

# Industrial hydraulic control valves

QUALITY - PERFORMANCE - EFFICIENCY

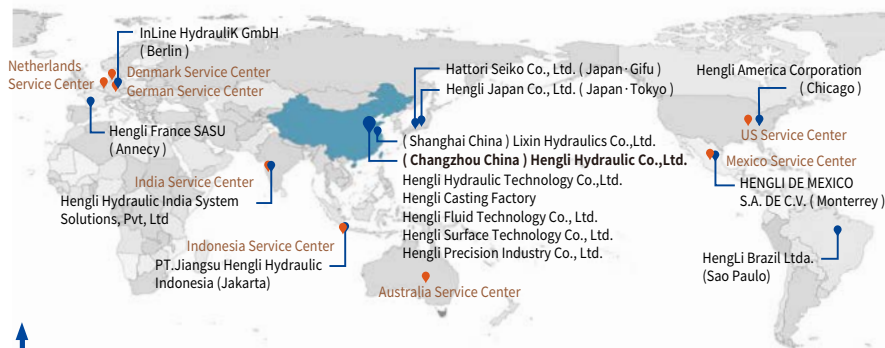
Product Catalog





## Company Profile

Through 30 years of continuous dedication and innovation, Hengli has developed from a hydraulic cylinder manufacturer to a leading comprehensive enterprise integrating hydraulic components, electronic control components, precision castings, pneumatic components and hydraulic system solutions. Today Hengli is the benchmark hydraulic solution provider, serving over 2000 top customers worldwide.



### 2023

Set up Hengli Brazil (Sao Paulo) branch.

### 2022

PT.Jiangsu Hengli Hydraulic was incorporated in Indonesia. Changzhou Hengli Surface Technology Co., LTD was established. Established Jiangsu Hengli Precision Industry Co., LTD.

### 2021

Hengli Mexican facility was incorporated in Monterrey.

### 2018

Hengli has acquired the Japanese hydraulic parts manufacturer-Hattori Seiko Co., Ltd.

### 2017

Hengli US factory (located in Chicago) built and put into operation.

### 2015

Started the strategic cooperation with HAWE, and financed InLine Hydraulik GmbH.

Hengli Hydraulic Cylinder Co.,td established and started mass production of excavator cylinders and tailor-made cylinders .

Subsidiaries in American and Japan established. Acquired Shanghai Lixin Hydraulics Co.,Ltd. Hengli casting factory established and started production of precise hydraulic castings.

Developed multi-way valve and plunger variable pump for 8T excavators. High-precision seamless cold-drawn tubefactory established.

### 2005

Wuxi Hengli Hydro pneumatic Co.,Ltd was founded and produced cylinders and pneumatic valves.

### 2012

Hengli cylinders production base in Wujin industrial zone was established.Hengli was successfully listed on Shanghai Stock Exchange.

### 2014

Jiangsu Hengli Hydraulic Technology Co., Ltd. established (Hydraulic component factory).

### 1990

### 2011

### 2013



#### Hengli Hydraulic Co.,Ltd.

- It is the world's leading cylinder production base.
- Total Investment: 230million USD.
- Building area: 290,000 square meters.
- Annual Capacity: 950K pcs excavator cylinders, 200K pcs customized cylinders, and 3K pcs ceramic coating rods.



#### Hengli Hydraulic Technology Co.,Ltd.

- Total Investment: 300 million USD.
- Building area: 400,000 square meters.
- Annual Capacity: 600K pcs industrial directional valves, 200K pcs mobile machinery control valves, 600K pcs pilot control devices, 300K pcs piston pumps, 200K pcs piston motors, and various integrated hydraulic systems.



#### Hengli Casting Factory

- Total Investment: 260 million USD.
- Building area: 180,000 square meters.
- Annual Capacity: 75k tons of casting.

#### Hengli Cold-drawn workshop

- Building area: 20K square meters.
- Annual Capacity: 60K ton cold-drawn tubes.



#### Lixin Hydraulics Co.,Ltd.

- Started in 1967, Lixin is one of the earliest manufacturers for hydraulic elements and systems.
- Introduced Rexroth's technology in 1984 which enabled us to produce Rexroth's series pressure, flow and directional, and various hydraulic systems.



#### Hengli Pneumatic Technology Co.,Ltd.

- Established in 1990.
- Building area: 34,000 square meters.
- Annual Capacity: 300K pcs pneumatic actuation and control components, 250K pcs pneumatic control valves, 100K pcs processing and control pneumatic integration systems.



#### Hengli Surface Technology Co.,Ltd.

- Established in 2008.
- Professional thermal spray service company.
- Varieties of thermal spray process, having large coating booth and complex components coating capability.
- Sep. 2022 Hengli acquired Praxair Surface Technologies (Changzhou) Co., Ltd.



#### Hengli Precision Industry Co.,Ltd.

- Established in 2022.
- Building area: 130,000 square meters.
- Committed to professional research and development, design, production and sales of electric cylinder, ball screw, linear guide.



#### InLine Hydraulik GmbH

- Founded in 1973, produce high performance axial piston pumps.
- Located in Berlin, Germany.
- Building area: 8,500 square meters.
- Nov. 2015 Hengli a global strategic partnership agreement with HAWE and acquired InLine Hydraulik company.



#### Hengli America Corporation

- Established in 2012, in Chicago, speed up the development of the North America Market.
- Building area: 4,300 square meters.



#### Hattori Seiko Co., Ltd.

- Started in 1947, in Japan.
- Building area: 13,500 square meters.
- In 2018, Hengli has acquired the Japanese hydraulic parts manufacturer-Hattori Seiko Co., Ltd.



#### HENGLI DE MEXICO S.A. DE C.V.

- Established in 2021, in Monterrey.
- Building area: 141,000 square meters.
- It mainly produces hydraulic cylinder, pump, valve assembly and after-sales service for excavators and walking machinery.

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# Important Contents

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## 1. Important explain

The article is suitable for hydraulic valves and hydraulic valve groups, such as hydraulic products, is the correct selection, use, maintenance of hydraulic products, an important description, can be used as an important part of the operating instructions or maintenance manuals.

As this product information for our company 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 Hengli hydraulic product be guaranteed, reduces downtimes and maintenance costs and increases the service life of your hydraulic products.

The Operating Instructions must be read and understood and all its provisions observed by those responsible and by the operative personnel. 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!

## 2. Product scope of application and responsibility

### 2.1 Hengli product scope of application

Our company of hydraulic products fulfil all safety requirements applicable to fluid power systems and their components.

If the operation does not explicitly allow the use of other media, Hengli product may be used with mineral oil.

For scope of supply, refer to the specific operating instructions and related contracts, technical agreements, etc...

### 2.2 Responsibilities of the customer

- ⚠ If our Hengli 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 fluid from igniting and oil pipe from aging.
- ⚠ Mineral-oil-based fluid is hazardous damaging components 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 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. Applicable statutory regulations must be observed.
- ⚠ You must also comply with the relevant national laws and regulations (especially safety), especially for potentially explosive environments, as well as in the case of accumulators.
- ⚠ If the relevant operating instructions are documented then it can be taken that the value is less than 70 dB (A). When there are other noise sources in the vicinity, this value will become larger. At or above 85 dB(A), the plant operator must make suitable hearing protection available to the personnel.
- ⚠ Hengli hydraulic product is intended above all for installation in machines, systems and power units as a component for installation into another machine or system, system designers, manufacturers must fully consider the laws and regulations and industry standards of in accordance with the customer, to comply with applicable industry standards, laws and regulations.

### 2.3 Quality assurance

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

Unauthorised tampering shall render the warranty null and void.

Hengli's standard warranty applies to all products.

### 2.4 Copyright

This product information may only be reproduced – electronically or mechanically, in whole or in part – with the express written permission of Hengli Hydraulic. 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

Switch off the hydraulic system and serve a proper lock-out device.

Secure the danger area so that no one can enter it unknowingly or uncontrolled.

Notify the relevant specialist personnel immediately.

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.

- ⚠ 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

The meanings of the safety labelling on the our company 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. Important basic safety instructions

### 3.3 Correct cutting speed

#### 3.3.1 Technical data and ambient conditions

##### • Technical data:

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.

Operating temperature range 0°C ~ +80°C, recommends 55°C; viscosity ranges: 12mm<sup>2</sup>/s-800mm<sup>2</sup>/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.

Oil cleanliness NAS1638 class 9, 7 (such as proportional valve, servo valve 6 or more). Specific products with the corresponding operating instructions shall prevail.

##### • 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, Hengli 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 .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 IP55. 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.

The effectiveness of pressure fluid diminishes as it ages (undergoes chemical changes). The following factors accelerate the aging process: high temperatures, oxygen in the pressure fluid, air humidity, water, metallic catalysers, operating pressure and contaminants. The product-specific technical data, (pressure, flow, min flow, fitting-up gang etc. ), refer to the operating instructions, include sample. (Our company are tested with test class ISO VG 46 at 40°C , viscosity  $\eta$  = approx. 46 mm<sup>2</sup>/s) .

⚠ 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.

### 3. Important basic safety instructions

#### • Transport and storage

Corrosion, especially oxidation, can cause metal surfaces to lose the standard of surface finish required for the hydraulic system to function properly. 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. no condensation or leakage water can enter the system and long standstills are avoided.

The factory-applied corrosion protection is adequate provided that.

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

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. After storage time has exceeds 24 months, the corrosion protection must be checked and further conservation measures applied if necessary.

- ⚠ Always ensure hydraulic products are empty of pressure fluid for transportation.  
Hengli hydraulic products are delivered empty of pressure fluid.  
However, products may contain oil residues left over from the final inspection at our factory.
- ⚠ If a hydraulic system is to be brought into use again following a long standstill, it must first be flushed clean.

**3.3.2** Hengli hydraulic products may only be operated acceptable if they are in operational condition.

In the event of power supply and/or damage to the electrical equipment, switch off immediately and secure the main switch against disruption being switched on again without authorization.

Report and rectify all faults and damage indicated by the system or discovered by other means.

**3.3.3** The connections, operating conditions and performance data specified in the Operating Instructions must be observed and never changed.

**3.3.4** Hengli hydraulic products shall not be converted or otherwise modified without prior consultation with Hengli .

**3.3.5** The plant operator shall not modify the program code of programmable control systems.

**3.3.6** Dependencies and time factors shall not be modified without prior consultation.

**3.3.7** The safety devices fitted by our company 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.

**3.3.8** Safety components such as limit switches, valves and other control components shall not be rendered inoperative.

**3.3.9** 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.

**3.3.10** The specified maintenance tasks in the operating Instructions shall be carried out at the intervals stated in the operating Instructions.

**3.3.11** Uncontrolled access by persons unfamiliar with the system to the immediate operating zone of our company hydraulic products is prohibited (even if the product in question has been shut down).

**3.3.12** Hengli hydraulic products must never be assembled, operated or maintained by persons under the influence of alcohol, drugs medication or any controlled substance which affect one's ability to use in accordance with applicable safety and operational instructions.

## 3. Important basic safety instructions

### 3.4 Relevant personnel

#### 3.4.1 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 Maintenance personnel

Including inspection, maintenance, repair. The Operating Instructions must be read and understood and all its provisions observed by those responsible and by the operative personnel.

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

Repair personnel, 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 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 Training

The plant operator using our company 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 our company hydraulic product;
- Observation of the instructions of safety officers and the plant operator's operating manual.



# Installation, adjustment and maintenance for valves

## Contents

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| 3.1 General installation rules | 10 | 4.3 Filtration          | 11 |
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## Installation, adjustment and maintenance for valves

### 1 General

The rules of the documents as follows should be complied with before adjusting the hydraulic valves:

-Relevant Specification Book    -German standard DIN 24346    -ISO standard ISO 4413

### 2 System washing

The system must be washed multiple times and tested on-line continuously by automatic grain counter to reach the cleanliness requirement. During washing, the filter must be inspected and the filter core must be changed.

### 3 Installation

#### 3.1 General installation rules

**3.1.1** Please check the product type and read the manual carefully before installing valves.

**3.1.2** The cleanness of the mounting surface and sub-plate shall be confirmed to insure that they have no moisture or oil.

##### 3.1.2.1 Cleanness

The cleanness of the valve and its round shall be confirmed during installation. The tank must be airtight to prevent outside pollution. It must be confirmed that there is no dirt, iron rust, solid particles, chips ,etc in the pipes and tank before installation. Hot-bending or welded pipes must be acid-washed, cleaned and oil-applied and only non-woven fabrics or special paper can be used for cleaning.

**3.1.2.2** It is not permitted to use seal material such as rope made of hemp, oil putty or sealing strip.

**3.1.2.3** Weldless steel pipe shall be adopted according to the DIN 2391 Part 1 and 2.

**3.1.2.4** Finish machining of mounting surface is on the basis of  $Ra \leq 0.4$  and flatness  $\leq 0.01\text{mm}/100\text{mm}$ .

**3.1.2.5** Fixing screws must be complied with the specification and intensity , and must be tightened to the value ruled by the Specification Book.

**3.1.2.6** It is recommended to use a filter and air filter that has the same precision of the hydraulic system.

#### 3.2 Valve installation

**3.2.1** Confirm that there is no moisture and oil on the mounting surface and sub-plate when installing. If oil is unavoidable on these surfaces, tighten the screws by manual operation instead of power tool. If more than four of pieces screws should be tightened, tighten the middle screws first.

**3.2.2** The installation position of the valve usually is optional. However, it is better to installed horizontally for directional valves (spool is horizontal); for check valves without spring it is better to install by vertically (poppet can be closed backward with its dead weight) ; for pressure switch with drain port, the pressure in the drain port must be kept and not exceed 2 bar.

#### 3.3 Electric connection

For the electric circuit example and pins arrangement see the relevant Specification Book.

## Installation, adjustment and maintenance for valves

### 4 Adjustment

#### 4.1 Hydraulic oil

The rules for Hydraulic oil, pressure and temperature range must be complied with. The recommended max. temperature should not be exceeded. In order to keep consistent responses, the temperature of the hydraulic oil should be kept constant ( $\pm 5^{\circ}\text{C}$ ).

#### 4.2 Seal material

According to the oil sorts and condition of max. and min. temperature, the seals NBR or FKM can be used as alternative.

#### 4.3 Filtration

The max. permissible contamination degree ruled by the Specification Book shall be complied with. It is not allowed that the pressure differential caused by filter exceeds the prescriptive max. value the filter with block alarm is recommended. The new filter must be kept clean. Contaminant entering system will reduce the core's service life.

#### 4.4 Gas release

Usually, it is not necessary to release gas from the hydraulic valve, however, the return line fulling of air but no oil shall be avoided (a backpressure valve is recommended).

### 5 Maintenance

Seals must be replaced as they will be worn out and age naturally.

### 6 Storage

The valves must be stored in place that is dry, dust-free, non-corrosion and non-steam. If the storage period exceeds 6 months, valves should be filled with rust-proof oil and sealed.

### 7 Final disposal

When the hydraulic valve is scrapped after its service life is over, it must be disassembled first, and the remaining oil must be collected and disposed of properly. It must not pollute water and soil. Rubber and plastic parts should be treated as solid waste and should not be discarded at will to damage the environment.

#### Notes:

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# Check valves Shuttle valves

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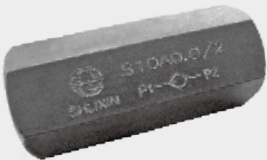


1.1

# Check valve

## Type S

Sizes 6 to 40  
Up to 315 bar  
Up to 600 L/min



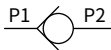
### Contents

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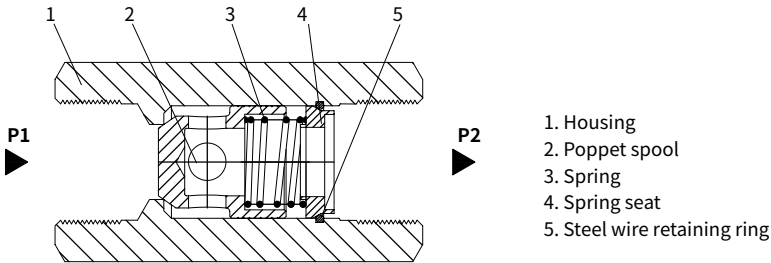
### Features

- Poppet valve seat
- Threaded connection and sub-plate mounting
- Various cracking pressures, optional

### Symbol



## Function and configuration



Check valve type S is used to allow fluid flowing in one direction and leakage-free closure in the opposite direction. When fluid flow via port P1, fluid pushes poppet (2) to move overcoming the spring(3), and connects chamber P1 and P2. When fluid flows from P2 to P1, poppet (2) moves left and the check valve closes.

For check valves without a spring, the fixed position should ensure that the poppet will remain at the closed position.

