3/2 and 4/2 directional seat valve with solenoid actuation

RE 22075/07.09 1/12
Replaces: 04.07

Type M-.SEW

Size 10
Component series 1X
Maximum operating pressure 420/630 bar *[6100/9150 psi]*
Maximum flow 40 l/min *[10.6 US gpm]*


H4663 + 4664

Table of contents

Features

- Direct operated directional seat valve with solenoid actuation
- Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
- Blocked connection tight
- Safe switching also with longer standstill periods under pressure
- Air-gap DC voltage solenoids with detachable coil (AC voltage possible by means of a rectifier)
- Solenoid coil can be rotated by 90°
- Electrical connection as individual connection (for more electrical connections see RE 08010)
- with concealed manual override, optional
- Inductive position switch (contactless), optional, see RE 24830.

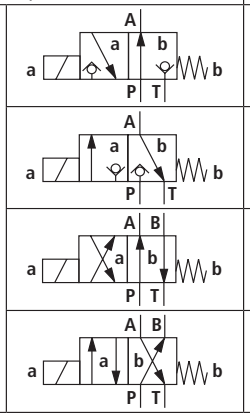
Ordering code

M–	SEW	10		1X/	M			K4	/		*

3 main ports = **3**
4 main ports = **4**

Seat valve

Size 10 = **10**

Main ports	3	4	
Symbols 	●	–	= **U**
	●	–	= **C**
	–	●	= **D**
	–	●	= **Y**

● = Available

Component series 10 to 19 = **1X**
(10 to 19: unchanged installation and connection dimensions)

Operating pressure 420 bar *[6100 psi]* = **420**
(Mounting screws M6)
Operating pressure 630 bar *[9150 psi]* = **630**
(Mounting screws M8)

Solenoid (air-gap) with detachable coil = **M**

DC voltage 24 V = **G24**
DC voltage 205 V = **G205** [2)]

Further details in the plain text

Seal material
No code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

No code = without check valve insert, without throttle insert
P = with check valve insert
B12 = Throttle Ø 1.2 mm *[0.047 inch]*
B15 = Throttle Ø 1.5 mm *[0.059 inch]*
B18 = Throttle Ø 1.8 mm *[0.071 inch]*
B20 = Throttle Ø 2.0 mm *[0.079 inch]*
B22 = Throttle Ø 2.2 mm *[0.087 inch]*

Spool position monitoring
No code = without position switch
QMAG24 = Monitored spool position “a”
QMBG24 = Monitored spool position “b”
For further details see RE 24830

Electrical connection
K4 [1;2)] **=** without mating connector, individual connection with connector DIN EN 175301-803

N9 = **with** concealed manual override
No code = **without** manual override

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

[1)] Mating connectors, separate order, see page 12.

[2)] For connection to the AC voltage mains, a DC voltage solenoid **must** be used, which is controlled via a rectifier (see table above).
In case of individual connections, a mating connector with integrated rectifier can be used (separate order, see page 12).

Standard types and units are contained in the EPS (standard price list).

Function, section, symbols: 3/2-directional seat valve

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

It basically comprises a housing (1), the solenoid (2), the hardened valve system (3) and the spool (8) as closing element.

Basic principle
In the initial position, the spool (8) is pressed onto the seat by the spring (9), in spool position by the solenoid (2). The force of the solenoid (2) acts via the angled lever (6) and the ball (7) on the spool (8) which is sealed on two sides. The space between the two sealing elements is connected to port P. Thus, the valve system (3) is pressure-compensated in relation to the actuating forces (solenoid or return spring). The valves can therefore be used up to 630 bar *[9150 psi]*.

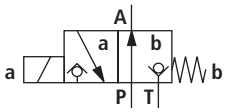
☞ **Note!**

- 3/2-directional seat valves feature a “negative spool underlap”. For this reason, port T must always be connected. This means that during the switching process - when one valve seat starts to open until the other valve seat is closed - ports P-A-T are connected to each other. This process takes, however, place within such a short time that it is irrelevant in nearly all applications.
- The manual override (10) allows for the switching of the valve without solenoid energization.

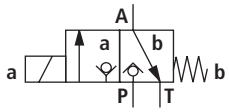
Attention!
Care must moreover be taken that the specified maximum flow is not exceeded! If required, a throttle insert must be used to limit the flow (see page 12).

