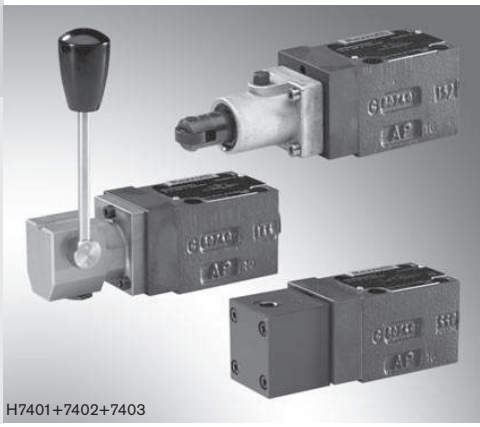
Rexroth
Bosch Group

# 2/2, 3/2 and 4/2 directional seat valve with mechanical, manual or fluidic operation

RE 22340/10.06 1/14

**Type M-.S..**


H7401+7402+7403

Sizes 6 and 10
Component series 3X
Maximum operating pressure 420/630 bar
Maximum flow 40 l/min

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Information on available spare parts:
www.boschrexroth.com/spc

## Features

- Direct operated directional seat valve with mechanical, manual or fluidic operation
- Porting pattern according to DIN 24340 form A (**without** locating bore)
- Reliable operation even after longer time under pressure
- Types of actuation:
  - Mechanical (roller plunger)
  - Manual (hand lever)
  - Hydraulic
  - Pneumatic
- Inductive position switch (contact-free), optional, see RE 24830.

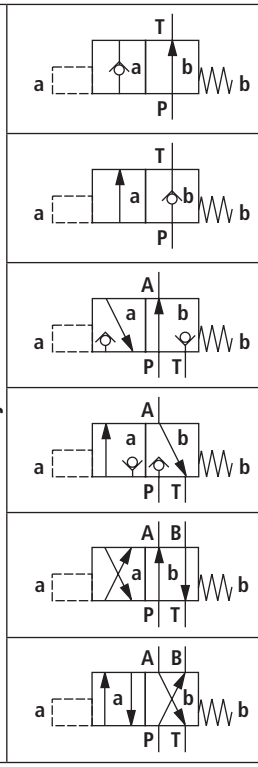
## Ordering code

**M** – | | | | **3X** / | | | | | | *

2 main ports (size 6 only) **= 2**
3 main ports **= 3**
4 main ports **= 4**

Seat valve, direct operated
Hydraulically operated **= SH**
Pneumatcally operated **= SP**
Manually operated (hand lever) **= SMM**
Mechanically operated (roller plunger) **= SMR**

Size 6 **= 6**
Size 10 **= 10**

| Main ports | 2 [1] | 3 | 4 | |
|---|---|---|---|---|
| Symbols  | ● | – | – | **= P** |
| | ● | – | – | **= N** |
| | – | ● | – | **= U** |
| | – | ● | – | **= C** |
| | – | – | ● | **= D** |
| | – | – | ● | **= Y** |
| | ● = Available | | | |

Further details in clear text

**Seal material**
**No code =** NBR seals
**V =** FKM seals
(other seals on enquiry)
⚠ **Important!**
Observe compatibility of seals with hydraulic fluid used!

**No code =** Without check valve insert, without throttle insert
**P =** With check valve insert
**B12 =** Throttle Ø1.2 mm
**B15 =** Throttle Ø1.5 mm
**B18 =** Throttle Ø1.8 mm
**B20 =** Throttle Ø2.0 mm
**B22 =** Throttle Ø2.2 mm
Further orifices on enquiry

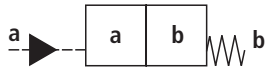
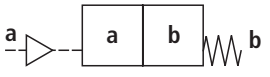
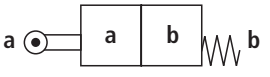
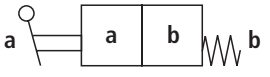
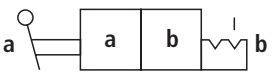
**Additional equipment**
Inductive position switch, see RE 24830
**No code =** Without position switch
**QMAG24 =** Monitored position “a“
**QMBG24 =** Monitored position “b“

**420 =** Operating pressure 420 bar
**630 =** Operating pressure 630 bar

**No code =** Without detent
**F =** With detent (type SMM only)

**3X =** Component series 30 to 39
(30 to 39: unchanged installation and connection dimensions)

## Types of actuation

| **Hydraulic** “SH“ | **Pneumatic** “SP“ | **Roller plunger** “SMR“ | **Hand lever** “SMM“ |
|---|---|---|---|
|  |  |  |  |
| | | | “SMM…F“  |

## Function, section, symbols: 2/2 and 3/2 directional seat valve

**General**

Directional valves of type M-.S are directional seat valves with manual, mechanical or fluidic operation. They control the start, stop and direction of a flow and basically consist of housing (1), actuator (2), a hardened valve system (3) as well as ball/spool (4) as closing body.

**Basic principle**

In the initial position, ball/spool (4) is pressed by spring (7) onto the seat, and in the operated position by the relevant actuator (2). The force of the actuator acts via ball (5) onto the actuating plunger (6), which is sealed on two sides. The chamber between the two seal elements is connected to port P. In this way, valve system (3) is pressure-compensated with regard to the actuating forces (actuator or return spring). The valves can therefore be used for pressures up to 630 bar.

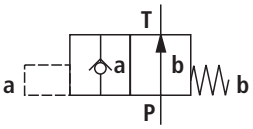
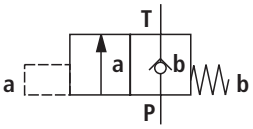
☞ **Note!**

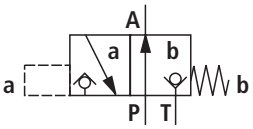
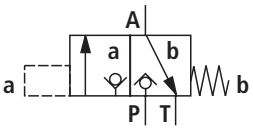
These 3/2 directional seat valves feature a “negative overlap”. Port T must therefore always be connected. This means that during switching - from the start of opening of one valve seat to closing of the other valve seat - ports P-A-T are interconnected. However, this process takes place so quickly that is irrelevant in nearly all applications.