## Ordering code

S

/

\*

Check valve

| Nominal sizes | Threaded connection | Sub-plate mounting |
|---------------|---------------------|--------------------|
| 6             | =6                  |                    |
| 8             | =8                  |                    |
| 10            | =10                 | =10                |
| 15            | =15                 |                    |
| 20            | =20                 | =20                |
| 25            | =25                 |                    |
| 30            | =30                 | =30                |
| 40            | =40                 |                    |

For threaded connection = A  
For sub-plate mounting = P

Further details in clear text

Only for sub-plate mounting

No code = NBR seals  
V = FKM seals

Only for threaded connection

No code= G thread  
2= Metric thread

·0 = Threaded connection revision index

-L2X = Sub-plate mounting series L20 to L29  
(L20 to L29: unchanged installation and connection dimensions)

0 = Without spring (Not for size 40 )

1 = Crack pressure 0.5 bar

2 = Crack pressure 1.5bar

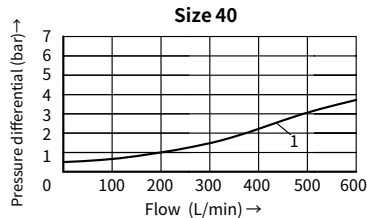
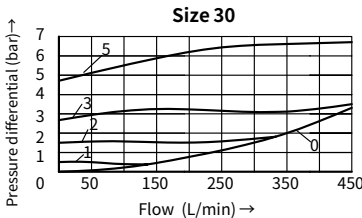
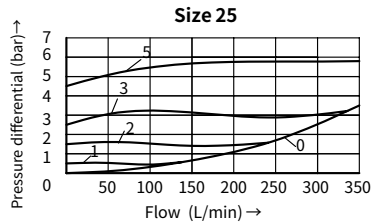
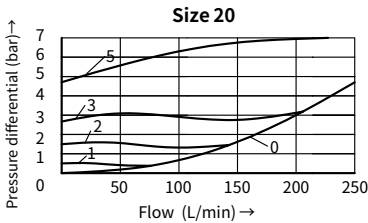
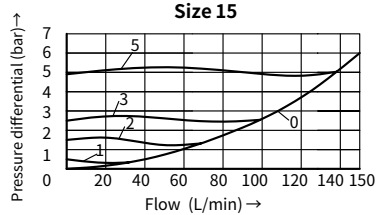
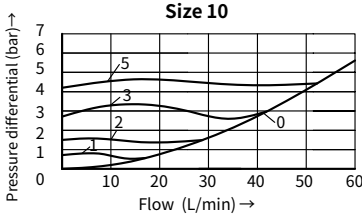
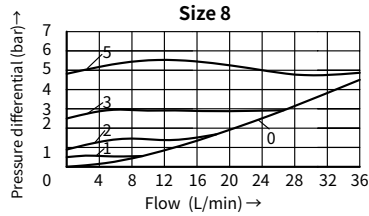
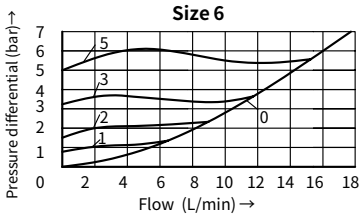
3 = Crack pressure 3bar

5 = Crack pressure 5bar

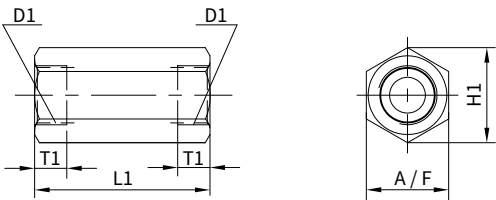
Technical data

|                         |                    |                                                                                              |    |    |     |     |     |     |     |
|-------------------------|--------------------|----------------------------------------------------------------------------------------------|----|----|-----|-----|-----|-----|-----|
| Size                    |                    | 6                                                                                            | 8  | 10 | 15  | 20  | 25  | 30  | 40  |
| Max. flow-rate          | L/min              | 15                                                                                           | 30 | 40 | 120 | 200 | 300 | 400 | 600 |
| Max. operating pressure | bar                | 315                                                                                          |    |    |     |     |     |     |     |
| Crack pressure          | bar                | 0.5; 1.5; 3; 5                                                                               |    |    |     |     |     |     |     |
| Fluid                   |                    | Mineral oil ; Phosphate ester                                                                |    |    |     |     |     |     |     |
| Fluid temperature range | °C                 | -30 to +80                                                                                   |    |    |     |     |     |     |     |
| Viscosity range         | mm <sup>2</sup> /s | 2.8 to 500                                                                                   |    |    |     |     |     |     |     |
| Degree of contamination |                    | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |    |    |     |     |     |     |     |

Characteristic curves (Measured at  $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , using HLP46)

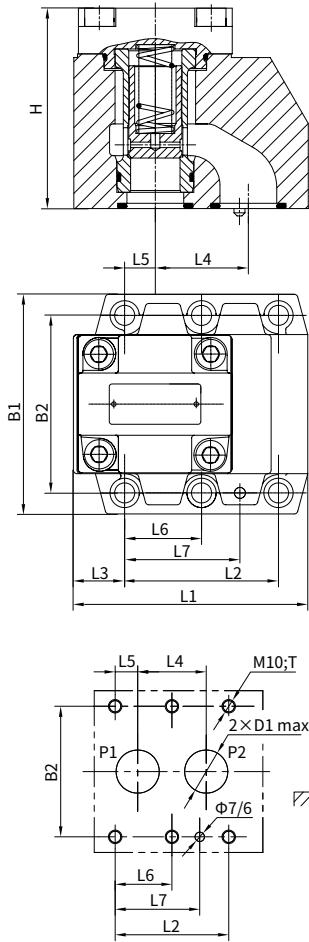


Unit dimensions of threaded connection



| Size       |               | 6       | 8       | 10      | 15    | 20    | 25     | 30     | 40    |
|------------|---------------|---------|---------|---------|-------|-------|--------|--------|-------|
| D1         | G thread      | G 1/4   | G 3/8   | G 1/2   | G 3/4 | G 1   | G1 1/4 | G1 1/2 | G 2   |
|            | Metric thread | M14×1.5 | M18×1.5 | M22×1.5 | M27×2 | M33×2 | M42×2  | M48×2  | M60×2 |
| H1         |               | 22      | 28      | 34.5    | 41.5  | 53    | 69     | 75     | 92    |
| L1         |               | 58      | 58      | 72      | 85    | 98    | 120    | 132    | 165   |
| T1         |               | 12      | 12      | 14      | 16    | 18    | 20     | 22     | 28    |
| A/F        |               | 19      | 24      | 30      | 36    | 46    | 60     | 65     | 80    |
| Weight(kg) |               | 0.1     | 0.2     | 0.3     | 0.5   | 1     | 2      | 2.5    | 4.4   |

Unit dimensions of sub-plate mounting



It must be ordered separately,  
if connection plate is needed.

Type:

Size 10:

G460/01A (G3/8)      G460/02(M18×1.5)  
G461/01A (G1/2)      G461/02(M22×1.5)

Size 20:

G412/01(G3/4)      G412/02(M27×2)  
G413/01(G1)      G413/02(M33×2)

Size 30:

G414/01(G1 1/4)      G414/02(M42×2)  
G415/01(G1 1/2)      G415/02(M48×2)

Valve fixing screws:

Size 10: 4-M10×40      GB/T 70.1-10.9  
Size 20: 4-M10×50      GB/T 70.1-10.9  
Size 30: 6-M10×60      GB/T 70.1-10.9

| Size | B1  | B2   | L1  | L2   | L3 | L4   | L5   | L6   | L7   | H   | D1  | T  | O-ring     | Weight(Kg) |
|------|-----|------|-----|------|----|------|------|------|------|-----|-----|----|------------|------------|
| 10   | 85  | 66.7 | 78  | 42.9 | 18 | 28.6 | 7.2  | -    | 31.8 | 71  | Φ13 | 23 | 17.12×2.62 | 2          |
| 20   | 102 | 79.4 | 101 | 60.3 | 23 | 38.1 | 11.1 | -    | 44.5 | 108 | Φ22 | 24 | 28.17×3.53 | 4.3        |
| 30   | 120 | 96.8 | 128 | 84.2 | 28 | 50.8 | 16.7 | 42.1 | 62.7 | 110 | Φ30 | 25 | 34.52×3.53 | 7.7        |

|                                   |                                    |
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1.2

# Check valve (large size)

## Type S...L1X

Sizes 52 to 150  
Up to 315bar  
Up to 15000 L/min



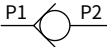
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| Characteristic curves                | 03    |
| Unit dimensions:                     | 04-05 |
| · sub-plate mounting                 | 04    |
| · flange connection sizes 52 to 102  | 05    |
| · flange connection sizes 125 to 150 | 05    |

### Features

- Sub-plate mounting (Size 52)
- Flange connection (Sizes 52 to 150)
- Leakage-free closure in one direction
- Various cracking pressures, optional (see Ordering code)

### Symbol



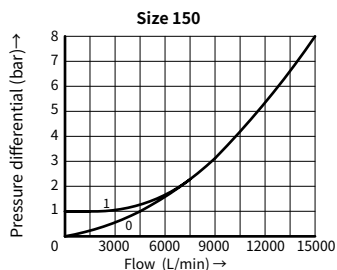
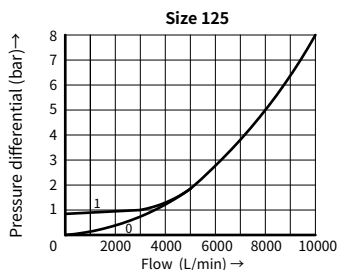
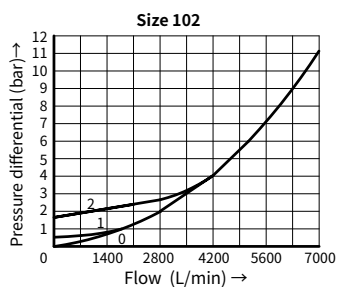
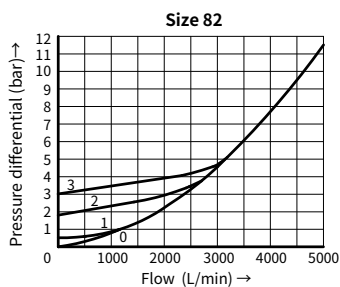
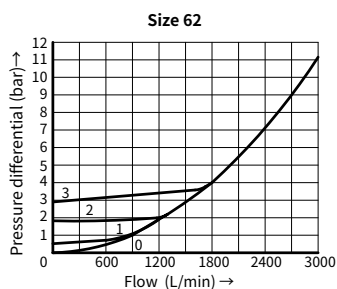
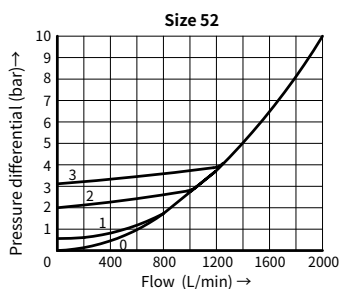


## Technical data

|                         |                    |                                                                                              |    |    |     |     |     |
|-------------------------|--------------------|----------------------------------------------------------------------------------------------|----|----|-----|-----|-----|
| Max. operating pressure | bar                | 315                                                                                          |    |    |     |     |     |
| Crack pressure          | bar                | Refer to the characteristic curve                                                            |    |    |     |     |     |
| Max. flow -rate         | L/min              | Refer to the characteristic curve                                                            |    |    |     |     |     |
| Viscosity range         | mm <sup>2</sup> /s | 2.8 to 500                                                                                   |    |    |     |     |     |
| Fluid temperature range | °C                 | -30 to +80 (NBR seal)<br>-20 to +80 (FKM seal)                                               |    |    |     |     |     |
| Fluid                   |                    | Mineral oil suit for NBR and FKM seal<br>Phosphate ester for FKM seal                        |    |    |     |     |     |
| Degree of contamination |                    | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |    |    |     |     |     |
| Size                    |                    | 52                                                                                           | 62 | 82 | 102 | 125 | 150 |

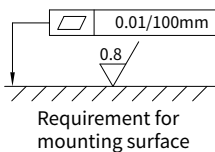
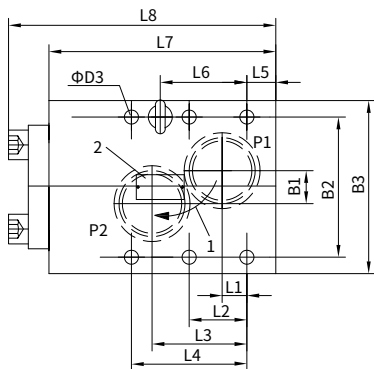
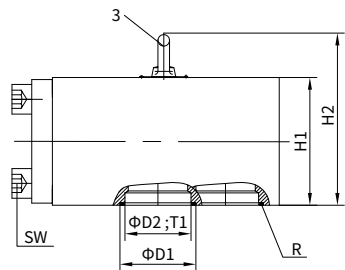
## Characteristic curves (Measured at $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , using HLP46)

Pressure differential  $\Delta P$  in relation to the flow  $Q$  at the cracking pressure.

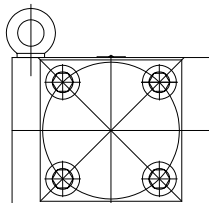


Unit dimensions: sub-plate mounting

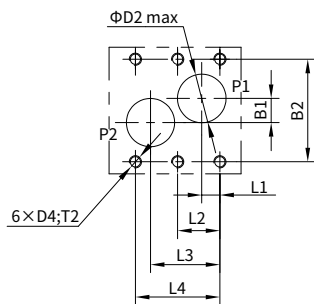
(Dimensions in mm)



Requirement for  
mounting surface



- 1 Free flow in direction of arrow
- 2 Name plate
- 3 Eyebolt for transport
  - 1 pcs with sizes 52

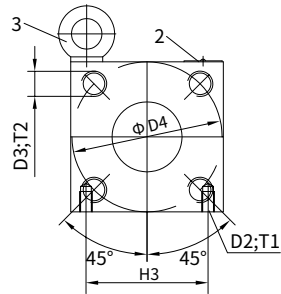
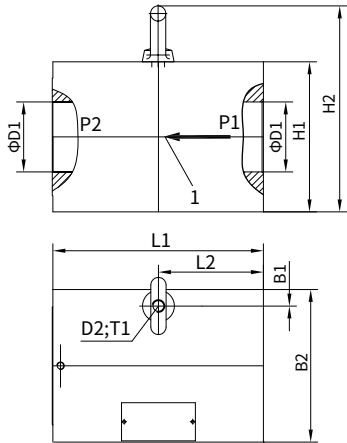


| Size | O-ring | D4, T2 | Valve fixing screws | M <sub>A</sub> (Tighting torque) |
|------|--------|--------|---------------------|----------------------------------|
| 52   | 54×3   | M16,32 | GB/T70.1-M16×130    | 310Nm                            |

| Size | B1 | B2  | B3  | ΦD1 | ΦD2 | ΦD3 | H1  | H2  | L1 | L2 | L3 | L4  | L5 | L6 | L7  | L8  | T1  | A/F | Weight (kg) |
|------|----|-----|-----|-----|-----|-----|-----|-----|----|----|----|-----|----|----|-----|-----|-----|-----|-------------|
| 52   | 40 | 115 | 145 | 60  | 50  | 18  | 105 | 141 | 25 | 50 | 77 | 100 | 12 | 75 | 172 | 207 | 2.3 | 14  | 20          |

Unit dimensions: flange connection sizes 52 to 102

(Dimensions in mm)

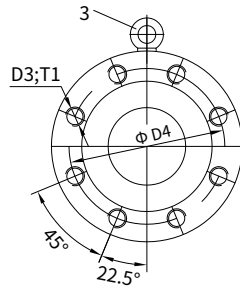
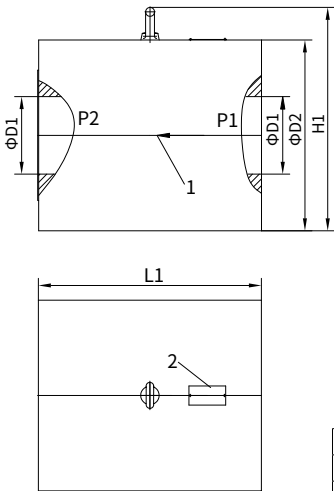