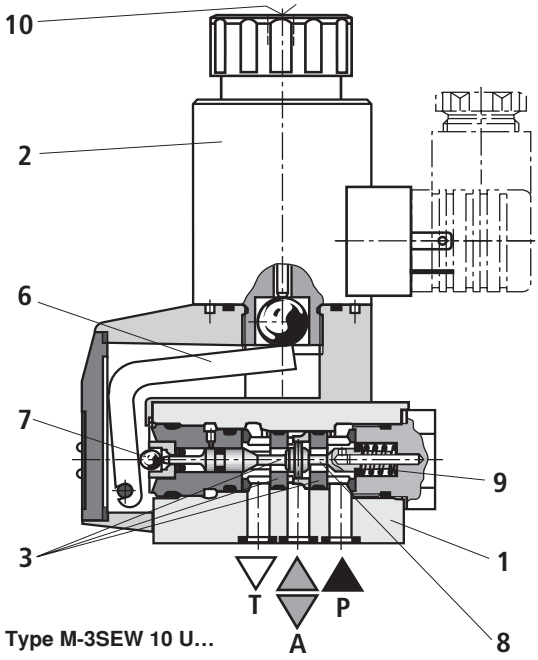
The seat arrangement offers the following options:

Symbol “U”:



Symbol “C”:





Type M-3SEW 10 U…

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

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

Function of the Plus-1 plate:

Initial position
The main valve is not operated. The spring (9) holds the ball (4) on the seat (11). Port P is blocked and A connected to T. Moreover, one pilot line is connected from A to the large area of the control spool (12), which is thus unloaded to the tank. The pressure applied via P now pushes the ball (13) onto the seat (14). P is now connected to B, and A to T.

Transition position
When the main valve is operated, the spool (8) is shifted against the spring (9) and pressed onto the seat (15). During this, port T is closed, P, A, and B are briefly connected to each other.

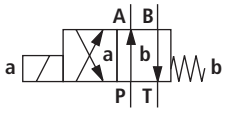
Spool position 0
P is connected to A. Because the pump pressure acts via A on the large area of the control spool (12), the ball (13) is pressed onto the seat (16). Thus, B is connected to T, and P to A. The ball (13) in the Plus-1 plate has a “positive spool underlap”.

Attention!

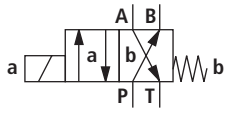
To prevent pressure intensification in conjunction with single-rod cylinders, the annulus area of the cylinder must be connected to A.

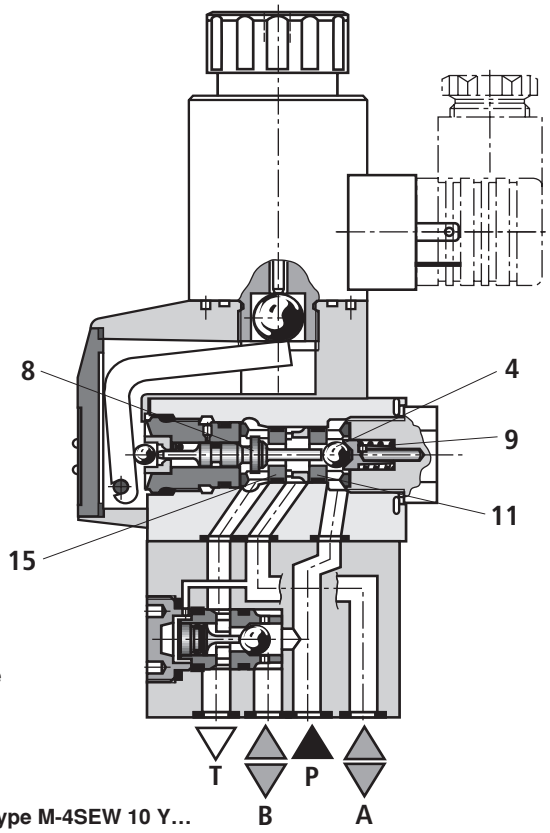
The use of the Plus-1 plate and the seat arrangement offer the following options:

Symbol “D”:



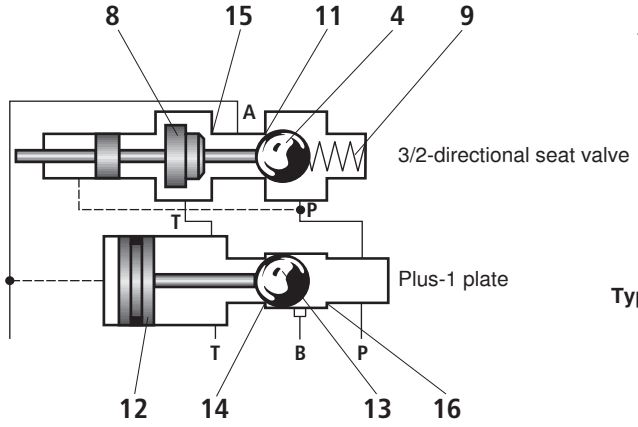
Symbol “Y”:





Type M-4SEW 10 Y…

Schematic illustration: Initial position



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

general

Weight	– 3/2-directional seat valve	kg *[lbs]*	2.0 *[4.41]*
	– 4/2 directional seat valve	kg *[lbs]*	3.5 *[7.72]*
Installation position			Any
Ambient temperature range		°C *[°F]*	–30 to +50 *[–22 to +122]* (NBR seals) –20 to +50 *[–4 to +122]* (FKM seals)

hydraulic

Maximum operating pressure	bar *[psi]*	See performance limit page 7
Maximum flow	l/min *[US gpm]*	40 *[10.6]*
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524 [1]; Fast biodegradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids upon request
Hydraulic fluid temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 500 *[15 to 2300]*
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [3]

electrical

Type of voltage			Direct voltage	Alternate voltage
Available voltages [4]		V	12, **24**, 42, 96, 110, 205, 220	Only possible via rectifier (see page 12)
Voltage tolerance (nominal voltage)		%	±10	
Power consumption		W	30	
Duty cycle		%	100	
Switching time according to ISO 6403	– ON	ms	25 to 60 (without rectifier) 30 to 70 (with rectifier)	
	– OFF		10 to 20 (without rectifier) 30 to 70 (with rectifier)	
Maximum switching frequency	– Operating pressure ≤ 350 bar	1/h	15000	
	– Operating pressure > 350 bar	1/h	3600	
Protection class according to DIN EN 60529			IP 65 (with mating connector mounted and locked)	
Maximum surface temperature of the spool [5]		°C *[°F]*	120 *[248]*	

[1] Suitable for NBR and FKM seals

[2] Only suitable for FKM seals

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

For selecting the filters, see datasheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

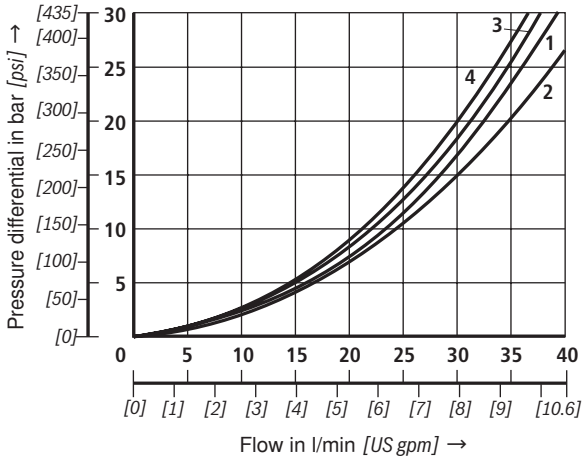
[4] Special voltages upon request

[5] Due to the temperatures occurring at the surfaces of the solenoid coils, the standards ISO 13732-1 and EN 982 need to be adhered to!

When establishing the electrical connection, the protective earthing conductor (PE ⏚) must be properly connected.

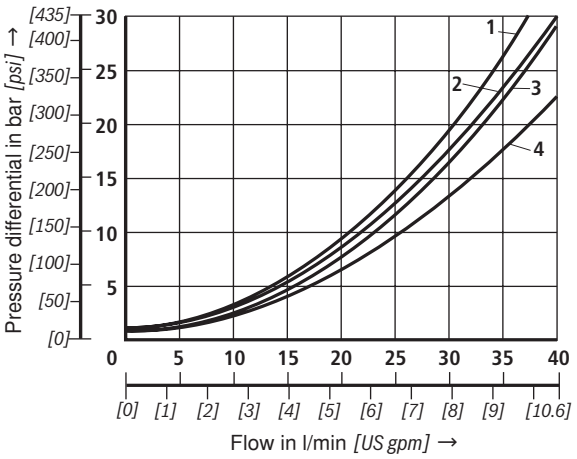
Characteristic curves (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

