

RE 22 049/11.02

Replaces: 06.01

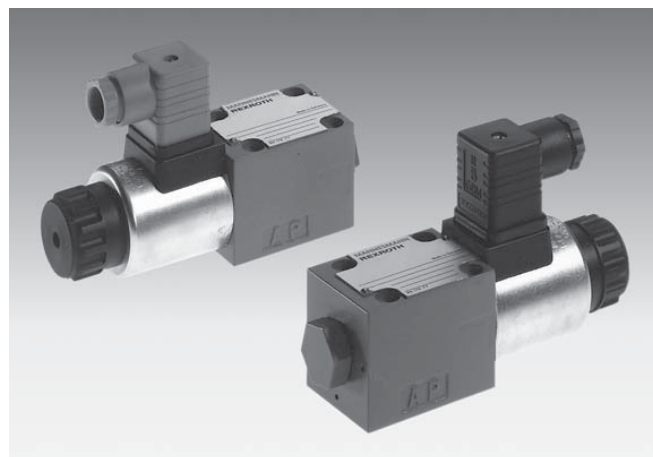
**3/2- and 4/2-way directional poppet valves, solenoid operated
Type M-.SED 6**

Nominal size 6

Series 1X

Maximum operating pressure 350 bar

Maximum flow 25 L/min



H/A 4243/94

Type M-3SED 6^{UK}_{CK} 1X/350CG24N9K4 with plug-in connector
(separate order)**Overview of contents**

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Features

- Direct operated directional poppet valve, solenoid operated
- Porting pattern to DIN 24 340 Form A, **without** locating pin hole (standard)
- 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)
- Closed port is leak-free
- Switching is ensured even when under pressure for long periods of time
- Wet pin DC solenoids with removable coil (AC voltage is possible by means of rectifier)
- Solenoid coil can be rotated by 90°
- When changing coils, opening of the pressure-tight chamber is not required
- Individual electrical connection
- With protected manual override, optional
- Inductive limit switch (contact and contactless), optional, see page 12.



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Ordering details

M-	SED	6	1X/350	C	K4	/	*
<p>3 actuator ports = 3 4 actuator ports = 4</p> <p>Poppet valve</p> <p>Nominal size 6 = 6</p>							
<p>Further details in clear text</p> <p>No code = Without locating pin hole /60³⁾ = With locating pin hole</p> <p>No code = NBR seals V = FKM seals (other seals on request)</p> <p>⚠ Attention! The compatibility of the seals and pressure fluid has to be taken into account!</p> <p>No code = Without cartridge check valve, without throttle insert P = With cartridge check valve B12 = Throttle Ø 1.2 mm B15 = Throttle Ø 1.5 mm B18 = Throttle Ø 1.8 mm B20 = Throttle Ø 2.0 mm B22 = Throttle Ø 2.2 mm</p> <p>Accessories Inductive limit switch, see page 12 and catalogue sheet RE 24 830</p> <p>No code = Without limit switch QMAG24 = Switched position „a“ is monitored QMBG24 = Switched position „b“ is monitored</p> <p>Electrical connection K4¹⁾ = Without plug-in connector Individual connection with component plug to DIN EN 175 301-803</p> <p>N9 = With protected hand override No code = Without hand override</p>							
Actuator ports		3	4				
Symbols							
		●	-	= UK			
		●	-	= CK			
		-	●	= D			
		-	●	= Y			
		● = Available					
Series 10 to 19 (10 to 19: unchanged installation and connection dimensions)		= 1X					
Operating pressure 350 bar		= 350					
Wet pin solenoid (in oil immersed) with removable coil		= C					
24 V DC		= G24					
205 V DC		= G205 ²⁾					

AC supply (permissible voltage tolerance ± 10%)	Nominal voltage of the DC solenoids when used with AC voltages	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

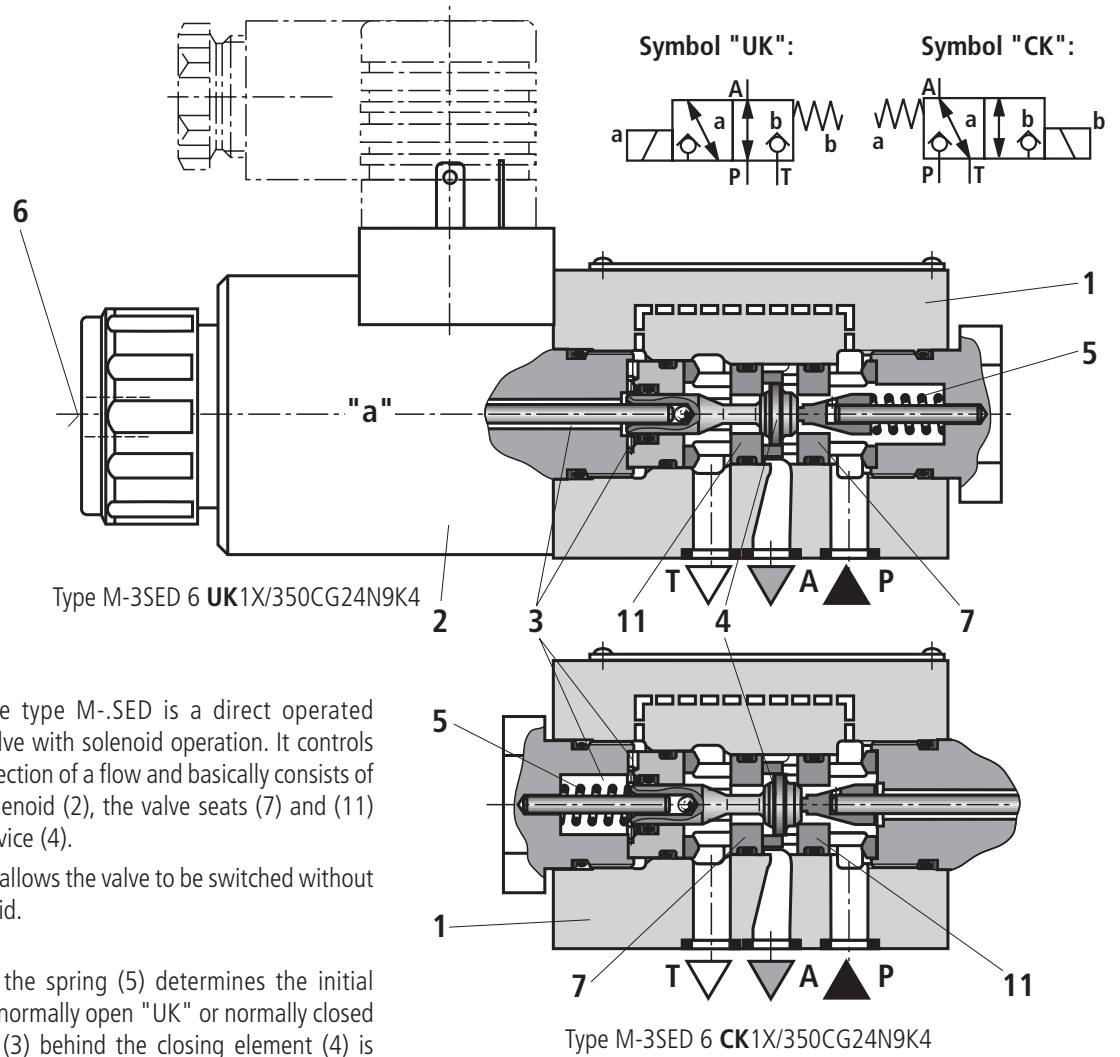
Preferred types (readily available)