- 1 Free flow in direction of arrow
- 2 Name plate
- 3 Eyebolt for transport

| Size | B1 | B2  | ΦD1 | D2  | D3  | ΦD4 | H1  | H2  | L1    | L2    | T1 | T2 | H3  | Weight(kg) |
|------|----|-----|-----|-----|-----|-----|-----|-----|-------|-------|----|----|-----|------------|
| 52   | 10 | 100 | 45  | M10 | M16 | 98  | 98  | 134 | 135.5 | 67.5  | 15 | 26 | 80  | 10         |
| 62   | 10 | 120 | 55  | M10 | M20 | 118 | 118 | 154 | 165.5 | 82.5  | 15 | 32 | 100 | 15         |
| 82   | 15 | 150 | 72  | M12 | M24 | 145 | 148 | 184 | 195.5 | 97.5  | 20 | 36 | 120 | 34         |
| 102  | 15 | 180 | 90  | M12 | M30 | 175 | 178 | 214 | 245.5 | 122.5 | 20 | 40 | 150 | 62         |

Unit dimensions: flange connection sizes 125 to 150

(Dimensions in mm)



- 1 Free flow in direction of arrow
- 2 Name plate
- 3 Eyebolt for transport

| Size | ΦD1 | ΦD2 | D3  | ØD4 | H1  | L1    | T1 | Weight (kg) |
|------|-----|-----|-----|-----|-----|-------|----|-------------|
| 125  | 122 | 300 | M30 | 245 | 353 | 350.5 | 50 | 190         |
| 150  | 150 | 360 | M36 | 290 | 431 | 501   | 60 | 370         |

|                                   |                                    |
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1.3

# Check valve cartridge

## Type M-SR...L1X

Sizes 6 to 30  
Up to 315 bar  
Up to 400 L/min



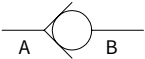
### Contents

|                                    |    |
|------------------------------------|----|
| Configuration                      | 02 |
| Ordering code                      | 02 |
| Technical data                     | 03 |
| Right angled check valve cartridge | 03 |
| Right angled check valve cartridge | 04 |

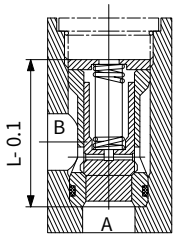
### Features

- Installation in manifold blocks
- Leakage-free closure in one direction
- Various cracking pressures, optional (see ordering code)

### Symbol



Configuration



Right angled  
check valve cartridge

Note: The supply scope is within the L size range, and the plug screw is not included in the supply scope.

| Size | L    |
|------|------|
| 8    | 36.3 |
| 10   | 39.3 |
| 15   | 45.8 |
| 20   | 55.3 |
| 25   | 74.3 |
| 30   | 83.3 |

Ordering code

M-SR

-

L1X

/

\*

Check valve cartridge

size 8 = 8

size 10 =10

size 15 =15

size 20 =20

size 25 =25

size 30 =30

Right angled check valve cartridge =KE

As for the check valve without spring, the fixing position should ensure that the poppet can locate itself closed under its gravity.

Further details in clear text

No code = NBR seals

V = FKM seals

L1X = Series L10 to L19

(L10 to L19: unchanged installation and connection dimensions)

00= Without spring

02= Crack pressure 0.2bar

05= Crack pressure 0.5bar

15= Crack pressure 1.5bar

30= Crack pressure 3bar

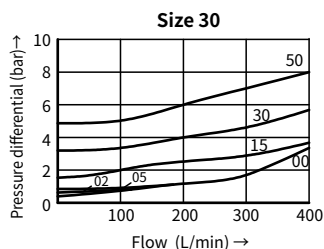
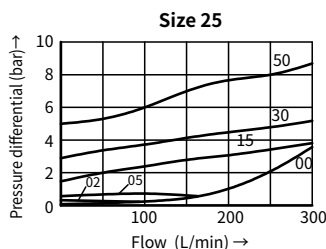
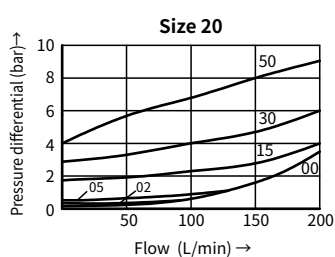
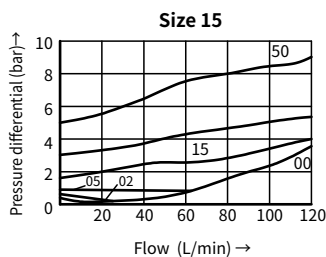
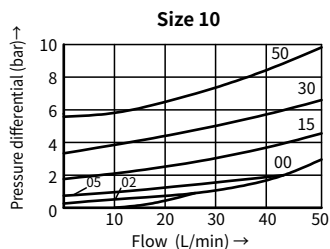
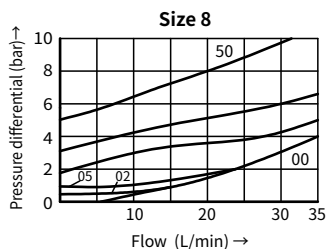
50= Crack pressure 5bar

## Technical data

|                         |                    |                                                                                              |      |      |      |      |      |
|-------------------------|--------------------|----------------------------------------------------------------------------------------------|------|------|------|------|------|
| Max. operating pressure | bar                | 315                                                                                          |      |      |      |      |      |
| Crack pressure          | bar                | Refer to the characteristic curve                                                            |      |      |      |      |      |
| Max. flow -rate         | L/min              | Refer to the characteristic curve                                                            |      |      |      |      |      |
| Viscosity range         | mm <sup>2</sup> /s | 2.8 to 380                                                                                   |      |      |      |      |      |
| Fluid temperature range | °C                 | -30 to +80 (NBR seal)                                                                        |      |      |      |      |      |
|                         |                    | -20 to +80 (FKM seal)                                                                        |      |      |      |      |      |
| Fluid                   |                    | Mineral oil suit for NBR and FKM seal                                                        |      |      |      |      |      |
|                         |                    | Phosphate ester for FKM seal                                                                 |      |      |      |      |      |
| Degree of contamination |                    | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |      |      |      |      |      |
| Size                    |                    | 8                                                                                            | 10   | 15   | 20   | 25   | 30   |
| Weight                  | Kg                 | 0.03                                                                                         | 0.05 | 0.08 | 0.14 | 0.32 | 0.47 |

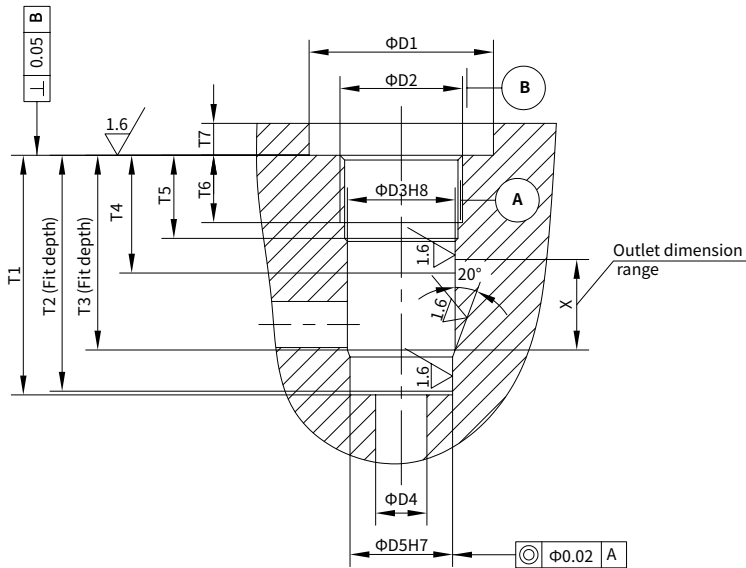
## Characteristic curves (Measured at $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , using HLP46)

Right angled check valve cartridge



Cavity dimensions: (Dimensions in mm)

Right angled check valve cartridge



| Size | Plug screw | Gasket | $\Phi D1$ | D2      | $\Phi D3H8$ | $\Phi D4$ | $\Phi D5H7$ | $T1+0.2/0$ | T2   | T3   | T4 | T5 | T6 | T7 | X  |
|------|------------|--------|-----------|---------|-------------|-----------|-------------|------------|------|------|----|----|----|----|----|
| 8    | M18×1.5    | JB982  | 27        | M18×1.5 | 14          | 8         | 13          | 47.5       | 46.5 | 37.5 | 23 | 17 | 14 | 7  | 18 |
| 10   | M22×1.5    |        | 32        | M22×1.5 | 18          | 10        | 17          | 52.5       | 51.5 | 42.5 | 25 | 19 | 16 | 7  | 19 |
| 15   | M27×2      |        | 37        | M27×2   | 24          | 15        | 22          | 61         | 60   | 49   | 28 | 22 | 18 | 8  | 24 |
| 20   | M33×2      |        | 44        | M33×2   | 30          | 20        | 28          | 72.5       | 71   | 57.5 | 28 | 24 | 20 | 8  | 30 |
| 25   | M42×2      |        | 55        | M42×2   | 38          | 25        | 36          | 93.5       | 91   | 75.5 | 32 | 27 | 22 | 9  | 43 |
| 30   | M48×2      |        | 62        | M48×2   | 44          | 30        | 42          | 104.5      | 102  | 84.5 | 38 | 30 | 24 | 9  | 48 |

Explanation:

The dimension in the list above t is in relation to the assuming JB1001 plug screw and JB982 combined gasket. If you choose the other plug screw and washer, then the dimension of T1, T2, T3, T4, T5, T6 should be calculated again according to the valve's total length L, plug screw and seal ring dimensions.

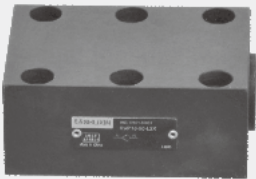


1.4

# Check valve

## Type RVP...L2X

Sizes 6 to 40  
Up to 350bar  
Up to 600 L/min



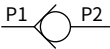
### Contents

|                                         |    |
|-----------------------------------------|----|
| Function and configuration              | 02 |
| Ordering code                           | 02 |
| Characteristic curves                   | 03 |
| Technical data                          | 03 |
| Dimensions of appearance and connection | 04 |

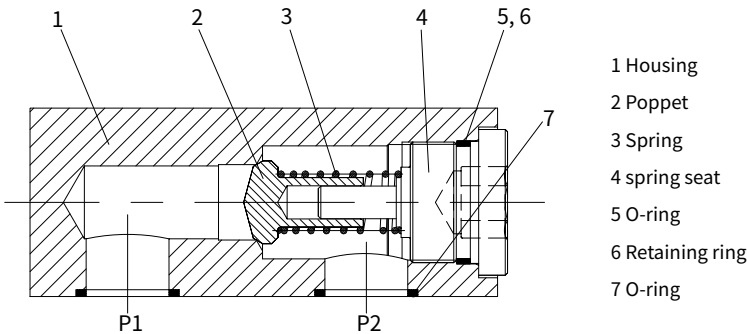
### Features

- Taper seat
- Sub-plate mounting
- Various cracking pressures, optional (see ordering code)

### Symbol



Function and configuration

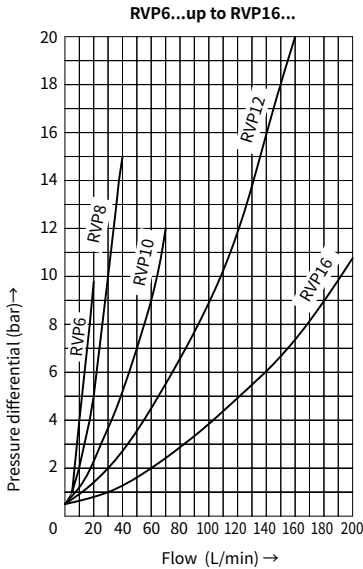


Check valve type RVP is used to allow fluid flowing in one direction and leakage-free closure in opposite direction. When fluid flows via port P1, fluid push poppet(2) to move right way overcoming the spring(3), then connects the chamber P1 and P2. When fluid flows P2 to P1, poppet(2) moves left way and then the check valve closes.

Ordering code

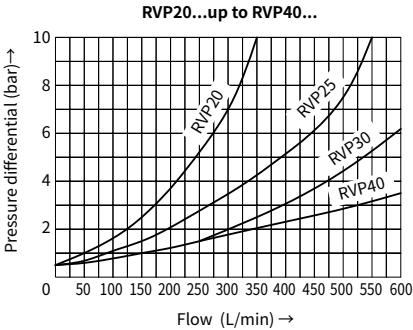
|                    |  |     |   |   |     |   |                                                                                               |
|--------------------|--|-----|---|---|-----|---|-----------------------------------------------------------------------------------------------|
| RV                 |  | P   | - | - | L2X | / | *                                                                                             |
| Check valve        |  |     |   |   |     |   | Further details in clear text                                                                 |
| Sup-plate mounting |  |     |   |   |     |   | No code = NBR seals<br>V = FKM seals                                                          |
| Nominal size 6     |  | = 6 |   |   |     |   | L2X = Series L20 to L29<br>(L20 to L29: unchanged installation and connection dimensions)     |
| Nominal size 8     |  | = 8 |   |   |     |   |                                                                                               |
| Nominal size 10    |  | =10 |   |   |     |   | 00 = Without spring (Size 40 has no this option )<br>(Suit for vertical, port P1 lies below ) |
| Nominal size 12    |  | =12 |   |   |     |   |                                                                                               |
| Nominal size 16    |  | =16 |   |   |     |   | 02 = Crack pressure 0.2bar                                                                    |
| Nominal size 20    |  | =20 |   |   |     |   |                                                                                               |
| Nominal size 25    |  | =25 |   |   |     |   | 05 = Crack pressure 0.5bar                                                                    |
| Nominal size 30    |  | =30 |   |   |     |   |                                                                                               |
| Nominal size 40    |  | =40 |   |   |     |   | 15 = Crack pressure 1.5bar                                                                    |
|                    |  |     |   |   |     |   |                                                                                               |
|                    |  |     |   |   |     |   | 30 = Crack pressure 3bar                                                                      |
|                    |  |     |   |   |     |   |                                                                                               |
|                    |  |     |   |   |     |   | 50 = Crack pressure 5bar                                                                      |
|                    |  |     |   |   |     |   |                                                                                               |

Characteristic curves (Measured at  $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , using HLP46)



Flow: P1 to P2

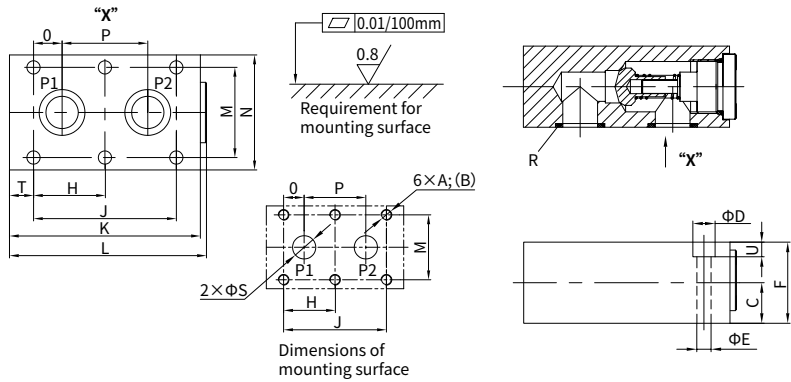
Pressure difference P dependent on flow Q Curve (Measured at  $v=38\text{mm}^2/\text{s}$   $t=43^{\circ}\text{C}$ ) (Crack pressure: 0.5bar)



Technical data

|                         |                        |                                                                                              |   |    |    |    |    |    |    |    |
|-------------------------|------------------------|----------------------------------------------------------------------------------------------|---|----|----|----|----|----|----|----|
| Nominal size            |                        | 6                                                                                            | 8 | 10 | 12 | 16 | 20 | 25 | 30 | 40 |
| Max. operating pressure | bar                    | To 350                                                                                       |   |    |    |    |    |    |    |    |
| Crack pressure          | bar                    | 0.2, 0.5, 1.5, 3, 5                                                                          |   |    |    |    |    |    |    |    |
| Viscosity range         | $\text{mm}^2/\text{s}$ | 2.8 to 500                                                                                   |   |    |    |    |    |    |    |    |
| Fluid temperature range | $^{\circ}\text{C}$     | -20 to +80                                                                                   |   |    |    |    |    |    |    |    |
| Fluid                   |                        | Mineral oil, Phosphat ester                                                                  |   |    |    |    |    |    |    |    |
| Degree of contamination |                        | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |   |    |    |    |    |    |    |    |

