

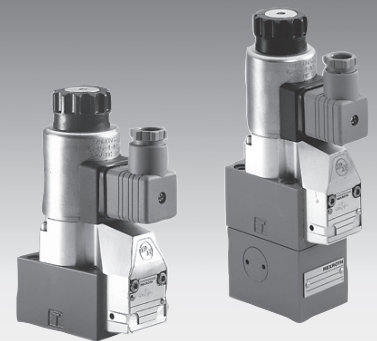
2/2-, 3/2- and 4/2-way directional poppet valves with solenoid operation

RA 22058/02.03
Replaces 09.99

1/12

Model M-.SEW 6

Nominal size 6
Series 3X
Maximum operating pressure 420/630 bar (6092/9138 PSI)
Maximum flow 25 L/min (6.6 GPM)



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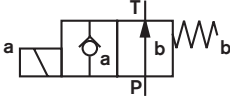
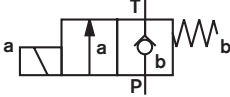
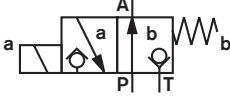
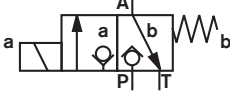
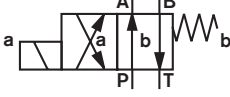
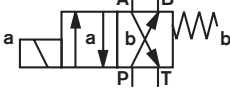
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Features

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2	– Porting pattern to DIN 24 340 Form A, without locating pin hole (standard)
3	– Porting pattern to ISO 4401 and CETOP-RP 121 H, with locating pin hole, (ordering detail .../ 60 at the end of the valve type code)
3, 4	– Closed port is leak-free
5	– Switching is ensured even after long periods of being under pressure
6	– Air gap DC solenoids with removable coil (AC voltages possible via a rectifier)
7	– Solenoid coil can be rotated by 90°
8, 9	– Individual electrical connection
10	– With protected hand override, optional
11	– Inductive limit switch (contact and contactless), optional, see page 10
12	

Ordering details

M –		SEW	6		3X /	M		K4	/			*
2 actuator ports	= 2											Further details in clear text
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 10 to 19 (10 to 19: unchanged installation and connection dimensions)				= 3X								
Operating pressure 420 bar (6092 PSI) (Fixing screws M5)				= 420								
Operating pressure 630 bar (9138 PSI) (Fixing screws M6)				= 630								
Solenoid (air gap) with removable coil				= M								

AC supply (permissible voltage tolerance ± 10%)	Nominal voltage of the DC solenoids when used with AC voltages	Ordering details
110 V – 50/60 Hz	96 V	G96
120 V – 60 Hz	110 V	G110
230 V – 50/60 Hz	205 V	G205

Standard types

Model	Material No.
M-3SEW 6 C3X/420MG205N9K4	R900050514
M-3SEW 6 C3X/420MG24N9K4	R900566273

Model	Material No.
M-3SEW 6 U3X/420MG205N9K4	R900050515
M-3SEW 6 U3X/420MG24N9K4	R900566283

No code = Without
locating pin hole
/60³⁾ = With
locating pin hole

No code = NBR seals
V = FKM 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 Ø1.2 mm (0.05")

B15 = Throttle Ø1.5 mm (0.06")

B18 = Throttle Ø1.8 mm (0.07")

B20 = Throttle Ø2.0 mm (0.08")

B22 = Throttle Ø2.2 mm (0.09")

Accessories

Inductive limit switch
see page 10 and
catalog sheet RE 24 830

No code = Without limit switch
QMAG24 = Switched position "a"
is monitored

QMBG24 = Switched position "b"
is monitored

Electrical connections

K4^{1;2)} = Without plug-in connector,
individual with component plug to
DIN EN 175 301-803

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

G24 = 24 V DC
G205²⁾ = 205 V DC

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

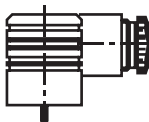
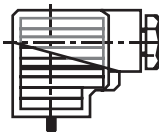
¹⁾ Plug-in connectors must be ordered separately
(see page 3).

²⁾ For the connection to an AC supply a DC solenoid
must be used which is controlled via rectifier (see
table on the left).

For individual connections a large plug-in connector
with integrated rectifier can be used (separate order,
see page 3).

³⁾ Locating pin 3 x 8 DIN EN ISO 8752,
Material No. **R900056944** (separate order)

Plug-in connectors to DIN EN 175 301-803 and ISO 4400 for component plug “K4”

For further plug-in connectors see RE 08 006					
		Material No.			
		Without circuitry	With indicator lamp 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Z-diode protective circuit 24 V
Valve side	Color				
a	Grey	R900074683	—	—	—
a/b	Black	—	R900057292	R900313933	R900310995

Function, section: 2/2-, 3/2-way poppet valve

General:

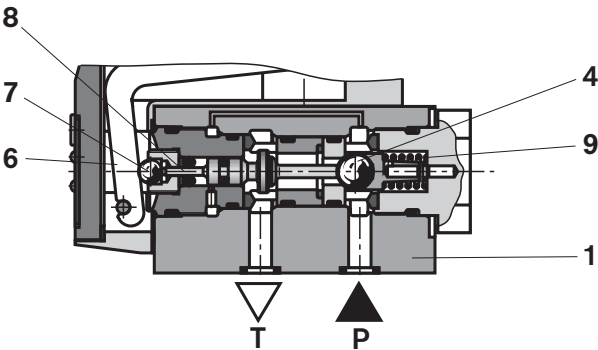
The type M-.SEW directional valve is a solenoid operated directional poppet valve. It controls the start, stop and direction of a flow. It basically consists of a housing (1), the solenoid (2), the hardened valve system (3) and the ball(s) (4) as the closing element.

