

Directional seat valves, direct operated, with solenoid actuation

Type SEW

RE 22058

Edition: 2013-06

Replaces: 07.09



H7383

- ▶ Size 6
- ▶ Component series 3X
- ▶ Maximum operating pressure 420/630 bar [6100/9150 psi]
- ▶ Maximum flow 25 l/min [6.6 gpm]

Features

- ▶ 2/2, 3/2 or 4/2 directional design
- ▶ Porting pattern according to DIN 24340 form A
- ▶ Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03
- ▶ Air-gap DC solenoids with detachable coil
- ▶ Solenoid coil can be rotated by 90°
- ▶ The coil can be changed without having to open the pressure-tight chamber
- ▶ Electrical connection as individual connection
- ▶ Manual override, optional
- ▶ Inductive position switch and proximity sensors (contactless)

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Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
M	-	SEW	6		3X	/		M			K4	/			*

01	Mineral oil	M
02	2 main ports	2
	3 main ports	3
	4 main ports	4
03	Seat valve, direct operated	SEW
04	Size 6	6

05	Symbols	Main ports			● = available
		2	3	4	
		●	-	-	P
		●	-	-	N
		-	●	-	U
		-	●	-	C
		-	-	●	D
		-	-	●	Y

06	Component series 30 to 39 (30 to 39: Unchanged installation and connection dimensions)	3X
07	Operating pressure 420 bar [6100 psi]	420
	Operating pressure 630 bar [9150 psi]	630

AC voltage mains (admissible voltage tolerance ±10%)	Nominal voltage of the DC solenoid in case of operation with alternating voltage	Ordering code
110 V - 50/60 Hz	96 V	G96
120 V - 60 Hz	110 V	G110
230 V - 50/60 Hz	205 V	G205

Notice! Preferred types and standard units are contained in the EPS (standard price list).

Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
M	-	SEW	6		3X	/		M		K4		/			*

08	High-power (air-gap) solenoid with detachable coil	M
09	Direct voltage 24 V	G24
	Direct voltage 205 V	G205
	Direct voltage 96 V	G96
	Connection to AC voltage mains via control with rectifier (see pages 2 and 13). For further ordering codes for other voltages, see page 7	
10	With concealed manual override (standard)	N9
	Without manual override	no code

Electrical connection

11	Without mating connector; connector DIN EN 175301-803	K4 ¹⁾
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Spool position monitoring

12	Without position switch	no code
	- Inductive position switch type QM	
	Monitored spool position "a"	QMAG24 ²⁾
	Monitored spool position "b"	QMBG24 ²⁾
	For more information, see data sheet 24830	
13	Without check valve insert, without throttle insert	no code
	With check valve insert	P
	Throttle Ø: 1.2 mm [0.047 inch]	B12
	Throttle Ø: 1.5 mm [0.059 inch]	B15
	Throttle Ø: 1.8 mm [0.071 inch]	B18
	Throttle Ø: 2.0 mm [0.079 inch]	B20
	Throttle Ø: 2.2 mm [0.087 inch]	B22
	Other orifices on request	

Seal material

14	NBR seals	no code
	FKM seals	V
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals on request)	
15	Without locating hole	no code
	With locating hole and locking pin ISO 8752-3x8-St	/62
16	Further details in the plain text	

¹⁾ For mating connectors, separate order, see page 13.

²⁾ Only version "420"

Notice!

For other types of actuation (e.g. pneumatic, hydraulic, rotary knob, rotary knob with lock, stylus, hand lever, roller actuation), see data sheet 22340 or inquire with us.

Function, sections, symbols: 2/2 and 3/2 directional seat valve

General

The SEW type directional valve is a directional seat valve with solenoid actuation. It controls start, stop and flow direction.

The valve basically consists of the housing (1), the solenoid (2), the hardened valve system (3) as well as the ball/spool (4) as closing element.

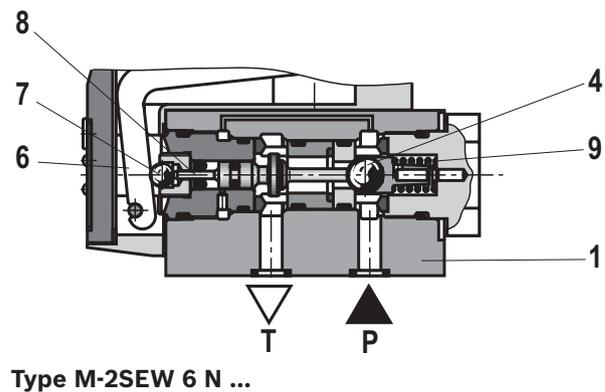
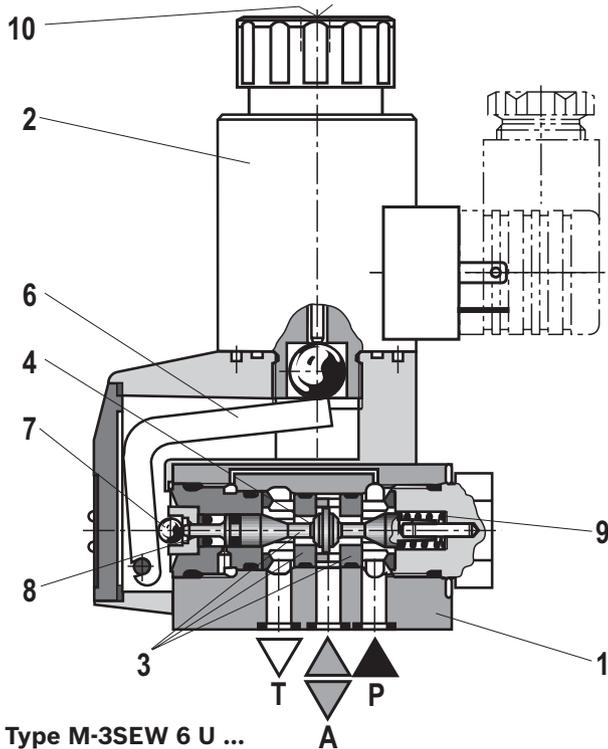
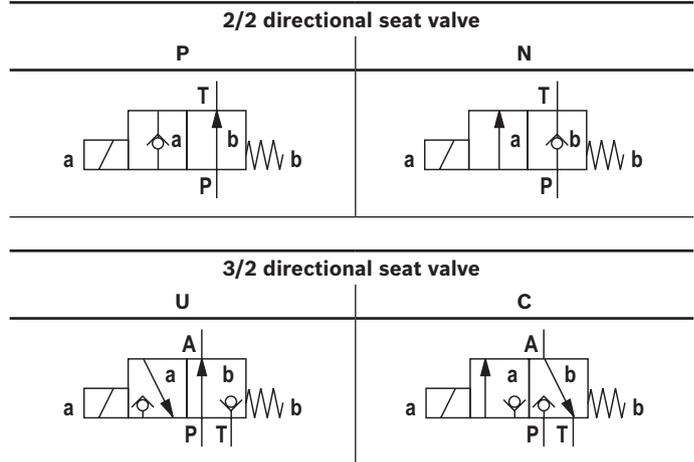
Basic principle

