

2/2-, 3/2- and 4/2-way poppet directional valves, solenoid actuated

Model M-.SEW 6

Nominal size 6

Series 3X

Maximum operating pressure 6100/9150 PSI
(420/630 bar)

Maximum flow 6.6 GPM (25 L/min)



H4232+H4236

Model M-3SEW 6 U3X/420MG24N9K4 with plug-in connector and
Model M-4SEW 6 D3X/420MG24N9K4 with plug-in connector

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Features

- Mounts on standard ISO 4401-3, NFPA T3.5.1 M R1 and ANSI B 93.7 **D 03** interface (except 630 bar version)
- 10-24 UNC (M5) mounting bolts for 6100 PSI (420 bar) Model
1/4-20 UNC (M6) mounting bolts for 9150 PSI (630 bar) Model
- Leakfree closure in checked condition
- Resists silting, even during extended pressure periods
- DC-solenoids (air gap) or solenoids with rectifier for AC voltage, frequency-independent
- Solenoid with removeable coil
- Additional electrical connections available
- Switching is ensured even after long periods of operating under pressure
- With protected manual override, optional

Ordering code

M-	SEW	6	3X/	M	K4/	*
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2 actuator ports = 2
 3 actuator ports = 3
 4 actuator ports = 4
 Poppet valve
 Nominal size 6 = 6

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

Series 30 to 39 (30 to 39: externally interchangeable) = 3X

Operating pressure 6100 PSI (420 bar) (10-24/M5 mounting bolts) = 420
 Operating pressure up to 9150 PSI (630 bar) (1/4-20/M6 mounting bolts) = 630

AC supply (permissible voltage tolerance ±10%)	Nominal voltage of the DC solenoid when used with an AC voltage	Order detail
110 V - 50/60 Hz	96 V	G96
120 V - 60 Hz	110 V	G110
230 V - 50/60 Hz	205 V	G205

Further details in clear text

No code = NBR seals
 V = FPM seals (other seals on request)

⚠ Attention!
 The compatibility of the seals and pressure fluid has to be taken into account!

No code = Without cartridge check valve, without throttle insert

P = With cartridge check valve
 B12 = Throttle Ø 0.047 in (1.2 mm)
 B15 = Throttle Ø 0.059 in (1.5 mm)
 B18 = Throttle Ø 0.071 in (1.8 mm)
 B20 = Throttle Ø 0.079 in (2.0 mm)
 B22 = Throttle Ø 0.087 in (2.2 mm)

Electrical connection

K4^{1;2)} = Individual connection, with component plug DIN 43 650-AM2, without plug-in connector

N9 = With protected manual override
 No code = Without manual override

G24 = 24 V DC
 G205²⁾ = 205 V DC

M = Solenoid (air gap) with removable coil

Note: Other models of actuators (e.g. pneumatic, hydraulic, rotary knob, rotary knob with lock, plunger, lever, roller lever) on request!

- 1) Plug-in connectors must be ordered separately (see page 3). For additional connector information, see datasheet RA 08 006.
- 2) For the connection to an AC supply a DC solenoid **must** be used which is controlled via a rectifier (see table on the left).

Ordering code, plug-in connectors to DIN 43 650 A and ISO 4400 for component plug "K4"

For further plug-in connectors see RA 08 006							
		Material no.					
Valve side	Color	Without circuitry	With indicator light 12 ... 240 V	With LED & rectifier 24 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Z diode protective circuit 24 V	Thread
a	grey	RR00 074683	-	-	-	-	Pg 11
b	black	RR00 074684	-	-	-	-	Pg 11
a/b	black	-	RR00 057292	RR00 057423	RR00 313933	RR00 310995	Pg 11
a	red/brown	RR00 004823	-	-	-	-	1/2" NPT
b	black	RR00 011039	-	-	-	-	1/2" NPT
a/b	black	-	RR00 057453	RR00 057455	RR00 842566	-	1/2" NPT

Functional description, cross-section: 2/2-, 3/2-way poppet valve

Directional control valves, Model SEW, are solenoid operated poppet type valves. They control the start, stop and direction of fluid flow.

3/2-way directional poppet valves

They consist of a steel housing (1), solenoid (2), hardened sleeve (3), and poppet (4), made of ball bearing steel.

Solenoid force is applied upon angled lever (6), ball (7) and on operating pin (8). The operating pin has seals on both sides.

The chamber between these two seals is connected to P port. This innovative design, allows operating forces (solenoid & spring forces) to be almost perfectly balanced, and permit high pressure applications to 9150 PSI (630 bar).

In the de-energized position, ball (4) is held against the left seat (lever side) by biasing spring (9).

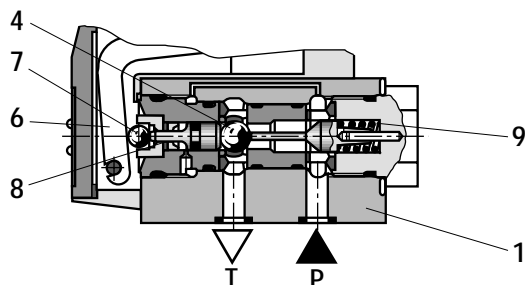
Note:

- 3/2-way directional poppet valves have a "negative shifting overlap".

During the shifting process – from the time one valve seat begins to open until the other is closed – ports P-A-T are connected.

However, this requires only milliseconds, and is not a concern for most applications.