Basic principle:

In the initial position the ball (4) is pressed onto the seat by the spring (9), and in the switched position by the solenoid (2). The solenoid (2) force acts via the lever (6) and the ball (7) on the actuator pin (8), which is sealed on two sides. The chamber between the two sealing elements is connected with port P. The valve system (3) is thereby pressure balanced with regard to the actuating forces (solenoid or return spring). The valves can therefore be used up to a pressure of 630 bar.

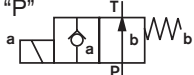
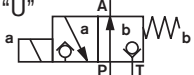
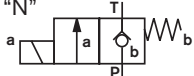
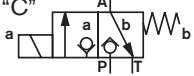
Note:

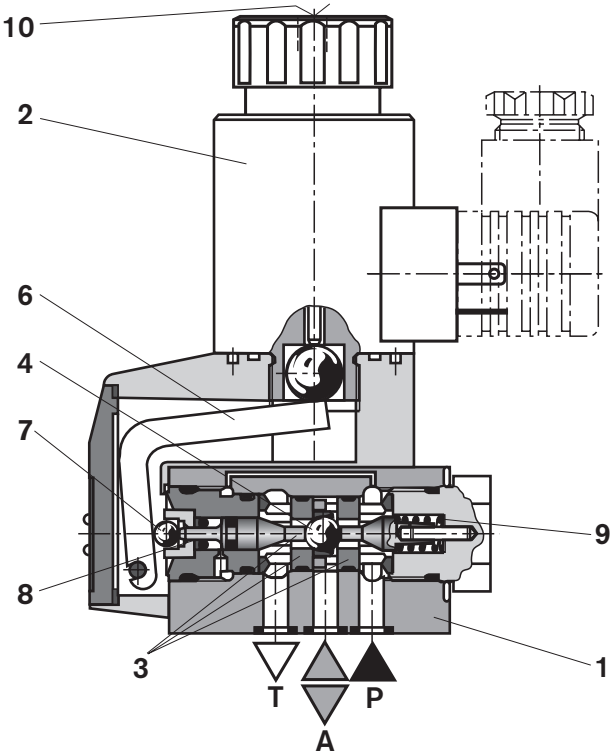
- The 3/2-way poppet valves have a “negative switching overlap”. Therefore port T must always be connected. This means that during the switching process – from the start of opening one valve seat to the closing of the other seat – all of the ports P–A–T are connected with each other. This, however takes place in such a short space of time that in most applications it is irrelevant.
- The hand override (10) makes it possible to switch the valve without energising the solenoids.
- Care has to be taken to ensure that the stated maximum flows are not exceeded! If necessary a cartridge throttle for flow limitation has to be fitted (see below).



Type 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



Type M-3SEW 6 U...

Function, section, schematic illustration: 4/2-way poppet valve

In conjunction with a sandwich plate, a plus-1 plate, under the 3/2-way poppet valve, this valve can be used as 4/2-way poppet valve.

Function of the plus-1 plate:

Initial position:

The main valve is not operated. The spring (9) holds the ball (4.1) on the seat (11). Port P is closed and A is connected to T. In addition, a control line runs from A to the large area of the control spool (12), which is thus unloaded to tank. The pressure applied via P now moves the ball (13) onto seat (14). Thus, P is connected to B and A to T.

Transition position:

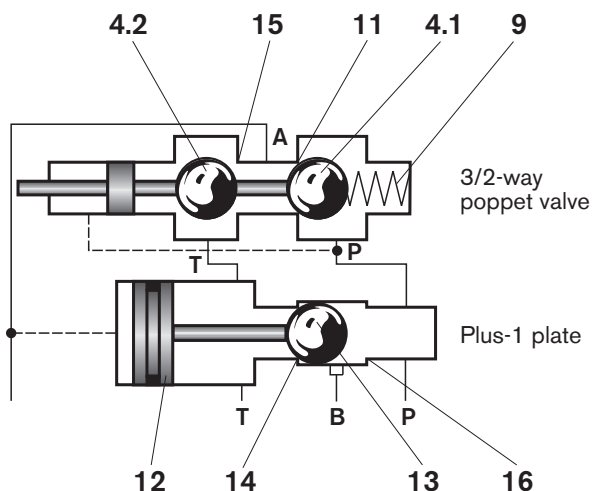
When the main valve is operated, the ball (4.2) is pushed against the spring (9) and then pressed onto the seat (15). Port T is then blocked, P, A and B are connected to each other for a short time.