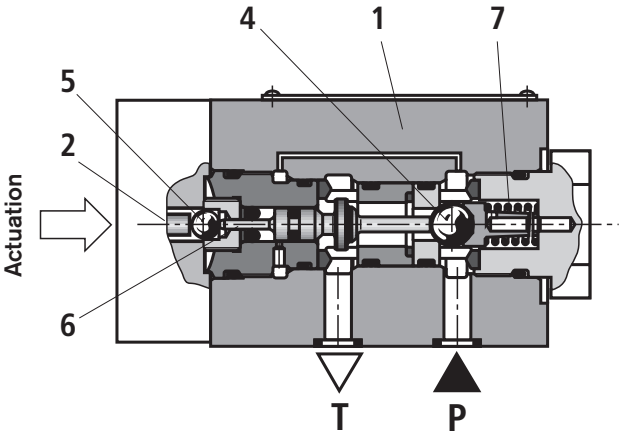
⚠ **Important!**

Care must be taken that the specified maximum flow is not exceeded! If required, a throttle insert must be used to limit the flow (see page 14)

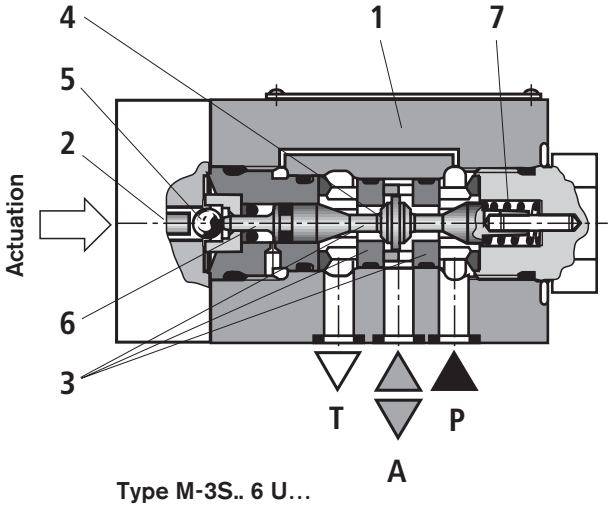
The seat arrangement offers the following possibilities:

| **2/2 directional seat valve** | |
|---|---|
| Symbol “**P**“ |  |
| Initial position | P and T connected |
| Operated position | P blocked |
| Symbol “**N**“ |  |
| Initial position | P blocked |
| Operated position | P and T connected |

| **3/2 directional seat valve** | |
|---|---|
| Symbol “**U**“ |  |
| Initial position | P and A connected,<br>T blocked |
| Operated position | P blocked,<br>A and T connected |
| Symbol “**C**“ |  |
| Initial position | P blocked<br>A and T connected |
| Operated position | P and A connected,<br>T blocked |




**Type M-2S.. 6 N…**




**Type M-3S.. 6 U…**

**For types of actuation, see page 2 and page 13**

## **Function, section, symbols, schematic illustration:** 4/2 directional seat valve

A sandwich plate, a **Plus-1-plate**, installed under the 3/2 directional seat valve can be used to realize the function of a 4/2 directional seat valve.

**Function of the Plus-1-plate:**

**Initial position**

The main valve is not operated. Spring (9) holds ball (4.1) on seat (11). Port P is blocked and A connected to T. Moreover, the pilot line from A is connected to the large area of pilot piston (12) and is therefore relieved to tank. The pressure applied via P now shifts ball (13) onto seat (14). Now, P is connected to B and A to T.

**Transitional position**

When the main valve is operated, spool (4.2) is shifted against spring (9) and pressed onto seat (15). This causes port T to be closed, whereas P, A and B are briefly connected.

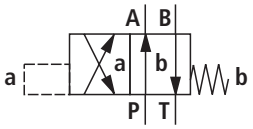
**Operated position**

P is connected to A. Because the pump pressure acts via A on the large area of pilot piston (12) , ball (13) is pressed onto seat (16). B is therefore connected to T and P to A. Ball (13) in the Plus-1-plate has a "positive overlap".

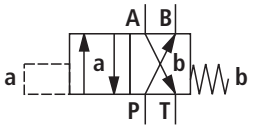
**In order to prevent pressure intensification when single-rod cylinders are used, the annulus chamber of the cylinder must be connected to A.**

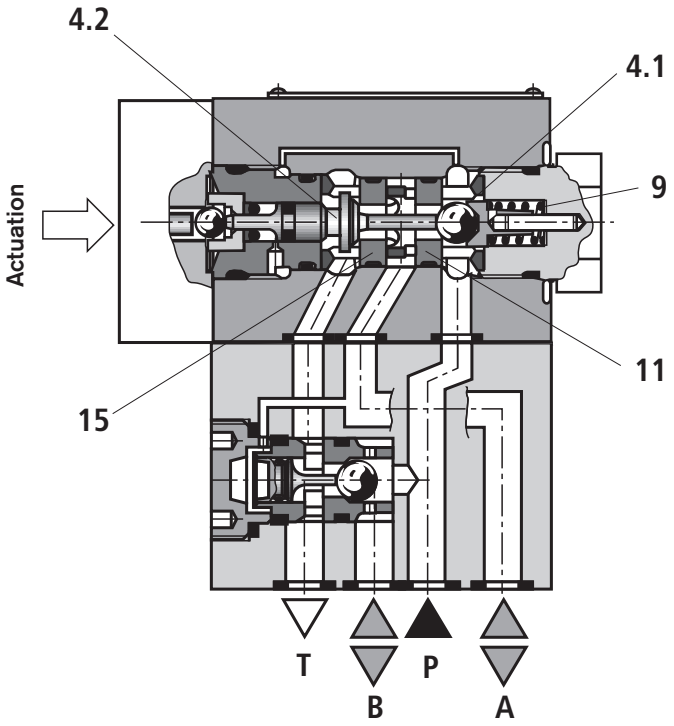
The use of a Plus-1-plate in conjunction with the seat arrangement offers the following possibilities:

**Symbol "D":**



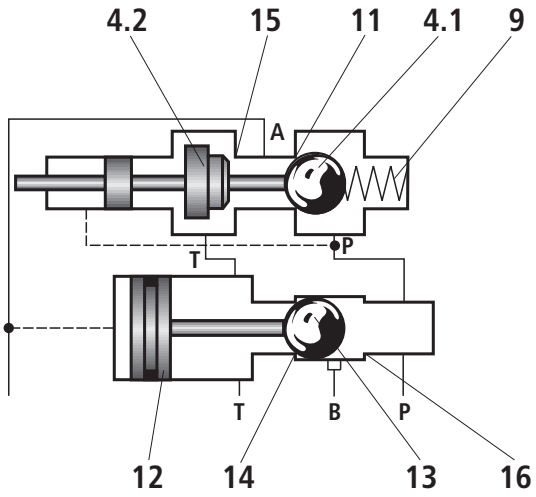

**Symbol "Y":**




**Type M-4S.. 6 Y…**

**Schematic illustration: Initial position**




**For types of actuation, see page 2 and page 13**

## Technical data (for applications outside these parameters, please consult us!)

### General

| Size | | Size | 6 | | | | 10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Type | | | SH | SP | SMR | SMM | SH | SP | SMR | SMM |
| Weight | – 2/2 directional seat valve | kg | 1.5 | 1.5 | 1.5 | 1.5 | – | – | – | – |
| | – 3/2 directional seat valve | kg | 1.5 | 1.5 | 1.5 | 1.5 | 2.45 | 2.45 | 2.45 | 2.45 |
| | – 4/2 directional seat valve | kg | 2.2 | 2.2 | 2.2 | 2.2 | 3.3 | 3.3 | 3.3 | 3.3 |
| Installation orientation | | | Optional | | | | | | | |
| Ambient temperature range | | °C | –30 to +50 (NBR seals)<br>–20 to +50 (FKM seals) | | | | | | | |
| Pilot pressure | – Minimum | bar | 5 | 3 | – | – | 5 | 3 | – | – |
| | – Maximum | bar | 210 | 12 | – | – | 210 | 12 | – | – |
| Actuating force | – Maximum | N | – | – | 250 | 50 | – | – | 250 | 50 |

### Hydraulic

| | | | |
|---|---|---|---|
| Maximum operating pressure | bar | See table on page 8 | |
| Maximum flow | l/min | 25 | 40 |
| Hydraulic fluid | | Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids in enquiry | |
| Hydraulic fluid temperature range | °C | –30 to +80 (NBR seals)<br>–20 to +80 (FKM seals) | |
| Viscosity range | $mm^2/s$ | 2.8 to 500 | |
| Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c) | | Class 20/18/15 [3] | |

[1] Suitable for NBR and FKM seals

[2] Suitable only for FKM seals

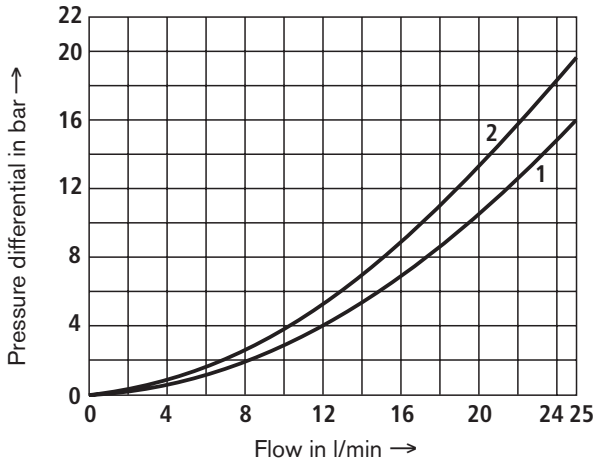
[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