Dimensions of appearance and connection



| Size  | A;(B)    | C    | D  | E   | F   | H    | J     | K    | L    |
|-------|----------|------|----|-----|-----|------|-------|------|------|
| RVP6  | M6;(12)  | 8    | 11 | 6.6 | 16  | -    | 19    | 41.5 | 43   |
| RVP8  | M6;(12)  | 10   | 11 | 6.6 | 20  | -    | 35    | 63.5 | 66.8 |
| RVP10 | M6;(12)  | 12.5 | 11 | 6.6 | 25  | -    | 33.5  | 70   | 72   |
| RVP12 | M6;(12)  | 16   | 11 | 6.6 | 32  | -    | 38    | 80   | 84   |
| RVP16 | M8;(12)  | 22.5 | 14 | 9   | 45  | 38   | 76    | 104  | 107  |
| RVP20 | M8;(16)  | 25   | 14 | 9   | 50  | 47.5 | 95    | 127  | 131  |
| RVP25 | M10;(20) | 27.5 | 18 | 11  | 55  | 60   | 120   | 165  | 169  |
| RVP30 | M12;(24) | 37.5 | 20 | 14  | 75  | 71.5 | 143   | 186  | 190  |
| RVP40 | M12;(24) | 50   | 20 | 14  | 100 | 67   | 133.5 | 192  | 196  |

| Size  | M    | N    | O    | P    | S  | R(O-ring)  | T    | U  | Weight(kg) |
|-------|------|------|------|------|----|------------|------|----|------------|
| RVP6  | 28.5 | 41.5 | 1.6  | 16   | 5  | 7×1.5      | 6.4  | 7  | 0.2        |
| RVP8  | 33.5 | 46   | 4.5  | 25.5 | 7  | 12×2       | 14.3 | 7  | 0.4        |
| RVP10 | 38   | 51   | 4    | 25.5 | 10 | 12×2       | 17   | 8  | 0.5        |
| RVP12 | 44.5 | 57.5 | 4    | 30   | 12 | 15×2       | 21   | 7  | 1          |
| RVP16 | 54   | 70   | 11.4 | 54   | 16 | 20.29×2.62 | 14   | 9  | 2.1        |
| RVP20 | 60   | 76.5 | 19   | 57   | 20 | 25×3       | 16   | 10 | 3.3        |
| RVP25 | 76   | 100  | 20.6 | 79.5 | 25 | 32×3       | 15   | 11 | 5.8        |
| RVP30 | 92   | 115  | 23.8 | 95   | 30 | 34.52×3.53 | 15   | 13 | 10.3       |
| RVP40 | 111  | 140  | 25.5 | 89   | 40 | 48×3       | 16   | 18 | 17.9       |

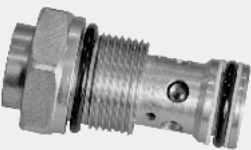


1.5

# Check valve - cartridge

Type RVM10120

Up to 350 bar  
Up to 100 L/min



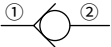
## Contents

|                         |    |
|-------------------------|----|
| Ordering code           | 02 |
| Technical data          | 02 |
| Characteristic curves   | 02 |
| Installation dimensions | 03 |

## Features

- Leakage-free closure in one direction
- Cartridge, for installation in manifold blocks

## Symbol



Ordering code

01

RVM

10120

-

-

L1X

/

\*

Check valve - cartridge

Size code

Without spring = 00

Cracking pressure 0.2bar = 02

Cracking pressure 0.5bar = 05

Further details in clear text

No code = NBR seals

V = FKM seals

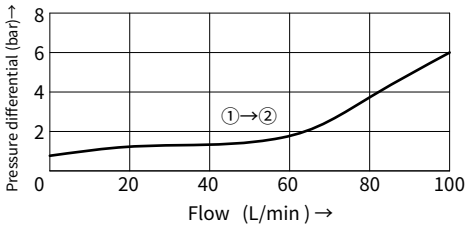
L1X = Series L10 to L19  
(L10 to L19: unchanged installation and connection dimensions)

As for the check valve without spring, the fixing position should ensure that the poppet can locate itself closed under its gravity.

Technical data

|                         |                                                                                              |                                        |
|-------------------------|----------------------------------------------------------------------------------------------|----------------------------------------|
| Weight                  | kg                                                                                           | 0.12                                   |
| Max.operating pressure  | bar                                                                                          | 350                                    |
| Crack pressure          | bar                                                                                          | 0.2, 0.5                               |
| Max.flow-rate           | L/min                                                                                        | 30                                     |
| Viscosity fange         | mm²/s                                                                                        | Recommendation 30~80; permission20~380 |
| Fluid temperature range | °C                                                                                           | -30 to +80 (NBR seal)                  |
|                         |                                                                                              | -20 to +80 (FKM seal)                  |
| Fluid                   | Mineral oil suit for NBR and FKM seal                                                        |                                        |
|                         | Phosphate ester for FKM seal                                                                 |                                        |
| Degree of contamination | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |                                        |

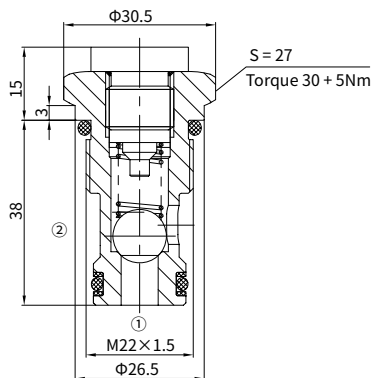
Characteristic curves (Measured at  $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$  , using HLP46)



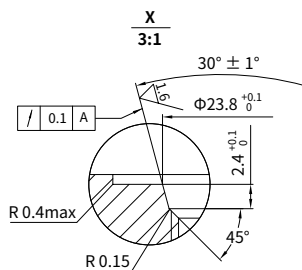
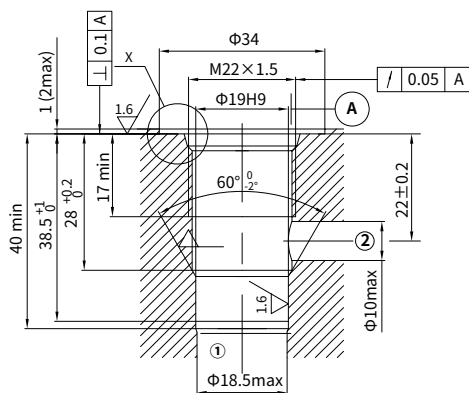
**Note:** characteristic curve at 0.5bar crack pressure.

## Installation dimensions

### Outline dimensions:



### Cavity dimensions:



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1.6

# Check valve

## Type Z1S...30

Sizes 6 to 22  
Up to 315bar  
Up to 400 L/min



### Contents

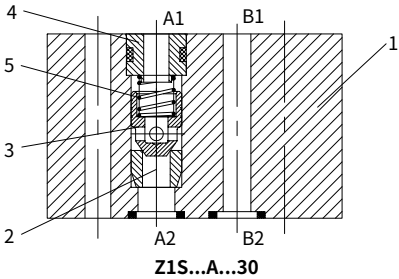
|                            |       |
|----------------------------|-------|
| Function and configuration | 02    |
| Ordering code              | 02    |
| Symbols                    | 03    |
| Technical data             | 03    |
| Characteristic curves      | 03    |
| Unit dimensions:           | 04-05 |
| · sizes 6 to 10            | 04    |
| · sizes 16 to 22           | 05    |

### Features

- Sandwich plate valve  
for use in vertical sandwich installation
- 8 different checking functions, optional  
(detail refer to the Ordering code)

Function and symbols

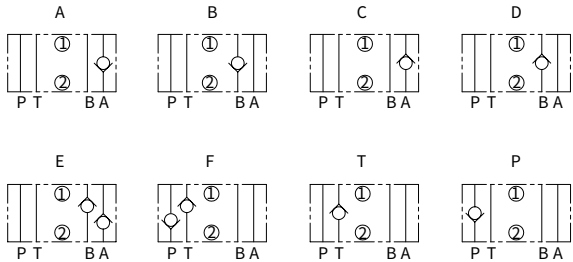
The Z1S ...valve is a direct operated check valve in sandwich plate design. It mainly consist of the housing (1) and check valve cartridge (2). It is used for the leak-free closure in one direction and allows free flow in the opposite direction. The stroke of the poppet (3) is limited by the spring seat (4). The integrated spring (5) holds the poppet (3) in the closed position.



Ordering code

|                                                   |   |    |                           |                               |    |   |  |   |
|---------------------------------------------------|---|----|---------------------------|-------------------------------|----|---|--|---|
| Z1S                                               |   |    |                           | -                             | 30 | / |  | * |
| Sandwich plate check valve                        |   |    |                           | Further details in clear text |    |   |  |   |
| Nominal size 6                                    | = | 6  | No code = NBR seals       |                               |    |   |  |   |
| Nominal size 10                                   | = | 10 | V = FKM seals             |                               |    |   |  |   |
| Nominal size 16                                   | = | 16 |                           |                               |    |   |  |   |
| Nominal size 22                                   | = | 22 |                           |                               |    |   |  |   |
| Closed in port A (A1 to A2)                       | = | A  | 30= 30 series             |                               |    |   |  |   |
| Closed in port B (B1 to B2)                       | = | B  |                           |                               |    |   |  |   |
| Closed in port A (A2 to A1)                       | = | C  |                           |                               |    |   |  |   |
| Closed in port B (B2 to B1)                       | = | D  |                           |                               |    |   |  |   |
| Closed in ports A and B (A2 to A1) and (B2 to B1) | = | E  | 1 = Crack pressure 0.5bar |                               |    |   |  |   |
| Closed in ports P and T (P1 to P2) and (T2 to T1) | = | F  | 2 = Crack pressure 3bar   |                               |    |   |  |   |
| Closed in port P (P1 to P2)                       | = | P  | 3 = Crack pressure 5bar   |                               |    |   |  |   |
| Closed in port T (T2 to T1)                       | = | T  |                           |                               |    |   |  |   |

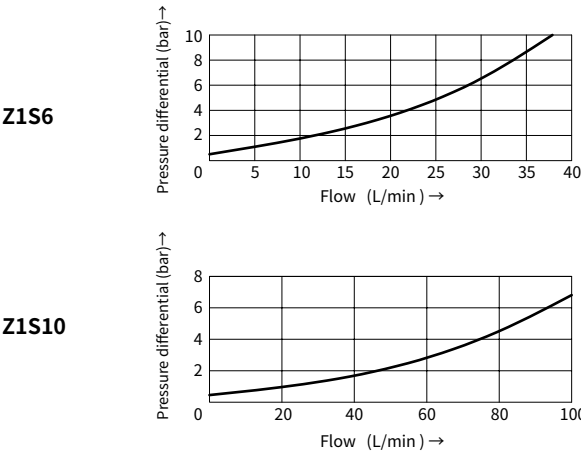
**Symbols** ( ① =valve side, ② = sub-plate side)



**Technical data**

|                         |                    |                                                                                              |     |     |     |
|-------------------------|--------------------|----------------------------------------------------------------------------------------------|-----|-----|-----|
| Nominal size            |                    | 6                                                                                            | 10  | 16  | 22  |
| Weight                  | kg                 | 0.8                                                                                          | 2.3 | 8.5 | 13  |
| Max. flow -rate         | L/min              | 42                                                                                           | 100 | 200 | 400 |
| Max. operating pressure | bar                | To 315                                                                                       |     |     |     |
| Crack pressure          | bar                | 0.5, 3, 5                                                                                    |     |     |     |
| Viscosity range         | mm <sup>2</sup> /s | -2.8 to 500                                                                                  |     |     |     |
| Fluid temperature range | °C                 | -20 to +70                                                                                   |     |     |     |
| Fluid                   |                    | Mineral oil suitable for NBR and FKM seal<br>Phosphate ester for FKM seal                    |     |     |     |
| Degree of contamination |                    | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |     |     |     |

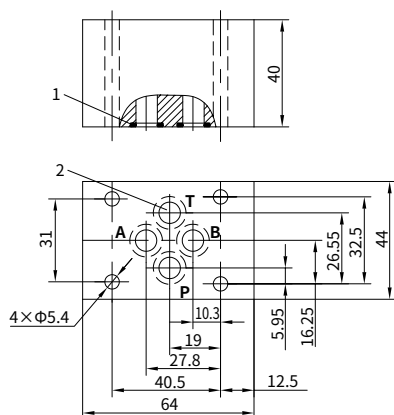
**Characteristic curves** (Measured at  $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$  , using HLP46)



## Unit dimensions (Sizes 6 and 10)

(Dimensions in mm)

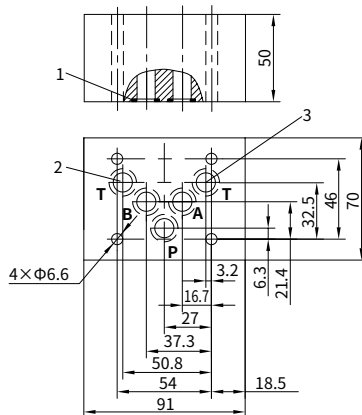
Z1S6



1 O-ring 9.25 x 1.78

2 Check valve of Z1S6T and Z1S6F are integrated at the line.

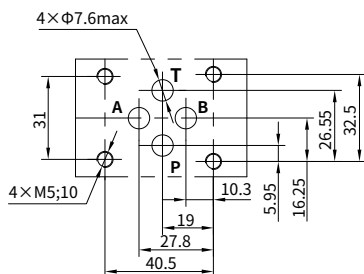
Z1S10



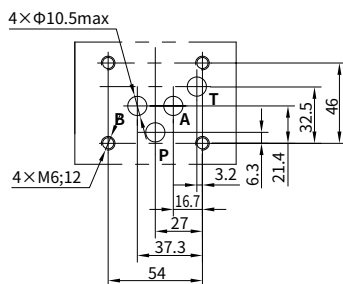
1 O-ring 10.82 x 1.78

2 Port T of Z1S10T and Z1S10F is blocked.

3 Check valves of Z1S10T and Z1S10F are integrated at the line.



0.01/100mm

Requirement for  
mounting surface

0.01/100mm

Requirement for  
mounting surfaceIt must be ordered separately  
if connection plate is needed.

Type:

G341/01(G1/4), G341/02 (M14×1.5)

G342/01(G3/8), G342/02 (M18×1.5)

G502/01(G1/2), G502/02 (M22×1.5)

It must be ordered separately  
if connection plate is needed.

Type:

G66/01(G3/8), G66/02 (M18×1.5)

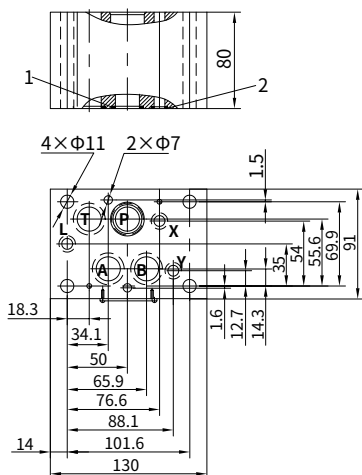
G67/01(G1/2), G67/02 (M22×1.5)

G534/01(G3/4), G534/02 (M27×2)

## Unit dimensions (Sizes 16 and 22)

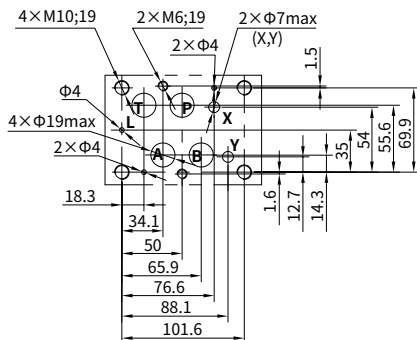
(Dimensions in mm)

Z1S16



1 O-rings 22×2.5 (Ports A, B, P, T)

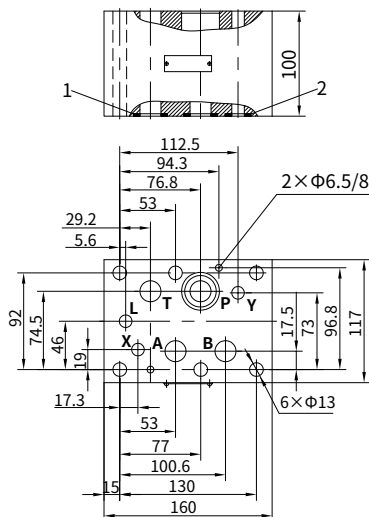
2 O-rings 10×2 (Ports X, Y, L)

Requirement for  
mounting surfaceIt must be ordered separately  
if connection plate is needed.

Type: G172/01(G3/4), G172/02(M27×2)

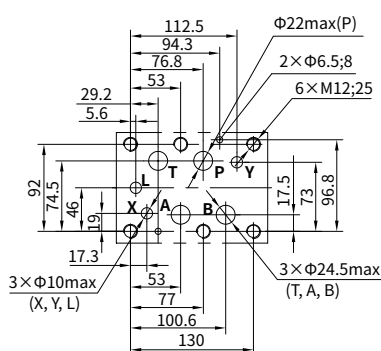
G174/01(G1), G172/02 (M33×2)

Z1S22



1 O-rings 27×3 (Ports A, B, P, T)

2 O-rings 19×3 (Ports X, Y, L)

Requirement for  
mounting surfaceIt must be ordered separately  
if connection plate is needed.