Switched position:

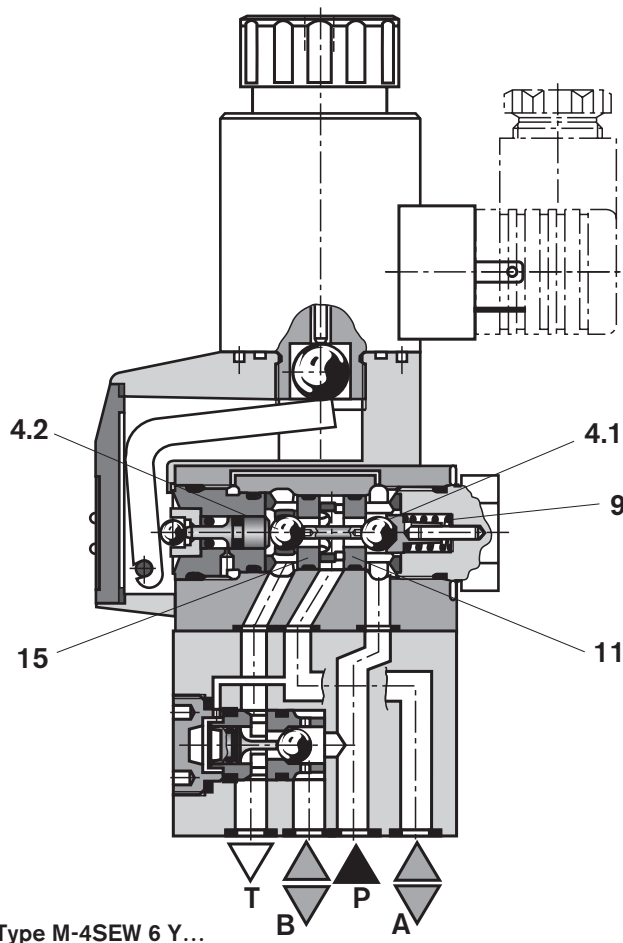
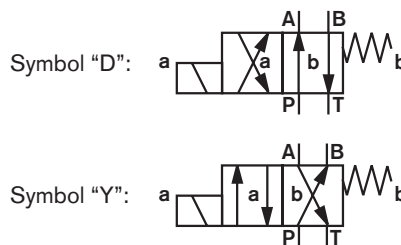
P is connected to A. As the pump pressure acts via A on the large area of the control spool (12), ball (13) is pushed onto seat (16). Thus, B is connected to T and P to A. Ball (13) in the plus-1 plate has a "positive switching overlap".

In order to avoid pressure intensification when single rod cylinders are used, the annulus area of the cylinder must be connected to A.

Schematic illustration: initial position



Due to the use of the plus-1 plate and the arrangement of the seats, the following combinations are possible:



Throttle insert

The use of a throttle insert is required, if, due to the operating conditions, flows are to be expected during the switching procedure, which are higher than the stated maximum.

Examples:

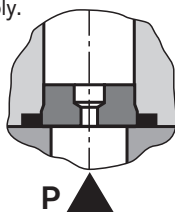
- Accumulator operation,
- Use as pilot valve with internal pilot oil supply.

3/2-way directional poppet valve (see page 3)

The throttle insert is inserted into port P of the poppet valve.

4/2-way directional poppet valve

The throttle insert is inserted into port P of the plus-1 plate.



Cartridge check valve

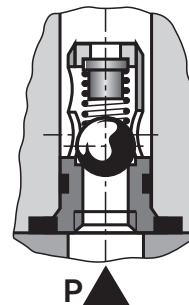
The cartridge check valve allows free-flow from P to A and closes leak-free from A to P. For examples, see page 11.

3/2-way directional poppet valve (see page 3)

The cartridge check valve is inserted into port P of the poppet valve.

4/2-way directional poppet valve

The cartridge check valve is inserted into port P of the plus-1 plate.



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

General				
Installation			Optional	
Maximum ambient temperature		°C (°F)	–30 to +50 (–22 to +131) – NBR seals	
			–20 to +50 (–4 to +131) – FKM seals	
Weight	2/2-way poppet valve	kg (lbs.)	1.5 (3.3)	
	3/2-way poppet valve	kg (lbs.)	1.5 (3.3)	
	4/2-way poppet valve	kg (lbs.)	2.3 (5.1)	
Hydraulic				
Maximum operating pressure		bar (PSI)	See table on page 7	
Maximum flow		L/min (GPM)	25 (6.6)	
Pressure fluid			Mineral oil (HL, HLP) to DIN 51 524 ¹⁾ ; Fast bio-degradable pressure fluids to VDMA 24 568 (see also RE 90 221); HETG (rape seed oil) ¹⁾ ; HEPG (polyglycols) ²⁾ ; HEES (synthetic ester) ²⁾ ; Other pressure fluids on request	
¹⁾ Suitable for NBR and FKM seals				
²⁾ Only suitable for FKM seals				
Pressure fluid temperature range		°C (°F)	–30 to + 80 (–22 to +176) – with NBR seals	
			–20 to + 80 (–4 to +176) – with FKM seals	
Viscosity range		mm ² /s (SUS)	2.8 to 500 (15 to 2300)	
Cleanliness class to ISO code			Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 20/18/15 3)	
Electrical				
Voltage type			DC	AC
Available voltages ⁴⁾		V	12, 24, 42, 96, 110, 205, 220	Only possible via a rectifier (see ordering details on page 11)
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 ⁵⁾			IP 65 with mounted and fixed plug-in connector	
Maximum coil temperature ⁶⁾		°C (°F)	150 (302)	

³⁾ The cleanliness class stated for the components must be adhered to in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life. For the selection of filters see catalogue sheets RE 50 070, RE 50 076 and RE 50081.