## **Characteristic curves:** Size 6 (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

### $\Delta p$-$q_V$ characteristic curves

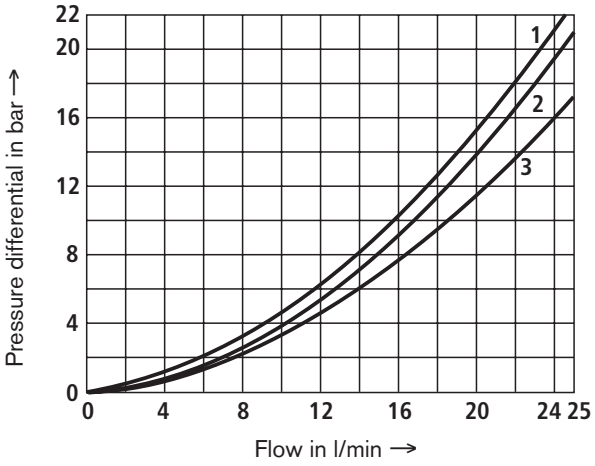
**2/2 directional seat valve**




**1** M-2S.. 6 **N** …, P to T

**2** M-3S.. 6 **P** …, P to T

**3/2 directional seat valve**

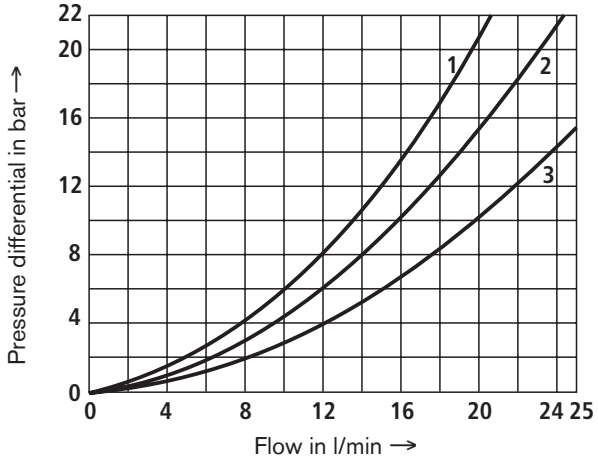



**1** M-3S.. 6 **U** **C** …, A to T

**2** M-3S.. 6 **U** …, P to A

**3** M-3S.. 6 **C** …, P to A

**4/2 directional seat valve**

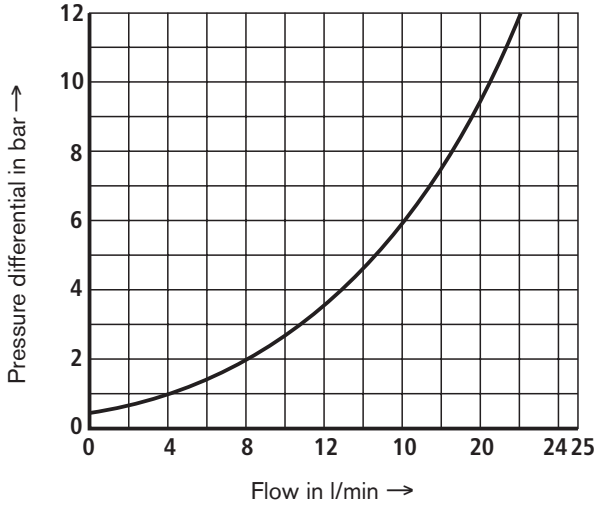



**1** M-4S.. 6 **D** **Y** …, A to T

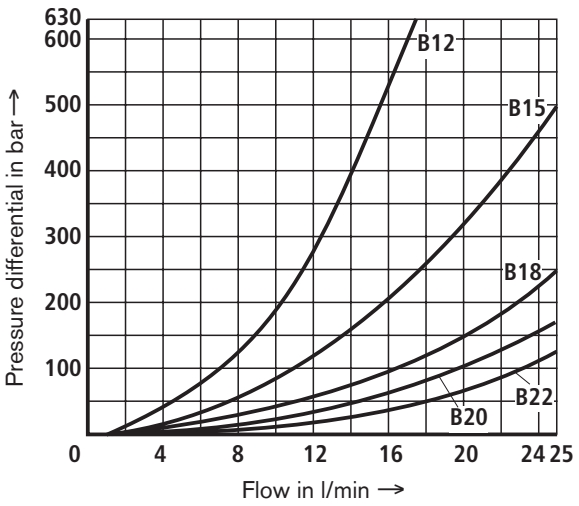
**2** M-4S.. 6 **D** **Y** …, P to A

**3** M-4S.. 6 **D** **Y** …, P to B and B to T

**Check valve insert**



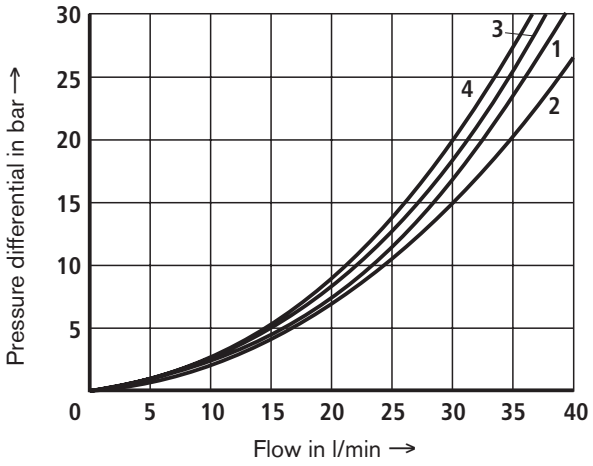

**Throttle insert**



## Characteristic curves: Size 10 (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

### $\Delta p$-$q_V$ characteristic curves

**3/2 directional seat valve**



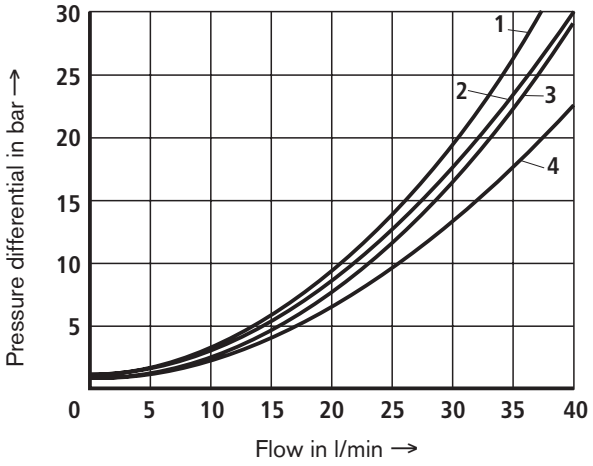

**1** M-3S.. 10 **C** …, P to A

**2** M-3S.. 10 **C** …, A to T

**3** M-3S.. 10 **U** …, P to A

**4** M-3S.. 10 **U** …, A to T

**4/2 directional seat valve**



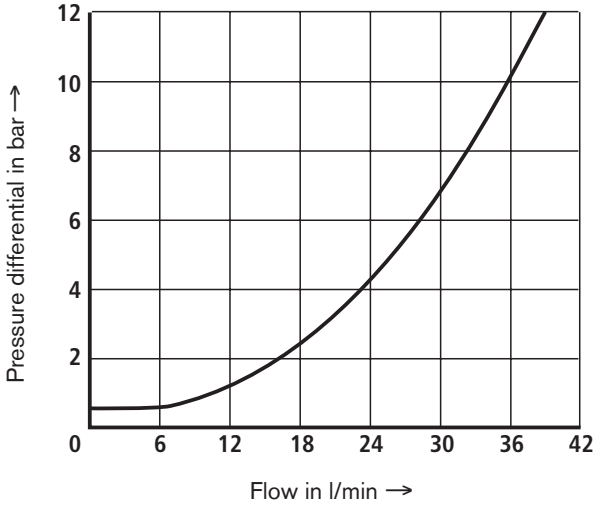

**1** M-4S.. 10 **D** **Y** …, A to T

**2** M-4S.. 10 **D** **Y** …, P to A

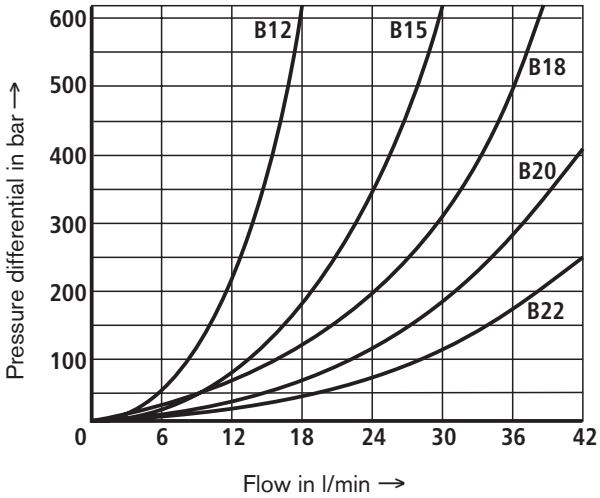
**3** M-4S.. 10 **D** **Y** …, P to B

**4** M-4S.. 10 **D** **Y** …, B to T

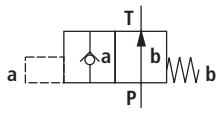
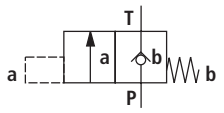
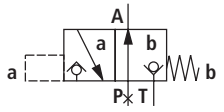
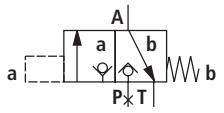
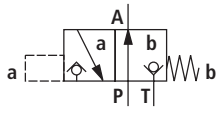
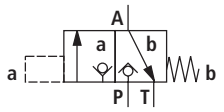
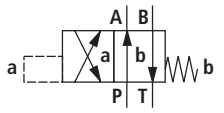
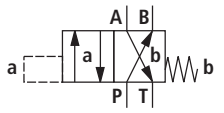
**Check valve insert**




**Throttle insert**



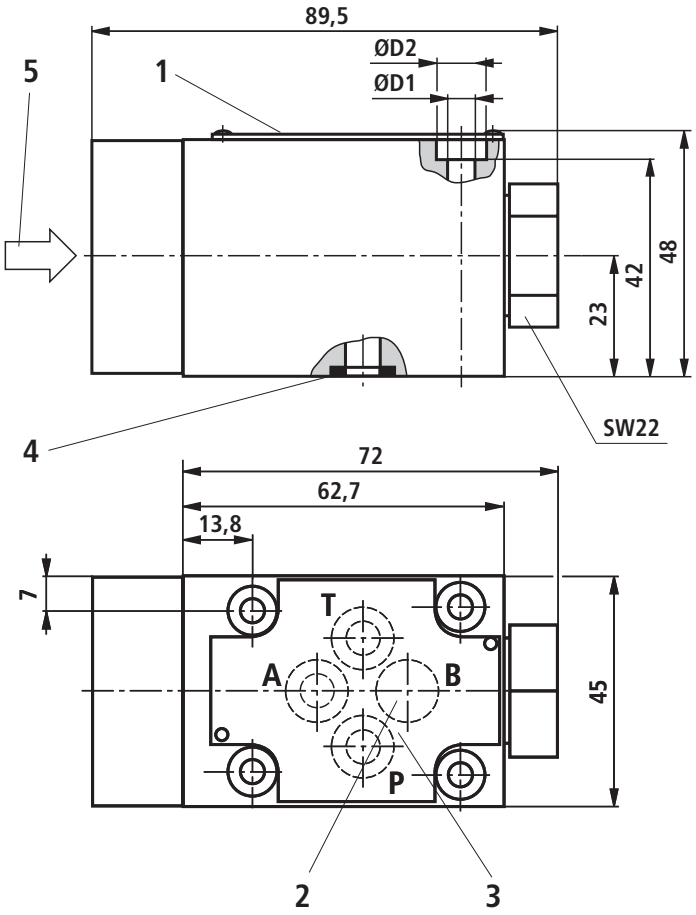