In the initial position, the ball/the spool (4) is pressed onto the seat by the spring (9) and in the switching position by the solenoid (2). The force of the solenoid (2) acts via the angled lever (6) and the ball (7) on the actuating plunger (8) that is sealed on two sides. The chamber between the two sealing elements is connected to port P. Therefore, the valve system (3) is pressure-compensated in relation to the actuating forces (solenoid or return spring). This means the valves can be used up to 630 bar.

Notices!

- ▶ 3/2 directional seat valves feature "negative spool overlap". Therefore, port T must always be connected. That means that during the switching process – from the starting of the opening of one valve seat to the closing of the other valve seat – ports P–A–T are connected with each other. However, this process takes place within such a short time that it is irrelevant in nearly all applications.
- ▶ The manual override (10) allows for the switching of the valve without solenoid energization.
- ▶ **Make sure that the specified maximum flow is not exceeded! Use a throttle insert for limiting the flow, if necessary (see page 13).**

Symbols



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

With a sandwich plate, the **Plus-1 plate**, under the 3/2 directional seat valve, the function of a 4/2 directional seat valve is achieved.

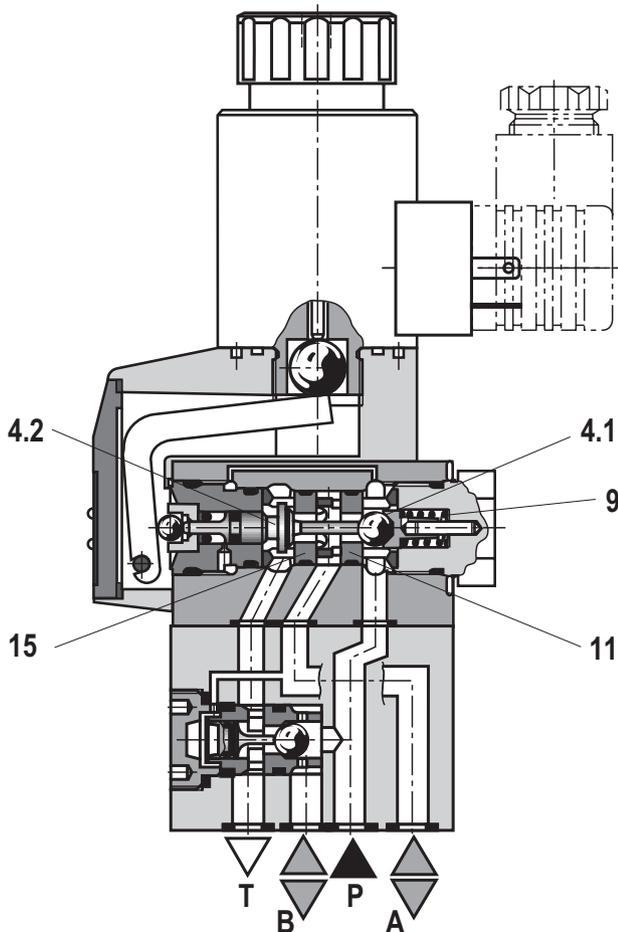
Function of the Plus-1 plate

- ▶ **Initial position:**
The main valve is not actuated. The spring (9) holds the ball (4.1) on the seat (11). Port P is blocked and A is connected to T. Apart from that, one pilot line is connected from A to the large area of the control spool (12), which is thus unloaded to the tank. The pressure applied via P now pushes the ball (13) onto the seat (14). Now, P is connected to B, and A to T.
- ▶ **Transition position:**
When the main valve is actuated, the spool (4.2) is shifted against the spring (9) and pressed onto the seat (15). Port T is closed; P, A, and B are briefly connected to each other.

- ▶ **Spool position:**
P is connected to A. As the pump pressure acts via A on the large area of the control spool (12), the ball (13) is pressed onto the seat (16). Therefore, B is connected to T, and P to A. The ball (13) in the Plus-1 plate has a "positive spool overlap".

