical

Type of voltage			Direct voltage
Supply voltage [2]		V	12 DC; 24 DC
Voltage tolerance against ambient temperature			See characteristic curve page 5
Power consumption		W	22
Duty cycle		%	See characteristic curve page 5
Maximum coil temperature [3]		°C	150
Switching time according to ISO 6403 (solenoid horizontal)	– ON	ms	≤ 60 (≤ 95 with version “R…-17”)
	– OFF	ms	≤ 60 (≤ 95 with version “R…-17”)
Maximum switching frequency	– Version “R”	1/h	9000
	– Version “U”	1/h	3600
Protection class according to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version “K4”		IP 65 with mating connector mounted and locked
	– Version “C4”		IP 66 with mating connector mounted and locked
			IP 69K with Rexroth mating connector (Material no. R901022127)
	– Version “K40”		IP 69K with mating connector mounted and locked

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

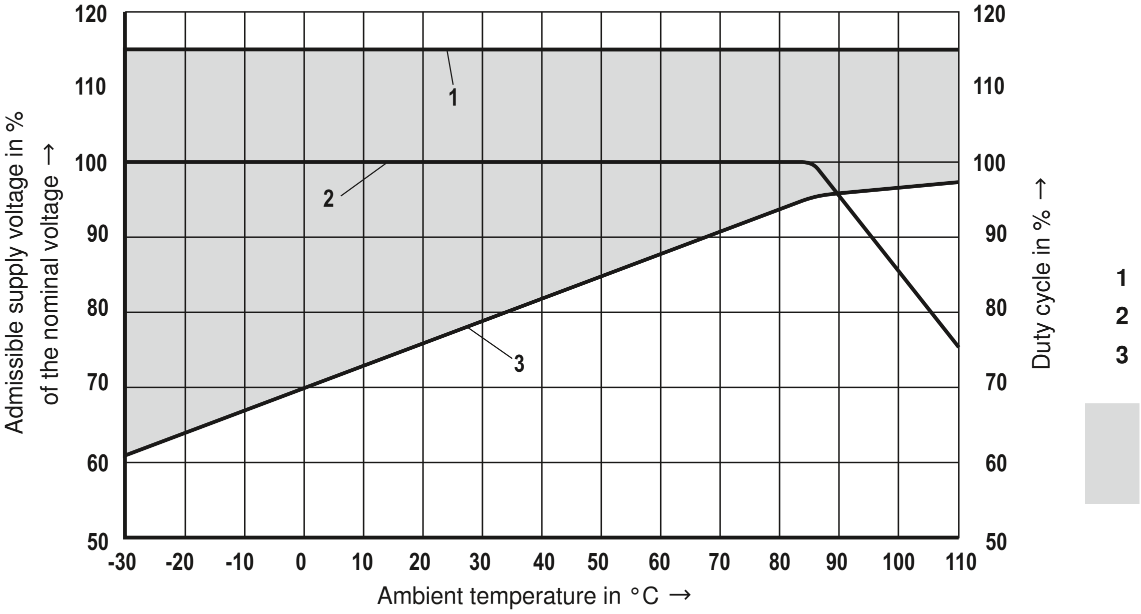
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

[2] Other voltages upon request

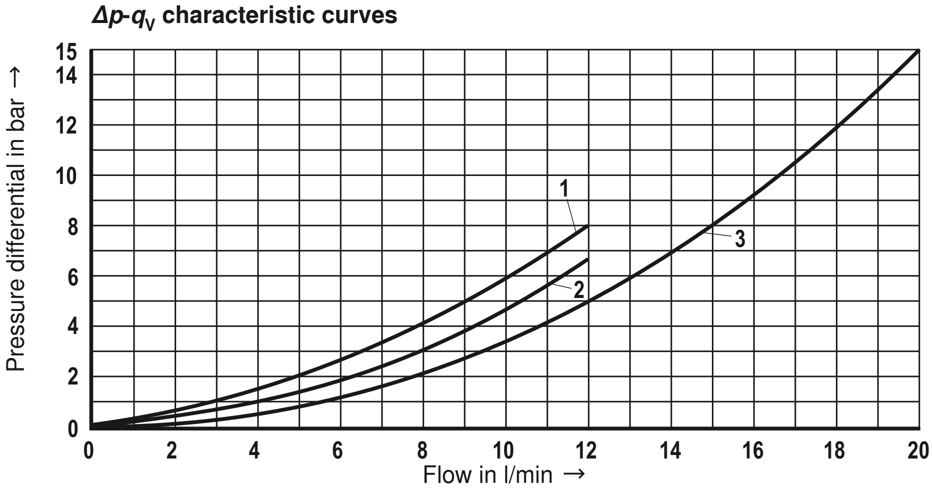
[3] Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

At the electrical connection “K4”, the protective earthing conductor (PE ⏚) has to be connected properly.

Voltage tolerance against ambient temperature; duty cycle

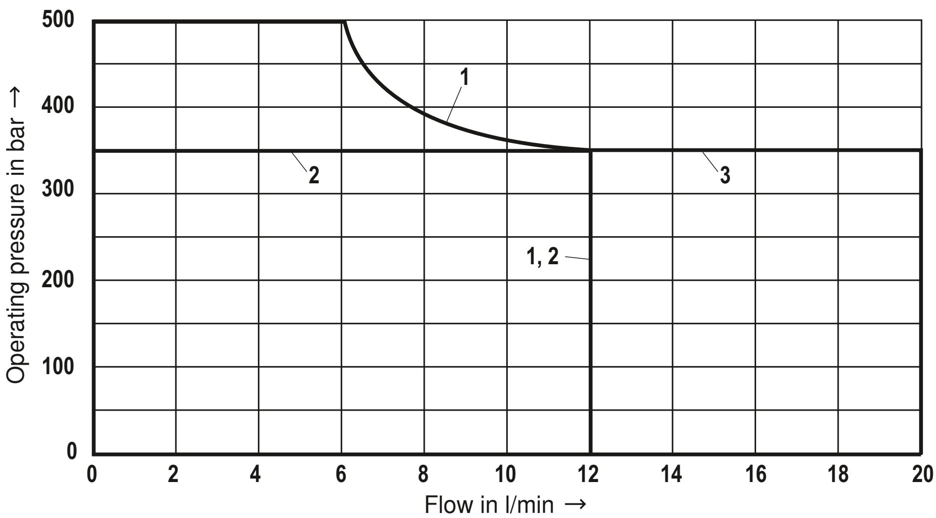


Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)



1 Standard	② → ③
2 Standard	① → ② ② → ①
3 Version "R…-17"	① → ② ② → ③

Performance limits (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

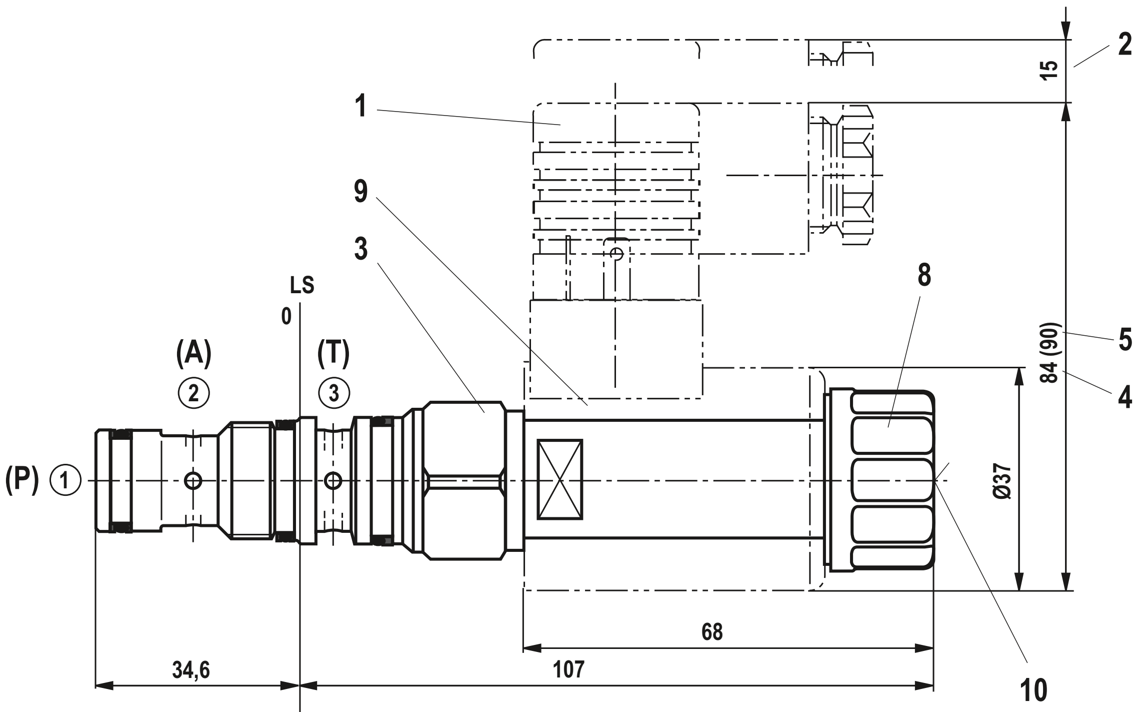


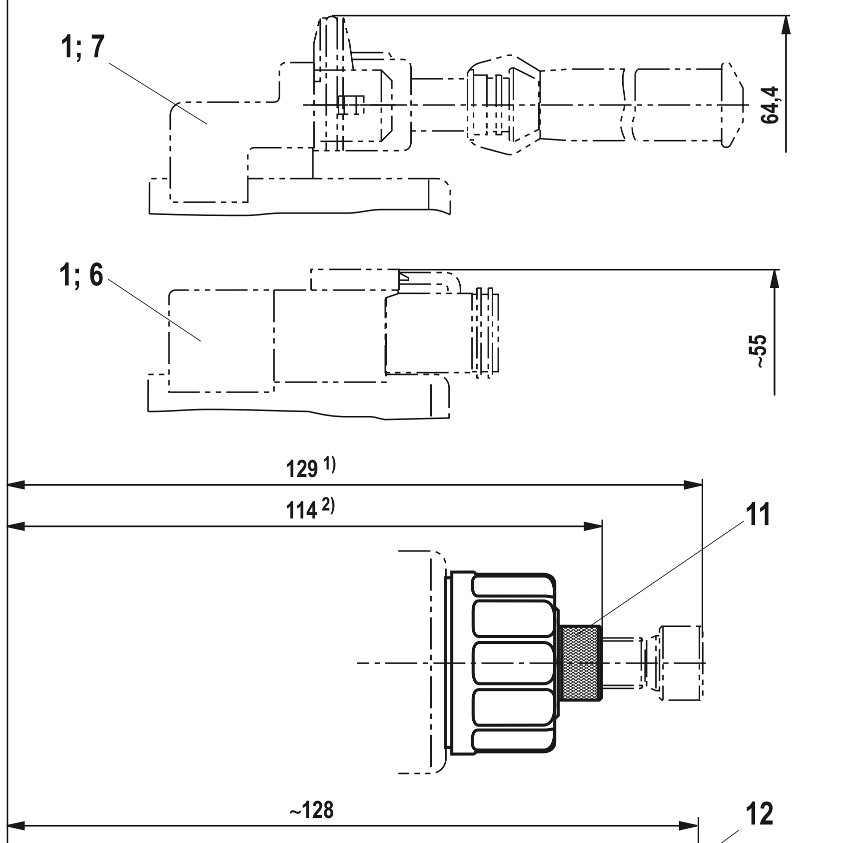
Attention!

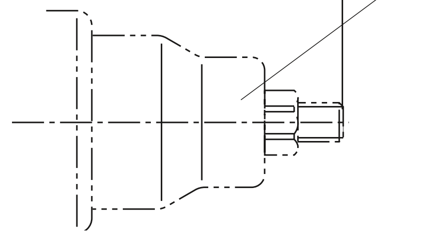
The performance limits were determined when the solenoids were at operating temperature and at 10% undervoltage.

1 Version "U"	① → ②
2 Version "R"	① ↔ ② ② → ①
3 Version "R…-17"	① → ②

Unit dimensions (dimensions in mm)





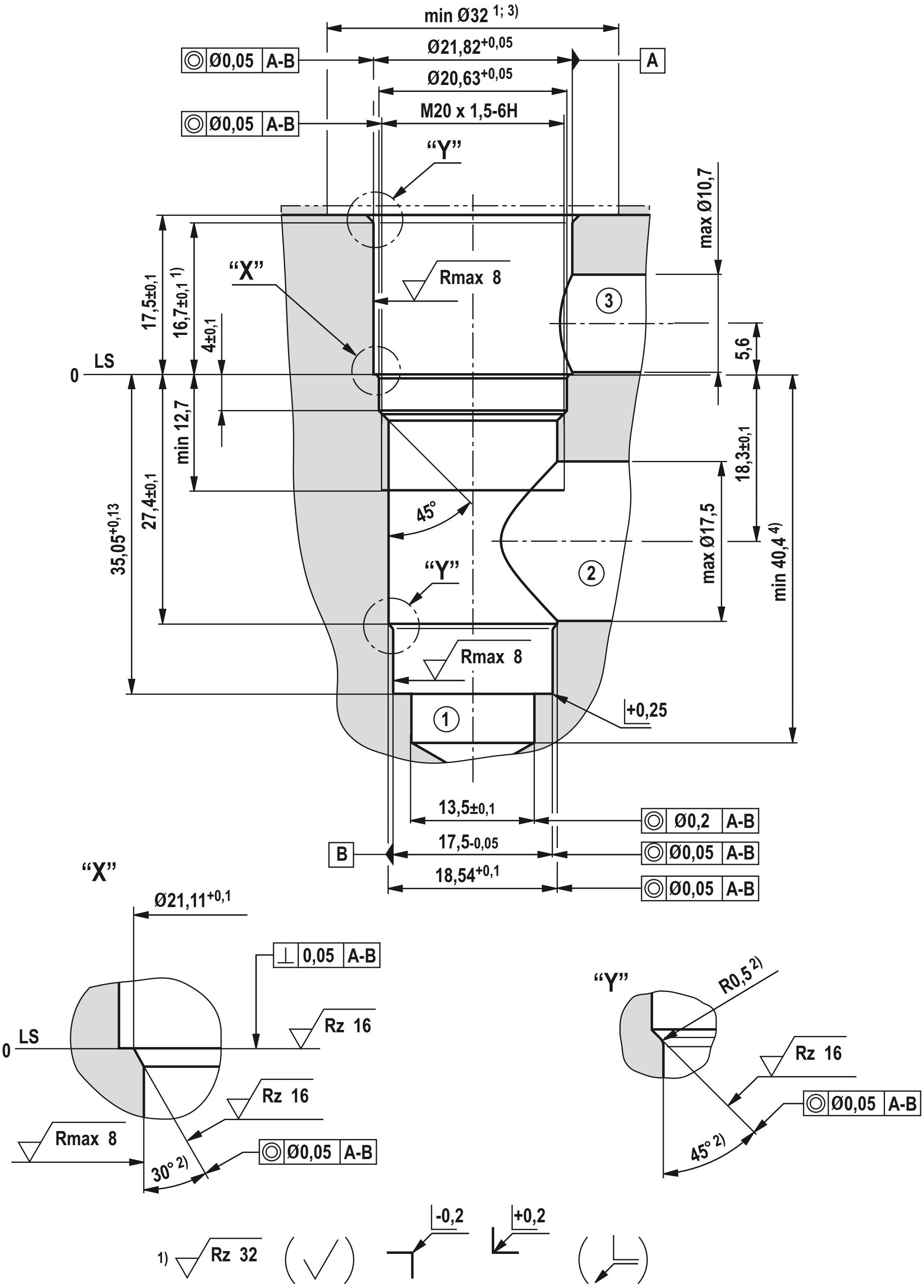


1 Mating connector (separate order, see RE 08006)
2 Space required for removing the mating connector
3 SW24, tightening torque $M_A = 60^{+5}$ Nm
4 Dimension for “K4” mating connector, without circuitry
5 Dimension () for “K4” mating connector, with circuitry
6 Version “K40”
7 Version “C4”
8 Nut, tightening torque $M_A = 5^{+1}$ Nm
9 Coil (separate order, see page 2)
10 Concealed manual override “N9”, optional
11 Screwable manual override “N11”, optional
12 Screwable manual override “N10” (separate order, see page 2)

① = Main port 1, pump P [3]
② = Main port 2, actuator A [3]
③ = Main port 3, tank T [3]
LS = Positive stop shoulder (location shoulder)

[1] Actuated
[2] Acrewed in
[3] **Attention!**
Unambiguous pinout.
P, A, and T must not be exchanged or closed!

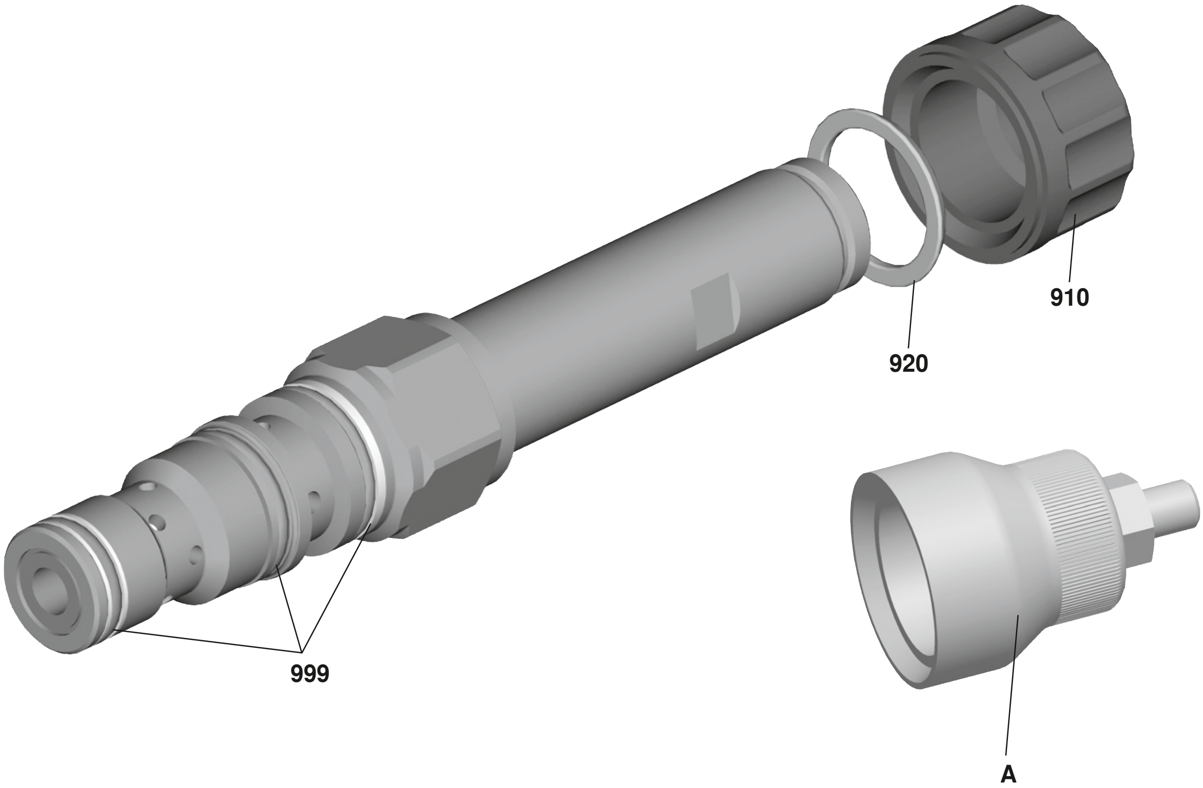
Mounting cavity R/T-11A; 3 main ports; thread M20 x 1.5 (dimensions in mm)



1) Differing from T-11A
2) All seal ring insertion chamfers are rounded and free of burrs
3) with counterbore
4) Depth for moving parts

① = Main port 1
② = Main port 2
③ = Main port 3
LS = Positive stop shoulder (location shoulder)
Tolerance for all angles ±0.5°

Available individual components



Item	Description	Material no.
910	Nut	R900991453
920	O-ring for pole tube	R900004280
999	Seal kit of the valve	R961003235
A	Manual override "N10" 1)	R901051231

Coils, separate order, see page 2

1) Only with ordering code "N9", see page 2

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2/2 directional seat valve, direct operated with solenoid actuation

RE 18136-12/10.11 1/10
Replaces: 06.08

Type KSDE (High Performance)

Component size 8
Component series B
Maximum operating pressure 500 bar
Maximum flow 5 l/min

Table of contents

Features

– Direct operated directional seat valve with solenoid actuation, tight on both sides
– Mounting cavity R/T-8A
– Blocked connection tight in a leak-free form
– Safe switching also with longer standstill periods
– Wet-pin DC solenoids
– Rotatable solenoid coil

Information on available spare parts:
www.boschrexroth.com/spc

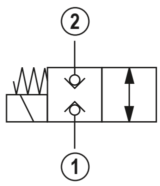
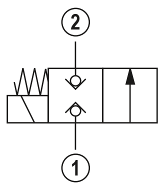
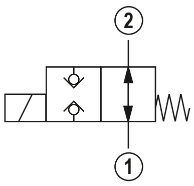
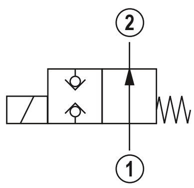
Ordering code (valve without coil) 1)

KSDE		8		B / H		V	*

Directional seat valve, direct operated, electrically operated = KSDE

Maximum operating pressure 500 bar **= U**
Maximum operating pressure 350 bar **= R**

Component size **= 8**

	2 main ports		
	"R" (350 bar)	**"U"** (500 bar)	
Symbols			**= N**
			**= P**

B = Component series

H = High-performance and mounting cavity R/T-8A (see page 8)

N0 = **Without** manual override
N9 = **With** concealed manual override
N11 = **With** screwable manual override (operation by knurled screw)

	Symbol N			Symbol P	
Version	**N0**	**N9**	**N11**	**N0**	**N9**
R (350 bar)	X	–	X	X	X 2)
U (500 bar)	X	–	–	X	–

Seal material

V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of the seal with the hydraulic fluid used!

Further details in the plain text

Valve types (without coil) 1)

Operating pressure 350 bar		
Spool symbol	**Type**	**Material no.**
N	KSDER8NB/HN0V	R901085000
	KSDER8NB/HN11V	R901207100
P	KSDER8PB/HN0V	R901085005
	KSDER8PB/HN9V	R901207098

Operating pressure 500 bar		
Spool symbol	**Type**	**Material no.**
N	KSDEU8NB/HN0V	R901085007
P	KSDEU8PB/HN0V	R901085009

Available coils (separate order) 1)

Direct voltage DC 4)	Material no. for coil with connector 3)		
	"K4" 03pol (2+PE) DIN EN 175301-803	**"K40"** 02pol K40 DT 04-2PA, company Deutsch	**"C4"** 02pol C4/Z30 AMP Junior-Timer
12 V	R900991678	R900729189	R900315818
24 V	R900991121	R900729190	R900315819

1) Complete valves with mounted coil on request

2) Screwable manual override "N10" (actuation by means of internal hexagon with lock nut), possible as separate order, Material no. **R901051231**; ordering code **"N9"**!

3) Mating connectors (separate order), see data sheet 08006

4) Other voltages upon request

Function, section, symbols

General

The 2/2 directional seat valves are direct operated, pressure-compensated cartridge valves. They basically comprises of screw-in section (1), solenoid (4) as well as closing element (3) and compression spring (2).

Function

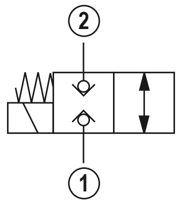
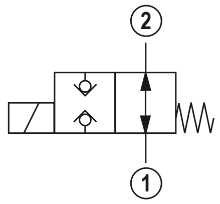
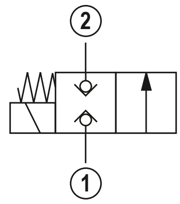
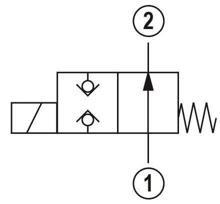
The initial position of the valve (normally open "P" or normally closed "N") is determined by the position of the closing element (3) and the arrangement of the compression spring (2). Due to the structural design, the 2/2 directional seat valves are always pressure-compensated in relation to the actuating forces. The main ports ① and ② can be loaded with an operating pressure of 350/500 bar (see page 4).

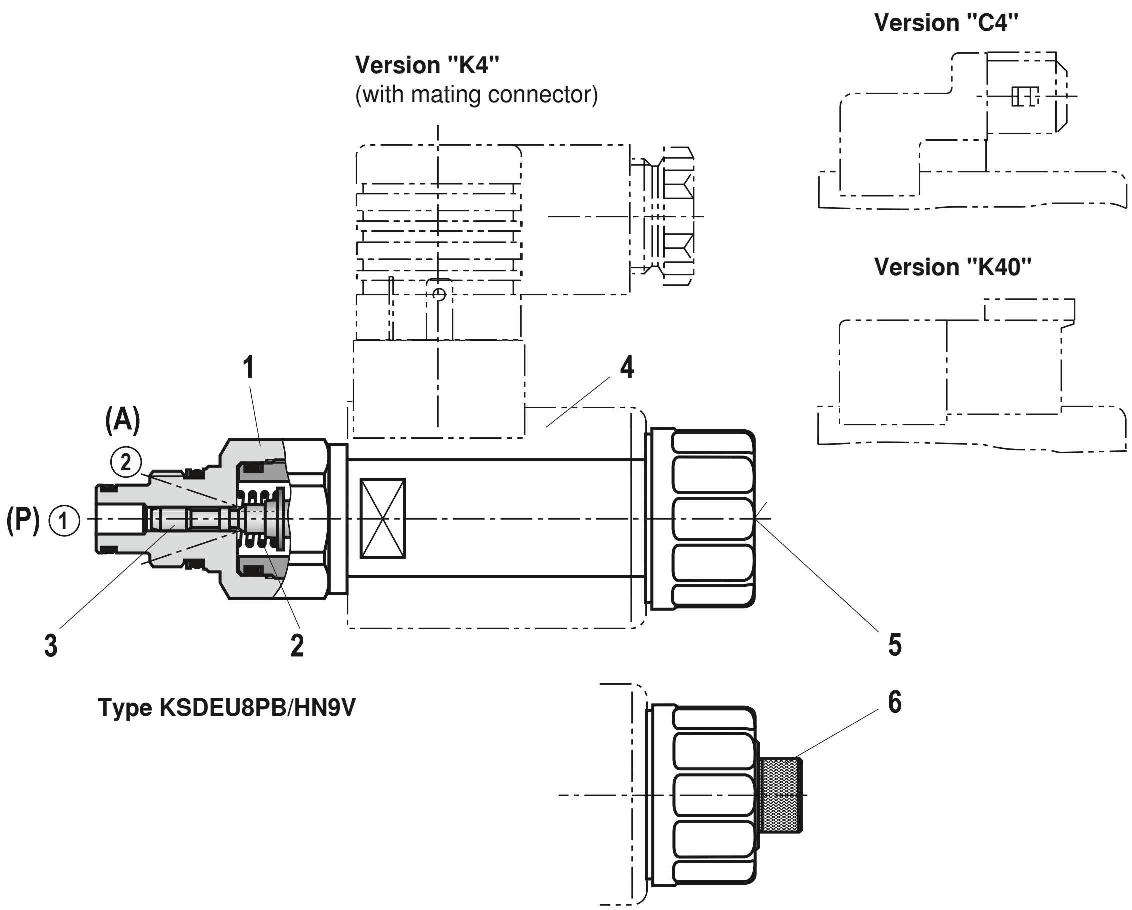
Attention!

Flow is only admissible in the direction of the arrow (see symbols)! With version "U" (operating pressure 500 bar), main port ① must be connected with pump connection P!

With symbol "P", the closing element (3) is pressed onto the seat by the solenoid (4), with symbol "N" by the compression spring (2). The flow is blocked in a leak-free form.

The manual override allows for the the switching of the valve without solenoid energization. It is available in concealed version "N9" (5) or in screwable version "N11" (6) (see page 2).

Version **"R"** (350 bar)		Version **"U"** (500 bar)	
Symbol "N" Normally closed	**Symbol "P"** Normally open	**Symbol "N"** Normally closed	**Symbol "P"** Normally open
			



Type KSDEU8PB/HN9V

Technical data (For applications outside these parameters, please consult us!)

general

Weight	– Valve	kg	0.30
	– Coil	kg	0.25
Installation position			Any
Ambient temperature range		°C	–40 to +110

hydraulic

Maximum operating pressure	– Version "U"	bar	500 (at all ports if P ≥ A; for design reasons)
	– Version "R"	bar	350 (at all ports)
Maximum flow	– Version "U"	l/min	3 (see limits of performance page 6)
	– Version "R"	l/min	5 (see limits of performance page 6)
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C	–40 to +80
Viscosity range		mm^2/s	4 to 500
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]
Load cycles	– Version "R" (350 bar)		10 million
	– Version "U" (500 bar)		5 million

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD, HVLP, HVLPD	FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFAS	FKM	ISO 12922

☞ **Important information on hydraulic fluids!**

– For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!

– There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

– The flash point of the process and operating medium used must be 40 K higher than the maximum solenoid surface temperature.

– **Flame-resistant – water-containing**: Maximum pressure differential per control edge 175 bar, otherwise, increased cavitation erosion!
Tank pre-loading < 1 bar or > 20 % of the pressure differential. The pressure peaks should not exceed the maximum operating pressures!

– **Environmentally compatible:** When using environmentally compatible hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the medium (700 mg zinc per pole tube).

[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of the filters see www.boschrexroth.com/filter.

Technical data (For applications outside these parameters, please consult us!)

electric

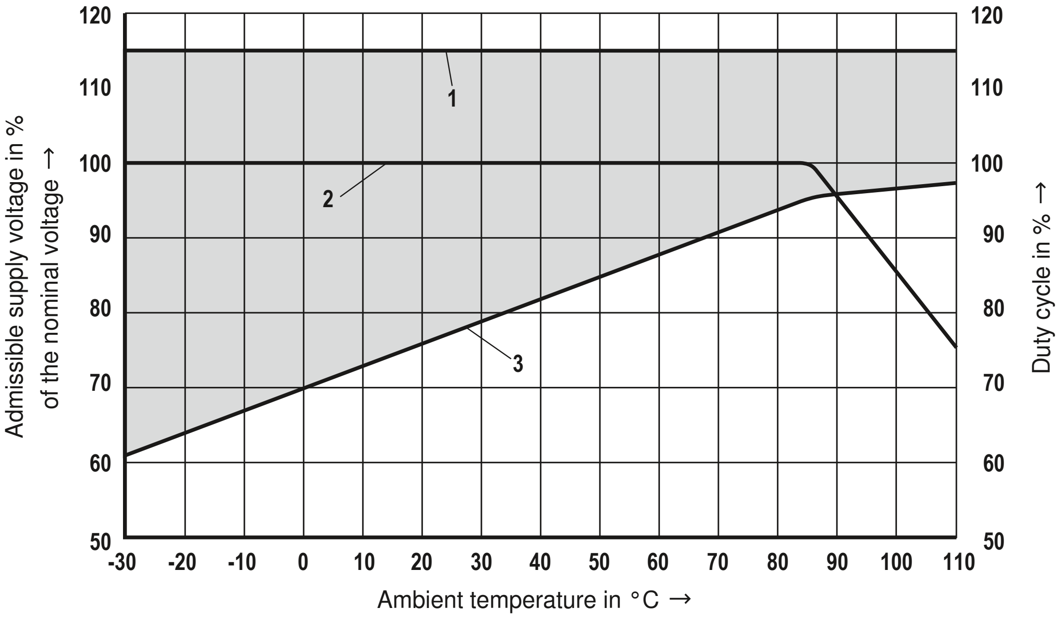
Voltage type			Direct voltage
Supply voltage [2]		V	12 DC; 24 DC
Voltage tolerance against ambient temperature			See characteristic curves page 6
Power consumption		W	22
Duty cycle		%	See characteristic curves page 6
Maximum coil temperature [3]		°C	150
Switching time according to ISO 6403 (solenoid horizontal)	– ON (1 → 2)	ms	≤ 80
	– OFF (2 → 1)	ms	≤ 80
Maximum switching frequency	– Version "R"	1/h	9000
	– Version "U"	1/h	3600
Type of protection according to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version "K4"		IP 65 with mating connector mounted and locked
	– Version "C4"		IP 66 with mating connector mounted and locked
			IP 69K with Rexroth mating connector (Material no. R901022127)
	– Version "K40"		IP 69K with mating connector mounted and locked

[2] Other voltages upon request

[3] Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

With the electrical connection "K4", the protective earthing conductor (PE ⏚) must be connected correctly.

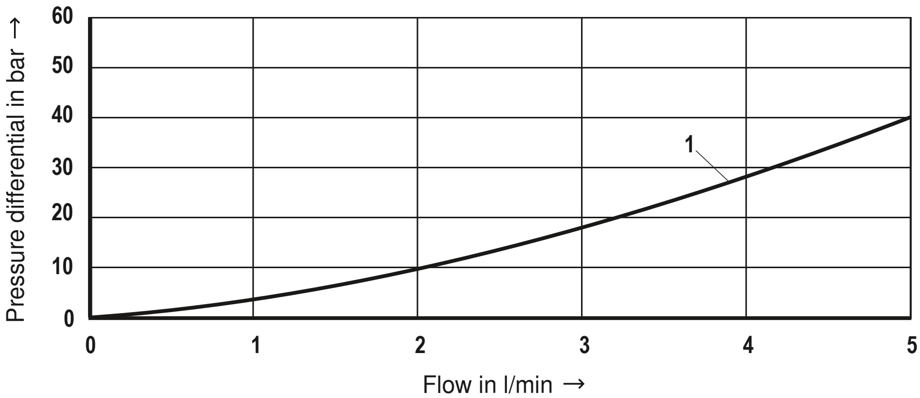
Voltage tolerance against ambient temperature; duty cycle



1 Maximum voltage
2 Duty cycle
3 Minimum response voltage
Admissible supply voltage range

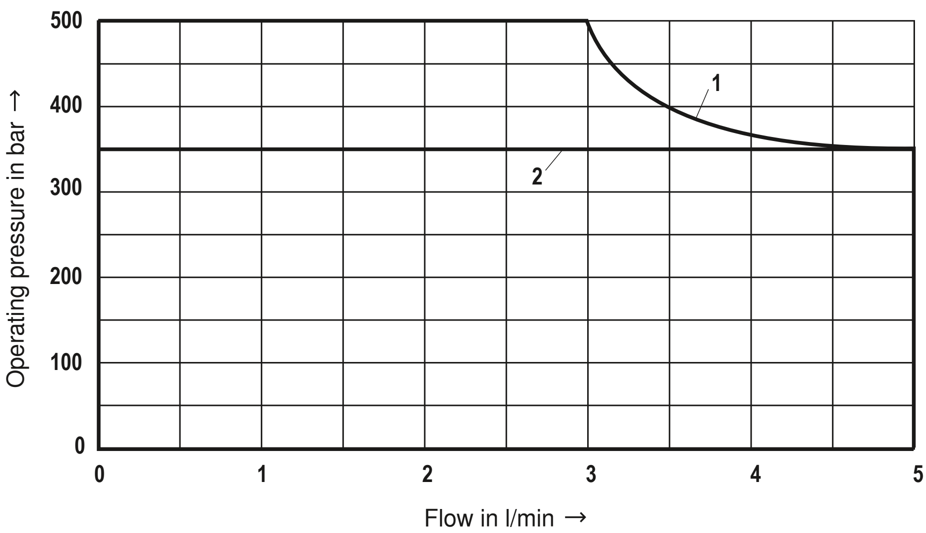
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Δp-q_V-Characteristic curves



1 Version "R" and "U"	1 → 2 2 → 1

Limits of performance (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

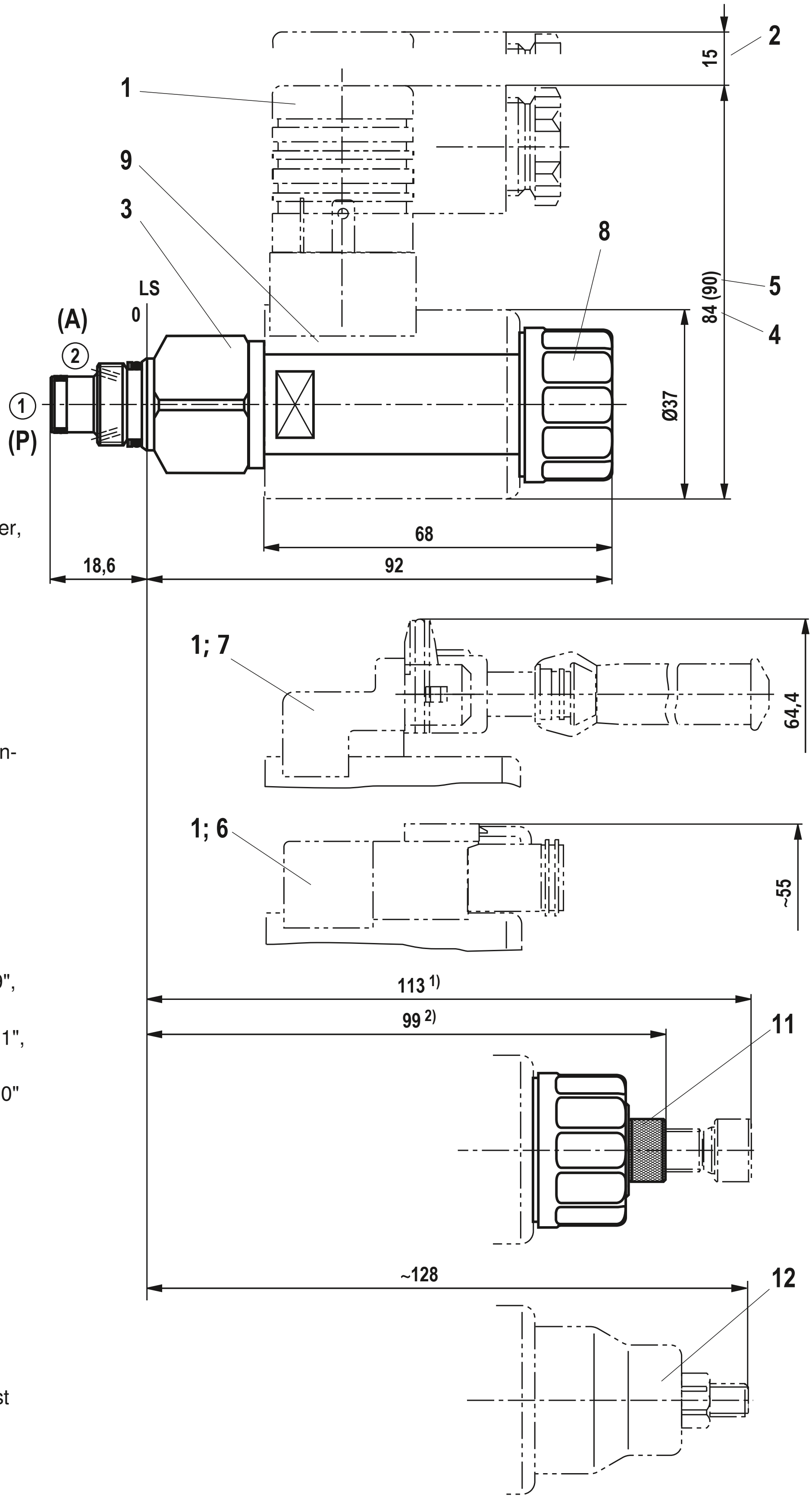


Attention!

The limits of performance were determined when the solenoids were at operating temperature and at 10 % undervoltage.

1 Version "U"	1 → 2
2 Version "R"	1 → 2 2 → 1

Unit dimensions (dimensions in mm)



1 Mating connector (separate order, see data sheet 08006)

2 Space required to remove the mating connector

3 SW24, tightening torque $\boldsymbol{M}_A = 45^{+5}$ Nm

4 Dimension for "K4" mating connector, without circuitry

5 Dimension () for "K4" mating connector, with circuitry

6 Version "K40"

7 Version "C4"

8 Nut, tightening torque $\boldsymbol{M}_A = 5^{+1}$ Nm

9 Coil (separate order, see page 2)

10 Concealed manual override "N9", optional

11 Screwable manual override "N11", optional

12 Screwable manual override "N10" (separate order, see page 2)

① = main port 1, pump P [3)]

② = main port 2, actuator A [3)]

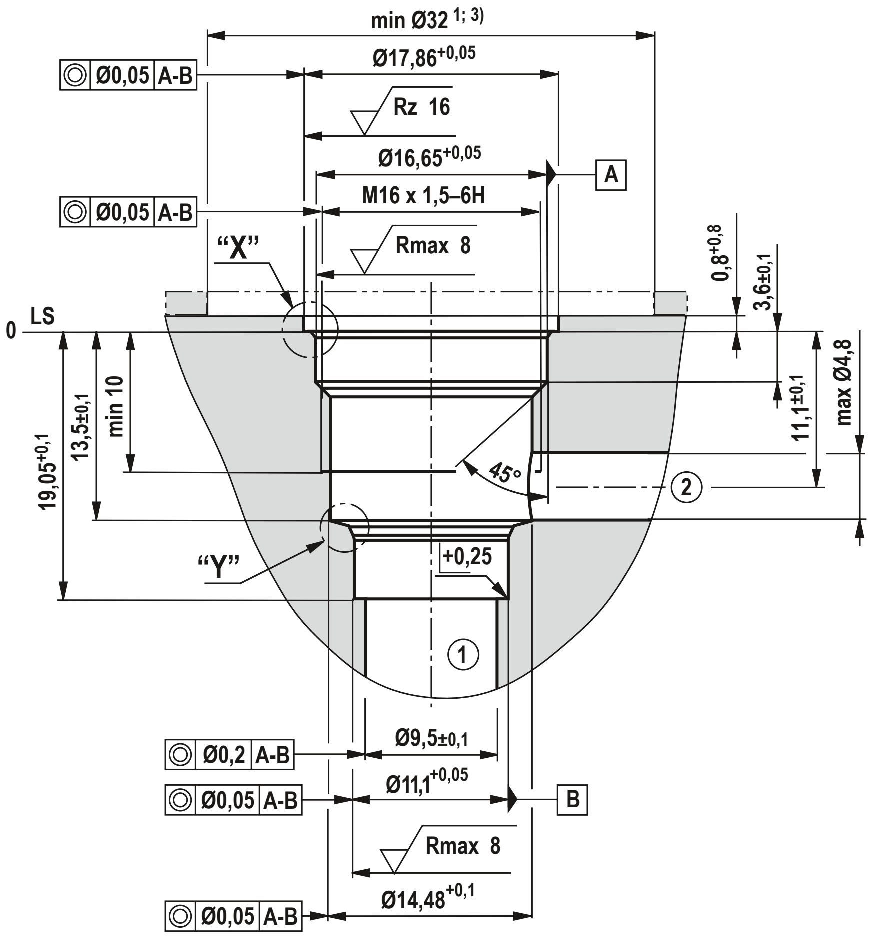
LS = location shoulder

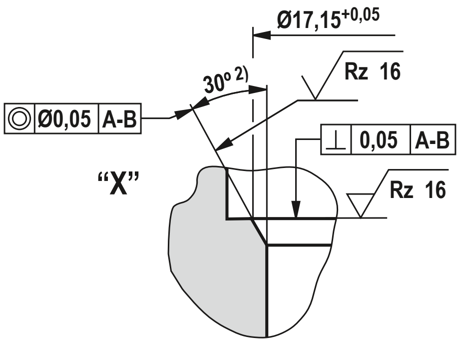
[1)] Operated

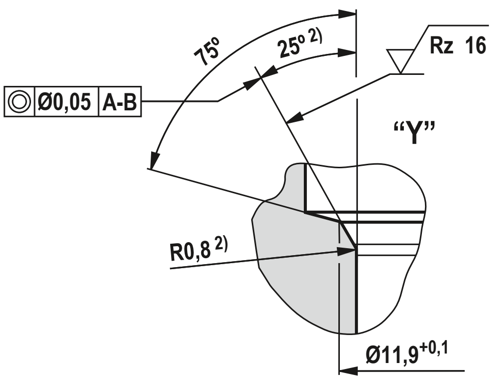
[2)] Screwed in

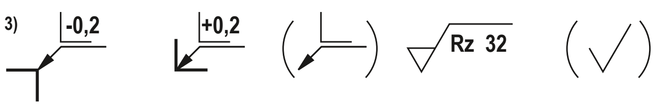
[3)] **Attention!**
Unambiguous pinout. P and A must not be exchanged or closed!

Mounting cavity R/T-8A; 2 main ports; thread M16 x 1.5 (dimensions in mm)







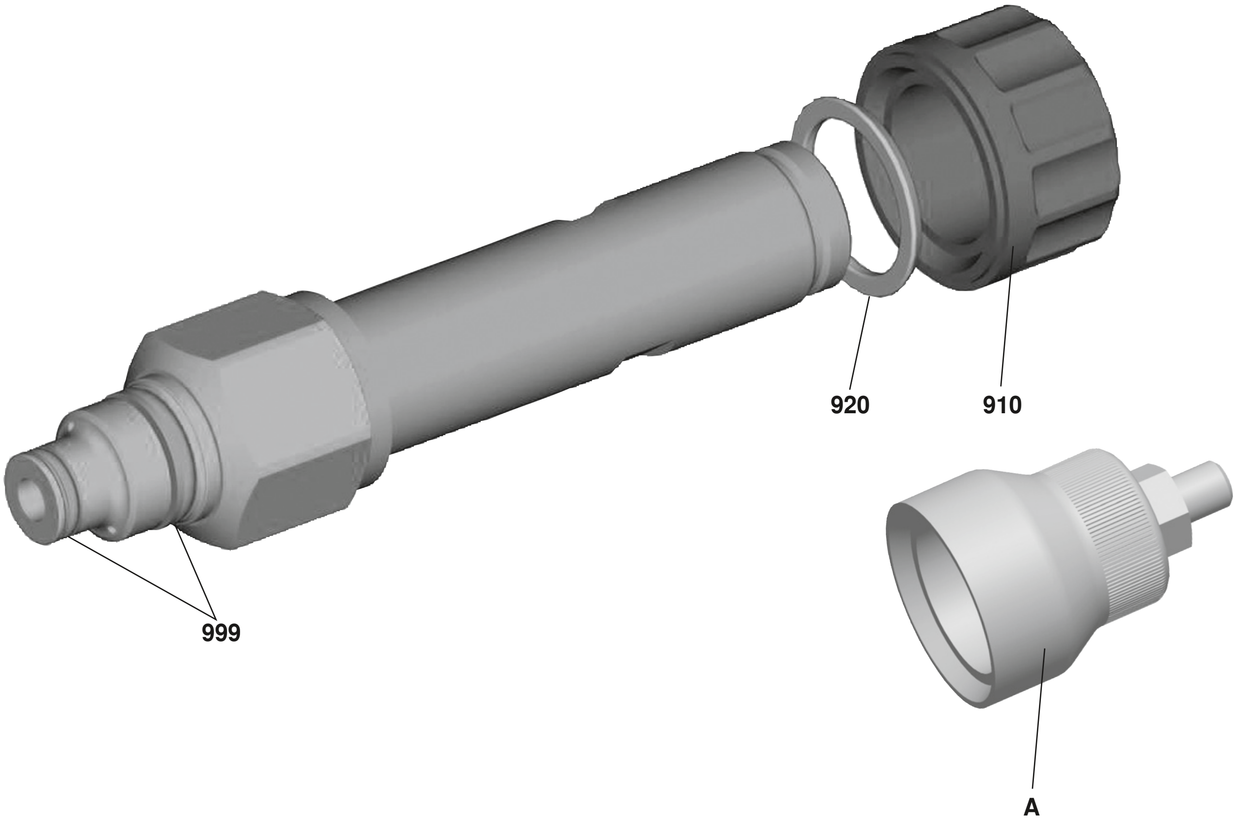


[1] Deviating from T-8A
[2] All seal ring insertion faces are rounded and free of burrs
[3] With counterbore

① = main port 1
② = main port 2
LS = location shoulder

Tolerance for all angles ±0.5°

Available individual components



Item	Denomination	Material no.
910	Nut	R900991453
920	O-ring for pole tube	R900004280
999	Seal kit of the valve	R961003237
A	Manual override "N10" 1)	R901051231

Coils, separate order, see page 2

1) Only with ordering code "N9", see page 2

Notes

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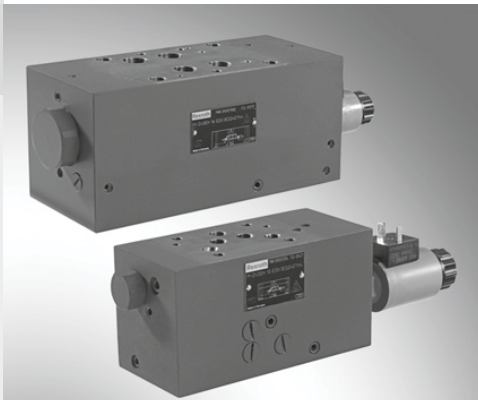
4/2 directional seat valve, pilot operated

Type M-Z4SEH

Size 10 and 16
Component series 2X
Maximum operating pressure 315 bar
Maximum flow 300 l/min



H7761+7762

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

– Sandwich plate valve
– Electro-hydraulic actuation
– Porting pattern according to ISO 4401-05-05-0-05 (size 10) and ISO 4401-07-07-0-05 (size 16)
– Wet-pin DC solenoid
– Pilot oil supply optionally internal or external
– Different combinations of the blocking and pass-through functions
– With manual override, optional
– Electrical connection as individual connection

– More information:

• 3/2 directional seat valve type KSDE (pilot control valve)	Data sheet 18136-21
• Subplates size 10	Data sheet 45054
• Subplates size 16	Data sheet 45056
• Sandwich plates, type HSZ, size 10	Data sheet 48052
• Sandwich plates, type HSZ, size 16	Data sheet 48054
• Hydraulic fluids on mineral oil basis	Data sheet 90220

Ordering code

M – Z	4	SEH		–2X/ 3	C				K4/	*

Mineral oil **= M**

Sandwich plate **= Z**

4 main ports **= 4**

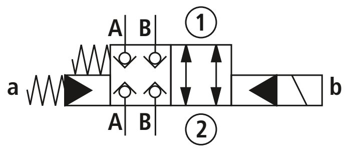
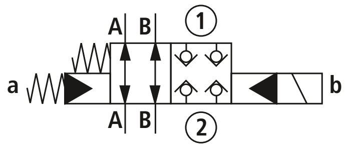
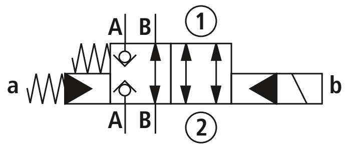
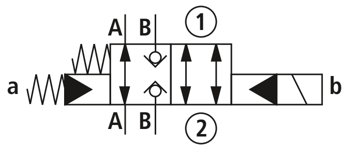
Type of actuation

Electro-hydraulic **= SEH**

Size 10 **= 10**

Size 16 **= 16**

Symbols

Symbol	
	**= E**
	**= E1**
	**= A**
	**= B**

Component series 20 to 29 **= 2X**
(20 to 29: unchanged installation and connection dimensions)

Pilot control valve

3/2 directional seat valve type KSDE **= 3**
(see data sheet 18136-21)

Wet-pin DC solenoid with detachable coil **= C**

G24 = Direct voltage 24 V
G205 = Direct voltage 205 V
G96 = Direct voltage 96 V

No Code = **Without** manual override
N9 = **With** concealed manual override
N11 = **With** screwable manual override (operation by means of knurled screw)

XY = Pilot oil supply external, pilot oil return external
PY = Pilot oil supply internal, pilot oil return external
PT = Pilot oil supply internal, pilot oil return internal
XT = Pilot oil supply external, pilot oil return internal
For more information see page 11.

Electrical connection

K4 [1; 2] **= Without** mating connector, individual connection with connector according to DIN EN 175301-803

Seal material

N = NBR seals
F = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with the hydraulic fluids used!

Further details in the plain text

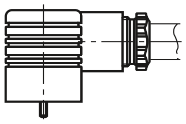
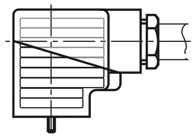
AC voltage mains (permissible voltage tolerance ±10 %)	**Nominal voltage of the DC solenoid in case of operation with alternating voltage**	**Ordering code**
110 V - 50/60 Hz	96 V	**G96**
230 V - 50/60 Hz	205 V	**G205**

1) For the connection to AC voltage mains, a DC voltage solenoid **must** be used, which is controlled via a rectifier (see table on the left).
In the case of individual connection, a large mating connector with integrated rectifier can be used (separate order, see page 3).

2) Mating connectors, separate order, see page 3.

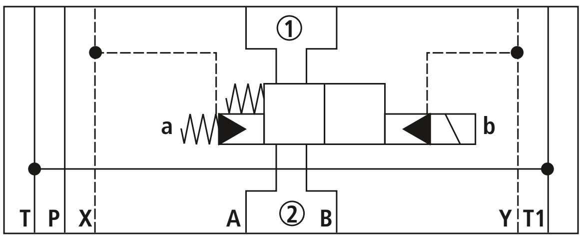
① = component side
② = plate side

Mating connectors according to DIN EN 175301-803

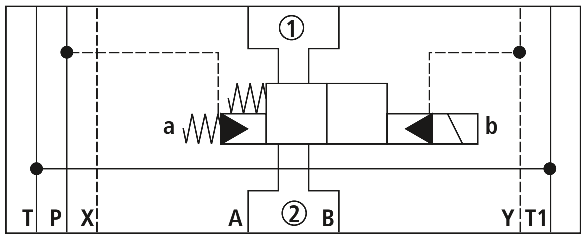
Details and more mating connectors see data sheet 08006				
	Material no.			
Color	without circuitry	with indicator light 12 … 240 V	with rectifier 12 … 240 V	with indicator light and Zener diode suppression circuit 24 V
Gray	**R901017010**	–	–	–
Black	**R901017011**	**R901017022**	**R901017025**	**R901017026**

Symbols: Pilot oil supply (① = component side, ② = plate side)

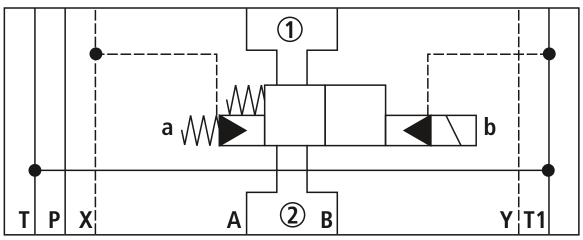
Version "XY"



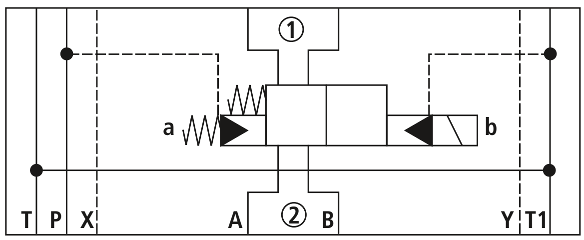
Version "PY"



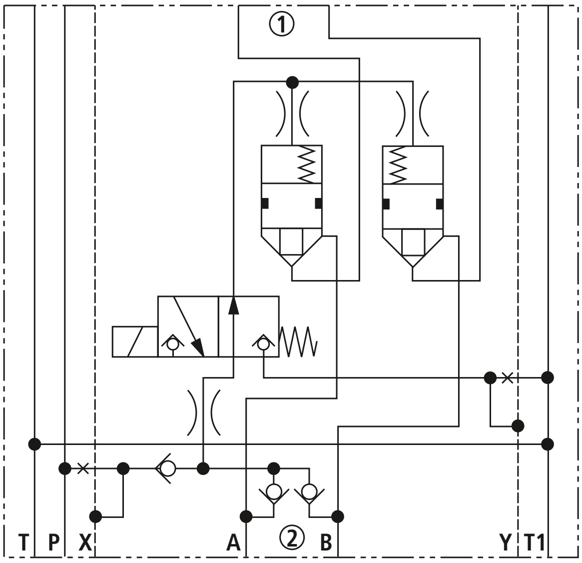
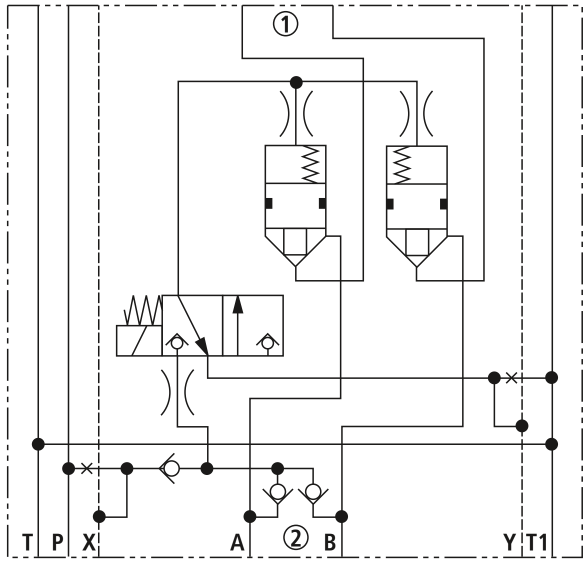
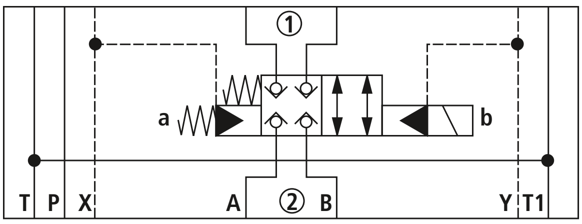
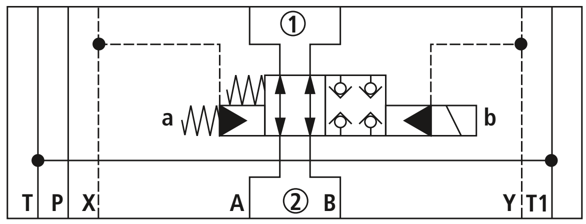
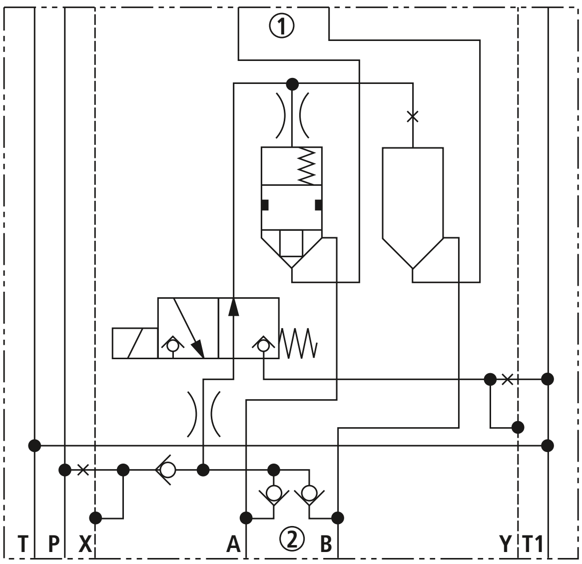
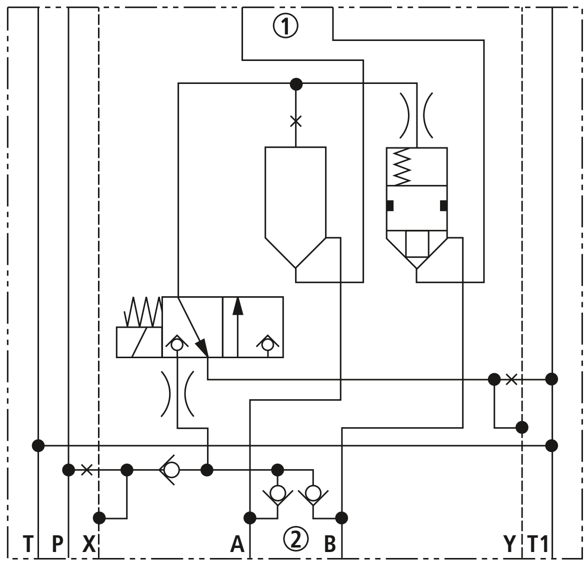
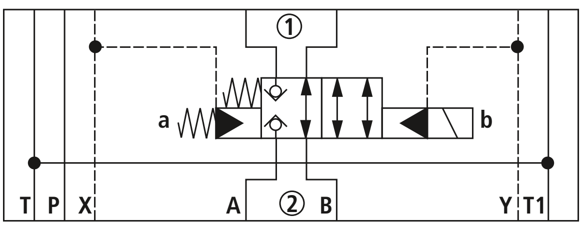
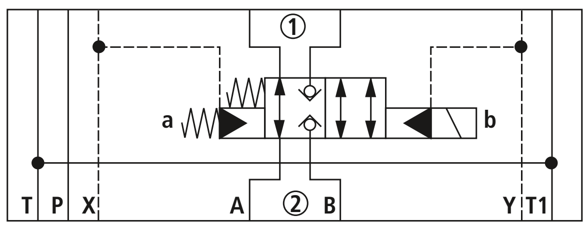
Version "XT"



Version "PT"



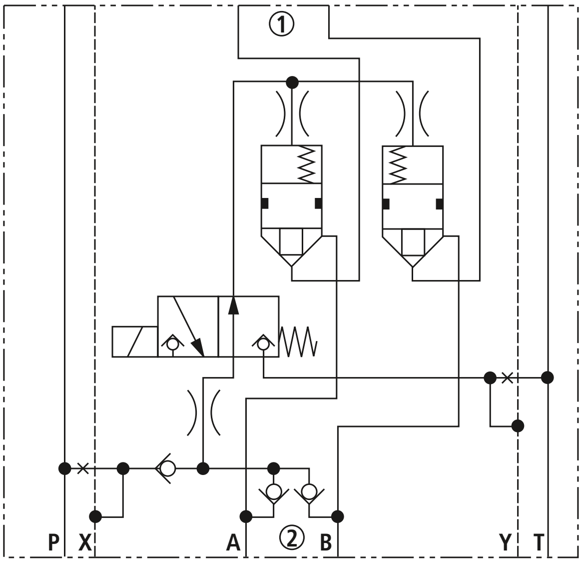
Symbols: Size 10 (① = component side, ② = plate side)

	Pilot control valve normally open, symbol "E"	Pilot control valve normally closed, symbol "E1"
Detailed		
Version "XY"		
	Pilot control valve normally open, symbol "A"	**Pilot control valve normally closed, symbol "B"**
Detailed		
Version "XY"		

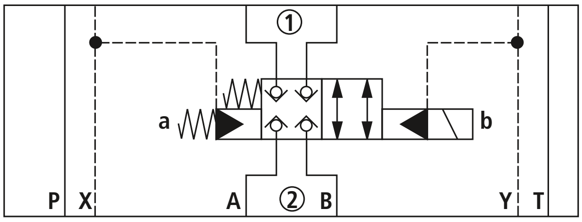
Symbols: Size 16 (① = component side, ② = plate side)

Pilot control valve normally open, symbol "E"

Detailed

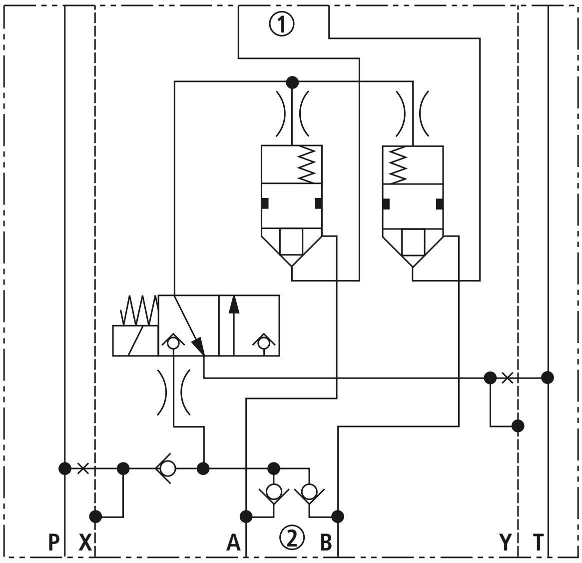


Version "XY"

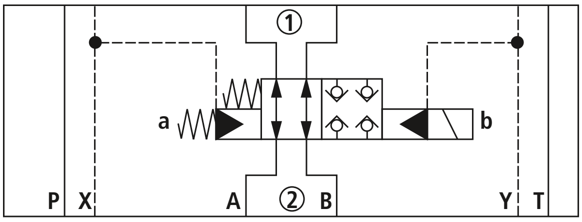


Pilot control valve normally closed, symbol "E1"

Detailed

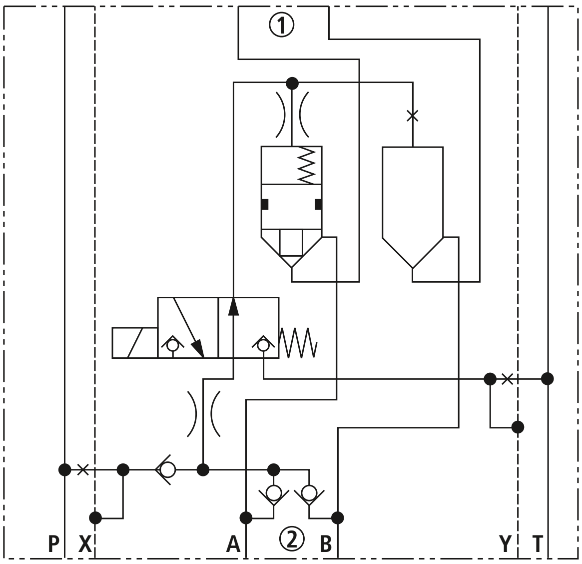


Version "XY"

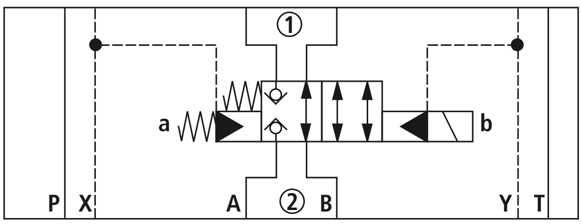


Pilot control valve normally open, symbol "A"

Detailed

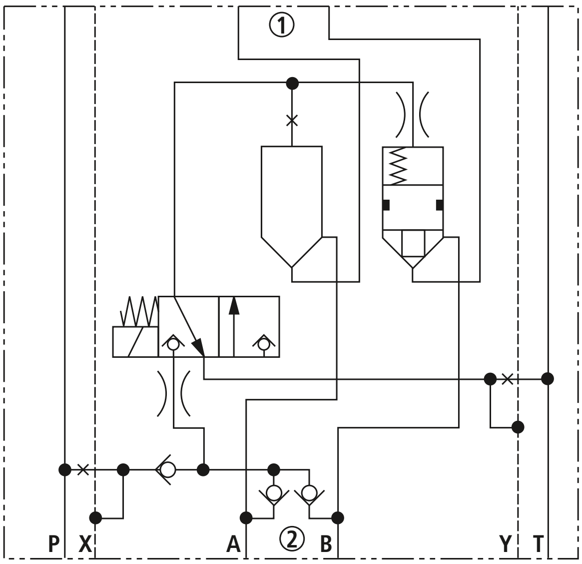


Version "XY"

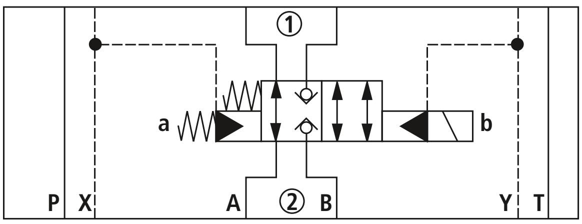


Pilot control valve normally closed, symbol "B"

Detailed



Version "XY"



Function, section

General

Directional valve types SEH are directional seat valves with electro-hydraulic operation. Depending on the order version, one- or two-channel connection or shut-off is possible.

The directional valve basically comprises of housing (1), pilot operated check valve installation kit (2), pilot control valve (3) as well as blanking plug for the pilot oil supply. The valve is free-flowing irrespective of the direction and opened or blocked in a leakage-free form depending on the spool position of the pilot control valve and the pressure conditions.

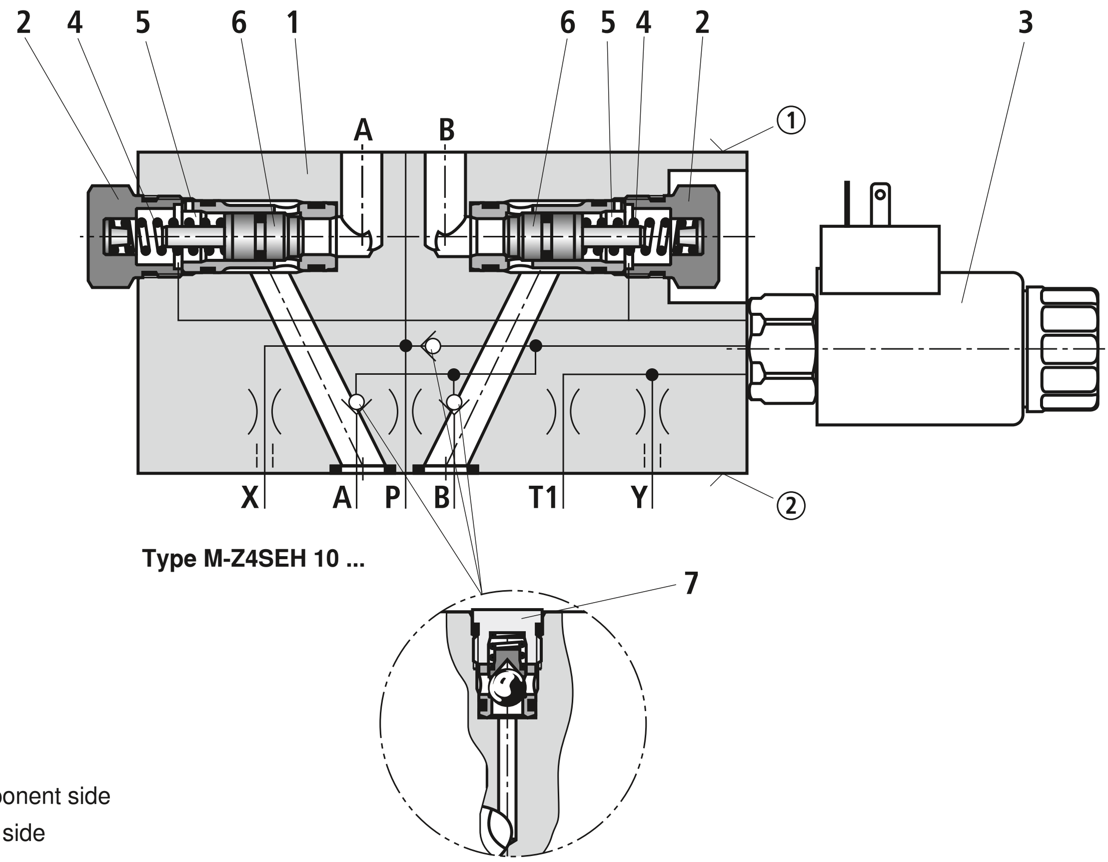
Function

The function of the valve depends on the pressure. The force of the compression spring (4) as well as the compressive force in the control chamber (5) act in closing direction, the compressive forces in channels A and B in opening direction of the valve spool (6) with spool sealing. The effective direction of the resulting force of opening and closing forces determines the spool position of the check valve installation kits (2). The pilot pressure is applied and/or discharged via the pilot control valve (3) depending on the pilot oil supply selection. The pilot oil is supplied via the highest pressure from channels A, B, P or X and is secured by means of a check valve (7).

☞ **Note!**

Nozzles and plug fitting see page 12

Pilot oil supply see page 11.
Symbols see page 3.



Type M-Z4SEH 10 ...

① = component side

② = plate side

Technical data (For applications outside these parameters, please consult us!)

general

Size	Size	10	16
Weight	kg	6	14
Installation position		Any	
Ambient temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)	

hydraulic

Maximum operating pressure	bar	315	
Maximum flow	l/min	140	300
Hydraulic fluid		See table below	
Hydraulic fluid temperature range (at the valve working ports)	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)	
Viscosity range	mm^2/s	10 to 380	
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1]	

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HEES	NBR, FKM	ISO 15380
		HEPR	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFC	NBR	

Important information on hydraulic fluids!

- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- **Environmentally compatible:** When using environmentally compatible hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the medium (700 mg zinc per pole tube).

electric

Voltage type		Direct voltage
Available voltages	V	24; 96; 205
Power consumption	W	22
Duty cycle (ED)		Continuous operation up to ambient temperature 85 °C
Protection class according to EN 60529		IP 65 with mating connector mounted and locked

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of the filters see www.boschrexroth.com/filter.

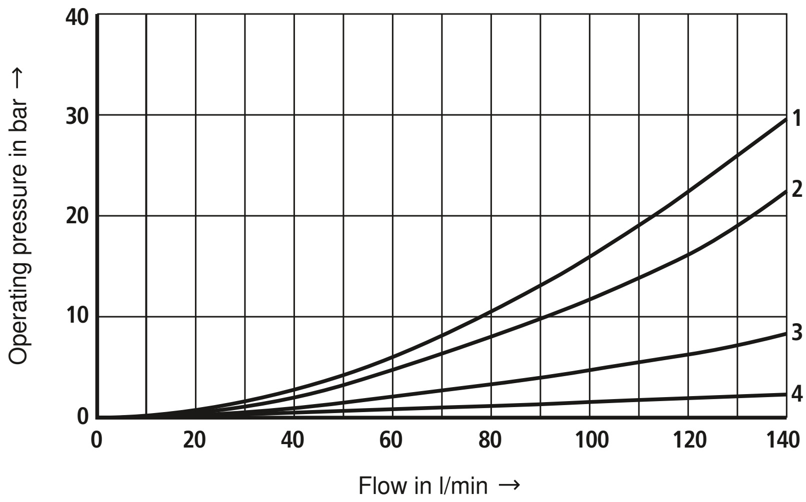
When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected properly.

Note!

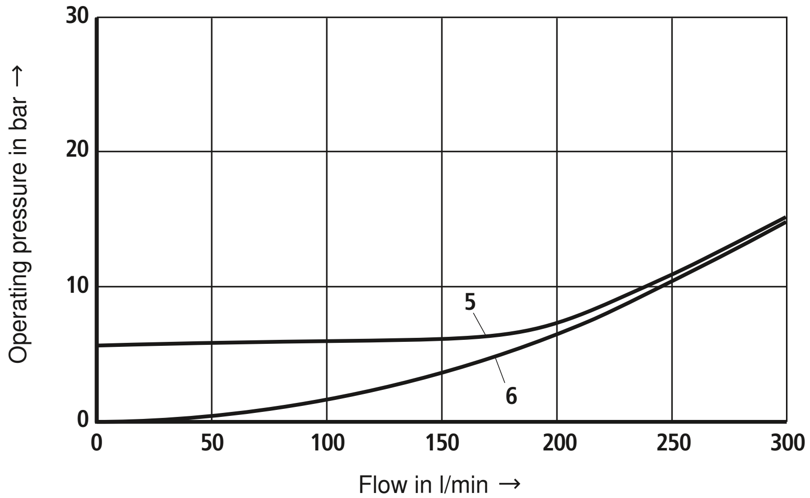
For more technical data of the pilot control valve type KSDE see data sheet 18136-21.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Δ*p*-*q*$_V$ characteristic curves
Size 10



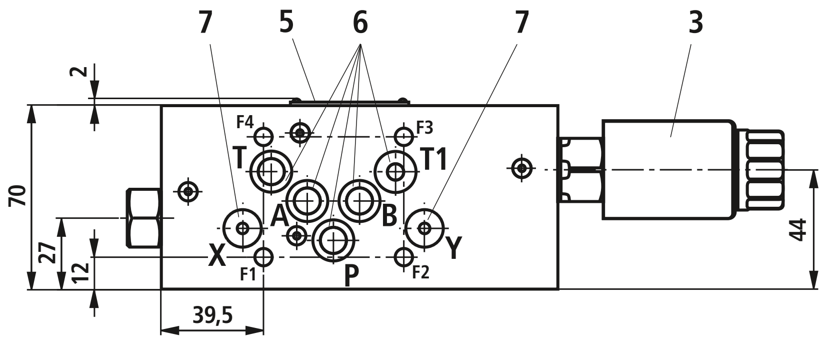
Δ*p*-*q*$_V$ characteristic curves
Size 16

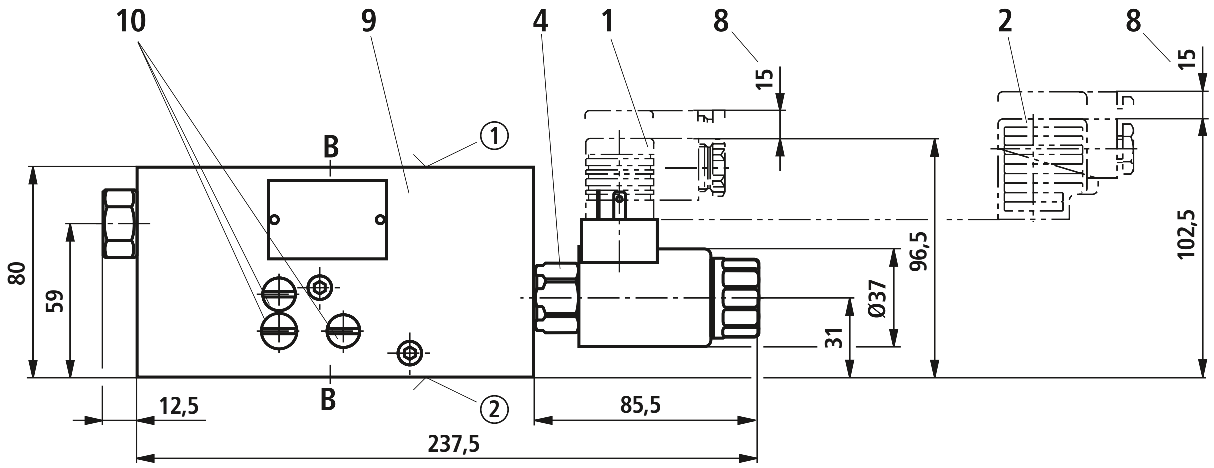


1 B① → B②
2 A① → A②
3 T① → T②
4 P① → P②
5 A② → A①; B② → B①
6 A① → A②; B① → B②

① = component side
② = plate side

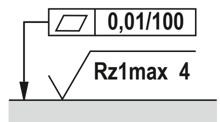
Unit dimensions: Size 10 (dimensions in mm)





① Component side – porting pattern according to ISO 4401-05-05-0-05

② Plate side – porting pattern according to ISO 4401-05-05-0-05



Required surface quality of the valve mounting face

1 Mating connector **without** wiring (separate order, see page 3)

2 Mating connector **with** wiring (separate order, see page 3)

3 DC solenoid "a" (mating connector color gray)

4 3/2 directional seat valve type KSDE (see data sheet 18136-21)

5 Name plate

6 Identical seal rings for ports A, B, P, T and T1

7 Identical seal rings for ports X and Y

8 Space required for removing the mating connector

9 Main valve

10 Plug screw or check valve, tightening torque M_A = 8 Nm

Subplates according to data sheet 45054 (separate order)

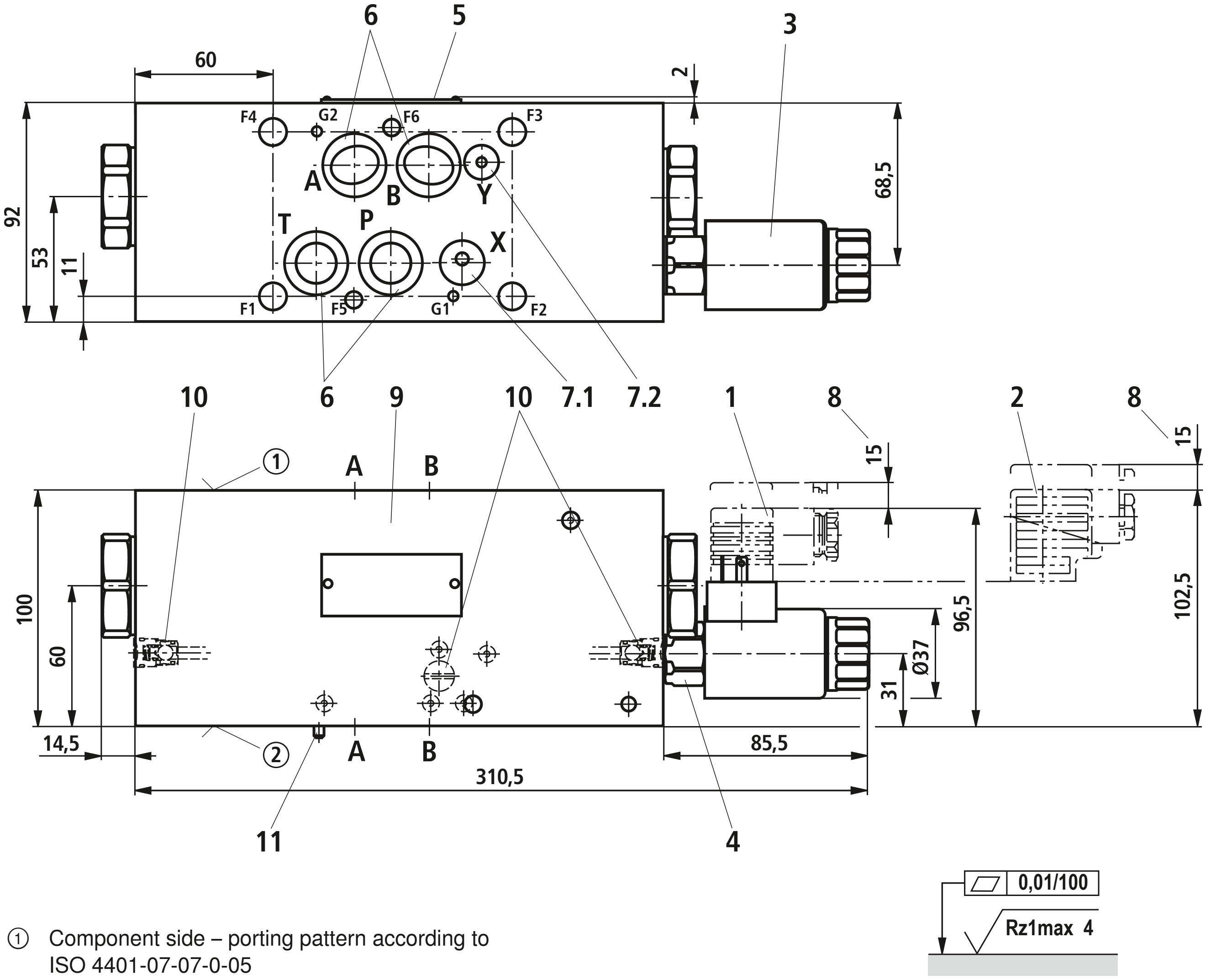
Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M6 - 10.9

☞ **Note!**

Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Unit dimensions: Size 16 (dimensions in mm)



① Component side – porting pattern according to ISO 4401-07-07-0-05

② Plate side – porting pattern according to ISO 4401-07-07-0-05

Required surface quality of the valve mounting face

1 Mating connector **without** wiring (separate order, see page 3)

2 Mating connector **with** wiring (separate order, see page 3)

3 DC solenoid "a" (mating connector color gray)

4 3/2 directional seat valve type KSDE (see data sheet 18136-21)

5 Name plate

6 Identical seal rings for ports A, B, P, and T

7.1 Seal ring for port X

7.2 Seal ring for port Y

8 Space required for removing the mating connector

9 Main valve

10 Plug screw or check valve, tightening torque M_A = 8 Nm

11 Grooved pin

Subplates according to data sheet 45056 (separate order)

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M10 - 10.9

☞ **Note!**

Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Pilot oil supply

Version "XY"

The pilot oil supply is implemented **externally** via channel X from a separate circuit.

The pilot oil return is implemented **externally** via channel Y into the tank.

Version "PY"

The pilot oil supply is implemented **internally** from channel P of the main valve.

The pilot oil return is implemented **externally** via channel Y into the tank. In the subplate, port X is closed.

Version "PT"

The pilot oil supply is implemented **internally** from channel P of the main valve.

The pilot oil return is implemented **internally** via channel T into the tank. In the subplate, ports X and X are closed.

Version "XT"

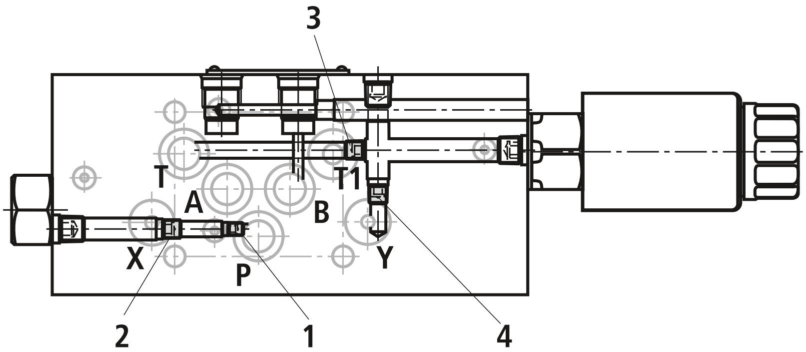
The pilot oil supply is implemented **externally** via channel X from a separate circuit.

The pilot oil supply is implemented **internally** via channel T into the tank. In the subplate, port Y is closed.

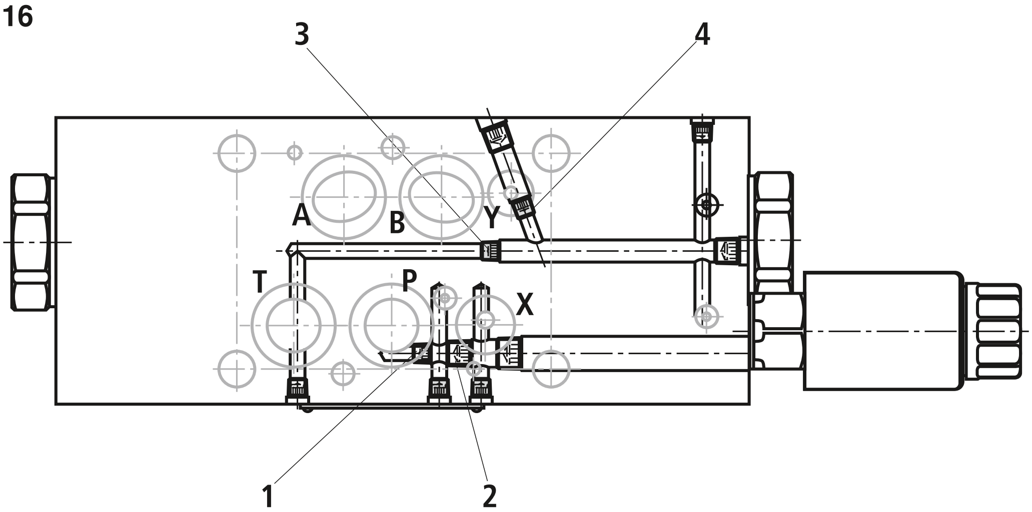
		Port	Internal	External	Port in subplate closed
Version "XY"	Pilot oil supply	X	–	✓	–
	Pilot oil return	Y	–	✓	
Version "PY"	Pilot oil supply	P	✓	–	X
	Pilot oil return	Y	–	✓	
Version "PT"	Pilot oil supply	P	✓	–	X and Y
	Pilot oil return	T	✓	–	
Version "XT"	Pilot oil supply	X	–	✓	Y
	Pilot oil return	T	✓	–	

Project planning information

Plug for size 10



Plug for size 16



Item	Version	Plug screw Size 10	Plug screw Size 16
1	"XY"	M4 x 5	M6
3		M6	M6
2	"PY"	M6	M8 x 1
3		M6	M6
1	"PT"	M4 x 5	M6
4		M6	M6
2	"XT"	M6	M8 x 1
4		M6	M6

Tightening torques M_A in Nm	Size 10	Size 16
Plug or check valve (channel A, B, P and X)	8	45
3/2 directional seat valve type KSDEU (see data sheet 18136-21)	45	45
Mounting screw coil	4	4
Plug screw 2-way cartridge valve	25	100

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

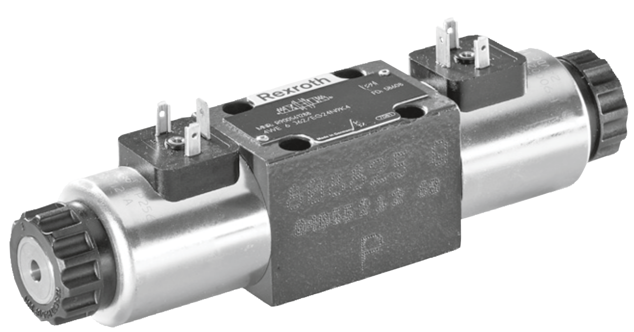
The Drive & Control Company

Rexroth
Bosch Group

Directional spool valves, direct operated, with solenoid actuation

Type WE

RE 23178
Edition: 2013-06
Replaces: 04.09



H7564

- Size 6
- Component series 6X
- Maximum operating pressure 350 bar *[5076 psi]*
- Maximum flow: 80 l/min *[21 US gpm]* – DC
  60 l/min *[15.8 US gpm]* – AC

CE

Features

- 4/3, 4/2 or 3/2 directional design
- High-power solenoid
- Porting pattern according to DIN 24340 form A
- Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03
- Wet-pin DC or AC solenoids with detachable coil
- Solenoid coil can be rotated by 90°
- The coil can be changed without having to open the pressure-tight chamber
- Electrical connection as individual or central connection
- Manual override, optional
- Spool position monitoring, optional

Contents

Ordering code

01	02	03	04	05		06	07	08	09	10	11		12	13	14	15	16
	WE	6		6X	/		E					/					*

01	3 main ports	**3**
	4 main ports	**4**
02	Directional valve	**WE**
03	Size 6	**6**
04	Symbols e.g. C, E, EA, EB, etc; for the possible version, see page 5	
05	Component series 60 to 69 (60 to 69: Unchanged installation and connection dimensions)	**6X**
06	**With** spring return	**no code**
	Without spring return	**O**
	Without spring return with detent	**OF**
07	High-power wet-pin solenoid with detachable coil	**E**
08	Direct voltage 24 V	**G24**
	AC voltage 230 V 50/60 Hz	**W230**
	AC voltage 120 V or 110 V 50/60 Hz	**W110** **W + voltage**
	Direct voltage 205 V	**G205**
	DC solenoid with rectifier for AC voltage (not frequency-related; only available with plug-in connection with cover, see page 17)	**W110R**
	Connection to AC voltage mains via control with rectifier (see table below and page 4) [1)] For further ordering codes for other voltages and frequencies, see page 8	
09	**Without** manual override	**no code**
	With concealed manual override (standard)	**N9** [2)]
	With manual override	**N** [2)]
	With lockable manual override "mushroom button" (small)	**N4** [2)]
	With lockable manual override "mushroom button" (big)	**N5** [2; 3)]
	With manual override "mushroom button" (big), not lockable	**N6** [2)]
	With lockable manual override "nut"	**N7** [2)]

Electrical connection

10	**Individual connection**	
	Without mating connector, with connector according to DIN EN 175301-803	**K4** [4)]
	Without mating connector, with connector AMP Junior-Timer	**C4** [4)]
	Without mating connector, with connector DT 04-2PA (Deutsch plug)	**K40** [4; 7)]
	Without mating connector, 4-pole with connector M12x1 according to IEC 60947-5-2, integrated interference protection circuit and status LED	**K72L** [5)]
	Without mating connector, 4-pole with connector M12x1 according to IEC 60947-5-2, integrated interference protection circuit and status LED (no connection pin 1 to pin 2)	**K73L** [5)]
	Central connection	
	Cable entry at the cover, with indicator light	**DL**
	Central plug-in connection at the cover, with indicator light (without mating connector); connector according to DIN EN 175201-804	**DK6L** [6)]
	For further electrical connections, see data sheet 08010	

AC voltage mains (admissible voltage tolerance ±10%)	Nominal voltage of the DC solenoid in case of operation with alternating voltage	**Ordering code**
110 V - 50/60 Hz	96 V	**G96**
230 V - 50/60 Hz	205 V	**G205**

Ordering code

01	02	03	04	05		06	07	08	09	10	11		12	13	14	15	16
	WE	**6**		**6X**	**/**		**E**					**/**					*

Spool position monitoring

11	**Without** position switch	**no code**
	– Inductive position switch type QM	
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored rest position	**QM0G24**
	– Inductive position switch type QR	
	Monitored rest position	**QR0G24S**
	Monitored spool position "a" and "b"	**QRABG24E**
	– Inductive position switch type QL	
	Monitored spool position "a"	**QLAG24**
	Monitored spool position "b"	**QLBG24**
	– Inductive proximity sensor type QS	
	Monitored spool position "a"	**QSAG24W**
	Monitored spool position "b"	**QSBG24W**
	Monitored spool position "0"	**QS0G24W**
	Monitored spool position "0" and "a"	**QS0AG24W**
	Monitored spool position "0" and "b"	**QS0BG24W**
	Monitored spool position "a" and "b"	**QSABG24W**
	For more information, see data sheet 24830	

12	**Without** throttle insert			**no code**
	With throttle insert see table:			
	Port	Throttle Ø in mm *[inch]*		
		0.8 *[0.031]*	1.0 *[0.039]*	1.2 *[0.047]*
	P	**= B08**	**= B10**	**= B12**
	A	**= H08**	**= H10**	**= H12**
	B	**= R08**	**= R10**	**= R12**
	A and B	**= N08**	**= N10**	**= N12**
	T	**= X08**	**= X10**	**= X12**
	Use with flows which exceed the performance limit of the valve (see page 6).			

Clamping length

13	42 mm *[1.65 inch]* (standard)	**no code**
	22 mm *[0.87 inch]*	**Z**

Seal material

14	NBR seals	**no code**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

15	**Without** locating hole	**no code**
	With locating hole	**/60** 8)
	With locating hole and locking pin ISO 8752-3x8-St	**/62**

16	Further details in the plain text	

Explanation of the footnotes see page 4.

Preferred types and standard units are contained in the EPS (standard price list).

Ordering code

[1] Only for version "individual connection"

[2] The manual override cannot be allocated a safety function. The manual override units may only be used up to a tank pressure of 50 bar.

[3] With tank pressures above 50 bar, it cannot be guaranteed that the valve remains in the position switched by the manual override “N5”.

[4] Mating connectors, separate order, see below and data sheet 08006

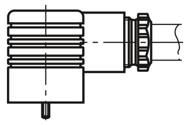
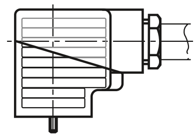
[5] Only version "G24", see data sheet 08010

[6] Mating connector, separate order, material no. **R900005538**

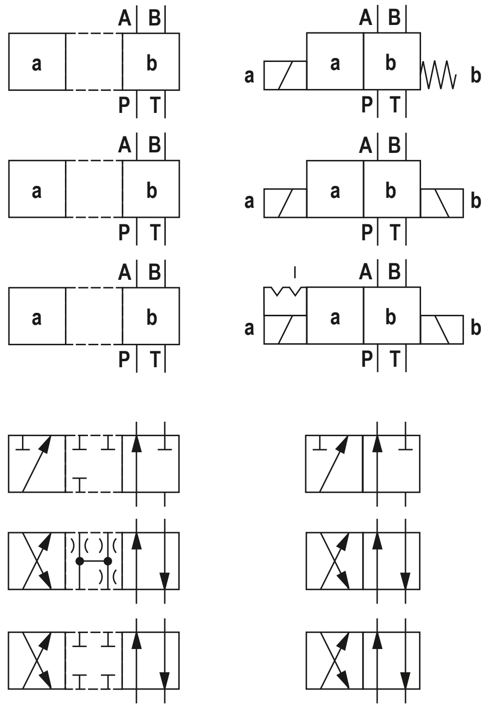
[7] Only possible in connection with the symbols G, J, D and E as well a reduced performance limit.

[8] Locking pin ISO 8752-3x8-St, material no. **R900005694** (separate order)

Mating connectors according to DIN EN 175301-803

For details and more mating connectors, see data sheet 08006							
			Material number				
Port	**Valve side**	**Color**	Without circuitry	With indicator light 12 ... 240 V	With indicator light and rectifier 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Zener diode suppression circuit 24 V
M16 x 1.5	a	Gray	**R901017010**	–	–	–	–
	b	Black	**R901017011**	–	–	–	–
	a/b	Black	–	**R901017022**	**R901017029**	**R901017025**	**R901017026**
1/2" NPT (Pg 16)	a	Red/ brown	**R900004823**	–	–	–	–
	b	Black	**R900011039**	–	–	–	–
	a/b	Black	–	**R900057453**	**R900057455**	**R900842566**	–

Symbols



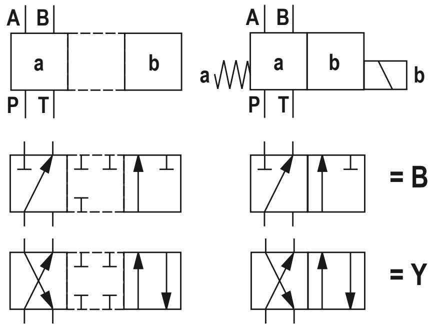
= .../O..

= .../OF..

= A

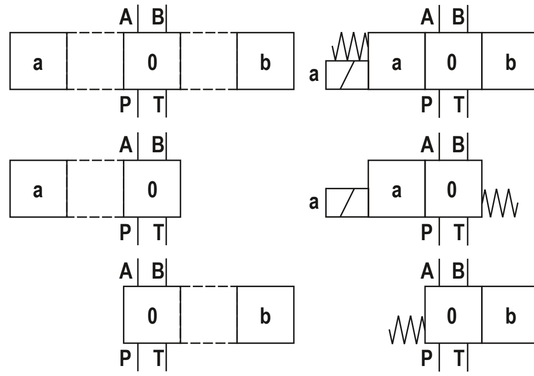
= C

= D



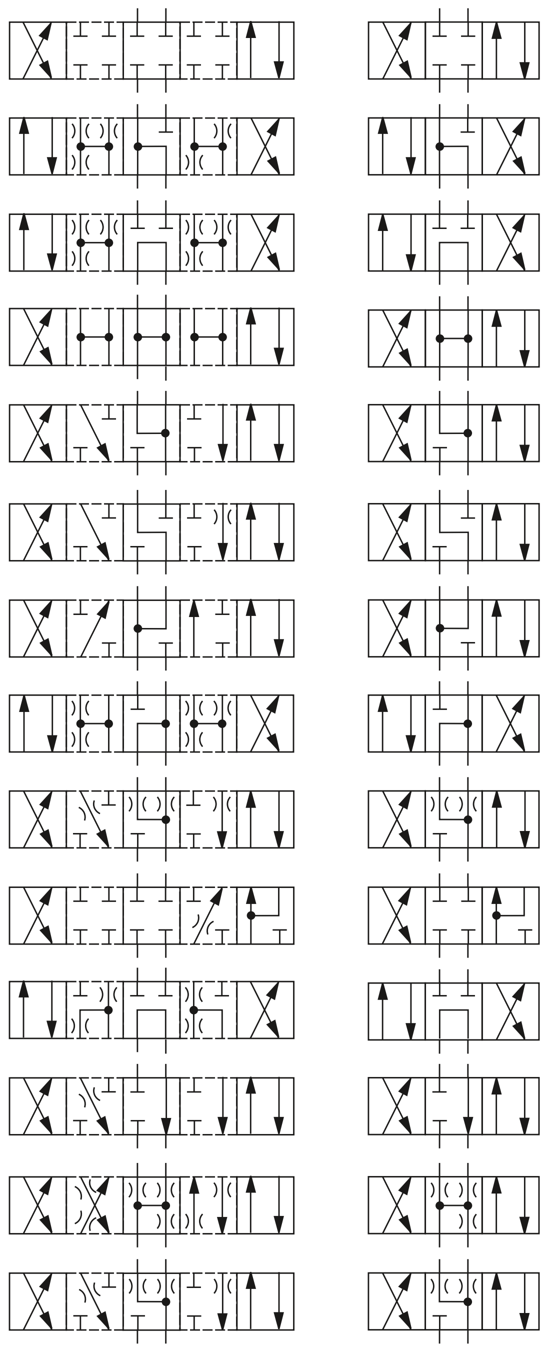
= B

= Y



= .A [1]

= .B



= E [1]
= E1- [2]

= F

= G

= H

= J

= L

= M

= P

= Q

= R

= T

= U

= V

= W

[1] **Example:**
Symbol E with spool position "a", ordering code ..**EA**..

[2] Symbol E1-: P – A/B pre-opening,
Caution in conjunction with differential cylinders due to pressure intensification!

Notices!
Representation according to DIN ISO 1219-1.
Hydraulic interim positions are shown by dashes.

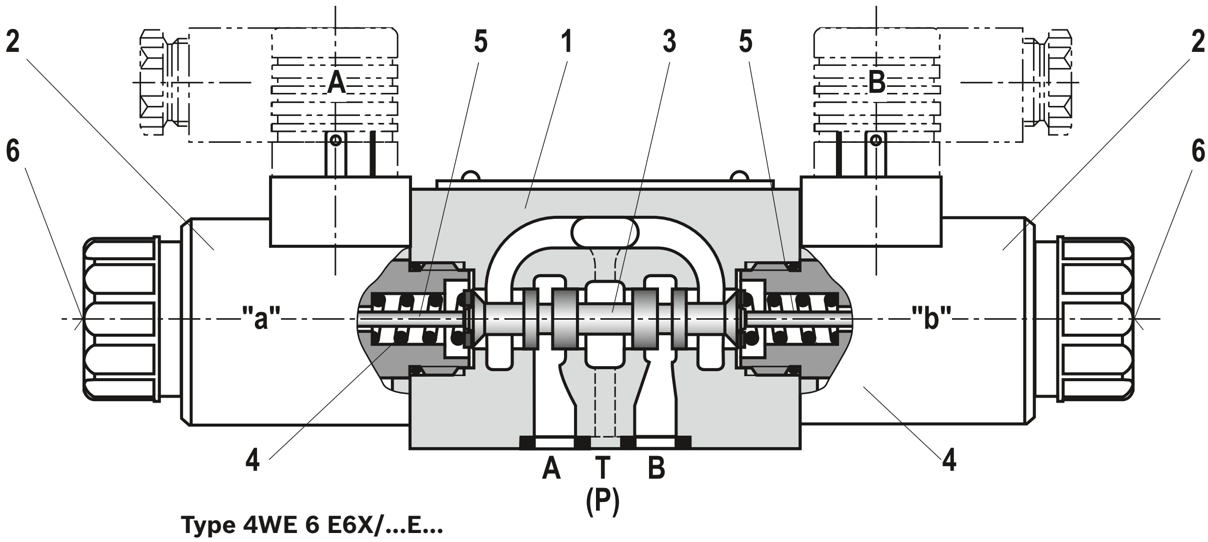
Function, section

Directional valves of type WE are solenoid operated directional spool valves. They control the start, stop and direction of a flow.
The directional valves basically consist of the housing (1), one or two electronic solenoids (2), the control spool (3), and one or two return springs (4).
In the de-energized condition, the control spool (3) is held in the central position or in the initial position by the return springs (4) (except for impulse spools). The control spool (3) is actuated by wet-pin electronic solenoids (2).
To ensure proper functioning, care must be taken that the pressure chamber of the electronic solenoid is filled with oil.
The force of the electronic solenoid (2) acts via the plunger (5) on the control spool (3) and pushes the latter from its rest position to the required end position. This enables the necessary direction of flow from P to A and B to T or P to B and A to T.
When the electronic solenoid (2) is de-energized, the return spring (4) pushes the control spool (3) back to its rest position.
An optional manual override (6) allows the control spool (3) to be moved without solenoid energization.

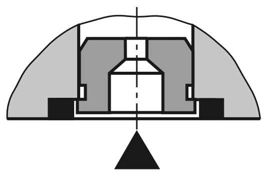
Without spring return "O" (only possible with symbols A, C and D)
This version is a directional valve with 2 spool positions and 2 electronic solenoids **without** detent. The valve without spring return at the control spool (3) has no defined basic position in the de-energized condition.

Without spring return with "OF" detent (only possible with symbols A, C and D)
This version is a directional valve with 2 spool positions and 2 electronic solenoids **with** detent. The detents are used to fix the control spool (3) in the relevant spool position. During operation, continuous application of current to the electronic solenoid can thus be omitted which contributes to energy-efficient operation.

Notices!
Pressure peaks in the tank line to two or several valves can result in unintended control spool movements in the case of valves with detent! We therefore recommend that separate return lines be provided or a check valve installed in the tank line.
Due to the design principle, internal leakage is inherent to the valves, which may increase over the life cycle.



Type 4WE 6 E6X/...E...



Throttle insert
The use of the throttle insert is required when, due to prevailing operating conditions, flows occur during the switching processes which exceed the performance limit of the valve.

Technical data
(for applications outside these parameters, please consult us!)

general			
Weight	– Valve with one solenoid	kg *[lbs]*	1.45 *[3.2]*
	– Valve with two solenoids	kg *[lbs]*	1.95 *[4.3]*
Installation position			Any
Ambient temperature range		°C *[°F]*	–30 ... +50 *[–22 ... +122]* (NBR seals) –20 ... +50 *[–4 ... +122]* (FKM seals)
$MTTF_d$ values according to EN ISO 13849		Years	150 (for further details see data sheet 08012)

hydraulic			
Maximum operating pressure	– Ports A, B, P	bar *[psi]*	350 *[5076]*
	– Port T	bar *[psi]*	210 *[3050]* (DC); 160 *[2320]* (AC) With symbols A and B, port T must be used as leakage oil connection.
Maximum flow		l/min *[US gpm]*	80 *[21]* (DC); 60 *[15.8]* (AC)
Flow cross-section (spool position 0)	– Symbol Q	mm^2	Approx. 6% of nominal cross-section
	– Symbol W	mm^2	Approx. 3% of nominal cross-section
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C *[°F]*	–30 ... +80 *[–22 ... +176]* (NBR seals) –15 ... +80 *[–4 ... +176]* (FKM seals)
Viscosity range		mm^2/s *[SUS]*	2.8 ... 500 *[35 ... 2320]*
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

☞ **Important information on hydraulic fluids!**

- For more information and data on the use of other hydraulic fluids, refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – containing water**:
  - Maximum pressure difference per control edge 50 bar
  - Pressure pre-loading at the tank port >20% of the pressure differential, otherwise increased cavitation
  - Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%
- **Bio-degradable:** When using bio-degradable hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the fluid (per pole tube 700 mg zinc).

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For maintenance requirements of the hydraulic fluid and contamination limit values, see data sheet 07300.
For the selection of the filters, see www.boschrexroth.com/filter.

Technical data
(for applications outside these parameters, please consult us!)

electric				
Voltage type			Direct voltage	Alternating voltage 50/60 Hz
Available voltages [2)] (For ordering codes for AC voltage solenoids, see below)		V	12, 24, 96, 205	110, 230
Voltage tolerance (nominal voltage)		%	±10	
Power consumption		W	30	–
Holding power		VA	–	50
Switch-on power		VA	–	220
Duty cycle		%	100	
Switching time according to ISO 6403 [3)]	– ON	ms	25 ... 45	10 ... 20
	– OFF	ms	10 ... 25	15 ... 40
Maximum switching frequency		1/h	15000	7200
Maximum surface temperature of the coil [4)]		°C *[°F]*	120 *[248]*	180 *[356]*
Protection class according to DIN EN 60529	– With connector "K4", "K72L", "K73L"		IP 65 (with mating connector mounted and locked)	
	– With connector "C4"		IP 66A (with mating connector mounted and locked)	
	– With connector "K40"		IP 69K (with mating connector mounted and locked)	

[2)] Special voltages available upon request

[3)] The switching times were determined at a hydraulic fluid temperature of 40 °C *[104 °F]* and a viscosity of 46 cSt. Deviating hydraulic fluid temperatures can result in different switching times! Switching times change depending on operating time and application conditions.

[4)] Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO13732-1 and ISO 4413 need to be adhered to!
The specified surface temperature in AC solenoids is valid for the faultless operation. In case of error (e.g. blocking of the control spool), the surface temperature may rise to above 180 °C *[356 °F]*. Thus, the system must be checked for possible dangers considering the flash point (see page 7).
As fuse protection, circuit breakers (see table on page 19) must be used, unless the creation of an ignitable atmosphere can be excluded in a different way. Thus, the surface temperature can – in case of error – be limited to maximally 220 °C *[428 °F]*.
The tripping current must lie within a time interval of 0.6 s with 8 to 10 times the nominal power supply. (tripping characteristics "K").
The necessary non-tripping current of the fuse must not fall below the value I_1 (see table on page 19). The maximum tripping current of the fuse must not exceed the value I_2 (see table on page 19).
The temperature dependence of the tripping behavior of the circuit breakers has to be considered according to the manufacturer's specifications.

☞ **Notices!**
- The actuation of the manual override is only possible up to a tank pressure of approx. 50 bar *[725 psi]*. Avoid damage to the bore of the manual override! (Special tool for the operation, separate order, material no. **R900024943**). When the manual override is blocked, actuation of the opposite solenoid must be ruled out!
- The simultaneous actuation of 2 solenoids of one valve must be ruled out!

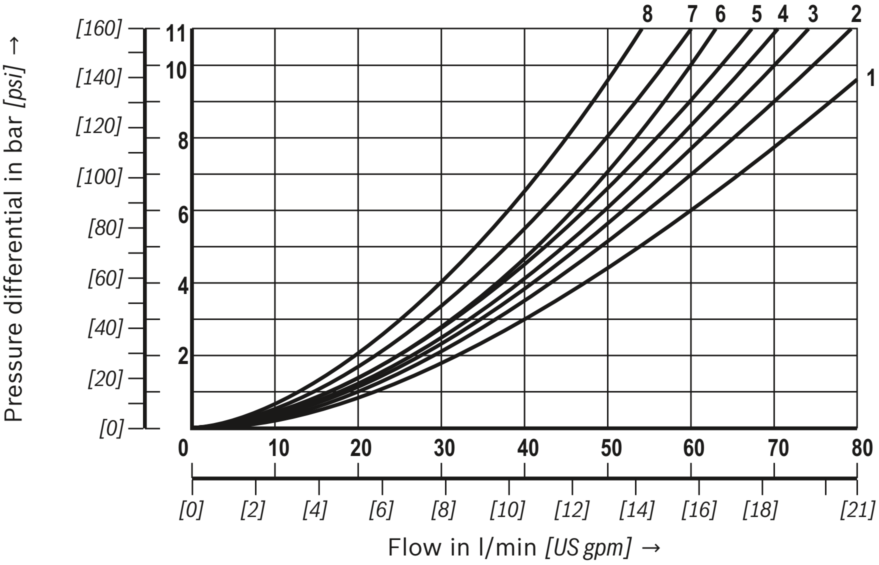
☞ **Notice!**
AC solenoids can be used for 2 or 3 mains; e.g. solenoid type **W110** for:
110 V, 50 Hz; 110 V, 60 Hz; 120 V, 60 Hz

Ordering code	Mains
W110	110 V, 50 Hz 110 V, 60 Hz 120 V, 60 Hz
W230	230 V, 50 Hz 230 V, 60 Hz

When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected correctly.

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Δp-q_V characteristic curves

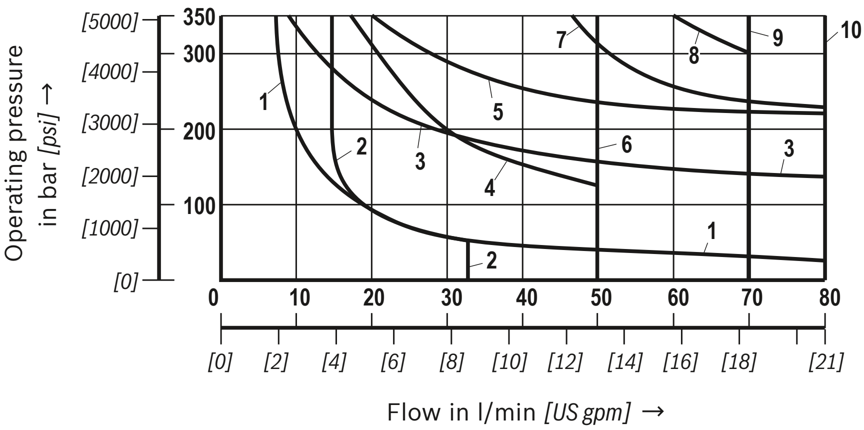


Symbol	Direction of flow			
	P – A	**P – B**	**A – T**	**B – T**
A; B	5	5	–	–
C	3	3	5	3
D; Y	6	6	5	5
E	5	5	3	3
F	3	5	3	3
T	8	8	4	4
H	2	1	2	2
J; Q	3	3	2	3
L	5	5	1	4
M	2	1	5	5
P	5	3	3	3
R	6	6	1	–
V	3	2	3	3
W	3	3	2	2
U	5	5	4	1
G	7	7	4	4

7 Symbol "R" in spool position B – A
8 Symbol "G" and "T" in central position P – T
9 Symbol "H" in central position P – T

Performance limits
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

☞ **Notice!**
The specified performance limits are valid for operation with two directions of flow (e.g. from P to A and simultaneous return flow from B to T).
Due to the flow forces acting within the valves, the admissible performance limit may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked).
In such cases of application, please consult us!
The performance limit was determined when the solenoids were at operating temperature, at 10% undervoltage and without tank preloading.



DC solenoid	
Characteristic curve	**Symbol**
1	A; B[1]
2	V
3	A; B
4	F; P
5	J
6	G; H; T
7	A/O; A/OF; L; U
8	C; D; Y
9	M
10	E; E1–[2]; R[3]; C/O; C/OF; D/O; D/OF; Q; W

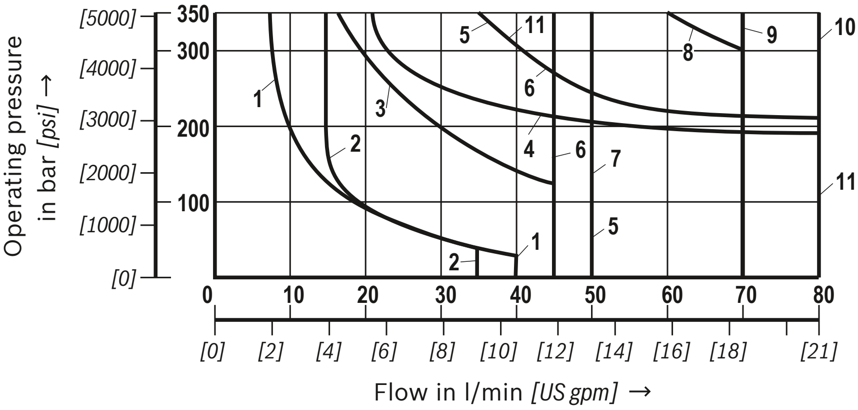
[1] With manual override
[2] P – A/B pre-opening
[3] Return flow from actuator to tank

Solenoid voltage (DC solenoid)
12; 24; 48; 96; 125; 205 V

(other voltages, see page 11)

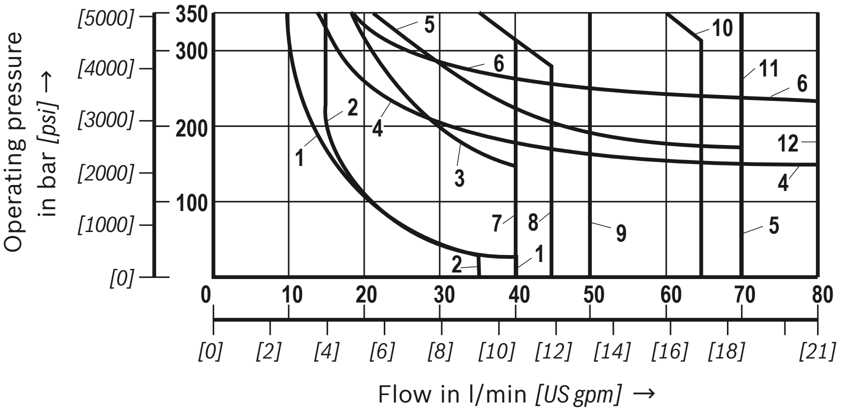
Performance limits
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

See notice on page 10.



Solenoid voltage (DC solenoid)
110; 180 V

DC solenoid	
Characteristic curve	**Symbol**
1	A; B
2	V
3	F; P
4	J; L; U
5	G
6	T
7	H
8	D; C
9	M
10	C/O; C/OF; D/O; D/OF; E; E1–; R, Q; W
11	A/O; A/OF

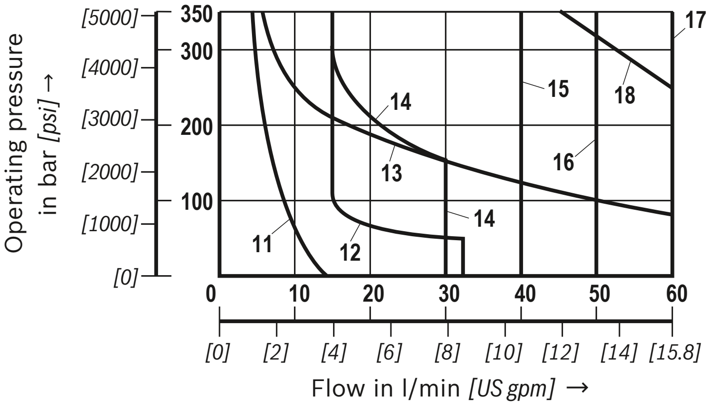


Solenoid voltage (DC solenoid)
42; 80; 220 V

DC solenoid	
Characteristic curve	**Symbol**
1	A; B
2	V
3	F; P
4	J; L; U
5	A/O; A/OF
6	E
7	T
8	G
9	H
10	D; C
11	M
12	C/O; C/OF; D/O; D/OF; E1–; R, Q; W

Performance limits
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

See notice on page 10.

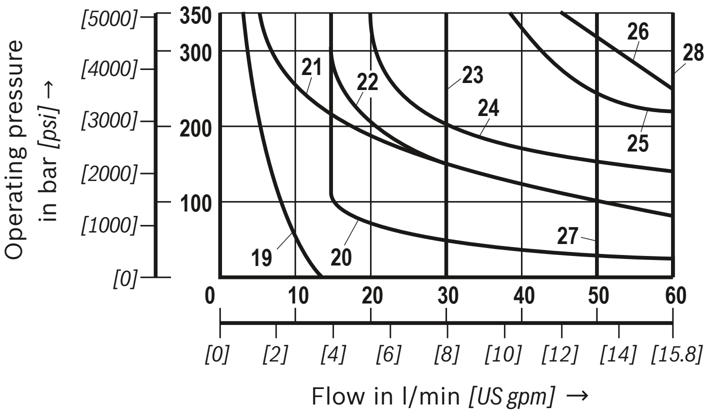


AC solenoid – 50 Hz	
Characteristic curve	**Symbol**
11	A; B[1)]
12	V
13	A; B
14	F; P
15	G; T
16	H
17	A/O; A/OF; C/O; C/OF; D/O; D/OF; E; E1–[2)]; J; L; M; Q; R[3)]; U; W
18	C; D; Y

[1)] With manual override
[2)] P – A/B pre-opening
[3)] Return flow from actuator to tank

Solenoid voltage (AC solenoid)	
W110	110 V; 50 Hz 120 V; 60 Hz
W230	230 V; 50 Hz

(other voltages upon request)



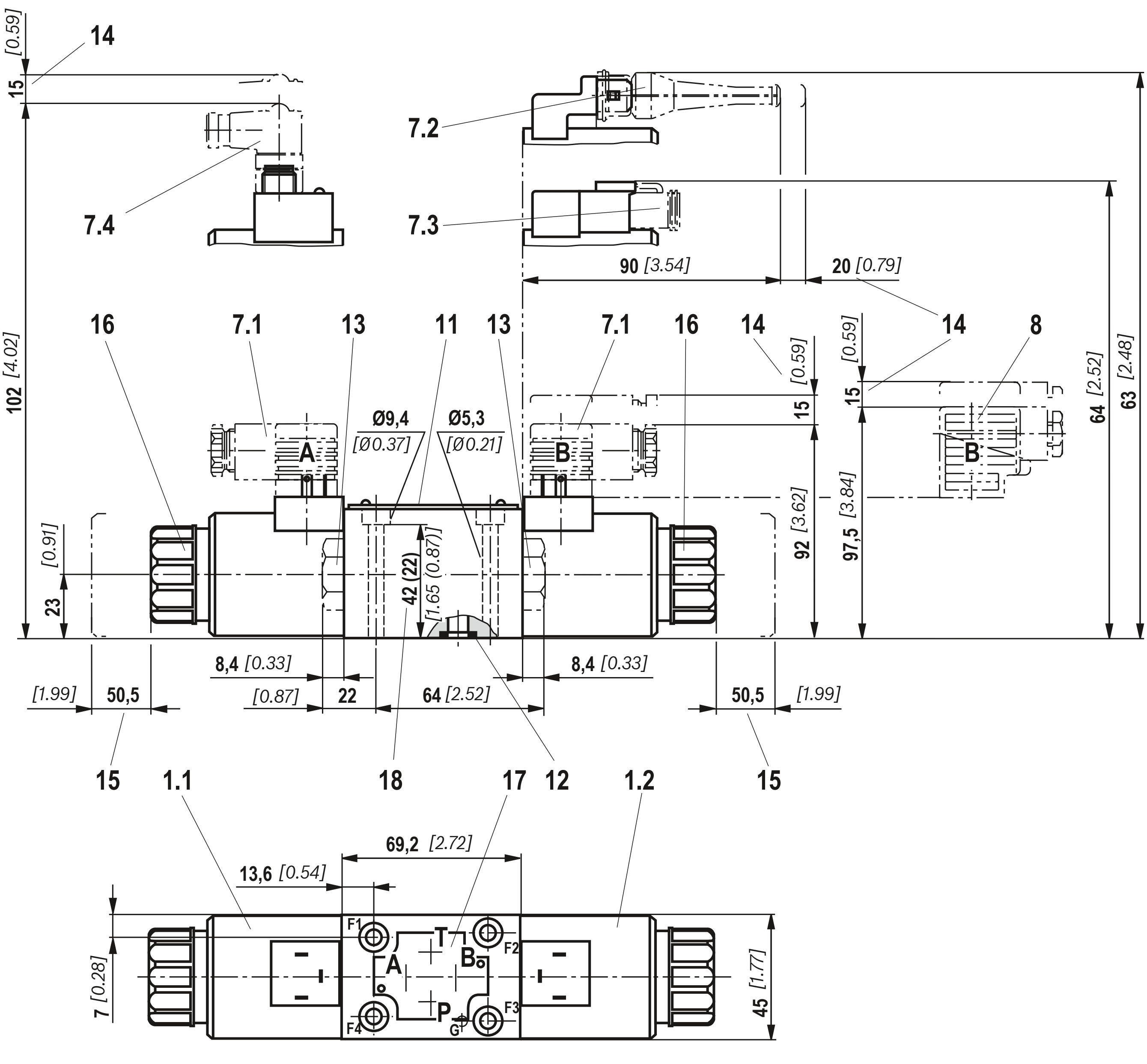
AC solenoid – 60 Hz	
Characteristic curve	**Symbol**
19	A; B[1)]
20	V
21	A; B
22	F; P
23	G; T
24	J; L; U
25	A/O; A/OF; Q; W
26	C; D; Y
27	H
28	C/O; C/OF; D/O; D/OF; E; E1–[2)]; M; R[3)]

[1)] With manual override
[2)] P – A/B pre-opening
[3)] Return flow from actuator to tank

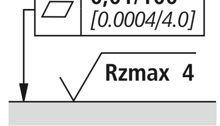
Solenoid voltage (AC solenoid)	
W110	110 V; 60 Hz
W230	230 V; 60 Hz

(other voltages upon request)

Dimensions: Valve with DC solenoid – **Individual connection**
(dimensions in mm *[inch]*)

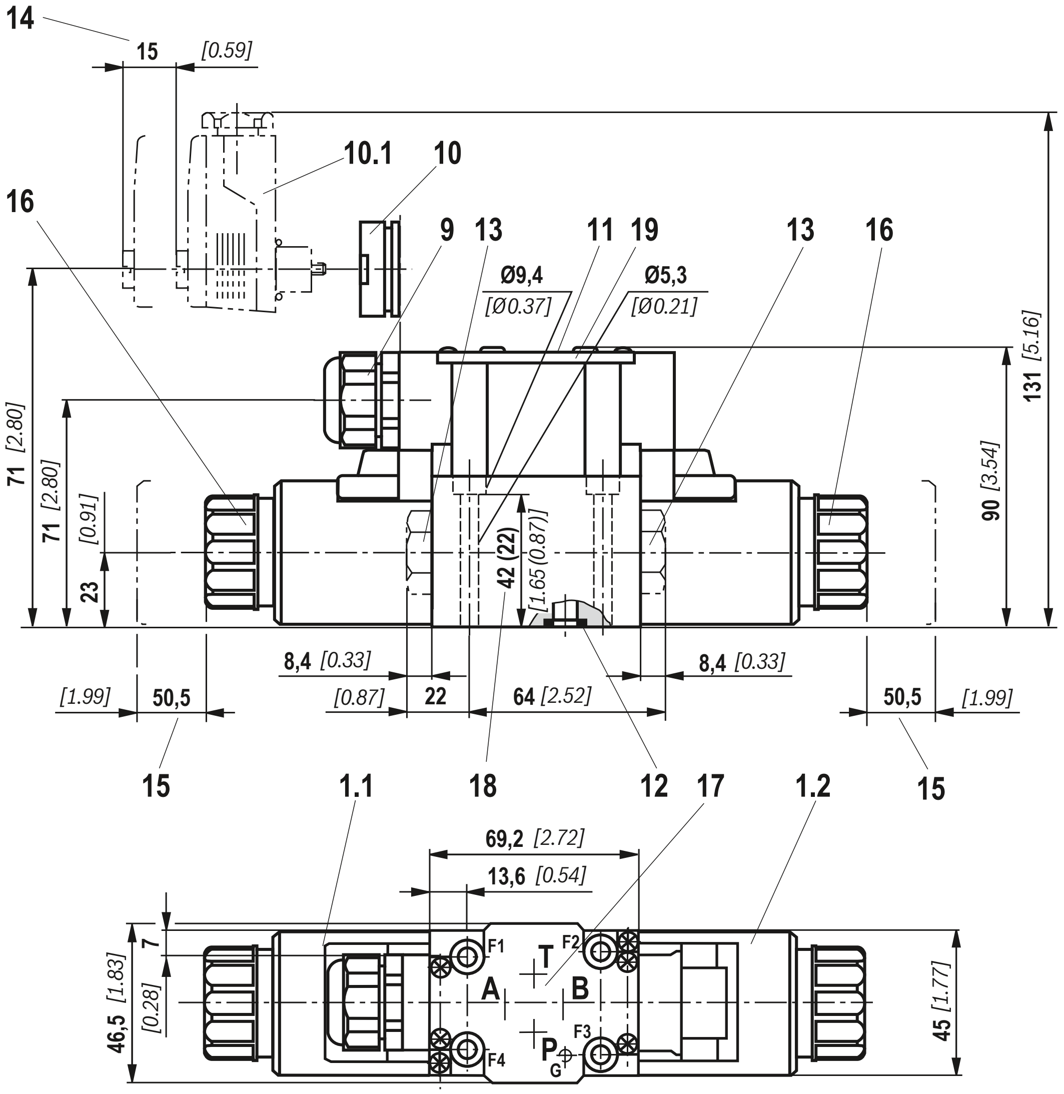


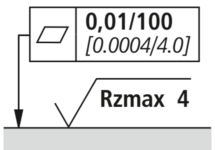
Dimensions for manual overrides see page 15.
Item explanations, valve mounting screws and **subplates** see page 18.



Required surface quality of the valve contact surface

Dimensions: Valve with DC solenoid – **Central connection**
(dimensions in mm *[inch]*)





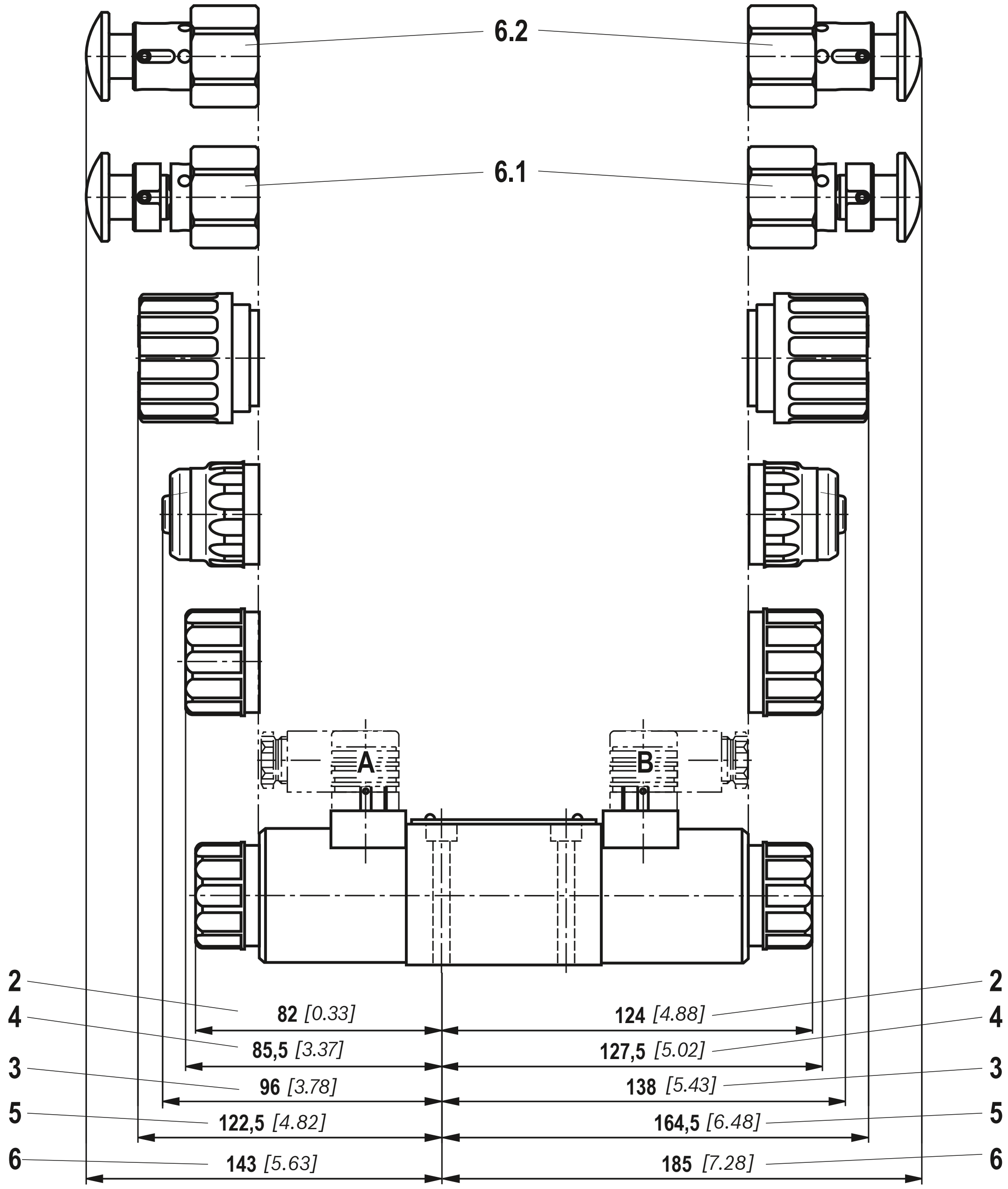
Required surface quality of the valve contact surface

Terminal assignment with central connection:

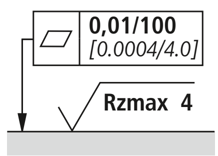
- **1 solenoid:**
  Always connect the solenoid to terminals 1 and 2, the protective earthing connector to terminal ⏚ PE
- **2 solenoids:**
  Always connect solenoid "a" to terminals 1 and 2, solenoid "b" to terminals 3 and 4, the protective earthing conductor to terminal ⏚ PE

Dimensions for manual overrides see page 15.
Item explanations, valve mounting screws and **subplates** see page 18.

Dimensions: Valve with DC solenoid – Manual overrides
(dimensions in mm *[inch]*)

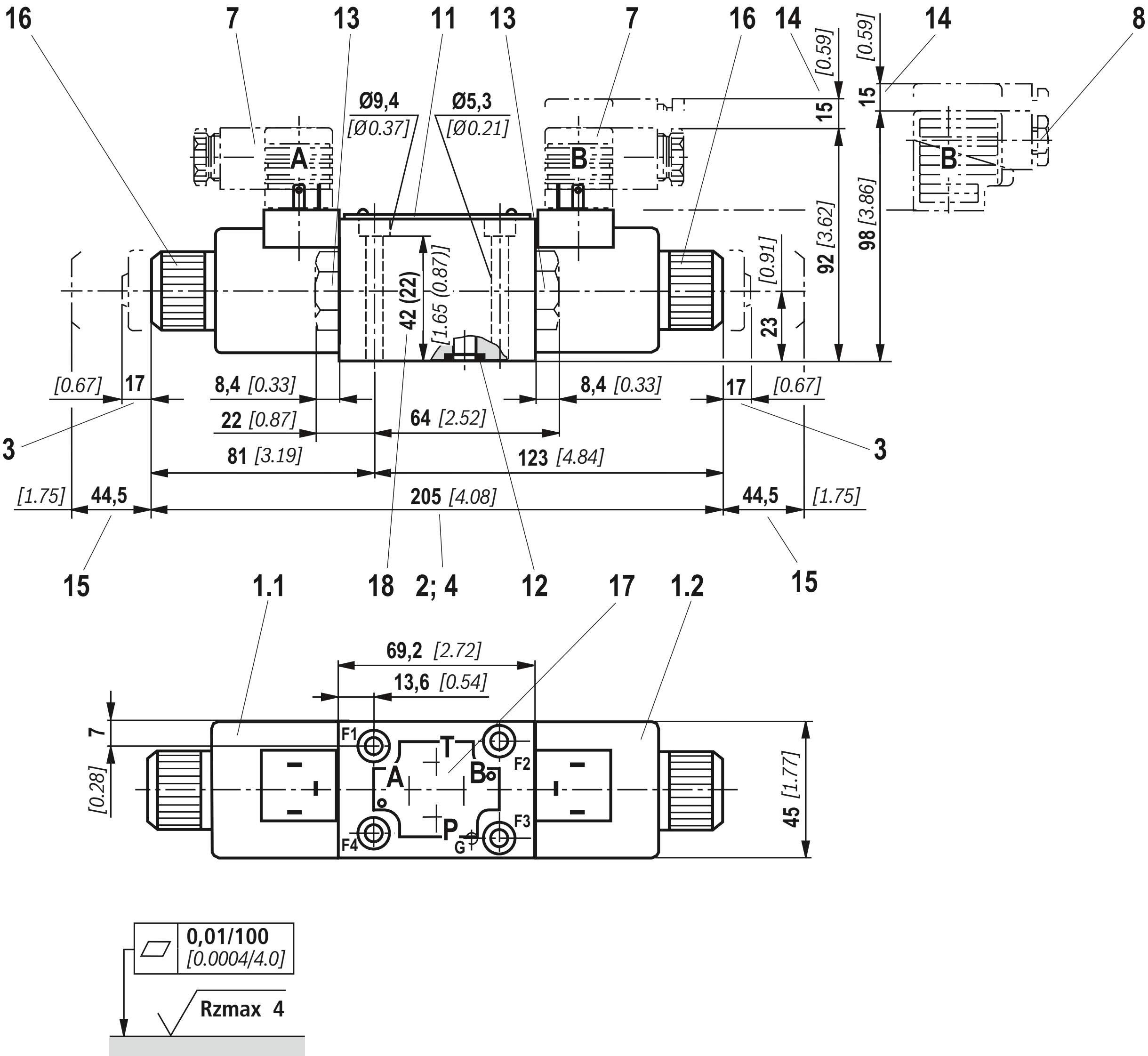


Item explanations, valve mounting screws and **subplates**
see page 18.



Required surface quality of
the valve contact surface

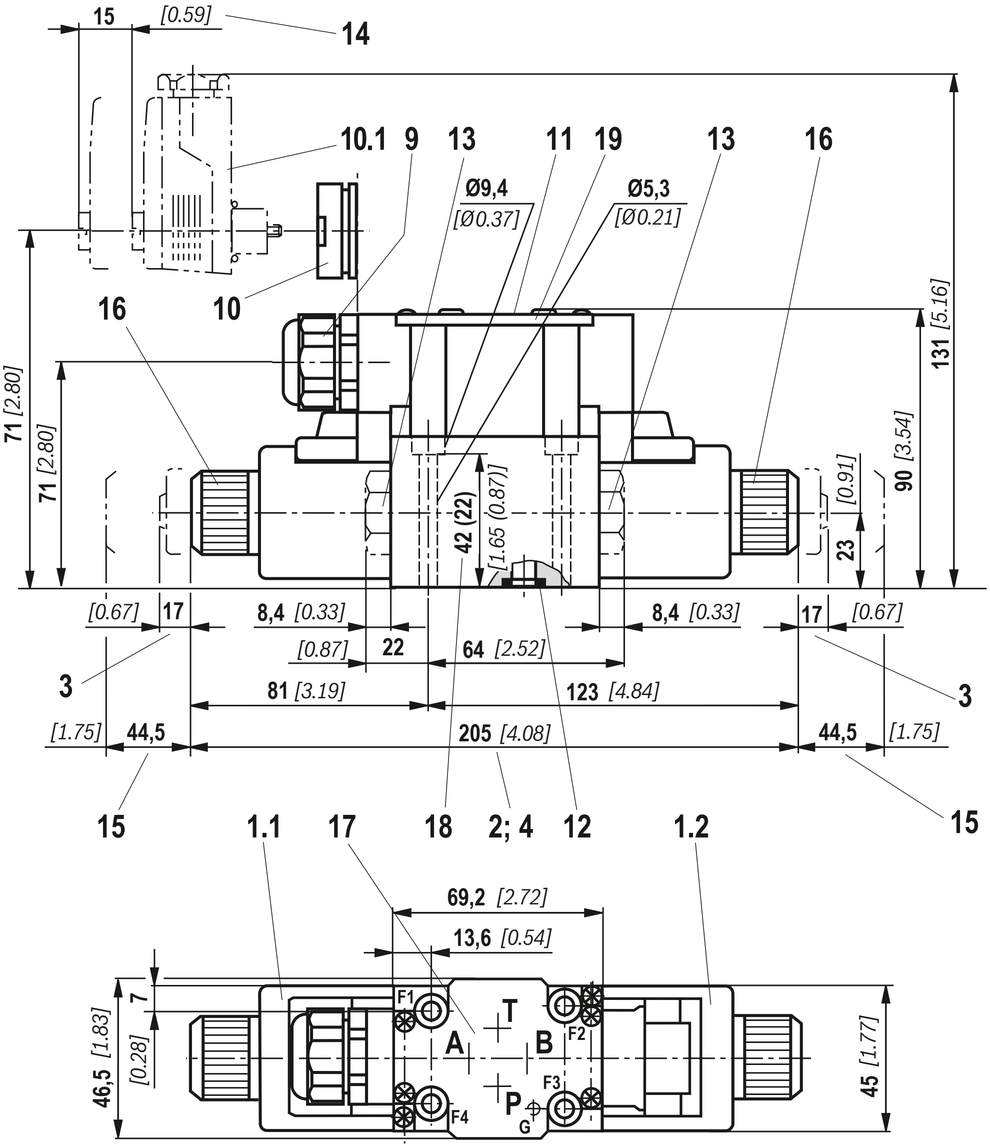
Dimensions: Valve with AC solenoid – **Individual connection**
(dimensions in mm *[inch]*)

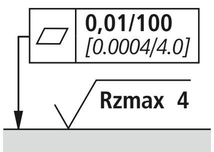


Required surface quality of the valve contact surface

Item explanations, valve mounting screws and **subplates**
see page 18.

Dimensions: Valve with AC solenoid – **Central connection**
(dimensions in mm *[inch]*)





Required surface quality of
the valve contact surface

Terminal assignment with central connection:

- **1 solenoid:**
  Always connect the solenoid to terminals 1 and 2, the protective earthing connector to terminal ⏚ PE
- **2 solenoids:**
  Always connect solenoid "a" to terminals 1 and 2, solenoid "b" to terminals 3 and 4, the protective earthing to terminal ⏚ PE

Item explanations, valve mounting screws and **subplates** see page 18.

Dimensions

1.1 Solenoid "a"
1.2 Solenoid "b"
2 Dimension for solenoid **with concealed** manual override "**N9**" (standard)
3 Dimension for solenoid **with** manual override "**N**"
4 Dimension for solenoid **without** manual override
5 Dimension for solenoid **with** manual override "**N7**"
6 Dimension for solenoid **with** manual override "**N5**" and **"N6"**
6.1 Manual override "**N5**"
6.2 Manual override "**N6**"
7.1 Mating connector **without** circuitry for connector "K4" (separate order, see page 4 and data sheet 08006)
7.2 Mating connector (AMP Junior Timer) with connector "C4" (separate order, see data sheet 08006)
7.3 Mating connector DT 04-2PA (Deutsch plug) with connector "K40" (separate order, see data sheet 08006)
7.4 Mating connector angled with M12x1 plug-in connection with status LED "K72L" (separate order, see data sheet 08006)
8 Mating connector **with** circuitry for connector "K4" (separate order, see page 4 and data sheet 08006)
9 Cable gland Pg 16 *[1/2" NPT]* "DL"
10 Central plug-in connection "DKL"
10.1 Angled socket (red, separate order) Material no. **R900005538**)
11 Name plate
12 Identical seal rings for ports A, B, P, T
☞ **Notice!** The ports are clearly determined according to their tasks and must not be arbitrarily interchanged or closed.
13 Plug screw for valves with one solenoid
14 Space required to remove the mating connector/ angled socket
15 Space required to remove the coil
16 Mounting nut, tightening torque $\boldsymbol{M}_A$ = 4^{+1} Nm *[$2.95^{+0.74}$ ft-lbs]*
17 Porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order)
18 Alternative clamping length (): 22 mm *[0.87 inch]*
19 Cover
Attention!
The valve may only be operated with properly mounted cover.

Subplates according to data sheet 45052 (separate order)

(**without** locating hole)	G 341/01 (G1/4)
	G 342/01 (G3/8)
	G 502/01 (G1/2)
(**with** locating hole)	G 341/60 (G1/4)
	G 342/60 (G3/8)
	G 502/60 (G1/2)
	G 341/12 (SAE-6) [1]
	G 342/12 (SAE-8) [1]
	G 502/12 (SAE-10) [1]

[1] Upon request

Valve mounting screws (separate order)

- Clamping length 42 mm:
  4 metric hexagon socket head cap screws
  ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  tightening torque $\boldsymbol{M}_A$ = 7 Nm *[5.2 ft-lbs]* ± 10%,
  material no. **R913000064**
  or
  4 hexagon socket head cap screws
  ISO 4762 - M5 x 50 - 10.9 [2]
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 8.1 Nm *[6 ft-lbs]* ± 10%

  4 hexagon socket head cap screws UNC 10-24 UNC x 2" ASTM-A574
  (friction coefficient μ_{total} = 0.19 bis 0.24);
  tightening torque $\boldsymbol{M}_A$ = 11 Nm *[8.2 ft-lbs]* ± 15%,
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 8 Nm *[5.9 ft-lbs]* ± 10%,
  material no. **R978800693**

- Clamping length 22 mm:
  4 metric hexagon socket head cap screws
  ISO 4762 - M5 x 30 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  tightening torque $\boldsymbol{M}_A$ = 7 Nm *[5.2 ft-lbs]* ± 10%,
  material no. **R913000316**
  or
  4 hexagon socket head cap screws
  ISO 4762 - M5 x 30 - 10.9 [2]
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 8.1 Nm *[6 ft-lbs]* ± 10%

  4 hexagon socket head cap screws UNC 10-24 UNC x 1 1/4"
  (friction coefficient μ_{total} = 0.19 to 0.24);
  tightening torque $\boldsymbol{M}_A$ = 11 Nm *[8.2 ft-lbs]* ± 15%,
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 8 Nm *[5.9 ft-lbs]* ± 10%,
  material no. **R978802879**

[2] Not included in the Rexroth delivery range

Circuit breakers with tripping characteristic "K"

according to EN 60898-1 (VDE 0641-11), EN 60947-2 (VDE 0660-101), IEC 60898 and IEC 60947-2

AC solenoid 50 Hz	Lower rated current I_1 in A	Upper rated current I_2 in A
W24	2.30	3.60
W42	1.45	1.92
W48	1.15	1.92
W100	0.64	0.90
W110	0.60	0.90
W115	0.52	0.90
W127	0.48	0.60
W200	0.33	0.60
W220	0.31	0.60
W230	0.26	0.36
W240	0.26	0.36

AC solenoid 50 Hz	Lower rated current I_1 in A	Upper rated current I_2 in A
W24	1.73	2.40
W42	1.13	1.92
W48	1.09	1.92
W100	0.58	0.90
W110	0.52	0.90
W115	0.43	0.90
W127	0.37	0.60
W200	0.30	0.60
W220	0.26	0.36
W230	0.20	0.36
W240	0.22	0.36

More information

- Subplates — Data sheet 45052
- Inductive position switch and proximity sensors (contactless) — Data sheet 24830
- Smoothly switching version — Data sheet 23183
- Mineral oil-based hydraulic fluids — Data sheet 90220
- Reliability characteristics according to EN ISO 13849 — Data sheet 08012
- General product information on hydraulic products — Data sheet 07008
- Installation, commissioning and maintenance of industrial valves — Data sheet 07300
- Hydraulic valves for industrial applications — Data sheet 07600-B
- Selection of the filters — www.boschrexroth.com/filter

Notes

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documentation@boschrexroth.de
www.boschrexroth.de

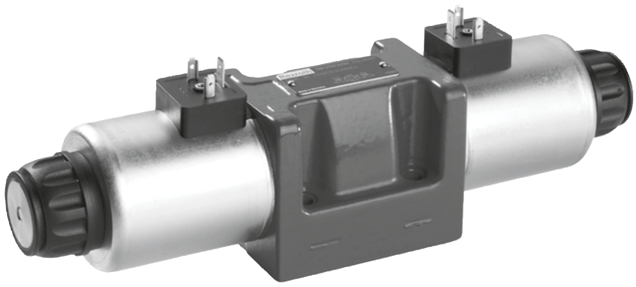
The Drive & Control Company

Rexroth
Bosch Group

Directional spool valves, direct operated, with solenoid actuation

Type WE

RE 23340
Edition: 2013-06
Replaces: 2012-06



H7832

- Size 10
- Component series 5X
- Maximum operating pressure 350 bar *[5076 psi]*
- Maximum flow 160 l/min *[42.3 US gpm]*

Features

- 4/3, 4/2 or 3/2 directional design
- High-power solenoid
- Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
- Wet-pin DC solenoids with detachable coil
- Solenoid coil can be rotated by 90°
- The coil can be changed without having to open the pressure-tight chamber
- Electrical connection as individual or central connection
- Central connection possible via double mating connector
- Manual override, optional

Contents

Ordering code

01	02	03	04	05		06	07	08	09	10	11	12		13	14	15	16	17
	WE	**10**		**5X**	**/**		**E**						**/**					*****

01	3 main ports	**3**
	4 main ports	**4**
02	Directional valve	**WE**
03	Size 10	**10**
04	Symbols e.g. C, E, EA, EB, etc; possible version see page 4 and 5	e.g. **C**
05	Component series 50 to 59 (50 to 59: Unchanged installation and connection dimensions)	**5X**
06	**With** spring return	**no code**
	With reinforced compression spring	**D**
	Without spring return	**O**
	Without spring return with detent	**OF**
07	High-power wet-pin solenoid with detachable coil	**E**
08	Direct voltage 12 V	**G12**
	Direct voltage 24 V	**G24**
	Direct voltage 26 V	**G26**
	Direct voltage 96 V	**G96**
	Direct voltage 110 V	**G110** [1)]
	Direct voltage 180 V	**G180**
	Direct voltage 205 V	**G205**
	Direct voltage 220 V	**G220**
	Alternating voltage 100 V	**W100R** [1)]
	Alternating voltage 110 V	**W110R** [1)]
	Alternating voltage 120 V	**W120R** [1)]
	Alternating voltage 200 V	**W200R** [1)]
	Alternating voltage 230 V	**W230R** [1)]
	Connection to AC voltage mains via control with rectifier (see table below and page 18) [2)]	
	Electrical connections and available voltages see page 10	
09	**Without** manual override	**no code**
	With concealed manual override (standard)	**N9** [3)]
	With concealed manual override and protective cap [5)]	**N8** [3)]
	With lockable manual override "mushroom button" (large)	**N5** [3; 4)]
	With manual override "mushroom button" (large), not lockable	**N6** [3)]

Corrosion resistance (outside)

10	None (valve housing primed)	**no code**
	Improved corrosion protection (240 h salt spray test according to EN ISO 9227) (see also page 10)	**J2**

1) Only for version "central connection"
2) Only for version "individual connection"
3) The manual override cannot be allocated a safety function. The manual override units may only be used up to a tank pressure of 50 bar.
4) With tank pressures above 50 bar, it cannot be guaranteed that the valve remains in the position switched by the manual override "N5".
5) Protective cap must be removed prior to actuation.

AC voltage mains (admissible voltage tolerance ±10%)	**Nominal voltage of the DC solenoid in case of operation with alternating voltage**	**Ordering code**
100 V - 50/60 Hz	96 V	**G96**
110 V - 50/60 Hz	96 V	**G96**
200 V - 50/60 Hz	180 V	**G180**
230 V - 50/60 Hz	205 V	**G205**

Ordering code

01	02	03	04	05		06	07	08	09	10	11	12		13	14	15	16	17
	WE	**10**		**5X**	**/**		**E**						**/**					*****

Electrical connection

11	**Individual connection**	
	Without mating connector; connector according to DIN EN 175301-803	**K4** [6)]
	Without mating connector; connector according to DIN EN 175301-803	**K4K** [6)]
	Without mating connector, 4-pole with connector M12x1 according to IEC 60947-5-2, integrated interference protection circuit and status LED	**K72L** [6)]
	Without mating connector; connector AMP Junior-Timer	**C4Z** [6)]
	Central connection	
	Cable entry at the cover, with indicator light	**DL**
	Central plug-in connection at the cover, with indicator light (without mating connector); connector according to DIN EN 175201-804	**DK6L**
	Additional electrical connections and available voltages see page 10	

Switching time increase

12	**Without** switching time increase	**no code**
	With switching time increase (only with symbol ".73"; not for version "D" with reinforced compression spring; more information upon request)	**A12**

13	**Without** throttle insert			**no code**
	With throttle insert [7; 8)]			
	Port	Throttle Ø in mm *[inch]*		
		0.8 *[0.031]*	1.0 *[0.039]*	1.2 *[0.047]*
	P	**= B08**	**= B10**	**= B12**
	A	**= H08**	**= H10**	**= H12**
	B	**= R08**	**= R10**	**= R12**
	A and B	**= N08**	**= N10**	**= N12**
	T [9)]	**= X08**	**= X10**	**= X12**
	Further throttle insert diameters upon request.			

Seal material

14	NBR seals	**M**
	FKM seals	**V**
	Seals for HFC hydraulic fluids	**MH**
	Low-temperature version	**MT**
	Attention: Observe compatibility of seals with hydraulic fluid used!	

Control spool play

15	Standard	**no code**
	Limited (for little leakage)	**T06**
	Increased (for extended temperature range, higher leakage)	**T12**

16	Approval according to CSA C22.2 No. 139-10	**CSA**
	Porting pattern according to ANSI B93.9 (if solenoid "a" is energized, channel P is connected to A)	**AN**

17	Further details in the plain text	

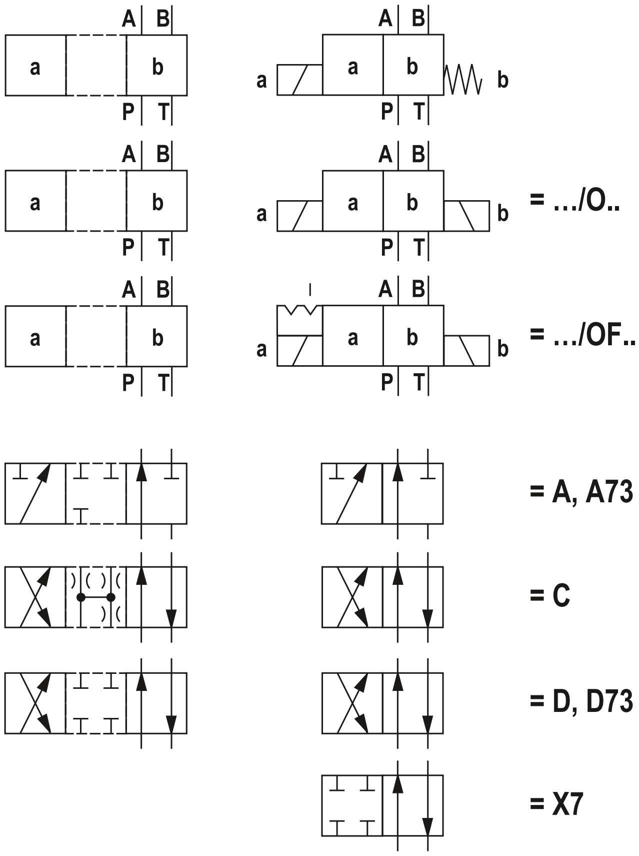
6) Mating connector, separate order, see page 18 and data sheet 08006.

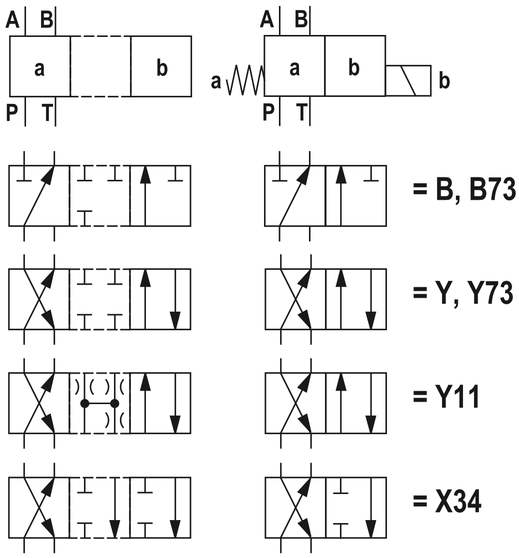
7) When the admissible valve performance limits are exceeded, installation of throttle inserts is to be intended (performance limits see page 12 and 13).

8) Not with low-temperature version "MT".

9) If throttle inserts are used in channel T, the pressure in the working ports and for connection to the tank chambers must not exceed 210 bar.

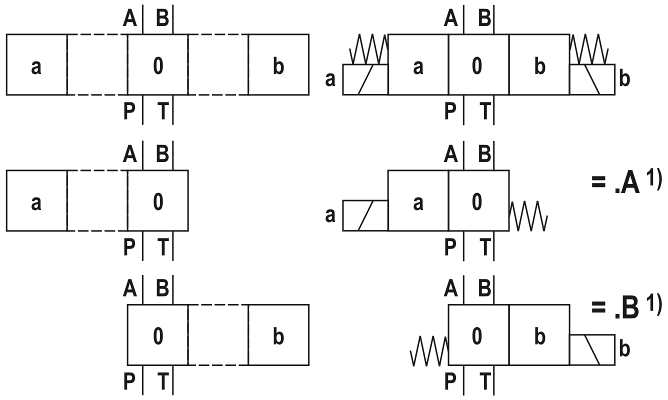
Symbols

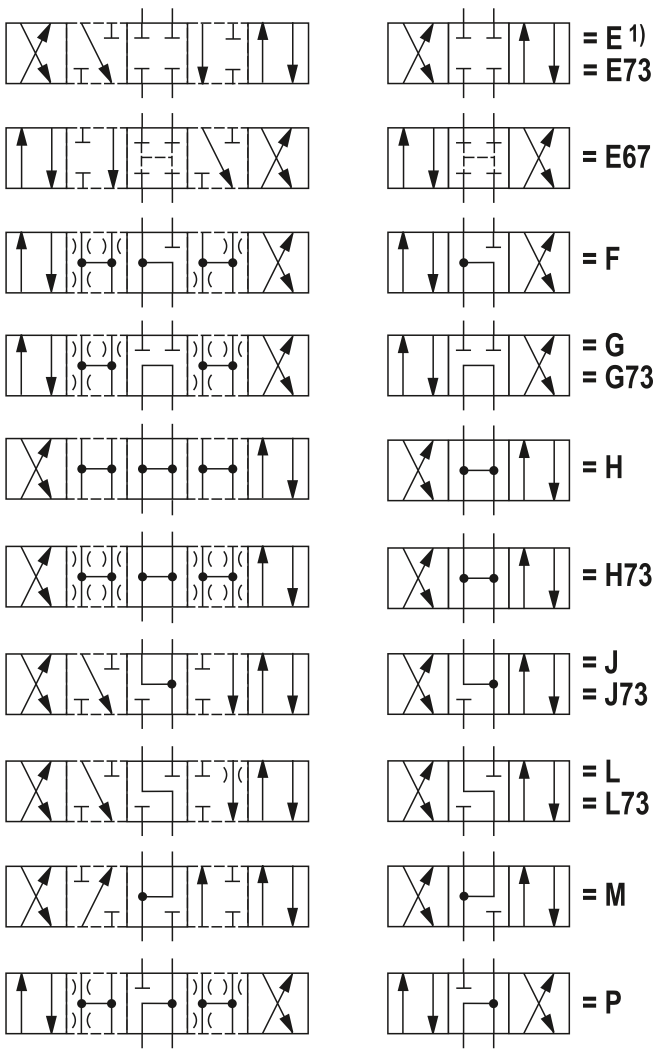


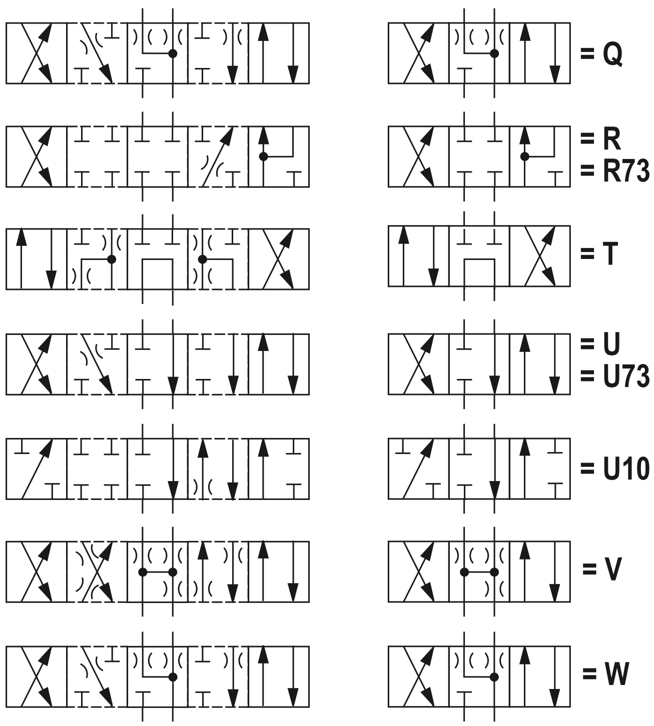


☞ **Notice!**
Representation according to DIN ISO 1219-1.
Hydraulic interim positions are shown by dashes.

Symbols







[1] **Example:**

- Spool E with spool position "a" ordering code ..**EA**..
- Spool E with spool position "b" ordering code ..**EB**..

Notice!

- Representation according to DIN ISO 1219-1.
  Hydraulic interim positions are shown by dashes.
- Other symbols upon request.

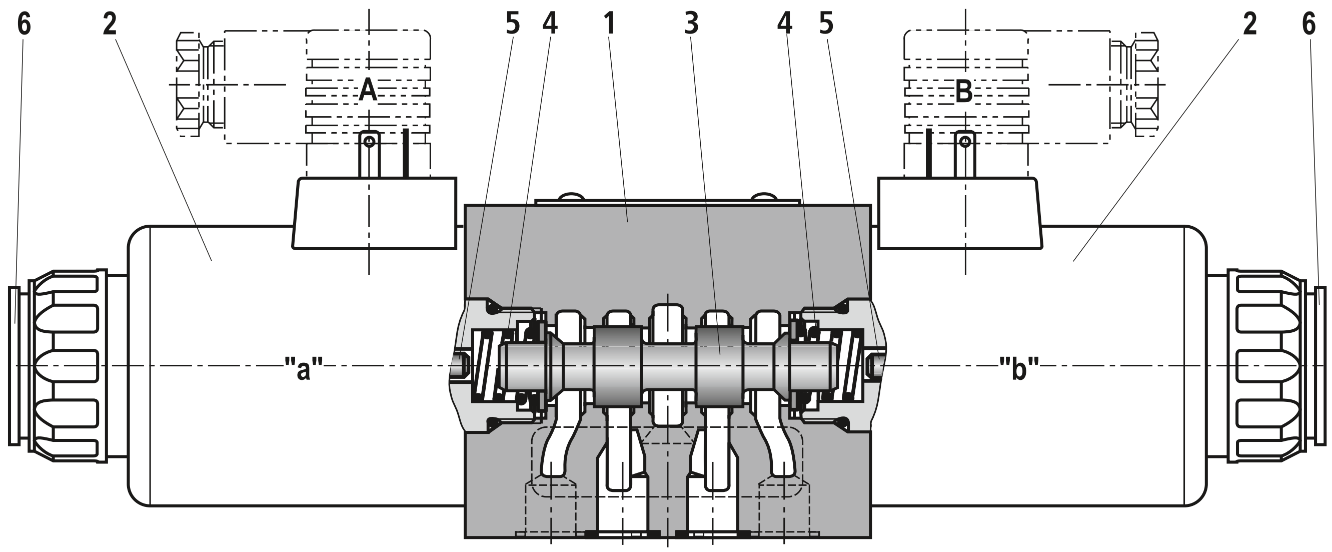
Function, section

The directional valve type WE is a solenoid-actuated directional spool valve that can be used as electro-magnetic component. It controls the start, stop and direction of a flow.
The directional valve basically consists of housing (1), one or two electronic solenoids (2), the control spool (3), and the return springs (4).
In the de-energized condition, the control spool (3) is held in the central position or in the initial position by the return springs (4) (except for version "O").
In case of energization of the wet-pin electronic solenoid (2), the control spool (3) moves out of its rest position into the required end position. In this way, the required direction of flow according to the selected symbol is released.

After the electronic solenoid (2) has been switched off, the control spool (3) is pushed back into the central position or in the initial position (except for valve with "OF" detent and valve without spring type "O").
A manual override (6) allows the valve to be switched manually without solenoid energization.

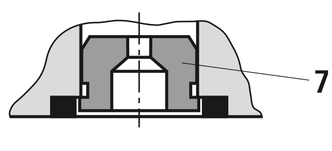
To ensure proper functioning, care must be taken that the pressure chamber of the solenoid is filled with oil.

More functions see page 7.



Type .WE 10 E...

Throttle insert "B.."
Using a throttle insert (7) in channels P, A, B or T, the flow resistance at the valve can be increased. Its use is required when, due to prevailing operating conditions, flows occur during the switching processes which exceed the performance limit of the valve.

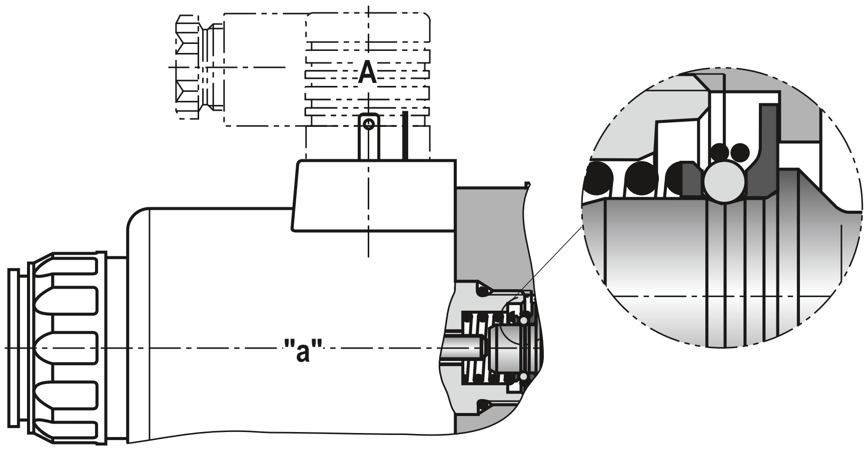


Function, section

Without spring return "O" (only possible with symbols A, C and D)
This version is a directional valve with 2 spool positions and 2 electronic solenoids **without** detent. The valve without spring return at the control spool (3) has no defined basic position in the de-energized state.

Without spring return with "OF" detent (only possible with symbols A, C and D)
This version is a directional valve with 2 spool positions and 2 electronic solenoids **with** detent. The detents are used to fix the control spool (3) in the relevant spool position. During operation, continuous application of current to the electronic solenoid can therefore be omitted, which contributes to energy-efficient operation.

☞ **Notice!**
Pressure peaks in the tank line to two or several valves can result in unintended control spool movements for valves with detent! We therefore recommend that separate return lines be provided or a check valve installed in the tank line.



Type .WE 10 ../OF...

Technical data
(for applications outside these parameters, please consult us!)

general				
Weight			Individual connection	Central connection
	– Valve with one solenoid	kg *[lbs]*	3.9 *[8.6]*	4.0 *[8.8]*
	– Valve with two solenoids	kg *[lbs]*	5.5 *[12.1]*	5.6 *[12.3]*
Installation position			Any [1]	
Ambient temperature range	– Standard version	°C *[°F]*	–20 ... +70 *[–4 ... +158]* (NBR seals) –15 ... +70 *[+5 ... +158]* (FKM seals)	
	– Version for HFC hydraulic fluid	°C *[°F]*	–20 ... +50 *[–4 ... +122]*	
	– Low-temperature version [2]	°C *[°F]*	–40 ... +50 *[–4 ... +122]*	
Storage temperature range		°C *[°F]*	–20 ... +50 *[–4 ... +122]*	
$MTTF_d$ values according to EN ISO 13849		Years	300 (for further details see data sheet 08012)	

hydraulic			
Maximum operating pressure [2]	– Port A, B, P	bar *[psi]*	350 *[5076]*
	– Port T	bar *[psi]*	210 *[3050]* Tank pressure (standard) With symbols A and B, port T must be used as leakage oil connection if the operating pressure exceeds the maximum admissible tank pressure.
Maximum flow		l/min *[US gpm]*	160 *[42.3]*
Hydraulic fluid			See table below
Hydraulic fluid temperature range (at the valve working ports)		°C *[°F]*	–20 ... +80 *[–4 ... +176]* (NBR seals) –15 ... +80 *[+5 ... +176]* (FKM seals) –20 ... +50 *[–4 ... +122]* (HFC hydraulic fluid) –40 ... +50 *[–4 ... +122]* (low-temperature version)
Viscosity range		mm²/s *[SUS]*	2.8 ... 500 *[35 ... 2320]*
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [3]

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR, HNBR	ISO 12922

☞ **Important information on hydraulic fluids!**
- For more information and data on the use of other hydraulic fluids, refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – containing water**:
  - Maximum pressure difference per control edge 50 bar
  - Pressure pre-loading at the tank port >20% of the pressure differential, otherwise increased cavitation
  - Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%
- **Bio-degradable:** When using bio-degradable hydraulic fluids that are also zinc-solving, zinc may accumulate in the fluid (per pole tube 700 mg zinc).

[1] With suspended installation, higher sensitivity to contamination. Horizontal installation is recommended.

[2] For use at low temperatures, see project planning information page 19.

[3] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components. For the selection of the filters, see www.boschrexroth.com/filter.

Technical data
(for applications outside these parameters, please consult us!)

electric					
Voltage type				Direct voltage	Alternating voltage
Nominal voltage according to VDE 0580 (ordering code see page 2 and 10)			V	12, 24, 26, 96, 110, 180, 205, 220	With central connection or possible via rectifier [4)]
Voltage tolerance (nominal voltage)			%	±10	
Nominal power according to VDE 0580			W	40	
Duty cycle			%	100 (S1 according to VDE 0580)	
Switching time [5)]	– ON	Pressure change 5%	ms	60 ... 104 [6)]	
		Pressure change 95%	ms	90 ... 165 [6)]	
	– OFF	Pressure change 5%	ms	12 ... 50	230 ... 330
		Pressure change 95%	ms	48 ... 104	250 ... 360
Switching time according to ISO 6403 [7)]	– ON			45 ... 60	
	– OFF			20 ... 30	250 ... 360
Maximum switching frequency			1/h	15000	7200
Protection class according to DIN EN 60529				See page 10	
Protection class according to VDE 0580				See page 10	
Maximum surface temperature of the coil [8)]			°C *[°F]*	140 *[284]*	
Insulation class VDE 0580				F	
Electrical protection				Every solenoid must be protected individually, using a suitable fuse with tripping characteristic K (inductive loads). The valve must be installed on a surface that is included in the equipotential bonding.	

4) ▶ Mating connectors with rectifier see page 18
▶ Possible voltages see page 2
▶ Rectifiers must comply with the relevant standards as well as the coil performance data!
▶ With a central connection, the rectifier is on the board

5) Measured with flow, 80% performance limit and horizontal installation position.

6) Not with symbols A, B and .73.

7) Measured without flow

8) Possible surface temperature >50 °C, provide contact protection!

Notice!
- The solenoid coils must not be painted.
- Actuation of the manual override is only possible up to a tank pressure of approx. 50 bar *[725 psi]*. Avoid damage to the bore of the manual override! (Special tool for the operation, separate order, material no. **R900024943**). When the manual override is blocked, actuation of the opposite solenoid must be ruled out!
- The simultaneous actuation of 2 solenoids of one valve must be ruled out!
- Use cables that are approved for a working temperature above 105 °C *[221 °F]*.
- Valves with individual connection and supply voltage 12 V or 24 V can be operated with twice the voltage for reducing the switching time. For this purpose, the voltage has to be reduced to the nominal valve voltage after 100 ms by means of pulse width modulation. The maximum admissible switching frequency is 3 1/s.
- Due to possible overload of the board, valves with central connection must not be operated with twice the voltage.
- If the standard environmental conditions according to VDE 0580 cannot be provided, the valve must be especially protected!

Electrical connections see page 10.

Technical data
(for applications outside these parameters, please consult us!)

Electrical connections and available voltages

Ordering code connector		Ordering code (voltage) G12	G24	G26	G96	G110	G180	G205	G220	Protection class according to DIN EN 60529 [8]	Protection class according to VDE 0580
Without mating connector, individual connection; connector according to DIN EN 175301-803	**K4**	✓ [9]	✓ [9]	[10]	✓ [9]	–	✓	✓ [9]	✓	IP65	I
	K4K	✓	✓	✓	[10]	–	–	[10]	[10]	IP65, IP67	I
Without mating connector, 4-pole with connector M12x1 according to IEC 60947-5-2, integrated interference protection circuit and status LED	**K72L**	–	✓	–	–	–	–	–	–	IP65	III [12]
Without mating connector; connector AMP Junior-Timer	**C4Z**	–	–	✓	–	–	✓	–	–	IP66	III [12]
Without mating connector; threaded connection 1/2"-14 NPT	**DAL**	✓ [9]	✓ [9]	–	✓ [9]	–	–	✓ [9]	✓ [9]	IP65 [13]	I
Central plug-in connection at the cover, with indicator light (without mating connector) with connector according to DIN EN 175201-804	**DK6L**	✓ [9]	✓ [9]	–	✓ [9]	✓	–	✓ [9]	✓ [9]	IP65	I
Cable gland at the cover, with indicator light (terminal area 6 ... 12 mm *[0.23 ... 0.47 inch]*)	**DL** [11]	✓ [9]	✓ [9]	–	✓ [9]	✓	–	✓ [9]	✓ [9]	IP65	I
Cable gland at the cover, with indicator light and cable bridge at the ground connection	**DJL** [11]	–	✓ [9]	–	–	✓ [9]	–	–	–	IP65	I
Mini-change connector, 5-pin	**DK25L**	–	✓ [9]	–	✓ [9]	–	–	–	–	IP65	I

[8] Only with correctly mounted valve with a mating connector suitable for the protection class.

[9] "Recognized component" according to UL 429.

[10] Upon request.

[11] Possible with version "J2".

[12] With protection class II, a protective extra-low voltage with isolation transformer (PELV, SELV) is to be provided.

[13] Only with professionally designed connection with appropriate sealing to the central connection.

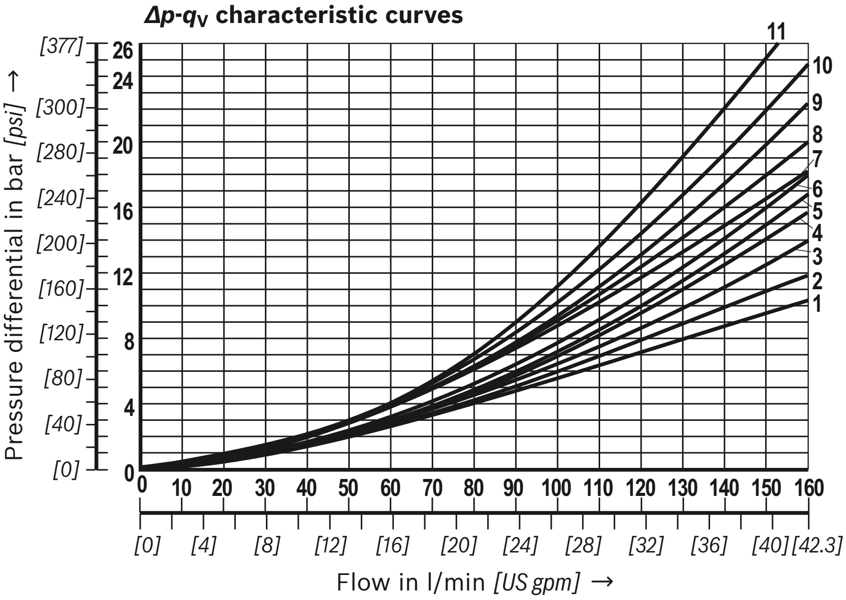
When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected correctly.

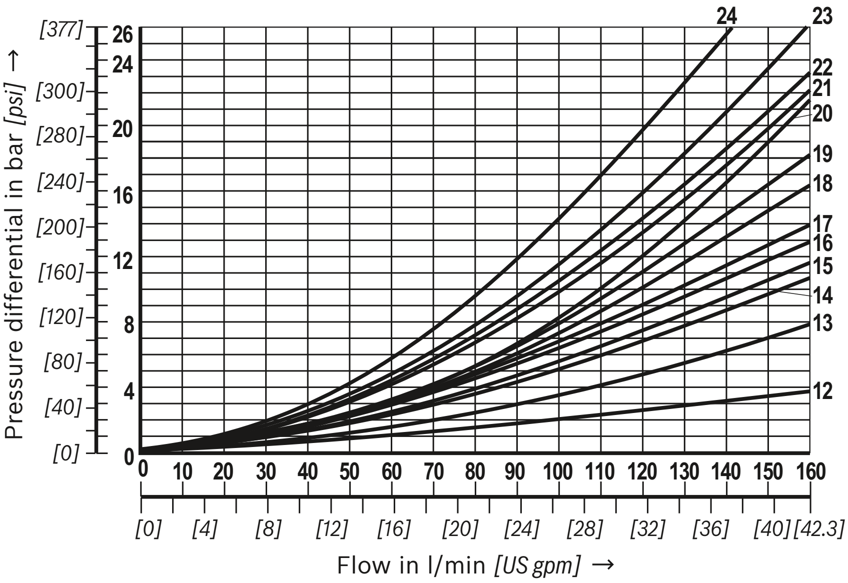
Notice!
- ▶ The plug-in connectors used are not intended to be plugged in or disconnected during normal operation under load.
- ▶ Operation of the valves only admissible with appropriate and locked mating connector.

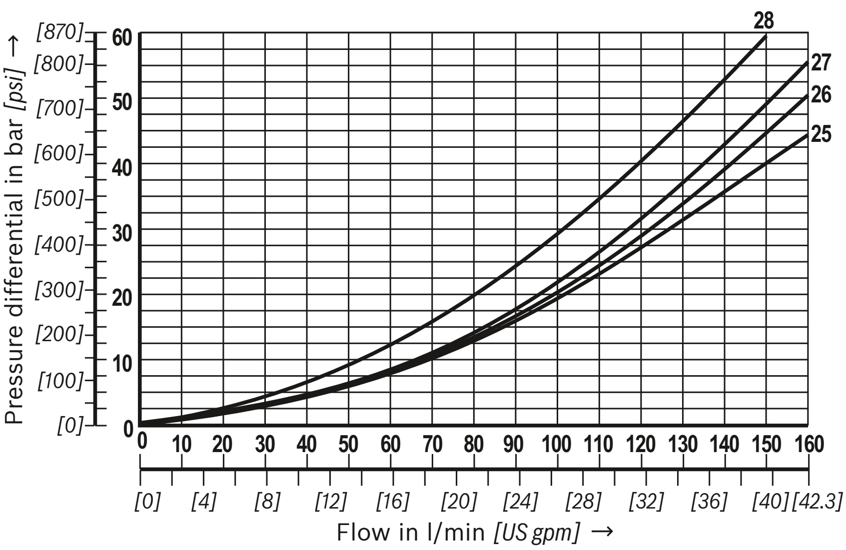
Characteristic curves

(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Δp-q_V characteristic curves







Symbol	Direction of flow			
	P – A	**P – B**	**A – T**	**B – T**
A; B	6	6	–	–
A73, B73	23	23	–	–
C	1	2	5	7
D	2	2	5	7
D73	25	26	26	27
E	17	16	19	21
E67	4	4	11	24
E73	17	18	21	21
F	2	3	22	23
G	4	4	24	24
G73	18	18	24	24
H	14	14	20	21
H73	14	14	6	9
J	3	3	9	11
J73	22	21	23	24
L	3	3	9	9
L73	22	10	11	24
M	14	14	6	8
P	17	14	20	23
Q	16	17	4	8
R	18	21	18	24
R73	24	24	23	24
T	18	4	10	24
U	3	3	6	11
U10	Upon request			
U73	22	22	23	24
V	17	17	18	20
W	Upon request			
X7	Upon request			
X34	Upon request			
Y	17	16	18	21
Y11	3	2	4	9
Y73	26	26	26	28

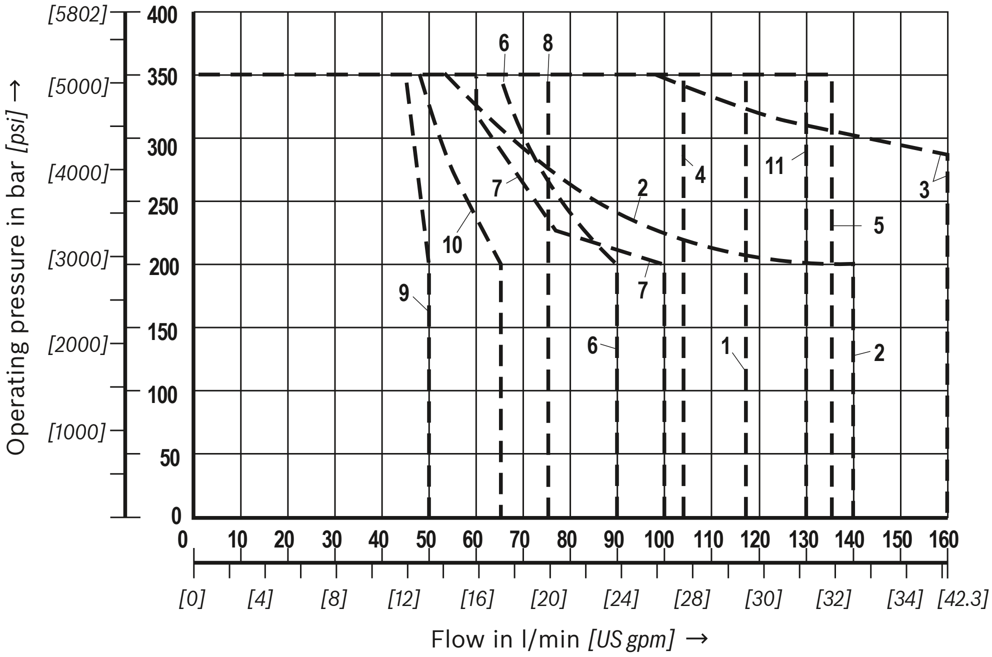
Central position:

Symbol	Direction of flow				
	P – A	**P – B**	**B – T**	**A – T**	**P – T**
H	12	12	13	13	15

Performance limits
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

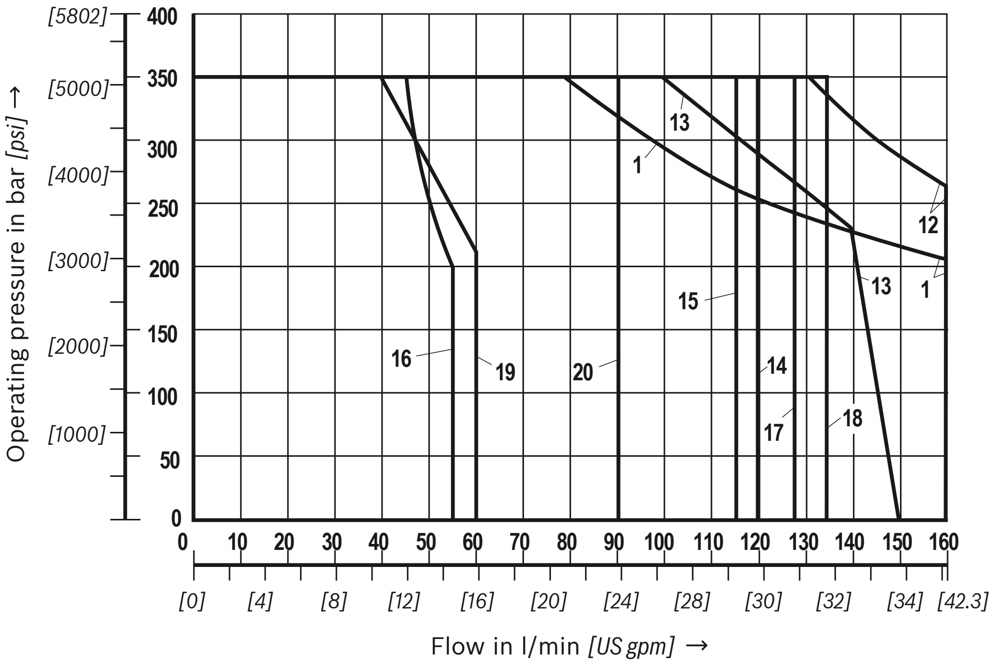
☞ **Notice!**
The specified performance limits are valid for use with two directions of flow (e.g. from P to A and simultaneous return flow from B to T).
Due to the flow forces acting within the valves, the admissible performance limit may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked).
In such cases, please consult us!
The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank preloading.

Spring side



Characteristic curve	Symbol
1	L
2	A
3	B
4	Y
5	E73, Q
6	F
7	G73
8	M; V
9	P
10	A73
11	H73

Solenoid side



Characteristic curve	Symbol
1	L
12	A/O
13	J
14	H
15	D73
16	B73
17	Y11
18	C; D; E73
19	E67
20	G

Performance limits

(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

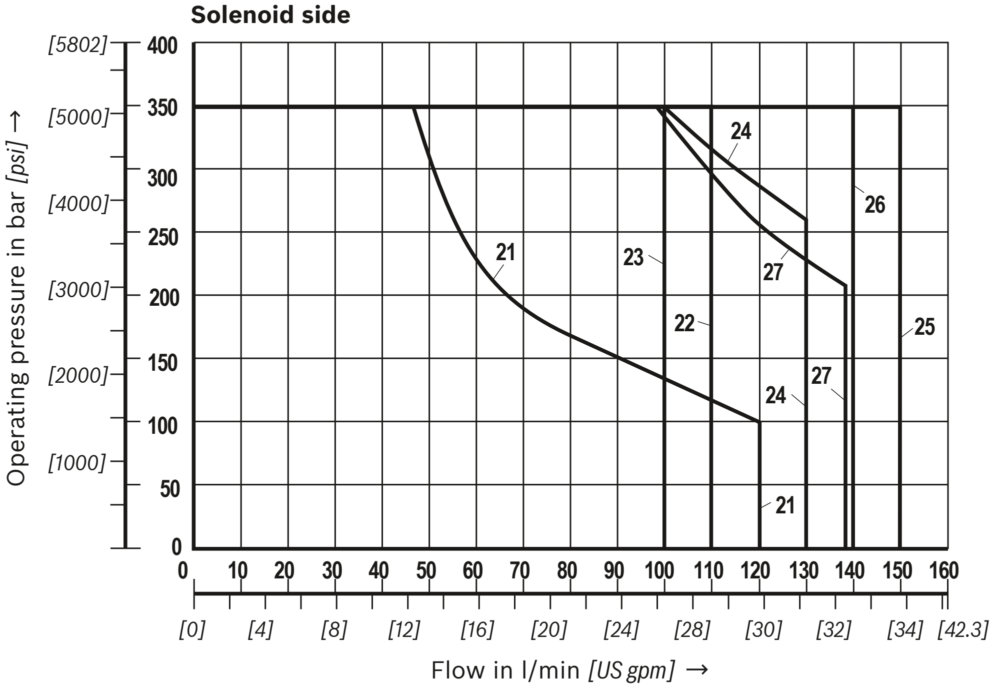
☞ **Notice!**

The specified performance limits are valid for use with two directions of flow (e.g. from P to A and simultaneous return flow from B to T).

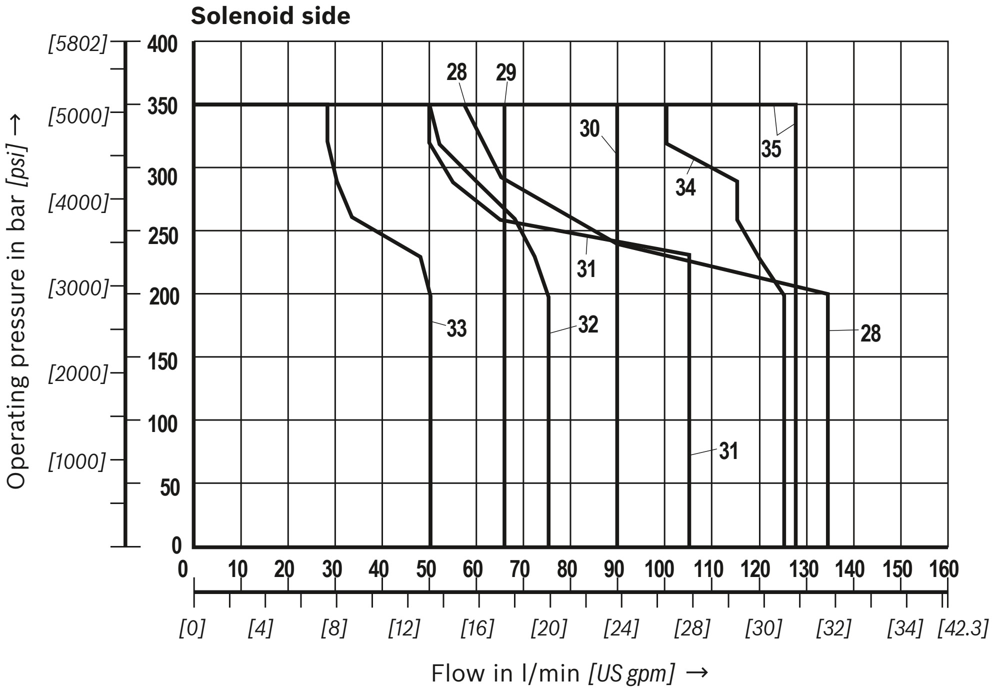
Due to the flow forces acting within the valves, the admissible performance limit may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked).

In such cases, please consult us!

The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank preloading.

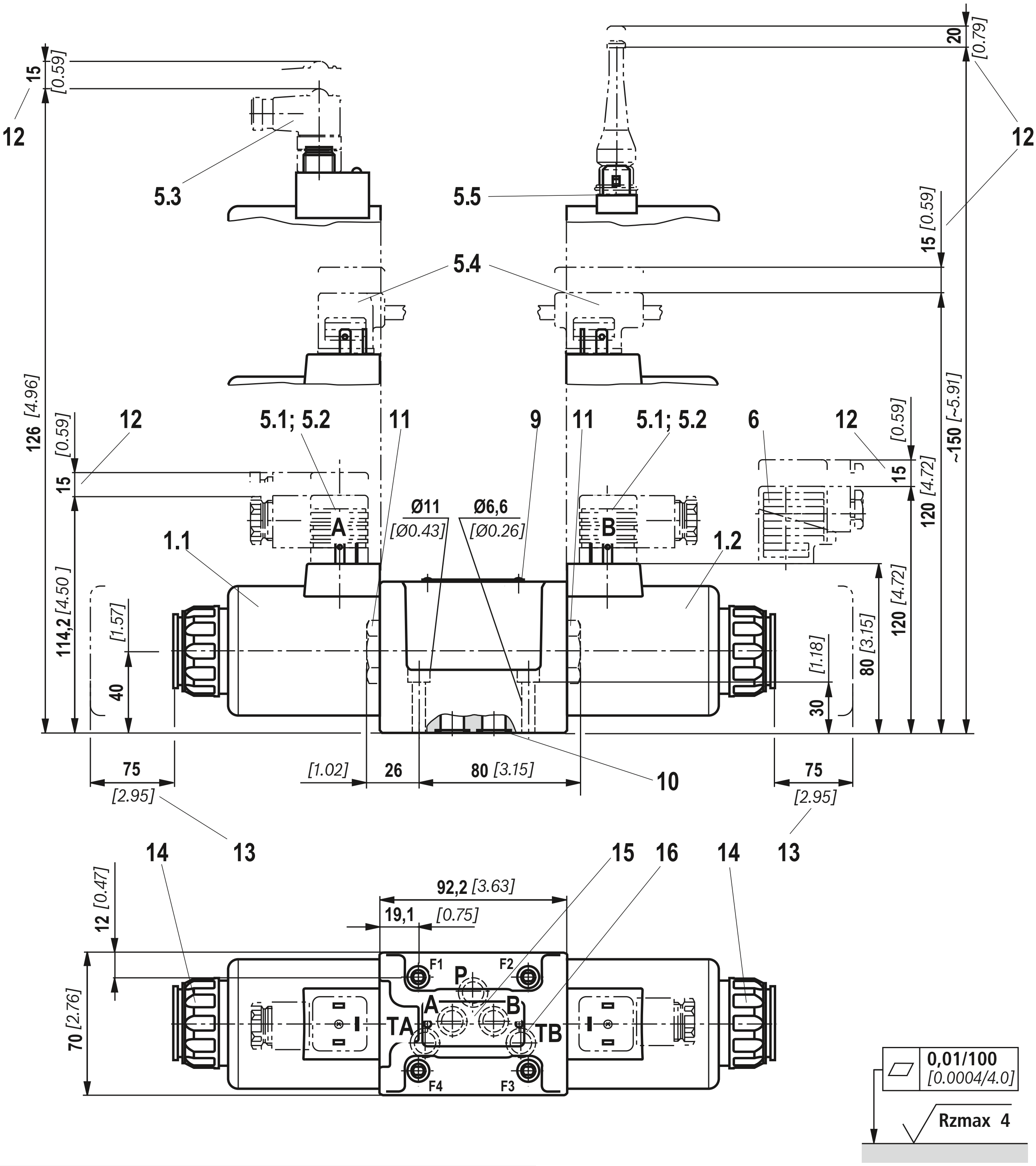


Characteristic curve	Symbol
21	A; B
22	G73
23	F; L73
24	E
25	C/O; D/O
26	J73
27	U



Characteristic curve	Symbol
28	Q
29	V
30	P
31	R
32	R73
33	T
34	U73
35	Y73

Dimensions: Individual connection
(dimensions in mm *[inch]*)

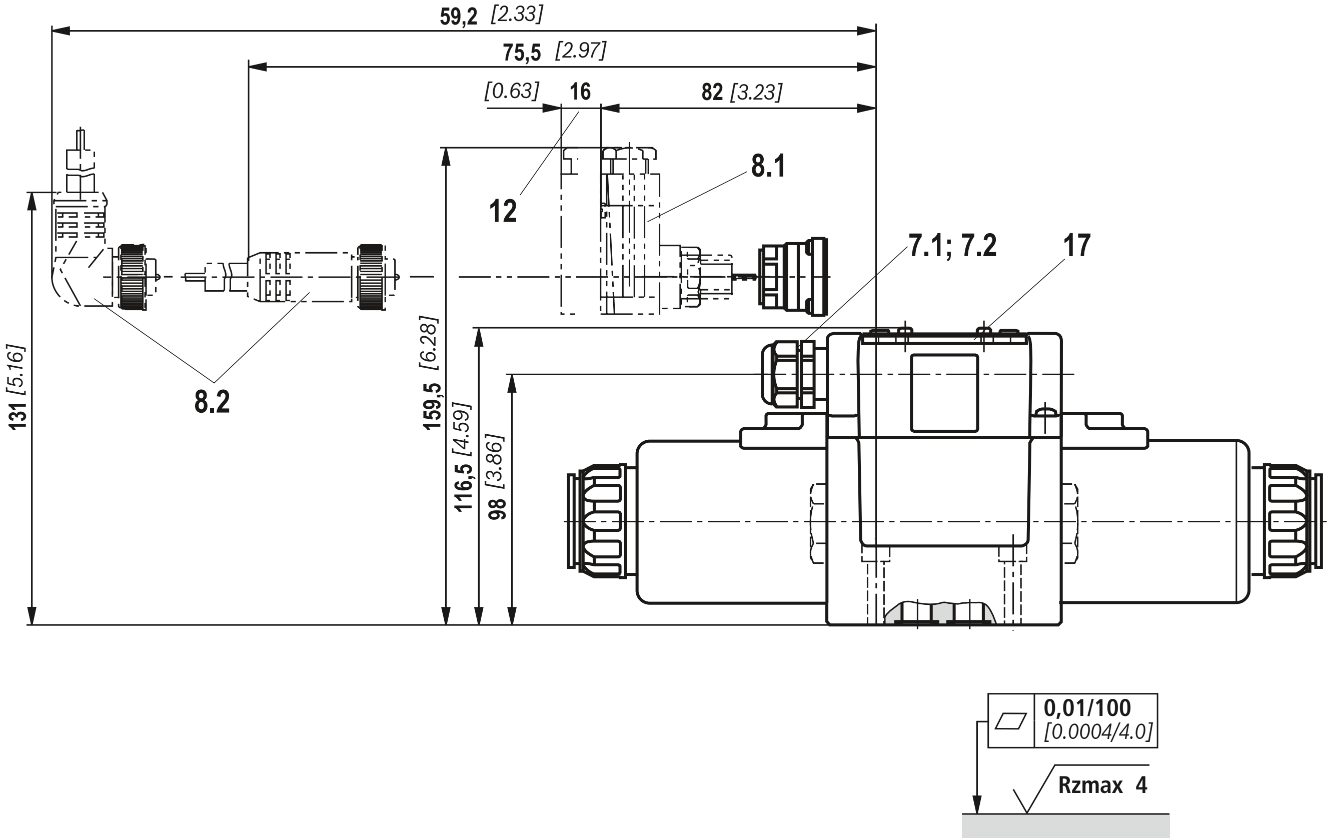


Required surface quality of the valve contact surface

> **Notice!**
> - Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.
> - The dimensions are nominal dimensions which are subject to tolerances.

Dimensions for manual overrides see page 16.
Item explanations, valve mounting screws and **subplates** see page 17.

Dimensions: Central connection
(dimensions in mm *[inch]*)



Required surface quality of the valve contact surface

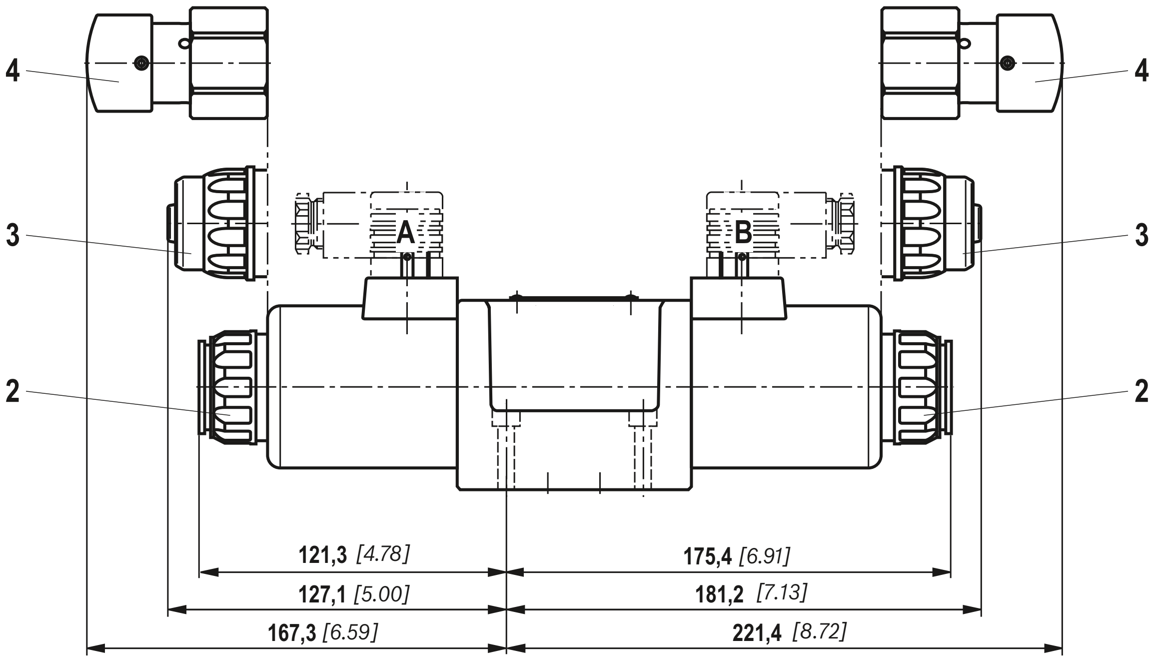
☞ **Special points with version "DAL" and "DL"**

- Version "DL" is only suitable for permanently installed cables. Lines must be routed in a pull-relieved manner!
- Minimum line cross-section 0.75 mm^2
- With a maximum line cross-section of 1.5 mm^2 the wire end ferrules must be crimped to a maximum cross-section of 1.5 x 2 using appropriate tools to ensure they fit into the printed circuit board terminals.
- Before crimping, at least 11 mm *[0.43 inch]* of the cables have to be stripped.
- For the line cross-section, wire end ferrules according to DIN 46228-1 with a minimum length of 10 mm *[0.39 inch]* are to be used.
- For the earthing connection, ring cable lugs according to DIN 46234-4-1 are to be used, tightening torque M_A = 1.75 Nm *[1.29 ft-lbs]* ± 10%

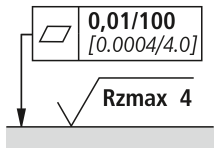
☞ **Notice!**
The dimensions are nominal dimensions which are subject to tolerances.

Dimensions for manual overrides see page 16.
Item explanations, valve mounting screws and **subplates** see page 17.

Dimensions: Manual overrides
(dimensions in mm *[inch]*)



Notice!
The dimensions are nominal dimensions which are subject to tolerances.



Required surface quality of the valve contact surface

Item explanations, valve mounting screws and **subplates** see page 17.

Dimensions

1.1 Solenoid "a"
1.2 Solenoid "b"
2 Version **without** and **with concealed** manual override "**N9**" (standard)
3 Version **with** concealed manual override and protective cap "**N8**". (The protective cap must be removed prior to actuation.)
4 Version **with** manual override "**N5**" and **"N6"**
5.1 Mating connector **without** circuitry for connector "K4" (separate order, see page 18 and data sheet 08006)
5.2 Mating connector **without** circuitry for connector "K4K" (separate order, see data sheet 08006)
5.3 Mating connector angled with M12x1 plug-in connection and status LED for connector "K72L" (separate order, see data sheet 08006)
5.4 Double mating connector **without/with** circuitry for connector "K4" (separate order, see data sheet 08006)
5.5 Mating connector (AMP Junior Timer) for connector "C4Z" (separate order, see data sheet 08006)
6 Mating connector **with** circuitry for connector "K4" (separate order, see page 18 and data sheet 08006)
7.1 Cable gland Pg 16 "DL" (terminal area 6 ... 12 mm *[0.24 ... 0.47 inch]*); lock nut, tightening torque M_A = 3.3 Nm *[2.43 ft-lbs]* ± 10%
7.2 Central connection box "DAL" 1/2" NPT, tightening torque M_A = 5 Nm *[3.69 ft-lbs]* ± 10 %; sealing by sealant
8.1 Mating connector for connector "DK6L" (separate order, see data sheet 08006)
8.2 Mini-change connector, 5-pin for connector "DK25L" (separate order, material no. **R900057631**)
9 Name plate
10 Identical seal rings for ports A, B, P, TA, TB
11 Plug screw for valves with one solenoid
12 Space required to remove the mating connector/ angled socket
13 Space required to remove the coil
14 Mounting nut, tightening torque M_A = 14.5$^{\pm 1.5}$ Nm *[10.69$^{\pm 1.1}$ ft-lbs]*
15 Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
16 Connection TB can only be used in connection with separately produced bore.
17 Cover
Attention! The valve may only be operated with properly mounted cover! Tightening torque of the cover screws M_A = 1.0 Nm *[0.74 ft-lbs]* ± 10%.
Prior to opening the frame, it must be ensured that the valve has no voltage!

Subplates according to data sheet 45054 (separate order)
G 66/01 (G3/8)
G 67/01 (G1/2)
G 534/01 (G3/4)
G 66/12 (SAE-6; 9/16-18) [1)]
G 67/12 (SAE-8; 3/4-16) [1)]
G 534/12 (SAE-12; 1-1/16-12) [1)]

[1)] Upon request

Valve mounting screws (separate order)
4 metric hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_A = 12.5 Nm *[9.2 ft-lbs]* ± 10%,
material no. **R913000058**
or
4 hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
tightening torque M_A = 15.5 Nm *[11.4 ft-lbs]* ± 10%

4 UNC hexagon socket head cap screws
1/4-20 UNC x 1-1/2" ASTM-A574
(friction coefficient) μ_{total} = 0.19 to 0.24);
tightening torque M_A = 25 Nm *[18.4 ft-lbs]* ± 15%,
(friction coefficient μ_{total} = 0.12 to 0.17);
tightening torque M_A = 19 Nm *[14.0 ft-lbs]* ± 10%,
material no. **R978800710**

With different friction coefficients, the tightening torques are to be adjusted accordingly!

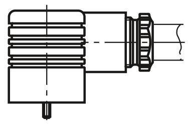
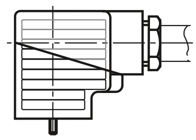
Over-current fuse and switch-off voltage peaks

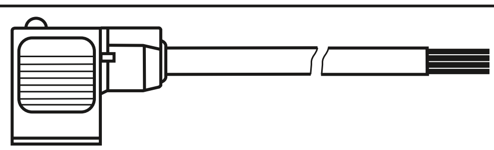
Maximum admissible overvoltages according to DIN EN 60664-1:2008-01 (VDE 0110-1) (overvoltage category II):

Electrical connection	**Nominal voltage** in V	**Rated current** in A	**Maximum switch-off overvoltage to be energized** in V
K4, K4K, DAL, D6KL, DL	12	3.72	500
K4, K4K, K72L, DAL, D6KL, DL, DJL, DK25L	24	1.74	500
K4, C4Z	26	1.70	500
K4, DAL, D6KL, DL, DK25L	96	0.47	776
D6KL, DL, DJL	110	0.41	940
K4, C4Z	180	0.28	1700
K4, DAL, D6KL, DL	205	0.22	1867
K4, DAL, D6KL, DL	220	0.21	1967

☞ **Notice!**
When solenoid coils are switched off, voltage peaks result which may cause faults or damage in the connected control electronics. We therefore recommend limiting them to 2 x nominal voltage by means of a interference protection circuit. It must be noted that a diode switched in an antiparallel form extends the switching off time.

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006						
			Material no.			
Port	**Valve side**	**Color**	Without circuitry	With indicator light 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Zener diode suppression circuit 24 V
M16 x 1.5	a	Gray	**R901017010**	–	–	–
	a/b	Black	**R901017011**	**R901017022**	**R901017025**	**R901017026**
1/2" NPT (Pg16)	a	Red/brown	**R900004823**	–	–	–
	a/b	Black	**R900011039**	**R900057453**	**R900842566**	–

Details see data sheet 30362				
			Material number	
			Type VT-SSBA1-PWM-1X/V001/5,00 as fast switching amplifier	Type VT-SSBA1-PWM-1X/V002/5,00 for energy reduction
M16 x 1.5	a/b	Black	**R901265633**	**R901290194**

Project planning information:
Temperature range and maximum operating pressure in case of use at low temperatures

Port	Pressure	Temperature range in °C *[°F]*
– P, A, B, T	Static 100 bar *[1450 psi]*	–40 ... –35 *[–40 ... –31]*
– P, A, B	Dynamic from 100 bar *[1450 psi]* to 350 bar *[5076 psi]* in linear form as function of the temperature	–35 ... –30 *[–31 ... –22]*
– T	Dynamic from 100 bar *[1450 psi]* to 210 bar *[3050 psi]* in linear form as function of the temperature	–35 ... –30 *[–31 ... –22]*
– P, A, B, T	Maximum operating pressure	–30 ... +50 *[–22 ... 122]*

☞ **Notice!**
With valves for low temperatures, the "T12" control spool play is to be preferably selected.

More information

- Subplates — Data sheet 45054
- Mineral oil-based hydraulic fluids — Data sheet 90220
- Reliability characteristics according to EN ISO 13849 — Data sheet 08012
- General product information on hydraulic products — Data sheet 07008
- Installation, commissioning and maintenance of industrial valves — Data sheet 07300
- Hydraulic valves for industrial applications — Data sheet 07600-B
- Selection of the filters — www.boschrexroth.com/filter

Notes

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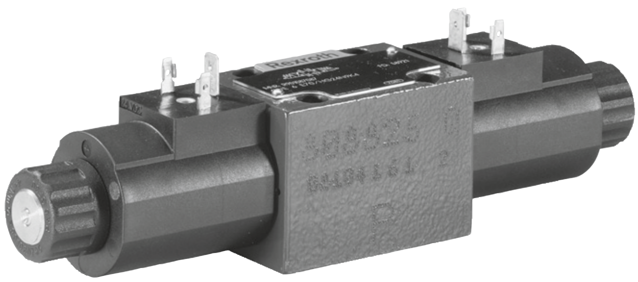
The Drive & Control Company

Rexroth
Bosch Group

Directional spool valves, direct operated, with solenoid actuation

Type WE

RE 23164
Edition: 2013-01
Replaces: 07.06



H7380

- Size 6
- Component series 7X
- Maximum operating pressure 315 bar
- Maximum flow 60 l/min

Features

- 4/3-, 4/2- or 3/2-way version
- Standard version
- Porting pattern according to DIN 24340 form A
- Wet-pin DC solenoids
- Rotatable solenoid coil
- The coil can be changed without having to open the pressure-tight chamber
- Electrical connection as individual connection
- Concealed manual override

Contents

Ordering code

01	02	03	04	05		06	07	08	09	10		11	12
	WE	**6**		**7X**	**/**		**H**		**N9**		**/**		*

01	3 main ports	**3**
	4 main ports	**4**
02	Directional valve	**WE**
03	Size 6	**6**
04	Symbols e.g. D, E etc.; possible design see page 3	
05	Component series 70 ... 79 (70 ... 79: Unchanged installation and connection dimensions)	**7X**
06	**With** spring return	**no code**
	Without spring return with detent	**OF** [1]
07	Standard solenoid, wet-pin	**H**
08	Direct voltage 12 V	**G12**
	Direct voltage 24 V	**G24**
09	**With** concealed manual override	**N9**

Electrical connection

10	**Individual connection**	
	Without mating connector with connector DIN EN 175301-803	**K4** [2]
	Without mating connector with connector AMP Junior-Timer	**C4Z** [2]

Seal material

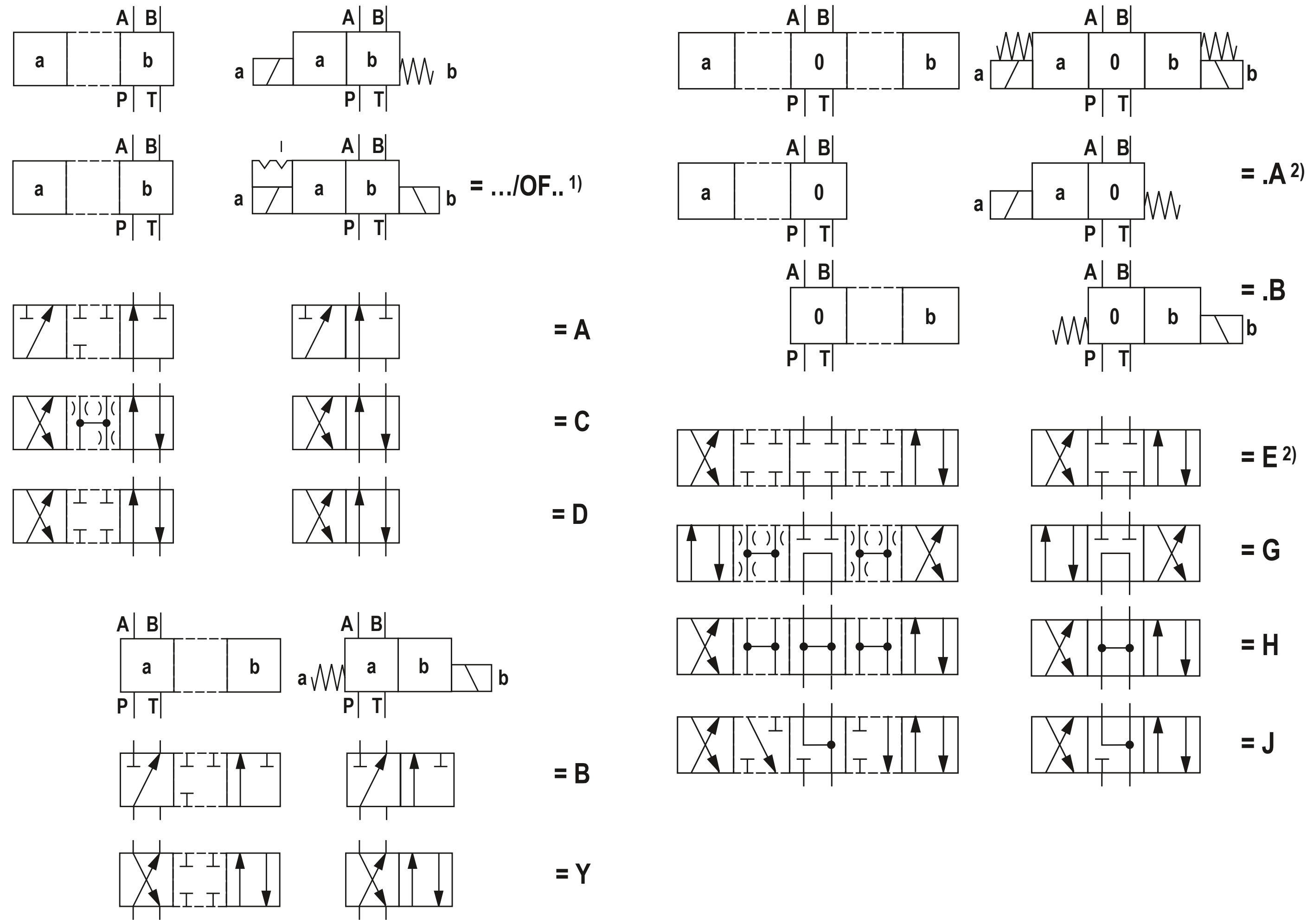
11	NBR seals	**no code**
	(other seals upon request) Attention! Ensure compatibility of seals with hydraulic fluid used!	
12	Further details in the plain text	

1) Only symbol D

2) Mating connectors, separate order, see page 10 and data sheet 08006.

Preferred types and standard units are contained in the EPS (standard price list).

Symbols



1) Only symbol D

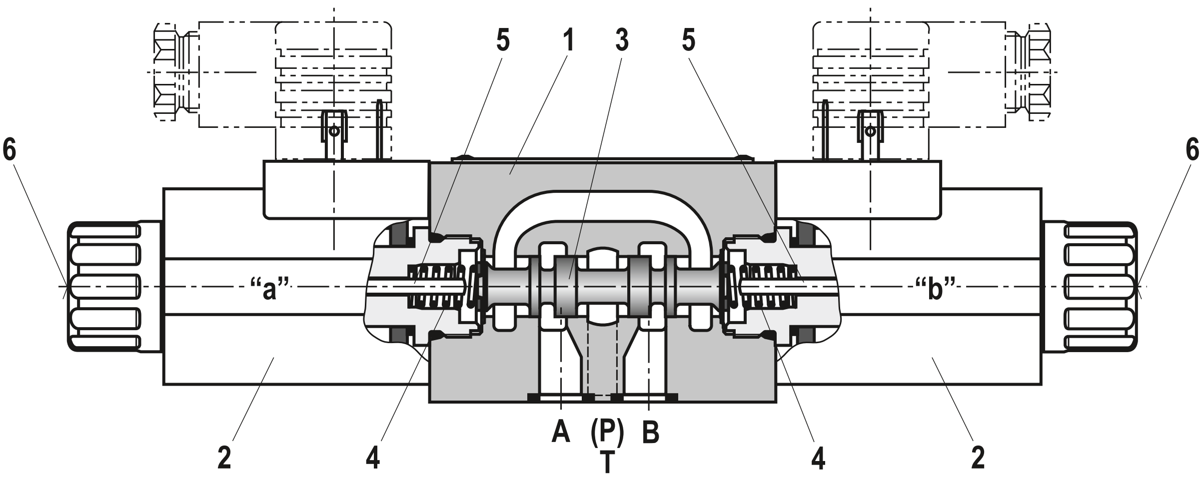
2) **Example:**
Symbol E with switching position "a" ordering code ..**EA**..

Function, section

Directional valves of type WE are solenoid operated directional spool valves. They control the start, stop and direction of a flow.
The directional valves basically consist of housing (1), one or two solenoids (2), control spool (3), and one or two return springs (4).
In the de-energized condition, control spool (3) is held in the central position or in the initial position by the return springs (4). The control spool (3) is actuated by wet-pin solenoids (2).

For proper functioning, it must be ensured that the solenoid's pressure chamber is filled with oil!

The force of solenoid (2) acts via plunger (5) on control spool (3) and pushes the latter from its rest position to the required end position. This opens up the required flow direction according to the spool symbol.
After solenoid (2) has been de-excited, return spring (4) pushes control spool (3) back to its rest position again.
The manual override (6) allows control spool (3) to be moved without solenoid energization.



Type 4WE 6 E7X/H...

Technical data
(For applications outside these parameters, please consult us!)

general			
Weight	– Valve with 1 solenoid	kg	Approx. 1.25
	– Valve with 2 solenoids	kg	Approx. 1.6
Installation position			Any
Ambient temperature range		°C	–30 ... +50

hydraulic			
Maximum operating pressure	– Port A, B, P	bar	315
	– Port T	bar	160 With symbols A and B, port T must be used as leakage port if the operating pressure exceeds the permissible tank pressure.
Maximum flow		l/min	60
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C	–30 ... +80
Viscosity range		mm^2/s	2.8 ... 500
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – containing water**:
  – Maximum pressure differential per control edge 50 bar
  – Pressure pre-loading at the tank port > 20 % of the pressure differential, otherwise increased cavitation
  – Life cycle as compared to operation with mineral oil HL, HLP 50 to 100 %
- **Bio-degradable:** When using bio-degradable hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the fluid (per pole tube 700 mg zinc).

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components. For the selection of the filters see www.boschrexroth.com/filter.

Notice!
- Only actuate the manual override using a rounded tool (Ø3^{+1} mm) or special tool (separate order, material no. **R900024943**)!
- Actuation of the manual override only up to a tank pressure of approx. 50 bar.
- When the manual override is blocked, the operation of the solenoid must be prevented!
- The simultaneous operation of the solenoids must be prevented!

Technical data
(For applications outside these parameters, please consult us!)

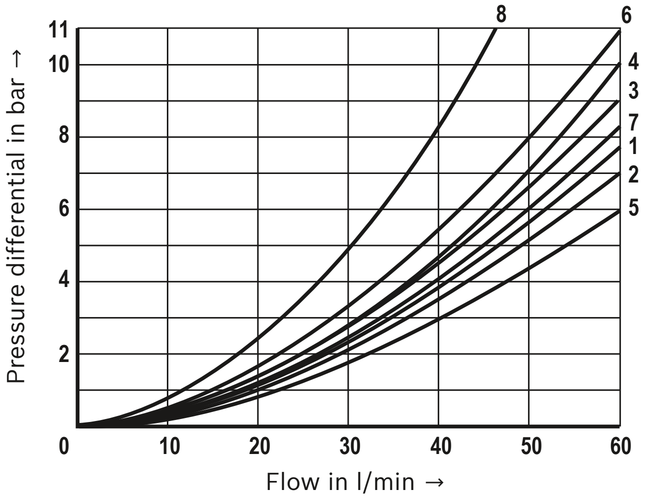
electric			
Voltage type			Direct voltage
Available voltages		V	12; 24
Voltage tolerance (nominal voltage)		%	±10
Power consumption		W	26
Duty cycle			S1 (continuous operation)
Switching time	ON	ms	20 ... 45
	OFF	ms	10 ... 25
Maximum switching frequency		1/h	15000
Maximum coil temperature [2)]		°C	150
Protection class according to EN 60529			IP 65 with mating connector mounted and locked
Insulation class VDE 0580			F

2) Due to the high surface temperatures of the solenoid coils > 50 °C the standards ISO 13732-1 and ISO 4413 must be adhered to and the coils must be equipped with contact protection if required.

When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected correctly.

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

***Δp-q*$_V$ characteristic curves**



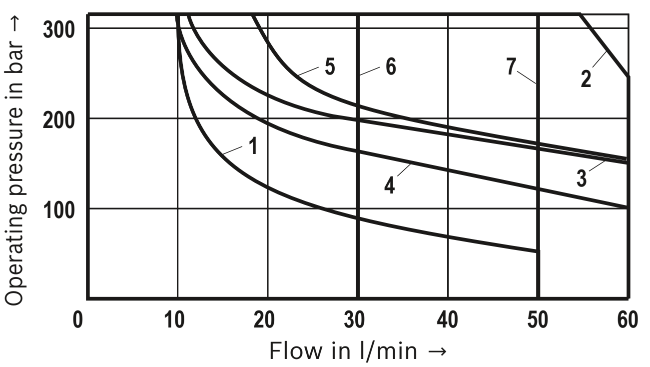
7 Symbol "H" in central position P – T

8 Symbol "G" in central position P – T

Symbol	Direction of flow			
	P–A	P–B	A–T	B–T
A, B	3	3	–	–
C	1	1	3	1
D, Y	4	4	3	3
E	3	3	1	1
J	1	1	2	1
G	6	6	7	7
H	2	5	2	2

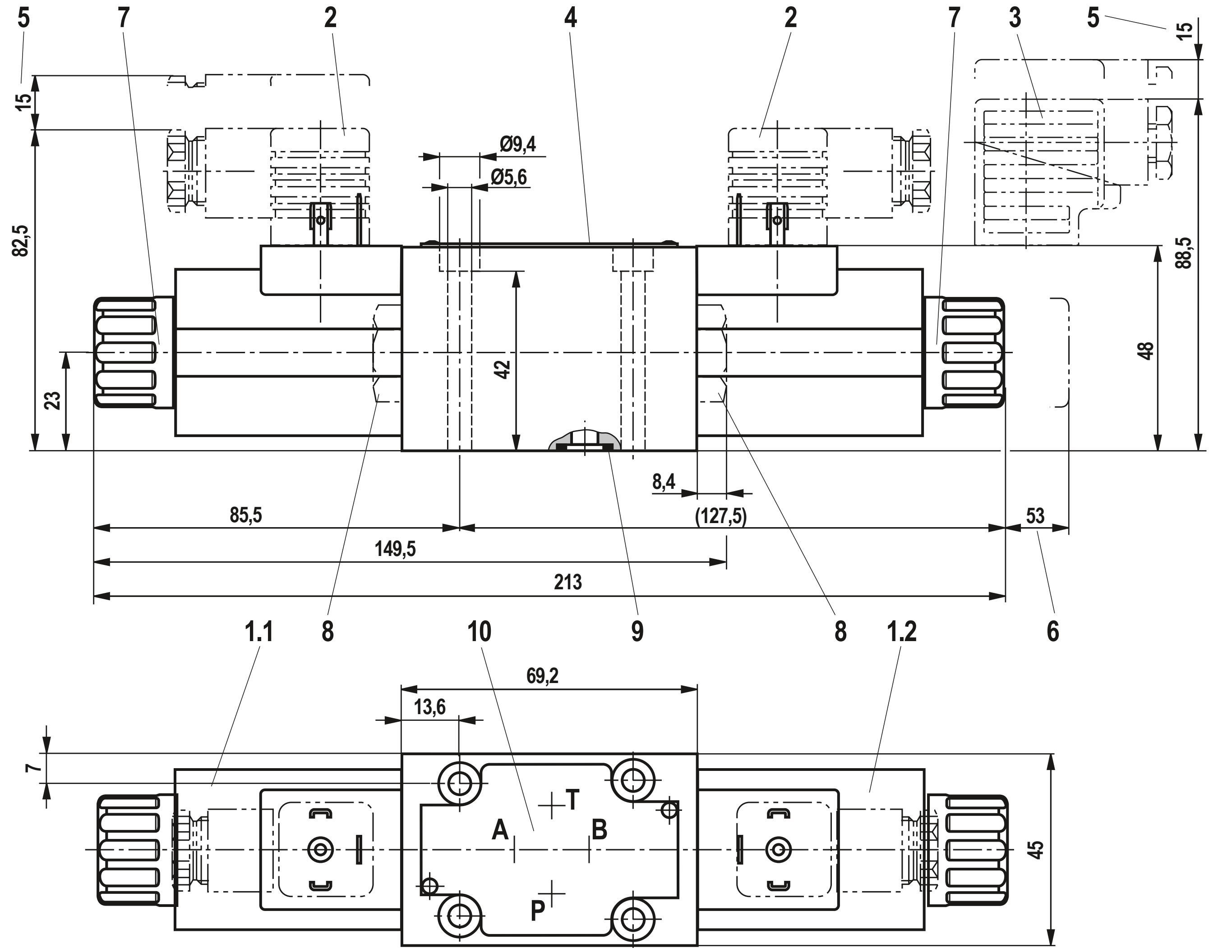
Switching power limits
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

☞ **Notice!**
The specified switching power limits are valid for operation with two directions of flow (e.g. from P to A and simultaneous return flow from B to T).
Due to the flow forces acting within the valves, the permissible switching power limit may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked)!
In such cases, please consult us!
The switching power limit was established while the solenoids were at operating temperature, at 10 % undervoltage and without tank preloading.

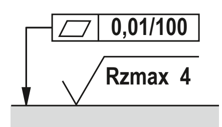


DC solenoid	
Characteristic curve	Symbol
1	A, B
2	C, Y
3	E
4	J
5	D
6	G, H
7	D/OF

Unit dimensions: Version "K4"
(dimensions in mm)

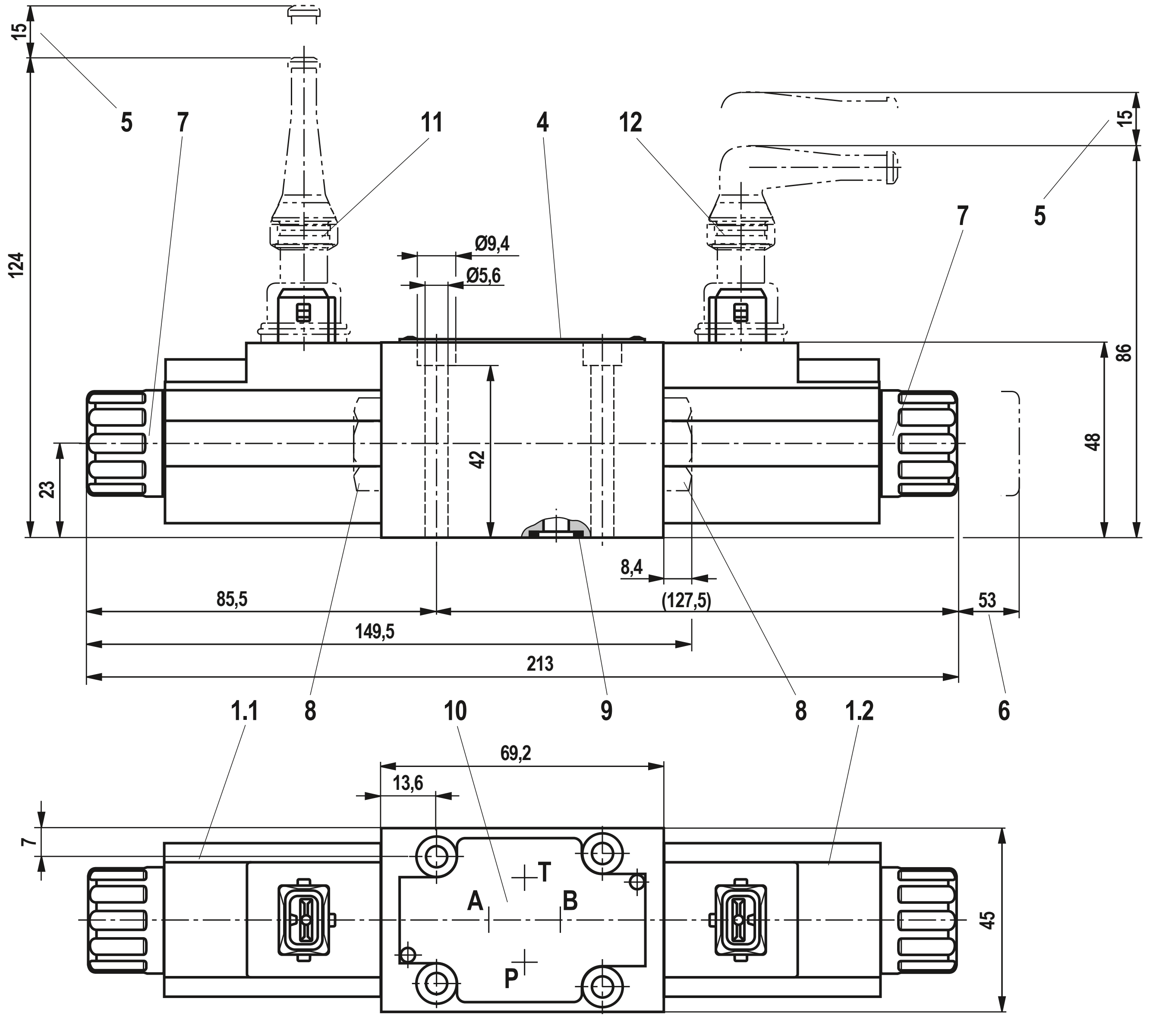


Item explanations, valve mounting screws and **sub-plates** see page 10.

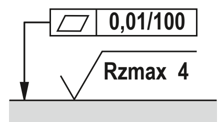


Required surface quality of the valve contact surface

Unit dimensions: Version "C4Z"
(dimensions in mm)



Item explanations, valve mounting screws and **sub-plates** see page 10.



Required surface quality of the valve contact surface

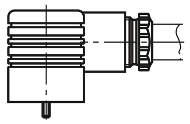
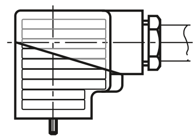
Unit dimensions

1.1 Solenoid "a"
1.2 Solenoid "b"
2 Mating connector **without** circuitry (separate order, see below)
3 Mating connector **with** circuitry (separate order, see below)
4 Name plate
5 Space required to remove the mating connector
6 Space required to remove the coil
7 Mounting nut, $\boldsymbol{M}_A = 4^{+1}$ Nm
8 Plug screw for valves with one solenoid
9 Identical seal rings for ports A, B, P, and T
10 Porting pattern according to DIN 24340 form A
11 Mating connector "Junior Timer", straight (separate order, see data sheet 08006)
12 Mating connector "Junior Timer", angled (separate order, see data sheet 08006)

Subplates according to data sheet 45052 (separate order)
G 341/01 (G1/4)
G 342/01 (G3/8)
G 502/01 (G1/2)

Valve mounting screws (separate order)
- **4 hexagon socket head cap screws ISO 4762 - M5 x 50 - 10.9-flZn-240h-L**
  (friction coefficient $\boldsymbol{\mu}_{total}$ = 0.09 to 0.14);
  tightening torque $\boldsymbol{M}_A$ = 7 Nm ± 10 %,
  material no. **R913000064**
  or
- **4 hexagon socket head cap screws ISO 4762 - M5 x 50 - 10.9**
  with friction coefficient $\boldsymbol{\mu}_{total}$ = 0.12 to 0.17 a
  tightening torque $\boldsymbol{M}_A$ = 8.1 Nm ± 10 % results
  (not included in the Rexroth delivery range)

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006					
		Material no.			
Valve side	**Color**	Without circuitry	With indicator light 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Zener diode suppression circuit 24 V
a	Gray	**R901017010**	–	–	–
b	Black	**R901017011**	–	–	–
a/b	Black	–	**R901017022**	**R901017025**	**R901017026**

More information

- Subplates — Data sheet 45052
- Hydraulic fluids on mineral oil basis — Data sheet 90220
- General product information on hydraulic products — Data sheet 07008
- Installation, commissioning and maintenance of industrial valves — Data sheet 07300
- Hydraulic valves for industrial applications — Data sheet 07600-B
- Selection of the filters — www.boschrexroth.com/filter

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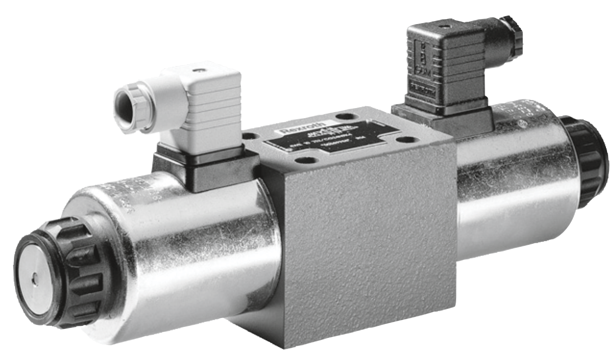
The Drive & Control Company

Rexroth
Bosch Group

Directional spool valves, direct operated, with solenoid actuation

Type WE

RE 23327
Edition: 2013-05
Replaces: 08.08



H5958

- Size 10
- Component series 3X; 4X
- Maximum operating pressure 315 bar *[4569 psi]*
- Maximum flow 120 l/min *[31.7 US gpm]*

Features

- 4/3, 4/2 or 3/2 directional design
- High-power solenoid
- Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
- Wet-pin AC solenoids with detachable coil
- Solenoid coil can be rotated by 90°
- The coil can be changed without having to open the pressure-tight chamber
- Electrical connection as individual or central connection
- Manual override, optional

Contents

Ordering codes

01	02	03	04	05		06	07	08	09	10	11		12	13	14	15	16
	WE	**10**			**/**		**C**					**/**					*****

01	3 main ports	**3**
	4 main ports	**4**
02	Directional valve	**WE**
03	Size 10	**10**
04	Symbols e.g. C, E, EA, EB, etc; for the possible version, see page 3	
05	Component series 30 ... 39 (30 ... 39: Unchanged installation and mounting dimensions)	**3X**
	Component series 40 ... 49 (40 ... 49: Unchanged installation and mounting dimensions)	**4X**
06	**With** spring return	**no code**
	Without spring return	**O**
	Without spring return with detent	**OF**
07	High performance wet-pin solenoid with detachable coil	**C**
08	AC voltage 230 V 50/60 Hz	**W230**
	For further ordering codes for other voltages and frequencies, see page 7; for direct voltage, see data sheet 23340	
09	**With** concealed manual override (standard)	**N9**
	With manual override	**N**
	Without manual override	**no code**

Electrical connection

10	**Individual connection**	
	Without mating connector; connector DIN EN 175301-803	**K4** [1]
	Central connection	
	Cable entry at the cover, with indicator light	**DL**
	Central plug-in connection at the cover, with indicator light (without mating connector)	**DK6L**
	For further electrical connections, see data sheet 08010	

Spool position monitoring

11	**Without** position switch	**no code**
	– Inductive position switch type QM	
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored rest position	**QM0G24**
	For further information, see data sheet 24830	
12	**Without** throttle insert	**no code**
	Throttle Ø 0.8 mm *[0.031 inch]*	**B08**
	Throttle Ø 1.0 mm *[0.039 inch]*	**B10**
	Throttle Ø 1.2 mm *[0.047 inch]*	**B12**
	Use with flows which exceed the performance limit of the valve (see page 4).	

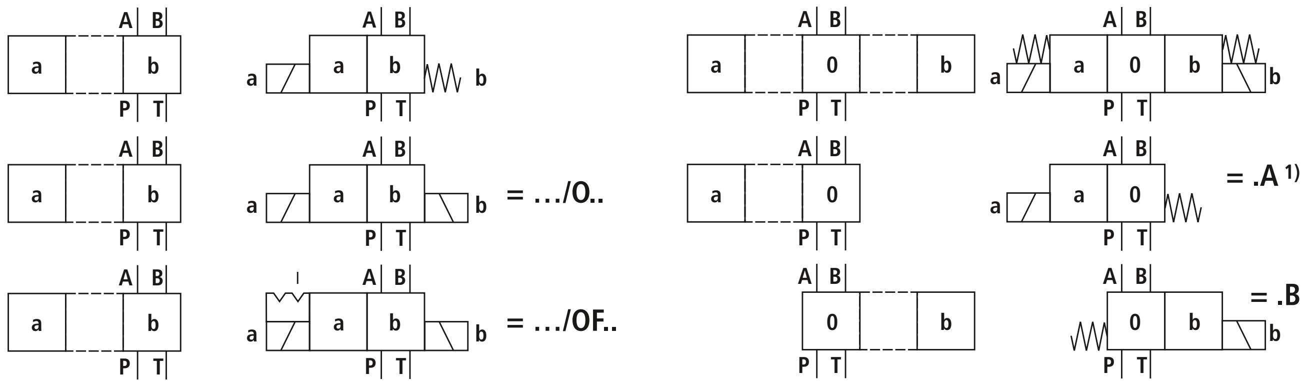
Seal material

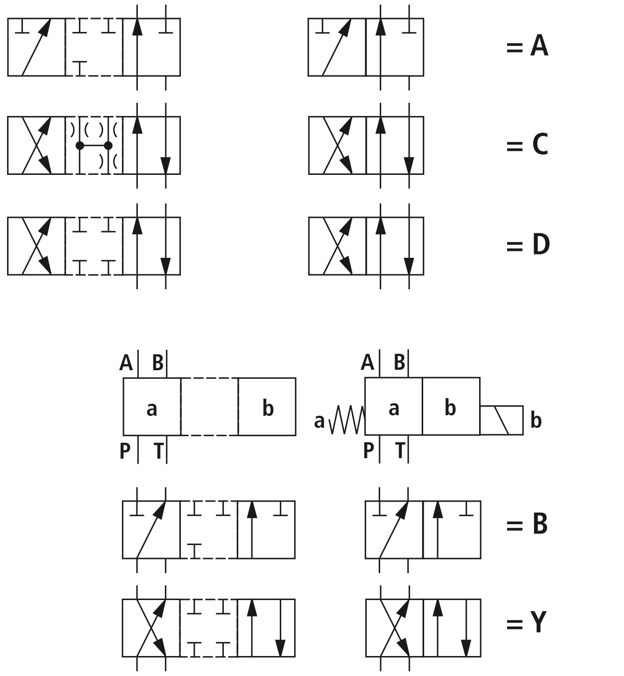
13	NBR seals	**no code**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	
14	Further details in the plain text	

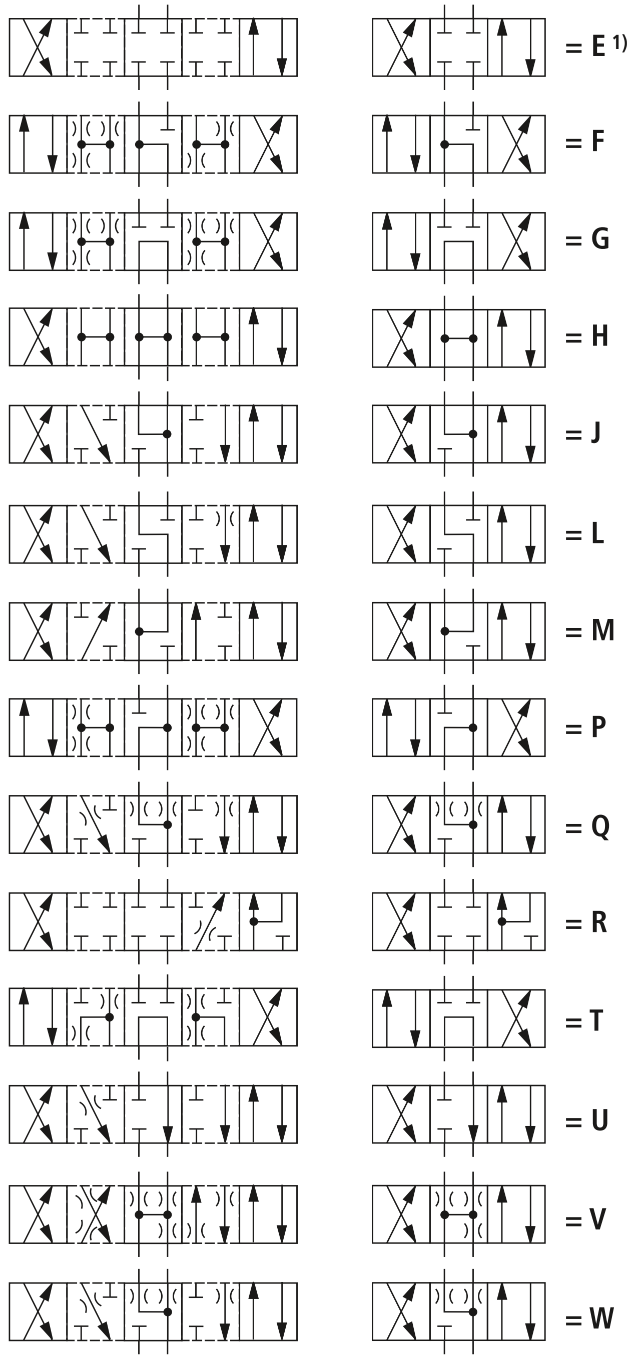
[1] Mating connectors, separate order, see page 14 and data sheet 08006.

☞ **Notice!** Preferred types and standard units are contained in the EPS (standard price list).

Symbols







1) **Example:**
Symbol E with spool position "a", ordering code ..**EA**..

Notices!
Representation according to DIN ISO 1219-1.
Hydraulic interim positions are shown by dashes.

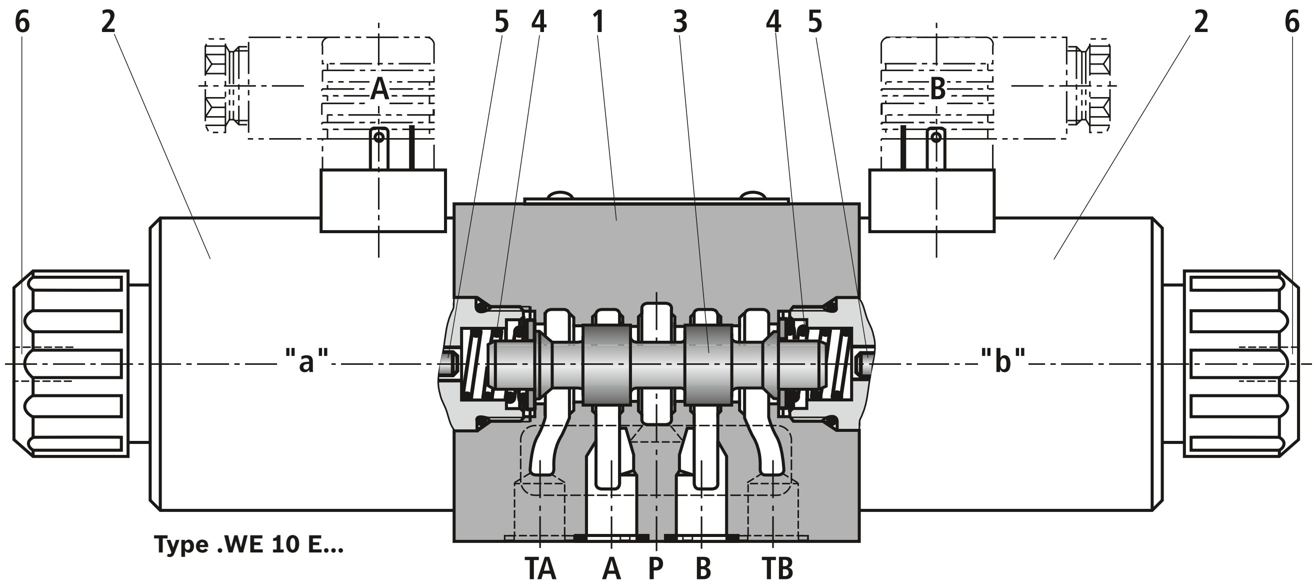
Function, section

The directional valve type WE is a solenoid actuated directional spool valve. It controls the start, stop and direction of a flow.
The directional valve basically consists of the housing (1), one or two electronic solenoids (2), the control spool (3), and the return springs (4).
In the de-energized condition, the control spool (3) is held in the central position or in the initial position by the return springs (4) (except for version "O"). The control spool (3) is actuated by wet-pin electronic solenoids (2).
The force of electronic solenoid (2) acts via the plunger (5) on the control spool (3) and pushes the latter from its rest position to the required end position. This enables the necessary direction of flow from P to A and B to T or P to B and A to T.

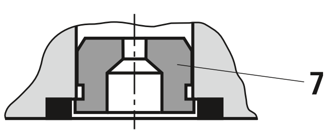
When the electronic solenoid (2) is de-energized, the return spring (4) pushes the control spool (3) back to its rest position.
A manual override (6) allows for the manual switching of the valve without solenoid energization.

To ensure proper functioning, make sure that the pressure chamber of the solenoid is filled with oil.

For additional functions, see page 5.



Throttle insert "B.."
Using a throttle insert (7) in channels P, A, B or T increases the flow resistance at the valve. Its use is required when due to prevailing operating conditions, flows occur during the switching processes, which exceed the performance limit of the valve.

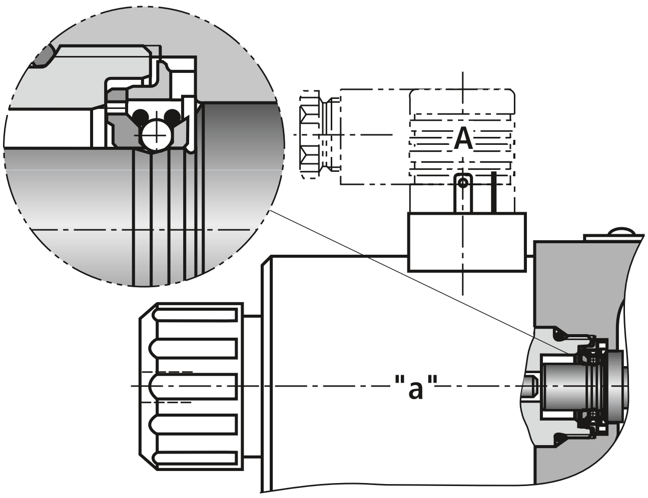


Function, section

Without spring return "O" (only possible with symbols A, C and D)
This version is a directional valve with 2 spool positions and 2 electronic solenoids **without** detent. The valve without spring return at the control spool (3) has no defined basic position in the de-energized condition.

Without spring return with "OF" detent (only possible with symbols A, C and D)
This version is a directional valve with 2 spool positions and 2 electronic solenoids **with** detent. The detents are used to fix the control spool (3) in the relevant spool position. During operation, continuous application of current to the electronic solenoid can therefore be omitted which contributes to energy-efficient operation.

☞ **Notice!**
Pressure peaks in the tank line to two or several valves can result in unwanted control spool movements in the case of valves with detent! We therefore recommend that separate return lines be provided or a check valve installed in the tank line.



Type .WE 10 ../OF...

Technical data
(for applications outside these parameters, please consult us!)

general				
Weight			Individual connection	Central connection
	– Valve with one solenoid	kg *[lbs]*	3.6 *[7.9]*	3.5 *[7.7]*
	– Valve with two solenoids	kg *[lbs]*	4.4 *[9.7]*	4.3 *[9.5]*
Installation position			Any	
Ambient temperature range		°C *[°F]*	–30 ... +50 *[–22 ... +122]* (NBR seals) –20 ... +50 *[–4 ... +122]* (FKM seals)	
$MTTF_d$ values according to EN ISO 13849		Years	150 (for further details see data sheet 08012)	

hydraulic			
Maximum operating pressure	– Port A, B, P	bar *[psi]*	315 *[4569]*
	– Port T	bar *[psi]*	160 *[2320]* With symbols A and B, port T has to be used as leakage oil connection if the operating pressure exceeds the tank pressure.
Maximum flow		l/min *[US gpm]*	120 *[31.7]*
Flow cross-section (spool position 0)	– Symbol V	mm^2 *[$inch^2$]*	11 *[0.017]* (A/B to T); 10.3 *[0.016]* (P to A/B)
	– Symbol W	mm^2 *[$inch^2$]*	2.5 *[0.004]* (A/B to T)
	– Symbol Q	mm^2 *[$inch^2$]*	5.5 *[0.009]* (A/B to T)
Hydraulic fluid			See table below
Hydraulic fluid temperature range (at the valve operating ports)		°C *[°F]*	–30 ... +80 *[–22 ... +176]* (NBR seals) –20 ... +80 *[–4 ... +176]* (FKM seals)
Viscosity range		mm^2/s *[SUS]*	2.8 ... 500 *[35 ... 2320]*
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

☞ **Important information on hydraulic fluids!**
- ▶ For more information and data on the use of other hydraulic fluids, refer to data sheet 90220 or contact us!
- ▶ There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- ▶ The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- ▶ **Flame-resistant – containing water**:
  - – Maximum pressure difference per control edge 50 bar
  - – Pressure pre-loading at the tank port > 20% of the pressure differential, otherwise increased cavitation
  - – Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%
- ▶ **Bio-degradable:** When using bio-degradable hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the fluid (per pole tube 700 mg zinc).

[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters, see www.boschrexroth.com/filter.

Technical data
(for applications outside these parameters, please consult us!)

electric			
Voltage type			Alternating voltage 50/60 Hz
Available voltages [2] (For ordering codes for AC voltage solenoids, see below)		V	42, 110, 230
Voltage tolerance (nominal voltage)		%	±10
Power consumption		W	–
Holding power		VA	90
Switch-on power		VA	550
Duty cycle (ED)		%	100
Switching time according to ISO 6403	– ON	ms	15 ... 25
	– OFF	ms	20 ... 30
Maximum switching frequency		1/h	7200
Maximum surface temperatures of the coil [3]		°C *[°F]*	180 *[356]*
Protection class according to DIN EN 60529			IP 65 with mating connector mounted and locked
Insulation class VDE 0580			H
Electrical protection			Every solenoid must be protected individually, using a suitable fuse with tripping characteristic K (inductive loads).
Behavior in case of an error (solenoid does not switch though)			The solenoid surface temperature may be exceeded.

2) Special voltages on request
3) Possible surface temperature > 50 °C, provide contact protection!

☞ **Notice!**
- The solenoid coils must not be painted.
- Actuation of the manual override is only possible up to a tank pressure of approx. 50 bar *[725 psi]*. Avoid damage to the bore of the manual override! (Special tool for the operation, separate order, material no. **R900024943**). When the manual override is blocked, actuation of the opposite solenoid must be ruled out!
- The simultaneous actuation of 2 solenoids of one valve must be ruled out!
- Use cables that are approved for an operation temperature above 105 °C *[221 °F]*.
- When solenoid coils are switched off, voltage peaks result which may cause failures or damage in the connected control electronics. The user has to provide for a suitable circuit for limiting the voltage peaks. It must be noted that a diode switched in an anti-parallel form extends the switching off time.
- Valves with individual connection and supply voltage 12 V or 24 V can be operated with twice the voltage for reducing the switching time. For this purpose, the voltage has to be reduced to the nominal valve voltage after 100 ms by means of pulse width modulation. The maximum admissible switching frequency is 5 1/s.
- Due to possible overloads of the printed-circuit board, valves with central connection must not be operated with twice the voltage.

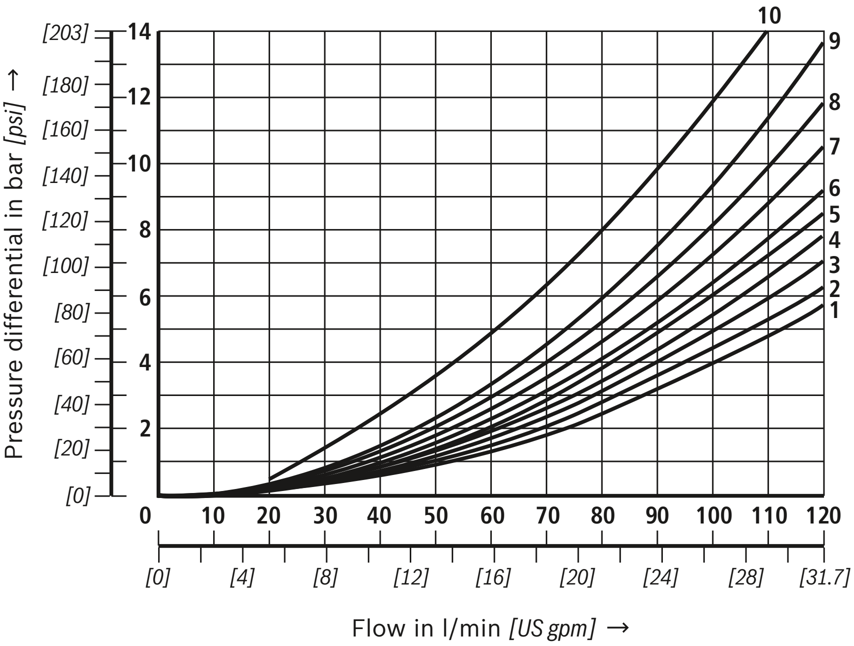
☞ **Notice!**
AC solenoids can be used for 2 or 3 mains; e.g. solenoid type **W110** for: 110 V, 50 Hz; 110 V, 60 Hz; 120 V, 60 Hz

Ordering code	Mains
W42	42 V, 50 Hz 42 V, 60 Hz
W110	110 V, 50 Hz 110 V, 60 Hz 120 V, 60 Hz
W230	230 V, 50 Hz 230 V, 60 Hz

When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected correctly.

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Δp-q_V characteristic curves



Symbol	Direction of flow			
	P – A	P – B	A – T	B – T
A; B	3	3	–	–
C	3	3	4	5
D; Y	5	5	6	6
E	1	1	4	4
F	2	3	7	4
G	3	3	6	7
H	1	1	6	7
J	1	1	3	3
L	2	2	3	5
M	1	1	4	5
P	4	2	5	7
Q	1	2	1	3
R	3	6	4	–
T	3	3	6	7
U; V	2	2	3	3
W	2	2	4	5

Central position:

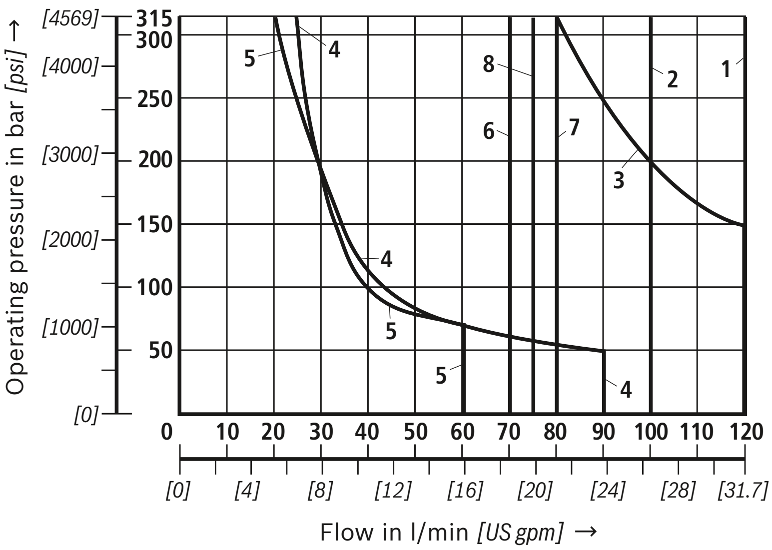
Symbol	Direction of flow				
	P – A	P – B	B – T	A – T	P – T
F	4	–	–	9	9
P	–	5	8	–	10
G, T	–	–	–	–	9
H	–	–	–	–	3

Spool position:

Symbol	Direction of flow			
	P – A	B – A	A – T	P – T
R	–	9	–	–

Performance limits
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

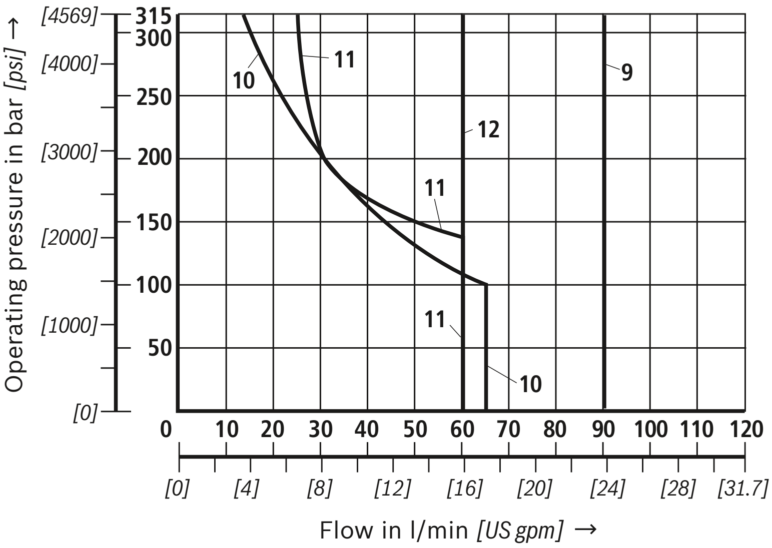
☞ **Notice!**
The specified performance limits are valid for operation with two directions of flow (e.g. from P to A and simultaneous return flow from B to T).
Due to the flow forces acting within the valves, the permissible performance limit may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked).
In such cases, please consult us.
The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank pre-loading.



Characteristic curve	Symbol
1	C; C/O; C/OF; D; D/O; D/OF; Y
2	E; L; U; Q; W
3	A/O; A/OF; J
4	F; P
5	T
6	H
7	R
8 [2)]	L; U

[2)] Central position only

42 V, 50 Hz; 110 V, 50 Hz; 120 V, 60 Hz;
127 V, 50 Hz; 220 V, 50 Hz; 240 V, 60 Hz



Characteristic curve	Symbol
9	M
10	A, B
11	G
12	V

42 V, 50 Hz; 110 V, 50 Hz; 120 V, 60 Hz;
127 V, 50 Hz; 220 V, 50 Hz; 240 V, 60 Hz

Performance limits

(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

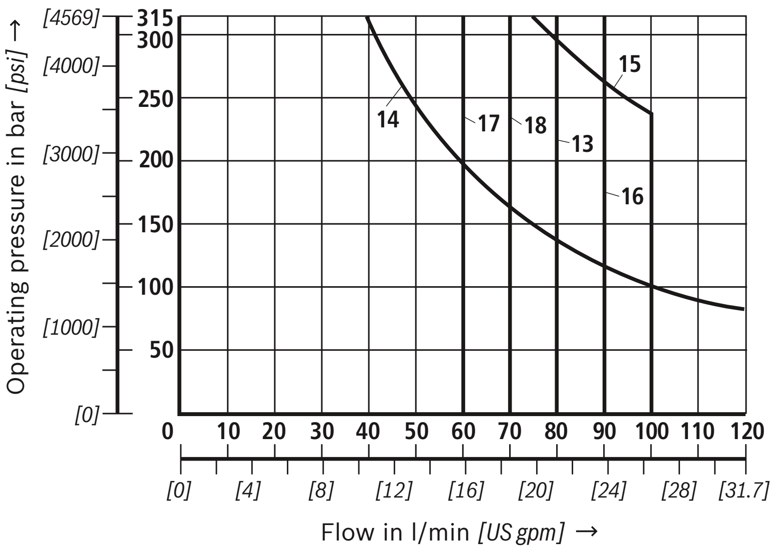
☞ **Notice!**

The specified performance limits are valid for operation with two directions of flow (e.g. from P to A and simultaneous return flow from B to T).

Due to the flow forces acting within the valves, the permissible performance limit may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked).

In such cases, please consult us.

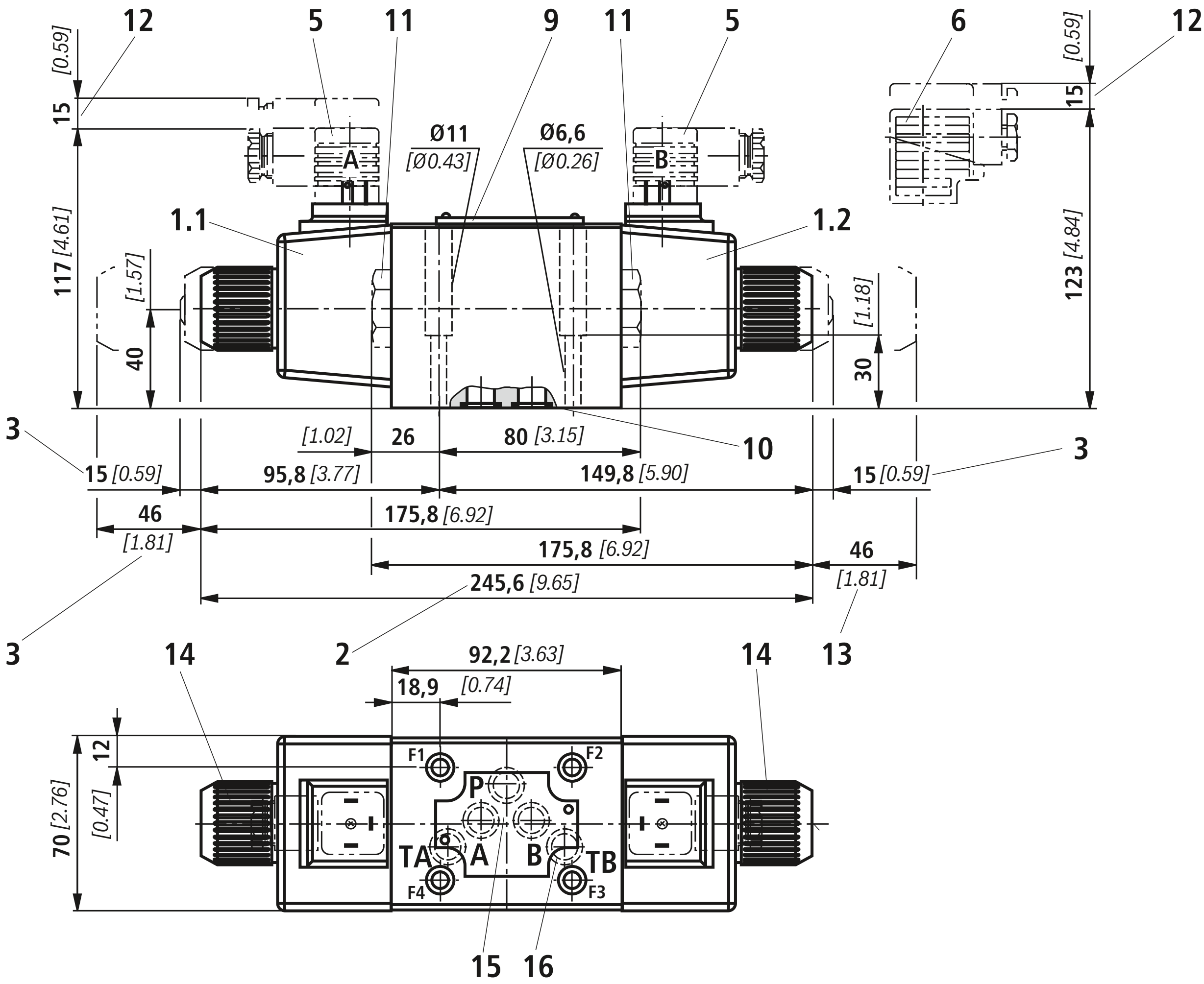
The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank pre-loading.

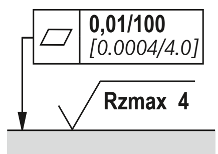


Characteristic curve	Symbol
13	C; C/O; C/OF; D; D/O; D/OF; Y
14	A/O; A/OF
15	E
16	M
17	V
18	H

42 V, 60 Hz; 110 V, 60 Hz;
127 V, 60 Hz; 220 V, 60 Hz
Please consult us regarding the performance limits for other symbols.

Dimensions: Individual connection
(dimensions in mm *[inch]*)



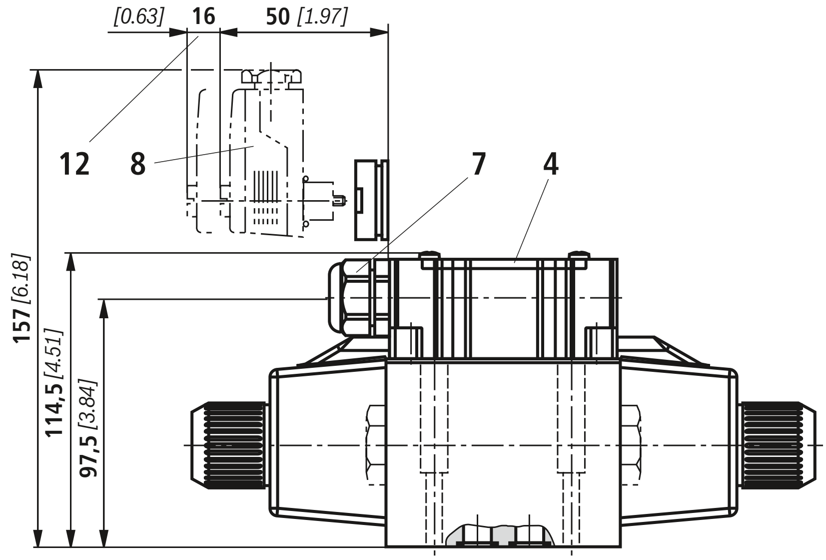


Required surface quality of the valve contact surface

> ☞ **Notice!**
> - Deviating from ISO 4401, in this data sheet port T is called TA, port T1 is called TB.
> - The dimensions are nominal dimensions which are subject to tolerances.

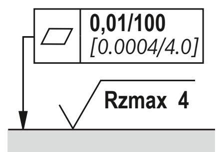
For item explanations, valve mounting screws and **sub-plates,** see page 13.

Dimensions: Central connection (dimensions in mm *[inch]*)



Terminal assignment with central connection:

- **1 solenoid:**
  Always connect the solenoid to terminals 1 and 2,
  the protective grounding conductor to terminal ⏚ PE
- **2 solenoids:**
  Always connect solenoid "a" to terminals 1 and 2,
  solenoid "b" to terminals 3 and 4,
  the protective grounding conductor to terminal ⏚ PE



Required surface quality of the valve contact surface

☞ **Notice!**

- Deviating from ISO 4401, in this data sheet port T is called TA, port T1 is called TB.
- The dimensions are nominal dimensions which are subject to tolerances.

For item explanations, valve mounting screws and **subplates,** see page 13.

Dimensions

1.1 Solenoid "a"

1.2 Solenoid "b"

2 Dimension for solenoid **without** and **with concealed** manual override "**N9**" (standard)

3 Dimension for solenoid **with** manual override "**N**"

4 Cover
Attention!
The valve may only be operated with properly mounted cover.

5 Mating connector **without** circuitry (separate order, see page 14 and data sheet 08006)

6 Mating connector **with** circuitry (separate order, see page 14 and data sheet 08006)

7 Cable gland Pg 16 *[1/2" NPT]* "DL"

8 Angled socket (red, separate order) (material no. **R900005538**)

9 Name plate

10 Identical seal rings for ports A, B, P, TA, TB (for valves with throttle insert: O ring in channel P)

11 Plug screw for valves with one solenoid

12 Space required to remove the mating connector/ angled socket

13 Space required to remove the coil

14 Mounting nut, tightening torque $M_A = 6^{+2}$ Nm *[*$4.43^{+1.48}$ *ft-lbs]*

15 Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05

16 Connection TB can only be used in connection with separately produced bore.

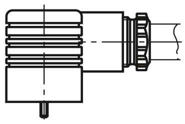
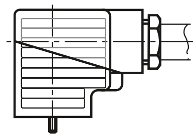
Subplates according to data sheet 45054 (separate order)
G 66/01 (G3/8)
G 67/01 (G1/2)
G 534/01 (G3/4)
G 66/12 (SAE-6; 9/16-18) [1)]
G 67/12 (SAE-8; 3/4-16) [1)]
G 534/12 (SAE-12; 1-1/16-12) [1)]
[1)] On request

Valve mounting screws (separate order)
4 metric hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 ... 0.14);
tightening torque M_A = 12.5 Nm *[9.2 ft-lbs]* ± 10%,
material no. **R913000058**
or
4 hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 ... 0.17);
tightening torque M_A = 15.5 Nm *[11.4 ft-lbs]* ± 10%

4 UNC hexagon socket head cap screws
1/4-20 UNC x 1-1/2" ASTM-A574
(friction coefficient μ_{total} = 0.19 ... 0.24);
tightening torque M_A = 20 Nm *[14.7 ft-lbs]* ± 15%,
(friction coefficient μ_{total} = 0.12 ... 0.17);
tightening torque M_A = 14 Nm *[10.3 ft-lbs]* ± 10%,
material no. **R978800710**

With different friction coefficients, the tightening torques are to be adjusted accordingly!

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006					
			Material number		
Port	**Valve side**	**Color**	Without circuitry	With indicator light 12 ... 240 V	With indicator light and Zener diodes-protection circuit 24 V
M16 x 1.5	a	Gray	**R901017010**	**–**	**–**
	b	Black	**R901017011**	**–**	**–**
	a/b	Black	**–**	**R901017022**	**R901017026**
1/2" NPT (Pg 16)	a	Red/brown	**R900004823**	**–**	**–**
	b	Black	**R900011039**	**–**	**–**
	a/b	Black	**–**	**R900057453**	**–**

Further information

- ▶ Subplates — Data sheet 45054
- ▶ Inductive position switches and proximity sensors (contactless) — Data sheet 24830
- ▶ Version with DC solenoids — Data sheet 23340
- ▶ Hydraulic fluids on mineral oil basis — Data sheet 90220
- ▶ Reliability characteristics according to EN ISO 13849 — Data sheet 08012
- ▶ General product information on hydraulic products — Data sheet 07008
- ▶ Installation, commissioning and maintenance of industrial valves — Data sheet 07300
- ▶ Selection of the filters — www.boschrexroth.com/filter

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www.boschrexroth.de

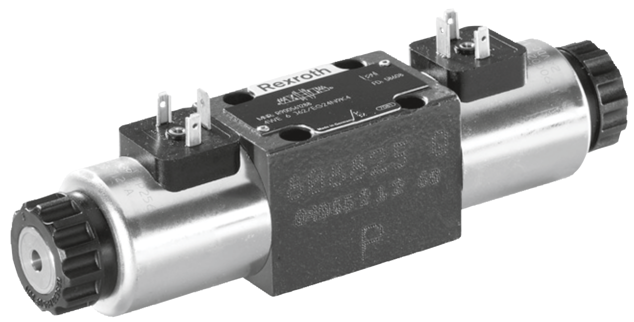
The Drive & Control Company

Rexroth
Bosch Group

Directional spool valves, direct operated, smoothly switching, with solenoid actuation

Type WE . .73...A12

RE 23183
Edition: 2013-06
Replaces: 04.05



H7564

- Size 6
- Component series 6X
- Maximum operating pressure 350 bar *[5076 psi]*
- Maximum flow 60 l/min *[15.9 US gpm]*
- Smooth switching behavior

Features

- 4/2 or 4/3 directional design
- Porting pattern according to DIN 24340 form A
- Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole)
- Wet-pin DC solenoids with detachable coil
- Solenoid coil can be rotated by 90°
- The coil can be changed without having to open the pressure-tight chamber
- Electrical connection as individual or central connection
- With concealed manual override

Contents

Ordering code

01	02	03	04		05		06	07	08	09	10		11	12	13	14	15	16
	WE	**6**		**–**	**6X**	**/**		**E**		**N9**		**/**	**A12**					*

01	3 main ports	**3**
	4 main ports	**4**
02	Directional valve	**WE**
03	Size 6	**6**
04	Symbols e.g. D73, E73, E73A, E73B etc; for possible design, see page 4	
05	Component series 60 ... 69 (60 ... 69: Unchanged installation and connection dimensions)	**6X**
06	**With** spring return	**no code**
	Without spring return with detent (only with symbol "D73")	**OF**
07	High-power wet-pin solenoid with detachable coil	**E**
08	Direct voltage 24 V	**G24**
	Direct voltage 205 V	**G205** [1)]
	Possible voltages see page 7	
09	**With** concealed manual override	**N9**

Electrical connection [2)]

10	**Individual connection**	
	Without mating connector; connector DIN EN 175301-803	**K4** [3)]
	Central connection	
	Cable entry at the cover, with indicator light	**DL**
	Central plug-in connection at the cover, with indicator light (without mating connector); connector according to DIN EN 175201-804	**DK6L**
	For further electrical connections, see data sheet 08010	
11	Influencing the switching time	**A12**
12	**Without** throttle insert	**no code**
	Throttle insert Ø 0.8 mm *[0.031 inch]*	**B08**
	Throttle insert Ø 1.0 mm *[0.039 inch]*	**B10**
	Throttle insert Ø 1.2 mm *[0.047 inch]*	**B12**
	Use if flow higher than performance limit of the valve, effective in channel P	

Clamping length

13	42 mm *[1.65 inch]* (standard)	**no code**
	22 mm *[0.87 inch]*	**Z**

Seal material

14	NBR seals	**no code**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	
15	**Without** locating hole	**no code**
	With locating hole	**/60** [4)]
16	Further details in the plain text	

Footnotes see page 3.

Ordering code

[1] For connection to the AC voltage mains, a DC solenoid **must** be used, which is controlled via a rectifier (see table below).
In case of individual connections, a mating connector with integrated rectifier can be used (separate order, see page 12).

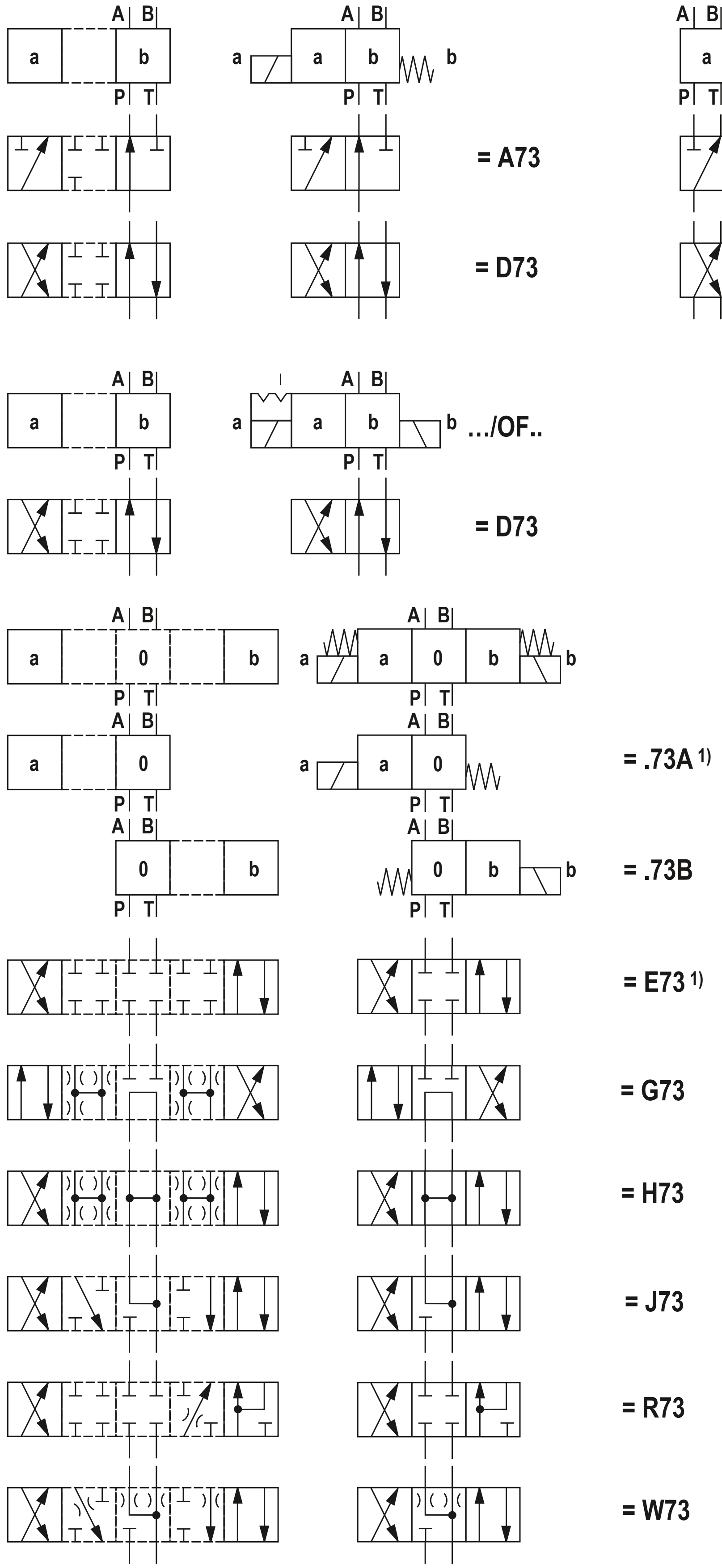
[2] Also available with M12x1 plug-in connection (only design "G24"), see data sheet 08010.

[3] Mating connectors, separate order, see page 12 and data sheet 08006.

[4] Locking pin ISO 8752-3x8-St, material no. **R900005694** (separate order).

AC voltage mains (admissible voltage tolerance ±10%)	**Nominal voltage of the DC solenoid in case of operation with alternating voltage**	**Ordering code**
110 V – 50/60 Hz 120 V – 60 Hz	96 V	**G96**
230 V – 50/60 Hz	205 V	**G205**

Symbols



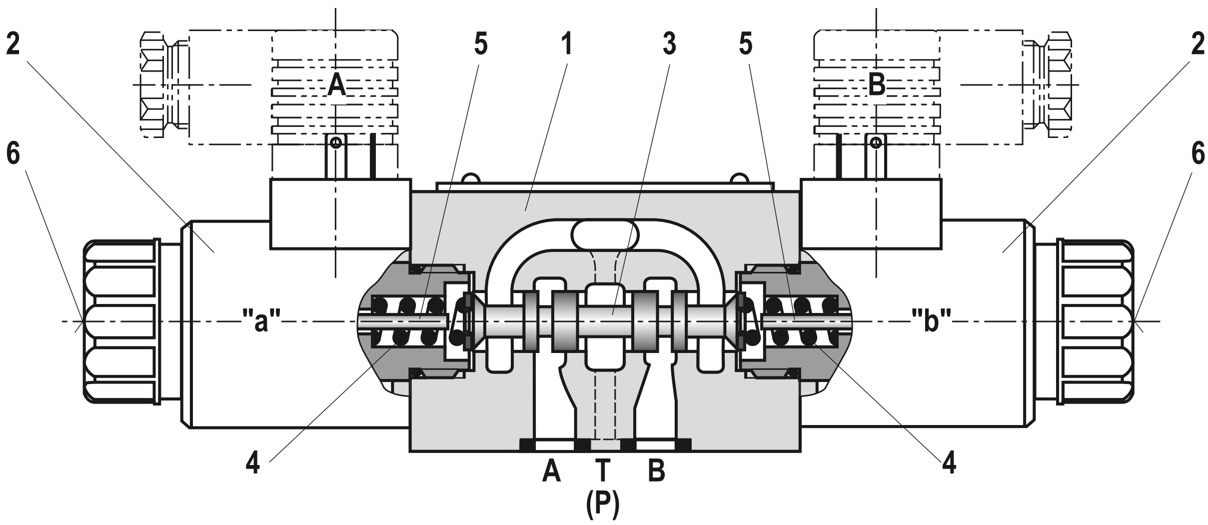
1) **Example:**
Symbol E73 with switching position "a"
ordering code ..**E73A**..

☞ **Notices!**
Representation according to DIN ISO 1219-1.
Hydraulic interim positions are shown by dashes.

Function, section

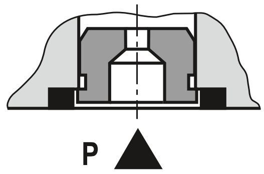
Directional valves type WE . .73... are solenoid-actuated directional spool valves with smooth switching behavior. They control start, stop and direction of the flow.
By means of structural design of the control spools and solenoids, switching shocks occurring when activating and deactivating the valves are significantly reduced.
The switching shocks, measured as acceleration values ***a***, can be reduced by up to approx. 85 % when compared to the standard valve depending on the design of the control spool (for this, see "Acceleration values" on page 7).
The directional valves basically consist of the housing (1), one or two solenoids (2), the control spool (3), and one or two return springs (4).
In the de-energized condition, the control spool (3) is held in the central position or in the initial position by the return springs (4) (except for impulse spools). The control spool (3) is actuated by wet-pin solenoids (2).

To ensure proper functioning, make sure that the pressure chamber of the solenoid is filled with oil.
The force of the solenoid (2) acts via the plunger (5) on the control spool (3) and pushes the latter from its rest position to the required end position. This enables the required direction of flow from P to A and B to T or P to B and A to T.
After the solenoid (2) is de-energized, the return spring (4) pushes the control spool (3) back to its rest position.
A manual override (6) allows the control spool (3) to be moved without solenoid energization.



Type 4WE 6 E73-6X/E.../A12...

Throttle insert
The use of a throttle insert is required when, due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.
It is inserted in channel P of the directional valve.



Type 4WE...73.../.../**B**..

Technical data
(for applications outside these parameters, please consult us!)

general			
Weight	– Valve with one solenoid	kg *[lbs]*	1.45 *[3.2]*
	– Valve with two solenoids	kg *[lbs]*	1.95 *[4.3]*
Installation position			Any [1]
Ambient temperature range		°C *[°F]*	–30 ... +50 *[–22 ... +122]* (NBR seals) –20 ... +50 *[–4 ... +122]* (FKM seals)
Acceleration ***a***		%	See "Acceleration values" page 7
$MTTF_d$ values according to EN ISO 13849		Years	150 (for further details, see data sheet 08012)

hydraulic			
Maximum operating pressure	– Port A, B, P	bar *[psi]*	350 *[5076]*
	– Port T	bar *[psi]*	210 *[3046]*
Maximum flow		l/min *[US gpm]*	60 *[15.9]*
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C *[°F]*	–30 ... +80 *[–22 ... +176]* (NBR seals) –15 ... +80 *[–4 ... +176]* (FKM seals)
Viscosity range		mm²/s *[SUS]*	2.8 ... 500 *[13 ... 2317]*
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [2]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!

- For more information and data on the use of other hydraulic fluids, refer to data sheet 90220 or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – containing water**:
  - Maximum pressure difference per control edge 50 bar
  - Pressure pre-loading at the tank port > 20 % of the pressure differential, otherwise increased cavitation
  - Life cycle as compared to operation with mineral oil HL, HLP 50 to 100 %
- **Bio-degradable:** When using bio-degradable hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the fluid (per pole tube 700 mg zinc).

1) With suspended installation, higher sensitivity to contamination. Horizontal installation is recommended.

2) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter.

Technical data
(for applications outside these parameters, please consult us!)

electric		
Available voltages [2]	V	12, 24, 96, 205
Voltage tolerance (nominal voltage)	%	±10
Power consumption	W	30
Duty cycle	%	100
Switching time according to ISO 6403	ms	Approx. 3 to 4 times longer than standard valve
Maximum switching frequency	1/h	7200
Maximum surface temperature of the coil [3]	°C *[°F]*	150 *[302]*
Protection class according to DIN EN 60529		IP 65 (with mating connector mounted and locked)
Insulation class VDE 0580		F
Electrical protection		Every solenoid must be protected individually, using a suitable fuse with tripping characteristic K (inductive loads).
Behavior in case of errors		The specified solenoid surface temperature may be exceeded.

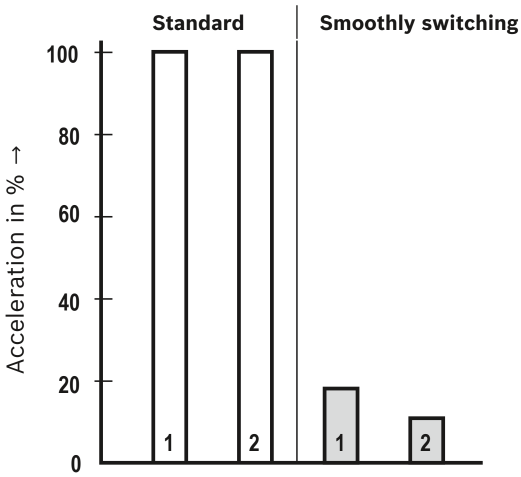
[2] Special voltages on request

[3] Possible surface temperature > 50 °C, provide contact protection!

When establishing the electrical connection, the protective earthing conductor (PE ⏚) must be connected correctly.

Notices!
- The solenoid coils must not be painted.
- Operation of the manual override is only possible up to a tank pressure of approx. 50 bar *[725 psi]*. Avoid damage to the bore of the manual override! (Special tool for the operation, separate order, material no. **R900024943**). When the manual override is blocked, operation of the opposite solenoid must be disabled!
- The simultaneous operation of 2 solenoids of one valve must be disabled!
- Use cables that are approved for an operation temperature above 105 °C *[221 °F]*.
- Valves with individual connection and supply voltage 12 V or 24 V can be operated with twice the voltage for reducing the switching time. For this purpose, the voltage has to be reduced to the nominal valve voltage after 100 ms by means of pulse width modulation. The maximum admissible switching frequency is 3 1/s.
- Due to possible overloads of the printed-circuit board, valves with central connection must not be operated with twice the voltage.
- If the standard ambient conditions in accordance with VDE 0580 cannot be complied with, the valve must be protected separately!

Acceleration value *a* (measured at the cylinder)



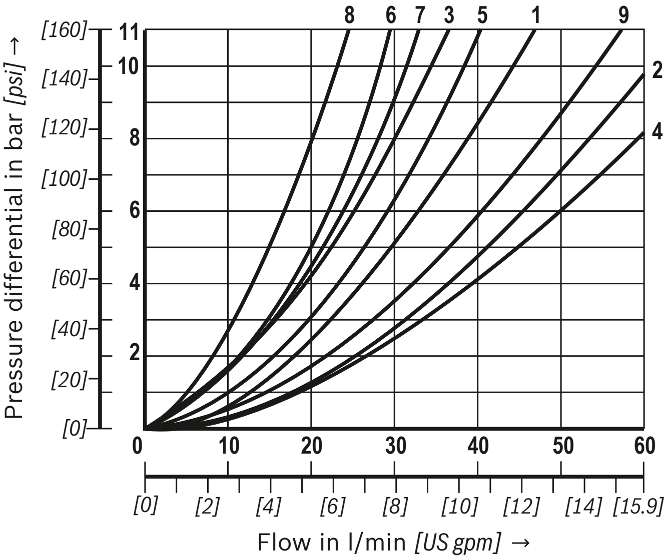
1 Solenoid

2 Spring

Notice!
Damping significantly reduces switching shocks so that the acceleration values and acceleration noise (judder) at the actuator are reduced to approx. 20 %. Within the pole tube, the switching off time is increased proportionally to the flow by 20 ... 30%, the run up time is increased by up to 20%.

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Δp-q_V characteristic curves

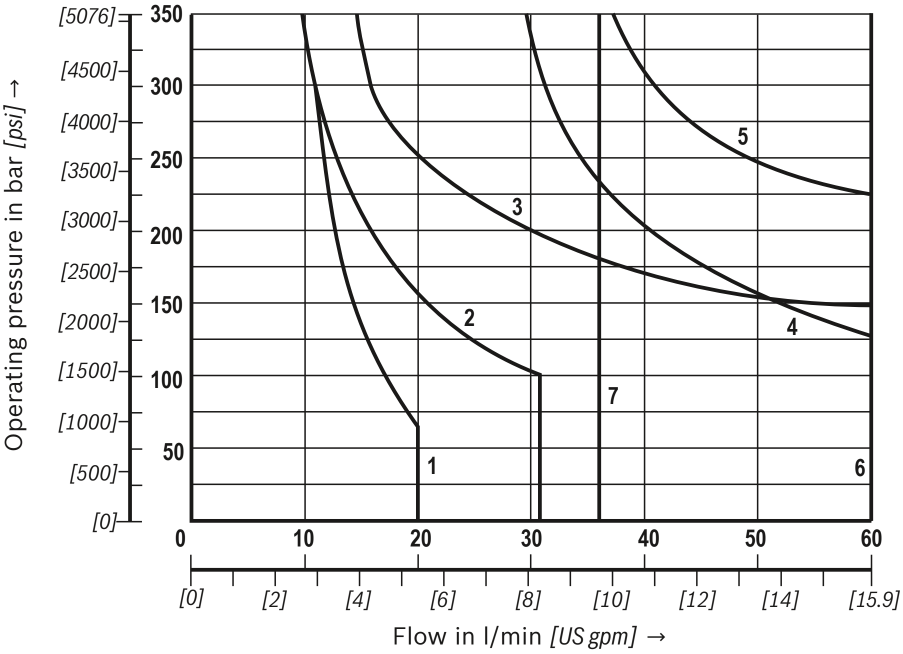


Symbol	Direction of flow					
	P – A	P – B	A – T	B – T	P – T	B – A
E73	1	1	1	1	–	–
J73	3	3	2	2	–	–
H73	1	1	1	1	5	–
A/B73	6	6	–	–	–	–
D/Y73	7	7	7	7	–	–
G73	8	8	8	8	5	
R73	9	6	9	–	–	6
W73	9	9	9	9	–	–

5 Symbol "R73" in switching position B – A (differential circuit)
6 Symbol "R73" in switching position P – B (differential circuit)

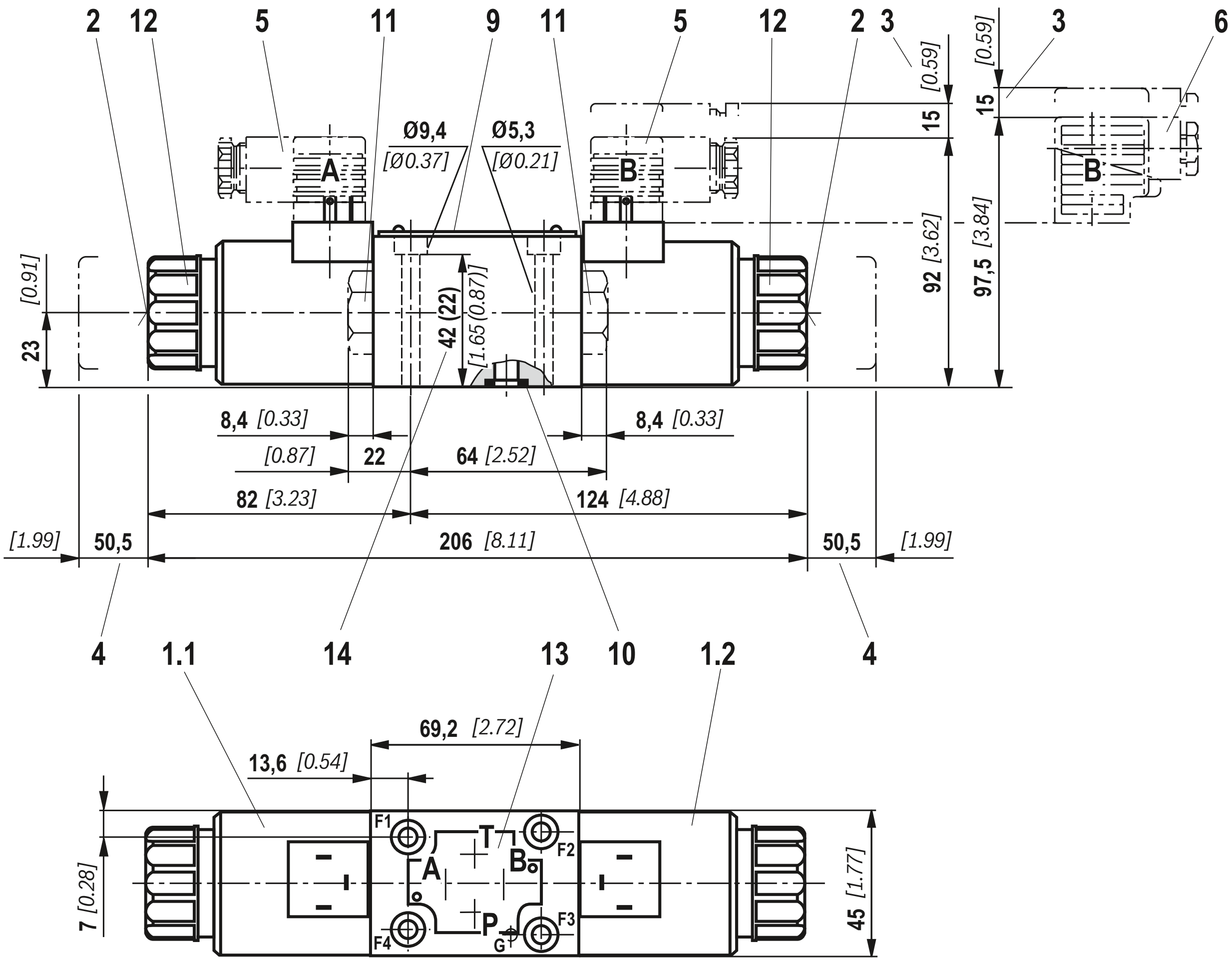
Performance limits
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

☞ **Notice!**
The specified switching power limits are valid for operation with two directions of flow (e.g. from P to A and simultaneous return flow from B to T).
Due to the flow forces acting within the valves, the permissible switching power limit may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked) the admissible switching power limit must be significantly lower!
In such cases of application, please consult us!
The switching power limit was established while the solenoids were at operating temperature, at 10 % undervoltage, and without tank preloading.

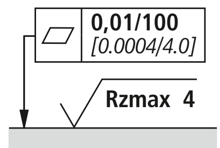


Characteristic curve	Symbol
1	A73, B73
2	G73
3	D73, Y73
4	J73
5	R73
6	E73, W73, D73/OF
7	H73

Dimensions: Individual connection
(dimensions in mm *[inch]*)

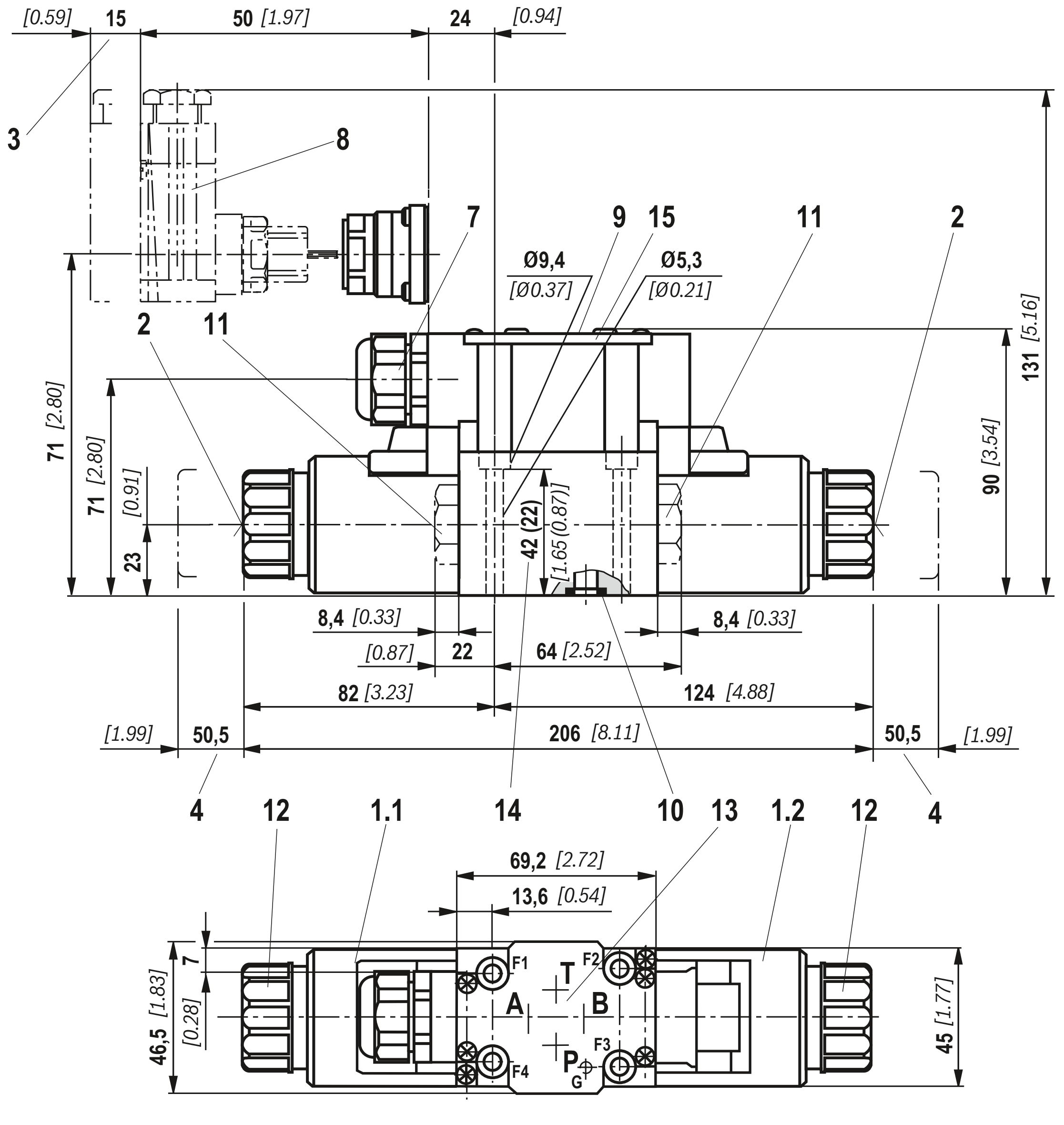


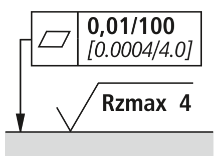
Item explanations, valve mounting screws and **subplates**
see page 11.



Required surface quality of the
valve contact surface

Dimensions: Central connection
(dimensions in mm *[inch]*)





Required surface quality of the valve contact surface

Terminal assignment with central connection:

- ▶ **1 solenoid:**
  Always connect the solenoid to terminals 1 and 2, protective grounding conductor to terminal ⏚ PE
- ▶ **2 solenoids:**
  Connect solenoid "a" to terminals 1 and 2, solenoid "b" to terminals 3 and 4, protective grounding conductor to terminal ⏚ PE

Item explanations, valve mounting screws and **subplates** see page 11.

Dimensions

1.1 Solenoid "a"
1.2 Solenoid "b"
2 Concealed manual override "**N9**"
3 Space required to remove the mating connector/angled socket
4 Space required to remove the coil
5 Mating connector **without** circuitry (separate order, see page 12 and data sheet 08006)
6 Mating connector **with** circuitry (separate order, see page 12 and data sheet 08006)
7 Cable gland Pg 16 *[1/2" NPT]* "DL"
8 Mating connector for connector "DK6L"(separate order, see data sheet 08006)
9 Name plate
10 Identical seal rings for ports A, B, P, T
11 Plug screw for valves with one solenoid
12 Mounting nut, tightening torque M_A = 4 Nm *[2.95 ft-lbs]*
13 Porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order)
14 Alternative clamping length (): 22 mm *[0.87 inch]*
15 Cover
Attention! The valve may only be operated with properly mounted cover!

Subplates according to data sheet 45052 (separate order)

(**without** locating hole)	G 341/01 (G1/4)
	G 342/01 (G3/8)
	G 502/01 (G1/2)
(**with** locating hole)	G 341/60 (G1/4)
	G 342/60 (G3/8)
	G 502/60 (G1/2)
	G 341/12 (SAE-6) [1)]
	G 342/12 (SAE-8) [1)]
	G 502/12 (SAE-10) [1)]

[1)] Upon request

Valve mounting screws (separate order)

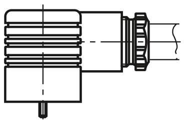
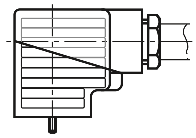
- Clamping length 42 mm:
  4 metric hexagon socket head cap screws
  ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
  (Friction coefficient μ_{tot} = 0.09 to 0.14);
  tightening torque M_A = 7 Nm *[5.2 ft-lbs]* ± 10 %,
  material no. **R913000064**
  or
  4 hexagon socket head cap screws
  ISO 4762 - M5 x 50 - 10.9 (self-procurement)
  (friction coefficient μ_{tot} = 0.12 to 0.17);
  tightening torque M_A = 8.1 Nm *[6 ft-lbs]* ± 10 %

  4 hexagon socket head cap screws UNC 10-24 UNC x 2" ASTM-A574
  (friction coefficient μ_{tot} = 0.19 to 0.24);
  tightening torque M_A = 11 Nm *[8.2 ft-lbs]* ± 15 %,
  (friction coefficient μ_{tot} = 0.12 to 0.17);
  tightening torque M_A = 8 Nm *[5.9 ft-lbs]* ± 10 %,
  material no. **R978800693**

- Clamping length 22 mm:
  4 metric hexagon socket head cap screws
  ISO 4762 - M5 x 30 - 10.9-flZn-240h-L
  (friction coefficient μ_{tot} = 0.09 to 0.14);
  tightening torque M_A = 7 Nm *[5.2 ft-lbs]* ± 10 %,
  material no. **R913000316**
  or
  4 hexagon socket head cap screws
  ISO 4762 - M5 x 30 - 10.9 (self-procurement)
  (friction coefficient μ_{tot} = 0.12 to 0.17);
  tightening torque M_A = 8.1 Nm *[6 ft-lbs]* ± 10 %

  4 hexagon socket head cap screws UNC 10-24 UNC x 1 1/4"
  (friction coefficient μ_{tot} = 0.19 to 0.24);
  tightening torque M_A = 11 Nm *[8.2 ft-lbs]* ± 15 %,
  (friction coefficient μ_{tot} = 0.12 to 0.17);
  tightening torque M_A = 8 Nm *[5.9 ft-lbs]* ± 10 %,
  material no. **R978802879**

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006							
				Material number			
Port	**Valve side**	**Color**	without circuitry	with indicator light 12 ... 240 V	with ndicator light and rectifier 12 ... 240 V	with rectifier 12 ... 240 V	with indicator light and Zener diode suppression circuit 24 V
M16 x 1.5	a	Gray	**R901017010**	–	–	–	–
	b	Black	**R901017011**	–	–	–	–
	a/b	Black	–	**R901017022**	**R901017029**	**R901017025**	**R901017026**
1/2" NPT (Pg 16)	a	Red/brown	**R900004823**	–	–	–	–
	b	Black	**R900011039**	–	–	–	–
	a/b	Black	–	**R900057453**	**R900057455**	**R900842566**	–

More information

- Subplates — Data sheet 45052
- Directional spool valve (standard) — Data sheet 23178
- Mineral oil-based hydraulic fluids — Data sheet 90220
- Reliability characteristics according to EN ISO 13849 — Data sheet 08012
- Directional spool and seat valves with electrical actuation and M12x1 plug-in connection — Data sheet 08010
- Mating connectors and cable sets for valves and sensors — Data sheet 08006
- General product information on hydraulic products — Data sheet 07008
- Installation, commissioning and maintenance of industrial valves — Data sheet 07300
- Hydraulic valves for industrial applications — Data sheet 07600-B
- Selection of the filters — www.boschrexroth.com/filter

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The Drive & Control Company

Rexroth
Bosch Group

4/3, 4/2 and 3/2 directional valves influencing the switching time

Type 5-.WE (5-chamber version)

RE 23352
Edition: 2012-04
Replaces: 23351

H7832

- Size 10
- Component series 5X
- Maximum operating pressure 420 bar *[6091 psi]*
- Maximum flow 150 l/min *[39.6 US gpm]*

Features

- Direct operated directional spool valve with solenoid actuation in high performance version
- Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
- Wet-pin DC solenoids with detachable coil
- Solenoid coil can be rotated by 90°
- The coil can be changed without having to open the pressure-tight chamber
- Electrical connection as single connection or as central connection via double valve mating connector
- Manual override, optional
- Inductive position switches and proximity sensors (contactless)

Contents

Ordering code

01	02		03	04	05	06		07		08	09	10	11	12	13	14		15	16	17	18		19	20
	5	**–**		**WE**	**10**		**–**	**5X**	**/**		**E**						**/**					**=**		*****

01	Standard version (maximum operating pressure 350 bar)	**no code**
	High-pressure version (maximum operating pressure 420 bar)	**H**

02	5-chamber version	**5**

03	3 main ports	**3**
	4 main ports	**4**

04	Directional valve	**WE**

05	Size 10	**10**

06	Symbols e. g. C, E, EA, EB etc; possible version see page 5 and 6.	

07	Component series 50 to 59 (50 to 59: Unchanged installation and connection dimensions)	**5X**

Spool return

08	**With** spring return	**no code**
	With reinforced compression spring (for quick switch-off)	**D**
	Without spring return	**O**
	Without spring return with detent	**OF**

09	High-power wet-pin solenoid with detachable coil	**E**

10	Direct voltage 12 V	**G12**
	Direct voltage 24 V	**G24**
	Direct voltage 26 V	**G26**
	Direct voltage 96 V	**G96**
	Direct voltage 180 V	**G180**
	Direct voltage 205 V	**G205**
	Direct voltage 220 V	**G220**
	Connection to AC voltage mains via control with rectifier (see table page 3 and 18).	
	Electrical connections and coil-connection combinations see page 11	

11	**Without** manual override	**no code**
	With concealed manual override (standard)	**N9** [1]
	With manual override	**N** [1]
	With lockable manual override "mushroom button"	**N5** [1; 2]
	With manual override "mushroom button", not lockable	**N6** [1]

Corrosion resistance (outside)

12	None (valve housing primed)	**no code**
	Improved corrosion protection (240 h salt spray test according to EN ISO 9227)	**J2**

Electrical connection [4]

13	**Single connection**	
	Without mating connector, with connector according to DIN EN 175301-803	**K4** [3]
	Without mating connector, with connector according to DIN EN 175301-803 (possible with "J2" version)	**K4K** [3]
	Without mating connector, 4-pole with connector M12x1, integrated interference protection circuit, status LED according to IEC 60947-5-2	**K72L** [3]
	Without mating connector, with connector AMP Junior-Timer	**C4Z** [3]
	More electrical connections and coil-connection combinations see page 11	

Ordering code

01	02		03	04	05	06		07		08	09	10	11	12	13	14		15	16	17	18		19	20
	5	**–**		**WE**	**10**		**–**	**5X**	**/**		**E**						**/**					**=**		*****

Spool position monitoring

14	**Without** position switch	**no code**
	– Inductive position switch type QM	
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored spool position "0"	**QM0G24**
	– Inductive proximity sensor type QS	
	Monitored spool position "a"	**QSAG24W**
	Monitored spool position "b"	**QSBG24W**
	Monitored spool position "0"	**QS0G24W**
	Monitored spool position "0" and "a"	**QS0AG24W**
	Monitored spool position "0" and "b"	**QS0BG24W**
	Monitored spool position "a" and "b"	**QSABG24W**
	For more information see data sheet 24830	

Influencing of the switching time

15	**Without** influencing of the switching time	**no code**
	With throttle screw	**C**
	With orifice Ø 0.6 mm *[0.024 inch]*	**A06**
	With orifice Ø 0.8 mm *[0.031 inch]*	**A08**
	With orifice Ø 1.0 mm *[0.039 inch]*	**A10**

Throttle insert

16	**Without** throttle insert			**no code**
	With throttle insert [4; 5]:			
	Connection	Throttle Ø in mm *[inch]*		
		0.8 *[0.031]*	1.0 *[0.039]*	1.2 *[0.047]*
	P	**= B08**	**= B10**	**= B12**
	A	**= H08**	**= H10**	**= H12**
	B	**= R08**	**= R10**	**= R12**
	A and B	**= N08**	**= N10**	**= N12**
	T [6]	**= X08**	**= X10**	**= X12**
	Further throttle insert diameters upon request			

1) The manual override cannot be allocated a safety function. The manual override units may only be used up to a tank pressure of 50 bar.

2) With tank pressures above 50 bar, it cannot be guaranteed that the valve remains in the position switched by the "N5" manual override.

3) Mating connectors, separate order, see page 18 and data sheet 08006.

4) When the admissible valve performance limits are exceeded, installation of throttle inserts is to be intended (performance limits see page 13).

5) Not with low-temperature version "MT".

6) When throttle inserts are used in channel T, the pressure in the working ports and in case of connection to the tank chambers must not exceed 210 bar.

AC voltage mains (admissible voltage tolerance ±10 %)	**Nominal voltage of the DC solenoid in case of operation with alternating voltage**	**Ordering code**
100 V - 50/60 Hz	96 V	**G96**
110 V - 50/60 Hz	96 V	**G96**
200 V - 50/60 Hz	180 V	**G180**
230 V - 50/60 Hz	205 V	**G205**

Ordering code

01	02		03	04	05	06		07		08	09	10	11	12	13	14		15	16	17	18		19	20
	5	**–**		**WE**	**10**		**–**	**5X**	**/**		**E**						**/**					**=**		*****

Seal material

17	NBR seals	**M**
	FKM seals	**V**
	Seals for HFC hydraulic fluids	**MH**
	Low-temperature version	**MT**
	Attention: Observe compatibility of seals with hydraulic fluid used!	

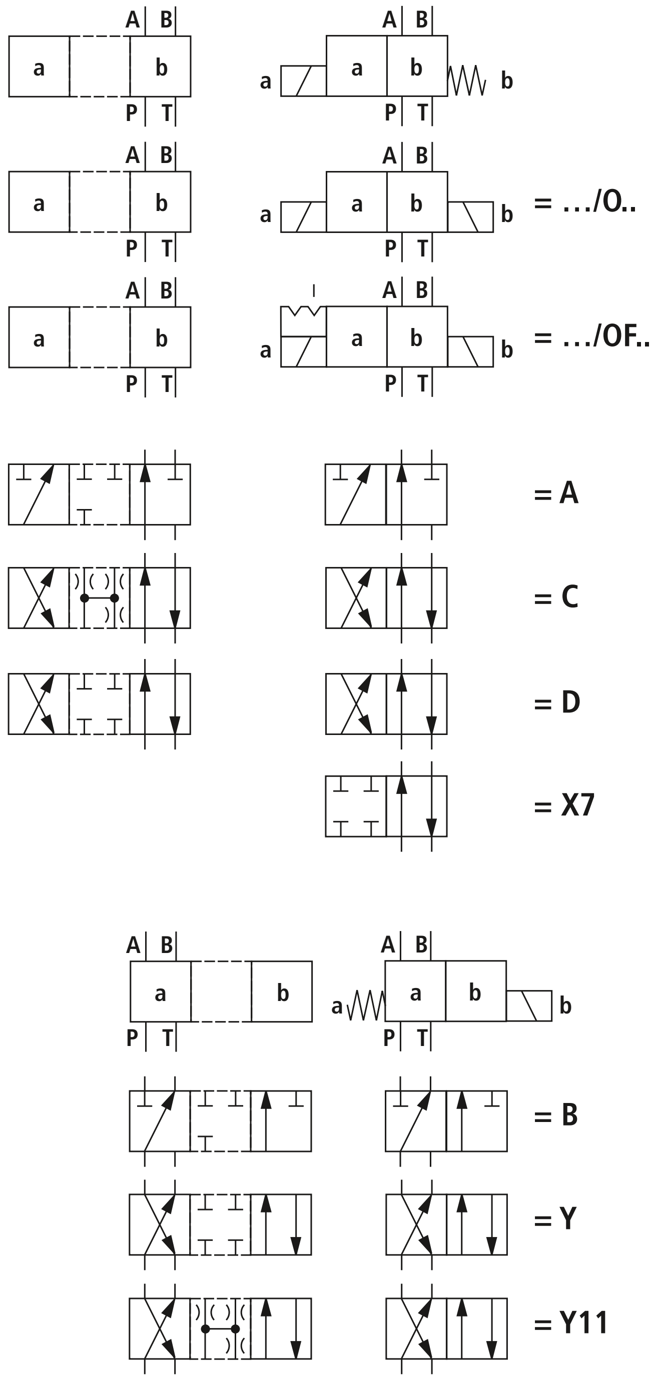
Control spool play

18	Standard	**no code**
	Limited (for little leakage)	**T06**
	Increased (for extended temperature range, higher leakage)	**T12**

19	Approval according to CSA	**CSA**
	Porting pattern according to ANSI B93.9 (if solenoid "a" is energized, channel P is connected to A)	**ON**

20	Further details in the plain text	

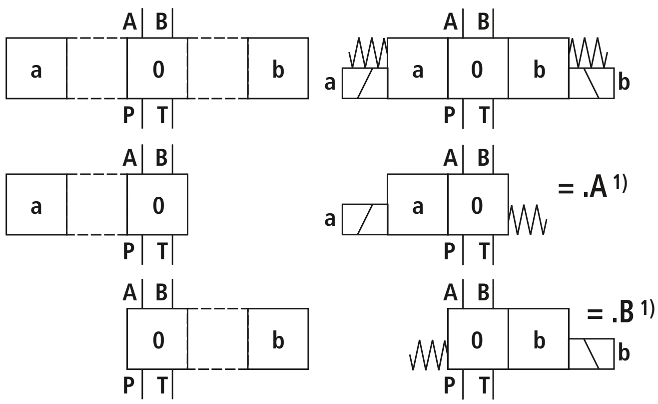
Symbols: 2 spool positions

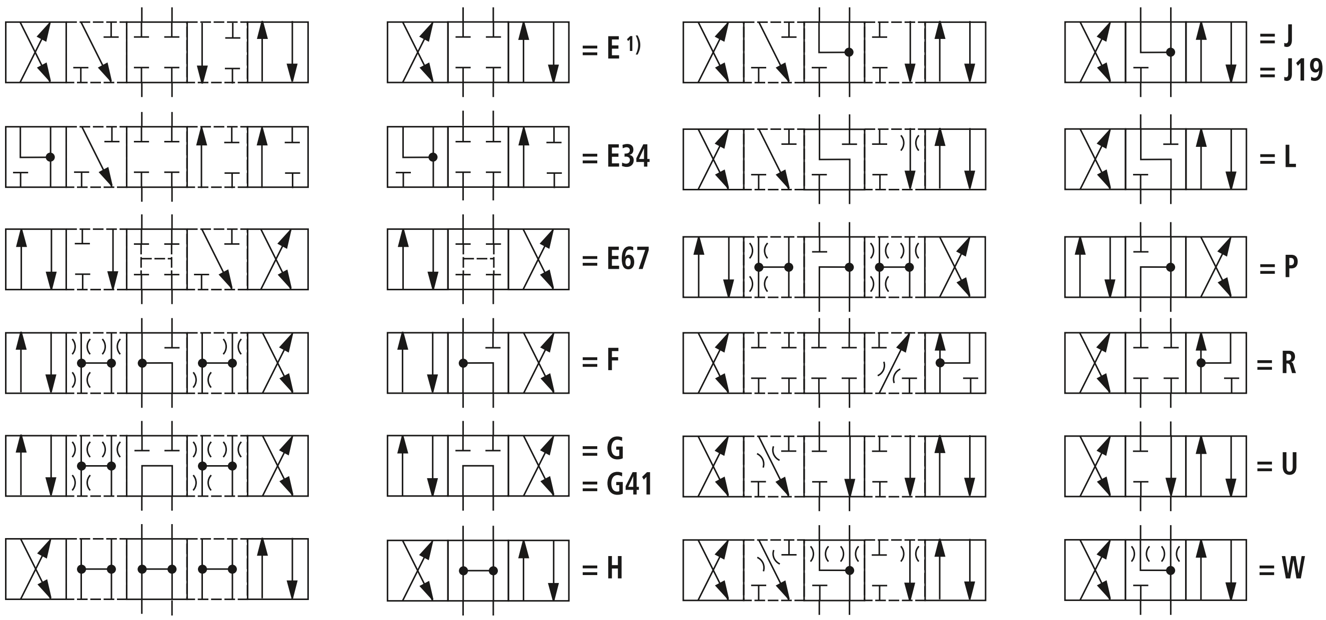


Notice!

- Presentation according to DIN ISO 1219-1.
  Hydraulic interim positions are shown by dashes.
- Other symbols upon request.

Symbols: 3 spool positions





1) **Example:**

- Spool E with spool position "a" ordering code ..**EA**..
- Spool E with spool position "b" ordering code ..**EB**..

Notice!

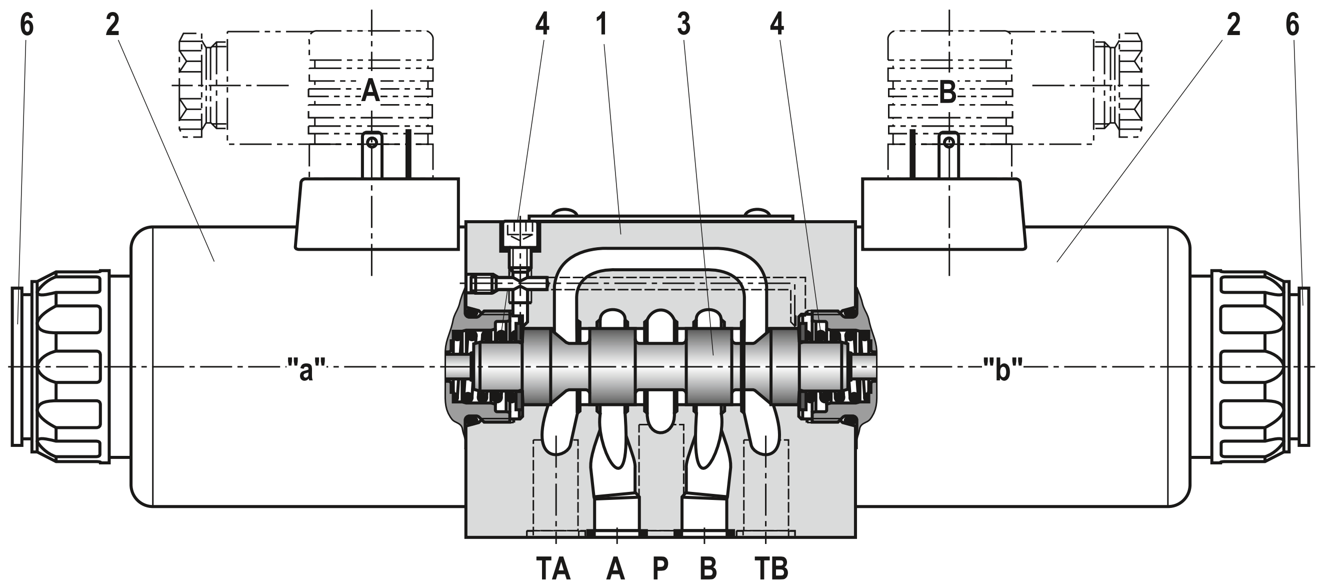
- Presentation according to DIN ISO 1219-1.
  Hydraulic interim positions are shown by dashes.
- Other symbols upon request.

Function, section

The 5-chamber directional valve type 5-.WE is a solenoid operated directional spool valve influencing the switching time. It controls the start, stop and direction of a flow.
The directional valves basically consist of housing (1), one or two electronic solenoids (2), control spool (3), and the return springs (4).
In the de-energized condition, control piston (3) is held in the central position or in the initial position by the return springs (4) (except for valve without spring "O").
In case of energization of the wet-pin electronic solenoid (2), the control spool (3) moves out of its rest position into the required end position. In this way, the required flow position according to the selected symbol is released.
After the electronic solenoid (2) has been switched off, the control spool (3) is pushed back into the central position or in the initial position (except for valve with "OF" detent and valve without spring type "O").
A manual override (6) allows for the manual switching of the valve without solenoid energization.

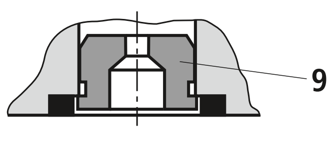
To ensure proper functioning, care must be taken that the pressure chamber of the solenoid is filled with oil.

More functions see page 8.



Type 5-4WE 10 ...

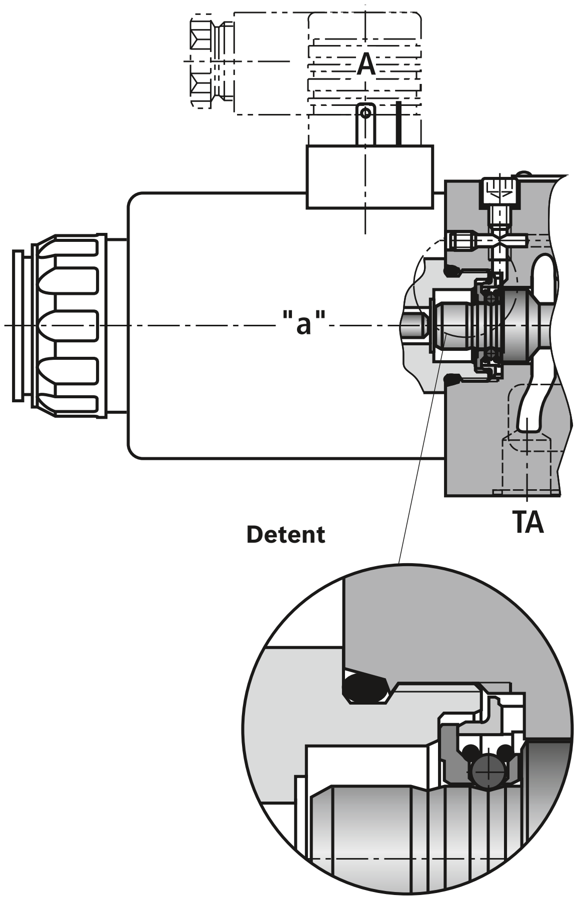
Throttle insert
Using a throttle insert (9) in channels P, A, B or T, the flow resistance at the valve can be increased. Its use is required when due to prevailing operating conditions, flows occur during the switching processes, which exceed the performance limit of the valve.



Function, section

Without spring return "O" (only possible with symbols A, C and D)
This version is a directional valve with 2 spool positions and 2 electronic solenoids **without** detent. The valve without spring return at the control spool (3) has no defined basic position in the de-energized condition.

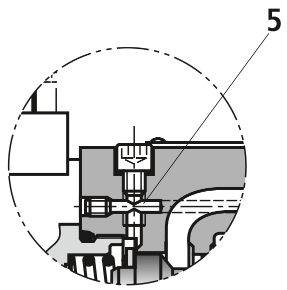
Without spring return with "OF" detent (only possible with symbols A, C and D)
This version is a directional valve with 2 spool positions and 2 electronic solenoids **with** detent. The detents are used to fix the control spool (3) in the relevant spool position. During operation, continuous application of current to the electronic solenoid can thus be omitted which contributes to energy-efficient operation.



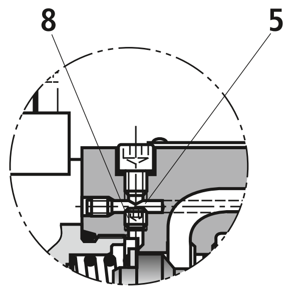
Version "OF"

Influencing of the switching time
With the 5-chamber directional valve type 5-.WE, the switching time can be delayed to 100 ms and more by means of a "C" throttle screw (7) or a selected "A0." orifice (8). In this connection, the switching time is pressure-, flow- and viscosity-dependent, specific to the installation. The switching time is influenced by means of a restriction (throttle or orifice) in the connection channel (5) between the two spring chambers in which the liquid volume is displaced from one spring chamber into the other in case of a switching process.
The T channels are separated from the spring chambers in order to achieve soft switching.

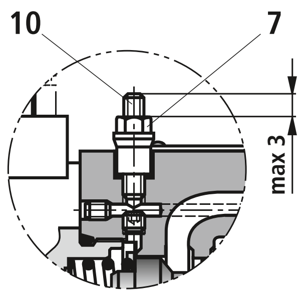
> ☞ **Notice!**
> The adjustment spindle (10) may only be screwed out so that it protrudes from the nut by max. 3 mm.



Without throttle screw / without orifice



With "A0." orifice



With "C" throttle screw

Technical data
(For applications outside these parameters, please consult us!)

general			
Weight	– Valve with one solenoid	kg *[lbs]*	3.9 *[8.6]*
	– Valve with two solenoids	kg *[lbs]*	5.5 *[12.1]*
Installation position			Any [1]
Ambient temperature range	– Standard seals	°C *[°F]*	–20 ... +70 *[–4 ... +158]* (NBR seals) –15 ... +70 *[+5 ... +158]* (FKM seals)
	– Seals for HFC hydraulic fluid	°C *[°F]*	–20 ... +50 *[–4 ... +122]*
	– Low-temperature version [2]	°C *[°F]*	–40 ... +50 *[–4 ... +122]*
Storage temperature range		°C *[°F]*	–20 to +50 *[–4 ... +122]*
$MTTF_d$ values according to EN ISO 13849		Years	300 (for further details see data sheet 08012)

hydraulic			
Maximum operating pressure ($\boldsymbol{p}_P > \boldsymbol{p}_A; \boldsymbol{p}_B > \boldsymbol{p}_T$)	– Port A, B, P	bar *[psi]*	350 *[5076]; 420 [6091]*
	– Port T	bar *[psi]*	210 *[3050]* Tank pressure (standard) With spool symbols A and B, port T must be used as leakage oil connection if the operating pressure exceeds the maximum admissible tank pressure.
Maximum flow		l/min *[US gpm]*	150 *[39.6]*
Hydraulic fluid			See table below
Hydraulic fluid temperature range (at the valve working ports)		°C *[°F]*	–20 ... +80 *[–4 ... +176]* (NBR seals) –15 ... +80 *[+5 ... +176]* (FKM seals) –20 ... +50 *[–4 ... +122]* (HFC hydraulic fluid) –40 ... +50 *[–4 ... +122]* (Low-temperature version)
Viscosity range		mm²/s *[SUS]*	2.8 ... 500 *[35 ... 2320]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [3]

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– Insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– Soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Containing water	HFC	NBR	ISO 12922

Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – containing water:** Maximum pressure difference per control edge 50 bar, otherwise, increased cavitation erosion! Pressure pre-loading at the tank port > 1 bar or > 20 % of the pressure differential. The pressure peaks should not exceed the maximum operating pressures!
- **Bio-degradable:** When using bio-degradable hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the fluid (per pole tube 700 mg zinc).

[1] With suspended installation, higher sensitivity to contamination. Horizontal installation is recommended.

[2] In case of use at low temperatures, see project planning information page 18.

[3] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components. For the selection of the filters see www.boschrexroth.com/filter.

Technical data

(For applications outside these parameters, please consult us!)

electric					
Voltage type				Direct voltage	Alternating voltage
Nominal voltage according to VDE 0580 (ordering code see page 2 and 11)			V	12, 24, 26, 96, 180, 205, 220	Only possible with rectifier [4]
Voltage tolerance (nominal voltage)			%	±10	
Nominal power according to VDE 0580			W	30	
Duty cycle			%	100 (S1 according to VDE 0580)	
Switching time according to ISO 6403 [5]	– ON	Pressure change 5 %	ms	60 ... 104 [6]	
		Pressure change 95 %	ms	90 ... 165 [6]	
	– OFF	Pressure change 5 %	ms	12 ... 50	
		Pressure change 95 %	ms	48 ... 104	
Maximum switching frequency			1/h	15000	7200
Protection class according to DIN EN 60529				See page 11	
Protection class according to VDE 0580				See page 11	
Maximum surface temperature of the coil [7]			°C *[°F]*	140 *[284]*	
Insulation class VDE 0580				F	
Electrical protection				Every solenoid must be protected individually, using a suitable fuse with tripping characteristic K (inductive loads). The valve must be installed on a surface that is included in the equipotential bonding.	

4)
- Mating connectors with rectifier see page 18
- Possible voltages see page 3
- Rectifiers must comply with the relevant standards as well as the coil performance data!

5) Switching time is measured in horizontal position and without influencing of the switching time.

6) Not with symbols A and B.

7) Surface temperature > 50 °C possible, provide contact protection!

Notice!

- The solenoid coils must not be painted.
- Actuation of the manual override is only possible up to a tank pressure of ca. 50 bar *[725 psi]*. Avoid damage to the bore of the manual override! (Special tool for the operation, separate order, material no. **R900024943**). When the manual override is blocked, actuation of the opposite solenoid must be ruled out!
- The simultaneous actuation of 2 solenoids of one valve must be ruled out!
- Use cables that are approved for an operation temperature above 105 °C *[221 °F]*.
- When solenoid coils are switched off, voltage peaks result which may cause failures or damage in the connected control electronics. The user has to provide for a suitable circuit for limiting the voltage peaks. It must be noted that a diode switched in an anti-parallel form extends the switching off time.
- Valves with single connection and supply voltage 12 V or 24 V can be operated with twice the voltage for reducing the switching time. For this purpose, the voltage has to be reduced to the nominal valve voltage after 100 ms by means of pulse width modulation. The maximum admissible switching frequency is 5 1/s.

Electrical connections see page 11.

Technical data

(For applications outside these parameters, please consult us!)

Electrical connections and coil-connection combinations

Ordering code connector		Ordering code (voltage) G12	G24	G26	G96	G180	G205	G220	Protection class according to DIN EN 60529 [8]	Protection class according to VDE 0580
Without mating connector, single connection with connector according to DIN EN 175301-803	**K4**	✓ [9]	✓ [9]	[10]	✓ [9]	✓	✓ [9]	✓	IP65	I
	K4K [11]	✓	✓	✓	[10]	–	[10]	[10]	IP67	I
Without mating connector, single connection 4-pole with connector M12x1, integrated interference protection circuit, status LED and quenching diode	**K72L**	–	✓	–	–	–	–	–	IP65	II [12]
Without mating connector, with connector AMP Junior-Timer	**C4Z**	–	–	✓	–	–	–	–	IP66	II [12]

[8] Only with correctly mounted valve with a mating connector suitable for type of protection.

[9] Coil with approval according to UL 429

[10] Upon request

[11] Possible with version "J2".

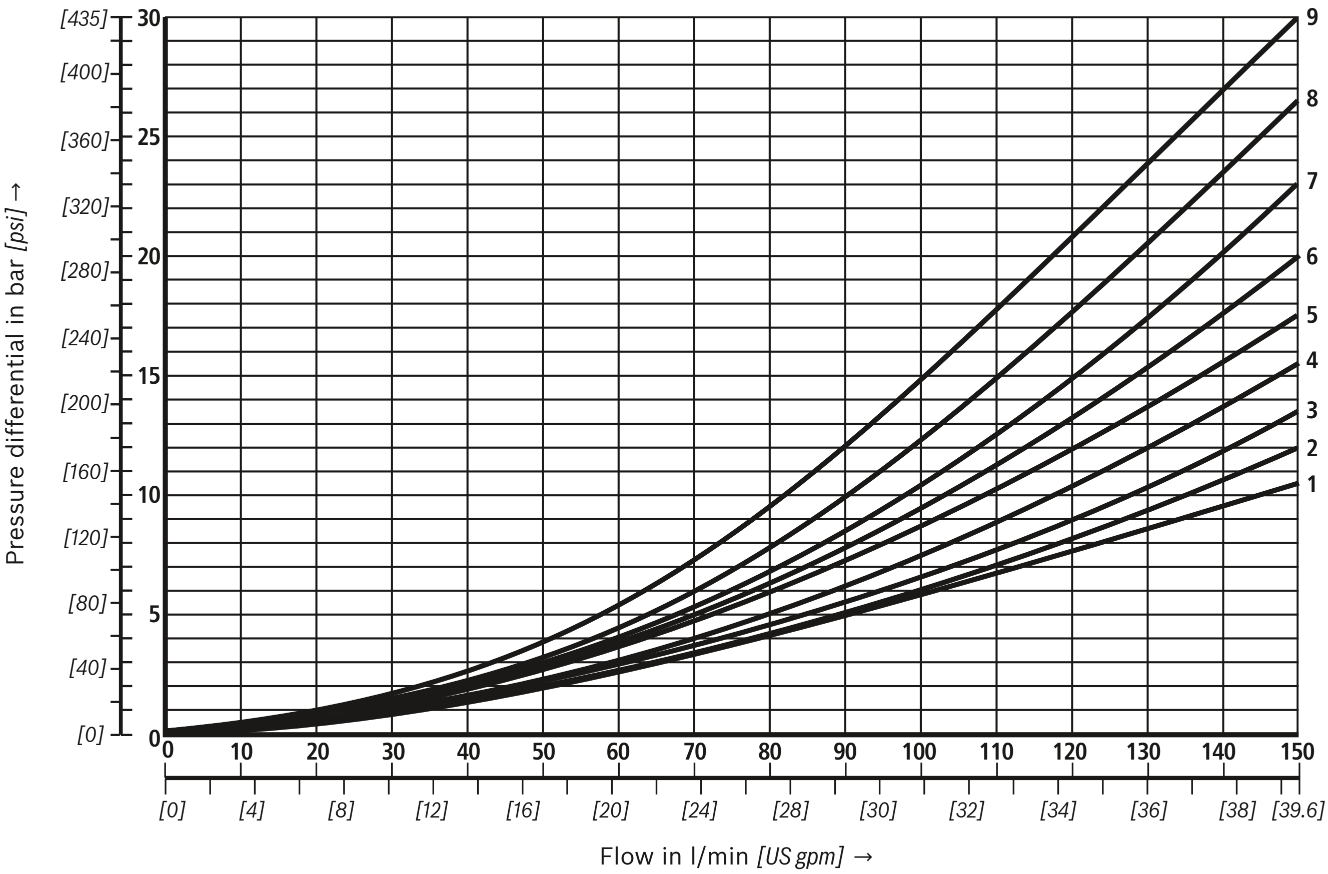
[12] With protection class II, a protective extra-low voltage with isolation transformer (PELV, SELV) is to be provided.

When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected properly.

Characteristic curves

(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Δ*p*-*q*$_V$ characteristic curves



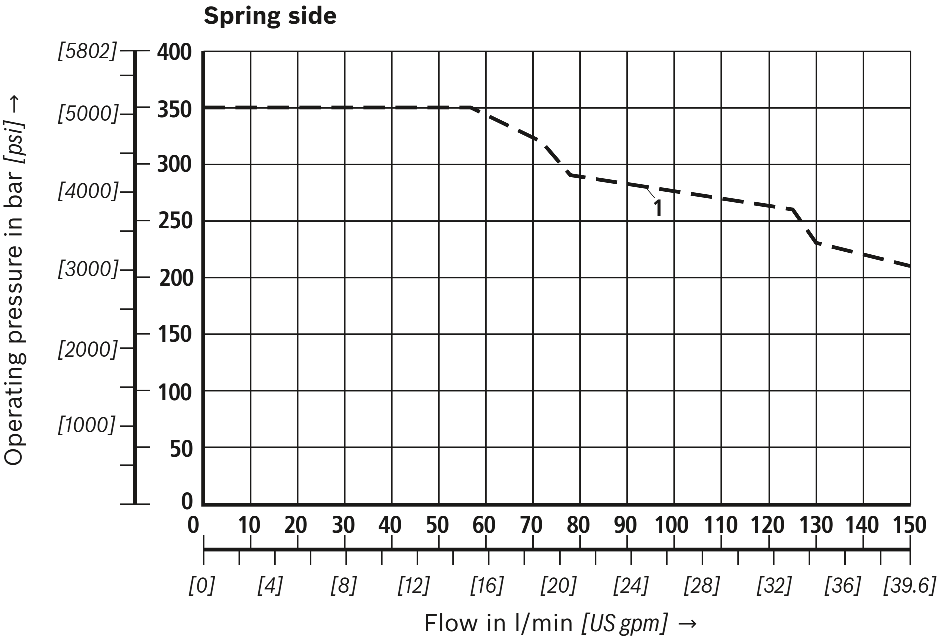
Symbol	Direction of flow			
	P – A	P – B	A – T	B – T
A	4	4	–	–
B	4	5	–	–
C, J, Q, Y	2	3	5	7
D	2	2	5	7
E	3	3	6	7
E – "QS"	3	2	6	7
E34	5	–	5	8
E67	3	4	4	7
H	1	1	6	8
J19	7	–	9	9
L, Y11	3	3	5	7
R	3	4	5	6
U	2	2	5	7
W	2	2	5	6
X7	3	–	–	6

Symbol	Direction of flow				
	P – A	P – B	A – T	B – T	P – T
F	1	3	3	8	4
G	4	5	6	8	7
H	1	1	6	8	7
P	3	1	5	6	5

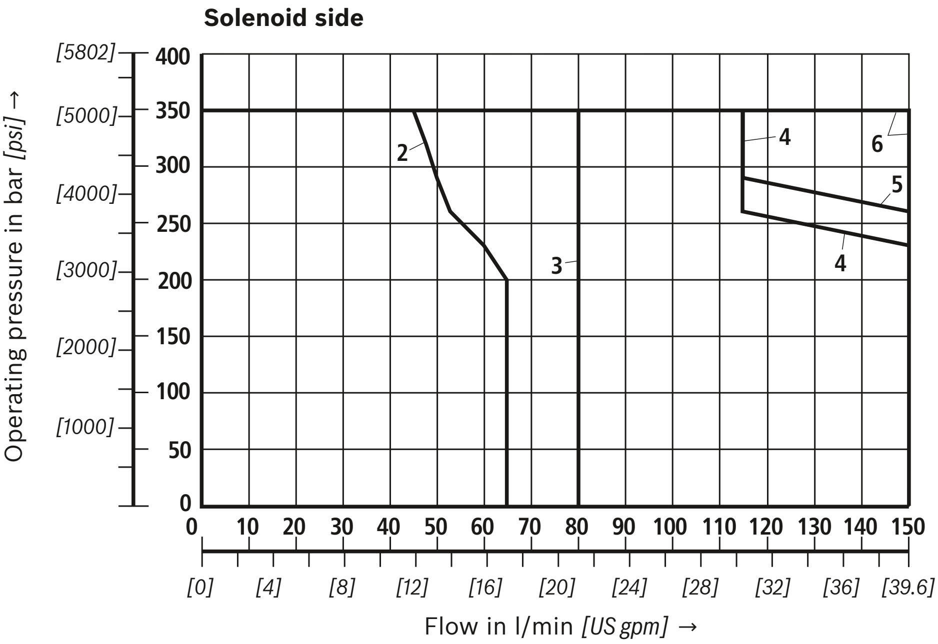
Characteristic curve for symbol G41 upon request.

Performance limits: 2 spool positions
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

☞ **Notice!**
The specified switching power limits are valid for operation with two directions of flow (e. g. from P to A and simultaneous return flow from B to T).
Due to the flow forces acting within the valves, the permissible switching power limit may be considerably lower with only one direction of flow (e. g. from P to A while port B is blocked)!
In such applications, please consult us!
The switching power limit was established while the solenoids were at operating temperature, at 10 % undervoltage and without tank pre-loading.



Characteristic curve	Symbol
1	B



Characteristic curve	Symbol
2	A, B
3	C; Y11
4	D
5	Y
6	X7

Performance limits: 3 spool positions (measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

☞ **Notice!**

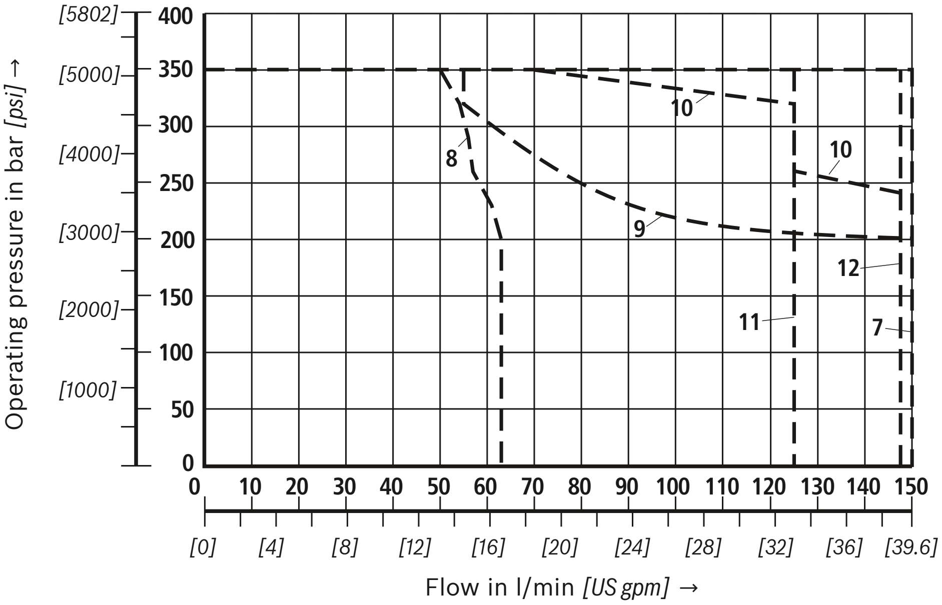
The specified switching power limits are valid for operation with two directions of flow (e. g. from P to A and simultaneous return flow from B to T).

Due to the flow forces acting within the valves, the permissible switching power limit may be considerably lower with only one direction of flow (e. g. from P to A while port B is blocked)!

In such applications, please consult us!

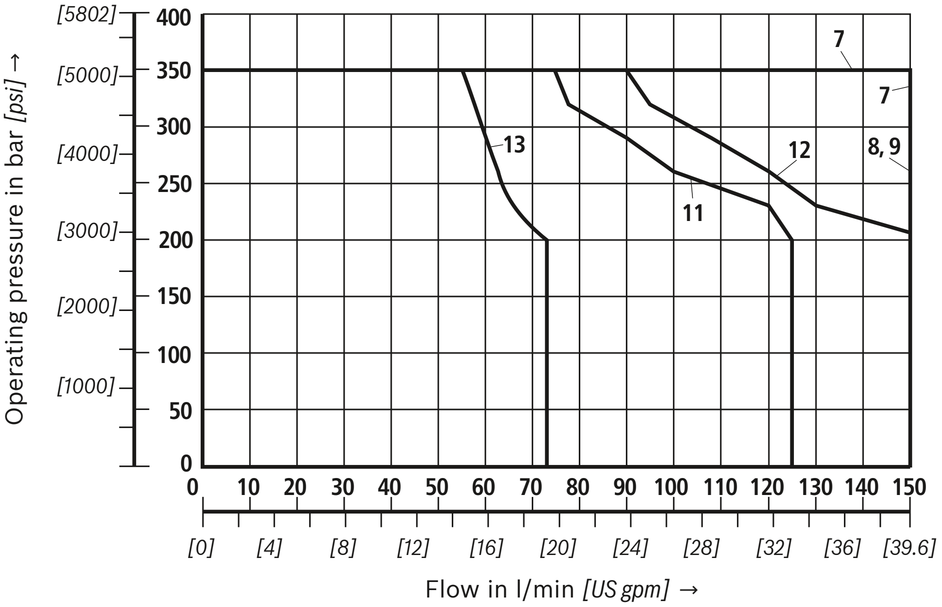
The switching power limit was established while the solenoids were at operating temperature, at 10 % undervoltage and without tank pre-loading.

Spring side



Characteristic curve	Symbol
7	E
8	F
9	G
10	H
11	J; J19
12	L

Solenoid side

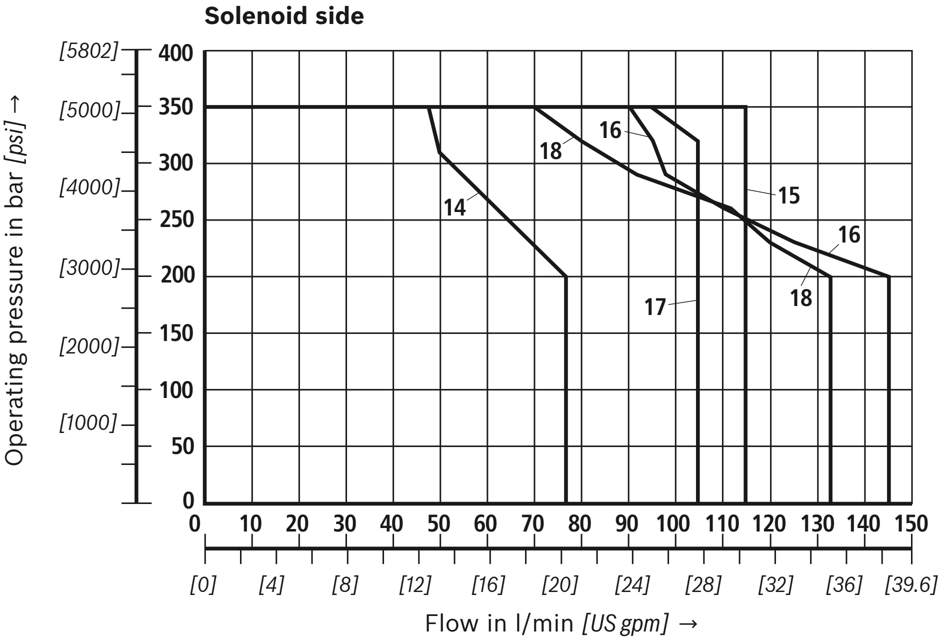


Characteristic curve	Symbol
7	E
8	F
9	G
11	J, J19
12	L
13	E34

Characteristic curves for symbols G41 and P upon request.

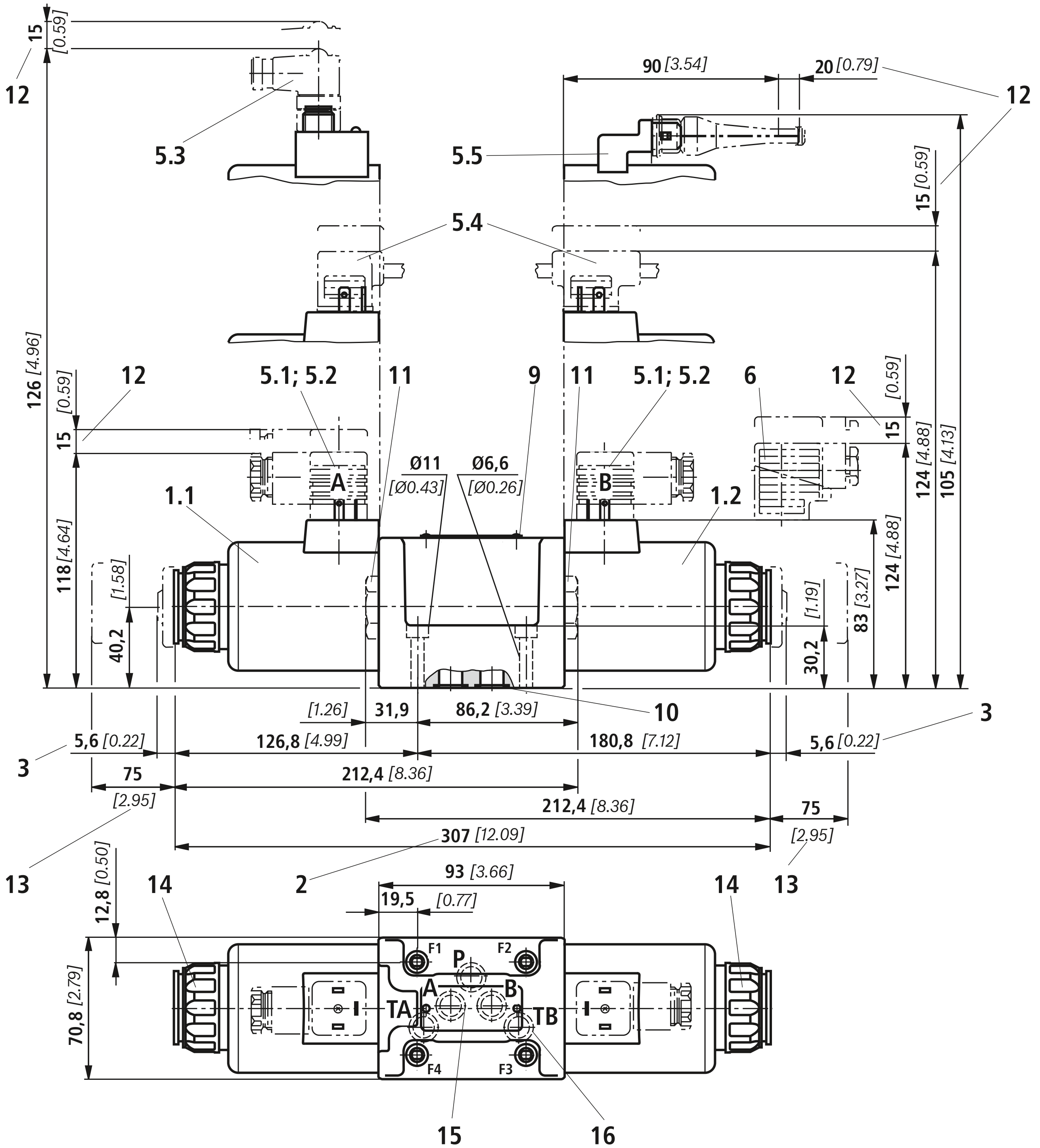
Performance limits: 3 spool positions
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

☞ **Notice!**
The specified switching power limits are valid for operation with two directions of flow (e. g. from P to A and simultaneous return flow from B to T).
Due to the flow forces acting within the valves, the permissible switching power limit may be considerably lower with only one direction of flow (e. g. from P to A while port B is blocked)!
In such applications, please consult us!
The switching power limit was established while the solenoids were at operating temperature, at 10 % undervoltage and without tank pre-loading.

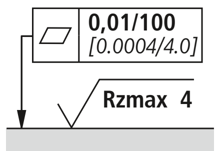


Characteristic curve	Symbol
14	E67
15	E – "QS"
16	U
17	R
18	W

Unit dimensions
(dimensions in mm)



> ☞ **Notice!**
> Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.



Required surface quality of the valve mounting face

Item explanations, valve mounting screws and **subplates** see page 17.

Unit dimensions

1.1 Solenoid "a"
1.2 Solenoid "b"
2 Dimension for solenoid **without** and **with concealed** manual override "**N9**" (standard)
3 Dimension for solenoid **with** manual override "**N**"
5.1 Mating connector **without** circuitry for connector "K4" (separate order, see page 18 and data sheet 08006)
5.2 Mating connector **without** circuitry for connector "K4K" (separate order, see data sheet 08006)
5.3 Mating connector angled with M12x1 plug-in connection and status LED for connector "K72L" (separate order, see data sheet 08006)
5.4 Double valve mating connector **without/with** circuitry for connector "K4" (separate order, see data sheet 08006)
5.5 Mating connector (AMP Junior Timer) for connector "C4Z" (separate order, see data sheet 08006)
6 Mating connector **with** circuitry for connector "K4" (separate order, see page 18 and data sheet 08006)
9 Name plate
10 Identical seal rings for ports A, B, P, TA, TB
11 Plug screw for valves with one solenoid
12 Space required to remove the mating connector/ angled socket
13 Space required to remove the coil
14 Lock nut, tightening torque M_A = $14.5^{\pm 1.5}$ Nm *[$10.69^{\pm 1.1}$ ft-lbs]*
15 Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
16 Connection TB can only be used in connection with separately produced bore

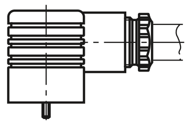
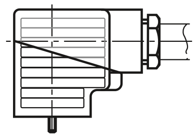
Subplates according to data sheet 45054 (separate order)
G 66/01 (G3/8)
G 67/01 (G1/2)
G 534/01 (G3/4)
G 66/12 (SAE-6; 9/16-18) [1)]
G 67/12 (SAE-8; 3/4-16) [1)]
G 534/12 (SAE-12; 1-1/16-12) [1)]
[1)] Upon request

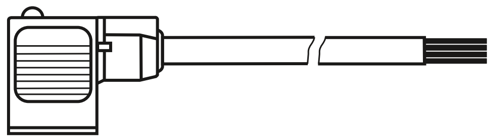
Valve mounting screws (separate order)
4 hexagon socket head cap screws metric
ISO 4762 - M6 x 40 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_A = 12.5 Nm *[9.2 ft-lbs]* ±10 %,
material no. **R913000058**
or
4 hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
tightening torque M_A = 15.5 Nm *[11.4 ft-lbs]* ±10 %

4 hexagon socket head cap screws UNC
1/4-20 UNC x 1-1/2" ASTM-A574
(friction coefficient μ_{total} = 0.19 to 0.24);
tightening torque M_A = 25 Nm *[18.4 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17);
tightening torque M_A = 19 Nm *[14.0 ft-lbs]* ±10 %,
material no. **R978800710**

With different friction coefficients, the tightening torques are to be adjusted accordingly!

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006						
			Material no.			
Connection	**Valve side**	**Color**	Without circuitry	With indicator light 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Zener diode suppression circuit 24 V
M16 x 1.5	a	Gray	**R901017010**	**–**	**–**	**–**
	a/b	Black	**R901017011**	**R901017022**	**R901017025**	**R901017026**
1/2" NPT (Pg16)	a	Red/brown	**R900004823**	**–**	**–**	**–**
	a/b	Black	**R900011039**	**R900057453**	**R900842566**	**–**

Details upon request				
			Material number	
			Type VT-SSBA1-PWM-1X/V001/5,00 as fast switching amplifier	Type VT-SSBA1-PWM-1X/V002/5,00 for energy reduction
M16 x 1.5	a/b	black	**R901265633**	**R901290194**

Project planning information:
Temperature range and maximum operating pressure in case of use at low temperatures

Connection	**Pressure**	**Temperature range** in °C *[°F]*
– P, A, B, T	Static 100 bar *[1450 psi]*	–40 ... –35 *[–40 ... –31]*
– P, A, B	Dynamic from 100 bar *[1450 psi]* to 350 bar *[5076 psi]* linearly increasing as temperature function	–35 ... –30 *[–31 ... –22]*
– T	Dynamic from 100 bar *[1450 psi]* to 210 bar *[3050 psi]* linearly increasing as temperature function	–35 ... –30 *[–31 ... –22]*
– P, A, B, T	Maximum operating pressure	–30 ... +50 *[–22 ... 122]*

☞ **Notice!**
With valves for low temperatures, the "T12" control spool play is to be preferably selected.

More information

▶ Subplates	Data sheet 45054
▶ Inductive position switches and proximity sensors (contactless)	Data sheet 24830
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ General product information on hydraulic products	Data sheet 07008
▶ Assembly, commissioning and maintenance of industrial valves	Data sheet 07003
▶ Selection of the filters	www.boschrexroth.com/filter

Notes

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Hydraulics
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97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

2/2 directional spool valve direct operated with solenoid actuation

RE 18136-06/06.12 1/10
Replaces: 10.09

Type KKDE (high-performance)

Component size 1
Component series A
Maximum operating pressure 350 bar
Maximum flow 55 l/min

H6851

Table of contents

Features

- Mounting cavity R/T-13A
- Direct operated directional spool valve with solenoid actuation
- Free-flowing in both directions
- Very low flow resistance values
- Positive overlap helps to avoid switching shocks
- Wet-pin DC solenoids
- Rotatable solenoid coil
- With concealed manual override

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code (Valve without coil) 1)

KKDE	R	1		A / H		V	*

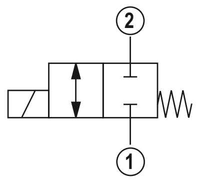
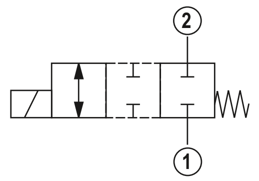
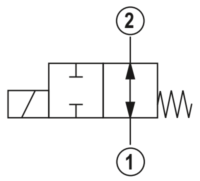
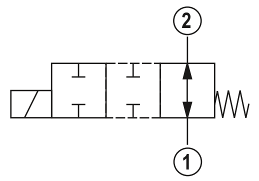
Directional spool valve, direct operated, electrically operated

Maximum operating pressure 350 bar **= R**

Component size **= 1**

2 main ports

Symbols

		**= N**
		**= P**

Further details in the plain text

Seal material

V = FKM seals (other seals upon request)

Attention! Observe compatibility of seals with hydraulic fluid used!

N0 = **without** manual override

N9 = **with** concealed manual override 4)

H = High-performance and mounting cavity R/T-13A (see page 9)

A = Component series

Valve types (without coil) 1)

Spool variant	without manual override **“N0”** Type	Material no.	with concealed manual override **“N9”** Type	Material no.
N	KKDER1NA/HN0V	R901069995	KKDER1NA/HN9V	R901069997
P	KKDER1PA/HN0V	R901069996	KKDER1PA/HN9V	R901070000

Available coils (separate order) 1)

Direct voltage DC 3)	**Material no. for coil with connector** 2) **“K4”** 03pol (2+PE) DIN EN 175301-803	**“K40”** 02pol K40 DT 04-2PA, make. Deutsch	**“C4”** 02pol C4/Z30 AMP Junior Timer
12 V	R900991678	R900729189	R900315818
24 V	R900991121	R900729190	R900315819

1) Complete valves with mounted coil upon request

2) Mating connectors (separate order), see RE 08006

3) Other voltages upon request

4) Screwable manual override “**N10**” possible (Material no. **R901051231**, separate order)

Function, section, symbols

General

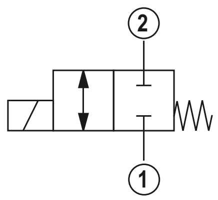
The 2/2 directional spool valves are direct operated, pressure compensated cartridge valves. They control the start, stop and direction of a flow and basically comprise a housing (1) with a movably mounted socket (2), the control spool (5) and a return spring (4).

Function

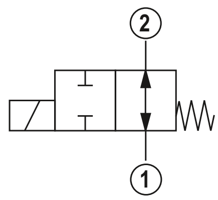
In the de-energized condition, control spool (5) is held in the initial position by the return spring (4). Control spool (5) is actuated by wet-pin DC solenoids (3). The various symbols are realized by corresponding spools (N and P). The main ports ① and ② are suitable for a continuous load with an operating pressure of 350 bar and the flow can be directed into both directions (see symbols).

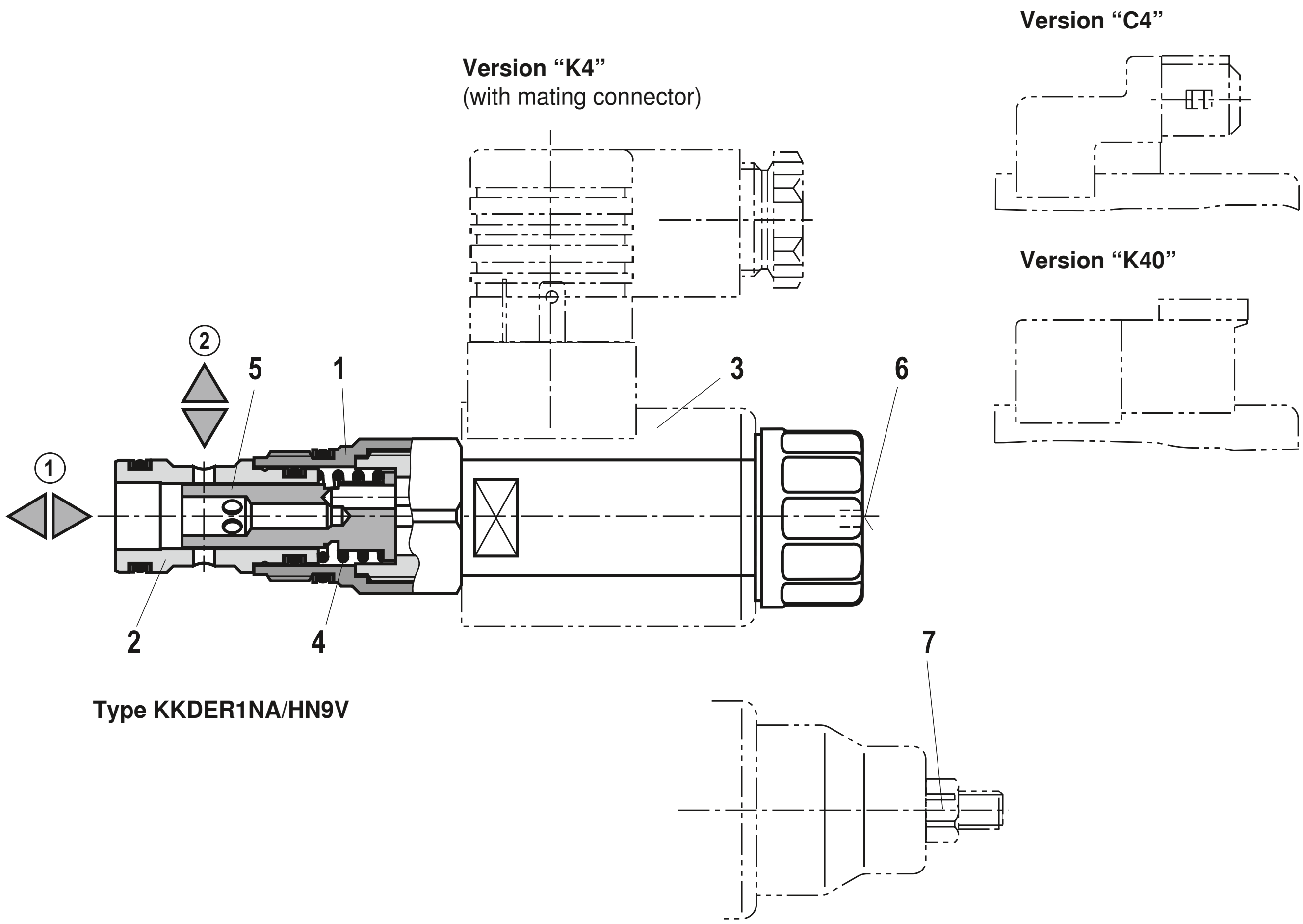
The manual override (6) allows for the switching of the valve without solenoid energization. It is also available in screwable version “N10” (7) (see page 2).

Symbol “N”



Symbol “P”





Technical data (For applications outside these parameters, please consult us!)

general

Weight	– Valve	kg	0.30
	– Coil	kg	0.25
Installation position			Any
Ambient temperature range		°C	–40 to +110

hydraulic

Maximum operating pressure	bar	350 (at all ports)
Maximum flow	l/min	55
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524; quickly bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids upon request
Hydraulic fluid temperature range	°C	–40 to +80
Viscosity range	mm^2/s	4 to 500
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]
Load cycles		10 million (at 350 bar)

electrical

Voltage type			Direct voltage
Supply voltage [2)]		V	12 DC; 24 DC
Voltage tolerance against ambient temperature			See characteristic curve page 5
Power consumption		W	22
Duty cycle		%	See characteristic curve page 5
Maximum coil temperature [3)]		°C	150
Switching time according to ISO 6403 (solenoid horizontal)	– ON	ms	≤ 80
	– OFF	ms	≤ 50
Maximum switching frequency		cy/h	15000
Protection class according to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version “K4”		IP 65 with mating connector mounted and locked
	– Version “C4”		IP 66 with mating connector mounted and locked
			IP 69K with Rexroth mating connector (Material no. R901022127)
	– Version “K40”		IP 69K with mating connector mounted and locked

[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

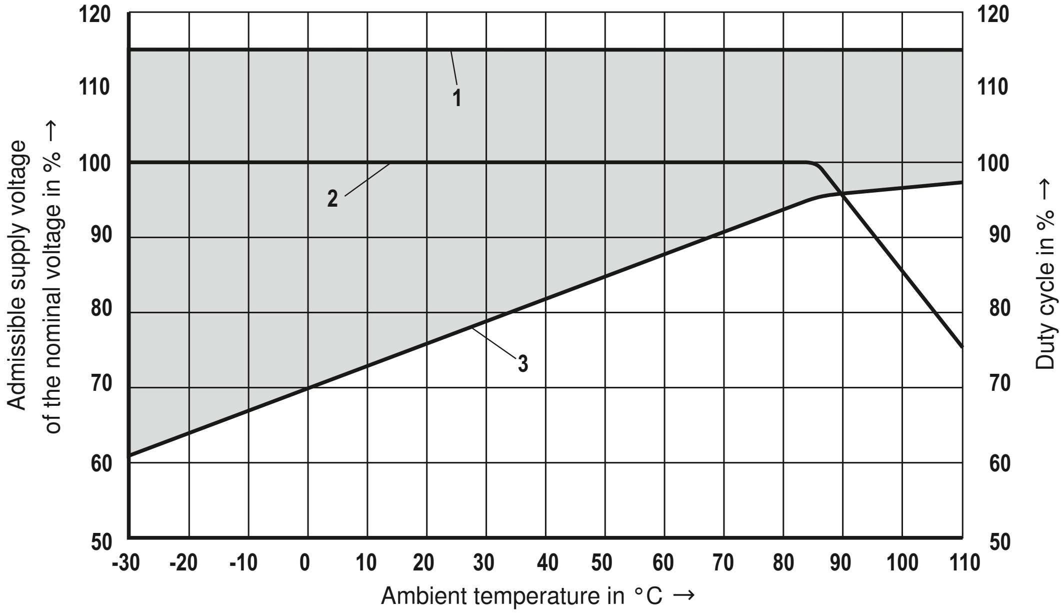
[2)] Other voltages upon request

[3)] Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

At the electrical connection “K4”, the protective earthing conductor (PE ⏚) has to be connected properly.

Voltage tolerance against ambient temperature; duty cycle

Voltage range and duty cycle depending on the ambient temperature



1 Maximum voltage

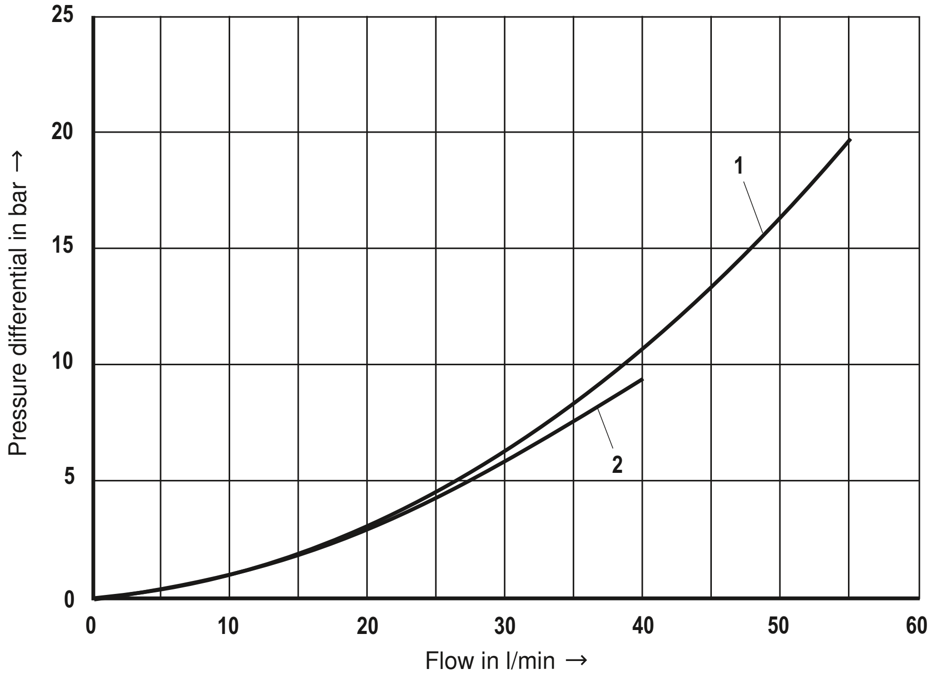
2 Duty cycle

3 Minimum response voltage

Admissible supply voltage range

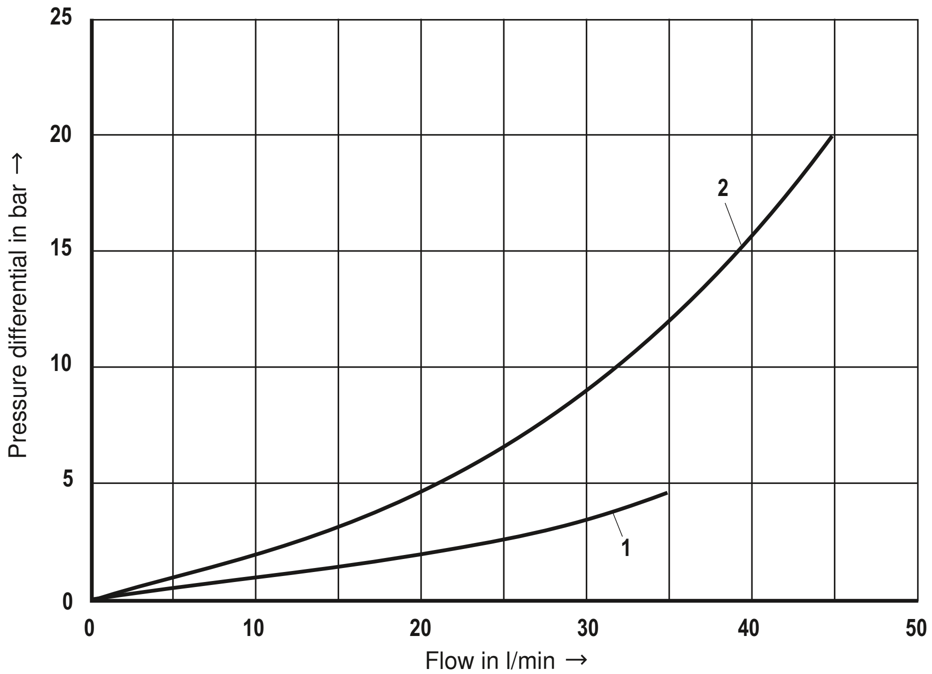
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Δp-q_V characteristic curves – symbol N



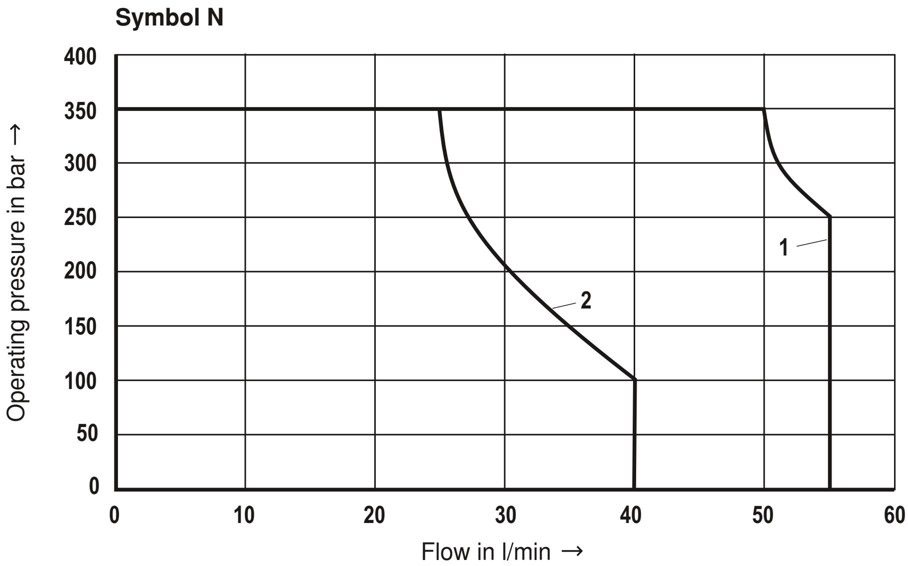
1	2 → 1
2	1 → 2

Δp-q_V characteristic curves – symbol P

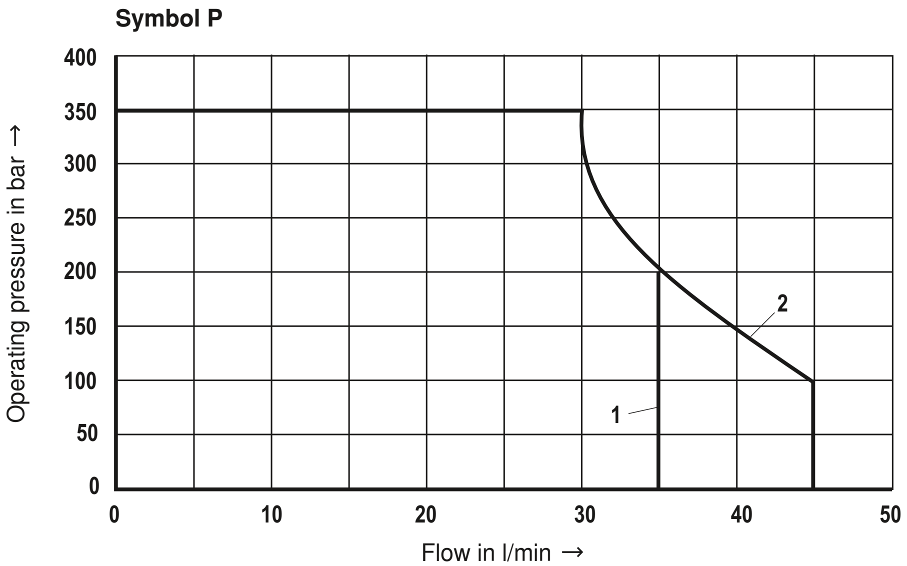


1	2 → 1
2	1 → 2

Performance limits (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)



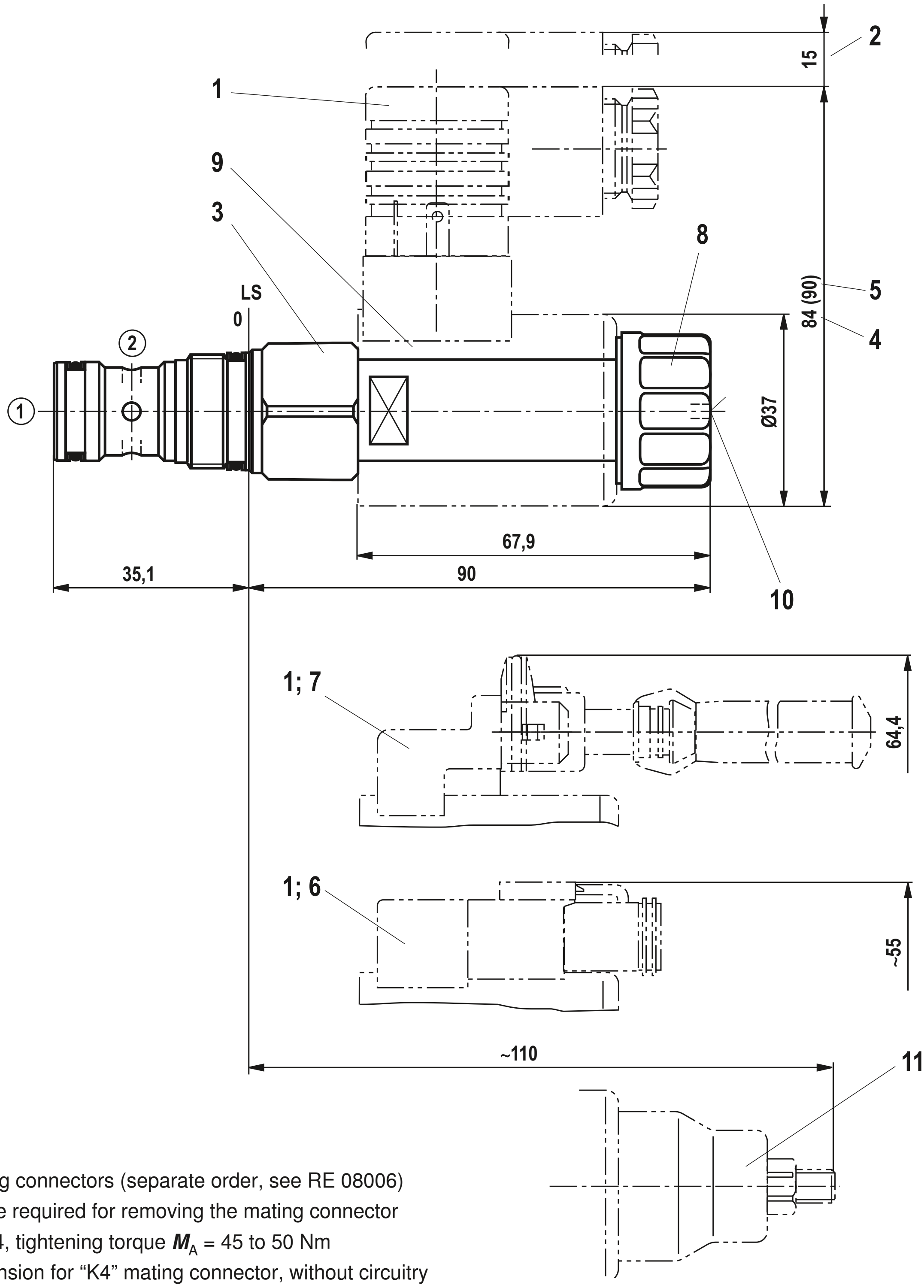
1	2 → 1
2	1 → 2



1	2 → 1
2	1 → 2

Attention!
The performance limits were determined when the solenoids were at operating temperature and at 10% undervoltage.

Unit dimensions (dimensions in mm)

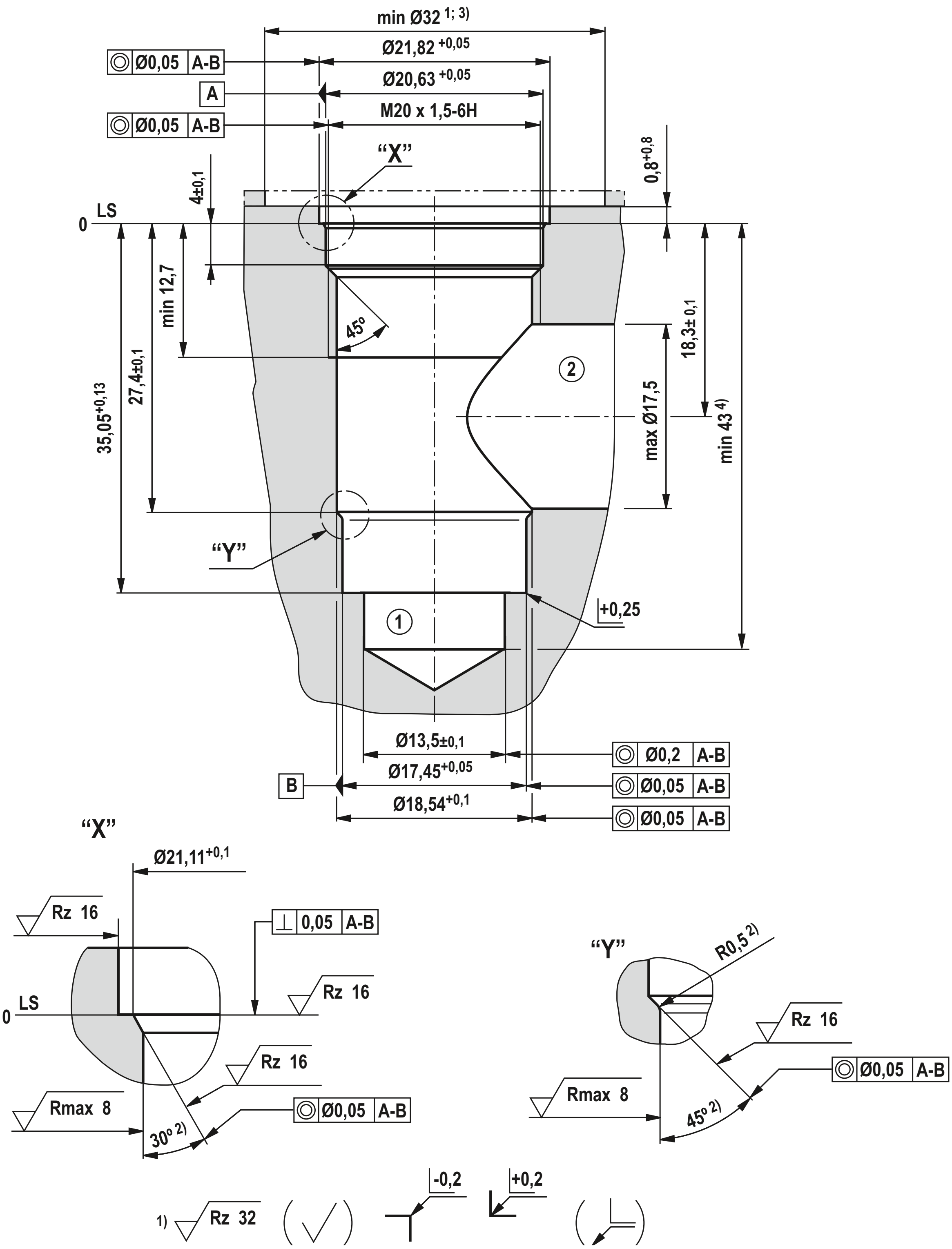


1 Mating connectors (separate order, see RE 08006)
2 Space required for removing the mating connector
3 SW24, tightening torque M_A = 45 to 50 Nm
4 Dimension for "K4" mating connector, without circuitry
5 Dimension () for "K4" mating connector, with circuitry
6 Version "K40"
7 Version "C4"
8 Nut, tightening torque $M_A = 5^{+1}$ Nm
9 Coil (separate order, see page 2)
10 Concealed manual override "N9", optional
11 Screwable manual override "N10"
(separate order, see page 2)

① = Main port 1
② = Main port 2
LS = Location shoulder

Mounting cavity R/T-13A; 2 main ports; thread M20 x 1.5

(dimensions in mm)



1) Differing from T-13A

2) All seal ring in sertion faces are rounded and free of burrs

3) with counterbore

4) Depth for moving parts

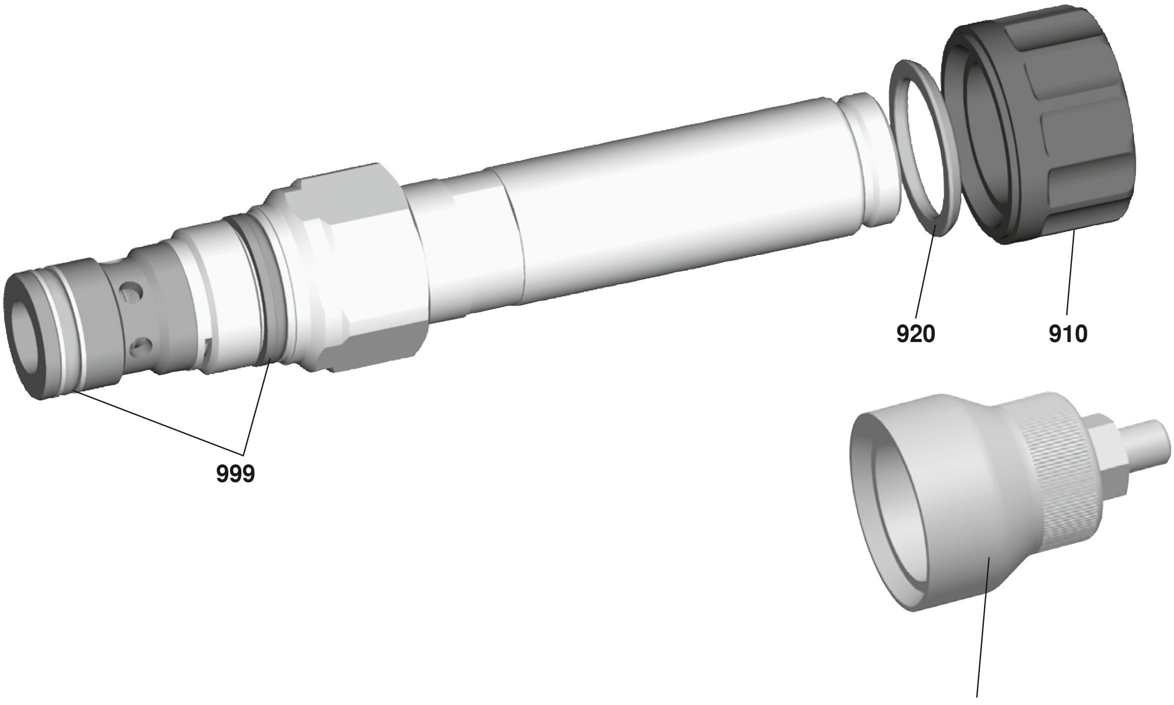
① = Main port 1

① = Main port 2

LS = Location Shoulder

Tolerance for all angles ±0.5°

Available individual components



Item	Description	Material no.
910	Nut	R900991453
920	O-ring for pole tube	R900007769
999	Seal kit of the valve	R961003236
A	Manual override “N10” [1]	R901051231

Coils, separate order, see page 2

[1] Only with ordering code “N9”, see page 2

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Rexroth
Bosch Group

3/2 directional spool valve, direct operated with solenoid actuation

Type KKDE (high-performance)

H6810

Size 1
Component series A
Maximum operating pressure 350 bar
Maximum flow 60 l/min

Table of contents

Features

– Direct operated directional spool valve with solenoid actuation
– Mounting cavity R/T-11A
– Free-flowing in both directions
– Wet-pin DC solenoids
– Rotatable solenoid coil
– with concealed manual override

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code (valve without coil) 1)

KKDE	R	1		A / H		V	*

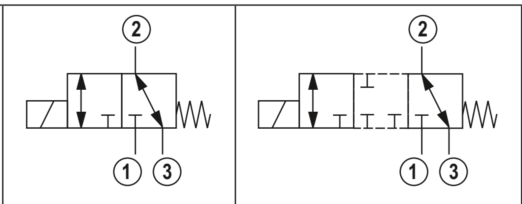
Directional spool valve, direct operated, electrically operated

Maximum operating pressure 350 bar **= R**

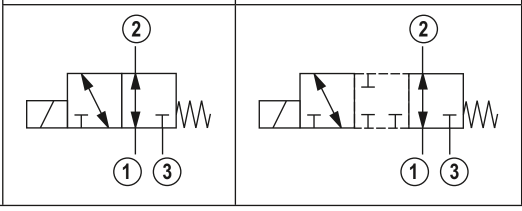
Size **= 1**

3 main ports

Symbols 2)



= C



= U

A = Component series

H = High-performance and mounting cavity R/T-11A (see page 9)

N0 = **Without** manual override
N9 = **With** concealed manual override 5)

Seal material
V = FKM seals
(Other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

Further details in the plain text

Valve types (without coil) 1)

Spool symbol	without manual override "**N0**" Type	Material no.	with concealed manual override "**N9**" Type	Material no.
C	KKDER1CA/HN0V	R901070094	KKDER1CA/HN9V	R901070103
U	KKDER1UA/HN0V	R901070099	KKDER1UA/HN9V	R901070105

Available coils (separate order) 1)

	Material no. for coil with connector 3)		
Direct voltage DC 4)	**"K4"** 03pol (2+PE) DIN EN 175301-803	**"K40"** 02pol K40 DT 04-2PA, make Deutsch	**"C4"** 02pol C4/Z30 AMP Junior Timer
12 V	R900991678	R900729189	R900315818
24 V	R900991121	R900729190	R900315819

1) Complete valves with mounted coil upon request
2) With transition function during the switching process
3) Mating connectors, separate order, see data sheet 08006
4) Other voltages upon request
5) Screwable manual override "**N10**" possible (Material no. **R901051231**, separate order)

Function, section, symbols

General

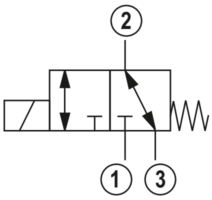
The 3/2 directional spool valves are direct operated, pressure-compensated cartridge valves. They control the start, stop and direction of a flow and basically comprise a housing (1) with a movably mounted socket (2), the control spool (5)and a return spring (4).

Function

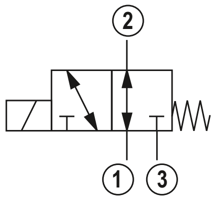
In the de-energized condition, the control spool (5) is held in the initial position by the return spring (4). The control spool (5) is actuated by wet-pin DC solenoids (3). The symbols are realized by different spools (C or U). The main ports ①, ②, and ③ are suitable for a continuous load with an operating pressure of 350 bar and the flow can be directed into both directions (see symbols).

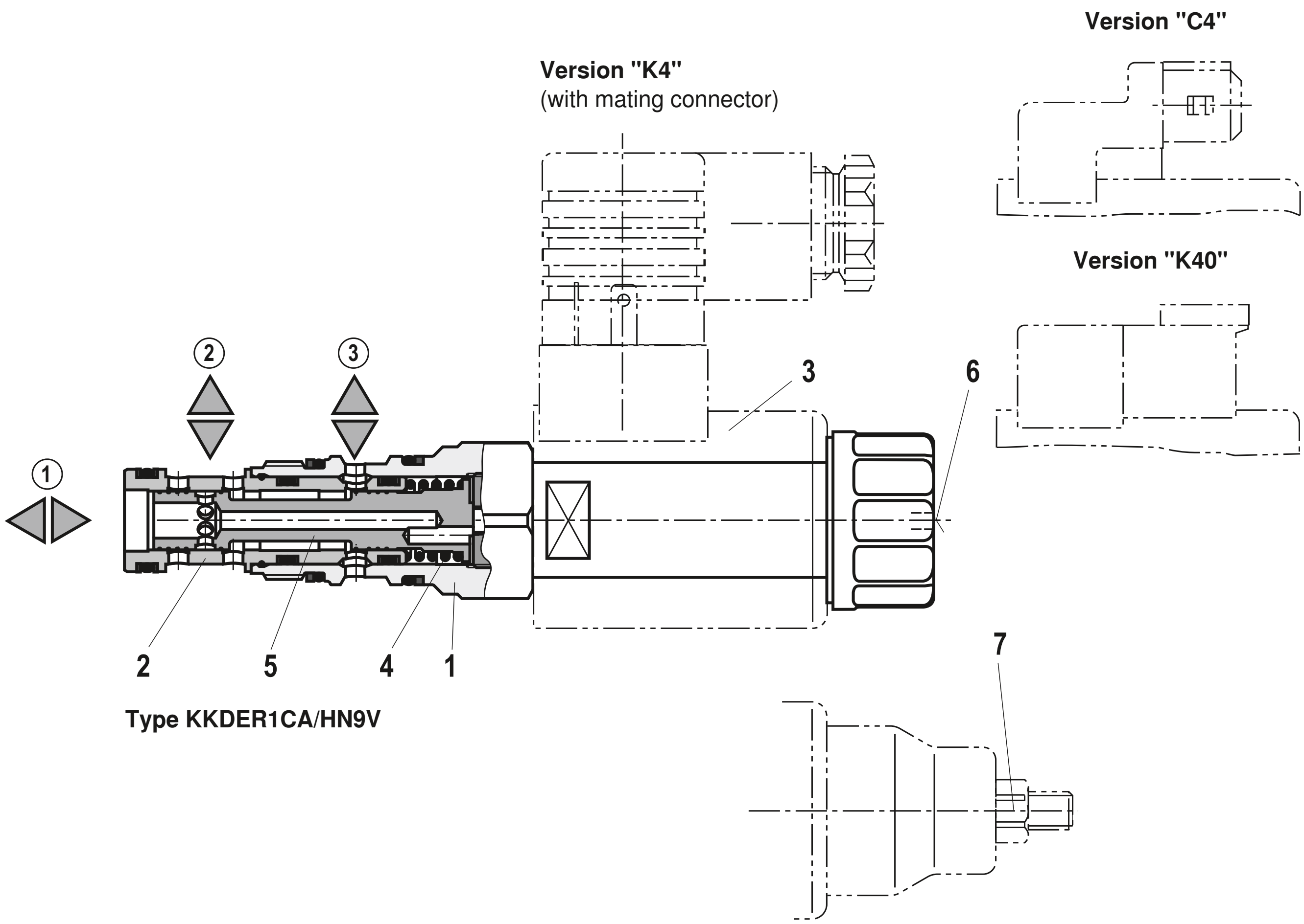
The manual override (6) allows for the switching of the valve without solenoid energization. It is also available in screwable version "N10" (7) (see page 2).

Symbol "C"



Symbol "U"





Technical data (For applications outside these parameters, please consult us!)

general

Weight	– Valve	kg	0.3
	– Coil	kg	0.25
Installation position			Any
Ambient temperature range		°C	–40 to +110

hydraulic

Maximum operating pressure	bar	350 (at all ports)
Maximum flow	l/min	60
Hydraulic fluid		See table below
Hydraulic fluid temperature range	°C	–40 to +80
Viscosity range	mm^2/s	4 to 500
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]
Load cycles		10 million (at 350 bar)

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD, HVLP, HVLPD	FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HEES	FKM	ISO 15380
		HEPR	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFAS	FKM	ISO 12922

Important information on hydraulic fluids!

- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- The flash point of the process and operating medium used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – water-containing:** Maximum pressure differential per control edge 175 bar, otherwise, increased cavitation erosion!
  Tank pre-loading < 1 bar or > 20 % of the pressure differential. The pressure peaks should not exceed the maximum operating pressures!
- **Environmentally compatible:** When using environmentally compatible hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the medium (700 mg zinc per pole tube).

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of the filters see www.boschrexroth.com/filter.

Technical data (For applications outside these parameters, please consult us!)

electric

Voltage type			Direct voltage
Supply voltage [2]		V	12 DC; 24 DC
Voltage tolerance against ambient temperature			See characteristic curve below
Power consumption		W	22
Duty cycle		%	See characteristic curve below
Maximum coil temperature [3]		°C	150
Switching time according to ISO 6403 (solenoid horizontal)	– ON	ms	≤ 80
	– OFF	ms	≤ 50
Maximum switching frequency		cy/h	15000
Protection class according to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version "K4"		IP 65 with mating connector mounted and locked
	– Version "C4"		IP 66 with mating connector mounted and locked
			IP 69K with Rexroth mating connector (Material no. R901022127)
	– Version "K40"		IP 69K with mating connector mounted and locked

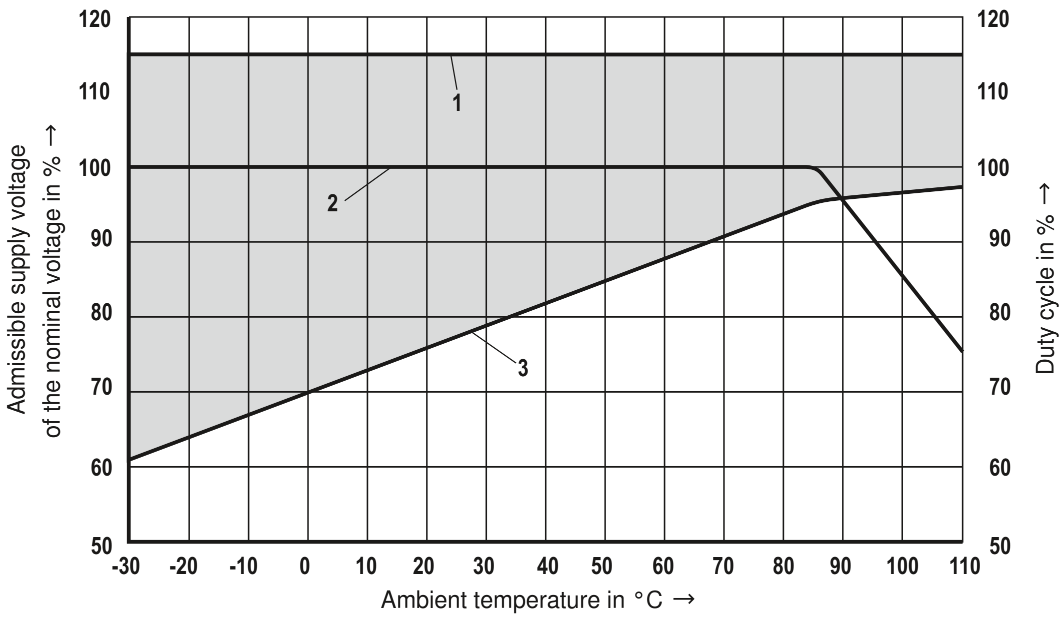
[2] Other voltages upon request

[3] Due to the surface temperatures of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

At the electrical connection "K4", the protective earthing conductor (PE ⏚) has to be connected properly.