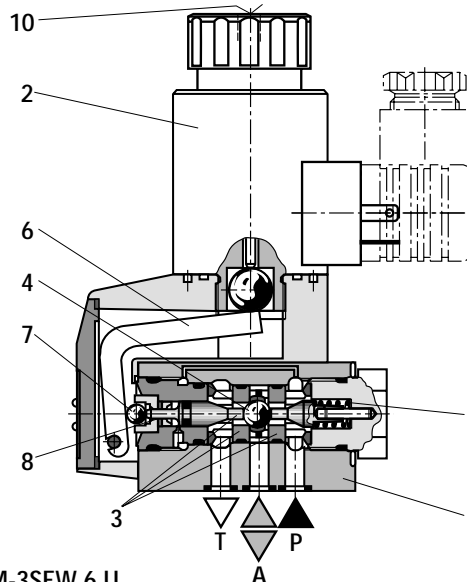
- DC solenoids are interchangeable
- Optional manual override (10)



Model M-2SEW 6 N...

The following possibilities are obtainable via the seat orientation:

	2/2-way poppet valve	3/2-way poppet valve
Symbol		
Initial position	P and T connected	P and A connected, T closed leak-free
Switched position	P closed leak-free	P closed leak-free, A and T connected
Symbol		
Initial position	P closed leak-free	P closed leak-free, A and T connected
Switched position	P and T connected	P and A connected, T closed leak-free



Model M-3SEW 6 U...

Functional description, cross-section: 2/2-, 3/2-way poppet valve

Orifice insert

To limit maximum flow, orifice inserts are optionally available. The orifice insert is required when, due to operating conditions during switching, flow rates occur that exceed the performance limits of the valve. For this purpose, the insert installs in Port P. The orifice inserts will fit any of the valve ports, allowing for design flexibility.

Examples:

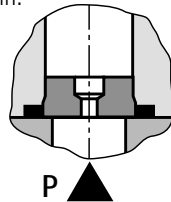
- accumulator circuits,
- application as a pilot valve with internal pilot drain.

3/2-way directional poppet valve

The cartridge throttle is inserted in port P of the poppet valve.

4/2-way directional poppet valve

The cartridge throttle is inserted in port P of the base plate.



Cartridge check valve insert

Cartridge check valves allow free flow from P to A and provide leakfree closure from A to P.

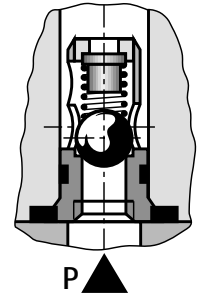
Examples are shown on page 11.

3/2-way directional poppet valves

The cartridge check valve is inserted in the P port of the valve.

4/2-way directional poppet valves

The cartridge check valve is inserted in the P port of the base plate.



Functional description, cross-section: 4/2-way poppet valve

Function of base plate

An additional base plate permits 4/2 directional control functions.

De-energized position, (spool type Y, example below)

With the solenoid de-energized, bias spring (9) holds poppet (4.1) against seat (11). Port "A" communicates with port "T"; therefore piston (12) is pressureless. Poppet/spool (13) is held against seat (14) by system pressure which permits "P" to communicate with "B".

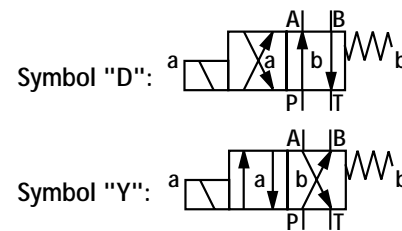
Crossover condition

Poppets (4.2) and (4.1) move to the right, as does poppet /spool (13). During movement, all ports P, A, B, and T are common. Please consider this underlap for critical applications, or small flow rates (less than 1/2 GPM).

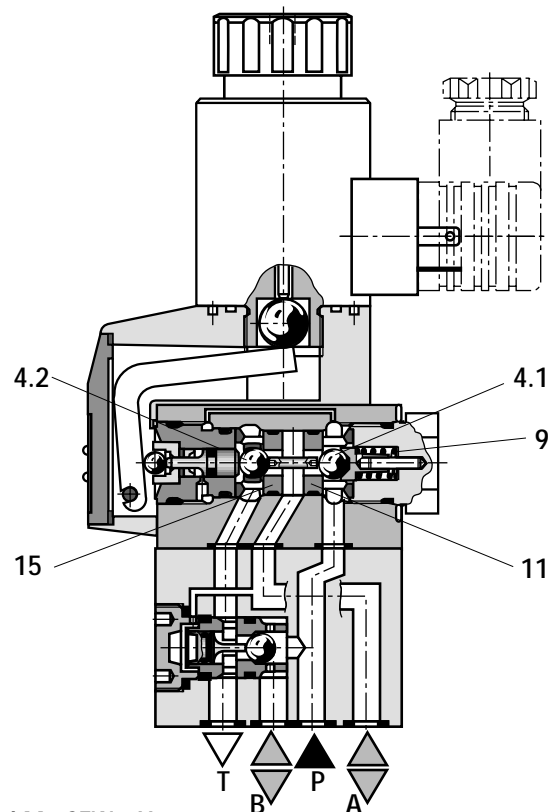
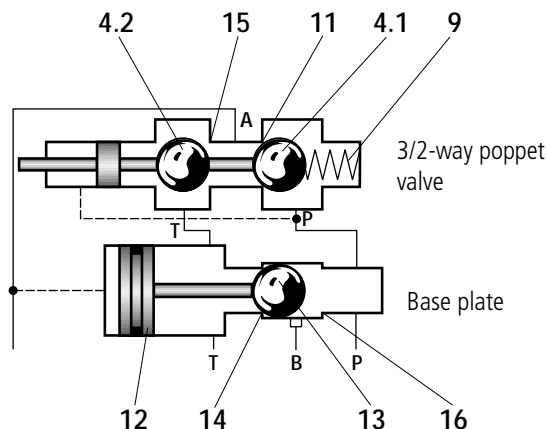
Shifted position

At full stroke, poppet (4.2) is held against seat (15) via solenoid force. Poppet (4.1) compresses bias spring (9). Port "P" communicates with "A", and pressure against piston (12) causes poppet/spool (13) to move right against seat (16). Port "B" communicates with "T".