Δp-q_V characteristic curves
3/2-directional seat valve



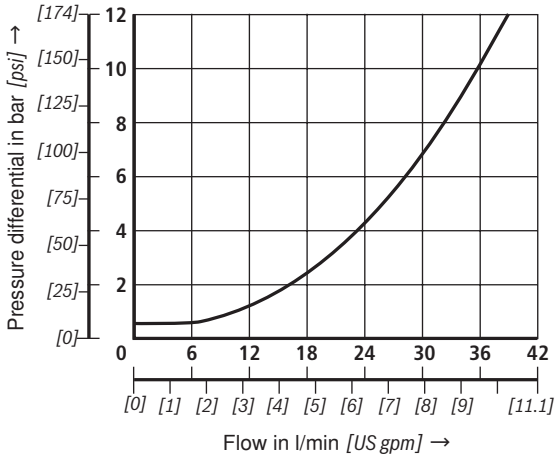
1 M-3SEW 10 **C** …, P to A
2 M-3SEW 10 **C** …, A to T
3 M-3SEW 10 **U** …, P to A
4 M-3SEW 10 **U** …, A to T

Δp-q_V characteristic curves
4/2-directional seat valve

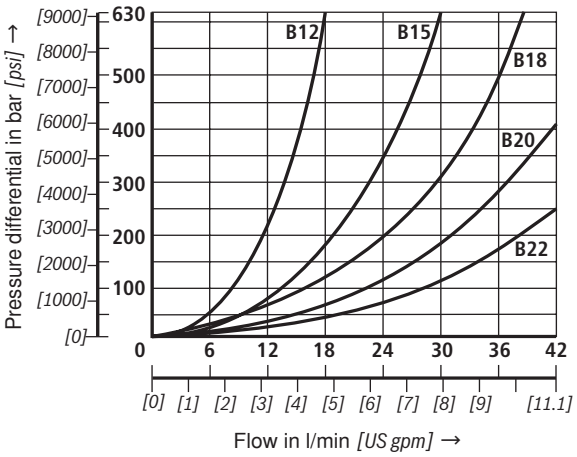


1 M-4SEW 10 **D Y** …, A to T
2 M-4SEW 10 **D Y** …, P to A
3 M-4SEW 10 **D Y** …, P to B
4 M-4SEW 10 **D Y** …, B to T

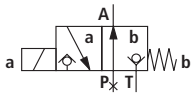
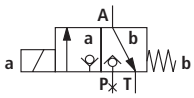
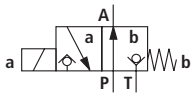
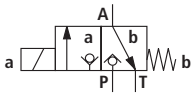
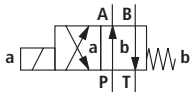
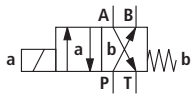
Δp-q_V characteristic curves
Check valve insert



Δp-q_V characteristic curves
Throttle insert



Performance limit (measured with HLP46, ϑ_{Oil} = 40 ± 5 °C *[104 ± 9 °F]*)