Voltage tolerance against ambient temperature; duty cycle

Voltage range and duty cycle depending on the ambient temperature



1 Maximum voltage

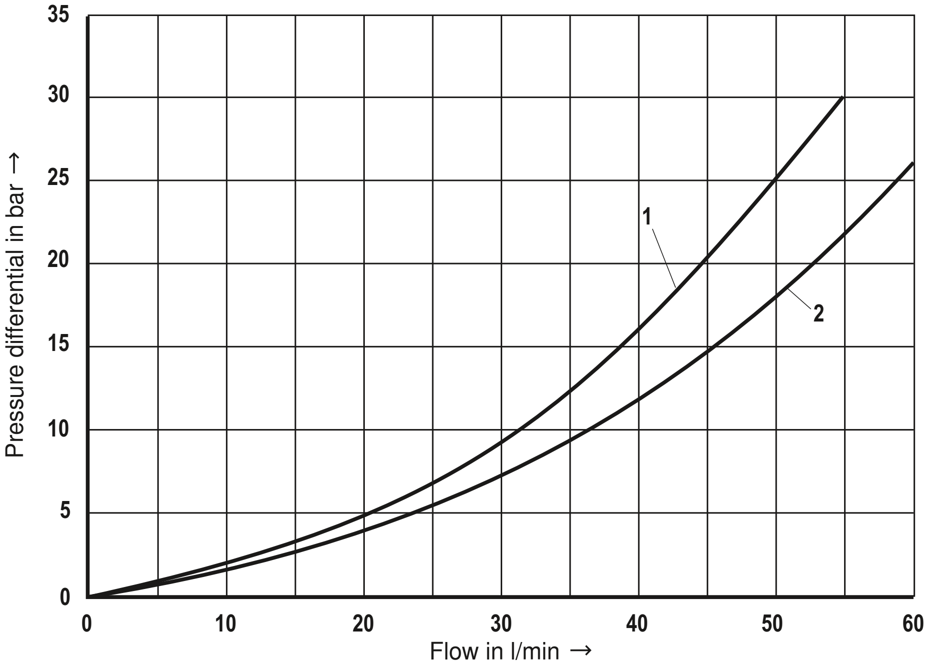
2 Duty cycle

3 Minimum response voltage

Admissible supply voltage range

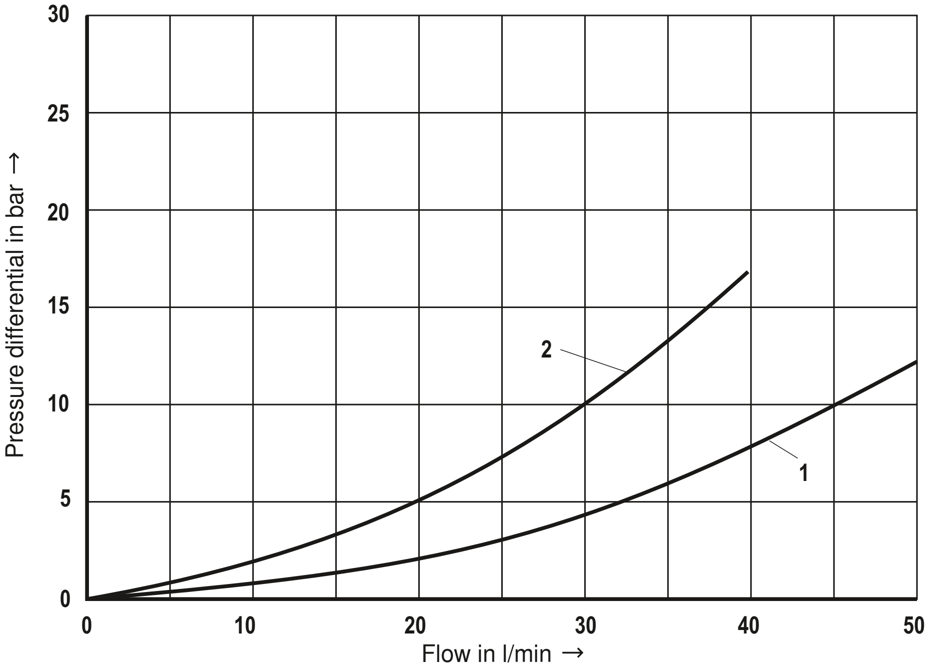
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Δp-q_V characteristic curves – symbol C



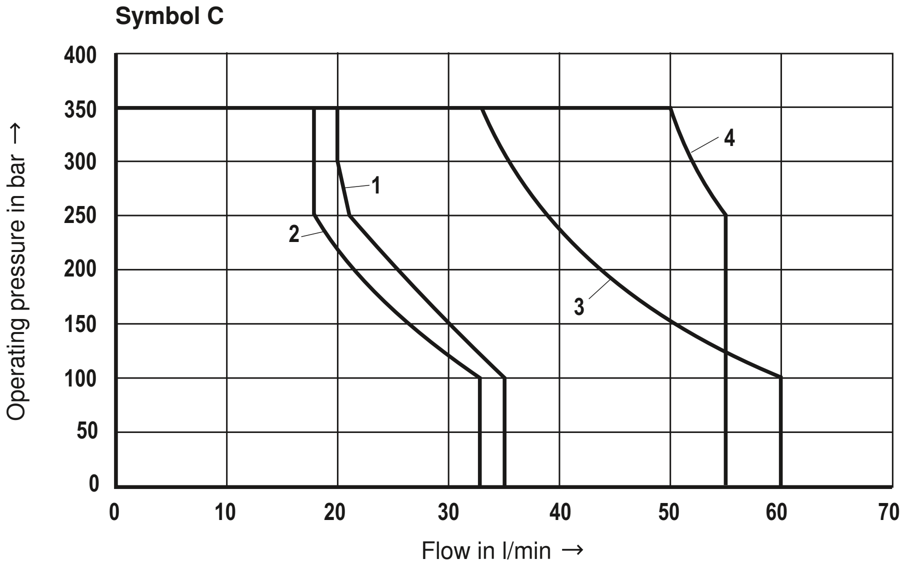
1	① → ② ② → ①
2	③ → ② ② → ③

Δp-q_V characteristic curves – symbol U



1	① → ② ② → ①
2	③ → ② ② → ③

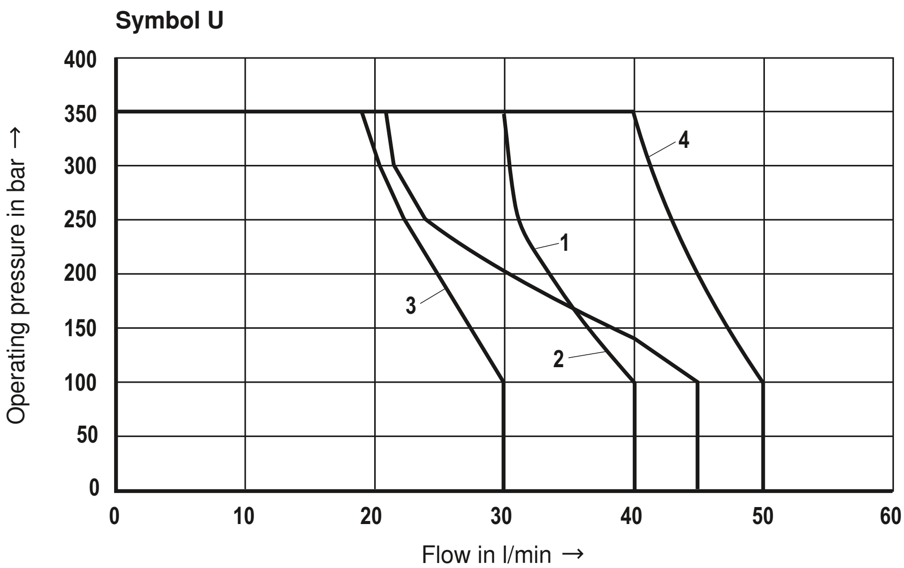
Performance limits (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)



Attention!

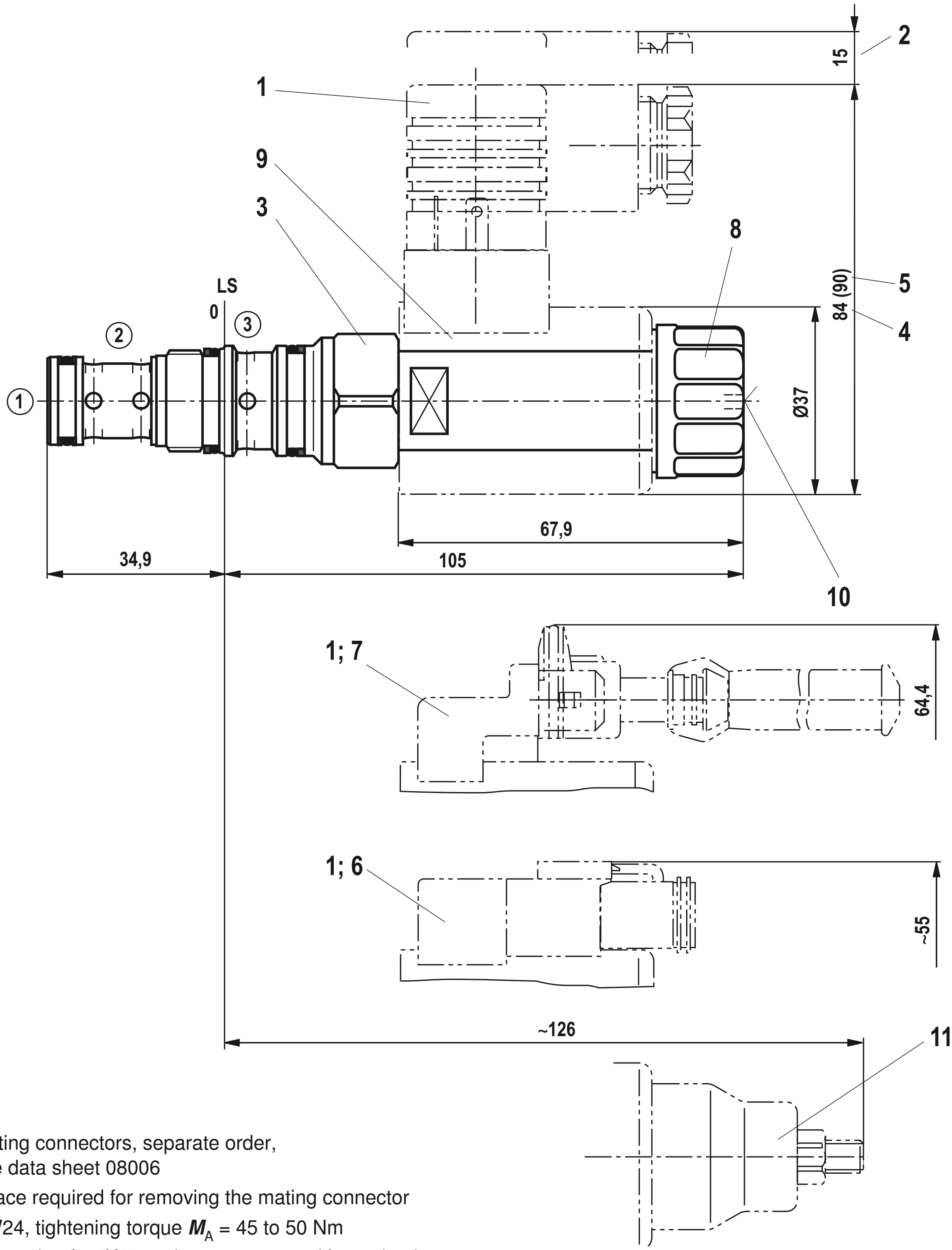
The performance limits were determined when the solenoids were at operating temperature and at 10 % undervoltage.

1	① → ②
2	② → ③
3	③ → ②
4	② → ①



1	① → ②
2	② → ③
3	③ → ②
4	② → ①

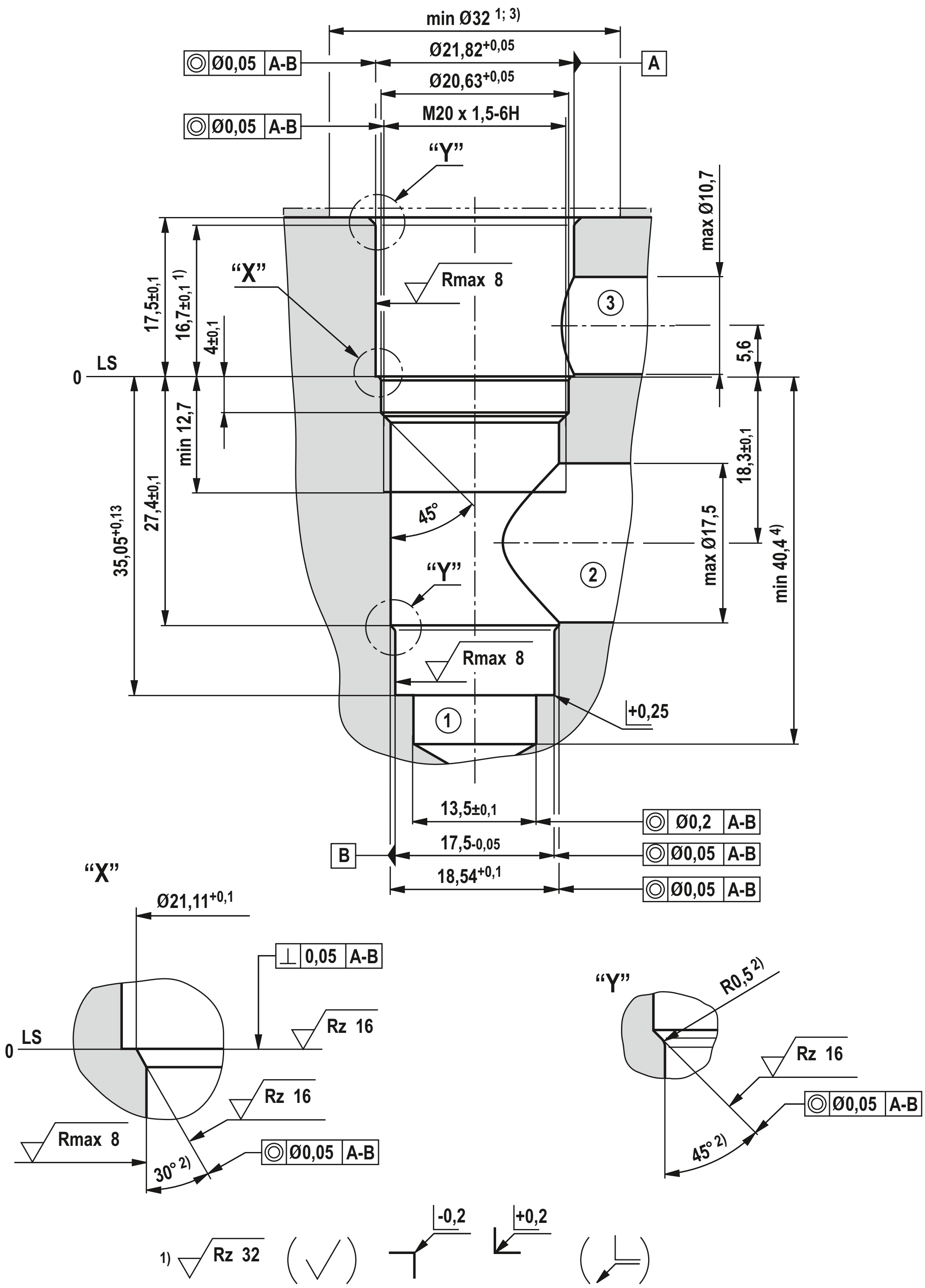
Unit dimensions (dimensions in mm)



- **1** Mating connectors, separate order, see data sheet 08006
- **2** Space required for removing the mating connector
- **3** SW24, tightening torque $\boldsymbol{M}_A$ = 45 to 50 Nm
- **4** Dimension for "K4" mating connector, without circuitry
- **5** Dimension () for "K4" mating connector, with circuitry
- **6** Version "K40"
- **7** Version "C4"
- **8** Nut, tightening torque $\boldsymbol{M}_A = 5^{+1}$ Nm
- **9** Coil (separate order, see page 2)
- **10** Concealed manual override "N9", optional
- **11** Screwable manual override "N10" (separate order, see page 2)

① = Main port 1
② = Main port 2
③ = Main port 3
LS = Location shoulder

Mounting cavity R/T-11A; 3 main ports; thread M20 x 1.5 (dimensions in mm)

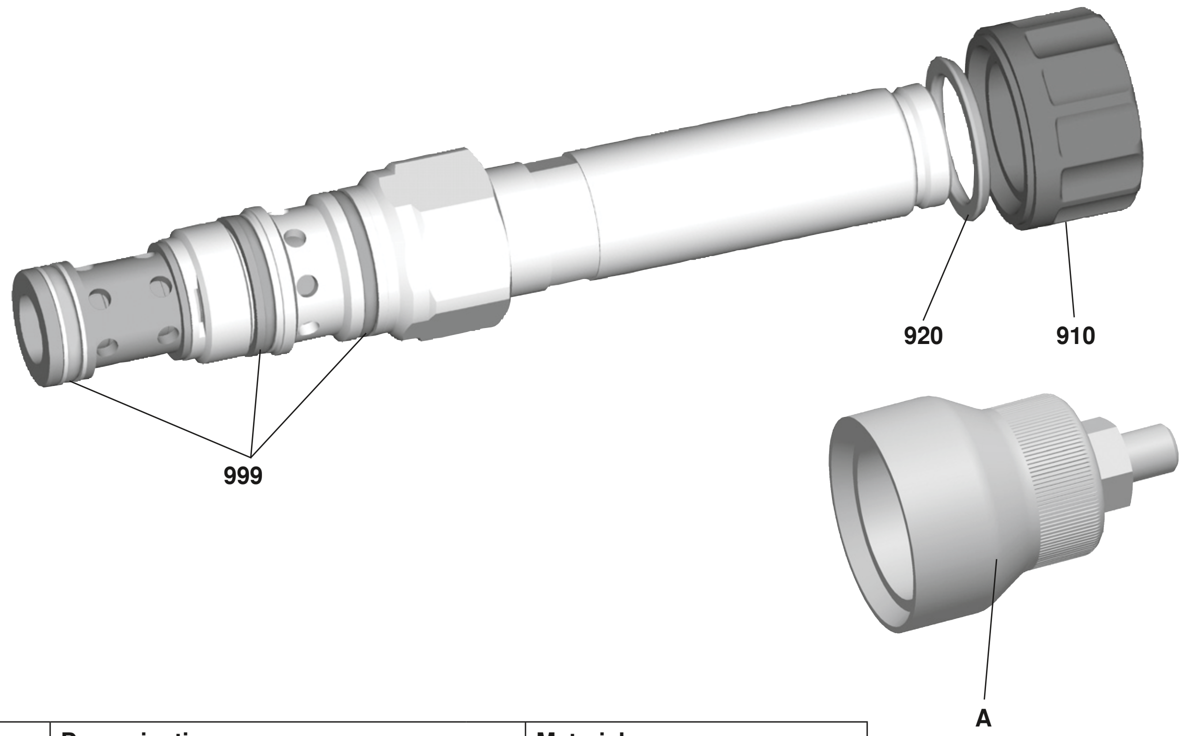


[1] Differing from T-11A
[2] All seal ring insertion faces are rounded and free of burrs
[3] With counterbore
[4] Depth for moving parts

① = Main port 1
② = Main port 2
③ = Main port 3

LS = Location shoulder
Tolerance for all angles ±0.5°

Available individual components



Item	Denomination	Material no.
910	Nut	R900991453
920	O-ring for pole tube	R900007769
999	Seal kit of the valve	R961003235
A	Manual override "N10" [1)]	R901051231

Coils, separate order, see page 2

[1)] Only with ordering code "N9", see page 2

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Rexroth
Bosch Group

4/2 directional spool valve direct operated with solenoid actuation

RE 18136-05/06.12 1/10
Replaces: 10.09

Type KKDE (high-performance)

H6812

Component size 1
Component series A
Maximum operating pressure 350 bar
Maximum flow 40 l/min

Table of contents

Features

- Mounting cavity R/T-31A
- Direct operated directional spool valve with solenoid actuation
- Free-flowing in both directions
- Wet-pin DC solenoids
- Rotatable solenoid coil
- With concealed manual override

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code (Valve without coil) 1)

KKDE	R	1		A / H		V	*

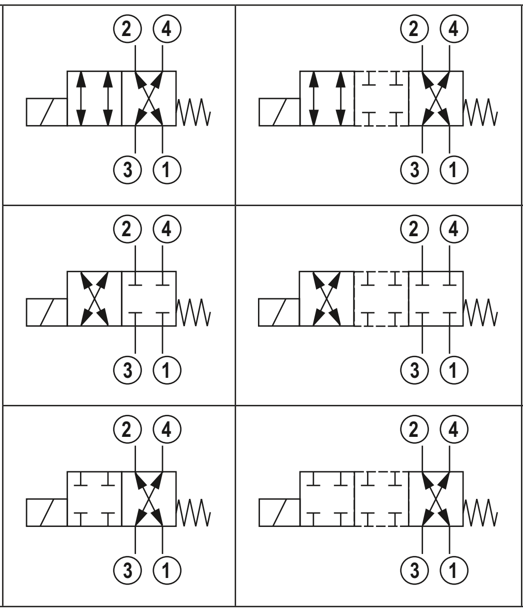
Directional spool valve, direct operated, electrically operated — KKDE

Maximum operating pressure 350 bar = R

Component size = 1

4 main ports

Symbols



= D

= E

= F

A = Component series

H = High-performance and mounting cavity R/T-31A (see page 9)

N0 = **without** manual override

N9 = **with** concealed manual override 4)

Seal material

V = FKM seals (other seals upon request)

Attention! Observe compatibility of seals with hydraulic fluid used!

* Further details in the plain text

Valve types (without coil) 1)

Spool symbol	without manual override "**N0**" Type	Material no.	with concealed manual override "**N9**" Type	Material no.
D	KKDER1DA/HN0V	R901070118	KKDER1DA/HN9V	R901070125
E	KKDER1EA/HN0V	R901070123	KKDER1EA/HN9V	R901070127
F	KKDER1FA/HN0V	R901070124	KKDER1FA/HN9V	R901070129

Available coils (separate order) 1)

Direct voltage DC 3)	Material no. for coil with connector 2) "K4" 03pol (2+PE) DIN EN 175301-803	"K40" 02pol K40 DT 04-2PA, make. Deutsch	"C4" 02pol C4/Z30 AMP Junior Timer
12 V	R900991678	R900729189	R900315818
24 V	R900991121	R900729190	R900315819

1) Complete valves with mounted coil upon request

2) Mating connectors (separate order), see RE 08006

3) Other voltages upon request

4) Screwable manual override **"N10"** possible (Material no. **R901051231**, separate order)

Function, section, symbols

General

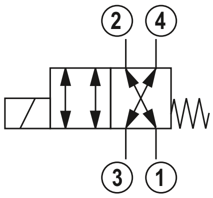
The 4/2 directional spool valves are direct operated, pressure compensated cartridge valves. They control the start, stop and direction of a flow and basically comprise a housing (1) with a movably mounted socket (2), the control spool (5) and a return spring (4).

Function

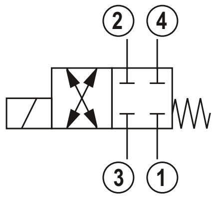
In the de-energized condition, control spool (5) is held in the initial position by the return spring (4). Control spool (5) is actuated by wet-pin DC solenoids (3). The various symbols are realized by corresponding spools (D; E, and F). The main ports ①, ②, ③, and ④ are suitable for a continuous load with an operating pressure of 350 bar and the flow can be directed into both directions (see symbols).

The manual override (6) allows for the switching of the valve without solenoid energization. It is also available in screwable version "N10" (7) (see page 2).

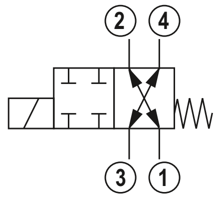
Symbol "D"



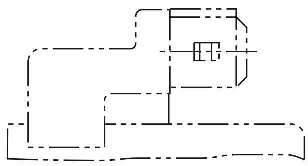
Symbol "E"



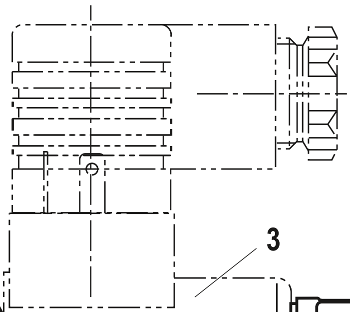
Symbol "F"



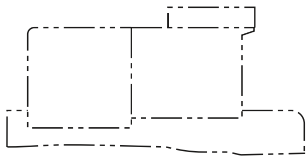
Version "C4"

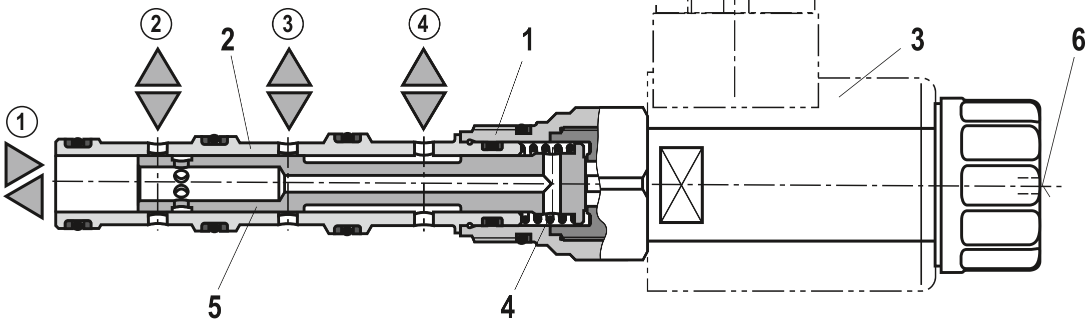


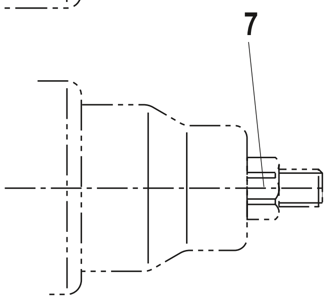
Version "K4"
(with mating connector)



Version "K40"







Type KKDER1EA/HN9V

Technical data (For applications outside these parameters, please consult us!)

general

Weight	– Valve	kg	0.35
	– Coil	kg	0.25
Installation position			Any
Ambient temperature range		°C	–40 to +110

hydraulic

Maximum operating pressure	bar	350 (at all ports)
Maximum flow	l/min	40
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524; quickly bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids upon request
Hydraulic fluid temperature range	°C	–40 to +80
Viscosity range	mm^2/s	4 to 500
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]
Load cycles		10 million (at 350 bar)

electrical

Voltage type			Direct voltage
Supply voltage [2)]		V	12DC; 24DC
Voltage tolerance against ambient temperature			See characteristic curve page 5
Power consumption		W	22
Duty cycle		%	See characteristic curve page 5
Maximum coil temperature [3)]		°C	150
Switching time according to ISO 6403 (solenoid horizontal)	– ON	ms	≤ 80
	– OFF	ms	≤ 50
Maximum switching frequency		cy/h	15000
Protection class according to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version “K4”		IP 65 with mating connector mounted and locked
	– Version “C4”		IP 66 with mating connector mounted and locked
			IP 69K with Rexroth mating connector (Material no. R901022127)
	– Version “K40”		IP 69K with mating connector mounted and locked

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

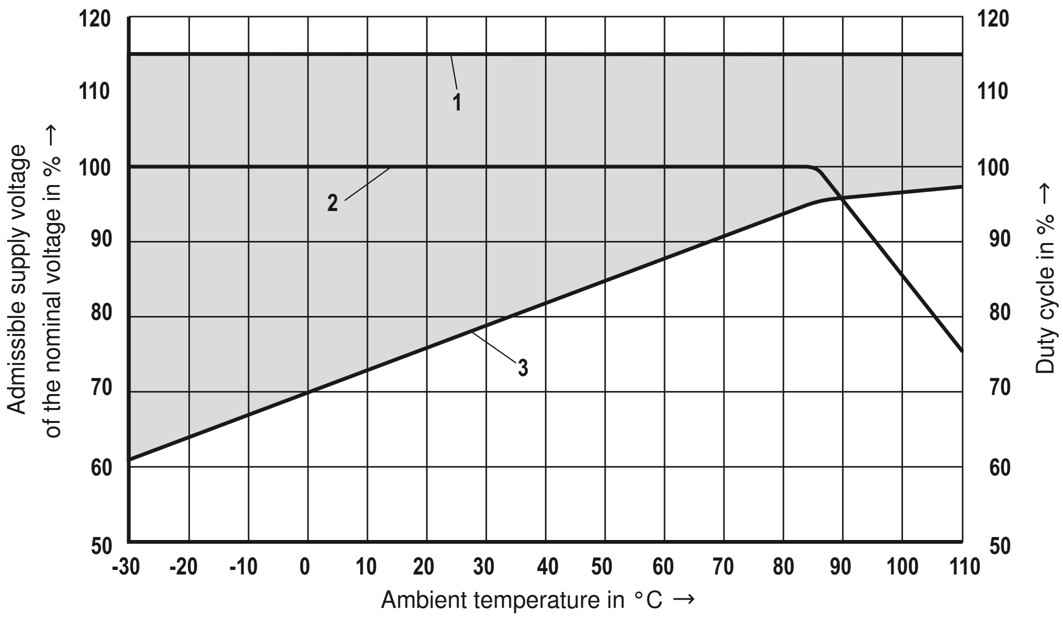
2) Other voltages upon request

3) Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

At the electrical connection “K4”, the protective earthing conductor (PE ⏚) has to be connected properly.

Voltage tolerance against ambient temperature; duty cycle

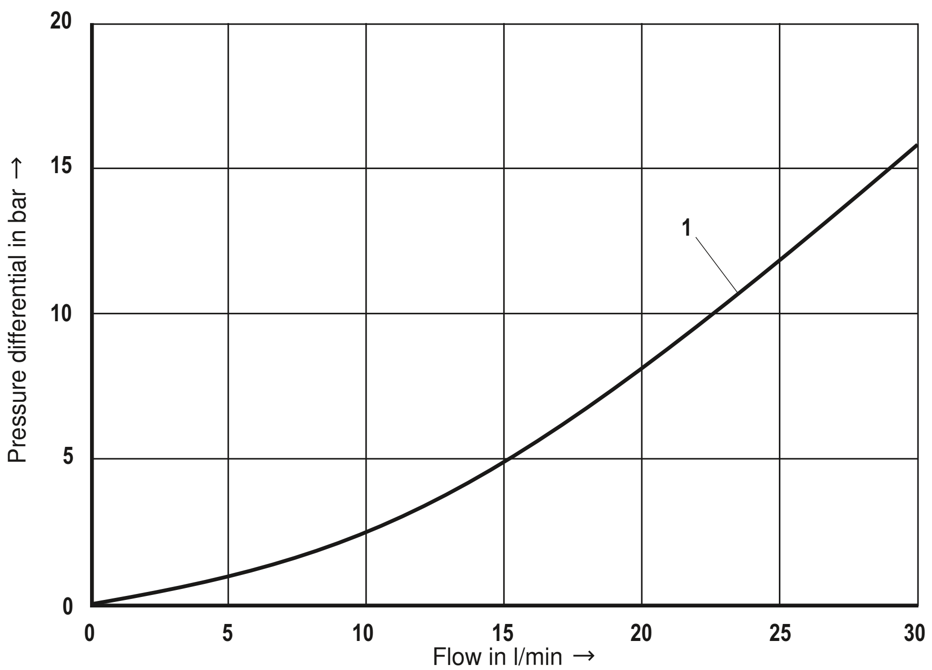
Voltage range and duty cycle depending on the ambient temperature



1 Maximum voltage
2 Duty cycle
3 Minimum response voltage
Admissible supply voltage range

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

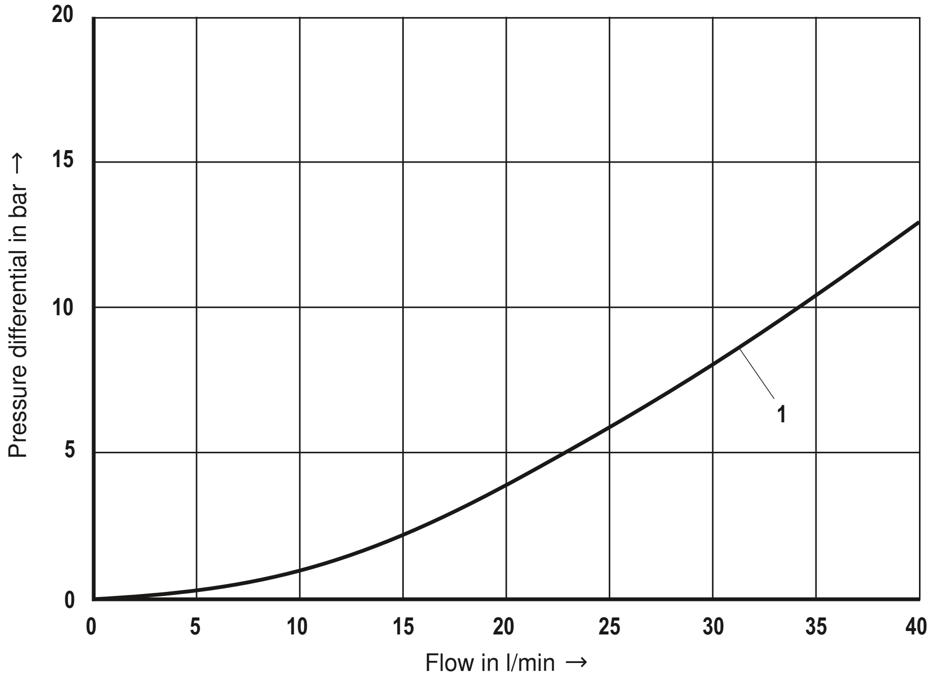
***Δp*-*q_V* characteristic curves – symbol D**



1	1 → 2 2 → 1 3 → 4 4 → 3

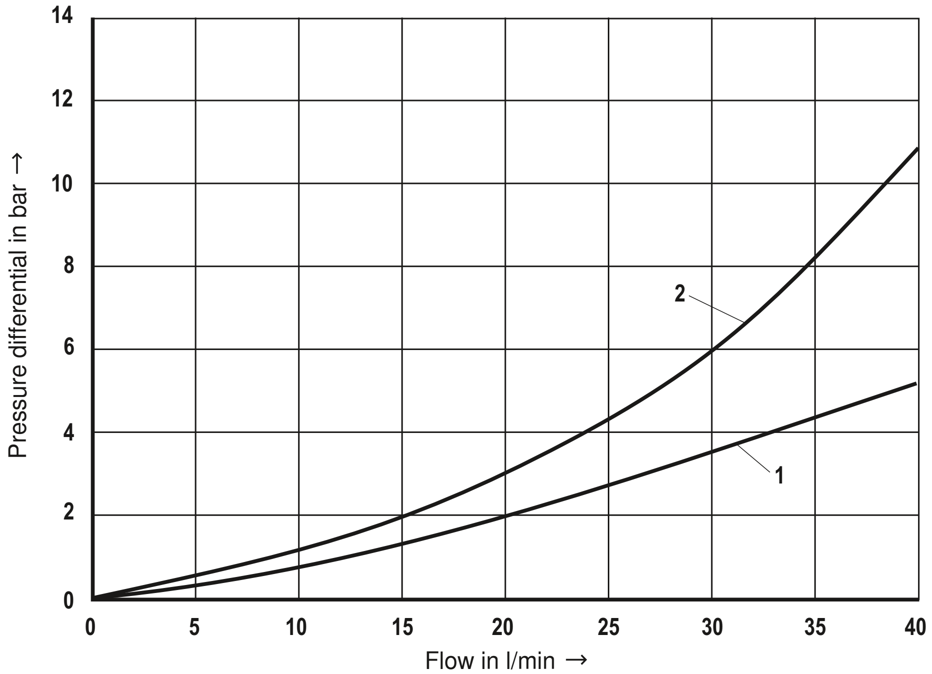
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Δp-q_V characteristic curves – symbol E



1	1 → 2 3 → 4 2 → 1 4 → 3

Δp-q_V characteristic curves – symbol F



1	1 → 2 2 → 1
2	3 → 4 4 → 3

Performance limits (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

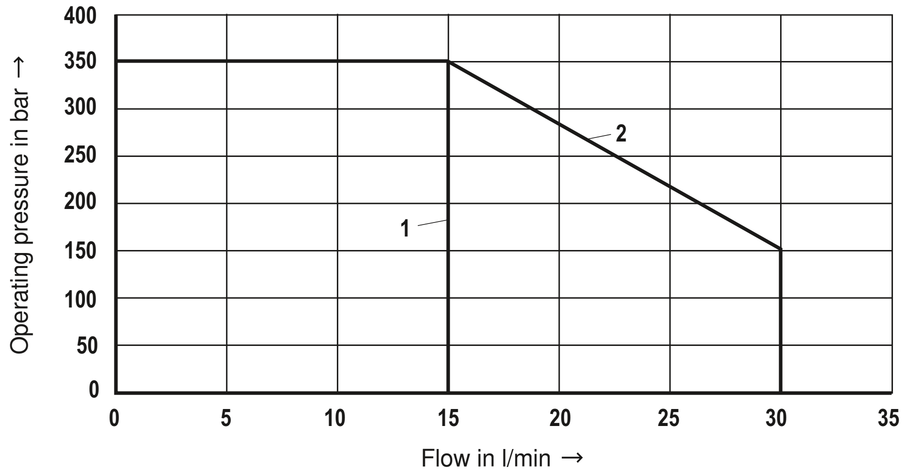
Attention!

The specified performance limits are valid for operation with two directions of flow (e.g. symbol D: ① to ② and simultaneous return flow from ④ to ③).

Due to the flow forces acting within the valves, the permissible performance limit may be considerably lower with only one direction of flow (e. g. from ① to ② while port B is blocked)! In such cases, please consult us!

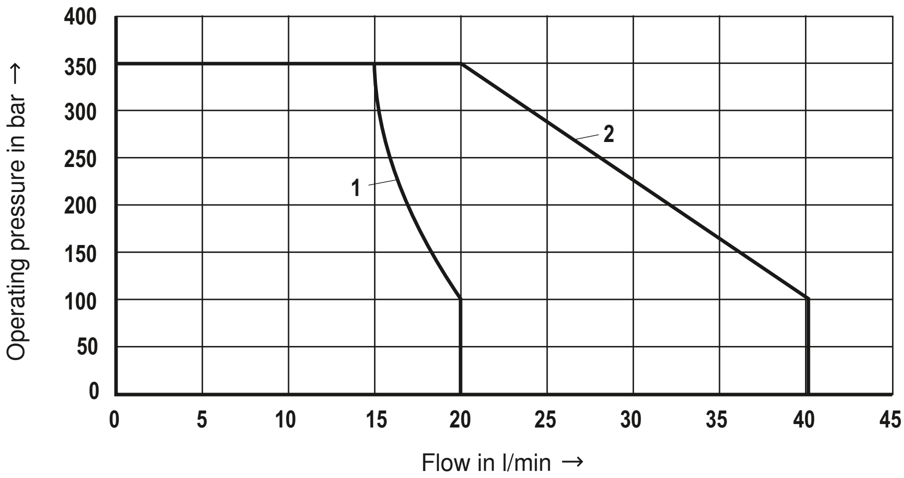
The performance limits were determined when the solenoids were at operating temperature and at 10 % undervoltage and without tank pre-loading.

Symbol D



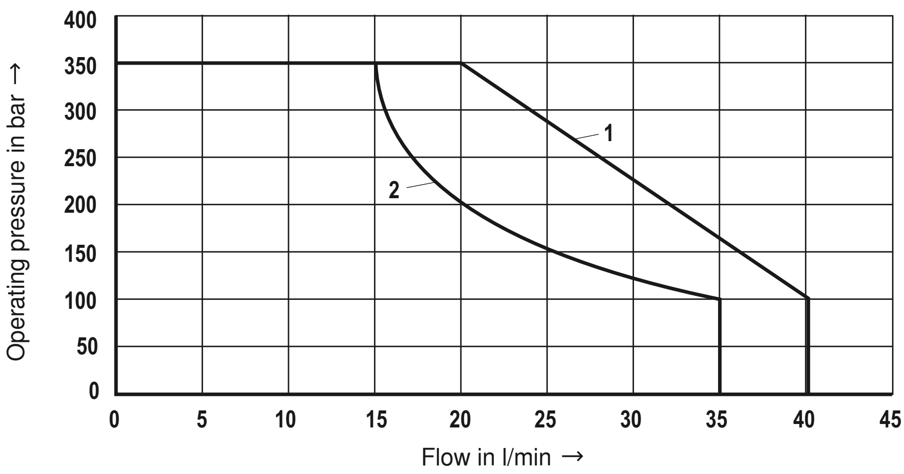
1	1 → 2 → 4 → 3
2	3 → 4 → 2 → 1

Symbol E



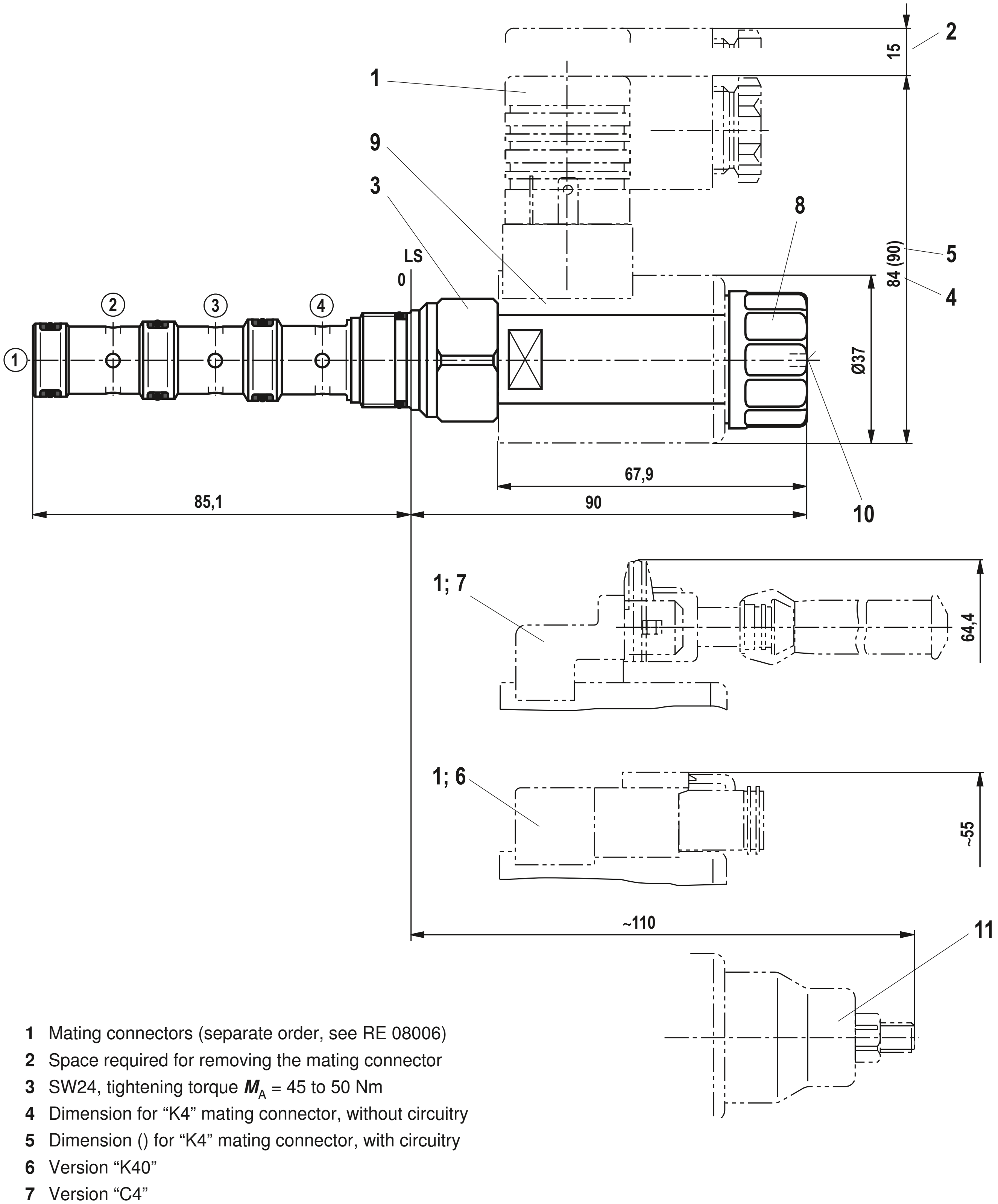
1	1 → 2 → 4 → 3
2	3 → 4 → 2 → 1

Symbol F



1	1 → 2 → 4 → 3
2	3 → 4 → 2 → 1

Unit dimensions (dimensions in mm)

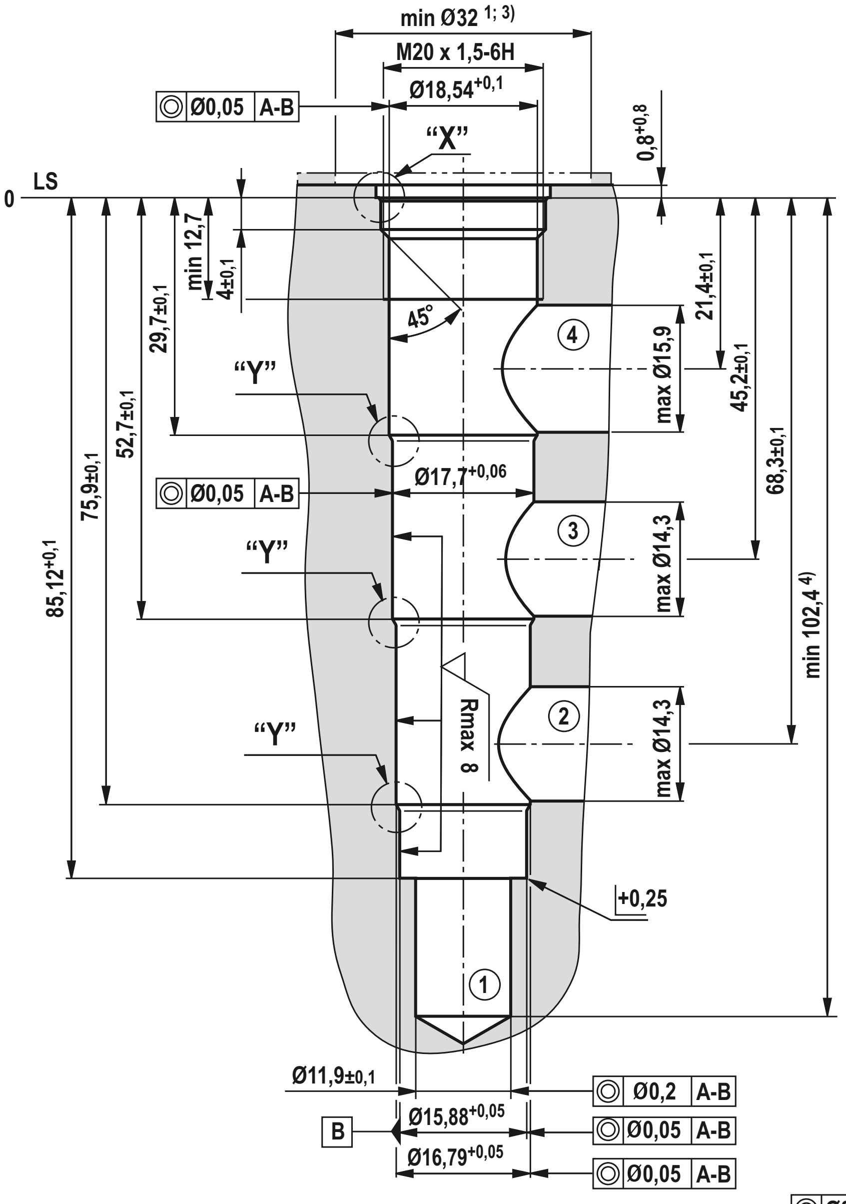


1 Mating connectors (separate order, see RE 08006)
2 Space required for removing the mating connector
3 SW24, tightening torque $\boldsymbol{M}_A$ = 45 to 50 Nm
4 Dimension for “K4” mating connector, without circuitry
5 Dimension () for “K4” mating connector, with circuitry
6 Version “K40”
7 Version “C4”
8 Nut, tightening torque $\boldsymbol{M}_A = 5^{+1}$ Nm
9 Coil (separate order, see page 2)
10 Concealed manual override “N9”, optional
11 Screwable manual override “N10” (separate order, see page 2)

① = Main port 1
② = Main port 2
③ = Main port 3
④ = Main port 4
LS = Location shoulder

Mounting cavity R/T-31A; 4 main ports; thread M20 x 1.5

(dimensions in mm)



1) Differing from T-31A

2) All seal ring in sertion faces are rounded and free of burrs

3) with counterbore

4) Depth for moving parts

① = Main port 1

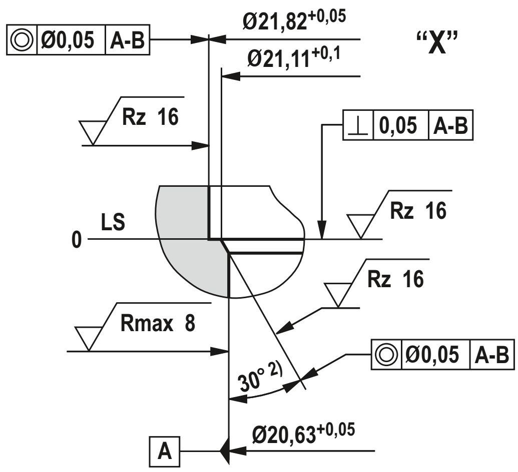
② = Main port 2

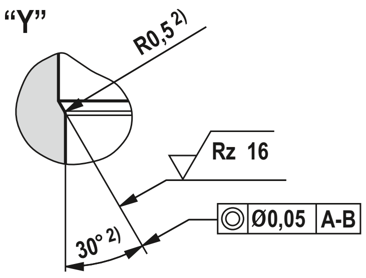
③ = Main port 3

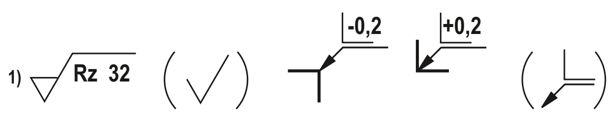
④ = Main port 4

LS = Location Shoulder

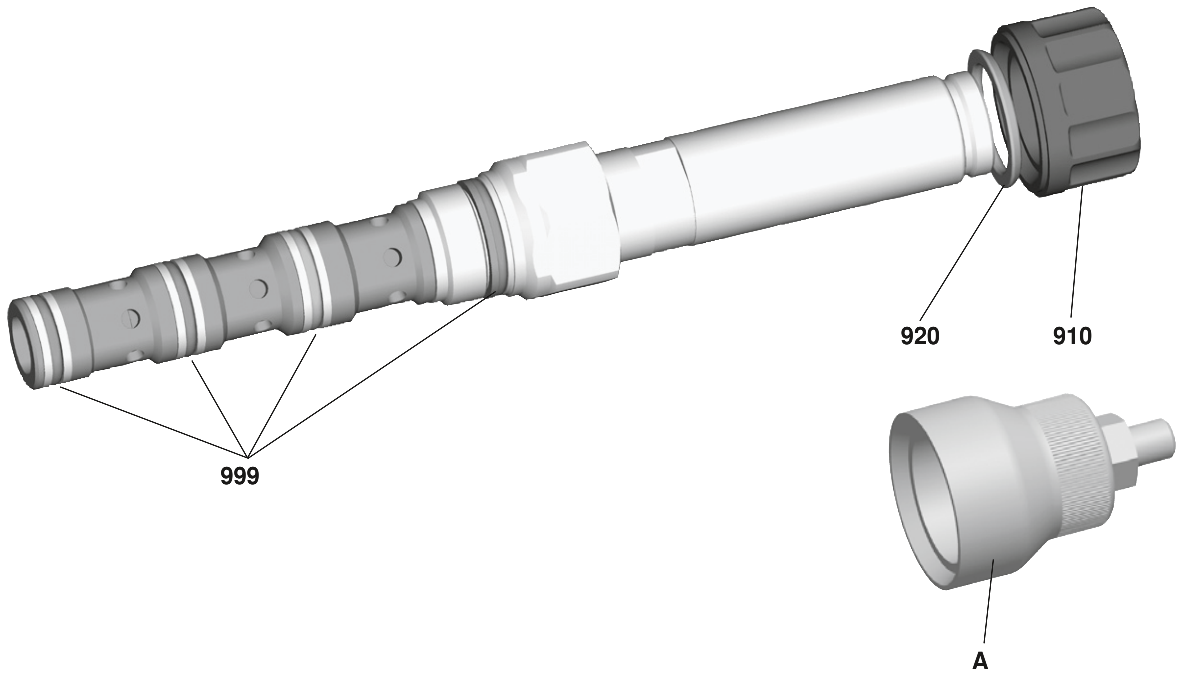
Tolerance for all angles ±0.5°







Available individual components



Item	Description	Material no.
910	Nut	R900991453
920	O-ring for pole tube	R900007769
999	Seal kit of the valve	R961003413
A	Manual override "N10" 1)	R901051231

Coils, separate order, see page 2

1) Only with ordering code "N9", see page 2

Bosch Rexroth AG
Hydraulics
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97816 Lohr am Main, Germany
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documentation@boschrexroth.de
www.boschrexroth.de

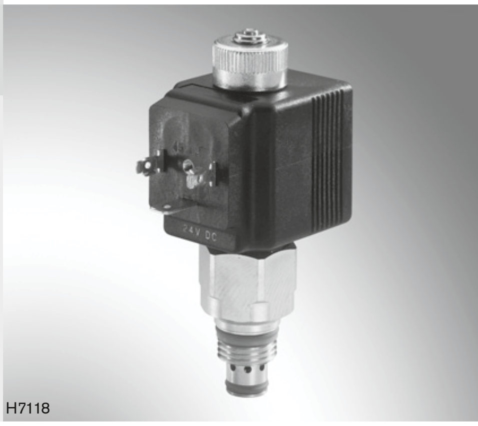
Rexroth
Bosch Group

2/2 directional spool valve, direct operated with solenoid actuation

RE 18136-16/02.07
Replaces: 09.05

Type KKDE (Standard Performance)

Component size 8
Component series A
Maximum operating pressure 250 bar
Maximum flow 25 l/min



H7118

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Features

- Pilot valve
- Mounting cavity R/T-8A
- Direct operated directional spool valve with solenoid actuation
- Fluid can flow through the valve in both directions
- Positive overlap prevents switching shocks
- Wet-pin DC solenoids
- Solenoid coil can be rotated
- With concealed manual override, optional

Information on available spare parts:
www.boschrexroth.com/spc

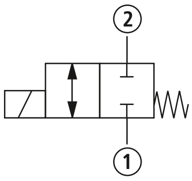
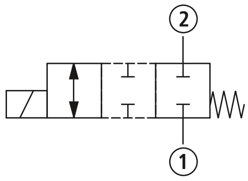
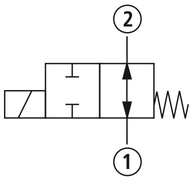
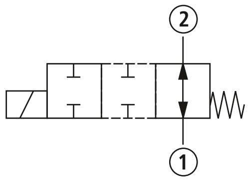
Ordering code (valve without coil) 1)

KKDE	N	8		A / S		V	*

Directional spool valve, direct operated, electrically operated

Maximum operating pressure 250 bar = N

Component size = 8

2 service ports		
		= N
		= P

Symbols

A = Component series

S = Standard Performance and mounting cavity R/T-8A (see page 9)

N0 = **Without** manual override
N9 = **With** concealed manual override

Seal material
V = FKM seals
(other seals on enquiry)
⚠ Caution!
Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

Valve types (without coil) 1)

Spool variant	Without manual override "**N0**"		With concealed manual override "**N9**"	
	Type	**Material no.**	**Type**	**Material no.**
N	KKDEN8NA/SN0V	R901069950	KKDEN8NA/SN9V	R901069954
P	KKDEN8PA/SN0V	R901069951	KKDEN8PA/SN9V	R901069955

Available coils (separate order) 1)

DC voltage 3)	Material no. for coil with component plug 2)		
	"K4" 03-pin (2+PE) DIN EN 175301-803	**"K40"** 02-pin K40 DT 04-2PA, make: Deutsch	**"C4"** 02-pin C4/Z30 AMP Junior-Timer
12 V	R901017496	R901017590	R901017599
24 V	R901017511	R901017592	R901017601

1) Completely assembled valves with coil on enquiry

2) Cable sockets (separate order), see RE 08006

3) Further voltages on enquiry

Function, section, symbols

General

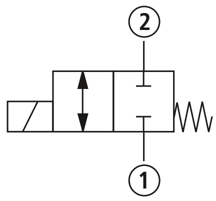
2/2 directional spool valves are direct operated, pressure-balanced cartridge valves. They control the start, stop and direction of a flow and basically consist of housing (1), pilot spool (2) and return spring (3).

Function

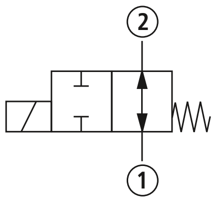
In the non-operated state, pilot spool (2) is held by return spring (3) in the initial position. Pilot spool (2) is operated by means of wet-pin DC solenoid (4). The various symbols refer to corresponding spools (N and P). Service ports 1 and 2 can be continuously pressurised to an operating pressure of 250 bar, and the flow can be directed in both directions (see symbols).

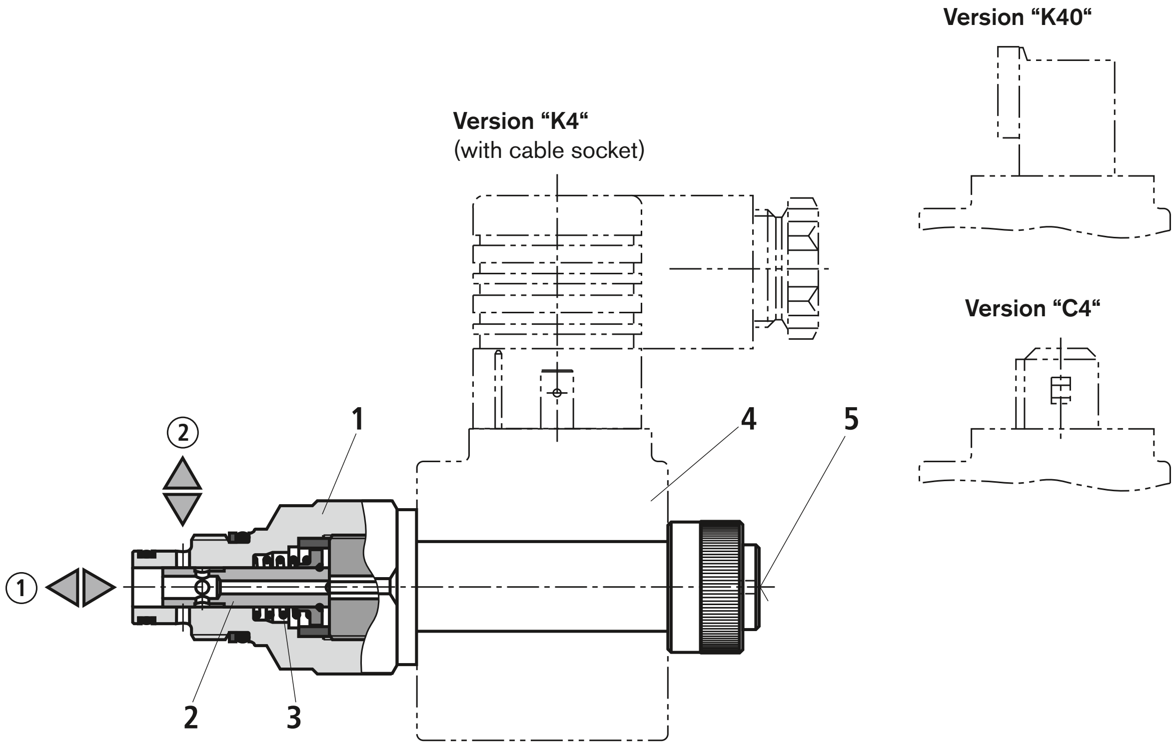
With the help of manual override (5) the valve can be operated without energisation of the solenoid.

Symbol “N“



Symbol “P“





Type KKDEN8NA/SN9V

Technical data (for applications outside these parameters, please consult us!)

General

Weight	– Valve	kg	0.15
	– Coil	kg	0.20
Installation orientation			Optional
Ambient temperature range		°C	–40 to +120

Hydraulic

Maximum operating pressure	bar	250 (in all ports)
Maximum flow	l/min	25
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids on enquiry
Hydraulic fluid temperature range	°C	–40 to +80
Viscosity range	mm^2/s	4 to 500
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [1]
Load cycles		1.5 million

Electrical

Type of voltage			DC voltage
Supply voltage [2]		V	12 DC; 24 DC
Voltage tolerance vs. ambient temperature			see characteristic curve on page 5
Power consumption		W	18
Duty cycle		%	see characteristic curve on page 5
Maximum coil temperature [3]		°C	150
Switching time to ISO 6403 (solenoid horizontal)	– ON	ms	≤ 80
	– OFF	ms	≤ 50
Maximum switching frequency		1/h	15000
Type of protection to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version “K4“		IP 65 with cable socket mounted and locked
	– Version “C4“		IP 66 with cable socket mounted and locked
			IP 69K with Rexroth cable socket (Material no. R901022127)
	– Version “K40“		IP 69K with cable socket mounted and locked

[1] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

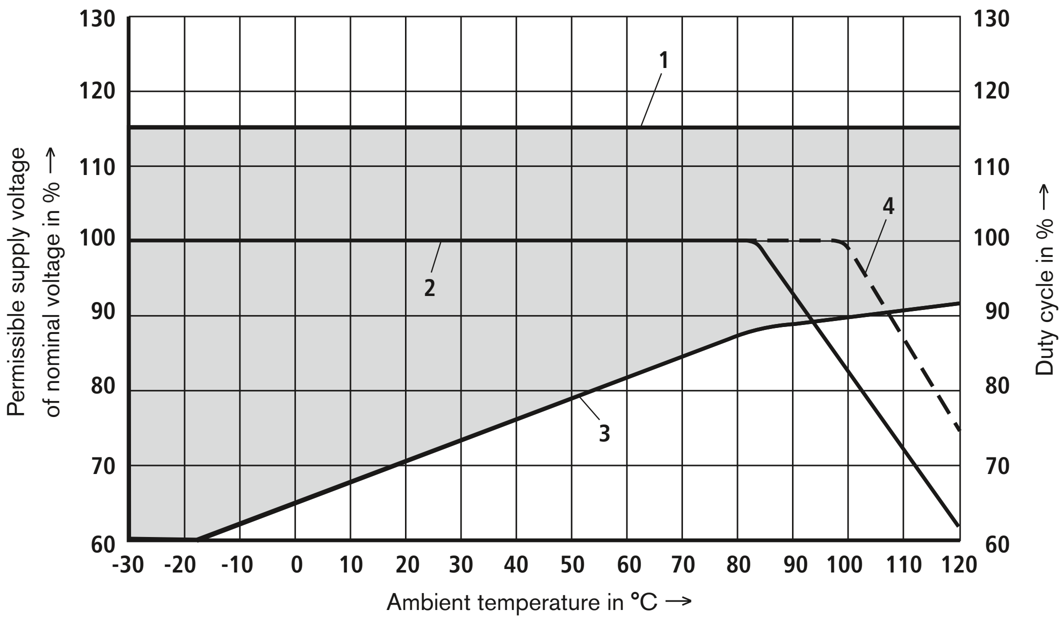
[2] Further voltages on enquiry

[3] Due to the surface temperatures of solenoid coils, observe European standards EN563 and EN982!

With electrical connection “K4“, the protective conductor (PE ⏚) must be properly connected.

Voltage tolerance vs. ambient temperature; duty cycle

Voltage range and duty cycle in dependence on ambient temperature



1 Maximum voltage

2 Duty cycle

3 Minimum operate voltage

4 Extension of duty cycle possible in the case of better heat dissipation

Permissible supply voltage range

☞ **Note!**

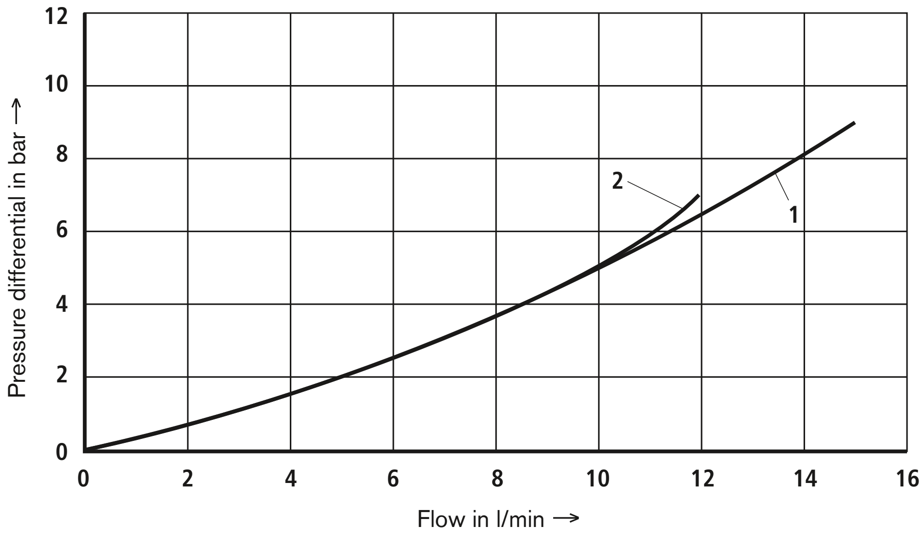
The diagram was determined for a coil with valve and medium test block size (110 x 70 x 66) without flow in static air.

Depending on the installation conditions (block size, flow, air circulation, etc.), a better heat dissipation may be achieved. This results in an extended operating range.

In individual cases, more unfvourable conditions may prevail, which result in a restriction of the operating range.

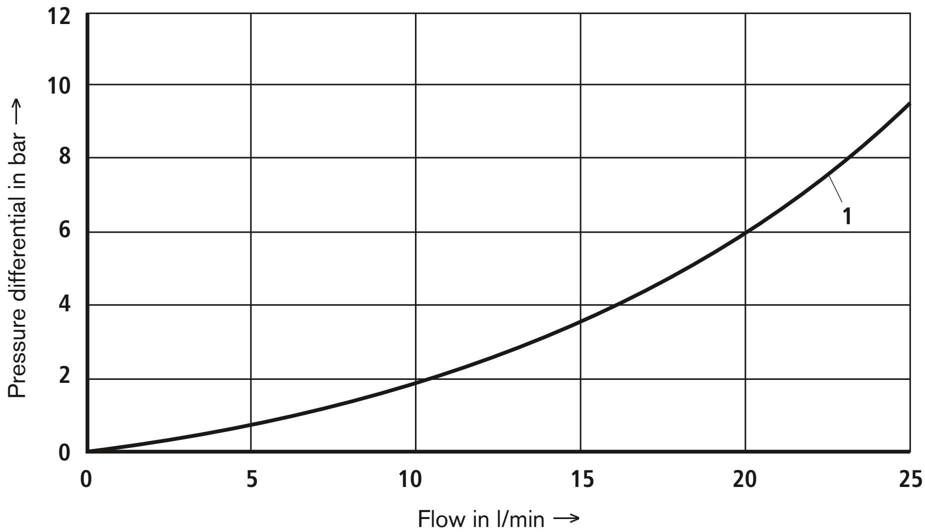
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Δp-q_V characteristic curves – symbol N



1	1 → 2
2	2 → 1

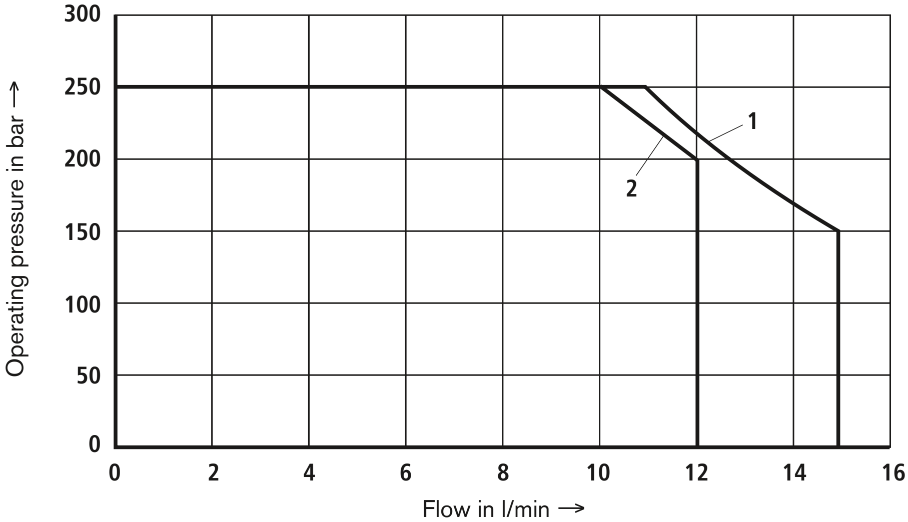
Δp-q_V characteristic curves – symbol P



1	1 ↔ 2

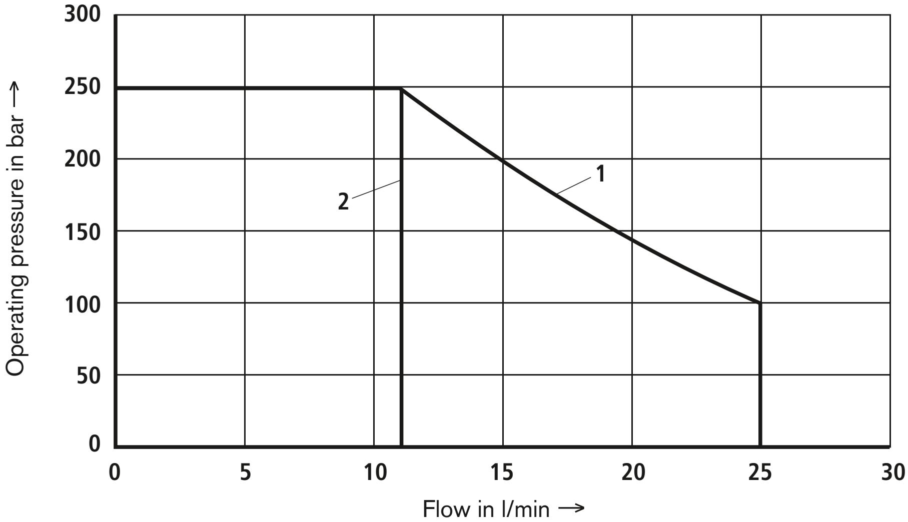
Performance limits (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Symbol N



1	1 → 2
2	2 → 1

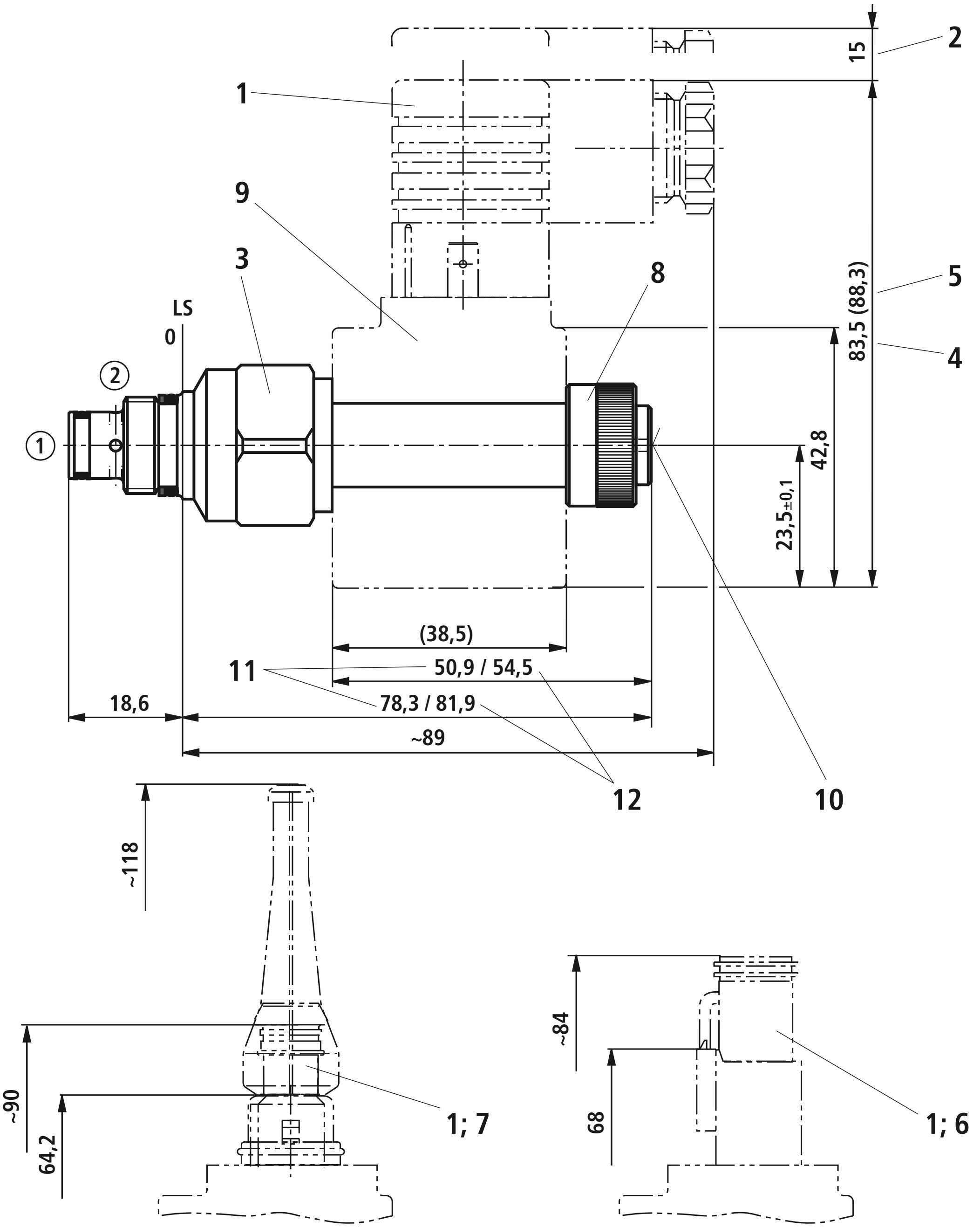
Symbol P



1	1 → 2
2	2 → 1

⚠ **Caution!** The performance limit was determined with minimum current.

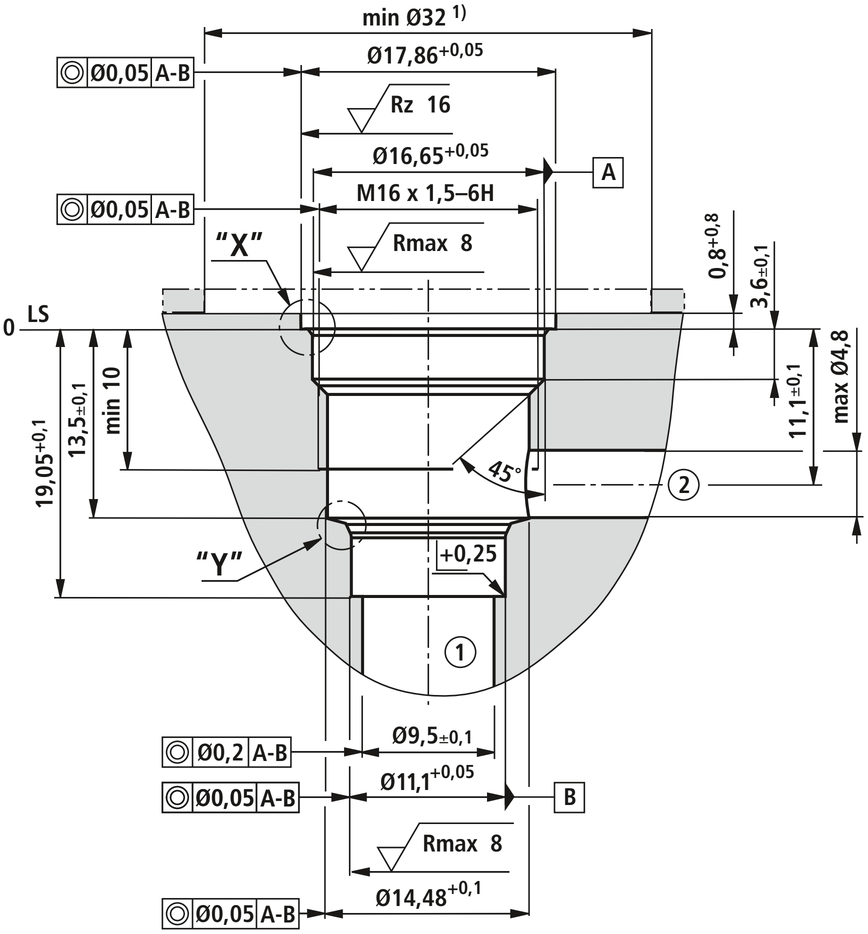
Unit dimensions (nominal dimensions in mm)

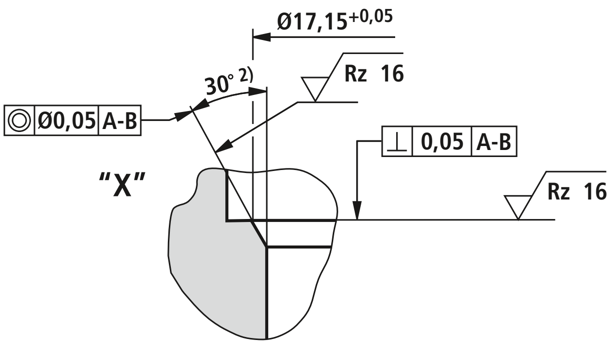


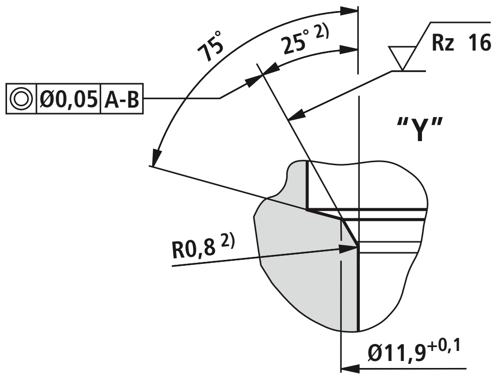
- **1** Cable sockets (separate order, see RE 08006)
- **2** Space required to remove cable socket
- **3** A/F 24, tightening torque M_T = 34 to 41 Nm
- **4** Dimension for cable socket "K4", without circuitry
- **5** Dimension () for cable socket "K4", with circuitry
- **6** Version "K40"
- **7** Version "C4"
- **8** Nut, tightening torque $M_T = 5^{+1}$ Nm
- **9** Coil; depth 36±0.1 (separate order, see page 2)
- **10** Concealed manual override "N9"
- **11** Dimension for valve with version "N0"
- **12** Dimension for valve with version "N9"

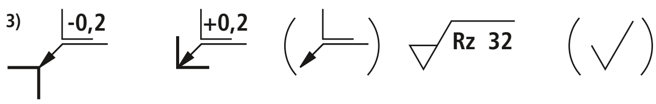
1 = Main port 1
2 = Main port 2
LS = Location Shoulder

Mounting cavity R/T-8A; 2 service ports; thread M16 x 1.5 (nominal dimensions in mm)









[1)] When countersunk, deviating from T-8A

[2)] All angled seal ring insertion faces are rounded and free from burrs

[3)] Deviating from T-8A

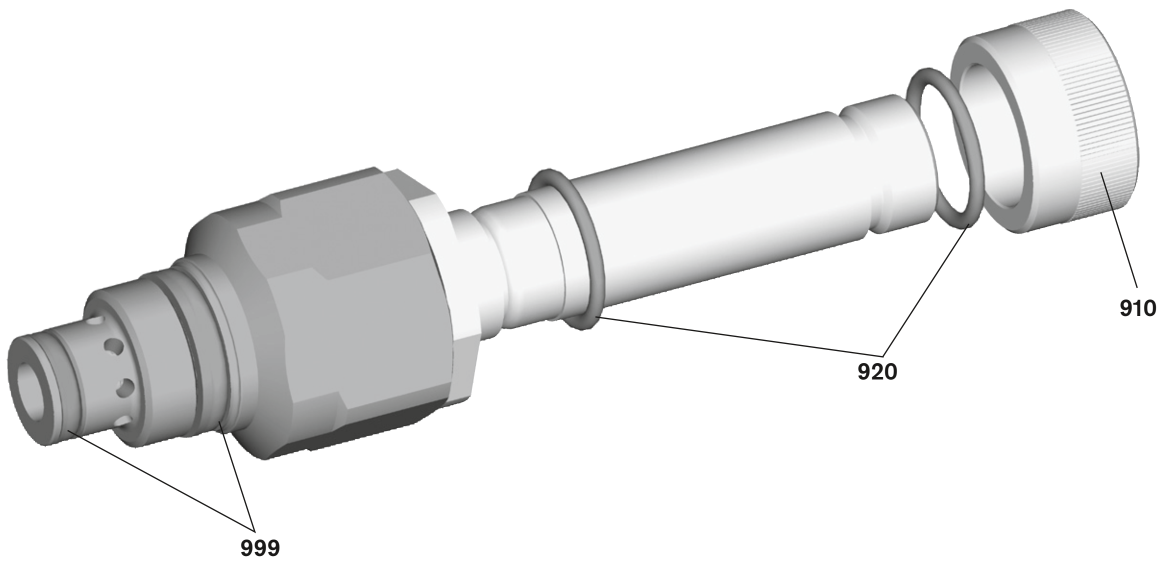
① = Main port 1

② = Main port 2

LS = Location Shoulder

Tolerance for all angles ± 0.5°

Available individual components



Item	Designation	Material no.
910	Nut	R900754552
920	O-ring for pressure tube	R900004452
999	Valve seal kit	R961003237

Coils, separate order, see page 2

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
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Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

3/2 directional spool valve, direct operated with solenoid actuation

RE 18136-17/02.07 1/10
Replaces: 09.05

Type KKDE (Standard Performance)

Component size 8
Component series A
Maximum operating pressure 250 bar
Maximum flow 20 l/min

H7117

Table of contents

Features

– Pilot valve
– Mounting cavity R/T-9A
– Direct operated directional spool valve with solenoid actuation
– Fluid can flow through the valve in both directions
– Positive overlap prevents swiching shocks
– Wet-pin DC solenoids
– Solenoid coil can be rotated
– With concealed manual override, optional

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code (valve without coil) [1)]

KKDE	N	8		A / S		V	*

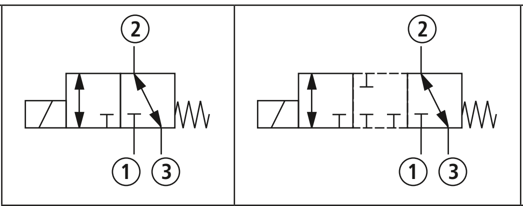
Directional spool valve, direct operated, electrically operated

Maximum operating pressure 250 bar = N

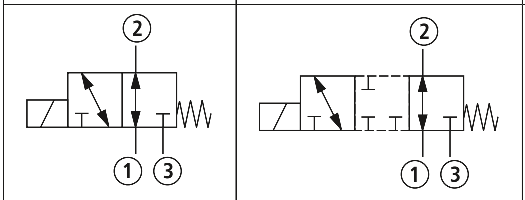
Component size = 8

3 service ports

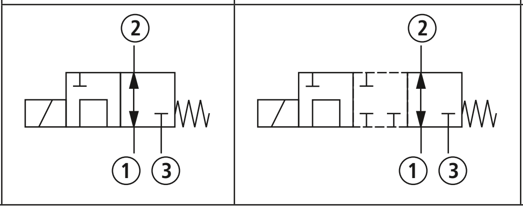
Symbols



= C



= U



= G

A = Component series

S = Standard Performance and mounting cavity R/T-9A (see page 9)

N0 = **Without** manual override

N9 = **With** concealed manual override

Seal material

V = FKM seals (other seals on enquiry)

⚠ Caution! Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

Valve types (without coil) [1)]

	Without manual override "**N0**"		With concealed manual override "**N9**"	
Spool variant	**Type**	**Material no.**	**Type**	**Material no.**
C	KKDEN8CA/SN0V	R901070037	KKDEN8CA/SN9V	R901070044
U	KKDEN8UA/SN0V	R901070040	KKDEN8UA/SN9V	R901070045
G	KKDEN8GA/SN0V	R901070042	KKDEN8GA/SN9V	R901070046

Available coils (separate order) [1)]

	Material no. for coil with component plug [2)]		
DC voltage [3)]	**"K4"** 03-pin (2+PE) DIN EN 175301-803	**"K40"** 02-pin K40 DT 04-2PA, make: Deutsch	**"C4"** 02-pin C4/Z30 AMP Junior-Timer
12 V	R901017496	R901017590	R901017599
24 V	R901017511	R901017592	R901017601

[1)] Completely assembled valves with coil on enquiry

[2)] Cable sockets (separate order), see RE 08006

[3)] Further voltages on enquiry

Function, section, symbols

General

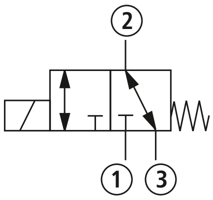
3/2 directional spool valves are direct operated, pressure-balanced cartridge valves. They control the start, stop and direction of a flow and basically consist of housing (1), pilot spool (2) and return spring (3).

Function

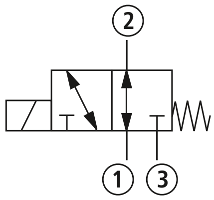
In the non-operated state, pilot spool (2) is held by return spring (3) in the initial position. Pilot spool (2) is operated by means of wet-pin DC solenoid (4). The various symbols refer to corresponding spools (C, U and G). Service ports 1, 2 and 3 can be continuously pressurised to an operating pressure of 250 bar, and the flow can be directed in both directions (see symbols).

With the help of manual override (5) the valve can be operated without energisation of the solenoid.

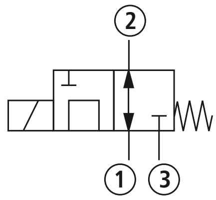
Symbol "C"



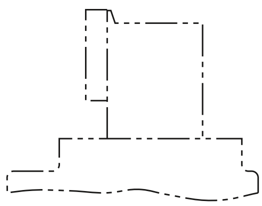
Symbol "U"



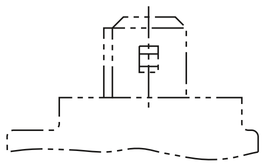
Symbol "G"



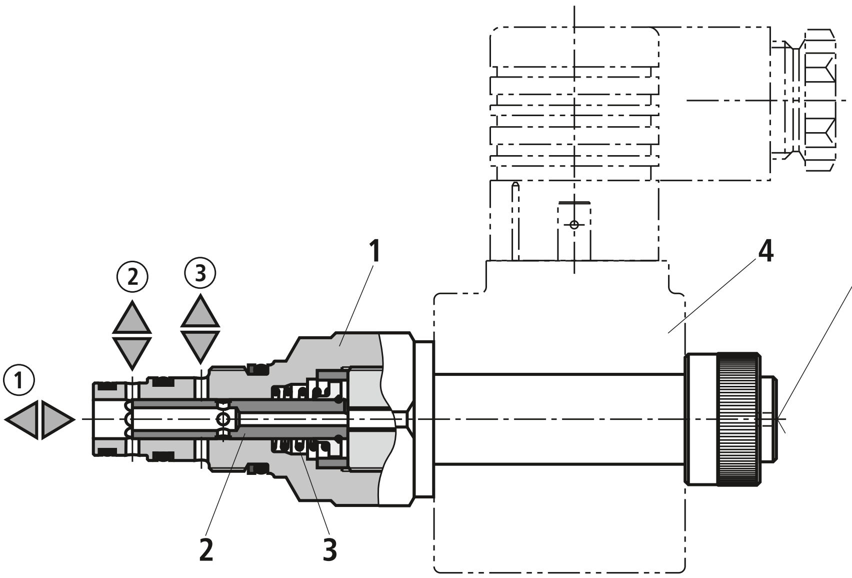
Version "K40"



Version "C4"



Version "K4"
(with cable socket)



Type KKDEN8GA/SN9V

Technical data (for applications outside these parameters, please consult us!)

General

Weight	– Valve	kg	0.17
	– Coil	kg	0.20
Installation orientation			Optional
Ambient temperature range		°C	–40 to +120

Hydraulic

Maximum operating pressure	bar	250 (in all ports)
Maximum flow	l/min	20
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids on enquiry
Hydraulic fluid temperature range	°C	–40 to +80
Viscosity range	mm^2/s	4 to 500
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [1]
Load cycles		1.5 million

Electrical

Type of voltage			DC voltage
Supply voltage [2]		V	12 DC; 24 DC
Voltage tolerance vs. ambient temperature			see characteristic curve on page 5
Power consumption		W	18
Duty cycle		%	see characteristic curve on page 5
Maximum coil temperature [3]		°C	150
Switching time to ISO 6403 (solenoid horizontal)	– ON	ms	≤ 80
	– OFF	ms	≤ 50
Maximum switching frequency		1/h	15000
Type of protection to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version “K4“		IP 65 with cable socket mounted and locked
	– Version “C4“		IP 66 with cable socket mounted and locked
			IP 69K with Rexroth cable socket (material no. R901022127)
	– Version “K40“		IP 69K with cable socket mounted and locked

[1] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

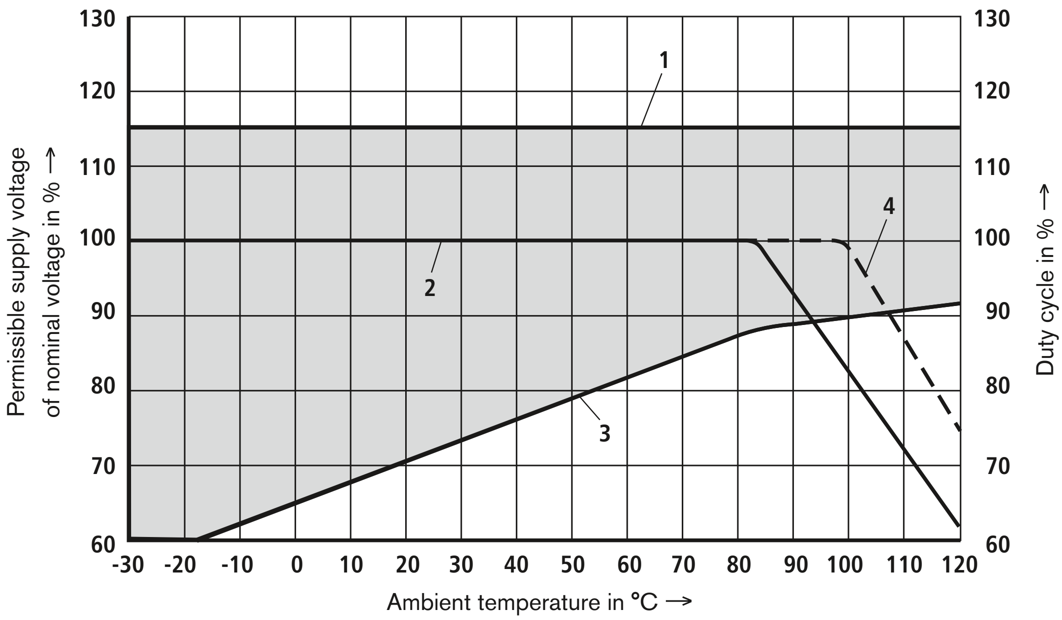
[2] Further voltages on enquiry

[3] Due to the surface temperatures of solenoid coils, observe European standards EN563 and EN982!

With electrical connection “K4“, the protective conductor (PE ⏚) must be properly connected.

Voltage tolerance vs. ambient temperature; duty cycle

Voltage range and duty cycle in dependence on ambient temperature



1 Maximum voltage

2 Duty cycle

3 Minimum operate voltage

4 Extension of duty cycle possible in the case of better heat dissipation

Permissible supply voltage range

☞ **Note!**

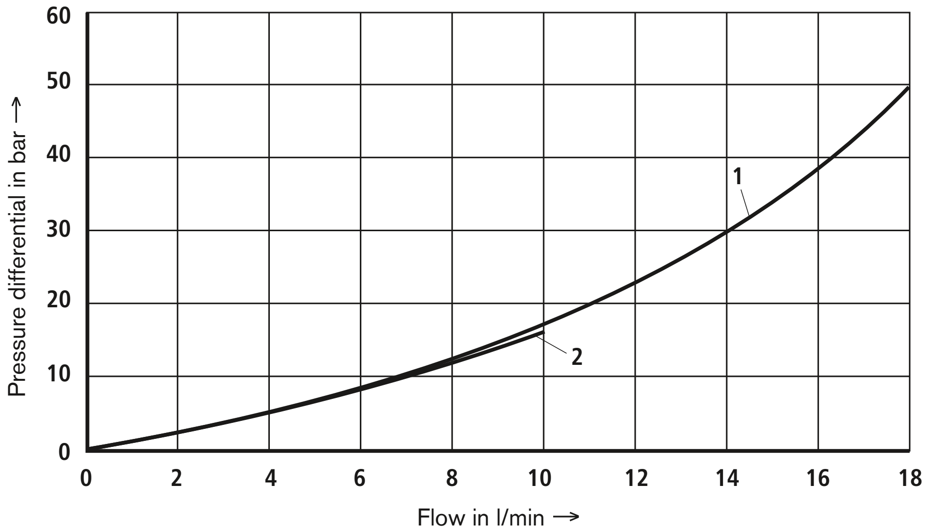
The diagram was determined for a coil with valve and medium test block size (110 x 70 x 66) without flow in static air.

Depending on the installation conditions (block size, flow, air circulation, etc.), a better heat dissipation may be achieved. This results in an extended operating range.

In individual cases, more unfvourable conditions may prevail, which result in a restriction of the operating range.

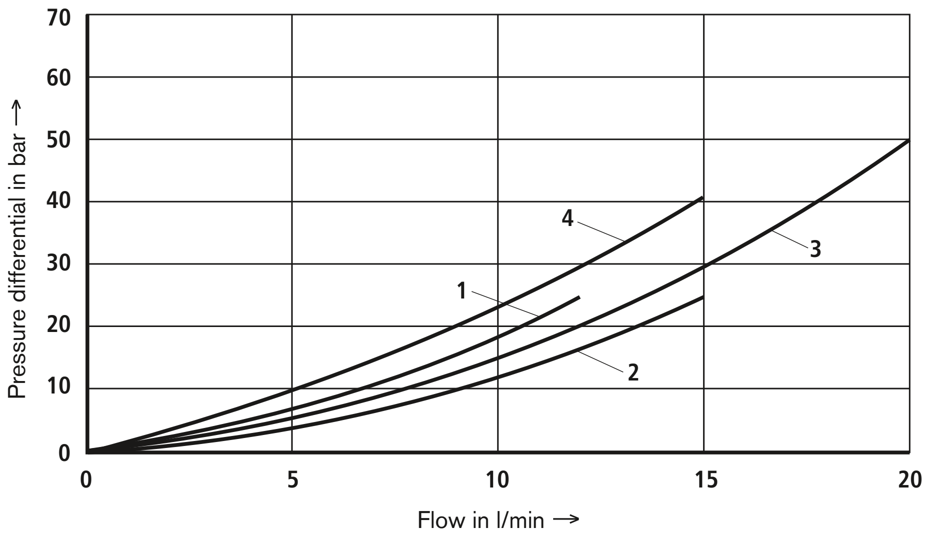
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Δp-q_V characteristic curves – symbol C



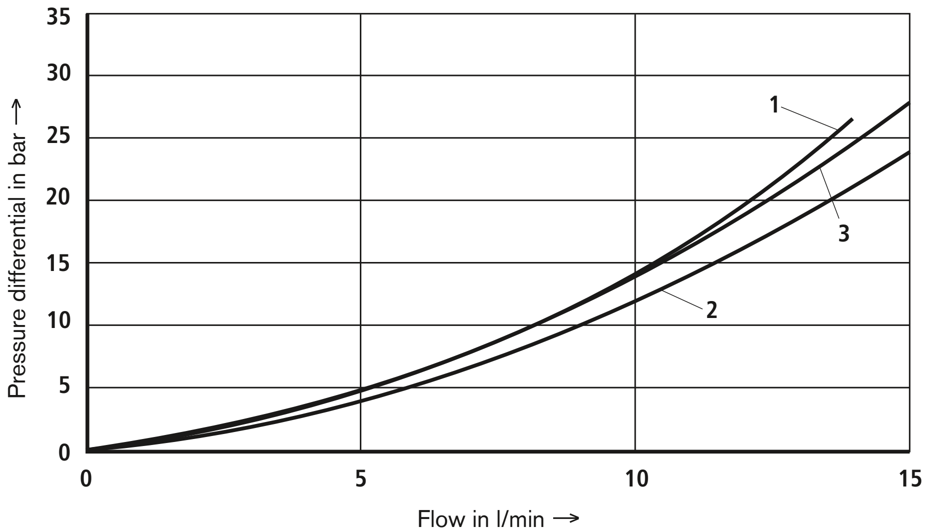
1	1 → 2 2 → 1
2	2 → 3 3 → 2

Δp-q_V characteristic curves – symbol U



1	1 → 2
2	2 → 1
3	2 → 3
4	3 → 2

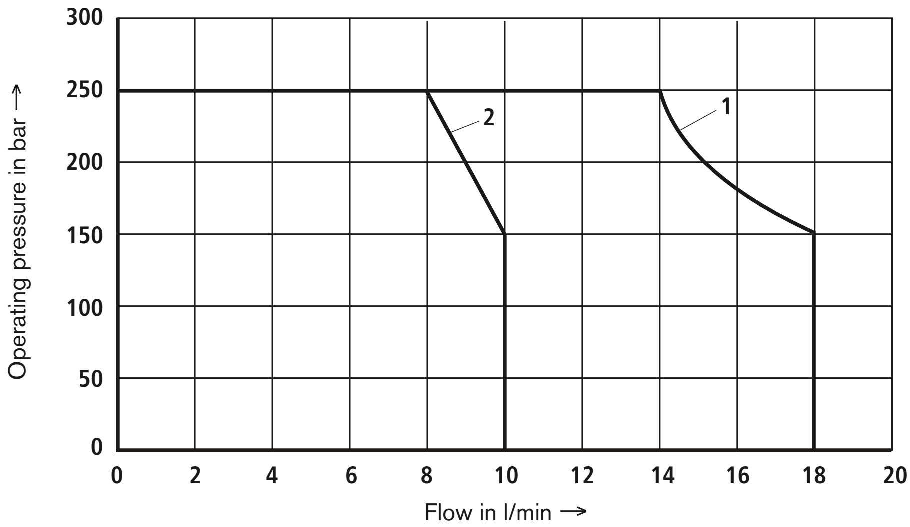
Δp-q_V characteristic curves – symbol G



1	1 → 2 3 → 1
2	2 → 1
3	1 → 3

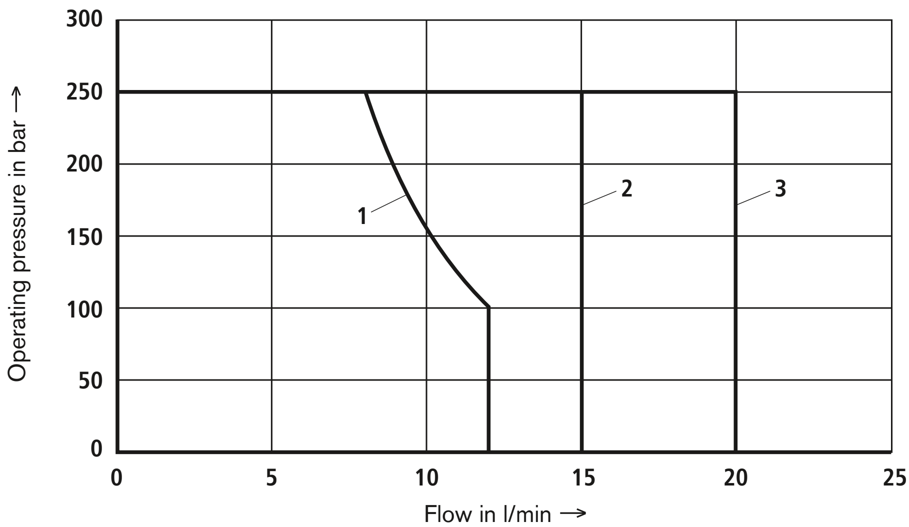
Performance limits (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$ and 24 V coil)

Symbol C



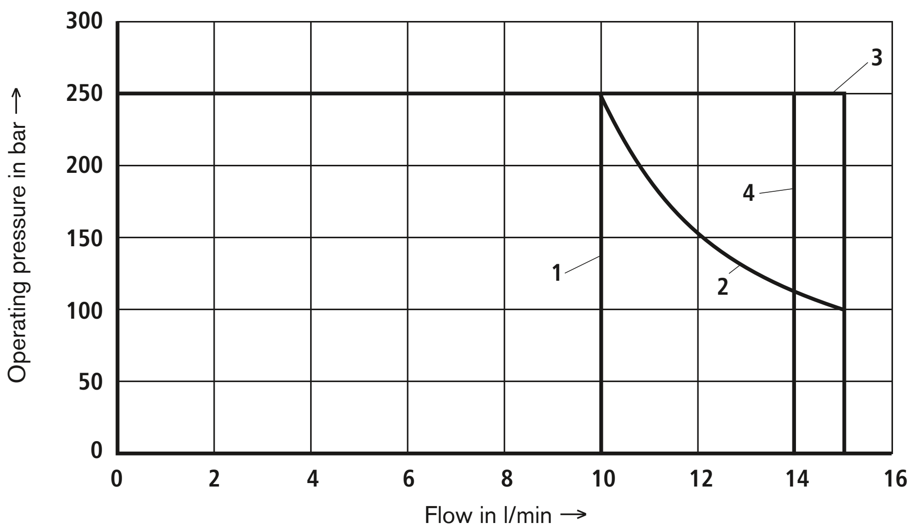
1	1 → 2 2 → 1
2	2 → 3 3 → 2

Symbol U



1	1 → 2
2	2 → 1 3 → 2
3	2 → 3

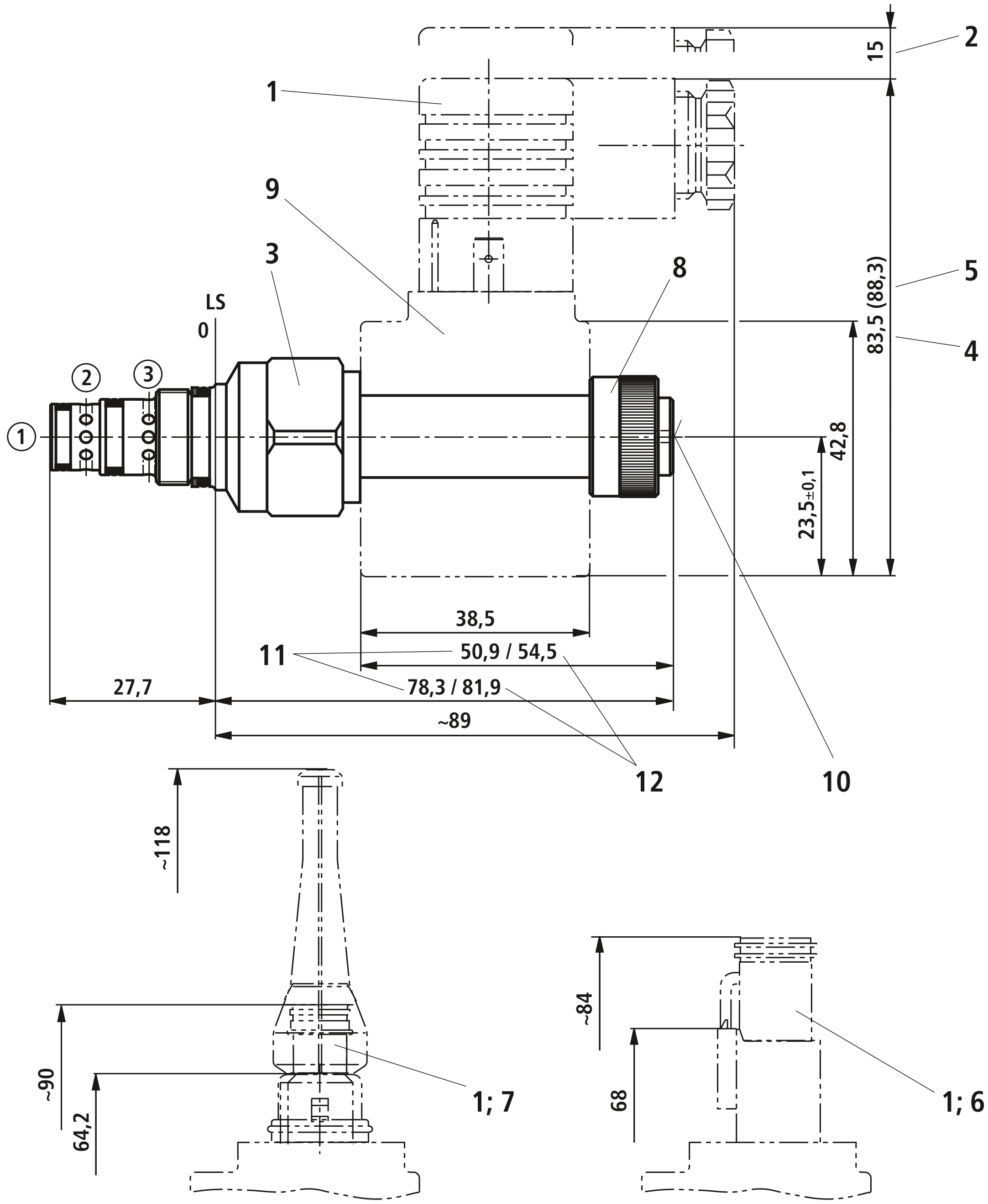
Symbol G



1	1 → 2
2	2 → 1
3	1 → 3
4	3 → 1

⚠ **Caution!** The performance limit was determined with minimum current.

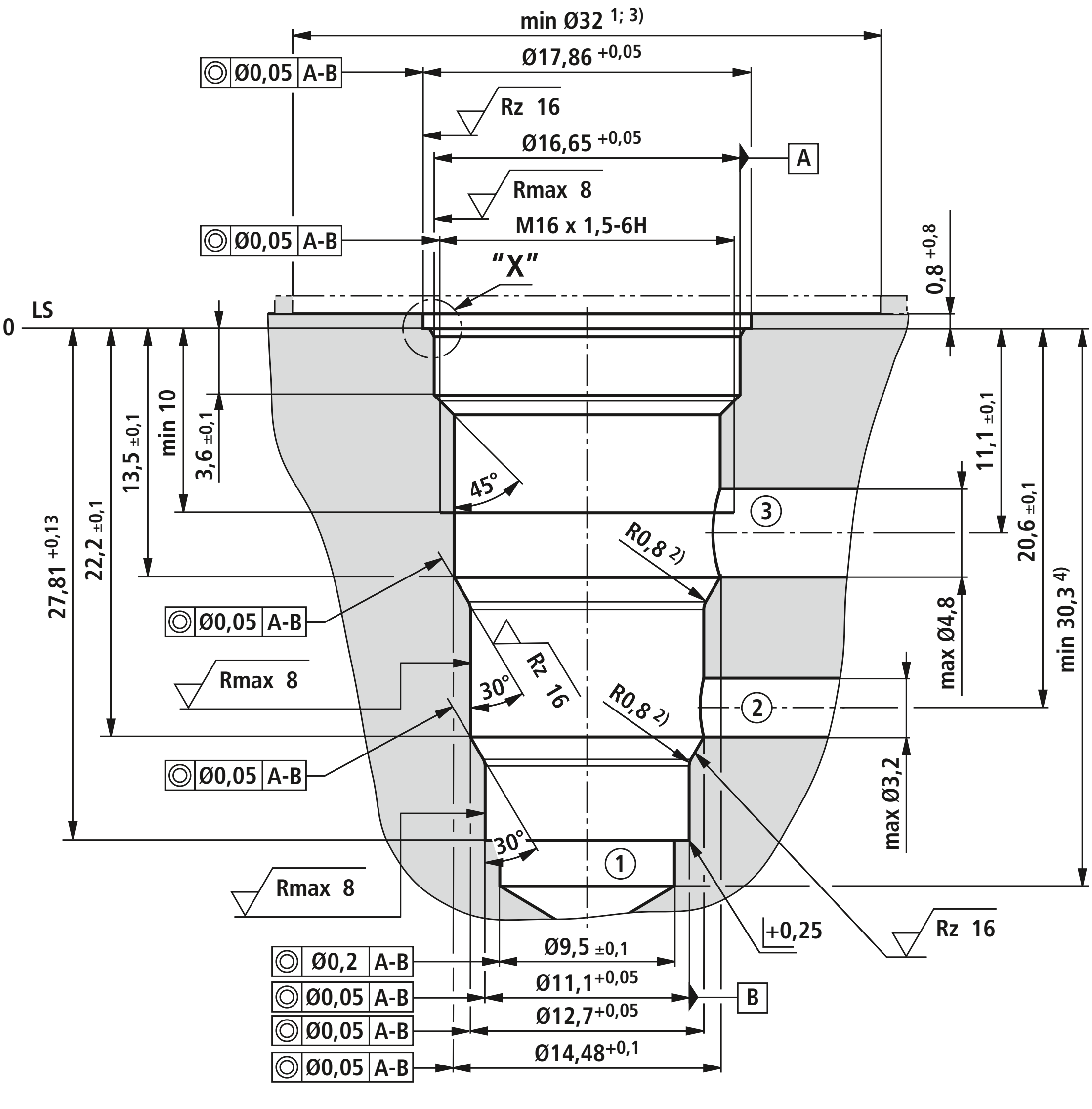
Unit dimensions (nominal dimensions in mm)

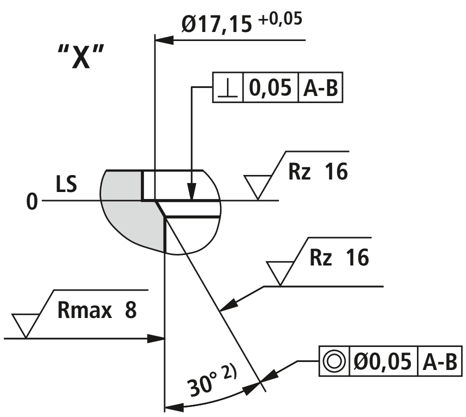


1 Cable sockets (separate order, see RE 08006)
2 Space required to remove cable socket
3 A/F 24, tightening torque M_T = 34 to 41 Nm
4 Dimension for cable socket "K4", without circuitry
5 Dimension () for cable socket "K4", with circuitry
6 Version "K40"
7 Version "C4"
8 Nut, tightening torque $M_T = 5^{+1}$ Nm
9 Coil; depth 36±0.1 (separate order, see page 2)
10 Concealed manual override "N9"
11 Dimension for valve with version "N0"
12 Dimension for valve with version "N9"

1 = Main port 1
2 = Main port 2
3 = Main port 3
LS = Location Shoulder

Mounting cavity R/T-9A; 3 service ports; thread M16 x 1.5 (nominal dimensions in mm)





1) Rz 32 -0,2 +0,2

[1)] Deviating from T-9A

[2)] All angled seal ring insertion faces are rounded and free from burrs

[3)] When countersunk

[4)] Depth for moving parts

1 = Main port 1

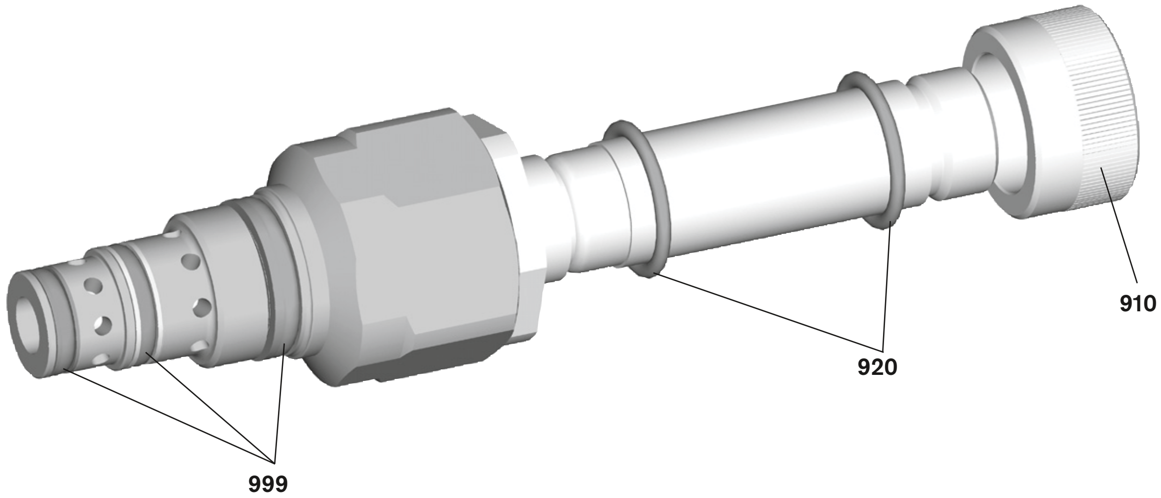
2 = Main port 2

3 = Main port 3

LS = Location Shoulder

Tolerance for all angles ± 0.5°

Available individual components



Item	Designation	Material no.
910	Nut	R900754552
920	O-ring for pressure tube	R900004452
999	Valve seal kit	R961003414

Coils, separate order, see page 2

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

2/2 directional spool valve direct operated with solenoid actuation

RE 18136-08/06.12 1/10
Replaces: 10.09

Type KKDE (high-performance)

Component size 8
Component series A
Maximum operating pressure 350 bar
Maximum flow 45 l/min

H7010

Table of contents

Features

- Pilot valve
- Mounting cavity R/T-8A
- Direct operated directional spool valve with solenoid actuation
- Free-flowing in both directions
- Positive overlap helps to avoid switching shocks
- Wet-pin DC solenoids
- Rotatable solenoid coil
- With concealed manual override

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code (Valve without coil) 1)

KKDE	R	8		A / H		V	*

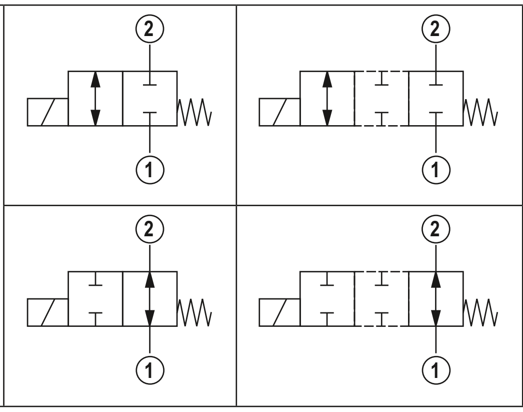
Directional spool valve, direct operated, electrically operated (pilot valve)

Maximum operating pressure 350 bar **= R**

Component size **= 8**

2 main ports

Symbols



= N

= P

A = Component series

H = High-performance and mounting cavity R/T-8A (see page 9)

N0 = **without** manual override

N9 = **with** concealed manual override 4)

Seal material

V = FKM seals (other seals upon request)

Attention! Observe compatibility of seals with hydraulic fluid used!

Further details in the plain text

Valve types (without coil) 1)

	without manual override "**N0**"		with concealed manual override "**N9**"	
Spool variant	**Type**	**Material no.**	**Type**	**Material no.**
N	KKDER8NA/HN0V	R901069969	KKDER8NA/HN9V	R901069975
P	KKDER8PA/HN0V	R901069973	KKDER8PA/HN9V	R901069978

Available coils (separate order) 1)

	Material no. for coil with connector 2)		
Direct voltage DC 3)	**"K4"** 03pol (2+PE) DIN EN 175301-803	**"K40"** 02pol K40 DT 04-2PA, make. Deutsch	**"C4"** 02pol C4/Z30 AMP Junior Timer
12 V	R900991678	R900729189	R900315818
24 V	R900991121	R900729190	R900315819

1) Complete valves with mounted coil upon request

2) Mating connectors (separate order), see RE 08006

3) Other voltages upon request

4) Screwable manual override "N10" (actuation by means of internal hexagon with lock nut), possible as separate order, Material no. **R901051231**; ordering code **"N9"**!

Function, section, symbols

General

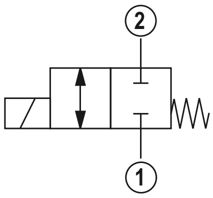
The 2/2 directional spool valves are direct operated, pressure compensated cartridge valves. They control the start, stop and direction of a flow and basically comprise a housing (1), the control spool (4) and a return spring (2).

Function

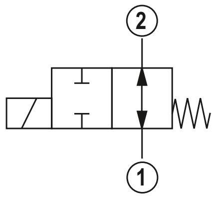
In the de-energized condition, control spool (4) is held in the initial position by the return spring (2). Control spool (4) is actuated by wet-pin DC solenoids (3). The various symbols are realized by corresponding spools (N and P). The main ports ① and ② are suitable for a continuous load with an operating pressure of 350 bar and the flow can be directed into both directions (see symbols).

The manual override (5) allows for the switching of the valve without solenoid energization. It is also available in screwable version “N10” (6) (see page 2).

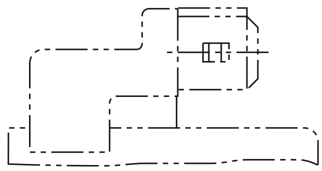
Symbol “N”



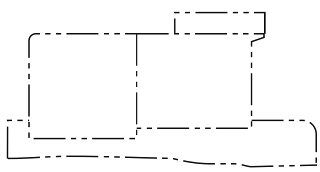
Symbol “P”



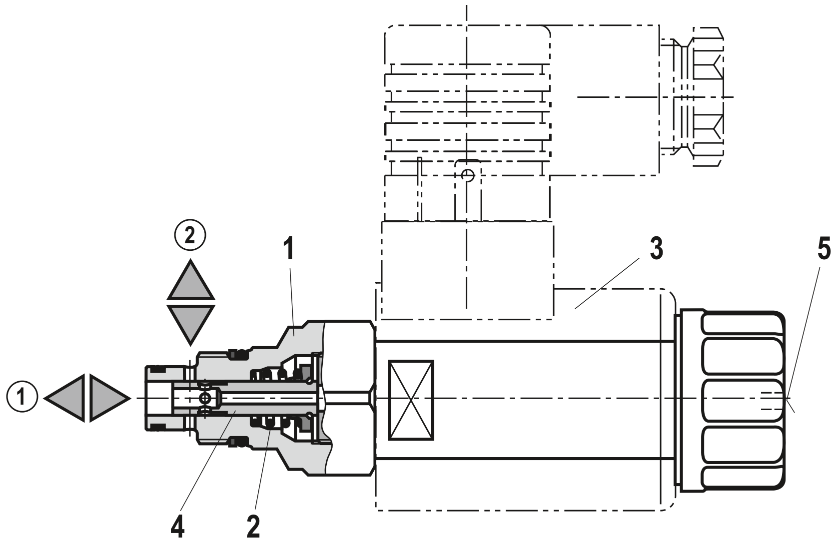
Version “C4”

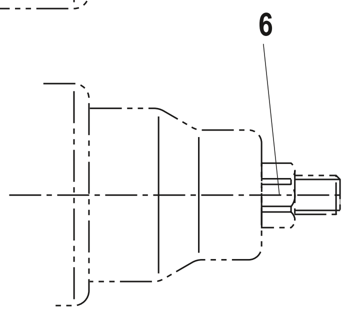


Version “K40”



Version “K4”
(with mating connector)





Type KKDER8NA/HN9V

Technical data (For applications outside these parameters, please consult us!)

general

Weight	– Valve	kg	0.30
	– Coil	kg	0.25
Installation position			Any
Ambient temperature range		°C	–40 to +110

hydraulic

Maximum operating pressure	bar	350 (at all ports)
Maximum flow	l/min	45
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524; quickly bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids upon request
Hydraulic fluid temperature range	°C	–40 to +80
Viscosity range	mm^2/s	4 to 500
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1]
Load cycles		10 million (at 350 bar)

electrical

Voltage type			Direct voltage
Supply voltage [2]		V	12 DC; 24 DC
Voltage tolerance against ambient temperature			See characteristic curve page 5
Power consumption		W	22
Duty cycle		%	See characteristic curve page 5
Maximum coil temperature [3]		°C	150
Switching time according to ISO 6403 (solenoid horizontal)	– ON	ms	≤ 80
	– OFF	ms	≤ 50
Maximum switching frequency		cy/h	15000
Protection class according to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version “K4”		IP 65 with mating connector mounted and locked
	– Version “C4”		IP 66 with mating connector mounted and locked
			IP 69K with Rexroth mating connector (Material no. R901022127)
	– Version “K40”		IP 69K with mating connector mounted and locked

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

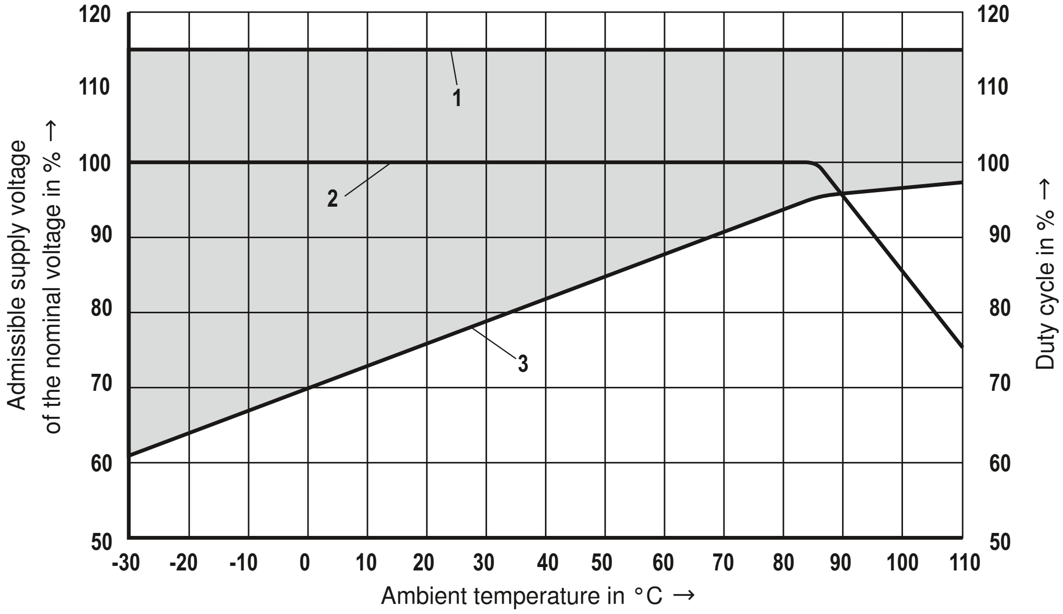
2) Other voltages upon request

3) Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

At the electrical connection “K4”, the protective earthing conductor (PE ⏚) has to be connected properly.

Voltage tolerance against ambient temperature; duty cycle

Voltage range and duty cycle depending on the ambient temperature



1 Maximum voltage

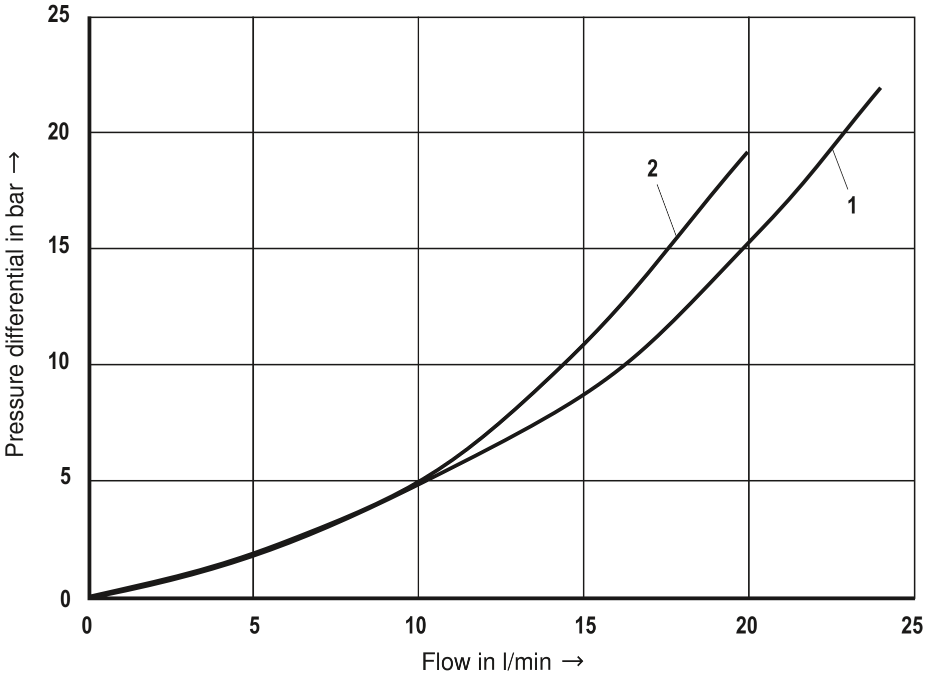
2 Duty cycle

3 Minimum response voltage

Admissible supply voltage range

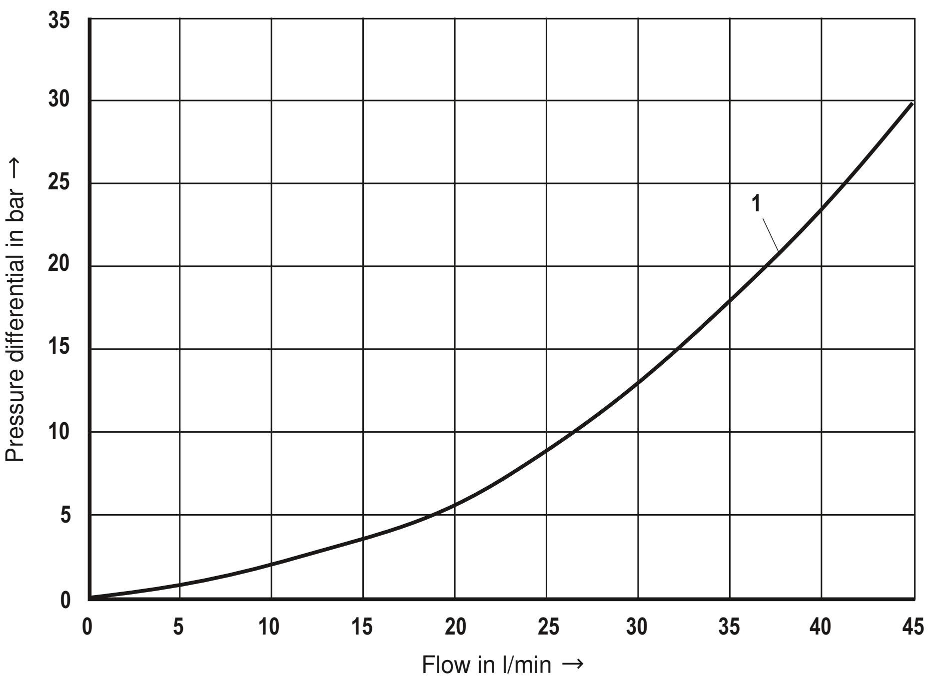
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Δp-q_V characteristic curves – symbol N



1	1 → 2
2	2 → 1

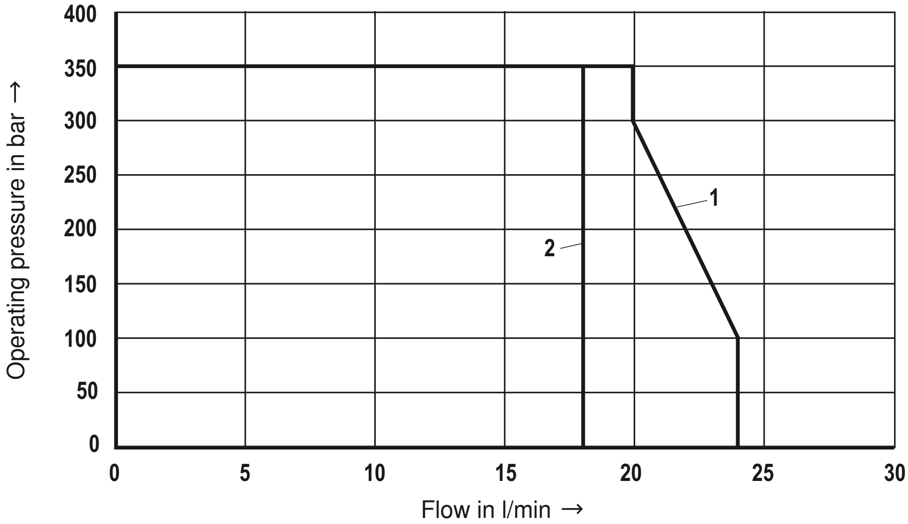
Δp-q_V characteristic curves – symbol P



1	1 ↔ 2

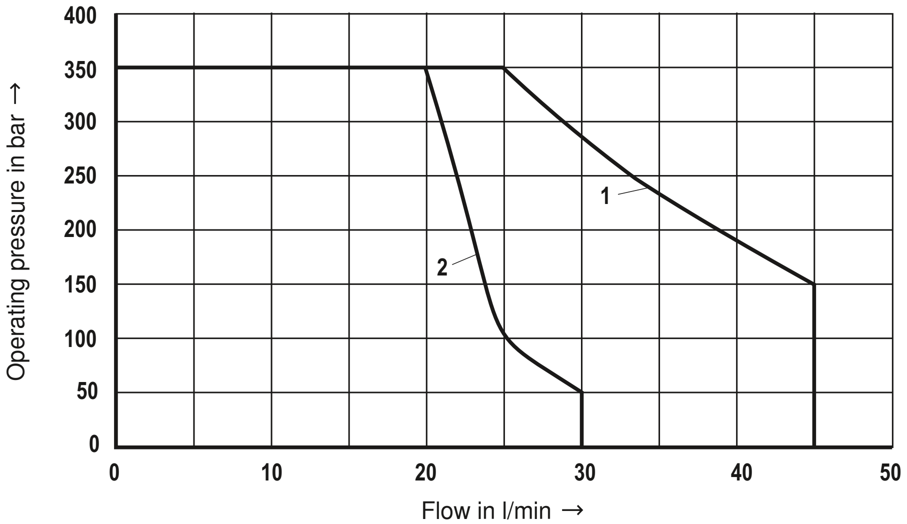
Performance limits (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Symbol N



1	1 → 2
2	2 → 1

Symbol P

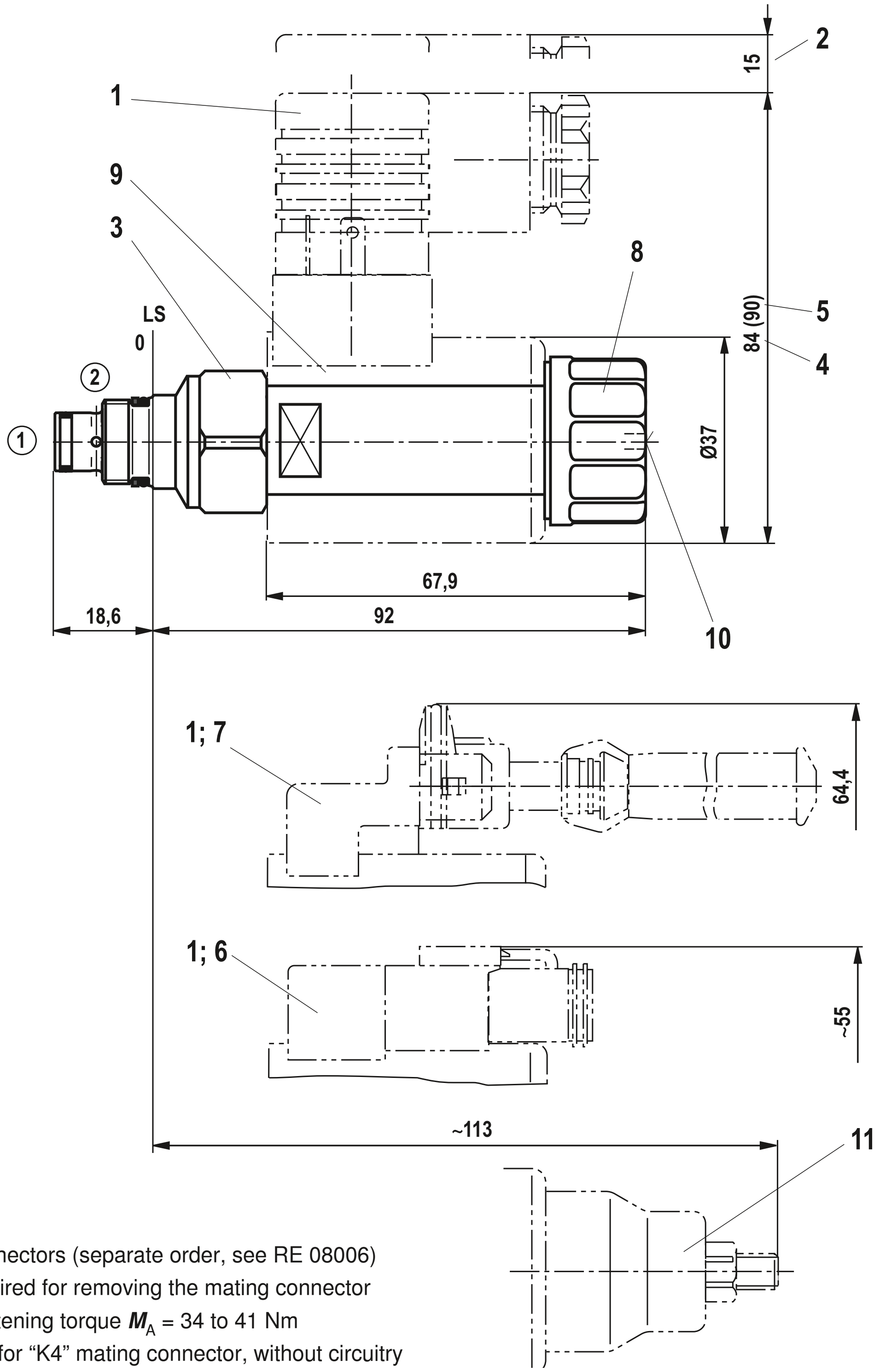


1	1 → 2
2	2 → 1

Attention!

The performance limits were determined when the solenoids were at operating temperature and at 10% undervoltage.

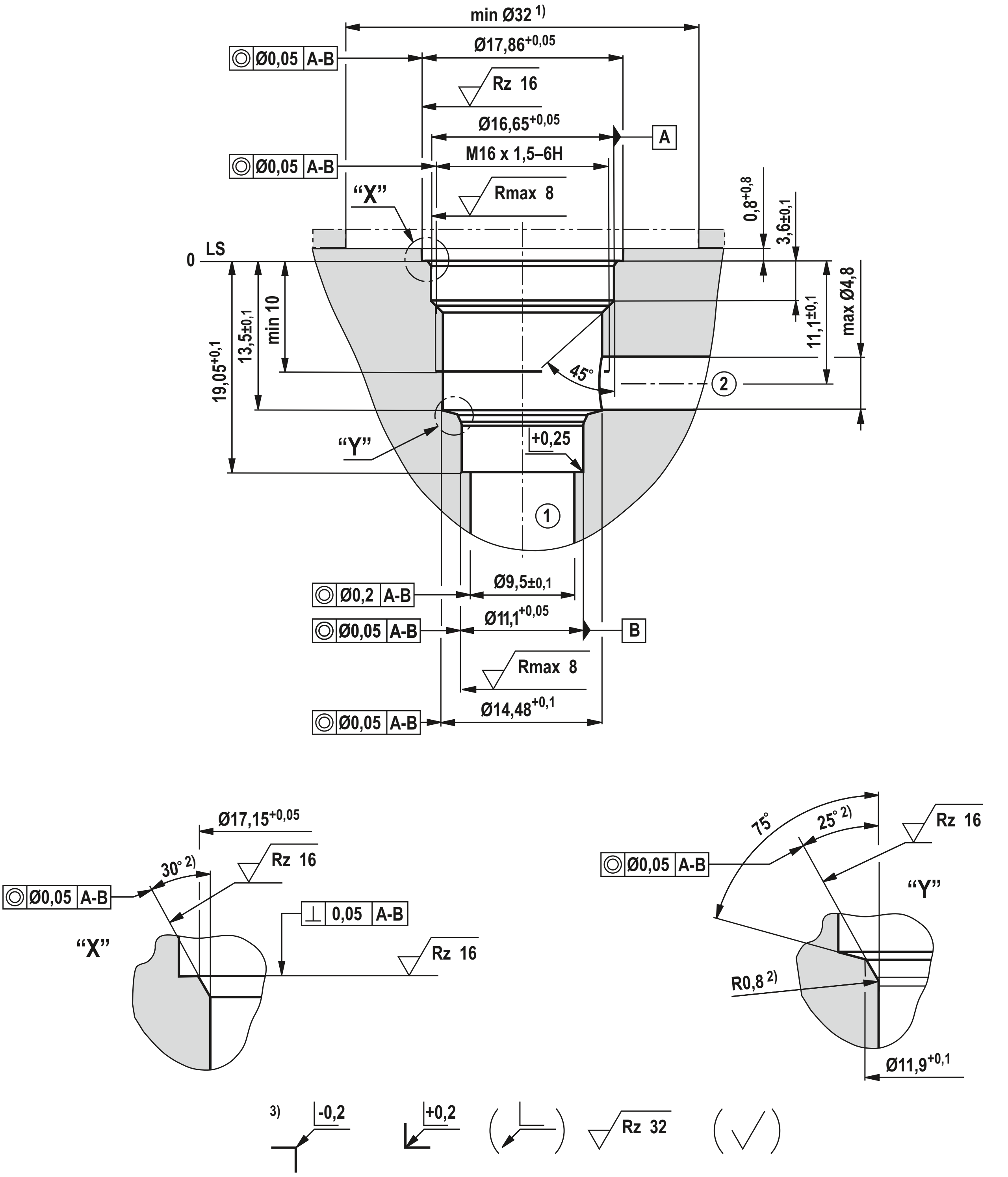
Unit dimensions (dimensions in mm)



1 Mating connectors (separate order, see RE 08006)
2 Space required for removing the mating connector
3 SW24, tightening torque M_A = 34 to 41 Nm
4 Dimension for "K4" mating connector, without circuitry
5 Dimension () for "K4" mating connector, with circuitry
6 Version "K40"
7 Version "C4"
8 Nut, tightening torque $M_A = 5^{+1}$ Nm
9 Coil (separate order, see page 2)
10 Concealed manual override "N9", optional
11 Screwable manual override "N10"
(separate order, see page 2)

① = Main port 1
② = Main port 2
LS = Location shoulder

Mounting cavity R/T-8A; 2 main ports; thread M16 x 1.5 (dimensions in mm)

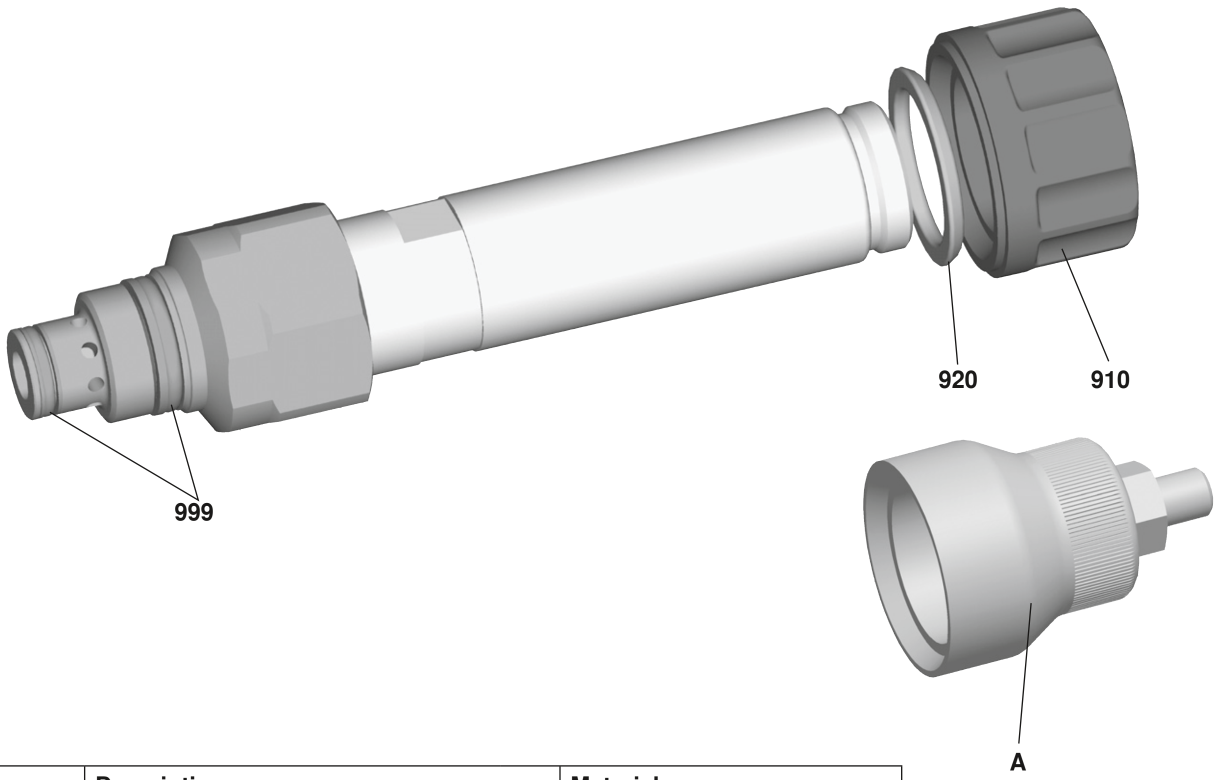


1) with counterbore, deviating from T-8A
2) All seal ring in sertion faces are rounded and free of burrs
3) Differing from T-8A

① = Main port 1
② = Main port 2
LS = Location shoulder

Tolerance for all angles ±0.5°

Available individual components



Item	Description	Material no.
910	Nut	R900991453
920	O-ring for pole tube	R900007769
999	Seal kit of the valve	R961003237
A	Manual override “N10” 1)	R901051231

Coils, separate order, see page 2

1) Only with ordering code “N9”, see page 2

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3/2 directional spool valve direct operated with solenoid actuation

RE 18136-09/06.12 1/10
Replaces: 10.09

Type KKDE (high-performance)

Component size 8
Component series A
Maximum operating pressure 350 bar
Maximum flow 30 l/min

Table of contents

Features

– Pilot valve
– Mounting cavity R/T-9A
– Direct operated directional spool valve with solenoid actuation
– Free-flowing in both directions
– Wet-pin DC solenoids
– Rotatable solenoid coil
– With concealed manual override

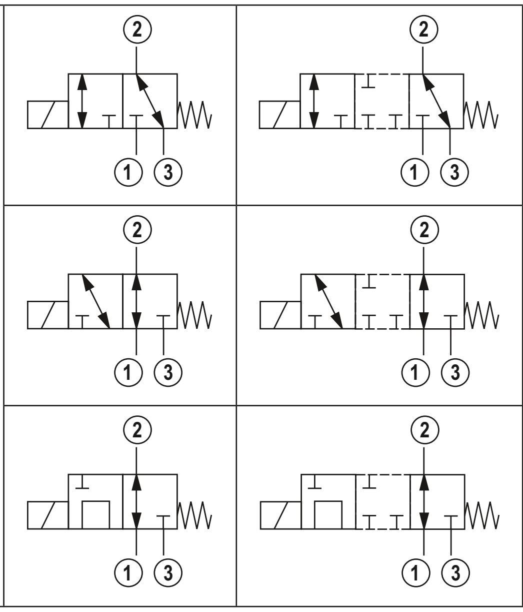
Information on available spare parts:
www.boschrexroth.com/spc

Ordering code (Valve without coil) 1)

KKDE	R	8		A / H		V	*

Directional spool valve, direct operated, electrically operated (pilot valve)	KKDE
Maximum operating pressure 350 bar	**= R**
Component size	**= 8**
3 main ports	
Component series	**A =**
High-performance and mounting cavity R/T-9A (see page 9)	**H =**
without manual override	**N0 =**
with concealed manual override 4)	**N9 =**
Seal material	
FKM seals (other seals upon request) Attention! Observe compatibility of seals with hydraulic fluid used!	**V =**
Further details in the plain text	*

Symbols



= C

= U

= G

Valve types (without coil) 1)

Spool variant	without manual override "**N0**" Type	Material no.	with concealed manual override "**N9**" Type	Material no.
C	KKDER8CA/HN0V	R901070049	KKDER8CA/HN9V	R901070055
U	KKDER8UA/HN0V	R901070050	KKDER8UA/HN9V	R901070068
G	KKDER8GA/HN0V	R901070051	KKDER8GA/HN9V	R901070072

Available coils (separate order) 1)

Direct voltage DC 3)	**Material no. for coil with connector** 2) **"K4"** 03pol (2+PE) DIN EN 175301-803	**"K40"** 02pol K40 DT 04-2PA, make. Deutsch	**"C4"** 02pol C4/Z30 AMP Junior Timer
12 V	R900991678	R900729189	R900315818
24 V	R900991121	R900729190	R900315819

1) Complete valves with mounted coil upon request

2) Mating connectors (separate order), see RE 08006

3) Other voltages upon request

4) Screwable manual override **"N10"** possible (Material no. **R901051231**, separate order)

Function, section, symbols

General

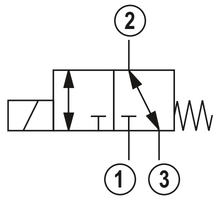
The 3/2 directional spool valves are direct operated, pressure compensated cartridge valves. They control the start, stop and direction of a flow and basically comprise a housing (1), the control spool (2) and a return spring (4).

Function

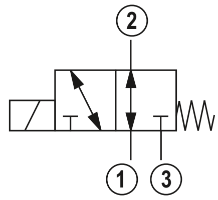
In the de-energized condition, control spool (2) is held in the initial position by the return spring (4). Control spool (2) is actuated by wet-pin DC solenoids (3). The various symbols are realized by corresponding spools (C, U, and G). The main ports ①, ②, and ③ are suitable for a continuous load with an operating pressure of 350 bar and the flow can be directed into both directions (see symbols).

The manual override (5) allows for the switching of the valve without solenoid energiaztion. It is also available in screwable version “N10” (6) (see page 2).

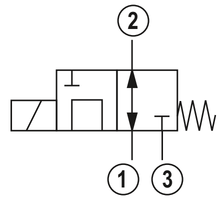
Symbol “C”



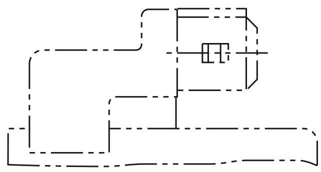
Symbol “U”



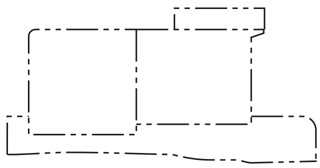
Symbol “G”



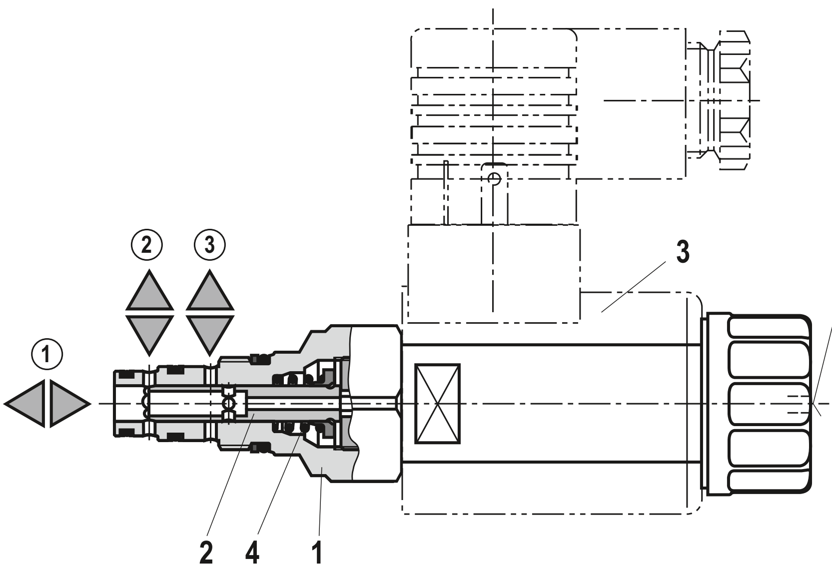
Version “C4”



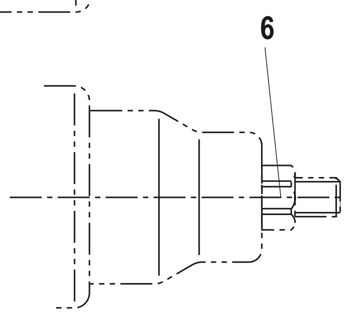
Version “K40”



Version “K4”
(with mating connector)



Type KKDER8GA/HN9V



Technical data (For applications outside these parameters, please consult us!)

general

Weight	– Valve	kg	0.3
	– Coil	kg	0.25
Installation position			Any
Ambient temperature range		°C	–40 to +110

hydraulic

Maximum operating pressure	bar	350 (at all ports)
Maximum flow	l/min	30
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524; quickly biodegradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids upon request
Hydraulic fluid temperature range	°C	–40 to +80
Viscosity range	mm^2/s	4 to 500
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]
Load cycles		10 million (at 350 bar)

electrical

Voltage type			Direct voltage
Supply voltage [2)]		V	12 DC; 24 DC
Voltage tolerance against ambient temperature			See characteristic curve page 5
Power consumption		W	22
Duty cycle		%	See characteristic curve page 5
Maximum coil temperature [3)]		°C	150
Switching time according to ISO 6403 (solenoid horizontal)	– ON	ms	≤ 80
	– OFF	ms	≤ 50
Maximum switching frequency		cy/h	15000
Protection class according to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version "K4"		IP 65 with mating connector mounted and locked
	– Version "C4"		IP 66 with mating connector mounted and locked
			IP 69K with Rexroth mating connector (Material no. R901022127)
	– Version "K40"		IP 69K with mating connector mounted and locked

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

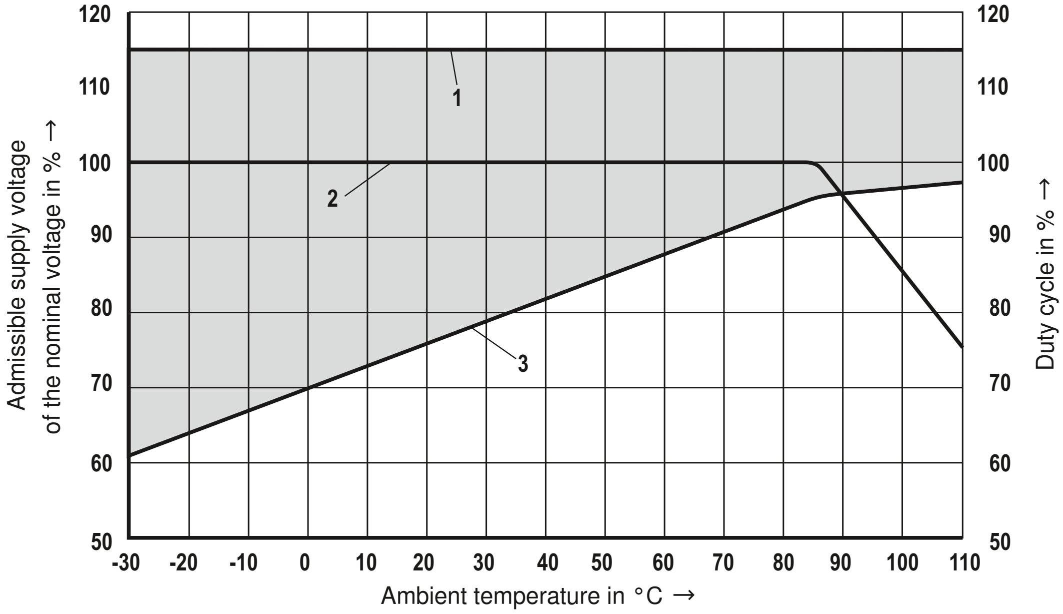
2) Other voltages upon request

3) Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

At the electrical connection "K4", the protective earthing conductor (PE ⏚) has to be connected properly.

Voltage tolerance against ambient temperature; duty cycle

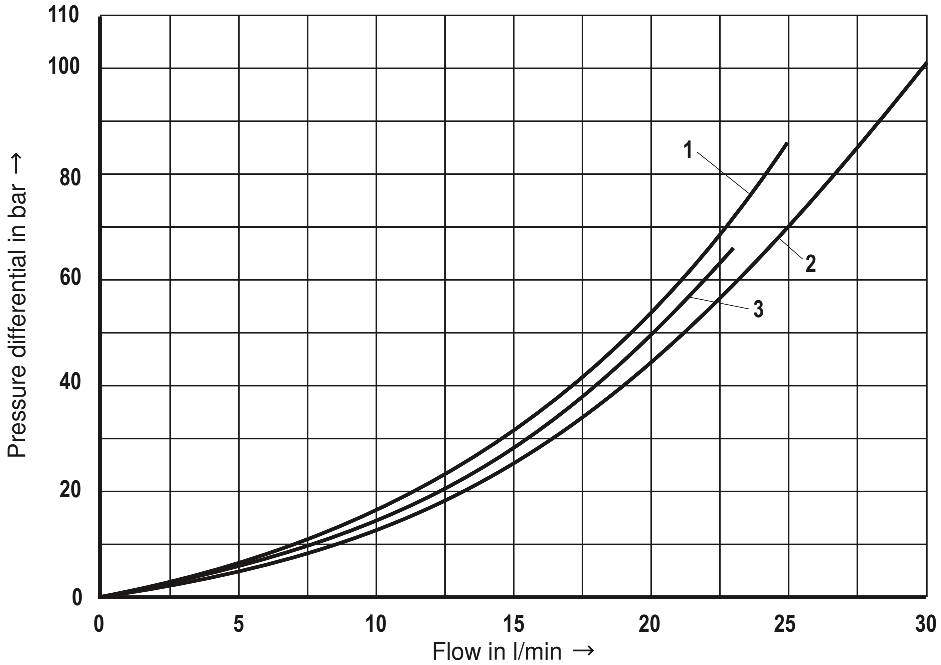
Voltage range and duty cycle depending on the ambient temperature



1 Maximum voltage
2 Duty cycle
3 Minimum response voltage
Admissible supply voltage range

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

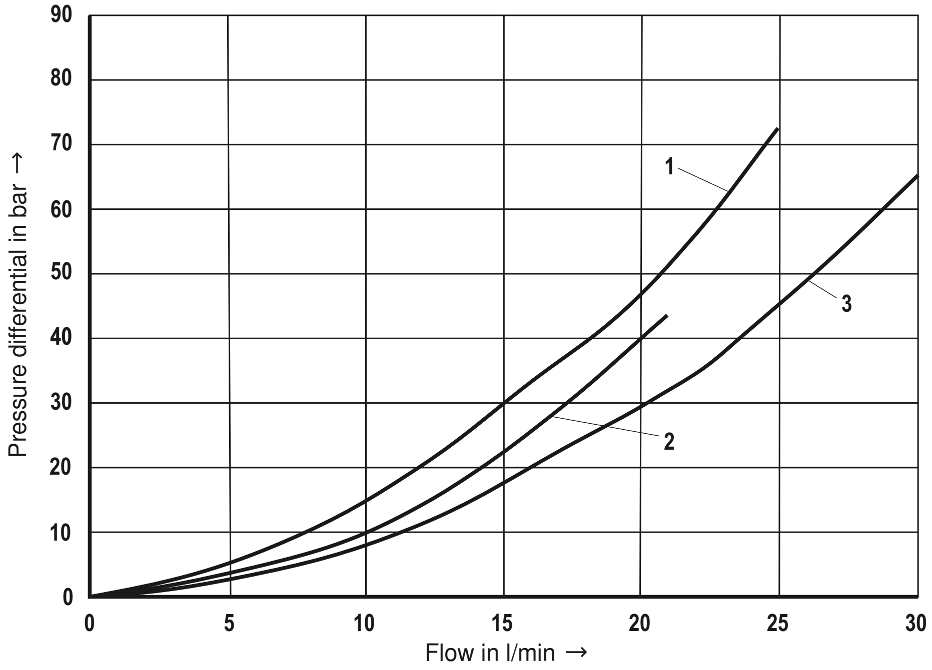
***Δp-q*$_V$ characteristic curves – symbol C**



1	1 → 2 2 → 1
2	2 → 3
3	3 → 2

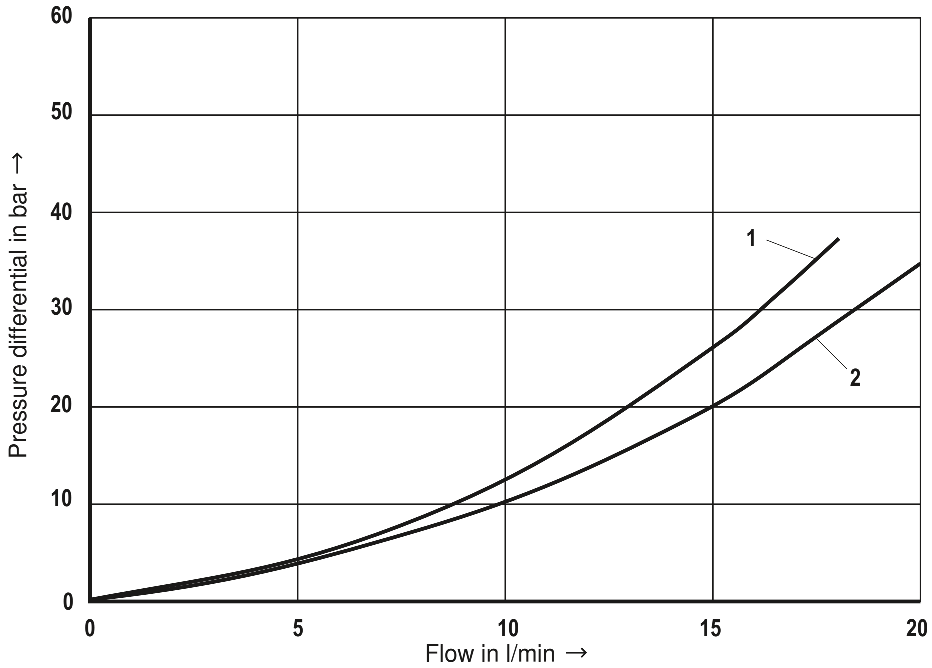
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)

Δp-q_V characteristic curves – symbol U



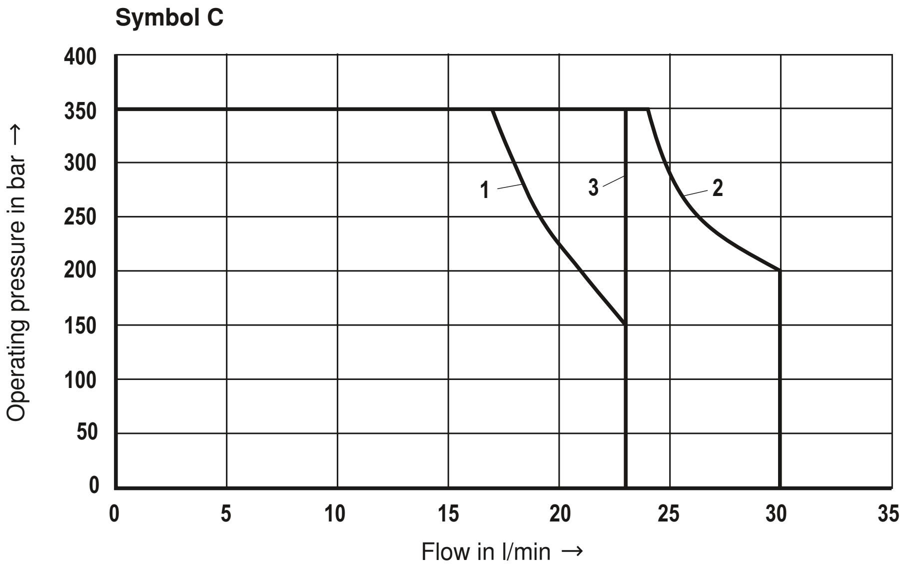
1	3 → 2
2	1 → 2
3	2 → 1 2 → 3

Δp-q_V characteristic curves – symbol G

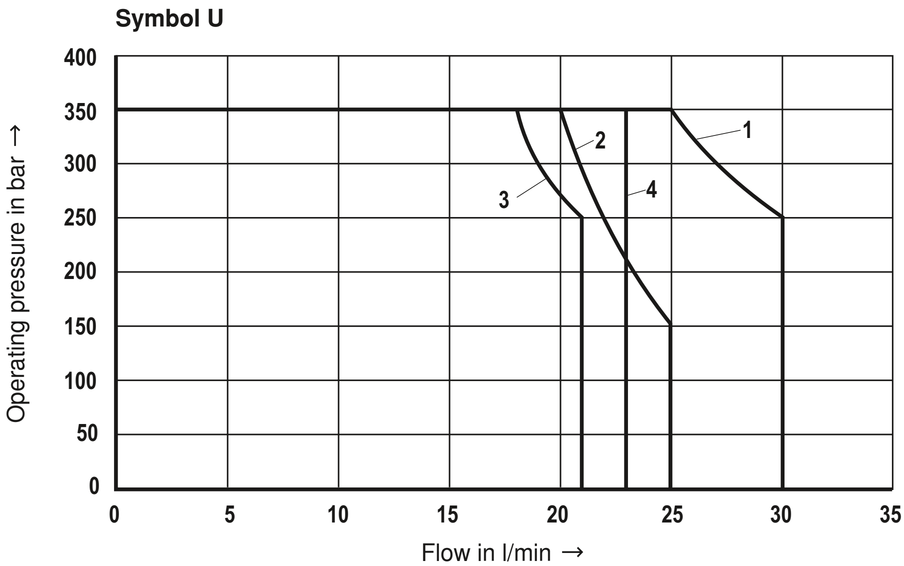


1	1 → 2 3 → 1
2	1 → 3 2 → 1

Performance limits (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and 24 V coil)



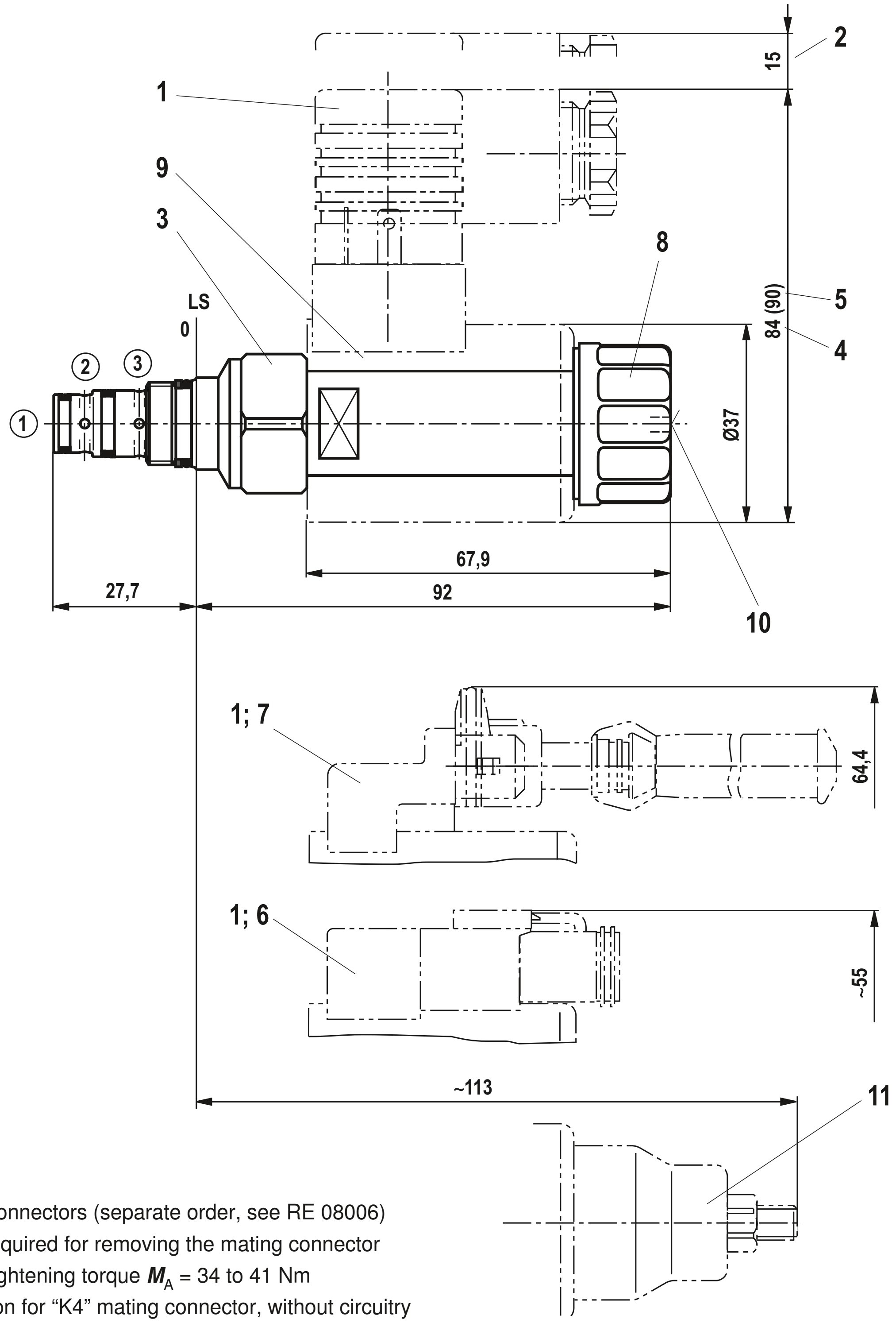
1	1 → 2 2 → 1
2	2 → 3
3	3 → 2



1	2 → 3
2	3 → 2
3	1 → 2
4	2 → 1

1	1 → 2
2	1 → 3 3 → 1
3	2 → 1

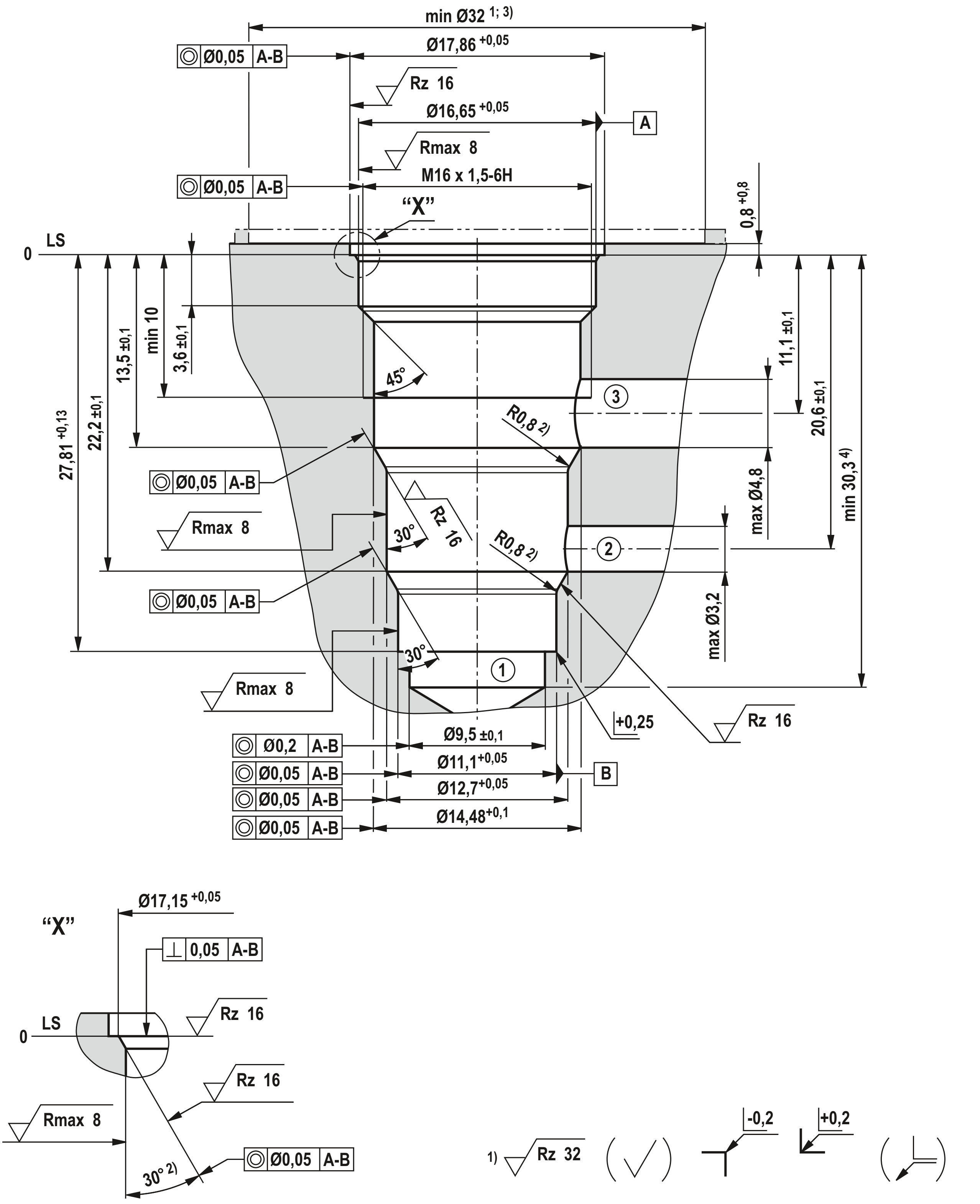
Unit dimensions (dimensions in mm)



1 Mating connectors (separate order, see RE 08006)
2 Space required for removing the mating connector
3 SW24, tightening torque M_A = 34 to 41 Nm
4 Dimension for “K4” mating connector, without circuitry
5 Dimension () for “K4” mating connector, with circuitry
6 Version “K40”
7 Version “C4”
8 Nut, tightening torque $M_A = 5^{+1}$ Nm
9 Coil (separate order, see page 2)
10 Concealed manual override “N9”, optional
11 Screwable manual override “N10” (separate order, see page 2)

① = Main port 1
② = Main port 2
③ = Main port 3
LS = Location shoulder

Mounting cavity R/T-9A; 3 main ports; thread M1 x 1.5 (dimensions in mm)



1) Differing from T-9A

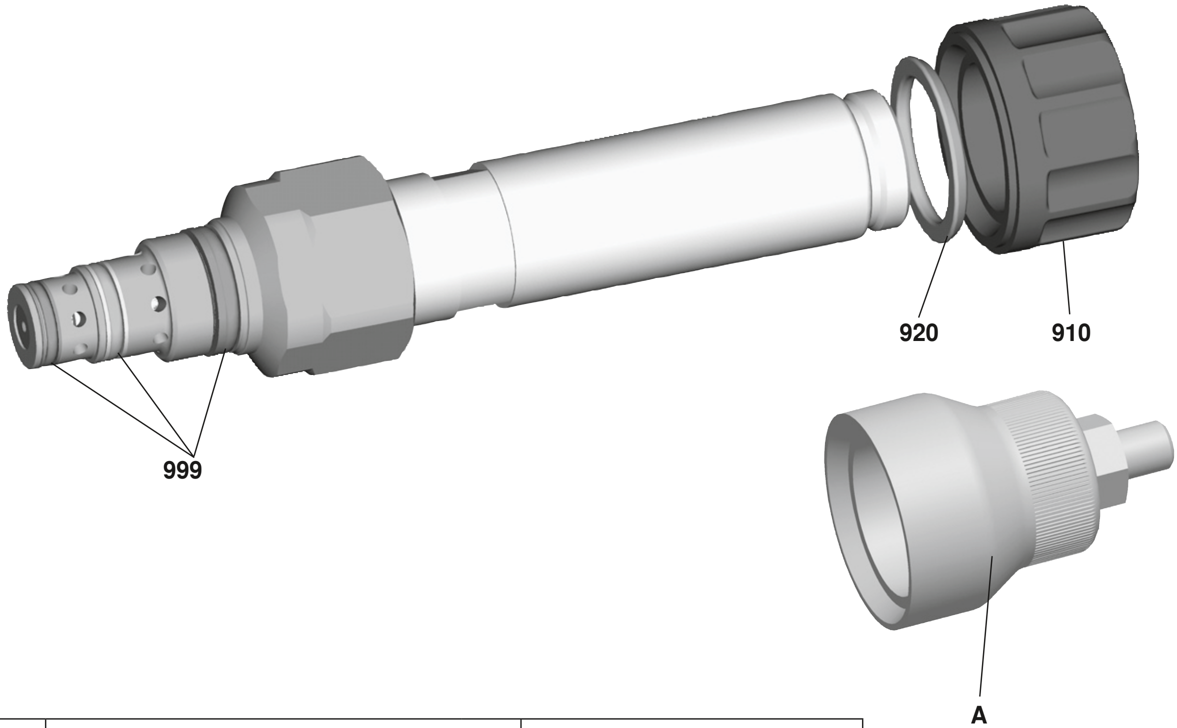
2) All seal ring in sertion faces are rounded and free of burrs

3) with counterbore

4) Depth for moving parts

① = Main port 1
② = Main port 2
③ = Main port 3
LS = Location shoulder
Tolerance for all angles ±0.5°

Available individual components



Item	Description	Material no.
910	Nut	R900991453
920	O-ring for pole tube	R900007769
999	Seal kit of the valve	R961003414
A	Manual override "N10" 1)	R901051231

Coils, separate order, see page 2

1) Only with ordering code "N9", see page 2

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The Drive & Control Company

Rexroth
Bosch Group

4/3 directional spool valve, direct operated, with solenoid actuation

Type VEDS..43

RE 18156
Edition: 2012-11
Replaces: 05.12

H7900

- Frame size 10
- Component series 0
- Maximum operating pressure 350 bar
- Maximum flow 35 l/min

Features

- Mounting cavity R/UNF10-04-0-06
- Wet-pin DC solenoids
- Rotatable solenoid coil
- Manual override, optional

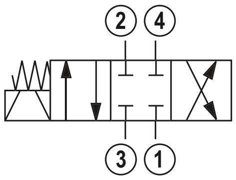
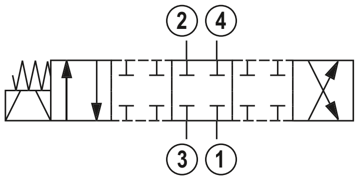
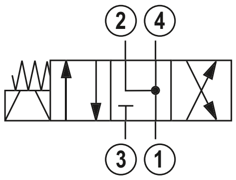
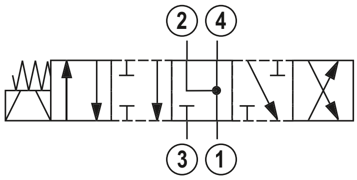
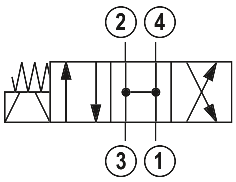
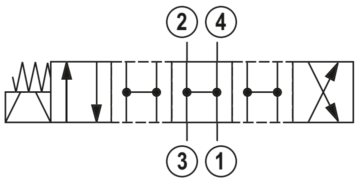
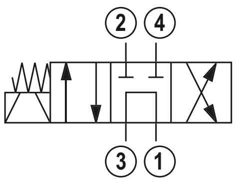
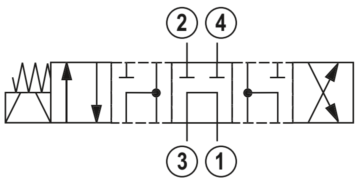
Contents

Ordering code (valve without coil) [1)]

01		02		03	04	05		06	07	08	09	10	11	12
VEDS	**–**	**10A**	**–**	**43**				**OD14**		**78**	**KK2**		**0**	**0**

01	Directional spool valve, direct operated	**VEDS**
02	Frame size 10	**10A**
03	4/3 directional design	**43**

Symbols

04			**10**
			**20**
			**40**
			**60**

05	**Without** manual override	**0**
	With pull/push manual override	**-M1**
06	4/3 directional spool valve, direct operated, with solenoid actuation	**OD14**

Symbols

07	See item 04	**10**
		20
		40
		60
08	Frame size 10: R/UNF 10-04-0-06, see page 11	**78**
09	On/off valve with 2 coils	**KK2**
10	**Without** manual override	**0**
	With pull/push manual override	**1**
11	Standard version	**0**
12	Revision status	**0**

Valve types (without coil) 1)

Symbol	**Without** manual override **"0"**			**With** pull/push manual override **"-M1", "1"**		
	Type		**Material no.**	**Type**		**Material no.**
10	VEDS-10A-4310	OD141078KK2000	R901237595	VEDS-10A-4310-M1	OD141078KK2100	R901255425
20	VEDS-10A-4320	OD142078KK2000	R901237594	VEDS-10A-4320-M1	OD142078KK2100	R901255421
40	VEDS-10A-4340	OD144078KK2000	R901237592	VEDS-10A-4340-M1	OD144078KK2100	R901255423
60	VEDS-10A-4360	OD146078KK2000	R901237591	VEDS-10A-4360-M1	OD146078KK2100	R901255424

Available coils (separate order) 1)

Direct voltage DC 3)	**Material no. for coil with connector** 2)		
	"K4" 03pol (2+PE) DIN EN 175301-803	**"K40"** 02pol K40 DT 04-2PA, make Deutsch	**"C4"** 02pol C4/Z30 AMP Junior-Timer
12 V	R900991678	R900729189	R900315818
24 V	R900991121	R900729190	R900315819

1) Complete valves with mounted coil on request.

2) Mating connectors, separate order, see data sheet 08006.

3) Other voltages upon request.

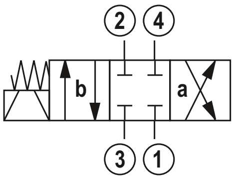
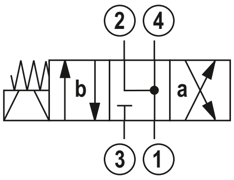
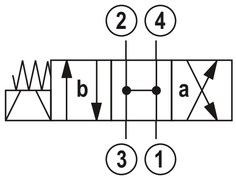
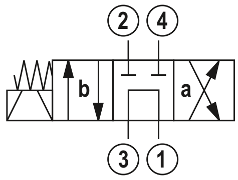
Function, section, symbols

General

The 4/3 directional spool valves are direct operated, pressure-compensated cartridge valves. They control the start, stop and direction of a flow and basically comprise of pole tube (1), socket (2), a control spool (5) as well as of a return spring (4).

Function

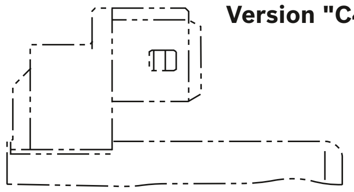
In the de-energized condition, the control spool (5) is held in the initial position by the return spring (4). The control spool (5) is actuated by wet-pin DC solenoids (3.1; 3.2).
The symbols are realized by different spools ("10"; "20"; "40" and "60"). Main ports ②, ③ and ④ can be permanently pressurized with an operating pressure of 350 bar. The ports have a fixed pin assignment (see symbols). At port ① there must be a maximum pressure of 250 bar.
The manual override (6) allows for the switching of the valve without solenoid energization.

Symbol "10"	Symbol "20"	Symbol "40"	Symbol "60"
			

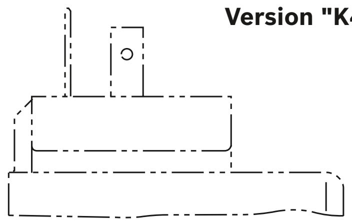
① = Main port 1 (T)
② = Main port 2 (A)
③ = Main port 3 (P)
④ = Main port 4 (B)

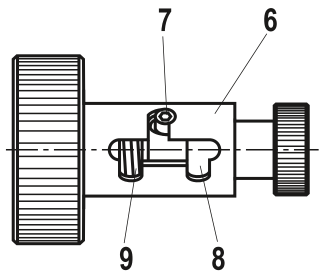
7 Initial position
8 Spool position "a"
9 Spool position "b"

Version "C4"

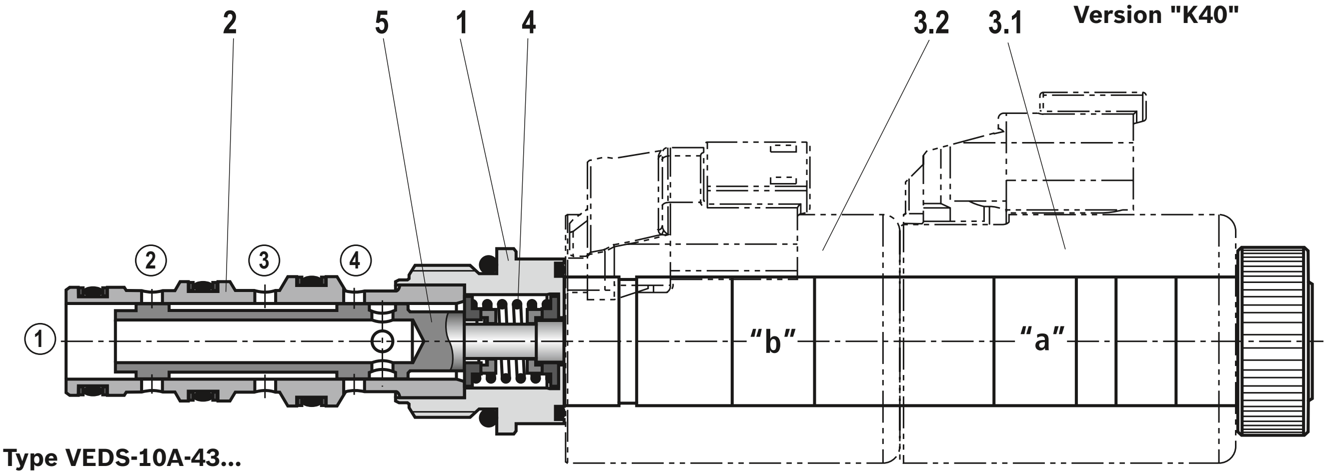


Version "K4"





Version "K40"



Type VEDS-10A-43...

Technical data
(For applications outside these parameters, please consult us!)

general			
Weight	– Valve	kg	0.35
	– Coil	kg	0.25 each
Installation position			Any - if it is ensured that no air can collect upstream the valve. Otherwise, we recommend suspended installation of the valve.
Ambient temperature range		°C	–40 to +110 (see page 6)
Storage temperature range		°C	–20 to +80

Environmental audits

Salt spray test according to DIN 50021	h	720
Surface protection DC solenoids		Coating according to DIN 50962-Fe//ZnNi with thick film passivation

hydraulic			
Maximum operating pressure	– Connection ②, ③, ④	bar	350
	– Connection ①	bar	250
Maximum flow		l/min	35
Leakage		ml/min	< 60 (with Δp = 250 bar; HLP46, ϑ_{oil} = 40 °C)
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C	–40 to +80
Viscosity range		mm²/s	5 to 1000 (preferably 10 to 100)
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]
Load cycles			2 million

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils		HL, HLP	FKM	DIN 51524
Bio-degradable	– Insoluble in water	HEES	FKM	VDMA 24568
	– Soluble in water	HEPG	FKM	

Important information on hydraulic fluids!
- ▶ For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- ▶ There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- ▶ The flash point of the hydraulic fluids used must be 40 K higher than the maximum solenoid surface temperature.
- ▶ **Bio-degradable:** When using bio-degradable hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the fluid.

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components. For the selection of the filters see www.boschrexroth.com/filter.

Technical data
(For applications outside these parameters, please consult us!)

electric			
Voltage type			Direct voltage
Supply voltages [2]		V	12 DC; 24 DC
Voltage tolerance against ambient temperature			See characteristic curve below
Power consumption		W	22
Duty cycle		%	See characteristic curve below
Maximum coil temperature [3]		°C	150
Switching time according to ISO 6403 (solenoid horizontal)	– ON	ms	≤ 80
	– OFF	ms	≤ 50
Maximum switching frequency		cy/h	15000
Protection class according to VDE 0470-1 (DIN EN 60529) DIN 40050-9	– Version "K4"		IP 65 with mating connector mounted and locked
	– Version "C4"		IP 66 with mating connector mounted and locked
			IP 69K with Rexroth mating connector (material no. R901022127)
	– Version "K40"		IP 69K with mating connector mounted and locked

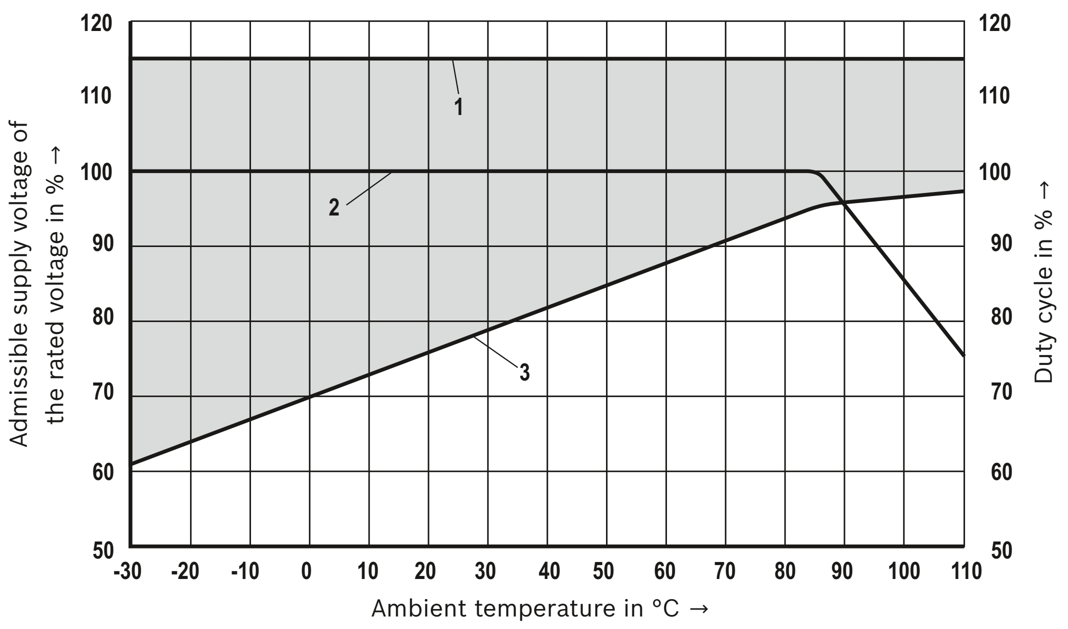
[2] Other voltages upon request.

[3] Due to the surface temperatures of the solenoid coils, the standards ISO 13732-1 and ISO 4413 need to be adhered to!

When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected properly.

Voltage tolerance against ambient temperature; duty cycle

Voltage range and duty cycle depending on the ambient temperature



1 Maximum voltage

2 Duty cycle

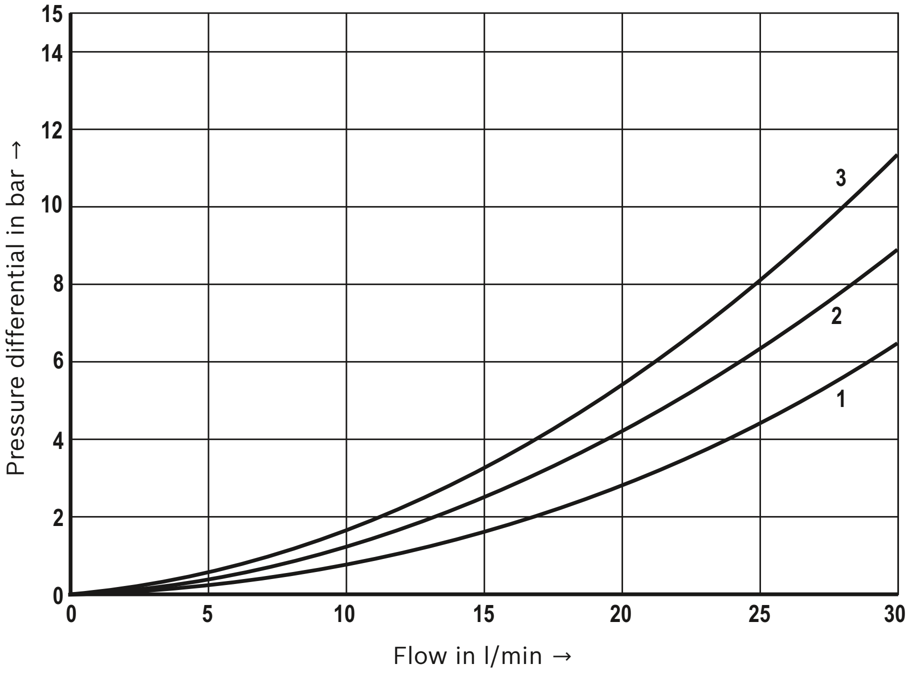
3 Minimum response voltage

Admissible supply voltage range

Characteristic curves

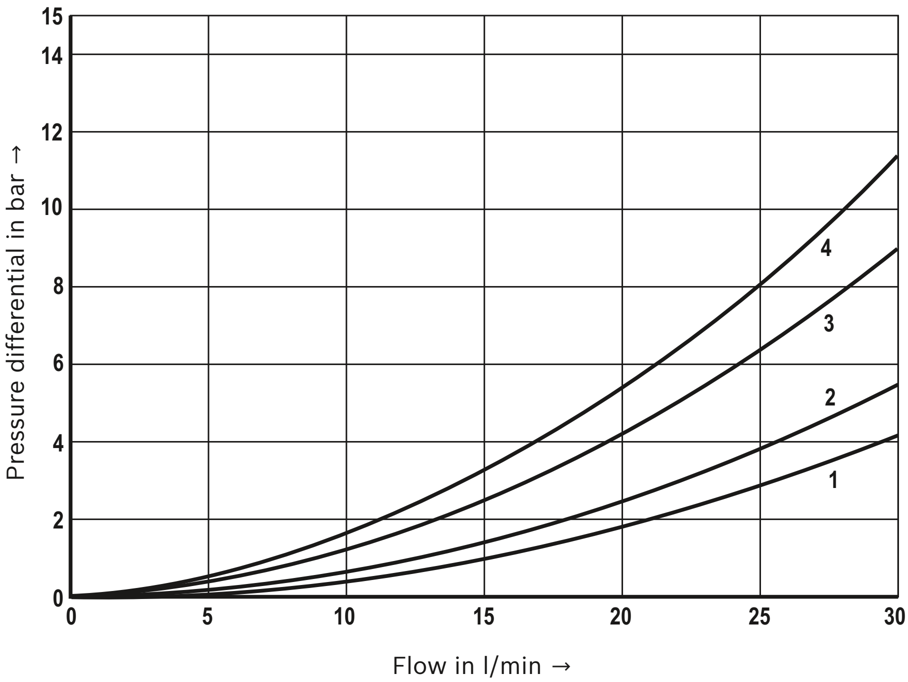
(measured with HLP46, ϑ_{oil} = 40 ±5 °C and 24 V coil)

Δp-q_V characteristic curves – Symbol "10"



1	④ → ① ② → ①
2	③ → ④
3	③ → ②

Δp-q_V characteristic curves – Symbol "20"

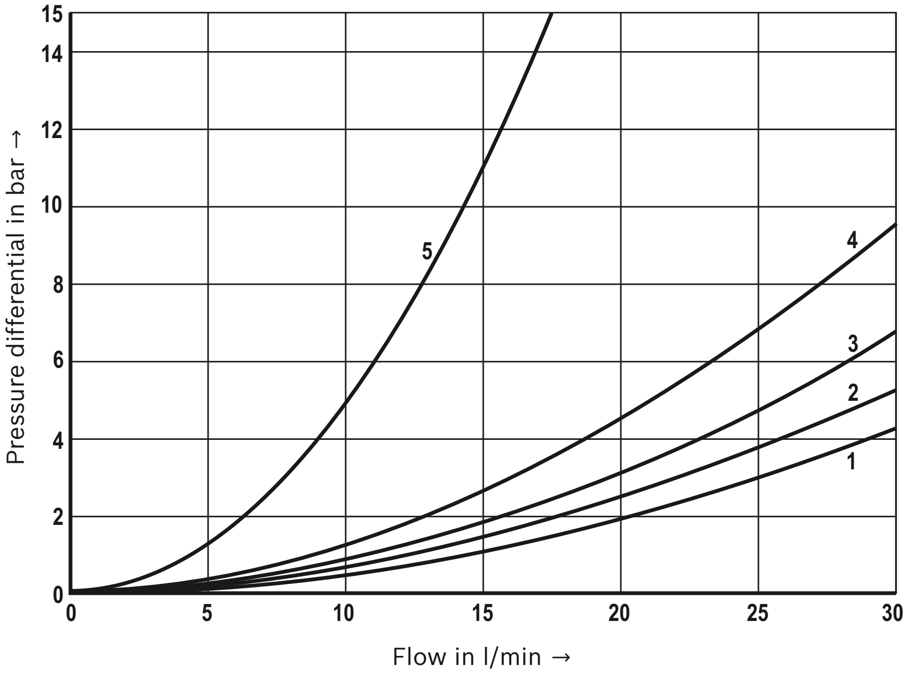


1	② → ①
2	④ → ①
3	③ → ④
4	③ → ②

Characteristic curves

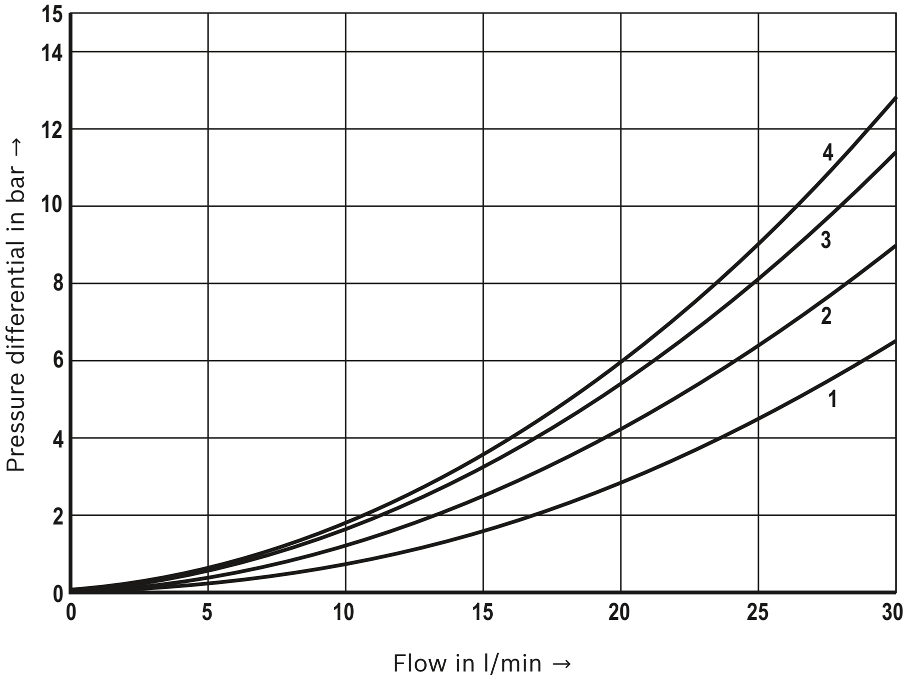
(measured with HLP46, ϑ_{oil} = 40 ±5 °C and 24 V coil)

Δp-q_V characteristic curves – Symbol "40"



1	② → ①
2	④ → ①
3	③ → ④
4	③ → ②
5	③ → ①

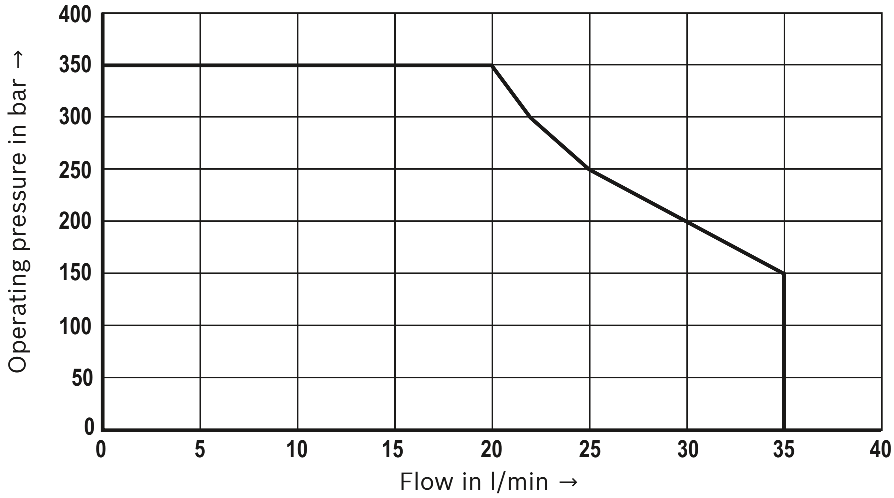
Δp-q_V characteristic curves – Symbol "60"



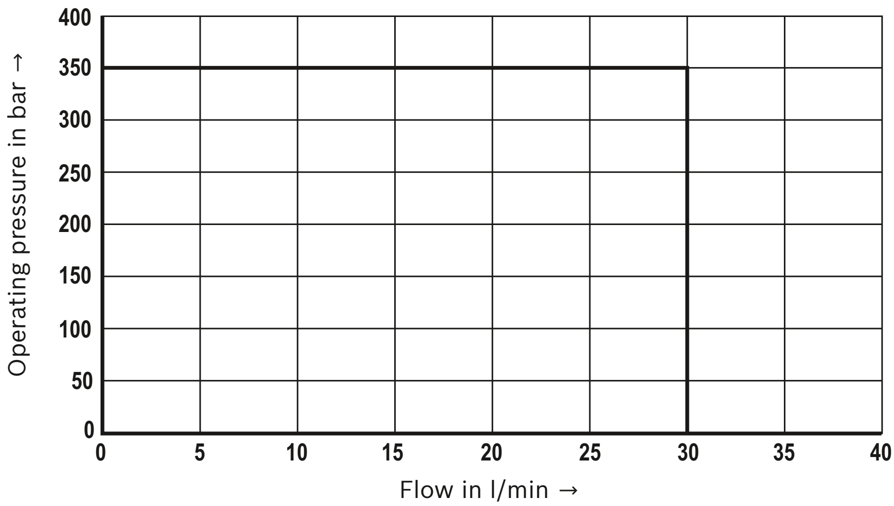
1	④ → ① ② → ①
2	③ → ④
3	③ → ②
4	③ → ①

Limits of performance
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

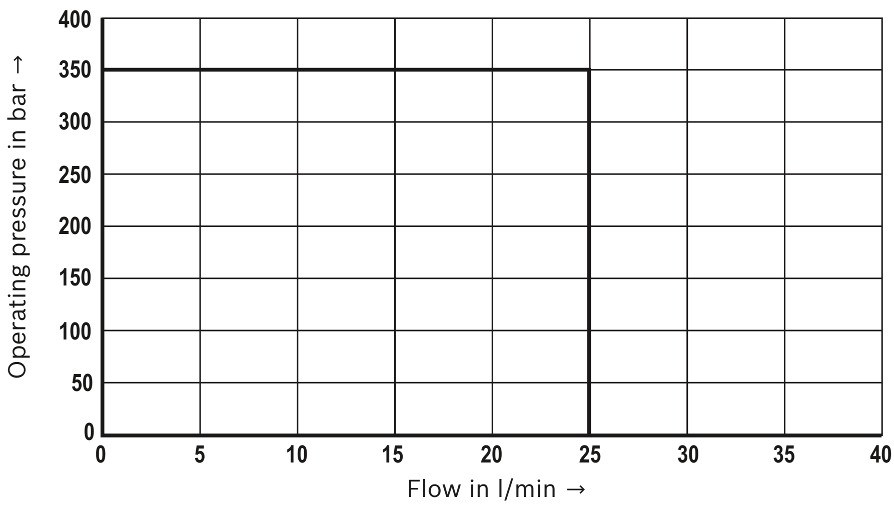
Symbol "10" and "20"



Symbol "40"

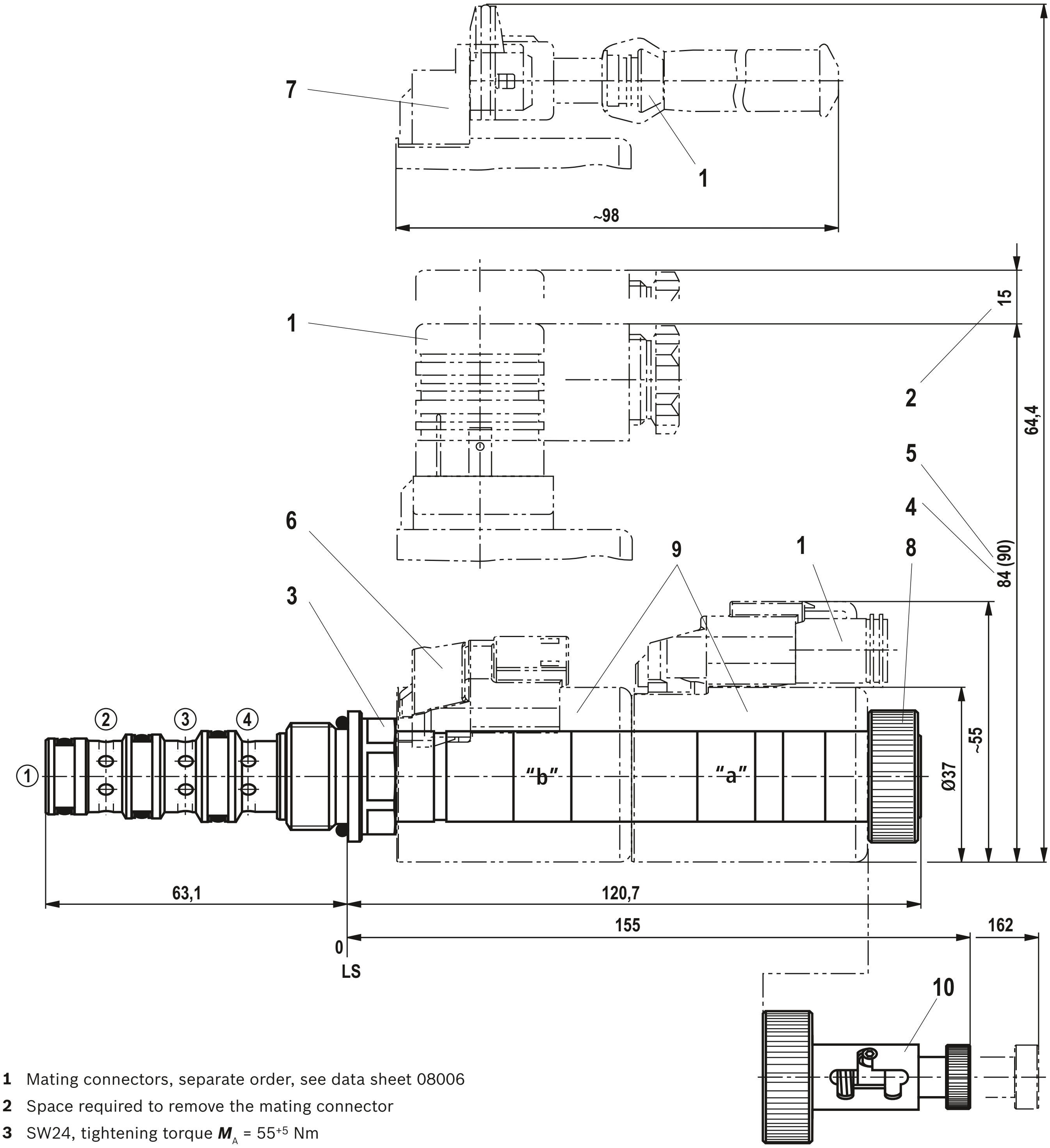


Symbol "60"



⚠ **Attention!**
The specified limits of performance are valid for operation with two directions of flow (e.g. from ③ to ② and simultaneous return flow from ④ to ①).
Due to the current forces acting within the valves, the permissible performance limit may be considerably lower with only one direction of flow (e.g. from ③ to ② and blocked port ④)!
In such applications, please consult us!
The performance limit was determined when the solenoids were at operating temperature, at 10% undervoltage and without tank pre-loading.

Unit dimensions
(dimensions in mm)

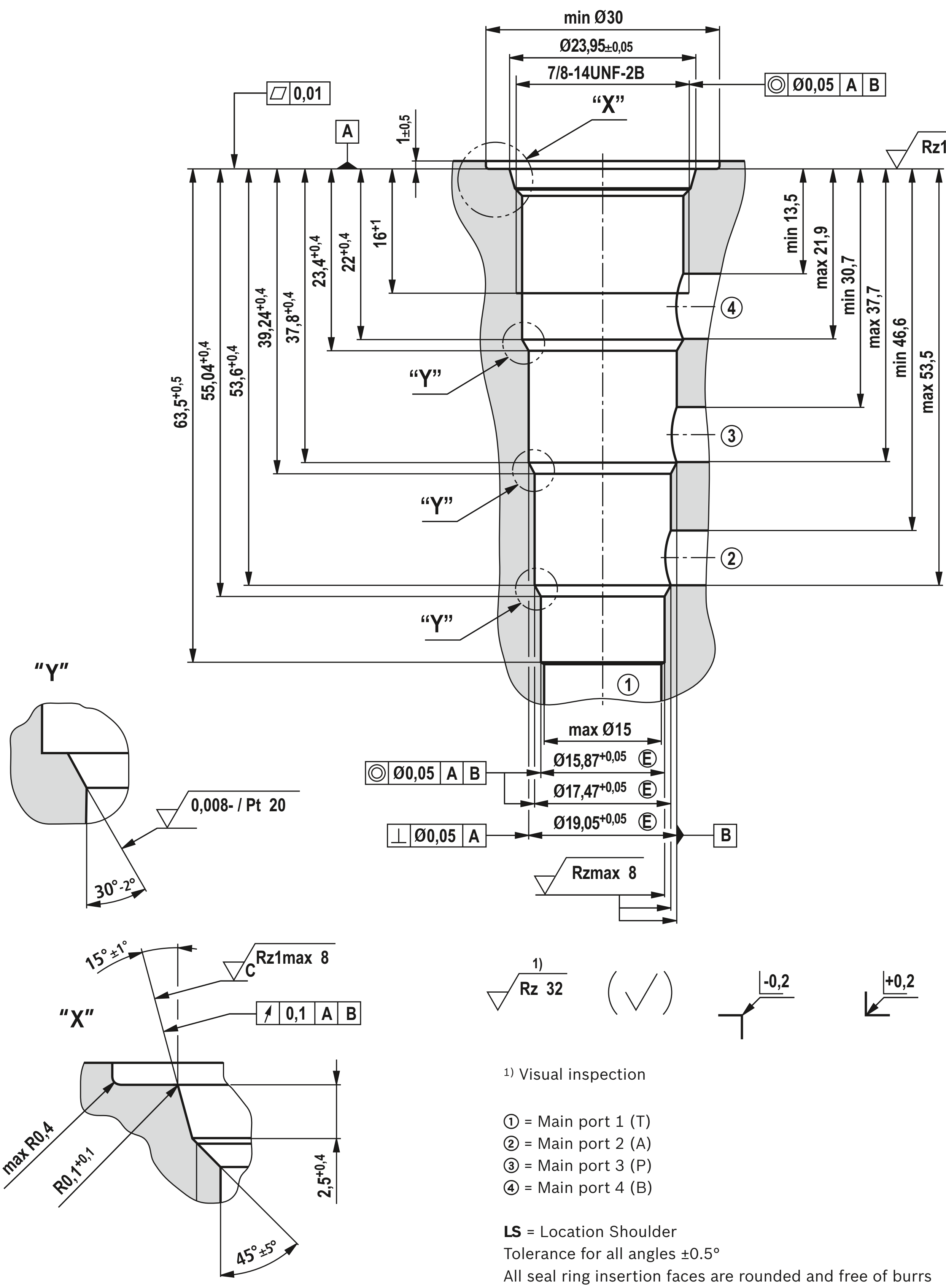


1 Mating connectors, separate order, see data sheet 08006
2 Space required to remove the mating connector
3 SW24, tightening torque $M_A = 55^{+5}$ Nm
4 Dimension for "K4" mating connector, without circuitry
5 Dimension () for "K4" mating connector, with circuitry
6 Version "K40"
7 Version "C4"
8 Nut, tightening torque $M_A = 5^{+1}$ Nm
9 Coil (separate order, see page 3)
10 Pull/push manual override "1"

① = Main port 1 (T)
② = Main port 2 (A)
③ = Main port 3 (P)
④ = Main port 4 (B)

LS = Location Shoulder

Mounting cavity R/UNF-10-04-0-06; 4 main ports; thread 7/8-14UNF-2B
(dimensions in mm)

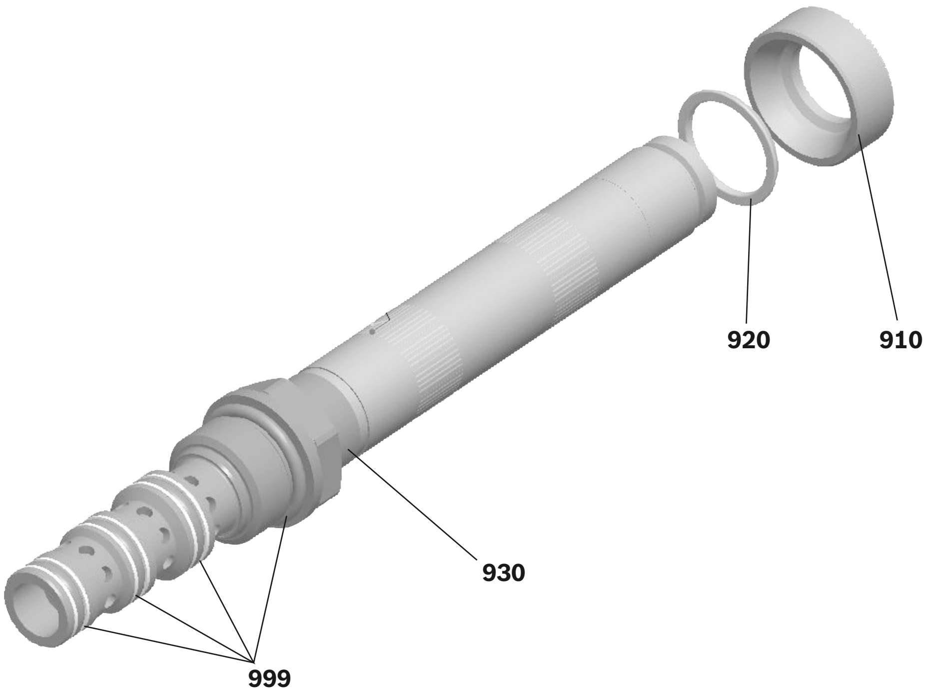


1) Visual inspection

① = Main port 1 (T)
② = Main port 2 (A)
③ = Main port 3 (P)
④ = Main port 4 (B)

LS = Location Shoulder
Tolerance for all angles ±0.5°
All seal ring insertion faces are rounded and free of burrs

Available individual components



Item	Denomination	Material no.
910	Nut	R901241052
920	O-ring for pole tube	R900007769
930	O-ring for pole tube	R913014944
999	Seal kit of the valve	R961005190

Coils, separate order, see page 3

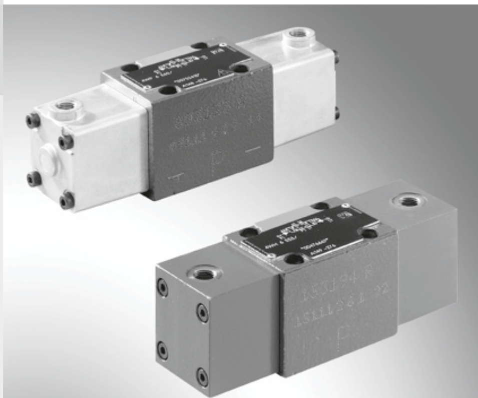
Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

4/3, 4/2 and 3/2 directional valve with fluidic actuation

RE 22282/04.10
Replaces: 08.08

Type WP, WH



H6875

Size 6
Component series 6X (WP), 5X (WH)
Maximum operating pressure 315 bar *[4569 psi]*
Maximum flow 60 l/min *[15.8 US gpm]*

Table of contents

Features

- Direct operated directional spool valve
- Types of actuation:
  - Pneumatic (WP, WPZ)
  - Hydraulic (WH, WHZ)
- Porting pattern according to DIN 24340 form A (**without** locating hole)
- Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole)
- Subplates according to data sheet 45052 (separate order)
- Inductive positions witch and proximity sensor (contactless), see data sheet 24830

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

	W			6		/	J		/				*

3 main ports **= 3**
4 main ports **= 4**

Directional valve **= W**

Type of actuation
Pneumatic **= P**
Hydraulic **= H**

Connections radial = **no code**
Connections axial = **Z** [1]

Size 6 **= 6**

Spool symbol e.g. C, E, EA, EB, etc. [2]

Type WP
Component series 60 to 69 **= 6X**
(60 to 69: unchanged installation and connection dimensions)
Type WH
Component series 50 to 59 **= 5X**
(50 to 59: unchanged installation and connection dimensions)

with spring return **= no code**
without spring return **= O**
without spring return with detent **= OF**

Improved corrosion protection [3] **= J**

without manual override **= no code**
with manual override **= N** [3]

Further details in the plain text

no code = without locating hole
/60 [5] **=** with locating hole
/62 = **with** locating hole and locating pin ISO 8752-3x8-St

Clamping length
no code = 42 mm (standard)
Z = 22 mm

Seal material
no code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

no code = without throttle insert
B08 [6] **=** Throttle Ø 0.8 mm *[0.0315 inch]*
B08 [6] **=** Throttle Ø 1.0 mm *[0.0394 inch]*
B12 [6] **=** Throttle Ø 1.2 mm *[0.0472 inch]*

Spool position monitoring [7]
no code = without position switch
QMAG24 = Monitored spool position "a"
QMBG24 = Monitored spool position "b"
QM0G24 = Monitored rest position
For further details see data sheet 24830

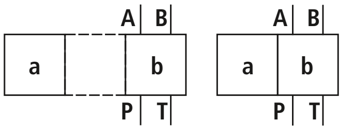
Standard types and standard units are contained in the EPS (standard price list).

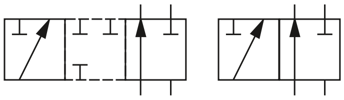
	Spool positions			
	2	3	Type WP, Type WPZ	Type WP, Type WHZ
no code	✓	✓	✓	✓
O	✓		✓	✓
OF	✓		✓	✓

• = Available

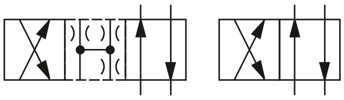
1) Not for model "N"
2) Symbols and examples, see pages 3 and 4
3) The external metal parts are galvanized, treated with anti-corrosion agent or manufactured from stainless steel. This model is also suitable for on-deck applications.
4) Only for pneumatic actuation "P"
6) Use if volume flow > performance limit of the valve, effective in channel P
5) Locating pin ISO 8752-3x8-St, material no. **R900005694**, separate order
7) Not for model "J"

Spool symbols

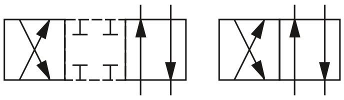




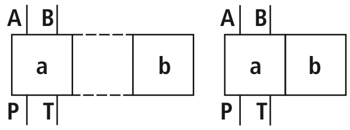
= A

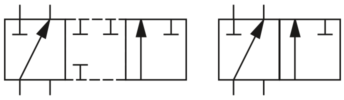


= C

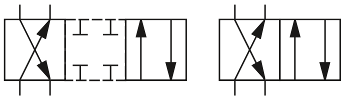


= D

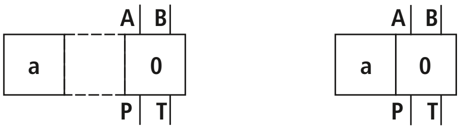




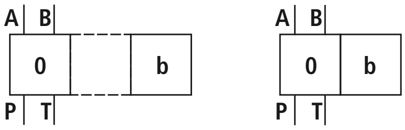
= B



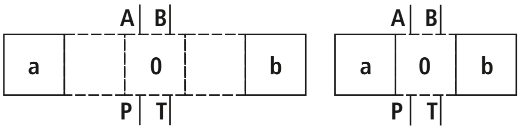
= Y



= .A 1)



= .B 1)



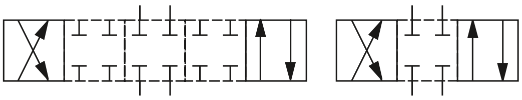
1) **Example:**

- Spool symbol E with spool position “a”
  → ordering code ..**EA**..
- Spool symbol E with spool position “b”
  → ordering code ..**EB**..

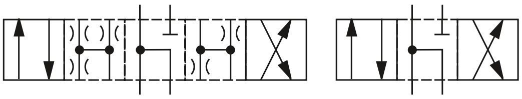
2) **Symbol E1**-: P → A/B pre-opening

Attention!

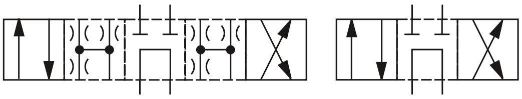
Caution in conjunction with single-rod cylinders due to pressure intensification!



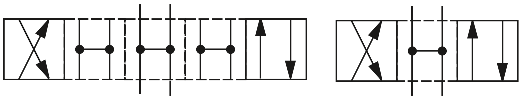
= E 1)
= E1- 2)



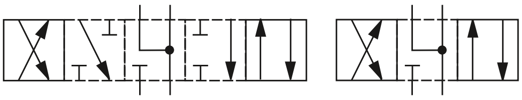
= F



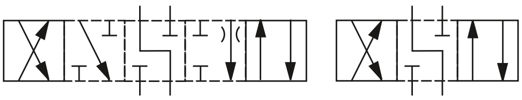
= G



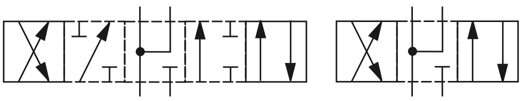
= H



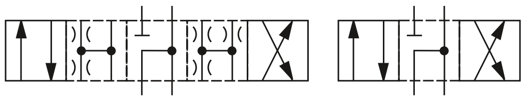
= J



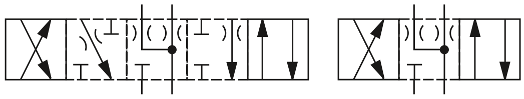
= L



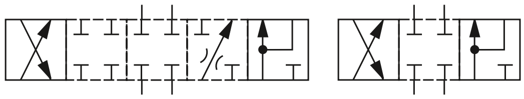
= M



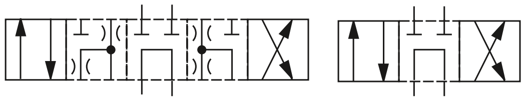
= P



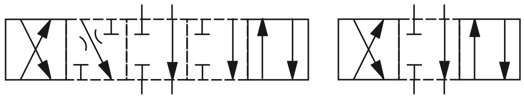
= Q



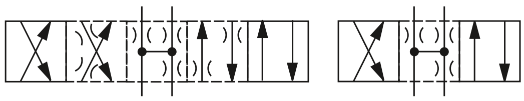
= R



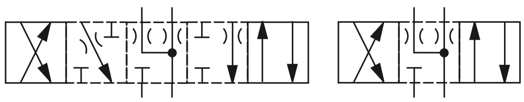
= T



= U

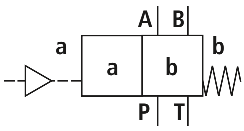
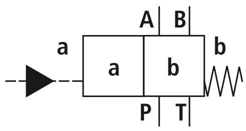
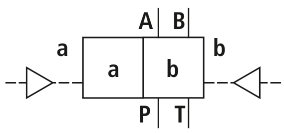
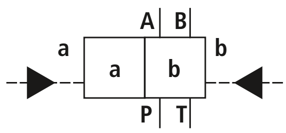
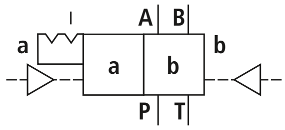
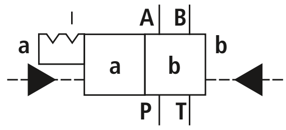
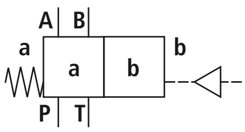
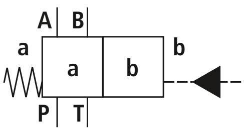
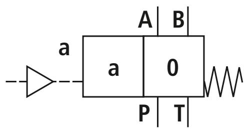
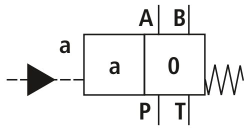
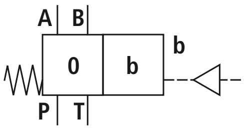
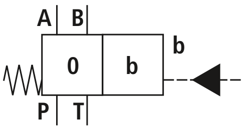
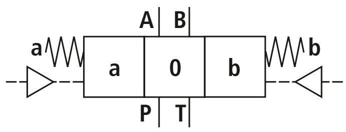
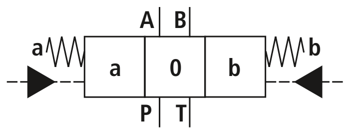


= V



= W

Types of actuation

Codification			Type of actuation	
Spool symbol	**Actuation side**	**Spool return**	**P** (pneumatic)	**H** (hydraulic)
A, C, D				
		../O..		
		../OF..		
B, Y				
E, F G, H J, L M, P Q, R T, U V, W	**"a" [1] = .A**			
	"b" [1] = .B			
				

[1] See symbols page 3.

Function, section

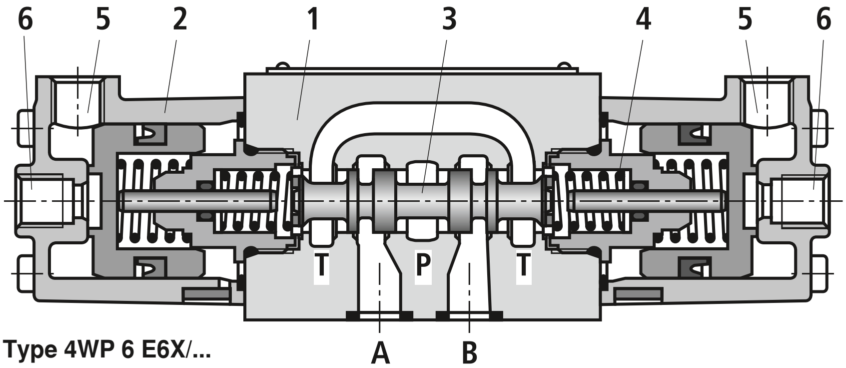
General

Valves of type WP and WH are directional spool valves with fluid logics actuation. They control the start, stop and direction of a flow.

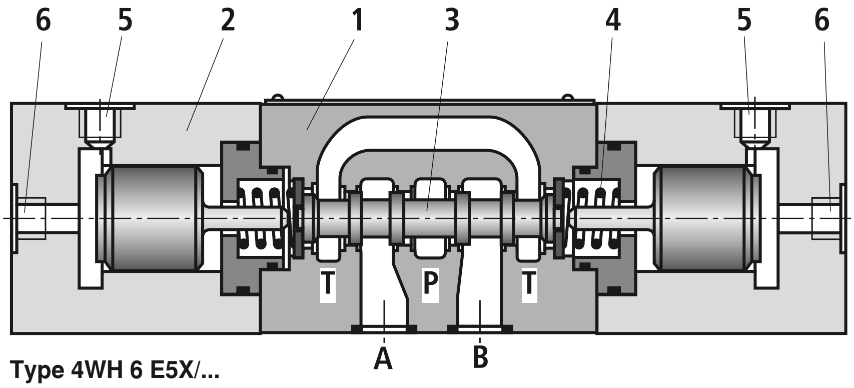
The directional valves basically consist of housing (1), one or two actuation elements (2) (hydraulic, pneumatic actuation cylinder), control piston (3), and one or two return springs (4). The connections for control are arranged in a radial (model "WP", "WH") (5) or axial (model "WPZ", "WHZ") (6) way.

In the de-energized condition, control piston (3) is held in the central position or in the initial position by the return springs (4) (except for impulse spool).

The control spool (3) is moved to the required spool position by means of the actuation elements.



Type 4WP 6 E6X/...

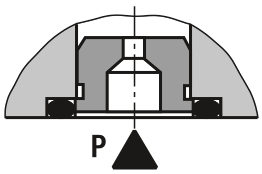


Type 4WH 6 E5X/...

Throttle insert

The use of a throttle insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

It is inserted in channel P of the directional valve.

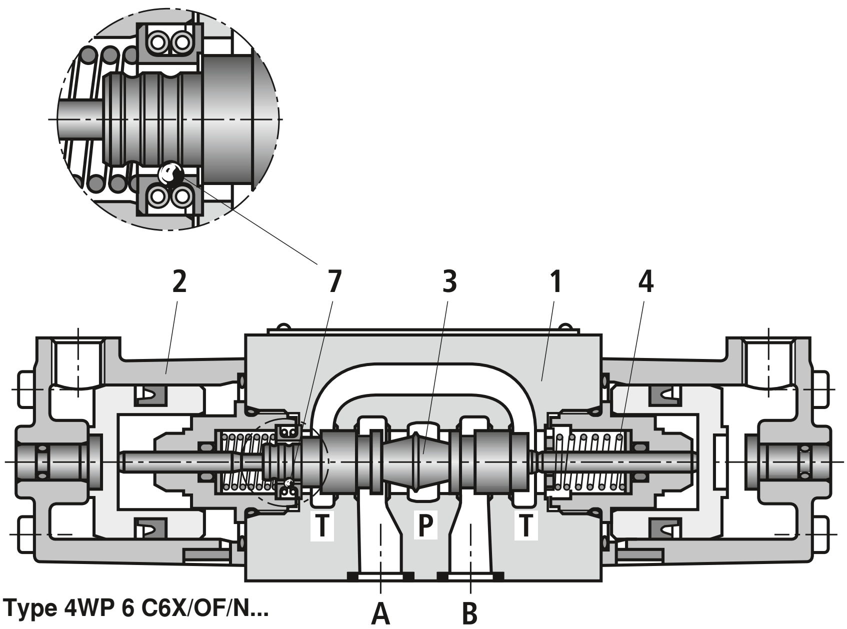


Without spring return with detent, model **..OF/..**

Directional valves with hydraulic or pneumatic actuation are also available as 2-spool position valve with detent (7). If using actuation elements with detent, every spool position can be locked.

Without spring return, model **..O/..**

If using actuation elements without return springs and without detent, a defined spool position is not given in the de-energized condition.



Type 4WP 6 C6X/OF/N...

Technical Data (For applications outside these parameters, please consult us!)

general

Version			"WP"	"WH"	"WHZ"
Weight	– Valve with one actuation cylinder	kg *[lbs]*	approx. 1.8 *[3.97]*	approx. 2.0 *[4.41]*	approx. 2.2 *[4.85]*
	– Valve with two actuation cylinders	kg *[lbs]*	approx. 2.0 *[4.41]*	approx. 2.2 *[4.85]*	approx. 2.4 *[5.29]*
Installation position			Any [1)]		
Ambient temperature range		°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)		

hydraulic

Maximum operating pressure	– Port A, B, P	bar *[psi]*	315 *[4569]*	
	– Port T	bar *[psi]*	160 *[2320]* With symbols A and B, port T must be used as leakage port if the operating pressure exceeds the tank pressure.	
Maximum flow		l/min *[US gpm]*	60 *[15.8]*	
Flow cross-section (Spool position 0)	– for spool symbol Q		6 % of nominal cross-section	
	– for spool symbol W		3 % of nominal cross-section	
Minimum pilot pressure		bar *[psi]*	4 (see characteristic curve page 7)	6 to 10 > tank pressure [2)]
Maximum pilot pressure		bar *[psi]*	10 *[145]*	200 *[2900]*
Pilot volume		cm^3 *[in^3]*	4,24 *[0.26]*	1,23 *[0.075]*
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524 [3)]; fast biodegradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [3)]; HEPG (polyglycols) [4)]; HEES (synthetic esters) [4)]; other hydraulic fluids upon request	
Hydraulic fluid temperature range		°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)	
Viscosity range		mm^2/s *[SUS]*	2.8 to 500 *[35 to 2320]*	
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [5)]	
Maximum switching frequency		1/h	7200	

1) For models **../O..** (A, C, and D): Horizontal

2) Performance limit depending on the minimum pilot pressure, see page 9

3) Suitable for NBR **and** FKM seals

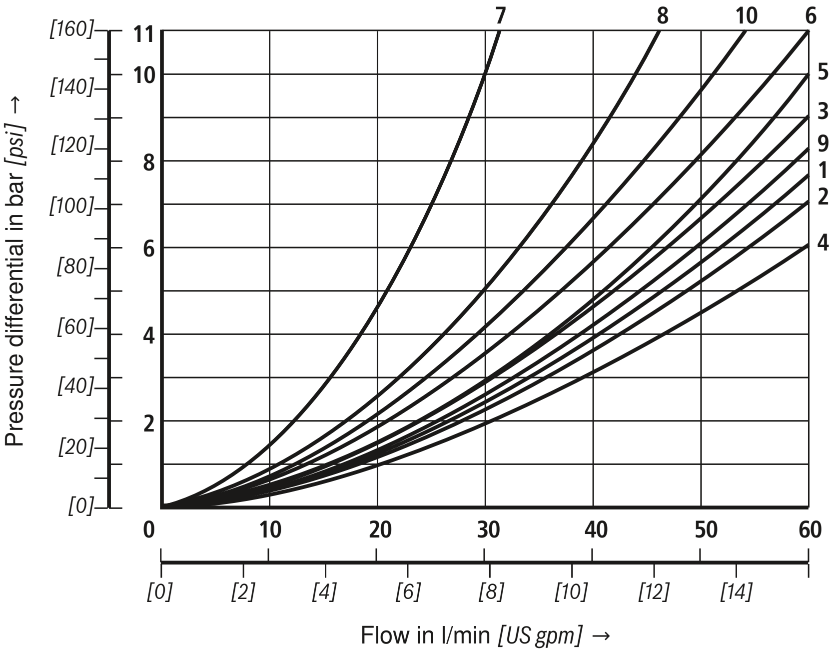
4) Suitable **only** for FKM seals

5) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of filters, see data sheets 50070, 50076, 50081, 50086, 50087 and 50088.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

Δp-q_V characteristic curves



Further characteristic curves:

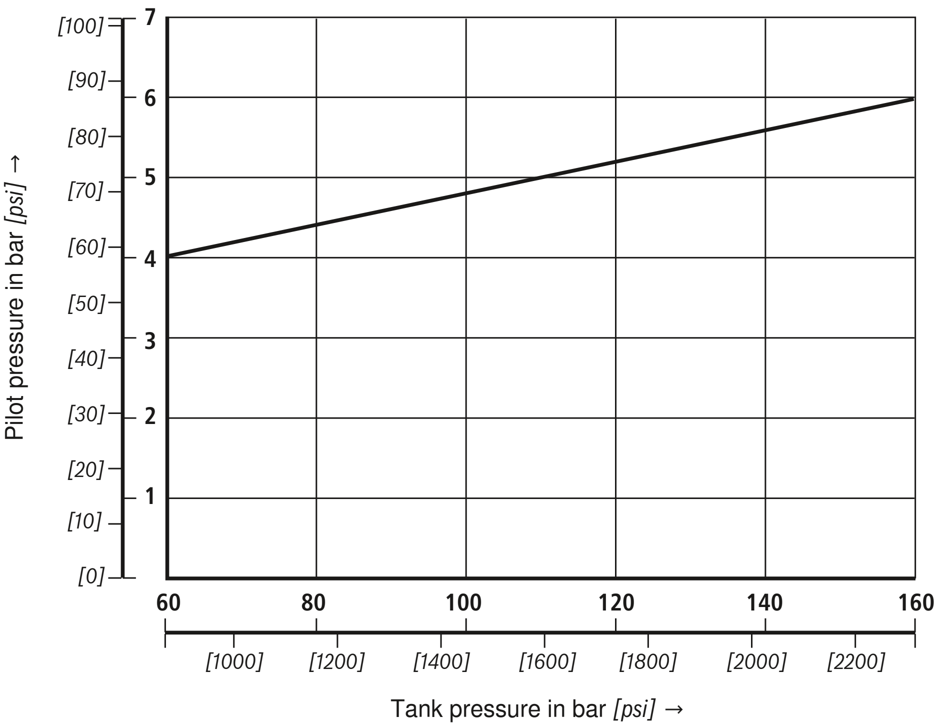
7 Spool symbol "R" in spool position "b" (B → A)

8 Spool symbol "G" and "T" in central position (P → T)

9 Spool symbol "H" in central position (P → T)

Spool symbol	Flow direction			
	P–A	P–B	A–T	B–T
A	3	3	–	–
B	3	3	–	–
C	1	1	3	1
D	5	5	3	3
E	3	3	1	1
F	1	3	1	1
G	6	6	9	9
H	2	4	2	2
J	1	1	2	1
L	3	3	4	9
M	2	4	3	3
P	3	1	1	1
Q	1	1	2	1
R	5	5	4	–
T	10	10	9	9
U	3	3	9	4
V	1	2	1	1
W	1	1	2	2
Y	5	5	3	3

Minimum pilot pressure depending on tank pressure



In case of a higher tank pressure, the minimum pilot pressure has to be increased according to this diagram.

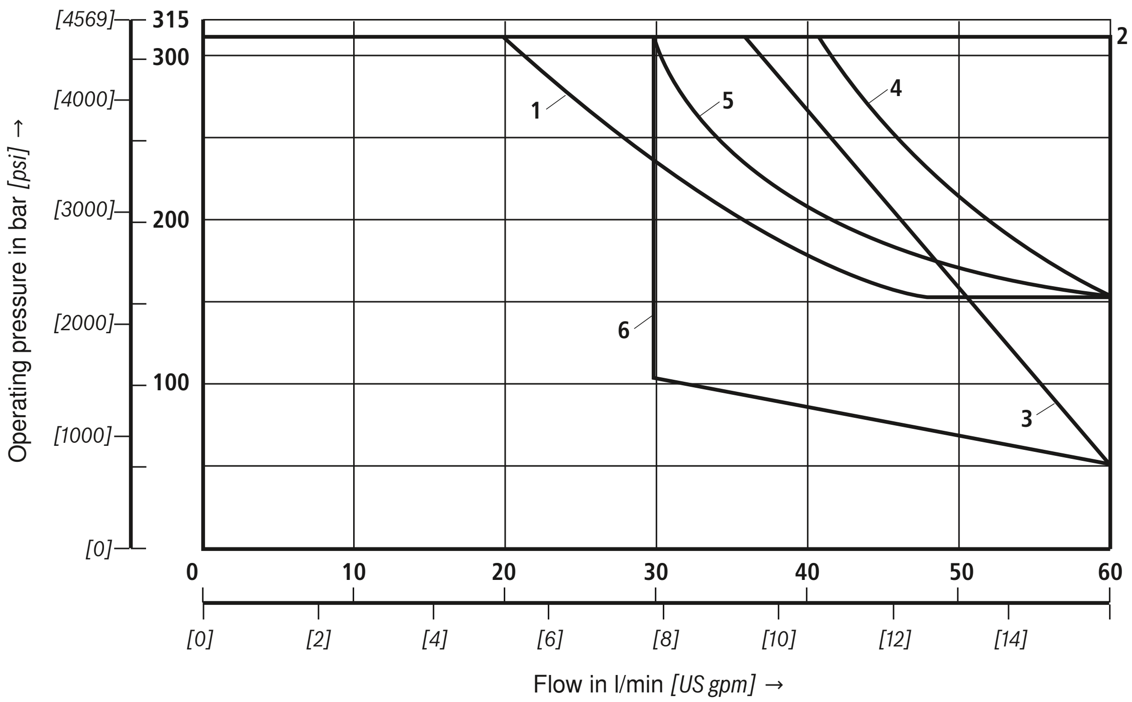
Performance limits: Type WP, WPZ (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

☞ **Note!**

Because of the adhesive effect, the switching function of the valves depends on the filtration. In order to achieve the specified admissible flow values, we recommend full flow filtration with 25 µm. The flow forces acting within the valves also affect the flow performance.

With 4 way valves the specified flow data thus apply to normal operation with 2 volume flow directions (e.g. from P to A and at the same time return flow from B to T) (see table).

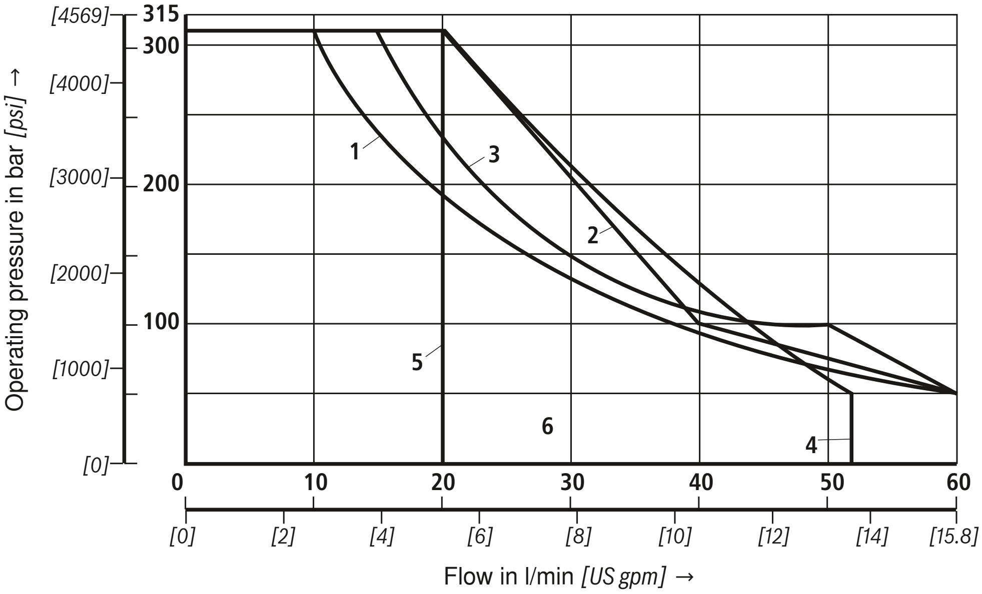
If only one flow direction is available, in critical cases, the admissible flow can be significantly smaller (e.g. when using a 4 way valve as 3 way valve, due to blocked connection A or B).

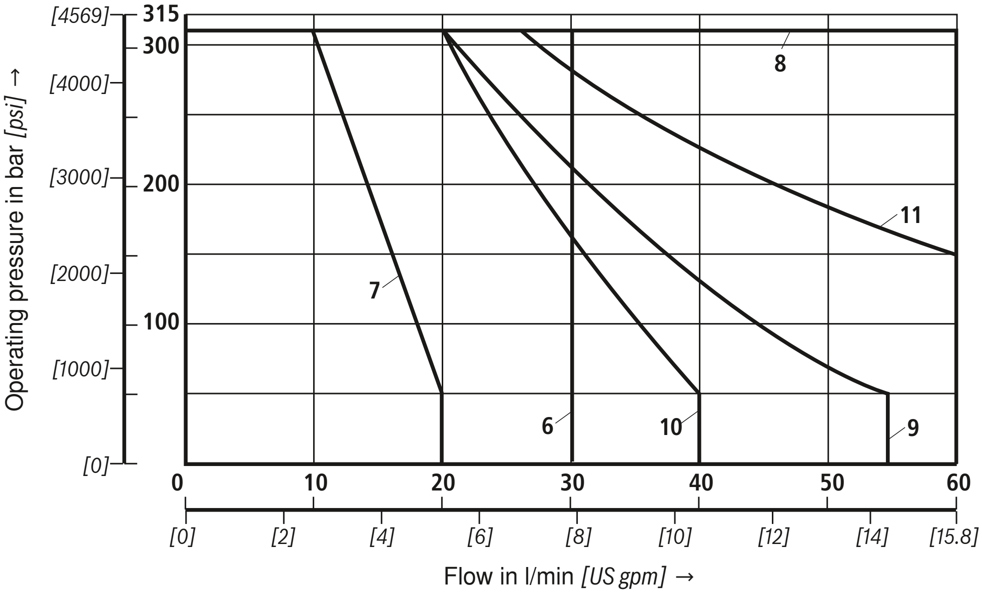


Characteristic curve	Spool symbol
1	A, B
2	A/O, C, C/O, D, D/O, E, E1-, G, H, J, L, M, Q, U, W, and Y
3	F, P
4	R
5	T
6	V

Performance limits: Type WH, WHZ (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

See note on page 8!

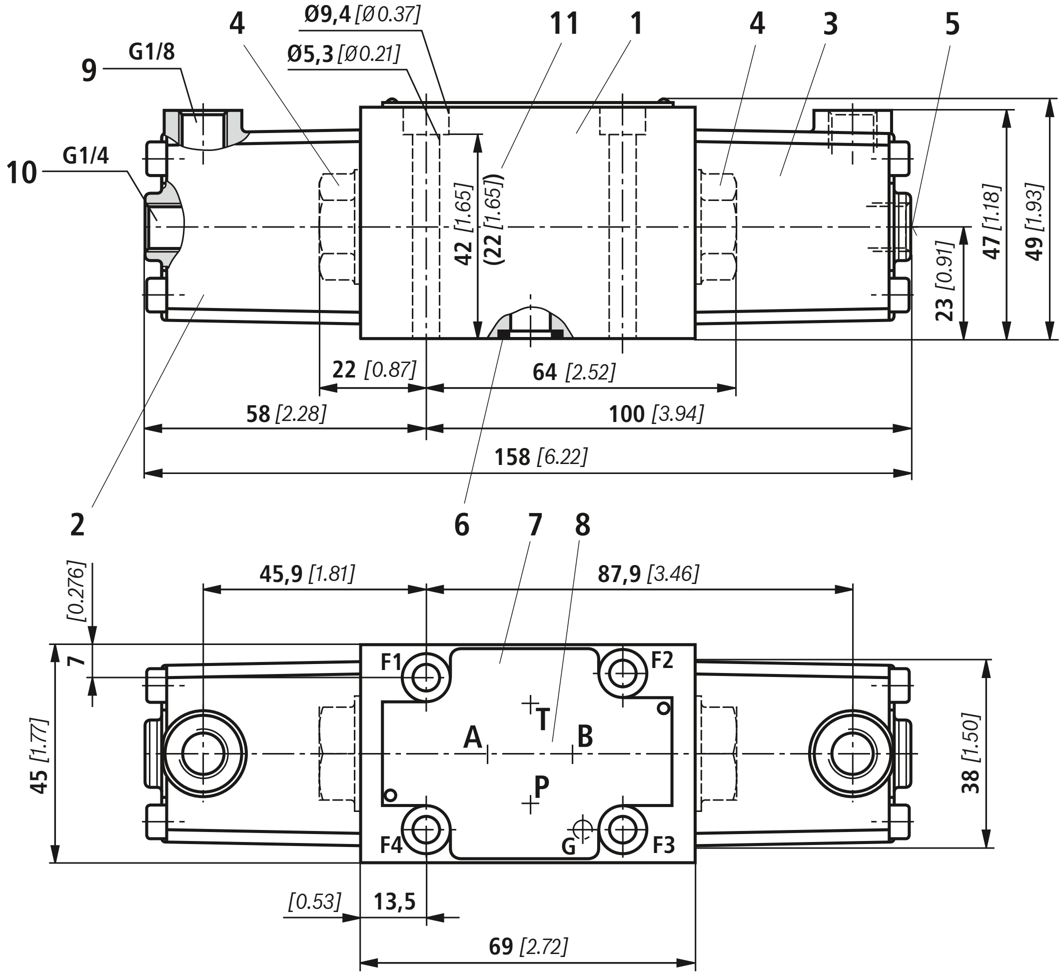


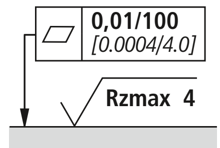


Pilot pressure 6 bar > tank pressure		
Spring return	**Characteristic curve**	**Spool symbol**
"no code" (with spring return)	1	A, B
	2	C, D, Y
	3	E, J, L, U, M, Q, V, W, E1-
	4	F, P
	5	T
	6	G, H
	7	R
../O..	8	A, C, D
../OF..		

Pilot pressure 10 bar > tank pressure		
Spring return	**Characteristic curve**	**Spool symbol**
"no code" (with spring return)	1	A, B
	8	C, D, Y, E, G, H, J, L, U, M, Q, V, W, E1-
	9	F, P
	10	R
	11	T
../O..	8	A, C, D
../OF..		

Unit dimensions: Type WP, WPZ (dimensions in mm *[inch]*)



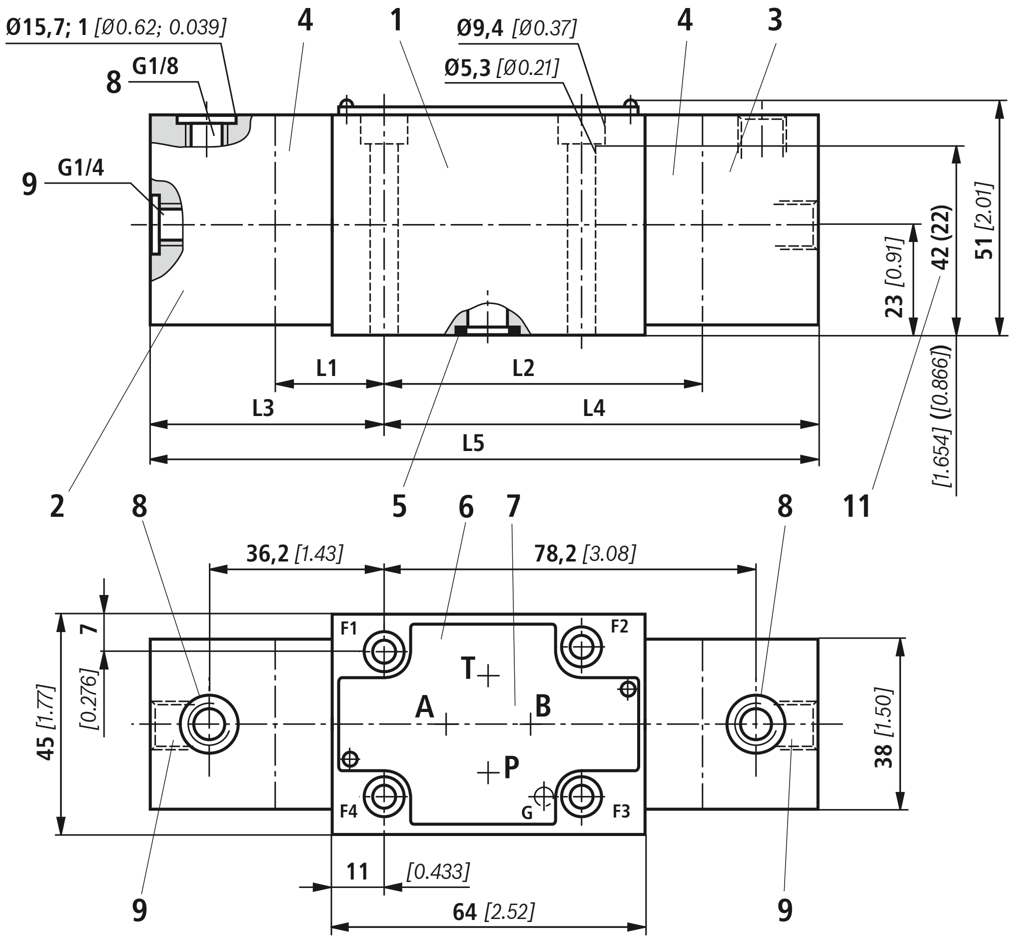


Required surface quality of the valve mounting face

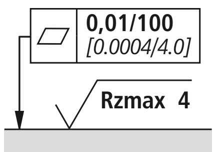
- **1** Valve with 2 spool positions and 2 actuation cylinders
  Valve with 3 spool positions and 2 actuation cylinders
- **2** Actuation cylinder “a”
- **3** Actuation cylinder “b”
- **4** Plug screw for valve with 1 actuation cylinder (2 switching positions)
- **5** Manual override, optional (only with model “WP”)
- **6** Identical seal rings for ports A, B, P, T
- **7** Name plate
- **8** Porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locating pin ISO 8752-3x8-St
  Material no. **R900005694**, separate order)
- **9** Connection with model “WP”
- **10** Connection with model “WPZ”
- **11** Alternative clamping length (): 22 mm

Subplates and **valve mounting screws** see page 12.

Unit dimensions: Type WH, WHZ (dimensions in mm *[inch]*)



Type	L1	L2	L3	L4	L5
WH	22,5 *[0.89]*	64,5 *[2.54]*	48 *[1.89]*	90 *[3.54]*	138 *[5.45]*
WHZ	21,5 *[0.85]*	63 *[2.48]*	55 *[2.16]*	96,5 *[3.80]*	152 *[5.98]*



Required surface quality of the valve mounting face

1 Valve with 2 spool positions and 2 actuation cylinders
Valve with 3 spool positions and 2 actuation cylinders
2 Actuation cylinder “a”
3 Actuation cylinder “b”
4 Cover for valve with 1 actuation cylinder (2 switching positions)
5 Identical seal rings for ports A, B, P, T
6 Name plate
7 Porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locating pin ISO 8752-3x8-St
Material no. **R900005694**, separate order)
8 Connection with model “WH”
9 Connection with model “WHZ”
11 Alternative clamping length (): 22 mm

Subplates and **valve mounting screws** see page 12.

Unit dimensions

Subplates according to data sheet 45052
(separate order)

(**without** locating hole)	G 341/01 (G1/4)
	G 342/01 (G3/8)
	G 502/01 (G1/2)
(**with** locating hole)	G 341/60 (G1/4)
	G 342/60 (G3/8)
	G 502/60 (G1/2)
	G 341/12 (SAE-6) 1)
	G 342/12 (SAE-8) 1)
	G 502/12 (SAE-10) 1)

1) On request

Valve mounting screws (separate order)

– Clamping length 42 mm:
4 cylinder bolts, metric
ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque $\boldsymbol{M}_A$ = 7 Nm *[5.2 ft-lbs]* ±10 %;
Material no. **R913000064**
or
4 cylinder bolts
ISO 4762 - M5 x 50 - 10.9 (own procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque $\boldsymbol{M}_A$ = 8.1 Nm *[6 ft-lbs]* ±10 %

4 hexagon socket head cap screw UNC
10-24 UNC x 2” ASTM-A574
(friction coefficient μ_{total} = 0.19 to 0.24);
Tightening torque $\boldsymbol{M}_A$ = 11 Nm *[8.2 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque $\boldsymbol{M}_A$ = 8 Nm *[5.9 ft-lbs]* ±10 %;
Material no. **R978800693**

– Clamping length 22 mm:
4 cylinder bolts, metric
ISO 4762 - M5 x 30 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque $\boldsymbol{M}_A$ = 7 Nm *[5.2 ft-lbs]* ±10 %,
Material no. **R913000316**
or
4 cylinder bolts
ISO 4762 - M5 x 30 - 10.9 (own procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque $\boldsymbol{M}_A$ = 8.1 Nm *[6 ft-lbs]* ±10 %

4 cylinder bolts UNC
10-24 UNC x 1 1/4”
(friction coefficient μ_{total} = 0.19 to 0.24);
Tightening torque $\boldsymbol{M}_A$ = 11 Nm *[8.2 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque $\boldsymbol{M}_A$ = 8 Nm *[5.9 ft-lbs]* ±10 %;
Material no. **R978802879**

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The Drive & Control Company

Rexroth
Bosch Group

Directional spool valves, directly operated, with manual and fluid logics actuation

Type WMM, WN and WP

RE 22334
Edition: 2013-04
Replaces: 22331

- Size 10
- Component series 5X
- Maximum operating pressure 350 bar *[5076 psi]*
- Maximum flow 160 l/min *[42.3 US gpm]*

Features

- 4/3-, 4/2- or 3/2-way version
- Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
- Types of actuation:
  - Hand lever
  - Pneumatic
  - Hydraulic

Contents

Ordering code

01	02	03	04	05		06		07	08	09	10	11
		10		**5X**	**/**		**/**					*****

01	3 main ports	**3**
	4 main ports	**4**

Types of actuation

02	**– Manual**	
	Hand lever	**WMM**
	– Fluidic	
	Pilot pressure 1.5 ... 10 bar *[22 ... 145 psi]*	**WN**
	Pilot pressure 8 ... 160 bar *[116 ... 2321 psi]*	**WP**

03	Size 10	**10**
04	Symbols e.g. C, E, EA, EB, etc; possible versions see page 3 ... 5	
05	Component series 50 ... 59 (50 ... 59: Unchanged installation and connection dimensions)	**5X**

06	**With** spring return	**no code**
	Without spring return (not for valves with 3 switching positions and version "WMM")	**O**
	With detent (not for versions "WN" and "WP")	**F**
	Without spring return with detent (not for valves with 3 switching positions and version "WMM")	**OF**

Corrosion protection

07	Standard corrosion protection	**no code**
	Improved corrosion protection (720 h salt spray test according to EN ISO 9227; only version "WMM")	**J4**

Throttle insert [1)]

08	**Without** throttle insert			**no code**
	With throttle insert:			
	Connection	Throttle Ø in mm *[inch]*		
		0.8 *[0.031]*	1.0 *[0.039]*	1.2 *[0.047]*
	P	**= B08**	**= B10**	**= B12**
	A	**= H08**	**= H10**	**= H12**
	B	**= R08**	**= R10**	**= R12**
	A and B	**= N08**	**= N10**	**= N12**
	T [2)]	**= X08**	**= X10**	**= X12**
	Further throttle insert diameters upon request.			

Seal material

09	NBR seals	**M**
	FKM seals	**V**
	Seals for HFC hydraulic fluids	**MH**
	Attention: Observe compatibility of seals with hydraulic fluid used!	

Pilot oil port

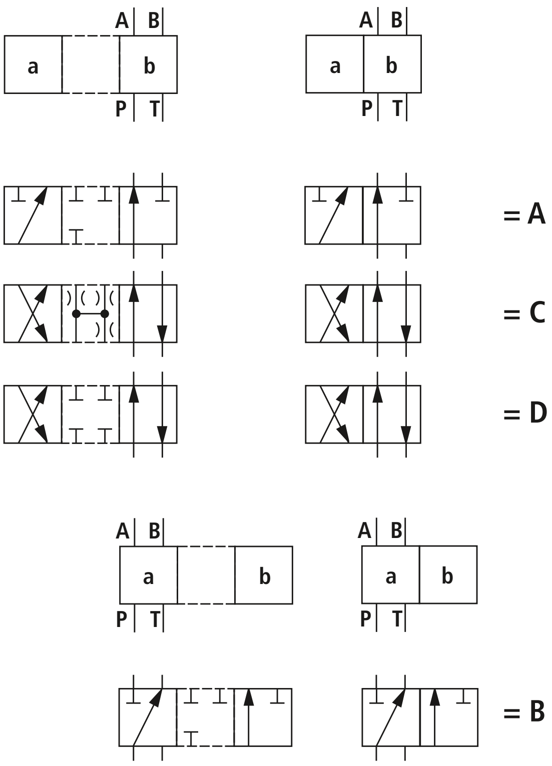
10	Whitworth pipe thread G1/4	**–**
	UNF thread 7/16" - 20 UNF (only versions "WN" and "WP")	**/12**

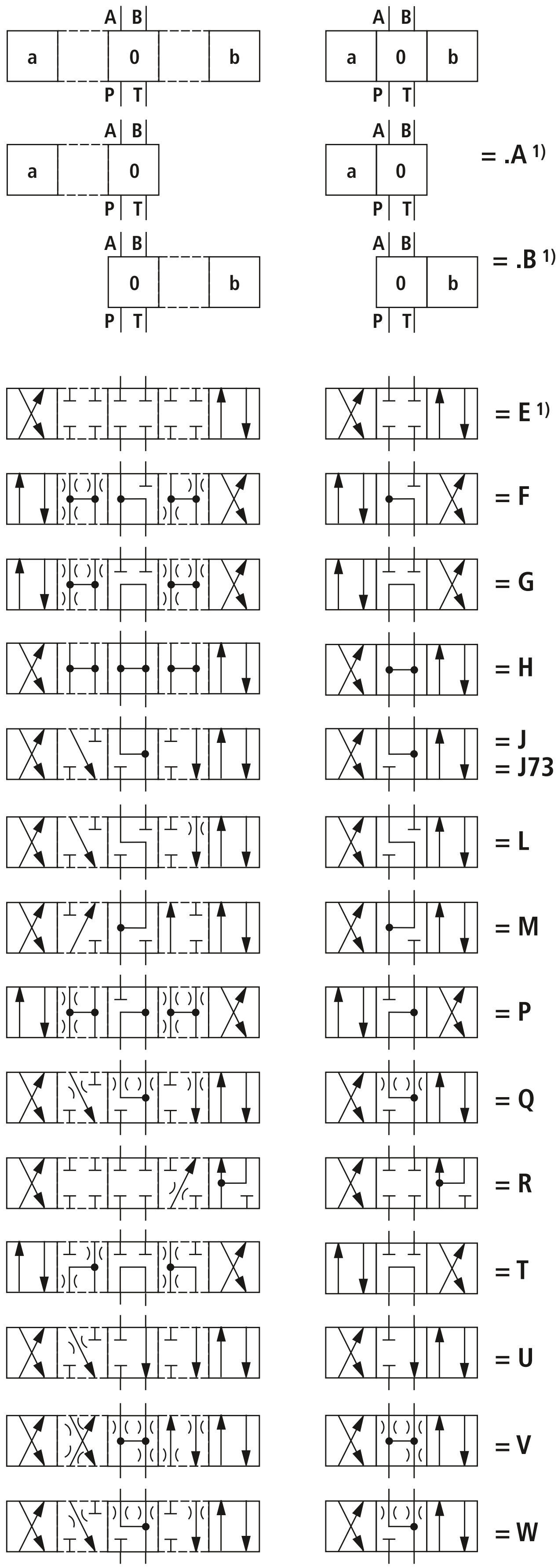
11	Further details in the plain text	

1) If the admissible valve performance limits are exceeded, throttle inserts must be installed (performance limits see page 9).

2) If throttle inserts are used in channel T, the pressure in the working ports and for connection to the tank chambers must not exceed 210 bar.

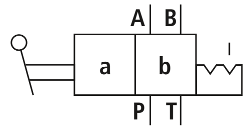
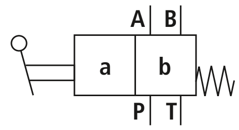
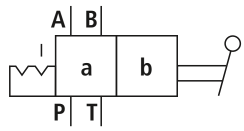
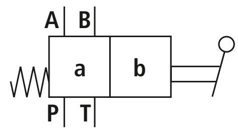
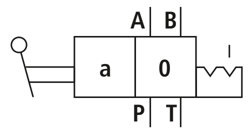
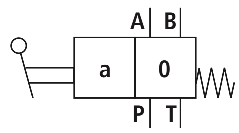
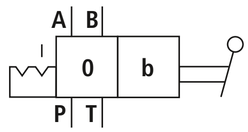
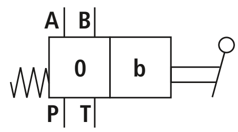
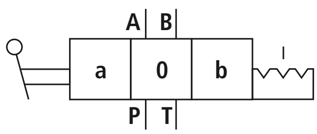
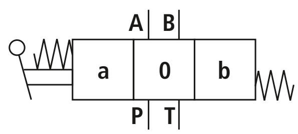
Symbols





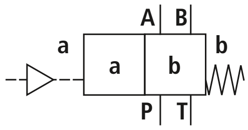
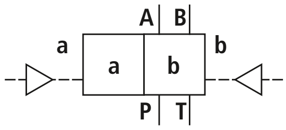
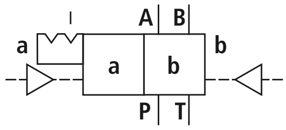
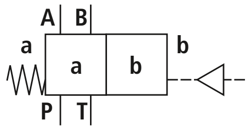
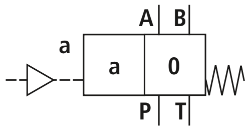
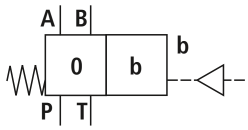
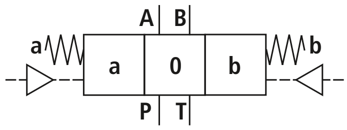
1) **Example:**
– Symbol E with switching position "a": Ordering code ..**EA**..
– Symbol E with switching position "b": Ordering code ..**EA**..

Types of actuation: Type WMM

Ordering code			Type of actuation	
Symbol	**Actuating side**	**Detent**	**Hand lever**	
A, C, D		../F..		2)
				2)
B		../F..		3)
				3)
E, F, G, H, J, J73, L, M, P, Q, R, T, U, V, W	"a" 1) = **.A**	../F..		2)
				2)
	"b" 1) = **.B**	../F..		3)
				3)
		../F..		4)
				4)

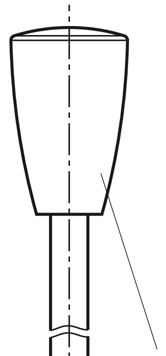
1) See symbols on page 3
2) See pos. 2, page 11
2) See pos. 1, page 11
2) See pos. 3, page 11

Types of actuation: WN and WP

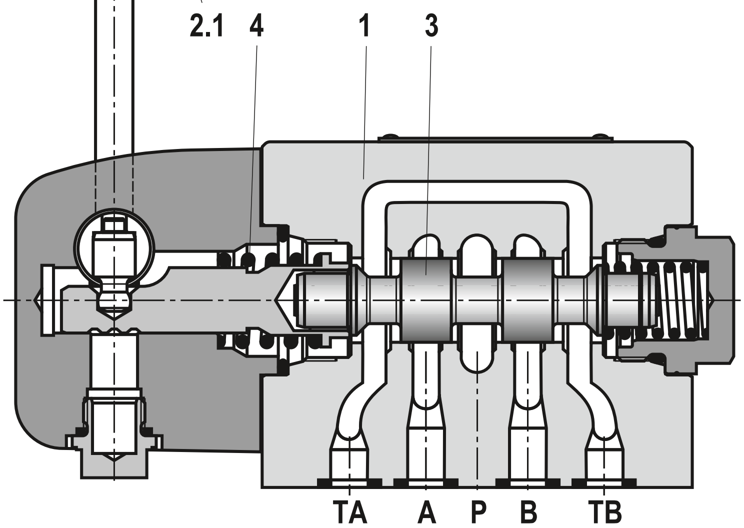
	Ordering code		Type of actuation
Symbol	**Actuating side**	**Detent**	**Fluidic**
A, C, D			
		../O..	
		../OF..	
B			
E, G, H, J, L, U	"a" 1) **= .A**		
	"b" 1) **= .B**		
			

1) See symbols on page 3

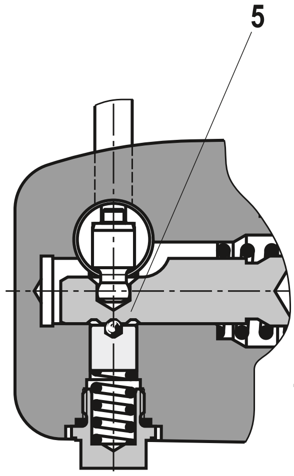
Function, section



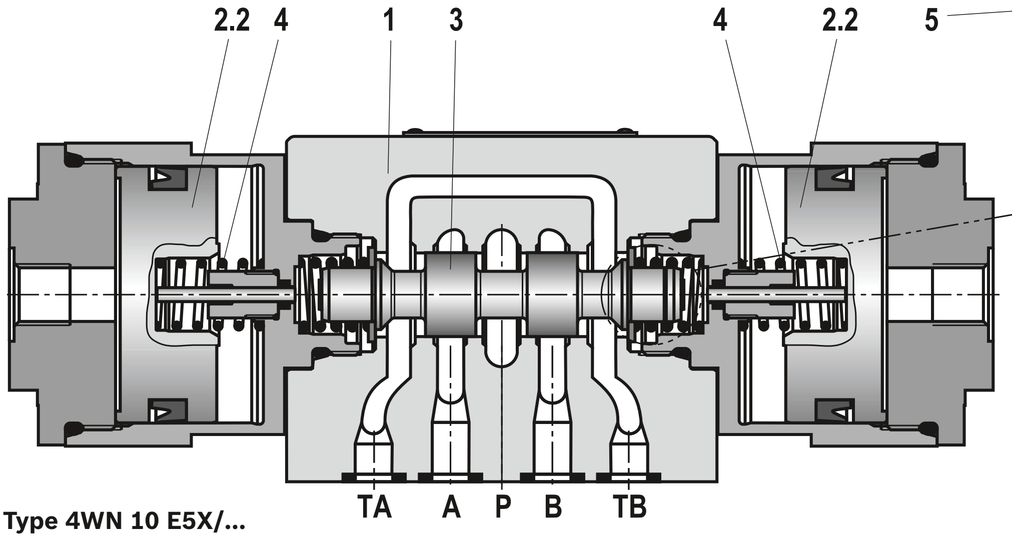
Valves of type WMM are manually actuated directional spool valves, valves of type WN and WP are fluidically actuated directional spool valves. They control the start, stop and direction of a flow.
The directional valves basically consist of housing (1), one type of actuation (2.1) (hand lever) or two types of actuation (2.2) (hydraulic, pneumatic actuation cylinder), control spool (3), and one or two return springs (4).
When de-energized, the control spool (3) is held in the central position or in the initial position by the return springs (4) (except for version "O").
The control spool (3) is moved to the desired spool position by means of the types of actuation.



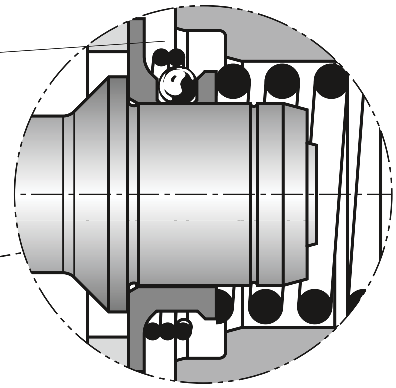
Type 4WMM 10 E5X/...



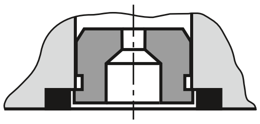
Type 4WMM 10 D5X/F/...
(with detent)



Type 4WN 10 E5X/...



Type 4WN 10 D5X/OF...



Throttle insert
The use of a throttle insert is required when, due to prevailing operating conditions, flows occur during the switching processes which exceed the performance limit of the valve.

Technical data
(for applications outside these parameters, please consult us!)

general					
Type			WN	WP	WMM
Weight	– 1 actuation cylinder	kg *[lbs]*	3.4 *[7.5]*	2.9 *[6.4]*	3.6 *[7.9]*
	– 2 actuation cylinder	kg *[lbs]*	4.8 *[10.6]*	3.7 *[8.2]*	
Actuating force	– With detent "F"	N *[lbf]*	–	–	30 ... 40 *[6.7 ... 9.0]*
	– With spring return	N *[lbf]*	–	–	18 ... 20 *[4.1 ... 4.5]*
Installation position			Any		
Ambient temperature range		°C *[°F]*	–20 ... +70 *[–4 ... +158]* (NBR seals) –15 ... +70 *[–59 ... +158]* (FKM seals)		
Storage temperature range		°C *[°F]*	–20 ... +50 *[–4 ... +122]*		

hydraulic					
Maximum operating pressure	– Ports A, B, P	bar *[psi]*	350 *[5076]*		
	– Port T	bar *[psi]*	210 *[3050]* Tank pressure (standard) With symbols A or B, port T must be used as a leakage port if the operating pressure exceeds the admissible tank pressure.		
Pilot pressure [1)]		bar *[psi]*	1.5 ... 10 *[22 ... 145 psi]*	8 ... 160 *[116 ... 2321 psi]*	–
Maximum flow		l/min *[US gpm]*	160 *[42.3]*		
Pilot volume		cm^3 *[$inch^3$]*	23.7 *[1.45]*	6.9 *[0.42]*	–
Hydraulic fluid			See table below		
Hydraulic fluid temperature range (at the valve working ports)		°C *[°F]*	–20 ... +80 *[–4 ... +176]* (NBR seals) –15 ... +80 *[–59 ... +176]* (FKM seals)		
Viscosity range		mm^2/s *[SUS]*	2.8 ... 500 *[35 ... 2320]*		
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [2)]		

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils and related hydrocarbons		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

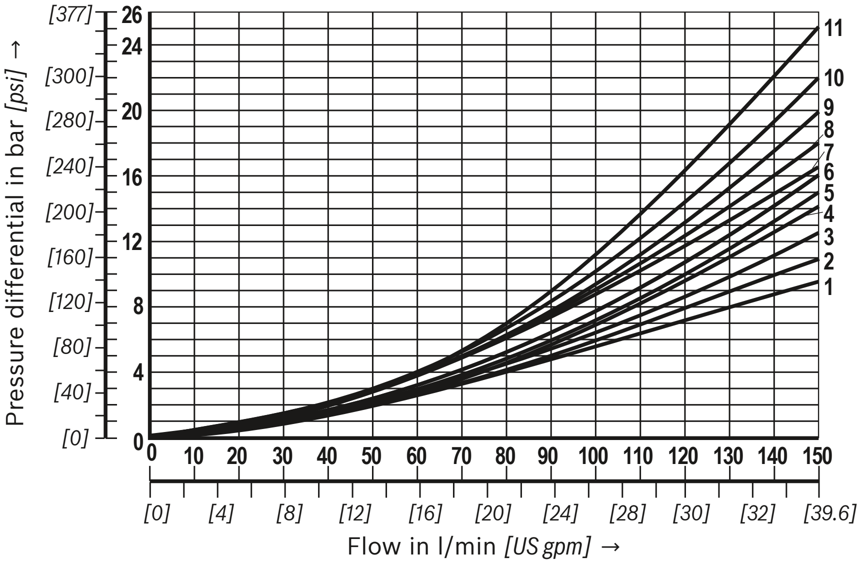
Important information on hydraulic fluids
- For more information and data on the use of other hydraulic fluids, refer to data sheet 90220 or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc).
- **Flame-resistant – contains water**:
  - Maximum pressure differential per control edge 50 bar
  - Pressure pre-loading at the tank port > 20% of the pressure differential, otherwise increased cavitation
  - Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%

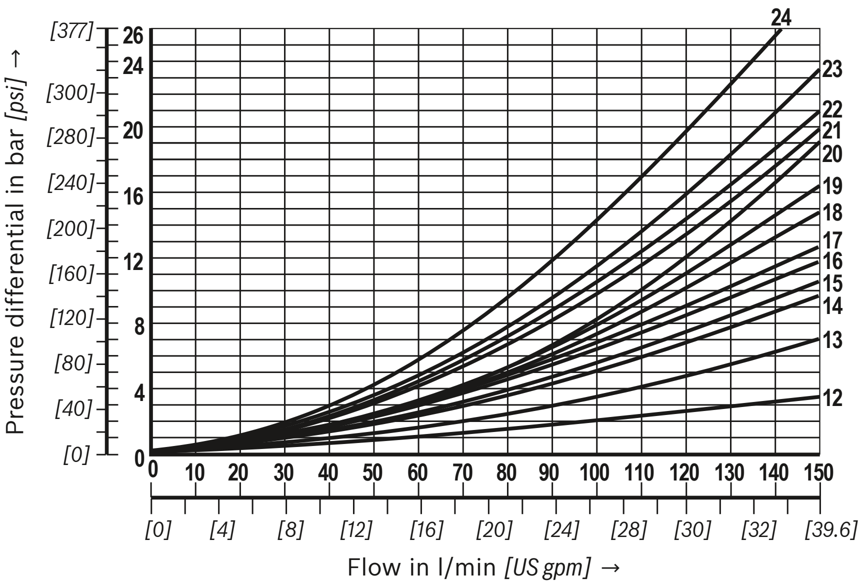
1) The information given only applies if the actuation pressure is applied directly to the valve.

2) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
To select filters, see www.boschrexroth.com/filter.

Characteristic curves
(measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Δp-q_V characteristic curve





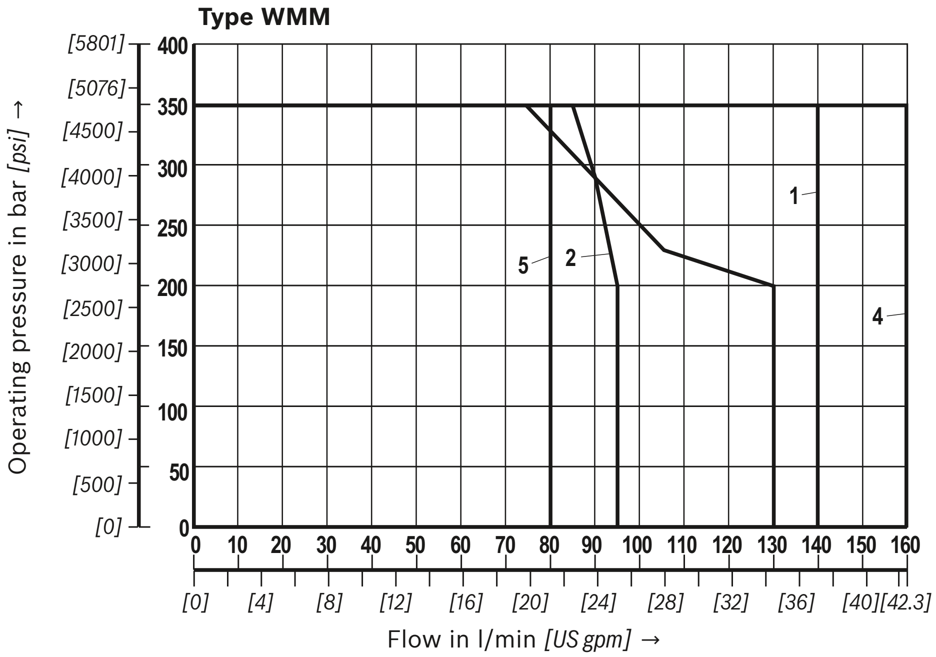
Symbol	Direction of flow			
	P – A	**P – B**	**A – T**	**B – T**
A; B	6	6	–	–
C	1	2	5	7
D	2	2	5	7
E	17	16	19	21
F	2	3	22	23
G	4	4	24	24
H	14	14	20	21
J	3	3	9	11
J73	22	21	23	24
L	3	3	9	9
M	14	14	6	8
P	17	14	20	23
Q	16	17	4	8
R	18	21	18	24
T	18	4	10	24
U	3	3	6	11
V	17	17	18	20
W	Upon request			

Central position:

Symbol	Direction of flow				
	P – A	**P – B**	**B – T**	**A – T**	**P – T**
H	12	12	13	13	15

Performance limits
(measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

☞ **Notice!**
The specified performance limits are valid for operation with two directions of flow (e. g. from P to A and simultaneous return flow from B to T).
Due to the flow forces acting within the valves, the admissible switching power limit may be considerably lower with only one direction of flow (e. g. from P to A while port B is blocked).
In such cases, please consult us.

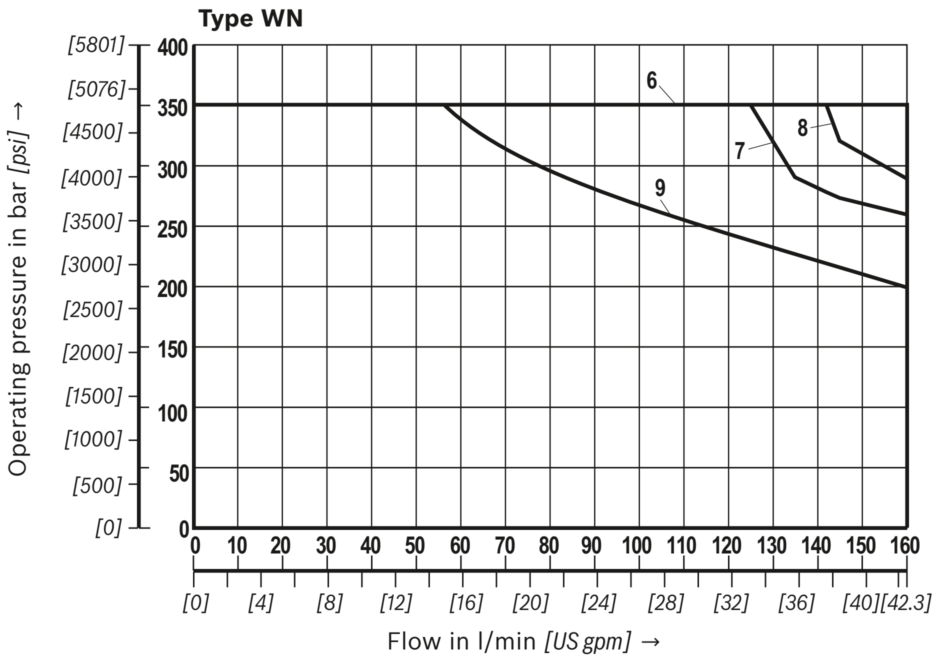


With spring return "–"

Characteristic curve	Symbol
1	C, D, E, J, J73, L, M, Q, U, V, W
2	H
3	T, G

With detent "F"

Characteristic curve	Symbol
4	C, D, E, J, J73, L, M, Q, U
5	T, G, H



Characteristic curve	Symbol
6	C, C/OF, D, D/OF, E, J, L, M, U
7	H
8	G
9	A, B

Performance limits

(measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

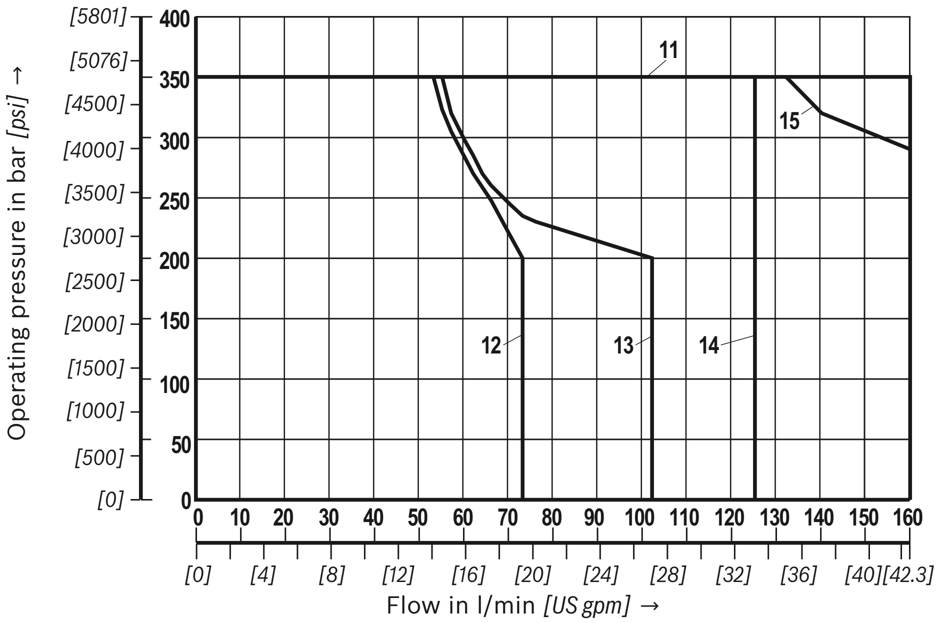
Notice!

The specified performance limits are valid for operation with two directions of flow (e. g. from P to A and simultaneous return flow from B to T).

Due to the flow forces acting within the valves, the admissible switching power limit may be considerably lower with only one direction of flow (e. g. from P to A while port B is blocked).

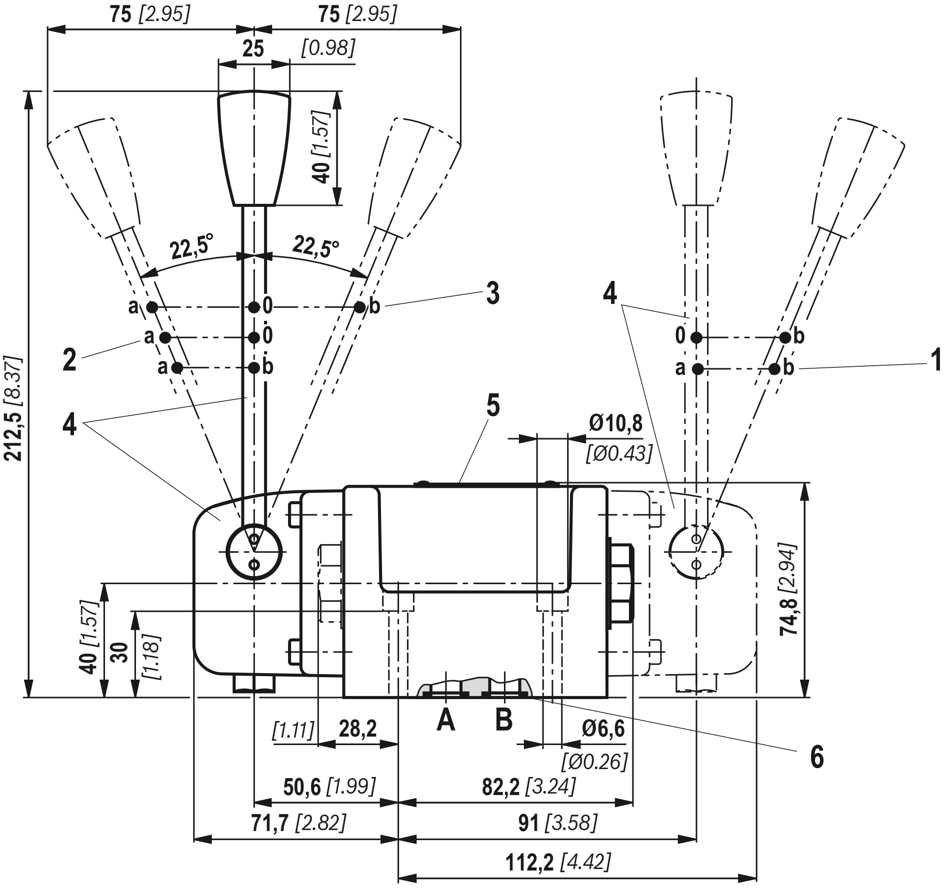
In such cases, please consult us.

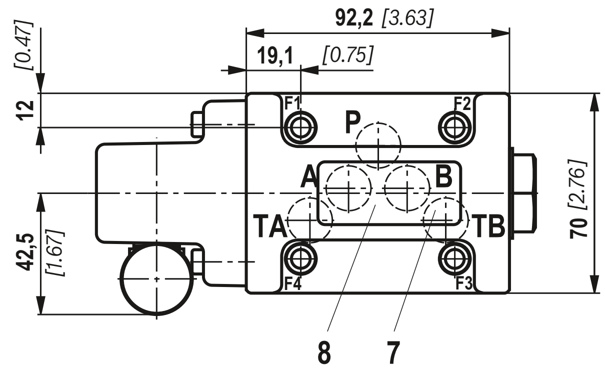
Type WP

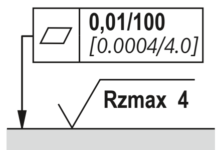


Characteristic curve	Symbol
11	C, C/OF, D, D/OF, E, J, L, M, U
12	B
13	A
14	G
15	H

Dimensions: Type WMM
(dimensions in mm *[inch]*)







Required surface quality of the valve contact surface

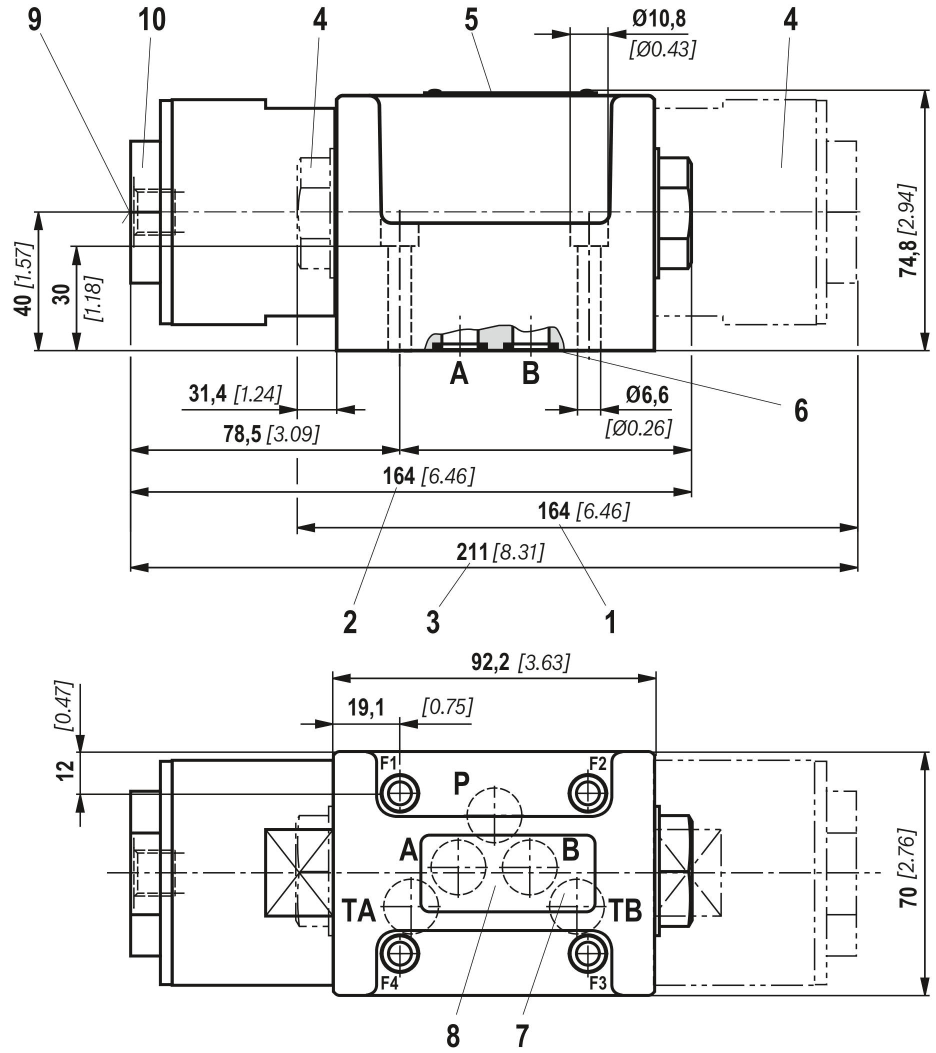
1 Valves with 2 switching positions, symbol B and .B
2 Valves with 2 switching positions, symbol A, C, D .A
3 Valves with 3 switching positions
4 Cover and hand lever
5 Name plate
6 Identical seal rings for port A, B, P, TA, TB
7 Additional port TB can optionally be used
8 Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05

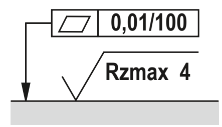
Notes

- Deviating from ISO 4401, port T is called TA in this data sheet; port T1 is called TB.
- For valves with 2 switching positions and symbols B and .B, the hand lever is installed on valve side B.
- The dimensions are nominal dimensions which are subject to tolerances.

Valve mounting screws and **subplates** see page 14.

Dimensions: Type WM
(dimensions in mm *[inch]*)





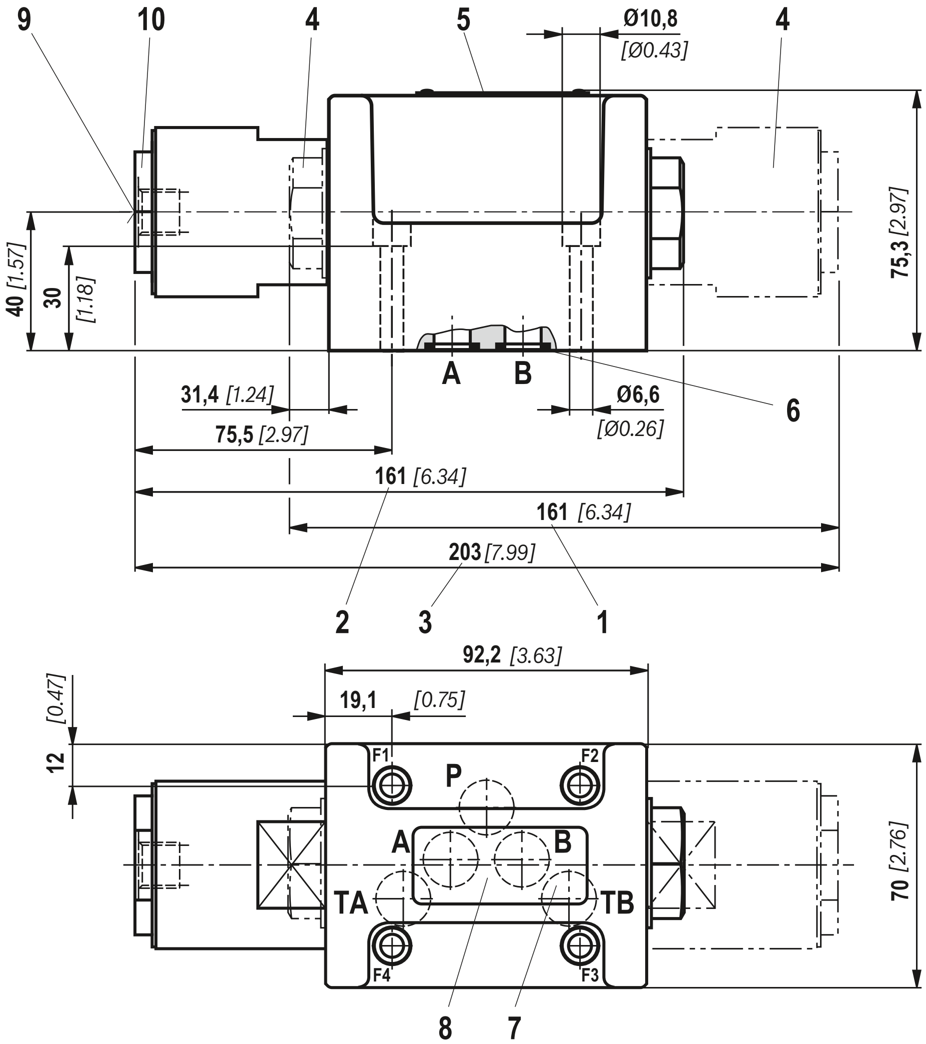
Required surface quality of the valve contact surface

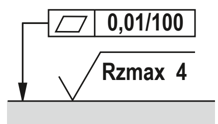
1 Valves with 2 switching positions, symbol B and .B
2 Valves with 2 switching positions, symbol A, C, D .A
3 Valves with 3 switching positions
4 Cover and plug screw
5 Name plate
6 Identical seal rings for port A, B, P, TA, TB
7 Additional port TB can optionally be used
8 Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
9 Pilot oil port G1/4 (version "–")
Pilot oil port 7/16" - 20 UNF (version "/12")
10 Socket

Notes
- Deviating from ISO 4401, port T is called TA in this data sheet; port T1 is called TB.
- The dimensions are nominal dimensions which are subject to tolerances.
- When screwing in/releasing the connection tube on the pilot oil port (9), the bushing (10) must be secured against twisting by using an open-end wrench.

Valve mounting screws and **subplates** see page 14.

Dimensions: Type WP
(dimensions in mm *[inch]*)





Required surface quality of the valve contact surface

1 Valves with 2 switching positions, symbol B and .B
2 Valves with 2 switching positions, symbol A, C, D, EA...
3 Valves with 3 switching positions
4 Cover and plug screw for valves with 2 switching positions, symbol B, Y, EB...
5 Name plate
6 Identical seal rings for port A, B, P, TA, TB
7 Additional port TB can optionally be used
8 Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
9 Metric pilot oil port: G1/4
UNC pilot oil port: 7/16" - 20 UNF
10 Socket

Notes
- Deviating from ISO 4401, port T is called TA in this data sheet; port T1 is called TB.
- The dimensions are nominal dimensions which are subject to tolerances.
- When screwing in/releasing the connection tube on the pilot oil port (9), the bushing (10) must be secured against twisting by using an open-end wrench.

Valve mounting screws and **subplates** see page 14.

Dimensions

Subplates according to data sheet 45054 (separate order)
G 66/01 (G3/8) [1)]
G 67/01 (G1/2) [1)]
G 534/01 (G3/4) [1)]
G 66/12 (SAE-6; 9/16-18) [2)]
G 67/12 (SAE-8; 3/4-16) [2)]
G 534/12 (SAE-12; 1-1/16-12) [2)]

1) For version "J4" upon request
2) Upon request

Valve mounting screws (separate order)
4 metric hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque M_A = 12.5 Nm *[9.2 ft-lbs]* ± 10%,
material no. **R913000058**
or
4 hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9 (self procurement)
(Friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 15.5 Nm *[11.4 ft-lbs]* ± 10%

4 UNC hexagon socket head cap screws
1/4-20 UNC x 1-1/2" ASTM-A574
(Friction coefficient μ_{total} = 0.19 to 0.24);
Tightening torque M_A = 25 Nm *[18.4 ft-lbs]* ± 15%,
(Friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 19 Nm *[14.0 ft-lbs]* ± 10%,
material no. **R978800710**

With different friction coefficients, the tightening torques are to be adjusted accordingly.

More information

▶ Subplates	Data sheet 45054
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ General product information on hydraulic products	Data sheet 07008
▶ Installation, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Hydraulic valves for industrial applications	Data sheet 07600-B
▶ Selection of the filters	www.boschrexroth.com/filter

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Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

The Drive & Control Company

Rexroth
Bosch Group

Directional spool valves, direct operated, with mechanical or manual actuation

Type WMR, WMRZ, WMU, WMM and WMD(A)

RE 22280
Edition: 2013-06
Replaces: 04.10

H7114

- Size 6
- Component series 5X; 6X
- Maximum operating pressure 315 *[4569 psi]*
- Maximum flow 60 l/min *[15.8 US gpm]*

Features

- 4/3, 4/2 or 3/2 directional design
- Porting pattern according to DIN 24340 form A (**without** locating hole)
- Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole)
- Types of actuation:
  - Roller plunger
  - Hand lever
  - Rotary knob
- Inductive position switches and proximity sensors (contactless)

Contents

Ordering code

01	02	03	04	05		06	07	08		09	10	11	12	13
		6			/				/					*

01	3 main ports	**3**
	4 main ports	**4**

Type of actuation

02	Roller plunger (see page 12)	**WMR**
	Roller plunger (see page 12)	**WMRZ**
	Roller plunger (see page 12)	**WMU**
	Hand lever	**WMM**
	Rotary knob	**WMD**
	Lockable rotary knob [1]	**WMDA**

03	Size 6	**6**

04	Symbols e.g. C, E, EA, EB, etc; possible version see pages 4 and 5	

05	Component series 50 to 59 (50 to 59: Unchanged installation and connection dimensions)	**5X**
	Component series 60 to 69 (60 to 69: Unchanged installation and connection dimensions) (only version "WMRZ")	**6X**

06	**With** spring return (version "WMR", "WMRZ", "WMU", "WMM")	**no code**
	Without spring return with detent (version "WMM", "WMD", "WMDA")	**F**

Corrosion protection

07	Standard corrosion protection	**no code**
	Improved corrosion protection [2]	**J**

Spool position monitoring [3]

08	**Without** position switch	**no code**
	– Inductive position switch type QM	
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored rest position	**QM0G24**
	For more information see data sheet 24830	

1) Key with material no. **R900006980** for series 50 to 52 and **R900008158** from series 53 is included in the scope of delivery.
2) The external parts made of metal are galvanized, treated with an anti-corrosion agent or made of stainless steel. This design is also suitable for on-wall applications.
3) Only for valves with 2 spool positions such as versions "WMR", "WMU" and "WMM"; not for version "J"
4) Use if volume flow > performance limit of the valve, effective in channel P.
5) Locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order

Notice! Preferred types and standard units are contained in the EPS (standard price list).

Ordering code

01	02	03	04	05		06	07	08		09	10	11	12	13
		6			**/**				**/**					*

09	**Without** throttle insert	**no code**
	Throttle Ø 0.8 mm *[0.0315 inch]*	**B08** [4)]
	Throttle Ø 1.0 mm *[0.0394 inch]*	**B10** [4)]
	Throttle Ø 1.2 mm *[0.0472 inch]*	**B12** [4)]

Clamping length

10	42 mm *[1.65 inch]* (standard)	**no code**
	22 mm *[0.87 inch]* (only version "WMRZ")	**Z**

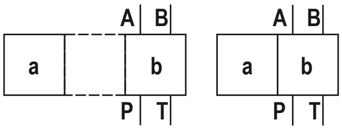
Seal material

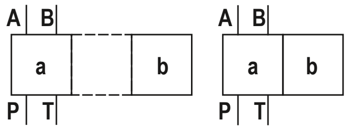
11	NBR seals	**no code**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

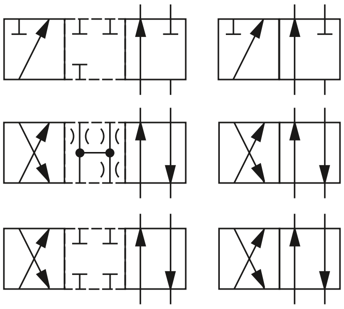
12	**Without** locating hole	**no code**
	With locating hole	**/60** [5)]
	With locating hole and locking pin ISO 8752-3x8-St	**/62**

13	Further details in the plain text	

Symbols



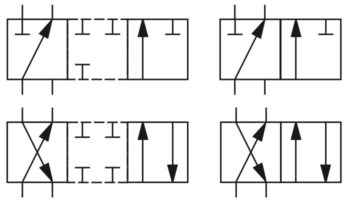




= A

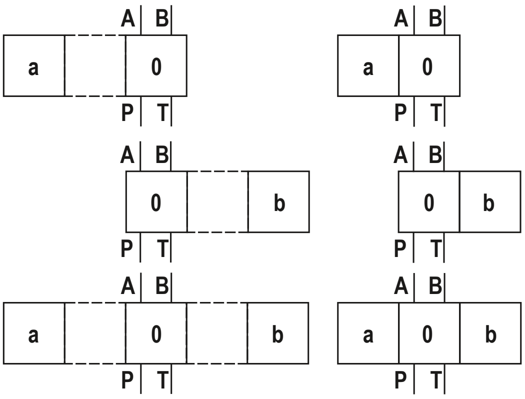
= C

= D



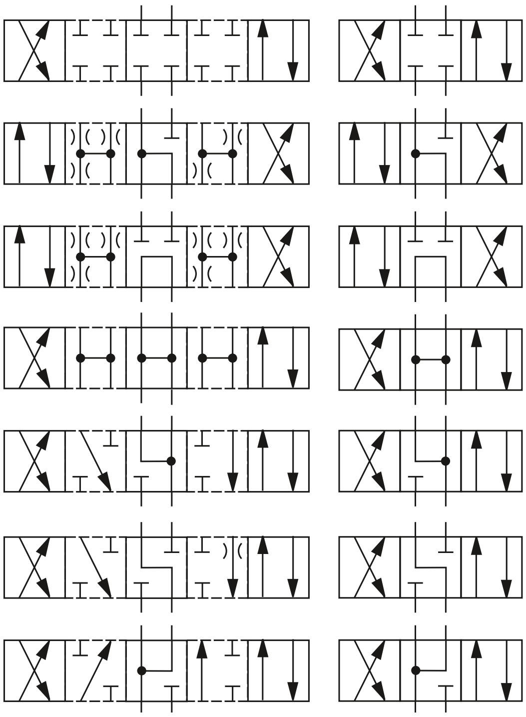
= B 2)

= Y 2)

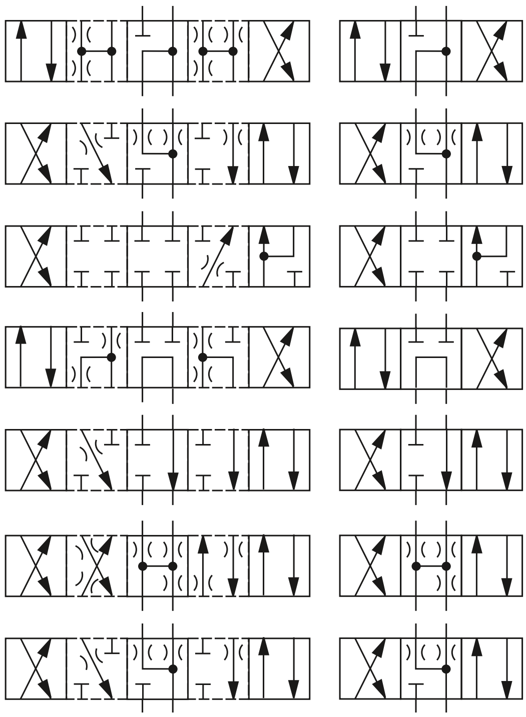


= .A 1)

= .B 1)



= E 1)
= E1- 3)
= F
= G
= H
= J
= L
= M



= P
= Q
= R
= T
= U
= V
= W

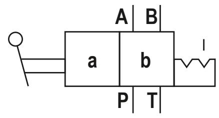
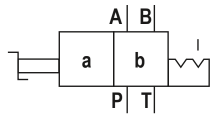
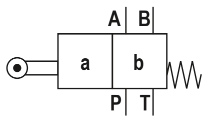
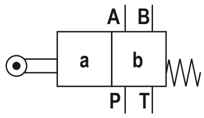
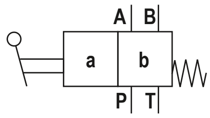
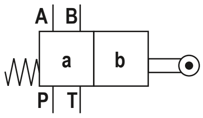
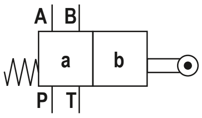
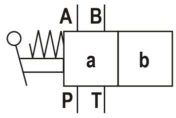
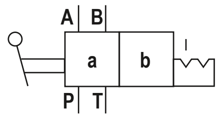
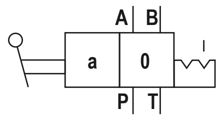
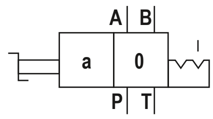
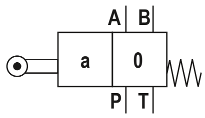
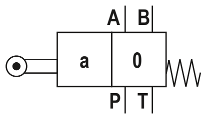
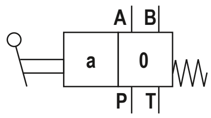
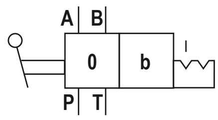
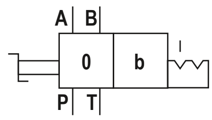
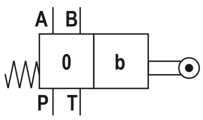
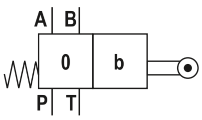
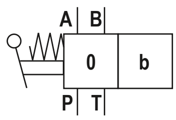
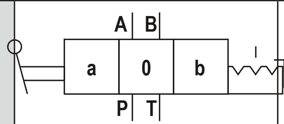
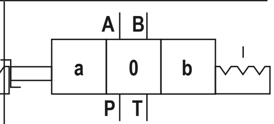
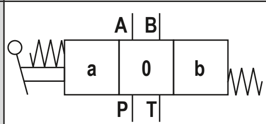
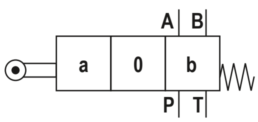
1) **Example:**
Symbol E with spool position "a" → ordering code ..**EA**..
Symbol E with spool position "a" → ordering code ..**EB**..

2) Only version "WMR", "WMU" and "WMM"

3) **Symbol E1**-: P → A/B pre-opening
Caution in conjunction with differential cylinders due to pressure intensification!

Notice!
Representation according to DIN ISO 1219-1.
Hydraulic interim positions are shown by dashes.

Types of actuation

Ordering code			Type of actuation			
Symbol	**Actuating side**	**Detent**	**Roller plunger** "WMRZ" 2)	**Roller plunger** "WMR", "WMU"	**Hand lever** "WMM"	**Rotary knob** "WMD", "WMDA"
A, C, D		**../F..**				
						
B, Y						
		../F..				
E1–, E, F, G, H, J, L M, P, Q, R, T, U, V, W	"a" 1) **= .A**	**../F..**				
						
	"b" 1) **= .B**	**../F..**				
						
		../F..				
						
						

1) See symbols on page 4

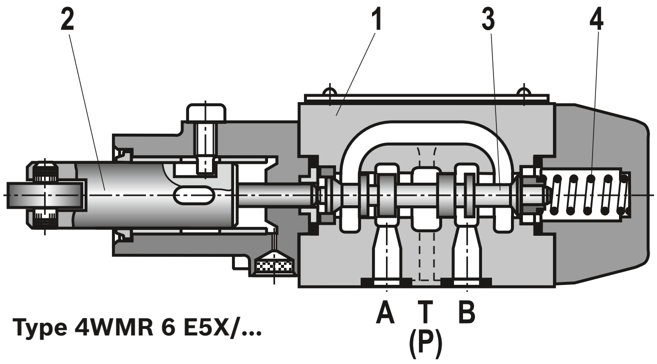
2) Only for valves with 2 spool positions

Function, section

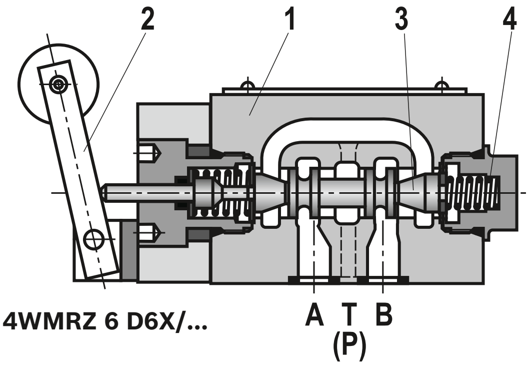
Type WM.. valves are mechanical, manually actuated directional spool valves. They control the start, stop and direction of a flow.
Directional valves basically consist of housing (1), one type of actuation (2) (roller plunger, hand lever, rotary knob), control spool (3), and one or two return springs (4).
In de-energized state, the return springs (4) maintain the control spool (3) in central or starting position - if the rotary knob is actuated with a detent.
The control spool (3) is moved to the desired spool position by means of the type of actuation (2).

Detent
Directional valves with rotary knob are generally designed with detent. Directional valves with hand lever are optionally available as 2 or 3 position valves with detent. Directional valves with roller plunger are generally designed without detent. If types of actuation with detent are used, each spool position can be locked, depending on the valve type.

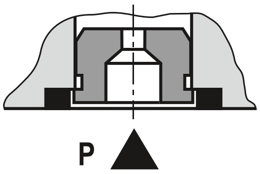
Throttle insert
The use of a throttle insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.
It is inserted in channel P of the directional valve.



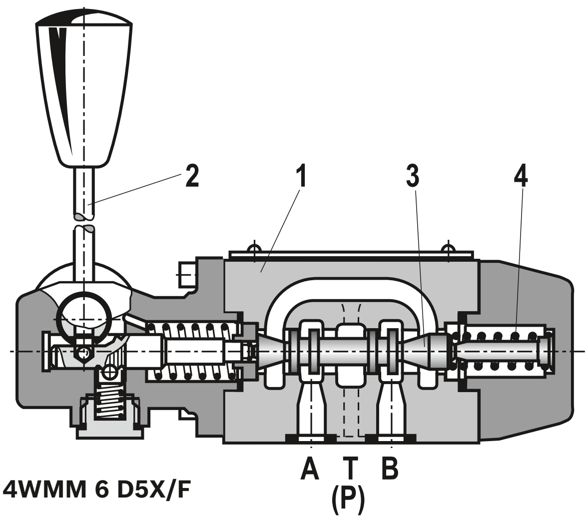
Type 4WMR 6 E5X/...



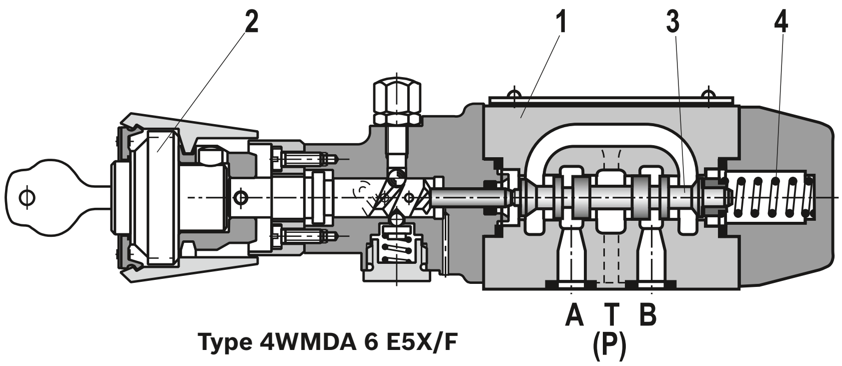
Type 4WMRZ 6 D6X/...



Type 4WM. 6 ..5X/..B..



Type 4WMM 6 D5X/F



Type 4WMDA 6 E5X/F

Technical data
(for applications outside these parameters, please consult us!)

general		
Weight	kg *[lbs]*	Approx. 1.4 *[3.1]*
Installation position		Any
Ambient temperature range	°C *[°F]*	–20 ... +80 *[–4 ... +176]* (NBR seals) –20 ... +80 *[–4 ... +176]* (FKM seals)

hydraulic				
Maximum operating pressure	– Port A, B, P	bar *[psi]*	315 *[4569]*	
	– Port T: "WMM", "WMD", "WMDA"	bar *[psi]*	160 *[2320]*	With symbols A or B, port T must be used as leakage oil connection if the operating pressure exceeds the permissible tank pressure.
	"WMR", "WMRZ", "WMU"	bar *[psi]*	60 *[900]*	
Maximum flow		l/min *[US gpm]*	60 *[15.8]*	
Flow cross-section (spool position 0)	– Symbol Q	mm^2	Approx. 6% of nominal cross-section	
	– Symbol W	mm^2	Approx. 3% of nominal cross-section	
Hydraulic fluid			See table below	
Hydraulic fluid temperature range		°C *[°F]*	–30 ... +80 *[–22 ... +176]* (NBR seals) –20 ... +80 *[–4 ... +176]* (FKM seals)	
Viscosity range		mm^2/s *[SUS]*	2.8 ... 500 *[35 ... 2320]*	
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]	

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR, HNBR	ISO 12922

☞ **Important information on hydraulic fluids!**

- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.

▶ **Flame-resistant – containing water**:
- Maximum pressure difference per control edge 50 bar
- Pressure pre-loading at the tank port > 20% of the pressure differential, otherwise increased cavitation
- Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter.

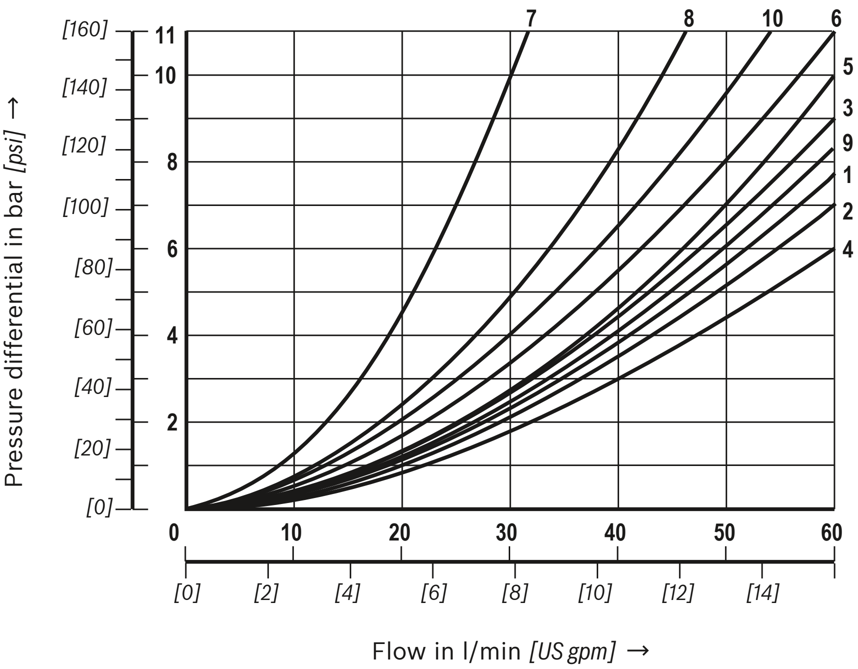
Actuating force/torque

			Design					
			"WMR", "WMU"			"WMM"	"WMD"	"WMRZ"
Operating pressure	– Port A, B, P	bar *[psi]*	100 *[1450]*	200 *[2900]*	315 *[4600]*			315 *[4600]*
Actuating force at the roller plunger	– Without tank pressure	N *[lbs]*	100 *[22.5]*	112 *[25.2]*	121 *[27.2]*			30 *[6.7]*
	– With tank pressure	N *[lbs]*	184 *[41.4]*	196 *[44.1]*	205 *[46.1]*			160 *[36]*
	(Tank pressure $p_{T\ max}$)	bar *[psi]*	60 bar *[900 psi]* – corresponds to 1.4 N *[0.022 lbs]* per bar *[psi]* of tank pressure					210 *[47.2]*
Maximum actuating torque		Ncm *[lb-in]*				–	150 *[13.3]*	
Actuating force	– Without tank pressure, with/without detent	N *[lbs]*				20 *[4.5]*	–	
	– At a tank pressure of 150 bar *[2175 psi]*	N *[lbs]*				30 *[6.7]*	–	

Calculation formula for the actuating force (F_R) at the roller plunger in case of tank pressure: $F_R = F_{\text{without tank pressure}} + p_T \times 1.4$ N/bar

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Δp-q_V characteristic curves



7 Symbol "R" in spool position "b" (A → B)

8 Symbols "G" and "T" in central position (P → T)

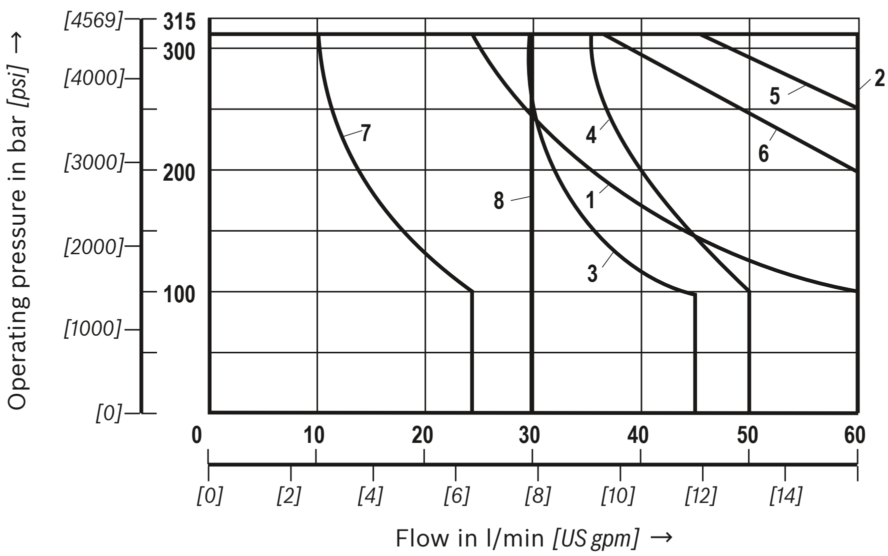
Symbols	Direction of flow			
	P–A	P–B	A–T	B–T
A	3	3	–	–
B	3	3	–	–
C	1	1	3	1
D	5	5	3	3
E	3	3	1	1
F	1	3	1	1
G	6	6	9	9
H	2	4	2	2
J	1	1	2	1
L	3	3	4	9
M	2	4	3	3
P	3	1	1	1
Q	1	1	2	1
R	5	5	4	–
T	10	10	9	9
U	3	3	9	4
V	1	2	1	1
W	1	1	2	2
Y	5	5	3	3

Performance limits

(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

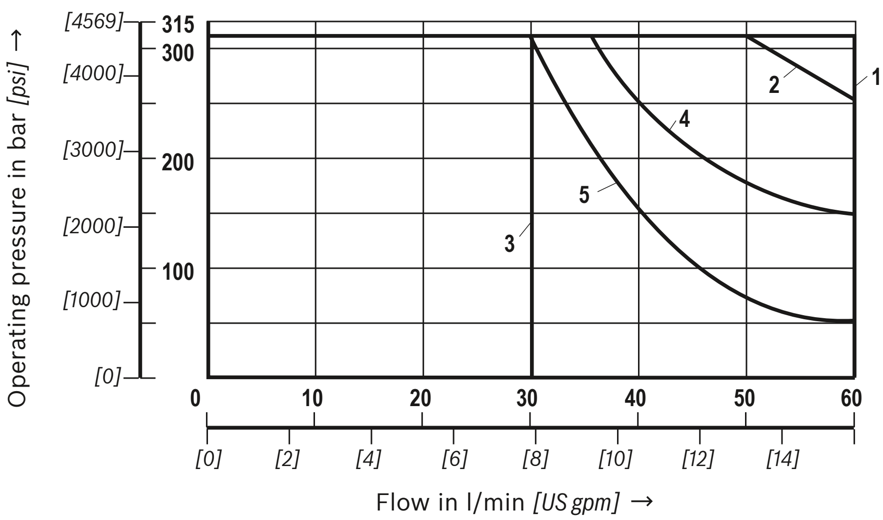
☞ **Notice!**
The specified switching power limits are valid for operation with two directions of flow (e.g. from P to A and simultaneous return flow from B to T).
Due to the flow forces acting within the valves, the permissible switching power limit may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked)!
In such cases, please consult us!

Version "WMR", "WMRZ", "WMU"



Characteristic curve	Symbol
1	A, B
2	C, D, Y, E, E1–, H, M, Q, U, W
3	F, P
4	G
5	J, L
6	R
8	V
7	T

Version "WMM" - spring return

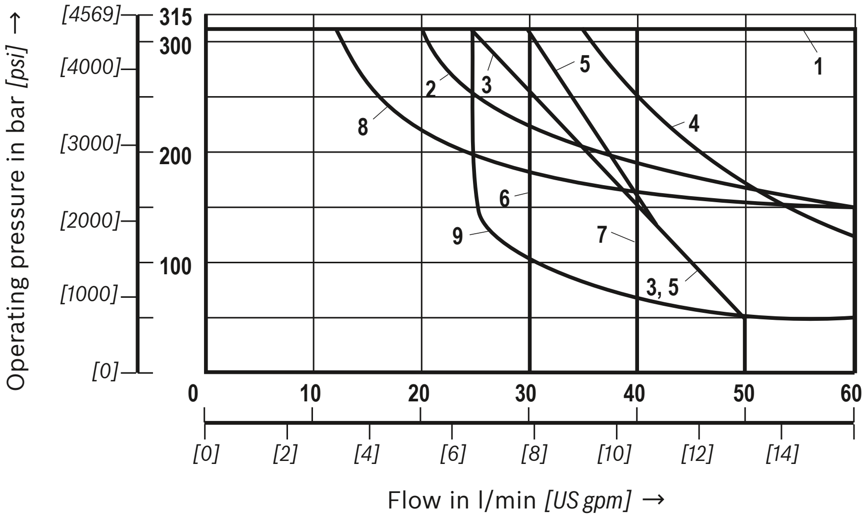


Characteristic curve	Symbol
1	E, E1–, M, J, L, Q, U, W, C, D, Y, G, H, R
2	A, B
3	V
4	F, P
5	T

Performance limits

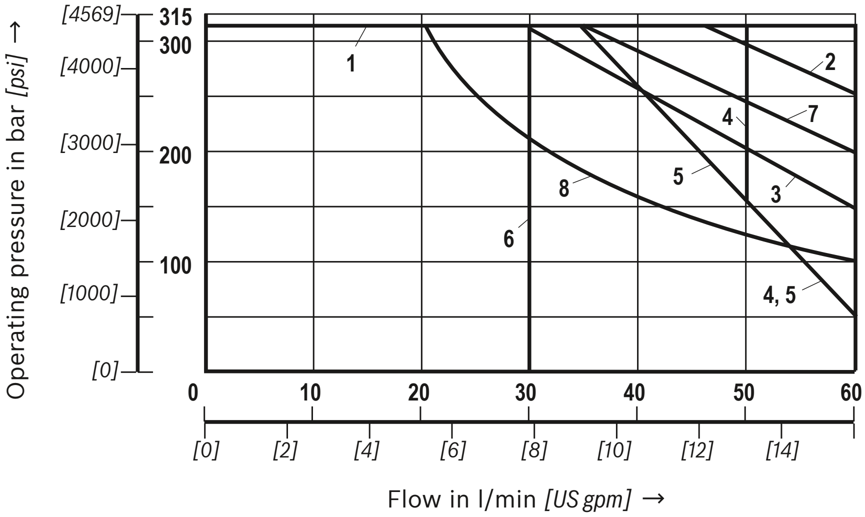
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Version "WMM" - with detent



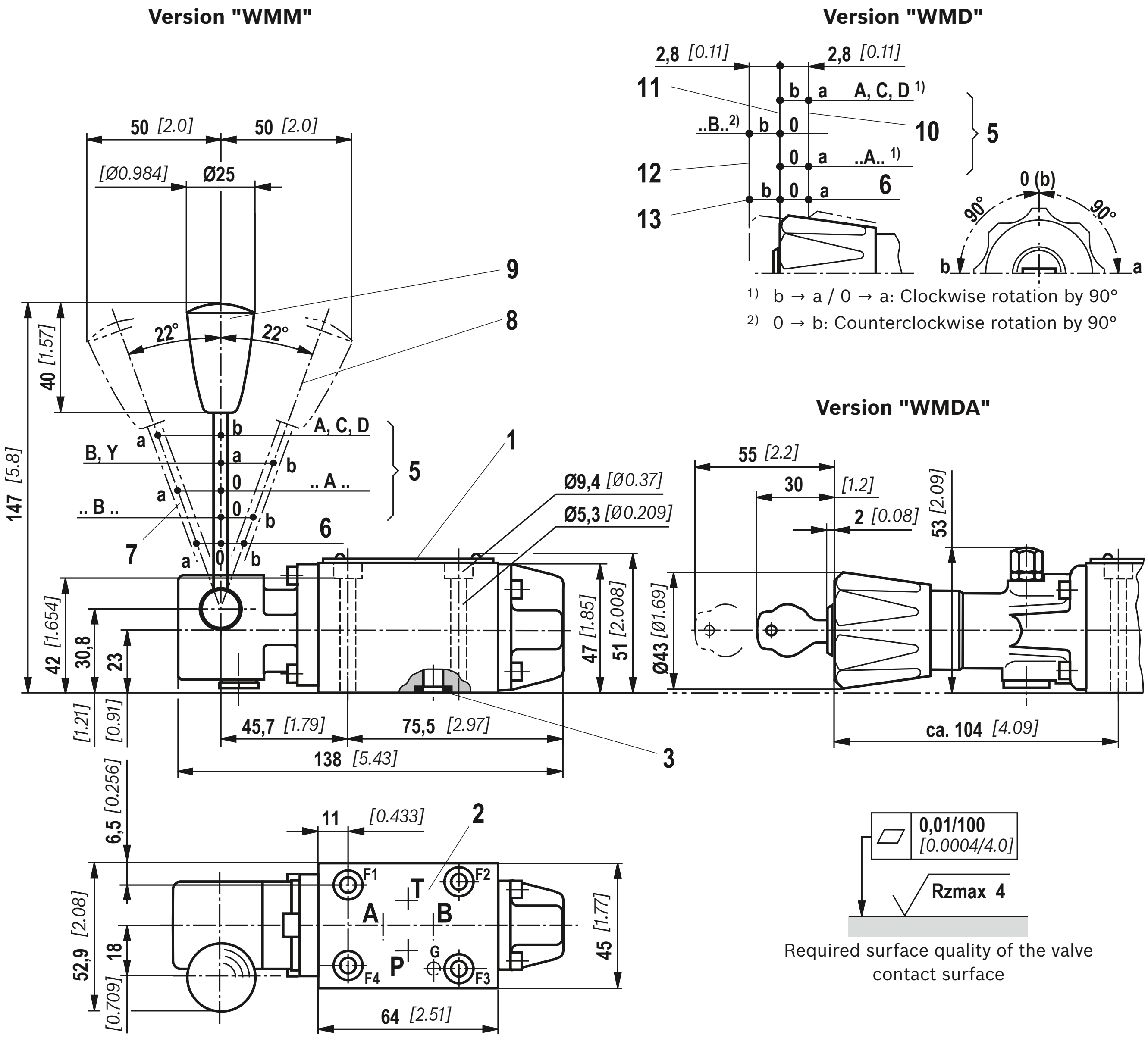
Characteristic curve	Symbol
1	E1–, M, H, C, D, Y
2	E, J, Q, L, U, W
3	A, B
4	G, T
5	F
6	V
7	P
8	R
9	T

Version "WMD", "WMDA"



Characteristic curve	Symbol
1	E, E1–, M, H, C, D, Y, Q, U, W
2	J, L
3	A, B
4	G, P
5	F
6	V
7	R
8	T

Dimensions
(dimensions in mm *[inch]*)



1 Name plate

2 Porting pattern according to DIN 24340 form A (**without** locating hole), ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order)

3 Identical seal rings for ports A, B, P and T

5 Valve with 2 spool positions

6 Valve with 3 spool positions

Version "WMM"

7 Spool position "a"

8 Spool position "b"

9 Spool position "0", "a" and "b" (a and b for valves with 2 spool positions)

Version "WMD", "WMDA"

10 Spool position "a"

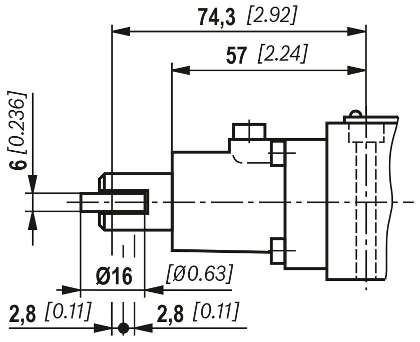
11 Spool position "0" and "b" (b for valves with 2 spool positions)

12 Spool position "b"

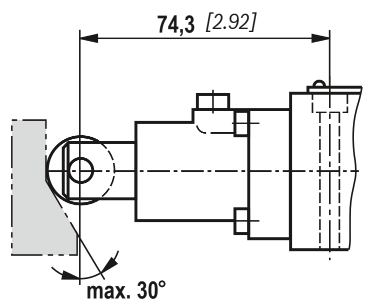
13 Switching angle 90° right and 90° left (for valves with 3 spool positions)

Dimensions
(dimensions in mm *[inch]*)

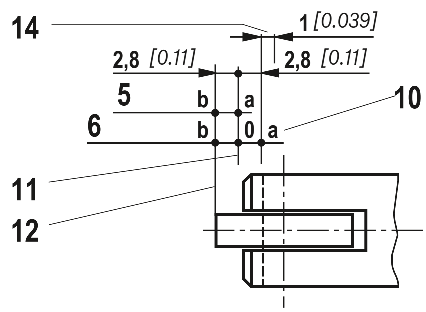
Version "WMR"



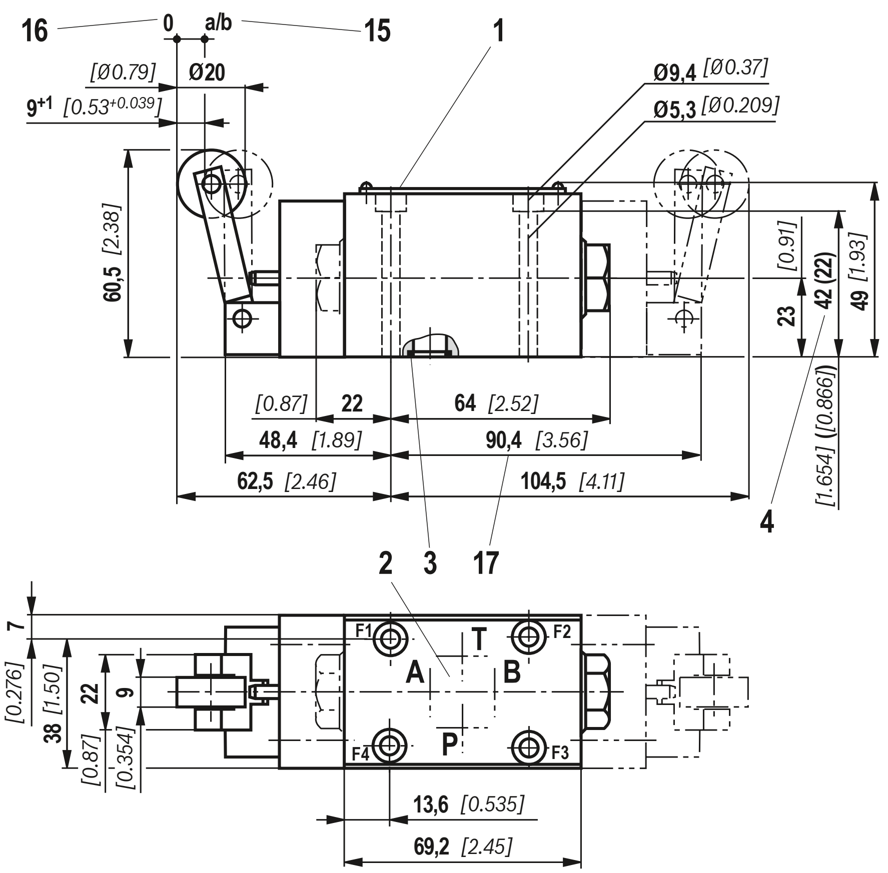
Version "WMU"



Version "WMR", "WMU"



Version "WMRZ"



1 Name plate

2 Porting pattern according to DIN 24340 form A (**without** locating hole), ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order)

3 Identical seal rings for ports A, B, P and T

4 Alternative clamping length (): 22 mm (only version "WMRZ")

Version "WMR", "WMRZ", "WMU"

5 Valve with 2 spool positions

6 Valve with 3 spool positions

10 Spool position "a"

11 Spool position "0" and "b" (b for valves with 2 spool positions)

12 Spool position "b"

14 Excessive stroke, cannot be used as working stroke

15 Spool position "a" or "b"

16 Spool position "0"

17 Actuation on side B (depending on the piston)

Subplates and **valve mounting screws** see page 13.

Dimensions

Subplates according to data sheet 45052 (separate order)

(**without** locating hole)	G 341/01 (G1/4)
	G 342/01 (G3/8)
	G 502/01 (G1/2)
(**with** locating hole)	G 341/60 (G1/4)
	G 342/60 (G3/8)
	G 502/60 (G1/2)
	G 341/12 (SAE-6) [1)]
	G 342/12 (SAE-8) [1)]
	G 502/12 (SAE-10) [1)]

[1)] Upon request

Valve mounting screws (separate order)

- Clamping length 42 mm:
  4 metric hexagon socket head cap screws
  ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
  (friction coefficient μ_{ges} = 0.09 to 0.14);
  tightening torque $\boldsymbol{M}_A$ = 7 Nm *[5.2 ft-lbs]* ± 10%,
  material no. **R913000064**
  or
  4 hexagon socket head cap screws
  ISO 4762 - M5 x 50 - 10.9 (not part of Rexroth delivery range)
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 8.1 Nm *[6 ft-lbs]* ± 10%

  4 hexagon socket head cap screws UNC
  10-24 UNC x 2" ASTM-A574
  (friction coefficient μ_{total} = 0.19 to 0.24);
  tightening torque $\boldsymbol{M}_A$ = 11 Nm *[8.2 ft-lbs]* ± 15%,
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 8 Nm *[5.9 ft-lbs]* ± 10%,
  material no. **R978800693**

- Clamping length 22 mm:
  4 metric hexagon socket head cap screws
  ISO 4762 - M5 x 30 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  tightening torque $\boldsymbol{M}_A$ = 7 Nm *[5.2 ft-lbs]* ± 10%,
  material no. **R913000316**
  or
  4 hexagon socket head cap screws
  ISO 4762 - M5 x 30 - 10.9 (not part of Rexroth delivery range)
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 8.1 Nm *[6 ft-lbs]* ± 10%

  4 hexagon socket head cap screws UNC
  10-24 UNC x 1 1/4"
  (friction coefficient μ_{total} = 0.19 to 0.24);
  tightening torque $\boldsymbol{M}_A$ = 11 Nm *[8.2 ft-lbs]* ± 15%,
  (friction coefficient μ_{total} = 0.12 to 0.17);
  tightening torque $\boldsymbol{M}_A$ = 8 Nm *[5.9 ft-lbs]* ± 10%,
  material no. **R978802879**

More information

▶ Subplates	Data sheet 45052
▶ Mineral oil-based hydraulic fluids	Data sheet 90220
▶ General product information on hydraulic products	Data sheet 07008
▶ Installation, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Hydraulic valves for industrial applications	Data sheet 07600-B
▶ Selection of the filters	www.boschrexroth.com/filter

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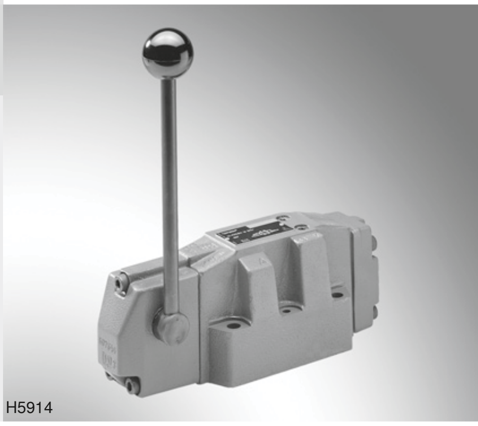
Rexroth
Bosch Group

4/3 and 4/2 directional valve with hand lever actuation

RE 22371/01.08
Replaces: 10.05

Type WMM

Sizes 16 to 32
Component series 5X; 7X
Maximum operating pressure 350 bar
Maximum flow 450 l/min



H5914

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

– Direct operated directional spool valve with hand lever actuation
– Porting pattern to DIN 24340 Form A and ISO 4401
– With spring return or detent, optionally
– Actuating mechanism is protected against contamination and ingress of humidity
– Head piece with actuating mechanism can be replaced without having to disassemble the valve
– Inductive position switches and proximity sensors (contact-free and floating), see RE 24830 (only sizes 16 and 25)

– Further information:

Subplates size 16:	RE 45056
Subplates size 25:	RE 45058
Subplates size 32:	RE 45060

Ordering code

H – 4	WMM				/			*

Maximum operating pressure 350 bar **= H**

4 main ports **= 4**

Actuation
Hand lever **= WMM**

Size 16 **= 16**
Size 25 **= 22**
Size 32 **= 32**

Spool symbols, e.g. C, E, etc., see page 3

Sizes 16 and 25 – component series 70 to 79 **= 7X**
(70 to 79: unchanged installation and connection dimensions)
Sizes 32 – Component series 30 to 39 **= 5X**
(30 to 39: unchanged installation and connection dimensions)

No code = With spring return
F = With detent

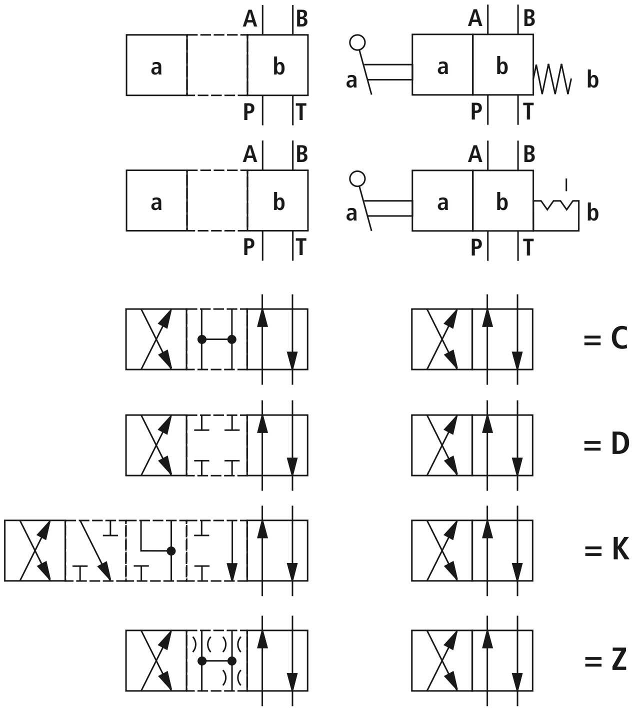
Spool position monitoring (only sizes 16 and 25)
No code = Without position switch
QMAG24 = Monitored spool position “a“
QMBG24 = Monitored spool position “b“
QM0G24 = Monitored rest position

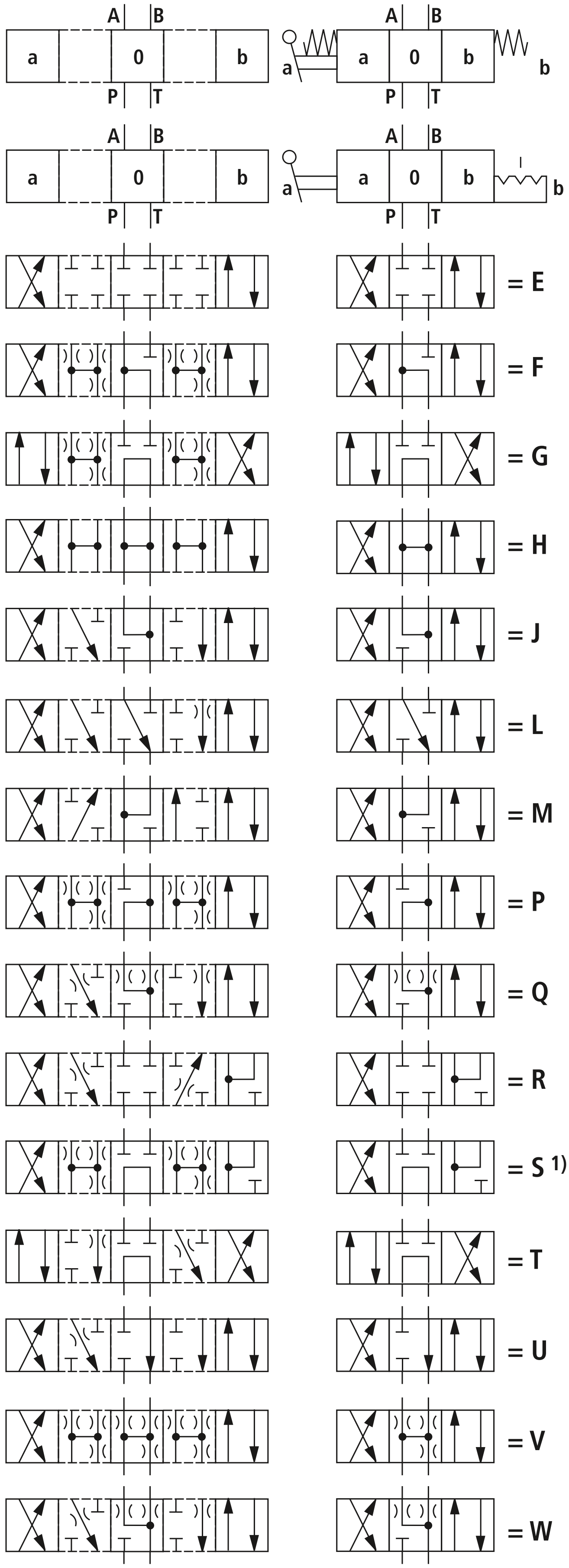
Seal material
No code = NBR seals
V = FKM seals
(other seals on request)
⚠ **Attention!**
Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

Standard types and standard devices can be found in the EPS (Standard Price List).

Spool symbols





1) Only sizes 16 and 32

Function, sections

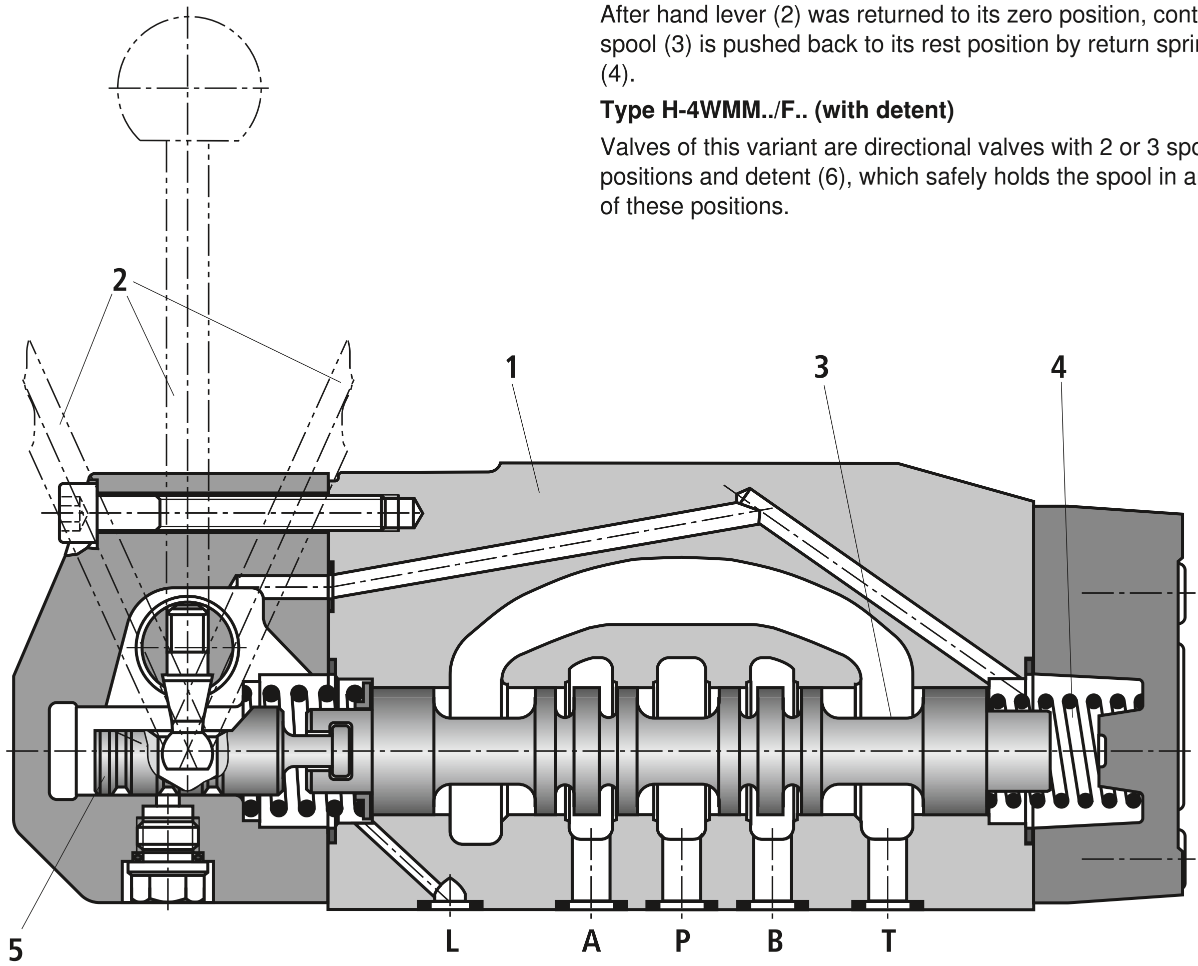
Valves of type WMM are hand lever-actuated directional spool valves. They control the start, stop and direction of a flow and basically consist of housing (1), hand lever (2), control spool (3), and one or two return springs (4).

In the non-operated condition, control spool (3) is held by return springs (4) in the central or starting position. Control spool (3) is actuated by hand lever (2), which acts via a joint and pin (5) directly onto control spool (3), which is thereby moved from its rest position to the desired end position.

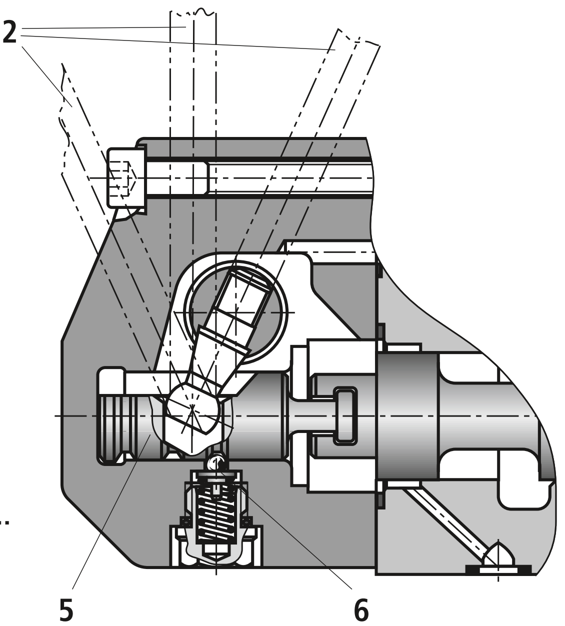
After hand lever (2) was returned to its zero position, control spool (3) is pushed back to its rest position by return spring (4).

Type H-4WMM../F.. (with detent)

Valves of this variant are directional valves with 2 or 3 spool positions and detent (6), which safely holds the spool in any of these positions.



Type H-4WMM 16 E 7X/…



Type H-4WMM 16 E 7X/F…
(with detent)

Technical data (for applications outside these parameters, please consult us!)

General

Sizes			Size 16	Size 25	Size 32
Weight		kg	ca. 8	ca. 12.2	ca. 49
Installation position			Optional		
Ambient temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)		
Actuating force	– with spring return	N	max 75	max 105	max 150
	– with detent	N	ca. 75	ca. 105	ca. 100
Actuating angle from central position (see Unit dimensions on pages 9 to 11)		°	2 x 26	2 x 24.5	2 x 25

Hydraulic

Maximum operating pressure	– Ports A, B, P		bar	350		
	– Part T		bar	250 At tank pressure > 160 bar the leakage oil must be drained via port L (size16) or port Y (sizes 25 and 32)!		
Maximum flow				300	450	1100
Hydraulic fluid				Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on request		
Hydraulic fluid temperature range			°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)		
Viscosity range			mm^2/s	2.8 to 380		
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)				Class 20/18/15 [3]		
Flow cross-section	– Symbol Q	(A/B → T)	mm^2	32	78	116
	– Symbol V	(A/B → T)	mm^2	32	73	136
		(P → A/B)	mm^2	32	84	120
	– Symbol W	(A/B → T)	mm^2	6	10	20

1) Suitable for NBR and FKM seals

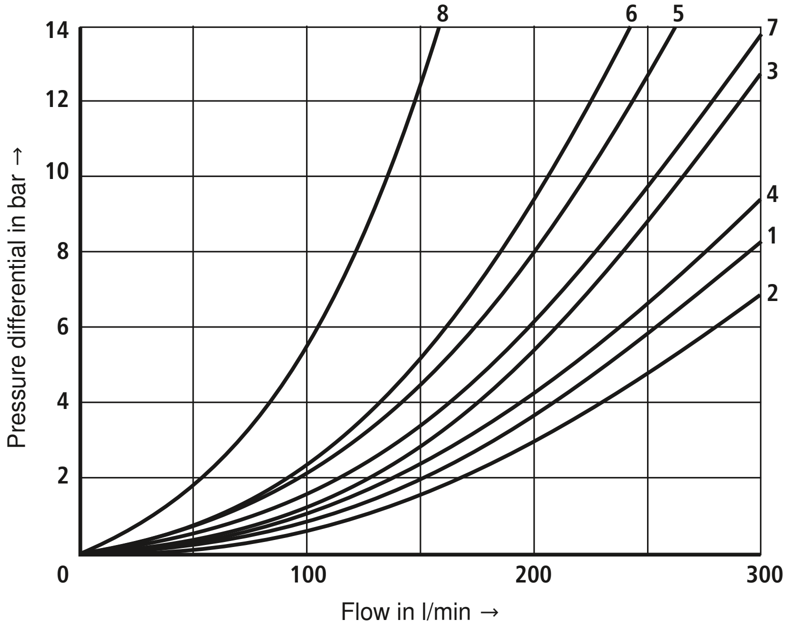
2) Suitable only for FKM seals

3) The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves: Size 16 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Δp-q_V characteristic curves



Spool symbol	Direction of flow				
	P – A	**P – B**	**A – T**	**B – T**	**P – T**
E, D, Y	1	1	1	3	–
F	2	2	3	3	–
G , T	5	1	3	7	6
H, C, Q	2	2	3	3	–
V, Z	2	2	3	3	–
J, K, L	1	1	3	3	–
M, W	2	2	4	3	–
R	2	2	4	–	–
U	1	1	4	7	–
S	4	4	4	–	8

Performance limits: Size 16 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

⚠ **Attention!**

Due to the sticking effect, the switching function of the valves depends on filtration. To achieve the specified permissible flows, full-flow filtration with 25 μm is recommended. The flow forces acting within the valves also have an effect on the flow performance.

For 4-way directional valves, the specified flows are therefore valid for normal operation with 2 directions of flow (e.g. from P to A and simultaneous return flow from B to T) (see table). In the case of only one direction of flow, the permissible flow can be significantly smaller (e.g. when using a 4-way directional valve as 3-way directional valve with port A or B plugged).

2-position valves – $q_{V\,max}$ in l/min

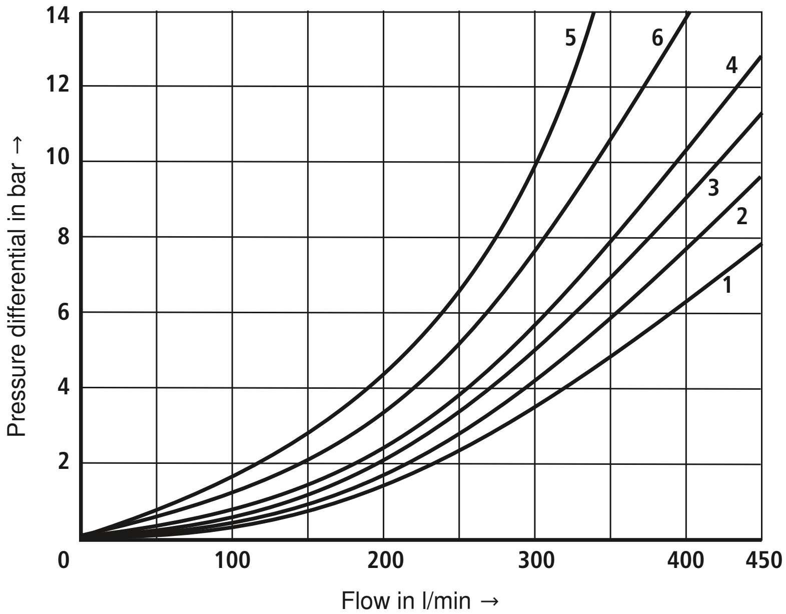
Spool symbol	Operating pressure p_{max} in bar				
	70	140	210	280	350
– With spring return					
C	300	300	300	260	220
D	300	300	210	190	160
K	300	300	200	150	130
Z	300	240	190	170	150
– Wth detent					
C, D, K, Z	300	300	300	300	300

3-position valves – $q_{V\,max}$ in l/min

Spool symbol	Operating pressure p_{max} in bar				
	70	140	210	280	350
– With spring return					
E, H, J, L, M, Q, R, U, W	300	300	300	300	300
F, P	300	300	210	190	170
G, S, T	300	300	220	210	180
V	300	260	200	180	170
– With detent					
E, H, J, L, M, Q, R, U, W	300	300	300	300	300
F, P	300	300	280	230	230
G, S, T	300	300	230	230	230
V	300	300	250	230	230

Characteristic curves: Size 25 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

***Δp-q*$_V$ characteristic curves**



Spool symbol	Direction of flow					
	P – A	P – B	A – T	B – T	P – T	B – A
E	2	2	1	4	–	–
F	1	2	1	2	4	–
G	2	2	2	4	6	–
H	2	2	1	3	2	–
J	2	2	1	3	–	–
L	2	2	1	2	–	–
M	2	2	1	4	–	–
P	2	2	1	4	6	–
Q	2	2	1	4	–	–
R	1	2	1	–	–	5
T	2	2	2	4	5	–
U	2	2	1	4	–	–
V	2	2	1	4	–	–
W	2	2	1	3	–	–

4 Spool symbol **L** Central position **A – T**
6 Spool symbol **U** Central position **B – T**

Performance limits: Size 25 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

⚠ **Attention!**

Due to the sticking effect, the switching function of the valves depends on filtration. To achieve the specified permissible flows, full-flow filtration with 25 µm is recommended. The flow forces acting within the valves also have an effect on the flow performance.

For 4-way directional valves, the specified flows are therefore valid for normal operation with 2 directions of flow (e.g. from P to A and simultaneous return flow from B to T) (see table). In the case of only one direction of flow, the permissible flow can be significantly smaller (e.g. when using a 4-way directional valve as 3-way directional valve with port A or B plugged).

2-position valves – $q_{V\,max}$ in l/min

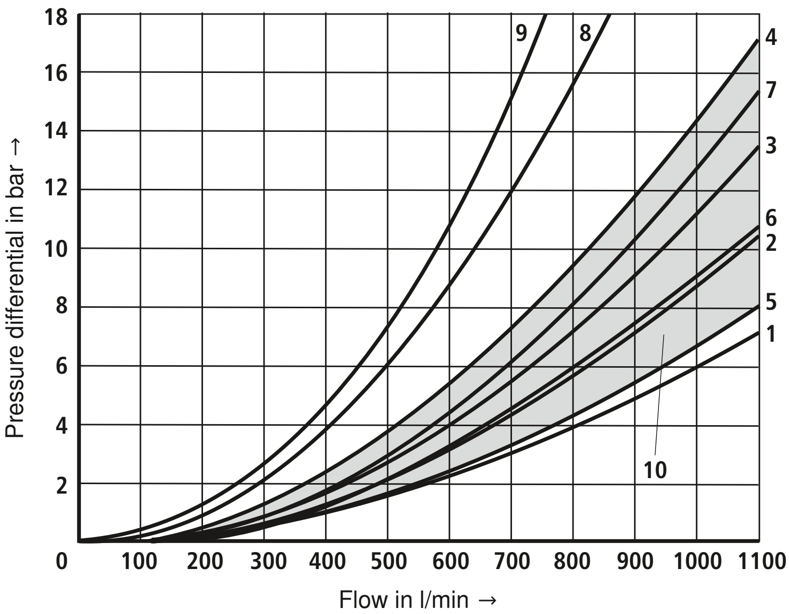
Spool symbol	Operating pressure p_{max} in bar				
	70	140	210	280	350
– With spring return					
C	450	300	250	200	180
D	350	300	275	250	200
K	200	150	140	130	120
Z	300	270	240	220	200
– With detent					
C, D, K, Z	450	450	450	450	450

3-position valves – $q_{V\,max}$ in l/min

Spool symbol	Operating pressure p_{max} in bar				
	70	140	210	280	350
– with spring return					
E, J, L, M, Q, R, U, W	450	450	450	450	450
F	450	250	200	135	110
G, T	450	330	290	230	180
H	450	450	400	400	350
P	450	310	240	215	150
V	450	310	280	270	200
– With detent					
E, F, G, H, J, L, M, P, Q, R, T, U, W	450	450	450	450	450
V	450	450	400	350	300

Characteristic curves: Size 32 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

***Δp-q*$_V$ characteristic curves**



Spool symbol	Direction of flow					
	P – A	P – B	A – T	B – T	P – T	B – A
E	1	1	2	3	–	–
G	6	5	6	7	7	–
R	1	1	2	–	–	4
S	–	–	–	–	9	8
T	6	5	6	7	7	–
W	1	1	2	3	–	4

10 All other spool symbols

Performance limits: Size 32 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

⚠ **Attention!**

Due to the sticking effect, the switching function of the valves depends on filtration. To achieve the specified permissible flows, full-flow filtration with 25 μm is recommended. The flow forces acting within the valves also have an effect on the flow performance.

For 4-way directional valves, the specified flows are therefore valid for normal operation with 2 directions of flow (e.g. from P to A and simultaneous return flow from B to T) (see table). In the case of only one direction of flow, the permissible flow can be significantly smaller (e.g. when using a 4-way directional valve as 3-way directional valve with port A or B plugged).

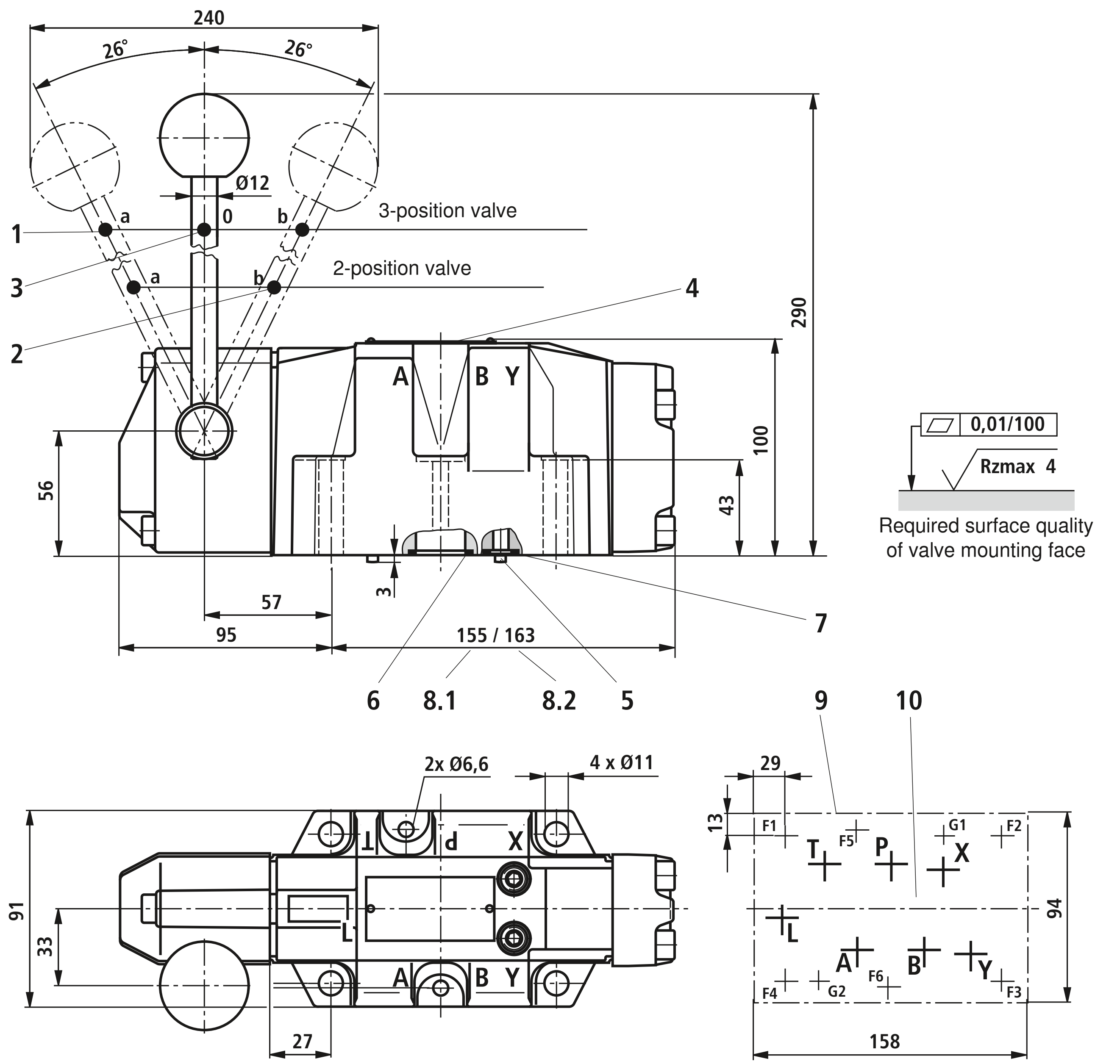
2-position valves – $q_{V\,max}$ in l/min

Spool symbol	Operating pressure p_{max} in bar				
	70	140	210	280	350
– With spring return					
C	1100	1040	860	800	700
D	1100	1040	540	480	420
K	1100	1040	860	500	450
Z	1100	1040	860	700	650
– With detent					
C, D, K, Z	1100	1040	860	750	680

3-position valves – $q_{V\,max}$ in l/min

Spool symbol	Operating pressure p_{max} in bar				
	70	140	210	280	350
– With spring return					
E, J, L, M, Q, R, U, W	1100	1040	860	750	680
F, G, S, T, H, P	900	900	800	650	450
V	1100	1000	680	500	450
– With detent					
E, F, G, H, J, L, M, P, Q, R, S, T, U, V, W	1100	1040	860	750	680

Unit dimensions: Size 16 (dimensions in mm)



1	Spool position a
2	Spool position b
3	Spool position 0
4	Nameplate
5	2 locating pins Ø3
6	Identical seal rings for ports A, B, P and T
7	Identical seal rings for ports L, X and Y
8.1	Dimension for 3-position valve
8.2	Dimension for 2-position valve with spring return
9	Machined valve mounting face
10	Porting pattern to DIN 24340 form A16 and ISO 4401-07-07-0-05

Subplates according to data sheet RE 45056 (separate order)

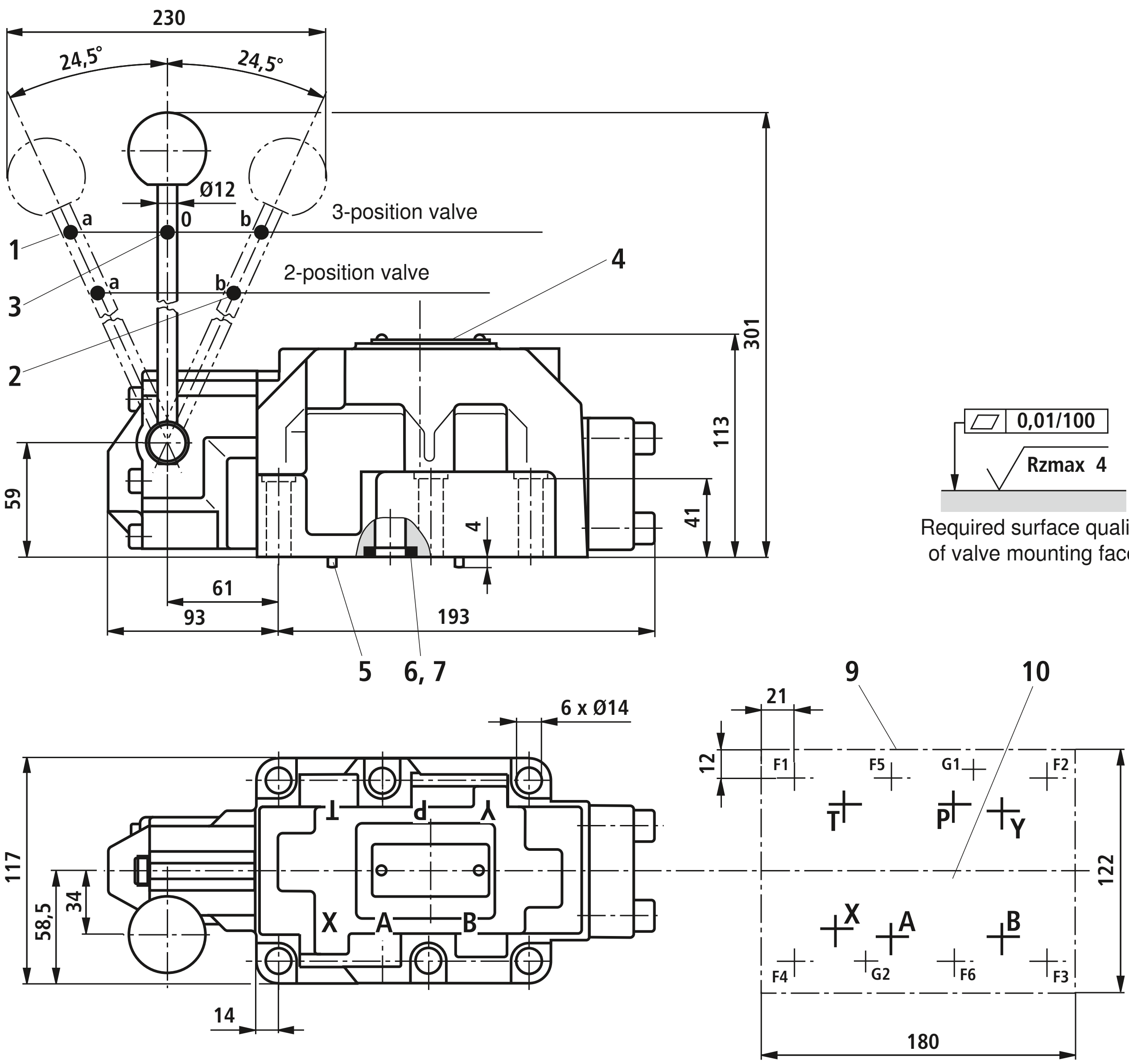
G 172/01 (G3/4)
G 174/01 (G1)
G 174/08 (flange)

Valve mounting screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M10 x 60 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 75 Nm,
Material no. **R913000116**

2 hexagon socket head cap screws ISO 4762 - M6 x 60 - 10.9,
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 12.5 Nm
Material no. **R913000115**

Unit dimensions: Size 25 (dimensions in mm)



Required surface quality of valve mounting face

- **1** Spool position a
- **2** Spool position b
- **3** Spool position 0
- **4** Nameplate
- **5** 2 locating pins Ø6
- **6** Identical seal rings for ports A, B, P and T
- **7** Identical seal rings for ports X and Y
- **9** Machined valve mounting face
- **10** Porting pattern to DIN 24340 form A25 and ISO 4401-08-08-0-05

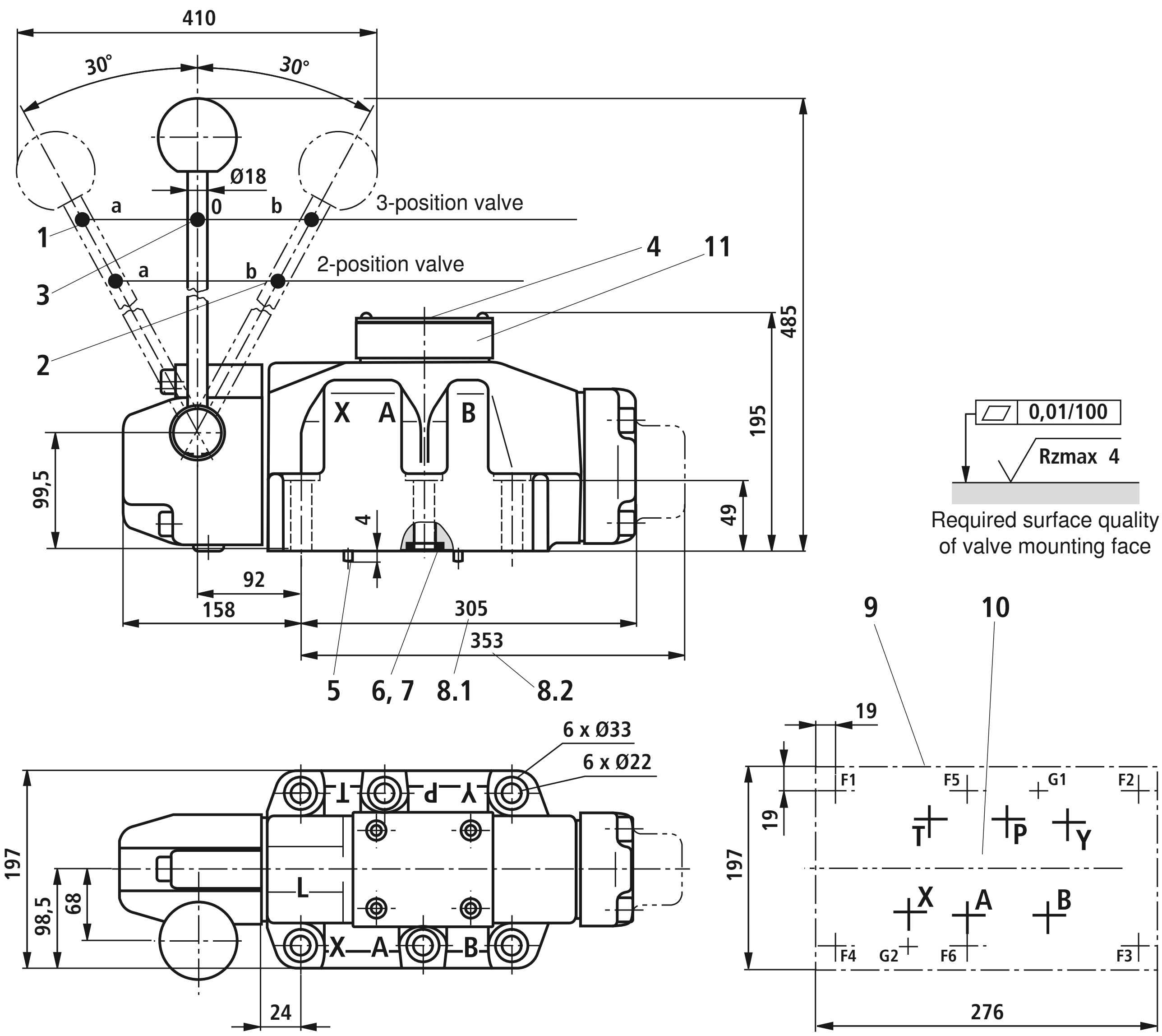
Subplates according to data sheet RE 45058, 45059 (separate order)

G 150/01 (G3/4)
G 151/01 (G1)
G 154/01 (G1 1/4)
G 156/01 (G1 1/2)

Valve mounting screws (separate order)

6 hexagon socket head cap screws
ISO 4762 - M12 x 60 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 130 Nm,
Material no. **R913000121**

Unit dimensions: Size 32 (dimensions in mm)



1 Spool position a
2 Spool position b
3 Spool position 0
4 Nameplate
5 2 locating pins Ø6
6 Identical seal rings for ports A, B, P and T
7 Identical seal rings for ports X and Y
8.1 Dimension for 2- and 3-position valve with detent and 3-position valve with spring return
8.2 Dimension for 2-position valve with spring return
9 Machined valve mounting face
10 Porting pattern to DIN 24340 form A32 and ISO 4401-10-09-0-05
11 Diversion plate

Subplates according to data sheet RE 45060 (separate order)
G 157/01 (G1 1/2)
G 157/02 (M48 x 2)
G 158/10 (flange)

Valve mounting screws (separate order)
6 hexagon socket head cap screws
ISO 4762 - M20 x 80 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque $\boldsymbol{M}_T$ = 160 Nm,
Material no. **R901035246**

Notes

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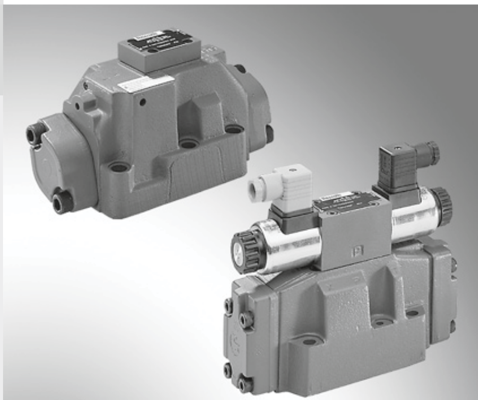
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

3/2, 4/2 and 4/3 directional valves, internally pilot operated, externally pilot operated

RE 24751/08.08
Replaces: 02.03

Types 4WEH and 4WH

Sizes 10 to 32
Component series 4X; 6X; 7X
Maximum operating pressure 350 bar *[5076 psi]*
Maximum flow 1100 l/min *[290 US gpm]*



H6092+5589

Table of contents

Content	**Page**

Information on available spare parts:
www.boschrexroth.com/spc

Features

- 2 types of actuation:
  - Electrohydraulic (type WEH)
  - Hydraulic (type WH)
- For subplate mounting
- Porting pattern to ISO 4401 and NFPA T3.5.1 R2
- For subplates to data sheets RE 45054 to RE 45060 (separate order), see page 32
- Spring- or pressure-centering, spring end position or hydraulic end position
- Wet-pin DC or AC voltage solenoids, optional
- Manual override, optional
- Electrical connection as individual or central connection, see RE 23178 and RE 08010
- Switching time adjustment, optional
- Pre-load valve in channel P of main valve, optional
- Stroke adjustment of main spool, optional
- Stroke adjustment and/or end position control, optional
- Inductive position switches and proximity sensors (contactless), see RE 24830

Ordering code

Up to 280 bar = **No code**
Up to 350 bar = **H –**

3-way design = **3**
4-way design = **4**

Types of actuation
Electrohydraulic = **WEH**
Hydraulic = **WH**

Size
NG10 = **10**
NG16 = **16**
NG25 (type 4W.H 22 .7X/…) = **22**
NG25 (type 4W.H 25 .6X/…) = **25**
NG32 = **32**

Spool return in main valve
By springs = **No code**
Hydraulic [1] = **H**

For spool symbols, see pages 4 and 5

Component series
40 to 49 – NG10 = **4X**
(40 to 49: unchanged installation and connection dimensions)
60 to 69 – NG25 (4W.H 25.) and NG32 = **6X**
(60 to 69: unchanged installation and connection dimensions)
70 to 79 – NG16 (series 72 or higher) and NG25 (4W.H 22.) = **7X**
(70 to 79: unchanged installation and connection dimensions)

Spool return in pilot valve with 2 spool positions and 2 solenoids
Only possible with spools A, B, C, D, K, Z and hydraulic spool return in main valve:
With spring return = **No code**
Without spring return = **O**
Without spring return **with** detent [2] = **OF**

Pilot valve [2]
High-performance valve (RE 23178) = **6E**

DC voltage 24 V [2] = **G24**
AC voltage 230 V 50/60 Hz [2] = **W230**
For further voltages, frequencies and electric data, see data sheet RE 23178

Without manual override = **No code**
With manual override = **N**
With concealed manual override = **N9**

External pilot oil supply, external pilot oil drain [3] = **No code**
Internal pilot oil supply, external pilot oil drain [3; 4] = **E**
Internal pilot oil supply, internal pilot oil drain [4] = **ET**
External pilot oil supply, internal pilot oil drain [3] = **T**
(for type 4WH… **only “No code“** possible!)
(Variants “ET“ and “T“ for 3-position valve, pressure-centering **only** possible, if $p_{St} \geq 2 \times p_{Tank} + p_{St\,min}$!)

p_{St} = pilot pressure
$p_{St\,min}$ = pilot pressure, min,
p_{Tank} = tank pressure
$p_{ö}$ = cracking pressure

Standard types and components are shown in the EPS (standard price list).

For explanation of footnotes, see page 3!

			/					*

Further details in clear text

Seal material

No code = NBR seals
V = FKM seals
(other seals on request)

⚠ **Attention!**
Observe compatibility of seals with hydraulic fluid used!

No code = **Without** pressure reducing valve
D3 [5] **=** **With** pressure reducing valve

Pre-load valve (not for NG10) [2; 5]
No code = **Without** pre-load valve
P4,5 = **With** pre-load valve ($\boldsymbol{p}_{ö}$ = 4.5 bar *[65 psi]*)

Throttle insert [2]
No code = Without throttle insert
B08 = Throttle Ø 0.8 mm *[0.0315 inch]*
B10 = Throttle Ø 1.0 mm *[0.0394 inch]*
B12 = Throttle Ø 1.2 mm *[0.0472 inch]*
B15 = Throttle Ø 1.5 mm *[0.0591 inch]*
B20 = Throttle Ø 2.0 mm *[0.0787 inch]*
B25 = Throttle Ø 2.5 mm *[0.0984 inch]*

Stroke adjustment
For ordering code, see pages 34 and 35

Spool position monitoring
No code = Without position switch
QMAG24 = Monitored spool position “a“
QMBG24 = Monitored spool position “b“
QMABG24 = Monitored spool positions “a“ and “b“
QM0G24 = Monitored rest position
For further details, see RE 24830

Electrical connection [2]
K4 [6] **=** Without mating connector, individual connection with component plug to DIN EN 175301-803
For further electrical connections, see RE 23178 and RE 08010

No code = **Without** switching time adjustment
S = Switching time adjustment as meter-in control
S2 = Switching time adjustment as meter-out control

[1] – 2 spool positions (hydraulic end position): Spools C, D, K, Z, Y only
– 3 spool positions (hydraulically centered): Only with NG16, NG25 (type 4W.H **25** …) and NG32

[2] Only with electrohydraulic actuation

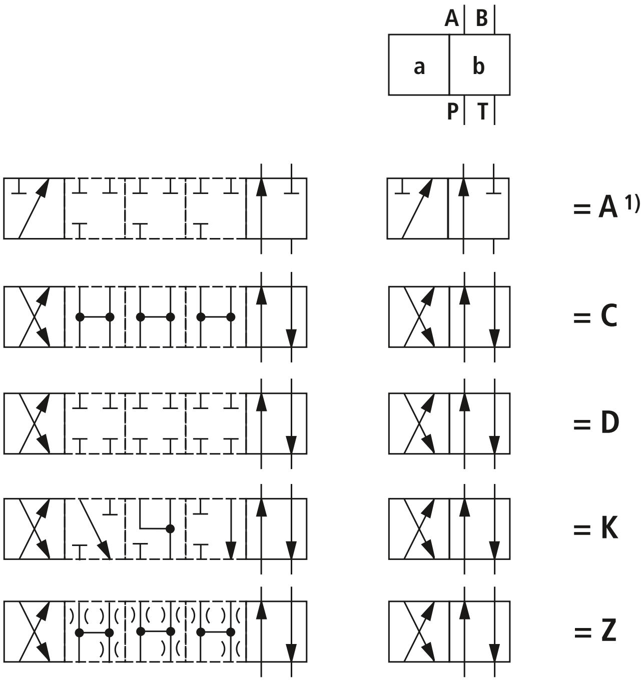
[3] Pilot oil supply X or drain Y **external**:
– In the case of NG10, variant SO30 must be provided for the use of sandwich plates. Code SO30 must be entered at the end of the type code (sandwich plate).
– Make sure that the permissible operating parameters of the pilot oil are not exceeded (see RE 23178)!
– Maximum pilot pressure: Please observe page 14!

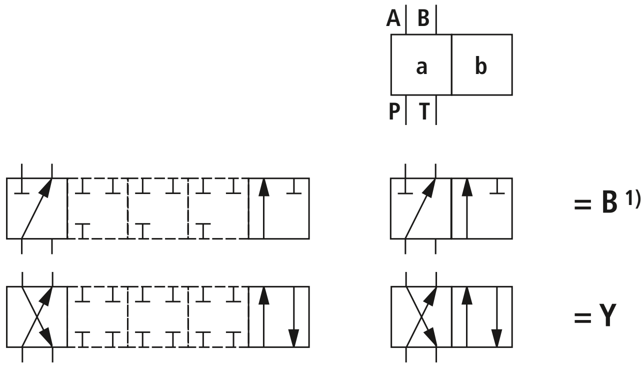
[4] Internal pilot oil **supply** (version “ET“ and “E“):
– Minimum pilot pressure: Please observe page 15!
– To avoid impermissibly high pressure peaks, a **throttle insert “B10“** must be provided in the P port of the pilot valve (see page 13).
– In conjunction with version “H-“, **pressure reducing valve “D3“** must be provided additionally.

[5] Only in conjunction with throttle insert **“B10“**

[6] Mating connectors, separate order, see RE 23178

Spool symbols: 2 spool positions

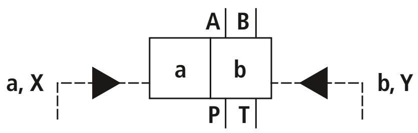
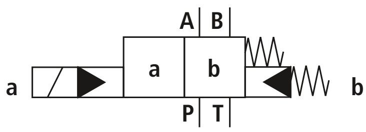
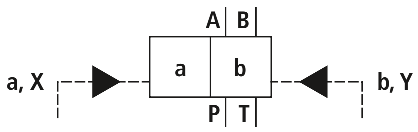
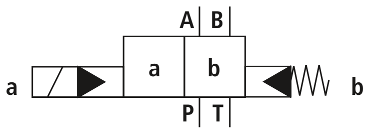
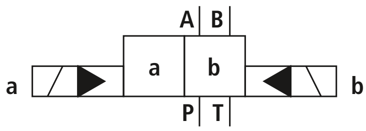
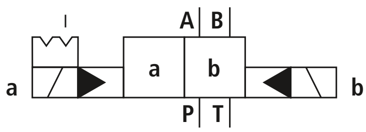
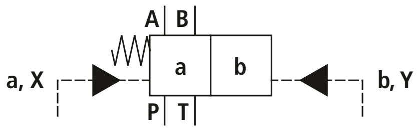
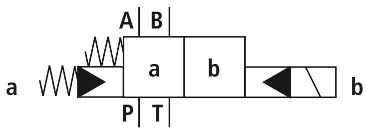
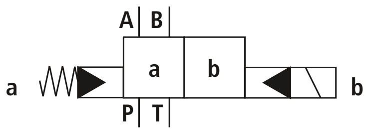




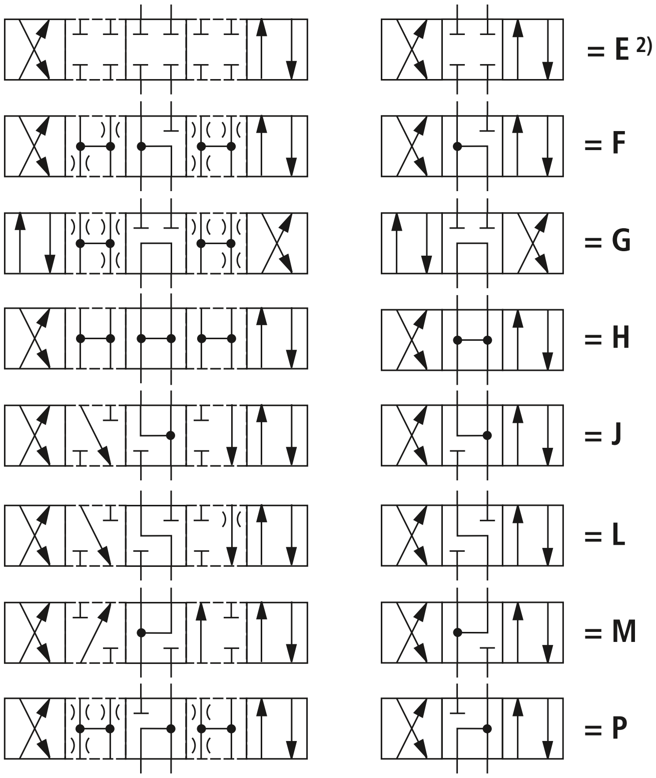
1) Only for NG10 and 25 (4W.H 22.)
If operating pressure > tank pressure, port T must be used as leakage port!

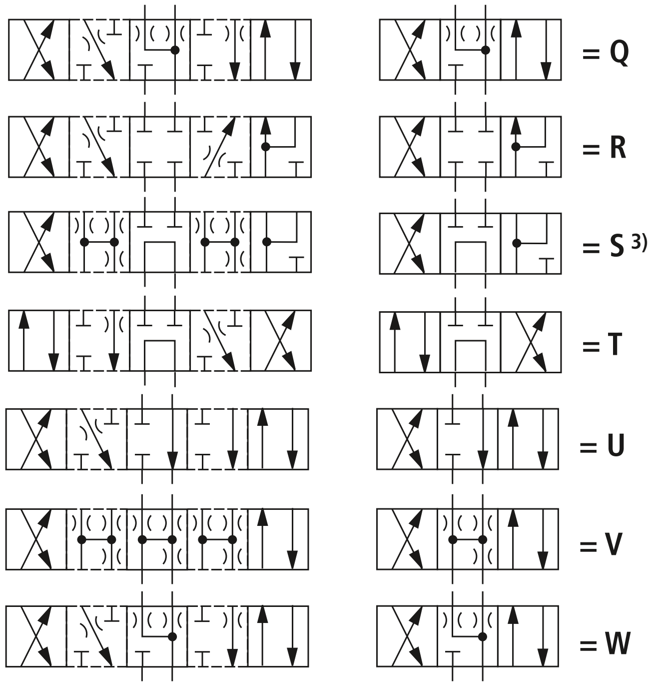
2) **Example:**
Symbol E with actuating side "a"
→ ordering code ..EA..

3) Spool symbol S for NG16 only

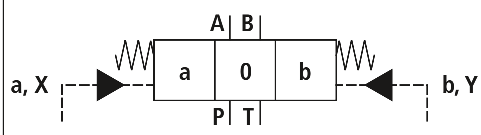
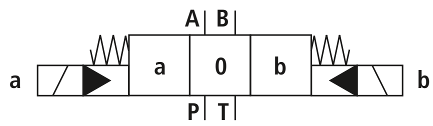
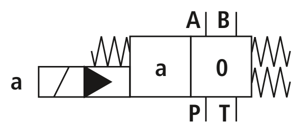
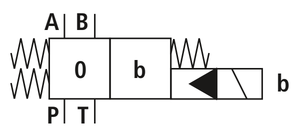
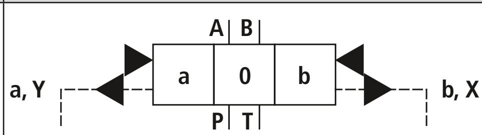
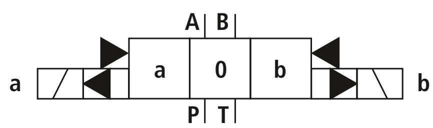
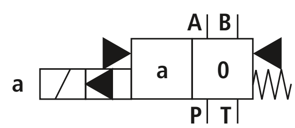
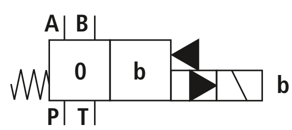
Ordering code		Type of actuation	
		Hydraulic	**Electrohydraulic**
Spool symbol	**Spool return**	Type WH	Type WEH
A, C, D, K, Z	**../..**		
	..H../..		
	..H../O		
	..H../OF		
B, Y	**../..**		
	..H../..		

Spool symbols: 3 spool positions

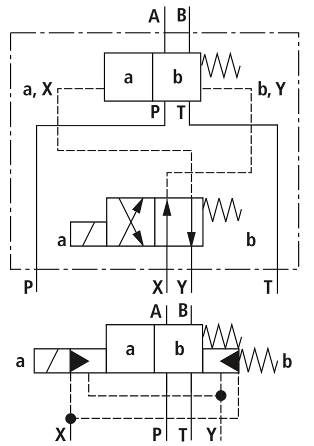
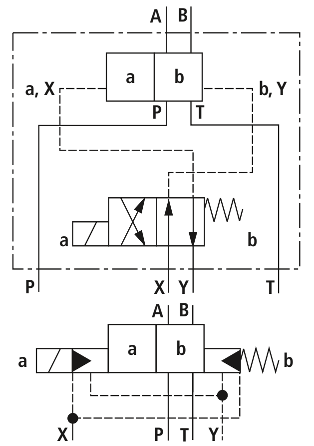
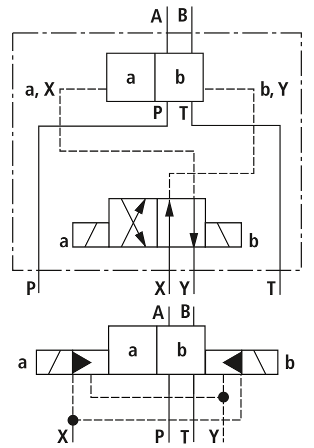
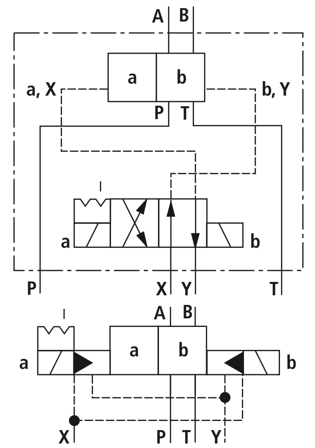
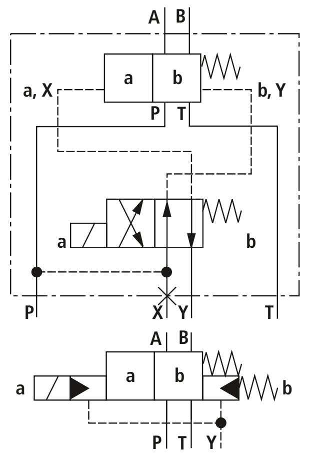
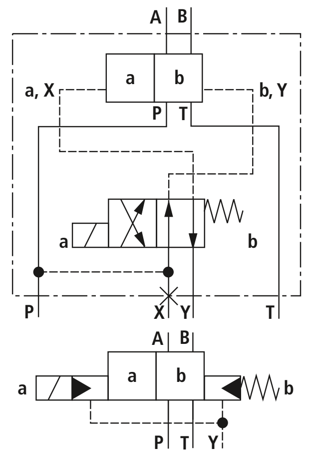
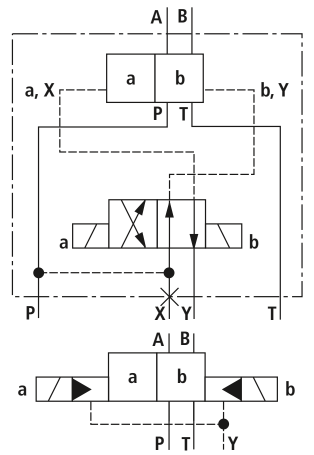
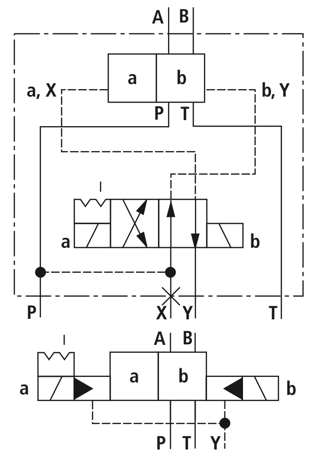
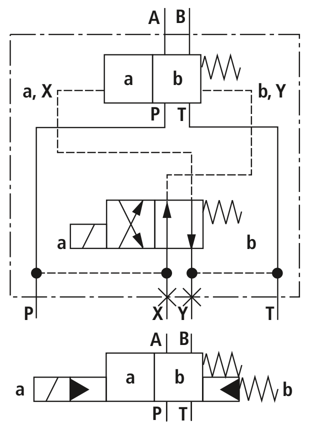
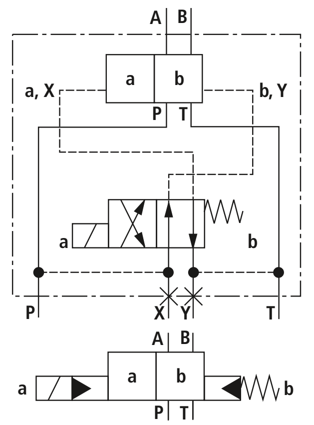
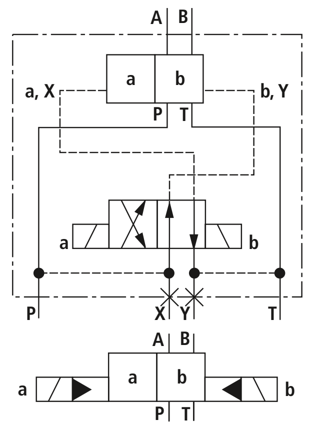
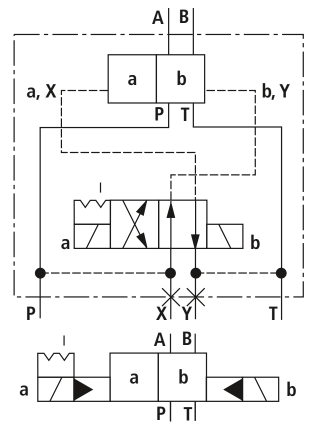




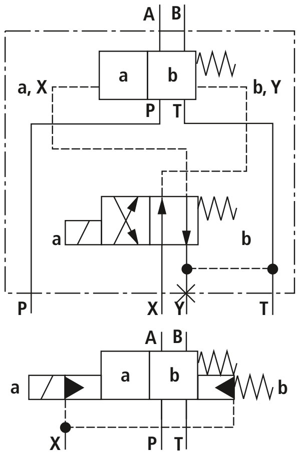
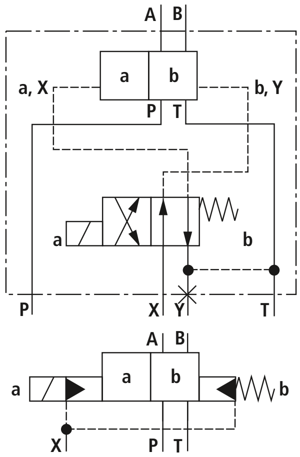
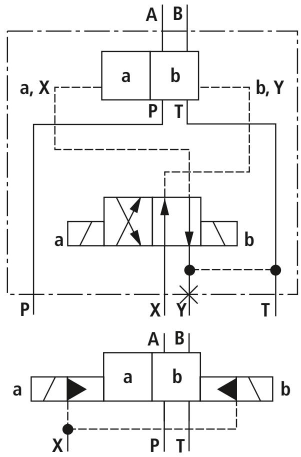
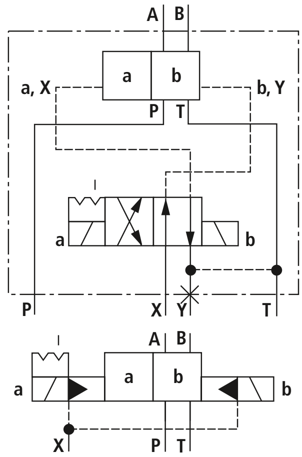
For explanation of footnotes, see page 4!