If pressure intensification is to be avoided where single rod cylinders are installed, the annulus area of the cylinder must be connected at A.



Schematic illustration: initial position



Model M-4SEW 6 Y...

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

Installation	optional		
Max. ambient temperature	°F (°C)	+122 (+50)	
Weight	2/2-way poppet valve	lbs (kg)	3.31 (1.5)
	3/2-way poppet valve	lbs (kg)	3.31 (1.5)
	4/2-way poppet valve	lbs (kg)	5.07 (2.3)

Hydraulic data

Max. operating pressure	PSI (bar)	see table on page 7
Max. flow	GPM (L/min)	6.6 (25)
Pressure fluid	Mineral oil (HL, HLP) to DIN 51 524 ¹⁾ ; Fast bio-degradable pressure fluids to VDMA 24 568 (also see RA 90 221); HETG (rape seed oil) ¹⁾ ; HEPG (Polyglycols) ²⁾ ; HEES (synthetic esters) ²⁾ ; other pressure fluids on request	
¹⁾ suitable for NBR and FPM seals ²⁾ only suitable for FPM seals		
Pressure fluid temperature range	°F (°C)	-22 to +176 (-30 to +80) (with NBR seals)
		-4 to +176 (-20 to +80) (with FPM seals)
Viscosity range	SUS (mm ² /s)	35 to 2318 (2.8 to 500)
Degree of contamination	Maximum permissible degree of contamination of the pressure fluid is to NAS 1638 class 9. We, therefore, recommend a filter with a minimum retention rate of $\beta_{10} \geq 75$.	

Electrical data

Model of voltage		DC	AC
Available voltages ³⁾	V	12, 24, 42, 96, 110, 205, 220	only possible via rectifier (see ordering details on page 2)
Voltage tolerance (nominal voltage)	%	±10	
Power consumption	W	30	
Duty	continuous		
Switching time to ISO 6403	see table below		
Switching frequency	cycles/h	15000	
Protection to DIN 40 050	IP 65		
Max. coil temperature ⁴⁾	°F (°C)	302 (150)	

³⁾ Special voltages on request

⁴⁾ Due to the surface temperatures which occur on the solenoid coils, the European standards EN563 and EN982 must be taken into account!

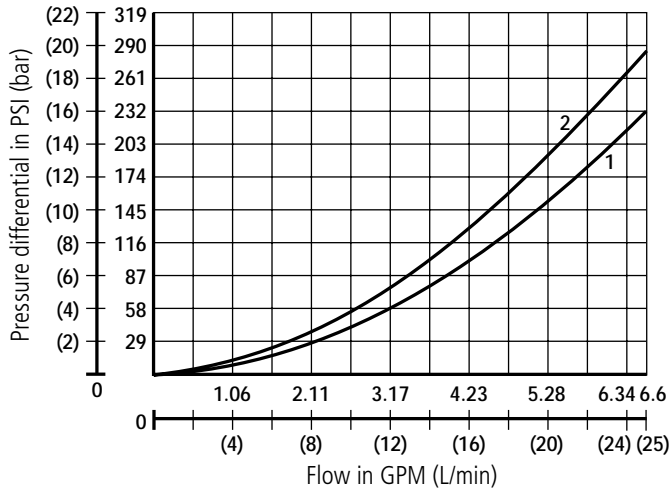
When connecting electric power, the protective conductor (PE \perp) must be connected according to the relevant regulations.

Switching time t in ms (installation: solenoid vertical)

Pressure p PSI (bar)	Flow q_v GPM (L/min)	DC solenoid						DC solenoid + rectifier						
		Symbols U, C, D, Y						Symbols U, C, D, Y						
		Without tank pressure				U	t_{off}	D	Without tank pressure				U	t_{off}
		U	C	D	Y	C	Y	U	C	D	Y	C	Y	Y
2031 (140)	6.604 (25)	25	30	25	30	10	10	30	40	30	40	35	35	
4061 (280)	6.604 (25)	25	30	25	30	10	10	35	45	35	45	40	40	
4641 (320)	6.604 (25)	25	35	25	35	10	10	35	50	35	50	40	40	
6092 (420)	6.604 (25)	25	35	25	35	10	10	40	50	40	50	50	50	
7252 (500)	6.604 (25)	25	40	25	40	10	10	40	55	40	55	50	50	
8702 (600)	6.604 (25)	25	40	25	40	10	10	40	55	40	55	55	55	