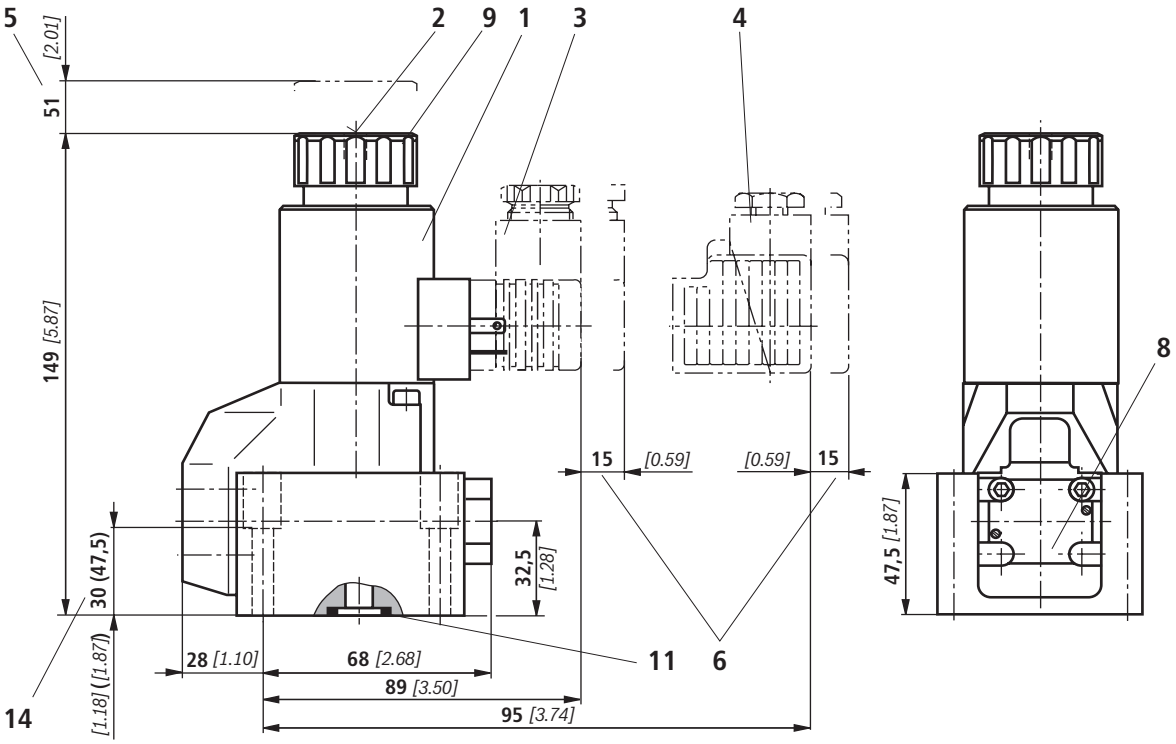
	Symbol		Comment	Maximum operating pressure in bar *[psi]*				Flow in l/min *[US gpm]*
				P	A	B	T	
2-way circuit (3/2-directional seat valve) Only as unloading function	**U**		Before switching from the initial position to the spool position, pressure must be applied in port A. $p_A \geq p_T$		420/630 *[6100/9150]*		100 *[1450]*	40 *[10.6]*
	C		$p_A \geq p_T$		420/630 *[6100/9150]*		100 *[1450]*	40 *[10.6]*
3-way circuit	**U**		$p_P \geq p_A \geq p_T$	420/630 *[6100/9150]*	420/630 *[6100/9150]*		100 *[1450]*	40 *[10.6]*
	C			420/630 *[6100/9150]*	420/630 *[6100/9150]*		100 *[1450]*	40 *[10.6]*
4-way circuit (flow only possible in the direction of arrow!)	**D**		3/2-directional valve (symbol "U") in connection with Plus-1 plate: $p_P > p_A \geq p_B > p_T$	420/630 *[6100/9150]*	420/630 *[6100/9150]*	420/630 *[6100/9150]*	100 *[1450]*	40 *[10.6]*
	Y		3/2-directional valve (symbol "C") in connection with Plus-1 plate: $p_P > p_A \geq p_B > p_T$	420/630 *[6100/9150]*	420/630 *[6100/9150]*	420/630 *[6100/9150]*	100 *[1450]*	40 *[10.6]*

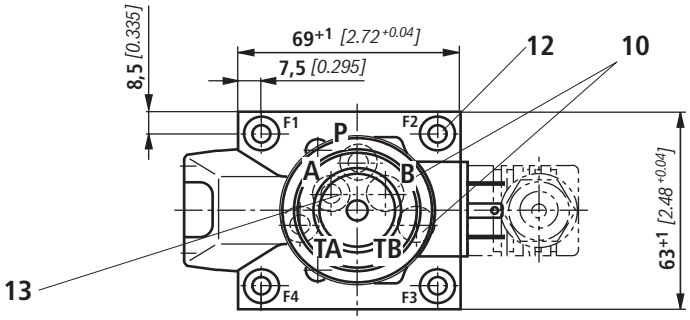
Attention!

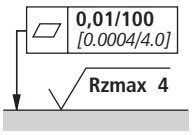
Please observe the general notes on page 12!

The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank pre-loading.

Unit dimensions: 3/2-directional seat valve (dimensions in mm *[inch]*)