## **Performance limit** (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

| | Symbol | | Remark | Maximum operating pressure in bar | | | | Flow in l/min | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | P | A | B | T | Size 6 | Size 10 |
| **2-way circuit** (2/2 directional seat valve) | **P** |  | $p_P \geq p_T$ | 420/ 630 | | | 100 | 25 | 40 |
| | **N** |  | | 420/ 630 | | | 100 | 25 | 40 |
| **2-way circuit** (3/2 directional seat valve) only as unloding function | **U** |  | Before switching from the initial position to the operated position, pressure must be applied in port A. $p_A \geq p_T$ | | 420/ 630 | | 100 | 25 | 40 |
| | **C** |  | $p_A \geq p_T$ | | 420/ 630 | | 100 | 25 | 40 |
| **3-way circuit** | **U** |  | $p_P \geq p_A \geq p_T$ | 420/ 630 | 420/ 630 | | 100 | 25 | 40 |
| | **C** |  | | 420/ 630 | 420/ 630 | | 100 | 25 | 40 |
| **4-way circuit** (flow possible only in the direction of the arrow!) | **D** |  | 3/2 directional valve (symbol "U") in conjunction with Plus-1-plate: $p_P > p_A \geq p_B > p_T$ | 420/ 630 | 420/ 630 | 420/ 630 | 100 | 25 | 40 |
| | **Y** |  | 3/2 directional valve (symbol "C") in conjunction with Plus-1-plate: $p_P > p_A \geq p_B > p_T$ | 420/ 630 | 420/ 630 | 420/ 630 | 100 | 25 | 40 |

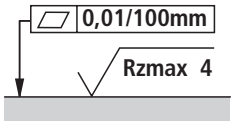
**⚠ Important!**

Please observe the general notes on page 14!

## **Unit dimensions:** 2/2, 3/2 directional seat valve – size 6 (nominal dimensions in mm)




| **Operating pressure** in bar | ØD1 | ØD2 |
|---|---|---|
| 420 | 5,3 | 10 |
| 630 | 6,5 | 11 |




Required surface quality of the valve mounting face

**1** Nameplate

**2** ⚠ **Important!**

– With 3/2 and 4/2 directional seat valves, port B is provided as blind bore on the 420-bar version, and not provided on the 630-bar variant.