Material No.	Type
R900052621	M-3SED 6 UK1X/350CG24N9K4
R900052392	M-3SED 6 CK1X/350CG24N9K4

- 1) Plug-in connectors must be ordered separately (see page 13).
- 2) When connecting to an AC supply a DC solenoid **must** be used which is controlled via a rectifier (see table on the left). For individual connections a large plug-in connector with integrated rectifier can be used (separate order, see page 13).
- 3) Locating pin 3 x 8 DIN EN ISO 8752, Material No. 000056944 (separate order)

Further preferred types and standard units are to be found in the EPS (Standard Price List).

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



General:

The directional valve type M-.SED is a direct operated directional poppet valve with solenoid operation. It controls the start, stop and direction of a flow and basically consists of a housing (1), the solenoid (2), the valve seats (7) and (11) and as the closing device (4).

The hand override (6) allows the valve to be switched without energising the solenoid.

Basic function:

The arrangement of the spring (5) determines the initial position of the valve (normally open "UK" or normally closed "CK"). The chamber (3) behind the closing element (4) is connected to port P and is sealed off from port T. Hence the valve is pressure-balanced with respect to the operating forces (solenoid and spring).

Due to the special closing element (4) it is possible to apply the maximum operating pressure (350 bar) to ports P, A and T. The flow can also pass in both directions (see symbols)!

In the initial position the closing element (4) is pressed onto seat (11) by the spring (5), in the switched position it is pushed onto seat (7) by the solenoid (2). This results in leak-free closure.

Throttle insert

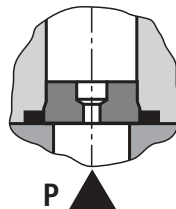
The use of a throttle insert is required, if, due to the operating conditions, flows are to be expected during the switching procedure, which are higher than the stated maximum performance limits of the valve.

Examples:

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

3/2-way directional poppet valve

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



4/2-way directional poppet valve

(see page 4)

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

Cartridge check valve

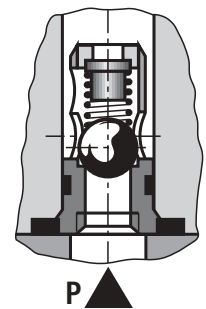
The cartridge check valve allows free-flow from P to A and provides leak-free closure from A to P. For examples, see page 14.

3/2-way directional poppet valve

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

4/2-way directional poppet valve

(see page 4) The cartridge check valve is inserted into port P of the plus-1 plate.



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

It is possible to achieve the function of a 4/2-way directional poppet valve by fitting a sandwich plate, a **Plus-1 plate**, under the 3/2-way directional poppet valve.

Function der Plus-1 plate:

Initial position:

The main valve is not actuated. The spring (5) holds the closing element (4) in its seat (11). Port P is closed, and port A is connected to T. In addition, a control line runs from A to the large area of the control piston (8) so that this is unloaded to tank. The pressure applied via P now moves ball (9) onto seat (10). P is now connected to B and A with T.

Transition position:

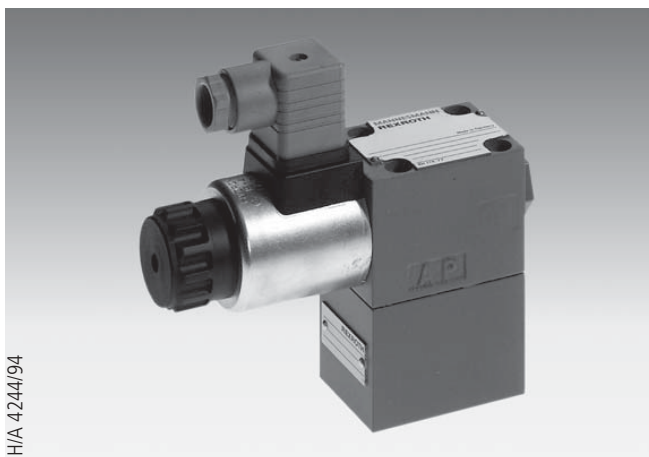
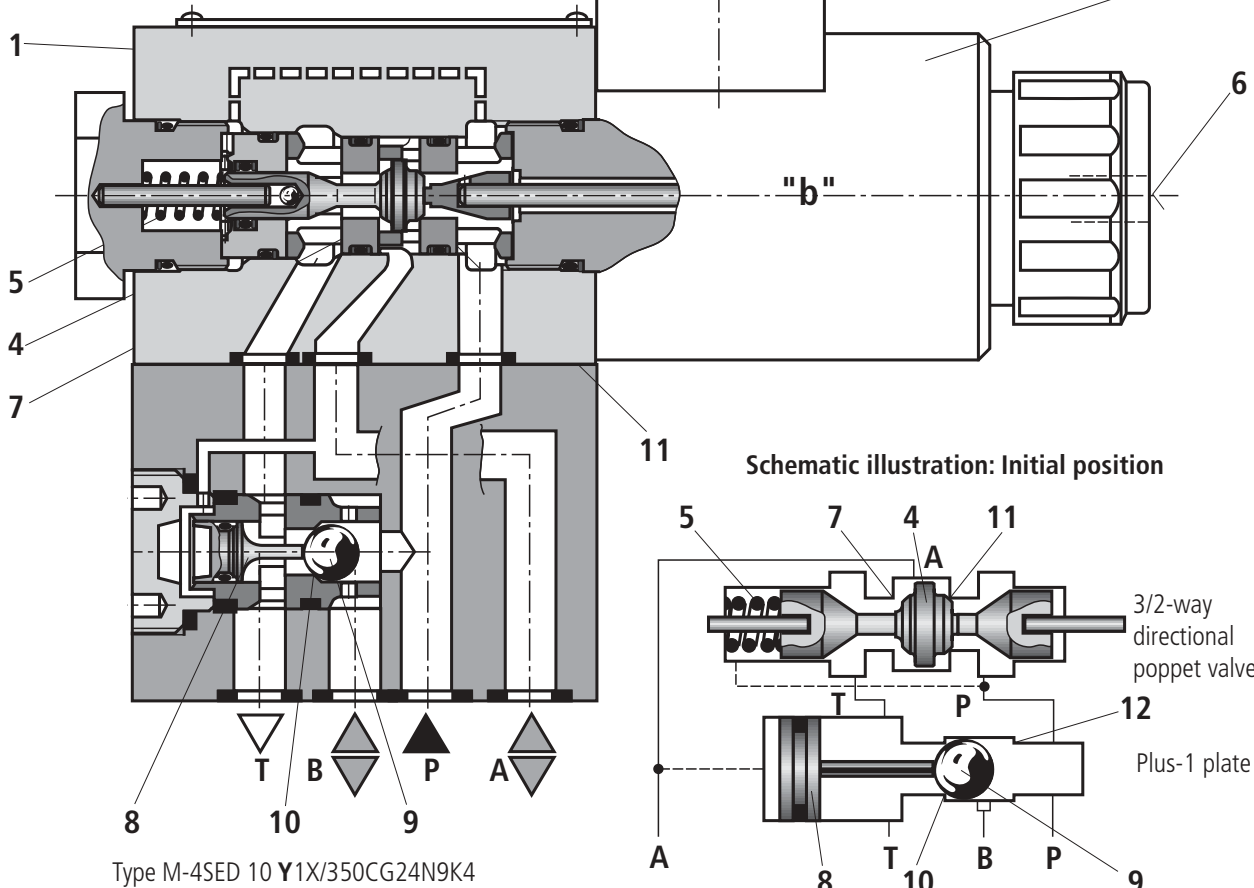
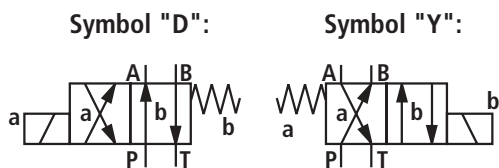
When the main valve is operated, the closing element (4) is pushed against the spring (5) and hence onto seat (7). Port T is therefore closed and P, A and B are briefly connected.

Switched position:

P is connected to A. As the pump pressure acts via A on the large area of the control piston (8), ball (9) is pushed onto seat (12). Thus, B is connected to T and P to A. The ball (9) 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.

By using the plus-1 plate and due to the different seat arrangements the following possibilities exist:



Type M-4SED 6 D1X/350CG24N9K4 with plug-in connector

H/A 4244/94

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

General

Installation	Optional		
Ambient temperature range	°C	– 30 to +50 (NBR seals)	
		– 20 to +50 (FKM seals)	
Weight	3/2-way directional poppet valve	kg	1.5
	4/2-way directional poppet valve	kg	2.3

Hydraulic

Maximum operating pressure	bar	See table on page 7
Maximum flow	L/min	25
Pressure fluid		Mineral oil (HL, HLP) to DIN 51 524 ¹⁾ ; Fast bio-degradable pressure fluid 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	– 30 to + 80 (with NBR seals)
		– 20 to + 80 (with FKM seals)
Viscosity range	mm ² /s	2.8 to 500
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 rectifier (see ordering details on page 13)
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 with mounted and fixed plug-in connector	
Maximum coil temperature ⁵⁾	°C	150	

³⁾ The cleanliness class stated for the components must be adhered too 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 50 081.

⁴⁾ Special voltages on request

⁵⁾ Due to the occurring surface temperatures of the solenoid coils, please take the European Standards EN563 and EN982 into account!

When connecting the electrics, the protective conductor (PE $\frac{1}{2}$) must be connected according to the relevant regulations.

Switching time t in ms (installation position: solenoid horizontal)

Pressure p in bar	Flow q_v in L/min	DC solenoid						DC solenoid + rectifier						
		Symbols UK, CK, D, Y						Symbols UK, CK, D, Y						
		t_{on}				t_{off}		t_{on}				t_{off}		
Without tank pressure				UK	D	UK	D	Without tank pressure				UK	D	
UK	CK	D	Y	CK	Y	UK	CK	D	Y	CK	Y	UK	CK	Y
70	25	45	40	50	50	10	15	45	40	45	40	40	40	40
140	25	60	40	50	50	10	15	55	40	55	40	40	40	40
210	25	60	45	60	50	10	15	60	45	60	45	40	40	40
280	25	60	45	60	50	10	15	65	45	65	45	40	40	40
315	25	65	45	65	50	10	15	65	45	65	45	40	40	40
350	25	65	45	65	50	10	15	65	45	65	45	40	40	40