Type: G153/01(G1), G153/02 (M33×2)

G154/01(G11/4), G154/02 (M42×2)

G156/01(G11/2), G156/02 (M48×2)

|                                   |                                    |
|-----------------------------------|------------------------------------|
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| <b>Germany</b><br>+49 172 3683463 | <b>Japan</b><br>+81 03 6809 1696   |



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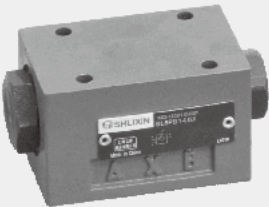


1.7

# Pilot operated check valve

Type SV / SL6...L6X

Size 6  
Up to 315 bar  
Up to 60 L/min



## Contents

|                             |    |
|-----------------------------|----|
| Function and configurations | 02 |
| Symbols                     | 02 |
| Ordering code               | 03 |
| Technical data              | 03 |
| Characteristic curves       | 04 |
| Unit dimensions             | 05 |

## Features

- For sub-plate mounting, porting pattern conforms to DIN 24 340 form A, ISO 4401 and CETOP 121 H
- With or without drain port
- 4 cracking pressures

## Function and configurations

Valves of types SV and SL are pilot operated check valves of poppet design that can be opened in the checked direction. These valves are used to isolate pressurised working circuits, to prevent a load from lowering in the event of a pipe rupture or to protect hydraulically isolated actuators from creeping down.

They basically consist of the housing (1), the poppet (2), a compression spring (3) and the pilot piston (4).

### Type SV ... (without drain port)

Fluid may flow freely from A to B. In the reverse direction, the poppet (2) is held firmly on to its seat both by the compression spring and the system pressure.

By applying pressure to pilot connection X, the pilot piston (4) is moved to the right. This lifts poppet (2) off its seat, then fluid flows from B to A.

In order to ensure that the valve opens due to pressure applied to the pilot piston, a certain minimum pilot pressure is required (see next page).

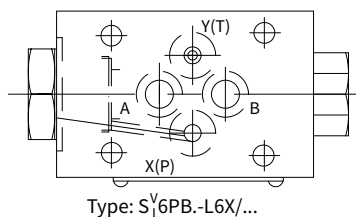
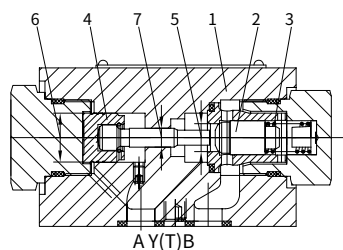
The drain port Y is plugged.

### Type SL... (with drain port)

In principle, the function of this valve corresponds to that of type SV.

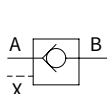
The difference lies in the additional drain port Y for type SL, the annular area of the pilot piston (4) is separated from the port A. Pressure present in port A acts only on area A3 (7) of the pilot.

It is used in the situation having load on port A when valve opens, while type SV is used in that unloading on port A when this valve opens.

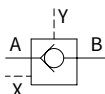


- 1 Housing
- 2 Poppet
- 3 Compression spring
- 4 Pilot piston
- 5 Area A1
- 6 Area A2
- 7 Area A3

## Symbols



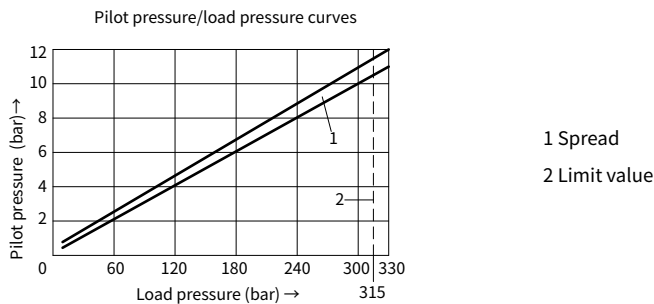
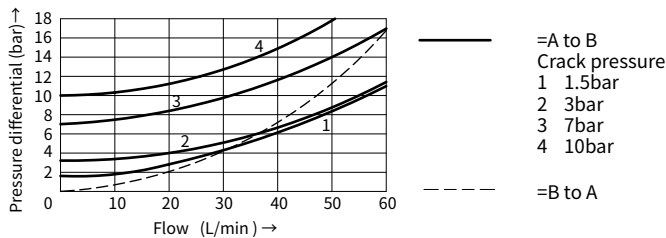
SV6PB.-L6X/...



SL6PB.-L6X/... (with drain port)

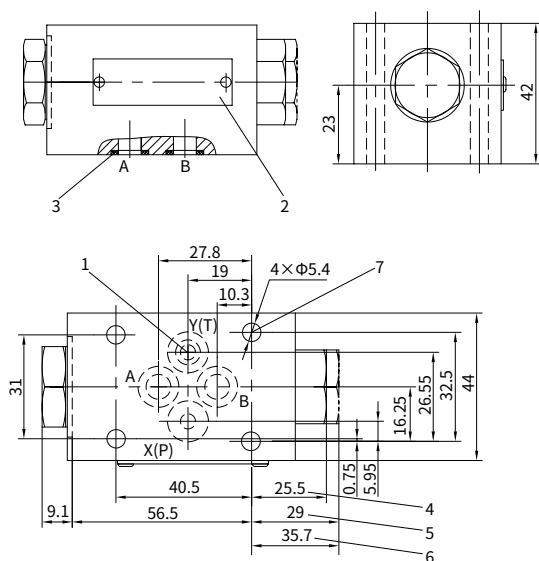


Characteristic curves (Measured at  $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , using HLP46)

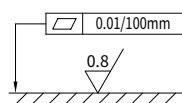


## Unit dimensions

(Dimensions in mm)



- 1 Port Y with valve type "SL"  
(in valve type "SV" this port is plugged)
- 2 Nameplate
- 3 O-Ring 9.25 x 1.78  
(Ports A, B, X, Y)
- 4 For valve with cracking pressure version "1", "2", "3" PB
- 5 For valve with cracking pressure version "4" PB
- 6 For valve with PA
- 7 Through-hole for valve mounting screws



Requirement for  
mounting surface

It must be ordered separately  
if connection plate is needed.

Type:

G341/01(G1/4), G341/02 (M14×1.5)

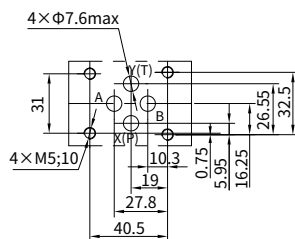
G342/01(G3/8), G342/02(M18×1.5)

G502/01(G1/2), G502/02(M22×1.5)

#### Valve mounting screws:

Internal hexagon screw GB/T 70.1-10.9

M5×50, tightening torque  $M_A=8.9\text{Nm}$



Dimensions of  
mounting surface

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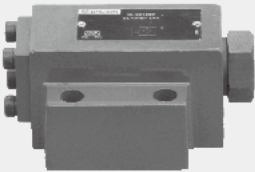


1.8

# Pilot operated check valve

Type SV / SL...L4X

Sizes 10 to 32  
Up to 315bar  
Up to 550 L/min



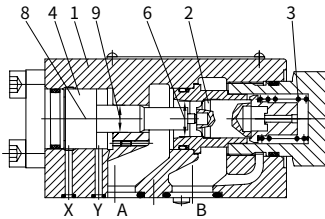
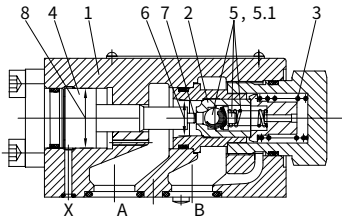
## Contents

|                                                                     |       |
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| Symbols                                                             | 02    |
| Ordering code                                                       | 03    |
| Technical data                                                      | 03    |
| Characteristic curves                                               | 04    |
| Unit dimensions                                                     | 05-07 |
| · sub-plate mounting valve                                          | 05    |
| · threaded connection valve                                         | 06-07 |
| Ordering code for threaded connection<br>valve type SV/SL series 30 | 07    |

## Features

- For sub-plate mounting,  
porting pattern conforms to DIN 24 340 Form D,  
ISO 5781
- For threaded connection
- With or without drain port
- With or without unloading function
- 4 cracking pressures

# Function and configuration



- 6 Area A1
- 7 Area A2
- 8 Area A3
- 9 Area A4

SV and SL valves are hydraulic pilot operated check valves in poppet type design which may be opened to permit reverse flow.

These valves are used for the isolation of operating circuits under pressure, to prevent a load from falling or creeping movements of hydraulically locked-in actuators.

Basically these valves consist of housing (1), poppet (2), compression spring (3), control spool (4) as well as a optional pre-opening ball poppet valve (5).

## Type SV (without drain port)

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 at control port X the control piston (4) is moved to the right. This lifts the poppet (2) from the seat, then fluid flows from B to A.

In order to ensure the valve opens due to the

pressure applied to the control piston (4) a certain minimum pilot pressure is necessary.

## Type SV...A...and SL...A... (with pre-opening)

This valve has a additional decompression feature. When pressure is applied at control port X the control piston (4) is pushed to the right. The ball poppet (5.1) leaves first then the poppet (2) leaves from the seat. Now the valve may also have a flow from B to A.

Because of the pre-opening there is a dampened decompression of the fluid under pressure to avoid possible pressure shocks.

## Type SL... (with drain port )

The function of this valve correspond to the valve SV .

The difference is the additional leakage port Y. The annular area of the control piston (4) is separated from port A. The pressure at port A only effects area A4 (9) of the control piston (4).

# Symbols



## Symbols type SV

Type SV..PA.-L4X/...  
(without drain port, with pre-opening)



## Symbols type SL

Type SL..PB.-L4X/...  
(with drain port, without pre-opening)

## Ordering code

|   |  |  |  |  |  |      |  |   |
|---|--|--|--|--|--|------|--|---|
| S |  |  |  |  |  | L4X/ |  | ★ |
|---|--|--|--|--|--|------|--|---|

No leakage port = V  
With leakage port = L

| Type           | SV   |     | SL  |     |
|----------------|------|-----|-----|-----|
| Connected port | G    | P   | G   | P   |
| Size           | Code |     |     |     |
| Size 10        | =10  | =10 | =10 | =10 |
| Size 16        | =15  | -   | =15 | -   |
| Size 20        | =20  | =20 | =20 | =20 |
| Size 25        | =25  | -   | =25 | -   |
| Size 32        | =30  | =30 | =30 | =30 |

Sub-plate mounting = P  
Threaded connection = G

With pre-opening(standard version) =A  
No pre-opening =B

Further details in clear text

No code = NBR seals  
V = FKM seals

For threaded connection

No code= Inch  
2 = Metric

L4X = Series L40 to L49  
(L40 to L49: unchanged installation and connection dimensions)

1= Cracking pressure: Size 10 = 1.5bar  
Size16 and 20 = 2.5bar  
Size25 and 32 = 2.5bar

2= Cracking pressure: Size10 =3bar  
Size16 and 20 =5bar  
Size25 and 32 =5bar

3= Cracking pressure: Size10 =6bar  
Size16 and 20 =7.5bar  
Size25 and 32 =8bar

4= Cracking pressure: =10bar

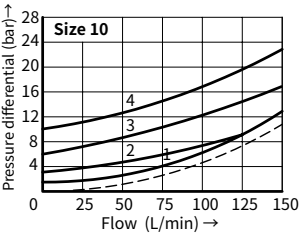
## Technical data

|                          |                     |                                                                                              |                                                |       |       |       |       |
|--------------------------|---------------------|----------------------------------------------------------------------------------------------|------------------------------------------------|-------|-------|-------|-------|
| Nominal size             |                     |                                                                                              | 10                                             | 16    | 20    | 25    | 32    |
| Weight                   | Sub plate mounting  | kg                                                                                           | 2.1                                            |       | 4.7   |       | 7.8   |
|                          | Threaded connection | kg                                                                                           | 2.5                                            | 5.7   | 5.7   | 10    | 10    |
| Installation position    |                     |                                                                                              | Optional                                       |       |       |       |       |
| Flow direction           |                     |                                                                                              | From A to B free, from B to A through opening  |       |       |       |       |
| Operating pressure       |                     | bar                                                                                          | To 315                                         |       |       |       |       |
| Port pilot pressure      |                     | bar                                                                                          | 5 to 315                                       |       |       |       |       |
| Control capacity -Port X |                     | cm <sup>3</sup>                                                                              | 2.5                                            | 10.8  | 10.8  | 19.27 | 19.27 |
| -Port Y(only type SL)    |                     | cm <sup>3</sup>                                                                              | 2                                              | 9.6   | 9.6   | 17.5  | 17.5  |
| Control area-area A1     |                     | cm <sup>2</sup>                                                                              | 1.33                                           | 3.46  | 3.46  | 5.72  | 5.72  |
| -area A2                 |                     | cm <sup>2</sup>                                                                              | 0.33                                           | 0.7   | 0.7   | 1.33  | 1.33  |
| -area A3                 |                     | cm <sup>2</sup>                                                                              | 3.8                                            | 10.17 | 10.17 | 16.61 | 16.61 |
| -area A4                 |                     | cm <sup>2</sup>                                                                              | 0.79                                           | 1.13  | 1.13  | 1.54  | 1.54  |
| Viscosity range          |                     | mm <sup>2</sup> /s                                                                           | 10 to 800                                      |       |       |       |       |
| Fluid temperature range  |                     | °C                                                                                           | -30 to +80 (NBR seal)<br>-20 to +80 (FKM seal) |       |       |       |       |
| Fluid                    |                     | Mineral oil suitable for NBR and FKM seal                                                    |                                                |       |       |       |       |
|                          |                     | Phosphate ester for FKM seal                                                                 |                                                |       |       |       |       |
| Degree of contamination  |                     | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |                                                |       |       |       |       |

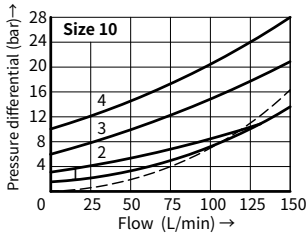
Characteristic curves

(Measured at  $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , using HLP46)

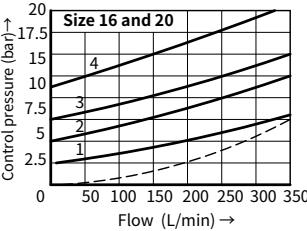
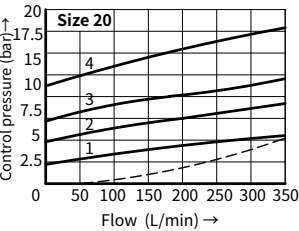
$\Delta P$ -Q curves – sub plate mounting



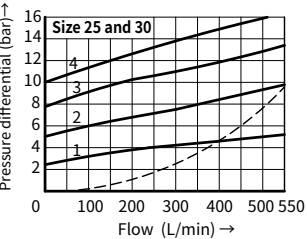
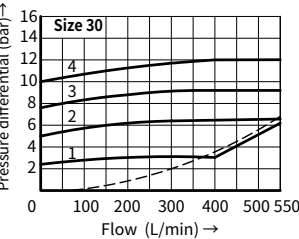
$\Delta P$ -Q curves – threaded connection



- A to B Cracking pressure
- 1 1.5bar
  - 2 3bar
  - 3 6bar
  - 4 10bar
- B to A

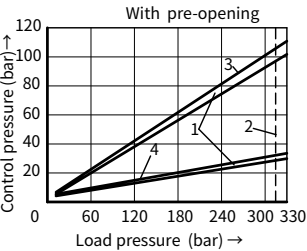
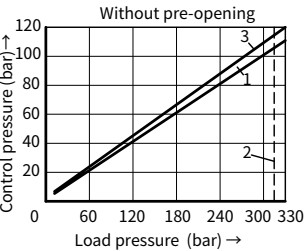


- A to B Cracking pressure
- 1 2.5 bar
  - 2 5bar
  - 3 7.5bar
  - 4 10bar
- B to A



- A to B Cracking pressure
- 1 2.5bar
  - 2 5bar
  - 3 7.5bar
  - 4 10bar
- B to A

Control pressure-load pressure curves

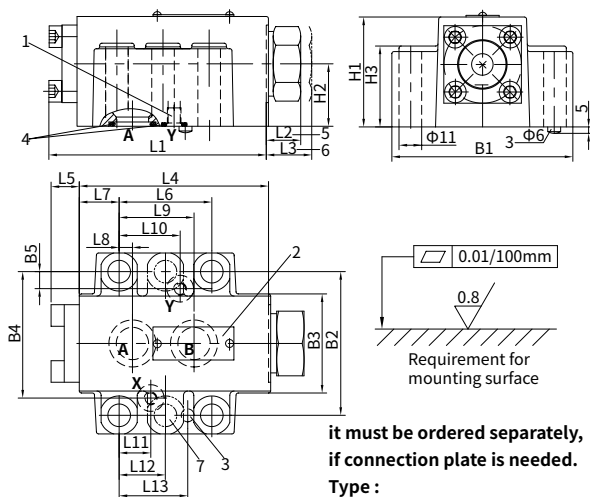


- 1 Tolerance range
- 2 Limit value
- 3 Poppet
- 4 Pre-opening ball poppet valve

## Unit dimensions

(Dimensions in mm)

## • sub-plate mounting valve



it must be ordered separately,  
if connection plate is needed.