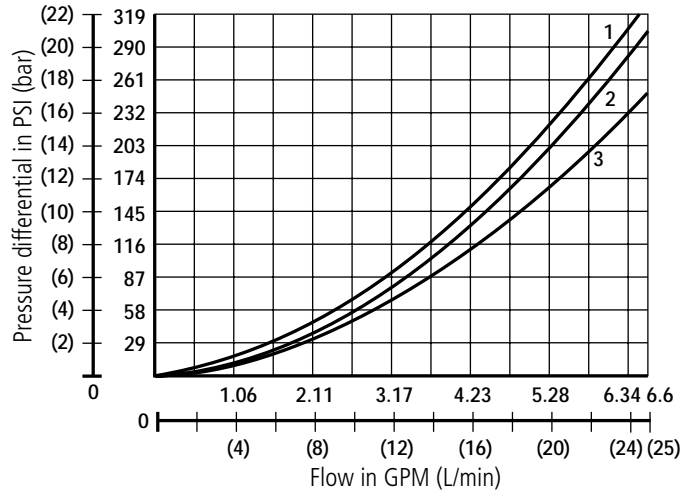
Characteristic curves, measured at $v = 190 \text{ SUS}$ ($41 \text{ mm}^2/\text{s}$) and $t = 122 \text{ }^\circ\text{F}$ ($50 \text{ }^\circ\text{C}$)

2/2-way poppet valve



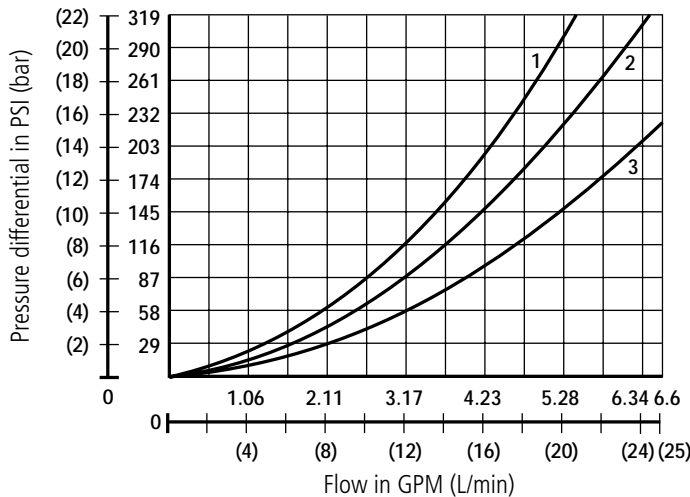
- 1 M-2SEW 6 N ..., P to T
- 2 M-2SEW 6 P ..., P to T

3/2-way poppet valve



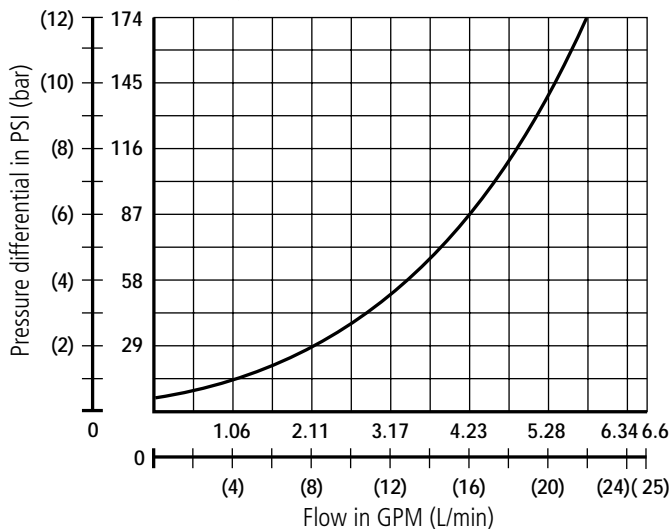
- 1 M-3SEW 6 U_C..., A to T
- 2 M-3SEW 6 U..., P to A
- 3 M-3SEW 6 C..., P to A

4/2-way poppet valve

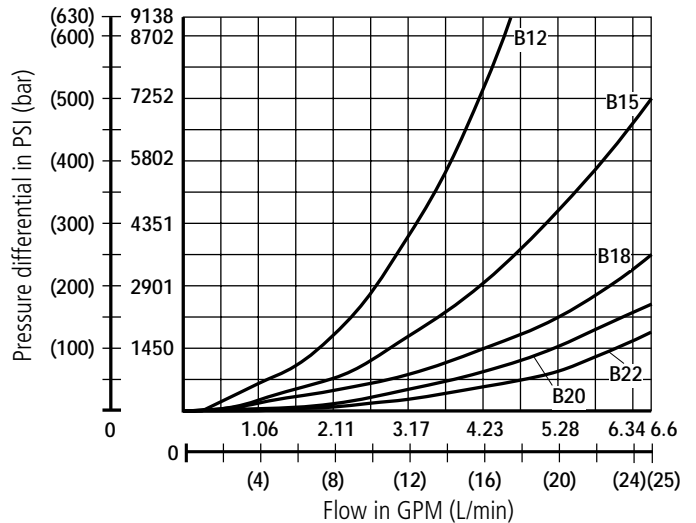


- 1 M-4SEW 6 D_Y..., A to T
- 2 M-4SEW 6 D_Y..., P to A
- 3 M-4SEW 6 D_Y..., P to B, B to T

Cartridge check valve insert



Orifice insert



Performance limits, measured at $v = 190 \text{ SUS}$ ($41 \text{ mm}^2/\text{s}$) and $t = 122 \text{ }^\circ\text{F}$ ($50 \text{ }^\circ\text{C}$)