⁴⁾ Special voltages on request

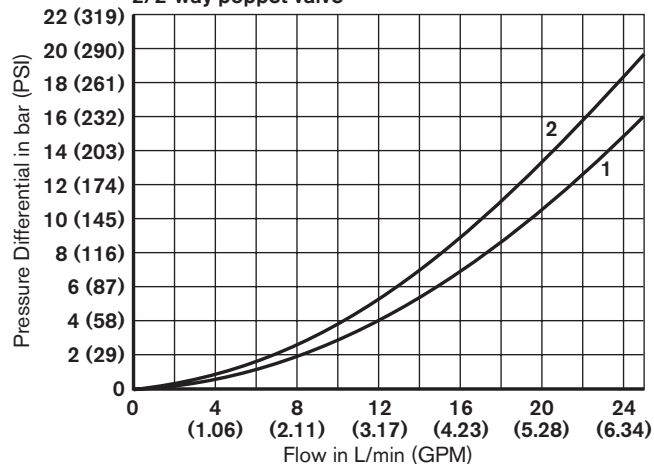
⁵⁾ With mounted and fixed plug-in connector

⁶⁾ Due to the surface temperatures which occur on the solenoid coils, the European standards EN563 and EN982 must be taken into account!

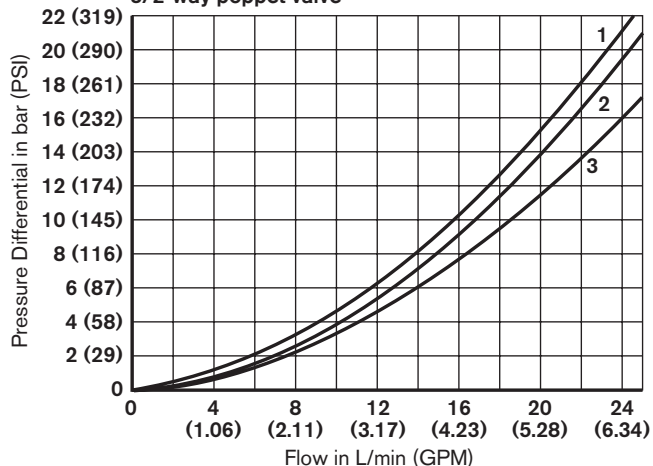
When connecting the electrics, the protective conductor (PE $\perp$) must be connected according to the relevant regulations.

Switching time t in ms (installation: solenoid horizontal)

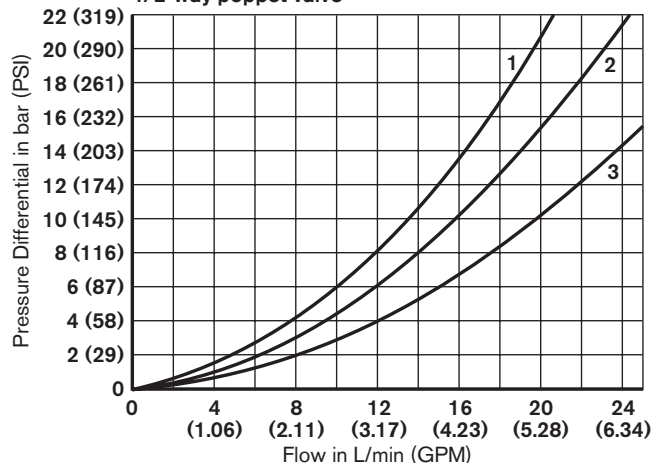
Pressure p in bar (PSI)	Flow q_v in L/min (GPM)	DC solenoid						DC solenoid + rectifier					
		Symbols U, C, D, Y						Symbols U, C, D, Y					
		t_{on}				t_{off}		t_{on}				t_{off}	
		Without tank pressure				U	D	Without tank pressure				U	D
		U	C	D	Y	C	Y	U	C	D	Y	C	Y
140 (2030)	25 (6.6)	25	30	25	30	10	10	30	40	30	40	35	35
280 (4060)	25 (6.6)	25	30	25	30	10	10	35	45	35	45	40	40
320 (4640)	25 (6.6)	25	35	25	35	10	10	35	50	35	50	40	40
420 (6090)	25 (6.6)	25	35	25	35	10	10	40	50	40	50	50	50
500 (7250)	25 (6.6)	25	40	25	40	10	10	40	55	40	55	50	50
600 (8700)	25 (6.6)	25	40	25	40	10	10	40	55	40	55	55	55

Characteristic curves – measured with HLP46, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ (104 °F $\pm$ 41 °F)
 Δp - q_v characteristic curves
2/2-way poppet valve