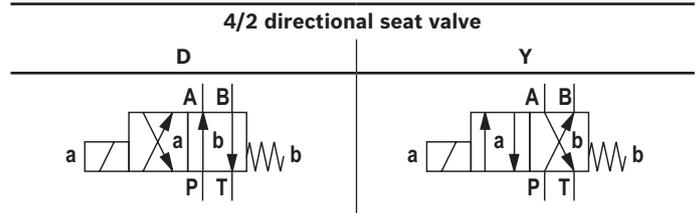
Notice!

If the annulus area of differential cylinders is not connected to port A, a pressure peak is created in port B during the switching process due to the pressure intensification. This pressure peak may exceed the maximum operating pressure over the permissible limit.

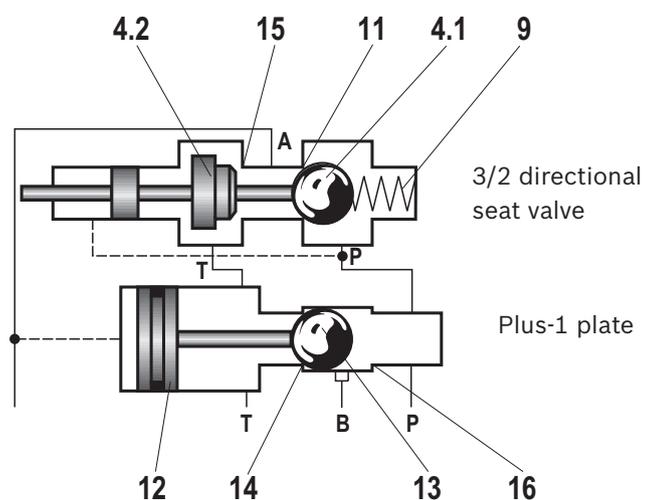


Type M-4SEW 6 Y ...

Symbols



Schematic illustration: Initial position



Technical data

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

general			
Weight	- 2/2 directional seat valve	kg [lbs]	1.5 [3.3]
	- 3/2 directional seat valve	kg [lbs]	1.5 [3.3]
	- 4/2 directional seat valve	kg [lbs]	2.3 [5.1]
Installation position		Any	
Ambient temperature range		°C [°F]	-30 ... +50 [-22 ... +122] (NBR seals) -20 ... +50 [-4 ... +122] (FKM seals)

hydraulic			
Maximum operating pressure	bar [psi]	See performance limit on page 9	
Maximum flow	l/min [gpm]	25 [6.6]	
Hydraulic fluid	See table below		
Hydraulic fluid temperature range	°C [°F]	-30 ... +80 [-22 ... +176] (NBR seals) -20 ... +80 [-4 ... +176] (FKM seals)	
Viscosity range	mm ² /s [SUS]	2.8 ... 500 [35 ... 2320]	
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 ¹⁾	

Hydraulic fluid	Classification	Suitable sealing materials	Standards
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	- insoluble in water	HETG	VDMA 24568
		HEES	
	- soluble in water	HEPG	VDMA 24568
Flame-resistant	- water-free	HFDU, HFDR	ISO 12922
	- containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR ISO 12922

Important information on hydraulic fluids!

- ▶ For more information and data on the use of other hydraulic fluids, refer to data sheet 90220 or contact us.
- ▶ There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- ▶ The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.

▶ Flame-resistant – containing water:

- Maximum pressure difference per control edge 50 bar
- Pressure pre-loading at the tank port > 20% of the pressure differential, otherwise increased cavitation
- Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%

¹⁾ The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter.

Technical data

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

electric			
Voltage type		Direct voltage	Alternating voltage
Available voltages ²⁾	V	12, 24 , 42, 96, 110, 205, 220	Only possible with rectifier (see page 13)
Voltage tolerance (nominal voltage)	%	±10	
Power consumption	W	30	
Duty cycle	%	100	
Switching time according to ISO 6403	- ON	ms	25 to 40 (without rectifier) 30 to 55 (with rectifier)
	- OFF		10 to 15 (without rectifier) 35 to 55 (with rectifier)
Maximum switching frequency	- Operating pressure ≤ 350 bar	1/h	15000
	- Operating pressure > 350 bar	1/h	3600
Protection class according to DIN EN 60529		IP 65 (with mating connector mounted and locked)	
Maximum surface temperature of the coil ³⁾	°C [°F]	120 [248]	