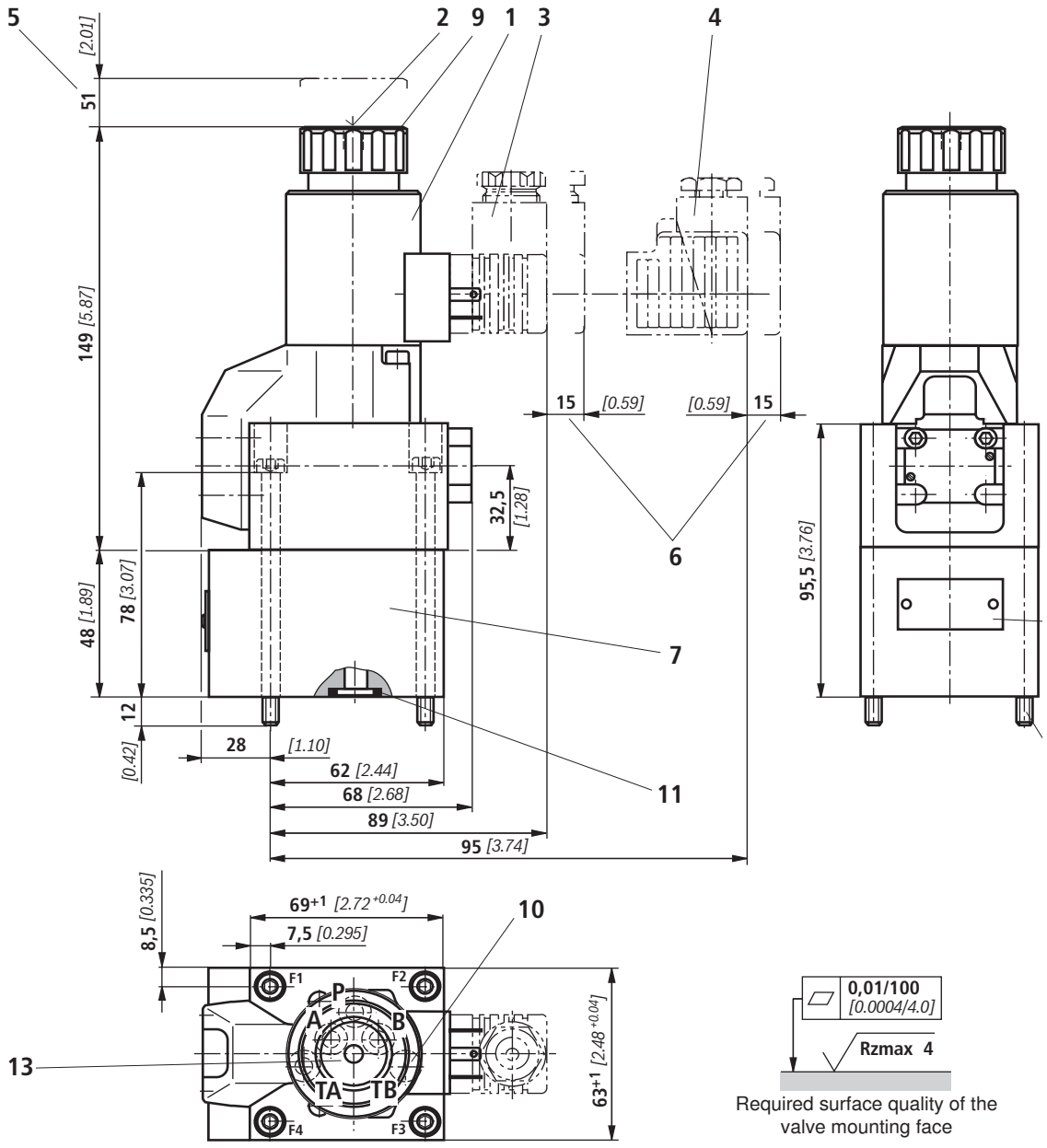




Required surface quality of the valve mounting face

Position explanations and valve mounting screws see page 11.