Type :

Size10:

G460/01(G3/8), G460/02(M18×1.5)

G461/01(G1/2), G461/02(M22×1.5)

Size20:

G412/01(G3/4), G412/02(M27×2)

G413/01(G1), G413/02(M33×2)

Size30:

G414/01(G1¼), G414/02(M42×2)

G415/01(G1½), G415/02(M48×2)

Valve fixing screws:

Internal hexagon screw

Size 10: 4-M10×50 GB/T 70.1-10.9

tightening torque  $M_A=75$  Nm

Size 20: 4-M10×75 GB/T 70.1-10.9

tightening torque  $M_A=75$  Nm

Size 30: 6-M10×85 GB/T 70.1-10.9

tightening torque  $M_A=75$  Nm

- 1 Port Y with valve type "SL"  
(with valve type "SV" this  
port is closed)
- 2 Name plate
- 3 Locating pin
- 4 O-rings

Size 10

-Ports A and B 17.12×2.62

- Ports X and Y 10×2.5

Size 20

-Ports A and B 24×3

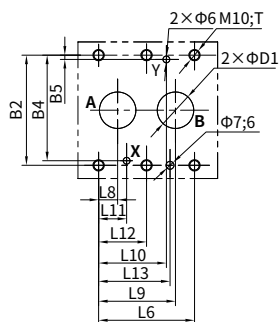
-Ports X and Y 10×2.5

Size 32

- Ports A and B 34×3

- Ports X and Y 10×2.5

- 5 Valve with cracking pressure  
versions "1" and "2"  
(dimension L2)
- 6 Valve with opening pressure  
versions "3" and "4"  
(dimension L3)
- 7 6 valve mounting holes  
with type SV/SL 30



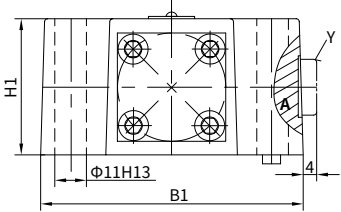
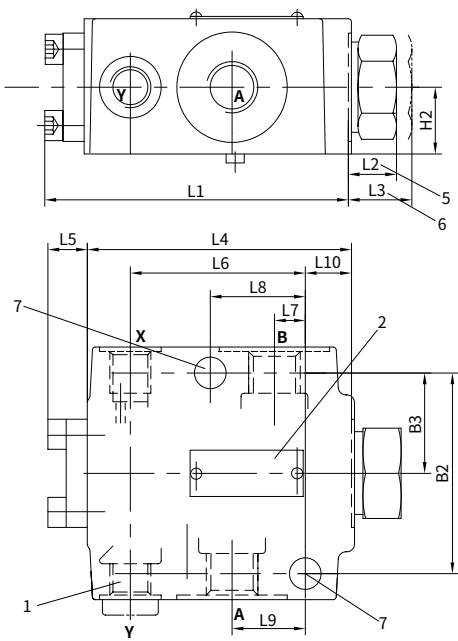
| Type | size | L1    | L2   | L3   | L4   | L5   | L6   | L7   | L8   | L9   | L10  |
|------|------|-------|------|------|------|------|------|------|------|------|------|
| SV   | 10   | 100.8 | 15.5 | 15.5 | 87.8 | 13   | 42.9 | 18.5 | 7.2  | 35.8 | -    |
|      | 20   | 135   | 17.7 | 47.7 | 117  | 18   | 60.3 | 27.5 | 11.1 | 49.2 | -    |
|      | 32   | 156.1 | 36.1 | 46.1 | 134  | 22.1 | 84.2 | 39   | 16.7 | 67.5 | -    |
| SL   | 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 | 39.7 |
|      | 32   | 156.1 | 36.1 | 46.1 | 134  | 22.1 | 84.2 | 39   | 16.7 | 67.5 | 59.5 |

| Type | size | L11  | L12  | L13  | B1  | B2   | B3   | B4   | B5  | H1 | H2   | H3 | D1 | T  |
|------|------|------|------|------|-----|------|------|------|-----|----|------|----|----|----|
| SV   | 10   | 21.5 | -    | 31.8 | 84  | 66.7 | 46   | 58.8 | -   | 51 | 29   | 36 | 13 | 23 |
|      | 20   | 20.6 | -    | 44.5 | 100 | 79.4 | 63.5 | 73   | -   | 70 | 37   | 55 | 22 | 24 |
|      | 32   | 24.6 | 42.1 | 62.7 | 118 | 96.8 | 75   | 92.8 | -   | 85 | 42.5 | 69 | 32 | 25 |
| SL   | 10   | 21.5 | -    | 31.8 | 84  | 66.7 | 46   | 58.8 | 7.9 | 51 | 29   | 36 | 13 | 23 |
|      | 20   | 20.6 | -    | 44.5 | 100 | 79.4 | 63.5 | 73   | 6.4 | 70 | 37   | 55 | 22 | 24 |
|      | 32   | 24.6 | 42.1 | 62.7 | 118 | 96.8 | 75   | 92.8 | 3.8 | 85 | 42.5 | 69 | 30 | 25 |

Unit dimensions

(Dimensions in mm)

• threaded connection valve



- 1 Port Y with valve type "SL" (with valve type "SV" this port is closed)
- 2 Name plate
- 5 Valve with cracking pressure versions "1" and "2" (dimension L2)
- 6 Valve with cracking pressure versions "3" and "4" (dimension L3)
- 7 2 valve mounting holes

**Caution:**  
On threaded connection valves, series L4X and series 30 have different connection dimensions. If series 30 valves need to be replaced by series L4X ones, the pitch of installation holes and the position of external tapping shall be changed. And as for the series 30 threaded connection valves, their configuration and connection dimensions see the Ordering code on next page.

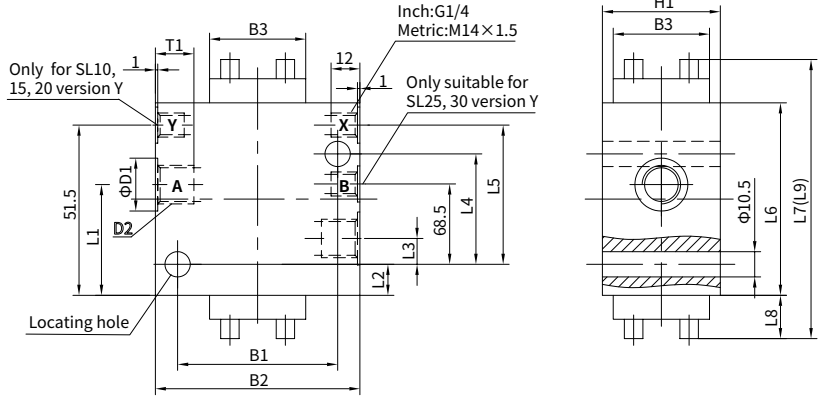
| Type | Size | Ports  |         |                 |
|------|------|--------|---------|-----------------|
|      |      | A, B   |         | X, Y            |
| SV   | 10   | G1/2   | M22×1.5 | G1/4<br>M14×1.5 |
|      | 16   | G3/4   | M27×2   |                 |
|      | 20   | G1     | M33×2   |                 |
|      | 25   | G1 1/4 | M42×2   |                 |
|      | 32   | G1 1/2 | M48×2   |                 |
| SL   | 10   | G1/2   | M22×1.5 | G1/4<br>M14×1.5 |
|      | 16   | G3/4   | M27×2   |                 |
|      | 20   | G1     | M33×2   |                 |
|      | 25   | G1 1/4 | M42×2   |                 |
|      | 32   | G1 1/2 | M48×2   |                 |

| Type | Size  | 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 | 86 | 43 |
| 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 | 86 | 43 |

Unit dimensions

(Dimensions in mm)

• threaded connection valve



| Type | Size | B1   | B2  | B3 | D1 | T1 | H1 | L1   | L2   | L3   | L4   | L5   | L6  | L7  | L8 | L9  | Inch  | Metric D2 |
|------|------|------|-----|----|----|----|----|------|------|------|------|------|-----|-----|----|-----|-------|-----------|
| SV   | 10   | 66.5 | 85  | 40 | 34 | 14 | 43 | 27.5 | 18.5 | 10.5 | 33.5 | 49   | 80  | 116 | 18 | 116 | G1/2  | M22×1.5   |
|      | 15   | 79.5 | 100 | 55 | 42 | 16 | 57 | 36.5 | 17.5 | 13   | 50.5 | 67.5 | 95  | 135 | 20 | 146 | G3/4  | M27×2     |
|      | 20   | 79.5 | 100 | 55 | 47 | 18 | 57 | 36.5 | 17.5 | 13   | 50.5 | 67.5 | 95  | 135 | 20 | 146 | G1    | M33×2     |
|      | 25   | 97   | 120 | 70 | 56 | 20 | 75 | 54.5 | 15.5 | 20.5 | 73.5 | 89.5 | 115 | 173 | 29 | 179 | G11/4 | M42×2     |
|      | 30   | 97   | 120 | 70 | 61 | 22 | 75 | 54.5 | 15.5 | 20.5 | 73.5 | 89.5 | 115 | 173 | 29 | 179 | G11/2 | M48×2     |
| SL   | 10   | 66.5 | 85  | 40 | 34 | 14 | 43 | 22.5 | 18.5 | 10.5 | 33.5 | 49   | 80  | 116 | 18 | 116 | G1/2  | M22×1.5   |
|      | 15   | 79.5 | 100 | 55 | 42 | 16 | 57 | 30.5 | 17.5 | 13   | 50.5 | 72.5 | 100 | 140 | 20 | 151 | G3/4  | M27×2     |
|      | 20   | 79.5 | 100 | 55 | 47 | 18 | 57 | 30.5 | 17.5 | 13   | 50.5 | 72.5 | 100 | 140 | 20 | 151 | G1    | M33×2     |
|      | 25   | 97   | 120 | 70 | 56 | 20 | 75 | 54.5 | 15.5 | 20.5 | 84   | 99.5 | 125 | 183 | 29 | 189 | G11/4 | M42×2     |
|      | 30   | 97   | 120 | 70 | 61 | 22 | 75 | 54.5 | 15.5 | 20.5 | 84   | 99.5 | 125 | 183 | 29 | 189 | G11/2 | M48×2     |

Note: Dimension L7 suits valve with opening pressure types "1" and "2", and dimension L9 suits valve with opening pressure types "3".

Ordering code: for threaded connection valve type SV/SL series30

S

V

30

\*

No leakage port = V

With leakage port = L

Nominal size10 = 10

Nominal size15 = 15

Nominal size 20 = 20

Nominal size25 = 25

Nominal size30 = 30

Threaded connection = G

With pre-opening(standard version) = A

No pre-opening = B

Further details in clear text

No code = NBR seals

V = FKM seals

No code = Inch

2 = Metric

30 = Series 30

1 = Opening pressure 3 bar

2 = Opening pressure 5 bar

3 = Opening pressure 8 bar

|                                   |                                    |
|-----------------------------------|------------------------------------|
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| <b>Germany</b><br>+49 172 3683463 | <b>Japan</b><br>+81 03 6809 1696   |



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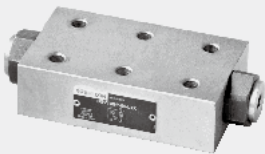


1.9

# Pilot Operated Check Valve

## Type DSV10...L1X

Size 10  
Up to 350bar  
Up to 50 L/min



### Contents

|                             |    |
|-----------------------------|----|
| Function and configurations | 02 |
| Ordering code               | 02 |
| Characteristic curves       | 02 |
| Symbols                     | 02 |
| Technical data              | 03 |
| Unit dimensions             | 03 |

### Features

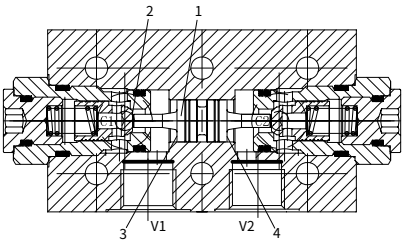
- Sub-plate mounting
- Double operating ports with leakage-free closure
- Stable cracking pressure

Function and symbols

Check valve type DSV is made up of two pilot operated check valves with excellent closure.

Usually fluid can flow free from V1 to C1 or from V2 to C2 with leakage-free closure in the opposite direction.

When fluid flows from C1 to V1, pressure from V2 pushes the piston (1) to move left and pushes the poppet (2) off the seat to realize reverse flow. In order to make the reliable closure of the poppets, the ports V1 and V2 must be connected to tank when the directional valve is in the central position.



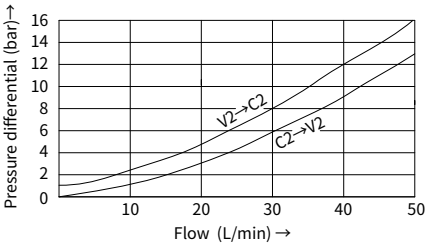
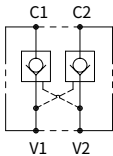
- 1 Piston
- 2 Check valve poppet
- 3 Area A1
- 4 Area A2

Ordering code

|                                                         |     |      |     |     |   |   |                                                                                              |
|---------------------------------------------------------|-----|------|-----|-----|---|---|----------------------------------------------------------------------------------------------|
| DSV                                                     | 10  | GP   | 80  | L1X | / | ★ | Further details in clear text                                                                |
| Check valve pilot operated                              |     |      |     |     |   |   |                                                                                              |
| Nominal size                                            | =10 |      |     |     |   |   | No code = NBR seals<br>V = FKM seals                                                         |
| Inlet threaded connection,<br>Outlet sub-plate mounting |     | = GP |     |     |   |   | L1X = Series L10 to L19<br>(L10 to L19: unchanged installation<br>and connection dimensions) |
|                                                         |     |      | 80= |     |   |   | Cracking pressure 8bar                                                                       |

Characteristic curves (Measured at  $\vartheta_{oil}=40^{\circ}C \pm 5^{\circ}C$  , using HLP46)

Symbol

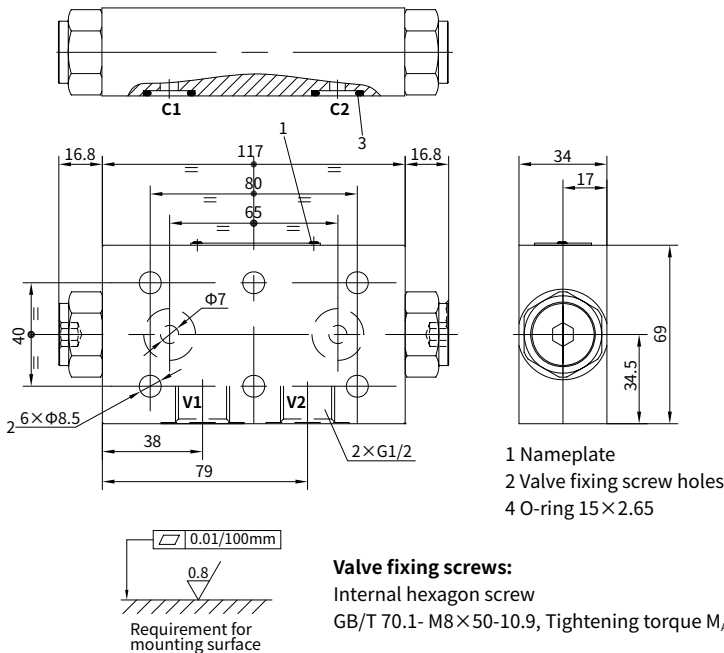


Technical data

|                             |       |                                                                                              |
|-----------------------------|-------|----------------------------------------------------------------------------------------------|
| Weight                      | kg    | 2.24                                                                                         |
| Max. operating pressure     | bar   | 350                                                                                          |
| Max. cracking pressure      | bar   | 8                                                                                            |
| Max. flow-rate              | L/min | 50                                                                                           |
| Flow direction              |       | See the symbols                                                                              |
| Free flow cracking pressure | bar   | See the characteristic curve                                                                 |
| Area ratio                  |       | A1:A2=3.2:1                                                                                  |
| Fluid temperature range     | °C    | -30 to +80 (NBR seal)<br>-20 to +80 (FKM seal)                                               |
| Fluid                       |       | Mineral oil suitable for NBR and FKM seal<br>Phosphate ester for FKM seal                    |
| Degree of contamination     |       | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |

Unit dimensions

(Dimensions in mm)



**Valve fixing screws:**  
Internal hexagon screw  
GB/T 70.1- M8x50-10.9, Tightening torque  $M_A=37\text{ Nm}$

|                                   |                                    |
|-----------------------------------|------------------------------------|
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1.10

# Check valve pilot operated

## Type Z2S 6...L6X

Size 6  
Up to 315 bar  
Up to 60 L/min



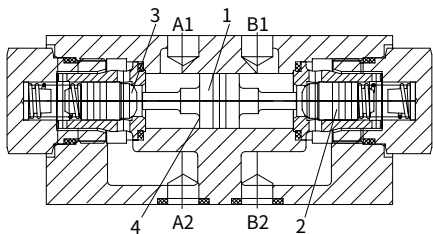
### Contents

|                             |    |
|-----------------------------|----|
| Function and configurations | 02 |
| Ordering code               | 02 |
| Symbols                     | 03 |
| Technical data              | 03 |
| Characteristic curves       | 04 |
| Unit dimensions             | 04 |

### Features

- Sandwich plate valve
- Porting pattern to DIN 24 340 Form A, ISO 4401 and CETOP -RP 121 H
- Leakage-free closure for one or two actuator ports
- For use in sandwich stacking systems
- 3 different opening pressures, optional

Function and configuration



- 1 Piston

2 Poppet
- 3 Area A1

4 Area A2

Type: Z2S6...-L6X/..