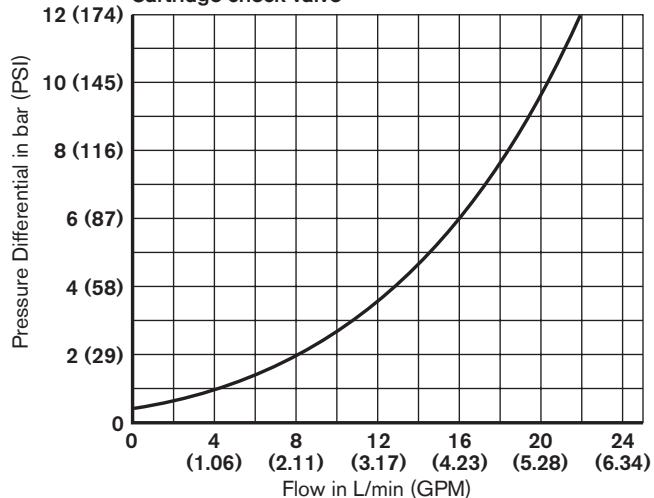
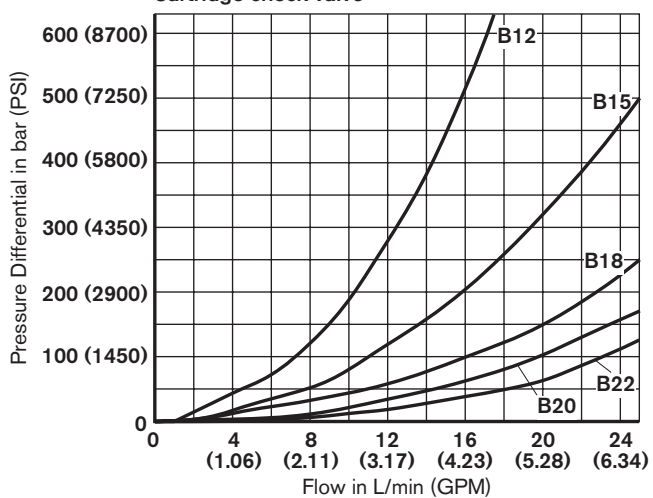
- 1 M-2SEW 6 N ..., P to T
2 M-2SEW 6 P ..., P to T

 Δp - q_v characteristic curves
3/2-way poppet valve


- 1 M-3SEW 6 $\frac{U}{C}$..., 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-way poppet valve


- 1 M-4SEW 6 $\frac{D}{Y}$..., A to T
2 M-4SEW 6 $\frac{D}{Y}$..., P to A
3 M-4SEW 6 $\frac{D}{Y}$..., P to B, B to T

 Δp - q_v characteristic curves
Cartridge check valve

 Δp - q_v characteristic curves
Cartridge check valve


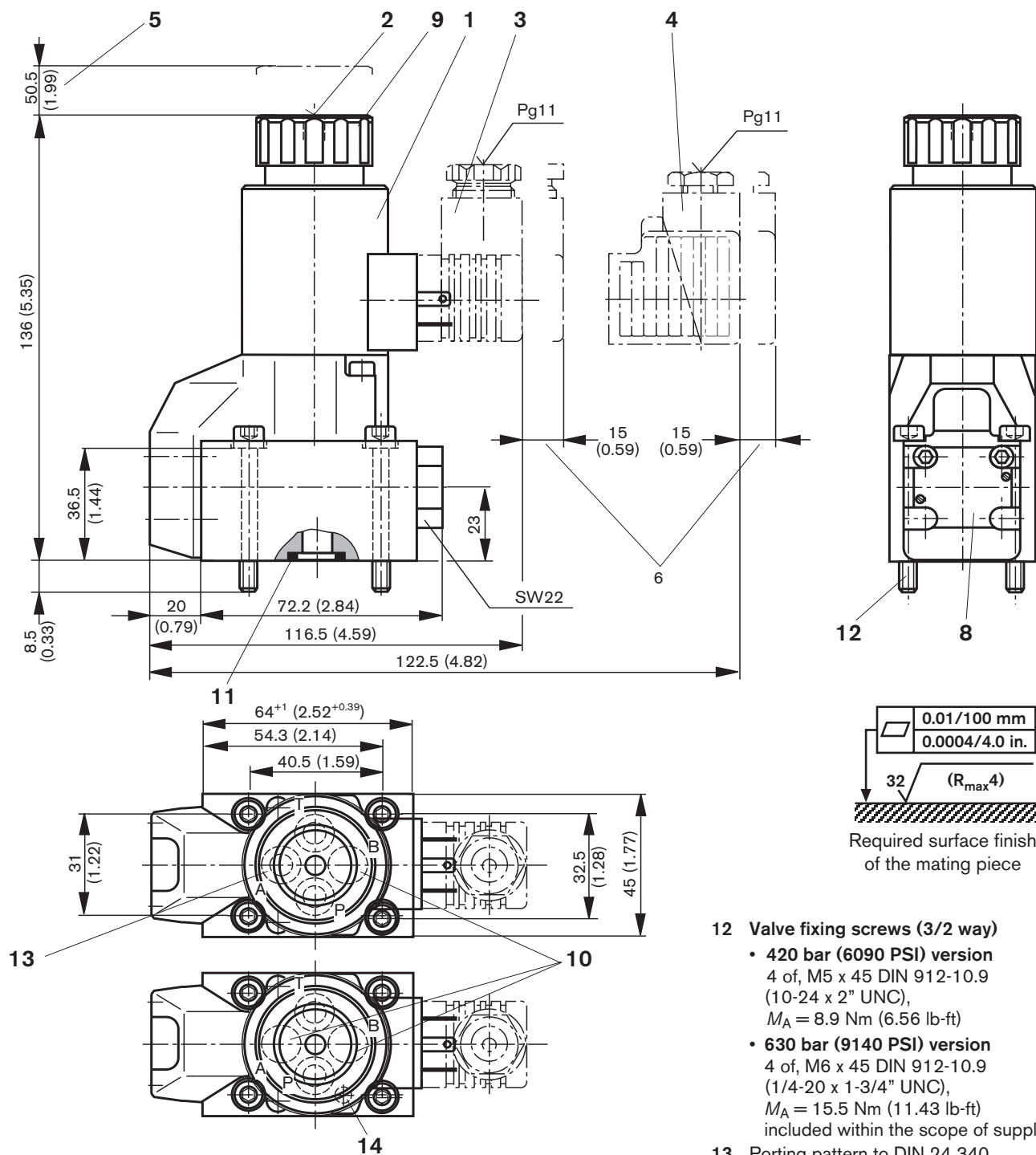
Performance limits – measured with HLP 46, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ (104 °F $\pm$ 41 °F)