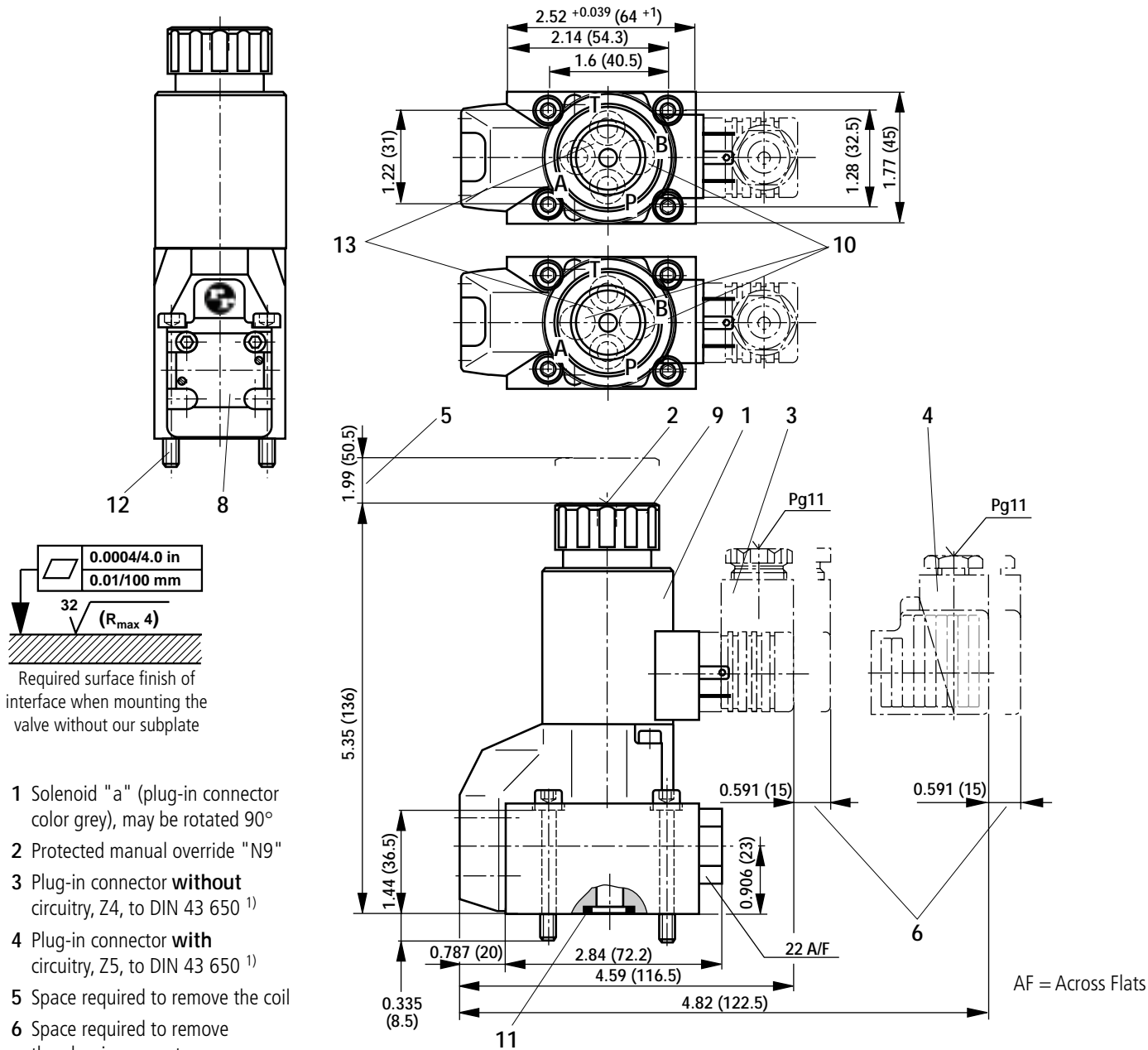
	Symbol	Comments	Operating pressure in PSI (bar)				Flow in GPM (L/min)
			P	A	B	T	
2-way circuit	"P" 	Pressure to $P \geq T$	6092/9138 (420/630)			1450 (100)	6.604 (25)
	"N" 		6092/9138 (420/630)			1450 (100)	6.604 (25)
3-way circuit	"U" 	Pressure to $P \geq A \geq T$	6092/9138 (420/630)	6092/9138 (420/630)		1450 (100)	6.604 (25)
	"C" 		6092/9138 (420/630)	6092/9138 (420/630)		1450 (100)	0.528 (2)
2-way circuit (only for unloading function)	"U" 	Before switching from the initial position to the switched position, pressure must be present in port A. Pressure at $A \geq T$		6092/9138 (420/630)		1450 (100)	6.604 (25)
	"C" 	Pressure at $A \geq T$		6092/9138 (420/630)		1450 (100)	6.604 (25)
4-way circuit (flow is only possible in the direction of the arrow!)	"D" 	Single ball valve (symbol "U") in conjunction with a base plate $P > A \geq B > T$	6092/9138 (420/630)	6092/9138 (420/630)	6092/9138 (420/630)	1450 (100)	6.604 (25)
	"Y" 	Two ball valve (symbol "C") in conjunction with a base plate $P > A \geq B > T$	6092/9138 (420/630)	6092/9138 (420/630)	6092/9138 (420/630)	1450 (100)	6.604 (25)

⚠ Attention!

Please take into account the "general guidelines" stated on page 11!

The performance limit was determined with the solenoids at operating temperature, 10% under voltage and with the tank not pressurized.