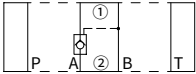
The check valve Z2S6 is a pilot operated check valve in sandwich plate design. It is used for the leakage-free closure of one or two actuator ports even during long standstill periods. Fluid flows freely in direction A1 to A2 or B1 to B2 and in the opposite direction the flow is blocked. If fluid flows from A1 to A2, the piston (1) is moved to the right and pushes the poppet (2) off its seat, then the pressure fluid may flow from B2 to B1. In order to make the reliable closure of the poppets (2) the ports must be connected to tank when the directional valve is in the central position (see circuit example).

Ordering code

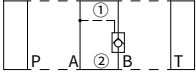
|                                                   |  |      |  |                                                                 |  |
|---------------------------------------------------|--|------|--|-----------------------------------------------------------------|--|
| Z2S6                                              |  | L6X  |  | *                                                               |  |
| Check valve, hydraulically pilot operated, Size 6 |  |      |  | Further details in clear text                                   |  |
| Leak-free closure in channels A and B = –         |  |      |  | No code = Without pilot opening (Standard)                      |  |
| Leak-free closure in channel A = A                |  |      |  | S055 = With pilot opening                                       |  |
| Leak-free closure in channel B = B                |  |      |  | No code = NBR seals                                             |  |
|                                                   |  |      |  | V = FKM seals                                                   |  |
| Opening pressure 1.5bar = 1                       |  | L6X= |  | Series L60 to L69                                               |  |
| Opening pressure 3bar = 2                         |  |      |  | ( L60 to L69: unchanged installation and connection dimensions) |  |
| Opening pressure 7bar = 3                         |  |      |  |                                                                 |  |

**Symbols** ( ① =valve side, ② = sub-plate side)

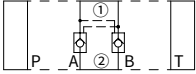
Type: Z2S6A-L6X/..



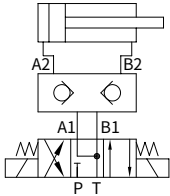
Type: Z2S6B-L6X/..



Type: Z2S6-L6X/..



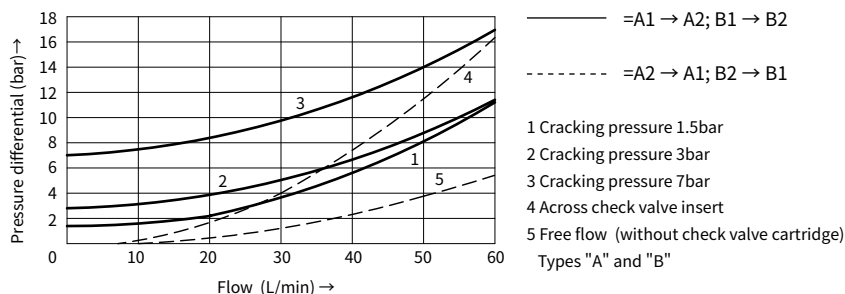
**Circuit example**



**Technical data**

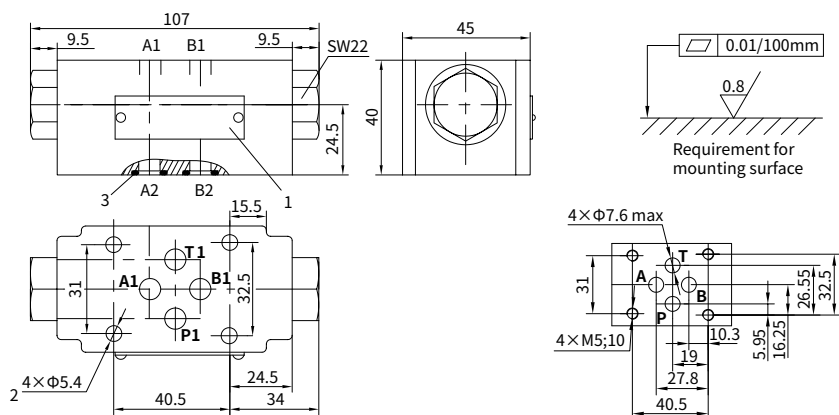
|                                  |                    |                                                                                              |
|----------------------------------|--------------------|----------------------------------------------------------------------------------------------|
| Fluid                            |                    | Mineral oil suitable for NBR and FKM seal<br>Phosphate ester for FKM seal                    |
| Degree of contamination          |                    | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |
| Pressure fluid temperature range | °C                 | -30 to +80 (NBR seal)<br>-20 to +80 (FKM seal)                                               |
| Viscosity range                  | mm <sup>2</sup> /s | 2.8 to 500                                                                                   |
| Operating pressure               | bar                | 315                                                                                          |
| Max. flow-rate                   | L/min              | 60                                                                                           |
| Flow direction                   |                    | See symbols                                                                                  |
| Flow freely opening pressure     | bar                | See curves                                                                                   |
| Ratio of areas                   |                    | A1/A2=1/3                                                                                    |
| Weight                           | kg                 | Approx. 1.0                                                                                  |

## Characteristic curves (Measured at $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , using HLP46)



## Unit dimensions

(Dimensions in mm)



**It must be ordered separately,  
if connection plate is needed.**

**Type:**

G341/01(G1/4), G341/02(M14×1.5)

G342/01(G3/8), G342/02(M18×1.5)

G502/01(G1/2), G502/02(M22×1.5)

1 Name plate

2 Valve fixing holes

3 O-rings 9.25×1.78 for ports A2, B2, P2, T2

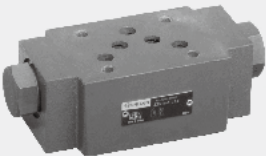


1.11

# Check valve pilot operated

Type Z2S 10...L3X

Size 10  
Up to 315bar  
Up to 120 L/min



## Contents

|                            |    |
|----------------------------|----|
| Function and configuration | 02 |
| Symbols                    | 02 |
| Ordering code              | 03 |
| Technical data             | 03 |
| Characteristic curves      | 03 |
| Unit dimensions            | 04 |

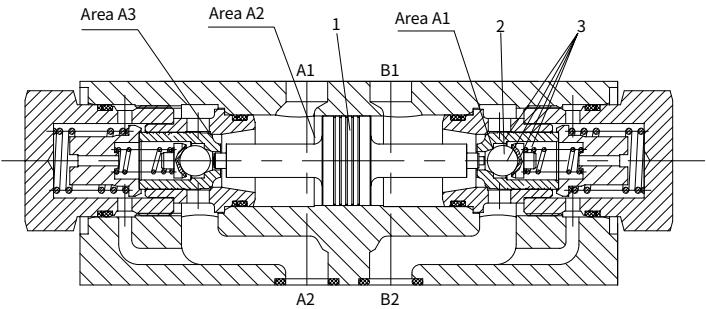
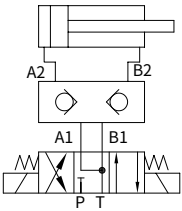
## Features

- Porting pattern to DIN 24 340
- Leakage-free closure for one or two ports
- Sandwich plate valve, for use in vertical stacking assemblies
- 4 cracking pressures, optional

## Function and configuration

Hydraulic pilot operated check valves type Z2S10 are sandwich plate design. They are used for the leakage-free closure of one or two ports, even for long periods of time. Fluid flows freely from A1 to A2 or B1 to B2. Flow in the opposite direction is blocked. When fluid flows from A1 to A2, the spool (1) is pressurised and is pushed to the right, thereby opening the ball poppet valve (2) which then opens the check valve (3). In order to make the reliable closure of the two check valves in the neutral position, the service ports A1 and B1 must be connected to tank.

### Circuit example

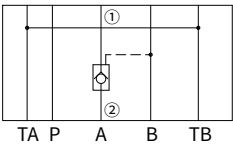


**Z2S10..L3X/...check valve, hydraulic pilot operated**

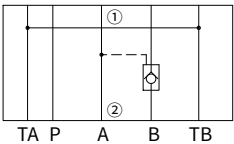
- 1 Spool      2 Ball poppet valve      3 Check valve

## Symbols ( ① =valve side, ② = sub-plate side)

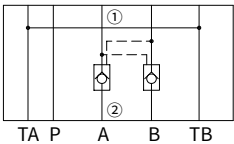
**Z2S10A..L3X/...**



**Z2S10B..L3X/...**



**Z2S10..L3X/...**



Ordering code

Z2S

10

L3X

\*

Check valve, hydraulic pilot operated

Nominal size 10 =10

Leak-free closure in channels A and B = -  
Leak-free closure in channel A = A  
Leak-free closure in channel B = B

Further details in clear text

No code = NBR seals  
V = FKM seals

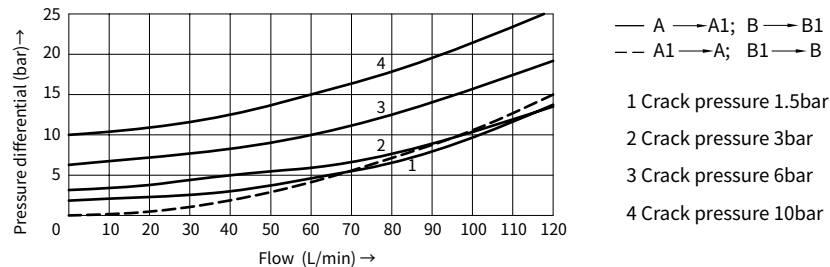
L3X= Series L30 to L39  
(L30 to L39: unchanged installation and connection dimensions)

1 = Crack pressure 1.5bar  
2 = Crack pressure 3bar  
3 = Crack pressure 6bar  
4 = Crack pressure 10bar

Technical data

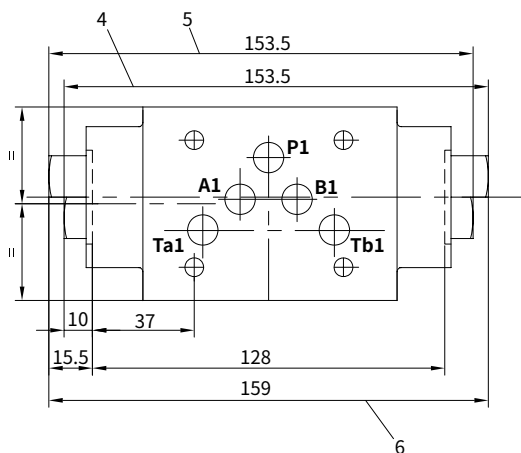
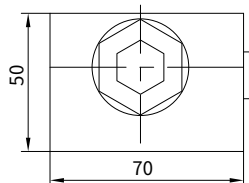
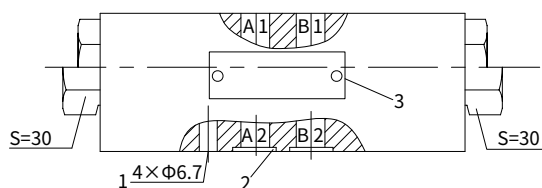
|                                     |                                                                                              |                                                |
|-------------------------------------|----------------------------------------------------------------------------------------------|------------------------------------------------|
| Fluid                               | Mineral oil suitable for NBR and FKM seal<br>Phosphate ester for FKM seal                    |                                                |
| Degree of contamination             | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |                                                |
| Fluid temperature range             | °C                                                                                           | -30 to +80 (NBR seal)<br>-20 to +80 (FKM seal) |
| Viscosity range                     | mm <sup>2</sup> /s                                                                           | 2.8 to 500                                     |
| Operating pressure                  | bar                                                                                          | 315                                            |
| Max.flow-rate                       | L/min                                                                                        | 120                                            |
| Flow direction                      | See symbol                                                                                   |                                                |
| Crack pressure(free flow direction) | bar                                                                                          | 1.5, 3, 6, 10                                  |
| Area ratio                          | A1/A2=1/13.4    A3/A2=1/2.68<br>(Please refer to page "02/04" for section drawing )          |                                                |
| Weight                              | kg                                                                                           | 3                                              |

Characteristic curves ( Measured at  $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$  , using HLP46)



## Unit dimensions

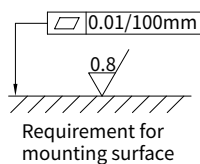
(Dimensions in mm)



- 1 4 through holes for valve mounting screws
- 2 O-rings  $12 \times 2$  for ports A, B, P, T
- 3 Name plate
- 4 Check valve in port B
- 5 Check valve in port A
- 6 Check valve in both port A and B

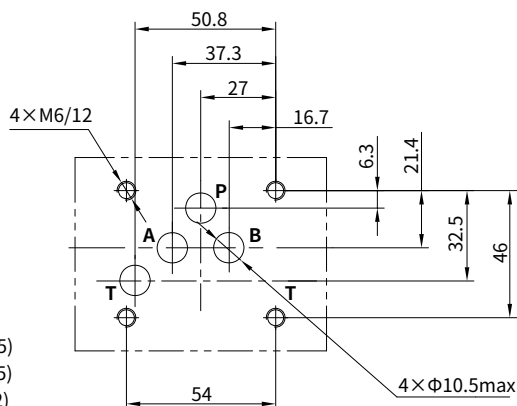
**Valve mounting screws:**

Internal hexagon screw  
 Size 10: 4-M6 GB/T 70.1-2000  
 Tightening torque  $M_A=15.5$  Nm  
 must be ordered separately



**It must be ordered separately, if connection is needed.**

**Type:** G66/01(G3/8), G66/02 (M18×1.5)  
 G67/01(G1/2), G67/02(M22×1.5)  
 G534/01(G3/4), G534/02(M27×2)





1.12

# Check valve pilot operated

## Type Z2S 16...L5X

Size 16  
Up to 315 bar  
Up to 300 L/min



### Contents

|                            |    |
|----------------------------|----|
| Function and configuration | 02 |
| Symbols                    | 02 |
| Ordering code              | 03 |
| Technical data             | 03 |
| Characteristic curves      | 03 |
| Unit dimensions            | 04 |

### Features

- Porting pattern to DIN 24 340
- Leakage-free closure for one or two ports
- Sandwich plate valve,  
for use in vertical stacking assemblies
- 4 cracking pressures, optional

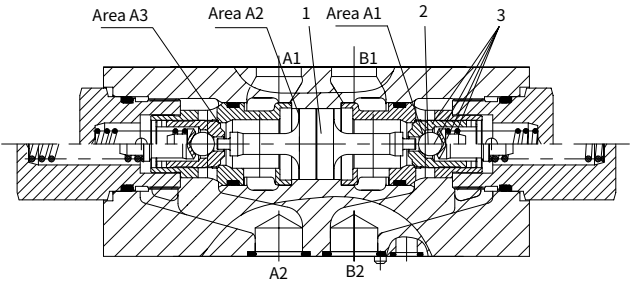
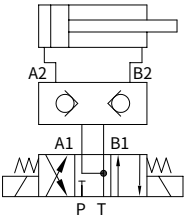
## Function and configuration

Hydraulic pilot operated check valves type Z2S16 are sandwich plate design. They are used for the leakage-free closure of one or two service ports, even for long periods of time. Free flow occurs from A1 to A2 or B1 to B2. Flow in the opposite direction is blocked.