	Symbol	Comments	Operating pressure in bar (PSI)				Flow in L/min (GPM)
			P	A	B	T	
2-way circuit	"P" 	Pressure to $P \geq T$	420/630 (6090/9140)			100 (1450)	25 (6.6)
	"N" 		420/630 (6090/9140)			100 (1450)	25 (6.6)
3-way circuit	"U" 	Pressure to $P \geq A \geq T$	420/630 (6090/9140)	420/630 (6090/9140)		100 (1450)	25 (6.6)
	"C" 		420/630 (6090/9140)	420/630 (6090/9140)		100 (1450)	25 (6.6)
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 $A \geq T$		420/630 (6090/9140)		100 (1450)	25 (6.6)
	"C" 	Pressure to $A \geq T$		420/630 (6090/9140)		100 (1450)	25 (6.6)
4-way circuit (flow is only possible in the direction of the arrow)	"D" 	Single ball valve (symbol "U") in conjunction with a plus-1 plate $P > A \geq B > T$	420/630 (6090/9140)	420/630 (6090/9140)	420/630 (6090/9140)	100 (1450)	25 (6.6)
	"Y" 	Two ball valve (symbol "C") in in conjunction with a plus-1 plate $P > A \geq B > T$	420/630 (6090/9140)	420/630 (6090/9140)	420/630 (6090/9140)	100 (1450)	25 (6.6)

⚠ Attention!

Please take into account the "General guidelines" stated on page 12!

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

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


Required surface finish
of the mating piece

- 1 Solenoid "a" (plug-in connector color, gray)
- 2 Protected hand override "N9"
- 3 Plug-in connector **without** circuitry to DIN EN 175 301-803 ¹⁾
- 4 Plug-in connector **with** circuitry to DIN EN 175 301-803 ¹⁾
- 5 Space required to remove the coil
- 6 Space required to remove the plug-in connector
- 8 Name plate

- 9 Fixing nut, tightening torque $M_A = 4 \text{ Nm}$ (2.95 lb-ft)
- 10 **Attention**
On 3/2-way poppet valves for 420 bar version, port B is a blind counterbore, and is not present in the 630 bar version.
On 2/2-way poppet valves for 420 version, ports A and B are blind counterbores.
- 11 Identical seal rings for ports A, B, P and T

12 Valve fixing screws (3/2 way)

- **420 bar (6090 PSI) version**
4 of, M5 x 45 DIN 912-10.9 (10-24 x 2" UNC),
 $M_A = 8.9 \text{ Nm}$ (6.56 lb-ft)
- **630 bar (9140 PSI) version**
4 of, M6 x 45 DIN 912-10.9 (1/4-20 x 1-3/4" UNC),
 $M_A = 15.5 \text{ Nm}$ (11.43 lb-ft)
included within the scope of supply.

- 13 Porting pattern to DIN 24 340 Form A, **without** locating pin hole
- 14 Porting pattern to ISO 4401 and CETOP-RP 121 H **with** locating pin hole