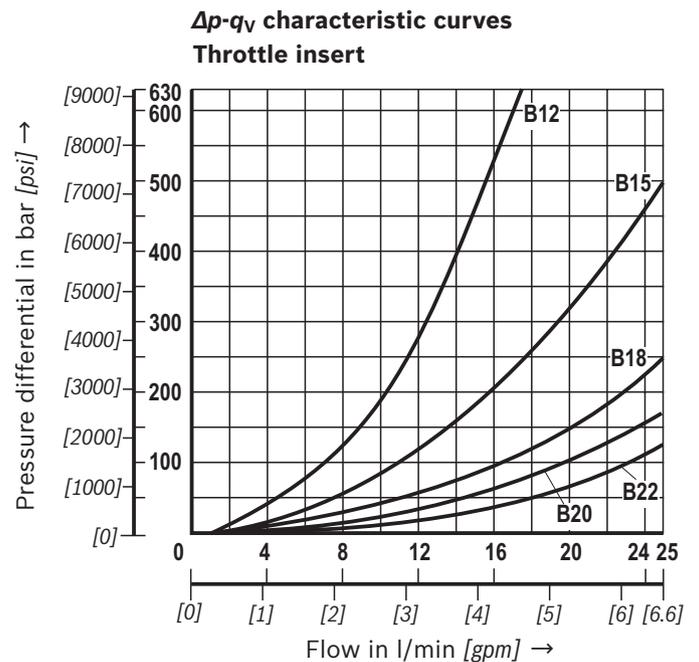
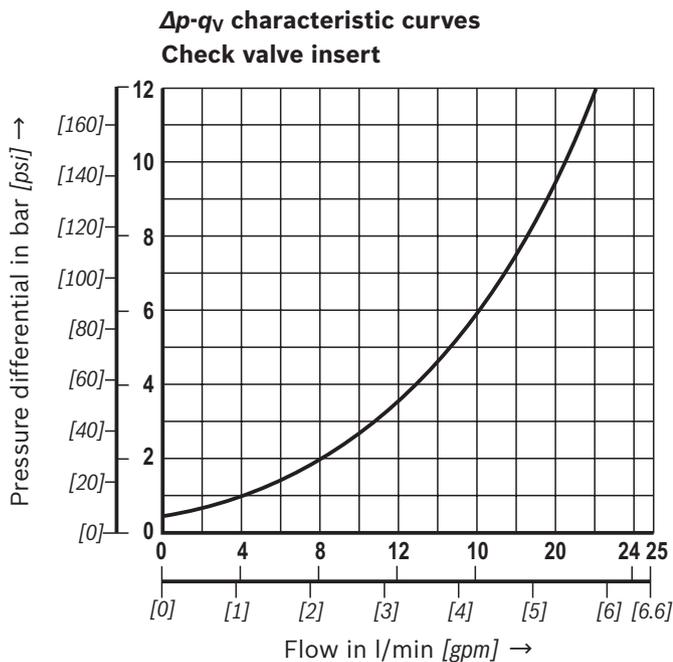
²⁾ Special voltages on request

³⁾ Possible surface temperature > 50 °C, provide contact protection.

When establishing the electrical connection, the protective grounding conductor (PE \perp) has to be connected correctly.

Characteristic curves

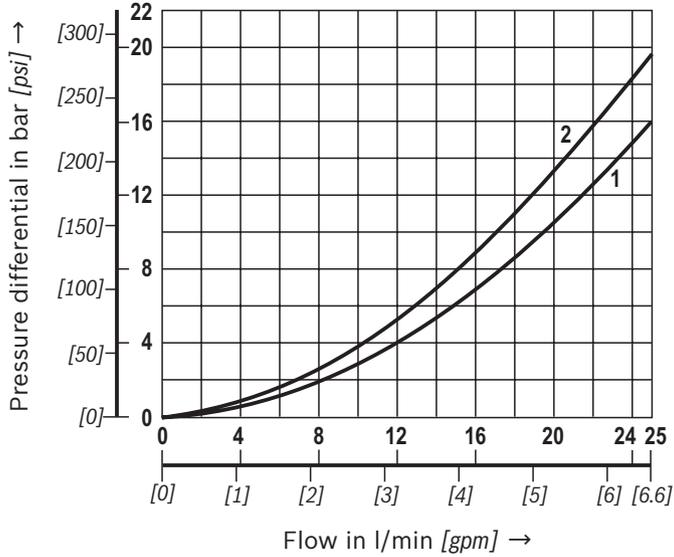
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ °C}$ [$104 \pm 9 \text{ °F}$])



Characteristic curves

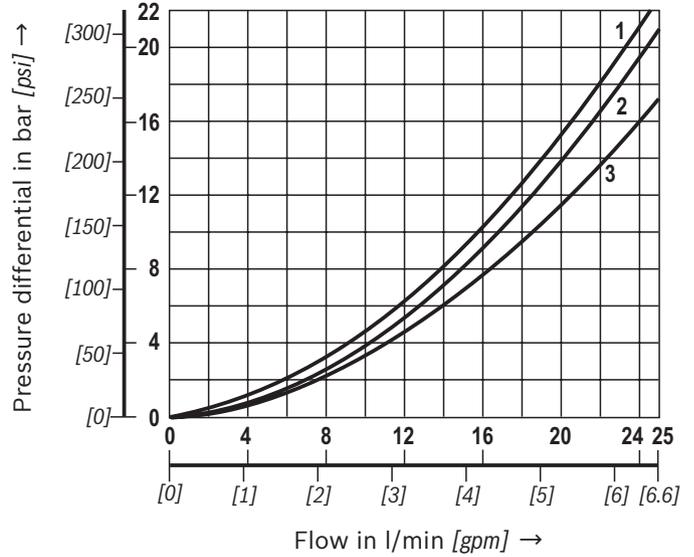
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ [$104 \pm 9 \text{ }^\circ\text{F}$])

**Δp - q_v characteristic curves
2/2 directional seat valve**



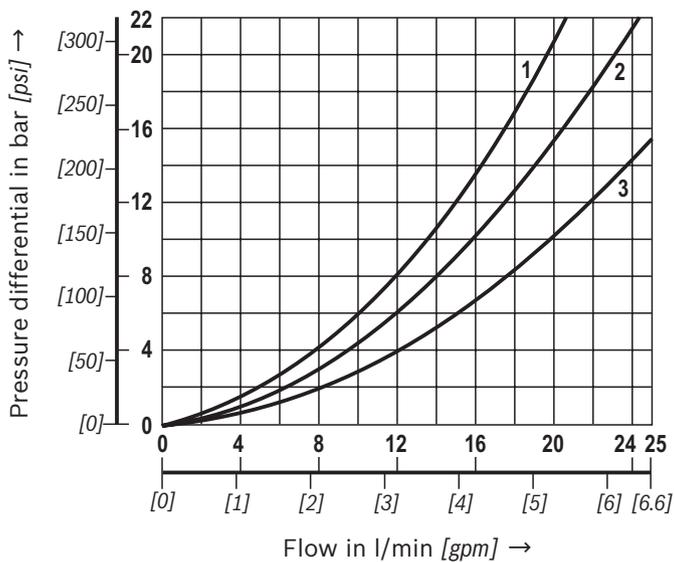
- 1 M-2SEW 6 N ..., P to T
- 2 M-3SEW 6 P ..., P to T