Unit dimensions, 2/2-, 3/2-way poppet valve: dimensions in inches (millimeters)



- 1 Solenoid "a" (plug-in connector color grey), may be rotated 90°
- 2 Protected manual override "N9"
- 3 Plug-in connector **without** circuitry, Z4, to DIN 43 650 ¹⁾
- 4 Plug-in connector **with** circuitry, Z5, to DIN 43 650 ¹⁾
- 5 Space required to remove the coil
- 6 Space required to remove the plug-in connector

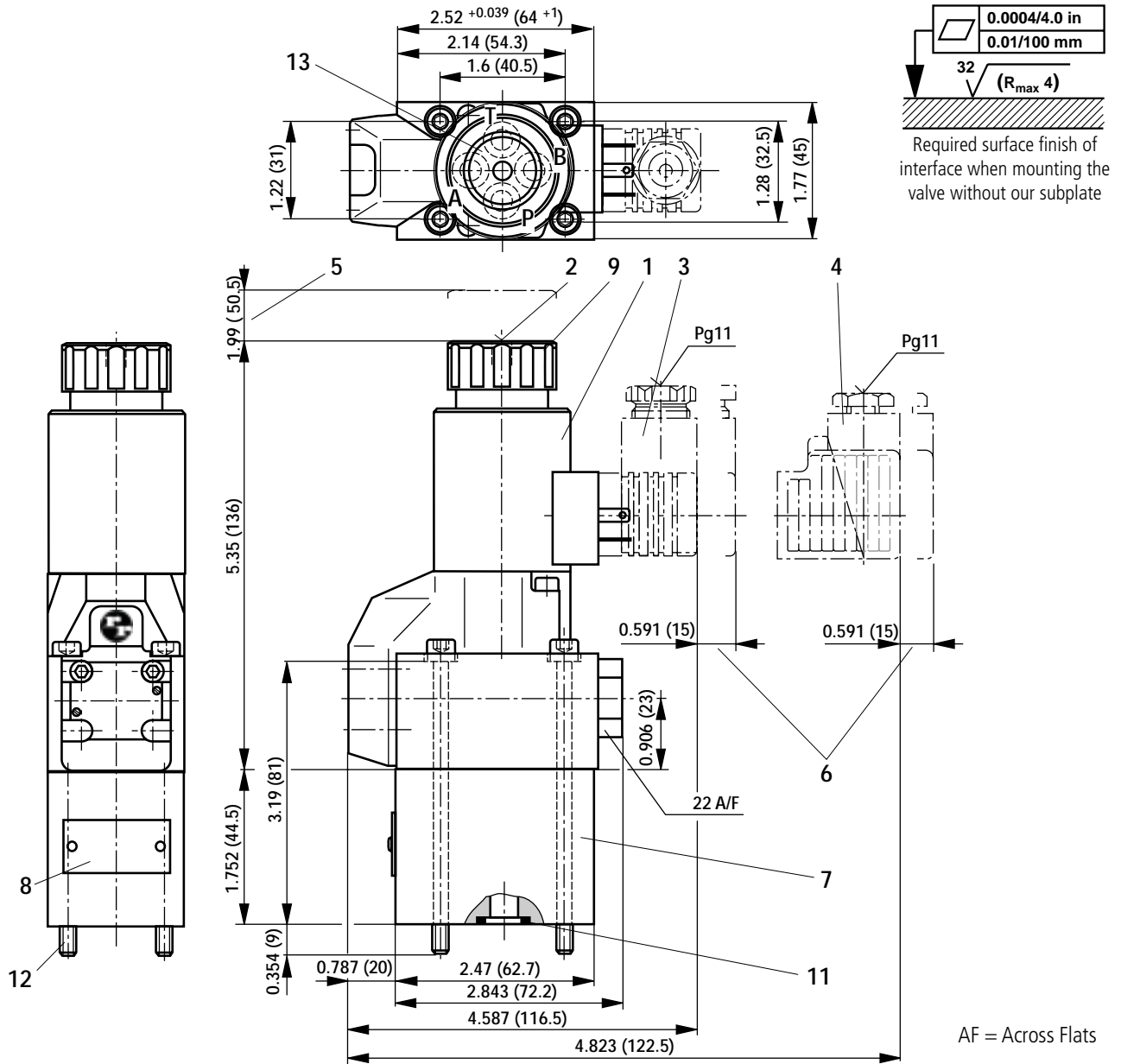
- 8 Name plate
- 9 Mounting bolt, tightening torque $M_A = 3$ ft-lbs (4 Nm)
- 10 **Attention!**
On 3/2-way poppet valves, 6092 PSI (420 bar) version, port B is a blind counterbore. On 2/2-way poppet valves, 6092 PSI (420 bar) version) ports A and B are blind counterbores.
- 11 O-ring 9.25 mm x 1.78 mm
R-ring 9.81 mm x 1.5 mm x 1.78 mm ports A, B and T
O-ring 10.82 mm x 1.78 mm
R-Ring 11.18 mm x 1.6 mm x 1.78 mm port P

- 12 Subplates, see RA 45 052 Valve mounting bolts (separate supply)
3/2-way poppet valve
6100 PSI (420 bar) version
4) 10-24 UNC x 1-3/4" (M5 x 45) tightening torque 6.6 lb-ft (8.9 Nm)
9150 PSI (630 bar) version
4) 1/4-20 UNC x 1-3/4" (M6 x 45) tightening torque 11.4 lb-ft (15.5 Nm)
- 4/2-way poppet valve**
6100 PSI (420 bar) version
4) 10-24 UNC x 3-1/2" (M5 x 90) tightening torque 6.6 lb-ft (8.9 Nm)
9150 PSI (630 bar) version

- 4) 1/4-20 UNC x 3-1/2" (M6 x 90) tightening torque 11.4 lb-ft (15.5 Nm)
- 13 Mounting pattern ISO / 4401-3 NFPA T3.5.1 D03
Subplates:
• 420 bar version
G341/12 SAE-6, G342/12 SAE-8, G502/12 SAE-10
• 630 bar version
G576 (1/4"), G577 (3/8")

¹⁾ Must be ordered separately, see page 2.