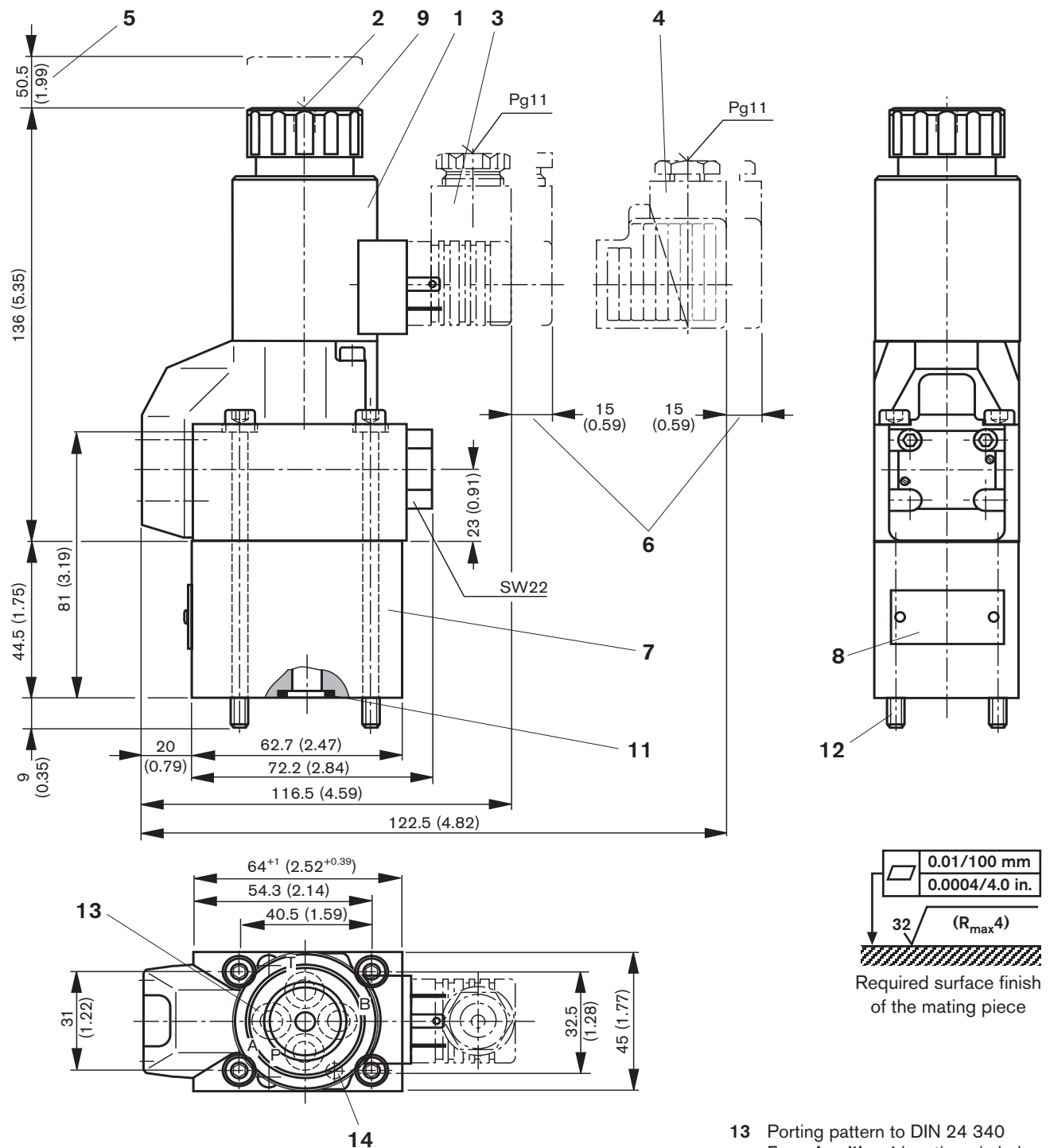
Associated subplates:

- **Without** locating pin hole
G 341/01 G1/4 (SAE-6; 9/16-18)
G 342/01 G3/8 (SAE-4; 7/16-20)
G 502/01 G1/2 (SAE-8; 3/4-16)

to catalog sheet RE 45 052:
must be ordered separately.

¹⁾ Must be ordered separately, see page 3.

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



- 1 Solenoid "a" (plug-in connector color, gray)
- 2 Protected hand override "N9"
- 3 Plug-in connector **without** circuitry to DIN EN 175 301-803 ¹⁾
- 4 Plug-in connector **with** circuitry to DIN EN 175 301-803 ¹⁾
- 5 Space required to remove the coil
- 6 Space required to remove the plug-in connector
- 8 Name plate
- 9 Fixing nut, tightening torque $M_A = 4 \text{ Nm}$ (2.95 lb-ft)

- 11 Identical seal rings for ports A, B, P and T
- 12 **Valve fixing screws (4/2 way)**
 - 420 bar (6090 PSI) version
4 of, M5 x 90 DIN 912-10.9 (10-24 x 3-1/2" UNC)
 $M_A = 8.9 \text{ Nm}$ (6.56 lb-ft)
 - 630 bar (9140 PSI) version
4 of, M6 x 90 DIN 912-10.9 (1/4-20 x 3-1/2" UNC)
 $M_A = 15.5 \text{ Nm}$ (11.43 lb-ft) included within the scope of supply.

- 13 Porting pattern to DIN 24 340 Form A, **without** locating pin hole
- 14 Porting pattern to ISO 4401 and CETOP-RP 121 H **with** locating pin hole

Associated subplates:

- **Without** locating pin hole
G 341/01 G1/4 (SAE-6; 9/16-18)
G 342/01 G3/8 (SAE-4; 7/16-20)
G 502/01 G1/2 (SAE-8; 3/4-16)

to catalog sheet RE 45 052:
must be ordered separately.

¹⁾ Must be ordered separately, see page 3.