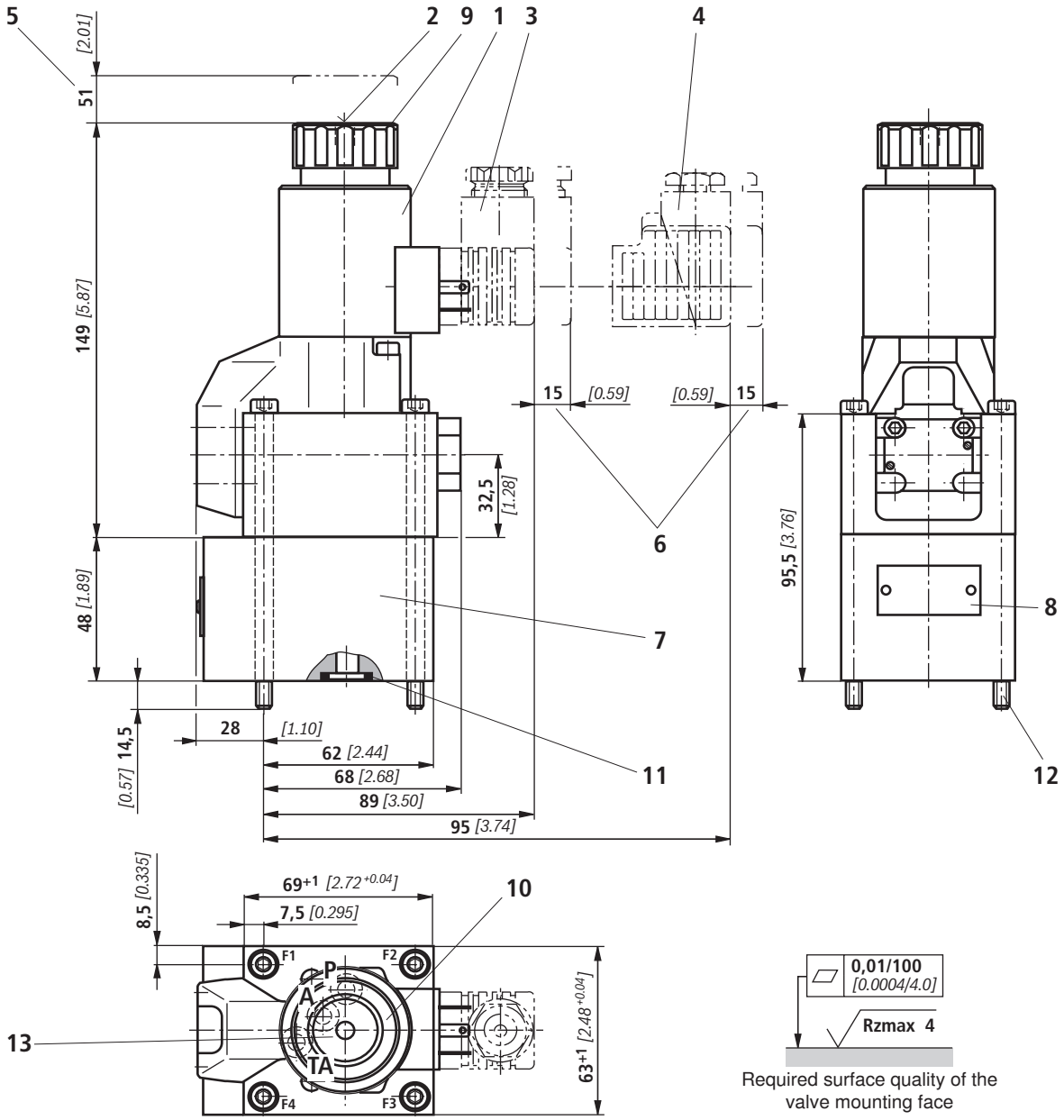
Unit dimensions: 4/2 directional seat valve, version “420” (dimensions in mm *[inch]*)



Required surface quality of the valve mounting face

Position explanations and valve mounting screws see page 11.

Unit dimensions: 4/2 directional seat valve, version “630” (dimensions in mm *[inch]*)



Position explanations and valve mounting screws
see page 11.

Unit dimensions

1 Solenoid “a”
2 Concealed manual override “N9”
3 Mating connector **without** circuitry (separate order, see page 12)
4 Mating connector **with** circuitry (separate order, see page 12)
5 Space required for removing the coil
6 Space required for removing the mating connector
7 Plus-1 plate
8 Nameplate
9 Lock nut, tightening torque $M_A = 4^{+1}$ Nm *[2.95$^{+0.74}$ ft-lbs]*
10 **Attention!**
- Ports B and TB are provided on 3/2-directional seat valves in version “420” as blind counterbore, and not provided for version “630”.
- Port TB is provided as blind counterbore on 4/2 directional seat valves in version “420”.
- Ports B and TB are not provided on 4/2 directional seat valves in version “630”.