**3** Porting pattern to DIN 24340 form A

**4** Seal rings

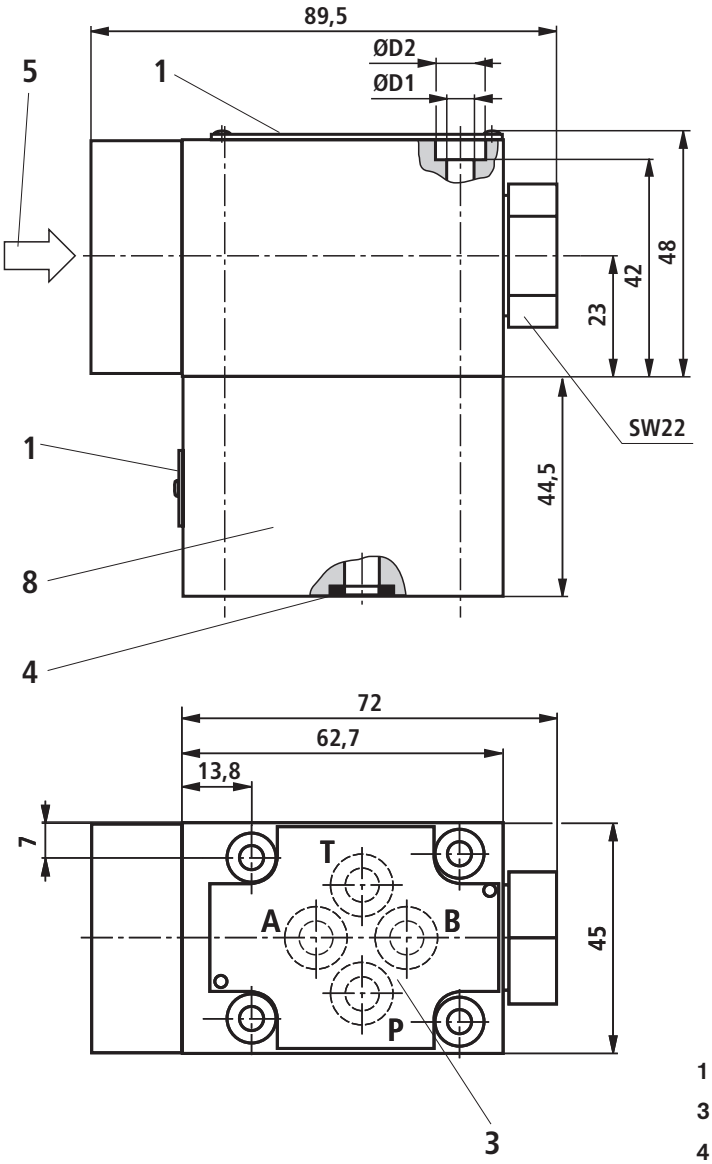
**5** For types of actuation, see page 13

**Valve fixing screws** (separate order)

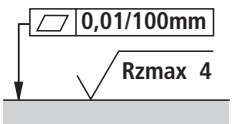
– 420 bar version:
**4 hexagon socket head cap screws ISO 4762 M5 x 50 - 10.9-flZn-240h-L**
(friction coefficient $\mu_{total} = 0.09$ to 0.14);
tightening torque $M_T = 7$ Nm ± 10%,
Material no. **R913000064**

– 630 bar version:
**4 hexagon socket head cap screws ISO 4762 M6 x 50 - 10.9-flZn-240h-L**
(friction coefficient $\mu_{total} = 0.09$ to 0.14);
tightening torque $M_T = 12.5$ Nm ± 10%,
Material no. **R913000151**

## **Unit dimensions:** 4/2 directional seat valve – size 6 (nominal dimensions in mm)




| **Operating pressure** in bar | **ØD1** | **ØD2** |
|---|---|---|
| 420 | 5,3 | 10 |
| 630 | 6,5 | 11 |




Required surface quality of the valve mounting face

**1** Nameplate

**3** Porting pattern to DIN 24340 form A

**4** Seal rings

**5** For types of actuation, see page 13

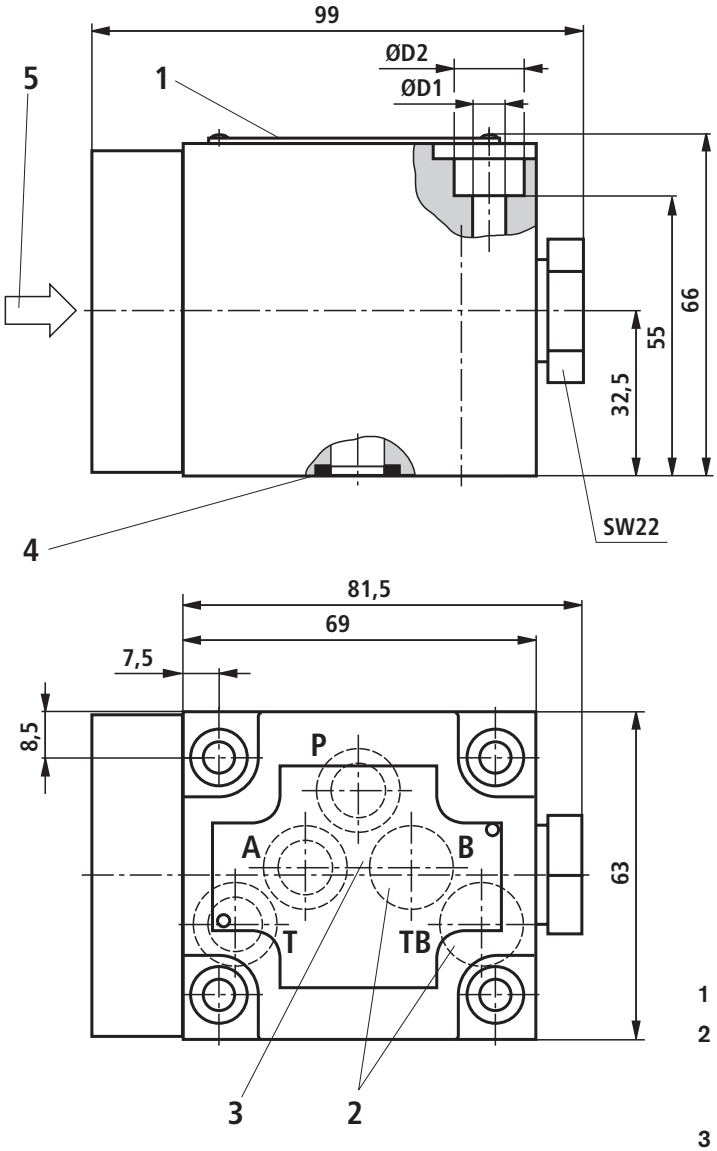
**8** Plus-1-plate

**Valve fixing screws** (included in the scope of supply)

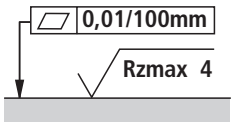
– 420 bar version:
**4 hexagon socket head cap screws**
**ISO 4762 M5 x 95 - 10.9-flZn-240h-L**
(friction coefficient $\mu_{total}$ = 0.09 to 0.14);
tightening torque $M_T$ = 7 Nm ± 10%,
Material no. **R913000223**