Accessories: inductive limit switch – dimensions in millimeters (dimensions)

Monitored switched position	Ordering details	Limit switch
Switched position “a” is monitored	QMAG24	Damped
Switched position “b” is monitored	QMBG24	Undamped

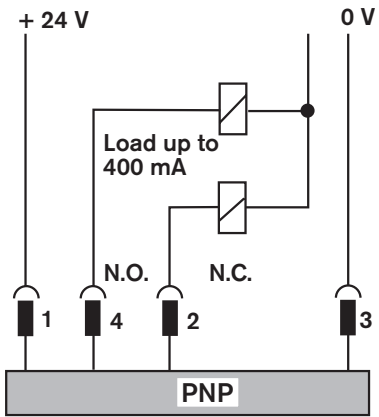
The electrical connection is via a 4-pin plug-in connector with an M12 x 1 connection thread.

The plug-in connector has to be ordered separately (see RE 08 006).

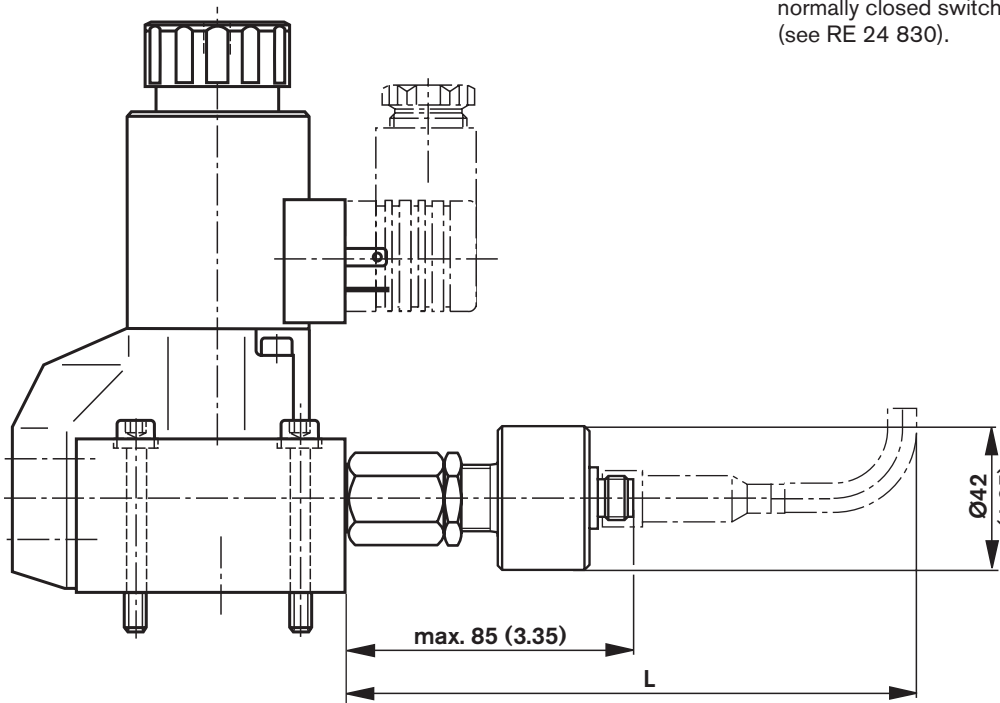
For further details regarding the

- Operating voltage,
- Current consumption,
- Load capacity of the outputs,
- Contact allocation,

see RE 24 830.



The inductive limit switch can be connected as a normally open or normally closed switch (see RE 24 830).



⚠ Attention!

It has to be ensured that terminal 1 of the plug-in connector is connected!

Dim. L (plug-in connector, 10 mm (0.39 in.) withdrawal room and minimum bend radius for the connection cable). Plug-in connectors see RE 08 006.

Straight plug-in connector Material No. R900031155	186
Angled plug-in connector Material No. R900082899	117
Plug-in connector with molded-on cable Material No. R900064381	156

Application examples

These examples serve only to explain the possibilities offered by the poppet valve. They do not include all of the complete functions.

Symbol "C"	2/2-way circuit with a two poppet valve and check valve at port A 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.	Symbol "U"	3/2-way circuit with a single poppet valve Initial position: Lifting Holding only due to limitation of travel and pressure in port P. Switched position: Lowering
Symbol "U"	2/2-way circuit with a single poppet valve and check valve at port A 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.	Symbol "C"	3/2-way circuit with a two poppet valve and cartridge check valve in port 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.
Symbol "C"	3/2-way circuit with a two poppet valve Initial position: Lowering Switched position: Lifting Holding only due to limitation of travel and pressure in port P.	Symbol "U"	3/2-way circuit with a single poppet valve and cartridge check valve in port 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 when the pump is switched off. Switched position: Lowering
Symbol "C"	4/3- (4/4-) way circuit with 2 two poppet valves 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 cylinder 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. ⚠ 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.		
Symbol "U"	4/3- (4/4-) way circuit with 2 two poppet valves and cartridge check valve in port P of the 3/2-way poppet valves 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. ⚠ 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!		

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 plus-1 plate (4/2-way function) the following lower operating values must be taken into account:
 $p_{\min} = 8 \text{ bar (116 PSI)}$; $q^V > 3 \text{ L/min (0.80 GPM)}$.
- The specified maximum flow must not be exceeded.

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