Ordering code			Type of actuation	
Spool symbol	**Actuating side**	**Spool return**	**Hydraulic** Type WH	**Electrohydraulic** Type WEH
E, F, G, H, J, L, M, Q, R, S, T, U, V, W		**../..**		
	.A			
	.B			
		..H../..		
		H.A		
		H.B		

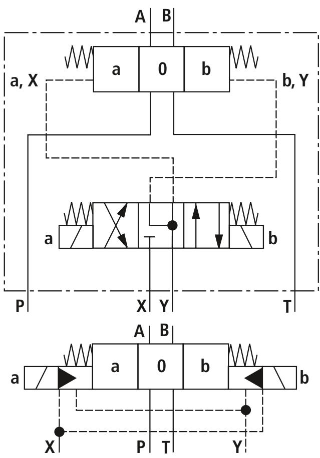
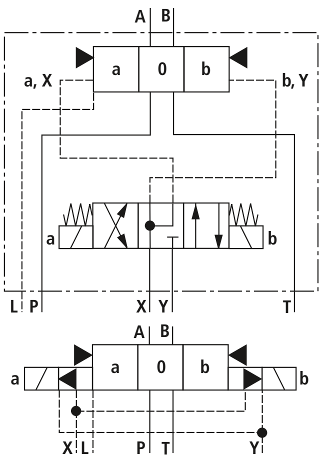
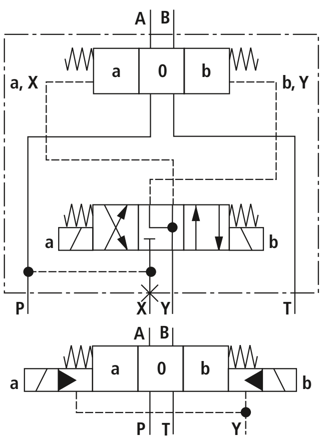
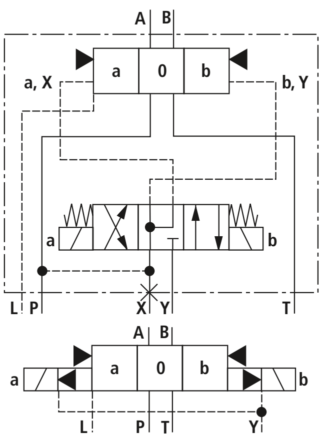
Symbols for valves with 2 spool positions

	Valve with spring end position	Valve with hydraulic end position		
X = external; **Y** = external	**Type 4WEH…/..** 	**Type 4WEH . H../...** 	**Type 4WEH . H../O...** 	**Type 4WEH . H../OF...** 
X = internal; **Y** = external	**Type 4WEH…/…E…** 	**Type 4WEH . H../…E…** 	**Type 4WEH . H../O…E…** 	**Type 4WEH . H../OF…E…** 
X = internal; **Y** = internal	**Type 4WEH…/…ET…** 	**Type 4WEH . H../…ET…** 	**Type 4WEH . H../O…ET…** 	**Type 4WEH . H../OF…ET…** 

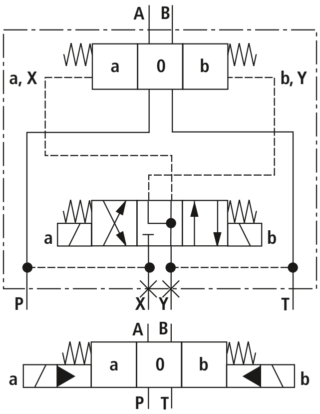
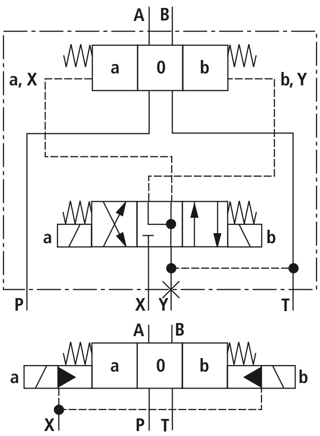
Symbols for valves with 2 spool positions

	Valve with spring end position	Valve with hydraulic end position		
	Type 4WEH…/…T…	Type 4WEH . H../…T…	Type 4WEH . H../O…T…	Type 4WEH . H../OF…T…
X = external; **Y** = internal				

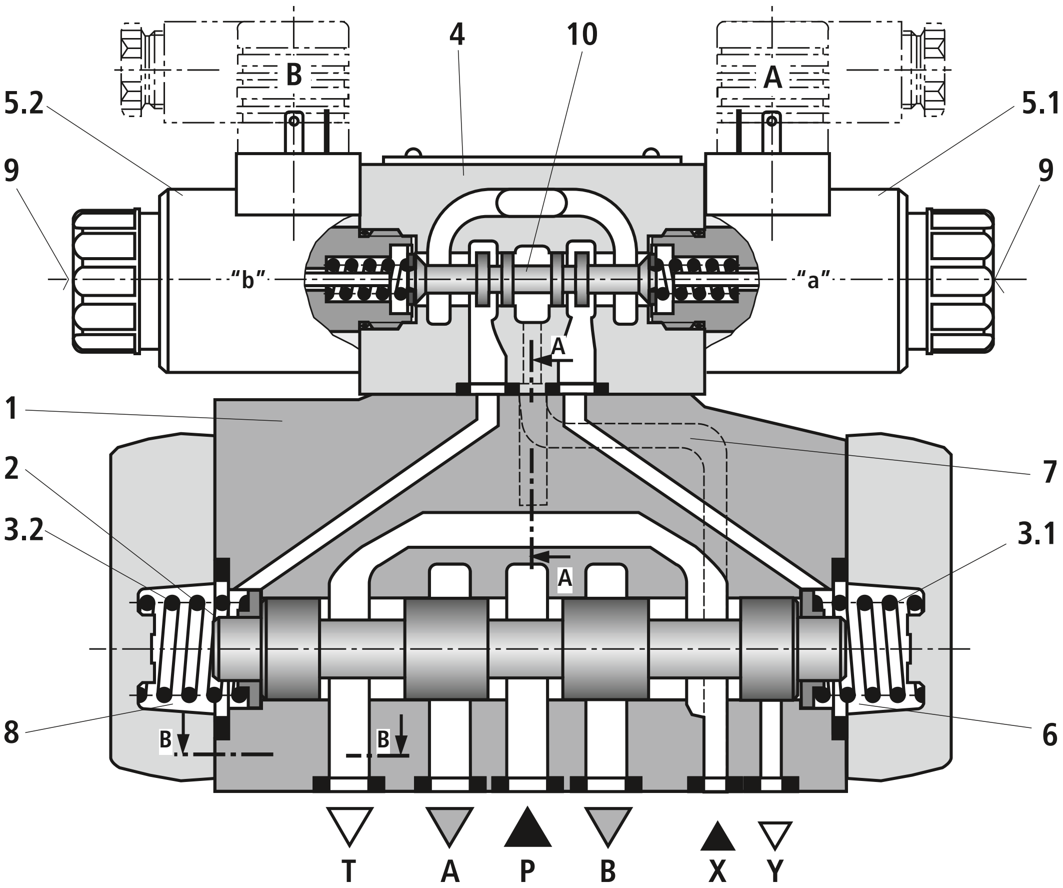
Symbols for valves with 3 spool positions

	Valve with spring-centered zero position	Valve with pressure-centered zero position only NG16, 25 (type 4W.H **25** .6X/…) and 32
	Type 4WEH…/…	Type 4WEH . H../…
X = external; **Y** = external		
	Type 4WEH…/…E…	Type 4WEH . H../…E…
X = internal; **Y** = external		

Symbols for valves with 3 spool positions

<table>
<tr><th colspan="2">Valve with spring-centered zero position</th><th>Valve with pressure-centered zero position
nur NG16, 25 (Type 4W.H 25 .6X/…) and 32</th></tr>
<tr><td>X = internal; Y = internal</td><td>Type 4WEH…/…ET…

</td><td rowspan="2">3-position valves, pressure-centered, preferably with external pilot oil supply and/or drain (“No code“, “E“)
For the preconditions for internal pilot oil supply and/or drain (“ET“, “T“), see pages 4 and 15.</td></tr>
<tr><td>X = external; Y = internal</td><td>Type 4WEH…/…T…

</td></tr>
</table>

Function, section: Type 4WEH



Directional valves of type 4WEH…

Valves of type WEH are directional spool valves with electro-hydraulic actuation. The control the start, stop and direction of a flow.

These directional valves basically consist of the main valve with housing (1), main control spool (2), one or two return springs (3.1) and (3.2), as well as pilot valve (4) with one or two solenoids "a" (5.1) and/or "b" (5.2).

Main control spool (2) in the main valve is held in the zero or initial position by springs or through pressurization. In the de-pressurized condition, the two spring chambers (6) and (8) are pressureless connected to the tank via pilot valve (4). The pilot valve is supplied with pilot oil via pilot line (7). The supply can be provided internally or externally (externally via port X).

When the pilot valve is operated, e.g. solenoid "a", pilot spool (10) is pushed to the left and spring chamber (8) is therefore pressurized to pilot pressure. Spring chamber (6) remains pressureless.

The pilot pressure acts on the left side of main control spool (2) and shifts the latter against spring (3.1). In the main valve, port P is consequently connected to B and A to T.

When the solenoid is de-energized, pilot spool (10) returns to its starting position (except for impulse spool). Spring chamber (8) is unloaded to the tank.

The pilot oil is drained internally (via channel T) or externally (via channel Y).

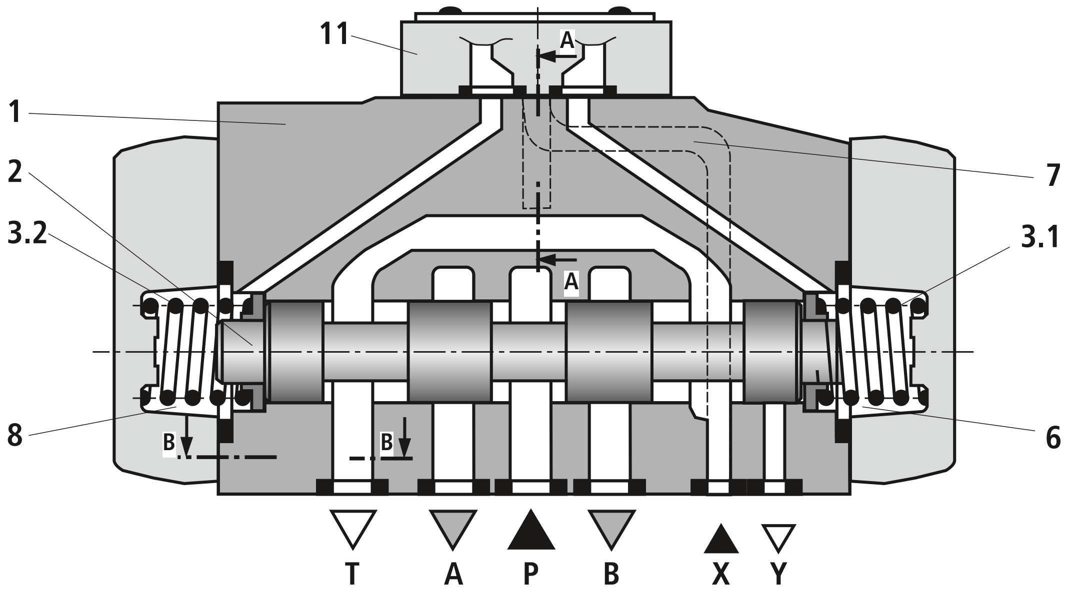
An optional manual override (9) allows pilot spool (10) to be moved without energization of the solenoid.

☞ **Note!**

Return springs (3.1) and (3.2) in spring chambers (6) and (8) hold the main control spool (2) in the central position, even if the valve is arranged, for example, vertically.

Pilot oil supply (sections A – A and B – B),
see pages 12 and 13.

Function, section: Type 4WH



Directional valves of type 4WH…

Valves of type WH are directional spool valves with hydraulic actuation. They control the start, stop and direction of a flow.

These directional valves basically consist of valve housing (1), main control spool (2), one or two return springs (3.1) and (3.2) on valves with spring return or spring centering, as well as reconnection plate (11).

The main control spool (2) is actuated directly through pressurization.

Main control spool (2) is held in the zero or initial position by springs or through pressurization. The pilot oil is supplied and drained externally (see page 12).

4/3 directional valve with spring centering of the pilot spool

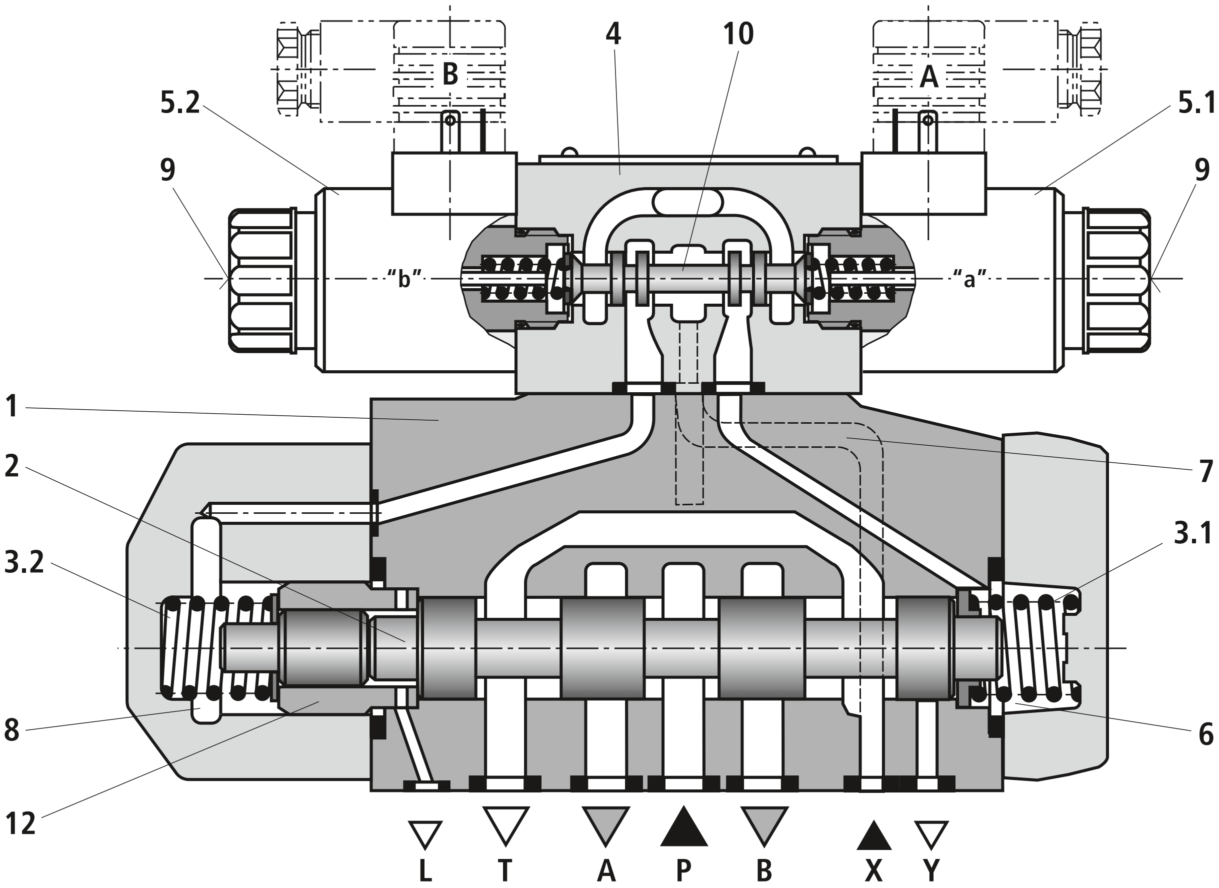
With this version, main control spool (2) is held by two return springs (3.1) and (3.2) in the zero position. The two spring chambers (6) and (8) are connected via reconnection plate (11) to ports X and Y.

When main control spool (2) is pressurized to pilot pressure on one of the two front faces, it is pushed to the operated position. The connections within the valve are established as required.

When the pressurized spool is depressurized, the spring on the opposite side causes the spool to be returned to the zero or initial position.

Pilot oil supply (sections A – A and B – B),
see pages 12 and 13.

Function, section: Type 4WEH…H



4/3 directional valves with pressure-centering of the main control spool, type 4WEH…H

Main control spool (2) in the main valve is held in the zero position through pressurization of the two spool faces. Centering bushing (12) is supported within the housing and holds the spool in position.

By depressurization of one spool face, main control spool (2) is brought to the operated position.

The unloaded spool area displaces the returning pilot oil via the pilot valve into channel Y (external).

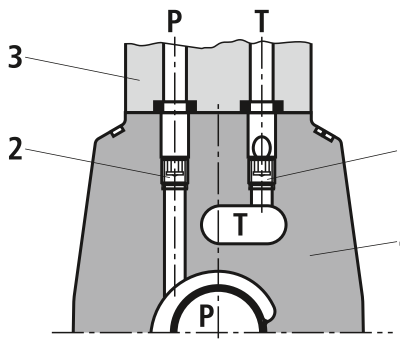
☞ **Note!**

In this variant, springs (3.1) and (3.2) do not assume a return function. The hold the horizontally installed main control spool (2) in the central position when de-pressurized.

Pilot oil supply

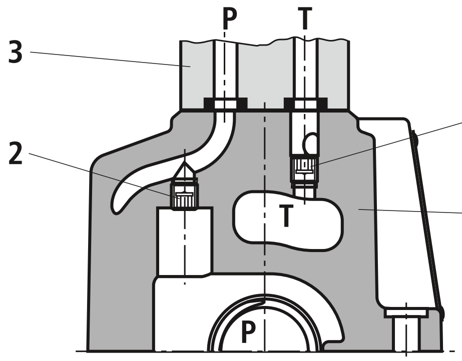
NG10

Section A – A



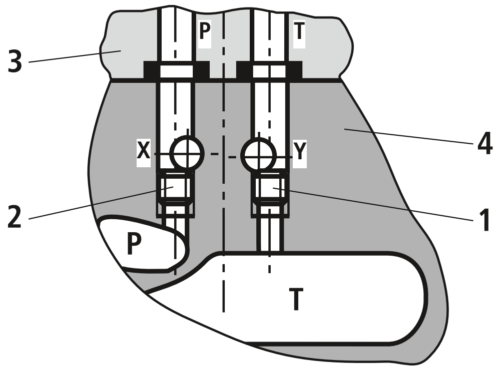
NG16

Section A – A



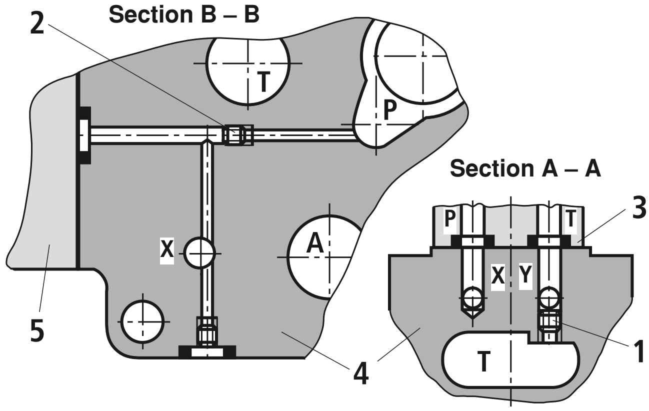
NG25 (type 4W.H **22** .7X/…)

Section A – A



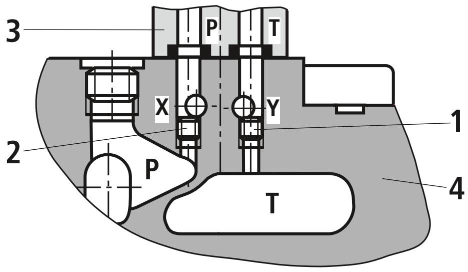
NG25 (type 4W.H **25** .6X/…)

Section B – B



NG32

Section A – A



PIlot oil supply		**Pilot oil drain**	
External:	**2** closed	External:	**1** closed
internal:	**2** open	Internal:	**1** open

For further details and explanations of items, see next page.

Pilot oil supply

Type 4WH…

The pilot oil is supplied and drained **externally** via channels X and Y.

Type 4WEH…

The pilot oil is supplied **externally** - via channel X - from a separate pressure supply.

The pilot oil is drained **externally** - via channel Y - to the tank.

Type 4WEH…E…

The pilot oil is supplied **internally** from channel P of the main valve. (See page 15, footnotes [8] and [9])

The pilot oil is drained **externally** - via channel Y - to the tank. Port X in the subplate is plugged.

Type 4WEH…ET…

The pilot oil is supplied **internally** from channel P of the main valve.

The pilot oil is drained **internally** - via channel T - to the tank. Ports X and Y in the subplate are plugged.

Type 4WEH…T…

The pilot oil is supplied **externally** - via channel X - from a separate pressure supply.

The pilot oil is drained **internally** - via channel T - to the tank. Port Y in the subplate is plugged.

1 Plug screw M6, 3 A/F – pilot oil drain
2 Plug screw M6, 3 A/F – pilot oil supply
3 Pilot valve
4 Main valve
5 Cover
6 Throttle insert

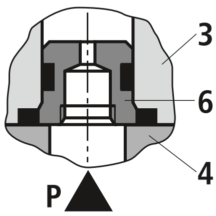
Tightening torques M_T for cover mounting screws:
NG16: 35 Nm *[25.8 ft-lbs]*; **NG25**: 68 Nm *[50.2 ft-lbs]*

Tightening torques M_T for mounting screws of the pilot valve: **NG10 to 32**: 9 Nm *[6.6 ft-lbs]*

Throttle insert

The use of throttle insert (6) is required, if the pilot oil supply in channel P of the pilot valve is to be restricted (see below).

Throttle insert (6) is to be installed in channel P of the pilot valve.



⚠ **Attention!**

The pilot oil supply may only be changed by authorized specialists or in the factory!

– **External** pilot oil supply X or drain Y:
  - For NG10, version SO30 must be provided for the use of sandwich plates. Code SO30 must be entered at the end of the type designation (sandwich plate).
  - Make sure that the permissible maximum parameters of the pilot valve are not exceeded (see RE 23178)!
  - Maximum pilot pressure: Please observe page 14!
– Internal pilot oil **supply** (versions “ET“ and “E“):
  - Minimum pilot pressure: Please observe page 15!
  - To avoid impermissibly high pressure peaks, a **throttle insert “B10“** must be provided in port P of the pilot valve (see above) .
  - In conjunction with version “H-“, **pressure reducing valve “D3“** must be provided additionally (see page 36).

Technical data (for applications outside these parameters, please consult us!)

General

Sizes		NG	10	16	25 4W.H **22**	25 4W.H **25**	32
Weight, ca.	– Valve with one solenoid	kg *[lbs]*	6.4 *[14.1]*	8.5 *[18.7]*	11.5 *[25.3]*	17.6 *[38.8]*	17.6 *[38.8]*
	– Valve with two solenoids, spring-centered	kg *[lbs]*	6.8 *[15.0]*	8.9 *[19.6]*	11.9 *[26.2]*	19.0 *[41.9]*	41.0 *[90.4]*
	– Valve with two solenoids, pressure-centered	kg *[lbs]*	6.8 *[15.0]*	8.9 *[19.6]*	11.9 *[26.2]*	19.0 *[41.9]*	41.0 *[90.4]*
	– Valve with hydraulic actuation (type 4WH…)	kg *[lbs]*	5.5 *[12.1]*	7.3 *[16.1]*	10.5 *[23.1]*	16.5 *[36.4]*	39.5 *[87.1]*
	– Switching time adjustment	kg *[lbs]*	0.8 *[1.8]*	0.8 *[1.8]*	0.8 *[1.8]*	0.8 *[1.8]*	0.8 *[1.8]*
	– Pressure reducing valve	kg *[lbs]*	0.4 *[0.9]*	0.4 *[0.9]*	0.4 *[0.9]*	0.4 *[0.9]*	0.4 *[0.9]*
Installation position			Optional; horizontal in the case of valves with hydraulic spool return "H" and spool symbols A, B, C, D, K, Z, Y				
Ambient temperature range		°C *[°F]*	–30 to +50 *[–22 to +122]*				
Storage temperature range		°C *[°F]*	–20 to +70 *[–4 to +158]*				
Surface protection (valve body)			Paint-coating, layer thickness max. 100 µm				

Hydraulic

Maximum operating pressure								
– Ports P, A, B	Type 4WEH		bar *[psi]*	280 *[4061]*	280 *[4061]*	280 *[4061]*	280 *[4061]*	280 *[4061]*
	Type H-4WEH		bar *[psi]*	350 *[5076]*	350 *[5076]*	350 *[5076]*	350 *[5076]*	350 *[5076]*
– Port T	Pilot oil drain Y external	Type 4WEH	bar *[psi]*	280 *[4061]*	250 *[3626]*	250 *[3626]*	250 *[3626]*	250 *[3626]*
		Type H-4WEH		315 *[4568]*	250 *[3626]*	250 *[3626]*	250 *[3626]*	250 *[3626]*
	Pilot oil drain Y internal [1]		bar *[psi]*	210 *[3046]* with DC voltage; 160 *[2320]* with AC voltage				
– Port Y	External pilot oil drain		bar *[psi]*	210 *[3046]* with DC voltage; 160 *[2320]* with AC voltage				
	Type 4WH		bar *[psi]*	250 *[3626]*	250 *[3626]*	210 *[3046]*	250 *[3626]*	250 *[3626]*
	Type H-4WH		bar *[psi]*	315 *[4568]*	315 *[4568]*	270 *[3916]*	315 *[4568]*	315 *[4568]*
Hydraulic fluid [2]				Mineral oil (HL, HLP) to DIN 51524 [3]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [3]; HEPG (polyglycols) [4]; HEES (synthetic esters) [4]; other hydraulic fluids on request				
Hydraulic fluid temperature range			°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)				
Viscosity range			mm^2/s *[SUS]*	2,8 to 500 *[35 to 2320]*				
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)				Class 20/18/15 [5]				
Maximum pilot pressure [6]			bar *[psi]*	250 *[3626]*	250 *[3626]*	210 *[3046]*	250 *[3626]*	250 *[3626]*

Technical data (for applications outside these parameters, please consult us!)

Hydraulic

Size			NG	10	16	25 4W.H **22**	25 4W.H **25**	32
Minimum pilot pressure (see also characteristic curves on page 17)								
– Pilot oil supply X external, pilot oil supply X internal (with spools: D, K, E, J, L, M, Q, R, U, W)								
	3-position valve, spring-centered	Type H-4WEH…	bar *[psi]*	10 *[145]*	14 *[203]*	12,5 *[181]*	13 *[188]*	8,5 *[123]*
		Type 4WEH…	bar *[psi]*	10 *[145]*	14 *[203]*	10,5 *[152]*	13 *[188]*	8,5 *[123]*
	3-position valve, pressure-centered		bar *[psi]*	–	14 *[203]*	–	18 *[261]*	8,5 *[123]*
	2-position valve with spring end position	Type H-4WEH…	bar *[psi]*	10 *[145]*	14 *[203]*	14 *[203]*	13 *[188]*	10 *[145]*
		Type 4WEH…	bar *[psi]*	10 *[145]*	14 *[203]*	11 *[159]*	13 *[188]*	10 *[145]*
	2-position valve with hydraulic end position		bar *[psi]*	7 *[101]*	14 *[203]*	8 *[116]*	8 *[116]*	5 *[72]*
– Pilot oil supply X internal (with spools C, F, G, H, P, T, V, Z, S 7))			bar *[psi]*	4.5 *[65]* 8)	4.5 *[65]* 9)	4.5 *[65]* 9)	4.5 *[65]* 9)	4.5 *[65]* 9)

1) With 3-position valve, pressure-centering is only possible, if $\boldsymbol{p}_{St} \geq 2 \times \boldsymbol{p}_{Tank} + \boldsymbol{p}_{St\ min}$.

2) The ignition temperature of the process and operating medium used must be higher than the maximum solenoid surface temperature.

3) Suitable for NBR **and** FKM seals

4) Suitable **only** for FKM seals

5) The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

6) – Internal pilot oil **supply**:
- In the case of a higher pilot pressure, a pressure reducing valve “D3“ must be used.
- In conjunction with version “H-“, **pressure reducing valve “D3“** must be provided additionally. (If not used, pilot pressure = operating pressure in the port)

– External pilot oil **supply**:
- In conjunction with version “H-“, the adherence to the maximum pilot pressure must be ensured by taking suitable measures (e.g. installation of a pressure relief valve to protect the separate pilot oil circuit)!

7) Spool S only for NG16

8) With symbols C, F, G, H, P, T, V, Z, an internal pilot oil supply is only possible, if the flow from P to T in the central position (with 3-position valve) or while passing the central position (with 2-position valve) is so high that the pressure differential from P to T reaches a value of at least 6.5 bar *[94 psi]*.

9) For spools C, F, G, J, H, P, T, V, Z, S 7) – by means of pre-load valve (not NG10) or correspondingly greater flow. (For the establishment of the required flow, see characteristic curves “Pre-load valve“ on page 37.)

Technical data (for applications outside these parameters, please consult us!)

Hydraulic

Size			NG	10	16	25 4W.H **22**	25 4W.H **25**	32
Pilot oil volume for switching process								
– 3-position valve, spring-centered			cm^3 *[inch³]*	2.04 *[0.124]*	5.72 *[0.349]*	7.64 *[0.466]*	14.2 *[0.866]*	29.4 *[1.794]*
– 2-position valve			cm^3 *[inch³]*	4.08 *[0.249]*	11.45 *[0.699]*	15.28 *[0.932]*	28.4 *[1.733]*	58.8 *[3.588]*
– 3-position valve, pressure-centered								
	from zero position to spool position “a“	Type WH	cm^3 *[inch³]*	–	2.83 *[0.173]*	–	7.15 *[0.436]*	14.4 *[0.879]*
		Type WEH	cm^3 *[inch³]*	–	2.83 *[0.173]*	–	7.15 *[0.436]*	14.4 *[0.879]*
	from spool position “a“ to zero position	Type WH	cm^3 *[inch³]*	–	5.72 *[0.349]*	–	14.18 *[0.865]*	29.4 *[1.794]*
		Type WEH	cm^3 *[inch³]*	–	2.9 *[0.177]*	–	7.0 *[0.427]*	15.1 *[0.921]*
	from zero position to spool position “b“	Type WH	cm^3 *[inch³]*	–	5.72 *[0.349]*	–	14.18 *[0.865]*	29.4 *[1.794]*
		Type WEH	cm^3 *[inch³]*	–	5.72 *[0.349]*	–	14.15 *[0.863]*	29.4 *[1.794]*
	from spool position “b“ to zero position	Type WH	cm^3 *[inch³]*	–	8.55 *[0.522]*	–	19.88 *[1.213]*	43.8 *[2.673]*
		Type WEH	cm^3 *[inch³]*	–	2.83 *[0.173]*	–	5.73 *[0.349]*	14.4 *[0.879]*
Pilot oil flow for shortest switching time, ca.			l/min *[US gpm]*	35 *[9.2]*	35 *[9.2]*	35 *[9.2]*	35 *[9.2]*	45 *[11.9]*

Switching times (= closing of contact on the pilot valve until the control land starts to open in the main valve and change of spool stroke by 95%)

Pilot pressure		bar *[psi]*	70 *[1015]*	210 *[3046]*	250 *[3626]*	Spring
			ON			OFF
NG10	– Without throttle insert	ms	40 to 60	–	40 to 60	20 to 30
	– With throttle insert	ms	60 to 90	–	50 to 70	20 to 30
NG16	– Without throttle insert	ms	50 to 80	–	40 to 60	50 to 80
	– With throttle insert	ms	110 to 130	–	80 to 100	50 to 80
NG25 (4W.H **22)**	– Without throttle insert	ms	40 to 70	40 to 60	–	50 to 70
	– With throttle insert	ms	140 to 160	80 to 110	–	50 to 70
NG25 (4W.H **25)**	– Without throttle insert	ms	70 to 100	–	50 to 70	100 to 130
	– With throttle insert	ms	200 to 250	–	120 to 150	100 to 130
NG32	– Without throttle insert	ms	80 to 130	–	70 to 100	140 to 160
	– With throttle insert	ms	420 to 560	–	230 to 350	140 to 160

☞ **Notes!**

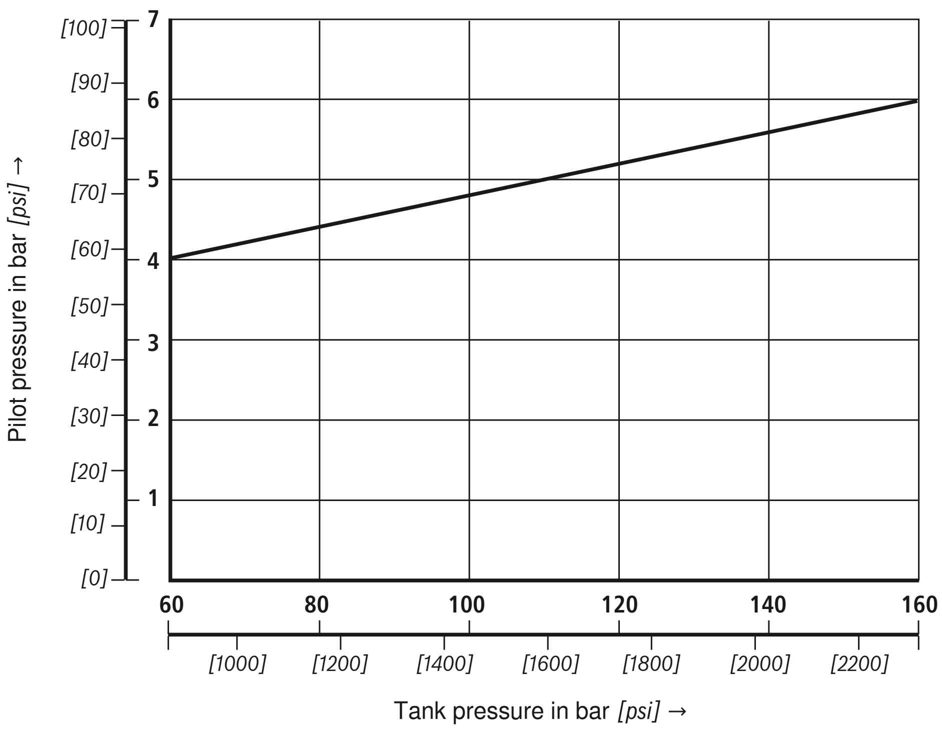
- The switching times are measured in accordance with ISO 6403 with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*. At different oil temperatures, deviations are possible!
- The switching times were established using DC voltage solenoids. They are reduced by ca. 20 ms when AC voltage solenoids are used.
- The de-energization of the solenoid generates voltage peaks, which can be prevented by installing suitable diodes.
- When pressure reducing valve “D3“ is used, the switching times increase by ca. 30 ms.
- The switching times were established under ideal conditions and can deviate within the system depending on the operating conditions.

Free flow cross-sections in zero position with spools Q, V and W

Size		NG	**10**	**16**	**25** 4W.H **22**	**25** 4W.H **25**	**32**
Spool **Q**	A – T; B – T	mm² *[inch²]*	13 *[0.02]*	32 *[0.05]*	78 *[0.121]*	83 *[0.129]*	78 *[0.121]*
Spool **V**	P – A; P – B	mm² *[inch²]*	13 *[0.02]*	32 *[0.05]*	73 *[0.113]*	83 *[0.129]*	73 *[0.113]*
	A – T; B – T	mm² *[inch²]*	13 *[0.02]*	32 *[0.05]*	84 *[0.13]*	83 *[0.129]*	84 *[0.13]*
Spool **W**	A – T; B – T	mm² *[inch²]*	2,4 *[0.004]*	6 *[0.009]*	10 *[0.015]*	14 *[0.022]*	20 *[0.031]*

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

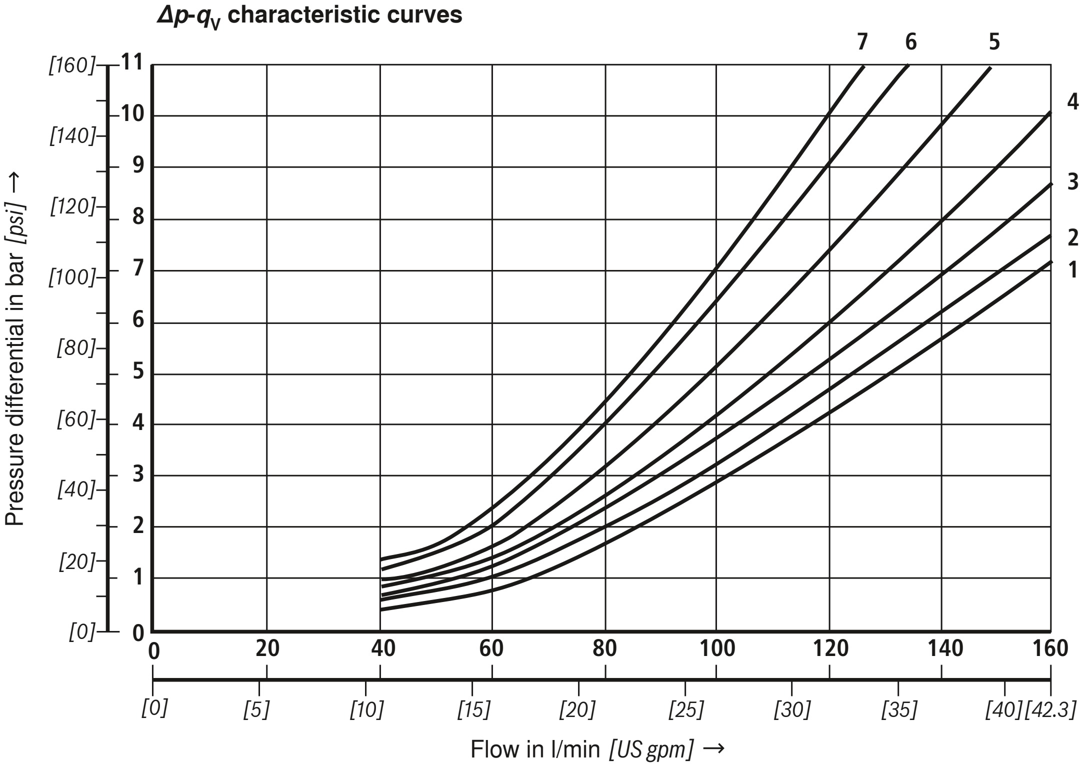
Minimum pilot pressure in dependence on tank pressure



At a higher tank pressure the minimum pilot pressure must be raised in accordance with this diagram.

Characteristic curves: NG10 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

***Δp-q_V* characteristic curves**



Spool	Spool position				Spool	Zero position		
	P – A	P – B	A – T	B – T		A – T	B – T	P – T
E, Y, D	2	2	4	5				
F	1	4	1	4	**F**	3	–	6
G, T	4	2	2	6	**G, T**	–	–	7
H, C	4	4	1	4	**H**	1	3	5
J, K	1	2	1	3				
L	2	3	1	4	**L**	3	–	–
M	4	4	3	4				
P	4	1	3	4	**P**	–	7	5
Q, V, W, Z	2	2	3	5				
R	2	2	3	–				
U	3	3	3	4	**U**	–	4	–
A, B	2	2	–	–				

Performance limits: NG10 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

2-position valves – $q_{V\,max}$ in l/min *[US gpm]*

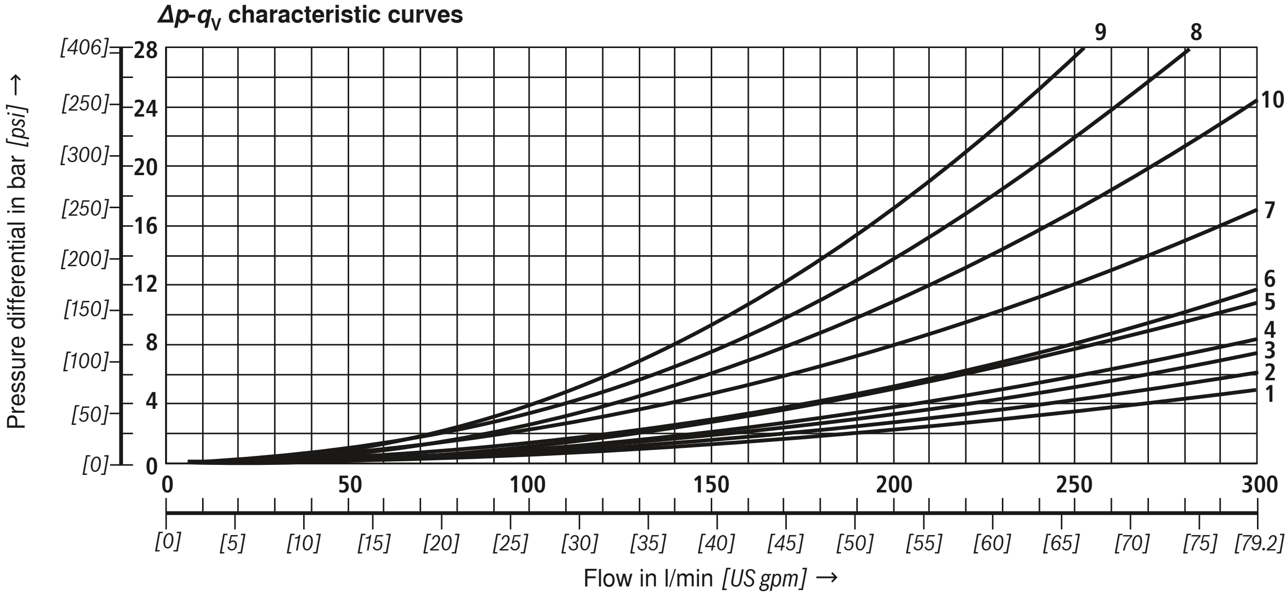
Spool	Operating pressure p_{max} in bar *[psi]*		
	200 *[2900]*	**250** *[3626]*	**315** *[4568]*
E, J, L, M, Q, R, U, V, W, C, D, K, Z, Y	160 *[42]*	160 *[42]*	160 *[42]*
H	160 *[42]*	150 *[39]*	120 *[32]*
G, T	160 *[42]*	160 *[42]*	140 *[37]*
F, P	160 *[42]*	140 *[37]*	120 *[32]*

⚠ **Attention!**

Important notes - see page 26!

Characteristic curves: NG16 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

Δp-q_V characteristic curves



Spool	Spool position				Zero position		
	P – A	P – B	A – T	B – T	P – T	A – T	B – T
D, E	1	1	3	3			
F	1	2	5	5	4	3	–
G	4	1	5	5	7	–	–
C, H	1	1	5	6	2	4	4
K, J	2	2	6	6	–	3	–
L	2	2	5	4	–	3	–
M	1	1	3	4			
P	2	1	3	6	5	–	–

Spool	Spool position				Zero position		
	P – A	P – B	A – T	B – T	P – T	A – T	B – T
Q	1	1	6	6			
R	2	4	7	–			
S	3	3	3	–	9	–	–
T	4	1	5	5	7	–	–
U	2	2	3	6			
V, Z	1	1	6	6	10	8	8
W	1	1	3	4			

Performance limits: NG16 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

2-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	**Operating pressure p_{max} in bar** *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring end position in main valve (at $p_{St\,min}$ = 12 bar *[174 psi]*)					
C, D, K, Y, Z	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*
X external – spring end position in main valve [1]					
C	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*
D, Y	300 *[79]*	270 *[71]*	260 *[68]*	250 *[66]*	230 *[60]*
K	300 *[79]*	250 *[66]*	240 *[63]*	230 *[60]*	210 *[55]*
Z	300 *[79]*	260 *[68]*	190 *[50]*	180 *[47]*	160 *[42]*
X external – hydraulic end position in main valve					
HC, HD, HK, HZ, HY	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*

3-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	**Operating pressure p_{max} in bar** *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring-centered					
E, H, J, L, M, Q, U, W, R	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*
F, P	300 *[79]*	250 *[66]*	180 *[47]*	170 *[45]*	150 *[39]*
G, T	300 *[79]*	300 *[79]*	240 *[63]*	210 *[55]*	190 *[50]*
S	300 *[79]*	300 *[79]*	300 *[79]*	250 *[66]*	220 *[58]*
V	300 *[79]*	250 *[66]*	210 *[55]*	200 *[53]*	180 *[47]*
X external – pressure-centered (at minimum pilot pressure of 16 bar *[232 psi]*)					
All spools [2]	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*

⚠ Attention!

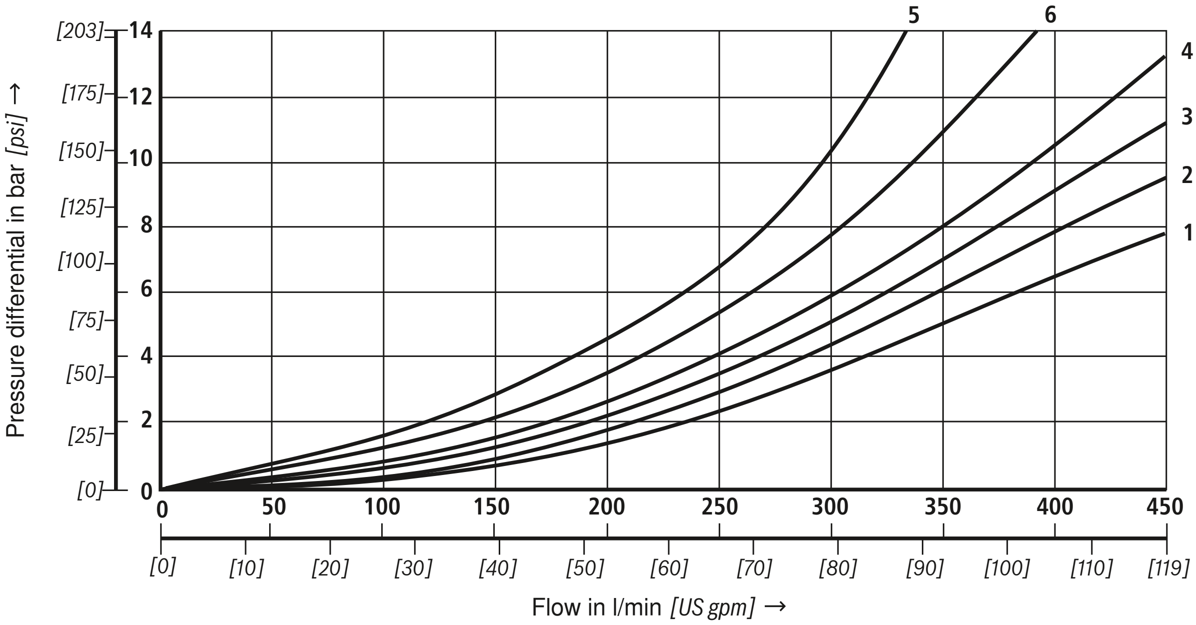
[1] When the specified flow values are exceeded, the function of the return springs can no longer be guaranteed in the event of a pilot pressure failure!

[2] With spool V , the pilot valve is not required in the case of flows > 160 l/min *[42 US gpm]*.

For further important notes, see page 26!

Characteristic curves: NG25 (type W.H **22**)
(measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

Δp-q$_V$ **characteristic curves**



Spool	Spool position				
	P – A	**P – B**	**A – T**	**B – T**	**B – A**
E, M, P, Q, U, V, Z, C	2	2	1	4	–
F	1	2	1	2	–
G, T	2	2	2	4	–
H, J, W, K, D	2	2	1	3	–
L	2	2	1	2	–
R	1	2	1	–	5
A, B	2	2	–	–	–

Spool	Zero position		
	A – T	**B – T**	**P – T**
F	–	–	4
G, P	–	–	6
H	–	–	2
L	4	–	–
T	–	–	5
U	–	6	–

Performance limits: NG25 (type W.H **22**)
(measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

2-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring end position in main valve (at $p_{St\,min}$ = 11 bar / 14 bar *[159 / 203 psi]*)					
C, D, K, Y, Z	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*
X external – spring end position in main valve [1]					
C	450 *[119]*	450 *[119]*	320 *[84]*	250 *[66]*	200 *[53]*
D, Y	450 *[119]*	450 *[119]*	450 *[119]*	400 *[105]*	320 *[84]*
K	450 *[119]*	215 *[57]*	150 *[39]*	120 *[32]*	100 *[26]*
Z	350 *[92]*	300 *[79]*	290 *[76]*	260 *[68]*	160 *[42]*
X external – hydraulic end position in main valve					
HC, HD, HK, HZ, HY	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*
HC./O…, HD./O…, HK./O…, HZ./O…	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*
HC./OF…, HD./OF…, HK./OF…, HZ./OF…	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*

3-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring-centered					
E, J, L, M, Q, U, W, R	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*
H	450 *[119]*	450 *[119]*	300 *[79]*	260 *[68]*	230 *[61]*
G	400 *[105]*	350 *[92]*	250 *[66]*	200 *[53]*	180 *[47]*
F	450 *[119]*	270 *[71]*	175 *[46]*	130 *[34]*	110 *[29]*
V	450 *[119]*	300 *[79]*	240 *[63]*	220 *[58]*	160 *[42]*
T	400 *[105]*	300 *[79]*	240 *[63]*	200 *[53]*	160 *[42]*
P	450 *[119]*	270 *[71]*	180 *[47]*	170 *[45]*	110 *[29]*

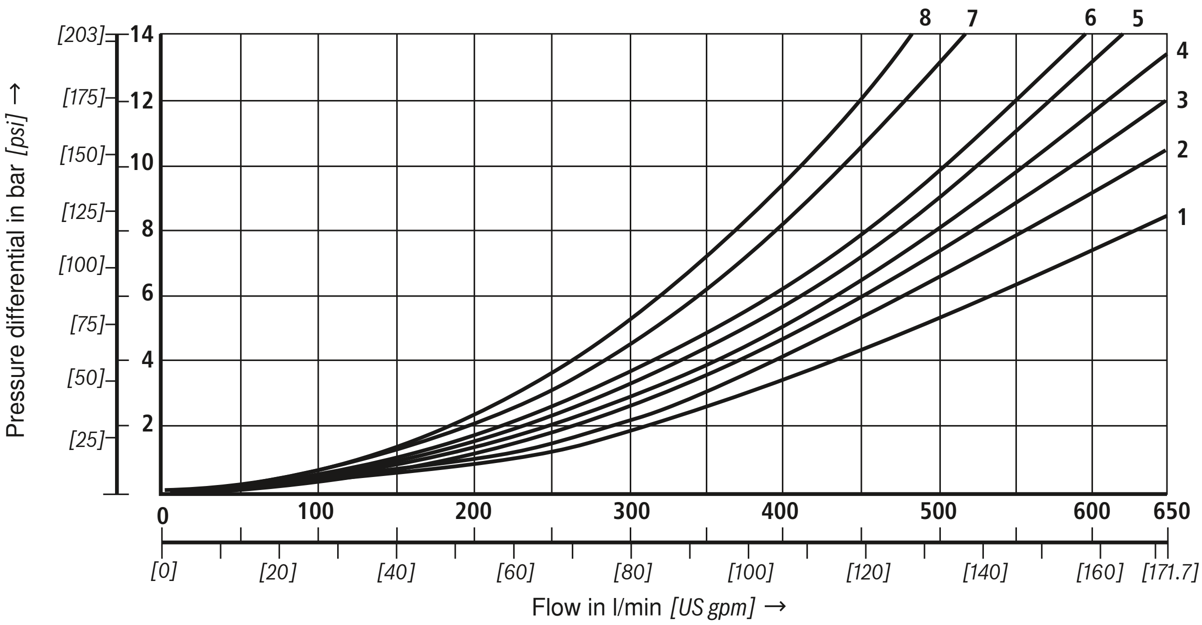
⚠ **Attention!**

[1] When the specified flow values are exceeded, the function of the return springs can no longer be guaranteed in the event of a pilot pressure failure!

For further important notes, see page 26!

Characteristic curves: NG25 (type W.H **25**)
(measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

***Δp-q$_V$* characteristic curves**



Spool	Spool position			
	P – A	P – B	A – T	B – T
E, C	1	1	1	3
F	1	4	3	3
G	3	1	2	4
H, D	4	4	3	4
J, Q, K	2	2	3	5
L	2	2	3	3
M	4	4	1	4

Spool	Spool position				
	P – A	P – B	A – T	B – T	B – A
P	4	1	1	5	–
R	2	1	1	–	8
U	4	1	1	6	–
V, Z	2	4	3	6	–
W	1	1	1	3	–
T	3	1	2	4	–

7 Spool G, central position P – T

8 Spool T, central position P – T

Performance limits: NG25 (type W.H **25**)
(measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

2-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring end position in main valve (at $p_{St\,min}$ = 13 bar *[188 psi]*)					
C, D, K, Y, Z	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*
X external – spring end position in main valve [1]					
C	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*
D, Y	700 *[185]*	650 *[172]*	400 *[105]*	350 *[92]*	300 *[79]*
K	700 *[185]*	650 *[172]*	420 *[111]*	370 *[98]*	320 *[84]*
Z	700 *[185]*	700 *[185]*	650 *[172]*	480 *[127]*	400 *[105]*
X external – hydraulic end position in main valve					
HC, HD, HK, HZ, HY	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*
HC./O…, HD./O…, HK./O…, HZ./O…	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*
HC./OF…, HD./OF…, HK./OF…, HZ./OF…	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*

⚠ **Attention!**

[1] When the specified flow values are exceeded, the function of the return springs can no longer be guaranteed in the event of a pilot pressure failure!

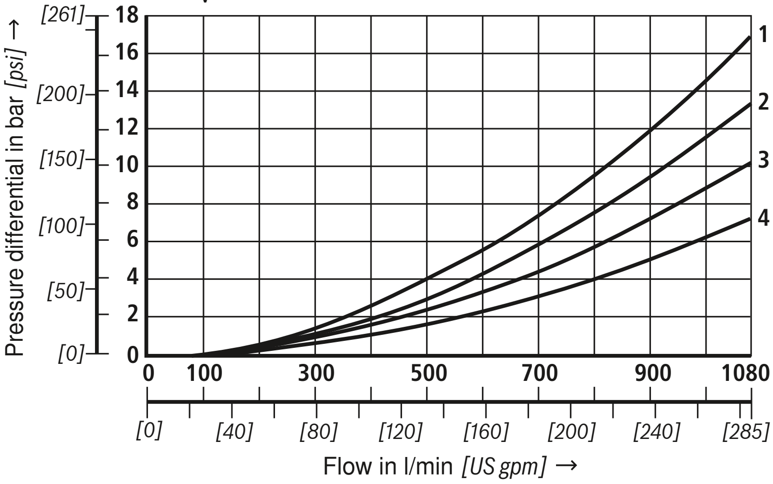
For further important notes, see page 26!

3-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring-centered					
E, L, M, Q, U, W	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*
G, T	400 *[105]*	400 *[105]*	400 *[105]*	400 *[105]*	400 *[105]*
F	650 *[172]*	550 *[145]*	430 *[113]*	330 *[87]*	300 *[79]*
H	700 *[185]*	650 *[172]*	550 *[145]*	400 *[105]*	360 *[95]*
J	700 *[185]*	700 *[185]*	650 *[172]*	600 *[158]*	520 *[137]*
P	650 *[172]*	550 *[145]*	430 *[113]*	330 *[87]*	300 *[79]*
V	650 *[172]*	550 *[145]*	400 *[105]*	350 *[92]*	310 *[82]*
R	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*	580 *[153]*
X external – pressure-centered (at minimum pilot pressure of 18 bar *[261 psi]*)					
E, F, H, J, L, M, P, Q, R, U, V, W	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*
G, T	400 *[105]*	400 *[105]*	400 *[105]*	400 *[105]*	400 *[105]*
X external – pressure-centered (at pilot pressure > 30 bar *[435 psi]*)					
G, T	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*

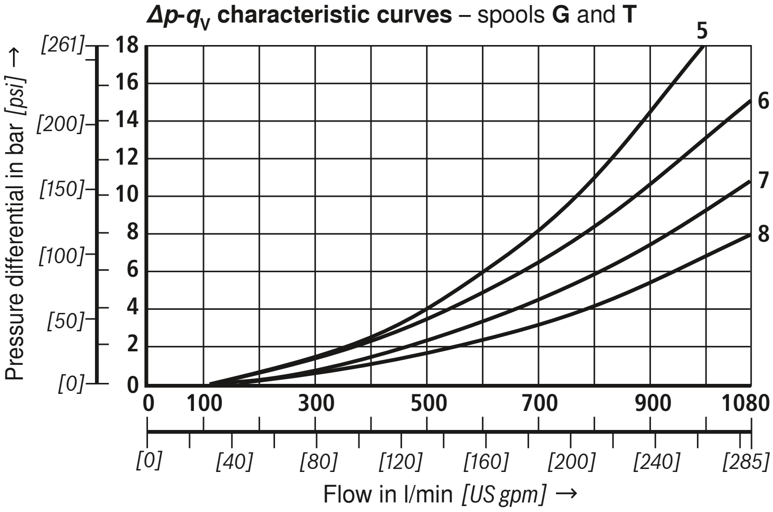
Characteristic curves: NG32 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

***Δp-q*$_V$ characteristic curves** – spools **E**, **R** and **W**



Spool	Spool position				
	P – A	P – B	A – T	B – T	B – A
E	4	4	3	2	–
R	4	4	3	–	1
W	4	4	3	2	–

***Δp-q*$_V$ characteristic curves** – spools **G** and **T**



Spool	Spool position				
	P – A	P – B	A – T	B – T	P – T
G	7	8	7	5	6
T	7	8	7	5	6

Performance limits: NG32 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

2-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring end position in main valve (at $p_{St\,min}$ = 10 bar *[145 psi]*)					
C, D, K, Y, Z	1100 *[290]*	1040 *[275]*	860 *[227]*	750 *[198]*	680 *[179]*
X external – spring end position in main valve [1]					
C	1100 *[290]*	1040 *[275]*	860 *[227]*	800 *[211]*	700 *[185]*
D, Y	1100 *[290]*	1040 *[275]*	540 *[142]*	480 *[127]*	420 *[111]*
K	1100 *[290]*	1040 *[275]*	860 *[227]*	500 *[132]*	450 *[119]*
Z	1100 *[290]*	1040 *[275]*	860 *[227]*	700 *[185]*	650 *[172]*
X external – hydraulic end position in main valve					
HC, HD, HK, HZ, HY	1100 *[290]*	1040 *[275]*	860 *[227]*	750 *[198]*	680 *[179]*

⚠ **Attention!**

1) When the specified flow values are exceeded, the function of the return springs can no longer be guaranteed in the event of a pilot pressure failure!

For further important notes, see page 26!

3-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring-centered					
E, J, L, M, Q, R, U, W	1100 *[290]*	1040 *[275]*	860 *[227]*	750 *[198]*	680 *[179]*
G, T, H, F, P	900 *[238]*	900 *[238]*	800 *[211]*	650 *[172]*	450 *[119]*
V	1100 *[290]*	1000 *[264]*	680 *[179]*	500 *[132]*	450 *[119]*
X external – pressure-centered (at minimum pilot pressure 8,5 bar *[123 psi]*)					
All spools	1100 *[290]*	1040 *[275]*	860 *[227]*	750 *[198]*	680 *[179]*

Performance limits: Important notes

General:

⚠ **Attention!**

The specified switching performance limits are valid for operation with two directions of flow (e.g. from P to A and simultaneous return flow from B to T in the ratio of 1:1).

Due to the flow forces acting within the valve, the permissible switching performance limits may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked with flow in only one direction or different flows)!

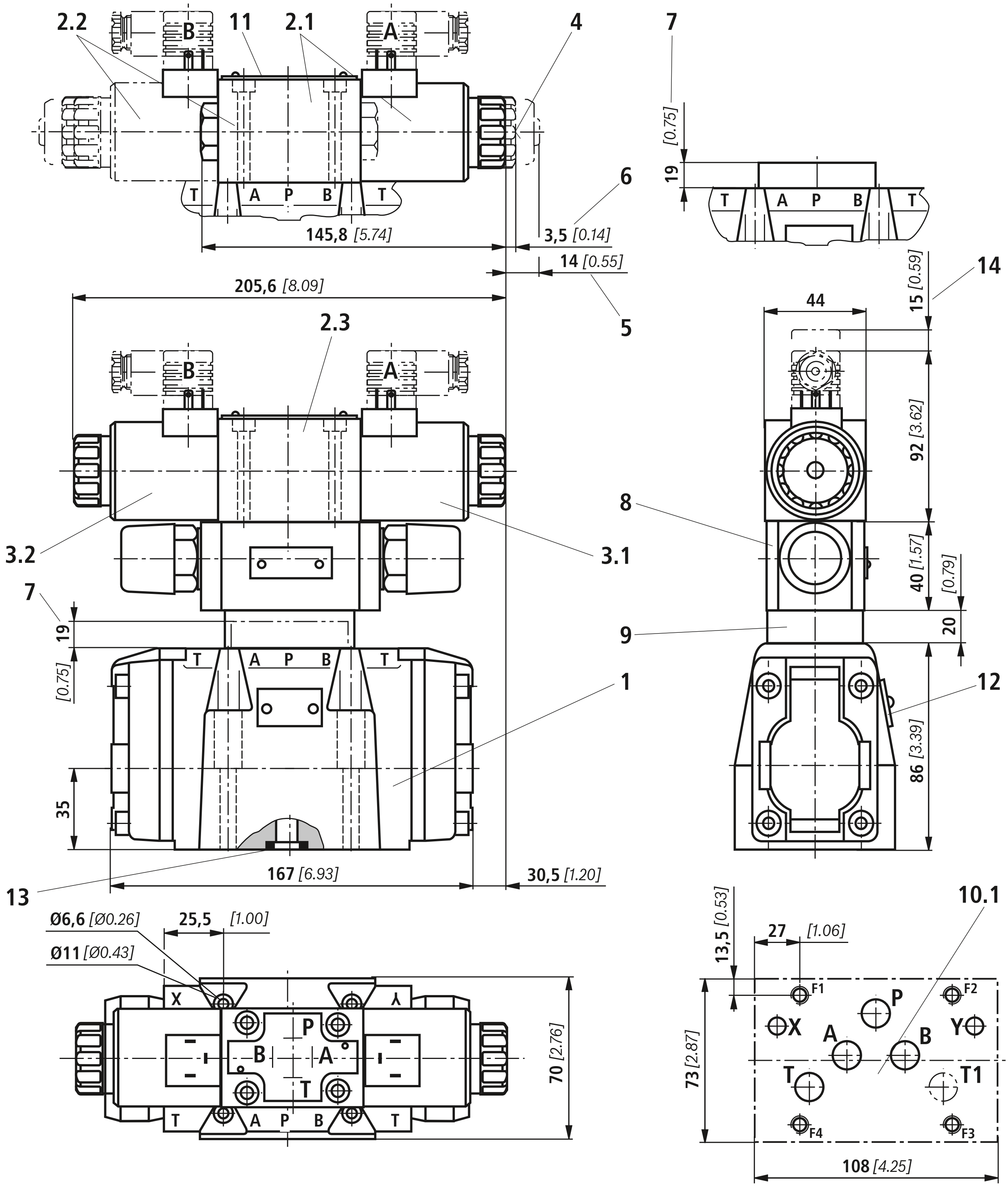
In the case of such applications, please consult us!

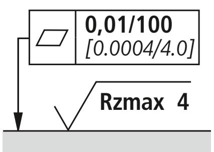
The switching performance limit was established when the solenoids were at operating temperature, at 10% undervoltage and without tank pre-loading.

⚠ **Attention!**

NG16	– With **X internal** pilot oil supply, a pre-load valve must be used at flows < 160 l/min *[42 US gpm]* due to the negative overlap of spools C, Z and HC, HZ. – When 4/3 directional valves with pressure-centered control spool in the main valve are used beyond the specified performance limit, a higher pilot pressure is required. At, for example, an operating pressure of $\boldsymbol{p}_{max}$ = 350 bar *[5076 psi]* and a flow of $\boldsymbol{q}_V$ = 300 l/min *[79 US gpm]* a pilot pressure of 16 bar *[232 psi]* is required. The maximum flow for these valves therefore depends on the $\boldsymbol{\Delta p}$ value, which is acceptable for the system. – With **X internal** pilot oil supply, a pre-load valve must generally be used (see page 37) due to the negative overlap of spools F, G, H, J, P, S, and T.
NG25	– With **X internal** pilot oil supply, a pre-load valve must be used at flows < 180 l/min *[47.5 US gpm]* due to the negative overlap of spools Z, HZ, and V. – With **X internal** pilot oil supply, a pre-load valve must generally be used due to the negative overlap of spools C, HC, F, G, H, P, and T.
NG32	– With **X internal** pilot oil supply, a pre-load valve must be used at flows < 180 l/min *[47.5 US gpm]* due to the negative overlap of spools Z, HZ, and V. – When 4/3 directional valves with pressure-centered control spool in the main valve are used beyond the specified performance limit, a higher pilot pressure is required. At, for example, an operating pressure of $\boldsymbol{p}_{max}$ = 350 bar *[5076 psi]* and a flow of $\boldsymbol{q}_V$ = 1100 l/min *[290 US gpm]* a pilot pressure of 15 bar *[217 psi]* is required. The maximum flow for these valves therefore depends on the $\boldsymbol{\Delta p}$ value, which is acceptable for the system. – With **X internal** pilot oil supply, a pre-load valve must generally be used due to the negative overlap of spools C, HC, F, G, H, P and T.

Unit dimensions: NG10 (dimensions in mm *[inch]*)

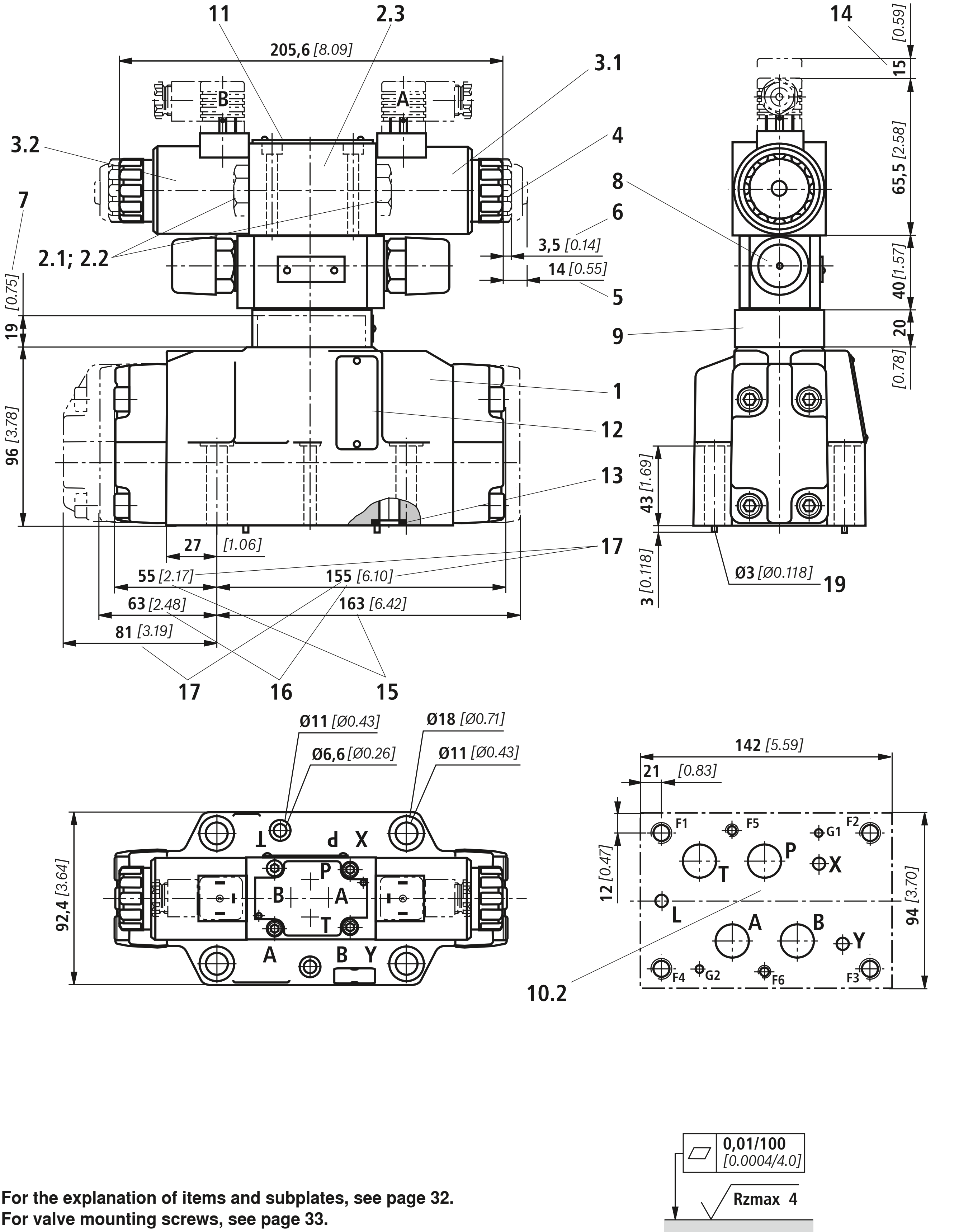




Required surface quality
of the valve mounting face

For the explanation of items and subplates, see page 32.
For valve mounting screws, see page 33.

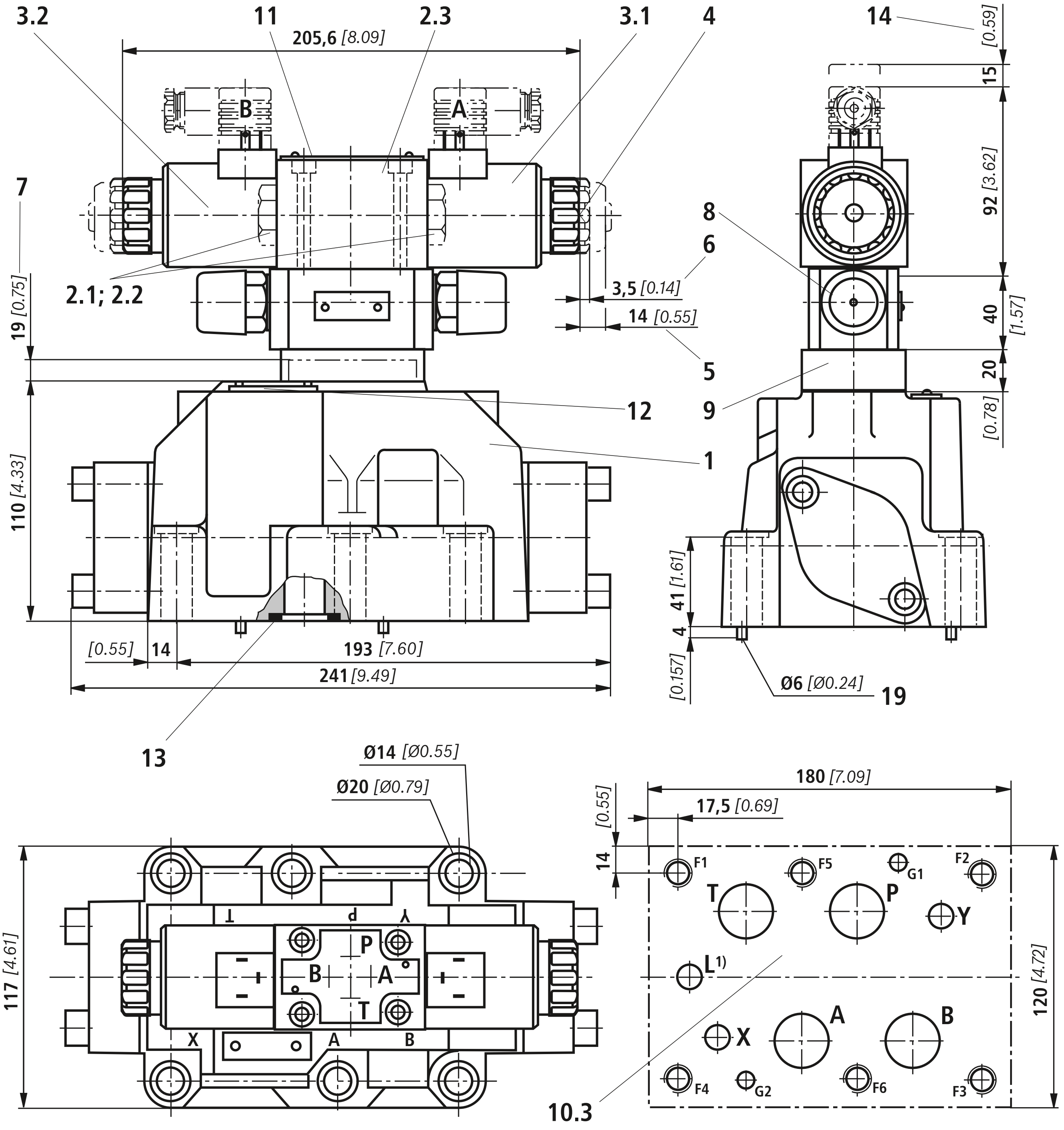
Unit dimensions: NG16 (dimensions in mm *[inch]*)



Required surface quality
of the valve mounting face

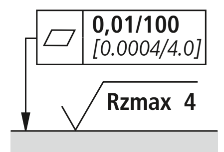
For the explanation of items and subplates, see page 32.
For valve mounting screws, see page 33.

Unit dimensions: NG25 (type W.H **22**) (dimensions in mm *[inch]*)



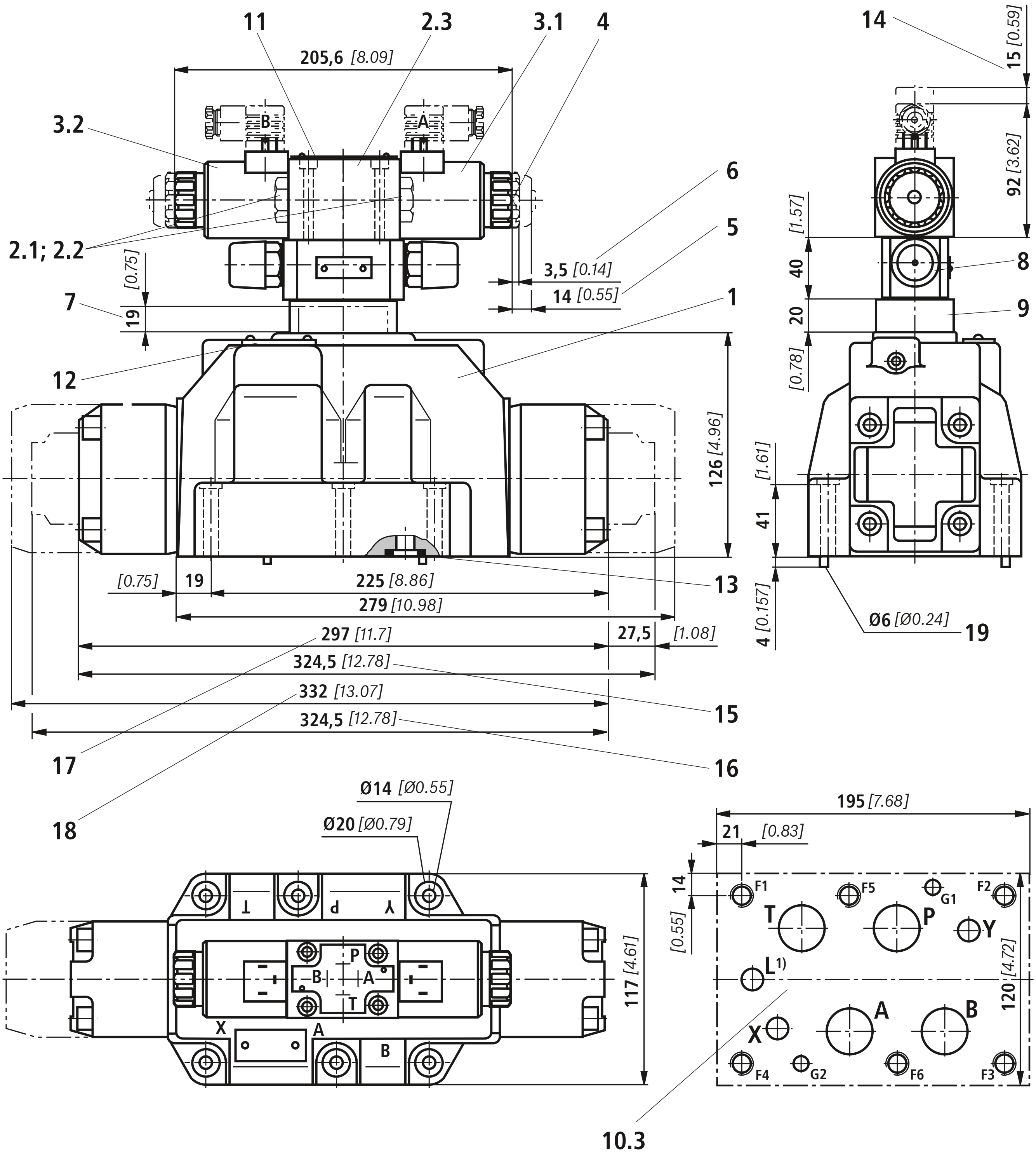
1) Port L only on valves with pressure-centered zero position

For the explanation of items and subplates, see page 32.
For valve mounting screws, see page 33.



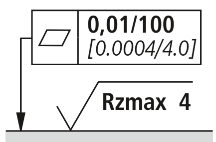
Required surface quality
of the valve mounting face

Unit dimensions: NG25 (type W.H **25**) (dimensions in mm *[inch]*)



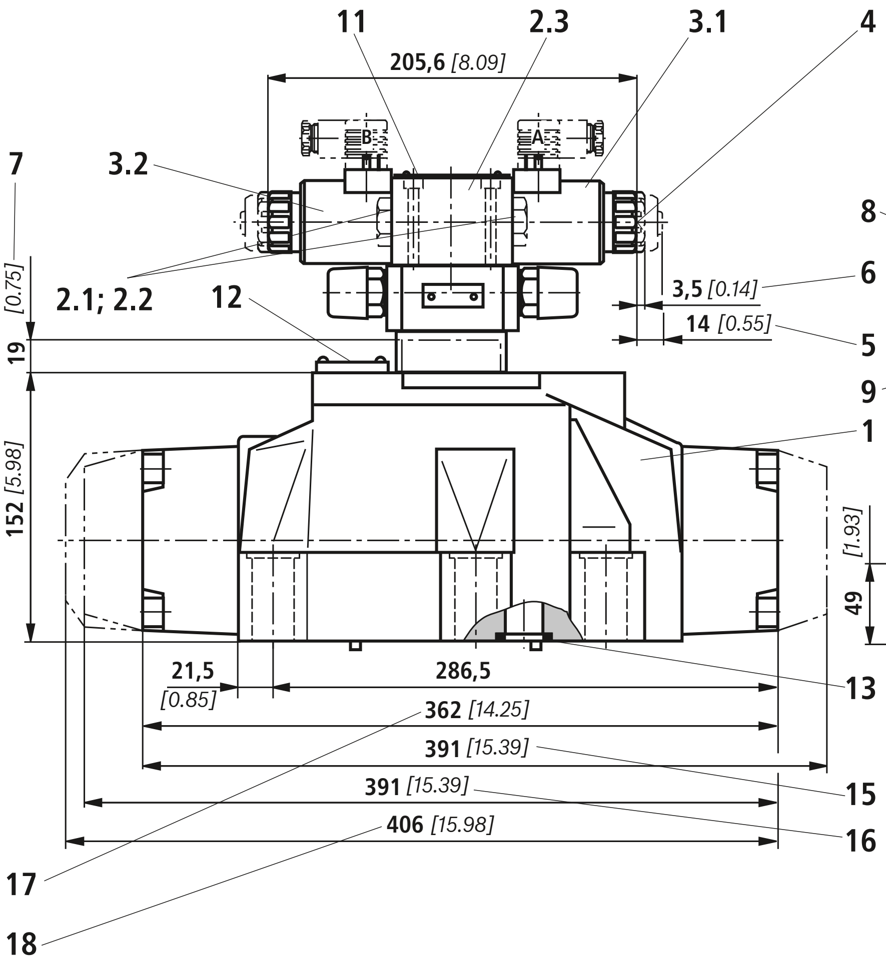
1) Port L only on valves with pressure-centered zero position

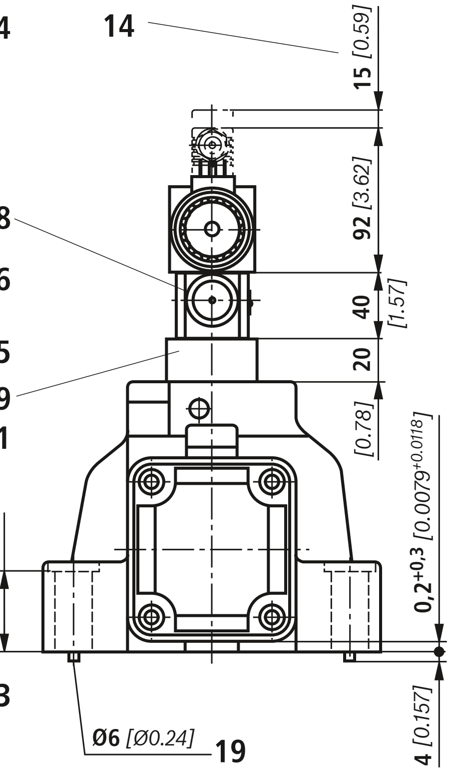
For the explanation of items and subplates, see page 32.
For valve mounting screws, see page 33.

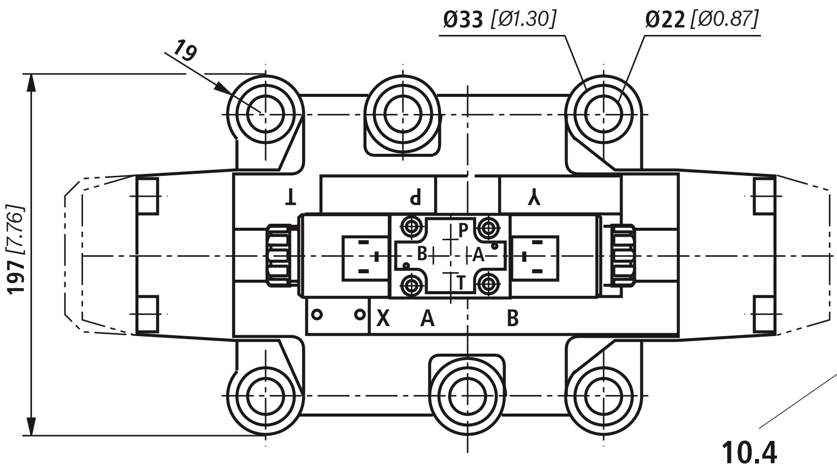


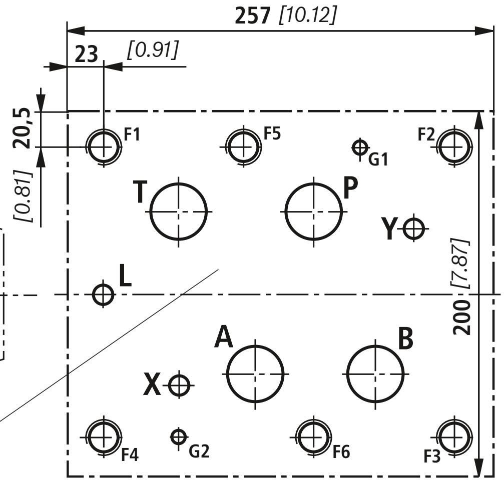
Required surface quality of the valve mounting face

Unit dimensions: NG32 (dimensions in mm *[inch]*)

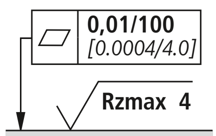








For the explanation of items and subplates, see page 32.
For valve mounting screws, see page 33.



Required surface quality
of the valve mounting face

Unit dimensions

1 Main valve

2 Pilot valve type 4WE 6 …
to data sheet RE 23178:

2.1 – Pilot valve type 4WE 6 D… (1 solenoid)
for main valves with spools C, D, K, Z
spools HC, HD, HK, HZ

– Pilot valve type 4WE 6 JA… (1 solenoid "a")
for main valves with spools EA, FA, etc.,
spring return

– Pilot valve type 4WE 6 MT… (1 solenoid "a")
for main valves with spools HEA, HFA, etc.,
hydraulic Spool return

2.2 – Pilot valve type 4WE 6 Y… (1 solenoid)
for main valves with spool Y
spool HY

– Pilot valve type 4WE 6 JB… (1 solenoid "b")
for main valves with spools EB, FB, etc.,
spring return

– Pilot valve type 4WE 6 MB… (1 solenoid "b")
for main valves with spools HEB, HFB, etc.,
hydraulic spool return

2.3 – Pilot valve type 4WE 6 J… (2 solenoids)
for main valves with 3 spool positions, spring-centered

– Pilot valve type 4WE 6 M… (2 solenoids)
for main valves with 3 spool positions,
pressure-centered

3.1 Solenoid "a"

3.2 Solenoid "b"

4 Manual override "N", optional

– The manual override can only be actuated up to a tank pressure of ca. 50 bar. Avoid damage to the bore for the manual override! (Special tool for operation, separate order, Material no. **R900024943**). When the manual override is blocked, operation of the solenoids must be ruled out!

– The simultaneous operation of the solenoids must be ruled out!

5 Solenoid **without** manual override

6 Solenoid **with** manual override

7 Height of reconnection plate for hydraulic operation (type 4WH…)

8 Switching time adjustment (6 A/F), optional

9 Pressure reducing valve, optional

10.1 Machined valve mounting face; porting pattern to ISO 4401-05-05-0-05 and NFPA T3.5.1 R2-D05

10.2 Machined valve mounting face; porting pattern to ISO 4401-07-07-0-05 and NFPA T3.5.1 R2-D07

10.3 Machined valve mounting face; porting pattern to ISO 4401-08-08-0-05 and NFPA T3.5.1 R2-D08

10.4 Machined valve mounting face; porting pattern to ISO 4401-10-09-0-05 and NFPA T3.5.1 R2-D10

11 Nameplate of pilot valve

12 Nameplate of complete valve

13 Seal rings

14 Space required to remove mating connector

15 2-position valves with spring end position in main valve (spool symbols A, C, D, K, Z)

16 2-position valves with spring end position in main valve (spool symbols B, Y)

17 3-position valves, spring-centered;
2-position valves with hydraulic end position in main valve

18 3-position valves, pressure-centered

19 Locating pin

Subplates (separate order)

– NG10 (to data sheet RE 45054)
• **Without** ports X, Y: G 534/01 (G3/4)
G 534/12 (SAE-12; 1 1/16-12) [1)]
• **With** port X, Y: G 535/01 (G3/4)
G 536/01 (G1)
G 535/12 (SAE-12; 1 1/16-12) [1)]
G 536/12 (SAE-16; 1 5/16-12) [1)]

– NG16 (to data sheet RE 45056)
G 172/01 (G3/4)
G 172/02 (M27 x 2)
G 174/01 (G1)
G 174/02 (M33 x 2)
G 174/08 (flange)
G 172/12 (SAE-12; 1 1/16-12) [1)]
G 174/12 (SAE-16; 1 5/16-12) [1)]

– NG25 (type W.H 22 to data sheet RE 45058)
G 151/01 (G1)
G 154/01 (G1 1/4)
G 156/01 (G1 1/2)
G 155/12 (SAE-16; 1 5/16-12) [1)]
G 154/12 (SAE-20; 1 5/8-20) [1)]
G 156/12 (SAE-24; 1 7/8-20) [1)]

– NG25 (type W.H 25 to data sheet RE 45058)
G 151/01 (G1)
G 153/01 (G1), for valves with pressure-centered zero position
G 154/01 (G1 1/4)
G 154/08 (flange)
G 156/01 (G1 1/2)
G 153/12 (SAE-16; 1 5/16-12) [1)]
G 154/12 (SAE-20; 1 5/8-20) [1)]
G 156/12 (SAE-24; 1 7/8-20) [1)]

– NG32 (to data sheet RE 45060)
G 157/01 (G1 1/2)
G 157/02 (M48 x 2)
G 158/10 (flange)
G 157/12 (SAE-24; 1 7/8-12) [1)]

[1)] on request

For valve mounting screws, see page 33.

Unit dimensions

Valve mounting screws (separate order)

– NG10:
4 hexagon socket head cap screws, metric
ISO 4762 - M6 x 45 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 12.5 Nm *[9.2 ft-lbs]* ±10%,
Material no. **R913000258**

4 hexagon socket head cap screws, UNC
1/4-20 UNC x 1 3/4” ASTM-A574
on request

– NG16:
4 hexagon socket head cap screws, metric
ISO 4762 - M10 x 60 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 75 Nm *[55.3 ft-lbs]* ±10%,
Material no. **R913000116**

2 hexagon socket head cap screws metric
ISO 4762 - M6 x 60 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 12.5 Nm *[9.2 ft-lbs]* ±10%,
Material no. **R913000115**

4 hexagon socket head cap screws, UNC
3/8-16 UNC x 2 1/4” ASTM-A574
on request

2 hexagon socket head cap screws, UNC
1/4-20 UNC x 2 1/4” ASTM-A574
on request

– NG25:
6 hexagon socket head cap screws, metric
ISO 4762 - M12 x 60 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 130 Nm *[95.9 ft-lbs]* ±10%,
Material no. **R913000121**

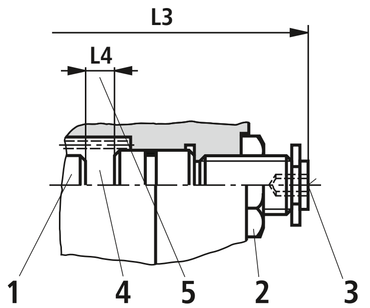
6 hexagon socket head cap screws, UNC
1/2-13 UNC x 2 1/2” ASTM-A574
on request

– NG32:
6 hexagon socket head cap screws, metric
ISO 4762 - M20 x 80 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 430 Nm *[317.2 ft-lbs]* ±10%,
Material no. **R901035246**

6 hexagon socket head cap screws, UNC
3/4-10 UNC x 3 1/4” ASTM-A574
on request

Stroke adjustment, attachment options (dimensions in mm *[inch]*)

The stroke adjustment feature limits the stroke of control spool (1). To reduce the spool stroke, loosen locknut (2) and turn adjustment screw (3) clockwise. Control chamber (4) must be depressurized during this process.

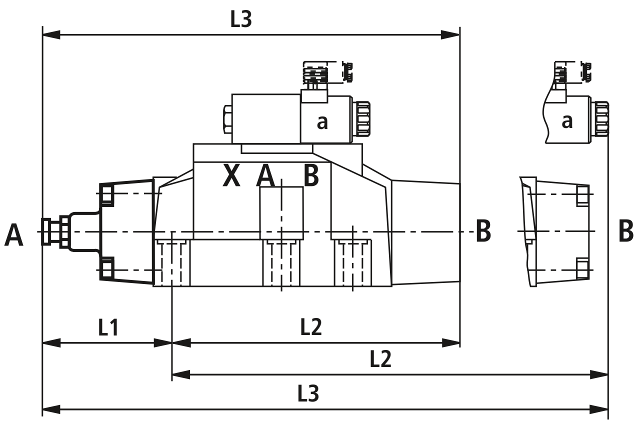


NG	L4
10	6,5 *[0.26]*
16	10 *[0.39]*
25 (type 4W.H 22)	9,5 *[0.37]*
25 (type 4W.H 25)	12,5 *[0.49]*
32	15 *[0.59]*

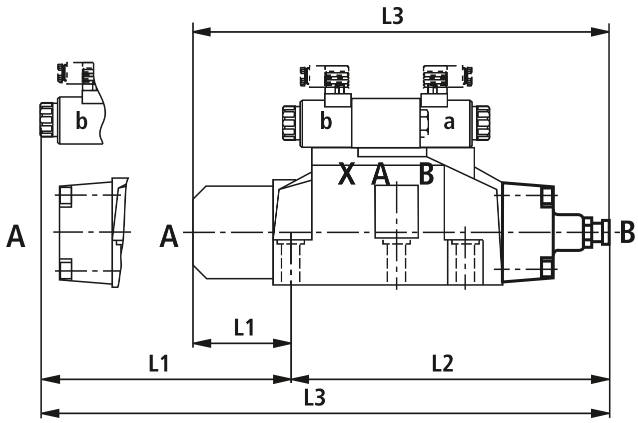
For further dimensions, see below and page 35.

5 Adjustment range
- NG10:
  1 turn = 1 mm *[0.0394 inch]* adjustment travel
- NG16 and 32:
  1 turn = 1.5 mm *[0.0591 inch]* adjustment travel

Stroke limitation on side A



Stroke limitation on side B



Attachment options	Ordering code	NG	3-position valve [1)] Spring-centered L1	Spring-centered L2	Spring-centered L3	Pressure-centered L1	Pressure-centered L2	Pressure-centered L3
Stroke adjustment on valve sides A and B	10	10	90 *[3.54]*	144 *[5.67]*	234 *[9.21]*			
		16	100 *[3.94]*	200 *[7.87]*	300 *[11.81]*			
		25 [1)]	96 *[3.77]*	241 *[9.49]*	337 *[13.27]*			
		25 [2)]	123 *[4.84]*	276 *[10.87]*	399 *[15.71]*			
		32	133 *[5.24]*	344 *[13.54]*	477 *[18.78]*			
Stroke adjustment on valve side A	11	10	90 *[3.54]*	106 *[4.17]*	196 *[7.72]*			
		16	100 *[3.94]*	156 *[6.14]*	256 *[10.08]*			
		25 [1)]	96 *[3.77]*	193 *[7.60]*	289 *[11.38]*			
		25 [2)]	123 *[4.84]*	225 *[8.86]*	348 *[13.70]*			
		32	133 *[5.24]*	287 *[11.30]*	420 *[16.54]*			
Stroke adjustment on valve side B	12	10	52 *[2.05]*	144 *[5.67]*	196 *[7.72]*	–	–	–
		16	56 *[2.20]*	200 *[7.87]*	256 *[10.08]*	81 *[3.19]*	200 *[7.87]*	281 *[11.06]*
		25 [1)]	48 *[1.89]*	241 *[9.49]*	289 *[11.38]*	–	–	–
		25 [2)]	72 *[2.83]*	276 *[10.87]*	348 *[13.70]*	107 *[4.21]*	276 *[10.87]*	283 *[11.14]*
		32	76 *[2.99]*	344 *[13.54]*	420 *[16.54]*	120 *[4.72]*	344 *[13.54]*	464 *[18.27]*

[1)] With spool symbol A, only version “11“ possible, with spool symbol B, only version “12“ .

Stroke adjustment, attachment options (dimensions in mm *[inch]*)

Attachment options	Ordering code	NG	2-position valve								
			Spring end position						Hydraulic end position		
			A, C, D, K, Z			B, Y			HC, HD, HK, HZ, HY		
			L1	**L2**	**L3**	**L1**	**L2**	**L3**	**L1**	**L2**	**L3**
Stroke adjustment on valve sides A and B	**10**	10	–	–	–	–	–	–	90 *[3.54]*	144 *[5.67]*	234 *[9.21]*
		16	–	–	–	–	–	–	100 *[3.94]*	200 *[7.87]*	300 *[11.81]*
		25 1)	96 *[3.78]*	241 *[9.49]*	337 *[13.27]*	96 *[3.78]*	241 *[9.49]*	337 *[13.27]*	96 *[3.78]*	241 *[9.49]*	337 *[13.27]*
		25 2)	–	–	–	–	–	–	123 *[4.84]*	276 *[10.87]*	399 *[15.71]*
		32	–	–	–	–	–	–	133 *[5.24]*	344 *[13.54]*	477 *[18.78]*
Stroke adjustment on valve side A	**11**	10	90 *[3.54]*	106 *[4.17]*	196 *[7.72]*	–	–	–	90 *[3.54]*	106 *[4.17]*	196 *[7.72]*
		16	100 *[3.94]*	180 *[7.09]*	280 *[11.02]*	–	–	–	100 *[3.94]*	156 *[6.14]*	256 *[10.08]*
		25 1)	96 *[3.78]*	193 *[7.60]*	289 *[11.38]*	96 *[3.78]*	193 *[7.60]*	289 *[11.38]*	96 *[3.78]*	193 *[7.60]*	289 *[11.38]*
		25 2)	123 *[4.84]*	253 *[9.96]*	376 *[14.8]*	–	–	–	123 *[4.84]*	225 *[8.86]*	348 *[13.70]*
		32	133 *[5.24]*	316 *[12.44]*	449 *[17.68]*	–	–	–	133 *[5.24]*	287 *[11.30]*	420 *[16.53]*
Stroke adjustment on valve side B	**12**	10	–	–	–	52 *[2.05]*	144 *[5.67]*	196 *[7.72]*	52 *[2.05]*	144 *[5.67]*	196 *[7.72]*
		16	–	–	–	80 *[3.15]*	200 *[7.87]*	280 *[11.02]*	56 *[2.21]*	200 *[7.87]*	256 *[10.08]*
		25 1)	48 *[1.89]*	241 *[9.49]*	289 *[11.38]*	48 *[1.89]*	241 *[9.49]*	289 *[11.38]*	48 *[1.89]*	241 *[9.49]*	289 *[11.38]*
		25 2)	–	–	–	100 *[3.94]*	276 *[10.87]*	376 *[14.80]*	72 *[2.84]*	276 *[10.87]*	348 *[13.70]*
		32	–	–	–	105 *[4.13]*	344 *[13.54]*	449 *[17.68]*	76 *[2.99]*	344 *[13.54]*	420 *[16.53]*

1) Types 4WEH 22… and 4WH 22…

2) Types 4WEH 25… and 4WH 25…

Switching time adjustment

The switching time of main valve (1) can be influenced by using a double throttle check valve (2) (type Z2FS 6 to data sheet RE 27506).

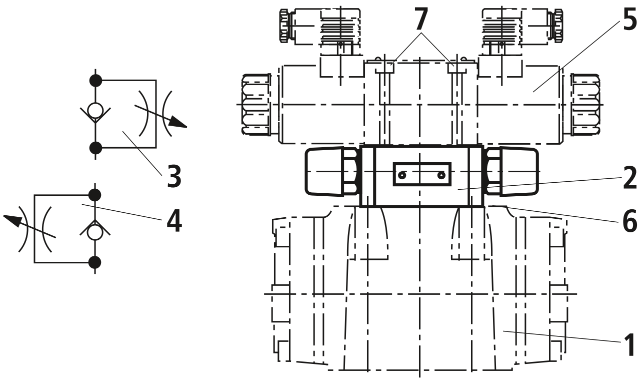
Conversion of meter-in (3) into meter-out control (4):

Remove pilot valve (5) – plate (6) for accommodating the seal rings remains in place – turn switching time adjustment feature (2) around its longitudinal axis and put it down again, re-mount pilot valve (5) .

Tightening torque of screws (7) M_T = 9 Nm *[6.6 ft-lbs]*.

⚠ **Attention!**

The conversion may only be carried out by authorized specialists or in the factory!



Type 4WEH 10 ..4X/…S

Type 4WEH 10 ..4X/…S2

Pressure reducing valve “D3“

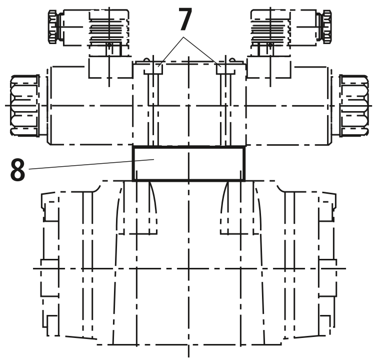
Pressure reducing valve (8) must be used in the case of a pilot pressure above 250 bar *[3626 psi]* (with type 4WEH 22 …: 210 bar *[3046 psi]*) and version “H-“.

The secondary pressure is held constant at 45 bar *[652 psi]*.

⚠ **Attention!**

When a pressure reducing valve “D3“ (8) is used, a throttle insert “B10“ must be provided in the P channel of the pilot valve.

Tightening torque of screws (7) M_T = 9 Nm *[6.6 ft-lbs]*.



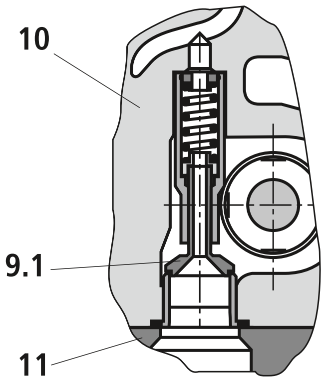
Type 4WEH 10 ..4X/…/..D3

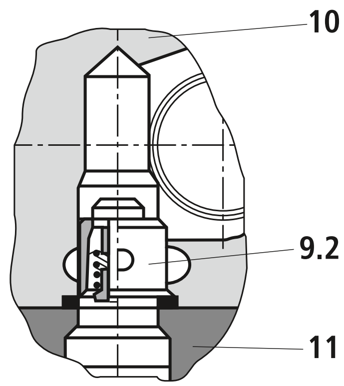
Pre-load valve (not for NG10)

For valves with pressureless circulation and internal pilot oil supply, a pre-load valve (9) must be installed in channel P of the main valve to build up the minimum pilot pressure.

The pressure differential of the pre-load valve must be added to the pressure differential of the main valve (see characteristic curves) to obtain a total value.

The cracking pressure is ca. 4.5 bar *[65 psi]*.

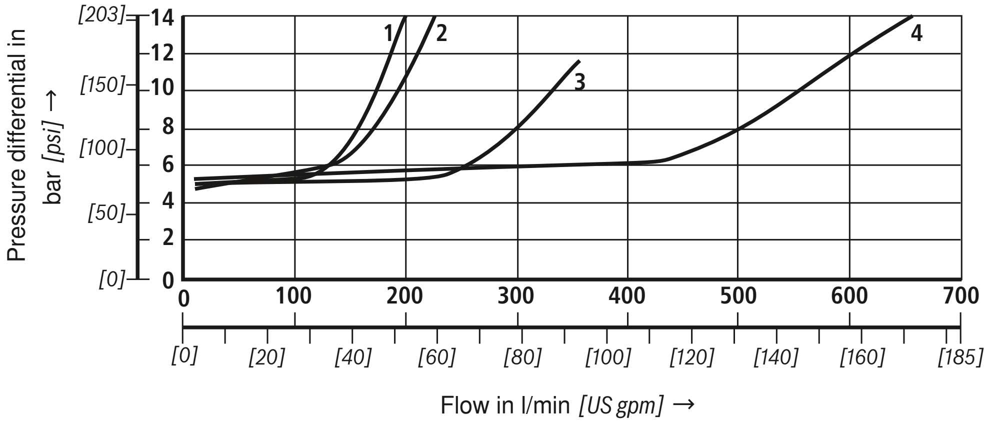




9.1 Pre-load valve NG16
9.2 Pre-load valve NG25 and NG32
10 Main valve
11 Suplate

Type	Material number P4,5
4W.H **16** …	R901002365
4W.H **22** …	R900315596
4W.H **25** …	R900303717
4W.H **32** …	R900317066

***Δp–q$_V$* characteristic curve** (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C *[104 °F ±9 °F]*)



1 **NG16**
2 **NG25** (type 4W.H **25** …)
3 **NG25** (type 4W.H **22** …)
4 **NG32**

Notes

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Hydraulics
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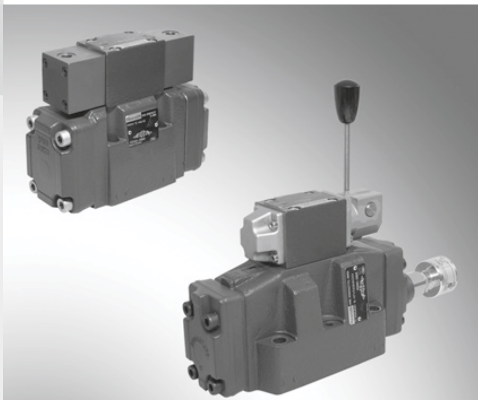
documentation@boschrexroth.de
www.boschrexroth.de

3/2, 4/2 and 4/3 directional valves, internally pilot operated, externally pilot operated

RE 24851/08.08 1/36

Types WPH, WHH, WMMH, WMDH, WMDAH, WMRH and WMUH

Sizes 10 to 32
Component series 4X; 6X; 7X
Maximum operating pressure 350 bar *[5076 psi]*
Maximum flow 1100 l/min *[290 US gpm]*



tb0253+0254

Table of contents

Notes on available spare parts:
www.boschrexroth.com/spc

Features

- 7 types of actuation:
  - Pneumatic-hydraulic (type WPH)
  - Hydraulic-hydraulic (type WHH)
  - Hand lever (type WMMH)
  - Rotary knob (type WMDH)
  - Rotary knob, lockable (type WMDAH)
  - Roller plunger (type WMRH)
  - Roller plunger, rotated 90° (type WMUH)
- For subplate mounting
- Porting pattern to ISO 4401 and NFPA T3.5.1 R2-2002
- Subplates according to data sheets RE 45054 to RE 45060 (separate order), see page 30
- Spring centering, spring end position or hydraulic end position
- Manual override, optional
- Switching time adjustment, optional
- Pre-load valve in channel P of the main valve, optional
- Stroke adjustment of main spool, optional
- Stroke adjustment and/or end position check, optional
- Inductive position switches and proximity sensors (contactless), see RE 24830

Ordering code

							/	6		

Up to 280 bar	= **No code**
Up to 350 bar [1; 2]	= **H –**
3-way version	= **3**
4-way version	= **4**
Types of actuation	
Pneumatic-hydraulic	= **WPH**
Hydraulic-hydraulic	= **WHH**
Mechanical-hydraulic:	
– Hand lever	= **WMMH**
– Rotary knob	= **WMDH**
– Rotary knob, lockable	= **WMDAH**
– Roller plunger	= **WMRH**
– Roller plunger, rotated 90°	= **WMUH**
Size	
NG10	= **10**
NG16	= **16**
NG25 (type 4W.H 22 .7X/…)	= **22**
NG25 (type 4W.H 25 .6X/…)	= **25**
NG32	= **32**
Spool return in main valve	
by springs	= **No code**
hydraulic [3]	= **H**
Spool symbols, see pages 4 to 7	
Component series	
40 to 49 – NG10	= **4X**
(40 to 49: unchanged installation and connection dimensions)	
60 to 69 – NG25 (4W.H 25.) and NG32	= **6X**
(60 to 69: unchanged installation and connection dimensions)	
70 to 79 – NG16 (from series 72 on) and NG25 (4W.H 22.)	= **7X**
(70 to 79: unchanged installation and connection dimensions)	
Spool return in pilot valve with 2 spool positions	
only possible with spools B, C, D and hydraulic spool return in main valve:	
With spring return – types WPH, WHH, WMMH, WMRH, WMUH	= **No code**
Without spring return – types WPH and WHH	= **O**
Without spring return **with** detent – types WPH, WHH	= **OF**
Without spring return **with** detent – types WMMH, WMDH, WMDAH	= **F**
Pilot valve	
With fluidic actuation (standard valve, RE 22282) – types WPH and WHH	= **6**
With mechanical, manual actuation (RE 22280) – type WM.H	
Without manual override	= **No code**
With manual override – type WPH only	= **N**
External pilot oil supply, external pilot oil drain [1]	= **No code**
Internal pilot oil supply, external pilot oil drain [1; 2]	= **E**
Internal pilot oil supply, internal pilot oil drain [2]	= **ET**
External pilot oil supply, internal pilot oil drain [1]	= **T**

p_{St} = pilot pressure

$p_{St\,min}$ = pilot pressure, minimum

p_{Tank} = tank pressure

$p_{ö}$ = cracking pressure

Standard types and components are shown in the EPS (standard price list).

For the explanation of footnotes, see page 3!

				/						*

Further details in clear text

Seal material

No code =	NBR seals
V =	FKM seals
	(other seals on request)

⚠ **Attention!**
Observe compatibility of seals with hydraulic fluid used!

No code =	**Without** pressure reducing valve
D3 [4] **=**	**With** pressure reducing valve

Pre-load valve (not for NG10) [4]

No code =	**Without** pre-load valve
P4,5 =	**With** pre-load valve ($\boldsymbol{p}_{ö}$ = 4.5 bar *[65 psi]*)

Throttle insert

No code =	Without throttle insert
B08 =	Throttle Ø 0.8 mm *[0.0315 inch]*
B10 =	Throttle Ø 1.0 mm *[0.0394 inch]*
B12 =	Throttle Ø 1.2 mm *[0.0472 inch]*
B15 =	Throttle Ø 1.5 mm *[0.0591 inch]*
B20 =	Throttle Ø 2.0 mm *[0.0787 inch]*
B25 =	Throttle Ø 2.5 mm *[0.0984 inch]*

Stroke adjustment

For ordering code, see pages 32 and 33

Spool position monitoring

No code =	Without position switches
QMAG24 =	Monitored spool position “a“
QMBG24 =	Monitored spool position “b“
QMABG24 =	Monitored spool positions “a“ and “b“
QM0G24 =	Monitored rest position
	For further details, see RE 24830

No code =	**Without** switching time adjustment
S =	Switching time adjustment as meter-in control
S2 =	Switching time adjustment as meter-out control

[1] Pilot oil supply X or drain Y **external**:

- For NG10, version SO30 must be provided for the use of sandwich plates. Code SO30 must be added at the end of the type designation (sandwich plate).
- The adherence to the permissible maximum operating parameters of the pilot valve (see RE 22280 and RE 22282) must be ensured!
- Maximum pilot pressure: please read page 12!

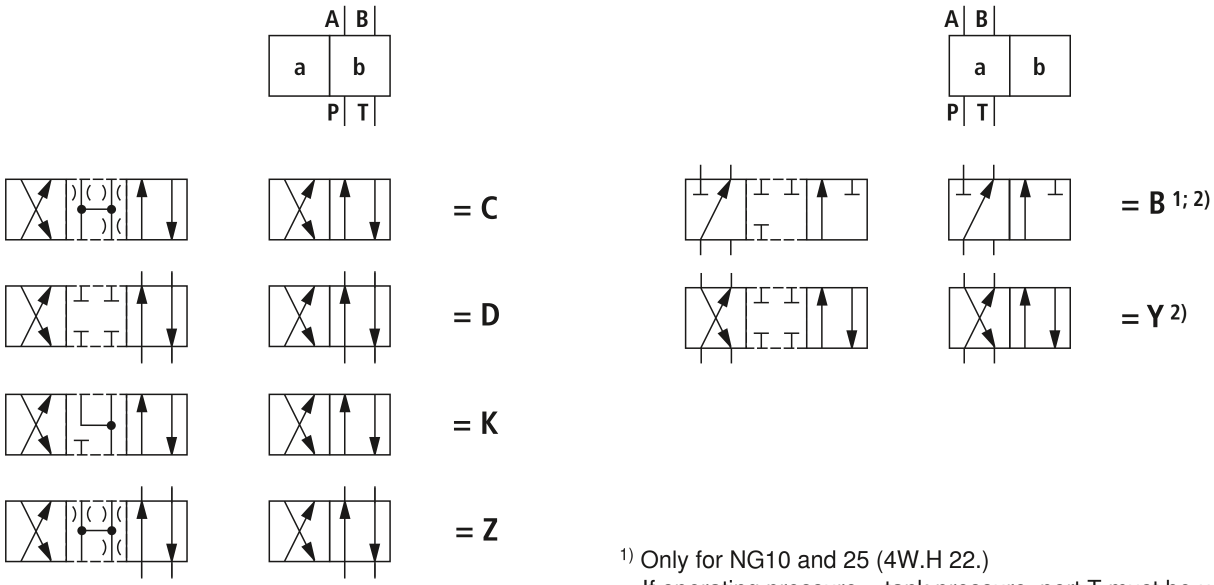
[2] Pilot oil supply **internal** (versions “ET“ and “E“):

- Minimum pilot pressure: please read page 13!
- To prevent impermissibly high pressure peaks, a **throttle insert “B10“** must be provided in the P port of the pilot valve (see page 11).
- In conjunction with version “H-“ **pressure reducing valve “D3“** must be provided additionally.

[3] 2 spool positions (hydraulic end position): only spools C, D, Y, K ,Z

[4] Only in conjunction with throttle insert **“B10“**

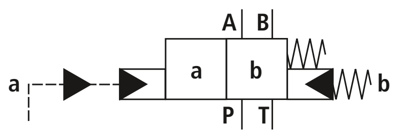
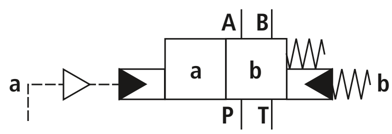
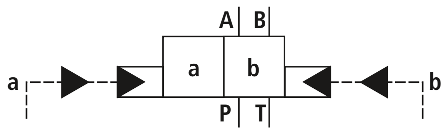
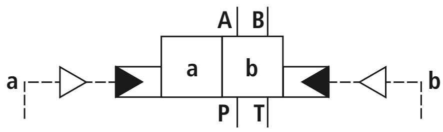
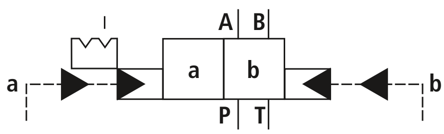
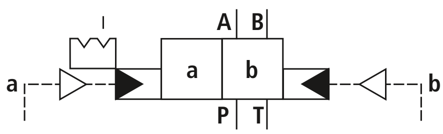
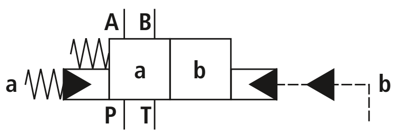
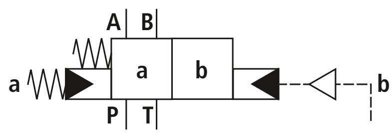
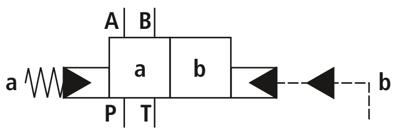
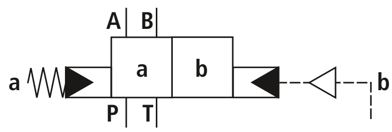
Spool symbols: 2 spool positions



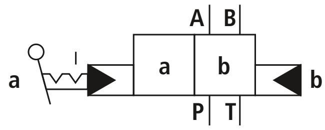
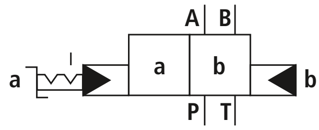
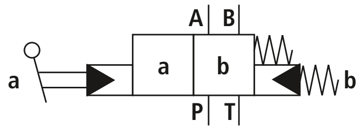
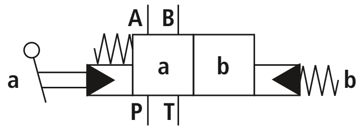
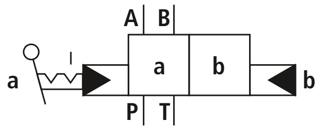
[1] Only for NG10 and 25 (4W.H 22.)
If operating pressure > tank pressure, port T must be used as leakage port!

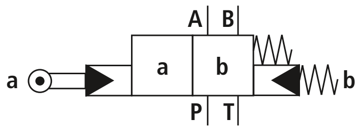
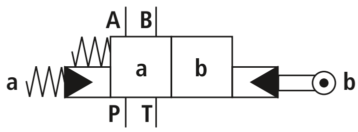
[2] Only types WMRH/WMUH and WMMH available.

⚠ **Attention!**
Caution in conjunction with single-rod cylinders due to pressure intensification!

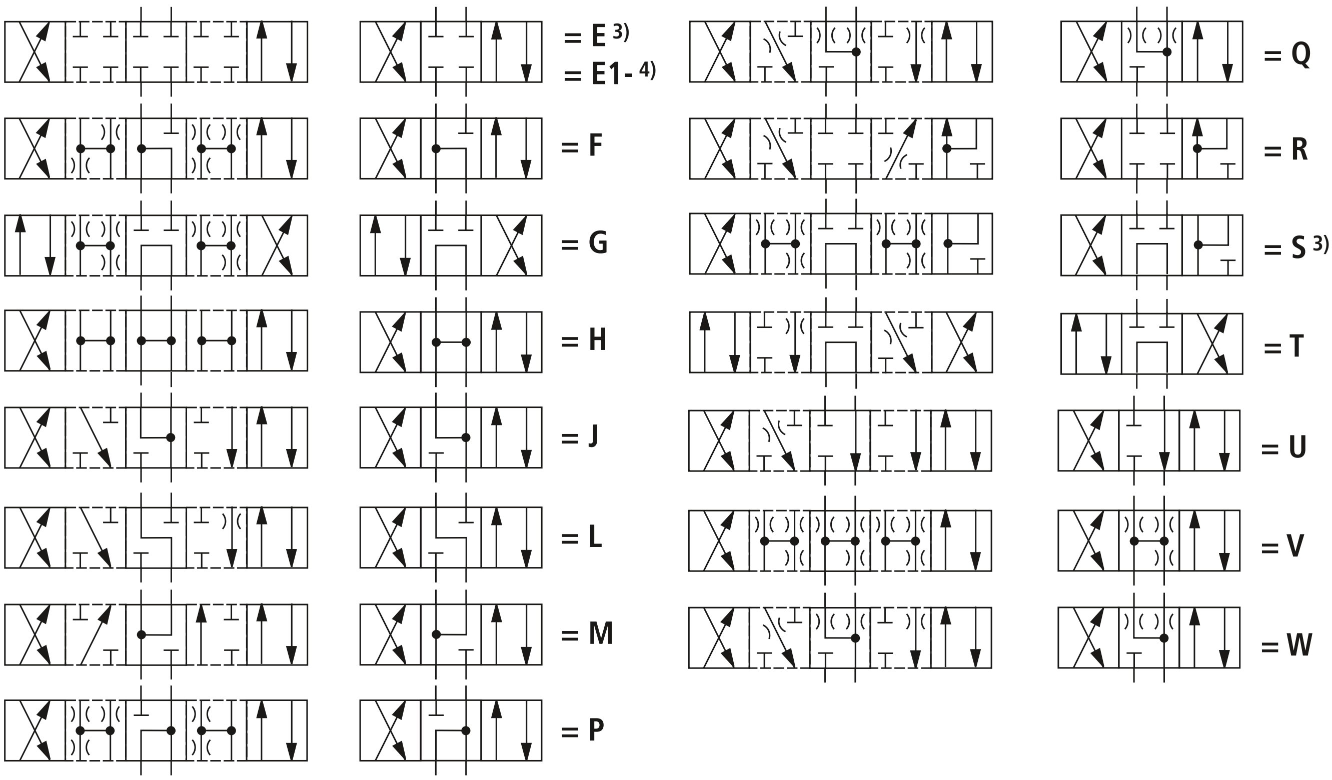
Ordering code		Type of actuation	
Spool symbol	**Spool return**	**Hydraulic** Type WHH	**Pneumatic** Type WPH
C, D, K, Z	**../..**		
	..H../O		
	..H../OF		
B, Y	**../..**		
Y	**..H../..**		

Spool symbols: 2 spool positions

Ordering code		Type of actuation	
Spool symbol	**Spool return**	**Hand lever** Type WMMH	**Rotary knob** Types WMDH, WMDAH
C, D, K, Z	**..H../F**		
			
B, Y			
Y	**..H../F**		

Ordering code		Type of actuation
Spool symbol	**Spool return**	**Roller plunger** Types WMRH, WMUH
C, D, K, Z		
B, Y		

Spool symbols: 3 spool positions

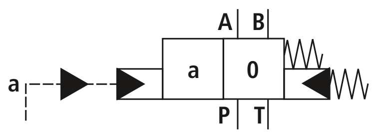
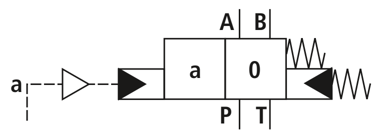
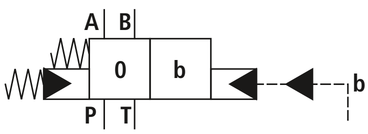
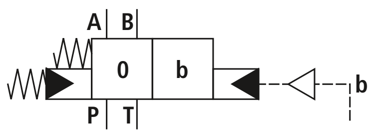
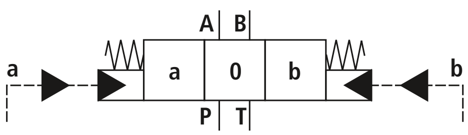
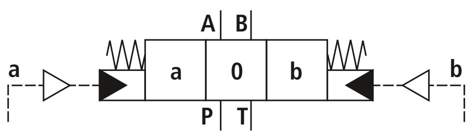


[3] **Example:**
– Spool E with actuation side “a” → ordering code ..EA..
– Spool E with actuation side “b” → ordering code ..EB..

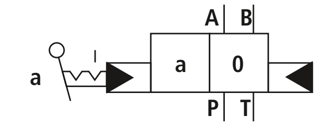
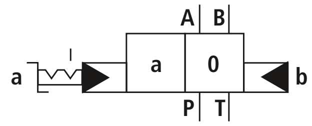
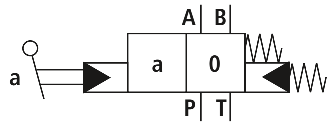
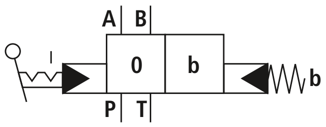
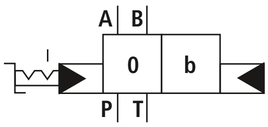
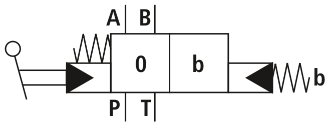
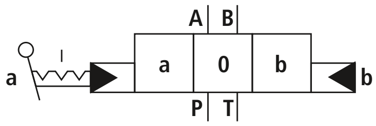
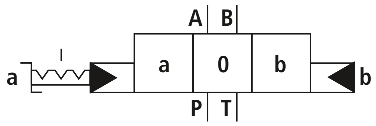
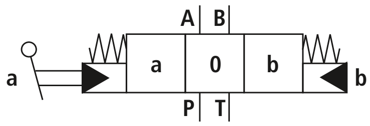
[4] Spool symbol E1-: P → A/B pre-opening

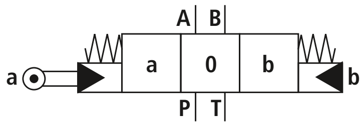
[5] Only on NG16

⚠ **Attention!**
Caution in conjunction with single-rod cylinders due to pressure intensification!

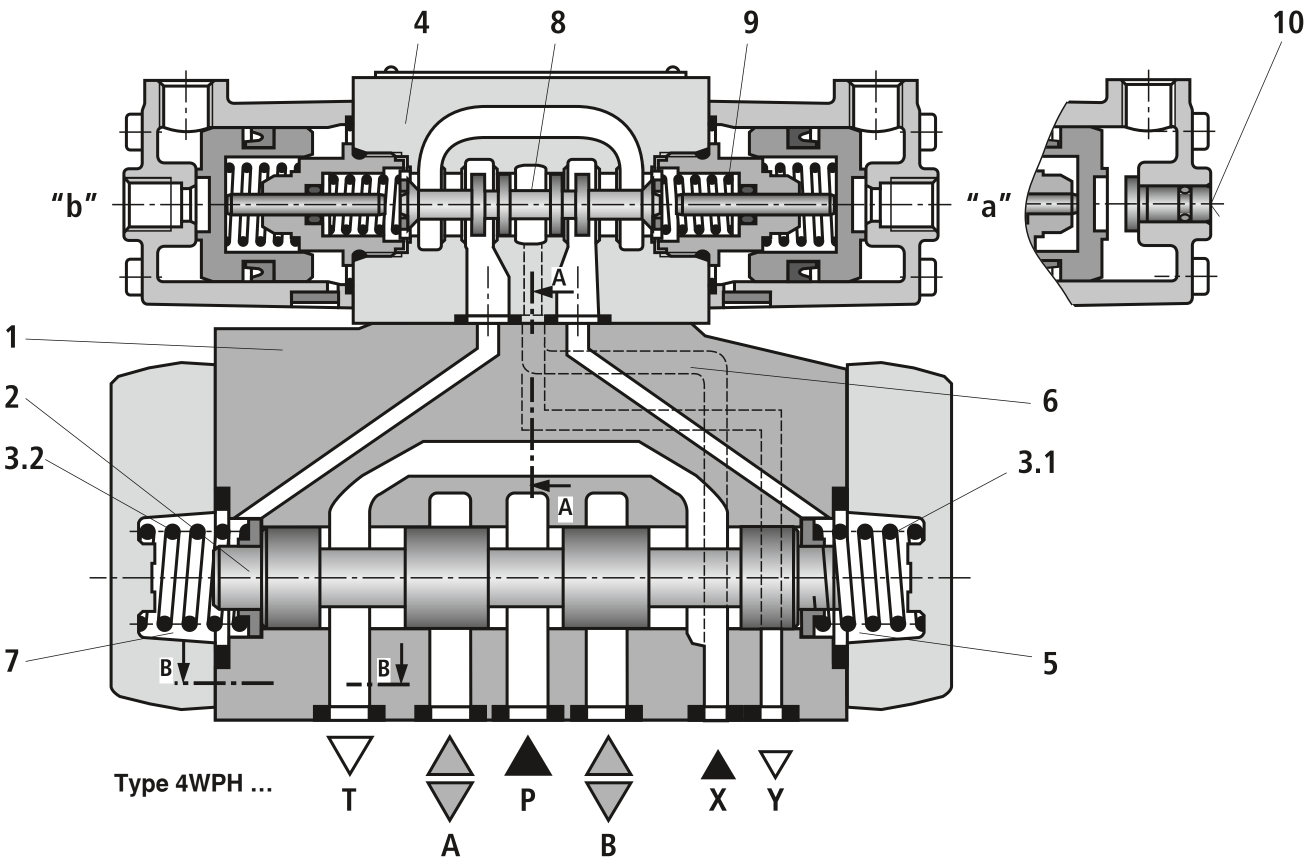
Ordering code			Type of actuation	
Spool symbol	**Actuation side**	**Spool return**	**Hydraulic** Type WHH	**Pneumatic** Type WPH
E, F, G, H, J, L, M, Q, R, S, T, U, V, W	**.A**			
	.B			
				

Spool symbols: 3 spool positions

Ordering code			Type of actuation	
Spool symbol	Ac-tuation side	Spool return	**Hand lever** Type WMMH	**Rotary knob** Types WMDH, WMDAH
E, E1-, F, G, H, J, L, M, Q, R, S, T, U, V, W	.A	..H../F		
	.A			
	.B	..H../F		
	.B			
		..H../F		
				

Ordering code			Type of actuation
Spool symbol	Ac-tuation side	Spool return	**Roller plunger** Types WMRH, WMUH
E, E1-, F, G, H, J, L, M, Q, R, S, T, U, V, W			

Function, section: Types WPH and WHH



Type 4WPH …

Directional valves Type WPH and WHH

Valves of type WPH are directional spool valves with pneumatic-hydraulic actuation, type WHH with hydraulic-hydraulic actuation. They control the start, stop and direction of a flow.

These directional valves basically consist of the main valve with housing (1), main control spool (2), one or two return springs (3.1) and (3.2), as well as pilot valve (4).

Main control spool (2) in the main valve is held in the zero or initial position by springs or through pressurization. In the initial position, the two spring chambers (5) and (7) are connected via pilot valve (4) pressureless to the tank. Pilot valve (4) is supplied with pilot oil via pilot channel (6). The supply can be provided internally or externally (externally via port X).

When the pilot valve is operated, e.g. side "a", pilot spool (8) is pushed to the left, and spring chamber (7) is consequently pressurized to pilot pressure. Spring chamber (5) remains pressureless.

The pilot pressure acts on the left side of main control spool (2) and pushes it against spring (3.1). As a result, port P is connected to B, and A to T in the main valve.

In the non-operated condition, control spool (8) is held by return spring (9) in the central or initial position (except for impulse spool). Spring chamber (7) is unloaded to the tank.

The pilot oil is displaced from the spring chamber via pilot valve (4) into channel Y.

The pilot oil is supplied and drained internally or externally (externally vie port Y).

An optional manual override (10) allows pilot spool (8) to be moved (8) without pneumatic pressure (type WPH only).

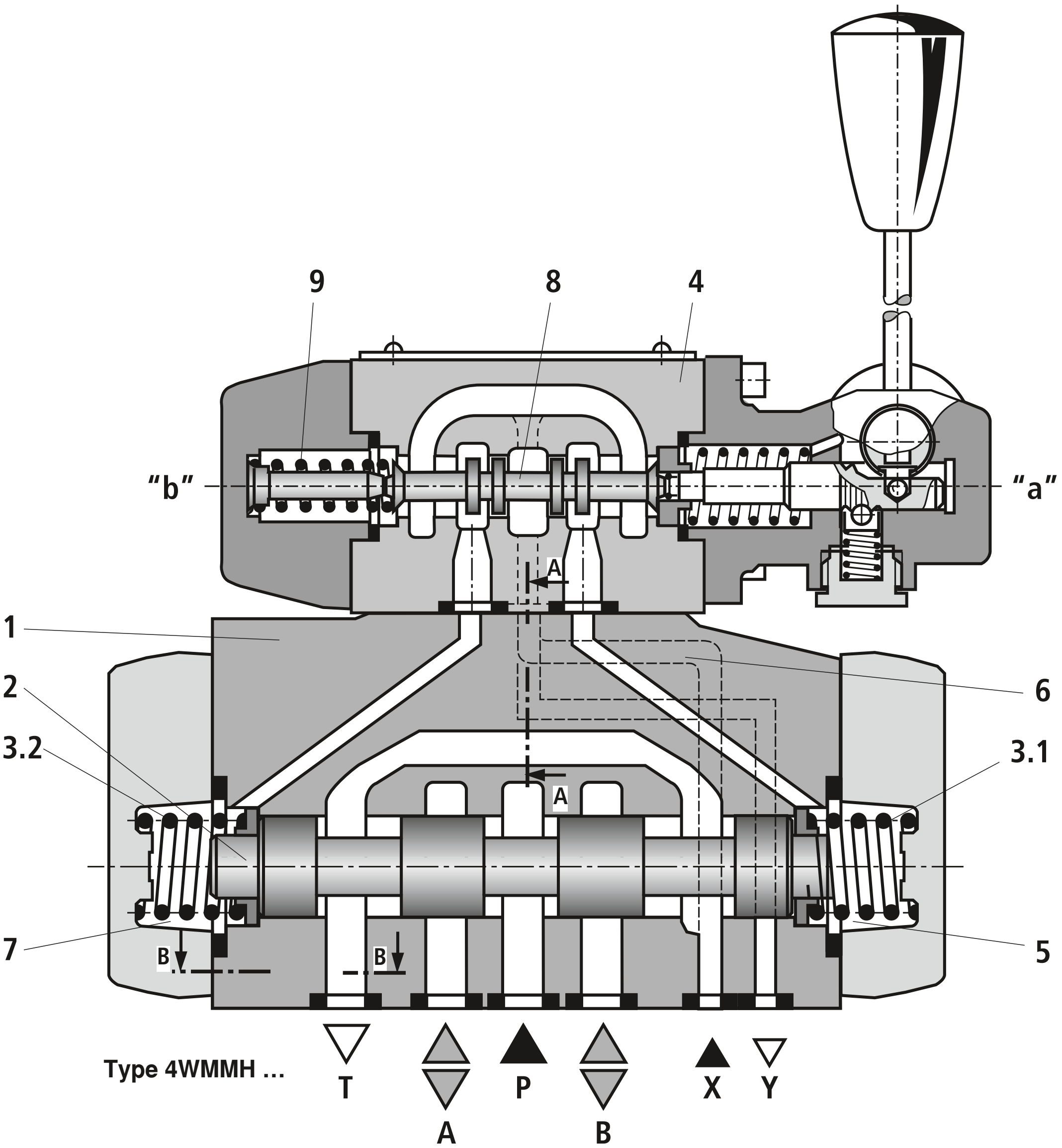
☞ **Note!**

Return springs (3.1) and (3.2) in spring chambers (5) and (7) hold main control spool (2) in the central position without pilot pressure, also in the case of, for example, a vertical valve arrangement.

Pilot valve for type WHH, see RE 22282.

Pilot oil supply (sections A – A and B – B), **see pages 10 and 11.**

Function, section: Type WM.H



Directional valves of type WM.H

Valves of type WM.H are directional spool valves with mechanical-hydraulic actuation. They control the start, stop and direction of a flow.

These directional valves basically consist of the main valve with housing (1), main control spool (2), one or two return springs (3.1) and (3.2), as well as the pilot valve (4).

The function of these valves corresponds to that of type WPH. The pilot valve is, however, actuated mechanically.

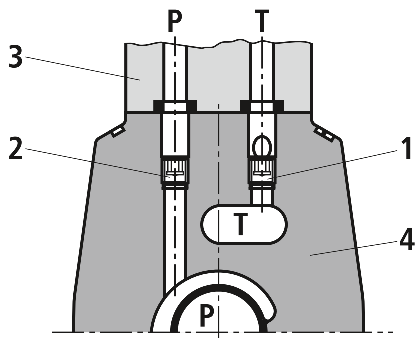
For pilot valves for types WMDH, WMDAH, WMRH, WMUH, see RE 22280.

Pilot oil supply (sections A – A and B – B), **see pages 10 and 11.**

Pilot oil supply

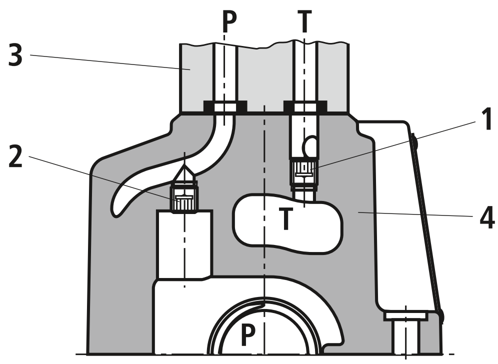
NG10

Section A – A



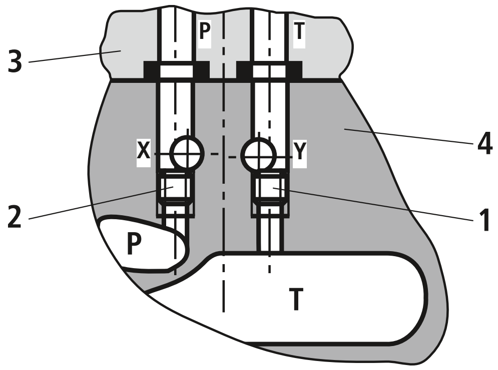
NG16

Section A – A

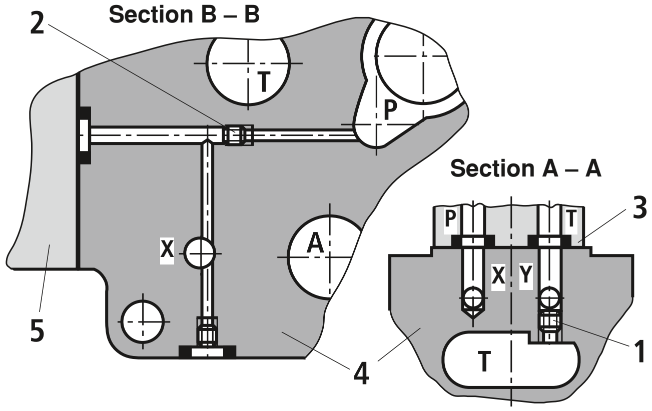


NG25 (type 4W.H **22** .7X/…)

Section A – A

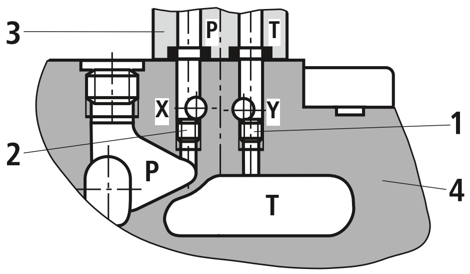


NG25 (type 4W.H **25** .6X/…)



NG32

Section A – A



Pilot oil supply

External: **2** closed

Internal: **2** open

Pilot oil drain

External: **1** closed

Internal: **1** open

For further details and explanations of items, see next page.

Pilot oil supply

Type 4W.H…

The pilot oil is supplied **externally** - via channel X - from a separate circuit.

The pilot oil is drained **externally** - via channel Y - into the tank.

Type 4W.H…E…

The pilot oil is supplied **internally** from channel P of the main valve (see also page 13, footnotes [6)] and [7)])

The pilot oil is drained **externally** - via channel Y - into the tank. Port X in the subplate must be plugged.

Type 4W.H…ET…

The pilot oil is supplied **internally** from channel P of the main valve.

The pilot oil is drained **internally** - via channel T - into the tank. Ports X and Y in the subplate must be plugged.

Type 4W.H…T…

The pilot oil is supplied **externally** - via channel X - from a separate circuit.

The pilot oil is drained **internally** - via channel T - into the tank. Port Y in the subplate must be plugged.

1 Plug screw M6, 3 A/F – Pilot oil drain
2 Plug screw M6, 3 A/F – Pilot oil supply
3 Pilot valve
4 Main valve
5 Cover
6 Throttle insert

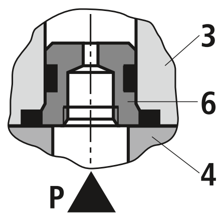
Tightening torques M_T for cover mounting screws:
NG16: 35 Nm *[25.8 ft-lbs]* ±10%;
NG25: 68 Nm *[50.2 ft-lbs]* ±10%

Tightening torques M_T for mounting screws for the pilot valve: **NG10 to 32**: 9 Nm *[6.6 ft-lbs]* ±10%

Throttle insert

The use of throttle insert (6) is required, if the pilot oil supply is to be limited in channel P of the pilot valve (see below).

Throttle insert (6) is to be instsalled in channel P of the pilot valve.



⚠ **Attention!**

The pilot oil supply may exclusively be modified by authorized specialists or in the factory!

- Pilot oil supply X or drain Y **external**:
  - For NG10, version SO30 must be provided for the use of sandwich plates. Code SO30 must be added at the end of the type designation (sandwich plate).
  - The adherence to the permissible maximum operating parameters must be ensured (see RE 22280 and RE 22282)!
  - Maximum pilot pressure: please read page 12!
- Pilot oil supply **internal** (version “ET“ and “E“):
  - Minimum pilot pressure: please read page 13!
  - To prevent impermissibly high pressure peaks, a **throttle insert “B10“** must be provided in the P port of the pilot valve (see above).
  - In conjunction with version “H-“ **pressure reducing valve “D3“** (see page 34) must be provided additionally.

Technical data (for applications outside these parameters, please consult us!)

General

				10	16	25 4W.H 22	25 4W.H 25	32
Sizes			NG	**10**	**16**	**25** 4W.H **22**	**25** 4W.H **25**	**32**
Weight, ca.	– Type WPH	2 spool positions	kg *[lbs]*	6.8 *[15.0]*	8.9 *[19.6]*	11.9 *[26.2]*	18.0 *[39.7]*	18.0 *[39.7]*
		3 spool positions	kg *[lbs]*	7.6 *[16.8]*	9.7 *[21.4]*	12.7 *[28.0]*	19.8 *[43.7]*	41.8 *[92.2]*
	– Type WHH	2 spool positions	kg *[lbs]*	6.9 *[15.2]*	9.0 *[19.8]*	12.0 *[26.5]*	18.1 *[39.9]*	18.1 *[39.9]*
		3 spool positions	kg *[lbs]*	6.8 *[15.0]*	8.9 *[19.6]*	11.9 *[26.2]*	19.0 *[41.9]*	41.0 *[90.4]*
	– Types WMMH, WMDH, WMDAH, WMRH and WMUH		kg *[lbs]*	6.4 *[14.1]*	8.5 *[18.7]*	11.5 *[25.3]*	17.6 *[38.8]*	17.6 *[38.8]*
	– Switching time adjustment		kg *[lbs]*	0.8 *[1.8]*	0.8 *[1.8]*	0.8 *[1.8]*	0.8 *[1.8]*	0.8 *[1.8]*
	– Pressure reducing valve		kg *[lbs]*	0.4 *[0.9]*	0.4 *[0.9]*	0.4 *[0.9]*	0.4 *[0.9]*	0.4 *[0.9]*
Installation position				Optional; vertical in the case of valves with hydraulic spool return “H“ and spool symbols B, C, D, K, Z, Y				
Ambient temperature range			°C *[°F]*	–30 to +50 *[–22 to +122]*				
Storage temperature range			°C *[°F]*	–20 to +70 *[–4 to +158]*				
Surface protection (valve body)				Paint coating, layer thickness max. 100 µm				

Hydraulic

				10	16	25 4W.H 22	25 4W.H 25	32
Maximum operating pressure								
– Ports P, A, B	Type 4W.H		bar *[psi]*	280 *[4061]*	280 *[4061]*	280 *[4061]*	280 *[4061]*	280 *[4061]*
	Type H-4W.H		bar *[psi]*	350 *[5076]*	350 *[5076]*	350 *[5076]*	350 *[5076]*	350 *[5076]*
– Port T	Pilot oil drain Y external	Type 4W.H	bar *[psi]*	280 *[4061]*	250 *[3626]*	250 *[3626]*	250 *[3626]*	250 *[3626]*
		Type H-4W.H		315 *[4568]*	250 *[3626]*	250 *[3626]*	250 *[3626]*	250 *[3626]*
	Pilot oil drain Y internal [1]		bar *[psi]*	160 *[2321]*; 60 *[870]* with types WMRH and WMUH				
– Port Y	Pilot oil drain external		bar *[psi]*	160 *[2321]*; 60 *[870]* with types WMRH and WMUH				
Hydraulic fluid				Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on request				
Hydraulic fluid temperature range			°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)				
Viscosity range			mm^2/s *[SUS]*	2.8 to 500 *[35 to 2320]*				
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)				Class 20/18/15 [4]				
Maximum pilot pressure [3]			bar *[psi]*	250 *[3626]*	250 *[3626]*	210 *[3046]*	250 *[3626]*	250 *[3626]*

Technical data (for applications outside these parameters, please consult us!)

Hydraulic

Size			NG	10	16	25 4W.H 22	25 4W.H 25	32
Minimum pilot pressure (see also characteristic curves on page 14)								
– Pilot oil supply X external, pilot oil supply X internal (with spools: D, K, E, J, L, M, Q, R, U, W)								
	3-spool-position valve, spring-centered	Type H-4W.H…	bar *[psi]*	10 *[145]*	14 *[203]*	12.5 *[181]*	13 *[188]*	8.5 *[123]*
		Type 4W.H…	bar *[psi]*	10 *[145]*	14 *[203]*	10.5 *[152]*	13 *[188]*	8.5 *[123]*
	3-spool-position valve, pressure-centered		bar *[psi]*	–	14 *[203]*	–	18 *[261]*	8.5 *[123]*
	2-spool-position valve with spring end position	Type H-4W.H…	bar *[psi]*	10 *[145]*	14 *[203]*	14 *[203]*	13 *[188]*	10 *[145]*
		Type 4W.H…	bar *[psi]*	10 *[145]*	14 *[203]*	11 *[159]*	13 *[188]*	10 *[145]*
	2-spool-position valve with hydraulic end position		bar *[psi]*	7 *[101]*	14 *[203]*	8 *[116]*	8 *[116]*	5 *[72]*
– Pilot oil supply X internal (with spools C, F, G, H, P, T, V, Z, S [5])			bar *[psi]*	4.5 *[65]* [6]	4.5 *[65]* [7]	4.5 *[65]* [7]	4.5 *[65]* [7]	4.5 *[65]* [7]
Pilot volume for switching process								
– 3-spool-position valve, spring-centered			cm^3 *[$inch^3$]*	2.04 *[0.124]*	5.72 *[0.349]*	7.64 *[0.466]*	14.2 *[0.866]*	29.4 *[1.794]*
– 2-spool-position valve			cm^3 *[$inch^3$]*	4.08 *[0.249]*	11.45 *[0.699]*	15.28 *[0.932]*	28.4 *[1.733]*	58.8 *[3.588]*
	from spool position “a“ to zero position		cm^3 *[$inch^3$]*	–	2.9 *[0.177]*	–	7.0 *[0.427]*	15.1 *[0.921]*
	from zero position to spool position “b“		cm^3 *[$inch^3$]*	–	5.72 *[0.349]*	–	14.15 *[0.863]*	29.4 *[1.794]*
	from spool position “b“ to zero position		cm^3 *[$inch^3$]*	–	2.83 *[0.173]*	–	5.73 *[0.349]*	14.4 *[0.879]*
Pilot flow for shortest switching time, ca.			l/min *[US gpm]*	35 *[9.2]*	35 *[9.2]*	35 *[9.2]*	35 *[9.2]*	45 *[11.9]*

[1] Suitable for NBR **and** FKM seals

[2] Suitable **only** for FKM seals

[3] – Pilot oil supply **internal**:
- In the case of higher pilot pressure, a pressure reducing valve must be used.
- In conjunction with version “H-“ **pressure reducing valve “D3“** must be provided additionally. (If it is not used, pilot pressure = operating pressure at the port)

– Pilot oil supply **external**:
- In conjunction with version “H-“ the adherence to the maximum pilot pressure must be ensured by taking suitable measures (e.g. protection of the separate pilot oil circuit through the use of a pressure relief valve)!

[4] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

[5] Spool S for NG16 only

[6] With symbols C, F, G, H, P, T, V, Z , internal pilot oil supply is only possible, if in the central position (in the case of 3-spool-position valve) or while passing the central position (in the case of 2-spool-position valve) the flow from P to T is so large that the pressure differential from P to T reaches a value of at least 6.5 bar *[94 psi]*.

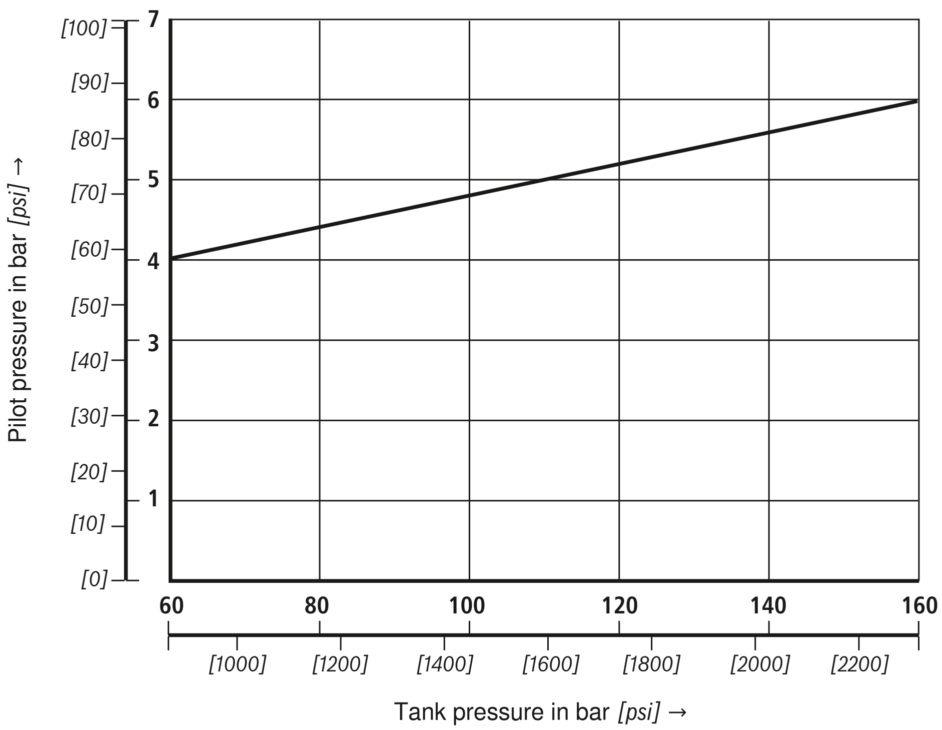
[7] For spools C, F, G, J, H, P, T, V, Z, S [5] – through pre-load valve (not for size NG10) or correspondingly large flow. (For the establishment of the required flow, see characteristic curves “pre-load valve“, page 35.)

Free flow cross-sections in zero position with spools Q, V and W

Size		NG	**10**	**16**	**25** 4W.H **22**	**25** 4W.H **25**	**32**
Spool **Q**	A – T; B – T	mm² *[inch²]*	13 *[0.02]*	32 *[0.05]*	78 *[0.121]*	83 *[0.129]*	78 *[0.121]*
Spool **V**	P – A; P – B	mm² *[inch²]*	13 *[0.02]*	32 *[0.05]*	73 *[0.113]*	83 *[0.129]*	73 *[0.113]*
	A – T; B – T	mm² *[inch²]*	13 *[0.02]*	32 *[0.05]*	84 *[0.13]*	83 *[0.129]*	84 *[0.13]*
Spool **W**	A – T; B – T	mm² *[inch²]*	2.4 *[0.004]*	6 *[0.009]*	10 *[0.015]*	14 *[0.022]*	20 *[0.031]*

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

Minimum pilot pressure in dependence upon tank pressure (type WPH)



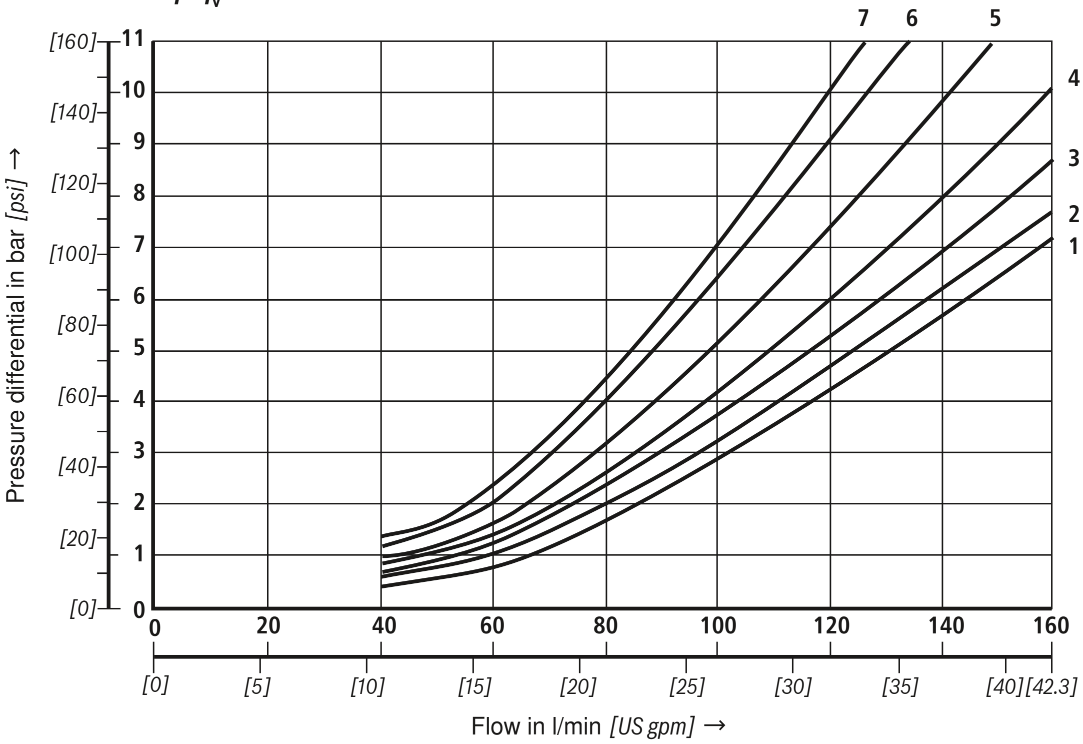
In the case of a higher tank pressure, the minimum pilot pressure must be raised in accordance with this diagram.

Minimum pilot pressure in dependence upon tank pressure (type WHH):

$p_{St\ min}$ > 6 to 10 bar *[87 to 145 psi]* > tank pressure

Characteristic curves: NG10 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

Δp-q_V characteristic curves



Spool	**Spool position**				**Spool**	**Zero position**		
	P – A	**P – B**	**A – T**	**B – T**		**A – T**	**B – T**	**P – T**
E, Y, D	2	2	4	5				
F	1	4	1	4	**F**	3	–	6
G, T	4	2	2	6	**G, T**	–	–	7
H, C	4	4	1	4	**H**	1	3	5
J, K	1	2	1	3				
L	2	3	1	4	**L**	3	–	–
M	4	4	3	4				
P	4	1	3	4	**P**	–	7	5
Q, V, W, Z	2	2	3	5				
R	2	2	3	–				
U	3	3	3	4	**U**	–	4	–
B	2	2	–	–				

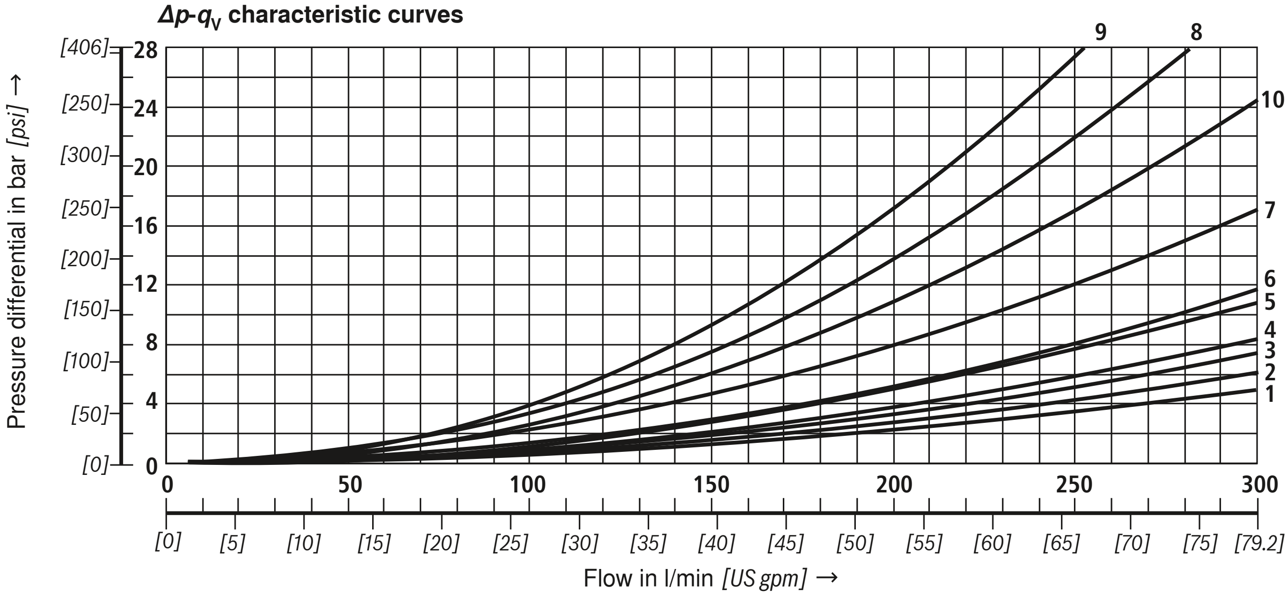
Performance limits: NG10 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

2-spool-position valves – $q_{V\,max}$ in l/min *[US gpm]*			
	Operating pressure p_{max} in bar *[psi]*		
Spool	**200** *[2900]*	**250** *[3626]*	**315** *[4568]*
E, J, L, M, Q, R, U, V, W, C, D, K, Z, Y	160 *[42]*	160 *[42]*	160 *[42]*
H	160 *[42]*	150 *[39]*	120 *[32]*
G, T	160 *[42]*	160 *[42]*	140 *[37]*
F, P	160 *[42]*	140 *[37]*	120 *[32]*

⚠ **Attention!**
Important notes on page 24!

Characteristic curves: NG16 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

***Δp-q*$_V$ characteristic curves**



Spool	Spool position				Zero position		
	P – A	**P – B**	**A – T**	**B – T**	**P – T**	**A – T**	**B – T**
D, E	1	1	3	3			
F	1	2	5	5	4	3	–
G	4	1	5	5	7	–	–
C, H	1	1	5	6	2	4	4
K, J	2	2	6	6	–	3	–
L	2	2	5	4	–	3	–
M	1	1	3	4			
P	2	1	3	6	5	–	–

Spool	Spool position				Zero position		
	P – A	**P – B**	**A – T**	**B – T**	**P – T**	**A – T**	**B – T**
Q	1	1	6	6			
R	2	4	7	–			
S	3	3	3	–	9	–	–
T	4	1	5	5	7	–	–
U	2	2	3	6			
V, Z	1	1	6	6	10	8	8
W	1	1	3	4			

Performance limits: NG16 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

2-spool-position valves – $q_{V\,max}$ in l/min *[US gpm]*					
Spool	**Operating pressure p_{max} in bar** *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring end position in main valve (at $p_{St\,min}$ = 12 bar *[174 psi]*)					
C, D, K, Y, Z	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*
X external – spring end position in main valve 1)					
C	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*
D, Y	300 *[79]*	270 *[71]*	260 *[68]*	250 *[66]*	230 *[60]*
K	300 *[79]*	250 *[66]*	240 *[63]*	230 *[60]*	210 *[55]*
Z	300 *[79]*	260 *[68]*	190 *[50]*	180 *[47]*	160 *[42]*
X external – hydraulic end position in main valve					
HC, HD, HK, HZ, HY	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*

⚠ Attention!

1) When the specified flow values are exceeded, the function of the return spring can no longer be guaranteed in the event of a pilot pressure failure!

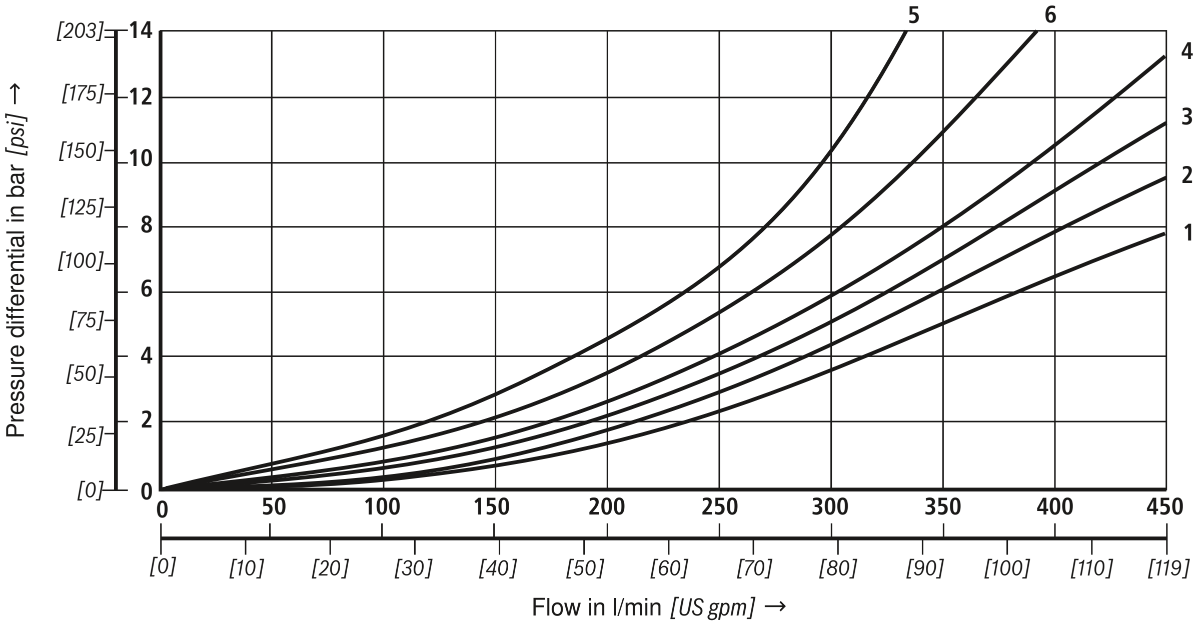
3-spool-position valves – $q_{V\,max}$ in l/min *[US gpm]*					
Spool	**Operating pressure p_{max} in bar** *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring-centered					
E, H, J, L, M, Q, U, W, R	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*
F, P	300 *[79]*	250 *[66]*	180 *[47]*	170 *[45]*	150 *[39]*
G, T	300 *[79]*	300 *[79]*	240 *[63]*	210 *[55]*	190 *[50]*
S	300 *[79]*	300 *[79]*	300 *[79]*	250 *[66]*	220 *[58]*
V	300 *[79]*	250 *[66]*	210 *[55]*	200 *[53]*	180 *[47]*
X external – pressure-centered (at minimum pilot pressure von 16 bar *[232 psi]*)					
All spools 2)	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*	300 *[79]*

2) With spool V, a pilot valve is not required in the case of flows > 160 l/min *[42 US gpm]*.

For further important notes, see page 24!

Characteristic curves: NG25 (type W.H **22**)
(measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

Δp-q$_V$ **characteristic curves**



Spool	**Spool position**				
	P – A	**P – B**	**A – T**	**B – T**	**B – A**
C, E, M, P, Q, U, V, Z	2	2	1	4	–
F	1	2	1	2	–
G, T	2	2	2	4	–
H, J, W, K, D	2	2	1	3	–
L	2	2	1	2	–
R	1	2	1	–	5
B	2	2	–	–	–

Spool	**Zero position**		
	A – T	**B – T**	**P – T**
F	–	–	4
G, P	–	–	6
H	–	–	2
L	4	–	–
T	–	–	5
U	–	6	–

Performance limits: NG25 (type W.H **22**)
(measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

2-spool-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring end position in main valve (at $p_{St\,min}$ = 11 bar / 14 bar *[159 / 203 psi]*)					
C, D, K, Y, Z	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*
X external – spring end position in main valve [1)]					
C	450 *[119]*	450 *[119]*	320 *[84]*	250 *[66]*	200 *[53]*
D, Y	450 *[119]*	450 *[119]*	450 *[119]*	400 *[105]*	320 *[84]*
K	450 *[119]*	215 *[57]*	150 *[39]*	120 *[32]*	100 *[26]*
Z	350 *[92]*	300 *[79]*	290 *[76]*	260 *[68]*	160 *[42]*
X external – hydraulic end position in main valve					
HC, HD, HK, HZ, HY	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*
HC./O…, HD./O…, HK./O…, HZ./O…	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*
HC./OF…, HD./OF…, HK./OF…, HZ./OF…	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*
HC./F…, HD./F…, HK./F…, HZ./F…	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*

3-spool-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring-centered					
E, J, L, M, Q, U, W, R	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*	450 *[119]*
H	450 *[119]*	450 *[119]*	300 *[79]*	260 *[68]*	230 *[61]*
G	400 *[105]*	350 *[92]*	250 *[66]*	200 *[53]*	180 *[47]*
F	450 *[119]*	270 *[71]*	175 *[46]*	130 *[34]*	110 *[29]*
V	450 *[119]*	300 *[79]*	240 *[63]*	220 *[58]*	160 *[42]*
T	400 *[105]*	300 *[79]*	240 *[63]*	200 *[53]*	160 *[42]*
P	450 *[119]*	270 *[71]*	180 *[47]*	170 *[45]*	110 *[29]*

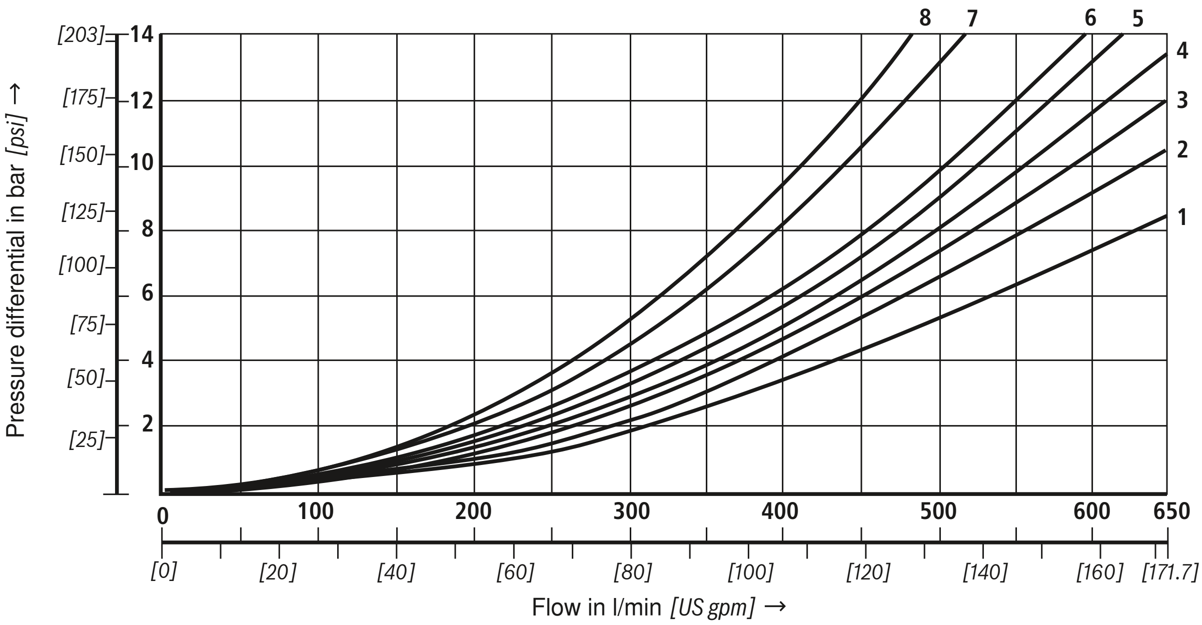
⚠ **Attention!**

[1)] When the specified flow values are exceeded, the function of the return spring can no longer be guaranteed in the event of a pilot pressure failure!

For further important notes, see page 24!

Characteristic curves: NG25 (type W.H **25**)
(measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

***Δp-q$_V$* characteristic curves**



Spool	Spool position			
	P – A	P – B	A – T	B – T
E, C	1	1	1	3
F	1	4	3	3
G	3	1	2	4
H, D	4	4	3	4
J, Q, K	2	2	3	5
L	2	2	3	3
M	4	4	1	4

Spool	Spool position				
	P – A	P – B	A – T	B – T	B – A
P	4	1	1	5	–
R	2	1	1	–	8
U	4	1	1	6	–
V, Z	2	4	3	6	–
W	1	1	1	3	–
T	3	1	2	4	–

7 Spool G central position P – T
8 Spool T central position P – T

Performance limits: NG25 (type W.H **25**)
(measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

2-spool-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring end position in main valve (at $p_{St\,min}$ = 13 bar *[188 psi]*)					
C, D, K, Y, Z	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*
X external – spring end position in main valve [1]					
C	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*
D, Y	700 *[185]*	650 *[172]*	400 *[105]*	350 *[92]*	300 *[79]*
K	700 *[185]*	650 *[172]*	420 *[111]*	370 *[98]*	320 *[84]*
Z	700 *[185]*	700 *[185]*	650 *[172]*	480 *[127]*	400 *[105]*
X external – hydraulic end position in main valve					
HC, HD, HK, HZ, HY	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*
HC./O…, HD./O…, HK./O…, HZ./O…	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*
HC./OF…, HD./OF…, HK./OF…, HZ./OF…	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*
HC./F…, HD./F…, HK./F…, HZ./F…	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*

3-spool-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring-centered					
E, L, M, Q, U, W	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*
G, T	400 *[105]*	400 *[105]*	400 *[105]*	400 *[105]*	400 *[105]*
F	650 *[172]*	550 *[145]*	430 *[113]*	330 *[87]*	300 *[79]*
H	700 *[185]*	650 *[172]*	550 *[145]*	400 *[105]*	360 *[95]*
J	700 *[185]*	700 *[185]*	650 *[172]*	600 *[158]*	520 *[137]*
P	650 *[172]*	550 *[145]*	430 *[113]*	330 *[87]*	300 *[79]*
V	650 *[172]*	550 *[145]*	400 *[105]*	350 *[92]*	310 *[82]*
R	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*	580 *[153]*
X external – pressure-centered (at minimum pilot pressure of 18 bar *[261 psi]*)					
E, F, H, J, L, M, P, Q, R, U, V, W	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*
G, T	400 *[105]*	400 *[105]*	400 *[105]*	400 *[105]*	400 *[105]*
X external – pressure-centered (at pilot pressure > 30 bar *[435 psi]*)					
G, T	700 *[185]*	700 *[185]*	700 *[185]*	700 *[185]*	650 *[172]*

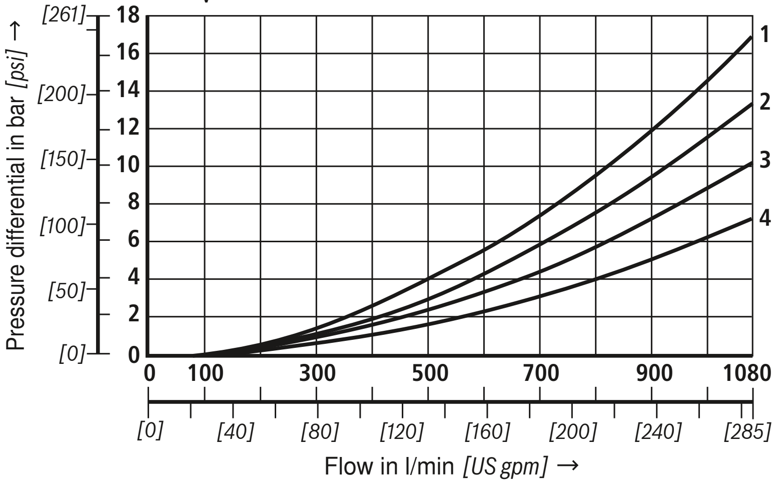
⚠ Attention!

[1] When the specified flow values are exceeded, the function of the return spring can no longer be guaranteed in the event of a pilot pressure failure!

For further important notes, see page 24!

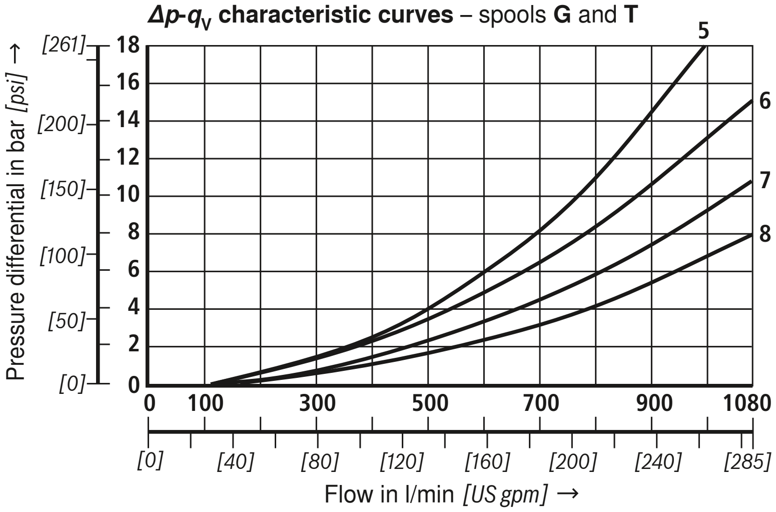
Characteristic curves: NG32 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

***Δp-q*_V characteristic curves** – spools **E**, **R** and **W**



Spool	Spool position				
	P – A	**P – B**	**A – T**	**B – T**	**B – A**
E	4	4	3	2	–
R	4	4	3	–	1
W	4	4	3	2	–

***Δp-q*_V characteristic curves** – spools **G** and **T**



Spool	Spool position				
	P – A	**P – B**	**A – T**	**B – T**	**P – T**
G	7	8	7	5	6
T	7	8	7	5	6

Performance lmits: NG32 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

2-spool-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring end position in main valve (at $p_{St\,min}$ = 10 bar *[145 psi]*)					
C, D, K, Y, Z	1100 *[290]*	1040 *[275]*	860 *[227]*	750 *[198]*	680 *[179]*
X external – spring end position in main valve 1)					
C	1100 *[290]*	1040 *[275]*	860 *[227]*	800 *[211]*	700 *[185]*
D, Y	1100 *[290]*	1040 *[275]*	540 *[142]*	480 *[127]*	420 *[111]*
K	1100 *[290]*	1040 *[275]*	860 *[227]*	500 *[132]*	450 *[119]*
Z	1100 *[290]*	1040 *[275]*	860 *[227]*	700 *[185]*	650 *[172]*
X external – hydraulic end position in main valve					
HC, HD, HK, HZ, HY	1100 *[290]*	1040 *[275]*	860 *[227]*	750 *[198]*	680 *[179]*

3-spool-position valves – $q_{V\,max}$ in l/min *[US gpm]*

Spool	Operating pressure p_{max} in bar *[psi]*				
	70 *[1015]*	**140** *[2030]*	**210** *[3046]*	**280** *[4061]*	**350** *[5076]*
X external – spring-centered					
E, J, L, M, Q, R, U, W	1100 *[290]*	1040 *[275]*	860 *[227]*	750 *[198]*	680 *[179]*
G, T, H, F, P	900 *[238]*	900 *[238]*	800 *[211]*	650 *[172]*	450 *[119]*
V	1100 *[290]*	1000 *[264]*	680 *[179]*	500 *[132]*	450 *[119]*
X external – pressure-centered (at minimum pilot pressure of 8.5 bar *[123 psi]*)					
alle Spool	1100 *[290]*	1040 *[275]*	860 *[227]*	750 *[198]*	680 *[179]*

⚠ **Attention!**

1) When the specified flow values are exceeded, the function of the return spring can no longer be guaranteed in the event of a pilot pressure failure!

For further important notes, see page 24!

Performance lmits: Important notes

General:

⚠ **Attention!**

The specified switching performance limits are valid for operation with two directions of flows (e.g. from P to A and simultaneous return flow from B to T in the ratio of 1:1).

Due to the flow forces acting within the valves, the permissible switching performance limits may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked, with flow in only one direction or different flows)!

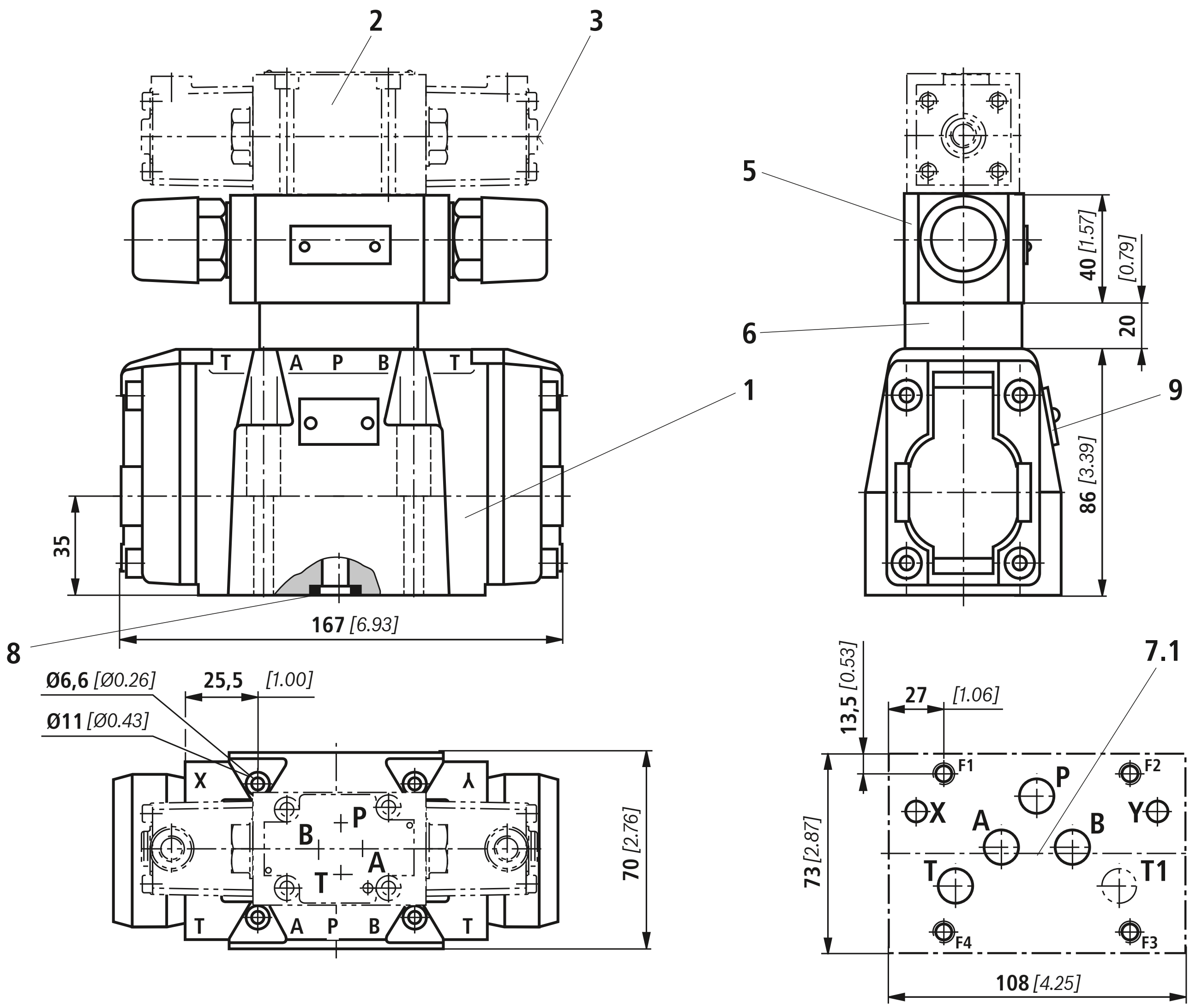
In the case of such applications, please consult us!

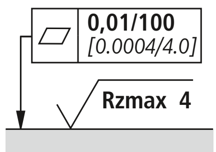
The switching performance limit was established while the solenoids had reached operating temperature, at 10 % undervotlage and without tank pre-loading.

⚠ **Attention!**

NG16	– With **X internal** pilot oil supply, a pre-load valve must be used at flows < 160 l/min *[42 US gpm]* due to the negative overlap of spools C, Z and HC, HZ. – When 4/3 directional valves with pressure-centered control spool in the main valve are operated beyond the specified performance limit, a higher pilot pressure is required. At, for example, an operating pressure of $\boldsymbol{p}_{\text{max}}$ = 350 bar *[5076 psi]* and a flow of $\boldsymbol{q}_{\text{V}}$ = 300 l/min *[79 US gpm]* a pilot pressure of 16 bar *[232 psi]* is required. The maximum flow for these valves therefore only depends on the $\boldsymbol{\Delta p}$ value, which is acceptable for the system. – With **X internal** pilot oil supply, a pre-load valve must generally be used (see page 35) due to the negative overlap of spools F, G, H, J, P, S, and T.
NG25	– With **X internal** pilot oil supply, a pre-load valve must be used at flows < 180 l/min *[47.5 US gpm]* due to the negative overlap of spools Z, HZ, and V. – With **X internal** pilot oil supply, a pre-load valve must generally be used due to the negative overlap of spools C, HC, F, G, H, P, and T.
NG32	– With **X internal** pilot oil supply, a pre-load valve must be used at flows < 180 l/min *[47.5 US gpm]* due to the negative overlap of spools Z, HZ, and V. – When 4/3 directional valves with pressure-centered control spool in the main valve are operated beyond the specified performance limit, a higher pilot pressure is required. At, for example, an operating pressure of $\boldsymbol{p}_{\text{max}}$ = 350 bar *[5076 psi]* and a flow of $\boldsymbol{q}_{\text{V}}$ = 1100 l/min *[290 US gpm]* a pilot pressure of 15 bar *[217 psi]* is required. The maximum flow for these valves therefore only depends on the $\boldsymbol{\Delta p}$ value, which is acceptable for the system. – With **X internal** pilot oil supply, a pre-load valve must generally be used due to the negative overlap of spools C, HC, F, G, H, P and T.

Unit dimensions: NG10 (dimensions in mm *[inch]*)

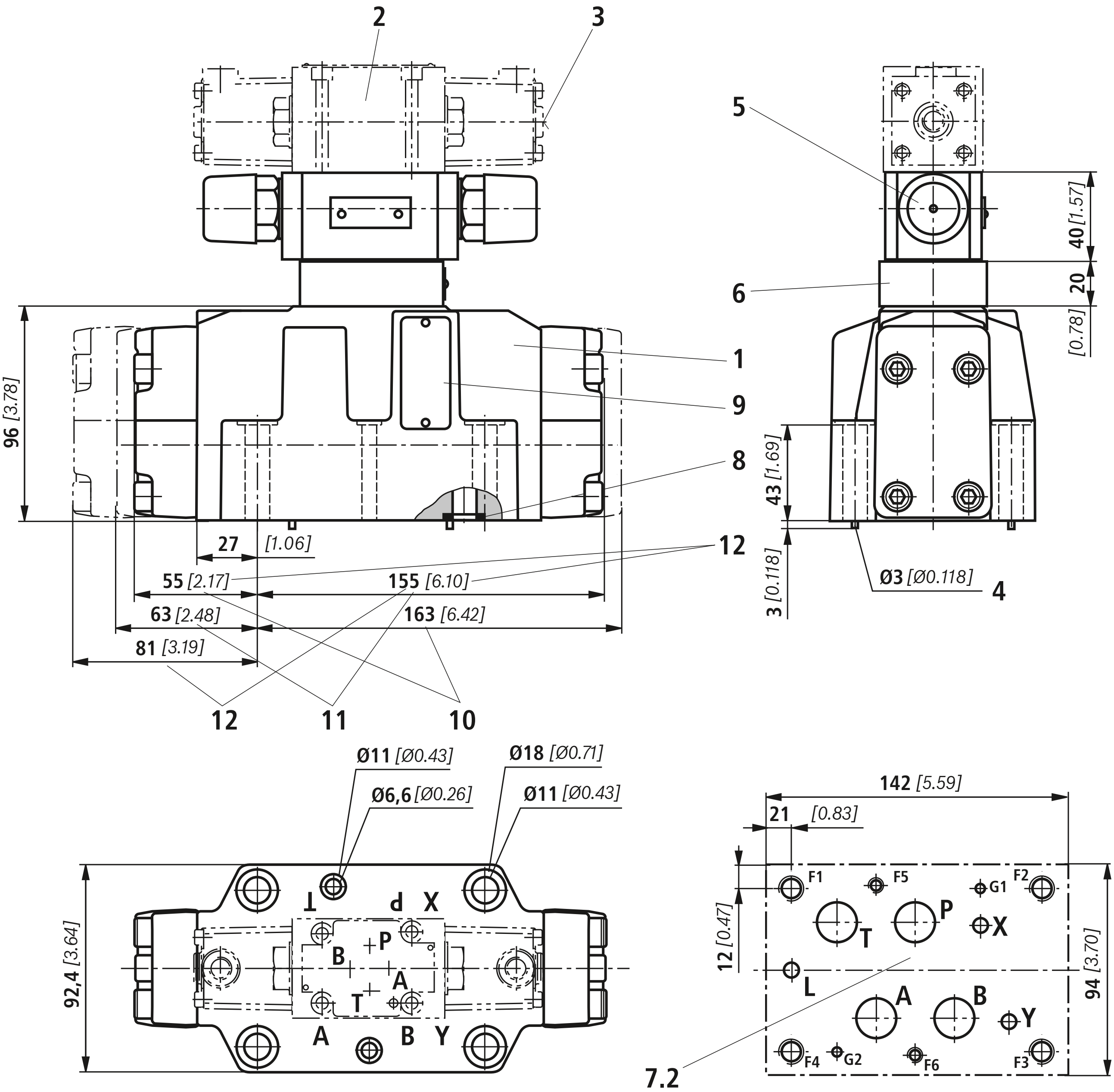


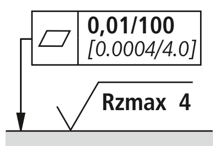


Required surface quality
of valve mounting face

For explanations of items and subplates, see page 30.
For valve mounting screws, see page 31.

Unit dimensions: NG16 (dimensions in mm *[inch]*)

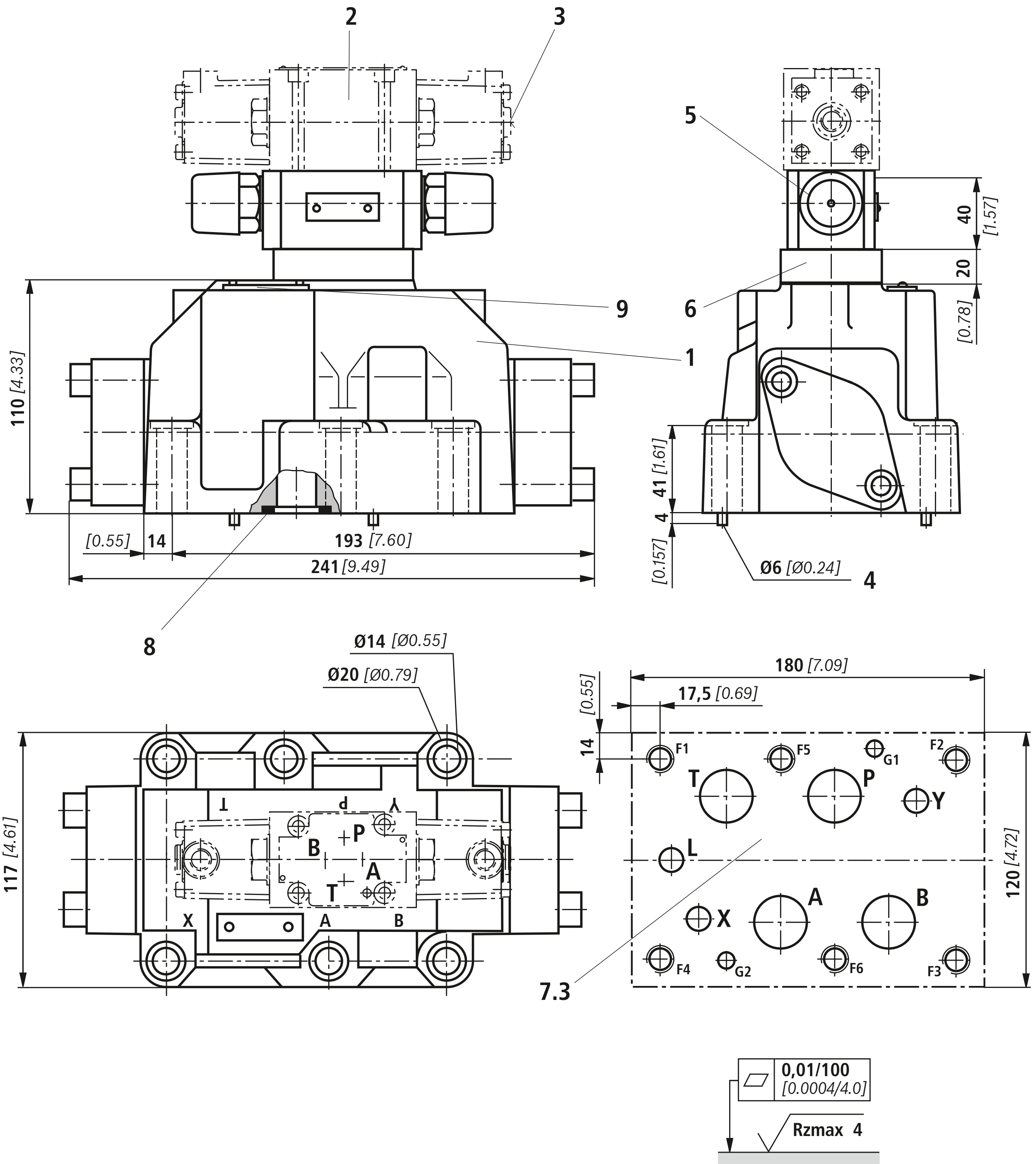




Required surface quality
of valve mounting face

For explanations of items and subplates, see page 30.
For valve mounting screws, see page 31.

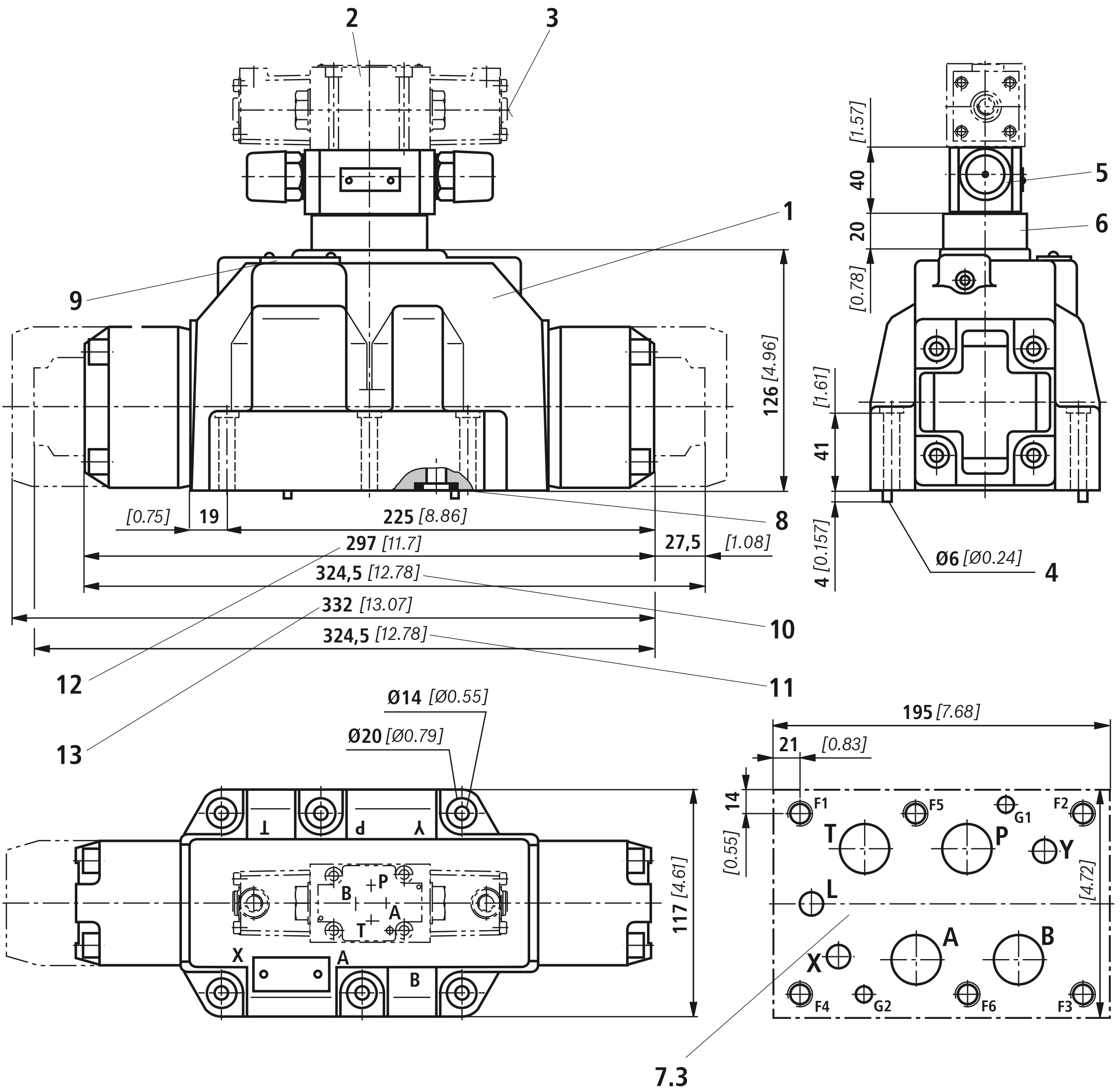
Unit dimensions: NG25 (type W.H **22**) (dimensions in mm *[inch]*)

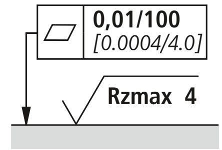


Required surface quality of valve mounting face

For explanations of items and subplates, see page 30.
For valve mounting screws, see page 31.

Unit dimensions: NG25 (type W.H **25**) (dimensions in mm *[inch]*)

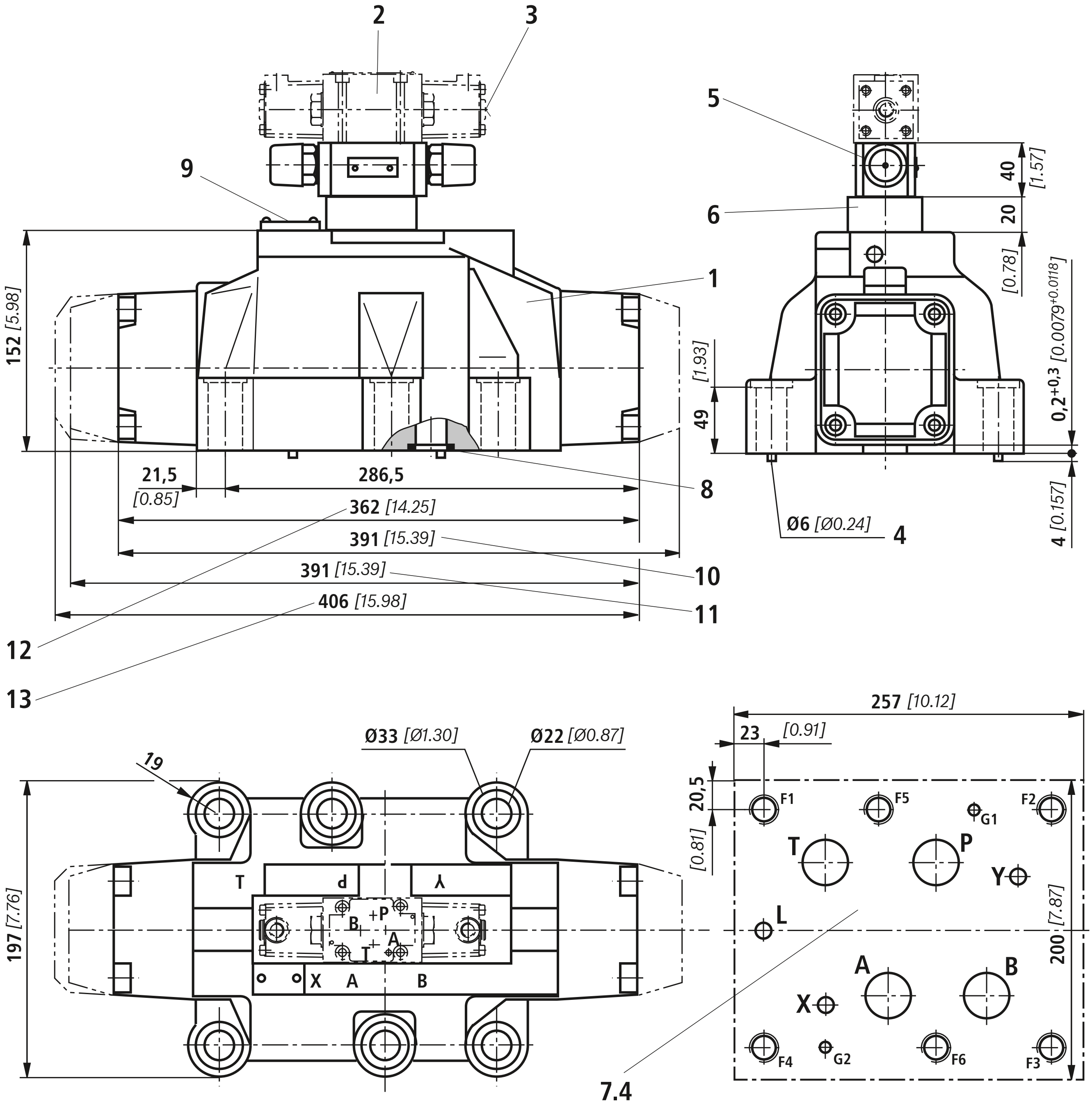


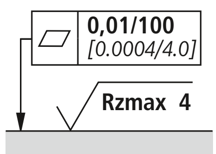


Required surface quality
of valve mounting face

For explanations of items and subplates, see page 30.
For valve mounting screws, see page 31.

Unit dimensions: NG32 (dimensions in mm *[inch]*)





Required surface quality
of valve mounting face

For explanations of items and subplates, see page 30.
For valve mounting screws, see page 31.

Unit dimensions

1 Main valve

2 Pilot valve:
For unit dimensions, see basic data sheets
– Types WPH and WHH: RE 22282
– Type WM.H: RE 22280

3 Manual override “N“, optional
(type WPH only)
– The manual override can only be operated up to a tank pressure of ca. 50 bar. Avoid damage to the bore for the manual override! (Special tool for actuation, separate order, Material no. **R900024943**).

4 Locating pin

5 Switching time adjustment (6 A/F), optional

6 Pressure reducing valve, optional

7.1 Machined valve mounting face; porting pattern to ISO 4401-05-05-0-05 and NFPA T3.5.1 R2-D05

7.2 Machined valve mounting face; porting pattern to ISO 4401-07-07-0-05 and NFPA T3.5.1 R2-D07

7.3 Machined valve mounting face; porting pattern to ISO 4401-08-08-0-05 and NFPA T3.5.1 R2-D08

7.4 Machined valve mounting face; porting pattern to ISO 4401-10-09-0-05 and NFPA T3.5.1 R2-D10

8 Seal rings

9 Nameplate of complete valve

10 2-spool-position valves with spring end position in main valve (spool symbols A, C, D)

11 2-spool-position valves with spring end position in main valve (spool symbols B, Y)

12 3-spool-position valves, spring-centered;
2-spool-position valves with hydraulic end position in main valve

13 3-spool-position valves, pressure-centered

Subplates (separate order)

– NG10 (to data sheet RE 45054)
- **Without** ports X, Y: G 534/01 (G3/4)
  G 534/12 (SAE-12; 1 1/16-12) [1)]
- **With** ports X, Y: G 535/01 (G3/4)
  G 536/01 (G1)
  G 535/12 (SAE-12; 1 1/16-12) [1)]
  G 536/12 (SAE-16; 1 5/16-12) [1)]

– NG16 (to data sheet RE 45056)
G 172/01 (G3/4)
G 172/02 (M27 x 2)
G 174/01 (G1)
G 174/02 (M33 x 2)
G 174/08 (flange)
G 172/12 (SAE-12; 1 1/16-12) [1)]
G 174/12 (SAE-16; 1 5/16-12) [1)]

– NG25 (type W.H 22 to data sheet RE 45058)
G 151/01 (G1)
G 154/01 (G1 1/4)
G 156/01 (G1 1/2)
G 155/12 (SAE-16; 1 5/16-12) [1)]
G 154/12 (SAE-20; 1 5/8-20) [1)]
G 156/12 (SAE-24; 1 7/8-20) [1)]

– NG25 (type W.H 25 to data sheet RE 45058)
G 151/01 (G1)
G 153/01 (G1), for valves with pressure-centered zero position
G 154/01 (G1 1/4)
G 154/08 (flange)
G 156/01 (G1 1/2)
G 153/12 (SAE-16; 1 5/16-12) [1)]
G 154/12 (SAE-20; 1 5/8-20) [1)]
G 156/12 (SAE-24; 1 7/8-20) [1)]

– NG32 (to data sheet RE 45060)
G 157/01 (G1 1/2)
G 157/02 (M48 x 2)
G 158/10 (flange)
G 157/12 (SAE-24; 1 7/8-12) [1)]

[1)] on request

For valve mounting screws, see page 31.

Unit dimensions

Valve mounting screws (separate order)

– NG10:
4 hexagon socket head cap screws, metric
ISO 4762 - M6 x 45 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 12.5 Nm *[9.2 ft-lbs]* ±10%,
Material no. **R913000258**

4 hexagon socket head cap screws, UNC
1/4-20 UNC x 1 3/4” ASTM-A574
on request

– NG16:
4 hexagon socket head cap screws, metric
ISO 4762 - M10 x 60 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 75 Nm *[55.3 ft-lbs]* ±10%,
Material no. **R913000116**

2 hexagon socket head cap screws, metric
ISO 4762 - M6 x 60 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 12.5 Nm *[9.2 ft-lbs]* ±10%,
Material no. **R913000115**

4 hexagon socket head cap screws, UNC
3/8-16 UNC x 2 1/4” ASTM-A574
on request

2 hexagon socket head cap screws, UNC
1/4-20 UNC x 2 1/4” ASTM-A574
on request

– NG25:
6 hexagon socket head cap screws, metric
ISO 4762 - M12 x 60 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 130 Nm *[95.9 ft-lbs]* ±10%,
Material no. **R913000121**

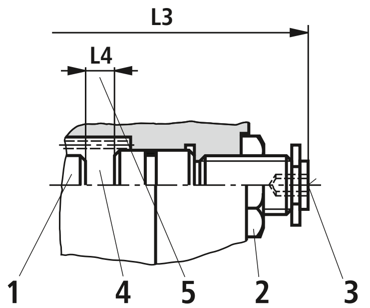
6 hexagon socket head cap screws, UNC
1/2-13 UNC x 2 1/2” ASTM-A574
on request

– NG32:
6 hexagon socket head cap screws, metric
ISO 4762 - M20 x 80 - 10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 430 Nm *[317.2 ft-lbs]* ±10%,
Material no. **R901035246**

6 hexagon socket head cap screws, UNC
3/4-10 UNC x 3 1/4” ASTM-A574
on request

Stroke adjustment, mounting options (dimensions in mm *[inch]*)

The stroke adjustment feature limits the stroke of control spool (1). To shorten the spool stroke, loosen locknut (2) and turn adjustment spindle (3) clockwise. During this, pressure chamber (4) must be pressureless.

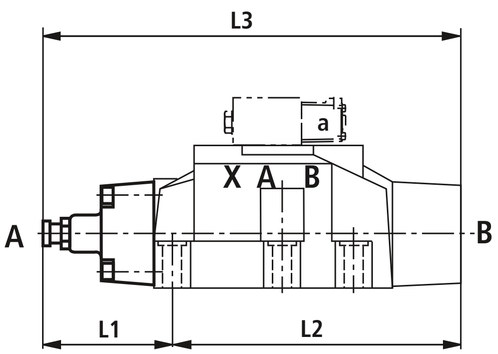


NG	L4
10	6.5 *[0.26]*
16	10 *[0.39]*
25 (type 4W.H 22)	9.5 *[0.37]*
25 (type 4W.H 25)	12.5 *[0.49]*
32	15 *[0.59]*

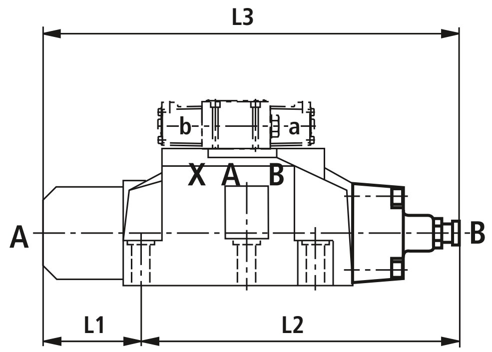
For further dimensions see below and page 33.

5 Adjustment range
- NG10:
  1 turn = 1 mm *[0.0394 inch]* adjustment travel
- NG16 to 32:
  1 turn = 1.5 mm *[0.0591 inch]* adjustment travel

Stroke limitation on side A



Stroke limitation on side B



Mounting options	Ordering code	NG	3-spool-position valve [1] Spring-centered L1	Spring-centered L2	Spring-centered L3	Pressure-centered L1	Pressure-centered L2	Pressure-centered L3
Stroke adjustment on valve sides A and B	**10**	10	90 *[3.54]*	144 *[5.67]*	234 *[9.21]*			
		16	100 *[3.94]*	200 *[7.87]*	300 *[11.81]*			
		25 [1]	96 *[3.77]*	241 *[9.49]*	337 *[13.27]*			
		25 [2]	123 *[4.84]*	276 *[10.87]*	399 *[15.71]*			
		32	133 *[5.24]*	344 *[13.54]*	477 *[18.78]*			
Stroke adjustment on valve side A	**11**	10	90 *[3.54]*	106 *[4.17]*	196 *[7.72]*			
		16	100 *[3.94]*	156 *[6.14]*	256 *[10.08]*			
		25 [1]	96 *[3.77]*	193 *[7.60]*	289 *[11.38]*			
		25 [2]	123 *[4.84]*	225 *[8.86]*	348 *[13.70]*			
		32	133 *[5.24]*	287 *[11.30]*	420 *[16.54]*			
Stroke adjustment on valve side B	**12**	10	52 *[2.05]*	144 *[5.67]*	196 *[7.72]*	–	–	–
		16	56 *[2.20]*	200 *[7.87]*	256 *[10.08]*	81 *[3.19]*	200 *[7.87]*	281 *[11.06]*
		25 [1]	48 *[1.89]*	241 *[9.49]*	289 *[11.38]*	–	–	–
		25 [2]	72 *[2.83]*	276 *[10.87]*	348 *[13.70]*	107 *[4.21]*	276 *[10.87]*	283 *[11.14]*
		32	76 *[2.99]*	344 *[13.54]*	420 *[16.54]*	120 *[4.72]*	344 *[13.54]*	464 *[18.27]*

[1] With spool symbol A, only version “11“ possible, with spool symbol B, only version “12“.

Stroke adjustment, mounting options (dimensions in mm *[inch]*)

Mounting options	Ordering code	NG	2-spool-position valve								
			Spring end position						Hydraulic end position		
			C, D, K, Z			B, Y			HC, HD, HY, HK, HZ		
			L1	**L2**	**L3**	**L1**	**L2**	**L3**	**L1**	**L2**	**L3**
Stroke adjustment on valve sides A and B	**10**	10	–	–	–	–	–	–	90 *[3.54]*	144 *[5.67]*	234 *[9.21]*
		16	–	–	–	–	–	–	100 *[3.94]*	200 *[7.87]*	300 *[11.81]*
		25 1)	96 *[3.78]*	241 *[9.49]*	337 *[13.27]*	96 *[3.78]*	241 *[9.49]*	337 *[13.27]*	96 *[3.78]*	241 *[9.49]*	337 *[13.27]*
		25 2)	–	–	–	–	–	–	123 *[4.84]*	276 *[10.87]*	399 *[15.71]*
		32	–	–	–	–	–	–	133 *[5.24]*	344 *[13.54]*	477 *[18.78]*
Stroke adjustment on valve side A	**11**	10	90 *[3.54]*	106 *[4.17]*	196 *[7.72]*	–	–	–	90 *[3.54]*	106 *[4.17]*	196 *[7.72]*
		16	100 *[3.94]*	180 *[7.09]*	280 *[11.02]*	–	–	–	100 *[3.94]*	156 *[6.14]*	256 *[10.08]*
		25 1)	96 *[3.78]*	193 *[7.60]*	289 *[11.38]*	96 *[3.78]*	193 *[7.60]*	289 *[11.38]*	96 *[3.78]*	193 *[7.60]*	289 *[11.38]*
		25 2)	123 *[4.84]*	253 *[9.96]*	376 *[14.8]*	–	–	–	123 *[4.84]*	225 *[8.86]*	348 *[13.70]*
		32	133 *[5.24]*	316 *[12.44]*	449 *[17.68]*	–	–	–	133 *[5.24]*	287 *[11.30]*	420 *[16.53]*
Stroke adjustment on valve side B	**12**	10	–	–	–	52 *[2.05]*	144 *[5.67]*	196 *[7.72]*	52 *[2.05]*	144 *[5.67]*	196 *[7.72]*
		16	–	–	–	80 *[3.15]*	200 *[7.87]*	280 *[11.02]*	56 *[2.21]*	200 *[7.87]*	256 *[10.08]*
		25 1)	48 *[1.89]*	241 *[9.49]*	289 *[11.38]*	48 *[1.89]*	241 *[9.49]*	289 *[11.38]*	48 *[1.89]*	241 *[9.49]*	289 *[11.38]*
		25 2)	–	–	–	100 *[3.94]*	276 *[10.87]*	376 *[14.80]*	72 *[2.84]*	276 *[10.87]*	348 *[13.70]*
		32	–	–	–	105 *[4.13]*	344 *[13.54]*	449 *[17.68]*	76 *[2.99]*	344 *[13.54]*	420 *[16.53]*

1) Type 4W.H 22

2) Type 4W.H 25

Switching time adjustment

The switching time of main valve (1) can be influenced by using a double throttle check valve (2) (type Z2FS 6 to data sheet RE 27506).

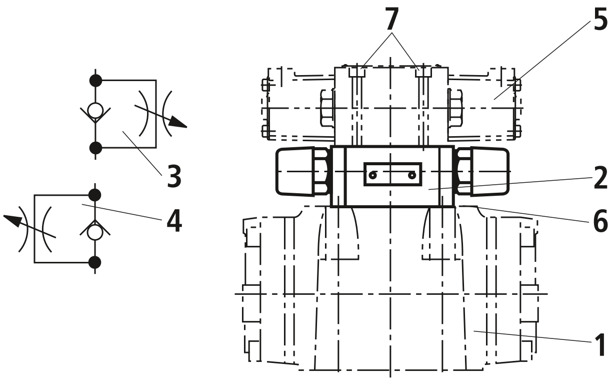
Conversion of meter-in (3) into meter-out control (4):

Remove pilot valve (5) – plate (6) for accommodating the seal rings remains in place – turn switching time adjustment feature (2) around its longitudinal axis and put it down again, remount pilot valve (5) .

Tightening torque of screws (7) M_T = 9 Nm *[6.6 ft-lbs]*.

⚠ Attention!

The conversion may only be carried out by authorized specialists or in the factory!



Type 4W.H 10 ..4X/…S
Type 4W.H 10 ..4X/…S2

Pressure reducing valve “D3“

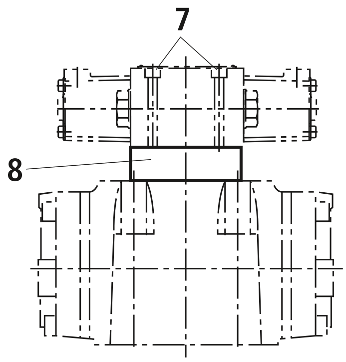
Pressure reducing valve (8) must be used in the case of pilot pressures above 250 bar *[3626 psi]* (with type 4W.H 22 …: 210 bar *[3046 psi]*) and version “H-“.

The secondary pressure is held constant at 45 bar *[652 psi]*.

⚠ Attention!

When a pressure reducing valve “D3“ (8) is used, a throttle insert “B10“ must be provided in the P channel of the pilot valve.

Tightening torque of screws (7) M_T = 9 Nm *[6.6 ft-lbs]*.



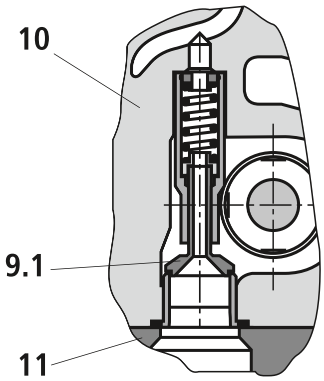
Type 4W.H 10 ..4X/…/..D3

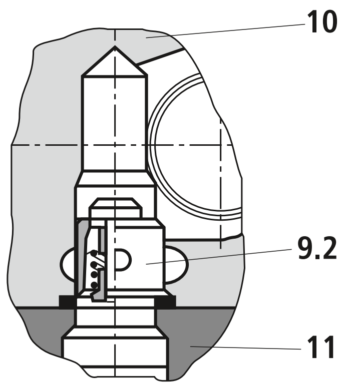
Pre-load valve (not for NG10)

For valves with pressureless circulation and internal pilot oil supply, a pre-load valve (9) must be installed in channel P of the main valve to build up the minimum pilot pressure.

The pressure differential of the pre-load valve must be added to the pressure differential of the main valve (see characteristic curves) to obtain a total value.

The cracking pressure is ca. 4.5 bar *[65 psi]*.

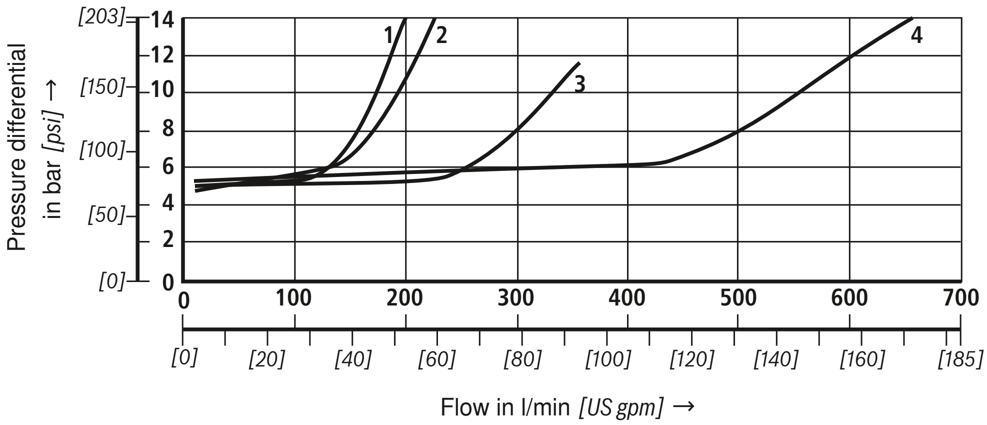




9.1 Pre-load valve NG16
9.2 Pre-load valve NG25 and NG32
10 Main valve
11 Subplate

Type	Marerial number P4,5
4W.H **16** …	R901002365
4W.H **22** …	R900315596
4W.H **25** …	R900303717
4W.H **32** …	R900317066

***Δp–q_V* characteristic curve** (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)



1 **NG16**
2 **NG25** (type 4W.H **25** …)
3 **NG25** (type 4W.H **22** …)
4 **NG32**

Notes

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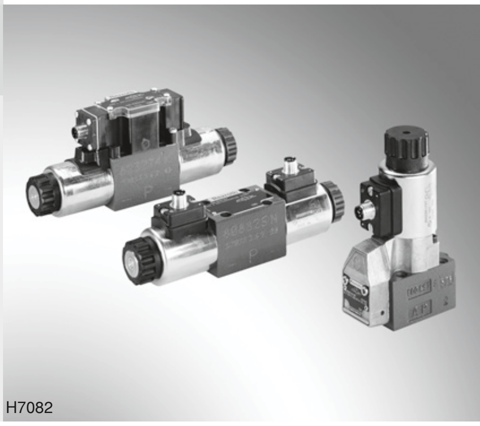
Rexroth
Bosch Group

Directional spool and seat valves with electrical actuation and M12x1 plug-in connection

RE 08010/10.09
Replaces: 07.07

Type WE, SED and SEW

Size 6 and 10



H7082

Table of contents

Features

– with individual connection directly on the solenoid coil
– with central connection at the housing
– Integrated operating display with light-emitting diodes (LED)
– Integrated interference protection circuit (suppressor diode)
– Electrical power consumption 8 and 30 Watt
– Function version according to ANSI

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code, available versions

Note!

The type designation information in the following tables that is printed in bold is the ordering code for the electrical connection. Points (...) in the listed type designations mark information that is to be amended. This information is to be taken from the ordering code of the respective basic data sheet.

Valves with M12x1 plug-in connection are only available with 24 V DC solenoids. Apart from that, there are no other limitations.

3/2, 4/2 and 4/3 directional spool valves

Type		Features	Basic data sheet
High-performance version	Reduced power consumption		
.WE 6 .6X/.EG24.**K72L**…		Individual connection 5-pole, integrated interference protection circuit, operating display with light-emitting diode	23178, 23183 [1)]
.WE 6 .6X/.EG24.**K73L**…		Individual connection 5-pole (no connection pin 1 to pin 2), integrated interference protection circuit, operating display with light-emitting diode	23178, 23183 [1)]
.WE 6 .6X/.EG24.**DK24L**…		Central connection 4-pole	23178, 23183 [1)]
.WE 6 .6X/.EG24.**DK35L**…		Central connection 4-pole, integrated interference protection circuit, operating display with light-emitting diode	23178, 23183 [1)]
	.WE 6 .6X/.EG24N9**K72L**/...SO407	Individual connection 5-pole, integrated interference protection circuit, operating display with light-emitting diode	23178-00
	.WE 6 .6X/.EG24N9**K73L**/...SO407	Individual connection 5-pole (no connection pin 1 to pin 2), integrated interference protection circuit, operating display with light-emitting diode	23178-00
	.WE 6 .6X/.EG24N9**DK35L**/...SO407	Central connection 4-pole, integrated interference protection circuit, operating display with light-emitting diode	23178-00
.WE 10 .3X/.CG24.**K72L**…		Individual connection 5-pole, integrated interference protection circuit, operating display with light-emitting diode	23327, 23183 [1)]
.WE 10 .4X/.CG24.**DK24L**…		Central connection 4-pole	23327, 3183 [1)]
.WE 10 .4X/.CG24.**DK35L**…		Central connection 4-pole, integrated interference protection circuit, operating display with light-emitting diode	23327, 23183 [1)]
5-.WE 10 .3X/.CG24.**K72L**…		Individual connection 5-pole, integrated interference protection circuit, operating display with light-emitting diode	23351

[1)] Smoothly switching

Ordering code, available versions

2/2, 3/2 and 4/2 directional seat valves

Type		Features	Basic data sheet
High-performance version	Reduced power consumption		
M-.SED 6 .1X/350CG24.**K72L**…		Individual connection 5-pole, integrated interference protection circuit, operating display with light-emitting diode	22049
M-.SED 10 .1X/350CG24.**K72L**…		Individual connection 5-pole, integrated interference protection circuit, operating display with light-emitting diode	22045
M-.SEW 6 .3X/420MG24.**K72L**…		Individual connection 5-pole, integrated interference protection circuit, operating display with light-emitting diode	22058
	M-.SEW 6 .3X/420MG24N9**K72L** SO407	Individual connection 5-pole, integrated interference protection circuit, operating display with light-emitting diode	22058 [2)]
M-.SEW 10 .1X/420MG24.**K72L**…		Individual connection 5-pole, integrated interference protection circuit, operating display with light-emitting diode	22075

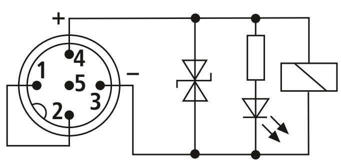
[2)] No separate basic data sheet for version “SO407” available. Please use data sheet 22058.

Electrical connections

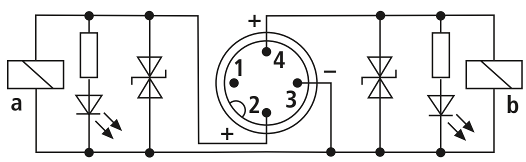
Individual connection

Central connection

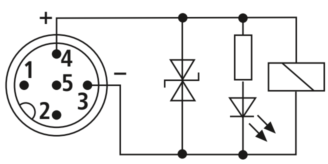
“K72L”



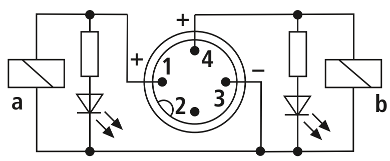
“DK35L”



“K73L”



“DK24L”



Pin 5 without function

☞ **Note!**

With version “DK24L”, voltage peaks result when the solenoid coil (inductivity) is switched off, which may cause failures or damage in the connected control electronics. For limiting these voltage peaks, a protection circuit must be provided.

Technical data: Type .WE 6 .6X/.EG24.(D)K…
(For applications of the component outside the specified values, please contact us!)

hydraulic

			High performance version (also smoothly switching)	Reduced power consumption "SO407"
Maximum operating pressure	– Port A, B, P	bar *[psi]*	350 *[5076]*	315 *[4569]*
	– Port T	bar *[psi]*	210 *[3046]*	210 *[3046]*
Maximum flow		l/min *[US gpm]*	80 *[21.1]*	60 *[15.9]*
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524 [1]; fast bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids upon request	

electrical

M12x1 plug-in connections [3]			K72L, K73L, DK24L, DK35L	K72L, K73L, DK35L
Available voltages [4]		V	24	
Switch-off voltage peak limited	– K72L, K73L, DK35L	V	–44 to –55	–44 to –55
	– DK24L	V	without limitation	–
Voltage tolerance (nominal voltage)		%	±10	
Power consumption		W	30	8
Duty cycle			S1 (continuous operation)	
Switching time according to ISO 6403	– Standard ON	ms	25 to 45	up to 60
	– Smoothly switching ON	ms	3 to 4 times longer than standard	–
	– Standard OFF	ms	10 to 25	up to 30
	– Smoothly switching OFF	ms	3 to 4 times longer than standard	–
Maximum switching frequency	– Standard	1/h	15000	7200
	– Smoothly switching	1/h	7200	–
Protection class according to DIN EN 60529			IP 65 [5]	
Protection class according to DIN EN 61140			III	
Maximum coil temperature [6]		°C *[°F]*	150 *[302]*	110 *[230]*

1) Suitable for NBR and FKM seals

2) Only suitable for FKM seals

3) Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006

4) Connection only to functional low voltage with safe insulation = PELV/SELV

5) Only when using the mating connectors specified by us and with correct assembly

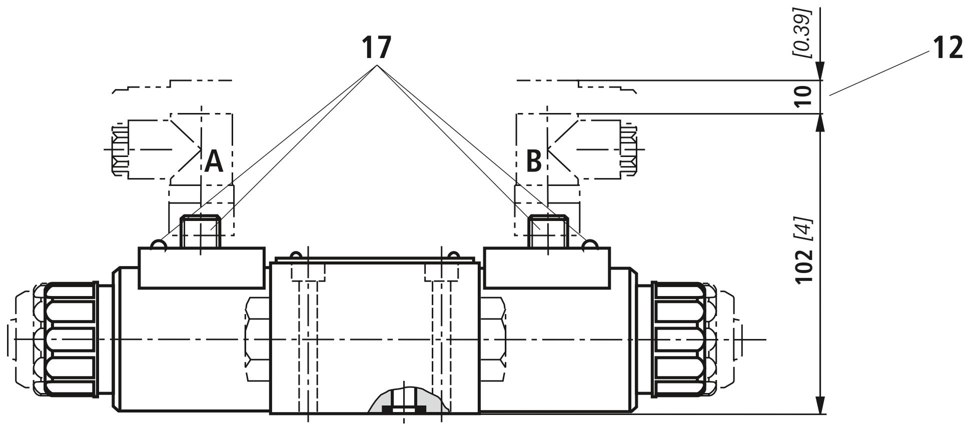
6) Due to the surface temperatures of the solenoid coils, the standards ISO 13732-1 and 982 need to be adhered to!

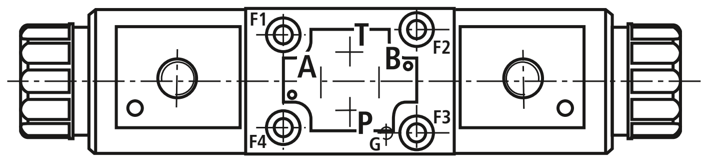
Note!

For more information, please refer to the corresponding basic data sheet.

Valve versions with electrical individual connection "**K…**" or central connection "**DK…**" and related basic data sheets see page 2.

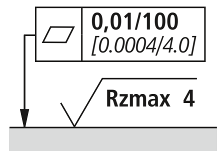
Unit dimensions: Type .WE 6 .6X/.EG24.**K...** – Individual connection (dimensions in mm *[inch]*)





12 Space required for removing the mating connector

17 M12x1 plug-in connection with operating display LED (Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006);
Electrical connections “K72L” and “K73L” see page 3



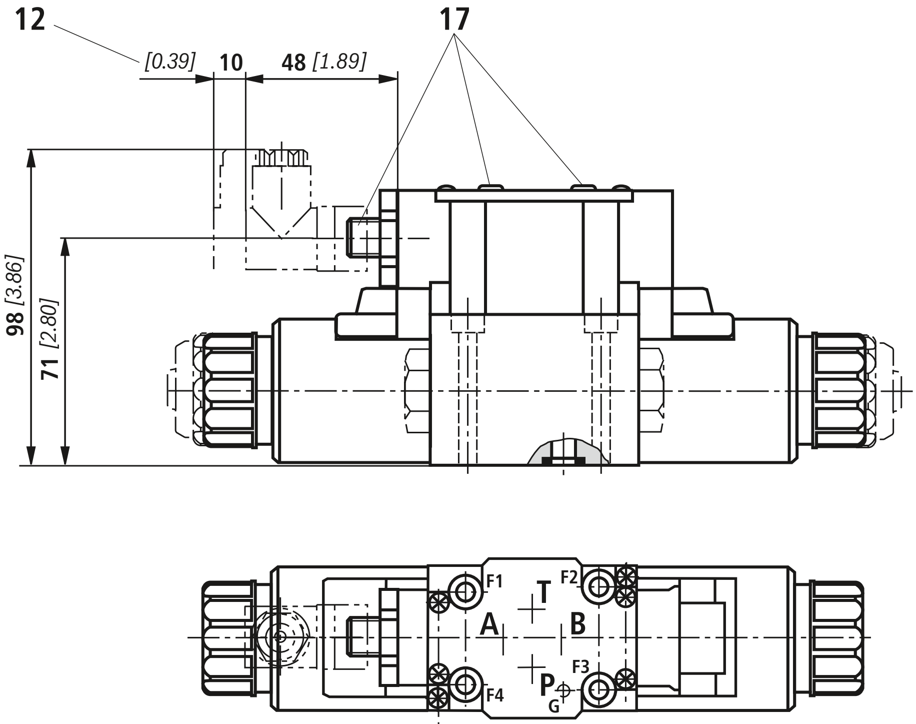
Required surface quality of the valve mounting face

☞ **Note!**

For missing **dimensions**, **position explanations, valve mounting screws** and **subplates**, please refer to the respective basic data sheet:

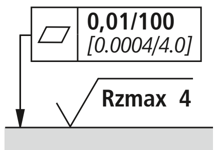
- 23178 (standard valve)
- 23183 (smoothly switching)
- 23178-00 (reduced power consumption)

Unit dimensions: Type .WE 6 .6X/.EG24.**DK…** – Central connection (dimensions in mm *[inch]*)



12 Space required for removing the mating connector

17 M12x1 plug-in connection with operating display LED (Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006);
Electrical connections “DK35L” and “DK24L” see page 3



Required surface quality of the valve mounting face

☞ **Note!**

For missing **dimensions**, **position explanations, valve mounting screws** and **subplates**, please refer to the respective basic data sheet:

– 23178 (standard valve)
– 23183 (smoothly switching)
– 23178-00 (reduced power consumption)

Technical data: Type (5-).WE 10 .3X/.CG24.(D)K…
(For applications of the component outside the specified values, please contact us!)

hydraulic

Maximum operating pressure	– Port A, B, P	bar *[psi]*	315 *[4569]*
	– Port T	bar *[psi]*	210 *[3046]*
Maximum flow		l/min *[US gpm]*	120 *[31.7]*
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524 [1]; fast bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids upon request

electrical

			Type .WE 10 …(D)K… (also smoothly switching)	Type 5-.WE 10 …K… (5-chamber version)
M12x1 plug-in connections [3]			K72L, DK24L, DK35L	K72L
Available voltages [4]		V	24	
Switch-off voltage peak limited	– K72L, DK35L	V	–44 to –55	–44 to –55
	– DK24L	V	without limitation	–
Voltage tolerance (nominal voltage)		%	±10	
Power consumption		W	35	
Duty cycle			S1 (continuous operation)	
Switching time according to ISO 6403	– Standard ON	ms	45 to 60	45 to 75
	– Smoothly switching ON	ms	3 to 4 times longer than standard	–
	– Standard OFF	ms	20 to 30	35 to 45
	– Smoothly switching OFF	ms	3 to 4 times longer than standard	–
Maximum switching frequency	– Standard	1/h	15000	15000
	– Smoothly switching	1/h	7200	–
Protection class according to DIN EN 60529			IP 65 [5]	
Protection class according to DIN EN 61140			III	
Maximum coil temperature [6]		°C *[°F]*	150 *[302]*	110 *[230]*

[1] Suitable for NBR and FKM seals

[2] Only suitable for FKM seals

[3] Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006

[4] Connection only to functional low voltage with safe insulation = PELV/SELV

[5] Only when using the mating connectors specified by us and with correct assembly

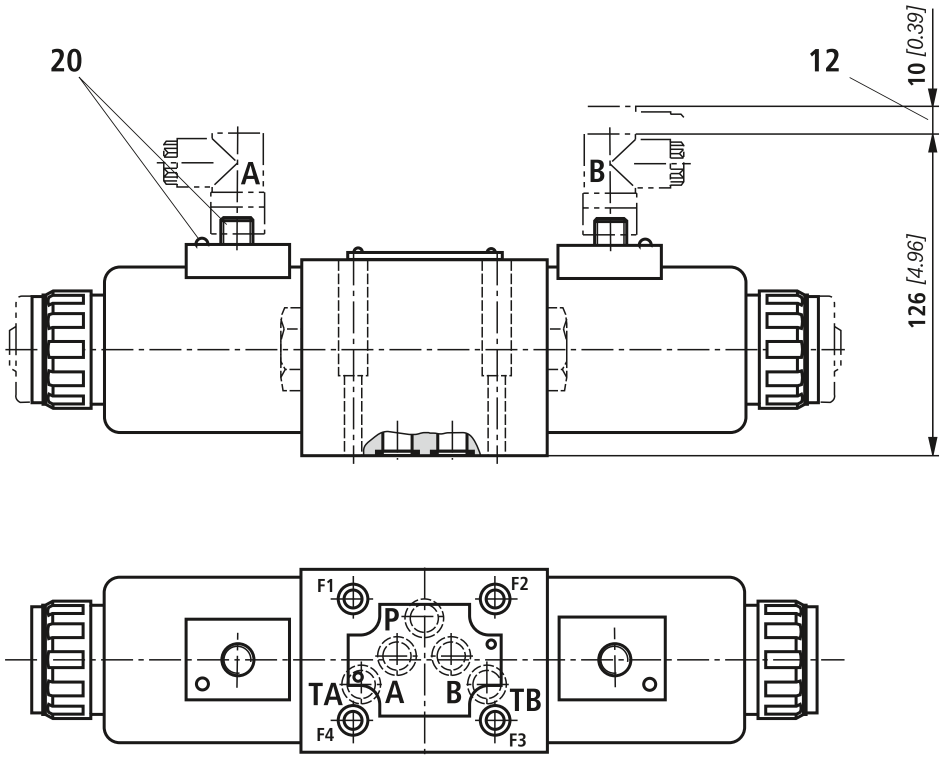
[6] Due to the surface temperatures of the solenoid coils, the standards ISO 13732-1 and 982 need to be adhered to!

Note!

For more information, please refer to the corresponding basic data sheet.

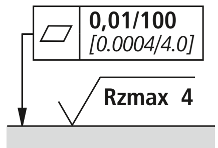
Valve versions with electrical individual connection "**K…**" or central connection "**DK…**" and related basic data sheets see page 2.

Unit dimensions: Type .WE 10 .3X/.CG24.**K72L…** – Individual connection (dimensions in mm *[inch]*)



12 Space required for removing the mating connector

20 M12x1 plug-in connection with operating display LED (Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006);
Electrical connection “K72L” see page 3



Required surface quality of the valve mounting face

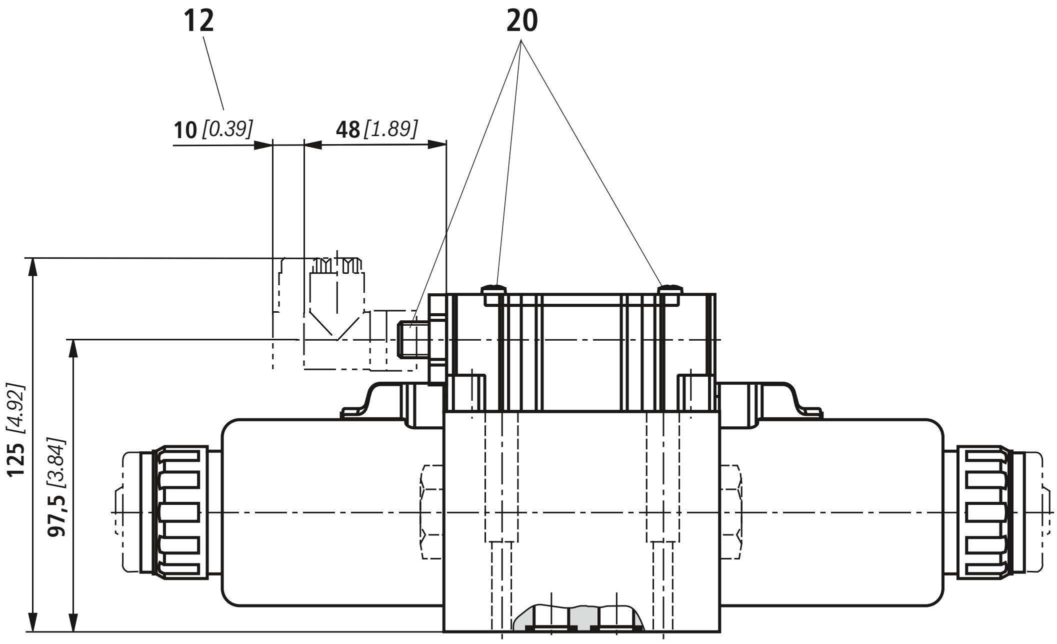
☞ **Note!**

For missing **dimensions**, **position explanations, valve mounting screws** and **subplates**, please refer to the respective basic data sheet:

– 23327 (standard valve)

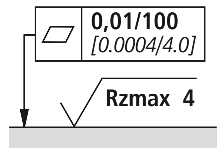
– 23183 (smoothly switching)

Unit dimensions: Type .WE 10 .4X/.CG24.**DK…** – Central connection (dimensions in mm *[inch]*)



12 Space required for removing the mating connector

20 M12x1 plug-in connection with operating display LED (Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006);
Electrical connections “DK35L” and “DK24L” see page 3



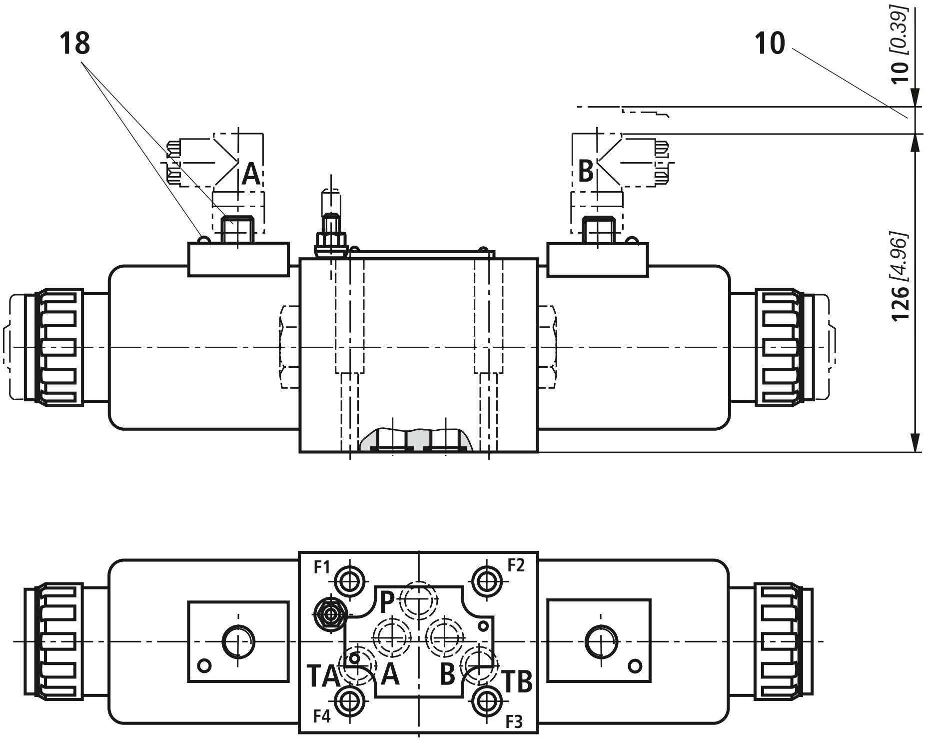
Required surface quality of the valve mounting face

Note!

For missing **dimensions**, **position explanations, valve mounting screws** and **subplates**, please refer to the respective basic data sheet:

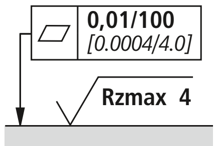
- 23327 (standard valve)
- 23183 (smoothly switching)

Unit dimensions: Type 5-.WE 10 .3X/.CG24.**K72L...** – Individual connection (dimensions in mm *[inch]*)



10 Space required for removing the mating connector

18 M12x1 plug-in connection with operating display LED (Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006);
Electrical connection “K72L” see page 3



Required surface quality of the valve mounting face

☞ **Note!**

For missing **dimensions**, **position explanations, valve mounting screws** and **subplates**, please refer to the basic data sheet 23351.

Technical data: Type M-.SED 6 .-1X/350CG24.K72L…
(For applications of the component outside the specified values, please contact us!)

hydraulic

Maximum operating pressure	bar *[psi]*	See basic data sheet 22049 (performance limits)
Maximum flow	l/min *[US gpm]*	25 *[6.6]*
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524 [1]; fast bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids upon request

electrical

M12x1 plug-in connection [3]			K72L
Available voltages [4]		V	24
Switch-off voltage peak limited		V	–44 to –55
Voltage tolerance (nominal voltage)		%	±10
Power consumption		W	30
Duty cycle			S1 (continuous operation)
Switching time according to ISO 6403	– ON	ms	40 to 70
	– OFF	ms	10 to 20 (without rectifier) 30 to 45 (with rectifier)
Maximum switching frequency		1/h	15000
Protection class according to DIN EN 60529			IP 65 [5]
Protection class according to DIN EN 61140			III
Maximum coil temperature [6]		°C *[°F]*	150 *[302]*

[1] Suitable for NBR and FKM seals

[2] Only suitable for FKM seals

[3] Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006

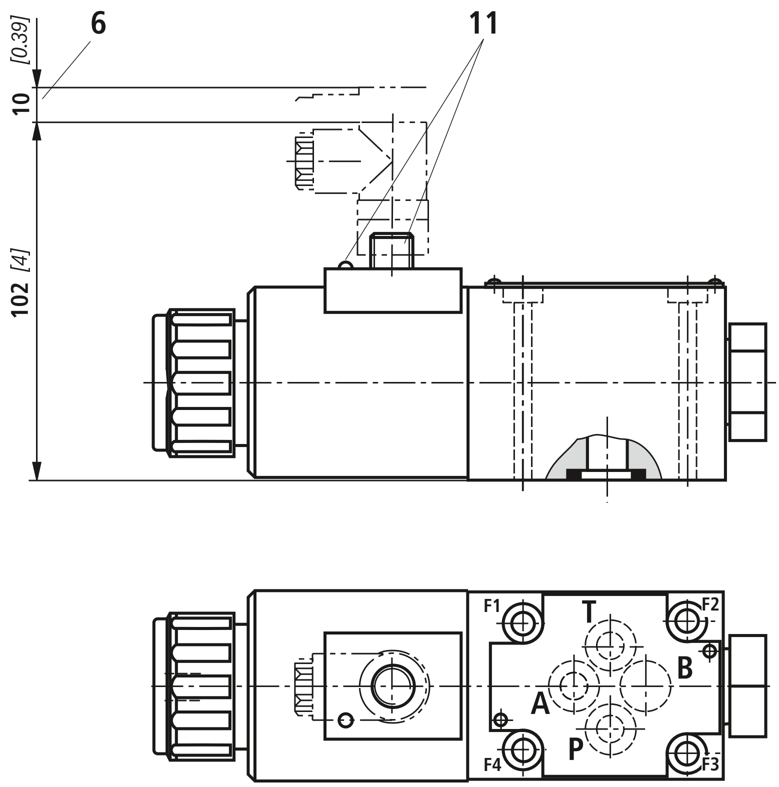
[4] Connection only to functional low voltage with safe insulation = PELV/SELV

[5] Only when using the mating connectors specified by us and with correct assembly

[6] Due to the surface temperatures of the solenoid coils, the standards ISO 13732-1 and 982 need to be adhered to!

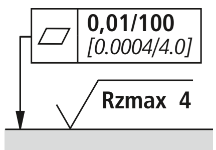
Note!
For more information, please refer to the basic data sheet 22049.

Unit dimensions: Type M-.SED 6 .-1X/350CG24.K72L…
(dimensions in mm *[inch]*)



6 Space required for removing the mating connector

11 M12x1 plug-in connection with operating display LED (Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006);
Electrical connection “K72L” see page 3



Required surface quality of the valve mounting face

☞ **Note!**

For missing **dimensions**, **position explanations, valve mounting screws** and **subplates**, please refer to the basic data sheet 22049.

Technical data: Type M-.SED 10 .-1X/350CG24.K72L…
(For applications of the component outside the specified values, please contact us!)

hydraulic

Maximum operating pressure		bar *[psi]*	See basic data sheet 22045 (performance limits)
Maximum flow		l/min *[US gpm]*	40 *[10.6]*
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524 [1]; fast bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids upon request

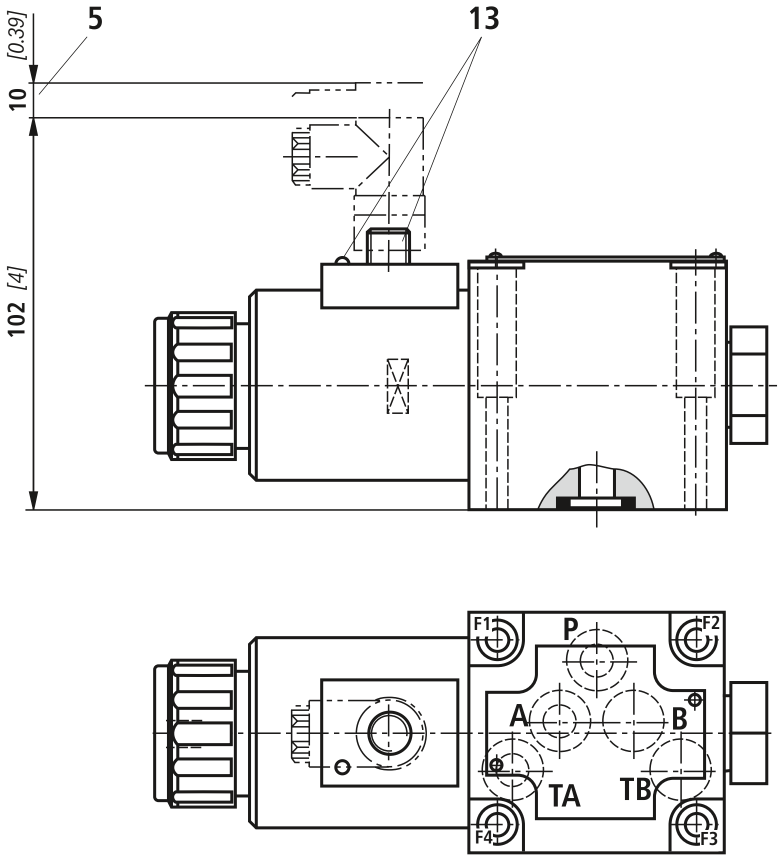
electrical

M12x1 plug-in connection [3]			K72L
Available voltages [4]		V	24
Switch-off voltage peak limited		V	–44 to –55
Voltage tolerance (nominal voltage)		%	±10
Power consumption		W	30
Duty cycle			S1 (continuous operation)
Switching time according to ISO 6403	– ON	ms	30 to 50
	– OFF	ms	10 to 20 (without rectifier) 35 to 45 (with rectifier)
Maximum switching frequency		1/h	15000
Protection class according to DIN EN 60529			IP 65 [5]
Protection class according to DIN EN 61140			III
Maximum coil temperature [6]		°C *[°F]*	150 *[302]*

1) Suitable for NBR and FKM seals
2) Only suitable for FKM seals
3) Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006
4) Connection only to functional low voltage with safe insulation = PELV/SELV
5) Only when using the mating connectors specified by us and with correct assembly
6) Due to the surface temperatures of the solenoid coils, the standards ISO 13732-1 and 982 need to be adhered to!

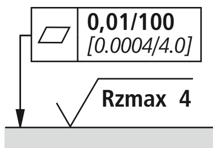
Note!
For more information, please refer to the basic data sheet 22045.

Unit dimensions: Type M-.SED 10 .-1X/350CG24.K72L…
(dimensions in mm *[inch]*)



5 Space required for removing the mating connector

13 M12x1 plug-in connection with operating display LED (Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006);
Electrical connection “K72L” see page 3



Required surface quality of the valve mounting face

Note!

For missing **dimensions**, **position explanations, valve mounting screws** and **subplates**, please refer to the basic data sheet 22045.

Technical data: Type M-.SEW 6 .-3X/420MG24.K72L…
(For applications of the component outside the specified values, please contact us!)

hydraulic

Maximum operating pressure	bar *[psi]*	See basic data sheet 22058 (performance limits)
Maximum flow	l/min *[US gpm]*	25 *[6.6]*
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524 1); fast bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) 1); HEPG (polyglycols) 2); HEES (synthetic esters) 2); other hydraulic fluids upon request

electrical

			High-performance version	Reduced power consumption “SO407”
M12x1 plug-in connection 3)			K72L	
Available voltages 4)		V	24	
Switch-off voltage peak limited		V	–44 to –55	
Voltage tolerance (nominal voltage)		%	±10	
Power consumption		W	30	8
Duty cycle			S1 (continuous operation)	
Switching time according to ISO 6403	– ON	ms	25 to 40 (without rectifier) 30 to 55 (with rectifier)	50 (spool symbol “C”) 55 (spool symbol “U”)
	– OFF	ms	10 to 15 (without rectifier) 35 to 55 (with rectifier)	30 (spool symbol “C”) 15 (spool symbol “U”)
Maximum switching frequency		1/h	15000	7200
Protection class according to DIN EN 60529			IP 40 5)	
Protection class according to DIN EN 61140			III	
Maximum coil temperature 6)		°C *[°F]*	150 *[302]*	110 *[230]*

1) Suitable for NBR and FKM seals

2) Only suitable for FKM seals

3) Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006

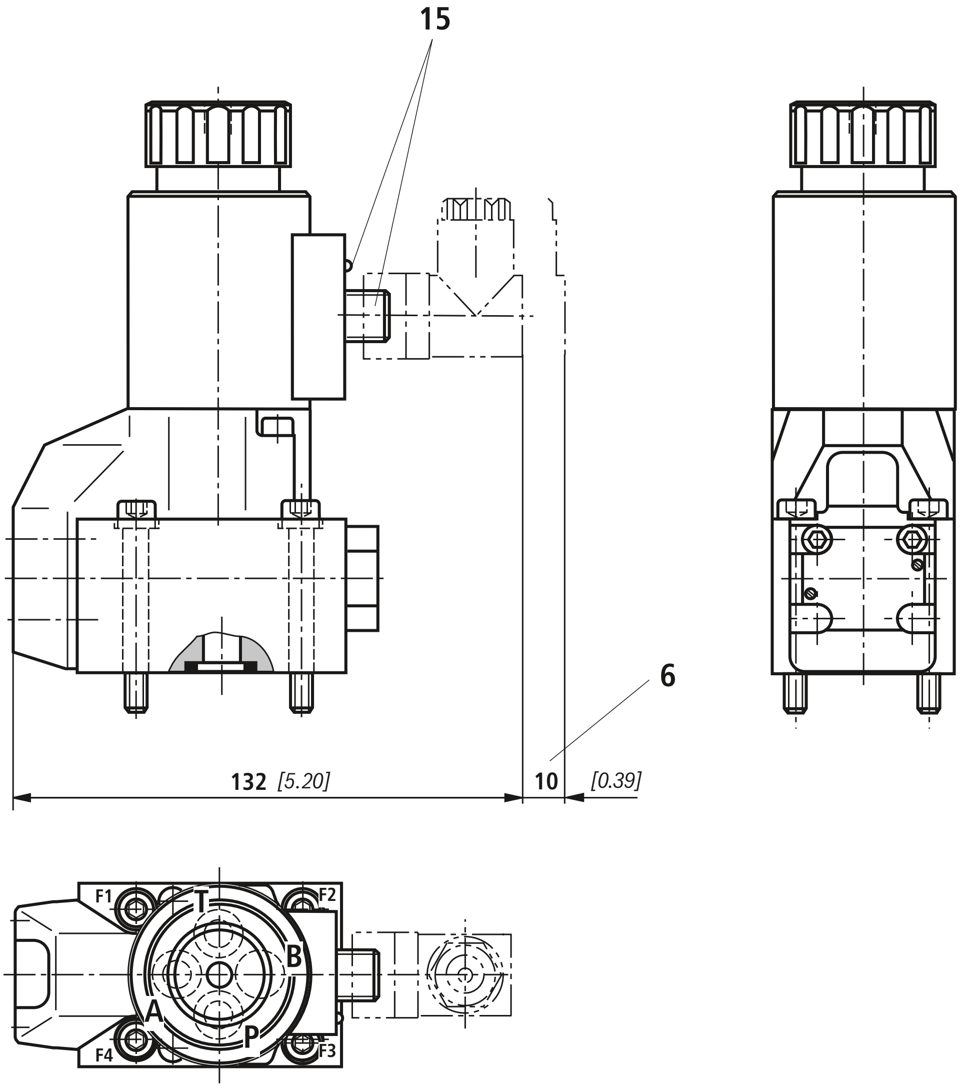
4) Connection only to functional low voltage with safe insulation = PELV/SELV

5) Only when using the mating connectors specified by us and with correct assembly

6) Due to the surface temperatures of the solenoid coils, the standards ISO 13732-1 and 982 need to be adhered to!

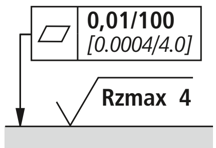
☞ **Note!**
For more information, please refer to the basic data sheet 22058 (without version “SO407”).

Unit dimensions: Type M-.SEW 6 .-3X/420MG24.K72L… (dimensions in mm *[inch]*)



6 Space required for removing the mating connector

15 M12x1 plug-in connection with operating display LED (Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006);
Electrical connection "K72L" see page 3



Required surface quality of the valve mounting face

☞ **Note!**

For missing **dimensions**, **position explanations, valve mounting screws** and **subplates**, please refer to the basic data sheet 22058.

Technical data: Type M-.SEW 10 .-1X/420MG24.K72L…
(For applications of the component outside the specified values, please contact us!)

hydraulic

Maximum operating pressure	bar *[psi]*	See basic data sheet 22075 (performance limits)
Maximum flow	l/min *[US gpm]*	40 *[10.6]*
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524 [1]; fast bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids upon request

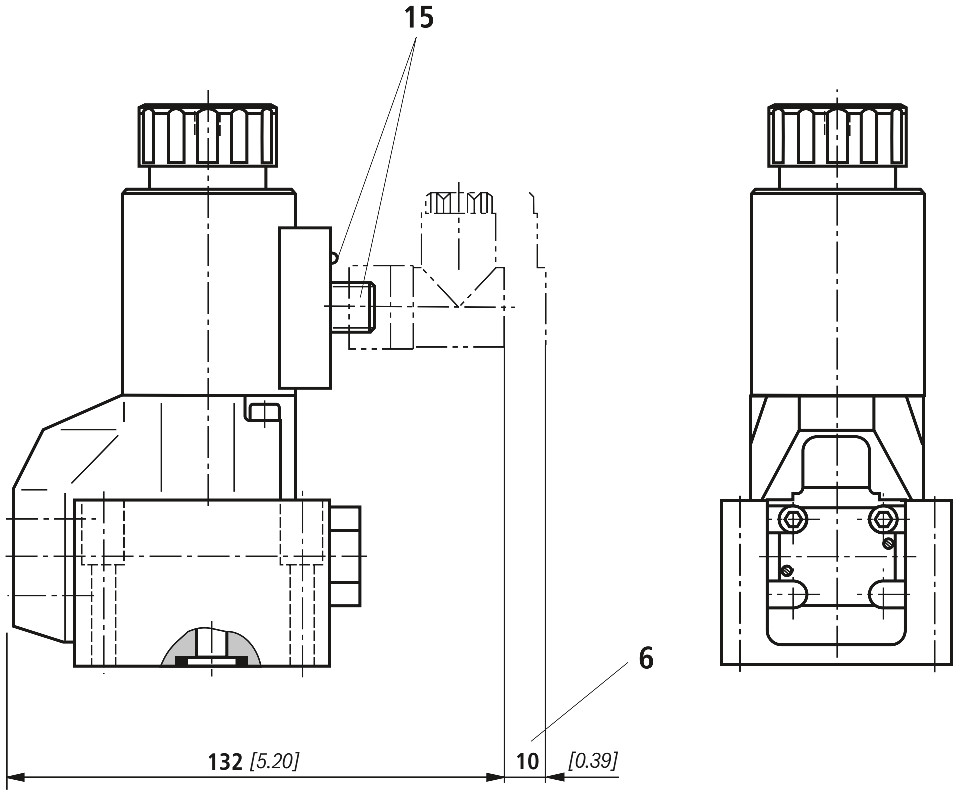
electrical

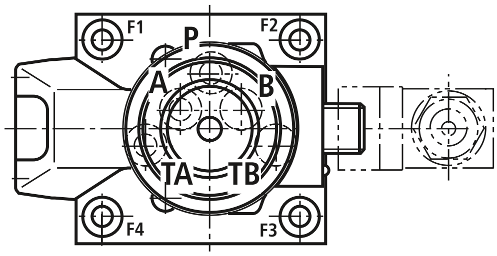
M12x1 plug-in connection [3]			K72L
Available voltages [4]		V	24
Switch-off voltage peak limited		V	–44 to –55
Voltage tolerance (nominal voltage)		%	±10
Power consumption		W	30
Duty cycle			S1 (continuous operation)
Switching time according to ISO 6403	– ON	ms	25 to 60 (without rectifier) 30 to 70 (with rectifier)
	– OFF	ms	10 to 20 (without rectifier) 30 to 70 (with rectifier)
Maximum switching frequency		1/h	15000
Protection class according to DIN EN 60529			IP 40 [5]
Protection class according to DIN EN 61140			III
Maximum coil temperature [6]		°C *[°F]*	150 *[302]*

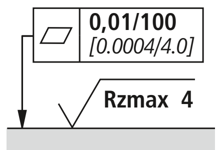
[1] Suitable for NBR and FKM seals
[2] Only suitable for FKM seals
[3] Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006
[4] Connection only to functional low voltage with safe insulation = PELV/SELV
[5] Only when using the mating connectors specified by us and with correct assembly
[6] Due to the surface temperatures of the solenoid coils, the standards ISO 13732-1 and 982 need to be adhered to!

☞ **Note!**
For more information, please refer to the basic data sheet 22075.

Unit dimensions: Type M-.SEW 10 .-1X/420MG24.K72L… (dimensions in mm *[inch]*)







Required surface quality
of the valve mounting face

6 Space required for removing the mating connector

15 M12x1 plug-in connection with operating display LED (Mating connectors according to IEC 60947-5-2, separate order, see data sheet 08006);

Electrical connection “K72L” see page 3

Note!

For missing **dimensions**, **position explanations, valve mounting screws** and **subplates**, please refer to the basic data sheet 22075.

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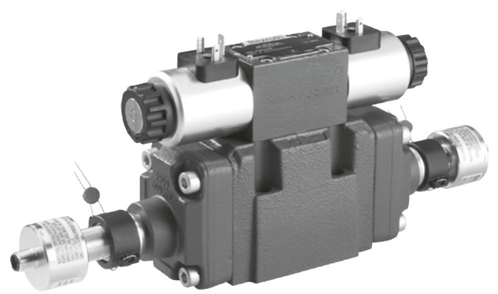
The Drive & Control Company

Rexroth
Bosch Group

On/off valves with spool position monitoring

Directional valves

RE 24830
Edition: 2013-05
Replaces: 02.11



H7478

- Sizes 6 ... 32

Features

- For directional seat valves type SED, SEW, SH, SP, SMM, SMR, Z4SEH
- For directional spool valves type WE, 5-.WE, Z4WE, WMM, WMU, WMR, WH, WP, W.H, WM.H, WH, WEH, Z4WEH
- Inductive position switches and proximity sensors
- Direct monitoring of the spool position
- High reliability
- Long life cycle

Contents

General information

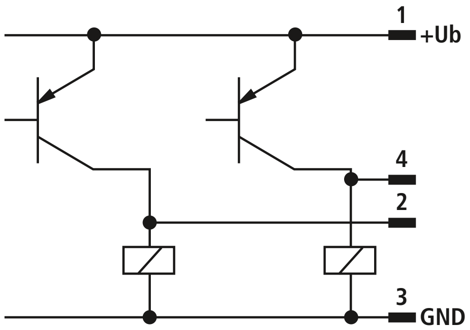
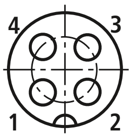
Inductive position switches and proximity sensors
For seat valves, contactless position switches and proximity sensors (hereinafter referred to only as position switches for short) with integrated switching amplifiers switch shortly before, for on/off valves only after the spool position to be monitored has been reached. The spool position reached is displayed by a binary signal.
Advantages of the position switches:
- Short-circuit-proof
- Available with M12 x 1 plug-in connections
- Direct monitoring of the spool position at the control spool
- Long life cycle
- High reliability due to no use of dynamic seals
- Reaction time of the switch upon operation approx. 15 ms

Attention!
Valves with inductive position switches and proximity sensors in safety-relevant controls may only be assembled and commissioned by hydraulically and electrically trained experts. Adjustment and maintenance work requires special tools and equipment. This work may only be performed by authorized specialists or in the factory!
Improper work at safety equipment leads to a risk of personal injury and damage to property!
- The essential valve components are coordinated with each other in the production plant and adjusted during assembly. They must not be interchanged. In case of valve or position switch defects, the entire valve must be exchanged!
- The factory setting of the position switch must not be changed. The position switch may only be set by the valve manufacturer.
- The position switch must be automatically monitored by the machine control to prevent initiation of a new machine cycle even in case of a failure of the position switch.
- The machine control and the selected components are to be designed so that the leaks cannot lead to an inadmissible closing movement.

Notices!
- In pilot operated directional valves, only the main valve is monitored, not the pilot control valve.
- In 4/2 directional seat valves, only the main valve is monitored, not the complete valve function.
- Position switches have an attenuating effect, i.e. the switching times specified in the basic data sheets of the valves may be increased.
- The switching times according to ISO 6403 specified in the respective valve data sheets do **not** correspond to the reaction times of the position switch (time between signal change at the solenoid and the signal change of the position switch).
  Temporal query mechanisms should be set at least to 80 ... 100 ms.

Inductive position switch type QM: Electrical connection

The electricity is connected via a 4-pole mating connector (separate order, see page 42) with connection thread M12 x 1.

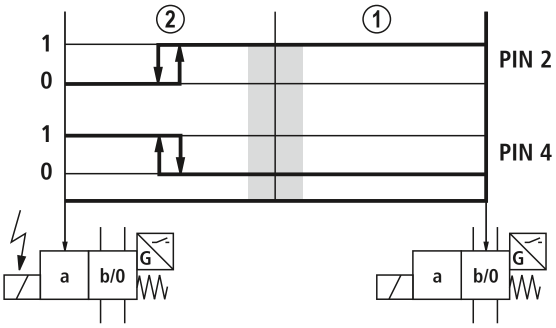
Connection voltage:	24 V +30%/–15%, direct voltage
Admissible residual ripple:	≤10%
Load capacity:	Maximum 400 mA
Switching outputs: 	PNP transistor outputs, load between switching outputs and GND
Pinout: 	**1** +24 V
	2 Switching output: 400 mA
	3 0 V, GND
	4 Switching output: 400 mA

Inductive position switch type QM: Switching logics

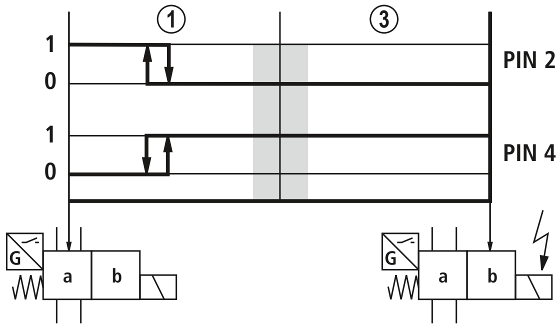
- **For directional seat valves type SED, SEW, SH, SP, SMM and SMR**
- **For directional spool valves type Z4SEH, WE, Z4WE, Z4WEH10.-5X**

Depending on the spool position to be monitored, the switching outputs have the following function:

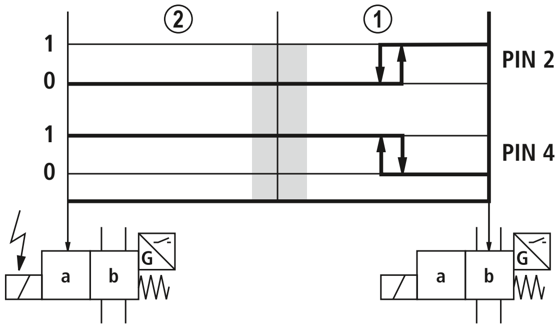
Model QMA
(position switch on side B, monitored spool position "a")



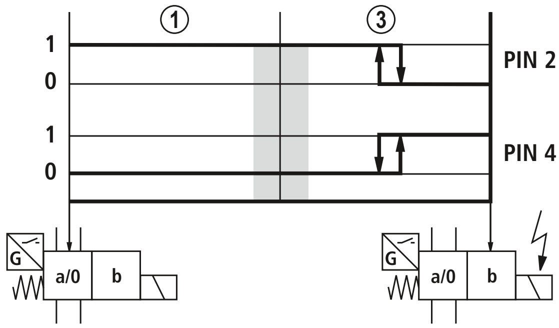
Model QMA (not for type Z4WEH10.-5X)
(position switch on side A, monitored spool position "a")



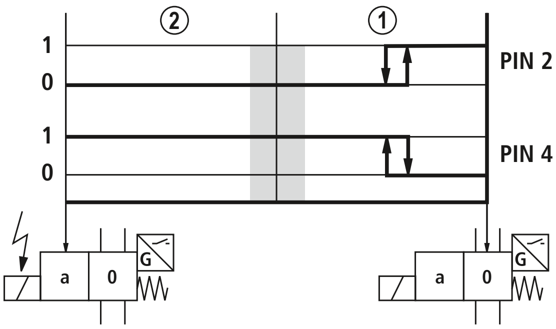
Model QMB
(position switch on side B, monitored spool position "b")



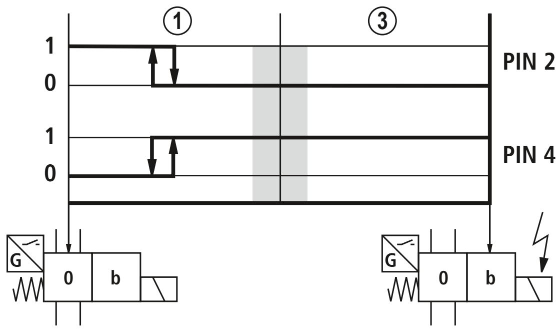
Model QMB (not for type Z4WEH10.-5X)
(position switch on side A, monitored spool position "b")



Model QM0 (not for type Z4WEH10.-5X)
(position switch on side B, monitored rest position)



Model QM0 (not for type Z4WEH10.-5X)
(position switch on side A, monitored rest position)



0 Contacts open (0 V)
1 Contacts closed (24 V)
Overlap area/hydraulic symbol change

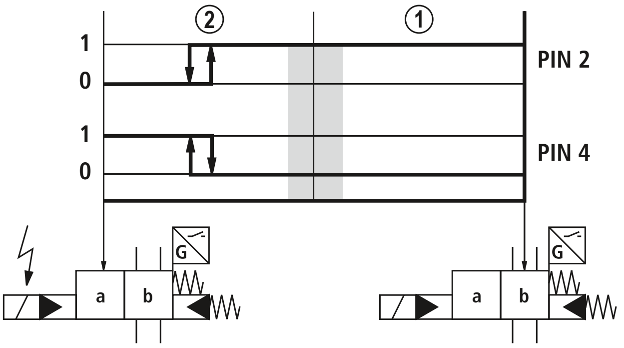
① Rest position
② Solenoid "a" switched
③ Solenoid "b" switched

Inductive position switch type QM: Switching logics

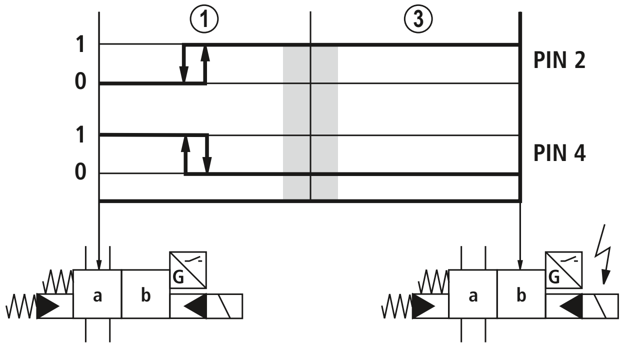
▶ **For directional spool valves type WH, WEH, Z4WH, Z4WEH** (except for Z4WEH10.-5X)

Depending on the spool position to be monitored, the switching outputs have the following function:

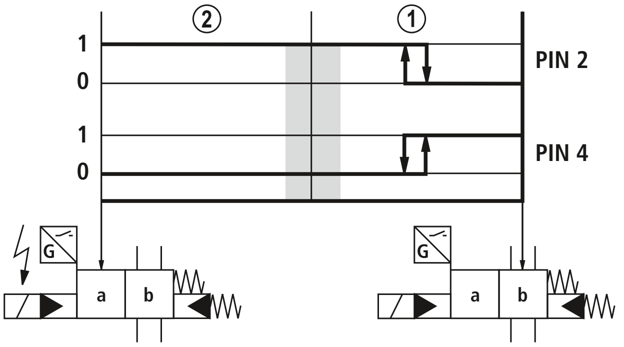
Model QMA
(position switch on side B, monitored spool position of the main stage "a")



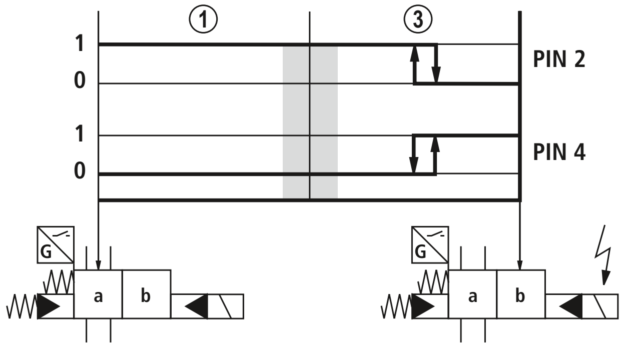
Model QMA
(position switch on side B, monitored spool position of the main stage "a")



Model QMB
(position switch on side A, monitored spool position of the main stage "b")



Model QMB
(position switch on side A, monitored spool position of the main stage "b")



0 Contacts open (0 V)
1 Contacts closed (24 V)
Overlap area/hydraulic symbol change

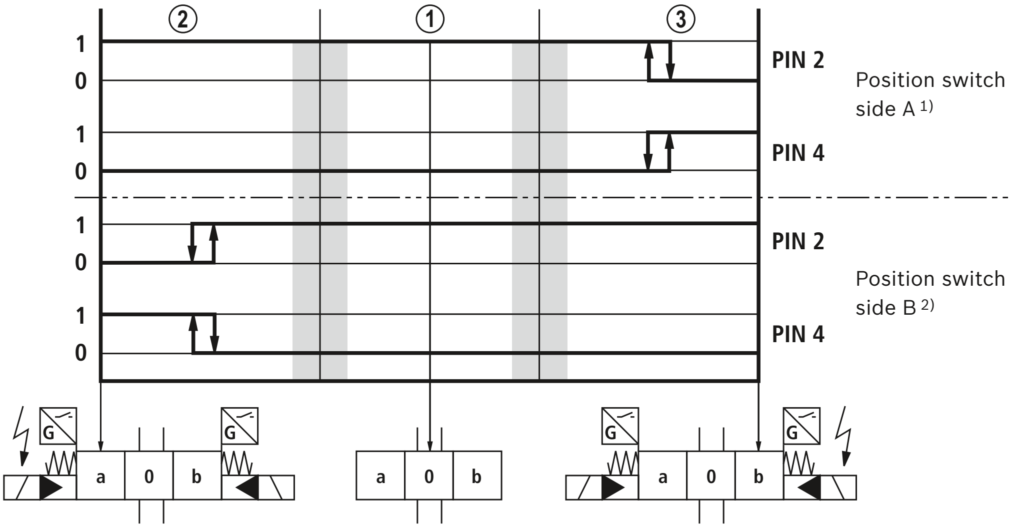
① Rest position
② Solenoid "a" switched
③ Solenoid "b" switched

Inductive position switch type QM: Switching logics

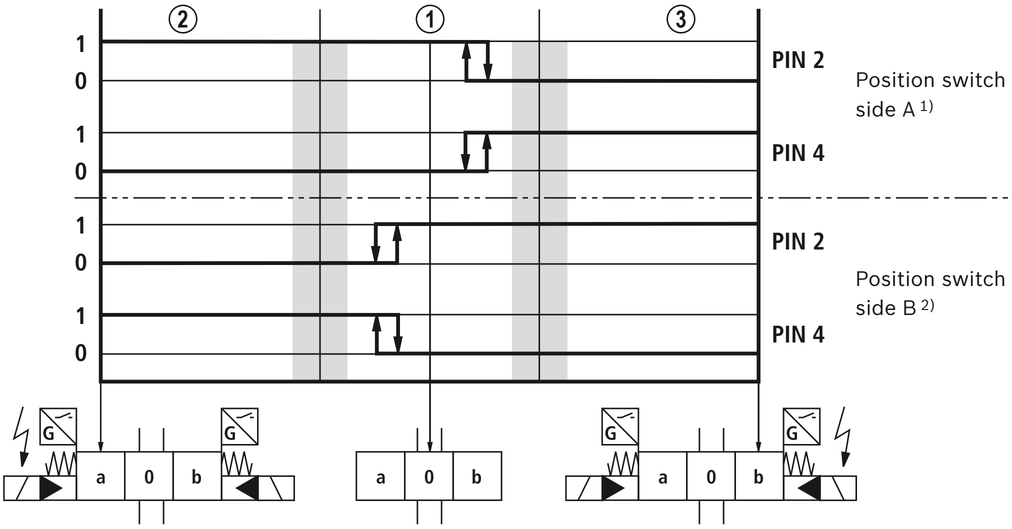
▶ **For directional spool valves type WH, WEH, Z4WH, Z4WEH** (except for Z4WEH10.-5X)

Depending on the spool position to be monitored, the switching outputs have the following function:

Model QMAB
(position switch on side A and B, monitored spool position "a" and "b")



Model QM0
(position switch on side A and B, monitored spool position "0")



0 Contacts open (0 V)
1 Contacts closed (24 V)
Overlap area/hydraulic symbol change

① Rest position
② Solenoid "a" switched
③ Solenoid "b" switched

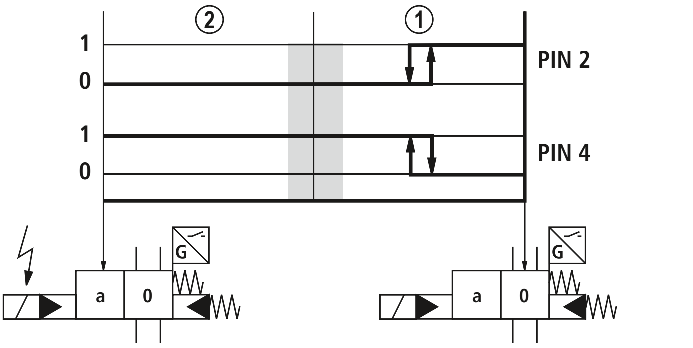
1) No signal change at the position switch on side B with spool position "a"
2) No signal change at the position switch on side A with spool position "b"

Inductive position switch type QM: Switching logics

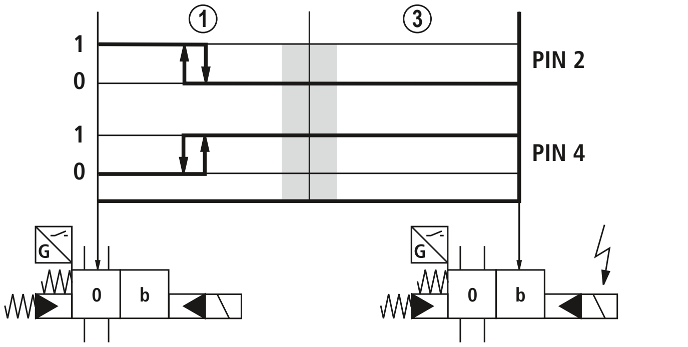
▶ **For directional spool valves type WH, WEH, Z4WH, Z4WEH**

Depending on the spool position to be monitored, the switching outputs have the following function:

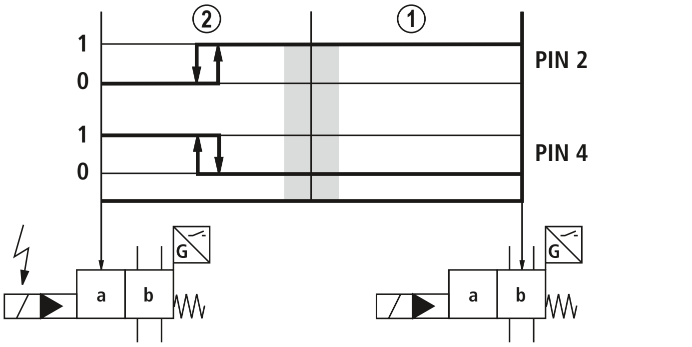
Model QM0 (not for type Z4WEH10.-5X)
(position switch on side B, monitored spool position of the main stage "0")



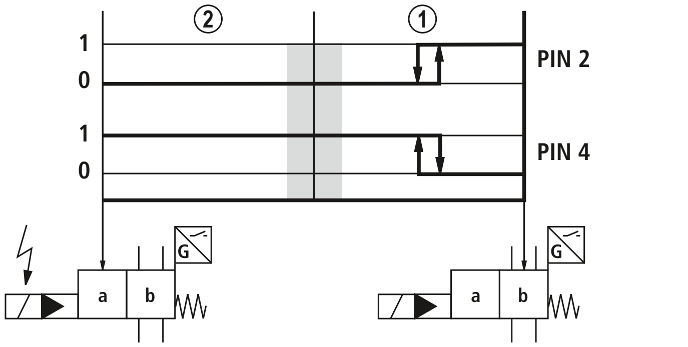
Model QM0 (not for type Z4WEH10.-5X)
(position switch on side A, monitored spool position of the main stage "0")



Model QM0 (only for type Z4WEH10.-5X)
(position switch on side B, monitored spool position of the main stage "a")



Model QMB (only for type Z4WEH10.-5X)
(position switch on side B, monitored spool position of the main stage "b")



0 Contacts open (0 V)
1 Contacts closed (24 V)
Overlap area/hydraulic symbol change

① Rest position
② Solenoid "a" switched
③ Solenoid "b" switched

Inductive position switch type QM: Directional seat valves type SED (dimensions in mm *[inch]*)

01		02	03	04	05		06		07	08	09	10	11	12		
M	**–**		**SED**			**–**	**1X**	**/**	**350**	**C**			**K4**		**/**	**...**

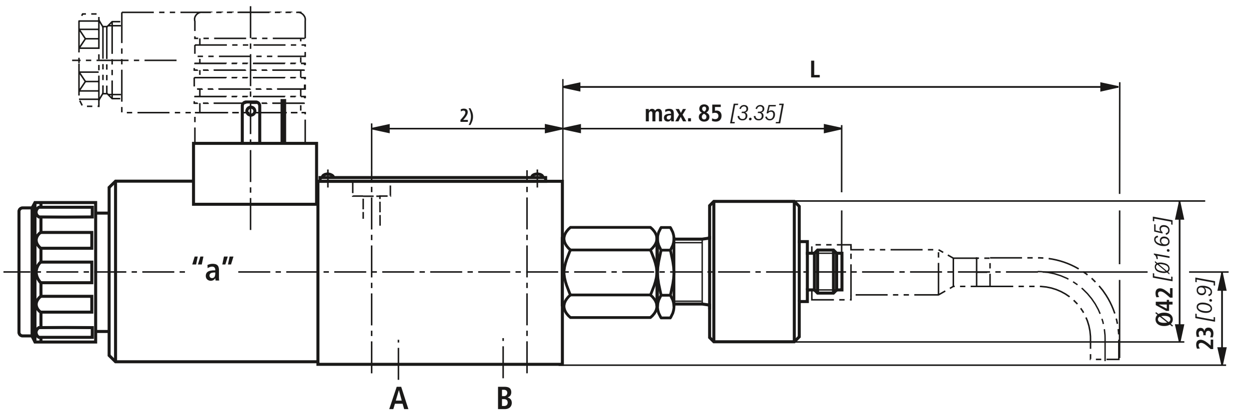
Spool position monitoring

12	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**

Order example:
M-3SED 6 UK1X/350CG24N9K4**QMAG24**/...

Complete ordering codes can be found on the basic data sheets:

Size 6	22049
Size 10	22045



Mating connector (order separately, see page 42)		**L** in mm *[inch]* [1)]	
	Material no.	Size 6	Size 10
Mating connector straight	R900031155	186 *[7.32]*	183 *[7.21]*
Mating connector angled	R900082899	117 *[4.61]*	114 *[4.48]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*	153 *[6.02]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

2) Dimensions see basic data sheet

Pinout see page 3.
Switching logics see page 4.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional seat valves type SEW (dimensions in mm *[inch]*)

01		02	03	04	05		06		07	08	09	10	11	12		
M	**–**		**SEW**			**–**		**/**		**M**			**K4**		**/**	**...**

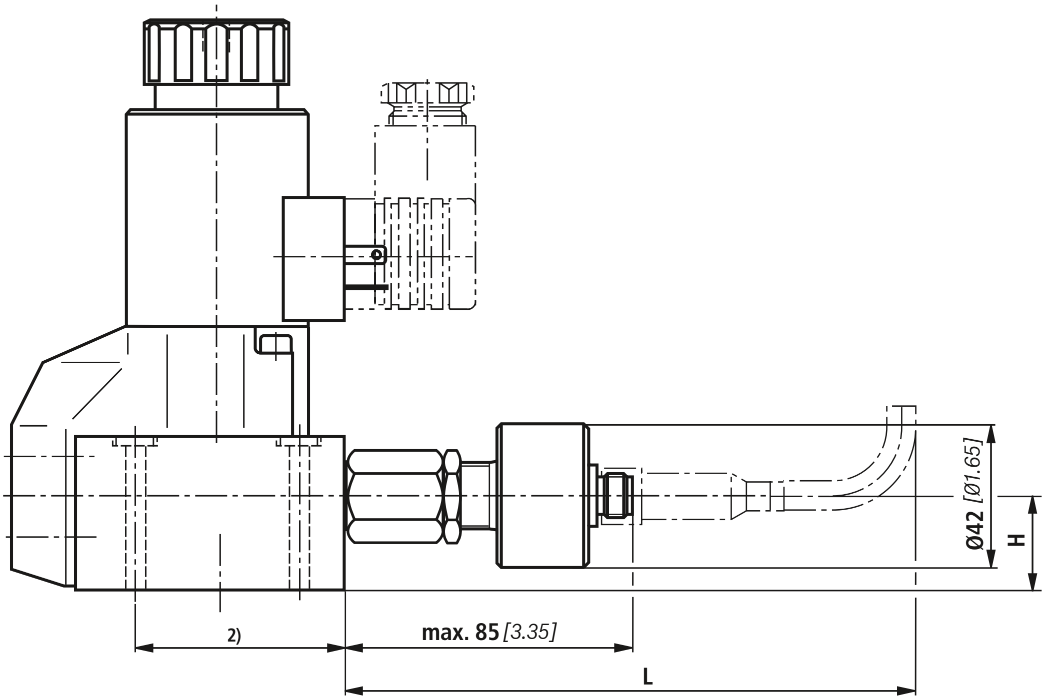
Spool position monitoring

12	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**

Order example:
M-3SEW 6 U3X/420MG24N9K4**QMAG24**/...

Complete ordering codes can be found on the basic data sheets:

Size 6	22058
Size 10	22075



Mating connector (order separately, see page 42)		**L** in mm *[inch]* [1]		**H** in mm *[inch]*	
	Material no.	Size 6	Size 10	Size 6	Size 10
Mating connector straight	R900031155	186 *[7.32]*	183 *[7.21]*	23 *[0.9]*	32.5 *[1.28]*
Mating connector angled	R900082899	117 *[4.61]*	114 *[4.48]*	23 *[0.9]*	32.5 *[1.28]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*	153 *[6.02]*	23 *[0.9]*	32.5 *[1.28]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

2) Dimensions see basic data sheet

Pinout see page 3.
Switching logics see page 4.

☞ **Notice!**
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional seat valves type SH, SP, SMM, SMR (dimensions in mm *[inch]*)

01		02	03	04	05	06		07	08	09	10	11	12
M	**–**					**3X**	**/**						*****

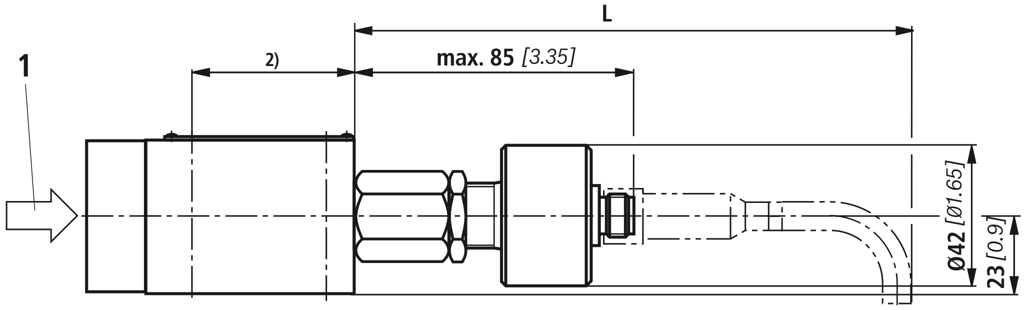
Spool position monitoring

9	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**

Order example:
M-2SMR 6 NU3X/420**QMAG24**...

Complete ordering codes can be found on the basic data sheets:

Size 6	22340
Size 10	



1 Types of actuation see basic data sheet 22340

Mating connector (order separately, see page 42)		**L** in mm *[inch]* [1)]	
	Material no.	Size 6	Size 10
Mating connector straight	R900031155	186 *[7.32]*	183 *[7.21]*
Mating connector angled	R900082899	117 *[4.61]*	114 *[4.48]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*	153 *[6.02]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

2) Dimensions see basic data sheet

Pinout see page 3.
Switching logics see page 4.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional spool valves type WE (dimensions in mm *[inch]*)

01	02	03	04	05		06	07	08	09	10	11		
	WE				**/**							**/**	**...**

Spool position monitoring

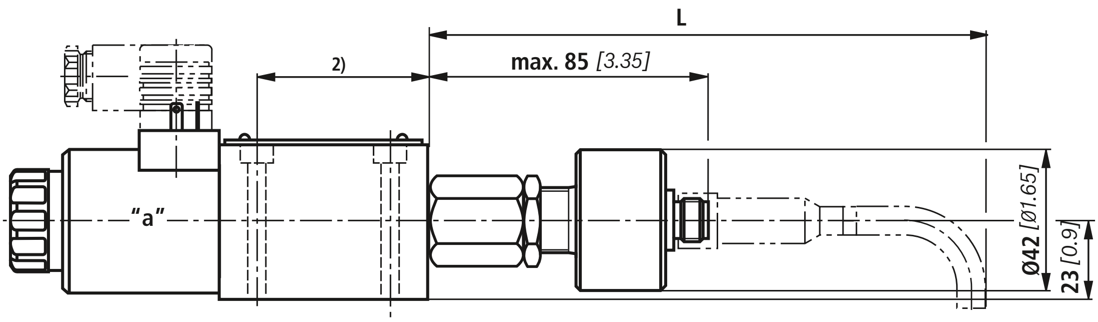
11	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored rest position	**QM0G24**

Order example:
4WE 6 C6X/EG24N9K4**QMAG24**/...

Complete ordering codes can be found on the basic data sheets:

Size 6	23178, 23178-00
Size 10	23327

☞ **Notice!**
For valves with 3 switching positions and valves with detent (models "O" and "OF"), no position switch is available!



Mating connector (order separately, see page 42)		**L** in mm *[inch]* 1)	
	Material no.	Size 6	Size 10
Mating connector straight	R900031155	186 *[7.32]*	183 *[7.21]*
Mating connector angled	R900082899	117 *[4.61]*	114 *[4.48]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*	153 *[6.02]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line
2) Dimensions see basic data sheet

Pinout see page 3.
Switching logics see page 4.

☞ **Notice!**
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional spool valves type 5-.WE (dimensions in mm *[inch]*)

01	02		03	04	05	06		07		08	09	10	11	12	13	14		15	16	17	18		19	20
	5	**–**		**WE**	**10**		**–**	**5X**	**/**		**E**						**/**					**=**		*****

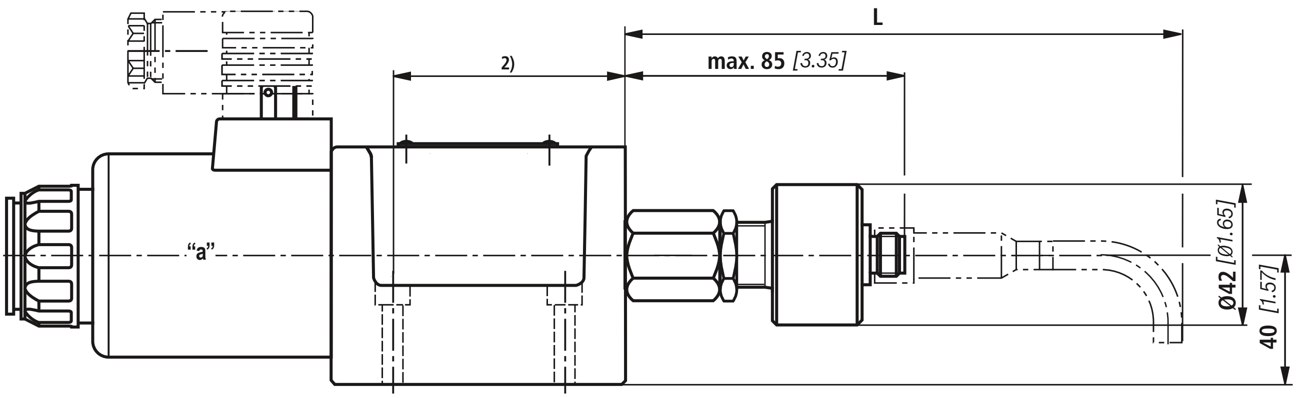
Spool position monitoring

14	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored rest position	**QM0G24**

Order example:
5-4WE 10 C5X/EG24N9K4**QMAG24**/...

Complete ordering codes can be found on the basic data sheets:

23352



Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* 1)
Mating connector straight	R900031155	183 *[7.21]*
Mating connector angled	R900082899	114 *[4.48]*
Mating connector with potted-in cable (3 m)	R900064381	153 *[6.02]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line
2) Dimensions see basic data sheet

Pinout see page 3.
Switching logics see page 4.

☞ **Notice!**
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional shut-off valves type Z4WE (dimensions in mm *[inch]*)

01	02	03		04		05	06	07	08	09	10	11	12
Z4WE	**6**		**–**	**3X**	**/**	**E**			**K4**				*****

Spool position monitoring

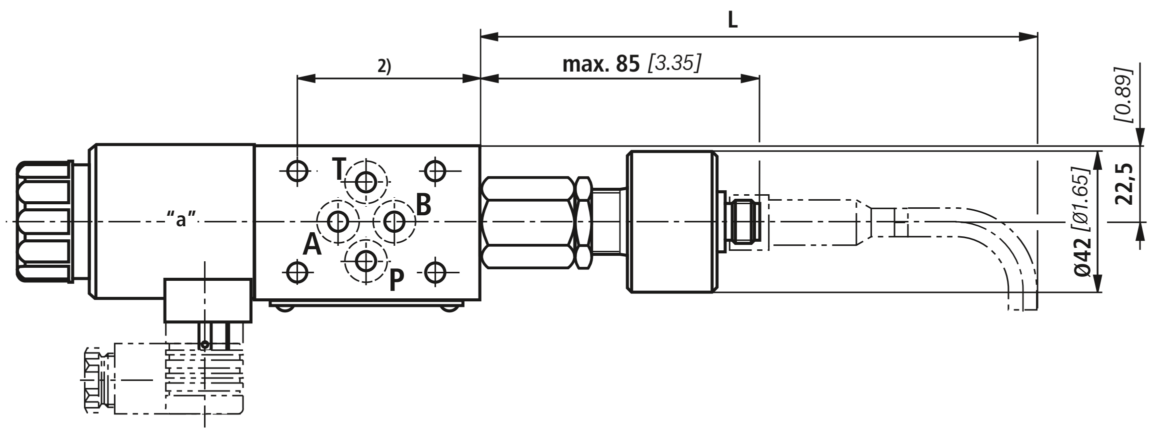
11	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored rest position	**QM0G24**

Order example:
Z4WE 6 D24-3X/EG24N9K4**QMAG24**/...

Notice!
Not available for symbol "E53"

Complete ordering codes can be found on the basic data sheets:

23193



Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* 1)
Mating connector straight	R900031155	183 *[7.21]*
Mating connector angled	R900082899	114 *[4.48]*
Mating connector with potted-in cable (3 m)	R900064381	153 *[6.02]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

2) Dimensions see basic data sheet

Pinout see page 3.
Switching logics see page 4.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional spool valves type WMM, WMU, WMR, WMRZ (dimensions in mm *[inch]*)

01	02	03	04	05		06	07	08		09	10	11	12	13
		6			/				/					*

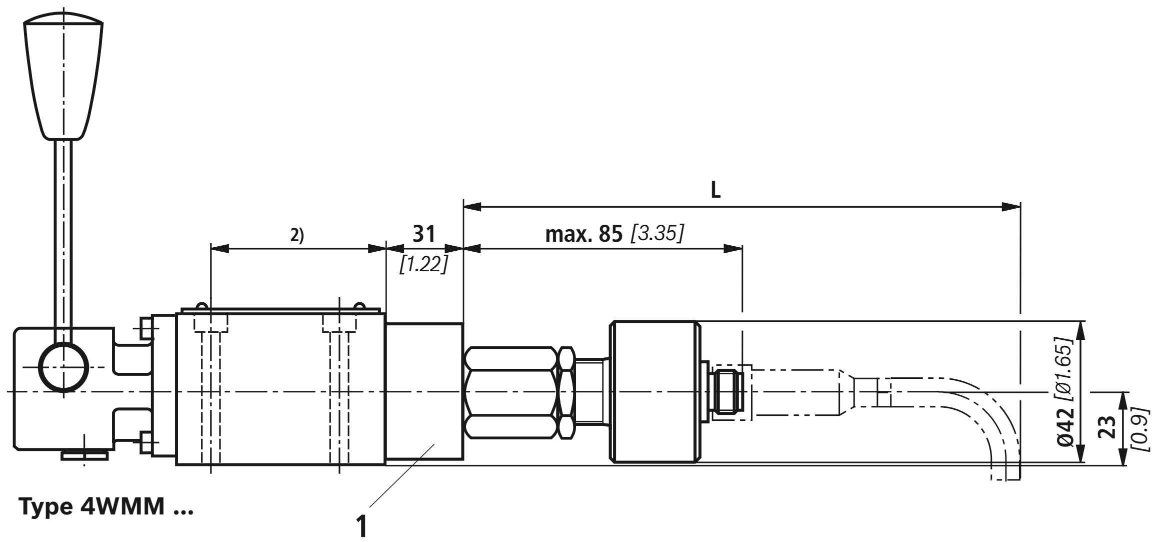
Spool position monitoring

08	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored rest position	**QM0G24**

Order example:
4WMM 6 LB5X/F**QMBG24**/...

Complete ordering codes can be found on the basic data sheets:

22280



Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* 1)
Mating connector straight	R900031155	186 *[7.32]*
Mating connector angled	R900082899	117 *[4.61]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*

1 Cover not available for type WMRZ

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

2) Dimensions see basic data sheet

Pinout see page 3.

Switching logics see page 4.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional spool valves type WMM (dimensions in mm *[inch]*)

01		02	03	04	05	06		07	08	09	10
H	**–**	**4**	**WMM**			**7X**	**/**				*****

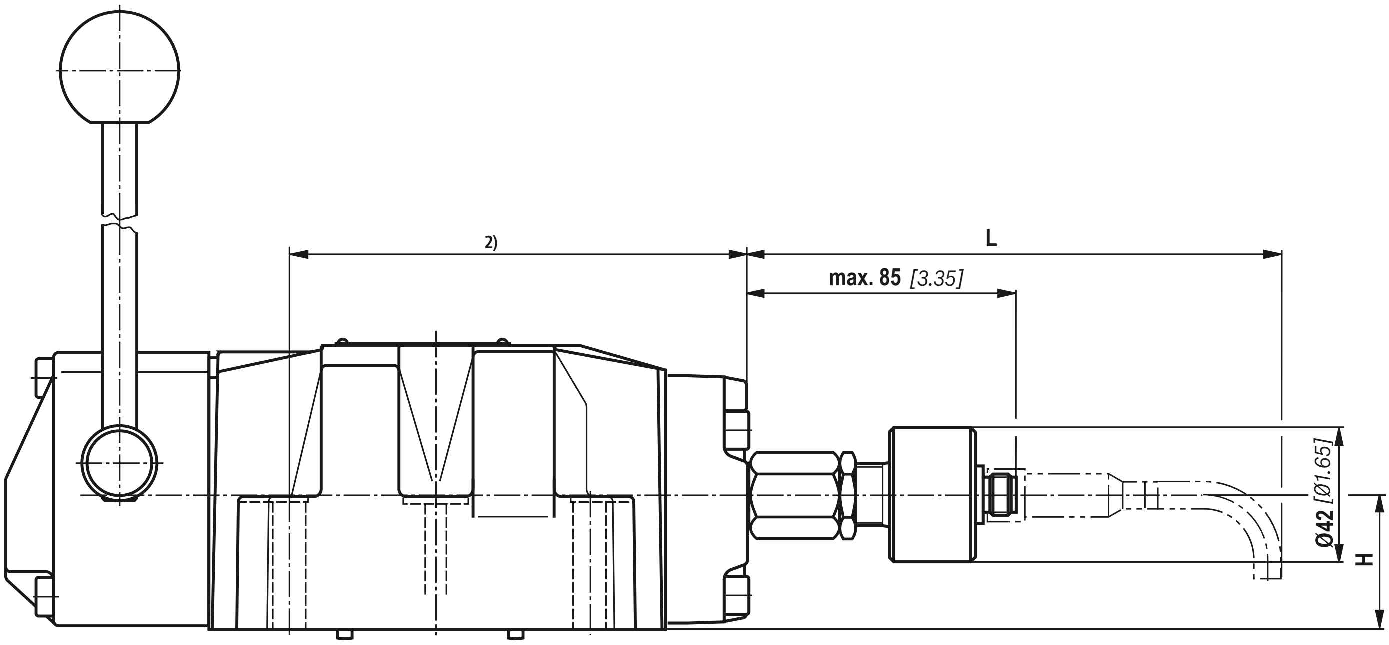
Spool position monitoring

08	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored rest position	**QM0G24**

Order example:
H-4WMM 16 C7X/**QMBG24**...

Complete ordering codes can be found on the basic data sheets:

Size 16	22371
Size 25	



Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* 1)
Mating connector straight	R900031155	186 *[7.32]*
Mating connector angled	R900082899	117 *[4.61]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*

Size	**H** in mm *[inch]*
16	34 *[1.34]*
25	37 *[1.46]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

2) Dimensions see basic data sheet

Pinout see page 3.
Switching logics see page 4.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional spool valves type WH, WP (dimensions in mm *[inch]*)

01	02	03	04	05	06	07		08	09	10	11		12	13	14	15	16
	W			**6**			**/**					**/**					*****

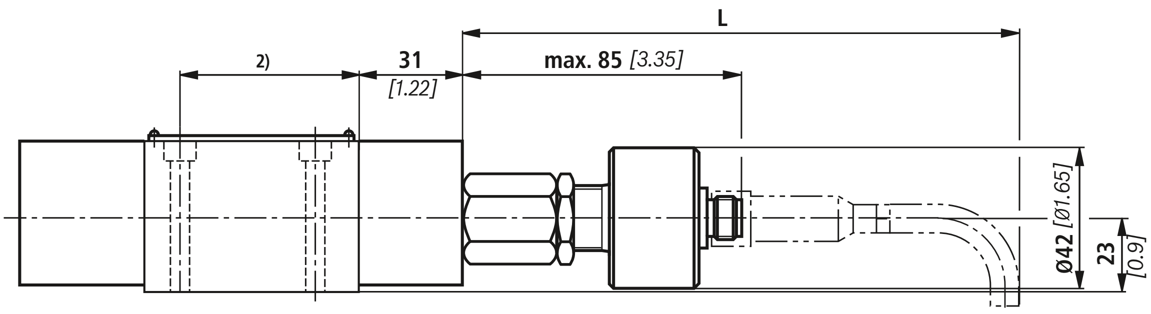
Spool position monitoring

11	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored rest position	**QM0G24**

Order example:
4WH 6 C5X/J**QMAG24**...

Complete ordering codes can be found on the basic data sheets:

22282



Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* 1)
Mating connector straight	R900031155	186 *[7.32]*
Mating connector angled	R900082899	117 *[4.61]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

2) Dimensions see basic data sheet

Pinout see page 3.
Switching logics see page 4.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional spool valves type W.H, WM.H (dimensions in mm *[inch]*)

01	02	03	04	05	06	07		08	09	10	11	12	13		14	15	16	17	18	19
							/		6					/						*

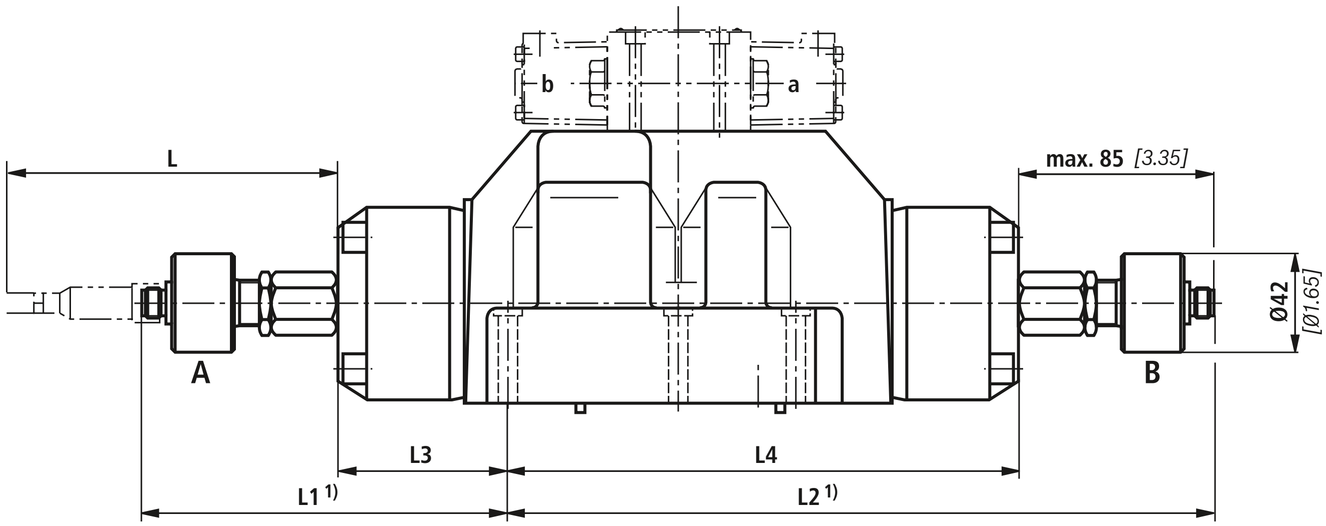
Spool position monitoring

13	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored spool position "a" and "b"	**QMABG24**
	Monitored rest position	**QM0G24**

Order example:
4WHH 16 C7X/6E**QMAG24**/...

Complete ordering codes can be found on the basic data sheets:

Sizes 10 ... 32	24851



Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* [2)]
Mating connector straight	R900031155	186 *[7.32]*
Mating connector angled	R900082899	117 *[4.61]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*

1) Without mating connector

2) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

Mounting options and dimensions see page 19 to 21.
Pinout see page 3.
Switching logics see page 5 to 7.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional spool valves type WH, WEH (dimensions in mm *[inch]*)

01	02	03	04	05	06	07		08	09	10	11	12	13	14	15		16	17	18	19	20	21
							/									/					*

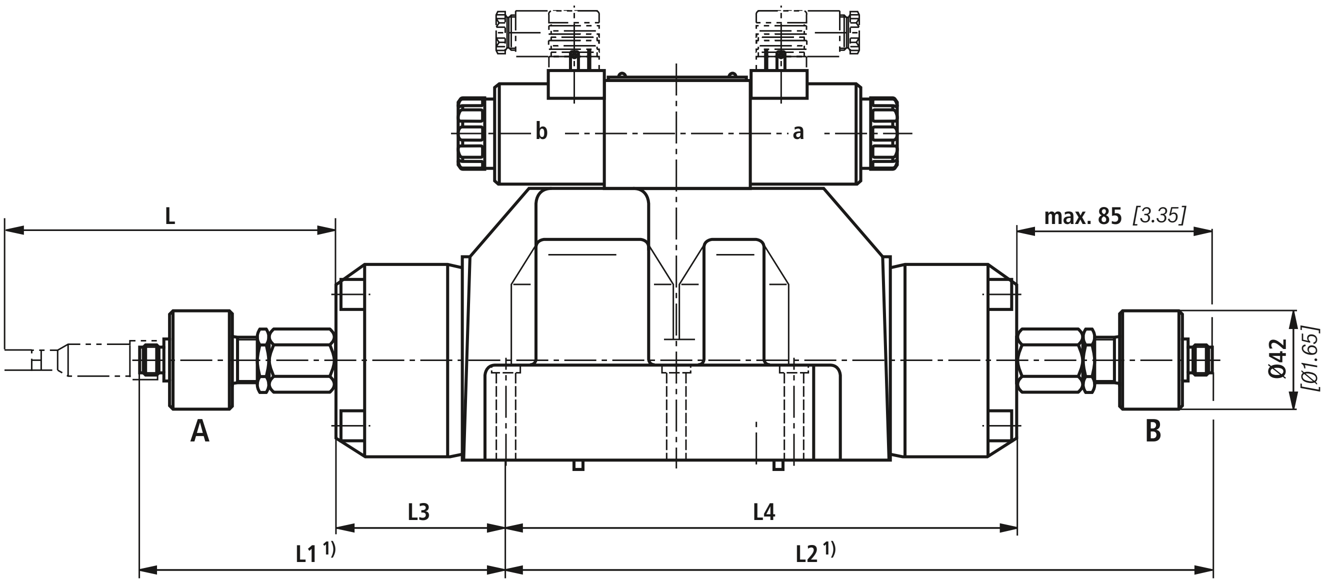
Spool position monitoring

15	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored spool position "a" and "b"	**QMABG24**
	Monitored rest position	**QM0G24**

Order example:
4WEH 16 C7X/6EG24N9K4**QMAG24**/...

Complete ordering codes can be found on the basic data sheets:

Sizes 10 ... 32	24751



Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* 2)
Mating connector straight	R900031155	186 *[7.32]*
Mating connector angled	R900082899	117 *[4.61]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*

1) Without mating connector
2) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

Mounting options and dimensions see page 19 to 21.
Pinout see page 3.
Switching logics see page 5 to 7.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional spool valves type W.H, WM.H, WEH (dimensions in mm *[inch]*)

Mounting options – 2-spool position valve

Monitored spool position	Ordering code	Size	Hydraulic end position HC, HD, HK, HZ, HY 4)				Spring end position C, D, K, Z				Spring end position Y			
			L1 3)	**L2** 3)	**L3**	**L4**	**L1** 3)	**L2** 3)	**L3**	**L4**	**L1** 3)	**L2** 3)	**L3**	**L4**
"a" (position switch on side B)	**QMAG24**	10		211 *[8.31]*	57 *[2.24]*			211 *[8.31]*	57 *[2.24]*			211 *[8.31]*	57 *[2.24]*	
		16		259 *[10.20]*	55 *[2.16]*							259 *[10.20]*	55 *[2.16]*	
		25 1)		294 *[11.58]*	47 *[1.85]*			294 *[11.58]*	47 *[1.85]*			294 *[11.58]*	47 *[1.85]*	
		25 2)		325 *[12.80]*	72 *[2.83]*							325 *[12.80]*	72 *[2.83]*	
		32		371 *[14.61]*	76 *[2.99]*							371 *[14.61]*	76 *[2.99]*	
"b" (position switch on side A)	**QMBG24**	10	157 *[6.18]*			111 *[4.37]*	157 *[6.18]*			111 *[4.37]*	157 *[6.18]*			111 *[4.37]*
		16	159 *[6.26]*			155 *[6.10]*	159 *[6.26]*			155 *[6.10]*				
		25 1)	149 *[5.87]*			192 *[7.56]*	149 *[5.87]*			192 *[7.56]*	149 *[5.87]*			192 *[7.56]*
		25 2)	172 *[6.77]*			225 *[8.86]*	172 *[6.77]*			225 *[8.86]*				
		32	161 *[6.34]*			287 *[11.30]*	161 *[6.34]*			287 *[11.30]*				
"a" and "b" (position switch on side A and B)	**QMABG24**	10	157 *[6.18]*	211 *[8.31]*			157 *[6.18]*	211 *[8.31]*			157 *[6.18]*	211 *[8.31]*		
		16	159 *[6.26]*	259 *[10.20]*										
		25 1)	149 *[5.87]*	294 *[11.58]*			149 *[5.87]*	294 *[11.58]*			149 *[5.87]*	294 *[11.58]*		
		25 2)	172 *[6.77]*	325 *[12.80]*										
		32	161 *[6.34]*	371 *[14.61]*										

1) Type 4WEH 22..
2) Type 4WEH 25..
3) Without mating connector
4) Only with type WEH

Inductive position switch type QM: Directional spool valves type W.H, WM.H, WEH (dimensions in mm *[inch]*)

Mounting options – 3-spool position valve

Monitored spool position	Ordering code	Size	Spring-centered				Pressure-centered			
			L1 3)	L2 3)	L3	L4	L1 3)	L2 3)	L3	L4
"a" (position switch on side B)	QMAG24	10		211 *[8.31]*	57 *[2.24]*					
		16		259 *[10.20]*	55 *[2.16]*			259 *[10.20]*	81 *[3.19]*	
		25 1)		294 *[11.58]*	47 *[1.85]*					
		25 2)		325 *[12.80]*	72 *[2.83]*			325 *[12.80]*	107 *[4.21]*	
		32		371 *[14.61]*	76 *[2.99]*			371 *[14.61]*	120 *[4.72]*	
"b" (position switch on side A)	QMBG24	10	157 *[6.18]*			111 *[4.37]*				
		16	159 *[6.26]*			155 *[6.10]*				
		25 1)	149 *[5.87]*			192 *[7.56]*				
		25 2)	172 *[6.77]*			225 *[8.86]*				
		32	161 *[6.34]*			287 *[11.30]*				
"a" and "b" (position switch on side A and B)	QMABG24	10	157 *[6.18]*	211 *[8.31]*						
		16	159 *[6.26]*	259 *[10.20]*						
		25 1)	149 *[5.87]*	294 *[11.58]*						
		25 2)	172 *[6.77]*	325 *[12.80]*						
		32	161 *[6.34]*	371 *[14.61]*						
Zero position (position switch on side A and B) 2 position switches	QM0G24 5)	10	157 *[6.18]*	211 *[8.31]*						
		16	159 *[6.26]*	259 *[10.20]*						
		25 1)	149 *[5.87]*	294 *[11.58]*						
		25 2)	172 *[6.77]*	325 *[12.80]*						
		32	161 *[6.34]*	371 *[14.61]*						

1) Type 4WEH 22..
2) Type 4WEH 25..
3) Without mating connector
5) 3-spool position valve

Inductive position switch type QM: Directional spool valves type W.H, WM.H, WEH (dimensions in mm *[inch]*)

Mounting options – 3-spool position valve with one solenoid

Monitored spool position	Ordering code	Size	Solenoids on Side A (EA, FA...) Spring-centered				Side B (EB, FB...) Spring-centered				Side A (EA, FA...) Pressure-centered			
			L1 [3]	L2 [3]	L3	L4	L1 [3]	L2 [3]	L3	L4	L1 [3]	L2 [3]	L3	L4
"a" (position switch on side B)	**QMAG24**	10		211 *[8.31]*	57 *[2.24]*									
		16		259 *[10.20]*	55 *[2.16]*							259 *[10.20]*	81 *[3.19]*	
		25 [1]		294 *[11.58]*	47 *[1.85]*									
		25 [2]		325 *[12.80]*	72 *[2.83]*							325 *[12.80]*	107 *[4.21]*	
		32		371 *[14.61]*								371 *[14.61]*	120 *[4.72]*	
"b" (position switch on side A)	**QMBG24**	10					157 *[6.18]*			111 *[4.37]*				
		16					159 *[6.26]*			155 *[6.10]*				
		25 [1]					149 *[5.87]*			192 *[7.56]*				
		25 [2]					172 *[6.77]*			225 *[8.86]*				
		32					161 *[6.34]*			287 *[11.30]*				
Zero position (position switch on side A or B) 1 position switches	**QM0G24** [6]	10		211 *[8.31]*	57 *[2.24]*		157 *[6.18]*			111 *[4.37]*				
		16		259 *[10.20]*	55 *[2.16]*		159 *[6.26]*			155 *[6.10]*		259 *[10.20]*	81 *[3.19]*	
		25 [1]		294 *[11.58]*	47 *[1.85]*		149 *[5.87]*			192 *[7.56]*				
		25 [2]		325 *[12.80]*	72 *[2.83]*		172 *[6.77]*			225 *[8.86]*		325 *[12.80]*	107 *[4.21]*	
		32		371 *[14.61]*	76 *[2.99]*		161 *[6.34]*			287 *[11.30]*		371 *[14.61]*	120 *[4.72]*	

1) Type 4WEH 22..
2) Type 4WEH 25..
3) Without mating connector
6) 2-spool position valve

Inductive position switch type QM: Directional spool valves type Z4WEH (dimensions in mm *[inch]*)

01	02	03	04		05		06	07	08	09	10	11	12		13	14	15	16	17
Z4	**WEH**	**10**		**–**	**5X**	**/**								**/**					*****

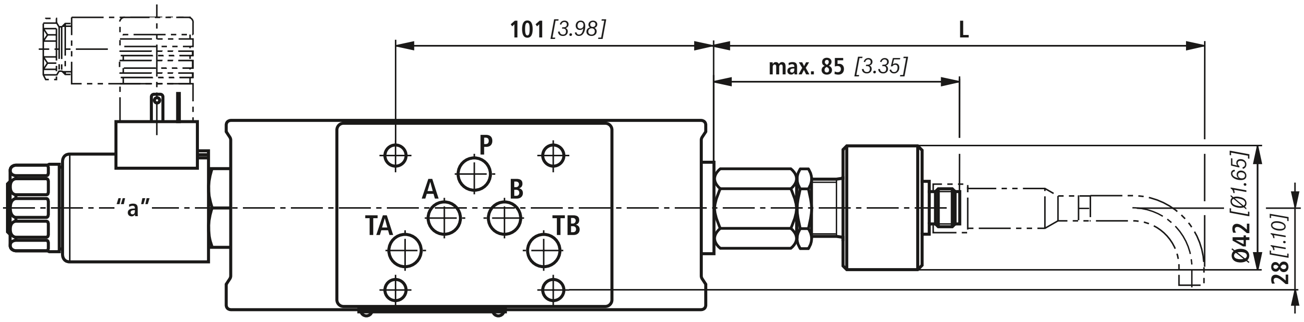
Spool position monitoring

12	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored spool position "a" and "b"	**QMABG24**

Order example:
Z4WEH 10 D24-5X/4KEG24N9ETK4**QMAG24**/...

Complete ordering codes can be found on the basic data sheets:

24755



Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* 2)
Mating connector straight	R900031155	186 *[7.32]*
Mating connector angled	R900082899	117 *[4.61]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

Pinout see page 3.
Switching logics see page 4 and 7.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional spool valves type Z4WH, Z4WEH (dimensions in mm *[inch]*)

01	02	03	04		05		06	07	08	09	10	11	12	13	14	15	16	17	18
Z4		**10**		**–**	**4X**	**/**						**K4**							*****

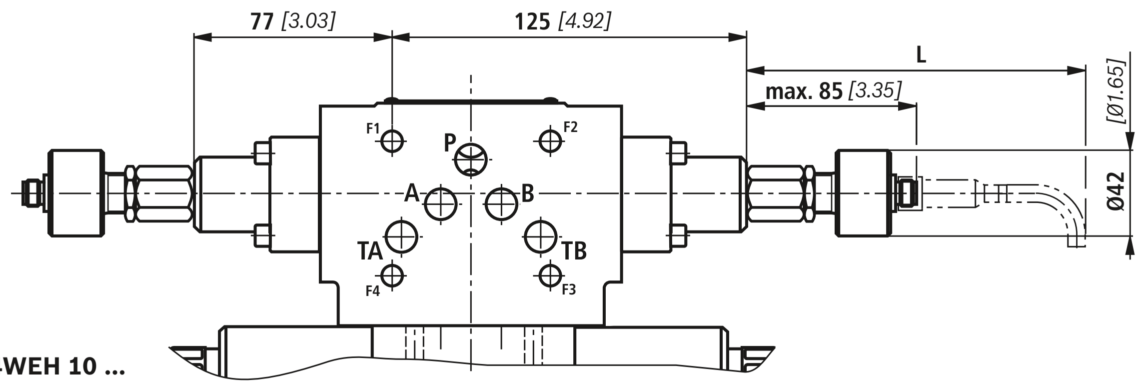
Spool position monitoring

12	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored spool position "a" and "b"	**QMABG24**

Order example:
Z4WEH 10 D24-4X/4KEG24N9ETK4**QMAG24**/...

Complete ordering codes can be found on the basic data sheets:

Size 10	24753



Type Z4WEH 10 ...

Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* 1)
Mating connector straight	R900031155	186 *[7.32]*
Mating connector angled	R900082899	117 *[4.61]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

Pinout see page 3.
Switching logics see page 5 to 7.

Mounting options:

Monitored spool position	**Ordering code**	**Position switch on side**		
		"a"	**"b"**	**"a"** and **"b"**
"a"	**QMAG24**		X	
"b"	**QMBG24**	X		
"a" and "b"	**QMABG24**			X

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QM: Directional spool valves type Z4WH, Z4WEH (dimensions in mm *[inch]*)

01	02	03	04		05		06	07	08	09	10	11	12	13	14	15	16	17	18
Z4				**–**	**5X**	**/**						**K4**							*****

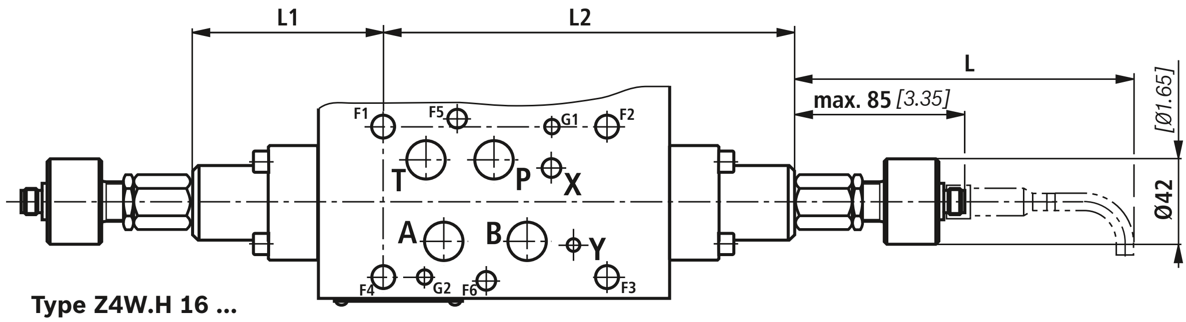
Spool position monitoring

12	**Without** position switch	**no code**
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored spool position "a" and "b"	**QMABG24**
	Monitored rest position (only with symbol "E62")	**QM0G24**

Order example:
Z4WEH 16 D24-5X/4KEG24N9ETK4**QMAG24**/...

Complete ordering codes can be found on the basic data sheets:

Size 16	24761
Size 25	24768



Type Z4W.H 16 ...

Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* [1)]
Mating connector straight	R900031155	186 *[7.32]*
Mating connector angled	R900082899	117 *[4.61]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

L1 in mm *[inch]*		**L2** in mm *[inch]*	
Size 16	Size 25	Size 16	Size 25
82 *[3.23]*	62 *[2.44]*	182 *[7.17]*	215 *[8.46]*

Mounting options:

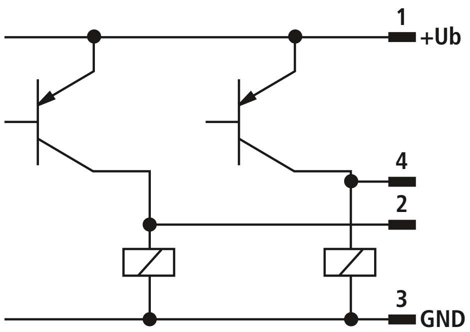
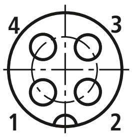
Monitored spool position	**Ordering code**	**Position switch on side**		
		"a"	**"b"**	**"a"** and **"b"**
"a"	**QMAG24**		X	
"b"	**QMBG24**	X		
"a" and "b"	**QMABG24**			X
"0"	**QM0G24**			X

Pinout see page 3.
Switching logics see page 5 to 7.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QL: Electrical connection

The electric connection is realized via a 4-pole mating connector (separate order, see page 42) with connection thread M12 x 1.

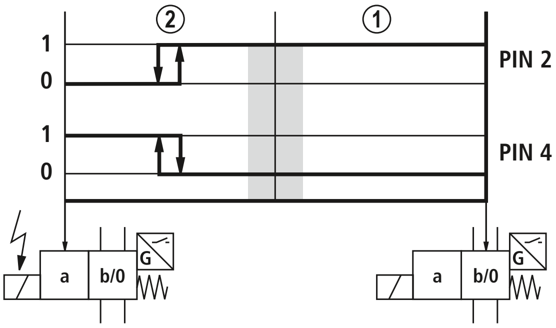
Connection voltage:	24 V +56%/−31%, direct voltage	
Admissible residual ripple:	≤10%	
Load capacity:	Maximum 25 mA	
Switching outputs: 	PNP transistor outputs, load between switching outputs and GND	
Pinout: 	**1**	+24 V
	2	Switching output: 25 mA
	3	0 V, GND
	4	Switching output: 25 mA

Inductive position switch type QL: Switching logics

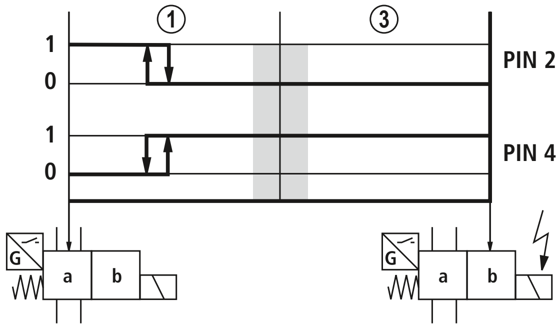
▶ **For directional spool valves type WE, Z4WEH10.-5X**

Depending on the spool position to be monitored, the switching outputs have the following function:

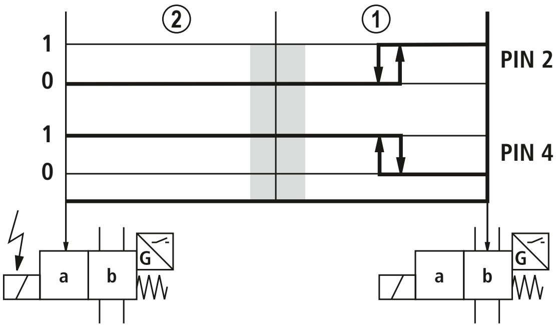
Model QLA
(position switch on side B, monitored spool position "a")



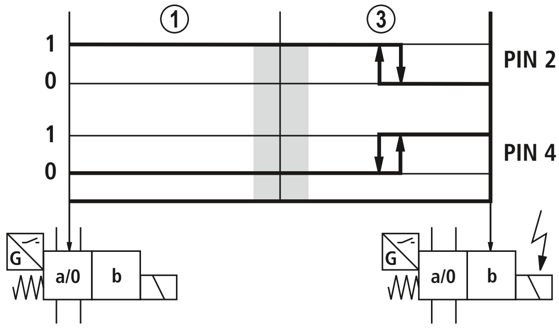
Model QLA (not for type Z4WEH10.-5X)
(position switch on side A, monitored spool position "a")



Model QLB
(position switch on side B, monitored spool position "b")



Model QLB (not for type Z4WEH10.-5X)
(position switch on side A, monitored spool position "b")



0 Contacts open (0 V)
1 Contacts closed (24 V)
Overlap area/hydraulic symbol change

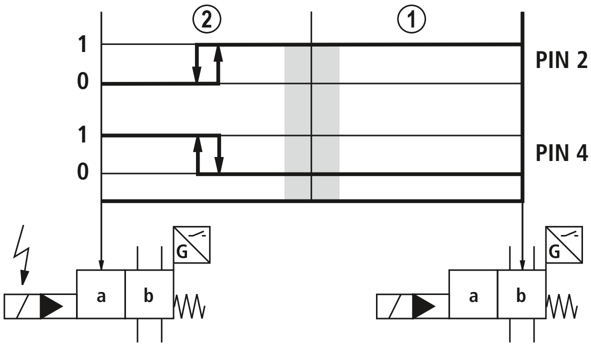
① Rest position
② Solenoid "a" switched
③ Solenoid "b" switched

Inductive position switch type QL: Switching logics

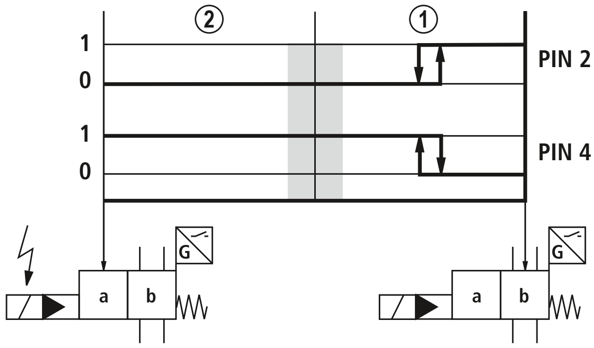
▶ **For directional spool valves type Z4WEH10.-5X**

Depending on the spool position to be monitored, the switching outputs have the following function:

Model QLA
(position switch on side B, monitored spool position of the main stage "a")



Model QLB
(position switch on side B, monitored spool position of the main stage "b")



0 Contacts open (0 V)
1 Contacts closed (24 V)
Overlap area/hydraulic symbol change

① Rest position
② Solenoid "a" switched
③ Solenoid "b" switched

Inductive position switch type QL: Directional spool valves type WE (dimensions in mm *[inch]*)

01	02	03	04	05		06	07	08	09	10	11		
	WE				**/**							**/**	**...**

Spool position monitoring

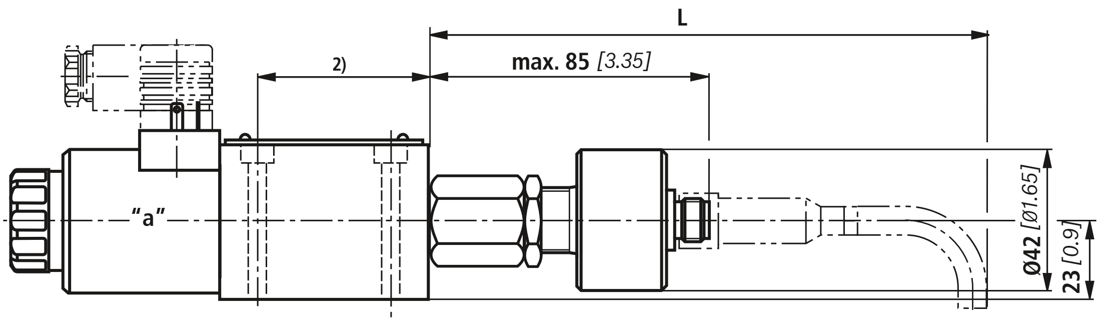
11	**Without** position switch	**no code**
	Monitored spool position "a"	**QLAG24**
	Monitored spool position "b"	**QLBG24**

Order example:
4WE 6 C6X/EG24N9K4**QLAG24**/...

Complete ordering codes can be found on the basic data sheets:

Size 6	23178

Notice!
For valves with 3 switching positions and valves with detent (models "O" and "OF"), no position switch is available!



Mating connector (order separately, see page 42)		**L** in mm *[inch]* [1)]	
	Material no.	Size 6	Size 10
Mating connector straight	R900031155	186 *[7.32]*	183 *[7.21]*
Mating connector angled	R900082899	117 *[4.61]*	114 *[4.48]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*	153 *[6.02]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

2) Dimensions see basic data sheet

Pinout see page 25.
Switching logics see page 26.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QL: Directional spool valves type 5-.WE (dimensions in mm *[inch]*)

01	02		03	04	05	06		07		08	09	10	11	12	13	14		15	16	17	18		19	20
	5	**–**		**WE**	**10**		**–**	**5X**	**/**		**E**						**/**					**=**		*****

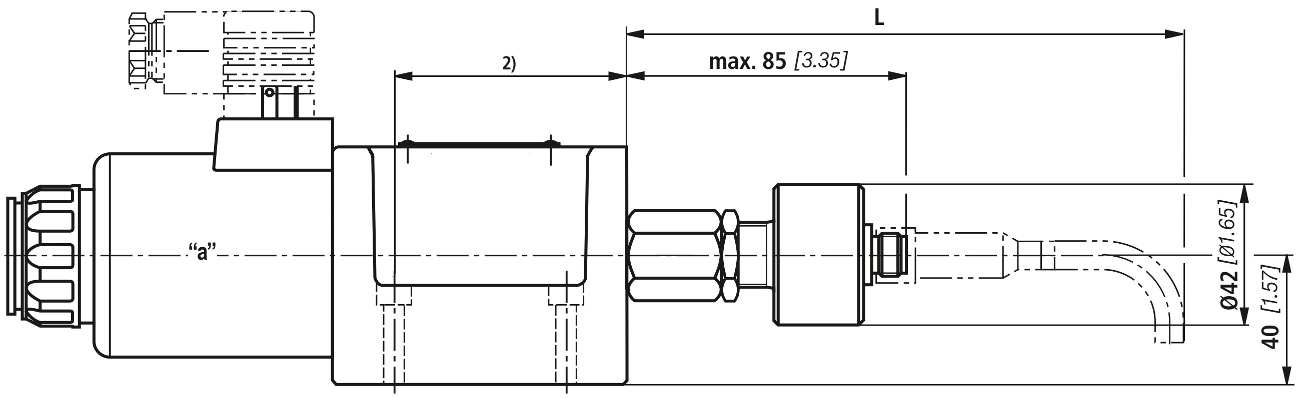
Spool position monitoring

14	**Without** position switch	**no code**
	Monitored spool position "a"	**QLAG24**
	Monitored spool position "b"	**QLBG24**

Order example:
5-4WE 10 C5X/EG24N9K4**QLAG24**/...

Complete ordering codes can be found on the basic data sheets:

23352



Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* 1)
Mating connector straight	R900031155	183 *[7.21]*
Mating connector angled	R900082899	114 *[4.48]*
Mating connector with potted-in cable (3 m)	R900064381	153 *[6.02]*

1) With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line
2) Dimensions see basic data sheet

Pinout see page 25.
Switching logics see page 26.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QL: Directional spool valves type Z4WEH (dimensions in mm *[inch]*)

01	02	03	04		05		06	07	08	09	10	11	12		13	14	15	16	17
Z4	**WEH**	**10**		**–**	**5X**	**/**								**/**					*****

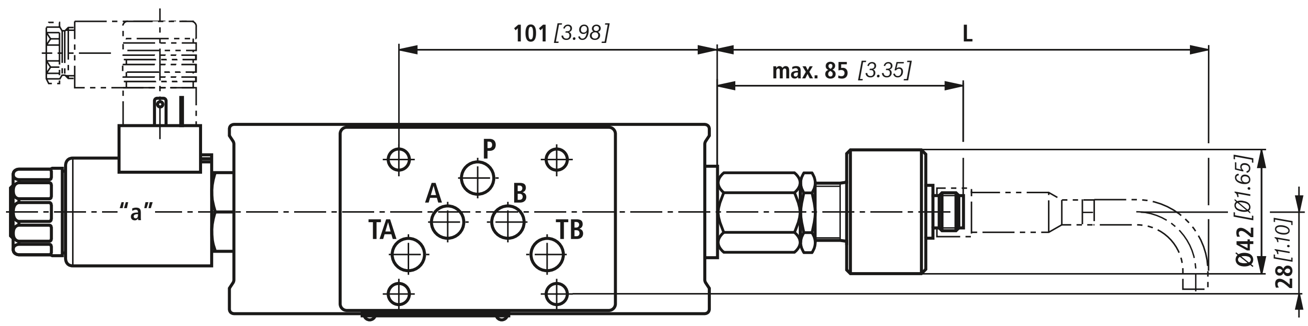
Spool position monitoring

12	**Without** position switch	**no code**
	Monitored spool position "a"	**QLAG24**
	Monitored spool position "b"	**QLBG24**

Order example:
Z4WEH 10 D24-5X/4KEG24N9ETK4**QLAG24**/...

Complete ordering codes can be found on the basic data sheets:

24755



Mating connector (order separately, see page 42)	Material no.	**L** in mm *[inch]* [2)]
Mating connector straight	R900031155	186 *[7.32]*
Mating connector angled	R900082899	117 *[4.61]*
Mating connector with potted-in cable (3 m)	R900064381	156 *[6.14]*

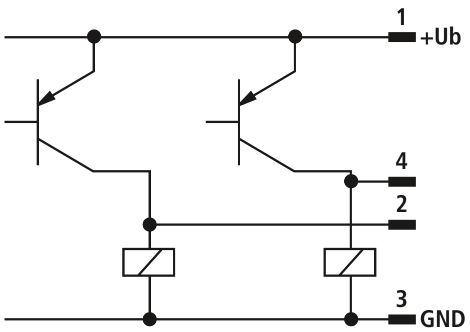
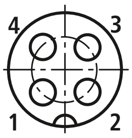
[1)] With mating connector, 10 mm *[0.39 inch]* removal space and minimum bending diameter for the connection line

Pinout see page 25.
Switching logics see page 26 and 27.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive position switch type QR: Electrical connection

The electric connection is realized via a 4-pole mating connector (separate order, see page 42) with connection thread M12 x 1.

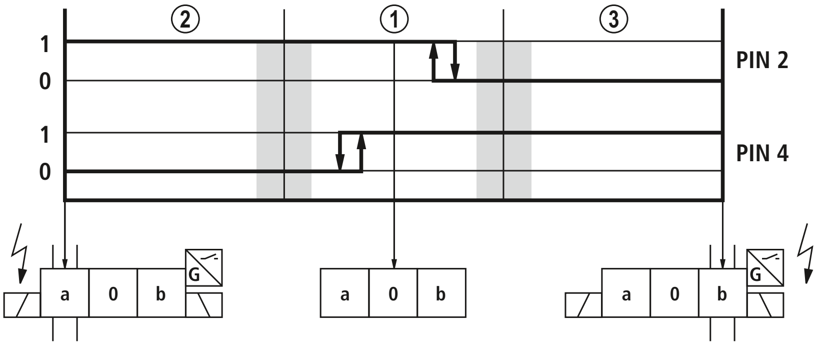
Connection voltage:	24 V +30%/–15%, direct voltage
Admissible residual ripple:	≤10%
Load capacity:	Maximum 400 mA
Switching outputs: 	PNP transistor outputs, load between switching outputs and GND
Pinout: 	**1** +24 V
	2 Switching output: 400 mA
	3 0 V, GND
	4 Switching output: 400 mA

Inductive position switch type QR: Switching logics

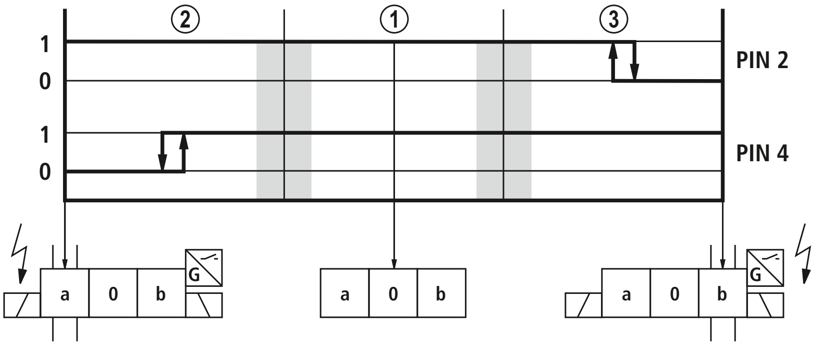
▶ **For directional spool valves type WE** (size 6)

Depending on the spool position to be monitored, the switching outputs have the following function:

Model QR0
(position switch on side B, monitored spool position "0")



Model QRAB
(position switch on side B, monitored spool position "a" and "b")



0 Contacts open (0 V)
1 Contacts closed (24 V)
Overlap area/hydraulic symbol change

① Rest position
② Solenoid "a" switched
③ Solenoid "b" switched

Inductive position switch type QR: Directional spool valves type WE (dimensions in mm *[inch]*)

01	02	03	04	05		06	07	08	09	10	11		
	WE	**6**		**6X**	**/**		**E**					**/**	**...**

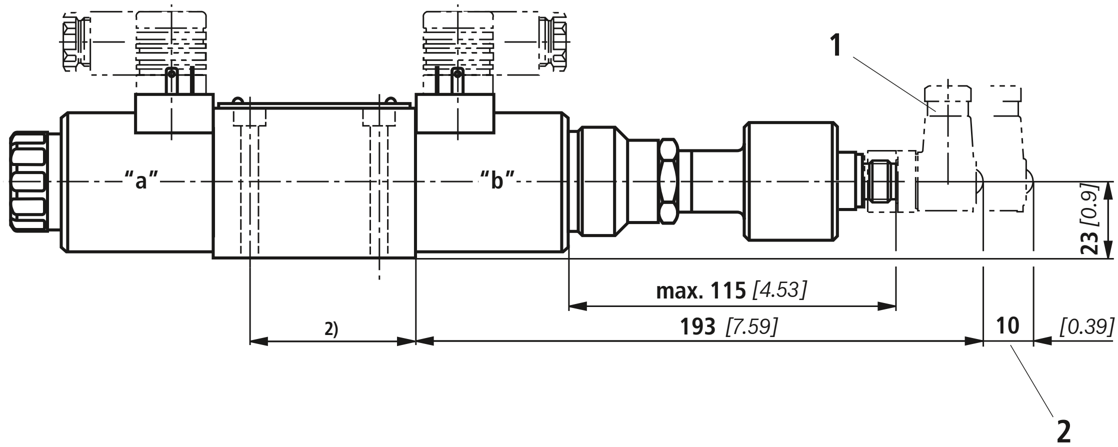
Spool position monitoring

11	**Without** position switch	**no code**
	Monitored rest position	**QR0G24S**
	Monitored spool position "a" and "b"	**QRABG24E**

Order example:
4WE 6 E6X/EG24K4**QR0G24S**/...

Complete ordering codes can be found on the basic data sheets:

23178



1 Mating connector, material no. **R900082899** (order separately, see page 42)

2 Space required to remove the mating connector

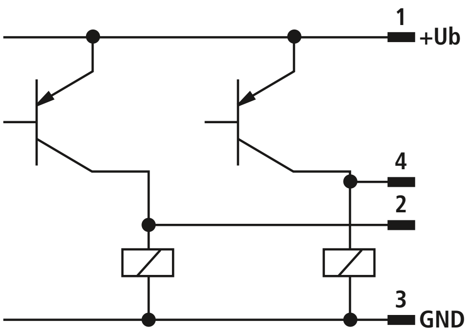
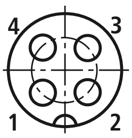
2) Dimensions see basic data sheet

Pinout see page 31.
Switching logics see page 32.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Inductive proximity sensor type QS: Electrical connection

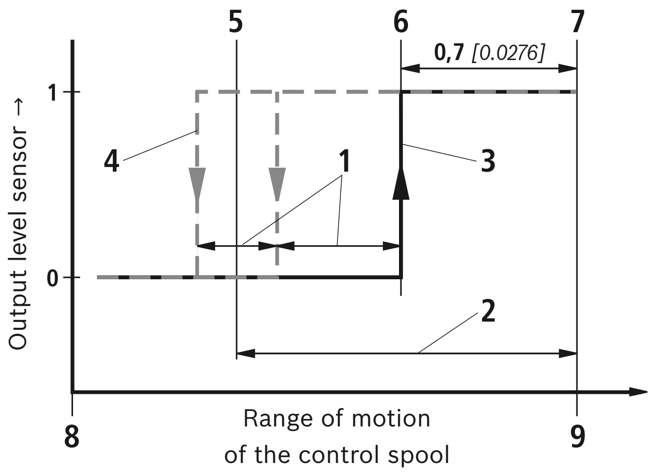
The electric connection is realized via a 4-pole mating connector (separate order, see page 42) with connection thread M12 x 1.

Connection voltage:	24 V ± 25%, direct voltage
Admissible residual ripple:	≤15%
Load capacity:	Maximum 200 mA
Switching outputs: 	PNP transistor outputs, load between switching outputs and GND
Pinout: 	**1** +24 V
	2 Switching output: 200 mA
	3 0 V, GND
	4 Switching output: 200 mA

Inductive proximity sensor type QS: Electrical connection

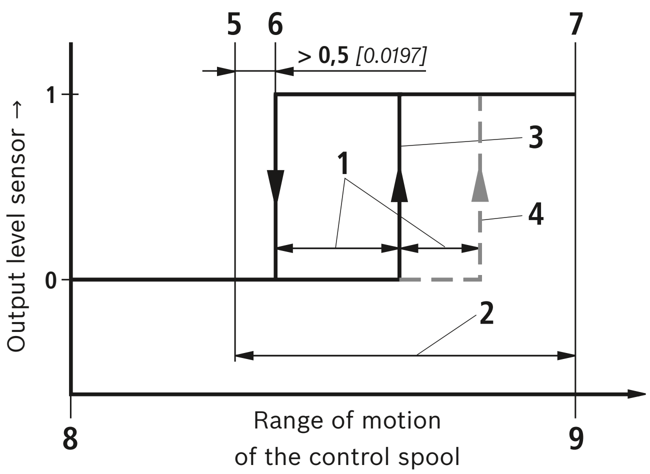
▶ **For directional spool valves type WE** (size 6, data sheet 23178)

☞ **Notice!**
The inductive proximity sensor type QS is set so that there is a signal change when moving the control spool to the (safe) spool position to be monitored, which is approx. 0.7 mm before the stroke end.
Upon switch-off, the signal change may take place outside the overlap area of control spool and housing edge due to the hysteresis and the temperature drift, if applicable.
I.e. monitoring is designed to only determine when the spool position to be monitored is reached and not when the safe area is left; see graphic on the right.



1 Width depending on hysteresis and temperature drift
2 Overlap in the monitored spool position
3 Signal flow (in the switching position to be monitored)
4 Signal flow (leaving the monitored switching position)
5 Beginning of the overlap
6 Switching point
7 Stroke end
8 Not monitored spool position
9 Monitored spool position

▶ **For directional spool valves type 5-.WE** (size 10, data sheet 23352)



☞ **Notice!**
The inductive proximity sensor type QS is set so that there is a signal change when moving the control spool to the (safe) spool position to be monitored >0.5 mm before opening.
I.e. monitoring is designed to only determine when the spool position to be monitored is left and not when the safe area is reached; see graphic on the left.

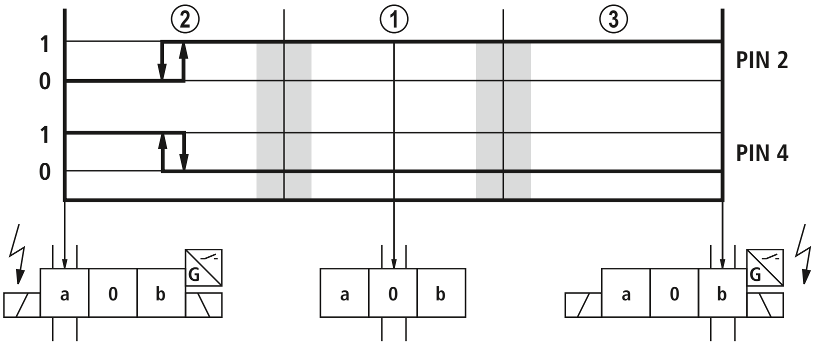
1 Width depending on hysteresis and temperature drift
2 Overlap in the monitored spool position
3 Signal flow (in the switching position to be monitored)
4 Signal flow (leaving the monitored switching position)
5 Beginning of the overlap
6 Switching point
7 Stroke end
8 Not monitored spool position
9 Monitored spool position

Inductive proximity sensor type QS: Switching logics

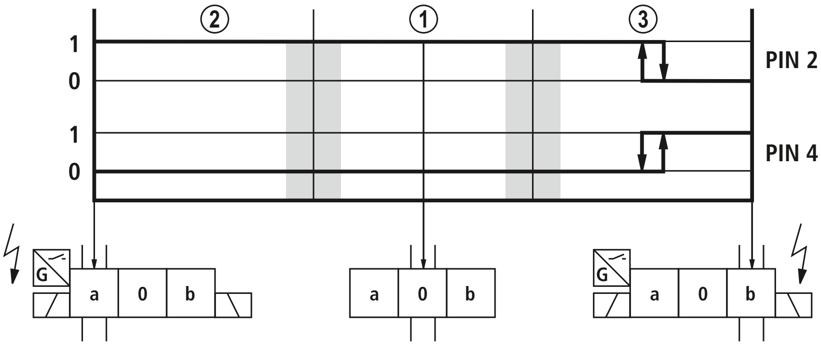
▶ **For directional spool valves type WE** (size 6 and 10)

Depending on the spool position to be monitored, the switching outputs have the following function:

Model QSAG24W (valves with 3 spool positions, e.g. symbols E, J, G, ...)
(proximity sensor on side B, monitored spool position "a")



Model QSBG24W (valves with 3 spool positions, e.g. symbols E, J, G, ...)
(proximity sensor on side A, monitored spool position "b")



0 Contacts open (0 V)
1 Contacts closed (24 V)
Overlap area/hydraulic symbol change

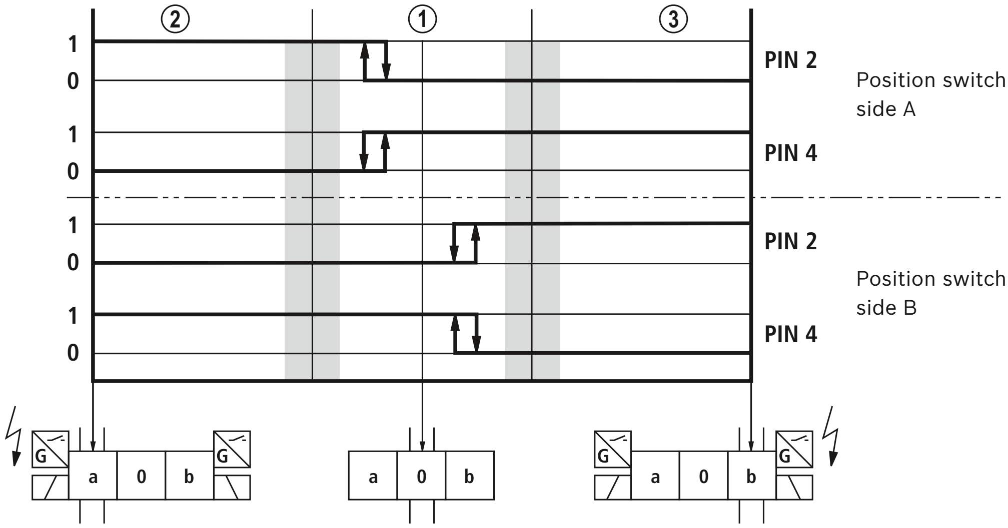
① Rest position
② Solenoid "a" switched
③ Solenoid "b" switched

Inductive proximity sensor type QS: Switching logics

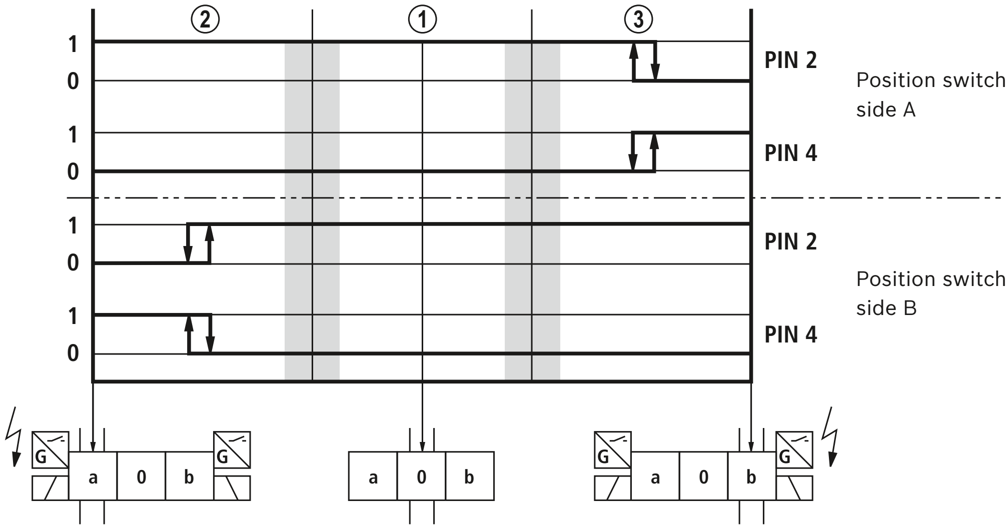
▶ **For directional spool valves type WE** (size 6 and 10)

Depending on the spool position to be monitored, the switching outputs have the following function:

Model QS0G24W (valves with 3 spool positions, e.g. symbols E, J, G, ...)
(proximity sensor on side A and B, monitored rest position)



Model QSABG24W (valves with 3 spool positions, e.g. symbols E, J, G, ...)
(proximity sensor on side A and B, monitored spool position "a" and "b")



0 Contacts open (0 V)
1 Contacts closed (24 V)
Overlap area/hydraulic symbol change

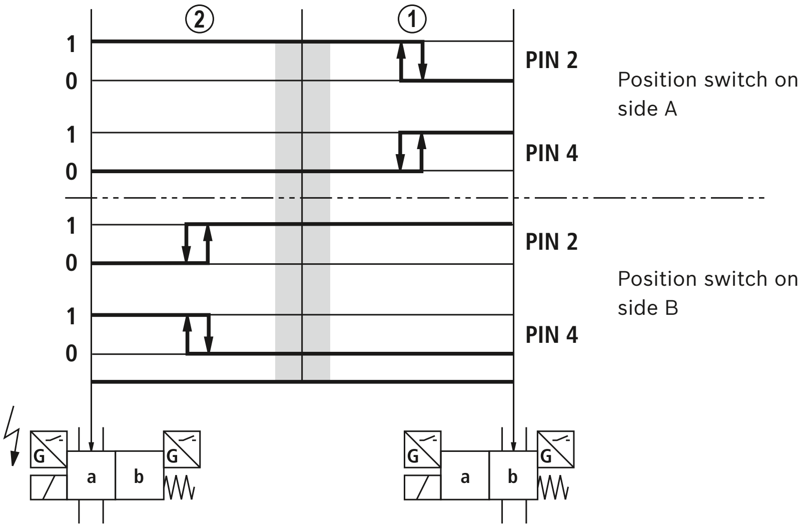
① Rest position
② Solenoid "a" switched
③ Solenoid "b" switched

Inductive proximity sensor type QS: Switching logics

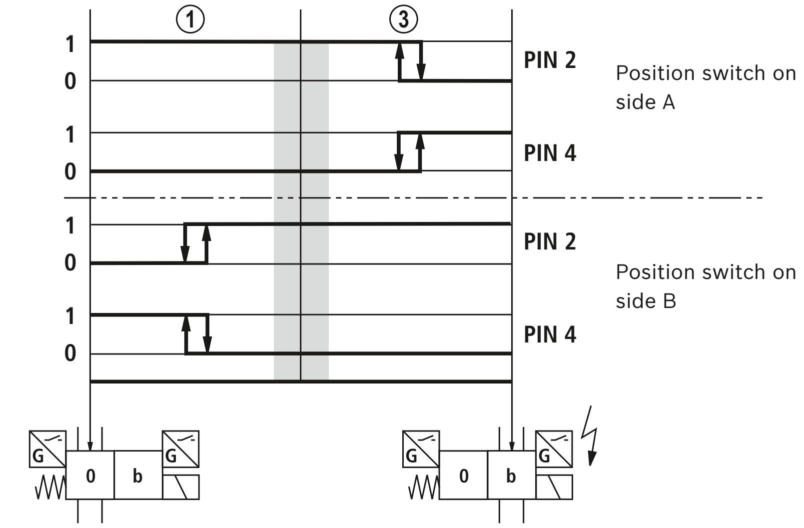
▶ **For directional spool valves type WE** (size 6 and 10)

Depending on the spool position to be monitored, the switching outputs have the following function:

Model QSABG24W (valves with 2 spool positions, e.g. symbols A, B, D, Y, ...)
(proximity sensor on side A and B, monitored spool position "a" and "b")



Model QS0BG24W (valves with 2 spool positions, e.g. symbols EB, ...)
(proximity sensor on side A and B, monitored spool position "0" and "b")



0 Contacts open (0 V)
1 Contacts closed (24 V)
Overlap area/hydraulic symbol change

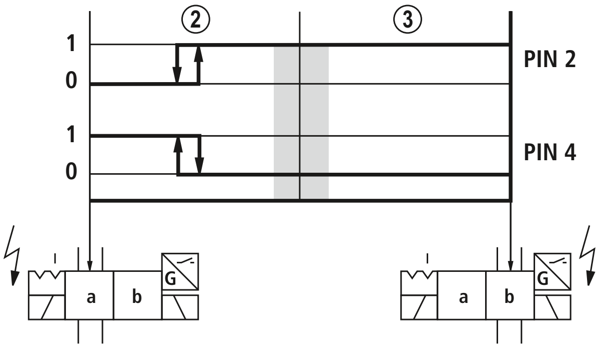
① Rest position
② Solenoid "a" switched
③ Solenoid "b" switched

Inductive proximity sensor type QS: Switching logics

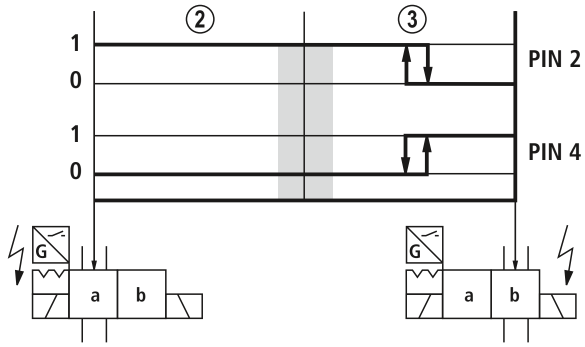
▶ **For directional spool valves type WE** (size 6 and 10)

Depending on the spool position to be monitored, the switching outputs have the following function:

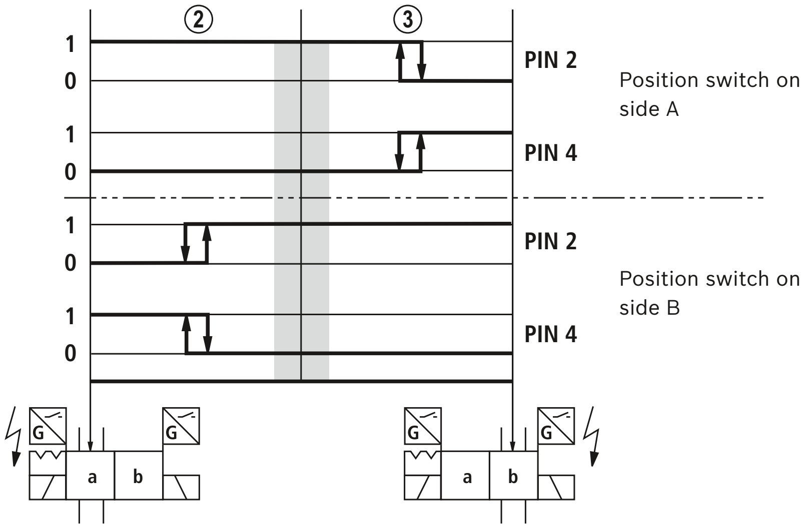
Model OF...QSAG24W
(proximity sensor on side B, monitored spool position "a")



Model OF... QSBG24W
(proximity sensor on side A, monitored spool position "b")



Model OF...QSABG24W
(proximity sensor on side A and B, monitored spool position "a" and "b")



0 Contacts open (0 V)
1 Contacts closed (24 V)
Overlap area/hydraulic symbol change

① Rest position
② Solenoid "a" switched
③ Solenoid "b" switched

Inductive proximity sensor type QS: Directional spool valves type WE (dimensions in mm *[inch]*)

01	02	03	04	05		06	07	08	09	10	11		
	WE				**/**							**/**	**...**

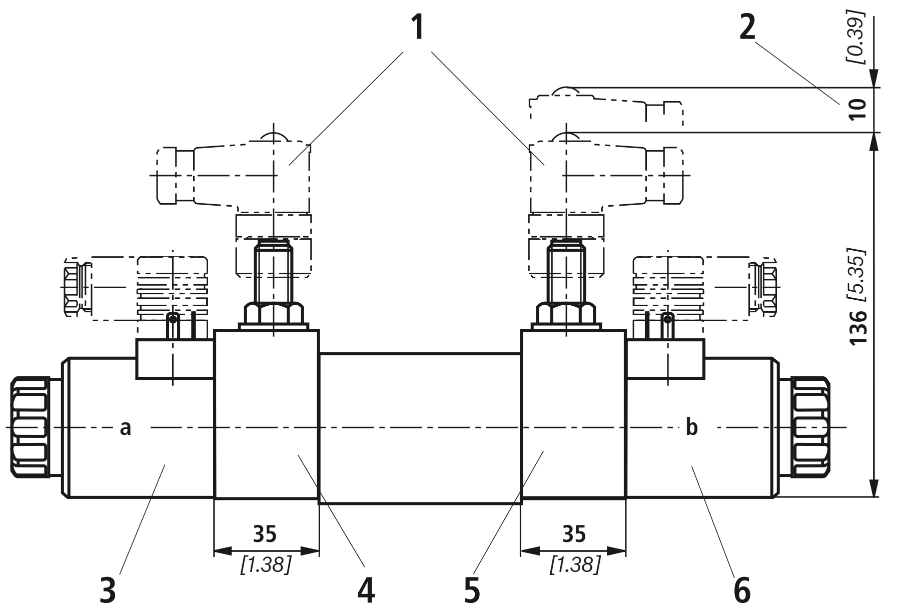
Spool position monitoring

11	**Without** position switch	**no code**
	Monitored spool position "a"	**QSAG24W**
	Monitored spool position "b"	**QSBG24W**
	Monitored spool position "0"	**QS0G24W**
	Monitored spool position "0" and "a"	**QS0AG24W**
	Monitored spool position "0" and "b"	**QS0BG24W**
	Monitored spool position "a" and "b"	**QSABG24W**

Order example:
4WE 6 E6X/EG24K4**QR0G24S**/...

Complete ordering codes can be found on the basic data sheets:

Size 6	23178



1 Mating connector, material no. **R900082899** (order separately, see page 42)
2 Space required to remove the mating connector
3 Solenoid side "a"
4 Switch side "a"
5 Switch side "b"
6 Solenoid side "b"

Mounting options:

Monitored spool position	**Ordering code**	**3-spool position valve with 2 solenoids** Switch side "a"	Switch side "b"	**2-spool position valve .../O...; .../OF...** Switch side "a"	Switch side "b"
"a"	**QSAG24W**	–	**X**	–	**X**
"b"	**QSBG24W**	**X**	–	**X**	–
"0"	**QS0G24W**	**X**	**X**	–	–
"0" and "a"	**QS0AG24W**	**X**	**X**	–	–
"0" and "b"	**QS0BG24W**	**X**	**X**	–	–
"a" and "b"	**QSABG24W**	**X**	**X**	**X**	**X**

Pinout see page 34.
Switching logics see page 36 to 39.

☞ **Notice!**
The dimensions are nominal dimensions which are subject to tolerances.

Inductive proximity sensor type QS: Directional spool valves type 5-.WE (dimensions in mm *[inch]*)

01	02		03	04	05	06		07		08	09	10	11	12	13	14		15	16	17	18		19	20
	5	**–**		**WE**	**10**		**–**	**5X**	**/**		**E**						**/**					**=**		*****

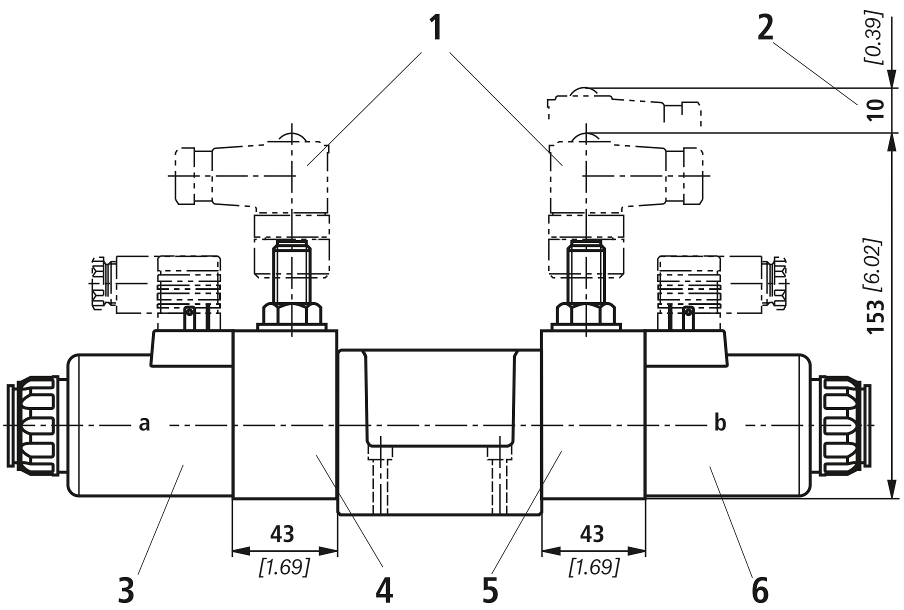
Spool position monitoring

11	**Without** position switch	**no code**
	Monitored spool position "a"	**QSAG24W**
	Monitored spool position "b"	**QSBG24W**
	Monitored spool position "0"	**QS0G24W**
	Monitored spool position "0" and "a"	**QS0AG24W**
	Monitored spool position "0" and "b"	**QS0BG24W**
	Monitored spool position "a" and "b"	**QSABG24W**

Order example:
5-4WE 10 C5X/EG24N9K4**QSAG24W**/...

Complete ordering codes can be found on the basic data sheets:

23352



1 Mating connector, material no. **R900082899** (order separately, see page 42)
2 Space required to remove the mating connector
3 Solenoid side "a"
4 Switch side "a"
5 Switch side "b"
6 Solenoid side "b"

Mounting options:

Monitored spool position	Ordering code	3-spool position valve with 2 solenoids		2-spool position valve .../O...; .../OF...	
		Switch side "a"	Switch side "b"	Switch side "a"	Switch side "b"
"a"	**QSAG24W**	–	**X**	–	**X**
"b"	**QSBG24W**	**X**	–	**X**	–
"0"	**QS0G24W**	**X**	**X**	–	–
"0" and "a"	**QS0AG24W**	**X**	**X**	–	–
"0" and "b"	**QS0BG24W**	**X**	**X**	–	–
"a" and "b"	**QSABG24W**	**X**	**X**	**X**	**X**

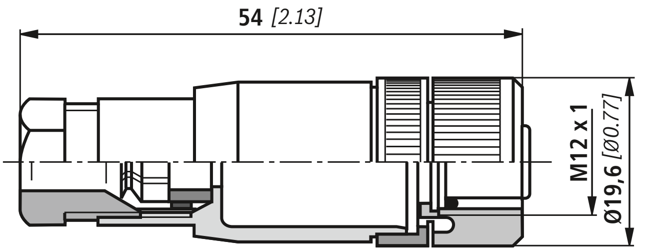
Pinout see page 34. Switching logics see page 36 to 39.

Notice!
The dimensions are nominal dimensions which are subject to tolerances.

Mating connectors
(dimensions in mm *[inch]*)

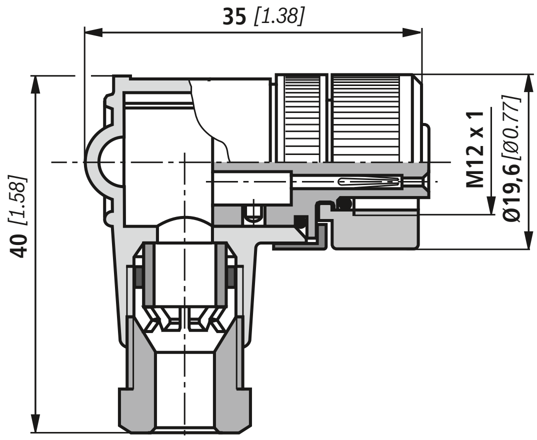
Mating connector suitable for K24 4-pole, M12 x 1
with screw connection, cable gland Pg 9.

Material no. **R900031155**



Mating connector suitable for K24 4-pole, M12 x 1
with screw connection, cable gland Pg 9, angled.
Housing can be rotated by 4 x 90° in relation to the contact insert.

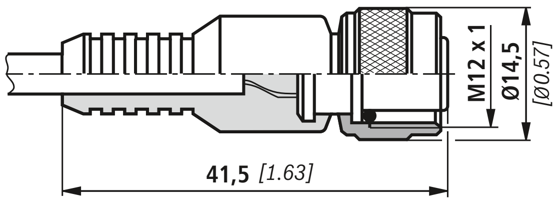
Material no. **R900082899**



Mating connector suitable for K24-3m 4-pin, M12 x 1
with potted-in PVC cable, 3 m long.

Line cross-section:	4 x 0.34 mm^2	
Core marking:	1	Brown
	2	White
	3	Blue
	4	Black

Material no. **R900064381**



For more information refer to data sheet 08006.

More information

▶ Mineral oil-based hydraulic fluids	Data sheet 90220
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ General product information on hydraulic products	Data sheet 07008
▶ Installation, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Hydraulic valves for industrial applications	Data sheet 07600-B
▶ Selection of the filters	www.boschrexroth.com/filter

Notes

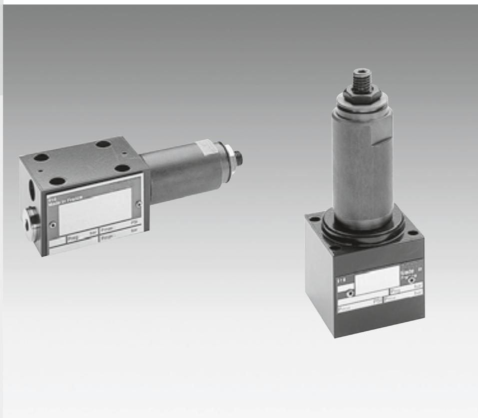
Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Pressure valves

4

Pressure relief valve, directly operated

Type DB6D



Nominal size 6
Unit series 1X
Maximum working pressure 315 bar
Maximum flow rate 60 l/min

Overview of contents

Features

– For subplate mounting
– 3 pressure setting elements, choice of:
  - Sleeve with hexagon socket
  - Rotary knob, lockable, with scale
  - Rotary knob with scale

Ordering data and scope of delivery

DB	6	D		W	– 1X /		V		*

Pressure relief valve = DB

Nominal size 6 = 6

Directly operated = D

Pressure relief in P-duct = P
Pressure relief in P and B-ducts = PB

Mounting hole configuration to ISO 6264 = W

Setting elements
Sleeve with hexagon socket = 2
Rotary knob, lockable, with scale [1)] = 3
Rotary knob with scale = 7

[1)] 2H key included in scope of delivery

= Further information in plain text

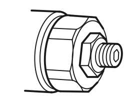
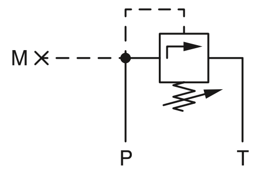
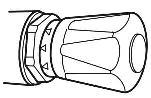
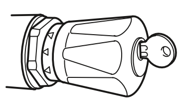
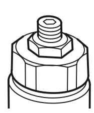
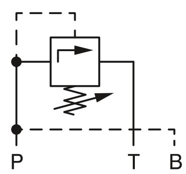
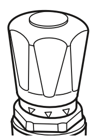
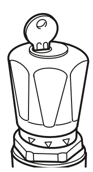
No code = horizontal adjustment
W65 = vertical adjustment

V = FPM seals
(other seals available on request)
Note
Take compatibility of seals
and pressure fluid into account!

80 = max. setting pressure = 80 bar
160 = max. setting pressure = 160 bar
315 = max. setting pressure = 315 bar

1X = Unit series 10 to 19
(10 to 19: installation and connection dimensions unchanged)

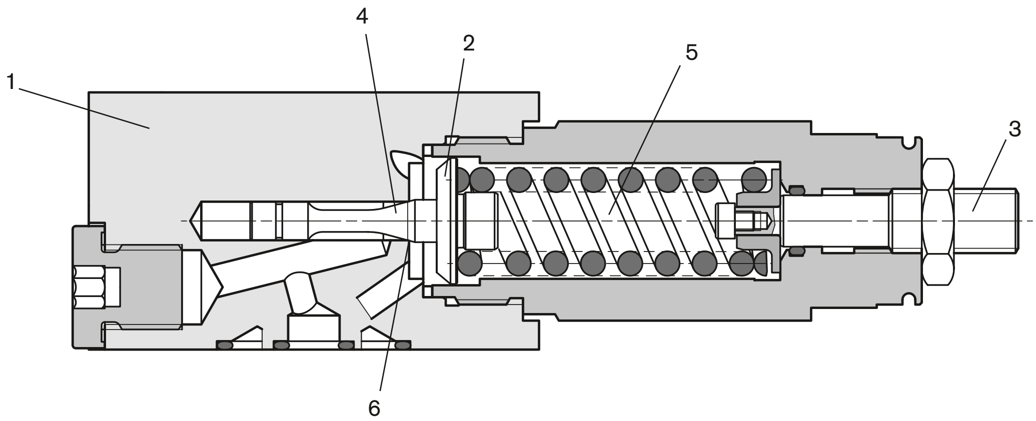
Preferred types (available at short notice)

Type	Material No.	Setting	Symbols
DB 6 D P W 2–1X/80V	**0 811 105 215**		 Horizontal
DB 6 D P W 2–1X/160V	**0 811 105 216**		
DB 6 D P W 2–1X/315V	**0 811 105 217**		
DB 6 D P W 7–1X/80V	**0 811 105 218**		
DB 6 D P W 7–1X/160V	**0 811 105 219**		
DB 6 D P W 7–1X/315V	**0 811 105 220**		
DB 6 D P W 3–1X/80V	**0 811 105 221**		
DB 6 D P W 3–1X/160V	**0 811 105 222**		
DB 6 D P W 3–1X/315V	**0 811 105 223**		
DB 6 D PB W 2–1X/80V W65	**0 811 105 224**		 Vertical
DB 6 D PB W 2–1X/160V W65	**0 811 105 225**		
DB 6 D PB W 2–1X/315V W65	**0 811 105 226**		
DB 6 D PB W 7–1X/80V W65	**0 811 105 227**		
DB 6 D PB W 7–1X/160V W65	**0 811 105 228**		
DB 6 D PB W 7–1X/315V W65	**0 811 105 229**		
DB 6 D PB W 3–1X/80V W65	**0 811 105 230**		
DB 6 D PB W 3–1X/160V W65	**0 811 105 231**		
DB 6 D PB W 3–1X/315V W65	**0 811 105 232**		

Function, sectional diagram

General
Type DB 6 D pressure valves are directly operated pressure relief valves.
They are used to limit the system pressure.
Pressure relief valves essentially consist of the main valve (1) with main piston insert (2) and the pressure setting element (3).

The pressure arising in the P-duct acts on the main piston (2). If the pressure in the P-duct exceeds the value set at the spring (5), the poppet (4) opens towards the spring (5) and the main piston (2) can then move against the spring. This causes pressure fluid to flow from duct P to T via the metering notch (6).



Technical data

General

Valve function		Pressure relief valve, directly operated
Type of mounting		Subplate, mounting hole configuration NG6, ISO 6264
Mounting position		Optional
Ambient temperature range	°C	–25 ... +50
Weight	Horizontal kg	1.4
	Vertical kg	1.1

Hydraulic

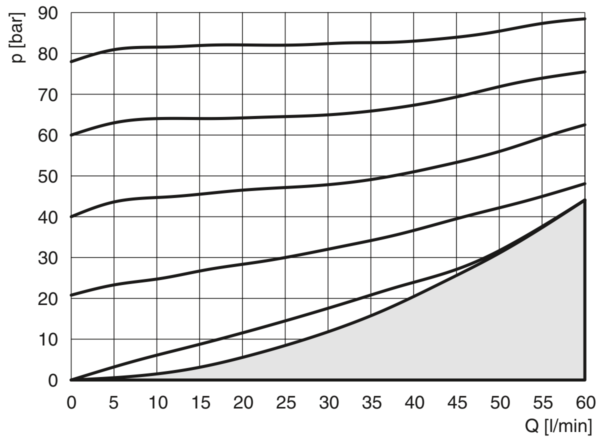
Pressure fluid		Mineral oil (HL, HLP) to DIN 51524, rapidly biodegradable pressure fluids to VDMA 24568 (also see RE 90221), HETG (rapeseed oil), HEPG (polyglycols), HEES (synthetic ester), other pressure fluids available on request
Maximum permissible degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 20/18/15 [1)]
Pressure fluid temperature range	°C	–25 ... +80
Seals		FPM (Viton® Dupont)
Viscosity range	mm^2/s	10 ... 500
Max. setting pressure	bar	80, 160 or 315
Max. working pressure	bar	315
Max. flow rate	l/min	60

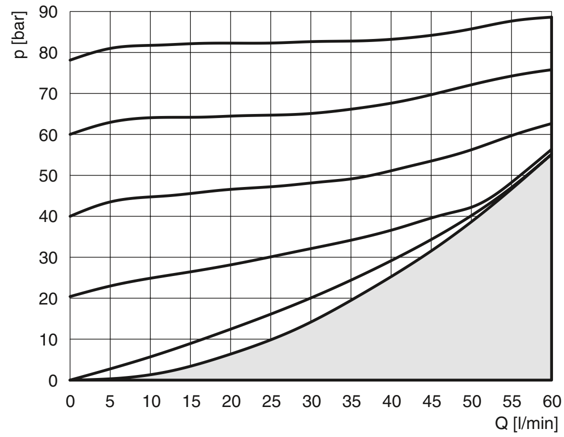
[1)] The purity classes stated for the components must be complied with in hydraulic systems.
Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see catalog sections RE 50070, RE 50076 and RE 50081.

Characteristic curves ($\upsilon = 35$ mm²/s)

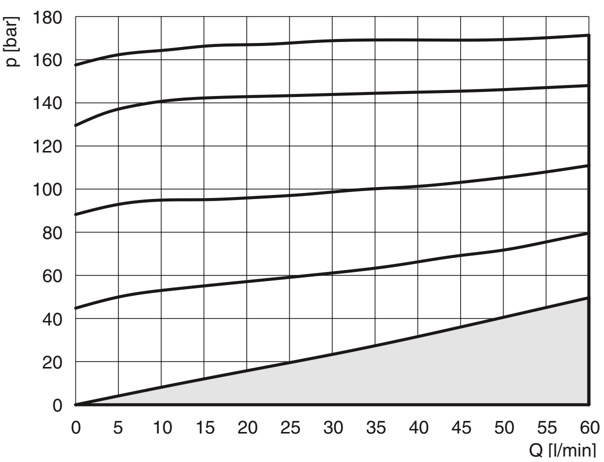
Horizontal setting **Vertical setting**

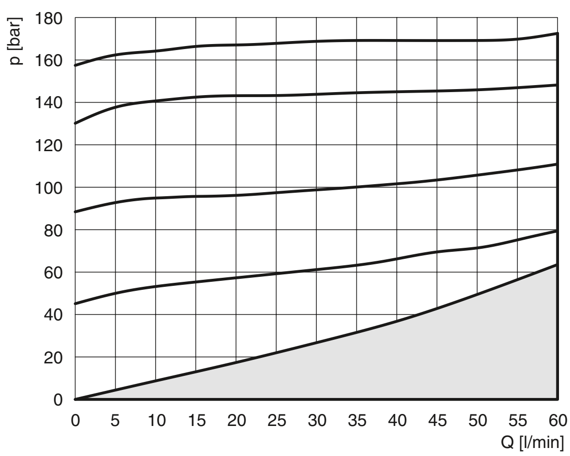
$p = 80$ bar



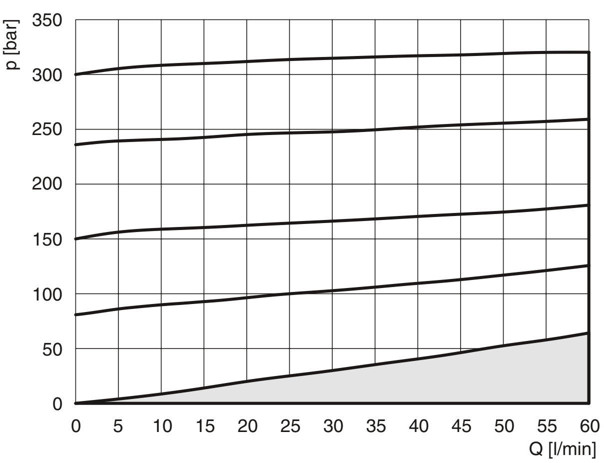


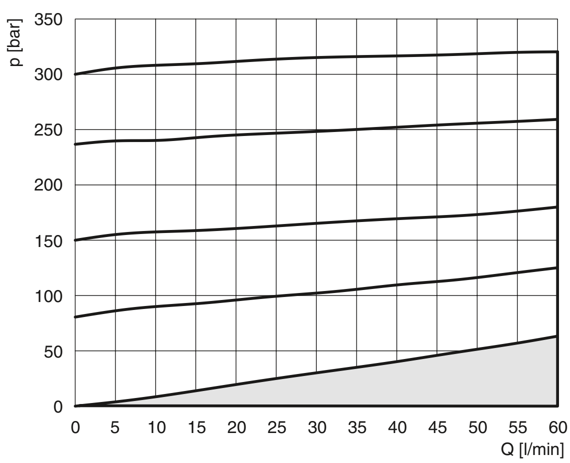
$p = 160$ bar





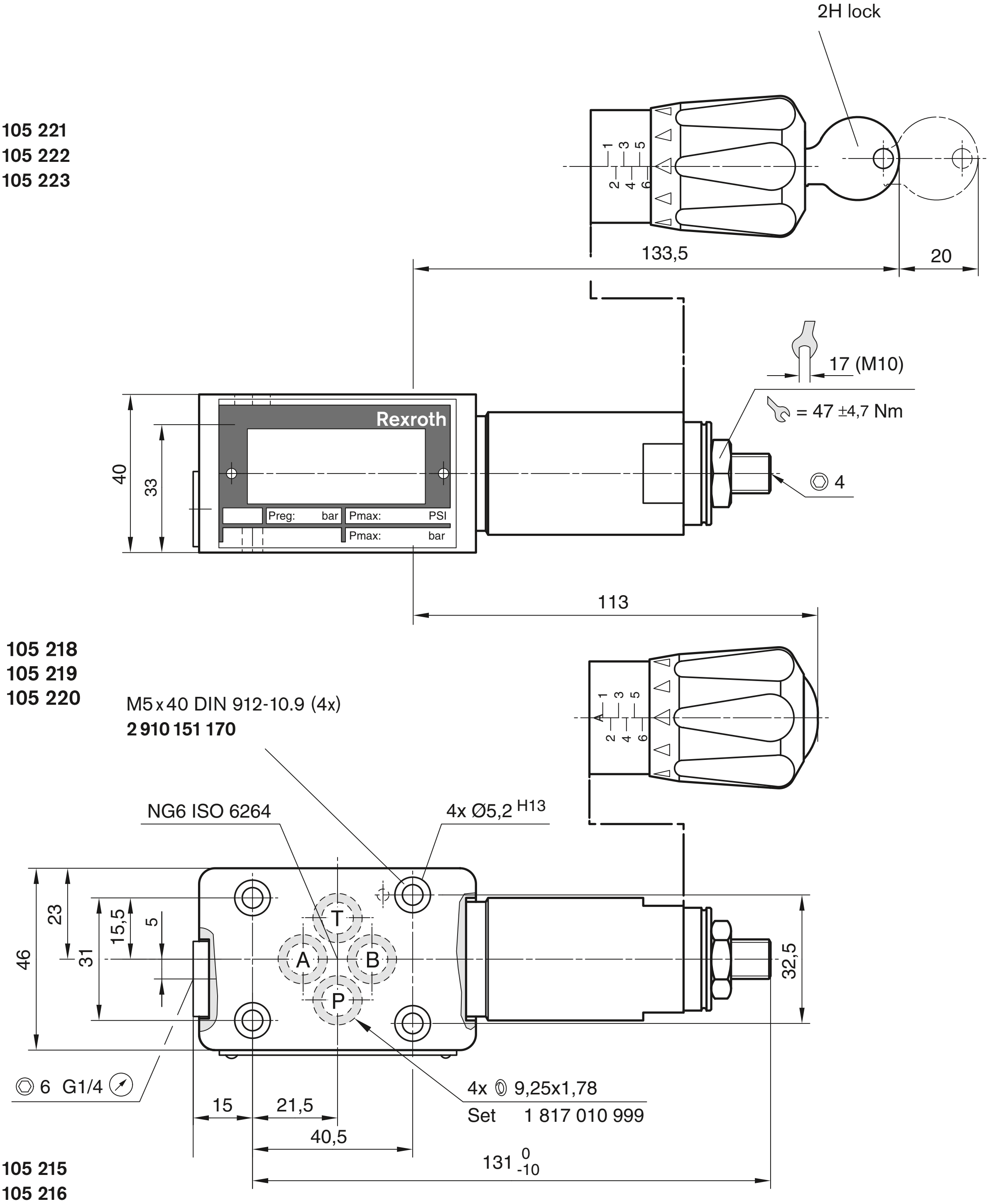
$p = 315$ bar





Unit dimensions (nominal dimensions in mm)

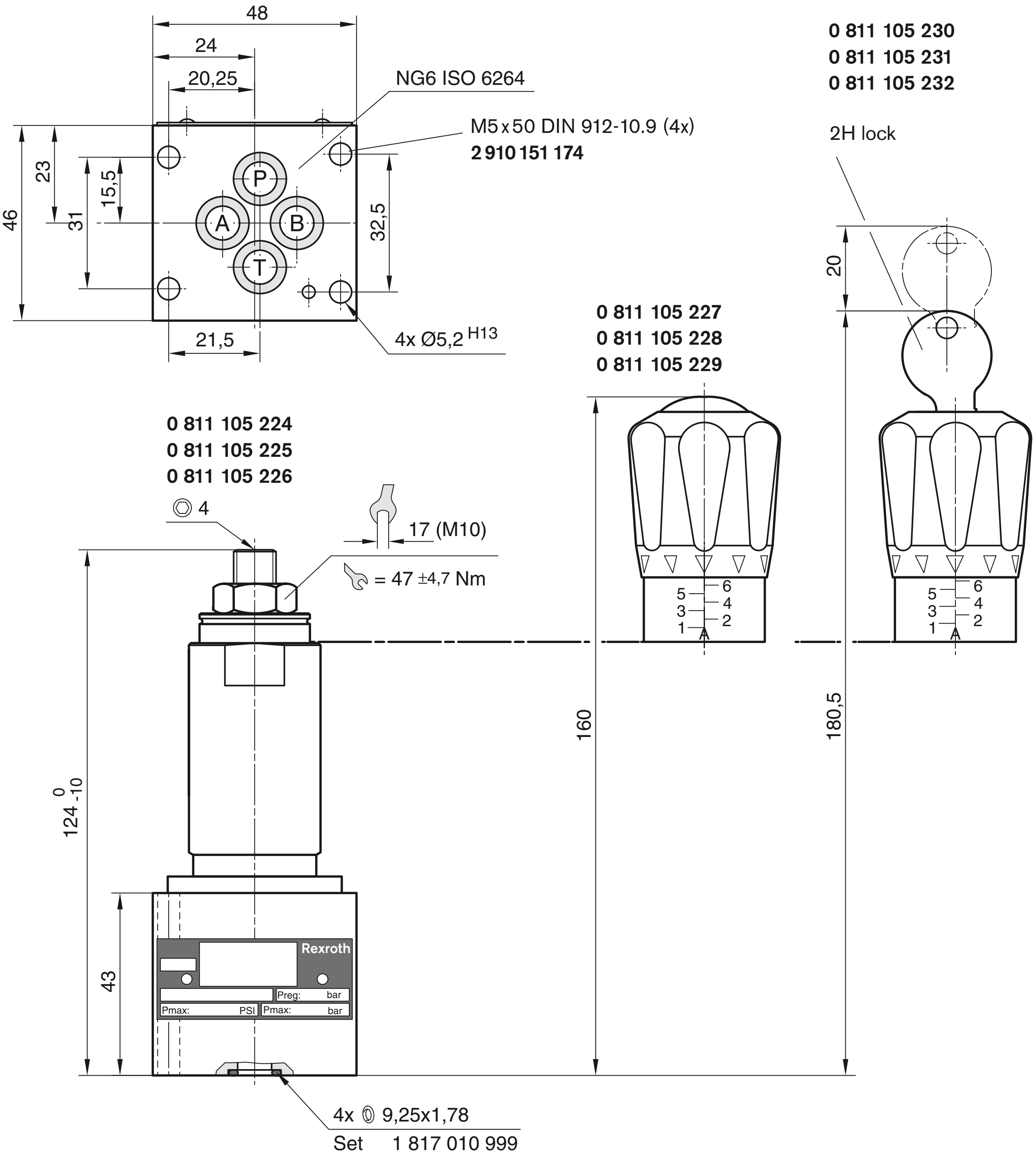
0 811 105 221
0 811 105 222
0 811 105 223



0 811 105 218
0 811 105 219
0 811 105 220

0 811 105 215
0 811 105 216
0 811 105 217

Unit dimensions (nominal dimensions in mm)



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documentation@boschrexroth.de
www.boschrexroth.de

Pressure relief valve, direct operated

RE 25402/10.10
Replaces: 02.09

Type DBD

Sizes 6 to 30
Component series 1X
Maximum operating pressure 630 bar *[9150 psi]*
Maximum flow 330 l/min *[87 US gpm]*

H5585

Table of contents

Features

- As screw-in cartridge valve
- For threaded connection
- For subplate mounting
- Adjustment types for pressure adjustment, optional:
  - Sleeve with hexagon and protective cap
  - Rotary knob / hand wheel
  - Lockable rotary knob

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

DBD				1X	/	

Pressure relief valve, direct operated

Type of adjustment for pressure adjustment	Size 6	8	10	15	20	25	30	
Sleeve with hexagon and protective cap	●	●	●	●	●	●	●	**= S**
Rotary knob [1]	●	●	●	●	●	–	–	**= H**
Hand wheel [2]	–	–	–	–	–	●	●	**= H**
Lockable rotary knob [1,3,5]	●	●	●	●	●	–	–	**= A**
Size	**= 6**	**= 8**	**= 10**	**= 15**	**= 20**	**= 25**	**= 30**	E.g. **= 10**
(Port)	G1/4	G3/8	G1/2	G3/4	G1	G1 1/4	G1 1/2	
Type of connection								
As screw-in cartridge valve	●	–	●	–	●	–	●	**= K**
For threaded connection [4]	●	●	●	●	●	●	●	**= G**
For subplate mounting	●	–	●	–	●	–	●	**= P**
Component series 10 to 1Z (10 to 1Z: unchanged installation and connection dimensions)								**= 1X**
Pressure rating [6]								
Pressure setting up to 25 bar *[362 psi]*	●	●	●	●	●	●	●	**= 25**
Pressure setting up to 50 bar *[725 psi]*	●	●	●	●	●	●	●	**= 50**
Pressure setting up to 100 bar *[1450 psi]*	●	●	●	●	●	●	●	**= 100**
Pressure setting up to 200 bar *[2900 psi]*	●	●	●	●	●	●	●	**= 200**
Pressure setting up to 315 bar *[4568 psi]*	●	●	●	●	●	●	●	**= 315**
Pressure setting up to 400 bar *[5800 psi]*	●	●	●	●	●	–	–	**= 400**
Pressure setting up to 630 bar *[9150 psi]* [7]	–	–	●	–	–	–	–	**= 630**

● = Available

1) With sizes 15 and 20, only available for pressure ratings 25, 50 or 100 bar.

2) Only available for pressure ratings 25, 50 or 100 bar.

3) Key with Material no. **R900008158** is included in the scope of supply.

4) Not available for type-tested safety valves of sizes 8, 15 and 25.

5) Not available for type-tested safety valves.

6) For the selection of the pressure rating, please observe the characteristic curves and notes on page 6!

7) For versions “G“ and “P“, only available as “SO292“, see pages 7 and 10!

Standard types and components are shown in the EPS (standard price list).

			*

Further details in clear text

PED

No code = Without type examination
E = Type-tested safety valve in accordance with PED 97/23/EC

Pipe connection

No code = Pipe thread to ISO 228/1
12 = SAE thread

Seal material

No code = NBR seals
V = FKM seals
(other seals on request)

Attention!
Observe compatibility of seals with hydraulic fluid used!

Function, section, symbol

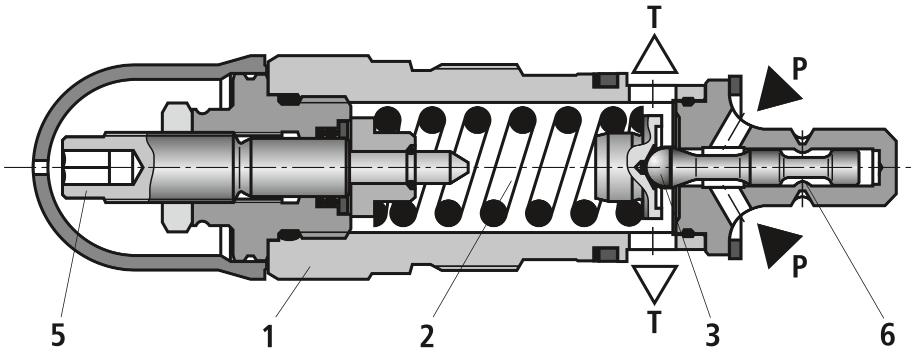
Pressure relief valves of type DBD are direct operated seat valves.

They serve to limit a system pressure.

These valves basically consist of sleeve (1), spring (2), poppet with damping piston (3) (pressure rating 25 to 400 bar) or ball (4) (pressure rating 630 bar) and adjustment element (5). The system pressure setting can be infinitely varied by means of adjustment element (5). Spring (2) presses poppet (3) or ball (4) onto its seat. Channel P is connected to the system. The pressure prevailing in the system acts on the poppet area (or ball).

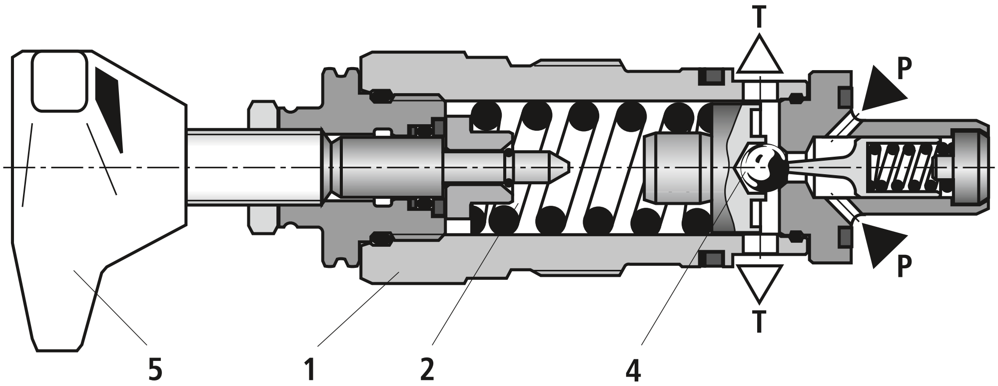
When the pressure in channel P rises above the value set on spring (2), poppet (3) or ball (4) opens against spring (2). Hydraulic fluid can now flow from channel P into channel T. The stroke of poppet (3) is limited by embossment (6).

To obtain good pressure settings over the entire pressure range, the entire pressure range was subdivided into 7 pressure ratings. A pressure rating corresponds to a certain spring, which can be used for setting a maximum operating pressure.



Type DBDS..K1X/…

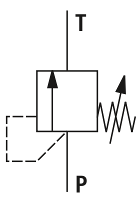
Version for pressure rating 25 to 400 bar (poppet seat valve)



Type DBDH 10 K1X/…

Version for pressure rating 630 bar (ball seat valve, NG10 only)

Symbol



Technical data (for applications outside these parameters, please consult us!)

General

Size	NG	6 and 8	10	15 and 20	25 and 30
Weight		See pages 7, 9 and 11			
Installation position		Optional			
Ambient temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –15 to +80 *[5 to 176]* (FKM seals)			
Minimum strength of housing materials		Housing materials must be selected so that sufficient safety is provided under all conceivable operating conditions (e.g. with regard to compressive strength, thread stripping strength and tightening torques).			

Hydraulic

Maximum operating pressure	– Inlet	bar *[psi]*	400 *[5800]*	630 *[9150]*	400 *[5800]*	315 *[4568]*
	– Outlet	bar *[psi]*	315 *[4568]*	315 *[4568]*	315 *[4568]*	315 *[4568]*
Maximum flow (standard valves)			See characteristic curves on page 6			
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524 [1)]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also data sheet 90221); HETG (rape-seed oil) [1)]; HEPG (polyglycols) [2)]; HEES (synthetic esters) [2)]; other hydraulic fluids on enquiry			
Hydraulic fluid temperature range		°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –15 to +80 *[5 to 176]* (FKM seals)			
Viscosity range		mm^2/s *[SUS]*	10 to 800 *[60 to 3710]*			
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [3)]			

1) Suitable for NBR and FKM seals

2) Suitable only for FKM seals

3) The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.
For the selection of the filters see www.boschrexroth.com/filter.

For deviating technical data for type-tested safety valves, see page 13.

General notes

Hydraulic backpressures in port T add 1:1 to the response pressure of the valve set by means of the adjustment element.