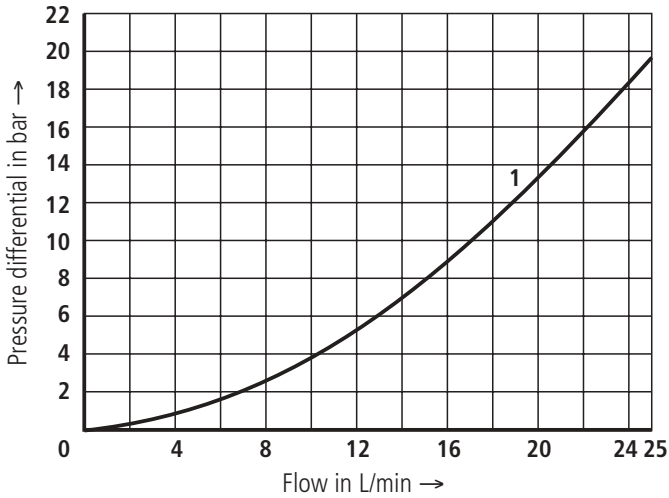
Attention!

The switching times relate to a flow direction of P to A and A to T.

With reversed flows deviations are possible!

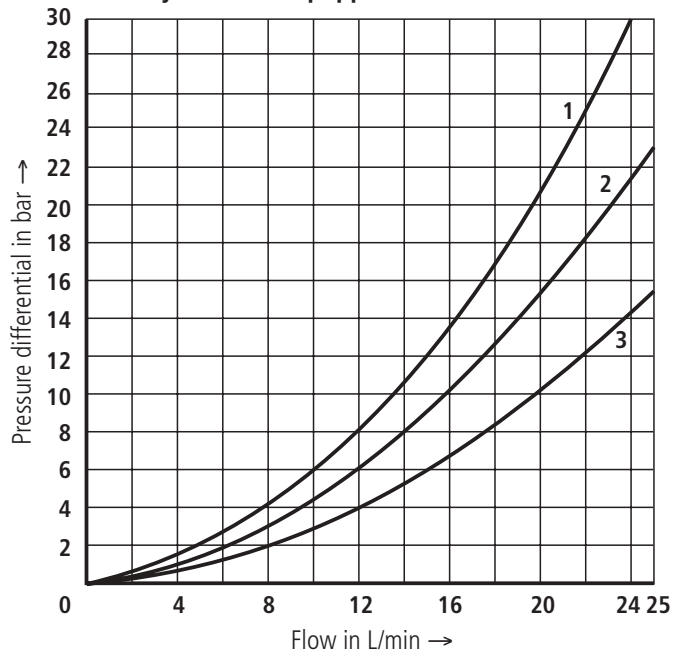
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$)

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



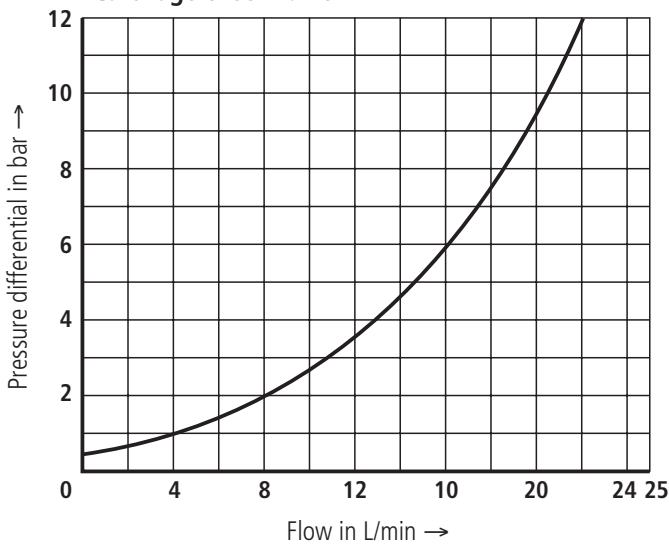
1 M-3SED 6 ^{UK}_{CK} ..., P to A and A to T