**Δp - q_v characteristic curves
3/2 directional seat valve**



- 1 M-3SEW 6 U C ..., A to T
- 2 M-3SEW 6 U ..., P to A
- 3 M-3SEW 6 C ..., P to A

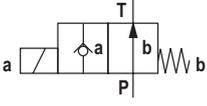
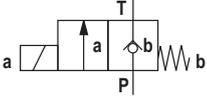
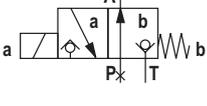
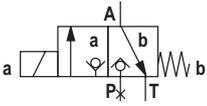
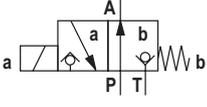
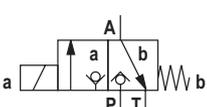
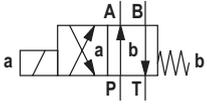
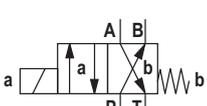
**Δp - q_v characteristic curves
4/2 directional seat valve**



- 1 M-4SEW 6 D Y ..., A to T
- 2 M-4SEW 6 D Y ..., P to A
- 3 M-4SEW 6 D Y ..., P to B and B to T

Performance limit

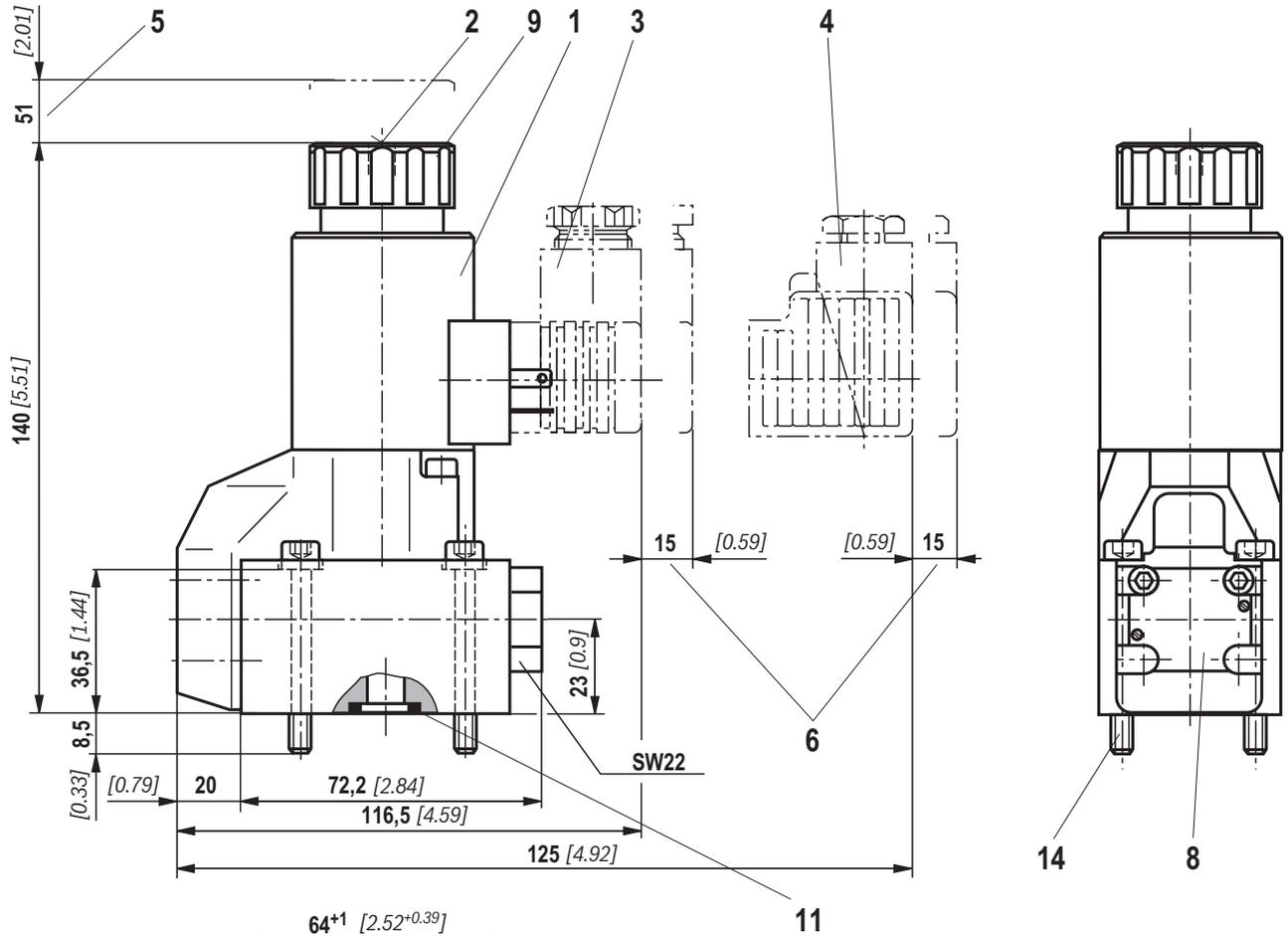
 (measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ [104 ± 9 °F])