– 630 bar version:
**4 hexagon socket head cap screws**
**ISO 4762 M6 x 95 - 10.9-flZn-240h-L**
(friction coefficient $\mu_{total}$ = 0.09 to 0.14);
tightening torque $M_T$ = 12.5 Nm ± 10%,
Material no. **R913000549**

## **Unit dimensions:** 3/2 directional seat valve – size 10 (nominal dimensions in mm)




| **Operating pressure** in bar | **ØD1** | **ØD2** |
|---|---|---|
| 420 | 6.4 | 14 |
| 630 | 8.4 | 14 |




Required surface quality of the valve mounting face

**1** Nameplate

**2** ⚠ **Important!**
On 3/2 directional seat valves, ports B and TB are provided as blind holes.

**3** Porting pattern to DIN 24340 form A

**4** Seal rings

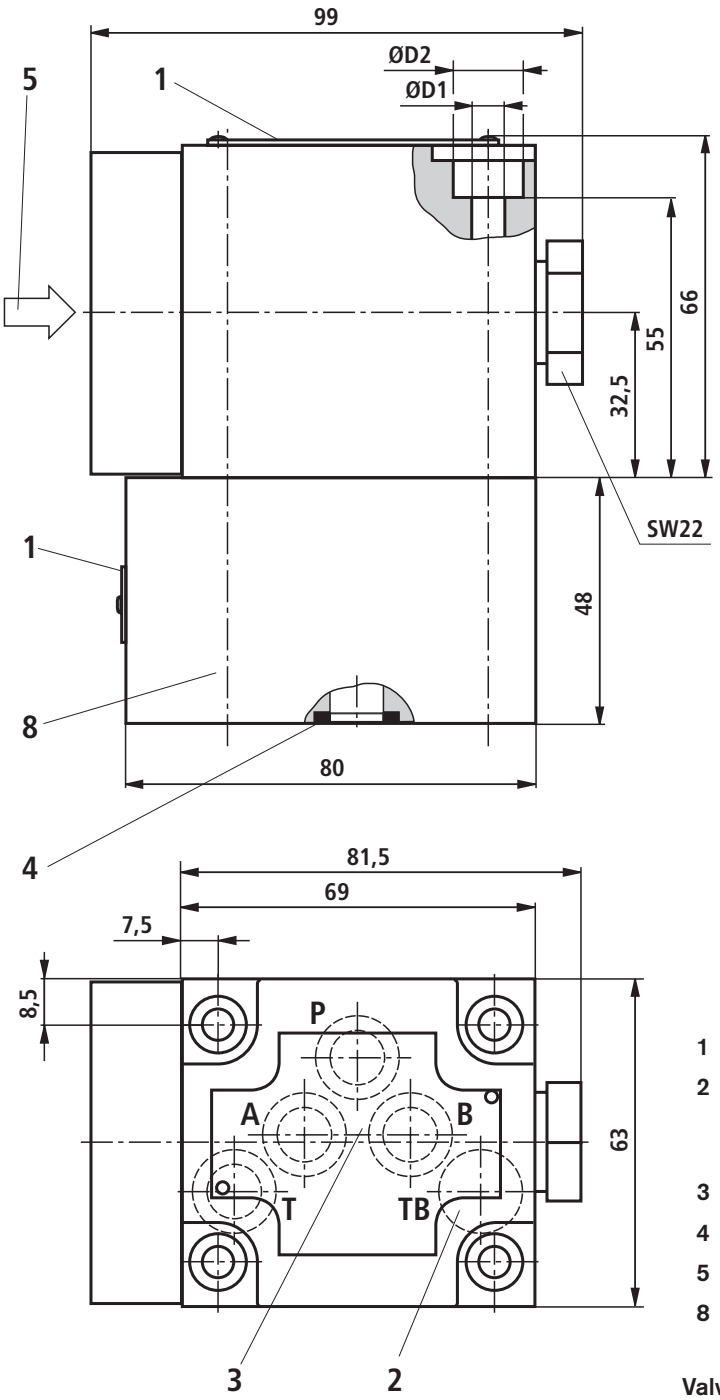
**5** For types of actuation, see page 13

**Valve fixing screws** (separate order)

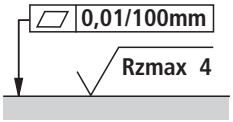
– 420 bar version:
**4 hexagon socket head cap screws ISO 4762 M6 x 65 - 10.9-flZn-240h-L**
(friction coefficient $\mu_{total} = 0.09$ to 0.14);
tightening torque $M_T = 12.5$ Nm ± 10%,
Material no. **R913000127**

– 630 bar version:
**4 hexagon socket head cap screws ISO 4762 M8 x 65 - 10.9-flZn-240h-L**
(friction coefficient $\mu_{total} = 0.09$ to 0.14);
tightening torque $M_T = 30$ Nm ± 10%,
Material no. **R913000368**

## **Unit dimensions:** 4/2 directional seat valve – size 10 (nominal dimensions in mm)




| **Operating pressure** in bar | **ØD1** | **ØD2** |
|---|---|---|
| 420 | 6.4 | 14 |
| 630 | 8.5 | 14 |




Required surface quality of the valve mounting face

**1** Nameplate

**2** ⚠ **Important!**
On 4/2 directional seat valves, port TB is provided as blind hole.

**3** Porting patter to DIN 24340 form A

**4** Seal rings

**5** For types of actuation, see page 13

**8** Plus-1-plate

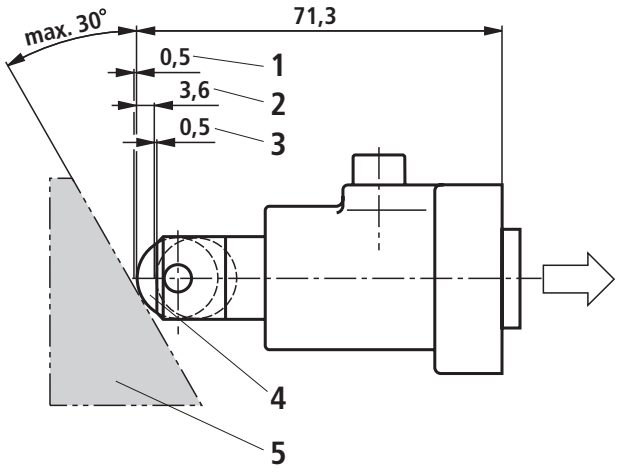
**Valve fixing screws** (included in the scope of supply)