Example:

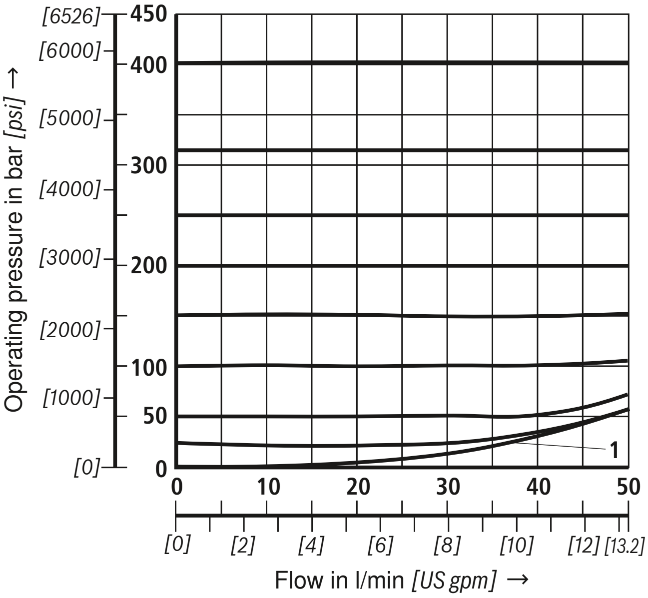
– Pressure adjustment of the valve by means of spring pretensioning (item 2 on page 4) $\boldsymbol{p}_{\text{spring}}$ **= 200 bar**

– Hydraulic backpressure in port T: $\boldsymbol{p}_{\text{hydraulic}}$ **= 50 bar**

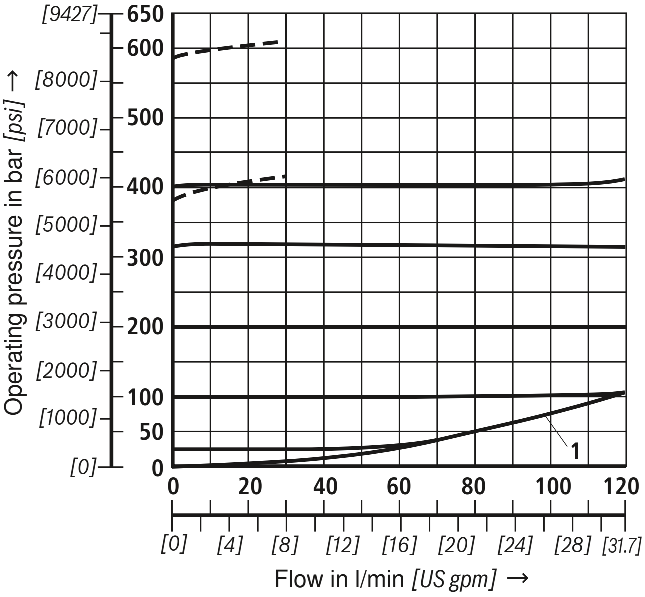
⇒ response pressure = $\boldsymbol{p}_{\text{spring}} + \boldsymbol{p}_{\text{hydraulic}}$ **= 250 bar**

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

NG6



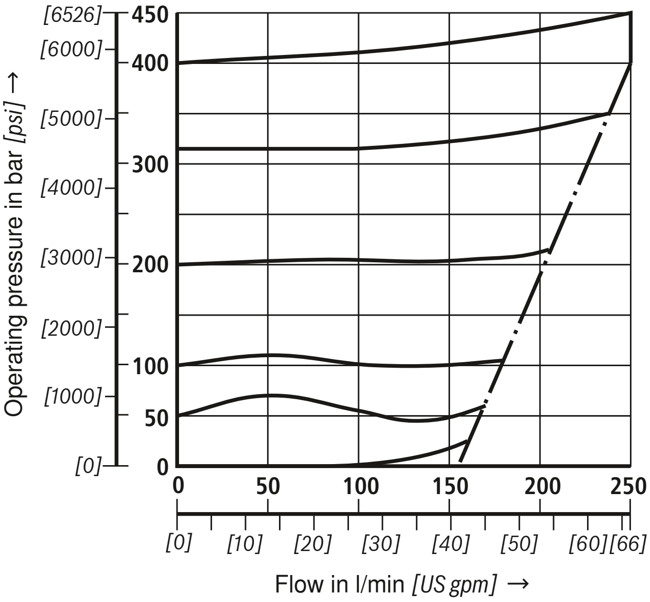
NG8 and 10



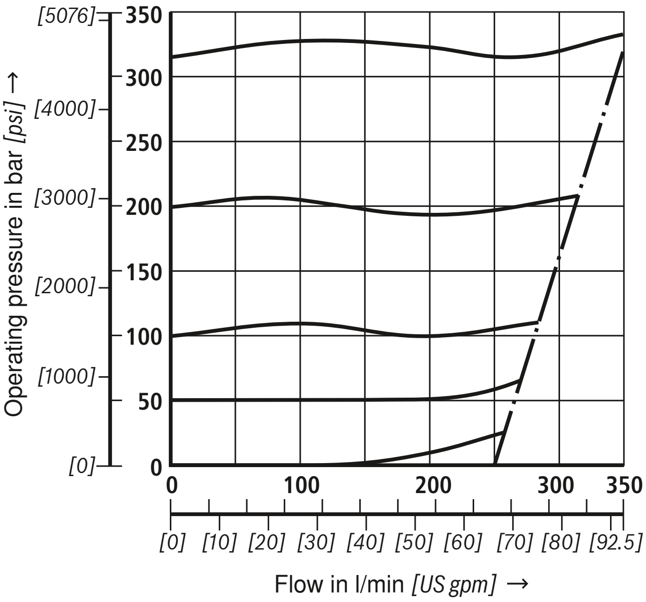
1 = lowest settable pressure

– – – – – = Pressure rating 630 bar *[9150 psi]* (NG10 only)

NG15 and 20



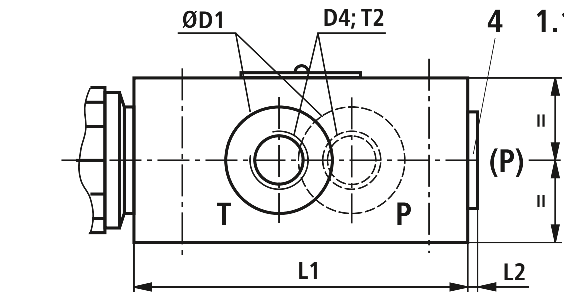
NG25 and 30

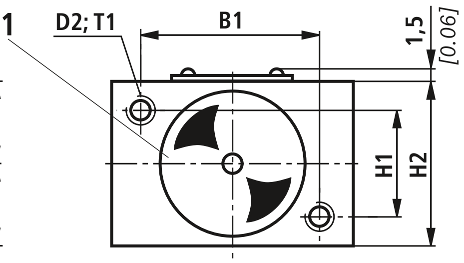


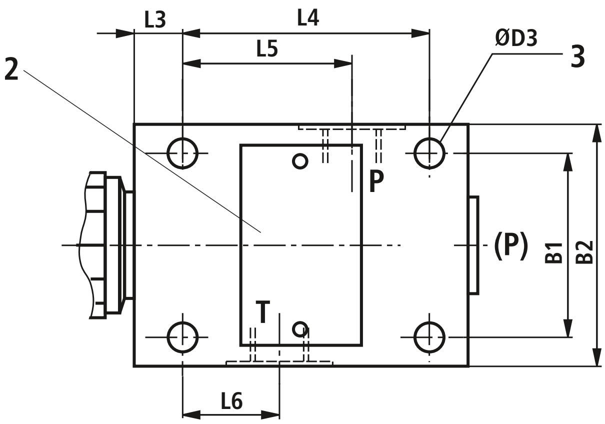
Attention!

- The characteristic curves are valid for output pressure = zero over the entire flow range and were measured without housing resistance!
- The characteristic curves are only valid under the specified ambient and temperature conditions. It must be noted that deviations in the boundary conditions have an influence on the characteristic curve!
- The characteristic curves refer to the given pressure ratings (e.g. 200 bar). The greater the difference between the set pressure value and the nominal pressure rating (e.g. < 200 bar), the greater is the pressure increase as the flow rises.

Unit dimensions: Threaded connection (dimensions in mm *[inch]*)







1.1 Adjustment element “S“ (example)
Set screw with hexagon and protective cap;
Hexagon socket (up to NG20)
Hexagon head (NG25 and 30)

2 Nameplate

3 4 valve mounting bores

4 Additional port (P), optional (e.g. for pressure measurement); not possible for NG10, pressure rating > 400 bar (= version “SO292“).
For dimensions, see D4, for tightening torques, see table below

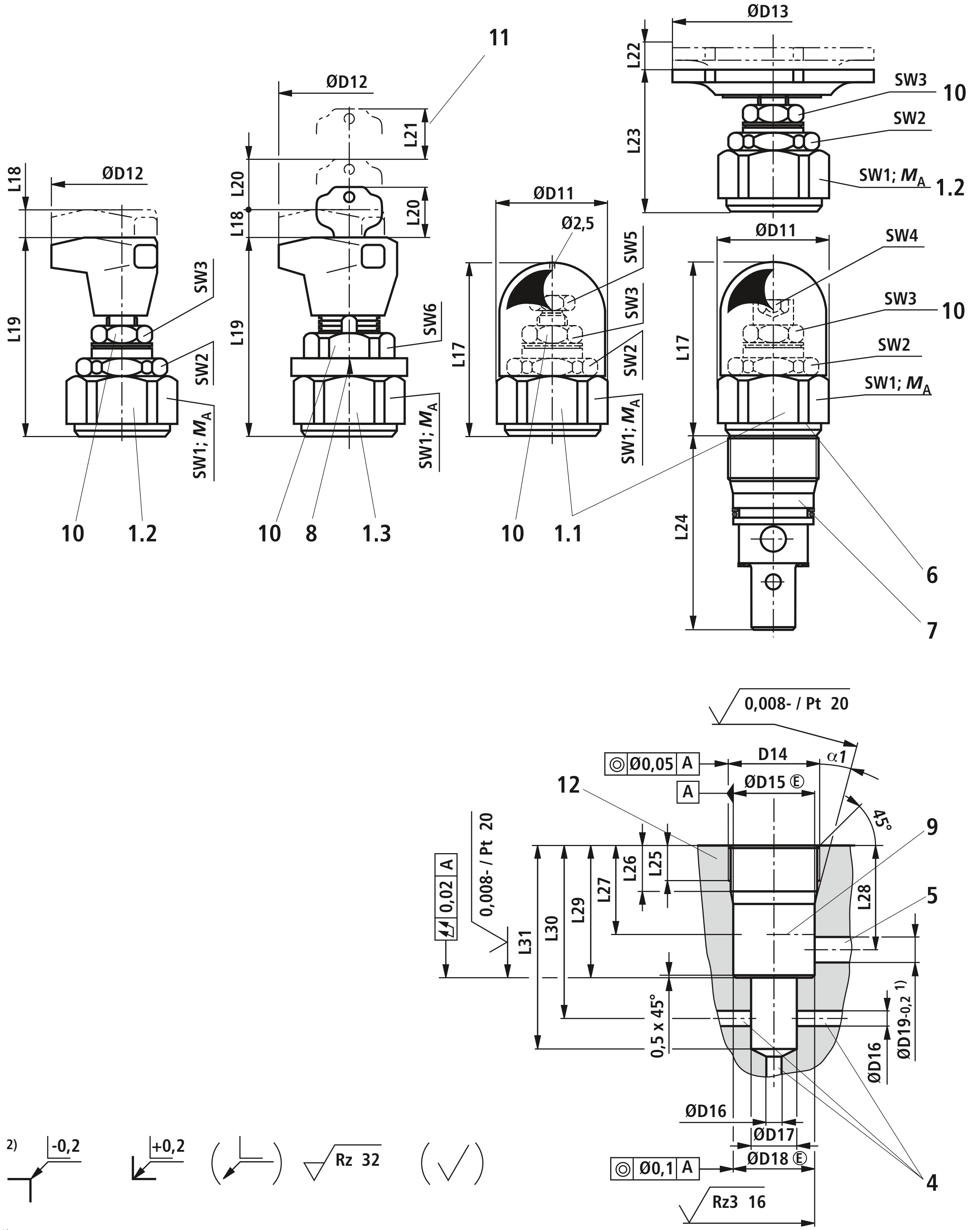
For versions and dimensions of the adjustment elements, see pages 8 and 9

NG	B1	B2	ØD1	D2	ØD3	D4	**Tightening torques M_A in Nm** *[ft-lbs]* **for screws** 1)	
							Plug screw (4)	Pipe fittings
6	45 *[1.77]*	60 *[2.36]*	25 *[0.98]*	M6	6,6 *[0.26]*	G1/4	30 *[22]*	60 *[44]*
8	60 *[2.36]*	80 *[3.15]*	28 *[1.10]*	M8	9 *[0.35]*	G3/8	40 *[29]*	90 *[66]*
10	60 *[2.36]*	80 *[3.15]*	34 *[1.34]*	M8	9 *[0.35]*	G1/2	60 *[44]*	130 *[95]*
15	70 *[2.76]*	100 *[3.94]*	42 *[1.65]*	M8	9 *[0.35]*	G3/4	80 *[59]*	200 *[147]*
20	70 *[2.76]*	100 *[3.94]*	47 *[1.85]*	M8	9 *[0.35]*	G1	135 *[99]*	380 *[280]*
25	100 *[3.94]*	130 *[5.12]*	56 *[2.21]*	M10	11 *[0.43]*	G1 1/4	480 *[354]*	500 *[368]*
30	100 *[3.94]*	130 *[5.12]*	65 *[2.56]*	M10	11 *[0.43]*	G1 1/2	560 *[413]*	600 *[442]*

NG	H1	H2	L1	L2	L3	L4	L5	L6	T1	T2	**Weight,** ca. in kg *[lbs]*
6	25 *[0.98]*	40 *[1.57]*	80 *[3.15]*	4 *[0.16]*	15 *[0.59]*	55 *[2.17]*	40 *[1.57]*	20 *[0.79]*	10 *[0.39]*	12 *[0.47]*	1.5 *[3.3]*
8	40 *[1.57]*	60 *[2.36]*	100 *[3.94]*	4 *[0.16]*	20 *[0.79]*	70 *[2.76]*	48 *[1.89]*	21 *[0.83]*	15 *[0.59]*	12 *[0.47]*	3.7 *[8.2]*
10	40 *[1.57]*	60 *[2.36]*	100 *[3.94]*	4 *[0.16]*	20 *[0.79]*	70 *[2.76]*	48 *[1.89]*	21 *[0.83]*	15 *[0.59]*	14 *[0.55]*	3.7 *[8.2]*
15	50 *[1.97]*	70 *[2.76]*	135 *[5.32]*	4 *[0.16]*	20 *[0.79]*	100 *[3.94]*	65 *[2.56]*	34 *[1.34]*	18 *[0.71]*	16 *[0.63]*	6.4 *[14.1]*
20	50 *[1.97]*	70 *[2.76]*	135 *[5.32]*	5.5 *[0.22]*	20 *[0.79]*	100 *[3.94]*	65 *[2.56]*	34 *[1.34]*	18 *[0.71]*	18 *[0.71]*	6.4 *[14.1]*
25	60 *[2.36]*	90 *[3.54]*	180 *[7.09]*	5.5 *[0.22]*	25 *[0.98]*	130 *[5.12]*	85 *[3.35]*	35 *[1.38]*	20 *[0.79]*	20 *[0.79]*	13.9 *[30.6]*
30	60 *[2.36]*	90 *[3.54]*	180 *[7.09]*	5.5 *[0.22]*	25 *[0.98]*	130 *[5.12]*	85 *[3.35]*	35 *[1.38]*	20 *[0.79]*	22 *[0.87]*	13.9 *[30.6]*

1) The tightening torques are standard values, referred to the maximum operating pressure and under the assumption that a torque wrench is used (tolerance ≤ ±10%).

Unit dimensions: Cartridge valve (dimensions in mm *[inch]*)



[1] Maximum dimensions

[2] All seal ring insertion faces are rounded and free from burrs

Tolerance for all angles ±0.5°

For dimensional tables and explanations of items, see page 9.

Unit dimensions: Cartridge valve (dimensions in mm [inch])

Cartridge valve

NG	ØD11	ØD12	ØD13	L17	L18	L19	L20	L21	L22	L23	L24
6	34 [1.34]	60 [2.36]	–	72 [2.83]	11 [0.43]	83 [3.26]	28 [1.10]	20 [0.79]	–	–	64.5 [2.54]
10	38 [1.50]	60 [2.36]	–	68 [2.68]	11 [0.43]	79 [3.11]	28 [1.10]	20 [0.79]	–	–	77 [3.03]
20	48 [1.89]	60 [2.36]	–	65 [2.56]	11 [0.43]	77 [3.03]	28 [1.10]	20 [0.79]	–	–	106 [4.17]
30	63 [2.48]	–	80 [3.15]	83 [3.26]	–	–	–	–	11 [0.43]	56 [2.21]	131 [5.16]

							Tightening torques M_A in Nm [ft-lbs] for cartridge valves [2)] Pressure rating in bar [psi]			Weight, ca. in kg [lbs]
NG	SW1	SW2	SW3	SW4	SW5	SW6	up to 200 [2900]	up to 400 [5800]	up to 630 [9150]	
6	32	30	19	6	–	30	$50^{\pm 5}$ [$37^{\pm 3.7}$]	$80^{\pm 5}$ [$59^{\pm 4}$]	–	0.4 [0.88]
10	36	30	19	6	–	30	$100^{\pm 5}$ [$74^{\pm 3.5}$]	$150^{\pm 10}$ [$110^{\pm 3.5}$]	$200^{\pm 10}$ [$148^{\pm 7.5}$]	0.5 [1.10]
20	46	36	19	6	–	30	$150^{\pm 10}$ [$111^{\pm 7.5}$]	$300^{\pm 15}$ [$221^{\pm 11}$]	–	1 [2.21]
30	60	46	19	–	13	–	$350^{\pm 20}$ [$258^{\pm 19.5}$]	$500^{\pm 30}$ [$369^{\pm 22}$]	–	2.2 [4.85]

[2)] The tightening torques are recommended values assuming a friction coefficient of ca. 0.12 and the use of a torque wrench.

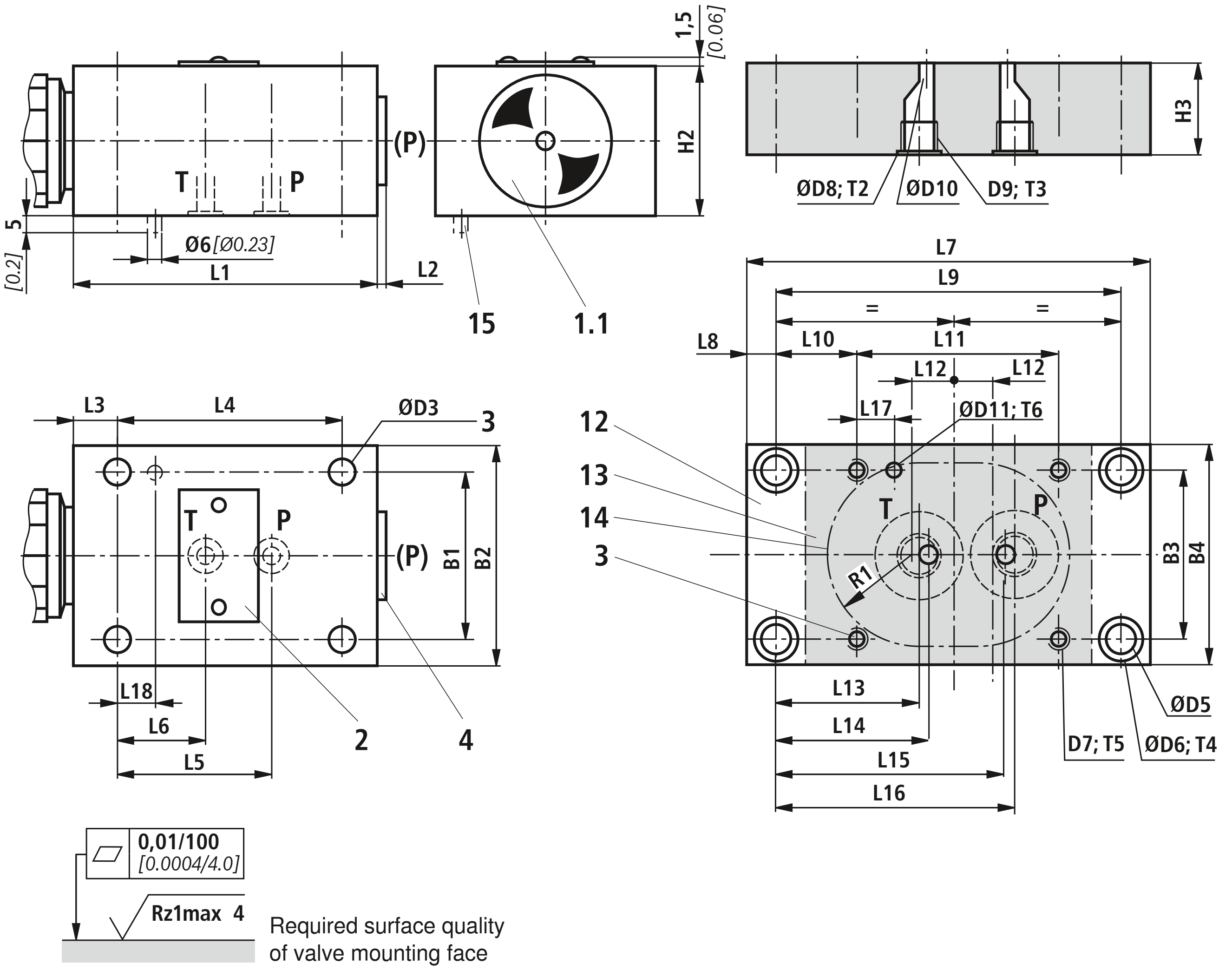
Mounting cavity

NG	D14	ØD15	ØD16	ØD17	ØD18	ØD19
6	M28 x 1.5	25H9 [$0.9843^{+0.002}$]	6 [0.24]	15 [0.59]	$24.9^{+0.152}_{-0.2}$ [$0.9803^{+0.006}_{-0.00786}$]	12 [0.47]
10	M35 x 1.5	32H9 [$1.2598^{+0.0024}$]	10 [0.39]	18.5 [0.73]	$31.9^{+0.162}_{-0.2}$ [$1.2559^{+0.0064}_{-0.0079}$]	15 [0.59]
20	M45 x 1.5	40H9 [$1.5748^{+0.0024}$]	20 [0.79]	24 [0.95]	$39.9^{+0.162}_{-0.2}$ [$1.5709^{+0.0063}_{-0.0079}$]	22 [0.87]
30	M60 x 2	55H9 [$2.1654^{+0.0029}$]	30 [1.18]	38.75 [1.53]	$54.9^{+0.174}_{-0.2}$ [$2.1614^{+0.0069}_{-0.0079}$]	34 [1.34]

NG	L25	L26	L27	L28	L29	L30	L31	α1
6	15 [0.59]	19 [0.75]	30 [1.18]	36 [1.42]	45 [1.77]	$56.5^{\pm 5.5}$ [$2.22^{\pm 0.217}$]	65 [2.56]	15°
10	18 [0.71]	23 [0.91]	35 [1.38]	41.5 [1.63]	52 [2.05]	$67.5^{\pm 7.5}$ [$2.66^{\pm 0.295}$]	80 [3.15]	15°
20	21 [0.83]	27 [1.06]	45 [1.77]	55 [2.17]	70 [2.76]	$91.5^{\pm 8.5}$ [$3.60^{\pm 0.335}$]	110 [4.33]	20°
30	23 [0.91]	29 [1.14]	45 [1.77]	63 [2.48]	84 [3.31]	$113.5^{\pm 11.5}$ [$4.47^{\pm 0.453}$]	140 [5.51]	20°

1.1 Adjustment element “S“ – set screw with hexagon and protective cap; hexagon socket (up to NG20), hexagon head (NG30)
1.2 Adjustment element “H“ – rotary knob (up to NG20), hand wheel (NG30)
1.3 Adjustment element “A“ – lockable rotary knob up to NG10 (NG20 to 100 bar [1450 psi])
4 Port P, optional, on the circumference or front face
5 Port T, optional, on the circumference
6 Type designation
7 Pressure rating (impressed)
8 Marking (adjustment of the zero position after the valve was screwed in; then securing of the ring by shifting it horizontally until the plug screw locks into position on the 6 A/F plug screw)
9 Depth of fit
10 Locknut, tightening torque $M_T = 10^{+5}$ Nm [$7.4^{+3.7}$ ft-lbs]
11 Space required to remove key
12 Minimum strength of housing materials, see Technical data on page 5

Unit dimensions: Subplate mounting (dimensions in mm *[inch]*)



Required surface quality of valve mounting face

For versions and dimensions of the adjustment elements, see pages 8 and 9.

1.1 Adjustment element "S" (example)
Set screw with hexagon and protective cap;
hexagon socket (up to NG20), hexagon head (NG30)

2 Nameplate

3 4 valve mounting bores

4 Additional port (P), optional (e.g. for pressure measurement); not possible for NG10, pressure rating > 400 bar (= version "SO292"). For tightening torques, see table of dimensions on page 7)

12 Subplate (for type designation, see table on page 11)

13 Valve mounting face

14 Front panel cutout

15 Locating pin (only on type-tested safety valves)

For strength reasons, use exclusively the following valve mounting screws (separate order):

4 hexagon socket head cap screws ISO 4762 - flZn-240h-L [1)]
(friction coefficient μ_{total} = 0.09 to 0.14)

NG	Dimension	Strength class	M_T in Nm *[ft-lbs]* [2)]	Material number
6	M6 x 50	10.9	12,5 *[9.2]*	R913000151
10	M8 x 70	10.9	28 *[20.7]*	R913000149
20	M8 x 90	12.9	28 *[20.7]*	R913000150
30	M10 x 110	12.9	56 *[41.3]*	R913000148

4 hexagon socket head cap screws UNC on request

[1)] Alternatively, bolts appropriately specified in accordance with DIN 912 can be used.

[2)] For tightening, use a torque wrench having a tolerance of ≤10%.

Unit dimensions: Subplate mounting (dimensions in mm [inch])

Pressure relief valve

NG	B1	B2	ØD3	H2	L1	L2	L3
6	45 [1.77]	60 [2.36]	6.6 [0.26]	40 [1.57]	80 [3.15]	4 [0.16]	15 [0.59]
10	60 [2.36]	80 [3.15]	9 [0.35]	60 [2.36]	100 [3.94]	4 [0.16]	20 [0.79]
20	70 [2.76]	100 [3.94]	9 [0.35]	70 [2.76]	135 [5.32]	5.5 [0.22]	20 [0.79]
30	100 [3.94]	130 [5.12]	11 [0.43]	90 [3.54]	180 [7.09]	5.5 [0.22]	25 [0.98]

NG	L4	L5	L6	L18	Port (P)	**Weight,** ca. in kg [lbs]
6	55 [2.17]	40 [1.57]	20 [0.79]	15 [0.59]	G1/4	1.5 [3.3]
10	70 [2.76]	45 [1.77]	21 [0.83]	15 [0.59]	G1/2	3.7 [8.2]
20	100 [3.94]	65 [2.56]	34 [1.34]	15 [0.59]	G3/4	6.4 [14.1]
30	130 [5.12]	85 [3.35]	35 [1.37]	15 [0.59]	G1 1/4	13.9 [30.6]

Subplates [3)]

NG	Type	B3	B4	ØD5	ØD6	D7	ØD8	D9
6	G300/01 [G300/12]	45 [1.77]	60 [2.36]	6.6 [0.26]	11 [0.43]	M6 [1/4-20 UNC]	25 [0.98]	G1/4 [SAE 4; 7/16-20]
10	G661//01	60 [2.36]	80 [3.15]	6.6 [0.26]	11 [0.43]	M8	25 [0.98]	G3/8
	G662/01	60 [2.36]	80 [3.15]	6.6 [0.26]	11 [0.43]	M8	34 [1.34]	G1/2
20	G303/01	70 [2.76]	100 [3.94]	11 [0.43]	18 [0.71]	M8	42 [1.65]	G3/4
	G304/01	70 [2.76]	100 [3.94]	11 [0.43]	18 [0.71]	M8	47 [1.85]	G1
30	G305/01	100 [3.94]	130 [5.12]	11 [0.43]	18 [0.71]	M10	56 [2.20]	G1 1/4
	G306/01	100 [3.94]	130 [5.12]	11 [0.43]	18 [0.71]	M10	65 [2.56]	G1 1/2

NG	ØD10	ØD11	H3	L7	L8	L9	L10	L11	L12
6	6 [0.24]	8 [0.32]	25 [0.98]	110 [4.33]	8 [0.32]	94 [3.70]	22 [0.87]	55 [2.17]	10 [0.39]
10	10 [0.39]	8 [0.32]	25 [0.98]	135 [5.32]	10 [0.39]	115 [4.53]	27.5 [1.08]	70 [2.76]	12.5 [0.49]
	10 [0.39]	8 [0.32]	25 [0.98]	135 [5.32]	10 [0.39]	115 [4.53]	27.5 [1.08]	70 [2.76]	12.5 [0.49]
20	15 [0.59]	8 [0.32]	40 [1.57]	170 [6.69]	15 [0.59]	140 [5.51]	20 [0.79]	100 [3.94]	20 [0.79]
	20 [0.79]	8 [0.32]	40 [1.57]	170 [6.69]	15 [0.59]	140 [5.51]	20 [0.79]	100 [3.94]	20 [0.79]
30	30 [1.18]	8 [0.32]	40 [1.57]	190 [7.48]	12.5 [0.49]	165 [6.50]	17.5 [0.67]	130 [5.12]	22.5 [0.89]

NG	L13	L14	L15	L16	L17	T2	T3	T4	T5
6	39 [1.54]	42 [1.65]	62 [2.44]	65 [2.56]	15 [0.59]	1 [0.039]	15 [0.59]	9 [0.35]	15 [0.59]
10	40.5 [1.59]	48.5 [1.91]	72.5 [2.85]	80.5 [3.17]	15 [0.59]	1 [0.039]	15 [0.59]	9 [0.35]	12 [0.47]
	40.5 [1.59]	48.5 [1.91]	72.5 [2.85]	80.5 [3.17]	15 [0.59]	1 [0.039]	16 [0.63]	9 [0.35]	15 [0.59]
20	45 [1.77]	54 [2.13]	85 [3.35]	94 [3.70]	15 [0.59]	1 [0.039]	20 [0.79]	13 [0.51]	22 [0.87]
	42 [1.65]	54 [2.13]	85 [3.35]	97 [3.82]	15 [0.59]	1 [0.039]	20 [0.79]	13 [0.51]	22 [0.87]
30	42 [1.65]	52.5 [2.07]	102.5 [4.04]	113 [4.45]	15 [0.59]	1 [0.039]	24 [0.95]	11.5 [0.45]	22 [0.87]

NG	T6	R1	**Weight,** ca. in kg [lbs]
6	6 [0.24]	25^{+2} [$0.98^{+0.079}$]	1.5 [3.3]
10	6 [0.24]	30^{+5} [$1.18^{+0.197}$]	2 [4.4]
20	6 [0.24]	40^{+3} [$1.57^{+0.118}$]	5.5 [12.1]
30	6 [0.24]	55^{+4} [$2.16^{+0.157}$]	8 [17.6]

[3)] **Attention!**
The subplates listed are **not** approved for use with type-tested safety valves according to Pressure Equipment Directive 97/23/EC!

Ordering code: Type-tested safety valves of type DBD [1)]

NG	Type designation	Component code
6	DBDS 6K1X/ □ E	TÜV.SV.■–849.5.F.$^{\alpha_w}_{G}$.p.
	DBDH 6K1X/ □ E	
	DBDS 6G1X/ □ E	
	DBDH 6G1X/ □ E	
	DBDS 6P1X/ □ E	
	DBDH 6P1X/ □ E	
10	DBDS 10K1X/ □ E	TÜV.SV.■–850.6.F.$^{\alpha_w}_{G}$.p. TÜV.SV.■–390.4,5.F.30.p. [2)]
	DBDH 10K1X/ □ E	
	DBDS 10G1X/ □ E	
	DBDH 10G1X/ □ E	
	DBDS 10P1X/ □ E	
	DBDH 10P1X/ □ E	

NG	Type designation	Component code
20	DBDS 20K1X/ □ E	TÜV.SV.■–361.10.F.α_w.p.
	DBDH 20K1X/ □ E	
	DBDS 20G1X/ □ E	
	DBDH 20G1X/ □ E	
	DBDS 20P1X/ □ E	
	DBDH 20P1X/ □ E	
	DBDS 30K1X/ □ E	
	DBDH 30K1X/ □ E	
	DBDS 30G1X/ □ E	
	DBDH 30G1X/ □ E	
	DBDS 30P1X/ □ E	
	DBDH 30P1X/ □ E	

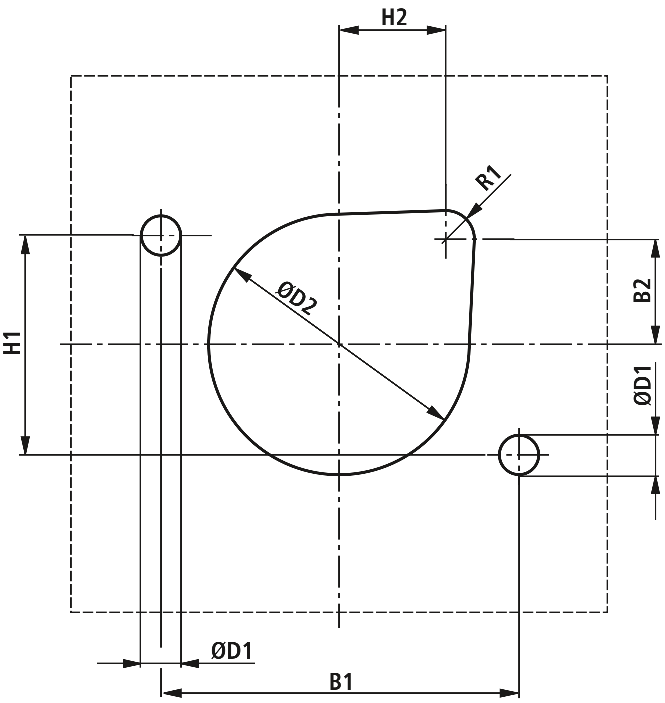
□ The customer must enter the pressure in the type designation; pressure settings are possible ≥ 30 bar *[435 psi]* and in 5-bar *[72 psi]* increments.

■ Details are entered in the factory

1) Component series 1X, to Pressure Equipment Directive 97/23/EC

2) Component code for DBD. 10.1X/...;
400 bar *[5801 psi]* < ***p*** ≤ 630 bar *[9150 psi]*

Unit dimensions: Sheet metal cutout for front panel installation of type-tested safety valves of type DBD [1)] (dimensions in mm *[inch]*)



NG	B1	B2	H1	H2
6	45 *[1.77]*	12.5 *[0.49]*	25 *[0.98]*	22.5 *[0.89]*
10	60 *[2.36]*	20.5 *[0.81]*	40 *[1.57]*	20.5 *[0.81]*
20	70 *[2.76]*	24 *[0.94]*	50 *[1.97]*	24 *[0.94]*
30	100 *[3.94]*	29.5 *[1.16]*	60 *[2.36]*	29.5 *[1.16]*

NG	ØD1H13	ØD2H13	R1
6	7 *[0.27]*	40 *[1.57]*	8 *[0.32]*
10	9 *[0.35]*	44 *[1.73]*	8 *[0.32]*
20	9 *[0.35]*	55 *[2.17]*	8 *[0.32]*
30	11 *[0.43]*	73 *[2.87]*	8 *[0.32]*

Note!
For valves of type DBDH.K..1X/..E the hand wheel must be removed and then refitted before the cartridge valve can be mounted on the valve panel.

1) Component series 1X, to Pressure Equipment Directive 97/23/EC

Deviating technical data: Type-tested safety valves of type DBD 1)

Hydraulic		
Maximum flow		See characteristic curves on pages 13 to 16
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524-1 and DIN 51524-2
Hydraulic fluid temperature range	°C *[°F]*	–20 to +60 *[–4 to +140]* (NBR seals) –15 to +60 *[5 to 140]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	12 to 230 *[55 to 1066]*

1) Component series 1X, to Pressure Equipment Directive 97/23/EC (for applications outside these parameters, please consult us!)

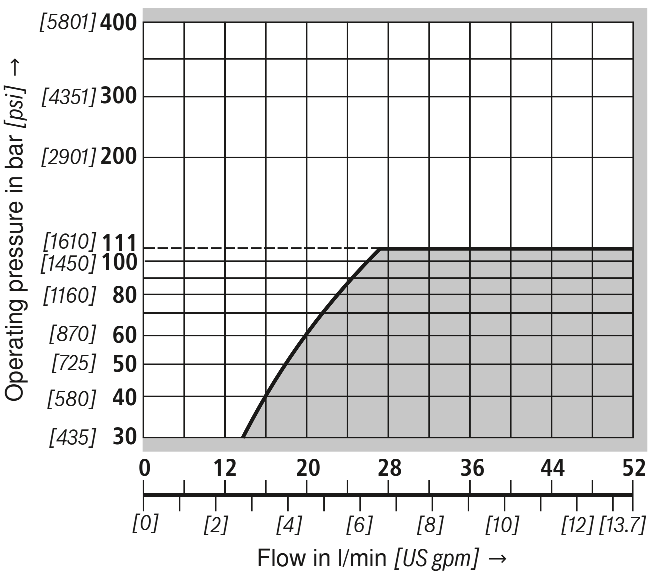
Characteristic curves: Type-tested safety valves of type DBD 1)

1) Component series 1X, according to Pressure Equipment Directive 97/23/EC

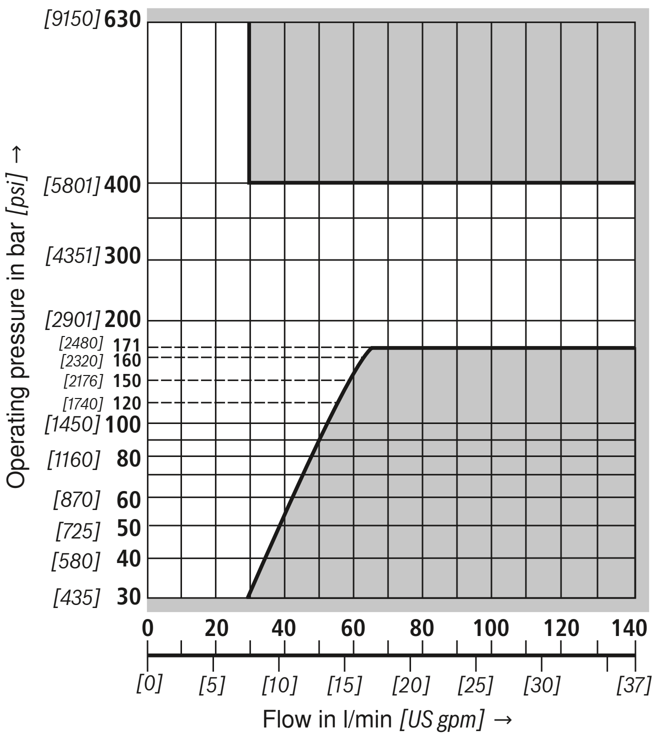
☞ **Note!**

Values within the gray-shaded sections of the characteristic curves can**not** be achieved with this valve!

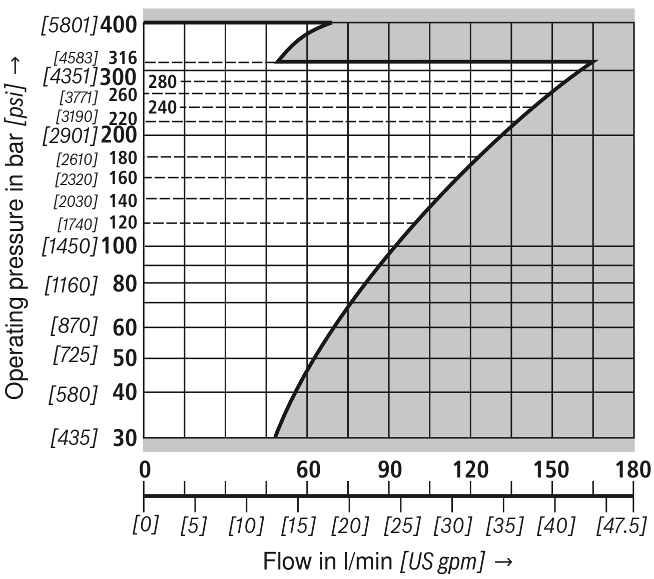
Size 6



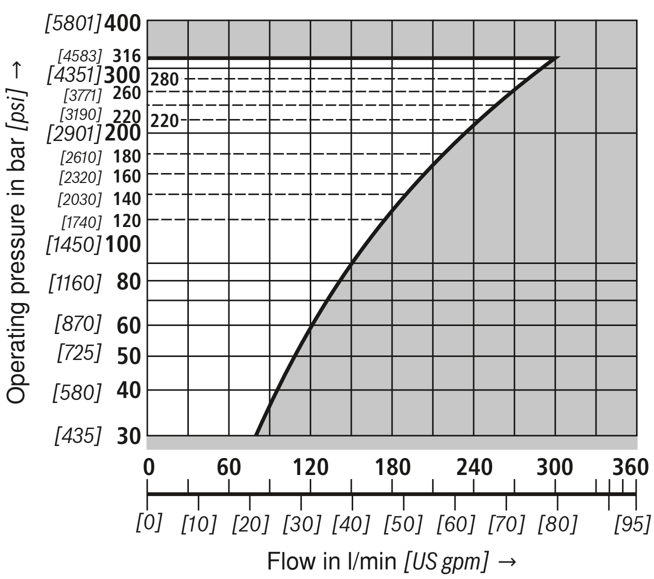
Size 10



Size 20



Size 30



Safety notes: Type-tested safety valves of type DBD [1)]

– Before ordering a type-tested safety valve, please note that at the desired **response pressure *p*** the permissible maximum **flow q_{Vmax}** of the safety valve is greater than the permissible maximum flow of the system / accumulator to be protected.

The relevant regulations must be observed!

– According to **PED 97/23/EC** the increase in the system pressure caused by the flow must not exceed 10 % of the set response pressure (see component code).

The permissible maximum flow q_{Vmax} specified in the component code must not be exceeded.

Drain lines of safety valves must terminate without any risks. **No** fluid may accumulate in the drain system (see AD2000 - sheet A2).

Strictly observe notes on the operation!

– The response pressure specified in the component code is factory-set at a flow of 2 l/min *[0.53 US gpm]* .

– The permissible maximum flow specified in the component code is valid for applications without backpressure in the drain line (port T).

– When the lead-seal is removed from the safety valve, the approval in accordance with PED becomes void!

– Generally, the requirements laid down in the Pressure Equipment Directive and in AD2000 sheet A2 must be observed!

– It is recommended that type-tested safety valves be secured against unauthorized removal from the housing/block by means of wires and lead-sealing (a bore is provided in the adjustment element).

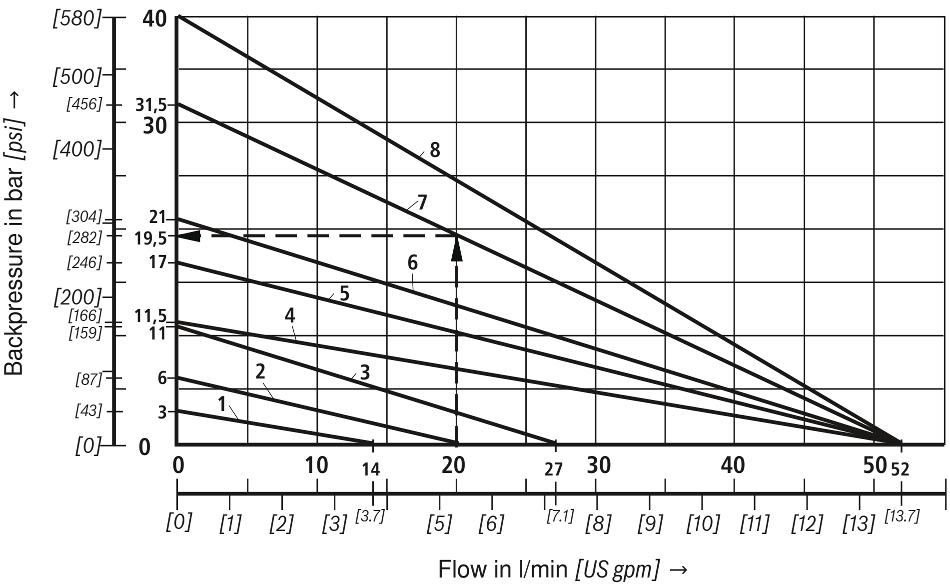
Attention!

As the flow rises, the system pressure increases by the backpressure in the drain line (port T). (Observe AD2000 - sheet A2, section 6.3!)

In order that this increase in the system pressure caused by the flow will not exceed 10 % of the set response pressure, the permissible flow must be reduced in dependence upon the backpressure in the drain line (port T) (see diagrams on pages 14 to 16).

Permissible maximum flow q_{Vmax} in dependence upon backpressure p_T in the drain line

Type DBD. 6 .1X/...E



Characteristic curves	Response pressure p_A in bar *[psi]*
1	30 *[435]*
2	60 *[870]*
3	110 *[1595]*
4	115 *[1668]*
5	170 *[2465]*
6	210 *[3046]*
7	315 *[4568]*
8	400 *[5800]*

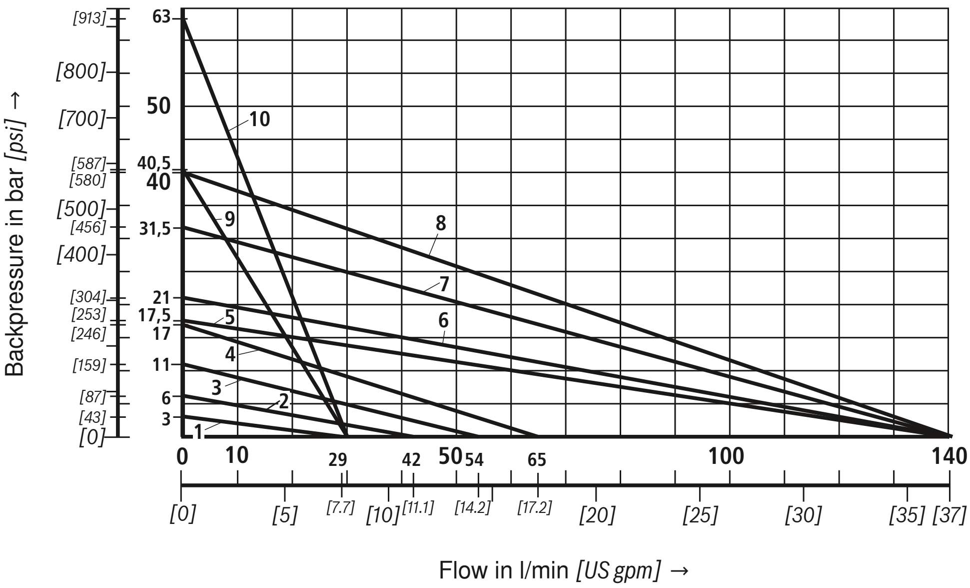
Characteristic curves for intermediate values can be generated by interpolation. Further explanations can be found on page 16.

[1)] Component series 1X, to Pressure Equipment Directive 97/23/EC

Safety notes: Type-tested safety valves of type DBD 1)

Permissible maximum flow q_{Vmax} in dependence upon backpressure p_T in the drain line

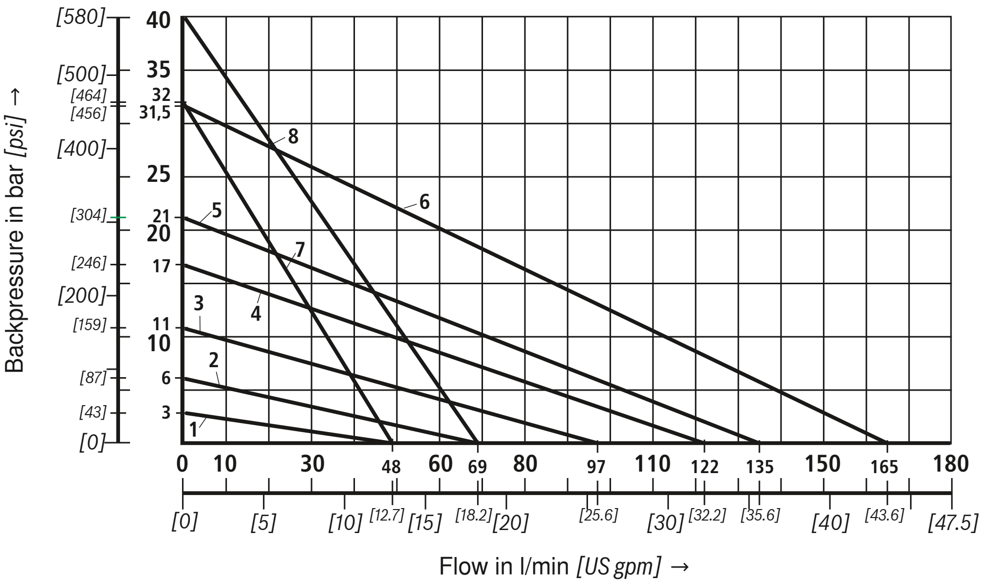
Type DBD. 10 .1X/...E



Charac-teristic curves	Response pressure p_A in bar [psi]
1	30 [435]
2	60 [870]
3	110 [1595]
4	170 [2465]
5	175 [2538]
6	210 [3046]
7	315 [4568]
8	400 [5800]
9	405 [5874]
10	630 [9150]

Characteristic curves for intermediate values can be generated by interpolation. Further explanations can be found on page 16.

Type DBD. 20 .1X/...E



Charac-teristic curves	Response pressure p_A in bar [psi]
1	30 [435]
2	60 [870]
3	110 [1595]
4	170 [2465]
5	210 [3046]
6	315 [4568]
7	320 [4641]
8	400 [5800]

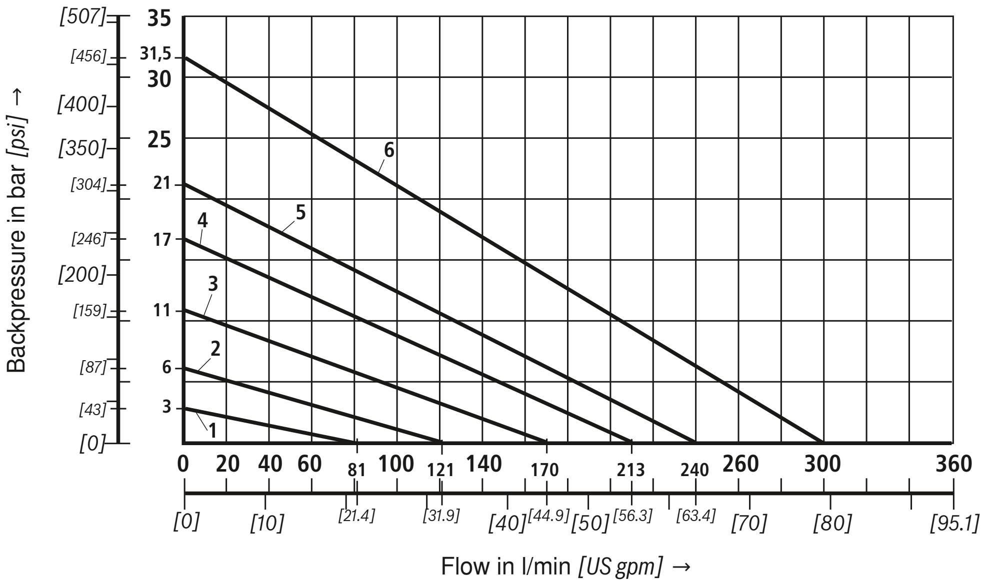
Characteristic curves for intermediate values can be generated by interpolation. Further explanations can be found on page 16.

1) Component series 1X, to Pressure Equipment Directive 97/23/EC

Safety notes: Type-tested safety valves of type DBD 1)

Permissible maximum flow q_{Vmax} in dependence upon backpressure p_T in the drain line

Type DBD. 30 .1X/...E



Charac-teristic curves	**Response pressure p_A** in bar *[psi]*
1	30 *[435]*
2	60 *[870]*
3	110 *[1595]*
4	170 *[2465]*
5	220 *[3191]*
6	315 *[4568]*

Characteristic curves for intermediate values can be generated by interpolation. For further explanations, see below.

p_A = response pressure in bar
p_T = permissible maximum backpressure in bar (sum of all tank pressures; see also AD2000 - sheet A2)
$q_{V\,max}$ = permissible maximum flow in l/min
PED: $p_{T\,max}$ = 10 % x p_A (at q_V = 0)

Explanation of diagrams (Example: type DBD 6 …E, page 14):

Given: – flow of the system/accumulator to be protected q_{Vmax} = 20 l/min
– set response pressure of the safety valve p_A = 315 bar

Sought: $p_{T\ permissible}$

Solution: See arrows in the diagram on page 14 (type DBD 6 …E)
$p_{T\ permissible}$ (20 l/min; 315 bar) = 19.5 bar

1) Component series 1X, to Pressure Equipment Directive 97/23/EC

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

Pressure relief valve, direct operated

RE 25710/03.13
Replaces: 01.09

Type DBD..K

Size 4
Component series 1X
Maximum operating pressure 500 bar
Maximum flow 20 l/min

K4942-1

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

– Screw-in cartridge valve
– 8 pressure ratings
– 2 adjustment types, optionally:
  • Setscrew with hexagon socket
  • Hand wheel

Ordering code

DBD		4	K	1X/		V		*

Pressure relief valve, direct operated = **DBD**

Adjustment type
Setscrew with hexagon socket = **S**
Hand wheel = **H**

Size 4 = **4**

Screw-in cartridge valve = **K**

Component series 10 to 19 = **1X**
(10 to 19: unchanged installation and connection dimensions)

Pressure rating
Set pressure up to 25 bar = **25**
Set pressure up to 50 bar = **50**
Set pressure up to 100 bar = **100**
Set pressure up to 200 bar = **200**
Set pressure up to 315 bar = **315**
Set pressure up to 350 bar = **350**
Set pressure up to 420 bar = **420**
Set pressure up to 500 bar = **500**

Further details in the clear text

Type testing
No code = Without type testing
E = Type tested safety valve according to PED 97/23/EC

Seal material
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

Standard types

Type	Material number
DBDS 4 K1X/25V	R900377429
DBDS 4 K1X/50V	R900400423
DBDS 4 K1X/100V	R900529359
DBDS 4 K1X/200V	R900393389

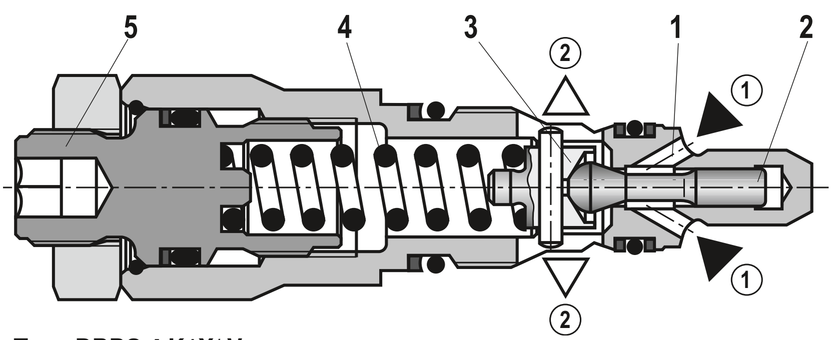
Type	Material number
DBDS 4 K1X/315V	R900528882
DBDS 4 K1X/420V	R900965798
DBDS 4 K1X/500V	R900969131

Further standard types and components are contained in the EPS (standard price list).

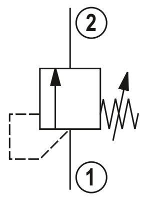
Function, section, symbol

The pressure valve type DBD.. K.. is a direct operated pressure relief valve to be installed in blocks. It is used to limit a system pressure. The system pressure can be set using the adjustment element (5).

In the initial position the valve is closed. The pressure in the main port ① acts on spring plate (3) via pilot line (1) and poppet (2). If the pressure in the main port ① rises above the value set at the compression spring (4), poppet (2) opens and the pressure fluid flows into the main port ②.



Type DBDS 4 K1X/.V



① = Main port 1 (P)
② = Main port 2 (T)

Technical data (For applications outside these parameters, please consult us!)

general

Weight	kg	ca. 0.3
Installation position		Any
Ambient temperature range	°C	–20 to +80

hydraulic

Maximum operating pressure	– Input	bar	500
	– Output	bar	315 (50 bar at set pressure 500 bar)
Maximum set pressure		bar	25; 50; 100; 200; 315; 350; 420; 500
Maximum volume flow		L/min	20
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN51524; quickly bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape oil); HEPG (polyglycols); HEES (synthetic esters); other pressure fluids upon request
Hydraulic fluid temperature range		°C	–20 to +80
Viscosity range		mm^2/s	10 to 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]

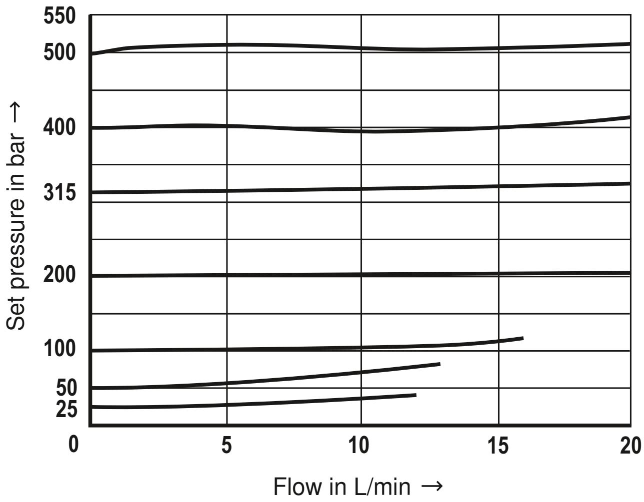
[1)] The cleanliness classes specified for the components need to be met in hydraulic systems. Efficient filtration prevents malfunctions and at the same time prolongs the service life of components.

For the selection of the filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087, and RE 50088.

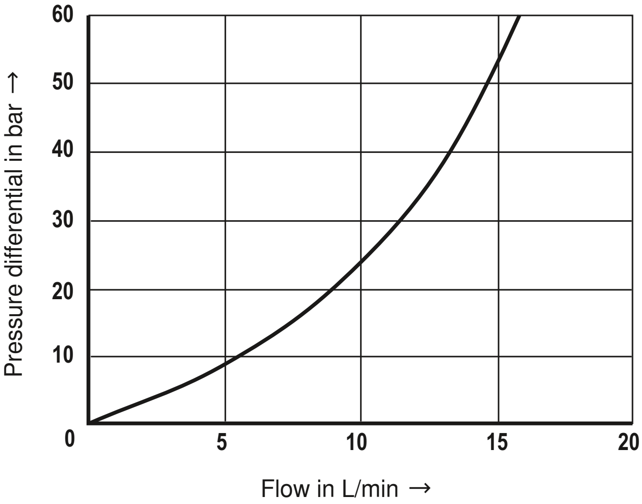
Deviating technical data for type tested safety valves, see page 7.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

p_E-q_V characteristic curve



Δp-q_V characteristic curve



Attention!

The characteristic curves apply to initial pressure = zero over the entire volume flow range and were measured without housing resistance!

General notes

Hydraulic backpressures in the main port ② (T) add 1:1 to the response pressure of the valve set at the adjustment element.

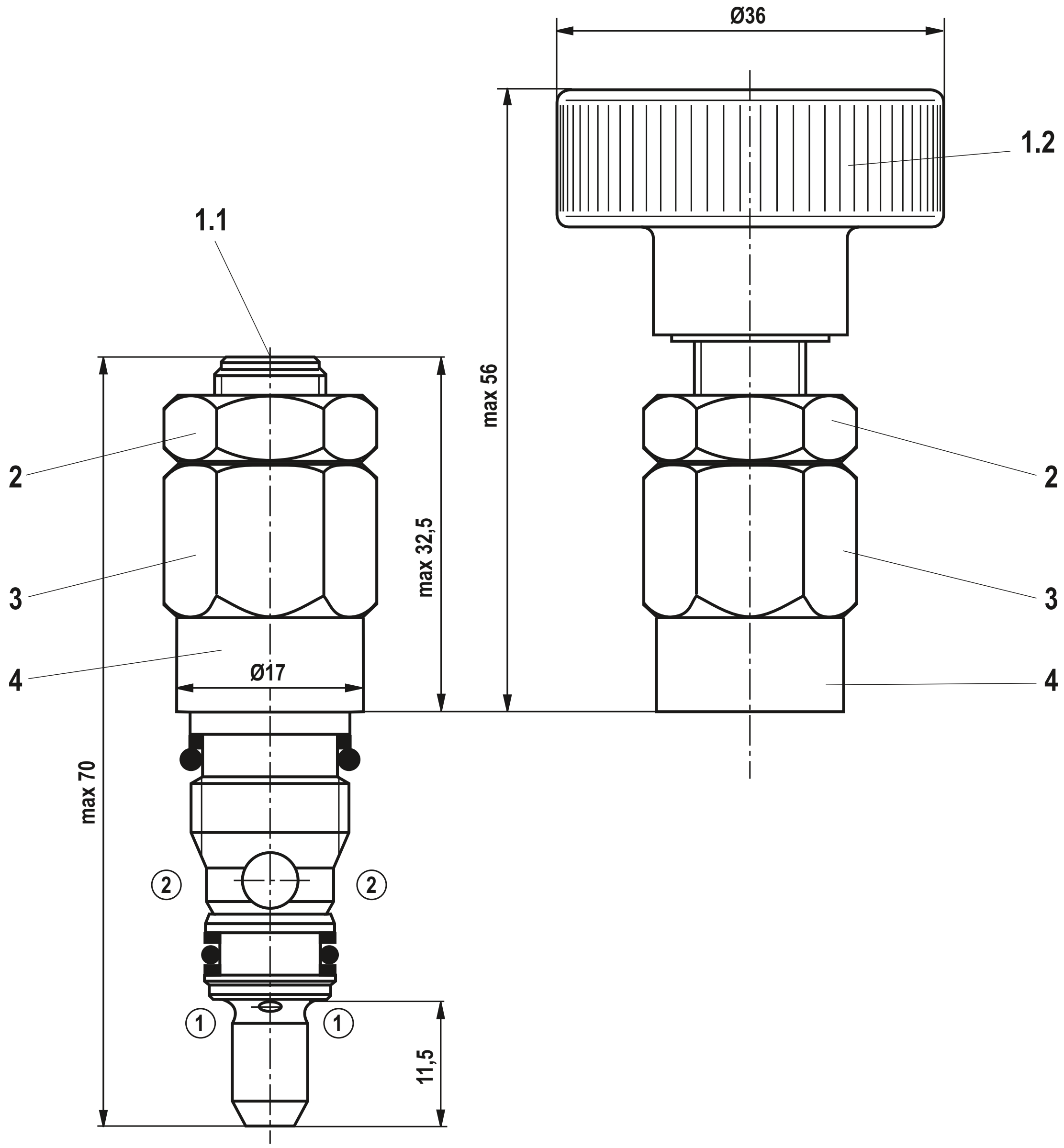
Example:

– Pressure setting of the valve through spring pretensioning (item. 4 on page 2) p_{Spring} **= 200 bar**

– Hydraulic backpressure in the main port ② (T): $p_{hydraulic}$ **= 50 bar**

⇒ Response pressure = p_{Spring} + $p_{hydraulic}$ **= 250 bar**

Unit dimensions (dimensions in mm)



1.1 Adjustment type "S", hexagon socket 5 A/F

1.2 Adjustment type "H", hand wheel

2 Lock nut 17 A/F, tightening torque M_T = 10+5 Nm

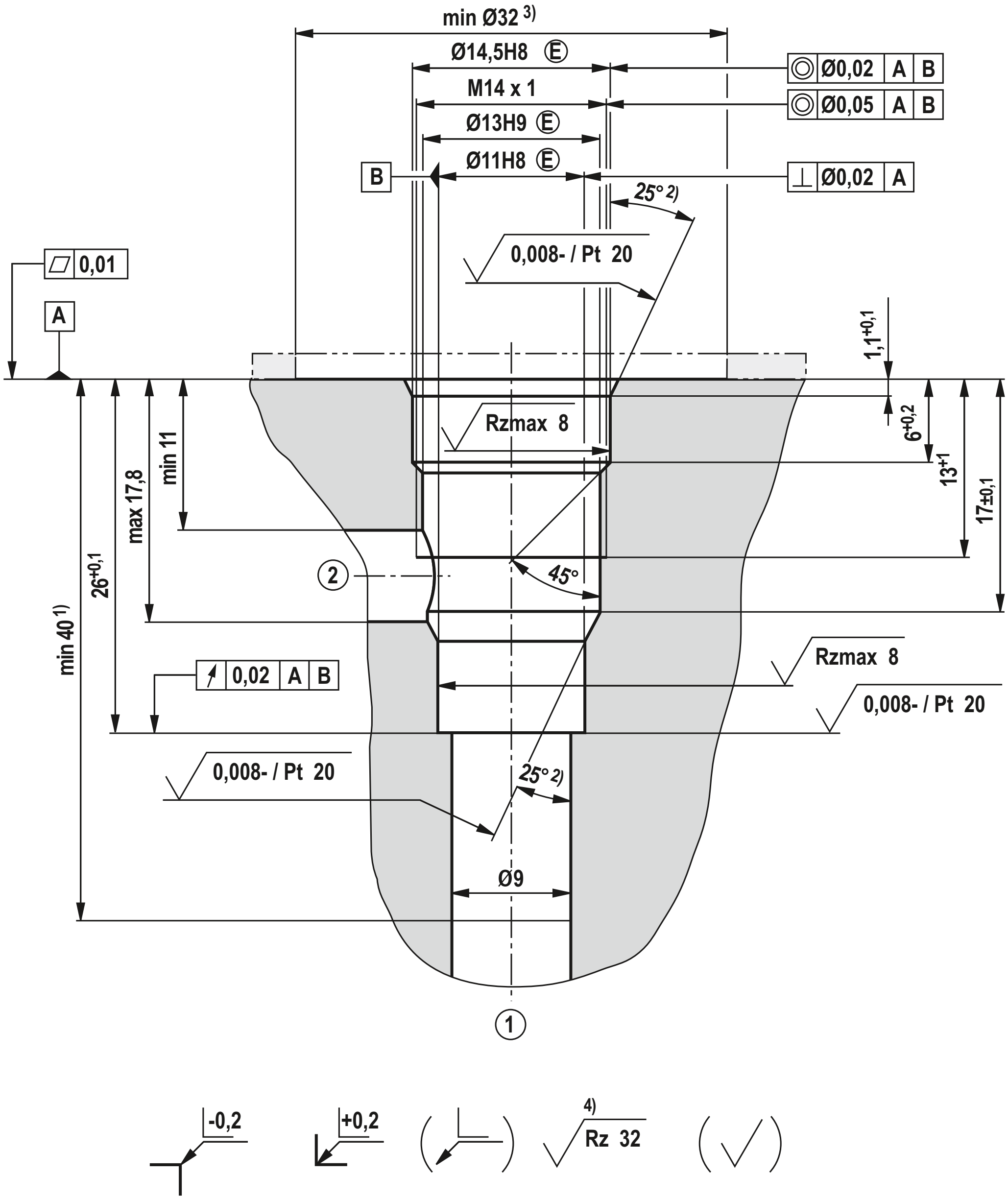
3 Hexagon head 17 A/F, tightening torque when screwing in M_T = 23±2 Nm

4 Embossed type designation

① = Main port 1 (P)

② = Main port 2 (T)

Mounting cavity R/DBD . 4K; 2 main ports; thread M14 x 1
(dimensions in mm)



1) Depth for moving parts
2) All seal ring insertion chamfers are rounded and free of burrs
3) With countersink
4) Visual inspection

① = Main port 1 (P)
② = Main port 2 (T), optional circumferential arrangement
LS = (location shoulder)
Tolerance for all angles ±0.5°

Ordering code for type tested safety valves type DBD..K../..E, series 1X

Type testing according to Pressure Equipment Directive 97/23/EC

Size	Designation	Part identification	Maximum admissible flow $q_{V\,max}$ in l/min	Set response overpressure p in bar
4	DBDS 4 K1X/ ▭ E	TÜV.SV.- ☐ -1038.4.F.G.p	10	60 to 315
	DBDH 4 K1X/ ▭ E		17	320 to 500

▭ The pressure has to be entered in the type designation by the customer! Pressure settings ≥ 60 bar and in 5 bar increments possible.

☐ Value entered in the factory

Deviating technical data for type tested safety valves [2)]

hydraulic

Maximum flow		See characteristic curves on page 8
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524-1 and DIN 51524-2
Hydraulic fluid temperature range	°C	–15 to +60
Viscosity range	mm²/s	12 to 230

2) For applications outside these parameters, please consult us!

Safety notes on type tested safety valves (type DBD..K../..E) according to Pressure Equipment Directive 97/23/EC

– Before ordering a type tested safety valve, please observe that at the desired **response pressure *p*** the maximum admissible **flow** $q_{V\,max}$ of the safety valve is higher than the maximum possible flow of the system/accumulator to be protected.
The corresponding regulations have to be observed!

– **According to PED 97/23/EC**, the increase in system pressure caused by the flow must not exceed 10% of the set response pressure (see part identification).

The maximum admissible flow $q_{V\,max}$ (= numerical value at the position of letter "G" in part identification, see above) specified in the part identification must not be exceeded.
Discharge lines of safety valves have to end in a non-dangerous manner. The accumulation of fluids in the discharge system is **not** admissible (see AD2000 - data sheet A2).

☞ **It is imperative to observe the application instructions!**

– The maximum admissible flow specified in the part identification applies to applications without backpressure in the discharge line (port "T").

– By removing the lead seal at the safety valve, the approval according to PED becomes void!

– Generally, the requirements of the Pressure Equipment Directive and of data sheet AD2000 A2 have to be observed!

– We recommend securing type tested screw-in cartridge valves against inadmissible removal from the screw-in housing/block by wiring and sealing with the housing/block.

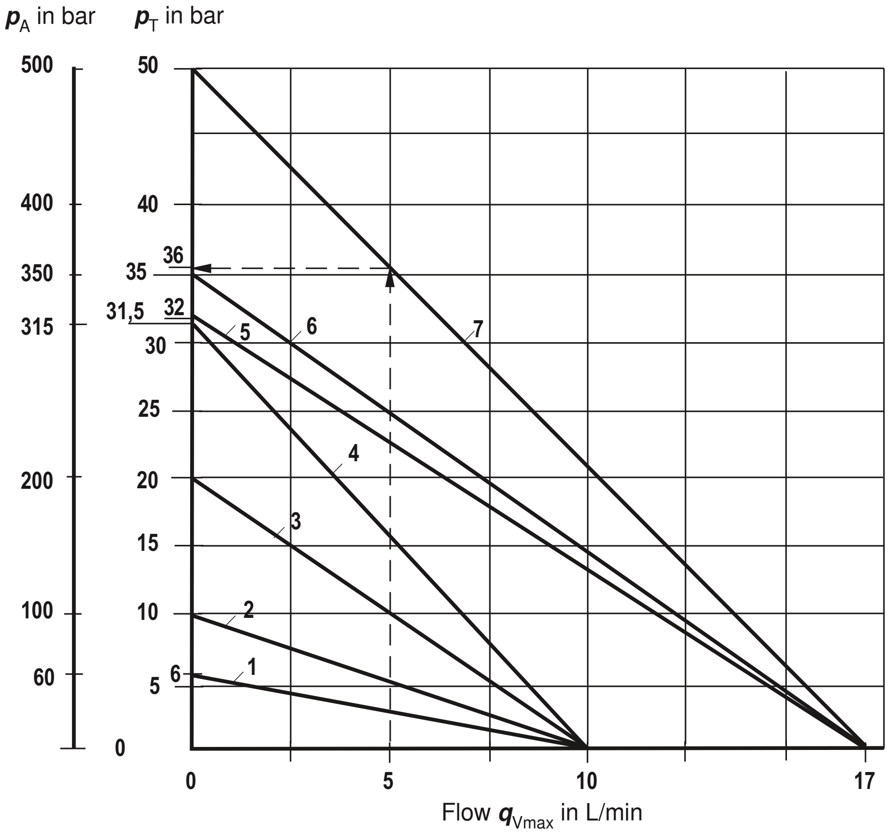
Attention!

As the flow rises the system pressure increases by the backpressure in the blow-off line (port "T").
(observe AD2000 - data sheet A2, item 6.3!)

In order that the increase in system pressure caused by the flow will not exceed the value of 10 % of the set response pressure, the admissible flow has to be reduced depending on the backpressure in the blow-off line (port T), see characteristic curves, page 8.

Safety notes on type tested safety valves (type DBD..K../..E) according to pressure equipment directive 97/23/EC

Maximum admissible flow $\boldsymbol{q}_{\mathbf{Vmax}}$ depending on the backpressure $\boldsymbol{p}_{\mathbf{T}}$ in the discharge line



Characteristic curves	Response pressure p_a in bar
1	60
2	100
3	200
4	315
5	320
6	350
7	500

Characteristic curves for intermediate values can be generated by interpolation. Further explanations see below.

p_A = Response pressure in bar
p_T = Maximum admissible backpressure in bar (sum of all possible backpressures; see also AD2000 - data sheet A2)
$q_{V\,max}$ = Maximum admissible flow in L/min
$p_{T\,max}$ = 10% x p_A (at q_V = 0) according to PED 97/23/EC

Explanation of the graph:

Known: – Flow of the system/accumulator to be protected q_{Vmax} = 5 l/min
– Set response pressure of the safety valve p_A = 500 bar

Unknown: p_T

Solution: See arrows in graph above; p_T ~ 36 bar (5 l/min; 500 bar)

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Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

The Drive & Control Company

Rexroth
Bosch Group

Pressure relief valve, direct operated

Type ZDBYD, Z2DBYD

RE 25722
Edition: 2012-08
Replaces: 01.09

tb0237

- Size 6
- Component series 1X
- Maximum operating pressure 315 bar
- Maximum flow 60 l/min

Features

- Sandwich plate valve
- Porting pattern according to ISO 4401-03-02-0-05
- 3 pressure ratings, optional
- 5 directions of action, optional
- With 1 or 2 pressure valve cartridges
- 2 adjustment types, optionally:
  - Sleeve with internal hexagon
  - Lockable rotary knob with scale

Contents

Ordering code

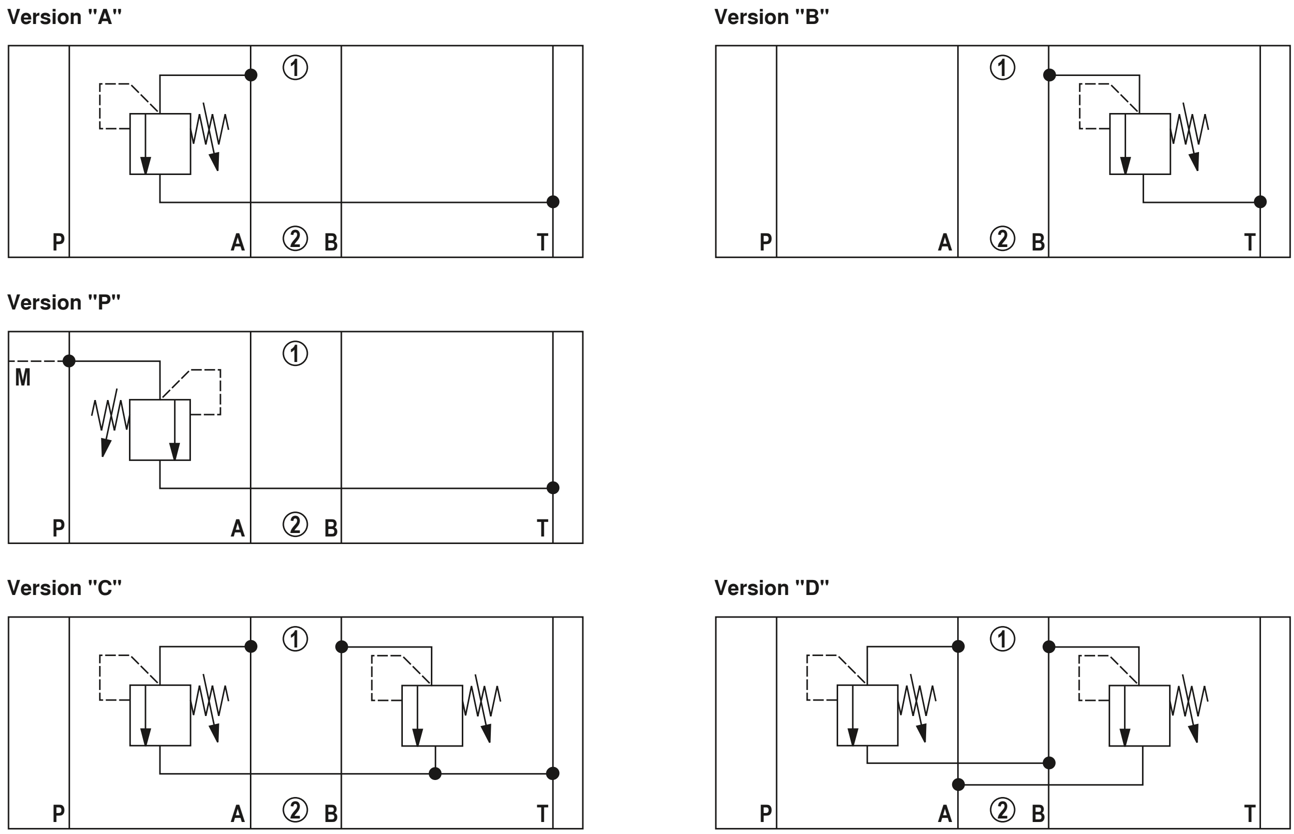
01	02	03	04	05	06	07	08		09		10	11		12	13
Z		DB	Y	6	D			–	1X	/		V	/	60	*

01	Sandwich plate valve	**Z**
02	1 pressure valve cartridge (only with version "A" "B" and "P")	**no code**
	2 pressure valve cartridges (only with version "C" and "D")	**2**
03	Pressure relief valve	**DB**
04	Porting pattern according to ISO 4401-03-02-0-05	**Y**
05	Size 6	**6**
06	Direct operated	**D**
07	**Relief function from - to:**	
	P – T	**P**
	A – T	**A**
	B – T	**B**
	A – T and B – T	**C**
	A – B and B – A	**D**
08	**Adjustment type**	
	Sleeve with internal hexagon	**2**
	Lockable rotary knob with scale (only version "80") [1]	**3**
09	Component series 10 to 19 (10 to 19: unchanged installation and connection dimensions)	**1X**
10	**Pressure rating**	
	Set pressure up to 80 bar	**80**
	Set pressure up to 160 bar	**160**
	Set pressure up to 315 bar	**315**
11	**Seal material**	
	FKM seals	**V**
	(other seals upon request) Attention! Observe compatibility of seals with hydraulic fluid used!	
12	Porting pattern according to ISO 4401-03-02-0-05	**60**
13	Further details in the plain text	

[1] H-key with the Material no. **R900008158** is included in the scope of delivery.

☞ **Notice!** Preferred types and standard units are contained in the EPS (standard price list).

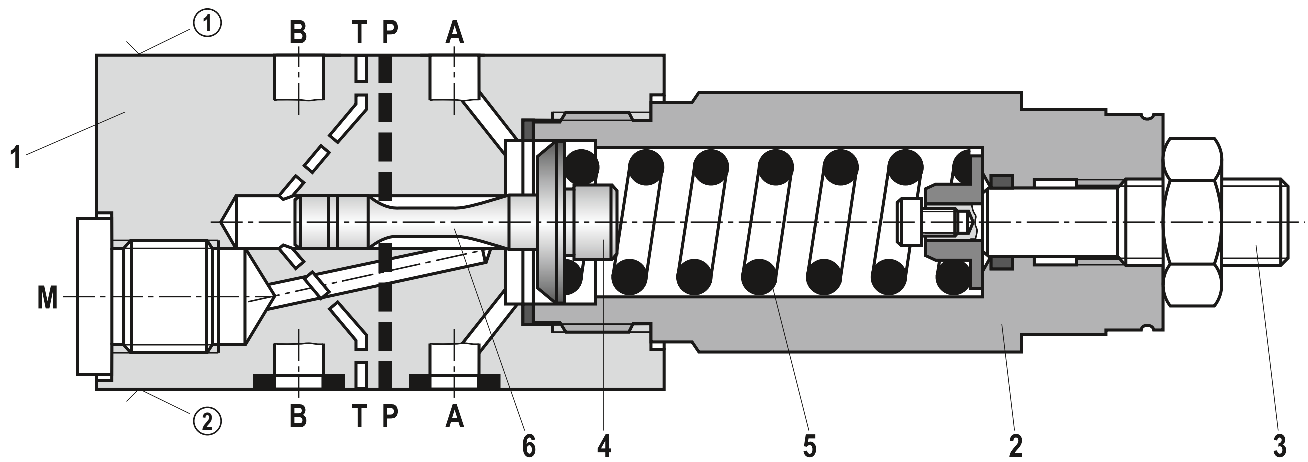
Symbols (① = component side, ② = plate side)



Function, section

Pressure valves of type ZDBY and Z2DBY are direct operated pressure relief valves in sandwich plate design. They are used for limiting a system pressure.
The valves basically consist of the housing (1) and one or two pressure valve cartridges (2). The system pressure can be set via the adjustment type (3).

In the initial position the valves are closed. The pressure in channel A acts on the spool (4). If the pressure in channel A exceeds the value set at the spring (5), the pilot poppet (6) opens. Hydraulic fluid flows from channel P into channel T. The pilot oil return from the spring chambers is implemented internally via channel T.



Type ZDBY 6 DP2 ...

Technical data
(For applications outside these parameters, please consult us!)

general			
Weight	– Version "2"	kg	1.4
	– Version "3"	kg	1.8
Installation position			any
Ambient temperature range		°C	–15 ... +80

hydraulic		
Maximum operating pressure	bar	315
Maximum counter pressure (port T)	bar	160
Maximum set pressure	bar	80; 160; 315
Maximum flow	l/min	60
Hydraulic fluid		see table below
Hydraulic fluid temperature range	°C	–15 ... +80
Viscosity range	mm^2/s	10 ... 500
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]

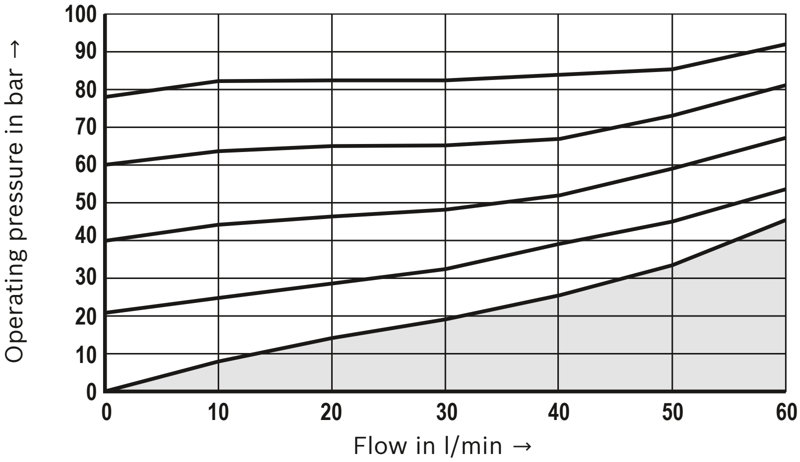
Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils and related hydrocarbons		HL, HLP, HLPD	FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568

Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

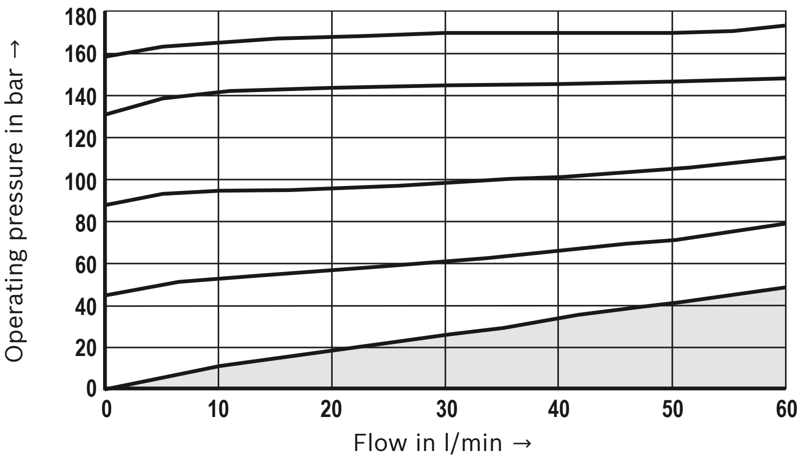
1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.
For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves: Version "A", "B", "P" and "C" (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C)

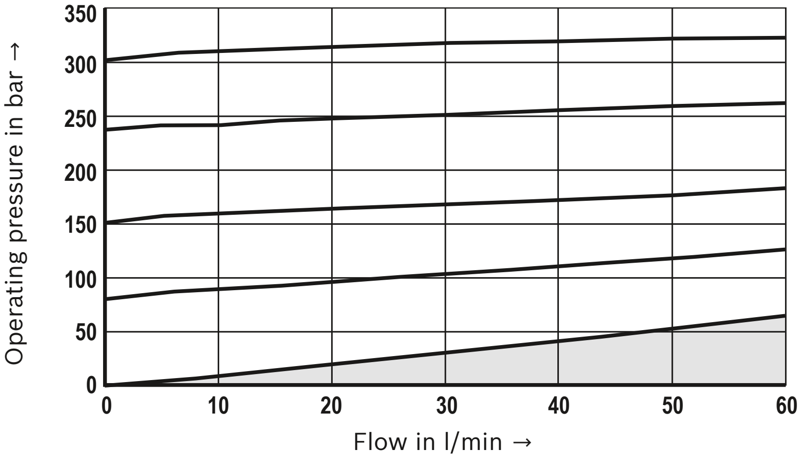
***p*-*q*$_V$ characteristic curves – version "80"**



***p*-*q*$_V$ characteristic curves – version "160"**

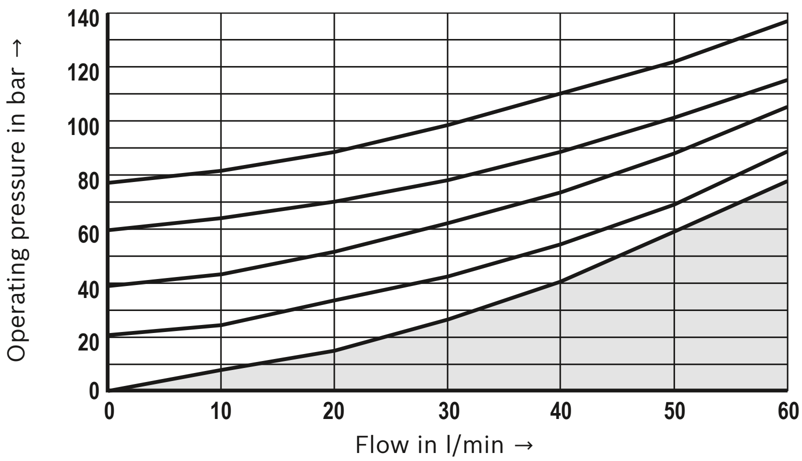


***p*-*q*$_V$ characteristic curves – version "315"**

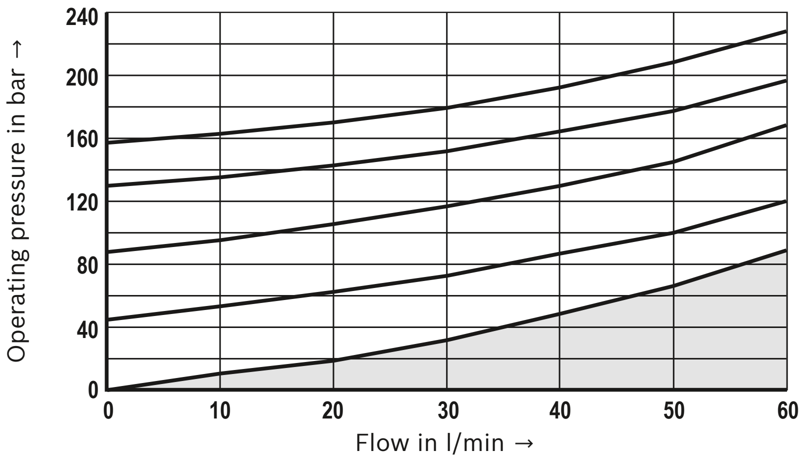


Characteristic curves: Version "D"
(measured with HLP46, ϑ_{Oil} = 40 ± 5 °C)

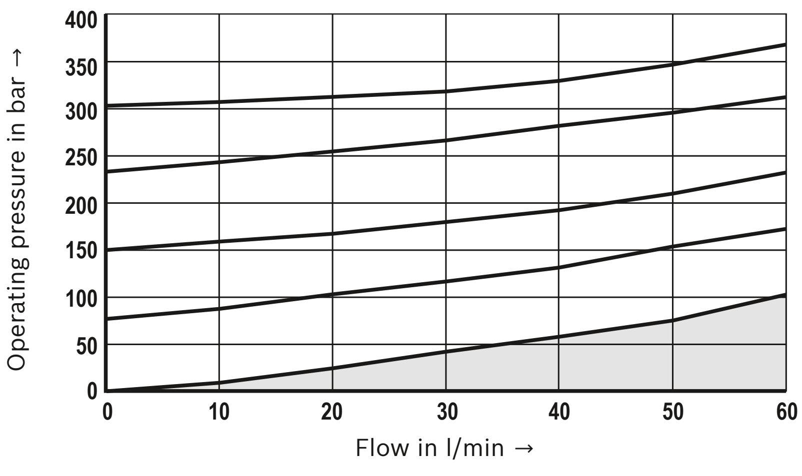
***p*-q_V characteristic curves – version "80"**



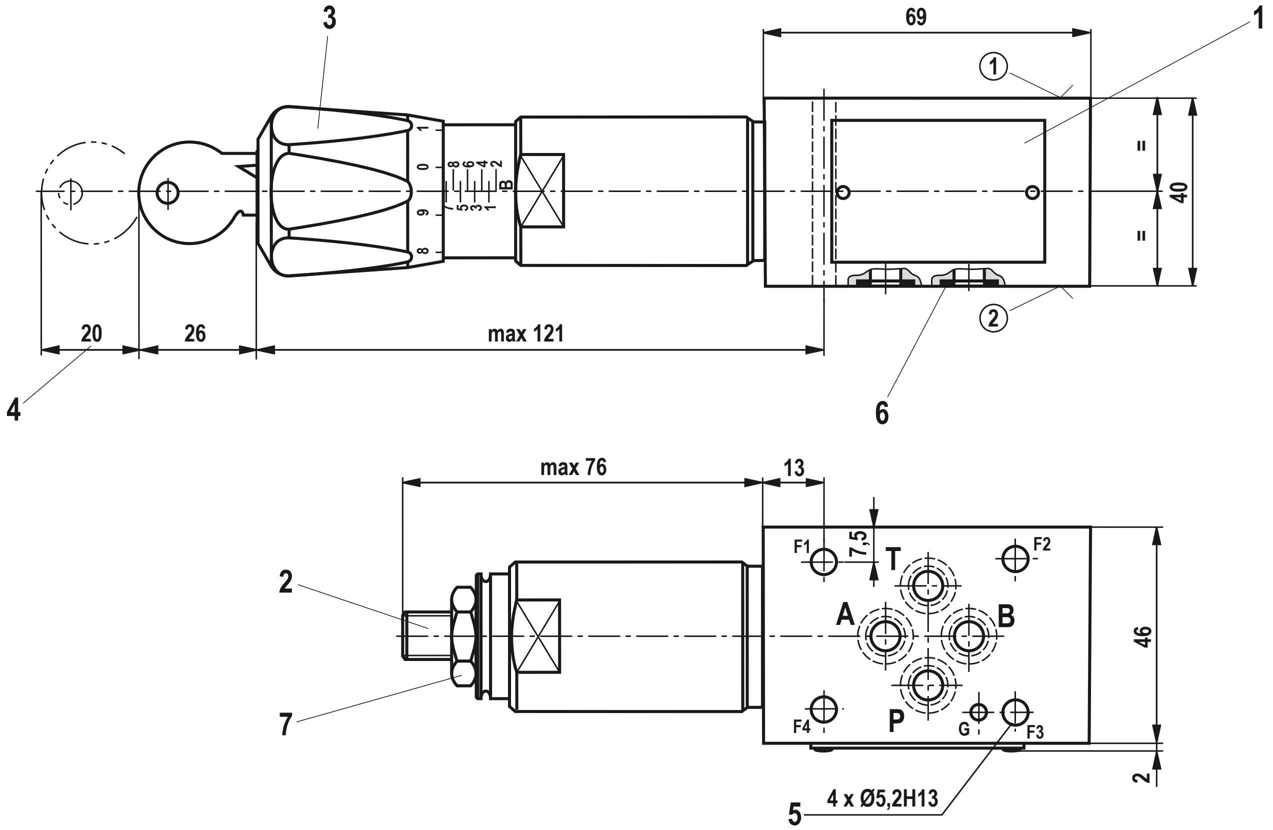
***p*-q_V characteristic curves – version "160"**

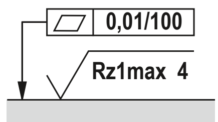


***p*-q_V characteristic curves – version "315"**



Device dimensions: Version "A"
(dimensions in mm)





Required surface quality of the valve contact surface

① component side – Porting pattern according to ISO 4401-03-02-0-05 (with locating hole Ø4 x 4 mm deep)

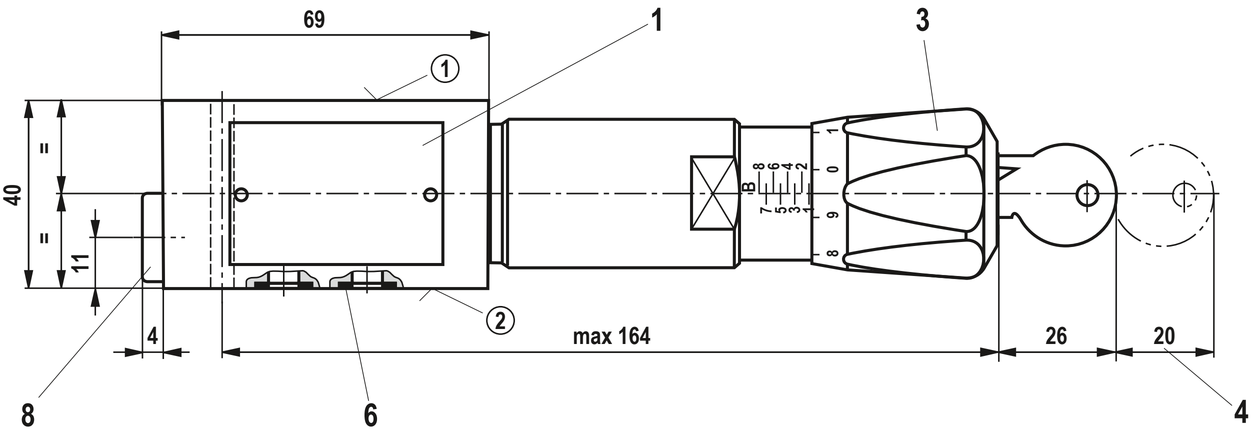
② plate side – Porting pattern according to ISO 4401-03-02-0-05 (with locating hole Ø3 x 5 mm deep for locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order)

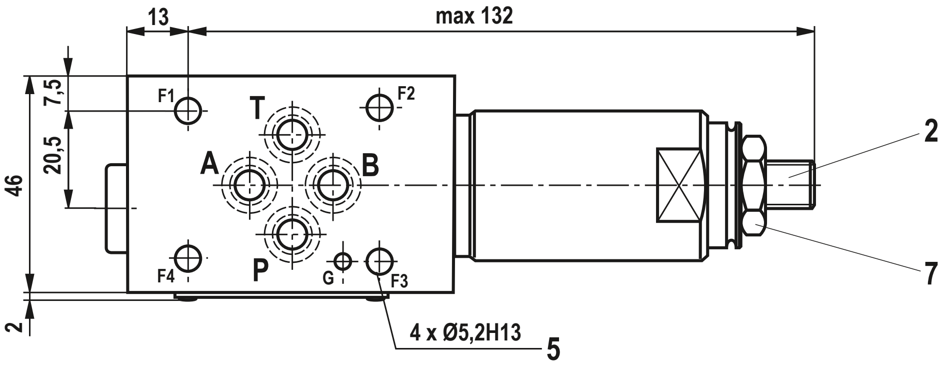
1 Name plate
2 Adjustment type "2"
3 Adjustment type "3"
4 Space required to remove the key
5 Valve mounting bores
6 Identical seal rings for ports A, B, P, T (plate side)
7 Lock nut SW17, tightening torque $\boldsymbol{M}_A = 10^{+5}$ Nm

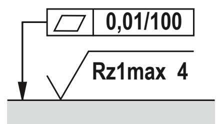
Valve mounting screws (separate order)
4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

Notice!
Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Device dimensions: Version "B" and "P"
(dimensions in mm)







Required surface quality of the valve contact surface

① component side – Porting pattern according to ISO 4401-03-02-0-05 (with locating hole Ø4 x 4 mm deep)

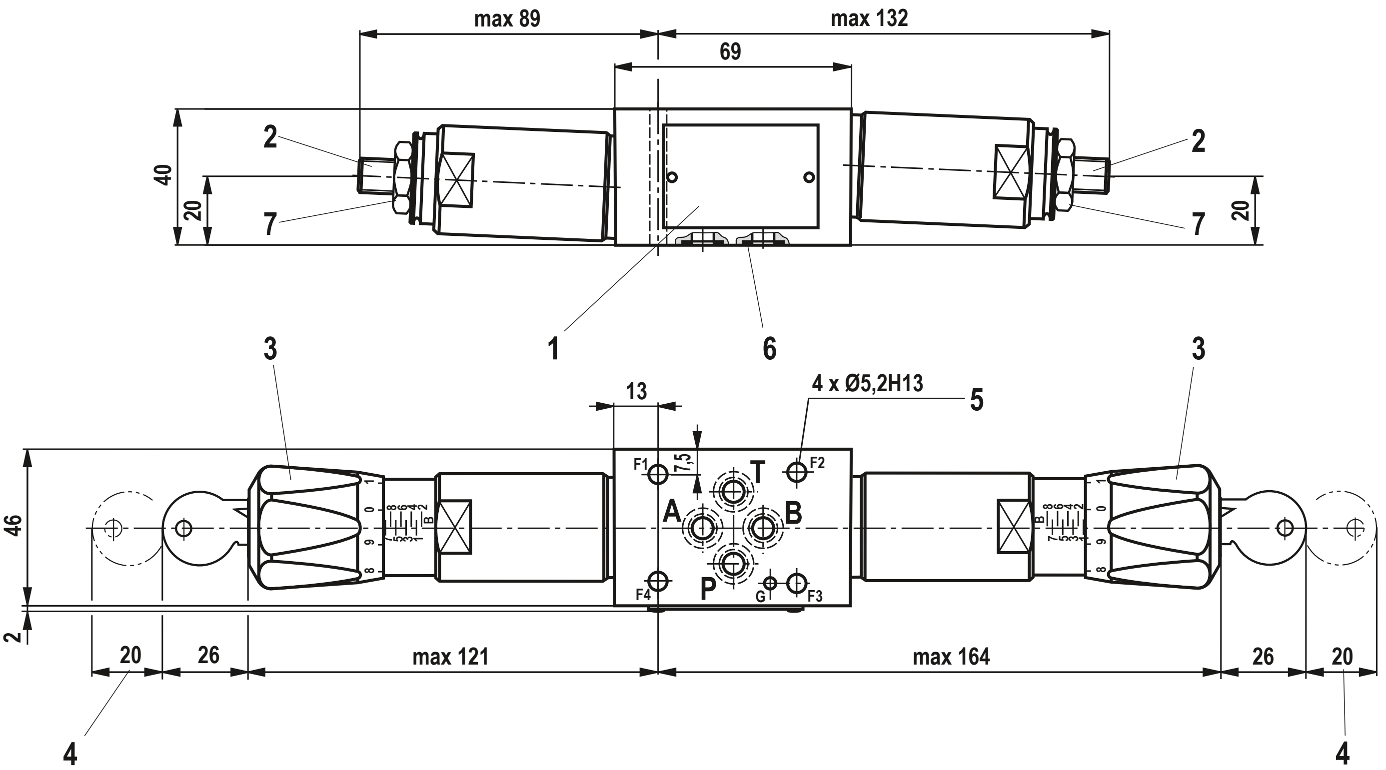
② plate side – Porting pattern according to ISO 4401-03-02-0-05 (with locating hole Ø3 x 5 mm deep for locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order)

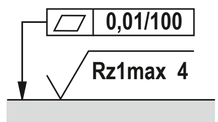
1 Name plate
2 Adjustment type "2"
3 Adjustment type "3"
4 Space required to remove the key
5 Valve mounting bores
6 Identical seal rings for ports A, B, P, T (plate side)
7 Lock nut SW17, tightening torque $\boldsymbol{M}_A = 10^{+5}$ Nm
8 Measuring port (only version "P")

Valve mounting screws (separate order)
4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

Notice!
Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Device dimensions: Version "C" and "D"
(dimensions in mm)





Required surface quality of the valve contact surface

① component side – Porting pattern according to ISO 4401-03-02-0-05 (with locating hole Ø4 x 4 mm deep)

② plate side – Porting pattern according to ISO 4401-03-02-0-05 (with locating hole Ø3 x 5 mm deep for locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order)

1 Name plate
2 Adjustment type "2"
3 Adjustment type "3"
4 Space required to remove the key
5 Valve mounting bores
6 Identical seal rings for ports A, B, P, T (plate side)
7 Lock nut SW17, tightening torque $M_A = 10^{+5}$ Nm

Valve mounting screws (separate order)
4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

Notice!
Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

More information

▶ Subplates	Data sheet 45053
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ General product information on hydraulic products	Data sheet 07008
▶ Assembly, commissioning and maintenance of industrial valves	Data sheet 07003
▶ Selection of the filters	www.boschrexroth.com/filter

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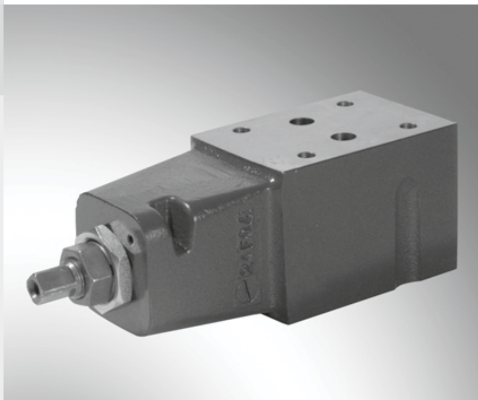
Pressure relief valve (Pilot control valve)

RE 25724/03.10
Replaces: 01.05

Type (Z)DBT/DZT

Size 6
Component series 1X
Maximum operating pressure 315 bar
Maximum flow 3 l/min



TB 0240
Type ZDBT

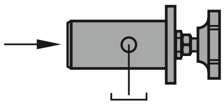
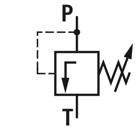
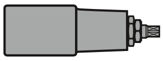
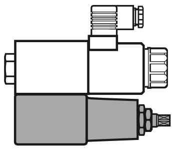
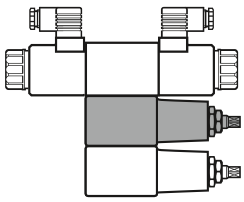
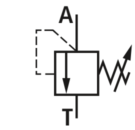
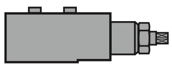
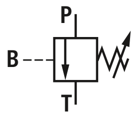
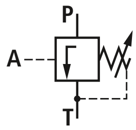
Table of contents

Features

– Directly operated valve for the limitation of the system pressure
– Application as pilot control valve
– For plate and control panel mounting

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code, symbols

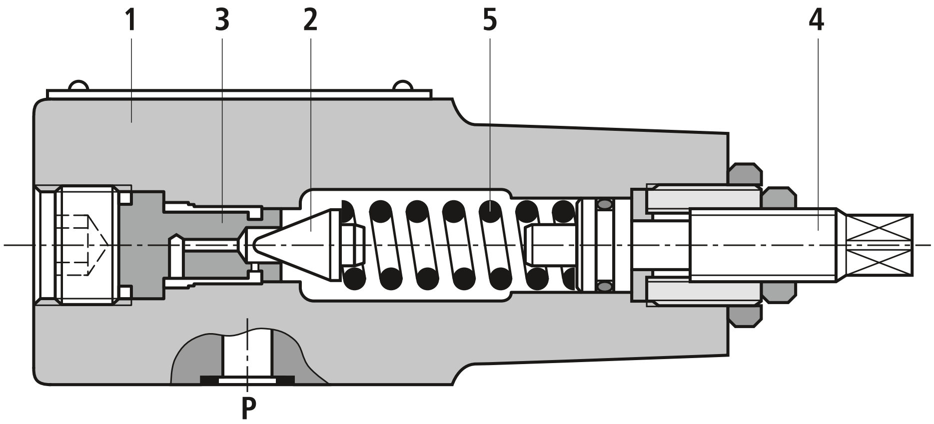
Type	Material no.	Examples of application	Symbols
DBT–G1–1X/160	**0 811 104 007**	 For control panel	
DBT–G1–1X/315	**0 811 104 013**		
DBT–G7–1X/160	**0 811 104 021**		
DBT–XP8–1X/160	**0 811 104 100**	 Sandwich plate for subplate mounting	
DBT–XP8–1X/315	**0 811 104 101**		
DBT–XP2–1X/160	**0 811 104 102**		
DBT–XP2–1X/315	**0 811 104 103**		
DBT–XP7–1X/160	**0 811 104 104**		
DBT–XP7–1X/315	**0 811 104 105**		
DBT–XP3–1X/160	**0 811 104 106**		
DBT–XP3–1X/315	**0 811 104 107**		
DBT–XP1–1X/160	**0 811 104 108**		
DBT–XP1–1X/315	**0 811 104 109**		
ZDBT–XP8–1X/160	**0 811 104 110**	 Sandwich plate for subplate mounting	
ZDBT–XP8–1X/315	**0 811 104 111**		
ZDBT–XP2–1X/160	**0 811 104 112**		
ZDBT–XP2–1X/315	**0 811 104 113**		
ZDBT–XP7–1X/160	**0 811 104 114**		
ZDBT–XP7–1X/315	**0 811 104 115**		
ZDBT–XP3–1X/160	**0 811 104 116**		
ZDBT–XP3–1X/315	**0 811 104 117**		
ZDBT–XA8–1X/160	**0 811 104 118**	 For subplate mounting Low pressure High pressure	
ZDBT–XA8–1X/315	**0 811 104 119**		
ZDBT–XA2–1X/160	**0 811 104 120**		
ZDBT–XA2–1X/315	**0 811 104 121**		
DZT–XB2–1X/315	**0 811 104 123**	Pressure cut-off valve for subplate mounting 	
DZT–XB2–1X/60	**0 811 104 124**		
DZT–XA2–1X/60	**0 811 104 125**		
DZT–XA2–1X/160	**0 811 104 126**		
DZT–XA2–1X/315	**0 811 104 127**		

Function, section

Type DBT pressure relief valves are seat design remote control valves and allow for the limitation of the system pressure. The valve is adjusted manually by the adjusting device (4). The valves basically consist of housing (1), valve poppet (2) and corresponding valve seat (3). In unloaded position, the valve poppet (2) applies pressure to the valve seat (3) locking the connection between P and T port.

If the hydraulic force equals the force set at the adjusting element (4), the valve controls the set pressure. As the valve poppet (2) lifts off the valve seat (3), the excess pressure fluid can flow off from P to T.
If the spring (5) is completely without load, a minimal pressure of 3 bar (spring pretensioning force) is reached.
These valves are basically used as pilot control valves for the indirect control of major flow.

Type DBT-XP2-1X



Technical data

general

Installation position		Any
Storage temperature range	°C	–20...+80
Ambient temperature range	°C	–20...+70
Weight	kg	2.0

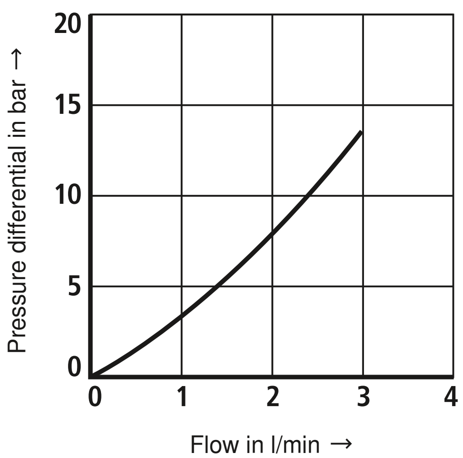
hydraulic (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C, ν = 35 mm²/s)

Maximum operating pressure	– Port P	bar	350
Maximum set pressure	– Pressure rating 60 bar	bar	60 (only possible for type DZT)
	– Pressure rating 160 bar	bar	160
	– Pressure rating 315 bar	bar	315
	– Pressure rating 350 bar	bar	350
Minimal set pressure		bar	3
Return flow	– Port T	bar	Separately depressurized to the tank
Maximum flow		l/min	3
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524 Other hydraulic fluids upon request!
Hydraulic fluid temperature range		°C	–20...+80
Viscosity range		mm²/s	15...380
Max admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]
Hysteresis		%	< 5 of the max. set pressure
Control oil volume (V_x) (only pressure on/off valves)		cm³	< 0,5

[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of filters, see data sheets 50070, 50076, 50081, 50086, 50087 and 50088.

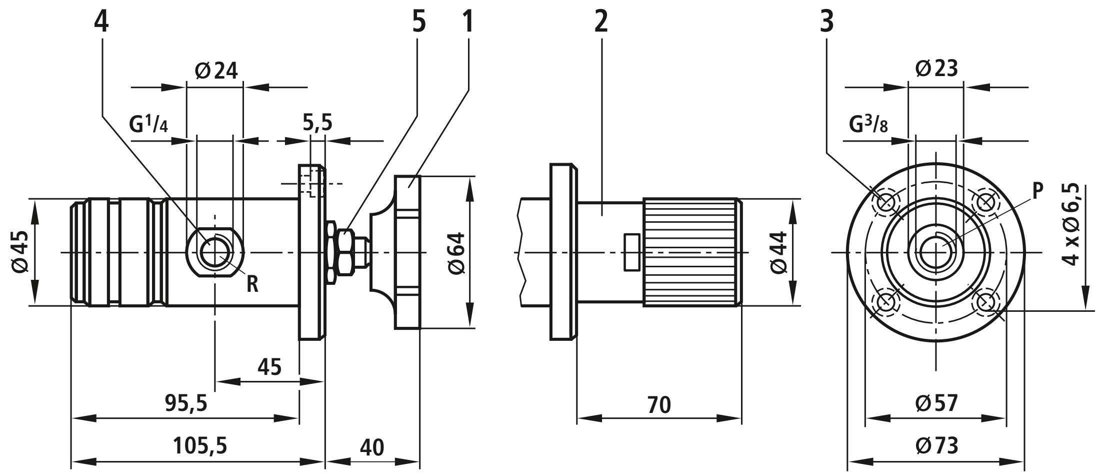
Characteristic curve (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C, v = 35 mm²/s)



$\Delta p = f(q_V)$

Unit dimensions (dimensions in mm)

Type DBT-G1-1X/...

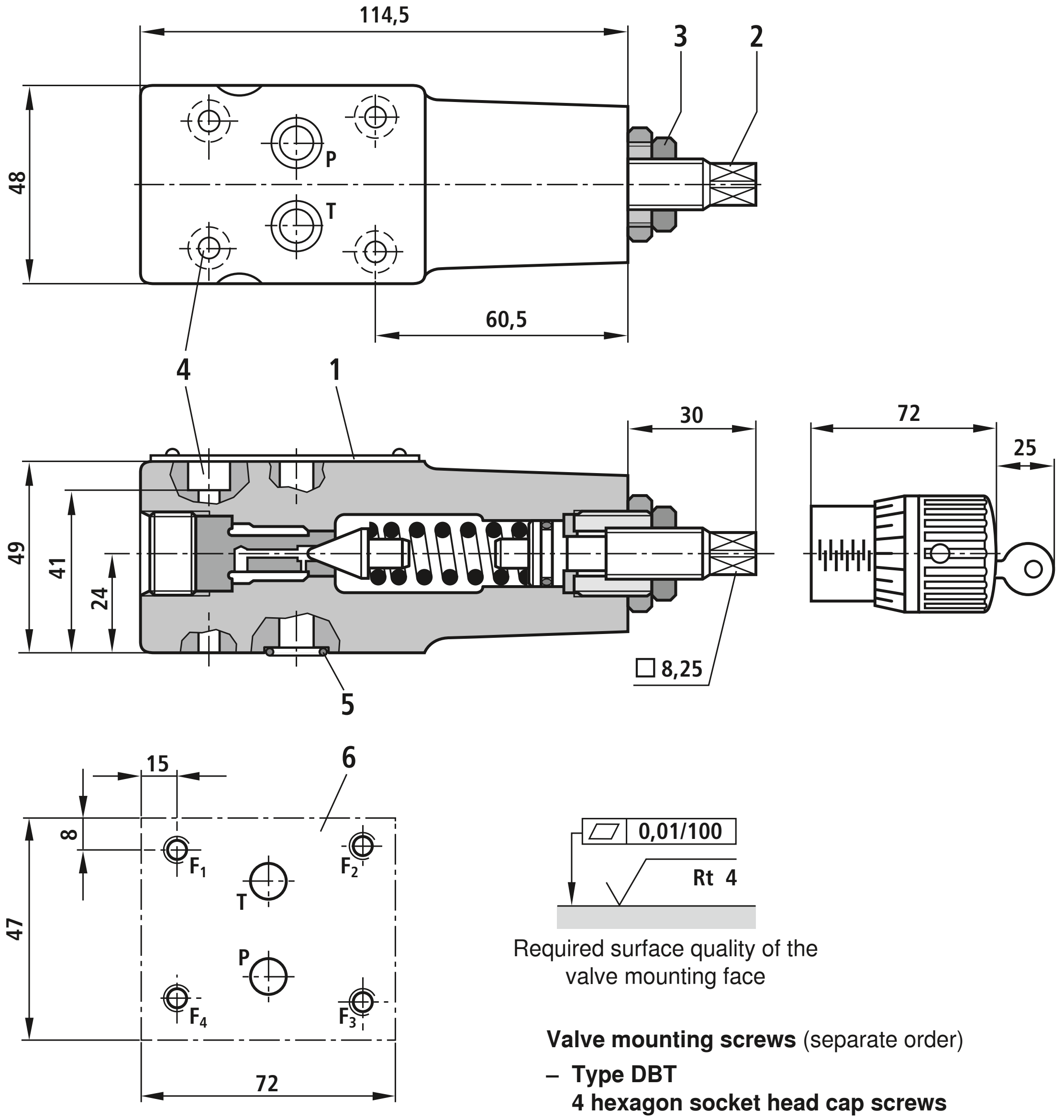


1 Hand wheel
2 Rotary knob
3 Valve mounting bores
4 Pressure gauge connection
5 Lock nut

Valve mounting screws (separate order)
4 M6 hexagon socket head cap screws
Screw length as required

Unit dimensions (dimensions in mm)

Type DBT-X...
Type ZDBT-X...



Required surface quality of the valve mounting face

1 Name plate or second flange surface
2 Adjustment type
3 Lock nut
4 Valve mounting bores
5 O-rings Ø9.25 x 1.78 (P, T ports)
6 Machined valve mounting face, porting pattern according to ISO 4401-03-02-0-05.
Subplates according to data sheet 45052 (separate order)

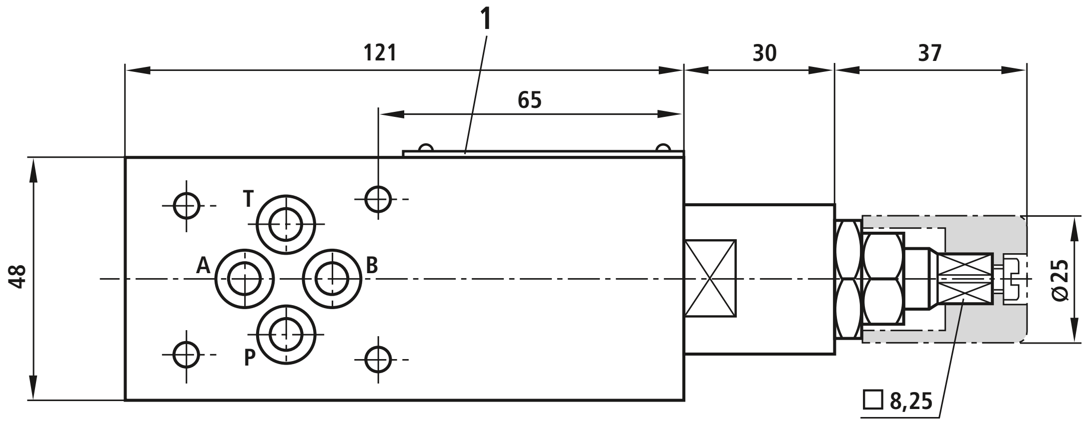
Valve mounting screws (separate order)

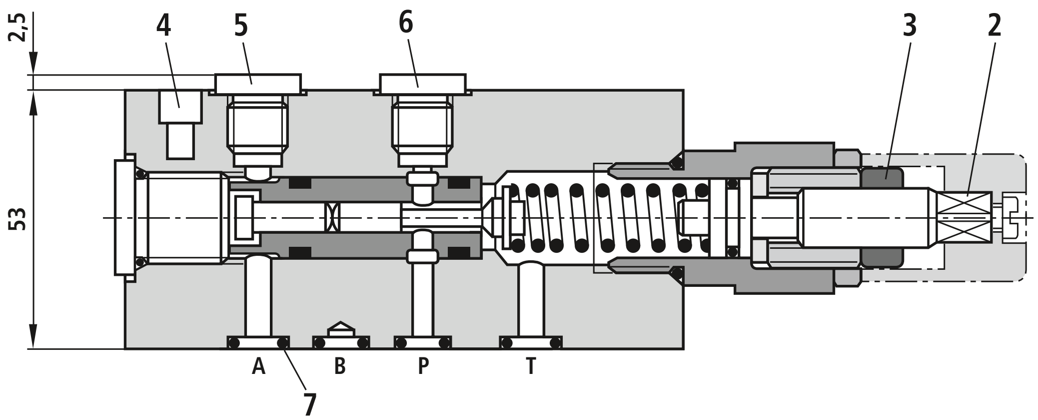
– **Type DBT**
4 hexagon socket head cap screws ISO 4762-M5x50-10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09–0.14);
Tightening torque M_A = 7 Nm ±10 %
or
4 hexagon socket head cap screws ISO 4762-M5x50-10.9
(friction coefficient μ_{total} = 0.12–0.17);
Tightening torque M_A = 8.9 Nm ±10 %

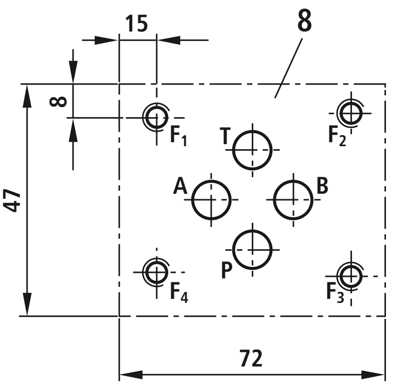
– **Type ZDBT**
4 hexagon socket head cap screws ISO 4762-M5-10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09–0.14);
Tightening torque M_A = 7 Nm ±10 %
or
4 hexagon socket head cap screws ISO 4762-M5-10.9
(friction coefficient μ_{total} = 0.12–0.17);
Tightening torque M_A = 8.9 Nm ±10 %
Screw length as required

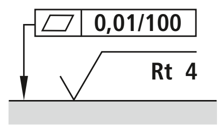
Unit dimensions (dimensions in mm)

Type DZT-X...









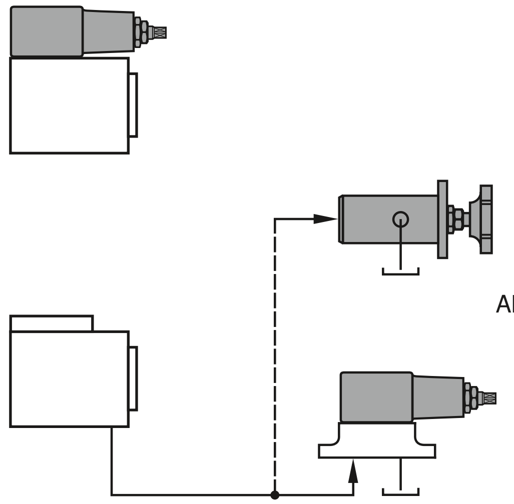
Required surface quality of the valve mounting face

1 Name plate
2 Adjusting element
3 Lock nut
4 Valve mounting bores
5 Pressure gauge connection for control pressure X, G1/4
6 Pressure gauge connection for system pressure A, G1/4
7 O-rings Ø10 x 1.5 (ports P, A, B, T)
8 Machined valve mounting face,
porting pattern according to ISO 4401-03-02-0-05.
Subplates according to data sheet 45052
(separate order)

Valve mounting screws (separate order)

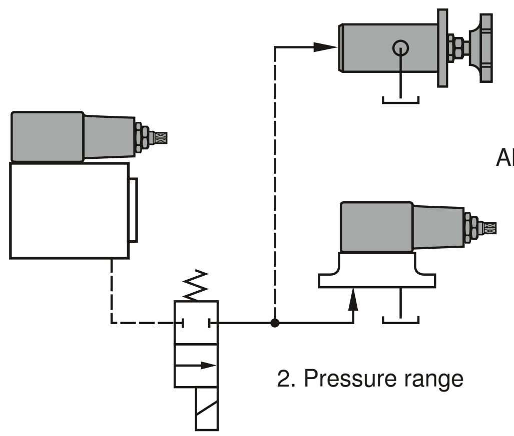
4 hexagon socket head cap screws
ISO 4762-M5x50-10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09−0.14);
Tightening torque M_A = 7 Nm ±10 %
or
4 hexagon socket head cap screws ISO 4762-M5x50-10.9
(friction coefficient μ_{total} = 0.12−0.17);
Tightening torque M_A = 8.9 Nm ±10 %
Screw length as required

Examples of application



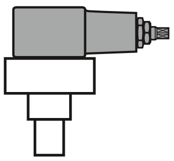
Alternative

Remote control

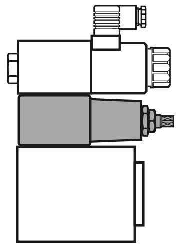


Alternative

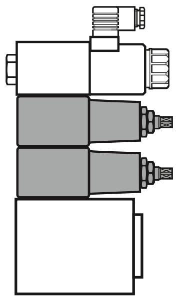
2. Pressure range



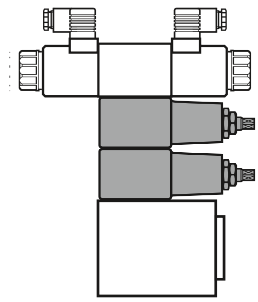
Block installation valves



Pressure release, electric



2 pressure ratings



Pressure release and 2 pressure stages

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

The Drive & Control Company

Rexroth
Bosch Group

Pressure relief valve, pilot operated

Type DB…W65; DBW…W65; DB 20 K

RE 25818
Edition: 2012-07
Replaces: 08.03

H6964

- Size 10 and 25
- Component series 1X; 4X
- Maximum operating pressure 350 bar
- Maximum flow 400 l/min

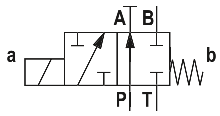
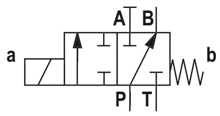
Features

- For subplate mounting
- Porting pattern according to ISO 6264-06-09-*-97 (size 10) and ISO 6264-08-13-*-97 (size 25)
- For threaded connection
- As screw-in cartridge valve
- 4 adjustment types for pressure adjustment, optionally:
  - Rotary knob
  - Bushing with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- 5 pressure ratings
- Solenoid operated unloading via a built-on directional spool valve

Contents

Ordering code

01	02	03	04	05	06		07		08	09	10	11	12	13	14	15	16	17	18
DB						**–**		**/**											*****

01	Pressure relief valve	**DB**
02	**Without** directional valve	**no code**
	With attached directional valve	**W** [1]
03	**– Size 10**	
	Subplate mounting "–"	**10**
	Threaded connection "G" (G1 1/2)	**10**
	– Size 25	
	Subplate mounting "–"	**20**
	Threaded connection "G" (G3/4)	**15**
	Threaded connection "G" (G1)	**20**
	Screw-in cartridge valve "K"	**20**
04	 normally closed	**A** [2]
	 normally open	**B** [2]

Type of connection

05	Subplate mounting	**–**
	Threaded connection	**G**
	Screw-in cartridge valve	**K**

Adjustment type

06	Rotary knob	**1**
	Bushing with hexagon and protective cap	**2**
	Lockable rotary knob with scale	**3** [3]
	Rotary knob with scale	**7**
07	Component series 10 to 19 (10 to 19: Unchanged installation and connection dimensions); (only version "K")	**1X**
	Component series 40 to 49 (40 to 49: Unchanged installation and connection dimensions); (only version "–" and "G")	**4X**

1) Only with version "G".

2) Ordering code only necessary with version "W".

3) H-key with the material no. **R900008158** is included in the scope of delivery.

4) Dash "–" only necessary with version "W" and without specification of "U".

5) Mating connectors, separate order, see page 19.

Notice!
In case spare parts of the screw-in cartridge valve for standard subplate mounting or threaded connection housing size 10 and 25 are necessary, **always** order type DB 20 K.-1X/.XY!
Type-examination tested safety valves are **only** available as type DB 20 K.-1X/.Y...E!

Preferred types and standard units are contained in the EPS (standard price list).

Ordering code

01	02	03	04	05	06		07		08	09	10	11	12	13	14	15	16	17	18
DB						**–**		**/**											*

Pressure rating

08	Set pressure up to 50 bar	**50**
	Set pressure up to 100 bar	**100**
	Set pressure up to 200 bar	**200**
	Set pressure up to 315 bar	**315**
	Set pressure up to 350 bar (only version "DB")	**350**

Pilot oil supply and pilot oil return (see also Symbols on page 4)

09	Pilot oil supply and pilot oil return internal	**–** [4)]
	Pilot oil supply external, pilot oil return internal	**X**
	Pilot oil supply internal, pilot oil return external	**Y**
	Pilot oil supply and pilot oil return external	**XY**

10	Standard version	**no code**
	Valve for minimum opening pressure (not suitable for mutual relief!)	**U**

11	**Without** directional valve	**no code**
	With directional spool valve (data sheet 23178)	**6E** [2)]

12	Direct voltage 24 V	**G24** [2)]
	AC voltage 230 V 50/60 Hz	**W230** [2)]

13	**With** concealed manual override (standard)	**N9** [2)]
	With manual override	**N** [2)]
	Without manual override	**no code**

Electrical connection

14	**Individual connection**	
	Without mating connector with connector DIN EN 175301-803	**K4** [2)]

Seal material

15	NBR seals	**no code**
	FKM seals	**V**
	(other seals upon request) Attention! Observe compatibility of seals with hydraulic fluid used!	

16	Vertical installation position of the screw-in cartridge valve (cartridge) (only version "–" and "G")	**W65**
	Any installation position of the screw-in cartridge valve (only version "K")	**no code**

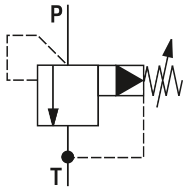
Type examination

17	**Without** type examination	**no code**
	Safety valve according to Pressure Equipment Directive 97/23/EC	**E**

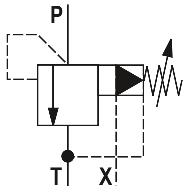
18	Further details in the plain text	

Symbols

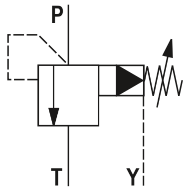
Type DB...**–**...



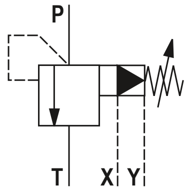
Type DB...**X**...



Type DB...**Y**...

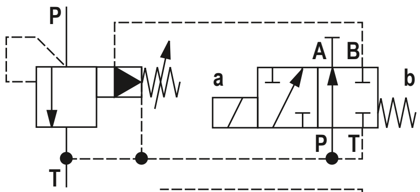


Type DB...**XY**...

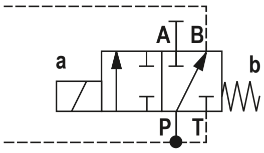


Type DBW...**–**...

normally closed

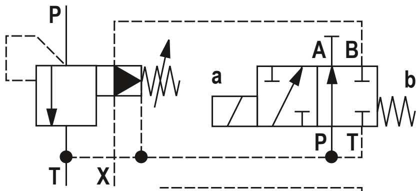


normally open

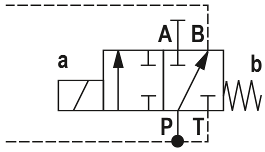


Type DBW...**X**...

normally closed

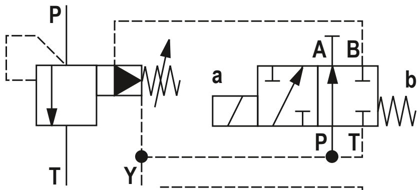


normally open

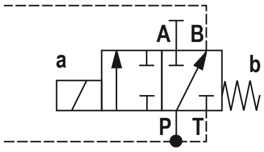


Type DBW...**Y**...

normally closed

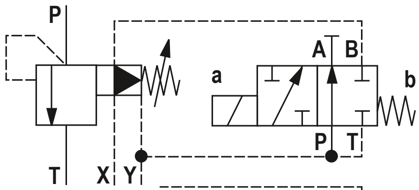


normally open

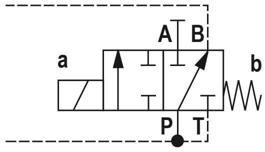


Type DBW...**XY**...

normally closed



normally open

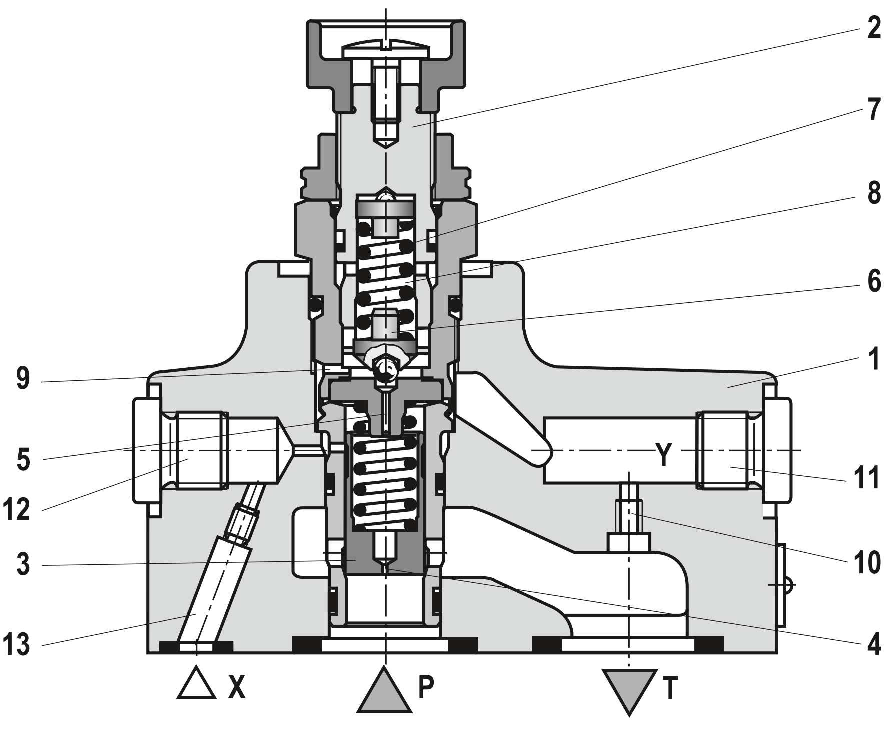


Function, section

Valves of type DB and DBW are pilot operated pressure relief valves. They are used for limiting (DB) or limiting and magnetically unloading (DBW) the operating pressure.
The valves basically consist of housing (1) and pilot control valve (2) with adjustment type.

Pressure relief valve type DB
The pressure applied to channel P acts on the main spool (3). Via the nozzle bores (4 and 5), the pressure is at the same time applied to the poppet (6). If the pressure in channel P exceeds the value set at spring (7), poppet (6) opens against spring (7). Via the nozzle bores (4 and 5), the hydraulic fluid from channel P now flows into the spring chamber (8). From here, it is led into the tank internally (version "–"), via the control line (9 and 10), or externally (version "Y") via the control line (9 and 11).

Due to the state of equilibrium at the main spool (3), hydraulic fluid flows from channel P to channel T, maintaining the set operating pressure.
A pressure gauge connection (12) allows for the control of the operating pressure.
The pressure relief valve can be unloaded or switched to another pressure (second pressure rating) via port X (13).
Pressure relief valve type DBW (only threaded connection)
The function of this valve is basically the same as that of valve type DB.
The main spool (3) is unloaded by controlling a built-on directional valve.



Technical data
(For applications outside these parameters, please consult us!)

general					
Size				Size 10	Size 25
Weight	▶ Subplate mounting "–"		kg	1.6	2.3
	▶ Threaded connection "G"	– Type DB	kg	2.95	2.95
		– Type DBW	kg	4.25	4.25
	▶ Screw-in cartridge valve "K"		kg	–	0.35
Installation position				Any	
Ambient temperature range		▶ Type DB	°C	–30 … +80 (NBR seals) –15 … +80 (FKM seals)	
		▶ Type DBW		–30 … +50 (NBR seals) –15 … +50 (FKM seals)	
Minimum stability of the housing materials				Housing materials are to be selected so that there is sufficient safety for all imaginable operating conditions (e. g. with regard to compressive strength, thread stripping strengths and tightening torques).	

hydraulic					
Maximum operating pressure	▶ Port P, X		bar	350	
	▶ Port T		bar	315	
Maximum back pressure	▶ Port Y	– Type DB	bar	250	
	▶ Port Y, T	– Type DBW	bar	210 (DC solenoid) 160 (AC solenoid)	
Minimum set pressure			bar	Flow-dependent, see characteristic curves page 8 … 9	
Maximum set pressure			bar	50; 100; 200; 315; 350 (only type DB)	
Maximum flow	▶ Subplate mounting "–"		l/min	200	400
	▶ Threaded connection "G"			150	200 (G3/4); 300 (G1)
Hydraulic fluid				See table page 7	
Hydraulic fluid temperature range (at the valve's working ports)			°C	–20 … +80 (NBR seals) –15 … +80 (FKM seals) –20 … +50 (HFC hydraulic fluid)	
Viscosity range			mm^2/s	10 … 800	
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)				Class 20/18/15 [1]	

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.
For the selection of the filters see www.boschrexroth.com/filter.

Technical data for directional spool valve see data sheet 23178.

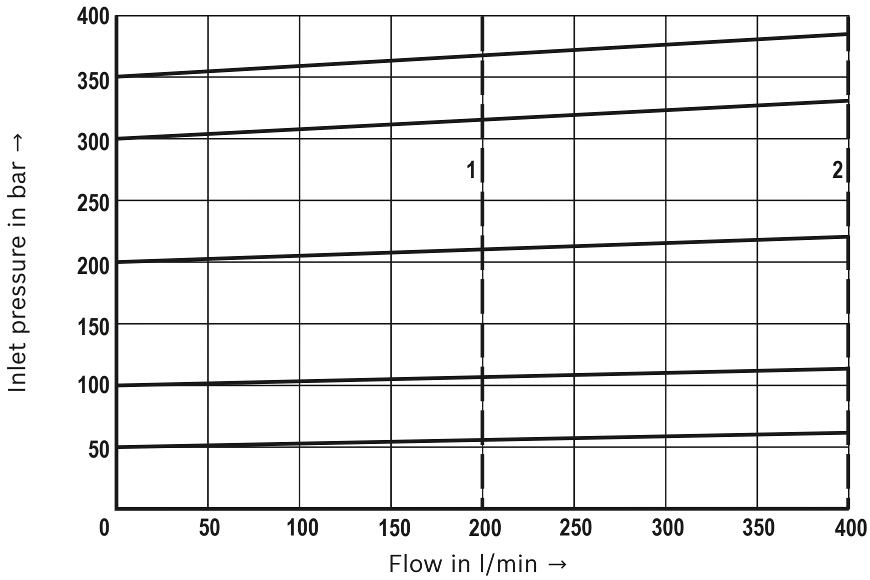
Technical data
(For applications outside these parameters, please consult us!)

hydraulic				
Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– Insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– Soluble in water	HEPG	FKM	VDMA 24568

Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Environmentally compatible:** When using environmentally compatible hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate (700 mg zinc per pole tube).

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

Inlet pressure depending on the flow

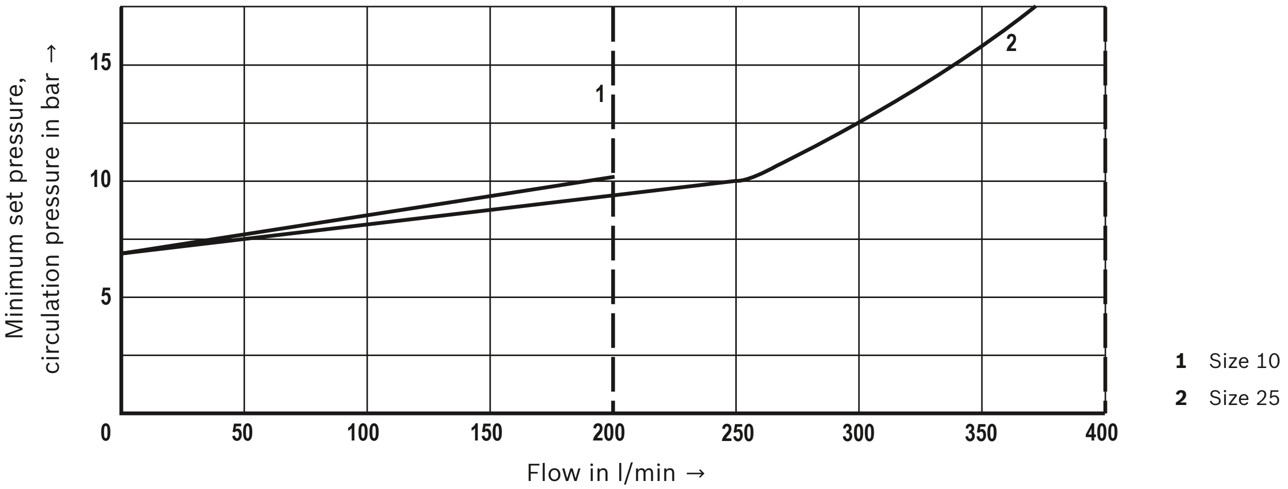


1 Size 10
2 Size 25

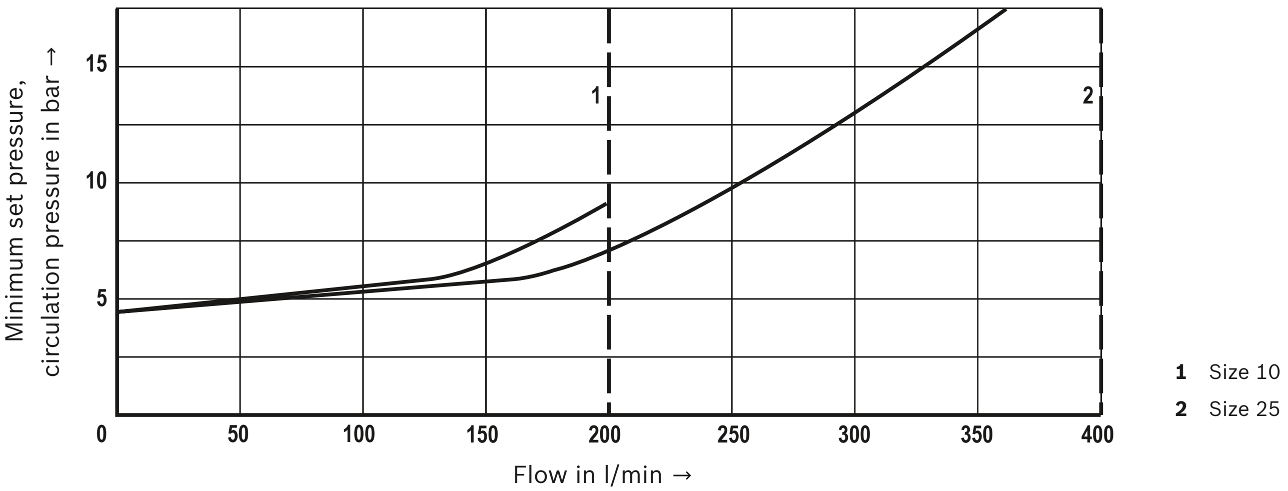
Notice!
The characteristic curves were measured with **external, depressurized pilot oil return**.
With internal pilot oil return, the inlet pressure increases by the output pressure present in port T.

Characteristic curves: Subplate mounting (measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

Minimum set pressure and circulation pressure depending on the flow 1)
Standard version



Minimum set pressure and circulation pressure depending on the flow 1)
Version "U"

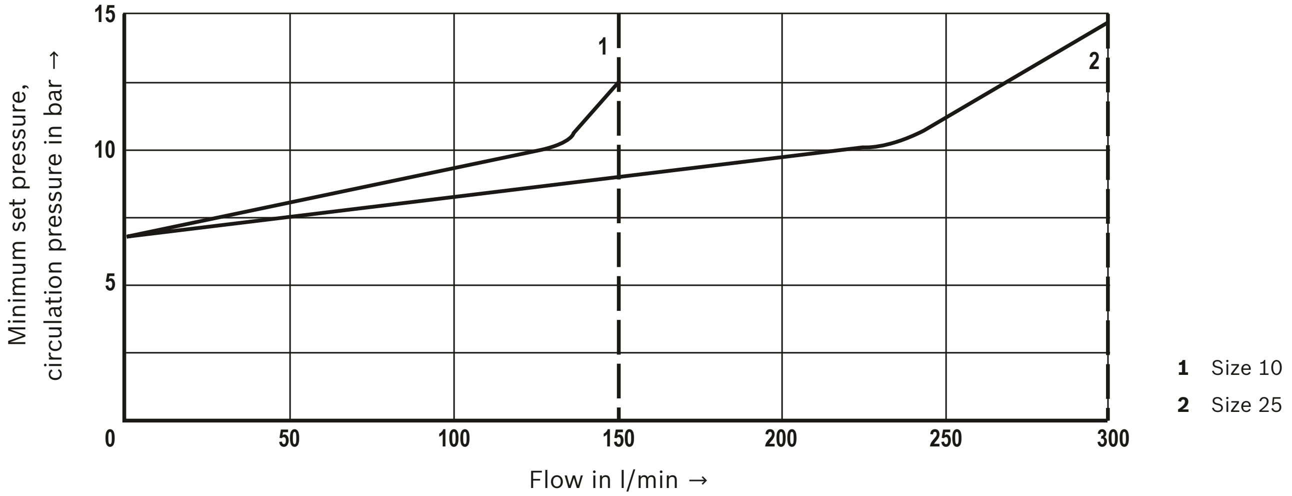


☞ **Notice!**
The characteristic curves were measured with **external, depressurized pilot oil return**.
With internal pilot oil return, the inlet pressure increases by the output pressure present in port T.

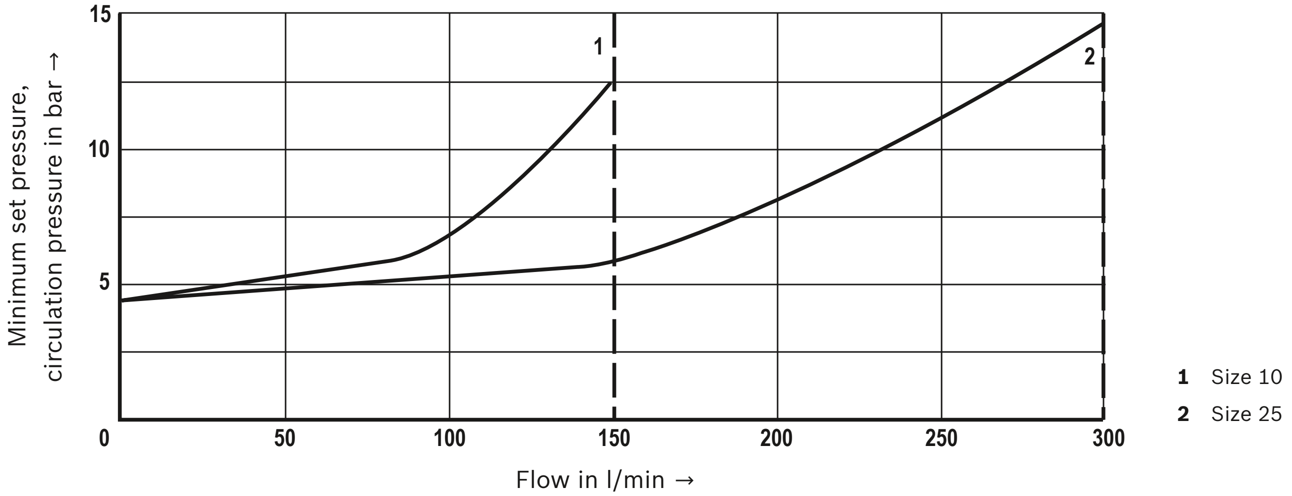
1) The characteristic curves apply to the pressure at the valve output p_T = 0 bar across the entire flow range.

Characteristic curves: Threaded connection
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

Minimum set pressure and circulation pressure depending on the flow 1)
Standard version



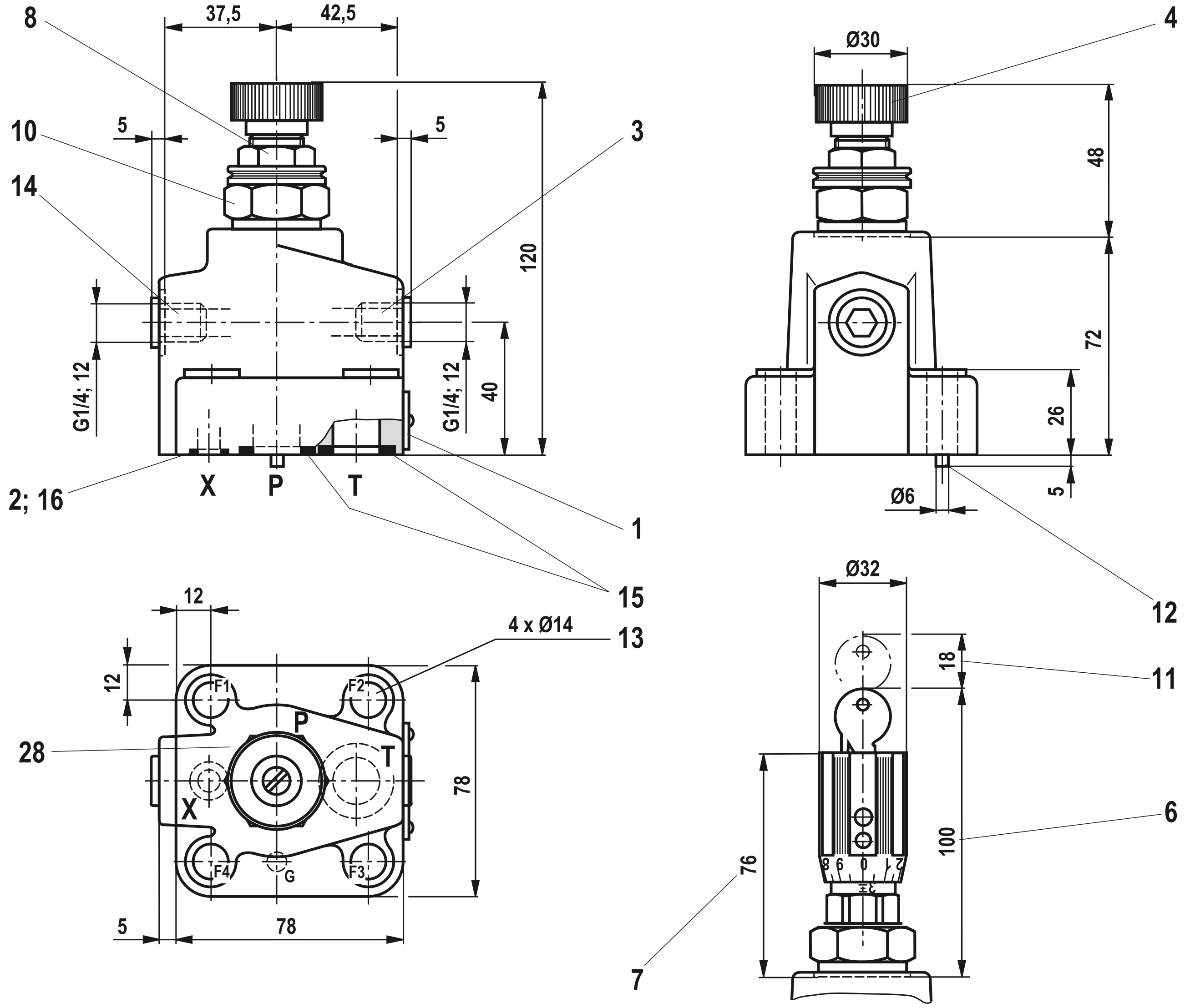
Minimum set pressure and circulation pressure depending on the flow 1)
Version "U"



☞ **Notice!**
The characteristic curves were measured with **external, depressurized pilot oil return**.
With internal pilot oil return, the inlet pressure increases by the output pressure present in port T.

1) The characteristic curves apply to the pressure at the valve output p_T = 0 bar across the entire flow range.

Unit dimensions: Subplate mounting – size 10
(dimensions in mm)

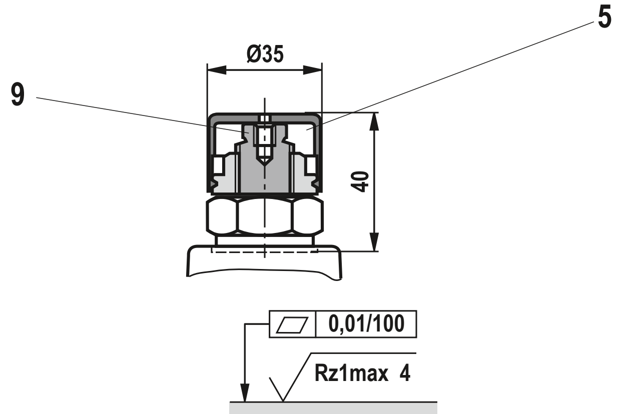


Valve mounting screws (separate order)
For reasons of stability, exclusively the following valve mounting screws may be used:

4 x ISO 4762 - M12 x 50 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_A = 75 Nm ±10 %,
material no. **R913000283**

☞ **Notice!**
The tightening torques are guidelines when using screws with the specified friction coefficients and when using a manual torque wrench (tolerance ±10 %).

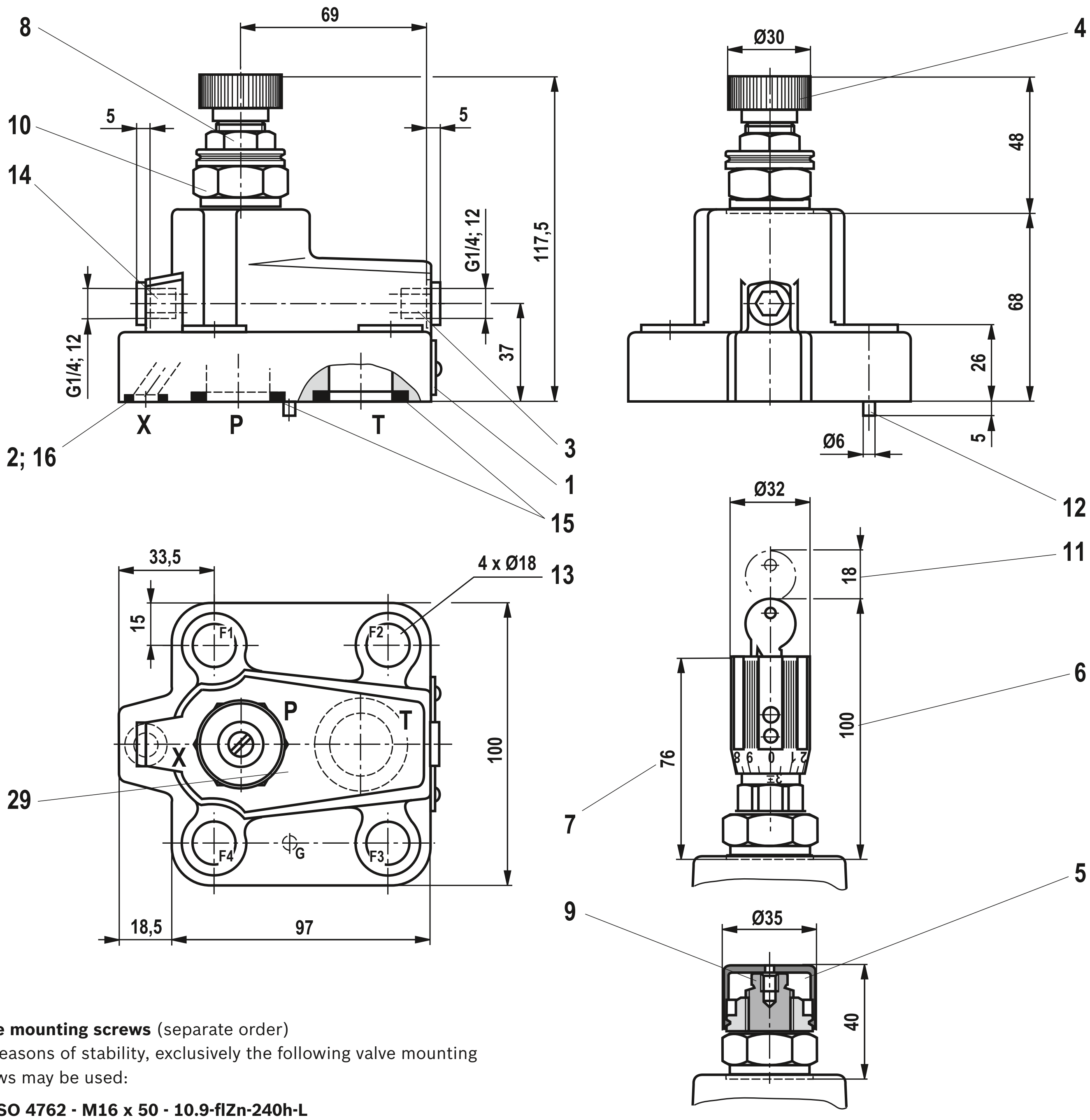
Subplates according to data sheet 45064 (separate order)
G 545/01 (G3/8)
G 546/01 (G1/2)
G 565/01 (G3/4)



Required surface quality of the valve mounting face

Item explanations see page 16.

Unit dimensions: Subplate mounting – size 25
(dimensions in mm)

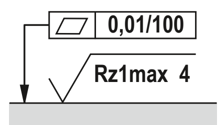


Valve mounting screws (separate order)
For reasons of stability, exclusively the following valve mounting screws may be used:

4 x ISO 4762 - M16 x 50 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_A = 185 Nm ±10 %,
material no. **R913000378**

Notice!
The tightening torques are guidelines when using screws with the specified friction coefficients and when using a manual torque wrench (tolerance ±10 %).

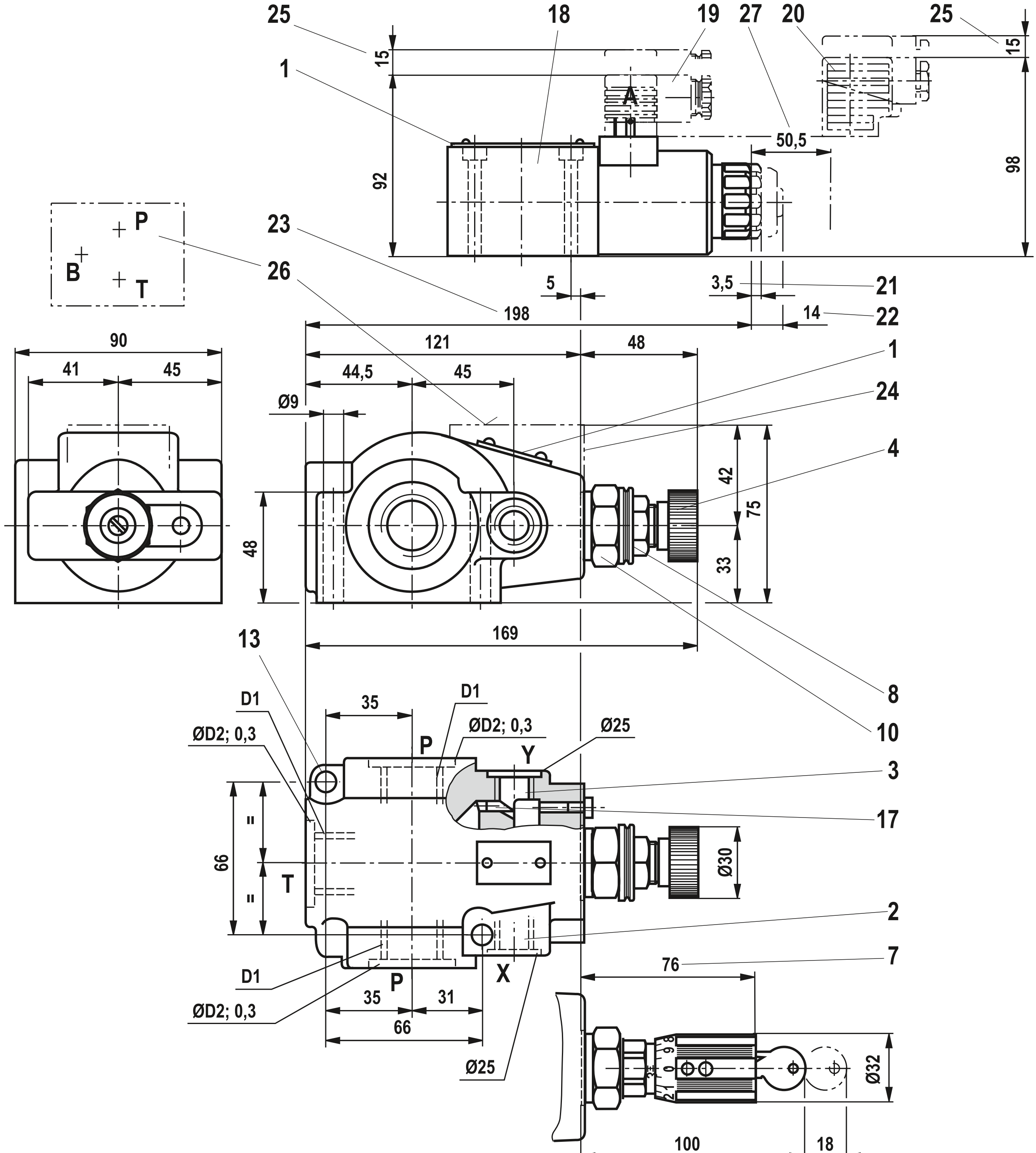
Subplates according to data sheet 45064 (separate order)
G 408/01 (G3/4)
G 409/01 (G1)

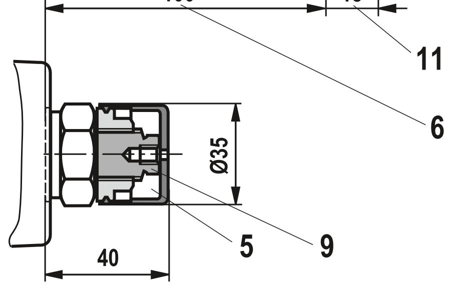


Required surface quality of the valve mounting face

Item explanations see page 16.

Unit dimensions: Threaded connection
(dimensions in mm)

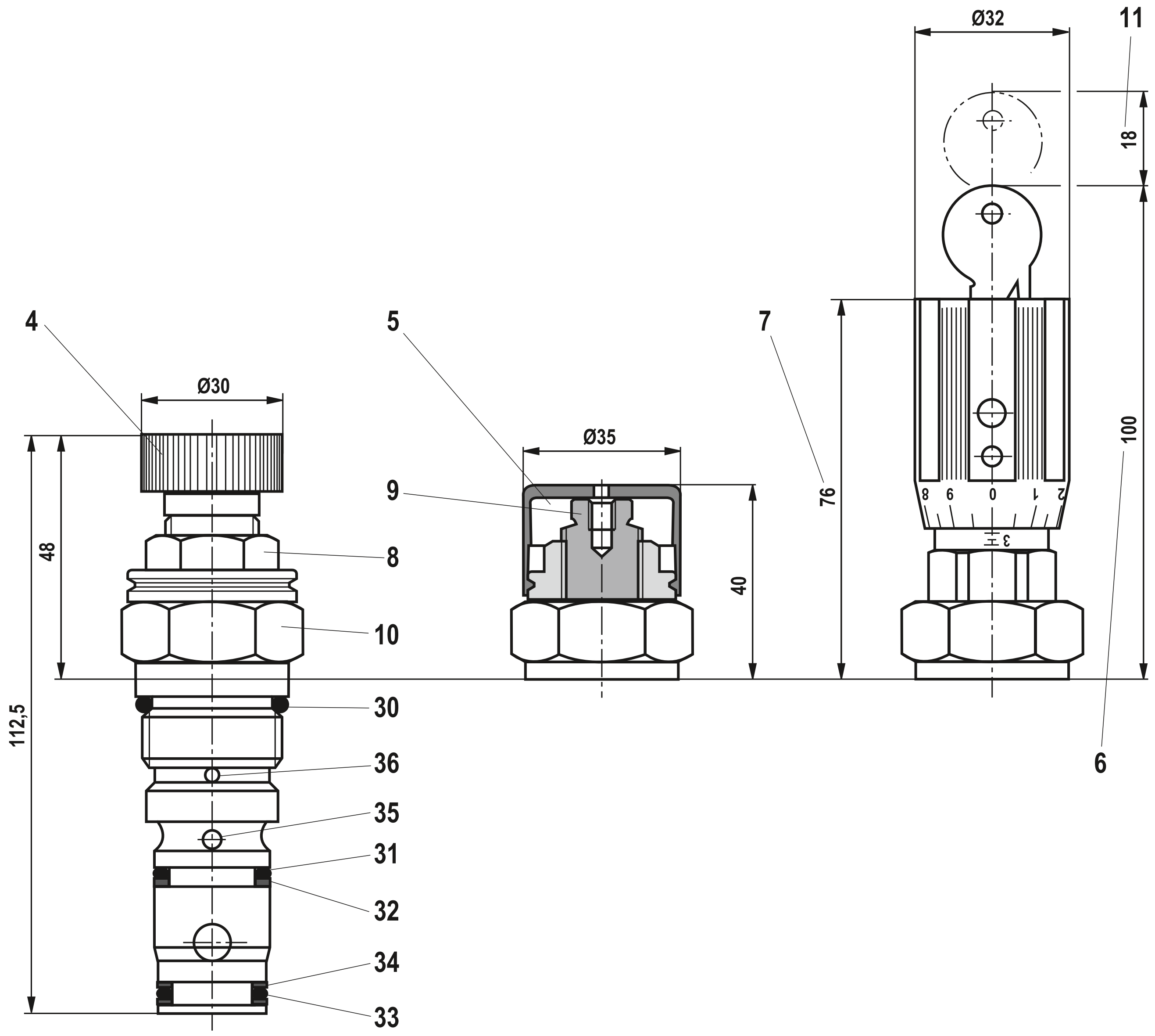




Type	D1	ØD2
DB.10.G	G1/2	34
DB.15.G	G3/4	42
DB.20.G	G 1	47

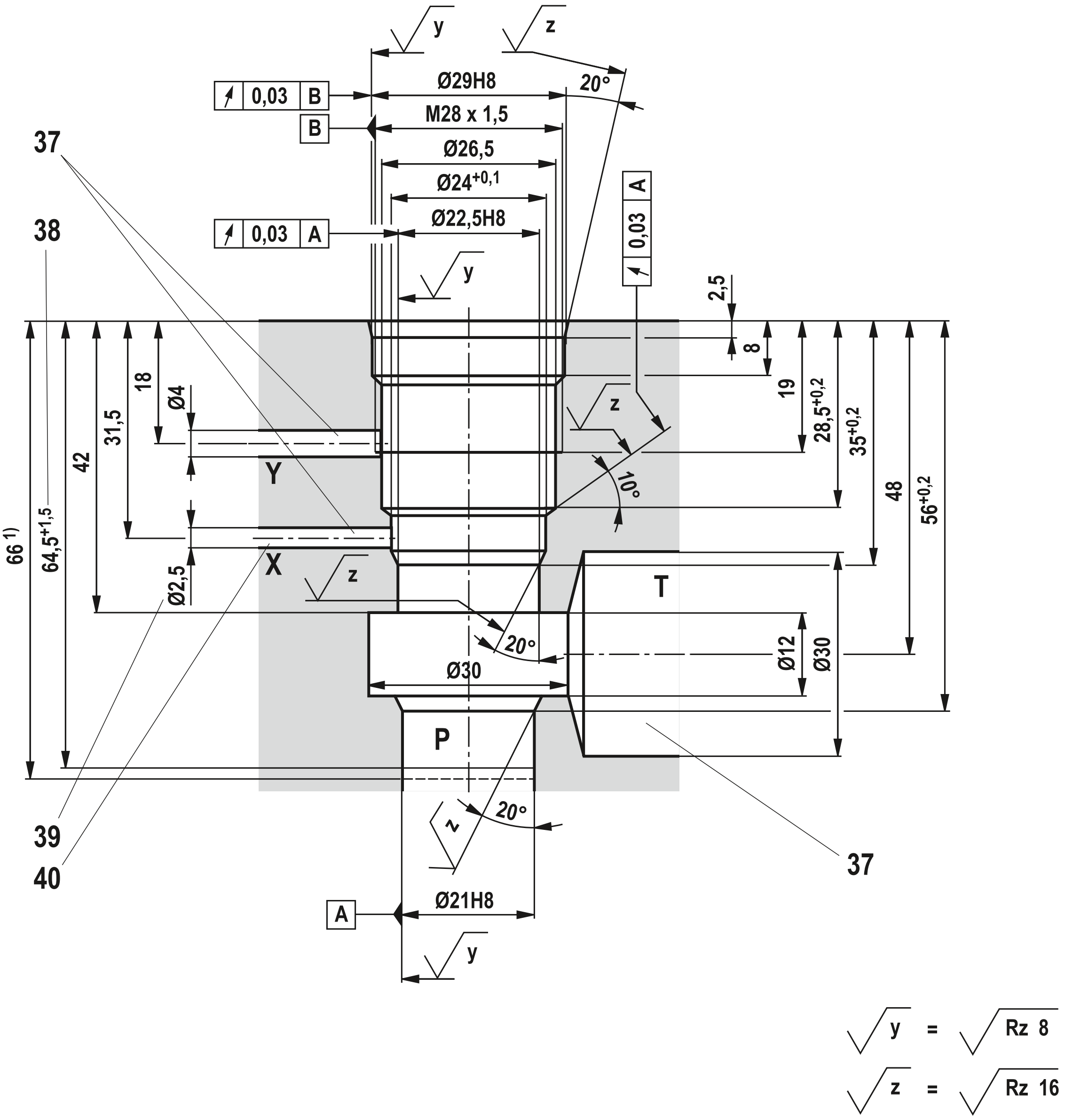
Item explanations see page 16.

Unit dimensions: Screw-in cartridge valve
(dimensions in mm)



Item explanations see page 16.

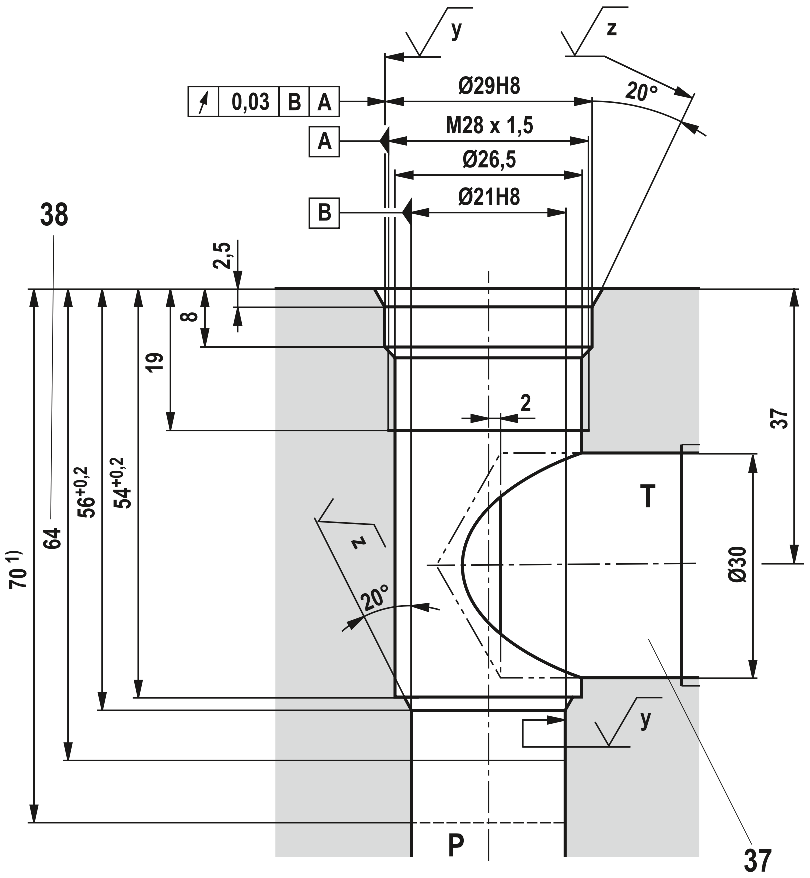
Mounting cavity: Version "XY" and type-examination tested safety valves version "Y...E" (dimensions in mm)



1) Installation depth

Item explanations see page 16.

Mounting cavity: Version "Y"
(dimensions in mm)



1) Installation depth

Item explanations see page 16.

Unit dimensions

1 Name plate
2 Port X for remote control, optional
3 Y port for pilot oil return, external
4 Adjustment type "1"
5 Adjustment type "2"
6 Adjustment type "3"
7 Adjustment type "7"
8 Lock nut SW22, tightening torque $M_A = 10^{+5}$ Nm
9 Hexagon SW10
10 Hexagon SW30, tightening torque M_A = 50 Nm
11 Space required to remove the key
12 Locating pin
13 Valve mounting bores
14 Pressure gauge connection
15 Identical seal rings for ports P and T
16 Seal ring for port X
17 Setscrew is omitted with internal pilot oil return
18 Directional spool valve size 6, see data sheet 23178
19 Mating connector **without** circuitry (separate order, see page 19)
20 Mating connector **with** circuitry (separate order, see page 19)
21 Dimension for valve without manual override
22 Dimension for valve with manual override "N"
23 Dimension for valve with concealed manual override "N9"
24 Housing for version "W“
25 Space required to remove the mating connector
26 Valve contact surface; port A is not bored
27 Space required to remove the solenoid coil
28 Porting pattern according to ISO 6264-06-09-*-97
29 Porting pattern according to ISO 6264-08-13-*-97
30 Seal ring
31 Seal ring (omitted with version "Y")
32 Support ring (omitted with version "Y")
33 Seal ring
34 2 support rings
35 Bore for port X not available with version "Y"
36 Bore for port Y available with version "XY" and "Y"
37
- Bore X, Y and T optionally at the circumference for version "XY"
- Bore B optionally at the circumference for version "Y"

38 Depth of fit
39 Bore Ø 2.5 is only to be bored if necessary
40 Port X does not have to be bored for type-examination tested safety valves version "Y...E" as it does not have any function!

Ordering code: Type-examination tested safety valves type DB 20 K...E, component series 1X according to Pressure Equipment Directive 97/23/EC

Size	Type designation	Part marking	Maximum flow q_{Vmax} in l/min	Set response overpressure p in bar
25	DB 20 K [1] –1X/ [2] Y [3] E	TÜV.SV.[ ]–1001.14,4.F.G.p	70	30 ... 60
			100	61 ... 110
			150	111 ... 210
			200	211 ... 315
			300	316 ... 350

Adjustment type

1	Hand wheel (Pressure setting sealed, unloading or setting of a lower response pressure possible!)	**1**
	With sealed protective cap (no adjustment/unloading possible)	**2**
2	Pressure in the designation is to be entered by the customer, pressure setting ≥ 30 bar and possible in 5-bar steps.	**e. g. 150**
3	NBR seals	**no code**
	FKM seals	**V**
(grey)	Value entered ex factory	**1X**

Deviating technical data: Type-examination tested safety valves type DB 20 K...E, component series 1X according to Pressure Equipment Directive 97/23/EC [1)]

hydraulic				
Maximum back pressure	– Port Y		bar	0
	– Port T	"No code" version	bar	0
		"Y" version		10
Maximum flow				See preceding table
Hydraulic fluid				Mineral oil (HL, HLP) according to DIN 51524
Hydraulic fluid temperature range			°C	–20 ... +60 (NBR seals) –15 ... +60 (FKM seals)
Viscosity range			mm^2/s	12 ... 230

1) For applications outside these parameters, please consult us!

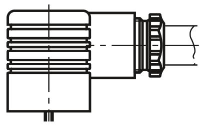
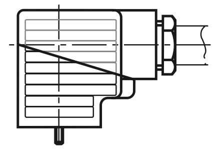
Safety instructions: Type-examination tested safety valves type DB 20 K...E, component series 1X according to Pressure Equipment Directive 97/23/EC

- Before ordering a type-examination tested safety valve, please observe that at the desired **response pressure *p***, the maximum admissible **flow** $q_{V\ max}$ (= numerical value at the position of letter "G" in the part identification) of the safety valve is higher than the maximum possible flow of the system/accumulator to be secured. In this, the corresponding regulations have to be observed!
- According to the **Pressure Equipment Directive 97/23/EC**, the increase in system pressure caused by the flow must not exceed 10 % of the set response pressure (see part identification).
- The maximum admissible flow $q_{V\ max}$ specified in the part identification must not be exceeded.
- Discharge lines of safety valves must end in a non-dangerous manner. The accumulation of fluids in the discharge lines must **not** be possible (see AD2000 - data sheet A2).

☞ **It is imperative to observe the application notes!**

- In the plant, the response pressure specified in the part identification is set with a flow of 2 l/min.
- The maximum admissible flow specified in the part identification applies to:
  - External pilot oil return **"Y"** without back pressure in the pilot oil return line:
    Admissible back pressure in the discharge line (port T) < 10 bar.
- By removing a lead seal at the safety valve, the approval according to the Pressure Equipment Directive becomes void
- Mounting cavities (see page 14 and 15)
- Basically, the requirements of the pressure equipment directives and of data sheet AD2000 A2 have to be observed!

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006				
	Material no.			
Color	Without circuitry	With indicator light 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Zener diode suppression circuit 24 V
Gray	**R901017010**	**–**	**–**	**–**
Black	**R901017011**	**R901017022**	**R901017025**	**R901017026**

General notes

- The unloading function (directional valve function with version "W") must not be used for safety functions!
- With version **"B"**, the lowest adjustable pressure (circulation pressure) is set in case of power failure or cable break. With version **"A"**, the pressure relief function is set in case of power failure or cable break.
- Hydraulic backpressures in port T with internal pilot oil return and/or port Y with external pilot oil return add 1:1 to the response pressure of the valve set at the pilot control.

Example:
Pressure setting of the valve due to spring pretensioning (item 7 on page 5) in the pilot control valve/adjustment type $\boldsymbol{p}_{\text{spring}}$ **= 200 bar**

Hydraulic backpressure in port T with internal pilot oil return $\boldsymbol{p}_{\text{hydraulic}}$ **= 50 bar**

=> Response pressure = $\boldsymbol{p}_{\text{spring}}$ **+** $\boldsymbol{p}_{\text{hydraulic}}$ **= 250 bar**

More information

▶ Directional spool valve	Data sheet 23178
▶ Subplates	Data sheet 45064
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ General product information on hydraulic products	Data sheet 07008
▶ Assembly, commissioning and maintenance of industrial valves	Data sheet 07003
▶ Selection of the filters	www.boschrexroth.com/filter

Notes

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Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

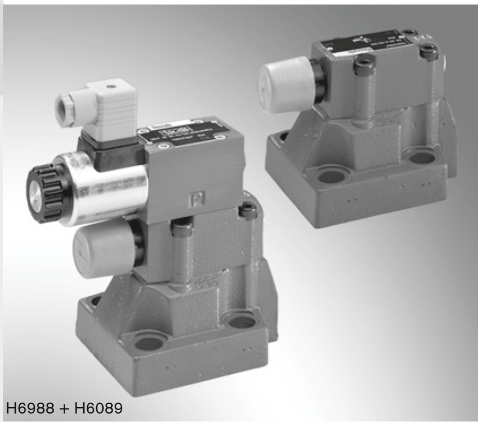
Rexroth
Bosch Group

Pressure relief valve, pilot operated

RE 25802/10.05
Replaces: 03.03
1/20

Types DB and DBW

Sizes 10 to 32
Component series 5X
Maximum operating pressure 350 bar
Maximum flow 650 l/min



H6988 + H6089

Table of contents

Contents	Page

Information on available spare parts:
www.boschrexroth.com/spc

Features

– For subplate mounting:
  Porting pattern to ISO 6264-AR-06-2-A (size 10),
  ISO 6264-AS-08-2-A (size 25),
  ISO 6264-AT-10-2–A (size 32)
– For threaded connection
– For installation into manifolds
– 4 adjustment elements for pressure setting, optional:
  • Rotary knob
  • Sleeve with hexagon and protective cap
  • Lockable rotary knob with scale
  • Rotary knob with scale
– 5 pressure stages
– Solenoid operated unloading via built-on directional spool valve or directional poppet valve
– Heavy duty solenoid
– Explosion-protected solenoid (on enquiry)
– Switching shock damping, optional (only type DBW)

– Further information:

High-performance directional valves	RE 23178 and RE 22058
Subplates	RE 45064

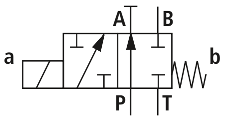
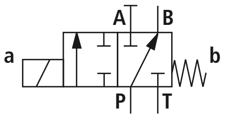
Ordering code

DB							5X /	

Without directional valve = **No code**
With built-on directional valve = **W**

Pilot operated valve (complete) = **No code**
Pilot valve **without** main spool insert (do **not** enter size) = **C**
Pilot valve **with** main spool insert (enter valve size 10 or 30) = **C**
Pilot valve **without** main spool insert for subplate mounting (do **not** enter size) = **T** 1)

	Ordering code	
Size	**Subplate mounting "No code"**	**Threaded connection "G"**
10	**= 10**	**= 10** (G1/2)
16		**= 15** (G3/4)
25	**= 20**	**= 20** (G1)
25		**= 25** (G1 1/4)
32	**= 30**	**= 30** (G1 1/2)

	Normally closed	**= A** 2)
	Normally open	**= B** 2)

For subplate mounting and installation into manifolds = **No code**
For threaded connection = **G**

Adjustment element for pressure adjustment
Rotary knob = **1**
Sleeve with hexagon and protective cap = **2**
Lockable rotary knob with scale = **3** 3)
Rotary knob with scale = **7**

With main spool Ø24 mm (all sizes) = **–**
With main spool Ø28 mm (only for size 32) = **N**

Component series 50 to 59 (50 to 59: unchanged installation and connection dimensions) = **5X**

Pressure setting up to 50 bar = **50**
Pressure setting up to 100 bar = **100**
Pressure setting up to 200 bar = **200**
Pressure setting up to 315 bar = **315**
Pressure setting up to 350 bar = **350**

1) DBT/DBWT corresponds to DBC/DBWC, but with plugged central bore

2) Ordering code required only for version with built-on directional valve (DBW).

3) H-key with material no. **R900008158** is included in the scope of supply.

4) Data sheet RE 23178 (directional spool valve) or RE 22058 (directional poppet valve)

5) Cable sockets, separate order, see page 3.

6) Ordering code required only for version with built-on directional valve and switching shock damping feature (DBW…/…S…).

7) Possible only up to pressure stage 315 bar

8) Hyphen "–" required only for version with built-on directional valve (DBW), without indication of "U" or "S".

9) **Not** for version DBC/DBWC

For ordering code for type-tested safety valves, see page 15.

										*

Further details in clear text

Type testing
No code = Without type testing
E = Type-tested safety valve according to PED 97/23/EC

Seal material
No code = NBR seals
V = FKM seals
(other seals on enquiry)
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

R12 [6] **=** Orifice Ø 1.2 mm in channel B of the directional valve

Electrical connection
K4 [2; 5] **=** Without cable socket
Individual connection with component plug to DIN EN 175301-803

N9 [2] **=** **With** concealed manual override (standard)
N [2] **=** **With** manual override
No code = **Without** manual override

G24 [2] **=** 24 V DC
W230 [2] **=** AC voltage 230 V 50/60 Hz

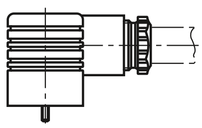
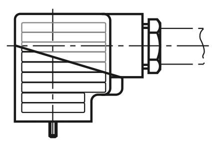
No code = **Without** directional valve
6E [2] **=** **With** directional spool valve (high-performance valve [4]) – up to 350 bar set pressure
6SM [2] **=** **with** directional poppet valve (high-performance valve [4]) – up to 350 bar set pressure

No code = **Without** switching shock damping feature
S = **With** switching shock damping feature (only with version DBW)

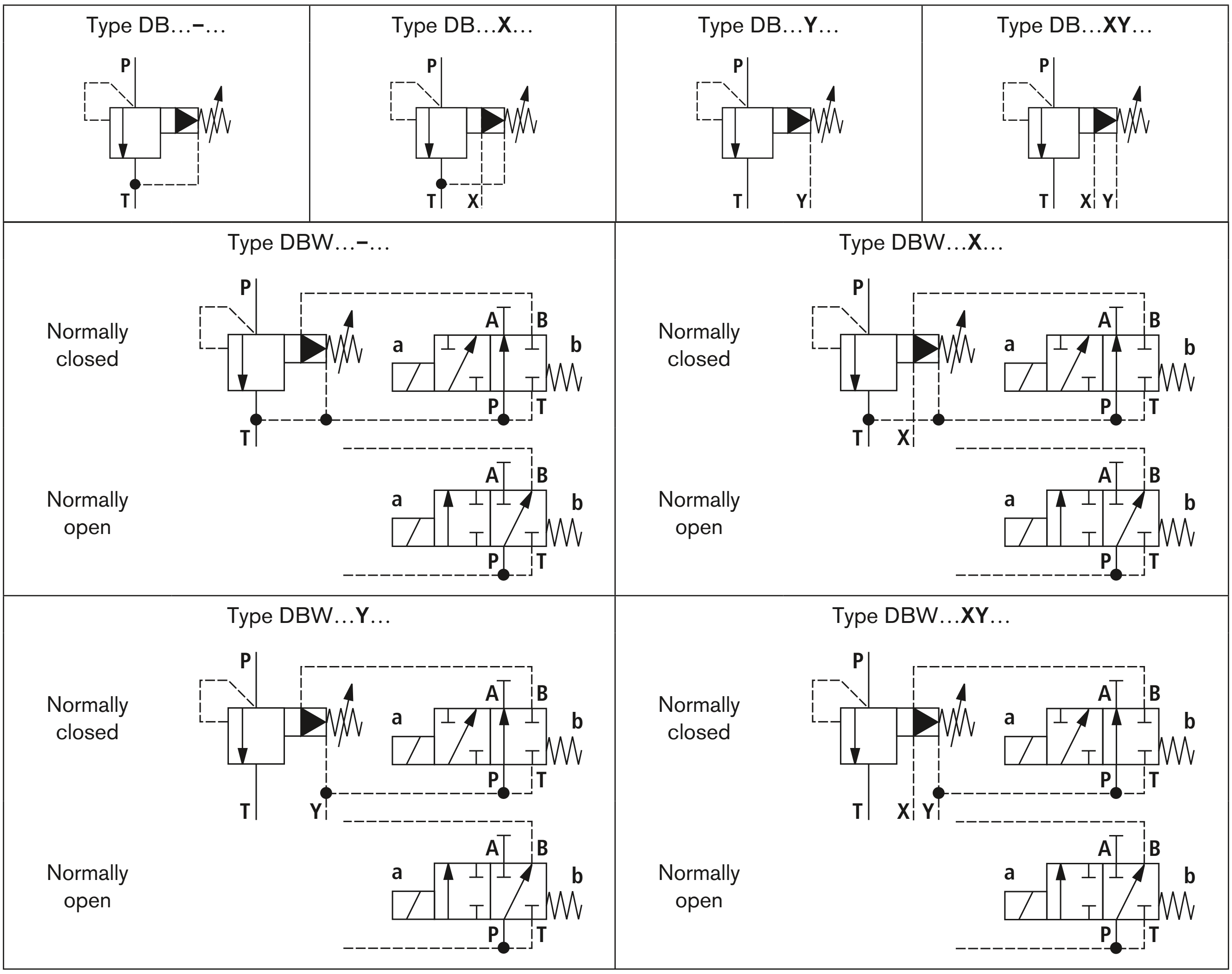
No code = Standard version
U [7] **=** Valve for minimum cracking pressure
(not for version without main spool insert and not suitable for cross-relief function!)

Pilot oil supply and pilot oil drain (see also symbols on page 4)
– [8] **=** Pilot oil supply and pilot oil drain internal
X = Pilot oil supply external, pilot oil drain internal [9]
Y = Pilot oil supply internal, pilot oil drain external
XY = Pilot oil supply and pilot oil drain external [9]

Cable sockets to DIN EN 175301-803

For details and further cable sockets, see RE 08006				
	Material no.			
Colour	Without circuitry	With indicator lamp 12 … 240 V	With rectifier 12 … 240 V	With indicator lamp and Zener-diode suppressor circuit 24 V
Grey	**R901017010**	–	–	–
Black	**R901017011**	**R901017022**	**R901017025**	**R901017026**

Symbols



Standard types

Type	Material number
DB 10-2-5X/50	R900590645
DB 10-2-5X/100	R900590646
DB 10-2-5X/200	R900587772
DB 10-2-5X/315	R900590334
DB 10-2-5X/350	R900597992
DB 20 -2-5X/50	R900597212
DB 20 -2-5X/100	R900589433
DB 20 -2-5X/200	R900590768
DB 20 -2-5X/315	R900593530
DB 20 -2-5X/350	R900590618
DB 20 G2-5X/50	R900590328
DB 20 G2-5X/200	R900597307
DB 20 G2-5X/315	R900597747
DB 20 G2-5X/350	R900599232

Type	Material number
DB 30-2-5X/50	R900593564
DB 30-2-5X/100	R900594677
DB 30-2-5X/200	R900588131
DB 30-2-5X/315	R900591128
DB 30-2-5X/350	R900504902
DB 30 G2-5X/50	R900598338
DB 30 G2-5X/100	R900502598
DB 30 G2-5X/200	R900500719
DB 30 G2-5X/315	R900594426
DB 30 G2-5X/350	R900535222

Further standard types and components can be found in the EPS (standard price list).

General notes

– The unloading function (directional valve function on DBW) must not be used for safety-related functions!

– Type DBW..**B**..5X/... changes to the lowest settable pressure (circulation pressure) in the event of a power failure or cable break.
  Type DBW..**A**..5X/... changes over to the pressure limitation function in the event of a power failure or cable break.

– In the case of internal pilot oil drain, hydraulic backpressures in port T, or, in the case of external pilot oil drain, hydraulic backpressures in port Y, fully add to the response pressure of the valve set on the pilot control.

Example:

Pressure setting of the valve by spring-pretensioning (item 12 on page 5) in the pilot valve/adjustment unit **p_{spring} = 200 bar**

Hydraulic backpressure in port T with internal pilot oil drain **$p_{hydraulic}$ = 50 bar**

=> Response pressure = p_{spring} + $p_{hydraulic}$ = **250 bar**

Function, section: Type DB…

General

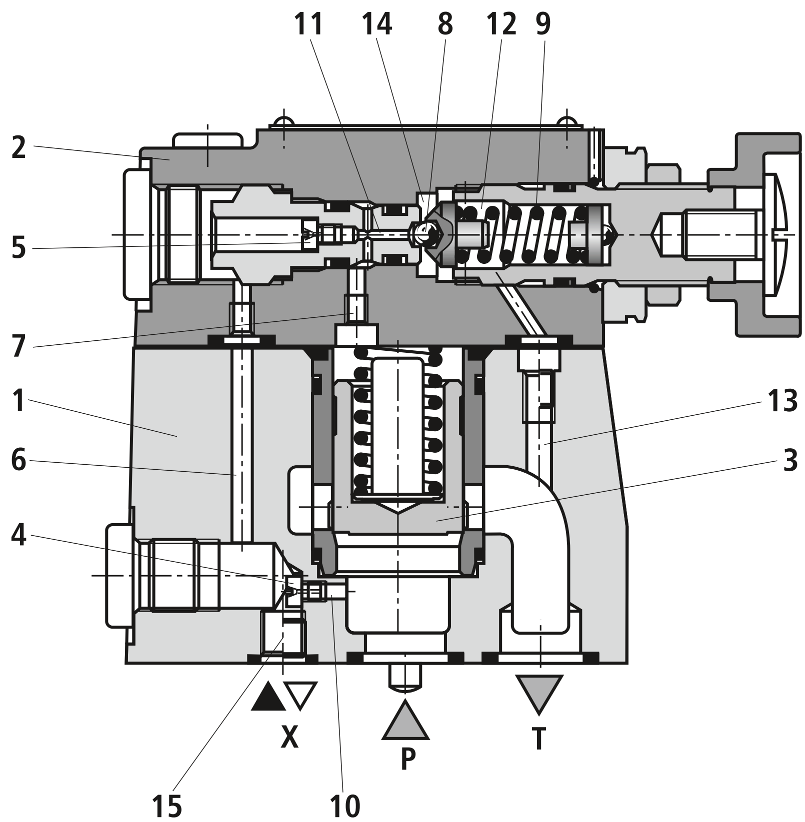
Pressure control valves of types DB and DBW are pilot operated pressure relief valves. They are used for the limitation (DB) or limitation and solenoid operated unloading (DBW) of the operating pressure.

Pressure relief valves (DB) basically consist of main valve (1) with main spool insert (3) and pilot valve (2) with pressure adjustment element.

Pressure relief valve type DB

The pressure present in channel P acts on main spool (3). At the same time, the pressure is applied via pilot lines (6) and (7) that are provided with orifices (4) and (5) to the spring-loaded side of main spool (3) and to ball (8) in pilot valve (2). When the pressure in channel P rises to a value above that set on spring (9), ball (8) opens against spring (9). The signal for this process is provided internally via pilot lines (10) and (6) from channel P. The hydraulic fluid on the spring-loaded side of main spool (3) can now flow via pilot line (7), orifice bore (11) and ball (8) into spring chamber (12). From here, it is fed internally via pilot line (13) in the case of type DB…–, or externally via pilot line (14) in the case of type DB…Y, back to the tank. Orifices (4) and (5) generate a pressure differential across main spool (3), and the connection from channel P to channel T opens. The hydraulic fluid now flows from channel P to channel T while the set operating pressure is maintained.

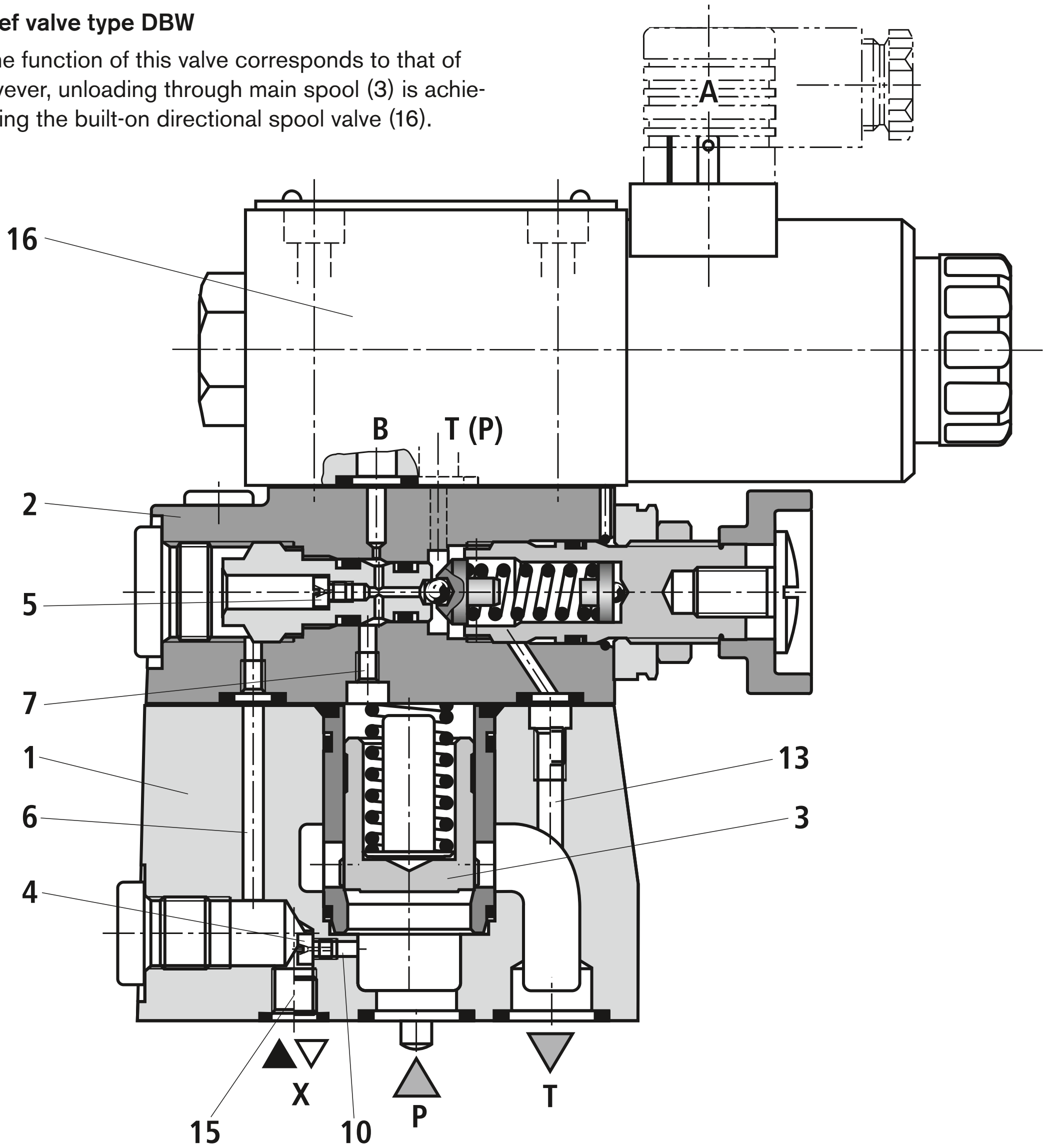
The pressure relief valve can be unloaded or changed over to another pressure (second pressure stage) via port "X" (15).



Function, section: Type DBW…

Pressure relief valve type DBW

In principle, the function of this valve corresponds to that of type DB. However, unloading through main spool (3) is achieved by operating the built-on directional spool valve (16).



Pressure relief valve with switching shock damping (sandwich plate), type DBW…/..S6...R12

When a switching shock damping valve (17) is used, the connection from B2 to B2 opens with a delay, which prevents pressure peaks and acoustic unloading shocks in the return line. The valve is installed between pilot valve (2) and directional valve (16).

The degree of damping (unloading shock) is determined by the size of orifice (18). We recommend orifice Ø1.2 mm (ordering code ..R12..).

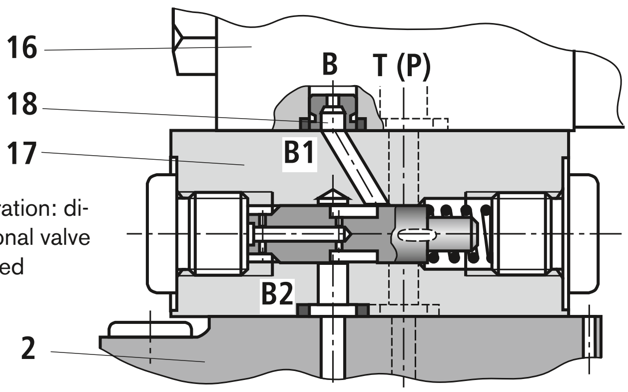
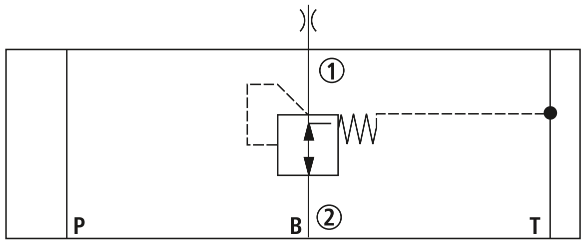


Illustration: directional valve opened



Technical data (for applications outside these parameters, please consult us!)

General

Sizes				Size 10	Size 16 DB.. **15**	Size 25 DB.. **20**	Size 25 DB.. **25**	Size 32
Weight	Subplate mounting	– DB…	kg	2.6	–	3.5	–	4.4
		– DBW…	kg	4.05	–	4.95	–	5.85
		– DBC…	kg	1.2				
		– DBWC…	kg	2.65				
		– DBC 10 or 30 …	kg	1.5				
		– DBWC 10 or 30 …	kg	2.95				
	Threaded connection	– DB…G	kg	5.3	5.2	5.1	5.0	4.8
		– DBW…G	kg	6.75	6.65	6.55	6.45	6.25
Installation orientation				Optional				
Ambient temperature range		– DB…	°C	–30 to +80 (NBR seals) –15 to +80 (FKM seals)				
		– DBW…	°C	–30 to +50 (NBR seals) –15 to +50 (FKM seals)				
Minimum strength of housing materials (for subplate-mounted and DBC../DBWC.. valves)				Select the housing materials so that sufficient safety is ensured under all operating conditions (e.g. with regard to compressive strength, thread stripping strength and tightening torques).				

Hydraulic

Maximum operating pressure	– Ports P, X	bar	350				
	– Port T	bar	315				
Maximum backpressure	– Port Y (DB)	bar	315				
	– Ports Y, T (DBW)	bar	210 with DC solenoid 160 with AC solenoid				
Maximum set pressure		bar	50; 100; 200; 315; 350				
Minimum set pressure			Depends on flow (see characteristic curves on page 8)				
Maximum flow	– Subplate mounting	l/min	250	–	500	–	650
	– Threaded connection	l/min	250	500	500	500	650
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on enquiry				
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –15 to +80 (FKM seals)				
Viscosity range		mm^2/s	10 to 800				
Max. permissible degreee of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Klasse 20/18/15 [3]				

For the technical data for directional poppet valve, see RE 22058, for the directional spool valve, RE 23178

For deviating technical data for type-tested safety valves, see page 16

[1] Suitable for NBR and FKM seals

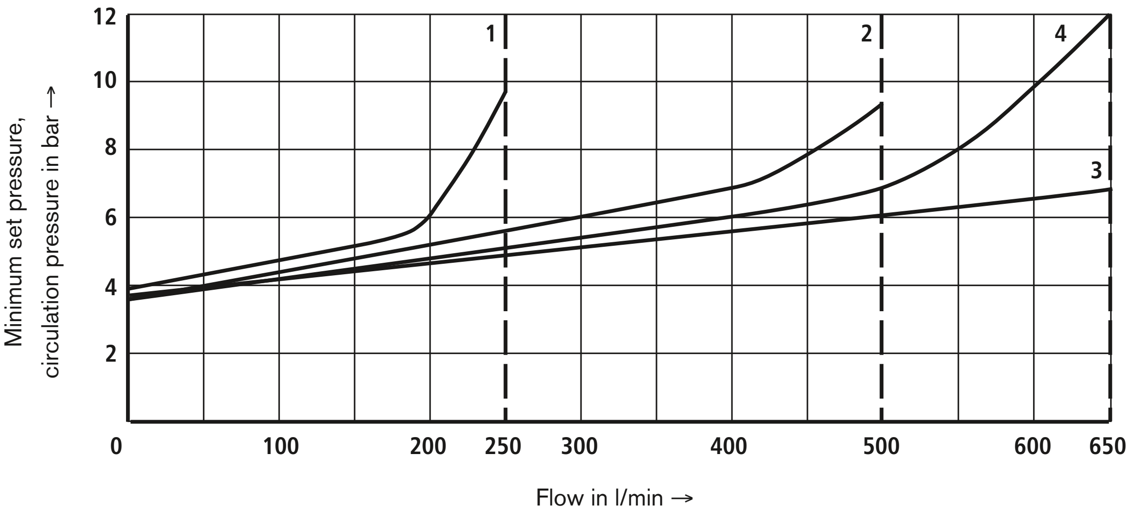
[2] Suitable only for FKM seals

[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

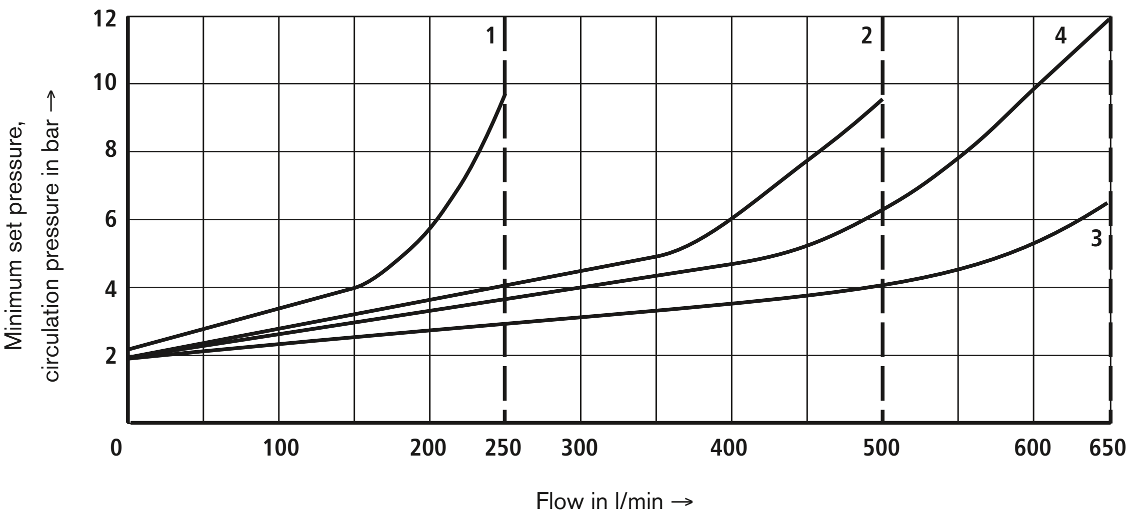
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Minimum set pressure and circulation pressure in dependence upon the flow [1)]
Standard version



1 Size 10
2 Size 25
3 Size 32 (N)
4 DBC 30
DBWC 30

Minimum set pressure and circulation pressure in dependence upon the flow [1)]
Version “U“



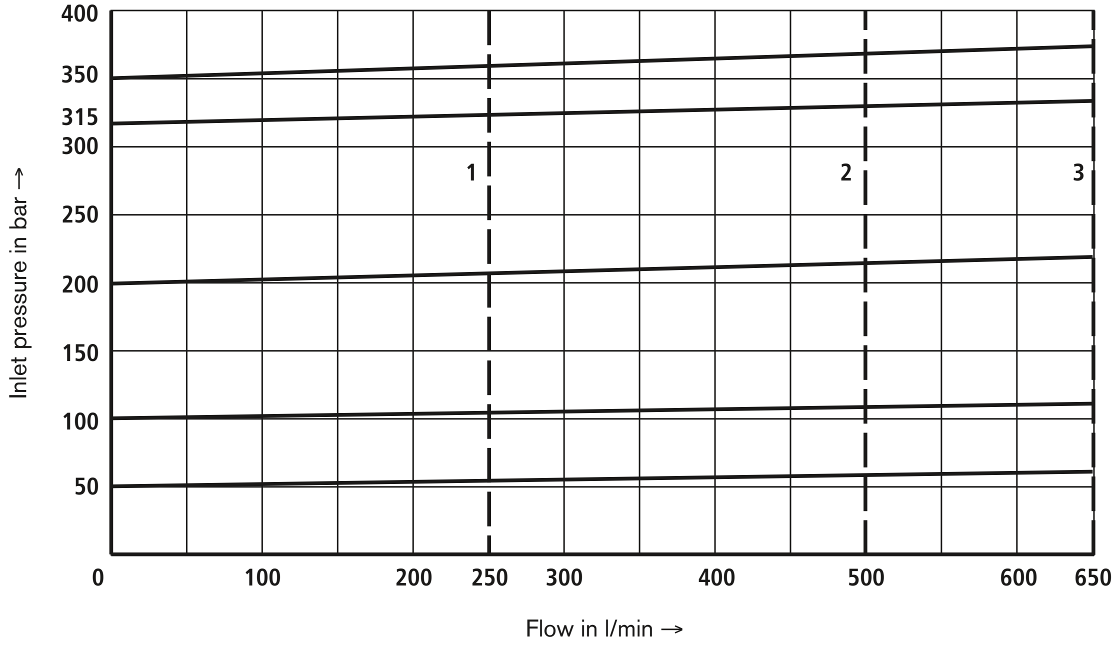
1 Size 10
2 Size 25
3 Size 32 (N)
4 DBC 30
DBWC 30

☞ **Note!**
The characteristic curves were measured with **external, pressureless pilot oil drain**.
In the case of internal pilot oil drain, the inlet pressure increases by the outlet pressure present in port T.

[1)] The characteristic curves are valid for an outlet pressure of $p_T = 0$ over the entire flow range!

Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Inlet pressure in dependence upon the flow

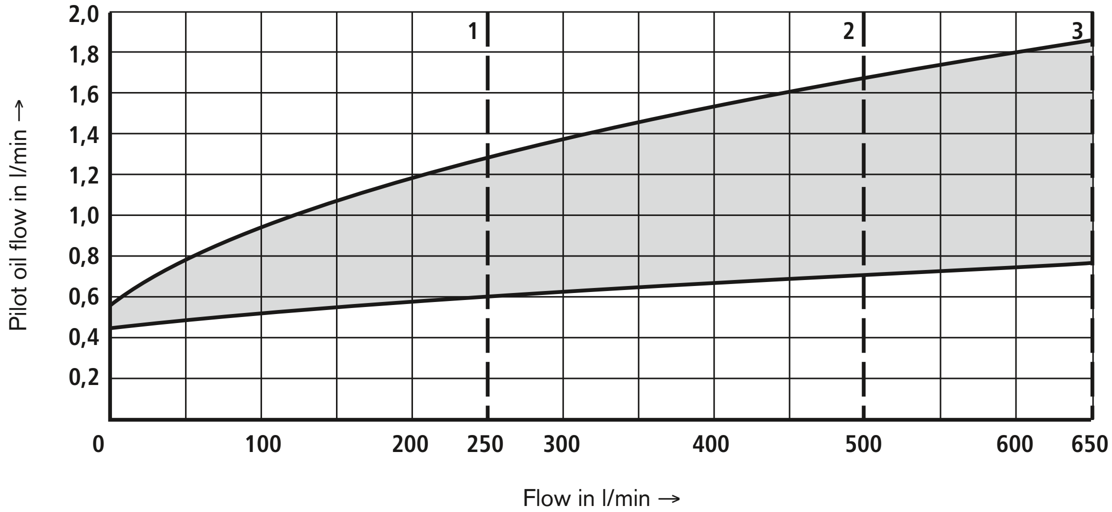


1 Size 10
2 Size 25
3 Size 32

☞ **Note!**
The characteristic curves were measured with **external, pressureless pilot oil drain**.
In the case of internal pilot oil drain, the inlet pressure increases by the outlet pressure present in port T.

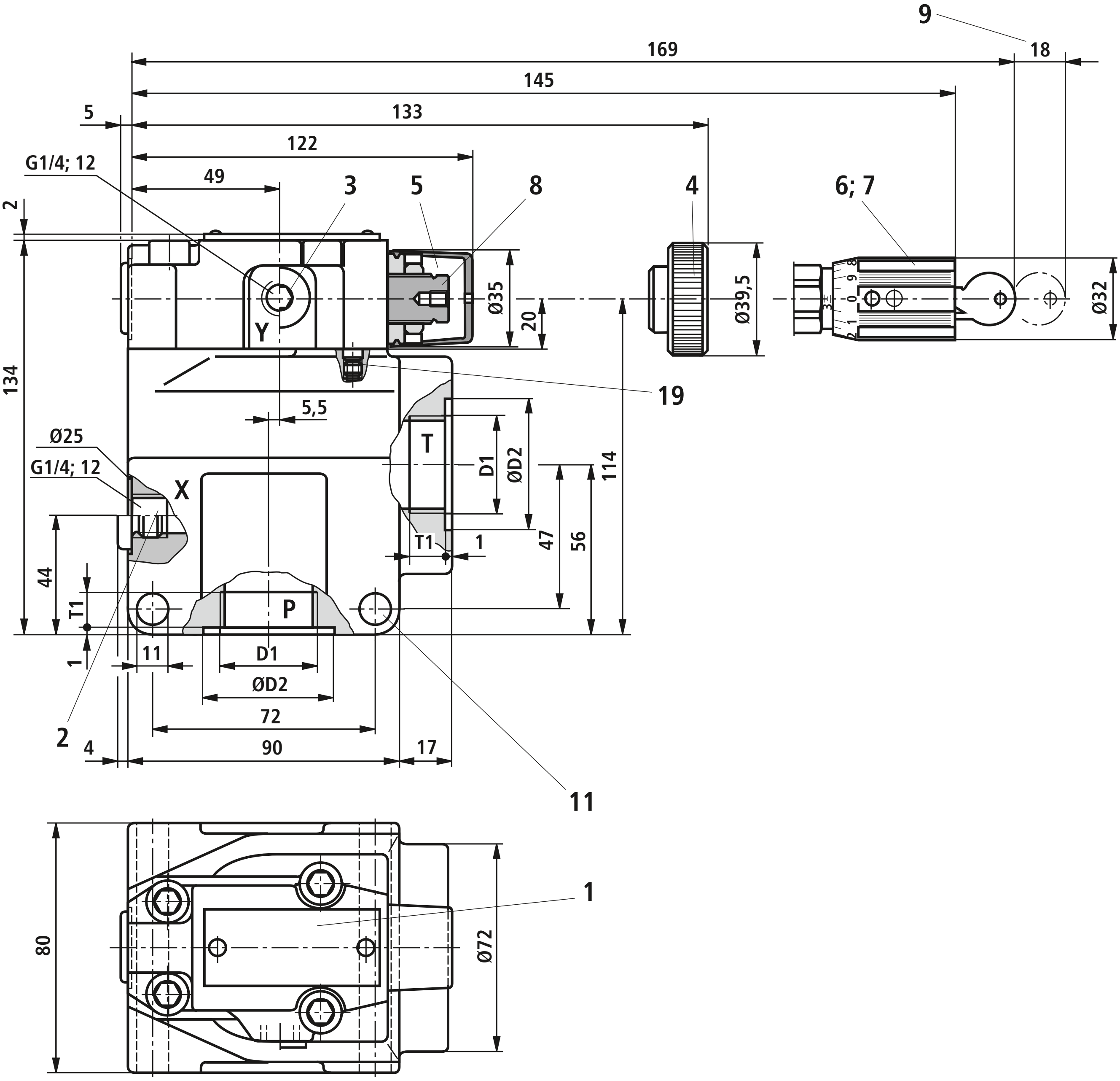
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Pilot oil flow



1 Size 10
2 Size 25
3 Size 32

Unit dimensions: Threaded connection (nominal dimensions in mm)

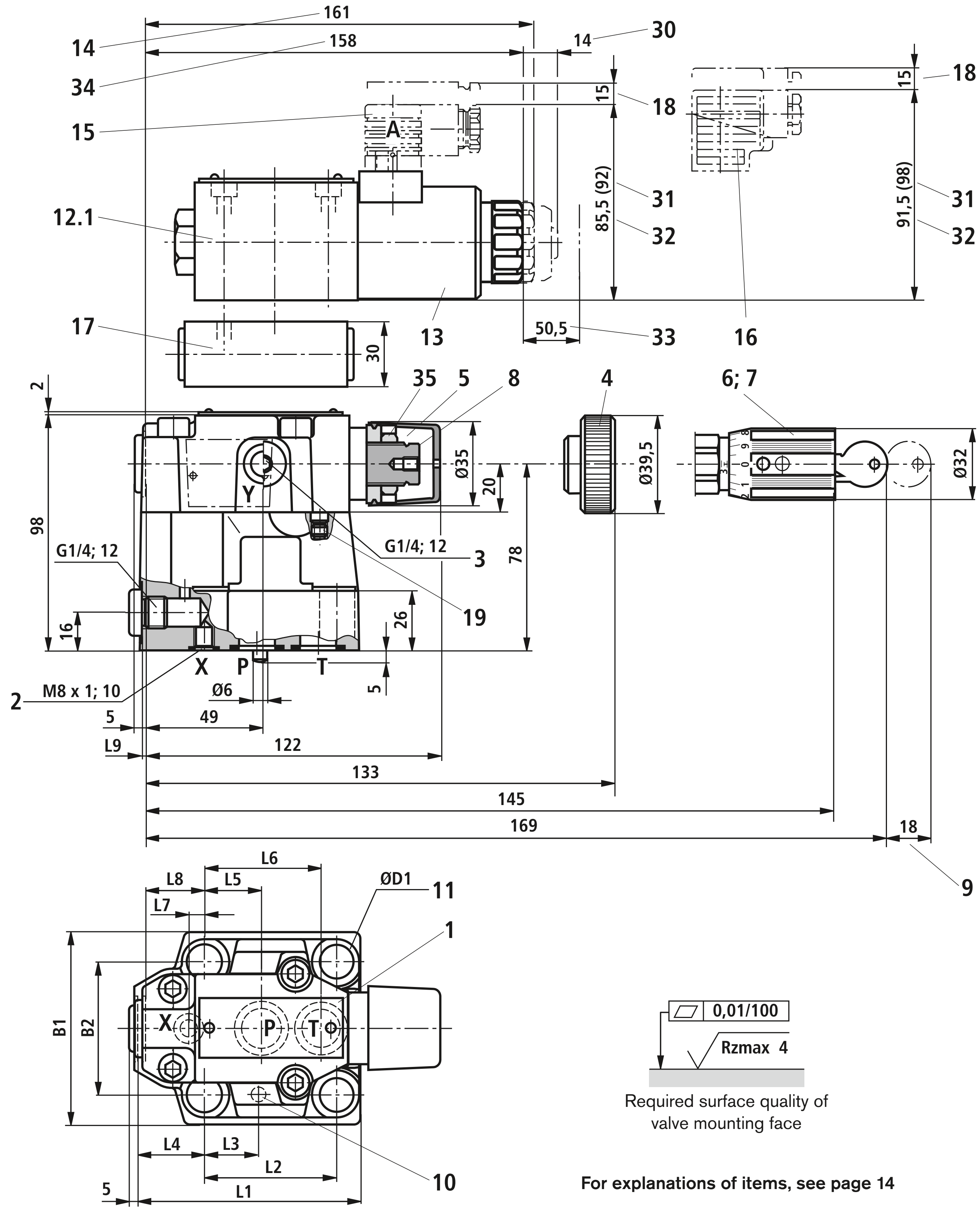


For the dimensions of the built-on directional valve, see pages 11 and 12

For explanations of items, see page 14

Type	D1	ØD2	T1
DB 10 G	G1/2	34	14
DB 15 G	G3/4	42	16
DB 20 G	G1	47	18
DB 25 G	G1 1/4	58	20
DB 30 G	G1 1/2	65	22

Unit dimensions: Subplate mounting with directional spool valve (nominal dimensions in mm)

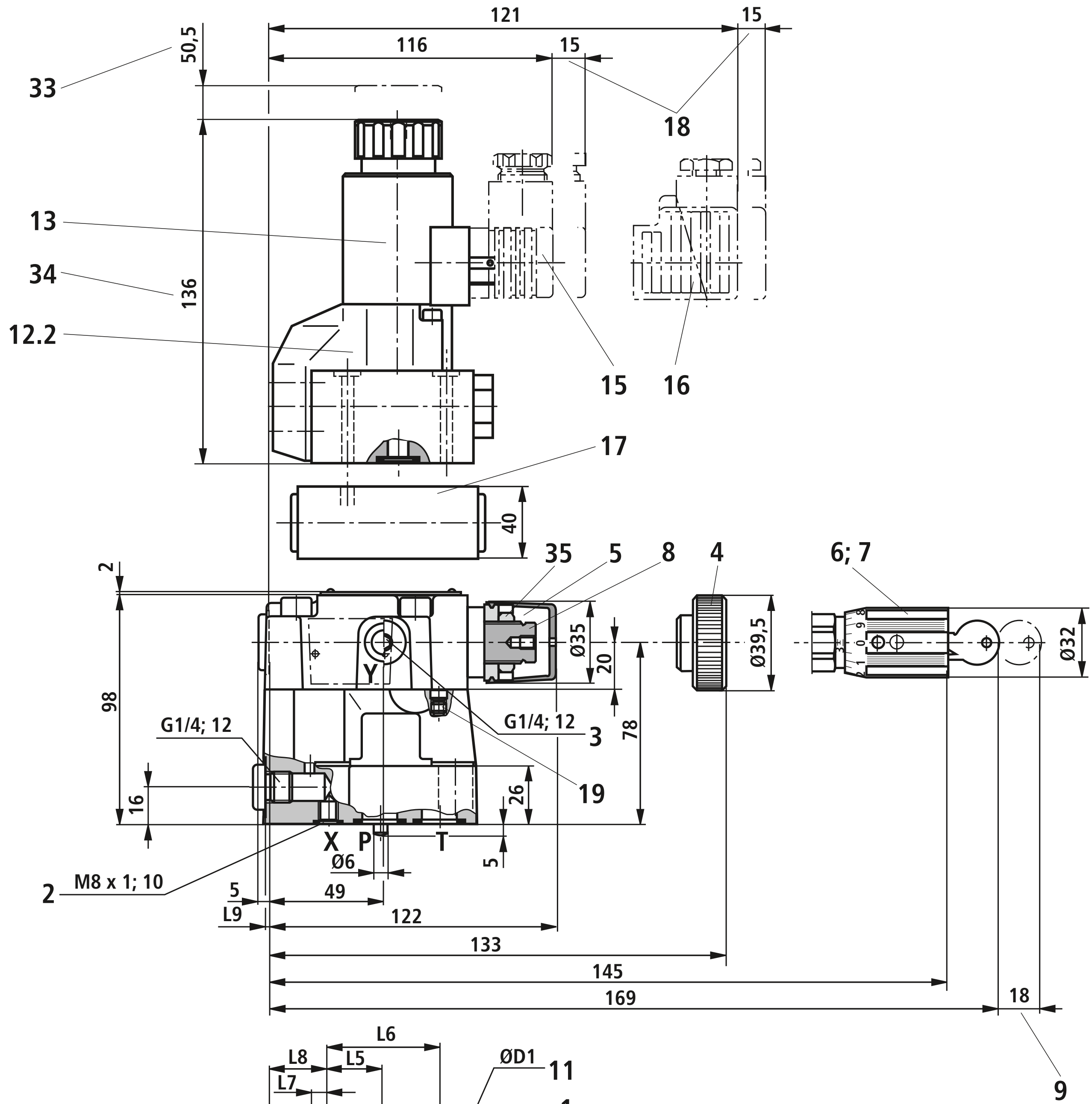


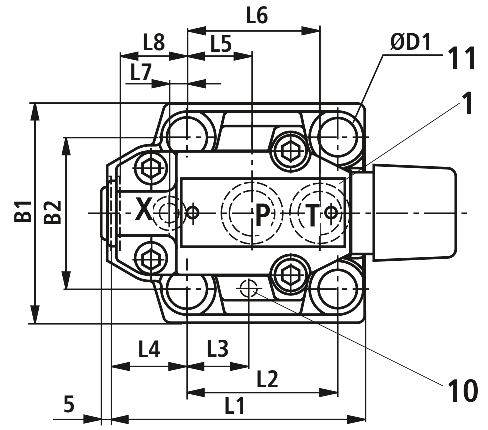
Required surface quality of valve mounting face

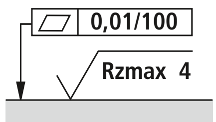
For explanations of items, see page 14

Type	L1	L2	L3	L4	L5	L6	L7	L8	L9	B1	B2	ØD1
DB. 10	91	53.8	22.1	27.5	22.1	47.5	0	25.5	2	78	53.8	14
DB. 20	116	66.7	33.4	33.3	11.1	55.6	23.8	22.8	10.5	100	70	18
DB. 30	147.5	88.9	44.5	41	12.7	76.2	31.8	20	21	115	82.6	20

Unit dimensions: Subplate mounting with directional poppet valve (nominal dimensions in mm)





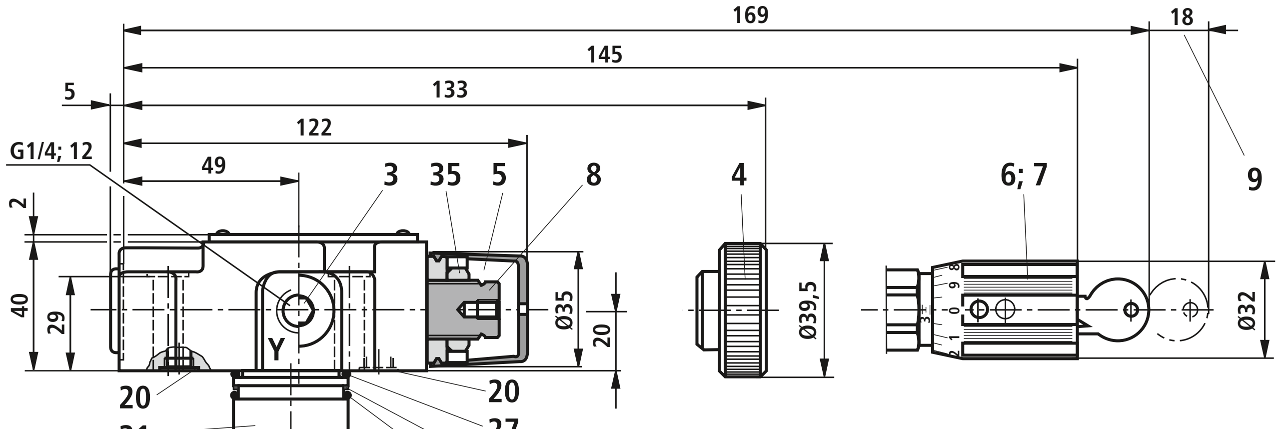


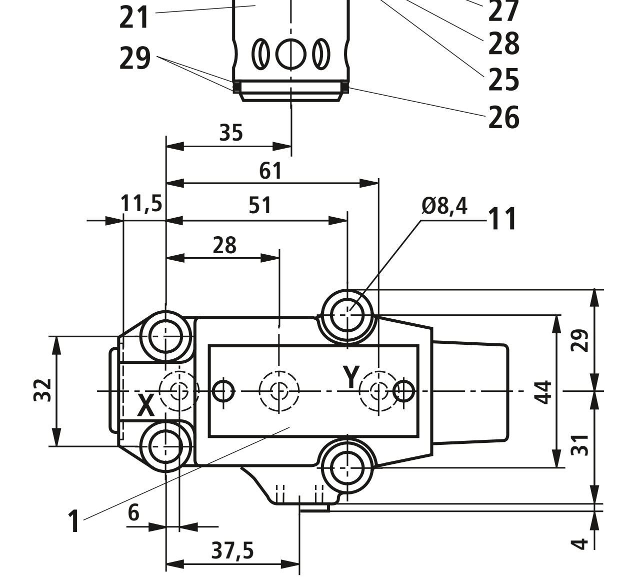
Required surface quality of valve mounting face

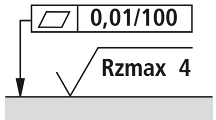
For explanations of items, see page 14

Type	L1	L2	L3	L4	L5	L6	L7	L8	L9	B1	B2	ØD1
DB. 10	91	53.8	22.1	27.5	22.1	47.5	0	25.5	2	78	53.8	14
DB. 20	116	66.7	33.4	33.3	11.1	55.6	23.8	22.8	10.5	100	70	18
DB. 30	147.5	88.9	44.5	41	12.7	76.2	31.8	20	21	115	82.6	20

Unit dimensions: Pilot valve with (DBC 10 or 30) or without (DBC, DBT) main spool insert (nominal dimensions in mm)



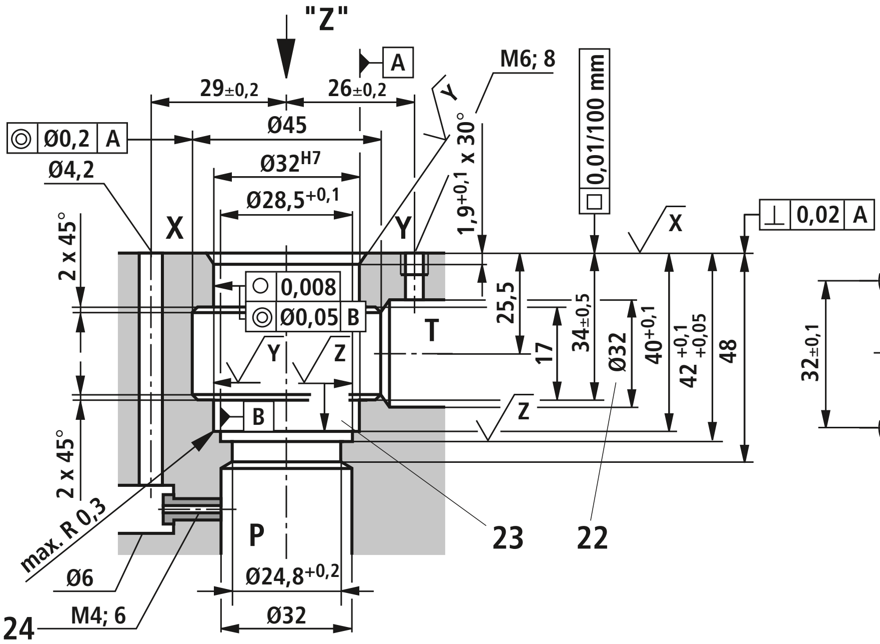


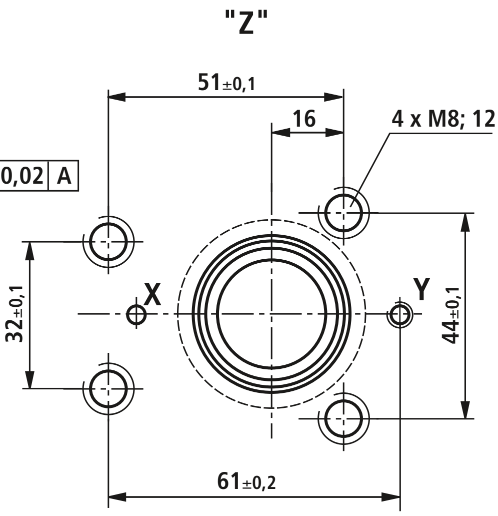


Required surface quality of valve mounting face

For dimensions of the built-on directional valve, see pages 11 and 12

For explanations of items, see page 14





$\sqrt{X}$ = $\sqrt{\text{Rzmax 4}}$ $\sqrt{Y}$ = $\sqrt{\text{Rzmax 8}}$ $\sqrt{Z}$ = $\sqrt{\text{Rz 16}}$

Unit dimensions: Explanations of items

1 Nameplate
2 Port X for external pilot oil supply
3 Port Y for external pilot oil drain
4 Adjustment element “1”
5 Adjustment element “2”
6 Adjustment element “3”
7 Adjustment element “7”
8 Hexagon A/F 10
9 Space required to remove key
10 Locating pin
11 Valve fixing bore
12.1 Directional spool valve size 6, see RE 23178
12.2 Directional poppet valve size 6, see RE 22058
13 Solenoid "a"
14 Dimension for valve without manual override
15 Cable socket **without** circuitry (separate order, see page 3)
16 Cable socket **with** circuitry (separate order, see page 3)
17 Switching shock damping valve, optional
18 Space required to remove cable socket
19 Not provided in the case of internal pilot oil drain
20 Seal ring
21 Main spool insert
22 Bore Ø32 can intersect Ø45 at any point. However, care must be taken that connection bore X and the fixing bore are not damaged!
23 The back-up ring and the seal ring must be inserted into this bore prior to the installation of the main spool.
24 Orifice (separate order)
25 Seal ring
26 Seal ring
27 Seal ring
28 Back-up ring
29 Back-up ring
30 Dimension for valve with manual override “N“
31 Dimension ( ) for valve with AC solenoid
32 Dimension for valve with DC solenoid
33 Space required to remove solenoid coil
34 Dimension for valve with concealed manual override “N9“
35 Locknut A/F 17, tightening torque $M_T = 10^{+5}$ Nm

Subplates to data sheet RE 45064 (separate order) [1)]

– Type DB/DBW 10	G 545/01	(G3/8)
	G 546/01	(G1/2)
– Type DB/DBW 20	G 408/01	(G3/4)
	G 409/01	(G1)
– Type DB/DBW 30	G 410/01	(G1 1/4)
	G 411/01	(G1 1/2)
– Type DBT/DBWT	G 51/01	(G1/4)

[1)] ⚠ **Caution!**

The subplates mentioned above are **not** approved for use with type-tested safety valves according to Pressure Equipment Directive 97/23/EC.

Valve fixing screws (separate order)

For strength reasons, only the following valve fixing screws may be used:

– Type DB/DBW 10
4 off ISO 4762 - M12 x 50 - 10.9-flZn-240h-L
at friction coefficient $\mu_{total} = 0.09$ to 0.14,
tightening torque $M_T = 75$ Nm ± 10%,
material no. **R913000283**

– Type DB/DBW 20
4 off ISO 4762 - M16 x 50 - 10.9-flZn-240h-L
at friction coefficient $\mu_{total} = 0.09$ to 0.14,
tightening torque $M_T = 185$ Nm ± 10%,
material no. **R913000378**

– Type DB/DBW 30
4 off ISO 4762 - M18 x 50 - 10.9-flZn-240h-L
at friction coefficient $\mu_{total} = 0.09$ to 0.14,
tightening torque $M_T = 248$ Nm ± 10%,
material no. **R900002245**

– Type DBC/DBWC,
type DBC 10/DBWC 10 and type DBC 30/DBWC 30
4 off ISO 4762 - M8 x 40 - 10.9-flZn-240h-L
at friction coefficient $\mu_{total} = 0.09$ to 0.14,
tightening torque $M_T = 31$ Nm ± 10%,
material no. **R913000205**

– Type DBT/DBWT
4 off ISO 4762 - M8 x 40 - 10.9-flZn-240h-L
at friction coefficient $\mu_{total} = 0.09$ to 0.14,
tightening torque $M_T = 31$ Nm ± 10%,
material no. **R913000205**

The tightening torques given are guidelines when screws with the specified friction coefficients and a torque wrench (tolerance ±10%) are used.

Ordering code: Type-tested safety valves of type DB(W)…E, component series 5X according to Pressure Equipment Directive 97/23/EC

Size	Designation	Component identification	Max. permissible flow $q_{V\ max}$ in l/min with pilot oil drain external "Y"	internal "–"	Set response pressure *p* in bar
10	DB 10 [2] [3] –5X/ [4] [5] [6] E	TÜV.SV. [ ] – 851.12.F.G.p	170	130	30 to 60
			230	200	61 to 110
	DBW 10 [1] [2] [3] –5X/ [4] [5] 6 [*] [6] E		230	200	111 to 210
			230	200	211 to 350
25	DB 20 [2] [3] –5X/ [4] [5] [6] E	TÜV.SV. [ ] – 852.22.F.G.p	250	180	30 to 60
			270	210	61 to 110
	DBW 20 [1] [2] [3] –5X/ [4] [5] 6 [*] [6] E		420	320	111 to 210
			450	400	211 to 350
32	DB 30 [2] [3] N5X/ [4] [5] [6] E	TÜV.SV. [ ] – 853.22.F.G.p	600	225	30 to 60
			600	340	61 to 110
	DBW 30 [1] [2] [3] N5X/ [4] [5] 6 [*] [6] E		650	540	111 to 210
			700	580	211 to 350

1	Directional valve, normally closed	**= A**
	Directional valve, normally open	**= B**
2	For subplate mounting	**= No code**
	For threaded connection	**= G**
3	Adjustment element, hand wheel (pressure setting sealed, unloading or setting of a lower response pressure possible)	**= 1**
	Adjustment element with sealed protective cap (adjustment/unloading impossible)	**= 2**
4	Pressure in the designation to be entered by customer, e.g. pressure setting ≥ 30 bar and in 5-bar increments possible	**= 150**
5	Pilot oil supply and drain internal	**= –** [1; 2]
	Recommendation: Pilot oil supply internal, pilot oil drain external	**= Y** [2]
*	Ordering code of electrical data (see page 3) e.g	**= EG24N9K4**
6	NBR seals	**= No code**
	FKM seals	**= V**
[ ]	Data entered in the factory	

[1] Hyphen "–" required **only** for version with built-on directional valve (DBW)

[2] Pilot oil supply external "X" impossible!

Deviating technical data: Type-tested safety valves of type DB(W)…E, component series 5X according to Pressure Equipment Directive 97/23/EC [1)]

Hydraulic

			DB../..	DB../..Y	DBW../..	DBW../..Y
Maximum backpressure						
	Port Y	bar	–	0	–	0
	Port T	bar	[2)]	$p_T < 15$	[2)]	$p_T < 15$
Maximum flow			See table on page 15 and characteristic curves on pages 17 and 18			
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524 and DIN 51524-1			
Hydraulic fluid temperature range		°C	–20 to +60 (NBR seals) –15 to +60 (FKM seals)			
Viscosity range		mm^2/s	12 to 230			

[1)] For applications outside these parameters, please consult us!

[2)] See characteristic curves and explanations for max. permissible backpressures on pages 17 and 18

Safety notes: Type-tested safety valves of type DB(W)…E, component series 5X according to Pressure Equipment Directive 97/23/EC

- Before ordering a type-tested valve, make sure that at the desired **response pressure *p*** the max. permissible **flow** $q_{V\,max}$ of the safety valve is greater than the max. possible flow of the system / accumulator to be protected.
  Observe relevant regulations!
- **According to PED 97/23/EC** the increase in the system pressure caused by the flow must not be greater than 10% of the set response pressure (see component identification).
- Return lines (ports T and Y) of safety valves must provide a safe outlet. **No** fluid is allowed to collect in the return lines.
- When a seal is removed from the safety valve, the approval according to the PED becomes invalid!
- Generally observe the requirements laid down in Pressure Equipment Directive 97/23 EC and the AD2000 sheet A2!
- ⚠ **Caution!**
  The unloading function provided by the directional valve must not be used for safety-relevant functions! If an unloading function is required for safety-relevant tasks, an additional unloading valve must be installed.

☞ **Strictly observe the application notes!**

The response pressure indicated in the component identification is factory-set at a flow of 2 l/min.

The permissible maximum flow $q_{V\,max}$ indicated in the component identification (= numerical value in the place of letter "G" in the component identification, see page 15) must not be exceeded.

The following is valid:

- Pilot oil drain **"external"** (= **Y** in the ordering code) **without backpressure** in **return line Y**, permissible backpressure in the return line (port T) < 15 bar
- Pilot oil drain **"internal"** (= No code in the ordering code). The max. permissible flow is only permitted **without backpressure** in the **return line** (port T).

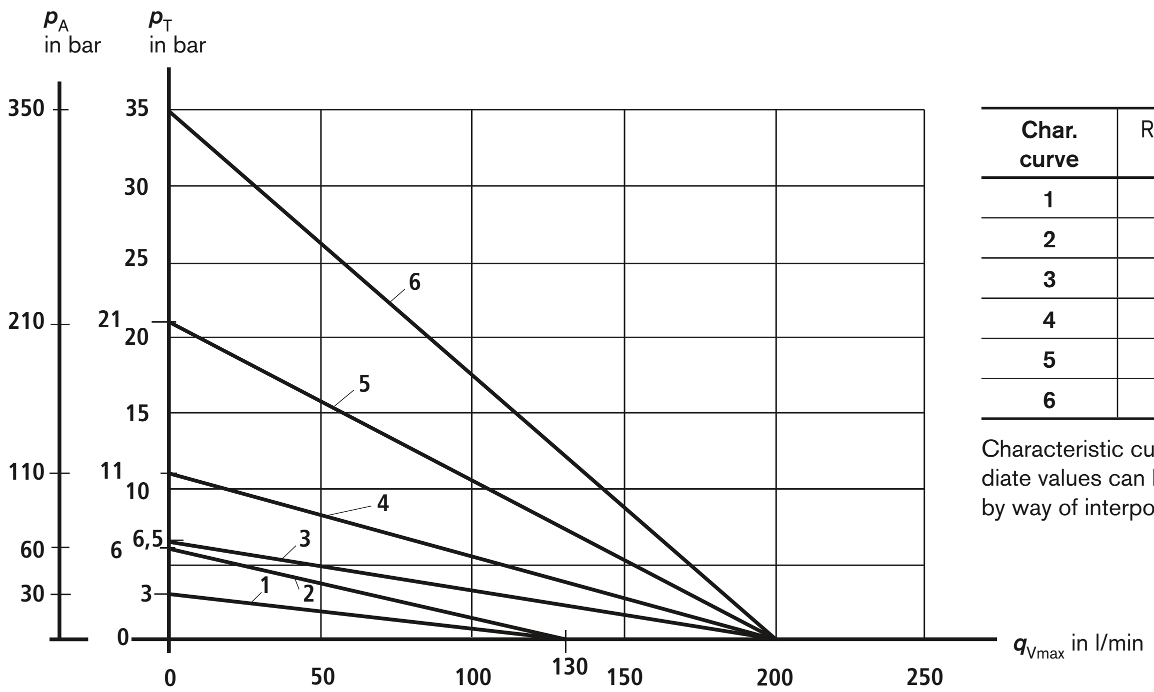
With internal pilot oil drain, the system pressure increases by the backpressure in the drain line (port T) (AD2000 - sheet A2, observe section 6.3!).

In order to prevent this increase in the system pressure caused by the flow from exceeding 10 % of the set response pressure, the permissible flow must be reduced in dependence upon the backpressure in the return line (port T) (see diagrams on pages 17 and 18).

Safety notes: Type-tested safety valves of type DB(W)…E, component series 5X according to Pressure Equipment Directive 97/23/EC

Max. permissible flow q_{Vmax} in dependence on the backpressure p_T in the return line with internal pilot oil drain

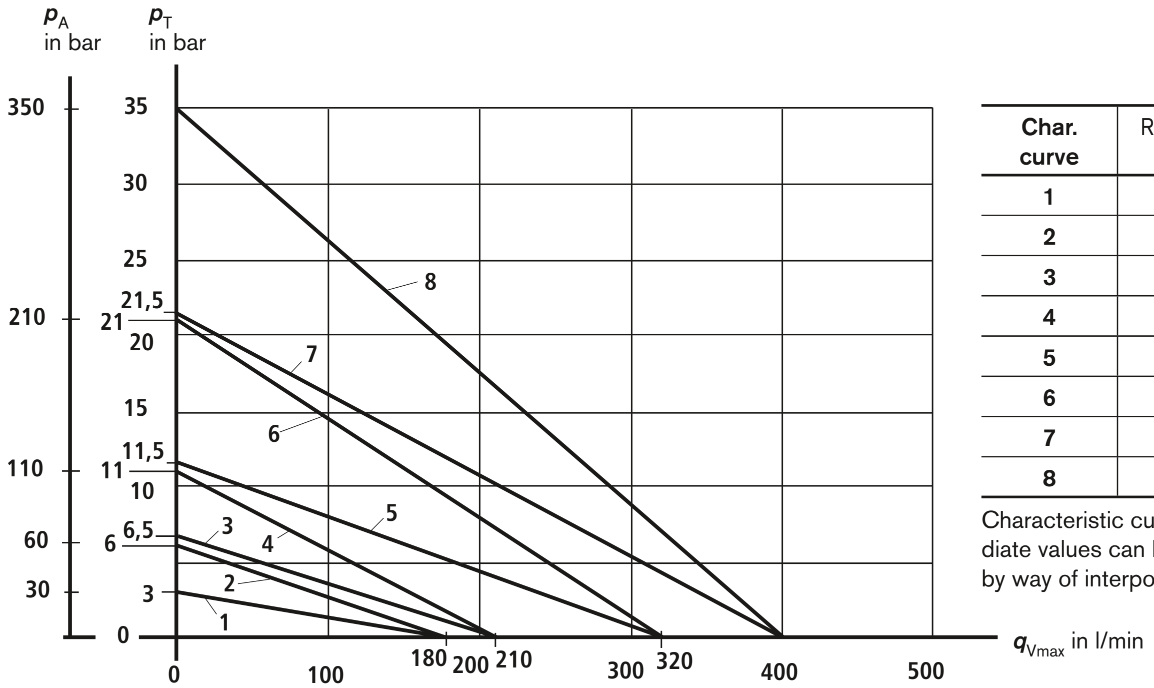
Type DB(W) 10 …-5X/…E



Char. curve	Response pressure p_R in bar
1	30
2	60
3	65
4	110
5	210
6	350

Characteristic curves for intermediate values can be determined by way of interpolation.

Type DB(W) 20 …-5X/…E



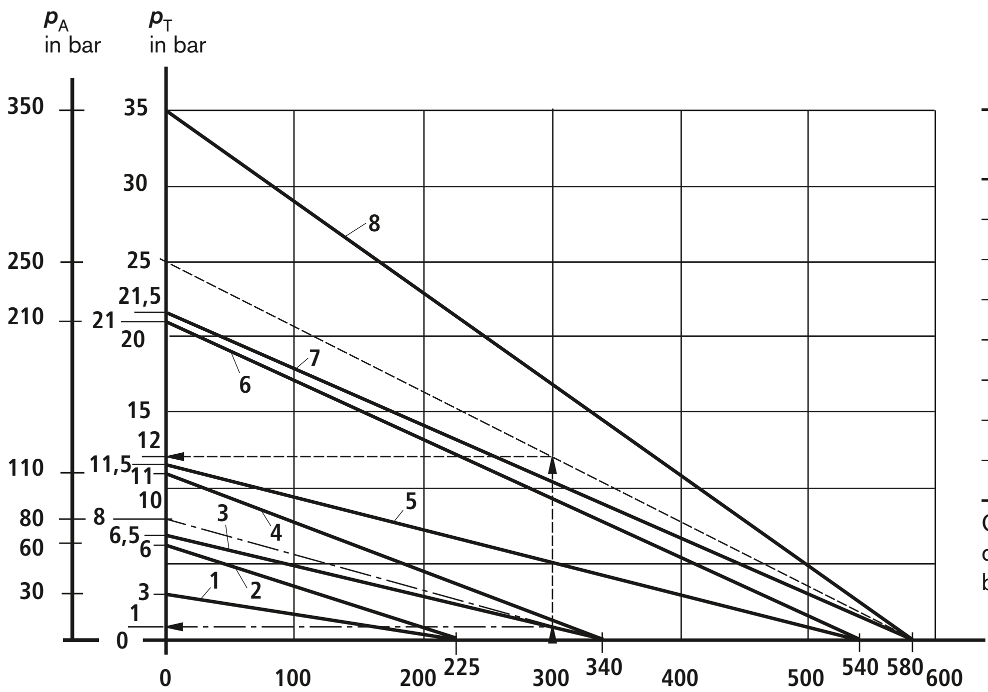
Char. curve	Response pressure p_R in bar
1	30
2	60
3	65
4	110
5	115
6	210
7	215
8	350

Characteristic curves for intermediate values can be determined by way of interpolation.

Safety notes: Type-tested safety valves of type DB(W)…E, component series 5X according to Pressure Equipment Directive 97/23/EC

Max. permissible flow q_{Vmax} in dependence on the backpressure p_T in the return line with internal pilot oil drain

Type DB(W) 30 …-5X/…E



Char. curve	Response pressure p_R in bar
1	30
2	60
3	65
4	110
5	115
6	210
7	215
8	350

Characteristic curves for intermediate values can be determined by way of interpolation.

_ _ _ _ _ _ _ _ _
250-bar characteristic curve

__ . __ . __
80-bar characteristic curve

p_A = Response pressure in bar

p_T = Max. permissible backpressure in the return line (port T) (sum of all possible backpressures, see also AD2000 sheet - A2)

$p_{T\,max}$ = 10% x p_A (at q_V = 0 l/min) to PED 97/23/EC

$q_{V\,max}$ = Max. permissible flow in l/min

Explanation of diagrams (example DB(W) 30 …E)

Example 1:
Given: Flow of the system / accumulator to be safeguarded $q_{V\,max}$ = 300 l/min
Set response pressure of the safety valve p_R = 250 bar
Required: p_T = ?
Solution: See arrows on the diagram:
p_T (300 l/min; 250 bar) ~ 12 bar

Example 2:
Given: Flow of the system / accumulator to be safeguarded $q_{V\,max}$ = 300 l/min
Set response pressure of the safety valve p_R = 80 bar
Required: p_T = ?
Solution: See arrows on the diagram:
p_T (300 l/min; 80 bar) ~ 1 bar

Notes

Notes

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documentation@boschrexroth.de
www.boschrexroth.de

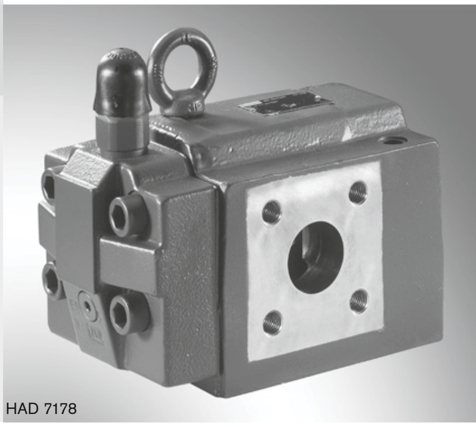
Rexroth
Bosch Group

Pressure relief valve, pilot operated

RE 25850/04.05
Replaces: 07.02

Type DB; DBW

Size 52
Component series 3X
Maximum operating pressure 315 bar
Maximum flow 2000 L/min



HAD 7178

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

– For flange connection
– For subplate mounting
– 3 pressure adjustment elements optional:
  • Sleeve with hexagon and protective cap
  • Rotary knob
  • Lockable rotary knob
– Solenoid operated unloading through built-on directional valve
– Internal or external pilot oil drain
– Remote control port, optional
– Main spool insert optional as poppet or spool version
– Further information:
  • High-performance directional valve, see RE 23178
  • Connecting flanges, see RE 45501

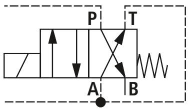
Ordering code

DB		52					3X/		U						*

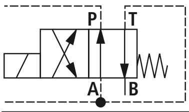
Pressure relief valve **= DB**

Without direc-tional valve **= No code**
With built-on directional valve **= W**

Size 52 **= 52**



Normally closed **= A** [1)]



Normally open **= B** [1)]

Version
For subplate mounting **= P**
For flange connection **= F**

Pressure adjustment element
Rotary knob **= 1**
Sleeve with hexagon and protective cap **= 2**
Lockable rotary knob **= 3** [2)]

Main spool
As seated spool version **= –**
As sliding spool version **= L**

Component series 30 to 39 **= 3X**
(30 to 39: unchanged installation and connection dimensions)

Pressure stage
Set pressure up to 100 bar **= 100**
Set pressure up to 315 bar **= 315**

Pilot oil supply
– =
X =
Y =
XY =
Ordering code according to symbols on page 3

U = For minimum cracking pressure of 3 bar

No code = **Without** directional valve
6E [1)] **=** **With** directional valve size 6

G24 [1)] **=** 24 V DC
W230 [1)] **=** AC voltage 230 V; 50/60 Hz

No code = **Without** manual override
N9 [1)] **=** **With concealed** manual override
N [1)] **=** **With** manual override

Electrical connection
Individual connection
K4 [3)] **=** **Without** cable socket, with component plug DIN EN 175301-803

Seal material
No code = NBR seals
V = FKM seals
(other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

Type testing
No code = Without type testing
E = Type-tested safety valves according to PED 97/23/EC

Further details in clear text

1) Indication **only** required for version with built-on directional valve (DBW).

2) H-key, order no. **R900008158,** included in the scope of supply

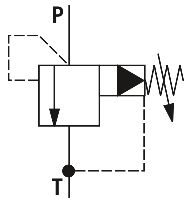
3) Cable sockets, separate order, see page 3

For ordering code for type-tested safety valves of type DB(W) 52..3X/..E, see page 10

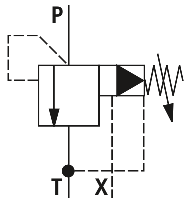
Preferred types and standard components are listed in the EPS (standard price list).

Symbols

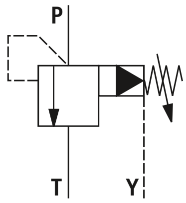
Type DB 52 …–..



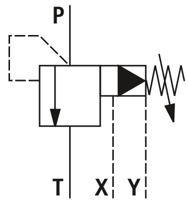
Type DB 52 …**X**..



Type DB 52 …**Y**..

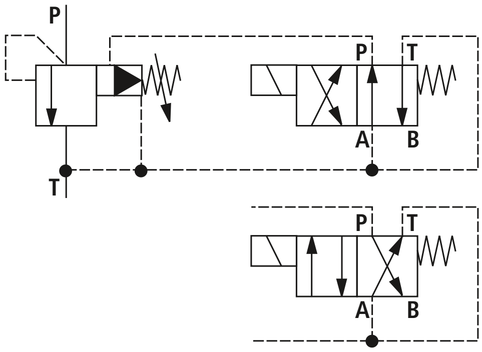


Type DB 52 …**XY**..



Type DBW 52 …–..

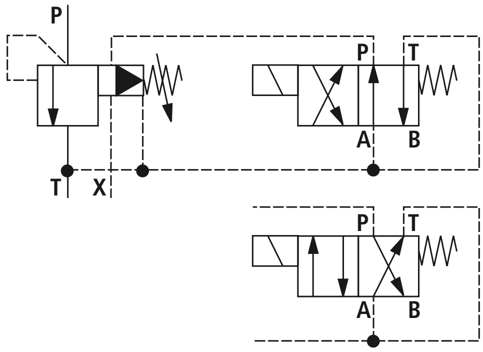
normally open



normally closed

Type DBW 52 …**X**..

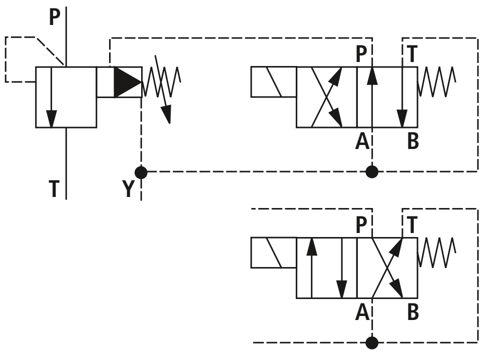
normally open



normally closed

Type DBW 52 …**Y**..

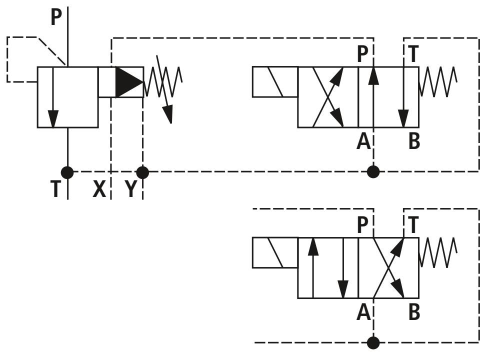
normally open



normally closed

Type DBW 52 …**XY**..

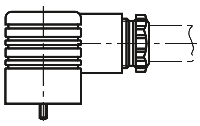
normally open

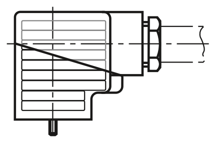


normally closed

Cable sockets to DIN EN 175301-803

Details and further cable sockets, see RE 08006





Colour	Material no.			
	Without circuitry	With LED lamp 12 … 240 V	With rectifier 12 … 240 V	With LED lamp and Zener diode suppressor circuit 24 V
Grey	**R901017010**	–	–	–
Black	**R901017011**	**R901017022**	**R901017025**	**R901017026**

Function, section, symbol

Pressure control valves of type DB/DBW are pilot operated pressure relief valves. They are used for limiting (DB) or for the limitation and solenoid-operated unloading of a system pressure.

These pressure relief valves basically consist of a pilot control valve (1) with pressure adjustment element (2), a main valve (3) with main spool insert (4) and an optional directional valve (5).

Pressure relief valves of type DB

The pressure applied by the system acts on the main spool (4). At the same time, the pressure is applied via the pilot lines (6), which are fitted with orifices, to the spring-loaded side of the main spool (4) and to the pilot control valve (1). When the system pressure exceeds the value set on the spring (7), the poppet (10) of the pilot control valve opens. The hydraulic fluid can now flow from the spring-loaded side of the main spool (4) via the spring chamber of the pilot control valve (1) internally via port T – or externally via port Y - to the tank. Due to the combination of orifices in the pilot lines, a pressure differential arises across the main spool, which causes the connection from P to T to open. The hydraulic fluid flows from channel P to channel T at the set operating pressure.

The pressure relief valve can be unloaded remotely controlled or changed over to another pressure value via port X X (8).

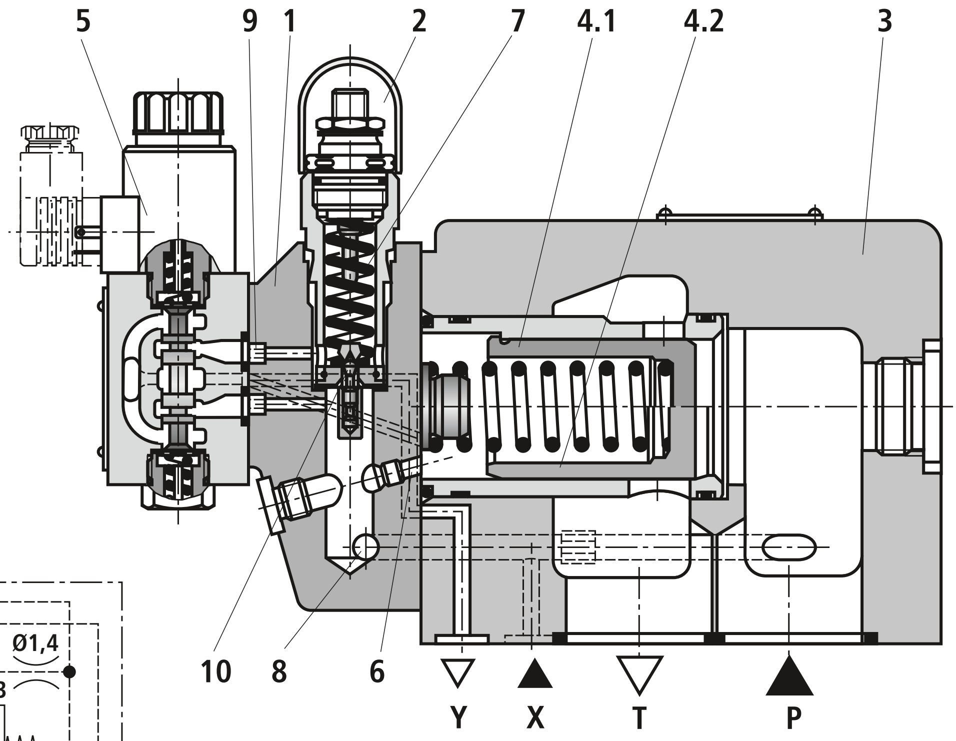
Pressure relief valves of type DBW

In principle, the function of this valve corresponds to that of valve type DB. Unloading on the main spool (4) is, however, achieved by operating the built-on directional valve (5).

To reduce tank pressure peaks when changing over to pressureless circulation by operation of the directional valve, the main spool of sliding spool design (4.1) can be used.

Influence on the turn-off time

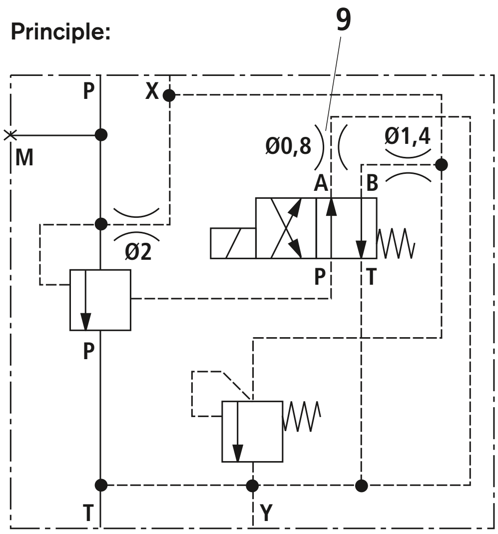
The turn-off time can be influenced by means of orifice (9), which has a Ø0.8 as a standard. By changing this orifice (9), the turn-off time can be extended or shortened. This has no effect on the pressure relief function.



Type DBW 52 BP2.3X/…XYU6EG24N9K4

4.1 Sliding spool
4.2 Seated spool

Principle:



With type DBW 52 …**Y**… the connection T–Y is closed.

Technical data (for applications outside these parameters, please consult us!)

General

Weight	Type DB 52 ...	kg	approx. 27
	Type DBW 52 ...	kg	approx. 28.5
Installation orientation			Optional
Ambient temperature range	Type DB 52...	°C	– 30 to + 80 (NBR seals) – 15 to + 80 (FKM seals)
	Type DBW 52...	°C	– 30 to + 50 (NBR seals) – 15 to + 50 (FKM seals)
Technical data of the directional valve			See data sheet RE 23178
Connecting flanges			See data sheet RE 45501

Minimum strength of materials for subplates, flanges, etc.:
The materials must be selected so that sufficient safety is provided under all conceivable operating conditions, e.g.: resistance to pressure, safety against stripping of threads and tightening torques.

Hydraulic

Maximum operating pressure	Ports P, T, X		bar	315
Maximum backpressure	Port Y	Type DB 52 ...	bar	315
		Type DBW…Y	bar	210 for DC solenoid
	Port T	Type DBW…	bar	160 for AC solenoid
Minimum set pressure			bar	Depends on flow (see characteristic curve on page 6)
Maximum set pressure			bar	100; 315
Maximum flow			L/min	2000
Hydraulic fluid				Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape-seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on enquiry
Hydraulic fluid temperature range			°C	– 30 to + 80 (NBR seals) – 15 to + 80 (FKM seals)
Viscosity range			mm^2/s	10 to 380
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)				Class 20/18/15 [3]

[1] Suitable for NBR and FKM seals

[2] Suitable only for FKM seals

[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, increases the service life of components.
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

Deviating technical data for type-tested safety valves [1)]

Hydraulic

Maximum flow			See table on page 10 and characteristic curves on page 12			
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524 and DIN 51524-1			
Hydraulic fluid temperature range		°C	– 20 to + 60 (NBR seals) – 15 to + 60 (FKM seals)			
Viscosity range		mm^2/s	12 to 230			
Maximum backpressures			DB../..	DB../..Y	DBW../..	DBW../..Y
	Port Y	bar	–	0	–	0
	Port T	bar	[2)]	$p_T < 15$	[2)]	$p_T < 15$

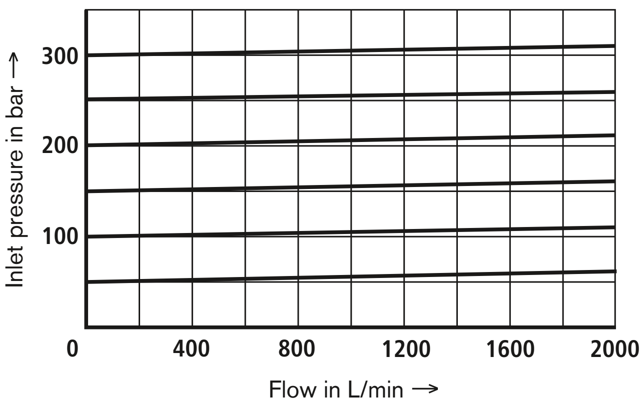
[1)] For applications outside these parameters, please consult us!

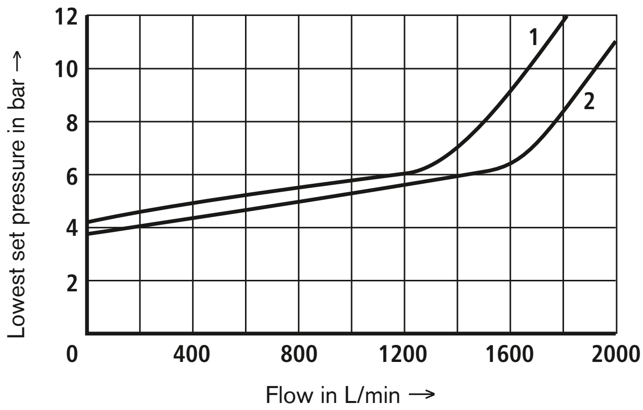
[2)] See characteristic curves and explanations on max. permissible backpressures on pages 10 and 11.

Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

The characteristic curves were measured with external pilot oil drain and pressureless return flow of the pilot oil.

With internal pilot oil drain, the inlet pressure increases by the outlet pressure present in port T.





1 Main spool insert with sliding spool

2 Main spool insert with seated spool

General notes

- The unloading function (directional valve function of DBW) must not be used for safety functions!
- With type DBW 52 **B**..3X/... , the lowest settable pressure (circulation pressure) is set in the event of a power failure or cable break.
  With type DBW 52 **A**..3X/..., the pressure relief function is set in the event of a power failure or cable break.
- In the case of internal pilot oil drain, the hydraulic backpressures in port T or , in the case of external pilot oil drain, the hydraulic backpressures in port Y are fully added to the response pressure of the valve set on the pilot control.

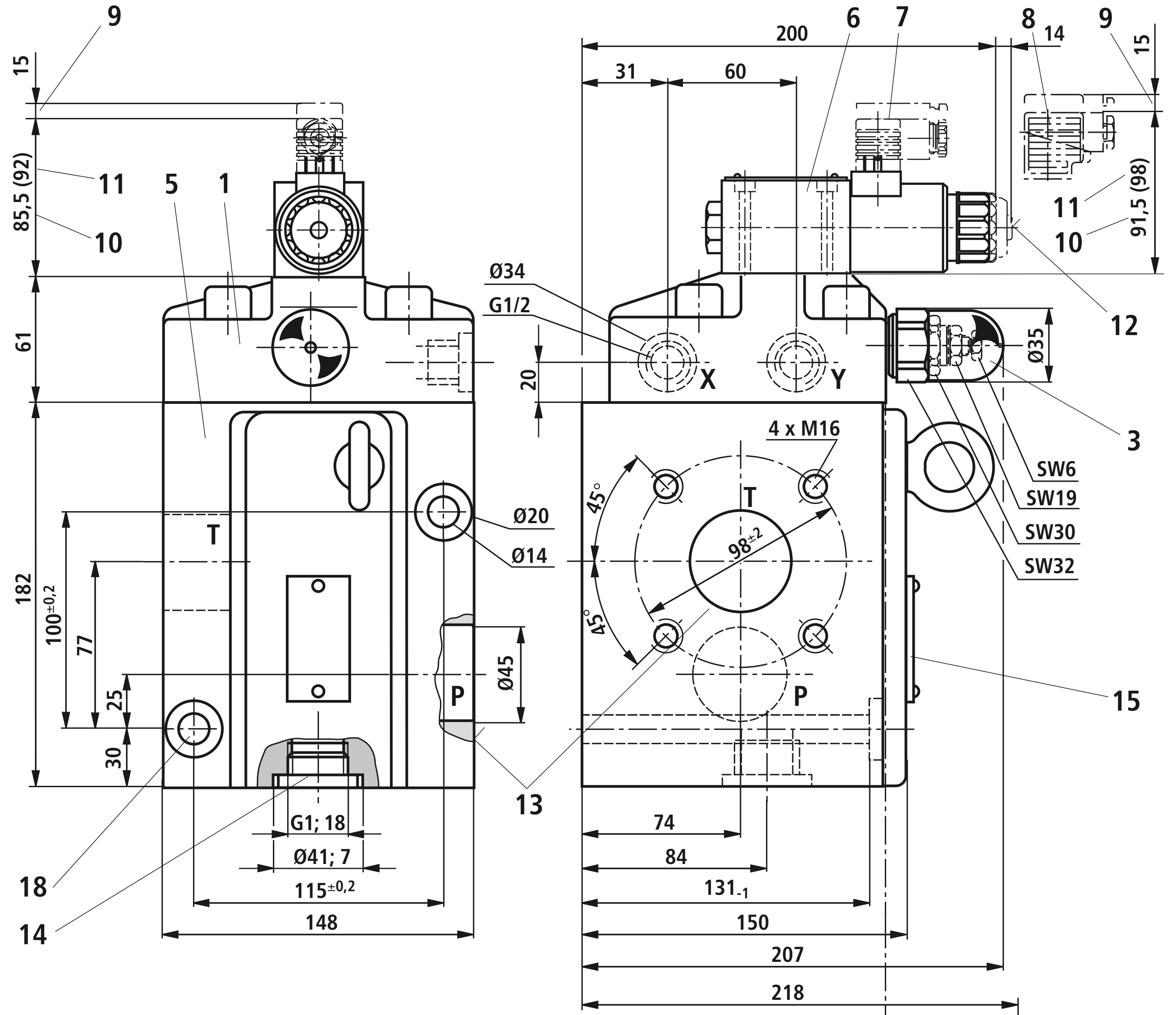
Example:

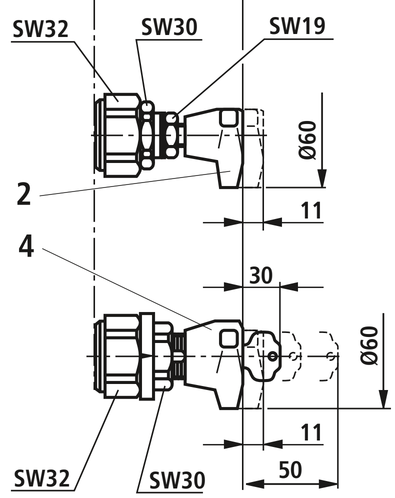
Pressure adjustment of the valve by spring pre-loading item 7 on page 4 in the pilot control valve/adjustment unit
$\boldsymbol{p_{spring}}$ **= 200 bar**

Hydraulic backpressure in port T with internal pilot oil drain
$\boldsymbol{p_{hydraulic}}$ **= 50 bar**

=> Response pressure $p_{spring} + p_{hydraulic}$ **= 250 bar**

Unit dimensions: Flange connection (nominal dimensions in mm)



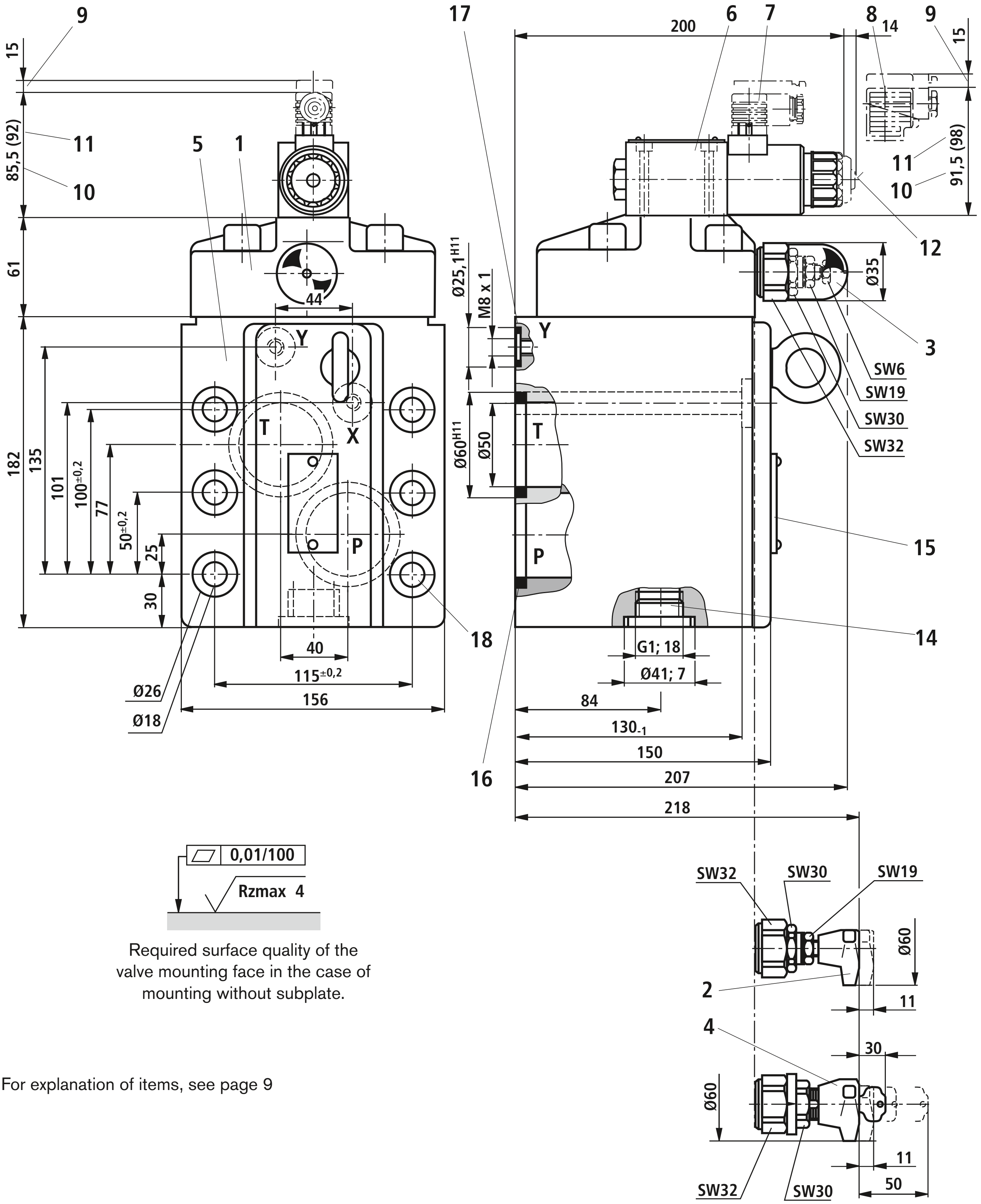


Explanation of items, see page 9

⚠ **Caution!**

Please fix the valve by means of the fixing bores so that reactive forces can be safely absorbed!

Unit dimensions: subplate mounting (nominal dimensions in mm)



Required surface quality of the valve mounting face in the case of mounting without subplate.

For explanation of items, see page 9

⚠ **Caution!**

Please fix the valve by means of the fixing bores so that reactive forces can be safely absorbed!

Explanation of items

1 Pilot control valve
2 Adjustment type "1"
3 Adjustment type "2"
4 Adjustment type "3"
5 Main valve
6 Directional valve size 6, see RE 23178
7 Cable socket **without** circuitry (separate order, see page 3)
8 Cable socket **with** circuitry (separate order, see page 3)
9 Space required to remove cable socket
10 Dimension for valve with DC solenoid
11 Dimension ( ) for valve with AC solenoid
12 Manual override, optional
13 Connecting flange (T and P), see RE 45501
14 Pressure gauge connection
15 Nameplate
16 Identical seal rings for ports P and T
17 Identical seal rings for ports X and Y
18 Valve fixing bores

Valve fixing screws for flange connection
(separate order)
– **2 socket head cap screws ISO 4762 - M12 - 10.9**

Valve fixing screws for subplate mounting
(separate order)
– **6 socket head cap screws ISO 4762 - M16 x 150 - 10.9-flZn-240h-L**
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 229 Nm ± 10%,
material no. **R913000154**

Subplate for subplate mounting (separate order):
G 479/10
(suitable connecting flange, see RE 45501)

Ordering code: Type-tested safety valves (type DB(W) 52 …E) in accordance with Pressure Equipment Directive 97/23/EC

Designation	Component code	Max. permissible flow qV_{max} in L/min with pilot oil return external "Y"	internal "–"	Set response pressure *p* in bar
DB 52 [2][3][4] 3X/ [5][6] U [7] E	TÜV.SV. [ ] – 734.46.F.G.p	1000 1500 2000	500 1000 1500	50 … 110 111 … 210 211 … 315
DBW 52 [1][2][3][4] 3X/ [5][6] U6 [*] [7] E	TÜV.SV. [ ] – 734.46.F.G.p			

1	Directional valve, normally closed	**= A**
	Directional valve, normally open	**= B**
2	For subplate mounting	**= P**
	For flange connection	**= F**
3	Adjustment element: hand wheel (pressure setting sealed, unloading or setting of a lower response pressure possible)	**= 1**
	Adjustment element with sealed protective cap (no adjustment/unloading possible)	**= 2**
4	Valve with seated main spool	**= –**
	Valve with sliding main spool	**= L**
5	Pressure must be entered by the customer in the designation, e.g. pressure setting ≥ 50 bar and in 5-bar increments possible	**= 150**
6	Internal pilot oil supply and drain	**= –** [1) 2)]
	Recommendation: Internal pilot oil supply, External pilot oil drain	**= Y** [2)]
*	Ordering code of electrical data (see page 2) e.g.	**= EG24N9K4**
7	NBR seals	**= No code**
	FKM seals	**= V**
[ ]	Details entered in the factory	

1) Dash "–" required **only** for version with built-on directional valve (DBW)

2) External pilot oil supply "X" impossible!

Safety notes: Type-tested safety valves (type DB(W) 52 …E) in accordance with Pressure Equipment Directive 97/23/EC

– Before ordering a type-tested safety valve, please note that at the requested **response pressure *p*** the max. permissible **flow $q_{V\ max}$** of the safety valve is greater than the max. possible flow of the system.

  The corresponding regulations must be observed!

– According to **PED 97/23/EC** the increase in the system pressure caused by the flow must not be greater than 10% of the set response pressure (see component code).

– Drain lines (ports T and Y) of safety valves must allow safe and reliable draining. **No** fluid may collect in the drain lines.

– The removal of the seal on the safety valve results in the loss of the approval according to the PED!

– Generally observe the requirements laid down in Pressure Equipment Directive 97/23 EC and in the AD2000 sheet A2!

– ⚠ **Caution!**
  The unloading function provided by the directional valve must not be used for safety-relevant tasks! Should an unloading function be required for safety-relevant tasks, an additional unloading valve must be installed.

☞ **Notes on the operation must be strictly observed!**

The response pressure specified in the component code is factory-set at a flow of 12 L/min.

The max. permissible flow (= figure in the place of letter “G” in the component code, see page 10) must not be exceeded.

The following is valid:

– Pilot oil drain **“external“** (= **Y** in the ordering code **without backpressure** in **drain line Y**, permissible backpressure in the drain line (port T) < 15 bar

– Pilot oil drain **“internal“** (= no code in the ordering code). The max. permissible flow is permitted only **without backpressure** in the **drain line** (port T).

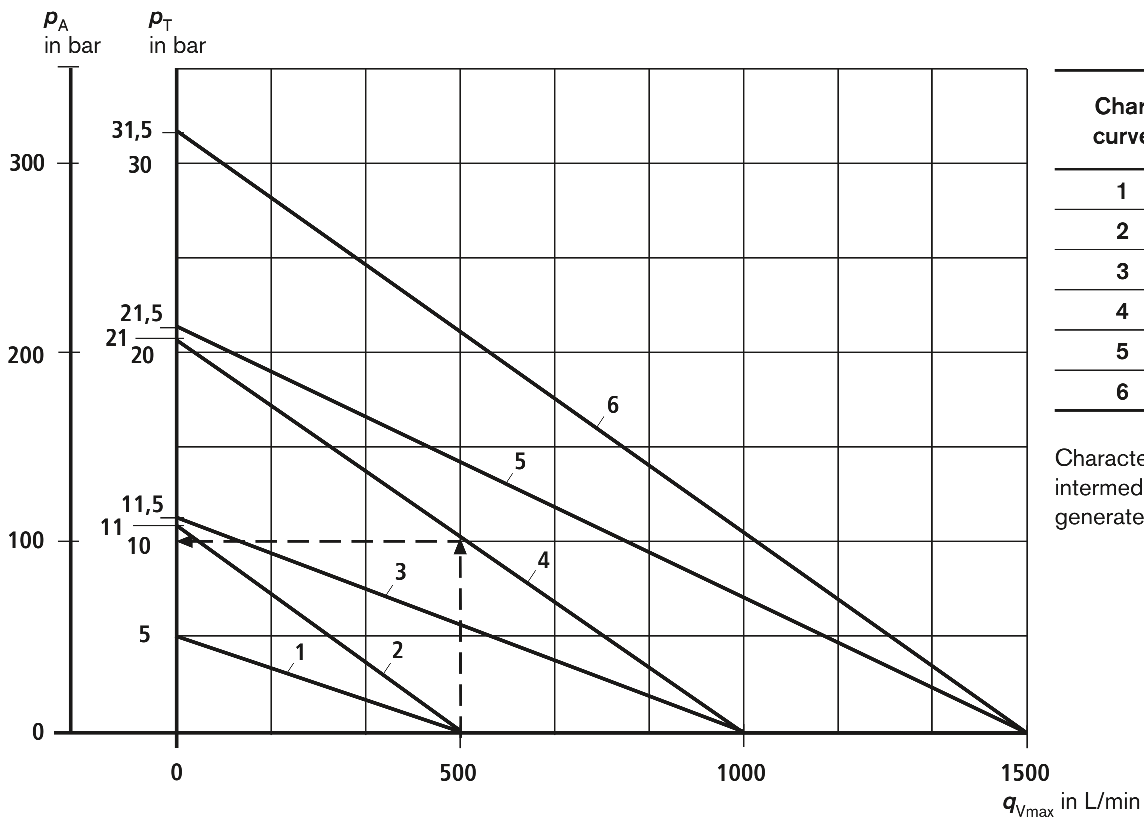
With internal pilot oil drain, as the flow increases, the system pressure rises by the backpressure in the drain line (port T) (observe AD2000 - sheet A2, para. 6.3!).

In order to limit this increase in the system pressure due to the flow to a maximum of 10% of the set response pressure, the permissible flow must be reduced in dependence upon the backpressure in the drain line (port T) (see diagram on page 12).

Safety notes: Type-tested safety valves (type DB(W) 52 …E) in accordance with Pressure Equipment Directive 97/23/EC

Max. permissible flow q_{Vmax} in dependence upon backpressure p_T in the drain line with internal pilot oil drain

Type DB(W) 52 ..3X/...E



Char. curve	Response pressure p_A in bar
1	50
2	110
3	115
4	210
5	215
6	315

Characteristic curves for intermediate values can be generated by interpolation.

p_A = Response pressure in bar

p_T = Max. permissible backpressure in the drain line (port T) (sum of all possible backpressures, see also AD2000 sheet - A2)

$p_{T\,max}$ = 10% x p_A (at q_V = 0 L/min)

$q_{V\,max}$ = Max. permissible flow in L/min

Explanation of diagram

Example:

Given: System / accumulator flow to be safeguarded $q_{V\,max}$ = 500 L/min

Set response pressure of the safety valve p_A = 210 bar

Searched: p_T = ?

Solution: See arrows in the diagram:
p_T (500 L/min; 210 bar) = 10 bar

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documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

Pressure relief valve, pilot operated

Type DB . K

Nominal sizes 6 and 10
Component series 4X
Maximum operating pressure 315 bar
Maximum flow 60 l/min (NS6)
100 l/min (NS10)

K4278-1

Overview of contents

Features

– Cartridge valve
– 4 pressure stages
– 4 adjustment types, optional:
  • Rotary knob
  • Sleeve with hexagon and protective cap
  • Lockable knob with scale
  • Rotary knob with scale

For information regarding the available spare parts see:
www.boschrexroth.com/spc

Ordering details

DB		K		–4X/		Y	V	*

Pressure relief valve, pilot operated **= DB**

Nominal size 6 **= 6**
Nominal size 10 **= 10**

Cartridge valve **= K**

Adjustment type
Rotary knob **= 1**
Sleeve with hexagon and protective cap **= 2**
Lockable rotary knob with scale **= 3** [1)]
Rotary knob with scale **= 7**

Component series 40 to 49 **= 4X**
(40 to 49: unchanged installation and connection dimensions)

Pressure stage
50 = Settable pressure up to 50 bar
100 = Settable pressure up to 100 bar
200 = Settable pressure up to 200 bar
315 = Settable pressure up to 315 bar

Y = Internal pilot oil supply, External pilot oil drain

Seal material
V = FKM seals
(other seals on request)

⚠ **Attention!**
The compatibility of the seals and pressure fluid is to be taken into account!

Futher details in clear text

1) H key with material No. **R900008158** is included within the scope of supply.

Preferred types

Nominal size 6

Type	Material No.
DB 6 K2-4X/50YV	R900487903
DB 6 K2-4X/100YV	R900483440
DB 6 K2-4X/200YV	R900486196
DB 6 K2-4X/315YV	R900483441

Nominal size 10

Type	Material No.
DB 10 K2-4X/50YV	R900422817
DB 10 K2-4X/100YV	R900453240
DB 10 K2-4X/200YV	R900438123
DB 10 K2-4X/315YV	R900438126

Further preferred types and standard components can be found within the EPS (Standard Price List).

Function, section, symbol

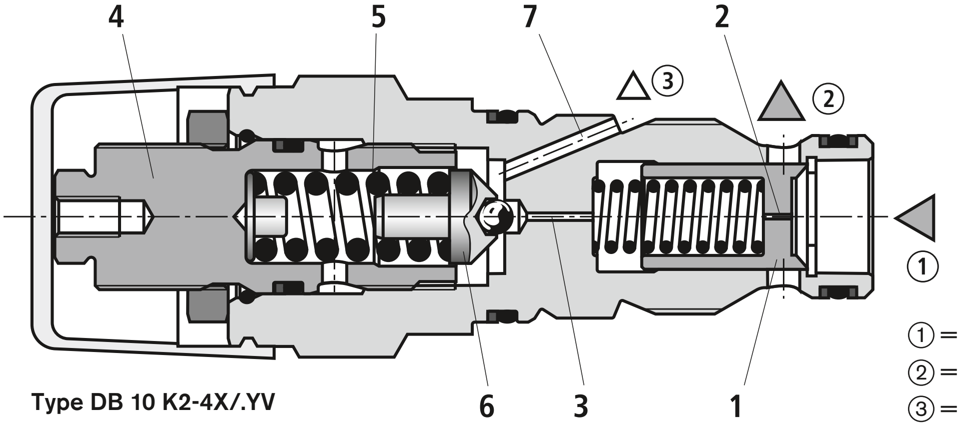
Pressure valves type DB..K.. are pilot operated pressure relief valves for installation in manifolds. They are used to limit the pressure in a hydraulic system. Setting of the system pressure is via adjustment element (4).

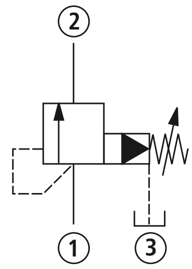
At rest, the valves are closed. Pressure in the main port 1 acts on the spool (1). At the same time, pressure is passed through orifice (2) onto the spring loaded side of the spool (1) and through orifice (3) to the pilot poppet (6). If the pressure in main port 1 rises above the value set at spring (5), then the pilot poppet opens (6). Pressure fluid can now flow from the spring loaded side of the spool (1), through the orifice (3) and channel (7) into main port 3. The resulting pressure drop moves piston (1) causing this to open the main port from 1 to 2, whilst the pressure set at spring (5) is maintained.

Pilot oil drain from the two spring chambers is taken externally via main port 3.

Note!

Back pressures (main port 3) are added to the set pressure.





1 = Main port 1 (P)
2 = Main port 2 (T)
3 = Main port 3 (Y)

Type DB 10 K2-4X/.YV

Technical data (for applications outside these parameters, please consult us!)

General				
Nominal size			6	10
Weight		kg	Approx. 0.15	Approx. 0.2
Installation			Optional	
Ambient temperature range		°C	–20 to +80	
Hydraulic				
Max. operating pressure [1]	– Main port 1 (P)	bar	315	
Max. settable pressure	– Main port 1 (P)	bar	50; 100; 200; 315	
Max. permissible back pressure [1]	– Main port 2 (T)	bar	315	
	– Main port 3 (Y)	bar	315	
Maximum flow		l/min	60	100
Pressure fluid			Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable pressue fluids to VDMA 24568 (also see RE 90221); HETG (rape seed oil); HEPG (polyglycole); HEES (synthetic ester); other pressure fluids on request	
Pressure fluid temperature range		°C	–20 to +80	
Viscosity range		mm^2/s	10 to 800	
Maximum permissible degree of pressure fluid contamination Cleanliness class to ISO 4406 (c)			Class 20/18/15 [2]	

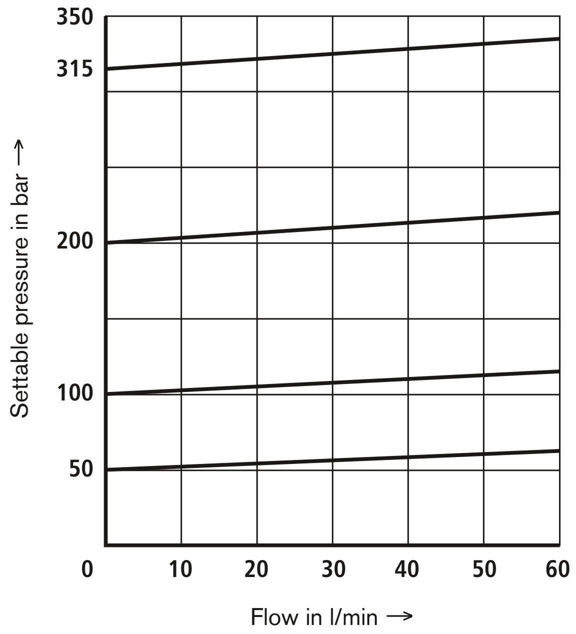
[1] ⚠ **Attention!** The maximum operating pressure results from the sum of the set pressure and the back pressure!

[2] The cleanliness class stated for the components must be adhered to in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.

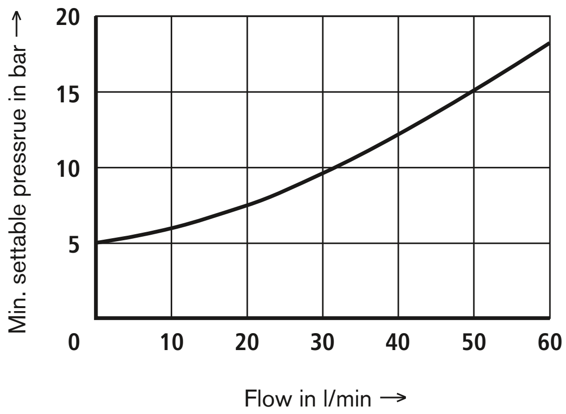
For the selection of filters see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

Characteristic curves – NS6 (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

p_E-q_V-characteristic curves



$p_{E\ min}$-q_V-characteristic curves

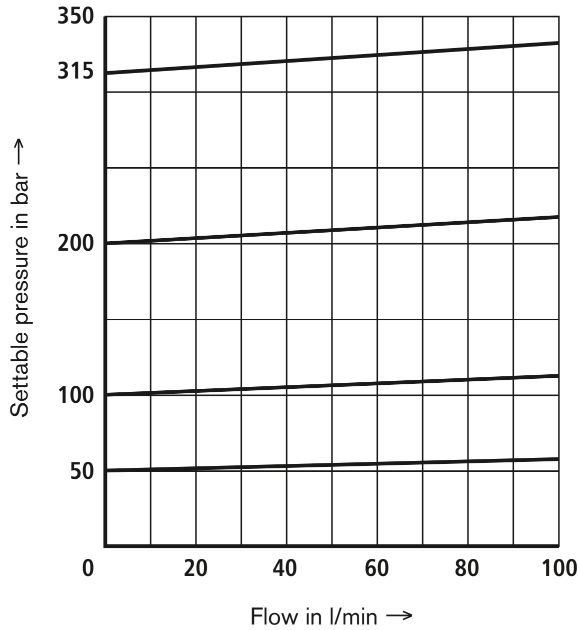


⚠ **Attention!**

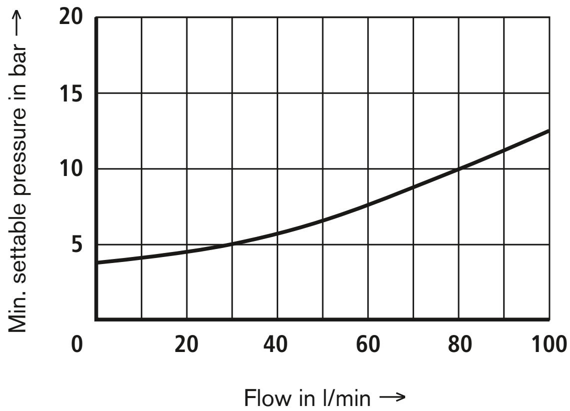
The characteristic curves are valid for an outlet pressure = zero over the entire flow range!

Characteristic curves – NS10 (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

p_E-q_V-characteristic curves



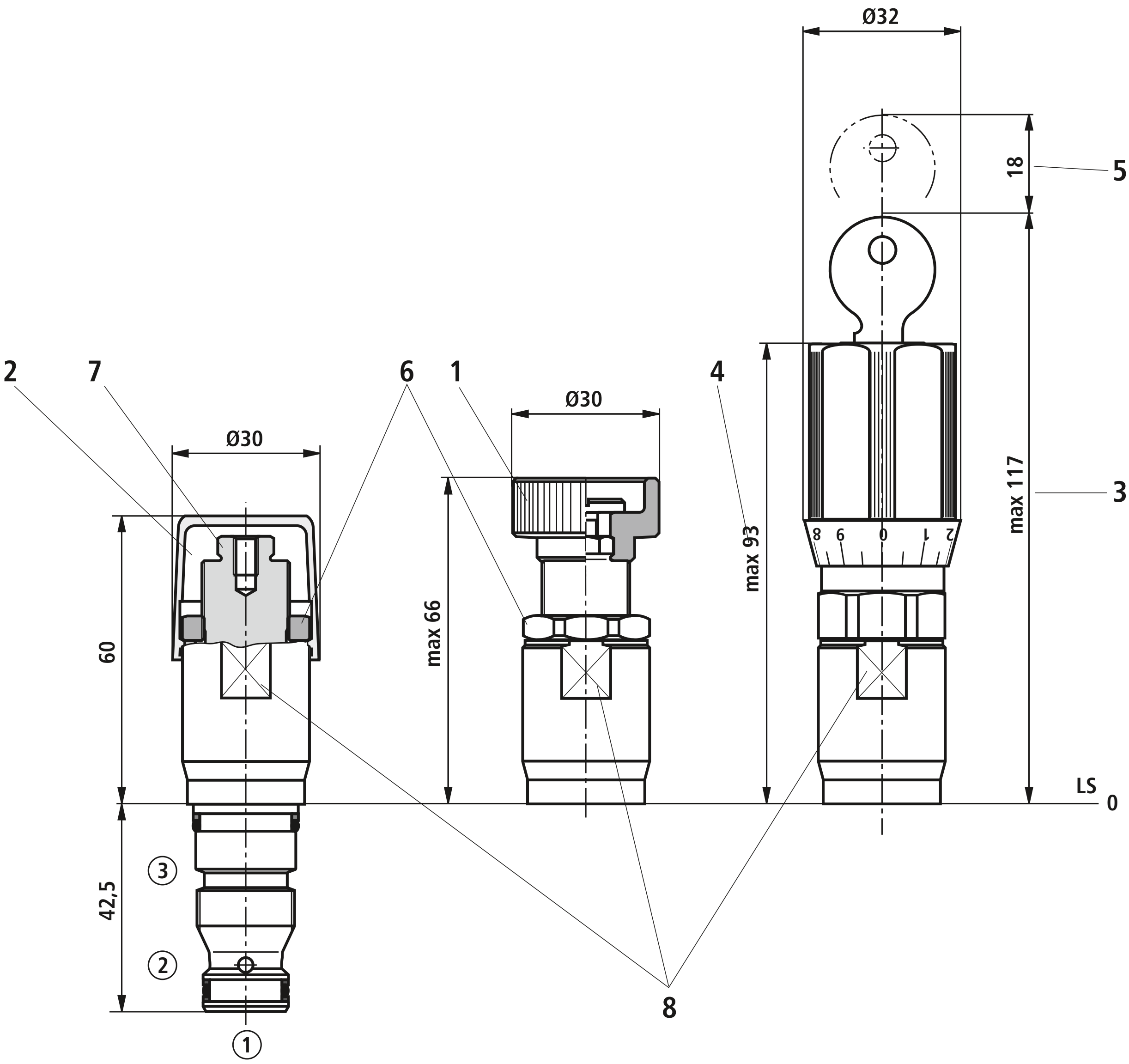
$p_{E\ min}$-q_V-characteristic curves



⚠ **Attention!**

The characteristic curves are valid for an outlet pressure = zero over the entire flow range!

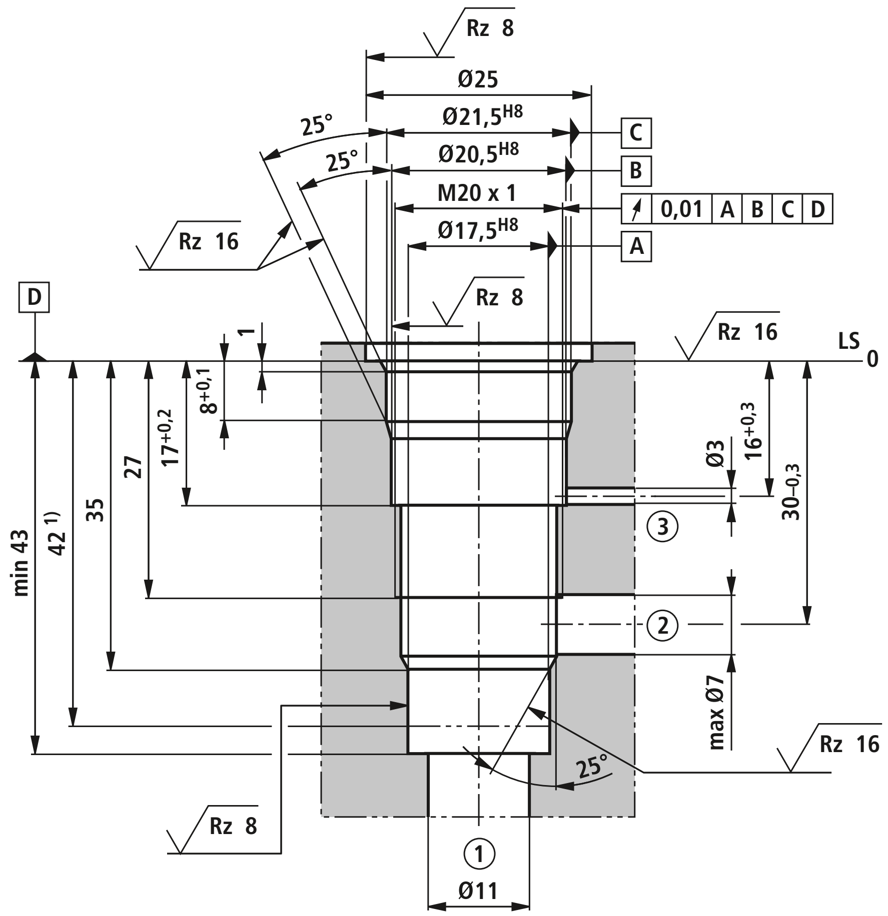
Unit dimensions – NS6 (nominal dimensions in mm)



1 Adjustment type "1"
2 Adjustment type "2"
3 Adjustment type "3"
4 Adjustment type "7"
5 Space required to remove the key
6 Locknut 24A/F
7 Hexagon 10A/F
8 Key width 24A/F, tightening torque M_A = 50 Nm

① = Main port 1 (P)
② = Main port 2 (T)
③ = Main port 3 (Y)
LS = Location Shoulder

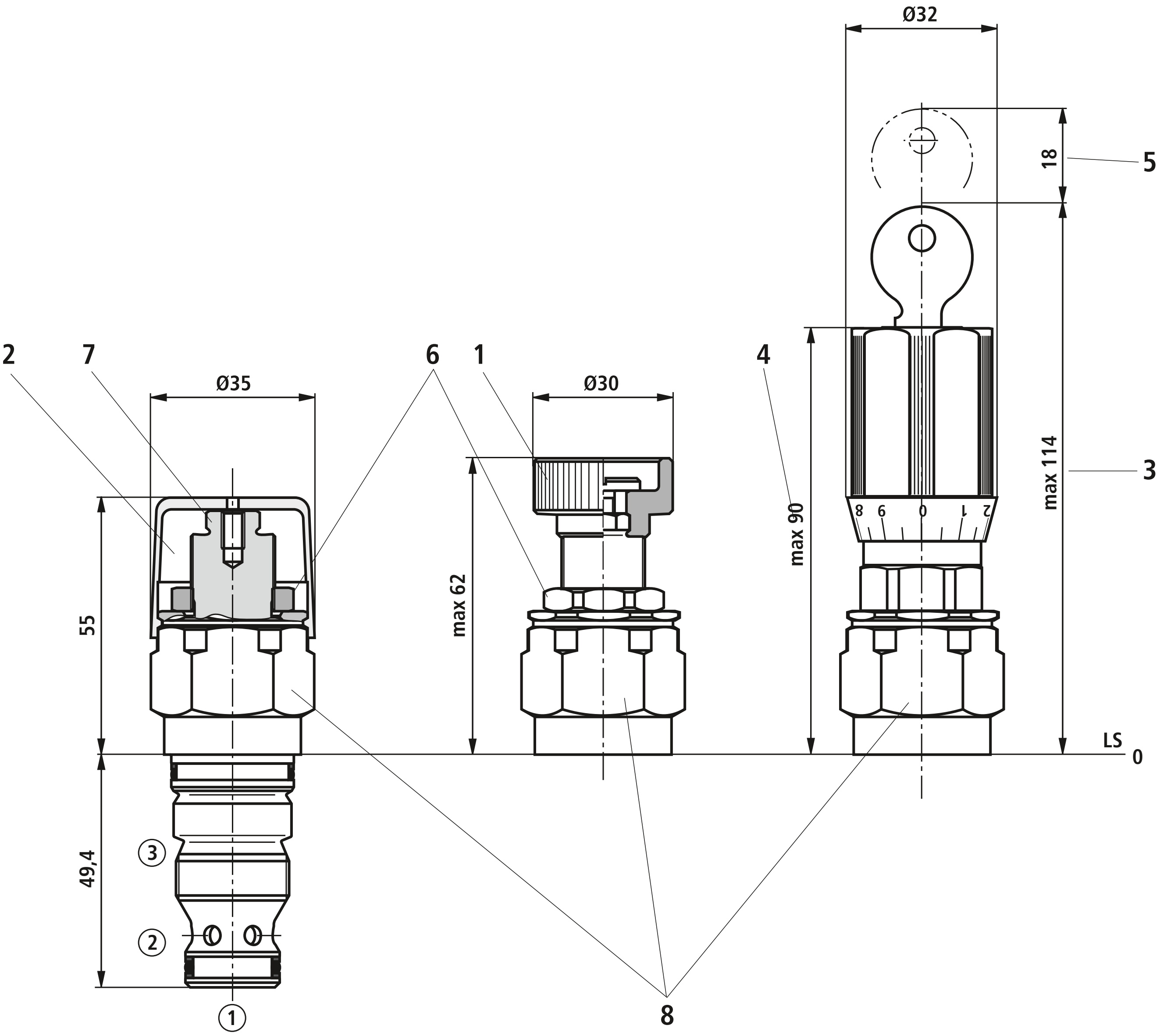
Cavity – NS6; 3 main ports; thread M20 x 1 (nominal size in mm)



① = Main port 1 (P)
② = Main port 2 (T), location; optional about the circumference
③ = Main port 3 (Y)
LS = Location Shoulder

[1] Depth of fit

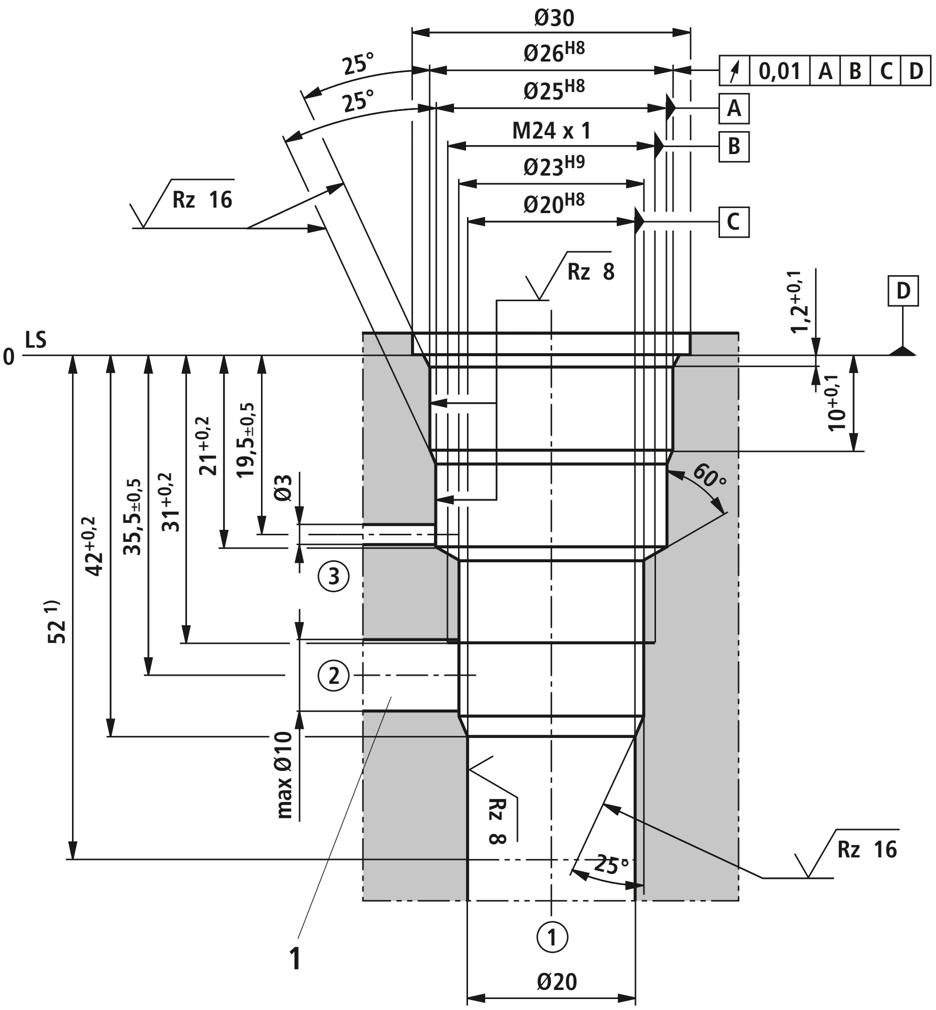
Unit dimensions – NS10 (nominal dimensions in mm)



1 Adjustment type "1"
2 Adjustment type "2"
3 Adjustment type "3"
4 Adjustment type "7"
5 Space required to remove the key
6 Locknut 24A/F
7 Hexagon 10A/F
8 Hexagon 30A/F, tightening torque M_A = 50 Nm

① = Main port 1 (P)
② = Main port 2 (T)
③ = Main port 3 (Y)
LS = Location Shoulder

Cavity – NS10; 3 main ports; thread M20 x 1 (nominal dimensions in mm)



① = Main port 1 (P)

② = Main port 2 (T), location: optional about the circumference

③ = Main port 3 (Y)

LS = Location Shoulder

1) Depth of fit

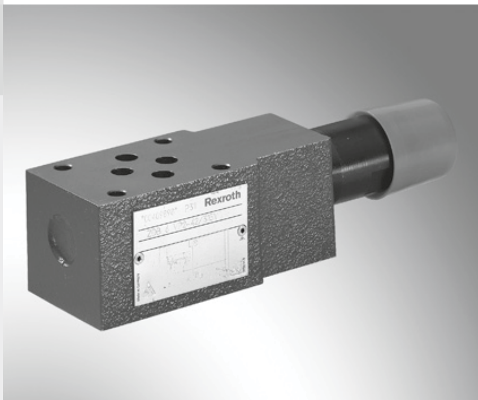
Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Pressure relief valve, pilot operated

RE 25751/10.05
Replaces: 05.02

Types ZDB and Z2DB

Nominal size 6
Component series 4X
Maximum operating pressure 315 bar
Maximum flow 60 L/min



HAD5564

Overview of contents

Features

- Sandwich plate valve
- Connection location to DIN 24340 form A (**without** locating pin), (standard)
- Connection location to ISO 4401-03-02-0-94 (**with** locating pin), (ordering code .../**60**)
- 4 pressure stages
- 5 circuit options
- With 1 or 2 pressure valve cartridges
- 4 adjustment elements for pressure adjustment, optional
  - Rotary knob
  - Sleeve with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale

For information regarding the available spare parts see:
www.boschrexroth.com/spc

Ordering details

Z		DB	6		–4X/		V		*

Sandwich plate = Z

1 pressure valve cartridge = **No code**
(only for versions „VA", „VB" and „VP")
2 pressure valve cartridges = **2**
(only for versions „VC" and „VD")

Pressure relief valve = **DB**

Nominal size 6 = **6**

Relief function from – to:
A – T = **VA**
P – T = **VP**
B – T = **VB**
A – T and B – T = **VC**
A – B and B – A = **VD**

Adjustment element for pressure adjustment
Rotary knob = **1**
Sleeve with hexagon and protective cap = **2**
Lockable rotary knob with scale = **3** [1]
Rotary knob with scale = **7**

4X = Component series 40 to 49
(40 to 49: unchanged installation and connection dimensions)

Pressure stage
50 = Settable pressure up to 50 bar
100 = Settable pressure up to 100 bar
200 = Settable pressure up to 200 bar
315 = Settable pressure up to 315 bar

Seal material
V = FKM seals
(other seals on request)
⚠ **Attention!**
The compatibility of the seals and pressure fluid is to be taken into account!

No code = **Without** locating pin
/60 [2] **=** **With** locating pin

Further details in clear text

[1] H key under Material No. **R900008158** is included within the scope of supply

[2] Locating pin ISO 8752-3x8-St, Material No. **R900005694** (separate order)

Further standard components can be found within the EPS (Standard Price List).

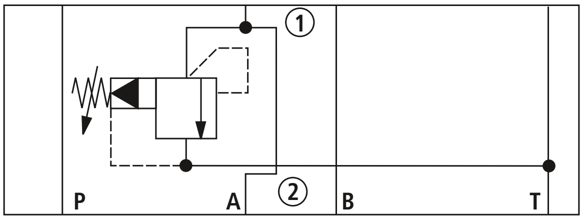
Preferred types (readily available)

Type ZDB	Material No.
ZDB 6 VA2-4X/100V	R900409889
ZDB 6 VA2-4X/200V	R900409886
ZDB 6 VA2-4X/315V	R900409893
ZDB 6 VB2-4X/200V	R900409854
ZDB 6 VB2-4X/315V	R900409896
ZDB 6 VP2-4X/50V	R900409847
ZDB 6 VP2-4X/100V	R900409933
ZDB 6 VP2-4X/200V	R900409844
ZDB 6 VP2-4X/315V	R900409898

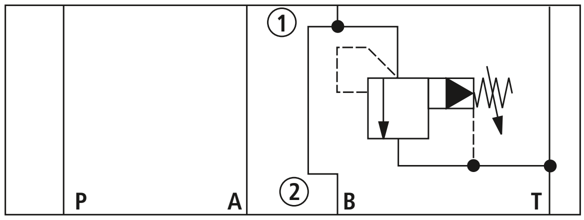
Type Z2DB	Material No.
Z2DB 6 VC2-4X/200V	R900411312
Z2DB 6 VC2-4X/315V	R900411318
Z2DB 6 VD2-4X/100V	R900411317
Z2DB 6 VD2-4X/200V	R900411314
Z2DB 6 VD2-4X/315V	R900411357

Symbols (① = valve side, ② = subplate side)

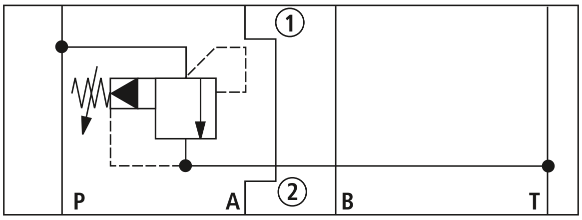
Type ZDB 6 VA...



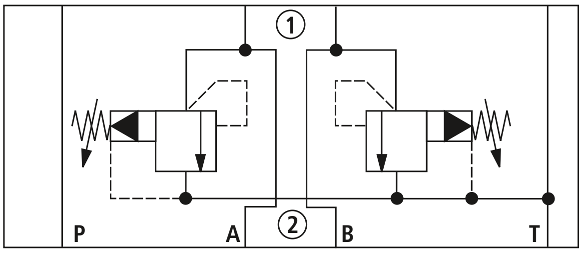
Type ZDB 6 VB...



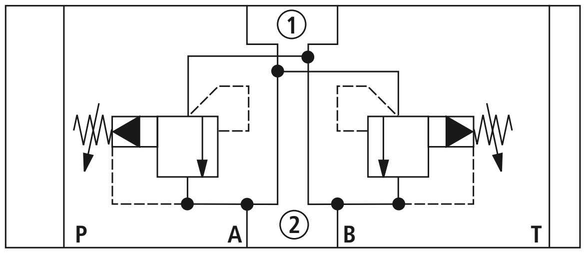
Type ZDB 6 VP...



Type Z2DB 6 VC...



Type Z2DB 6 VD...



Function, section

Pressure valve types ZDB and Z2DB are pilot operated pressue relief valves and of sandwich plate design.

They are used to limit the pressure within a hydraulic system.

They basically consist of the housing (7), together with one or two pressue relief valve cartridges.

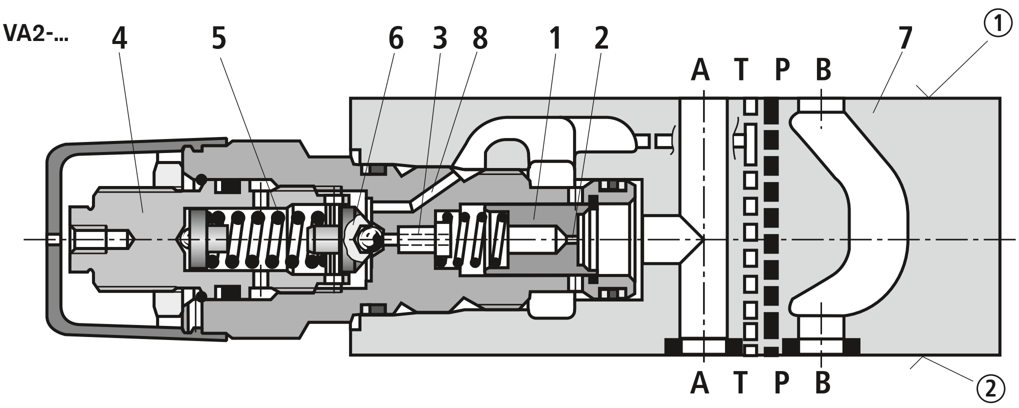
The system pressure is set by means of adjustment element (4).

At rest, the valve is closed. Pressure in port A acts on the spool (1). At the same time pressure passes through orifice (2) onto the spring loaded side of spool (1) and via orifice (3) to the pilot poppet (6). If the pressure in port A rises above the value set on spring (5), then the pilot poppet (6) opens.

Fluid can now flow from the spring loaded side of the spool (1), then via orifice (3), and channel (8) into port T. The resulting pressure drop then moves the spool (1) thereby opening the connection A to T, while maintaining the pressure set at spring (5).

Pilot oil return from the two spring chambers is taken externally via port T.

Type ZDB 6 VA2-...



Technical data (for applications outside these parameters, please consult us!)

General

Weight	Type ZDB 6	kg	Approx. 1
	Type Z2DB 6	kg	Approx. 1,2
Installation			Optional
Ambeint temperature range		°C	–20 to +80

Hydraulic

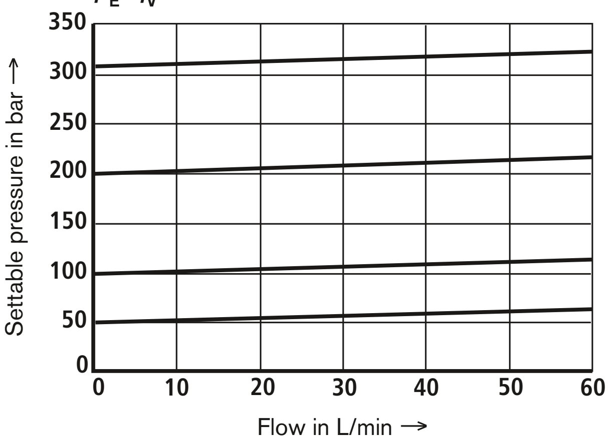
Maximum operating pressure	bar	315
Maximum settable pressure	bar	50; 100; 200; 315
Maximum back pressure (port Y)	bar	315 (take the max. tank pressure of the built-on valve/ directional valve into account!)
Maximum flow	L/min	60
Pressure fluid		Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable pressure fluids to VDMA 24568 (also see RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic ester); other pressure fluids on request
Pressure fluid temperature range	°C	–20 to +80
Viscosity range	mm^2/s	10 to 800
Max. permissible degree of pressure fluid contamination Cleanliness class to ISO 4406 (c)		Class 20/18/15 [1)]

[1)] The cleanliness class stated for the components must be adhered to in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the components service life.

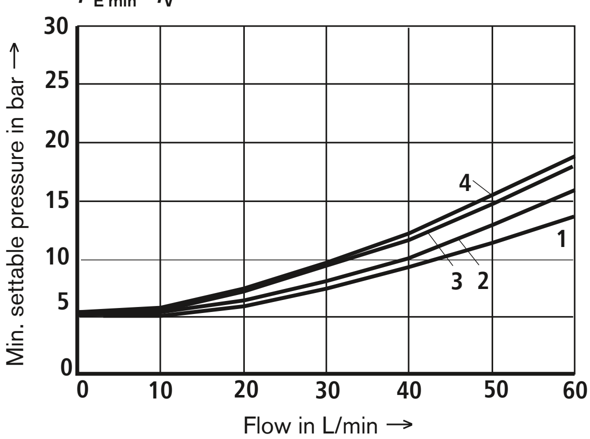
For the selection of filters see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

Characteristic curves (measured with HLP46 and ϑ_{oil} = 40 °C ± 5 °C)

p_E–q_V– characteristic curves



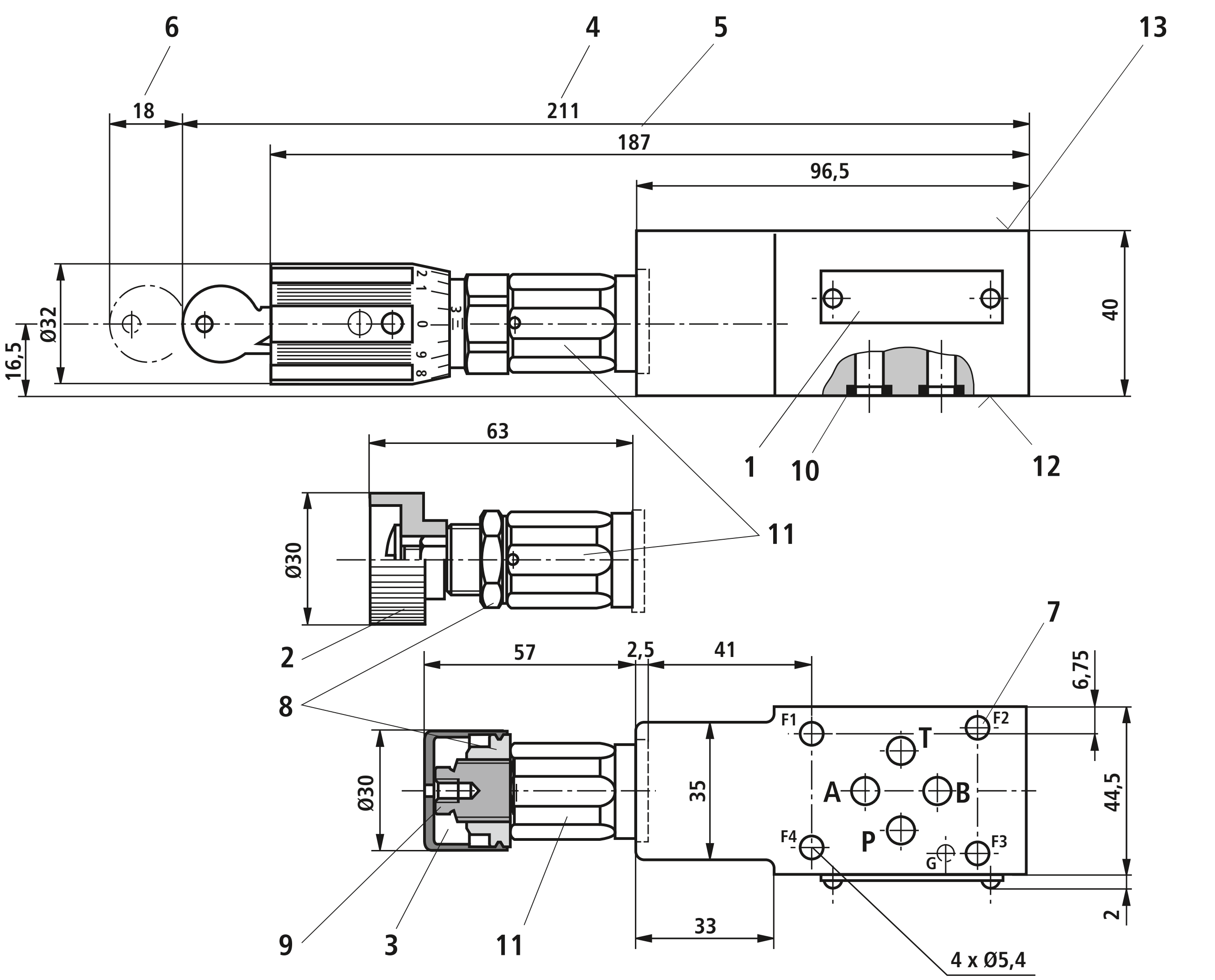
$p_{E\,min}$–q_V– characteristic curves

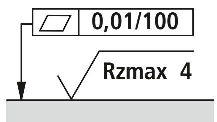


1 VD (A to B)
2 VA
3 VB, VC
4 VP, VD

The characteristic curves are valid for an outlet pressure = zero over the entire flow range!

Unit dimensions: type ZDB 6 VA... (nominal dirmensions in mm)





Required surface finish of the valve mounting surface

1 Name plate

2 Adjustment type "1"

3 Adjustment type "2"

4 Adjustment type "3"

5 Adjustment type "7"

6 Space required to remove the key

7 Valve sixing screw holes

8 Locknut A/F24, tightening torque M_A = 10^{+5} Nm

9 Hexagon A/F10

10 Identical seal rings for ports A, B, P, T (subplate side)

11 Hexagon 24A/F, tightening torque M_A = 50 Nm

12 Subplate side – connection location to DIN 24340 form A (**without** locating pin), or ISO 4401-03-02-0-94 (**with** locating pin Ø3 x 5 mm deep for locating pin ISO 8752-3x8-St, Material No. **R900005694**, separate order)

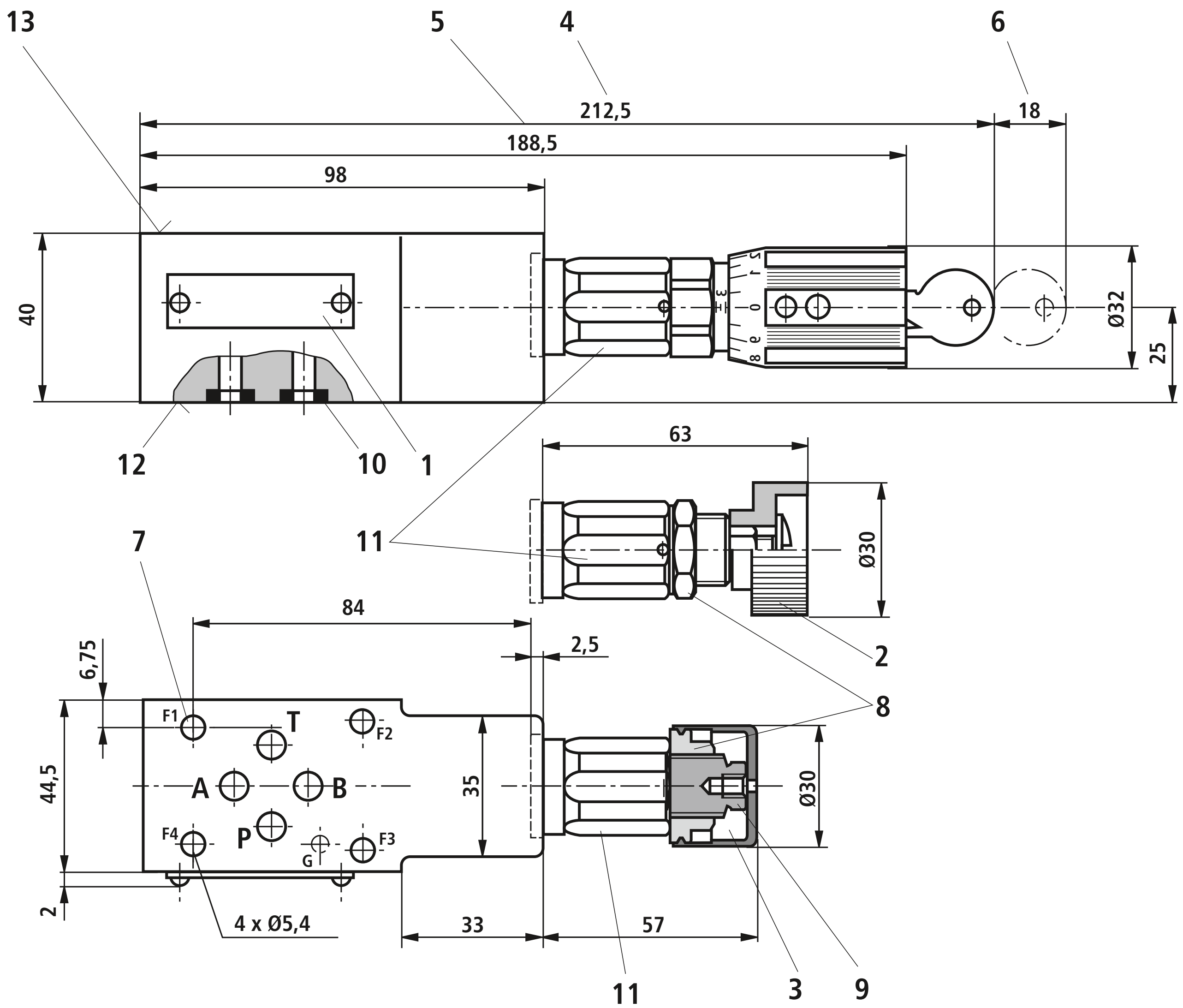
13 Valve side – connection location to DIN 24340 form A (**without** locating pin), or ISO 4401-03-02-0-94 (**with** locating pin Ø4 x 4 mm deep)

Valve fixing screws (separate order)

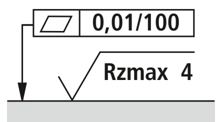
– **4 S.H.C.S. ISO 4762 - M5 - 10.9-flZn-240h-L**
  Friction co-efficient μ_{total} = 0.09 to 0.14;
  Tightening torque M_A = 7.4 Nm ± 10%,
  or

– **4 S.H.C.S. ISO 4762 - M5 - 10.9**
  Friction co-efficient μ_{total} = 0.12 to 0.17,
  Tightening torque M_A = 8.1 Nm ± 10%

Unit dimensions: type ZDB 6 VB... and type ZDB 6 VP... (nomainl dimensions in mm)



1 Name plate
2 Adjusment type "1"
3 Adjusment type "2"
4 Adjusment type "3"
5 Adjusment type "7"
6 Space required to remove the key
7 Valve fixing screw holes
8 Locknut 24A/F, tightening torque $M_A = 10^{+5}$ Nm
9 Hexagon 10A/F
10 Identical seal rings for ports A, B, P, T (subplate side)
11 Hexagon 24A/F, tightening torque $M_A = 50$ Nm
12 Valve side – connection location to DIN 24340 form A (**without** locating pin), or ISO 4401-03-02-0-94 (**with** locating pin Ø3 x 5 mm deep for locating pin ISO 8752-3x8-St, Material No. **R900005694**, separate order)
13 Valve side – connection location to DIN 24340 form A (**without** locating pin), or ISO 4401-03-02-0-94 (**with** locating pin Ø4 x 4 mm deep)

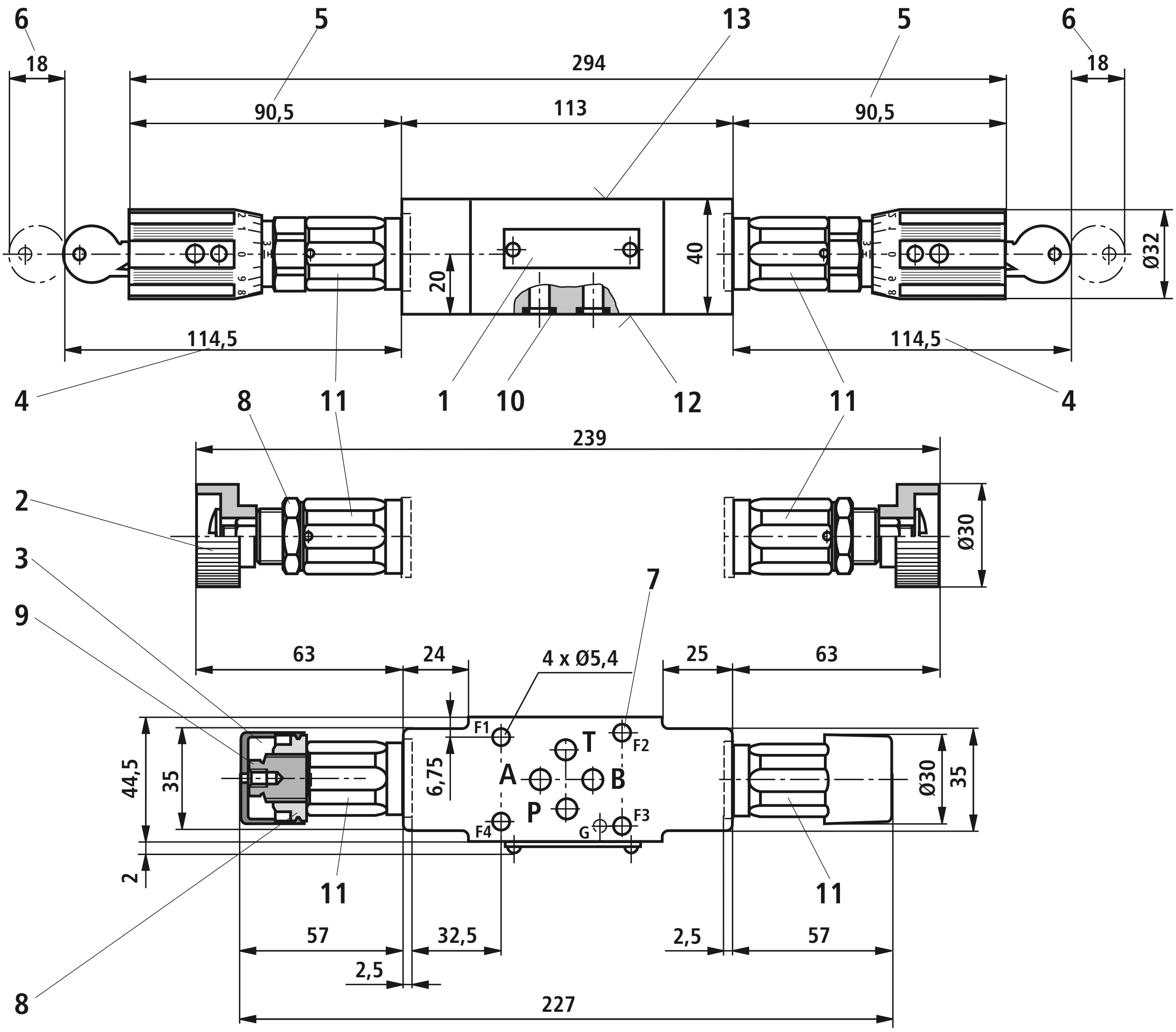


Required surface finish of the valve mounting surface

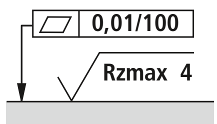
Valve fixing screws (separate order)

- **4 S.H.C.S. ISO 4762 - M5 - 10.9-flZn-240h-L**
  Friction co-efficient $\mu_{total} = 0.09$ to 0.14;
  Tightening torque $M_A = 7.4$ Nm ± 10%,
  or
- **4 S.H.C.S. ISO 4762 - M5 - 10.9**
  Friction co-efficient $\mu_{total} = 0.12$ to 0.17,
  Tightening torque $M_A = 8.1$ Nm ± 10%

Unit dimensions: type Z2DB 6 VC... and type Z2DB 6 VD... (nominal dimensions in mm)



1 Name plate
2 Adjustment type "1"
3 Adjustment type "2"
4 Adjustment type "3"
5 Adjustment type "7"
6 Space required to remove the key
7 Valve fixing screw holes
8 Locknut 24A/F, tightening torque $M_A = 10^{+5}$ Nm
9 Hexagon 10A/F
10 Identical seal rings for ports A, B, P, T (valve side)
11 Hexagon 24A/F, tightening torque $M_A = 50$ Nm
12 Subplate side – connection location to DIN 24340 form A (**without** locating pin), or ISO 4401-03-02-0-94 (**with** locating pin Ø3 x 5 mm deep for locating pin ISO 8752-3x8-St, Material No. **R900005694**, separate order)
13 Valve side – connection location to DIN 24340 form A (**without** locating pin), or ISO 4401-03-02-0-94 (**with** locating pin Ø4 x 4 mm deep)



Required surface finish of the valve mounting surface

Valve fixing screws (separate order)

- **4 S.H.C.S. ISO 4762 - M5 - 10.9-flZn-240h-L**
  Friction co-efficient $\mu_{total} = 0.09$ to 0.14;
  Tightening torque $M_A = 7.4$ Nm ± 10%,
  or
- **4 S.H.C.S. ISO 4762 - M5 - 10.9**
  Friction co-efficient $\mu_{total} = 0.12$ to 0.17,
  Tightening torque $M_A = 8.1$ Nm ± 10%

Notes

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www.boschrexroth.de

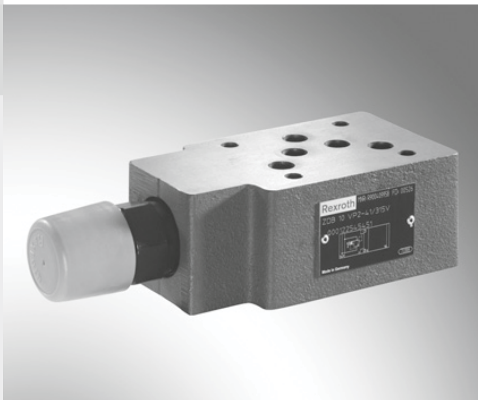
Rexroth
Bosch Group

Pressure relief valve, pilot operated

RE 25761/05.11
Replaces: 02.03

Type ZDB and Z2DB

Size 10
Component series 4X
Maximum operating pressure 315 bar *[4600 psi]*
Maximum flow 100 l/min *[26.4 US gpm]*



H7747

Table of contents

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Features

– Sandwich plate valve
– Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
– 4 pressure ratings
– 6 circuit options
– With 1 or 2 pressure valve cartridges
– 4 adjustment types for pressure adjustment, optional:
  • Rotary knob
  • Bushing with hexagon and protective cap
  • Lockable rotary knob with scale
  • Rotary knob with scale

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z		DB	10		–4X/			*

Sandwich plate **= Z**

1 pressure valve cartridge **= No code**
(Only with version "VA", "VB", "VT" and "VP")

2 pressure valve cartridges **= 2**
(Only with version "VC" and "VD")

Pressure relief valve **= DB**

Size 10 **= 10**

Relief function from - to:

A – TA	**= VA**
P – TA	**= VP**
TB1 – TA2	**= VT**
B – TB	**= VB**
A – TA and B – TB	**= VC**
A – B and B – A	**= VD**

Further details in the plain text

Seal material

No code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

50 = Setting pressure up to 50 bar *[725 psi]*
100 = Setting pressure up to 100 bar *[1450 psi]*
200 = Setting pressure up to 200 bar *[2900 psi]*
315 = Setting pressure up to 315 bar *[4600 psi]*

4X = Component series 40 to 49
(40 to 49: Identical installation and connection dimensions)

Adjustment type for pressure adjustment

1 = Rotary knob
2 = Bushing with hexagon and protective cap
3 = Lockable rotary knob with scale [1)]
7 = Rotary knob with scale

1) H-key with Material no. **R900008158** is included in the delivery

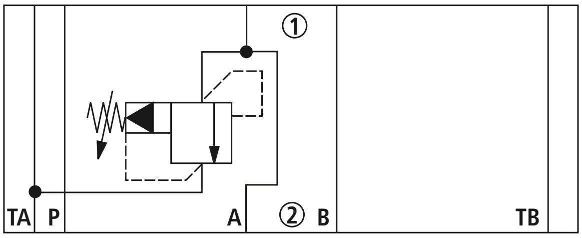
Note!

To port X and Y bored according to ISO 4401-05-05-0-05 (e.g. for pilot operated directional valve size 10), version **"SO30"** at the end of the ordering code applies!

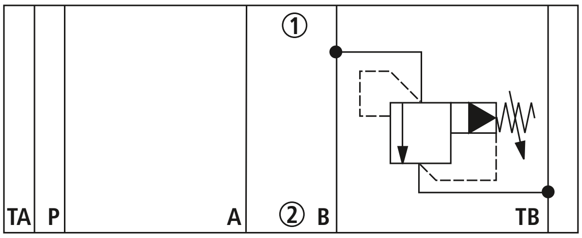
Standard types and standard units are contained in the EPS (standard price list).

Symbols (① = component side, ② = plate side)

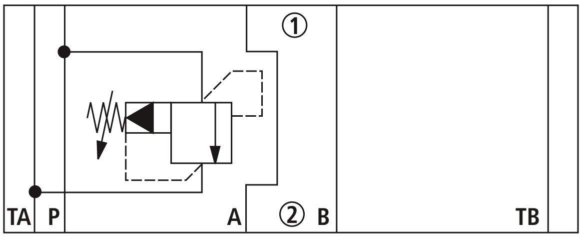
Type ZDB 10 VA…



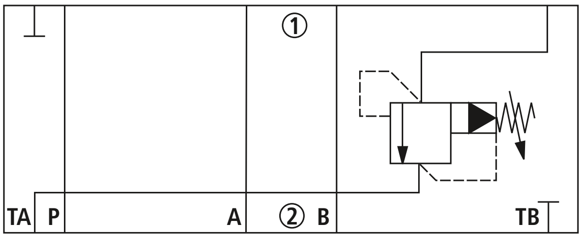
Type ZDB 10 VB…



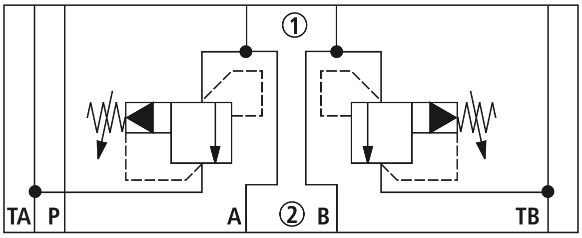
Type ZDB 10 VP…



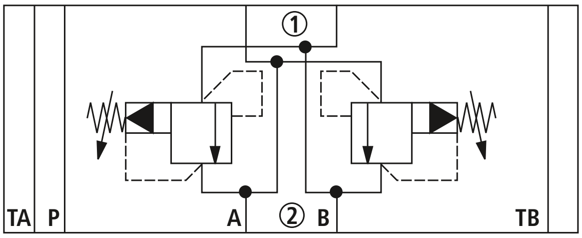
Type ZDB 10 VT…



Type Z2DB 10 VC…



Type Z2DB 10 VD…



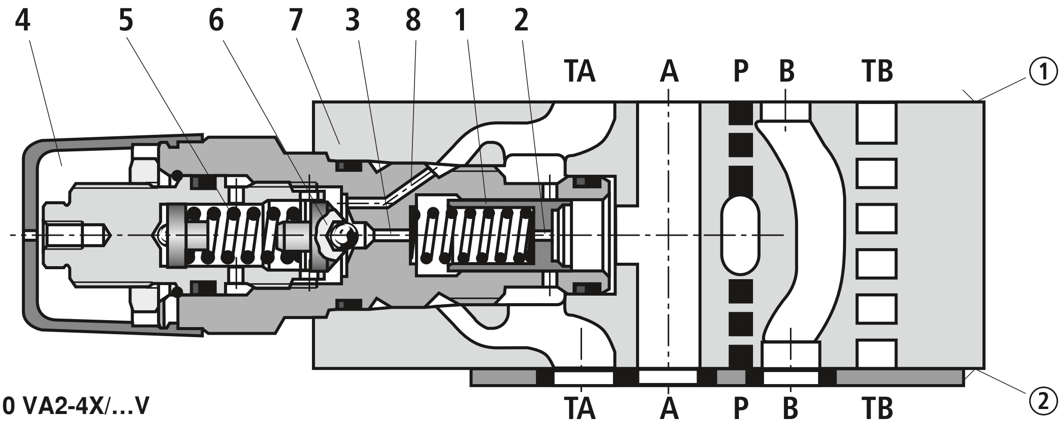
☞ **Note!**

Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.

Function, section

Pressure valves of type ZDB and Z2DB are pilot operated pressure relief valves in sandwich plate design. They are used for limiting a system pressure. The valves basically consist of a housing (7) and one or two pressure valve cartridges. The system pressure can be set via the adjustment type (4).

In the initial position the valves are closed. The pressure in channel A acts on the spool (1). At the same time, the pressure is applied to the spring-loaded side of the spool (1) via nozzle (2) and to the pilot poppet (6) via nozzle (3). If the pressure in channel A exceeds the value set at the spring (5), the pilot poppet (6) opens. Hydraulic fluid flows from the spring-loaded side of the spool (1), nozzle (3) and channel (8) into the channel T (TA). The resulting pressure drop moves the spool (1) and opens the connection A to T (TA). In channel A, the pressure set at the spring (5) is set.



Type ZDB 10 VA2-4X/…V

① = component side

② = plate side

Technical Data (For applications outside these parameters, please consult us!)

general

Weight	– Type ZDB	kg *[lbs]*	Approx. 2.4 *[5.3]*
	– Type Z2DB	kg *[lbs]*	Approx. 2.6 *[5.7]*

hydraulic

Maximum operating pressure	bar *[psi]*	315 *[4600]*
Maximum setting pressure	bar *[psi]*	50 *[725]*; 100 *[1450]*; 200 *[2900]*; 315 *[4600]*
Maximum flow	l/min *[US gpm]*	100 *[26.4]*
Hydraulic fluid		See table below
Hydraulic fluid temperature range	°C *[°F]*	–20 to +80 *[–4 to +176]*
Viscosity range	mm^2/s *[SUS]*	10 to 800 *[60 to 3710]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

☞ **Important information on hydraulic fluids!**

- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

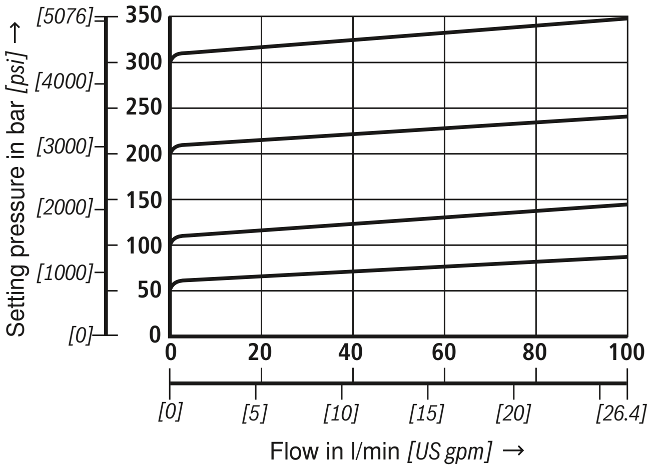
- **Flame-resistant – water-containing**:
  - Maximum operating pressure 210 bar
  - Maximum hydraulic fluid temperature 60 °C
  - Expected service life as compared to HLP hydraulic oil 30 % to 100 %

1) The cleanliness classes stated for the components need to be maintained in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

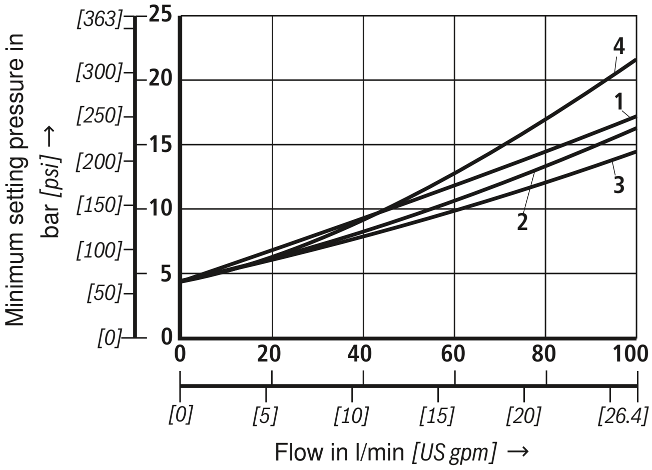
For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

p_E-q_V characteristic curves



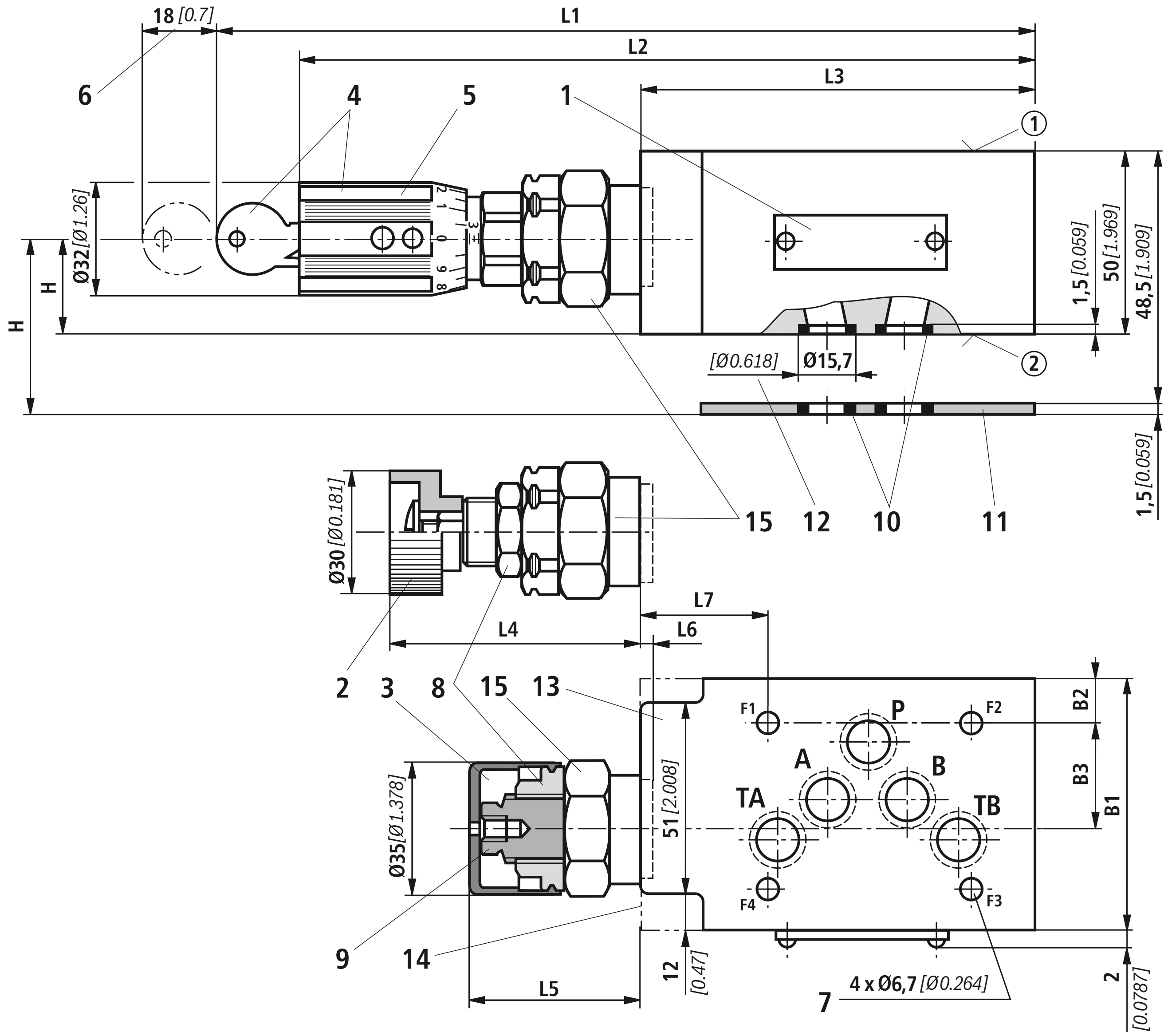
$p_{E\,min}$-q_V characteristic curves



The characteristic curves apply to the pressure at the valve output ***p*** = 0 bar across the entire flow range.

1 VD (A to B)
2 VA
3 VB, VC, VT
4 VP, VD (B to A)

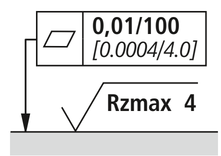
Unit dimensions: Type ZDB 10 VA, VP and VT (dimensions in mm *[inch]*)



Item explanations and valve mounting screws see page 10.

Notes!

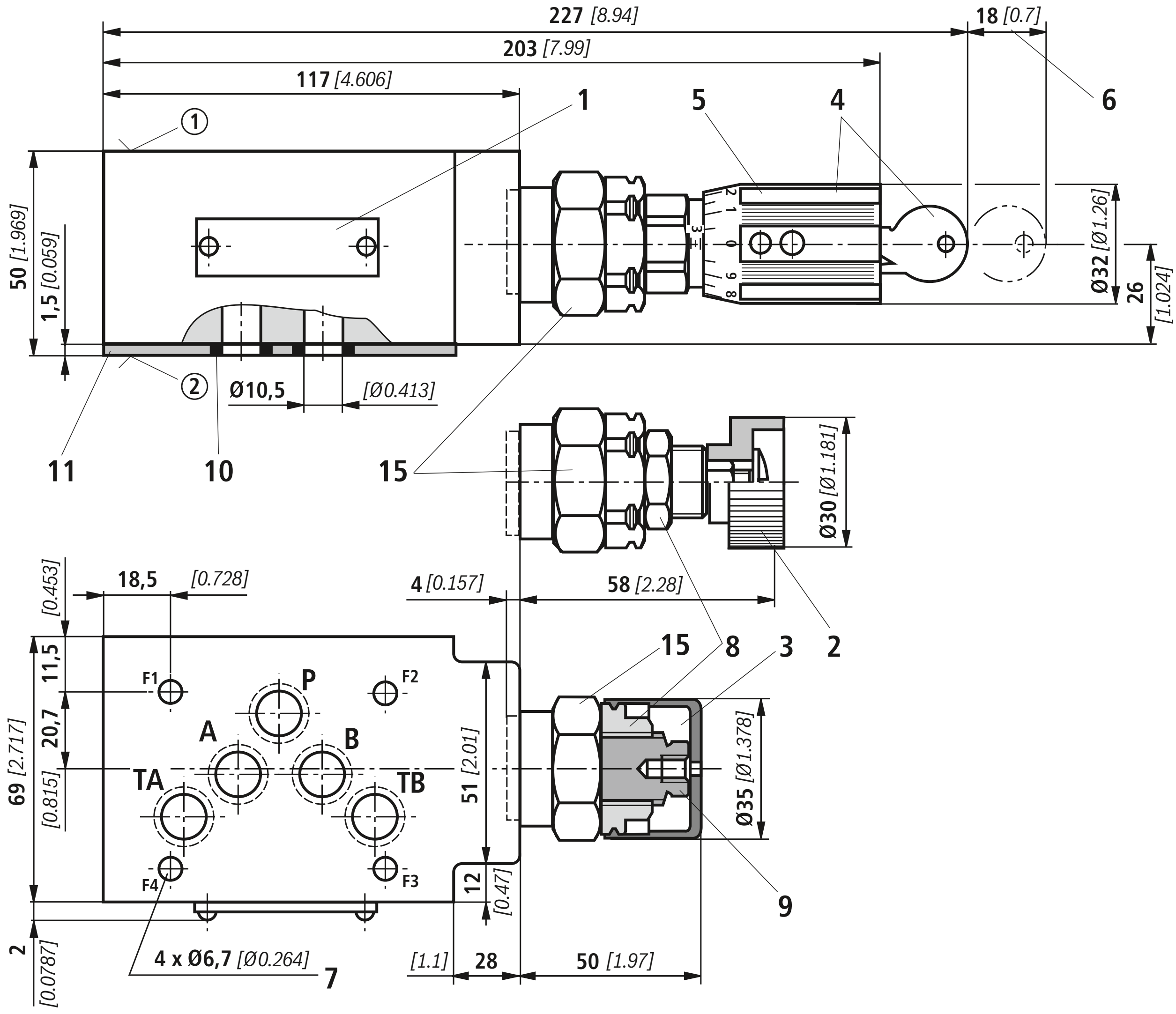
- To port X and Y bored according to ISO 4401-05-05-0-05 (e.g. for pilot operated directional valve size 10), version **"SO30"** at the end of the ordering code applies!
- Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.



Required surface quality of the valve mounting face

Type	B1	B2	B3	H	L1	L2	L3	L4	L5	L6	L7
VA and VP	69 *[2.72]*	11.5 *[0.45]*	20.7 *[0.82]*	26 *[1.02]*	227 *[8.94]*	203 *[7.99]*	117 *[4.61]*	57.6 *[2.27]*	50.3 *[1.98]*	4 *[0.16]*	45.5 *[1.79]*
VT	70 *[2.76]*	12 *[0.47]*	27 *[1.06]*	25 *[0.98]*	218 *[8.58]*	194 *[7.64]*	105 *[4.13]*	60.9 *[2.40]*	53.6 *[2.11]*	0.7 *[0.027]*	32.5 *[1.28]*

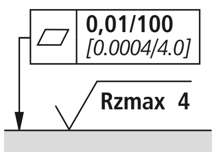
Unit dimensions: Type ZDB 10 VB (dimensions in mm *[inch]*)



Item explanations and valve mounting screws see page 10.

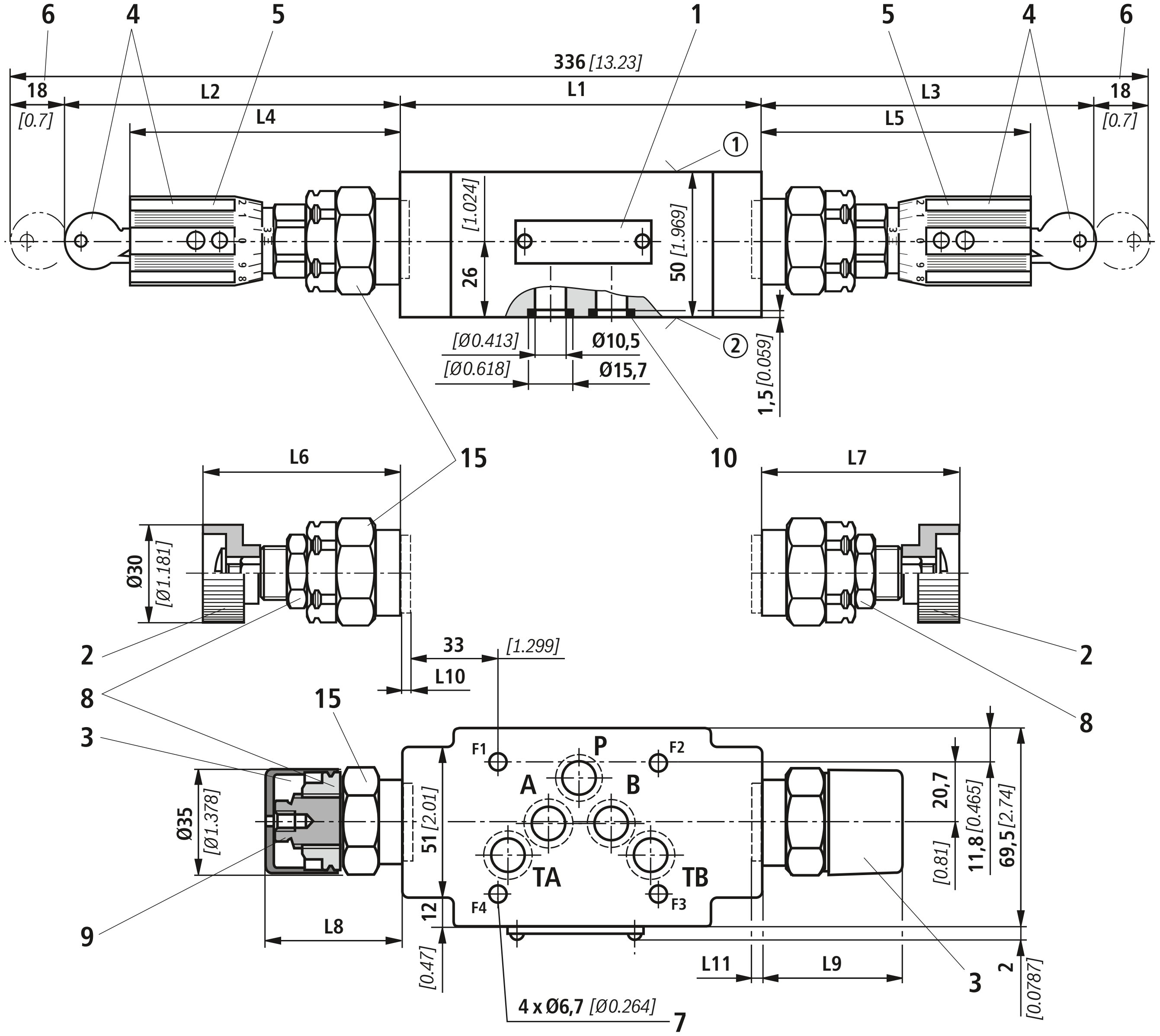
☞ **Notes!**

- To port X and Y bored according to ISO 4401-05-05-0-05 (e.g. for pilot operated directional valve size 10), version **"SO30"** at the end of the ordering code applies!
- Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.

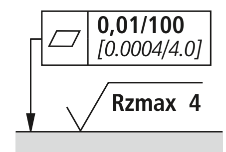


Required surface quality of the valve mounting face

Unit dimensions: Type Z2DB 10 VC and VD (dimensions in *[inch]*)



Item explanations and valve mounting screws see page 10.



Required surface quality of the valve mounting face

☞ **Notes!**

- To port X and Y bored according to ISO 4401-05-05-0-05 (e.g. for pilot operated directional valve size 10), version **"SO30"** at the end of the ordering code applies!
- Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.

Type	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11
VC	123 *[4.84]*	111 *[4.37]*	112 *[4.40]*	89 *[3.50]*	90 *[3.54]*	59 *[2.32]*	60 *[2.36]*	52 *[2.05]*	53 *[2.09]*	2 *[0.08]*	1 *[0.04]*
VD	132 *[5.20]*	107 *[4.20]*	112 *[4.40]*	85 *[3.30]*	90 *[3.54]*	56 *[2.20]*	56 *[2.20]*	49 *[1.93]*	49 *[1.93]*	6 *[0.24]*	6 *[0.24]*

Unit dimensions

1 Name plate
2 Adjustment type "1"
3 Adjustment type "2"
4 Adjustment type "3"
5 Adjustment type "7"
6 Dimensions required to remove the key
7 Valve mounting bores
8 Lock nut SW24
9 Hexagon SW10
10 Identical seal rings for ports A, B, P, TA, TB (plate side)
11 Sealing plate 80 x 70 x 1.5 *[2.76 x 3.15 x 0.06]* (only with version "VA" and "VP")
12 Counterbore (only with version "VT")
13 Version "VA" and "VP"
14 Version "VT"
15 Hexagon SW30, tightening torque M_A = 50 Nm *[36.8 ft-lbs]*

① Component side – porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
② Component side – porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05

Valve mounting screws (separate order)

4 hexagon socket head cap screws metric
ISO 4762 - M6 - 10.9-flZn-240h-L

4 hexagon socket head cap screws 1/4-20 UNC

☞ **Note!**
Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

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The Drive & Control Company

Rexroth
Bosch Group

Pump safety block

Type DBA, DBAW, DBAE(E)

RE 25891
Edition: 2013-05
Replaces: 11.10

H5872

- Size 16, 25, 32
- Component series 2X
- Maximum operating pressure 350 bar
- Maximum flow 400 l/min

Features

- Depressurized start-up and circulation of the pump
- Intended for direct mounting onto the SAE pressure port of the pump
- Low circulation pressure due to short distance
- Low compression volume for soft switching to depressurized circulation
- Quick pressure build-up
- 4 adjustment types for pressure adjustment, optionally:
  – Rotary knob
  – Bushing with hexagon and protective cap
  – Lockable rotary knob with scale
  – Rotary knob with scale
- 5 pressure ratings, optional
- Low noise level due to direct flange mounting onto the pump

Contents

Ordering code

01	02	03	04	05	06	07	08		09	10	11	12	13	14	15	16	17	18	19	20
DBA							**2X**	**/**												*****

01	Pump safety block	**DBA**

02	**Without** directional valve	**no code**
	With mounted directional spool valve (data sheet 23178)	**W**
	With mounted proportional pressure relief valve for external control electronics, type DBET-6X/.Y... [1]	**E**
	With mounted proportional pressure relief valve with integrated control electronics, type DBETE-6X/.Y... [1]	**EE**

03	Size 16	**15**
	Size 25	**25**
	Size 32	**30**

04	**Without** directional valve	**no code**
	With mounted directional valve, normally closed	**A** [2]
	With mounted directional valve, normally open; generally type DBAE(E)	**B** [2]

Type of connection/SAE flange [3]

05	Standard flange (3000 ... 5000 psi)	**F**
	High-pressure flange (5000 psi)	**H**

Adjustment type for pressure adjustment [4]

06	Rotary knob (rotary knob with "KW" scale)	**1**
	Sleeve with hexagon and protective cap (spindle with protective cap "S"; adjustment at pressure switch "AS")	**2**
	Lockable rotary knob with scale (lockable rotary knob with "KS" scale)	**3** [5]
	Rotary knob with scale (rotary knob with "KW" scale)	**7**

07	**Without** pressure switch	**–**
	With mounted pressure switch type HED 8 OH... (connector according to DIN EN 175301-803, without mating connector), (data sheet 50061)	**D** [6]

08	Component series 20 ... 29 (20 ... 29: Unchanged installation and connection dimensions)	**2X**

Pressure rating [7]

09	Set pressure up to 50 bar	**50**
	Set pressure up to 100 bar	**100**
	Set pressure up to 200 bar	**200**
	Set pressure up to 315 bar	**315**
	Set pressure up to 350 bar	**350**

10	**Without** additional pressure relief valve	**no code**
	With mounted pressure relief valve type ZDB 6 VB...-4X/..SO2 (data sheet 25751)	**Z** [7]
	With mounted pressure relief valve type Z2DB 6 VC...-4X/..SO2 (data sheet 25751)	**ZZ** [7; 8]

11	Standard version	**no code**
	Valve for minimum cracking pressure (not type DBAE(E))	**U**

12	**Without** directional valve	**no code**
	With directional spool valve (only type DBAW)	**6E** [2]

13	DC voltage 24 V (in general with model "DBAE(E)...")	**G24** [2]
	DC voltage 205 V	**G205** [2]
	AC voltage 230 V 50/60 Hz	**W230** [2]

☞ **Notice!** Preferred types and standard units are contained in the EPS (standard price list).

Ordering code

01	02	03	04	05	06	07	08		09	10	11	12	13	14	15	16	17	18	19	20
DBA							**2X**	**/**												*****

14	**With** concealed manual override (standard)	**N9** 2; 9)
	With manual override	**N** 2; 9)
	Without manual override	**no code**

Electrical connection 1)

15	**Individual connection**	
	Without mating connector; connector DIN EN 175301-803	**K4** 6)
	Without mating connector; connector DIN EN 175201-804 (only model "DBAEE...")	**K31** 6)

Interface electronics

16	**Without** electronics (models "DBA..." and "DBAW")	**no code**
	Command value 0 ... 10 V (only model "DBAEE...")	**A1**
	Command value 4 ... 20 mA (only model "DBAEE...")	**F1**
	External control electronics (only model "DBAE...")	**H1**

Nozzle fitting

17	**Displacement pumps**	
	Lateral channel closed, transverse channel open, pilot oil bore open; (standard for displacement pumps; pure DB/DBW function)	**no code**
	Variable displacement pumps	
	Lateral channel closed, transverse channel open, pilot oil bore closed (e.g. for axial piston variable displacement pump type A4VSO140 with DRG controller)	**A00**
	Nozzle Ø0.8 mm in lateral channel, transverse channel open; pilot oil bore closed (standard for control pumps with DFR1 or DFLR controller)	**A08** 10)
	Nozzle Ø1.0 mm in lateral channel, transverse channel open; pilot oil bore closed (for nozzle fitting of the block, refer to the circuit examples on pages 6 to 8)	**A10** 10)

Seal material

18	NBR seals	**no code**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

Type-examination procedure

19	**Without** type-examination procedure	**no code**
	Type-examination tested safety valve according to PED 97/23/EC	**E**

20	Further details in the plain text	

1) Externally discharge the pilot oil from the proportional pressure relief valve type DBET(E)

2) The ordering code is only required for models with mounted directional spool valve type DBAW or proportional pressure relief valve type DBAE(E).

3) Please observe pressure ratings and connection dimensions on page 20!

4) Adjustment type for pressure switch type HED 8 in brackets!

5) H-key with material no. **R900008158** is included in the scope of delivery.

6) Mating connectors, separate order, see page 24 and/or page 19 for model "DBAEE".

7) The same pressure rating at pressure limitation screw-in cartridge valves type DB 20 K, pressure relief valve (sandwich plate valve) type Z(2)DB 6 and pressure switches type HED 8.

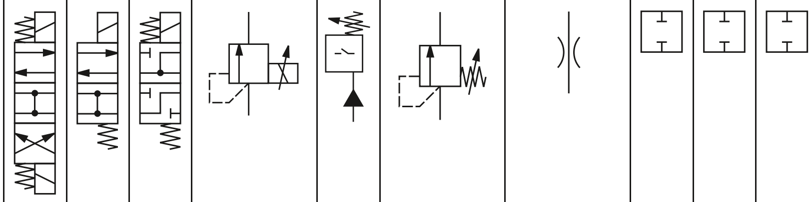
8) Only if used for pressure limitation and control of variable displacement pumps type A10VSO.

9) **Notice!** Accidental activation of the manual override may lead to uncontrolled machine movements!

10) If used on variable displacement pumps with DFLR controllers, the nozzle at port X of the pump control must be removed!

Model code

01	02	03	04	05	06	07	08		09	10	11	12	13	14	15	16	17	18	19	20
DBA							**2X**	**/**												*****



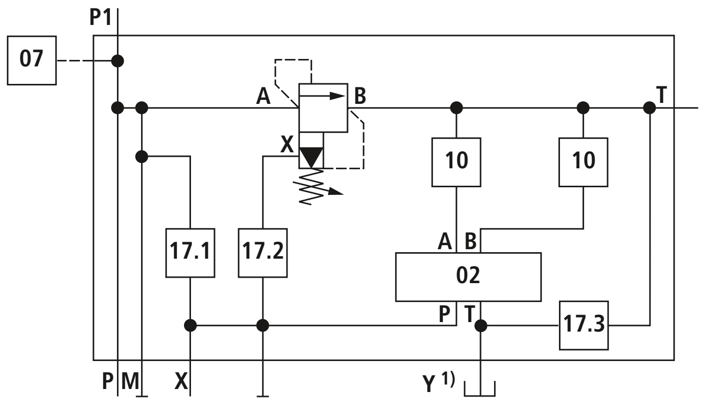
		02						07	10		17.1			17.2	17.3
		Cover plate HSA 06 A 001 ...	4WE 6 H 6X..	4WE 6 HB 6X..	4WE 6 L37B.6X/..	DBET-6X/.Y.K4	DBETE-6X/.Y.K31	HED 8 OH 2X/...K14..	ZDB 6 VB.-4X/...SO2	Z2DB 6 VC.-4X/...SO2	Nozzle Ø0.8 in lateral channel	Nozzle Ø1.0 in lateral channel	Plug in lateral channel	Plug in pilot oil bore/cartridge	Plug in pilot oil bore
01	**DBA**	X													
02	**W**		X	X	X										
	E					X									X
	EE						X								X
04	**A** (normally closed)				X										
	B (normally open)		X[1]	X[2]		X[3]	X[4]								
07	**–** (without pressure switch)							–							
	D (with pressure switch)							X							
10	**–** (standard valve [5])								–	–					
	Z (max. 2 pressure limitations)								X						
	ZZ (max. 3 pressure limitations)									X					
17	**no code** [6]												X		
	A00												X	X	
	A08										X			X	
	A10											X		X	

1) For model "DBAW" with pressure relief valve type Z(2)DB
2) For model "DBAW" without pressure relief valve type Z(2)DB
3) For model "DBAE" for external electronic controls/amplifier card
4) For model "DBAEE" with internal electronic controls/amplifier card
5) Only 1 pressure limitation
6) Standard for displacement pumps

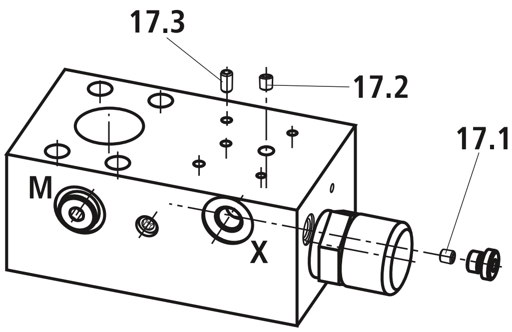
General circuit example set-ups can be found on page 5.

General circuit example set-up

Symbol



Disposition of nozzles/plugs item 17.1, 17.2 and 17.3

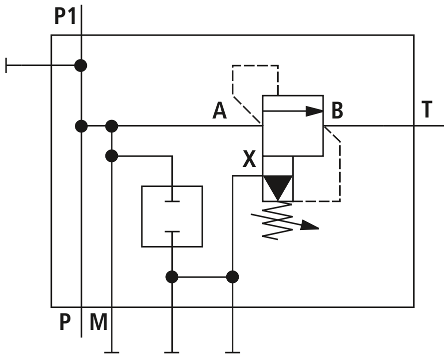


1) Only type DBAE(E)

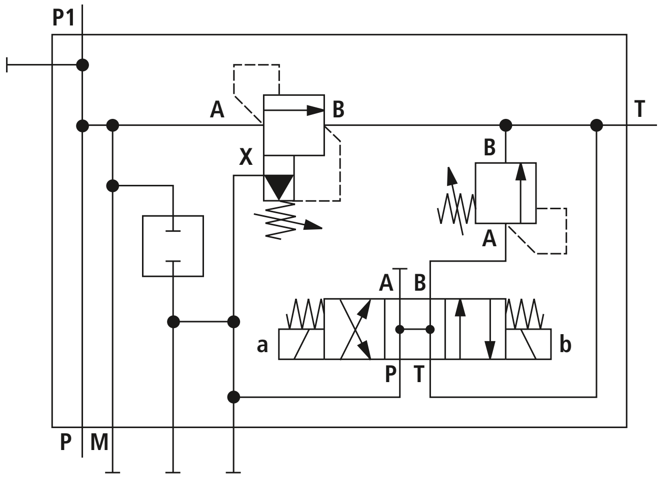
Model codes can be found on page 4.

Circuit examples: For displacement pumps (selection)

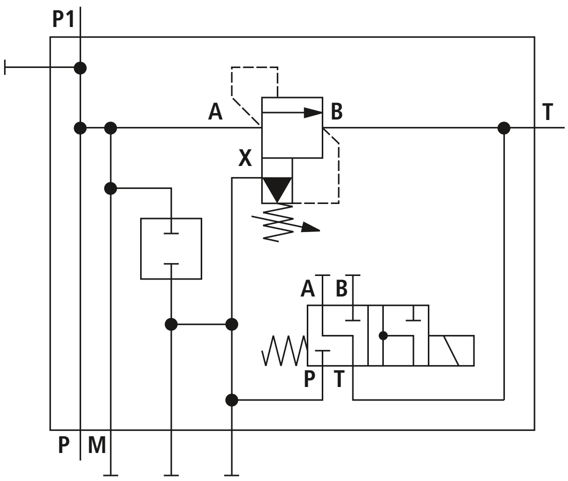
Type DBA…2X/…



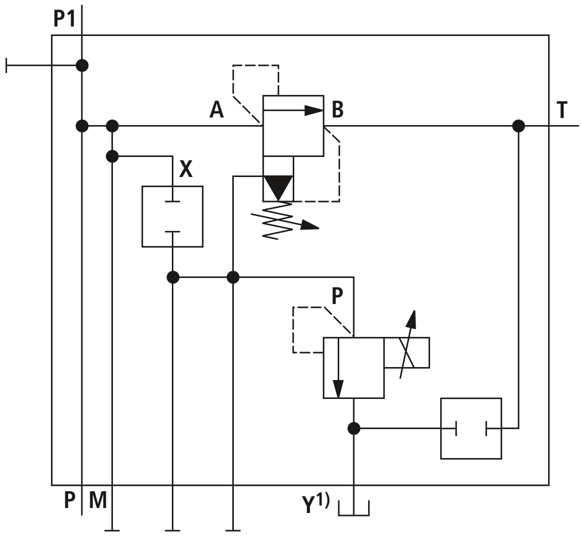
Type DBAW.B…2X/.Z



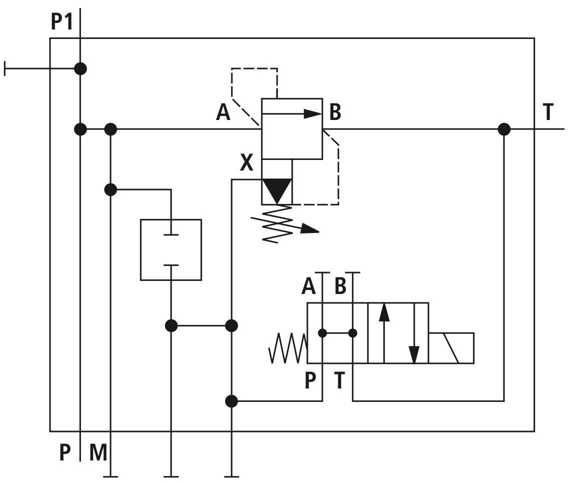
Type DBAW.A…2X/…



Type DBAE(E)…2X/…



Type DBAW.B…2X/…

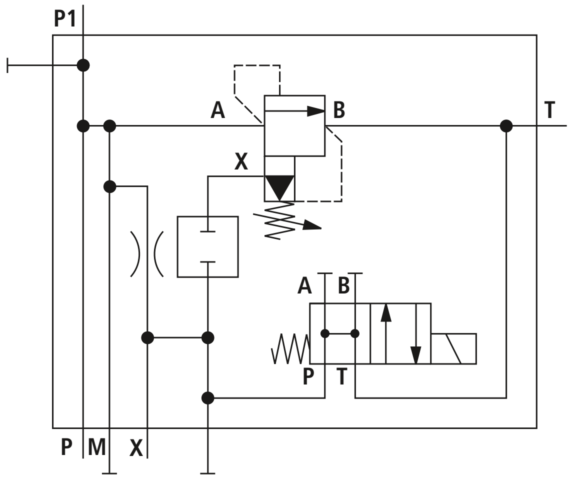


1) **Notice!**
Port Y of the proportional pressure relief valve type DBET mounted on the pump safety block type DBA must be connected to the tank in a depressurized way (possibly by means of the leakage line of the hydraulic system)!

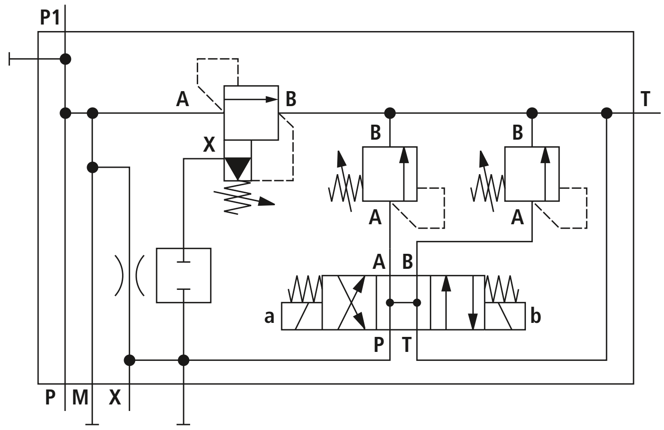
Circuit examples: For variable displacement pump (selection)

▶ **Preferably for axial piston variable displacement pumps type A10VSO with DR, DFR1 or DFLR controller** [2)]

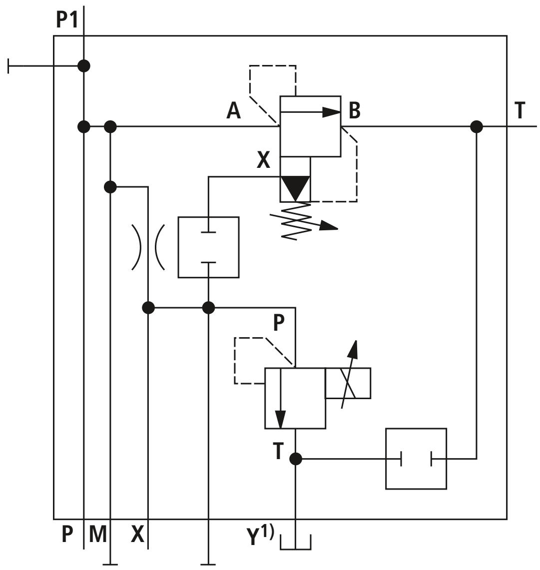
Type DBAW.B...2X/...A08



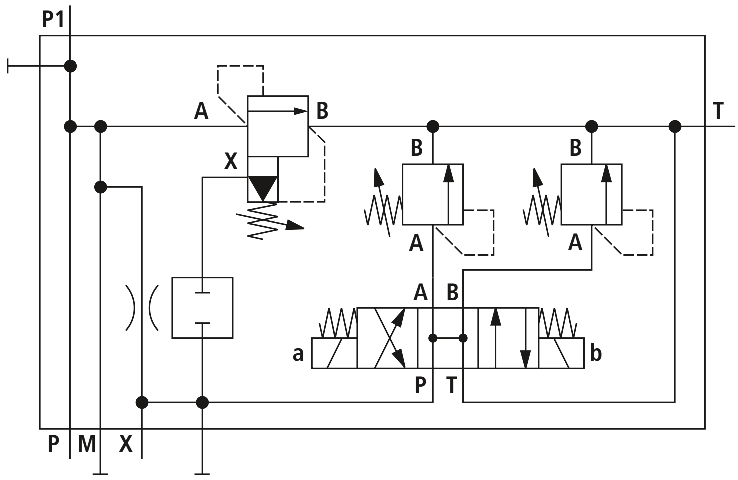
Type DBAW.B...2X/.Z...A08



Type DBAE(E)...2X/...A08



Type DBAW.B...2X/.ZZ...A08



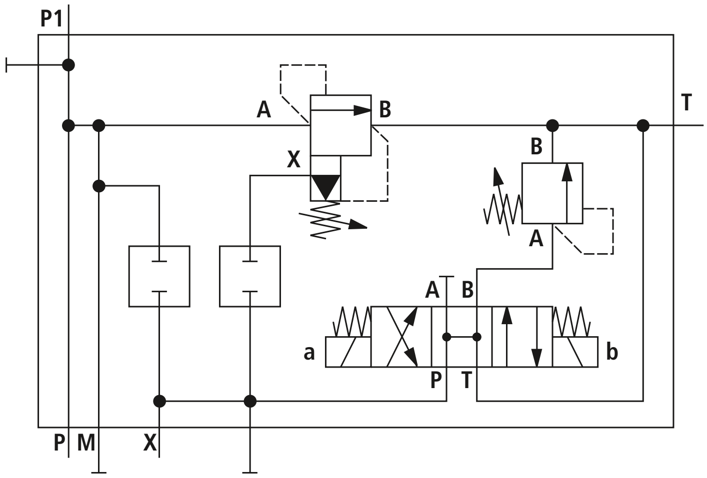
1) **Notice!**
Port Y of the proportional pressure relief valve type DBET mounted on the pump safety block type DBA must be connected to the tank in a depressurized way (possibly by means of the leakage line of the hydraulic system)!

2) **Notice!**
If used on variable displacement pumps with DFLR controller, the nozzle at port X of the pump control must be removed!

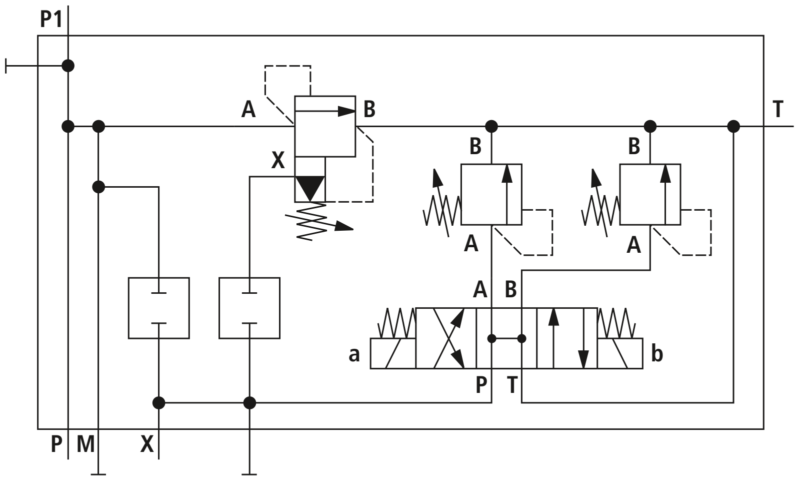
Circuit examples: For variable displacement pumps (selection)

▶ **Preferably for axial piston variable displacement pumps type A10VSO with DRG controller**

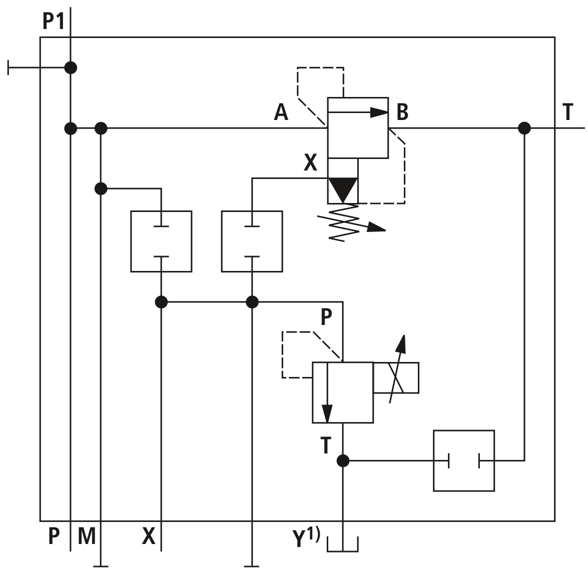
Type DBAW.B...2X/.Z...A00



Typ DBAW.B...2X/.ZZ...A00



Typ DBAE(E)...2X/...A00



1) **Notice!**
Port Y of the proportional pressure relief valve type DBET mounted on the pump safety block type DBA must be connected to the tank in a depressurized way (possibly by means of the leakage line of the hydraulic system)!

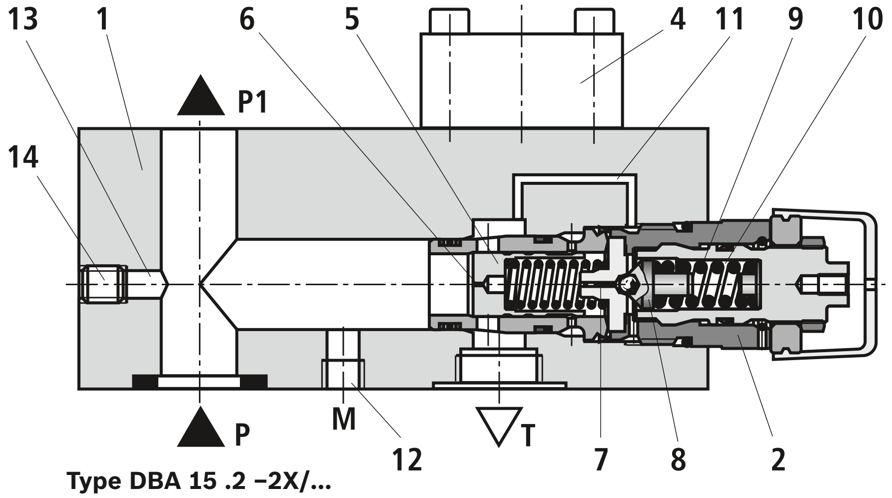
Function, sections: Type DBA...

General

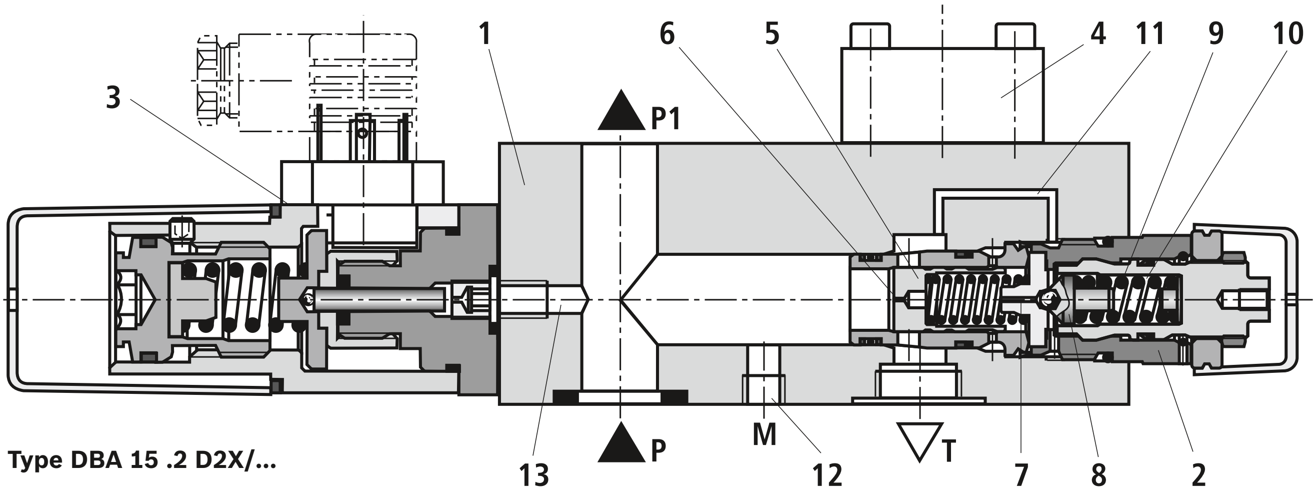
Pump safety blocks type DBA are pilot operated pressure relief valves which are integrated into a block and intended to be mounted directly onto SAE pressure ports of pumps.
They are used for limiting (type DBA) or limiting and solenoid-actuated unloading (type DBAW, DBAE) the operating pressure.
Pump safety blocks generally consist of valve block (1) and pressure limitation screw-in cartridge valve type DB 20 K (2) (data sheet 25818). Optionally, a pressure switch type HED 8 (3) (data sheet 50061) can be installed on the valve block.
The valve housing is equipped with a port P for hydraulic fluid input and port P1 for hydraulic fluid output. In a branch of the through connection between these two ports, the pressure limitation screw-in cartridge valve can be found. By opening this valve, a connection to port T (tank line) is established.
At the standard model, connection diagram size 6 is covered with the cover plate (4). The pressure in the through connection (P - P1) has an effect on the main control spool (5) of the pressure limitation screw-in cartridge valve. Via the nozzle bores (6 and 7), the pressure is at the same time applied to the poppet (8). If the pressure in port P exceeds the value set at spring (9), the poppet (8) opens against the spring (9).
Via the nozzle bores (6 and 7), the hydraulic fluid from channel P flows into the spring chamber (10) and is here internally directed via the control line (11) into the tank.
Due to the state of equilibrium at the main control spool (5), hydraulic fluid flows from channel P to channel T, maintaining the set operating pressure.
A pressure gauge connection (12) allows for the control of the operating pressure.

Pump safety block type DBA...D (with pressure switch)
The use of an electrical pressure switch type HED 8 (3) (data sheet 50061) enables activation and deactivation of an electric circuit via the control line (13).
In basic design, the control line (13) is closed with a plug screw (14).

The pressure gauge connection M and tank port T are illustrated with an offset of 90°!



Type DBA 15 .2 –2X/...



Type DBA 15 .2 D2X/...

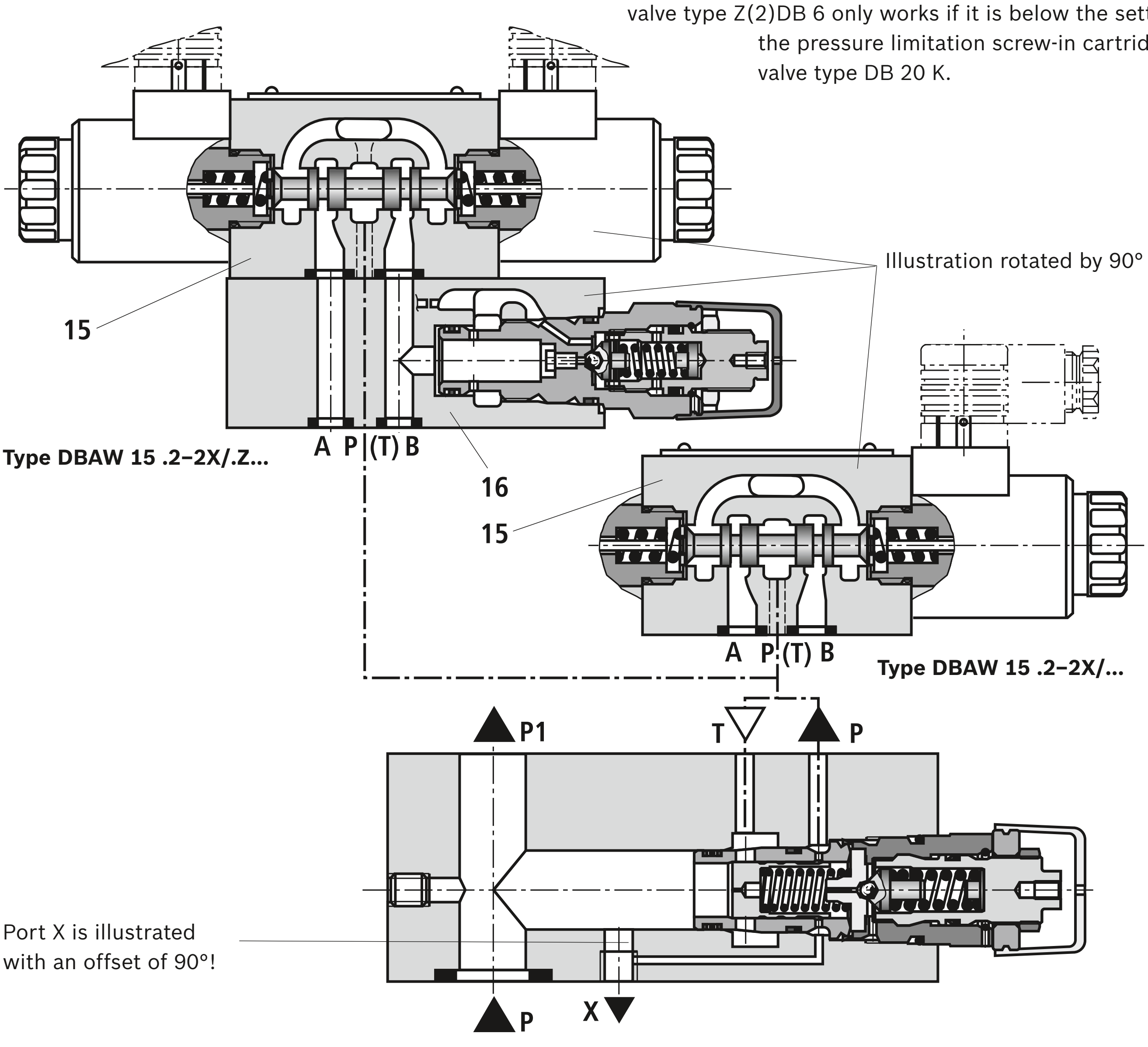
Function, sections: Type DBAW...

Pump safety block type DBAW
The function of this block basically corresponds to the function of block type DBA.... Unloading the main control spool, however, is achieved by controlling the mounted directional valve (15). In this case, no cover plate (4) is required.

Pump safety block type DBAW.B...Z... for displacement pumps (with pressure relief valve)
In general, the function corresponds to type DBAW.... By means of the pressure relief valve type ZDB 6 (16) (data sheet 25751) and actuation of the directional valve (15), the pilot control of the pressure limitation screw-in cartridge valve type DB 20 K is deactivated and the pressure set at the pressure relief valve type ZDB 6 is activated. The pressure adjustment at the pressure relief valve type ZDB 6 only works if it is below the setting of the pressure limitation screw-in cartridge valve type DB 20 K.

Pump safety block type DBAW.B...Z...A for control pump A10V... (with pressure relief valve)
In general, the function corresponds to type DBAW.... By means of the pressure relief valve type ZDB 6 (16) (data sheet 25751) and by actuation of the directional valve (15), a pressure change is achieved at control port X. The pressure change set at the pressure relief valve type ZDB 6 acts on the controller of the pump. The pressure adjustment at the pressure relief valve type ZDB 6 only works if it is below the setting of the pressure limitation screw-in cartridge valve type DB 20 K.

Pump safety block DBAW.B...ZZ...A for control pump A10V.. (with pressure relief valve)
In general, the function corresponds to type DBAW.... By means of the pressure relief valve type Z(2)DB 6 (16) (data sheet 25751) and by actuation of the directional valve (15), two pressure adjustments are possible at control port X. The pressure adjustment at the pressure relief valve type Z(2)DB 6 only works if it is below the setting of the pressure limitation screw-in cartridge valve type DB 20 K.

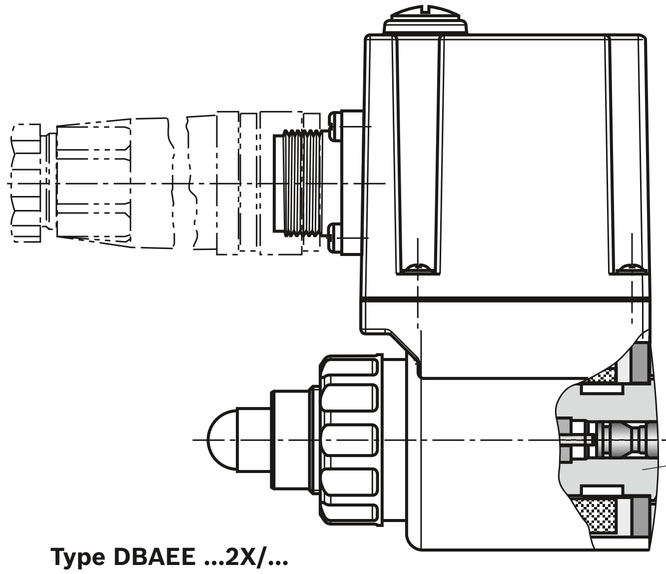


Function, sections: Type DBAE(E)...

Pump safety block type DBAE(E) for displacement pump (with proportional pressure relief valve)
In general, the function corresponds to type DBA....
Unloading at the main control spool, however, is achieved by control of the mounted proportional pressure relief valve type DBET(E)-6X/.Y... (17) (data sheet 29162). The cover plate (4) is not required.