Unit dimensions, 4/2-way poppet valve: dimensions in inches (millimeters)



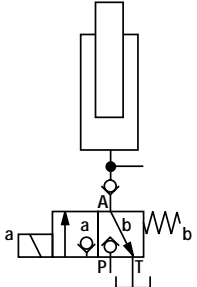
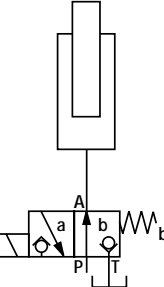
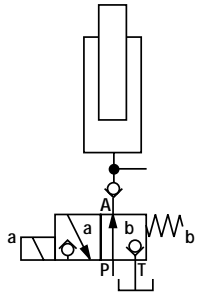
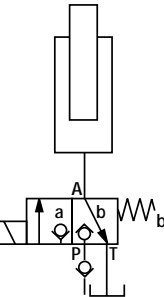
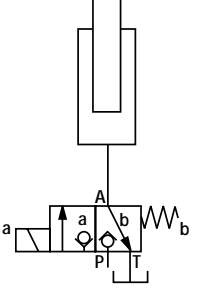
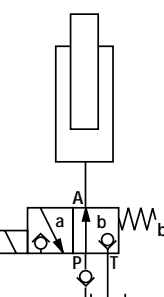
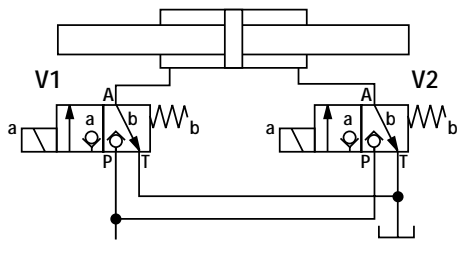
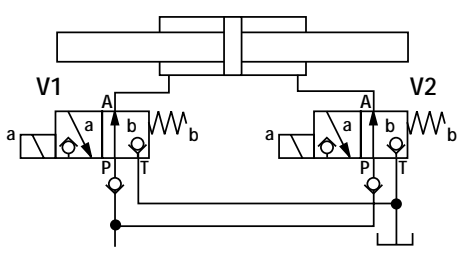
AF = Across Flats

- 1 Solenoid "a" (plug-in connector color grey), may be rotated 90°
 - 2 Protected manual override "N9"
 - 3 Plug-in connector **without** circuitry, Z4, to DIN 43 650 ¹⁾
 - 4 Plug-in connector **with** circuitry, Z5, to DIN 43 650 ¹⁾
 - 5 Space required to remove the coil
 - 6 Space required to remove the plug-in connector
 - 7 Base plate
 - 8 Name plate
 - 9 Mounting bolt, tightening torque $M_A = 2.95 \text{ lb-ft (4 Nm)}$
 - 11 O-ring 9.25 mm x 1.78 mm
R-ring 9.81 mm x 1.5 mm x 1.78 mm ports A, B and T
O-ring 10.82 mm x 1.78 mm
R-Ring 11.18 mm x 1.6 mm x 1.78 mm port P
 - 12 Subplates, see RA 45 052 Valve mounting bolts (separate supply)
- 3/2-way poppet valve**
6100 PSI (420 bar) version
4) 10-24 UNC x 1-3/4" (M5 x 45) tightening torque 6.6 lb-ft (8.9 Nm)
9150 PSI (630 bar) version
4) 1/4-20 UNC x 1-3/4" (M6 x 45) tightening torque 11.4 lb-ft (15.5 Nm)
- 4/2-way poppet valve**
6100 PSI (420 bar) version
4) 10-24 UNC x 3-1/2" (M5 x 90) tightening torque 6.6 lb-ft (8.9 Nm)
9150 PSI (630 bar) version
4) 1/4-20 UNC x 3-1/2" (M6 x 90) tightening torque 11.4 lb-ft (15.5 Nm)
- 13 Mounting pattern ISO / 4401-3 NFPA T3.5.1 D03**
Subplates:
• 420 bar version
G341/12 SAE-6, G342/12 SAE-8, G502/12 SAE-10
• 630 bar version
G576 (1/4"), G577 (3/8")