Δp - q_v characteristic curves
4/2-way directional poppet valve

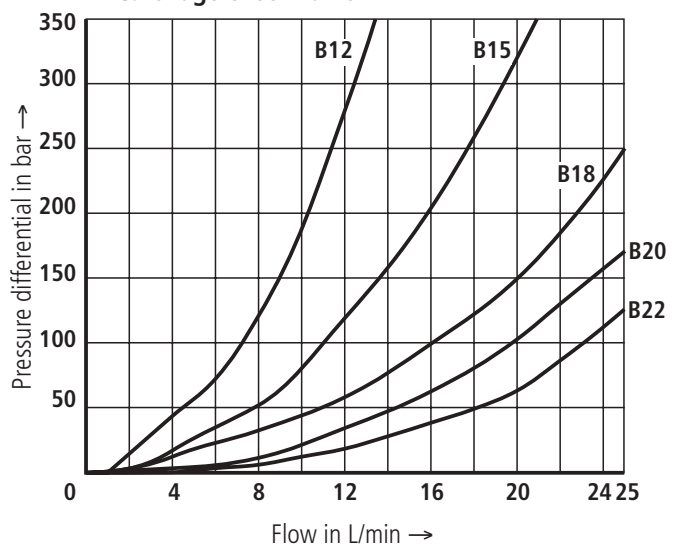


1 M-4SED 6 ^D_Y ..., A to T
2 M-4SED 6 ^D_Y ..., P to A
3 M-4SED 6 ^D_Y ..., B to T, P to B

Δp - q_v characteristic curves
Cartridge check valve



Δp - q_v characteristic curves
Cartridge check valve



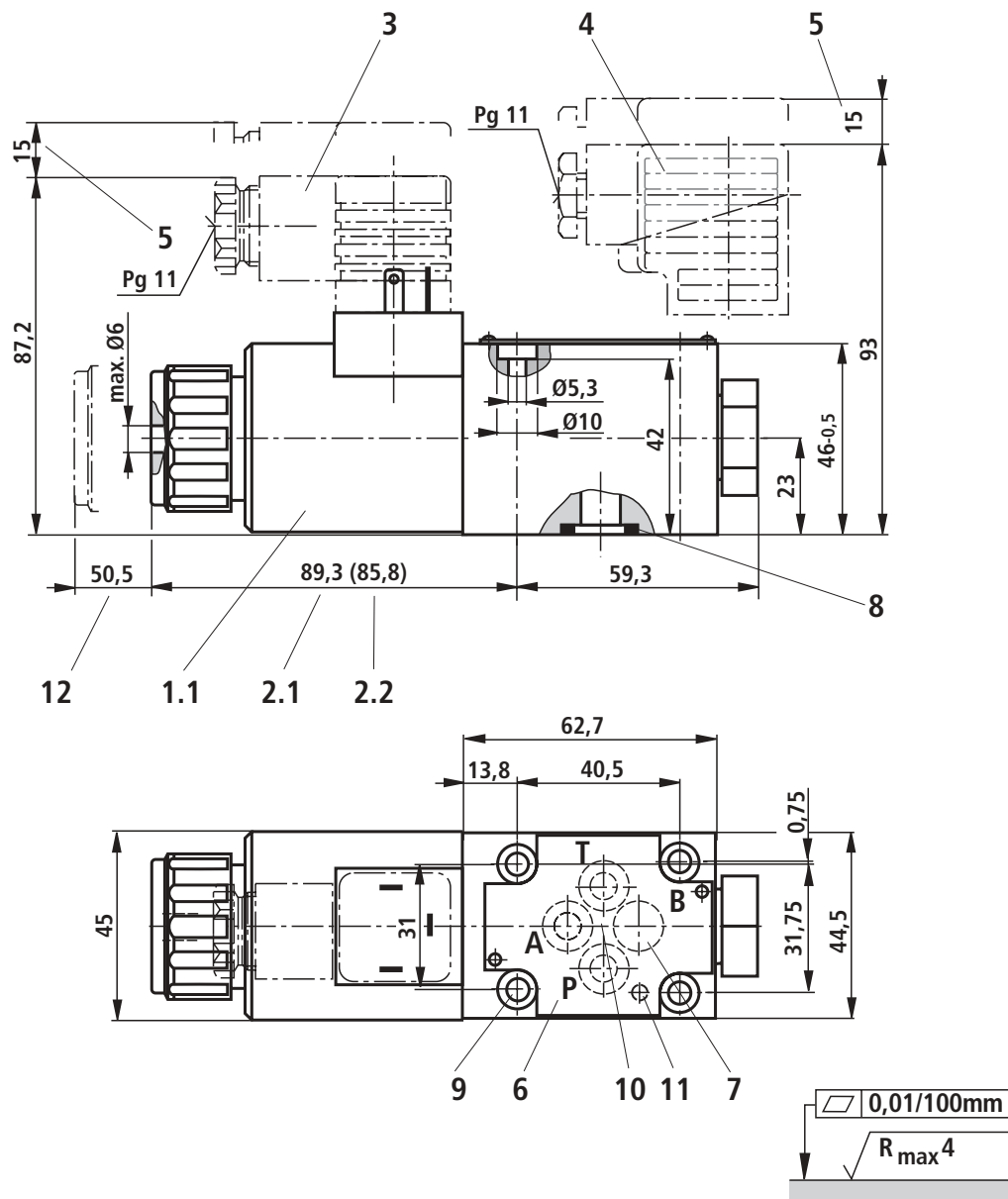
Performance limits (measured with HLP46, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$)

	Symbol	Description	Operating pressure in bar				Flow in L/min
			P	A	B	T	
2-way circuit		With a 2/2-way circuit port P or T has to be plugged by the customer!	350	350		350	25
			350	350		350	25
3-way circuit			350	350		350	25
			350	350		350	25
4-way circuit (flow is only possible in the direction of the arrow!)		3/2-way directional valve (symbol "UK") in conjunction with a Plus-1 plate: $P \geq A \geq B \geq T$	350	350	350	P/A/B – 40	25
		3/2-way directional valve (symbol "CK") in conjunction with a Plus-1 plate: $P \geq A \geq B \geq T$	350	350	350	P/A/B – 40	25

⚠ Attention!

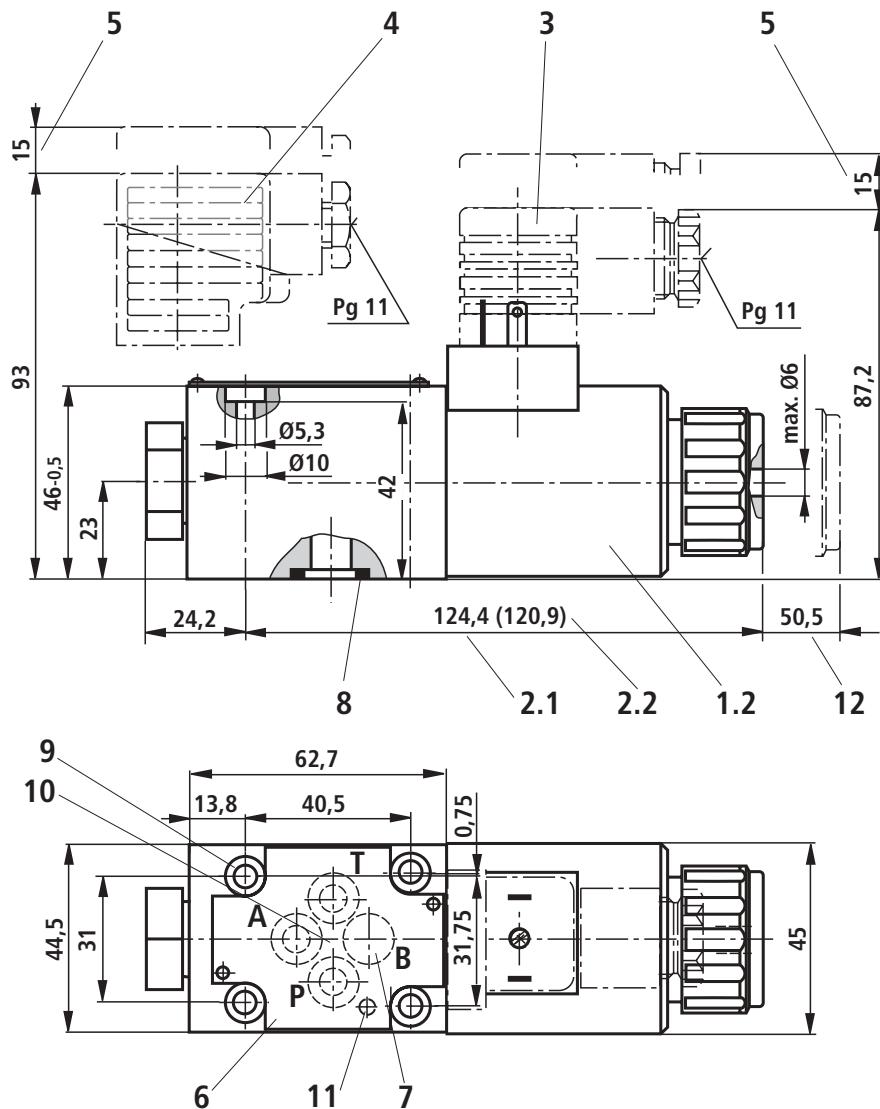
The performance limit was determined with the solenoids at operating temperature, 10% under voltage and with the tank not pressurised.