When fluid flows from A1 to A2, the spool (1) is pressurised and is pushed to the right, thereby opening the ball poppet valve (2) which then opens the check valve (3).

In order to make reliable closure of the two check valves in the neutral position, the service ports A1 and B1 of the directional valve must be connected to returning line.

### Circuit example

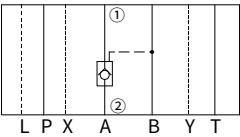


**Z2S16...L5X/...check valve, hydraulic pilot operated**

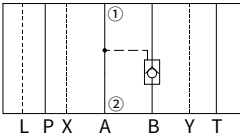
- 1 Spool      2 Ball poppet valve      3 Check valve

## Symbols ( ① =valve side, ② = sub-plate side)

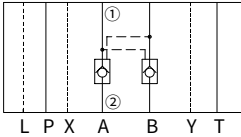
**Z2S16A...L5X/...**



**Z2S16B...L5X/...**



**Z2S16...L5X/...**



Ordering code

Z2S

16

L5X

\*

Check valve,  
hydraulic pilot operated

Size 16 =16

Leak-free closure in channels A and B = -  
Leak-free closure in channel A = A  
Leak-free closure in channel B = B

Further details in clear text

No code = NBR seals  
V = FKM seals

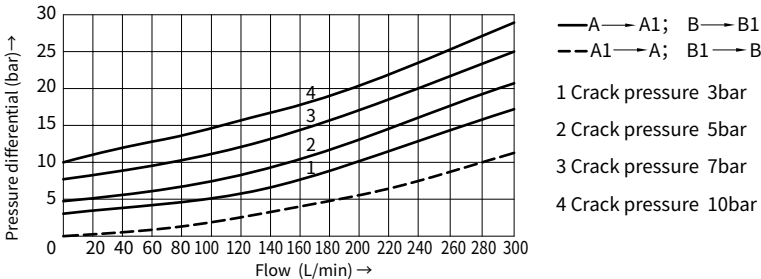
L5X= Series L50 to L59  
(L50 to L59: unchanged installation  
and connection dimensions)

1 = Crack pressure 3bar  
2 = Crack pressure 5bar  
3 = Crack pressure 7.5bar  
4 = Crack pressure 10bar

Technical data

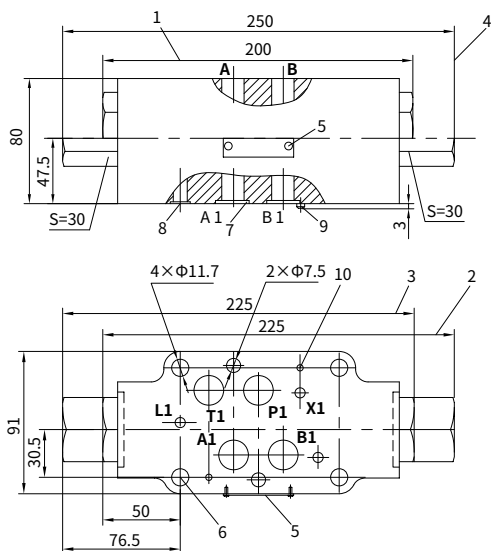
|                                     |                    |                                                                                              |
|-------------------------------------|--------------------|----------------------------------------------------------------------------------------------|
| Fluid                               |                    | Mineral oil suitable for NBR and FKM seal<br>Phosphate ester for FKM seal                    |
| Degree of contamination             |                    | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |
| Fluid temperature range             | °C                 | -30 to +80 (NBR seal)<br>-20 to +80 (FKM seal)                                               |
| Viscosity range                     | mm <sup>2</sup> /s | 2.8 to 500                                                                                   |
| Operating pressure                  | bar                | 315                                                                                          |
| Max.flow-rate                       | L/min              | 300                                                                                          |
| Flow direction                      |                    | See symbols                                                                                  |
| Crack pressure(free flow direction) | bar                | 3, 5, 7.5, 10                                                                                |
| Area ratio                          |                    | A1/A2=1/11.8 A3/A2=1/2.8<br>(Please refer to page"02/04"for section drawing )                |
| Weight                              | kg                 | 6.8                                                                                          |

Characteristic curves ( Measured at  $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$  , using HLP46)



## Unit dimensions

(Dimensions in mm)



- 1 Valve with version 1 or 2 cracking pressure, check valve in port A and/or port B
- 2 Valve with version 3 or 4 cracking pressure, check valve in port B.
- 3 Valve with version 3 or 4 cracking pressure, check valve in port A.
- 4 Valve with version 3 or 4 cracking pressure, check valve in port A and B
- 5 Name plate
- 6 Mounting holes
- 7 O-rings  
22×2.5 for ports A, B, P, T
- 8 O-rings  
10×2 for ports X, Y, L
- 9 Locating pin
- 10 Locating holes

## Valve mounting screws:

Internal hexagon screw

4-M10 GB/T 70.1-2000

Tightening torque

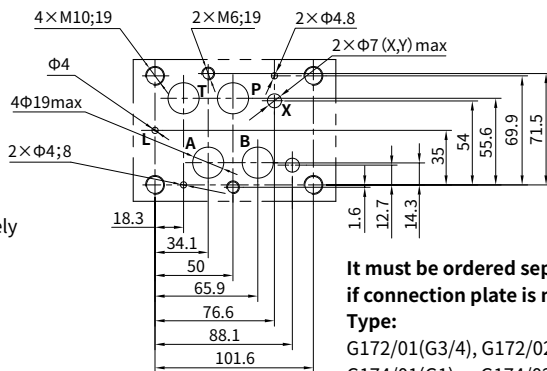
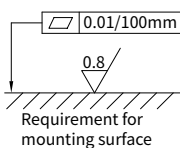
 $M_t=75 \text{ Nm}$ 

2-M6 GB/T 70.1-2000

Tightening torque

 $M_t=15.5 \text{ Nm}$ 

must be ordered separately



**It must be ordered separately  
if connection plate is needed.**

Type:

G172/01(G3/4), G172/02 (M27×2)

G174/01(G1), G174/02(M33×2)

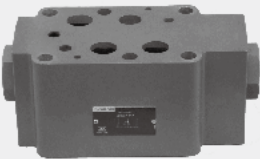


1.13

# Check valve pilot operated

Type Z2S 22...L5X

Size 22  
Up to 315bar  
Up to 450 L/min



## Contents

|                             |    |
|-----------------------------|----|
| Function and configurations | 02 |
| Symbols                     | 02 |
| Ordering code               | 03 |
| Technical data              | 03 |
| Characteristic curves       | 03 |
| Unit dimensions             | 04 |

## Features

- Porting pattern confirms to DIN 24 340
- Leakage-free closure for one or two ports
- Sandwich plate valve, for use in vertical stacking assemblies
- 4 cracking pressures, optional

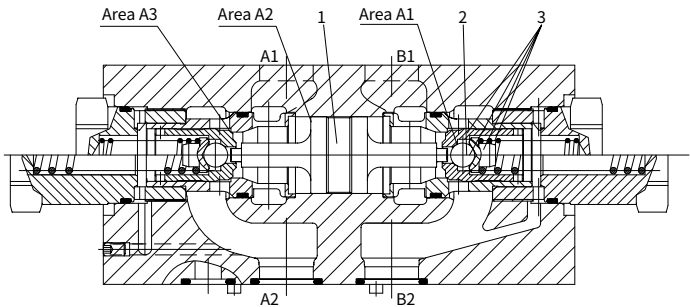
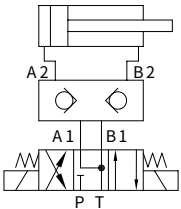
## Function and configuration

Hydraulic pilot operated check valves type Z2S22 are sandwich plate design. They are used for the leakage-free closure of one or two service ports, even for long periods of time. Free flow occurs from A1 to A2 or B1 to B2. Flow in the opposite direction is blocked.

When fluid flows from A1 to A2, the spool (1) is pressurised and is pushed to the right, thereby opening the ball poppet valve (2) which then opens the check valve (3).

In order to make reliable closure of the two check valves in the neutral position, the service ports A1 and B1 of the directional valve must be connected to returning line.

### Circuit example

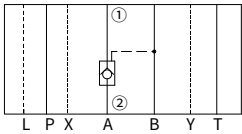


### Z2S22...L5X/...check valve, hydraulic pilot operated

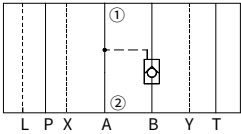
1 Spool      2 Ball poppet valve      3 Check valve

## Symbols ( ① =valve side, ② = sub-plate side)

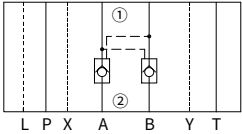
Z2S22A..L5X/...



Z2S22B..L5X/...



Z2S22..L5X/...



Ordering code

Z2S

22

L5X

\*

Check valve,  
hydraulic pilot operated

Nominal size 22 = 22

Check valve in channel A and B = -  
Check valve in channel A = A  
Check valve in channel B = B

Further details in clear text

No code = NBR seals  
V = FKM seals

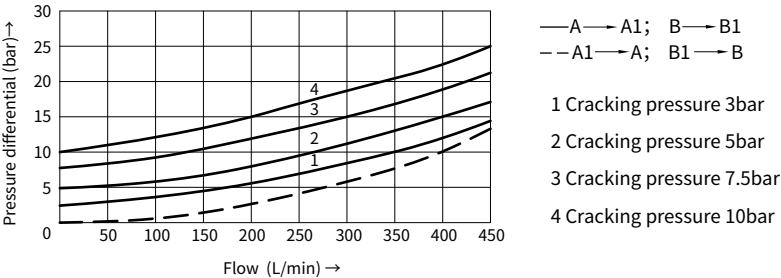
L5X= Series L50 to L59  
(L50 to L59: unchanged installation  
and connection dimensions)

1 = Cracking pressure 3bar  
2 = Cracking pressure 5bar  
3 = Cracking pressure 7.5bar  
4 = Cracking pressure 10bar

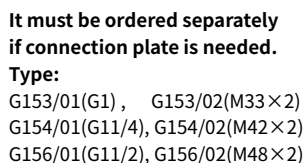
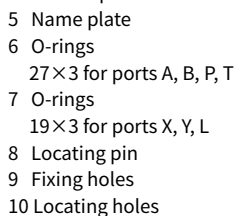
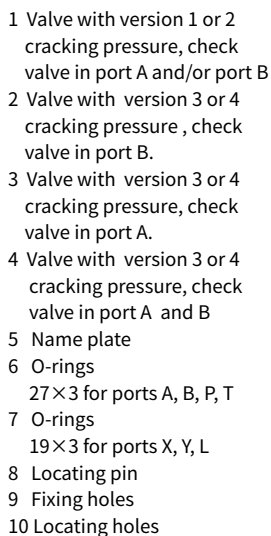
Technical data

|                                     |                                                                                              |                       |
|-------------------------------------|----------------------------------------------------------------------------------------------|-----------------------|
| Fluid                               | Mineral oil suitable for NBR and FKM seal                                                    |                       |
|                                     | Phosphate ester for FKM seal                                                                 |                       |
| Degree of contamination             | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |                       |
| Fluid temperature rang              | °C                                                                                           | -30 to +80 (NBR seal) |
|                                     |                                                                                              | -20 to +80 (FKM seal) |
| Viscosity range                     | mm <sup>2</sup> /s                                                                           | 2.8 to 500            |
| Operating pressure                  | bar                                                                                          | 315                   |
| Max.flow-rate                       | L/min                                                                                        | 450                   |
| Flow direction                      | See symbol                                                                                   |                       |
| Crack pressure(free flow direction) | bar                                                                                          | 3, 5, 7.5, 10         |
| Area ratio                          | A1/A2=1/13.6, A3/A2=1/2.8                                                                    |                       |
| Weight                              | kg                                                                                           | 12.8                  |

Characteristic curves ( Measured at  $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$  , using HLP46)



(Dimensions in mm)

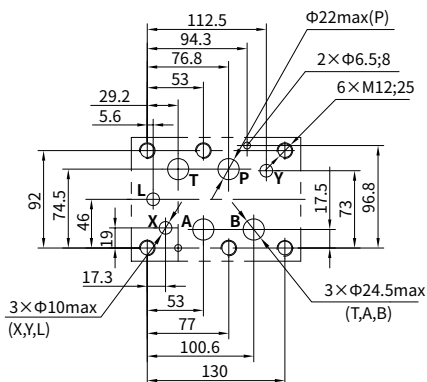


**Valve fixing screws:**

Internal hexagon screw

4-M6 GB/T 70.1-2000

Tightening torque  $M_A=130\text{Nm}$   
must be ordered separately





1.14

# Shuttle valve

## Type KSF...L1X

Sizes 6 and 10  
Up to 350bar  
Up to 60 L/min



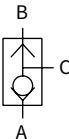
### Contents

|                         |    |
|-------------------------|----|
| Ordering code           | 02 |
| Technical data          | 02 |
| Installation dimensions | 03 |

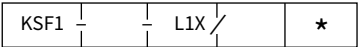
### Features

- For the leakage-free closure
- Cartridge structure for installation in manifolds

### Symbol



Ordering code



Shuttle valve

Size 6 = 6  
Size 10 = 10

Further details in clear text

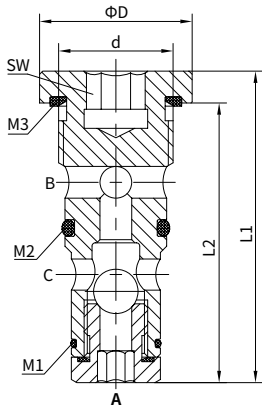
No code = NBR seals  
V = FKM seals

L1X= Series L10 to L19  
(L10 to L19: unchanged installation and connection dimensions)

Technical data

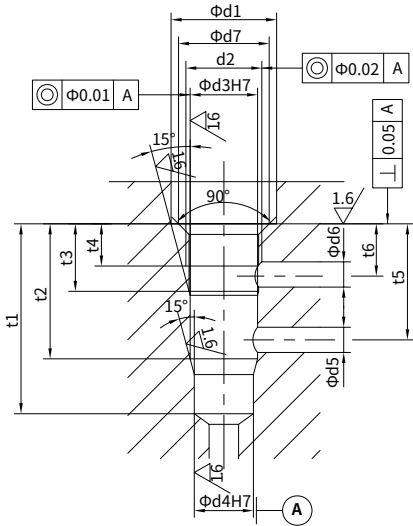
| Size                       | NG6                                                                                          | NG10 |
|----------------------------|----------------------------------------------------------------------------------------------|------|
| Fluid temperature range °C | -30 to +80 (NBR seal)                                                                        |      |
|                            | -20 to +80 (FKM seal)                                                                        |      |
| Viscosity range mm²/s      | Recommendation 30~80, permission 20~380                                                      |      |
| Max.operating pressure bar | 350                                                                                          |      |
| Max.flow-rate L/min        | 40                                                                                           | 60   |
| Weight kg                  | 0.5                                                                                          | 0.8  |
| Fluid                      | Mineral oil suit for NBR and FKM seal                                                        |      |
|                            | Phosphate ester for FKM seal                                                                 |      |
| Degree of contamination    | Maximum permissible degree of fluid contamination:<br>Class 9. NAS 1638 or 20/18/15, ISO4406 |      |

Installation dimensions



| Size | NG6                               | NG10                              |
|------|-----------------------------------|-----------------------------------|
| D    | 24                                | 34                                |
| L1   | 50                                | 74                                |
| d    | M18×1.5                           | M24×1.5                           |
| L2   | 45                                | 66                                |
| SW   | 8                                 | 12                                |
| M1   | O-ring 12×1                       | O-ring 17×1.5                     |
| M2   | O-ring 12×2                       | O-ring 17.3×2.4                   |
| M3   | Pipe connection gasket<br>M18×1.5 | Pipe connection gasket<br>M24×1.5 |

Dimensions of inserted hole



| Size | NG6                | NG10               |
|------|--------------------|--------------------|
| d1   | 25                 | 35                 |
| d2   | M18×1.5            | M24×1.5            |
| d3   | 16                 | 22                 |
| d4   | 14                 | 20                 |
| d5   | 6max               | 9max               |
| d6   | 6max               | 9max               |
| t1   | 46                 | 68                 |
| t2   | 32                 | 51                 |
| t3   | 16                 | 20                 |
| t4   | 10                 | 15                 |
| t5   | 27.5               | 40                 |
| t6   | 12                 | 13.5               |
| d7   | $\Phi 18^{+0.2}_0$ | $\Phi 24^{+0.2}_0$ |

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