	Symbol	Comment	Maximum operating pressure in bar [psi]				Flow in l/min [gpm]
			P	A	B	T	
2-way circuit (2/2 directional seat valve)	P 	$p_P \geq p_T$	420/630 [6100/ 9150]			100 [1450]	25 [6.6]
	N 		420/630 [6100/ 9150]			100 [1450]	25 [6.6]
2-way circuit (3/2 directional seat valve) only for unloading	U 	Before switching from the initial position to the spool position, pressure must be applied to port A. $p_A \geq p_T$		420/630 [6100/ 9150]		100 [1450]	25 [6.6]
	C 	$p_A \geq p_T$		420/630 [6100/ 9150]		100 [1450]	25 [6.6]
3-way circuit	U 	$p_P \geq p_A \geq p_T$	420/630 [6100/ 9150]	420/630 [6100/ 9150]		100 [1450]	25 [6.6]
	C 		420/630 [6100/ 9150]	420/630 [6100/ 9150]		100 [1450]	25 [6.6]
4-way circuit (flow only possible in the direction of arrow)	D 	3/2 directional valve (symbol "U") in connection with Plus-1 plate: $p_P > p_A \geq p_B > p_T$	420/630 [6100/ 9150]	420/630 [6100/ 9150]	420/630 [6100/ 9150]	100 [1450]	25 [6.6]
	Y 	3/2 directional valve (symbol "C") in connection with Plus-1 plate: $p_P > p_A \geq p_B > p_T$	420/630 [6100/ 9150]	420/630 [6100/ 9150]	420/630 [6100/ 9150]	100 [1450]	25 [6.6]

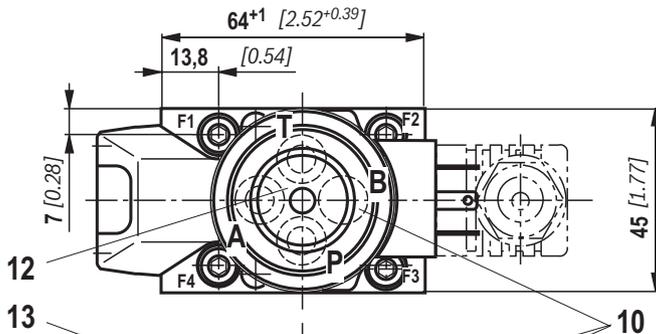
Notice!

- ▶ Please observe the general information on page 14.
- ▶ The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank pre-loading.

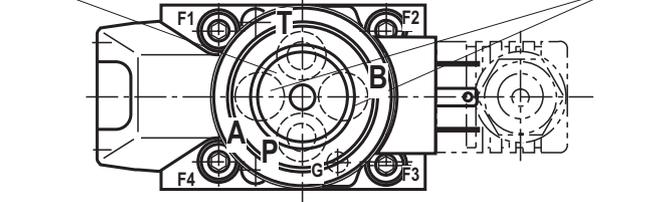
Dimensions: 2/2 directional seat valve and 3/2 directional seat valve
(dimensions in mm [inch])



3/2 directional seat valve



2/2 directional seat valve



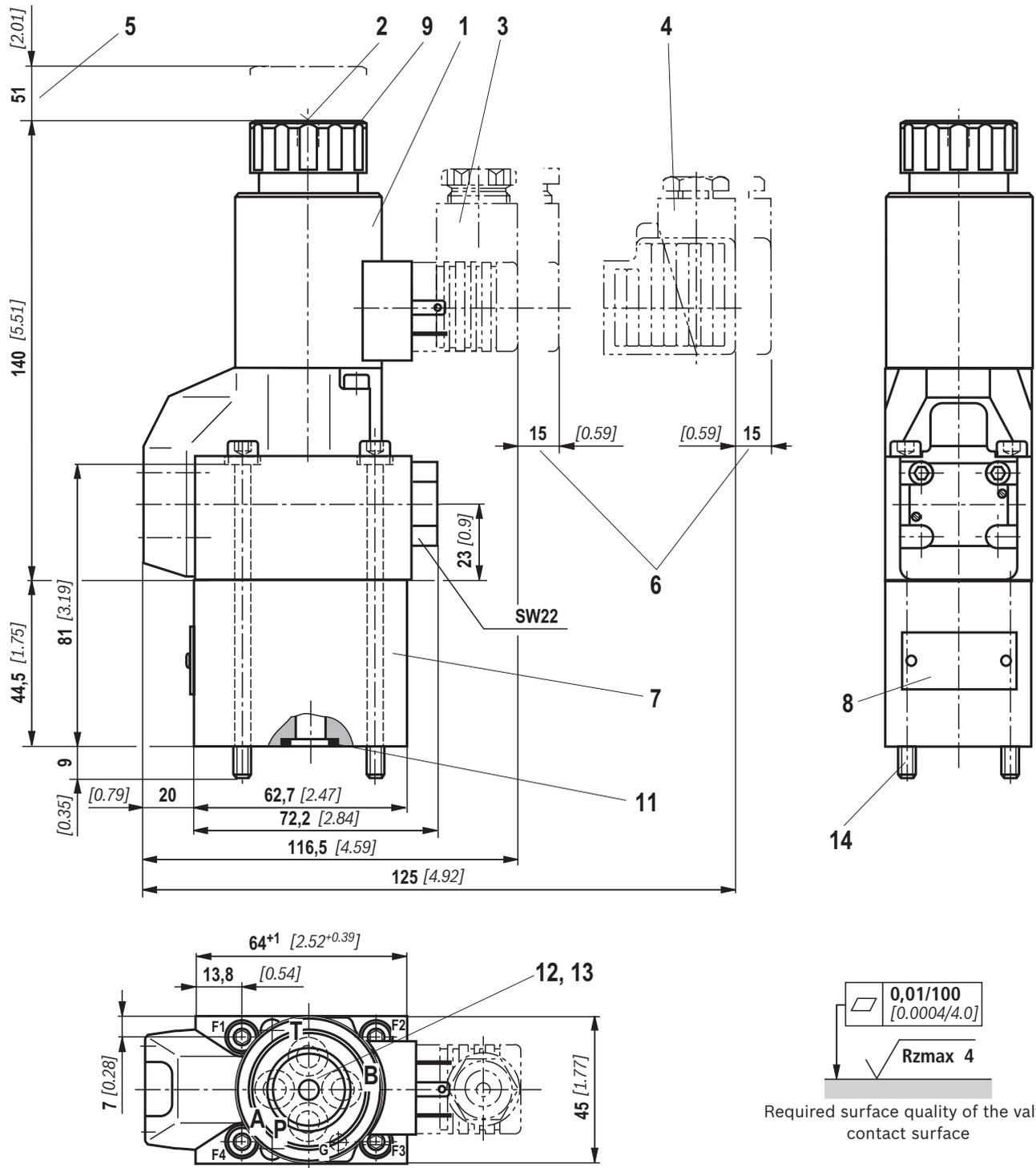
0,01/100
[0.0004/4.0]