The pressure adjustment at the proportional pressure relief valve type DBET(E) only works if it is below the setting of the pressure limitation screw-in cartridge valve type DB 20 K.

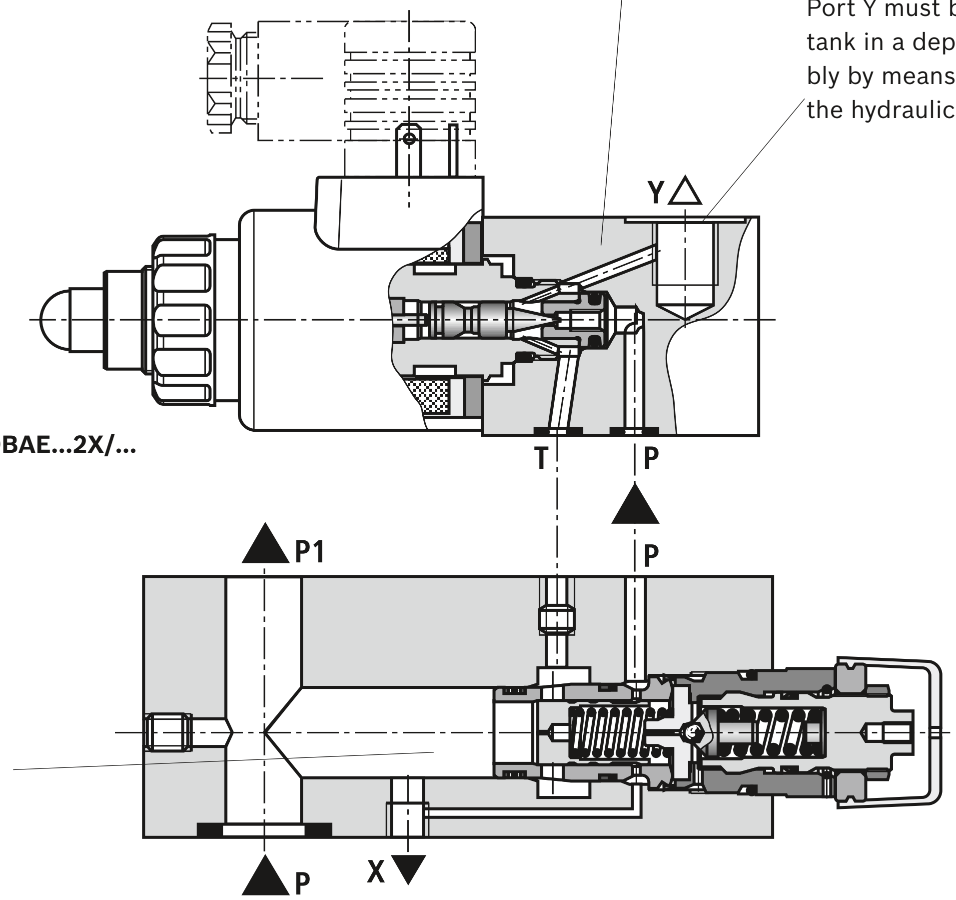
Pump safety block type DBAE(E) for variable displacement pumps type A10V.. (with proportional pressure relief valve)
In general, the function corresponds to type DBA....
By means of the proportional pressure relief valve type DBET(E)-6X/.Y... (17), a pressure change is achieved at the control port X. The pressure change acts on the controller of the pump. The cover plate (4) is not required.
The pressure adjustment at the proportional pressure relief valve type DBET(E) only works if it is below the setting of the pressure limitation screw-in cartridge valve type DB 20 K.



Type DBAEE ...2X/...

17 Illustration rotated by 90°

Port Y must be connected to the tank in a depressurized way (possibly by means of the leakage line of the hydraulic system)!



Type DBAE...2X/...

Port X is illustrated with an offset of 90°!

Technical data
(for applications outside these parameters, please consult us!)

general								
Size		Size	16		25		32	
Weight	Of SAE flange	psi	3000	5000	3000	5000	3000	5000
▶ Pump safety block	Type DBA...	kg	5.4	5.4	5.4	5.3	5.4	6.0
	Type DBAW...	kg	6.1	6.1	6.1	6.0	6.1	6.7
	Type DBAW...Z...	kg	7.9	7.9	7.9	7.8	7.9	8.5
	Type DBAW...ZZ...	kg	8.1	8.1	8.1	8.0	8.1	8.7
	Type DBAE...	kg	6.4	6.4	6.4	6.3	6.4	7.0
	Type DBAEE...	kg	7.0	7.0	7.0	6.9	7.0	7.6
▶ Pressure switches	Type HED 8...	kg	+0.8					
Installation position			Any					
Ambient temperature range			NBR seals			FKM seals		
	– Type DBA...	°C	–30 ... +80			–15 ... +80		
	– Type DBAW...	°C	–30 ... +50			–15 ... +50		
	– Type DBAE(E)...	°C	–20 ... +50			–15 ... +50		

hydraulic					
Maximum operating pressure	– Port P	bar	350		
Maximum counter pressure	– Type DBA...	bar	250		
– Port T	– Type DBAW...	bar	210 at DC and 160 at AC solenoids		
– Port Y	– Type DBAE(E)...	bar	Depressurized to the tank		
Minimum set pressure		bar	Flow-dependent (see characteristic curves page 13)		
Maximum set pressure		bar	50/100/200/315/350 (type HED 8: 50/100/200/350)		
Maximum flow		l/min	300	400	400
Hydraulic fluid			See table page 13		
Hydraulic fluid temperature range			NBR seals	FKM seals	
	– Type DBA(W)...	°C	–30 ... +80	–20 ... +80	
	– Type DBAE(E)...	°C	–20 ... +80	–15 ... +80	
Viscosity range	– Type DBA(W)...	mm^2/s	10 ... 800		
	– Type DBAE(E)...	mm^2/s	15 ... 380		
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1]		

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components. For the selection of the filters, see www.boschrexroth.com/filter.

For more technical data refer to the data sheets:

- ▶ Directional spool valve 23178
- ▶ Pressure relief valve (sandwich plate) 25751
- ▶ Proportional pressure relief valve 29162
  - – Corresponding amplifier (for type DBAE) type VT-VSPA1-2-1X 30115
- ▶ Pressure switches 50061

Deviating technical data for type-examination tested safety valves can be found on page 26.

Technical data
(for applications outside these parameters, please consult us!)

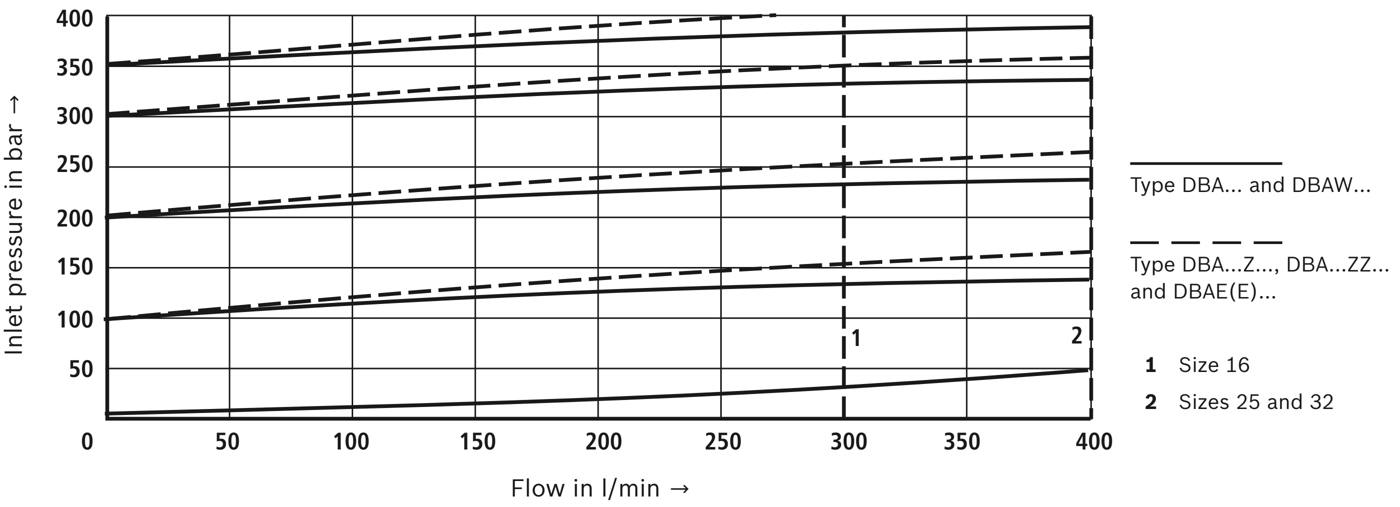
Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils		HL, HLP	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES [1]	FKM	
	– soluble in water	HEPG [1]	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids, refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – containing water**:
  - Maximum pressure difference per control edge 50 bar
  - Pressure pre-loading at the tank port >20% of the pressure differential, otherwise increased cavitation
  - Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%
- **Bio-degradable:** When using bio-degradable hydraulic fluids that are zinc-solving, zinc may accumulate in the fluid (700 mg zinc per pole tube).

[1] Not for model "DBAE(E)"

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

Inlet pressure dependent on the flow [2]

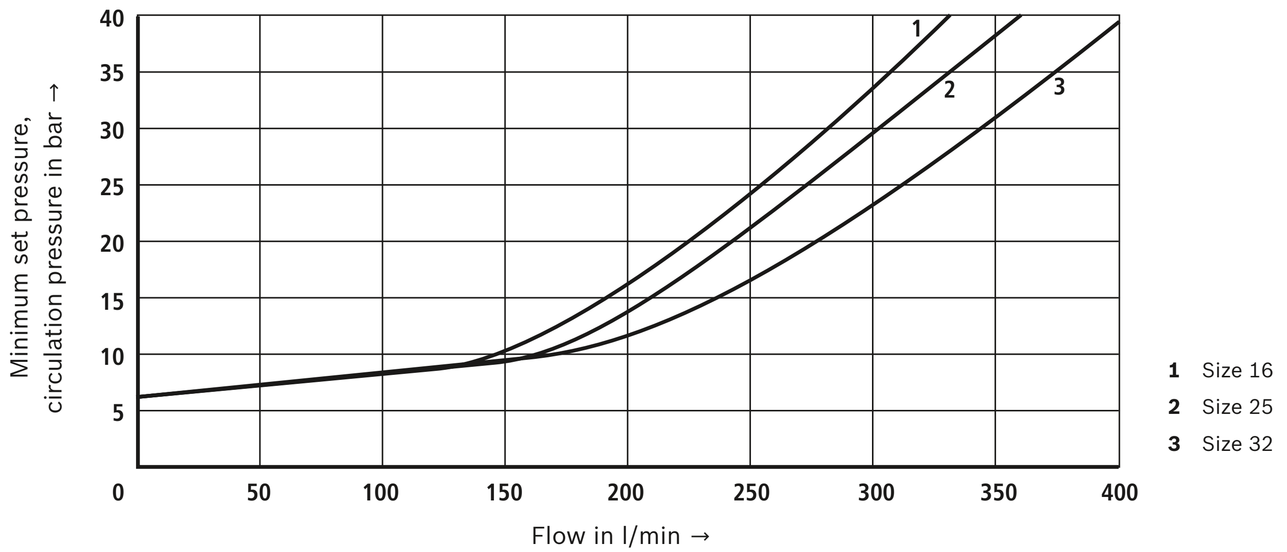


[2] The characteristic curves apply for output pressure p_T = 0 bar in the entire flow range!

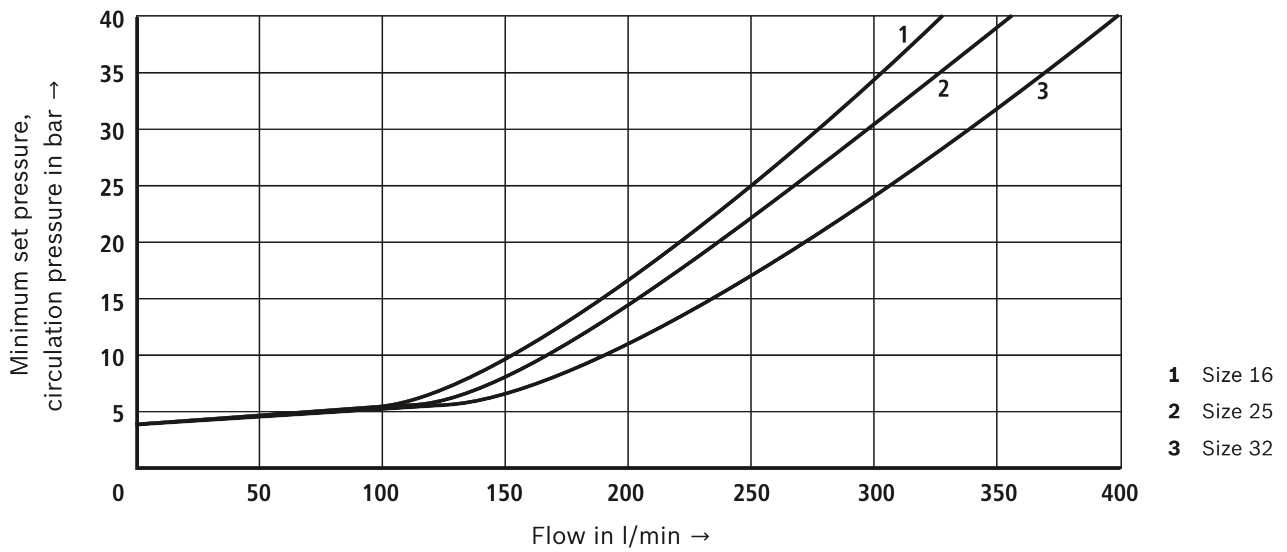
Notice!
The characteristic curves were measured with **internal pilot oil return**.
Due to the internal pilot oil return, the inlet pressure increases by the output pressure present in port T.

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

Minimum set pressure and circulation pressure depending on the flow 1)
Standard version



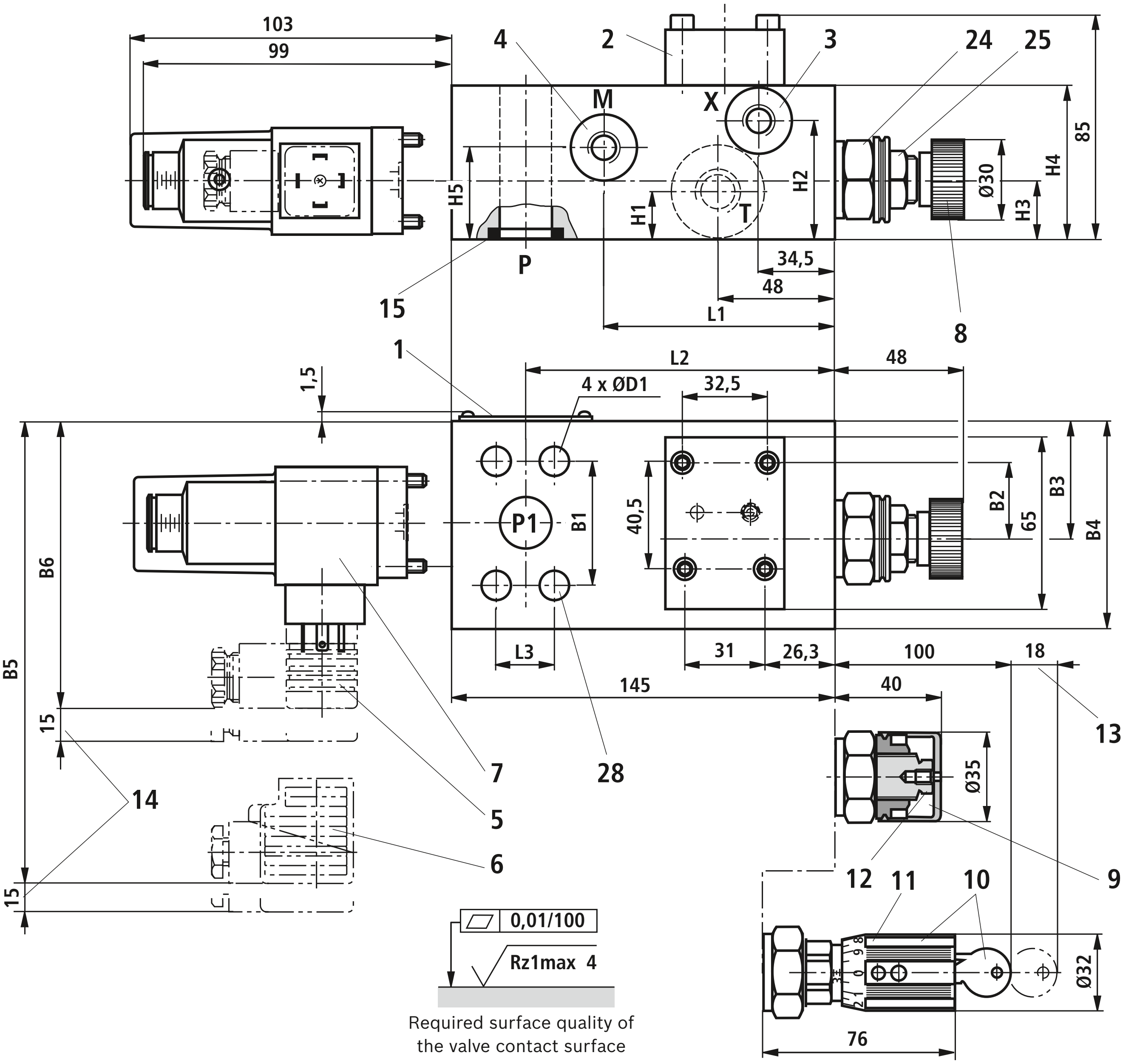
Minimum set pressure and circulation pressure depending on the flow 1)
Model "U"



1) The characteristic curves apply for output pressure p_T = 0 bar in the entire flow range!

Notice!
The characteristic curves were measured with **internal pilot oil return**.
Due to the internal pilot oil return, the inlet pressure increases by the output pressure present in port T.

Dimensions: Type DBA...
(dimensions in mm)



Standard flanges type DBA...**F**...

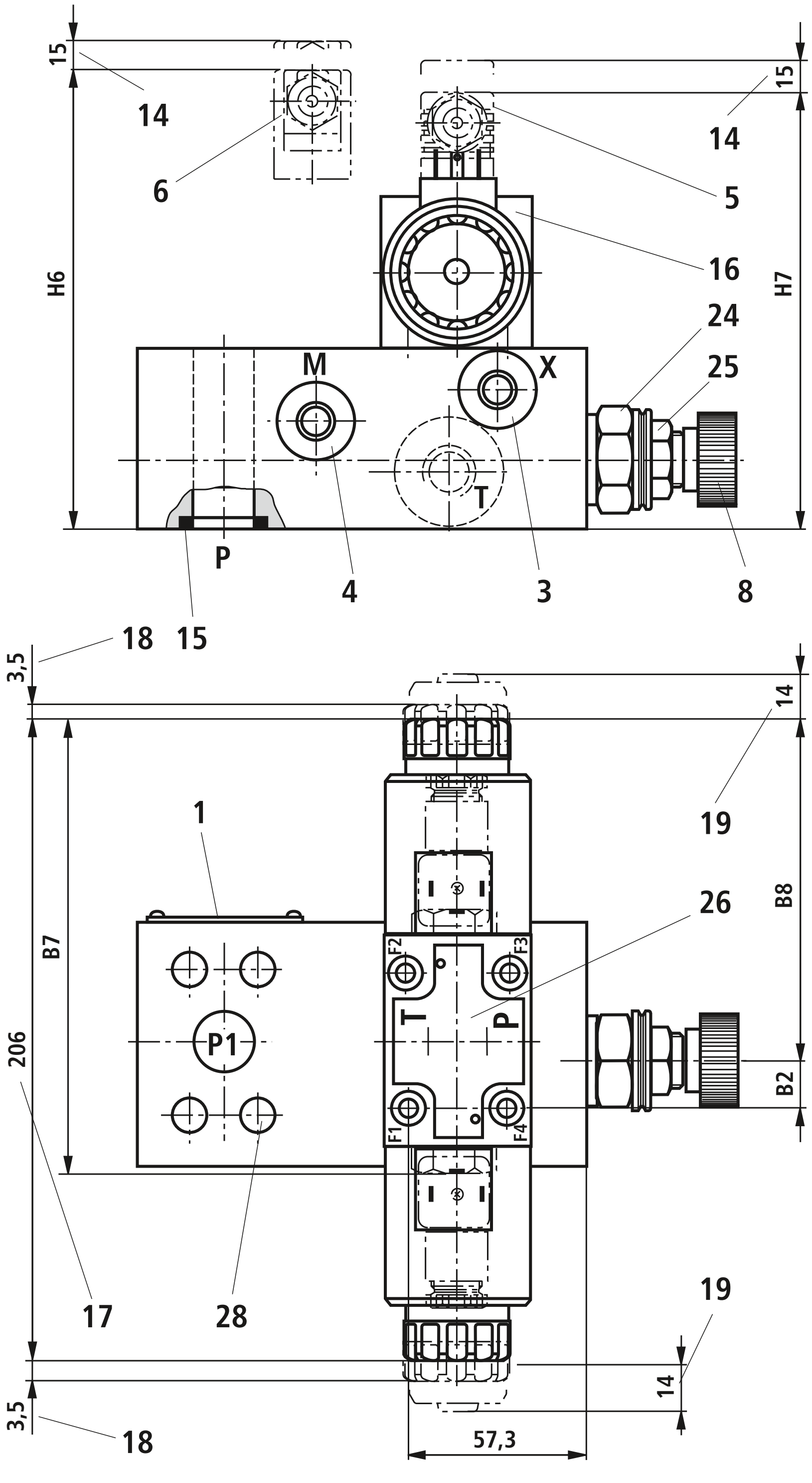
Size	L1	L2	L3	B1	B2	B3	B4	B5	B6	H1	H2	H3	H4	H5	ØD1
16	88	117	22.2	47.6	28.5	45	80	110	105	24	47	22	60	37	11
25	88	115.5	26.2	52.4	28.5	45	80	110	105	24	47	22	60	37	11
32	108.5	108.5	30.2	58.7	30.5	47	80	110	105	30	47	20	60	41	11.5

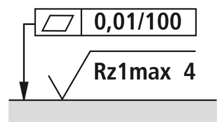
High-pressure flanges type DBA...**H**...

Size	L1	L2	L3	B1	B2	B3	B4	B5	B6	H1	H2	H3	H4	H5	ØD1
16	88	117	23.8	50.8	28.5	45	80	110	105	24	47	22	60	37	11
25	84	115.5	27.8	57.2	28.5	45	80	110	105	24	47	22	60	37	13
32	108.5	108.5	31.8	66.7	26	52	90	115	110	30	50	20	64	41	15

Item explanations can be found on page 21.

Dimensions: Type DBAW…
(dimensions in mm)





Required surface quality of the valve contact surface

Item explanations can be found on page 21, **dimensions** for pump safety block, pressure switchtype HED 8 and further adjustment types can be found on page 15.

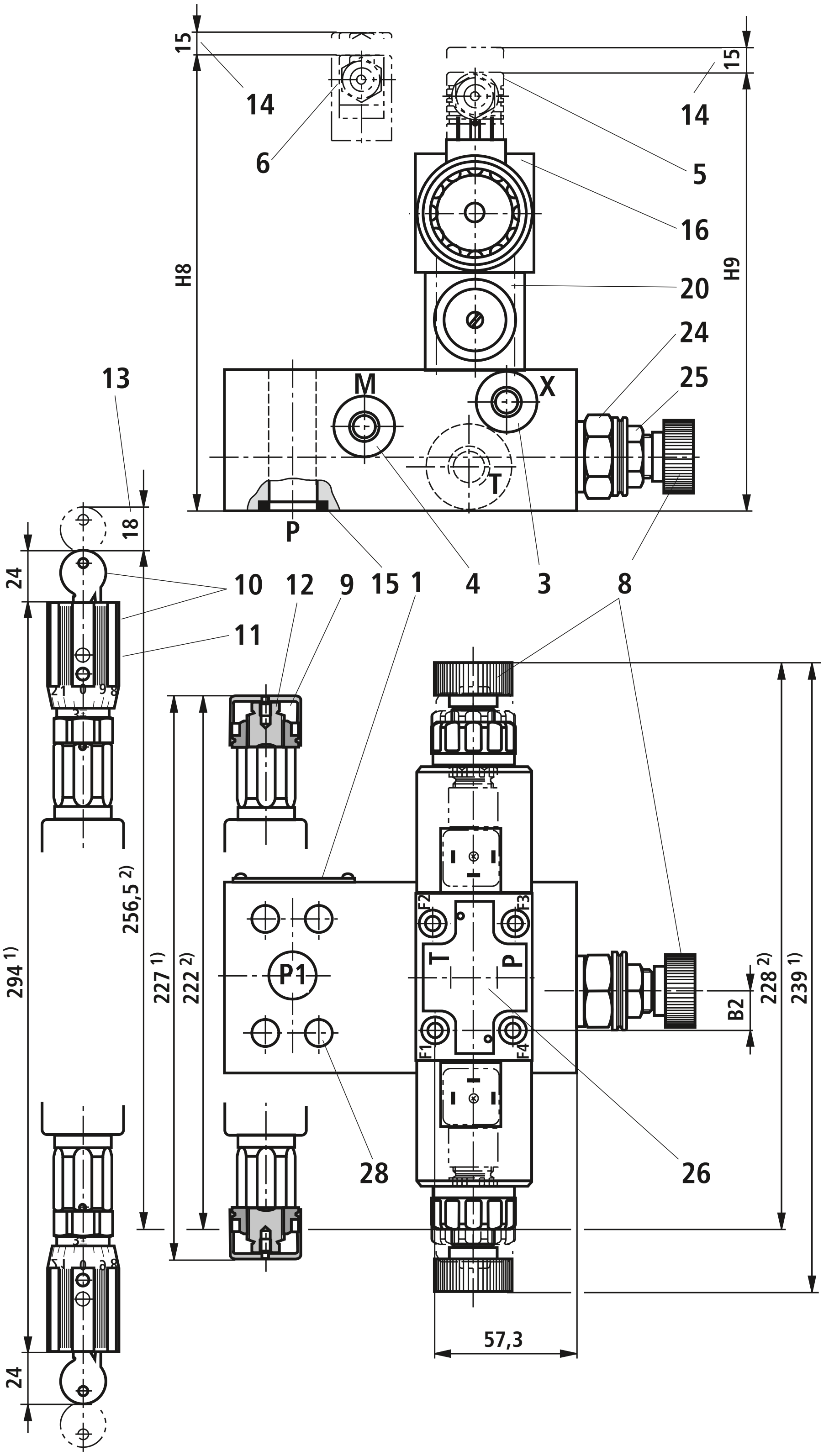
Standard flanges type DBAW…**F**…

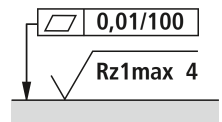
Size	B2	B7	B8	H6	H7
16	12	144.5	109.5	159	153
25	12	144.5	109.5	159	153
32	10	144.5	111.5	159	153

High-pressure flanges type DBAW…**H**…

Size	B2	B7	B8	H6	H7
16	12	144.5	109.5	159	153
25	12	144.5	109.5	159	153
32	14.5	145	107	163	157

Dimensions: Type DBAW...Z...
(dimensions in mm)





Required surface quality of the valve contact surface

Item explanations can be found on page 21, **dimensions** for pump safety block, pressure switch type HED 8 and other adjustment types can be found on page 15, **dimensions** for directional spool valves type WE can be found on page 16.

1) Model "ZZ"
2) Model "Z"

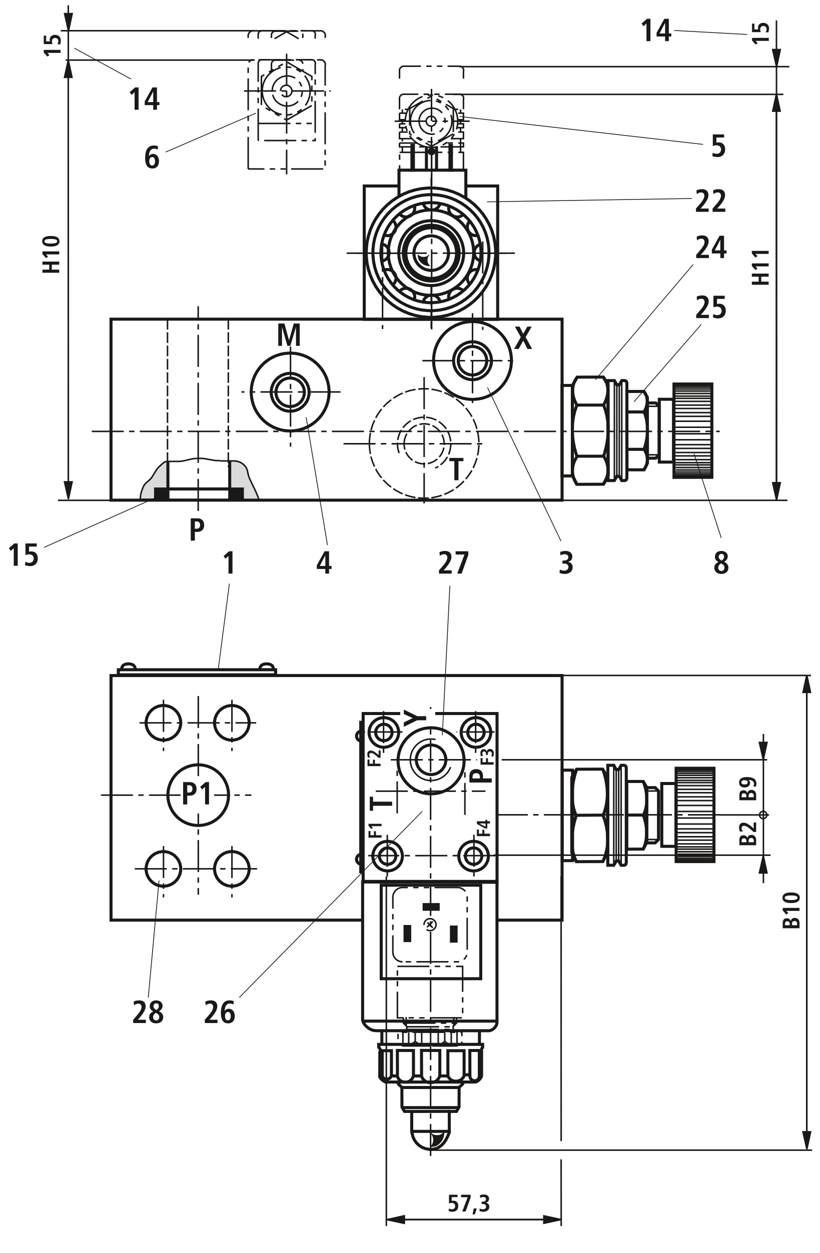
Standard flanges type DBAW..**F**...Z...

Size	B2	H8	H9
16	12	199	193
25	12	199	193
32	10	199	193

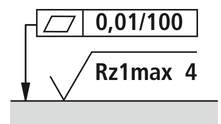
High-pressure flanges type DBAW..**H**...Z...

Size	B2	H8	H9
16	12	199	193
25	12	199	193
32	14.5	203	197

Dimensions: Type DBAE...
(dimensions in mm)



Item explanations can be found on page 21, **dimensions** for pump safety block, pressure switch type HED 8 and further adjustment types can be found on page 15.



Required surface quality of the valve contact surface

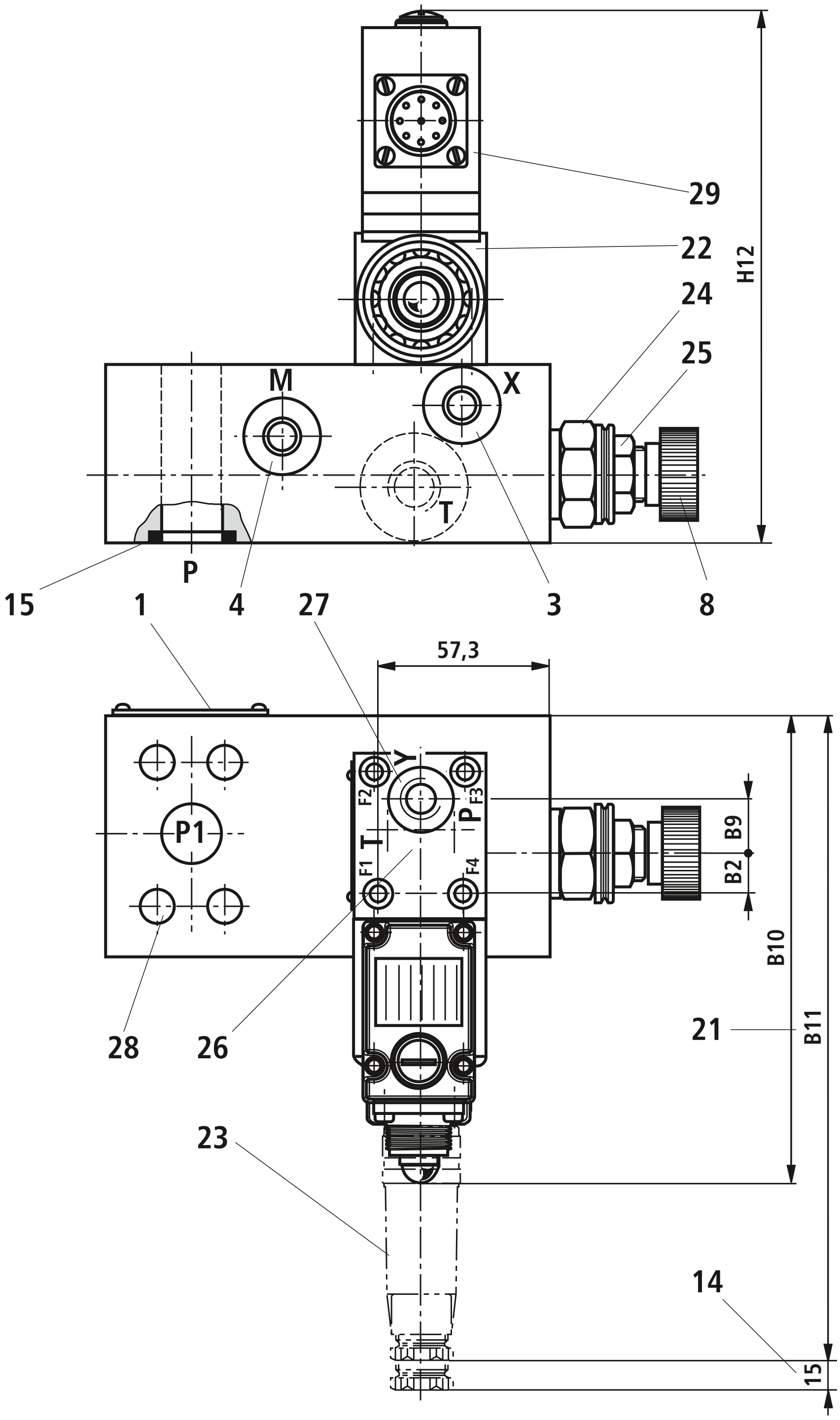
Standard flanges type DBAE(E)...**F**

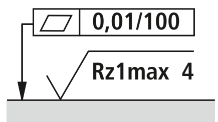
Size	B2	B9	B10	H10	H11
16	12	18.8	158	161	155
25	12	18.8	158	161	155
32	10	20.8	158	161	155

High-pressure flanges type DBAE(E)...**H**

Size	B2	B9	B10	H10	H11
16	12	18.8	158	161	155
25	12	18.8	158	161	155
32	14.5	16.3	169	166	160

Dimensions: Type DBAEE...
(dimensions in mm)





Required surface quality of the valve contact surface

Item explanations can be found on page 21, **dimensions** for pump safety block, pressure switchtype HED 8 and further adjustment types can be found on page 15.

Standard flanges type DBAE(E)...**F**

Size	B2	B9	B10	B11	H12
16	12	18.8	158	225	175
25	12	18.8	158	225	175
32	10	20.8	158	225	175

High-pressure flanges type DBAE(E)...**H**

Size	B2	B9	B10	B11	H12
16	12	18.8	158	225	175
25	12	18.8	158	225	175
32	14.5	16.3	169	235	179

Dimensions
(dimensions in mm)

Standard flanges type DBA...**F**... according to DIN ISO 6162-1

Size	Line connections			4 valve mounting screws ISO 4762 - 10.9 [1]		Tightening torque M_A in Nm [2]
	P and P1	T	X, M		Material no.	
16	SAE 3/4"	G3/4	G1/4	M10 x 95	R913000338	52
25	SAE 1"	G1	G1/4	M10 x 95	R913000338	52
32	SAE 1 1/4"	G1 1/4	G1/4	M10 x 95	R913000338	52

Admissible pressures (flange connections according to DIN ISO 6162-1)		
	in psi	in bar
SAE 3/4"	5000	350
SAE 1"	4500	315
SAE 1 1/4"	3600	250

High-pressure flanges type DBA...**H**... according to DIN ISO 6162-2

Size	Line connections			4 valve mounting screws ISO 4762 - 10.9 [1]		Tightening torque M_A in Nm [2]
	P and P1	T	X		Material no.	
16	SAE 3/4"	G3/4	G1/4	M10 x 95	R913000338	52
25	SAE 1"	G1	G1/4	M12 x 105	R913000659	66
32	SAE 1 1/4"	G1 1/4	G1/4	M14 x 105	R913000660	113

Admissible pressures (flange connections according to DIN ISO 6162-2)		
	in psi	in bar
SAE 3/4"	5000	350
SAE 1"	5000	350
SAE 1 1/4"	5000	350

1) **Valve mounting screws** (separate order)
4 hexagon socket head cap screws ISO 4762 - 10.9-flZn-240h-L
(for friction coefficient μ_{total} = 0.09 to 0.14)

☞ **Notice!**
For reasons of stability, other valve mounting screws must not be used!
Depending on the operating pressure, flange height and thread depth of the pump plate, other screw lengths may be necessary!

2) ☞ **Notice!**
The tightening torques stated are guidelines when using screws with the specified friction coefficients and when using a manual torque wrench (tolerance ±10%).

Dimensions

1 Name plate
2 Cover plate type HSA 06 A001-3X... (data sheet 48042)
3 Port X for variable displacement pump type A10VSO (otherwise closed); G1/4
4 Port M for pressure gauge; G1/4
5 Mating connector **without** circuitry (separate order, see page 24)
6 Mating connector **with** circuitry (separate order, see page 24)
7 Pressure switch type HED 8 OH... (data sheet 50061)
8 Adjustment type "1" 1)
9 Adjustment type "2" 1)
10 Adjustment type "3" 1)
11 Adjustment type "7" 1)
12 Hexagon SW10
13 Space required to remove the key
14 Space required for removing the mating connector
15 Seal ring
16 Directional spool valve type WE 6 (data sheet 23178)
17 Dimensions for solenoid **with concealed** manual override "**N9**" (standard) – The manual override can only be operated up to approx. 50 bar tank pressure. Avoid damage to the bore of the manual override! (Special tool for the operation, separate order, material no. **R900024943**)
18 Dimensions for valve **with** manual override "**N**"
19 Dimensions for valve **without** manual override
20 Pressure relief valve (sandwich plate) type Z(2)DB 6 ... (data sheet 25751)
21 Dimensions for valve with integrated electronics type DBAEE...
22 Proportional pressure relief valve type DBET(E)-6X.Y... (data sheet 29162)
23 Mating connector for type DBAEE according to DIN EN 175201-804 (separate order, material no. **R90021267**)
24 Hexagon SW30, tightening torque M_A = 50 Nm
(For tightening, a manual torque wrench with a tolerance of ≤10% must be used.)
25 Lock nut SW22, tightening torque M_A = $10^{\pm 5}$ Nm
26 Porting pattern according to DIN 24340 form A (without locating hole), or ISO 4401-03-02-0-05 (with locating hole for locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order)
27 Port Y (G1/4) must be connected to the tank in a depressurized way (possibly by means of the leakage line L of the hydraulic system)!
28 Valve mounting bores
29 Integrated electronics (OBE)

1) **Type DBAW...Z**:
Identical adjustment types for pressure limitation screw-in cartridge valve type DB 20 K and pressure relief valve type Z(2)DB 6!

Admissible pumps: Standard flange (3000 psi)

Pump safety block			**Size 16**	**Size 25**	**Size 32**
	Port P	Data sheet	SAE 3/4"	SAE 1"	SAE 1 1/4"
Pump type	▶ **Variable displacement pump**				
	Type A10VO, series 31	92701	A10VO28 –	A10VO45 A10VO71	– –
	Type A10VO, series 5X	92703	A10VO28 –	A10VO45 A10VO60	– –
	Type A10VSO, series 31	92711	A10VO28 – AV10SO18	A10VSO45 A10VSO71 –	– – –
	Type A10VSO, series 32	92714	–	A10VSO71	–
	▶ **Internal gear pump**				
	Type PGF3, component series 3X [1)]	10213	PGF3-3X/020 PGF3-3X/025 PGF3-3X/032 PGF3-3X/040	– – – –	– – – –
	Type PGP3, component series 3X [1)]	10231	PGP3-3X/032	–	–
	▶ **Vane pump** [2)]				
	Type PV7, component series 1X	10515	– –	– –	PV7-1X/63-71 PV7-1X/63-94

1) When using the pump in combination with a SAE flange as pressure connection, the ordering code of the pump contains "..07..".

2) Depending on the drive motor, a distance plate may be required, e.g. Height = 23 mm, material no. **R900058716** or alternatively a 90° plate: Height = 40 mm, material no. **R900241813**

Admissible pumps: High-pressure flange (5000 psi)

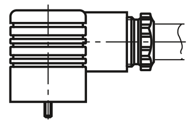
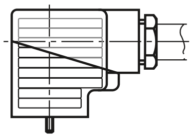
Pump safety block			**Size 16**	**Size 25**	**Size 32**
	Port P	Data sheet	SAE 3/4"	SAE 1"	SAE 1 1/4"
Pump type	▶ **Displacement pump**				
	Type A2FO, series 6	91401	A2FO45 A2FO56 A2FO63 – –	A2FO80 A2FO90 A2FO107 – –	A2FO125 A2FO160 A2FO180 A2FO200 A2FO250
	Type A4FO, series 1	91455	–	A4FO71	–
	Type A4FO, series 3	91455	A4FO16 A4FO22 A4FO40	– –	A4FO125 –
	▶ **Variable displacement pump**				
	Type A4VSO, series 1	92050	A4VSO40	A4VSO71	–
	Type A4VSO, series 3	92050	– –	– –	A4VSO125 A4VSO180
	Type A11VO, series 1	92500	A11VO40 A11VO60 –	A11VO75 A11VO95 A11VO130 [3] A11VO145 [3]	A11VLO130 [2] A11VLO145 [2] – –
	Type A10VSO, series 31 Type A10VSO, series 32	92711 92714	– –	– –	A10VSO100 A10VSO140
	Type A10VO, series 31	92701	– –	– –	A10VO100 A10VO140
	Type A10VO, series 5X [1]	92703	–	–	A10VO85
	Type A7VO, series 6 [1]	92202	A7VO28 A7VO55	A7VO80 A7VO107	A7VO160 –
	Type A7VO, series 6 [1]	92203	–	–	A7VO250
	▶ **Adjustable double pump**				
	Type A8VO, series 6X	93010	A8VO55 – –	A8VO80 A8VO107 A8VO140	A8VO200 – –
	▶ **Internal gear pump**				
	Type PGH4, PGH5, component series 2X	10223	PGH4-2X/020 PGH4-2X/025 PGH4-2X/032 PGH4-2X/040	PGH4-2X/050 PGH5-2X/063 – –	PGH5-2X/080 PGH5-2X/100 PGH5-2X/125 –
	Type PGH4, PGH5, component series 3X	10227	PGH4-3X/020 PGH4-3X/025 –	PGH4-3X/032 PGH4-3X/040 PGH4-3X/050	PGH5-3X/063 PGH5-3X/080 –

[1] A direct pressure switch attachment opposite of the pressure limitation screw-in cartridge valve type DB 20 K is not possible!

[2] With charging pump

[3] Without charging pump

Mating connectors according to DIN EN 175301-803 for connector "K4"

For details and more mating connectors see data sheet 08006				
	Material number			
Color	Without circuitry	With indicator light 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Zener diode suppression circuit 24 V
Gray	**R901017010**	–	–	–
Black	**R901017011**	**R901017022**	**R901017025**	**R901017026**

Mating connectors according to DIN EN 175301-803 for connector "K14"

	Material number					
	Without circuitry	With circuitry (indicator light) AC/DC				
	250 V	6 ... 14 V	16 ... 30 V	36 ... 60 V	90 ... 130 V	180 ... 240 V
Black	**R901017012**	**R901017030**	**R901017048**	**R901017032**	**R901017035**	**R901017037**
I_{max}	16 A	4 A	4 A	4 A	4 A	4 A

General notes:

- At types DBAW.B and DBAE/DBAEE, the lowest adjustable pressure (circulation pressure) is set at the pressure relief valve in case of a power failure or cable break. At type DBAW..A, the pressure limiting function is activated.
- The unloading function (DBAW/DBAE/DBAEE) must not be used for safety functions!

More information

▶ Directional spool valve	Data sheet 23178
▶ Proportional pressure relief valve type DBET(E)	Data sheet 29162
▶ Pressure switch HED 8 OH...	Data sheet 50061
▶ Pressure relief valve type Z(2)DB ...	Data sheet 25751
▶ Mineral oil based hydraulic fluids	Data sheet 90220
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ General product information on hydraulic products	Data sheet 07008
▶ Installation, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Selection of the filters	www.boschrexroth.com/filter

Ordering code: Type-examination tested safety valves type DBA...E, component series 2X according to Pressure Equipment Directive 97/23/EC

Size	Type designation	Component marking	Maximum admissible flow q_{Vmax} in l/min with pilot oil return	Set response overpressure p in bar
16	DBA 15 [2][3][4] 2X/ [5][6][7] E	TÜV.SV.□–1001.14,4.F.G.p	60 100 150 200 250	30 ... 60 61 ... 110 111 ... 210 211 ... 315 316 ... 350
	DBAW 15 [1][2][3][4] 2X/ [5][6] 6 [*][7] E			
	DBAE 15 [1][2][3][4] 2X/ [5][6] 6 [*][7] E			
	DBAEE 15 [1][2][3][4] 2X/ [5][6] 6 [*][7] E			
25	DBA 25 [2][3][4] 2X/ [5][6][7] E	TÜV.SV.□–1001.14,4.F.G.p	70 100 150 200 300	30 ... 60 61 ... 110 111 ... 210 211 ... 315 316 ... 350
	DBAW 25 [1][2][3][4] 2X/ [5][6] 6 [*][7] E			
	DBAE 25 [1][2][3][4] 2X/ [5][6] 6 [*][7] E			
	DBAEE 25 [1][2][3][4] 2X/ [5][6] 6 [*][7] E			
32	DBA 30 [2][3][4] 2X/ [5][6][7] E	TÜV.SV.□–1001.14,4.F.G.p	70 100 150 200 300	30 ... 60 61 ... 110 111 ... 210 211 ... 315 316 ... 350
	DBAW 30 [1][2][3][4] 2X/ [5][6] 6 [*][7] E			
	DBAE 30 [1][2][3][4] 2X/ [5][6] 6 [*][7] E			
	DBAEE 30 [1][2][3][4] 2X/ [5][6] 6 [*][7] E			

1	Directional valve, normally closed	**A**
	Directional valve, normally open	**B**

2	Standard flange (3000 psi)	**F**
	High-pressure flange (5000 psi)	**H**

3	Hand wheel adjustment type (pressure adjustment sealed, unloading or setting of a lower response pressure possible!)	**1**
	Adjustment type with sealed protective cap (no adjustment/unloading possible)	**2**

4	With mounted pressure switch type HED 8 OH... (without mating connector)	**D**
	Without pressure switch	**–**

5	In the designation, the pressure is to be entered by the customer, pressure adjustment ≥30 bar and possible in 5-bar steps.	e.g. **150**

2./3. pressure limiting function (see circuit example on pages 6 to 8)

6	**Without** additional pressure relief valve	**no code**
	With mounted pressure relief valve type ZDB 6 VB...-4X/..SO2 (data sheet 25751)	**Z**
	With mounted pressure relief valve type Z2DB 6 VC...-4X/..SO2 (data sheet 25751)	**ZZ**
	Models DBAW...Z(Z)E and DBAE(E)...E are only available with ordering code "A00", "A08" or "A10"	

*	Electrical data ordering codes can be found on pages 2 and 3	e.g. **EG24N9K4**

7	NBR seals	**no code**
	FKM seals	**V**

□ Value entered at the factory!

☞ **Important safety instructions on page 26!**

Safety instructions: Type-examination tested safety valves type DBA...E, component series 2X according to Pressure Equipment Directive 97/23/EC

- Before ordering a type-examination tested safety valve, it must be observed that, for the desired **response pressure *p***, the maximum admissible **flow** q_{Vmax} must be larger than the maximum possible flow of the system to be secured.
  In this respect, the applicable regulations must be observed.
- According to **PED 97/23/EC** the increase of system pressure due to the flow must not exceed 10% of the set response pressure (see component marking).
- The maximum admissible flow stated in the component marking q_{Vmax} (= numerical value instead of the character "G" in the component marking, see page 25) must not be exceeded.
- Discharge lines of safety valves must end in a risk-free manner. The accumulation of fluids in the discharge lines must **not** be possible.
- If a lead seal at the safety valve is removed, the approval according to the Pressure Equipment Directive becomes void.
- The requirements of the Pressure Equipment Directives 97/23/EC and of data sheet AD2000 A2 must be generally observed!
- Options DBAE/DBAEE or 2./3. pressure limiting function (6) are only possible for pressure relief valves for variable displacement pumps (also see page 3).
- The unloading function (DBAW../DBAE../DBAEE..) must not be used for safety functions!
- Possible unloading via the directional valve must not be applied for safety-relevant functions! If unloading is required for safety-relevant functions, an additional safety valve must be installed.

☞ **It is imperative to observe the application instructions!**
- In the plant, the response pressure specified in the component marking is set at a flow of 2 l/min.
- The maximum admissible flow stated in the component marking applies for applications without counter pressure in the discharge line (port T).

☞ **Notice!**
The system pressure increases by the counter pressure in the discharge line (port T) with increasing flow (observe AD2000 - data sheet A2 - item 6.3!).
To ensure that this increase in system pressure caused by the flow does not exceed 10% of the set response pressure, the admissible flow has to be reduced according to the counter pressure in the discharge line (port T) (see following diagrams on pages 27 and 28).

Deviating technical data: Type-examination tested safety valves type DBA...E, component series 2X according to Pressure Equipment Directive 97/23/EC [1)]

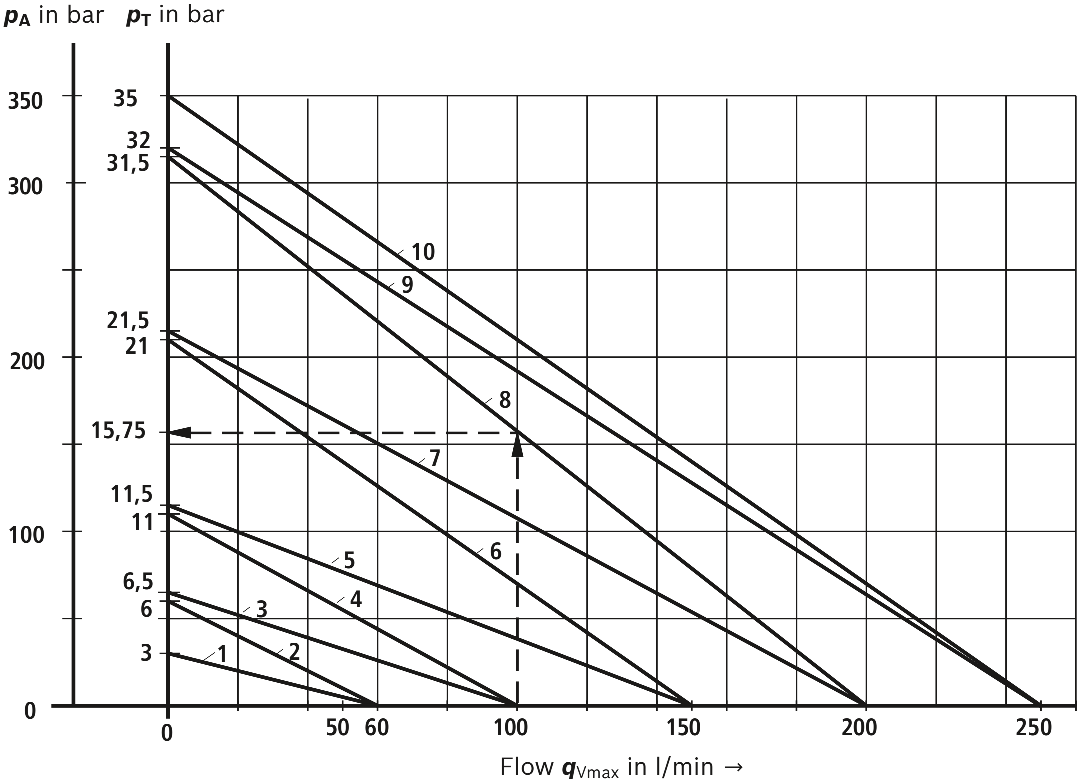
hydraulic		
Maximum flow		See ordering code on page 25 and diagrams on pages 27 and 28
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524-1 and DIN 51524-2
Hydraulic fluid temperature range	°C	–20 ... +60 (NBR seals) –15 ... +60 (FKM seals)
Viscosity range	mm^2/s	12 ... 230

1) For applications outside these parameters, please consult us!

Safety instructions: Type-examination tested safety valves type DBA...E, component series 2X according to Pressure Equipment Directive 97/23/EC

Maximum admissible flow q_{Vmax} dependent on the counter pressure p_T in the discharge line with internal pilot oil return

Type DBA 15 ...-2X/...E



Charac-teristic curves	Response pressure p_A in bar
1	30
2	60
3	65
4	110
5	115
6	210
7	215
8	315
9	320
10	350

Characteristic curves for intermediate values can be generated by interpolation. Further explanations see below.

p_A = Response pressure in bar

p_T = Maximum admissible counter pressure in the discharge line in bar (port T) (sum of all possible counter pressures; also see AD2000 - data sheet A2)

$p_{T\,max}$ = 10% x p_A (at q_V = 0) according to PED 97/23/EC

$q_{V\,max}$ = Maximum admissible flow in l/min

Explanation of the diagrams (Example: Type DBA 15...E):

Known:
- ▶ Flow of the system/accumulator that has to be secured q_{Vmax} = 100 l/min
- ▶ Set response pressure of the safety valve p_A = 315 bar

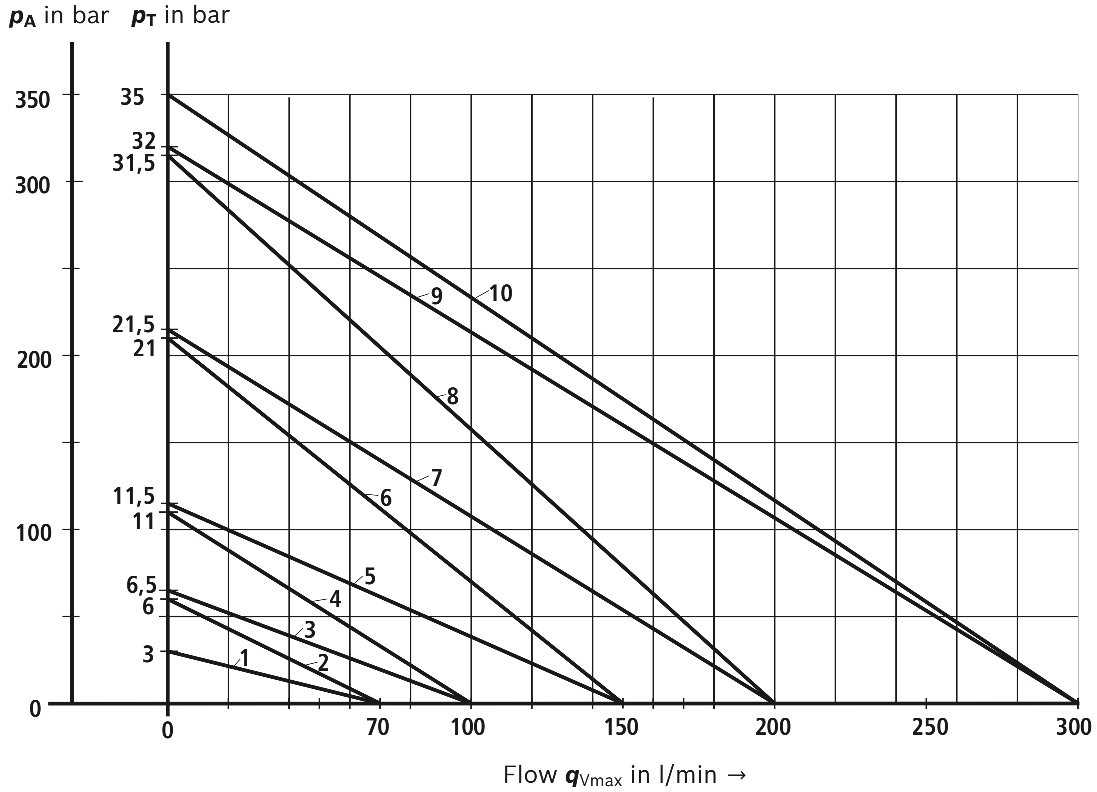
Unknown: $p_{T\,admissible}$

Solution: See arrows in diagram above
$p_{T\,admissible}$ (100 l/min; 315 bar) = 15.75 bar

Safety instructions: Type-examination tested safety valves type DBA...E, component series 2X according to Pressure Equipment Directive 97/23/EC

Maximum admissible flow q_{Vmax} dependent on the counter pressure p_T in the discharge line with internal pilot oil return

Type DBA 25 ...-2X/...E and type DBA 30 ...-2X/...E



Characteristic curves	Response pressure p_A in bar
1	30
2	60
3	65
4	110
5	115
6	210
7	215
8	315
9	320
10	350

Characteristic curves for intermediate values can be generated by interpolation. Further explanations can be found on page 27.

p_A = Response pressure in bar

p_T = Maximum admissible counter pressure in the discharge line in bar (port T) (sum of all possible counter pressures; also see AD2000 - data sheet A2)

$p_{T\,max}$ = 10% x p_A (at q_V = 0) according to PED 97/23/EC

$q_{V\,max}$ = Maximum admissible flow in l/min

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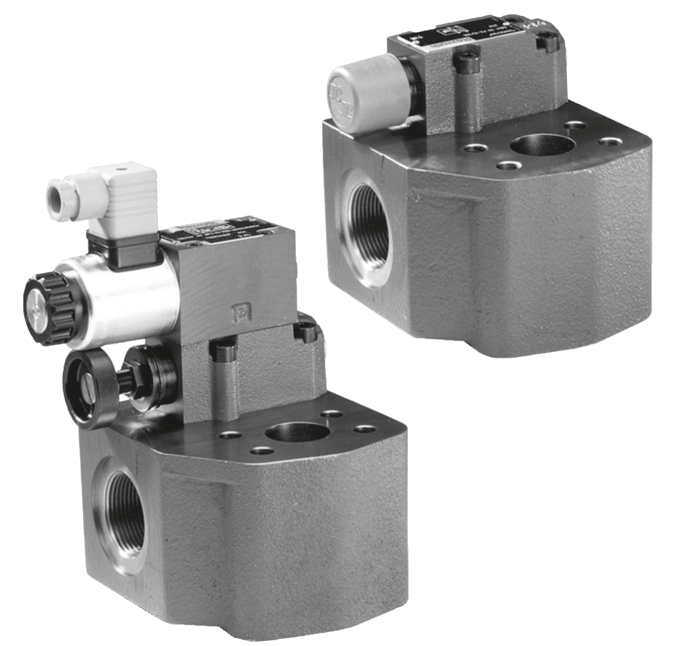
The Drive & Control Company Rexroth Bosch Group

Pump safety block

Type DBA; DBAW

RE 25880
Version: 2013-01
Replaces: 10.05



H5961+5962

- Sizes 32 and 40
- Component series 1X
- Maximum operating pressure 350 bar
- Maximum flow 650 l/min

Features

- Depressurized start-up and circulation of the pump
- To be mounted directly onto the SAE pressure port of the pump
- Quick pressure build-up
- 4 adjustment types for pressure adjustment, optionally
  - Rotary knob
  - Bushing with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- 5 pressure ratings, optional
- Solenoid-actuated unloading via a built-on directional valve
- Integrated check valve, optional
- Switching shock damping, optional (DBAW type only)

Contents

Ordering code

01	02	03	04	05	06	07	08	09		10	11	12	13	14	15	16	17	18	19	20	21
DBA								**1X**	**/**												*

01	Pump safety block	**DBA**
02	**Without** directional valve	**no code**
	With built-on directional valve	**W**
03	**Without** check valve	**no code**
	With check valve	**R** [1)]
04	Size 32	**30**
	Size 40	**40**
05	Normally closed	**A** [2)]
	Normally open	**B** [2)]
06	**Connection / SAE flange** [3)]	
	Standard flange (200 ... 350 bar)	**F**
	High-pressure flange (350 bar)	**H**
07	**Adjustment type for pressure adjustment**	
	Rotary knob	**1**
	Bushing with hexagon and protective cap	**2**
	Lockable rotary knob with scale	**3** [4)]
	Rotary knob with scale	**7**
08	**With** main spool Ø24 mm	**–**
	With main spool Ø28 mm	**N**
09	Component series 10 ... 19 (10 ... 19: Unchanged installation and connection dimensions)	**1X**
10	**Pressure rating**	
	Set pressure ... 50 bar	**50**
	Set pressure ... 100 bar	**100**
	Set pressure ... 200 bar	**200**
	Set pressure ... 250 bar	**250**
	Set pressure ... 315 bar	**315**
	Set pressure ... 350 bar (only version "H")	**350**
11	**Pilot flow**	
	Pilot oil supply and pilot oil return internal (standard)	**–** [5)]
	Pilot oil supply internal, pilot oil return external	**Y**
12	Standard version	**no code**
	Valve for minimum cracking pressure (not suitable for mutual relief!)	U

1) Only ... 315 bar

2) Ordering code only required if 02 = **"W"**

3) Please observe pressure ratings and connection dimensions. (See page 12)

4) H-key with material no. **R900008158** is included in the scope of delivery.

5) Hyphen "–" required only if 02 = **"W"** and 12 and 13 = **"no code"**

6) Mating connectors, separate order, see page 18

7) Ordering code only required if 02 = **"W"** and 13 = **"S"**

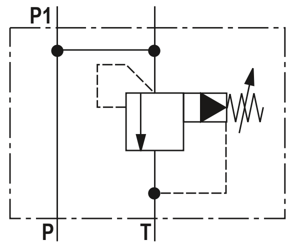
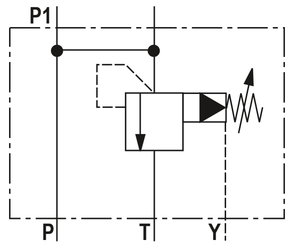
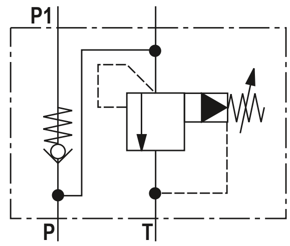
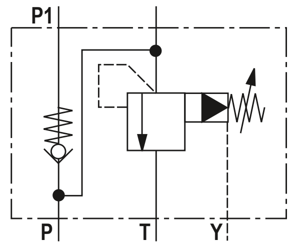
Preferred types and standard units are contained in the EPS (standard price list).

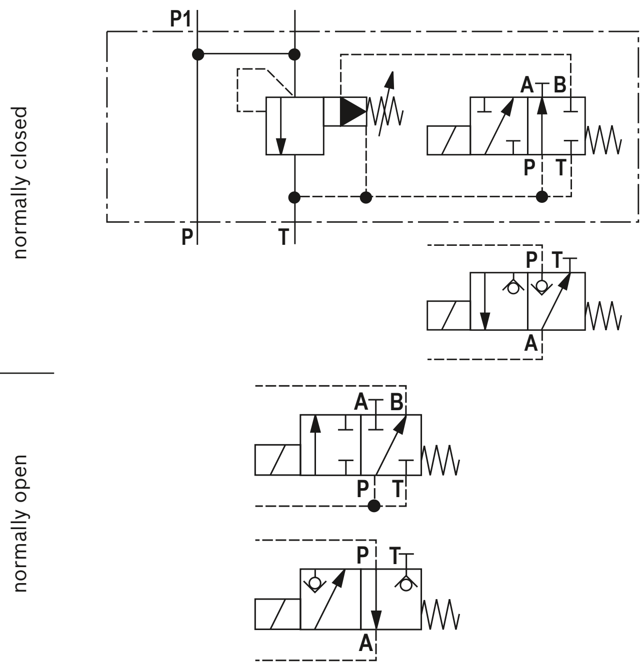
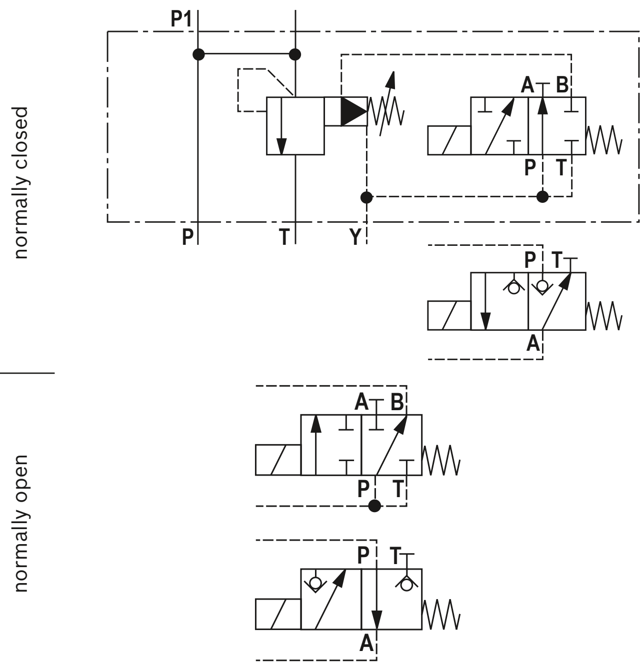
Ordering code

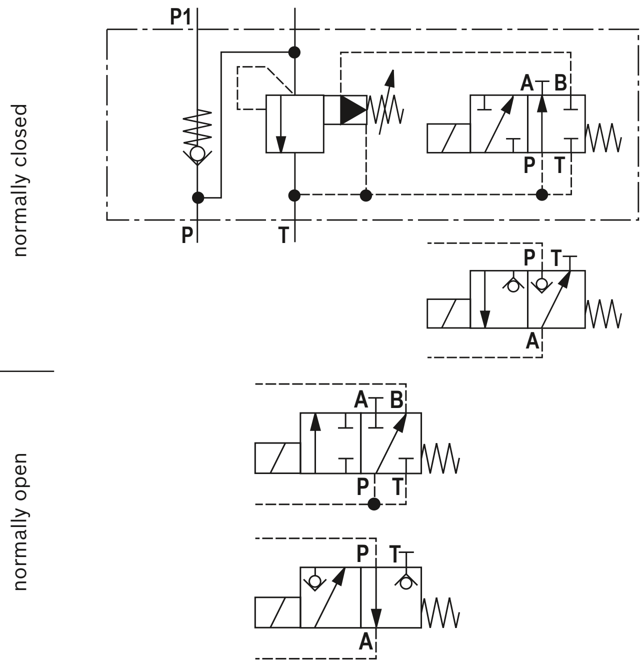
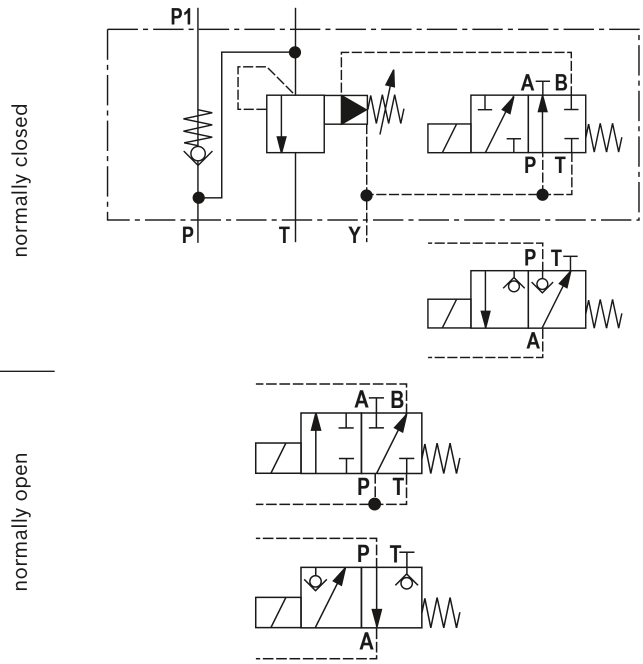
01	02	03	04	05	06	07	08	09		10	11	12	13	14	15	16	17	18	19	20	21
DBA								**1X**	**/**												*

13	**Without** switching shock damping	**no code**
	With switching shock damping (version "W" only)	S
14	**Without** directional valve	**no code**
	With directional spool valve (data sheet 23178)	**6E** [2)]
	With directional seat valve (data sheet 22058)	**6SM** [2)]
15	Direct voltage 24 V	**G24** [2)]
	Direct voltage 205 V	**G205** [2)]
	Alternating voltage 230 V 50/60 Hz (version "6E" only)	**W230** [2)]
16	**Without** manual override	**no code**
	With manual override (version "6E" only)	**N** [2)]
	With concealed manual override (standard)	**N9** [2)]
17	**Electrical connection**	
	Without mating connector with connector DIN EN 175301-803	**K4** [2; 6)]
18	Nozzles – Ø1.2 mm in channel B of the directional spool valve	**R12** [7)]
	Nozzles – Ø1.2 mm in channel P of the directional seat valve	**B12** [7)]
19	**Seal material**	
	NBR seals	**no code**
	FKM seals	**V**
	(Other seals upon request) Attention! Observe compatibility of seals with hydraulic fluid used!	
20	**Type examination**	
	Without type examination	**no code**
	Type-examination tested safety valve according to PED 97/23/EC	**E**
21	Further details in the plain text	

Symbols

Type DBA ...–..	Type DBA ...**Y**..	Type DBAR ...–..	Type DBAR ...**Y**..
			

Type DBAW...–...	Type DBAW...**Y**...
	

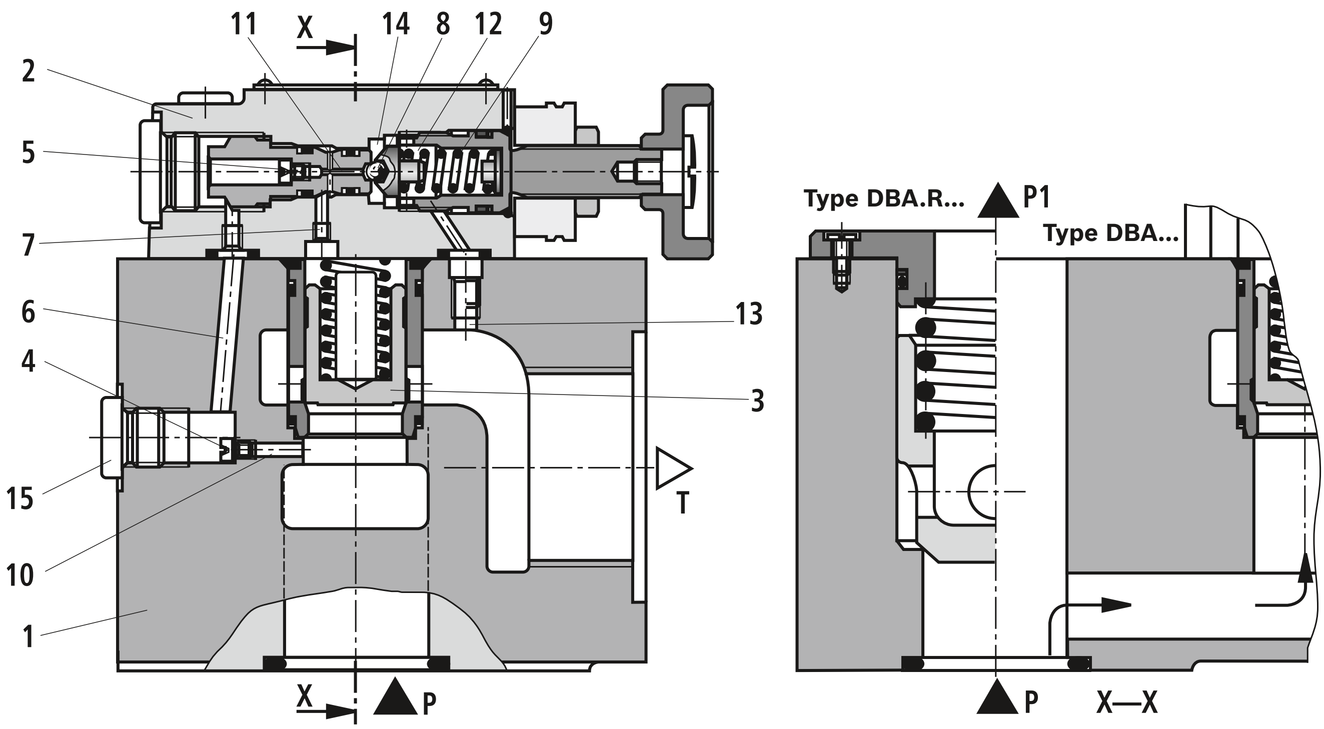
Type DBAWR...–...	Type DBAWR...**Y**...
	

Function, sections

Pump safety blocks of types DBA/DBAW are pilot operated pressure relief valves which are integrated into a block and intended to be mounted directly onto the SAE pressure port of pumps.
They are used for limiting (DBA) or limiting and magnetically unloading (DBAW) the operating pressure.
Pump safety blocks (DBA) basically consist of a valve block (1), main spool insert (3) and pilot control valve (2) with adjustment type for pressure adjustment. The valve housing has a port P for the hydraulic fluid input and port P1 for the output. In a branch of the through-bore between these two ports there is the main spool insert. When this is open there is a connection to port T (tank line).

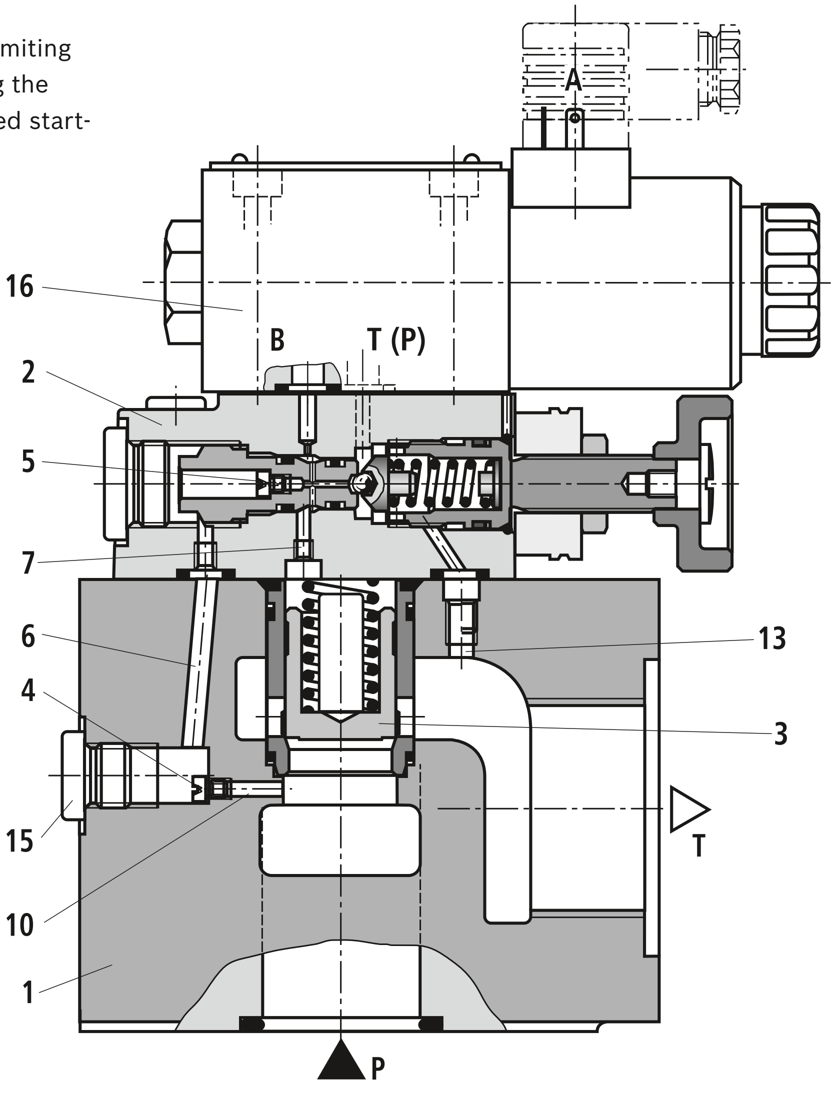
Pump safety block type DBA
The pressure applied in the through-bore acts on the main spool (3). At the same time, pressure is applied to the spring-loaded side of the main spool (3) and to the ball (8) in the pilot control valve (2) via the control lines (6) and (7) which are equipped with nozzles (4) and (5). If the pressure in the through-bore exceeds the value set at spring (9), ball (8) opens against spring (9).
The signal for this is provided internally from the through-bore via control lines (10) and (6). The hydraulic fluid on the spring-loaded side of main spool (3) now flows via the control line (7), nozzle bore (11) and ball (8) into the spring chamber (12). From here, it is fed into the tank, either internally for type DBA ...– via control line (13), or externally for type DBA ...Y via control line (14). Nozzles (4) and (5) cause a pressure drop to occur at the main spool (3), hence the connection from channel P to channel T opens. The hydraulic fluid now flows from channel P to channel T, whilst the set operating pressure is maintained.
Port (15) can be used for remote control purposes. If a pressure load cell or a pressure gauge isolator valve is to be connected here, then version SO616 – without nozzle (4) – must be ordered. This prevents delays in the build-up of pressure or brief pressure drops when the pressure gauge isolator valve is operated.

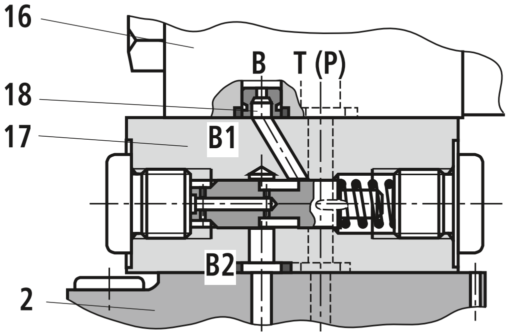
Pump safety block type DBAR (with check valve)
The integrated check valve maintains the system pressure when the pump is disconnected and prevents the hydraulic fluid from returning to the pump.
If this valve is selected, no separate check valve is needed.



Function, sections, symbols

Pump safety block type DBAW...
In addition, it can be switched from the pressure limiting function to depressurized circulation by controlling the built-on directional valve (16). Thus, a depressurized start-up of the pump is possible.

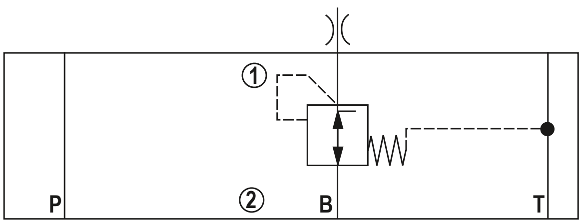




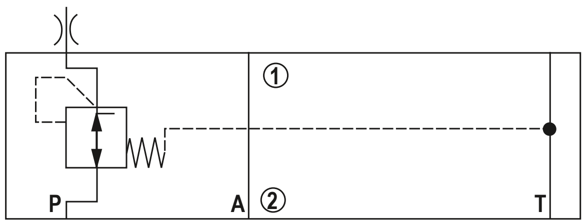
Representation: Directional valve open

Pump safety block with switching shock damping (sandwich plate), **type DBAW...S6E...R12** and **type DBAW...S6SM...B12**
The opening of the connection from B2 to B1 or P2 to P1 is delayed by means of the switching shock damping valve (17). Pressure peaks and acoustic decompression shocks in the return line can thus be avoided. It is installed between the pilot control valve (2) and the directional valve (16).
The degree of damping (decompression shock) is determined by the size of the nozzle (18). By default, a nozzle Ø1.2 mm is installed (ordering code ..**R12**.. or ..**B12**..).

Type DBAW...S6E...R12



Type DBAW...S6SM...B12



Technical data
(For applications outside these parameters, please consult us!)

general				
Size		Size	32	40
Weight	– Type DBA...	kg	8	11.4
	– Type DBAW...	kg	9.2	12.6
	– Check valve "R"	kg	+0.3	+0.4
	– Switching shock damping "S"	kg	+0.6	+0.6
Installation position			Any	
Ambient temperature range	– Type DBA...		–30 ... +80 (NBR seals) –15 ... +80 (FKM seals)	
	– Type DBAW...		–30 ... +50 (NBR seals) –15 ... +50 (FKM seals)	
Minimum stability of the housing materials			Housing materials are to be selected so that there is sufficient safety for all imaginable operating conditions (e.g. with regard to compressive strength, thread stripping strengths and tightening torques).	

hydraulic					
Maximum operating pressure	– Port P		bar	350	
	– Port T		bar	315	
Cracking pressure (for DBAR...)			bar	0.5	
Maximum counter pressure	– Type DBA	Port Y	bar	315	
	– Type DBAW	Port Y, T	bar	210 for DC solenoids or 160 for AC solenoid	
Minimum set pressure			bar	Flow-dependent (see characteristic curves page 8 and 9)	
Maximum set pressure			bar	50; 100; 200; 315; 350	
Maximum flow	– Type DBA/DBAW		l/min	600	650
	– Type DBAR/DBAWR		l/min	350	450
Hydraulic fluid				See table page 8	
Hydraulic fluid temperature range			°C	–30 ... +80 (NBR seals) –15 ... +80 (FKM seals)	
Viscosity range			mm^2/s	10 ... 800	
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)				Class 20/18/15 [1]	

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components. For the selection of the filters see www.boschrexroth.com/filter.

Technical data for directional seat valves see data sheet 22058, directional spool valves data sheet 23178.
Deviating technical data for type-examination tested safety valves see page 15.

Technical data
(For applications outside these parameters, please consult us!)

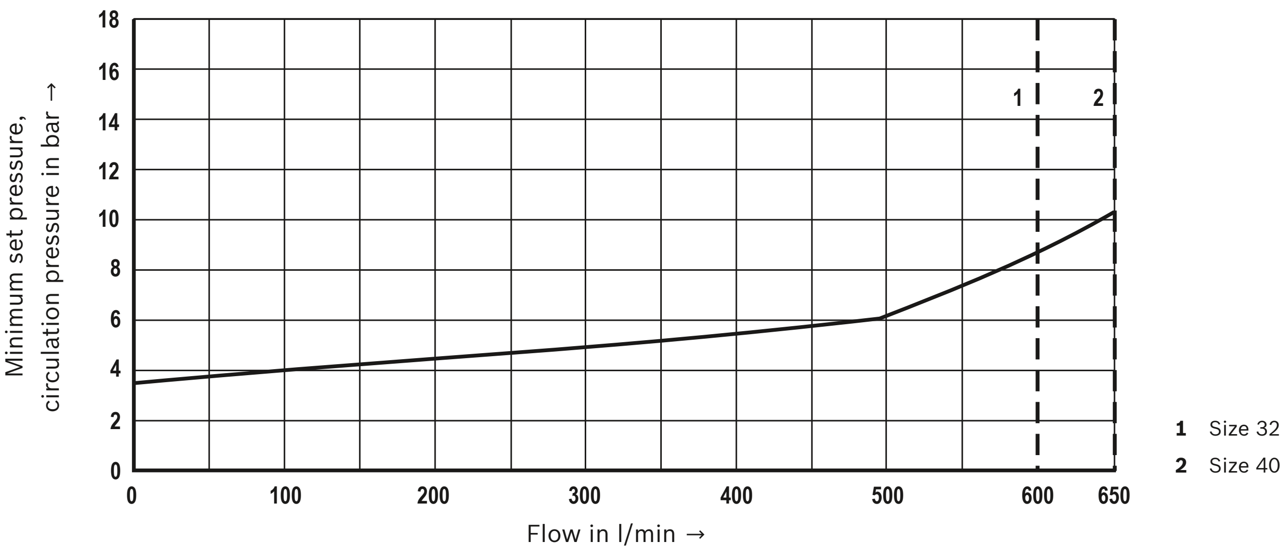
Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!

- **Flame-resistant – containing water**:
  - Maximum operating pressure 210 bar
  - Maximum hydraulic fluid temperature 60 °C
  - Life cycle as compared to operation with mineral oil HLP 30 ... 100 %

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

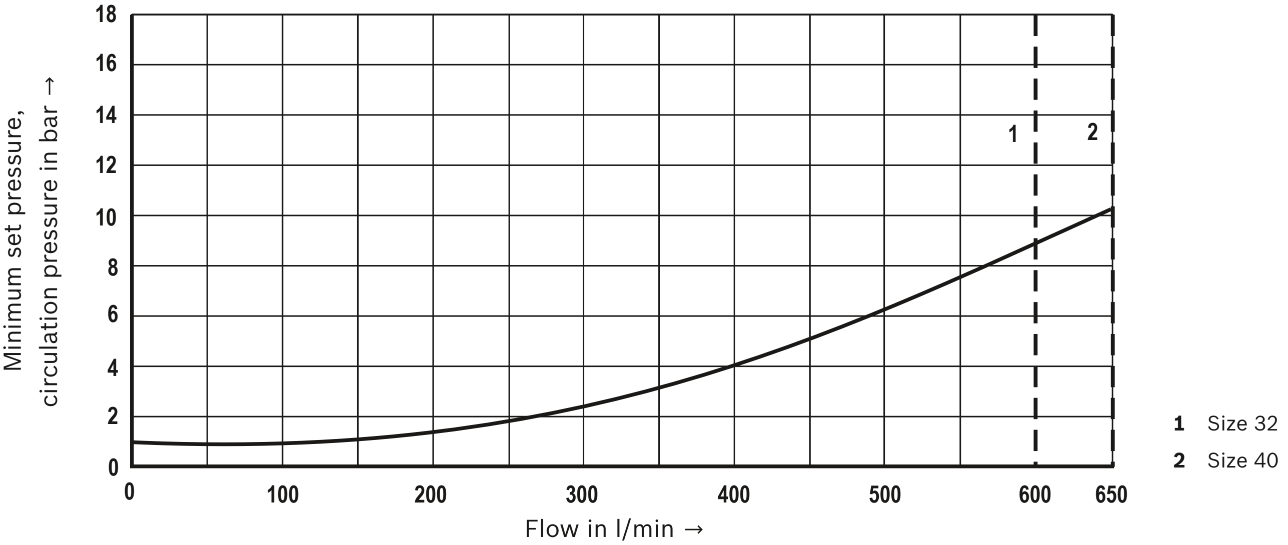
Minimum set pressure and circulation pressure dependent on the flow
Standard version



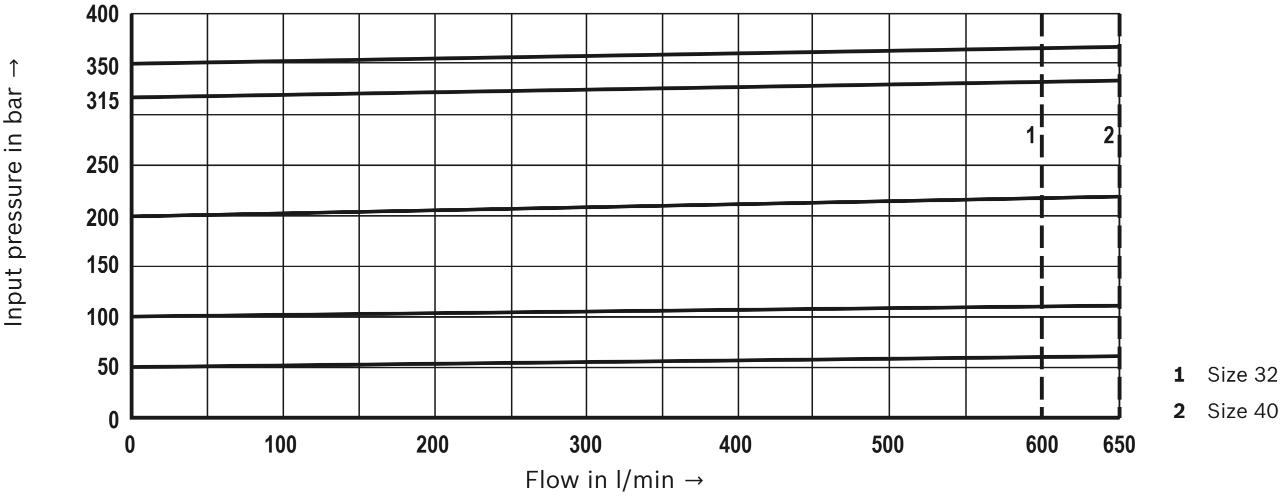
Notice!
- The characteristic curves were measured with **external, depressurized pilot oil return**.
  With internal pilot oil return, the inlet pressure increases by the output pressure present in port T.
- The characteristic curves apply to the pressure at the valve output p_T = 0 bar across the entire flow range.

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

Minimum set pressure and circulation pressure dependent on the flow
Version "U"

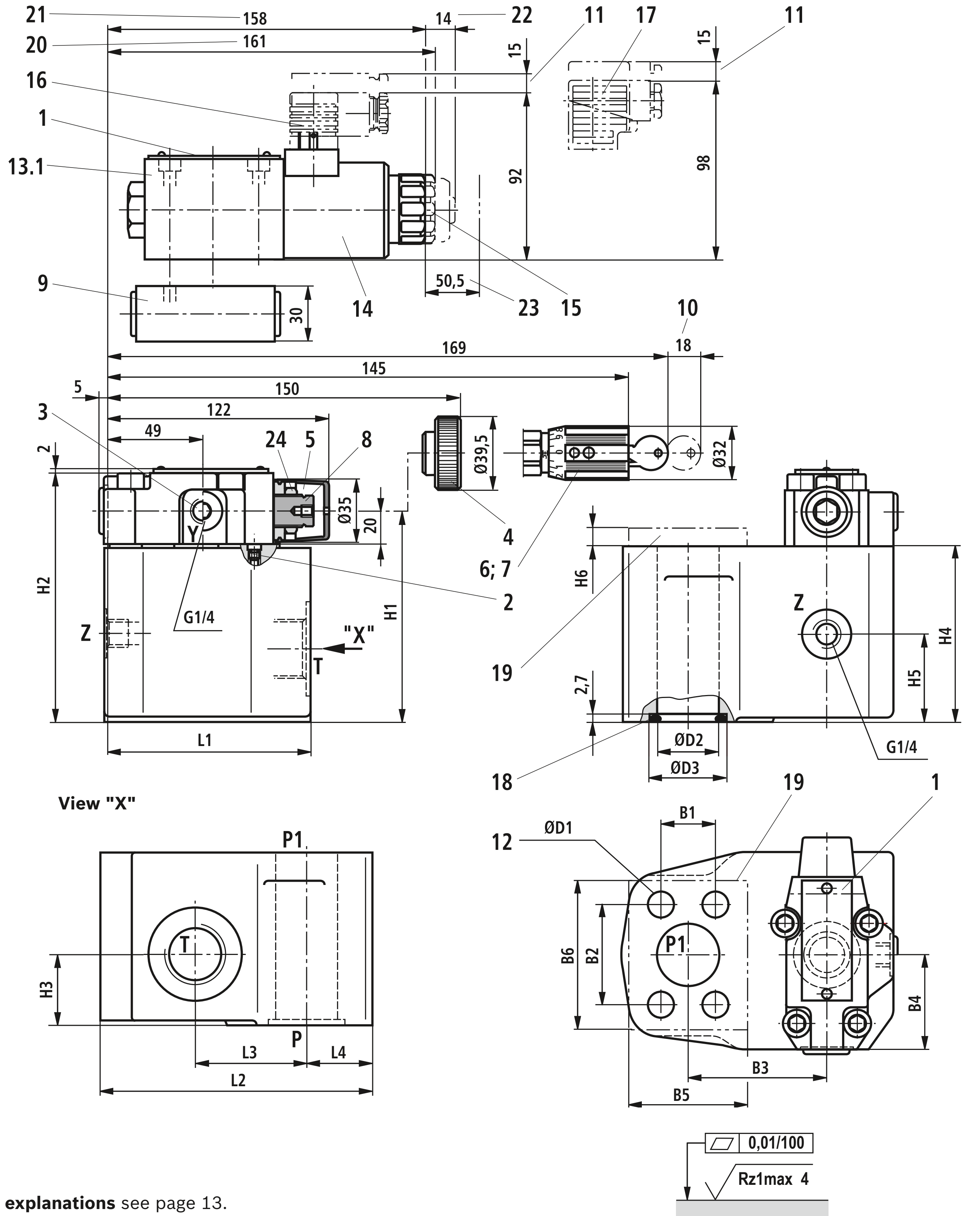


Inlet pressure dependent on the flow



Notice!
- The characteristic curves were measured with **external, depressurized pilot oil return**.
  With internal pilot oil return, the inlet pressure increases by the output pressure present in port T.
- The characteristic curves apply to the pressure at the valve output p_T = 0 bar across the entire flow range.

Unit dimensions: With directional spool valve (dimensions in mm)

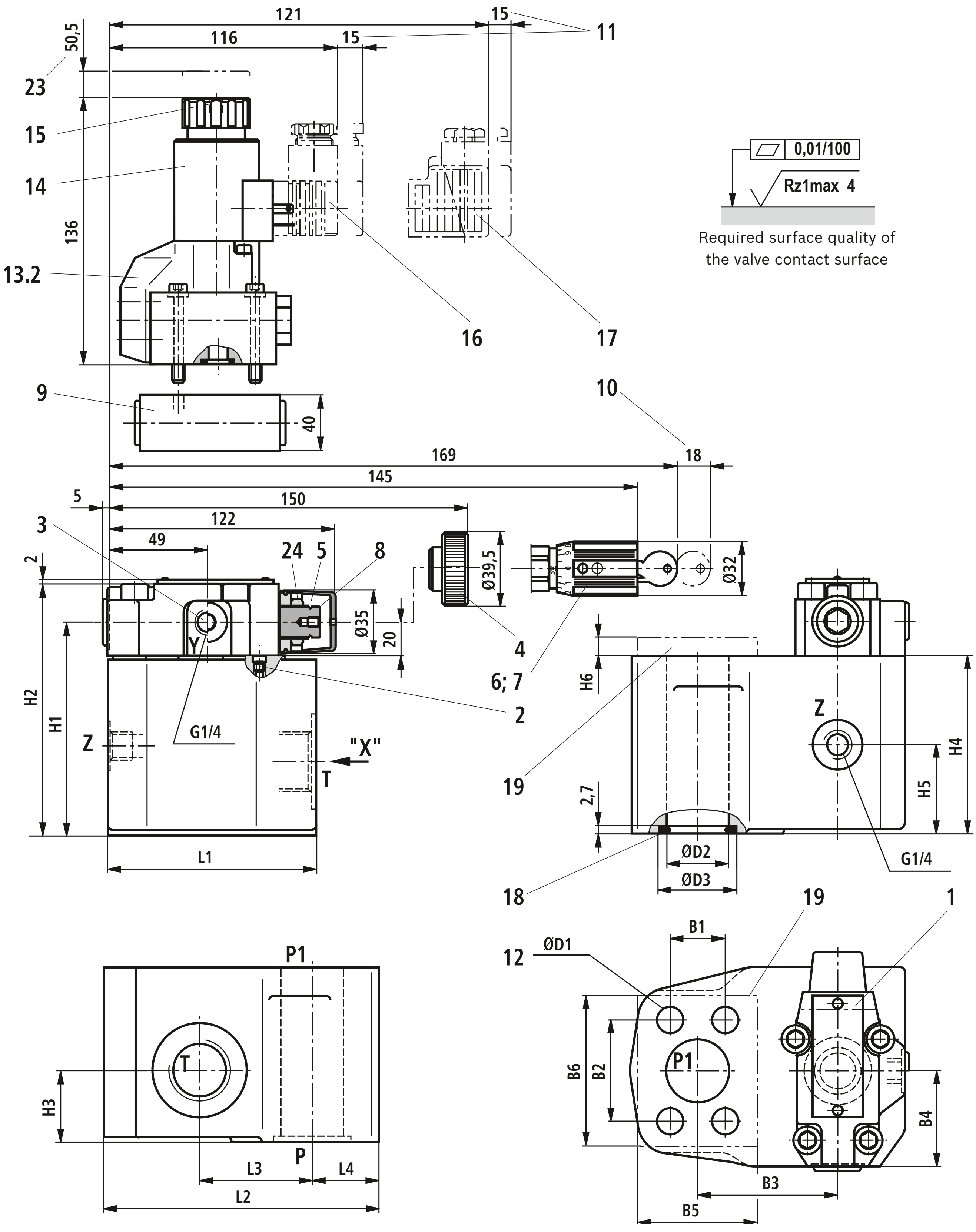


Required surface quality of the valve contact surface

Item explanations see page 13.

Dimensional tables see page 12.

Unit dimensions: With directional seat valve (dimensions in mm)



Item explanations see page 13.
Dimensional tables see page 12.

Unit dimensions
(dimensions in mm)

Standard flanges, version "DBA...**F**"

Size	L1	L2	L3	L4	B1	B2	B3	B4	B5 1)	B6 1)	H1	H2	H3	H4	H5	H6 1)	ØD1	ØD2	ØD3
32	121	138	55	38.5	30.2	58.7	65	48.3	60	80	105	125	43	85	43	9	11	32	45
40	138	156	54.5	49.5	35.8	69.9	74.5	54.7	60	100	118	138	50	98	56	8	13	40	54

Standard flanges, version "DBA**R..F**"

Size	L1	L2	L3	L4	B1	B2	B3	B4	B5 1)	B6 1)	H1	H2	H3	H4	H5	H6 1)	ØD1	ØD2	ØD3
32	121	138	55	38.5	30.2	58.7	65	48.3	60	80	105	125	43	85	43	9	11	25	40
40	138	156	54.5	49.5	35.8	69.9	74.5	54.7	60	100	118	138	50	98	56	8	13	30	54

Size	Version	Connections		4 valve mounting screws ISO 4762 - 10.9 2)		Tightening torque
		P and P1	T		Material no.	M_A in Nm 3)
32	"DBA"	SAE 1 1/4"	G1 1/4	M10 x 120	R913000074	52
	"DBAR"			M10 x 125	R913000668	
40	"DBA"	SAE 1 1/2"	G1 1/2	M12 x 135	R913024229	77
	"DBAR"			M12 x 140	R913000312	

Admissible pressures (flange connections according to ISO 6162-1) in bar	
SAE 1 1/4"	250
SAE 1 1/2"	200

High-pressure flanges, version "DBA...**H**"

Size	L1	L2	L3	L4	B1	B2	B3	B4	B5 1)	B6 1)	H1	H2	H3	H4	H5	H6 1)	ØD1	ØD2	ØD3
32	121	138	55	38.5	31.8	66.7	65	48.3	60	90	105	125	43	85	43	8	15	32	45
40	138	156	54.5	49.5	36.6	79.4	74.5	54.7	65	110	118	138	50	98	56	8	17	40	54

High-pressure flanges, version "DBA**R..H**"

Size	L1	L2	L3	L4	B1	B2	B3	B4	B5 1)	B6 1)	H1	H2	H3	H4	H5	H6 1)	ØD1	ØD2	ØD3
32	121	138	55	38.5	31.8	66.7	65	48.3	60	90	105	125	43	85	43	8	15	32	40
40	138	156	54.5	49.5	36.6	79.4	74.5	54.7	65	110	118	138	50	98	56	8	17	30	54

Size	Version	Connections		4 valve mounting screws ISO 4762 - 10.9 2)		Tightening torque
		P and P1	T		Material no.	M_A in Nm 3)
32	"DBA"	SAE 1 1/4"	G1 1/4	M14 x 135	R913024230	113
	"DBAR"			M14 x 145	R913024233	
40	"DBA"	SAE 1 1/2"	G1 1/2	M16 x 155	R913024234	184
	"DBAR"			M16 x 160	R913000354	

Admissible pressures (flange connections according to ISO 6162-1) in bar	
SAE 1 1/4"	350
SAE 1 1/2"	350

1) Only for version with check valve "R"

2) **Valve mounting screws** (separate order)
4 hexagon socket head cap screws ISO 4762 - 10.9-flZn-240h-L
(for friction coefficient μ_{total} = 0.09 ... 0.14)
Attention!
For reasons of stability, other valve mounting screws must not be used!

3) The tightening torques are guidelines when using screws with the specified friction coefficients and when using a manual torque wrench (tolerance ±10 %).

Unit dimensions

1 Name plate
2 Omitted with internal pilot oil return
3 Y port for pilot oil return, external
4 Adjustment type "1"
5 Adjustment type "2"
6 Adjustment type "3"
7 Adjustment type "7"
8 Hexagon wrench size 10
9 Switching shock damping sandwich plate, optional
10 Space required to remove the key
11 Space required to remove the mating connector
12 Valve mounting bore
13.1 Directional spool valve size 6 (data sheet 23178)
13.2 Directional seat valve size 6 (data sheet 22058)
14 Solenoid "a"
15 Manual override, optional
16 Mating connector without circuitry, separate order, see page 18
17 Mating connector with circuitry, separate order, see page 18
18 Seal ring
19 Integrated check valve, version "R"
20 Dimension for valve without manual override
21 Dimension for valve with concealed manual override "N9"
22 Dimension for valve with manual override "N"
23 Space required to remove the coil
24 Lock nut, wrench size 17, tightening torque M_A = 10^{+5} Nm

Possible pumps (selection)

Pump	Type	Component series/series	Data sheet
Internal gear pump	PGH	3X	10227
	PGH	2X	10223
Displacement pump	A2FO	Series 6	91401
Industrial-type variable displacement pump	A4VSO	Series 3	92050
	A4VG	Series 3	92003
Variable displacement pump	A7VO	Series 63	92203
	A7VO	Series 63	92202
	A10VSO	Series 31	92711
	A10VSO	Series 32	92714

Notice!
Ensure that the connection dimensions are appropriate when selecting the pump, see page 10 ... 12!

Ordering code: Type-examination tested safety valves type DBA...E, component series 1X according to Pressure Equipment Directive 97/23/EC

Size	Type designation	Component marking	Maximum flow q_{Vmax} in l/min with pilot oil return		Set response overpressure p in bar
			External "Y"	Internal "–"	
32	2 3 4 5 6 DBA 30 □□ N1X/□□□ E	TÜV.SV.□–938.22.F.G.p	200	175	30 ... 60
	2 3 4 5 6 DBAR 30 □□ N1X/□□□ E		400	260	61 ... 110
	1 2 3 4 5 6 DBAW 30 □□□ N1X/□□ 6 * □ E		600	360	111 ... 210
	1 2 3 4 5 6 DBAWR 30 □□□ N1X/□□ 6 * □ E		700	520	211 ... 350
40	2 3 4 5 6 DBA 40 □□ N1X/□□□ E	TÜV.SV.□–939.22.F.G.p	350	300	30 ... 60
	2 3 4 5 6 DBAR 40 □□ N1X/□□□ E		450	350	61 ... 110
	1 2 3 4 5 6 DBAW 40 □□□ N1X/□□ 6 * □ E		550	500	111 ... 210
	1 2 3 4 5 6 DBAWR 40 □□□ N1X/□□ 6 * □ E		700	600	211 ... 350

1	Directional valve, normally closed	**A**
	Directional valve, normally open	**B**
2	Standard flange	**F**
	High-pressure flange	**H**
3	**Adjustment type**	
	Hand wheel (pressure adjustment sealed, unloading or setting of a lower response pressure possible!)	**1**
	With sealed protective cap (no adjustment/unloading possible)	**2**
4	Pressure in the designation is to be entered by the customer, pressure adjustment ≥30 bar and possible in 5 bar steps.	**e. g. 150**
5	**Pilot oil supply and return**	
	Internal	**–** [1]
	Recommendation: Internal pilot oil supply, external pilot oil return (ordering code according to symbols page 4)	**Y**
*	Electrical data ordering code (see page 3)	**e. g. EG24N9K4**
6	NBR seals	**no code**
	FKM seals	**V**
□	Value entered at factory	**1X**

[1] Hyphen "–" required only if 02 = **"W"** and 12 and 13 = **"no code"** (see pages 2 and 3)

Deviating technical data: Type-examination tested safety valves type DBA...E, component series 1X according to Pressure Equipment Directive 97/23/EC [1)]

hydraulic			
Maximum counter pressures	– Port Y	bar	0
	– Port T	bar	10
Maximum flow			See table page 14 and characteristic curves page 16 and 17
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524
Hydraulic fluid temperature range		°C	–20 ... +60 (NBR seals) –15 ... +60 (FKM seals)
Viscosity range		mm²/s	12 ... 230

1) For applications outside these parameters, please consult us!

Safety instructions: Type-examination tested safety valves type DBA...E, component series 1X according to Pressure Equipment Directive 97/23/EC

- Before ordering a type-examination tested safety valve, it must be ensured that at the desired **response pressure *p***, the maximum admissible **flow** $q_{V\,max}$ (= numerical value at the position of letter "G" in the component marking) of the safety valve is higher than the maximum possible flow of the system/accumulator to be secured. In this, the corresponding regulations have to be observed!
- According to **PED 97/23/EC** , the increase in system pressure caused by the flow must not exceed 10 % of the set response pressure (see component marking). The maximum admissible flow $q_{V\,max}$ specified in the component marking must not be exceeded. Discharge lines of safety valves must end in a risk-free manner. The accumulation of fluids in the discharge lines must **not** be possible (see AD2000 - data sheet A2).

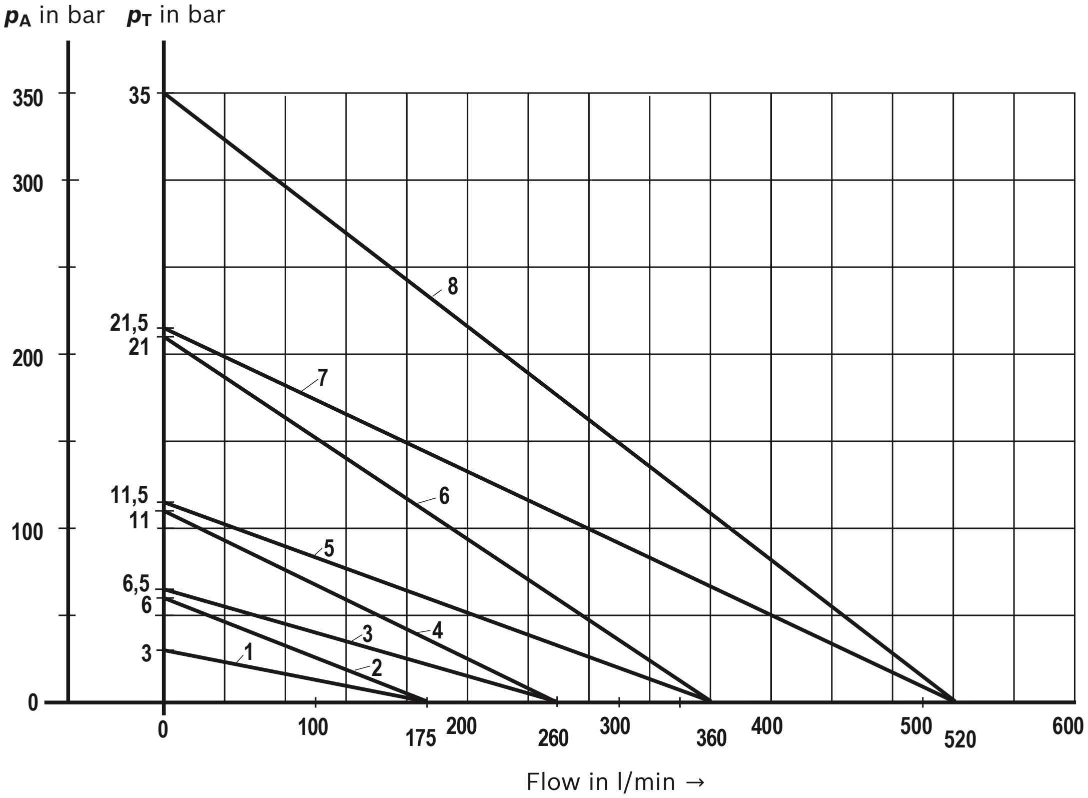
☞ **It is imperative to observe the application notes!**

- In the plant, the response pressure specified in the component marking is set with a flow of 2 l/min.
- The maximum admissible flow specified in the component marking applies to:
  - External pilot oil return **"Y"** without counter pressure in the pilot oil return line, admissible counter pressure in the discharge line (port T) < 15 bar.
  - Internal pilot oil return **"–"** without counter pressure in the discharge line (port T)
    With internal pilot oil return, the system pressure increases by the counter pressure in the discharge line (port T) due to the increasing flow (observe AD2000 - data sheet; A2, item 6.3).
    To ensure that this increase in system pressure caused by the volume flow does not exceed the value of 10 % of the set response pressure, the admissible volume flow has to be reduced dependent on the counter pressure in the discharge line (port T), see characteristic curves pages 16 and 17).
- If a lead seal at the safety valve is removed, the approval according to the Pressure Equipment Directive becomes void.
- Basically, the requirements of the pressure equipment directives and of data sheet AD2000 A2 have to be observed!

Safety instructions: Type-examination tested safety valves type DBA...E, component series 1X according to Pressure Equipment Directive 97/23/EC

Maximum admissible flow $q_{V\,max}$ dependent on the counter pressure p_T in the discharge line with internal pilot oil return

Type DBA 30 ...-1X/...E



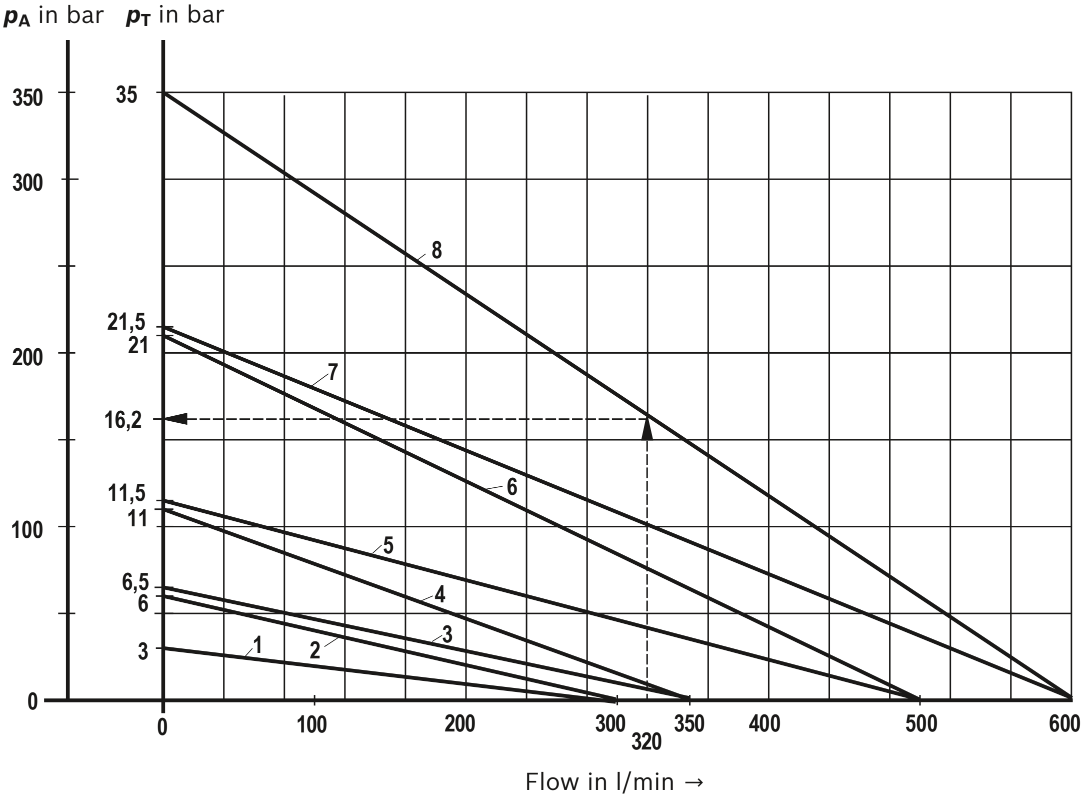
Charac-teristic curves	Response pressure p_A in bar
1	30
2	60
3	65
4	110
5	115
6	210
7	215
8	350

Characteristic curves for intermediate values can be generated by interpolation. Further explanations see page 17.

Safety instructions: Type-examination tested safety valves type DBA...E, component series 1X according to Pressure Equipment Directive 97/23/EC

Maximum admissible flow $q_{V\,max}$ dependent on the counter pressure p_T in the discharge line with internal pilot oil return

Type DBA 40 ...-1X/...E



Characteristic curves	Response pressure p_A in bar
1	30
2	60
3	65
4	110
5	115
6	210
7	215
8	350

Characteristic curves for intermediate values can be generated by interpolation. Further explanations see below.

p_A =	Response pressure in bar
p_T =	Maximum admissible counter pressure in bar (sum of all possible tank pressures; see also AD2000 - data sheet A2)
$q_{V\,max}$ =	Maximum admissible flow in l/min
$p_{T\,max}$ =	10 % x p_A (for q_V = 0) according to PED 97/23/EC

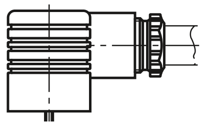
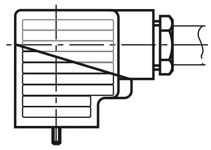
Explanation of the diagrams
(Example: Type DBA...E, above):

known:
- Flow of the system/accumulator that has to be secured $q_{V\,max}$ = 320 l/min
- Set response pressure of the safety valve p_A = 350 bar

unknown: $p_{T\,admissible}$

Solution: See arrows in diagram above
$p_{T\,admissible}$ (320 l/min; 350 bar) = 16.2 bar

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006				
	Material no.			
Color	Without circuitry	With indicator light 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Zener diode suppression circuit 24 V
Gray	**R901017010**	–	–	–
Black	**R901017011**	**R901017022**	**R901017025**	**R901017026**

General notes:

- The unloading function (directional valve function with version "W") must not be used for safety functions!
- With version **"B"**, the lowest adjustable pressure (circulation pressure) is set in case of power failure or cable break. With version **"A"**, the pressure limiting function is set in case of power failure or cable break.
- Hydraulic counter pressures in port T with internal pilot oil return and/or port Y with external pilot oil return add 1:1 to the response pressure of the valve set at the pilot control.

Example:
Pressure adjustment of the valve by spring preload (item 9 on page 5) in the pilot control valve/adjustment type
p_{spring} **= 200 bar**

Hydraulic counter pressure in port T with internal pilot oil return $p_{hydraulic}$ **= 50 bar**

=> Response pressure = $p_{spring} + p_{hydraulic}$ **= 250 bar**

More information

▶ Directional spool valve	Data sheet 23178
▶ Directional seat valve	Data sheet 22058
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ General product information on hydraulic products	Data sheet 07008
▶ Installation, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Selection of the filters	www.boschrexroth.com/filter

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Pressure reducing valve, direct operated

RE 26564/05.11
Replaces: 02.03

Type DR 6 DP

H7743

Size 6
Component series 5X
Maximum operating pressure 315 bar *[4568 psi]*
Maximum flow 60 l/min *[15.9 US gpm]*

Table of contents

Features

- For subplate mounting
- Porting pattern according to DIN 24340 form A
- Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole)
- 4 adjustment types for pressure adjustment, optionally:
  - Rotary knob
  - Setscrew with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- 5 pressure ratings
- Check valve, optional

- More informatio:
  - Subplates — Data sheet 45052

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

DR 6 DP		–5X /	Y				*

Pressure reducing valve, direct operated, size 6

Adjustment type

Rotary knob	**= 1**
Setscrew with hexagon and protective cap	**= 2**
Lockable rotary knob with scale	**= 3** [1]
Rotary knob with scale	**= 7**

Component series 50 to 59 **= 5X**
(50 to 59: Unchanged installation and connection dimensions)

Maximum secondary pressure 25 bar *[362 psi]*	**= 25**
Maximum secondary pressure 75 bar *[1088 psi]*	**= 75**
Maximum secondary pressure 150 bar *[2175 psi]*	**= 150**
Maximum secondary pressure 210 bar *[3046 psi]*	**= 210**
Maximum secondary pressure 315 bar *[4568 psi]*	**= 315** [2]

Y = Pilot oil supply internal, leakage oil discharge external

No code =	With check valve
M =	Without check valve

Seal material

No code =	NBR seals
V =	FKM seals

(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

No code =	Without locating hole
/60[3] **=**	With locating hole
/62 =	With locating hole and locating pin ISO 8752-3x8-St

Further details in the plain text

[1] H-key with Material no. **R900008158** is included in the delivery.

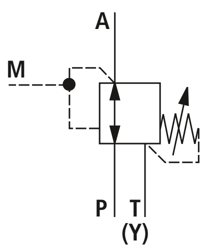
[2] Only with adjustment type "2" and without check valve

[3] Locating pin ISO 8752-3x8-St, Material no. **R900005694** (separate order)

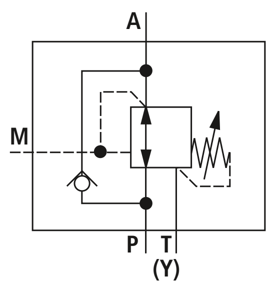
Standard types and standard units are contained in the EPS (standard price list).

Symbols

Version "M"
without check valve



"No code" version
with check valve



Function, section

The valve type DR 6 DP is a direct operated pressure reducing valve in 3-way design, i.e. with pressure limitation of the secondary circuit.

It is used to reduce a system pressure. The secondary pressure is set via the adjustment type (4).

In the initial position the valve is open. Hydraulic fluid can flow from channel P to channel A without obstructions. Via the pilot line (6), the pressure in channel A is applied to the spool face vis-à-vis the compression spring (3). If the pressure in channel A rises above the value set at the compression spring (3), the control spool (2) moves into the control position and holds the set pressure in channel A constant.

Signal and pilot oil are provided internally, via the control line (6) by channel A.

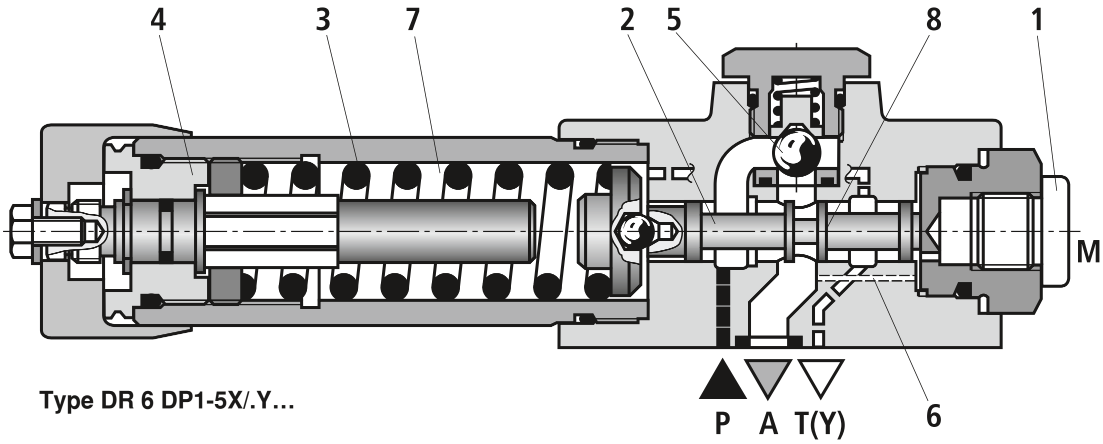
If the pressure in channel A continues to increase due to external forces at the actuator, it moves the control spool (2) further against the compression spring (3).

Thus, channel A is, via the control edge (8) at the control spool (2), connected with channel T(Y). Hydraulic fluid flows to the tank until the pressure can only increase slightly.

The leakage oil drain from the spring chamber (7) is always realized externally, via channel T(Y).

For the free flow back from channel A to channel P, you can optionally install a check valve (5).

A pressure gauge connection (1) allows for the control of the secondary pressure.



Type DR 6 DP1-5X/.Y…

Technical Data (For applications outside these parameters, please consult us!)

general

Weight	kg *[lbs]*	1.2 *[2.64]*
Installation position		Any
Ambient temperature range	°C *[°F]*	–30 to +80 *[−22 to +176]* (NBR seals) –20 to +80 *[−4 to +176]* (FKM seals)

hydraulic

Maximum operating pressure	– Port P	bar *[psi]*	315 *[4568]*
Maximum secondary pressure	– Port A	bar *[psi]*	25; 75; 150; 210; 315 *[362; 1088; 2175; 3046; 4568]*
Maximum backpressure	– Port T (Y)	bar *[psi]*	160 *[2320]*
Maximum flow		l/min *[US gpm]*	60 *[15.9]*
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C *[°F]*	–30 to +80 *[−22 to +176]* (NBR seals) –20 to +80 *[−4 to +176]* (FKM seals)
Viscosity range		mm²/s *[SUS]*	10 to 800 *[60 to 3710]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!

– For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!

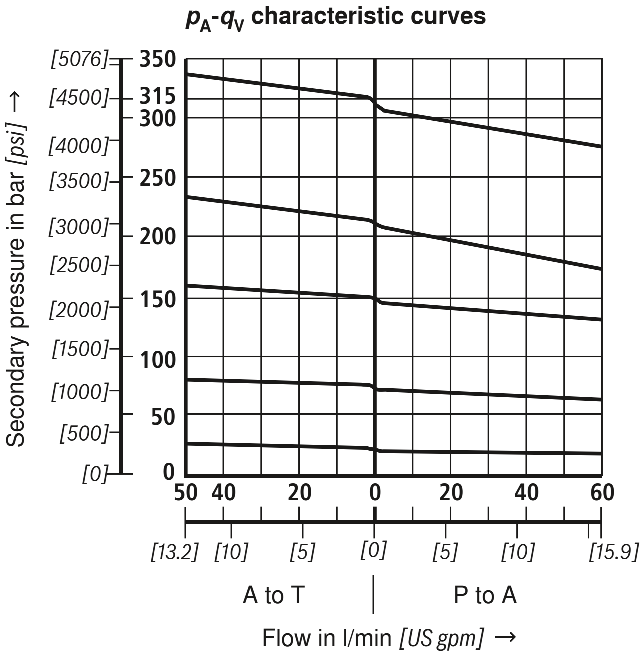
– There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

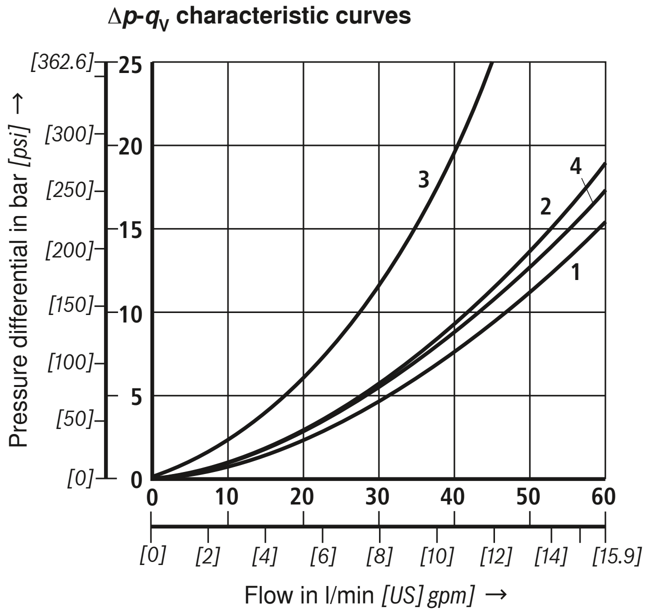
– **Flame-resistant – water-containing**:
  - Maximum operating pressure 210 bar
  - Maximum hydraulic fluid temperature 60 °C
  - Expected service life as compared to HLP hydraulic oil 30 % to 100 %

[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)





☞ **Note!**

With lower pressures set, the curve development is maintained according to the pressure rating.

The characteristic curves apply to the pressure at the valve output ***p*** = 0 bar across the entire flow range.

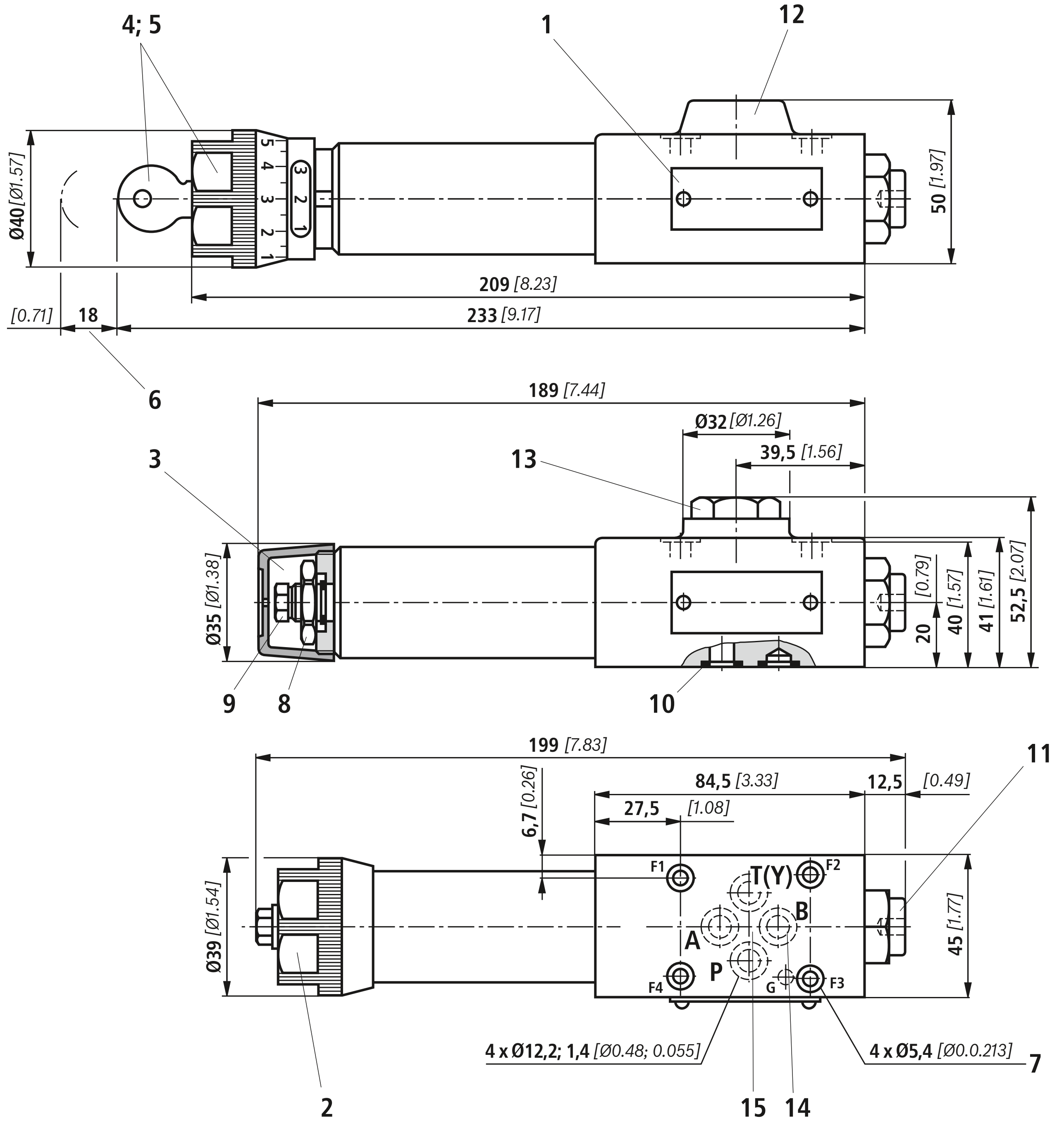
1 P to A (minimum pressure differential)

2 A to T(Y) (minimum pressure differential)

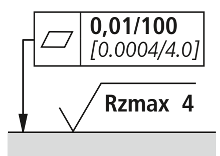
3 Δ***p*** only via check valve

4 Δ***p*** via check valve and completely opened control cross-section

Unit dimensions (dimensions in mm *[inch]*)



Explanations of items, valve mounting screws and **subplates** see page 7.



Required surface quality of the valve mounting face

Unit dimensions

1 Name plate
2 Adjustment type "1"
3 Adjustment type "2"
4 Adjustment type "3"
5 Adjustment type "7"
6 Space required to remove the key
7 Valve mounting bores
8 Lock nut SW24
9 Hexagon SW10
10 Identical seal rings for ports A, B, P, T(Y)
11 Pressure gauge connection G1/4, 12 deep. Internal hexagon SW6
12 Without check valve
13 With check valve
14 Port B without function
15 Porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locating pin ISO 8752-3x8-St, Material no. **R900005694**, separate order)

Subplates according to data sheet 45052 (separate order)

(**without** locating hole)	G 341/01 (G1/4)
	G 342/01 (G3/8)
	G 502/01 (G1/2)
(**with** locating hole)	G 341/60 (G1/4)
	G 342/60 (G3/8)
	G 502/60 (G1/2)

Valve mounting screws (separate order)

4 hexagon socket head cap screws metric
ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 7 Nm ±10 %,
Material no. **R913000064**

4 hexagon socket head cap screws UNC
10-24 UNC x 2" (on request)

Notes

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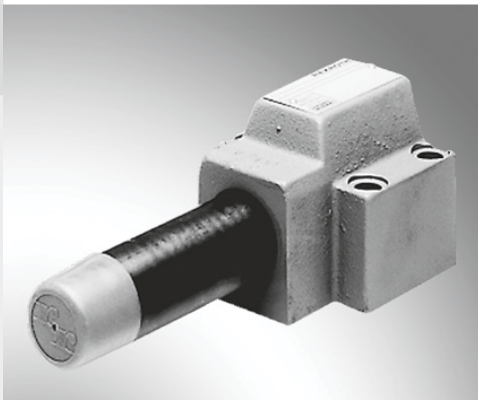
Pressure reducing valve, direct operated

RE 26580/05.11
Replaces: 02.03

Type DR 10 DP

Size 10
Component series 4X
Maximum operating pressure 210 bar
Maximum flow 80 l/min



K4786/11

Table of contents

Features

- For subplate mounting
- Porting pattern according to DIN 24340 Form D and ISO 5781-06-07-0-00
- 4 adjustment types for pressure adjustment, optionally:
  - Rotary knob
  - Setscrew with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- 4 pressure ratings
- With pressure gauge connection
- Check valve, optional

- More information:
  - Subplates — Data sheet 45062

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

DR 10 DP		–4X /	Y			*

Pressure reducing valve, direct operated, size 10

Adjustment type

Rotary knob	**= 1**
Setscrew with hexagon and protective cap	**= 2**
Lockable rotary knob with scale	**= 3** [1]
Rotary knob with scale	**= 7**

Component series 40 to 49 (40 to 49: Unchanged installation and connection dimensions)	**= 4X**

Maximum secondary pressure 25 bar	**= 25**
Maximum secondary pressure 75 bar	**= 75**
Maximum secondary pressure 150 bar	**= 150**
Maximum secondary pressure 210 bar	**= 210**

Y = Pilot oil supply internal, leakage oil discharge external

No code =	With check valve
M =	Without check valve

Seal material

No code =	NBR seals
V =	FKM seals

(other seals upon request)

Attention!
Observe compatibility of seals with hydraulic fluid used!

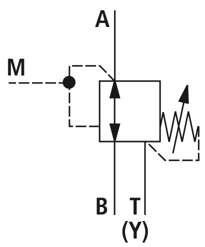
Further details in the plain text

[1] H-key with Material no. **R900008158** is included in the delivery.

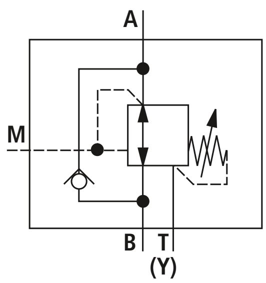
Standard types and standard units are contained in the EPS (standard price list).

Symbols

Version "M"
without check valve



"No code" version
with check valve



Function, section

The valve type DR 10 DP is a direct operated pressure reducing valve in 3-way design, i.e. with pressure limitation of the secondary circuit.

It is used to reduce a system pressure. The secondary pressure is set via the adjustment type (1).

In the initial position the valve is open. Hydraulic fluid can flow from channel B to channel A without obstructions. Via the pilot line (4), the pressure in channel A is applied to the spool face vis-à-vis the compression spring (3). If the pressure in channel A rises above the value set at the compression spring (3), the control spool (2) moves into the control position and holds the set pressure in channel A constant.

Signal and pilot oil are provided internally, via the control line (4) by channel A.

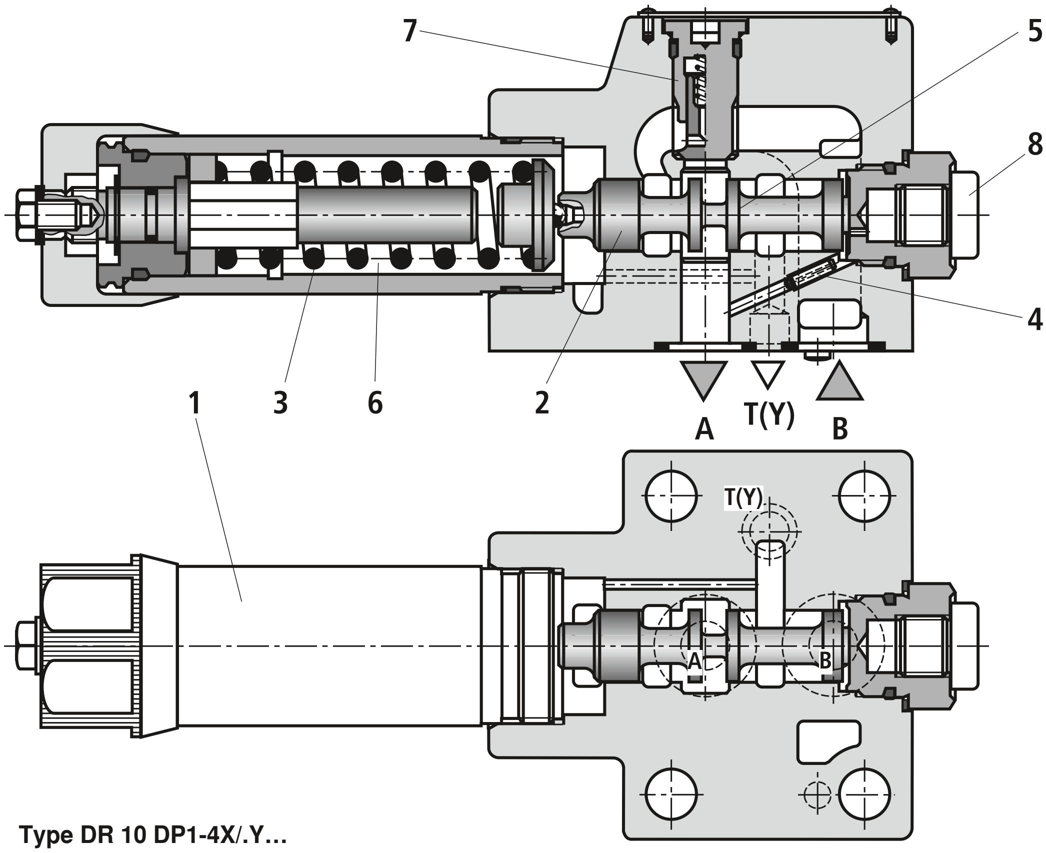
If the pressure in channel A continues to increase due to external forces at the actuator, it moves the control spool (2) further against the compression spring (3).

Thus, channel A is, via the control edge (5) at the control spool (2), connected with channel T(Y). Hydraulic fluid flows to the tank until the pressure can only increase slightly.

The leakage oil drain from the spring chamber (6) is always realized externally, via channel T (Y).

For the free flow back from channel A to channel B, you can optionally install a check valve (7).

A pressure gauge connection (8) allows for the control of the secondary pressure.



Type DR 10 DP1-4X/.Y…

Technical Data (For applications outside these parameters, please consult us!)

general

Weight	kg	3
Installation position		Any
Ambient temperature range	°C	–30 to +50 (NBR seals) –20 to +50 (FKM seals)

hydraulic

Maximum operating pressure	– Port B	bar	315
Maximum secondary pressure	– Port A	bar	25; 75; 150; 210
Maximum backpressure	– Port T (Y)	bar	160
Maximum flow		l/min	80
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	10 to 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

☞ **Important information on hydraulic fluids!**

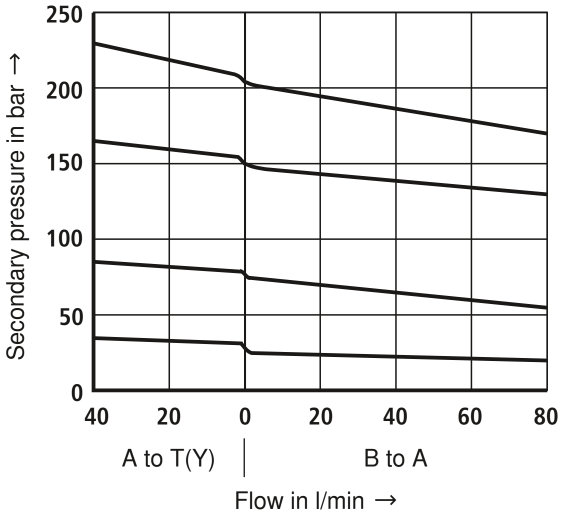
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- **Flame-resistant – water-containing**:
  - Maximum operating pressure 210 bar
  - Maximum hydraulic fluid temperature 60 °C
  - Expected service life as compared to HLP hydraulic oil 30 % to 100 %

[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

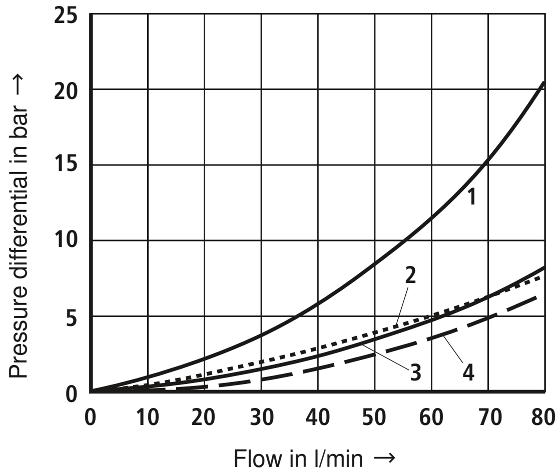
For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C)

p_A-q_V characteristic curves



Δp-q_V characteristic curves



Note!

With lower pressures set, the curve development is maintained according to the pressure rating.

The characteristic curves apply to the pressure at the valve output ***p*** = 0 bar across the entire flow range.

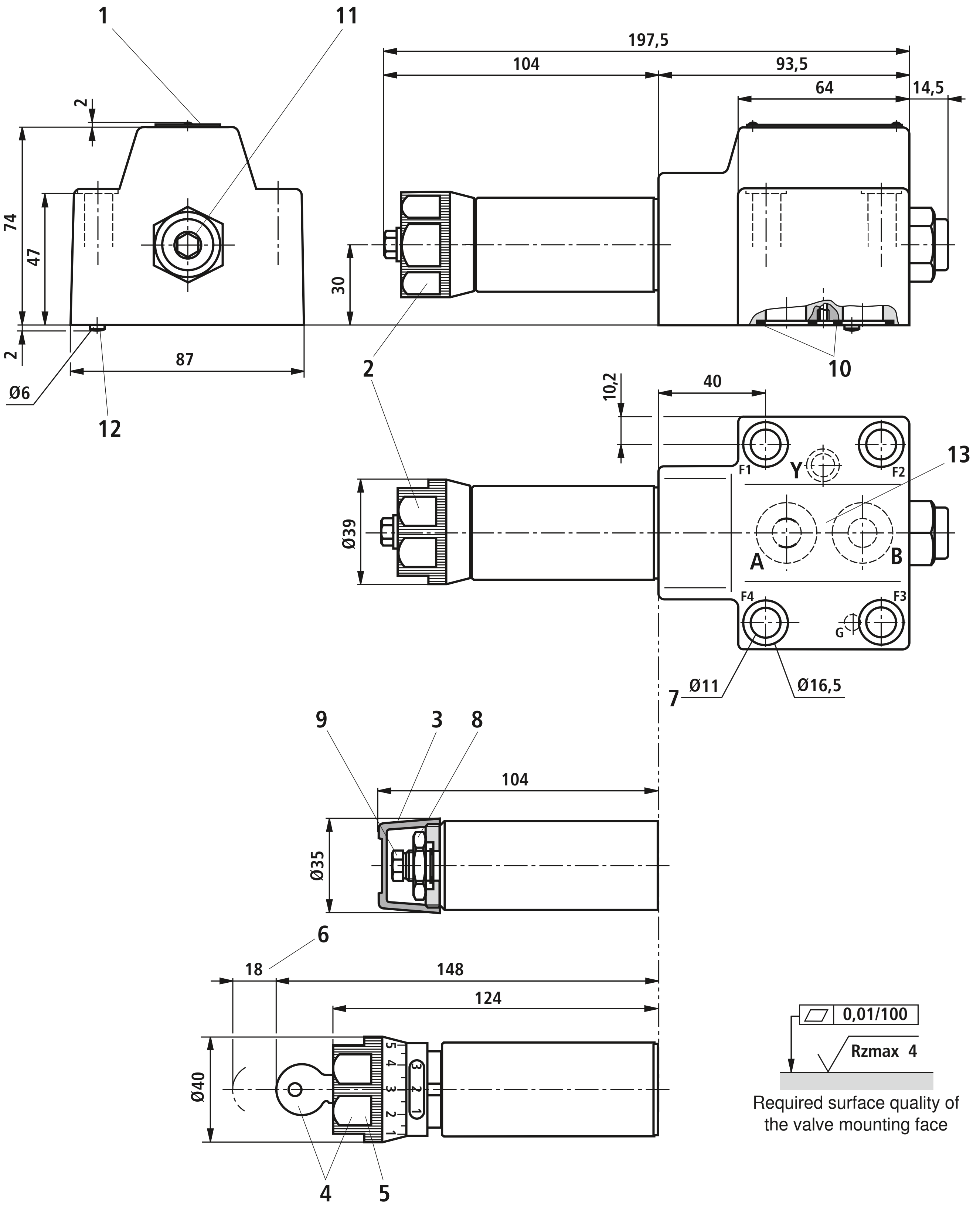
1 A to T (Y) (minimum pressure differential)

2 B to A (minimum pressure differential)

3 Δ***p*** only via check valve

4 Δ***p*** via check valve and completely opened control cross-section

Unit dimensions (dimensions in mm)



Required surface quality of the valve mounting face

Item explanations, valve mounting screws and **subplates**
see page 7.

Unit dimensions

1 Name plate
2 Adjustment type "1"
3 Adjustment type "2"
4 Adjustment type "3"
5 Adjustment type "7"
6 Space required to remove the key
7 Valve mounting bores
8 Lock nut SW24
9 Hexagon SW10
10 Identical seal rings for ports A, B, P, T(Y)
11 Pressure gauge connection G1/4; 12 deep. Internal hexagon SW6
12 Locating pin
13 Porting pattern according to DIN 24340 Form D and ISO 5781-06-07-0-00

Subplates according to data sheet 45062 (separate order)
G 460/01 (G3/8)
G 461/01 (G1/2)

Valve mounting screws (separate order)
4 hexagon socket head cap screws metric
ISO 4762 - M10 x 60 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 60 Nm ±10 %,
Material no. **R912000116**

Notes

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Hydraulics
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97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

2-way pressure reducing valve, direct operated

RE 18111-03/08.11
Replaces: 06.08

Type KRD (high performance)

Size 2
Component series B
Maximum operating pressure 400 bar
Maximum flow 25 l/min

H7311

Table of contents

Contents	**Page**

Features

- Cartridge valve
- Mounting cavity R/ISO 7789-27-01-1-98
- Available in 3 pressure ratings (100, 210 and 315 bar)
- Can be used for many pressure reduction functions without leakage oil drain

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

KRD			2	A	B / L		V

Pressure reducing valve, direct operated

Adjustment type

- Rotary knob **= 1** 1)
- Setscrew with hexagon and protective cap **= 2**
- Rotary knob with scale, lockable **= 3** 1)

Pressure rating

- 100 bar **= F**
- 210 bar **= L**
- 315 bar **= P**

Size **= 2**

Design principle

A = Seat valve

B = Component series

L = High performance and mounting cavity R/ISO7789-27-01-1-98 (see page 6)

No code = without pressure pre-adjustment
–… = with pressure pre-adjustment 2)

V = FKM seals

1) Only with pressure rating 100 bar ("F")

2) Example (pressure adjustment is made with q_V = 1 to 2 l/min):
– Set to 50 bar: …/L-**50** V

Preferred types

Pressure rating	Type	Material number
100 bar	KRD2F2AB/LV	R901082845
210 bar	KRD2L2AB/LV	R901082849
315 bar	KRD2P2AB/LV	R901082857

Function, section, symbol

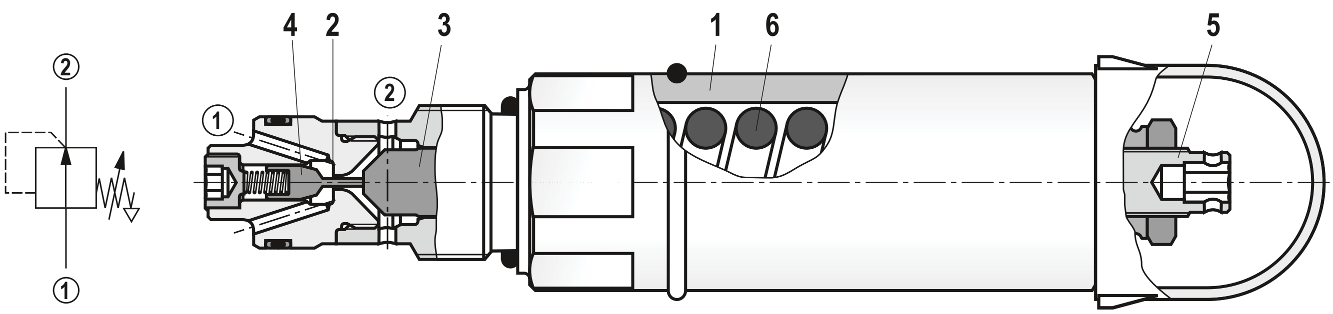
General

The direct operated 2-way pressure reducing valve type KRD is designed as tight seat valve. It is used for the leakage-free pressure reduction of a working pressure.

It basically comprises of the screw-in housing (1) with spring (6) and adjustment type (5) as well as spool (3), valve seat (2) and closing element (4).

Function

In the initial position, the valve seat is open. Hydraulic fluid can flow from the main port ① to ②. If the pressure in the main port increases ② to the pressure value set at the adjustment type (5), the closing element (4) closes the connection ① to ②. If the system pressure increases further (main port ①), this will no longer influence the pressure in main port ② (pressure holding function). Pressure losses in main port ② (actuator) will be compensated by the valve.



① = main port 1 (P)

② = main port 2 (A)

Technical data (For applications outside these parameters, please consult us!)

general

Weight	kg	1
Installation position		Any

hydraulic

Maximum operating pressure	– Main port ①	bar	400	
	– Main port ②	bar	315	
Maximum set pressure [1]			Rated pressure in A	Settable minimum pressure in A
	– Pressure rating 100 bar	bar	100	10
	– Pressure rating 210 bar	bar	210	20
	– Pressure rating 315 bar	bar	315	30
Maximum flow		l/min	25	
Maximum permitted leakage in the application/system		l/min	1.5	
Hydraulic fluid			See table below	
Hydraulic fluid temperature range		°C	–20 to +80	
Viscosity range		mm^2/s	5 to 1000 (preferably 10 to 100)	
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [2]	

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD, HVLP, HVLPD	FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HEES	FKM	ISO 15380
		HEPR	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFAS	FKM	ISO 12922

☞ **Important information on hydraulic fluids!**

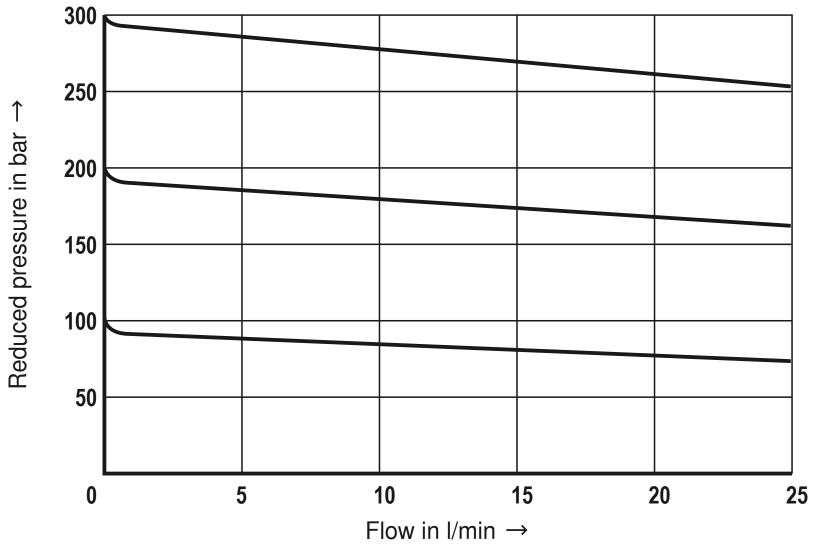
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- **Flame-resistant – water-containing**: Maximum pressure differential per control edge 175 bar; otherwise, increased cavitation erosion!
  Tank pre-loading < 1 bar or > 20 % of the pressure differential. The pressure peaks should not exceed the maximum operating pressures!

[1] Exact pressure control at p > 20 bar is possible.

[2] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.
For selecting the filters, see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Reduced pressure against the flow



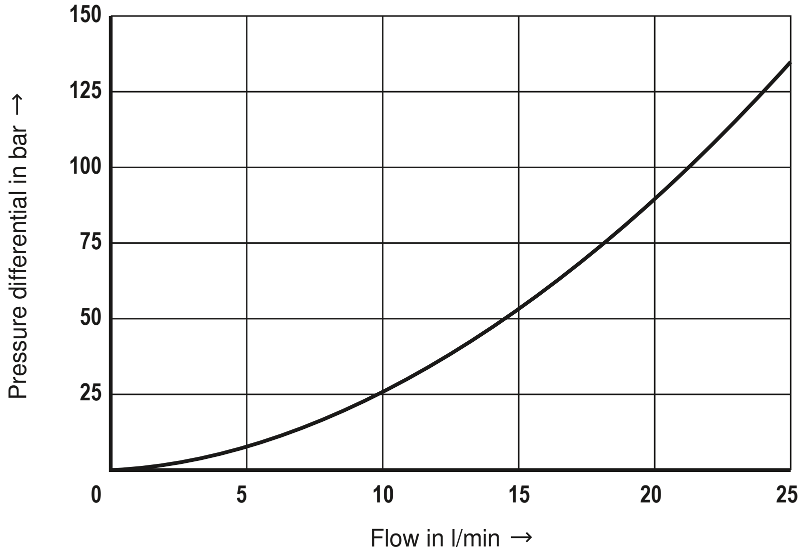
☞ **Notice!**

The figures show the $\boldsymbol{p}$-$\boldsymbol{q}_V$ characteristic curves of the 3 pressure ratings at the relevant rated pressures.

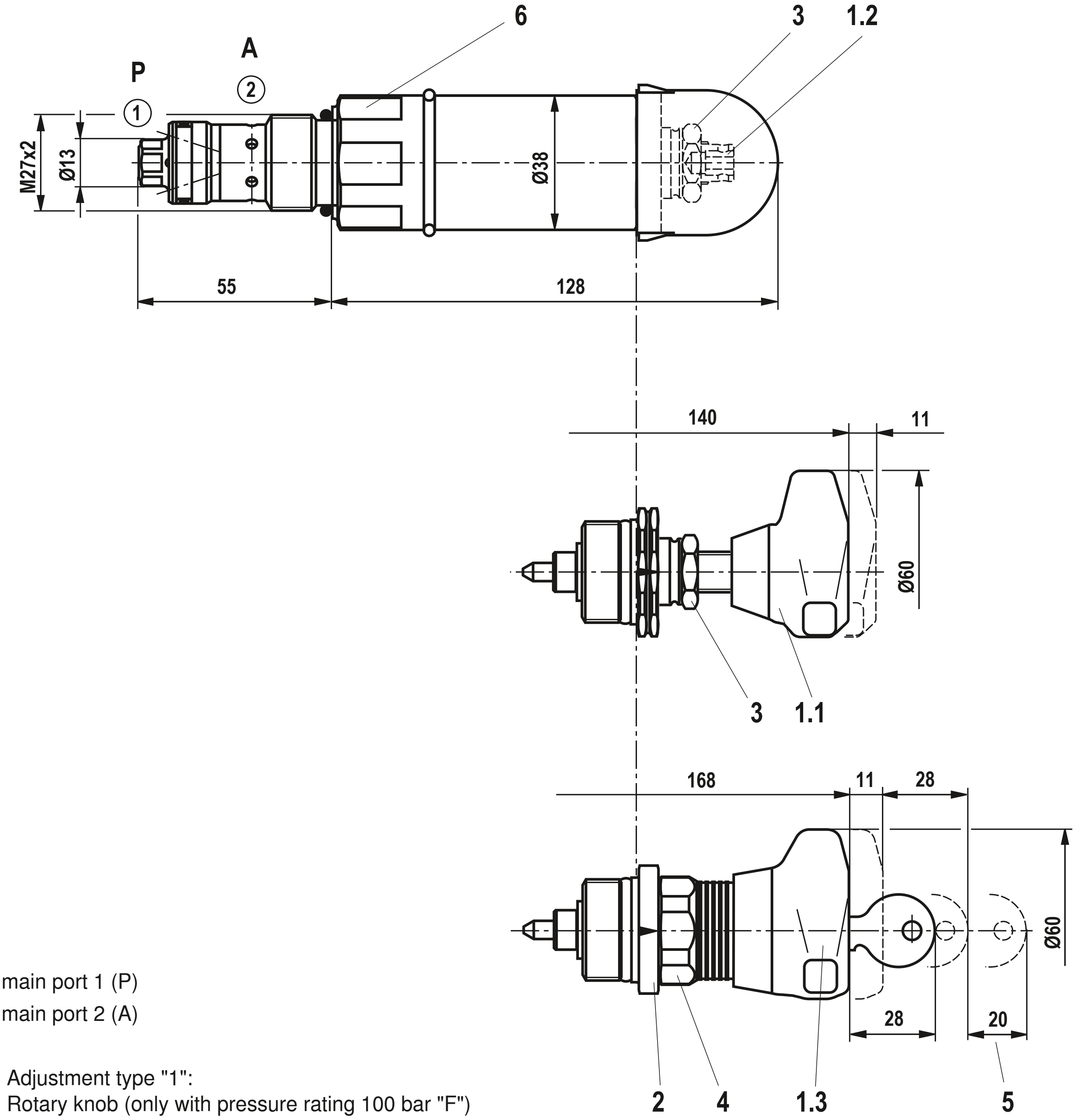
Recommendation for the pressure differential: $\Delta \boldsymbol{p} \geq 20$ bar

Flow resistance

$\Delta\boldsymbol{p}$-$\boldsymbol{q}_V$ characteristic curves



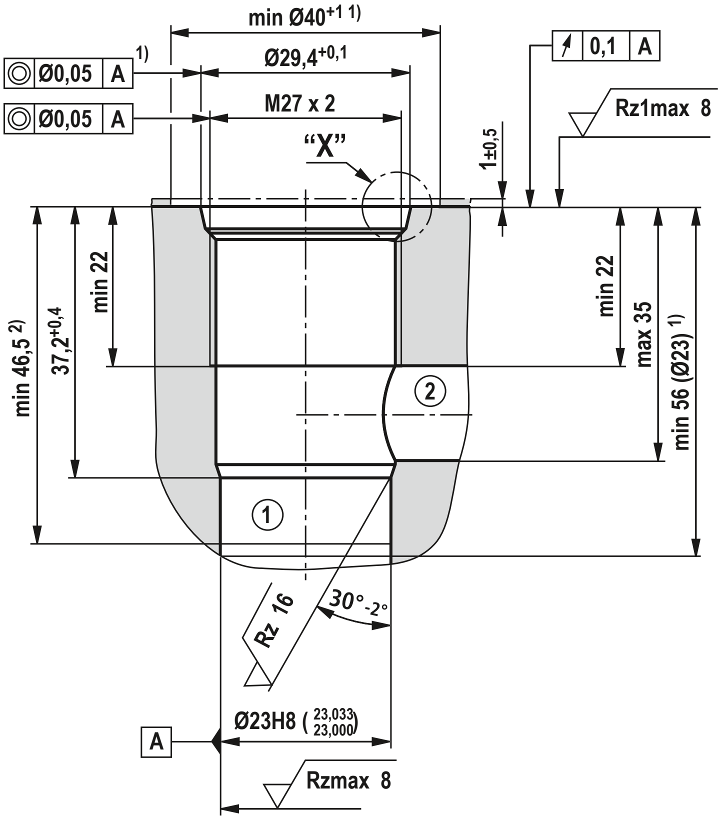
Unit dimensions (dimensions in mm)

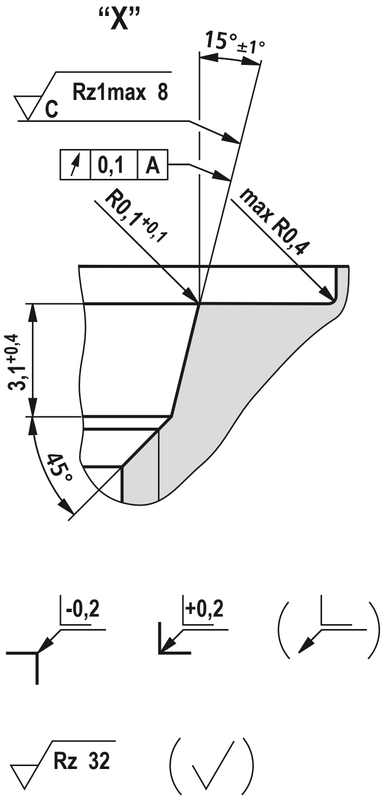


① = main port 1 (P)
② = main port 2 (A)

- **1.1** Adjustment type "1": Rotary knob (only with pressure rating 100 bar "F")
- **1.2** Adjustment type "2": Setscrew with hexagon SW5 and protective cap
- **1.3** Adjustment type "3": Lockable rotary knob with scale (only with pressure rating 100 bar "F")
- **2** Plastic ring with marking (adjustment of the zero position after the valve has been screwed in, then fixing of the ring by horizontal shifting until it engages on the reducing piece)
- **3** Lock nut SW19, tightening torque M_A = 30±5 Nm
- **4** Lock nut SW30, tightening torque M_A = 100 Nm
- **5** Space required to remove the key
- **6** Hexagon SW36, tightening torque M_A = 170 Nm

Mounting cavity R/ISO 7789-27-01-1-98 (similar to ISO 7789-27-01-0-98): 2 main ports, thread M27 x 2 (dimensions in mm)





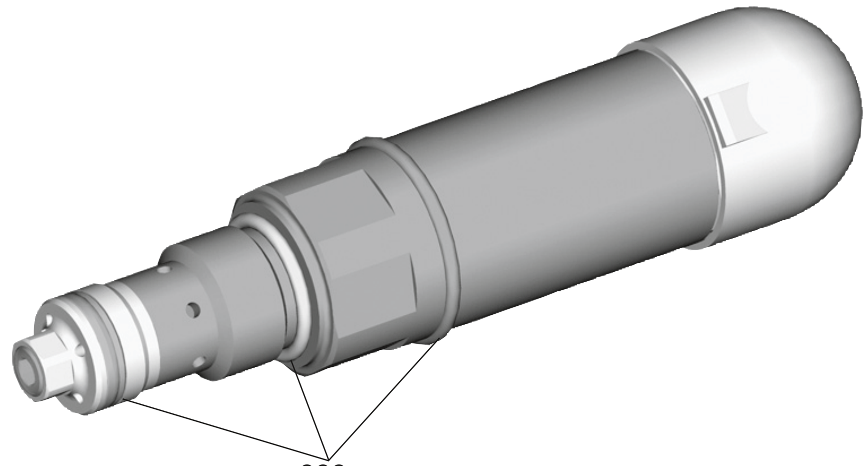
[1)] **Deviating from ISO 7789 27-01-0-98:**
Valves for mounting cavity ISO 7789 27-01-0-98 can be screwed into this bore!

[2)] Depth of fit

① = main port 1 (P)

② = main port 2 (A)

Available individual components



Item	Denomination	Material no.
999	Seal kit of the valve	R961001402

Notes

Bosch Rexroth AG
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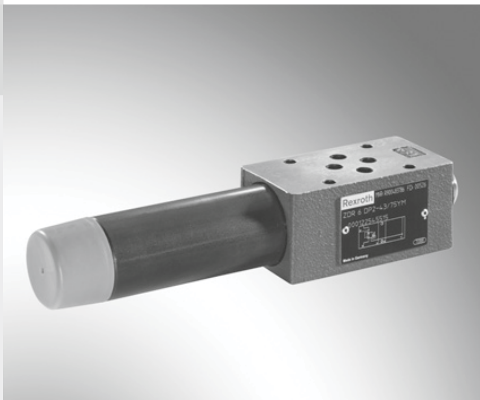
documentation@boschrexroth.de
www.boschrexroth.de

Pressure reducing valve, direct operated

Type ZDR

Size 6
Component series 4X
Maximum operating pressure 210 bar
Maximum flow 50 l/min



H7750

Table of contents

Features

– Sandwich plate valve
– Porting pattern according to DIN 24340 form A
– Porting pattern according to ISO 4401-03-02-0-05 (**with** locating hole)
– 4 pressure ratings
– 4 adjustment types:
  • Rotary knob
  • Bushing with hexagon and protective cap
  • Lockable rotary knob with scale
  • Rotary knob with scale
– Pressure reduction in channel A, B or channel P
– Check valve, optional (only version "A")

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z	DR	6	D		–4X/		Y				*

- Sandwich plate
- Pressure reducing valve
- Size 6 = 6
- Direct operated
- Pressure reduction in channel A② = A
- Pressure reduction in channel B② = B
- Pressure reduction in channel P① = P

Adjustment type

- Rotary knob = 1
- Bushing with hexagon and protective cap = 2
- Lockable rotary knob with scale = 3 [1)]
- Rotary knob with scale = 7

Component series 40 to 49 = 4X
(40 to 49: unchanged installation and connection dimensions)

- **25 =** Secondary pressure up to 25 bar
- **75 =** Secondary pressure up to 75 bar
- **150 =** Secondary pressure up to 150 bar
- **210 =** Secondary pressure up to 210 bar

Y = Pilot oil supply internal, pilot oil return external

- **No code =** **With** check valve (only with version "A")
- **M =** **Without** check valve

Seal material

- **No code =** NBR seals
- **V =** FKM seals

(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

- **No code =** Without locating hole
- **/60** [2)] **=** With locating hole
- **/62 =** With locating hole and locating pin ISO 8752-3x8-St

Further details in the plain text

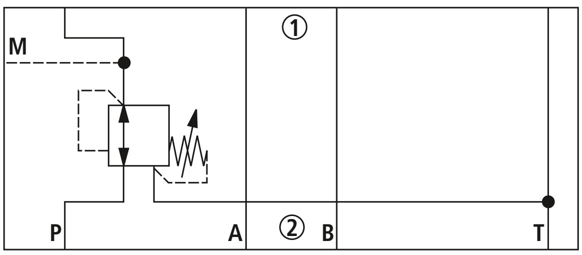
[1)] H key with material no. **R900008158** is included in the delivery.

[2)] Locating pin ISO 8752-3x8-St, Material no. **R900005694** (separate order)

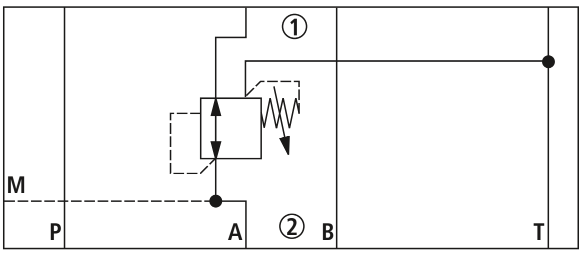
Standard types and standard units are contained in the EPS (standard price list).

Symbols (① = component side, ② = plate side)

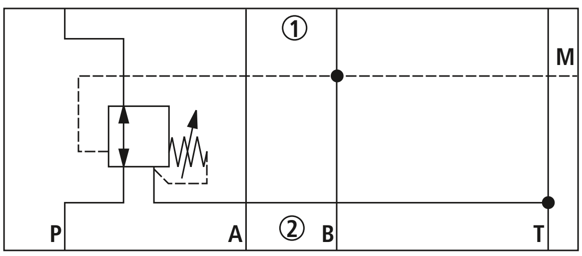
Type ZDR 6 DP…YM…



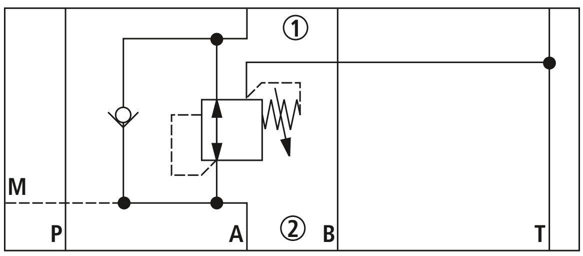
Type ZDR 6 DA…YM…



Type ZDR 6 DB…YM…



Type ZDR 6 DA…Y…



Function, section

The valve type ZDR is a direct operated pressure reducing valve in sandwich plate design with pressure limitation of the secondary circuit. It is used to reduce the system pressure.

The pressure reducing valve basically comprises of a housing (1), a control spool (2), a compression spring (3), adjustment type (4) and an optional check valve.

The secondary pressure is set via the adjustment type (4).

Version "A"

In the initial position the valve is open. Hydraulic fluid can flow from channel A① to channel A② without limitation. Via the pilot line (5), the pressure in channel A② is simultaneously applied to the spool face vis-à-vis the compression spring (3). If the pressure in channel A② rises above the value set at the compression spring (3), the control spool (2) moves against the compression spring (3) into the control position and thereby holds the set pressure in channel A② constant.

Control signal and pilot oil are provided internally, via the control line (5), from channel A②.

If the pressure in channel A② continues to increase due to external forces at the actuator, the control spool (2) moves further against the compression spring (3).

Thus, channel A② is, via control edge (9) at the control spool (2) and housing (1) connected with the tank. Hydraulic fluid continues to flow to the tank until the pressure no longer increases.

The leakage oil drain from the spring chamber (7) is always realized externally, via bore (6) and channel T (Y).

A pressure gauge connection (8) allows for the control of the secondary pressure at the valve.

With version "A", a check valve can be used for free flow back from channel A② to A①.

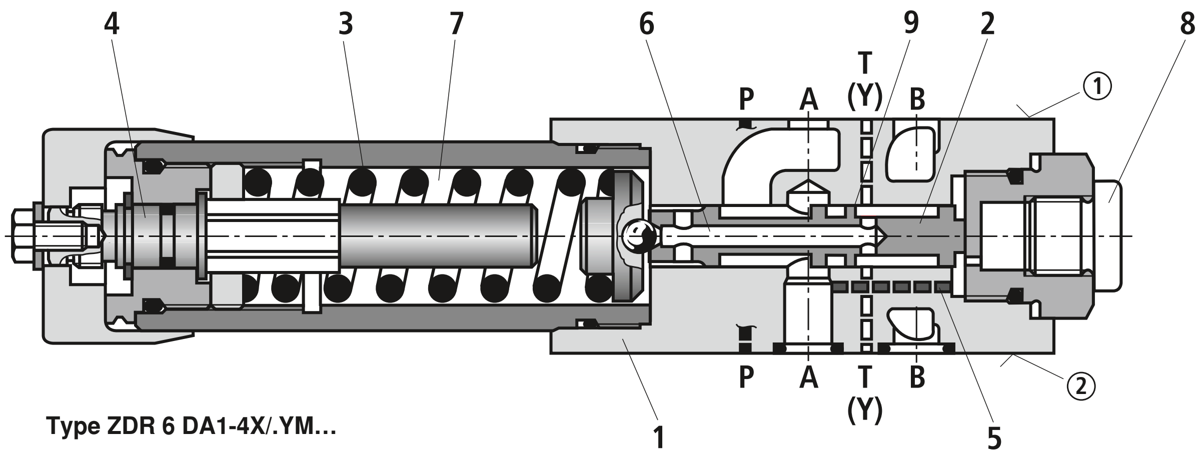
Versions "P" and "B"

With version "P", the pressure is reduced in channel P①. Control signal and pilot oil are provided internally, from channel P①.

With version "B", the pressure is reduced in channel P①, the pilot oil is, however, taken from channel B.

Attention!

If the directional valve is in spool position P to A, the pressure in channel B must not exceed the set secondary pressure. Otherwise, the pressure in channel A will be reduced.



Type ZDR 6 DA1-4X/.YM…

① = component side
② = plate side

Technical data (For applications outside these parameters, please consult us!)

general

Weight		kg	Approx. 1.2
Installation position			Any
Ambient temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)

hydraulic

Maximum operating pressure	– Input	bar	315
Maximum secondary pressure	– Output	bar	25; 75; 150; 210
Maximum backpressure	– Port T(Y)	bar	160
Maximum flow		l/min	50
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	10 to 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

☞ **Important information on hydraulic fluids!**

- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- **Flame-resistant – water-containing**:
  - Maximum operating pressure 210 bar
  - Maximum hydraulic fluid temperature 60 °C
  - Expected service life as compared to HLP hydraulic oil 30 % to 100 %

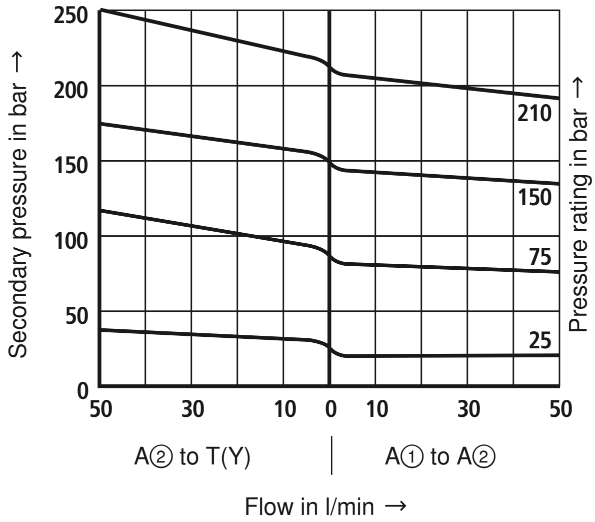
1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

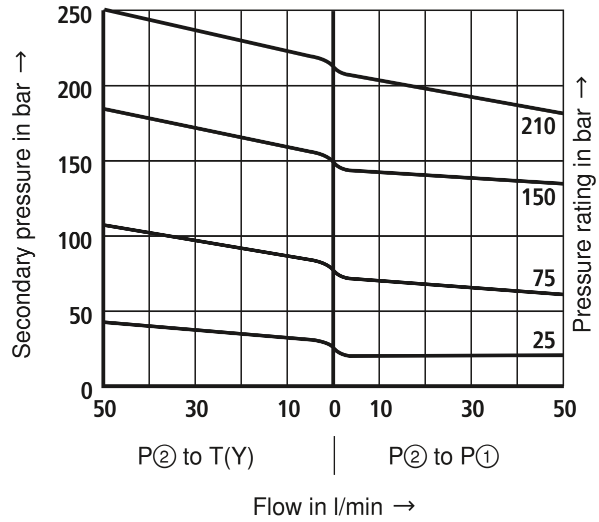
Version "A"

p_A-q_V characteristic curves



Version "B" and "P"

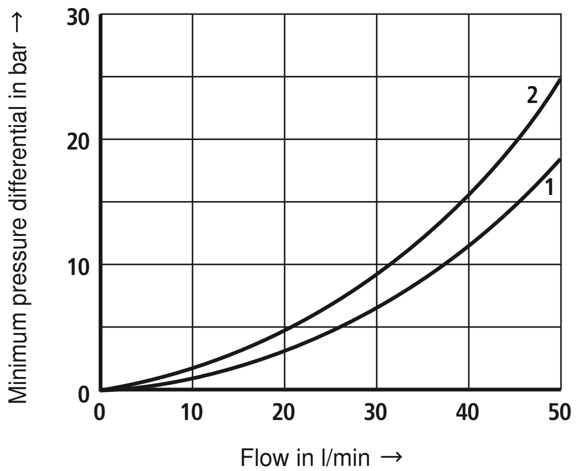
p_A-q_V characteristic curves



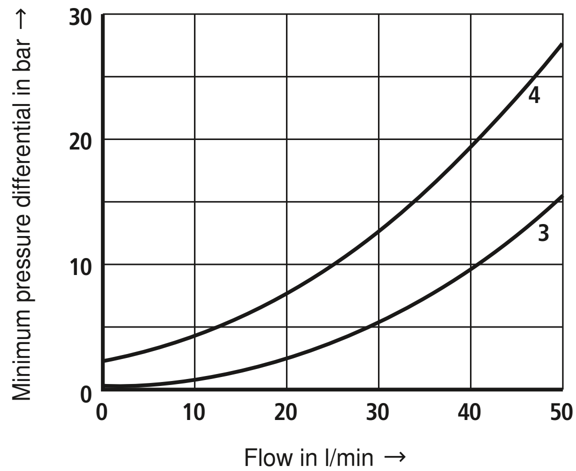
Note!

The curve development is maintained according to the pressure rating if the pressure is set lower.

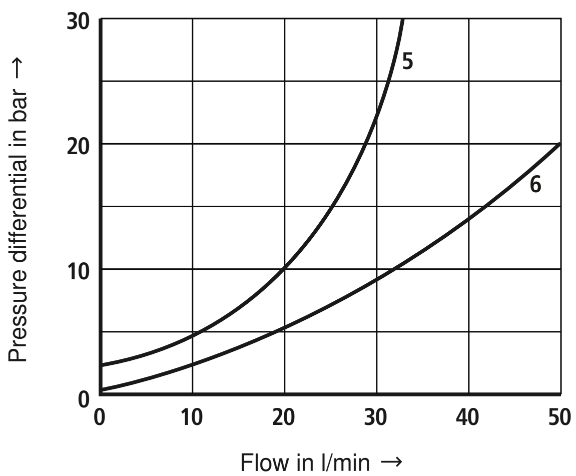
Δp_{min}-q_V characteristic curves



Δp_{min}-q_V characteristic curves



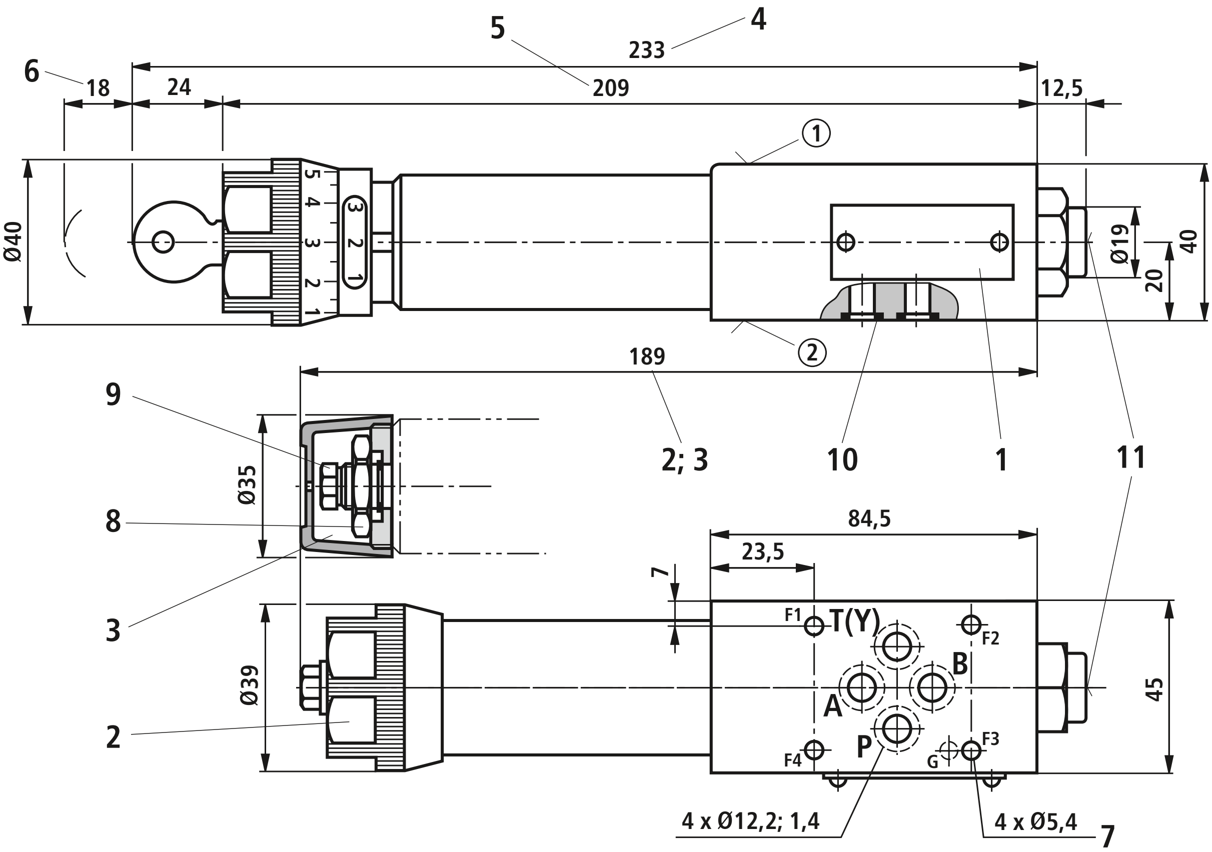
Δp-q_V characteristic curves



1 A① to A②
2 A② to T(Y) (3rd way)
3 P② to P①
4 P① to T(Y) (3rd way)
5 A② to A①; flow only via check valve
6 A② to A①; flow via check valve and completely opened control cross-section

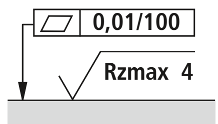
The characteristic curves apply to the pressure at the valve output p_T = 0 bar across the entire flow range.

Unit dimensions: Version "B" and "P" (dimensions in mm)



① Component side – porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 (**with** locating hole Ø3 x 5 mm deep)

② Plate side – porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 (**with** locating hole for locating pin ISO 8752-3x8-St; version "/60")



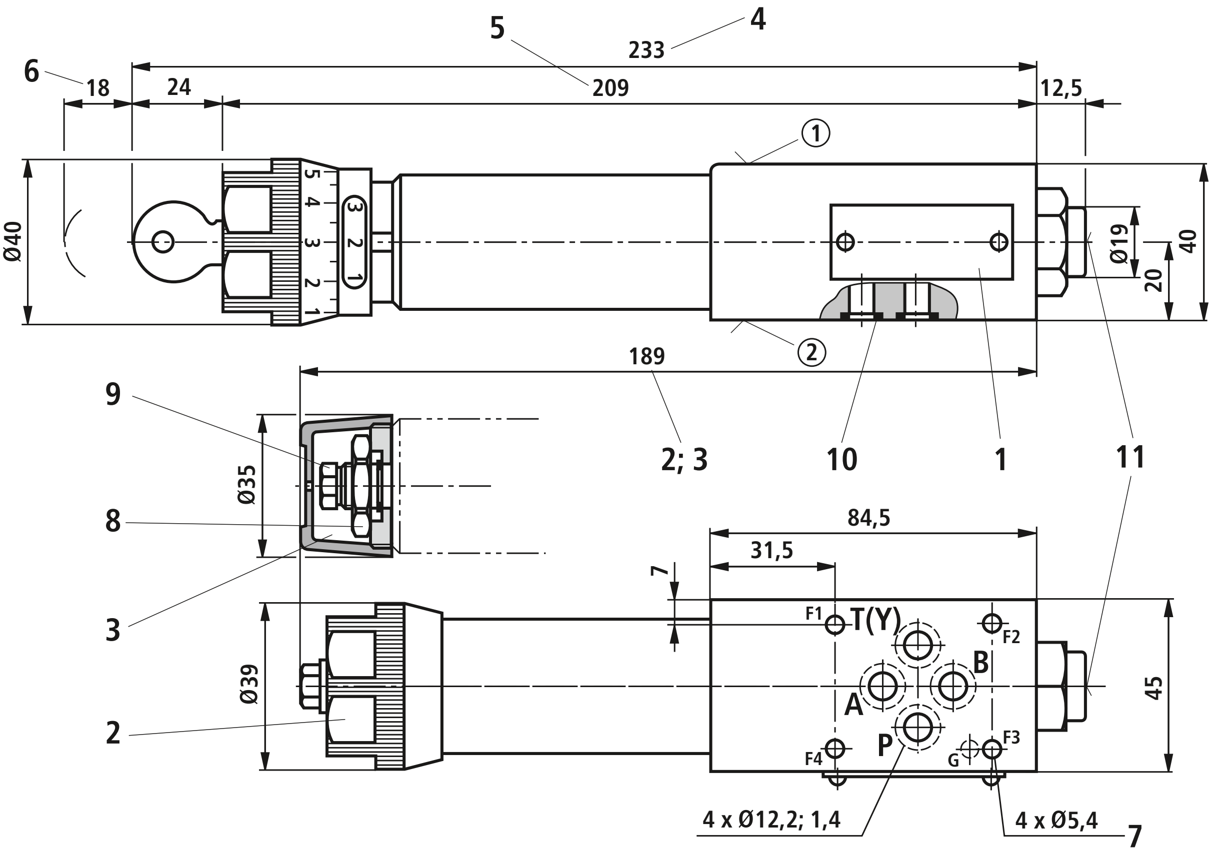
Required surface quality of the valve mounting face

1 Name plate
2 Adjustment type "1"
3 Adjustment type "2"
4 Adjustment type "3"
5 Adjustment type "7"
6 Space required to remove the key
7 Valve mounting bores
8 Lock nut SW24
9 Hexagon SW10
10 Identical seal rings for ports A, B, P, T(Y)
11 Pressure gauge connection G1/4; 12 deep; internal hexagon SW6

Valve mounting screws (separate order)
4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

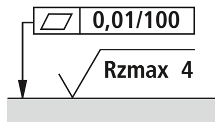
☞ **Note!**
Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Unit dimensions: Version "A" (dimensions in mm)



① Component side – porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 (**with** locating hole Ø3 x 5 mm deep)

② Plate side – porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 (**with** locating hole for locating pin ISO 8752-3x8-St; version "/60")



Required surface quality of the valve mounting face

1 Name plate
2 Adjustment type "1"
3 Adjustment type "2"
4 Adjustment type "3"
5 Adjustment type "7"
6 Space required to remove the key
7 Valve mounting bores
8 Lock nut SW24
9 Hexagon SW10
10 Identical seal rings for ports A, B, P, T(Y)
11 Pressure gauge connection G1/4; 12 deep; internal hexagon SW6

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

☞ **Note!**

Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Notes

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Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
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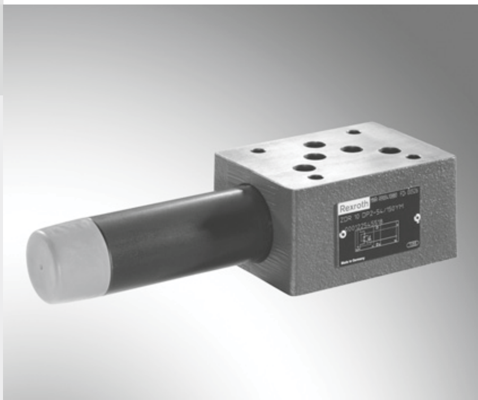
Pressure reducing valve, direct operated

RE 26585/05.11
Replacves: 06.03

Type ZDR

Size 10
Component series 5X
Maximum operating pressure 210 bar
Maximum flow 80 l/min



H7751

Table of contents

Contents	**Page**

Features

- Sandwich plate valve
- Porting pattern according to ISO 4401-05-04-0-05
- 4 pressure ratings
- 4 adjustment types, optional:
  - Rotary knob
  - Bushing with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- Check valve, optional (version "A")
- Pressure reduction in channel A, B or channel P

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z	DR	10	D		–5X/	Y			*

Sandwich plate valve = **Z**
Pressure reducing valve = **DR**
Size 10 = **10**
Direct operated = **D**
Pressure reduction in channel A② = **A**
Pressure reduction in channel P① = **B**
(pilot oil supply from channel B)
Pressure reduction in channel P① = **P**

Adjustment type
Rotary knob = **1**
Bushing with hexagon and protective cap = **2**
Lockable rotary knob with scale = **3** [1)]
Rotary knob with scale = **7**

Component series 50 to 59 = **5X**
(50 to 59: unchanged installation and connection dimensions)

25 = Secondary pressure up to 25 bar
75 = Secondary pressure up to 75 bar
150 = Secondary pressure up to 150 bar
210 = Secondary pressure up to 210 bar

Y = Pilot oil supply internal, pilot oil return external

No code = **With** check valve
(only with version "A")
M = **Without** check valve

Seal material
No code = NBR seals
V = FKM seals
(other seals at request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

Further details in the plain text

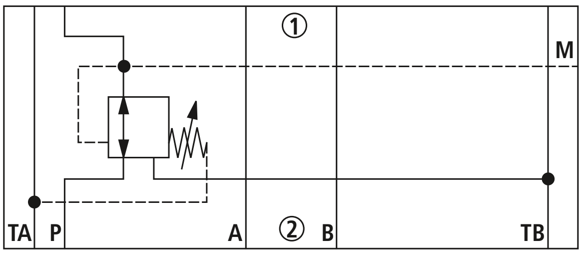
1) H-key with material no. **R900008158** is included in the delivery

Standard types and standard units are contained in the EPS (standard price list).

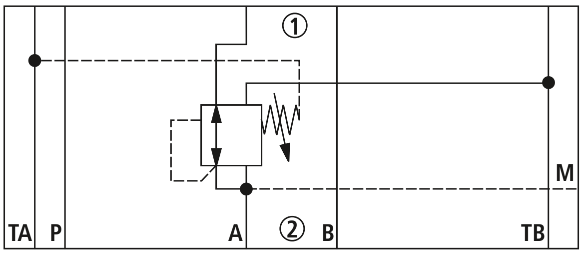
Note!
For port X and Y bored according to ISO 4401-05-05-0-05 (e.g. for pilot operated directional valve size 10), version **"SO30"** at the end of the order code applies!

Symbols (① = component side, ② = plate side)

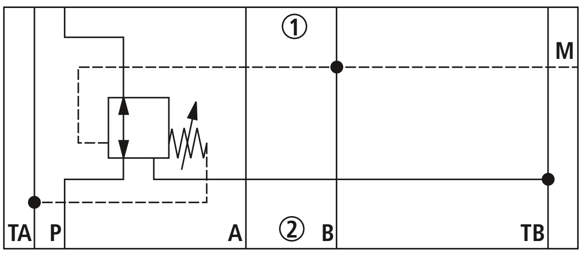
Type ZDR 10 DP…YM…



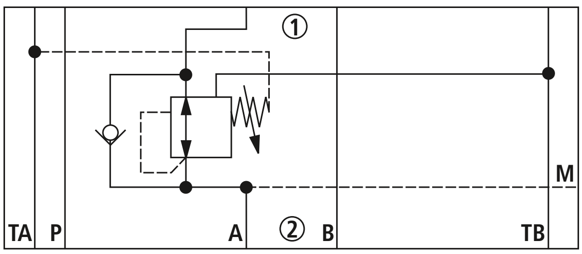
Type ZDR 10 DA…YM…



Type ZDR 10 DB…YM…



Type ZDR 10 DA…Y…



Note!
Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.

Function, section

The valve type ZDR is a direct operated pressure reducing valve in sandwich plate design with pressure limitation of the secondary circuit. It is used to reduce the system pressure.

The pressure reducing valve basically comprises of a housing (1), a control spool (2), a compression spring (3), adjustment type (4) and an optional check valve.

The secondary pressure is set via the adjustment type (4).

Version "A"

In the initial position the valve is open. Hydraulic fluid can flow from channel A① to channel A② without limitation. Via the pilot line (5), the pressure in channel A② is simultaneously applied to the spool face vis-à-vis the compression spring (3). If the pressure in channel A② rises above the value set at the compression spring (3), the control spool (2) moves against the compression spring (3) into the control position and thereby holds the set pressure in channel A② constant.

Control signal and pilot oil are provided internally, via the control line (5), from channel A②.

If the pressure in channel A② continues to increase due to external forces at the actuator, the control spool (2) moves further against the compression spring (3).

Thus, channel A② is, via control edge (6) at the control spool (2) and housing (1) connected with the tank (channel TB). Hydraulic fluid continues to flow to the tank until the pressure no longer increases.

The leakage oil drain from the spring chamber (7) is always external, via channel TA.

A pressure gauge connection (8) allows for the control of the secondary pressure at the valve.

With version "A", a check valve can be used for free flow back from channel A② to A①.

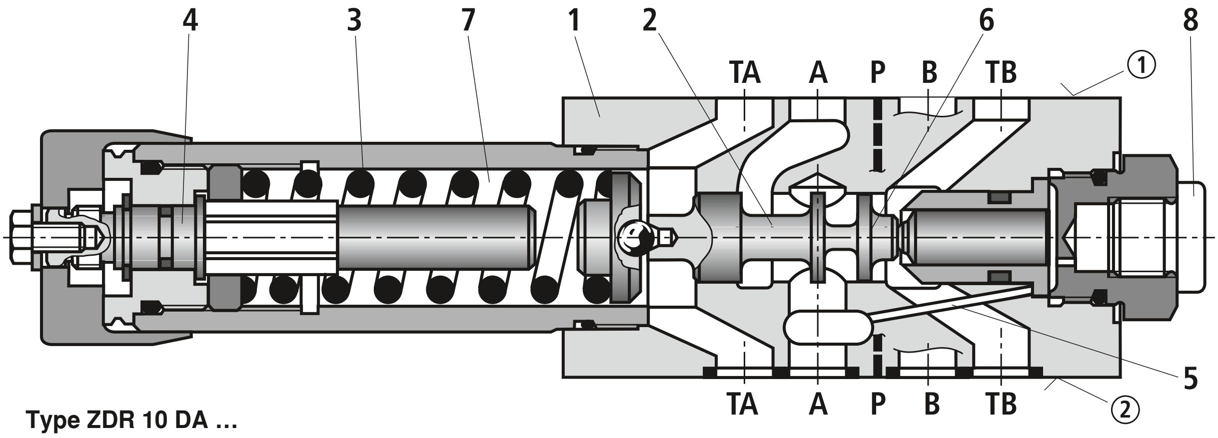
Versions "P" and "B"

With version "P", the pressure is reduced in channel P①. Control signal and pilot oil are provided internally, from channel P①.

With version "B", the pressure is reduced in channel P①, the pilot oil is, however, taken from channel B. If the directional valve is in spool position P to A, the pressure in channel B must not exceed the set secondary pressure. Otherwise, the pressure in channel A will be reduced.

Attention!

– In case of use without directional valve, channels TA and TB must be connected with each other (e.g. in the cover plate).
– In the set-up of a directional seat valve size 10, a sandwich plate type HSZ10A078-3X/M00 (Material no. R900537264) must be used.



Type ZDR 10 DA …

① = component side
② = plate side

Technical Data (For applications outside these parameters, please consult us!)

general

Weight		kg	Approx. 2.8
Installation position			Any
Ambient temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)

hydraulic

Maximum operating pressure	– Input	bar	315
Maximum secondary pressure	– Output	bar	25; 75; 150; 210
Maximum backpressure	– Port T	bar	160
Maximum flow		l/min	80
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	10 to 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

☞ **Important information on hydraulic fluids!**

– For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!

– There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

– **Flame-resistant – water-containing**:
- Maximum operating pressure 210 bar
- Maximum hydraulic fluid temperature 60 °C
- Expected service life as compared to HLP hydraulic oil 30 % to 100 %

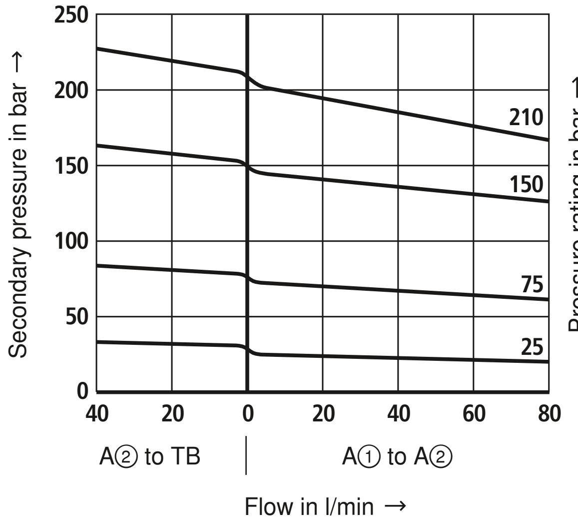
[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

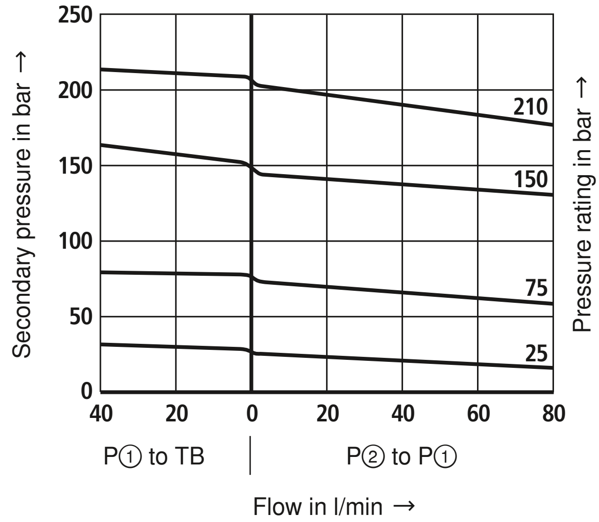
Version "A"

p_A-q_V characteristic curves



Version "B" and "P"

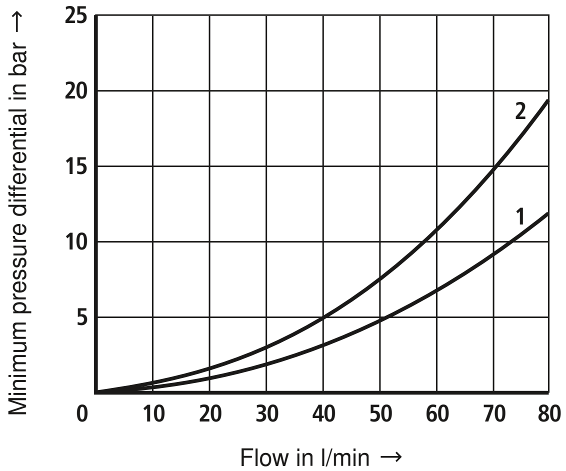
p_A-q_V characteristic curves



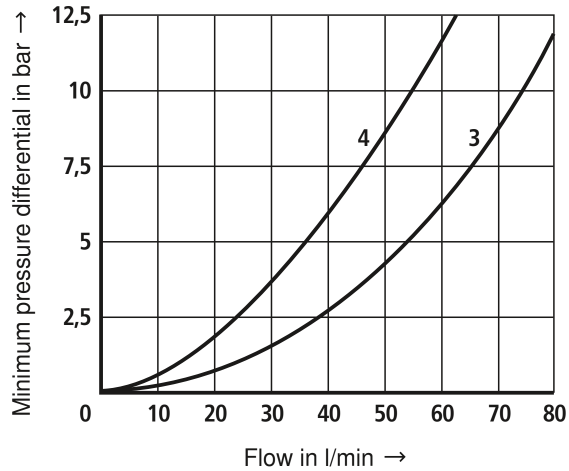
Note!

The curve development is maintained according to the pressure rating if the pressure is set lower.

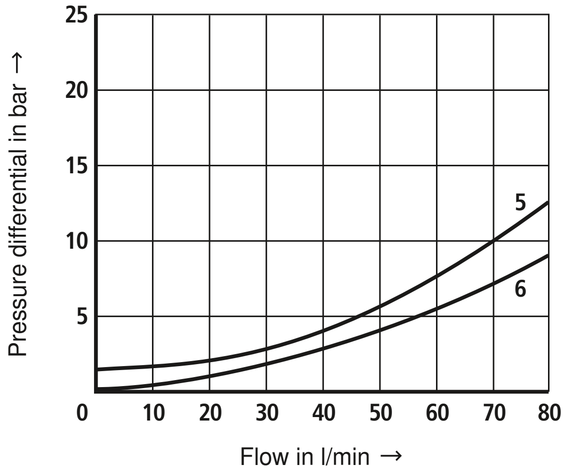
Δp_{min}-q_V characteristic curves



Δp_{min}-q_V characteristic curves



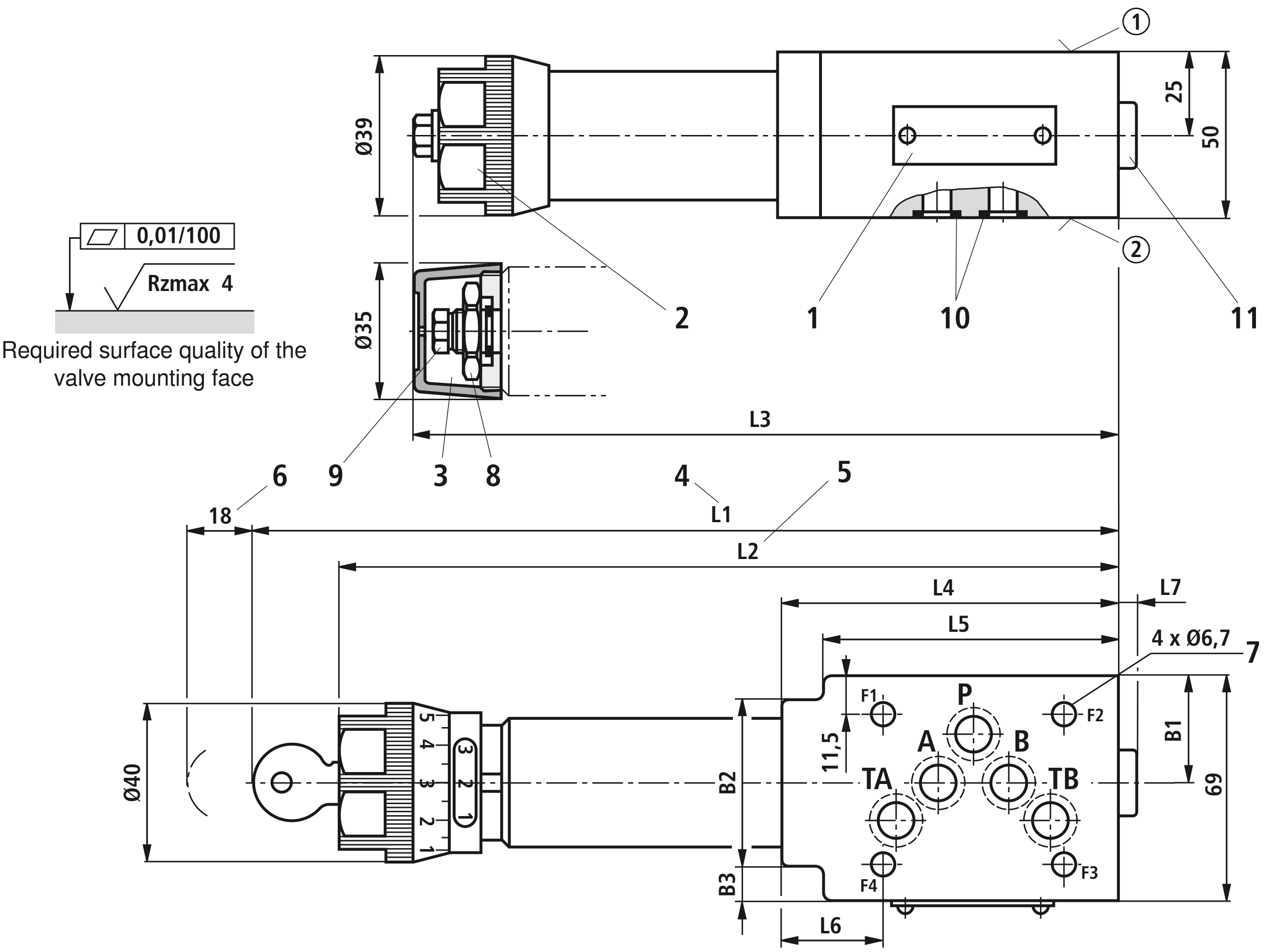
Δp-q_V characteristic curves



1 A① to A②
2 A② to TB (3rd way)
3 P② to P①
4 P① to TB (3rd way)
5 A② to A①; flow only via check valve
6 A② to A①; flow via check valve and completely opened control cross-section

The characteristic curves apply to the pressure at the valve output p_T = 0 bar across the entire flow range.

Unit dimensions (dimensions in mm)



Version	L1	L2	L3	L4	L5	L6	L7	B1	B2	B3
"A"	254	230	210	104	93	31,5	3,8	32,9	51	12
"B" and "P"	242	218	198	91	–	18,5	15,8	35	–	–

1 Name plate
2 Adjustment type "1"
3 Adjustment type "2"
4 Adjustment type "3"
5 Adjustment type "7"
6 Space required to remove the key
7 Valve mounting bores
8 Lock nut SW24
9 Hexagon SW10
10 Identical seal rings for ports A, B, P, TA and TB
11 Pressure gauge connection G1/4; 12 deep; internal hexagon SW6

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M6 - 10.9

Notes!

- Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.
- For port X and Y bored according to ISO 4401-05-05-0-05 (e.g. for pilot operated directional valve size 10), version **"SO30"** at the end of the order code applies!
- Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.

① Component side – porting pattern according to ISO 4401-05-04-0-05

② Plate side – porting pattern according to ISO 4401-05-04-0-05

Notes

Notes

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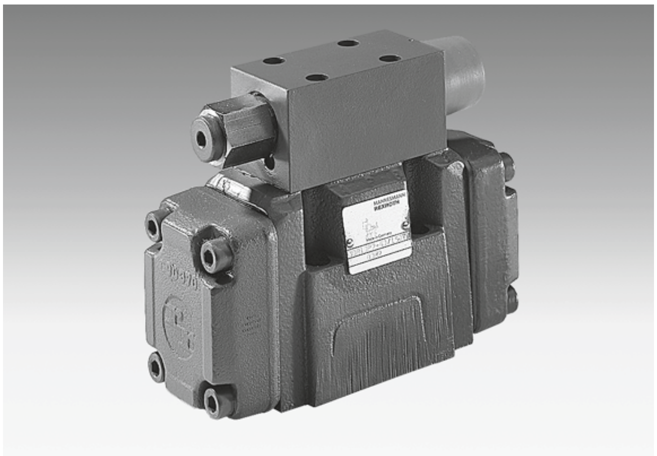
Pressure reducing valve, pilot operated, type 3DR

Nominal size 10
Series 6X
Maximum operating pressure 315 bar
Maximum flow 120 L/min



H/A/D 5845/97

Type 3DR 10 P5-6X/315Y/00M

Contents

Description	Page

Features

– Valve for the reduction (P to A) and limitation (A to T) of a pressure in a hydraulic system
– For sub-plate mounting, porting pattern DIN 24 340 form A, ISO 4401 and CETOP-RP 121 H, sub-plates to catalogue sheet RE 45 054 (separate order)
– 4 pressure stages
– 4 adjustiment elements:
  • rotary knob
  • sleeve with hexagon and protective cap
  • lockable rotary knob with scale
  • rotary knob with scale

Ordering details

3DR	10	P		– 6X /		Y /	00		*

3-way pressure reducing valve

Nominal size 10 **= 10**

Sub-plate mounting **= P**

Adjustment element
Rotary knob **= 4**
Sleeve with hexagon and protective cap **= 5**
Lockable rotary knob with scale **= 6** [1)]
Rotary knob with scale **= 7**

Series 60 to 69 **= 6X**
(60 to 69: unchanged installation and connection dimensions)

Setable pressure up to 50 bar **= 50**
Setable pressure up to 100 bar **= 100**
Setable pressure up to 200 bar **= 200**
Setable pressure up to 315 bar **= 315**

Further details in clear text

M = NBR seals
V = FPM seals
(other seals on request)

⚠ Attention!
The compatibility of the seals and pressure fluid has to be taken into account!

00 = without stroke limiter

Pilot oil supply
Y = pilot oil supply internal, pilot oil supply external

Preferred types and standard components are highlighted in the RPS (Rexroth Price list Standard).

1) H-key with material no. 00008158 is included within the scope of supply

Function, section, symbol

The pressure valve type 3DR is a pilot operated 3-way pressure reducing valve with pressure limitation in the secondary circuit. It is used for the reduction of pressure in a hydraulic system.

The pressure reducing valve consists mainly of main valve (1) with control spool (2) and pilot control valve (3) with pressure adjusment element (10).

At rest the valve is open. Pressure fluid can flow unrestricted from port P to port A. The pressure in port A is applied via the channel (4) to the spool area opposite to the compression spring (9). At the same time the pressure is applied via the orifice (6) to the spring loaded side of the control spool (2) and via channel (5) to the ball (7) in the pilot control valve (3).

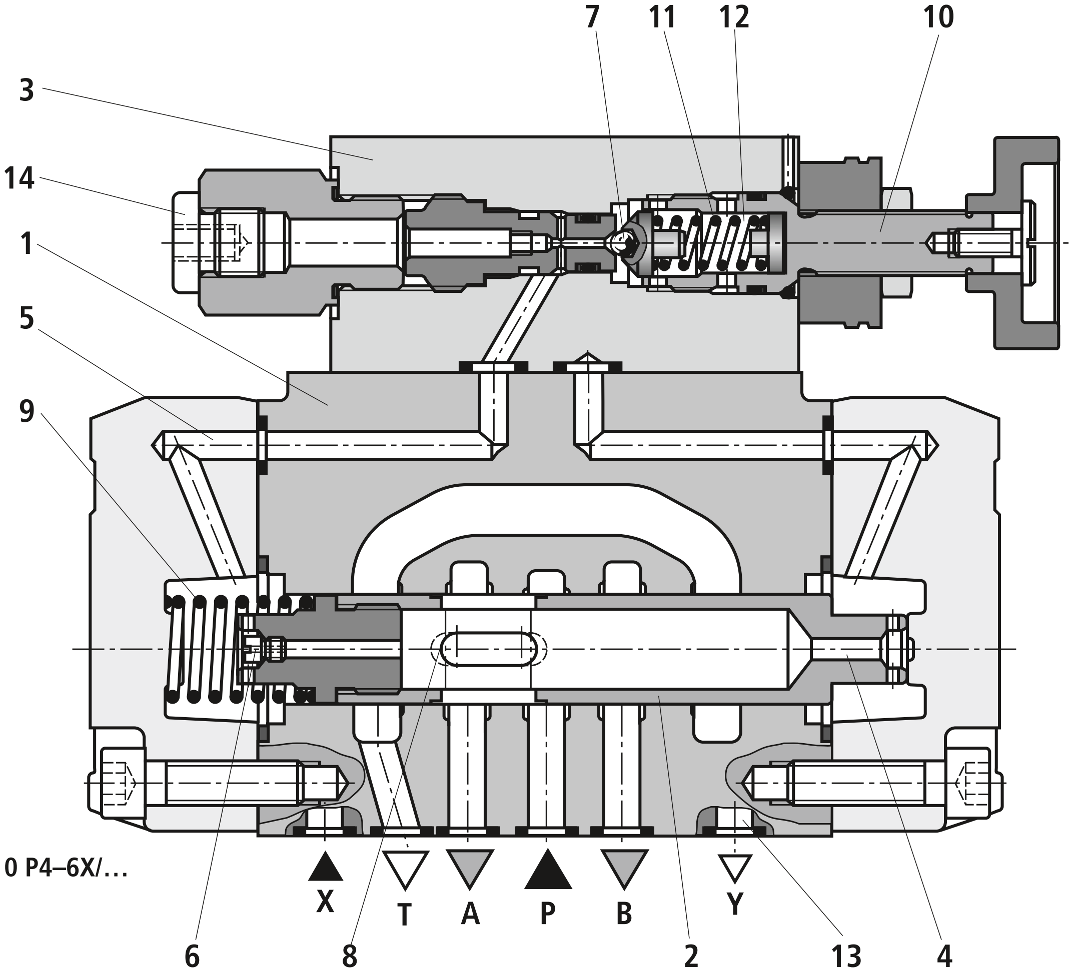
Dependent on the setting of the compression spring (11) a pressure builds up in front of the ball (7) and in channel (5) which holds the control spool (2) in an open position. Pressure fluids flows from port P via the control spool (2) into port A, until a pressure is built up in port A, which exceeds the pressure value set at the compression spring (11) and lifts the ball (7).

The control spool (2) moves into the closed position. The required reduced pressure is achieved when a balance between the pressure in port A and the pressure value set at the compression spring (11) is reached.

If the pressure in port A continues to rise at the actuator through external forces the control spool (2) is moved still further against the compression spring (9). Thus port A is connected to port T via the control lands (8) at the control spool (2). Enough pressure fluid flows to tank to ensure that the pressure does not rise any further.

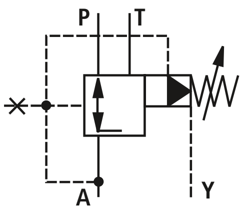
The pilot oil return from the spring chamber (12) is always external via the control line (13) to port Y. This must always flow at zero pressure to tank.

The pressure gauge connection (14) makes it possible to monitor the reduced pressure in port A.



Type 3DR 10 P4–6X/…

Symbol



Technical data (for applications outside these parameters, please consult us!)

General

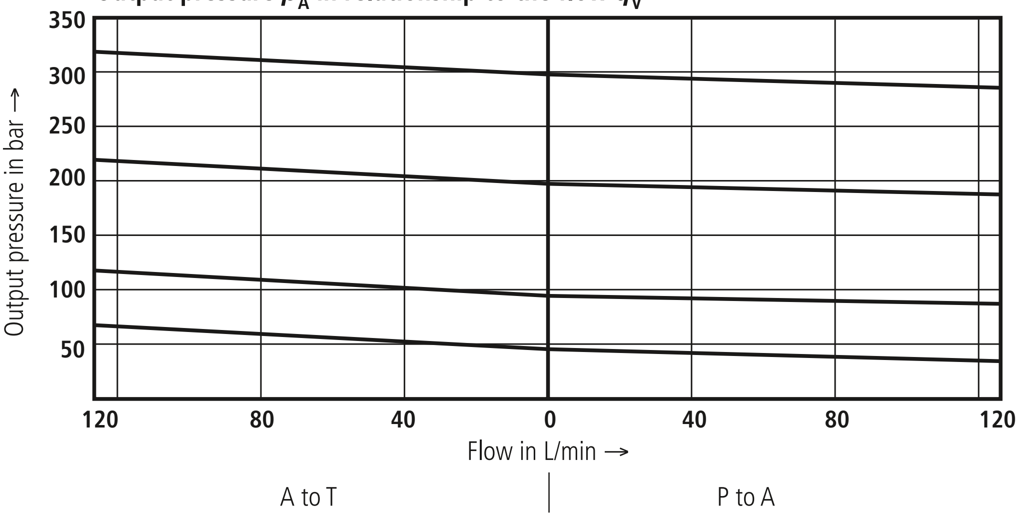
Description		pressure reducing valve
Graphic symbol		see page 2
Type code		see page 1
Mounting style		sub-plate mounting
Connection type		indirect connection via sub-plate or manifold block, porting pattern to DIN 24 340 form A, ISO 4401 and CETOP-RP 121 H
Nominal size		10
Weight	kg	6.0
Installation		optional
Direction of flow		see graphic symbol on page 2
Ambient temperature range	°C	– 30 to + 50

Hydraulic data

Nominal pressure		bar	315
Maximmum operating pressure at ports P and A		bar	315
Maximum operating pressure at port Y		bar	separate and at zero pressure to tank
Setable pressure	minimum	bar	dependent on the flow (see characteristic curves on page 4)
	maximum	bar	50; 100; 200; 315
Pressure fluid [1] suitable for NBR **and** FPM seals [2] **only** suitable for FPM seals			mineral oil (HL, HLP) to DIN 51 524 [1]; fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90 221); HETG (rape seed oil) [1]; HEPG (polyglycol) [2]; HEES (synthetic ester) [2]; other pressure fluids on request
Pressure fluid temperature range		°C	– 30 to + 80 with NBR seals
		°C	– 20 to + 80 with FPM seals
Viscosity range		mm^2/s	10 to 800
Maximum flow		L/min	120
Degree of contamination			maximum permissible degree of contamination of the pressure fluid is to NAS 1638 class 9. We, therefore, recommend a filter with a minimum retention rate of $\beta_{10} \geq 75$.

Characteristic curves (measured at $\nu = 41$ mm^2/s and $\vartheta = 50$ °C)

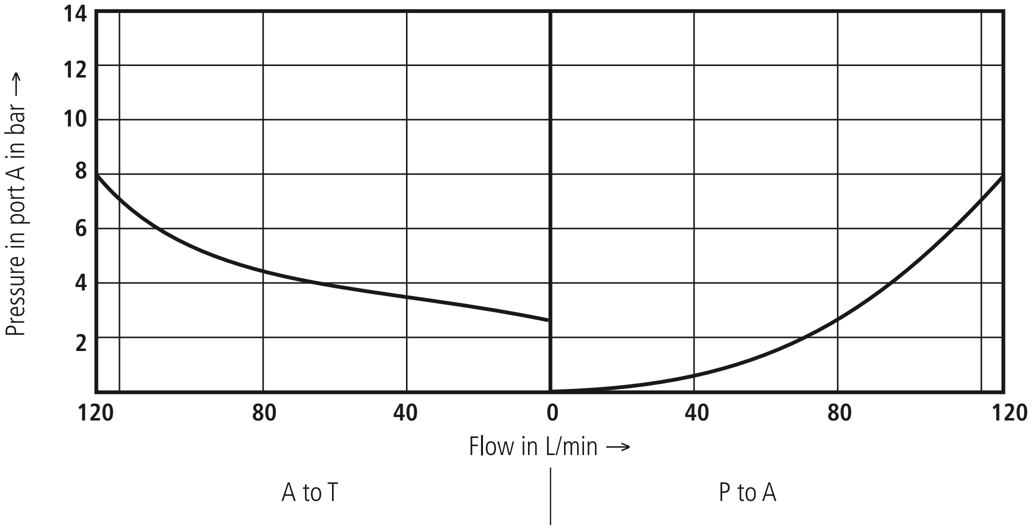
Output pressure p_A in relationship to the flow q_V



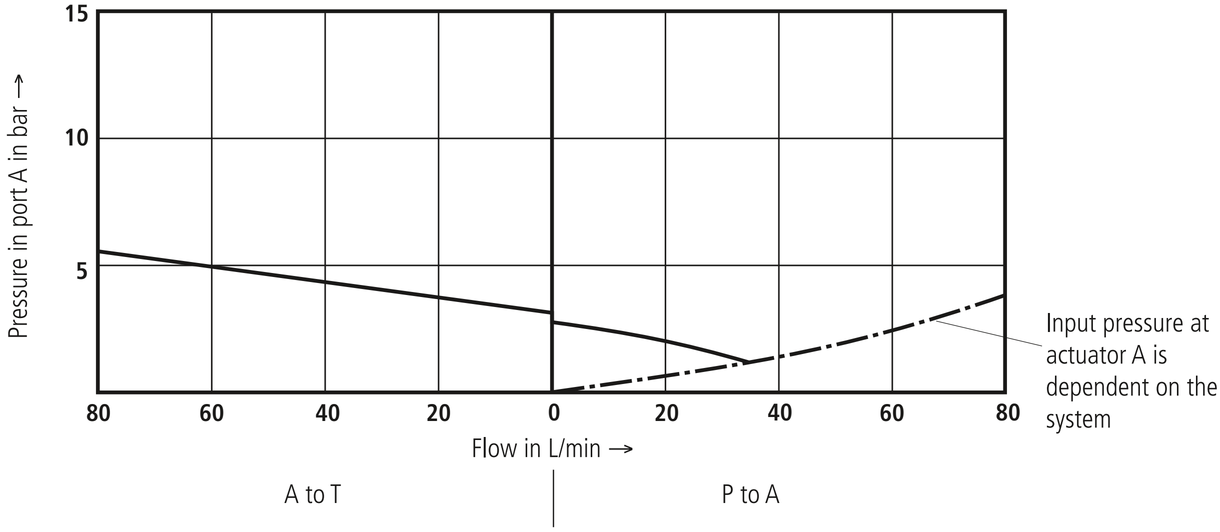
The characteristic curves are valid for output pressure p_T = zero over the entire flow range.

Characteristic curves (measured at $\nu = 41\ mm^2/s$ and $\vartheta = 50\ °C$)

Flow resistance

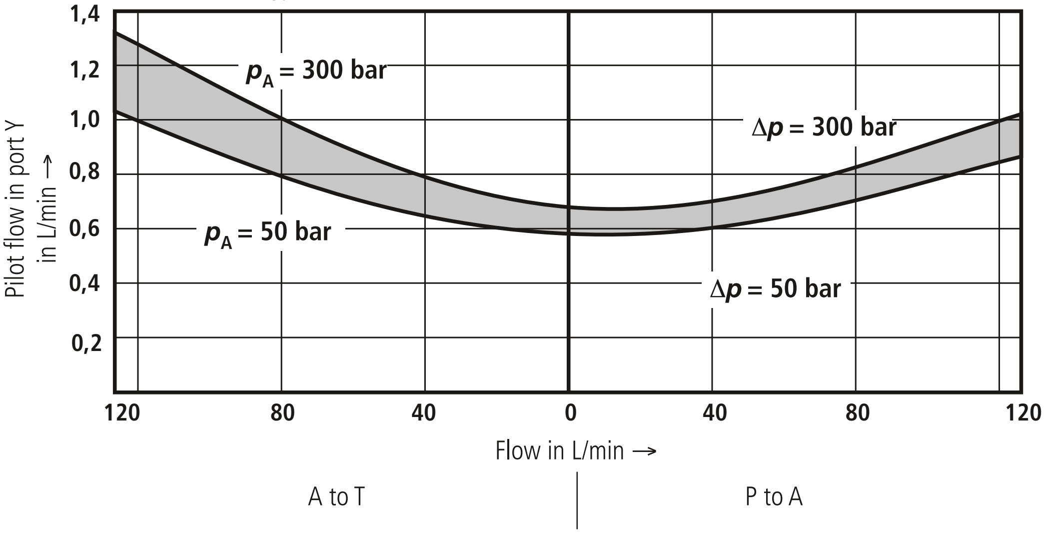


Minimum setable pressure p_{min} in relationship to the flow q_V



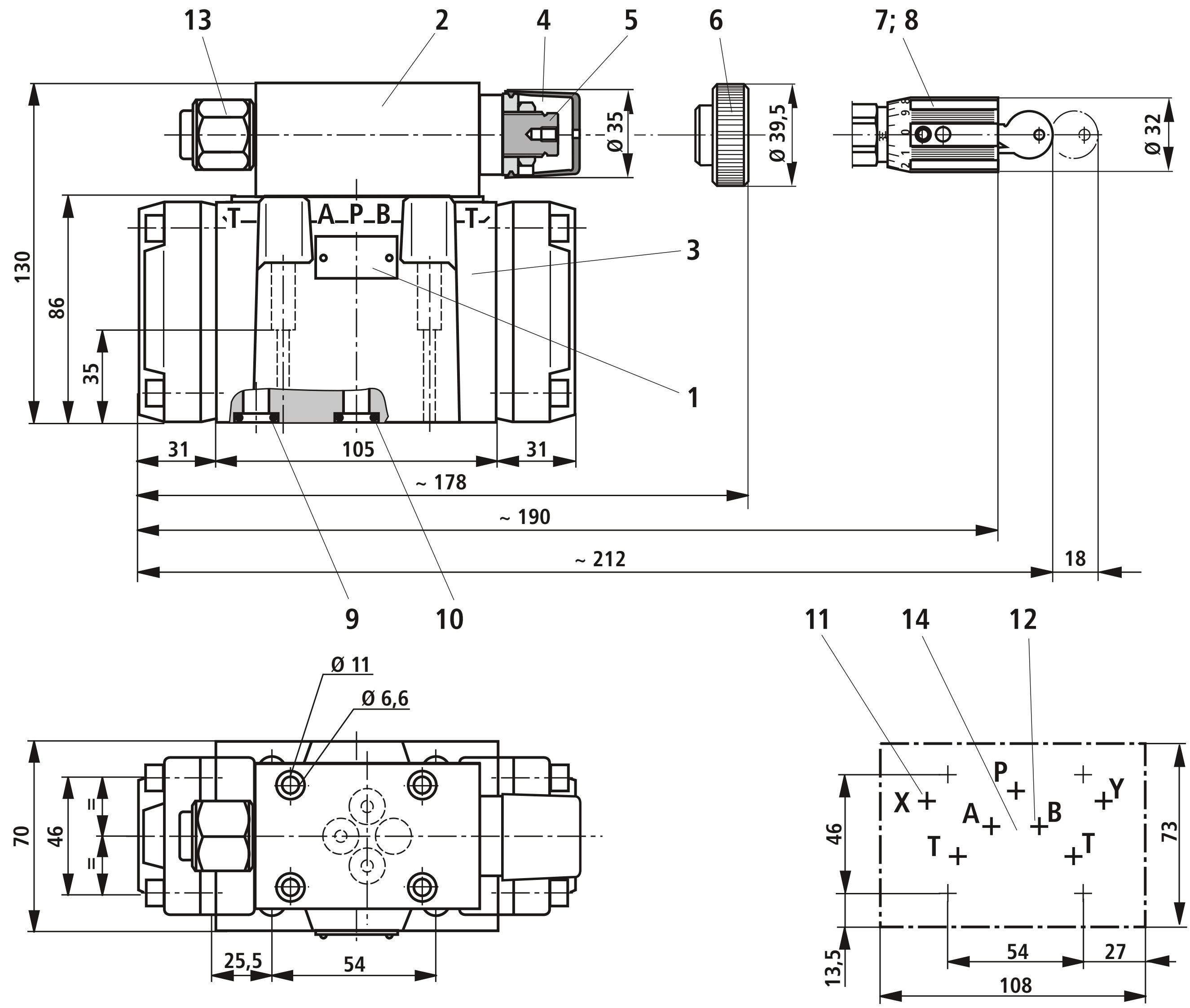
The characteristic curves are valid for output pressure p_T = zero over the entire flow range.

Pilot flow $q_{V\ St}$ in relationship to the flow q_V



Unit dimensions

(Dimensions in mm)

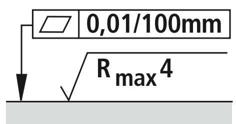


1 Name plate
2 Pilot control valve
3 Main valve
4 Adjustment element "5"
5 Hexagon A/F 10
6 Adjustment element "4"
7 Adjustment element "6"
8 Adjustment element "7"
9 O-rings 10.82 x 1.78 for ports X and Y
10 O-rings 12 x 2 for ports A, B, P and T
11 Port X has to be plugged in the sub-plate.
12 Port B has to be plugged in the sub-plate.
13 Pressure gauge connection
14 Valve mounting surface, porting pattern to DIN 24 340 form A, ISO 4401 and CETOP-RP 121 H

sub-plates G535/01 (G 3/4)
G536/01 (G 1)

to catalogue sheet RE 45 054 must be ordered separately.

Valve fixing screws
4 off M6 x 45 DIN 912-10.9,
M_A = 15.5 Nm,
must be ordered separately.



Required surface finish of mating piece

Notes

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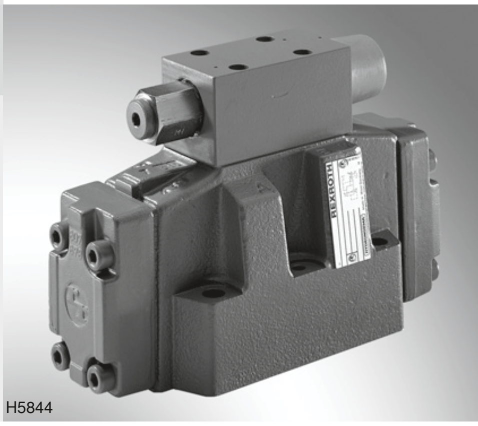
Internet www.boschrexroth.de

Pressure reducing valve, pilot operated

RE 26928/09.07
Replaces: 10.97

Type 3DR



H5844

Size 16
Component series 5X
Maximum operating pressure 250 bar
Maximum flow 220 l/min

Table of contents

Features

– Valve for reducing (P to A) and limiting (A to T) a system pressure
– For subplate mounting
– Porting pattern to ISO 4401-07-07-0-05
– Subplates to data sheet RE 45056 (separate order)
– 4 pressure ratings
– 4 adjustment elements, optional:
  • Rotary knob
  • Sleeve with hexagon and protective cap
  • Lockable rotary knob with scale
  • Rotary knob with scale

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

3DR	16	P	–5X/	Y / 00		*

3-way pressure reducing valve

Size 16 = **16**

Subplate mounting = **P**

Adjustment elements

Rotary knob	= **4**
Sleeve with hexagon and protective cap	= **5**
Lockable rotary knob with scale	= **6** [1]
Rotary knob with scale	= **7**

Component series 50 to 59 = **5X**
(50 to 59: unchanged installation and connection dimensions)

Pressure setting up to 50 bar	= **50**
Pressure setting up to 100 bar	= **100**
Pressure setting up to 200 bar	= **200**
Pressure setting up to 250 bar	= **250**

Further details in clear text

Seal material

M = NBR seals
V = FKM seals
(other seals on request)

⚠ **Attention!**
Observe compatibility of seals with hydraulic fluid used!

00 = Without stroke limiter

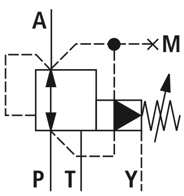
Pilot oil supply

Y = Internal pilot oil supply, external pilot oil drain

[1] H-key, Material no. **R900008158,** is included in the scope of supply

Standard types and components can be found in the EPS (standard price list).

Symbol



Function, section

Pressure control valves of type 3DR are pilot operated 3-way pressure reducing valves with pressure relief function for the secondary circuit. They are used to reduce a system pressure.

The pressure reducing valve basically consists of main valve (1) with control spool (2) and pilot control valve (3) with pressure adjustment element (10).

In the starting position, the valve is open. Hydraulic fluid can flow from channel P to channel A without any restrictions. The pressure in channel A is applied via bore (4) to the spool area opposite to compression spring (9). At the same time, pressure is applied via orifice (6) to the spring-loaded side of control spool (2) and via channel (5) to ball (7) in pilot control valve (3).

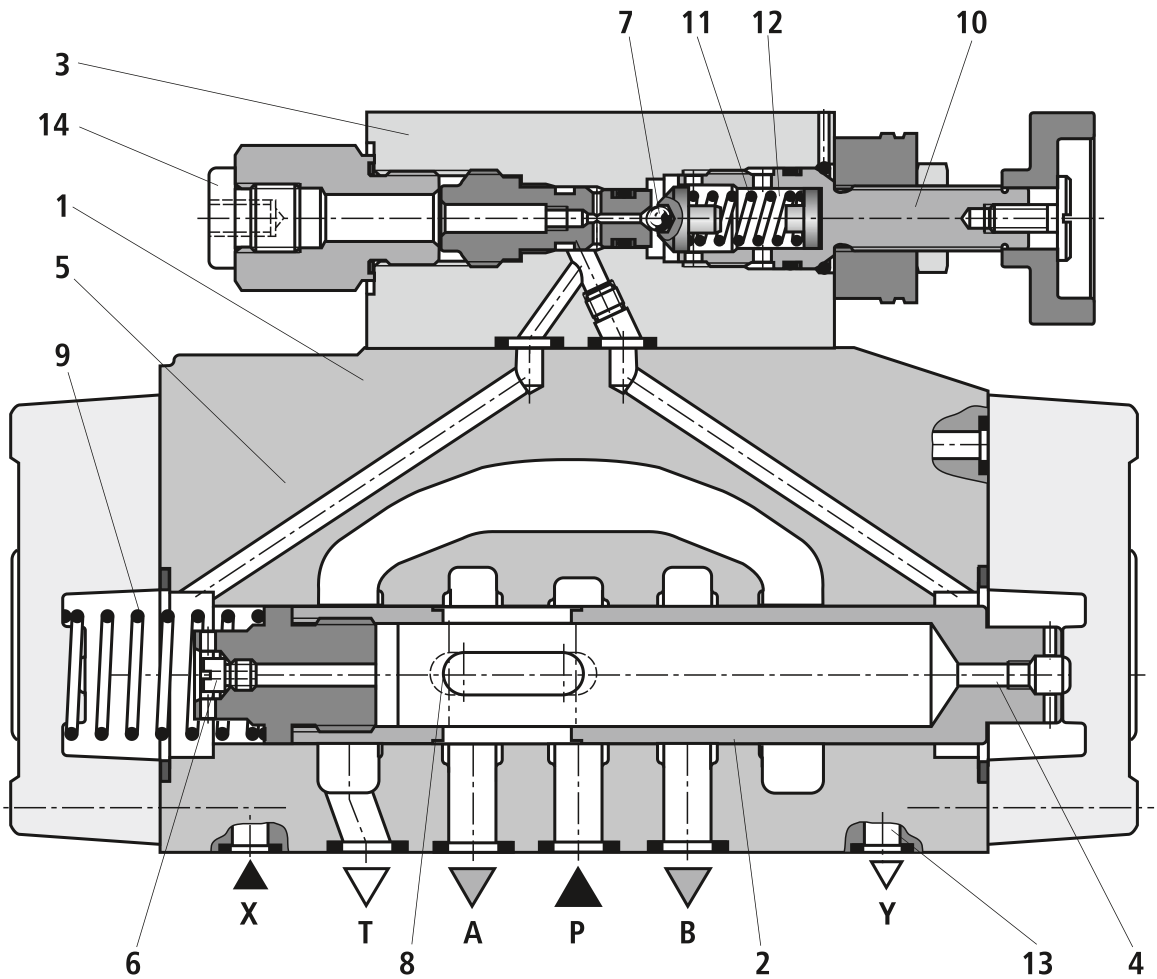
Depending on the setting of compression spring (11) pressure builds up upstream of ball (7) and in channel (5) and holds control spool (2) in the open position. Hydraulic fluid flows from channel P via control spool (2) to channel A until pressure builds up in channel A, which reaches a higher value than the pressure value set on compression spring (11) and lifts off ball (7).

Control spool (2) moves to the closed position. The required reduced pressure is reached when the pressure in channel A and the pressure value set on compression spring (11) are in balance.

When the pressure in channel A increases further due to external forces acting on the actuator, control spool (2) is pushed further against compression spring (9). This opens a connection between channel T and channel A via control land (8) on control spool (2). The amount of hydraulic fluid discharged to tank ensures that the pressure will no longer increase.

The pilot oil is always drained externally from spring chamber (12) via pilot line (13) at port Y. It must always be returned at zero pressure to tank.

Pressure gauge port (14) allows the reduced pressure in channel A to be checked.



Type 3DR 16 P4-5X/…

Technical data (for applications outside these parameters, please consult us!)

General

Weight		kg	8.0
Installation position			Optional
Ambient temperature range		°C	–30 to +50

Hydraulic

Nominal pressure		bar	315
Maximum operating pressure	– Port P	bar	315
	– Port A	bar	250
	– Port Y	bar	Separately and pressureless to tank
Pressure setting	– Minimum	bar	Depending on flow (see characteristic curves on page 5)
	– Maximum	bar	50; 100; 200; 250
Maximum flow		l/min	220
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on request
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	10 to 800
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [3]

[1] Suitable for NBR and FKM seals

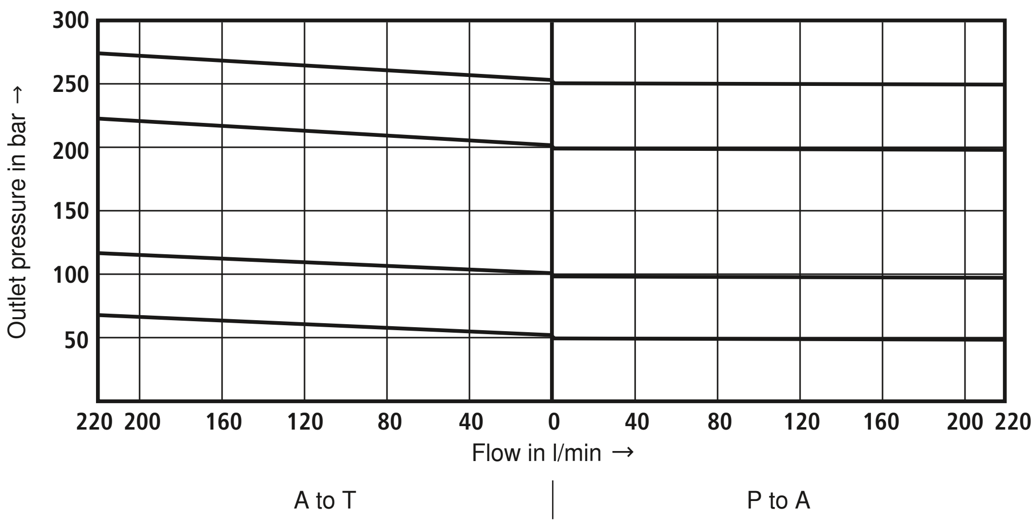
[2] Suitable only for FKM seals

[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

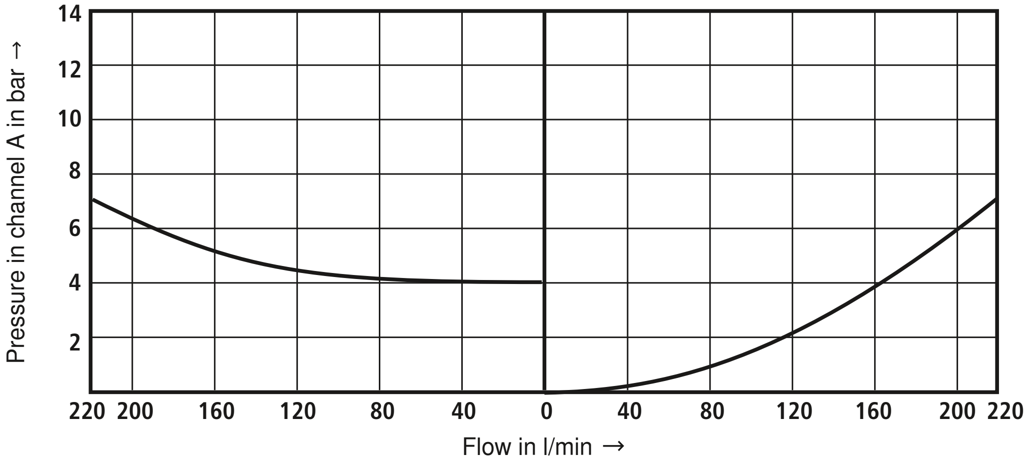
Outlet pressure p_A in dependence on flow q_V



The characteristic curves are valid for outlet pressure p_T = zero over the entire flow range.

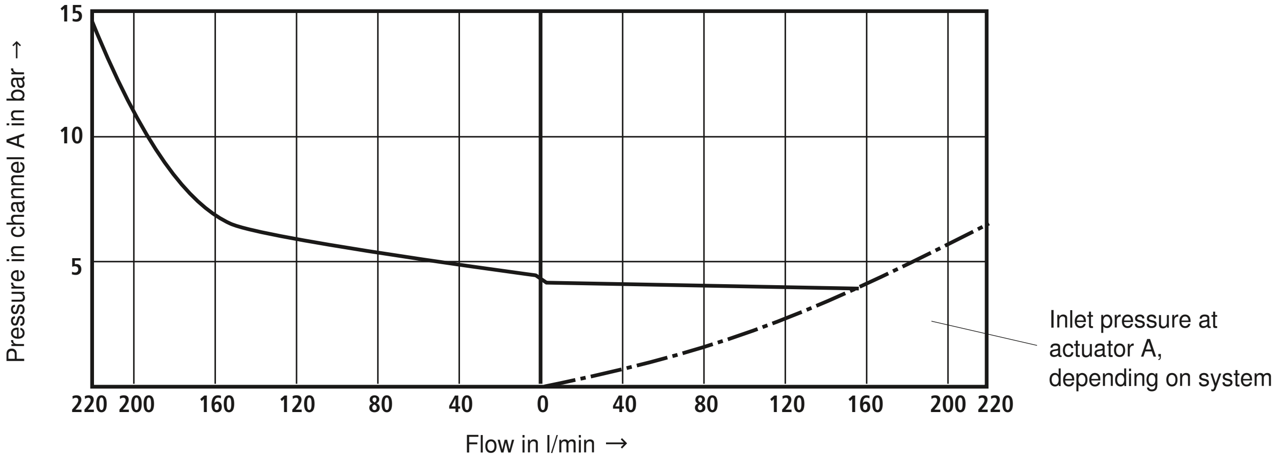
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Flow resistance



A to T | P to A

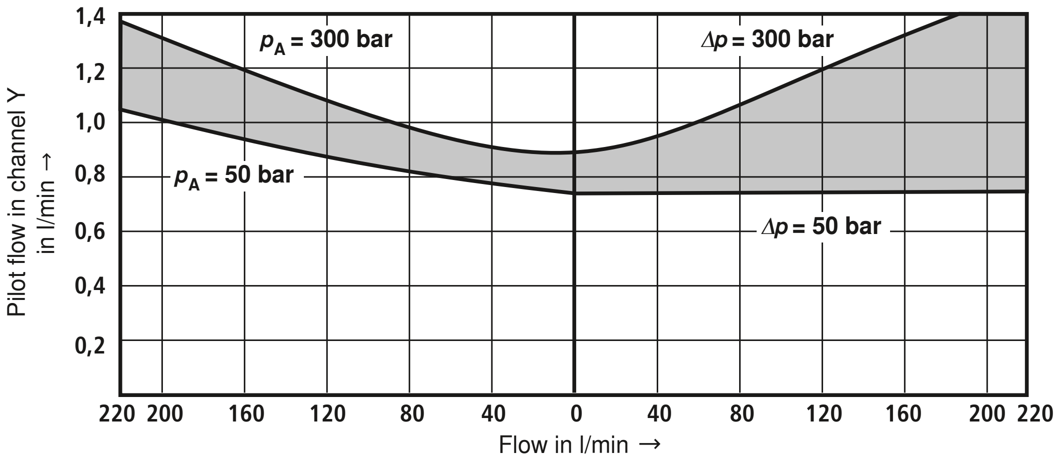
Minimum pressure setting p_{min} in dependence on flow q_V



A to T | P to A

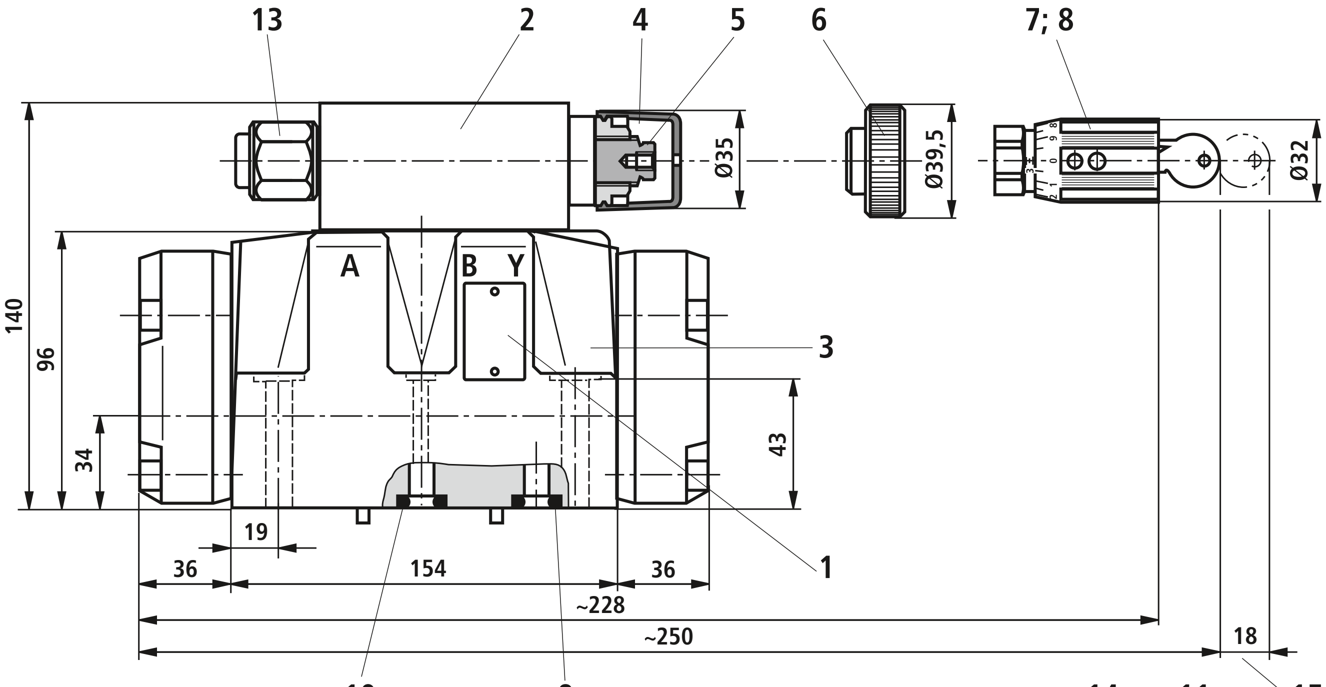
The characteristic curves are valid for outlet pressure p_T = zero over the entire flow range.

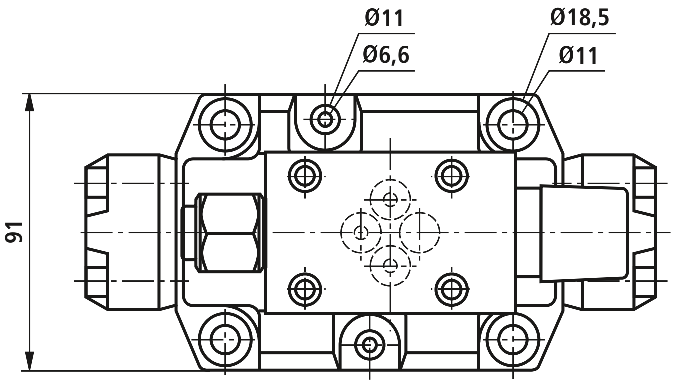
Pilot flow $q_{V\,St}$ in dependence on flow q_V

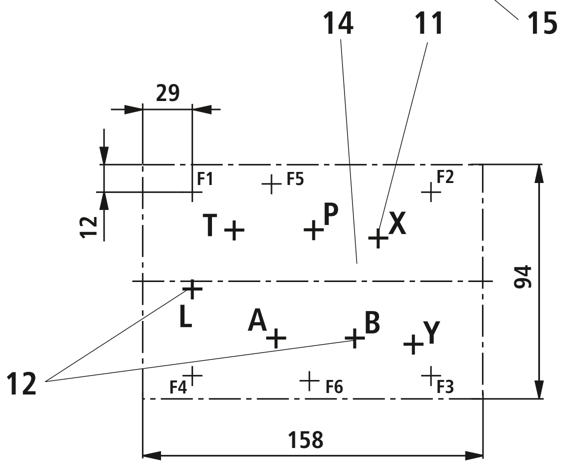


A to T | P to A

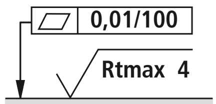
Unit dimensions (dimensions in mm)







For explanations of items and valve mounting screws, see page 7.



Required surface quality of valve mounting face

Unit dimensions

1 Nameplate
2 Pilot control valve
3 Main valve
4 Adjustment element “5”
5 Hexagon 10 A/F
6 Adjustment element “4”
7 Adjustment element “6”
8 Adjustment element “7”
9 Seal rings for ports X, Y and L
10 Seal rings for ports A, B, P and T
11 Port X must be plugged in the subplate
12 Ports B and L must be plugged in the subplate
13 Pressure gauge port
14 Valve mounting face – porting pattern to ISO 4401-07-07-0-05
15 Space required to remove key

Suplates to data sheet RE 45056
(separate order)

G172/01 (G3/4)
G174/01 (G1)

Valve mounting screws (separate order)

- **4 hexagon socket head cap screws ISO 4762 - M10 x 60 - 10.9-flZn-240h-L**
  Friction coefficient μ_{total} = 0.09 to 0.14,
  tightening torque M_T = 73 Nm ± 10%,
  Material no. **R913000116**
- **2 hexagon socket head cap screws ISO 4762 - M6 x 60 - 10.9-flZn-240h-L**
  Friction coefficient μ_{total} = 0.09 to 0.14,
  tightening torque M_T = 15.5 Nm ± 10%,
  Material no. **R913000115**

Note!

The specified tightening torques are recommended values when screws of the given friction coefficients and a torque wrench are used (tolerance ±10%).

Notes

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The Drive & Control Company **Rexroth** Bosch Group

Pressure reducing valve, pilot operated

Type DR

RE 26893
Edition: 2013-01
Replaces: 02.03

H7928

- Sizes 10 and 25
- Component series 1X; 4X
- Maximum operating pressure 315 bar
- Maximum flow 160 l/min

Features

- For subplate mounting
- Porting pattern according to ISO 5781
- For threaded connection
- As screw-in cartridge valve
- 4 adjustment types, optionally:
  – Rotary knob
  – Bushing with hexagon and protective cap
  – Lockable rotary knob with scale
  – Rotary knob with scale
- 4 pressure ratings

Contents

Ordering code

01	02	03		04		05		06	07	08	09	10
DR			–		–		/		Y			*

01	Pressure reducing valve	**DR**
02	**– Size 10**	
	Subplate mounting "no code"	**10**
	Threaded connection "G" (G1/2)	**10**
	– Size 25	
	Subplate mounting "no code"	**20**
	Threaded connection "G" (G3/4)	**15**
	Threaded connection "G" (G1)	**20**
	Screw-in cartridge valve "K"	**20**

Type of connection

03	Subplate mounting	**no code**
	Threaded connection	**G**
	Screw-in cartridge valve	**K**

Adjustment type

04	Rotary knob	**4**
	Bushing with hexagon and protective cap	**5**
	Lockable rotary knob with scale	**6** [1]
	Rotary knob with scale	**7**

05	Component series 10 to 19 (10 to 19: Unchanged installation and connection dimensions); (03 = "K")	**1X**
	Component series 40 to 49 (40 to 49: Unchanged installation and connection dimensions); (03 = "no code" and "G")	**4X**

Pressure rating

06	Set pressure up to 50 bar	**50**
	Set pressure up to 100 bar	**100**
	Set pressure up to 200 bar	**200**
	Set pressure up to 315 bar	**315**

07	Pilot oil supply internal, pilot oil return external	**Y**

08	**With** check valve (subplate mounting only)	**no code**
	Without spring return	**M**

Seal material

09	NBR seals	**no code**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

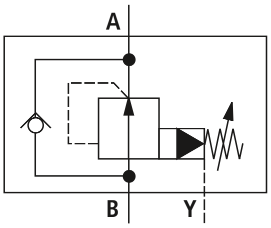
10	Further details in the plain text	

[1] H-key with the material no. **R900008158** is included in the scope of delivery.

☞ **Notice!** Preferred types and standard units are contained in the EPS (standard price list).

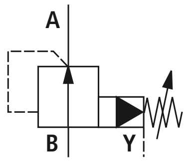
Symbols

Subplate mounting



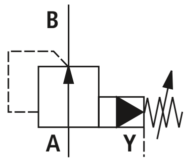
Type DR . .-.-4X/.Y

Subplate mounting
screw-in cartridge valve



Type DR . .-.-4X/.YM
Type DR . K-.-1X/.YM (screw-in cartridge valve)

Threaded connection



Type DR . G-.-4X/.YM

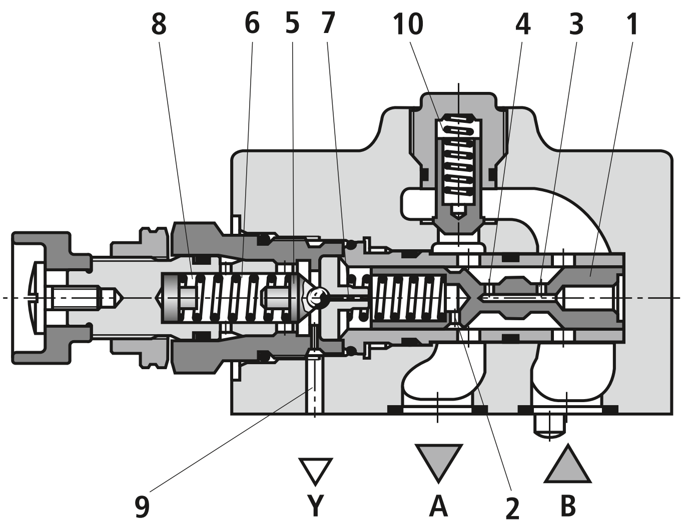
Function, section

The pressure valve type DR is a pilot operated pressure reducing valve. It is used to reduce the system pressure. It mainly consists of screw-in cartridge valve (cartridge) and housing, optionally with or without check valve (subplate mounting only).

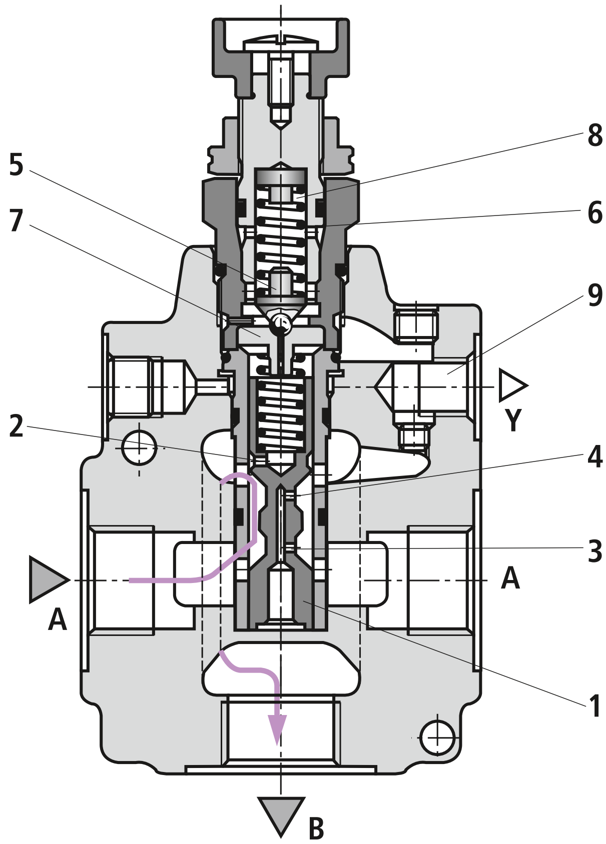
In the rest position the valve is open. The hydraulic fluid is able to flow freely from the input channel via the main control spool (1) to the output channel. The pressure in the output channel is applied to the spring-loaded side of the main control spool (1) via the bore (2). At the same time, the pressure acts upon the side of the main control spool (1) that is opposite to the spring via the bores (3) and (4).

If the pressure in the output channel exceeds the value set at the spring (6), the pilot poppet (5) opens. Hydraulic fluid flows from the spring-loaded side of the main control spool (1) via the nozzle (7) and the pilot poppet (5) into the spring chamber (8).
The main control spool (1) assumes its control position and keeps the value in the output channel set at the spring (6) constant. The pilot oil return from the spring chamber (8) is always effected externally via the Y port (9).
In the subplate mounting "P" version, a check valve (10) can be optionally installed for free flow back from channel A to B.

☞ **Notice!**
The pressure in port Y is added 1:1 to the set reduced pressure.



Type DR 10 -4-4X/...



Type DR 20 G-4-4X/...

Technical data

(For applications outside these parameters, please consult us!)

general				
Size		Size	**10**	**25**
Weight	– Subplate mounting	kg	3.2	3.5
	– Threaded connection	kg	3.6	3.3
	– Screw-in cartridge valve	kg	2.5	2.8
Installation position			Any	
Ambient temperature range		°C	–30 ... +80 (NBR seals) –20 ... +80 (FKM seals)	

hydraulic				
Nominal pressure		bar	315	
Maximum operating pressure	– Input	bar	315	
Maximum secondary pressure	– Output	bar	50; 100; 200; 315	
Maximum counter pressure	– Port Y	bar	250	
Set pressure	– Minimum	bar	Flow-dependent (see characteristic curves page 6)	
	– Maximum	bar	50; 100; 200; 315	
Maximum flow	– Subplate mounting	l/min	80	160
	– Threaded connection	l/min	80	160
Hydraulic fluid			See table below	
Hydraulic fluid temperature range		°C	–30 ... +80 (NBR seals) –20 ... +80 (FKM seals)	
Viscosity range		mm^2/s	10 ... 800	
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1]	

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils		HL, HLP	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!

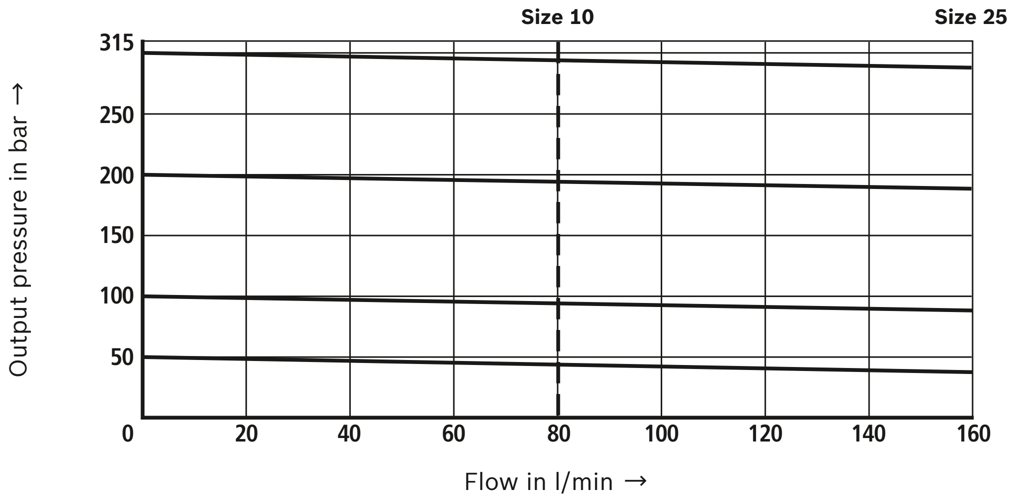
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum surface temperature.
- **Flame-resistant – containing water**:
  - Maximum pressure differential per control edge 210 bar, otherwise, increased cavitation erosion
  - Maximum hydraulic fluid temperature 60 °C
  - Life cycle as compared to operation with mineral oil HLP 30 to 100 %

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components. For the selection of the filters see www.boschrexroth.com/filter.

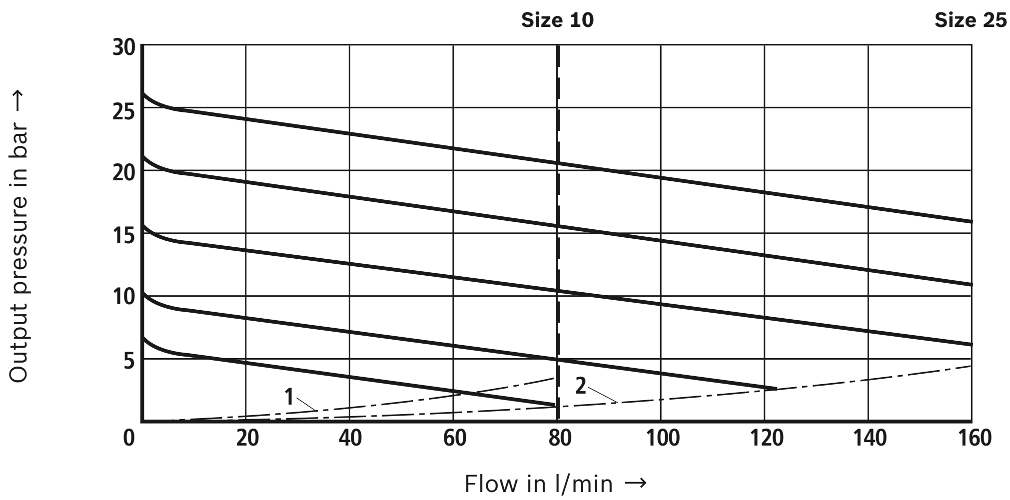
Characteristic curves

(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

Output pressure p_A dependent on the flow q_V (B to A)



Minimum adjustable output pressure $p_{A\ min}$ dependent on the flow q_V (B to A)



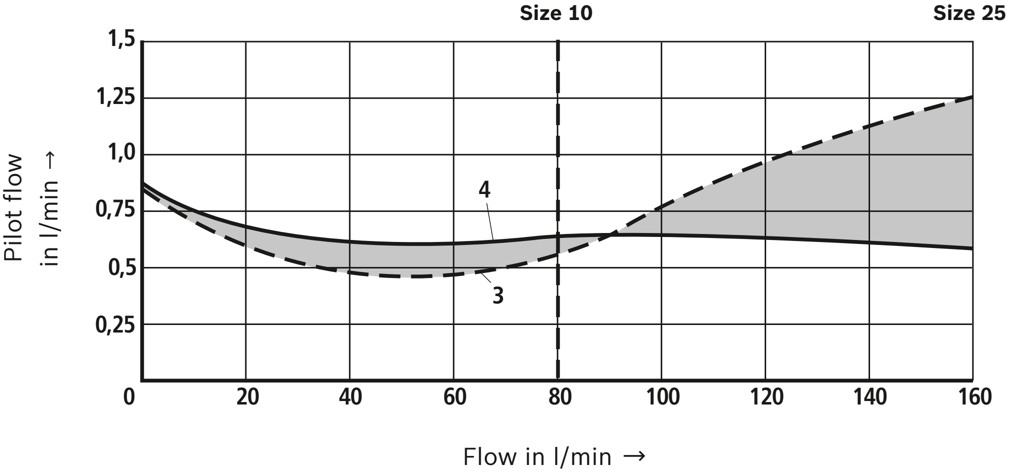
Performance limit (system-dependent):

1 Size 10

2 Size 25

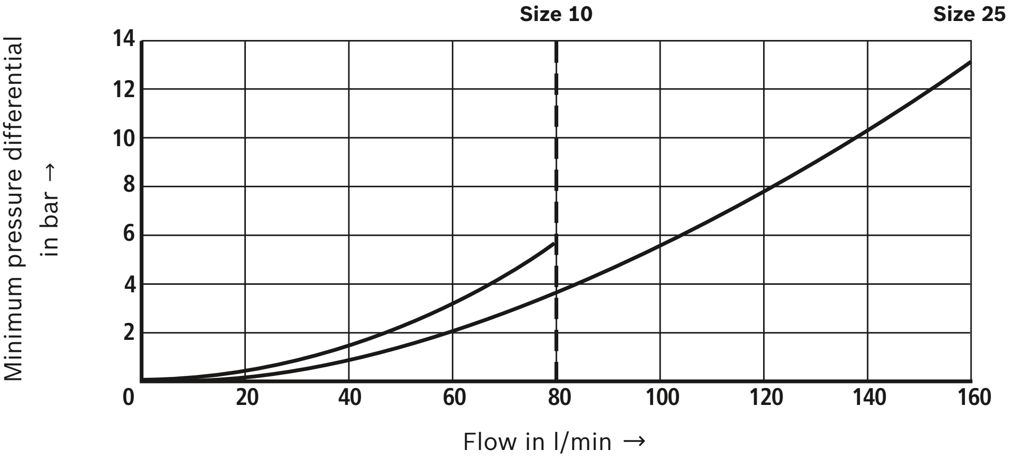
Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

Pilot flow $q_{V\ st}$ dependent on the flow q_V (B to A) and the pressure differential Δp

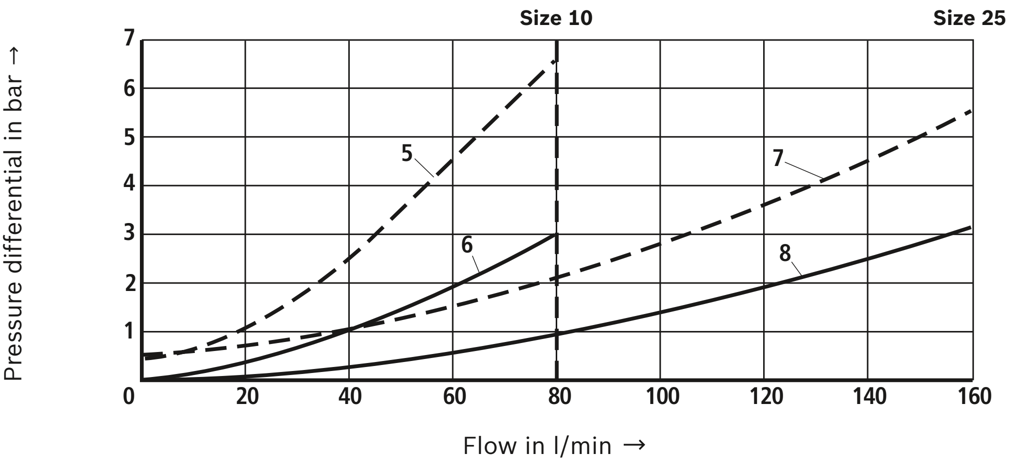


3 Δp = 250 bar
4 Δp = 50 bar

Δp_{min}-q_V characteristic curve (B to A)

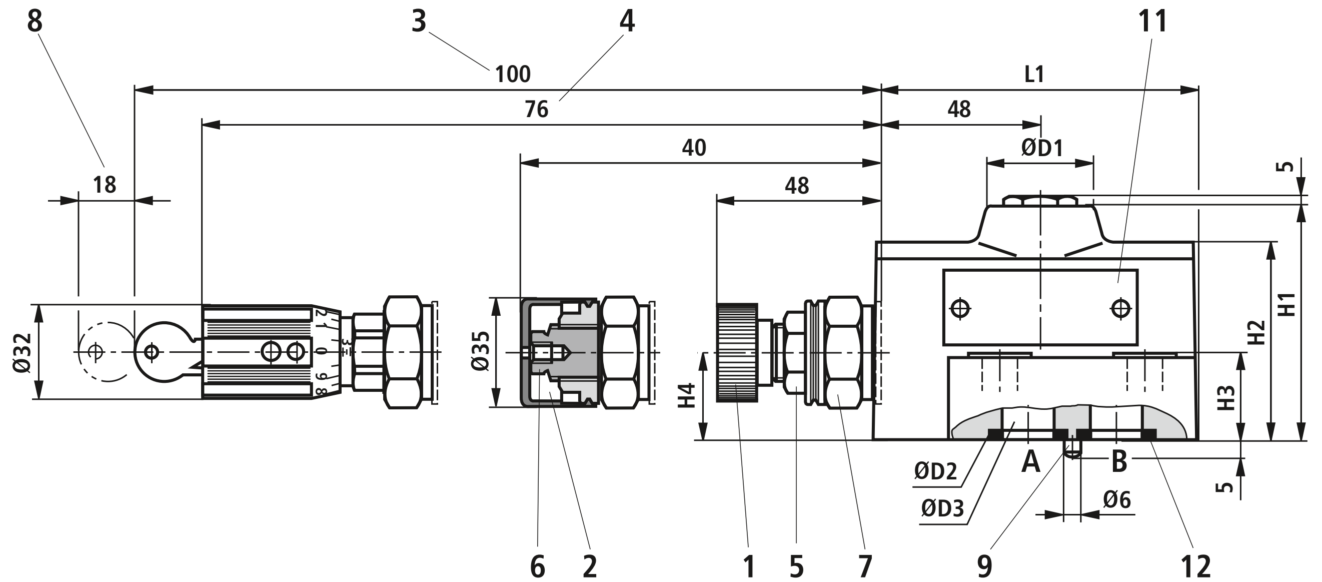


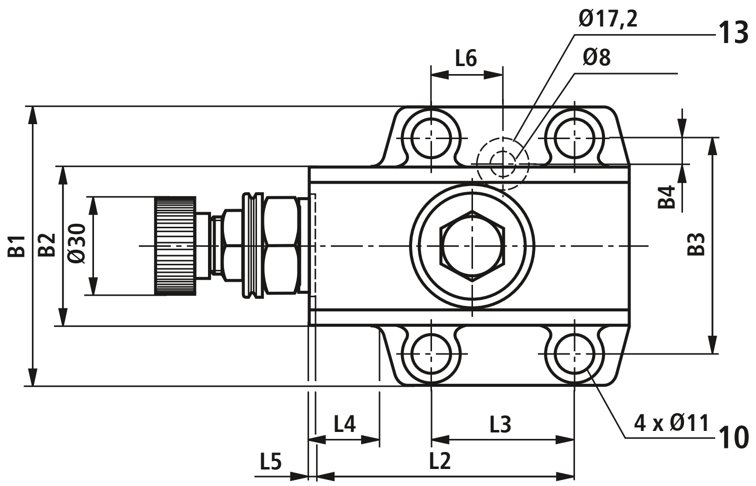
Δp q_V characteristic curve (B to A)

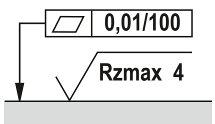


5, 6 **Size 10**
7, 8 **Size 25**
5, 7 Main stage closed
6, 8 Main stage fully open

Unit dimensions: Subplate mounting
(dimensions in mm)





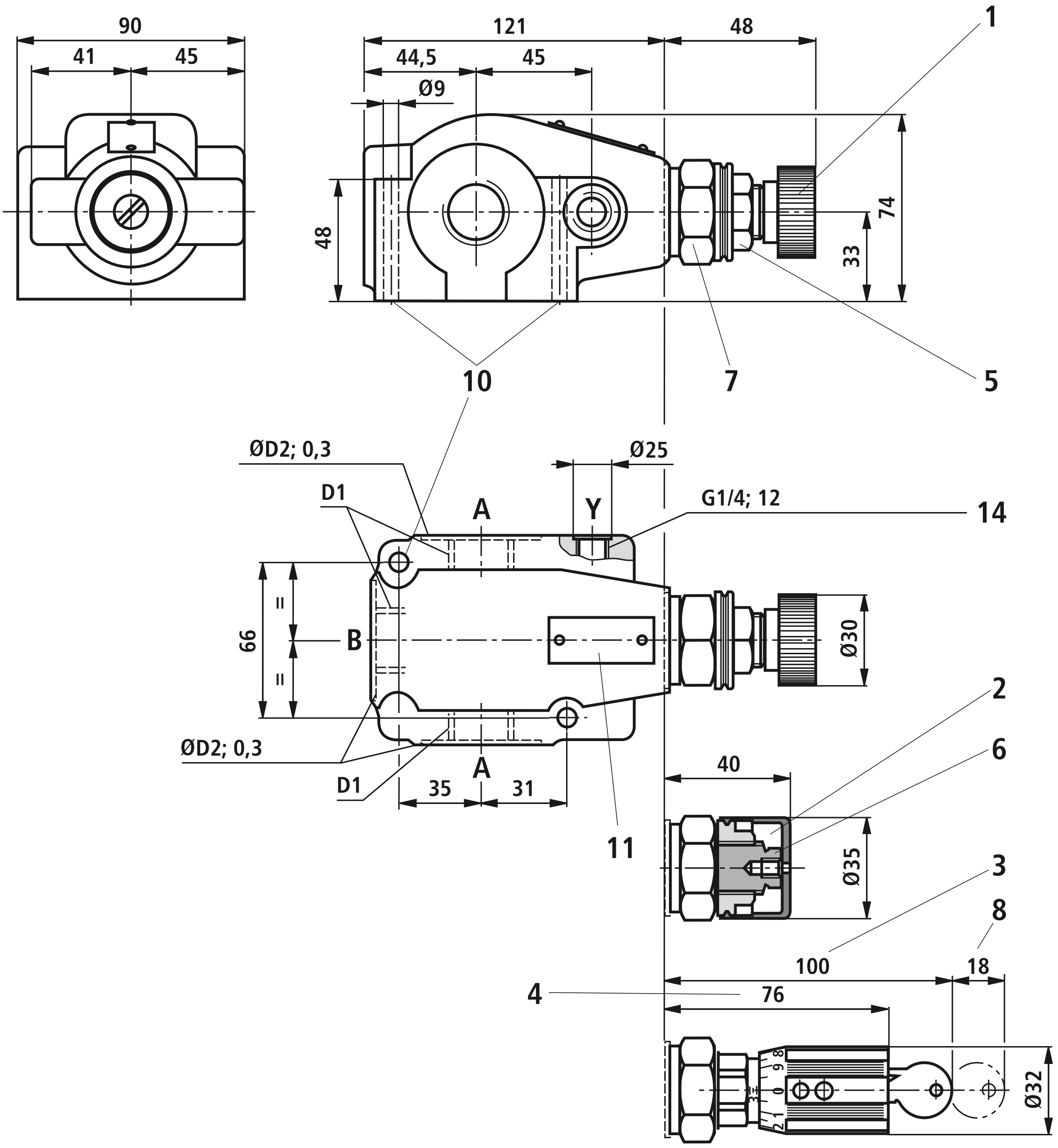


Required surface quality of the valve contact surface

Type	L1	L2	L3	L4	L5	L6	B1	B2	B3	B4	H1	H2	H3	H4	ØD1	ØD2	ØD3
DR 10	95.5	79	42.9	23	2.5	21.5	85	49	66.7	7.9	71	60	26	26	35.5	21.8	15
DR 20	96	79.5	60.3	7	4	39.7	100	58	79.4	6.4	96	78	26	40	41	34.8	25

Item explanations, subplates, and valve mounting screws see page 12.

Unit dimensions: Threaded connection "G"
(dimensions in mm)

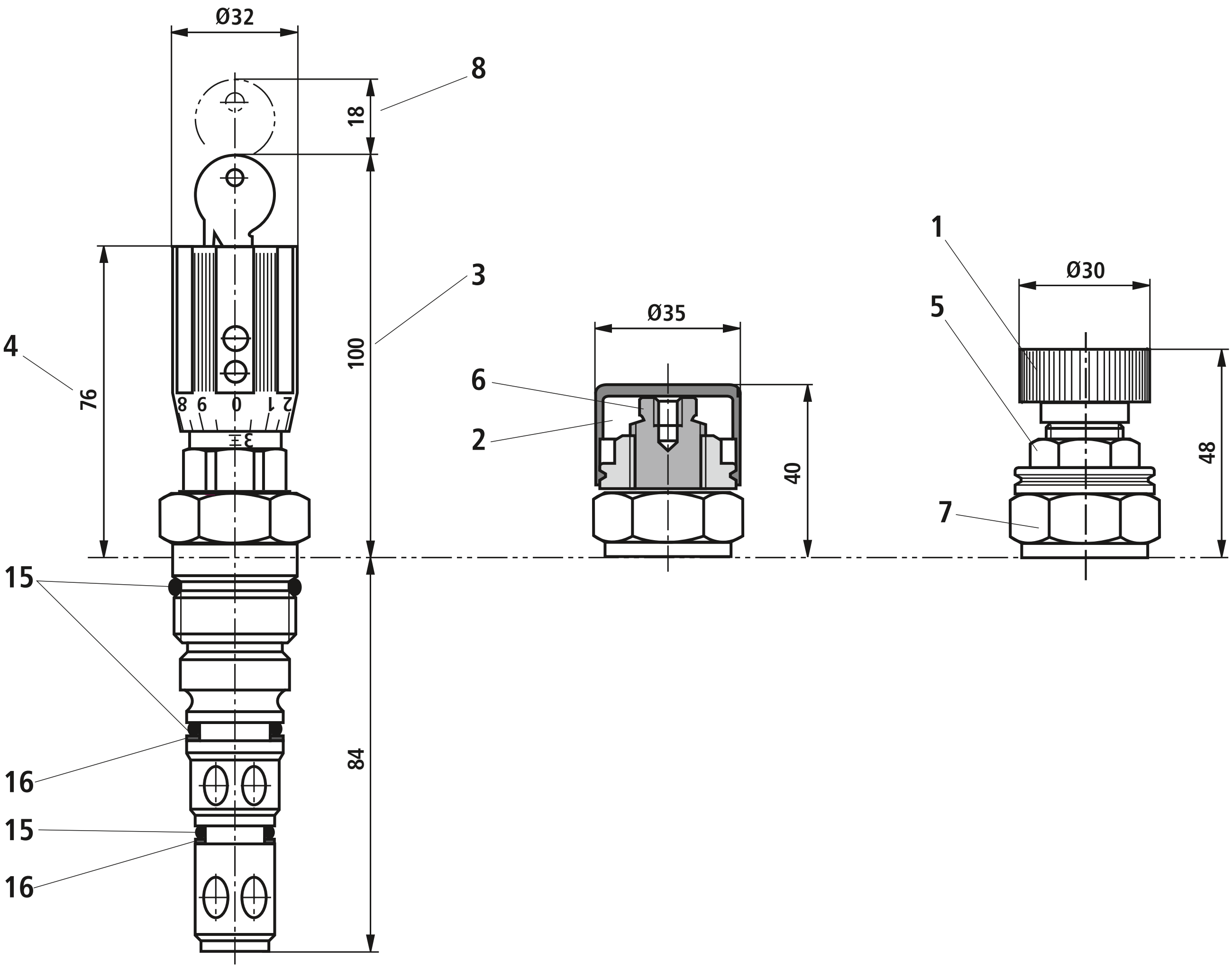


Type	D1	ØD2
DR 10 G	G1/2	34
DR 15 G	G3/4	42
DR 20 G	G1	47

Notice!
In this valve version, **no** check valve for free return flow is installed in the valve.

Item explanations, subplates, and valve mounting screws see page 12.

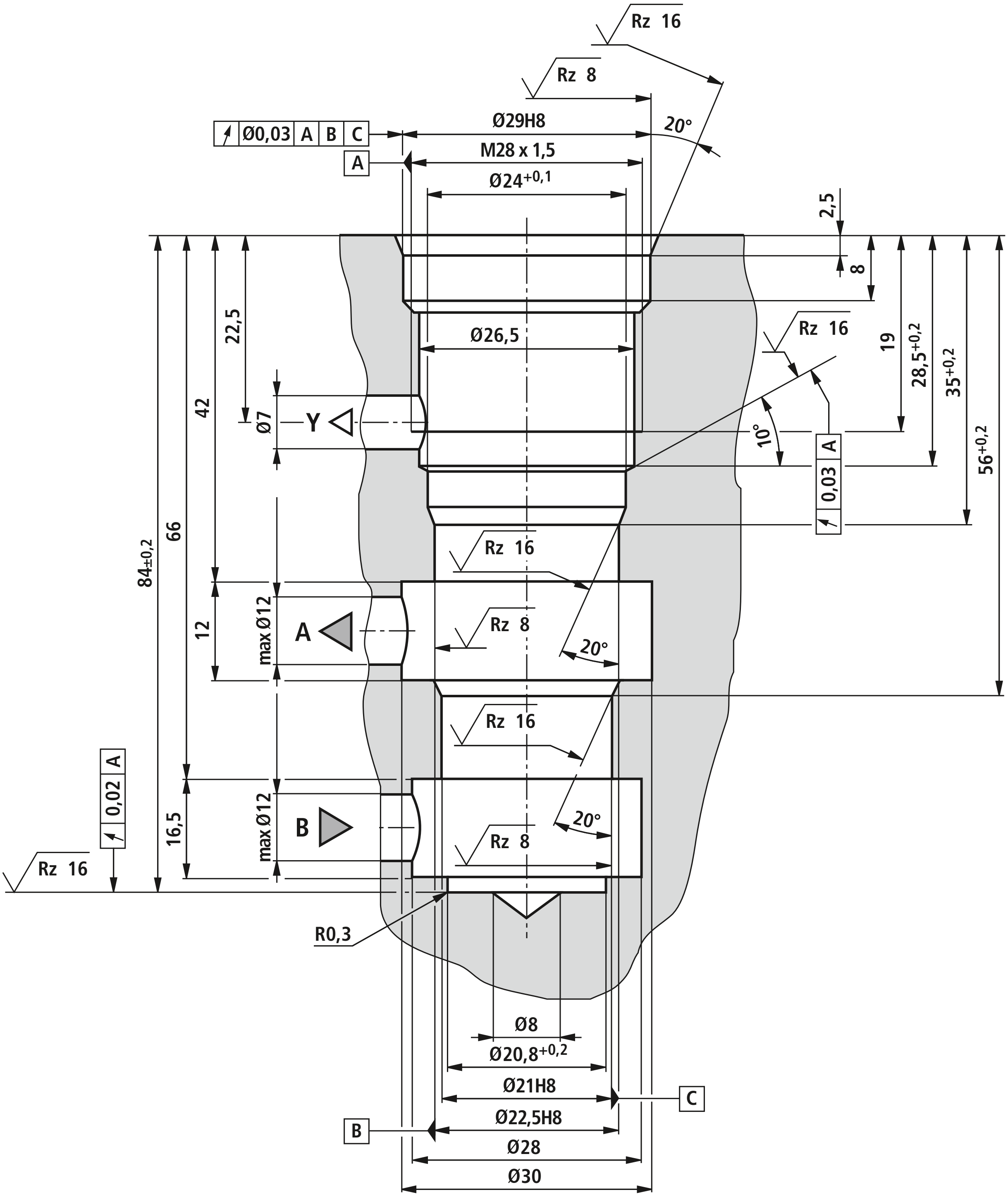
Unit dimensions: Screw-in cartridge valve "K"
(dimensions in mm)



1 Adjustment type "4"
2 Adjustment type "5"
3 Adjustment type "6"
4 Adjustment type "7"

5 Lock nut SW22
6 Hexagon SW10
7 Hexagon SW30, tightening torque when screwing in M_A = 50 Nm
8 Space required to remove the key
15 Seal ring
16 Support ring

Mounting cavity
(dimensions in mm)



Notice!
Optionally, the connection bores A, B and Y can be applied at the circumference.

Unit dimensions

1 Adjustment type "4"
2 Adjustment type "5"
3 Adjustment type "6"
4 Adjustment type "7"
5 Lock nut SW22
6 Hexagon SW10
7 Hexagon SW30, tightening torque when screwing in M_A = 50 Nm
8 Space required to remove the key
9 Locking pin
10 Valve mounting bores
11 Name plate
12 Identical seal rings for ports A and B
13 Seal ring for port Y
14 Y port for pilot oil return

Subplates according to data sheet 45062 (separate order)

- Size 10:
  G 460/01 (G3/8)
  G 461/01 (G1/2)
- Size 25:
  G 412/01 (G3/4)
  G 413/01 (G1)

Valve mounting screws (separate order)

- Size 10:
  4 hexagon socket head cap screws
  ISO 4762 - M10 x 40 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  Tightening torque M_A = 75 Nm ± 10 %
- Size 25:
  4 hexagon socket head cap screws
  ISO 4762 - M10 x 50 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  Tightening torque M_A = 75 Nm ± 10 %

Notice!
The tightening torques stated are guidelines when using screws with the specified friction coefficients and when using a manual torque wrench (tolerance ±10 %).

More information

▶ Subplates	Data sheet 45062
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ General product information on hydraulic products	Data sheet 07008
▶ Installation, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Selection of the filters	www.boschrexroth.com/filter

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Rexroth
Bosch Group

Pressure reducing valve, pilot operated

RE 26892/05.11
Replaces: 02.03

Type DR

Size 10 to 32
Component series 5X
Maximum operating pressure 350 bar
Maximum flow 400 l/min

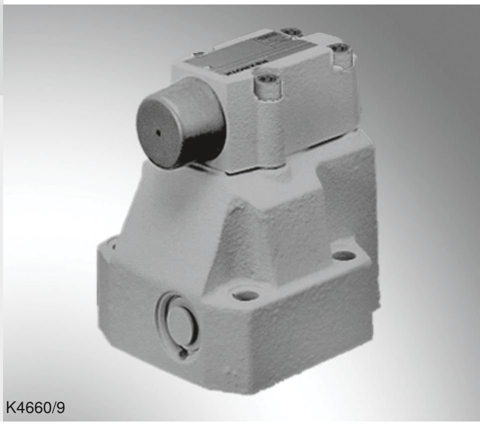

K4660/9

Table of contents

Features

- For subplate mounting
- Porting pattern according to ISO 5781
- For threaded connection
- As cartridge valve
- 4 adjustment types, optional:
  - Rotary knob
  - Bushing with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- 5 pressure ratings
- Check valve, optional (only subplate mounting)

- More information:
  - Subplates — Data sheet 45062

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

DR				–5X/	Y			*

Complete valve = **no code**
(Subplate mounting or threaded connection)

Pilot valve = **C**
without main spool insert (cartridge valve)
(do **not** enter size)

Pilot valve = **C**
with main spool insert (cartridge valve)
(enter valve size 30)

Size	Ordering code: Subplate mounting "–"	Ordering code: Threaded connection "G"
10	**= 10**	**= 10** (G1/2)
16	–	**= 15** (G3/4)
25	**= 20**	**= 20** (G1)
25	–	**= 25** (G1 1/4)
32	**= 30**	**= 30** (G1 1/2)

As cartridge valve = **no code**
(version "C", **without** main spool insert)

As cartridge valve = **–**
(version "C", **with** main spool insert)

For subplate mounting = **–**

For threaded connection = **G**

Adjustment type for pressure adjustment

Rotary knob = **4**

Bushing with hexagon and protective cap = **5**
(always with maximum pressure adjustment)

Lockable rotary knob with scale = **6** [1]

Rotary knob with scale = **7**

5X = Component series 50 to 59
(50 to 59: unchanged installation and connection dimensions)

50 = Set pressure up to 50 bar
100 = Set pressure up to 100 bar
200 = Set pressure up to 200 bar
315 = Set pressure up to 315 bar
350 = Set pressure up to 350 bar
(only version "M")

Pilot oil supply
Y = Pilot oil supply internal, pilot oil return external

No code = **With** check valve
(only for subplate mounting)
M = **Without** check valve

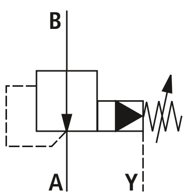
Seal material
No code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

Further details in the plain text

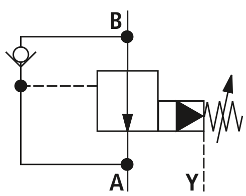
[1] H-key with Material no. **R900008158** is included in the delivery.

Symbols

Type DR…**YM**



Type DR…**Y**



Function, section

Pressure valves type DR are pilot operated pressure reducing valves that are controlled from the secondary circuit.

The pressure reducing valves basically comprise of a main valve (1) with main spool insert (3) and pilot control valve (2) with pressure adjustment element.

Basic principle:

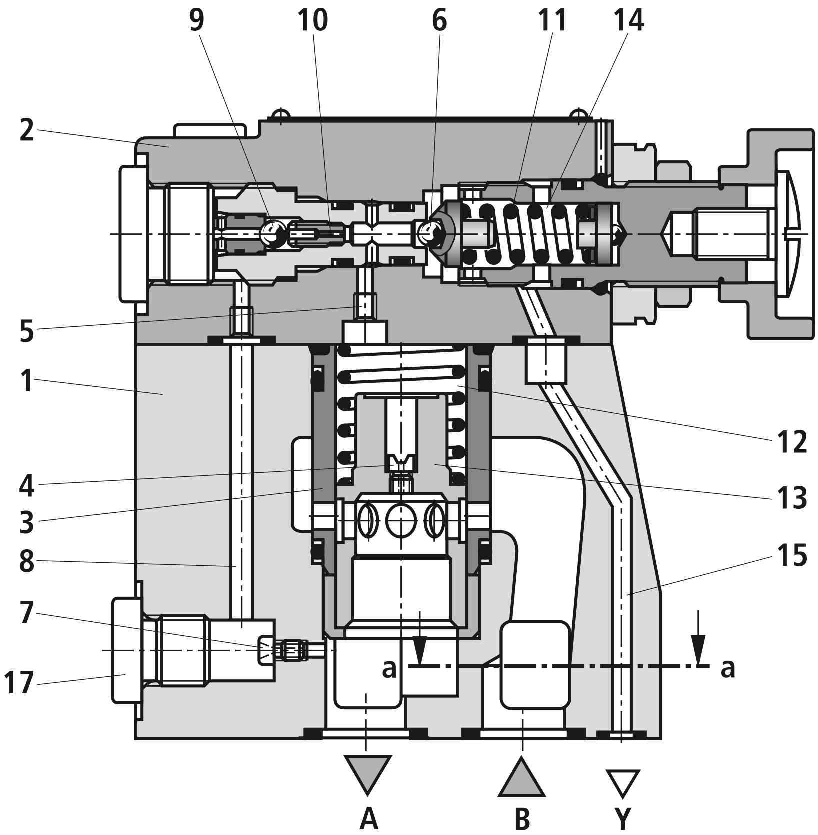
In rest position, the valves are open. Hydraulic fluid flows from channel B via the main spool insert (3) to channel A without obstructions. The pressure available in channel A acts on the lower main spool side. At the same time, the pressure is applied to the spring-loaded side of the main spool (3) via the nozzle (4) and at the ball (6) in the pilot control valve (2) via the channel (5). It also acts on the ball (6) via nozzle (7), control line (8), check valve (9) and nozzle (10). Depending on the spring (11) setting, a pressure builds up in front of the ball (6), in the channel (5) and in the spring chamber (12), which keeps the control spool (13) in opened position. The hydraulic fluid in channel B can flow via the main spool insert (3) to channel A without obstructions until a pressure builds up in channel A that exceeds the value set at the spring (11) and opens the ball (6). The control spool (13) moves in closing direction.

The desired reduced pressure is achieved if there is a state of equilibrium between the pressure in channel A and the pressure set at the spring (11).

The pilot oil return from the spring chamber (14) is always effected externally via the control line (15) into the tank.

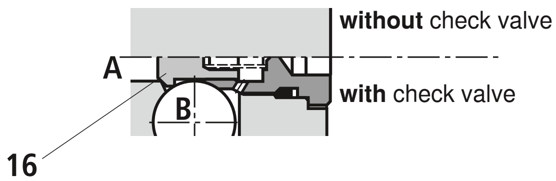
For the free flow back from channel A to channel B, you can optionally install a check valve (16).

A pressure gauge connection (17) allows for the control of the reduced pressure in channel A.



Type DR..-4-5X/...Y...

Section a - a



Technical Data (For applications outside these parameters, please consult us!)

general

Size				10	16	25 (type DR..20)	25 (type DR..25)	32
Weight	Subplate mounting	– Type DR . .–	kg	3.4	–	5.3	–	8.0
	Cartridge valve	– Type DRC	kg	1.2				
		– Type DRC 30	kg	1.5				
	Threaded connection	– Type DR . .G	kg	5.3	5.2	5.1	5.0	4.8
Installation position				Any				
Ambient temperature range			°C	–30 to +50 (NBR seals) –20 to +50 (FKM seals)				

hydraulic

Maximum operating pressure	– Port B	bar	350 [1]				
Maximum inlet pressure	– Port B	bar	350 [1]				
Maximum outlet pressure	– Port …	bar	350 [1]				
Operating pressure range	– Port A	bar	10 to 350 [1]				
Maximum backpressure	– Port Y	bar	350 [1]				
Minimal set pressure		bar	Flow-dependent (see characteristic curves page 5)				
Maximum set pressure		bar	50; 100; 200; 315; 350 [1]				
Maximum flow	– Subplate mounting	l/min	150	–	300	–	400
	– Threaded connection	l/min	150	300	300	400	400
Hydraulic fluid			See table below				
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)				
Viscosity range		mm^2/s	10 to 800				
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [2]				

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

☞ **Important information on hydraulic fluids!**

- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

- **Flame-resistant – water-containing**:
  - Maximum operating pressure 210 bar
  - Maximum hydraulic fluid temperature 60 °C
  - Expected service life as compared to HLP hydraulic oil 30 % to 100 %

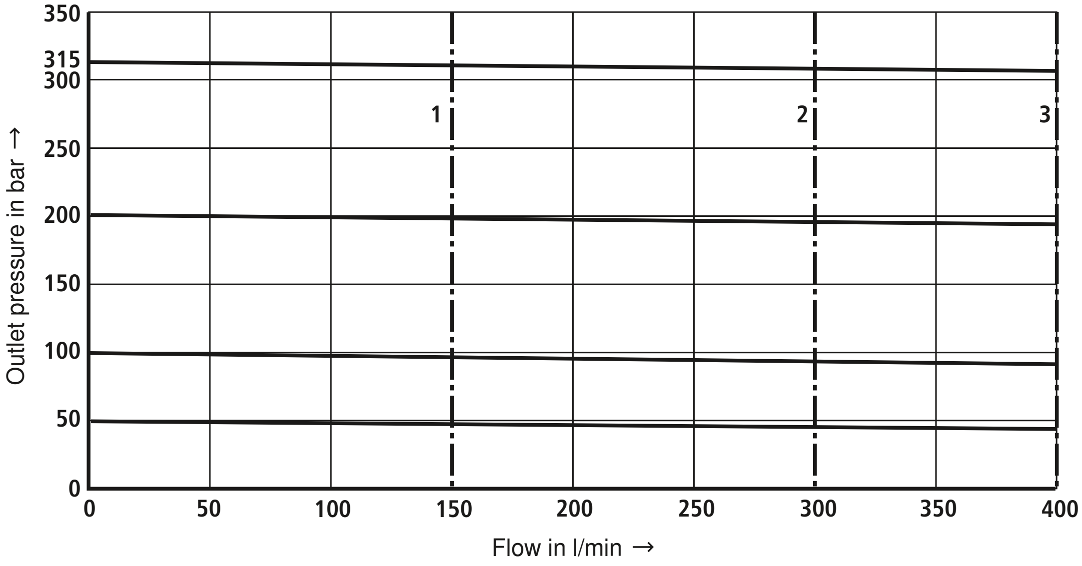
[1] 350 bar only possible with version without check valve

[2] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of the filters see www.boschrexroth.com/filter.

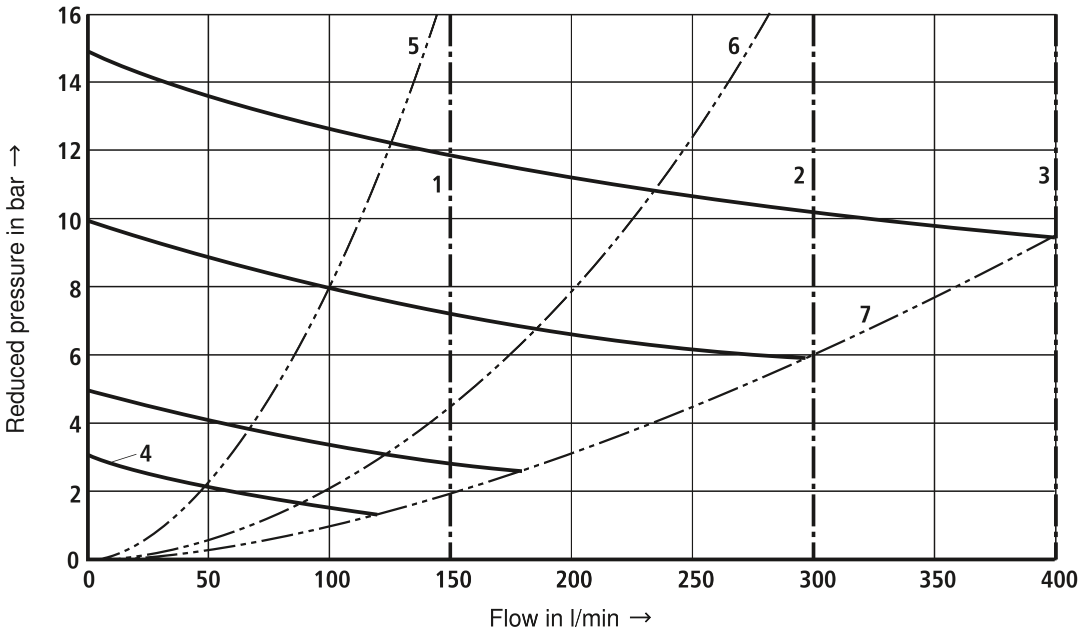
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Outlet pressure p_A depending on the flow q_V (B to A)



1 Size 10
2 Size 25
3 Size 32

Minimum set pressure with $p_{A\,min}$ depending on the flow q_V (B to A)



1 Size 10
2 Size 25
3 Size 32
4 $p_{A\,min}$

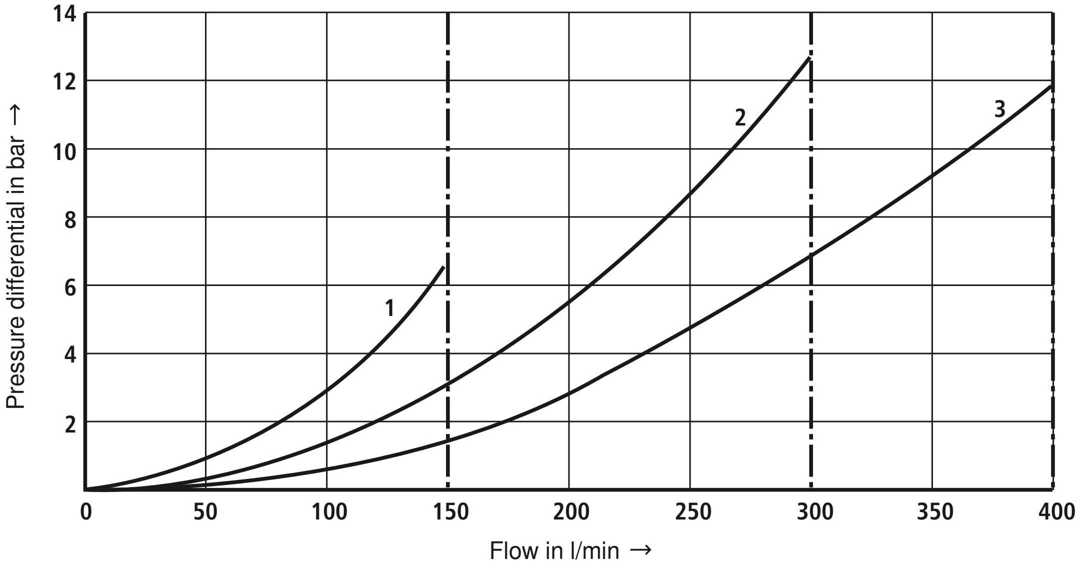
Performance limit (system-dependent)

5 Size 10
6 Size 25
7 Size 32

The characteristic curves apply to the pressure at the valve output p_T = 0 bar across the entire flow range.

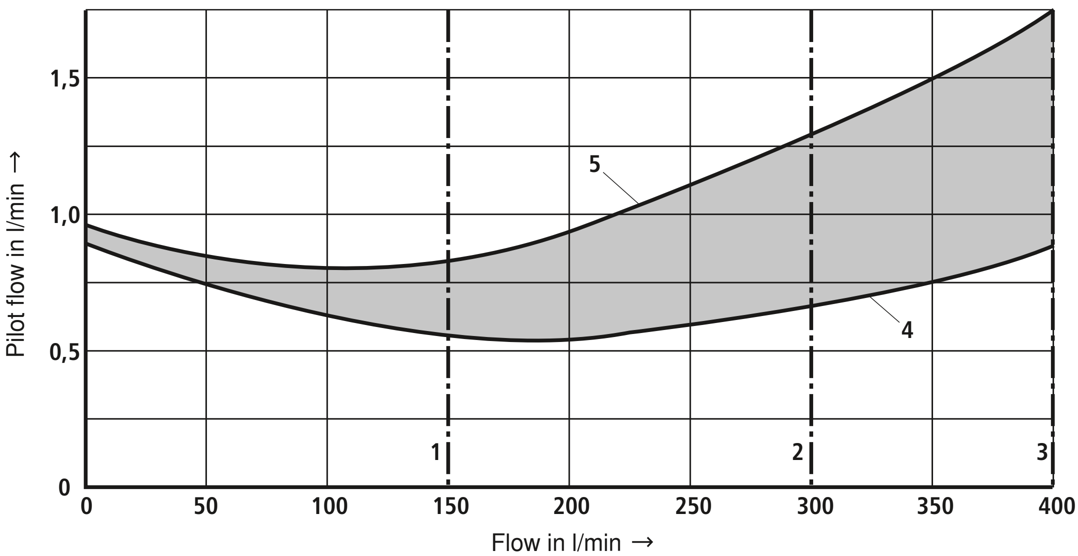
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Δp-q_V characteristic curves (B to A; lowest pressure differential adjustable)



1 Size 10
2 Size 25
3 Size 32

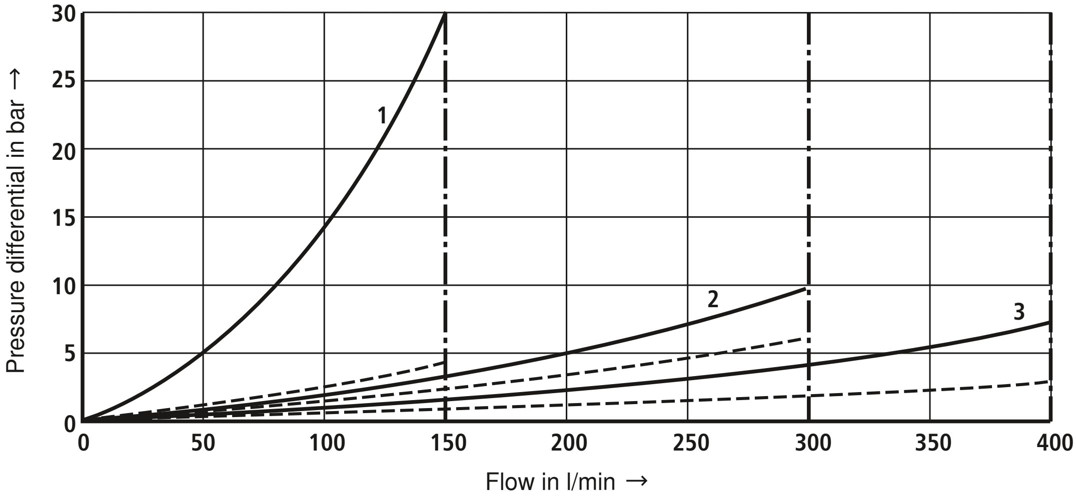
Pilot flow depending on flow (B to A) and pressure differential



1 Size 10
2 Size 25
3 Size 32
4 Δp = 50 bar
5 Δp = 200 bar

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

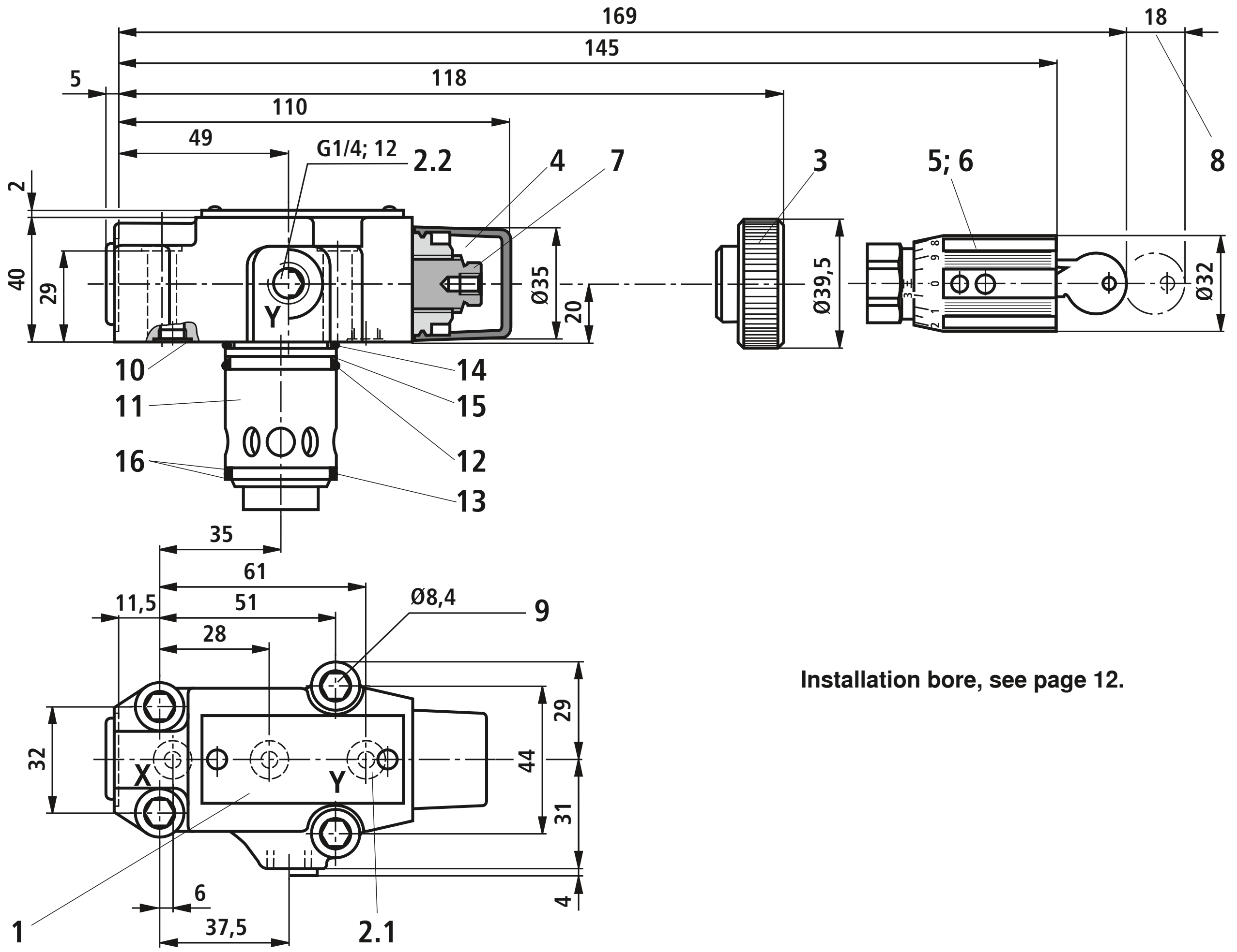
***Δp-q$_V$* characteristic curves across the check valve (A to B)**



1 Size 10
2 Size 25
3 Size 32

——— Flow resistance across check valve, main stage closed
– – – Flow resistance across check valve with completely opened main stage

Unit dimensions: Type DRC…; cartridge valve (dimensions in mm)

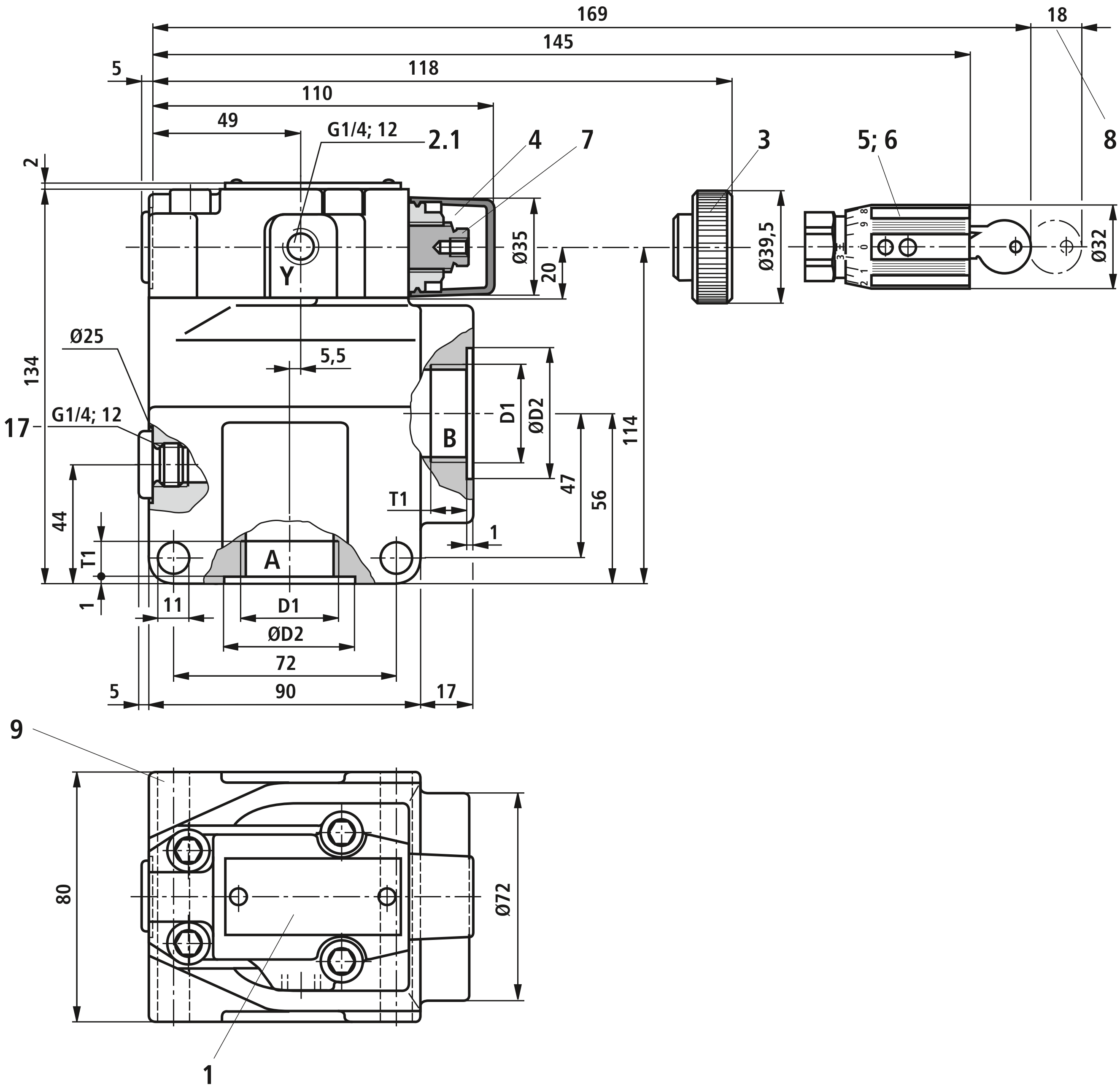


Installation bore, see page 12.

1 Name plate
2.1 Y port for pilot oil return external
2.2 Y port optionally for pilot oil return external
3 Adjustment type "4"
4 Adjustment type "5"
5 Adjustment type "6"
6 Adjustment type "7"
7 Hexagon SW10
8 Space required to remove the key
9 Valve mounting bores
10 Seal rings
11 Main spool insert
12 Seal ring
13 Seal ring
14 Seal ring
15 Support ring
16 Support ring

Valve mounting screws
(separate order)
4 hexagon socket head cap screws
ISO 4762 - M8 x 40 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 31 Nm ±10 %,
Material No. **R913000205**

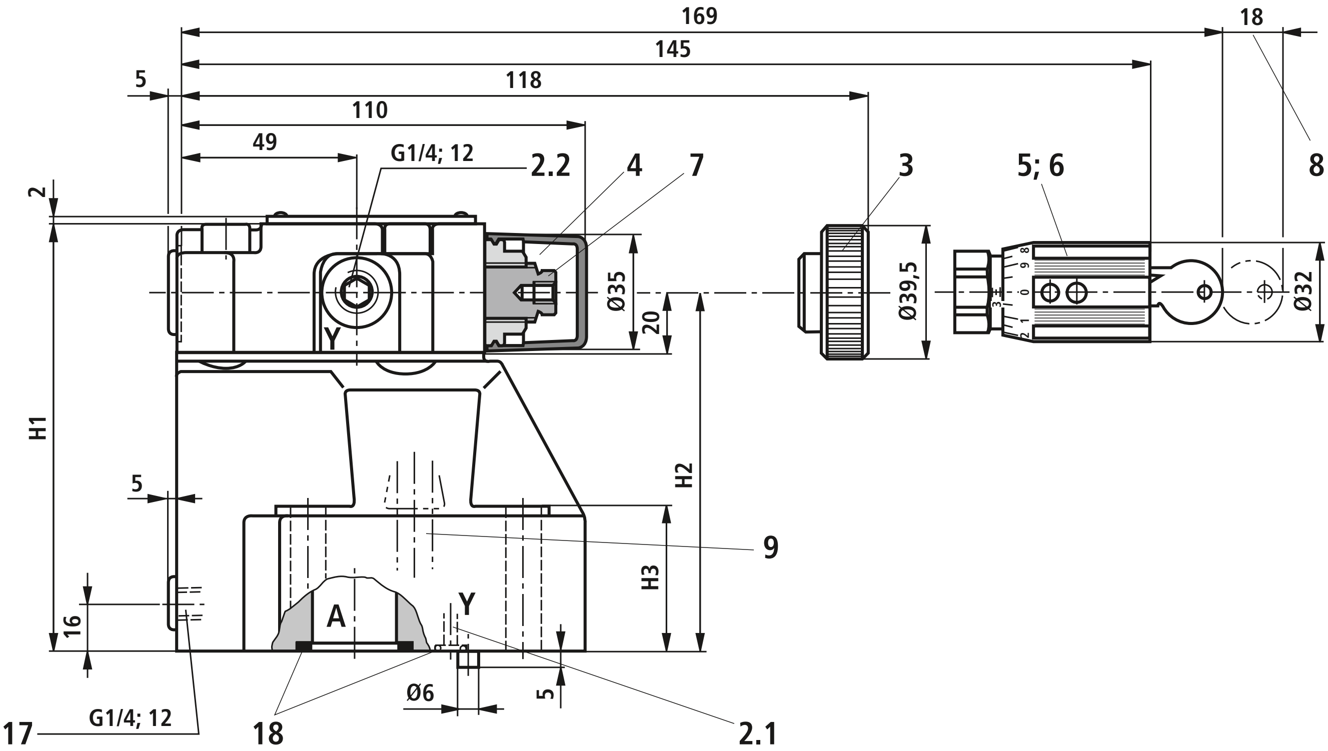
Unit dimensions: Type DR…; threaded connection (dimensions in mm)

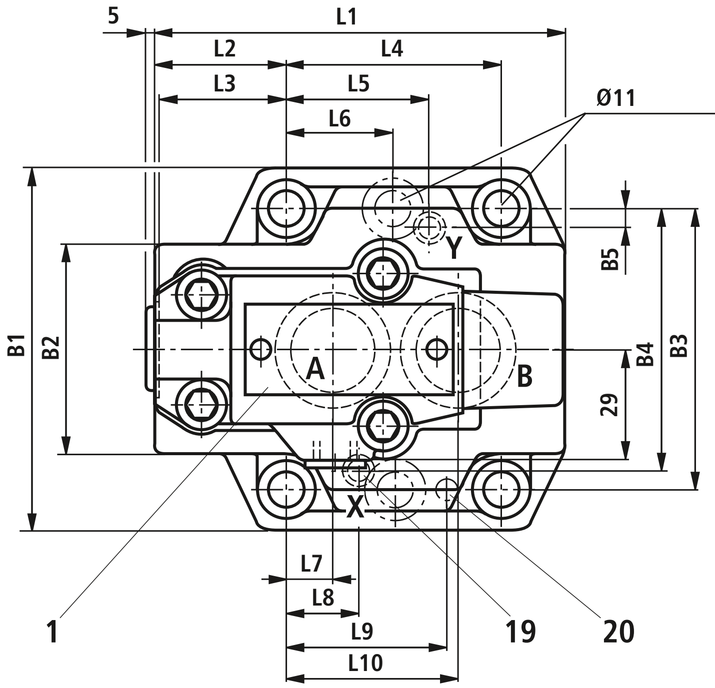


Size	D1	ØD2	T1
10	G1/2	34	14
16 (Type DR 15 G…)	G3/4	42	16
25 (Type DR 20 G…)	G1	47	18
25 (Type DR 25 G…)	G1 1/4	58	20
32 (Type DR 30 G…)	G1 1/2	65	22

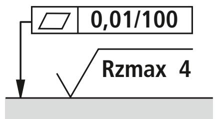
1 Name plate
2.1 Y port for pilot oil return external
3 Adjustment type "4"
4 Adjustment type "5"
5 Adjustment type "6"
6 Adjustment type "7"
7 Hexagon SW10
8 Space required to remove the key
9 Valve mounting bores
17 Pressure gauge connection

Unit dimensions: Type DR…; subplate mounting (dimensions in mm)





Item explanations, subplates, and valve mounting screws, see page 11.



Required surface quality of the valve mounting face

Size	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
10	96	35.5	33	42.9	21.5	–	7.2	21.5	31.8	35.8
25	116	37.5	35.4	60.3	39.7	–	11.1	20.6	44.5	49.2
32	145	33	29.8	84.2	59.5	42.1	16.7	24.6	62.7	67.5

Size	B1	B2	B3	B4	B5	H1	H2	H3
10	85	50	66.7	58.8	7.9	112	92	28
25	102	59.5	79.4	73	6.4	122	102	38
32	120	76	96.8	92.8	3.8	130	110	46

Unit dimensions

1 Name plate
2.1 Y port for pilot oil return external
2.2 Y port optionally for pilot oil return external
3 Adjustment type "4"
4 Adjustment type "5"
5 Adjustment type "6"
6 Adjustment type "7"
7 Hexagon SW10
8 Space required to remove the key
9 Valve mounting bore
17 Pressure gauge connection
18 Identical seal rings for ports A and B; identical seal rings for ports X and Y
19 Port B without function (blind hole)
20 Locating pin

Subplate mounting:

Subplates according to data sheet 45062 (separate order)

– Size 10	G 460/01 (G3/8)
	G 461/01 (G1/2)
– Size 20	G 412/01 (G3/4)
	G 413/01 (G1)
– Size 30	G 414/01 (G1 1/4)
	G 415/01 (G1 1/2)

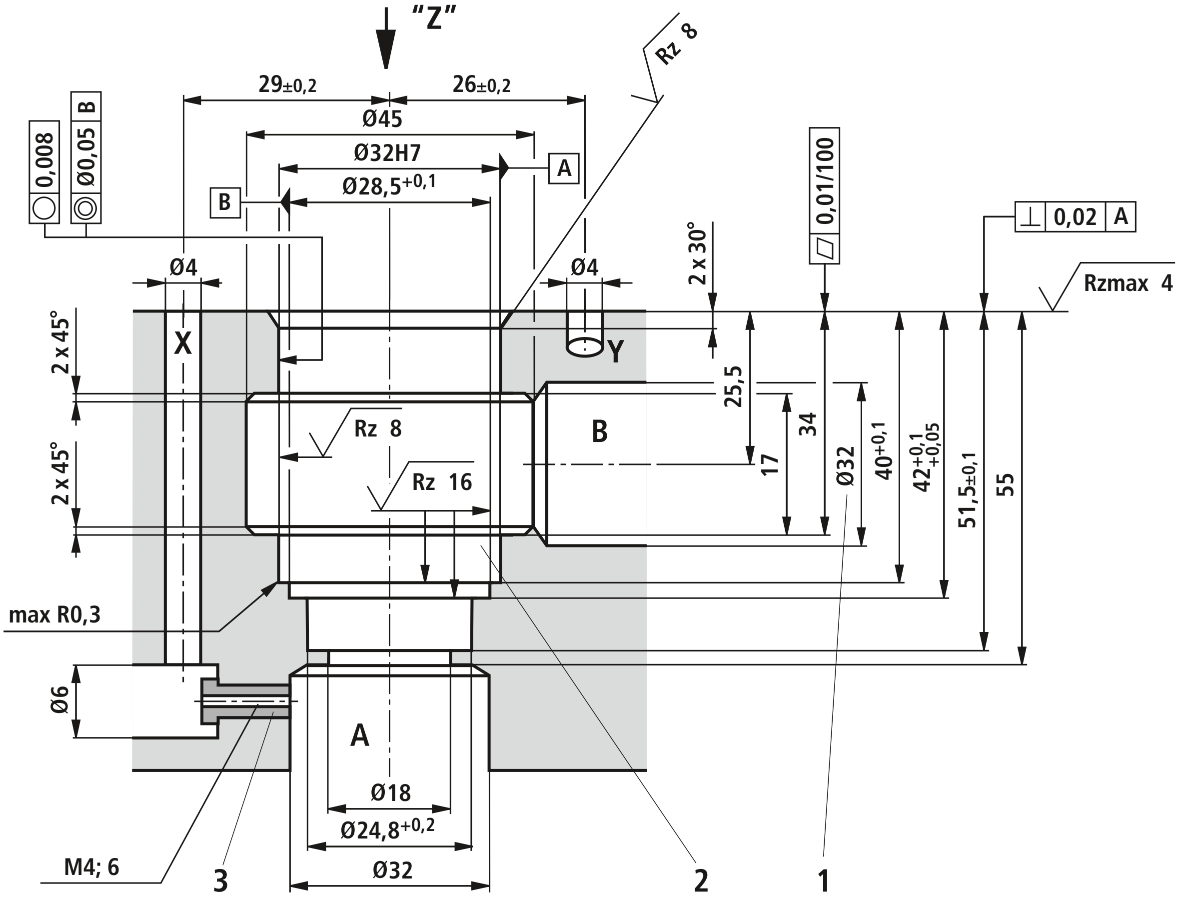
Valve mounting screws (separate order)

– Size 10
4 hexagon socket head cap screws metric ISO 4762 - M10 x 50 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 60 Nm ±10 %,
Material no. **R913000471**

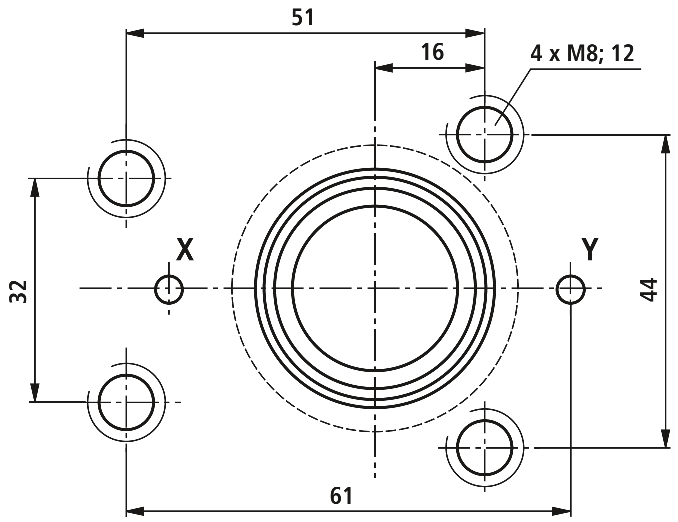
– Size 20
4 ISO 4762 - M10 x 60 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 60 Nm ±10 %,
Material no. **R913000116**

– Size 30
6 ISO 4762 - M10 x 70 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 60 Nm ±10 %,
Material no. **R913000126**

Installation bore (dimensions in mm)



View "Z"



1 ☞ **Note!**
The Ø32 bore can tap a Ø45 bore at any point. However, it must be observed that the connection bores and the valve mounting bores are not damaged!

2 A support ring and seal rings must be inserted into the bore before assembly of the main spool

3 Nozzle, separate order

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Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

Pressure reducing valve, pilot operated

RE 26850/10.05
Replaces: 02.03

Type DR 10 K

Size 10
Component series 3X
Maximum operating pressure 315 bar
Maximum flow 100 l/min

K4278/7

Table of contents

Features

– Cartridge valve
– 4 pressure stages
– 4 adjustment elements, optional:
  • Rotary knob
  • Sleeve with hexagon and protective cap
  • Lockable rotary knob with scale
  • Rotary knob with scale

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

DR	10	K		–3X/		Y	M		*

Pressure reducing valve, pilot operated **= DR**
Size 10 **= 10**
Cartridge valve **= K**

Type of adjustment
Rotary knob **= 4**
Sleeve with hexagon and protective cap **= 5**
Lockable rotary knob with scale **= 6** [1)]
Rotary knob with scale **= 7**

Component series 30 to 39 **= 3X**
(30 to 39: unchanged installation and connection dimensions)

Pressure stage
50 = Secondary pressure up to 50 bar
100 = Secondary pressure up to 100 bar
200 = Secondary pressure up to 200 bar
315 = Secondary pressure up to 315 bar

Y = Pilot oil supply internal, Pilot oil drain external

M = Without check valve

Seal material
No code = NBR seals
V = FKM seals
(other seals on enquiry)
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

[1)] H-key with material no. **R900008158** is included in the scope of supply.

Standard types

Type	Material number
DR 10 K5-3X/50YM	R900422568
DR 10 K5-3X/100YM	R900459508
DR 10 K5-3X/200YM	R900438134
DR 10 K5-3X/315YM	R900430682

Type	Material number
DR 10 K5-3X/50YMV	R900430976
DR 10 K5-3X/100YMV	R900432731
DR 10 K5-3X/200YMV	R900438117
DR 10 K5-3X/315YMV	R900434144

Further standard types and components can be found in the EPS (standard price list).

Function, section, symbol

Pressure control valves of type DR 10 K.. are pilot operated pressure reducing valves for installation into manifolds. They are used to reduce a system pressure. The secondary pressure is adjusted by means of adjustment element (4).

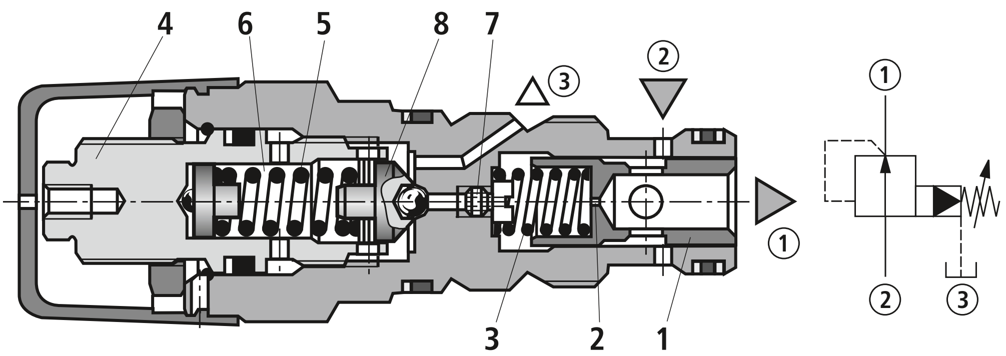
In the initial position, the valves are open. Hydraulic fluid can flow from service port 2 to 1 without any restrictions. The pressure in service port 1 simultaneously acts on main spool (1) and via orifice (2) on the spring-loaded inner side of main spool (1). In addition, it acts on pilot poppet (8) via orifice (7). When the pressure in service port 1 rises above the value set on spring (5), pilot poppet (8) opens. Hydraulic fluid flows from the chamber of spring (3) via orifice (7), pilot poppet (8) and spring chamber (6) to service port 3. Main spool (1) moves to the control position and keeps the pressure value set on spring (5) constant in service port 1 .

The pilot oil is always externally drained from spring chamber (6) via service port 3.

☞ **Note!**

Backpressures (service port 3) add to the set pressure.

① = Service port 1 (A)
② = Service port 2 (B)
③ = Service port 3 (Y)



Type DR 10 K5-3X/.YM

Technical data (for applications outside these parameters, please consult us!)

General

Weight		kg	0.2
Installation orientation			Optional
Ambient temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)

Hydraulic

Maximum operating pressure [1]	– Service port 2 (P)	bar	315
Secondary pressure	– Service port 1 (A)	bar	50; 100; 200; 315
Max. permissible backpressure [1]	– Service port 3 (T)	bar	315
Maximum flow		l/min	100
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524 [2]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [2]; HEPG (polyglycols) [3]; HEES (synthetic esters) [3]; other hydraulic fluids on enquiry
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	10 to 800
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [4]

[1] ⚠ **Caution!** The maximum operating pressure is the sum of the secondary pressure and the backpressure!

[2] Suitable for NBR and FKM seals

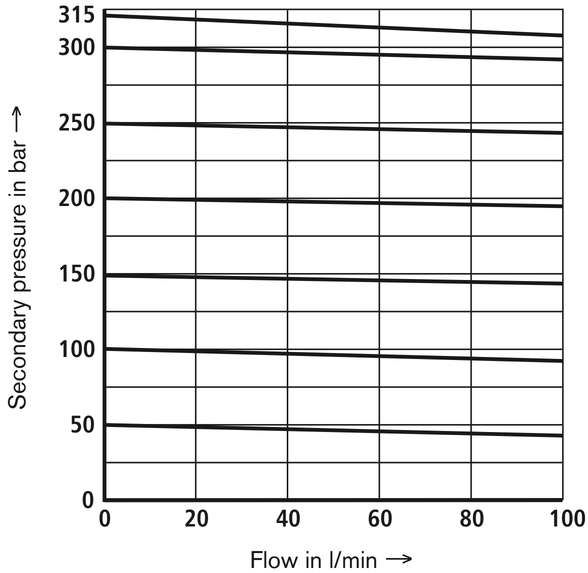
[3] Suitable only for FKM seals

[4] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

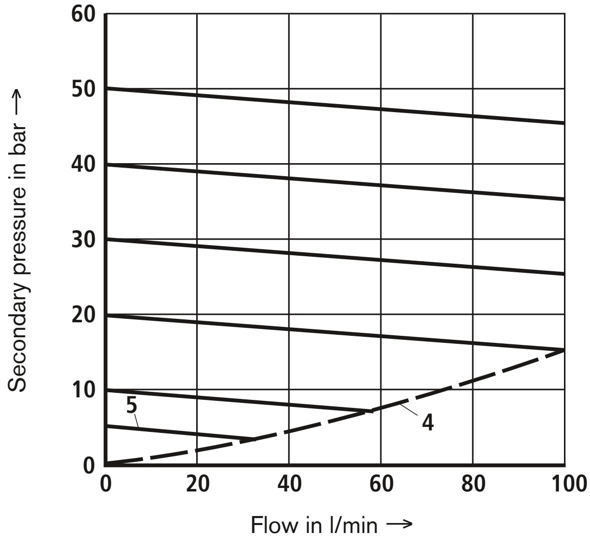
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

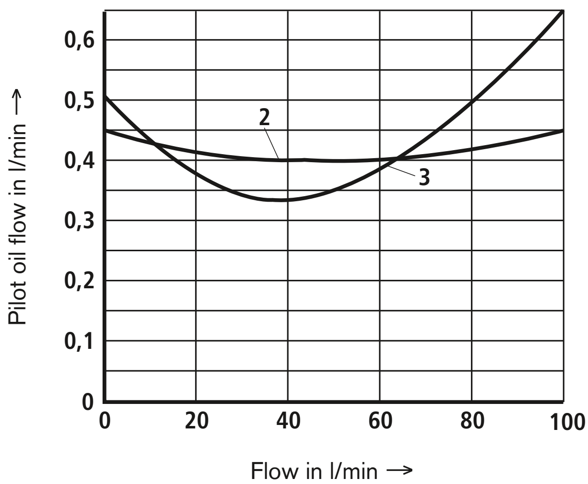
p_A-q_V characteristic curves



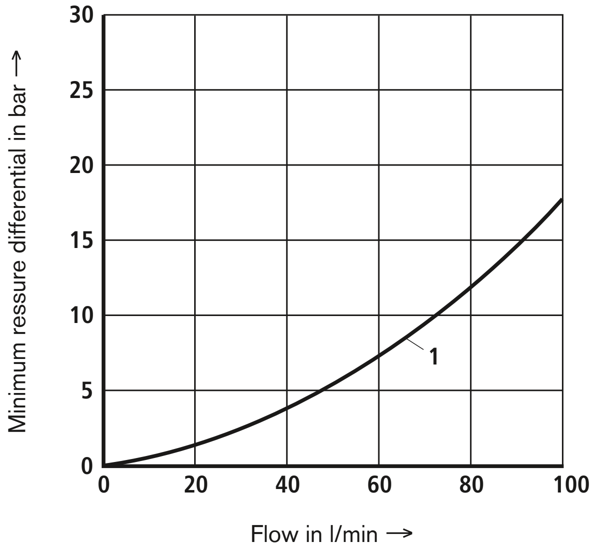
p_A-q_V characteristic curves
(within the range up to 50 bar)



$q_{V\,St}$-q_V characteristic curves at Δp ($p_E - p_A$)

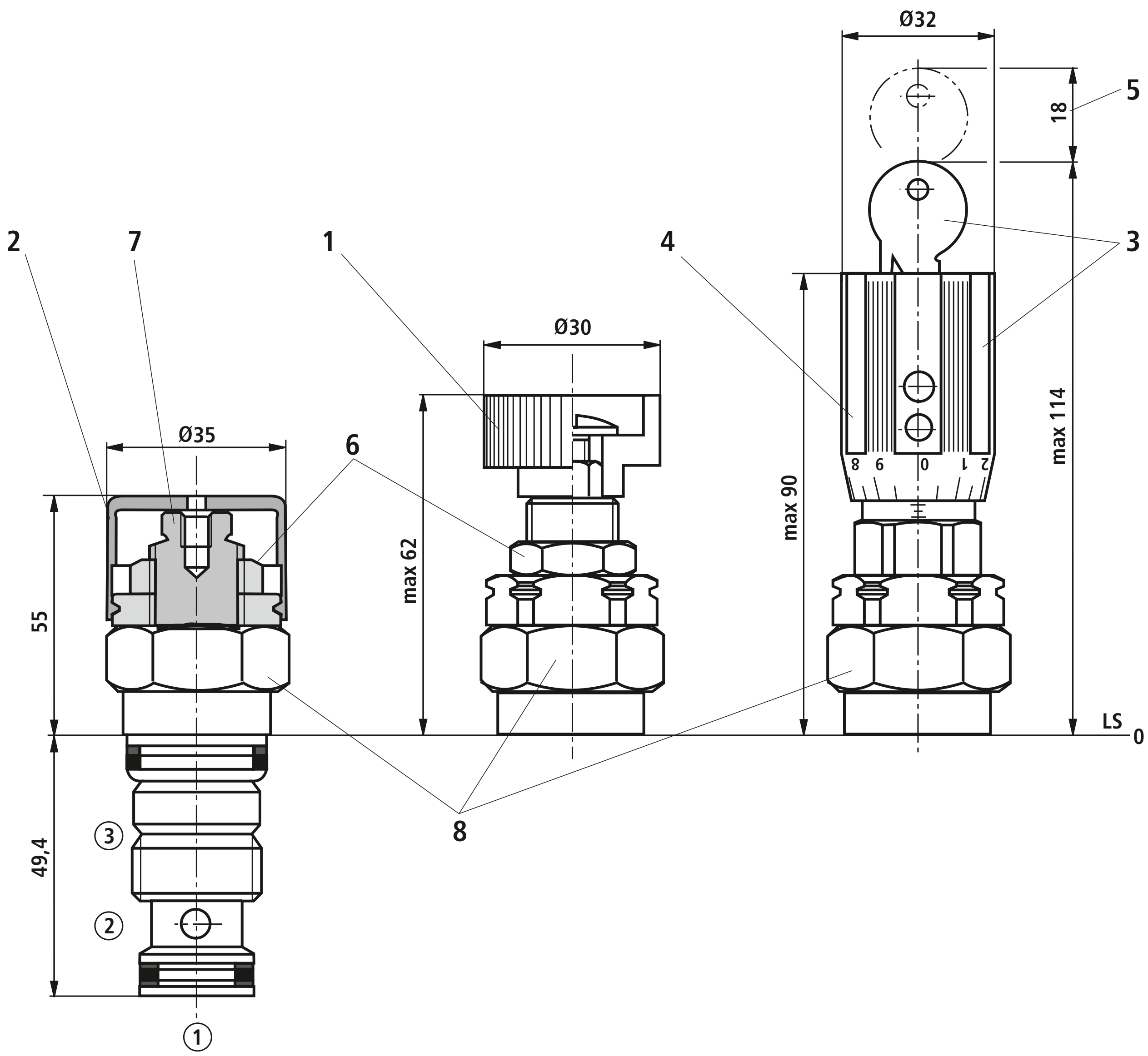


Δp_{min}-q_V characteristic curve



1	2 → 1 (P → A)
2	$\Delta p = 50$ bar
3	$\Delta p = 250$ bar
4	Actuator resistance, depending on system
5	Lowest settable secondary pressure p_A for all pressure stages

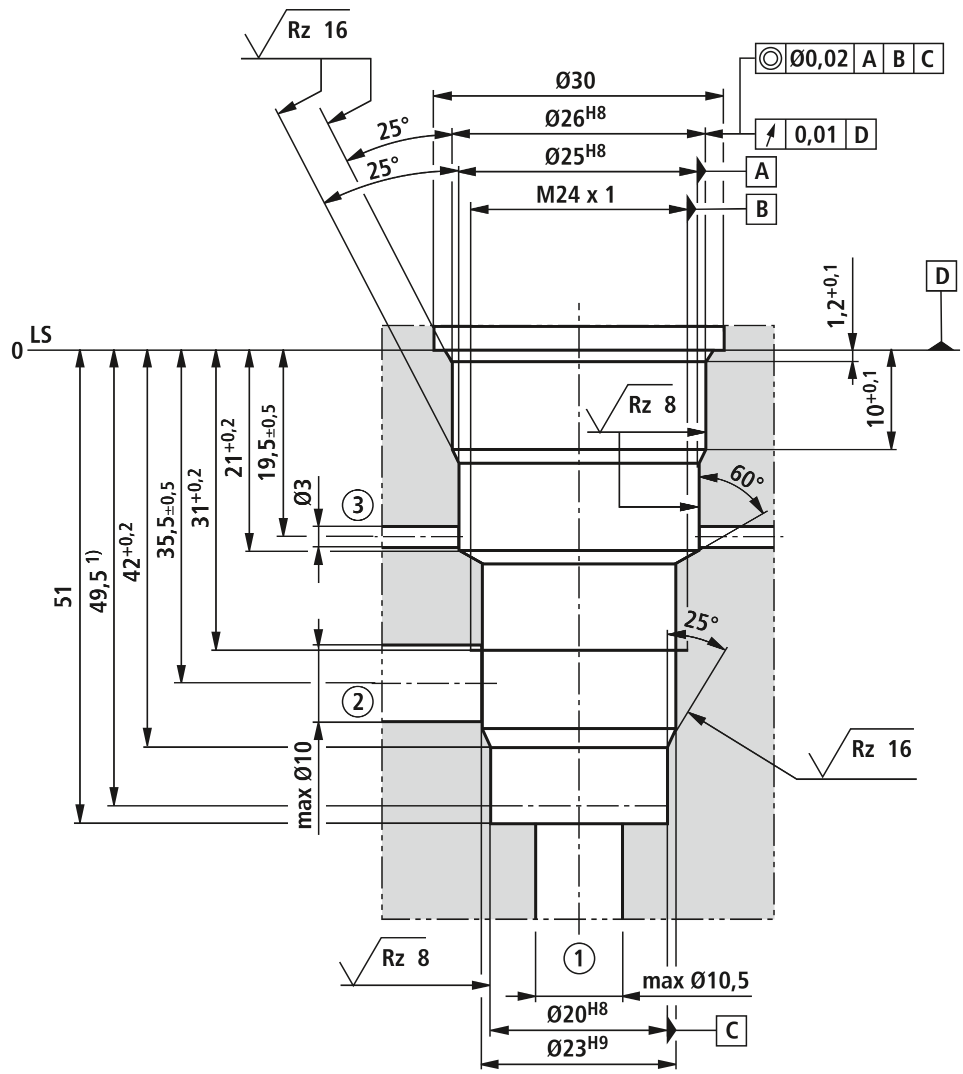
Unit dimensions (nominal dimensions in mm)



1 Type of adjustment "4"
2 Type of adjustment "5"
3 Type of adjustment "6"
4 Type of adjustment "7"
5 Space required to remove key
6 Locknut A/F 24
7 Hexagon A/F 10
8 Hexagon A/F 30, tightening torque for screwing in M_T = 50 Nm

① = Service port 1 (A)
② = Service port 2 (P)
③ = Service port 3 (Y)
LS = Location Shoulder

Mounting cavity; 3 service ports; thread M24 x 1 (nominal dimensions in mm)



(1) = Service port 1 (A)

(2) = Service port 2 (P), can be arranged optionally around the circumference

(3) = Service port 3 (Y), can be arranged optionally around the circumference

LS = Location Shoulder

1) Depth of fit

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Rexroth
Bosch Group

RE 26 572/11.02

Replaces: 12.95

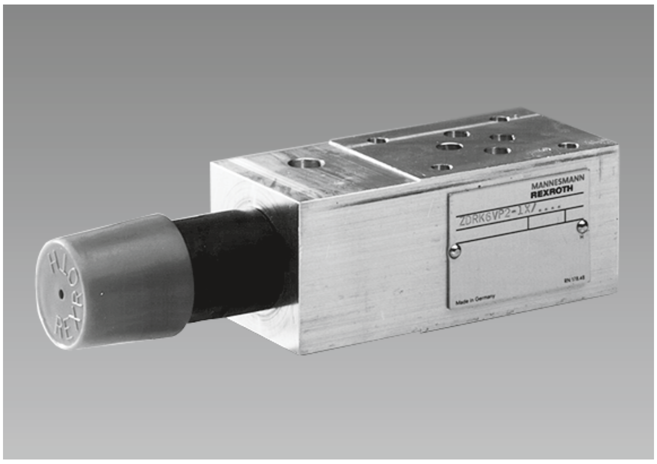
Pressure reducing valve, pilot operated, Type ZDRK 6 VP

Nominal size 6

Series 1X

Maximum operating pressure 210 bar

Maximum flow 40 L/min



H/A 4085/94

Type ZDRK 6 VP5-1X/…

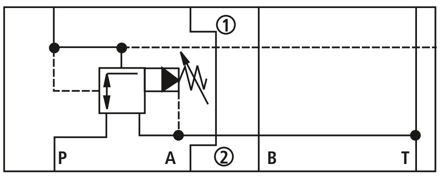
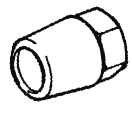
Overview of contents

Contents	Page

Features

– Sandwich plate valve
– Porting pattern to DIN 24 340 Form A, ISO 4401 and CETOP–RP 121 H (locating pin 3 x 8 DIN EN ISO 8752 Material No. R900005694 – separate order)
– 3 pressure stages
– Pressure reduction in port P1
– Pressure gauge connection port
– Adjustment element: Sleeve with hexagon and protective cap

Ordering details, symbol (1 = component side, 2 = subplate side)

Symbol	Pressure relief	Secondary pressure in bar	Setting element	Material No.	Type description
	In channel P1	50		R900564543	ZDRK 6 VP5-1X/50YMV
		100		R900564544	ZDRK 6 VP5-1X/100YMV
		210		R900564545	ZDRK 6 VP5-1X/210YMV

Function, section

Pressure reducing valves type ZDRK 6 VP are 3-way direct operated pressure reducing valves of sandwich plate design with a pressure relief function on the secondary side. It is used to reduce a system pressure.

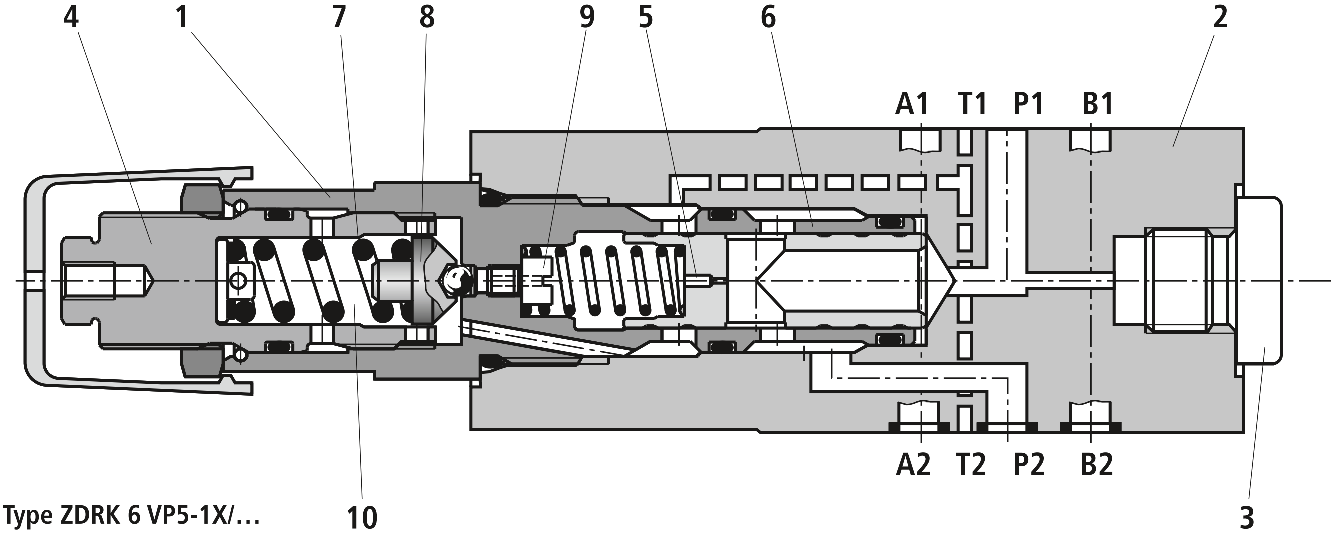
The pressure reducing valve basically consists of the cartridge (1) and housing (2). The secondary pressure is set by the pressure adjustment element (4).

At rest the valves are open; pressure fluid can flow unhindered from port P2 to port P1. The pressure in port P1 is applied simultaneously to the main spool (6) and via the bore (5) to the spring loaded internal area of the main spool (6). At the same time the pressure is also applied onto the pilot poppet (8) via orifice (9). If the pressure in port P1 rises abvove the value set at the compression spring (7) then the pilot poppet (8) opens. Pressure fluid flows from the spring loaded internal area of the main spool (6) via the orifice (9) and the pilot poppet (8) into the spring chamber (10). The main spool (6) moves into the control position and maintains the value in port P1, which was set at the spring (7).

If the pressure in port P1 continues to rise due to external forces at the actuator, then the main spool (6) moves still further against the compression spring (7).

Thereby port P1 is connected to the tank (port T) via the control land at the main spool and housing. Enough pressure fluid flows into the tank to ensure that the pressure does not continue to rise. The leakage oil return from the spring chamber (10) is via port T.

A pressure gauge port (3) makes it possible to monitor the secondary pressure at the valve.



Type ZDRK 6 VP5-1X/…

Technical data (for applications outside these parameters, please consult us!)

General

Installation		Optional
Ambient temperature range	°C	– 20 to + 80
Weight	kg	Approx. 1.8

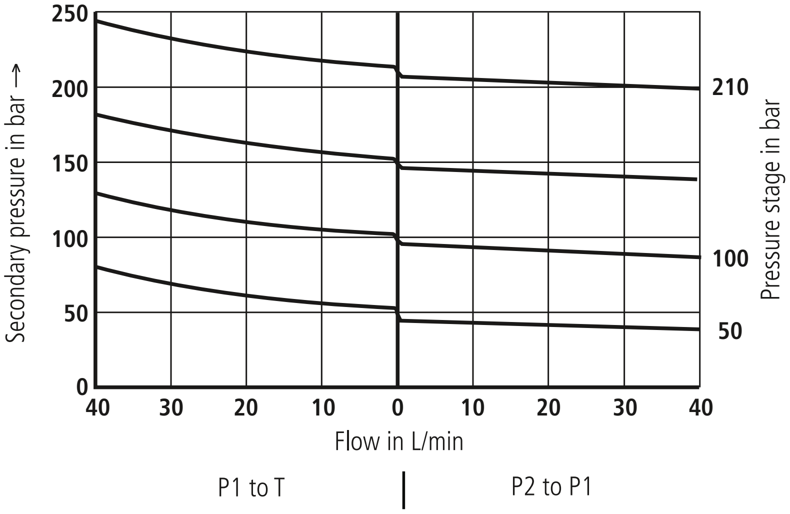
Hydraulic

Pressure fluid		Mineral oil (HL, HLP) to DIN 51 524; Fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90 221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic ester); Other pressure fluids on request
Pressure fluid temperature range	°C	– 20 … + 80
Viscosity range	mm^2/s	10 to 800
Cleanliness class to ISO code		Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 20/18/15 [1)]
Maximum operating pressure (input)	bar	210
Maximum secondary pressure (output)	bar	50; 100; 210
Maximum back pressure (port T)	bar	160
Maximum flow	L/min	40

1) The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.
For the selection of filters see catalogue sheets RE 50 070, RE 50 076 and RE 50 081.

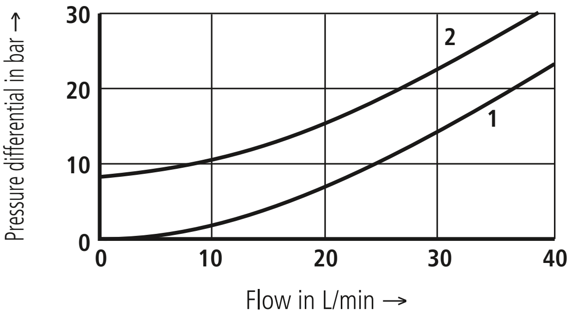
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

p_A–q_V characteristic curves



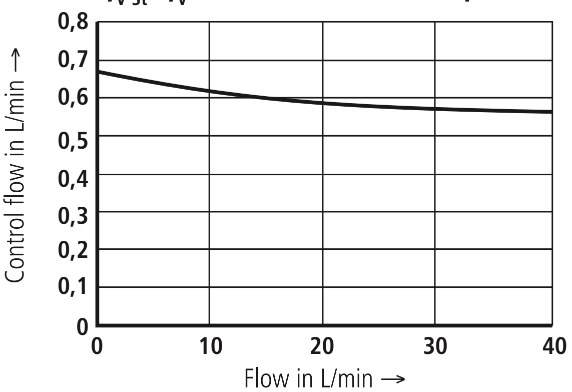
⚠ Attention!
The curve characteristics remain, with a lower set pressure, the same in relation to the pressure rating.

Δp–q_V characteristic curves



1 P2 to P1
2 P1 to T (3. way)

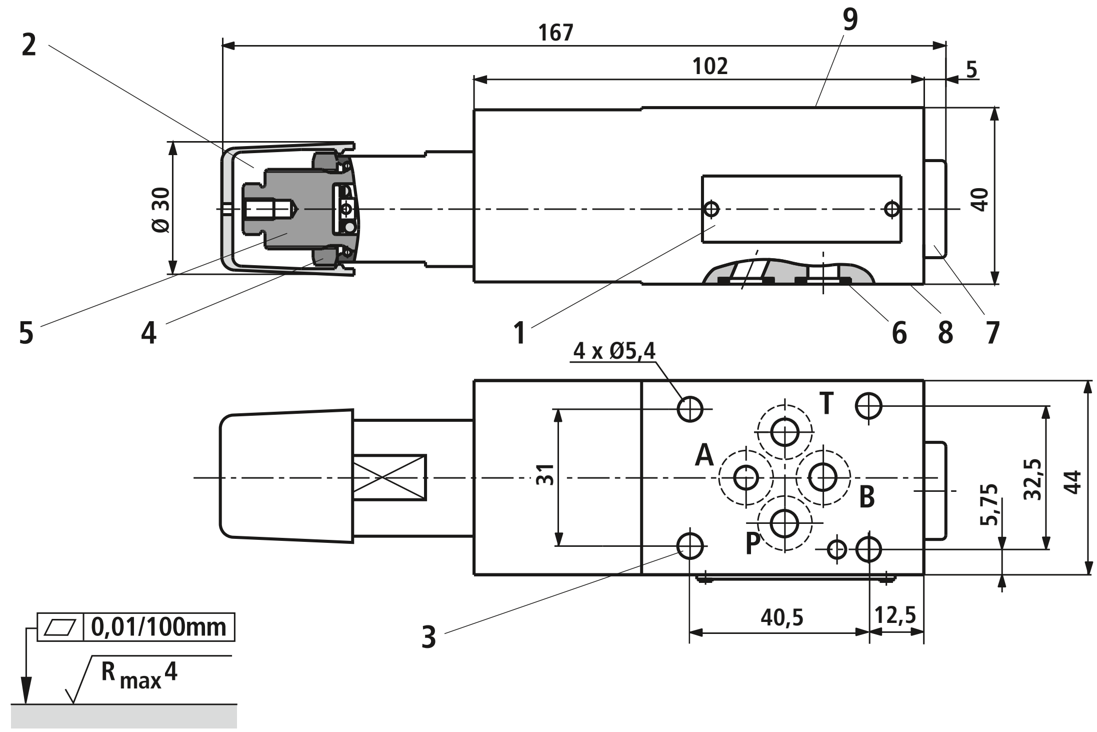
$q_{V\,St}$–q_V characteristic curve at Δp = 50 to 200 bar



The characteristic curves for the pressure relief function are valid for output pressure = zero over the complete flow range!

Unit dimensions

(Dimensions in mm)



Required surface finish of the mating piece

1 Name plate
2 Adjustment element (sleeve with hexagon and protective cap)
3 Valve fixing holes
4 Lock nut 24A/F
5 Hexagon 10A/F
6 Identical seal rings for ports A2, B2, P2, T2
7 Pressure gauge port: G 1/4; 12 deep, internal hexagon 6A/F
Pipe thread (G..) to ISO 228/1
8 Porting pattern to ISO 4401 and CETOP–RP 121 H, **with** locating pin hole, Ø3 x 5 mm deep for a Ø3 x 8 mm DIN EN ISO 8752 locating pin, Material No. R900005694 (separate order)
9 Porting pattern to ISO 4401 and CETOP–RP 121 H, **with** locating pin hole, Ø4 x 4 mm deep

Valve fixing screws
M5 DIN 912-10.9,
Tightening torque M_A= 8.9 Nm,
must be ordered separately

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Industrial Hydraulics
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Industrial Hydraulics | Electric Drives and Controls | Linear Motion and Assembly Technologies | Pneumatics | Service Automation | Mobile Hydraulics

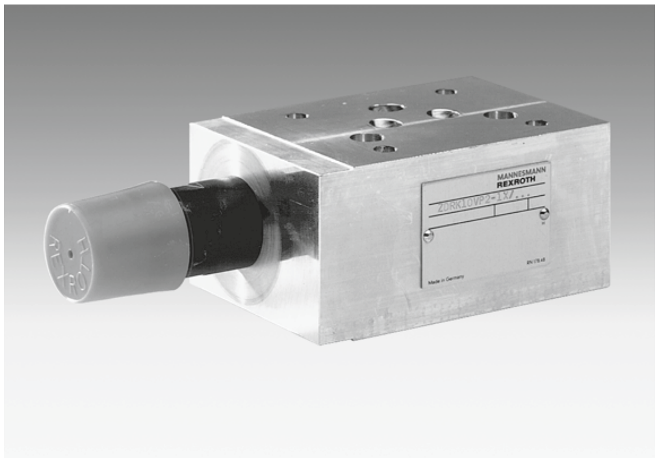
Rexroth
Bosch Group

RE 26 864/05.02

Replaces: 12.95

Pressure reducing valve, pilot operated, Type ZDRK 10 V

Nominal size 10
Series 1X
Maximum operating pressure 210 bar
Maximum flow 80 L/min


H/A 4085/94

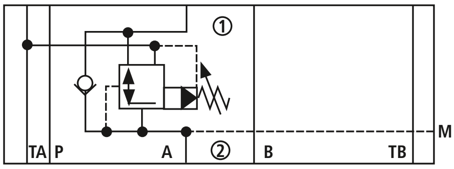
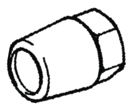
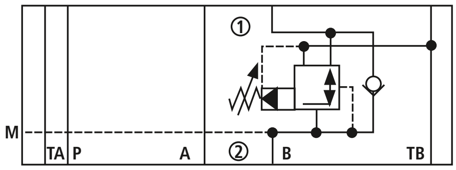
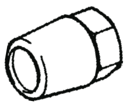
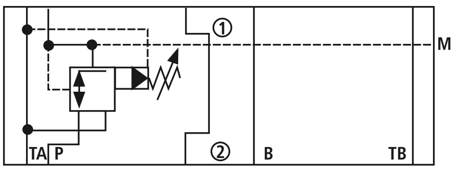
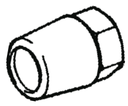
Type ZDRK 10 VP5-1X/…

Overview of contents

Features

- Sandwich plate valve
- Porting pattern to DIN 24 340 form A, ISO 4401 and CETOP–RP 121 H
- 3 pressure stages
- Pressure reduction in ports A2, B2 or P1
- Check valve with versions „VA" and „VB"
- Pressure gauge connection port
- Adjustment element: Sleeve with hexagon and protective cap

Ordering details, symbols (① = component side, ② = subplate side)

Symbol	Pressure reduction	Secondary pressure in bar	Setting elements	Material No.	Type description
	In port A2	50		00564546	ZDRK 10 VA5-1X/50YV
		100		00595461	ZDRK 10 VA5-1X/100YV
		210		00564547	ZDRK 10 VA5-1X/210YV
	In port B2	50		00564548	ZDRK 10 VB5-1X/50YV
		100		00564549	ZDRK 10 VB5-1X/100YV
		210		00564550	ZDRK 10 VB5-1X/210YV
	In port P1	50		00564551	ZDRK 10 VP5-1X/50YMV
		100		00564552	ZDRK 10 VP5-1X/100YMV
		210		00564553	ZDRK 10 VP5-1X/210YMV

Preferred types (readily available)

Type	Material No.
ZDRK 10 VP5-1X/100YMV	**00564552**
ZDRK 10 VP5-1X/210YMK	**00564553**

Preferred types and standard components are highlighted in the RPS (Standard Price list).

Function, section

ZDRK 10 V pressure valves are pilot operated 3-way pressure reducing valves of sandwich plate design with a pressure relief function for the secondary circuit. They are used to reduce the pressure in a hydraulic system.

The pressure reducing valves mainly consist of cartridge (1) and housing (2). The setting of the secondary pressure is via the adjustment element (4).

Version „VP“

At rest the valves are open; pressure fluid can flow unrestricted from port P2 to port P1. The pressure in port P1 is applied simultaneously to the main spool (6) and via the bore (5) to the spring loaded internal area of the main spool (6). It is also applied to the pilot poppet (8) via the orifice (9). If the pressure in port P1 rises above the value set at the compression spring (7) the pilot poppet (8) opens. Pressure fluid flows from the spring loaded internal area of the main spool (6) via the orifice (9) and the pilot poppet (8) into the spring chamber (10). The main spool (6) moves into the control position and keeps the value in channel P1 set at the compression spring (7) constant.

If the pressure in port P1 continues to rise due to external forces at the actuator, the main spool (6) moves still further against the compression spring (7).

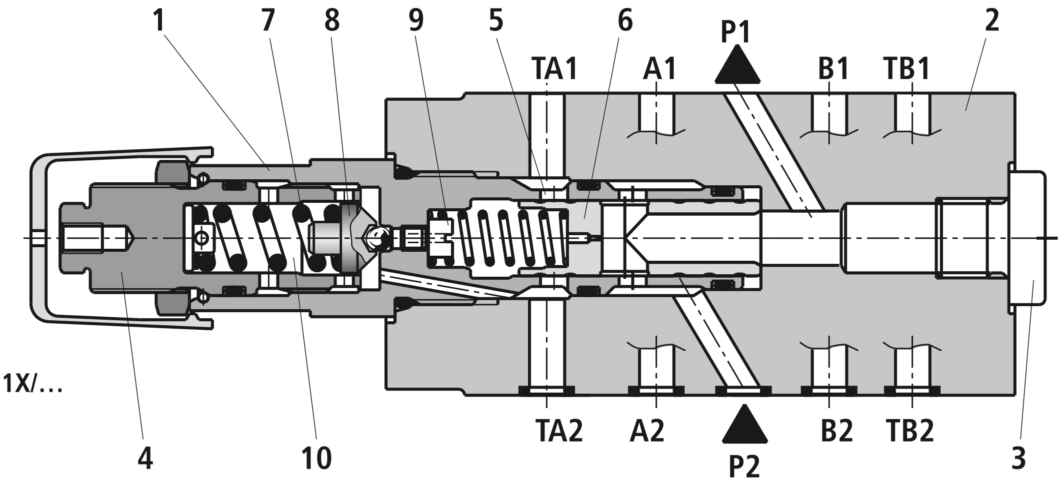
Thus port P1 is connected to the tank (port TA) via the control edge at the main spool and housing. Enough pressure fluid flows into the tank to ensure that the pressure does not continue to rise. The pilot oil return from the spring chamber (10) is via port TA.

A pressure gauge connection port (3) enables the control of the secondary pressure at the valve.

Versions „VA“ and „VB“

In versions VA and VB the pressure reduction is in port A2 / B2.

For free return flow from port A2 to A1 / B2 to B1 a check valve is installed. (Not possible for version VP.).



Type ZDRK 10 VP5-1X/…

Technical data (for applications outside these parameters, please consult us!)

General

Installation			Optional
Ambient temperature range		°C	– 20 to + 80
Weight	Versions VA and VB	kg	Approx. 1.5
	Version VP	kg	Approx. 1.1

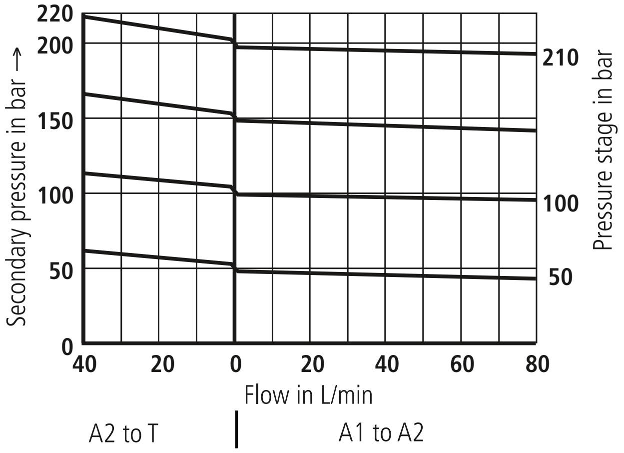
Hydraulic

Maximmum inlet pressure (inlet)	bar	210
Maximum secondary pressure (ports A2, B2 or P1)	bar	50; 100; 210
Maximum back pressure (ports TA, TB)	bar	160
Maximum flow	L/min	80
Pressure fluid		Mineral oil (HL, HLP) to DIN 51 524; Fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90 221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic ester); other pressure fluids on request
Pressure fluid temperature range	°C	–20 to +80
Viscosity range	mm^2/s	10 to 800
Degree of contamination		Maximum permissible degree of contamination of the pressure fluid is to NAS 1638 class 9. We therefore recommend a filter with a minimum retention rate of $\beta_{10} \geq 75$

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

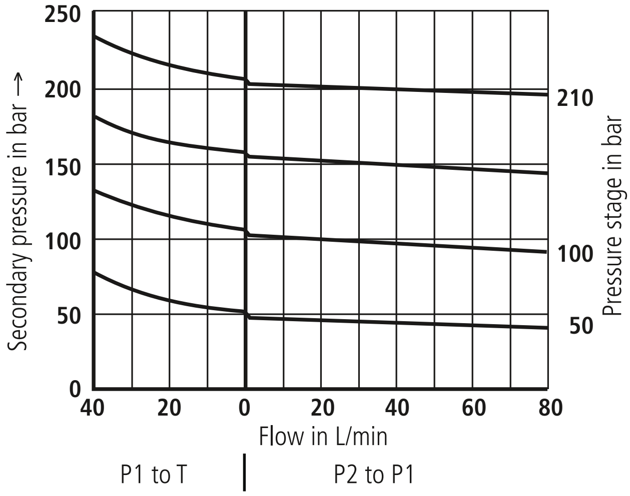
Versions VA and VB

p_A–q_V–characteristic curves



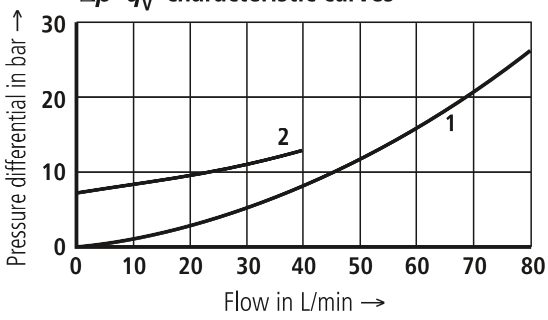
Version VP

p_A–q_V–characteristic curves

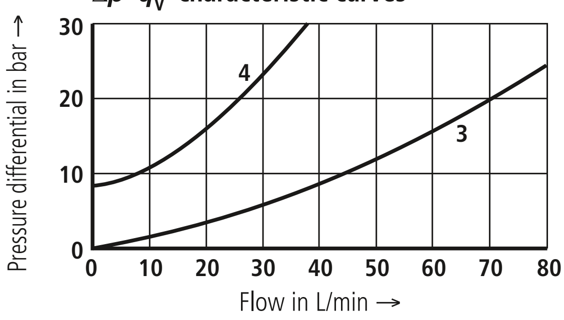


⚠ **Attention!** The curve characteristics are maintained at lower set pressure in relation to the pressure stage.

Δp–q_V–characteristic curves

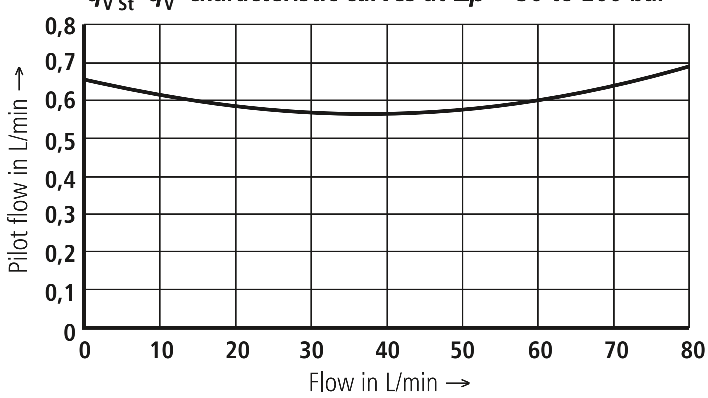


Δp–q_V–characteristic curves



1 A1 to A2
2 A2 to T (3. way)
3 P2 to P1
4 P1 to T (3.way)

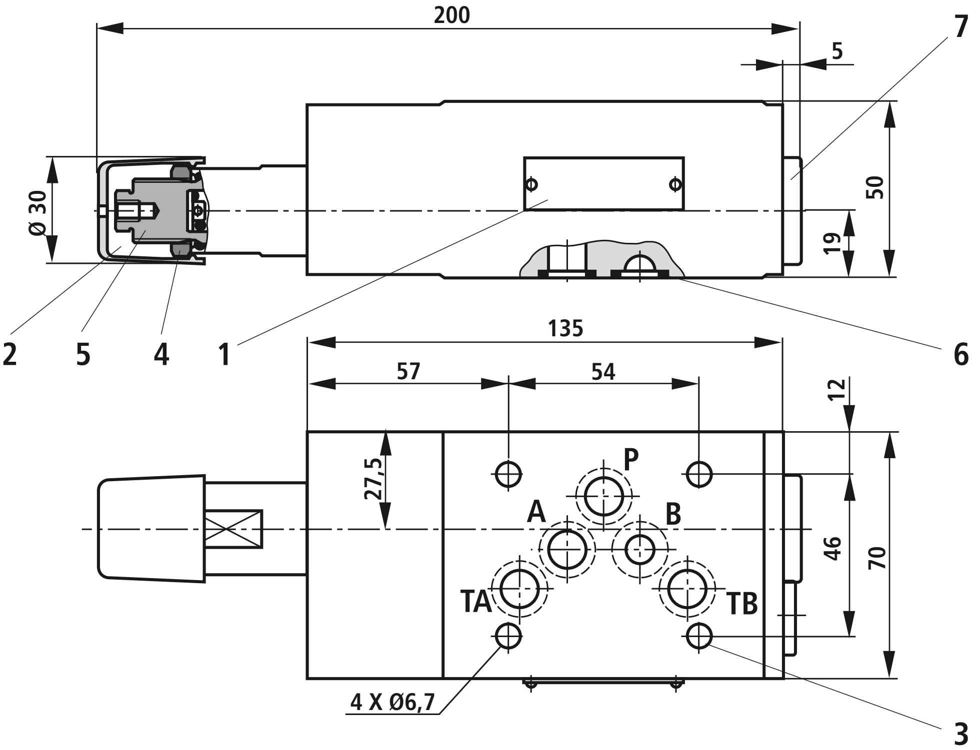
$q_{V\,St}$–q_V–characteristic curves at Δp = 50 to 200 bar



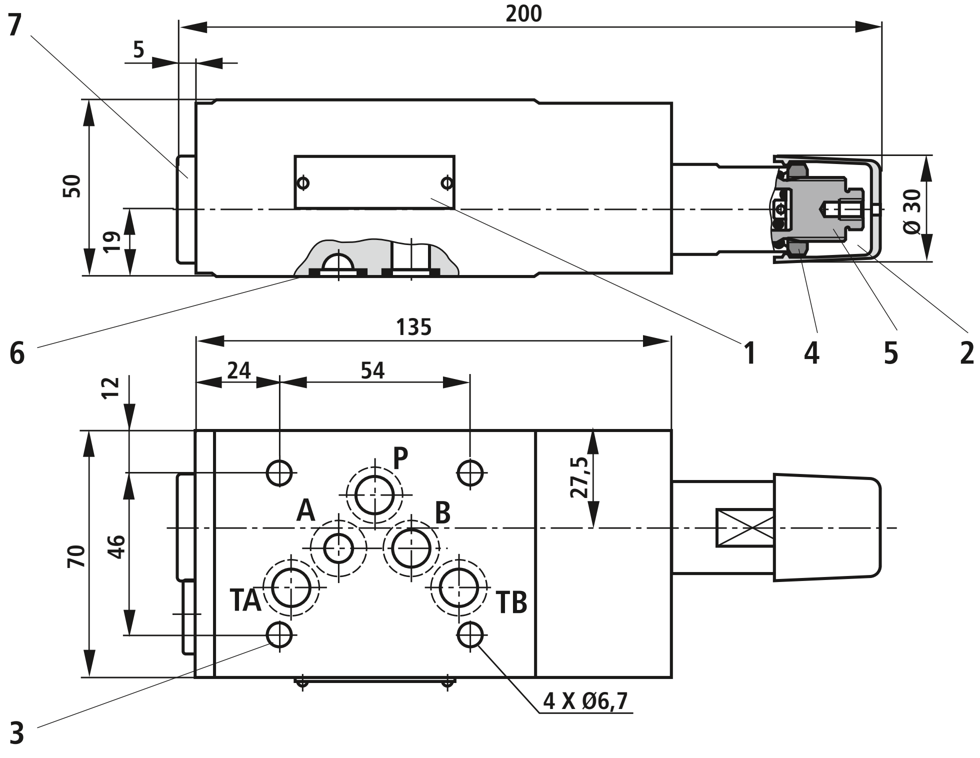
The characteristic curves for the pressure reducing function are valid for an output pressure = zero in the entire flow range!

Unit dimensions: versions VA and VB (dimensions in mm)

Type ZDRK 10 VA



Type ZDRK 10 VB



1 Name plate

2 Adjustment element (sleeve with hexagon and protective cap)

3 Valve fixing holes

4 Locknut 24A/F

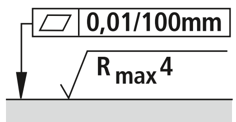
5 Hexagon 10A/F

6 Same seal rings for ports A2, B2, P2, TA2, TB2

7 Pressure gauge connection G 1/4; 12 deep; internal hexagon 6A/F

Valve fixing screws

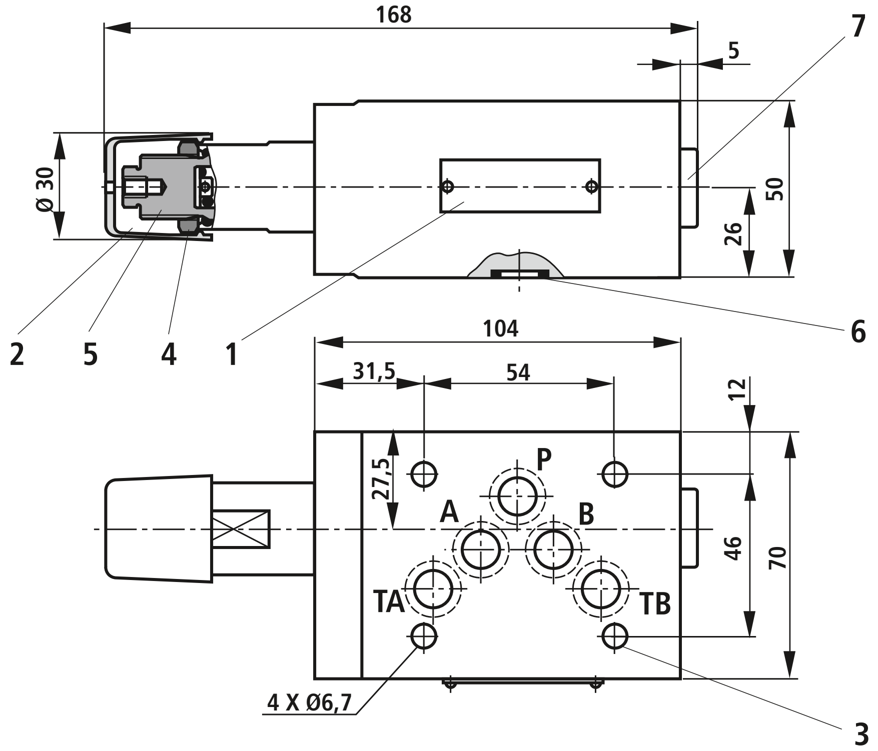
M6 DIN 912-10.9,
Tightening torque M_A = 15.5 Nm,
must be ordered separately



Required surface finish of the mating piece

Unit dimensions: version VP (dimensions in mm)

Type ZDRK 10 VP



1 Name plate

2 Adjustment element (sleeve with hexagon and protective cap)

3 Valve fixing holes

4 Locknut 24A/F

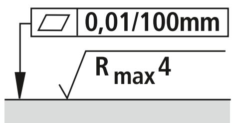
5 Hexagon 10A/F

6 Same seal rings for ports A2, B2, P2, TA2, TB2

7 Pressure gauge connection G 1/4; 12 deep; internal hexagon 6A/F

Valve fixing screws

M6 DIN 912-10.9,
Tightening torque M_A = 15.5 Nm,
must be ordered separately



Required surface finish of the mating piece

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E-mail: info@boschrexroth.co.uk

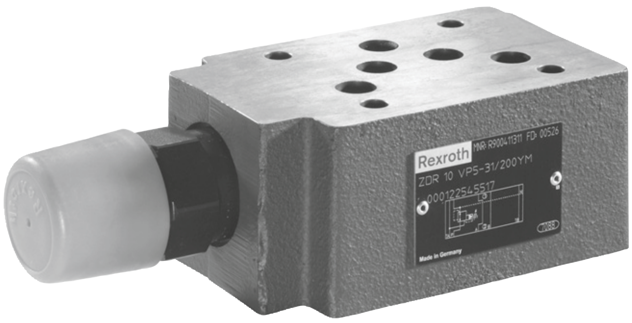
The Drive & Control Company

Rexroth
Bosch Group

Pressure reducing valve, pilot operated

Type ZDR

RE 26861
Version: 2013-02
Replaces: 02.03



H7752

- Size 10
- Component series 3X
- Maximum operating pressure 315 bar
- Maximum flow 100 l/min

Features

- Sandwich plate valve
- Porting pattern according to ISO 4401-05-04-0-05
- 4 pressure ratings
- 4 adjustment types, optionally:
  – Rotary knob
  – Bushing with hexagon and protective cap
  – Lockable rotary knob with scale
  – Rotary knob with scale
- Check valve, optional (version "A" and "B")
- Pressure gauge connection

Contents

Ordering code

01	02	03	04	05	06		07		08	09	10	11	12	13
Z	DR	10	V			–	3X	/		Y				*

01	Sandwich plate valve	**Z**
02	Pressure reducing valve	**DR**
03	Size 10	**10**
04	Pilot operated	**V**

Pressure reduction

05	In channel A2	**A**
	In channel B2	**B**
	In channel P1	**P**

Adjustment type

06	Rotary knob	**4**
	Bushing with hexagon and protective cap	**5**
	Lockable rotary knob with scale	**6** [1)]
	Rotary knob with scale	**7**

07	Component series 30 ... 39 (30 ... 39: Unchanged installation and connection dimensions)	**3X**

Secondary pressure

08	Up to 50 bar	**50**
	Up to 100 bar	**100**
	Up to 200 bar	**200**
	Up to 315 bar	**315**

09	Pilot oil supply internal, pilot oil return external	**Y**

10	**With** check valve (only version "A" and "B")	**no code**
	Without check valve	**M**

Seal material

11	NBR seals	**no code**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

Connection thread

12	Pipe thread according to ISO 228/1	**no code**
	SAE thread	**12**

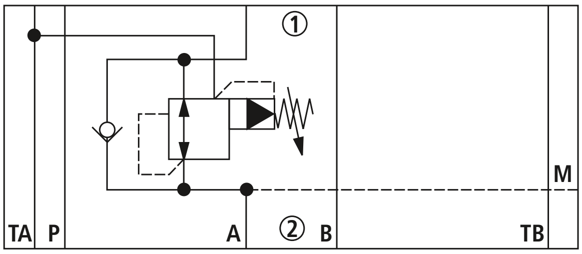
13	Further details in the plain text	

1) H-key with the material no. **R900008158** is included in the scope of delivery.

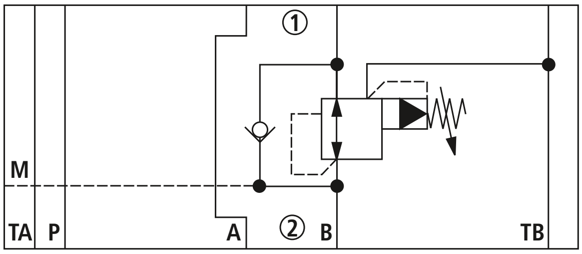
☞ **Notice!** Preferred types and standard units are contained in the EPS (standard price list).

Symbols (① = component side, ② = plate side)

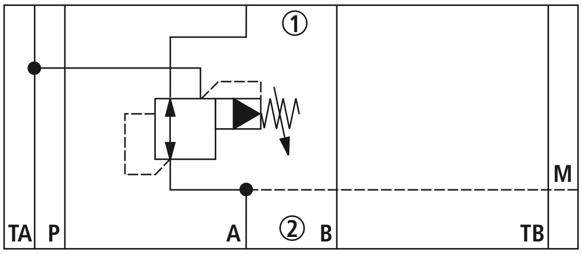
Pressure reduction in channel A② ("A")



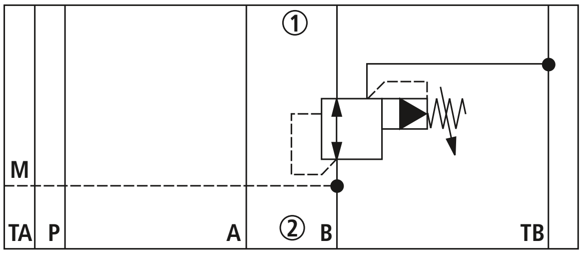
Pressure reduction in channel B② ("B")



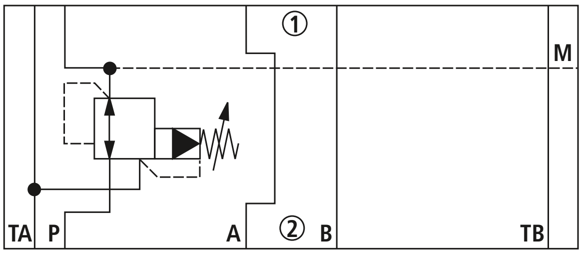
Pressure reduction in channel A② ("A...M")



Pressure reduction in channel B② ("B...M")



Pressure reduction in channel P① ("P...M")



☞ **Notice!**

Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.

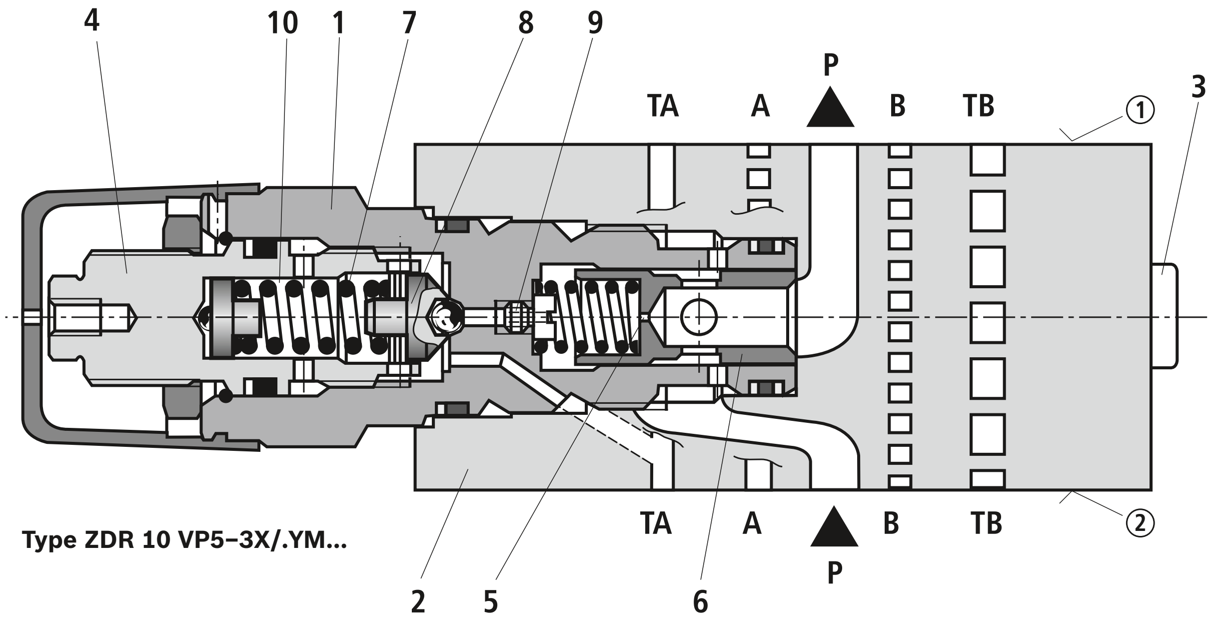
Function, section

Pressure valves of type ZDR 10 V are pilot operated pressure reducing valves in sandwich plate design. They are used for reducing a system pressure.
The pressure valves basically consist of pilot control valve (1) and housing (2). The secondary pressure is set via the adjustment type (4).

Pressure reduction in channel P① ("P")
In the initial position the valves are open. Hydraulic fluid can flow from channel P② to channel P① without restrictions. The pressure in channel P① acts simultaneously at the main spool (6), via the bore (5) at the spring-loaded inside of the main spool (6) and via the nozzle (9) on the pilot poppet (8).

If the pressure in channel P② exceeds the value set at the compression spring (7), the pilot poppet (8) opens. Hydraulic fluid flows from the spring-loaded inside of the main spool (6) via the nozzle (9) and the pilot poppet (8) into the spring chamber (10). The main spool (6) assumes its control position and keeps the value in channel P① set at the compression spring (7) constant. The pilot oil return from the spring chamber (10) is effected via port TA.

Pressure reduction in channel A② and B② ("A" and "B")
For free flow back from channel A② to A① / B② to B①, a check valve can be installed as option (not possible with version "P").
A pressure gauge connection (3) allows for the control of the secondary pressure.



Type ZDR 10 VP5–3X/.YM...

① = component side
② = plate side

Technical data
(for applications outside these parameters, please consult us!)

general			
Weight	– Version "A" and "P"	kg	Approx. 2.3
	– Version "B"	kg	Approx. 2.7
Ambient and storage temperature range		°C	–30 ... +80 (NBR seals) –20 ... +80 (FKM seals)

hydraulic			
Maximum set pressure		bar	50; 100; 200; 315
Maximum inlet pressure	– Port A①, B①, P②	bar	315
Maximum secondary pressure	– Port A②, B②, P①	bar	315
Maximum counter pressure	– Port TA, TB	bar	160
Maximum flow		l/min	100
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C	–30 ... +80 (NBR seals) –20 ... +80 (FKM seals)
Viscosity range		mm^2/s	10 ... 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]

Hydraulic fluid		**Classification**	**Suitable seal materials**	**Standards**
Mineral oils		HL, HLP	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

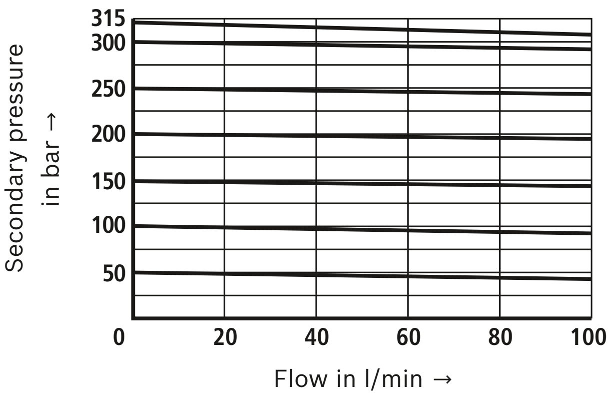
Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!

- **Flame-resistant – containing water**:
  - Maximum pressure differential per control edge 210 bar, otherwise, increased cavitation
  - Life cycle as compared to operation with mineral oil HL, HLP 30 to 100 %
  - Maximum hydraulic fluid temperature 60 °C

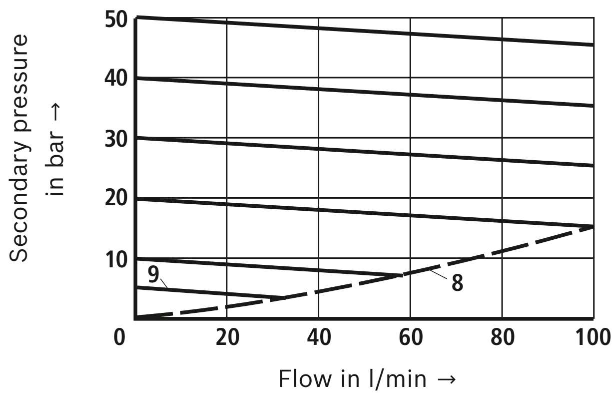
1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

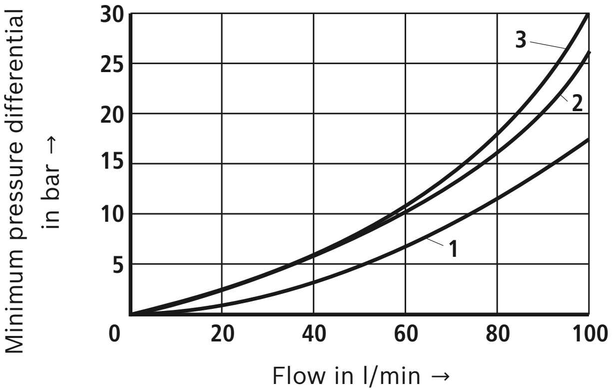
p_A-q_V characteristic curves



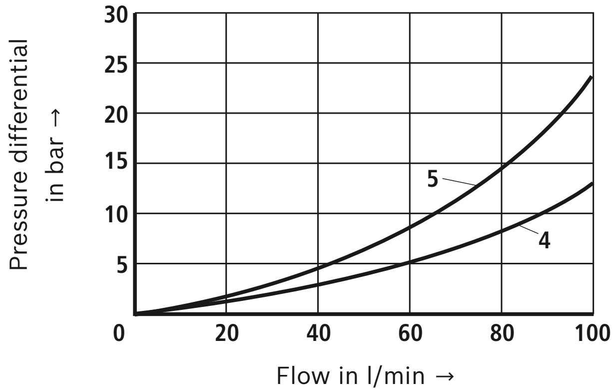
p_A-q_V characteristic curves (up to 50 bar)



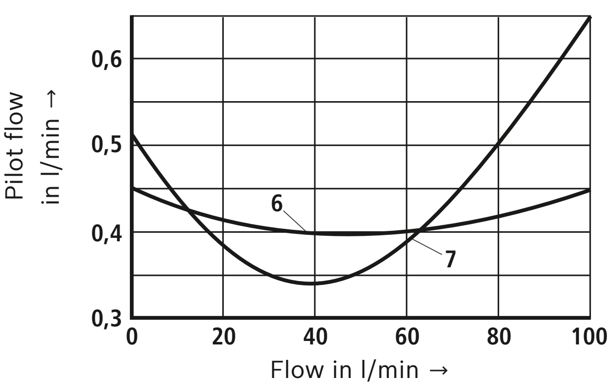
Δp_{min}-q_V characteristic curves



Δp-q_V characteristic curves

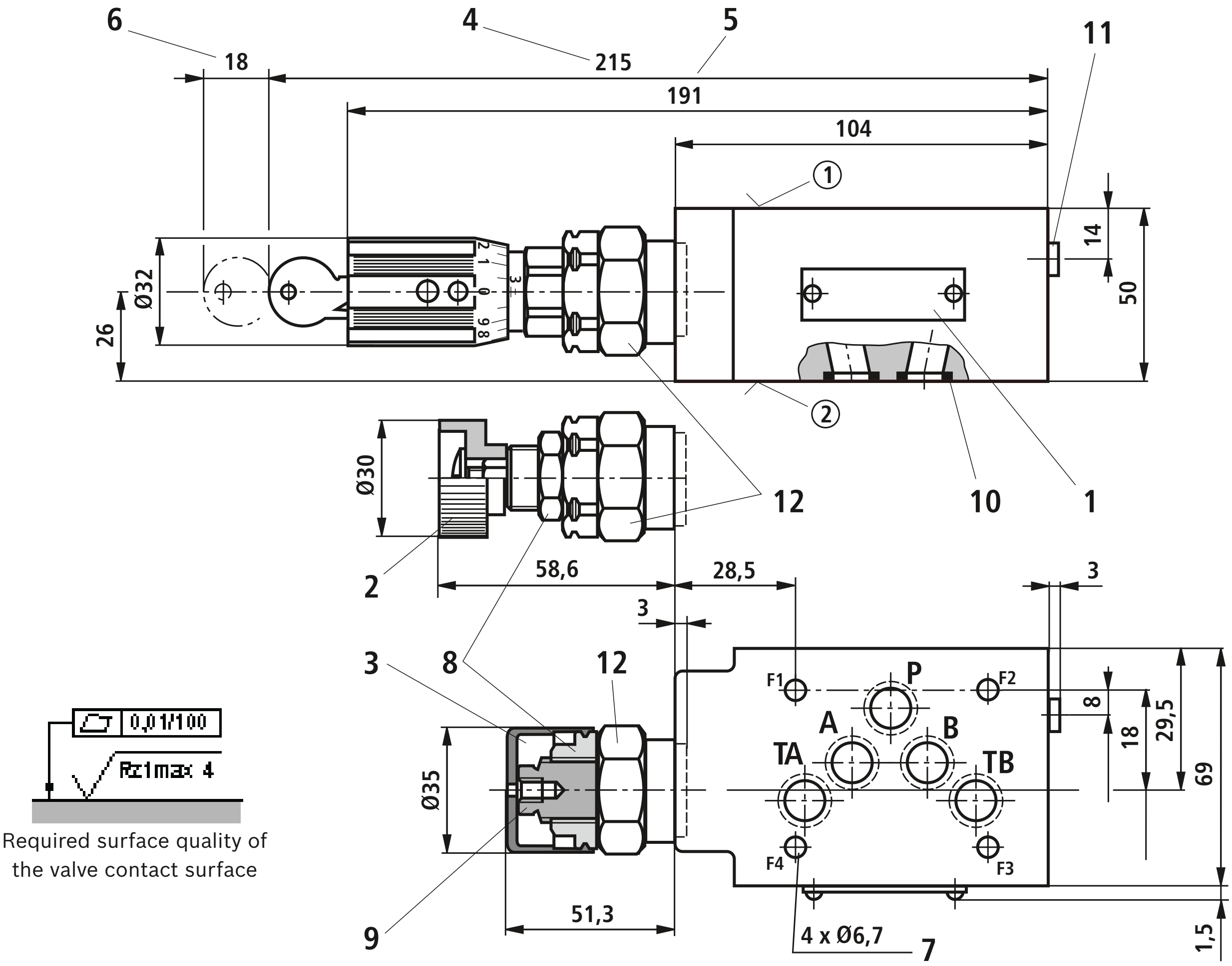


$q_{V\ St}$-q_V characteristic curves with **Δp (p_E–p_A)**



1 P② to P① (version "P")
2 A① to A② (version "A")
3 B① to B② (version "B")
4 A② to A① (version "A")
5 B② to B① (version "B")
6 Δp = 50 bar
7 Δp = 250 bar
8 Actuator resistance system-dependent
9 Lowest adjustable secondary pressure p_A for all pressure ratings

Dimensions: Version "A" and "P"
(dimensions in mm)



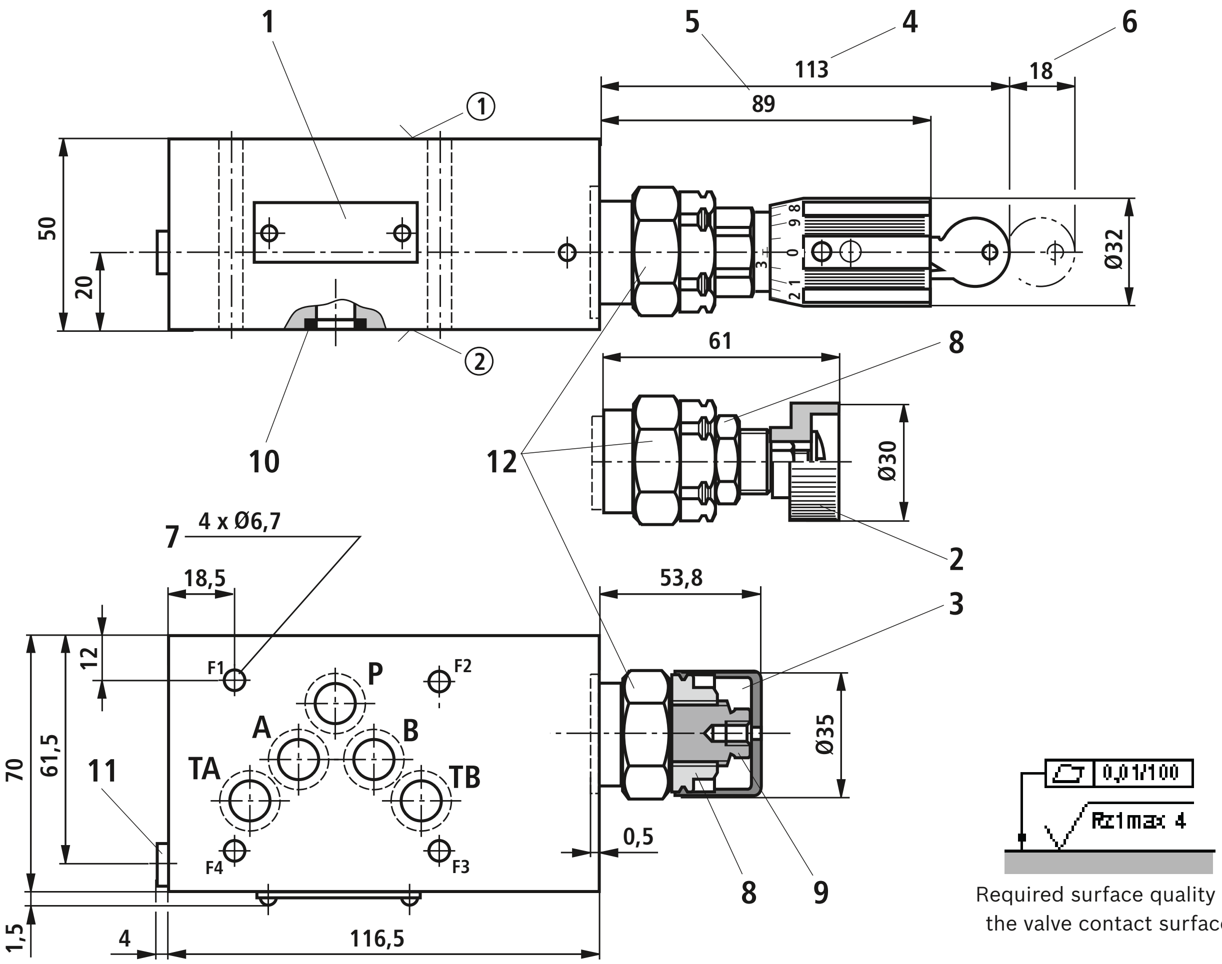
① Plate side – porting pattern according to ISO 4401-05-04-0-05
② Component side – porting pattern according to ISO 4401-05-04-0-05

1 Name plate
2 Adjustment type "4"
3 Adjustment type "5"
4 Adjustment type "6"
5 Adjustment type "7"
6 Dimensions required to remove the key
7 Valve mounting bores
8 Lock nut SW24
9 Hexagon SW10
10 Identical seal rings for ports A②, B②, P②, TA②, TB② (plate side)
11 Pressure gauge connection G1/8; 8.5 deep; internal hexagon SW5
12 Hexagon SW30, tightening torque M_A = 50 Nm

Valve mounting screws (separate order)
4 hexagon socket head cap screws ISO 4762 - M6 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_A = 12 Nm ± 10 %

☞ **Notice!**
- Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.
- Bored for port X and Y (e. g. for pilot operated directional valve size 10), version **SO30** is applicable!
- The device dimensions are nominal dimensions which are subject to tolerances.