Unit dimensions: 3/2-way directional poppet valve; version „UK“ (dimensions in mm)



Required surface finish of the mating piece

- | | | |
|--|--|---|
| <p>1.1 Solenoid „a“ (plug-in connector colour, grey)</p> <p>2.1 Protected hand override "N9"</p> <p>2.2 Without hand override</p> <p>3 Plug-in connector without circuitry to DIN EN 175 301-803 ¹⁾</p> <p>4 Plug-in connector with circuitry to DIN EN 175 301-803 ¹⁾</p> <p>5 Space required to remove the plug-in connector</p> <p>6 Name plate</p> <p>7 ⚠ Attention!
On 3/2-way directional poppet valves, port B is a blind counterbore.</p> | <p>8 Identical seal rings for ports A, B, P and T</p> <p>9 Valve fixing screws
4 off, M5 x 50 DIN 912-10.9, $M_A = 8,9$ Nm, must be ordered separately.</p> <p>10 Porting pattern to DIN 24 340 Form A, without locating pin hole</p> <p>11 Porting pattern to ISO 4401 and CETOP-RP 121 H with locating pin hole</p> <p>Associated subplates:</p> <ul style="list-style-type: none"> • Without locating pin hole
G 341/01 (G1/4)
G 342/01 (G3/8)
G 502/01 (G1/2) | <ul style="list-style-type: none"> • With locating pin hole
G 341/60 (G1/4)
G 342/60 (G3/8)
G 502/60 (G1/2) <p>to catalogue sheet RE 45 052, must be ordered separately.</p> <p>12 Space required to remove the coil</p> <p>¹⁾ Must be ordered separately, see page 13.</p> |
|--|--|---|



Required surface finish of the mating piece

- 1.1 Solenoid „b“ (plug-in connector colour, black)
- 2.1 Protected hand override "N9"
- 2.2 Without hand override
- 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 plug-in connector
- 6 Name plate
- 7 **⚠ Attention!**
On 3/2-way directional poppet valves, port B is a blind counterbore.

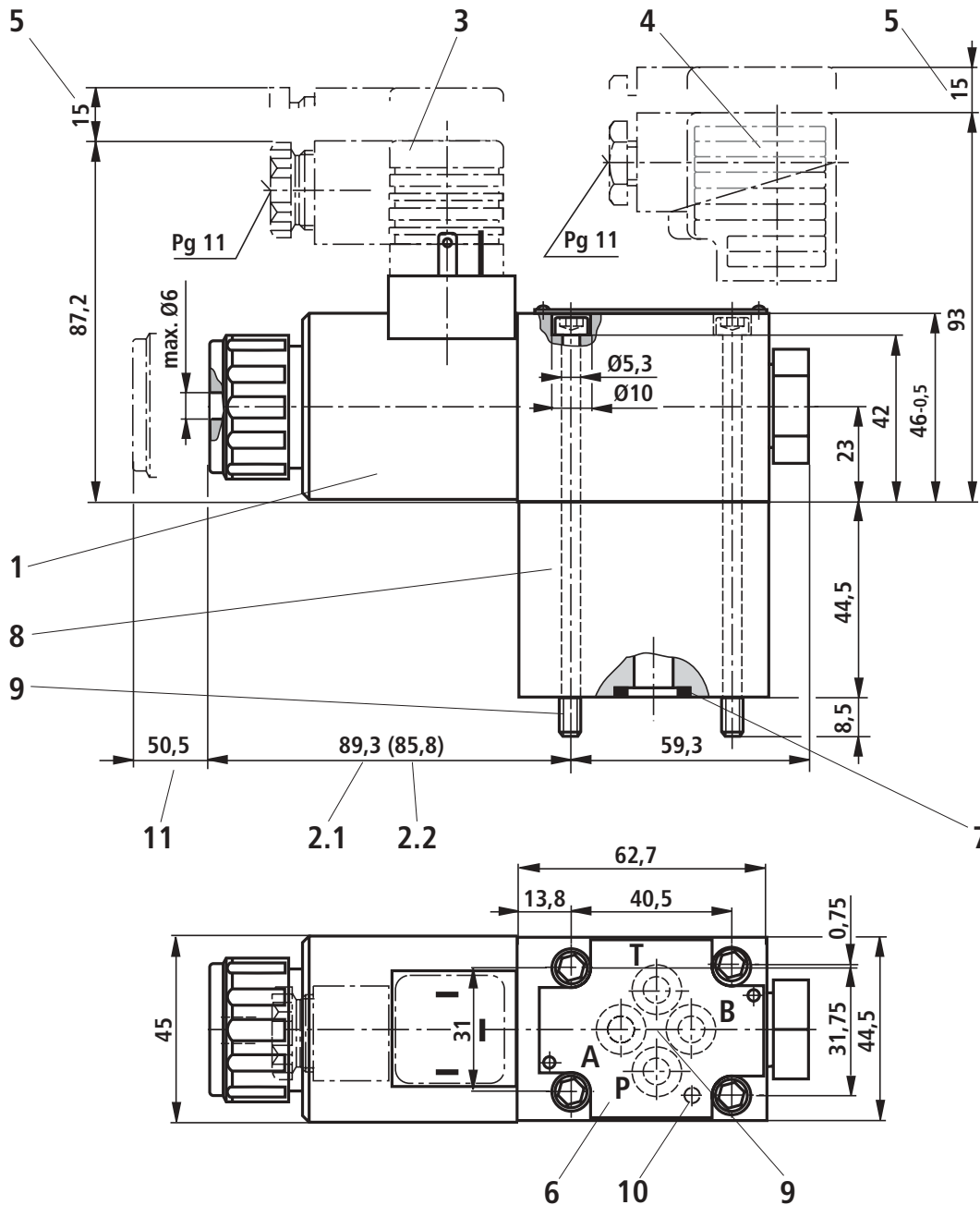
- 8 Identical seal rings for ports A, B, P and T
- 9 **Valve fixing screws**
4 off, M5 x 50 DIN 912-10.9, $M_A = 8,9 \text{ Nm}$, must be ordered separately.
- 10 Porting pattern to DIN 24 340 Form A, **without** locating pin hole
- 11 Porting pattern to ISO 4401 and CETOP-RP 121 H **with** locating pin hole