Rzmax 4

Required surface quality of the valve contact surface

For item explanations and valve mounting screws, see page 12.

Dimensions: 4/2 directional seat valve
(dimensions in mm [inch])



For item explanations and valve mounting screws,
see page 12.

Dimensions

- 1 Solenoid "a"
- 2 Concealed manual override "N9"
- 3 Mating connector **without** circuitry (separate order, see page 13)
- 4 Mating connector **with** circuitry (separate order, see page 13)
- 5 Space required to remove the coil
- 6 Space required for removing the mating connector
- 7 Plus-1 plate
- 8 Name plate
- 9 Mounting nut, tightening torque $M_A = 4 \text{ Nm}$ [2.95 ft-lbs]
- 10 ► With 3/2 directional seat valves version "420", port B is designed as blind counterbore, in version "630", it is not available.
 - With 2/2 directional seat valves version "420", ports A and B are available as blind counterbores.
- 11 Identical seal rings for ports A, B, and T; seal ring for port P
- 12 Porting pattern according to DIN 24340 form A
- 13 Porting pattern according to ISO 4401-03-02-0-05 and NFPA T3.5.1 R2-2002 D03 (**with** locating hole for locking pin ISO 8752-3x8-St, material no. **R900005694**, included in the scope of delivery)
- 14 For valve mounting screws, see below

Valve mounting screws (separate order)

2/2 and 3/2 directional seat valve

► Version "420":

4 metric hexagon socket head cap screws

ISO 4762 - M5 x 45 - 10.9-fZn-240h-L

(friction coefficient $\mu_{\text{total}} = 0.09$ to 0.14);
tightening torque $M_A = 7 \text{ Nm}$ [5.2 ft-lbs] $\pm 10\%$,
material no. **R913000140**

or

4 hexagon socket head cap screws

ISO 4762 - M5 x 45 - 10.9 ¹⁾

(friction coefficient $\mu_{\text{total}} = 0.12$ to 0.17);
tightening torque $M_A = 8.1 \text{ Nm}$ [6 ft-lbs] $\pm 10\%$

4 UNC hexagon socket head cap screws

10-24 UNC x 1 3/4" ASTM-574 ¹⁾

(friction coefficient $\mu_{\text{total}} = 0.19$ to 0.24 according to ASTM-574);
tightening torque $M_A = 11 \text{ Nm}$ [8.1 ft-lbs] $\pm 15\%$,
(friction coefficient $\mu_{\text{total}} = 0.12$ to 0.17 according to ISO 4762);
tightening torque $M_A = 8 \text{ Nm}$ [5.9 ft-lbs] $\pm 10\%$,
material no. **R978802649**

► Version "630":

4 metric hexagon socket head cap screws

ISO 4762 - M6 x 45 - 10.9-fZn-240h-L

(friction coefficient $\mu_{\text{total}} = 0.09$ to 0.14);
tightening torque $M_A = 12.5 \text{ Nm}$ [9.2 ft-lbs] $\pm 10\%$,
material no. metric **R913000258**

or

4 hexagon socket head cap screws

ISO 4762 - M6 x 45 - 10.9 ¹⁾

(friction coefficient $\mu_{\text{total}} = 0.12$ to 0.17);
tightening torque $M_A = 15.5 \text{ Nm}$ [11.5 ft-lbs] $\pm 10\%$

4 UNC hexagon socket head cap screws

1/4-20 UNC x 1 3/4" ASTM-574 ¹⁾

(friction coefficient $\mu_{\text{total}} = 0.19$ to 0.24 according to ASTM-574);
tightening torque $M_A = 20 \text{ Nm}$ [14.8 ft-lbs] $\pm 15\%$,
(friction coefficient $\mu_{\text{total}} = 0.12$ to 0.17 according to ISO 4762);
tightening torque $M_A = 14 \text{ Nm}$ [10.4 ft-lbs] $\pm 10\%$,
material no. **R978800711**

4/2 directional seat valve

► Version "420":

4 metric hexagon socket head cap screws

ISO 4762 - M5 x 90 - 10.9-fZn-240h-L

(friction coefficient $\mu_{\text{total}} = 0.09$ to 0.14);
tightening torque $M_A = 7 \text{ Nm}$ [5.2 ft-lbs] $\pm 10\%$,
material no. **R913000222**

or

4 hexagon socket head cap screws

ISO 4762 - M5 x 90 - 10.9 ¹⁾

(friction coefficient $\mu_{\text{total}} = 0.12$ to 0.17);
tightening torque $M_A = 8.1 \text{ Nm}$ [6 ft-lbs] $\pm 10\%$