– 420-bar version:
**4 hexagon socket head cap screws**
**ISO 4762 M6 x 115 - 10.9-flZn-240h-L**
(friction coefficient $\mu_{total}$ = 0.09 to 0.14);
tightening torque $M_T$ = 12.5 Nm ± 10%,
Material no. **R900018811**

– 630 bar version:
**4 hexagon socket head cap screws**
**ISO 4762 M8 x 115 - 10.9-flZn-240h-L**
(friction coefficient $\mu_{total}$ = 0.09 to 0.14);
tightening torque $M_T$ = 30 Nm ± 10%,
Material no. **R913000368**

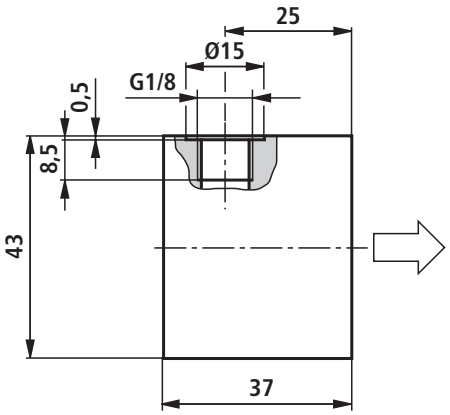
## **Unit dimensions:** Types of actuation (nominal dimensions in mm)

### Type M-.SMR…

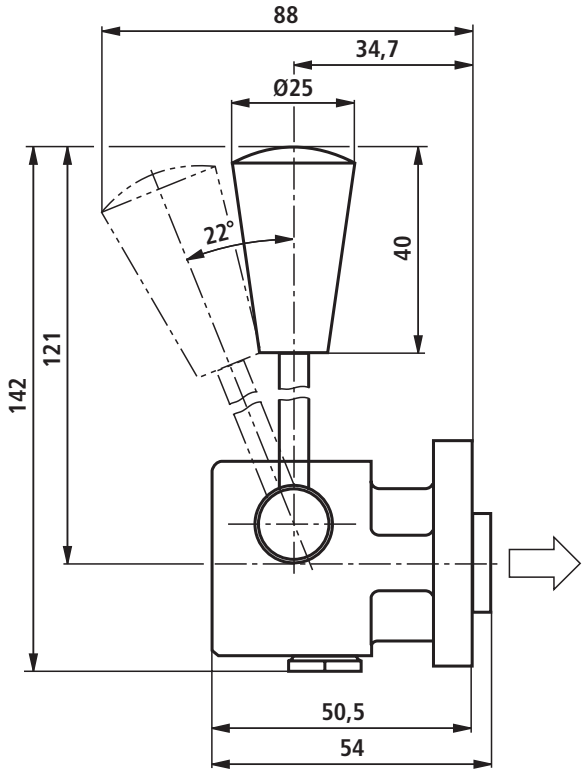



1 Idle stroke
2 Working stroke
3 Overtravel
4 Roller width 6 mm
5 Start-up angle in both directions

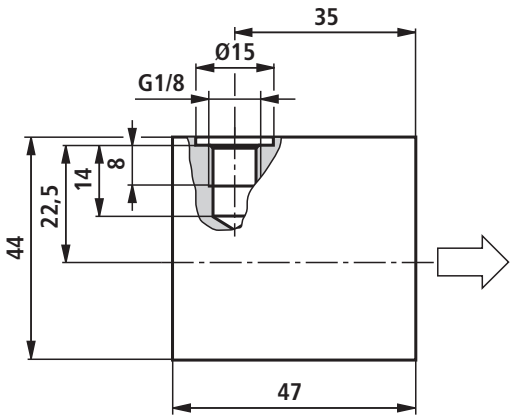
### Type M-.SH…




### Type M-.SMM…




### Type M-.SP…



## Throttle insert

The use of a throttle insert is required, if, due to given operating conditions, flows can occur during switching operations, which exceed the performance limit of the valve.

Examples:

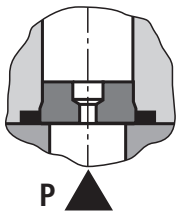
– Accumulator operation,
– Use as pilot valve with internal pilot oil tapping.

**2/2 and 3/2 directional seat valve** (see page 3)

The throttle insert must be plugged into port P of the directional seat valve.

**4/2 directional seat valve** (see page 4)

The throttle insert must be plugged into port P of the Plus-1-plate.




## Check valve insert

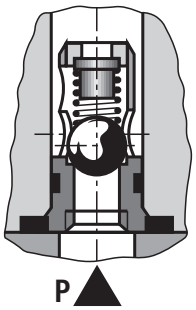
The check valve insert allows a free fluid flow from P to A and provides leak-free closure from A to P.

**2/2 and 3/2 directional seat valve** (see page 3)

The check valve insert must be plugged into port A of the seat valve.

**4/2 directional seat valve** (see page 4)

The check valve insert must be plugged into port P of the Plus-1-plate.




## General notes

Seat valves can be used according to the spool symbols and the assigned operating pressures and flows (see performance limits on page 8).

To ensure proper functioning, the points below must in any case be observed:

– To allow the reliable operation of the valve or holding it in the operated position, the pressure must be $p_P \geq p_A \geq p_T$ (for design reasons).
– Seat valves feature a negative overlap, i.e. during the switching operation, leakage oil incurs. This process takes place within such a short time that it is irrelevant in nearly all applications.
– The specified maximum flow must not be exceeded (if required, install a throttle insert to limit the flow)!

**Plus-1-plate:**

– When using the Plus-1-plate (4/2 directional function) the following lower operating values must be observed: $p_{min} = 8$ bar; $q_V > 3$ l/min.
– Ports P, A, B and T are clearly determined according to their functions. They must not be exchanged or plugged!
– In the 3- and 4-way position, port T must always be connected.
– The fluid flow is only permitted in the direction of the arrow!

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