Associated subplates:

- **Without** locating pin hole
G 341/01 (G1/4)
G 342/01 (G3/8)
G 502/01 (G1/2)

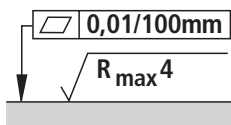
- **With** locating pin hole
G 341/60 (G1/4)
G 342/60 (G3/8)
G 502/60 (G1/2)
to catalogue sheet RE 45 052, must be ordered separately.
- 12 Space required to remove the coil

Unit dimensions: 4/2-way directional poppet valve (version "D") (dimensions in mm)



- 1 Solenoid „a“ (plug-in connector colour, grey)
- 2.1 Protected hand override "N9"
- 2.2 Without hand override
- 3 Plug-in connector **with** 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 plug-in connector
- 6 Name plate
- 7 Identical seal rings for ports A, B, P and T

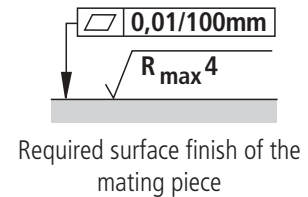
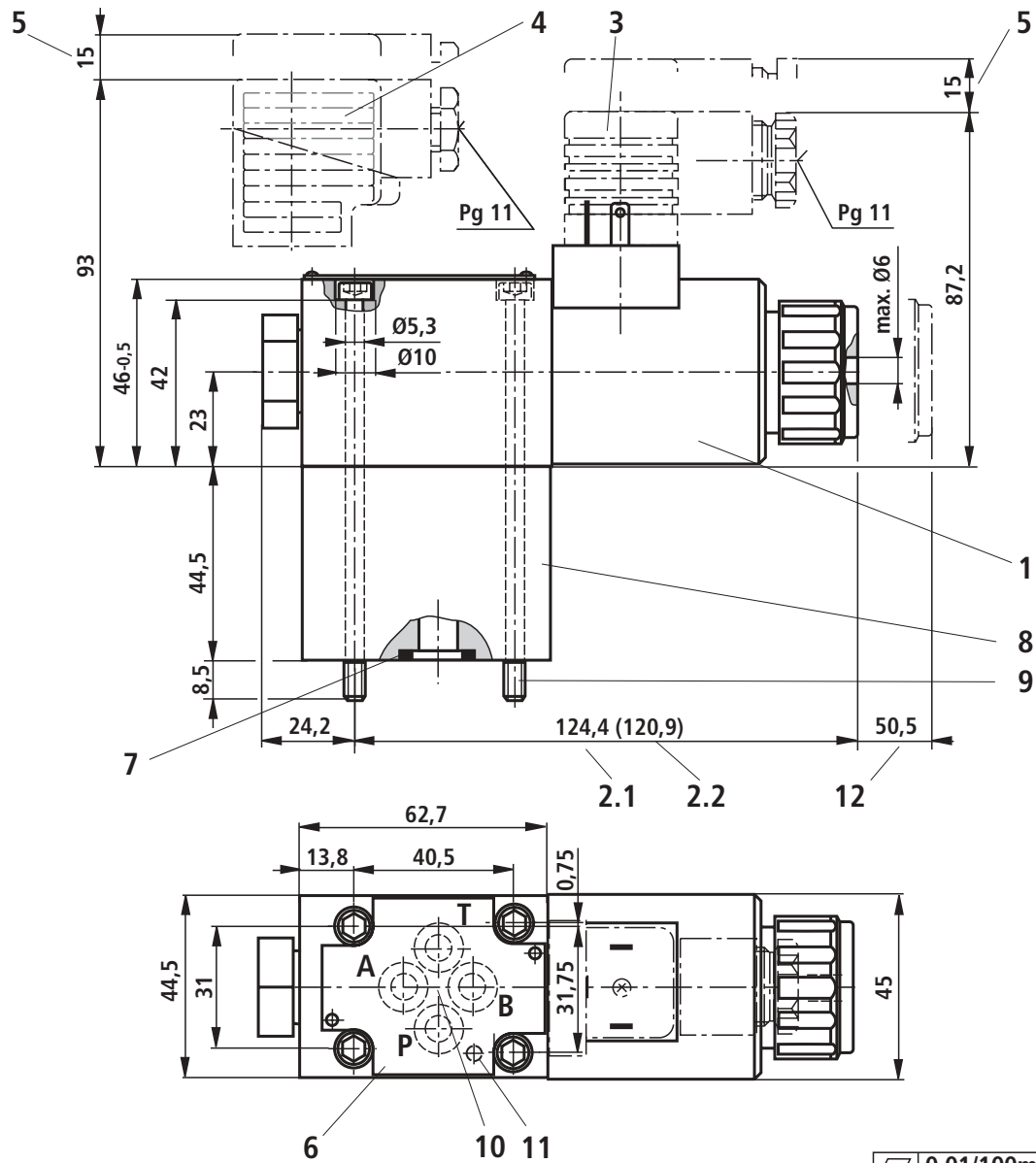
- 8 **Valve fixing screws**
4 off, M5 x 95 DIN 912-10.9,
 $M_A = 8.9 \text{ Nm}$, are included within the scope of supply
 - 9 Porting pattern to DIN 24 340 Form A, **without** locating pin hole
 - 10 Porting pattern to ISO 4401 and CETOP-RP 121 H **with** locating pin hole
- Associated subplates:**
- **Without** locating pin hole
G 341/01 (G1/4)
G 342/01 (G3/8)
G 502/01 (G1/2)