Dimensions: Version "B"
(dimensions in mm)



Required surface quality of the valve contact surface

① Plate side – porting pattern according to ISO 4401-05-04-0-05
② Component side – porting pattern according to ISO 4401-05-04-0-05

1 Name plate
2 Adjustment type "4"
3 Adjustment type "5"
4 Adjustment type "6"
5 Adjustment type "7"
6 Dimensions required to remove the key
7 Valve mounting bores
8 Lock nut SW24
9 Hexagon SW10
10 Identical seal rings for ports A②, B②, P②, TA②, TB② (plate side)
11 Pressure gauge connection G1/8; 8.5 deep; internal hexagon SW5
12 Hexagon SW30, tightening torque $\boldsymbol{M}_A$ = 50 Nm

Valve mounting screws (separate order)
4 hexagon socket head cap screws ISO 4762 - M6 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque $\boldsymbol{M}_A$ = 12 Nm ± 10 %

Notice!
- Deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.
- Bored for port X and Y (e. g. for pilot operated directional valve size 10), version **SO30** is applicable!
- The device dimensions are nominal dimensions which are subject to tolerances.

More information

▶ Subplates	Data sheet 45054
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ General product information on hydraulic products	Data sheet 07008
▶ Installation, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Selection of the filters	www.boschrexroth.com/filter

Notes

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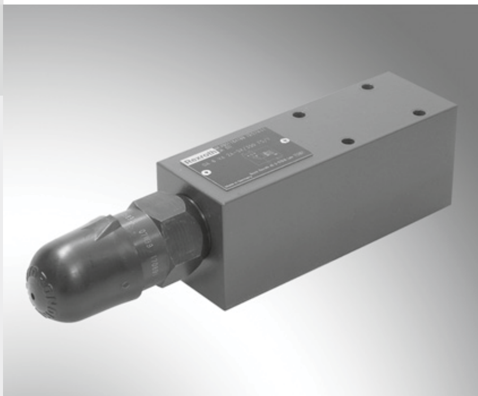
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Pressure cut-off valve, pilot operated

Type DA 6 V

Nominal size 6
Unit series 5X
Maximum operating pressure 350 bar
Maximum flow 40 l/min



tb0246

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Features:

- For subplate mounting
- Position of the ports according to ISO 5781-03-04-0-00 (deviating from the standard also without fixing bore)
- Subplates according to data sheet RD 45052 (order separately)
- As screw-in cartridge valve see data sheet RD 18107-01
- Adjustment type: Sleeve with hexagon and protective cap
- 4 pressure stages
- Switching pressure differential adjustable (10% to 50% of the nominal value)

Information on available spare parts:
www.boschrexroth.com/spc

Order details

DA	6	V		2		5X	/	FS			*

Pressure cut-off valve
Nominal size 6 **= 6**
Pilot controlled **= V**

Type of connection
Pump connection in channel P (standard) **= P**
Pump connection in channel A **= A**

Adjustment type
Sleeve with hexagon and protective cap **= 2**

Adjustment on A side **= A**
Adjustment on B side **= B**

Unit series 50 to 59 **= 5X**
(50 to 59: unaltered mounting and connection dimensions)

Pressure range
50 = 25 to 50 bar
100 = 50 to 100 bar
200 = 100 to 200 bar
350 = 150 to 350 bar

FS = Freely adjustable switching pressure differential

Sealing material
M = NBR seals
V = FKM seals
(other seals at request)
Attention!
Observe sealing capability of the hydraulic fluid used!

without designation = **without** fixing bore
/60 [1] **=** **with** fixing bore
/62 = **with** fixing bore and locking pin ISO 8752-3x8-St

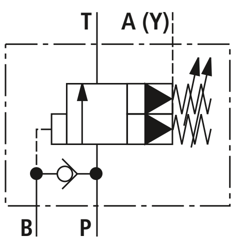
Further information in the clear text

[1] Locking pin ISO 8752-3x8-St,
Material no. **R900005694** (order separately)

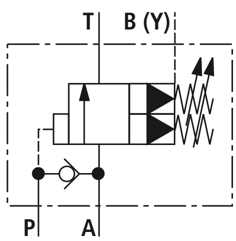
Preference types and standard units are shown in the EPS (standard price list).

Symbols

Model “VP”



Model “VA”



Function, Cross-sections

The type DA 6 V pressure valve is a pilot-operated pressure cut-off valve with continuously adjustable switching pressure differential. It basically consists of pilot control stage and main stage of the screw-in cartridge valve (1), check valve (2) and housing (3).

Via connection B, the pump volume flow in P is led into the system accumulator. If the pressure at the consumer in connection B exceeds the set upper switching pressure, the pilot control valve opens and control liquid can flow off via connection A (Y). The check valve (2) closes the connection of connection B to connection P and the pump volume flow is switched to zero-pressure circulation (from P to T).

Type DA 6 VP

– Switch-over of the pump volume flow from P to B (pump → consumer) in P to T (pump → tank)

The pump delivers via the check valve (2) into the hydro system (P to B). Via control line (4) and bore (5), the pressure present in channel B acts on the pilot control of the screw-in cartridge valve (1). At the same time, the pressure in channel P is - via the bore (7) - existent on the spring-loaded side of the main piston (8). As soon as the upper switch-off pressure set via the adjusting spindle (6) in the screw-in cartridge valve (1) has been reached in the hydro system (channel B), the pilot control of the screw-in cartridge valve (1) opens the connection of the spring-loaded side of the main piston (8) to the control line (9) and thus externally via connection A (Y) into the tank. Due to the bore (7), a pressure drop at the main piston (8) results. The main piston (8) raises from the seat and opens the connection P to T. The check valve (2) closes the connection B to P and the pilot control of the screw-in cartridge valve (1) is kept in an open position by the consumer load pressure in B.

– Switch-over of the pump volume flow from P to B (pump → tank) in P to B (pump → consumer).

If, compared with the switch-off pressure, the consumer pressure in B has been reduced according to the lower pressure value set at the adjusting spindle (10), the pilot control of the screw-in cartridge valve (1) moves back into its initial position. Thus, pressure builds up on the spring-loaded side of the main piston (8). This pressure closes the connection P to T by means of the spring (11) and the pump delivers via the check valve (2) into the hydro system from P to B again.

Type DA 6 VA

In this valve type, the pump connection is not designed in P but in A. The valve leads the pump volume flow from A to P or from A to T. The leakage connection is in B (Y).

The switching processes comply with the "VP" design (This valve model serves the simpler linkage with multi-station manifold plates).

☞ **Notes!**

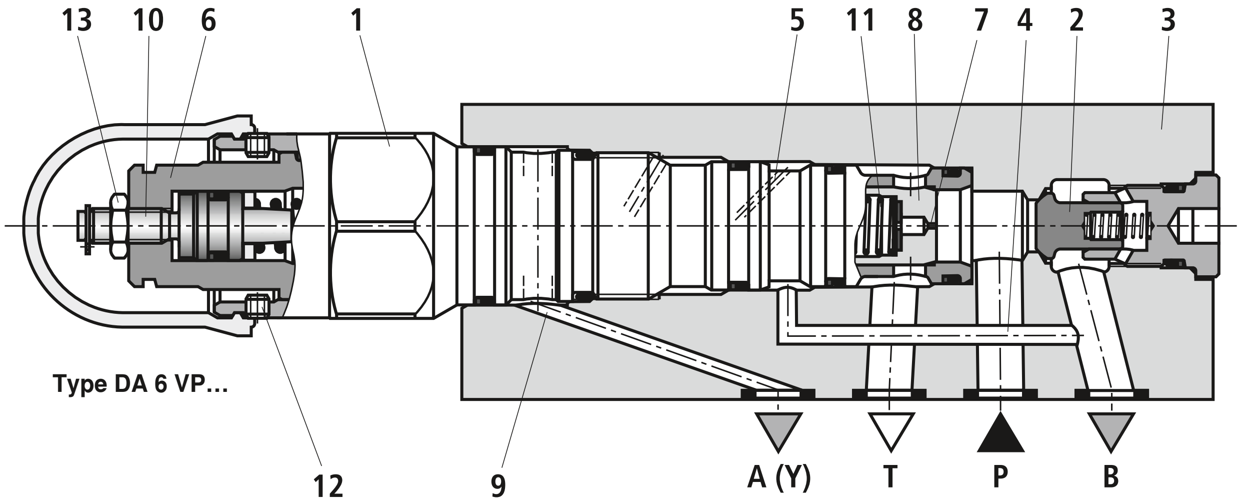
– **Only indirect pressure limitation function:**
  There is no direct pressure limitation function of the pump pressure (to the tank), but only an indirect one via the check valve (2) and the control line (4) in the consumer channel.

– **Setting the switching pressure differential:**
  In the factory, the valves are with nominal pressure set to a switching pressure differential of approx. 10% to 12%. Settings of up to 50% of the nominal pressure are possible.

  Upon delivery, the adjusting spindle (6) is set to the minimum settable, upper switching pressure, i.e. the adjusting spindle (6) is unscrewed to stop. By screwing the adjusting spindle (6) in, the upper switching pressure can be increased.

  By screwing the adjusting spindle (10) in, the lower switching pressure is increased and the switching pressure differential is thus reduced. By screwing the adjusting spindle (10) out, the lower switching pressure is reduced and the switching pressure differential is thus increased.

  The pressure setting is secured using clamping screws (12) and lock nuts (13).



Type DA 6 VP…

Specifications (Please inquire in case the intended use of unit is outside the given values!)

general

Mass		kg	2,2
Installation position			Any
Ambient temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)

hydraulic

Maximum operating pressure (Type “DA 6 V**P**”)	– Connection A (Y) (leakage pilot control)	bar	100 [1]
	– Connection B (consumer)	bar	350 (after switch-over P to T)
	– Connection P (pump)	bar	350
	– Connection T (tank)	bar	200
Maximum operating pressure (Type “DA 6 V**A**”)	– Connection A (pump)	bar	350
	– Connection B (Y) (leakage pilot control)	bar	100 [1]
	– Connection P (consumer)	bar	350 (after switch-over A to T)
	– Connection T (tank)	bar	200
Adjustment pressure range [2]	– Pressure stage 50	bar	25 to 50
	– Pressure stage 100	bar	50 to 100
	– Pressure stage 200	bar	100 to 200
	– Pressure stage 350	bar	150 to 350
Maximum volume flow		l/min	40
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524 [3]; Hydraulic fluids that are fast biodegradable according to VDMA 24568 (also see RE 90221); HETG (rape seed oil) [3]; HEPG (poly glycoles) [4]; HEES (synthetic esters) [4]; other hydraulic fluids at request
Hydraulic liquid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range	– Maximum	mm^2/s	10 to 800
	– Recommended	mm^2/s	20 to 60
Maximum permitted degree of pollution of the hydraulic fluid purity level according to ISO 4406 (c)			Class 20/18/15 [5]
Switching pressure differential [2]		%	Adjustable from 10% to 50% of the nominal value

[1] **Attention!**
The existing pressure adds up to the set pressure! Within the adjustment range, the switching pressure differential remains unchanged!

[2] When setting the switching pressure differential, the following instructions have to be complied with:

– The upper and lower switching point must lie within the adjustment range of the pressure stage (e.g. with a pressure stage of 100 bar: upper switching point 100 bar, lower switching point 50 bar ≙ 50% switching pressure differential)

– The lowest switching pressure differential possible largely depends on the system (set pressure, pump and consumer volume flow, accumulator size and initial pressure, line length and resistances, etc.). Here, the valve offers the possibility to optimally adjust the switching pressure differential to the system. For the reasons mentioned above, the smallest settable switching pressure differential of the valve can, however, not always be realized at the system.

– General: Keep the pipe connection between DA valve and hydro accumulator as short and the resistance as low as possible and discharge the control oil (Y) in a depressurized form, if possible.

– Information regarding the factory setting of the switching pressure differential see page 5.

[3] Suitable for NBR and FKM seals

[4] Only suitable for FKM seals

[5] The purity levels stated for the components need to be maintained in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.
For selecting the filters, see Data Sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

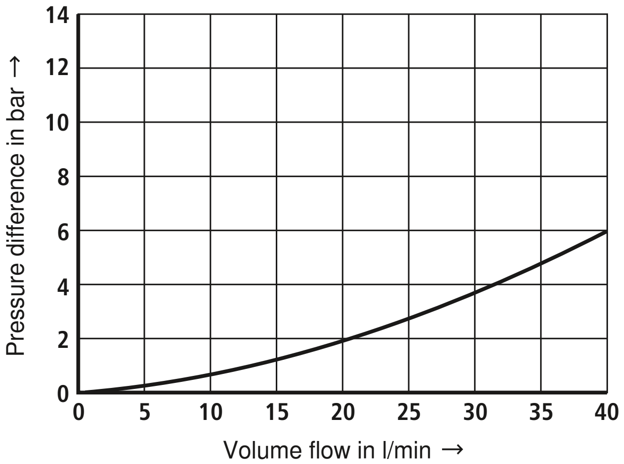
Note: Factory setting of the switching pressure differential

- In the factory, the valves are with nominal pressure set to a switching pressure differential of approx. 10% to 12% and they are delivered in a depressurized condition (adjusting spindle (6) unscrewed to stop, see page 3).
- The setting is made with nominal pressure, a pump volume flow of approx. 10 l/min and a consumer volume flow of approx. 2 l/min.
- With different system conditions (particularly with high pump and consumer volume flow), higher switching pressures could result. Here, the valve offers the possibility to optimally adjust the switching pressure differential to the system.

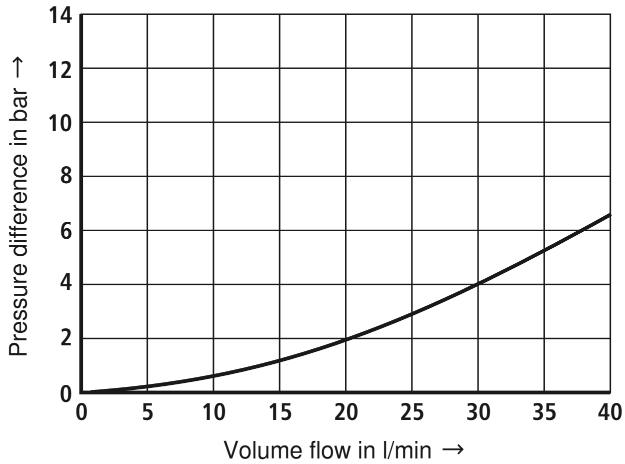
Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 °C ±5 °C)

Δp-q_V characteristic curves, circulation pressure – model "VP" (P to T)

Model "VP2A"

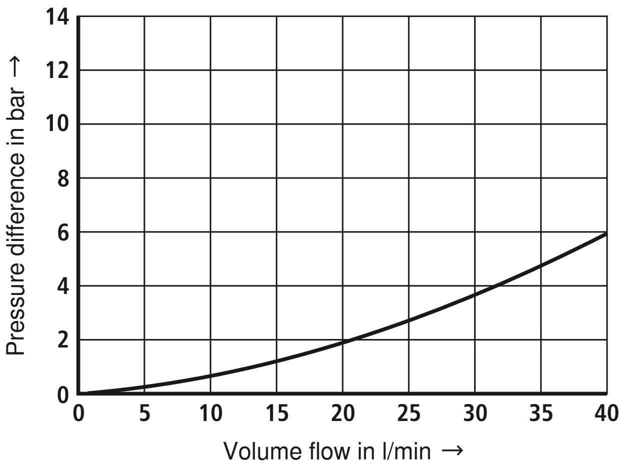


Model "VP2B"

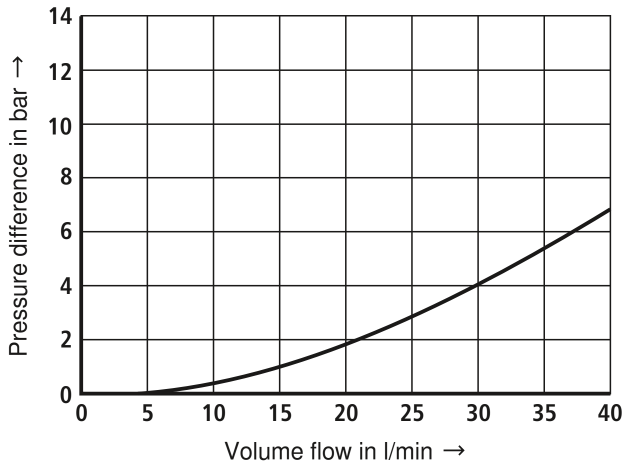


Δp-q_V characteristic curves, circulation pressure – model "VA" (A to T)

Model "VA2A"



Model "VA2B"



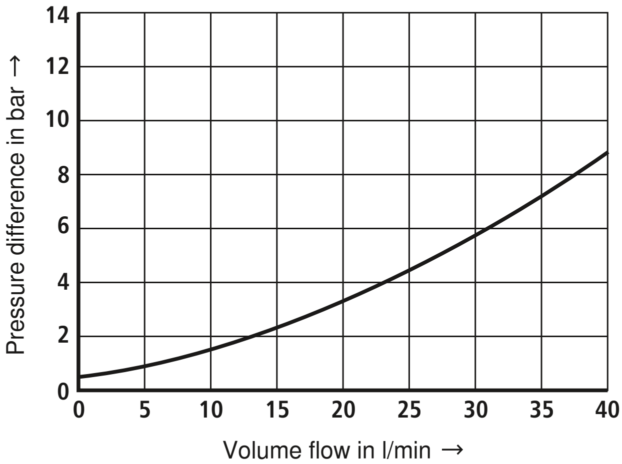
☞ **Note!**

- The characteristic curves have been measured with external, depressurized control oil return (circulation pressure).
- The characteristic curves are valid for output pressure = 0 bar over the whole volume flow range.

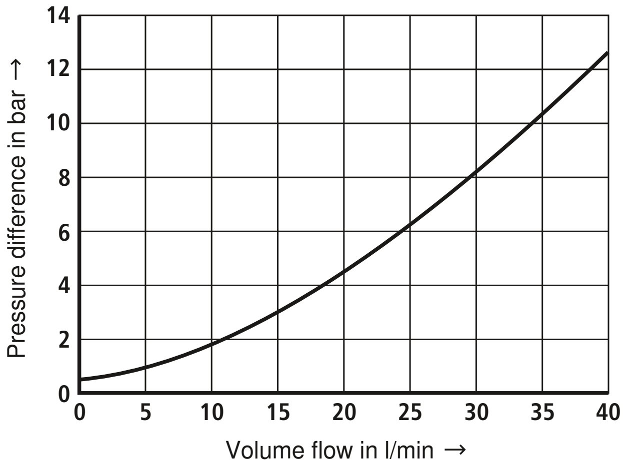
Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 °C ±5 °C)

Δp-q_V characteristic curves via check valve – model "VP" (P to B)

Model "VP2A"

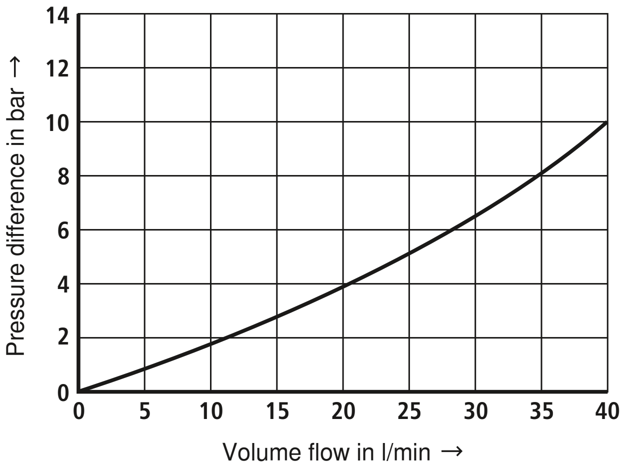


Model "VP2B"

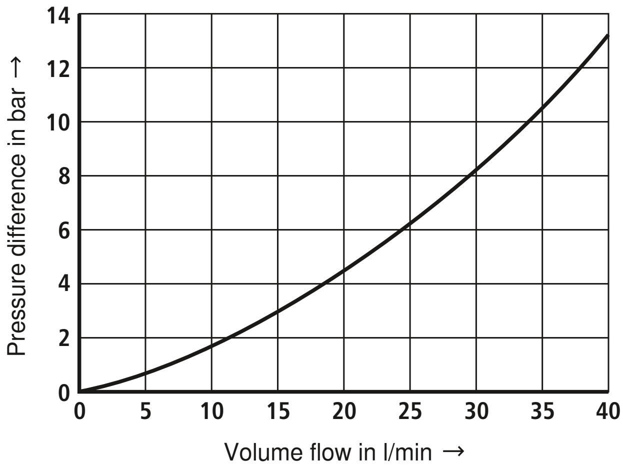


Δp-q_V characteristic curves via check valve – model "VA" (A to T)

Model "VA2A"



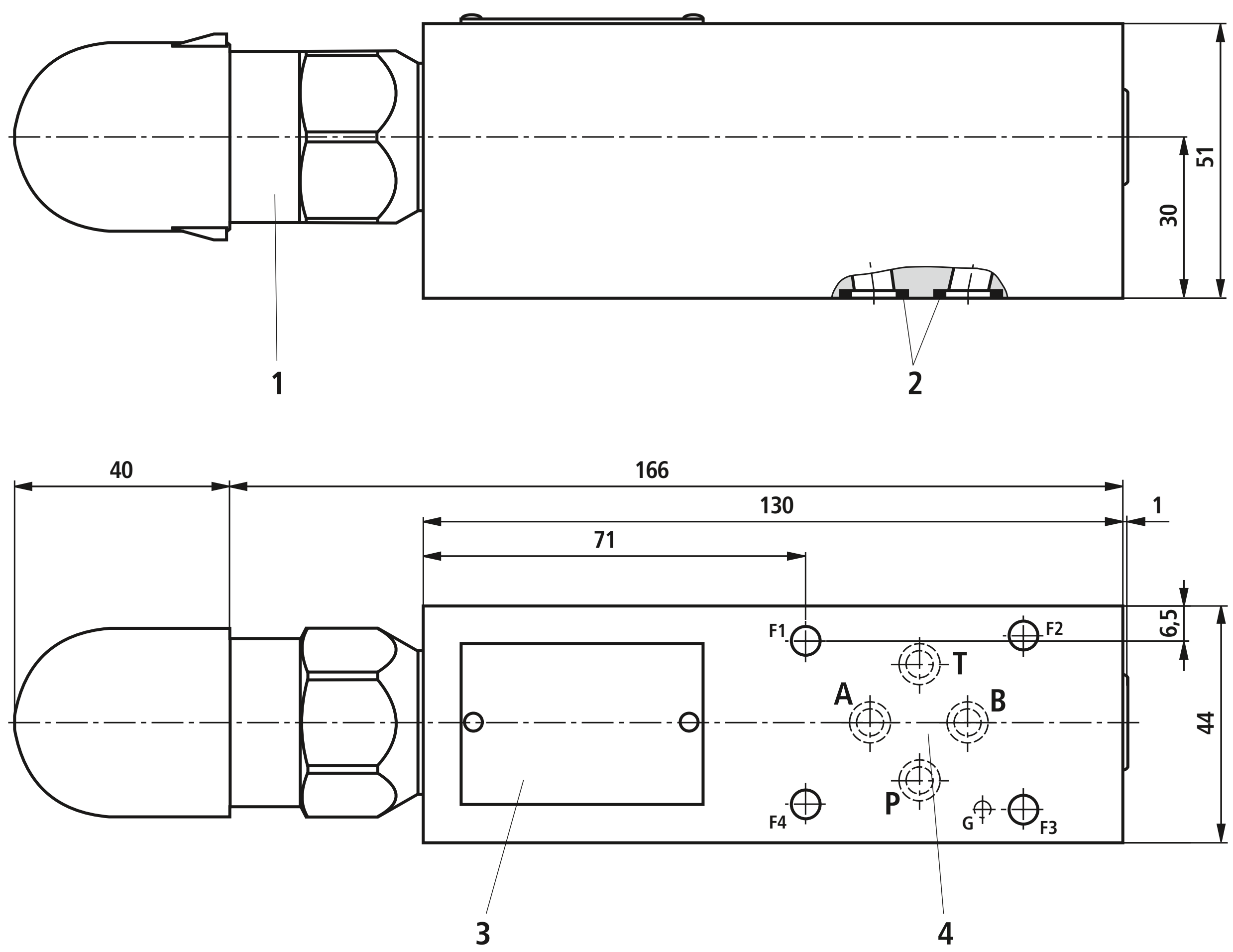
Model "VA2B"

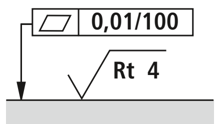


☞ **Note!**

- The characteristic curves have been measured with external, depressurized control oil return (circulation pressure).
- The characteristic curves are valid for output pressure = 0 bar over the whole volume flow range.

Dimensions: Model “2A” (dimensions in mm)





Required surface quality of the valve contact surface

1 Adjustment type “2”

2 Identical sealing rings for connections A, B, P, T

3 Typeplate

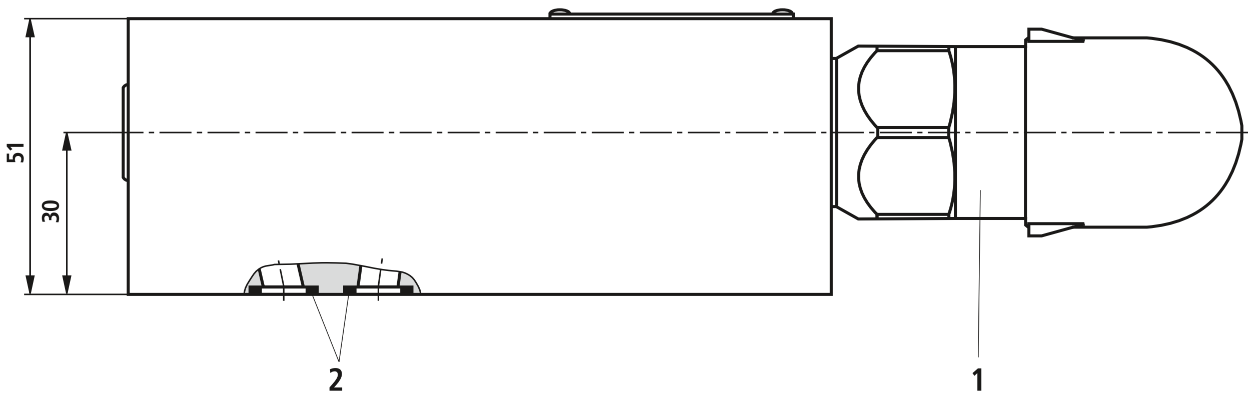
4 Position of the connections according to ISO 5781-03-04-0-00 (**with** fixingbore for locking pin ISO 8752-3x8-St, Material no. **R900005694**, order separately); deviating from the standard also possible without fixing bore

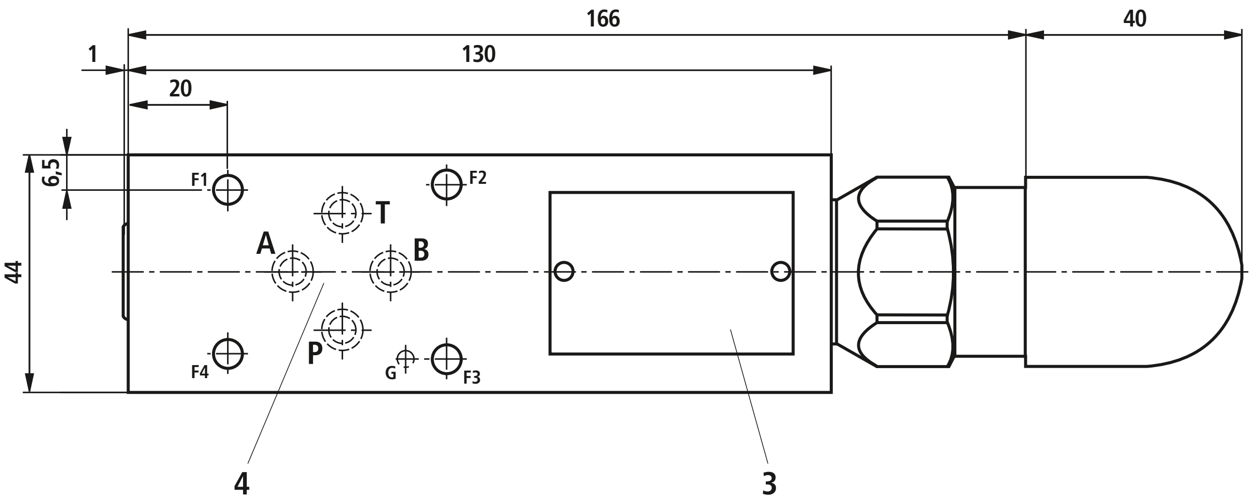
Subplates according to Data Sheet RE 45052 (order separately)

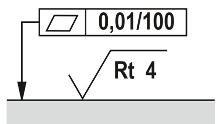
– without fixing bore	G 341/01 (G1/4) G 342/01 (G3/8) G 502/01 (G1/2)
– with fixing bore	G 341/60 (G1/4) G 342/60 (G3/8) G 502/60 (G1/2)

Valve fastening screws (order separately)
4 x ISO 4762 - M5 x 60 - 10.9flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque $\boldsymbol{M}_A$ = 7 Nm ±10%,
Material no. **R913000319**

Dimensions: Model “2B” (dimensions in mm)







Required surface quality of the valve contact surface

1. Adjustment type “2”
2. Identical sealing rings for connections A, B, P, T
3. Typeplate
4. Position of the connections according to ISO 5781-03-04-0-00 (**with** fixingbore for locking pin ISO 8752-3x8-St, Material no. **R900005694**, order separately); deviating from the standard also possible without fixing bore

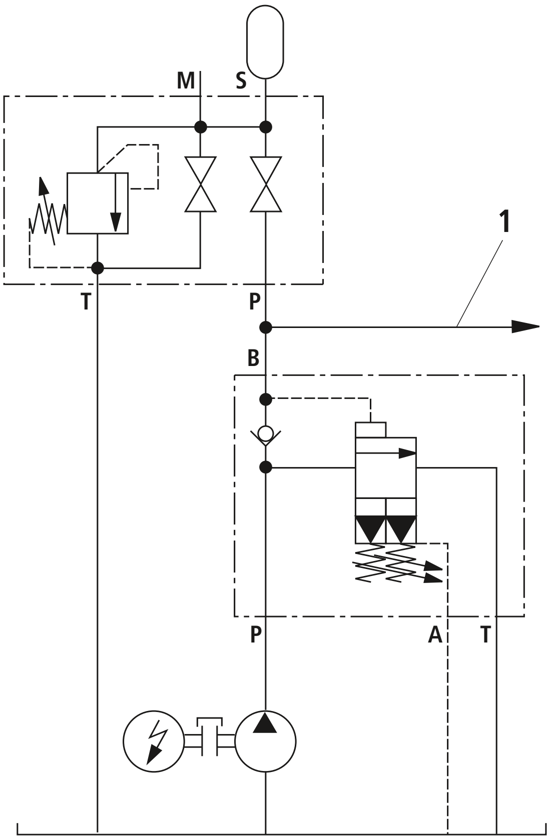
Subplates according to Data Sheet RE 45052 (order separately)

– without fixing bore	G 341/01 (G1/4)
	G 342/01 (G3/8)
	G 502/01 (G1/2)
– with fixing bore	G 341/60 (G1/4)
	G 342/60 (G3/8)
	G 502/60 (G1/2)

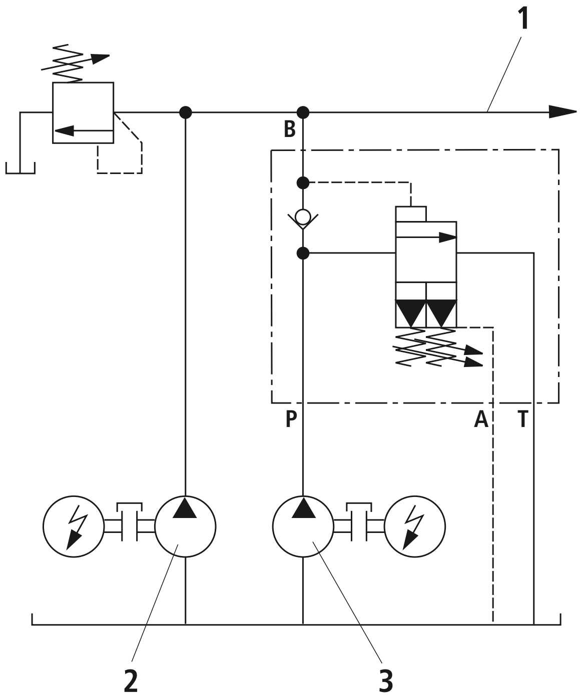
Valve fastening screws (order separately)
4 x ISO 4762 - M5 x 60 - 10.9flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque $\boldsymbol{M}_A$ = 7 Nm ± 10%,
Material no. **R913000319**

Sample switching: Type DA 6 VP…

Hydo system with pressure accumulator



Hydo system with high and low pressure pump



1 To the consumer
2 High-pressure pump
3 Low-pressure pump

☞ **Information regarding the use:**

Keep the pipe connection between pressure cut-off valve and hydro accumulator as short and the resistance as low as possible!

Attention!

- Accumulators may only be operated with suitable accumulator safety equipment!
- There is no direct pressure limitation function of the pump pressure (to the tank), but only an indirect one via the check valve and the control line in the consumer channel (see page 3).

Notes

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www.boschrexroth.de

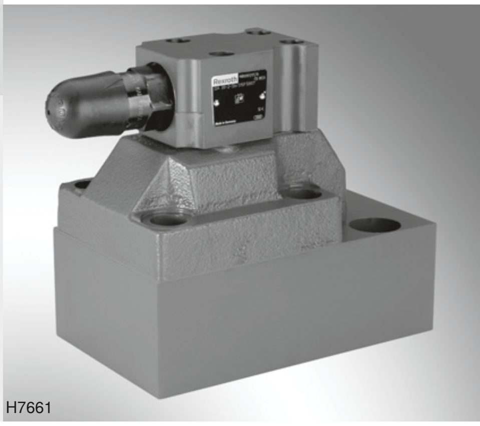
Rexroth
Bosch Group

Pressure cut-off valve, pilot operated

RE 26411/08.10
Replaces: 02.03

Type DA and DAW

Sizes 10 to 32
Component series 5X
Maximum operating pressure 315 bar
Maximum flow 400 l/min



H7661

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- For subplate mounting
- As installation valve
- 4 adjustment types, optionally:
  - Rotary knob
  - Adjustment spindle with protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- 4 pressure ratings
- Solenoid operated unloading via a built-on directional spool valve

- More information:

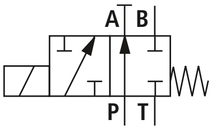
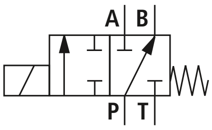
High-power directional valves	Data sheet 23178
Subplates	Data sheet 45062

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

DA				–	–5X/	–	

Pressure cut-off valve	
Without directional spool valve	**= no code**
With built-on directional spool valve	**= W**
Complete valve (subplate mounting)	**= no code**
Pilot contol valve **without** main spool insert (installation valve) (**Do not** state size)	**= C** 1)
Pilot contol valve **with** main spool insert (installation valve) (Valve size 30)	**= C**
Size 10	**= 10**
Size 25	**= 20**
Size 32	**= 30**

Symbols			
		Normally closed	**= A** 2)
		Normally open	**= B** 2)

Adjustment type	
Rotary knob	**= 1**
Adjustment spindle with protective cap	**= 2**
Lockable rotary knob with scale	**= 3** 3)
Rotary knob with scale	**= 7**
Component series 50 to 59 (50 to 59: Unchanged installation and connection dimensions)	**= 5X**
Pressure adjustment range	
25 to 50 bar	**= 50**
50 to 100 bar	**= 100**
100 to 200 bar	**= 200**
200 to 315 bar	**= 315**
Switching pressure differential (P → A)	
On average 10 %	**= 10**
On average 17 %	**= 17**
Freely adjustable switching pressure differential (see characteristic curves, page 11 and 12)	**= FS** 5)

1) Only for versions "10" and "17".

2) Ordering code only required for versions with built-on directional spool valve 8 "DAW".

3) H-key with the material no. **R900008158** is included in the scope of delivery.

4) Mating connectors, separate order, see page 3.

5) Only for version "2".

6) – With nozzle: Switching impact chushioning results in higher circulation pressure (P → T)
– Without nozzle: Lack of chushioning results in lower circulation pressure (P → T) (see characteristic curves page 10)

7) Only for version "FS"

Standard types and standard units are contained in the EPS (standard price list).

| | | – | | | | | * |

Further details in the plain text

Seal material
no code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

Electrical connection
K4 [1; 4] **=** Without mating connector
Individual connection with connector acc. to DIN EN 175301-803

N9 [1)] **=** **With** concealed manual override
N [1)] **=** **With** manual override
no code = **Without** manual override

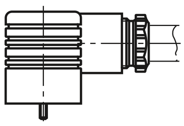
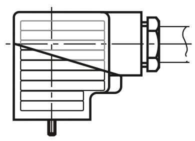
G24 [1)] **=** DC voltage 24 V
W230 [1)] **=** AC voltage 230 V 50/60 Hz

no code = **Without** directional spool valve
6E [1)] **=** **With** directional spool valve (high-power solenoid, data sheet 23178)

no code = Pilot oil return, internal
Y = Pilot oil return, external

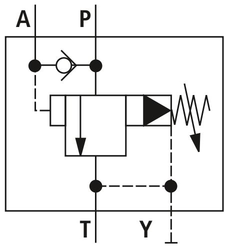
Cushioning nozzle [6)]
no code = Without nozzle
B07 [7)] **=** Nozzle Ø0.7 mm
(see characteristic curves page 10)

Mating connectors according to DIN EN 175301-803

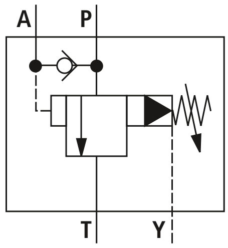
Details and more mating connectors see RE 08006				
	Material no.			
Color	without circuitry	with indicator light 12 … 240 V	with rectifier 12 … 240 V	with indicator light and Z diode protective circuitry 24 V
Gray	**R901017010**	–	–	–
Black	**R901017011**	**R901017022**	**R901017025**	**R901017026**

Symbols: Type DA. (without directional valve)

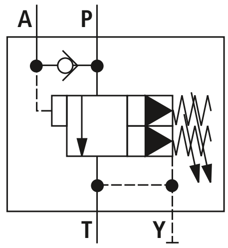
Type DA ...



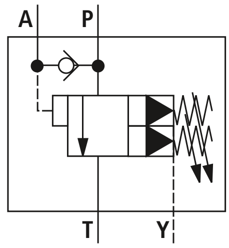
Type DA …**Y**…



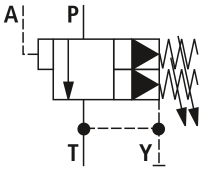
Type DA …**FS**…



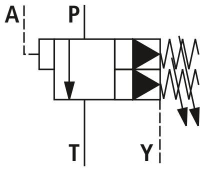
Type DA …**FS**.**Y**…



Type DAC 30 …**FS**…

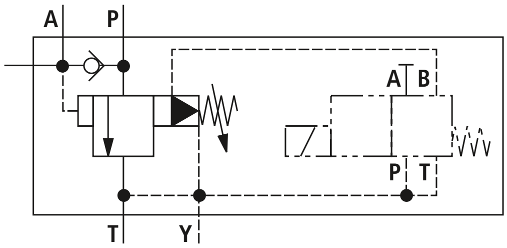


Type DAC 30 …**FS**.**Y**…

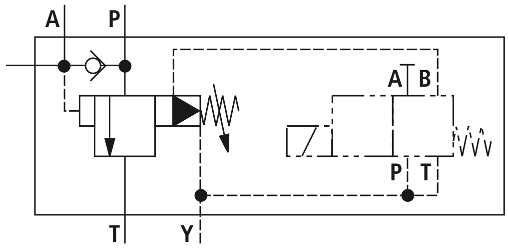


Symbols: Type DAW (with built-on directional valve)

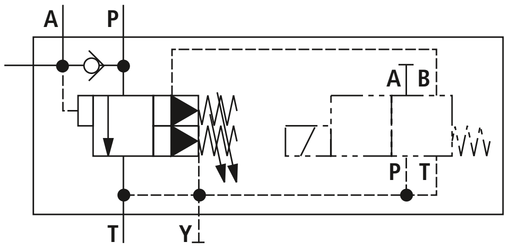
Type DAW …



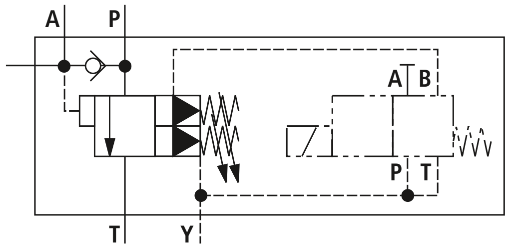
Type DAW …**Y**…



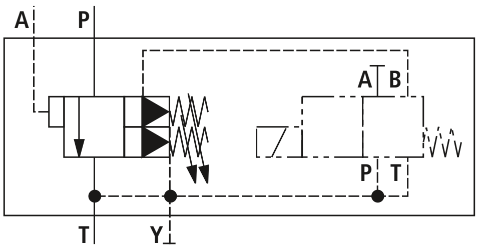
Type DAW …**FS**…



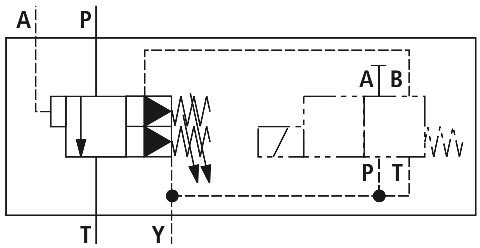
Type DAW …**FS**.**Y**…



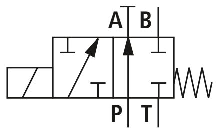
Type DAWC 30 …**FS**…



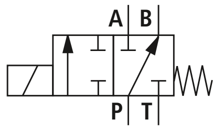
Type DAWC 30 …**FS**.**Y**…



Normally closed



Normally open



Function, section: Type DA…FS… (freely adjustable switching pressure differential)

The pressure valve type DA is a pilot operated pressure cut-off valve. It is used for example in accumulator charging circuits. In this application an accumulator is filled until the accumulated charging pressure is reached. When the accumulator pressure is reached the valve switches the displacement in depressurized circulation until the pressure in the hydraulic system has dropped by the switching pressure differential. Then the charging process is started again.

The pressure cut-off valve basically comprises of main housing (1), pilot contol valve (2 and 3), main spool insert (4) and check valve (7).

– Diverting the pump flow from 'P to A' to 'P to T'.

  The pump displaces via the check valve (7) into the hydraulic system (P to A). The pressure applied to channel A acts via the control line (8) on the control piston in the pilot contol valve (3). At the same time pressure is applied in channel P via the nozzle (5) on the spring loaded side of the main spool (4) and via the control line (9) at the input (11) of the cartridge valve (3). As soon as the upper cut-off pressure that was set at the cartridge valve (3) by means of the adjustment spindle (12) is reached in the hydraulic system the cartridge valve will internally open the connection of the spring loaded side of the main spool (4) towards the return line (10) after T (Type DA ...) or externally via the port Y (Type DA ... Y).

  Due to the nozzle (5) a pressure drop occurs at the main spool (4). The spool then lifts from its seat and opens the connection P to T. The check valve (7) closes the P to A connection. The actuator pressure A fixes the cartridge valve (3) in opened position.

– Diverting the pump flow from 'P to T' to 'P to A'.

  If the actuator pressure A has dropped to the pressure value set at the adjustment spindle (14), the cartridge valve (3) switches to the initial position and closes the connection between the spring loaded side of the main spool (4) and the return line (10). Consequently, the pressure on the spring loaded side of the main spool (4) increases and causes the closing of the P to T connection by means of the compression spring (6). The pump now again displaces via the check valve (7) into the hydraulic system (P to A).

Version "FSB07"

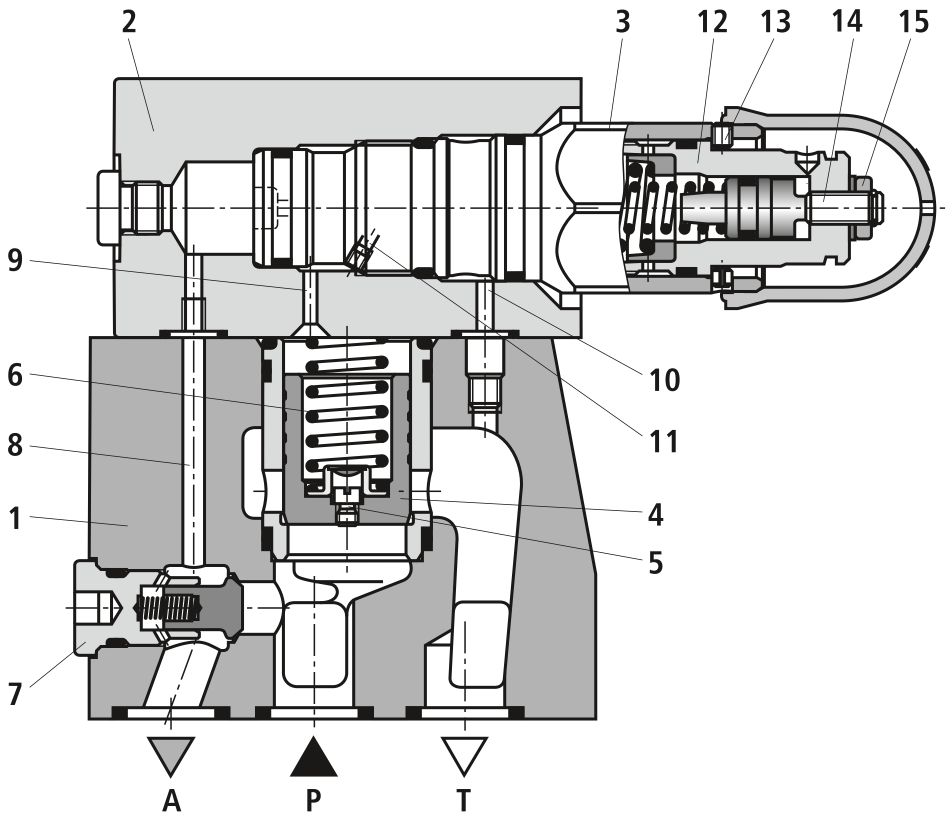
With this valve an nozzle used for damping a possible switching shock is integrated in the control line (11). This inevitably leads to an increased circulation pressure (P to T), see characteristic curves, page 10.

☞ **Notes!**

– **Indirect pressure relief function only:**
  A pressure relief function for the pump pressure (towards the tank) is not available directly but only indirectly via check valve (7), control line (8) and pilot contol valve (2) towards channel T.

– **Adjustment of the switching pressure differential**
  In the factory the valves are set to a switching pressure differential of approx. 10 % to 12 % at nominal pressure. Adjustment of up to 50 % of the nominal pressure is possible. The unit is delivered with the adjustment spindle turned out and set to the minimum adjustable upper switching pressure. The upper switching pressure can be increased by turning the adjustment spindle (12) in.
  Adjustment spindle (14) is used for changing the switching pressure differential: Turn out - decrease, turn in - increase.
  The pressure adjustments are secured by means of the clamping screw (13) and the lock nut (15).

  – Depending on the system conditions (in particular for high pump and actuator flow) switching pressure values may be higher than illustrated in the characteristic curves. For such cases the valve provides the possibility of ideally adapt the switching pressure differential to the system.



Type DA 10 -2-5X/.FS…

Function, section: Type DA… (fixed settings for switching pressure differential of 10 % or 17 %)

The function of this valve corresponds to the function of the "FS" version. However, with the pilot contol valve only the upper switching pressure an not the switching pressure differential can be adjusted.

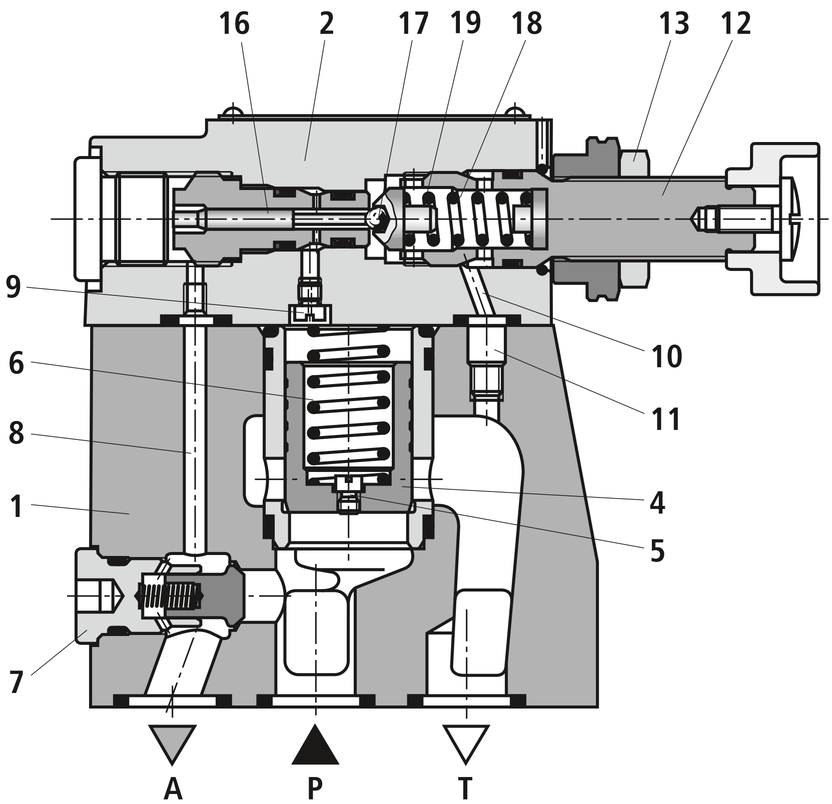
The area of the pilot spool (16) can optionally be selected to be 10 % or 17 % larger than the effective area of the ball (17). Consequently, the effective force at the pilot spool (16) is also 10 % or 17 % higher than the effective force at the ball (17).

– Diverting the pump flow from 'P to A' to 'P to T'.

  Pressure is applied in channel P via the nozzles (5 and 9) on the spring loaded side of the main spool (4) and at the ball (17) in the pilot contol valve (2). As soon as the cut-off pressure that is set by means of the adjustment spindle (12) is reached in the hydraulic system the ball (17) opens against the spring (18). Then the hydraulic fluid flows via the nozzles (5 and 9) into the spring chamber (19) into the return line (10) towards T (Type DA ...) or externally via port Y (Type DA …Y). The main spool (4) is lifted from its seat and opens the P to T connection. The check valve (7) closes the P to A connection. The actuator pressure A retains the ball in the pilot contol valve (2) in open position via the pilot spool (16).

– Diverting the pump flow from 'P to T' to 'P to A'.

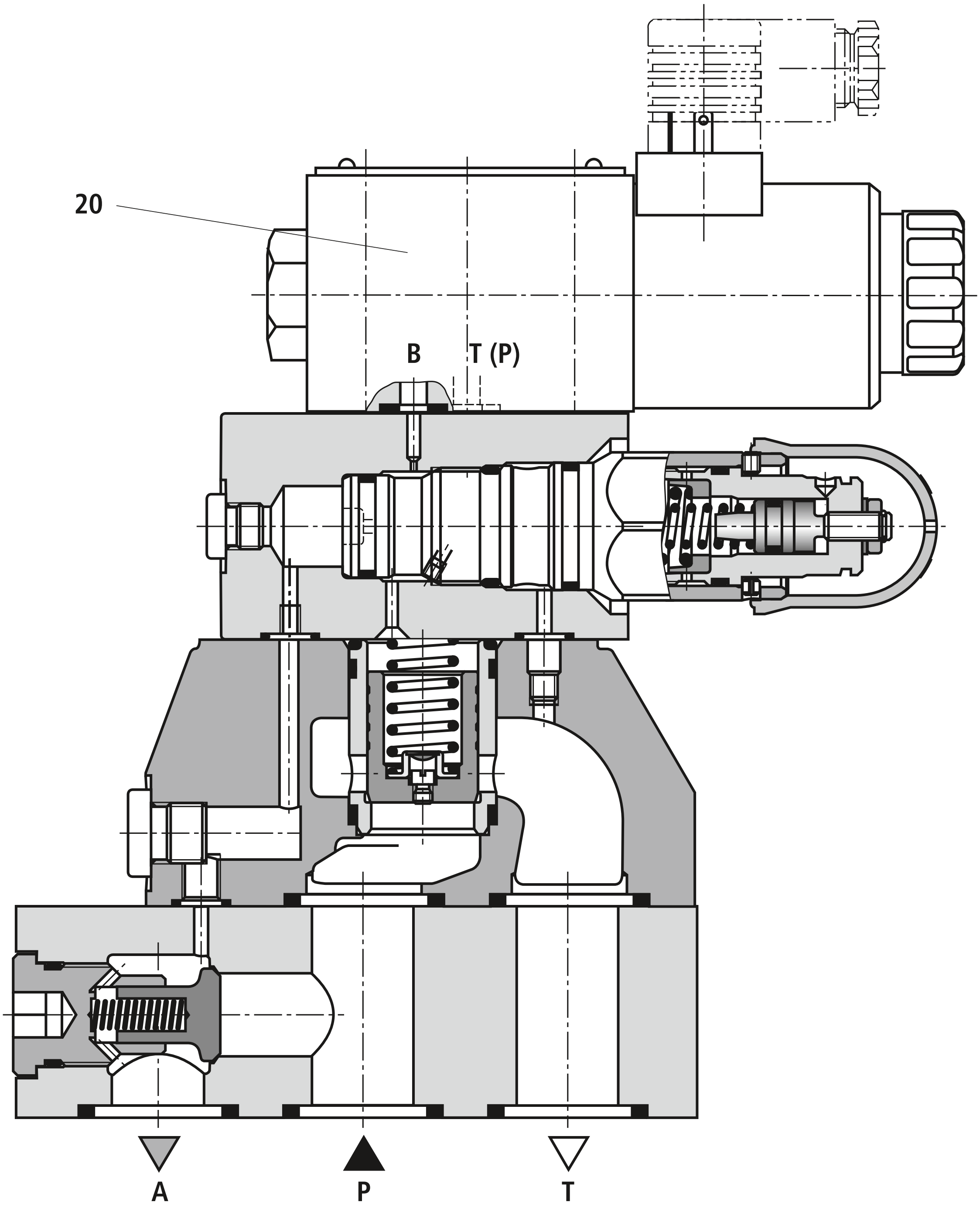
  If actuator pressure A has decreased by the switching pressure differential of 10 % or 17 % relative to the set cut-off pressure (acc. to characteristic curve, page 11), the spring (18) in the pilot contol valve (2) closes the ball (17). Consequently, the pressure on the spring loaded side of the main spool (4) increases and causes the closing of the P to T connection by means of the compression spring (6). The pump now again displaces via the check valve (7) into the hydraulic system (P to A).



Type DA 10 -1-5X/…

Function, section: Type DAW…

The function of this valve corresponds to the function of valve Type DA ... . However, for pressure values lower than the set cut-off pressure with this valve it is possible to optionally divert flow to P to T or P to A by means of the solenoid operated directional spool valve (20).



Type DAW 20 -1-5X/…6E..K4…

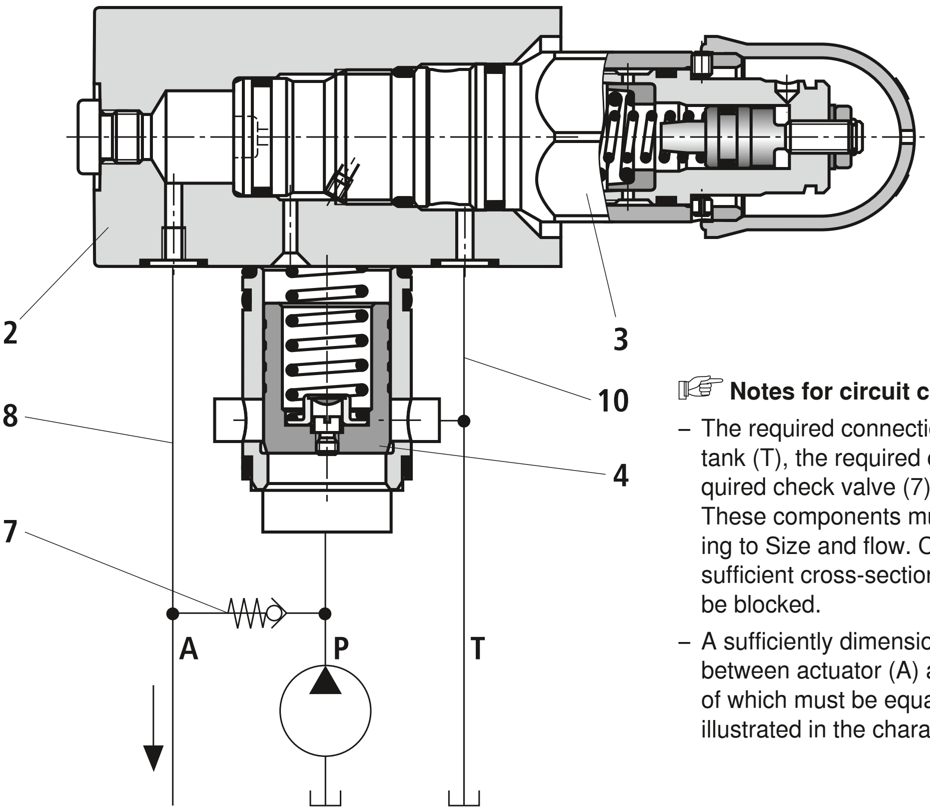
Function, section: Type DA(W)C…

Pressure cut-off valve Type DA(W)C 30 …FS…

This valve comprises pilot control housing (2), cartridge valve (3) as pilot control unit and a main spool insert (4).

Pressure cut-off valve Type DA(W)C …10/17...

This valve comprises pilot contol valve (2), and optionally a main spool insert (4).



☞ **Notes for circuit configuration with Type DAC...**

- The required connections for actuator (A), pump (P), and tank (T), the required control lines (8) and (10), and the required check valve (7) are not included in scope of delivery. These components must be appropriately designed according to Size and flow. Connections must be designed with a sufficient cross-section and arranged such that they cannot be blocked.
- A sufficiently dimensioned check valve must be integrated between actuator (A) and pump (P) the flow characteristics of which must be equal to or better than the characteristics illustrated in the characteristic curves on page 12.

Technical Data (For applications outside these parameters, please consult us!)

general

Size		Size	10	25	32
Weight	– Type DA …	kg	3.8	7.7	13.5
	– Type DA …FS	kg	4.4	8.3	14.1
	– Type DAW …	kg	5.3	9.2	15.0
	– Type DAW …FS	kg	5.8	9.8	15.6
	– Type DAC …	kg	1.2		
	– Type DAWC …	kg	2.4		
	– Type DAC 30 …	kg	1.4		
	– Type DAC 30 …FS	kg	1.9		
	– Type DAWC 30 …	kg	2.9		
	– Type DAC 30 …FS	kg	3.4		
Installation position			Any		
Ambient temperature range	– Type DA …	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)		
	– Type DAW …		–30 to +50 (NBR seals) –20 to +50 (FKM seals)		

Technical Data (For applications outside these parameters, please consult us!)

hydraulic

Size		Size	10	25	32
Maximum operating pressure	– Port P	bar	315		
	– Port A	bar	315 (after diverting P to T)		
	– Port T, Y	bar	100 [1; 4]		
Setting pressure range [2]	– Pressure rating 50	bar	25 to 50		
	– Pressure rating 100		50 to 100		
	– Pressure rating 200		100 to 200		
	– Pressure rating 315		200 to 315 (Type DA…FS… 150 to 315)		
Switching pressure differential [2]	– Version "FS”	%	Freely adjustable (10 % to 50 % of the nominal setting pressure)		
	– Version "10"	%	10		
	– Version "17"	%	17		
Maximum flow	– Version “FS”	l/min	120	250	400
	– Version "10"	l/min	40	80	120
	– Version "17"	l/min	60	120	240
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524; other hydraulic fluids upon request		
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)		
Viscosity range	– Maximum	mm^2/s	10 to 800		
	– Recommended	mm^2/s	20 to 60		
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [3]		

[1] **Attention!**
The applied pressure is added to the setting pressure! The switching pressure differential remains unchanged within the setting range!

[2] The following points must be observed for setting of the switching pressure differential:

– The upper and lower switching point must be within the setting range of the pressure rating (e.g. pressure rating 100 bar: Upper switching point 100 bar, lower switching point 50 bar corresponds to a switching pressure differential of 50 %)
– Basically the lowest possible switching pressure differential value depends on the system (i.e. set pressure, pump and actuator flow, size and preload of accumulator, length of line and line resistance before and after the valve, etc.). The valve provides a possibility of ideally adapting the switching pressure differential to the system conditions. However, the lowest switching pressure differential value of the valve cannot always be realized in a system due to above-stated reasons.
– The connection between pressure cut-off valve and hydraulic accumulator must generally be in the form of short and low-resistance connection tubing and the pilot oil (version "Y", if required) must be drained at zero pressure.
– For notes on factory settings of the switching pressure differential, see page 5.

[3] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

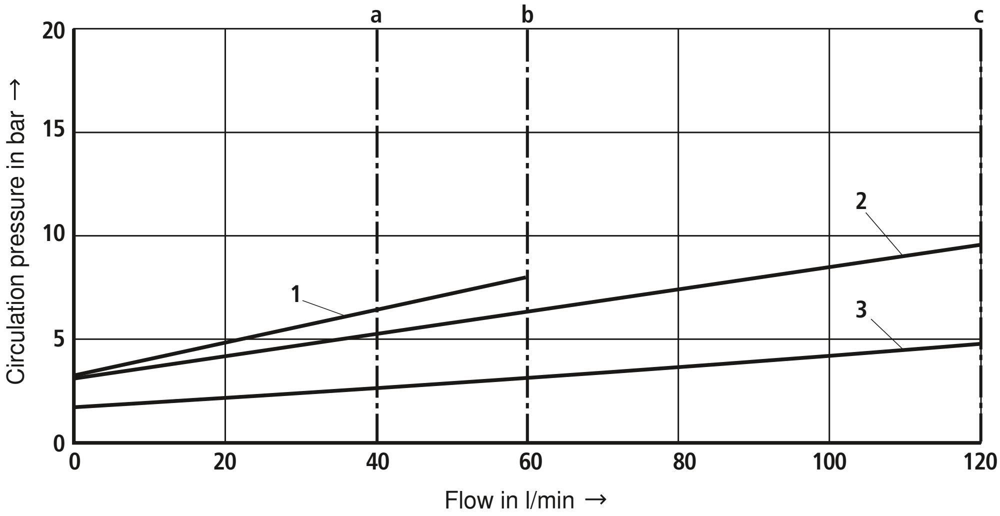
For the selection of the filters see www.boschrexroth.com/filter.

[4] The tank pressure must not be higher than the pump pressure.

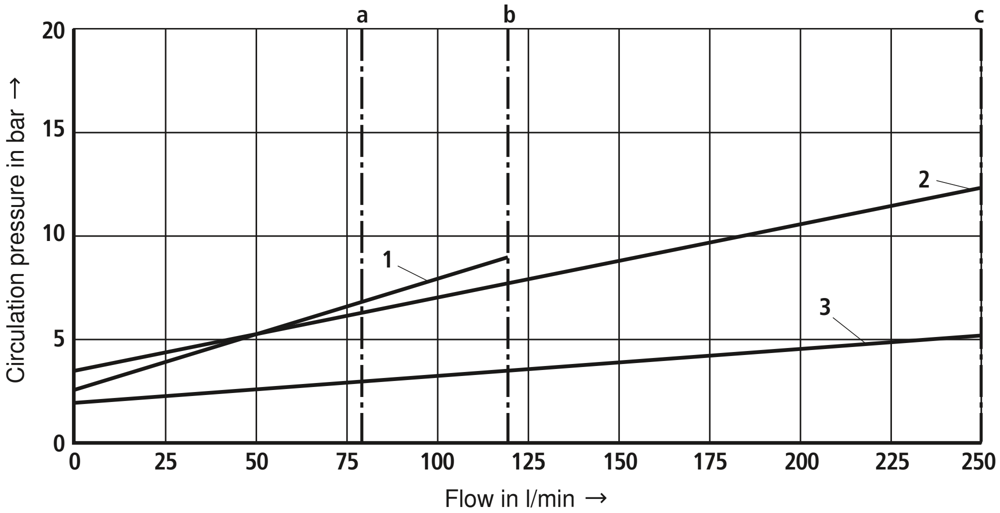
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Circulation pressure depending on flow $q_{V\ P}$ and chushioning (P → T)

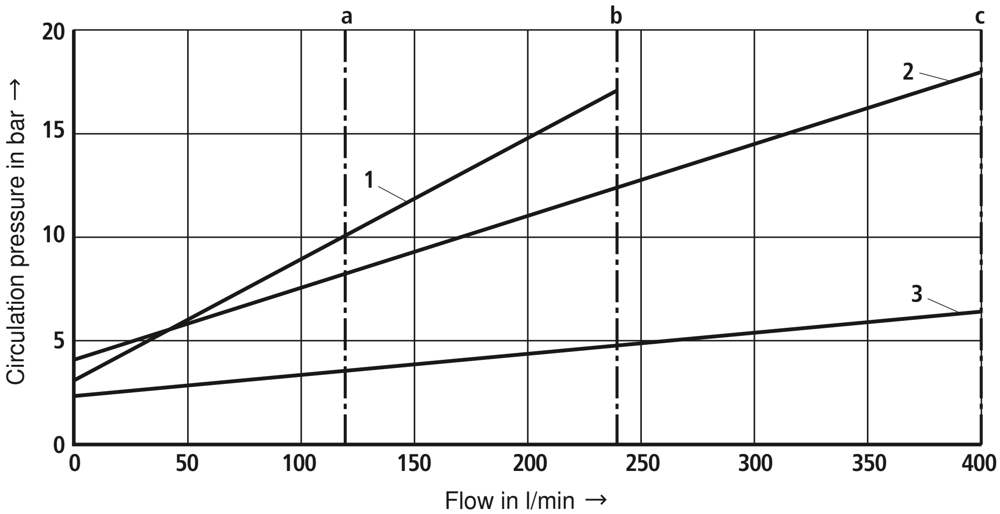
Size 10



Size 25



Size 32



a $q_{V\ P\ max}$ version "10"
b $q_{V\ P\ max}$ version "17"
c $q_{V\ P\ max}$ version "FS"

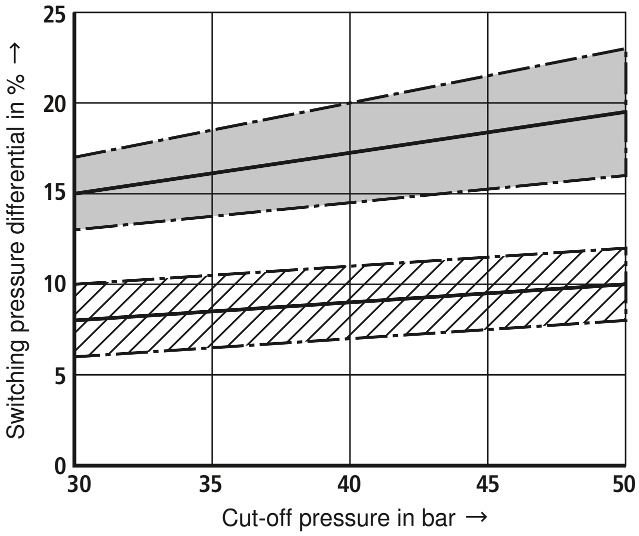
1 Type DA ...
2 Type DA …FSB07…
3 Type DAW …FS…

☞ **Note!**
Flow depends on the set switching pressure differential.

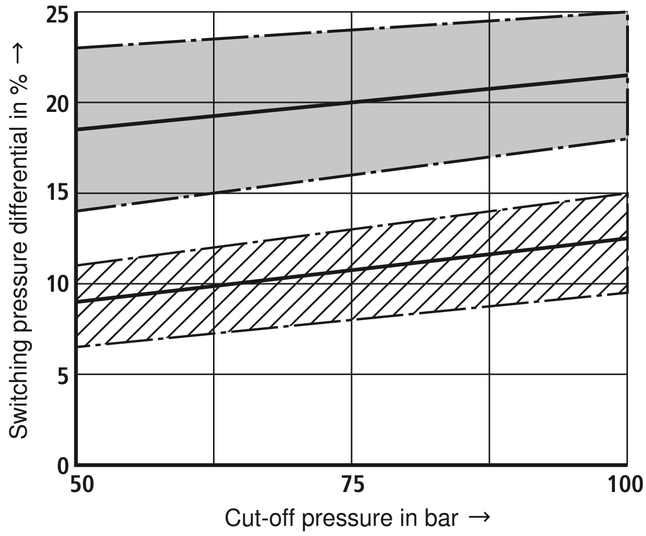
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Switching pressure differential (P → A) depending on cut-off pressure p_O (Type DA …)

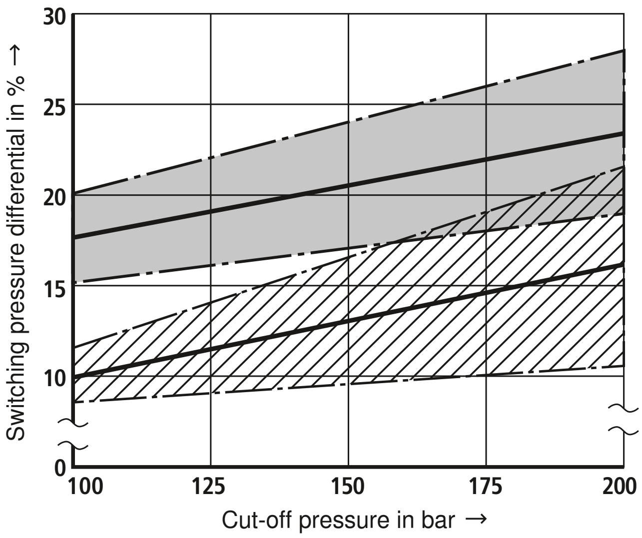
Pressure rating 50 bar



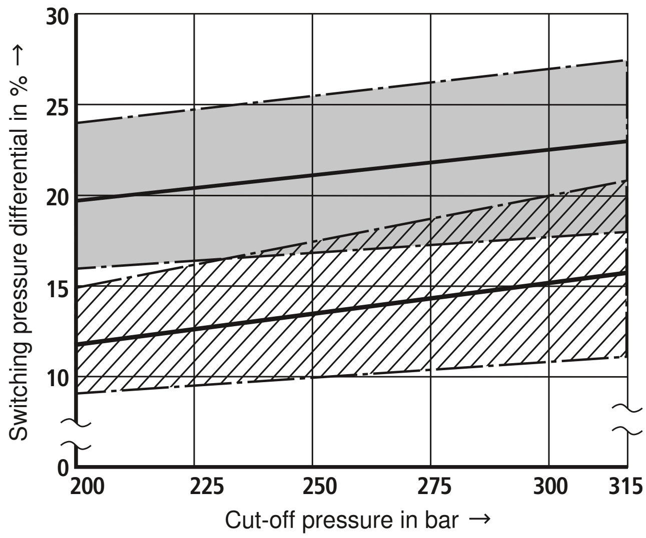
Pressure rating 100 bar



Pressure rating 200 bar



Pressure rating 315 bar



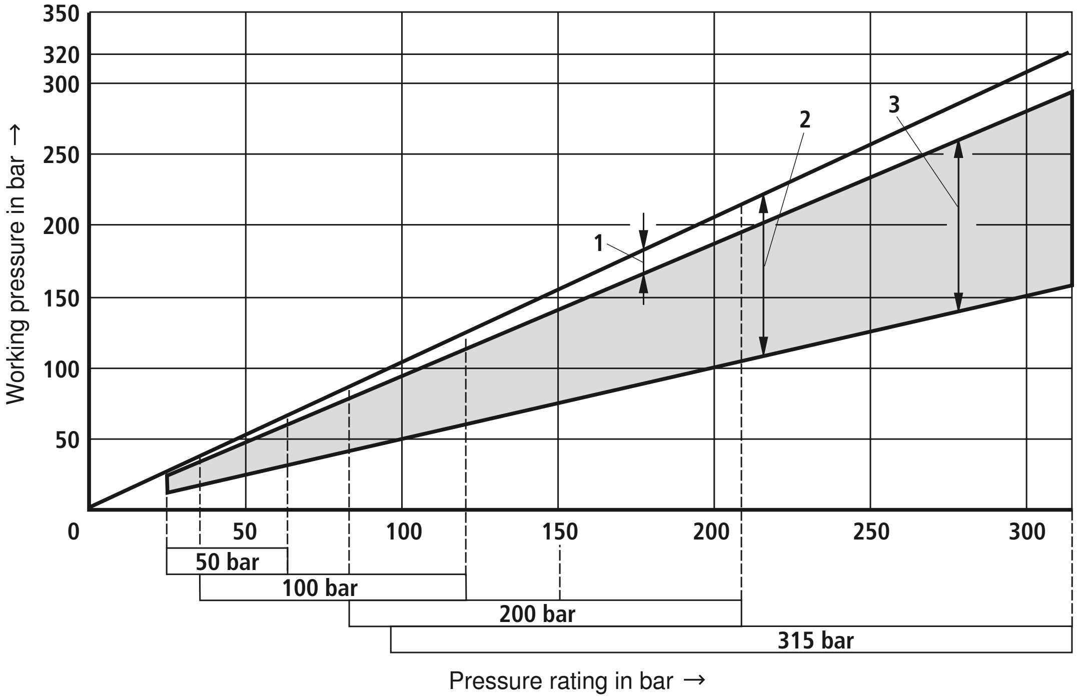
Scatter range for version "10"

Scatter range for version "17"

Version "FS" see page 12.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Switching pressure differential (P → A); pressure adjustment range p_U depending on the cut-off pressure p_O (Type DA …FS)



1 Minimum switching pressure differential

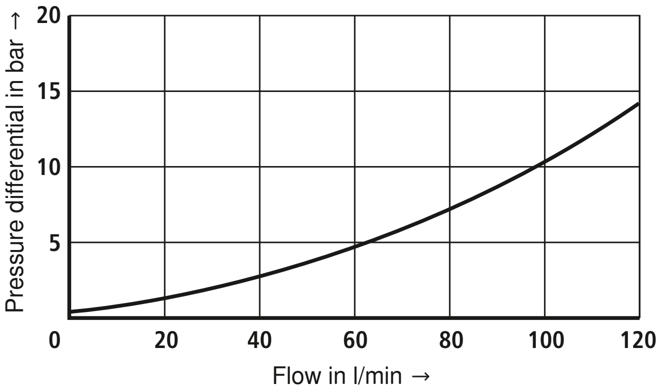
2 Maximum switching pressure differential

3 Pressure adjustment range p_U

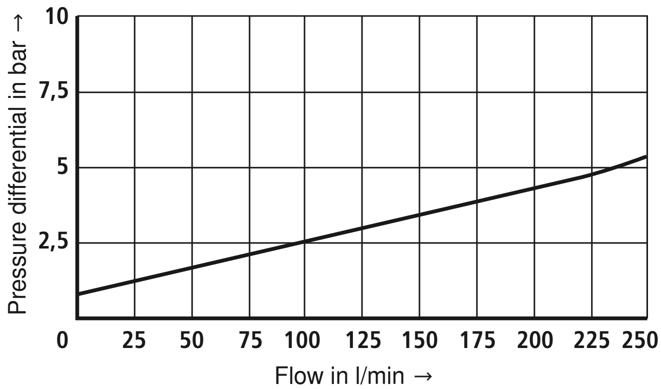
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Δp-q_V-curves via check valve (P → A)

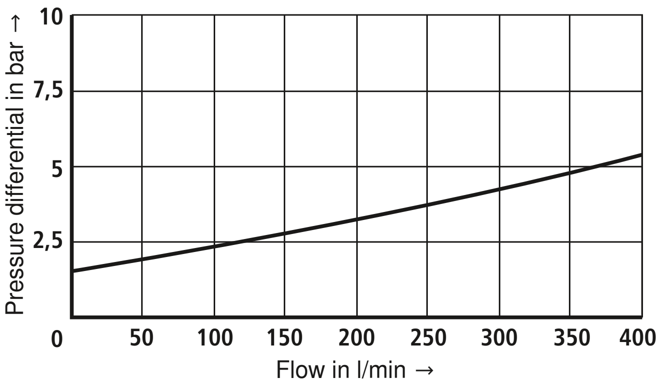
Size 10



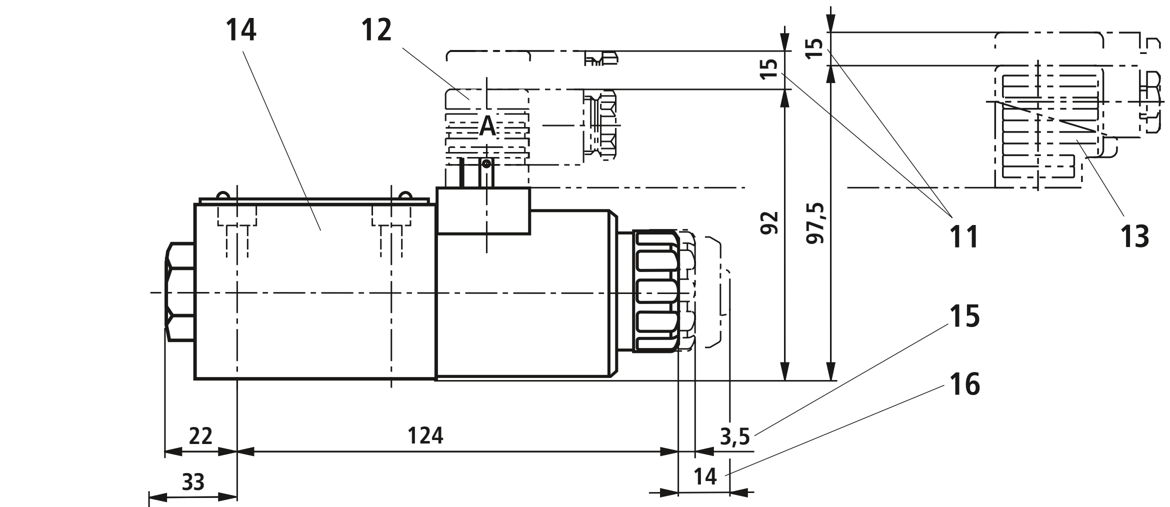
Size 25

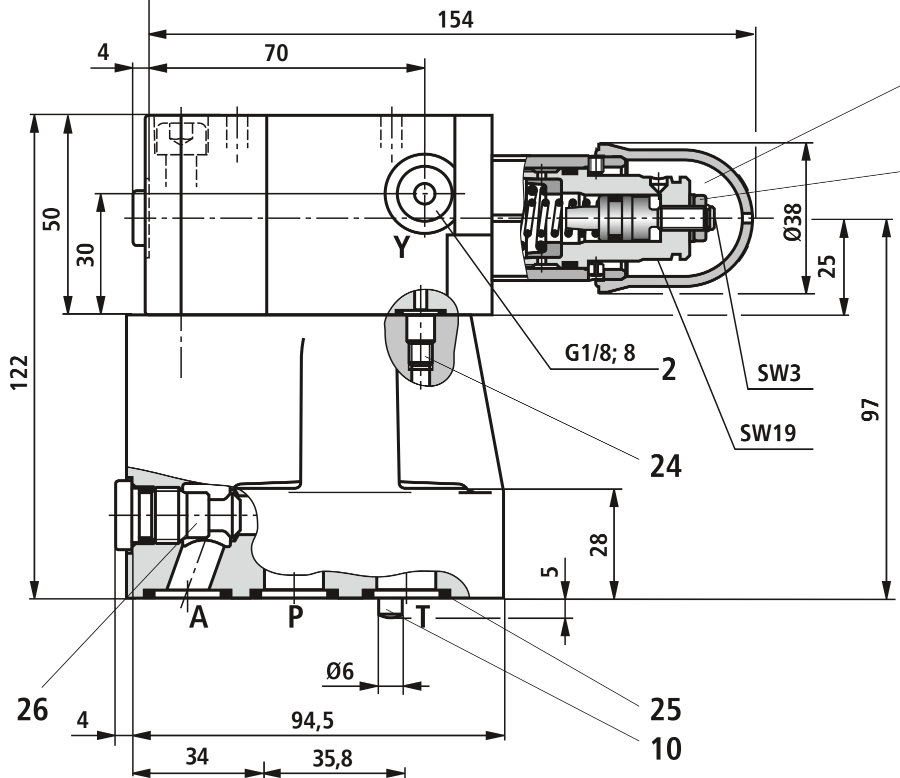


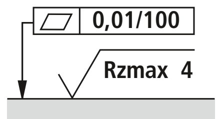
Size 32



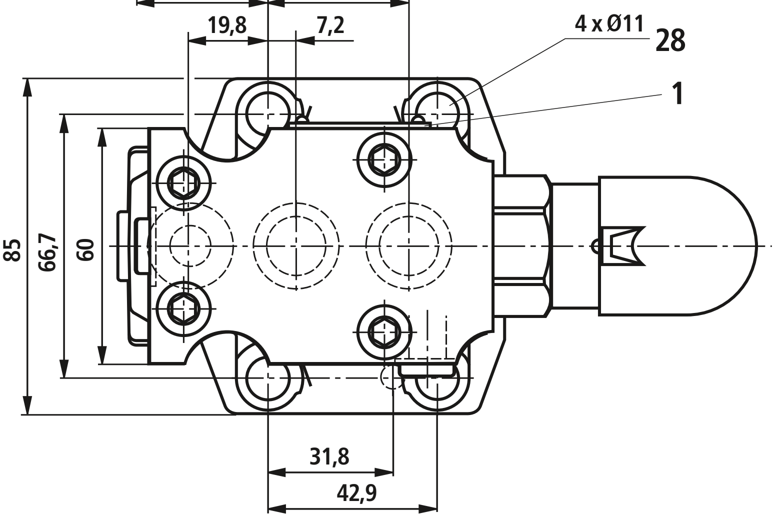
Unit dimensions: Type DA(W)…FS, size 10; subplate mounting (dimensions in mm)







Required surface quality of the valve mounting face

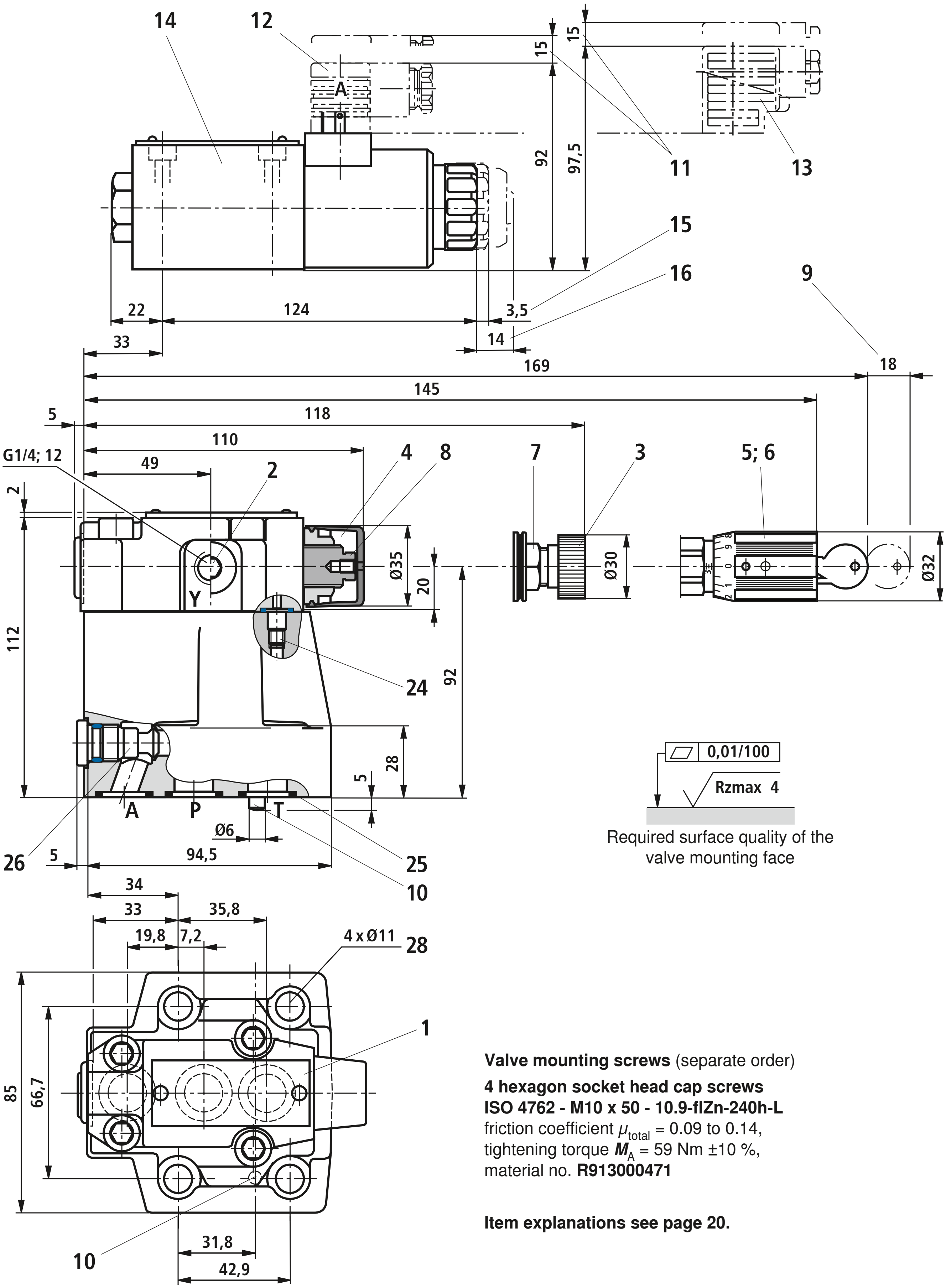


Valve mounting screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M10 x 50 - 10.9-flZn-240h-L
friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_A = 59 Nm ±10 %,
material no. **R913000471**

Item explanations see page 20.

Unit dimensions: Type DA(W)…, size 10; subplate mounting (dimensions in mm)



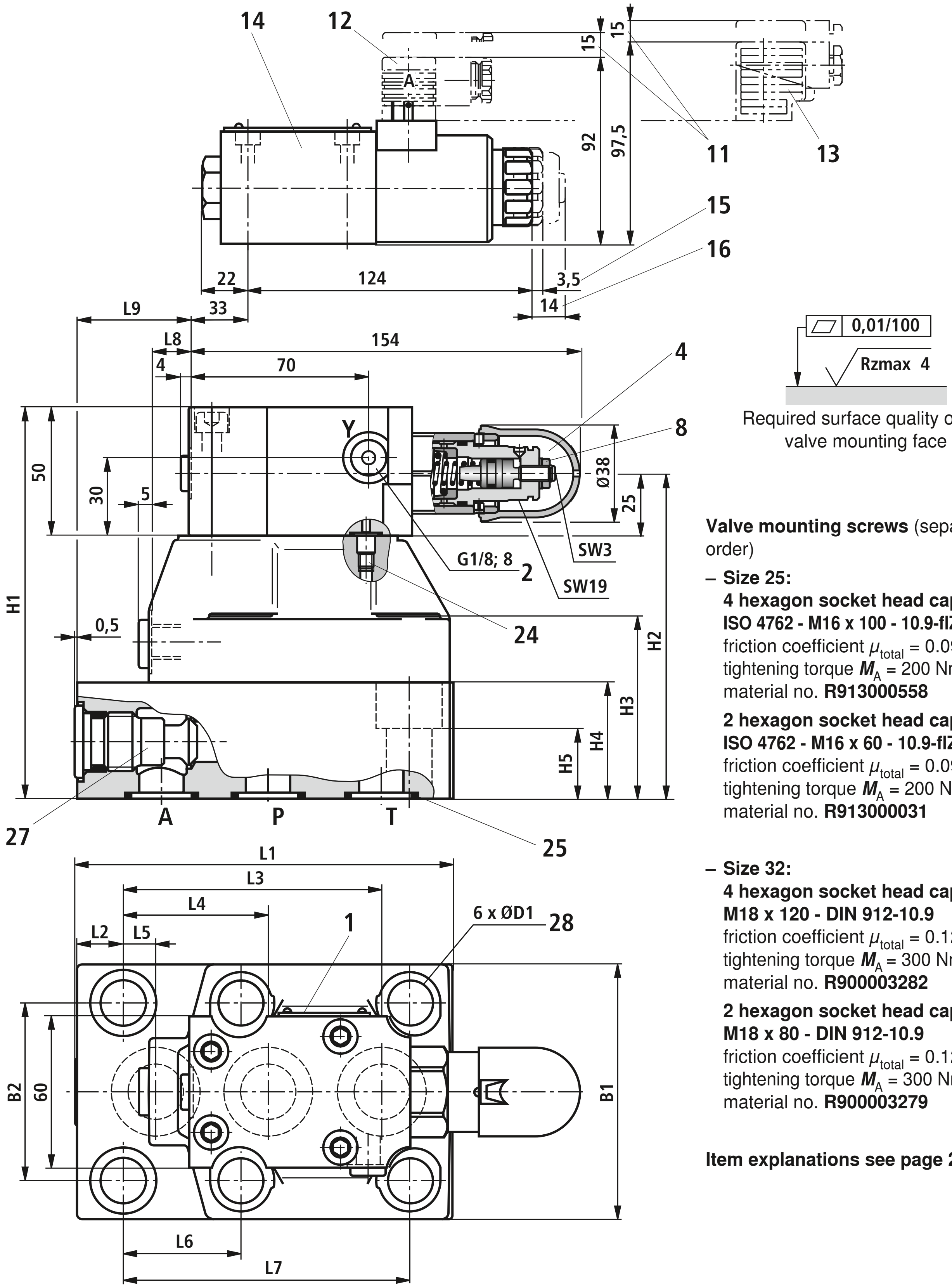
Required surface quality of the valve mounting face

Valve mounting screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M10 x 50 - 10.9-flZn-240h-L
friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_A = 59 Nm ±10 %,
material no. **R913000471**

Item explanations see page 20.

Unit dimensions: Type DA(W)…**FS**, size 25 and 32; subplate mounting (dimensions in mm)



Required surface quality of the valve mounting face

Valve mounting screws (separate order)

– **Size 25:**

4 hexagon socket head cap screws ISO 4762 - M16 x 100 - 10.9-flZn-240h-L
friction coefficient μ_{total} = 0.09 to 0.14, tightening torque M_A = 200 Nm ±10 %, material no. **R913000558**

2 hexagon socket head cap screws ISO 4762 - M16 x 60 - 10.9-flZn-240h-L
friction coefficient μ_{total} = 0.09 to 0.14, tightening torque M_A = 200 Nm ±10 %, material no. **R913000031**

– **Size 32:**

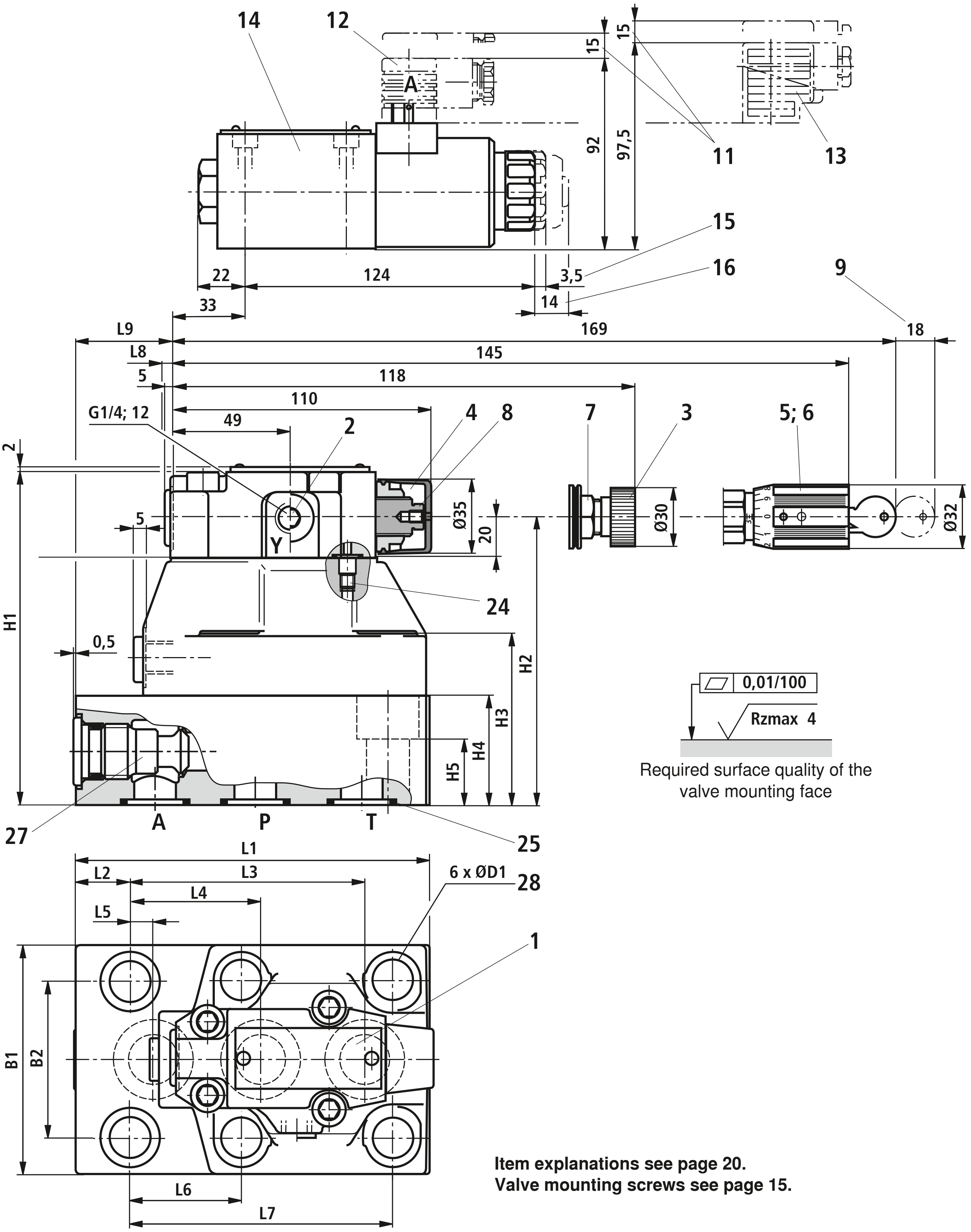
4 hexagon socket head cap screws M18 x 120 - DIN 912-10.9
friction coefficient μ_{total} = 0.12 to 0.17, tightening torque M_A = 300 Nm ±10 %, material no. **R900003282**

2 hexagon socket head cap screws M18 x 80 - DIN 912-10.9
friction coefficient μ_{total} = 0.12 to 0.17, tightening torque M_A = 300 Nm ±10 %, material no. **R900003279**

Item explanations see page 20.

Size	L1	L2	L3	L4	L5	L6	L7	L8	L9	B1	B2	H1	H2	H3	H4	H5	ØD1
25	149	19	101.6	57.1	12.7	46	112.7	15.5	41.5	100	70	154	129	72	46	28	18
32	190	34	127	63.5	12.7	50.8	139.7	26	66.5	116	82.5	175	150	93	67	45	20

Unit dimensions: Type DA(W)…, size 25 and 32; subplate mounting (dimensions in mm)

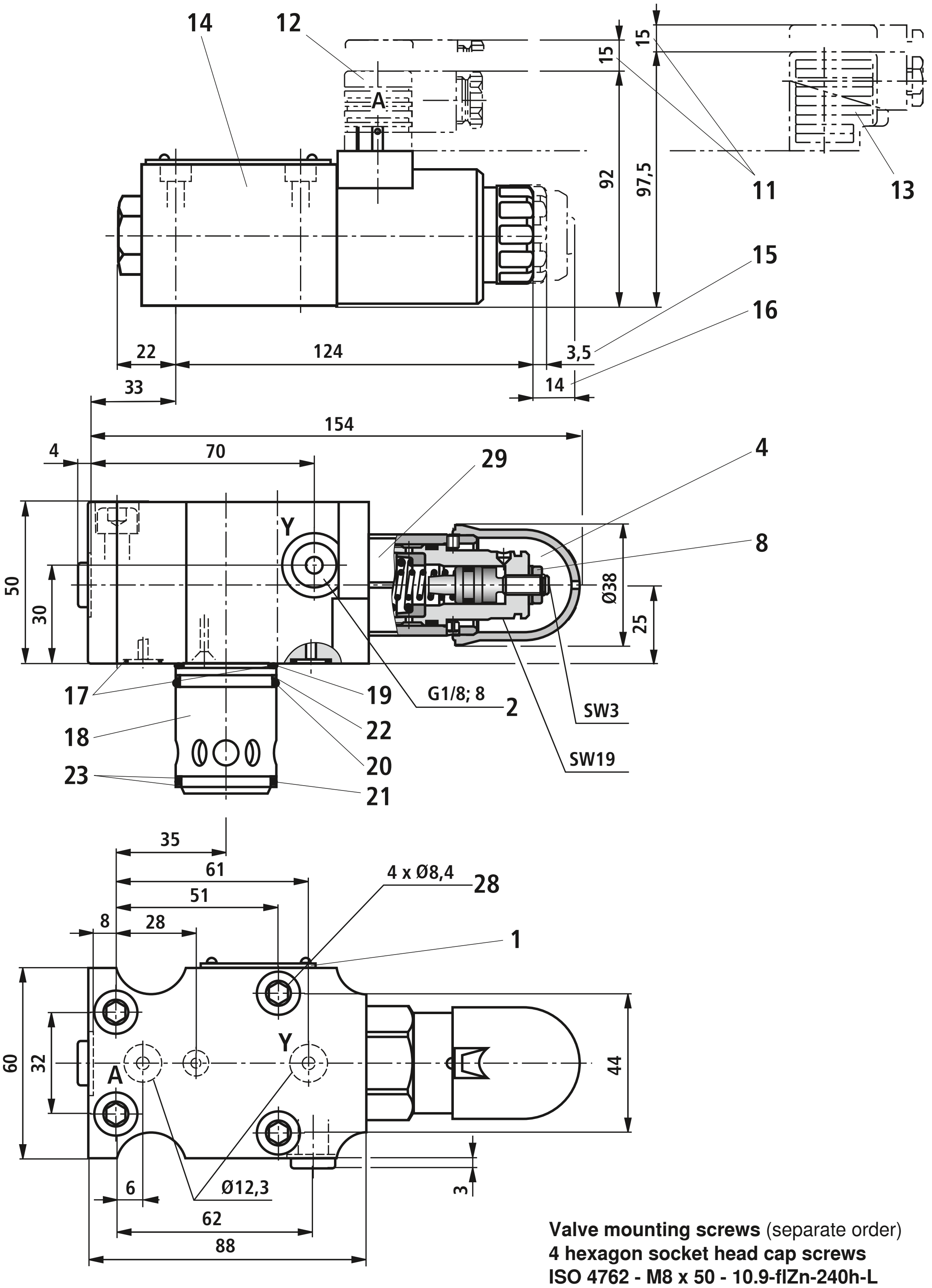


Required surface quality of the valve mounting face

Item explanations see page 20.
Valve mounting screws see page 15.

Size	L1	L2	L3	L4	L5	L6	L7	L8	L9	B1	B2	H1	H2	H3	H4	H5	ØD1
25	149	19	101.6	57.1	12.7	46	112.7	12	42	100	70	144	124	72	46	28	18
32	190	34	127	63.5	12.7	50.8	139.7	22.5	63	115	82.5	165	145	93	67	45	20

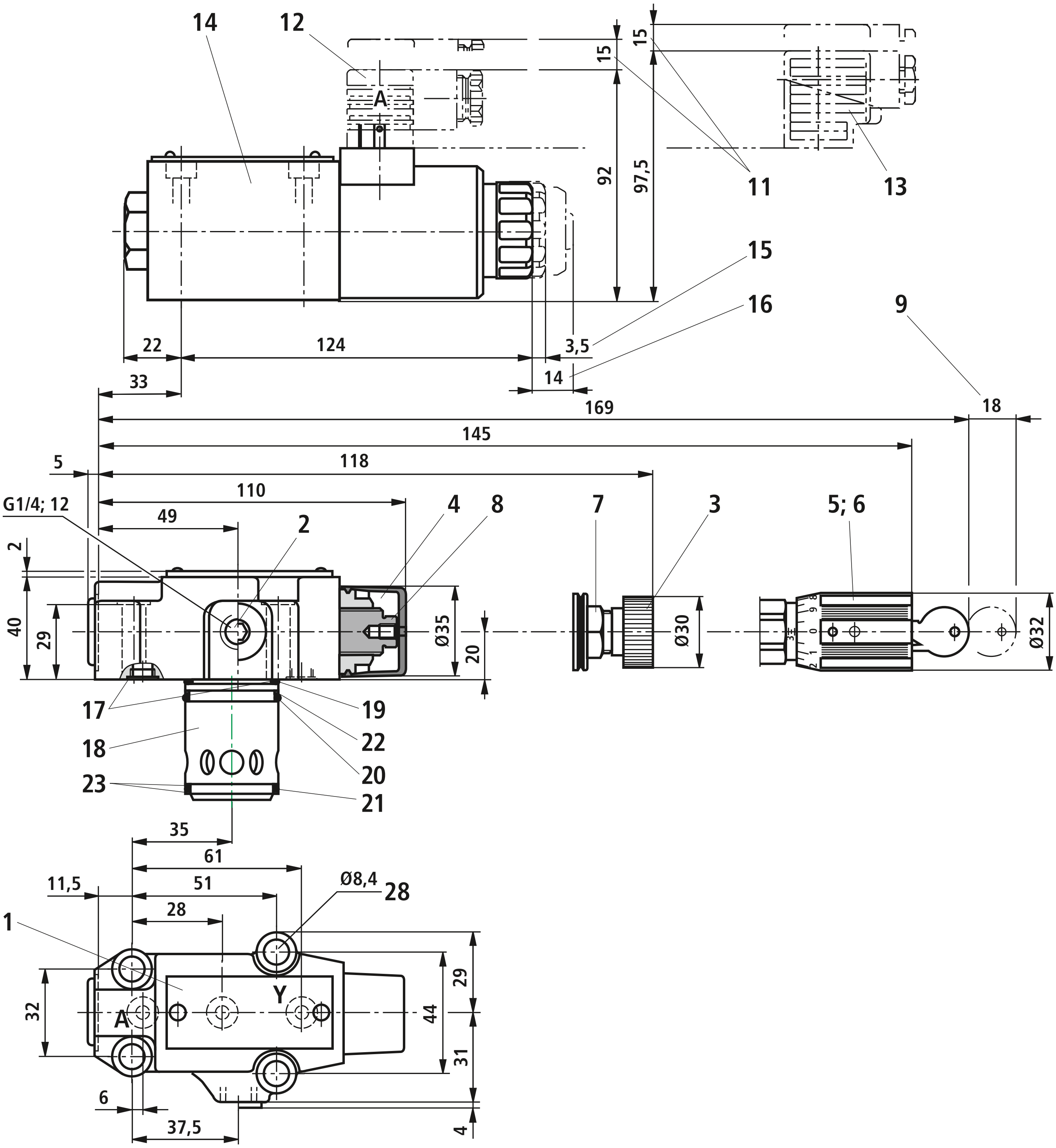
Unit dimensions: Type DA(W)C 30 …**FS**, installation valve (dimensions in mm)



Valve mounting screws (separate order)
4 hexagon socket head cap screws
ISO 4762 - M8 x 50 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_A = 30 Nm ±10 %,
material no. **R913000543**

Item explanations see page 20.
Installation bore, see page 19.

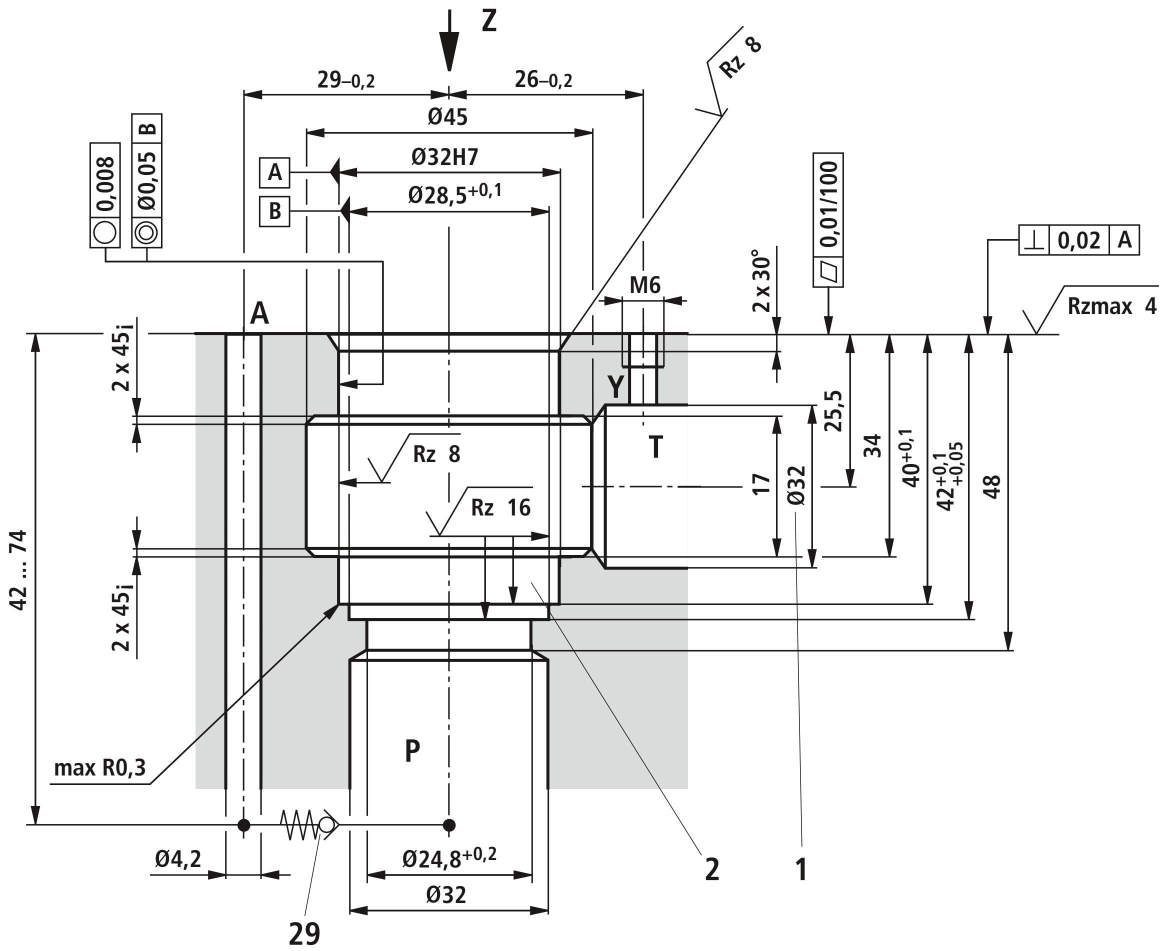
Unit dimensions: Type DA(W)C and DA(W)C 30; installation valve (dimensions in mm)



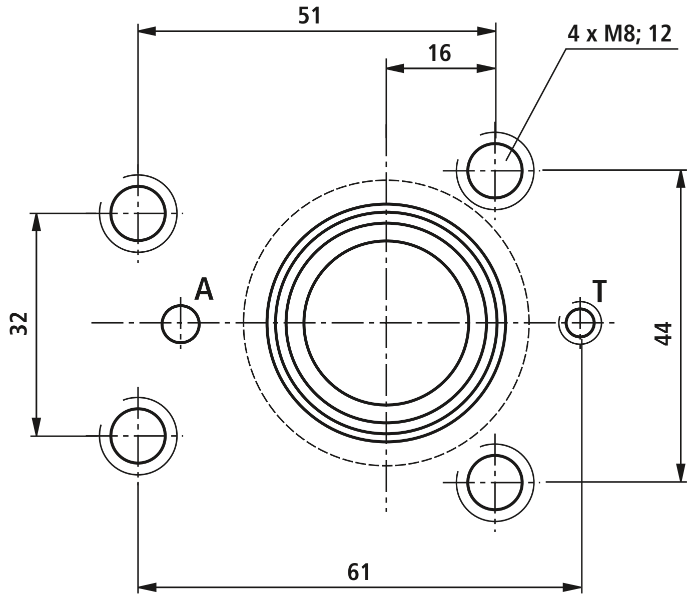
Valve mounting screws (separate order)
4 hexagon socket head cap screws
ISO 4762 - M8 x 40 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_A = 30 Nm ±10 %,
material no. **R913000205**

Item explanations see page 20.
Installation bore, see page 19.

Installation bore (dimensions in mm)



View "Z"



1 The Ø32 bore can tap a Ø45 bore at any point. However, it must be observed that the connection bore A and the mounting bore are not damaged!

2 A support ring and seal rings must be inserted into the bore before assembly of the main spool.

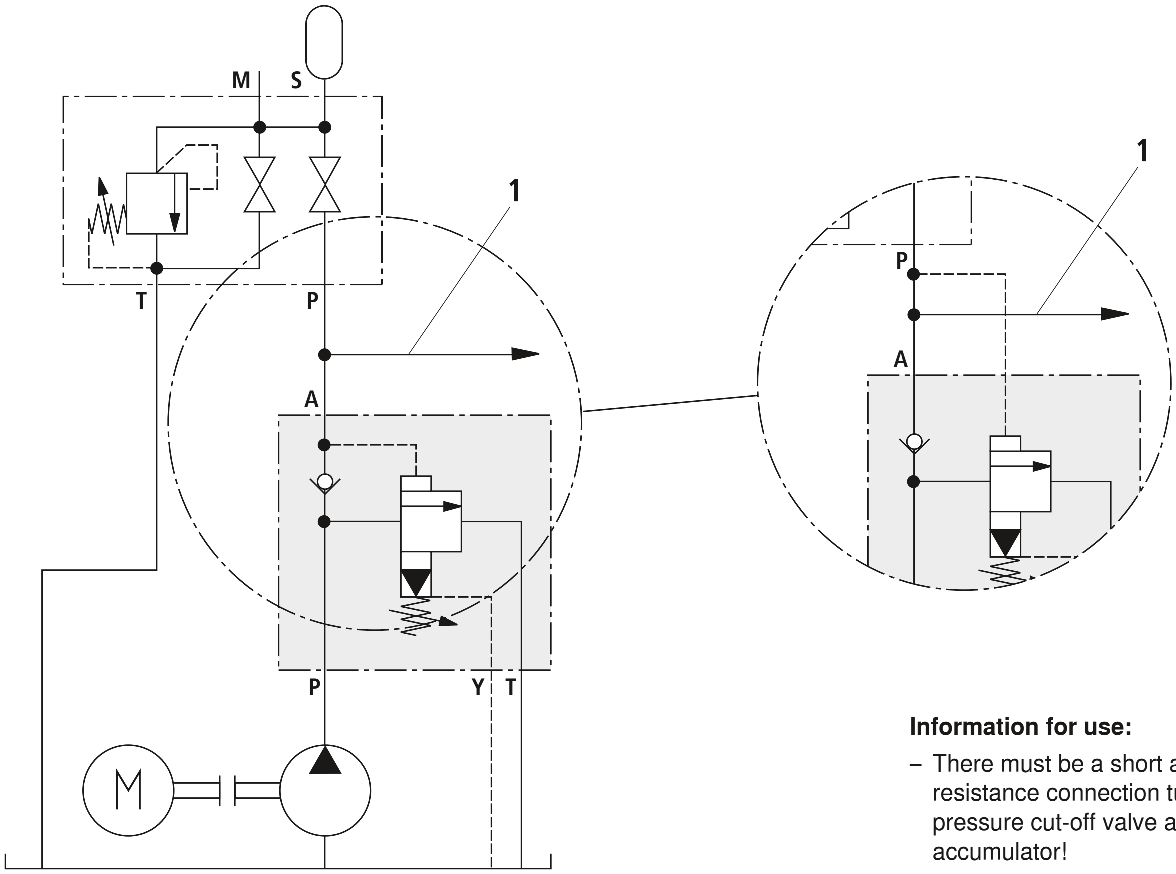
3 Check valve (separate order). When defining the position of the check valve and the pilot oil bore sufficient distance to the main spool insert bore must be kept.

Unit dimensions

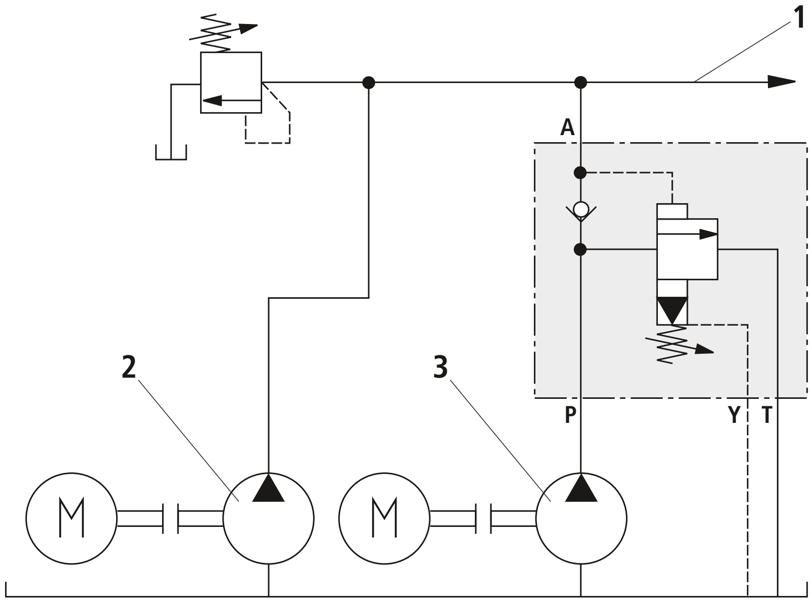
1 Name plate
2 Y port for pilot oil return, external
3 Adjustment type "1"
4 Adjustment type "2"
5 Adjustment type "3"
6 Adjustment type "7"
7 Lock nut SW22
8 Hexagon SW10
9 Space required to remove the key
10 Locking pin
11 Space required for removing the mating connector
12 Mating connector **without** wiring (separate order, see page 3)
13 Mating connector **with** wiring (separate order, see page 3)
14 Directional spool valve, size 6 (data sheet 23178)
15 Dimension for solenoid **without** manual override
16 Dimension for solenoid **with** manual override "**N**"
17 Identical seal rings for ports A, Y
18 Main spool
19 O ring
20 O ring
21 O ring
22 Support ring
23 Support ring
24 Omitted with internal pilot oil return
25 Identical seal rings for ports A, P, T
26 Integrated check valve
27 Check valve (sandwich plate)
28 Valve mounting bores (valve mounting screws see pages 13 to 18)
29 Tightening torque M_A = 60 Nm

Circuit examples

Hydraulic system with hydraulic accumulator



Hydraulic system with high and low pressure pump



Information for use:

- There must be a short and low-resistance connection tubing between pressure cut-off valve and hydraulic accumulator!
- With high line resistance, use version "DA…/SO80" (separate control line from pilot control valve to hydraulic accumulator)!
- With high pump flow and small switching pressure differential values (10 %) "Y" version valves should preferably be used.

Attention!

- Accumulators must only be operated with suitable accumulator safety equipment!
- For "FS" versions pressure relief function for the pump pressure (towards tank) is not directly available but only indirectly via check valve and control line in the actuator channel.
- Please observe the safety instructions for circuit configuration!

1 To the actuator
2 High pressure pump
3 Low pressure pump

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Pressure cut-off valve, pilot operated, with mechanical actuation

RE 18107-01/05.08
Replaces: 07.07

Type KAV (High Performance)

Component size 2
Component series A
Maximum operating pressure 350 bar
Maximum flow 140 l/min

H7200

Table of contents

Features

- Mounting cavity R/KAV.2
- High switching performance
- Available in 4 pressure ratings (50, 100, 200, 350 bar)
- Infinitely adjustable switching pressure differential
- Hexagon with protective cap
- Pilot control unit with main spool

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

KAV	2		2	A	A / A		–	V

Pressure cut-off valve, pilot operated

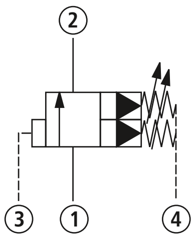
Adjustment element
Hexagon with protective cap **= 2**

Pressure rating
50 bar **= C**
100 bar **= F**
200 bar **= K**
350 bar **= R**

Component size **= 2**

4 main ports

Symbol



= A

A = Component series

A = High Performance and mounting cavity R/KAV.2 (see page 7)

No code = Without pressure pre-setting
– = With pressure pre-setting
P = with pressure pre-setting, lead-sealed

… = Upper switching pressure in bar [1)]

… = Lower switching pressure in bar [1)]

Seal material
V = FKM seals

[1)] Please enter values, see characteristic curves of "switching pressure differential" on page 5; required only for variant with pressure pre-setting (**"–"** or **"P"**):
The pressure is pre-set at
– a pump flow of approx. 10 l/min
– an actuator flow of approx. 2 l/min

Standard types

Pressure rating	Type	Material number
C	KAV2C2AA/AV	R901058924
F	KAV2F2AA/AV	R901058926
K	KAV2K2AA/AV	R901058929
R	KAV2R2AA/AV	R901058934

Function, section, symbol

General

Pressure control valves of type KAV are pilot operated pressure cut-off valves with infinitely variable switching pressure differentials.

They basically consist of a pilot stage (1) and main stage (2).

Function

The pump flow (main port ①) is fed via main port ③ to the accumulator of the system. When the actuator pressure in main port ③ rises above the set upper switching pressure, the connections to Y (main port ④) and T (main port ②) open, and the pump flow is changed over to pressureless circulation (① to ②). When the actuator pressure (main port ③) falls below the set lower switching pressure, the connections to Y (main port ④) and T (main port ②) close, the pump flow is again directed to the accumulator of the system.
When used as accumulator charging valve, a check valve (7) is required additionally, which closes the connection between main port ③ and main port ① in order to prevent the oil in the accumulator from flowing back.

When used for pressureless pump start-up, an additional bore Z is required in the mounting cavity (see page 6) in order to utilize port Z of the valve. A directional valve (8) must be connected between Z and Y (main port ④), which allows a remotely controlled cut-off (from main port ① to main port ②) below the set switching pressure.

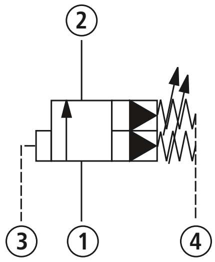
Adjustment of the switching pressure differential:

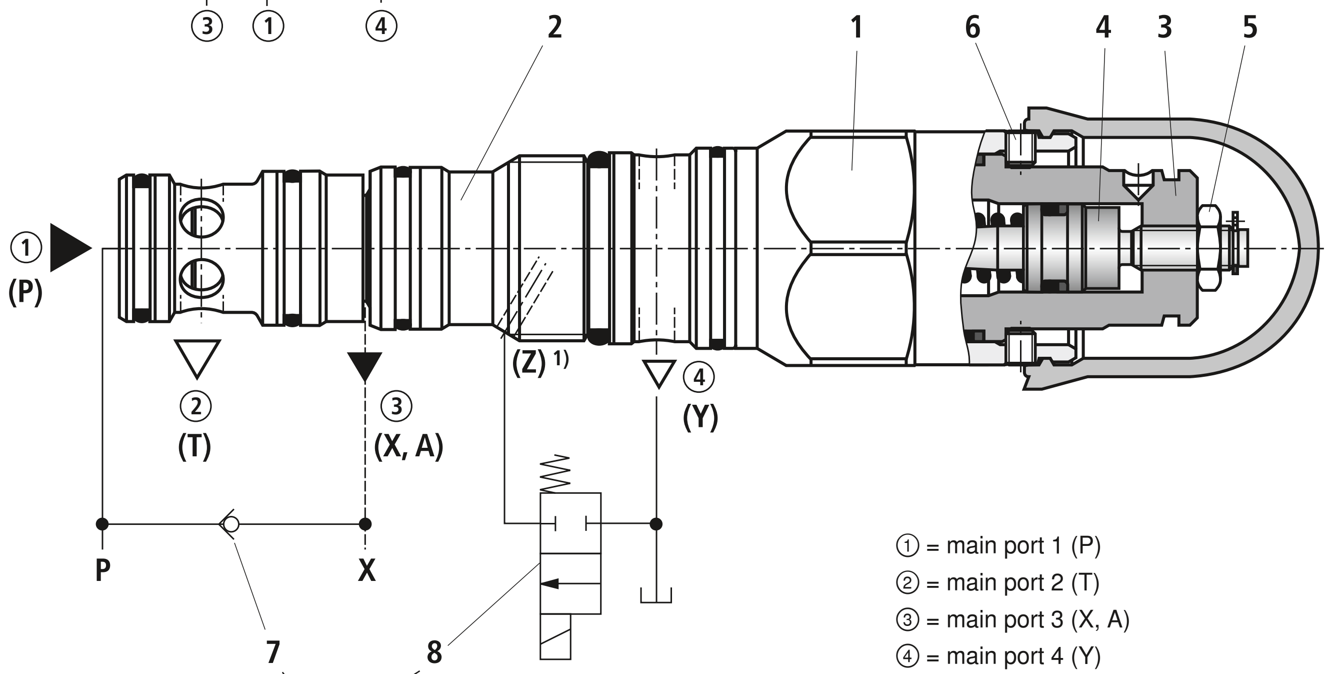
☞ **Note!** The valves are factory-set to a switching pressure differential of approx. 10 % to 12 % at nominal pressure. Settings of 8 % to 50 % of the nominal pressure are possible.

Adjustment spindle (3) is factory-set to the minimum upper switching pressure, i.e. the adjustment spindle is turned out to the mechanical limit stop. The upper switching pressure can be increased by turning adjustment spindle (3) in. The lower switching pressure differential is increased by turning adjustment spindle (4) in, which results in a reduction in the switching pressure differential. Turning adjustment spindle (4) out results in a reduction in the lower switches and hence in an increase in the switching pressure differential. The pressure setting is secured by clamping screw (6) and locknut (5).

For the adjustment range, see characteristic curve "switching pressure differential" on page 5.

Symbol





Not included in the scope of supply!
(see circuit examples on page 8)

① = main port 1 (P)
② = main port 2 (T)
③ = main port 3 (X, A)
④ = main port 4 (Y)

1) When used for pressureless pump start-up, port Z can be utilized in conjunction with a directional valve (see Mounting cavity on page 6).

Technical data (for applications outside these parameters, please consult us!)

General

Weight		kg	0.42
Installation position			Optional

Hydraulic

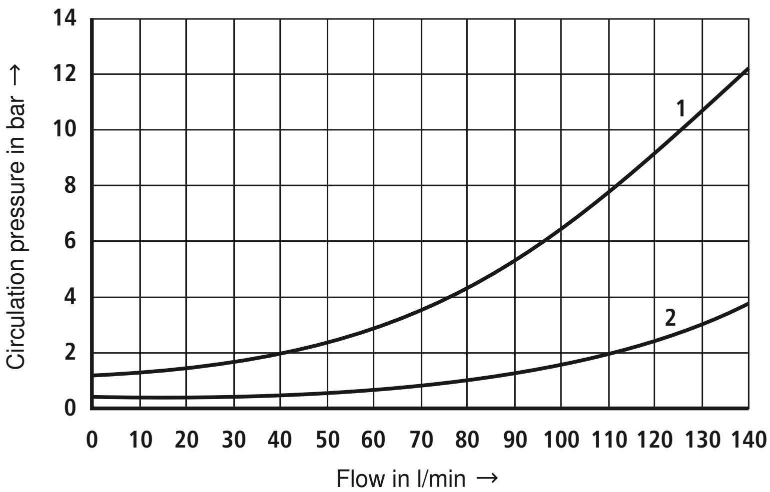
Maximum operating pressure		bar	350
Maximum set pressure	– Variant “C“	bar	50
	– Variant “F“	bar	100
	– Variant “K“	bar	200
	– Variant “R“	bar	350
Permissible maximum return line pressure	– Main port ② (T)	bar	200
	– Main port ④ (Y)	bar	100 [1)]
Maximum flow		l/min	140
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids on request
Hydraulic fluid temperature range		°C	–20 to +80
Viscosity range		mm^2/s	10 to 800
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [2)]
Load cycles			10 million

1) ⚠ **Attention!**
The applied pressure is added to the set pressure!
The switching pressure differential remains unchanged within the adjustment range.

2) The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves (measured with HLP46, ϑ_{oil} = 50 °C ±5 °C)

Circulation pressure in dependence on pump flow $q_{V\,P}$

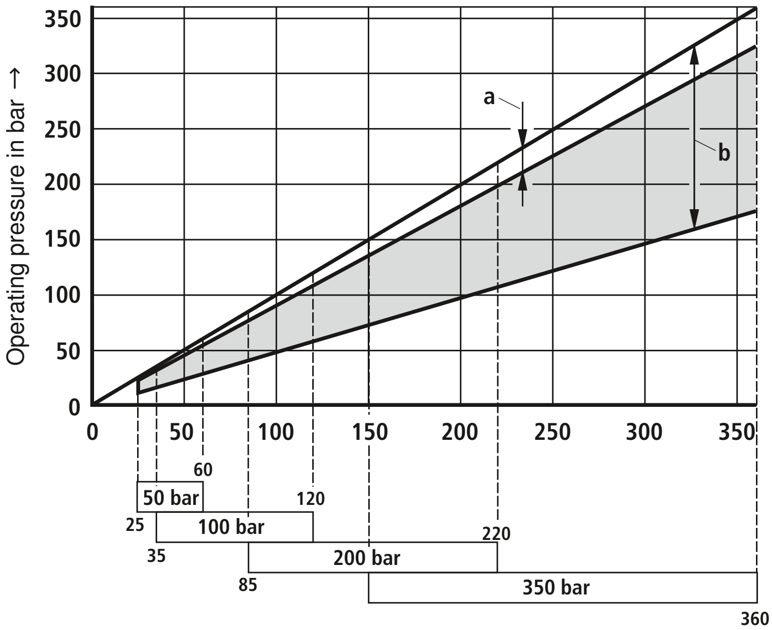


1 Circulation pressure for housing with supply and return diameter of 13 mm

2 Circulation pressure for pure cartridge resistance

Characteristic curves (measured with HLP46, ϑ_{oil} = 50 °C ±5 °C)

Switching pressure differential (P → X)

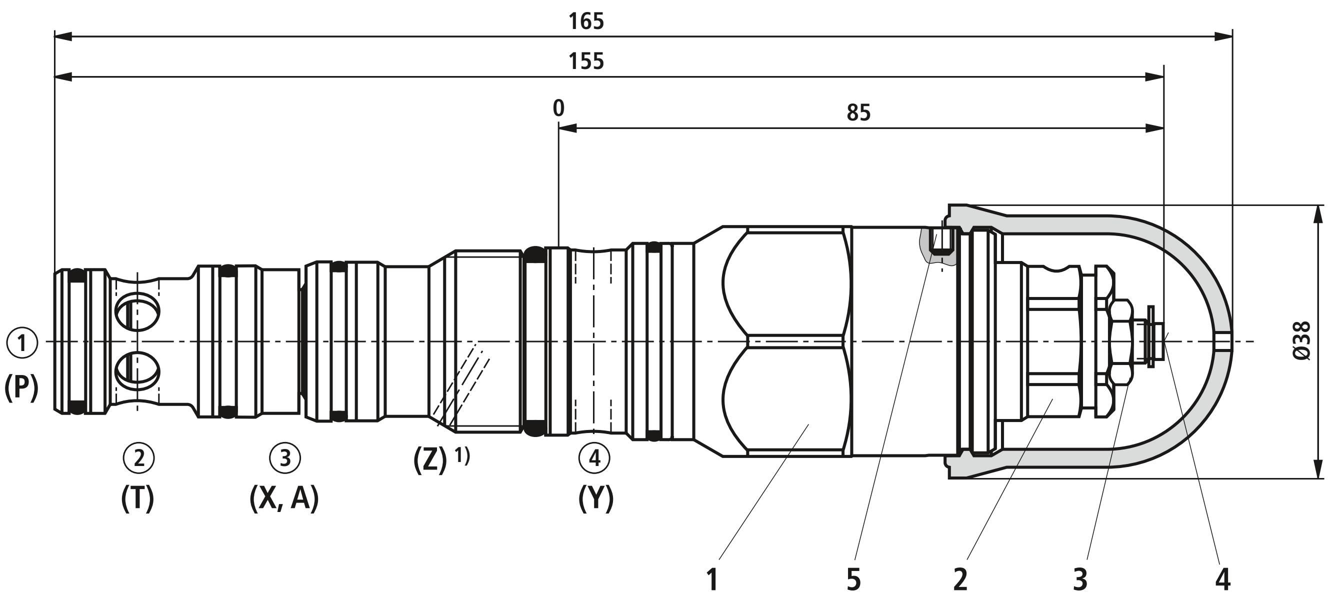


a Minimum switching pressure differential (8 % of nominal value)

b Maximum switching pressure differential (50 % of nominal value)

Adjustment range of switching pressure differential

Unit dimensions (dimensions in mm)



1 Hexagon A/F32
Tightening torque $\boldsymbol{M}_T$ = 60 Nm

2 Adjustment element “2“
Hexagon with protective cap A/F19

3 Hexagon A/F10

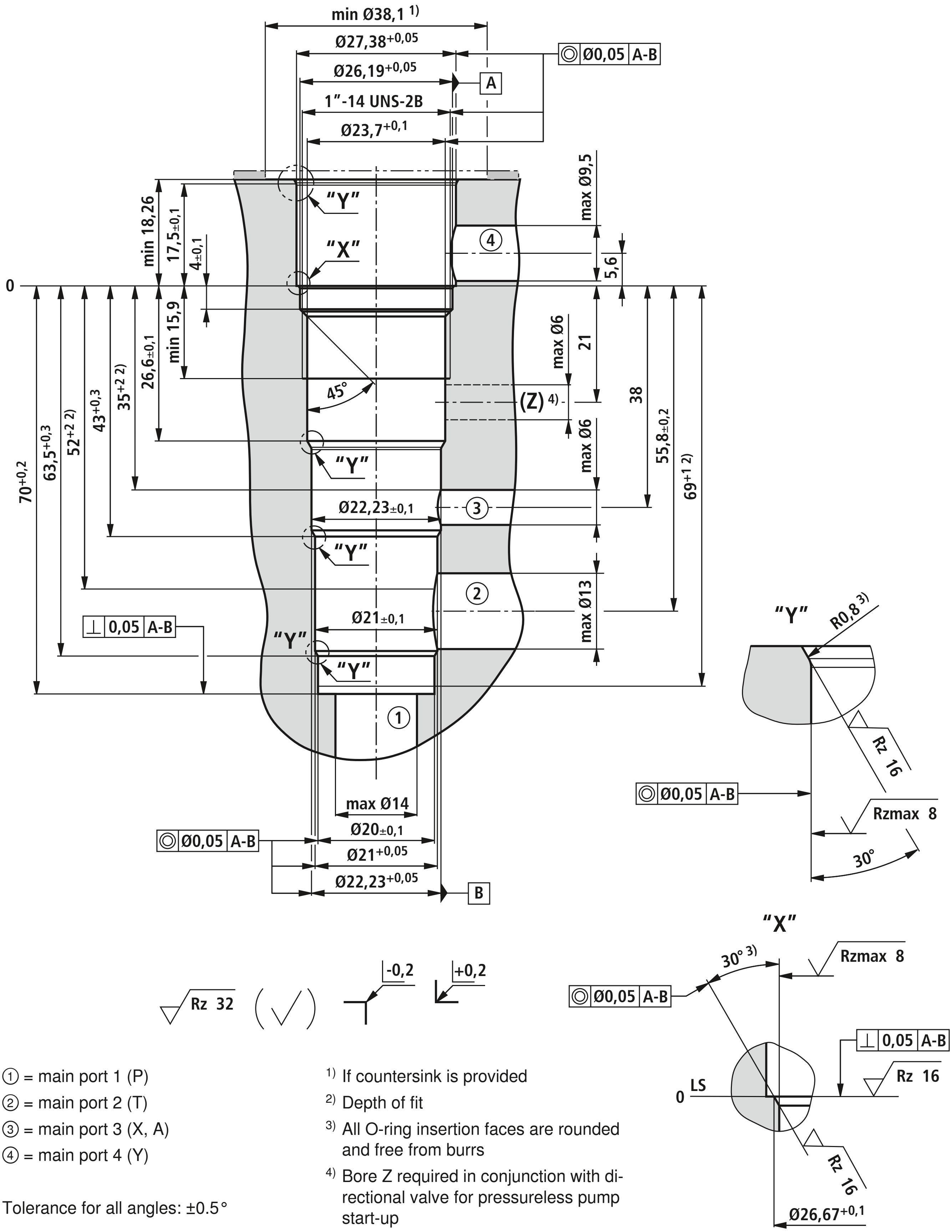
4 Hexagon socket A/F3

5 Lock screw A/F2

① = main port 1 (P)
② = main port 2 (T)
③ = main port 3 (X, A)
④ = main port 4 (Y)

1) When used for pressureless pump start-up, port Z can be utilized in conjunction with a directional valve (see Mounting cavity on page 6).

Mounting cavity R/KAV.2: 4 main ports; thread 1"-14 UNS-2B (dimensions in mm)



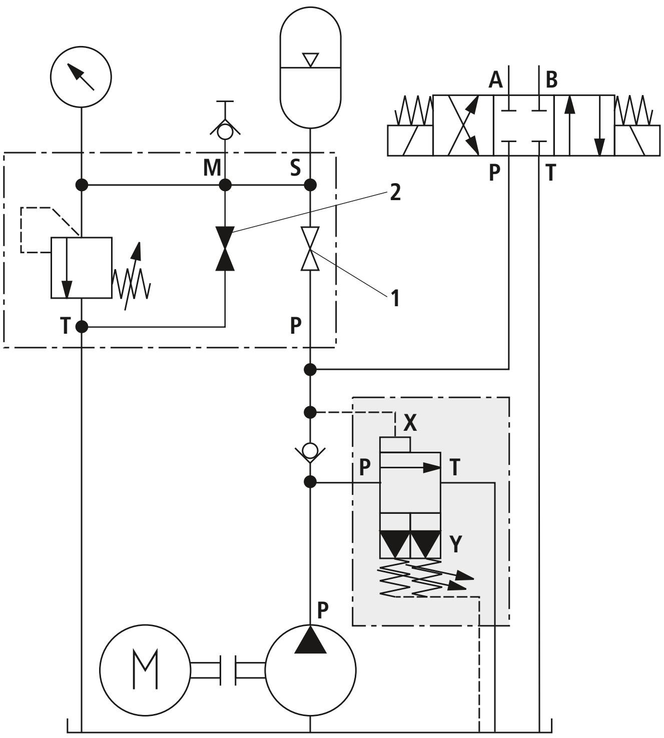
① = main port 1 (P)
② = main port 2 (T)
③ = main port 3 (X, A)
④ = main port 4 (Y)

Tolerance for all angles: ±0.5°

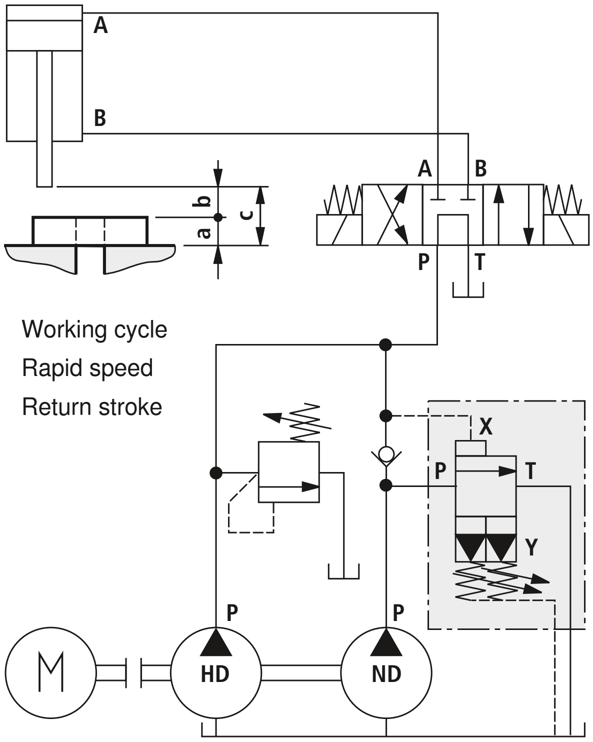
1) If countersink is provided
2) Depth of fit
3) All O-ring insertion faces are rounded and free from burrs
4) Bore Z required in conjunction with directional valve for pressureless pump start-up

Circuit examples

Hydraulic system with pressure accumulator

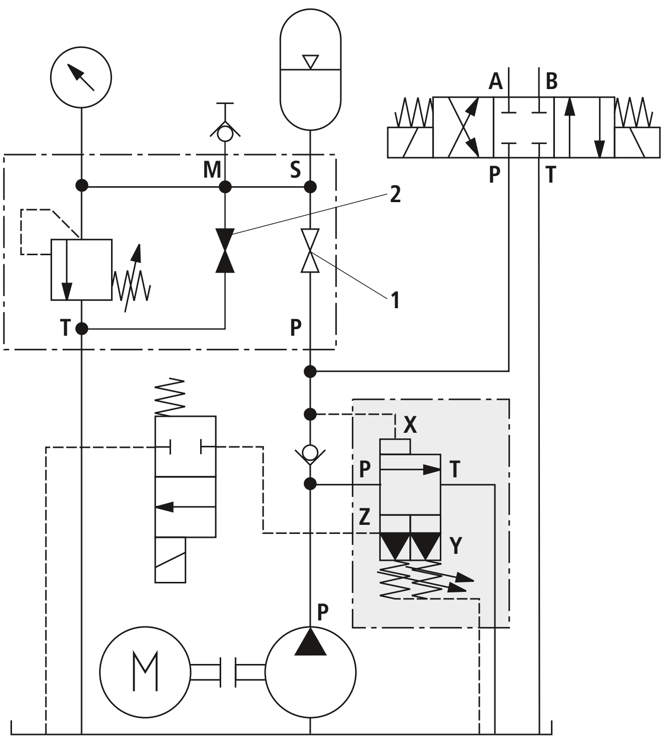


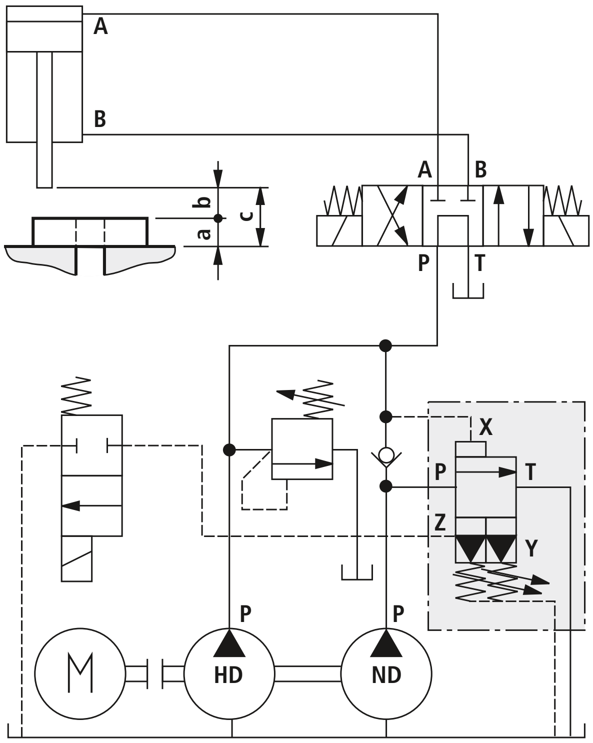
Hydraulic system with high and low pressure pump



a Working cycle
b Rapid speed
c Return stroke

… with directional valve (not included in the scope of supply!)





1 Keep always open!
Close only for maintenance work!

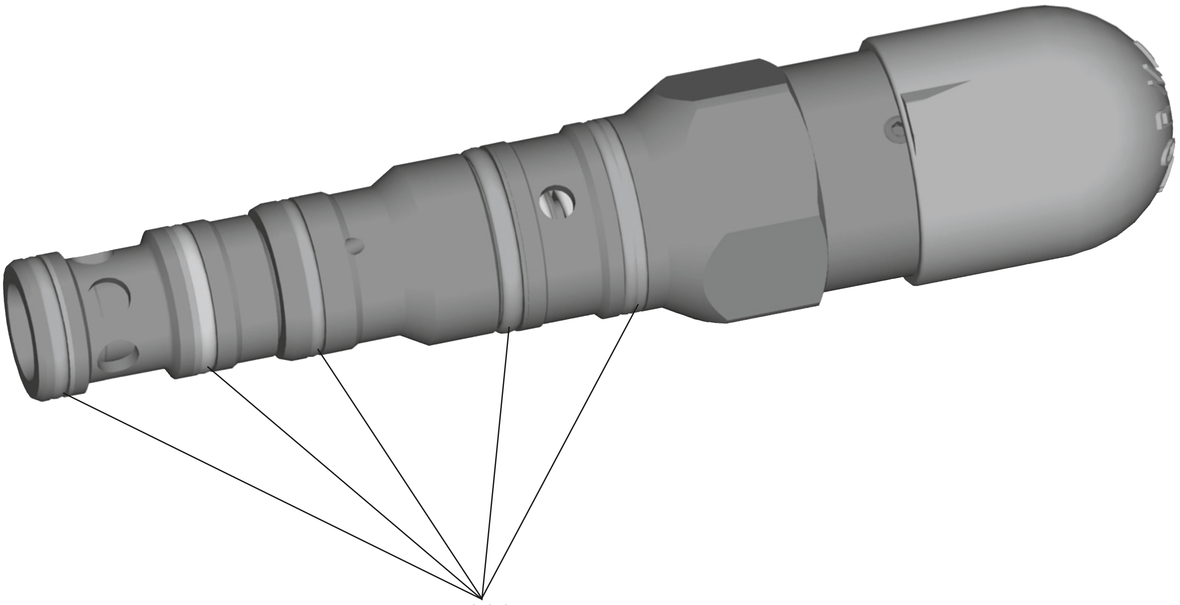
2 Keep always closed!
Open only for maintenance work!

☞ **Application note!**

Connect DA valve and hydraulic accumulators with short pipes

ensuring low resistance!

Available individual components



Item	Designation	Material no.
999	Valve seal kit	R961001575

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Pressure sequence valve, direct operated

Type DZ 6 DP

Nominal size 6
Series 5X
Maximum operating pressure 315 bar
Maximum flow 60 l/min

K 4297-9

Overview of contents

Contents	**Page**

Features

- For subplate mounting
- Connection location to DIN 24340 form A (without locating bore), (standard)
- Connection location to ISO 4401-03-02-0-05 (with locating bore), (ordering code .../60)
- Subplates see catalogue sheet RE 45052 (separate order)
- 5 pressure stages
- 4 adjustment elements, optional:
  - Rotary knob
  - Set screw with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- Check valve, optional

Informationen zu lieferbaren Ersatzteilen:
www.boschrexroth.com/spc

Order code

DZ 6 DP	– 5X /					*

Pressure sequence valve NG6, direct operated

Adjustment element

Rotary knob = **1**
Set screw with hexagon and protective cap = **2**
Lockable rotary knob with scale [1] = **3**
Rotary knob with scale = **7**

Series 50 to 59 = **5X**
(50 to 59: unchanged installation and connection dimensions)

Max. sequence pressure 25 bar = **25**
Max. sequence pressure 75 bar = **75**
Max. sequence pressure 150 bar = **150**
Max. sequence pressure 210 bar = **210**
Max. sequence pressure 315 bar = **315** [2]

No code = Internal pilot oil supply, internal leakage oil drain
X = External pilot oil supply, internal leakage oil drain
Y = Internal pilot oil supply, external leakage oil drain
XY = External pilot oil supply, external leakage oil drain

No code = **with** check valve
M = **without** check valve

Seal material
No code = NBR seals
V = FKM seals
(other seals on request)

⚠ **Attention!**
The compatibility of the seals and pressure fluid has to be taken into account!

No code = **without** locating pin hole
…/60 [3] **=** **with** locating pin hole

Further details in clear text

[1] H-key with Material No. **R900008158** is included within the scope of supply.

[2] Only with adjustment element „2“ and without check valve

[3] Locating pin ISO 8752-3x8-St, Material No. **R900005694** (separate order)

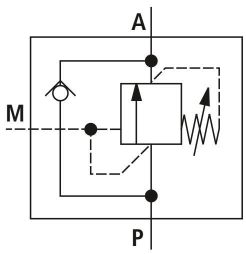
Standard types

Type	Material number
DZ 6 DP2-5X/25Y	R900403077
DZ 6 DP2-5X/75Y	R900481060
DZ 6 DP2-5X/150Y	R900481061
DZ 6 DP2-5X/210Y	R900481062
DZ 6 DP2-5X/315YM	R900513984

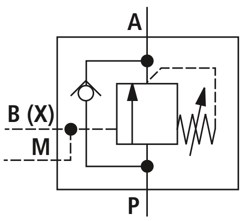
Preferred types and standard components are highlighted in the RPS (Standard Price list).

Symbols

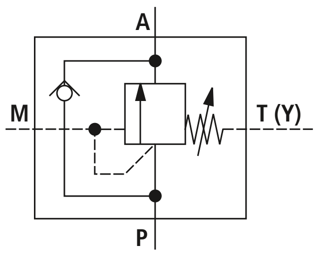
Version „No code“



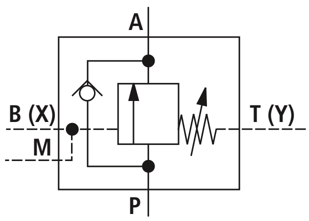
Version „X“



Version „Y“



Version „XY“



Function, section

The valve type DZ 6 DP is a direct operated pressure sequence valve. It is used for the pressure dependent connection of a second system. The setting of the sequence pressure is via the adjustment element (4).

The compression spring (3) holds the control spool (2) in its initial position, the valve is closed. The pressure in port P is applied to the piston area of the control spool (2) via the control line (6) at the opposite side to the spring (3).

When the pressure in port P reaches the set value of the spring (3), then the control spool (2) is moved to the left and the connection P to A is opened. The system connected to port A is connected without a pressure decrease occuring in port P.

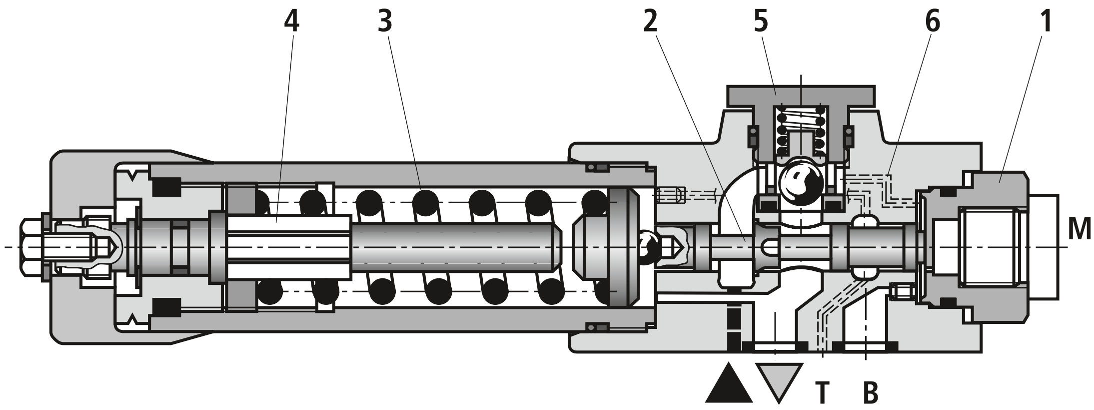
The control signal originates internally via the control line (6) from port P or externally via port B (X).

Depending on the use of the valve the leakage oil drain is externally via port T (Y) or internally via A.

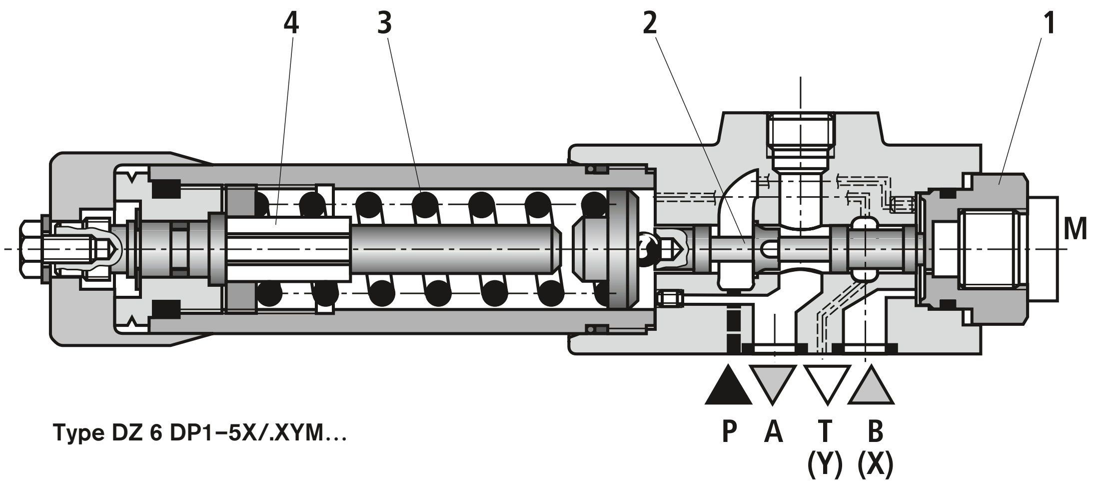
⚠ Attention!
With **internal** leakage oil drain the **set** opening pressure **increases** by the pressure present in port "A".

For the free return of the pressure fluid from port A to port P a check valve (5) may optionally be installed.

A pressure gauge port (1) enables the monitoring of the sequence pressure set at the valve.



Type DZ 6 DP1–5X/…



Type DZ 6 DP1–5X/.XYM…

Technical data (for applications outside these parameters, please consult us!)

General

Weight		kg	Approx. 1.2
Installation			Optional
Ambient temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)

Hydraulic

Maximum operating pressure	– Ports P, A, B (X)	bar	315
	– Ports T (Y)	bar	160
Maximum sequence pressure (adjustable)		bar	25; 75; 150; 210; 315
Maximum flow		l/min	60
Pressure fluid			Mineral oil (HL, HLP) to DIN 51524 [1]; Fast bio-degradable pressure fluids to VDMA 24568 (also see RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic ester) [2]; other pressure fluids on request
Pressure fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	10 to 800
Max. permissible degree of contamination of the hydraulic fluid – cleanliness class to ISO 4406 (c)			Class 20/18/15 [3]

[1] Suitable for NBR **and** FKM sesals

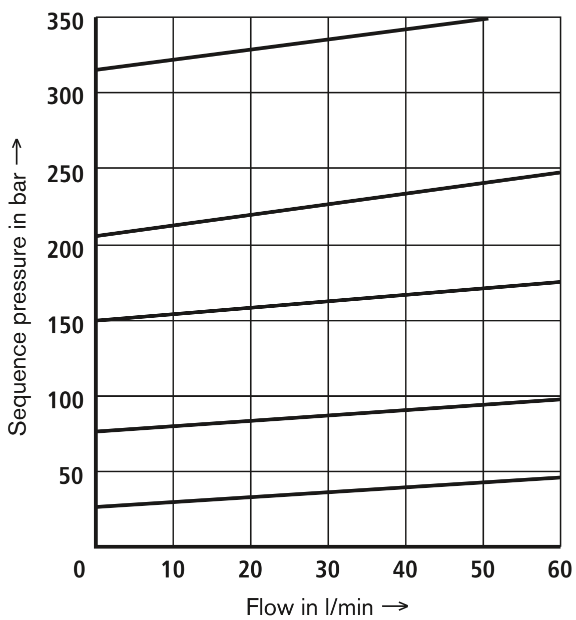
[2] **Only** suitable for FKM seals

[3] The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.

For the selection of filters see catalogue sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

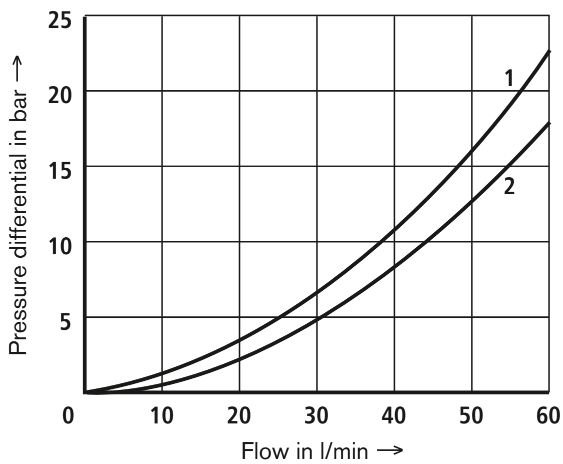
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

***p*-*q*$_V$-characteristic curves**



The characteristic curves are valid for the output pressure = zero over the entire flow range

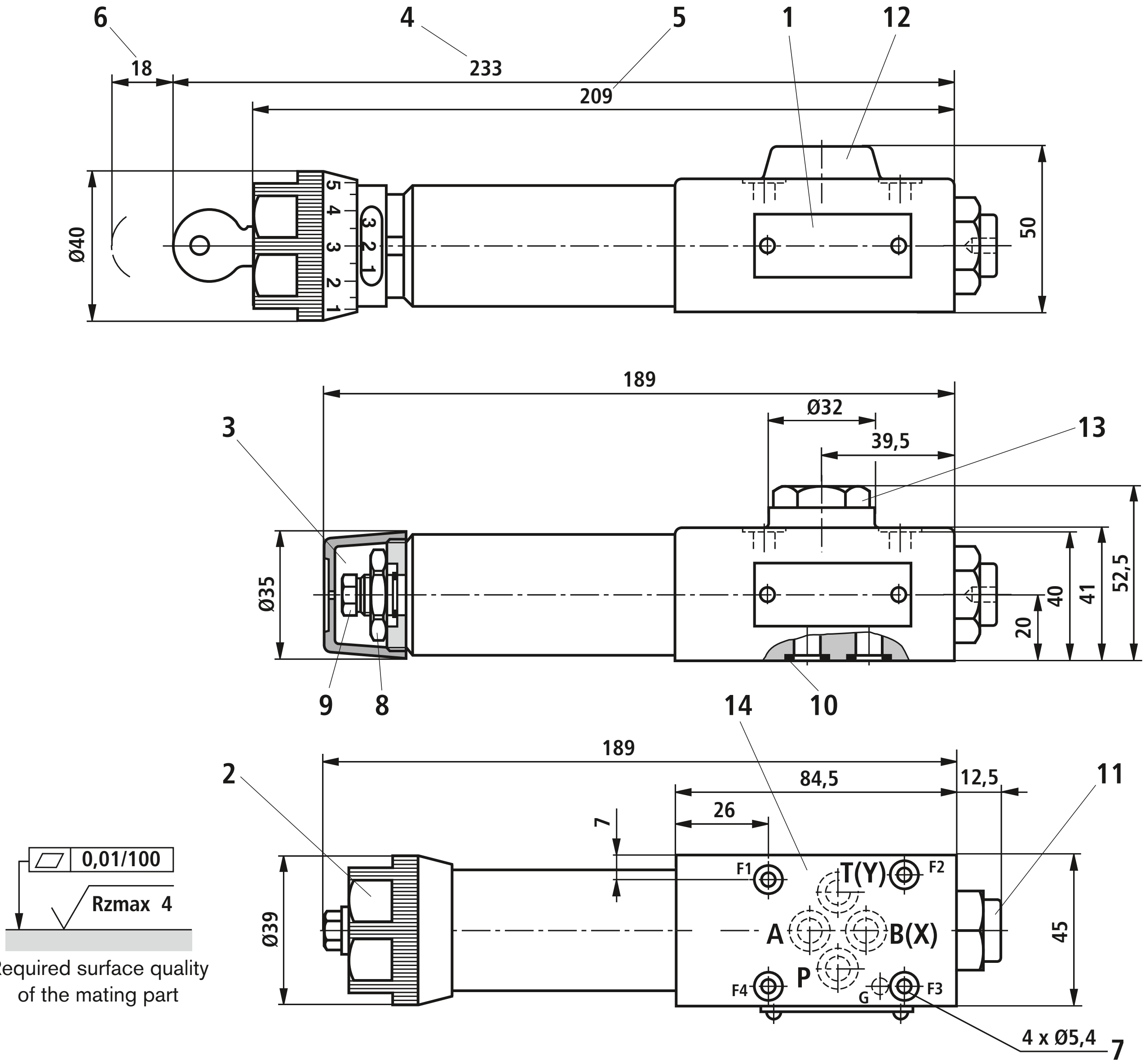
Δ*p*-*q*$_V$-characteristic curves



1 via check valve, flow from A to P

2 P to A

Unit dimensions (dirmensions in mm)



Required surface quality of the mating part

1 Name plate
2 Adjustment element „1“
3 Adjustment element „2“
4 Adjustment element „3“
5 Adjustment element „7“
6 Space required to remove the key
7 Valve fixing holes
8 Locknut 24A/F
9 Hexagon 10A/F
10 Same seal rings for ports A, B(X), P, T(Y)
11 Pressure gauge connection G1/4; 12 deep; internal hexagon 6A/F
12 Without check valve
13 With check valve
14 Connection location to DIN 24340 Form A (**without** locating bore), or ISO 4401-03-02-0-05 (**with** locating bore for locating pin ISO 8752-3x8-St, Material No. **R900005694**, order separately)

Subplates to data sheet RE 45052 (order separately)

(**without** locating bore)	G 341/01 (G1/4)
	G 342/01 (G3/8)
	G 502/01 (G1/2)
(**with** locating bore)	G 341/60 (G1/4)
	G 342/60 (G3/8)
	G 502/60 (G1/2)

Valve fixing screws (order separately)

4 socket head cap screws (SHCS)
ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
friction coefficient μ_{total} = 0.09 bis 0.14, tightening torque M_T = 7 Nm ± 10%, material number **R913000064**

Pipe thread (G..) to ISO 228/1

Notes

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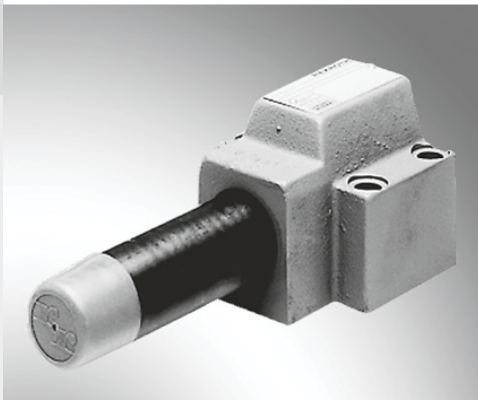
Rexroth
Bosch Group

Pressure sequence valve, direct operated

RE 26099/05.11
Replaces: 02.03

Type DZ 10 DP

Size 10
Component series 4X
Maximum operating pressure 210 bar
Maximum flow 80 l/min



K4786

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Information on available spare parts:
www.boschrexroth.com/spc

Features

– For subplate mounting
– Porting pattern according to ISO 5781-06-07-0-00
– 4 pressure ratings
– 4 adjustment types:
  • Rotary knob
  • Setscrew with hexagon and protective cap
  • Lockable rotary knob with scale
  • Rotary knob with scale
– With pressure gauge connection
– Check valve, optional

– More information:
  • Subplates Data sheet 45062

Ordering code

DZ 10 DP		–4X /				*

Pressure sequence valve, direct operated, size 10

Adjustment type

Rotary knob	**= 1**
Setscrew with hexagon and protective cap	**= 2**
Lockable rotary knob with scale	**= 3** [1]
Rotary knob with scale	**= 7**

Component series 40 to 49 **= 4X**
(40 to 49: unchanged installation and connection dimensions)

Maximum sequencing pressure

25 bar	**= 25**
75 bar	**= 75**
150 bar	**= 150**
210 bar	**= 210**

No code =	Pilot oil supply internal, leakage oil discharge internal
X =	Pilot oil supply external, leakage oil discharge internal
Y =	Pilot oil supply internal, leakage oil discharge external
XY =	Pilot oil supply external, leakage oil discharge external

No code =	With check valve
M =	Without check valve

Seal material

No code =	NBR seals
V =	FKM seals

(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

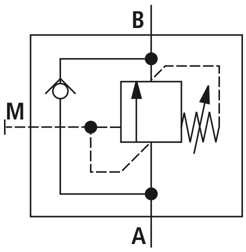
Further details in the plain text

Standard types and standard units are contained in the EPS (standard price list).

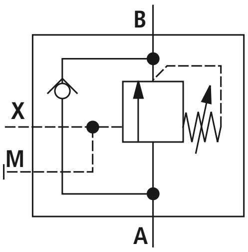
[1] H-key with Material no. **R900008158** is included in the delivery.

Symbols

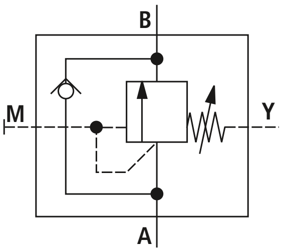
"No code" version



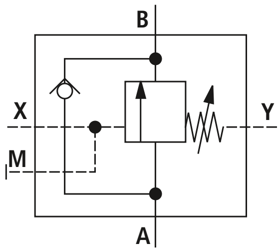
"X" version



"Y" version



"XY" version



Function, section

The valve type DZ 10 DP is a direct operated pressure sequence valve. It is used for the pressure-dependent sequencing of a second system. The sequencing pressure is set via the adjustment type (1).

The compression spring (2) holds the control spool (3) in the initial position - the valve is blocked. Via the pilot line (4), the pressure in channel A is applied to the spool face of the control spool (3) vis-à-vis the compression spring (2).

If the pressure in channel A reaches the set value of the compression spring (2), the control spool (3) is pushed to the right and the connection A to B is opened. The system connected at channel B is sequenced without a drop of the pressure in channel A.

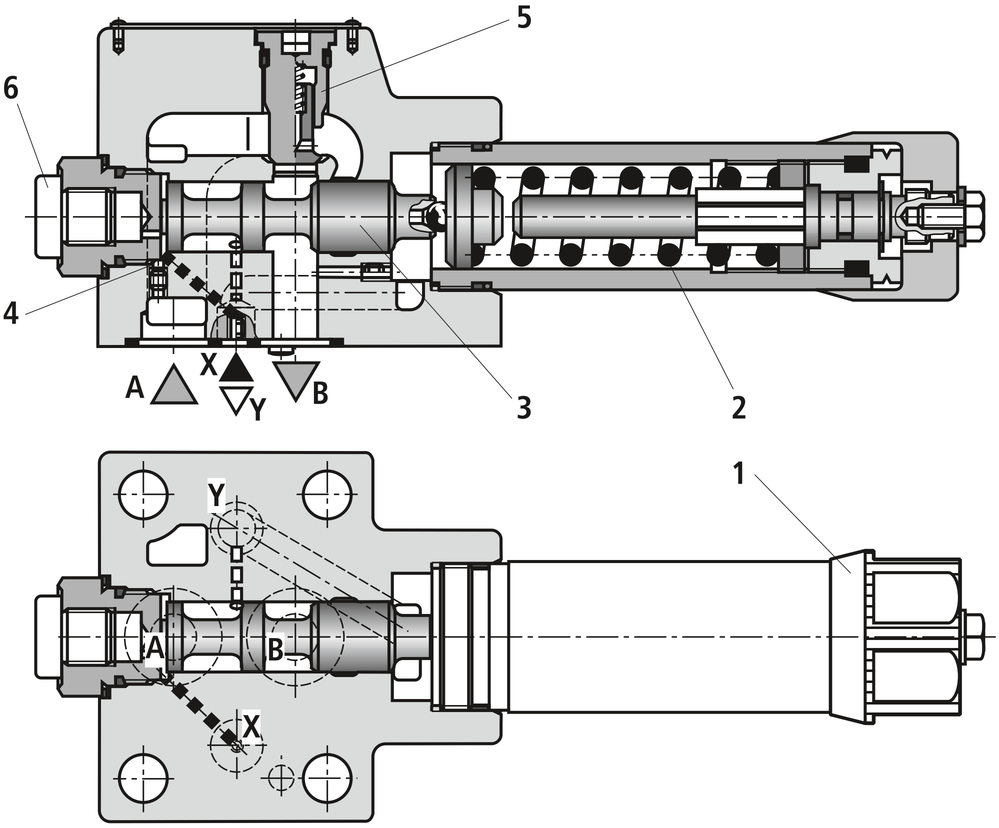
The control signal is provided internally, via the control line (4) from channel A, or externally, via port X.

Depending on the valve use, the leakage oil discharge is designed externally, via port Y or internally, via B.

Attention!
With **internal** leakage oil discharge, the **set** cracking pressure is increased by the pressure in channel B.

For the free flow back of the hydraulic fluid from channel B to channel A, you can optionally install a check valve (5).

A pressure gauge connection (6) allows for the control of the sequencing pressure at the valve.



Type DZ 10 DP1-4X/.XY..

Technical Data (For applications outside these parameters, please consult us!)

general

Weight	kg	Approx. 3
Installation position		Any
Ambient temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)

hydraulic

Maximum operating pressure – Port A, X	bar	210
– Port Y	bar	160
Maximum sequencing pressure (adjustable)	bar	25; 75; 150; 210
Maximum flow	l/min	80
Hydraulic fluid		See table below
Hydraulic fluid temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range	mm^2/s	10 to 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!

– For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!

– There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

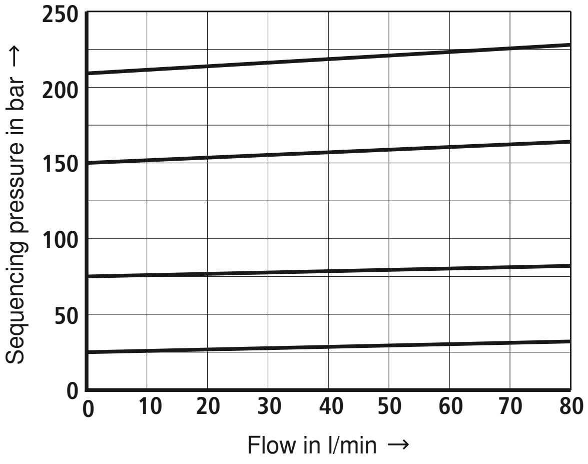
– **Flame-resistant – water-containing**:
- Maximum operating pressure 210 bar
- Maximum hydraulic fluid temperature 60 °C
- Expected service life as compared to HLP hydraulic oil 30 % to 100 %

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

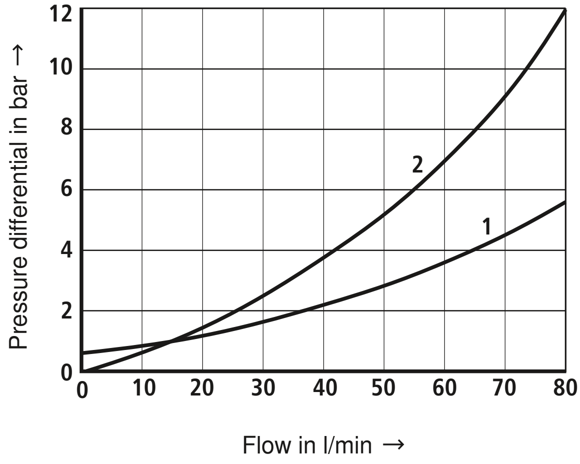
For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

p-q_V characteristic curves



Δp-q_V characteristic curves

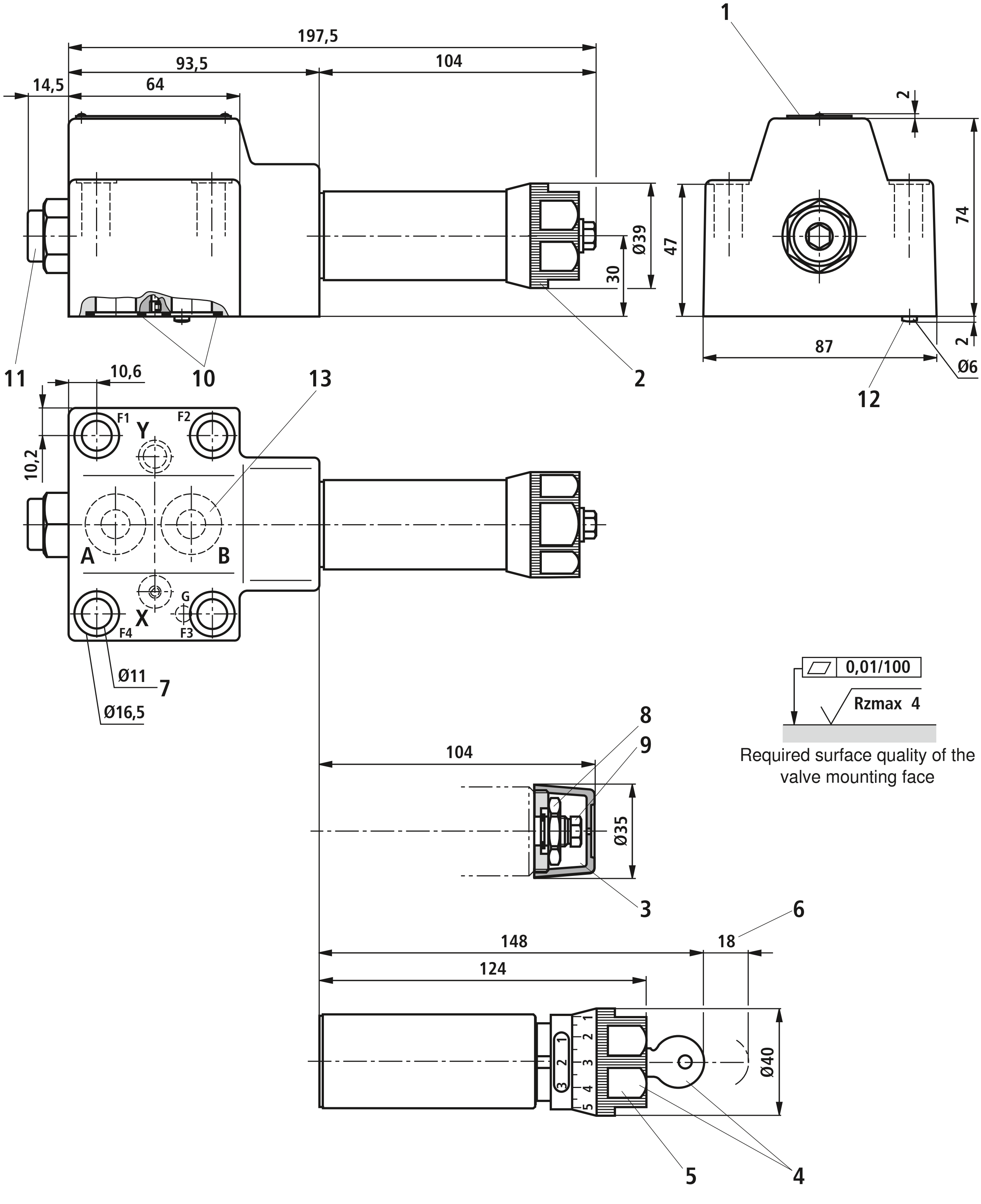


The characteristic curves apply to the pressure at the valve output p = 0 bar across the entire flow range.

1 Via check valve B to A

2 A to B

Unit dimensions (dimensions in mm)



Item explanations, subplates, and valve mounting screws see page 7.

Unit dimensions

1 Name plate
2 Adjustment type "1"
3 Adjustment type "2"
4 Adjustment type "3"
5 Adjustment type "7"
6 Space required to remove the key
7 Valve mounting bores
8 Lock nut SW24
9 Hexagon SW10
10 Identical seal rings for ports A and B
Identical seal rings for ports X and Y
11 Pressure gauge connection G1/4, 12 deep;
Internal hexagon SW6;
Tightening torque M_A = 20 Nm ±10 %
12 Locating pin
13 Porting pattern according to ISO 5781-06-07-0-00

Subplates according to data sheet 45062 (separate order)
G 460/01 (G3/8)
G 461/01 (G1/2)

Valve mounting screws
(separate order)

4 hexagon socket head cap screws
ISO 4762 - M10 x 60 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 60 Nm ±10 %,
Material No. **R913000116**

Notes

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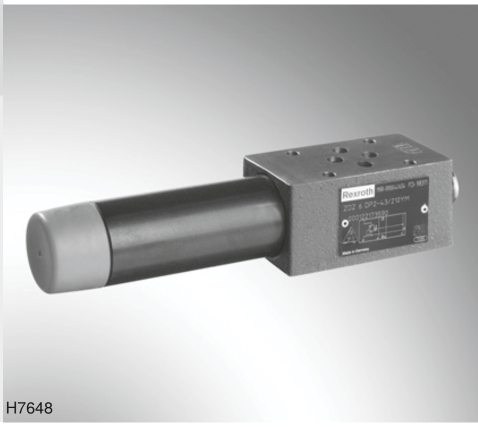
Pressure sequence valve, direct operated

RE 26088/01.09

Type ZDZ

Size 6
Component series 4X
Maximum operating pressure 210 bar
Maximum flow 60 l/min



H7648

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Contents	**Page**

Information on available spare parts:
www.boschrexroth.com/spc

Features

– Sandwich plate valve
– Porting pattern according to DIN 24340 form A (**without** locating bore), (standard)
– Porting pattern according to ISO 4401-03-02-0-05 (**with** locating bore), (order designation .../**60**)
– Subplates see data sheet RE 45052 (separate order)
– 4 pressure ratings
– 4 adjustment types, optionally:
  • Rotary knob
  • Threaded pin with hexagon and protective cap
  • Lockable rotary knob with scale
  • Rotary knob with scale
– Check valve, optional

Ordering code

Z	DZ	6	D		–4X/		Y				*

Sandwich plate valve

Pressure sequence valve

Size 6 **= 6**

Direct operated **= D**

Pressure reduction in channel P **= P**
Pressure reduction in channel A **= A**

Adjustment type
Rotary knob **= 1**
Threaded pin with hexagon and protective cap **= 2**
Lockable rotary knob with scale [1] **= 3**
Rotary knob with scale **= 7**

Component series 40 to 49 **= 4X**
(40 to 49: unchanged installation and connection dimensions)

Pressure rating
Maximum sequencing pressure 25 bar **= 25**
Maximum sequencing pressure 75 bar **= 75**
Maximum sequencing pressure 150 bar **= 150**
Maximum sequencing pressure 210 bar **= 210**

Y = Pilot oil supply internal, pilot oil return external

No code = With check valve [3]
M [2] **=** Without check valve

Seal material
No code = NBR seals
V = FKM seals
(other seals at request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

No code = **Without** locating bore
/60 [4] **=** **With** locating bore

Further details in the plain text

[1] H key with material no. **R900008158** is included in the delivery.

[2] Please enter for version “P”

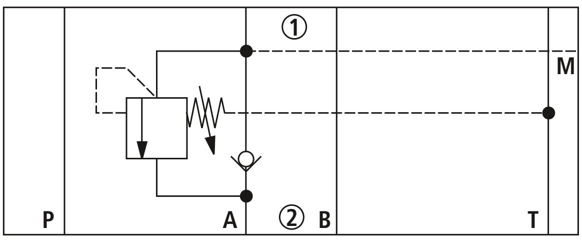
[3] Only for version “A”

[4] Locating pin ISO 8752-3x8-St, material no. **R900005694** (separate order)

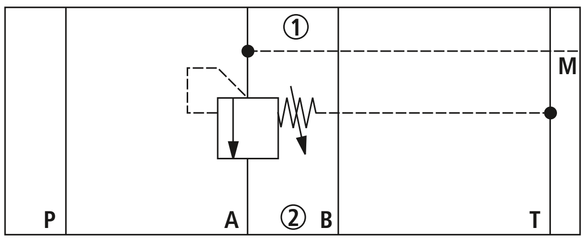
Standard types and components are contained in the EPS (standard price list).

Symbols (① = device side, ② = plate side)

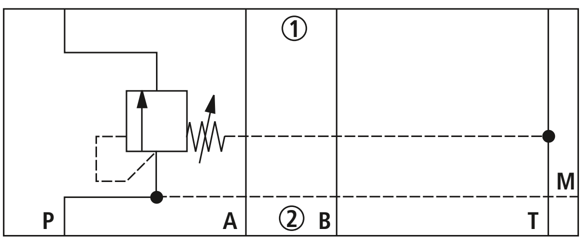
Type ZDZ 6 DA.-4X/.Y…



Type ZDZ 6 DA.-4X/.YM…



Type ZDZ 6 DP.-4X/.YM…



Function, section

The valve type ZDZ is a direct operated pressure sequence valve in sandwich plate design. It is used for the pressure-dependent sequencing of a second system. The sequencing pressure is set using the adjustment element (4).

Version “P”

The compression spring (3) holds the control spool (2) in the initial position - the valve is blocked. Via the pilot line (5), the pressure in channel P② is applied to the spool face of the control spool (2) opposite the compression spring (3).

When the pressure in channel P② reaches the set value of the compression spring (3), the control spool (2) is pushed to the left and the connection P② to P① is opened. The system connected at channel P① is sequenced without a drop of the pressure in channel P②.

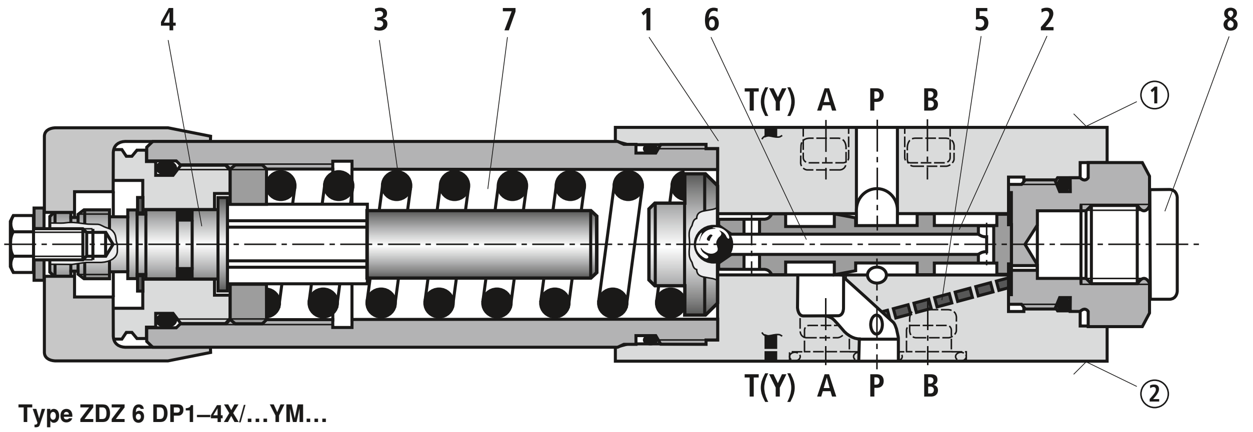
The pilot oil return from the spring chamber (7) is always effected externally via the bore (6) to channel T (Y).

A pressure gauge connection (8) allows checking of the sequencing pressure at the valve.

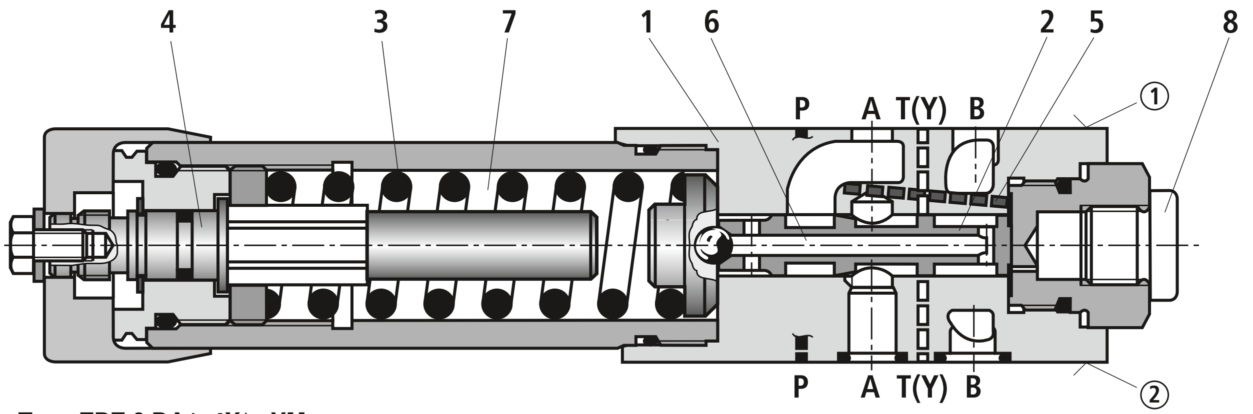
Version “A”

Here, the pressure is sequenced in channel A. Control signal and pilot fluid are provided internally, from channel A①.

For free return flow of the hydraulic fluid from A② to A①, a check valve can be installed as option.



Type ZDZ 6 DP1–4X/…YM…



Type ZDZ 6 DA1–4X/…YM

① = Component side
② = Plate side

Technical data (For applications outside these parameters, please consult us!)

general

Weight	kg	approx. 1.2
Installation position		any
Ambient temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)

hydraulic

Maximum operating pressure – Port P, A, B	bar	210
– Port T (Y)	bar	160
Maximum sequencing pressure (adjustable)	bar	25; 75; 150; 210
Maximum flow	l/min	60
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524 [1]; quickly bio-degradable hydraulic fluids according to VDMA 24568 (also see RE 90221); HETG (rape seed oil) [1]; HEPG ((polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids upon request
Hydraulic fluid temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range	mm^2/s	10 to 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [3]

1) Suitable for NBR and FKM seals

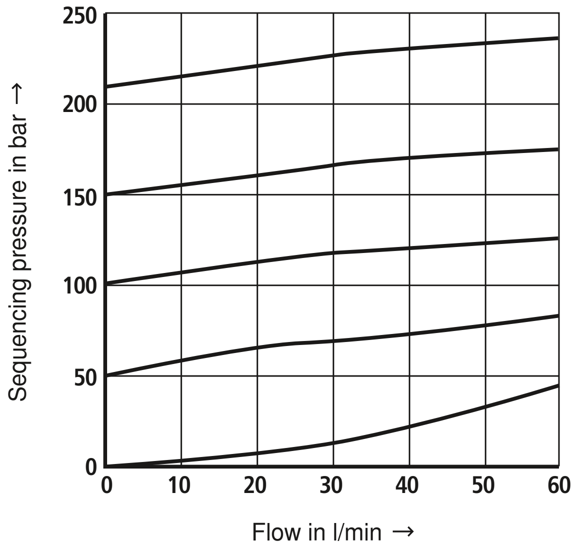
2) Only suitable for FKM seals

3) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Efficient filtration prevents malfunctions and at the same time prolongs the service life of components.

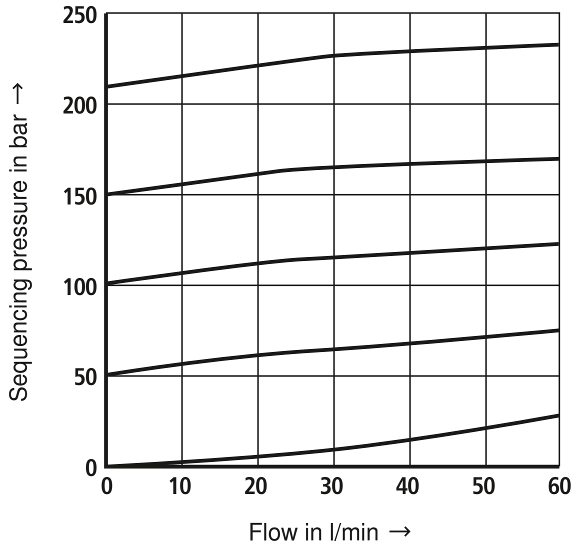
For the selection of the filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Version "P"
***p*-q_V characteristic curves**

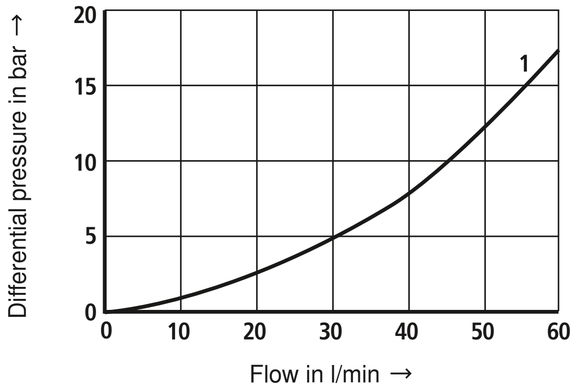


Version "A"
***p*-q_V characteristic curves**

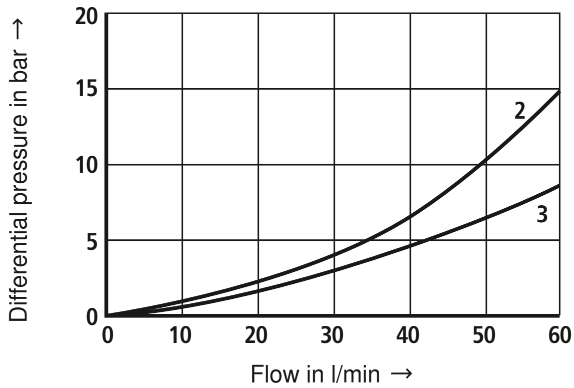


The characteristic curves apply to initial pressure = zero in the entire flow range!

Version "P"
***Δp*-q_V characteristic curves**



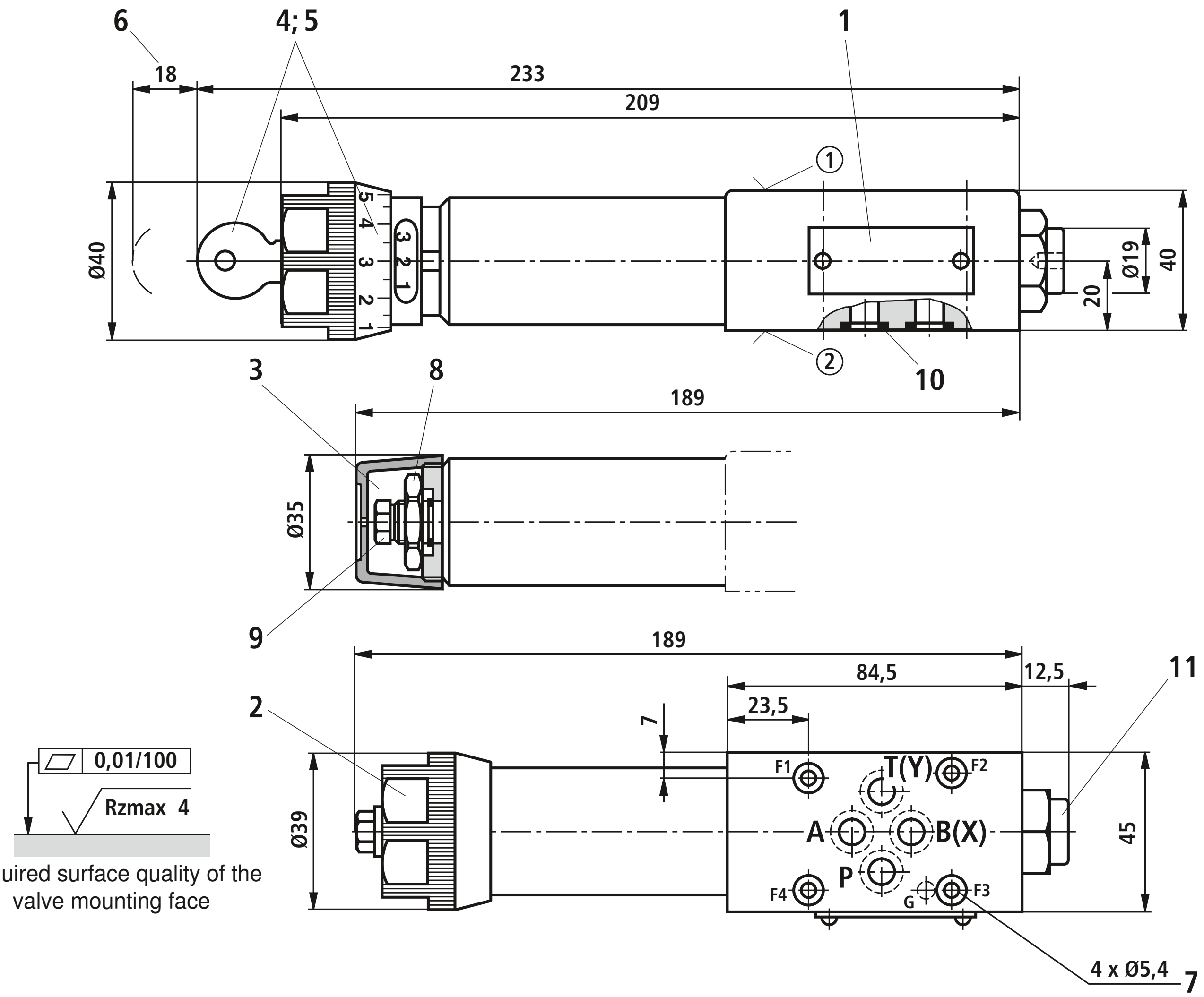
Version "A"
***Δp*-q_V characteristic curves**



1 P① to P②

2 A① to A②
3 Via check valve A② to A①

Unit dimensions: Version “P” (dimensions in mm)



Required surface quality of the valve mounting face

① Device side – porting pattern according to DIN 24340 form A (**without** locating bore), or ISO 4401-03-02-0-05 (**with** locating bore Ø4 x 4 mm deep)

② Plate side – porting pattern according to DIN 24340 form A (**without** locating bore), or ISO 4401-03-02-0-05 (**with** locating bore for locating pin ISO 8752-3x8-St, material no. **R900005694**, separate order)

1 Nameplate
2 Adjustment type “1”
3 Adjustment type “2”
4 Adjustment type “3”
5 Adjustment type “7”
6 Dimensions required to remove the key
7 Valve mounting bores
8 Lock nut 24 A/F
9 Hexagon 10 A/F
10 Identical seal rings for ports A②, B②, P②, T②(Y)
11 Pressure gauge connection G1/4, 12 deep; internal hexagon 6 A/F

Subplates according to data sheet RE 45052 (separate order)

(**without** locating hole)	G 341/01 (G1/4)
	G 342/01 (G3/8)
	G 502/01 (G1/2)
(**with** locating hole)	G 341/60 (G1/4)
	G 342/60 (G3/8)
	G 502/60 (G1/2)

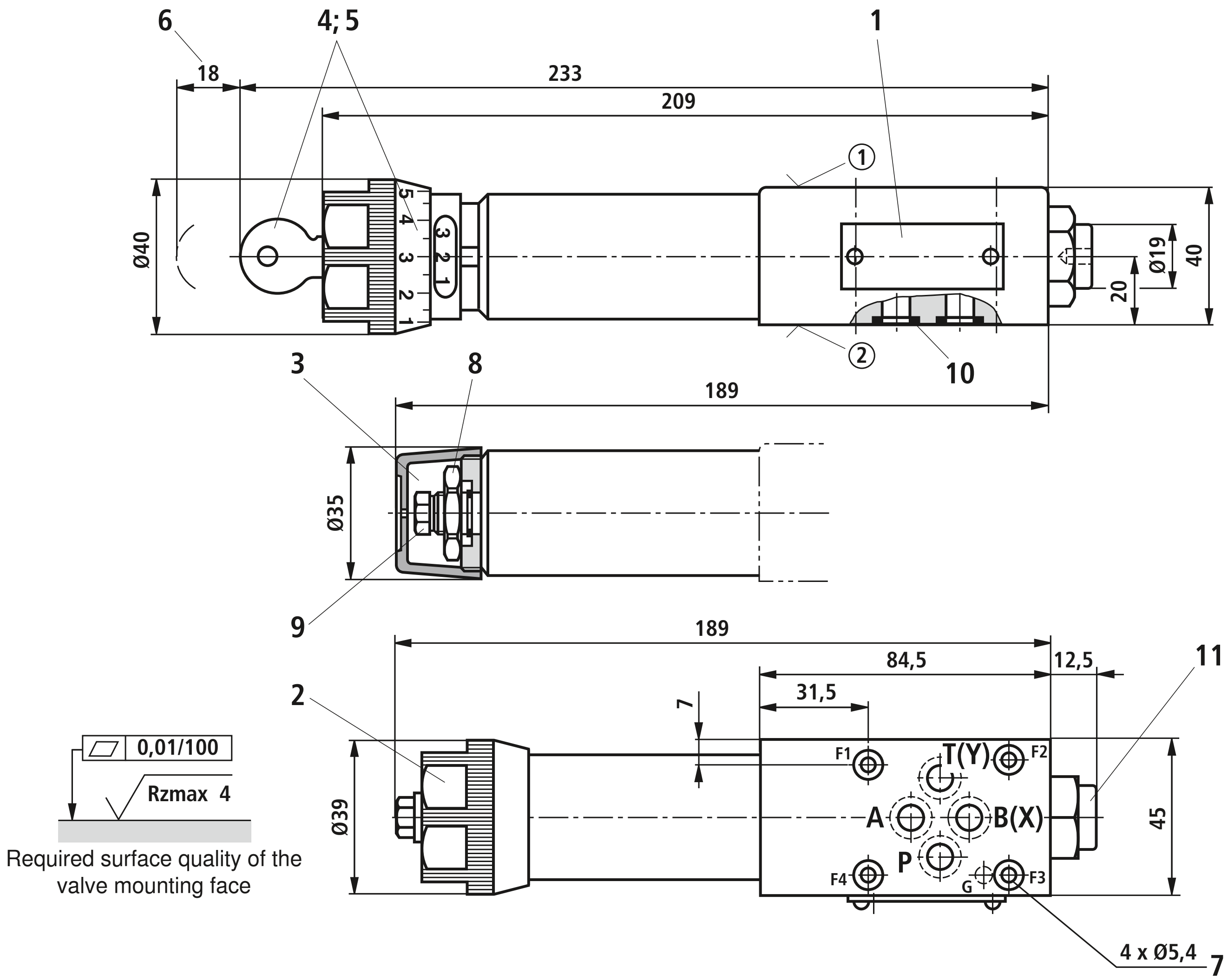
Valve mounting screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M5 - 10.9-flZn-240h-L

☞ **Note!**

Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and above the sandwich plate valve.

Unit dimensions: Version “A” (dimensions in mm)



Required surface quality of the valve mounting face

① Device side – porting pattern according to DIN 24340 form A (**without** locating bore), or ISO 4401-03-02-0-05 (**with** locating bore Ø4 x 4 mm deep)

② Plate side – porting pattern according to DIN 24340 form A (**without** locating bore), or ISO 4401-03-02-0-05 (**with** locating bore for locating pin ISO 8752-3x8-St, material no. **R900005694**, separate order)

1 Nameplate
2 Adjustment type “1”
3 Adjustment type “2”
4 Adjustment type “3”
5 Adjustment type “7”
6 Dimensions required to remove the key
7 Valve mounting bores
8 Lock nut 24 A/F
9 Hexagon 10 A/F
10 Identical seal rings for ports A②, B②, P②, T②(Y)
11 Pressure gauge connection G1/4, 12 deep; internal hexagon 6 A/F

Subplates according to data sheet RE 45052 (separate order)

(**without** locating bore)	G 341/01 (G1/4)
	G 342/01 (G3/8)
	G 502/01 (G1/2)
(**with** locating bore)	G 341/60 (G1/4)
	G 342/60 (G3/8)
	G 502/60 (G1/2)

Valve mounting screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M5 - 10.9-flZn-240h-L

☞ **Note!**

Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and above the sandwich plate valve.

Notes

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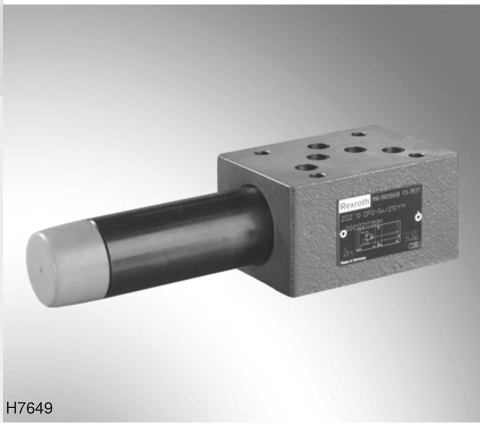
www.boschrexroth.de

Rexroth
Bosch Group

Pressure sequence valve, direct operated

Type ZDZ

Size 10
Component series 5X
Maximum operating pressure 210 bar
Maximum flow 80 l/min



H7649

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Features

– Sandwich plate valve
– Porting pattern according to ISO 4401-05-04-0-05
– Subplates see data sheet RE 45054 (separate order)
– 4 pressure ratings
– 4 adjustment types, optionally:
  • Rotary knob
  • Threaded pin with hexagon and protective cap
  • Lockable rotary knob with scale
  • Rotary knob with scale
– With pressure gauge connection

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z	DZ	10	D		–	5X /		Y	M		*

Sandwich plate valve

Pressure sequence valve

Size 10 = 10

Direct operated = D

Pressure reduction in channel A (pilot oil from channel A①) = A

Pressure reduction in channel A (pilot oil from channel A②) = C

Pressure reduction in channel P = P

Adjustment type

Rotary knob = 1

Threaded pin with hexagon and protective cap = 2

Lockable rotary knob with scale [1] = 3

Rotary knob with scale = 7

Component series 50 to 59 = 5X
(50 to 59: unchanged installation and connection dimensions)

Further details in the plain text

Seal material

no code = NBR seals
V = FKM seals
(other seals at request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

M = without check valve

Y = Pilot oil supply internal, pilot oil return external

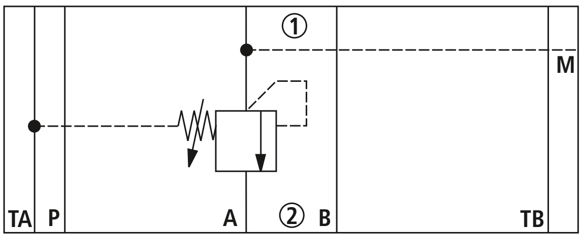
Pressure rating

25 = Maximum sequencing pressure 25 bar
75 = Maximum sequencing pressure 75 bar
150 = Maximum sequencing pressure 150 bar
210 = Maximum sequencing pressure 210 bar

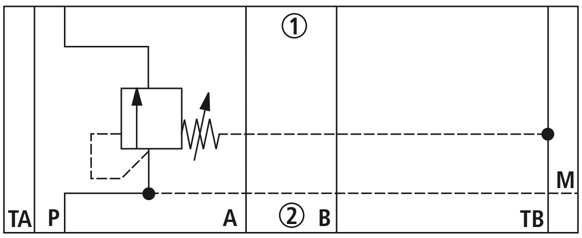
[1] H-key with material no. **R900008158** is included in the delivery.

Symbols (① = component side, ② = plate side)

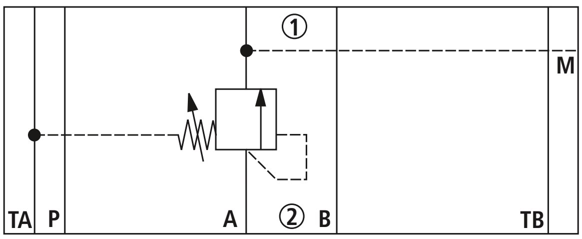
Version "A"



Version "P"



Version "C"



Function, section

The valve type ZDZ is a direct operated pressure sequence valve in sandwich plate design. It is used for the pressure-dependent sequencing of a second system. The sequencing pressure is set via the adjustment type (4).

Version “C”

The compression spring (3) holds the control spool (2) in the initial position - the valve is blocked. Via the pilot line (5), the pressure in channel A② is applied to the spool face of the control spool (2) vis-à-vis the compression spring (3).

If the pressure in channel A② reaches the set value of the compression spring (3), the control spool (2) is pushed to the left and the connection A② to A① is opened. The system connected at A① is sequenced without a drop of the pressure in channel A②.

The leakage oil drain from the spring chamber (7) is always realized externally, via channel T (Y).

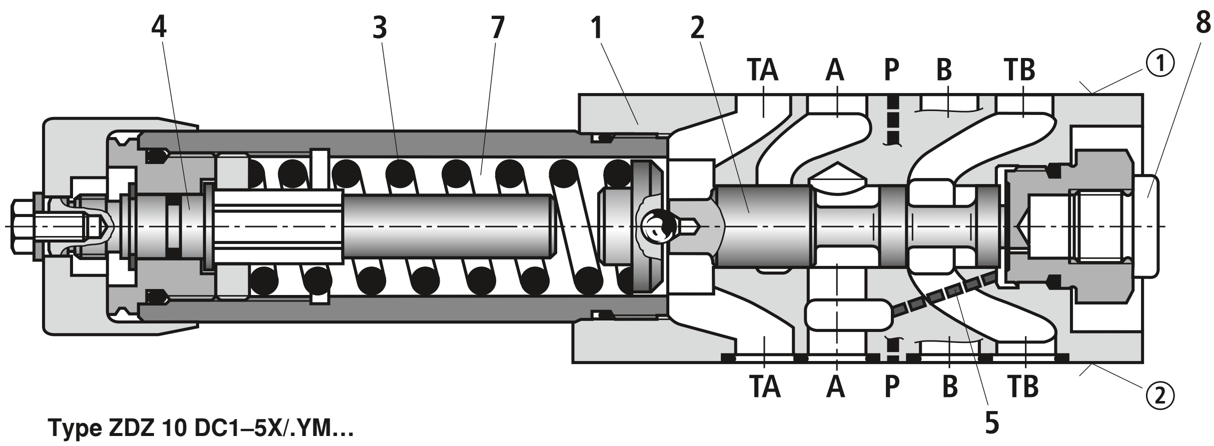
A pressure gauge connection (8) allows for the control of the sequencing pressure at the valve.

Version “A”

Here, the pressure is sequenced in channel A. Control signal and pilot fluid are provided internally, from channel A①.

Version “P”

With this version, the pressure is sequenced in channel P. Control signal and pilot fluid are provided internally, from channel P②.



Type ZDZ 10 DC1–5X/.YM…

① = component side
② = plate side

Technical data (For applications outside these parameters, please consult us!)

general

Weight		kg	Approx. 2.8
Installation position			Any
Ambient temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)

hydraulic

Maximum operating pressure	– Port P, A, B	bar	210
	– Port T (Y)	bar	160
Maximum sequencing pressure (adjustable)		bar	25; 75; 150; 210
Maximum flow		l/min	80
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524 [1]; Fast bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids upon request
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	10 to 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [3]

[1] Suitable for NBR and FKM seals

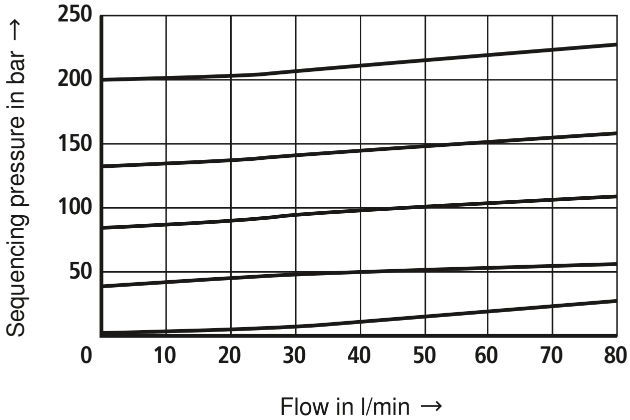
[2] Only suitable for FKM seals

[3] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For selecting the filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

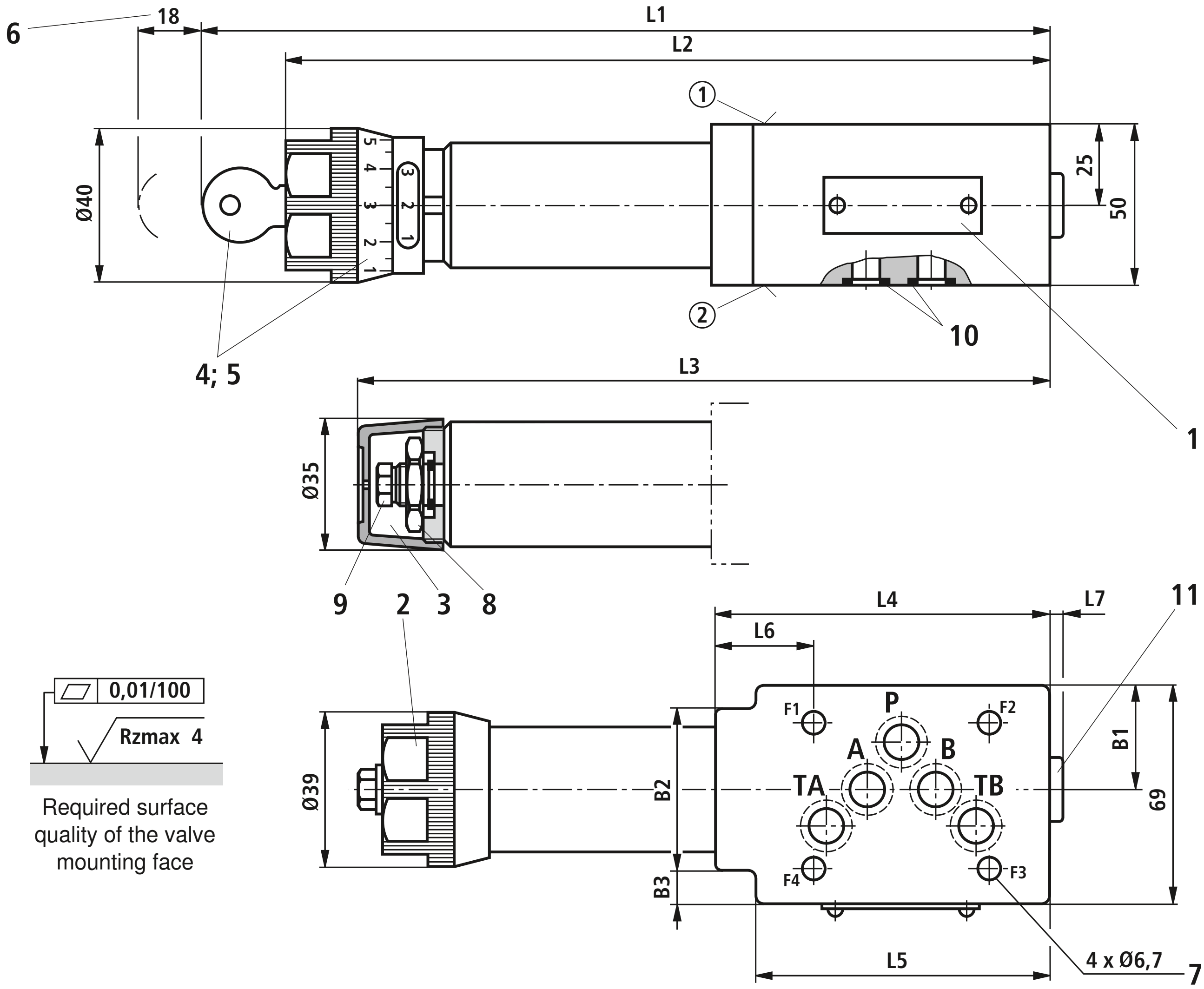
Version "C"
***p*-q_V characteristic curves**



The characteristic curves apply to initial pressure = Zero in the entire flow range!

Characteristic curves for version "A" and "P" on request.

Unit dimensions (dimensions in mm)



Required surface quality of the valve mounting face

Version	L1	L2	L3	L4	L5	L6	L7	B2	B1	B3
"A"; "C"	255	231	210	104	93	31,5	4	51	32,9	12
"P"	242	218	198	91	–	18,5	16	–	34	–

① Component side – Porting pattern according to ISO 4401-05-04-0-05

② Plate side – Porting pattern according to ISO 4401-05-04-0-05

1 Nameplate
2 Adjustment type "1"
3 Adjustment type "2"
4 Adjustment type "3"
5 Adjustment type "7"
6 Dimensions required to remove the key
7 Valve mounting bores
8 Lock nut SW24
9 Hexagon SW10
10 Identical seal rings for ports A②, B②, P②, TA② and TB②; deviating from ISO 4401, port T is in this data sheet called TA, port T1 is called TB.
11 Pressure gauge connection G1/4, 12 deep; internal hexagon SW6

Valve mounting screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M6 - 10.9-flZn-240h-L

Note!

Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Notes

Notes

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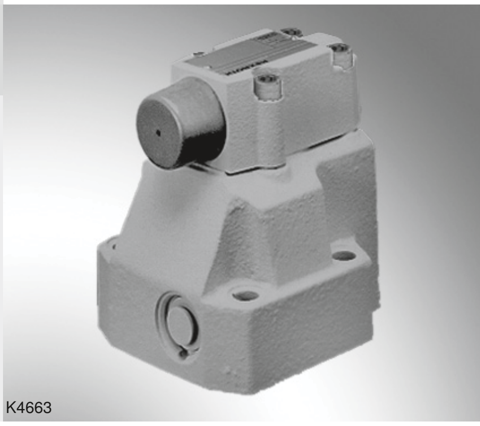
documentation@boschrexroth.de
www.boschrexroth.de

Pressure sequence valve, pilot-operated

RE 26391/06.11
Replaces: 02.03

Type DZ

Size 10, 25, 32
Component series 5X
Maximum operating pressure 315 bar
Maximum flow 600 l/min



K4663

Table of contents

Features

- Suitable for use as preload, sequence or switchover valve
- For subplate mounting
- Porting pattern according to ISO 5781
- As cartridge valve
- 4 pressure ratings
- 4 adjustment types:
  - Rotary knob
  - Bushing with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- Check valve, optional

- More information:

  Subplates — Data sheet 45062

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

DZ		–	–5X/				*

Pressure sequence valve, pilot-operated

Complete valve (subplate mounting) **= no code**
Pilot control valve **without** main spool insert (cartridge valve) (size **not** entered) **= C**
Pilot control valve **with** main spool insert (cartridge valve) (valve size 30 entered) **= C**

Size 10 **= 10**
Size 25 **= 20**
Size 32 **= 30**

Adjustment type
Rotary knob **= 1**
Bushing with hexagon and protective cap **= 2**
Lockable rotary knob with scale **= 3** [1)]
Rotary knob with scale **= 7**

Component series 50 to 59 **= 5X**
(50 to 59: Unchanged installation and connection dimensions)

Setting pressure
50 bar **= 50**
100 bar **= 100**
200 bar **= 200**
315 bar **= 315**

Pilot oil supply
no code = Pilot oil supply internal, pilot oil discharge internal
X = Pilot oil supply external, pilot oil return internal [2)]
Y = Pilot oil supply internal, pilot oil return external [2)]
XY = Pilot oil supply external, pilot oil return external
(see symbols below)

no code = **With** check valve [2)]
M = **Without** check valve

Seal material
no code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

Further details in the plain text

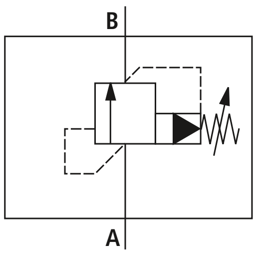
[1)] H-key with Material no. **R900008158** is included in the delivery.

[2)] Not with version "C"

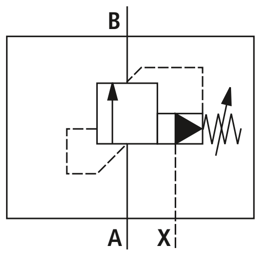
Standard types and standard units are contained in the EPS (standard price list).

Symbols

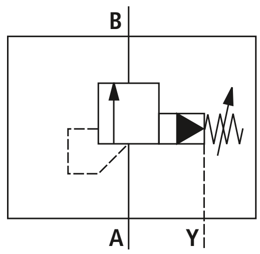
Type DZ. . -.-5X/.M…



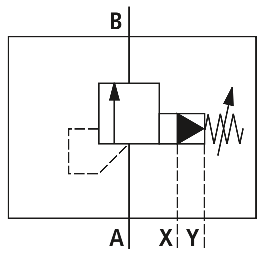
Type DZ. . -.-5X/.XM…



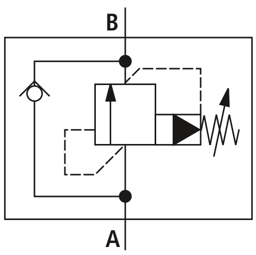
Type DZ. . -.-5X/.YM…



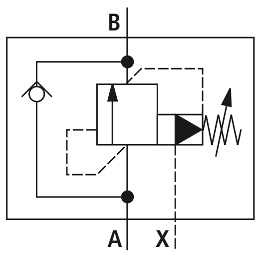
Type DZ. . -.-5X/.XYM…



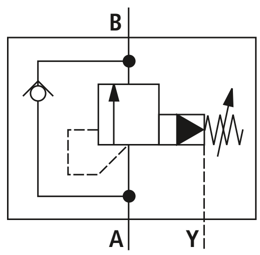
Type DZ. . -.-5X/…



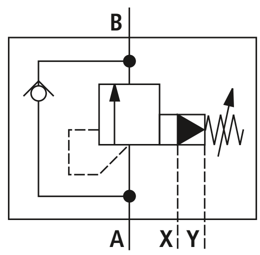
Type DZ. . -.-5X/.X…



Type DZ. . -.-5X/.Y…



Type DZ. . -.-5X/.XY…



Function, section

The valve type DZ is a pilot operated pressure sequence valve. It is used for the pressure-dependent sequencing of a second system.

The pressure sequence valve basically comprises of a main valve (1) with main spool insert (7) and pilot control valve (2) with adjustment type as well as optional check valve (3).

According to the pilot oil supply and return and thus the function you distinguish between:

Preload valve type DZ. . -.-5X/… (control lines 4.1, 12 and 13 open; control lines 4.2, 14 and 15 closed)

The pressure applied to channel A acts via the control line (4.1) on the pilot spool (5) in the pilot control valve (2). Via the nozzle (6), the pressure in channel A simultaneously acts on the spring-loaded side of the main spool (7). If the pressure exceeds the value set at the spring (8), the pilot spool (5) is moved against the spring (8). The hydraulic fluid on the spring-loaded side of the main spool (7) now flows via the nozzle (9), the control edge (10) and the control lines (11) and (12) into channel B. This results in a pressure drop at the main spool (7). The main spool (7) moves upwards and opens the connection from channel A to B. The pressure in channel A exceeds that in channel B by the value set at spring (8). The leakage occurring at the pilot spool (5) is led into channel B via the spring chamber (17) of the pilot control valve and the control line (13). If the pressure in the secondary circuit (channel B) is higher than that in channel A, an optional check valve (3) can be installed for free flow back.

Preload valve type DZ. . -.-5X/.X… (control lines 4.2, 12 and 13 open; control lines 4.1, 14 and 15 closed)

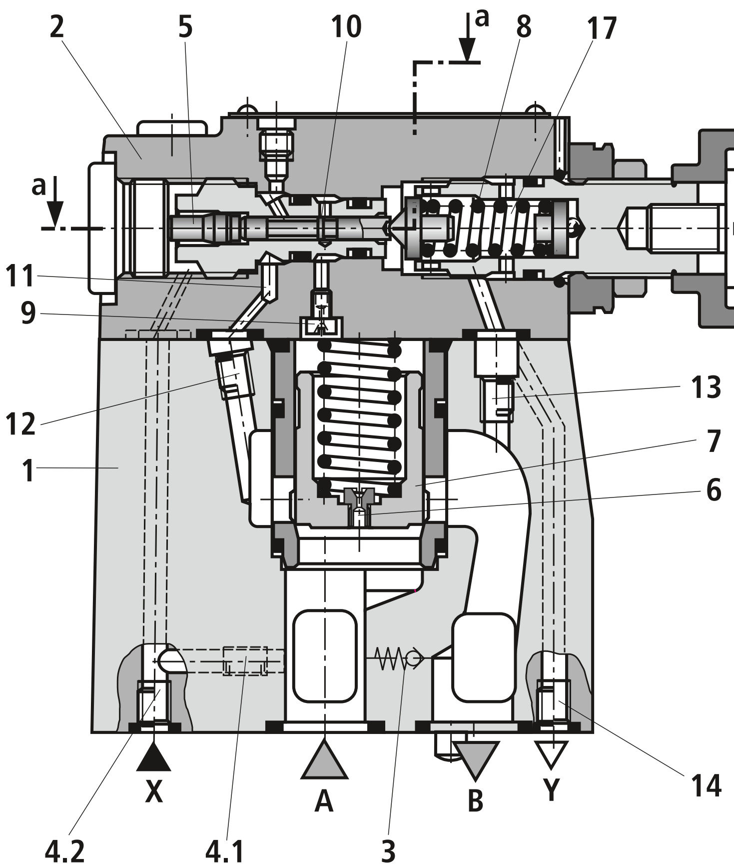
In principle, the function of this valve corresponds to the function of type DZ. . -.-5X/…. With version "X", the opening signal is, however, provided externally via control line X (4.2).

Sequence valve type DZ. . -.-5X/.Y… (control lines 4.1, 12 and 14 or 15 open; control lines 4.2 and 13 closed)

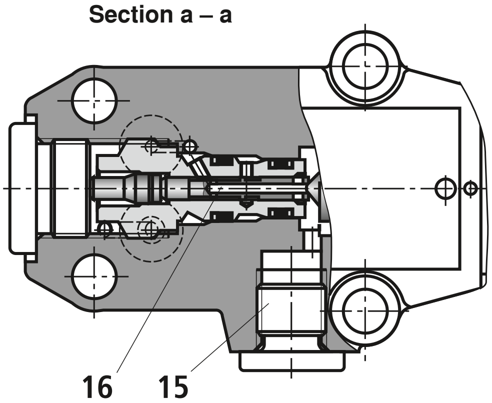
In principle, the function of this valve corresponds to the function of type DZ. . -.-5X/…. With version "Y", the leakage occurring at the pilot spool (5) must, however, be led to the tank via line (14) or (15) at zero pressure. The pilot oil is led into channel B via line (11) and (12).

Bypass valve type DZ. . -.-5X/.XY… (control lines 4.2, 14 or 15 open; control lines 4.1, 12 and 13 closed)

In principle, the function of this valve corresponds to the function of type DZ. . -.-5X/…. With version "XY", the opening signal is, however, provided externally via control line X (4.2). The pilot oil at the bored pilot spool (16) and the occurring leakage are to be led into the tank via line (14) or (15) at zero pressure.



Section a – a



Technical data (For applications outside these parameters, please consult us!)

general

Size			10	25	32
Weight	– Type DZ …	kg	3.4	5.3	8.0
	– Type DZC …	kg	1.2		
	– Type DZC 30 …	kg	1.5		
Installation position			Any		
Ambient temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)		

hydraulic

Maximum operating pressure	– Port A, B, X	bar	315		
Maximum backpressure	– Port Y	bar	315		
Minimal setting pressure		bar	Flow-dependent, see characteristic curves page 5		
Maximum setting pressure		bar	50; 100; 200; 315		
Maximum flow		l/min	200	400	600
Hydraulic fluid			See table below		
Hydraulic fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)		
Viscosity range		mm^2/s	10 to 800		
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]		

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!

– For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!

– There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

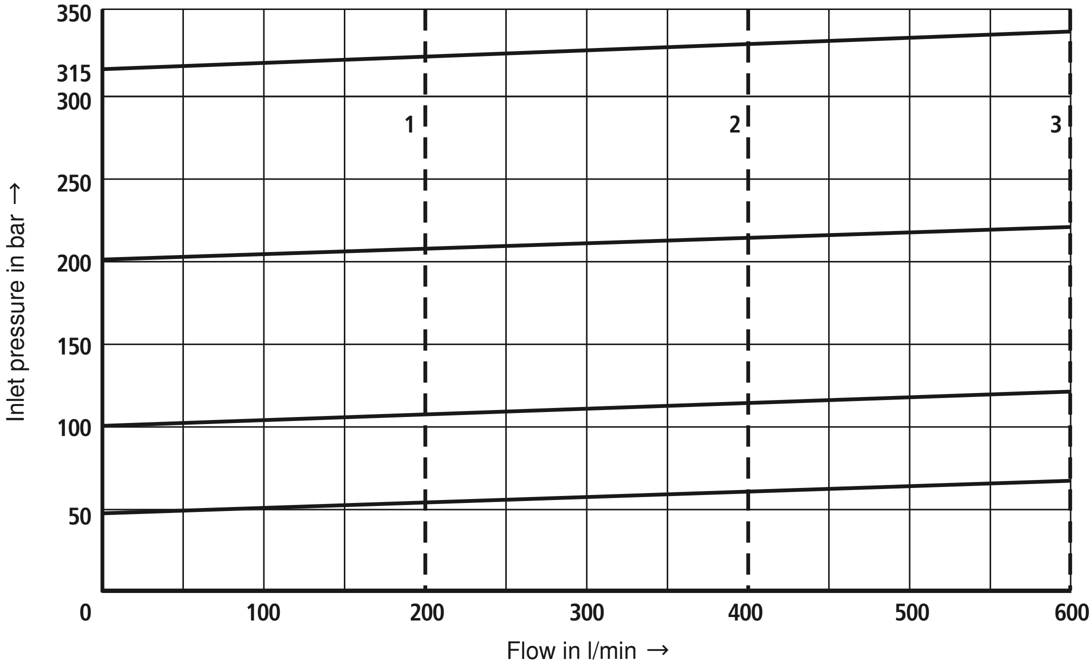
– **Flame-resistant – water-containing:**
- Maximum operating pressure 210 bar
- Maximum hydraulic fluid temperature 60 °C
- Expected service life as compared to HLP hydraulic oil 30 % to 100 %

[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of the filters see www.boschrexroth.com/filter.

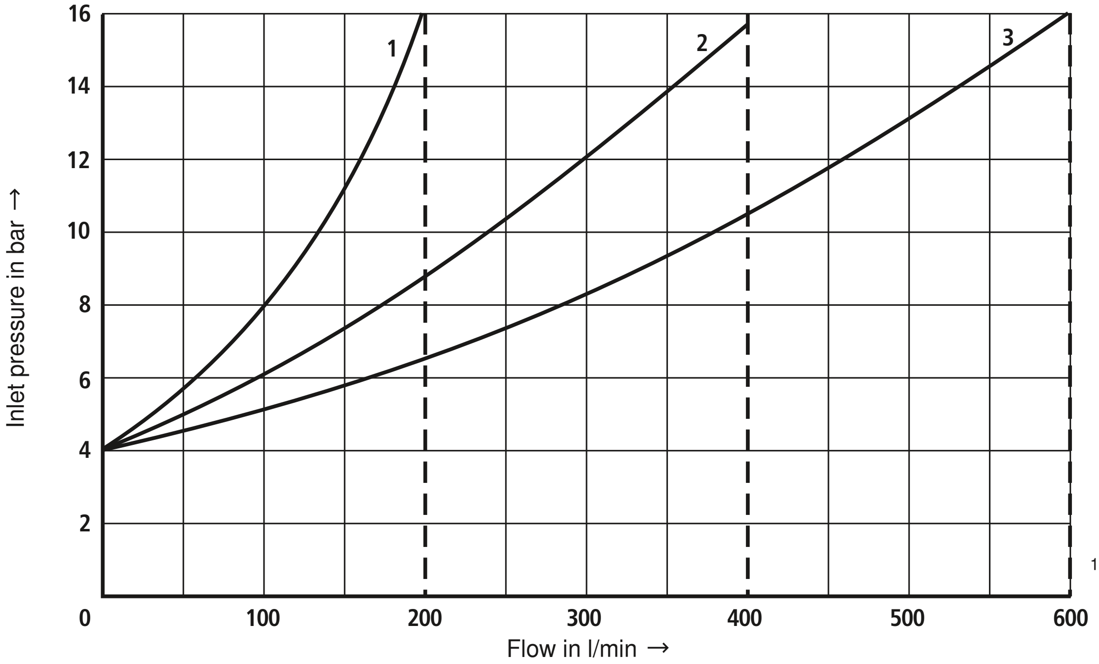
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40 \pm 5$ °C)

Inlet pressure against the flow (A → B)



1 Size 10
2 Size 25
3 Size 32

Minimum inlet pressure [1] against the flow (A → B)



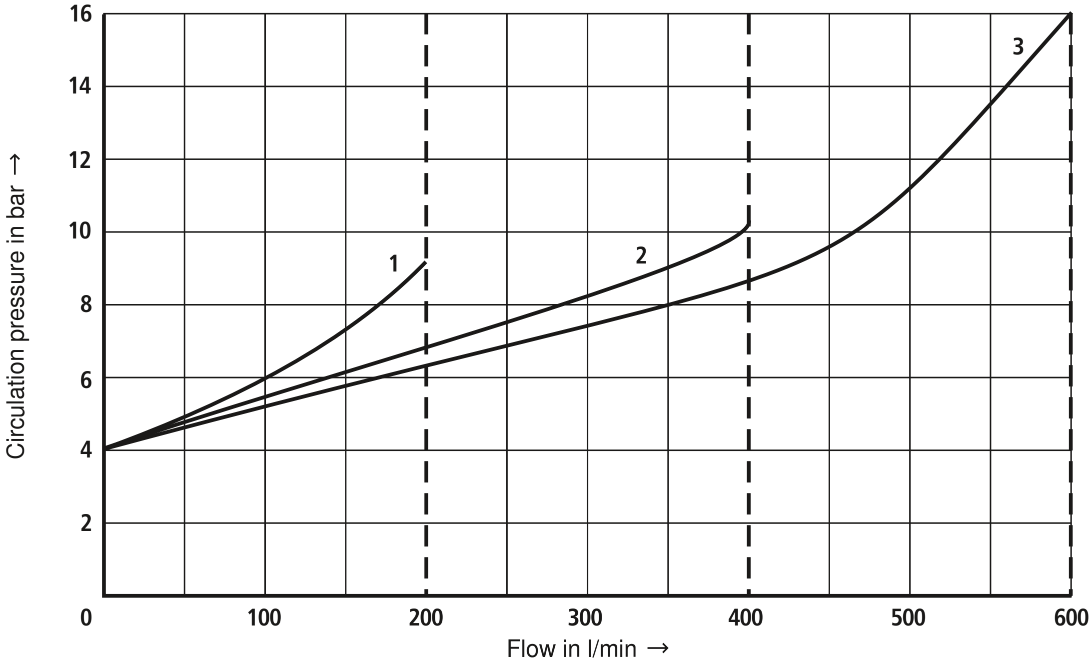
1 Size 10
2 Size 25
3 Size 32

[1] Circulation pressure with version "X"

The characteristic curves apply to the pressure at the valve output p_T = 0 bar across the entire flow range.

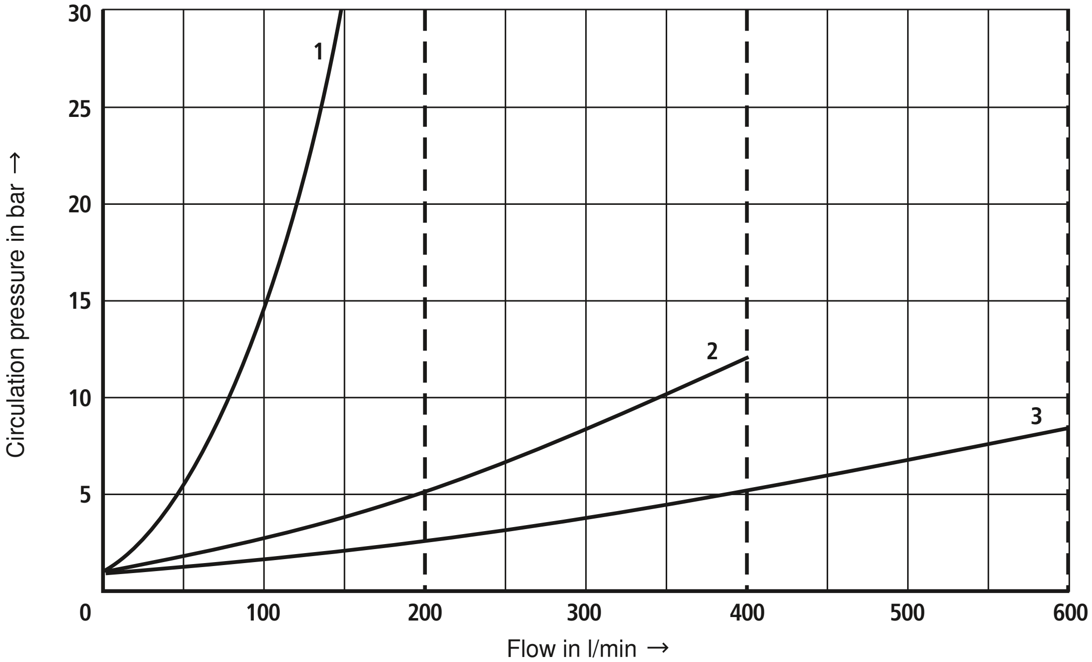
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

Circulation pressure against the flow (A → B) (only version "XY")

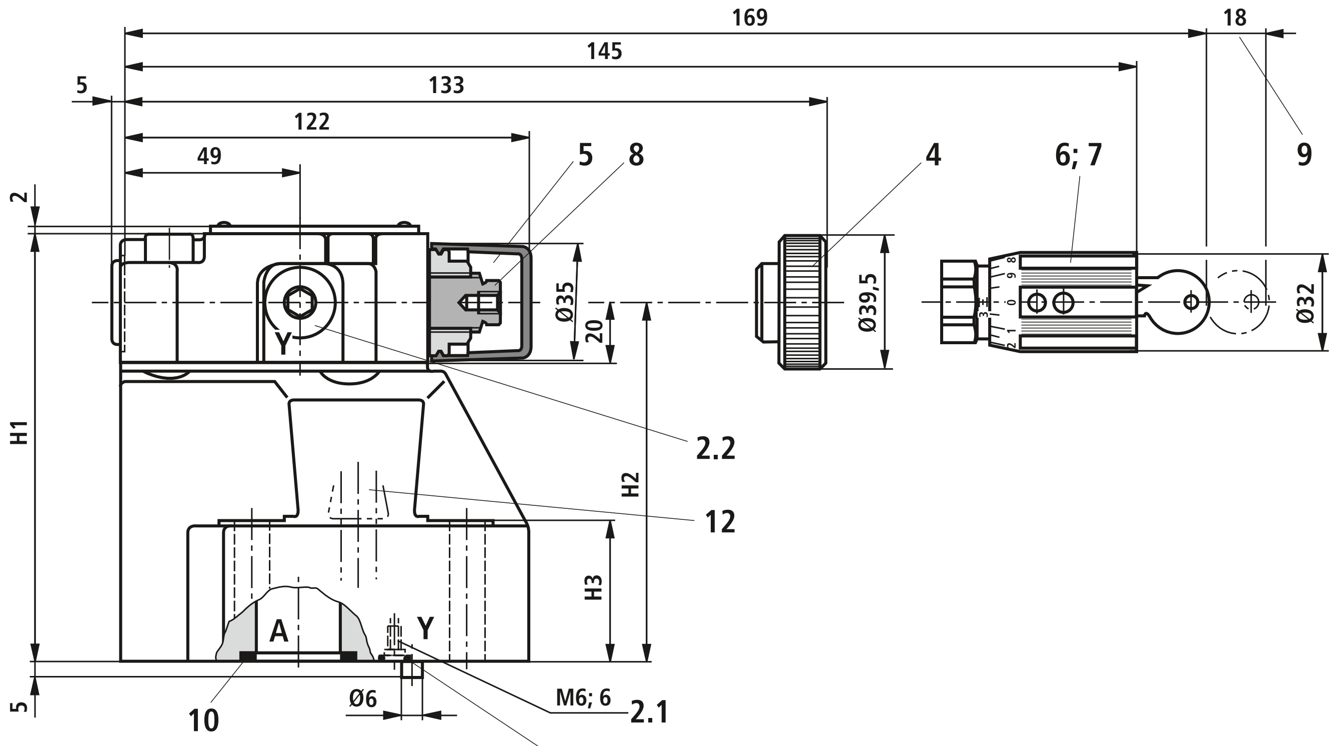


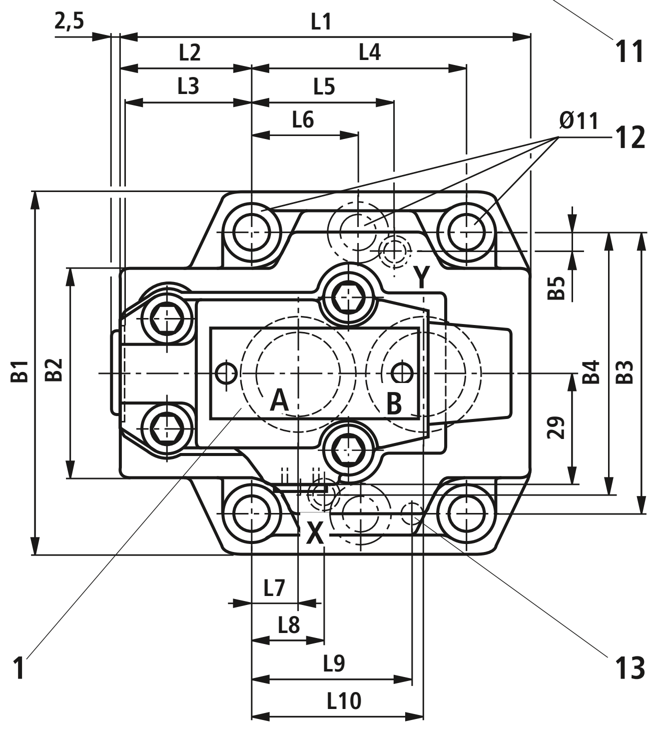
The characteristic curves apply to the pressure at the valve output p_T = 0 bar across the entire flow range.

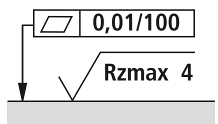
Δp-q_V characteristic curves across the check valve (B → A)



Unit dimensions: Subplate mounting (dimensions in mm)







Required surface quality of the valve mounting face

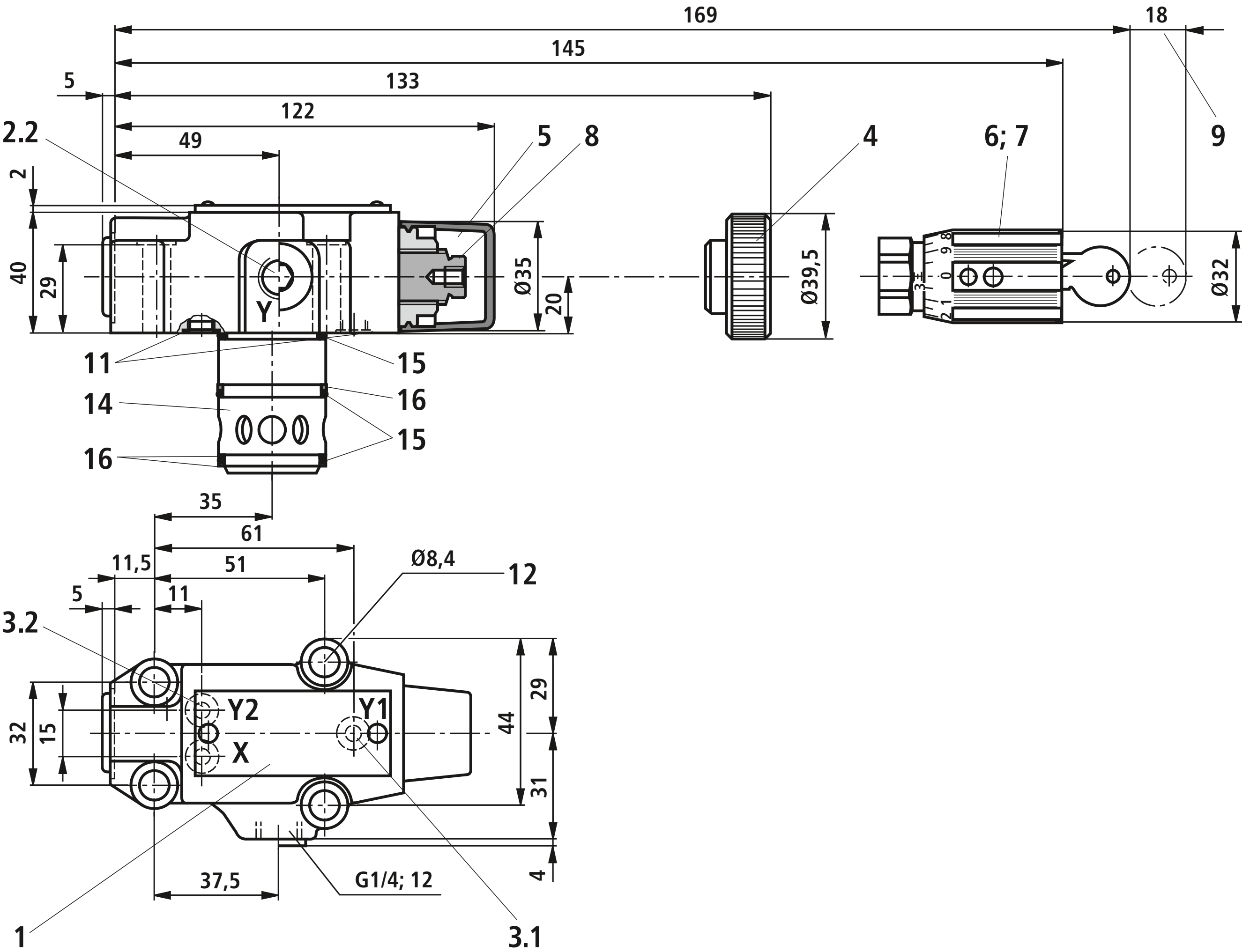
Size	L1	L2	L3	L4	L5	L6
10	96	35.5	33	42.9	21.5	–
25	116	37.5	35.4	60.3	39.7	–
32	145	33	29.8	84.2	59.5	42.1

Size	L7	L8	L9	L10	B1	B2
10	7.2	21.5	31.8	35.8	85	50
25	11.1	20.6	44.5	49.2	102	59.5
32	16.7	24.6	62.7	67.5	120	76

Size	B3	B4	B5	H1	H2	H3
10	66.7	58.8	7.9	112	92	28
25	79.4	73	6.4	122	102	38
32	96.8	92.8	3.8	130	110	46

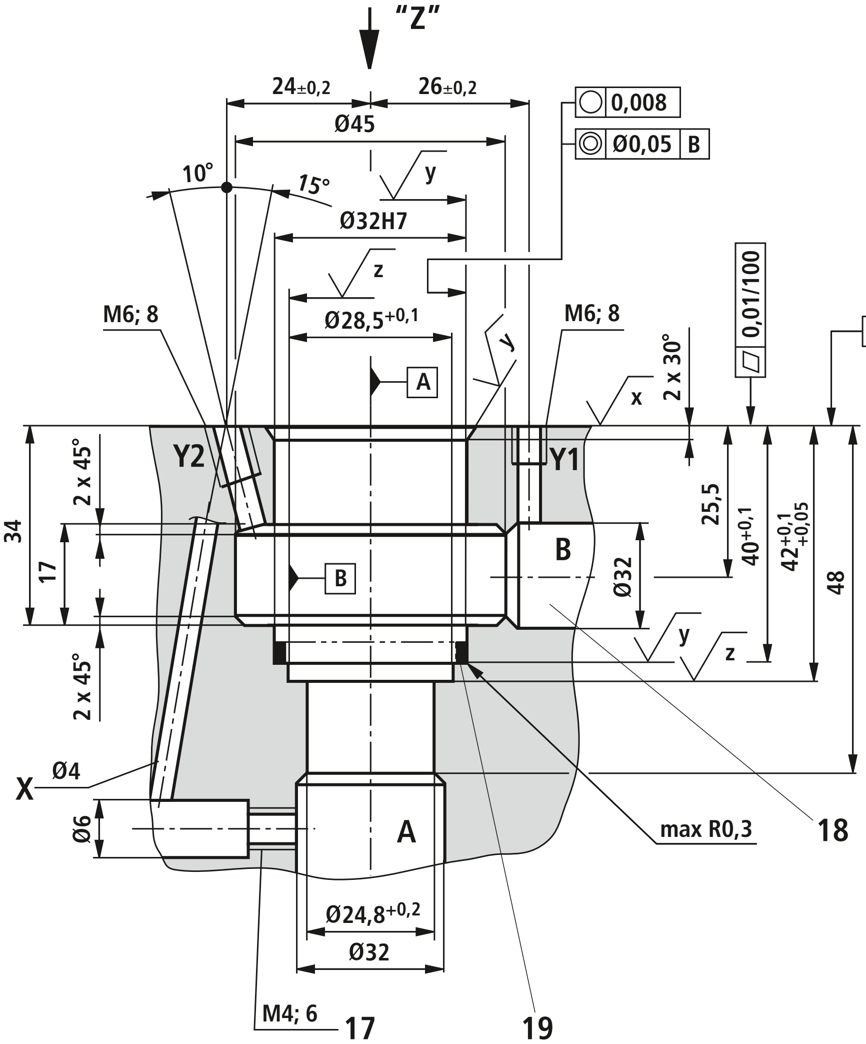
Item explanations, subplates, and valve mounting screws see page 10.

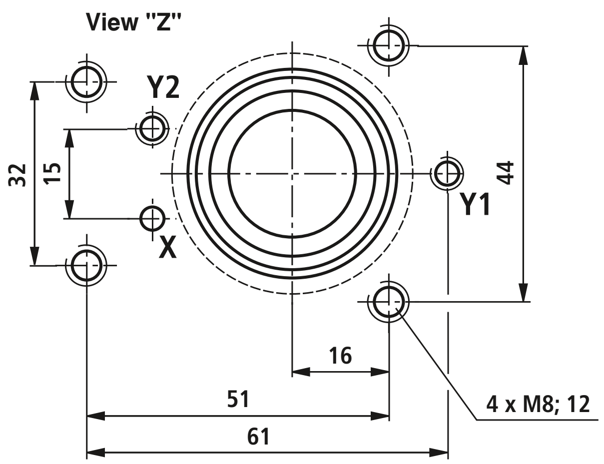
Unit dimensions: Cartridge valve (dimensions in mm)



Item explanations and valve mounting screws
see page 10.

Installation bore (dimensions in mm)





√x = √Rzmax 4

√y = √Rzmax 8

√z = √Rz 16

Item explanations see page 10.

Unit dimensions (dimensions in mm)

1 Name plate

2.1 Port Y for external pilot oil return with version "XY" or spring chamber unloading with version "Y"

2.2 Port Y (G1/4) optionally for external pilot oil return with version "XY" or spring chamber unloading with version "Y"

3.1 Port Y1 at the cartridge valve for pilot oil return with version "XY" or spring chamber unloading with version "no code", "X" and "Y"

3.2 Port Y2 at the cartridge valve for pilot oil return with version "no code", "X" and "Y"

4 Adjustment type "1"

5 Adjustment type "2"

6 Adjustment type "3"

7 Adjustment type "7"

8 Hexagon SW10

9 Space required to remove the key

10 Identical seal rings for ports A and B

11 Identical seal rings for ports X, Y, Y1 and Y2

12 Valve mounting bores

13 Locating pin

14 Main spool insert with nozzle

15 Seal ring (main spool)

16 Support ring (main spool)

17 Bore is omitted for version "X" and "XY"

18 ☞ **Note!**
The Ø32 bore can tap a Ø45 bore at any point. However, it must be ensured that the connection and valve mounting bores are not damaged!

19 Support ring and seal ring must be inserted into the bore before assembly of the main spool!

Subplates according to data sheet 45062 (separate order)

– Size 10	G 460/01 (G3/8) G 461/01 (G1/2)
– Size 25	G 412/01 (G3/4) G 413/01 (G1)
– Size 32	G 414/01 (G1 1/4) G 415/01 (G1 1/2)

Valve mounting screws (separate order)

For reasons of stability, exclusively the following valve mounting screws may be used:

Subplate mounting:

– Size 10
4 ISO 4762 - M10 x 50 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 60 Nm ±10 %,
Material no. **R913000471**

– Size 25
4 ISO 4762 - M10 x 60 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 60 Nm ±10 %,
Material no. **R913000116**

– Size 32
6 ISO 4762 - M10 x 70 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 60 Nm ±10 %,
Material no. **R913000126**

Cartridge valve:

4 ISO 4762 - M8 x 40 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 31 Nm ±10 %,
Material no. **R913000205**

The tightening torques are guidelines when using screws with the specified friction coefficients and when using a torque power screwdriver (tolerance ±10 %).

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documentation@boschrexroth.de
www.boschrexroth.de

Flow control valves

Designation	Type	Size	Component series	p_{max} in bar	Data sheet	Page
Throttle valves						
Throttle and throttle check valve, threaded connection	MG, MK	6 ... 30	1X	315	27219	1179
Throttle and throttle check valve, block installation	FG, FK	16/25/32	2X	315	27226	1185
Throttle check valve, sandwich plate valve	Z2FS	6	4X	315	27506	1193
Throttle check valve, sandwich plate valve	Z2FS	10	3X	315	27518	1201
Throttle check valve, sandwich plate valve	Z2FS	16	3X	350	27526	1209
Throttle check valve, sandwich plate valve	Z2FS	25	3X	350	27536	1217
Throttle valve, sandwich plate valve	Z1FG	6	4X	315	27482	1225
Throttle valve, sandwich plate valve	Z.FG	10	3X	315	27488	1229
Fine throttle, subplate mounting, threaded connection, block installation	F	5/10	2X/3X	210	27761	1237
Flow control valves						
2-way version, subplate mounting	FRM, Z4S	6	3X	315	28163	1247
2-way version, subplate mounting	FRM, FRH, FRW, Z4S	10/16	3X/2X	315	28389	1259
3-way version, subplate mounting	FRM	10/16	2X	315	28862	1275
2-way version, block installation	FRM.K	6/10	1X	315	28155	1283
2-way version, sandwich plate valve	Z2FRM	6	2X	315	28164	1291

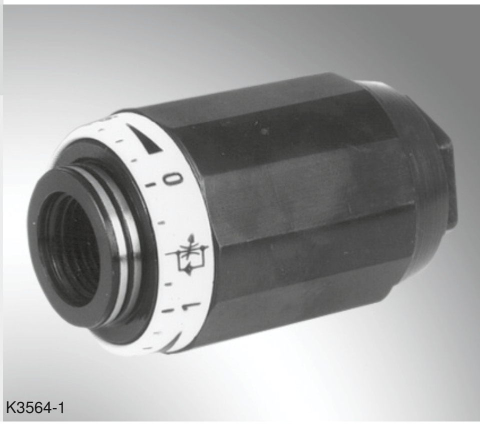
5

Rexroth
Bosch Group

Throttle and throttle check valve

RE 27219/01.09
Replaces: 03.06

Types MG and MK


K3564-1

Size 6 to 30
Component series 1X
Maximum operating pressure 315 bar
Maximum flow 400 l/min

Table of contents

Features

– Suitable for direct in-line installation
– Pressure and viscosity-dependent

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

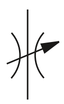
		G	1X	/	*

Throttle valve	**= MG**
Throttle check valve	**= MK**
Size 6	**= 6**
Size 8	**= 8**
Size 10	**= 10**
Size 15	**= 15**
Size 20	**= 20**
Size 25	**= 25**
Size 30	**= 30**
For threaded connection	**= G**
1X =	Component series 10 to 19 (10 to 19: unchanged installation and connection dimensions)
	Seal material
No code =	NBR seals
V =	FKM seals
	(other seals upon request)
	Attention! Observe compatibility of seals with hydraulic fluid used!
	Further details in the clear text

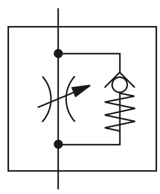
Standard types and components are contained in the EPS (standard price list).

Symbols

Type MG



Type MK



Function, section

The valve types MG and MK are pressure- and viscosity-dependent throttle and throttle check valves.

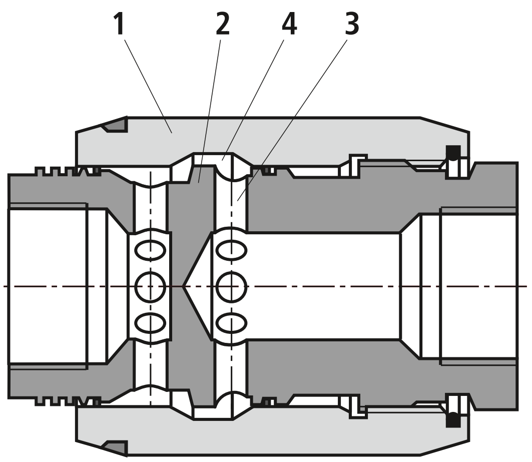
Type MG (throttle valve)

Throttling occurrs in both flow directions. The pressure fluid reaches the throttling point (4) via the lateral bores (3). The throttling point is formed between the housing (2) and the adjustable sleeve (1). By rotating the sleeve (1), the cross-section of the throttling point (4) can be changed infinitely.

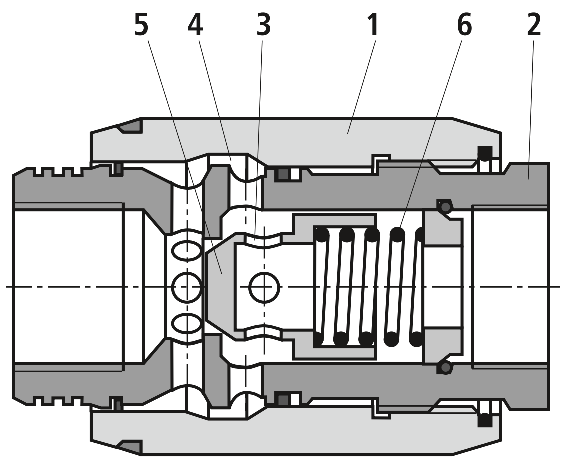
Type MK (throttle check valve)

When fluid flows through the valve in throttling direction, spring (6) and the pressure fluid press the poppet (5) onto the seat , thus blocking the connection. The pressure fluid uses the lateral bores (3) to reach the throttling point (4), which is formed between the housing (2) and the adjustable sleeve (1).

In the opposite direction, the pressure acts on the front face of the poppet (5), lifts the same from the seat, and allows the fluid to flow The pressure fluid flows through the valve without being throttled. At the same time, a part of the pressure fluid flows through the annular gap, which results in the desired self cleaning effect.



Throttle valve type MG



Throttle check valve type MK

Technical data (For applications outside these parameters, please consult us!)

general

Size		6	8	10	15	20	25	30
Weight	kg	0.3	0.4	0.7	1.1	1.9	3.2	4.1
Installation position		Any						
Ambient temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)						

hydraulic

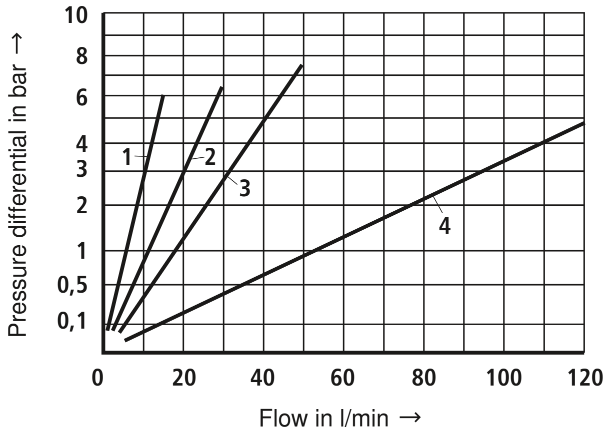
Maximum operating pressure	bar	315
Cracking pressure (type MK)	bar	0.5
Maximum volume flow	L/min	See characteristic curves page 5
Pressure fluid		Mineral oil (HL, HLP) according to DIN51524, other hydraulic fluids upon request
Pressure fluid temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range	mm^2/s	10 to 800
Maximum permitted degree of contamination of the pressure fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]

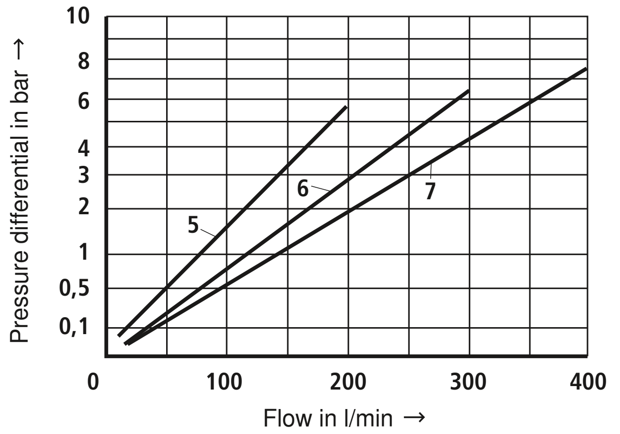
[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Efficient filtration prevents malfunctions and at the same time prolongs the service life of components.

For the selection of the filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 und RE 50088.

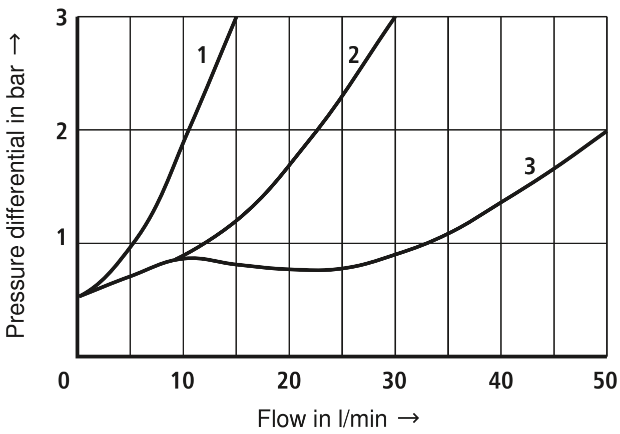
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

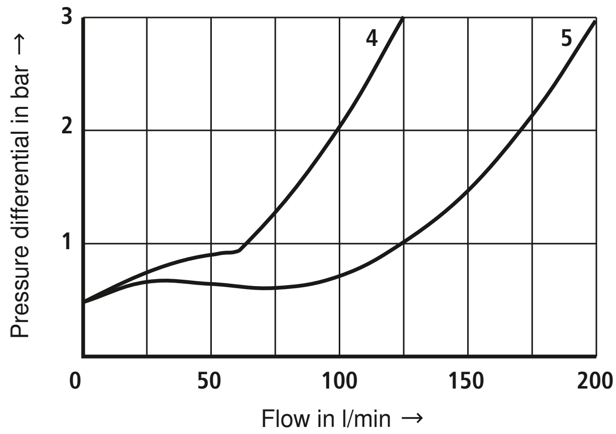
Δp-q_V characteristic curves with open throttle (types MK and MG)

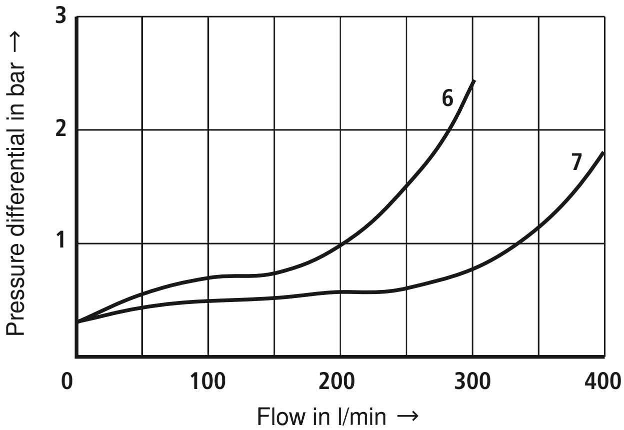




Δp-q_V characteristic curves with open check valve and closed throttle (type MK)

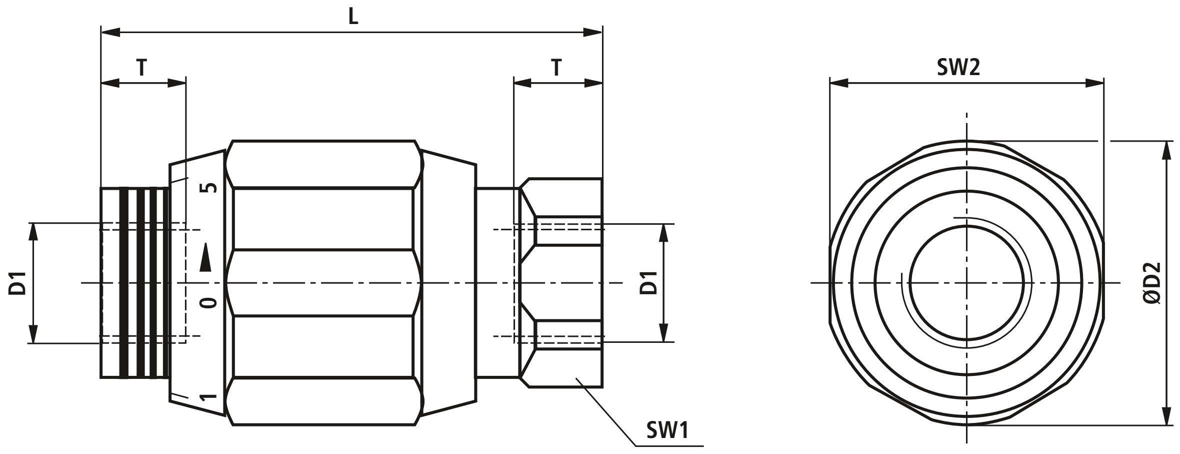






1 NG6
2 NG8
3 NG10
4 NG15
5 NG20
6 NG25
7 NG30

Unit dimensions (dimensions in mm)



Size	D1	ØD2	L	SW1	SW2	T
6	G1/4	34	65	22	32	12
8	G3/8	38	65	24	36	12
10	G1/2	48	80	30	46	14
15	G3/4	58	100	41	55	16
20	G1	72	110	46	70	18
25	G1 1/4	87	130	55	85	20
30	G1 1/2	93	150	60	90	22

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Throttle and throttle check valve

RE 27226/11.11
Replaces: 03.09

Types FG and FK

Size 16 to 32
Component series 2X
Maximum operating pressure 315 bar
Maximum flow 400 l/min

H7471

Table of contents

Features

– For block installation (cartridge valve, screw-in cartridge valve)
– 3 adjustment types, optionally:
  • Rotary knob
  • Lockable rotary knob with scale
  • Rotary knob with scale
– Different cracking pressures (type FK)

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

				–2X	/	*

Throttle valve	**= FG**
Throttle check valve	**= FK**
Size 16	**= 16**
Size 25	**= 25**
Size 32	**= 32**
Type of connection	
Cartridge valve	**= K**
Screw-in cartridge valve	**= C**
Adjustment type	
Rotary knob	**= 1**
Lockable rotary knob with scale	**= 3**
Rotary knob with scale	**= 7**
Cracking pressure (throttle check valve)	
0 [1] **=**	Without spring
2 [2] **=**	Cracking pressure 1.5 bar (standard)
3 [2] **=**	Cracking pressure 3 bar
2X =	Component series 20 to 29 (20 to 29: Unchanged installation and connection dimensions)
Seal material	
no code =	NBR seals
V =	FKM seals
	(other seals upon request)
	Attention! Observe compatibility of the seals with the hydraulic fluid used!
	Further details in the plain text

[1] Only with type FG

[2] Only with type FK

Function, symbols, sections

Type FG . K… and FK . K… (cartridge valve)

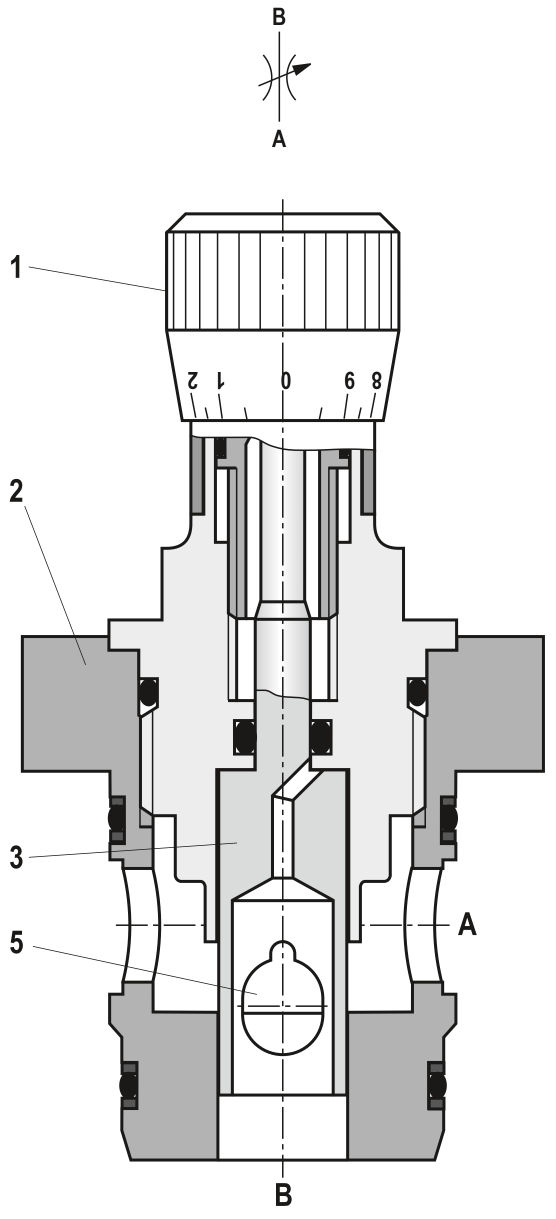
The valves of the types FG and FK are throttle and throttle check valves. The flow depends on the pressure differential between A and B and on the viscosity of the hydraulic fluid.

The valves mainly consist of adjustment type (1), housing (2), throttling pin (3) and check valve (4) with valve type FK.

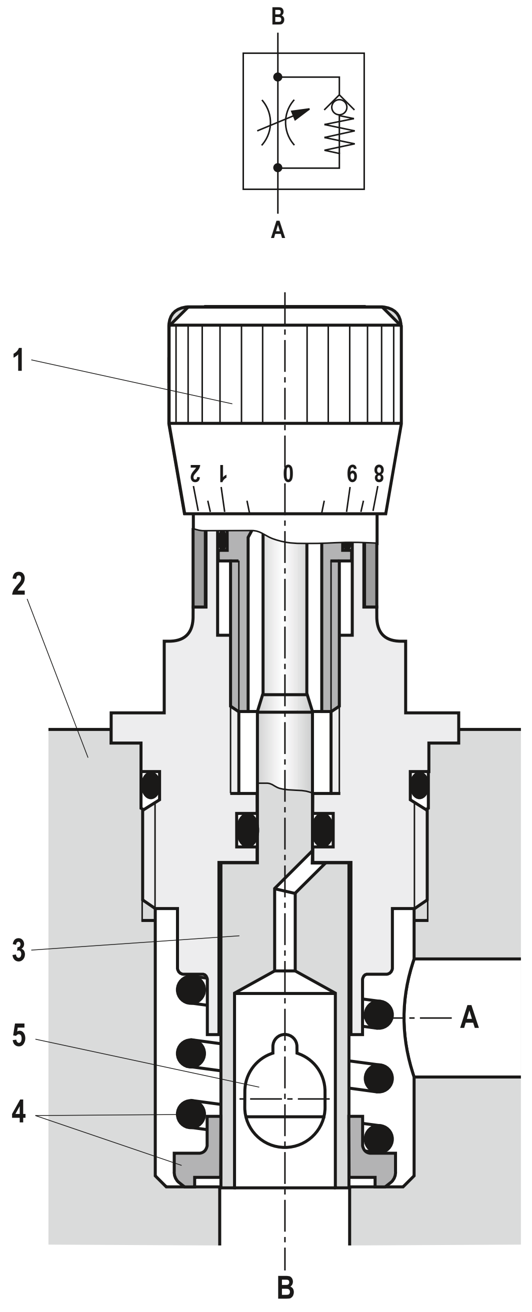
The flow is throttled from A to B. The throttle cross-section (5) is adjusted by displacing the throttling pin (3) in axial direction. For free flow back from B to A, a check valve (4) is installed with valve type FK.

Type FG . C… and FK . C… (screw-in cartridge valve)

In principle, the function of these valves corresponds to the function of version "K". However, they are delivered without housing (2) and thus can be screwed into the block directly.



Type FG . K1…



Type FK . C1…

Technical data (For applications outside these parameters, please consult us!)

general

Size		Size	16	25	32
Weight	– Cartridge valve "K"	kg	0.8	1.7	4.0
	– Screw-in cartridge valve "C"	kg	0.4	0.7	1.7
Installation position			Any		
Ambient temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)		

hydraulic

Maximum operating pressure	bar	315		
Maximum flow (standard valves)	l/min	100	200	400
Hydraulic fluid		See table below		
Hydraulic fluid temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)		
Viscosity range	mm^2/s	10 to 800		
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]		
Actuating torque (adjustment type)	Nm	Approx. 5		

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922

Important information on hydraulic fluids!

– For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!

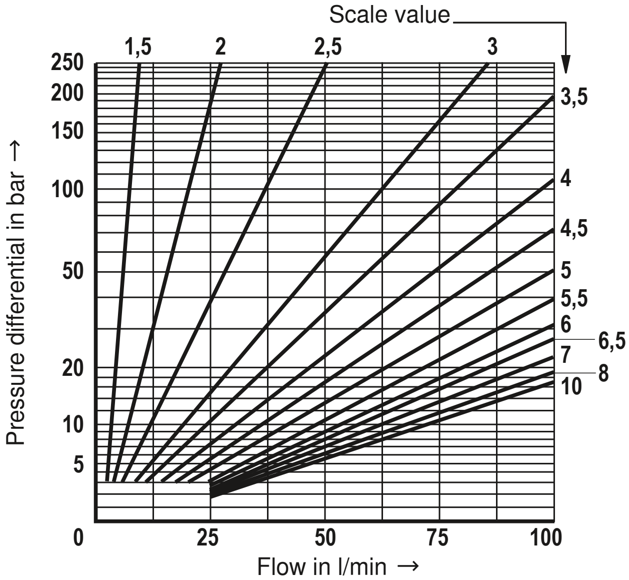
– There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

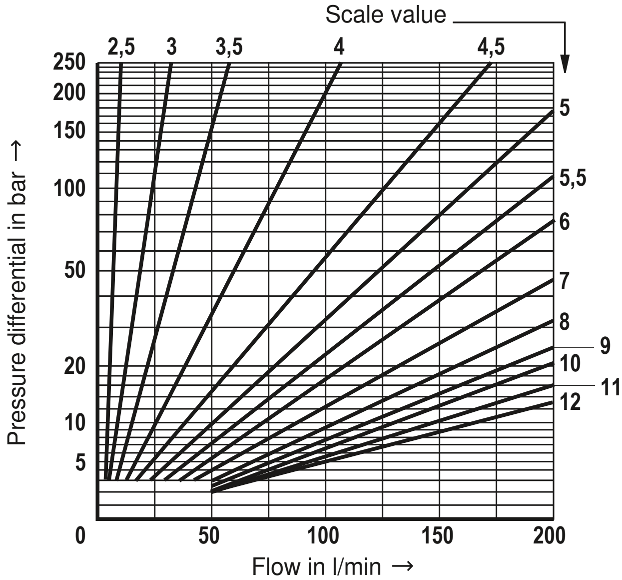
For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C)

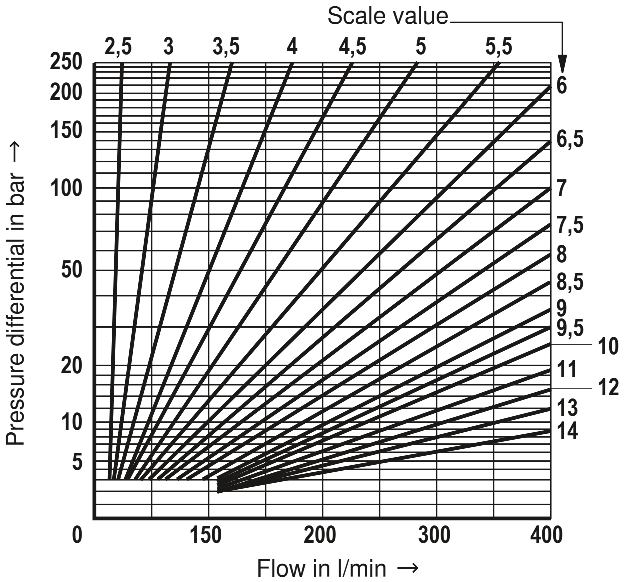
Δp-q_V-Characteristic curves – size 16



Δp-q_V-Characteristic curves – size 25

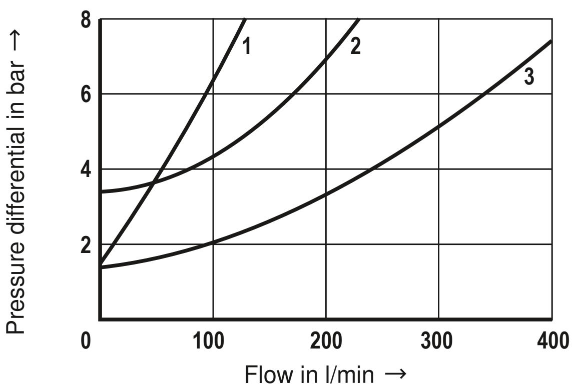


Δp-q_V-Characteristic curves – size 32



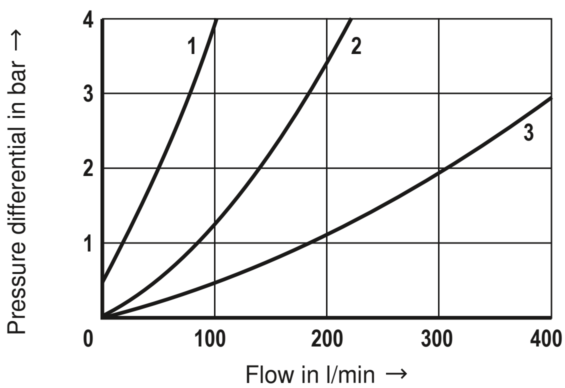
Δp-q_V-Characteristic curves (type FK)

Throttle closed by check valve



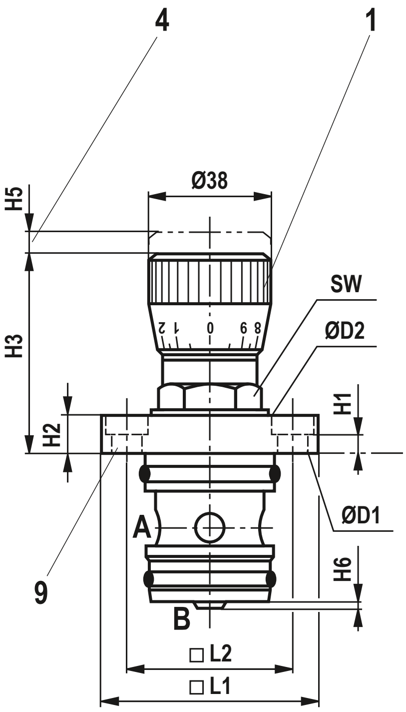
Δp-q_V-Characteristic curves (type FK)

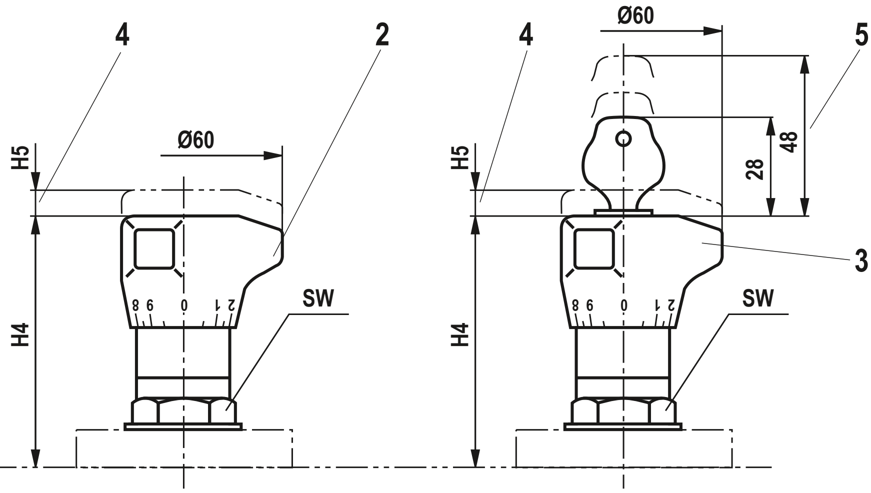
Throttle open by throttle and check valve



1 Size 16 **2** Size 25 **3** Size 32

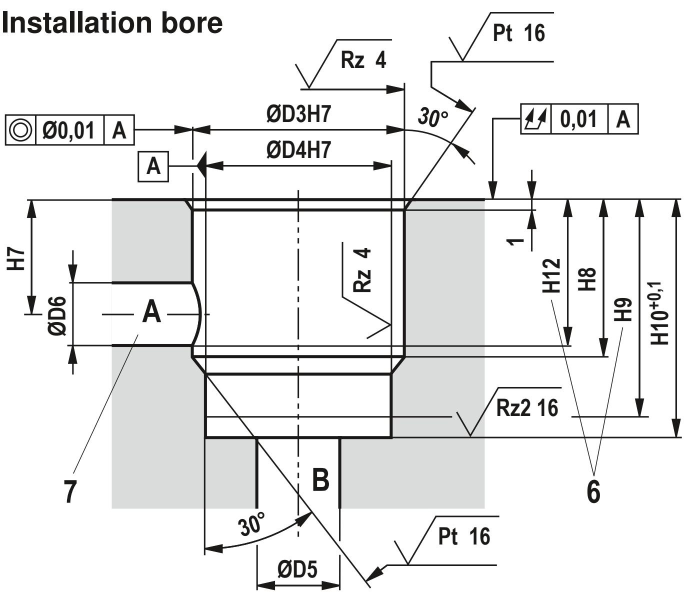
Unit dimensions: Cartridge valve "K" (dimensions in mm)



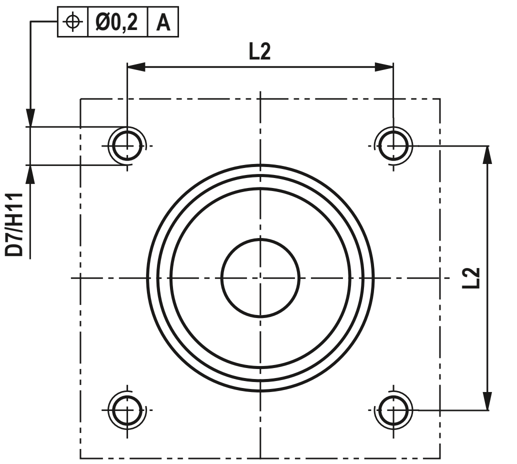


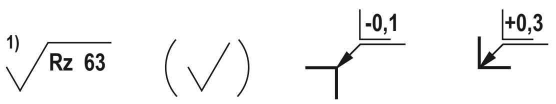
Size	ØD1	ØD2	H1	H2	H3	H4	H5	H6	□ L1	□ L2	SW
16	8.4	13.5	5.2	12	62.5	79.5	10	2	65	48	30
25	14	20	8	20	70	88	12	2	80	55	36
32	18	26	10	26	75	93	14	5	105	70	55

Installation bore



Contact surface





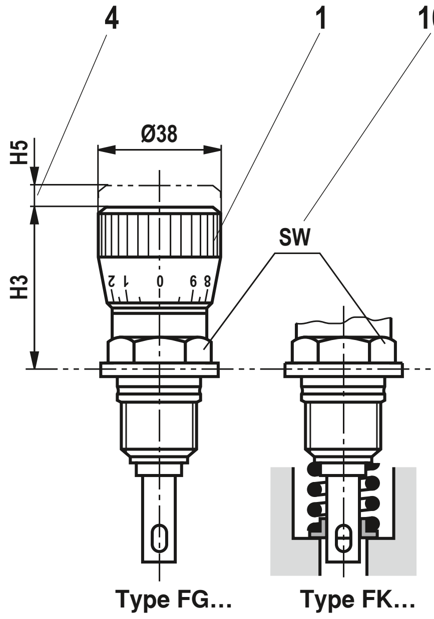
General tolerances ISO 2768-mK

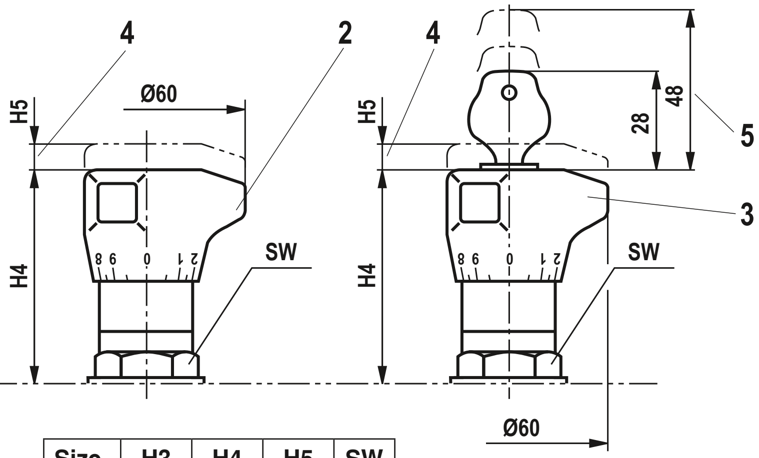
Item explanations see page 8

[1] Visual inspection

Size	ØD3H7	ØD4H7	ØD5	ØD6	D7	H7	H8	H9	$H10^{+0.1}$	H11	H12	L2
16	38	36	15	15	M8	20.5	34	44	47	16	33	48
25	52	50	25	20	M12	24	40.5	55	60.5	19	39.5	55
32	72	70	35	30	M16	35	58	75	80.5	26	57.5	70

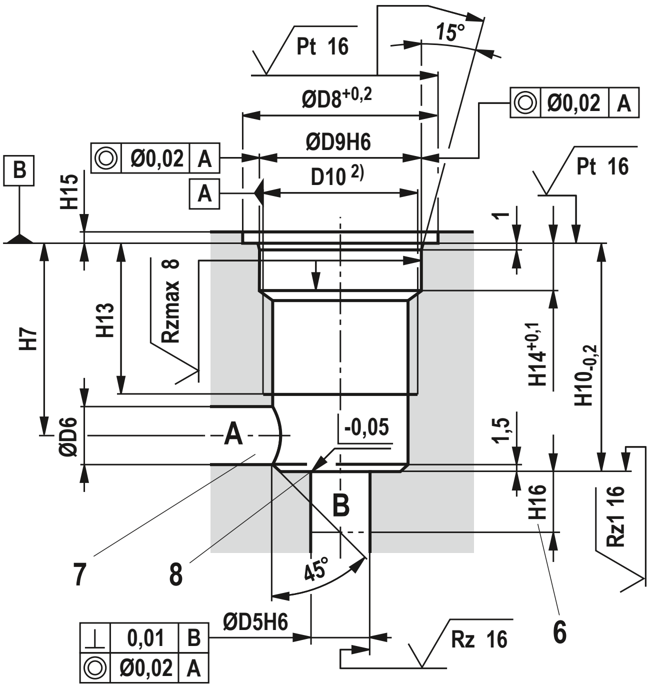
Unit dimensions: Screw-in cartridge valve "C" (dimensions in mm)

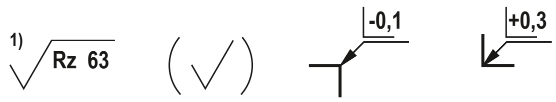




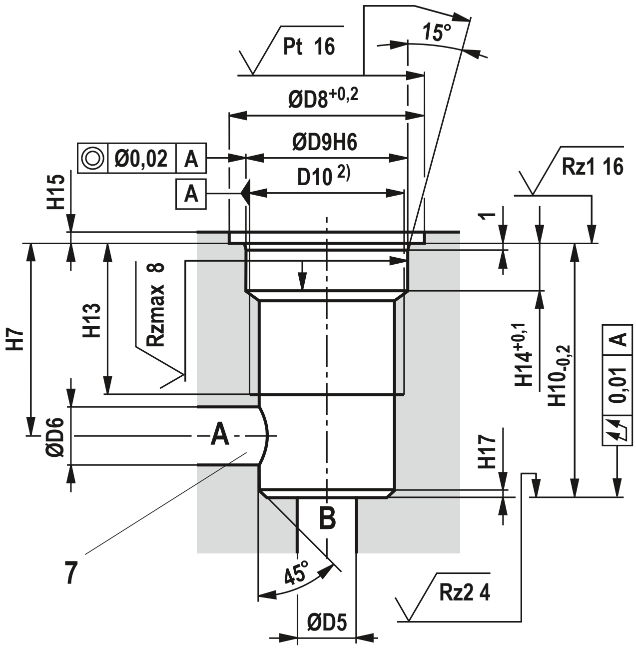
Size	H3	H4	H5	SW
16	50.5	67.5	10	30
25	50	68	12	36
32	49	67	14	55

Mounting cavity type FG…





Mounting cavity type FK…



General tolerances ISO 2768-mK
1) Visual inspection
2) Pipe thread according to ISO 228/1
Item explanations see page 8

	Valve type							Valve type						
	FG	FK						FG	FK					
Size	**ØD5H6**	**ØD5**	**ØD6**	**ØD8$^{+0.2}$**	**ØD9H6**	**D10 2)**	**H7**	**H10$_{-0.2}$**		**H13**	**H14$^{+0.1}$**	**H15**	**H16**	**H17**
16	10	14	10	34.1	28	G3/4	33	39.5	48	26	8.2	2	22	1.5
25	18	25	20	51.1	44	G1 1/4	41.5	55	67.5	27	9.4	2.5	27	2
32	28	35	30	70.1	60	G2	56	73.5	93.5	29	8.5	2.5	36	3

Unit dimensions

1 Adjustment type "1"

2 Adjustment type "7"

3 Adjustment type "3"

4 Setting range

5 Space required to remove the key

6 Depth of fit

7 Port A can be positioned around the central axis of port B. (**Attention!** Observe the position of the mounting bores!)

8 Control edge

9 Valve mounting screws (cartridge valve "K") see to the right

10 Tightening torques (screw-in cartridge valve "C"):

- Size 16
  M_A = 170 Nm ±10 %, moisten thread with hydraulic fluid
- Size 25
  M_A = 305 Nm ±10 %, moisten thread with hydraulic fluid
- Size 32
  M_A = 600 Nm ±10 %, moisten thread with hydraulic fluid

☞ **Notice!**

The tightening torques refer to a housing tensile strength of at least 300 N/mm² (corresponds to GG30)

Valve mounting screws Screw-in valve "K" (separate order)

– **Size 16**

4 hexagon socket
Head cap screws ISO 4762 - M8 x 20 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 30 Nm ±10 %,
Material no. **R901021242**

– **Size 25**

4 hexagon socket
Head cap screws ISO 4762 - M12 x 25 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 102 Nm ±10 %,
Material no. **R913000128**

– **Size 32**

4 hexagon socket
Head cap screws ISO 4762 - M16 x 35 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 250 Nm ±10 %,
Material no. **R913000509**

☞ **Notice!**

- The tightening torques refer to the maximum admissible operating pressure. Friction coefficients, tightening torques, and preload forces interact with each other. Thus, we recommend checking the mounting characteristics with genuine parts and boundary conditions.
- Tightening torques depend on the strength of the installation housing!

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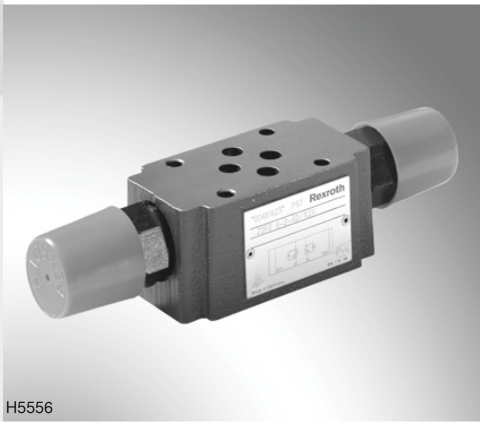
Twin throttle check valve

RE 27506/05.11
Replaces: 02.03

Type Z2FS

Size 6
Component series 4X
Maximum operating pressure 315 bar
Maximum flow 80 l/min



H5556

Table of contents

Features

– Sandwich plate valve
– Porting pattern according to DIN 24340 form A
– Porting pattern according to ISO 4401-03-02-0-05 (**with** locating hole)
– For the main or pilot flow limitation of 2 actuator ports
– 4 adjustment types:
  • Set screw with lock nut and protective cap
  • Lockable rotary knob with scale
  • Spindle with internal hexagon and scale
  • Rotary knob with scale
– For supply or discharge throttling

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2FS	6		–4X /			*

Twin throttle check valve; sandwich plate design — Z2FS

Size 6 **= 6**

Throttle check valve side A and B **= –** [1)]
Throttle check valve side A **= A**
Throttle check valve side B **= B**

Adjustment type
Setscrew with lock nut and protective cap **= 2**
Lockable rotary knob with scale **= 3** [2)]
Spindle with internal hexagon and scale **= 5**
Rotary knob with scale **= 7**

4X = Component series 40 to 49
(40 to 49: unchanged installation and connection dimensions)

1Q = With fine adjustment
2Q = Standard design

Seal material
No code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

No code = Without locating hole
/60 [3)] **=** With locating hole

Further details in the plain text

[1)] Identical adjustment types on the A and B side.

[2)] H key with material no. **R900008158** is included in the delivery.

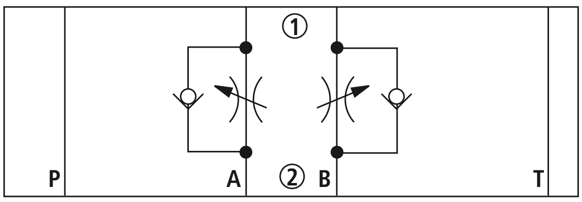
[3)] Locating pin ISO 8752-3x8-St, material no. **R900005694** (separate order)

Standard types and standard units are contained in the EPS (standard price list).

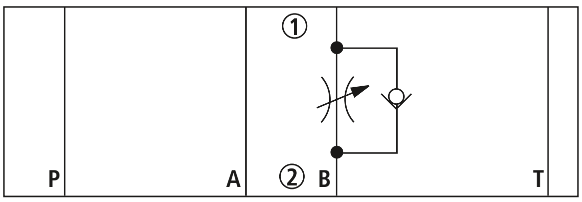
Symbols (① = component side, ② = plate side)

Supply throttling

Type Z2FS 6 –…

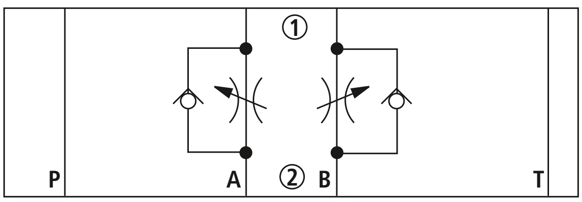


Type Z2FS 6 B…

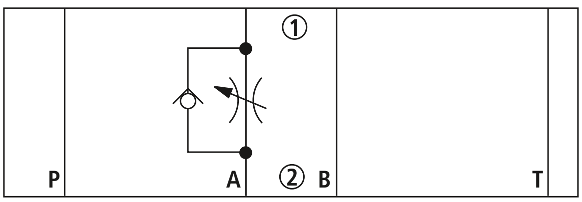


Discharge throttling

Type Z2FS 6 –…



Type Z2FS 6 A…



Function, section

The valve type Z2FS is a twin throttle check valve in sandwich plate design. It is used for the main or pilot flow limitation of one or two actuator ports.

Two throttle check valves aligned symmetrically to each other limit flows in one direction and allow free return flow in the opposite direction.

In the supply throttling, the hydraulic fluid reaches actuator A ② through channel ① via the throttling point (1) created by the valve seat (2) and the throttle spool (3). The throttle spool (3) can be axially adjusted by means of a setscrew (4) and thus allows for the setting of the throttling point (1).

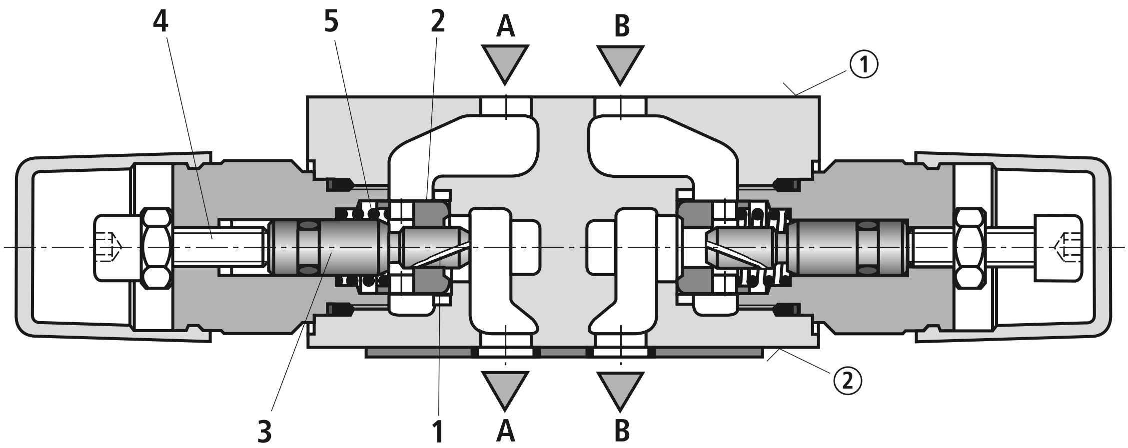
The hydraulic fluid flowing back from the actuator A② moves the valve seat (2) against the spring (5) in the direction of the throttle spool (3) and thus allows for the unhindered flow as check valve. Depending on the installation position, the throttling effect may be directly in the supply or in the discharge.

Main flow limitation (version "2Q")

For changing the velocity of an actuator (main flow limitation), the twin throttle check valve is installed between the directional valve and the subplate.

Pilot flow limitation (version "1Q")

With pilot operated directional valves, the twin throttle check valve can be used as switching time adjustment (pilot flow limitation). Then, it is installed between pilot control and main valve.



Type Z2FS 6 –2… (supply throttling)

① = component side

② = plate side

Technical Data (For applications outside these parameters, please consult us!)

general

Weight	kg	Approx. 0.8
Installation position		Any
Ambient temperature range	°C	–20 to +80

hydraulic

Maximum operating pressure	bar	315
Maximum flow	l/min	80
Hydraulic fluid		See table below
Hydraulic fluid temperature range	°C	–20 to +80
Viscosity range	mm^2/s	10 to 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!

- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

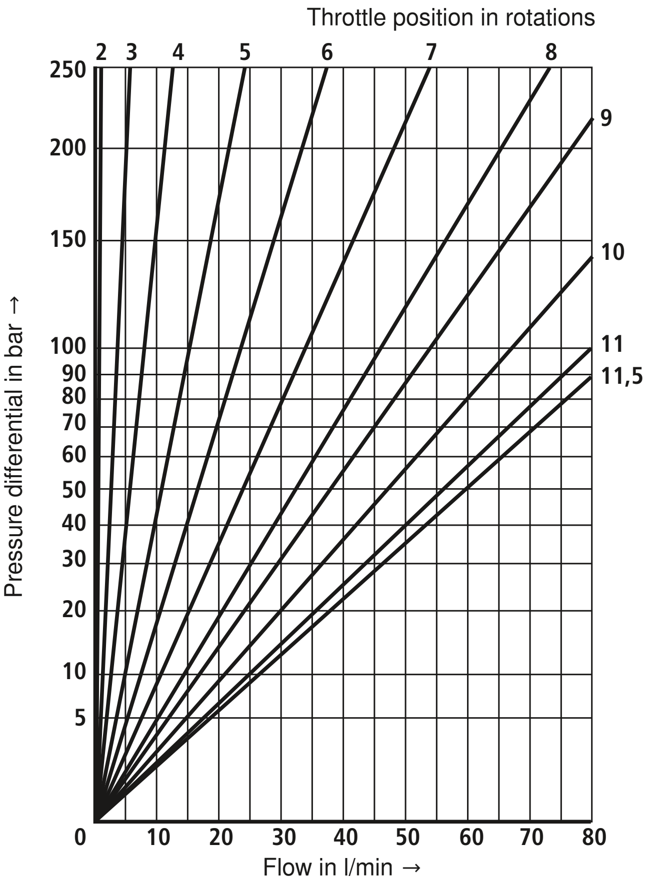
- **Flame-resistant – water-containing**:
  - Maximum operating pressure 210 bar
  - Maximum hydraulic fluid temperature 60 °C
  - Expected service life as compared to HLP hydraulic oil 30 % to 100 %

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

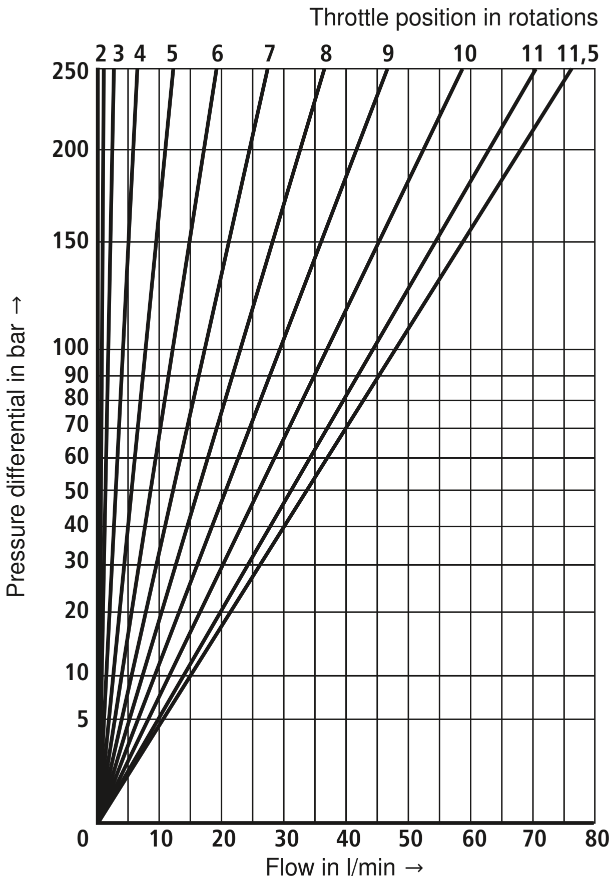
For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

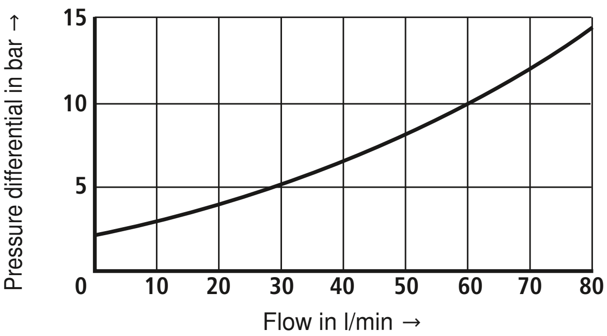
Δp-q_V characteristic curves (version "2Q")



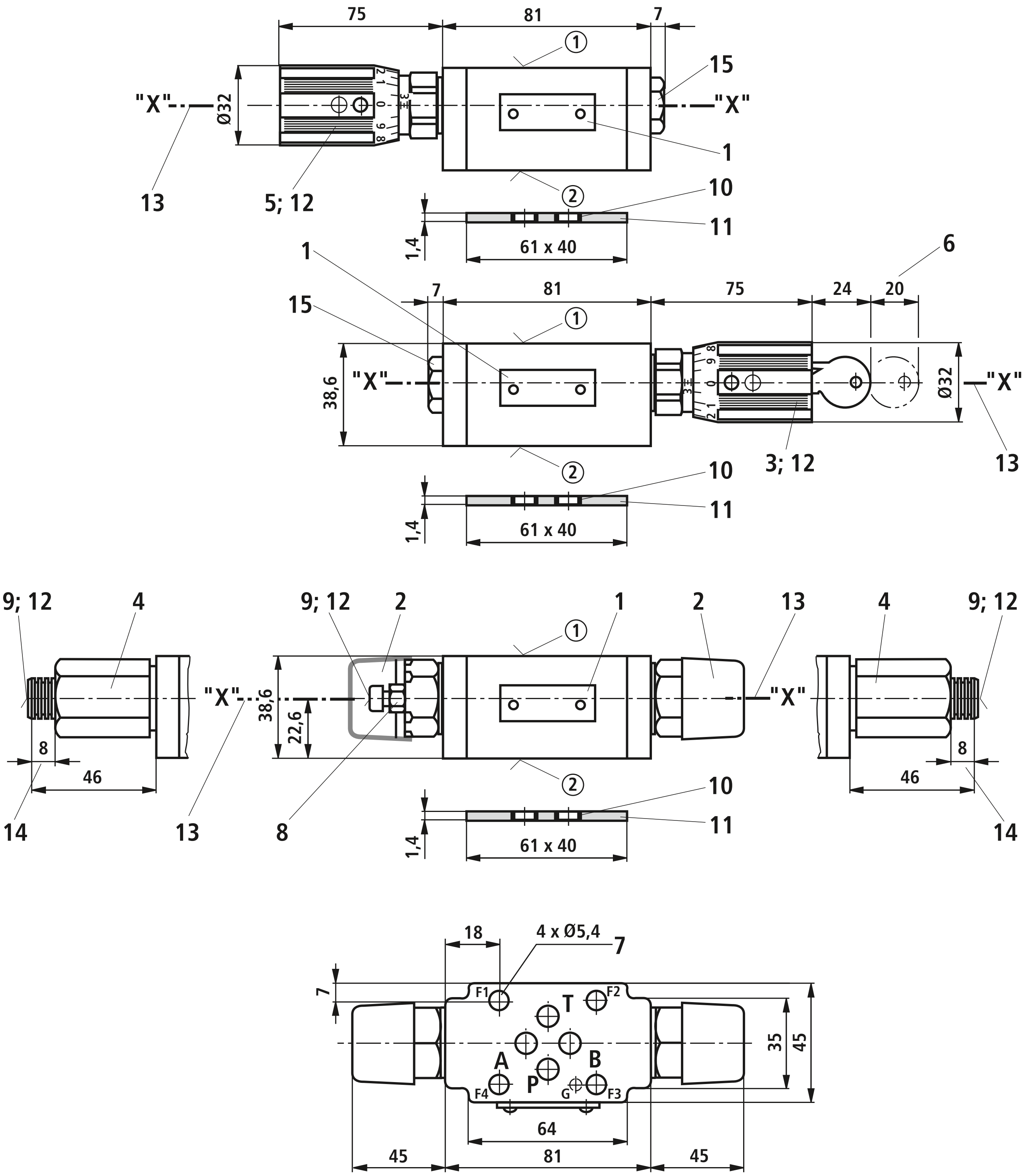
Δp-q_V characteristic curves (version "1Q")



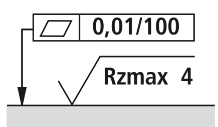
Δp-q_V characteristic curves
(via check valve; throttle closed)



Unit dimensions (dimensions in mm)



Item explanations and **valve mounting screws** see page 7.



Required surface quality of the valve mounting face

Unit dimensions

① Component side – porting pattern according to ISO 4401-03-02-0-05 (**with** locating hole Ø3 x 5 mm deep)

② Plate side – porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 (**with** locating hole for locating pin ISO 8752-3x8-St; version "/60")

1 Name plate
2 Adjustment type "2"
3 Adjustment type "3"
4 Adjustment type "5"
5 Adjustment type "7"
6 Space required to remove the key
7 Valve mounting bores
8 Lock nut SW10
9 Set screw/spindle for changing the flow cross-section (internal hexagon SW5)
10 Identical seal rings for ports A, B, P, and T
11 Seal ring plate
12 With all adjustment types:
Counterclockwise rotation = larger flow
Clockwise rotation = smaller flow
13 The unit is converted from supply to discharge throttling by rotating it around the "X"–"X" axis
14 Stroke
15 Plug screw SW22

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

☞ **Note!**

Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Notes

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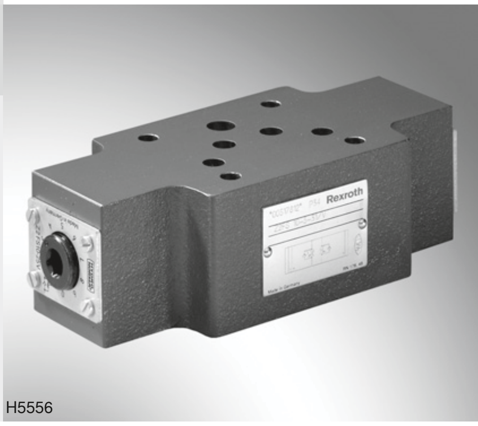
Rexroth
Bosch Group

Throttle check valve

RE 27518/10.07
Replaces: 02.03

Type Z2FS

Size 10
Component series 3X
Maximum operating pressure 315 bar *[4569 psi]*
Maximum flow 160 l/min *[42.3 US gpm]*



H5556

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Features

- Sandwich plate valve
- Porting pattern to ISO 4401-05-04-0-05, NFPA T3.5.1 R2 and ANSI B93-7 D05
- For limiting the main or pilot oil flow of 2 actuator ports
- 3 adjustment elements:
  - Lockable rotary knob with scale
  - Spindle with hexagon socket and scale
  - Rotary knob with scale
- For meter-in and meter-out throttling

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2FS	10			–3X/		V	*

Throttle check valve, sandwich plate design

Size 10 = **10**

Throttle check valve, sides A and B = **–** [1)]
Throttle check valve, side A = **A**
Throttle check valve, side B = **B**

Adjustment element
Lockable rotary knob with scale = **3** [2)]
Spindle with hexagon socket and scale = **5**
Rotary knob with scale = **7**

3X = Component series 30 to 39
(30 to 39: unchanged installation and connection dimensions)

No code = With two throttle check valves, meter-in or meter-out throttling (valve can be rotated)
S = (…A.–3X/S) meter-in throttling on side A
(…B.–3X/S) meter-in throttling on side B
S2 = (…A.–3X/S2) meter-out throttling on side A
(…B.–3X/S2) meter-out throttling on side B

Seal material
V = FKM seals
(other seals on request)
⚠ Attention!
Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

1) Identical adjustment elements on sides A and B.

2) H-key, Material no. **R900008158,** included in the scope of supply.

Standard types and components can be found in the EPS (standard price list).

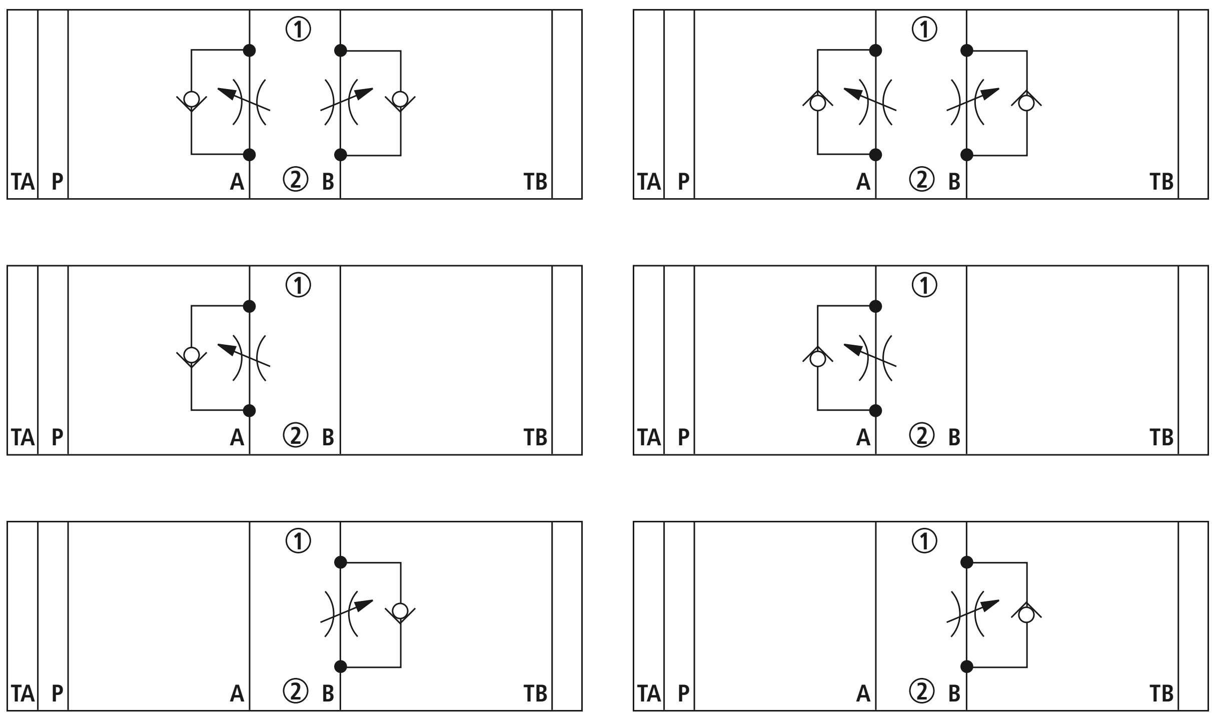
Symbols (① = component side, ② = plate side)

Meter-in throttling "S" **Meter-out throttling "S2"**

Variant "–"

Variant "A"

Variant "B"



Function, section

Valves of type Z2FS 10 are throttle check valves of sandwich plate design. They are used to limit the main or pilot oil flow of one or two actuator ports.

Two throttle check valves, which are arranged symmetrically to each other, limit flows in one direction and allow a free return flow in the opposite direction.

With meter-in throttling, hydraulic fluid flows through channel A1 via throttling point (1), which is formed by control land (2) and throttling spool (3.1), to actuator A2. Throttling spool (3.1) can be axially adjusted by means of spindle (4), thus allowing throttling point (1) to be adjusted.

At the same time, hydraulic fluid present in channel A1 flows through bore (5) to the opposite spool side (6). Together with the spring force, the pressure applied holds throttling spool (3.1) in the throttling position.

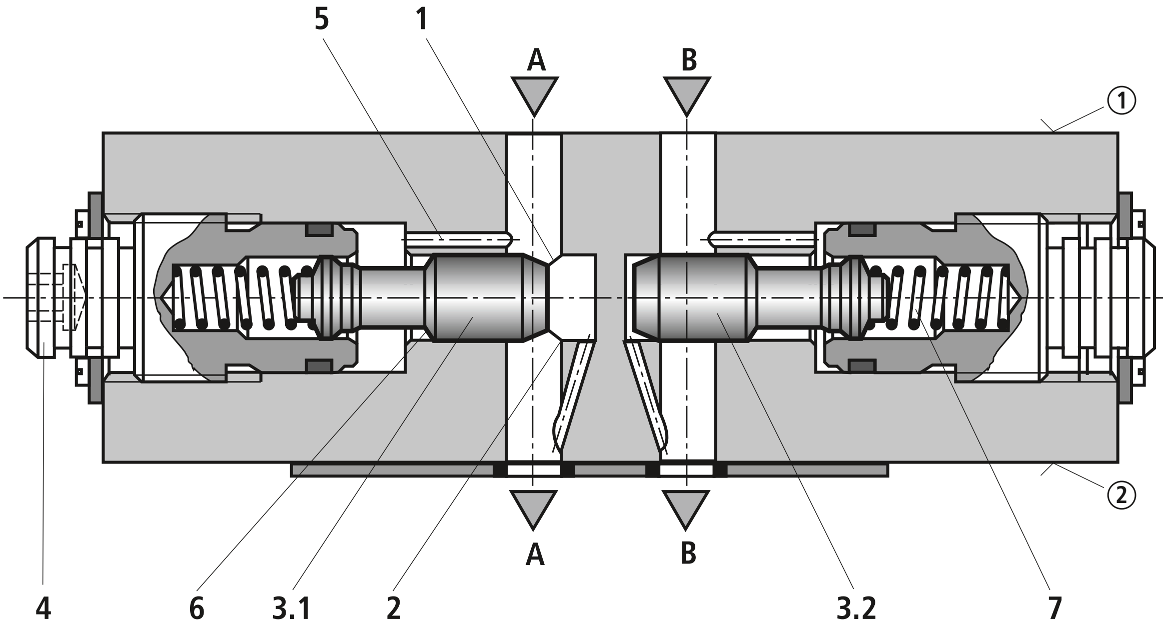
The hydraulic fluid returning from actuator B2 shifts throttling spool (3.2) against spring (7), thus allowing an unrestricted flow like with a check valve. Depending on the installation position, throttling can be effective in the supply or return line.

Main flow limitation

To change the velocity of an actuator (main flow limitation), the throttle check valve must be installed between the directional valve and the subplate.

Pilot oil flow limitation

In conjunction with pilot operated directional valves, the throttle check valve can be used for adjusting the actuating time (pilot oil flow limitation). In this case, it is installed between the pilot and the main valve.



Meter-in throttling

Technical data (for applications outside these parameters, please consult us!)

General

Weight	kg *[lbs]*	ca. 3.1 *[6.8]*
Installation position		Optional
Ambient temperature range	°C *[°F]*	–20 to +80 *[–4 to +176]*

Hydraulic

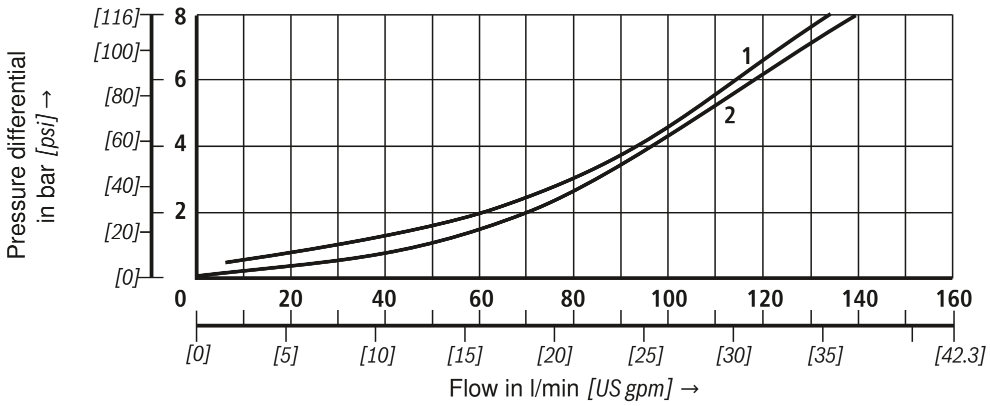
Maximum operating pressure	bar *[psi]*	315 *[4569]*
Maximum flow	l/min *[US gpm]*	160 *[42.2]*
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids on request
Hydraulic fluid temperature range	°C *[°F]*	–20 to +80 *[–4 to +176]*
Viscosity range	mm^2/s *[SUS]*	10 to 800 *[60 to 3710]*
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [1]

[1] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves (measured with HLP46, $\vartheta_{oil\ (\nu = 190\ SUS)}$ = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

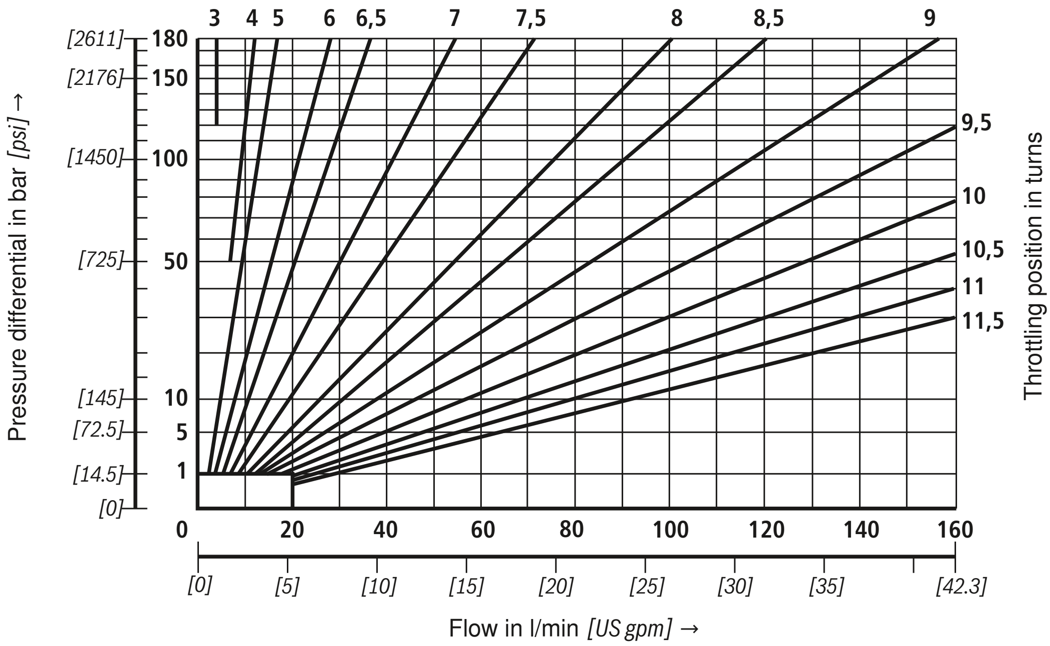
Δp-q_V **characteristic curves** (via check valve)



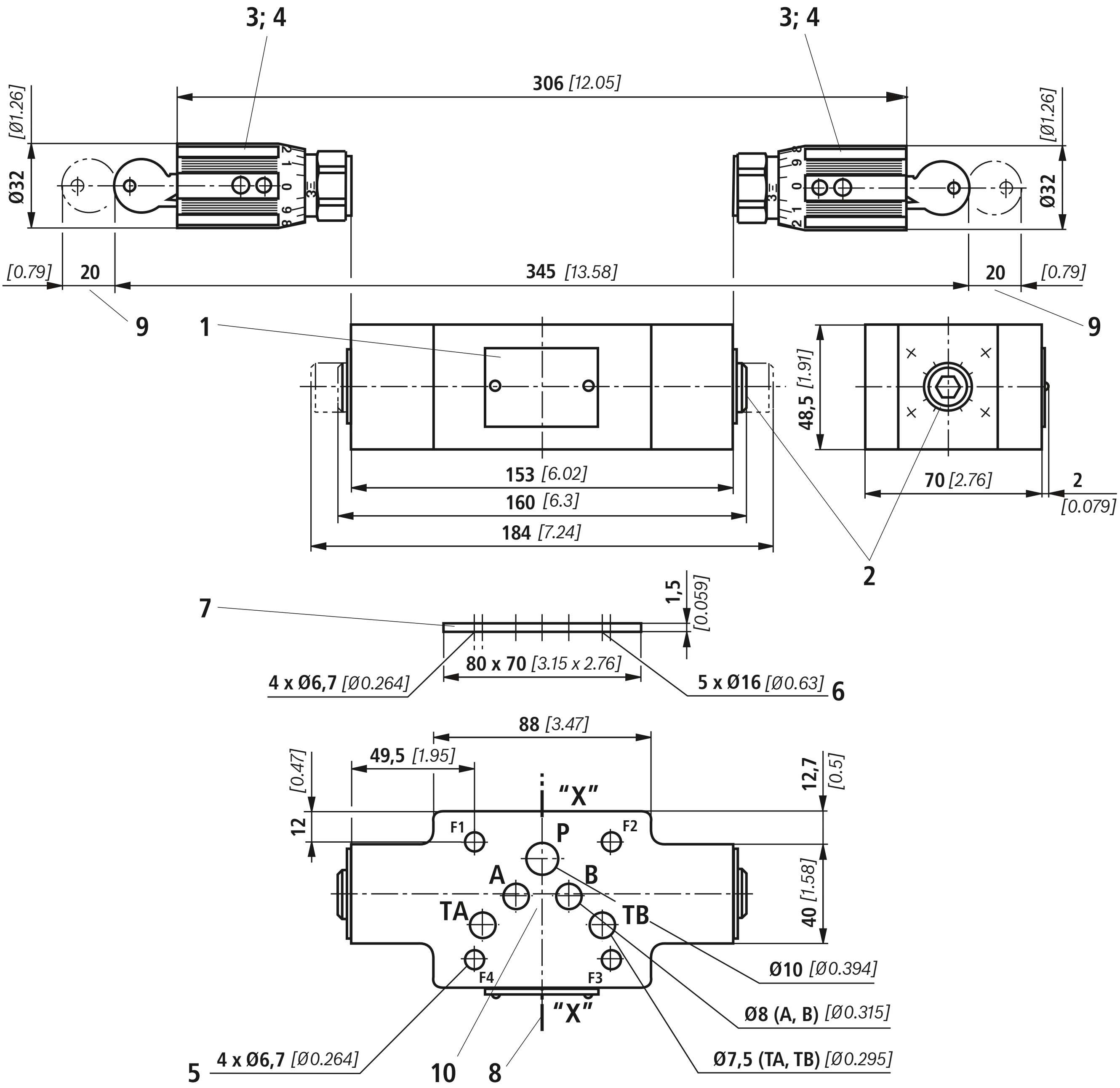
1 Throttle closed

2 Throttle open

Δp-q_V **characteristic curves** (constant throttling position)



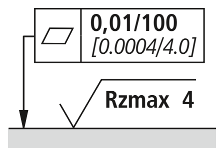
Unit dimensions: Variant “–“ (dimensions in mm)



⚠ **Attention!**

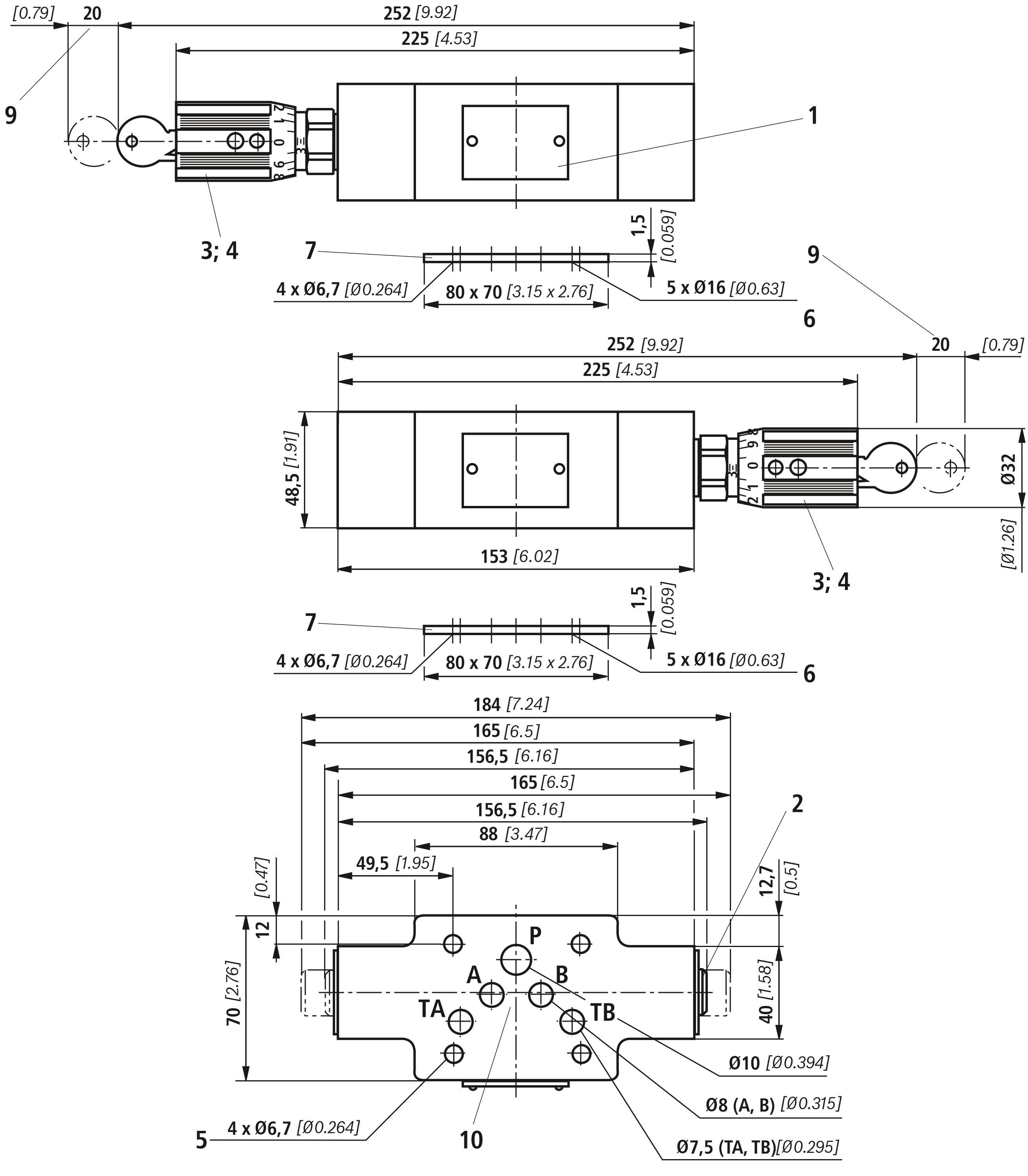
If bores are required for X- and Y-port (e.g. for pilot operated directional valve size 10) variant **SO30** must be selected!

For explanations of items and **valve mounting screws,** see page 8.



Required surface quality of the valve mounting face

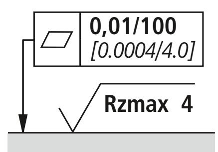
Unit dimensions: Variants "A" and "B" (dimensions in mm)



⚠ **Attention!**

If bores are required for X- and Y-port (e.g. for pilot operated directional valve size 10) variant **SO30** must be selected!

For explanations of items and **valve mounting screws,** see page 8.



Required surface quality of the valve mounting face

Unit dimensions

1 Nameplate

2 Adjustment element “5“
Spindle for adjusting the flow cross-section (hexagon socket 8 A/F)
• Turning counter-clockwise = larger flow
• Turning clockwise = smaller flow

3 Adjustment element “3“

4 Adjustment element “7“

5 4 through-bores for valve mounting

6 Identical seal rings for ports A, B, P, TA, TB

7 R-ring plate

8 To change over from meter-in to meter-out throttling, turn the device about the axis “X“–“X“ (only with variant “–“)

9 Space required to remove key

10 Porting pattern to ISO 4401-05-04-0-05, NFPA T3.5.1 R2 and ANSI B93-7 D05

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M6 - 10.9

4 hexagon socket head cap screws 1/4-20 UNC

☞ **Note!**

The length and tightening torque of the valve mounting screws must be calculated taking account of the components mounted above and below the sandwich plate valve.

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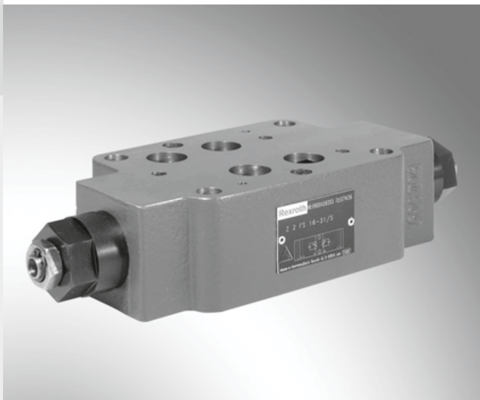
Rexroth
Bosch Group

Throttle check valve

RE 27526/04.08
Replaces: 11.02

Type Z2FS

Size 16
Component series 3X
Maximum operating pressure 350 bar *[5076 psi]*
Maximum flow 250 l/min *[66 US gpm]*



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– Sandwich plate valve
– Porting pattern to ISO 4401-07-07-0-05 and NFPA T3.5.1 R2-D07
– For limiting the flow in 2 actuator ports
– Adjustment element: Spindle with hexagon socket
– For meter-in or meter-out throttling

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2FS	16		8 –3X/		*

Throttle check valve, sandwich plate design

Size 16 = **16**

Throttle check valve Side A and B = **–**
Throttle check valve Side A = **A**
Throttle check valve Side B = **B**

Adjustment element
Spindle with hexagon socket = **8**

Component series 30 to 39 = **3X**
(30 to 39: unchanged installation and connection dimensions)

S = (…A8–3X/S) meter-in throttling on side A
(…B8–3X/S) meter-in throttling on side B
(…–8–3X/S) meter-in throttling on sides A and B

S2 = (…A8–3X/S2) meter-out throttling on side A
(…B8–3X/S2) meter-out throttling on side B
(…–8–3X/S2) meter-out throttling on sides A and B

Seal material
No code = NBR seals
V = FKM seals
(other seals on request)

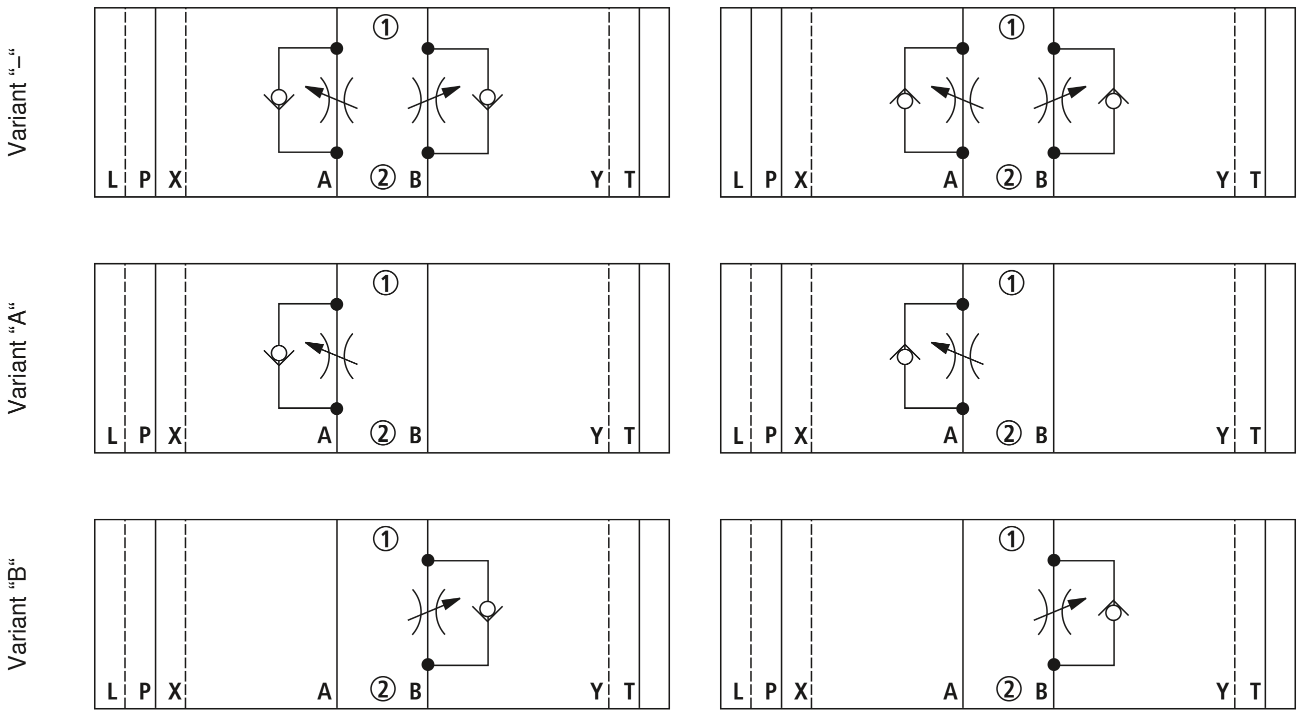
⚠ **Attention!**
Observe compatibility of seals with hydraulic fluid used

Further details in clear text

Standard types and components are given in the EPS (standard price list).

Symbols (① = component side, ② = plate side)

Meter-in throttling "S" **Meter-out throttling "S2"**



Function, section

Valves of type Z2FS are throttle check valves of sandwich plate design. They are used to limit the flow in one or two actuator ports.

Two throttle check valves, which are arranged symmetrically to each other, limit flows (through adjustable throttle spools) in one direction and allow free return flow in the opposite direction.

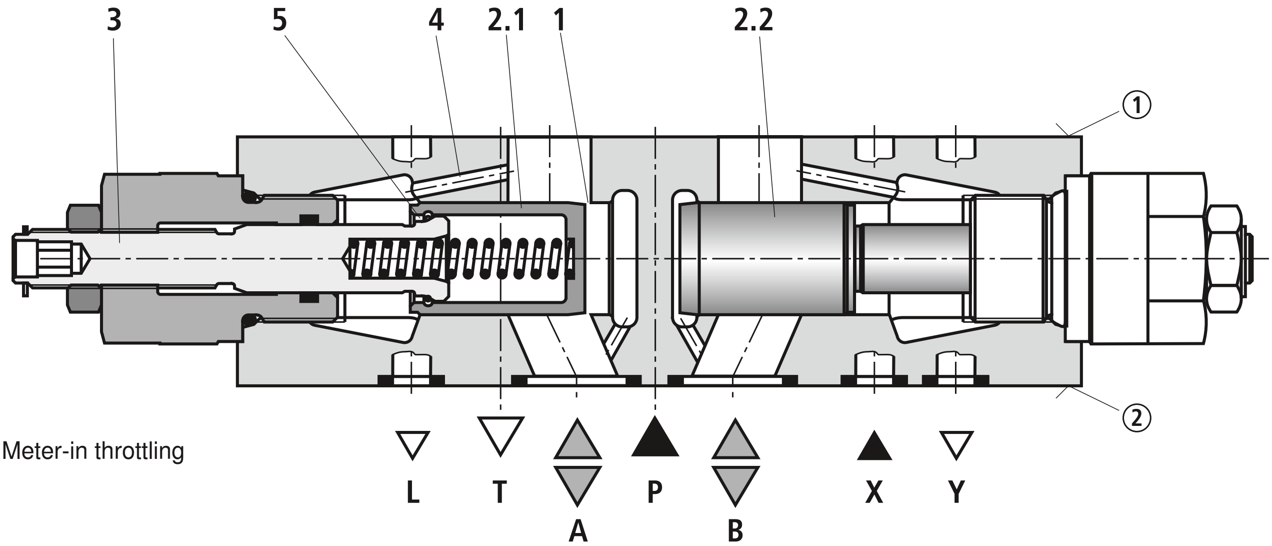
In the case of meter-in throttling the hydraulic fluid is fed through channel A1 via throttling point (1) to actuator A2. The throttle spool (2.1) can be axially adjusted by means of spindle (3), thus allowing throttling point (1) to be adjusted.

At the same time, the hydraulic fluid present in channel A1 gets via bore (4) to spool side (5). Together with the spring force, the applied pressure holds the throttle spool (2.1) in the throttling position.

The hydraulic fluid returning from actuator B2 shifts throttle spool (2.2). The valve then acts as check valve with free flow. Depending on the variant (“S“ or “S2“) throttling can be effective in the inflow or outflow.

Flow limitation

To change the velocity of an actuator, the throttle check valve is to be installed between the directional valve and the subplate.



Meter-in throttling

① = component side

② = plate side

Technical data (for applications outside these parameters, please consult us!)

General

Weight	kg *[lbs]*	ca. 4.7 *[10.4]*
Installation orientation		Optional
Ambient temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)

Hydraulic

Maximum operating pressure	bar *[psi]*	350 *[5076]*
Maximum flow	l/min *[US gpm]*	250 *[66]*
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on request
Hydraulic fluid temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 380 *[13 to 1760]*
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [3]

1) Suitable for NBR and FKM seals

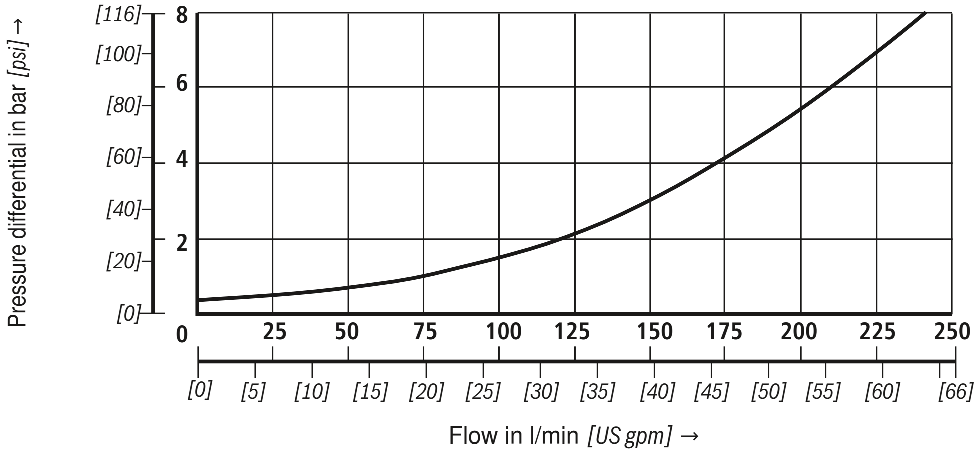
2) Suitable only for FKM seals

3) The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

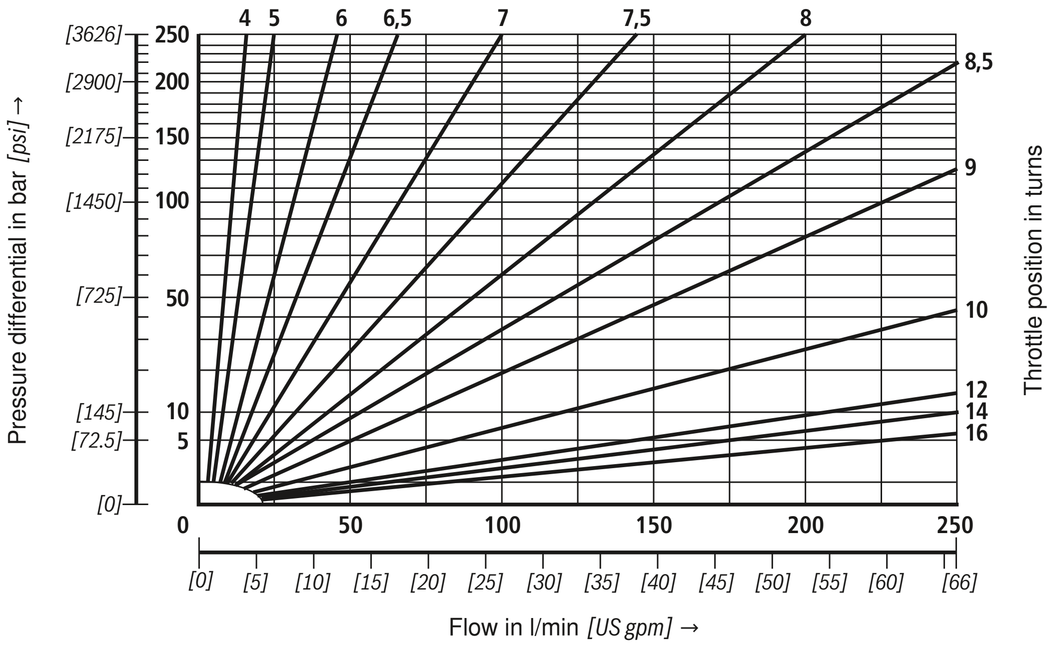
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves (measured with HLP46, $\vartheta_{oil\ (\nu = 190\ SUS)}$ = 40 °C ±5 °C *[104 °F ± 9 °F]*)

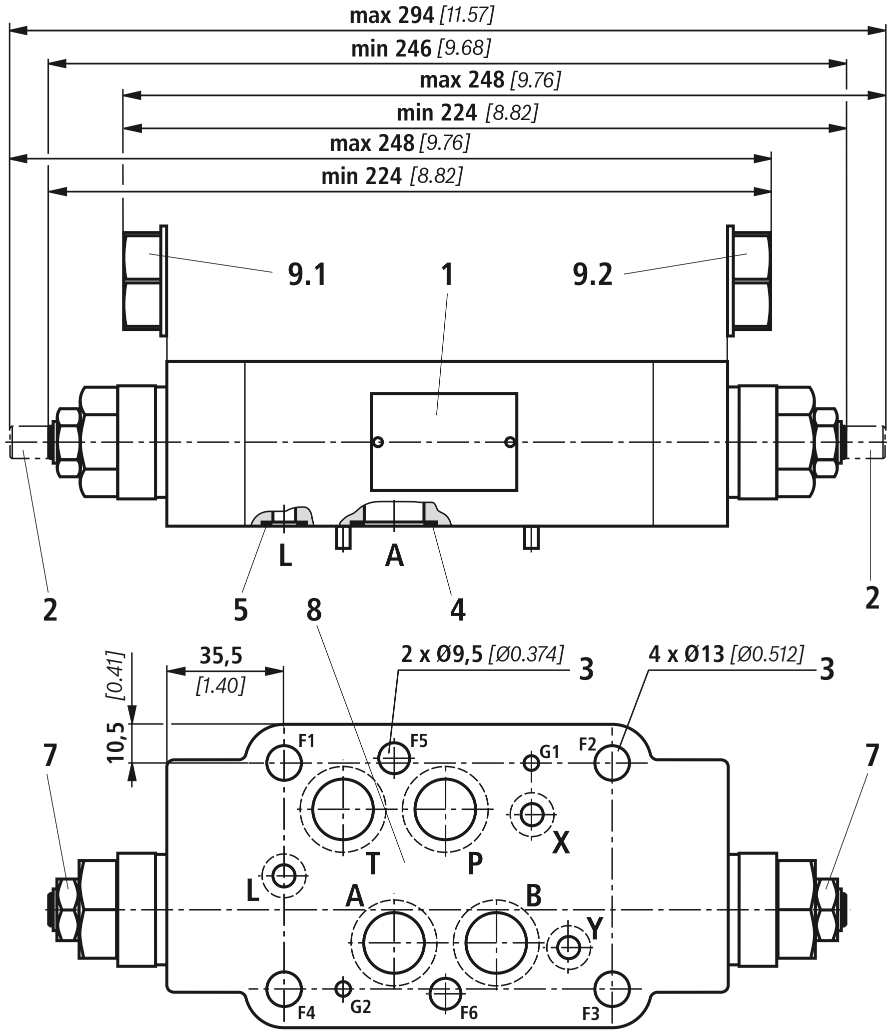
Δ*p*-*q*$_V$ characteristic curves (through check valve, with closed throttle)

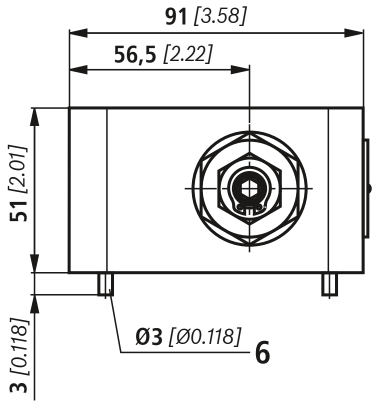


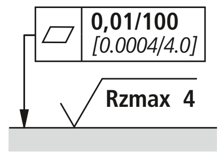
Δ*p*-*q*$_V$ characteristic curves (throtlte position constant)



Unit dimensions (dimensions in mm *[inch]*)







Required surface quality of valve mounting face

1 Nameplate

2 Type of adjustment “8“
Spindle for adjusting the flow cross-section (hexagon socket 6 A/F)
• Turning counter-clockwise = larger flow
• Turning clockwise = smaller flow

3 Through-bores for valve mounting

4 Identical seal rings for ports A, B, P, T

5 Identical seal rings for ports X, Y, L

6 Locating pin (included in the sope of supply)

7 Hexagon 19 A/F, tightening torque M_T = 25 Nm *[18.4 ft-lbs]*

8 Porting pattern to ISO 4401-07-07-0-05 and NFPA T3.5.1 R2-D07

9.1 Plug screw on variant “B“

9.2 Plug screw on variant “A“

Valve mounting screws (separate order)

– Metric

4 hexagon socket head cap screws
ISO 4762 - M10 - 10.9-flZn-240h-L

2 hexagon socket head cap screws
ISO 4762 - M6 - 10.9-flZn-240h-L

– UNC

4 hexagon socket head cap screws 3/8-16 UNC

2 hexagon socket head cap screws 1/4-20 UNC

Note!

The length and tightening torque of valve mounting screws must be calculated taking account of the components mounted above and below the sandwich plate valve.

Notes

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Throttle check valve

RE 27536/05.08
Replaces: 04.02

Type Z2FS

Size 25
Component series 3X
Maximum operating pressure 350 bar *[5076 psi]*
Maximum flow 360 l/min *[95 US gpm]*

tb0222

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Features

– Sandwich plate valve
– Porting pattern to ISO 4401-08-08-0-05 and NFPA T3.5.1 R2-D08
– For limiting the flow of 2 actuator ports
– Adjustment element: Spindle with hexagon socket
– For meter-in or meter-out throttling

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2FS	22		8	–3X /		*

Throttle check valve, sandwich plate design — Z2FS

Size 25 = 22

Throttle check valve, sides A and B = –
Throttle check valve, side A = A
Throttle check valve, side B = B

Adjustment element
Spindle with hexagon socket = 8

Component series 30 to 39 = 3X
(30 to 39: unchanged installation and connection dimensions)

S = (…A8–3X/S) meter-in throttling on side A
(…B8–3X/S) meter-in throttling on side B
(…–8–3X/S) meter-in throttling on sides A and B

S2 = (…A8–3X/S2) meter-out throttling on side A
(…B8–3X/S2) meter-out throttling on side B
(…–8–3X/S2) meter-out throttling on sides A and B

Seal material
No code = NBR seals
V = FKM seals
(other seals on request)

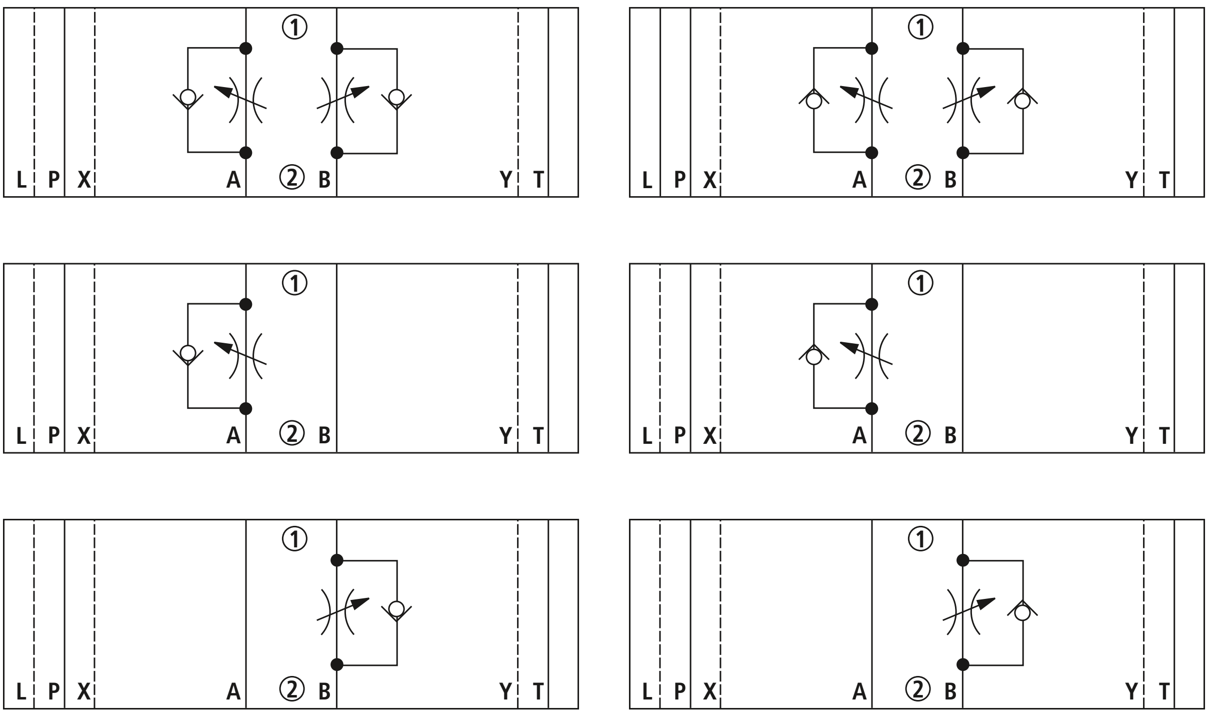
⚠ **Attention!**
Observe compatibility of seals with the hydraulic fluid used

Further details in clear text — *

Symbols (① = component side, ② = plate side)

Meter-in throttling "S" **Meter-out throttling "S2"**

Variant "–"
Variant "A"
Variant "B"



Function, section

Valves of type Z2FS are throttle check valves of sandwich plate design. They are used to limit the flow of one or two actuator ports.

Two throttle check valves, which are symmetrically arranged to each other, limit the flow (by means of adjustable throttle spools) in one direction and allow a free flow in the opposite direction.

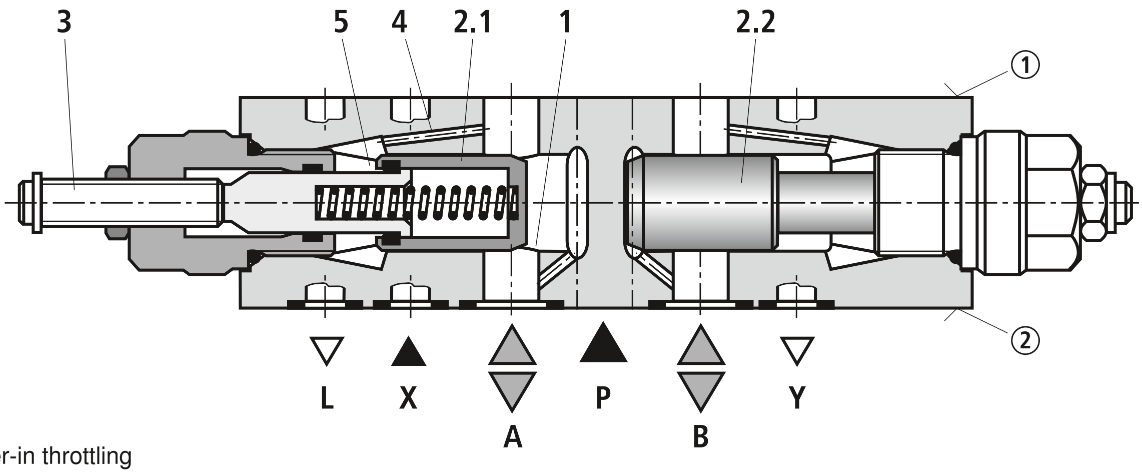
In the case of meter-in throttling the hydraulic fluid is fed through channel A1 via throttling point (1) to actuator A2. Throttle spool (2.1) can be axially adjusted by means of spindle (3), thus allowing throttling point (1) to be adjusted.

At the same time, the hydraulic fluid present in channel A1 is fed via bore (4) to spool side (5). In addition to the spring force, the applied pressure holds throttle spool (2.1) in the throttling position.

The hydraulic fluid returning from actuator B2 shifts throttle spool (2.2) and thus provides an unhindered flow as with a check valve. Depending on the variant ("S" or "S2") throttling can be effective on the supply or return side.

Flow limitation

To change the velocity of an actuator, the throttle check valve can be installed between the directional valve and the subplate.



Meter-in throttling

① = component side
② = plate side

Technical data (for applications outside these parameters, please consult us!)

General

Weight	kg *[lbs]*	ca. 8 *[17.6]*
Installation orientation		Optional
Ambient temperature range	°C *[°F]*	–30 to +50 *[–22 to +122]* (NBR seals) –20 to +50 *[–4 to +122]* (FKM seals)

Hydraulic

Maximum operating pressure	bar *[psi]*	350 *[5076]*
Maximum flow	l/min *[US gpm]*	360 *[95]*
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMT 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on request
Hydraulic fluid temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 380 *[13 to 1760]*
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [3]

[1] Suitable for NBR and FKM seals

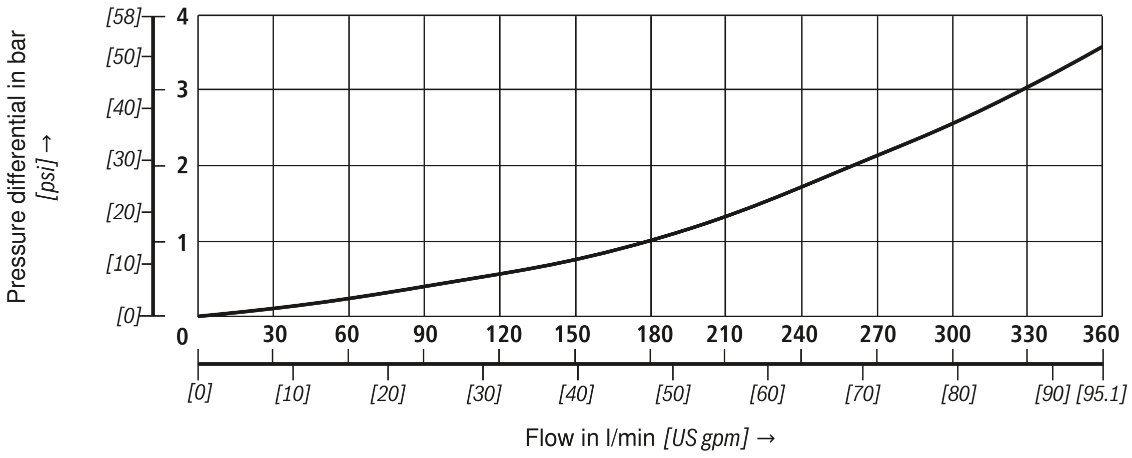
[2] Suitable for FKM seals only

[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

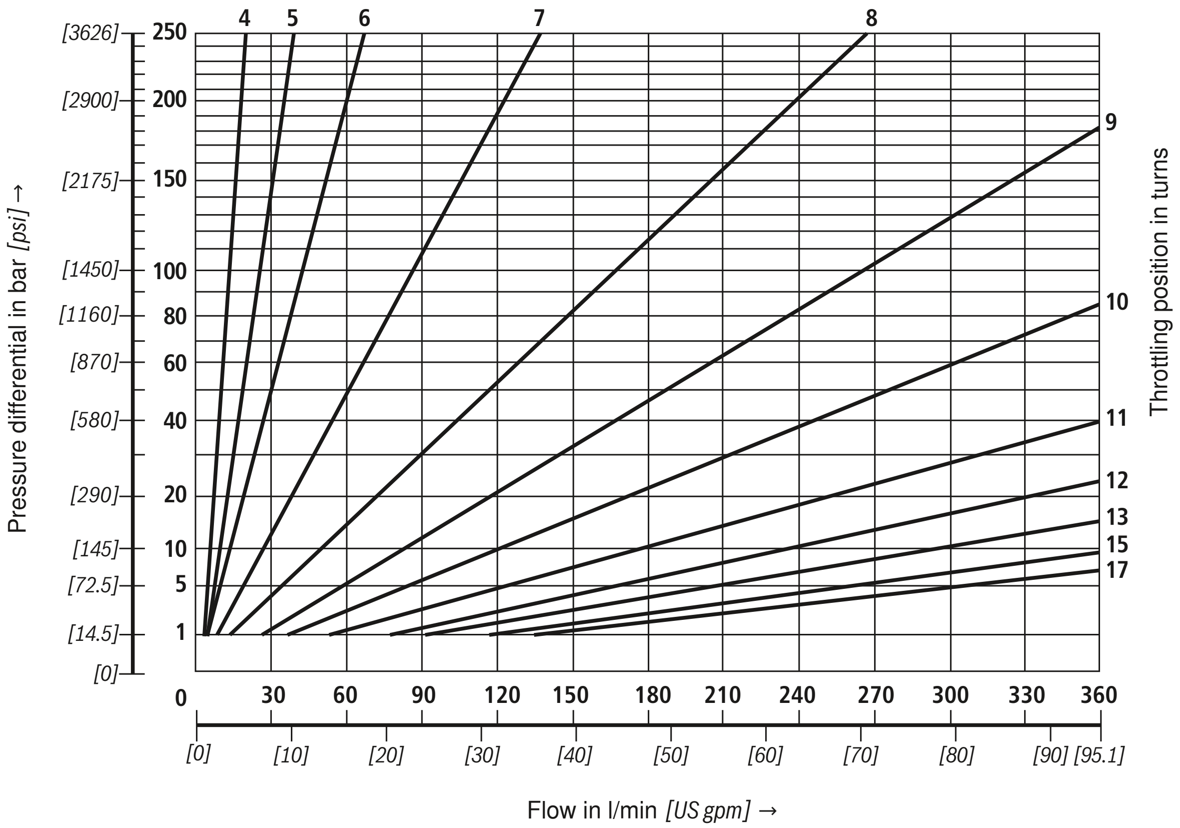
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves (measured with HLP46, $\vartheta_{oil\ (\nu = 190\ SUS)}$ = 40 °C ±5 °C *[104 °F ± 9 °F]*)

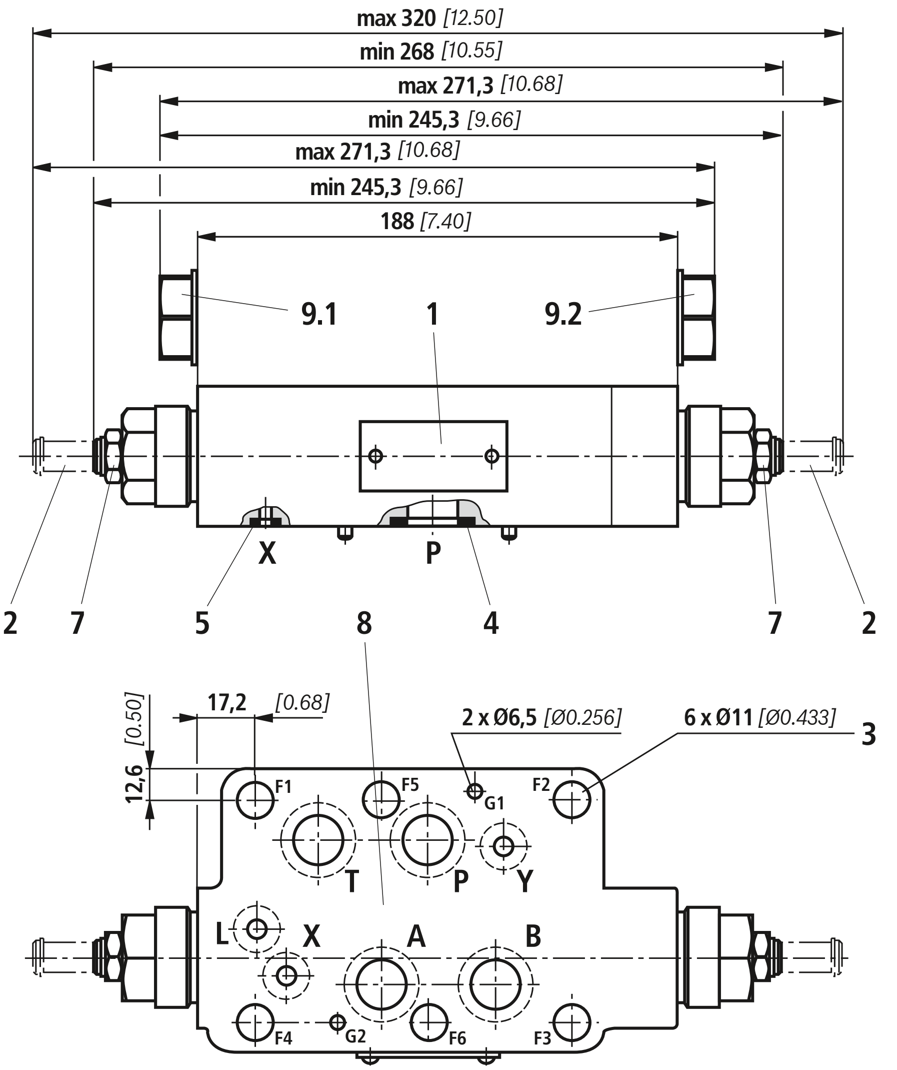
Δp-q_V **characteristic curves** (via check valve, with closed throttle)

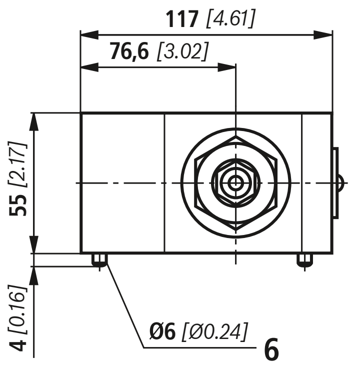


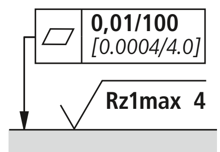
Δp-q_V **characteristic curves** (constant throttling position)



Unit dimensions (dimensions in mm *[inch]*)







Required surface quality of valve mounting face

1 Nameplate

2 Adjustment element "8"
Spindle for adjusting the flow cross-section (hexagon socket 6 A/F)
• Turning counter-clockwise = greater flow
• Turning clockwise = smaller flow

3 Through-bores for valve mounting

4 Identical seal rings for ports A, B, P, T

5 Identical seal rings for ports X, Y, L

6 Locating pin (included in the scope of supply)

7 Hexagon 22 A/F, tightening torque M_T = 25 Nm *[18.4 ft-lbs]*

8 Porting pattern to ISO 4401-08-08-0-05 and NFPA T3.5.1 R2-D08

9.1 Plug screw for variant "B"

9.2 Plug screw for variant "A"

Valve mounting screws (separate order)

– Metric
6 hexagon socket head cap screws
ISO 4762 - M12 - 10.9-flZn-240h-L

– UNC
6 hexagon socket head cap screws 5/8-11 UNC

☞ **Note!**

The length and tightening torque of valve mounting screws must be calculated taking account of the components mounted above and below the sandwich plate valve.

Notes

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Notes

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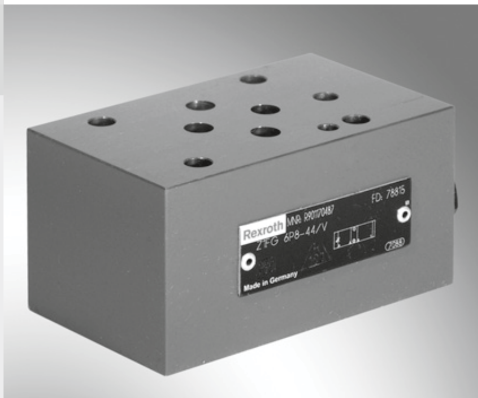
Throttle valve

RE 27482/08.07

Type Z1FG

Size 6
Component series 4X
Maximum operating pressure 315 bar *[4568 psi]*
Maximum flow 70 l/min *[18.5 US gpm]*



TB0198

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Features

– Sandwich plate valve
– Porting pattern to ISO 4401-03-02-0-05, NFPA T3.5.1 R2 and ANSI B93-7 D03 (**with** locating bore)
– For limiting a flow
– Adjustment element: Spindle with hexagon socket

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z	1	FG	6	P	8	–4X	/		*

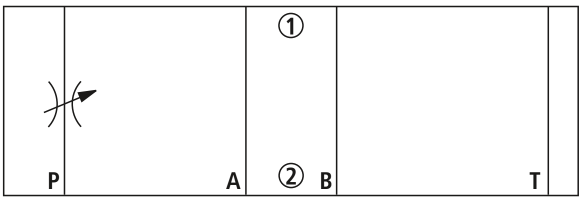
- Sandwich plate valve = Z
- 1 function = 1
- Throttle valve = FG
- Size 6 = 6
- Throttling in channel P = P
- **Adjustment element**
  Spindle with hexagon socket = 8
- 4X = Component series 40 to 49 (40 to 49: unchanged installation and connection dimensions)
- **Seal material**
  M = NBR seals
  V = FKM seals
  (other seals on request)
  ⚠ Attention!
  Observe compatibility of seals with hydraulic fluid used!
- Further details in clear text

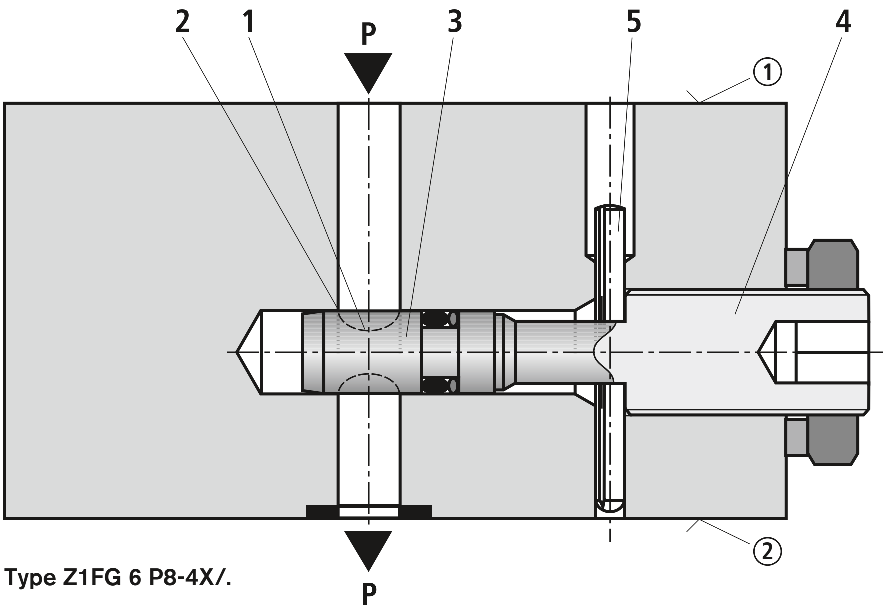
Function, section, symbol (① = component side, ② = plate side)

Valves of type Z1FG are throttle valves of sandwich plate design. They are used to limit the flow in channel P.

When throttled, the hydraulic fluid flows through channel P1 across throttling point (1), which is formed by control land (2) and throttling spool (3), to port P2. Throttling spool (3) can be axially adjusted by means of spindle (4) axial and thus allows the flow across throttling point (1) to be adjusted. The adjustment stroke is limited on both sides by pin (5). The flow depends on the pressure differential and viscosity.

Symbol





Type Z1FG 6 P8-4X/.

Technical data (for applications outside these parameters, please consult us!)

General

Weight	kg *[lbs]*	ca. 0.91 *[2.01]*
Installation position		Optional
Ambient temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)

Hydraulic

Maximum operating pressure	bar *[psi]*	315 *[4568]*
Maximum flow	l/min *[US gpm]*	70 *[18.5]*
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on request
Hydraulic fluid temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	10 to 800 *[46 to 3700]*
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [3]

[1] Suitable for NBR and FKM seals

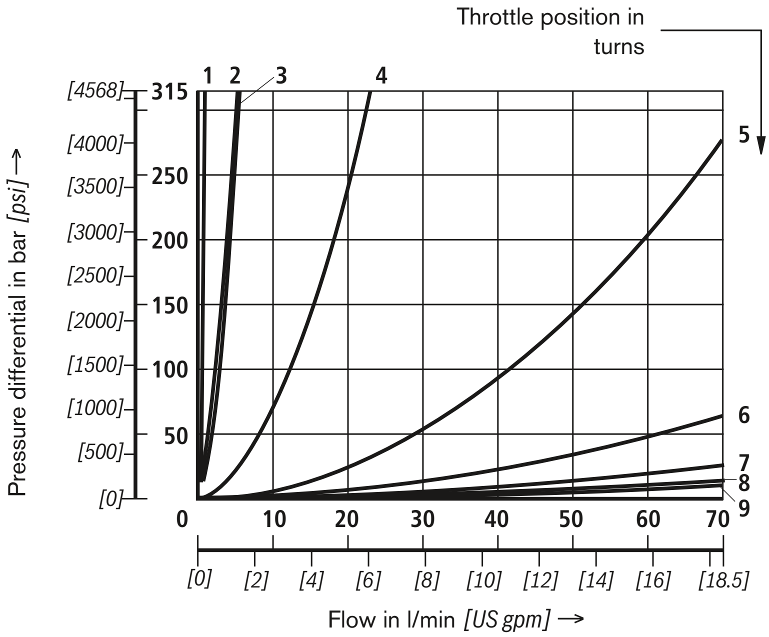
[2] Suitable only for FKM seals

[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

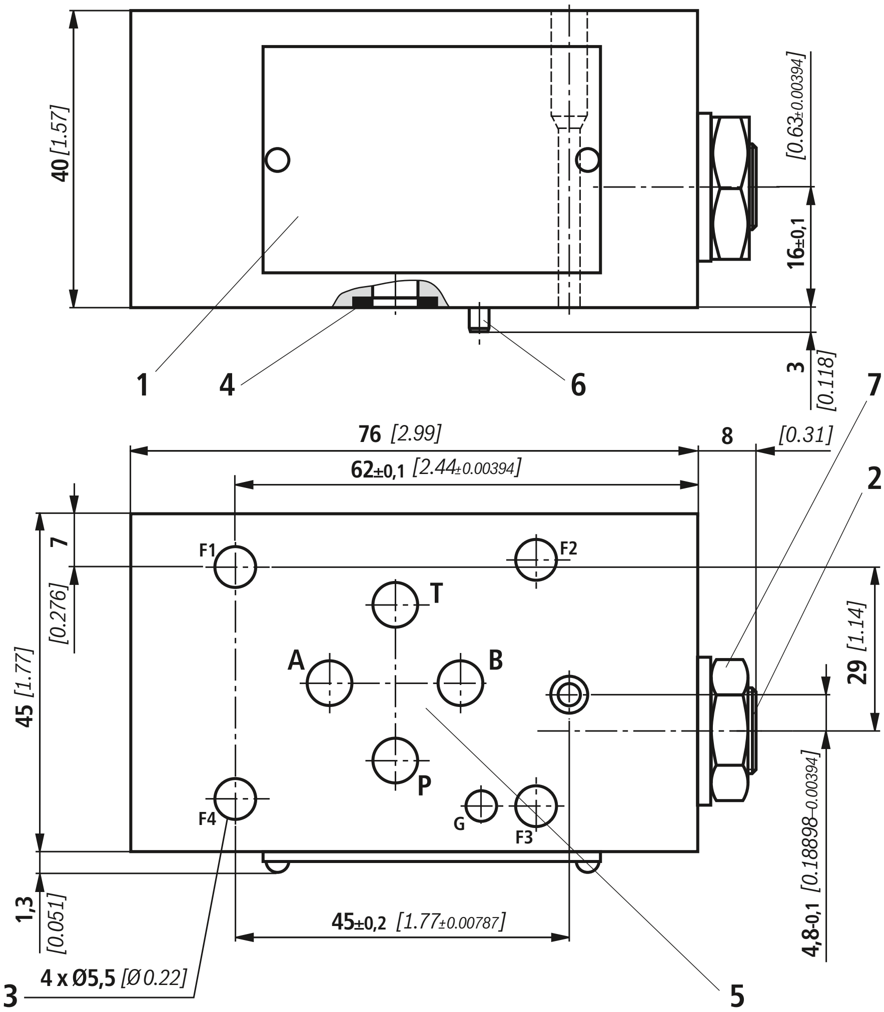
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

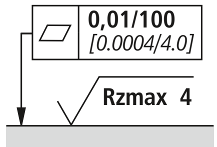
Characteristic curves (measured with HLP46, $\vartheta_{oil\ (\nu = 190\ SUS)} = 40\ °C \pm 5\ °C$ *[104 °F ± 9 °F]*)

Δp-q_V characteristincs with constant throttle position



Unit dimensions (dimensions in mm *[inch]*)





Required surface quality of valve mounting face

1 Nameplate

2 Adjustment element "8"
Spindle with hexagon socket for adjusting the flow cross-section (hexagon socket 8 A/F
- Turning counter-clockwise = increased flow
- Turning clockwise = reduced flow

3 4 valve mounting bores

4 Identical seal rings for ports A, B, P, T (plate side)

5 Porting pattern to ISO 4401-03-02-0-05, NFPA T3.5.1 R2 and ANSI B93-7 D03 (**with** locating bore)

6 Locating pin ISO 8752-3x8-St

7 Locknut 19 A/F, tightening torque $M_T = 10^{+5}$ Nm *[$7.4^{+3.7}$ ft-lbs]*

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

4 hexagon socket head cap screws 10-24 UNC

Note!

The length and tightening torque of the valve mounting screws must be calculated taking into account the components mounted above and below the sandwich plate valve.

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Throttle valve

Type Z.FG

Size 10
Component series 3X
Maximum operating pressure 315 bar
Maximum flow 160 l/min

tb0182

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Features

– Sandwich plate valve
– Porting pattern to ISO 4401-05-04-0-05
– For limiting the flow of 2 actuator ports
– Adjustment element:
  Spindle with hexagon socket and scale

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z		FG	10		5 –3X / V	*

Sandwich plate valve = Z

Number of functions
1 – Throttling in channel A, B or P = 1
2 – Throttling in channels A and B = 2

Throttle valve = FG

Size 10 = 10

Throttling in channels A and B = –
Throttling in channel A = A
Throttling in channel B = B
Throttling in channel P = P

Adjustment element
Spindle with hexagon socket and scale = 5

3X = Component series 30 to 39
(30 to 39: unchanged installation and connection dimensions)

Seal material
V = FKM seals
(other seals on request)
⚠ Attention!
Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

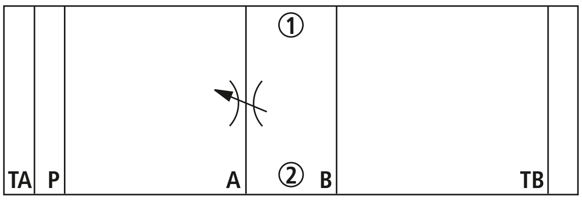
Standard types

Type	Material number
Z1FG 10 A5-3X/V	R900566445
Z1FG 10 B5-3X/V	R900538832
Z1FG 10 P5-3X/V	R901162976

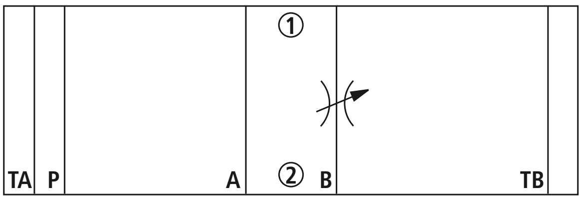
Type	Material number
Z2FG 10 –5-3X/V	R900987000

Symbols (1 = component side, 2 = plate side)

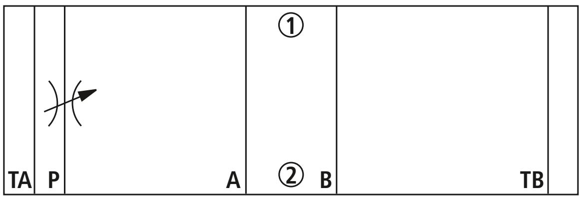
Type Z1FG 10 A5-3X/V



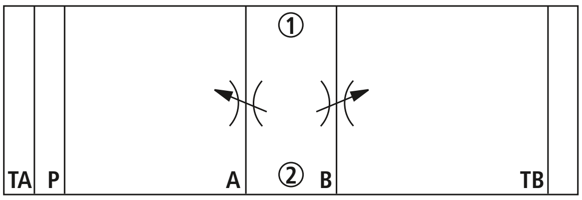
Type Z1FG 10 B5-3X/V



Type Z1FG 10 P5-3X/V



Type Z2FG 10 –5-3X/V



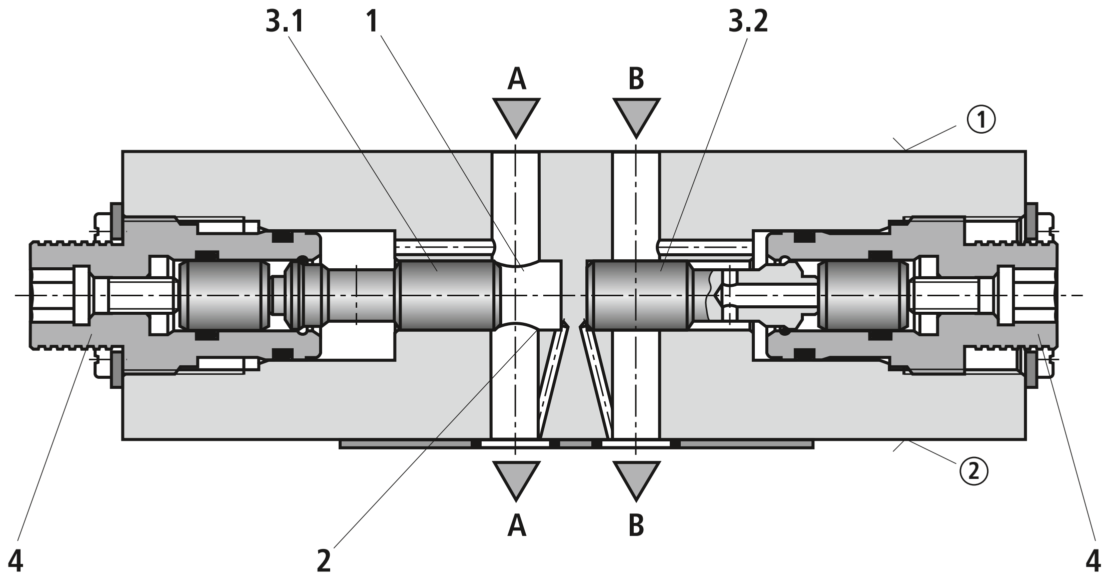
Function, section

Valves of type Z.FG are throttle valves of sandwich plate design. They are used to limit the flow in one or two actuator ports.

Two throttle valves arranged symmetrically to each other limit the flow in both directions.

When throttled, the hydraulic fluid flows through channel A1 or B1 via throttling point (1), which is formed by control land (2) and throttling piston (3.1), to actuator A2 or B2, respectively. Throttling piston (3.1) can be axially adjusted by means of spindle (4) and thus allows the flow across throttling point (1) to be adjusted. The flow depends on the pressure differential and viscosity.

With variant “P“ throttling takes place in channel P. Channels A and B allow a free flow. With variants “A“ or “B“ the channel in which no throttling takes place allows a free flow of the fluid.



Type Z2FG 10-5-3X/V

Technical data (for applications outside these parameters, please consult us!)

General

Weight	– Variants “A“ and „B“	kg	approx. 3
	– Variant “P“	kg	approx. 2.5
	– Variant “–“	kg	approx. 3
Installation position			Optional
Ambient temperature range		°C	–20 to +80

Hydraulic

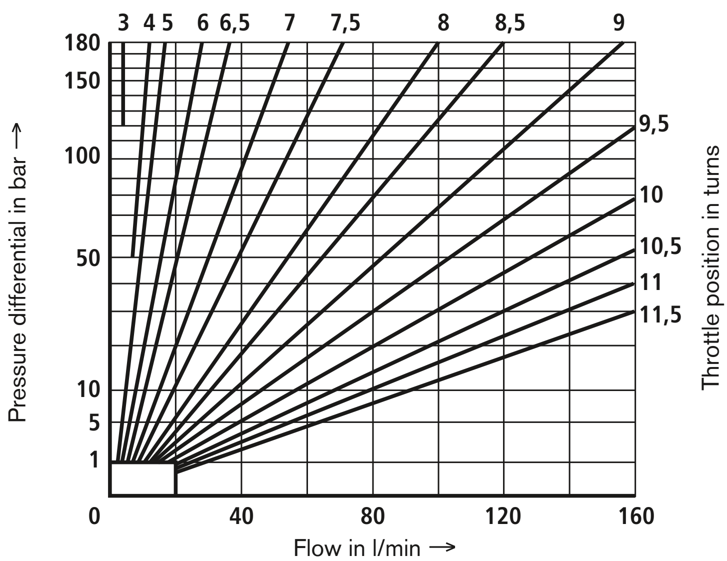
Maximum operating pressure	bar	315
Maximum flow	l/min	160
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524; other hydraulic fluids on request
Hydraulic fluid temperature range	°C	–20 to +80
Viscosity range	mm^2/s	10 to 800
Permissible max. degree of contamination of the hydrauilc fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [1)]

[1)] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

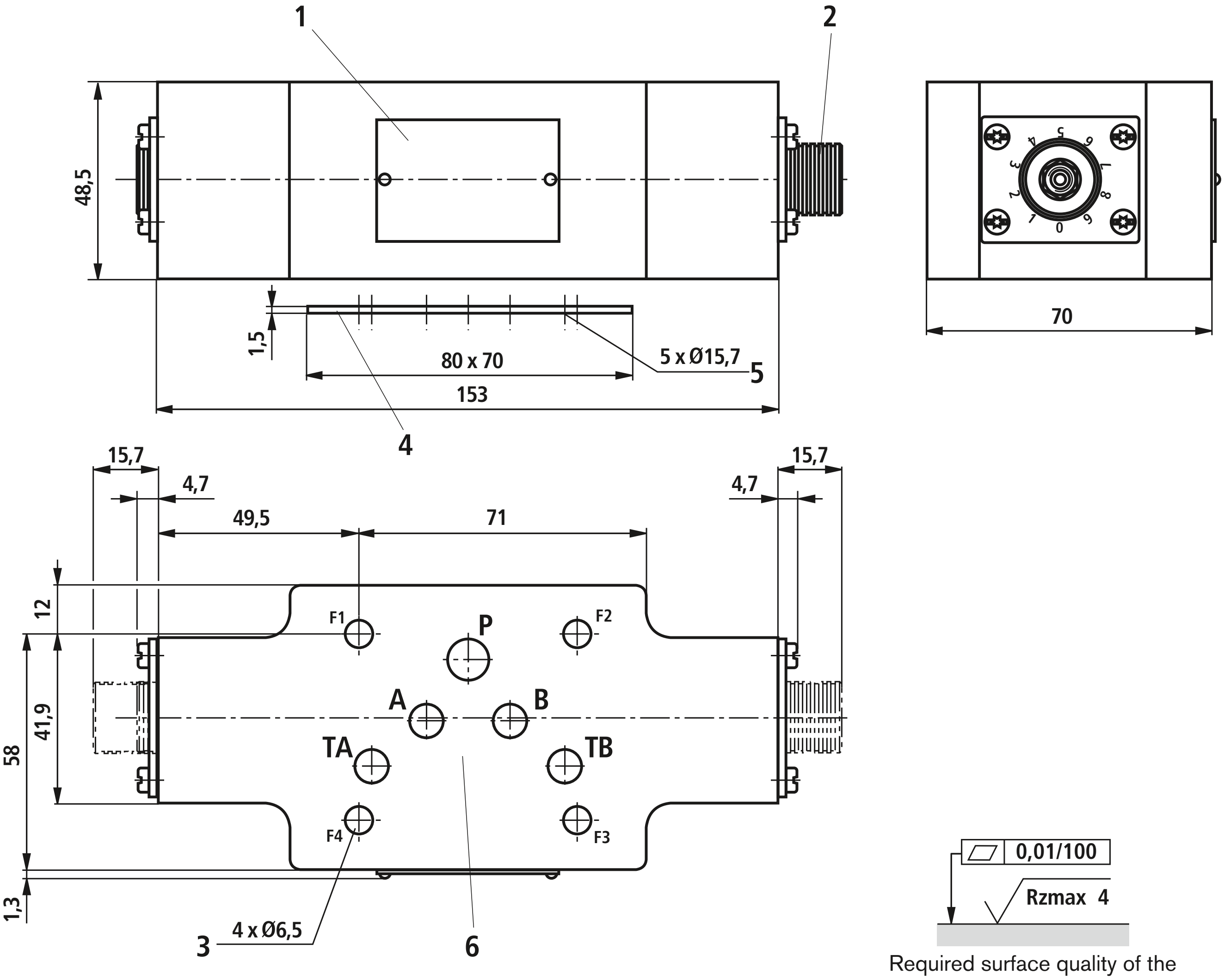
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Δp-q_V characteristic curves with constant throttle position



Unit dimensions: Variant "–" (dimensions in mm)



Required surface quality of the valve mounting face

1 Nameplate

2 Adjustment element "5"
Spindle with hexagon socket and scale for adjusting the flow cross-section (hexagon socket 8 A/F)

- Anti-clockwise turning = larger flow
- Clockwise turning = smaller flow

3 4 valve mounting bores

4 R-ring plate

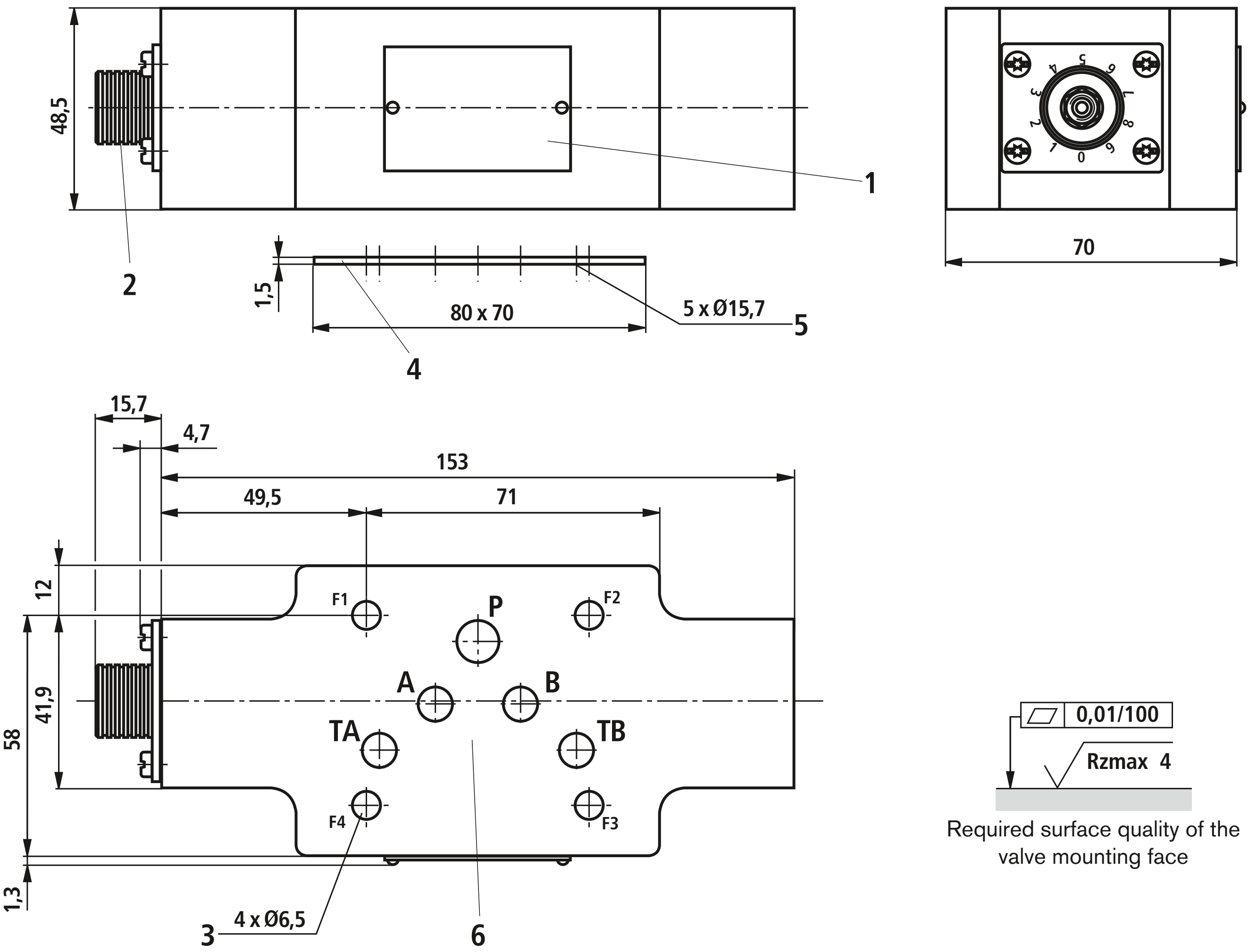
5 Identical seal rings for ports A, B, P, TA, TB

6 Porting pattern to ISO 4401-05-04-0-05

Valve fixing screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M6 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 12 Nm ± 10%

Unit dimensions: Variant “A“ (dimensions in mm)



Required surface quality of the valve mounting face

1 Nameplate

2 Adjustment element “5“
Spindle with hexagon socket and scale for adjusting the flow cross-section (hexagon socket 8 A/F)

- Anti-clockwise turning = larger flow
- Clockwise turning = smaller flow

3 4 valve mounting bores

4 R-ring plate

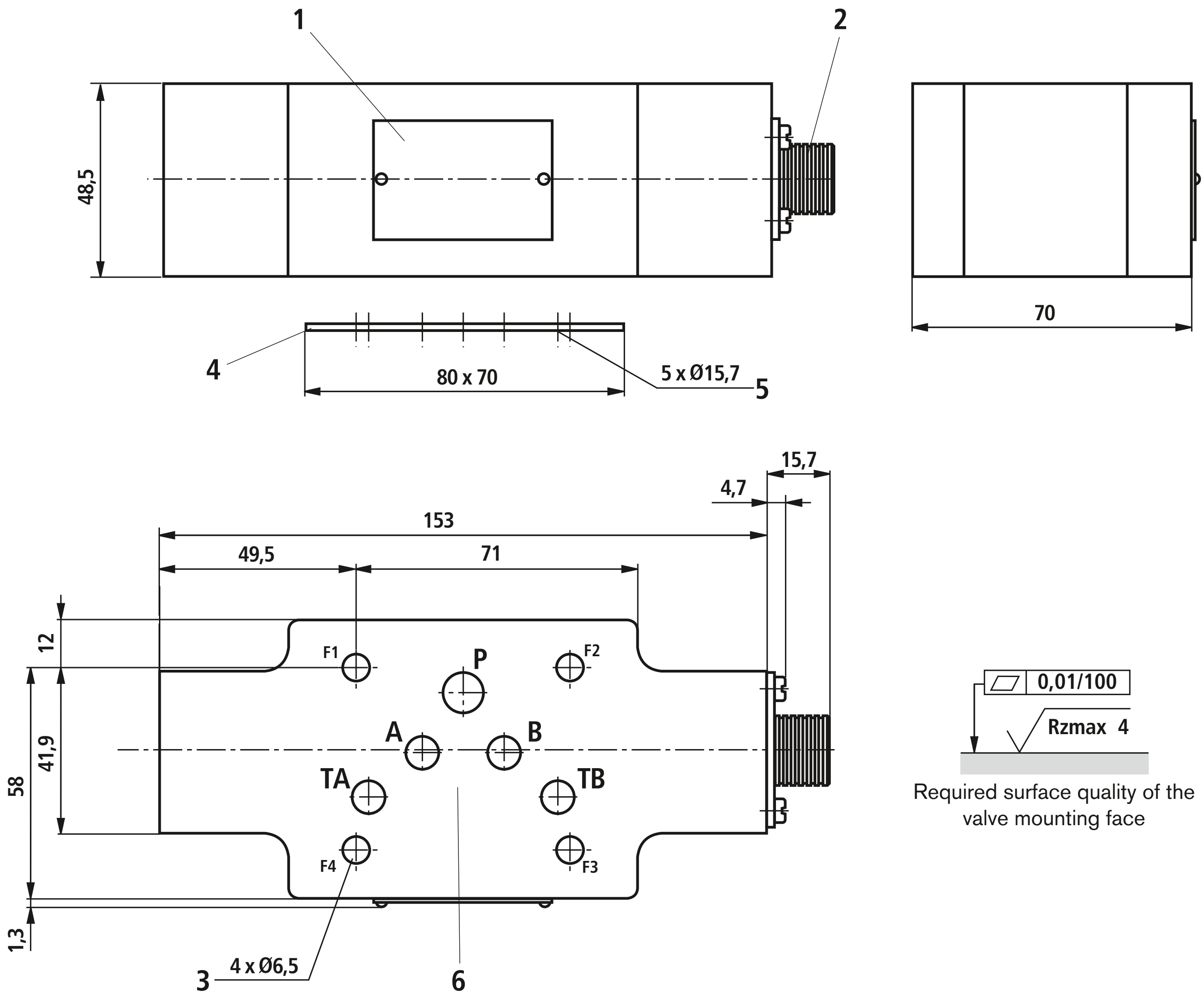
5 Identical seal rings for ports A, B, P, TA, TB

6 Porting pattern to ISO 4401-05-04-0-05

Valve fixing screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M6 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 12 Nm ± 10%

Unit dimensions: Variant “B“ (dimensions in mm)



Required surface quality of the valve mounting face

1 Nameplate

2 Adjustment element “5“
Spindle with hexagon socket and scale for adjusting the flow cross-section (hexagon socket 8 A/F)

- Anti-clockwise turning = larger flow
- Clockwise turning = smaller flow

3 4 Valve mounting bores

4 R-ring plate

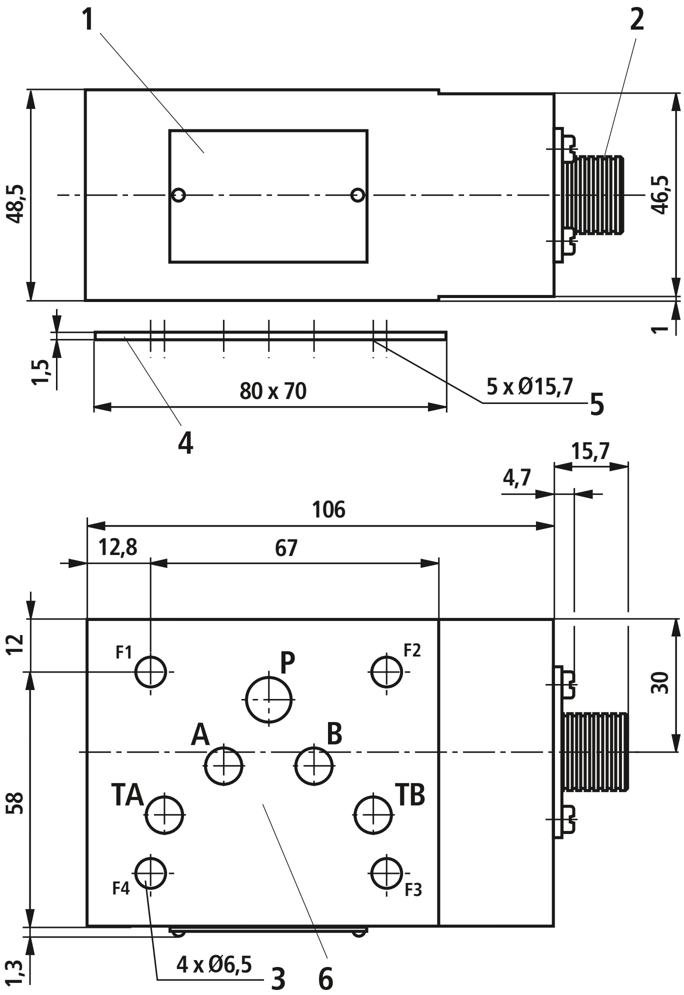
5 Identical seal rings for ports A, B, P, TA, TB

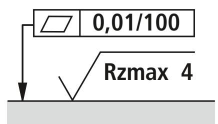
6 Porting pattern to ISO 4401-05-04-0-05

Valve fixing screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M6 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 12 Nm ± 10%

Unit dimensions: Variant “P“ (dimensions in mm)





Required surface quality of the valve mounting face

1 Nameplate
2 Adjustment element “5“
 Spindle with hexagon socket and scale for adjusting the flow cross-section (hexagon socket 8 A/F)
 - Anti-clockwise turning = larger flow
 - Clockwise turning = smaller flow
3 4 valve mounting bores
4 R-ring plate
5 Identical seal rings for ports A, B, P, TA, TB
6 Porting pattern to ISO 4401-05-04-0-05

Valve fixing screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M6 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 12 Nm ± 10%

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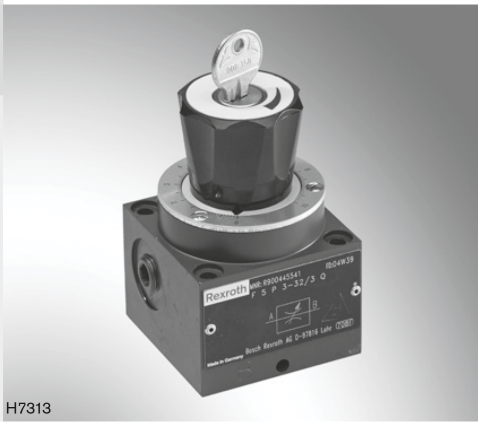
Rexroth
Bosch Group

Fine throttle

RE 27761/10.05
Replaces: 11.02

Type F

Sizes 5 and 10
Component series 2X and 3X
Maximum operating pressure 210 bar
Maximum flow 80 l/min



H7313

Overview of contents

Features

– For subplate mounting
– For threaded connections
– For manifold mounting
– Lockable rotary knob

For information regarding the available spare parts see:
www.boschrexroth.com/spc

Ordering details

F			3 –	/		*

Nominal size 5 = 5
Nominal size 10 = 10

For block installation = K
For threaded connections = G
For subplate mounting = P

Component series 20 to 29 (version **"K"**) = 2X
(20 to 29: unchanged installation and connection dimensions)
Component series 30 to 39 (versions **"G" and "P"**) = 3X
(30 to 39: unchanged installation and connection dimensions)

NS5			NS10					
Progressive			**Progressive**			**Linear**		
Orifice 0.2	=	**0,2Q**	Orifice 5	=	**5Q**	Orifice 2	=	**2L**
Orifice 0.6	=	**0,6Q**	Orifice 10	=	**10Q**	Orifice 5	=	**5L**
Orifice 1.2	=	**1,2Q**	Orifice 16	=	**16Q**	Orifice 10	=	**10L**
Orifice 3	=	**3Q**	Orifice 25	=	**25Q**	Orifice 16	=	**16L**
Orifice 6	=	**6Q**				Orifice 25	=	**25L**
Orifice 10	=	**10Q**				Orifice 50	=	**50L**

Further details in clear text

Seal material

No code = NBR seals
V = FKM seals
(other seals on request)

⚠ **attention!**
The compatibility of the seals and pressure fluid has to be taken into account!