4 UNC hexagon socket head cap screws

10-24 UNC x 3 1/2" ¹⁾

(friction coefficient $\mu_{\text{total}} = 0.19$ to 0.24 according to ASTM-574);
tightening torque $M_A = 11 \text{ Nm}$ [8.1 ft-lbs] $\pm 15\%$,
(friction coefficient $\mu_{\text{total}} = 0.12$ to 0.17 according to ISO 4762);
tightening torque $M_A = 8 \text{ Nm}$ [5.9 ft-lbs] $\pm 10\%$,
material no. **R978800696**

► Version "630":

4 metric hexagon socket head cap screws

ISO 4762 - M6 x 90 - 10.9-fZn-240h-L

(friction coefficient $\mu_{\text{total}} = 0.09$ to 0.14);
tightening torque $M_A = 12.5 \text{ Nm}$ [9.2 ft-lbs] $\pm 10\%$,
material no. **R913000259**

or

4 hexagon socket head cap screws

ISO 4762 - M6 x 90 - 10.9 ¹⁾

(friction coefficient $\mu_{\text{total}} = 0.12$ to 0.17);
tightening torque $M_A = 15.5 \text{ Nm}$ [11.4 ft-lbs] $\pm 10\%$

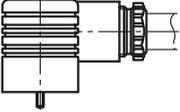
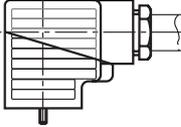
4 UNC hexagon socket head cap screws

1/4-20 UNC x 3 1/2" ¹⁾

(friction coefficient $\mu_{\text{total}} = 0.19$ to 0.24);
tightening torque $M_A = 20 \text{ Nm}$ [14.8 ft-lbs] $\pm 15\%$,
(friction coefficient $\mu_{\text{total}} = 0.12$ to 0.17);
tightening torque $M_A = 14 \text{ Nm}$ [10.4 ft-lbs] $\pm 10\%$,
material no. **R978800717**

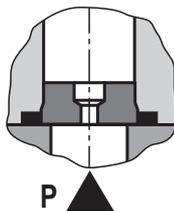
¹⁾ Not included in the Rexroth product range

Mating connectors according to DIN EN 175301-803

For details and more mating connectors, see data sheet 08006						
Port	Valve side	Color	Material no.			
			Without circuitry	With indicator light 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Zener diode suppression circuit 24 V
M16 x 1.5	a	Gray	R901017010	-	-	-
	a/b	Black	R901017011	R901017022	R901017025	R901017026
1/2" NPT (Pg16)	a	Red/Brown	R900004823	-	-	-
	a/b	Black	R900011039	R900057453	R900842566	-

Throttle insert

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



Examples:

- ▶ Accumulator operation
- ▶ Use as pilot control valve with internal pilot fluid tapping

2/2 and 3/2 directional seat valve

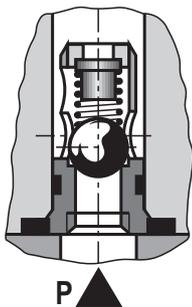
The throttle insert is inserted in port P of the seat valve.

4/2 directional seat valve (see page 5)

The throttle insert is inserted in port P of the Plus-1 plate.

Check valve insert

The check valve insert allows a free flow from P to A and closes A to P in a leak-free form.



2/2 and 3/2 directional seat valve (see page 4)

The check valve insert is inserted in port P of the seat valve.

4/2 directional seat valve (see page 5)

The check valve insert is inserted in port P of the Plus-1 plate.

General notes

Seat valves can be used according to the spool symbols as well as the assigned operating pressures and flows (see performance limits on page 9).

In order to ensure safe functioning, it is absolutely necessary to observe the following:

- ▶ In order to switch the valve safely or maintain it in its spool position, the pressure must be $p_P \geq p_A \geq p_T$ (for design reasons).
- ▶ Seat valves have a negative spool overlap, i.e. during the switching process, there is leakage oil. However, this process takes place within such a short time that it is irrelevant in nearly all applications.
- ▶ The specified maximum flow must not be exceeded (use a throttle insert for limiting the flow, if necessary)!

Plus-1 plate:

- ▶ If the Plus-1 plate (4/2 directional function) is used, the following lower operating values have to be observed:
 $p_{\min} = 8 \text{ bar}$; $q_V > 3 \text{ l/min}$.
- ▶ The ports P, A, B and T are clearly specified according to their tasks. They must not be arbitrarily exchanged or closed!
- ▶ With 3- and 4-way spool position, port T must always be connected.
- ▶ Observe the pressure level and pressure distribution!
- ▶ The flow is only permitted in the direction of the arrow!

More information

- | | |
|--|--|
| ▶ Directional spool and seat valves with electrical actuation and M12x1 plug-in connection | Data sheet 08010 |
| ▶ Inductive position switch and proximity sensors (contactless) | Data sheet 24830 |
| ▶ Mineral oil-based hydraulic fluids | Data sheet 90220 |
| ▶ Reliability characteristics according to EN ISO 13849 | Data sheet 08012 |
| ▶ General product information on hydraulic products | Data sheet 07008 |
| ▶ Installation, commissioning and maintenance of industrial valves | Data sheet 07300 |
| ▶ Hydraulic valves for industrial applications | Data sheet 07600-B |
| ▶ Selection of the filters | www.boschrexroth.com/filter |

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Notes

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Notes