11 Identical seal rings for ports A, B, TA, and TB; seal ring for port P
12 Valve mounting screws see below
13 Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
14 30 (420 bar); 47.5 (630 bar)

Valve mounting screws

3/2-directional seat valve (separate order)

– 420 bar *[6100 psi]* version:
4 hexagon socket head cap screws metric
ISO 4762 - M6 x 40 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque M_A = 12.5 Nm *[9.2 ft-lbs]* ±10 %,
Material no. **R9130001058**
or
4 hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 15.5 Nm *[11.4 ft-lbs]* ±10 %

4 hexagon socket head cap screws UNC
1/4-20 UNC x 1 1/2” (self procurement)
(friction coefficient μ_{total} = 0.19 to 0.24 according to ASTM-574);
Tightening torque M_A = 20 Nm *[14.8 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17 according to ISO 4762);
Tightening torque M_A = 14 Nm *[10.3 ft-lbs]* ±15 %,
Material no. **R978800710**

– 630 bar *[9150 psi]* version:
4 hexagon socket head cap screws metric
ISO 4762 - M8 x 60 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque M_A = 30 Nm *[22.1 ft-lbs]* ±10 %,
Material no. metric **R913000217**
or
4 hexagon socket head cap screws
ISO 4762 - M8 x 60 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 37 Nm *[27.3 ft-lbs]* ±10 %

4 hexagon socket head cap screws UNC
5/16-18 UNC x 2” (self procurement)
(friction coefficient μ_{total} = 0.19 to 0.24 according to ASTM-574);
Tightening torque M_A = 40 Nm *[29.5 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17 according to ISO 4762);
Tightening torque M_A = 28 Nm *[20.7 ft-lbs]* ±15 %,
Material no. **R978800730**

4/2 directional seat valve (included in scope of delivery)

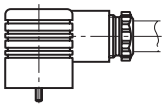
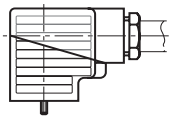
– 420 bar *[6100 psi]* version:
4 hexagon socket head cap screws metric
ISO 4762 - M6 x 90 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque M_A = 12.5 Nm *[9.2 ft-lbs]* ±10 %,
Material no. **R913000259**
or
4 hexagon socket head cap screws
ISO 4762 - M6 x 90 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 15.5 Nm *[11.4 ft-lbs]* ±10 %

4 hexagon socket head cap screws UNC
1/4-20 UNC x 3 1/2” (self procurement)
(friction coefficient μ_{total} = 0.19 to 0.24 according to ASTM-574);
Tightening torque M_A = 20 Nm *[14.8 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17 according to ISO 4762);
Tightening torque M_A = 14 Nm *[10.3 ft-lbs]* ±15 %,
Material no. **R978800717**

– 630 bar *[9150 psi]* version:
4 hexagon socket head cap screws metric
ISO 4762 - M8 x 110 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14);
Tightening torque M_A = 30 Nm *[22.1 ft-lbs]* ±10 %,
Material no. **R913000260**
or
4 hexagon socket head cap screws
ISO 4762 - M8 x 110 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 37 Nm *[27.3 ft-lbs]* ±10 %

4 hexagon socket head cap screws UNC
5/16-18 UNC x 4 1/4” (self procurement)
(friction coefficient μ_{total} = 0.19 to 0.24);
Tightening torque M_A = 40 Nm *[29.5 ft-lbs]* ±15 %,
(friction coefficient μ_{total} = 0.12 to 0.17);
Tightening torque M_A = 28 Nm *[20.7 ft-lbs]* ±15 %

Mating connectors according to DIN EN 175301-803

Details and more mating connectors see RE 08006				

Connection	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:

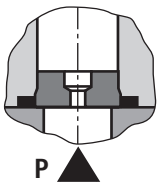
- Accumulator operation,
- Use as pilot control valve with internal pilot fluid tapping.

3/2-directional seat valve (see page 3)

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

4/2 directional seat valve (see page 4)

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



Check valve insert

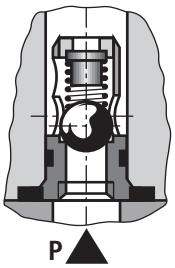
The check valve insert allows a free flow from P to A and closes A to P in a leak-free form.

3/2-directional seat valve (see page 3)

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

4/2 directional seat valve (see page 4)

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



General Notes

- In order to switch the valve safely or maintain it in its spool position, the pressure situation must be as follows: P ≥ A ≥ T (for design reasons).
- Ports P, A and TA (3/2 directional seat valve) as well as P, A, B and TA (4/2 directional seat valve) are clearly assigned according to their function. They must not be exchanged or closed. The flow is only permitted in the direction of arrow.
- When the Plus-1 plate (4/2-directional function) is used, the following lower operating values must be taken into account: p_{min} = 8 bar; q_V > 3 l/min.
- The total flow of the valve must not be exceeded.