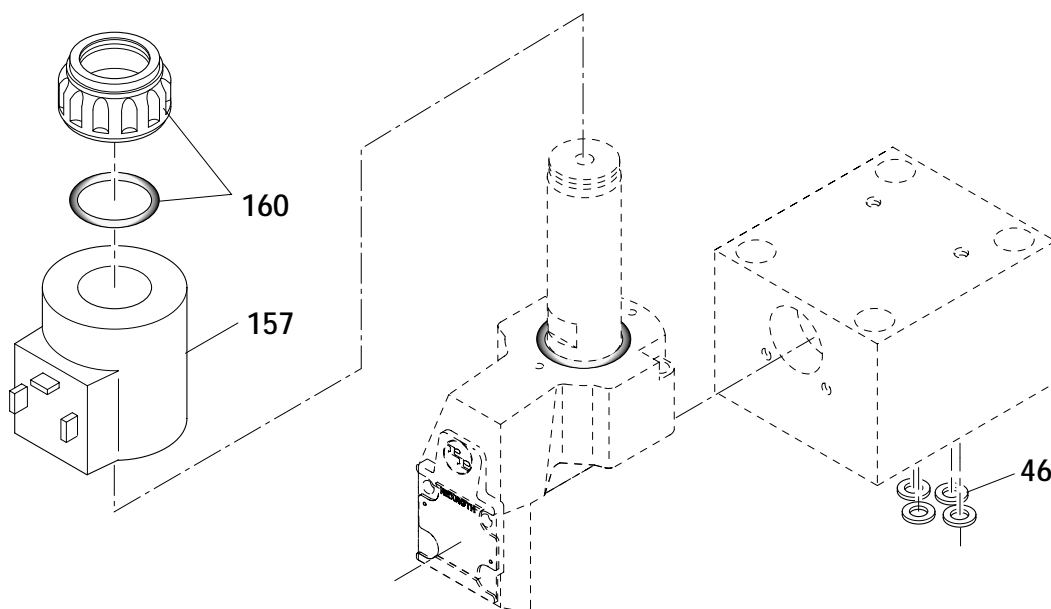
¹⁾ Must be ordered separately, see page 2.

Application examples

These examples serve **only to explain** the possibilities offered by the poppet valve. They do not include the complete function.

<p>Symbol "C"</p> 	<p>2/2-way circuit with a two poppet valve and check valve at port A</p> <p>The check valve must be installed in the pipework. Initial position: Flow blocked, maximum pressure permissible. Pressure is held in the actuator, even when the pump is switched off, due to the check valve at port A. Switched position: Free-flow, maximum pressure permissible. Leakage drained via port T. The only leakage occurring is that which flows to T during the switching process.</p>	<p>Symbol "U"</p> 	<p>3/2-way circuit with a single poppet valve</p> <p>Initial position: Lifting Holding only due to limitation of travel and pressure in port P. Switched position: Lowering</p>
<p>Symbol "U"</p> 	<p>2/2-way circuit with a single poppet valve and check valve at port A</p> <p>The check valve must be fitted in the pipework. Initial position: Free-flow, maximum pressure permissible. Pressure is held in the actuator, even when the pump is switched off, due to the check valve at port A. Switched position: Flow blocked, maximum pressure permissible. Leakage drained via port T. The only leakage occurring is that which flows to T during the switching process.</p>	<p>Symbol "C"</p> 	<p>3/2-way circuit with a two poppet valve and cartridge check valve in port P</p> <p>The check valve is fitted in the P port of the 3/2-way poppet valve. Initial position: Lowering Switched position: Lifting The load can be held in any position while the pump is switched off and the solenoid energized.</p>
<p>Symbol "C"</p> 	<p>3/2-way circuit with a two poppet valve</p> <p>Initial position: Lowering Switched position: Lifting Holding only due to limitation of travel and pressure in port P.</p>	<p>Symbol "U"</p> 	<p>3/2-way circuit with a single poppet valve and cartridge check valve in port P</p> <p>The check valve is fitted into the P port of the 3/2-way poppet valve. Initial position: Lifting The load can be held in any position while the pump is switched off. Switched position: Lowering</p>
<p>Symbol "C"</p> 	<p>4/3- (4/4-) way circuit with a 2 two poppet valves</p> <p>V1 and V2 in the initial position: Both cylinder sides are connected to the tank port. V2 in the switched position: The piston moves to the left V1 in the switched position: The piston moves to the right V1 and V2 in the switched position: Both cylinders sides are connected to the pump port. Rapid traverse is possible when a single rod cylinder with an area ratio of 2:1, is used.</p> <p>⚠ Attention! When using single rod cylinders, the performance limit (double flow) and the maximum permissible operating pressure (pressure intensification) of the valve must be taken into account.</p>		
<p>Symbol "U"</p> 	<p>4/3- (4/4-) way circuit with a 2 two poppet valves and cartridge check valve in port P of the 3/2-way poppet valves</p> <p>V1 and V2 in the initial position: The piston is locked externally to prevent movement. V2 in the switched position: The piston moves to the right V1 in the switched position: The piston moves to the left V1 and V2 in the switched position: Both cylinder sides are connected to the tank port.</p> <p>⚠ Attention! When using single rod cylinders, the performance limit (double flow) and the maximum permissible operating pressure (pressure intensification) of the valve must be taken into account!</p>		

Ordering codes: spare parts and seals



Spare parts – solenoid

Item	Designation	DC	
		Voltage	Material no.
157	Coil for individual connection	12 V	RR00 021388
		24 V	RR00 021389
		96 V	RR00 021392
		205 V	RR00 071036
160	Seal kit – nut for pressure tube without manual override		RR00 838254
	Seal kit – nut for pressure tube with protected manual override		

Seal kit – valve

Item	Sealing material	Material no.
46	NBR seals	RR00 075699
	FPM seals	RR00 075700

General guidelines

- In order to operate the valve safely and to hold it safely in the switched position, the pressure in P must be $\geq A \geq T$ (for design reasons).
- The ports P, A and T (3/2-way poppet valve) as well as P, A, B and T (4/2-way poppet valve) are positively assigned to their individual functions. They must not be interchanged or plugged. Flow is only permitted in the direction of the arrow.
- When using the base plate (4/2-way function) the following operating values must be taken into account: $p_{\min} = 116 \text{ PSI (8 bar)}$; $q_V > 0.793 \text{ GPM (3 L/min)}$.
- The specified maximum flow must not be exceeded.

Notes:



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