Preferred types

Nominal size 5

Type	Material number
F 5 P3-3X/0,2Q	R900452659
F 5 P3-3X/1,2Q	R900451141
F 5 P3-3X/3Q	R900445541
F 5 P3-3X/6Q	R900445542

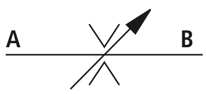
Nominal size 10

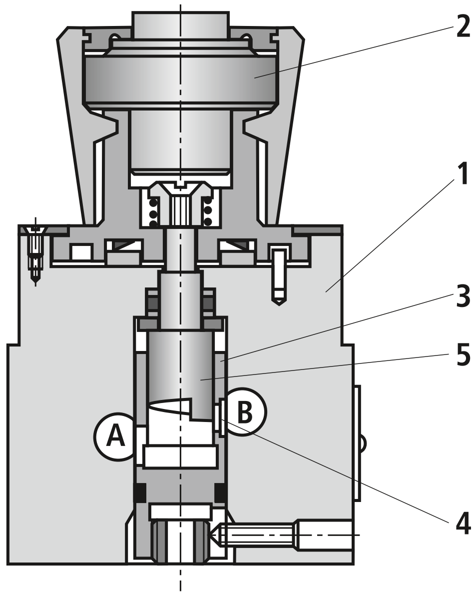
Type	Material number
F 10 P3-3X/2L	R900422786
F 10 P3-3X/5L	R900464865
F 10 P3-3X/10L	R900445543
F 10 P3-3X/16L	R900465171
F 10 P3-3X/25L	R900466374

Function, section, symbol

The type F flow control valve is a fine throttle valve with an orifice type of throttling point. It basically comprises of a housing (1), adjustment element (2) and orifice (3) and is used for throttling a flow with low dependence on temperature.

Throttling of the flow from A to B is carried out at the orifice aperture (4). The orifice cross-section is adjusted by rotating the scroll pin (5). The low dependence on temperature is due to the throttle area being designed as an orifice.





Technical data (for applications outside these parameters, please consult us!)

General

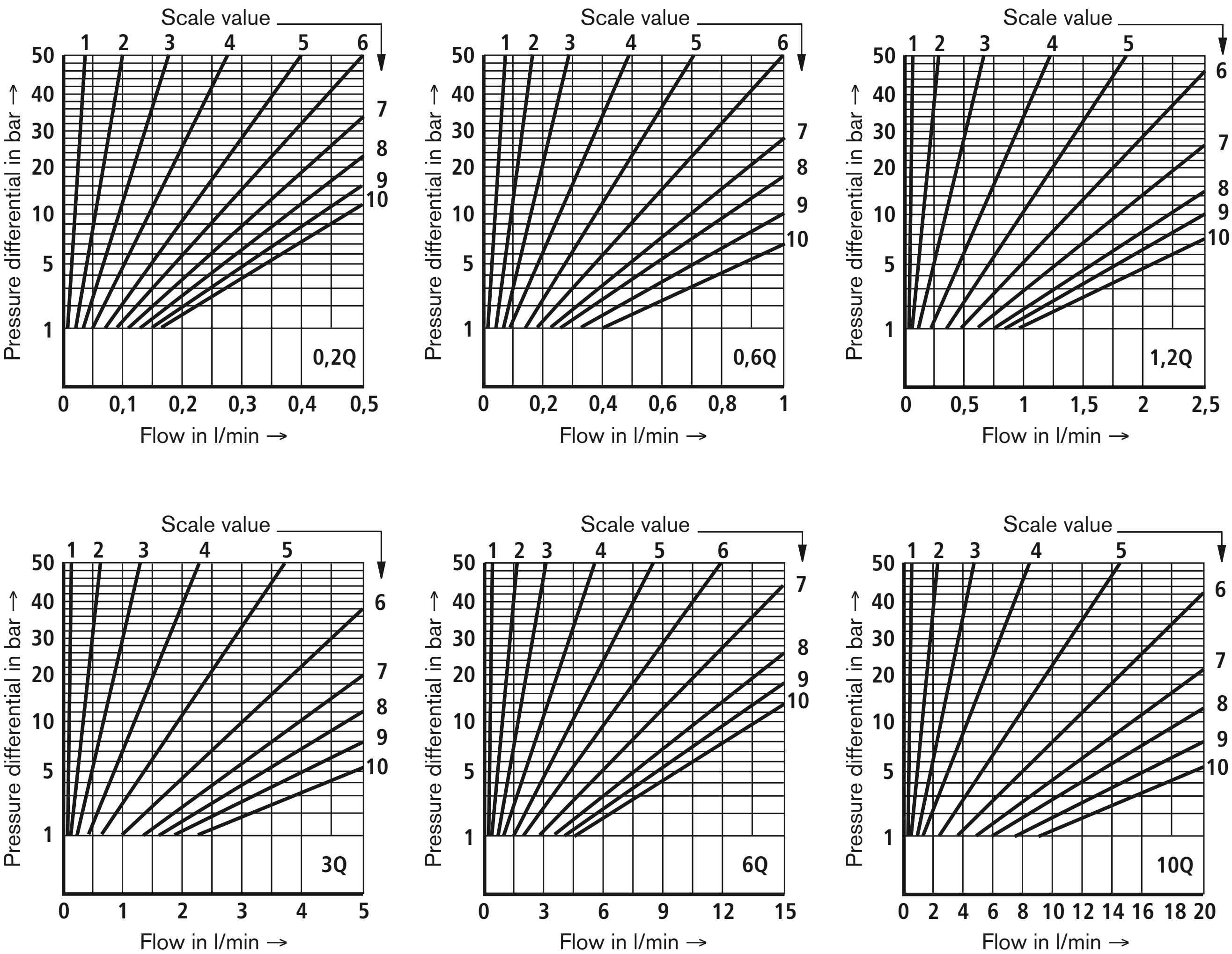
Weight	– Manifold mounting	kg	1.0
	– Threaded connection	kg	1.6
	– Subplate mounting	kg	1.4
Installation			Optional
Ambient temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Hydraulic			
Maximum operating pressure		bar	210
Maximum flow		l/min	80
Pressure fluid			Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable pressure fluids to VDMA 24568 (also see RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic ester) [2]; other pressure fluids on request
Pressure fluid temperature range		°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range		mm^2/s	2.8 to 380
Max. permissible degree of pressure fluid contamination - cleanliness class to ISO 4406 (c)			Class 20/18/15 [3]
Adjustment angle		°	300
Actuating moment	– at 100 bar	Nm	1.1
	– at 200 bar	Nm	1.8

[1] Suitable for NBR and FKM seals

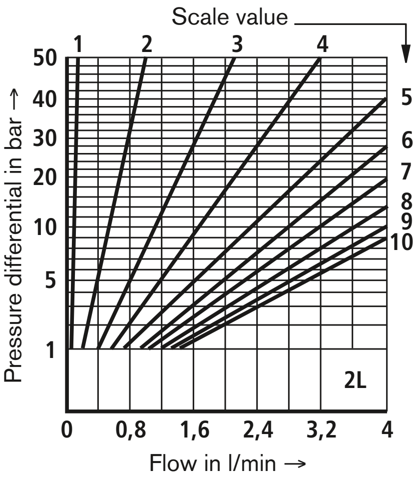
[2] Suitable for FKM seals only

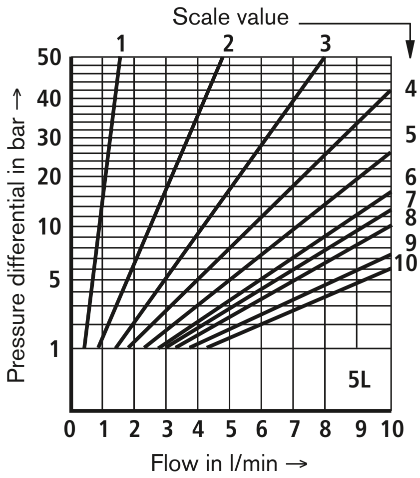
[3] The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.
For the selection of filters see catalogue sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

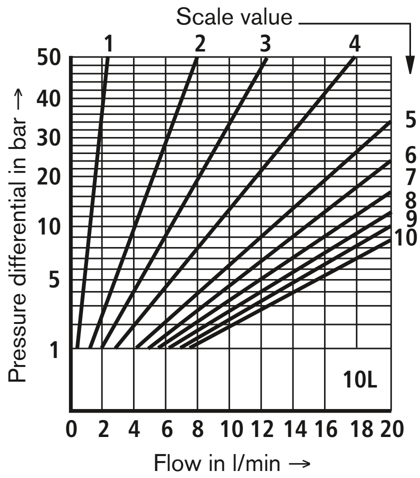
Δp-q_V characteristic curves: NS5 (measured with HLP41, ϑ_{oil} = 40 °C ± 5 °C)

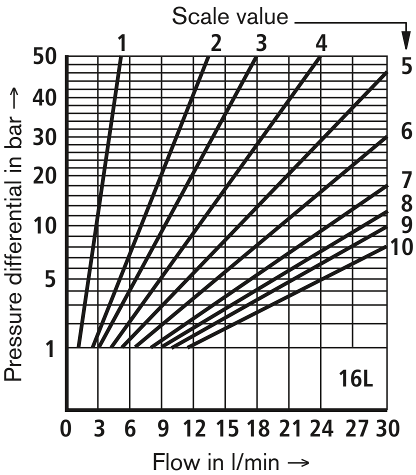


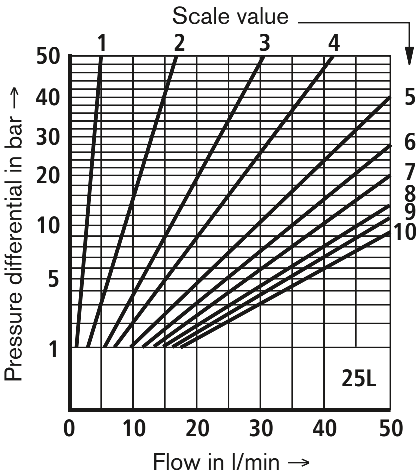
Δp-q_V characteristic curves: NS10 – linear (measured with HLP41, ϑ_{oil} = 40 °C ± 5 °C)

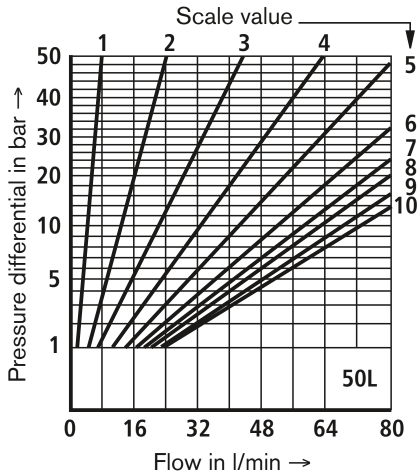




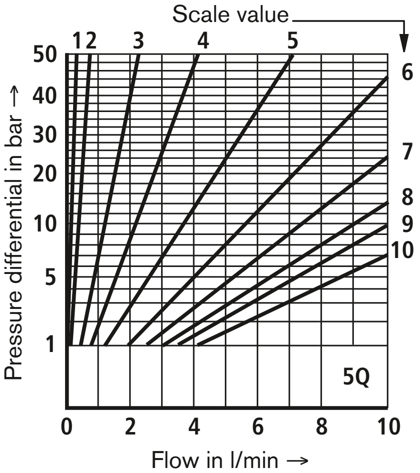


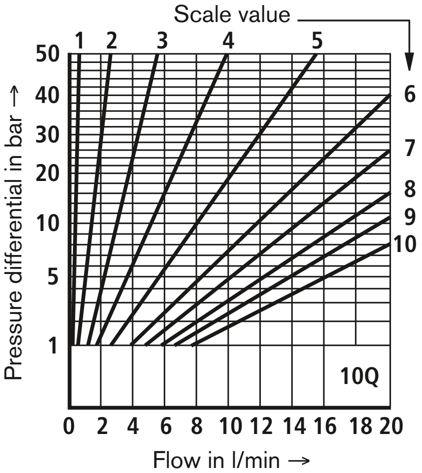


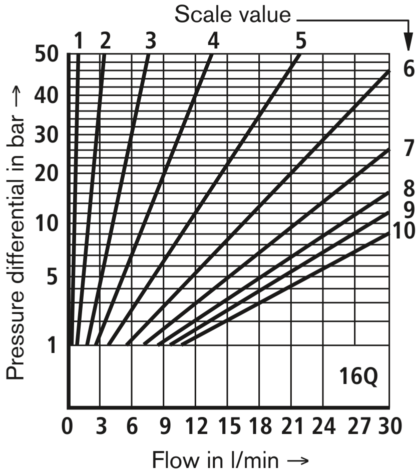


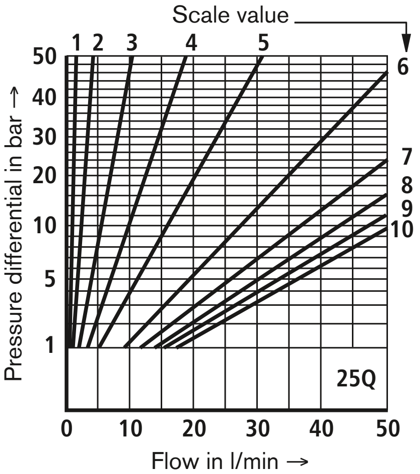


Δp-q_V characteristic curves: NS10 – progressive (measured with HLP41, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

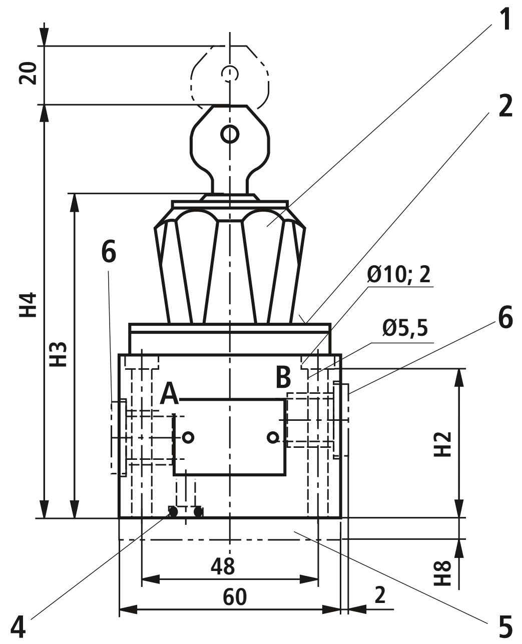


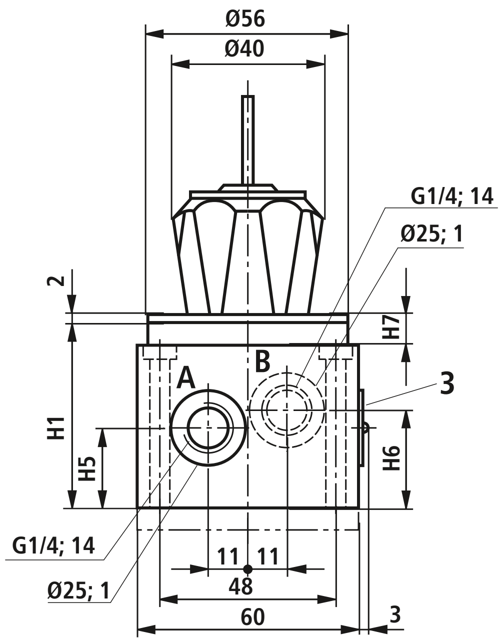






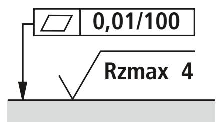
Unit dimensions: for threaded connections and subplate mounting (nominal dimensions in mm)





NS	5	10
H1	56	58
H2	42	42
H3	95	97
H4	122	124
H5	26	22
H6	30	27
H7	12	14
H8	10	10

Pipe thread "G" to ISO 228/1



Required surface quality of the valve mounting surface

1 Lockable rotary knob (lockable in any position) 300° rotation range relates to 10 scale divisions

2 Scale

3 Name plate

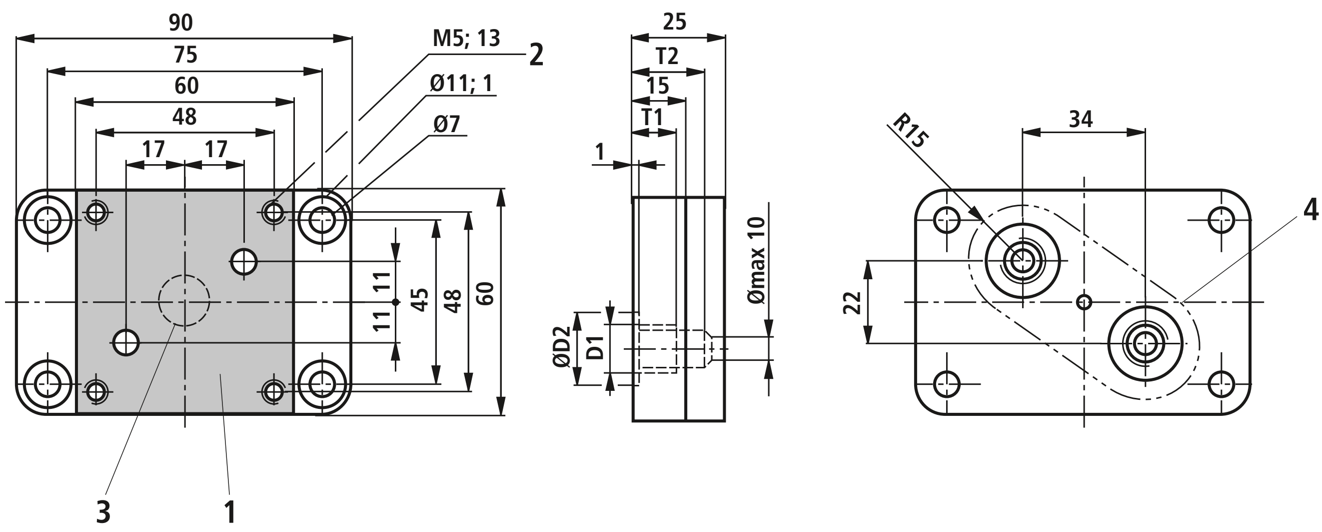
4 Seal ring

5 Blind plate (available only in conjunction with threaded connections)

6 Connection drillings for version „P“ are plugged.

Valve fixing screws (separate order)
4 S.H.C.S. ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 7 Nm ± 10%,
Material No. **R913000064**

Unit dimensions: Subplate (nominal dimensions in mm)



Order no.	Weight in kg	D1	ØD2	T1	T2	Material No.
G 44/01	0,9	G1/4	25	12	17	R900424453
G 45/01		G1/2	32	14	20	R900424455

1 Valve mounting surface, MRR ground; Rzmax 4

2 Valve fixing holes

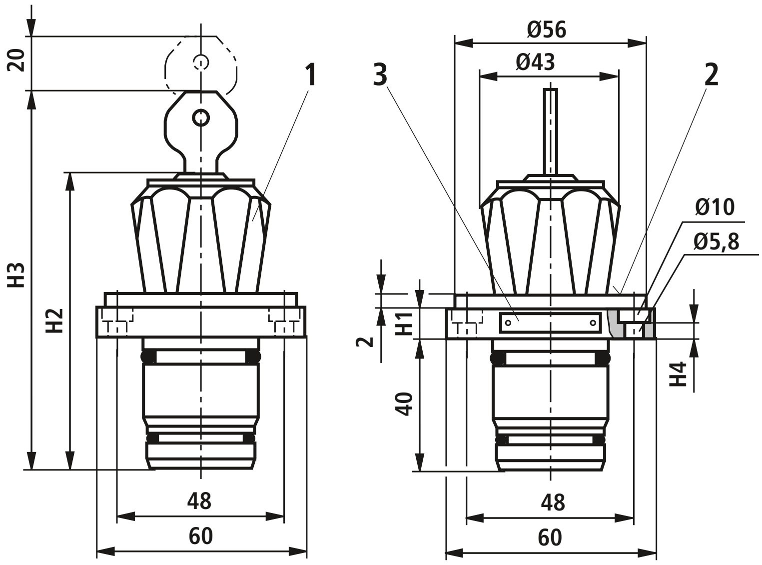
3 Ø20 keep free for valve function

4 Valve panel cut-out

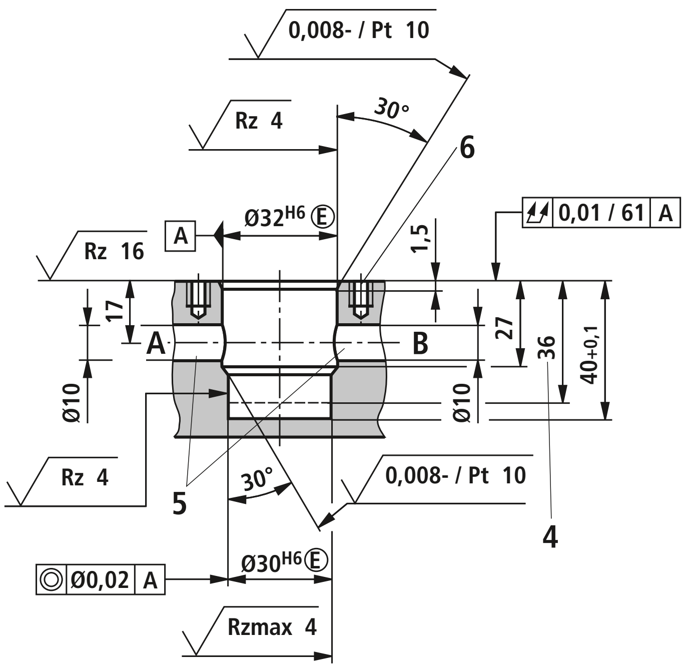
Valve fixing screws (separate order)

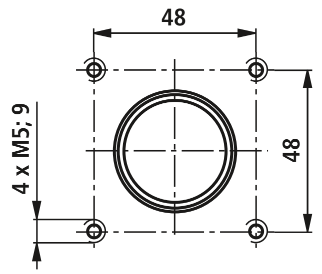
4 S.H.C.S. ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 7 Nm ± 10%,
Material No. **R913000064**

Unit dimensions: for manifold mounting (nominal dimensions in mm)



NS	5	10
H1	16	18
H2	93	95
H3	120	122
H4	10,3	12,4





1 Rotary knob safety lock (lockable in any position) 300° rotation range relates to 10 scale divisions

2 Scale

3 Name plate

4 Clearance depth

5 ⚠ **Attention!** Ports A and B are to be located away from the M5 fixing threads due to the danger of a breakthrough!

6 **NS5:**

4 S.H.C.S.
ISO 4762 - M5 x 16 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_A = 7 Nm ± 10%
Material No. **R913000468**

NS10:

4 S.H.C.S.
ISO 4762 - M5 x 20 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_A = 7 Nm ± 10%
Material No. **R913000488**

Notes

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Hydraulics
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Phone +49 (0) 93 52 / 18-0
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documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

2-way flow control valve

RE 28163/02.09
Replaces: 02.03

Type 2FRM

Size 6
Component series 3X
Maximum operating pressure 315 bar [1)]
Maximum flow 32 L/min

H5851+5852

Table of contents

Contents	**Page**
Features	1
Order details	2
Symbols	3
Function, section	4 to 6
Technical data	7
Characteristic curves	8
Unit dimensions	9 to 12

Features

– Location of the ports according to DIN 24340 form A
– Subplates see data sheet RE 45052 (separate order)
– external closing of the pressure compensator, optional
– as threaded connection for panel mounting with connection thread G3/8
– Check valve, optional
– 2 adjustment types, optional:
  • Rotary knob with scale
  • lockable rotary knob with scale

Information on available spare parts:
www.boschrexroth.com/spc

1) For use of the component with a rectifier sandwich plate up to 210 bar

Order details: 2-way flow control valve

2FRM	6			6	–3X/			V	*

2-way flow control valve

Size 6 **= 6**

With closing of the pressure compensator **= A**
(suppression of the start-up jump)
Without closing of the pressure compensator **= B**
Without closing of the pressure compensator **= SB**
For panel mounting

Adjustment type
Lockable rotary knob with scale [1] **= 3**
Rotary knob with scale **= 7**

Zero position of the marking at port P **= 6**

Component series 30 to 39 **= 3X**
(30 to 39: unchanged installation and connection dimensions)

Flow (A → B)
0.2Q = up to 0.2 l/min
0.6Q = up to 0.6 l/min
1.5Q = up to 1.5 l/min
3Q = up to 3.0 l/min
6Q = up to 6.0 l/min
10Q = up to 10.0 l/min
16Q = up to 16.0 l/min
25Q = up to 25.0 l/min
32Q = up to 32.0 l/min

R = **With** check valve
M = **Without** check valve

Seal material
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with the hydraulic fluid used!

Further details in the clear text

[1] Key with the material no. **R900008158** is included in the delivery.

Preferred types and standard units are contained in the EPS (standard price list).

Order details: Rectifier sandwich plate (only for version “B”)

Z4S	6	–1X/	V	*

Rectifier sandwich plate

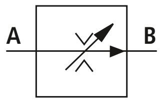
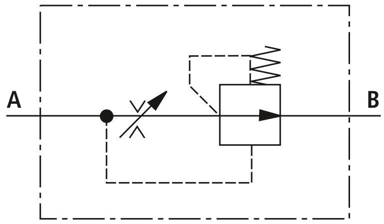
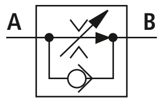
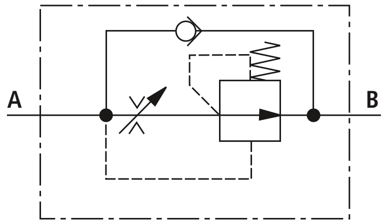
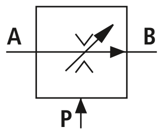
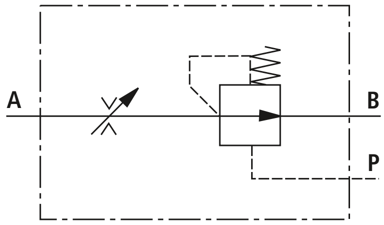
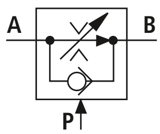
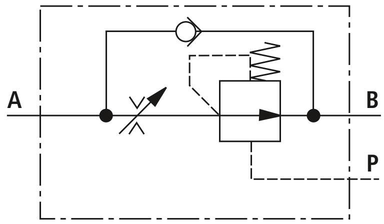
Size 6 **= 6**

Component series 10 to 19 **= 1X**
(10 to 19: unchanged installation and connection dimensions)

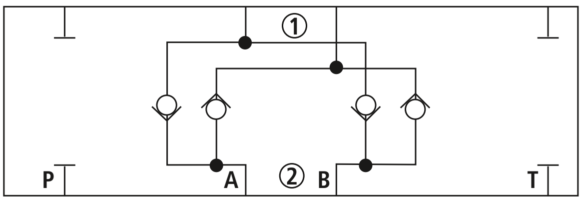
Seal material
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with the hydraulic fluid used!

Further details in the clear text

Symbols: 2-way flow control valves

	Simplified	Detailed
Without check valve; **without** external closing Type 2FRM 6 B…MV Type 2FRM 6 SB…MV		
With check valve; **without** external closing Type 2FRM 6 B…RV Type 2FRM 6 SB…RV		
Without check valve; **with** external closing Type 2FRM 6 A…MV		
With check valve; **with** external closing Type 2FRM 6 A…RV		

Symbol: Rectifier sandwich plate (① = component side, ② = plate side)



Function, section: Type 2FRM 6 B…

General

The flow control valve type 2 FRM is a 2-way flow control valve.

It is used for maintaining a constant flow, independent of pressure and temperature.

The valve basically comprises of a housing (1), a rotary knob (2), orifice bush (3), pressure compensator (4) and an optional check valve.

Flow control valve type 2FRM 6 B…MV
(**without** external closing**, without** check valve)

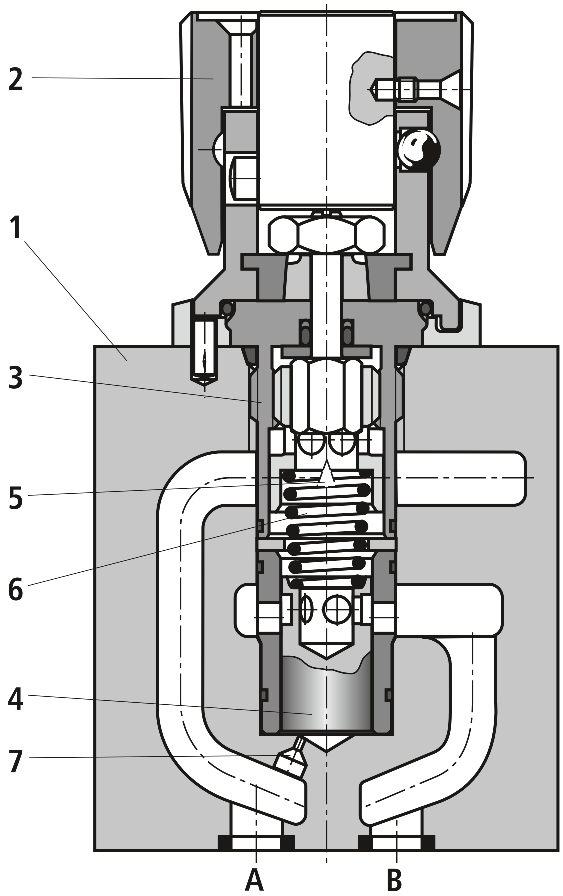
The flow from channel A to channel B is throttled at the throttling point (5). The throttle cross-section is set by turning the rotary knob (2).

In order to keep the flow in channel B constant, independent of the pressure, a pressure compensator (4) is fitted downstream of the throttling point (5).

The compression spring (6) presses the pressure compensator (4) downwards against its stop and keeps the pressure compensator (4) in the open position when there is no flow through the valve. When fluid flows through the valve, the pressure present in port A applies a force to the pressure compensator (4) via orifice (7).

The pressure compensator (4) moves to the control position until the forces are in balance. When the pressure in channel A rises, the pressure compensator (4) moves in the closing direction until a balance of forces is once again attained. Due to this continuous compensation of the pressure compensator (4), a constant flow is obtained.

In order to control a flow through the valve in both directions, a rectifier sandwich plate type Z4S 6 may be fitted below this flow control valve.



Type 2FRM 6 B76-3X/.MV

Function, section: Type 2FRM 6 **SB**…

General

The flow control valve type 2 FRM is a 2-way flow control valve.

It is used for maintaining a constant flow, independent of pressure and temperature.

The valve basically comprises of a housing (1), a rotary knob (2), orifice bush (3), pressure compensator (4) and an optional check valve (8).

Flow control valve type 2FRM 6 SB…RV
(**without** external closing**, with** check valve, with threaded connection **for panel mounting**)

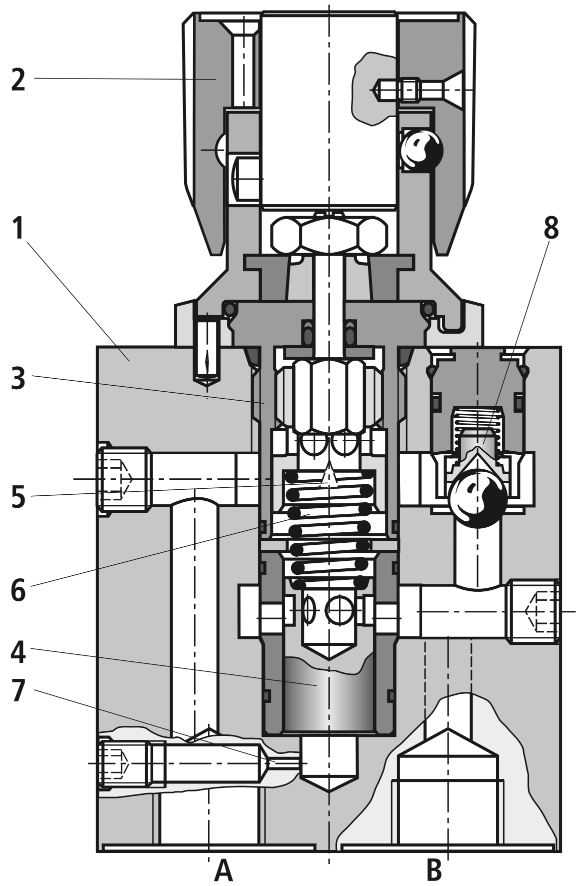
The flow from channel A to channel B is throttled at the throttling point (5). The throttle cross-section is set by turning the rotary knob (2).

In order to keep the flow in channel B constant, independent of the pressure, a pressure compensator (4) is fitted downstream of the throttling point (5).

The compression spring (6) presses the pressure compensator (4) downwards against its stop and keeps the pressure compensator (4) in the open position when there is no flow through the valve. When fluid flows through the valve, the pressure present in port A applies a force to the pressure compensator (4) via orifice (7).

The pressure compensator (4) moves to the control position until the forces are in balance. When the pressure in channel A rises, the pressure compensator (4) moves in the closing direction until a balance of forces is once again attained. Due to this continuous compensation of the pressure compensator (4), a constant flow is obtained.

The free return flow from channel B to channel A is directed via the check valve (8).



Type 2FRM 6 SB76-3X/..RV

Function, section, sample circuit: Type 2FRM 6 A…

General

The flow control valve type 2 FRM is a 2-way flow control valve.

It is used for maintaining a constant flow, independent of pressure and temperature.

The valve basically comprises of a housing (1), a rotary knob (2), orifice bush (3), pressure compensator (4) and an optional check valve (8).

Flow control valve type 2FRM 6 A…RV
(**with** external closing**, with** check valve)

The function of this valve is basically the same as that of valve type 2FRM 6 B...MV.

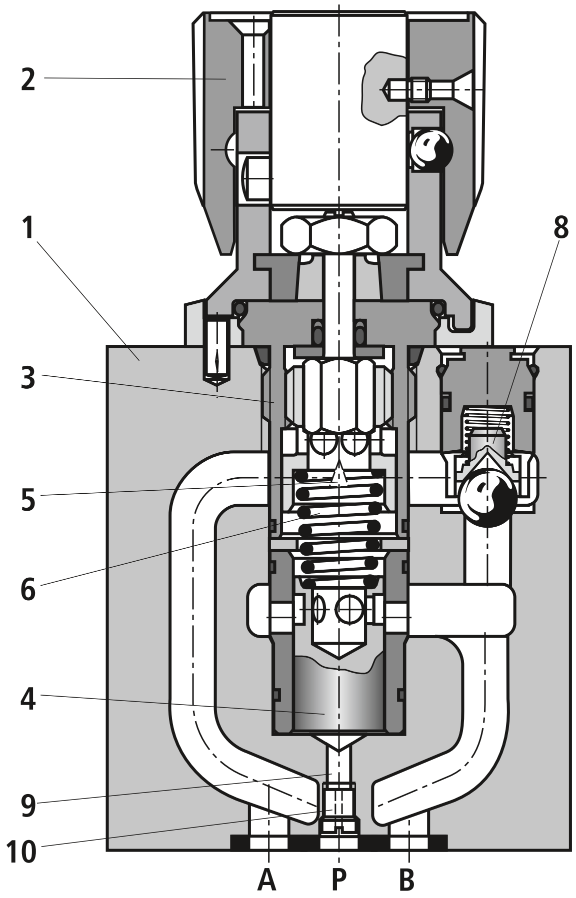
However, the flow control valve features external closing of the pressure compensator (4) via channel P (9). The external pressure acting in channel P (9) via orifice (10), holds the pressure compensator (4) closed against the compression spring (6). When the connected directional valve (11) is actuated to permit flow from P to B, control is achieved as with type 2 FRM 6 B. Thus, a start-up jump is avoided.

The version with closing of the pressure compensator can only be used for meter-in control.

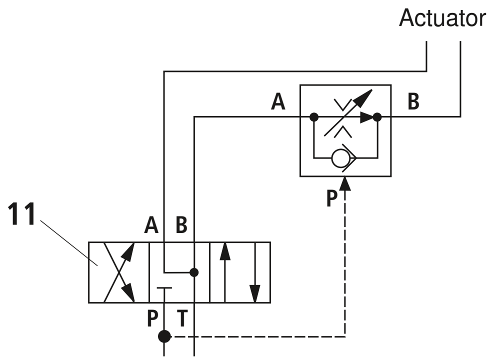
The free return flow from channel B to channel A is directed via the check valve (8).

Attention!

The pressure loss of port P upstream of the directional valve to port A upstream of the flow control valve makes itself felt by a reduced flow.



Type 2FRM 6 A76-3X/..RV



Technical data: 2-way flow control valve
(For applications of the component outside the specified values, please contact us!)

general

Weight	– Version "A" and "B"	kg	ca. 1.3
	– Version "SB"	kg	ca. 1.5
Installation position			Any
Ambient temperature range		°C	–20 to +50

hydraulic

Maximum operating pressure (port A)		bar	315									
Pressure differential Δp with free return flow B → A		bar	See characteristic curves page 8									
Minimum pressure differential		bar	6 to 14									
Pressure stability up to Δp = 315 bar		%	±2 ($q_{V\,max}$)									
Maximum flow		l/min	0.2	0.6	1.5	3.0	6.0	10.0	16.0	25.0	32.0
Minimum flow	– up 100 bar	cm^3/min	15	15	15	15	25	50	70	100	250
	– up 315 bar	cm^3/min	25	25	25	25	25	50	70	100	250
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN51524; other hydraulic fluids upon request									
Hydraulic fluid temperature range		°C	–20 to +80									
Viscosity range		mm^2/s	10 to 800									
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1]									

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Efficient filtration prevents malfunctions and at the same time prolongs the service life of components.

For the selection of the filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087, and RE 50088.

Technical data: Rectifier sandwich plate
(For applications of the component outside the specified values, please contact us!)

general

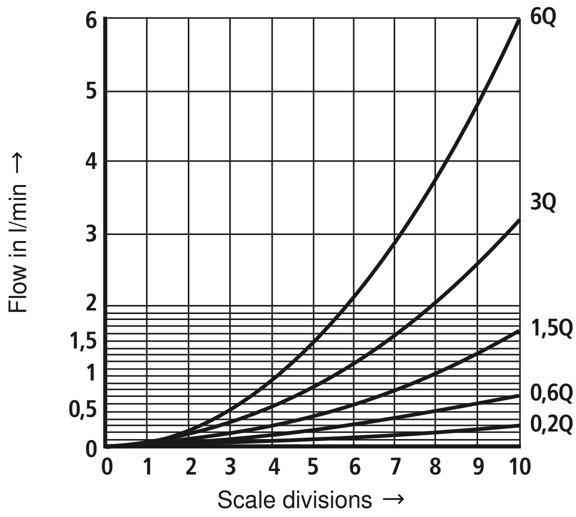
Weight	kg	ca. 0.9

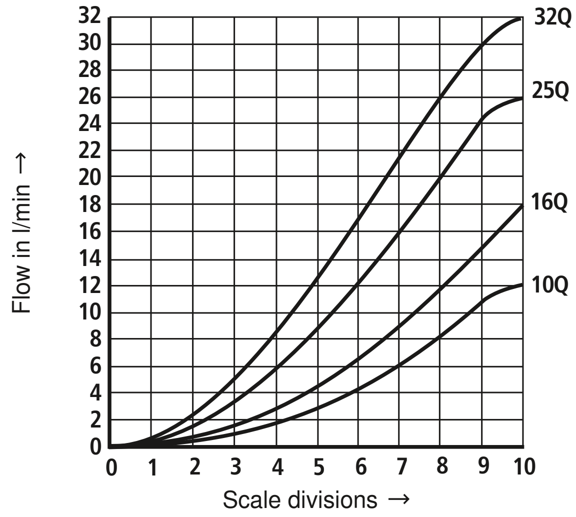
hydraulic

Maximum operating pressure	bar	210
Cracking pressure	bar	0.7
Maximum flow	l/min	32

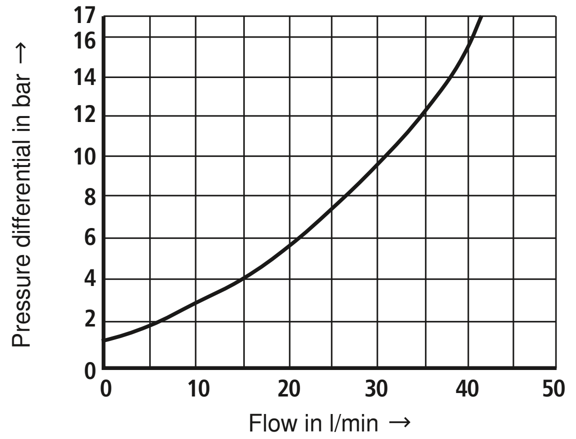
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

Flow dependency on the scale setting (flow control A → B)

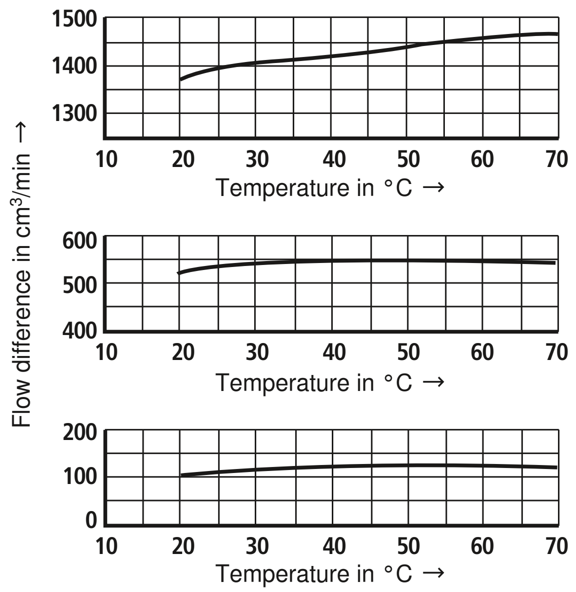




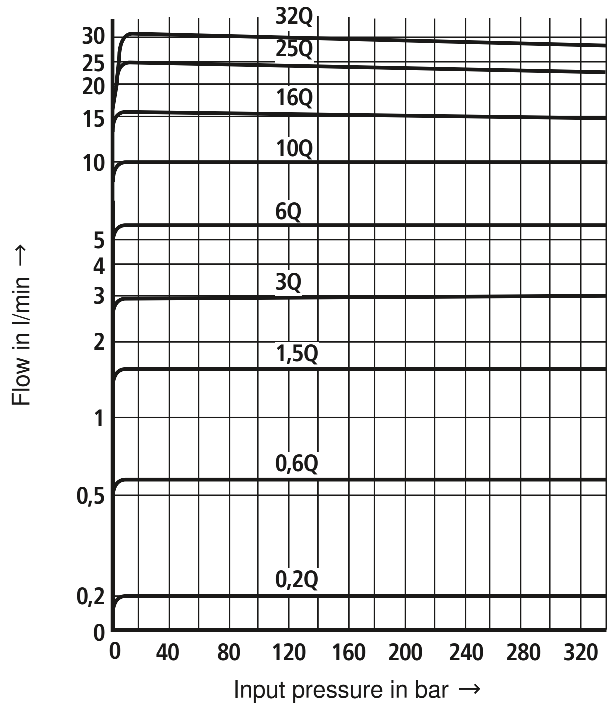
***Δp*-q_V characteristic curve** via check valve B → A;
Orifice closed



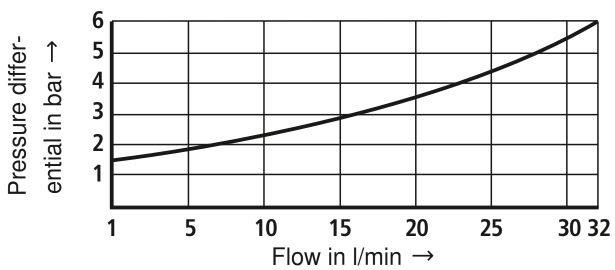
Temperature dependency at ***Δp*** = 20 bar



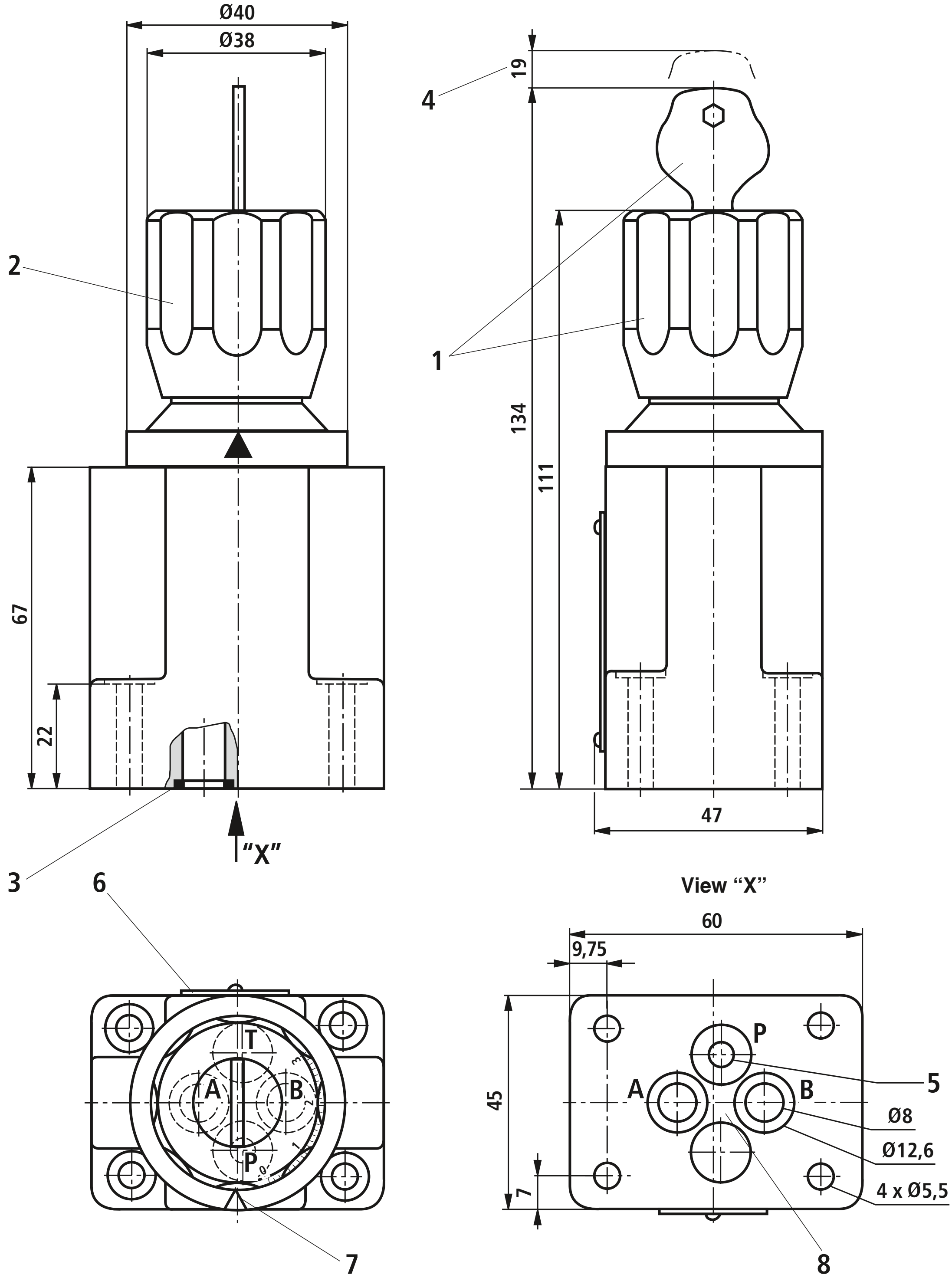
p_E-q_V characteristic curve



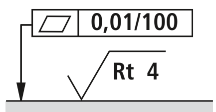
Rectifier sandwich plate
***Δp*-q_V characteristic curve**



Unit dimensions: Subplate mounting – Version “A” and “B” (dimensions in mm)

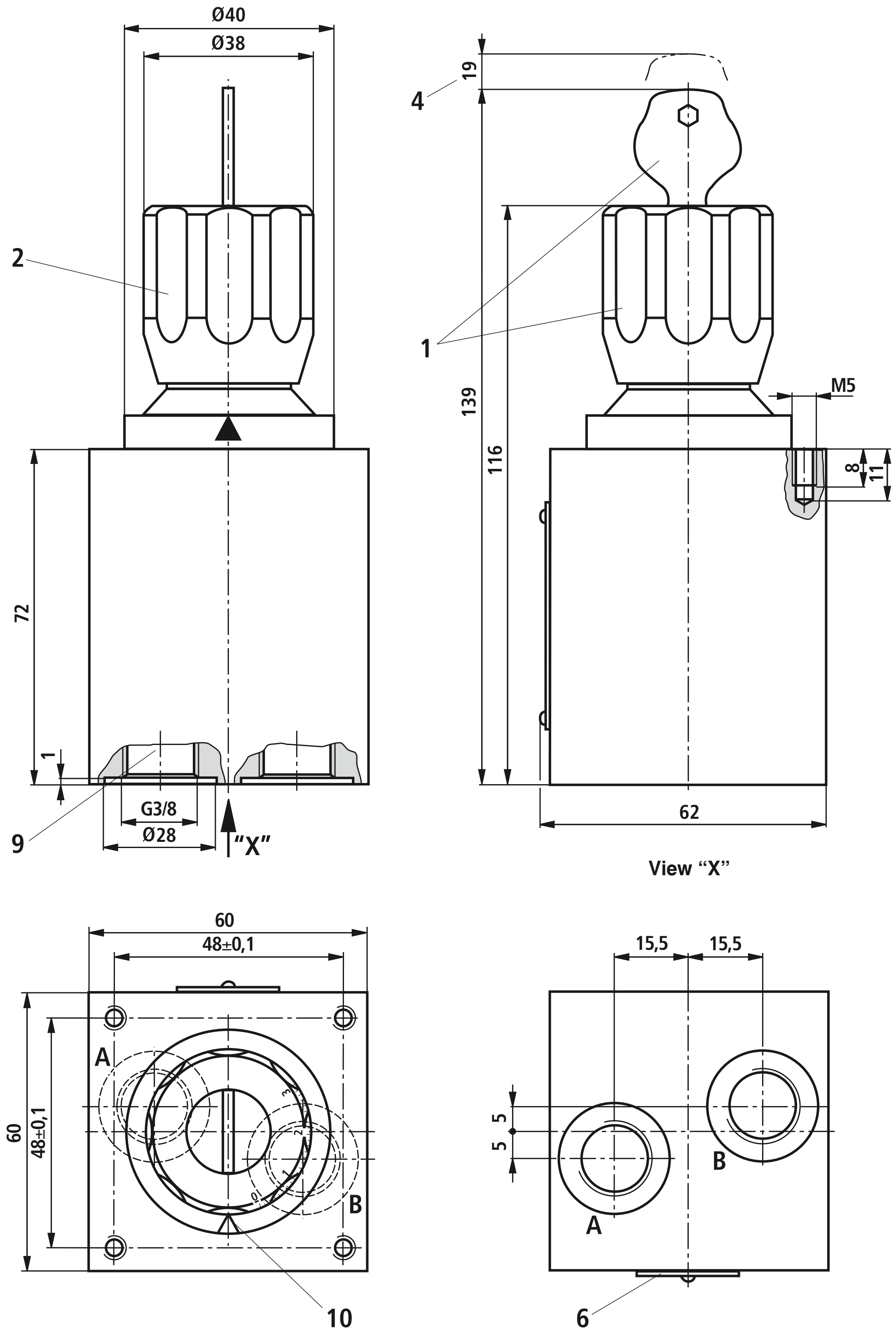


For explanation of items, subplates, and valve mounting bolts, see page 11.



Required surface quality of the valve mounting face

Unit dimensions: Threaded connection for panel mounting – version “SB”
(dimensions in mm)



For explanation of items and valve mounting bolts, see page 11.

Unit dimensions

1 Adjustment type "3" (lockable rotary knob with scale)
2 Adjustment type "7" (rotary knob with scale)
3 Identical seal rings for ports A, B, P, and T
4 Space required to remove the key
5 Ø3 bore in version "B" not bored (without external closing)
6 Nameplate
7 Position of the marking at port P
8 Porting pattern according to DIN 24340 form A
9 Connection thread G3/8 according to ISO 228-1
10 Position of the marking vis-à-vis nameplate

Panel mounting (version "SB"):

Valve mounting screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M5 - 8.8-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque $\boldsymbol{M}_A$ = 7 Nm ±10%,
(minimum useable thread depth = 6.5 mm)

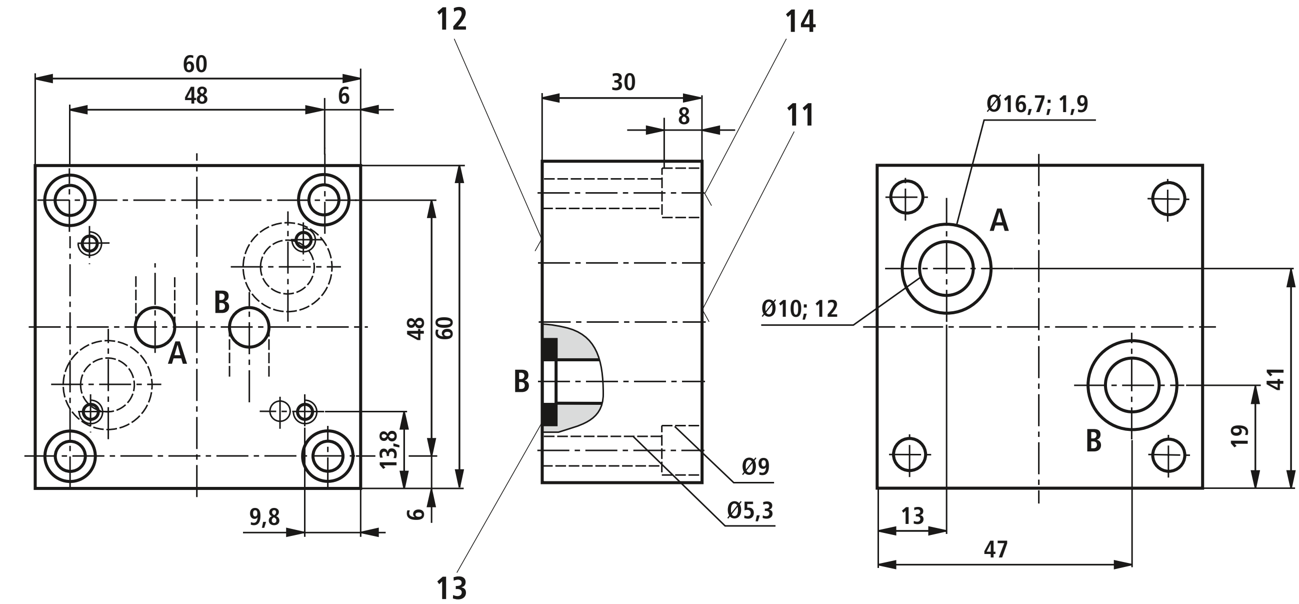
Subplate mounting (version "A" and "B"):

Subplates according to data sheet RE 45052
(separate order)
Type G 341/01 (G1/4)
Type G 342/01 (G3/8)
Type G 502/01 (G1/2)

Valve mounting screws (separate order)

- without rectifier sandwich plate
  4 hexagon socket head cap screws
  ISO 4762 - M5 x 30 - 10.9-flZn-240h-L
  with friction coefficient μ_{total} = 0.09 to 0.14,
  tightening torque $\boldsymbol{M}_T$ = 7 Nm ±10%,
  Material no. **R913000316**
- with rectifier sandwich plate
  4 hexagon socket head cap screws
  ISO 4762 - M5 x 70 - 10.9-flZn-240h-L
  with friction coefficient μ_{total} = 0.09 to 0.14,
  tightening torque $\boldsymbol{M}_T$ = 7 Nm ±10%,
  Material no. **R913000325**

Unit dimensions: Adapter plate HSE 05 G06A001-3X/V00 (dimensions in mm)

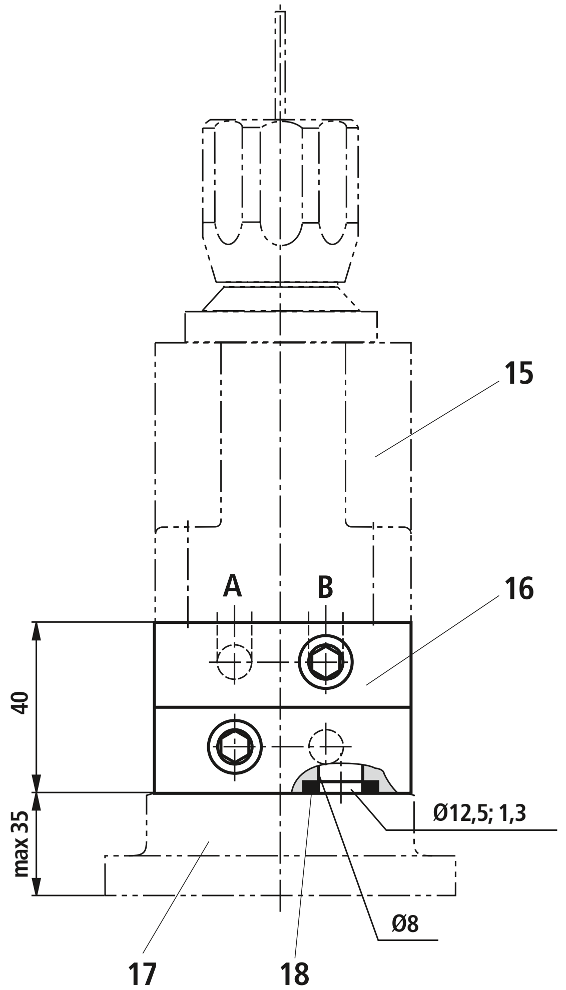


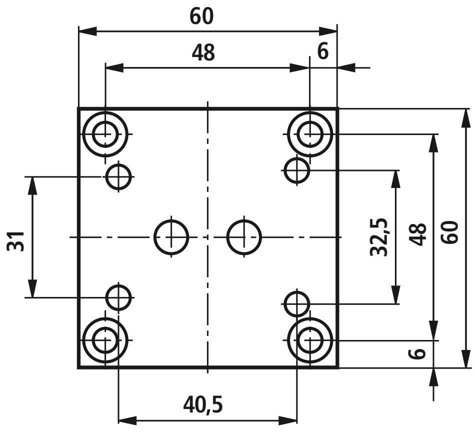
11 Connection surface for flow control valve type 2FRM 6
12 Connection surface for flow control valve type 2FRM 5
13 Seal ring
14 Mounting screws for adapter plate,
4 cylinder bolts
ISO 4762 - M5 x 30 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque $\boldsymbol{M}_T$ = 7 Nm ±10%,
are included in the delivery.

☞ **Note!**

The adapter plate (**Material no. R900496121**) is required for mounting a flow control valve type 2FRM 6 B..-3X/.. to an existing flow control valve type 2FRM 5 -3X/...

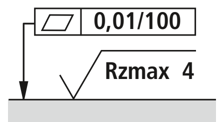
Unit dimensions: Rectifier sandwich plate type Z4S 6-1X/V (dimensions in mm)





Attention!

The rectifier sandwich plate type Z4S 6 -1X/V can **only** be used in connection with the flow control valve type 2FRM 6 **B**..-3X/.. (without closing of the pressure compensator)!



Required surface quality of the valve mounting face

15 2-way flow control valve

16 Rectifier sandwich plate

17 Subplate according to data sheet RE 45052 and valve mounting screws, see page 11.

18 Seal ring

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

The Drive & Control Company

Rexroth
Bosch Group

2-way flow control valve

Type 2FRM, 2FRH, 2FRW

RE 28389
Edition: 2013-05
Replaces: 07.04


H5552

- Sizes 10 and 16
- Component series 3X
- Maximum operating pressure 315 bar
- Maximum flow 160 l/min

Features

- For subplate mounting
- Porting pattern according to DIN 24340 form G and ISO 6263
- Mechanical actuation (type 2FRM)
- Hydraulic actuation (type 2FRH)
- Electro-hydraulic actuation (type 2FRW)
- Pressure compensator stroke limitation, optional
- Start-up jump reduction
- Stroke limitation of the geared piston drive adjustable on both sides (type 2FRH and 2FRW)
- Flow control in both directions by means of rectifier sandwich plate

Contents

Ordering code: 2-way flow control valve

01	02	03		04		05	06	07	08	09	10	11	12	13	14
2FR			**–**	**3X**	**/**										*****

01	2-way flow control valve	**2FR**

Type of actuation

02	Mechanical	**M**
	Hydraulic	**H**
	Electro-hydraulic	**W**

03	Size 10	**10**
	Size 16	**16**

04	Component series 30 ... 39 (30 ... 39: Unchanged installation and connection dimension)	**3X**

Flow range A to B

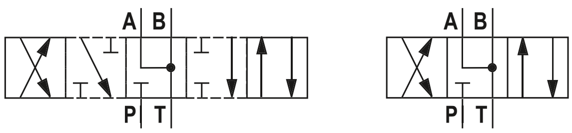
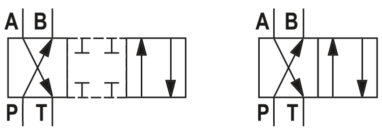
05	**– Size 10, linear**	
	Up to 10 l/min	**10L**
	Up to 16 l/min	**16L**
	Up to 25 l/min	**25L**
	Up to 50 l/min	**50L**
	– Size 16, linear	
	Up to 60 l/min	**60L**
	Up to 100 l/min	**100L**
	Up to 160 l/min	**160L**

06	**Without** pressure compensator stroke limitation	**no code**
	With pressure compensator stroke limitation	**B**

07	**Without** actual value potentiometer	**no code**
	With actual value potentiometer (only types 2FRH and 2FRW)	**P**

08	Directional spool valve size 6 (data sheet 23178)	**6E** [1]

Symbols

09		**J** [1]
		**Y** [1]

10	Direct voltage 24 V	**G24** [1]
	AC voltage 230 V 50/60 Hz	**W230** [1]
	For more voltages and frequencies, please refer to data sheet 23178)	

1) Ordering code **only** required for type 2FRW!

2) Mating connectors, separate order, see page 15 and data sheet 08006.

☞ **Notice!** Preferred types and standard units are contained in the EPS (standard price list).

Ordering code: 2-way flow control valve

01	02	03		04		05	06	07	08	09	10	11	12	13	14
2FR			**–**	**3X**	**/**										*****

11	**With** concealed manual override (standard)	**N9** [1)]
	With manual override	**N** [1)]
	Without manual override	**no code**

Electrical connection

12	**Individual connection**	
	Without mating connector; connector DIN EN 175301-803	**K4** [1; 2)]

Seal material

13	NBR seals	**no code**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

14	Further details in the plain text	

Ordering code: Rectifier sandwich plate

01	02		03		04	05
Z4S		**–**		**/**		*****

01	Rectifier sandwich plate	**Z4S**

02	Size 10	**10**
	Size 16	**16**

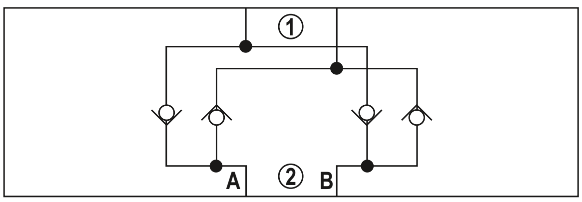
03	Component series 30 ... 39 (30 ... 39: Unchanged installation and connection dimension) **– size 10**	**3X**
	Component series 20 ... 29 (20 ... 29: Unchanged installation and connection dimension) **– size 16**	**2X**

Seal material

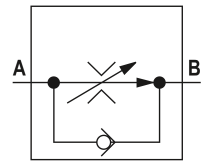
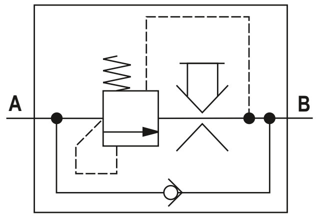
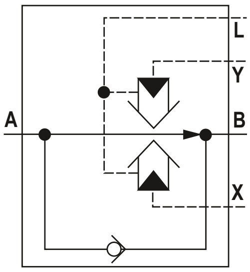
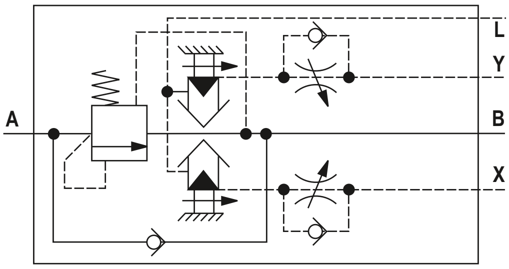
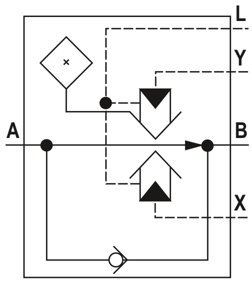
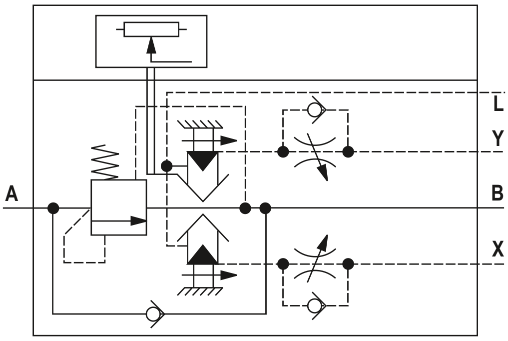
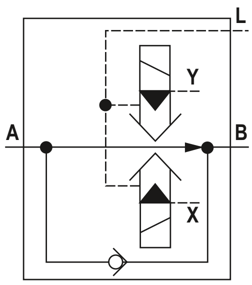
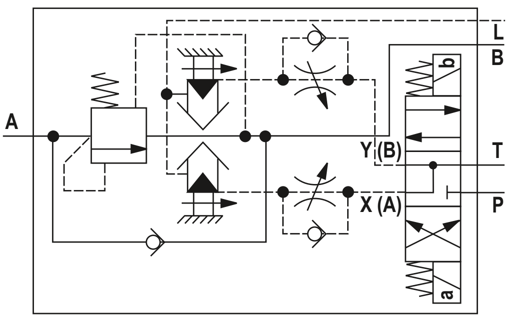
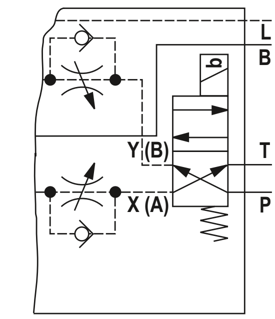
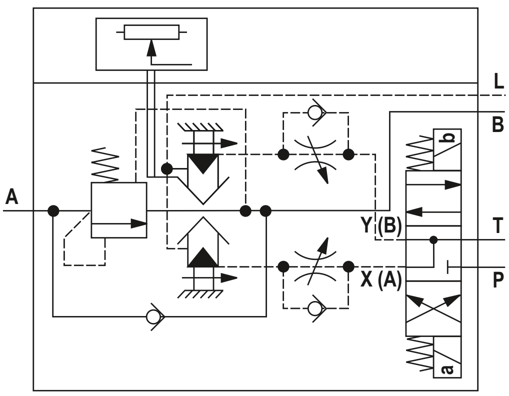
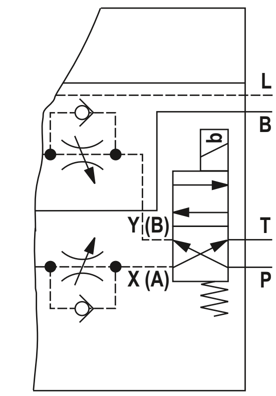
04	NBR seals	**no code**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

05	Further details in the plain text	

Symbols: Rectifier sandwich plate (① = component side, ② = plate side)



Symbols: 2-way flow control valve

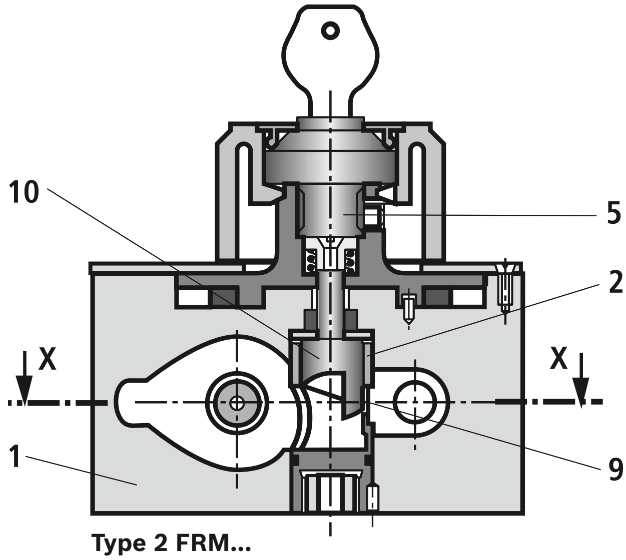
	Simplified	Detailed	
Type 2FRM			
Type 2FRM			
Type 2FRH			
		Symbol J 1)	**Symbol Y** 2)
Type 2FRW			
Type 2FRW...P			

1) **Symbol J:**
Solenoid "a" switched → flow controller $q_{V\ min}$
Solenoid "b" switched → flow controller $q_{V\ max}$

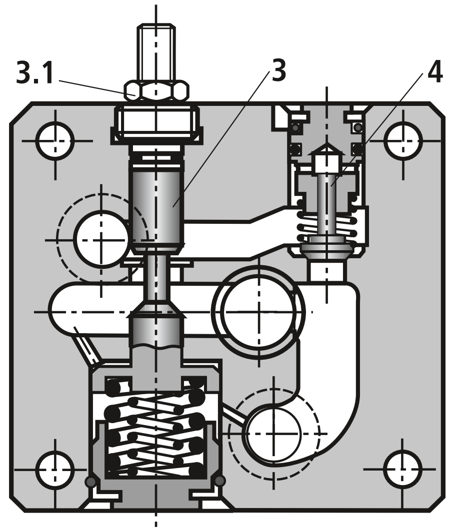
2) **Symbol Y:**
Solenoid "b" not switched → flow controller $q_{V\ min}$
Solenoid "b" switched → flow controller $q_{V\ max}$

Function, section

Flow control valves type 2FRM, 2FRH and 2FRW are 2-way flow control valves. They are used to maintain a constant flow, mostly independent of pressure and temperature.
Generally, the valves consist of housing (1), orifice bush (2), pressure compensator (3) with optional stroke limitation (3.1), check valve (4), adjustment element (5) at type 2FRM as well as geared piston drive (6), directional valve (7) and actual value potentiometer (8) at type 2FRH and 2FRW.
The flow from channel A to channel B is throttled at the throttling point (9). At type 2FRM, the throttle cross-section is set mechanically with the adjustment element (5) by turning the curved bolt (10). In the case of types 2FRH and 2FRW, this is achieved hydraulically by means of a geared piston drive (6) controlled by an integrated electrically operated directional valve (7). The regulating speed can be adjusted by means of the throttle check valve (6.3 and 6.4). To fix the required adjustment range, the geared piston drive (6) is equipped with an adjustable stroke limitation (6.1 and 6.2) on both sides. An upstream pressure compensator (3) is included to keep the flow at the throttling point (9) constant.
Temperature independence is achieved thanks to the orifice design of the throttling point.
The free flow from channel B to channel A is via the check valve (4).
For permanent monitoring of the throttle orifice position, types 2FRH and 2FRW can be equipped with an actual value potentiometer (8). In connection with an electrical command value presetting, electrical control components are offered.
The regulated flow only flows from channel A to B. For oscillating flows (forward and return flow), a rectifier sandwich plate type Z4S can be installed under the flow control valve.



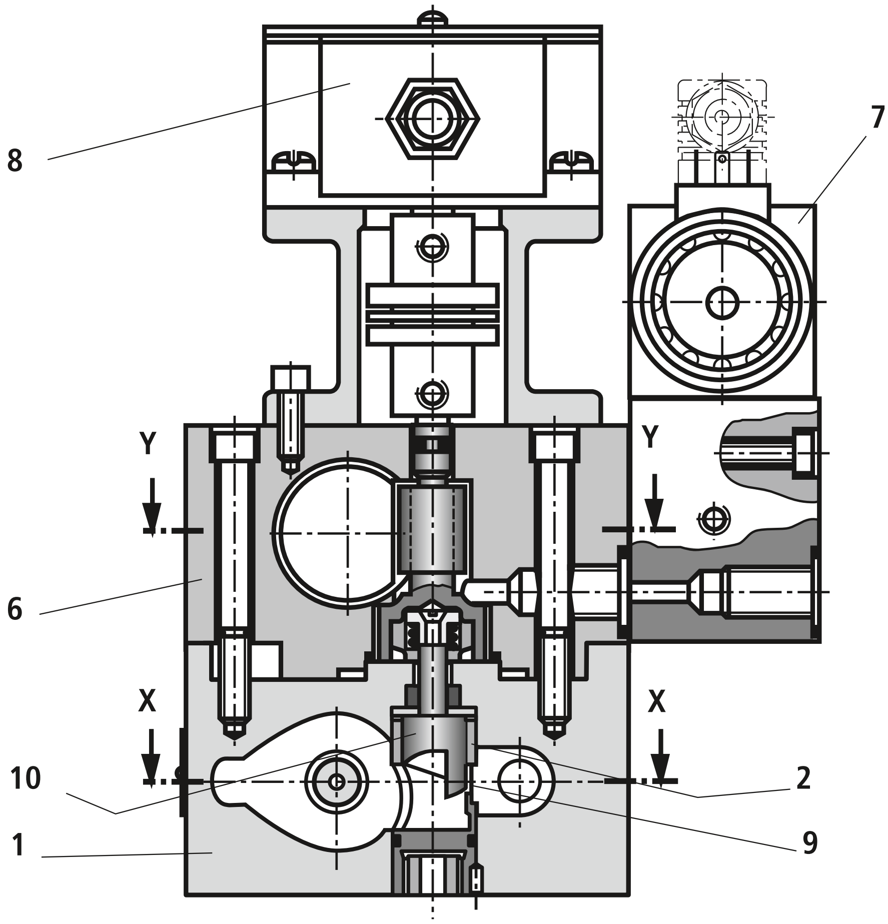
Type 2 FRM...



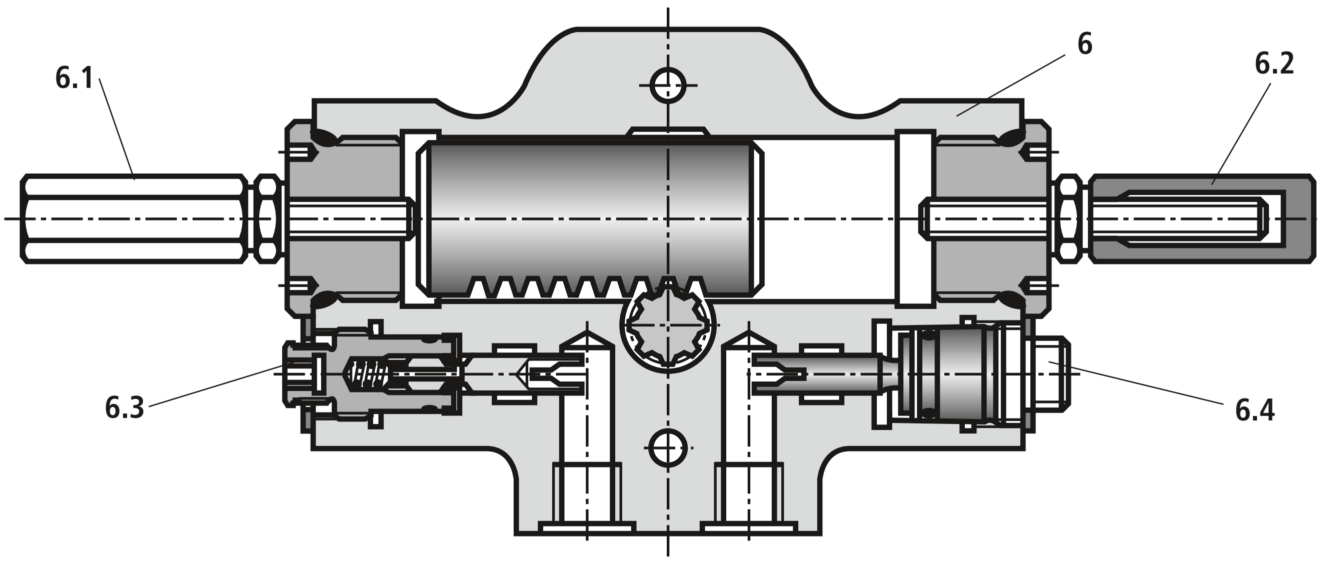
Section X–X

Type 2FRW, see page 6.

Function, sections



Type 2FRW...P...



Section Y–Y (rotated by 90°)

Technical data
(for applications outside these parameters, please consult us!)

general				
Size			**Size 10**	**Size 16**
Weight	▶ Type 2FRM	kg	5.6	11.3
	▶ Type 2FRH	kg	9.2	14.9
	▶ Type 2FRH...P	kg	10.3	16
	▶ Type 2FRW	kg	11.3	17
	▶ Type 2FRW...P	kg	12.4	18.1
	▶ Rectifier sandwich plate	kg	3.0	8.1
Installation position	▶ Type 2FRM		Any	
	▶ Types 2FRH and 2FRW		Control cylinder (geared piston drive) horizontal	
Ambient temperature range		°C	–30 ... +80 (–30 ... +50 at type 2FRW) (NBR seals) –20 ... +80 (–20 ... +50 at type 2FRW) (FKM seals)	

hydraulic – 2-way flow control valve type 2FRM, 2FRH, 2FRW									
Size			**Size 10**				**Size 16**		
Maximum flow		l/min	10	16	25	50	60	100	160
Maximum operating pressure (port A)		bar	315						
Pressure differential with free return flow B to A, q_V dependent		bar	2	2.5	3.5	6	2.8	4.3	7.3
Minimum pressure differential		bar	3 ... 7				5 ... 12		
Flow control	▶ Temperature stability (–20 ... +80 °C)		±2% ($q_{V\ max}$)				±2% ($q_{V\ max}$)		
	▶ Pressure stability (up to Δp = 315 bar)		±2% ($q_{V\ max}$)				< ±5% ($q_{V\ max}$)		
Hydraulic fluid			See table page 8						
Hydraulic fluid temperature range		°C	–30 ... +80 (NBR seals) –20 ... +80 (FKM seals)						
Viscosity range		mm²/s	10 ... 800						
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1]						
hydraulic – 2-way flow control valve type 2FRH, 2FRW									
Pilot volume at maximum adjustment range		cm³	22 (300 °)						
Pilot pressure range		bar	10 ... 100 (the maximum value **must not** be exceeded!) (at least 40 bar at a low regulating speed)						
Regulating speed (pilot pressure dependent)			**Without** potentiometer				**With** potentiometer		
		°/s	5 ... 2000				5 ... 300		
Maximum flow (directional valve)		l/min	10				See data sheet 23178		
Maximum operating pressure (directional valve)		bar	315				See data sheet 23178		
hydraulic – rectifier sandwich plate type Z4S									
Maximum flow		l/min	50				160		
Maximum operating pressure		bar	315						
Cracking pressure		bar	1.5						

electrical – actual value potentiometer		
Resistance	Ω	1000
Load capacity	W	5
Maximum wiper current	A	0.12
Protection class according to DIN EN 60529		IP 65
Control limit error (regulating speed dependent)		±1.5 ° at 10 °/s

1) The cleanliness classes specified for the components must be adhered to in the hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter.

Technical data
(for applications outside these parameters, please consult us!)

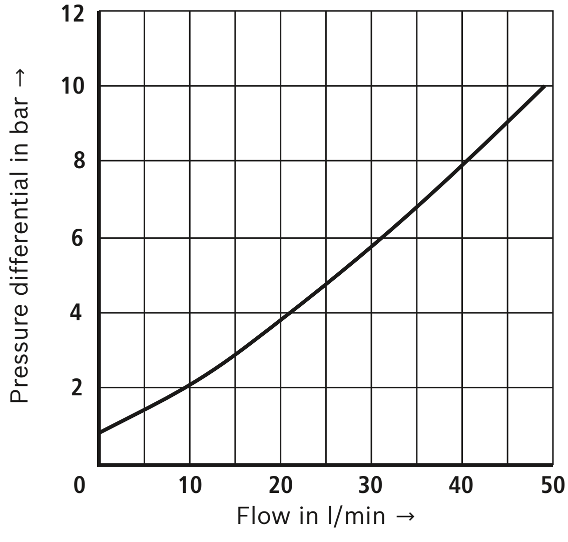
Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils		HL, HLP	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids, refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – containing water**:
  - Maximum pressure difference per control edge 50 bar
  - Pressure pre-loading at the tank port >20% of the pressure differential, otherwise increased cavitation
  - Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%
- **Bio-degradable:** When using bio-degradable hydraulic fluids that are zinc-solving, zinc may accumulate in the fluid (700 mg zinc per pole tube).

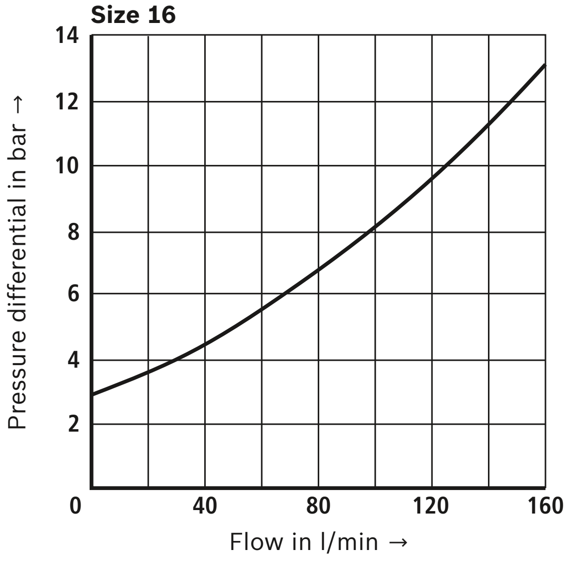
Characteristic curves: Rectifier sandwich plate
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

The pressure differential Δp in both flow directions corresponds to flow q_V from A to B (B to A)

Size 10

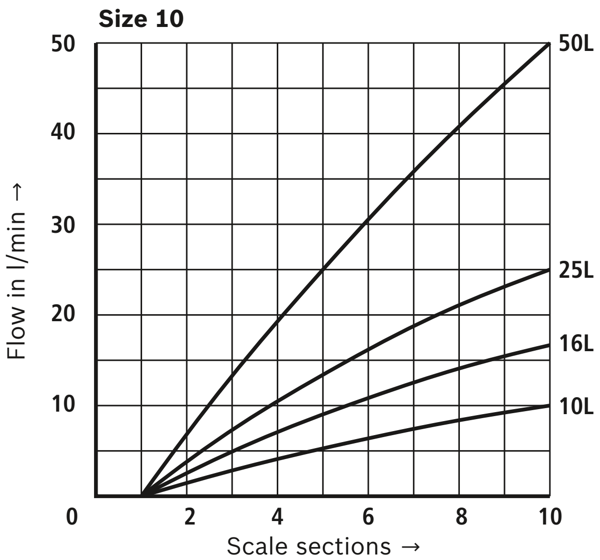


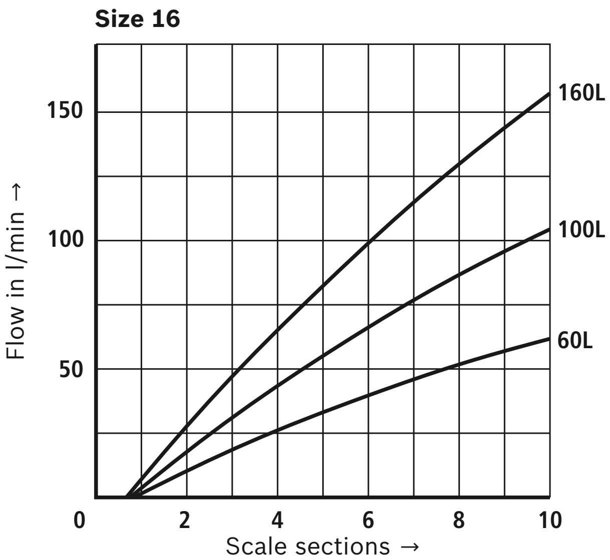
Size 16



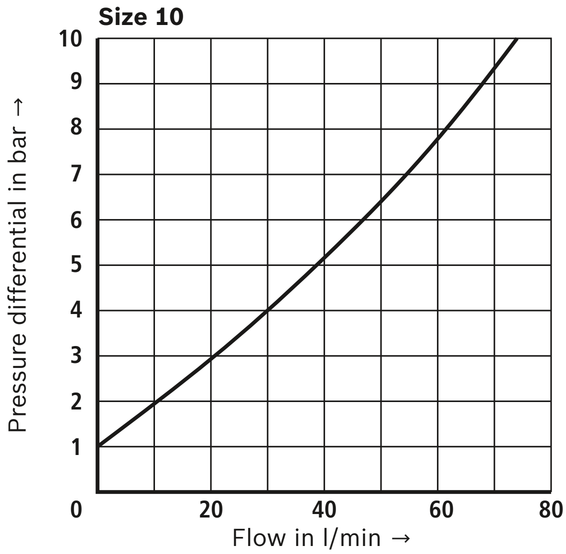
Characteristic curves: 2-way flow control valve
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

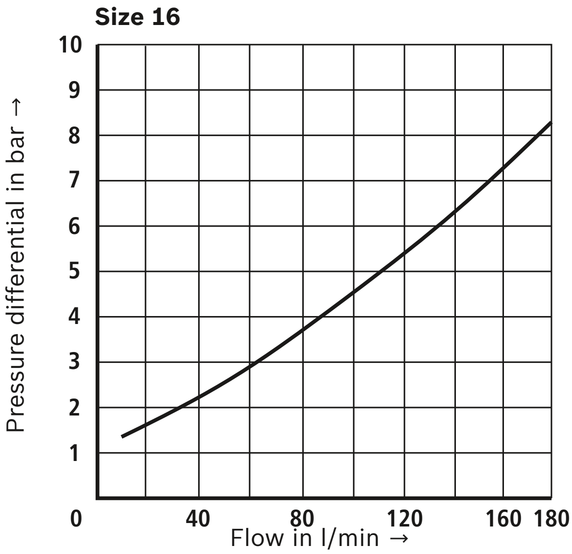
Flow control (A to B)



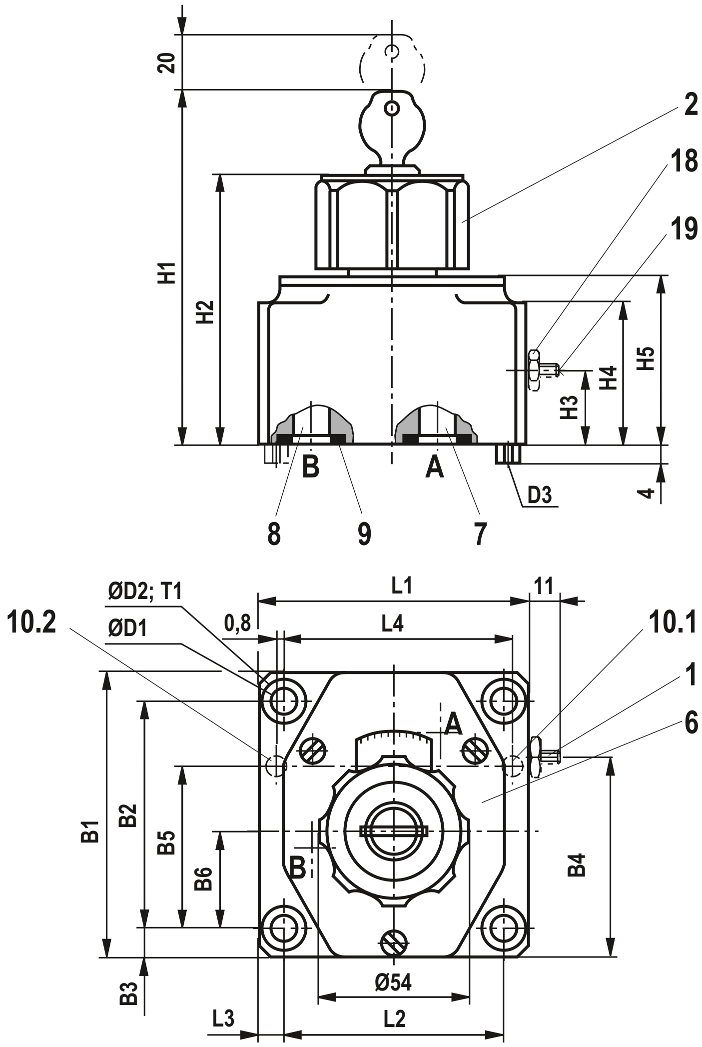


Free return flow (B to A)

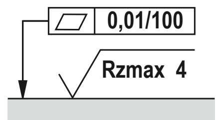




Dimensions: 2-way flow control valve type 2FRM (dimensions in mm)



1 Pressure compensator stroke limitation, optional
2 Adjustment element, rotary knob security lock (all positions can be locked), rotation range 300 ° = 10 scale sections, $M_d \approx 0.7$ Nm
6 Name plate
7 Input A
8 Output B
9 Seal ring
10.1 Locating pin (sizes 10 and 16)
10.2 Locating pin (size 16)
18 Hexagon SW10
19 Internal hexagon SW3

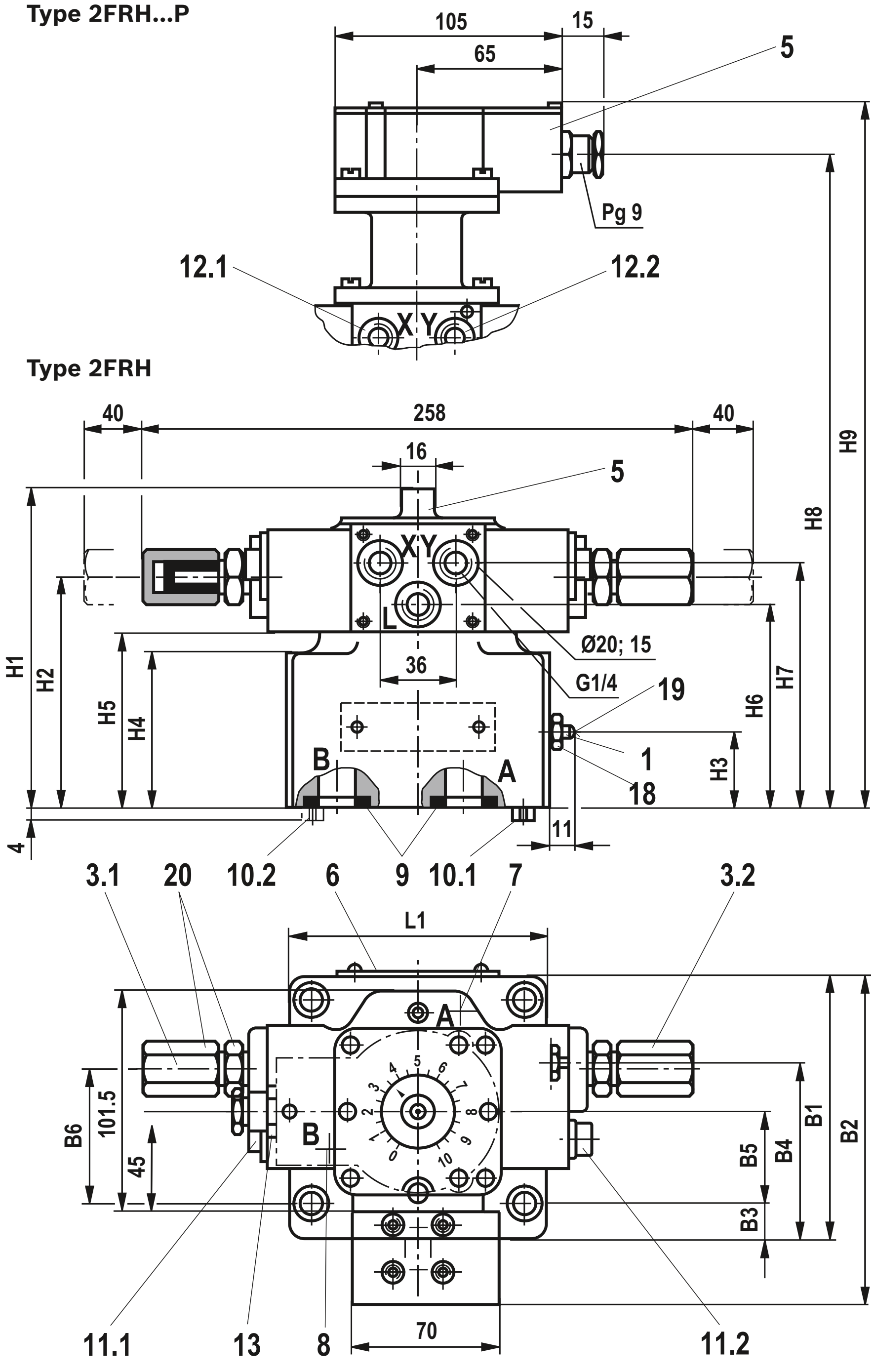


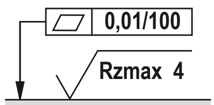
Required surface quality of the valve contact surface

For valve mounting screws and **subplates,** see page 14.

Size	B1	B2	B3	B4	B5	B6	ØD1	ØD2	D3	H1	H2	H3	H4	H5	L1	L2	L3	L4	T1
10	101.5	82.5	9.5	68	58.7	35.5	9	15	6	125	95	26	51	60	95	76	9.5	79.4	13
16	123.5	101.5	11	81.5	72.9	41.5	11	18	6	147	117	34	72	82	123.5	101.5	11	102.4	12

Dimensions: 2-way flow control valve type 2FRH
(dimensions in mm)





Required surface quality of the valve contact surface

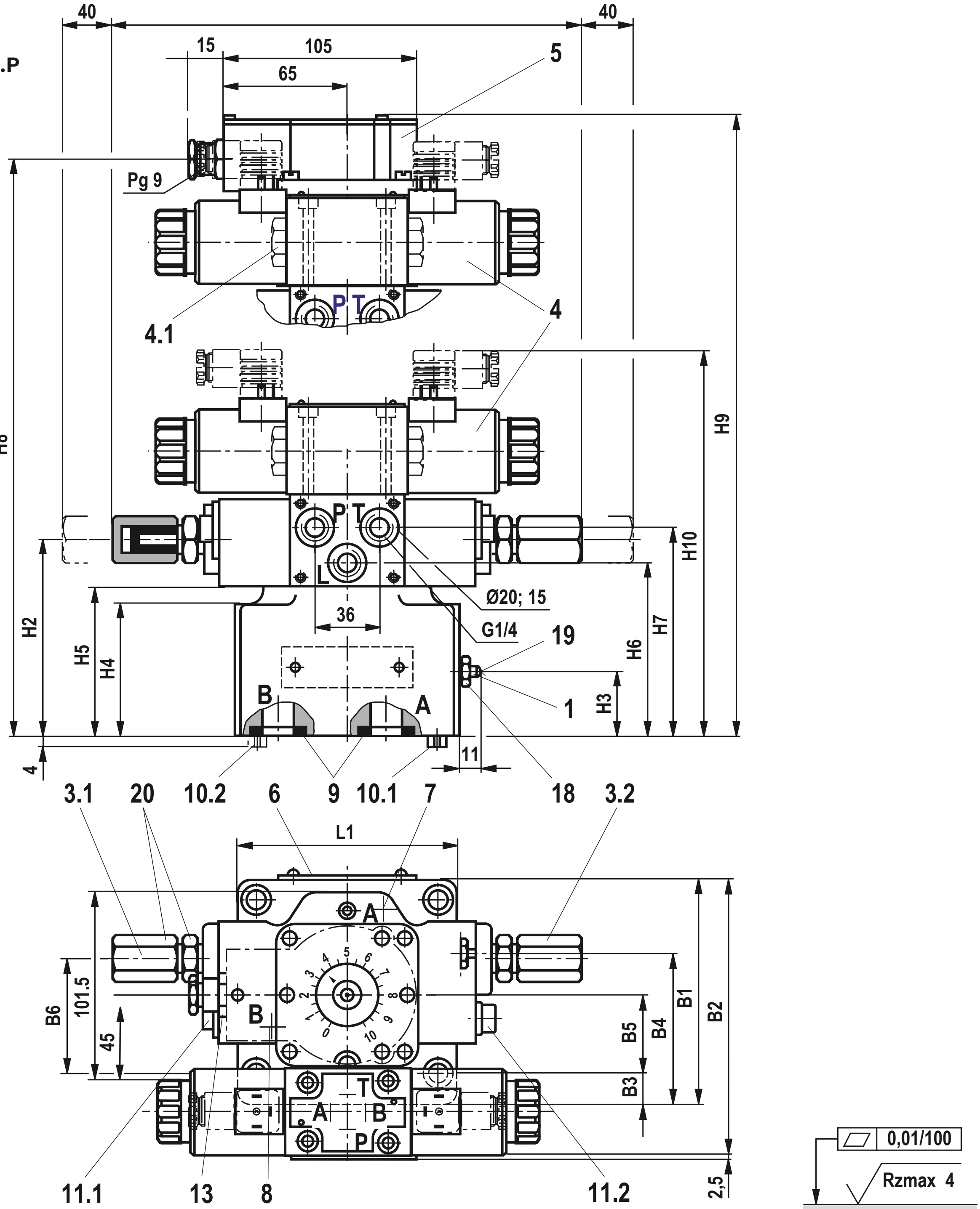
For item explanations, valve mounting screws and **subplates,** see page 14. **For valve connection dimensions,** see page 10.

Size	B1	B2	B3	B4	B5	B6	H1	H2	H3	H4	H5	H6	H7	H8	H9	L1
10	101.5	148.5	9.5	68	35.5	54.5	125.5	84	26	51	58	70	89	179	203	95
16	123.5	163	11	81.5	41.5	60.5	147.5	106	34	72	80	92	111	201	225	123.5

Dimensions: 2-way flow control valve type 2FRW (dimensions in mm)

Type 2FRW...P

Type 2FRW



Required surface quality of the valve contact surface

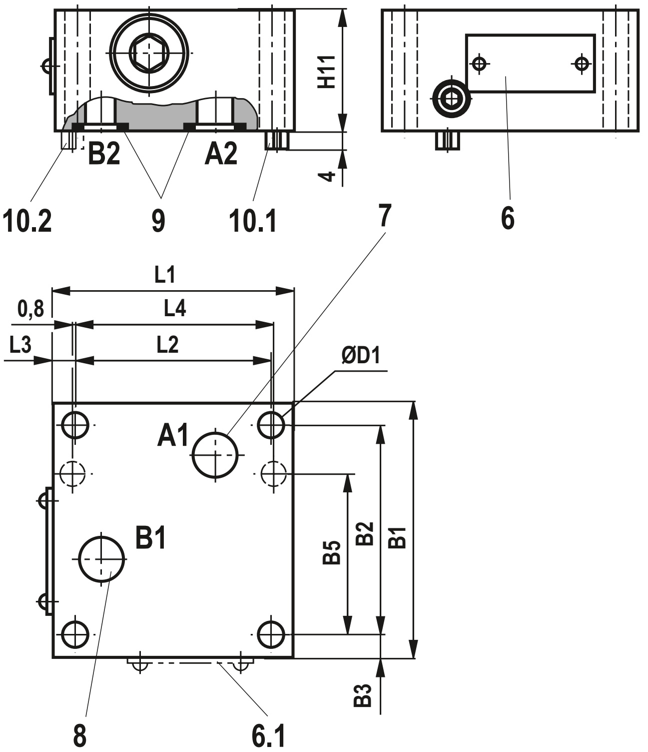
[1] Dimensions for valve with mating connector **without** circuitry for connector "K4" (separate order, see page 15 and data sheet 08006)

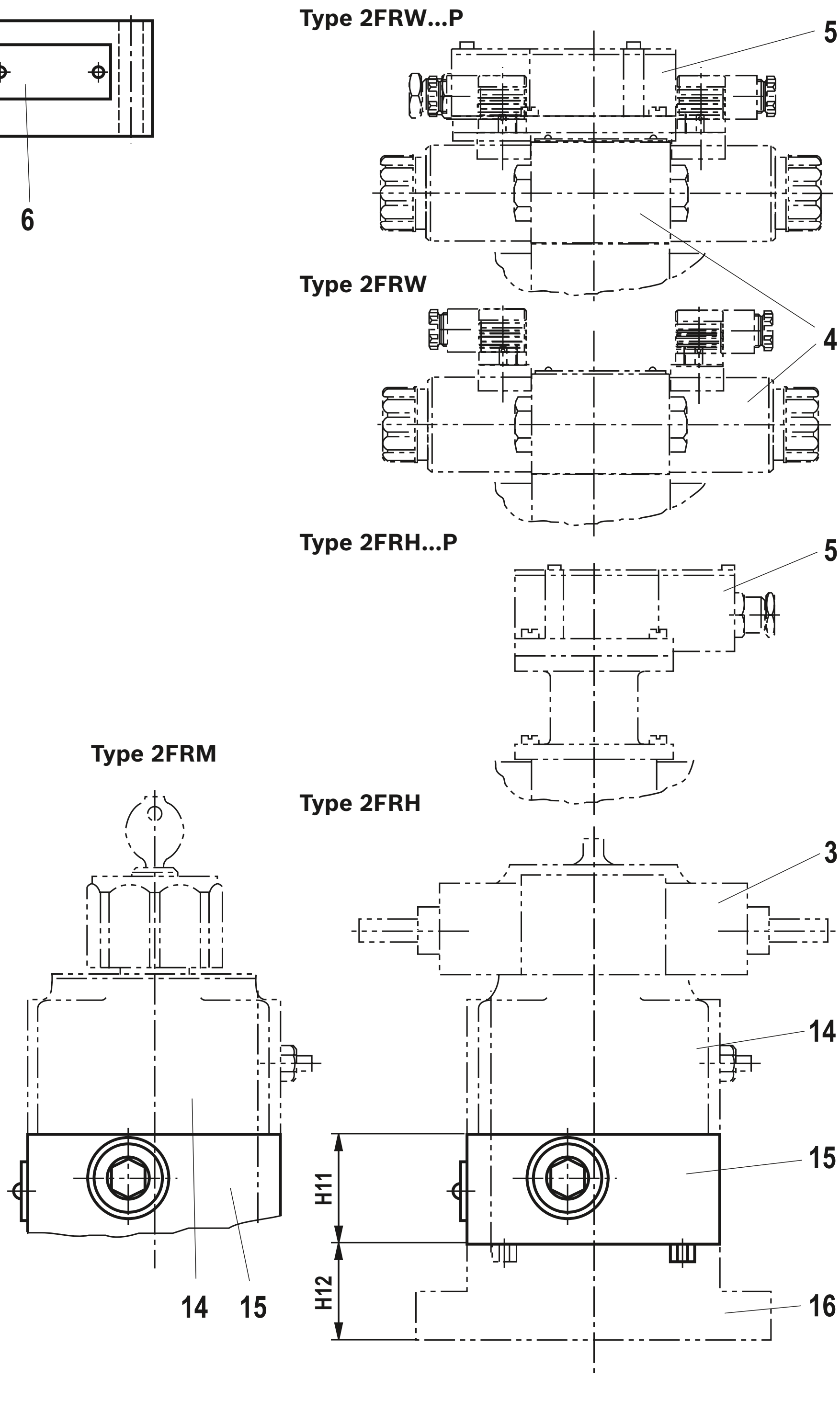
[2] Dimensions for valve with mating connector **with** circuitry for connector "K4" (separate order, see page 15 and data sheet 08006)

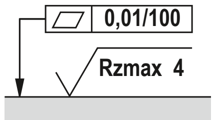
For item explanations, valve mounting screws and **subplates** see page 14. **For valve connection dimensions,** see page 10.

Size	B1	B2	B3	B4	B5	B6	H2	H3	H4	H5	H6	H7	H8	H9	H10 [1]	H10 [2]	L1
10	101.5	146	9.5	68	35.5	54.5	84	26	51	58	70	87	179	203	201	206	95
16	123.5	160.5	11	81.5	41.5	60.5	106	34	72	80	92	109	201	225	223	228	123.5

Dimensions: Rectifier sandwich plate
(dimensions in mm)







Required surface quality of
the valve contact surface

Valve mounting screws for the installation of a rectifier sandwich plate between subplate and flow control valve (separate order)

- Size 10:
  4 hexagon socket head cap screws
  ISO 4762 - M8 x 100 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  tightening torque M_A = 30 Nm ± 10%,
  material no. **R913000379**
- Size 16:
  4 hexagon socket head cap screws
  ISO 4762 - M10 x 160 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  tightening torque M_A = 64 Nm ± 10%,
  material no. **R913000072**

For item explanations and **subplates** see page 14. **For valve connection dimensions,** see page 10.

Size	B1	B2	B3	B5	Ø D1	H11	H12	L1	L2	L3	L4
10	101.5	82.5	9.5	58.7	9	50	30	95	76	9.5	79.4
16	123.5	101.5	11	72.9	11	85	40	123.5	101.5	11	102.4

Dimensions

1 Pressure compensator stroke limitation, optional
2 Flow display, rotation range 300 ° = 10 scale sections
3 Geared piston drive
3.1 Geared piston drive stroke limitation for minimum flow; 1 rotation = approx. 12 ° (of 300 °)
3.2 Geared piston drive stroke limitation for maximum flow; 1 rotation = approx. 12 ° (of 300 °)
4 Directional spool valve size 6, symbol J or Y (Y de-energized = $\boldsymbol{q}_{\mathbf{V\ min}}$) (see data sheet 23178)
4.1 Cover for symbol Y
5 Actual value potentiometer
6 Name plate
6.1 Name plate (size 16)
7 Input A
8 Output B
9 Seal ring
10.1 Locating pin (sizes 10 and 16)
10.2 Locating pin (size 16)
11.1 Regulating speed throttle in the direction of the minimum flow ($\boldsymbol{v}_0$ ... $\boldsymbol{v}_{max.}$ = 5 rotations); internal hexagon SW6
11.2 Regulating speed throttle in the direction of the maximum flow ($\boldsymbol{v}_0$ ... $\boldsymbol{v}_{max.}$ = 5 rotations); internal hexagon SW6
12.1 Pressure loading at X = opening the orifice
12.2 Pressure loading at Y = closing the orifice
13 Scale disc
14 2-way flow control valve
15 Rectifier sandwich plate
16 Subplate (see right)
18 Hexagon SW10
19 Internal hexagon SW3
20 Hexagon SW13

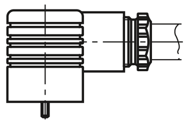
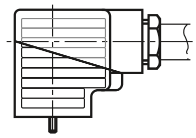
Subplates according to data sheet 45066 (separate order)

Size 10:	G 279/01 (G 1/2) G 280/01 (G 3/4)
Size 16:	G 281/01 (G 1) G 282/01 (G 1 1/4)

Valve mounting screws (separate order)

- Size 10:
  4 hexagon socket head cap screws
  ISO 4762 - M8 x 50 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  tightening torque $\boldsymbol{M}_A$ = 30 Nm ± 10%,
  material no. **R913000543**
- Size 16:
  4 hexagon socket head cap screws
  ISO 4762 - M10 x 80 - 10.9-flZn-240h-L
  (friction coefficient μ_{total} = 0.09 to 0.14);
  tightening torque $\boldsymbol{M}_A$ = 64 Nm ± 10%,
  material no. **R913000496**

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006					
		Material number			
Valve side	**Farbe**	Without circuitry	With indicator light 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Zener diode suppression circuit 24 V
a	Gray	**R901017010**	**–**	**–**	**–**
b	Black	**R901017011**	**–**	**–**	**–**
a/b	Black	**–**	**R901017022**	**R901017025**	**R901017026**

More information

- ▶ Directional spool valve — Data sheet 23178
- ▶ Subplates — Data sheet 45066
- ▶ Mineral oil-based hydraulic fluids — Data sheet 90220
- ▶ General product information on hydraulic products — Data sheet 07008
- ▶ Installation, commissioning and maintenance of industrial valves — Data sheet 07300
- ▶ Hydraulic valves for industrial applications — Data sheet 07600-B
- ▶ Selection of the filters — www.boschrexroth.com/filter

Notes

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documentation@boschrexroth.de
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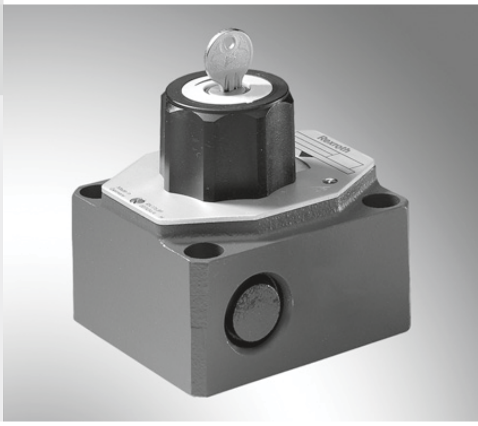
3-way flow control valve

RE 28862/08.08
Replaces: 04.81

Type 3FRM



Sizes 10 and 16
Component series 2X
Maximum operating pressure 315 bar
Maximum flow 160 l/min

Table of contents

Features

– For subplate mounting
– Mechanical actuation
– Pressure relief valve (overload protection), optional
– Reduction of the start-up jump
– Unloading port for free circulation, optional

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

3FR	M	–2X/				*

3-way flow control valve

Mechanical actuation = **M**

Size 10 = **10**
Size 16 = **16**

Component series 20 to 29 = **2X**
(20 to 29: unchanged installation and connection dimensions)

Flow range from A to B

NG10,	**linear**	
	Up to 10 l/min	**= 10L**
	Up to 16 l/min	**= 16L**
	Up to 25 l/min	**= 25L**
	Up to 50 l/min	**= 50L**
NG16,	**linear**	
	Up to 60 l/min	**= 60L**
	Up to 100 l/min	**= 100L**
	Up to 160 l/min	**= 160L**

No code = **Without** pressure relief valve
D = **With** pressure relief valve

No code = **Without** unloading port
X = **With** unloading port

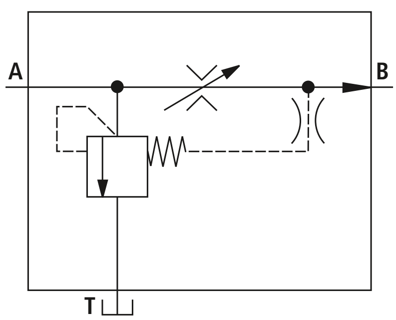
Seal material
No code = NBR seals
V = FKM seals
(other seals on request)
⚠ **Attention!**
Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

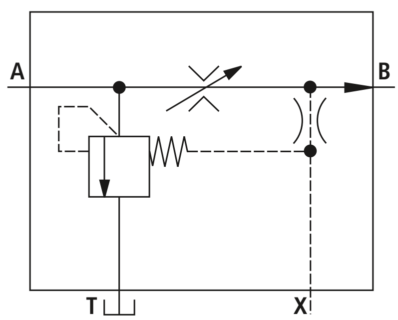
Standard types and components are shown in the EPS (standard price list).

Symbols

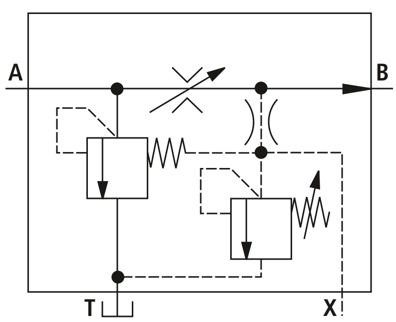
Type 3FRM …



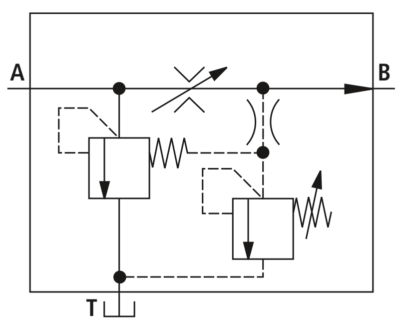
Type 3FRM …X…



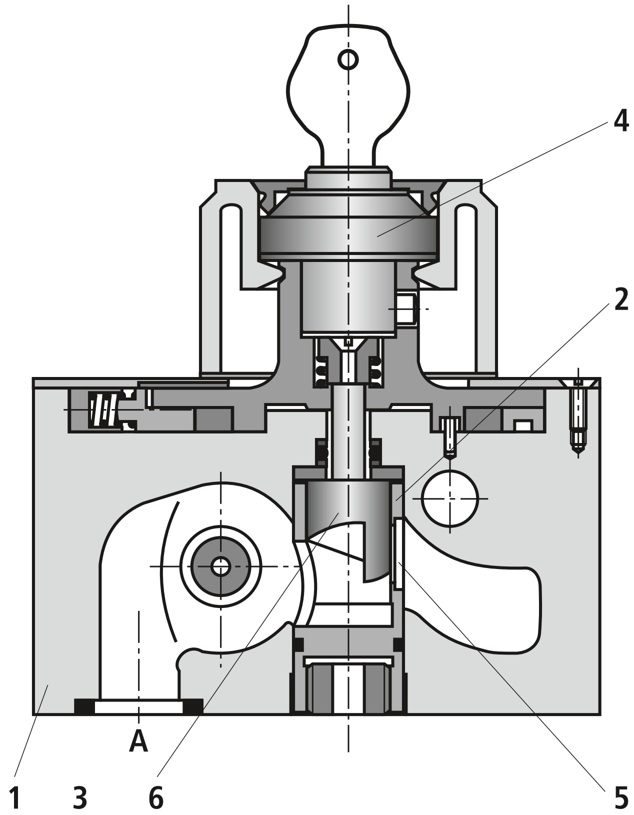
Type 3FRM …DX…

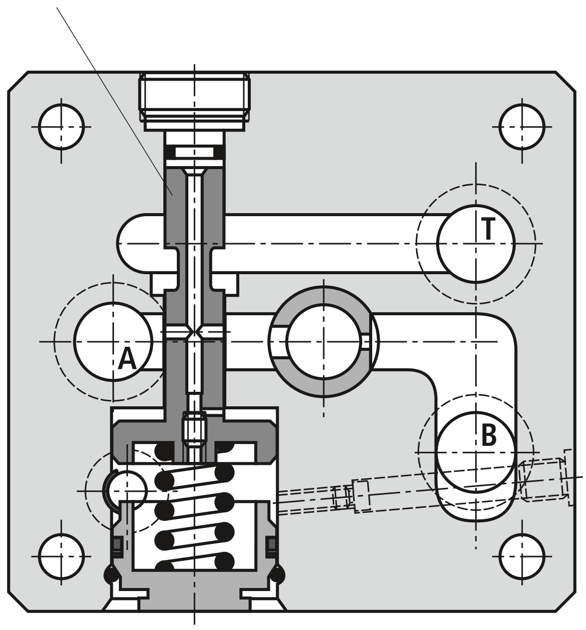


Type 3FRM …D…



Function, section





Flow control valves of type 3FRM are 3-way flow control valves. They keep a set flow constant independently of pressure and temperature fluctuations.

The valves basically consist of housing (1), orifice bushing (2), pressure compensator (3) and adjustment element (4).

The flow from channel A to B is throttled at throttling point (5). The throttle cross-section is adjusted by turning curved pin (6) mechanically by means of adjustment element (4). To keep the flow constant at throttling point (5) a pressure compensator (3) is connected upstream.

The pressure compensator discharges the excessive flow via an additional line to the tank. For this reason, these valves may only be used in the supply line!

On 3-way flow control valves (contrary to 2-way flow control valves) the metering and control orifices are not connected in series, but in parallel.

The independence on temperature results from the design of the throttling point of the orifice.

The working pressure of the hydraulic pump is only by the amount of the pressure differential across the metering orifice greater than the actuator pressure, whereas with a 2-way flow control valve, the hydraulic pump must always generate the pressure set on the pressure relief valve. The 3-way flow control valve therefore features lower line losses and thus offers a more favorable system efficiency while generating less heat.

Flow control valves are optionally available with or without unloading port (for free circulation) and with or without pressure relief valve (overload protection).

Technical data (for applications outside these parameters, please consult us!)

General

Size		NG10	NG16
Weight	kg	3.3	7.0
Installation position		Optional	
Ambient temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)	

Hydraulic

Maximum operating pressure	bar	315						
Minimum pressure differential range	bar	3 to 7				5 to 12		
Maximum flow	l/min	10	16	25	50	60	100	160
Flow control – Temperature-stable (-20 to +80 °C)		±2 % ($q_{V\ max}$)				±2 % ($q_{V\ max}$)		
Flow control – Pressure-stable (to ***Δp*** = 315 bar)		±2 % ($q_{V\ max}$)				< ±2 % ($q_{V\ max}$)		
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on request						
Hydraulic fluid temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)						
Viscosity range	mm²/s	2.8 to 380 (recommended: 30 to 46)						
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [3]						

[1] Suitable for NBR and FKM seals

[2] Suitable only for FKM seals

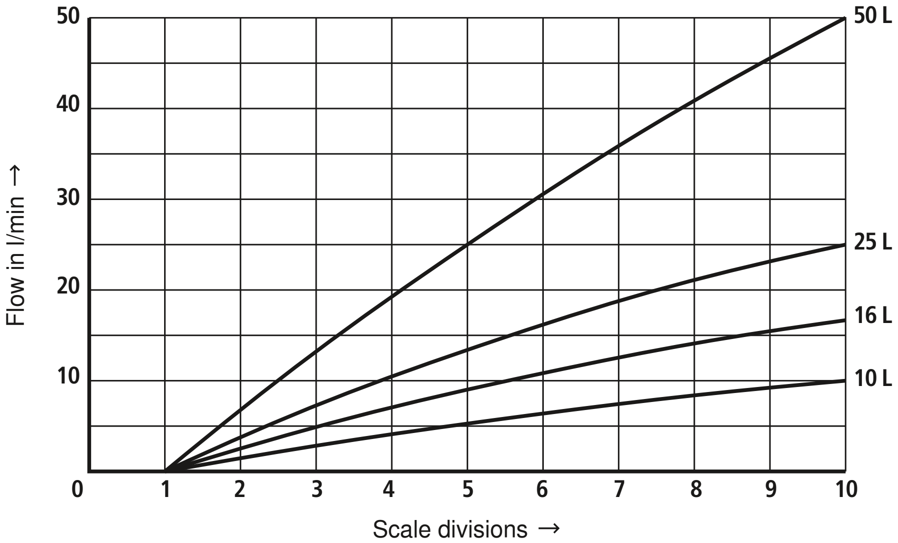
[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

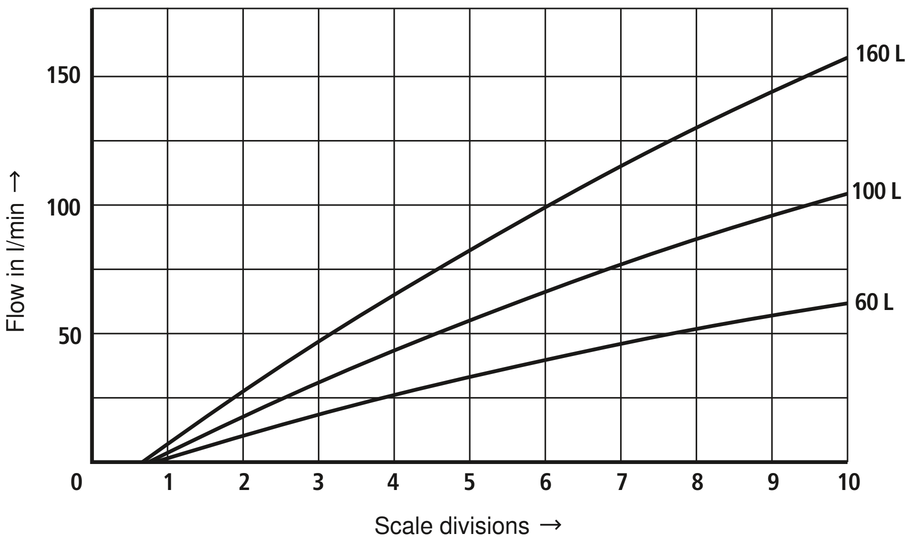
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Flow control (A → B)

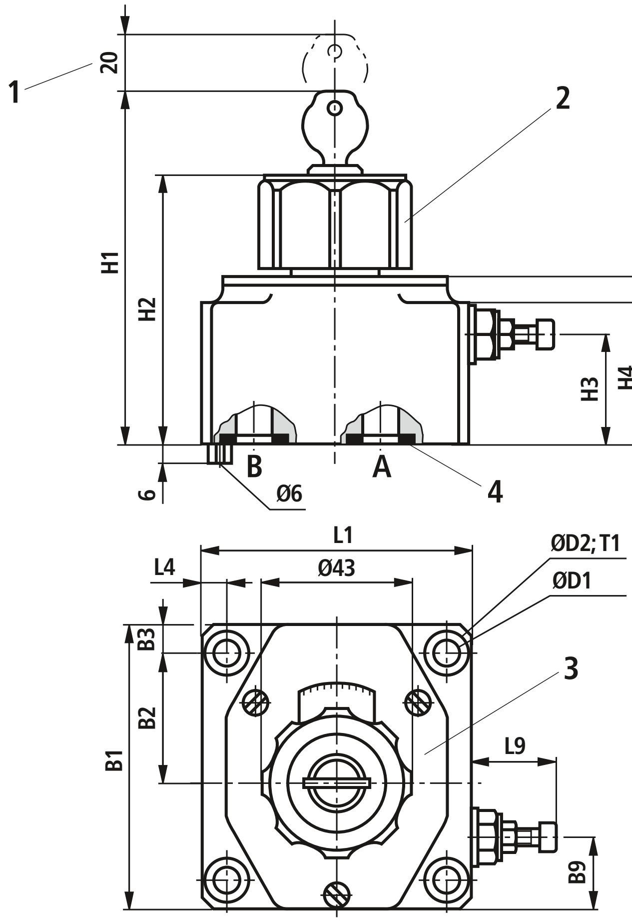
NG10

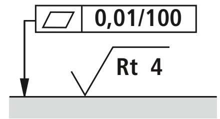


NG16

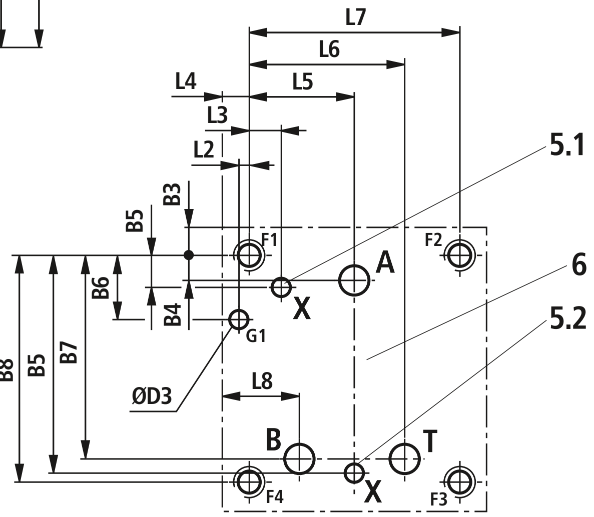


Unit dimensions (dimensions in mm)





Required surface quality
of the valve mounting face



1 Space required to remove key
2 Adjustment element, rotary knob lock
(each position can be locked)
Turning range 300° = 10 scale divisions; $M_d \approx 0.7$ Nm
3 Nameplate
4 Identical seal rings for ports A and B
5.1 Unloading port X on NG10
5.2 Unloading port X in NG16
6 Position of ports (similar to ISO 6263)

Subplates on request
– Size 10: G 337/01 (G1/2)
G 343/01 (G1/2)
– Size 16: G 340/01 (G1)
G 346/01 (G1)

Valve mounting screws (separate order)
– Size 10
4 pcs ISO 4762 - M8 x 50 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 30 Nm ±10%,
Material no. **R913000543**
– Size 16
4 pcs ISO 4762 - M10 x 80 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 60 Nm ±10%,
Material no. **R913000496**

													Port	
NG	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**	**B9**	**ØD1**	**ØD2**	**ØD3**	**X**	**A. B. T**
10	101.5	47	9.5	9.5	11.9	23.8	74.6	82.5	27	9	15	6	6.3 [1)]	14.7 [1)]
16	123.5	60	11	12.5	95.1	28.6	88.8	101.5	76	11	18	6	7.9 [1)]	17.5 [1)]

NG	**H1**	**H2**	**H3**	**H4**	**H5**	**L1**	**L2**	**L3**	**L4**	**L5**	**L6**	**L7**	**L8**	**L9** min	**L9** max	**T1**
10	123	93	39.5	51	58	95	3.2	29.5	9.5	11.9	58.2	76	19.1	21.3	29.5	13
16	145	115	58	72	80	123.5	0.8	29.5	11	50.8	77.8	101.5	23.8			12

[1)] Maximum dimension

Notes

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2-way flow control valve

RE 28155/11.10
Replaces: 11.02

Type 2FRM

Sizes 6 and 10
Component series 1X
Maximum operating pressure 315 bar
Maximum flow 60 l/min

H5012

Overview of contents

Contents	Page

Features

– Cartridge valve
– Adjustment element with internal hexagon
– With built-in check valve
– Low start-up jump

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

2FRM		K	2	–1X /		R	V	*

2-way flow control valve

Size 6	**= 6**
Size 10	**= 10**
Cartridge valve	**= K**
Adjustment element Internal hexagon	**= 2**
Series 10 to 19 (10 to 19: unchanged installation and connection dimensions)	**= 1X**

Flow (A → B)

6Q =	up to 6.0 l/min (size 6)
32Q =	up to 32.0 l/min (size 6)
60Q =	up to 60.0 l/min (size 10)

R =	With check valve

Seal material

V =	FKM seals
	(Other seals on request)

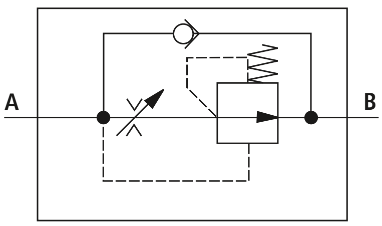
Attention!
Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

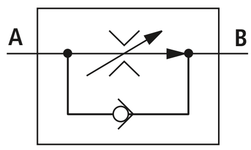
Preferred types and standard components can be found in the EPS (Standard Price List).

Symbols (detailed and simplified)

Detailed



Simplified



Function, section

Flow control valves type 2FRM . K are 2-way flow control valves suitable for fitting into manifold systems. They are used for maintaining a constant flow, independent of pressure and temperature.

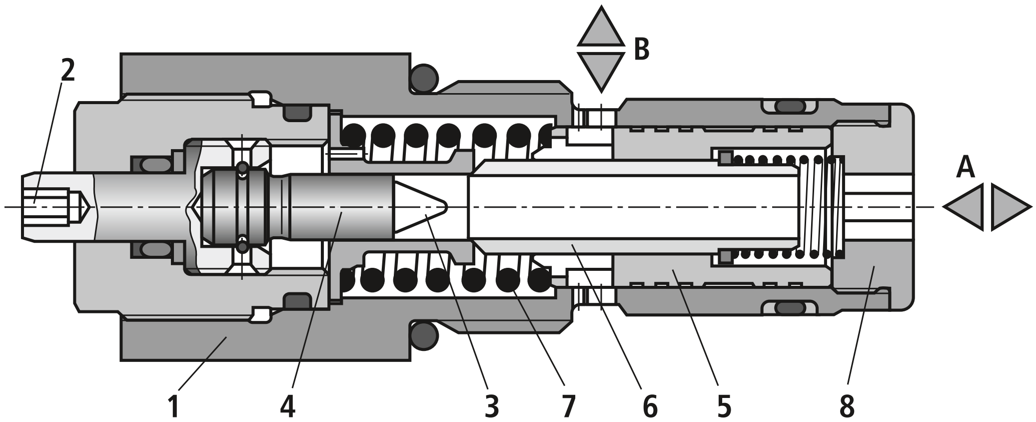
The valve basically consists of the housing (1), adjustment element (2), throttling area (3), throttle bolt (4), pressure compensator (5) and check valve (6).

Throttling of the flow from port A to port B occurs at the throttle area (3). The throttle cross-section is changed by turning the adjustment element (2). This takes place between the throttle area (3) and the throttle bolt (4).

In order to hold the flow constant, independent from the pressure, in port B a pressure compensator (5) is fitted downstream of the throttle area (3).

The pressure compensator (5) is pressed against the plug (8) by the compression spring (7) and so stays in the open position as long as there is no flow through the valve. When flow takes place through the valve the pressure, which is present in port A, applies a force onto the pressure compensator (5). The pressure compensator moves into the compensating position until the forces are balanced. If the pressure increases in port A, then the pressure compensator (5) moves towards its closed position until the forces are balanced. Due to this continuous compensating action a constant flow is obtained.

Free return flow from port B to port A is obtained via the check valve (6).



Technical data (for applications outside these parameters, please consult us!)

General

Size		NG6	NG10
Weight	kg	0.19	0.6
Installation		Optional	
Ambient temperature range	°C	–20 to +50	

Hydraulic

Maximum operating pressure – Port A		bar	315		210
Pressure differential Δp for free return flow B → A		bar	See characteristic curves on page 5		
Minimum pressure differential		bar	18		
Pressure stable up to Δp = 315 bar / 210 bar		%	±3 ($p_{V\,max}$)		
Flow	– $p_{V\,max}$	l/min	6.0	32	60
	– $p_{V\,min}$	cm^3/min	50	250	500
Pressure fluid			Mineral oil (HL, HLP) to DIN 51524; Fast bio-degradable pressure fluids to VDMA 24568 (also see data sheet 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic ester); Other pressure fluids on request		
Pressure fluid temperature range		°C	–20 to +80		
Viscosity range		mm^2/s	10 to 800		
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [1]		

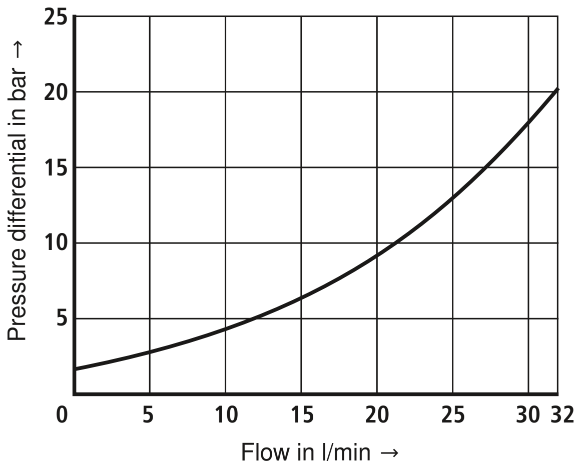
[1] The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.

For the selection of the filters see www.boschrexroth.com/filter.

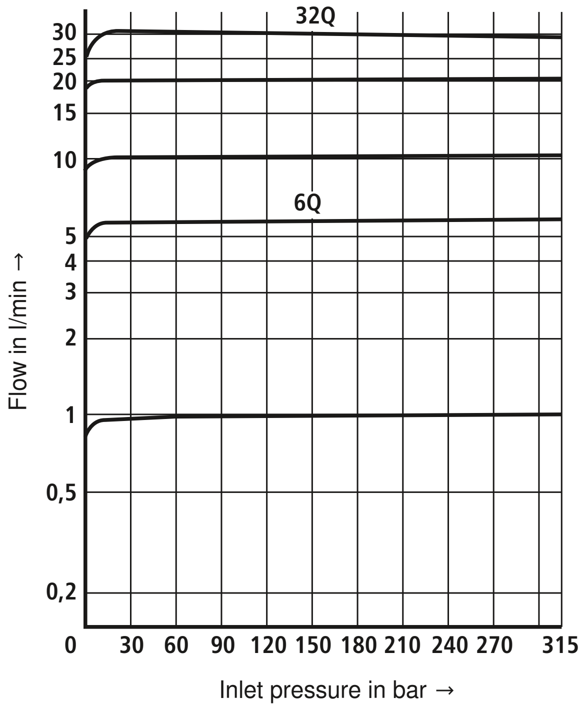
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Size 6

***Δp*-q_V-characteristic curve via the check valve**
(B → A) Orifice closed

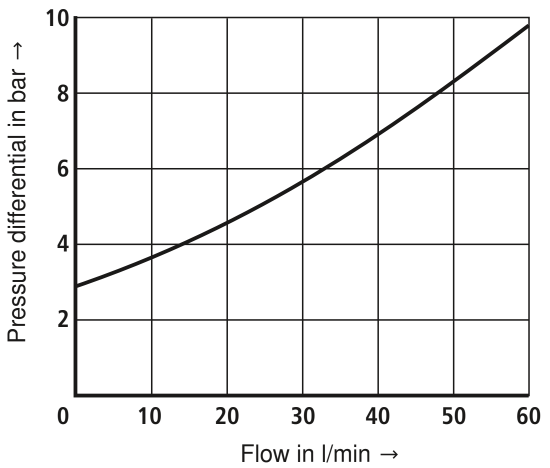


Flow q_V in relation to the inlet pressure *p*

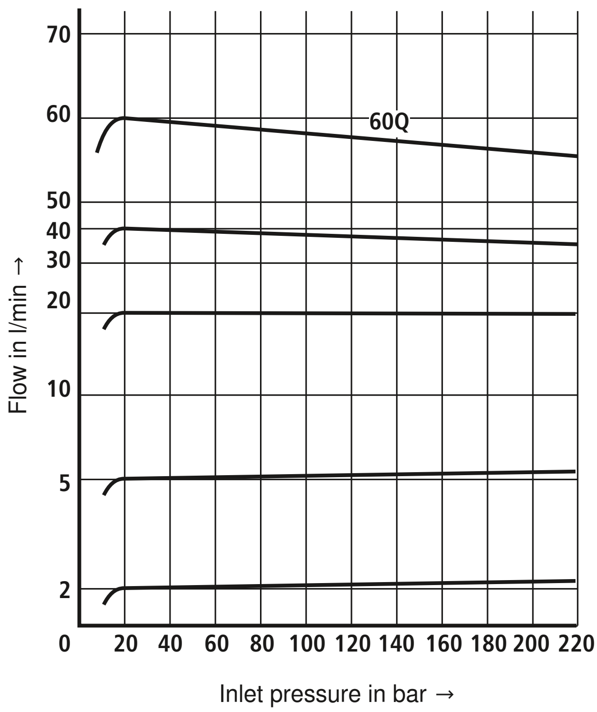


Size 10

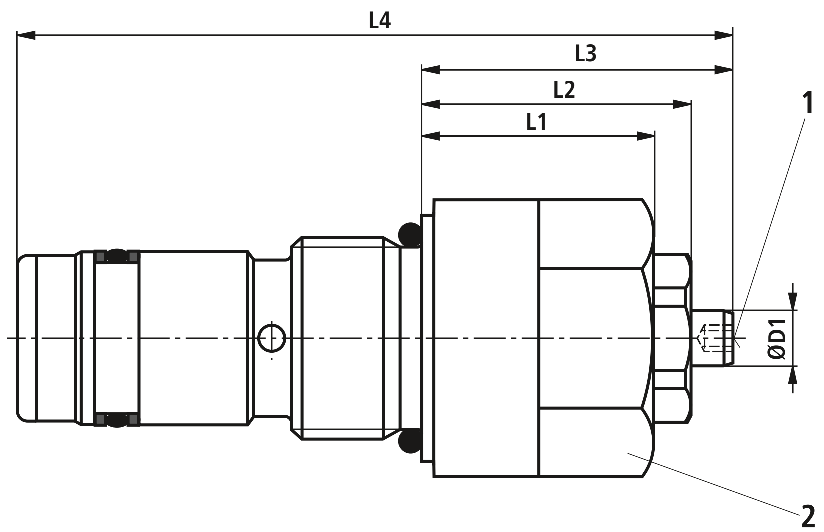
***Δp*-q_V-characteristic curve via the check valve**
(B → A) Orifice closed



Flow q_V in relation to the inlet pressure *p*



Dimensions (dimensions in mm)

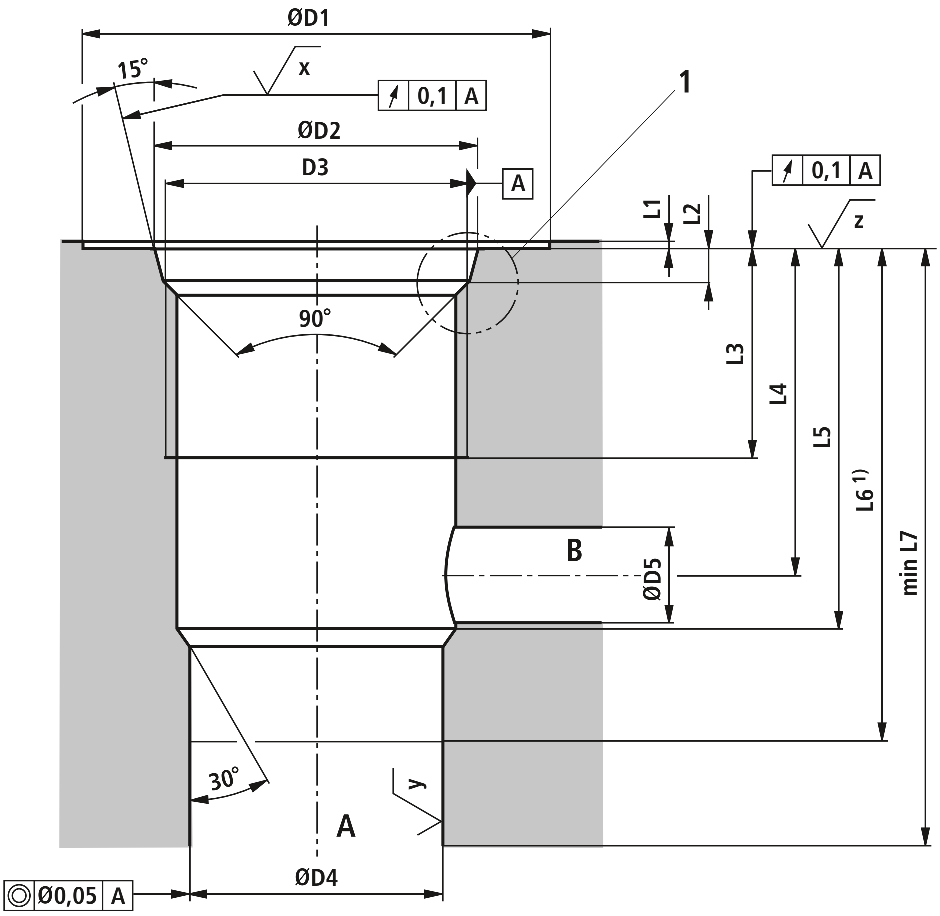


Size	L1	L2	L3	L4	ØD1
6	25	29	33,5	77	6
10	36	41	45,5	109	6

1 Internal hexagon 3A/F

2 – NG6: Hexagon 27A/F; M_A = 40 Nm
– NG10: Hexagon 41A/F; M_A = 120 Nm

Cavities to DIN ISO 7789 (dimensions in mm)



Size	L1	L2	L3	L4	L5	L6 1)	L7	ØD1	ØD2	D3	ØD4	ØD5
6	0,5	$2{,}4^{+0{,}4}$	17	24_{-4}	28±0,1	38,5	$45^{+0{,}2}$	34	23,8±0,1	M22 x 1,5	19H7	7
10	0,5	$3{,}1^{+0{,}4}$	23	32_{-4}	$39^{+0{,}4}$	55	65	46	35,4±0,1	M33 x 2	29H8	11

1 to DIN 3852-W

1) Depth of fit

Size 6

$\sqrt{x} = \sqrt{\text{Rmax } 8}$

$\sqrt{y} = \sqrt{\text{Rz } 8}$

$\sqrt{z} = \sqrt{\text{Rz } 16}$

Size 10

$\sqrt{x} = \sqrt{\text{Rz } 8}$

$\sqrt{y} = \sqrt{\text{Rz } 8}$

$\sqrt{z} = \sqrt{\text{Rz } 25}$

Notes

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2-way flow control valve

RE 28164/05.11
Replaces: 02.03

Type Z2FRM

Size 6
Component series 2X
Maximum operating pressure 315 bar
Maximum flow 32 l/min

H5379

Table of contents

Features

– Sandwich plate valve
– Porting pattern according to DIN 24340 form A
– Porting pattern according to ISO 4401-03-02-0-05 (**with** locating hole)
– With 1 or 2 flow control cartridges
– Adjustment type with internal hexagon

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z	2FRM	6		B	2	–2X/		R	V		*

Sandwich plate design

2-way flow control valve

Size 6 = 6

Flow control function (discharge control) in
Channel A = **A**
Channel B = **B**
Channel A and B = **C**
Channel T [1)] = **T**

Without closing of the pressure compensator = **B**

Adjustment type
With internal hexagon = **2**

2X = Component series 20 to 29
(20 to 29: Unchanged installation and connection dimensions)

Flow
6Q = up to 6.0 l/min
32Q = up to 32.0 l/min

R = with check valve

Seal material
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

No code = Without locating hole
/60 [2)] **=** With locating hole

Further details in the plain text

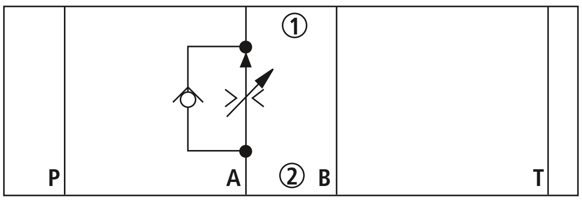
[1)] The flow control function in channel P (supply control) results from the rotation around the longitudinal axis, see also page 8.

[2)] Locating pin ISO 8752-3x8-St,
Material no. **R900005694** (separate order)

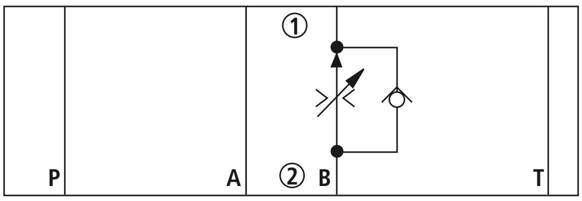
Standard types and standard units are contained in the EPS (standard price list).

Symbols (① = component side, ② = plate side)

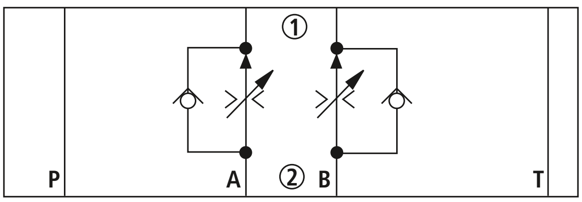
Type Z2FRM 6 A…



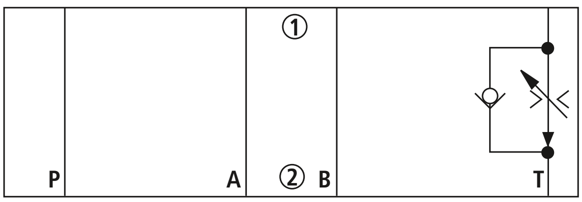
Type Z2FRM 6 B…



Type Z2FRM 6 C…



Type Z2FRM 6 T…



Function, section

The valve type Z2FRM is a 2-way flow control valve in sandwich plate design. It is used for keeping a flow constant, independent of pressure and temperature.

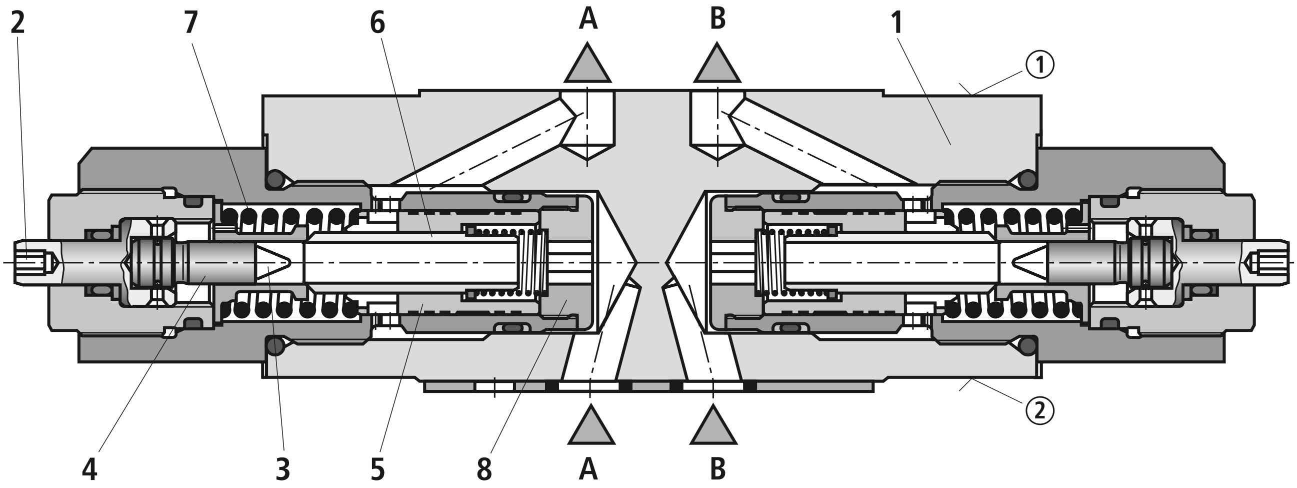
The valve basically comprises of a housing (1) and one or two flow control cartridges.

The flow from channel A②/B② to channel A①/B① is controlled at the throttling point (3). The throttle cross-section is set by turning the adjustment type (2) between the throttling point (3) and the throttling pin (4).

In order to keep the flow in channel A①/B① constant, independent of the pressure, a pressure compensator (5) is fitted downstream of the throttling point (3).

The compression spring (7) presses the pressure compensator (5) against the plug screw (8) and keeps the pressure compensator in the open position when there is no flow through the valve. When fluid flows through the valve, the pressure acting in channel A②/B② applies a force to the pressure compensator (5). The pressure compensator moves into the control position until the forces balance. If the pressure in channel A②/B② rises, the pressure compensator (5) moves in the closing direction until a balance of forces is once again attained. Due to this continuous compensation of the pressure compensator, a constant flow is obtained.

The free flow from channel A①/B① to channel A②/B② is via the check valve (6).



Type Z2FRM 6 C…

① = component side
② = plate side

Technical Data (For applications outside these parameters, please consult us!)

general

Weight	– Flow control function in channel A, B, T	kg	1.3
	– Flow control function in channel A, B	kg	1.4
Installation position			Any
Ambient temperature range		°C	–20 to +50

hydraulic

Maximum operating pressure		bar	315
Minimum pressure differential	– with $q_{V\ max}$	bar	18
	– with $q_{V\ min}$	bar	7
Pressure stability up to Δp = 315 bar		%	±3 ($q_{V\ max}$)
Maximum flow	– $q_{V\ max}$	l/min	6; 32
	– $q_{V\ min}$	cm^3/min	50; 250
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C	–20 to +80
Viscosity range		mm^2/s	10 to 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP, HLPD	FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922

Important information on hydraulic fluids!

– For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!

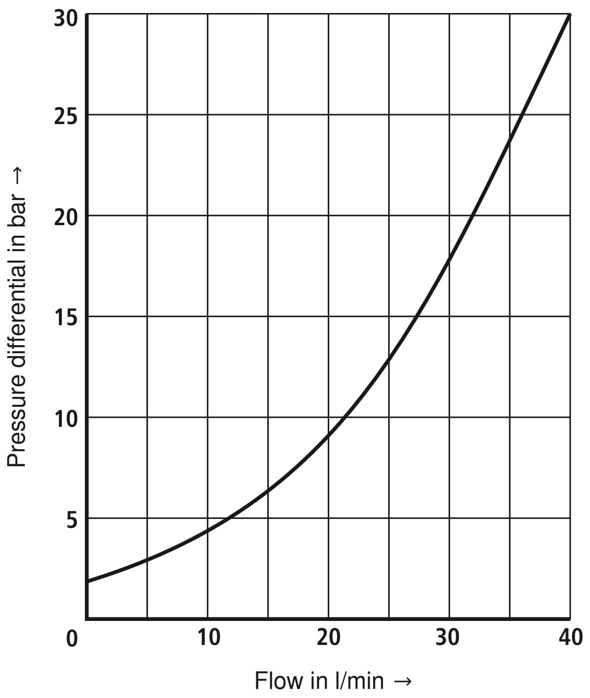
– There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!

1) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

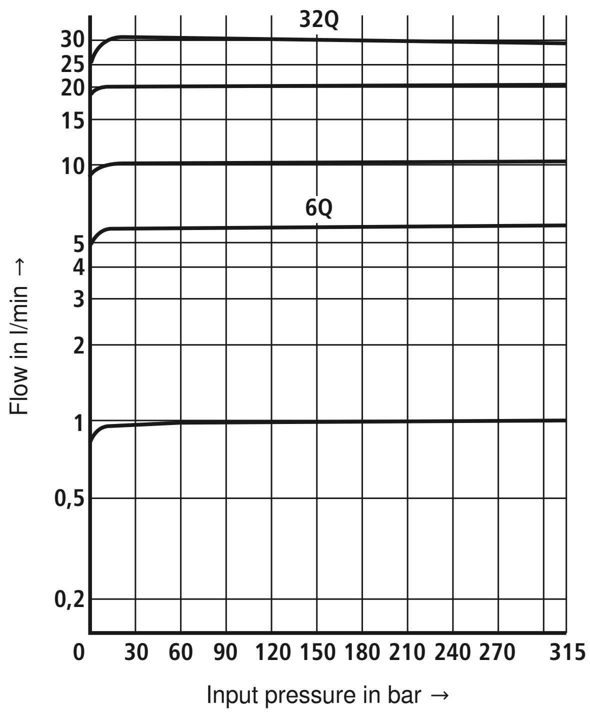
For the selection of the filters see www.boschrexroth.com/filter.

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

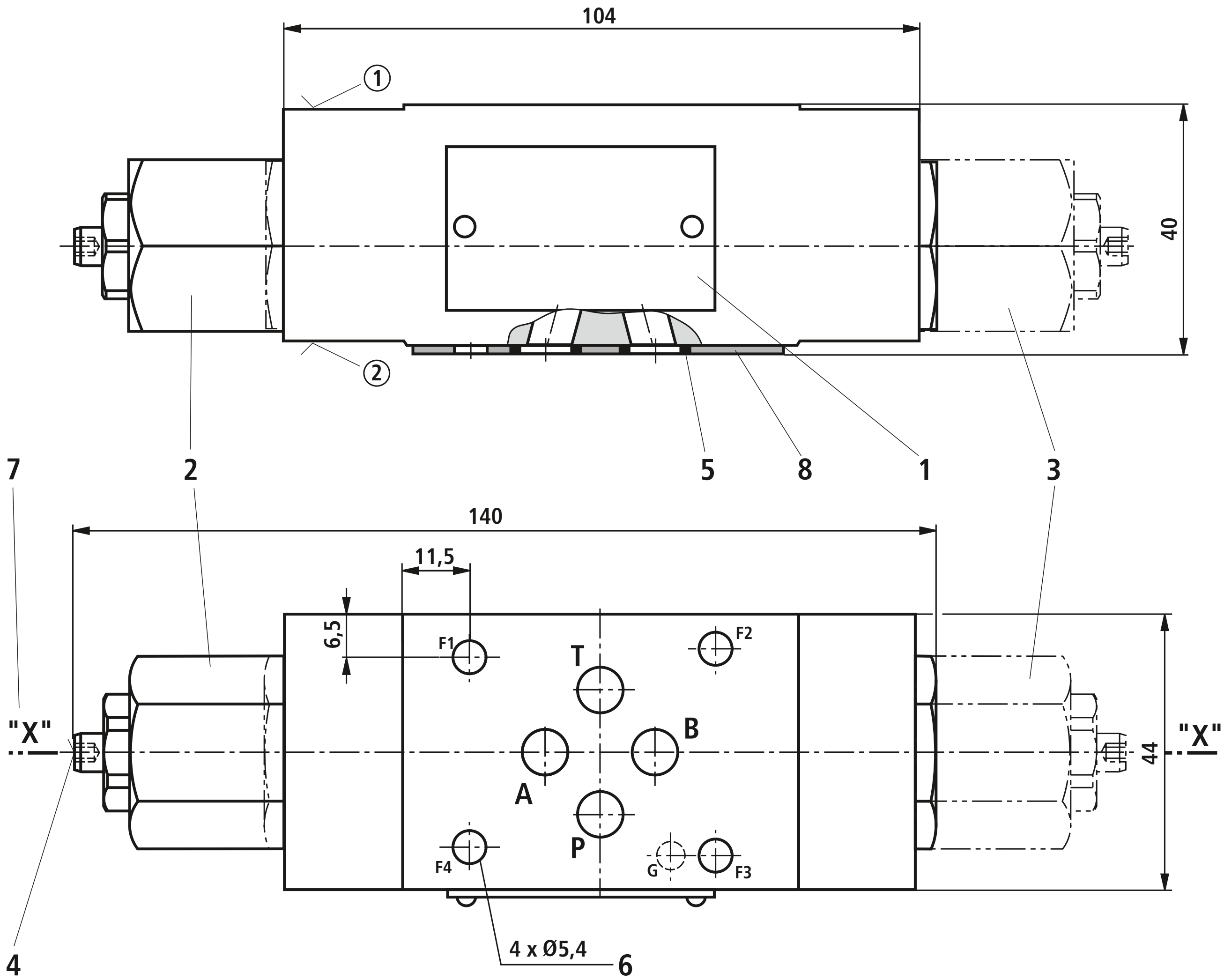
Δp-q_V characteristic curves
(via check valve; orifice closed)



Flow q_V against the input pressure p_E

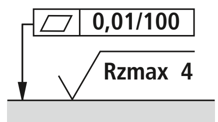


Unit dimensions: Version "A" and "B" (dimensions in mm)



① Component side – porting pattern according to ISO 4401-03-02-0-05 (**with** locating hole Ø3 x 5 mm deep)

② Plate side – porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 (**with** locating hole for locating pin ISO 8752-3x8-St; version "/60")



Required surface quality of the valve mounting face

1 Name plate

2 Flow control cartridge with flow control in channel A, hexagon SW27, M_A = 50 Nm

3 Flow control cartridge with flow control in channel B, hexagon SW27, M_A = 50 Nm

4 Adjustment type with internal hexagon SW3

5 Identical seal rings for ports A②, B②, P②, T②

6 Valve mounting bores

7 Conversion from discharge into supply control is effected by rotating the device around the "X"-"X" axis

8 Seal ring plate

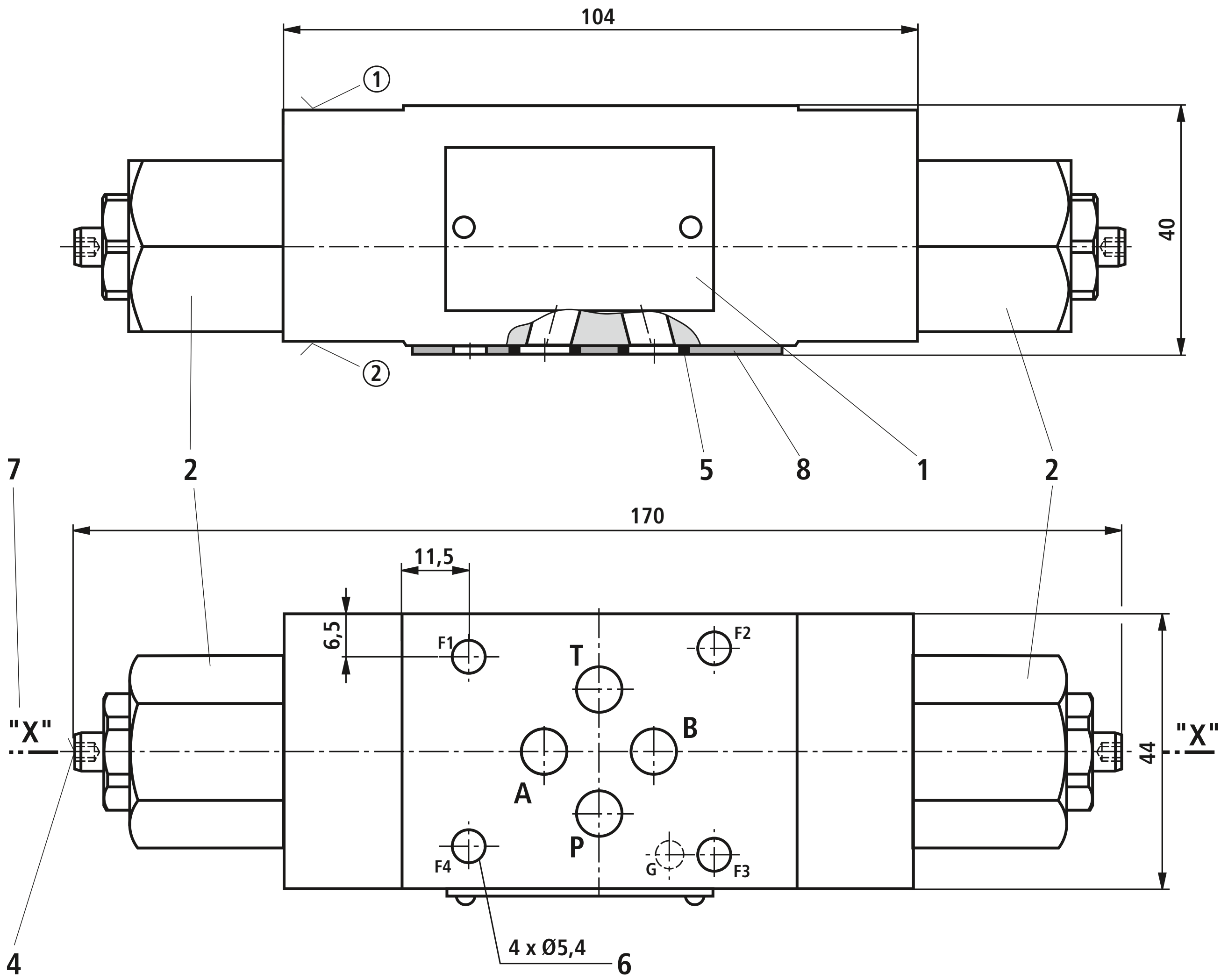
Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

Note!

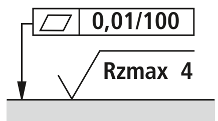
Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Unit dimensions: Version "C" (dimensions in mm)



① Component side – porting pattern according to ISO 4401-03-02-0-05 (**with** locating hole Ø3 x 5 mm deep)

② Plate side – porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 (**with** locating hole for locating pin ISO 8752-3x8-St; version "/60")



Required surface quality of the valve mounting face

1 Name plate
2 Flow control cartridge, hexagon SW27, M_A = 50 Nm
4 Adjustment type with internal hexagon SW3
5 Identical seal rings for ports A②, B②, P②, T②
6 Valve mounting bores
7 Conversion from discharge into supply control is effected by rotating the device around the "X"-"X" axis
8 Seal ring plate

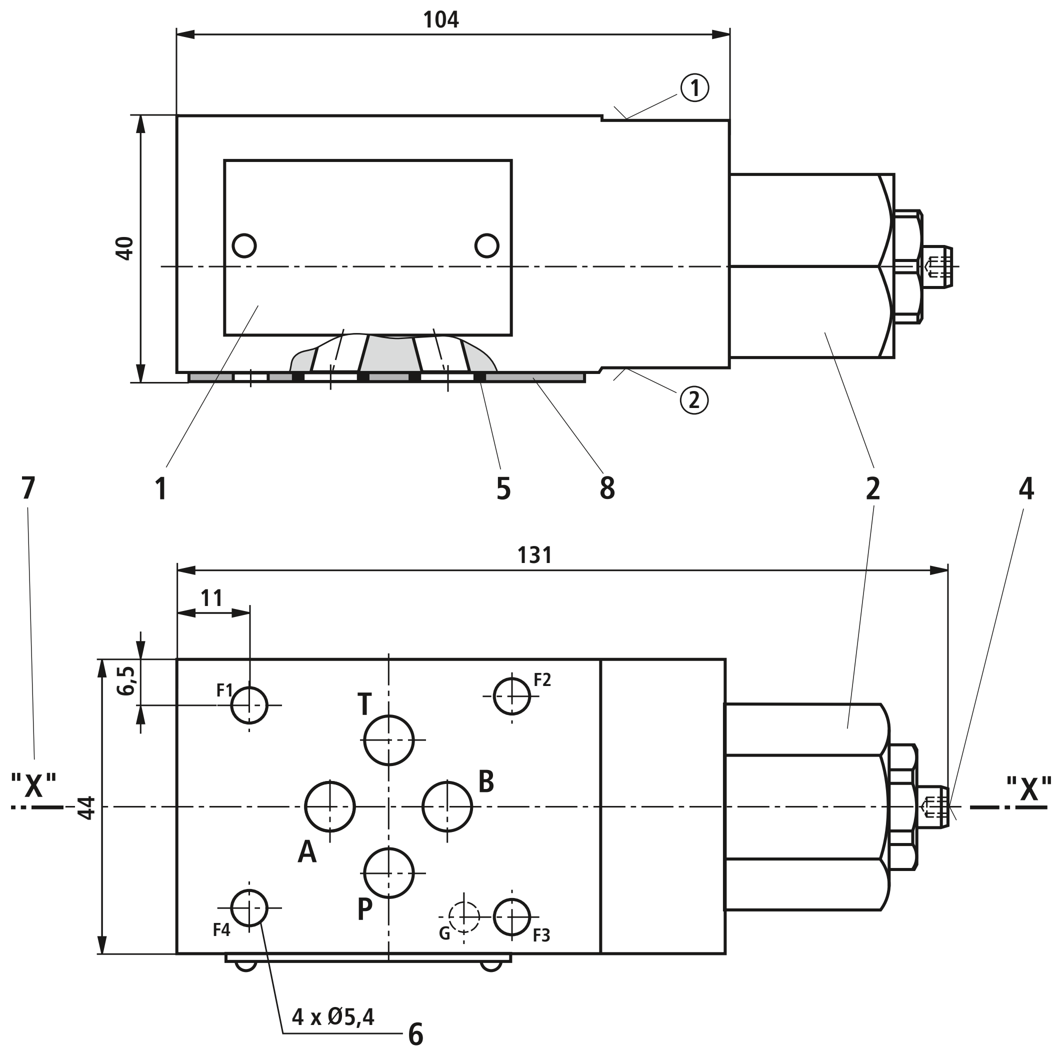
Valve mounting screws (separate order)

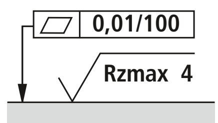
4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

☞ **Note!**

Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Unit dimensions: Version "T" (dimensions in mm)





Required surface quality of the valve mounting face

Item explanations and **valve mounting screws** see page 7.

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2-way cartridge valves

Designation	Type	Size	Component series	p_{max} in bar	Data sheet	Page
Logic elements - directional function						
Cartridge valves, control covers	LC, LFA	16 ... 160	2X/6X/7X	420	21010	1301
Actively controllable	LC2A	16 ... 100	1X	420	21040	1369
Logic elements - pressure function						
Cartridge valves, Control covers; Pressure relief function, pressure reducing function, pressure sequence function	LC, LFA	16 ... 160	6X/7X	420	21050	1395

2-way cartridge valves Directional functions

Cartridge valves and control covers

RE 21010/03.05
Replaces: 02.03

Types LC and LFA

Sizes 16 to 160
Component series 2X; 6X; 7X
Maximum operating pressure 420 bar
Maximum flow 25000 L/min

Control cover type LFA 25 WEA-7X/… with directional valve type 4WE 6 D6X/EG24N9K4 and cable socket

Cartridge valve type LC 25 A40E7X/…

Table of contents

Features

– Valve poppet with or without damping nose
– 2 area ratios
– 4 different springs
– 4 stroke limiters
– Control cover with integrated poppet valve
– Control cover with integrated shuttle valve
– Control cover for mounting directional spool valves with or without integrated shuttle valve
– Control cover with or without limit switch monitoring
– Further information:

Pilot control valves	Size 6	Size 10
Directional spool valve type WE	RE 23178	RE 23327
Directional poppet valve type SEW	RE 22058	RE 22075
Directional poppet valve type SED	RE 22049	RE 22045

Table of contents

Function, sections, symbol

2-way cartridge valves are designed as elements for insertion into compact blocks. The power part with ports A and B is installed in a mounting cavity, which is standardised according to DIN ISO 7368, in the block and sealed by means of a cover. In most cases, the cover forms at the same time the connection between the control section of the power part and the pilot control valves. By controlling the power part with appropriate pilot control valves, it can perform pressure control, directional and throttling functions or a combination of these. Particularly economic solutions can be achieved by adapting the sizes to the different flows in the individual channels of an actuator. A very cost-efficient solution can be obtained, if several functions are assigned to the power part of an element.

Directional function

2-way cartridge valves mainly consist of a control cover (1) and a cartridge element (2). The control cover is provided with pilot bores and, depending on the required overall function, optionally a stroke limiter, a hydraulically controlled directional poppet valve or a shuttle valve. Moreover, electrically operated directional spool valves or directional poppet valves can be mounted onto the control cover. The cartridge consists of a bushing (3), a ring (4) (up to size 32 only), a valve poppet (5), optionally with damping nose (6) or without damping nose (7) and a closing spring (8).

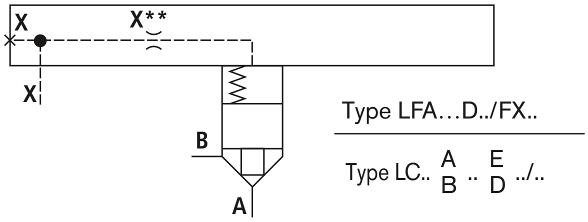
Function

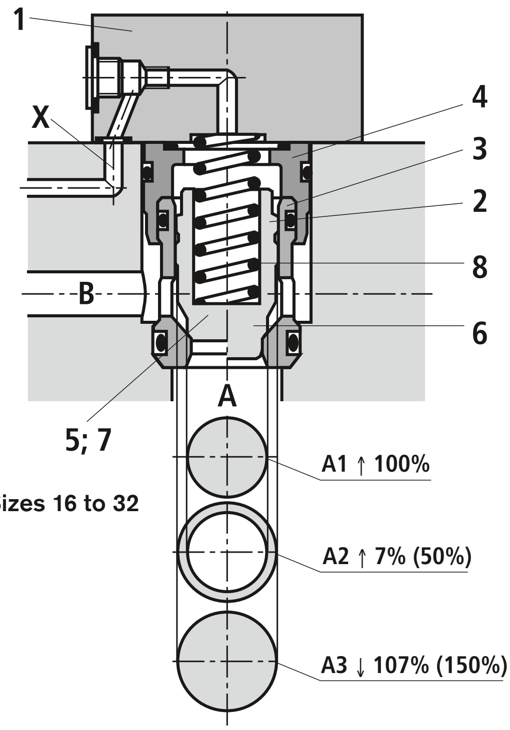
2-way cartridge valve operate in dependence upon pressure. Three pressurised areas are essential for the function: A1, A2, A3. The area of the valve seat is always taken as 100%. As a result of the stepping, the annulus area A2 is 7% or 50% of area A2, depending on the version. Consequently, the area ratio A1: A2 is either 14.3:1 or 2:1. Area A3 is equal to the sum of areas A1 + A2. Due to the different area ratios A1: A2 and the resulting different annulus areas (A2), area A3 is either 107% or 150% of area A1 on the seat that is assumed to be 100%.

The following is generally valid:

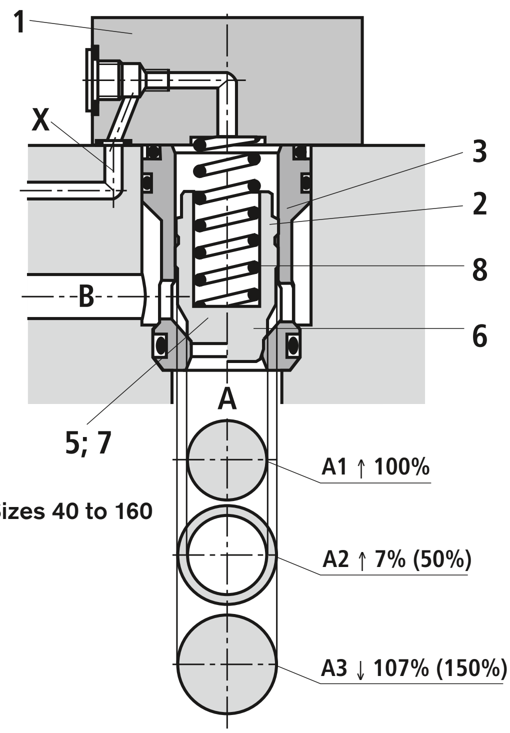
Areas A1 and A2 act in the direction of opening. Area A3 and the spring act in the direction of closing. The effective direction of the force resulting from the opening and closing forces determines the spool position of the 2-way cartridge valve.

The medium can flow through 2-way cartridge valves from A to B or from B to A. When area A3 is pressurised due to the pilot oil flow from channel B or external pilot oil supply, channel A is leak-free closed.



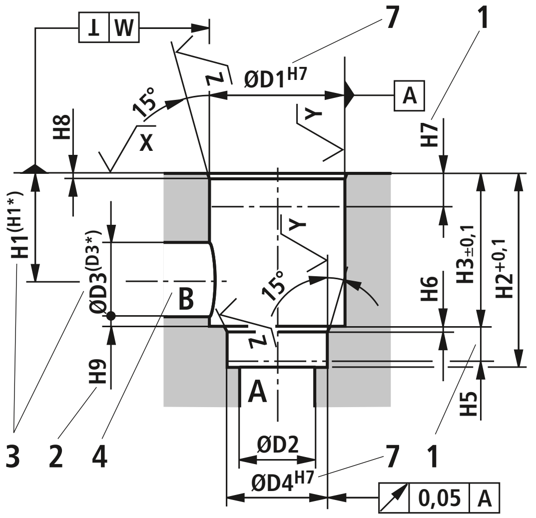


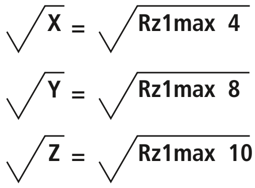
Sizes 16 to 32



Sizes 40 to 160

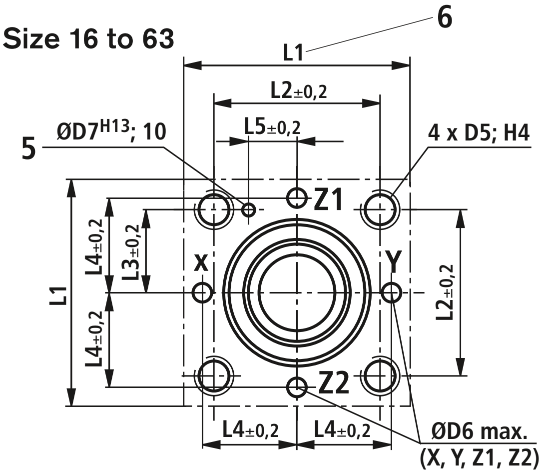
Mounting cavity and connection dimensions to DIN ISO 7368 (except for sizes 125 and 160) (nominal dimensions in mm)



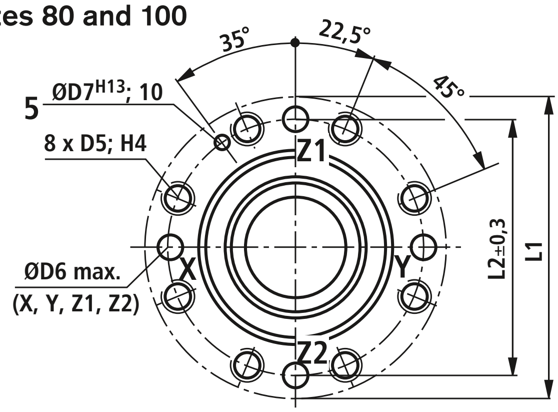


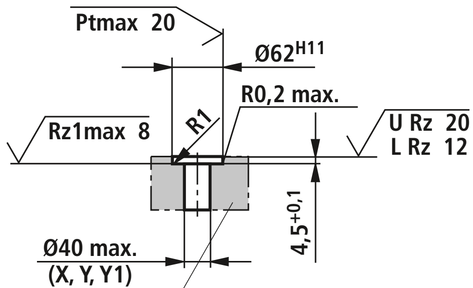
For indication of dimensions and explanation of positions, see page 9!

Size 16 to 63

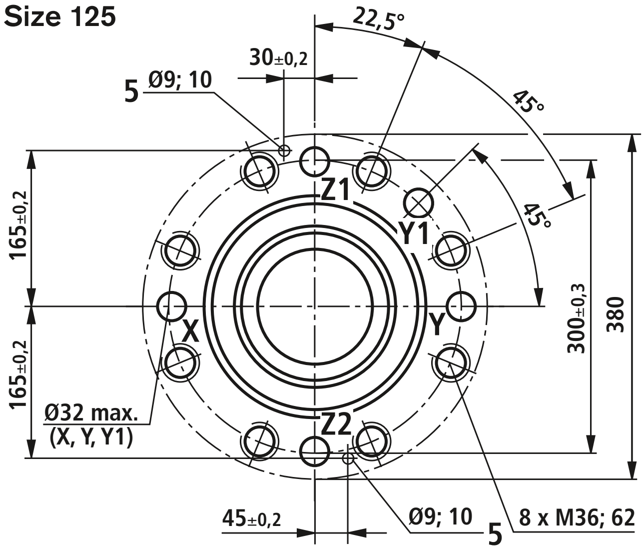


Sizes 80 and 100

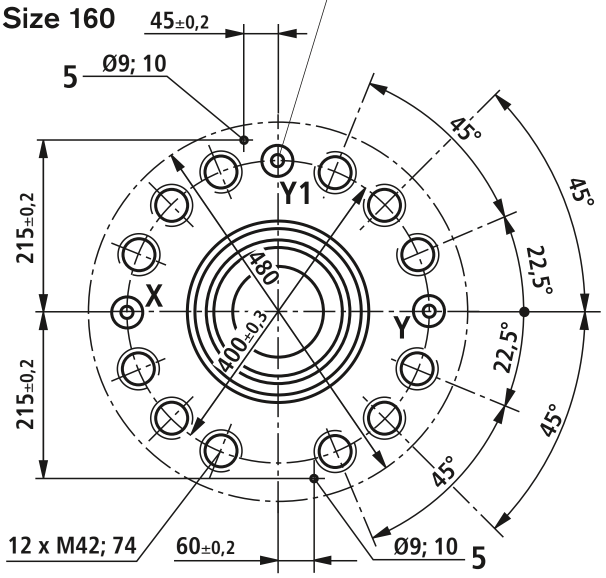




Size 125



Size 160



Mounting cavity and connection dimensions to DIN ISO 7368 (except for sizes 125 and 160) (nominal dimensions in mm)

Size	16	25	32	40	50	63	80	100	125	160
ØD1	32	45	60	75	90	120	145	180	225	300
ØD2	16	25	32	40	50	63	80	100	150 [1)]	200 [1)]
ØD3	16	25	32	40	50	63	80	100	125	200
(ØD3*)	25	32	40	50	63	80	100	125	150	250 [1)]
ØD4	25	34	45	55	68	90	110	135	200	270
ØD5	M8	M12	M16	M20	M20	M30	M24	M30	–	–
ØD6 [1)]	4	6	8	10	10	12	16	20	–	–
ØD7	4	6	6	6	8	8	10	10	–	–
H1	34	44	52	64	72	95	130	155	192	268
(H1*)	29.5	40.5	48	59	65.5	86.5	120	142	180	243
H2	56	72	85	105	122	155	205	245	$300^{+0.15}$	$425^{+0.15}$
H3	43	58	70	87	100	130	$175^{\pm0.2}$	$210^{\pm0.2}$	$257^{\pm0.5}$	$370^{\pm0.5}$
H4	20	25	35	45	45	65	50	63	–	–
H5	11	12	13	15	17	20	25	29	31	45
H6	2	2.5	2.5	3	3	4	5	5	$7^{\pm0.5}$	$8^{\pm0.5}$
H7	20	30	30	30	35	40	40	50	40	50
H8	2	2.5	2.5	3	4	4	5	5	$5.5^{\pm0.2}$	$5.5^{\pm0.2}$
H9	0.5	1	1.5	2.5	2.5	3	4.5	4.5	2	2
L1	65/80	85	102	125	140	180	250	300	–	–
L2	46	58	70	85	100	125	200	245	–	–
L3	23	29	35	42.5	50	62.5	–	–	–	–
L4	25	33	41	50	58	75	–	–	–	–
L5	10.5	16	17	23	30	38	–	–	–	–
W	0.05	0.05	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2

[1)] Maximum dimension

1 Depth of fit

2 Reference dimension

3 For diameters other than ØD3 or (ØD3*) for port B, the distance from the cover support surface to the centre of the bore must be calculated.

4 Port B can be arranged around the central axis of port A. However, care must be taken to ensure that the mounting cavities and the pilot bores are not damaged.

5 Drilling for locating pin

6 Note on porting patter for size 16: Length L1 (x–y axis of bores) for control cover with built-on directional valve is 80 mm.

7 For Ø ≤ 45 mm → fit H8 permitted!

Technical data (for applications outside these parameters, please consult us!)

Ambient temperature range		°C	– 20 to + 70
Maximum operating pressure	– Without directional valve	bar	420
	– Ports A, B, X, Z1, Z2	bar	315; 350: 420 (according to the maximum operating pressure of built-on valves)
	– Port Y	bar	corresponds to maximum tank pressure of built-on valves
	– With monitored spool position	bar	400
Maximum flow		L/min	25000 (size-dependent; see characteristic curves on page 9)
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on enquiry
Hydraulic fluid temperature range		°C	– 20 to + 80
Viscosity range		mm^2/s	2.8 to 500
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [3]

[1] Suitable for NBR and FKM seals

[2] Suitable for FKM seals only

[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, increases the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

Ordering code: Cartridge valve (without control cover)

LC					/	

Size 16 (series 7X)	= 16
Size 25 (series 7X)	= 25
Size 32 (series 7X)	= 32
Size 40 (series 7X)	= 40
Size 50 (series 7X)	= 50
Size 63 (series 7X)	= 63
Size 80 (series 6X)	= 80
Size 100 (series 6X)	= 100
Size 125 (series 2X)	= 125
Size 160 (series 2X)	= 160

Area ratio 2:1	(annulus area = 50%)	= A
Area ratio 14x3:1	(annulus area = 7%)	= B

Cracking pressure approx. 0 bar (without spring)	= 00
Cracking pressure approx. 0.5 bar	= 05
Cracking pressure approx. 1.0 bar	= 10
Cracking pressure approx. 2 bar	= 20
Cracking pressure approx. 3 bar (size 125 only)	= 30
Cracking pressure approx. 4 bar (not with sizes 125 and 160)	= 40

For exact values, see page 8.

E = Valve poppet **without** damping nose
D = Valve poppet **with** damping nose

7X = (Sizes 16 to 63) component series 70 to 79
(70 to 79: unchanged installation and connection dimensions)
6X = (Sizes 80 and 100) component series 60 to 69
(60 to 69: unchanged installation and connection dimensions)
2X = (Sizes 125 and 160) component series 20 to 29
(20 to 29: unchanged installation and connection dimensions)

No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

Preferred types

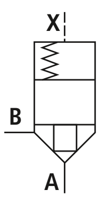
Type LC (cartridge vavle)	Material number
LC 16 A20D7X/	R900912572
LC 16 A20E7X/	R900910269
LC 16 A40D7X/	R900912573
LC 16 A40E7X/	R900912568
LC 16 B20E7X/	R900912595
LC 25 A20D7X/	R900912580
LC 25 A20E7X/	R900910270
LC 25 A40D7X/	R900912581
LC 25 A40E7X/	R900912574
LC 25 B20E7X/	R900912604
LC 25 B40D7X/	R900912609
LC 25 B40E7X/	R900912601
LC 32 A20D7X/	R900912589
LC 32 A20E7X/	R900906337
LC 32 A40D7X/	R900909665
LC 32 A40E7X/	R900909662
LC 32 B20E7X/	R900912613
LC 32 B40D7X/	R900912617
LC 32 B40E7X/	R900912610

Type LC (cartridge vavle)	Material number
LC 40 A20D7X/	R900937999
LC 40 A20E7X/	R900938000
LC 40 A40D7X/	R900935732
LC 40 A40E7X/	R900927973
LC 40 B20E7X/	R900938007
LC 50 A20D7X/	R900938026
LC 50 A20E7X/	R900920273
LC 50 A40D7X/	R900938027
LC 50 A40E7X/	R900929935
LC 50 B20E7X/	R900929665
LC 63 A20D7X/	R900938058
LC 63 A20E7X/	R900928826
LC 63 A40D7X/	R900938059
LC 63 A40E7X/	R900933230
LC 63 B20E7X/	R900938064

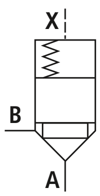
Further preferred types and standard components can be found in the EPS (standard price list).

Symbols: Cartridge valve (for versions, see ordering code)

Without damping nose

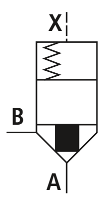


Area ratio
A1 : A2 = 2 : 1
Version
…A..E../…

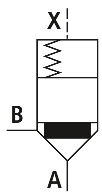


Area ratio
A1 : A2 = 14.3 : 1
Version
…B..E../…

With damping nose



Area ratio
A1 : A2 = 2 : 1
Version
…A..D../…



Area ratio
A1 : A2 = 14.3 : 1
Version
…B..D../…

Technical data (for applications outside these parameters, please consult us!)

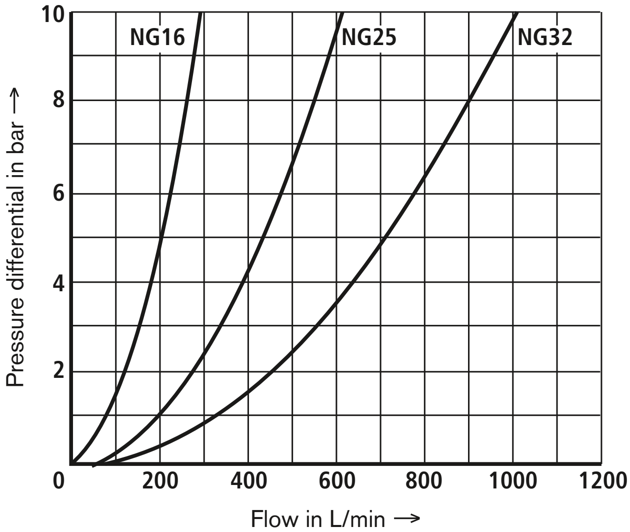
2-way cartridge valves for directional function

		Size									
		16	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
Area ***A***1 in cm²	LC..A..	1.89	4.26	6.79	11.1	19.63	30.2	37.9	63.6	95	160.6
	LC..B..	2.66	5.73	9.51	15.55	26.42	41.28	52.8	89.1	133.7	224.8
Area ***A***2 in cm²	LC..A..	0.95	1.89	3.39	5.52	8.64	14.0	18.84	31.4	48	79.9
	LC..B..	0.18	0.43	0.67	1.07	1.85	2.90	3.94	5.9	9.3	15.7
Area ***A***3 in cm²	LC..A..	2.84	6.16	10.18	16.62	28.27	44.2	56.74	95	143	240.5
	LC..B..	2.84	6.16	10.18	16.62	28.27	44.2	56.74	95	143	240.5
Stroke in cm	LC..E..	0.9	1.17	1.4	1.7	2.1	2.3	2.4	3.0	3.8	5.0
	LC..D..	0.9	1.17	1.4	1.9	2.3	2.8	3.0	3.8	4.8	6.5
Pilot oil volume in cm³	LC..E..	2.56	7.21	14.3	28.3	59.4	102	136	285	544	1203
	LC..D..	2.56	7.21	14.3	31.6	65.0	124	170	361	687	1563
Theoretical pilot flow in L/min [1)]	LC..E..	15.4	43.3	86	170	356	612	816	1710	3264	7218
	LC..D..	15.4	43.3	86	190	390	744	1020	2166	4122	9378
Weight in kg	Cartridge valve	0.25	0.5	1.1	1.9	3.9	7.2	13.0	27.0	44.0	75.0
	Control cover	1.2	2.3	4.0	7.4	10.5	21.0	27.0	42.0	80.0	150.0
Cracking pressure in bar											
Direction of flow from A to B	LC..A 00..	0.02	0.025	0.05	0.05	0.05	0.07	0.07	0.1	0.15	0.15
	LC..A 05..	0.35	0.35	0.36	0.35	0.37	0.31	0.44	0.43	0.43	0.45
	LC..A 10..	0.70	0.68	0.72	0.71	0.67	0.64	0.88	0.88	0.88	–
	LC..A 20..	2.03	2.18	2.12	2.02	2.01	2.0	1.75	1.75	1.76	1.94
	LC..A 30..	–	–	–	–	–	–	–	–	2.05	–
	LC..A 40..	3.50	3.90	3.80	4.0	4.11	3.8	3.13	3.04	–	–
	LC..B 00..	0.014	0.02	0.035	0.035	0.035	0.05	0.05	0.07	0.1	0.1
	LC..B 05..	0.25	0.26	0.26	0.25	0.28	0.23	0.31	0.31	0.31	0.32
	LC..B 10..	0.49	0.50	0.51	0.51	0.48	0.47	0.63	0.63	0.62	–
	LC..B 20..	1.44	1.62	1.52	1.44	1.5	1.5	1.26	1.25	1.25	1.4
	LC..B 30..	–	–	–	–	–	–	–	–	1.45	–
	LC..B 40..	2.48	2.90	2.70	2.86	3.05	2.8	2.25	2.17	–	–
Direction of flow from B to A	LC..A 00..	0.04	0.05	0.1	0.1	0.1	0.14	0.14	0.2	0.30	0.33
	LC..A 05..	0.69	0.78	0.72	0.7	0.84	0.68	0.88	0.88	0.86	0.91
	LC..A 10..	1.38	1.53	1.42	1.43	1.47	1.37	1.77	1.78	1.73	–
	LC..A 20..	4.05	4.91	4.25	4.06	4.57	4.33	3.53	3.54	3.50	3.9
	LC..A 30..	–	–	–	–	–	–	–	–	4.0	–
	LC..A 40..	6.96	8.74	7.6	8.05	9.34	8.15	6.3	6.2	–	–
	LC..B 00..	0.24	0.25	0.5	0.5	0.5	0.8	0.7	1.0	1.5	1.5
	LC..B 05..	3.69	3.40	3.64	3.64	3.95	3.27	4.2	4.6	4.4	4.6
	LC..B 10..	7.43	6.69	7.24	7.37	6.88	6.62	8.4	9.4	8.9	–
	LC..B 20..	21.3	21.5	21.6	20.9	21.4	20.9	16.9	18.7	17.9	20
	LC..B 30..	–	–	–	–	–	–	–	–	20.7	–
	LC..B 40..	36.6	38.3	38.6	41.5	43.6	39.4	30.2	32.5	–	–

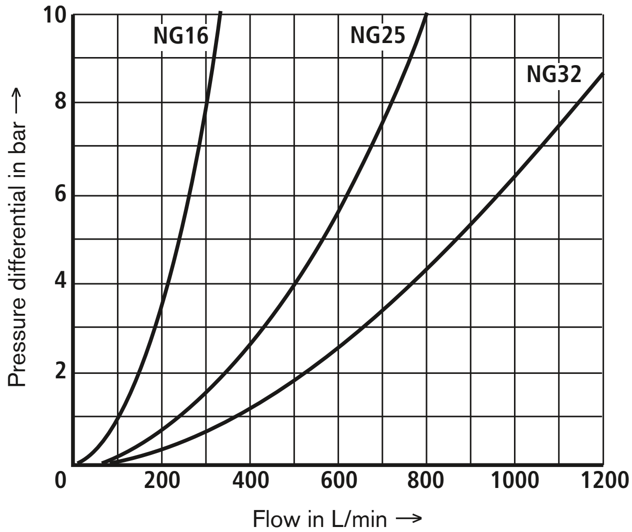
[1)] with a switching time of 10 ms

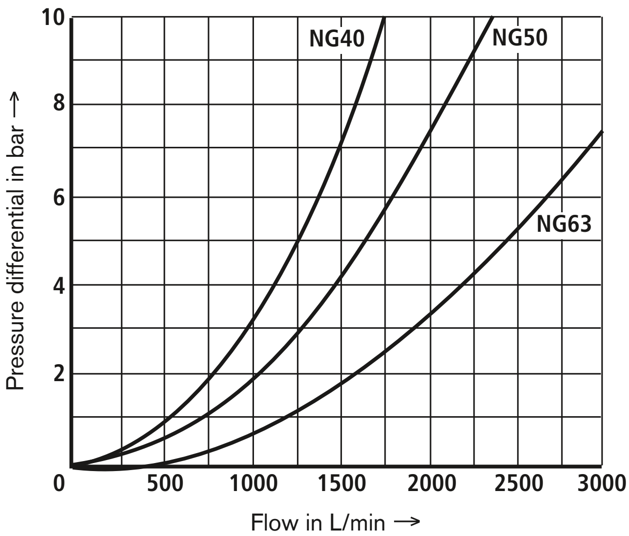
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

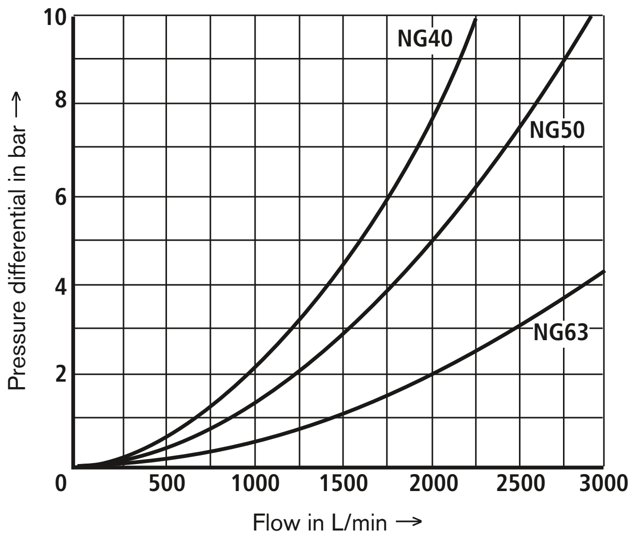
With damping nose

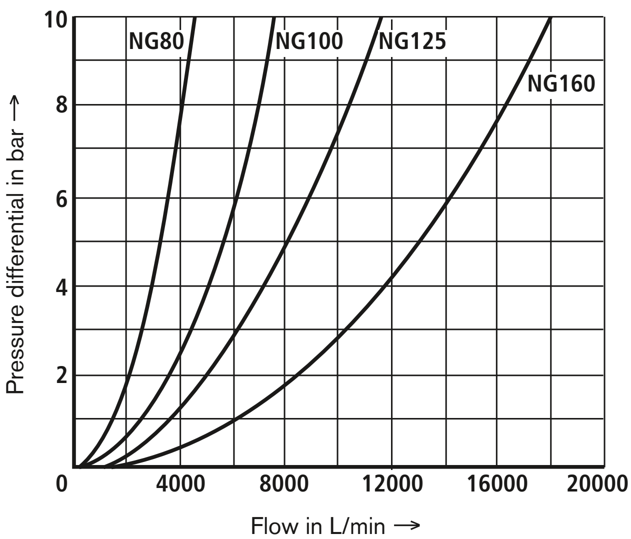


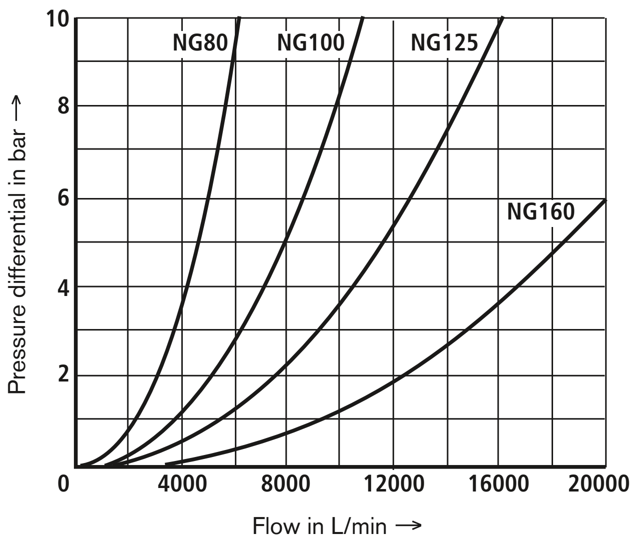
Without damping nose











General notes on the ordering code for control covers

x = available
• = on enquiry

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
LFA			– 1) /	2)	3)	4)										

Size 16	25	32	40	50	63	80	100	125	160	Type	Component series	Area ratio	Cracking pressure	Damping	El. monitor for closed position	Remote control port	Nozzles in channel 5) A	B	P	T	X	F	Z1	Seal material
x	x	x	x	x	x						7X													The ordering code can be found on the relevant pages of the individual control cover variants
						x	x				6X													
								x	x		2X													
x	x	x	x	x	x	x	x	x	x	**D**						F					x			
x	x	x	x							**H1**						F					x			
x	x	x	x	x	x	x	x	x	x	**H2**						F					x			
x	x	x	x							**H3**						F					x			
x	x	x	x	x	x	x	x			**H4**						F					x			
x	x	x	x	x	x	x	x			**G**											x		x	
	x	x	x	x	x	x	x			**R**												x		
	x	x	x	x	x					**RF**												x		
						x	x			**R2**												x		
x	x	x	x	x	x	x	x	•	•	**WEA**							x		x	x				
x	x	x	x	x	x	x	x	•	•	**WEB**								x	x	x				
x	x	x	x	x	x					**WEMA**									x	x		x		
						x	x			**WEA8**									x	x		x		
x	x	x	x	x	x					**WEMB**									x	x		x		
						x	x			**WEB8**									x	x		x		
x	x	x	x	x	x					**WECA**							x	x	x	x				
						x	x			**WEA9**							x	x	x	x				
x	x	x	x	x	x	x	x			**GWA**							x		x	x				
x	x	x	x	x	x	x	x			**GWB**								x	x	x				
x	x	x	x	x	x	x	x			**KWA**							x							
x	x	x	x	x	x	x	x			**KWB**								x						
x	x	x	x	x	x	•	•	•	•	**E**		x	x	D	QMG24	F					x			
x	x	x	x	x	x	•	•			**EH2**		x	x	D	QMG24	F					x			
x	x	x	x	x	x					**EWA**		x	x	D	QMG24		x		x	x				
x	x	x	x	x	x					**EWB**		x	x	D	QMG24			x	x	x				

1) **7X** = component series 70 to 79,
6X = component series 60 to 69 and
2X = component series 20 to 29: (unchanged installation and connection dimensions)

2) **CA** = 2 : 1 (area ratio *A*1:*A*2)
CB = 14.3 : 1 (area ratio *A*1:*A*2)
CD = 0 %
For the control cover with electrical monitor of the closed position (including position switch), the type designation includes the version of the control cover and the cartridge valve).

3) **10 =** 1.0 bar cracking pressure
20 = 2.0 bar cracking pressure
40 = 4.0 bar cracking pressure

4) **D =** valve poppet of the cartridge with damping nose

5) Order of nozzles for the purchase order and representation in symbols and circuit diagrams.
Further details can be found on the relevant pages of the individual control cover variants and on page 14 (nozzle characteristic curves).

Preferred types, see page 11, are available at short notice!

General notes on the ordering code for control covers

<table>
<tr><th colspan="2">Nozzle symbol</th><th colspan="2">Symbol in the ordering code</th></tr>
<tr><td>A**</td><td></td><td>A**</td><td></td></tr>
<tr><td colspan="4">This nozzle is designed as screw-in nozzle. If a nozzle is to be installed, the relevant code letter must be entered in the type designation together with the nozzle Ø in 1/10 mm.
Examle: A12 = nozzle with Ø1 .2 mm in channel A.</td></tr>
</table>

<table>
<tr><th colspan="2">Nozzle symbol</th><th>Symbol in the ordering code</th></tr>
<tr><td>Ø1,2</td><td></td><td></td></tr>
<tr><td colspan="3">This nozzle is designed as a drilling; no entries are required in the type designation. (Nozzle Ø in mm)</td></tr>
</table>

<table>
<tr><th colspan="2">Nozzle symbol</th><th>Symbol in the ordering code</th></tr>
<tr><td>Z12</td><td></td><td></td></tr>
<tr><td colspan="3">This nozzle is designed as threaded nozzle. It is a standard nozzle, for which no entries are required in the type designa-tion. (Nozzle Ø in 1/10 mm)</td></tr>
</table>

For pilot control valves, see page 16!

Preferred types

Type LFA (control cover)	Material number
LFA 16 D-7X/F	R900912625
LFA 16 H2-7X/F	R900912655
LFA 16 WEA-7X/	R900910271
LFA 16 GWA-7X/	R900912636
LFA 16 E-7X/CA40DQMG24F	R900912619
LFA 25 D-7X/F	R900905302
LFA 25 H2-7X/F	R900912694
LFA 25 WEA-7X/	R900910273
LFA 25 GWA-7X/	R900912675
LFA 25 E-7X/CA40DQMG24F	R900912670
LFA 32 D-7X/F	R900905303
LFA 32 H2-7X/F	R900912728
LFA 32 WEA-7X/	R900912712
LFA 32 GWA-7X/	R900912708
LFA 32 E-7X/CA40DQMG24F	R900912703

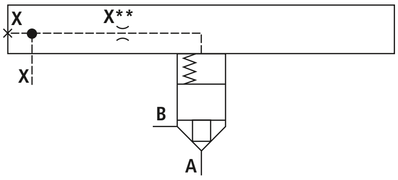
Type LFA (control cover)	Material number
LFA 40 D-7X/F	R900938073
LFA 40 H2-7X/F	R900938122
LFA 40 WEA-7X/	R900931581
LFA 40 GWA-7X/	R900938114
LFA 40 E-7X/CA40DQMG24F	R900938107
LFA 50 D-7X/F	R900938150
LFA 50 H2-7X/F	R900938205
LFA 50 WEA-7X/	R900938215
LFA 50 GWA-7X/	R900938200
LFA 50 E-7X/CA40DQMG24F	R900938197
LFA 63 D-7X/F	R900938225
LFA 63 H2-7X/F	R900938250
LFA 63 WEA-7X/	R900938257
LFA 63 GWA-7X/	R900938245
LFA 63 E-7X/CA40DQMG24F	R900938242

Further preferred types and standard components can be found in the EPS (standard price list).

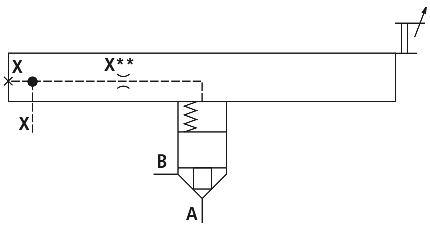
Symbols (basic symbols)

The symbols used in the description of types below are binding!

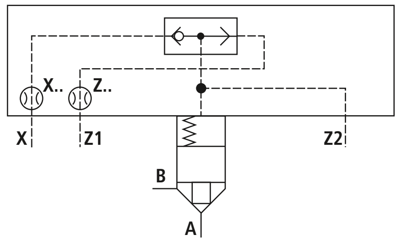
LFA . D-../F…
Control cover with remote control port
Sizes 16 to 160
Pages 17 and 18



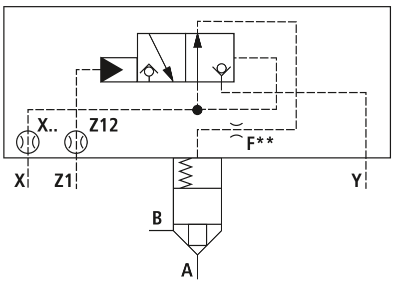
LFA . H.-../F…
Control cover with stroke limiter, with remote control port
Sizes 16 to 160
Pages 19 to 21



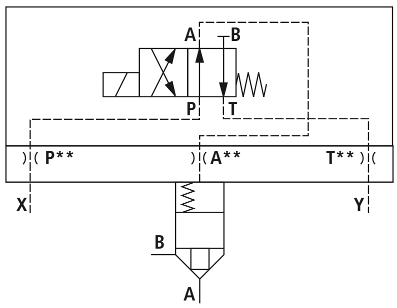
LFA . G-../…
Control cover with integrated shuttle valve
Sizes 16 to 100
Pages 22 and 23



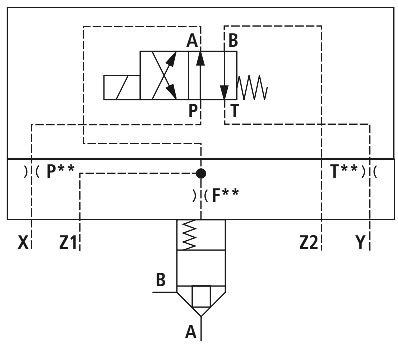
LFA . R-../…
Control cover with integrated pilot operated pilot control valve (directional poppet valve)
Sizes 25 to 100
Pages 24 to 27



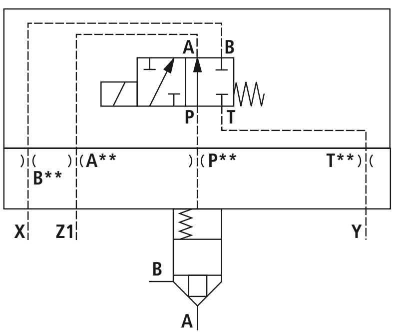
LFA . WEA-../…
Control cover for mounting a directional spool or poppet valve
Sizes 16 to 160
Pages 28 to 33



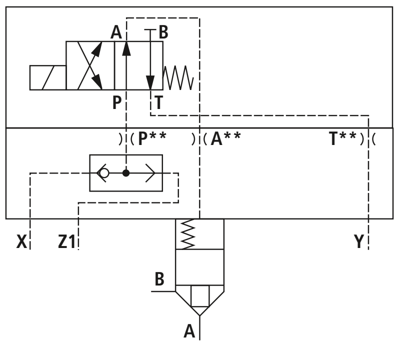
LFA . WEMA-../…; LFA . WEA8-../…
Control cover for mounting a directional spool or poppet valve with pilot ports for operating a 2nd valve
Sizes 16 to 100
Pages 34 to 39



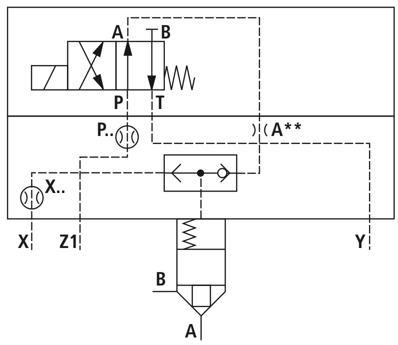
LFA . WECA-../…; LFA . WEA9-../…
Control cover for mounting a directional spool valve as check valve circuit
Sizes 16 to 100
Pages 40 to 43



LFA . GWA-../…
Control cover for mounting a directional spool or poppet valve, with integrated shuttle valve
Sizes 16 to 100
Pages 44 to 49



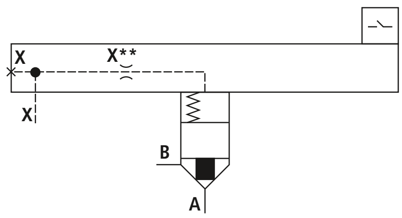
LFA . KWA-../…
Control cover for mounting a directional spool or poppet valve, with integrated shuttle valve as check valve circuit
Sizes 16 to 100
Pages 50 to 55



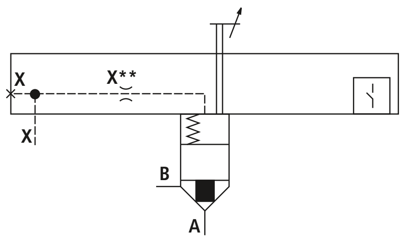
Symbols (basic symbols)

The symbols used in the description of types below are binding!

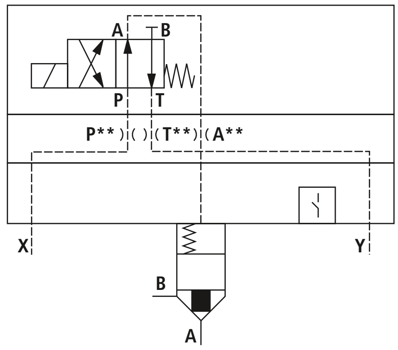
LFA . E-../..DQMG24F…
Control cover with electrical monitor for the closed position, including cartridge insert
Sizes 16 to 160
Pages 56 and 57



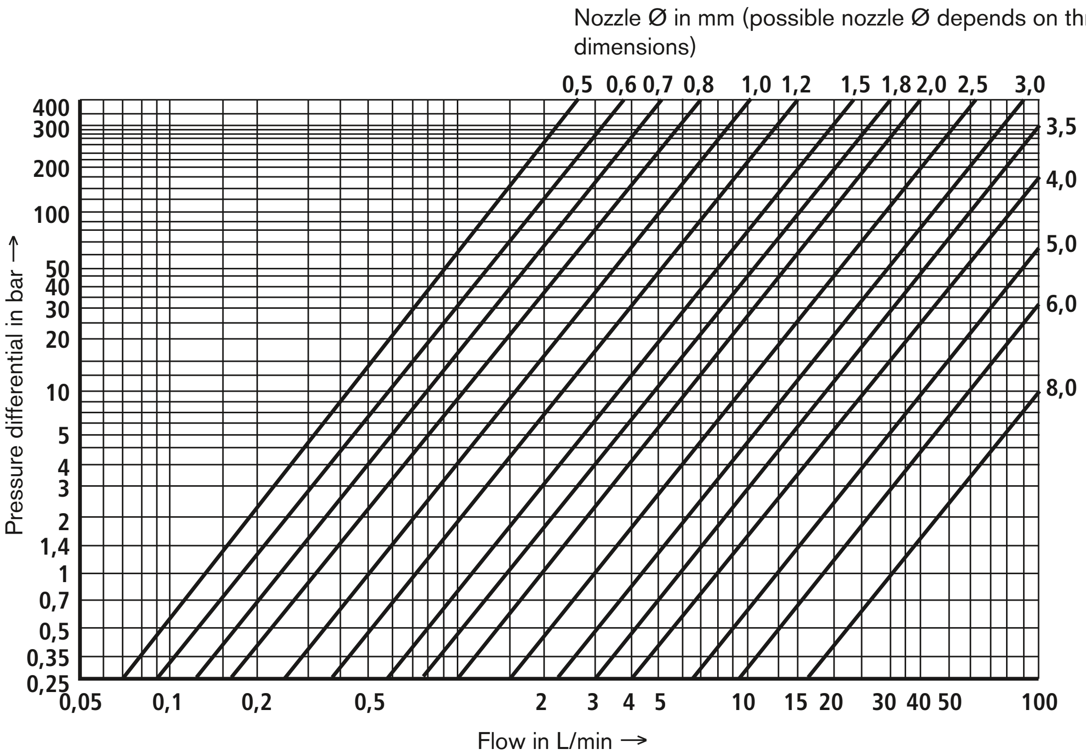
LFA . EH2-../..DQMG24F…
Control cover with electrical monitor for the closed position and stroke limiter, including cartridge insert
Sizes 16 to 100
Pages 58 and 59



LFA . EWA-../..DQMG24…
Control cover with electrical monitor for the closed position, for mounting a directional spool or poppet valve, including cartridge insert
Sizes 16 to 63
Pages 60 to 65



Characteristic curves for the selection of nozzles



Thread	Nozzle Ø in mm
M6 tap.	0.5 to 3.0
M8 x 1 tap.	0.5 to 4.0
G3/8	0.8 to 6.0
G1/2	1.0 to 8.0

Material numbers of nozzles and plug screws

Standard nozzle for size	Nozzle Ø in mm	Material number			
		M6 tap.	M8 x 1 tap.	G3/8	G1/2
	0.5	R900157933	R900157930	–	–
	0.6	R900157934	R900149430	–	–
	0.7	R900157931	R900143957	–	–
16	0.8	R900152276	R900136843	R900159043	–
25	1.0	R900149335	R900136842	R900159033	R900139115
32	1.2	R900152286	R900139101	R900159032	R900150714
40	1.5	R900148823	R900133712	R900159031	R900139117
50	1.8	R900157932	R900150953	R900159030	R900159026
63 and 80	2.0	R900156650	R900137299	R900159029	R900148352
100	2.5	R900157929	R900137445	R900146259	R900148353
	3.0	R900181894	R900144761	R900149044	R900148361
	3.5	–	R900136079	R900146258	R900159027
	4.0	–	R900802480	R900149052	R900149939
	5.0	–	–	R900152287	R900143775
	6.0	–	–	R900135774	R900147875
	8.0	–	–	–	R900159028
Plug screw		R900023986	R900003443	R900006325	R900006445

General notes on the ordering code for control covers (pilot control valves)

Pilot control valve	Type	Size	Data sheet no.	Control cover type	Size (control cover)
Directional spool valve (wet pin)	4WE 6 D…6X/E	6	23178	WEA, WEB, GWA, GWB, KWA, KWB, EWA, EWB, WEMA, WEMB	16 to 50
	3WE 6 A…6X/E	6	23178	WECA	16 to 50
	4WE 10 D…3X/E	10	23327	WEA, WEB, GWA, KWA, KWB, EWA, EWB	63 to 100
	4WE 10 A…3X/E	10	23327	WEA 9, WECA	63 to 100
Diretional poppet valve	M-3SED 6 UK../350 M-3SED 6 CK../350	6	22049	WEMA, WEA, GWA, KWA	16 to 50
	M-3SEW 6 U../420 M-3SEW 6 C../420	6	22058	WEA, GWA, KWA, EWA, WEMA	16 to 50
	M-3SED 10 UK../350 M-3SED 10 CK../350	10	22045	WEA, GWA, KWA	63 to 100
	M-3SEW 10 U../420 M-3SEW 10 C../420	10	22075	WEA, GWA, KWA, EWA	63 to 100

Pilot control valves must be ordered separately.
For more details, see data sheet.

Valve fixing screws are included in the scope of supply of the control cover.

Note!

By combining a 2-way cartridge valve with a pilot control valve, various valve functions can be realised. In particular, the following components with porting patter to ISO 4401-03-02-0-94 (up to size 50) and ISO 4401-05-04-0-94 (sizes 63 to 100) are suitable for this purpose.

Fixing screws [1] (included in the scope of supply)

Size	Control cover type	Qty	Dimensions	Tightening torque M_T in Nm [3]
16	WE., GW.	4	M8 x 45	**32**
	WEM.		M8 x 70	
	E		M8 x 60	
	EH2		M8 x 80	
	EW.		M8 x 85	
	[2]		M8 x 40	
25	E	4	M12 x 60	**110**
	EH2, EW.		M12 x 90	
	[2]		M12 x 50	
32	H1, H2, E	4	M16 x 80	**270**
	H3, H4		M16 x 70	
	EH2, EW.		M16 x 110	
	[2]		M16 x 60	
40	E, EW.	4	M20 x 120	**520**
	EH2		M20 x 200	
	H1, H2		M20 x 110	
	[2]		M20 x 70	

Size	Control cover type	Qty	Dimensions	Tightening torque M_T in Nm [3]
50	H2, H4	4	M20 x 120	**520**
	E, EW.		M20 x 130	
	EH2		M20 x 210	
	[2]		M20 x 80	
63	H2, H4	4	M30 x 150	**1800**
	E, EW.		M30 x 180	
	EH2		M30 x 250	
	[2]		M30 x 100	
80	H2, H4	8	M24 x 120	**900**
	[2]		M24 x 100	
100	D, WE.	8	M30 x 120	**1800**
	[2]		M30 x 140	
125	All control covers available	8	M36 x 160	**3100**
160	All control covers available	12	M42 x 220	**5000**

[1] **Hexagon socket head cap screws to ISO 4762 - 10.9**

[2] Other available standard control covers

[3] Calculated with a total coefficienct of friction $\mu = 0.14$; must be adjusted for other surfaces

Control cover with or without remote control port: Type ..D… (nominal dimensions in mm)

Sizes 16 to 63

1	2	3	4	9	14	17
LFA		D	–7X	/ F		

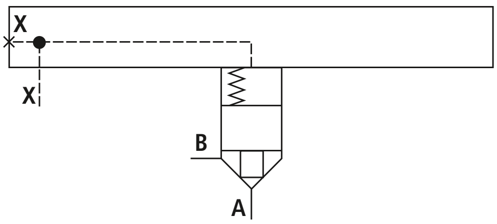
Size						Remote control port	Nozzle in channel (Ø in 1/10 mm)
16	25	32	40	50	63		
x	x	x	x	x	x	F	X** ◿

◿ Nozzle possible; indicate, if required

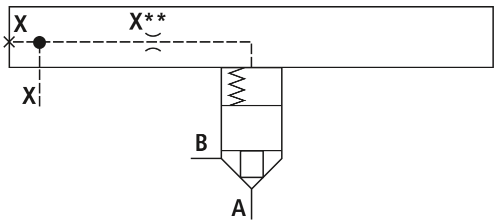
No code = NBR seals
V = FKM seals
(other seals on enquiry)

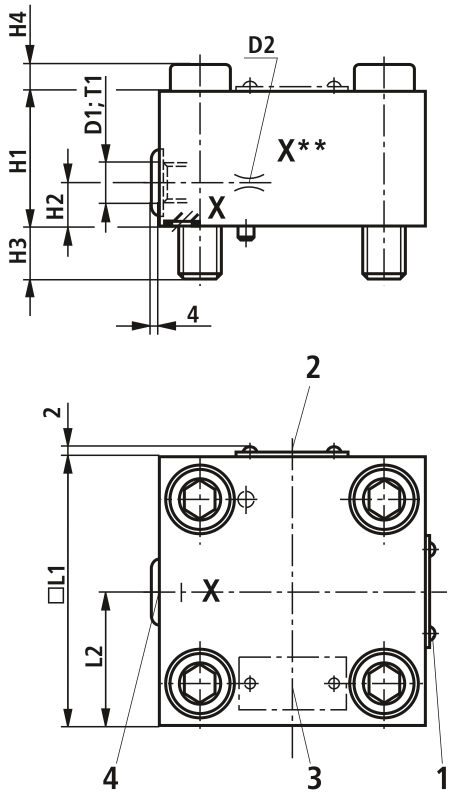
⚠ **Caution!**
Observe compatibility of seals with the hydraulic fluid used!

Type LFA . D…/F



Type LFA . D…/FX**





Size	16	25	32	40	50	63
D1	G1/8	G1/4	G1/4	G1/2	G1/2	G3/4
D2 [1)]	M6	M6	M6	M8 x 1	M8 x 1	G3/8
H1	27	30	35	60	68	82
H2	12	16	16	30	32	40
H3	15	24	28	32	34	50
H4	8	12	16	–	–	–
□ L1	65	85	100	125	140	180
L2	32,5	42,5	50	72	80	90
T1	8	12	12	14	14	16

[1)] For ordering codes for nozzles, see pages 14 and 15.

1 Nameplate for sizes 16, 25
2 Nameplate for size 32
3 Nameplate for sizes 40, 50, 63
4 Port X optionally as threaded connection

Control cover with or without remote control port: Type ..D… (nominal dimensions in mm)

Sizes 80 to 160

1	2	3	4		9	14	17
LFA		D	– 1)	/	F		

Size				Remote control port	Nozzle in channel (Ø in 1/10 mm)
80	100	125	160		
x	x	x	x	F	X**

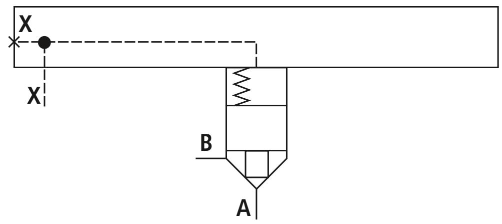
◺ Nozzle possible; indicate, if required

1) 6X = series 6X (sizes 80, 100)
2X = series 2X (sizes 125, 160)

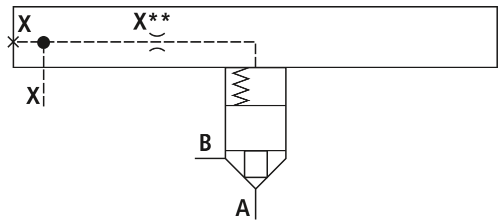
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

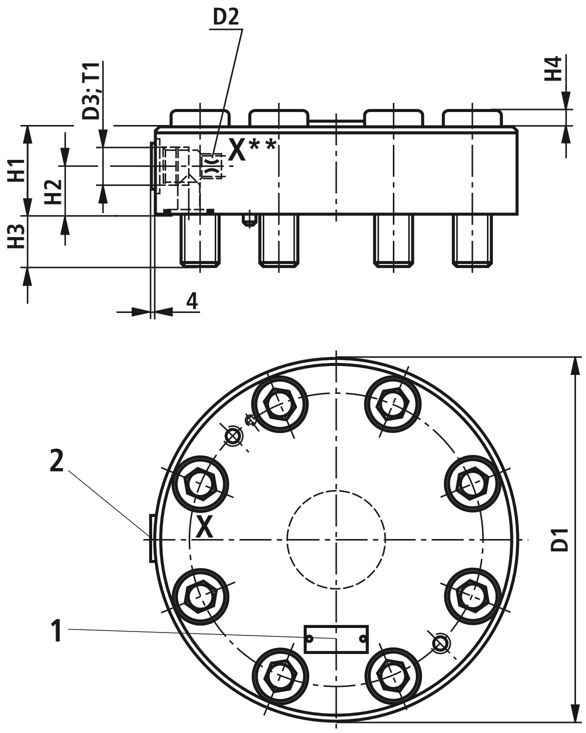
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

Type LFA . D…/F



Type LFA . D…/FX**





Size	80	100	125	160
D1	250	300	380	480
D2	G3/8	G1/2	G1	G1
D3 2)	G3/4	G1	G1 1/4	G1 1/4
H1	70	75	105	147
H2	35	40	50	70
H3	45	52,5	61	74
H4	–	24	31	42
T1	16	18	20	20

2) For ordering codes for nozzles, see page 14 and 15.

1 Nameplate

2 Port X optionally as threaded connection

Control cover with stroke limiter and remote control port: Type ..H… (nominal dimensions in mm)

Size 16 to 40

1	2	3	4	9	14	17
LFA			–7X/	F		

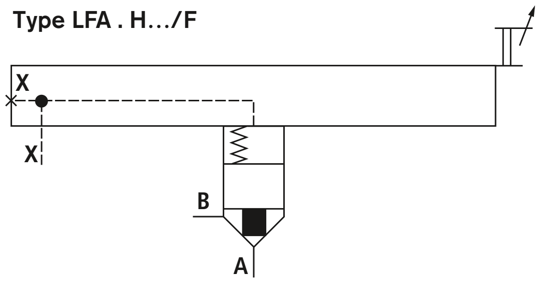
Size				Control	Remote control port	Nozzle in channel (Ø in 1/10 mm)
16	25	32	40			
x	x	x	x	H1	F	X**
x	x	x	x	H2	F	X**
x	x	x	x	H3	F	X**
x	x	x	x	H4	F	X**

No code = NBR seals
V = FKM seals
(Other seals on enquiry)

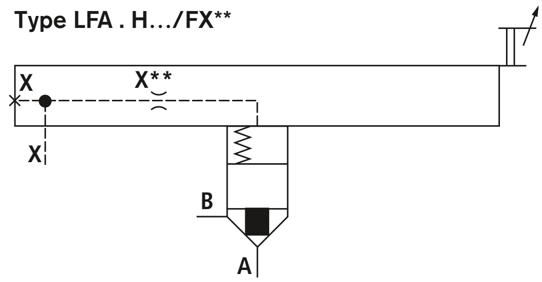
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

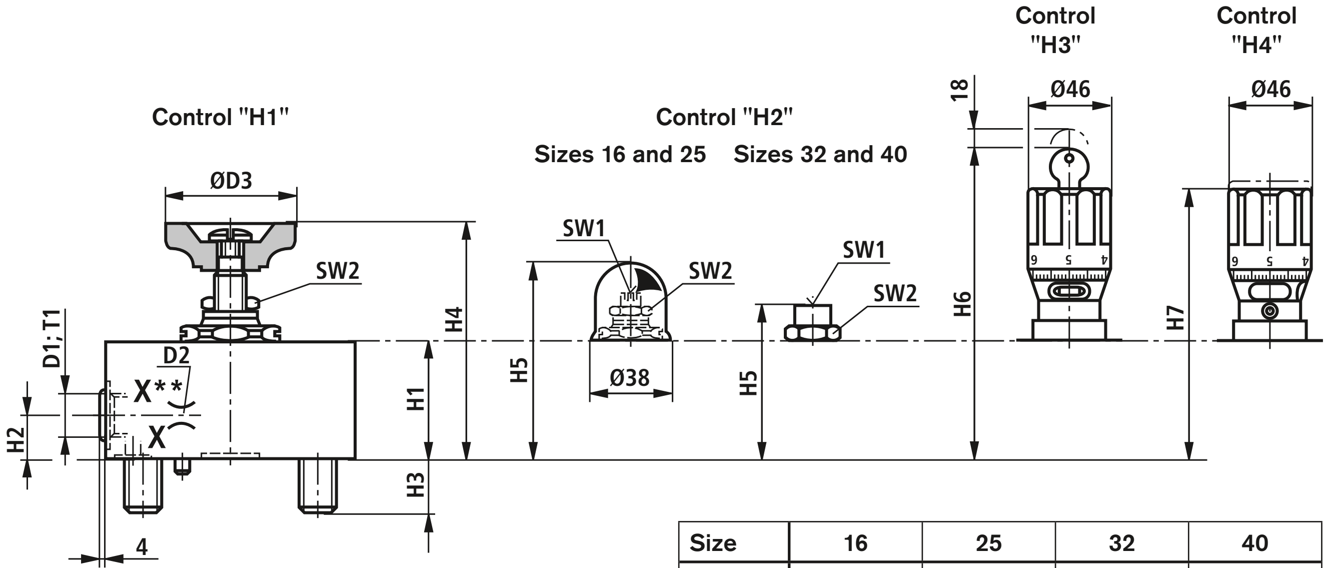
◺ Nozzle possible; indicate, if required

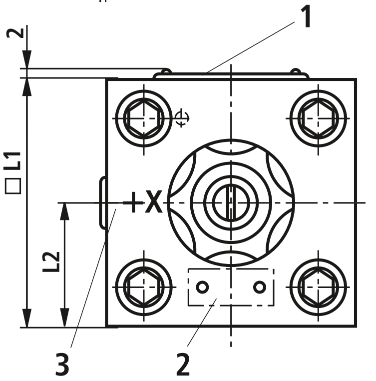
Type LFA . H…/F



Type LFA . H…/FX**







1) For ordering codes for nozzles, see page 14 and 15.
2) Dimensions () valid only for controls "H3" and "H4"
3) Hexagon socket

Size	16	25	32	40
D1	G1/8	G1/4	G1/4	G1/2
D2 1)	M6	M6	M6	M8 x 1
ØD3	52	80	80	100
H1	35	40	75 (60 2))	95 (100 2))
H2	12	16	16	30
H3	15	24	28	32
H4 max	90	95	120	160
H5 max	76	80	100	146
H6 max	155	160	180	234
H7 max	130	135	155	209
□ L1	65	85	100	125
L2	32.5	42.5	50	72
T1	8	12	12	14
A/F1 3)	6	6	10	14
A/F2	21	22	27	46

1 Nameplate for sizes 16, 25, 32
2 Nameplate for size 40
3 Port X optionally as threaded connection

Control cover with stroke limiter and remote control port: Type ..H… (nominal dimensions in mm)

Sizes 50 and 63

1	2	3	4	9	14	17
LFA			–7X/	F		

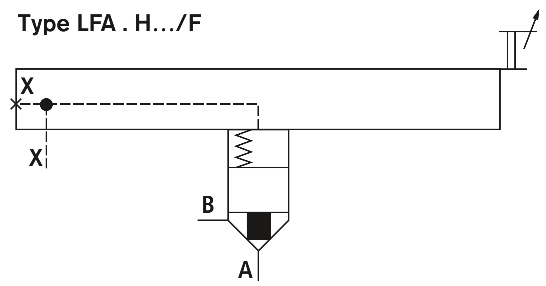
Size		Control	Remote control port	Nozzle in channel (Ø in 1/10 mm)
50	63			
x	x	H2	F	X**
x	x	H4	F	X**

No code = NBR seals
V = FKM seals
(Other seals on enquiry)

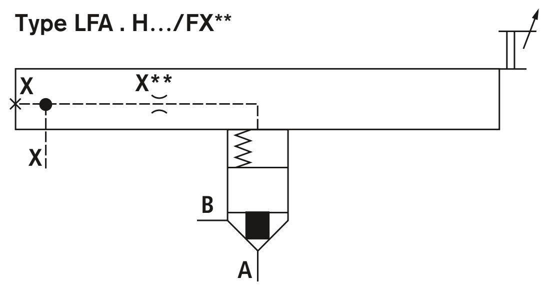
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

◺ Nozzle possible; indicate, if required

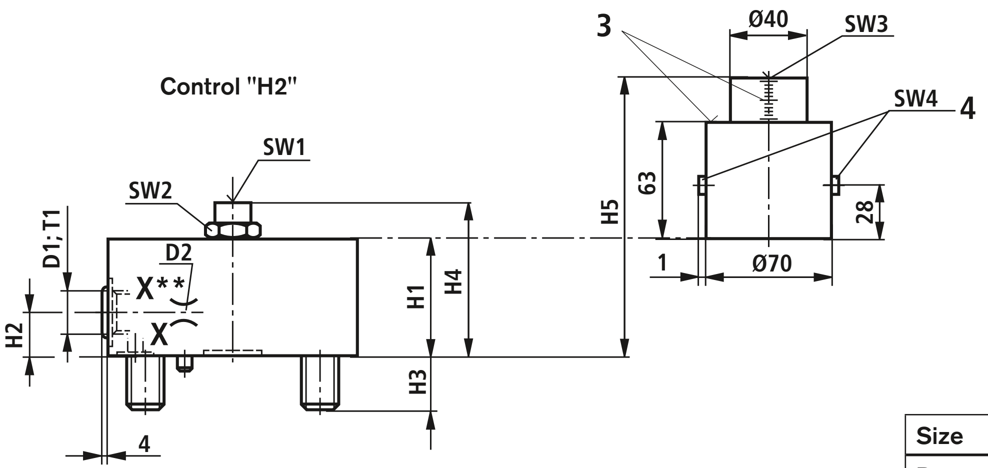
Type LFA . H.../F

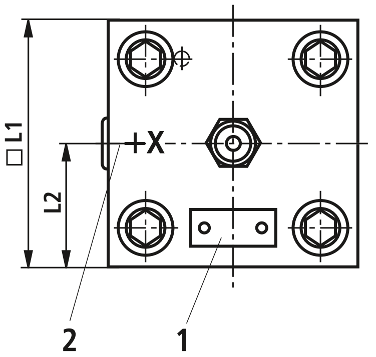


Type LFA . H.../FX**



Control "H4"





1 Nameplate
2 Port X optionall as threaded connection
3 Scale
4 Secured by means of locknut

[1] For ordering codes for nozzles, see page 14 and 15.
[2] Hexagon socket

Size	50	63
D1	G1/2	G3/4
D2 [1]	M8 x 1	G3/8
H1	110	125
H2	32	40
H3	34	50
H4 max	156	175
H5 max	200	220
□ L1	140	180
L2	80	90
T1	14	16
A/F1 [2]	17	24
A/F2	55	65
A/F3 [2]	19	19
A/F4	5	5

Control cover with stroke limiter and remote control port: Type ..H… (nominal dimensions in mm)

Sizes 80 to 160

1	2	3	4	9	14	17
LFA			– 1)	/ F		

Size				Control	Remote control port	Nozzle in channel (Ø in 1/10 mm)
80	100	125	160			
x	x	x	x	H2	F	X**
x	x			H4	F	X**

⊿ Nozzle possible; indicate, if required

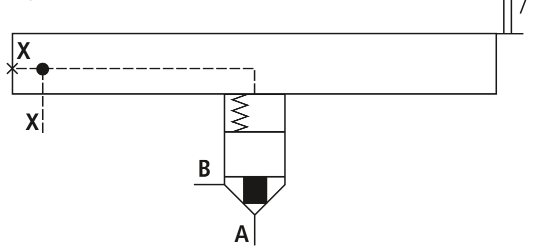
No code =	NBR seals
V =	FKM seals

(Other seals on enquiry)

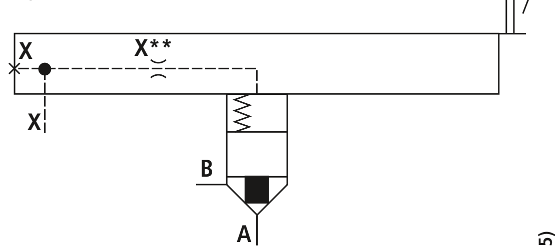
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

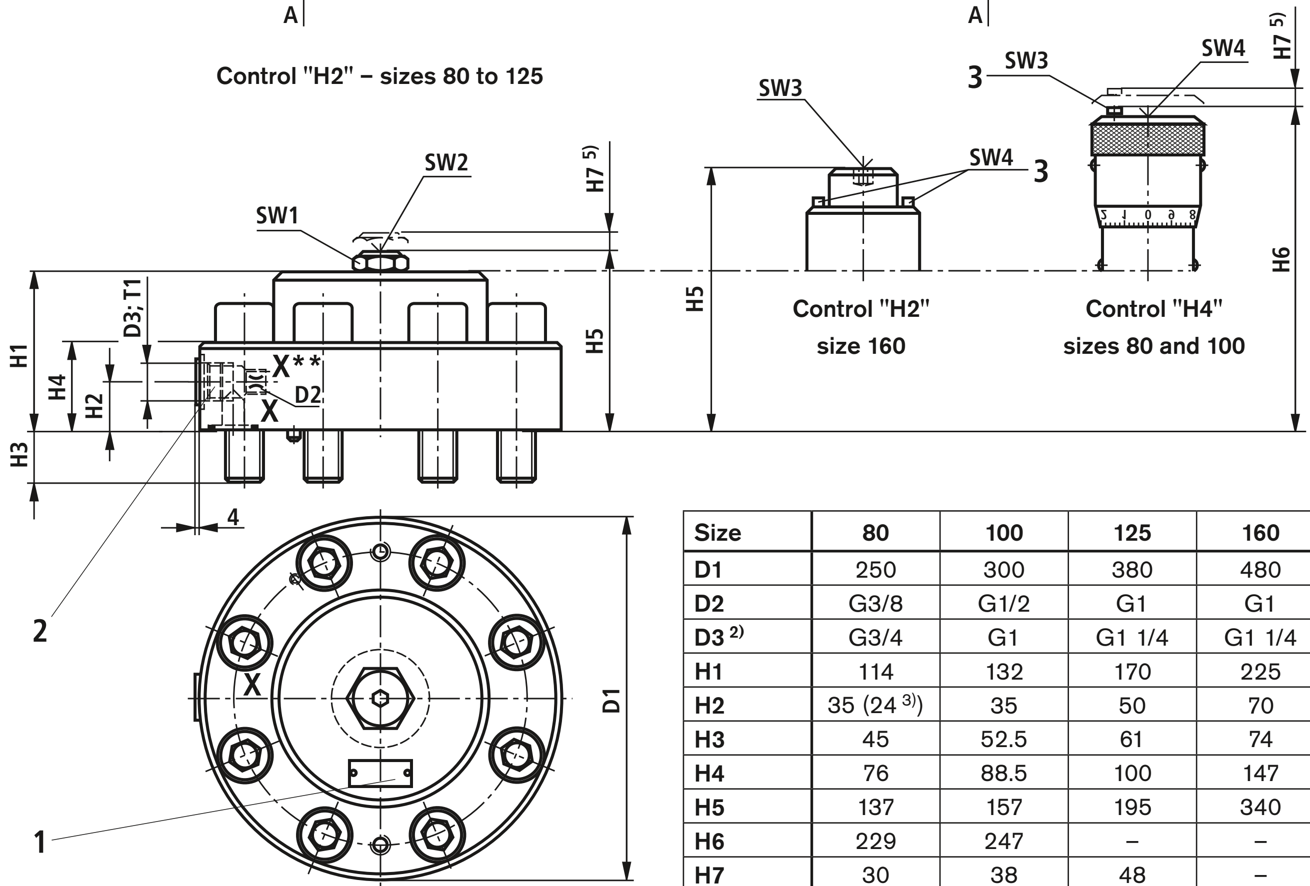
1) 6X = series 6X (sizes 80, 100)
2X = series 2X (sizes 125, 160)

Type LFA . H…/F



Type LFA . H…/FX**





Size	80	100	125	160
D1	250	300	380	480
D2	G3/8	G1/2	G1	G1
D3 2)	G3/4	G1	G1 1/4	G1 1/4
H1	114	132	170	225
H2	35 (24 3))	35	50	70
H3	45	52.5	61	74
H4	76	88.5	100	147
H5	137	157	195	340
H6	229	247	–	–
H7	30	38	48	–
T1	16	18	20	20
A/F1	75	75	95	–
A/F2 4)	24	27	27	–
A/F3 4)	–	–	–	32
A/F4 4)	–	–	–	8
A/F5 4)	5	5	–	–
A/F6 4)	14	14	–	–

1 Nameplate
2 Port X optionally as threaded connection
3 Secured by means of locknut

2) For ordering codes for nozzles, see page 14 and 15.
3) Dimension () valid only for control "H4"
4) Hexagon socket
5) Maximum dimension

Control cover with integrated shuttle valve: Type ..G… (nominal dimensions in mm)

Sizes 16 to 63

1	2	3	4	14	16	17
LFA		G	–7X/			

Size	Nozzle in channel	
	X	Z1
16	Ø1,2	Ø1,2
25	Ø1,5	Ø1,5
32	Ø2,0	Ø2,0
40	X15	Z15
50	X18	Z18
63	X20	Z20

No code = NBR seals
V = FKM seals
(Other seals on enquiry)

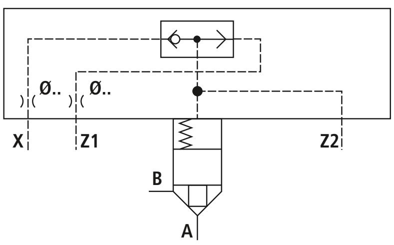
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

◢ Nozzle drilled (Ø in mm) [1]
◿ Standard nozzle (Ø in 1/10 mm) [1]

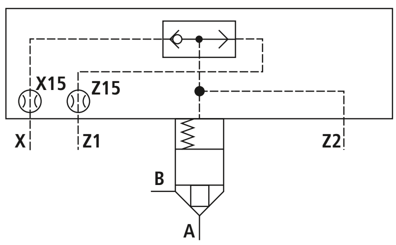
[1] Not shown in the type designation

For ordering codes for nozzles, see page 14 and 15.

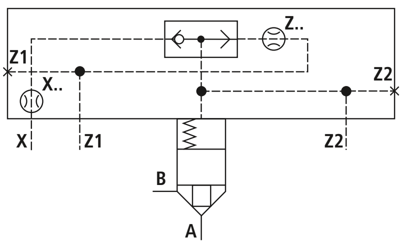
LFA . G…
sizes 16 to 32

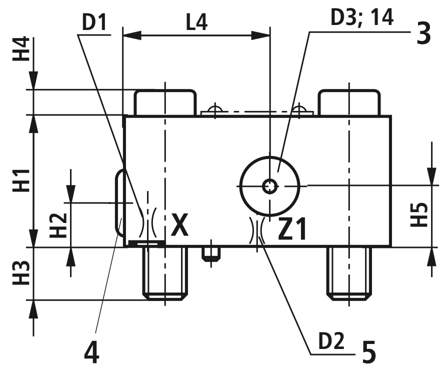


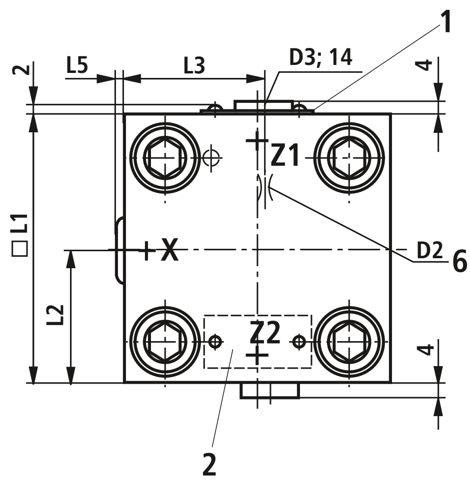
LFA . G…
size 40



LFA . G…
sizes 50 and 63







Size	16	25	32	40	50	63
D1	Ø1.2	Ø1.5	Ø2.0	M6	M8 x 1	M8 x 1
D2	Ø1.2	Ø1.5	Ø2.0	M6	M8 x 1	M8 x 1
D3	–	–	–	–	G1/2	G1/2
H1	35	30	35	60	68	82
H2	17	17	21.5	30	32	42
H3	15	24	28	32	34	50
H4	–	12	16	–	–	–
H5	–	–	–	–	32	40
□ L1	65	85	100	125	140	180
L2	36.5	45.5	50	62.5	74	90
L3	–	–	–	–	72	81
L4	–	–	–	–	72	90
L5	4.5	4	1	–	6	4

1 Nameplate for sizes 16, 25, 32
2 Nameplate for sizes 40, 50, 63
3 Ports Z1 and Z2 optionally as threaded connection for sizes 50 and 63
4 Shuttle valve
5 D2 for sizes 16 to 40
6 D2 for sizes 50 and 63

Control cover with integrated shuttle valve: Type ..G… (nominal dimensions in mm)

Sizes 80 to 100

1	2	3	4	14	15	16	17
LFA		G	–6X	╳		╳	

Size	Nozzle in channel (Ø in 1/10 mm)		
	X	F	Z1
80	X20 ◿	F** ◿	Z20 ◿
100	X20 ◿	F** ◿	Z20 ◿

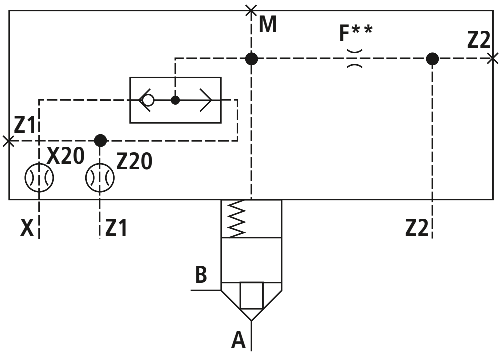
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

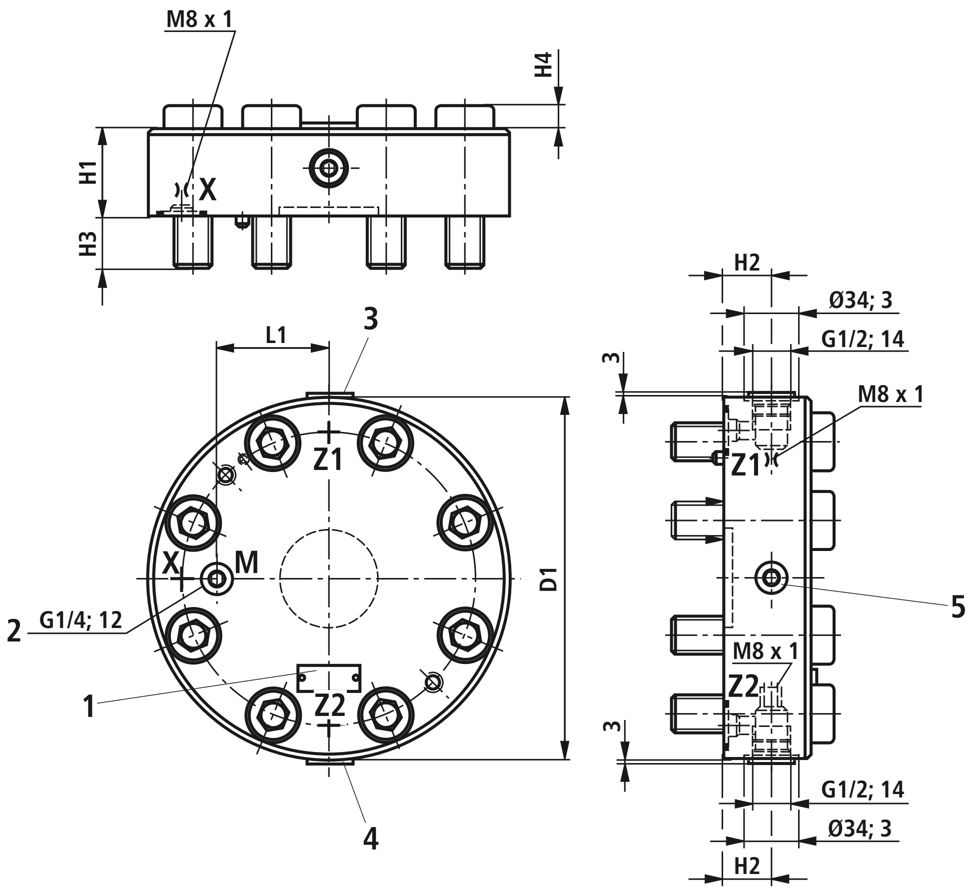
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

◿ Standard nozzle – not shown in the type designation
◿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

LFA . G…





Size	80	100
D1	250	300
H1	80	75
H2	45	43
H3	45	52,5
H4	4	23,5
L1	73	96.5

1 Nameplate
2 Measuring port
3 Port Z1 optionally as threaded connection
4 Port Z2 optionally as threaded connection
5 Shuttle valve

Control cover with integrated directional poppet valve: Type ..R…; ..RF…

Sizes 25 to 63

1	2	3	4	14	15	16	17
LFA			–7X/	X		X	

Size	Type	Nozzle in channel (Ø in 1/10 mm)		
		X	F	Z1
25	R	X10	F**	Z12
32	R	X12	F**	Z12
40	R	X15	F**	Z12
50	R	X15	F**	Z12
63	R	X18	F**	Z12
25	RF [1]	X10	F**	Z12
32	RF [1]	X12	F**	Z12
40	RF [1]	X15	F**	Z12
50	RF [1]	X15	F**	Z12
63	RF [1]	X18	F**	Z12

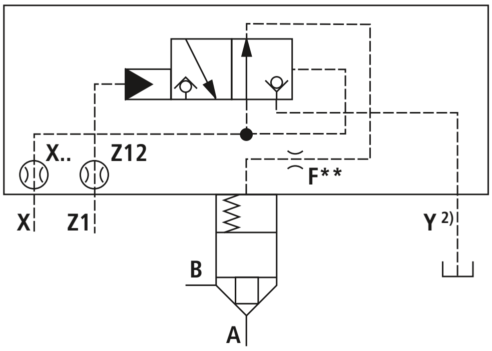
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

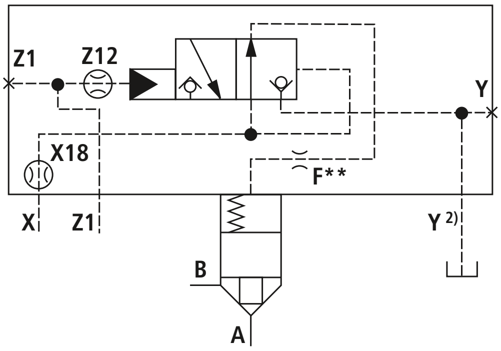
⊿ Standard nozzle – not shown in the type designation
⊿ Nozzle possible; indicate, if required

[1] Directional poppet valve with spring return

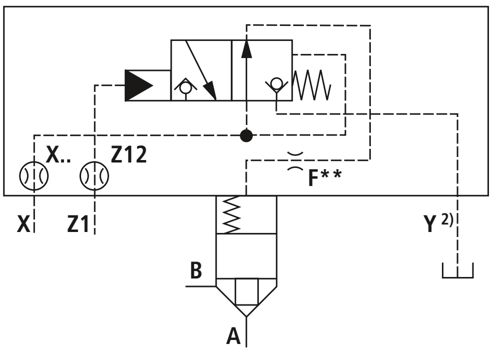
LFA . R…
sizes 25 to 50



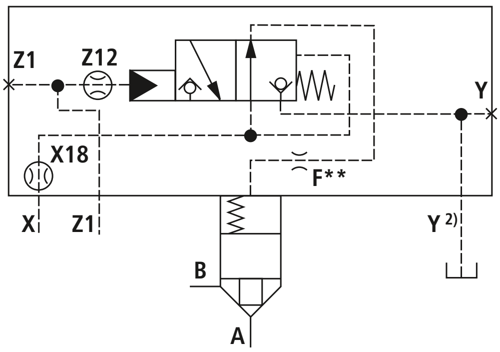
LFA 63 R…
size 63



LFA . RF…
sizes 25 to 50



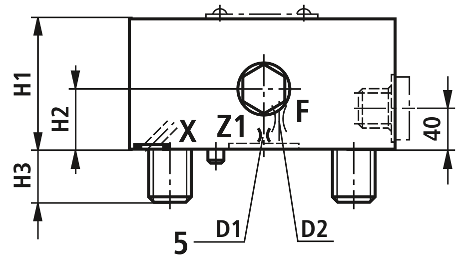
LFA 63 RF…
size 63



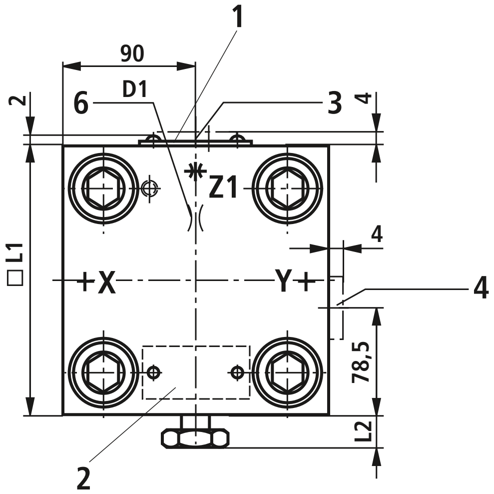
[2] Max. pressure in port Y 5 bar

Control cover with integrated directional poppet valve: Type ..R…; ..RF… (nominal dimensions in mm)

Sizes 25 to 63



Area ratio $\frac{A_{Z1}}{A_X} = \frac{3}{1}$



Size	Type	25	32	40	50	63
D1 [3)]		M6	M6	M8 x 1	M8 x 1	M8 x 1
D2 [3)]		M6	M6	M8 x 1	M8 x 1	M8 x 1
H1		40	50	60	68	82
H2		20	26	33	32	40
H3		24	28	32	34	50
□ L1		85	100	125	140	180
L2	R	2	1	4	3	–
	RF	18.5	17.5	25	24	16

[3)] For ordering codes for nozzles, see page 14 and 15.

1 Nameplate for sizes 16, 25, 32

2 Nameplate for sizes 40, 50, 63

3 Port Z1 optionally as threaded connection for size 63 – G1/4; 12

4 Port Y optionally as threaded connection for size 63 – G1/2; 14

5 D1 for sizes 16 to 50

6 D1 for size 63

Control cover with integrated directional poppet valve: Type ..R…; ..R2…(nominal dimensions in mm)

Sizes 80 and 100

1	2	3	4	14	15	16	17
LFA			–6X /				

Size	Type	Nozzle in channel (Ø in 1/10 mm)		
		X	F	Z1
80	R	X20	F**	Z12
100	R	X25	F**	Z12
80	R2 [1]	X20	F**	Z12
100	R2 [1]	X25	F**	Z12

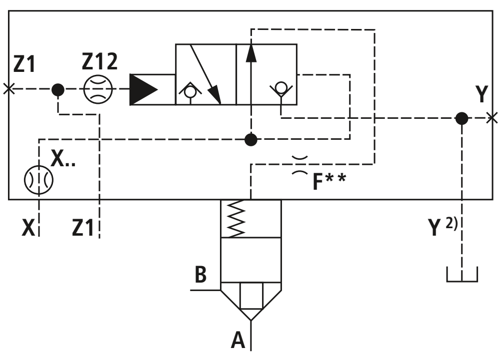
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

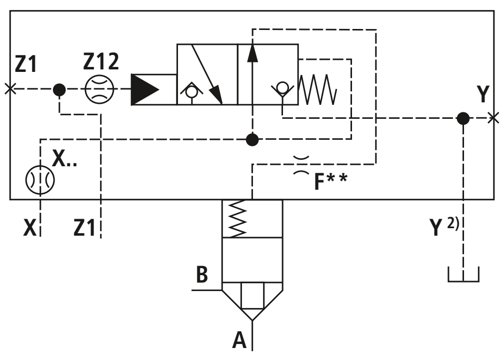
Standard nozzle – not shown in the type designation
Nozzle possible; indicate, if required

[1] Directional poppet valve with spring return

LFA . R…



LFA . R2…

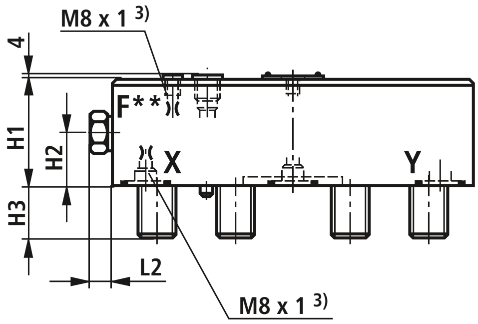


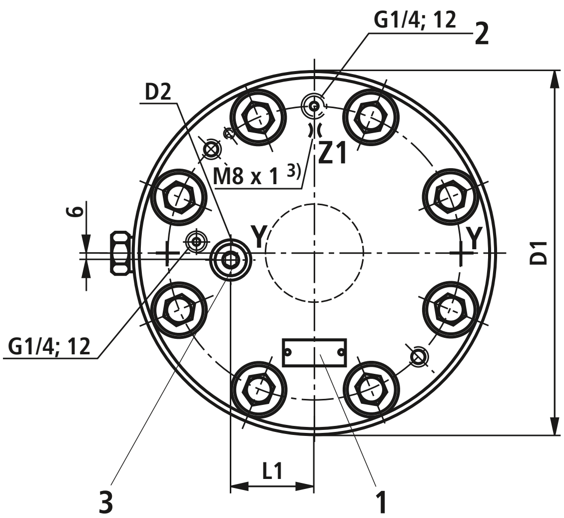
[2] Max. pressure in port Y 5 bar

Control cover with integrated directional poppet valve: Type ..R…; ..R2… (nominal dimensions in mm)

Sizes 80 and 100

Area ratio $\frac{A_{Z1}}{A_X} = \frac{3}{1}$





Size	80	100
D1	250	300
D2	G1/4; 12	G1/2; 14
H1	80	100
H2	36	45
H3	45	52
L1	52	74
L2	21	18
L3	6	5

3) For ordering codes for nozzles, see page 14 and 15.

1 Nameplate
2 Port Z1 optionally as threaded connection
3 Port Y optionally as threaded connection

Control cover for mounting a directional spool or poppet valve: Type ..WEA…, ..WEB…

Sizes 16 to 50

1	2	3	4	10	11	12	13	17
LFA			–7X/					

Size					Type	Nozzle in channel (Ø in 1/10 mm)			
16	25	32	40	50		A	B	P	T
x	x	x	x	x	WEA	A**		P**	T**
x	x	x	x	x	WEB		B**	P**	T**

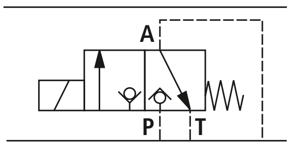
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

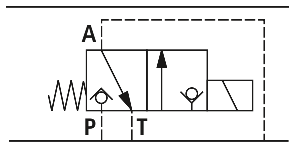
◿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

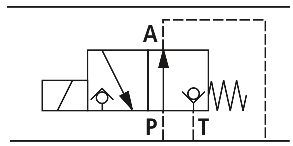
M-3SEW 6 C../420…



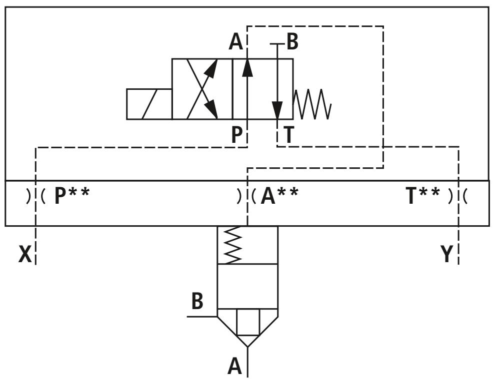
M-3SED 6 CK../350…



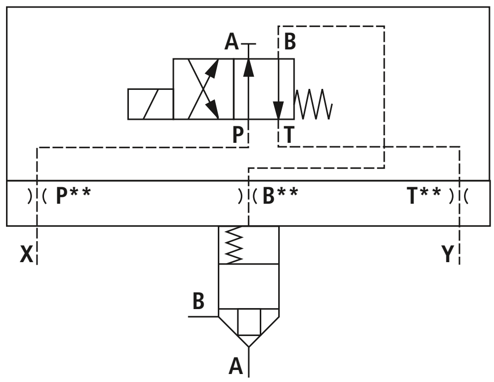
M-3SED 6 UK../350…
M-3SEW 6 U../420…



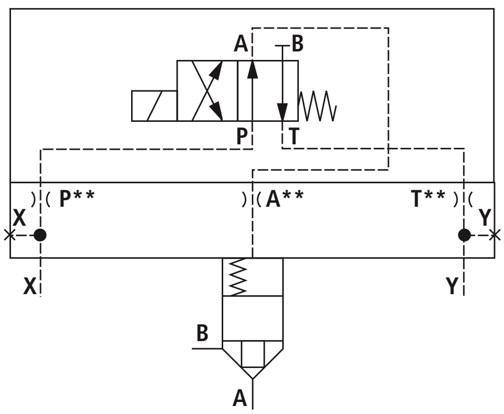
LFA . WEA…
sizes 16 to 32
(with directional spool valve type 4WE 6 D…)



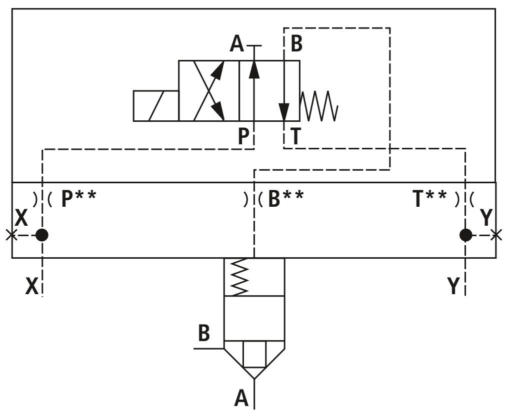
LFA . WEB…
sizes 16 to 32
(with directional spool valve type 4WE 6 D…)



LFA . WEA…
sizes 40 and 50
(with directional spool valve type 4WE 6 D…)

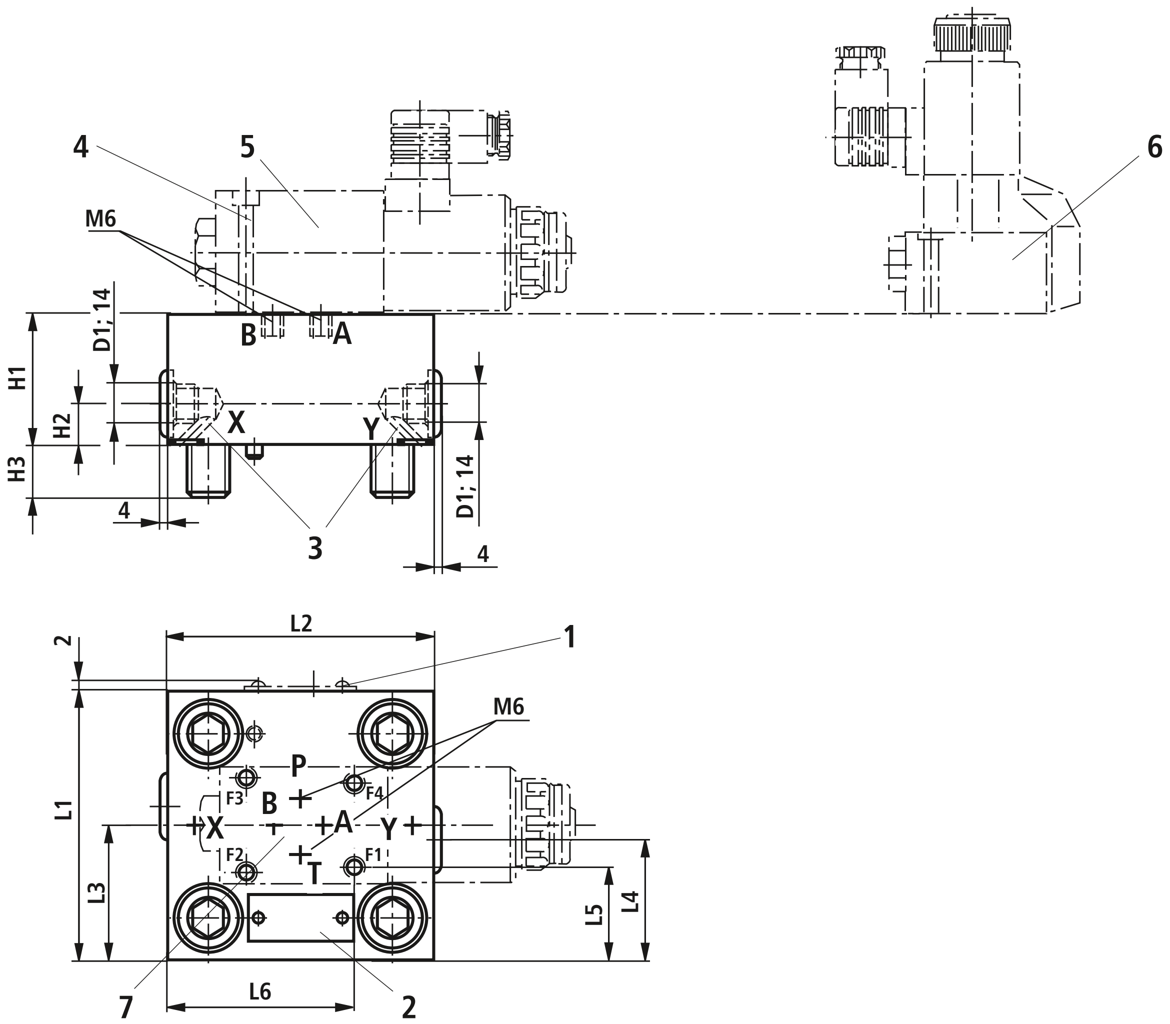


LFA . WEB…
sizes 40 and 50
(with directional spool valve type 4WE 6 D…)



Control cover for mounting a directional spool or poppet valve: Type ..WEA…, ..WEB… (nominal dimensions in mm)

Sizes 16 to 50



1 Nameplate for sizes 16, 25, 32
2 Nameplate for sizes 40 and 50
3 Ports X and Y optionally as threaded connection for sizes 40 and 50
4 Valve fixing scews included in the control cover's scope of supply
5 Directional spool valve type 4WE 6 D…
6 Directional poppet valve type M-3SEW 6 …
7 Position of ports according to ISO 4401-03-02-0-94

Size	16	25	32	40	50
D1	–	–	–	G1/2	G1/2
H1	40	40	50	60	68
H2	–	–	–	30	32
H3	15	24	28	32	34
L1	65	85	100	125	140
L2	80	85	100	125	140
L3	–	–	–	72	80
L4	–	–	–	53	60
L5	17	27	34.5	47	54.5
L6	47.5	64	71.5	84	91.5

Control cover for mounting a directional spool or poppet valve: Type ..WEA…, ..WEB…

Size 63

1	2	3	4	10	11	12	13	17
LFA	63		–7X/					

Type	Nozzle in channel (Ø in 1/10 mm)			
	A	B	P	T
WEA	A**		P**	T**
WEB		B**	P**	T**

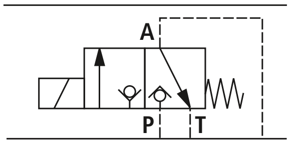
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

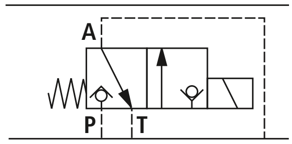
◿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

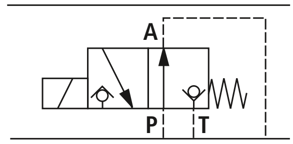
M-3SEW 10 C../420…



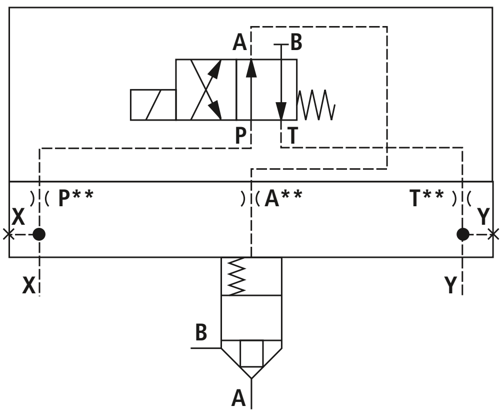
M-3SED 10 CK../350…



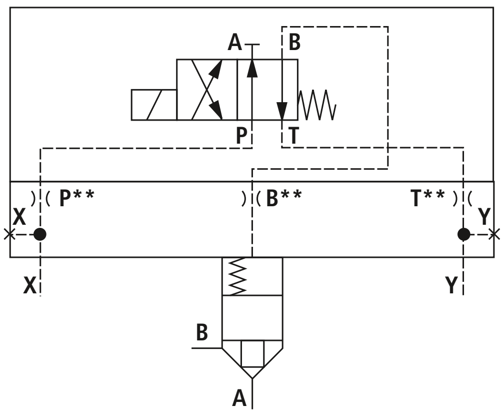
M-3SED 10 UK../350…
M-3SEW 10 U../420…



LFA 63 WEA…
(with directional spool valve type 4WE 10 D…)

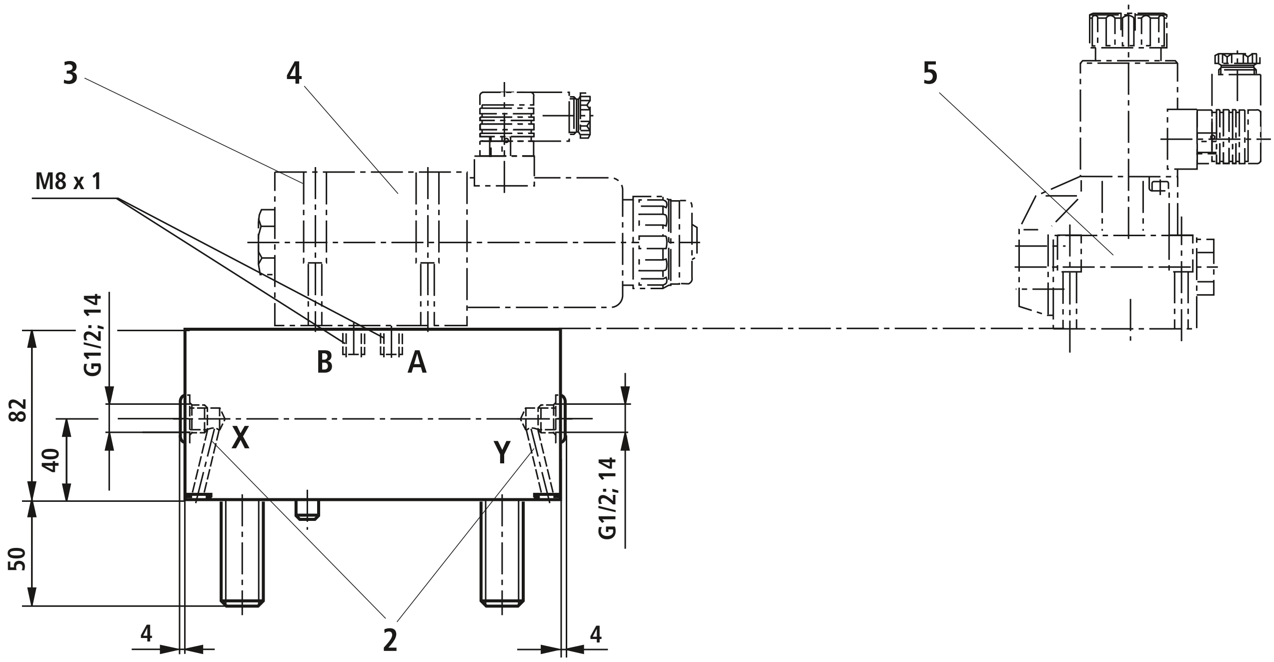


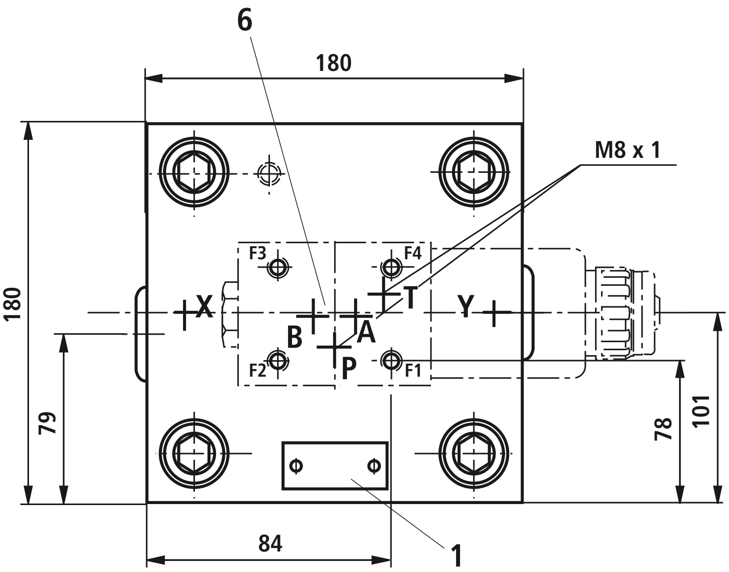
LFA 63 WEB…
(with directional spool valve type 4WE 10 D…)



Control cover for mounting a directional spool or poppet valve: Type ..WEA…, ..WEB…
(nominal dimensions in mm)

Size 63





1 Nameplate
2 Ports X and Y optionally as threaded connection
3 Valve fixing screws are included in the control cover‘s scope of supply
4 Directional spool valve type 4WE 10 D…
5 Directional poppet valve type M-3SEW 10 …
6 Position of ports to ISO 4401-05-04-0-94

Control cover for mounting a directional spool or poppet valve: Type ..WEA…, ..WEB…

Sizes 80 and 100

1	2	3	4	10	11	12	13	17
LFA			–6X/					

Size		Type	Nozzle in channel (Ø in 1/10 mm)			
80	100		A	B	P	T
x	x	WEA	A** ⊿		P** ⊿	T** ⊿
x	x	WEB		B** ⊿	P** ⊿	T** ⊿

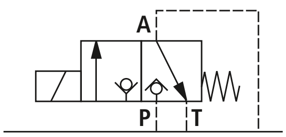
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

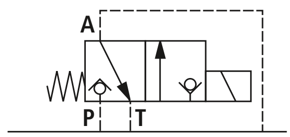
⊿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

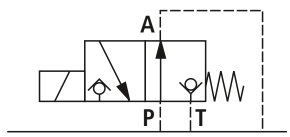
M-3SEW 10 C../420…



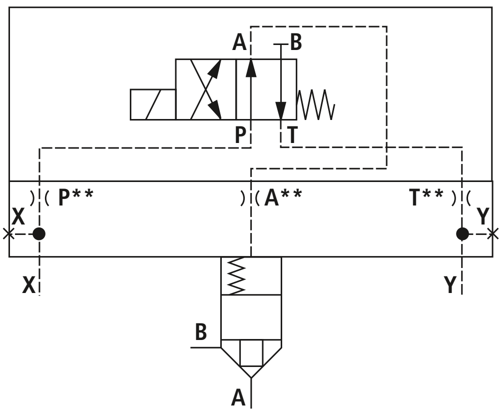
M-3SED 10 CK../350…



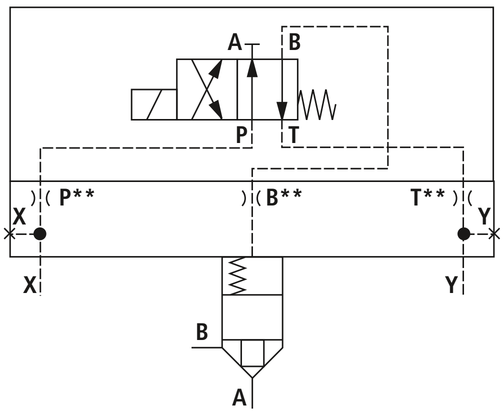
M-3SED 10 UK../350…
M-3SEW 10 U../420…



LFA . WEA…
sizes 80 and 100
(with directional spool valve type 4WE 10 D…)

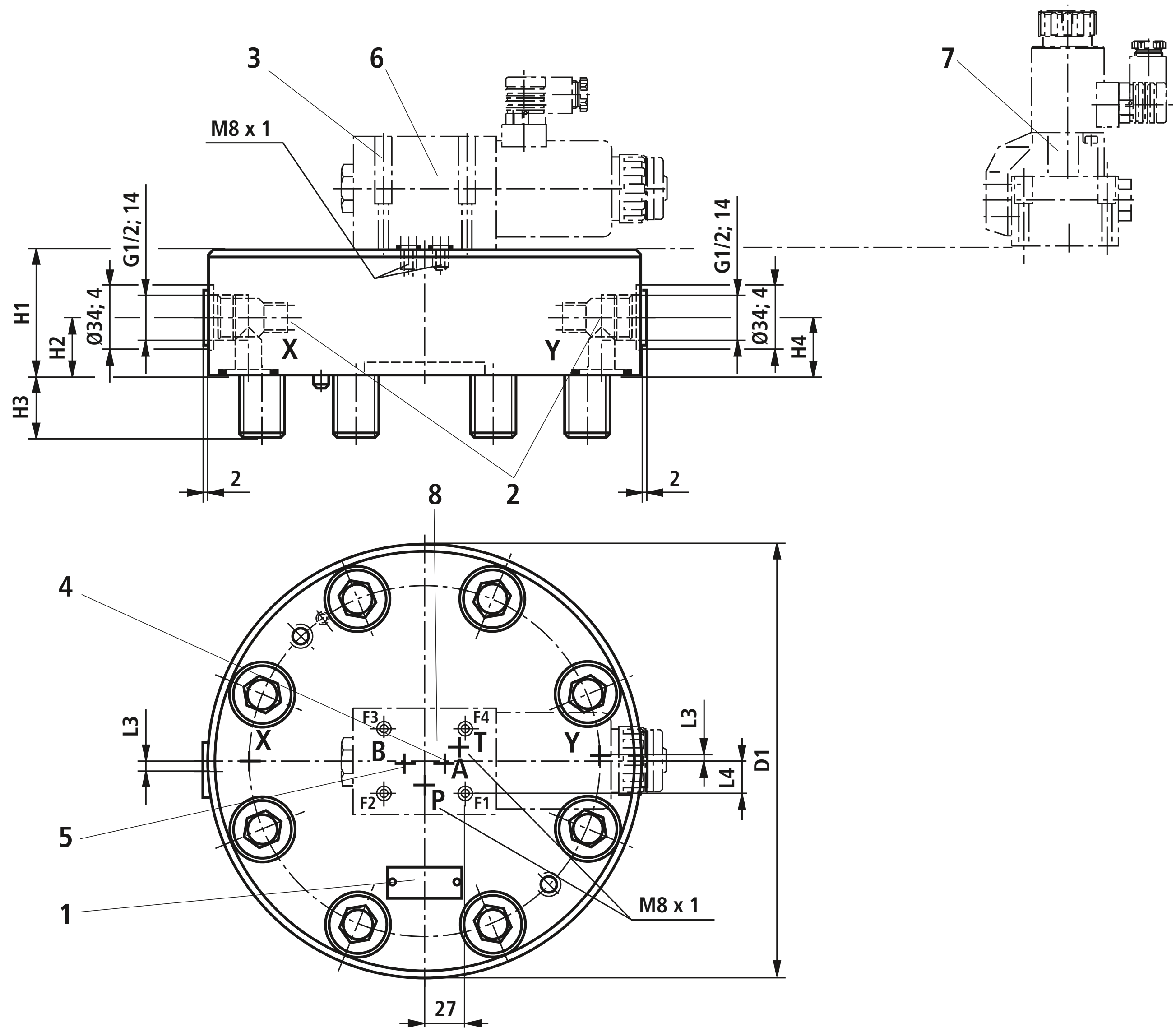


LFA . WEB…
sizes 80 and 100
(with directional spool valve type 4WE 10 D…)



Control cover for mounting a directional spool or poppet valve: Type ..WEA…, ..WEB…
(nominal dimensions in mm)

Sizes 80 and 100



1 Nameplate
2 Ports X and Y optionally as threaded connection
3 Valve fixing screws are included in the control cover's scope of supply
4 Plug screw for type .. WEB..
5 Plug screw for type .. WEA..
6 Directional spool valve type 4WE 10 D…
7 Directional poppet valve type M-3SEW 10 …
8 Position of ports to ISO 4401-05-04-0-94

Size	80	100
D1	250	300
H1	80	100
H2	30	24
H3	45	52.5
H4	45	55
L3	10	13
L4	16	18

Control cover for mounting a directional spool or poppet valve: Type ..WEMA…, ..WEMB…

Sizes 16 to 50

1	2	3	4	12	13	15	17
LFA		–	7X/				

Size					Type	Nozzle in channel (Ø in 1/10 mm)		
16	25	32	40	50		P	T	F
x	x	x	x	x	WEMA	P**	T**	F**
x	x	x	x	x	WEMB	P**	T**	F**

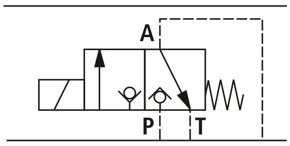
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

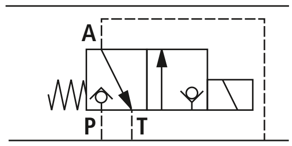
◿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

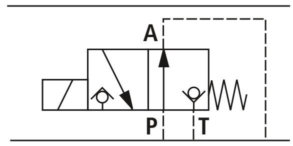
M-3SEW 6 C../420…



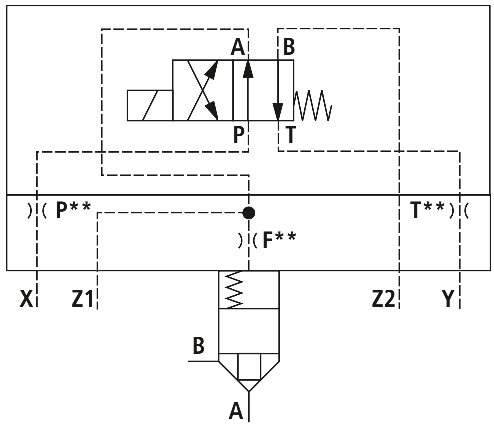
M-3SED 6 CK../350…



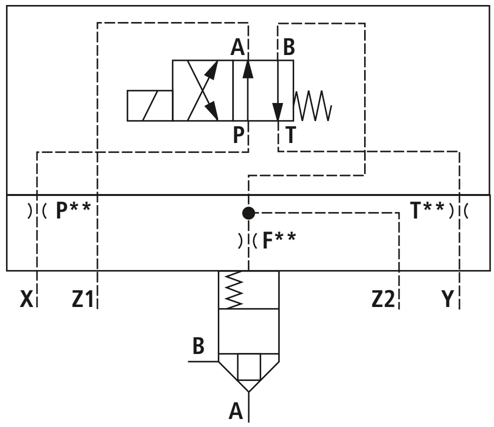
M-3SED 6 UK../350…
M-3SEW 6 U../420…



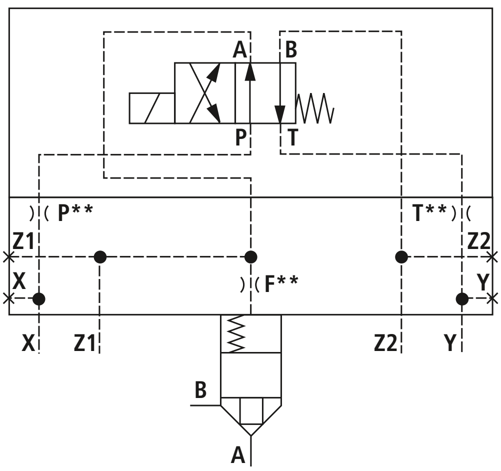
LFA . WEMA…
sizes 16 to 32
(with directional spool valve type 4WE 6 D…)



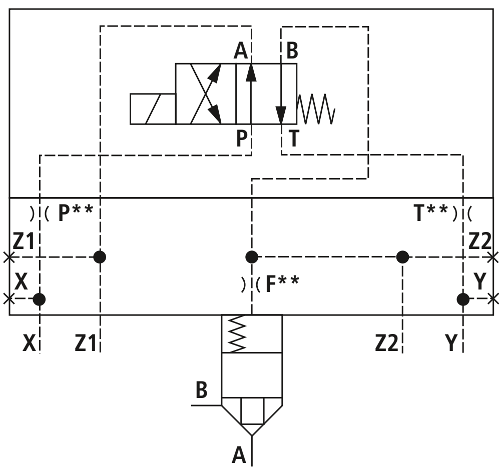
LFA . WEMB…
sizes 16 to 32
(with directional spool valve type 4WE 6 D…)



LFA . WEMA…
sizes 40 and 50
(with directional spool valve type 4WE 6 D…)

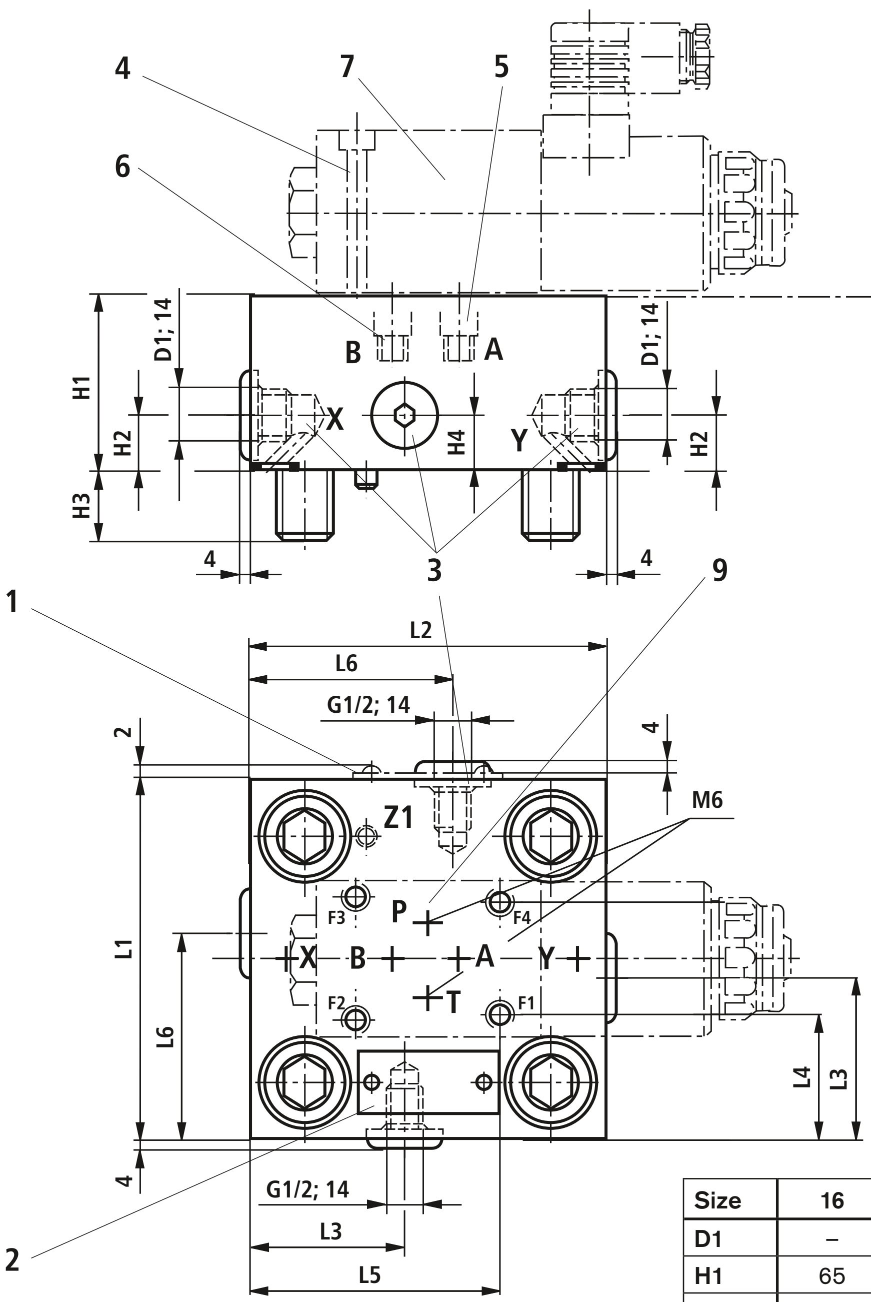


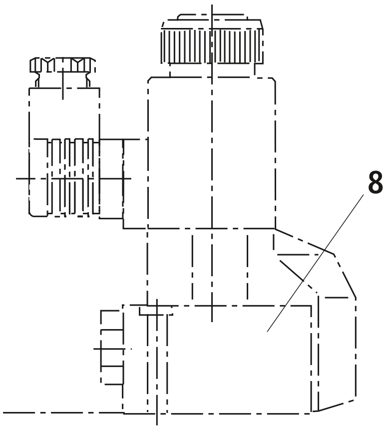
LFA . WEMB…
sizes 40 and 50
(with directional spool valve type 4WE 6 D…)



Control cover for mounting a directional spool or poppet valve: Type ..WEMA…, ..WEMB…
(nominal dimensions in mm)

Sizes 16 to 50





1 Nameplate for sizes 16, 25, 32
2 Nameplate for sizes 40 and 50
3 Ports X, Y, Z1 and Z2 optionally as threaded connection for sizes 40 and 50
4 Valve fixing screws are included in the control cover's scope of supply
5 Plug screw M6 for type ..WEMB…
6 Plug screw M6 for type ..WEMA….
7 Directional spool valve type 4WE 6 D…
8 Directional poppet valve type M-3SEW 6 …
9 Position of ports to ISO 4401-03-02-0-94

Size	16	25	32	40	50
D1	–	–	–	G1/2	G1/2
H1	65	40	50	60	68
H2	–	–	–	30	32
H3	15	24	28	32	34
H4	–	–	–	30	32
L1	65	85	100	125	140
L2	80	85	100	125	140
L3	–	–	–	53	60
L4	17	27	34.5	47	54.5
L5	47.5	64	71.5	84	91.5
L6	–	–	–	72	80

Control cover for mounting a directional spool or poppet valve: Type ..WEMA…, ..WEMB…

Size 63

1	2	3	4	12	13	15	17
LFA	63		–7X/				

Type	Nozzle in channel (Ø in 1/10 mm)		
	P	T	F
WEMA	P** ◿	T** ◿	F** ◿
WEMB	P** ◿	T** ◿	F** ◿

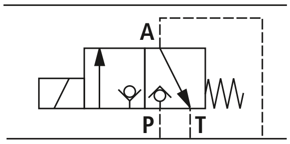
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

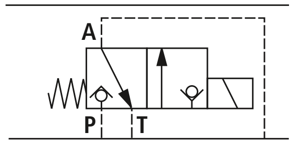
◿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

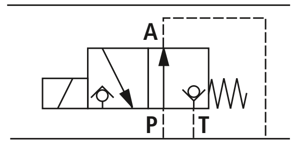
M-3SEW 10 C../420…



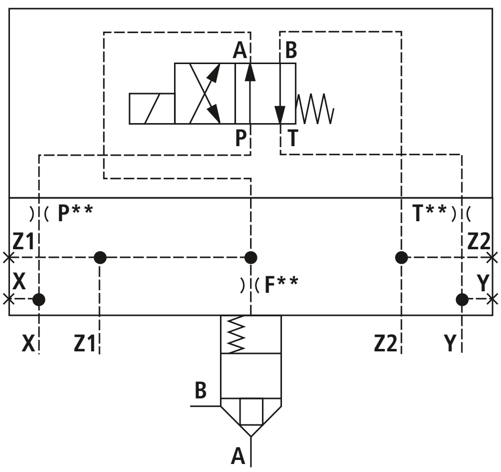
M-3SED 10 CK../350…



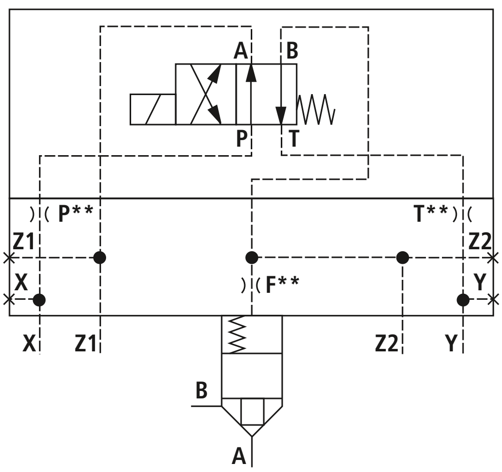
M-3SED 10 UK../350…
M-3SEW 10 U../420…



LFA 63 WEMA…
(with directional spool valve type 4WE 10 D…)

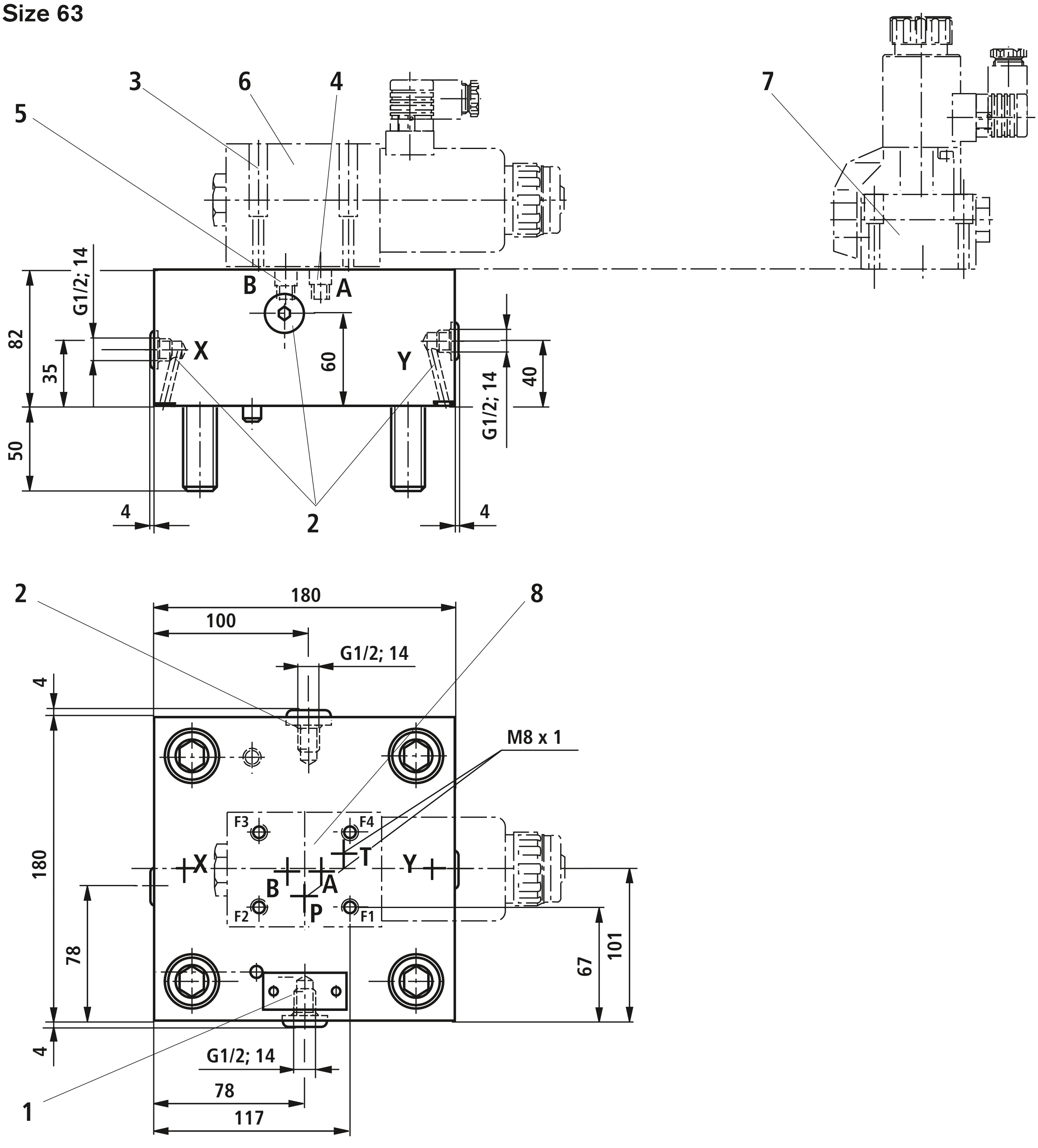


LFA 63 WEMB…
(with directional spool valve type 4WE 10 D…)



Control cover for mounting a directional spool or poppet valve: Type ..WEMA…, ..WEMB…
(nominal dimensions in mm)

Size 63



1 Nameplate
2 Ports X, Y, Z1 and Z2 optionally as threaded connection
3 Valve fixing screws are included in the control cover's scope of supply
4 Plug screw M8 x 1 for type ..WEMB…
5 Plug screw M8 x 1 for type ..WEMA….
6 Directional spool valve type 4WE 10 D…
7 Directional poppet valve type M-3SEW 10 …
8 Position of ports to ISO 4401-05-04-0-94

Control cover for mounting a directional spool or poppet valve: Type ..WEA8…, ..WEB8…

Sizes 80 and 100

1	2	3	4	12	13	15	17
LFA		–6X	/				

Size		Type	Nozzle in channel (Ø in 1/10 mm)		
80	100		P	T	F
x	x	WEA8	P**	T**	F**
x	x	WEB8	P**	T**	F**

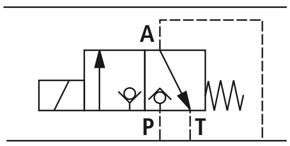
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

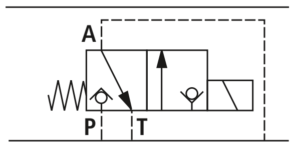
◺ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

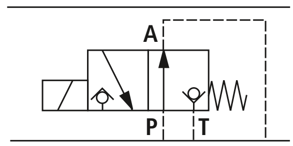
M-3SEW 10 C../420…



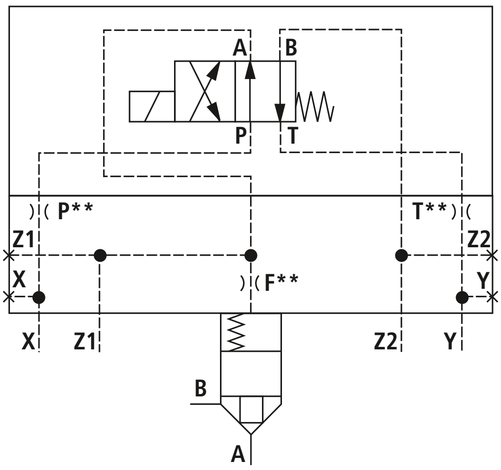
M-3SED 10 CK../350…



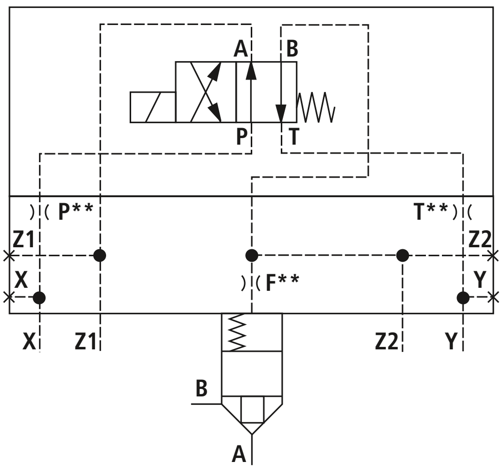
M-3SED 10 UK../350…
M-3SEW 10 U../420…



LFA . WEA8…
sizes 80 and 100
(with directional spool valve type 4WE 10 D…)

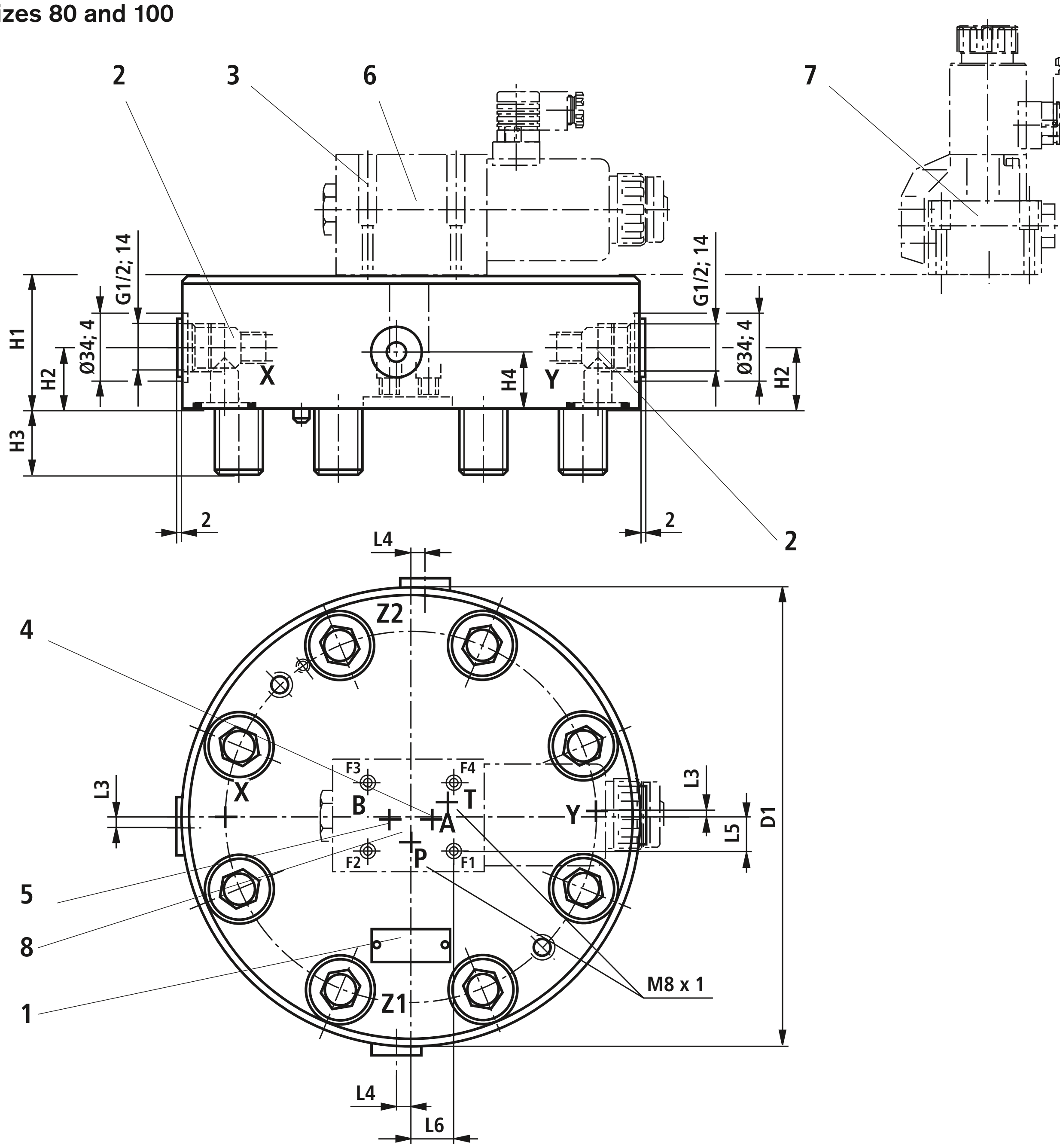


LFA . WEB8…
sizes 80 and 100
(with directional spool valve type 4WE 10 D…)



Control cover for mounting a directional spool or poppet valve: Type ..WEA8…, ..WEB8…
(nominal dimensions in mm)

Sizes 80 and 100



1 Nameplate
2 Ports X, Y, Z1 and Z2 optionally as threaded connection
3 Valve fixing screws are included in the control cover's scope of supply
4 Plug screw M8 x 1 for type .. WEB8..
5 Plug screw M8 x 1 for type .. WEA8..
6 Directional spool valve type 4WE 10 D…
7 Directional poppet valve type M-3SEW 10 …
8 Position of ports to ISO 4401-05-04-0-94

Size	80	100
D1	250	300
H1	80	100
H2	42	55
H3	45	52.5
H4	26	35
L3	10	13
L4	10	9.5
L5	16	27
L6	27	26

Control cover for mounting a directional spool valve: Type ..WECA…

Sizes 16 to 50

1	2	3	4	10	11	12	13	17
LFA		WECA	–7X/					

Size					Nozzle in channel (Ø in 1/10 mm)			
16	25	32	40	50	A	B	P	T
x	x	x	x	x	A**	B**	P**	T**

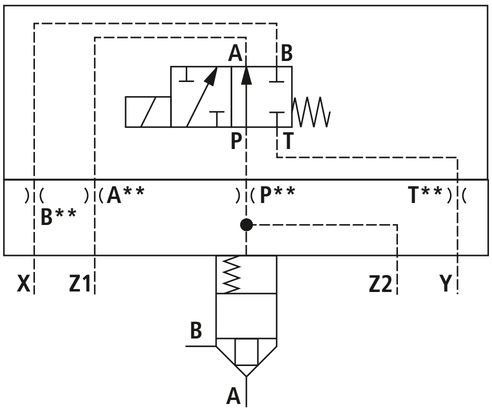
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

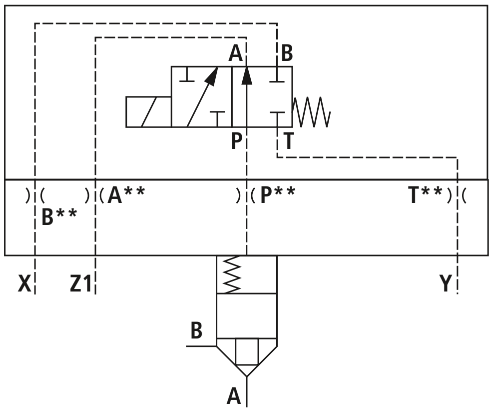
Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

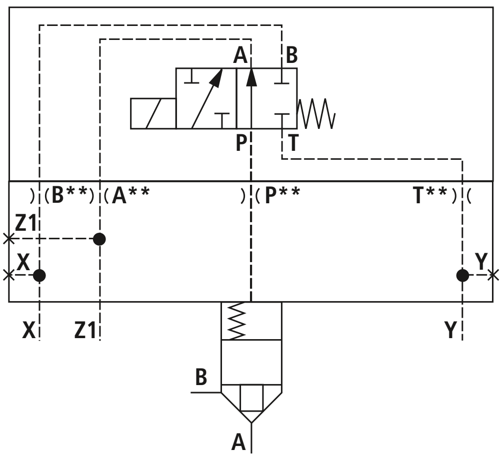
LFA . WECA…
size 16
(with directional spool valve type 3WE 6 A…)



LFA . WECA…
sizes 25 and 32
(with directional spool valve type 3WE 6 A…)

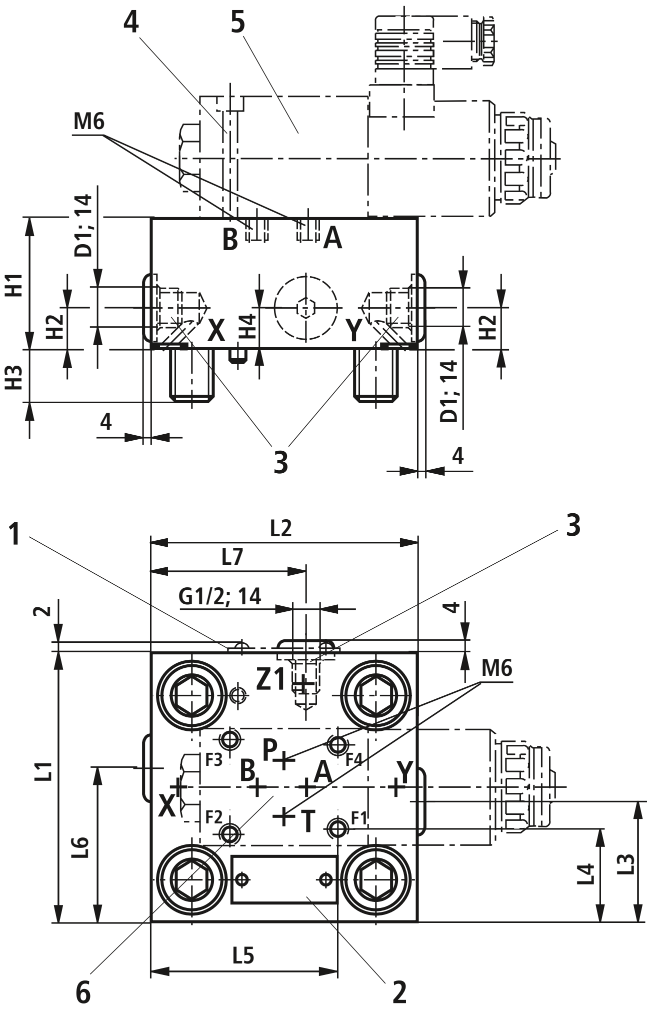


LFA . WECA…
sizes 40 and 50
(with directional spool valve type 3WE 6 A…)



Control cover for mounting a directional spool valve: Type ..WECA… (nominal dimensions in mm)

Sizes 16 to 50



Size	16	25	32	40	50
D1	–	–	–	G1/2	G1/2
H1	40	40	50	60	68
H2	–	–	–	30	32
H3	15	24	28	32	34
H4	–	–	–	30	32
L1	65	85	100	125	140
L2	80	85	100	125	140
L3	–	–	–	53	60
L4	17	27	34.5	47	54.5
L5	47.5	64	71.5	84	91.5
L6	–	–	–	62.5	70
L7	–	–	–	72	80

1 Nameplate for sizes 16, 25, 32

2 Nameplate for sizes 40 and 50

3 Ports X, Y and Z1 optionally as threaded connection for sizes 40 and 50

4 Valve fixing screws are included in the control cover's scope of supply

5 Directional spool valve type 3WE 6 A…

6 Position of ports to ISO 4401-03-02-0-94

Control cover for mounting a directional spool valve: Type ..WECA… (nominal dimensions in mm)

Size 63

1	2	3	4	10	11	12	13	17
LFA	63	WECA	–7X/					

Nozzle in channel (Ø in 1/10 mm)

A	B	P	T
A**	B**	P**	T**

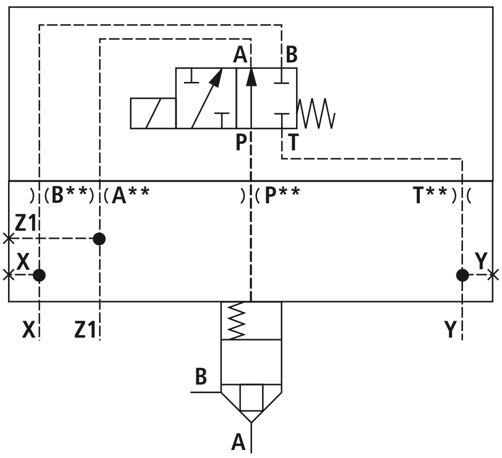
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

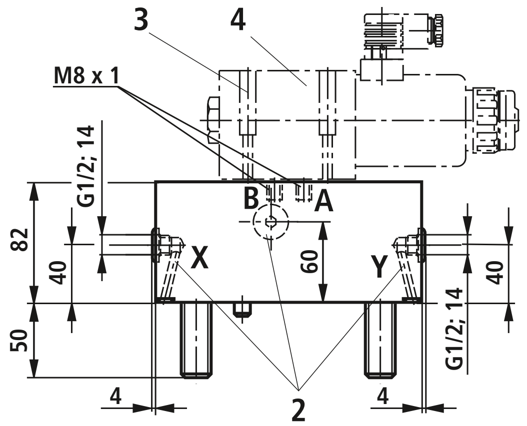
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

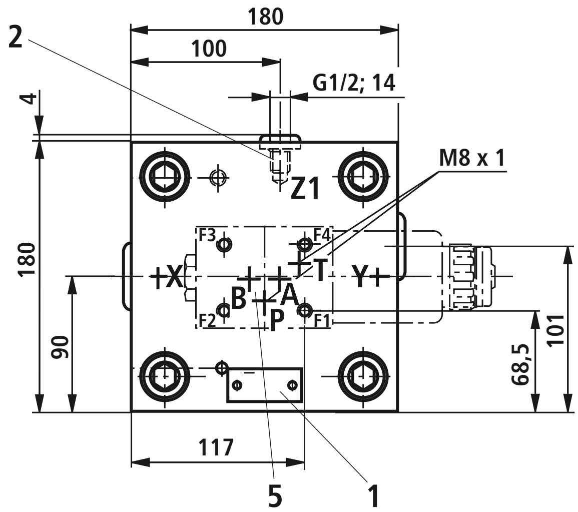
⊿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

LFA 63 WECA…
(with directional spool valve type 3WE 10 A…)







1 Nameplate

2 Ports X, Y and Z1 optionally as threaded connection

3 Valve fixing screws are included in the control cover's scope of supply

4 Directional spool valve type 3WE 6 A…

5 Position of ports to ISO 4401-05-04-0-94

Control cover for mounting a directional spool valve: Type ..WEA9… (nominal dimensions in mm)

Sizes 80 and 100

1	2	3	4	10	11	12	13	17
LFA		WEA9	–6X	/				

Size		Nozzle in channel (Ø in 1/10 mm)			
80	100	A	B	P	T
x	x	A** ◿	B** ◿	P** ◿	T** ◿

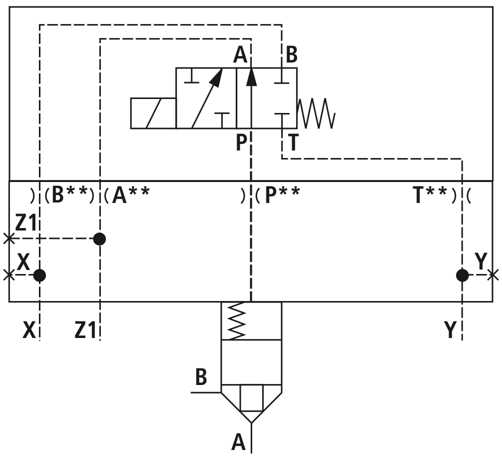
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

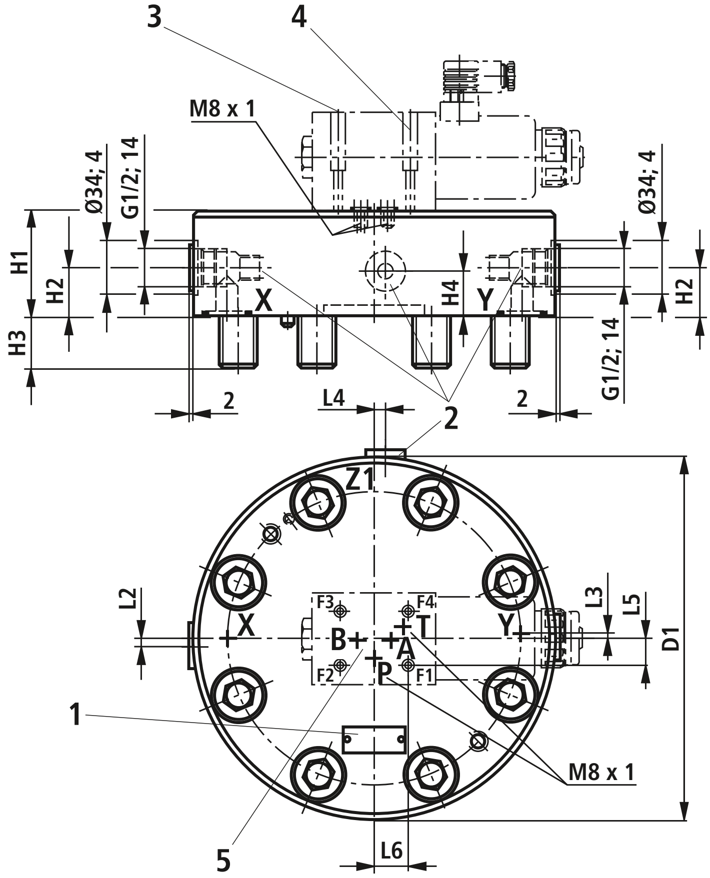
⚠ Caution!
Observe compatibility of seals with hydraulic fluid used!

◿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

LFA . WEA9…
sizes 80 and 100
(with directional spool valve type 3WE 10 A…)





Size	80	100
D1	250	300
H1	80	100
H2	30	40
H3	45	52.5
H4	30	70
L2	0	6
L3	6	6
L4	6	6
L5	23	19
L6	27	26

1 Nameplate
2 Ports X, Y, Z1 and Z2 optionally as threaded connection
3 Valve fixing screws included in the control cover's scope of supply
4 Directional spool valve type 3WE 10 A…
5 Position of ports to ISO 4401-05-04-0-94

Control cover for mounting a directional spool valve: Type ..GWA…, ..GWB…

Sizes 16 to 50

1	2	3	4	10	11	12	13	17
LFA			–7X/					

Size					Type	Nozzle in channel (Ø in 1/10 mm)			
16	25	32	40	50		A	B	P	T
x	x	x	x	x	GWA	A** ◿		P** ◿	T** ◿
x	x	x	x	x	GWB		B** ◿	P** ◿	T** ◿

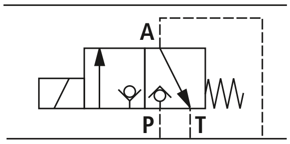
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ Caution!
Observe compatibility of seals with hydraulic fluid used!

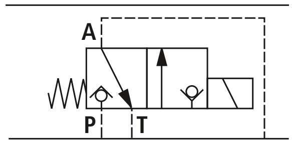
◿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

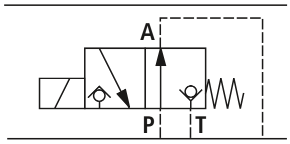
M-3SEW 6 C../420…



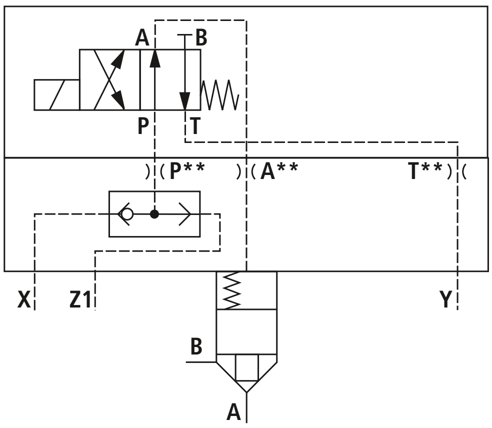
M-3SED 6 CK../350…



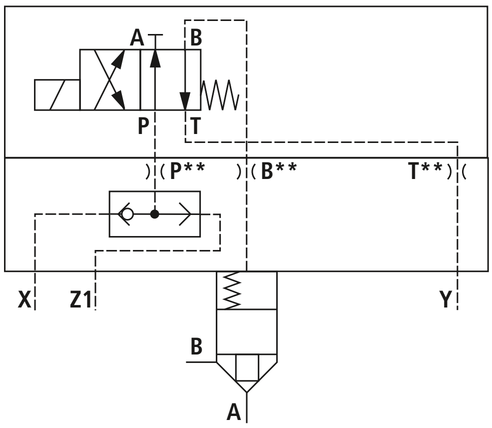
M-3SED 6 UK../350…
M-3SEW 6 U../420…



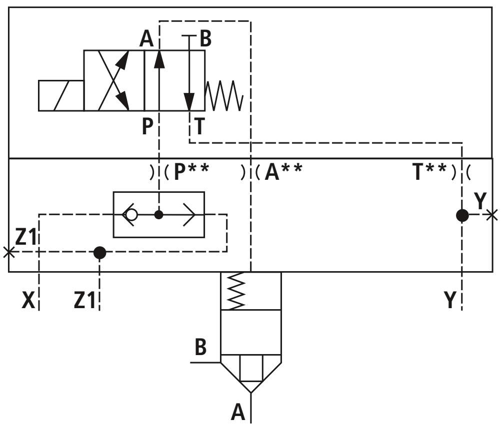
LFA . GWA…
sizes 16 to 32
(with directional spool valve type 4WE 6 D…)



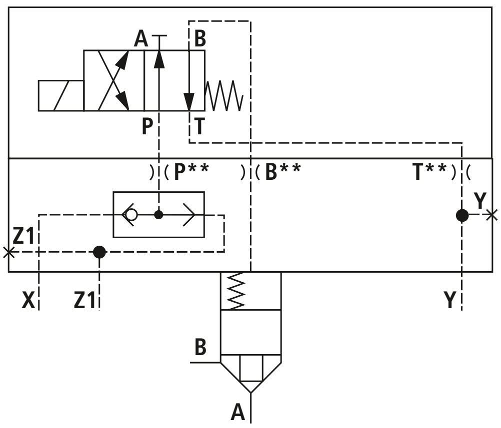
LFA . GWB…
sizes 16 to 32
(with directional spool valve type 4WE 6 D…)



LFA . GWA…
sizes 40 and 50
(with directional spool valve type 4WE 6 D…)

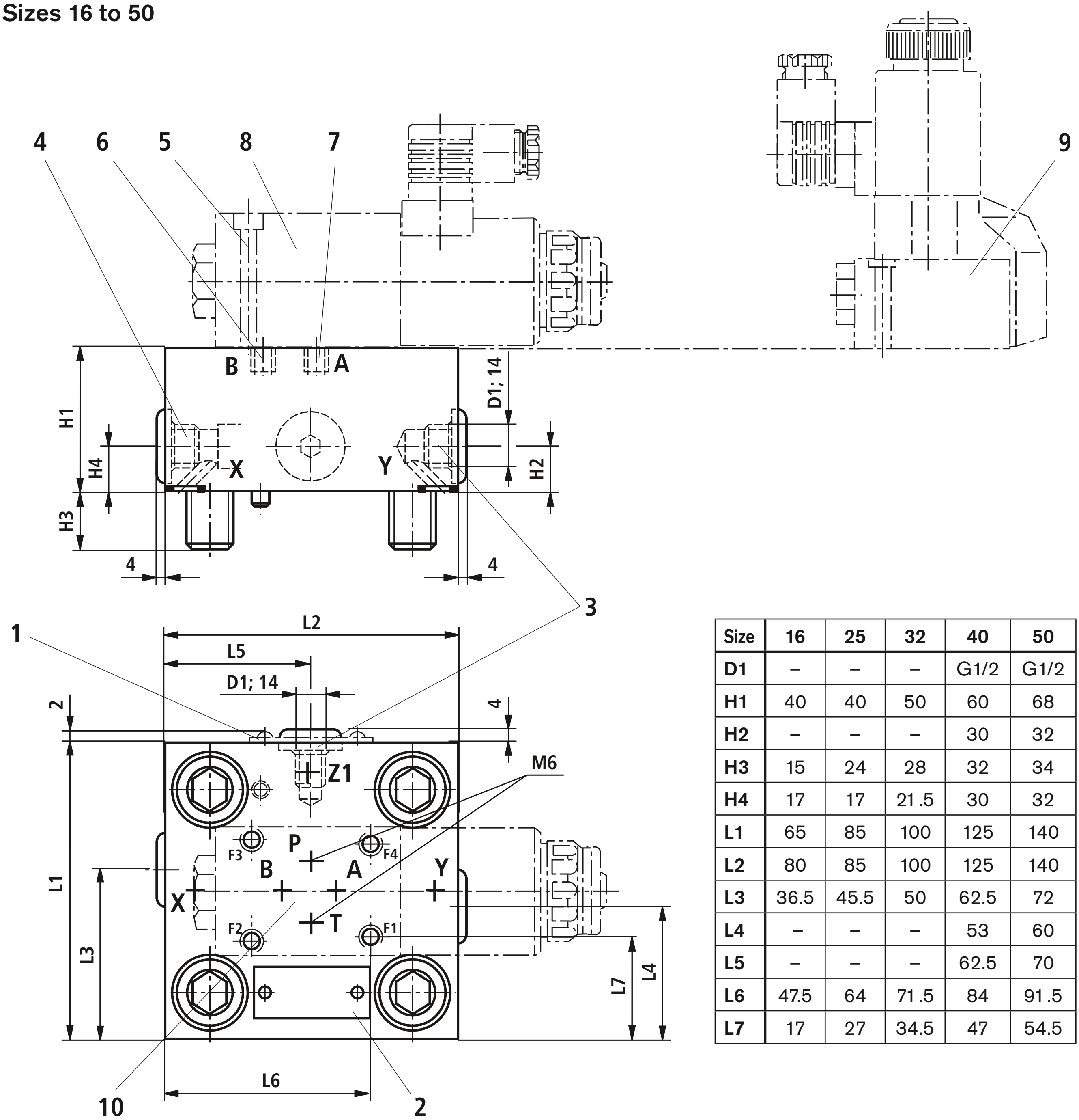


LFA . GWB…
sizes 40 and 50
(with directional spool valve type 4WE 6 D…)



Control cover for mounting a directional spool valve: Type ..GWA…, ..GWB… (nominal dimensions in mm)

Sizes 16 to 50



Size	16	25	32	40	50
D1	–	–	–	G1/2	G1/2
H1	40	40	50	60	68
H2	–	–	–	30	32
H3	15	24	28	32	34
H4	17	17	21.5	30	32
L1	65	85	100	125	140
L2	80	85	100	125	140
L3	36.5	45.5	50	62.5	72
L4	–	–	–	53	60
L5	–	–	–	62.5	70
L6	47.5	64	71.5	84	91.5
L7	17	27	34.5	47	54.5

1 Nameplate for sizes 16, 25, 32
2 Nameplate for sizes 40 and 50
3 Ports Y and Z1 optionally as threaded connection for sizes 40 and 50
4 Shuttle valve
5 Valve fixing screws are included in the control cover's scope of supply
6 Plug screw M6 for ..GWA…
7 Plug screw M6 for ..GWB…
8 Directional spool valve type 4WE 6 D…
9 Directional poppet valve type M-3SEW 6 …
10 Position of ports to ISO 4401-03-02-0-94

Control cover for mounting a directional spool or poppet valve: Type ..GWA…, ..GWB…

Size 63

1	2	3	4	10	11	12	13	17
LFA	63		–7X/					

Type	Nozzle in channel (Ø in 1/10 mm)			
	A	B	P	T
GWA	A** ⊿		P** ⊿	T** ⊿
GWB		B** ⊿	P** ⊿	T** ⊿

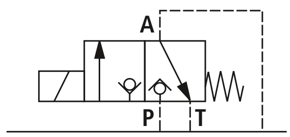
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

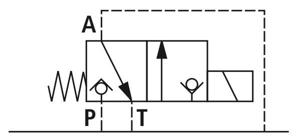
⊿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

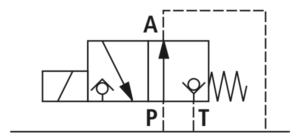
M-3SEW 10 C../420…



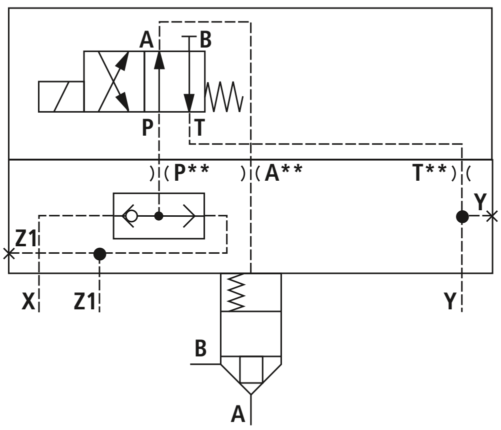
M-3SED 10 CK../350…



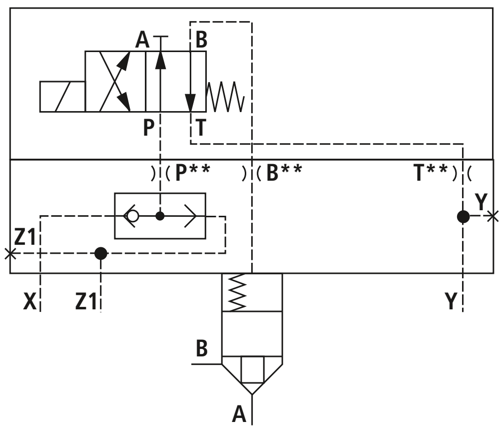
M-3SED 10 UK../350…
M-3SEW 10 U../420…



LFA 63 GWA…
(with directional spool valve type 4WE 10 D…)

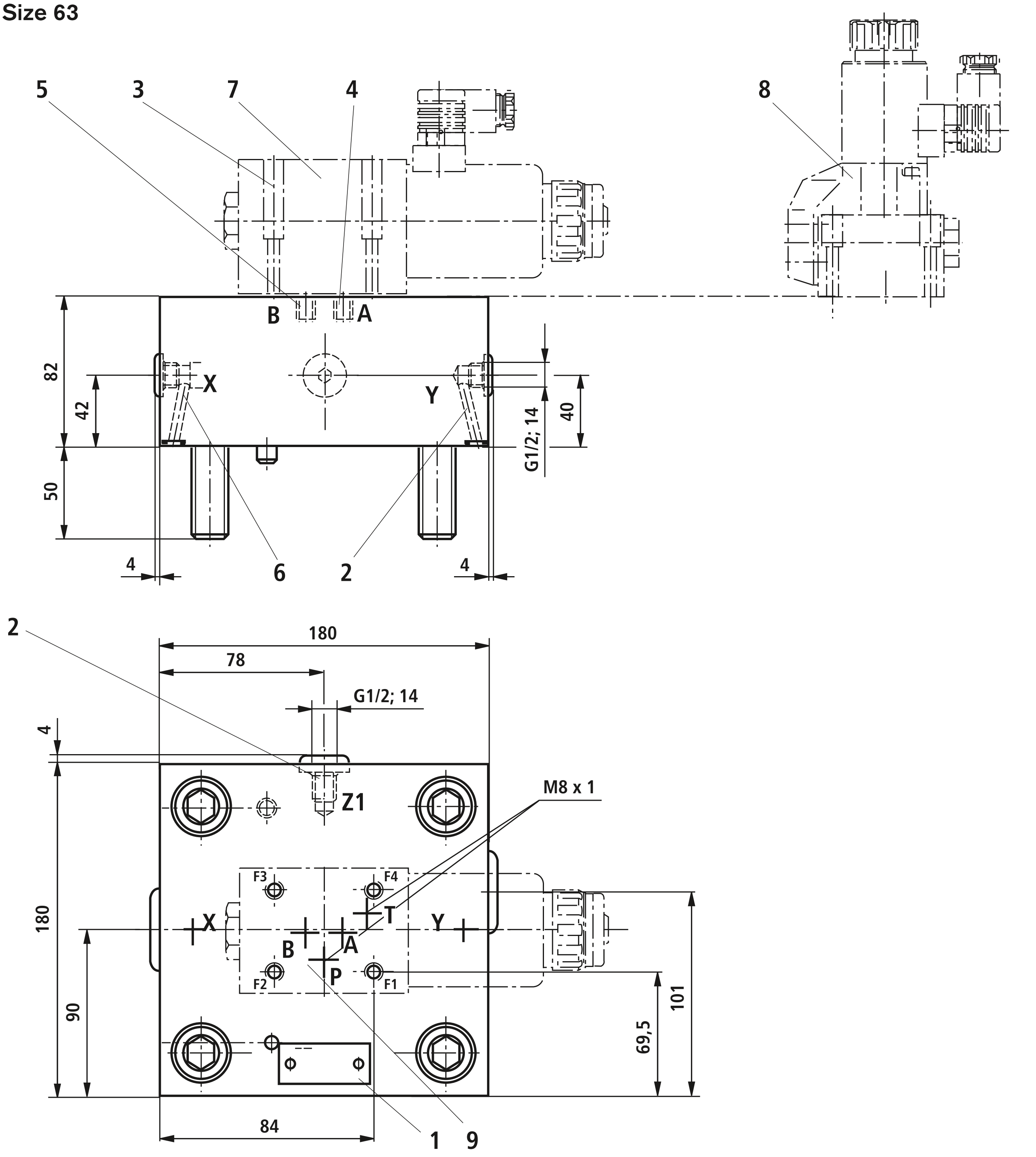


LFA 63 GWB…
(with directional spool valve type 4WE 10 D…)



Control cover for mounting a directional spool or poppet valve: Type ..GWA…, ..GWB…
(nominal dimensions in mm)

Size 63



1 Nameplate

2 Ports Y and Z1 optionally as threaded connection

3 Valve fixing screws are included in the control cover's scope of supply

4 Plug screw M8 x 1 for type ..GWB…

5 Plug screw M8 x 1 for type ..GWA….

6 Shuttle valve

7 Directional spool valve type 4WE 10 D…

8 Directional poppet valve type M-3SEW 10 …

9 Position of ports to ISO 4401-05-04-0-94

Control cover for mounting a directional spool or poppet valve: Type ..GWA…, ..GWB…

Sizes 80 and 100

1	2	3	4	10	11	12	13	17
LFA			–6X/					

Size		Type	Nozzle in channel (Ø in 1/10 mm)			
80	100		A	B	P	T
x	x	GWA	A** ◿		P** ◿	T** ◿
x	x	GWB		B** ◿	P** ◿	T** ◿

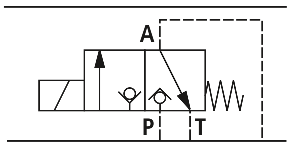
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

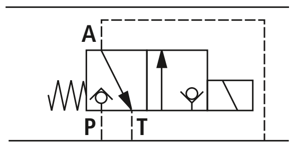
◿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

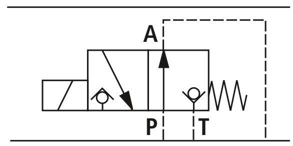
M-3SEW 10 C../420…



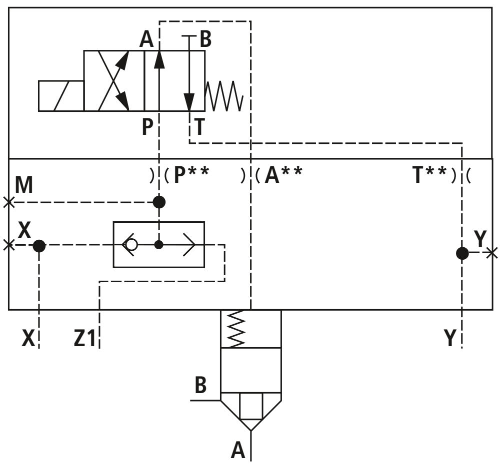
M-3SED 10 CK../350…



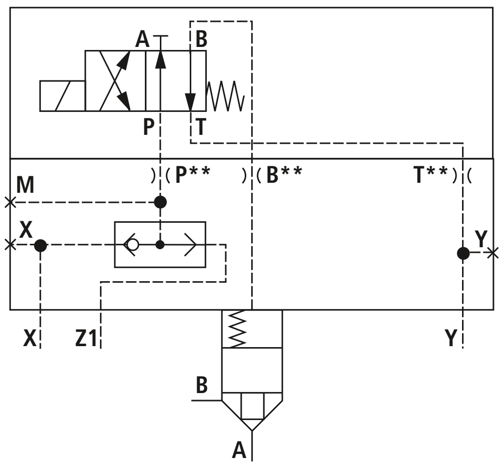
M-3SED 10 UK../350…
M-3SEW 10 U../420…



LFA . GWA…
sizes 80 and 100
(with directional spool valve type 4WE 10 D…)

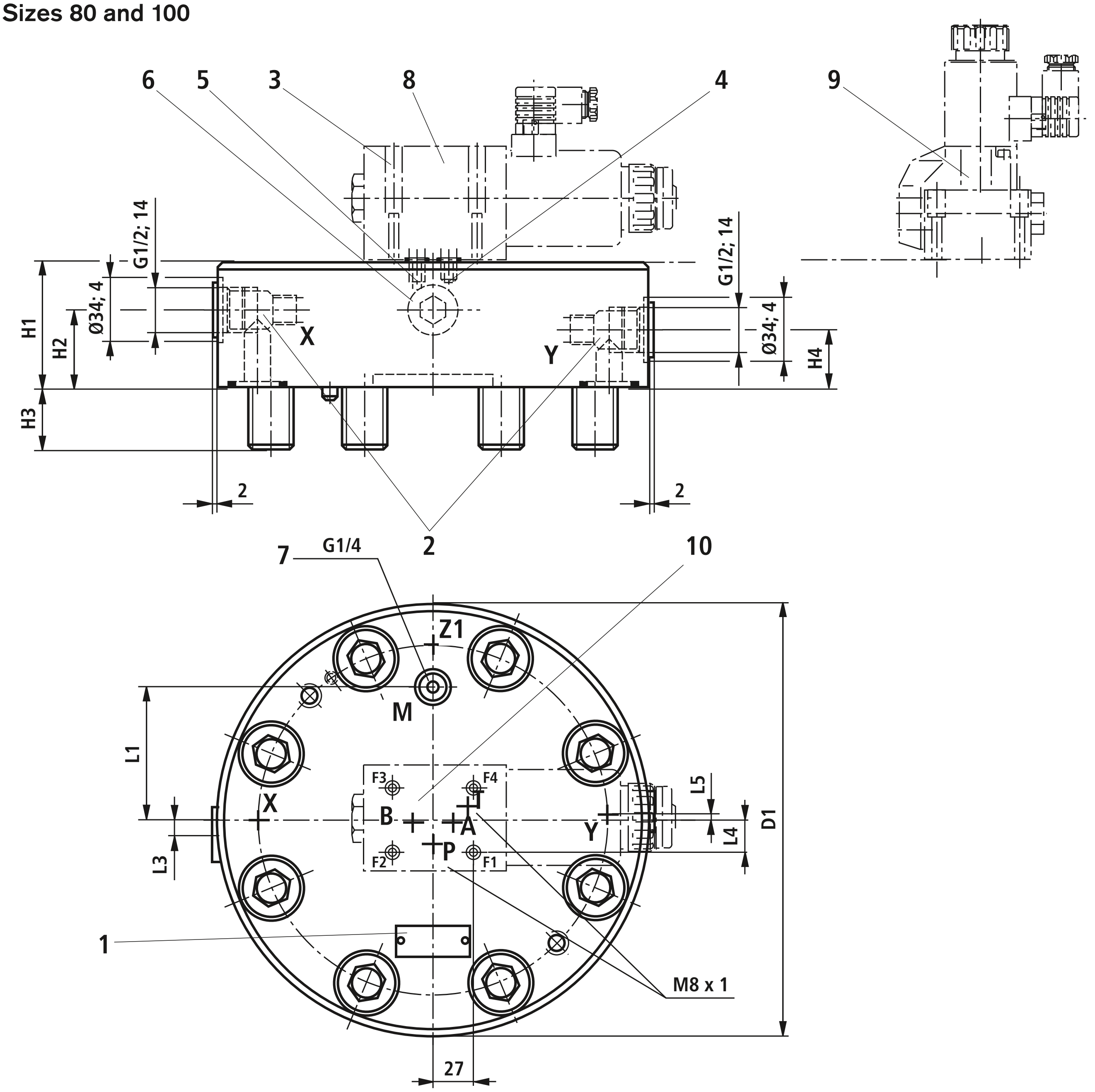


LFA . GWB…
sizes 80 and 100
(wth directional spool valve type 4WE 10 D…)



Control cover for mounting a directional spool or poppet valve: Type ..GWA…, ..GWB… (nominal dimensions in mm)

Sizes 80 and 100



1 Nameplate
2 Ports X and Y optionally as threaded connection
3 Valve fixing screws are included in the control cover's scope of supply
4 Plug screw M8 x 1 for type ..GWB..
5 Plug screw M8 x 1 for type ..GWA..
6 Shuttle valve
7 Measuring port
8 Directional spool valve type 4WE 10 D…
9 Directional poppet valve type M-3SEW 10 …
10 Position of ports to ISO 4401-05-04-0-94

Size	80	100
D1	250	300
H1	80	100
H2	26	40
H3	45	52.5
H4	26	55
L1	74	96.5
L3	9.5	13
L4	17	18
L5	10.5	13

Control cover for mounting a directional spool or poppet valve: Type ..KWA…, ..KWB…

Sizes 16 to 50

1	2	3	4	10	11	12	14	17
LFA			–7X /			X	X	

Size	Type	Nozzle in channel (Ø in 1/10 mm)			
		A	B	P	X
16	KWA	A** ⊿		P15 ◿	X15 ◿
25	KWA	A** ⊿		P15 ◿	Ø2,0 ◢
32	KWA	A** ⊿		P20 ◿	Ø2,5 ◢
40	KWA	A** ⊿		P20 ◿	X30 ◿
50	KWA	A** ⊿		P20 ◿	X30 ◿
16	KWB		B** ⊿	P15 ◿	X15 ◿
25	KWB		B** ⊿	P15 ◿	Ø2,0 ◢
32	KWB		B** ⊿	P20 ◿	Ø2,5 ◢
40	KWB		B** ⊿	P20 ◿	X30 ◿
50	KWB		B** ⊿	P20 ◿	X30 ◿

No code = NBR seals
V = FKM seals
(Other seals on enquiry)

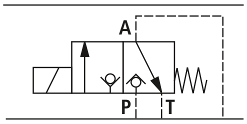
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

◢ Nozzle drilled (Ø in mm) [1]
◿ Standard nozzle (Ø in 1/10 mm) [1]
⊿ Nozzle possible; indicate, if required (Ø in 1/10 mm)

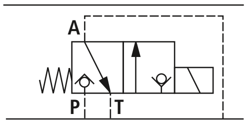
[1] Not shown in the type designation

For ordering codes for nozzles, see page 14 and 15.

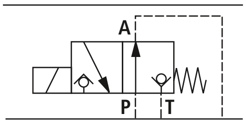
M-3SEW 6 C../420…



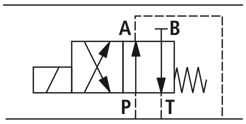
M-3SED 6 CK../350…



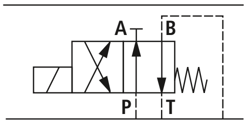
M-3SED 6 UK../350…
M-3SEW 6 U../420…



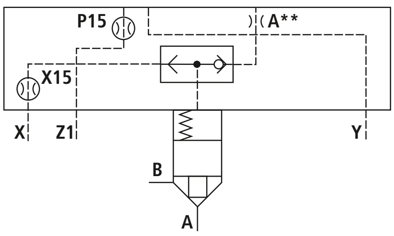
4WE 6 D…
(for type LFA . **KWA** only)



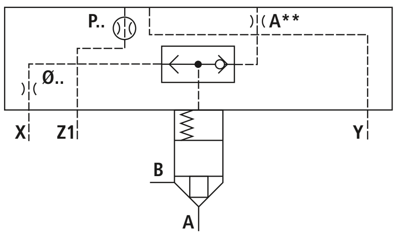
4WE 6 D…
(for type LFA . **KWB** only)



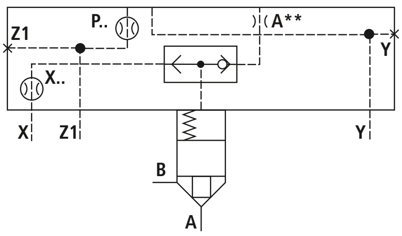
LFA . KWA…
size 16
(for directional valve, see above)



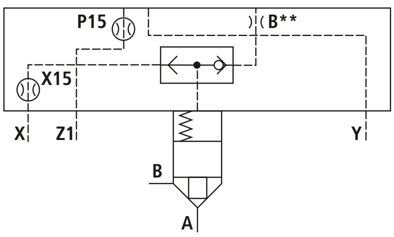
LFA . KWA…
sizes 25 and 32
(for directional valve, see above)



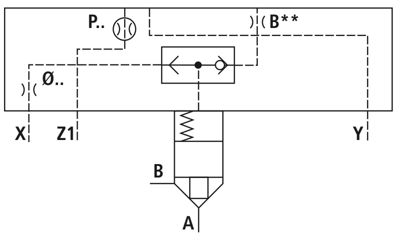
LFA . KWA…
sizes 40 and 50
(for directional valve, see above)



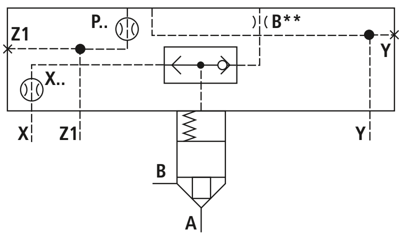
LFA . KWB…
size 16
(for directional valve, see above)



LFA . KWB…
sizes 25 and 32
(for directional valve, see above)

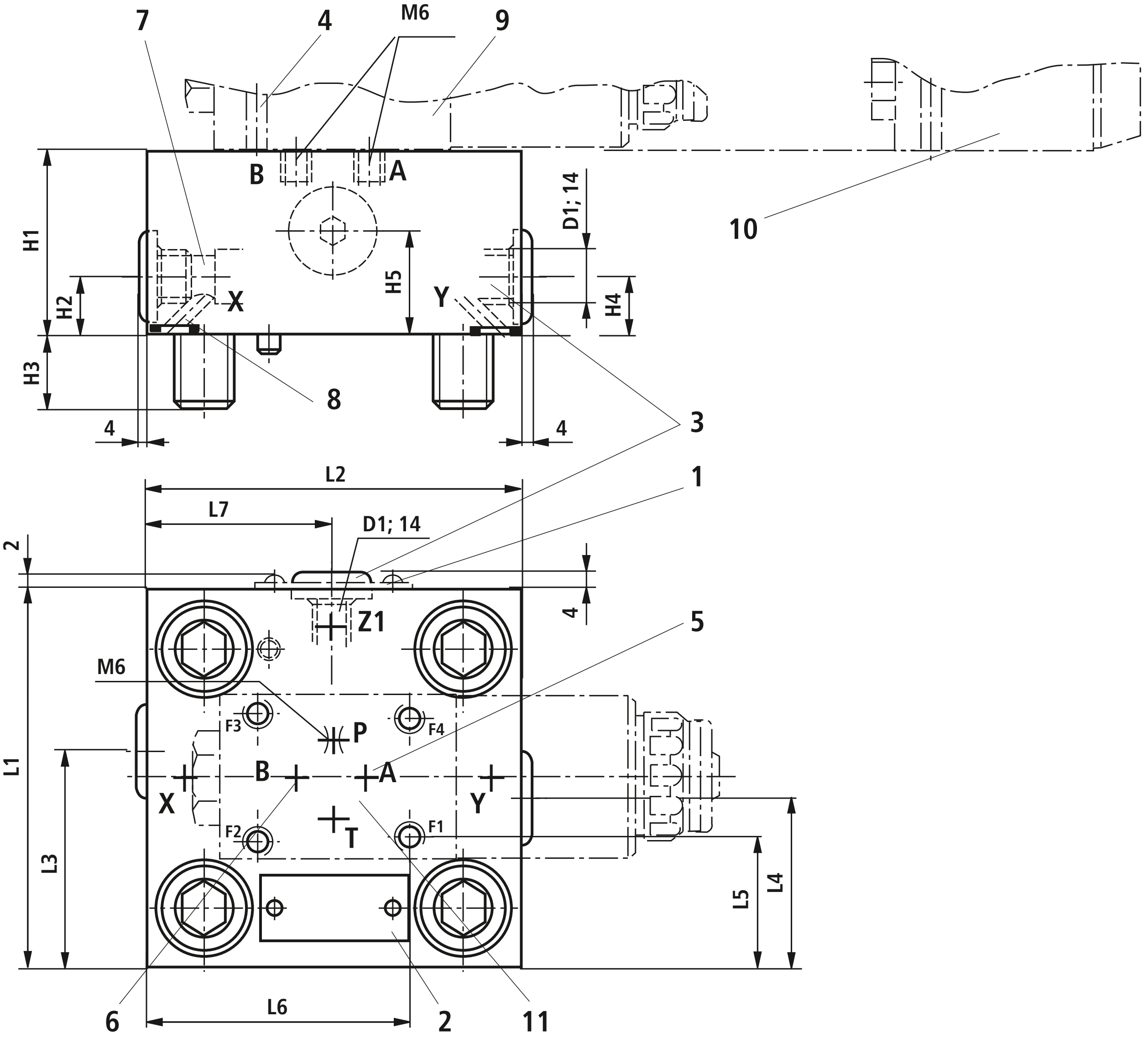


LFA . KWB…
sizes 40 and 50
(for directional valve, see above)



Control cover for mounting a directional spool or poppet valve: Type ..KWA…, ..KWB… (nominal dimensions in mm)

Sizes 16 to 50



1 Nameplate for sizes 16, 25 and 32
2 Nameplate for sizes 40 and 50
3 Ports Y and Z1 optionally as threaded connection for sizes 40 and 50
4 Valve fixing screws are included in the control cover's scope of supply
5 Plug screw ..KWB…
6 Plug screw ..KWA…
7 Shuttle valve
8 M6 for sizes 16 and 40, M8 x 1 for size 50
9 Directional spool valve type 4WE 6 D…
10 Directional poppet valve type M-3SEW 6 …
11 Position of ports to ISO 4401-03-02-0-94

Size	16	25	32	40	50
D1	–	–	–	G1/2	G1/2
H1	40	40	50	60	68
H2	17	17	21.5	30	32
H3	15	24	28	32	34
H4	–	–	–	30	32
H5	–	–	–	30	50
L1	65	85	100	125	140
L2	80	85	100	125	140
L3	36.5	45.5	50	62.5	72
L4	–	–	–	53	60
L5	17	27	34.5	47	54.5
L6	47.5	64	71.5	84	91.5
L7	–	–	–	62.5	70

Control cover for mounting a directional spool or poppet valve: Type ..KWA…, ..KWB…

Size 63

1	2	3	4	10	11	12	14	17
LFA	63		–7X/					

Type	Nozzle in channel (Ø in 1/10 mm)			
	A	B	P	X
KWA	A**		P25	X**
KWB		B**	P25	X**

No code = NBR seals
V = FKM seals
(Other seals on enquiry)

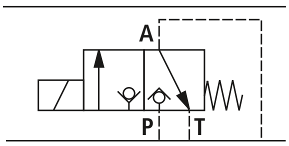
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

⊿ Standard ozzle (Ø in 1/10 mm) – is not shown in the type designation

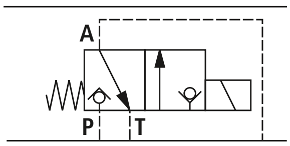
⊿ Nozzle possible; indicate, if required (Ø in 1/10 mm)

For ordering codes for nozzles, see pages 14 and 15.

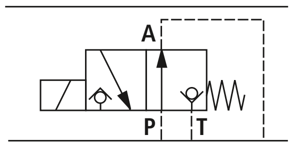
M-3SEW 10 C../420…



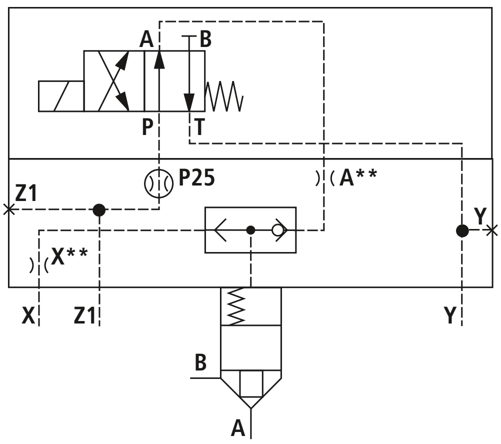
M-3SED 10 CK../350…



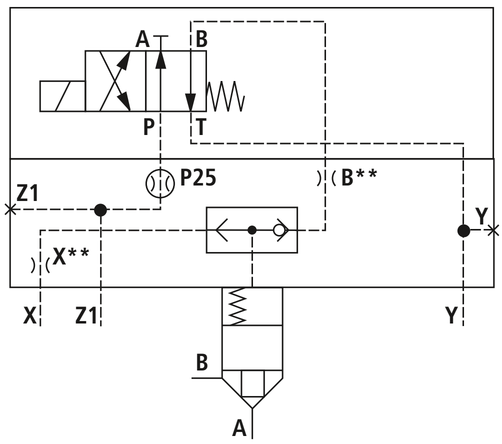
M-3SED 10 UK../350…
M-3SEW 10 U../420…



LFA 63 KWA…
(with directional spool valve type 4WE 10 D…)

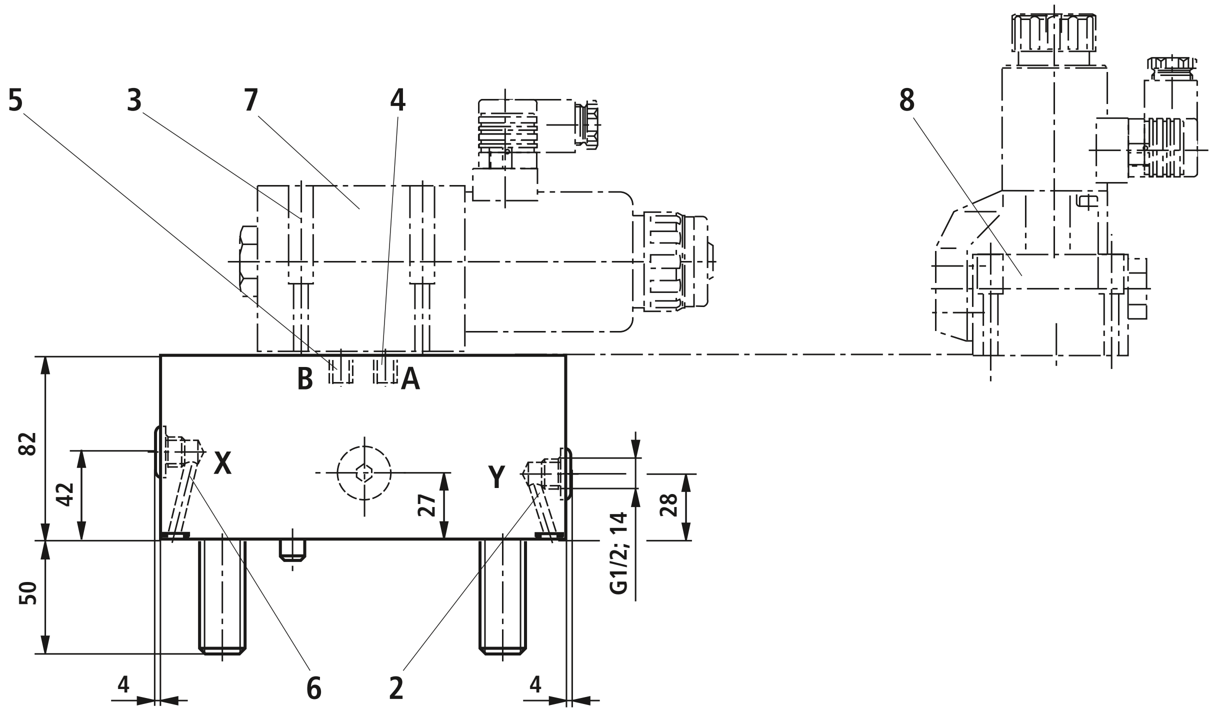


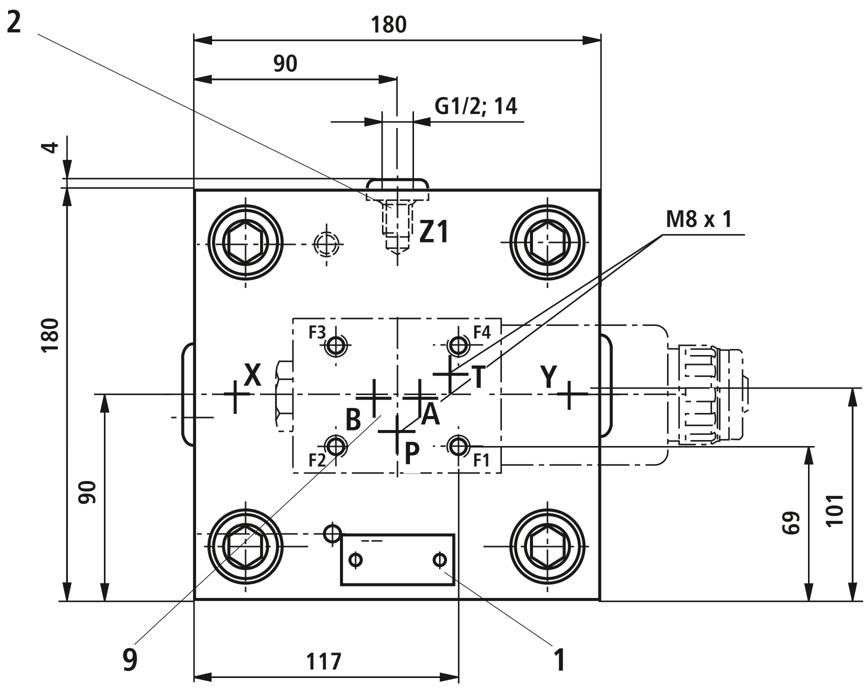
LFA 63 KWB…
(with directional spool valve type 4WE 10 D…)



Control cover for mounting a directional spool or poppet valve: Type ..KWA…, ..KWB…
(nominal dimensions in mm)

Size 63





1 Nameplate
2 Ports Y and Z1 optionally as threaded connection
3 Valve fixing screws are included in the control cover's scope of supply
4 Plug screw M8 x 1 for type ..KWB…
5 Plug screw M8 x 1 for type ..KWA…
6 Shuttle valve
7 Directional spool valve type 4WE 10 D…
8 Directional poppet valve type M-3SEW 10 …
9 Position of ports to ISO 4401-03-02-0-94

Control cover for mounting a directional spool or poppet valve: Type ..KWA…, ..KWB…

Sizes 80 and 100

1	2	3	4	10	11	12	13	14	17
LFA			–6X/			X		X	

Size		Type	Nozzle in channel (Ø in 1/10 mm)				
80	100		A	B	P	T	X
x	x	KWA	A**		P25	T**	X20
x	x	KWB		B**	P25	T**	X20

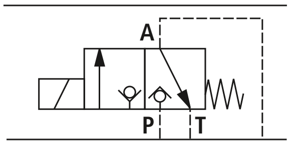
No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

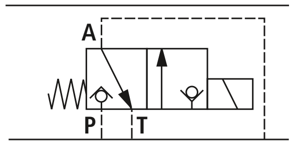
⊿ Standard nozzle – is not shown in the type designation
⊿ Nozzle possible; indicate, if required

For ordering codes for nozzles, see page 14 and 15.

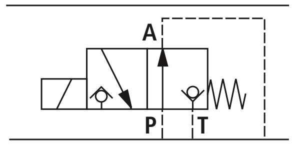
M-3SEW 10 C../420…



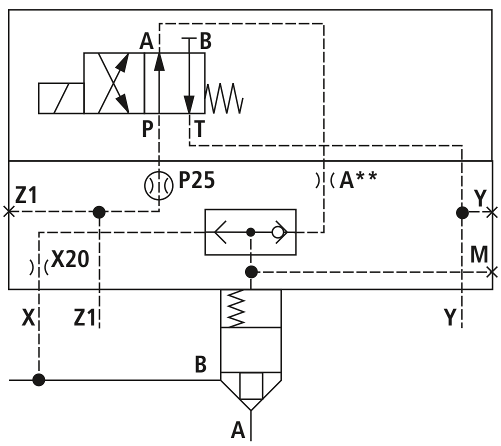
M-3SED 10 CK../350…



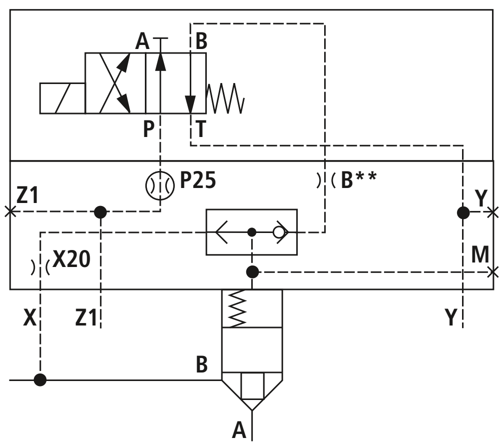
M-3SED 10 UK../350…
M-3SEW 10 U../420…



LFA . KWA…
sizes 80 and 100
(with directional spool valve type 4WE 10 D…)

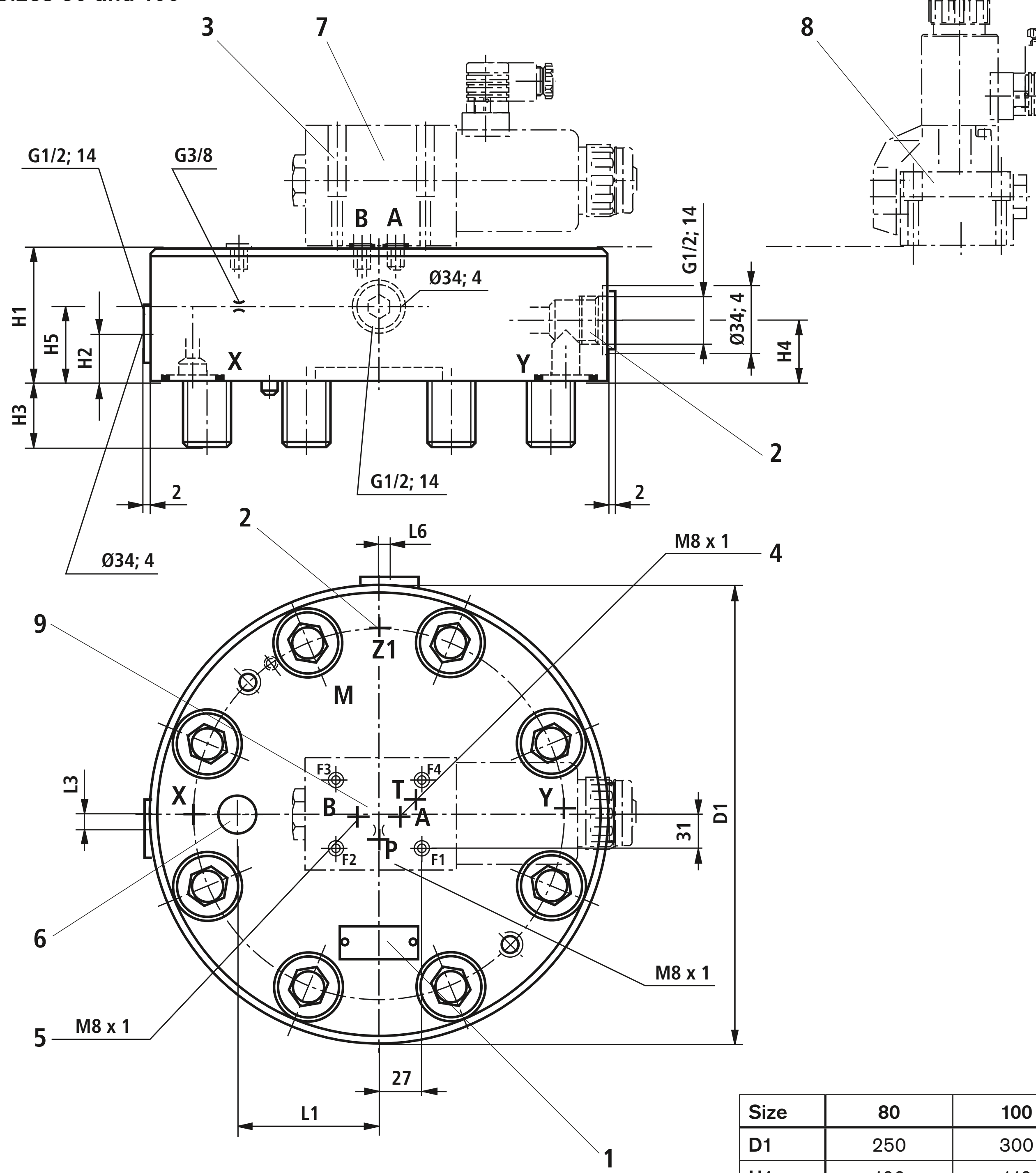


LFA . KWB…
sizes 80 and 100
(with directional spool valve type 4WE 10 D…)



Control cover for mounting a directional spool or poppet valve: Type ..KWA…, ..KWB…
(nominal dimensions in mm)

Sizes 80 and 100



1 Nameplate
2 Ports Y and Z1 optionally as threaded connection
3 Valve fixing screws are included in the control cover‘s scope of supply
4 Plug screw ..KWB…
5 Plug screw ..KWA…
6 Shuttle valve
7 Directional spool valve type 4WE 10 D…
8 Directional poppet valve type M-3SEW 10 …
9 Position of ports to ISO 4401-05-04-0-94

Size	80	100
D1	250	300
H1	100	110
H2	19.5	27
H3	45	52.5
H4	60	70
H5	52	62
L1	55	62
L3	6.5	5
L6	6.5	2

Control cover with electrical monitor of the closed position: Type ..E…
(monitoring of the closed position)

Technical data and notes are valid for all listed control covers with electrical monitor (E, EH2, EWA and EWB).

The contact-free position switch with integrated amplifier switches after having reached the switching position. This position switch offers the following advantages:

– No dynamic seals
– Direct monitoring of the closed position of the valve
– Long service life
– **Control cover and cartridge valve included completely in this type**
– **p_{max} = 400 bar**

Position switch

For connection, functions, pin assignment, see page 66.

⚠ **Caution!**
Outputs of the position switch protected only from load short-circuit.
Prevent short-circuit of the outputs against +24 V.

Sizes 16 to 63

1	2	3	4	5	6	7	8	9	14	17
LFA		E	–7X	/		D	QMG24	F		

Size					
16	25	32	40	50	63
x	x	x	x	x	x

Area ratio *A*1: *A*2
CA = 2:1 [1]
CB = 14.3:1 [2]

Cracking pressure $p_ö$
10 = 1.0 bar
20 = 2.0 bar
40 = 4.0 bar

Nozzle in channel (Ø in 1/10 mm)
X** ◿

No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

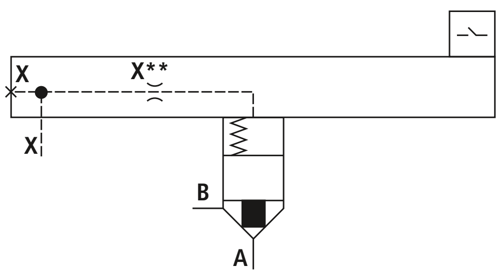
◿ Nozzle possible; indicate, if required

QM = Inductive position switch, see page 66
G24 = 24 V DC voltage

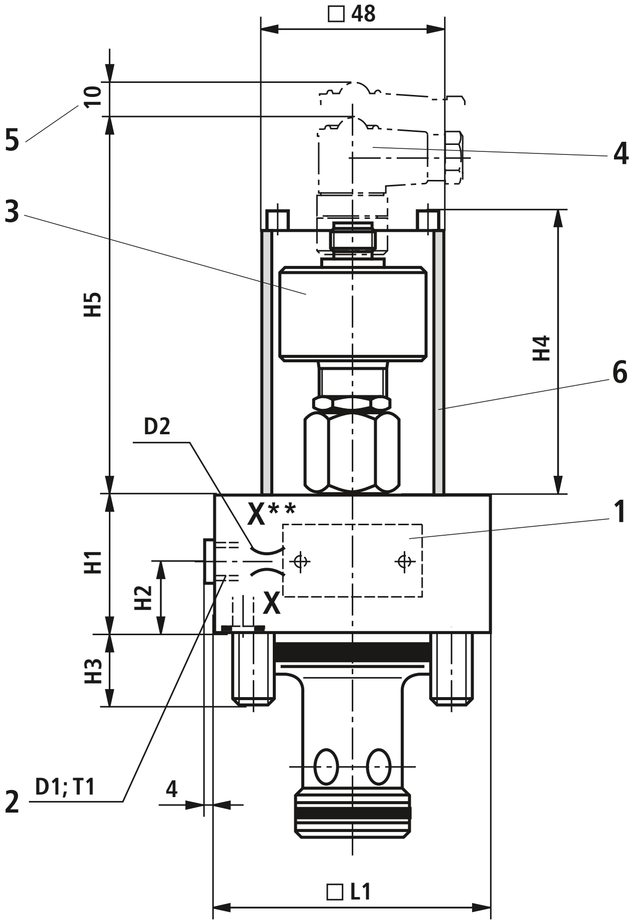
For ordering codes for nozzles, see page 14 and 15.

[1] Annulus area = 50% (standard version)
[2] Annulus area = 7%

LFA . E…
sizes 16 to 63



Control cover with electrical monitor of the closed position: Type ..E… (monitoring of the closed position) (nominal dimensions in mm)



Size	16	25	32	40	50	63
D1	G1/8	G1/4	G1/4	G1/2	G1/2	G3/4
D2	M6	M6	M6	M8 x 1	M8 x 1	M8 x 1
H1	50	50	70	110	120	150
H2	12	16	16	83	93	113
H3	15	24	28	32	34	50
H4	78	78	78	98	98	98
H5	105	105	105	123	123	123
□ L1	65	85	100	125	140	180
T1	8	12	12	14	14	16

1 Nameplate
2 Port X optionally as threaded connection
3 Position switch type QM (included in the type, see page 66)
4 Cable socket Z24 (separate order, see page 66)
5 Space required to remove cable socket
6 Protective cap

Control cover with electrical monitor of the closed position and stroke limiter: Type ..EH2… (monitoring of the closed position)

Sizes 16 to 40

1	2	3	4	5	6	7	8	9	14	17
LFA		EH2	– 7X	/		D	QMG24	F		

Size

16	25	32	40
x	x	x	x

Area ratio *A*1: *A*2
CA = 2:1 1)
CB = 14.3:1 2)

Cracking pressure $p_ö$
10 = 1.0 bar
20 = 2.0 bar
40 = 4.0 bar

Nozzle in channel (Ø in 1/10 mm)
X** ◿

No code = NBR seals
V = FKM seals
(Other seals on enquiry)
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

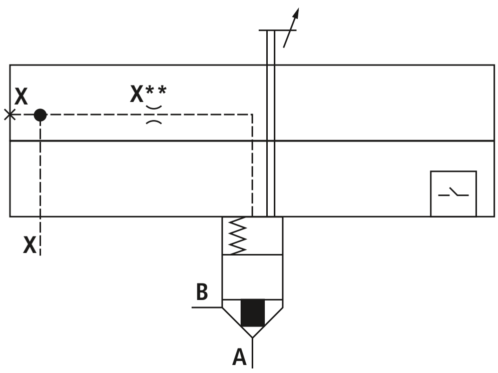
◿ Nozzle possible; indicate, if required

QM = Inductive position switch, see page 66
G24 = 24 V DC voltage

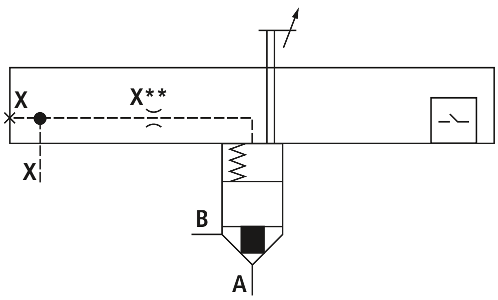
For ordering codes for nozzles, see page 14 and 15.

1) Annulus area = 50% (standard version)
2) Annulus area = 7%

LFA . EH2…
sizes 16 and 32

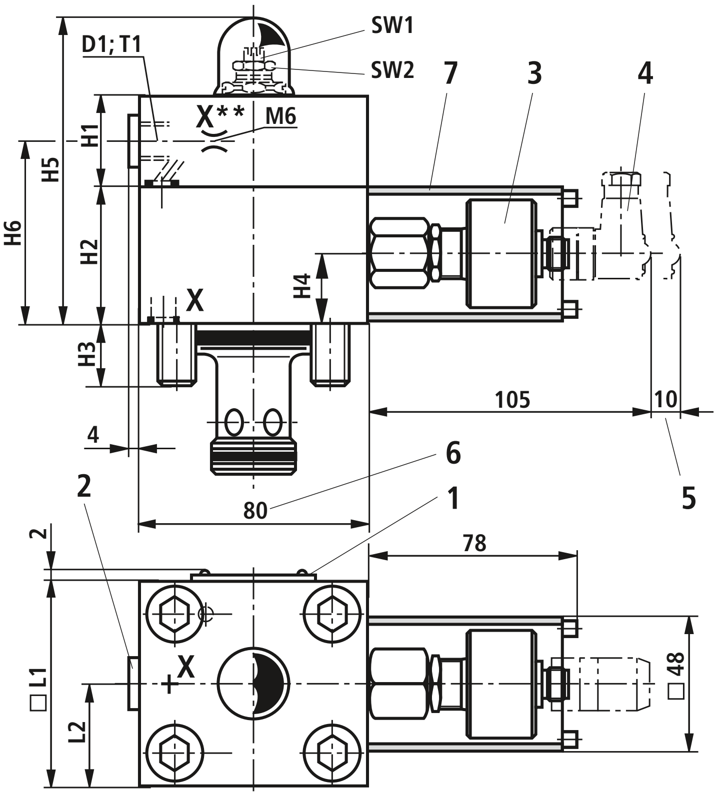


LFA . EH2…
size 40

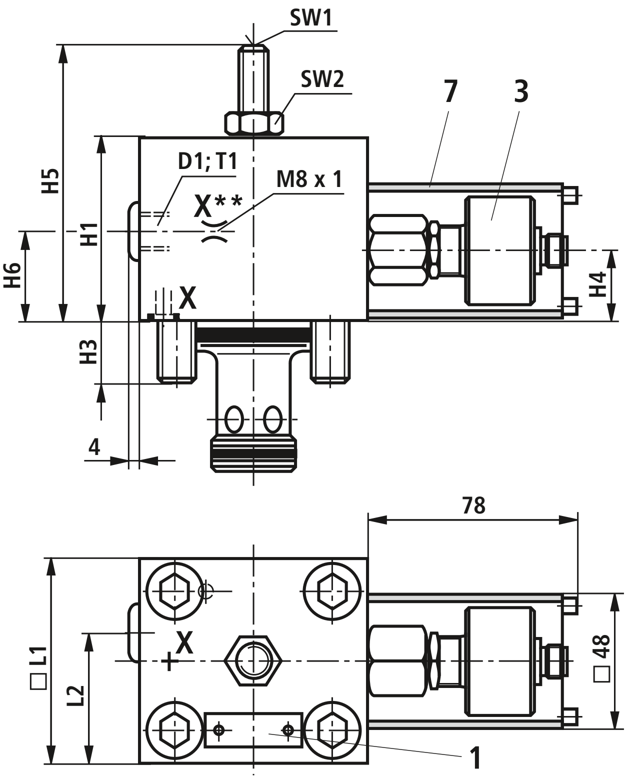


Control cover with electrical monitor of the closed position and stroke limiter: Type ..EH2…
(monitoring of the closed position) (nominal dimensions in mm)

Sizes 16 to 32



Size 40



Size	16	25	32	40
D1	G1/8	G1/4	G1/4	G1/2
H1	35	40	50	182
H2	50	50	50	–
H3	15	24	28	32
H4	25	25	25	25
H5	126	130	150 3)	233 3)
H6	62	66	66	88
□ L1	65	85	100	125
L2	32.5	42.5	50	62.5
T1	8	12	12	14
A/F1	6	6	10	14
A/F2	21	21	27	46

3) Maximum dimension

1 Nameplate
2 Port X optionally as threaded connection
3 Position switch type QM (included in type, see page 66)
4 Cable socket Z24 (separate order, see page 66)
5 Space required to remove cable socket
6 For size 16 (lower cover only)
7 Protective cap

Control cover with electrical monitor of the closed position for mounting a directional spool or poppet valve: Type ..EWA…, ..EWB… (monitoring of the closed position)

Sizes 16 to 32

1	2	3	4	5	6	7	8	10	11	12	13	17
LFA		–	7X	/		D	QMG24					

Size 16	Size 25	Size 32	Type
x	x	x	EWA
x	x	x	EWB

Area ratio $A1$: $A2$
CA = 2:1 [1]
CB = 14.3:1 [2]

Cracking pressure $p_{ö}$
10 = 1.0 bar
20 = 2.0 bar
40 = 4.0 bar

Nozzle in channel (Ø in 1/10 mm)

A	B	P	T
A** ⊿		P** ⊿	T** ⊿
	B** ⊿	P** ⊿	T** ⊿

⊿ Nozzle possible; indicate, if required

No code = NBR seals
V = FKM seals
(Other seals on enquiry)

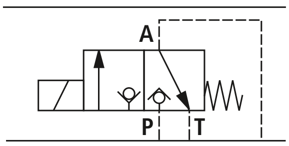
⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

QM = Inductive position switch, see page 66
G24 = 24 V DC voltage

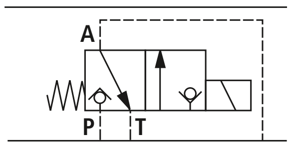
For ordering codes for nozzles, see page 14 and 15.

[1] Annulus area = 50% (standard version)
[2] Annulus area = 7%

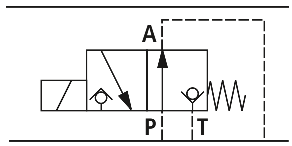
M-3SEW 6 C../420…



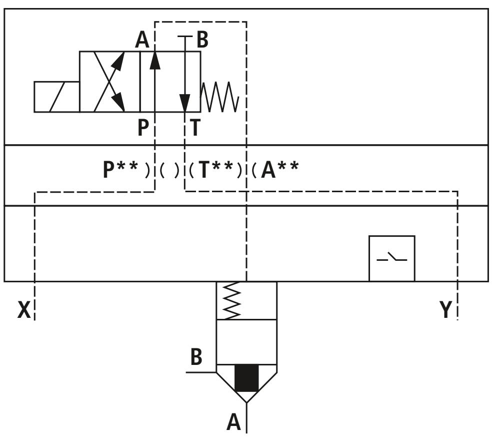
M-3SED 6 CK../350…



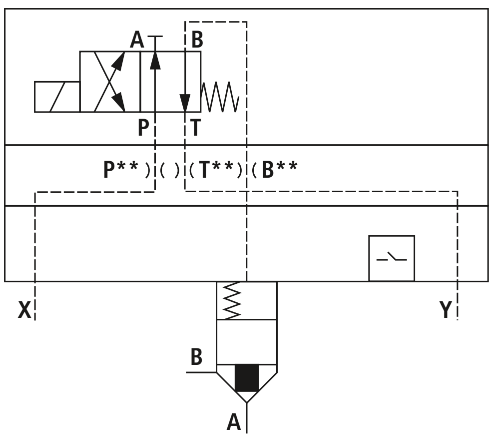
M-3SED 6 UK../350…
M-3SEW 6 U../420…



LFA . EWA…
sizes 16 to 32
(with directional spool valve type 4WE 6 D…)

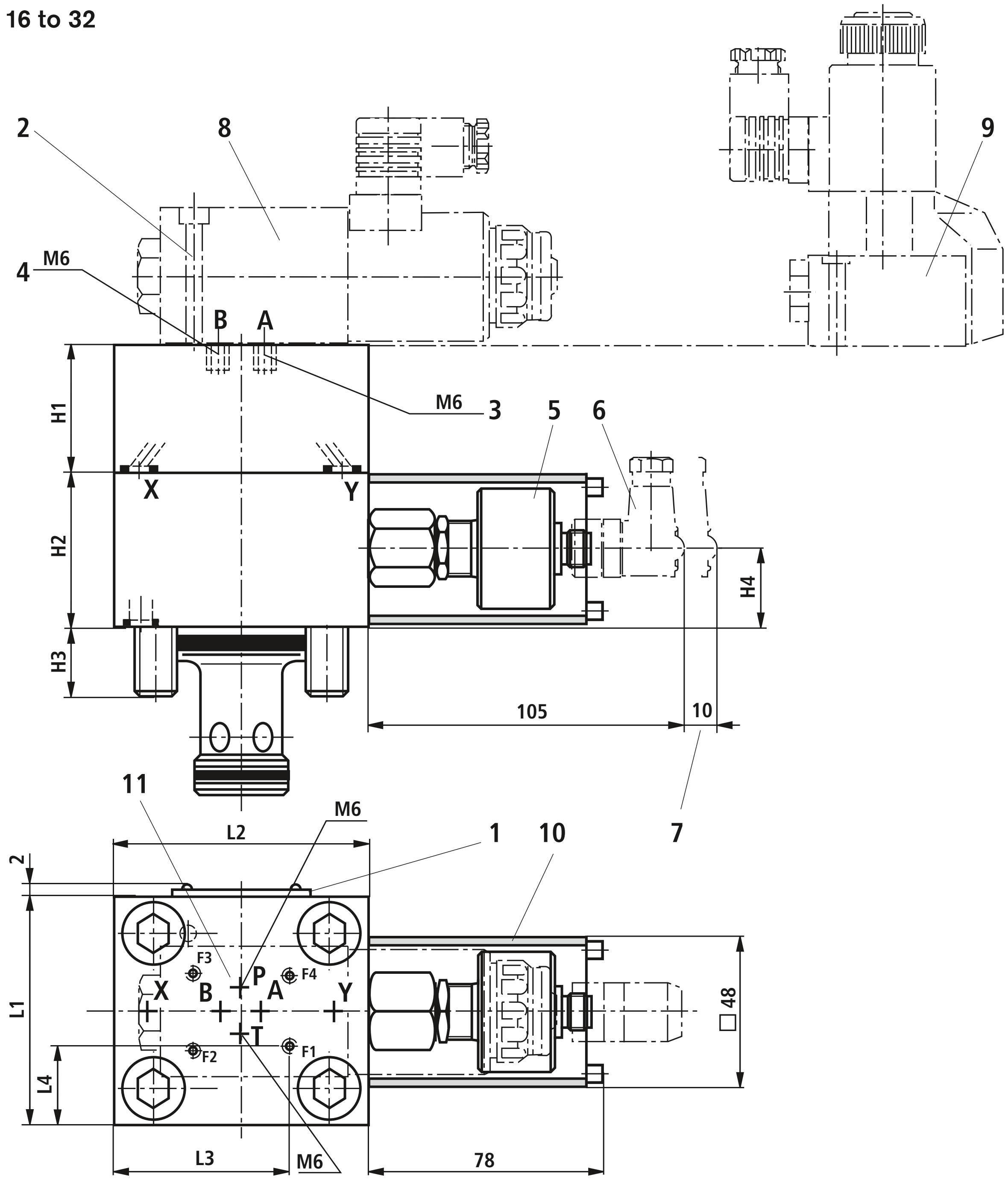


LFA . EWB…
sizes 16 to 32
(with directional spool valve type 4WE 6 D…)



Control cover with electrical monitor of the closed position for mounting a directional spool or poppet valve: Type ..EWA…, ..EWB… (monitoring of the closed position) (nominal dimensions in mm)

Sizes 16 to 32



1 Nameplate

2 Valve fixing screws are included in the control cover's scope of supply

3 Plug screw M6 for type ..EWB...

4 Plug screw M6 for type ..EWA...

5 Position switch type QM (included in type, see page 66)

6 Cable socket Z24 (separate order, see page 66)

7 Space required to remove cable socket

8 Directional spool valve type 4WE 6 D…

9 Directional poppet valve type M-3SEW 6 …

10 Protective cap

11 Position of ports to ISO 4401-03-02-0-94

Size	16	25	32
H1	40	40	50
H2	50	50	50
H3	15	24	28
H4	25	25	25
L1	65	85	100
L2	80	85	100
L3	47.5	64	71 .5
L4	17.25	27.25	34.75

Control cover with electrical monitor of the closed position for mounting a directional spool or poppet valve: Type ..EWA…, ..EWB… (monitoring of the closed position)

Sizes 40 and 50

1	2	3	4	5	6	7	8	10	11	12	13	17
LFA			–7X	/		D	QMG24					

Size 40	Size 50	Type
x	x	EWA
x	x	EWB

Area ratio $A1$: $A2$
CA = 2:1 1)
CB = 14.3:1 2)

Cracking pressure $p_{ö}$
10 = 1.0 bar
20 = 2.0 bar
40 = 4.0 bar

Nozzle in channel (Ø in 1/10 mm)			
A	B	P	T
A** ⊿		P** ⊿	T** ⊿
	B** ⊿	P** ⊿	T** ⊿

No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

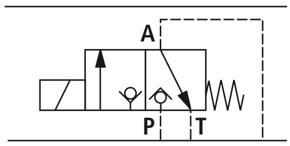
⊿ Nozzle possible; indicate, if required

QM = Inductive position switch, see page 66
G24 = 24 V DC voltage

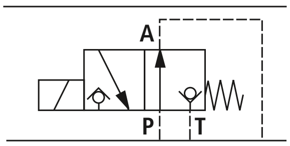
For ordering codes for nozzles, see page 14 and 15.

1) Annulus area = 50% (standard version)
2) Annulus area = 7%

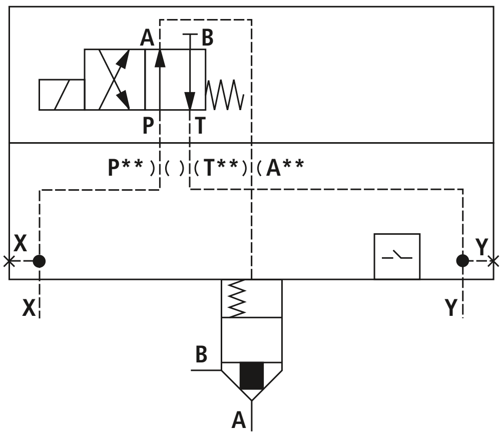
M-3SEW 6 C../420…



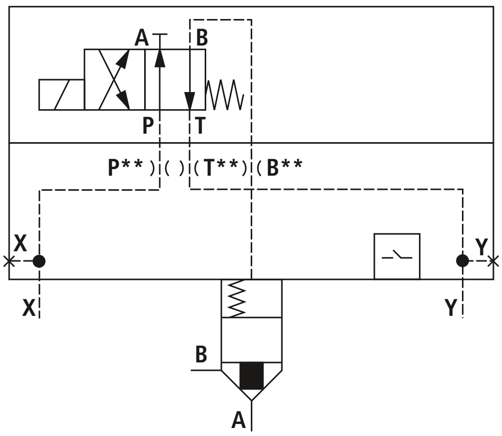
M-3SED 6 UK../350…
M-3SEW 6 U../420…



LFA . EWA…
sizes 40 and 50
(with directional spool valve type 4WE 6 D…)

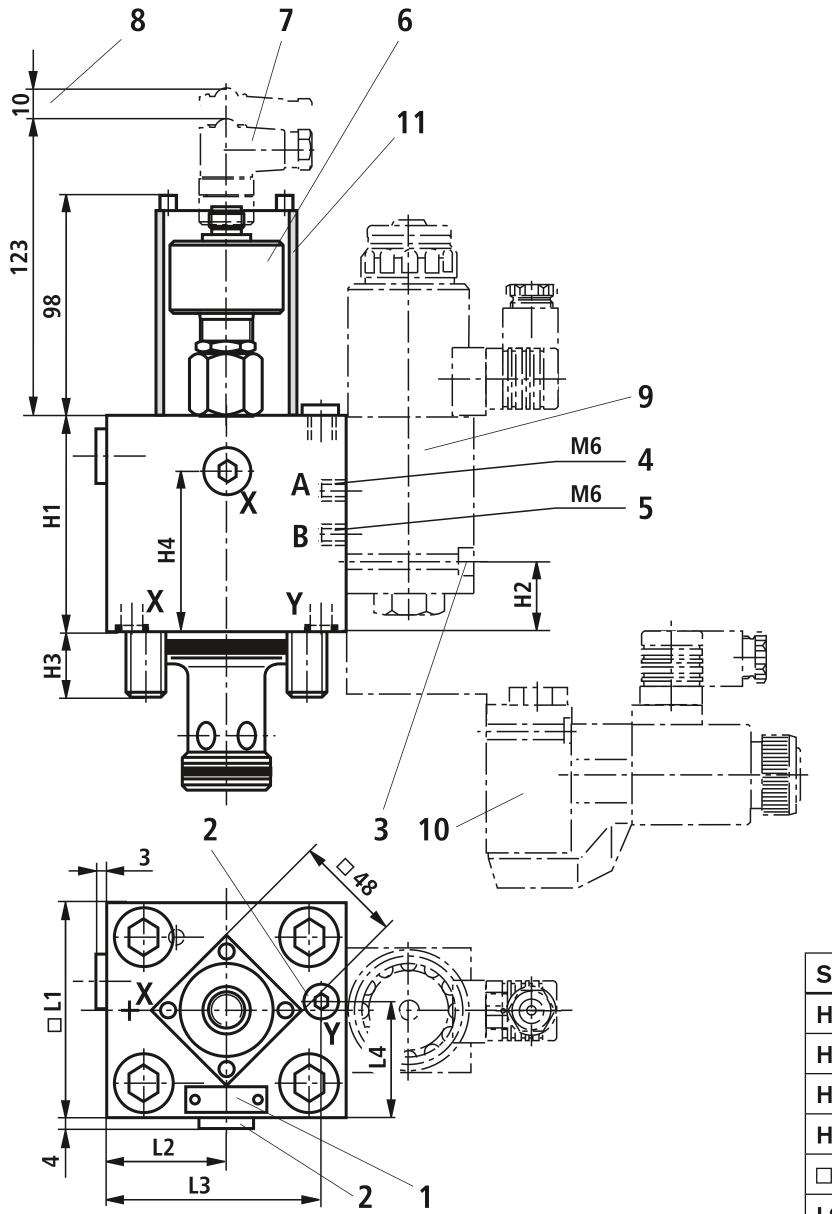


LFA . EWB…
sizes 40 and 50
(with directional spool valve type 4WE 6 D…)



Control cover with electrical monitor of the closed position for mounting a directional spool or poppet valve: Type ..EWA…, ..EWB… (monitoring of the closed position) (nominal dimensions in mm)

Sizes 40 and 50



Size	40	50
H1	110	120
H2	58.5	68
H3	32	34
H4	77.5	87
□ L1	125	140
L2	62.5	70
L3	98.5	113
L4	66.5	70

1 Nameplate
2 Ports X and Y optionally as threaded connection G1/4
3 Valve fixing screws are included in the control cover's scope of supply
4 Plug screw M6 for ..EWB...
5 Plug screw M6 for ..EWA...
6 Position switch type QM (included in type, see page 66)
7 Cable socket Z24 (separate order, see page 66)
8 Space required to remove cable socket
9 Directional spool valve type 4WE 6 D…
10 Directional poppet valve type M-3SEW 6 …
11 Protective cap

Control cover with electrical monitor of the closed position for mounting a directional spool or poppet valve: Type ..EWA…, ..EWB… (monitoring of the closed position)

Size 63

1	2	3	4	5	6	7	8	10	11	12	13	17
LFA	63		–7X	/		D	QMG24					

Type
EWA
EWB

Area ratio $A1$: $A2$
CA = 2:1 [1)]
CB = 14.3:1 [2)]

Cracking pressure $p_{ö}$
10 = 1.0 bar
20 = 2.0 bar
40 = 4.0 bar

Nozzle in channel (Ø in 1/10 mm)

A	B	P	T
A**		P**	T**
	B**	P**	T**

No code = NBR seals
V = FKM seals
(Other seals on enquiry)

⚠ **Caution!**
Observe compatibility of seals with hydraulic fluid used!

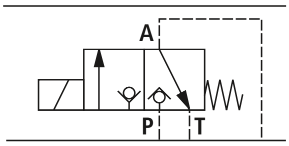
◿ Nozzle possible; indicate, if required

QM = Inductive position switch, see page 66
G24 = 24 V DC voltage

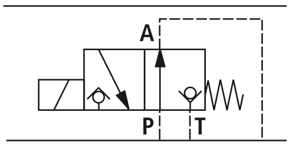
For ordering codes for nozzles, see page 14 and 15.

1) Annulus area = 50% (standard version)
2) Annulus area = 7%

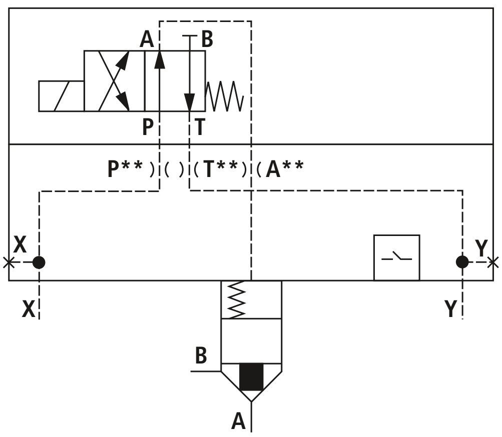
M-3SEW 10 C../420…



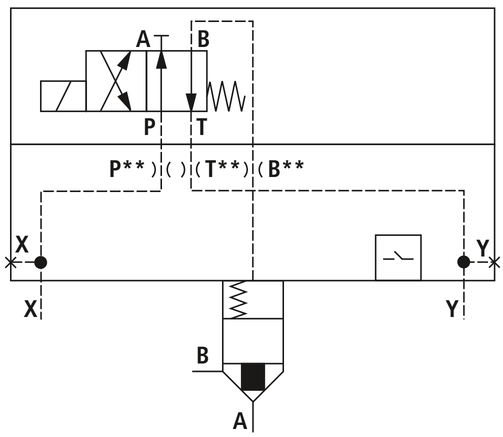
M-3SED 10 UK../350…
M-3SEW 10 U../420…



LFA 63 EWA…
(with directional spool valve type 4WE 10 D…)

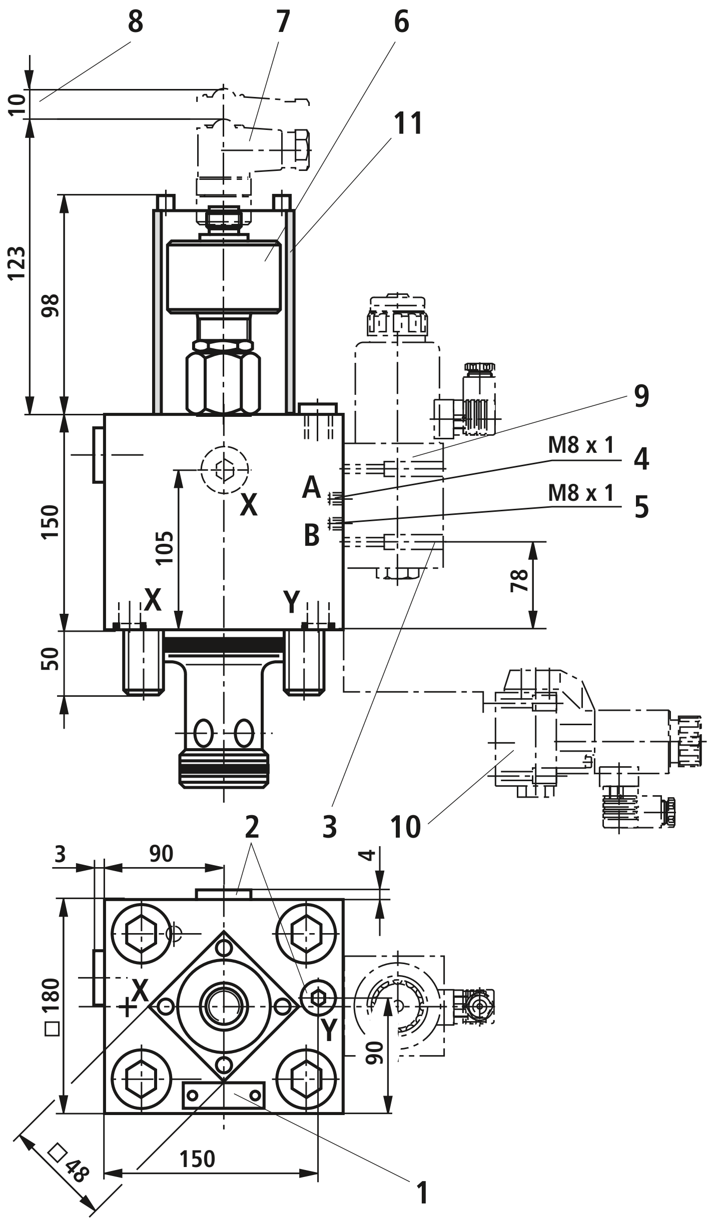


LFA 63 EWB…
(with directional spool valve type 4WE 10 D…)



Control cover with electrical monitor of the closed position for mounting a directional spool or poppet valve: Type ..EWA…, ..EWB… (monitoring of the closed position) (nominal dimensions in mm)

Size 63



1 Nameplate

2 Ports X and Y optionally as threaded connection G1/2

3 Valve fixing screws are included in the control cover's scope of supply

4 Plug screw M8 x 1 for ..EWB...

5 Plug screw M8 x 1 for ..EWA...

6 Position switch type QM (included in type, see page 66)

7 Cable socket Z24 (separate order, see page 66)

8 Space required to remove cable socket

9 Directional spool valve type 4WE 10 D…

10 Directional poppet valve type M-3SEW 10 …

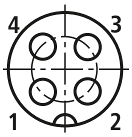
11 Protective cap

Inductive position switch type QM, electrical connection

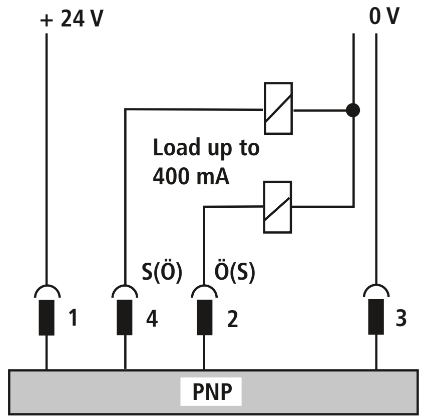
The electrical connection is made by means of a 4-pin cable socket with threaded connection M12 x 1 .

The cable socket must be ordered separately (see below).

Operating voltage	24 V DC voltage + 20 % / – 10 % (Residual ripple content < 10%)
Current consumption:	Maximum 40 mA
Load-carrying capacity of outputs :	400 mA (output to PNP 24 V =)
Temperature range:	–20° C to +80° C
Pin assignment:	**1:** +24V **2:** Normally-closed (low-resistance–high-resistance) **3:** 0 V **4:** Normally-open (high-resistance–low-resistance)



Plug-in contacts on position switch



Inductive position switch type QM can be a normally-closed or normally-open contact.

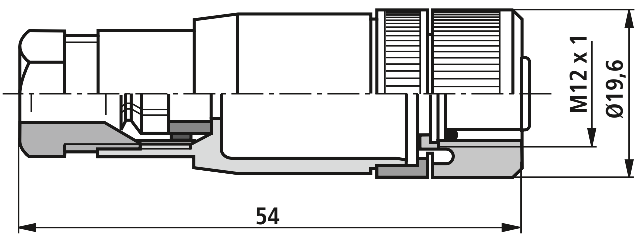
⚠ **Caution!**

The position switch is not provided with a protective conductor connection!

Cable socket for inductive position switch type QM, separate order (nominal dimensions in mm)

Cable socket Z24, 4-pin, M12 x 1
with threaded connection, cable gland Pg 9.

Material no. **R900031155**

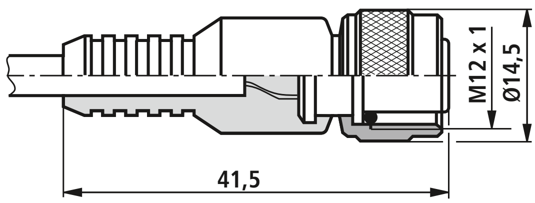


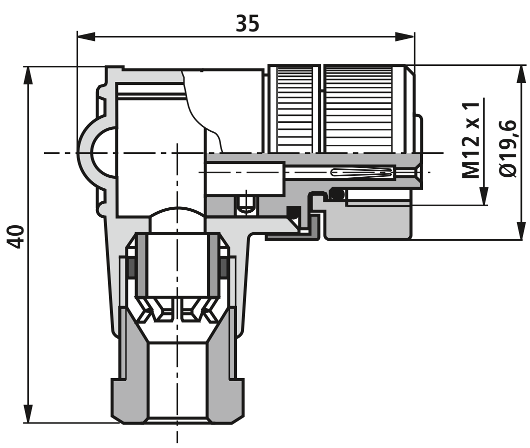
Cable socket Z24-3m, 4-pin, M12 x 1
with moulded-on PVC cable, 3m long.

Cable cross-section: 4 x 0.34 mm^2

Wire identification:
1: brown
2: white
3: blue
4: black

Material no. **R900064381**





Cable socket Z24 – angled, 4-pin, M12 x 1
with threaded connection, cable gland Pg 9, angled.

Housing can be rotated through 4 x 90° in relation to the contact insert.

Material no. **R900082899**

Notes

Notes

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Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

The Drive & Control Company

Rexroth
Bosch Group

2-way cartridge valve, actively controllable

Type LC2A

RE 21040
Edition: 2013-06
Replaces: 11.10

H7697+7694

- Size 16 ... 100
- Component series 1X
- Maximum operating pressure 420 bar
- Flow up to 12500 l/min (***Δp*** = 10 bar)

Features

- Actively controllable 2/2 directional cartridge valve ("two-level active logics")
- Installation bore according to ISO 7368
- Functional diversity due to the installation of standard logic covers type LFA
- "Passive logic" function possible
- Variable assignment of the pilot oil channels to the active area
- Adjustment-free position switch type Q7
- Redundant spool position monitoring, optional
- Position signal open, optional
- Switching time-optimized check valve function, on request

Contents

Ordering code

01	02	03	04	05	06		07		08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
LC	**2A**					**–**	**1X**	**/**																*

01	Logic Cartridge	**LC**

02	2-level, active	**2A**

03	Size 16	**016**
	Size 25	**025**
	Size 32	**032**
	Size 40	**040**
	Size 50	**050**
	Size 63	**063**
	Size 80	**080**
	Size 100	**100**

Spool design (for area ratio see section on page 6)

04	$A_1 : A_2$ = 2 : 1 (A_2 = 50%)	**A**
	$A_1 : A_2$ = 14.3 : 1 (A_2 = 7%)	**B**
	$A_1 : A_2$ = 1 : 0 (A_2 = 0%)	**D**

05	**Without** spring	**00**
	With spring, cracking pressure approx. 4 bar (relating to spool design "A")	**40**

06	Valve poppet **without** damping nose	**E**
	Valve poppet **with** damping nose	**D**
	Valve poppet **with** overlap	**F**

07	Component series 10 to 19 (10 to 19: Unchanged installation and connection dimensions)	**1X**

Active area [1)] connected to port:

08	Z1	**Z1**
	Z2	**Z2**
	Z1 and Z2	**U**
	X	**X**
	Y	**Y**

Spool position monitoring [2)] (position switch 1 = "1"; position switch 2 = "2")

09	**– Position monitoring "closed"**	
	Without position switch (standard version; "1" can be retrofitted on side "Y")	**no code**
	With 1 position switch (standard version; "1" mounted on side "Y")	**Q7**
	With 2 position switches ("1" mounted on side "Y", installation side of "2" depending on size)	**Q7Q7**
	With 1 position switch and second installation bore (installation side of "1" depending on size, side of "2" is "Y")	**Q.Q7**
	Without position switch, with 2 installation bores (installation side of "1" is "Y", of "2" depending on size)	**Q.Q.**
	– Position monitoring "open" [3)]	
	Without position switch (standard version; "1" can be retrofitted on side "Y")	**Q.T**
	With 1 position switch (standard version; "1" mounted on side "Y")	**Q7T**
	– Combined position monitoring "1" (closed) and "2" (open) [3)]	
	With 2 position switches (installation side of "1" is "Y", side of "2" depending on size)	**Q7Q7T**
	Without position switch, with 2 installation bores (installation side of "1" is "Y", of "2" depending on size)	**Q.Q.T**
	With 1 position switch and second installation bore (installation side of "1" is "Y", side of "2" depending on size)	**Q.Q7T**
	– Position monitoring "closed"; NAMUR [4)]	
	With 1 position switch (special version; "1" mounted on side "Y")	**Q8**
	– Analog, position sensing	
	Analog sensor, voltage output (additional information upon request)	**Q9**

Ordering code

01	02	03	04	05	06		07		08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
LC	2A					–	1X	/																*

Electrical connection for position switch [5)]

10	**Without** position switch	**no code**
	U_B = 24 V DC (standard; only with version "Q7")	**G24**
	U_B = 8 V DC (NAMUR; only with version "Q8")	**G08**

Pilot oil bore in the control spool [6)]

11	**Without** pilot oil bore	**no code**
	– Pilot oil bore A → F (only size 25 to 100)	
	Size 25 – Maximum pilot oil bore Ø 10.0 mm	**A100**
	Size 32 – Maximum pilot oil bore Ø 13.0 mm	**A130**
	Size 40 – Maximum pilot oil bore Ø 16.0 mm	**A160**
	Size 50 – Maximum pilot oil bore Ø 20.0 mm	**A200**
	Size 63 – Maximum pilot oil bore Ø 26.0 mm	**A260**
	Size 80 – Maximum pilot oil bore Ø 32.0 mm	**A320**
	Size 100 – Maximum pilot oil bore Ø 40.0 mm	**A400**

Orifice fitting [7)]

12	**Without** orifice	**no code**
	With orifice in channel X – top	**X****
13	**Without** orifice	**no code**
	With orifice in channel F – to the active area	**F****
14	**Without** orifice	**no code**
	With orifice in channel Z1 – bottom (not with version "X" and "Y")	**D****
15	**Without** orifice	**no code**
	With orifice in channel Z1 – top	**Z****
16	**Without** orifice	**no code**
	With orifice in channel Y – top	**Y****
17	**Without** orifice	**no code**
	With orifice in channel Z2 – bottom (not with version "X" and "Y")	**S****
18	**Without** orifice	**no code**
	With orifice in channel Z2 – top	**W****
19	**Without** orifice	**no code**
	With orifice in channel X – bottom (not with version "Z1", "Z2" and "U")	**H****
20	**Without** orifice	**no code**
	With orifice in channel Y – bottom (not with version "Z1", "Z2" and "U")	**L****

Corrosion resistance housing (outside)

21	None	**no code**
	Galvanic coating DIN 50979 – Fe//Zn8//Cn//T0 (thick film passivation)	**J50**

Seal material [8)]

22	FKM seals (other seals upon request)	**F**
23	Further details in the plain text	

Footnotes see page 4

Ordering code

1) Due to the construction, the active area (***A***$_4$) can always only be combined with one of the two pilot oil pairs "Z1/Z2" or "X/Y". Any subsequent change from "Z1/Z2" to "X/Y" is not possible.

2) Recommendation: Version "D" (valve poppet with damping nose); BG certificate only valid for this version (see page 24).

3) Not for sizes 16, 25 and 32.

4) Only with version "G08". Analysis electronics designed and approved of for NAMUR are commercially available.

5) Mating connectors, separate order, see page 25.

6) Only with type LC2A . D40E-1X/... for "check valve function"; the maximum pilot oil bore Ø has been determined depending on the size.

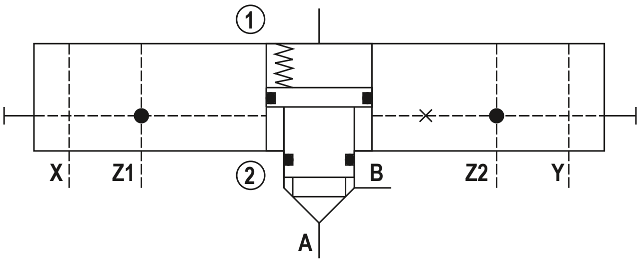
7) Order example: ** = dimension in mm x 10
– e.g. orifice Ø1.2 mm in channel X – top = **"X12"**
or as blanking plug: Ordering code "99"
– e.g. blanking plug in channel Z2 – top = **"W99"**

8) The selection of the seal material depends on the operating parameters (fluid, temperature, etc.).

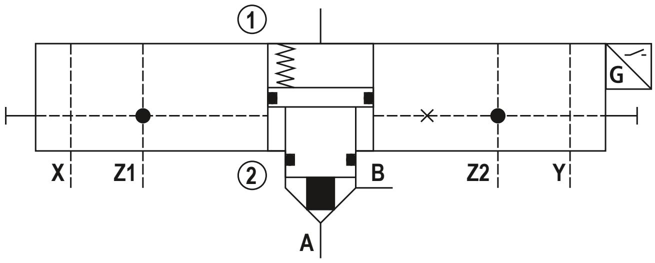
Symbols (① = component side, ② = plate side)

Examples for spool forms and circuitries of the active area

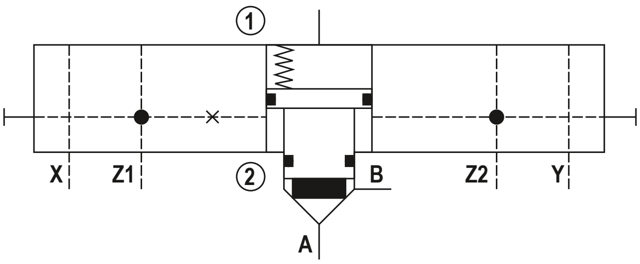
Type LC2A . B40E-1X/Z1...



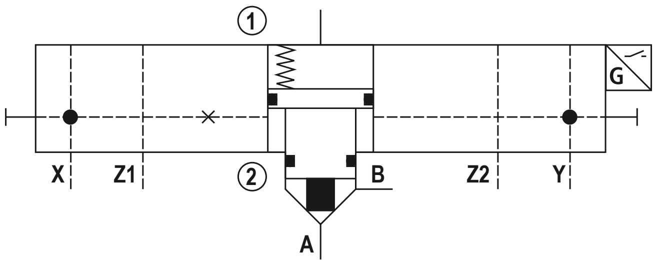
Type LC2A . A40D-1X/Z1Q7G24...



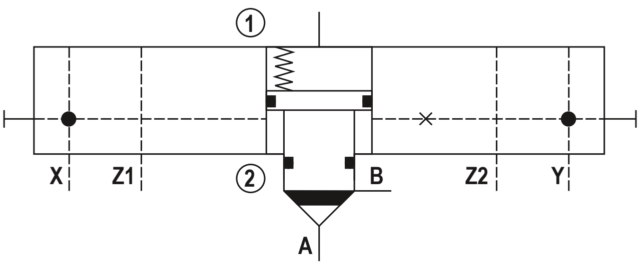
Type LC2A . B40D-1X/Z2...



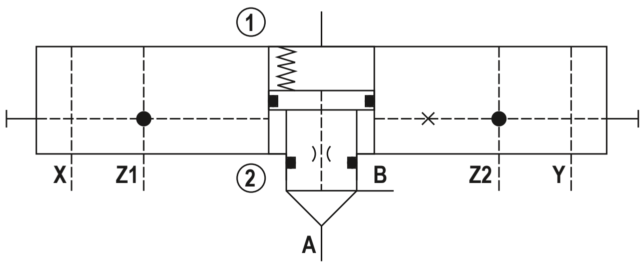
Type LC2A . A40D-1X/YQ7G24...



Type LC2A . D40D-1X/X...

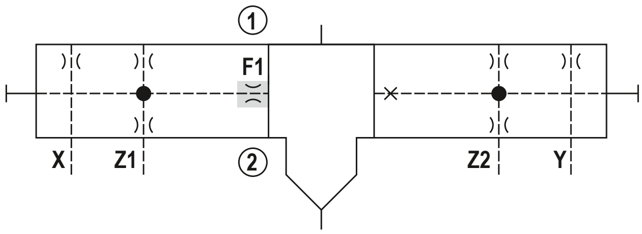


Type LC2A . D40E-1X/Z1..A...

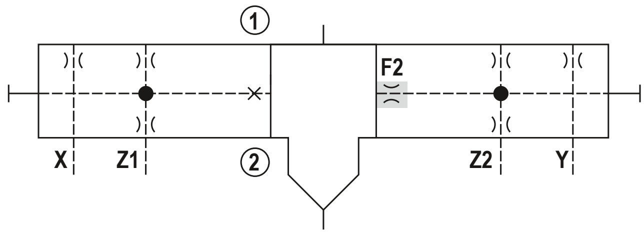


Assignment of the "active area" A_4 (① = component side, ② = plate side)

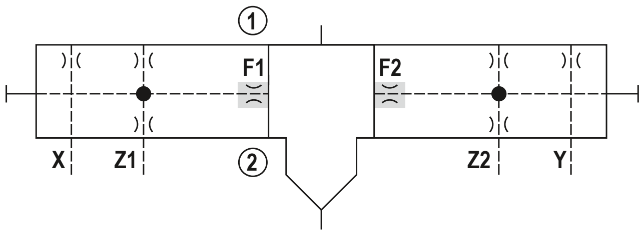
Type LC2A ...-1X/Z1... (F1 not fitted)



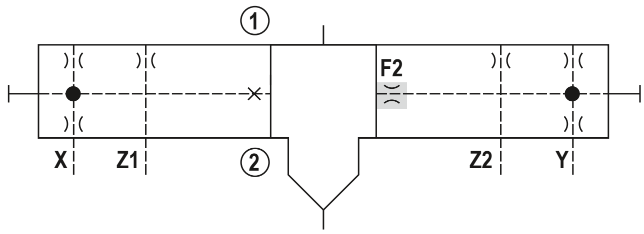
Type LC2A ...-1X/Z2 ... (F2 not fitted)



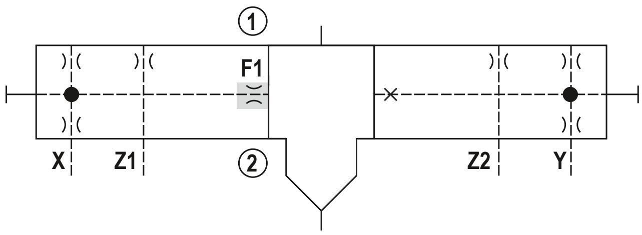
Type LC2A ...-1X/U ... (F1 and F2 not fitted)



Type LC2A ...-1X/Y ... (F2 not fitted)



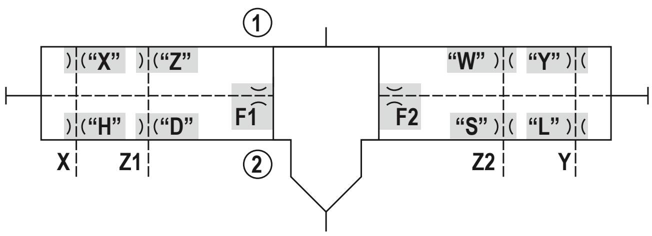
Type LC2A ...-1X/X ... (F1 not fitted)



For details regarding the "open" or "closed" circuitry of channels F1 and F2 (control of the active area) refer to the "Dimensions" page 13 to 16 and "Ordering code" page 2 and 3.
Depending on the "active area" ordering code, the number of possible orifice fittings is different in the continuous pilot oil guides, see "Orifice assignments" below.

Orifice assignment (① = component side, ② = plate side)

Orifice fitting of the pilot oil guides in the cover



The fitting and assignment of the "active area" is not shown here (see "Assignment of the active area" above)

For details on the dimensions of the orifice installation bores "X" to "L", see "Dimensions" page 13 to 16.
On the component side, the orifice installation bores are always completely available; on the plate side, only the combinations of versions "H" and "L" or "D" and "S" are possible, see "Ordering code" page 2 and 3.

Function, section

General

The 2-way cartridge valves type LC2A (hereinafter referred to as "active logics" (2)) are designed as modular elements in compact block design and basically consist of cartridge (control spool (3) and socket (4)), the intermediate cover (5) as fixed functional unit and a control cover type LFA (1) that is part of the Rexroth standard logics program. This control cover (separate order, see data sheet 21010 or 21050) establishes the connection with the pilot control valves and/or other hydraulic elements and thus integrates the most different functions - irrespective of the basic assembly. Virtually all standard and special control covers type LFA can be mounted; thus, the active logics program can be limited to a few versions.
Optionally, the active logics (2) is available with a position switch (6). By default, the "closed" position of the control spool (3) is recorded. The receiving hole for the position switch is provided as a standard. This means that the position switch "Q7" can be retrofitted at any time without requiring adjustments.
In contrast to the logic assemblies with only one control area in the spring chamber ("passive logics"), the name "active logics" significantly stands for a version with differential spool, with at least one additional control area $\boldsymbol{A}_4$ ("two-level active logics"). This area allows for the opening and keeping open of the active logics (2) by means of pilot pressure (without the necessity of pressure in the main ports A or B).
The spring chamber area $\boldsymbol{A}_5$ of the control spool (3) consists of the individual areas $\mathbf{A}_1 + \boldsymbol{A}_2 + \boldsymbol{A}_4$. Compared to passive logics without control area $\boldsymbol{A}_4$, this results in excess area which, with suitable hydraulic circuitry, offers advantages during closing and keeping closed (excessive force, closing velocity).

In general

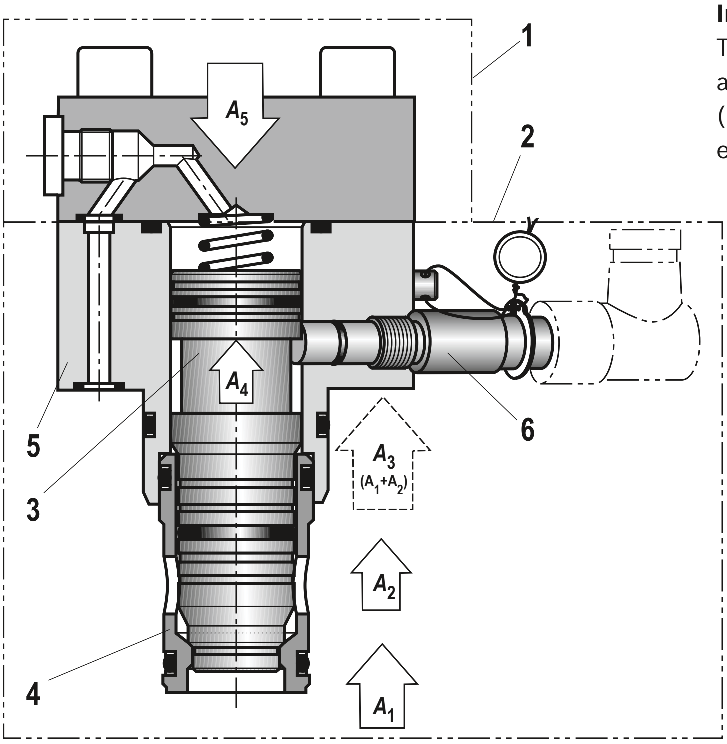
Area total $\boldsymbol{A}_5 = \boldsymbol{A}_1 + \boldsymbol{A}_2 + \boldsymbol{A}_4 = \boldsymbol{A}_3 + \boldsymbol{A}_4$
The areas $\boldsymbol{A}_1$, $\boldsymbol{A}_2$ and $\boldsymbol{A}_4$ are effective in the opening direction, area $\boldsymbol{A}_5$ (and the spring force) in closing direction. So the resulting effective force determines the position and movement of the control spool (3). Usually, there are no interim positions in the directional function versions. The direction of flow is free and can thus be perfectly adjusted to the application.
Active logics type LC2A are generally equipped with spool sealing and are therefore leakage-free inside. The seat area is hydraulically "tight".

Active logics for directional function

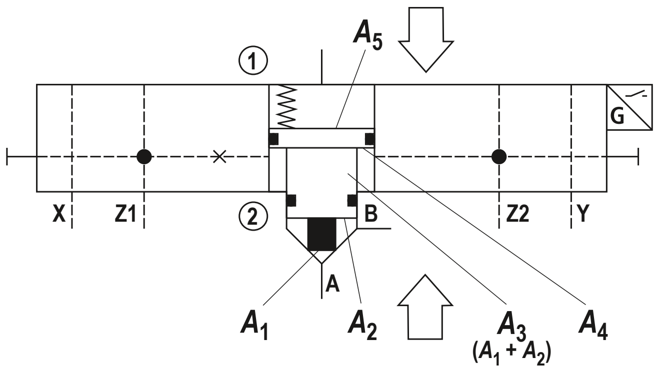
Depending on the task, different control spool versions are possible. The active area can be connected with the available pilot oil guides in almost any way and in this way, most different functions can be realized with only 1 basic assembly.

Installation bore

The active logics type LC2A can be directly installed in a standard installation bore according to ISO 7368 (see page 19). Thus, it is also suitable as retrofitting for existing "passive logics" that must be leakage-free inside or require position monitoring.



Type LC2A 025 ...-1X/.Q7G24... (with control cover type LFA . D... and monitoring of the closed position of the valve poppet)



Technical data
(for applications outside these parameters, please consult us!)

general		
Ambient temperature range	°C	–20 ... +80
MTTFd values according to EN ISO 13849	Years	150 (for further details see data sheet 08012)

hydraulic		
Maximum operating pressure	bar	420 (500 bar on request)
Maximum flow	l/min	12500 (for size 100, see characteristic curves page 9 and 11)
Hydraulic fluid		See table below
Hydraulic fluid temperature range (at the valve working ports)	°C	–20 ... +80
Viscosity range	mm^2/s	2.8 ... 500
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1]

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils		HL, HLP, HVLP	FKM, NBR [2]	DIN 51524
Bio-degradable	– insoluble in water	HETG	FKM, NBR [2]	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR [2]	ISO 12922

☞ **Important information on hydraulic fluids!**

- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.

- **Flame-resistant – containing water**:
  – Maximum pressure difference per control edge 175 bar
  – Pressure pre-loading at the tank port >20% of the pressure differential, otherwise increased cavitation
  – Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter.

[2] Upon request

Technical data
(for applications outside these parameters, please consult us!)

Size of the annulus area

Area in cm²	**Type**	**Size** 16	25	32	40	50	63	80	100
$\boldsymbol{A}_1$	LC2A . A...	1.89	4.26	6.79	11.1	19.63	30.2	37.9	63.6
	LC2A . B...	2.66	5.73	9.51	15.55	26.42	41.28	52.8	89.1
	LC2A . D...	2.84	6.16	10.18	16.62	28.27	44.2	56.74	95.0
$\boldsymbol{A}_2$	LC2A . A...	0.95	1.89	3.39	5.52	8.64	14.0	18.84	31.4
	LC2A . B...	0.18	0.43	0.67	1.07	1.85	2.90	3.94	5.9
	LC2A . D...	–	–	–	–	–	–	–	–
$\boldsymbol{A}_3$	LC2A . A/B/D...	2.84	6.16	10.18	16.62	28.27	44.2	56.74	95.0
$\boldsymbol{A}_4$		0.62	1.39	2.39	3.81	5.94	8.75	11.2	19.1
$\boldsymbol{A}_5$		3.46	7.55	12.6	20.4	34.2	52.8	67.9	114.0
Area ratio $\boldsymbol{A}_5 : \boldsymbol{A}_4$ 3)		5.58	5.43	5.27	5.35	5.76	6.03	6.06	5.92

3) When determining the orifice diameters for influencing the switching time, please observe the area ratio $\boldsymbol{A}_5 : \boldsymbol{A}_4$ (inflowing and outflowing hydraulic fluid in the control chambers $\boldsymbol{A}_5$ and $\boldsymbol{A}_4$)
In case of non-compliance there may be pressure pressure intensification!

Spool form (damping nose)

		Type	**Size** 16	25	32	40	50	63	80	100
Stroke	cm	LC2A . ..E...	0.9	1.17	1.4	1.7	2.1	2.3	2.4	3.0
		LC2A . ..D...	0.9	1.17	1.4	1.9	2.3	2.8	3.0	3.8
		LC2A . ..F...	0.9	1.17	1.4	1.9	2.3	2.8	3.0	3.8
Pilot volume	cm³	LC2A . ..E...	3.1	8.8	17.6	34.7	71.8	121.4	163.0	339.0
		LC2A . ..D...	3.1	8.8	17.6	38.8	78.7	147.8	203.7	429.4
		LC2A . ..F...	3.1	8.8	17.6	38.8	78.7	147.8	203.7	429.4
Theoretical pilot flow 4)	l/min	LC2A . ..E...	3.7	10.6	21.1	41.6	86.6	145.7	195.6	406.8
		LC2A . ..D...	3.7	10.6	21.1	46.6	94.4	177.4	244.4	515.3
		LC2A . ..F...	3.7	10.6	21.1	46.6	94.4	177.4	244.4	515.3
Weight	kg	LC2A ...	2.2	2.6	3.9	10.3	16.5	30.5	52.5	92.0

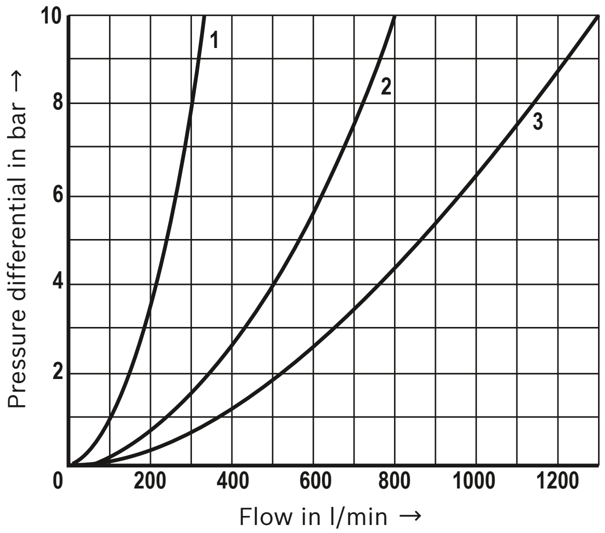
Cracking pressure in bar

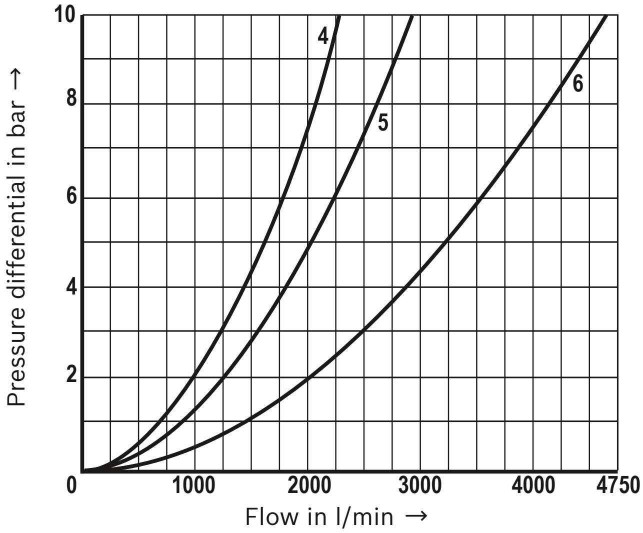
Direction of flow A to B 5)	LC2A . A...	3.50	3.90	3.80	4.0	4.11	3.8	3.13	3.04
	LC2A . B...	2.48	2.90	2.70	2.86	3.05	2.8	2.25	2.17
Direction of flow B to A 5)	LC2A . A...	6.96	8.74	7.6	8.05	9.34	8.15	6.3	6.2
	LC2A . B...	36.6	38.3	38.6	41.5	43.6	39.4	30.2	32.5
Control open with active area	Version "40"	> 30							
	Without spring	> 12							

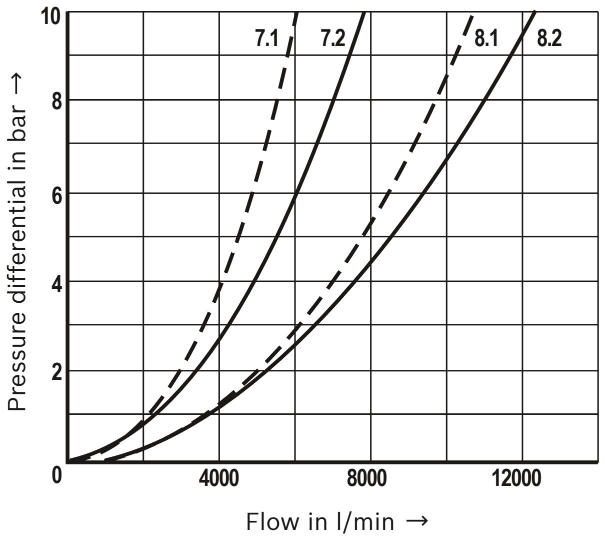
4) Quantity indications refer to a theoretical switching time of $\boldsymbol{t}$ = 50 ms (control chamber $\boldsymbol{A}_5$)

5) With direction of flow B → A, the control spool version "D" ("0%") has no immediately effective control open area ($\boldsymbol{A}_2$ = 0). For this direction of flow, the active area is to be controlled. We recommend a minimum pressure of 30 bar. The cracking pressure of the control spool version "D" almost corresponds to version "B" (A → B)

Characteristic curves: Without damping nose "E"
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)



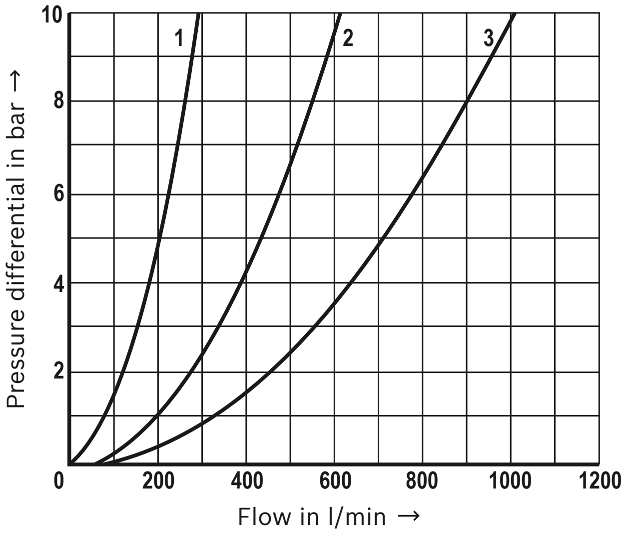


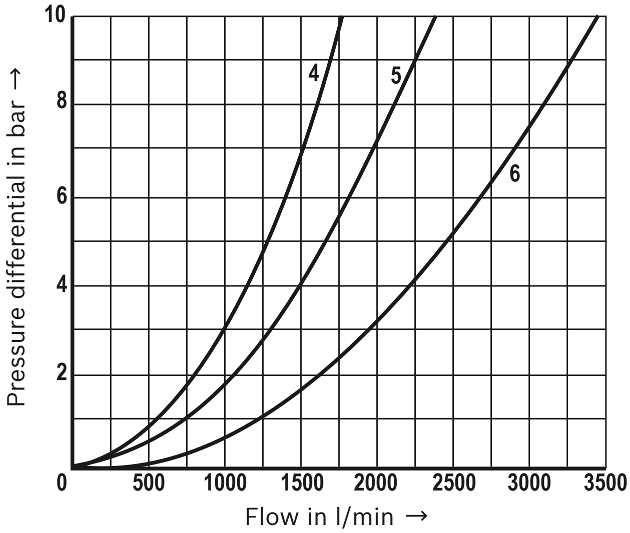


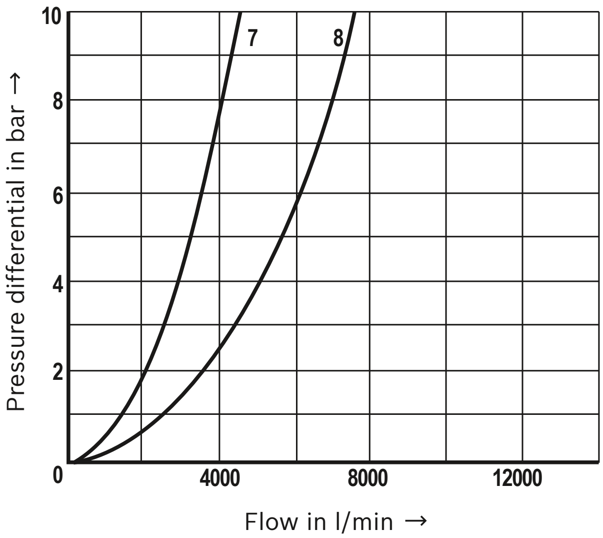
1	Size 16
2	Size 25
3	Size 32
4	Size 40
5	Size 50
6	Size 63
7.1	Size 80, spool design "A"
7.2	Size 80, spool design "B" and "D"
8.1	Size 100, spool design "A"
8.2	Size 100, spool design "B" and "D"

☞ **Notice!**
The indicated characteristic curves have been determined without inserted springs and show average values with regard to the two possible directions of flow.

Characteristic curves: With damping nose "D"
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)



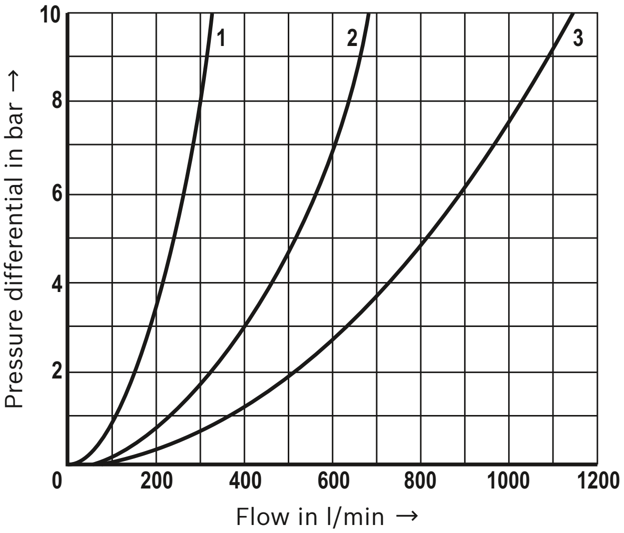


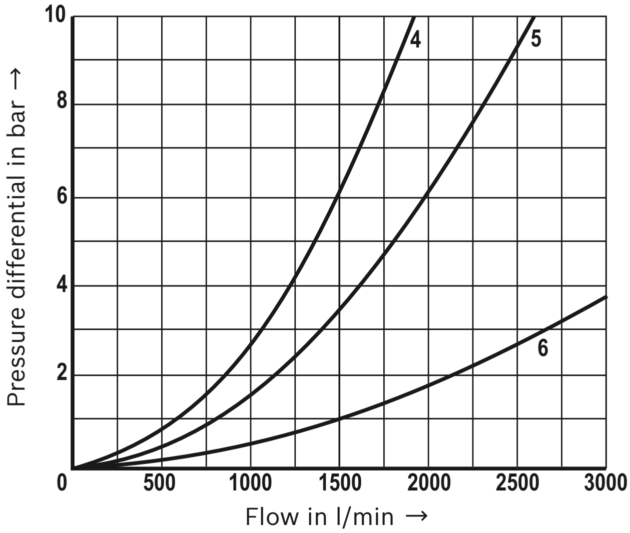


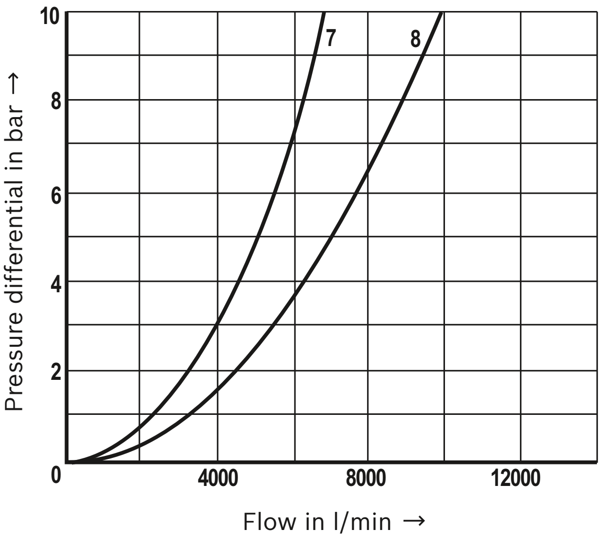
1 Size 16
2 Size 25
3 Size 32
4 Size 40
5 Size 50
6 Size 63
7 Size 80
8 Size 100

Notice!
The indicated characteristic curves have been determined without inserted springs and show average values with regard to the two possible directions of flow.

Characteristic curves: With overlap "F"
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)



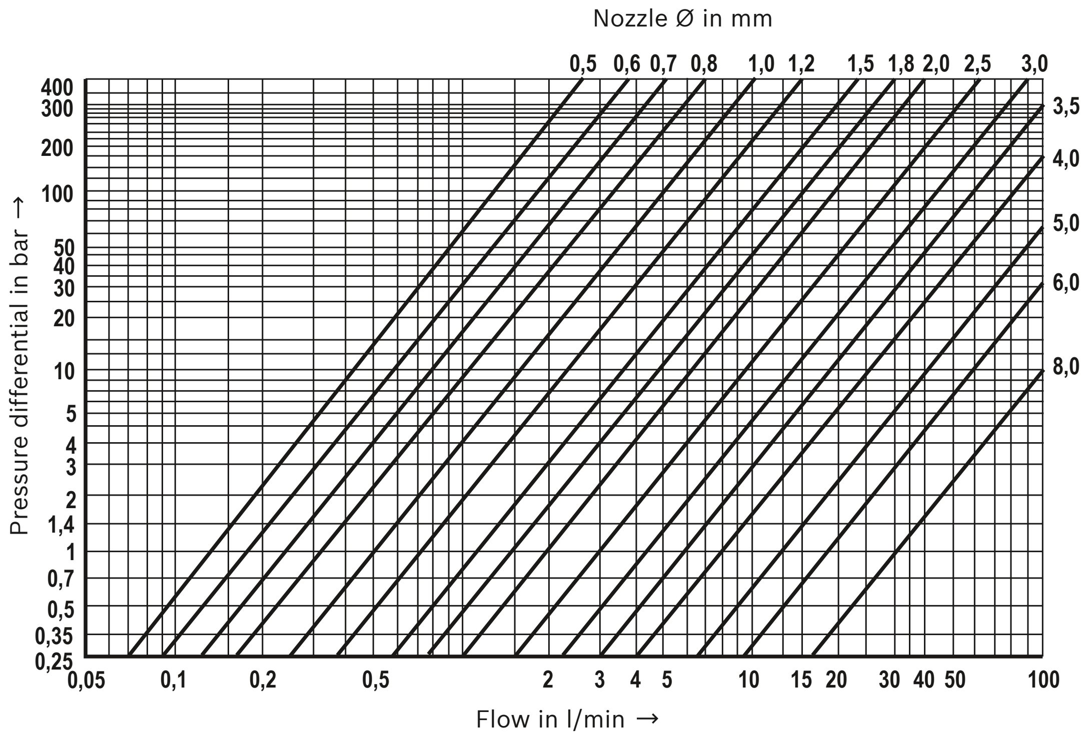




1 Size 16
2 Size 25
3 Size 32
4 Size 40
5 Size 50
6 Size 63
7 Size 80
8 Size 100

☞ **Notice!**
The indicated characteristic curves have been determined without inserted springs and refer to the direction of flow A → B.

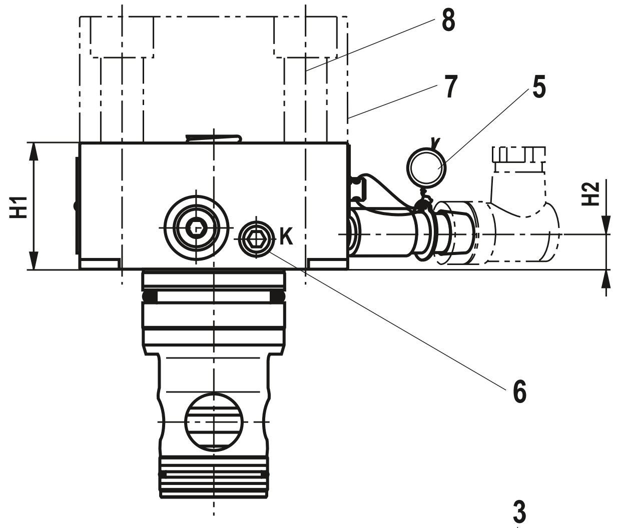
Characteristic curves for selecting the orifices

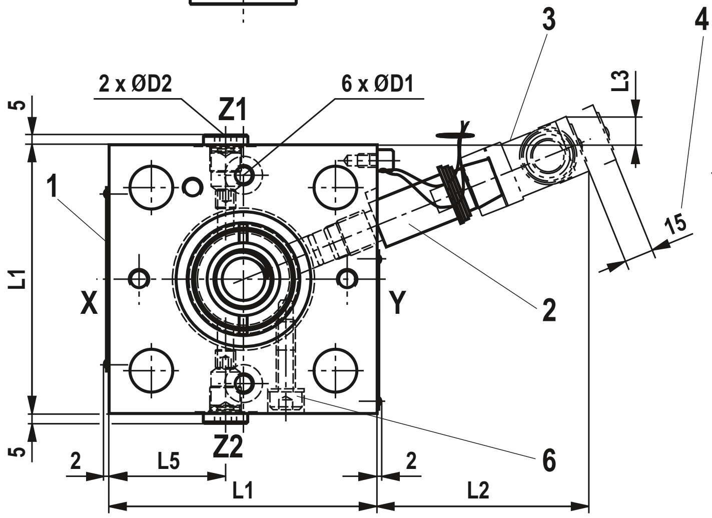


Orifice Ø in mm	Material number				
	M6 conical	M8 x 1 conical	G1/8	G1/4	G1/2
0.5	R900157933	R900157930	R900164240	R913000879	–
0.6	R900157934	R900149430	R900159145	R900756301	–
0.7	R900157931	R900143957	R901082918	–	–
0.8	R900152276	R900136843	R900144212	R900153856	R900691565
1.0	R900149335	R900136842	R900135607	R900147884	R900139115
1.2	R900152286	R900139101	R900146270	R900153868	R900150714
1.5	R900148823	R900133712	R900144910	R900144911	R900139117
1.8	R900157932	R900150953	R900142840	R900159108	R900159026
2.0	R900156650	R900137299	R900155897	R900147890	R900148352
2.5	R900157929	R900137445	R900148351	R900165178	R900148353
3.0	R900181894	R900144761	R900111282	R900153866	R900148361
3.5	–	R900136079	R900688752	R900684311	R913019857
4.0	–	R900802480	R900178466	R900155898	R900149939
5.0	–	–	R900167529	R900141422	R900143775
6.0	–	–	–	–	R900147875
8.0	–	–	–	–	R900159028
Plug screw (ordering code "99")	R900023986	R900003443	R900006324	R900003455	R900006445

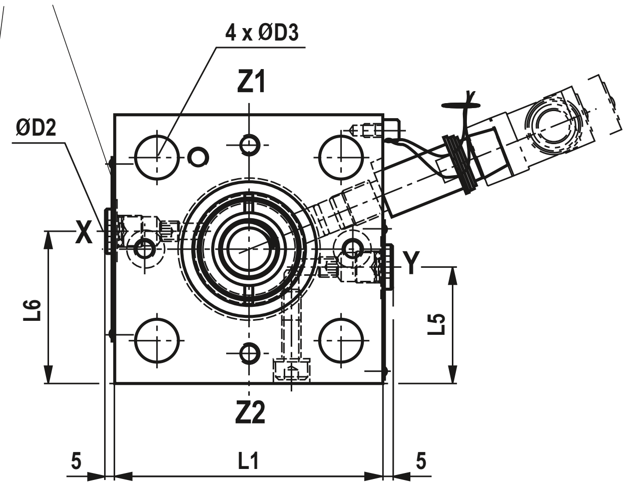
Dimensions: Size 16 ... 63 (dimensions in mm)

With spool position monitoring (1 position switch "Q7")





View: Version "Z1", "Z2" or "U"

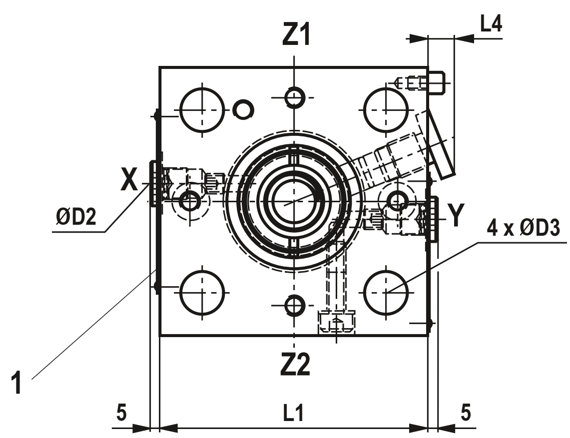


View: Version "X" or "Y"

Size	16	25	32	40	50	63
L1	80	85	100	125	140	180
L2	67	67	65	58	58	45
L3	15	9.5	2	–	–	–
L4	7	10	7	–	–	–
L5	34.5	37	45	56	63.5	82.5
L6	45.5	48	55	69	63.5	82.5
H1	40	40	50	80	100	110
H2 [1]	11.5	11.5	13.5	29.5	42.5	45.5
H2 [2]	–	–	–	23	35	36
ØD1	M6	M6	M8 x 1	G1/8	G1/8	G1/4
ØD2	G1/8	G1/8	G1/8	G1/4	G1/4	G3/8
ØD3	8.5	13.5	19	22	24	26^{+1}

1) Position monitoring "closed"
2) Position monitoring "open"

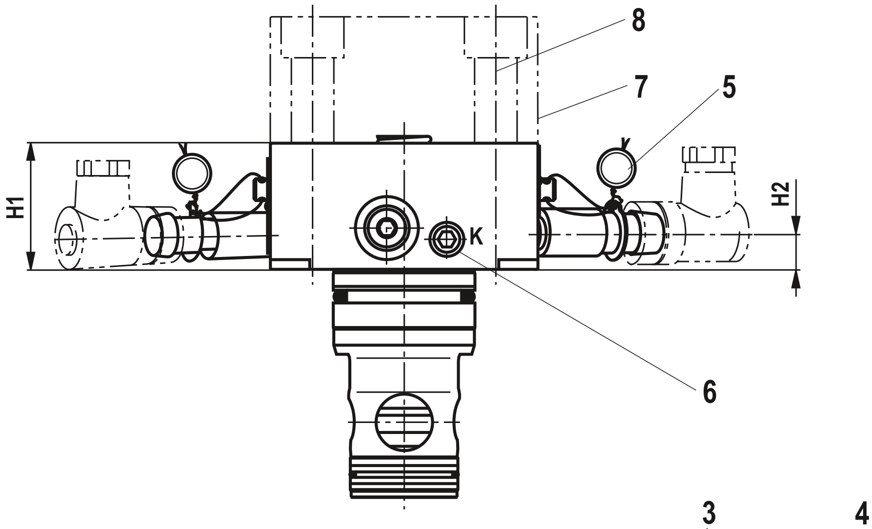
Without spool position monitoring (blind plug)

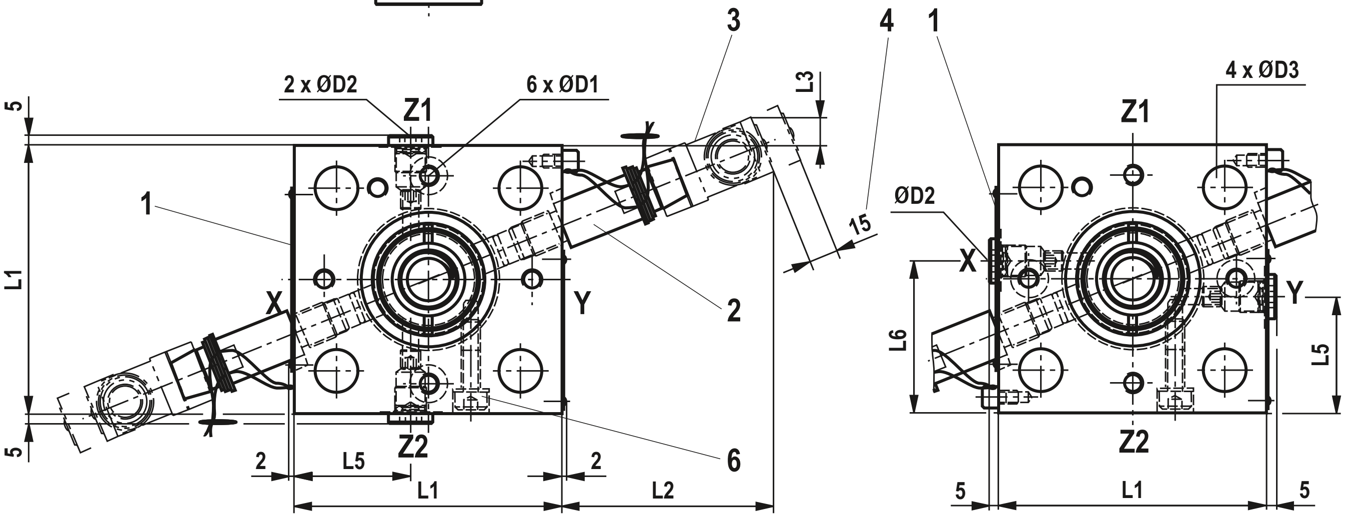


Item explanations see page 18.

Dimensions: Size 16 ... 32 (dimensions in mm)

With spool position monitoring (2 position switches "Q7", position monitoring "closed")





View: Version "Z1", "Z2" or "U"

View: Version "X" or "Y"

Size	16	25	32
L1	80	85	100
L2	67	67	65
L3	15	9.5	2
L5	34.5	37	45
L6	45.5	48	55
H1	40	40	50
H2 [1]	11.5	11.5	13.5
H2 [2]	11.5	11.5	13.5
ØD1	M6	M6	M8 x 1
ØD2	G1/8	G1/8	G1/8
ØD3	8.5	13.5	19

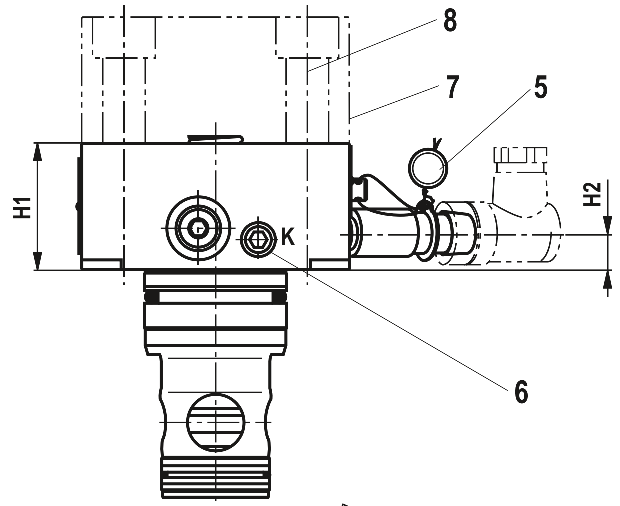
[1] Position monitoring "closed"

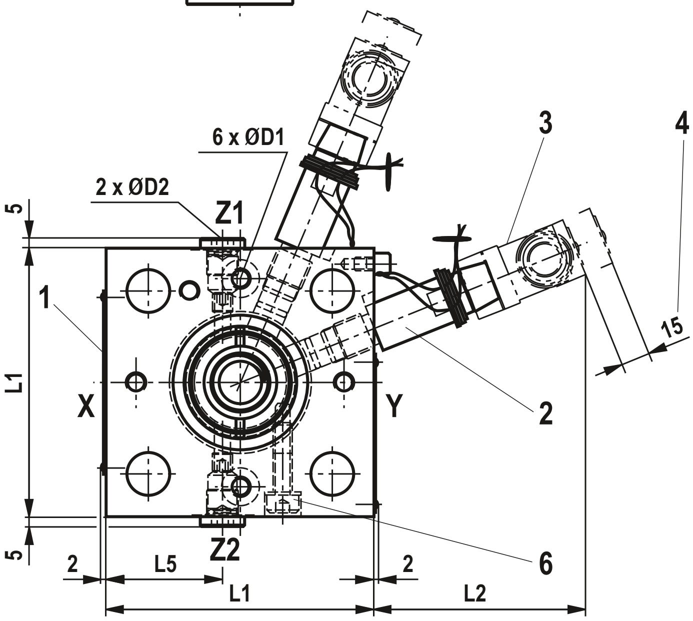
[2] Position monitoring "open"

Item explanations see page 18.

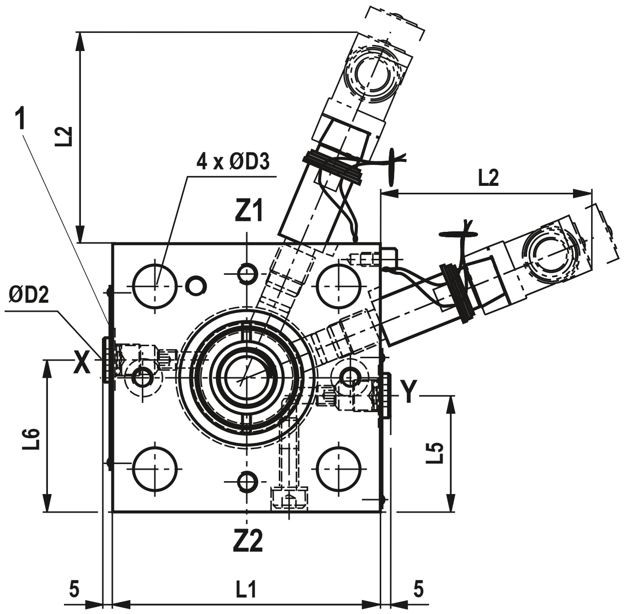
Dimensions: Size 40 ... 63 (dimensions in mm)

With spool position monitoring (2 position switch "Q7")





View: Version "Z1", "Z2" or "U"



View: Version "X" or "Y"

Size	40	50	63
L1	125	140	180
L2	58	58	45
L5	56	63.5	82.5
L6	69	63.5	82
H1	80	100	110
H2 [1)]	29.5	42.5	45.5
H2 [2)]	23	35	36
ØD1	G1/8	G1/8	G1/4
ØD2	G1/4	G1/4	G3/8
ØD3	22	24	26^{+1}

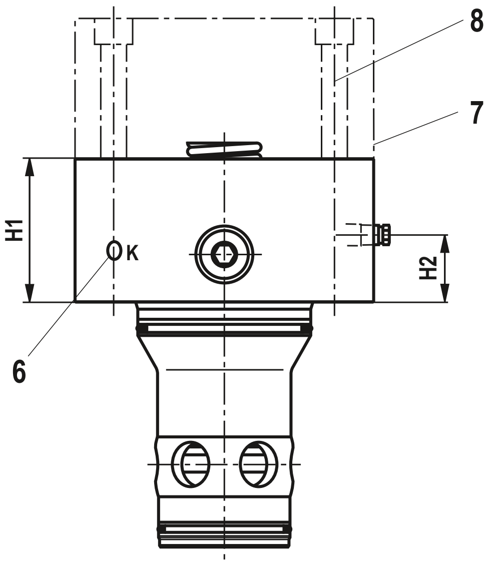
1) Position monitoring "closed"

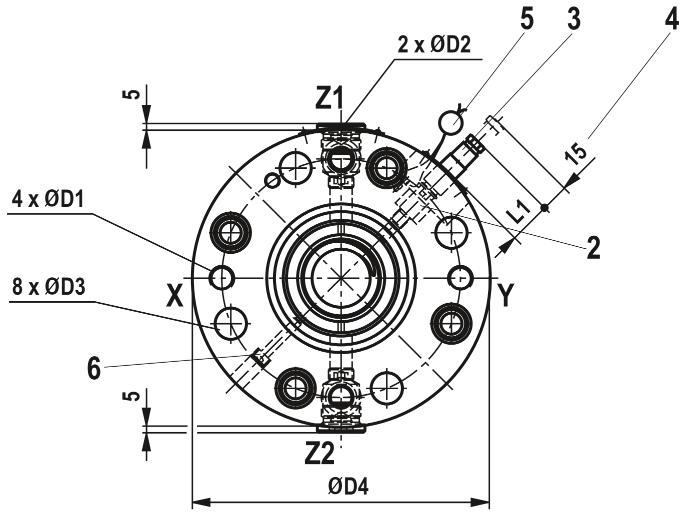
2) Position monitoring "open"

Item explanations see page 18.

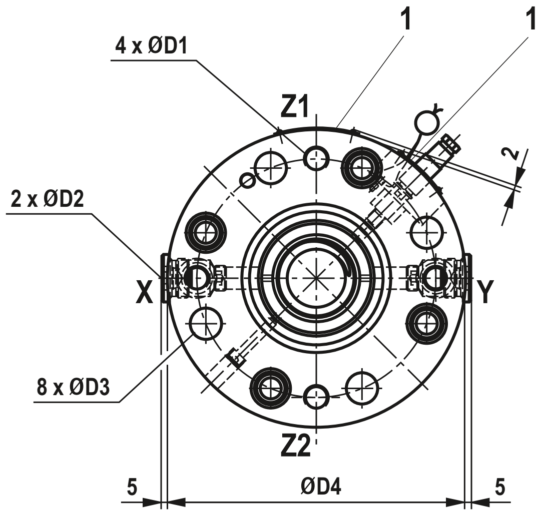
Dimensions: Size 80 ... 100 (dimensions in mm)

With spool position monitoring (1 position switch "Q7")





View: Version "Z1", "Z2" or "U"



View: Version "X" or "Y"

Size	**80**	**100**
ØD1	G1/2	G1/2
ØD2	G1	G1
ØD3	26^{+1}	$33^{+0.5}$
ØD4	250	300
L1	37	26
H1	120	140
H2 [1)]	48	55.2
H2 [2)]	37.5	44.7

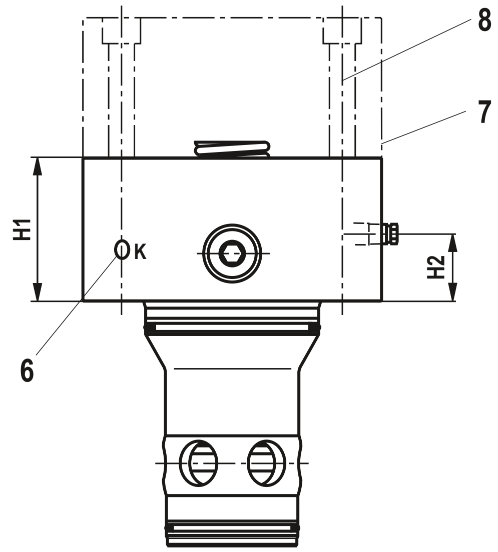
1) Position monitoring "closed"

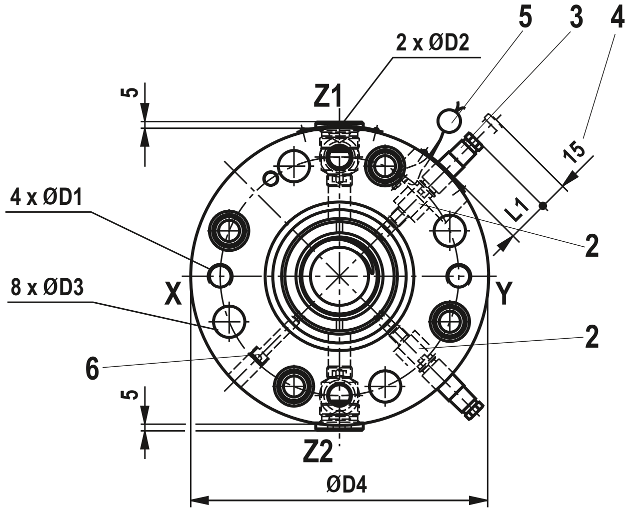
2) Position monitoring "open"

Item explanations see page 18.

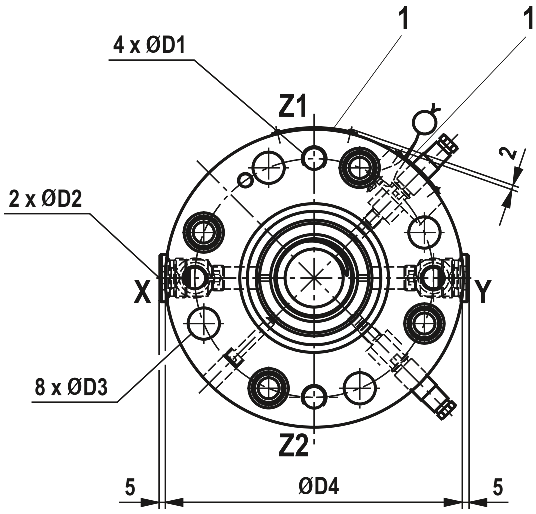
Dimensions: Size 80 ... 100
(dimensions in mm)

With spool position monitoring (2 position switch "Q7")





View: Version "Z1" or "Z2"



View: Version "X" or "Y"

Size	**80**	**100**
ØD1	G1/2	G1/2
ØD2	G1	G1
ØD3	26^{+1}	$33^{+0.5}$
ØD4	250	300
L1	37	26
H1	120	140
H2 [1]	48	55.2
H2 [2]	37.3	44.7

[1] Position monitoring "closed"

[2] Position monitoring "open"

Item explanations see page 18.

Dimensions

1 Name plate
2 Position switch (optional) or blind plug
3 Mating connector (separate order, see page 25)
4 Space required for removing the mating connector
5 Sealing by the factory
6 Transport lock for control spool (identification K). **Don not remove! Only loosen or disassemble and assemble for service/repair purposes!**
7 Standard end/control cover type LFA... (separate order, depends on the basic hydraulic function)
8 Valve mounting screws (separate order, see table below)

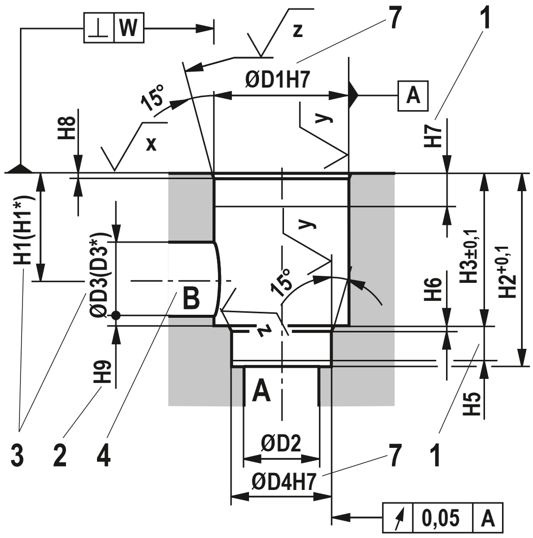
Valve mounting screws (separate order)

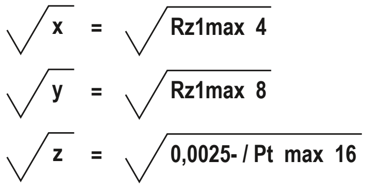
Size	Control cover type LFA	Hexagon socket head cap screws ISO 4762 - 10.9-flZn-240h-L			
		Quantity	Dimension	Material number	Tightening torque M_A 2) in Nm ±10%
16	WE., GW.	4	M8 x 85	R913004145	30
	WEM.		M8 x 110	R913000260	
	1)		M8 x 80	R913000276	
25	HWM.	4	M12 x 140	R913000312	100
	1)		M12 x 90	R913000473	
32	H1, H2	4	M16 x 130	R913000636	240
	H3, H4		M16 x 120	R913000594	
	HWM.		M16 x 160	R913000354	
	1)		M16 x 110	R913000079	
40	H1, H2, HWM.	4	M20 x 190	R913001911	480
	1)		M20 x 150	R913000385	
50	H2, H4, HWM.	4	M20 x 220	R913001910	480
	1)		M20 x 180	R913004960	
63	H2, H4, HWM.	4	M30 x 260	R913015758	1600
	1)		M30 x 210	R913000491	
80	H2, H4	8	M24 x 240	R913004973	800
	2)		M24 x 220	R913000195	
100	D, WE.	8	M30 x 260	R913015758	1600
	1)		M30 x 280	R913015760	

1) More available series control covers
2) Calculated with total friction coefficient μ = 0.09 to 0.14, adjust in case of modified surfaces

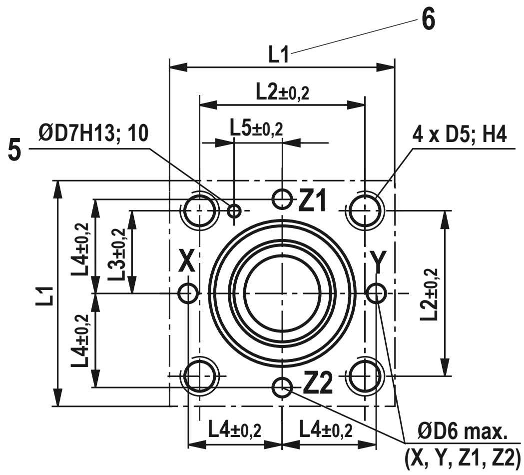
Notice!
The length of the valve mounting screws of the active logics (intermediate cover) must be selected according to the related control cover type LFA....
Screw type, screw length and tightening torque are to be adjusted to the conditions depending on the application.
For reasons of stability, exclusively the above valve mounting screws may be used.

Installation bore and connection dimensions according to DIN ISO 7368
(dimensions in mm)

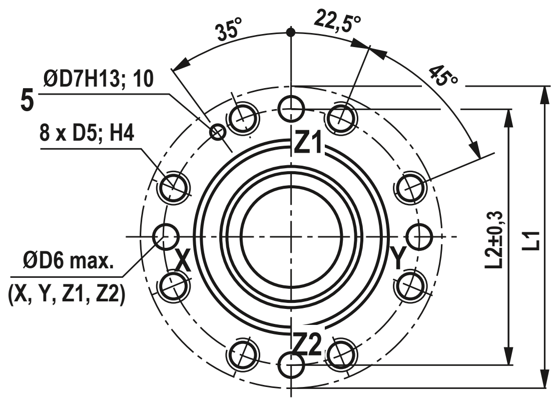




Size 16 ... 63



Size 80 and 100



1 Depth of fit
2 Control dimension
3 With a different diameter ØD3 or ØD3*, the distance H1 or H1* has to be adjusted.
4 Port B can be positioned around the central axis of port A. However, it must be observed that the mounting bores and the pilot oil bores are not damaged.
5 Bore for locking pin
6 With size 16 to 32, fit H8 is admissible!

Notice!
All the information on the mounting bore D5 is based on the use of hexagon socket head cap screws according to ISO 4762.

Dimensions see page 20.

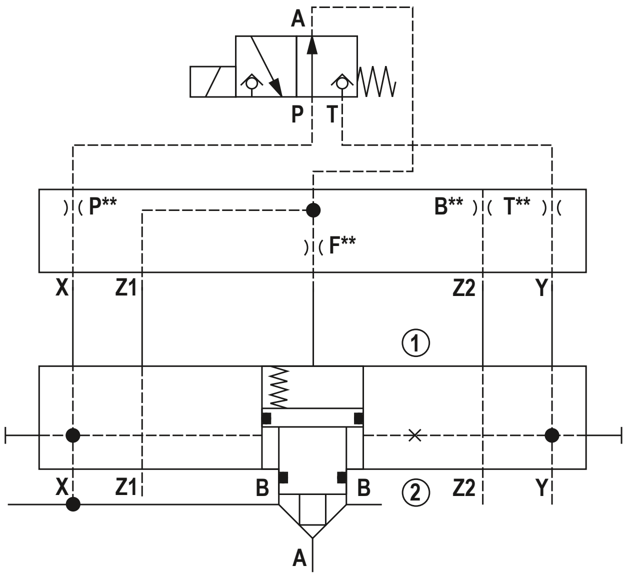
Installation bore and connection dimensions according to DIN ISO 7368
(dimensions in mm)

Size	16	25	32	40	50	63	80	100
ØD1	32	45	60	75	90	120	145	180
ØD2	16	25	32	40	50	63	80	100
ØD3	16	25	32	40	50	63	80	100
ØD3* [1]	25	32	40	50	63	80	100	125
ØD4	25	34	45	55	68	90	110	135
ØD5	M8	M12	M16	M20	M20	M30	M24	M30
ØD6 [2]	4	6	8	10	10	12	16	20
ØD7	4	6	6	6	8	8	10	10
H1	34	44	52	64	72	95	130	155
H1* [1]	29.5	40.5	48	59	65.5	86.5	120	142
H2	56	72	85	105	122	155	205	245
H3	43	58	70	87	100	130	$175^{\pm0.2}$	$210^{\pm0.2}$
H4	20	25	35	45	45	65	50	63
H5	11	12	13	15	17	20	25	29
H6	2	2.5	2.5	3	3	4	5	5
H7	20	30	30	30	35	40	40	50
H8	2	2.5	2.5	3	4	4	5	5
H9	0.5	1	1.5	2.5	2.5	3	4.5	4.5
L1	80	85	102	125	140	180	250	300
L2	46	58	70	85	100	125	200	245
L3	23	29	35	42.5	50	62.5	–	–
L4	25	33	41	50	58	75	–	–
L5	10.5	16	17	23	30	38	–	–
W	0.05	0.05	0.1	0.1	0.1	0.2	0.2	0.2

[1] Dimension ØD3* refers to dimension H1*
[2] Maximum dimension

Circuit examples (function must be checked with the application)

Check valve, releasable

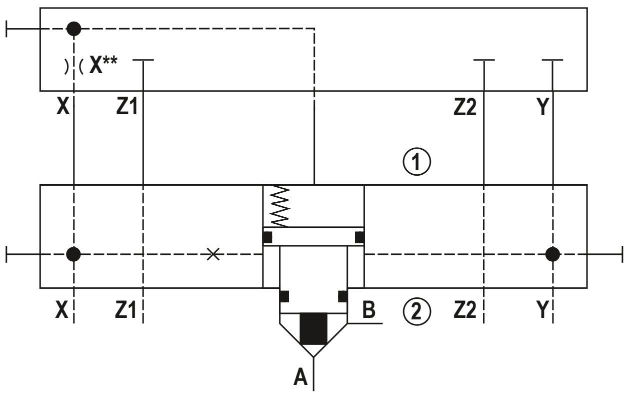


Type M-3SEW 6 U../420..

Type LFA . WEMA...

Type LC2A . A40E-1X/X...

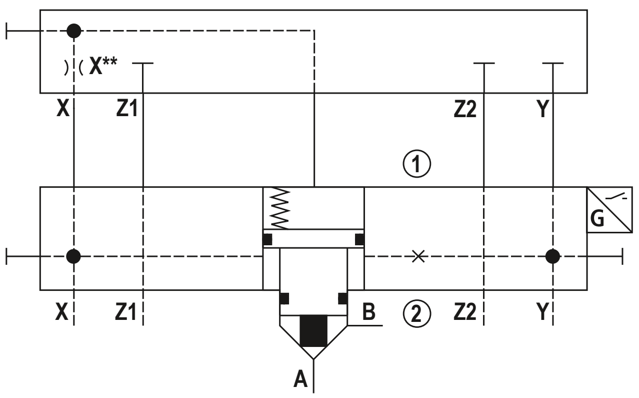
"Closing pressure-supported by excess area" function (e.g. with control cover type "D")



Type LFA . D...

Type LC2A . A40D-1X/Y...

"Passive logics with piston seal and spool position monitoring" function (closing with spring force without excess area; here with control cover type "D"); ideal for the retrofitting of existing circuits

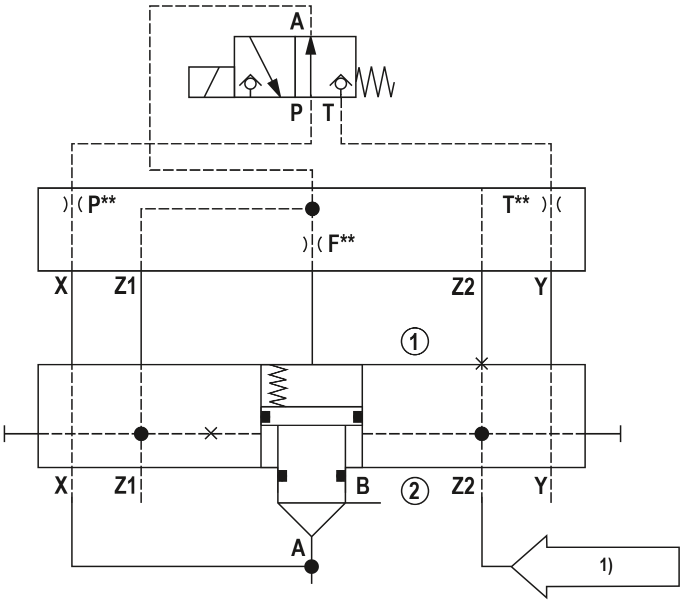


Type LFA . D...

Type LC2A . A40D-1X/XQ7...

Circuit examples (function must be checked with the application)

"Self-closing" or "open basic position" (e.g. with control cover type "WEMA")



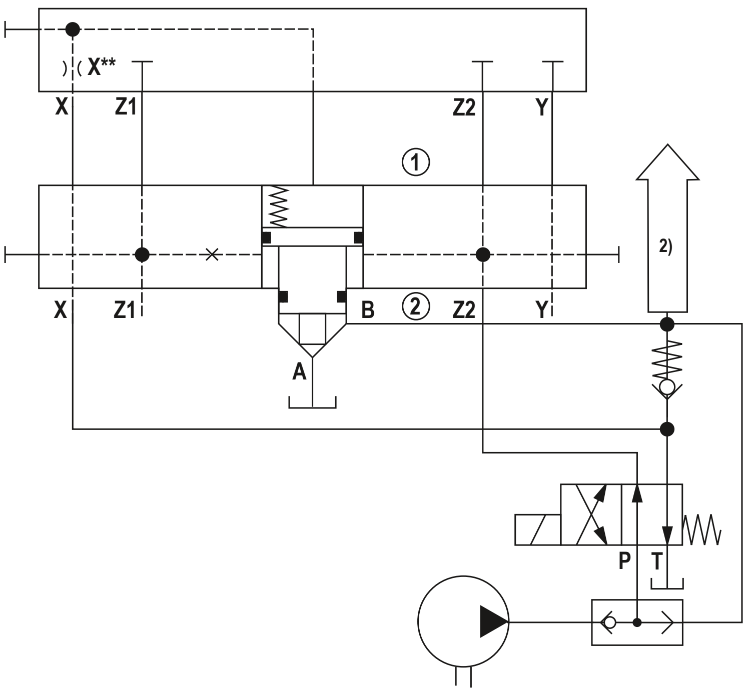
Type M-3SEW 6 U../420..

Type LFA . WEMA...

Type LC2A . D40E-1X/Z2...W99

Control spool remains open as long as $\boldsymbol{F}_{Z2} \geq \boldsymbol{F}_{A}$ + spring force
In case of failure or drop of the pilot pressure, the logic element closes hydraulically. Irrespective thereof, the logic element can be opened by unloading the spring chamber (minimum pilot pressure required).

"Pulling" function and safe keeping closed



Type LFA . D...

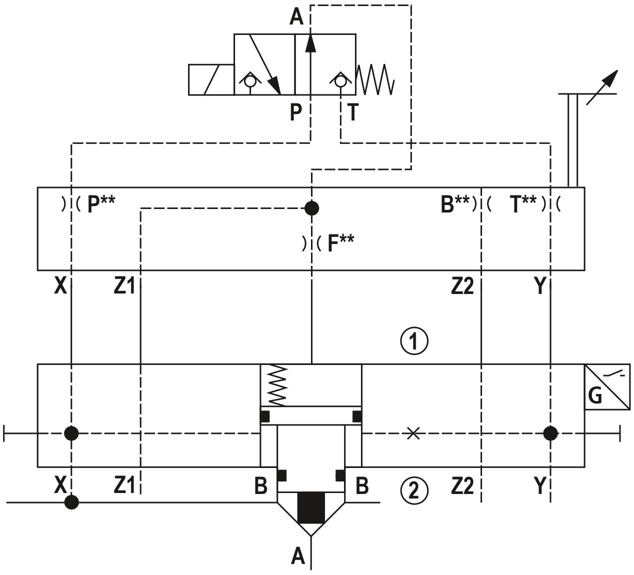
Type LC2A . A40E-1X/Z2...

The control spool of the active logics can be opened or closed depending on the two pilot oil pressures X and Z2. Thus, free flow is possible in both directions, irrespective of the pressure level in port B.

[1] Pilot pressure
[2] Actuator

Circuit examples (function must be checked with the application)

"Passive logics with spool sealing" function, spool position monitoring and stroke limitation

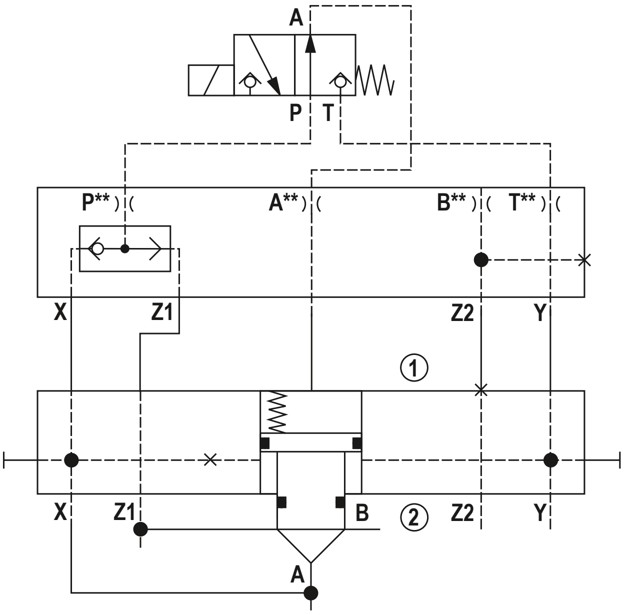


Type M-3SEW 6 U../420..

Type LFA . HWMA...

Type LC2A . A40D-1X/XQ7...

"Closed basic position" function; safe keeping closed with maximum pilot pressure



Type M-3SEW 6 U../420..

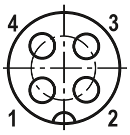
Type LFA . GWMA...

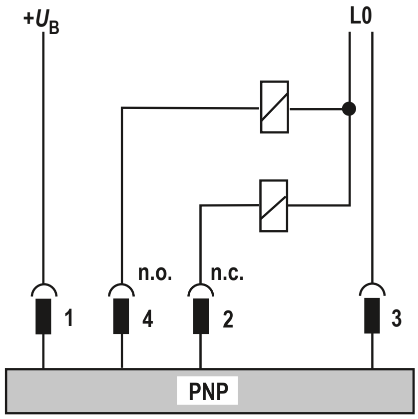
Type LC2A . D40E-1X/Y... (W99)

Inductive position switch type Q7, electrical connection

The electrical connection is realized via a 4-pole mating connector with connection thread M12 x 1 (separate order, see page 25)

Operating voltage	Direct voltage 12 to 30 V (residual ripple <15%)
Load capacity of the outputs:	200 mA; short-circuit-proof
Contact assignment:	**1:** $+U_B$ **2:** Normally closed contact **3:** L0 **4:** Normally open contact
Tightening torque:	$M_A = 10^{+5}$ Nm



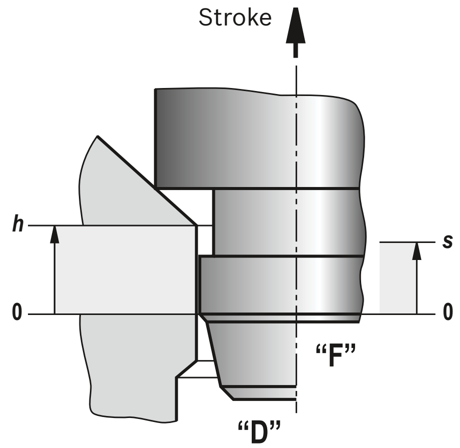


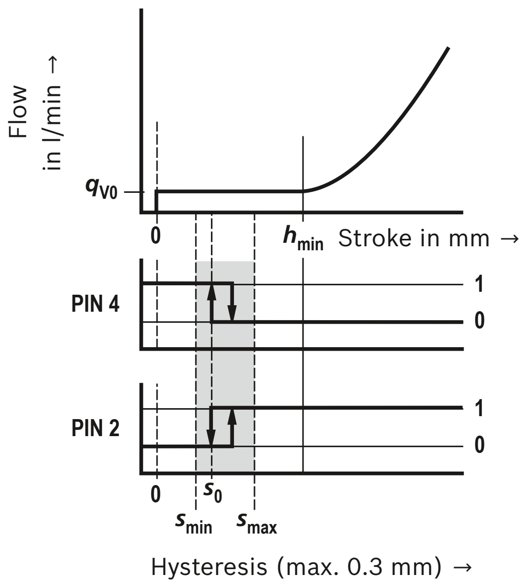
The inductive position switch type Q7 can be connected as normally closed or normally open contact.

Notice!

- The "closed" spool position is adjusted to and optimized for a condition at operating temperature.
  Considerably deviating operating temperatures thus influence the absolute switching position as well as its hysteresis.
- Attention! The position switch type Q7 has no connection for the protective earthing conductor!
- Assembly tool for position switch type Q7 or blind plug upon request.
- **BG certificate**
  The respectively valid "MHHW 10014" certificate for using the active logics type LC2A with position switch type Q7 in hydraulic security locks in injection molding machines according to the manufacturer's installation instructions is available upon request.

Switching point behavior and overlap: Valve poppet with damping nose "D" or overlap nose "F" and position overlap "closed"



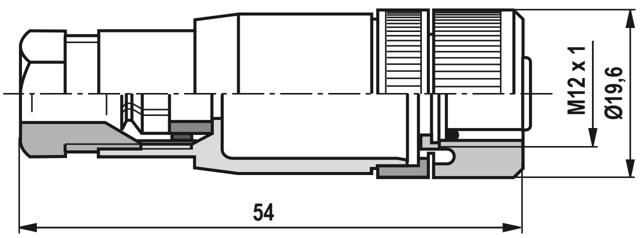


h	Overlap stroke (mechanical)
s	Switching point window (electrical)
q_{V0}	Maximum flow until h_{min}

Mating connectors for inductive position switch
(dimensions in mm)

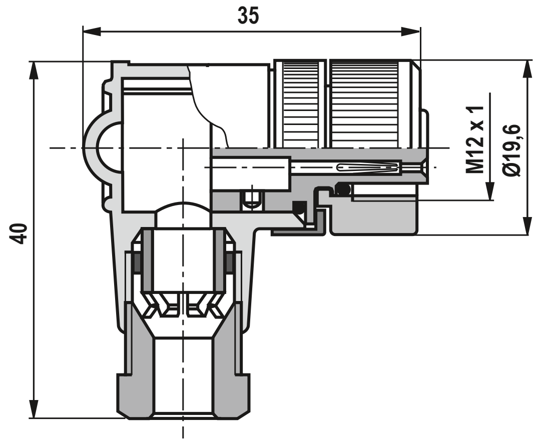
Mating connector suitable for K24 4-pole, M12 x 1 with screw connection, cable gland Pg 9.

Material no. **R900031155**



Mating connector suitable for K24 4-pole (only up to size 80), M12 x 1 with screw connection, cable gland Pg 9, angled. Housing can be rotated by 4 x 90° in relation to the contact insert.

Material no. **R900082899**



For more information refer to data sheet 08006.

More information

▶ Passive logics (directional function)	Data sheet 21010
▶ Passive logics (pressure function)	Data sheet 21050
▶ Mineral oil-based hydraulic fluids	Data sheet 90220
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ General product information on hydraulic products	Data sheet 07008
▶ Installation, commissioning and maintenance of industrial valves	Data sheet 07300
▶ Hydraulic valves for industrial applications	Data sheet 07600-B
▶ Selection of the filters	www.boschrexroth.com/filter
▶ Production of logistic bores	On request

Notes

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documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

RE 21 050/02.03

Replaces: 02.99

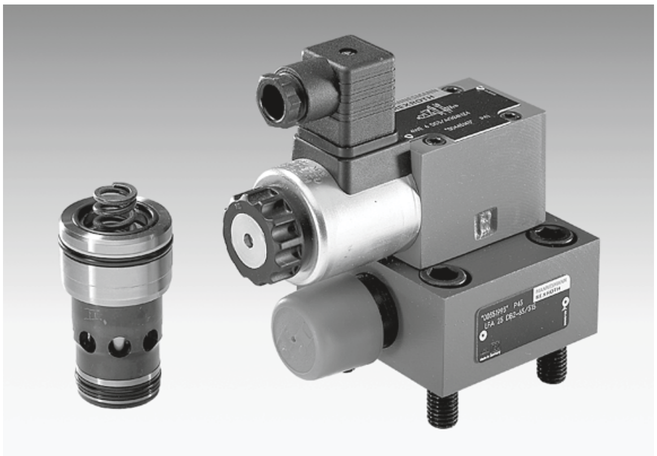
2-way cartridge valves; pressure functions Cartridge valves type LC... Control covers type LFA...

Nominal sizes 16 to 100

Series 6X; 7X

Maximum operating pressure 420 bar

Maximum flow 7000 L/min



H/A/D 5593

Cartridge valve type LC 25 DB40E-7X
Control cover type LFA 25 DBW2-7X/315 with manual pressure adjustment, electrical unloading with built-on directional valve.

Overview of contents

Continued on page 2

Overview of contents

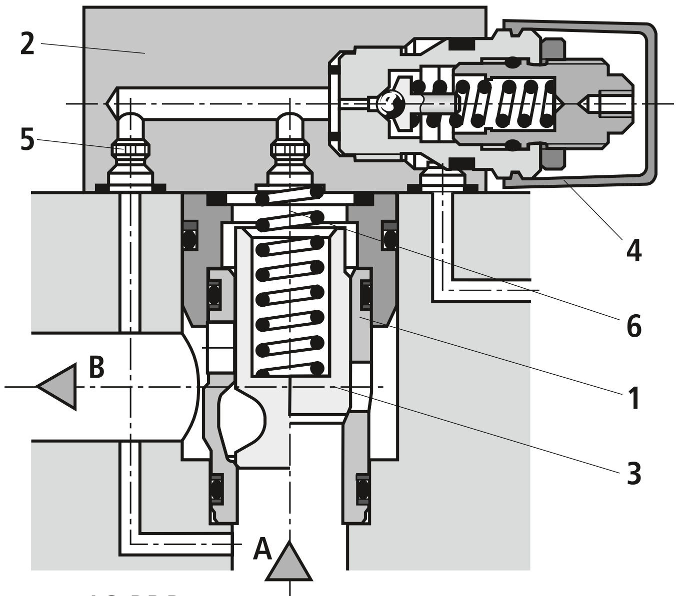
Function, section, symbols

General

The 2-way cartridge valves for pressure control functions are pilot operated poppet or spool valves. The main component designed as a cartridge valve (1) is inserted into a cavity which is standardised to DIN ISO 7368 and is sealed by the control cover (2).

The pilot valve (4) for either manual or electrical proportional pressure control is integrated into the control cover (2) or mounted onto the control cover (2) as a pilot valve with interface connections to DIN 24 340.

By combining the cartridge valve with the control covers different pressure functions can be realised.



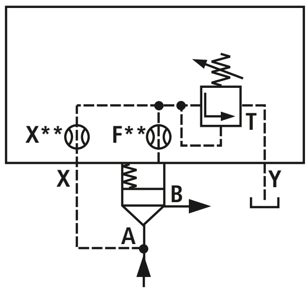
LC..DB.D... **LC..DB.E...**

Pressure relief function

Control cover type LFA..DB...

Cartridge valve type LC..DB...

The cartridge valve (1) for the pressure relief function (type LC . DB…) is a poppet valve without an area differential (no effective area at port B). The pressure acting at port A is fed via the pilot supply orifice (5) to the spring side (6) of the element. At pressures below the setting of pilot valve (4) the forces on spool (3) are balanced and the spool remains closed due to the spring force. On reaching the set pressure, spool (3) opens and limits the pressure at port A in relation to the pressure-flow characteristics.



Type LFA..DB...

Type LC..DB...

Pressure reducing function

a) Normally open: Control cover type LFA..DB...

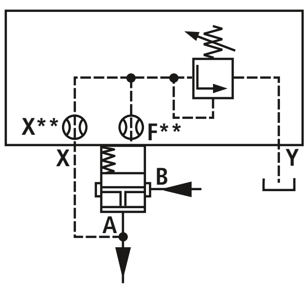
Cartridge valve type LC..DR...

The cartridge valve for the pressure reducing function is a spool valve without an area differential (no effective area at port B).

The same types of cover are used as pilot valves that are used for the pressure relief functions (type LFA..DB...).

The pressure acting at port A is fed to the spring side of the spool via the pilot oil supply orifice. Below the performance limit and pressure set at the pilot valve, the spool is pressure-balanced and is held open by the spring force, so that oil is free to flow from port B to port A.

On reaching the set pressure, the spool closes and reduces the pressure at port A in relation to the pressure-flow characteristics.



E.g.

Type LFA..DB...

Type LC..DR40...

Function, symbols

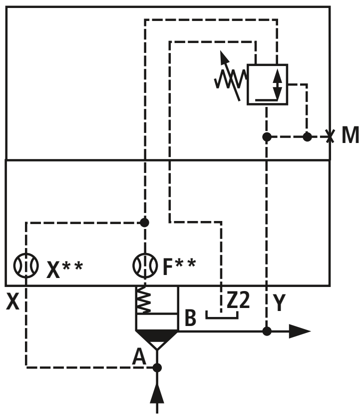
b) Normally closed: **Control cover type LFA..DR...**

Cartridge valve type LC..DB40D...

For the pressure reducing function with opening characteristics a pressure relief valve cartridge (type LC..DB40D...) and a control cover with a pressure reducing valve (type LFA..DR...) as the pilot valve are used. The pilot oil is fed from port A via the pilot supply orifice and the open pilot valve to side B.

The main spool opens and allows free-flow from port A to port B.

On reaching the set pressure, the spool closes and reduces the pressure at port B in relation to the pressure-flow characteristics. Possible excess pressures occurring on the secondary side are led away to tank via the third port of the pilot valve. By fitting a directional valve, an additional isolating function can also be attained (type LFA..DRW...).



E.g.

Type LFA..DR...

Type LC..DB40D...

Pressure sequencing function

Control cover type LFA..DZ...

Cartridge valve type LC..DB...

This function enables a pressure-dependent sequencing of a second system.

The required sequencing pressure is set by the pilot valve which is integrated into the control cover.

The pilot oil supply may be either external (pilot oil port X) or internal (from port A via pilot oil port X or Z2).

The spring chamber of the pilot control is drained at zero pressure via ports Y or Z1 to tank.

When the pressure set at the pilot control spring is reached, the pilot valve switches and unloads the spring chamber of the main valve to tank. The main spools opens and makes the connection from port A to B possible.

In version LFA..DZW..., the required spool position may be selected by means of an electrically operated pilot valve (not included with the scope of control cover LFA..DZW... supply) in addition to the normal hydraulic control.

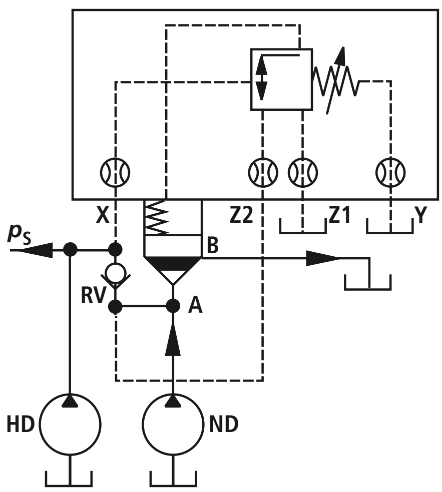
Circuit examples

Example 1: (circuit for the pressure dependent unloading of the low pressure system)

In the circuit shown, the system is fed by a high pressure pump and a low pressure pump. The system pressure p_S acts externally from the high pressure side via the pilot oil port X on the pilot valve which, on reaching the set pressure, switches the low pressure side to give zero pressure circulation. The check valve RV (not included within the scope of supply) prevents the high pressure system from flowing into the low pressure system which is now at zero pressure.

Example 2: (circuit for the pressure dependent sequencing of a 2nd system)

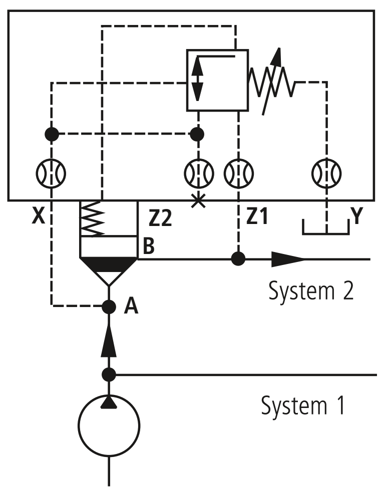
With this circuit, oil is allowed to flow into system 2 when the pressure in system 1 has reached a pre-set value. The pilot oil supply is internal from port A of the main valve.



E.g.

Type LFA..DZ...XY

Type LC..DB20D...



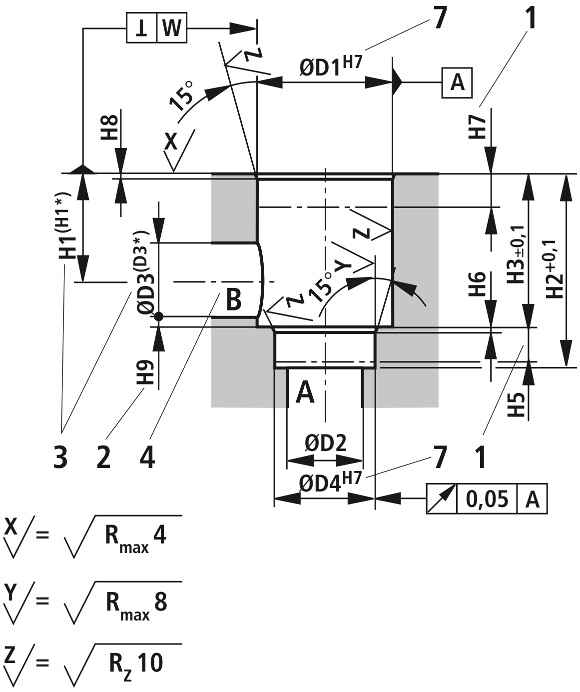
E.g.

Type LFA..DZ...Y

Type LC..DB20D...

Installation cavity and porting pattern to DIN ISO 7368

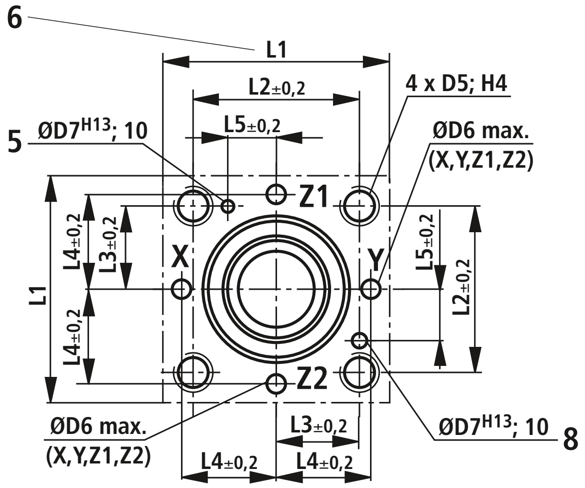
(Dimensions in mm)



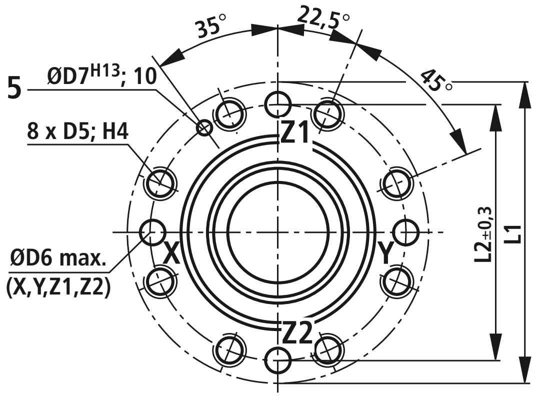
NS	16	25	32	40	50	63	80	100
ØD1H7	32	45	60	75	90	120	145	180
ØD2	16	25	32	40	50	63	80	100
ØD3	16	25	32	40	50	63	80	100
(ØD3*)	25	32	40	50	63	80	100	125
ØD4H7	25	34	45	55	68	90	110	135
ØD5	M8	M12	M16	M20	M20	M30	M24	M30
ØD6 1)	4	6	8	10	10	12	16	20
ØD7H13	4	6	6	6	8	8	10	10
H1	34	44	52	64	72	95	130	155
(H1*)	29.5	40.5	48	59	65.5	86.5	120	142
H2	56	72	85	105	122	155	205	245
H3	43	58	70	87	100	130	$175^{\pm 0.2}$	$210^{\pm 0.2}$
H4	20	25	35	45	45	65	50	63
H5	11	12	13	15	17	20	25	29
H6	2	2,5	2.5	3	3	4	5	5
H7	20	30	30	30	35	40	40	50
H8	2	2.5	2.5	3	4	4	5	5
H9	0.5	1	1.5	2.5	2.5	3	4.5	4.5
L1	65/80	85	102	125	140	180	Ø250	Ø300
L2	46	58	70	85	100	125	Ø200	Ø245
L3	23	29	35	42,5	50	62.5	–	–
L4	25	33	41	50	58	75	–	–
L5	10.5	16	17	23	30	38	–	–
W	0.05	0.05	0.1	0.1	0.1	0.2	0.2	0.2

1) Max. dim.

NS 16 to 63



NS 80, 100



1 Depth of fit

2 Reference dimension

3 For diameters of port B other than ØD3 or (ØD3*), the distance from the cover mounting surface to the centre of this hole must be calculated.

4 Port B may be moved about the central axis of port A. Care must however be taken to ensure that the fixing holes and control holes are not damaged.

5 Drilling for location pin (cover location pin fitted to DIN 24 342)

6 **Note on NS 16 porting pattern:** Length L1 (axis x–y drilling) is 80 mm.

7 For Ø ≤ 45 mm → fit H8 is permitted!

8 Drilling for locating pin with functions as a main pressure relief valve (cover locating pin has to be appropriately relocated during assembly)

Pressure relief function

Ordering details: pressure relief cartridge valve (without control cover)

LC		DB			/

Nominal size 16	(Series 7X)	= 16
Nominal size 25	(Series 7X)	= 25
Nominal size 32	(Series 7X)	= 32
Nominal size 40	(Series 7X)	= 40
Nominal size 50	(Series 7X)	= 50
Nominal size 63	(Series 7X)	= 63
Nominal size 80	(Series 6X)	= 80
Nominal size 100	(Series 6X)	= 100

Opening pressure approx. 0 bar (without spring)	= 00
Opening pressure approx. 2 bar	= 20
Opening pressure approx. 3 bar	= 30 [1)]
Opening pressure approx. 4 bar	= 40
Opening pressure approx. 5 bar	= 50 [2)]
Opening pressure approx. 8 bar	= 80 [3)]

E =	Poppet valve **without** orifice (standard)
D =	Spool poppet valve **without** orifice (standard)
A =	Poppet valve **with** orifice
B =	Spool poppet valve **with** orifice

7X = (NS 16 to 63) Series 70 to 79
(70 to 79: unchanged installation and connection dimensions)

6X = (NS 80 and 100) Series 60 to 69
(60 to 69: unchanged installation and connection dimensions)

No code = NBR seals
V FKM seals
(other seals on request)

⚠ **Attention!**
The compatibility of the seals and pressure fluid has to be taken into account!

1) Opening pressure 3.0 bar only with NS16 for fitting a pilot operated pressure relief valve type DBC . -5X/…SO187 (see catalogue sheet RE 25 802)

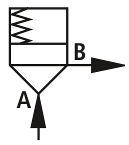
2) Only with NS 16, 25 and 32

3) Special installation space is required (see page 12)

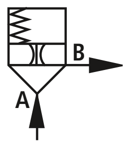
Preferred¡ types, see page 12, are readily available!

Symbols: cartridge valves (for versions see ordering details)

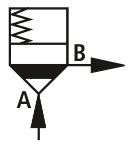
Poppet valve **without** orifice Version **„E“**



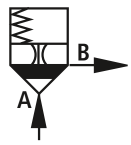
Poppet valve **with** orifice Version **„A“**



Spool poppet valve **without** orifice Version **„D“**



Spool poppet valve **with** orifice Version **„B“**



Technical data (for applications outside these parameters, please consult us!)

Pressure fluid 1) Suitable for NBR **and** FKM seals 2) **Only** suitable for FKM seals		Mineral oil (HL, HLP) to DIN 51 524 1); Fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90 221); HETG (rape seed oil) 1); HEPG (polyglycols) 2); HEES (synthetic ester) 2); Other pressure fluids on request
Pressure fluid temperature range	°C	– 30 to + 80 for NBR seals
		– 20 to + 80 for FKM seals
Viscosity range	mm^2/s	2.8 to 380
Cleanliness class to ISO code		Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 20/18/15 3)

2-way cartridge valve

Maximum operating pressure – Ports A and B	bar	420							
Maximum flow (recommended)	NS	16	25	32	40	50	63	80	100
– Poppet valve cartridges „E“ and „A“	L/min	300	450	600	1000	1600	2500	4500	7000
– Spool valve cartridges „D“ and „B“	L/min	175	300	450	700	1400	1750	3200	4900

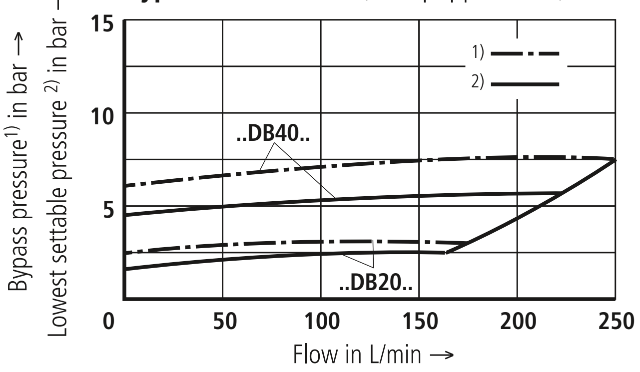
3) The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.
For the selection of filters see catalogue sheets RE 50 070, RE 50 076 and RE 50 081.

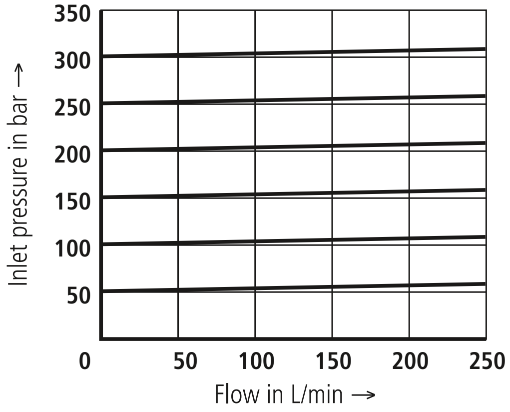
Characteristic curves: NS 16 (measured with HLP 46; $\vartheta_{oil -/} = 40\ °C \pm 5\ °C$)

The characteristic curves were measured with an external pilot oil drain at zero pressure. With an internal pilot oil drain the inlet pressure is increased by the pressure being applied at port B.

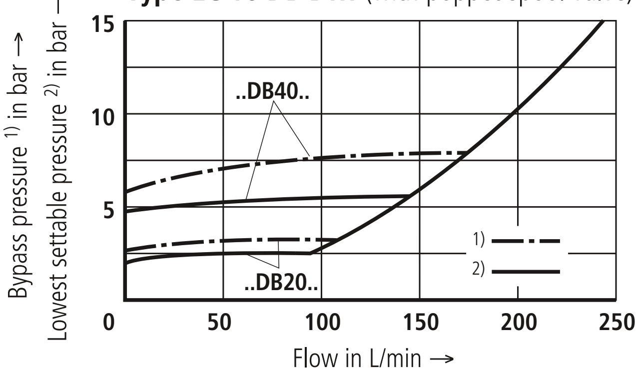
Manual pressure adjustment, type LFA 16 **DB**… and type LFA 16 **DBW**…

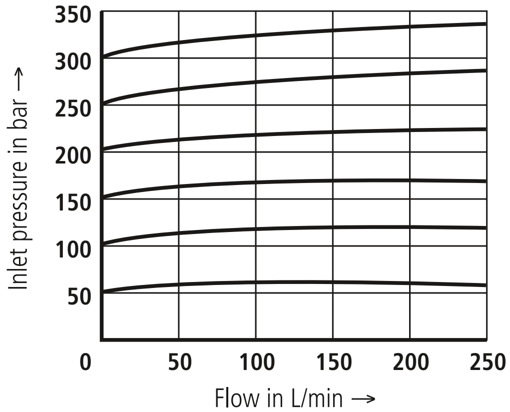
Type LC 16 DB.E… (with poppet valve)





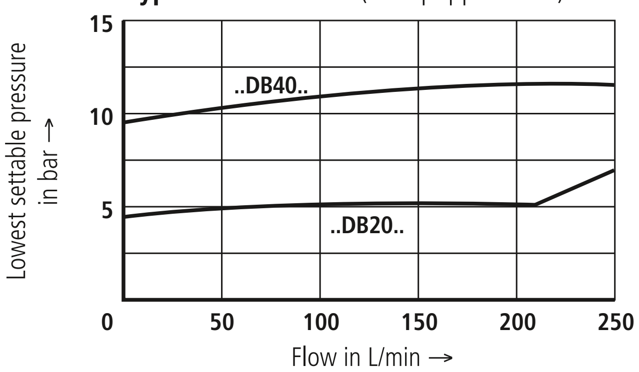
Type LC 16 DB.D… (with poppet spool valve)

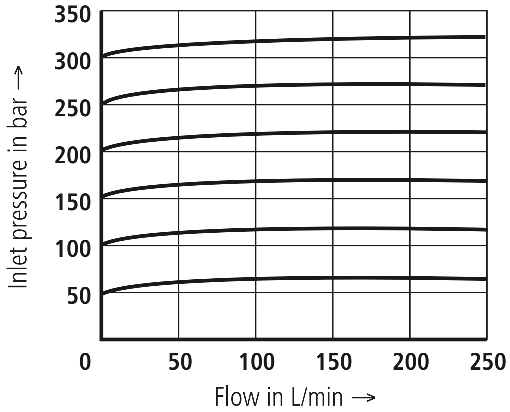




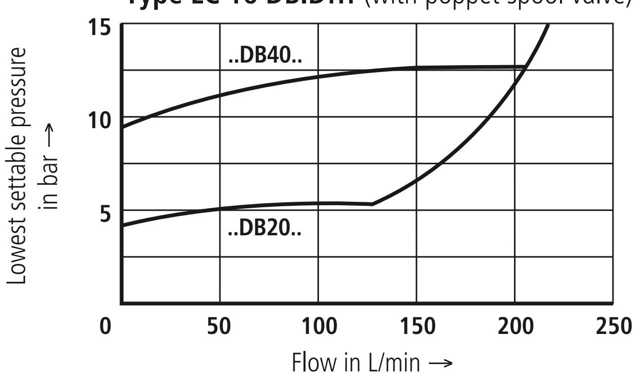
Electrical proportional pressure adjustment, type LFA 16 **DBE**…

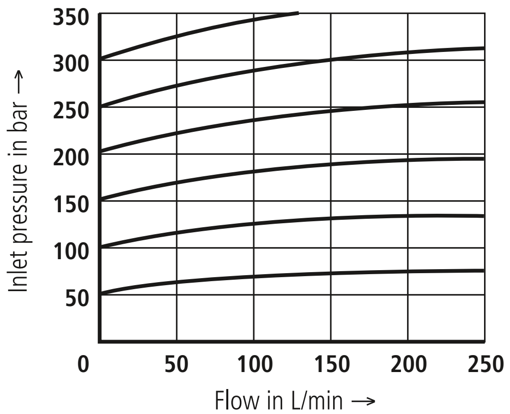
Type LC 16 DB.E… (with poppet valve)





Type LC 16 DB.D… (with poppet spool valve)



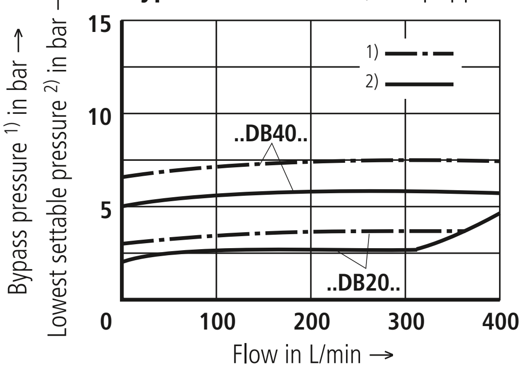


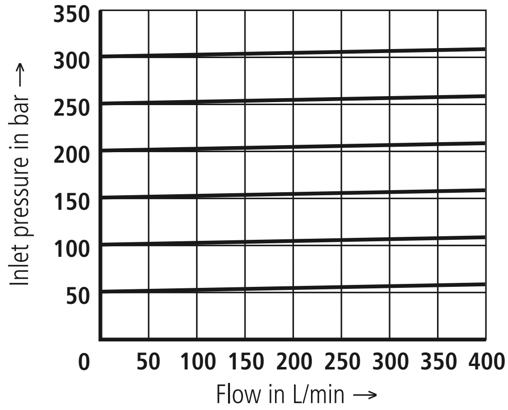
Characteristic curves: NS 25 (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

The characteristic curves were measured with an external pilot oil drain at zero pressure. With an internal pilot oil drain the inlet pressure is increased by the pressure being applied at port B.

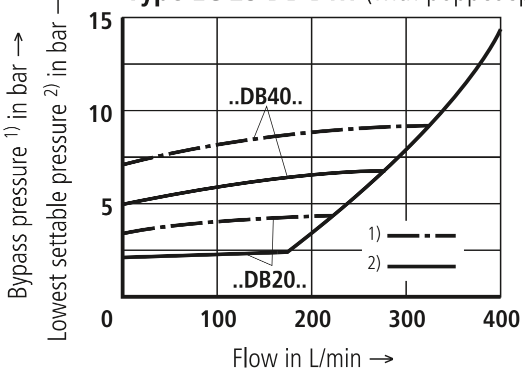
Manual pressure adjustment, type LFA 25 **DB**… and type LFA 25 **DBW**…

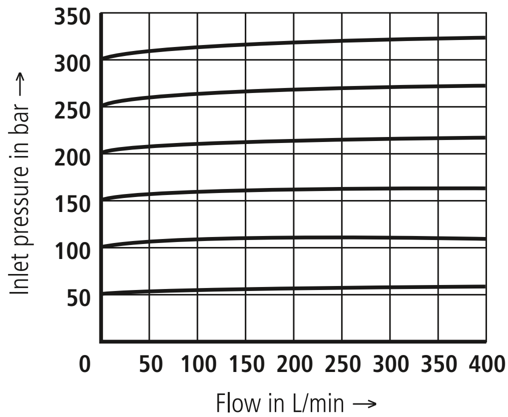
Type LC 25 DB.E… (with poppet valve)





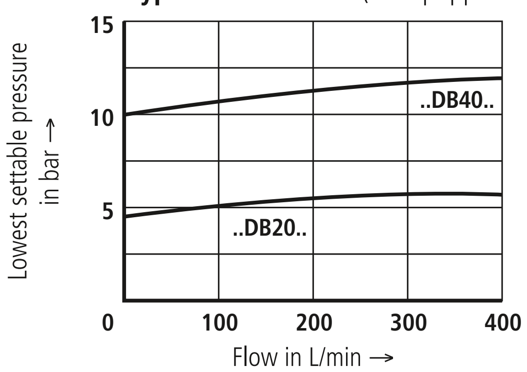
Type LC 25 DB.D… (with poppet spool valve)

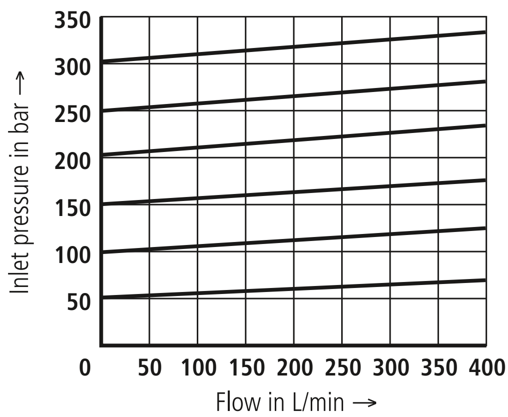




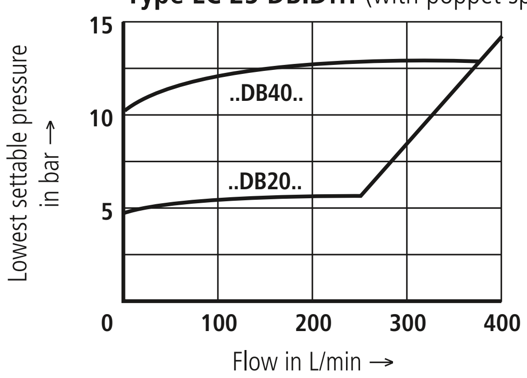
Electrical proportional pressure adjustment, type LFA 25 **DBE**…

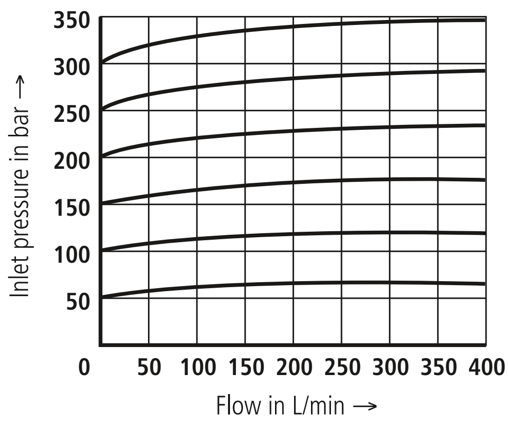
Type LC 25 DB.E… (with poppet valve)





Type LC 25 DB.D… (with poppet spool valve)



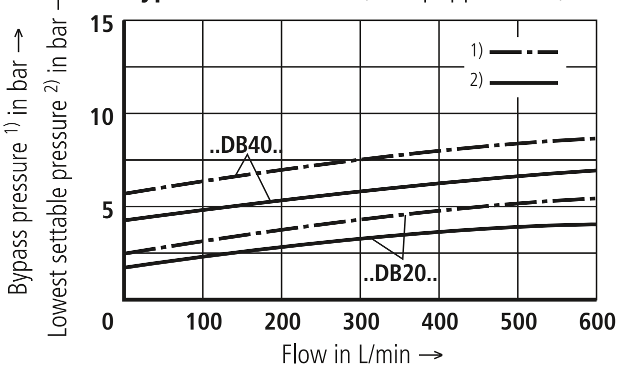


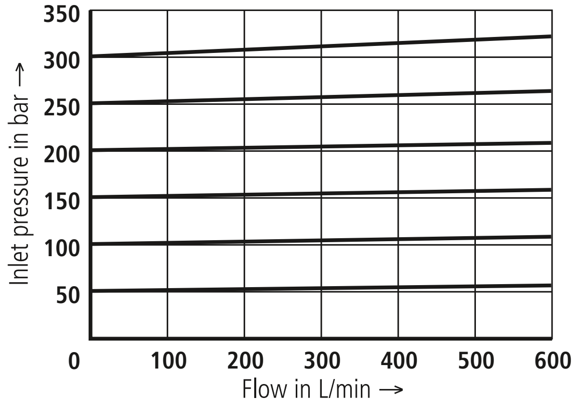
Characteristic curves: NS 32 (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

The characteristic curves were measured with an external pilot oil drain at zero pressure. With an internal pilot oil drain the inlet pressure is increased by the pressure being applied at port B.

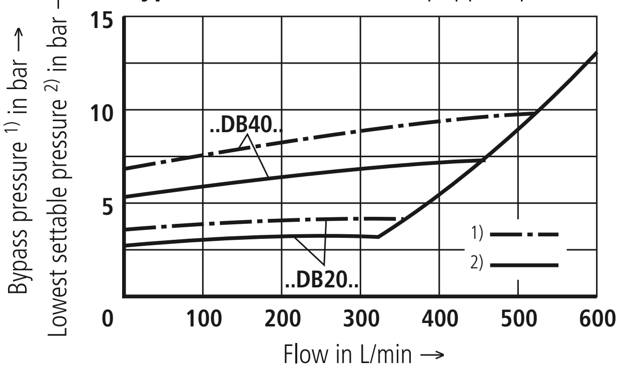
Manual pressure adjustment, type LFA 32 **DB**… and type LFA 32 **DBW**…

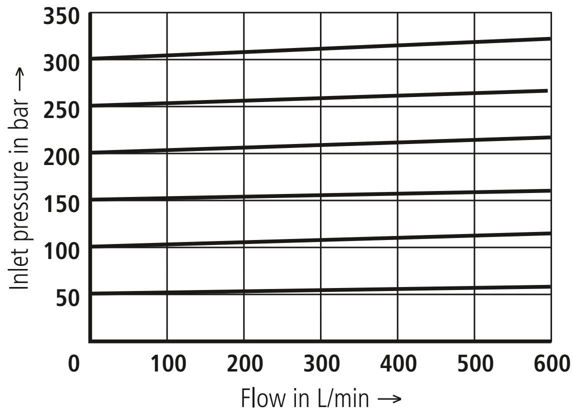
Type LC 32 DB.E… (with poppet valve)





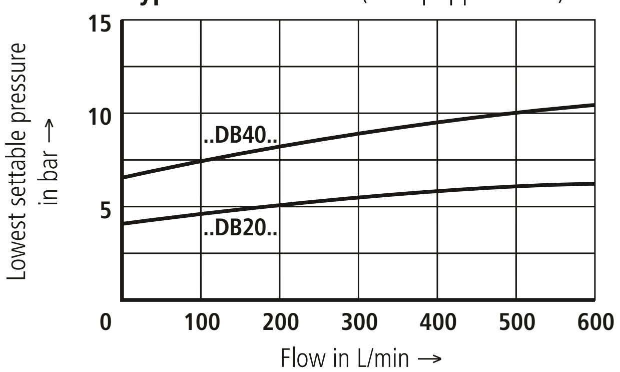
Type LC 32 DB.D… (with poppet spool valve)

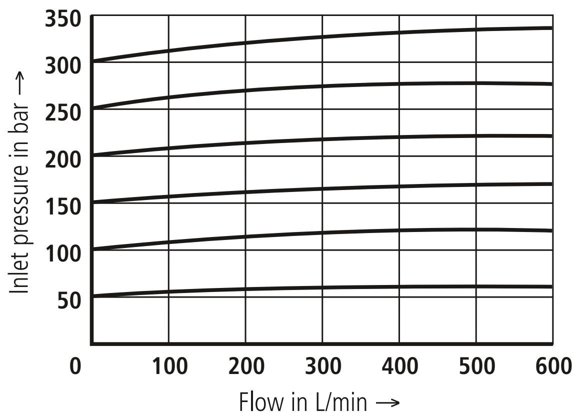




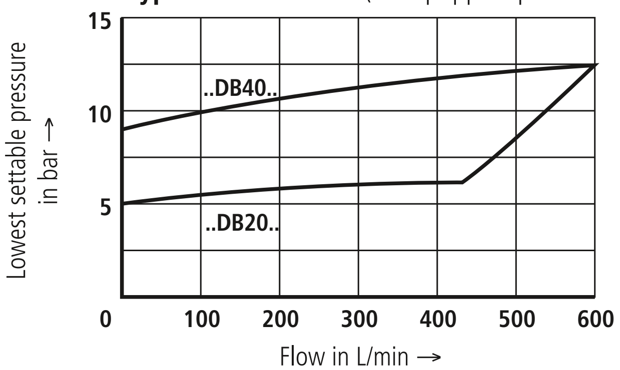
Electrical proportional pressure adjustment, type LFA 32 **DBE**…

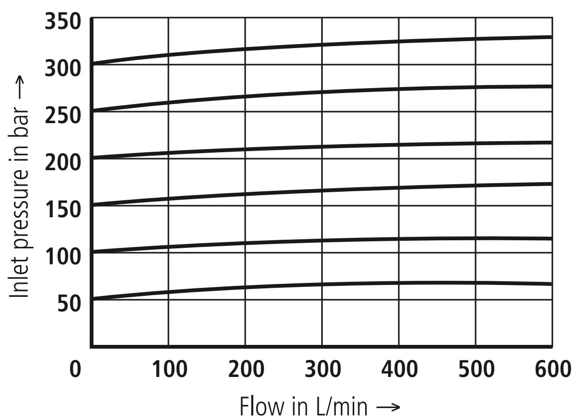
Type LC 32 DB.E… (with poppet valve)





Type LC 32 DB.D… (with poppet spool valve)



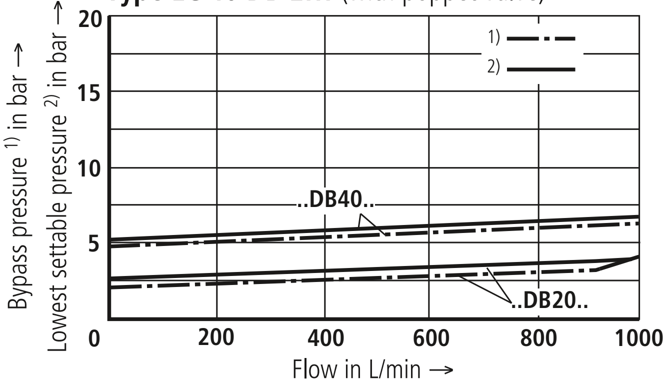


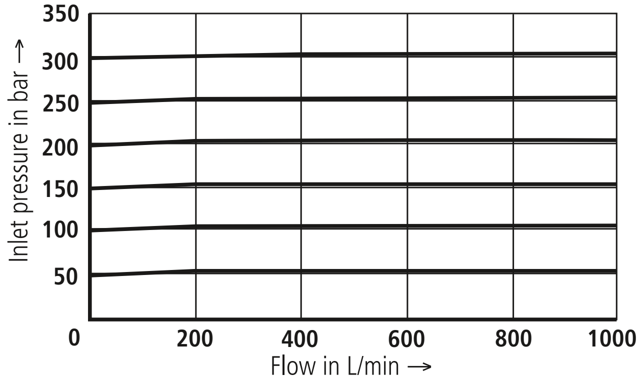
Characteristic curves: NS 40 (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

The characteristic curves were measured with an external pilot oil drain at zero pressure. With an internal pilot oil drain the inlet pressure is increased by the pressure being applied at port B.

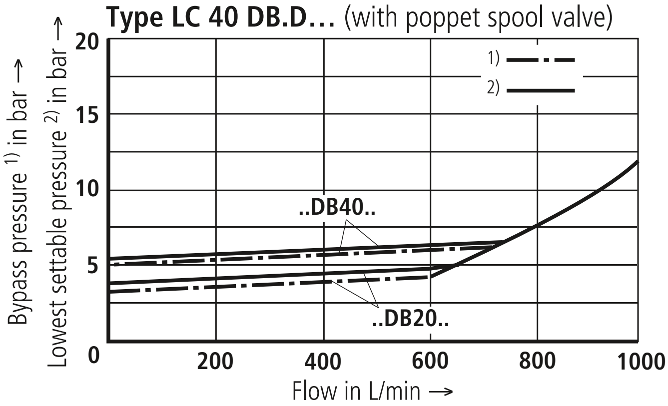
Manual pressure adjustment, type LFA 40 **DB**… and type LFA 40 **DBW**…

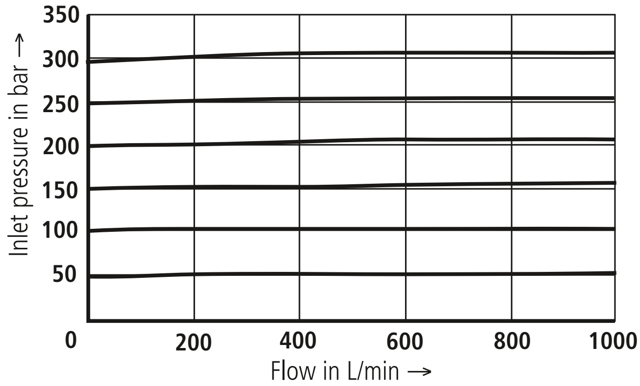
Type LC 40 DB.E… (with poppet valve)





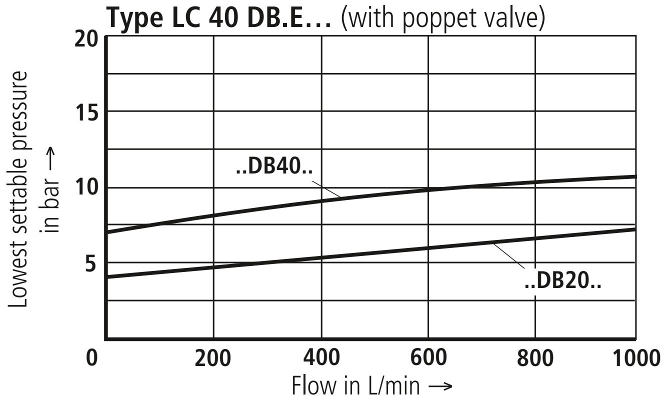
Type LC 40 DB.D… (with poppet spool valve)

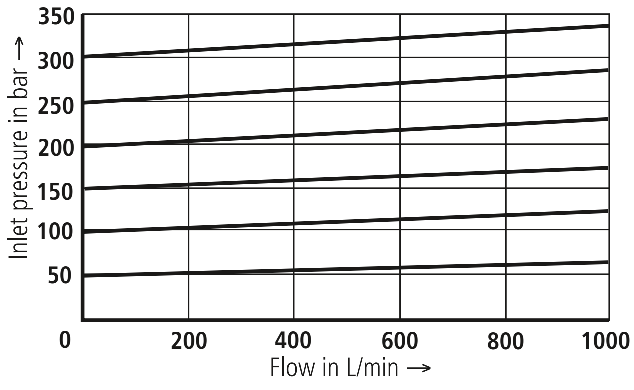




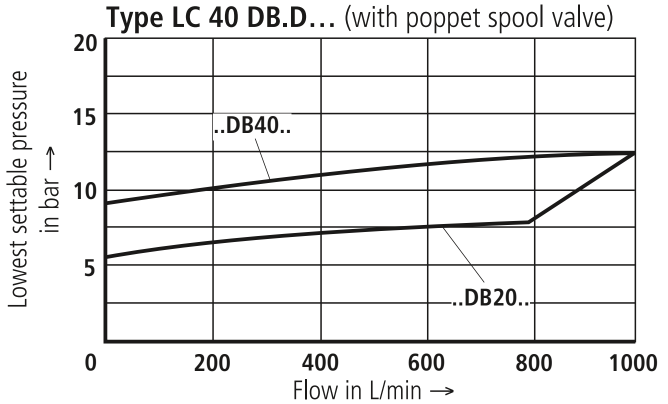
Electrical proportional pressure adjustment, type LFA 40 **DBE**…

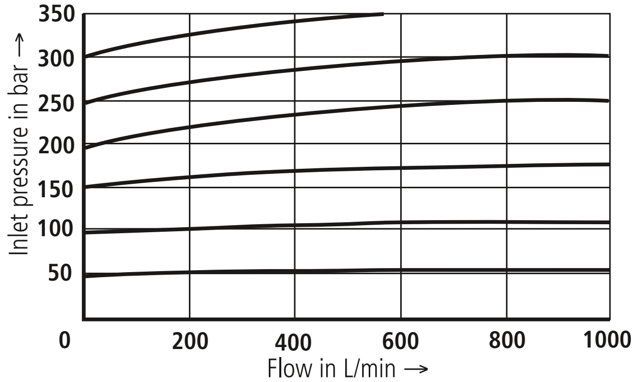
Type LC 40 DB.E… (with poppet valve)





Type LC 40 DB.D… (with poppet spool valve)



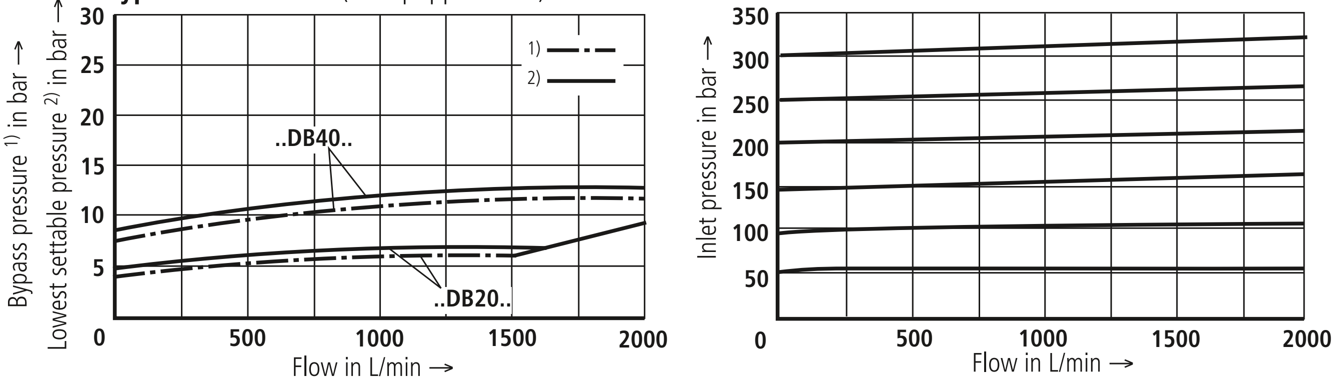


Characteristic curves: NS 50 (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

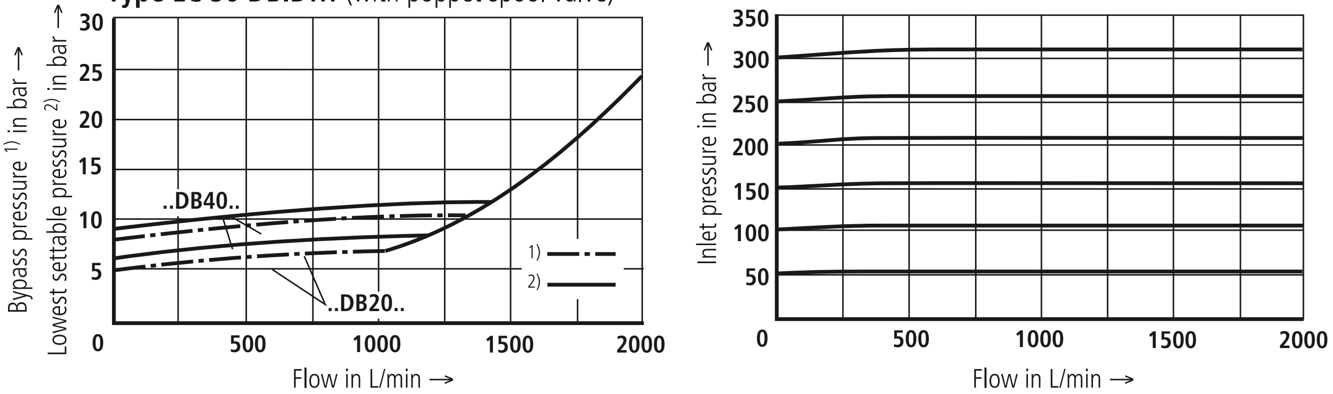
The characteristic curves were measured with an external pilot oil drain at zero pressure. With an internal pilot oil drain the inlet pressure is increased by the pressure being applied at port B.

Manual pressure adjustment, type LFA 50 **DB**… and type LFA 50 **DBW**…

Type LC 50 DB.E… (with poppet valve)

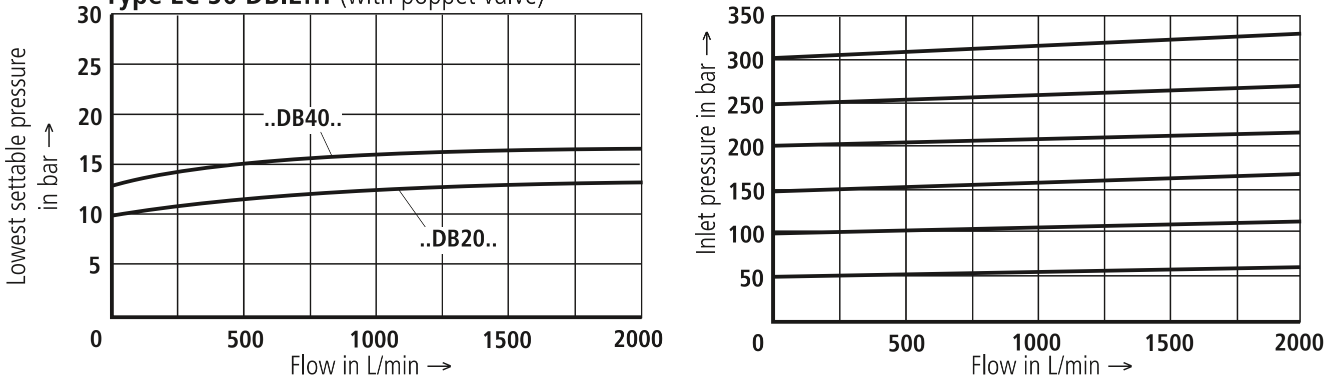


Type LC 50 DB.D… (with poppet spool valve)

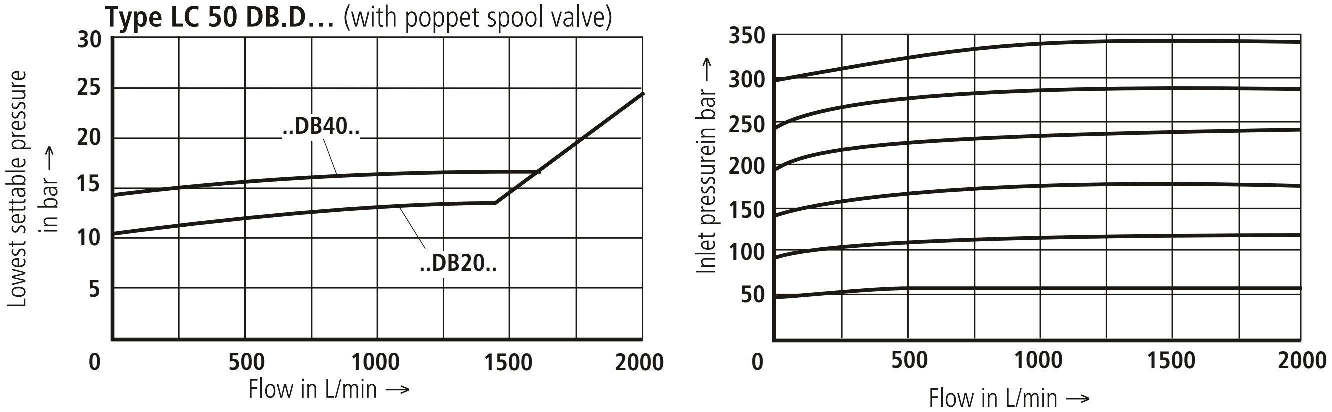


Electrical proportional pressure adjustment, type LFA 50 **DBE**…

Type LC 50 DB.E… (with poppet valve)



Type LC 50 DB.D… (with poppet spool valve)

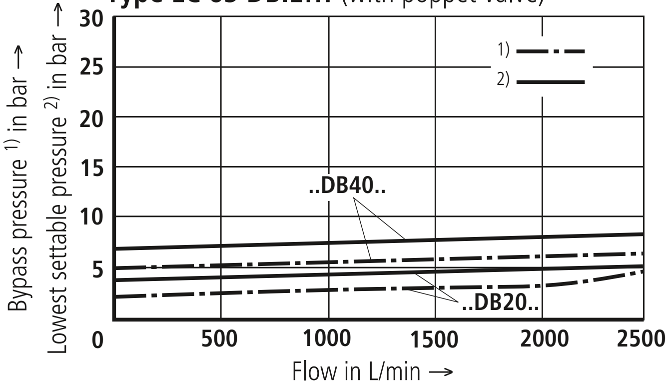


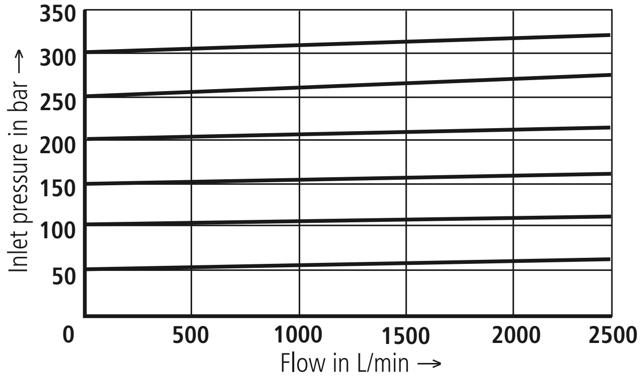
Characteristic curves: NS 63 (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

The characteristic curves were measured with an external pilot oil drain at zero pressure. With an internal pilot oil drain the inlet pressure is increased by the pressure being applied at port B.

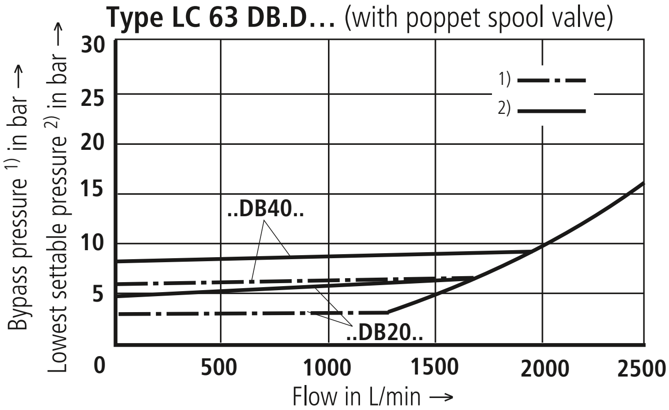
Manual pressure adjustment, type LFA 63 **DB**… and type LFA 63 **DBW**…

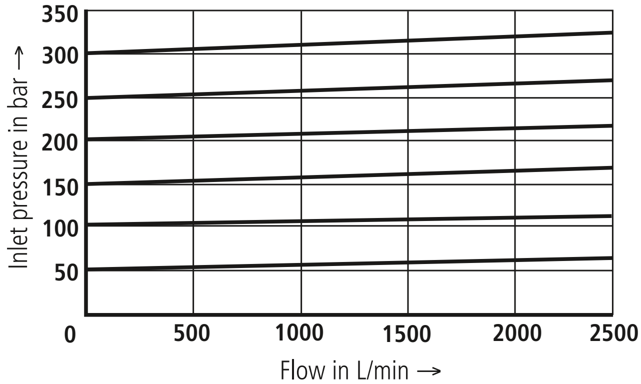
Type LC 63 DB.E… (with poppet valve)





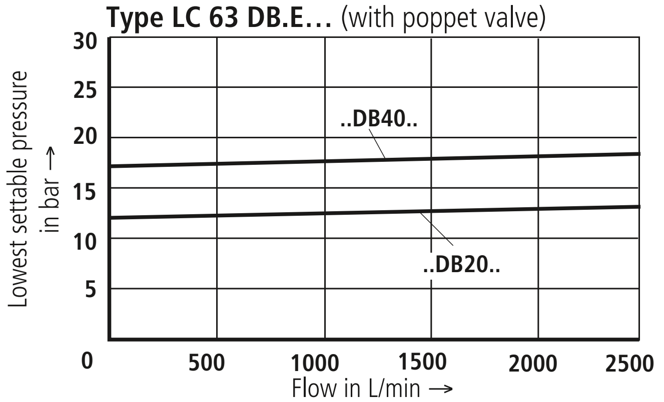
Type LC 63 DB.D… (with poppet spool valve)

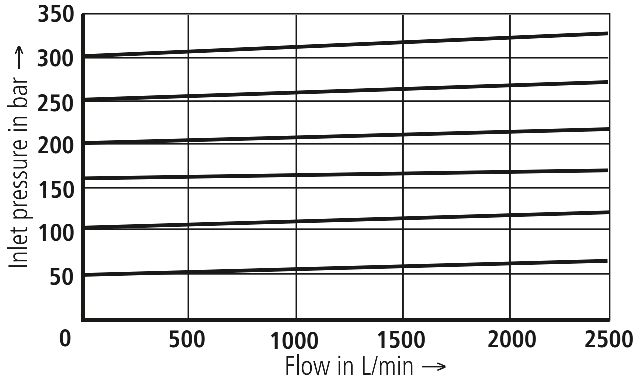




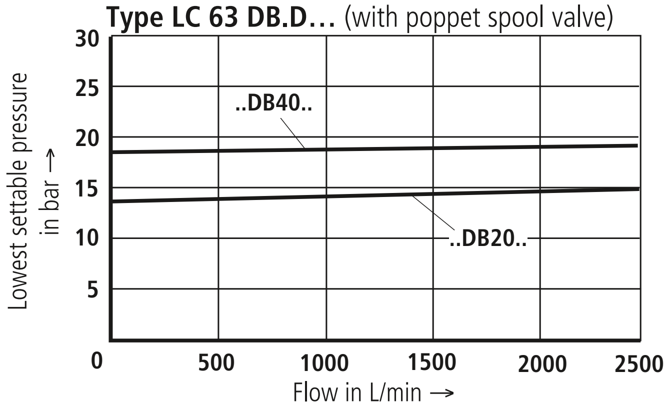
Electrical proportional pressure adjustment, type LFA 63 **DBE**…

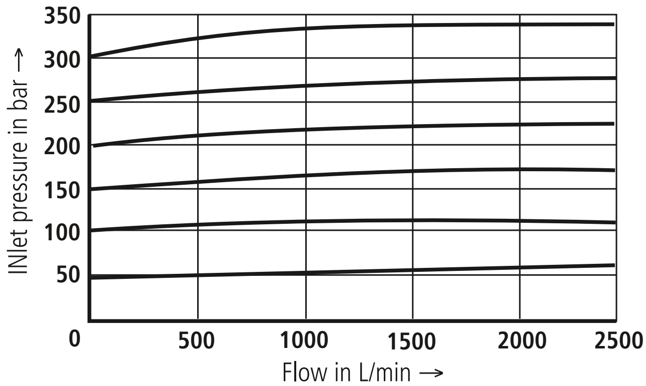
Type LC 63 DB.E… (with poppet valve)





Type LC 63 DB.D… (with poppet spool valve)





Seal kits for cartridge valves type LC...

Nominal size	Material No.	
	NBR seals	FKM seals
16	R900313104	R900313107
25	R900313105	R900313108
32	R900313106	R900313109
40	R900873022	R900873025

Nominal size	Material No.	
	NBR seals	FKM seals
50	R900873023	R900873026
63	R900873024	R900873027
80	R900314058	R900314067
100	R900314059	R900314068

Compression springs for cartridge valves type LC...

NS	Spring dimensions in mm	Opening pressure in bar	Material No.
16	10.2/1.3 x 40.5/8.0	2.0	R900062747
	10.0/1.6 x 38.2/9.0	3.0	R900062753
	9.8/1.7 x 38.0/9.0	4.0	R900062754
	9.7/1.9 x 35.7/8.5	5.0	R900062757
	9.2/2.4 x 60.5/14.5	8.0 [1)]	R900082073
25	15.3/2.25 x 55.0/8.0	2.0	R900062762
	14.9/2.7 x 53.4/8.5	3.0	R900062764
	14.7/2.8 x 53.5/8.5	4.0	R900062820
	14.6/3.0 x 52.5/8.5	5.0	R900062819
	14.1/3.5 x 78.5/12.0	8.0 [1)]	R900082072
32	19.6/2.8 x 69.5/7.5	2.0	R900062813
	19.2/3.2 x 71.0/8.5	3.0	R900062783
	19.1/3.4 x 72.0/9.5	4.0	R900062810
	19.1/3.5 x 72.8/9.0	5.0	R900062805
	18.5/4.0 x 109/14.5	8.0 [1)]	R900082071

NS	Spring dimensions in mm	Opening pressure in bar	Material No.
40	25.9/4.25 x 63.0/6.0	2.0	R900206675
	25.7/4.5 x 68.5/6.0	4.0	R900206673
	24.8/5.3 x 105.0/10.0	8.0 [1)]	R900206671
50	33.2/5.0 x 82.0/5.5	2.0	R900206684
	32.8/5.3 x 92.0/6.5	4.0	R900206681
	31.7/6.5 x 137.0/10.5	8.0 [1)]	R900206680
63	40.6/6.5 x 108.0/7.0	2.0	R900206690
	40.7/6.5 x 127.5/7.5	4.0	R900206692
	38.6/8.5 x 183.5/11.5	8.0 [1)]	R900206689
80	48.5/8 x 138/7.5	2.0	R900012353
	49/8 x 152.5/7.5	4.0	R900024113
100	52.3/9.5 x 176/9.5	2.0	R900012385
	52.3/9.5 x 195.5/9.5	4.0	R900024483

[1)] These springs require an additional installation length. When using standard control covers an additional sandwich plate type LFA..D22... must be used.

⚠ **Exception:**
Control cover type "D" can be replaced by type LFA..D8-../F (no sandwich plate required).

Preferred types (readily available)

Typ LC (Einbauventil)	Material-Nummer
LC 16 DB40E7X/	**R900912532**
LC 16 DB40D7X/	**R900912547**
LC 40 DB40E7X/	**R900927969**
LC 40 DB40D7X/	**R900938014**
LC 50 DB40E7X/	**R900938041**
LC 50 DB40D7X/	**R900938040**
LC 63 DB40E7X/	**R900938070**
LC 63 DB40D7X/	**R900938069**

Typ LFA (Steuerdeckel)	Material-Nummer
LFA 16 DB2-7X/315	**R900912757**
LFA 32 DB2-7X/315	**R900912768**
LFA 40 DB2-7X/315	**R900927972**
LFA 50 DB2-7X/315	**R900938163**
LFA 63 DB2-7X/315	**R900938230**
LFA 16 DBW2-7X/315	**R900912805**
LFA 25 DBW2-7X/315	**R900912810**
LFA 32 DBW2-7X/315	**R900912815**
LFA 40 DBW2-7X/315	**R900938096**
LFA 50 DBW2-7X/315	**R900938191**
LFA 63 DBW2-7X/315	**R900938238**

Further preferred types and standard components are shown in the EPS (standard price list).

General notes on the ordering details for control covers

1	2	3	4	5	6	7	8	9
LFA				—	/	A...	B...	
					DB max	DB1	DB2	

•= Available

Nominal size 16	25	32	40	50	63	80	100	Type [1]	Adjustment type	Series	Pressure stage in bar for nominal sizes 16 to 32	40 to 100	Seal material	Page
•	•	•	•	•	•					7X				
						•	•			6X				
•	•	•	•	•	•	•	•	DB			025 050 100	025 050 100	For ordering details, see pages giving details of the individual cover variations	18 to 20
•	•	•	•	•	•	•	•	DBW			200 315 420	200 315 400		21 to 25
			•	•	•	•	•	DBS				025; 050; 100; 200; 315; 400		21 to 25
•	•	•	•	•	•	•	•	DBWD			025 050	025 050		26 to 28
•	•	•	•	•	•	•	•	DBU2A			100	100		29 to 32
•	•	•	•	•	•	•	•	DBU2B			200	200		29 to 32
•	•	•	•	•	•	•	•	DBU3D			315 420	315 400		33 to 37
•	•	•	•	•	•			DBE						38
•	•	•	•	•	•	•	•	DBEM			025; 050; 100; 200; 315; 420	025; 050; 100; 200; 315; 400		39 to 42

[1] For functions, see selection table on page 15

Preferred types and standard components can be found in the EPS (Standard Price List).

4

Adjustment types for pressure relief valves

1 = Rotary knob
2 = Hexagon with protective cap
3 = Lockable rotary knob with scale
(H-key to automotive industry standards)
4 = Rotary knob with scale, not lockable

5

Series

7X = Series 70 to 79 and
6X = Series 60 to 69
(unchanged installation and connection dimensions)

6

Pressure stages

Dependent on the normianl size and permissible working pressure of the pilot valve. For futher details see ordering details for the control cover.

7

A... Pressure data for DB1, only required for types DBU2 and DBU3D

8

B... Pressure data for DB2, only required for type DBU3D

Ordering example for type DBU3D
…/315* A 100 B 200 (DB max /DB1/DB2)
*DB max. always first

The control covers are always fitted with a, optimised on our test rig, standard orifice. Orifice details are therefore not required in the type code. Deviating operating conditions could make it necessary to match the orifice size. The orifices are of the threaded type.

Orifice as shown within the main symbol

General notes on the ordering details for control covers: pilot control valve (max. operating pressure)

Pilot control valve		Control cover		Max. operating pressure in bar			Included in type code	Has to be specially ordered
					Y, T			
Type	Catalogue sheet No.	NS	Type	X	For pressure control	Static		
DBD. 2 K2X/… 1)	On request	16 to 32	DB, DBW, DBWD,	420	Zero pressure (up to ≈ 2 bar)	315	•	
DBD. 6 K1X/… 2)	25 402	40 to 63	DBU2., DBU3D,	400		315	•	
DBD. 10 K1X/… 2)	25 402	80, 100	DBEM, DBS	400		315	•	
.WE 6 …	23 178	16 to 63	DBW, DBWD,	350		210 (=); 160 (~)		•
.WE 10 …	23 327	80, 100	DBU2., DBU3D	315		210 (=); 160 (~)		•
M-3SEW 6 …	22 058	16 to 63	DBW, DBS	420		100		•
M-3SED 6 …	22 049	16 to 63	DBW, DBS	315		X-40		•
M-3SEW 10 …	22 075	80, 100	DBW, DBS	420		100		•
M-3SED 10 …	22 045	80, 100	DBW, DBS	315		X-40		•
DBET-5X/.G24-1 3)	29 165	16 to 32	DBE, DBEM	350		100		•
DBET-5X/.G24…	29 165	40	DBE, DBEM	350		100		•
DBET-5X/.YG24-1 3)	On request	50 to 100	DBE, DBEM	350		100		•
DBETR…	On request	16 to 100	auf Anfrage					

1) Possible pressure stages: 25, 50, 100, 200, 315, 420

2) Possible pressure stages: 25, 50, 100, 200, 315, 400

3) Possible pressure stages: 50, 100, 200, 315, 350
1 = G 1/4 threaded connection T; special poppet

Note:

By combining a 2-way cartridge valve with a pilot control valve, various valve functions can be obtained.
The following components may be considered with porting pattern form A6 (up to NS 63) and form A10 (NS 80 to 100) DIN 24 340.

Valve fixing screws are included within the control cover scope of supply.

Fixing screws: S.H.C.S. to DIN 912-10.9

Pilot control valve Type	Dimensions	Tightening torque in Nm
M-3SEW 6 …	M5 x 45	8.9
M-3SEW 10 …	M6 x 40	15.5
M-3SED 6 …	M5 x 50	8.9
M-3SED 10 …	M6 x 40	15.5

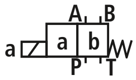
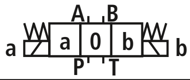
Pilot control valve Type	Dimensions	Tightening torque in Nm
.WE 6 …	M5 x 50	8.9
.WE 10 …	M6 x 40	15.5
DBET …	M5 x 30	8.9

Technical data (for applications outside these parameters, please consult us!)

Maximum operating pressure	bar	420 ⚠ **Attention:** p_{max} Take the pilot control valve into account!
Pressure fluid 1) Suitable for NBR **and** FKM seals 2) **Only** suitable for FKM seals		Mineral oil (HL, HLP) to DIN 51 524 1); Fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90 221); HETG (rape seed oil) 1); HEPG (polyglycols) 2); HEES (synthetic ester) 2); Other pressure fluids on request
Pressure fluid temperature range	°C	– 30 to + 80 for NBR seals
		– 20 to + 80 for FKM seals
Viscosity range	mm^2/s	2.8 to 380
Cleanliness class to ISO code		Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 20/18/15 3)

3) The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.
For the selection of filters see catalogue sheets RE 50 070, RE 50 076 and RE 50 081.

Pilot control valves (selection table)

	Nom. size 16 to 32	Nom. size 40 to 63	Nom. size 80 and 100	Type	Pilot control valve	Manual pressure setting			Symbols (see page 16)
	•	•	•	DB		**Without** directional valve			1
						**With** directional valve: Position"a"	Position "b"		
• = Availaable						Position"a"	Position"0"	Position "b"	
Directional valve unloading	•	•		DBW	3WE6B9-...	Open	DB function		2 3
	•				M-3SE.6C...				
	•	•			4WE6D...	DB function	Open		
	•				M-3SE.6U...				
			•		3WE10B9-...	Open	DB function		3
			•		4WE10D...	DB function	Open		
				DBS		Open	DB function		4
		•			M-3SE.6C...				
						DB function	Open		
		•			M-3SE.6U...				
			•		M-3SE.10C./...	Open	DB function		
			•		M-3SE.10U./...	DB function	Open		
Isolating function	•	•		DBWD	3WE6B9-...	DB function	Closed		5
			•		3WE10B9-...				
	•	•			3WE6A-...	Closed	DB function		
	•	•			4WE6M..			Open	
			•		3WE10A...				
			•		4WE10M...			Open	
2 spressure stages	•	•		DBU2A	4WE6H...	DBmax. function	Open	DB1 function	6
			•		4WE10H...				
	•	•			4WE6D...		DB1 function		
			•		4WE10D...				
	•	•		DBU2B	4WE6D...	DB1 function	DBmax. function		—
			•		4WE10D...				
3 pressure stages	•	•		DBU3D	4WE6H...	DB2 function	Open	DB1 function	7
			•		4WE10H...				
	•	•			4WE6E...		DBmax. function		
			•		4WE10E...				
	•	•			4WE6D...		DB1 function		
			•		4WE10D...				
						Proportional pressure setting version			
Proportional valves	•	•		DBE	DBET-5X/...	**Without** max. pressure safety limitation			8
	•	•		DBEM	DBET-5X/...	**With** max. pressure safety limitation			9

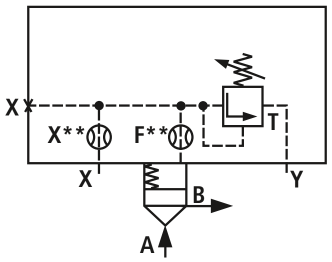
Open = Bypass circuit
Closed = Cartridge valve is hydraulically locked
DB function = Pressure relief function

Symbol overview (basic symbols), **pressure relief function**

Valid symbols are shown in the following type descriptions !

①

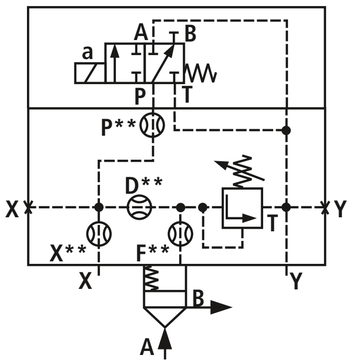
LFA..DB.-../..NS16 to 100



See pages 18 to 20

②

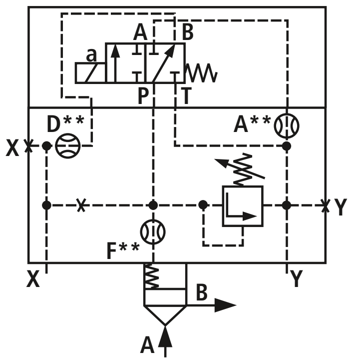
LFA..DBW.-../..NS16 to 32



See pages 21, 22

③

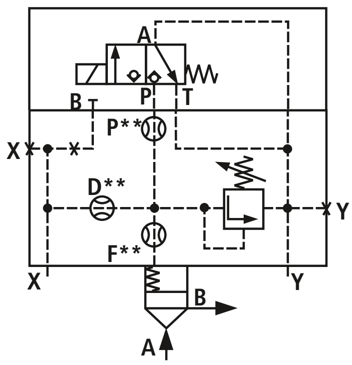
LFA..DBW.-../..NS40 to 100



See pages 21 to 25

④

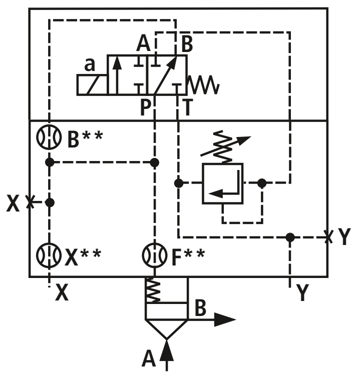
LFA..DBS.-../..NS40 to 100



See pages 21 to 25

⑤

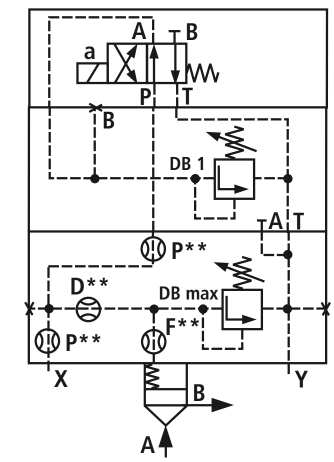
LFA..DBWD.-../..NS16 to 100



See pages 26 to 28

⑥

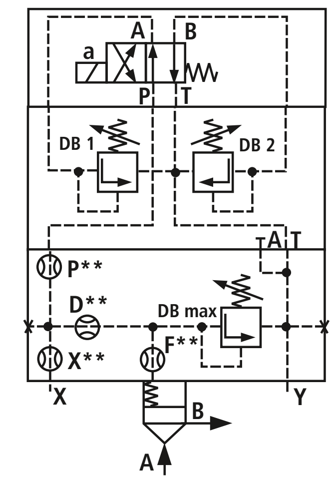
LFA..DBU2A.-../..NS16 to 100



See pages 29 to 32

⑦

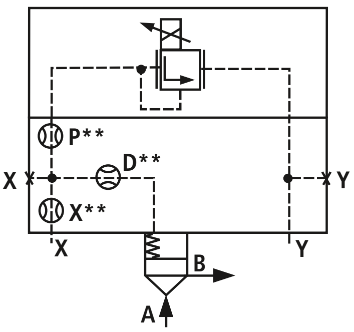
LFA..DBU3D.-../..NS16 to 100



See pages 33 to 37

⑧

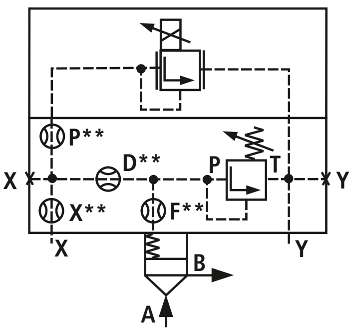
LFA..DBE-../..NS16 to 63



See page 38

⑨

LFA..DBEM-../..NS16 to 100



See pages 39 to 42

R-rings dimensions for ports X, Y (included within the scope of supply)

NS	Dimensions mm	Material No. NBR	Material No. FKM
16	8.41 x 1.40 x 1.78	R900025407	R900025408
25	9.81 x 1.50 x 1.78	R900017453	R900017610
32	11.18 x 1.60 x 1.78	R900017455	R900017611
40, 50	13.00 x 2.30 x 2.62	R900017457	R900017617
63	18.72 x 2.62 x 2.62	R900024445	R900024446
80	26.57 x 3.53 x 3.53	R900017466	R900017630
100	34.52 x 3.53 x 3.53	R900017472	R900017633

Seal kits for control cover type LFA..

Seal kit for LFA...	Material No.							
	NS 16		NS 25		NS 32		NS 40	
	NBR	FKM	NBR	FKM	NBR	FKM	NBR	FKM
..DB..; DBW..; ..DBS.. ..DBWD..; ..DBEM..	R900313955	R900313956	R900313957	R900313958	R900313802	R900313803	R900313722	R900313723
..DBU2..; ..DBU3..	R900313709	R900313710	R900313711	R900313712	R900313713	R900313714	R900885152	R900313716
DBE..	R900313701	R900313702	R900313703	R900313704	R900313705	R900313706	R900313707	R900313708

Seal kit for LFA...	Material No.							
	NS 50		NS 63		NS 80		NS 100	
	NBR	FKM	NBR	FKM	NBR	FKM	NBR	FKM
..DB..; DBW..; ..DBS.. ..DBWD..;	R900895786	R900313725	R900313726	R900313727	R900310533		R900313054	
..DBU2..; ..DBU3..	R900313717	R900313718	R900313719	R900313720	R900312090			
..DBE..	R900313897	R900313898	R900313899	R900313700				
..DBEM..	R900313893	R900313894	R900313895	R900313896	R900311930		R900312219	

Fixing screws (included within the scope of supply)

S.H.C.S. to DIN 912-10.9

NS	Qty.	Dimensions	Tightening torque in Nm
16	4	M 8 x 45	32
25	4	M 12 x 50	110
32	4	M 16 x 60	270
40	4	M 20 x 70	520
50	4	M 20 x 80	520
63	4	M 30 x 100	1800
80	8	M 24 x 120	900
100	8	M 30 x 120	1800

Orifice thread size

D orifices for type ..DBE.. NS 25 to 63	M8 x 1 tapered
Orifices for NS 80, 100	M8 x 1 tapered (A**, B**, P**, D**) or G 1/4 (X**, F**)
Other built-in orifices	M6 tapered

Control cover with manual pressure adjustment

NS 16 to 100

1	2	3	4	5	6	9
LFA		DB		–	/	

Nom. size 16	Series 7X	=	**16**
Nom. size 25		=	**25**
Nom. size 32		=	**32**
Nom. size 40		=	**40**
Nom. size 50		=	**50**
Nom. size 63		=	**63**
Nom. size 80	Series 6X	=	**80**
Nom. size 100		=	**100**

Adjustment type

Rotary knob **= 1**
Hexagon with protective cap **= 2**
Lockable rotary knob with scale **= 3**
(H-key to automotive industry standards)
Rotary knob with scale **not** lockable **= 4**

No code = NBR seals
V = FKM seals
(other seals on request)

⚠ Attention!
The compatibility of the seals and pressure fluid has to be taken into account!

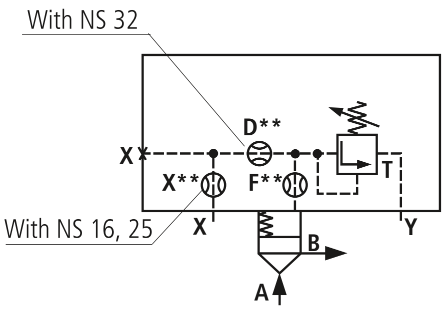
Pressure stages

NS 16, 25 ,32	NS 40, 50, 63, 80, 100
025 = 25 bar	**025** = 25 bar
050 = 50 bar	**050** = 50 bar
100 = 100 bar	**100** = 100 bar
200 = 200 bar	**200** = 200 bar
315 = 315 bar	**315** = 315 bar
420 = 420 bar	**400** = 400 bar

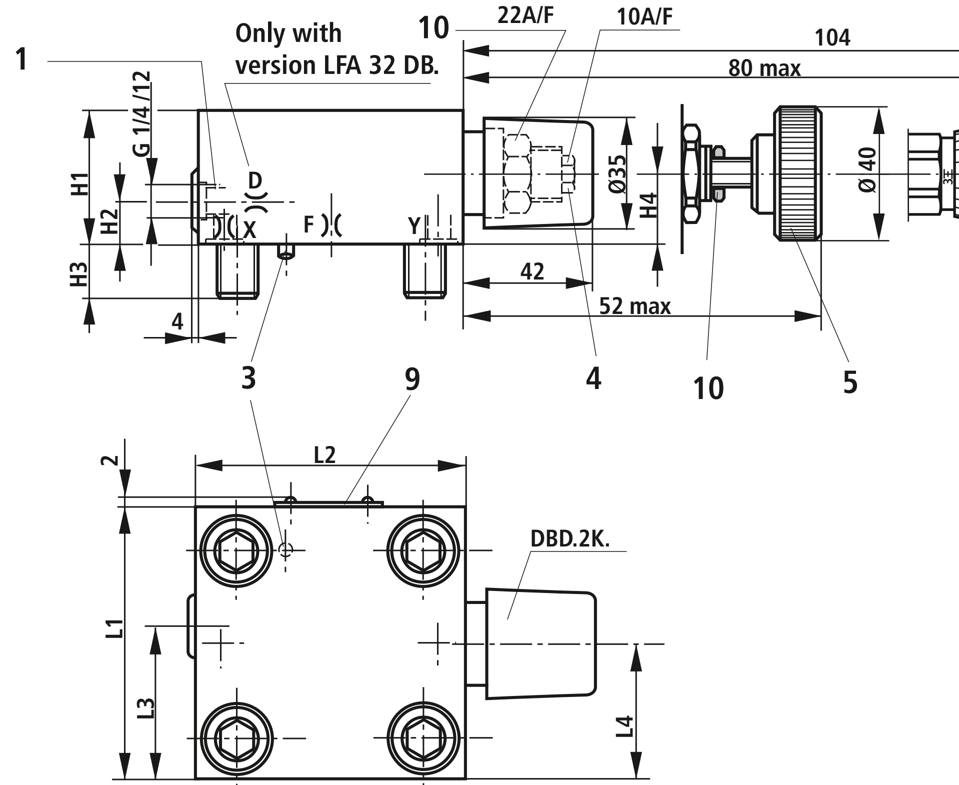
6X = Series 6X (NS 80 and 100)
7X = Series 7X (NS 16 to 63)

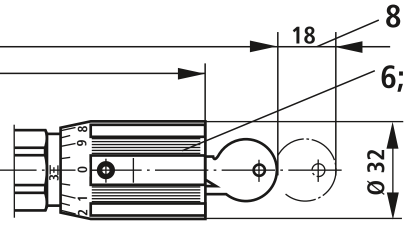
NS 16, 25 ,32

Dimensions in mm



LFA..DB.-7X/..
NS 16, 25, 32



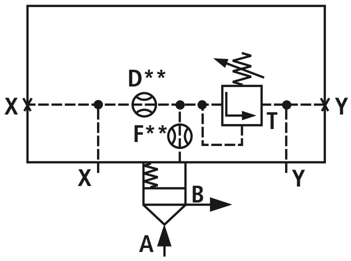


NS	16	25	32
X** 1)**	0.8	0.8	
F** 1)**	1.0	1.0	1.2
D** 1)**			0.8
H1	40	40	50
H2	17	19	26
H3	15	24	28
H4	19	19	26
L1	65	85	100
L2	80	85	100
L3	36.5	49	56.5
L4	32.5	45.5	53

** Orifice Ø
[1] Orifice M6 tapered

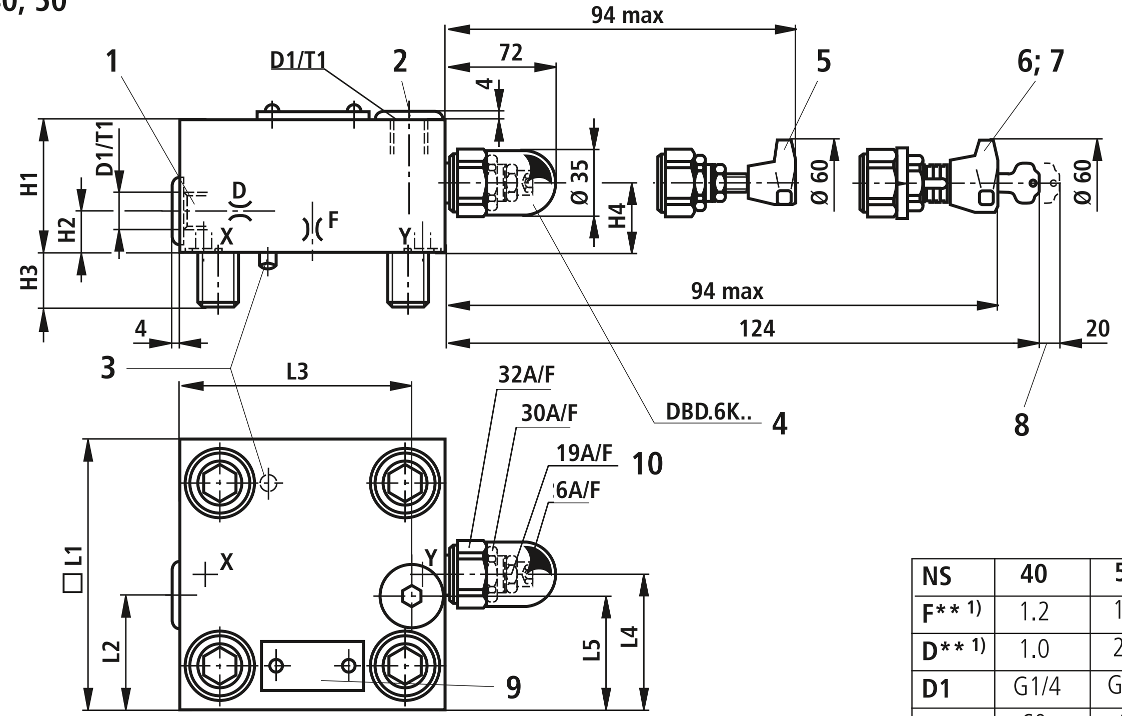
1 Port X optionally as threaded port
3 Locating pin
4 Adjustment type "2"
5 Adjustment type "1"
6 Adjustment type "3"
7 Adjustment type "4"
8 Space required to remove the key
9 Name plate
10 Locknut

Control cover with manual pressure adjustment

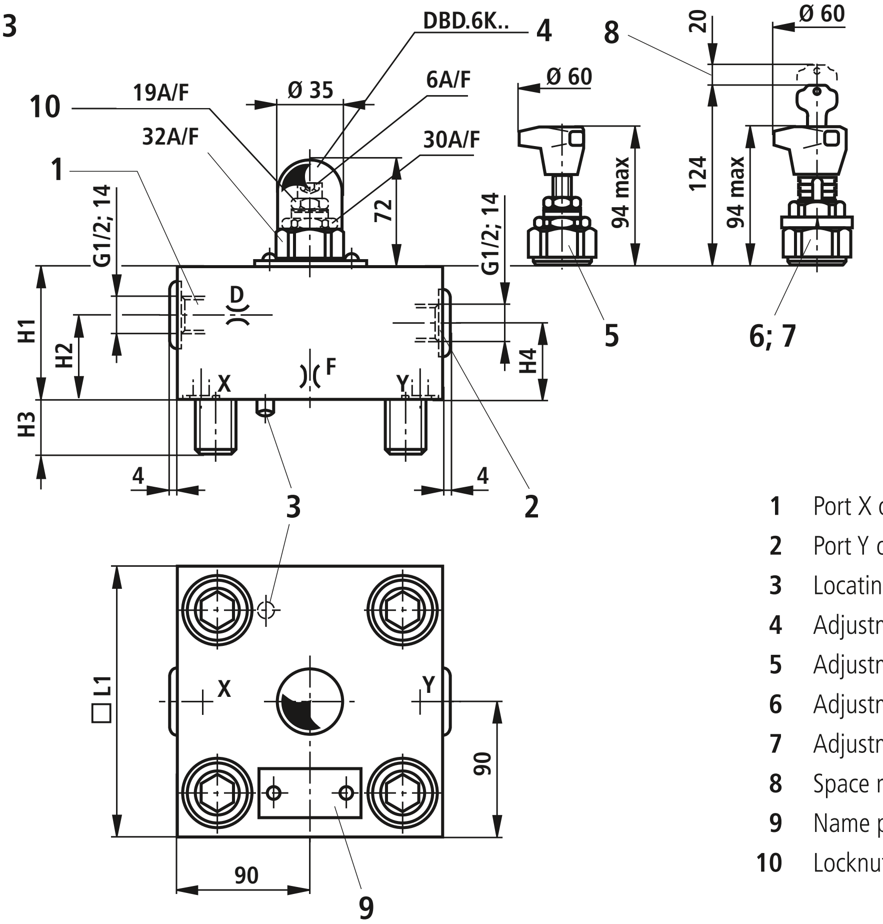


LFA..DB.-7X/..
NS 40, 50, 63

NS 40, 50



NS 63

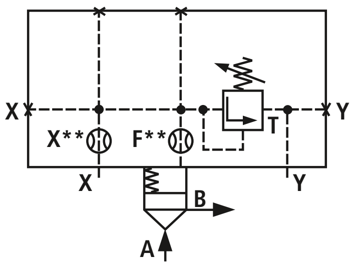


NS	40	50	63
F** 1)	1.2	1.5	2.0
D** 1)	1.0	2.0	2.5
D1	G1/4	G1/2	
H1	60	68	82
H2	28	19.5	30
H3	32	34	50
H4	27	35	45.5
□ L1	125	140	180
L2	69	80	
L3	89	105	
L4	76	84	
L5	60	70	
T1	12	14	

** Orifice Ø
1) Orifice M6 tapered

1. Port X optionally as a threaded port
2. Port Y optionally as a threaded port
3. Locating pin
4. Adjustment "2"
5. Adjustment "1"
6. Adjustment "3"
7. Adjustment "4"
8. Space required to remove the key
9. Name plate
10. Locknut

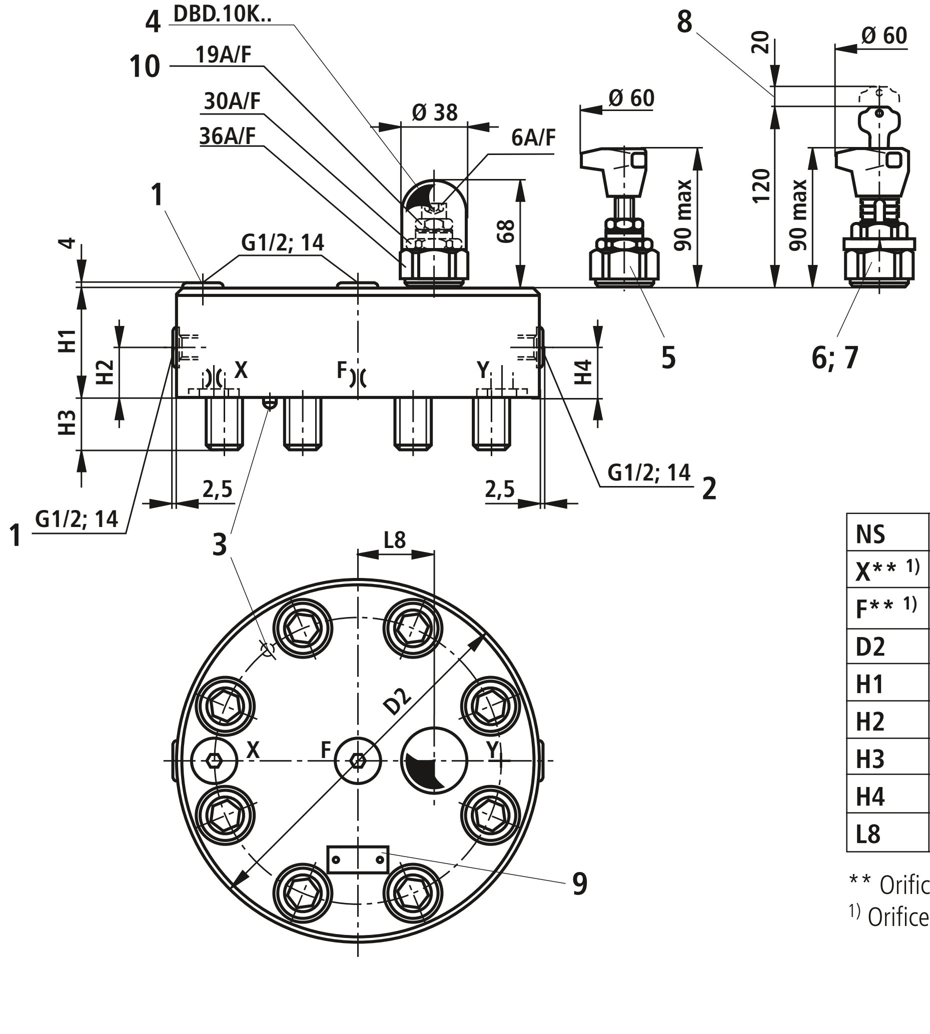
Control cover with manual pressure adjustment



LFA...DB.-6X/...
NS 80, 100

NS 80, 100

Dimensions in mm



NS	80	100
X 1)**	3.0	3.0
F 1)**	2.5	2.5
D2	250	300
H1	100	100
H2	38	38
H3	45	51
H4	58	58
L8	50	50

** Orifice Ø
1) Orifice G 1/4 tapered

1 Port X optionally as a threaded port
2 Port Y optionally as a threaded port
3 Locating pin
4 Adjustment type "2"
5 Adjustment type "1"
6 Adjustment type "3"
7 Adjustment type "4"
8 Space required to remove the key
9 Name plate
10 Locknut

Control cover with manual pressure adjustment, for electrical unloading

NS 16 to 100

1	2	3	4	5	6	9
LFA				–	/	

NS 16	Series 7X	= **16**	
NS 25		= **25**	
NS 32		= **32**	
NS 40		= **40**	
NS 50		= **50**	
NS 63		= **63**	
NS 80	Series 6X	= **80**	
NS 100		= **100**	

Control cover type

For mounting a directional spool (NS 16 to 100) or directional poppet valve (for NS 16, 25, 32) = **DBW**

For mounting a directional poppet valve (for NS 40, 50, 63, 80, 100) = **DBS**

Adjustment type

Rotary knobe = **1**

Hexagon with protective cap = **2**

Lockable rotary knob with scale (H-key to automotive industry standards) = **3**

Rotary knob with scale **not** lockable = **4**

No code = NBR seals

V = FKM seals

(other seals on request)

⚠ **Attention!**
The compatibility of the seals and pressure fluid has to be taken into account!

Pressure stages

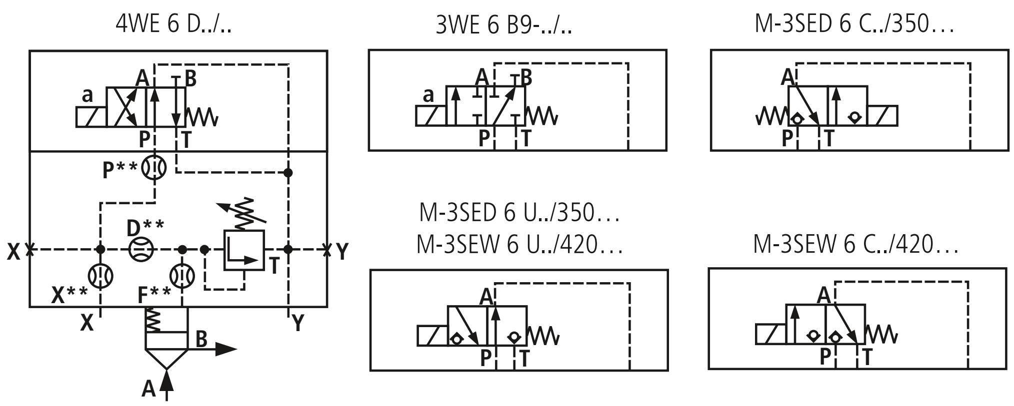
(take max. perm. pressure of pilot valve into account)

NS 16, 25 ,32	NS 40, 50, 63, 80, 100
025 = 25 bar	**025** = 25 bar
050 = 50 bar	**050** = 50 bar
100 = 100 bar	**100** = 100 bar
200 = 200 bar	**200** = 200 bar
315 = 315 bar	**315** = 315 bar
420 = 420 bar	**400** = 400 bar

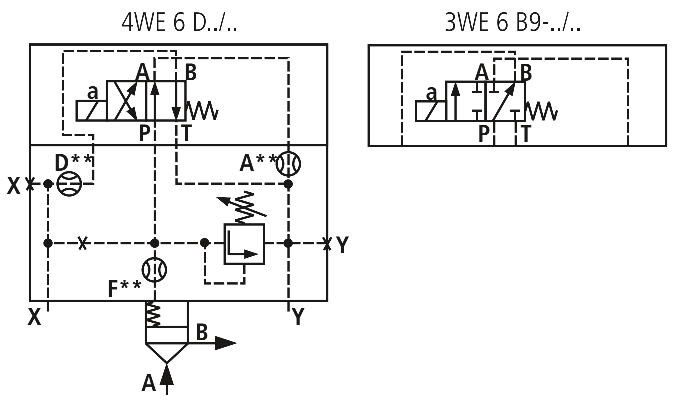
6X = Series 6X (NS 80 and 100)

7X = Series 7X (NS 16 to 63)

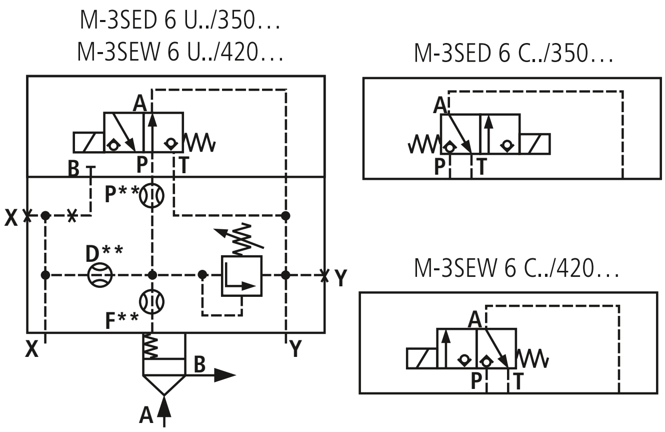
NS 16 to 63



LFA..DBW.-7X/...
NS 16, 25, 32



LFA..DBW.-7X/...
NS 40, 50, 63

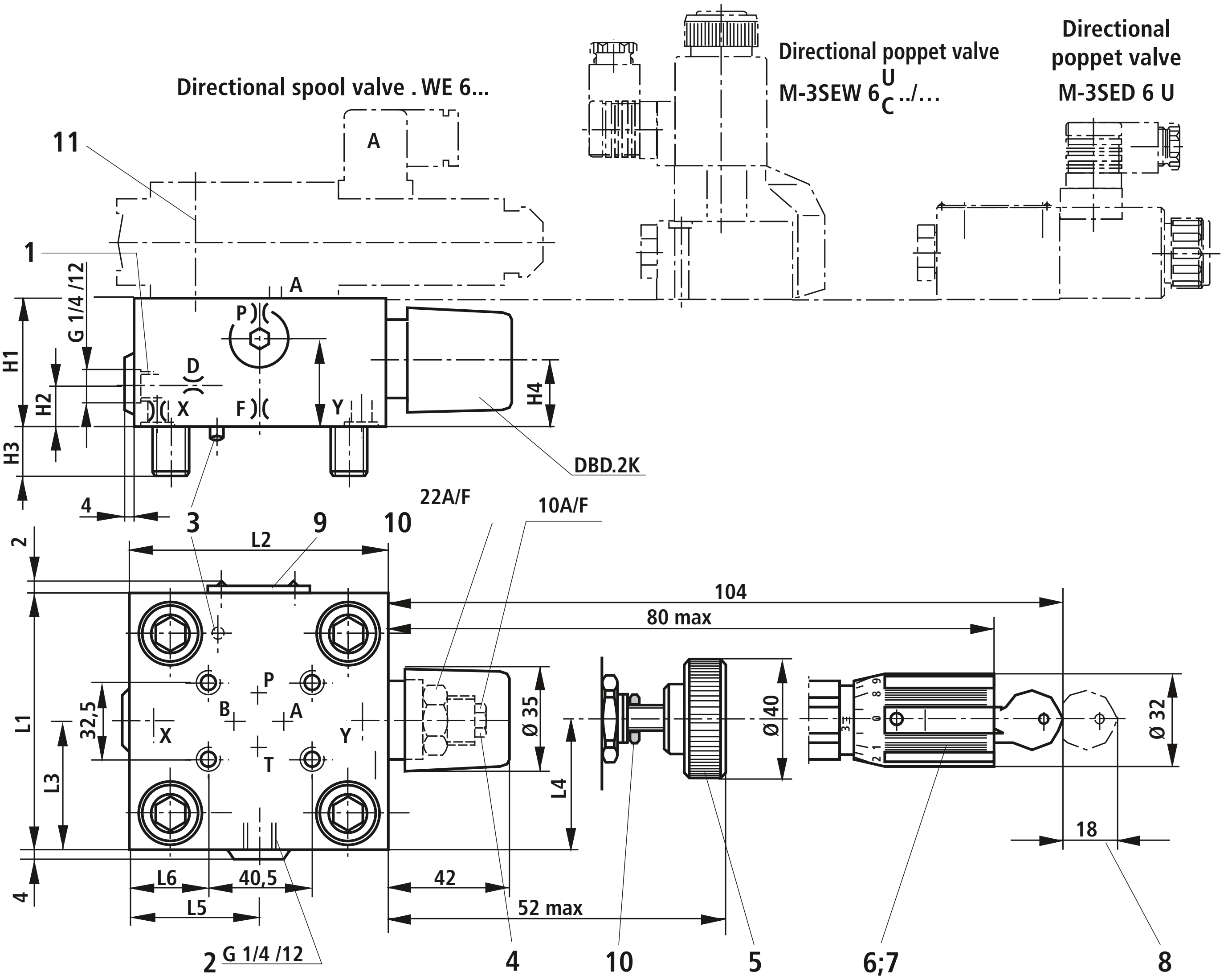


LFA..DBS.-7X/...
NS 40, 50, 63

Control cover with manual pressure adjustment, for electrical unloading

NS 16, 25, 32

Dimensions in mm



NS	P**1)	X**1)	F**1)	D**1)	H1	H2	H3	H4	H5	L1	L2	L3	L4	L5	L6	L7
16	1.0	0.8	1.0	0.8	40	17	15	19	28	65	80	36.5	32.5	35	7	17
25	1.0	0.8	1.0	0.8	40	19	24	19	28	85	85	49	45.5	36	8	27
32	1.0	1.0	1.2	1.0	50	26	28	26	37	100	100	56.5	53	57	31	34.5

** Orifice Ø

1) Orifice M6 tapered

1 Port X optionally as a threaded port

2 Port Y optionally as a threaded port

3 Locating pin

4 Adjustment type "2"

5 Adjustment type "1"

6 Adjustment type "3"

7 Adjustment type "4"

8 Space required to remove the key

9 Name plate

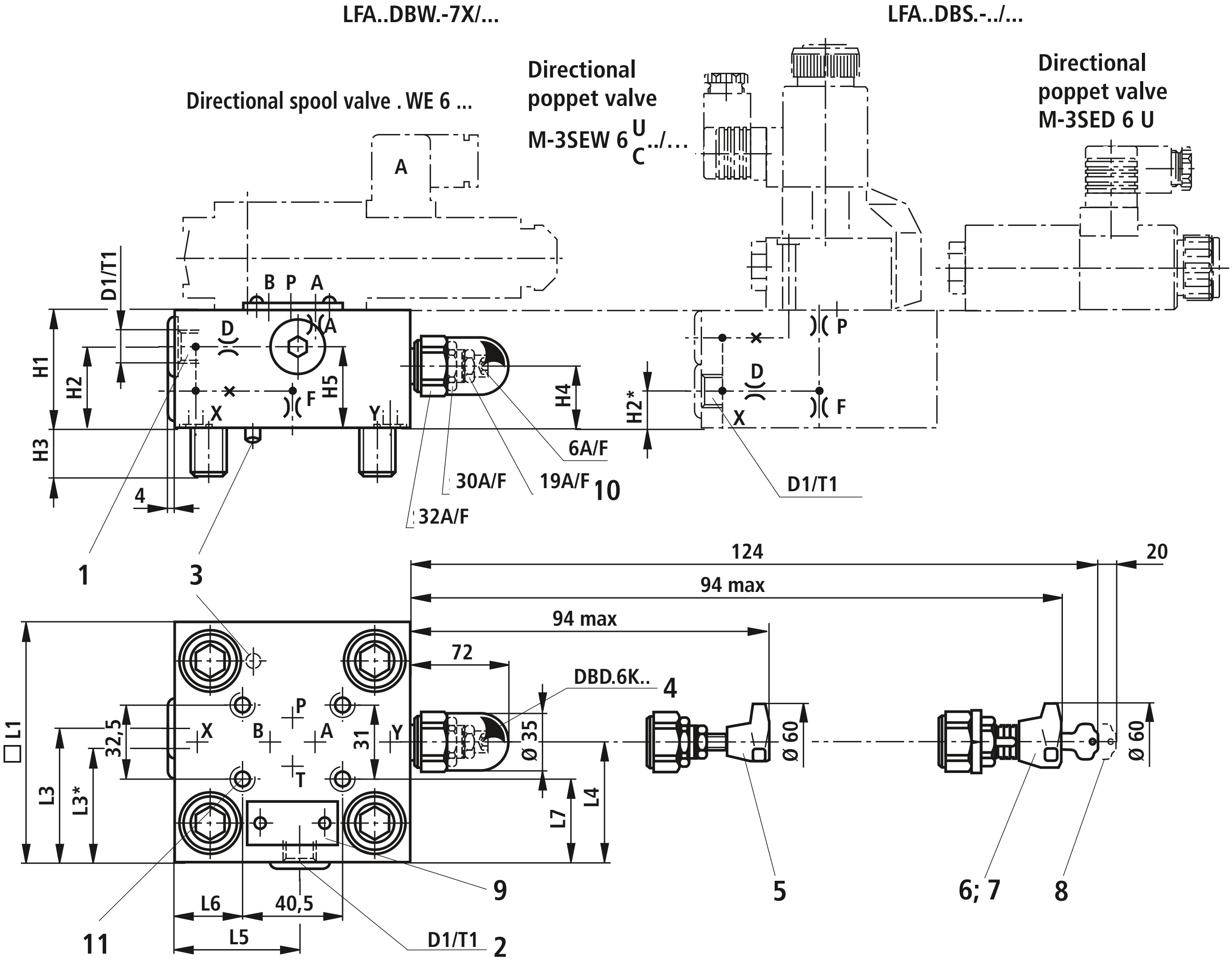
10 Locknut

11 Valve fixing screws are included within the control cover scope of supply

Control cover with manual pressure adjustment, for electrical unloading

NS 40, 50

Dimensions in mm



NS	A**1)	P**1)	F**1)	D**1)	D1	T1	H1	H2	H2*	H3	H4	H5	□L1	L3	L3*	L4	L5	L6	L7
40	0.8	1.2	1.2	1.0	G1/4	12	60	46	17	32	27	40	125	62.5	69	76	68	43.5	47
50	0.8	1.5	1.5	2.0	G1/2	14	68	51	19.5	34	35	50	140	67.5	80	84	74.5	51	54.5

* Dimensions for control cover LFA..DBS..

** Orifice Ø

1) Orifice M6 tapered

1 Port X optionally as a threaded port

2 Port Y optionally as a threaded port

3 Locating pin

4 Adjustment type "2"

5 Adjustment type "1"

6 Adjustment type "3"

7 Adjustment type "4"

8 Space required to remove the key

9 Name plate

10 Locknut

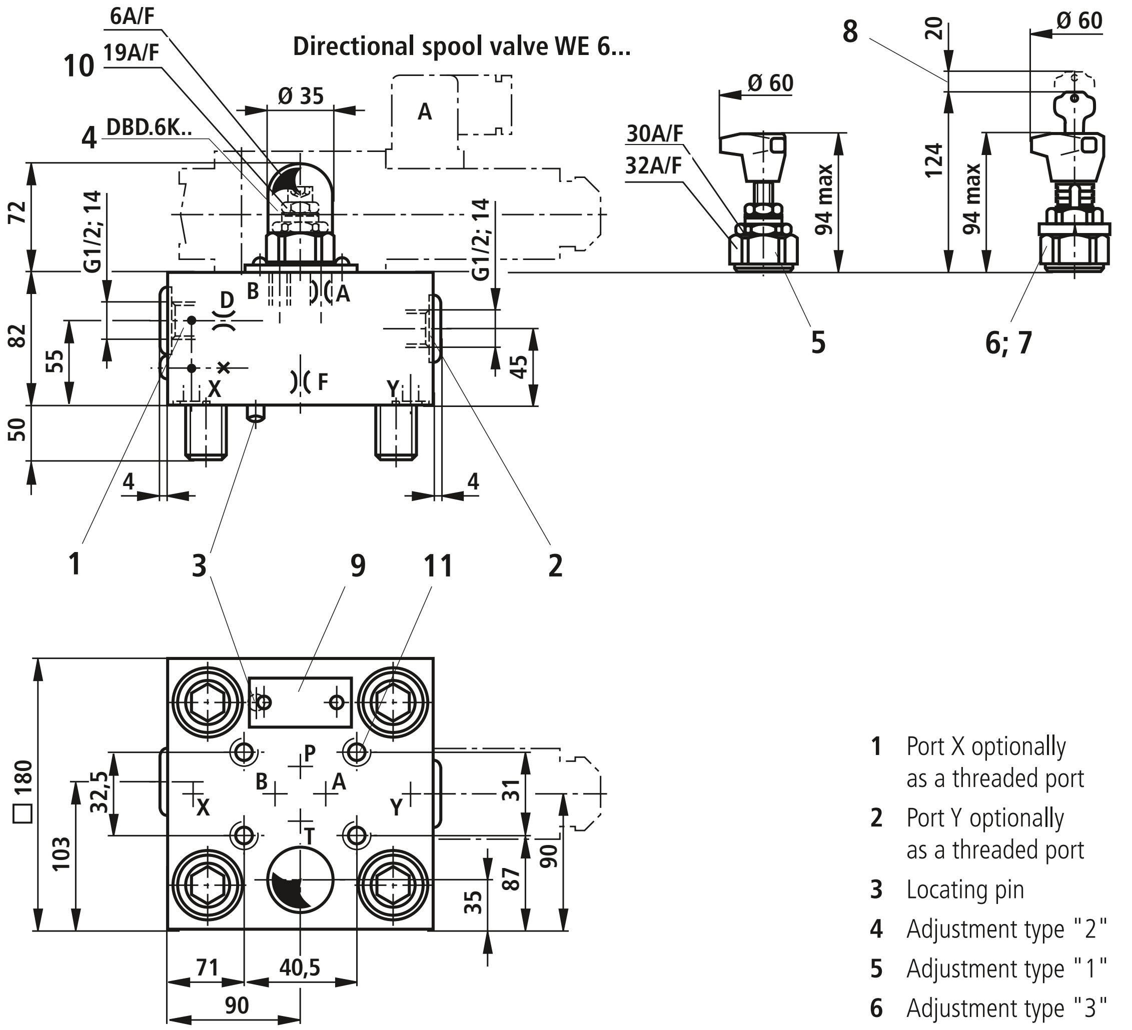
11 Valve fixing screws are included within the control cover scope of supply

Control cover with manual pressure adjustment, for electrical unloading

NS 63

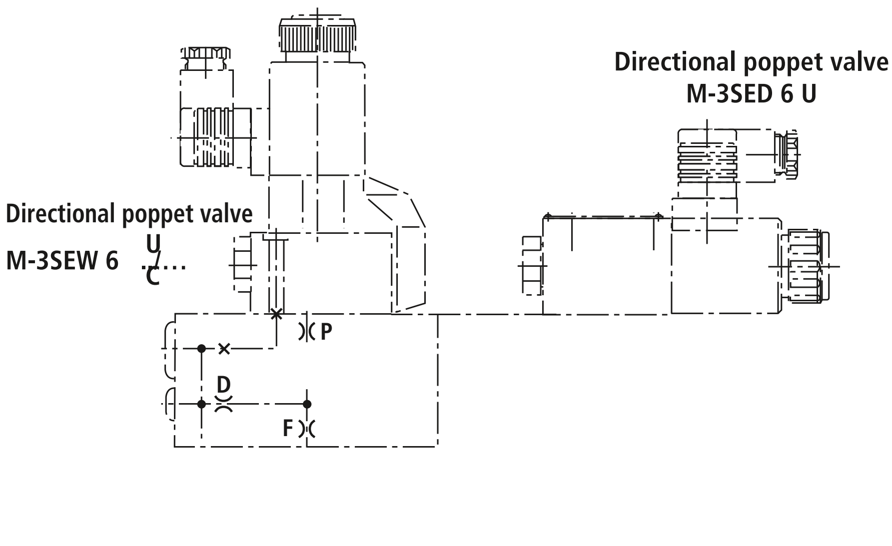
Dimensions in mm

LFA..DBW.-7X/...



1 Port X optionally as a threaded port
2 Port Y optionally as a threaded port
3 Locating pin
4 Adjustment type "2"
5 Adjustment type "1"
6 Adjustment type "3"
7 Adjustment type "4"
8 Space required to remove the key
9 Name plate
10 Locknut
11 Valve fixing screws are included within the control cover scope of supply

LFA..DBS.-.../...



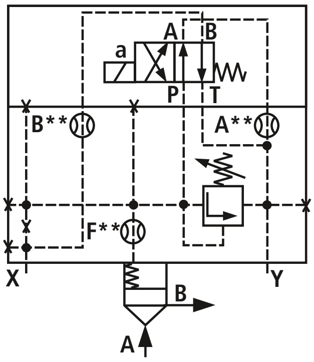
	A**1)	P**1)	F**1)	D**1)
DBW	1.0		2.0	2.5
DBS		1.8	2.0	2.0

** Orifice Ø
1) Orifice M6 tapered

Control cover with manual pressure adjustment, for electrical unloading

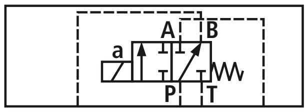
NS 80, 100

4WE 10 D...

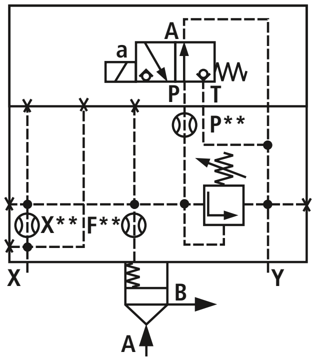


LFA..DBW.-6X/...
NS 80, 100

3WE 10 B9...

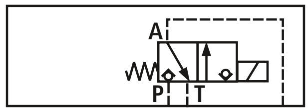


M-3SED 10 U../350…
M-3SEW 10 U../420…

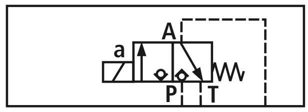


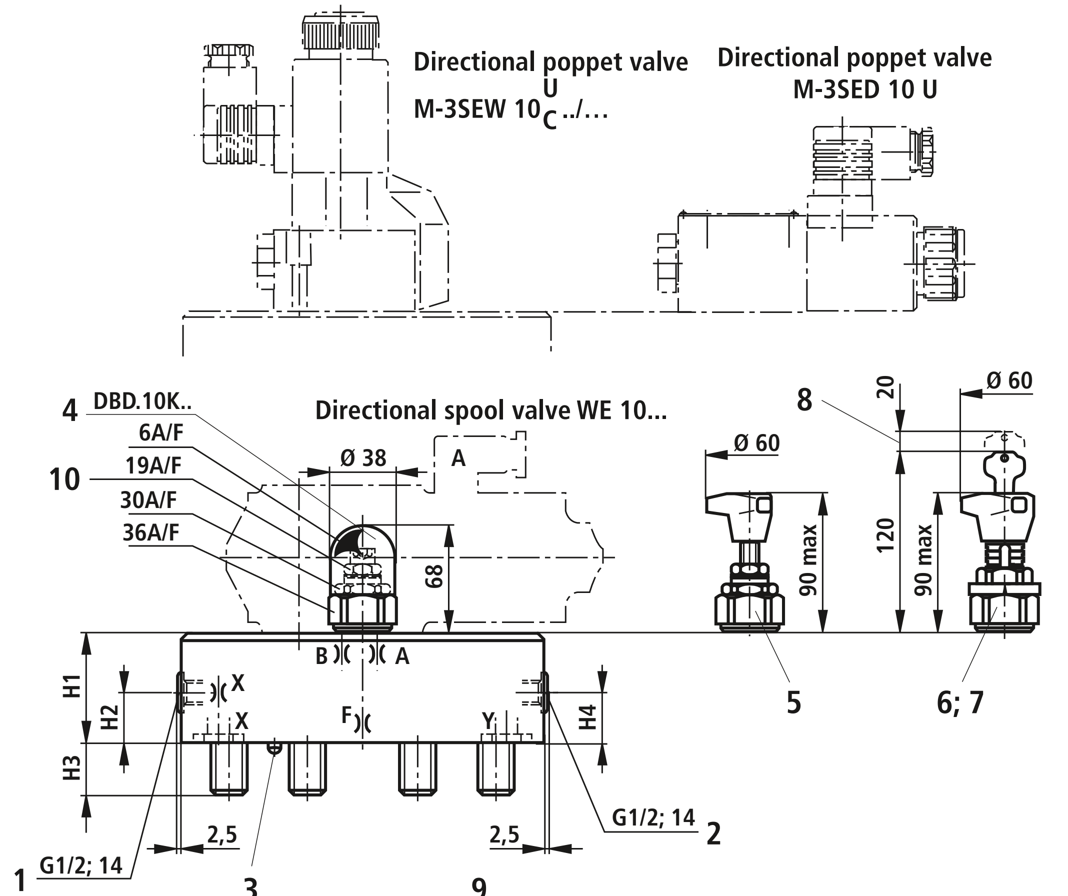
LFA..DBS.-6X/...
NS 80, 100

M-3SED 10 C../350…



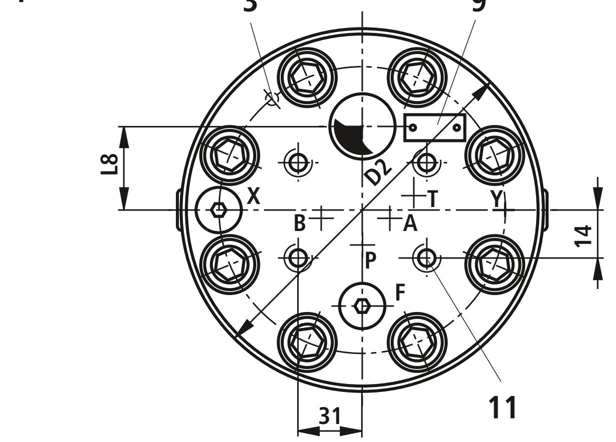
M-3SEW 10 C../420…





NS	80	100
A**1)	1.2	1.5
B**1)	3.0	3.0
P**1)	3.5	3.5
X**2)	3.0	3.0
F**2)	2.5	2.5
D2	250	300
H1	100	100
H2	30	30
H3	45	51
H4	52	52
L8	75	85

** Orifice Ø
1) Orifice M8 x 1 tapered
2) Orifice G 1/4 tapered



1 Port X optionally as a threaded port
2 Port Y optionally as a threaded port
3 Locating pin
4 Adjustment type "2"
5 Adjustment type "1"
6 Adjustment type "3"
7 Adjustment type "4"
8 Space required to remove the key
9 Name plate
10 Locknut
11 Valve fixing screws are included within the control cover scope of supply

Control cover with manual pressure adjustment, for isolation functions

NS 16 to 100

1	2	3	4	5	6	9
LFA		DBWD		–	/	

NS 16	Series 7X	= **16**	
NS 25	Series 7X	= **25**	
NS 32	Series 7X	= **32**	
NS 40	Series 7X	= **40**	
NS 50	Series 7X	= **50**	
NS 63	Series 7X	= **63**	
NS 80	Series 6X	= **80**	
NS 100	Series 6X	= **100**	

No code = NBR seals
V = FKM seals
(other seals on request)

⚠ **Attention!**
The compatibility of the seals and pressure fluid has to be taken into account!

Adjustment type

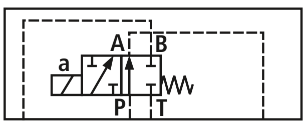
Rotary knob	**= 1**
Hexagon with protective cap	**= 2**
Lockable rotary knob with scale (H-key to automotive industry standard)	**= 3**
Rotary knob with scale **not** lockable	**= 4**

Series 6X (NS 80 and 100)	**= 6X**
Series 7X (NS 16 to 63)	**= 7X**

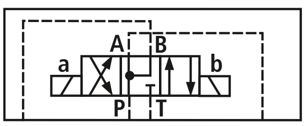
Pressure stages
(take max. perm. pressure of pilot valve into account)

NS 16, 25 ,32	NS 40, 50, 63, 80, 100
025 = 25 bar	**025** = 25 bar
050 = 50 bar	**050** = 50 bar
100 = 100 bar	**100** = 100 bar
200 = 200 bar	**200** = 200 bar
315 = 315 bar	**315** = 315 bar
420 = 420 bar	**400** = 400 bar

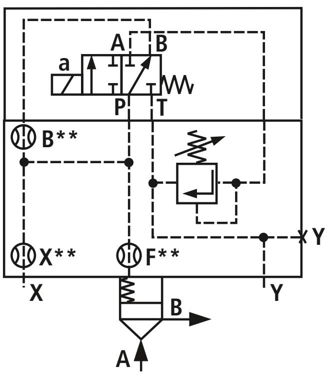
3 WE 6 A../...



4 WE 6 M../...

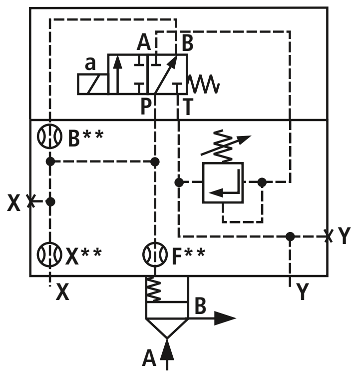


3 WE 6 B9-../...



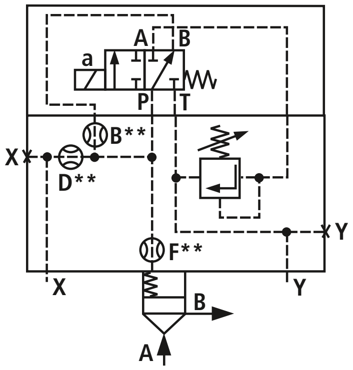
LFA..DBWD.-7X/...
NS 16

3 WE 6 B9-../...



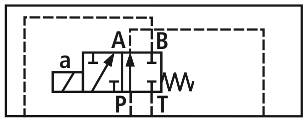
LFA..DBWD.-7X/...
NS 25, 32

3 WE 6 B9-../...

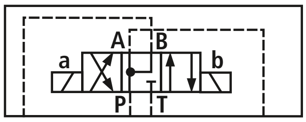


LFA..DBWD.-7X/...
NS 40, 50, 63

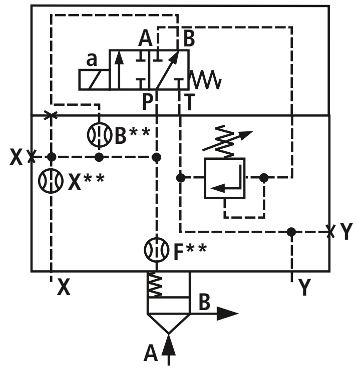
3 WE 10 A...



4 WE 10 M...



3 WE 10 B9...

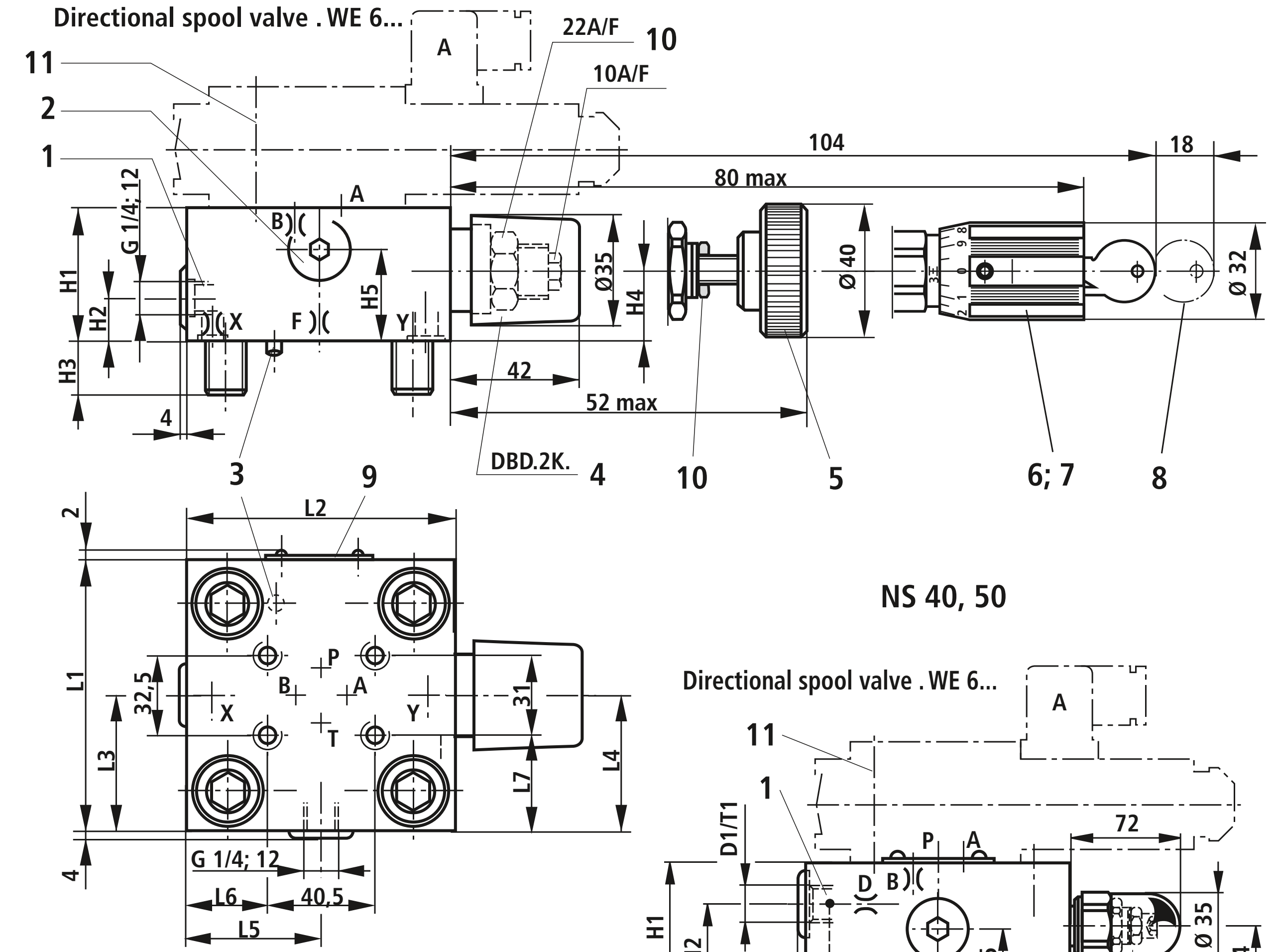


LFA..DBWD.-6X/...
NS 80, 100

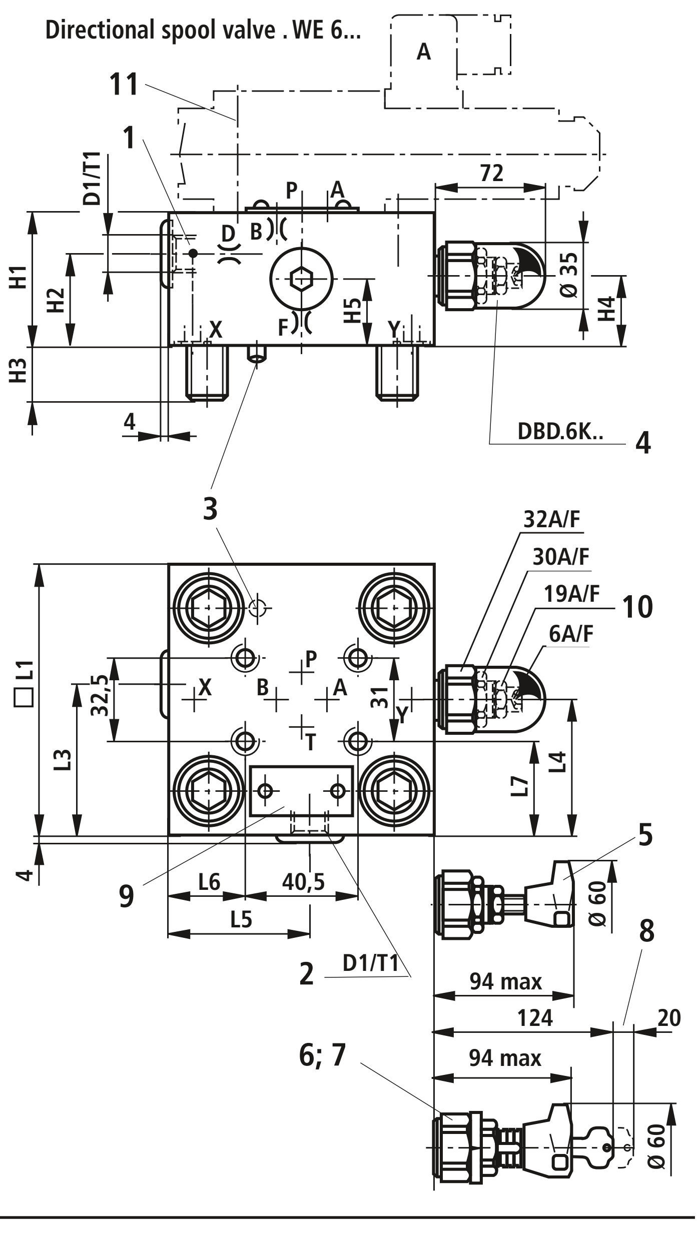
Control cover with manual pressure adjustment, for isolation functions

NS 16, 25, 32

Dimensions in mm



NS 40, 50



1 Port X optionally as a threaded port

2 Port Y optionally as a threaded port

3 Locating pin

4 Adjustment type "2"

5 Adjustment type "1"

6 Adjustment type "3"

7 Adjustment type "4"

8 Space required to remove the key

9 Name plate

10 Locknut

11 Valve fixing screws are included within the control cover scope of supply

For dimension table see page 28

Control cover with manual pressure adjustment, for isolation functions

NS	16	25	32	40	50	63	80	100
B** 1)	1.0	1.0	1.0	1.2	1.5	1.8	3.5	3.5
X** 2)	0.8	0.8	1.0				3.0	3.0
F** 2)	1.0	1.0	1.2	1.2	1.5	2.0	2.5	2.5
D** 1)				1.0	2.0	2.5		
D1				G 1/4	G 1/2			
D2							250	300
H1	40	40	50	60	68	82	100	100
H2		19	26	46	50	55	67	67
H3	15	24	28	32	34	50	45	51
H4	19	19	26	27	35	45	58	58
H5	28	28	37	16	20			
L1	65	85	100					
□L1				125	140	180		
L2	80	85	100					
L3		49	56.5	62.5	70			
L4	32.5	45.5	53	76	84			
L5	35	36	57	68	75			
L6	7	8	31	43.5	51			
L7	17	27	34.5	47	54.5			
L8							75	85
T1				12	14			

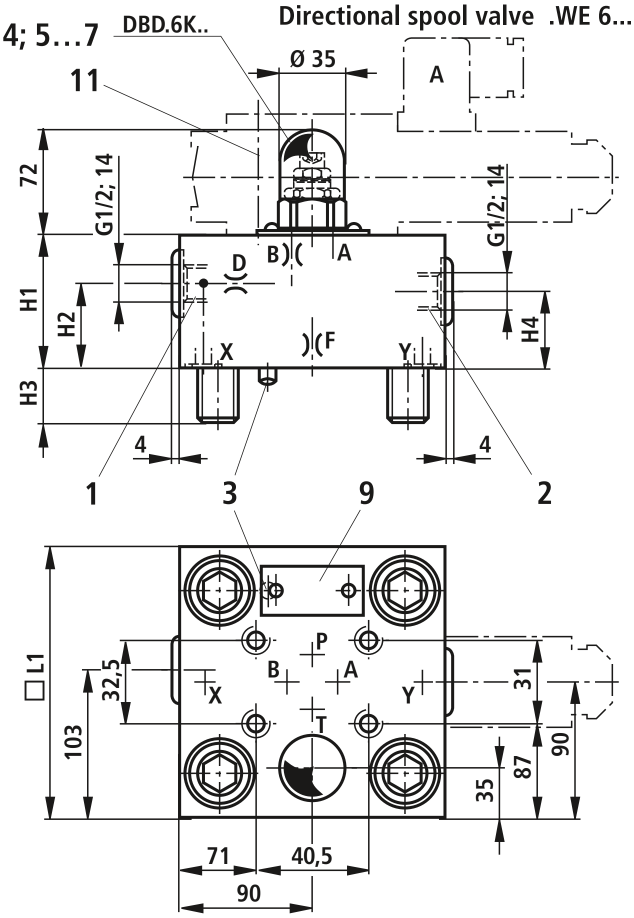
** Orifice Ø

1) Orifice M6 tapered (NS 16...63) or M8 x 1 tapered (NS 80 and 100)

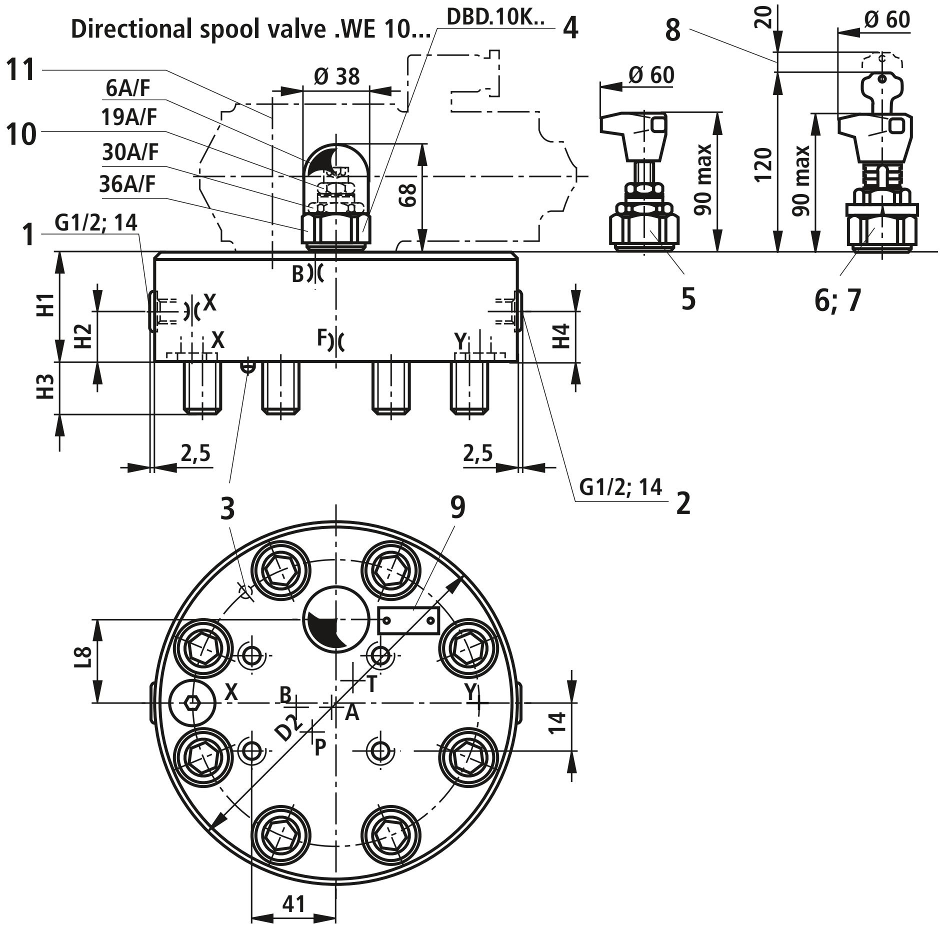
2) Orifice M6 tapered (NS 16...63) or G 1/4 tapered (NS 80 and 100)

NS 63

Dimensions in mm



NS 80, 100



1 Port X optionally as a threaded port
2 Port Y optionally as a threaded port
3 Locating pin
4 Adjustment type "2"
5 Adjustment type "1"
6 Adjustment type "3"
7 Adjustment type "4"
8 Space required to remove the key
9 Name plate
10 Locknut
11 Valve fixing screws are included within the control cover scope of supply

Control cover with 2 manual pressure adjusters, electrically selectable

NS 16 to 100

1	2	3	4	5	6	7	9
LFA						A...	

NS 16		= **16**	
NS 25		= **25**	
NS 32	Series	= **32**	NS 80 Series = **80**
NS 40	7X	= **40**	NS 100 6X = **100**
NS 50		= **50**	
NS 63		= **63**	

Control cover type

De-energised - DB1 (4 WE.. D)
De-energised - open (4 WE.. H) = **DBU2A**

De-energised - DB max. (4 WE.. D) = **DBU2B**
(see symbols)

Adjustment type (details only required for DB1)

Rotary knob	= **1**
Hexagon with protective cap	= **2**
Lockable rotary knob with scale (H-key to automotive industry standards)	= **3**
Rotary knob with scale **not** lockable	= **4**

DB max. DB1

No code = NBR seals
V = FKM seals
(other seals on request)

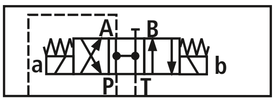
⚠ Attention!
The compatibility of the seals and pressure fluid has to be taken into account!

Pressure stages
(take max. perm. pressure of pilot valve into account)

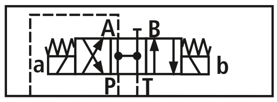
NS 16, 25 ,32	NS 40, 50, 63, 80, 100
025 = 25 bar	**025** = 25 bar
050 = 50 bar	**050** = 50 bar
100 = 100 bar	**100** = 100 bar
200 = 200 bar	**200** = 200 bar
315 = 315 bar	**315** = 315 bar
420 = 420 bar	**400** = 400 bar

6X = Series 6X (NS 80 and 100)
7X = Series 7X (NS 16 to 63)

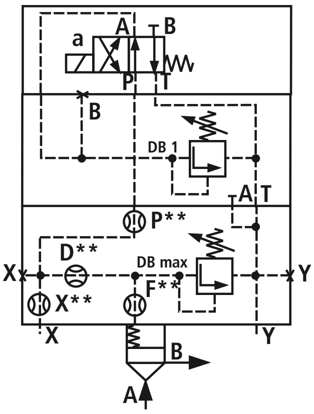
4 WE 6 H../...



4 WE 6 H../...

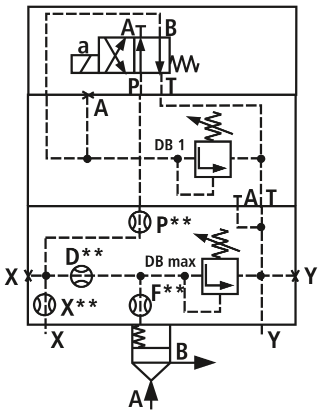


4 WE 6 D../...



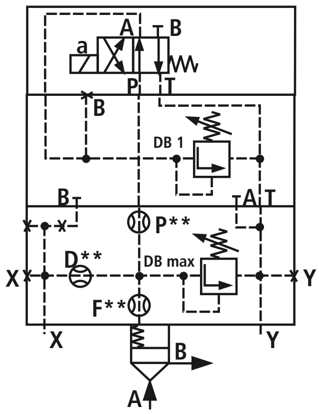
LFA..DBU2A.-7X...
NS 16, 25, 32

4 WE 6 D../...



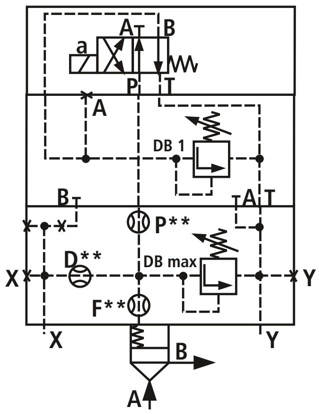
LFA..DBU2B.-7X/...
NS 16, 25, 32

4 WE 6 D../...



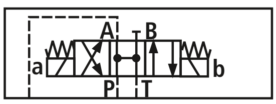
LFA..DBU2A.-7X/...
NS 40, 50, 63

4 WE 6 D../...

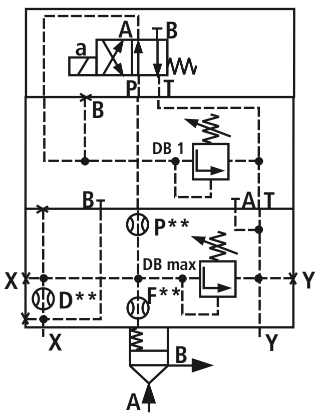


LFA..DBU2B.-7X/...
NS 40, 50, 63

4 WE 10 H../...

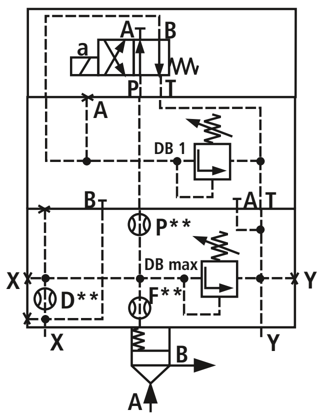


4 WE 10 D../...



LFA...DBU2A.-6X/...
NS 80, 100

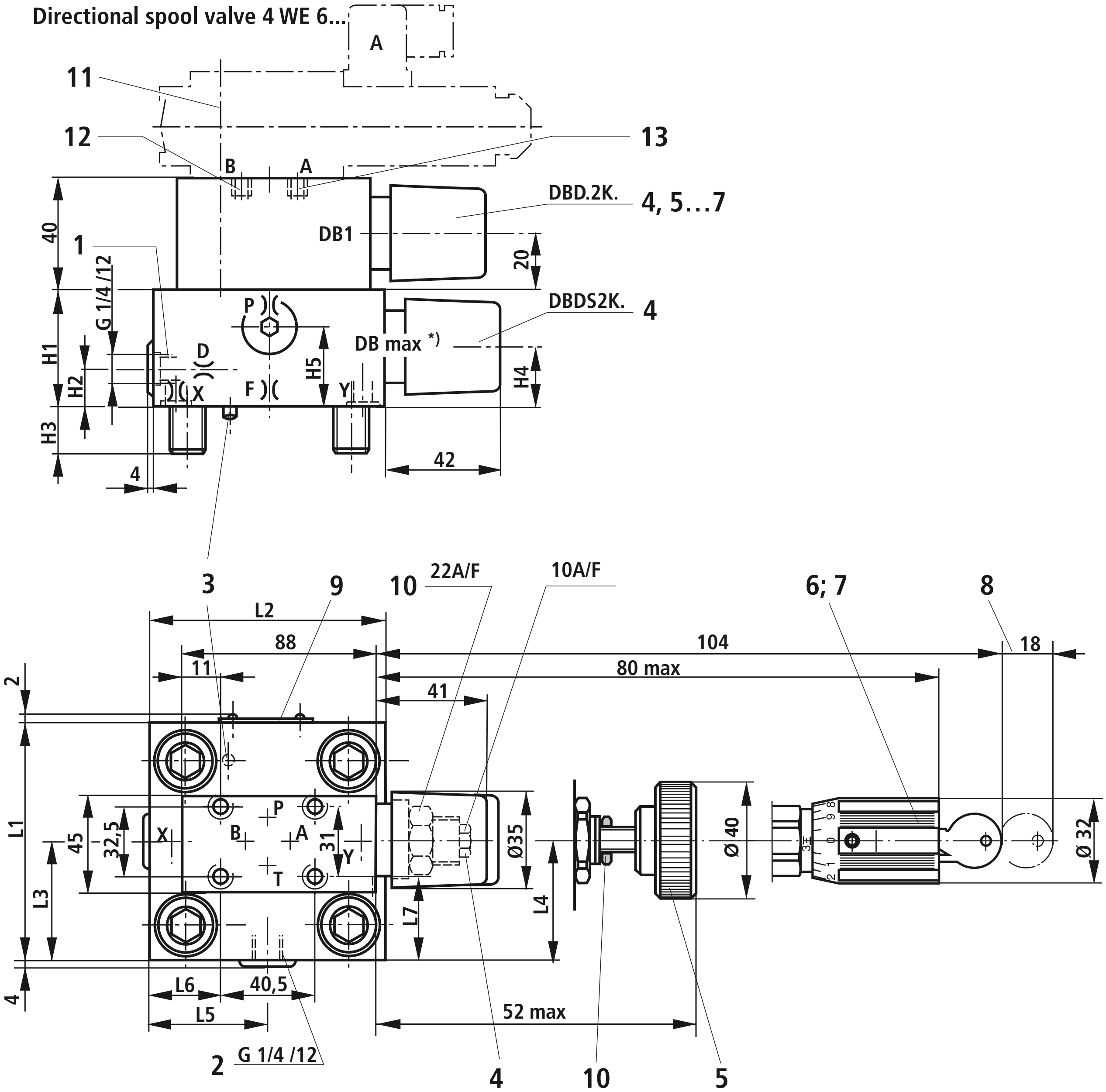
4 WE 10 D../...



LFA...DBU2B.-6X/...
NS 80, 100

Control cover with 2 manual pressure adjusters, electrically selectable

NS 16, 25, 32



NS	P**1)	X**1)	F**1)	D**1)	H1	H2	H3	H4	H5	L1	L2	L3	L4	L5	L6	L7
16	1.0	0.8	1.0	0.8	40	17	15	19	28	65	80	36.5	32.5	35	7	17
25	1.0	0.8	1.0	0.8	40	19	24	19	28	85	85	49	45.5	36	8	27
32	1.0	1.0	1.2	1.0	50	26	28	26	37	100	100	56.5	53	57	31	34.5

** Orifice Ø

1) Orifice M6 tapered

1 Port X optionally as a threaded port

2 Port Y optionally as a threaded port

3 Locating pin

4 Adjustment type "2"

5 Adjustment type "1"

6 Adjustment type "3"

7 Adjustment type "4"

8 Space required to remove the key

9 Name plate

10 Locknut

11 Valve fixing screws M5 x 90 are included within the scope of the control cover supply

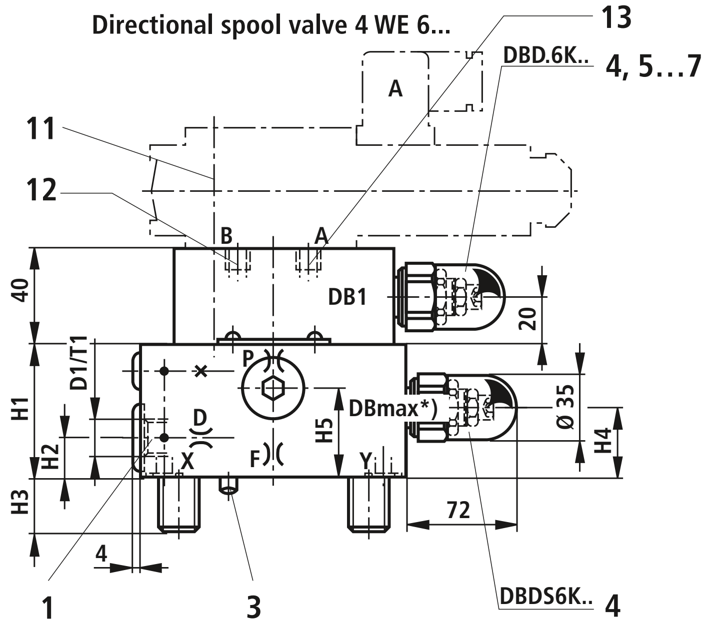
12 Plug M6 tapered for ..DBU 2A..

13 Plug M6 tapered for ..DBU 2B..

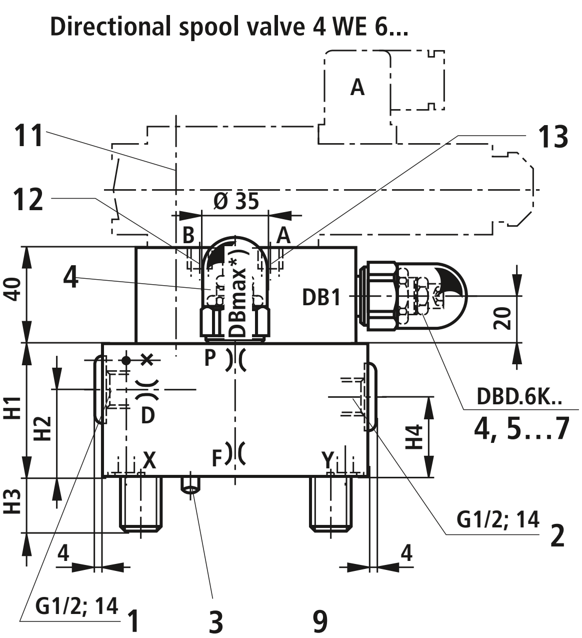
*) For DB max. only adjustment type "2" is possible

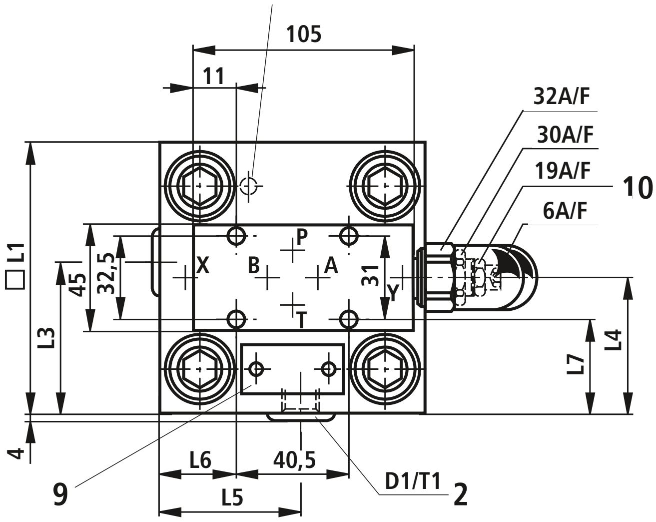
Control cover with 2 manual pressure adjusters, electrically selectable

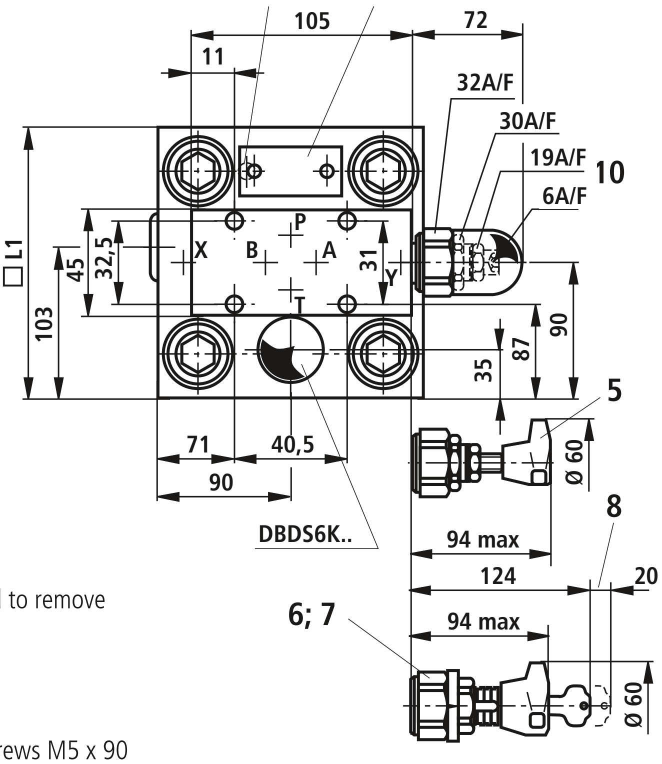
NS 40, 50



NS 63







1 Port X optionally as a threaded port
2 Port Y optionally as a threaded port
3 Locating pin
4 Adjustment type "2"
5 Adjustment type "1"
6 Adjustment type "3"
7 Adjustment type "4"
8 Space required to remove the key
9 Name plate
10 Locknut
11 Valve fixing screws M5 x 90 are included within the control cover scope
12 Plug M6 tapered for ..DBU 2A..
13 Plug M6 tapered for ..DBU 2B..
*) For DB max. only adjustment type "2" is possible

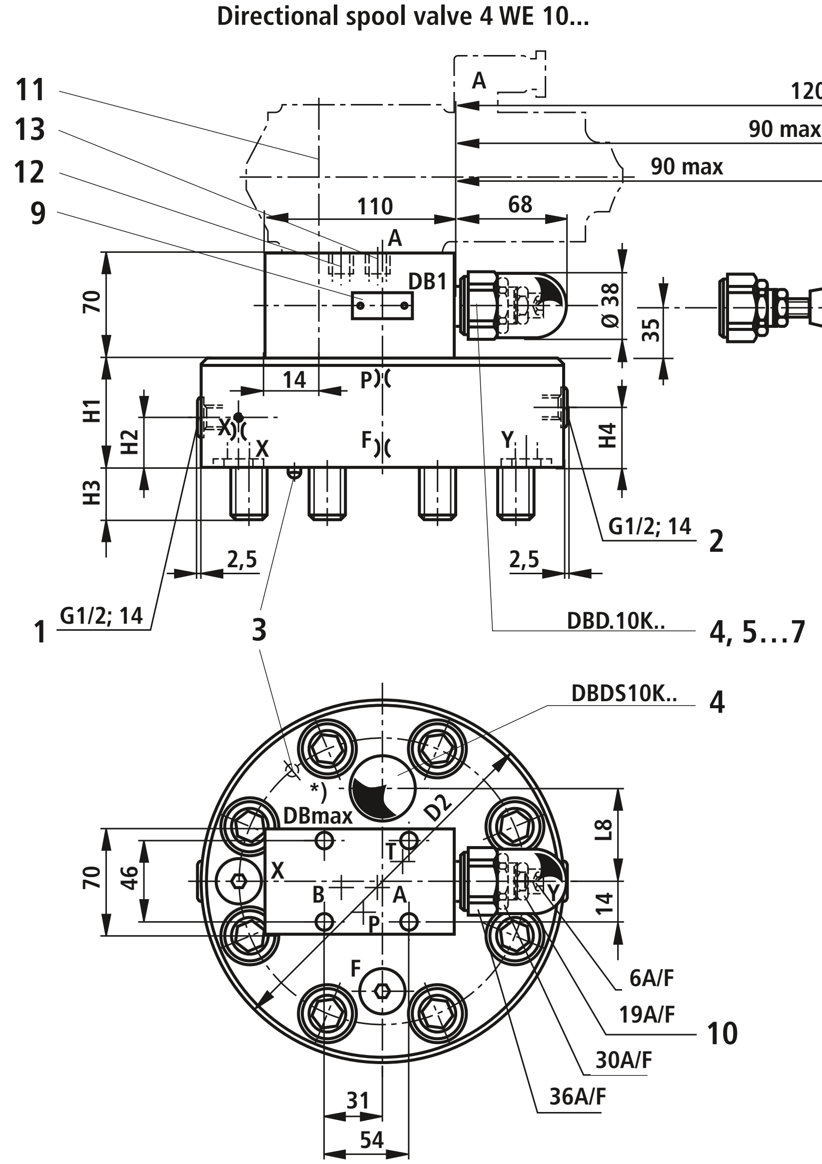
NS	P**1)	F**1)	D**1)	D1	H1	H2	H3	H4	H5	□ L1	L3	L4	L5	L6	L7	T1
40	1.2	1.2	1.0	G1/4	60	17	32	27	40	125	69	76	68	43.5	47	12
50	1.5	1.5	2.0	G1/2	68	19.5	34	35	50	140	80	84	74.5	51	54.5	14
63	2.5	2.0	2.5		82	55	50	45		180						

** Orifice Ø
1) Orifice M6 tapered

Control cover with 2 manual pressure adjusters, electrically selectable

NS 80, 100

Dimensions in mm



NS	P**[1]	X**[2]	F**[2]	D2	H1	H2	H3	H4	L8
80	3.5	3.0	2.5	250	100	30	45	52	75
100	3.5	3.0	2.5	300	100	30	51	52	85

** Orifice Ø
[1] Orifice M8 x1 tapered
[2] Orifice G 1/4 tapered

1 Port X optionally as a threaded port
2 Port Y optionally as a threaded port
3 Locating pin
4 Adjustment type "2"
5 Adjustment type "1"
6 Adjustment type "3"
7 Adjustment type "4"
8 Space required to remove the key
9 Name plate
10 Locknut
11 Valve fixing screws are included within the control cover scope of supply
12 Plug M8 x 1 tapered for ...DBU2A...
13 Plug M8 x 1 tapered for ...DBU2B...
*) For DB max. only adjustment type "2" is possible

Control cover with 3 manual manual pressure adjusters, electrically selectable

NS 16 to 100

1	2	3	4	5	6	7	8	9
LFA		**DBU3D**				**A...**	**B...**	

DB max — DB1 — DB2

Nom. size 16	Series 7X	=	**16**
Nom. size 25	Series 7X	=	**25**
Nom. size 32	Series 7X	=	**32**
Nom. size 40	Series 7X	=	**40**
Nom. size 50	Series 7X	=	**50**
Nom. size 63	Series 7X	=	**63**
Nom. size 80	Series 6X	=	**80**
Nom. size 100	Series 6X	=	**100**

Adjustment type (details only for DB1or DB2)*)

Rotary knob	**= 1**
Hexagon with protective cap	**= 2**
Lockable rotary knob with scale (H-key to automotive industry standards)	**= 3**
Rotary knob with scale **not** lockable	**= 4**

Series 6X (NS 80 and 100)	**= 6X**
Series 7X (NS 16 to 63)	**= 7X**

No code = NBR seals
V = FKM seals
(other seals on request)

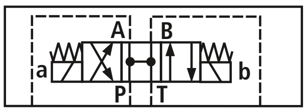
⚠ Attention!
The compatibility of the seals and pressure fluid has to be taken into account!

Pressure stages
(take max. perm. pressure of pilot valve into account)

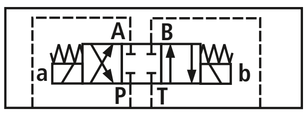
NS 16, 25 ,32	NS 40, 50, 63, 80, 100
025 = 25 bar	**025** = 25 bar
050 = 50 bar	**050** = 50 bar
100 = 100 bar	**100** = 100 bar
200 = 200 bar	**200** = 200 bar
315 = 315 bar	**315** = 315 bar
420 = 420 bar	**400** = 400 bar

*) For DB1 and DB2 select the same adjustment type

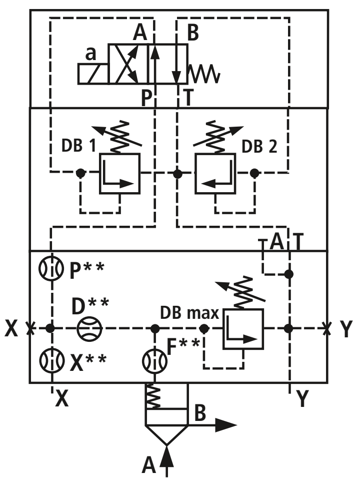
4WE 6 H .. /...



4WE 6 E .. /...

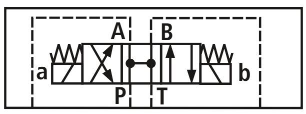


4WE 6 D .. /...

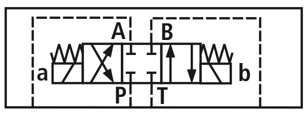


LFA..DBU3D.-7X/...
NS 16, 25, 32

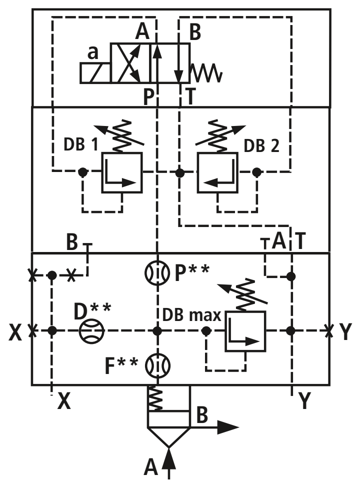
4WE 6 H .. /...



4WE 6 E .. /...

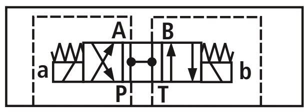


4WE 6 D .. /...

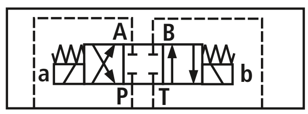


LFA..DBU3D.-7X/...
NS 40, 50, 63

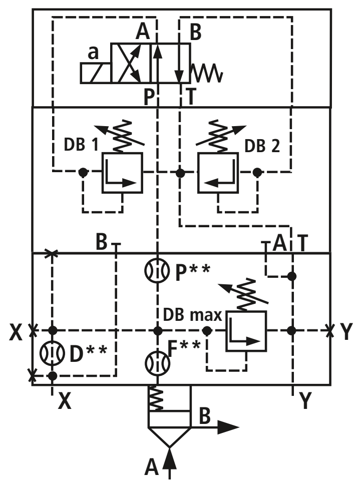
4WE 10 H.. /...



4WE 10 E.. /...



4WE 10 D.. /...

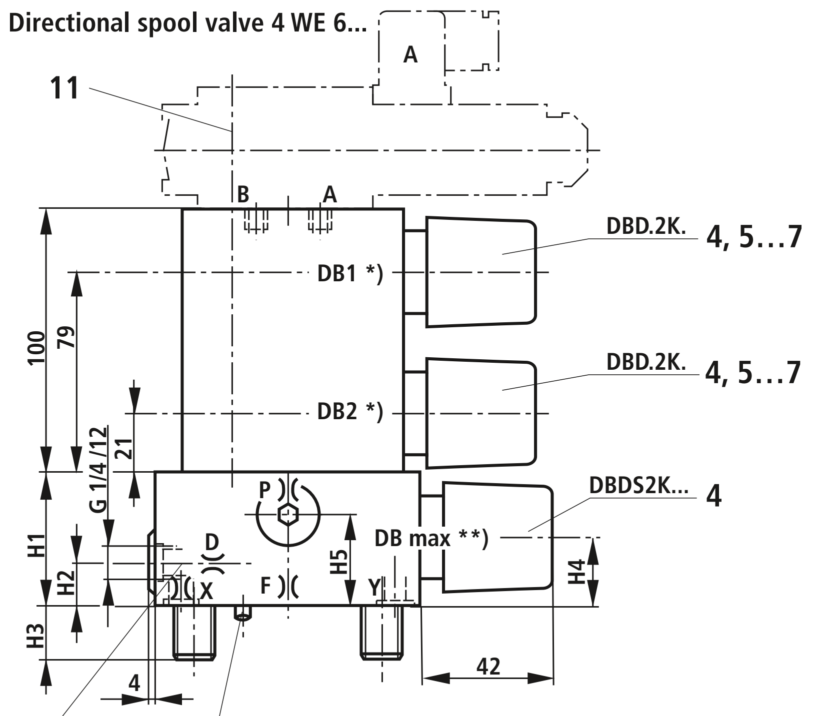


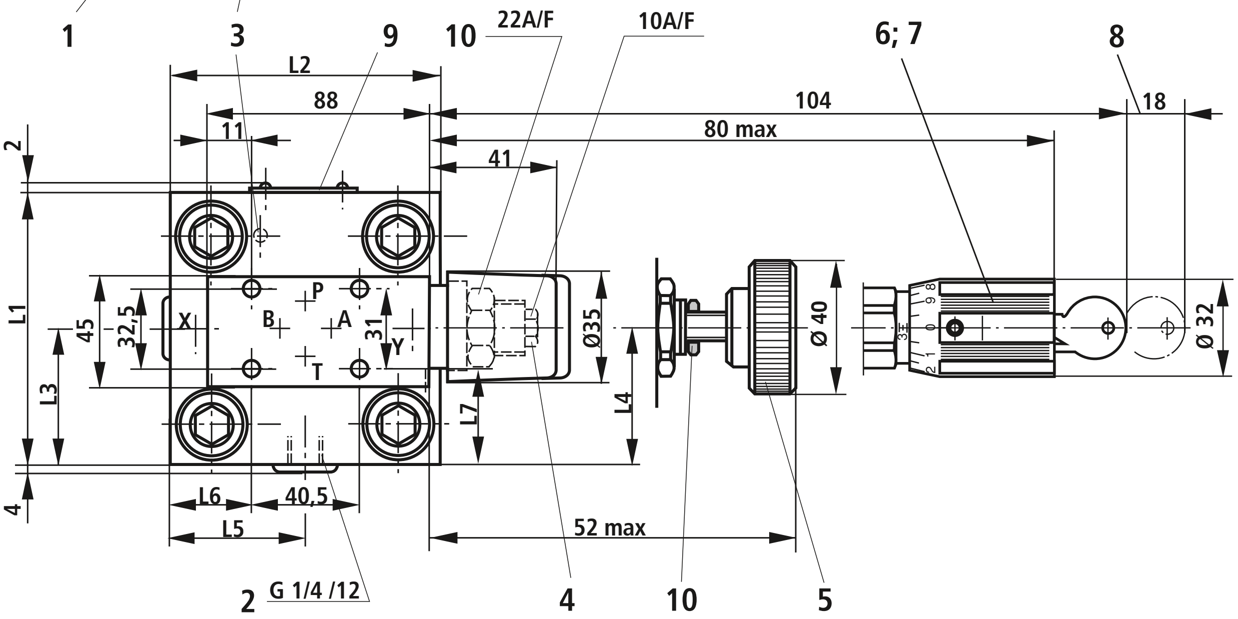
LFA...DBU3D.-6X/...
NS 80, 100

Control cover with 3 manual pressure adjusters, electrically selectable

NS 16, 25, 32

Dimensions in mm





1 Port X optionally as a threaded port

2 Port Y optionally as a threaded port

3 Locating pin

4 Adjustment type "2"

5 Adjustment type "1"

6 Adjustment type "3"

7 Adjustment type "4"

8 Space required to remove the key

9 Name plate

10 Locknut

11 Valve fixing screws are included within the control cover scope of supply

*) For DB1 and DB2 select the same adjustment type

**) For DB max. only adjustment type "2" is possible

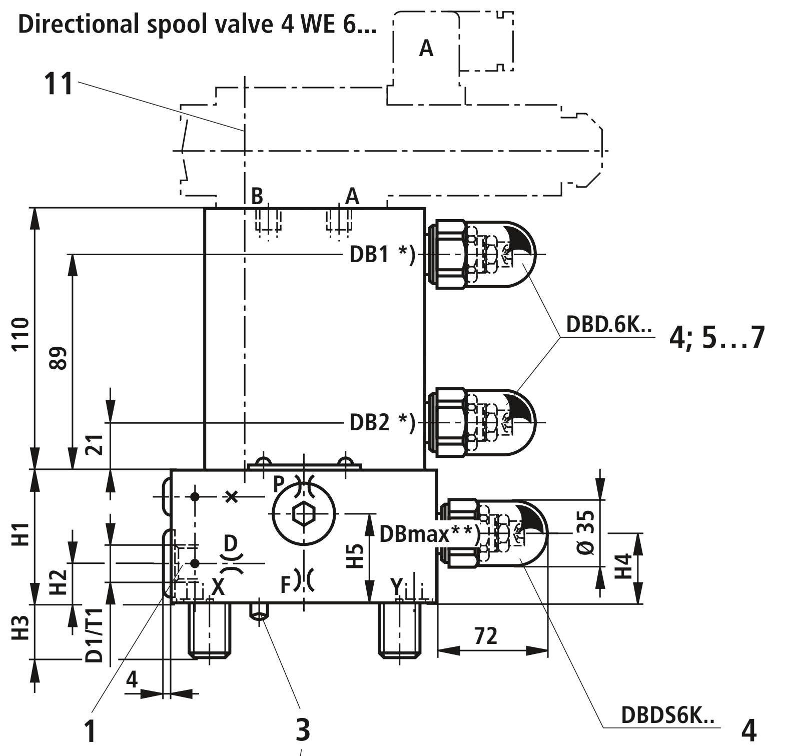
NS	P**1)	X**1)	F**1)	D**1)	H1	H2	H3	H4	H5	L1	L2	L3	L4	L5	L6	L7
16	1.0	0.8	1.0	0.8	40	17	15	19	28	65	80	36.5	32.5	35	7	17
25	1.0	0.8	1.0	0.8	40	19	24	19	28	85	85	49	45.5	36	8	27
32	1.0	1.0	1.2	1.0	50	26	28	26	37	100	100	56.5	53	57	31	34.5

** Orifice Ø

1) Orifice M6 tapered

Control cover with 3 manual pressure adjustmers, electrically selectable

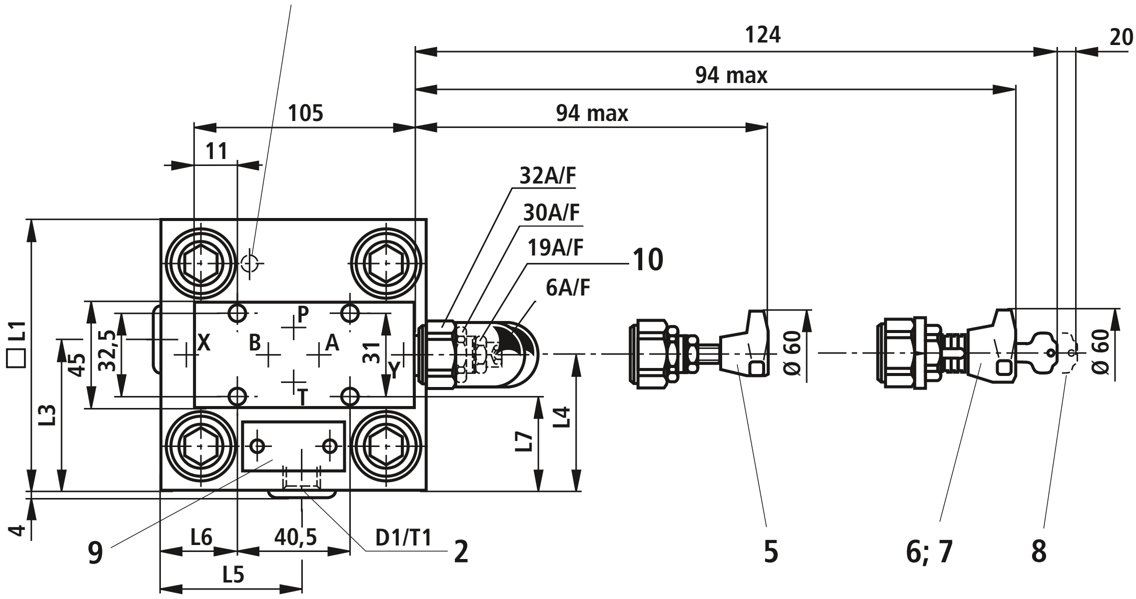
NS 40, 50



1 Port X optionally as a threaded port
2 Port Y optionally as a threaded port
3 Locating pin
4 Adjustment type "2"
5 Adjustment type "1"
6 Adjustment type "3"
7 Adjustment type "4"
8 Space required to remove the key
9 Name plate
10 Locknut
11 Valve fixing screws are included within the control cover scope of supply

*) For DB1 and DB2 select the same adjustment type

**) For DB max. only adjustment type "2" is possible



NS	P**[1)]	F**[1)]	D**[1)]	D1	H1	H2	H3	H4	H5	□L1	L3	L4	L5	L6	L7	T1
40	1.2	1.2	1.0	G1/4	60	17	32	27	40	125	69	76	68	43.5	47	12
50	1.5	1.5	2.0	G1/2	68	19.5	34	35	50	140	80	84	74.5	51	54.5	14

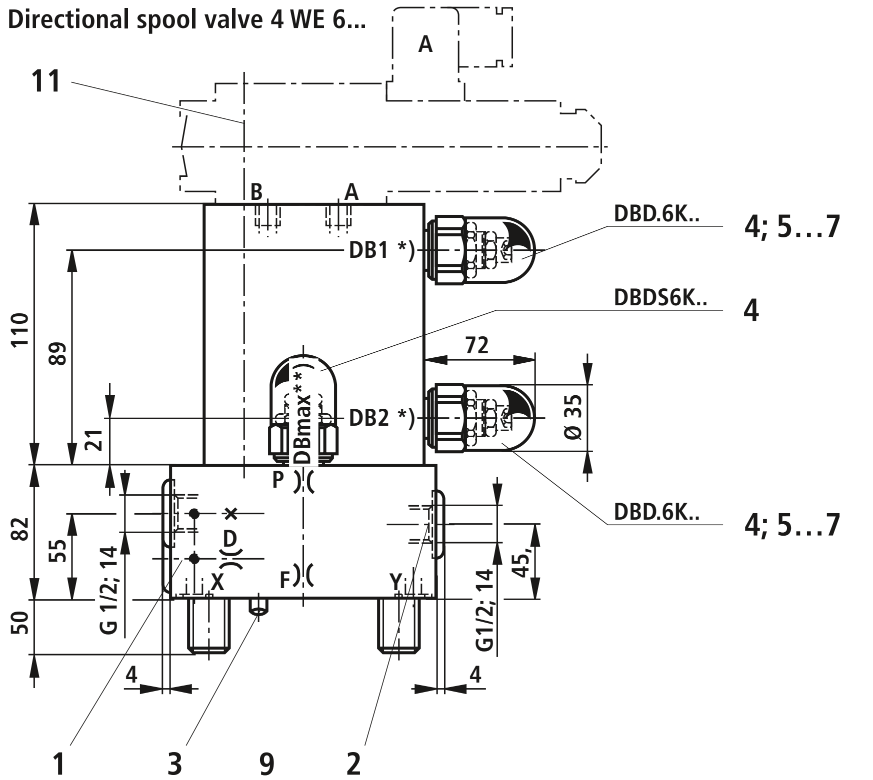
** Orifice Ø

[1)] Orifice M6 tapered

Control cover with 3 manual pressure adjusters, electrically selectable

NS 63

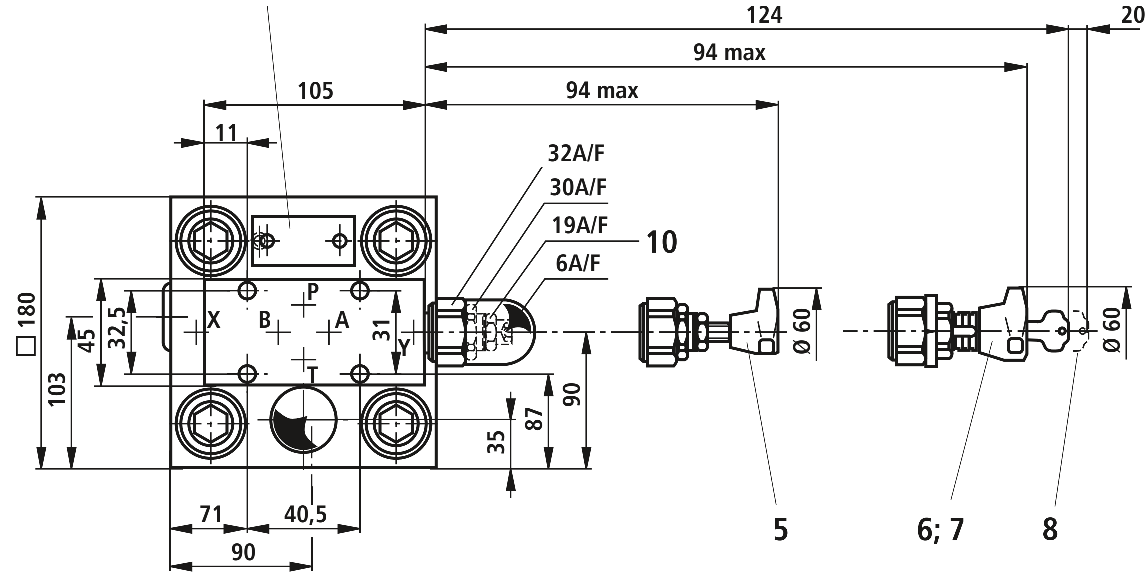
Dimensions in mm



NS	63
P** 1)	2.5
F** 1)	2.0
D** 1)	2.5

** Orifice Ø

1) Orifice M6 tapered



1 Port X optionally as a threaded port

2 Port Y optionally as a threaded port

3 Locating pin

4 Adjustment type "2"

5 Adjustment type "1"

6 Adjustment type "3"

7 Adjustment type "4"

8 Space required to remove the key

9 Name plate

10 Locknut

11 Valve fixing screws are included within the control cover scope of supply

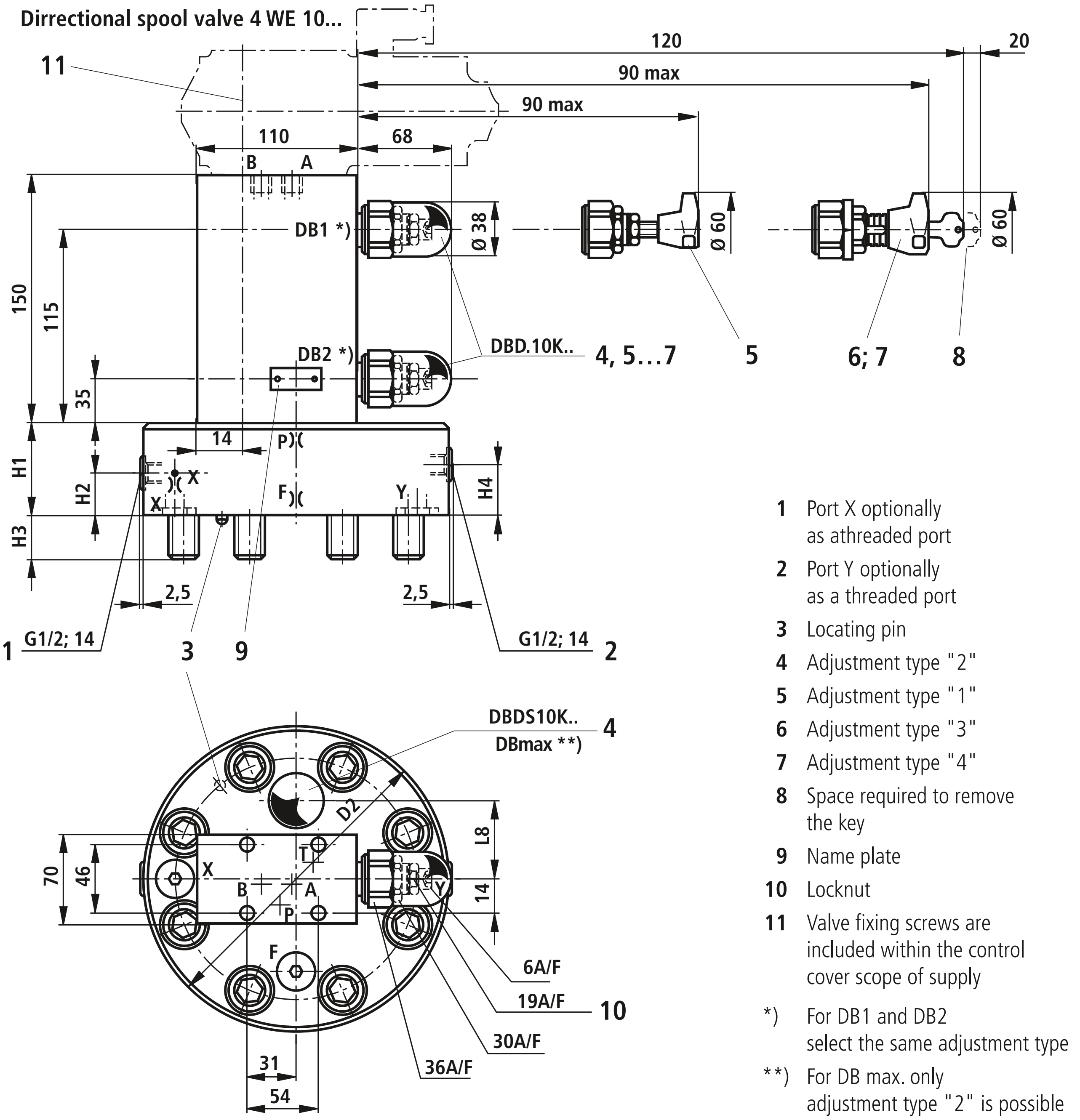
*) For DB1 and DB2 select the same adjustment type

**) For DB max. only adjustment type "2" is possible

Control cover with 3 manual pressure adjusters, electrically selectable

NS 80, 100

Dimensions in mm



1 Port X optionally as athreaded port

2 Port Y optionally as a threaded port

3 Locating pin

4 Adjustment type "2"

5 Adjustment type "1"

6 Adjustment type "3"

7 Adjustment type "4"

8 Space required to remove the key

9 Name plate

10 Locknut

11 Valve fixing screws are included within the control cover scope of supply

*) For DB1 and DB2 select the same adjustment type

**) For DB max. only adjustment type "2" is possible

NS	P** 1)	X** 2)	F** 2)	D2	H1	H2	H3	H4	L8
80	3.5	3.0	2.5	250	100	30	45	52	75
100	3.5	3.0	2.5	300	100	30	51	52	85

** Orifice Ø

1) Orifice M8 x1 tapered

2) Orifice G 1/4 tapered

Control cover for electrical-proportional pressure adjustment, without maximum pressure limitation

NS 16 to 63

Dimensions in mm

1	2	3	5	9
LFA		DBE	– 7X	/

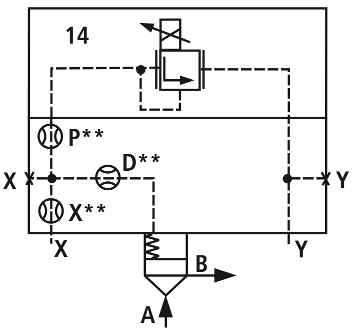
NS 16	= **16**	NS 40	= **40**
NS 25	= **25**	NS 50	= **50**
NS 32	= **32**	NS 63	= **63**

For mounting a proportional pressure relief valve **without** electrical feedback = **DBE**

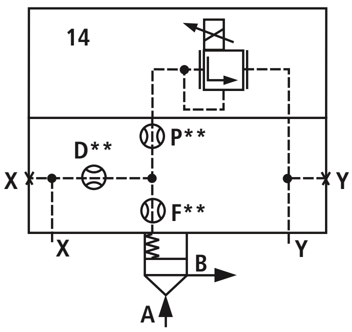
Series 7X (NS 16 to 63) = **7X**

No code = NBR seals
V = FKM seals
(other seals on request)

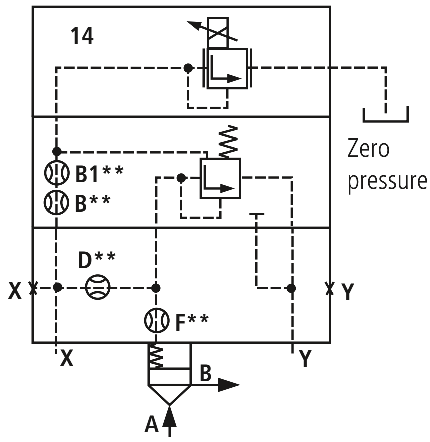
Attention!
The compatibility of the seals and pressure fluid has to be taken into account!



LFA...DBE-7X/ NS 16

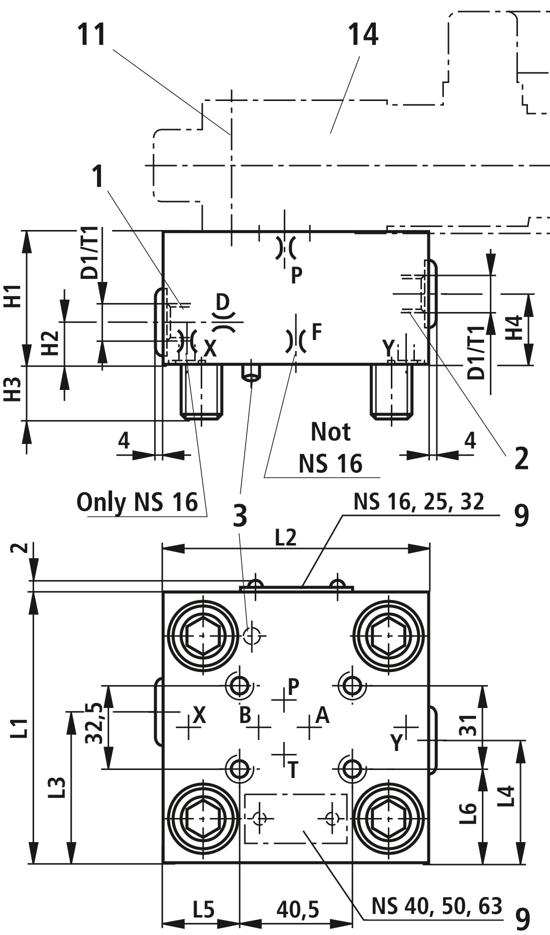


LFA...DBE-7X/ NS 25, 32, 40

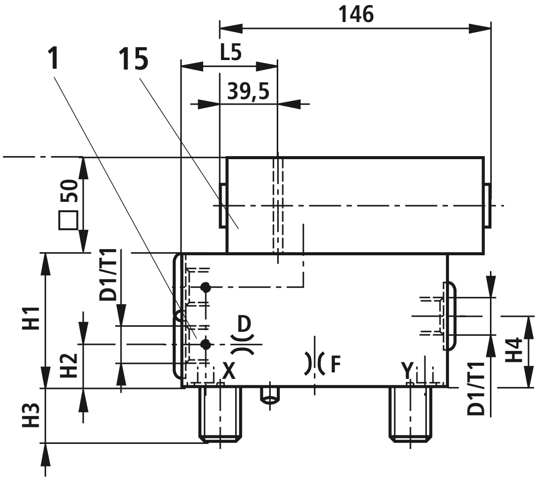


LFA...DBE-7X/ NS 50, 63

NS 16 to 40



NS 50, 63



NS	16	25	32	40	50	63
B**[1)]					0.8	0.8
P**[1)]	1.0	1.0	1.0	1.5		
X**[1)]	0.8					
F**[1)]		0.8	1.0	1.2	1.5	2.0
D**[2)]	0.8	0.8	0.8	1.0	2.0	2.5
D1	G1/4	G1/4	G1/4	G1/2	G1/2	G1/2
H1	40	40	50	60	68	82
H2	17	19	26	30	32	30
H3	15	24	28	32	34	50
H4	20	19	26	30	32	40
L1	65	85	100	125	140	180
L2	80	85	100	125	140	180
L3	36.5	49	56.5	72	80	100
L4	23.5	36	43,5	53	50	80
L5	7	23.5	31	43.5	51	71
L6	17	27	34.5	47	54.5	74.5
T1	12	12	12	14	14	14

1 Port X optionally as a threaded port
2 Port Y optionally as a threaded port
3 Locating pin
9 Name plate
11 Valve fixing screws are included within the control cover scope of supply
14 Prop. pressure relief valve type DBET-5X/... (see summary on page 14, also catalogue sheet RE 29 165)
15 Pressure relief valve NS 6 (included within the scope of supply)

** Orifice Ø
1) Orifice M6 tapered
2) Orifice M6 tapered (NS 16), M8 x 1 tapered (NS 25 ... 63)

Control cover for electrical-proportional pressure adjustment, with maximum pressure limitation

NS 16 to 100

1	2	3		5		6	9
LFA		DBEM	–		/		

Item 2:

Nom. size 16	Series 7X	=	**16**
Nom. size 25	Series 7X	=	**25**
Nom. size 32	Series 7X	=	**32**
Nom. size 40	Series 7X	=	**40**
Nom. size 50	Series 7X	=	**50**
Nom. size 63	Series 7X	=	**63**
Nom. size 80	Series 6X	=	**80**
Nom. size 100	Series 6X	=	**100**

For mounting a proportional pressure relief valve **Without** electrical feedback and **with** maximum pressure safety = **DBEM**

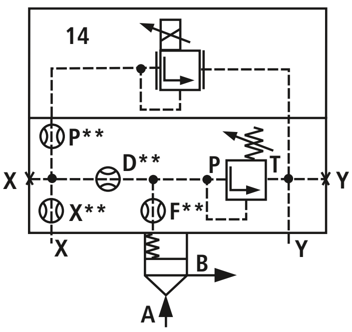
Series 6X (NS 80 to 100) = **6X**
Series 7X (NS 16 to 63) = **7X**

No code = NBR seals
V = FKM seals
(other seals on request)

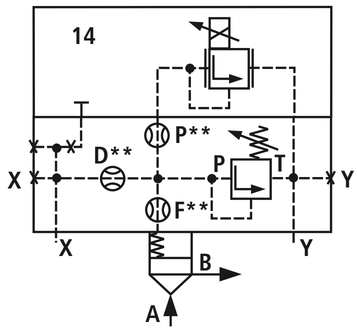
⚠ **Attention!**
The compatibility of the seals and pressure fluid has to be taken into account!

Pressure stages
(take max. perm. pressure of pilot valve into account)

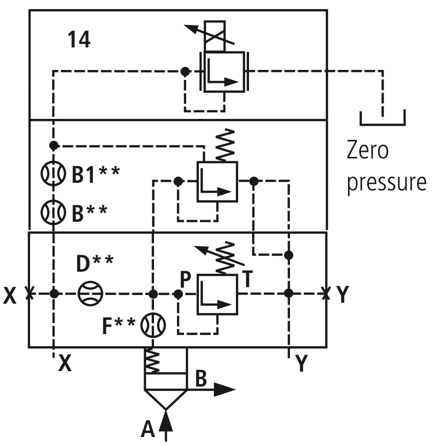
NS 16, 25 ,32	NS 40, 50, 63, 80, 100
025 = 25 bar	**025** = 25 bar
050 = 50 bar	**050** = 50 bar
100 = 100 bar	**100** = 100 bar
200 = 200 bar	**200** = 200 bar
315 = 315 bar	**315** = 315 bar
420 = 420 bar	**400** = 400 bar



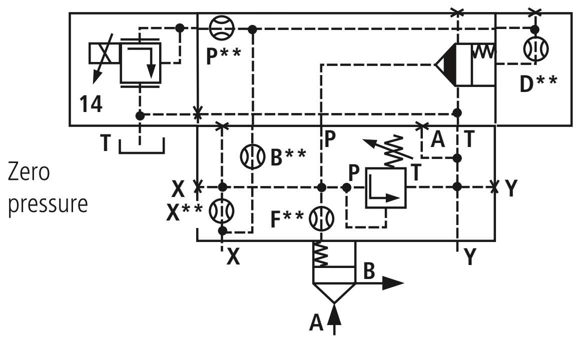
LFA..DBEM-7X/...
NS 16, 25, 32



LFA..DBEM-7X/...
NS 40



LFA..DBEM-7X/...
NS 50, 63



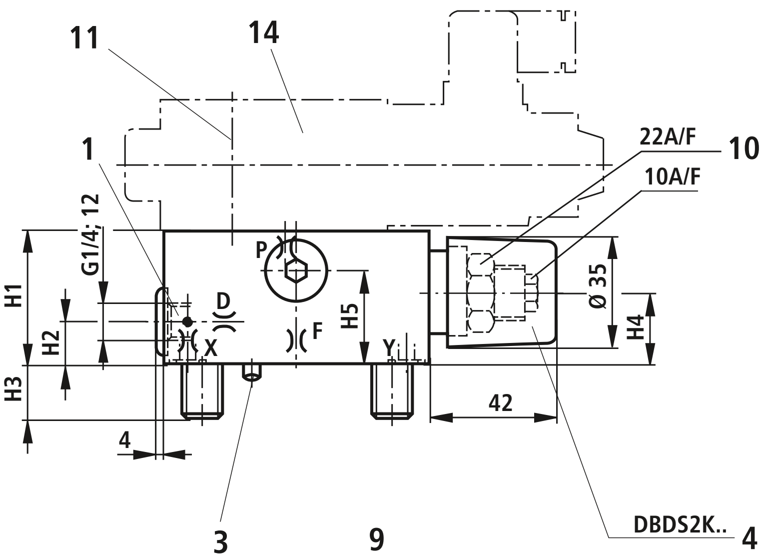
LFA..DBEM-6X/...
NS 80, 100

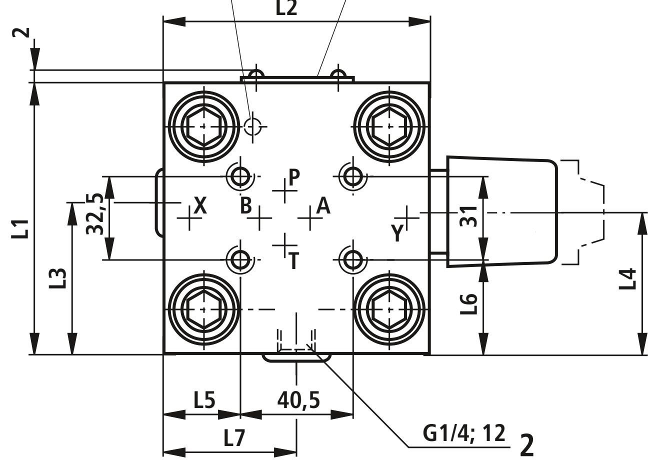
For item nos. see page 40

Control cover for electrical-proportional pressure adjustment, with maximum pressure limitation

NS 16, 25, 32

Dimensions in mm





Ports T and Y - zero pressure

1 Port X optionally as a threaded port

2 Port Y optionally as a threaded port

3 Locating pin

4 Adjustment type "2"

9 Name plate

10 Locknut

11 Valve fixing screws are included within the control cover scope of supply

14 Proportional pressure relief valve type DBET-5X/…–1[3] (see summary on page 14, also catalogue sheet RE 29 165)

[3] 1 = G 1/4 threaded port T, special poppet

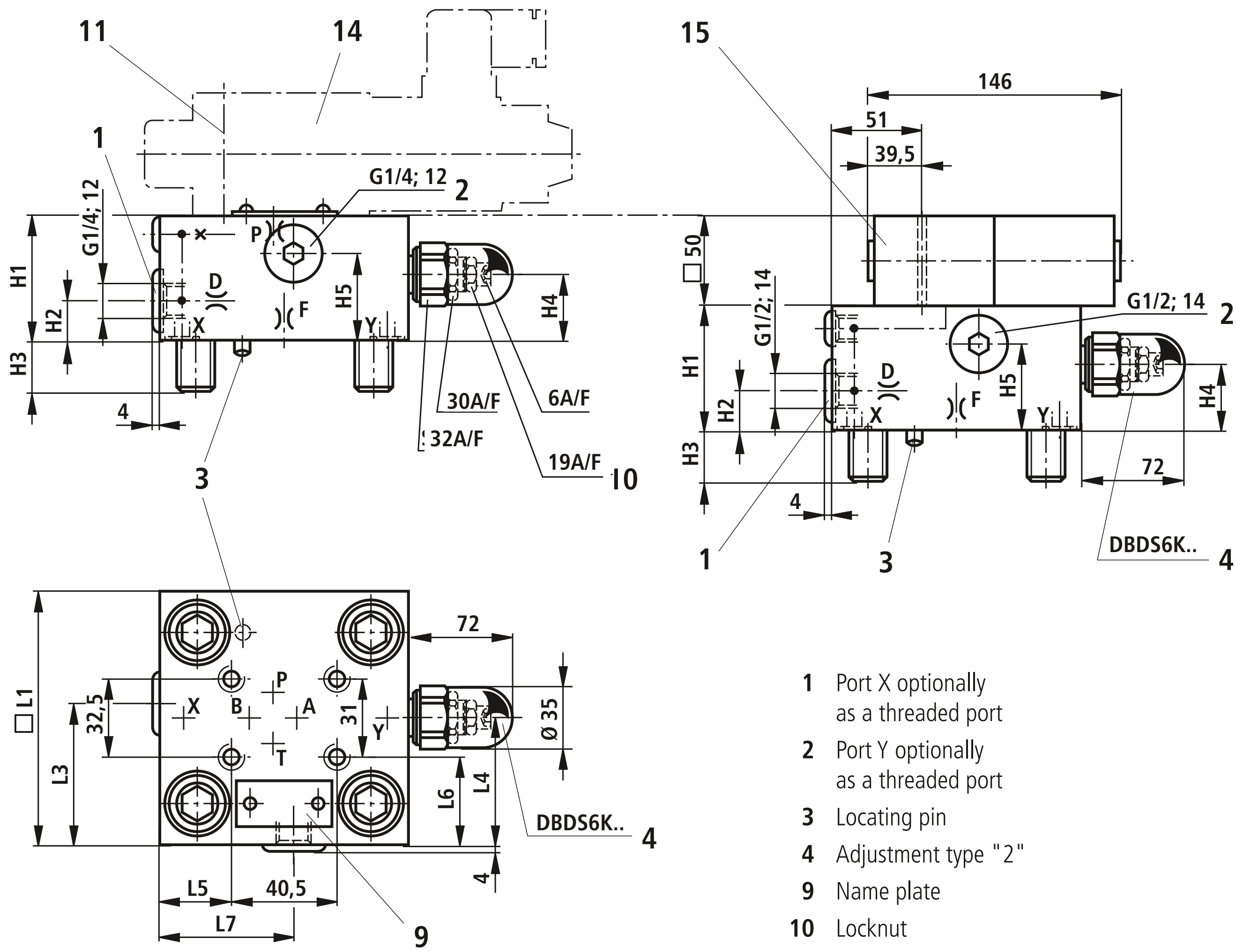
NS	P**[1]	X**[1]	F**[1]	D**[1]	H1	H2	H3	H4	H5	L1	L2	L3	L4	L5	L6	L7
16	1.0	0.8	1.0	0.8	40	17	15	19	28	65	80	36.5	32.5	7	17	35
25	1.0	0.8	1.0	0.8	40	19	24	19	28	85	85	49	45.5	8	27	36
32	1.0	1.0	1.2	1.0	50	26	28	26	37	100	100	56.5	53	31	34.5	57

** Orifice Ø

[1] Orifice M6 tapered

Control cover for electrical-proportional pressure adjustment, with maximum pressure limitation

NS 40 **NS 50**



1 Port X optionally as a threaded port

2 Port Y optionally as a threaded port

3 Locating pin

4 Adjustment type "2"

9 Name plate

10 Locknut

11 Valve fixing screws are included within the control cover scope of supply

14 Propportional pressure relief valve type DBET-5X/…G24 (NS 40) type DBET-5X/…Y G24-1[3] (NS 50) (see summary on page 14, also catalogue sheet RE 29 165)

15 Pressure relief valve NS 6 (is included within the scope of supply)

[3] 1 = G 1/4 threaded port T, special poppet

NS	B**[1]	P**[1]	F**[1]	D**[1]	H1	H2	H3	H4	H5	□ L1	L3	L4	L5	L6	L7
40		1.5	1.2	1.0	60	20	32	27	40	125	69	76	43.5	47	68
50	0.8		1.5	2.0	68	19.5	34	35	50	140	80	84	51	54.5	74.5

** Orifice Ø

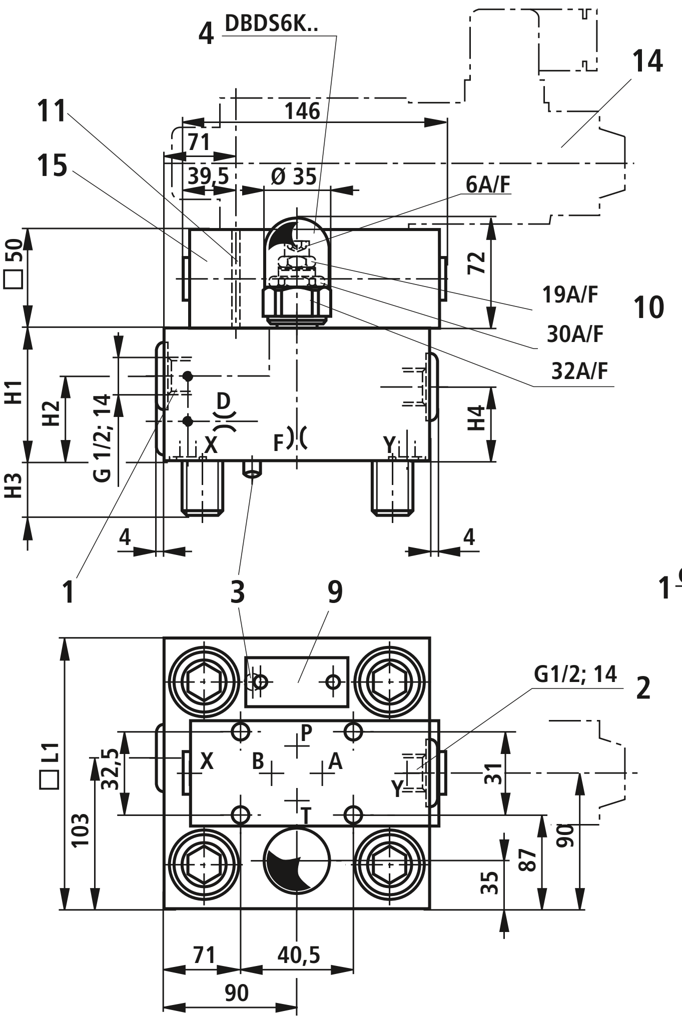
[1] Orifice M6 tapered

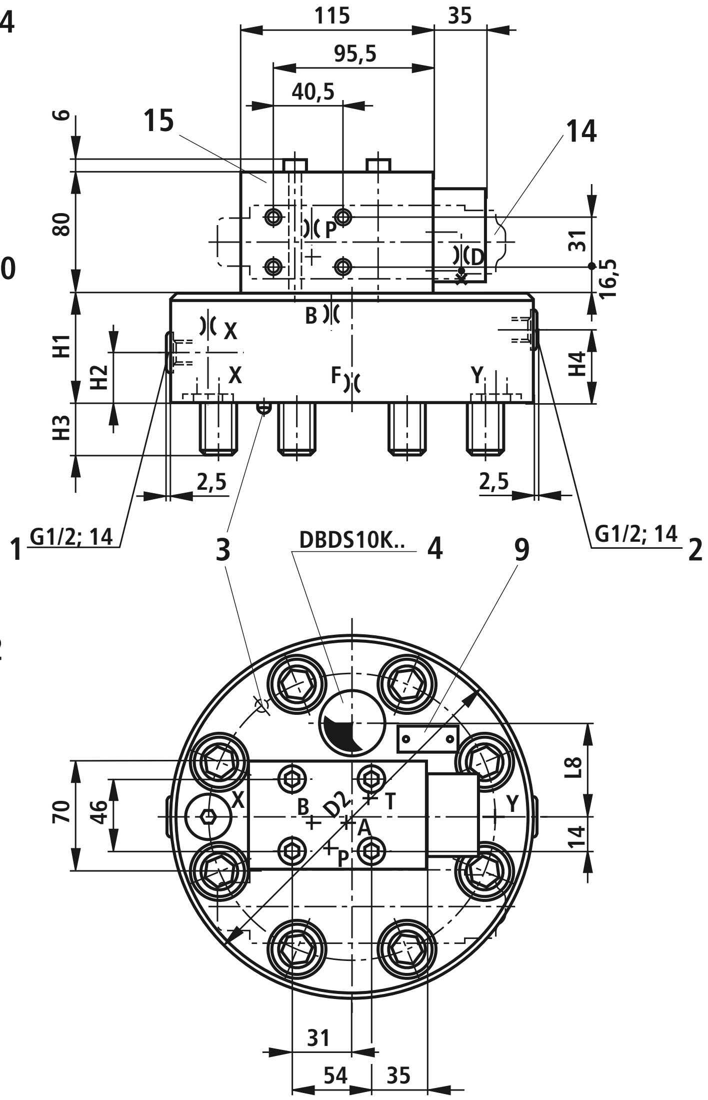
Control cover for electrical-proportional pressure adjustment, with maximum pressure limitation

NS 63

NS 80, 100

Dimensions in mm





1 Port X optionally as a threaded port

2 Port Y optionally as a threaded port

3 Locating pin

4 Adjustment type "2"

9 Name plate

10 Locknut

11 Valve fixing screws are included within the control cover scope of supply

14 Proportional pressure relief valve type DBET-5X/…Y G24-1[3] (see summary on page 14, also catalogue sheet Re 29 165)

15 Pressure relief valve NS 6 (is included within the scope of supply)

[3] 1 = G 1/4 threaded port T, special poppet

NS	B**[1]	P**[1]	X**[2]	F**[2]	D**[1]	H1	H2	H3	H4	D2	□ L1	L8
63	0.8			2.0	2.5	82	55	50	45		180	
80	0.8	1.0	3.0	2.5		100	30	45	52	250		75
100	0.8	1.0	3.5	3.0		100	30	51	52	300		85

** Orifice Ø

[1] Orifice M6 tapered (NS 63) orifice M8 x 1 tapered (NS 80, 100)

[2] Orifice M6 tapered (NS 63) orifice G 1/4 tapered (NS 80, 100)

Pressure reducing function

Ordering details: pressure reducing cartridge valve (without associated control cover LFA..DB..)

LC		DR		E	7X /	

Nominal size 16	**= 16**
Nominal size 25	**= 25**
Nominal size 32	**= 32**
Nominal size 40	**= 40**
Nominal size 50	**= 50**
Nominal size 63	**= 63**
Closing pressure approx. 0 bar (without spring)	**= 00**
Closing pressure approx. 2 bar	**= 20**
Closing pressure approx. 3 bar	**= 30** [1]
Closing pressure approx. 4 bar (standard spring)	**= 40**
Closing pressure approx. 5 bar	**= 50** [2]
Closing pressure approx. 8 bar	**= 80** [3]

No code = NBR seals
V = FKM seals
(other seals on request)

⚠ **Attention!**
The compatibility of the seals and pressure fluid has to be taken into account!

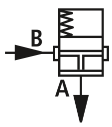
7X = (NS 16 to 63) Series 70 to 79
(70 to 79: unchanged installation and connection dimensions)

E = Spool without fine control grooves

Preferred types and standard components can be found in the EPS (Standard Price List).

1) Closing pressure 3.0 bar only for NS 16 for mounting a pilot operated pressure relief valve type DBC . -5X/…SO187 (see catalogue sheet RE 25 802)
2) Only for NS 16, 25 and 32
3) Special installation space is required (see page 47)

Symbol: cartridge valves



Type LC..DR..

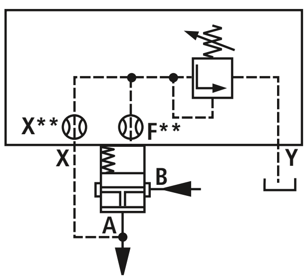
Technical data (for applications outside these parameters, please consult us!)

Maximum operating pressure	– Ports A and B	bar	315					
Maximum flow (recommended)		NS	16	25	32	40	50	63
	– LC..DR20.../..	L/min	100	200	300	750	1000	1600
	– LC..DR40.../..	L/min	150	300	450	1000	1300	2000
Pressure fluid 1) Suitable for NBR **and** FKM seals 2) **Only** suitable for FKM seals			Mineral oil (HL, HLP) to DIN 51 524 1); Fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90 221); HETG (rape seed oil) 1); HEPG (polyglycols) 2); HEES (synthetic ester) 2); other pressure fluids on request					
Pressure fluid temperature range		°C	– 30 to + 80 for NBR seals					
			– 20 to + 80 for FKM seals					
Viscosity range		mm^2/s	2.8 to 380					
Cleanliness class to ISO code			Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 20/18/15 3)					

3) The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.
For the selection of filters see catalogue sheets RE 50 070, RE 50 076 and RE 50 081.

Preferably use 5 and 8 bar springs for flow control. The usable Δp is available on request.

⚠ **Attention!**
2-way cartridge valves type LC..DR... are combined with control covers type LFA..DB... (for ordering details see page 13).



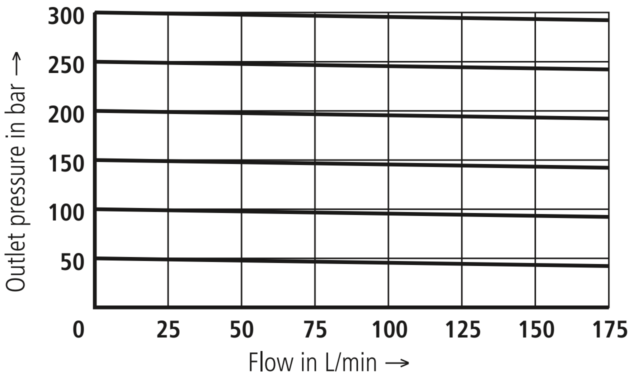
Pressure reducing function
Normally open

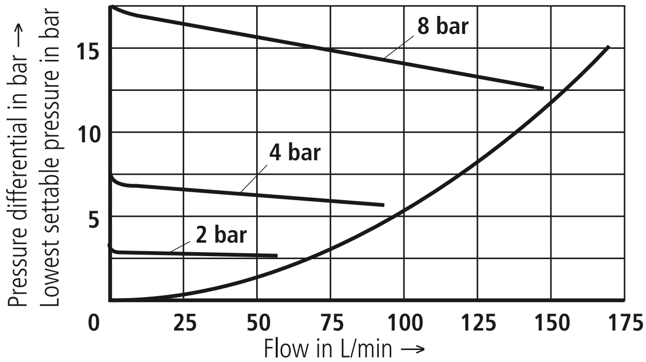
E.g.
Type LFA...DB...

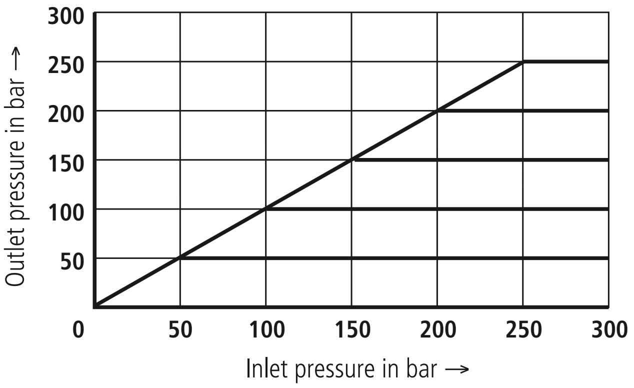
Type LC..DR 40...

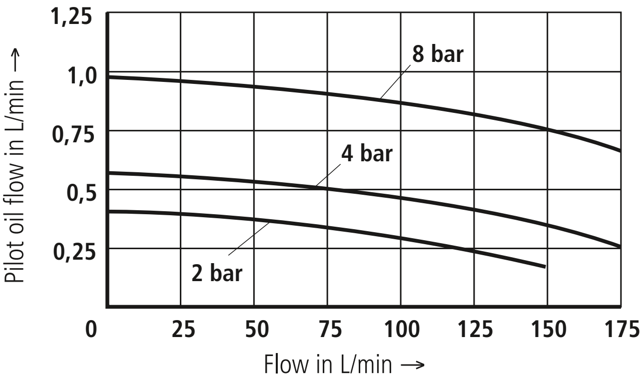
Characteristic curves (measured with HLP 46; ϑ_{oil}= 40 °C ± 5 °C)

LC 16 DR...



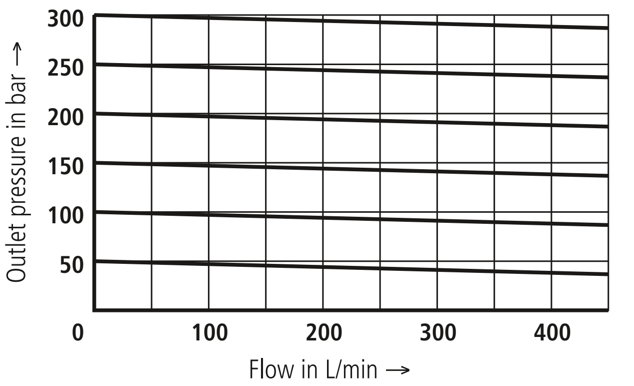


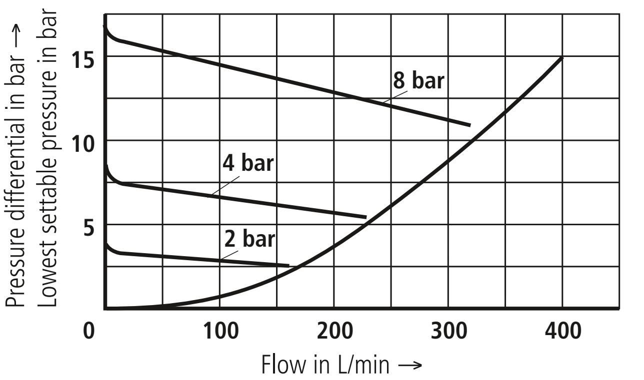


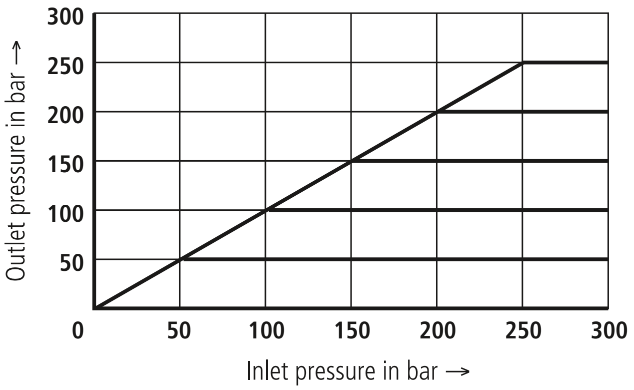


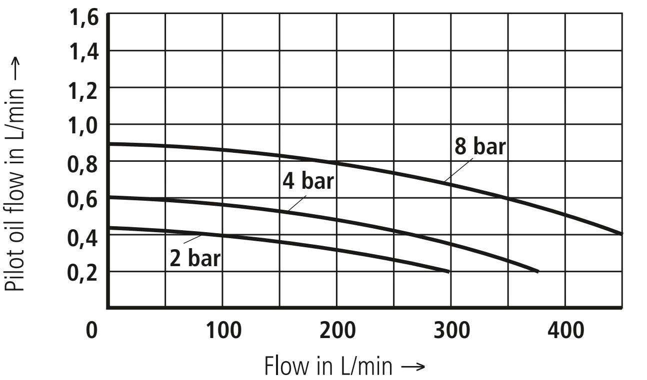
Measured at: p_a = 50 bar

LC 25 DR...





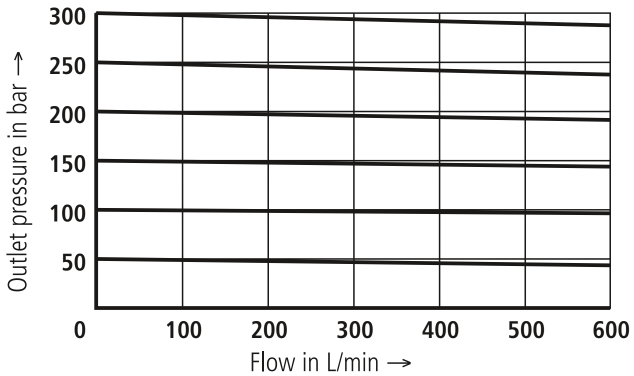


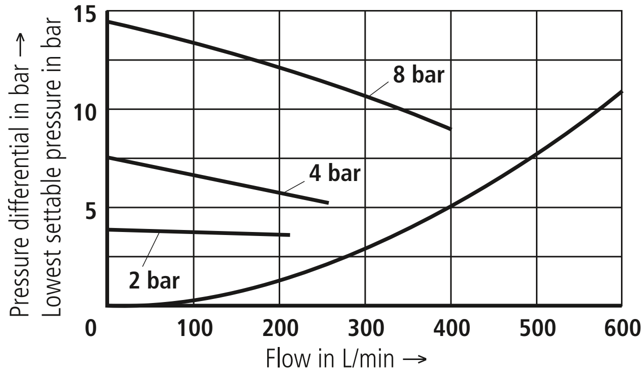


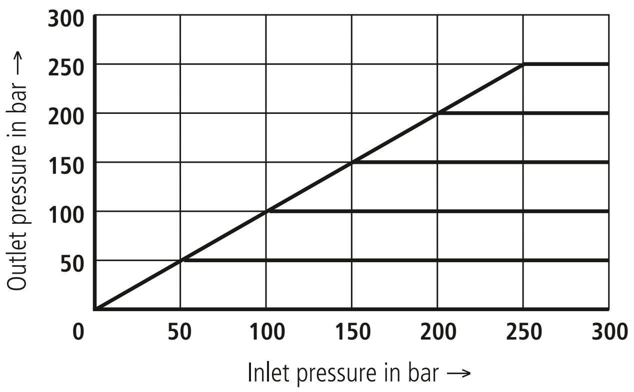
Measured at: p_a = 50 bar

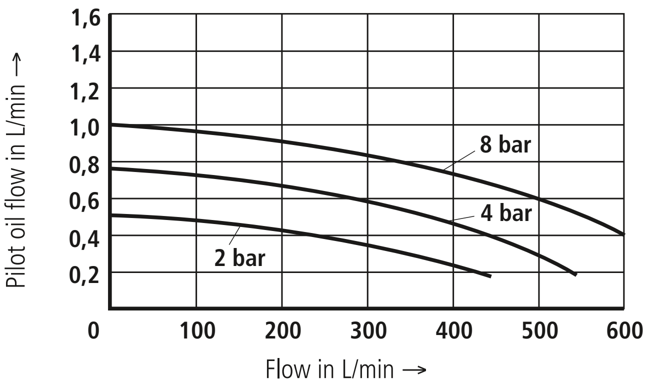
Characteristic curves (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

LC 32 DR...



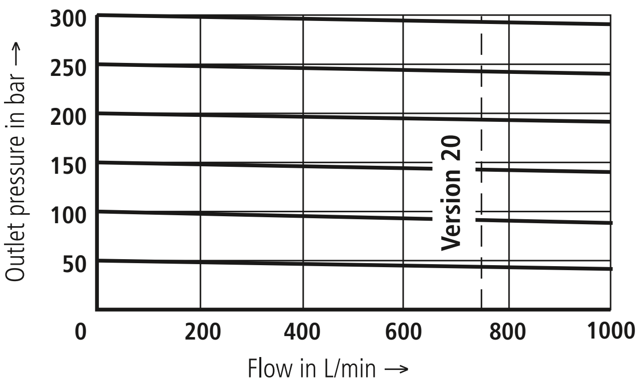


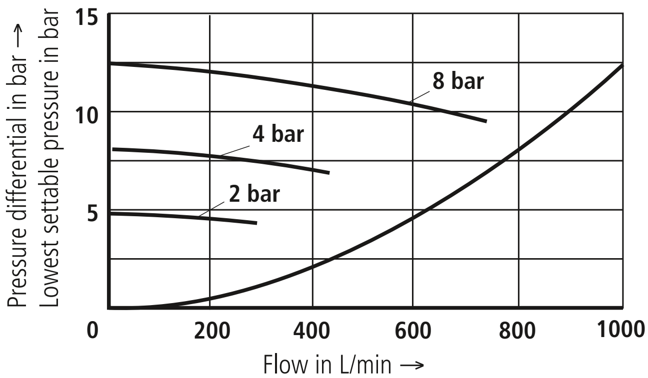


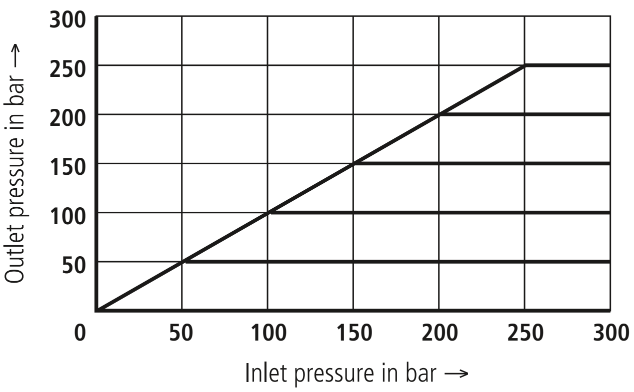


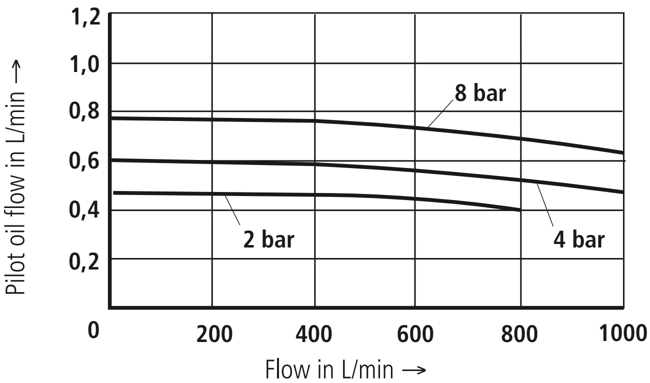
Measured at: p_a = 50 bar

LC 40 DR...





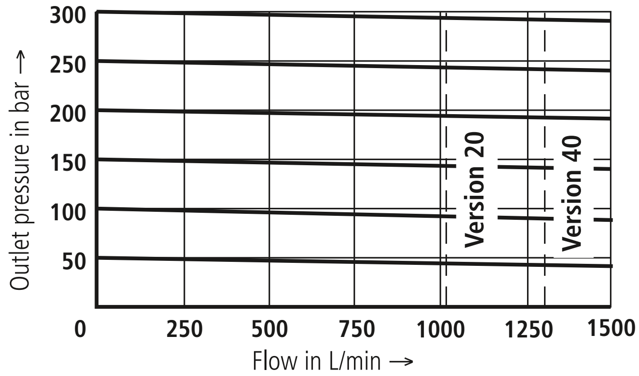


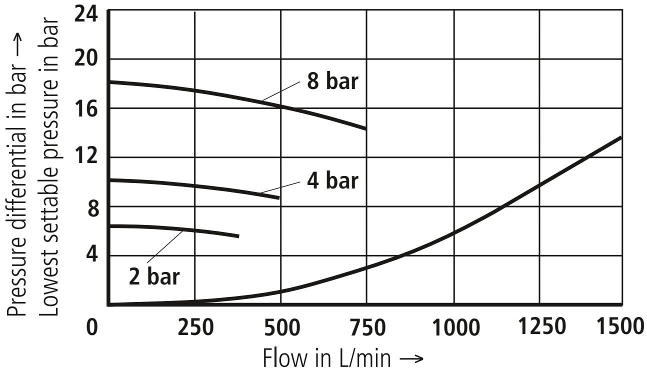


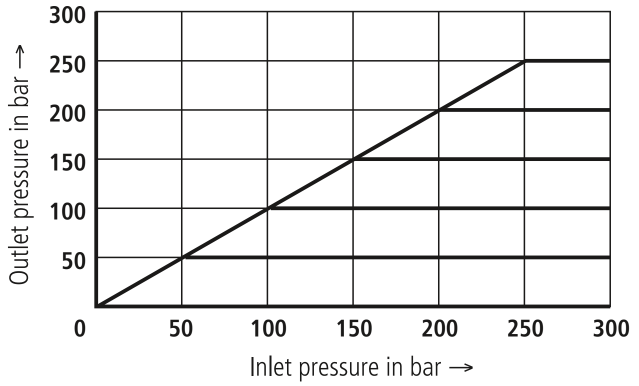
Measured at: p_a = 50 bar

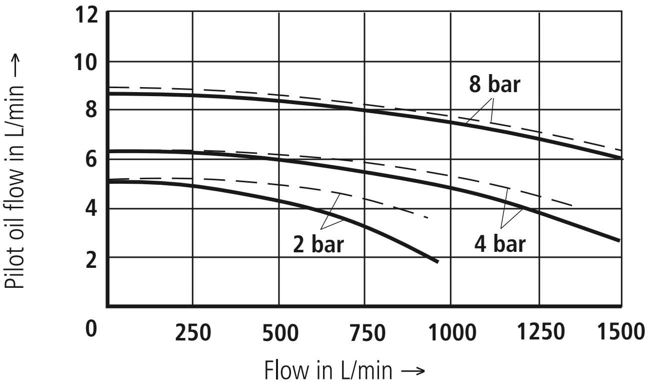
Characteristic curves (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

LC 50 DR...



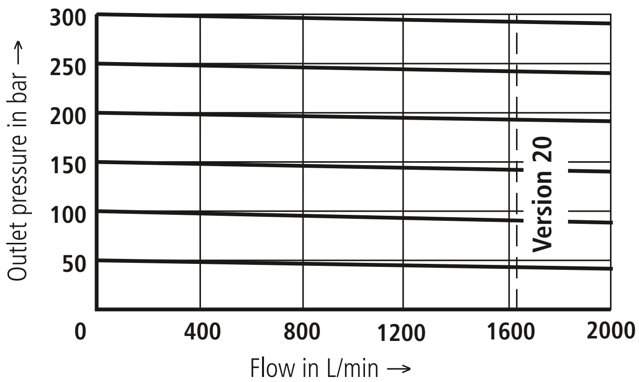


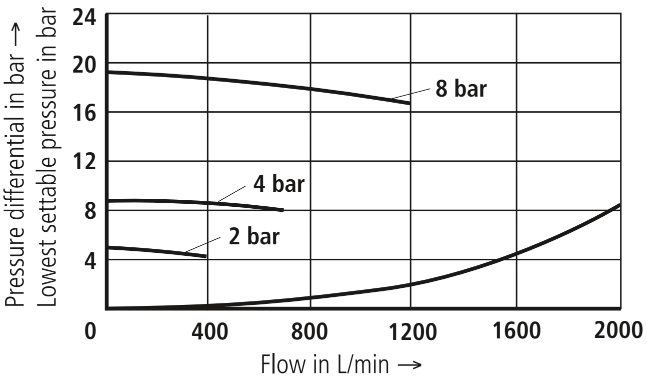


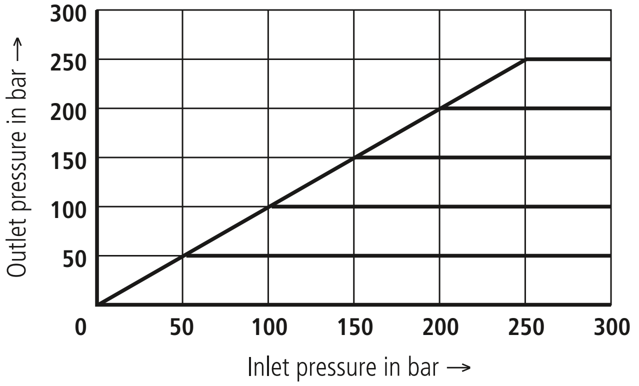


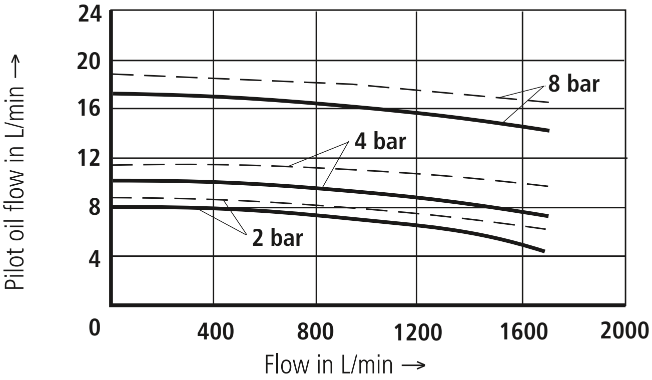
Measured at: p_a = 50 bar
——— p_e = 100 bar
– – – p_e = 350 bar

LC 63 DR...









Measured at: p_a = 50 bar
——— p_e = 100 bar
– – – p_e = 350 bar

Seal kits for cartridge valves type LC...

Nom. size	Material No. NBR seals	Material No. FKM seals
16	R900313104	R900313107
25	R900313105	R900313108
32	R900313106	R900313109
40	R900873022	R900873025
50	R900873023	R900873026
63	R900873024	R900873027

Compression springs for cartridge valves type LC...

NS	Spring dimensions in mm	Opening pressure in bar	Material No.
16	10.2/1.3 x 40.5/8.0	2.0	R900062747
	10.0/1.6 x 38.2/9.0	3.0	R900062753
	9.8/1.7 x 38.0/9.0	4.0	R900062754
	9.7/1.9 x 35.7/8.5	5.0	R900062757
	9.2/2.4 x 60.5/14.5	8.0 [1)]	R900082073
25	15.3/2.25 x 55.0/8.0	2.0	R900062762
	14.9/2.7 x 53.4/8.5	3.0	R900062764
	14.7/2.8 x 53.5/8.5	4.0	R900062820
	14.6/3.0 x 52.5/8.5	5.0	R900062819
	14.1/3.5 x 78.5/12.0	8.0 [1)]	R900082072
32	19.6/2.8 x 69.5/7.5	2.0	R900062813
	19.2/3.2 x 71.0/8.5	3.0	R900062783
	19.1/3.4 x 72.0/9.5	4.0	R900062810
	19.1/3.5 x 72.8/9.0	5.0	R900062805
	18.5/4.0 x 109/14.5	8.0 [1)]	R900082071
40	25.9/4.25 x 63/6	2.0	R900206675
	25.7/4.5 x 68.5/6	4.0	R900206673
	24.8/5.3 x 105/10	8.0 [1)]	R900206671
50	33.2/5 x 82/5.5	2.0	R900206684
	32.8/5.3 x 92/6.5	4.0	R900206681
	31.7/6.5 x 137/10.5	8.0 [1)]	R900206680
63	40.6/6.5 x 108/7	2.0	R900206690
	40.7/6.5 x 127.5/7.5	4.0	R900206692
	38.6/8.5 x 183.5/11.5	8.0 [1)]	R900206689

1) These springs require an additional installation length.
When using standaard control covers an additional sandwich plate type LFA . D22… must be used.

Exception:
Control cover type "D" can be replaced by type LFA . D8-../F (no sandwich plate is required).

Control cover for pressure reducing function

Main spool normally closed - LC..DB 40 D.. – separate order

General notes

1	2	3	4	5	6	7
LFA				— 7X /		

•= Available

Nominal size						Type	Adjustment type	Series	Pressure stage in bar for nominal size		Seal material	Page
16	25	32	40	50	63				...DR... ..DRW.	..DRE..		
•	•	•	•	•	•	DR			025		For ordering details see pages for the individual control cover variants	53, 54
•	•	•	•	•	•	DRW			075			55, 56
	•	•	•	•	•	DREV			150	006		57, 58
	•	•	•	•	•	DREZ			210	014		57, 58
	•	•	•	•	•	DREWV			315	006		59, 60
	•	•	•	•	•	DREWZ			350	014		59, 60

Preferred types and standard components can be found in the EPS (Standard Price List).

4

Adjustment elements for pressure reducing valves

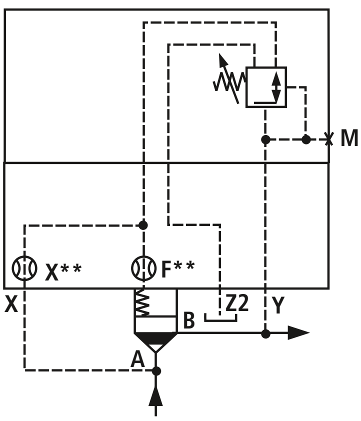
1 = Rotary knob
2 = Hexagon with protective cap
3 = Rotary knob with scale
(H-key to automotive industry standards)
4 = Rotary knob with scale

5

Series

7X = Series 70 to 79
(unchanged installation and connection dimensions)

⚠ Attention !
Control covers type LFA..DR... are combined with 2-way cartridge valves type LC..DB 40 D... (for ordering details see page 5)



Pressure reducing function
Normally closed

E.g.
Type LFA...DR...
Type LC..DB 40 D..

Control cover for pressure reducing function

Main spool normally closed - LC..DB 40 D.. – separate order

Technical data (for applications outside these parameters, please consult us!)

Pressure fluid 1) Suitable for NBR **and** FKM seals 2) **Only** suitable for FKM seals	Mineral oil (HL, HLP) to DIN 51 524 [1]; Fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90 221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (snthetic ester) [2]; Other pressure fluids on request
Pressure fluid temperature range °C	– 30 to + 80 for NBR seals
	– 20 to + 80 for FKM seals
Viscosity range mm^2/s	2.8 to 380
Cleanliness class to ISO code	Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 20/18/15 [3]

3) The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.
For the selection of filters see catalogue sheets RE 50 070, RE 50 076 and RE 50 081.

Control cover

Max. perm. operating pressure at port ...		Control cover type LFA..DR.-../... LFA..DRW.-../...	LFA..DRE..-../...
...X (primary pressure)		315 bar	350 bar
...Y (secondary pressure = max. settable pressure)		315 bar	350 bar
...Z2	When regulating the pressure	Zero pressure (up to ≈ 2 bar)	
	Static	60 bar	315 bar
...T	When regulating the pressure		Zero pressure (up to ≈ 2 bar)
	Static (corresponds to the permissible tank pressure of the pilot valves)		100 bar

Notes on pilot control valves (not included within the scope of supply, must be ordered separately!)

Directional spool valve (porting pattern form A 6 to DIN 24 340)

Directional spool valve	Nominal size	Catalogue sheet No.	Control cover
3WE 6 A-../...	6	23 178	DREWV, DREWZ
3WE 6 B9-../...	6	23 178	DRW

Proportional pressure relief valve

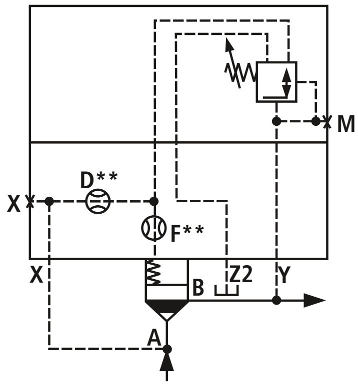
Prop. pressure relief valve	Nominal size	Catalogue sheet No.	Control cover
DBET-5X/...[4] Y G24-1	6	29 165	DREV, DREWV
DBETR-1X/...	On request	On request	DREZ, DREWZ

4) Possible pressure stages 50, 100, 200, 315, 350

Valve fixing screws are included within the control cover scope of supply.

Overview of symbols (basic symbols) **- pressure reducing function**

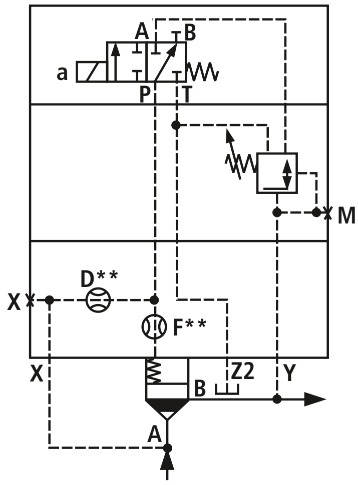
Valid symbols are shown in the following type descriptions !



LFA..DR.-.../...
NS 16 to 63
Control cover with manual pressure adjustment

Port T - zero pressure

See pages 53; 54



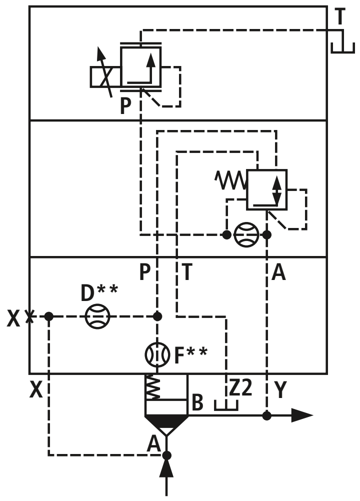
LFA..DRW.-.../...
NS 16 to 63
Control cover with manual pressure adjustment and isolating function

Port T - zero pressure

3WE 6 B9-../..
Solenoid de-energised → closed

Solenoid energised → pressure reducing function

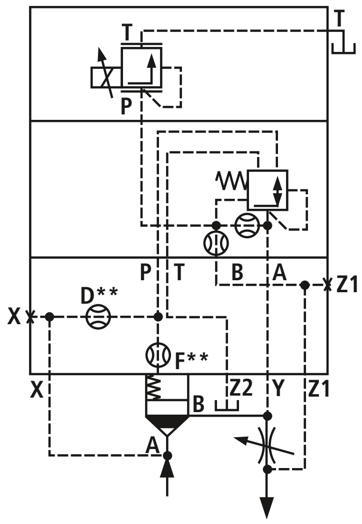
See pages 55; 56



LFA..DREV-.../...
NS 25 to 63
Control cover for electrical-proportional pressure adjustment

Port T - zero pressure

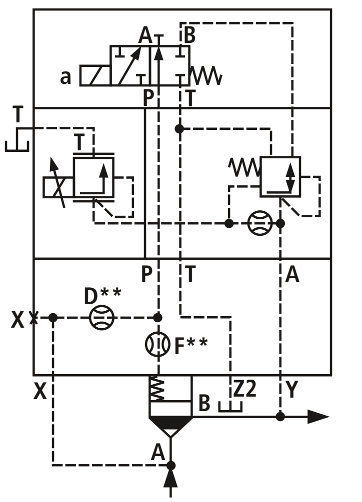
See pages 57; 58



LFA..DREZ-.../...
NS 25 to 63
Control cover for electrical-proportional pressure adjustment

Port T - zero pressure

See pages 57; 58



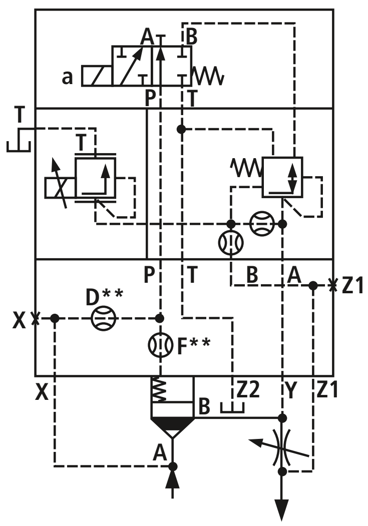
LFA..DREWV-.../...
NS 25 to 63
Control cover for electrical-proportional pressure adjustment and isolating function

Port T - zero pressure

3WE 6 A-../..
Solenoid de-energised → closed

Solenoid energised → pressure reducing function

See pages 59; 60



LFA..DREWZ-.../...
NS 25 to 63
Control cover for electrical-proportional pressure adjustment and isolating function

Port T - zero pressure

3WE 6 A-../..
Solenoid de-energised → closed

Solenoid energised → pressure reducing function

See pages 59; 60

The orifices built into the control covers are threaded type orifices.
These are standard orifices. **No** type is entered in the ordering detail.

Orifice as shown within the main symbol

R-rings dimensions for ports X, Y, Z1, Z2 (are included within the scope of supply)

NS	Dimensions in mm	Material No. NBR	Material No. FKM
16	8.41 x 1.40 x 1.78	R900025407	R900025408
25	9.81 x 1.50 x 1.78	R900017453	R900017610
32	11.18 x 1.60 x 1.78	R900017455	R900017611
40, 50	13.00 x 2.30 x 2.62	R900017457	R900017617
63	18.72 x 2.62 x 2.62	R900024445	R900024446
80	26.57 x 3.53 x 3.53	R900017466	R900017630
100	34.52 x 3.53 x 3.53	R900017472	R900017633

Seal kits for control cover type LFA../.. (NS 16 to 63)

Seal kit for LFA...		Material No.					
		NS 16		NS 25		NS 32	
		NBR	FKM	NBR	FKM	NBR	FKM
..DR..[1]	Pilot control ..DR6..	R900311273	R900311276	R900311273	R900311276	R900311273	R900311276
..DR..[1] / ..DRW..[1]	Control cover ..DR.. LFA..DRW..	R900313701	R900313702	R900313703	R900313704	R900313705	R900313706
..DRW..[1]	Pilot control ..ZDR6..	R900314298	R900314299	R900314298	R900314299	R900314298	R900314299
DREV..; ..DREWV.. ..DREZ..; ..DREWZ..				R900313885	R900313886	R900313887	R900313888

Seal kit for LFA...		Material No.					
		NS 40		NS 50		NS 63	
		NBR	FKM	NBR	FKM	NBR	FKM
..DR..[1]	Pilot control ..DR6..	R900311273	R900311276	R900311273	R900311276	R900311273	R900311276
..DR..[1] / ..DRW..[1]	Control cover ..DR.. LFA..DRW..	R900313889	R900313890	R900313889	R900313890	R900313891	R900313892
..DRW..[1]	Pilot control ..ZDR6..	R900314298	R900314299	R900314298	R900314299	R900314298	R900314299
DREV..; ..DREWV..[2] ..DREZ..; ..DREWZ..[2]		R900313881	R900313882	R900313881	R900313882	R900313883	R900313884

[1] The seals for the pilot valves (DR6..., ZDR...) are **not** included within the scope of supply.
[2] For pilot valve seal kits see the relevant catalogue sheet.

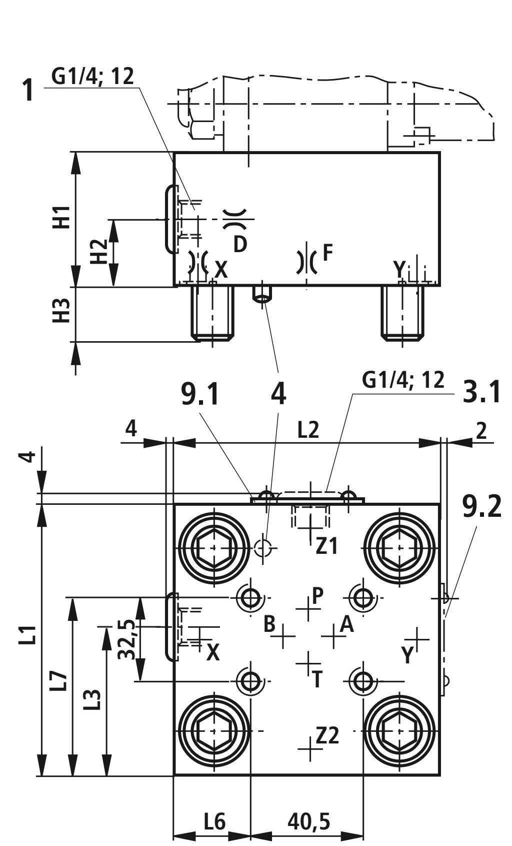
Fixing screws (are included within the scope of supply)

S.H.C.S. to DIN 912-10.9

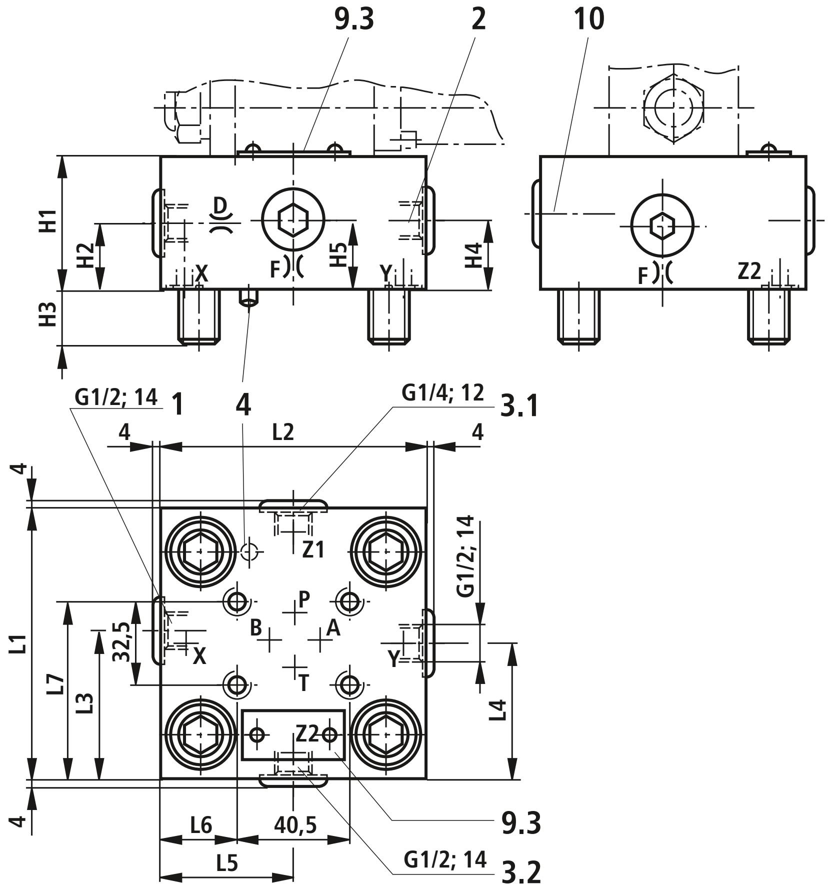
NS	Qty.	Dimensions	Tightening torque in Nm
16	4	M 8 x 45	32
25	4	M 12 x 50	110
32	4	M 16 x 60	270
40	4	M 20 x 70	520
50	4	M 20 x 80	520
63	4	M 30 x 100	1800

Control covers for versions DR, DRW, DREV, DREZ, DREWV and DREWZ

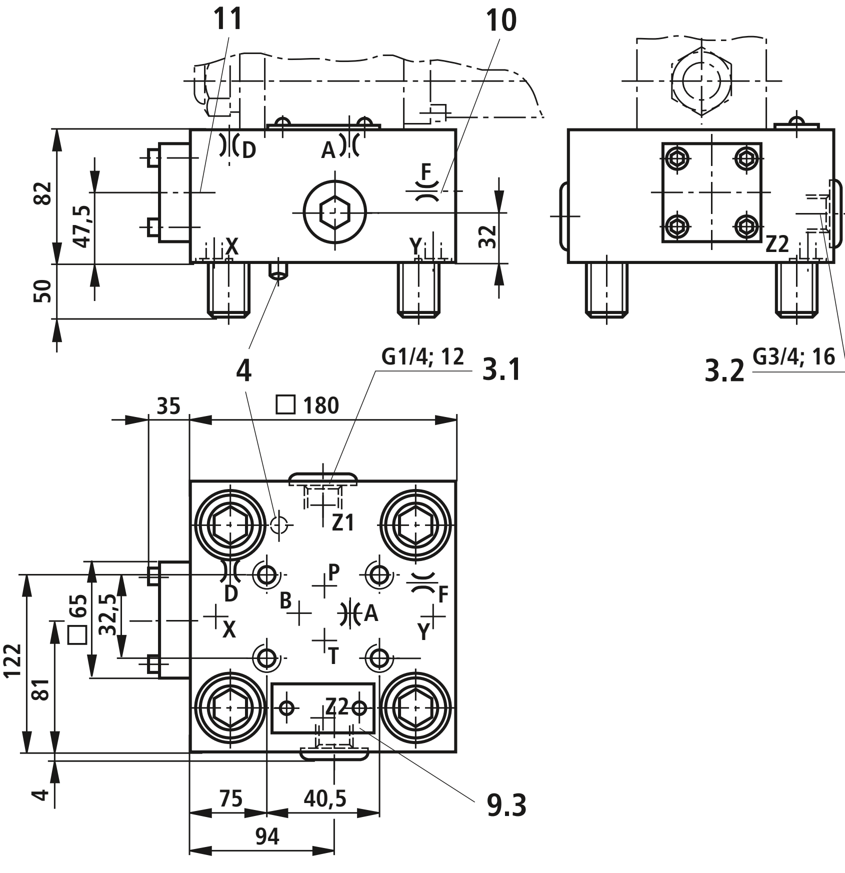
NS 16, 25, 32



NS 40, 50



NS 63



NS	16	25	32	40	50
H1	40	40	50	60	68
H2	17	19	26	30	32
H3	15	24	28	32	34
H4				40	32
H5				40	32
L1	65	85	100	125	140
L2	80	85	100	125	140
L3	36.5	49	56.5	72	80
L4				62.5	70
L5				62.5	70
L6	7	23.5	31	43.5	51
L7	49	59	66.5	79	86.5

1 Port X optionally as a threaded port (for NS 16...50)

2 Port Y optionally as a threaded port (for NS 40, 50)

3.1 Port Z1 optionally as threaded port (for LFA..DREZ.. , LFA..DREWZ..., NS 25..63)

3.2 Port Z2 optionally as threaded port (for NS 40, 50, 63)

4 Locating pin

9.1 Name plate (NS 16)

9.2 Name plate (NS 25, 32)

9.3 Name plate (NS 40, 50, 63)

10 Check valve (for NS 63 orifice F in poppet)

11 For control cover NS 63 Logic element NS 16

Control cover for pressure reducing functions

Main spool normally closed - LC..DB 40 D.. – separate order

NS 16 to 63

1	2	3	4		5		6	7
LFA		DR		–	7X	/		

Nominal size 16	=	**16**
Nominal size 25	=	**25**
Nominal size 32	=	**32**
Nominal size 40	=	**40**
Nominal size 50	=	**50**
Nominal size 63	=	**63**

Adjustment type

Rotary knob	=	**1**
Set screw with hexagon and protective cap	=	**2**
Lockable rotary knob with scale	=	**3**[1)]
Rotary knob with scale	=	**4**

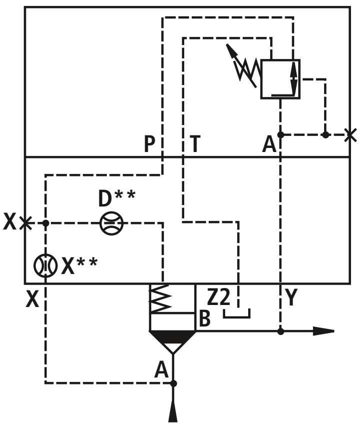
[1)] H-key to Material No. **R900008158** is included within the scope of supply

No code =	NBR seals
V =	FKM seals
	(other seals on request)

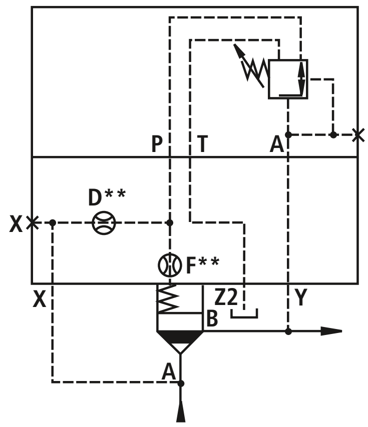
⚠ Attention!
The compatibility of the seals and pressure fluid has to be taken into account!

025 =	Max. secondary pressure 25 bar
075 =	Max. secondary pressure 75 bar
150 =	Max. secondary pressure 150 bar
210 =	Max. secondary pressure 210 bar
315 =	Max. secondary pressure 315 bar

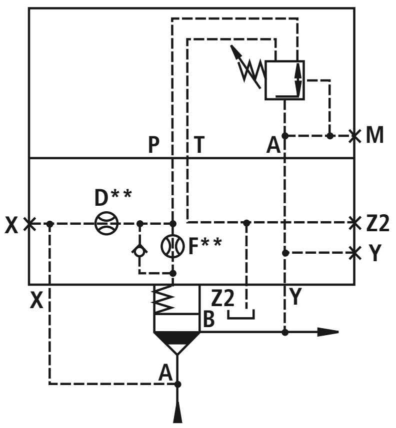
7X =	Series 7X (NS 16 to 63)



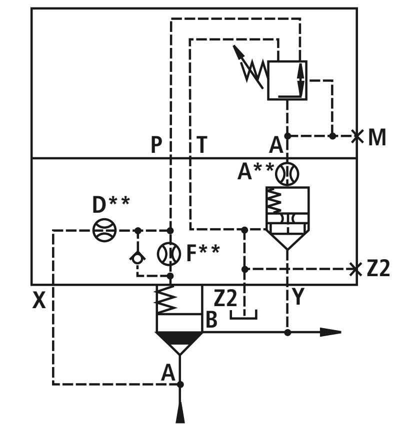
LFA..DR.-7X/...
NS 16



LFA..DR.-7X/...
NS 25, 32



LFA..DR.-7X/...
NS 40, 50



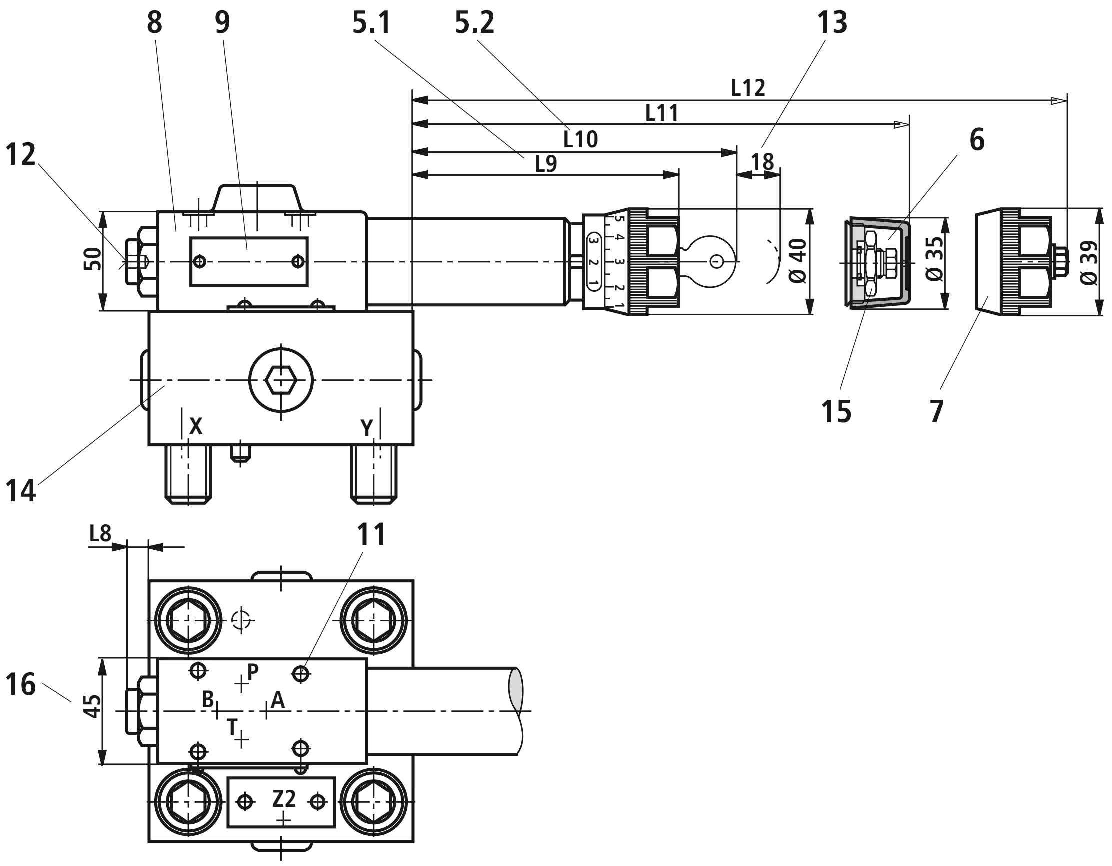
LFA..DR.-7X/...
NS 63

Control cover for pressure reducing functions

Main spool normally closed - LC..DB 40 D.. – separate order

NS 16 to 63

Dimensions in mm



5.1 Adjustment element "4"
5.2 Adjustment element "3"
6 Adjustment element "2"
7 Adjustment element "1"
8 Direct operated pressure reducing valve (is included within the scope of supply)
9 Name plate for pressure reducing valves
11 Valve fixing screws M5x50 DIN 912-10.9 M_A = 8.9 Nm are included within the control cover scope of supply
12 Pressure gauge port G 1/4, 12 deep; Socket screw 6A/F
13 Space required to remove the key
14 Control cover, see page 52
15 Locknut 24A/F
16 For type .../315 → 50 mm

NS		16	25	32	40	50	63
A** 1)							2.0
F** 1)			0.8	1.0	1.2	1.5	1.5
X** 1)		2.5					
D** 2)		0.8	3.0	3.0	3.0	3.0	3.0
	.../315	0.8	1.8	1.8	1.8	1.8	1.8
L8		22	5.5				
	.../315	30.5	14	6			
L9		119.5	131	123.5	111	103.5	87.5
	.../315	116.5	128	120.5	108	100.5	84.5
L10		143.5	155	148.5	135	128.5	111.5
	.../315	140.5	152	145.5	132	125.5	108.5
L11		99.5	111	103.5	91	83.5	67.5
	.../315	96.5	108	100.5	88	80.5	64.5
L12		99.5	111	103.5	91	83.5	67.5
	../315	96.5	108	100.5	88	80.5	64.5
Special dim.		See page 52					

** Orifice Ø
1) Orifice M6 tapered
2) Orifice M6 tapered (NS16, 63), orifice M8 x 1 tapered (NS25...50)

Control cover for pressure reducing and isolating functions

Main spool normally closed - LC..DB 40 D.. – separate order

NS 16 to 63

1	2	3	4	5	6	7
LFA		DRW	–	7X	/	

Nominal size 16 = **16**
Nominal size 25 = **25**
Nominal size 32 = **32**
Nominal size 40 = **40**
Nominal size 50 = **50**
Nominal size 63 = **63**

Adjustment type

Rotary knob = **1**
Set screw with hexagon and protection cap = **2**
Lockable rotary knob with scale = **3**[1)]
Rotary knob with scale = **4**

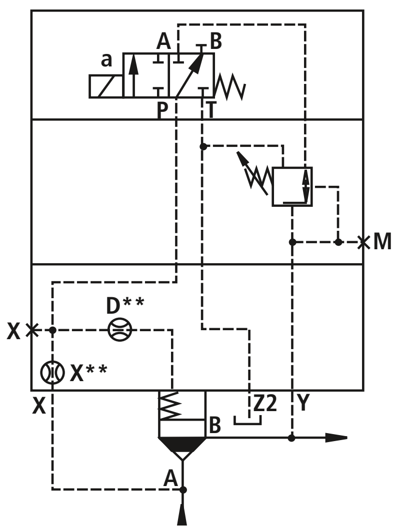
1) H-key for Material No. **R900008158** is included within scope of supply

No code = NBR seals
V = FKM seals
(other seals on request)

⚠ Attention!
The compatibility of the seals and pressure fluid has to be taken into account!

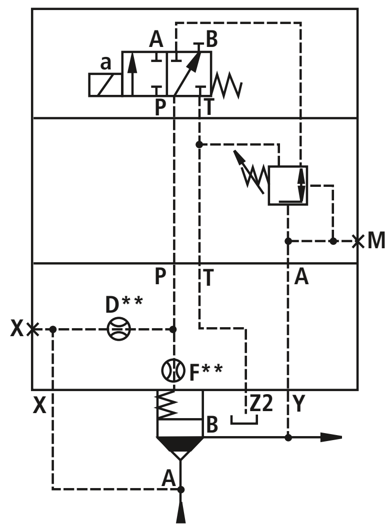
025 = Max. secondary pressure 25 bar
075 = Max. secondary pressure 75 bar
150 = Max. secondary pressure 150 bar
210 = Max. secondary pressure 210 bar
315 = Max. secondary pressure 315 bar

7X = Series 7X (NS 16 to 63)

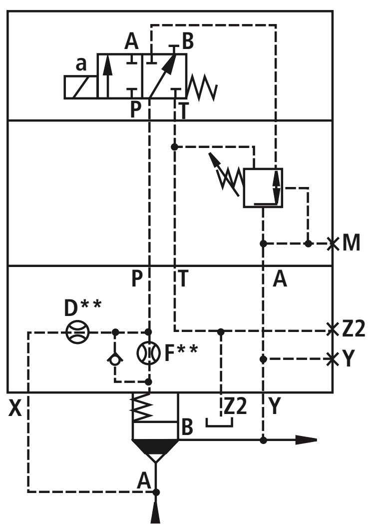


LFA..DRW.-7X/...
NS 16

3WE 6 B9-../..
Solenoid de-energised → closed
Solenoid energised → pressure reducing function

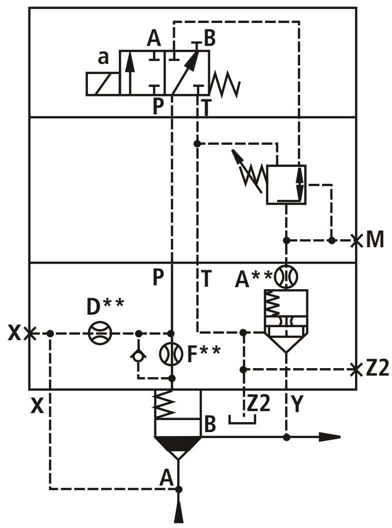


LFA..DRW.-7X/...
NS 25, 32



LFA..DRW.-7X/...
NS 40, 50

3WE 6 B9-../..
Solenoid de-energised → closed
Solenoid energised → pressure reducing function



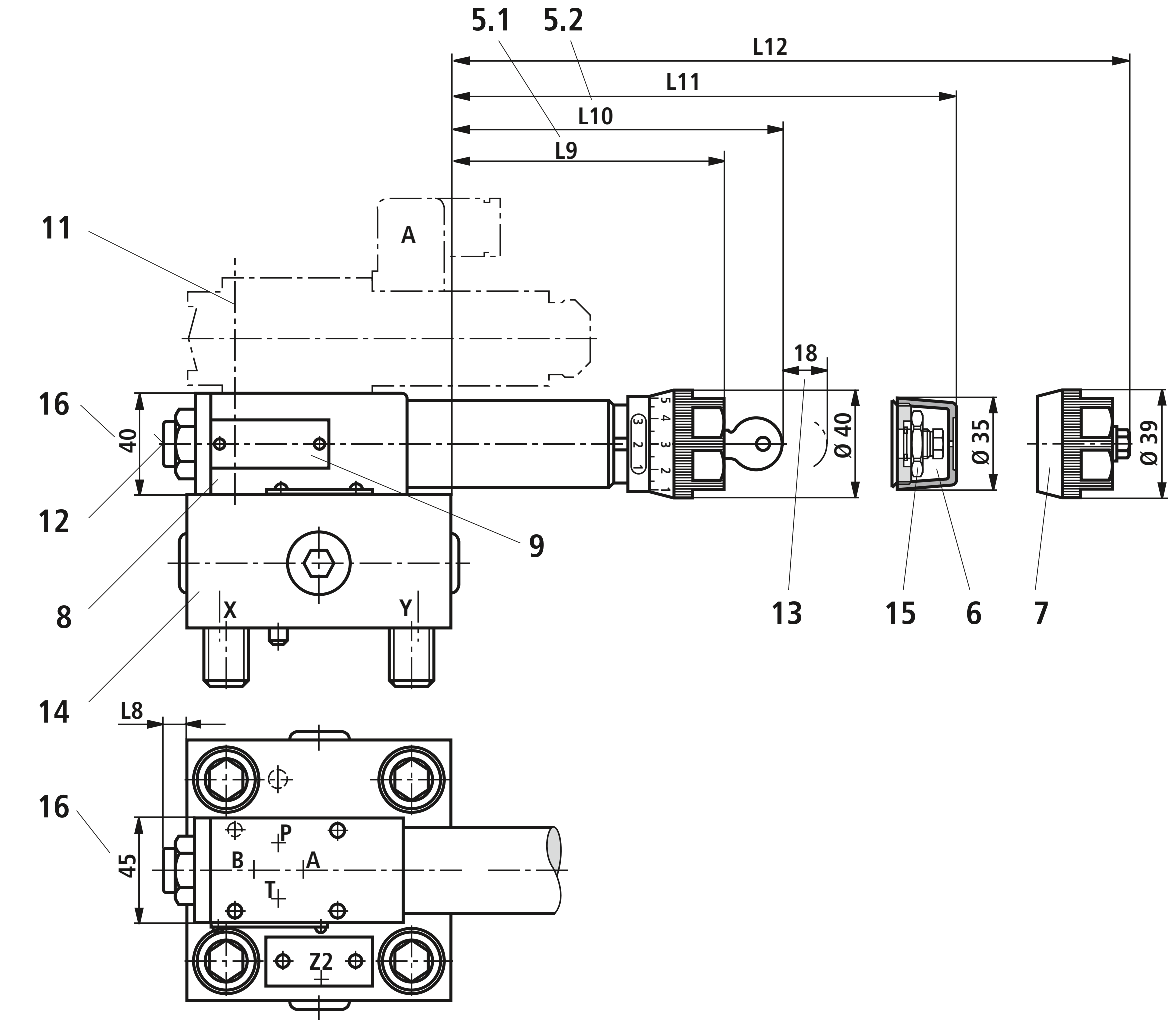
LFA..DRW.-7X/...
NS 63

Control cover for pressure reducing and isolating functions

Main spool normally closed - LC..DB 40 D.. – separate order

NS 16 to 63

Dimensions in mm



5.1 Adjustment element "4"
5.2 Adjustment element "3"
6 Adjustment element "2"
7 Adjustment element "1"
8 Direct operated pressure reducing valve (included within the scope of supply)
9 Pressure reducing valve name plate
11 Valve fixing screws M5x50 DIN 912-10.9 M_A = 8.9 Nm are included within the control cover scope of supply
12 Pressure gauge port G 1/4, 12 deep; Socket screw 6A/F
13 Space required to remove the key
14 Control cover, see page 52
15 Locknut 24A/F
16 For type .../315 → □50 mm

NS		16	25	32	40	50	63
A**[1]							2.0
X**[1]		2.5					
F**[1]			0.8	1.0	1.2	1.5	1.5
D**[2]		0.8	3.0	3.0	3.0	3.0	3.0
	.../315	0.8	1.8	1.8	1.8	1.8	1.8
L8		18	2				
	.../315	30.5	14	6			
L9		123.5	135	127.5	115	107.5	91.5
	.../315	116.5	128	120.5	108	100.5	84.5
L10		147.5	159	152.5	139	129.5	112.5
	.../315	140.5	152	145.5	132	125.5	108.5
L11		103.5	115	107.5	95	87.5	71.5
	.../315	96.5	108	100.5	88	80.5	64.5
L12		103.5	115	107.5	95	87.5	71.5
	../315	96.5	108	100.5	88	80.5	64.5
Special dim.		See page 52					

** Orifice Ø
[1] Orifice M6 tapered
[2] Orifice M6 tapered (NS16, 63), orifice M8 x 1 tapered (NS25...50)

Control cover for pressure reducing functions; electrical-proportional

Main spool normally closed - LC..DB 40 D.. – separate order

NS 25 to 63

1	2	3	5	6	7
LFA			– 7X /		

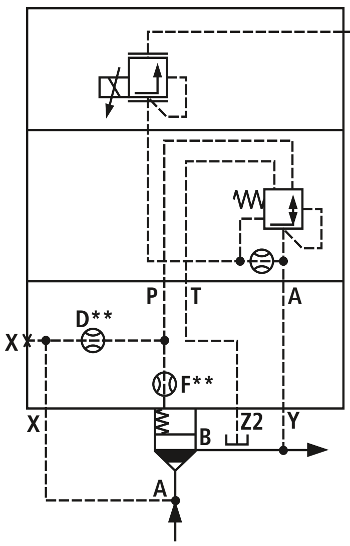
Nominal size 25	= **25**
Nominal size 32	= **32**
Nominal size 40	= **40**
Nominal size 50	= **50**
Nominal size 63	= **63**
Pressure reducing function; electrical-proportional	= **DREV**
Pressure reducing function; electrical-prop. and possibility for 2-way flow control function	= **DREZ**
Series 7X (NS 25 to 63)	= **7X**

No code =	NBR seals
V =	FKM seals
	(other seals on request)

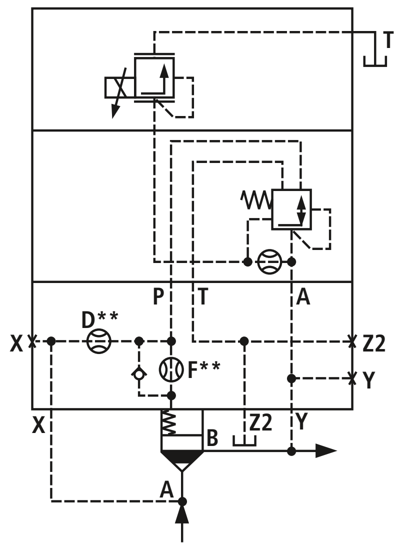
⚠ Attention!
The compatibility of the seals and pressure fluid has to be taken into account!

Pressure stages (pressure reducing valve)

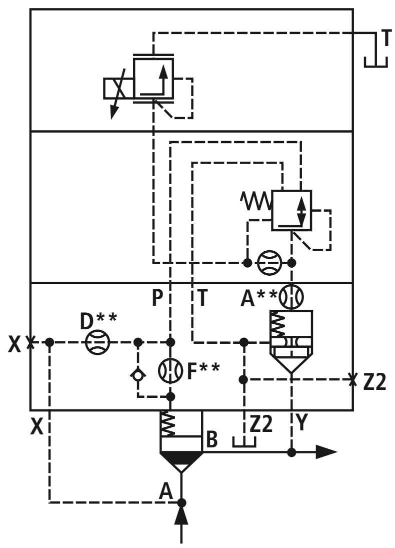
006 =	7.0 bar (only for DREV)
014 =	16.0 bar (only flor DREZ)



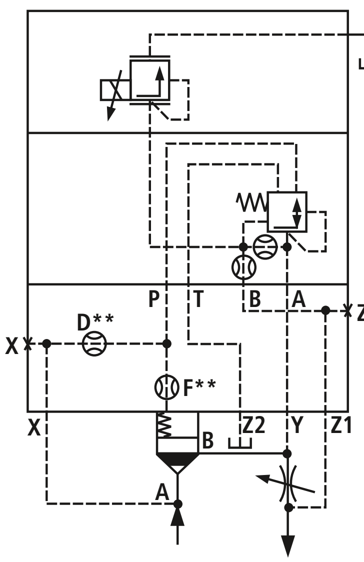
LFA..DREV-7X/006
NS 25, 32



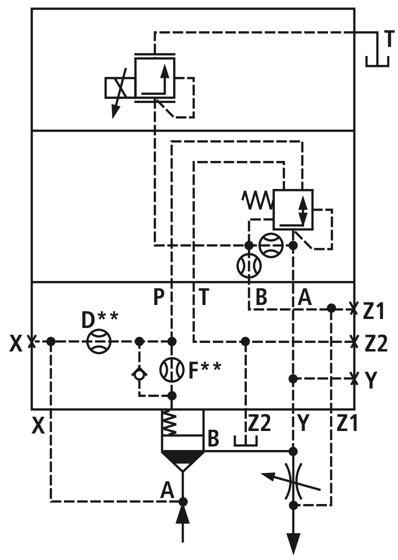
LFA..DREV-7X/006
NS 40, 50



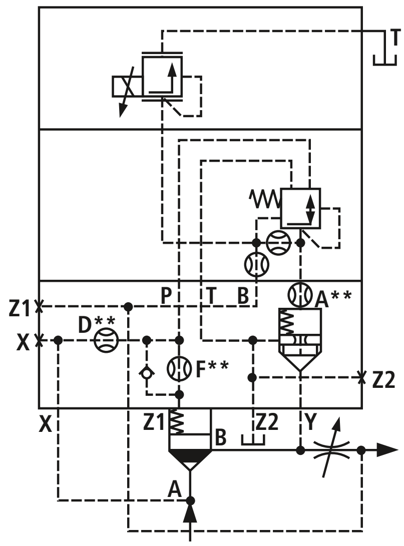
LFA..DREV-7X/006
NS 63



LFA..DREZ-7X/014
NS 25, 32



LFA..DREZ-7X/014
NS 40, 50



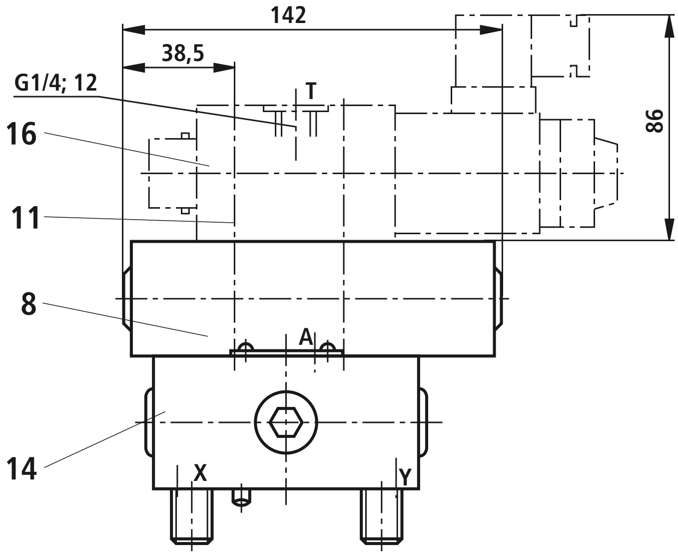
LFA..DREZ-7X/014
NS 63

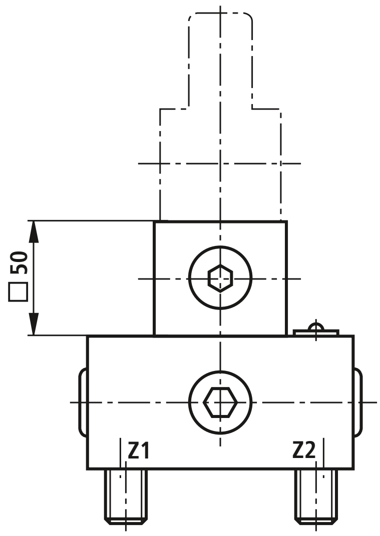
Control cover for pressure reducing functions; electrical-proportional

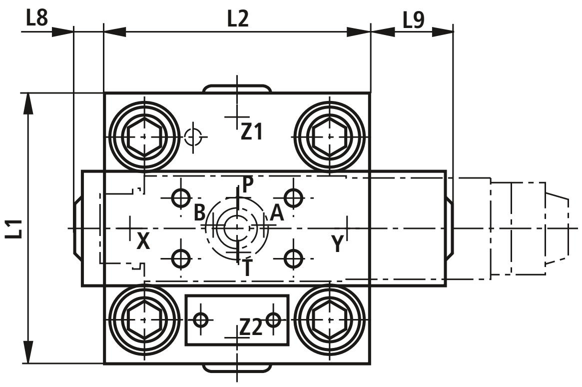
Main spool normally closed - LC..DB 40 D.. – separate order

NS 25 to 63

Dimensions in mm







NS	A**1)	F**1)	D**2)	L1	L2	L8	L9	Special dim.
25		0.8	1.5	85	85	15	42	See page 52
32		1.0	1.5	100	100	7.5	35	
40		1.2	1.8	125	125		22	
50		1.5	1.8	140	140		15	
63	2.0	1.5	1.8	180	180			

** Orifice Ø

1) Orifice M6 tapered

2) Orifice M8 x 1 tapered (NS25...50), orifice M6 tapered (NS63)

8 Pressure reducing valve (is included within the scope of supply)

11 Valve fixing screws M5 DIN 912-10.9 M_A = 8.9 Nm are included within the scope of supply

14 Control cover, see page 52

16 Proportional pressure relief valve DBET-5X/...3)Y G24-14) (must be ordered separately)

3) Pressure stages for valve type:
DBET-5X/... 50, 100, 200, 315 and 350 bar

4) 1 = G 1/4 threaded port T, special poppet

Control cover for pressure reducing functions and isolating functions; electrical-proportional

Main spool normally closed - LC..DB 40 D.. – separate order

NS 25 to 63

1	2	3	5	6	7
LFA			– 7X /		

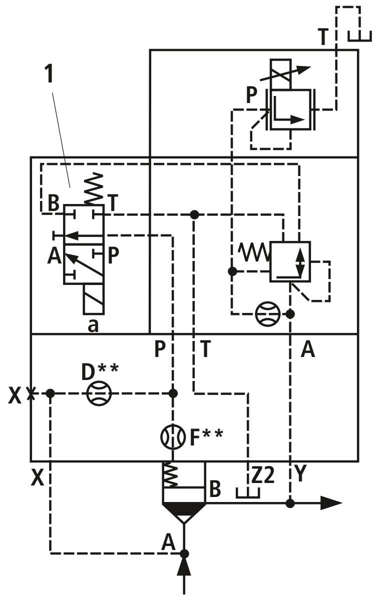
Nominal size 25	= **25**
Nominal size 32	= **32**
Nominal size 40	= **40**
Nominal size 50	= **50**
Nominal size 63	= **63**
Pressure reducing function, electrical-proportional and isolating function	= **DREWV**
Pressure reducing function, electr.-prop. and isolating function, including possibility for 2-way flow control function	= **DREWZ**
Series 7X (NS 25 to 63)	**= 7X**

Pressure stages

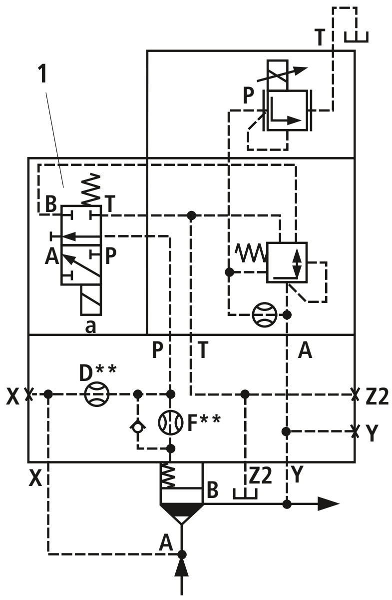
006 =	7.0 bar (only for DREWV)
014 =	16.0 bar (only for DREWZ)

No code =	NBR seals
V =	FKM seals
	(other seals on request)

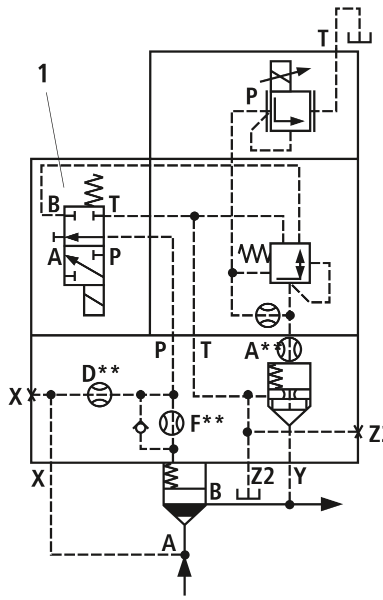
⚠ Attention!
The compatibility of the seals and pressure fluid has to be taken into account!



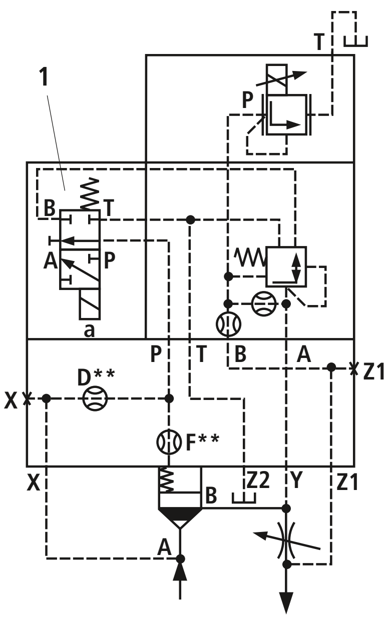
LFA..DREWV-7X/006
NS 25, 32



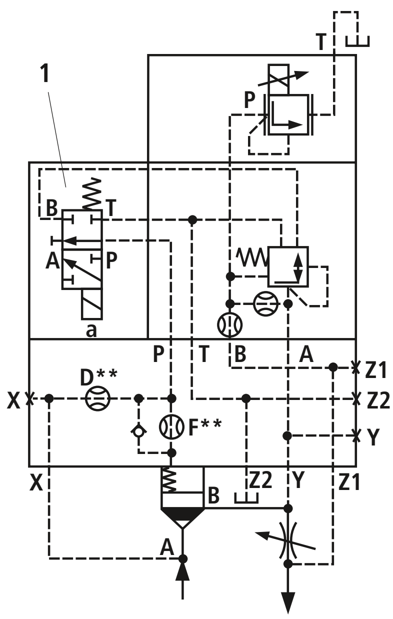
LFA..DREWV-7X/006
NS 40, 50



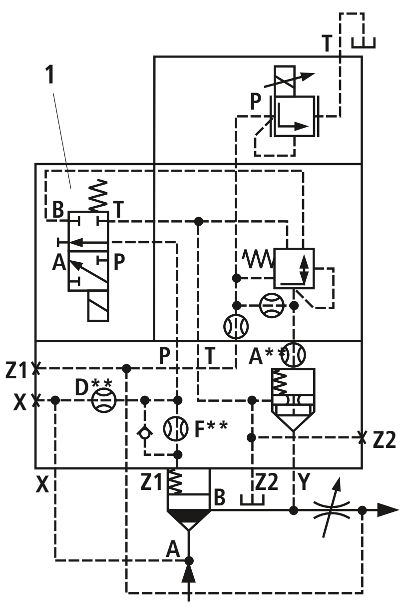
LFA..DREWV-7X/006
NS 63



LFA..DREWZ-7X/014
NS 25, 32



LFA..DREWZ-7X/014
NS 40, 50



LFA..DREWZ-7X/014
NS 63

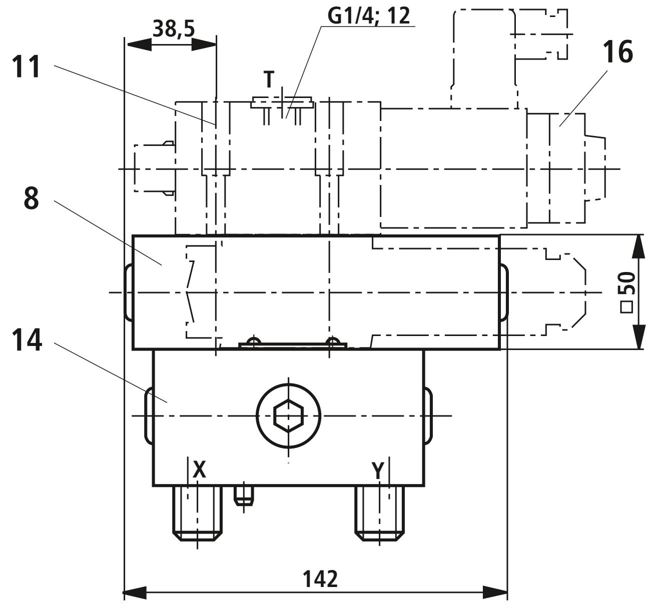
1 3WE 6 A-../.. Solenoid de-energised → closed
Solenoid energised → pressure reducing function

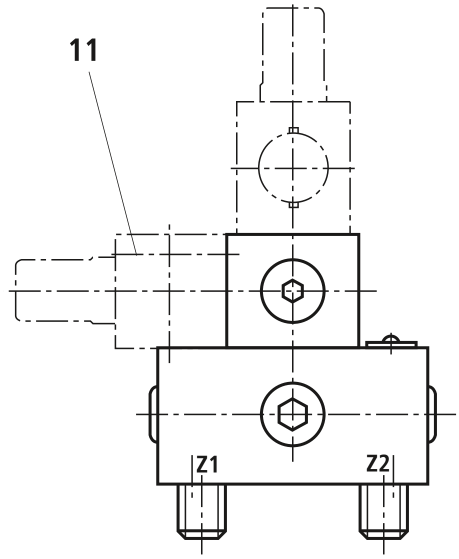
Control cover for pressure reducing functions and isolating functions; electrical-proportional

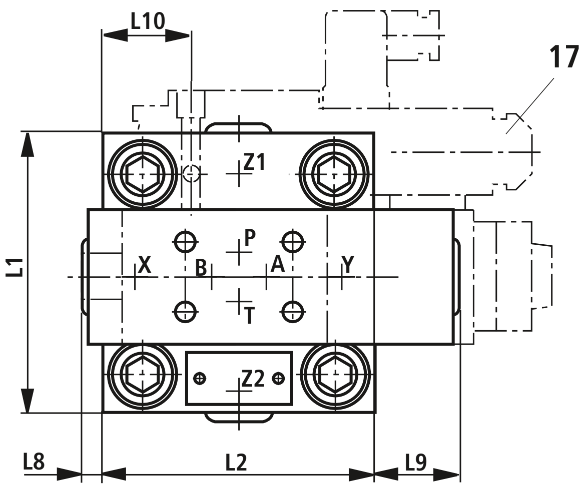
Main spool normally closed - LC..DB 40 D.. – separate order

NS 25 to 63

Dimensions in mm







NS	A**1)	F**1)	D**2)	L1	L2	L8	L9	L10	Special dim.
25		0.8	1.5	85	85	15	42	30	See page 52
32		1.0	1.5	100	100	7.5	35	37.5	
40		1.2	1.8	125	125		22	50	
50		1.5	1.8	140	140		15	57.5	
63	2.0	1.5	1.8	180	180			81.5	

** Orifice Ø
1) Orifice M6 tapered
2) Orifice M8 x 1 tapered (NS 25...50), orifice M6 tapered (NS 63)

8 Pressured reducing valve (is included within the scope of supply)
11 Valve fixing screws M5 DIN 912-10.9 M_A = 8.9 Nm are included with the scope of supply
14 Control cover, see page 52
16 Proportional pressure relief valve DBET-5X/...[3)]Y G24-1[4)] (must be ordered separately, see page 49)
17 Directional spool valve 3WE 6 A... (must be ordered separately, see page 49)

3) Pressure stages of valve type:
DBET-5X/... 50, 100, 200, 315 and 350 bar

4) 1 = G 1/4 threaded port T, special port

Pressure sequencing functions

General information regarding control cover for pressure sequencing functions

1	2	3	4	5	6	7	8
LFA				– 7X	/		

•= Available

Nominal size					Type	Adjustment type	Series	Max. settable sequencing pressure in bar	Pilot oil supply	Seal material	Page
•	•	•	•	•	DZ			210		Ordering details	63, 64
•	•	•	•	•	DZWA			315		see pages	65, 66
•	•	•	•	•	DZWB			350		63 and 65	65, 66

Preferred types and standard components can be found in the EPS (Standard Price List).

4

Adjustment type for pressure sequence valves

1 = Rotary knob
2 = Hexagon with protective cap
3 = Lockable rotary knob with scale
(H-key to automotive industry standard)
4 = Rotary knob with scale not lockable

For seal kits see page 62

⚠ **Attention !**
Control cover types LFA..DZ...are combined with 2-way cartridge valves type LC..DB...
(for ordering details see page 5)

Directional spool valve (porting pattern to DIN 24 340 form A6)

Directional spool valve Type	NS	Catalogue sheet RE No.	Control cover Type
4WE 6 D../..	6	23 178	DZWA, DZWB

5

Series
7X = Series 70 to 79
(unchanged installation and connection dimensions)

7

Pilot oil supply
No code =
X =
Y =
XY =
Ordering details to symbol (see pages 63 and 65)

The orifices built into the control cover are threaded type orifices. These are standard orifices. **No** type coded is entered in the ordering code.

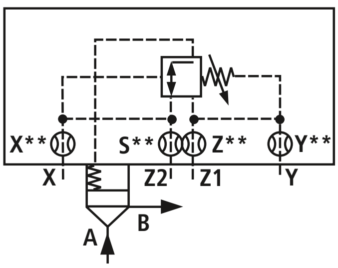
Orifice as shown within the main symbol

⚠ **Attention !** Pilot valves (electrical directional spool valves type 4WE 6 D...) must be ordered separately, for further details see catalogue sheet RE 23 178.
Valve fixing screws M5 x 50 DIN 912-10.9, M_A = 8.9 Nm are included within the control cover scope of supply.

Overview of symbols (basic symbols), pressure sequencing functions

Valid symbols are shown in the following type descriptions !

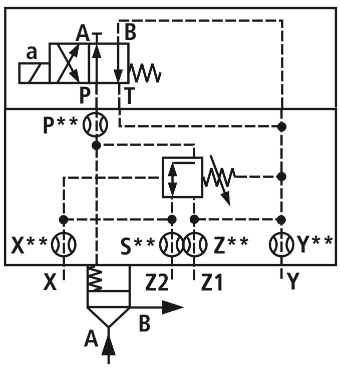
Control cover with manual pressure adjustment



LFA..DZ.-../ 210 315 350

Control cover with manual pressure adjustment and pressure dependent or pressure independent sequencing functions

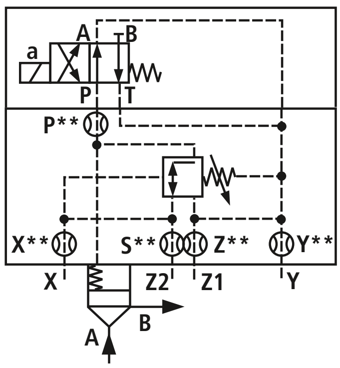
4 WE 6 D ../...



Solenoid de-energised: Sequencing function

LFA..DZWA.-../ 210 315 350

4 WE 6 D ../...



Solenoid energised: Sequencing function

LFA..DZWB.-../ 210 315 350

Control cover for pressure sequencing functions

Technical data (for applications outside these parameters, please consult us!)

Pressure fluid [1] Suitable for NBR **and** FKM seals [2] **Only** suitable for FKM seals		Mineral oil (HL, HLP) to DIN 51 524 [1]; Fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90 221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic ester) [2]; Other pressure fluids on request
Pressure fluid temperature range	°C	– 30 to + 80 for NBR seals
		– 20 to + 80 for FKM seals
Viscosity range	mm^2/s	2.8 to 380
Cleanliness class to ISO code		Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 20/18/15 [3]

[3] The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filteration prevents faults from occurring and at the same time increases the component service life.
For the selection of filters see catalogue sheets RE 50 070, RE 50 076 and RE 50 081.

Control cover

Max. perm operating pressure im Anschluss ...		Control cover type LFA..DZ.-../...	LFA..DZW.-../... /.... /...X	LFA..DZW.-../... /...Y /...XY
...X; ...Z2		315 bar		
...Y	When regulating the pressure	Zero pressure (up to ≈ 2 bar)		
	Static	315 bar	210 bar (=) [1] 160 bar (~) [1]	
...Z1	When regulating the pressure	Zero pressure (up to ≈ 2 bar)		
	Static	315 bar	210 bar (=) [1] 160 bar (~) [1]	315 bar
Settable sequencing pressure		210 315 350		

[1]) Max. perm. value 4WE 6 D

R-rings dimensions for ports X, Y, Z1, Z2 (are included within the scope of supply)

NS	Dimensions in mm	Material No. NBR	Material No. FKM
16	8.41 x 1.40 x 1.78	R900025407	R900025408
25	9.81 x 1.50 x 1.78	R900017453	R900017610
32	11.18 x 1.60 x 1.78	R900017455	R900017611
40, 50	13.00 x 2.30 x 2.62	R900017457	R900017617

Seal kits for cartridge valves and control covers

Seal kits for cartridge valves
Type LC.. DB../... (NS 16 ... 50)

Seal kit for	Material No.	
	NBR	FKM
LC 16 DB..7X/..	R900313104	R900313107
LC 25 DB..7X/..	R900313105	R900313108
LC 32 DB..7X/..	R900313106	R900313109
LC 40 DB..7X/..	R900873022	R900873025
LC 50 DB..7X/..	R900873023	R900873026

Seal kits for control cover
Type LFA.. /... (NS 16 ... 50)

Seal kit for LFA…	Material No.									
	16		25		32		40		50	
	NBR	FKM	NBR	FKM	NBR	FKM	NBR	FKM	NBR	FKM
...DZ... ...DZW...	R900860006		R900311540		R900311541		R900309378		R900312089	

Fixing screws (are included within the scope of supply)

S.H.C.S. to DIN 912-10.9

NS	Qty.	Dimensions	Tightening torque in Nm
16	4	M 8 x 115	32
25	4	M 12 x 120	110
32	4	M 16 x 120	270
40	4	M 20 x 70	520
50	4	M 20 x 80	520

Orifice thread size

all built-in orifices: M6 tapered

Control cover for pressure sequencing functions

NS 16 to 50

1	2	3	4	5	6	7	8
LFA		DZ	–	7X	/		

Nominal size 16	= **16**
Nominal size 25	= **25**
Nominal size 32	= **32**
Nominal size 40	= **40**
Nominal size 50	= **50**

Adjustment type

Rotary knob	= **1**
Hexagon with protective cap	= **2**
Lockable rotary knob with scale (H-key to automotive industry standards)	= **3**
Rotary knob with scale **not** lockable	= **4**

Series 7X (NS 16 to 50) = **7X**

Pressure stages (max. settable sequencing pressure)

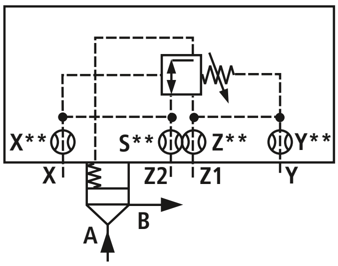
210 bar	= **210**
315 bar	= **315**
350 bar	= **350**

No code = NBR seals
V = FKM seals
(other seals on request)

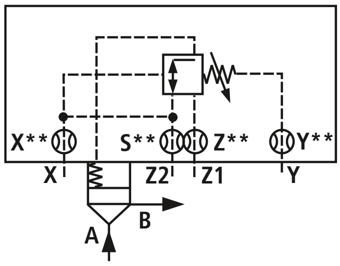
⚠ Attention!
The compatibility of the seals and pressure fluid has to be taken into account!

Pilot oil supply

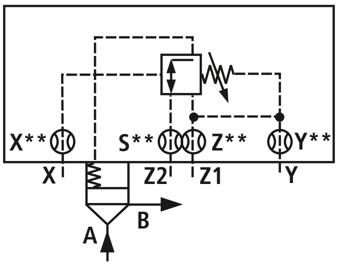
		Pilot oil supply	Pilot oil drain
No code	=	Internal	Internal
X	=	External	Internal
Y	=	Internal	External
XY	=	External	External



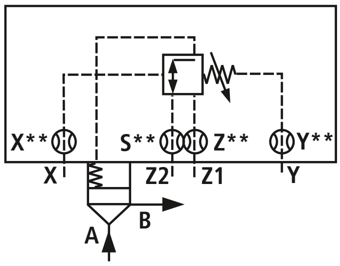
LFA..DZ.-../ 210 / 315 / 350



LFA..DZ.-../ 210 / 315 Y / 350



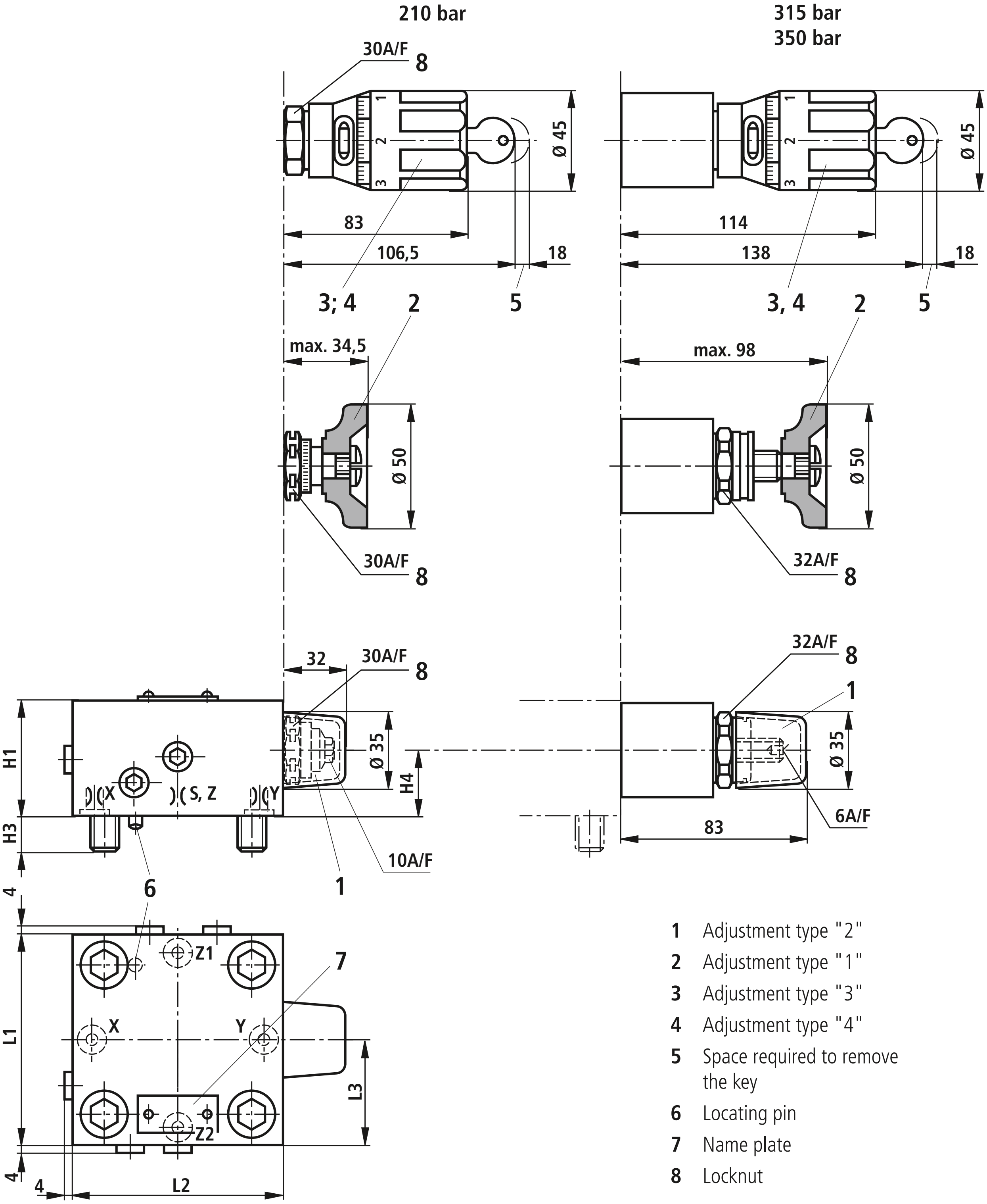
LFA..DZ.-../ 210 / 315 X / 350



LFA..DZ.-../ 210 / 315 XY / 350

Control cover for pressure sequencing functions

NS 16 bis 50



1 Adjustment type "2"
2 Adjustment type "1"
3 Adjustment type "3"
4 Adjustment type "4"
5 Space required to remove the key
6 Locating pin
7 Name plate
8 Locknut

NS	S**1)	X**1)	Y**1)	Z**1)	H1	H3	H4	L1	L2	L3
16	0.8	0.8	1.0	1.0	40	16	20	65	105	39.5
25	0.8	0.8	1.0	1.0	40	24	20	85	110	53
32	1.0	1.0	1.2	1.2	50	28	25	100	115	60.5
40	1.0	1.0	1.2	1.2	60	32	36	125	125	62.5
50	1.0	1.0	1.2	1.2	68	34	36	140	140	70

** Orifice Ø
1) All orifices M6 tapered

Control cover for pressure dependent and independent sequencing functions

NS 16 to 50

1	2	3	4	5	6	7	8
LFA				– 7X /			

Nominal size 16	= **16**
Nominal size 25	= **25**
Nominal size 32	= **32**
Nominal size 40	= **40**
Nominal size 50	= **50**

Solenoid de-energised: Pressure sequence function Solenoid energised: Open	= **DZWA**
Solenoid de-energised: Open solenoid energised: Pressure sequence function	= **DZWB**

Adjustment type

Rotary knob	= **1**
Hexagon with protective cap	= **2**
Lockable rotary knob with scale (H-key to automotive industry standards)	= **3**
Rotary knob with scale **not** lockable	= **4**

Series 7X (NS 16 to 50) = **7X**

Pressure stages (max. settable sequencing pressure)

210 =	210 bar
315 =	315 bar
350 =	350 bar

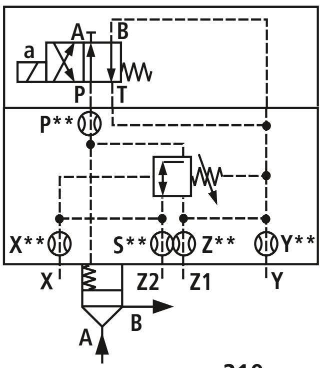
Pilot oil supply

		Pilot oil supply	Pilot oil drain
No code	=	Internal	Internal
X	=	External	Internal
Y	=	Internal	External
XY	=	External	External

No code =	NBR seals
V =	FKM seals
	(other seals on request)

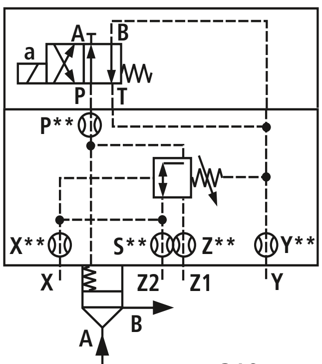
⚠ **Attention!**
The compatibility of the seals and pressure fluid has to be taken into account!

4 WE 6 D ../..



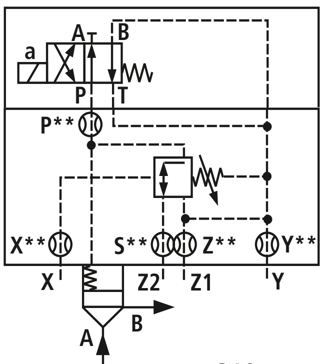
210
LFA..DZWA.-../ 315
350

4 WE 6 D ../..



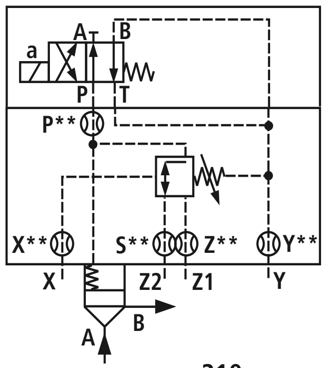
210
LFA..DZWA.-../ 315 Y
350

4 WE 6 D ../..



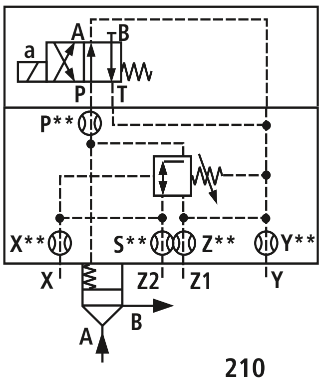
210
LFA..DZWA.-../ 315 X
350

4 WE 6 D ../..



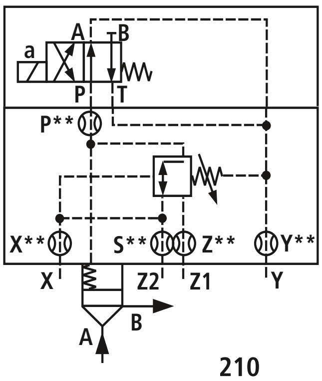
210
LFA..DZWA.-../ 315 XY
350

4 WE 6 D ../..



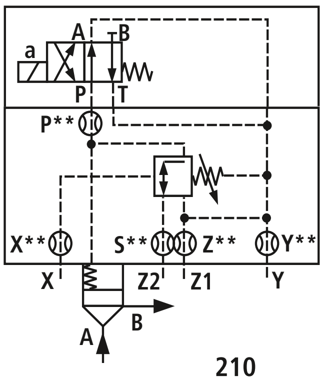
210
LFA..DZWB.-../ 315
350

4 WE 6 D ../..



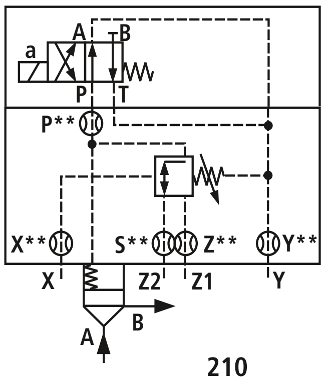
210
LFA..DZWB.-../ 315 Y
350

4 WE 6 D ../..



210
LFA..DZWB.-../ 315 X
350

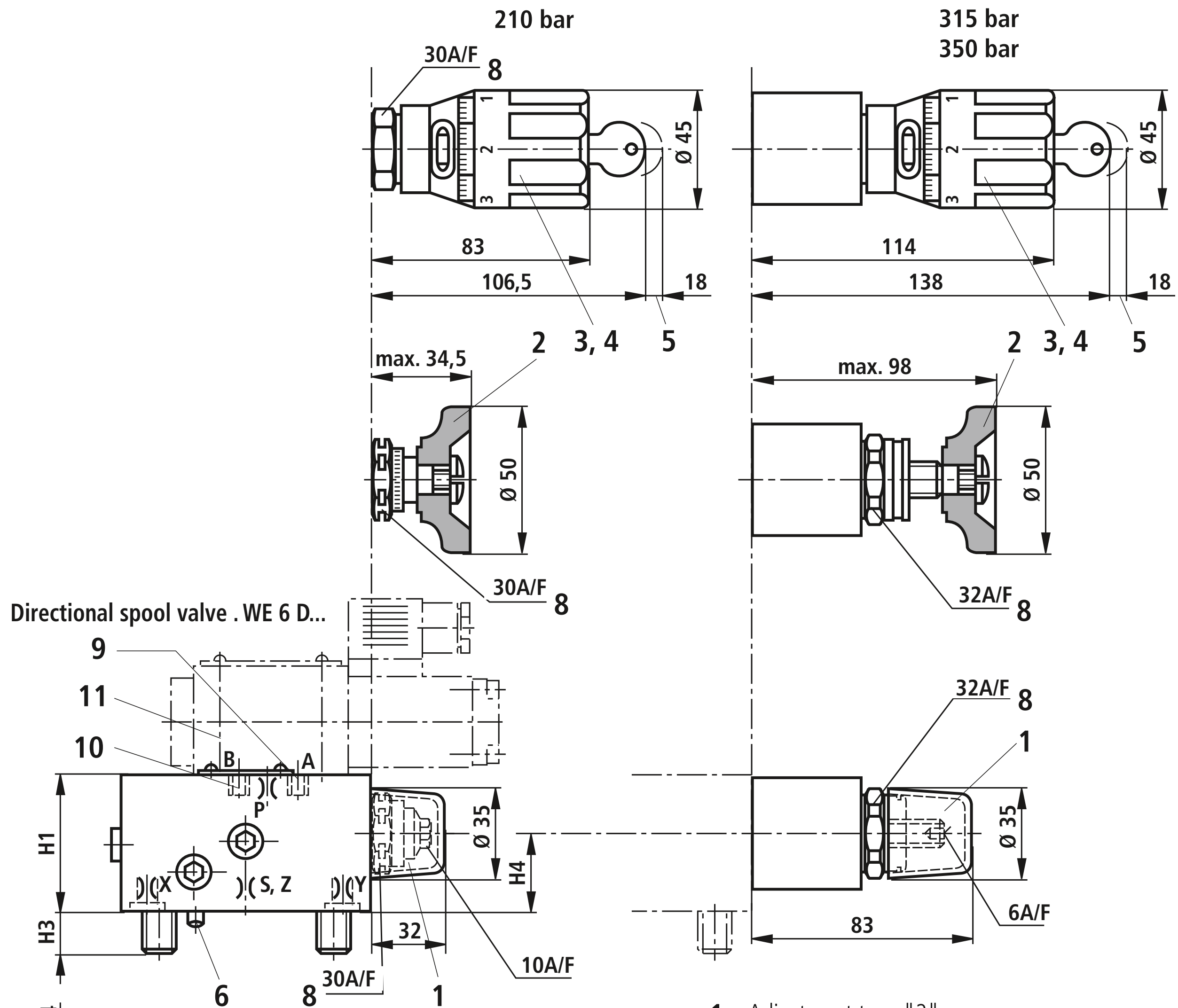
4 WE 6 D ../..

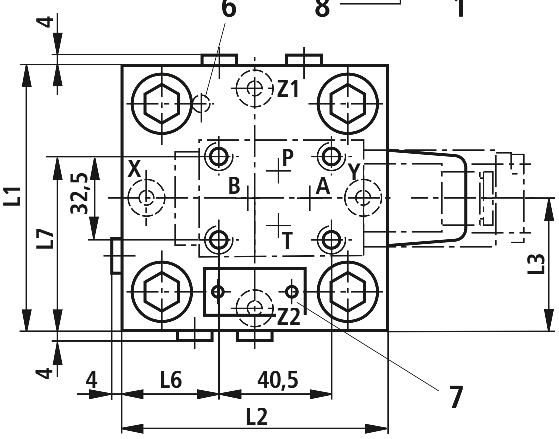


210
LFA..DZWB.-../ 315 XY
350

Control cover for pressure dependent and indpendent sequencing functions

NS 16 to 50





1 Adjustment type "2"
2 Adjustment type "1"
3 Adjustment type "3"
4 Adjustment type "4"
5 Space required to remove the key
6 Locating pin
7 Name plate
8 Locknut
9 Plug M6 tapered for DZWA..
10 Plug M6 tapered for DZWB..
11 Valve fixing screws are included within the control cover scope of supply

NS	S**1)	X**1)	Y**1)	Z**1)	P**1)	H1	H3	H4	L1	L2	L3	L6	L7
16	0.8	0.8	1.0	1.0	1.0	40	16	20	65	105	39.5	16	49
25	0.8	0.8	1.0	1.0	1.0	40	24	20	85	110	53	21	59
32	1.0	1.0	1.2	1.2	1.2	50	28	25	100	115	60.5	26.5	66.5
40	1.0	1.0	1.2	1.2	1.2	60	32	36	125	125	62.5	55	76.5
50	1.0	1.0	1.2	1.2	1.2	68	34	36	140	140	70	70	84

** Orifice Ø
1) All orifices 6 tapered

Notes

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