Required surface finish of the mating piece

- **With** locating pin hole
G 341/60 (G1/4)
G 342/60 (G3/8)
G 502/60 (G1/2)
to catalogue sheet RE 45 052,
must be ordered separately.

- 11 Space required to remove the coil
- ¹⁾ Must be ordered separately, see page 13.

Unit dimensions: 4/2-way directional poppet valve; version "Y" (dimensions in mm)

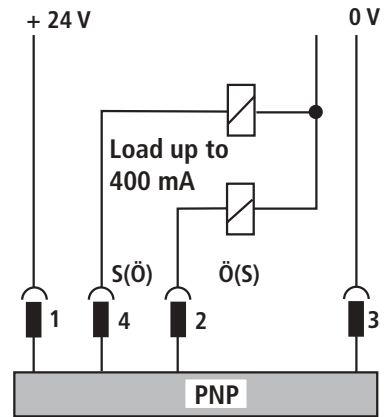


- | | | |
|---|---|---|
| <p>1 Solenoid „b“ (plug-in connector colour, black)</p> <p>2.1 Protected hand override "N9"</p> <p>2.2 Without hand override</p> <p>3 Plug-in connector without circuitry to DIN EN 175 301-803 ¹⁾</p> <p>4 Plug-in connector with circuitry to DIN EN 175 301-803 ¹⁾</p> <p>5 Space required to remove the plug-in connector</p> <p>6 Name plate</p> <p>7 Identical seal rings for ports A, B, P and T</p> | <p>8 Plus-1 plate</p> <p>9 Valve fixing screws
4 off, M5 x 95 DIN 912-10.9, $M_A = 8,9$ Nm, are included within the scope of supply</p> <p>10 Porting pattern to DIN 24 340 Form A, without locating pin hole</p> <p>11 Porting pattern to ISO 4401 and CETOP-RP 121 H with locating pin hole</p> <p>Associated subplates:</p> <ul style="list-style-type: none"> • Without locating pin hole G 341/01 (G1/4) G 342/01 (G3/8) G 502/01 (G1/2) | <ul style="list-style-type: none"> • With locating pin hole G 341/60 (G1/4) G 342/60 (G3/8) G 502/60 (G1/2) <p>to catalogue sheet RE 45 052, must be ordered separately.</p> <p>12 Space required to remove the coil</p> <p>¹⁾ Must be ordered separately, see page 13.</p> |
|---|---|---|

Accessories: inductive limit switch (dimensions in mm)

Monitored switched position	Ordering details
Switched position „a” is monitored	QMAG24
Switched position „b” is monitored	QMBG24

	Limit switch for version	
	CK, Y	UK, D
Switched position „a”	Undamped	Damped
Switched position „b”	Damped	Undamped



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

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

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

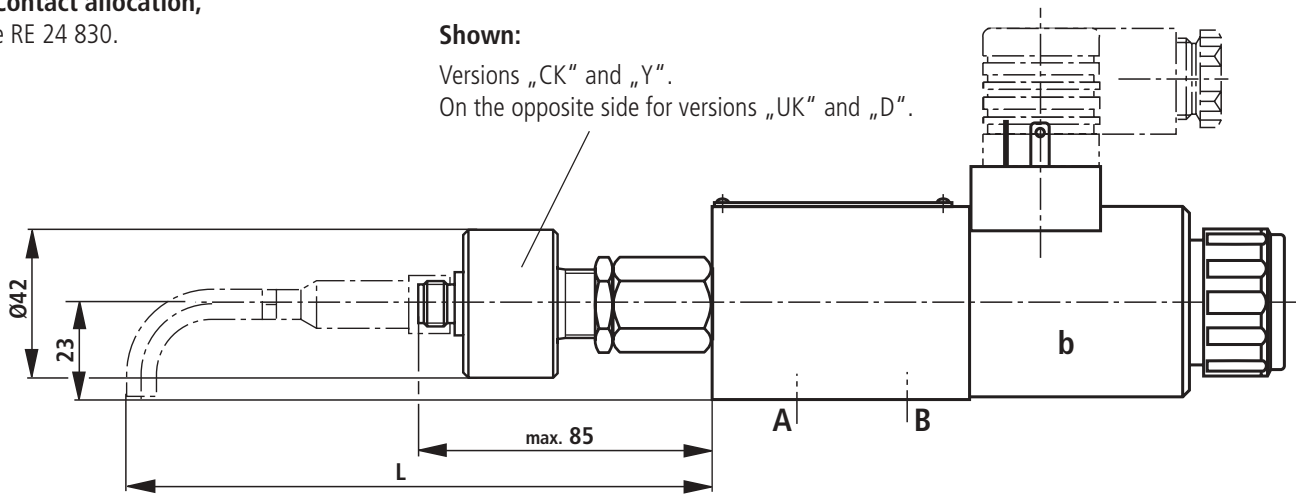
For further details regarding the

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

see RE 24 830.

Shown:

Versions „CK” and „Y”.
On the opposite side for versions „UK” and „D”.



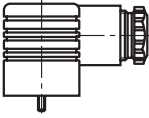
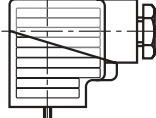
⚠ Attention!

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

Dim. L (plug-in connector, 10 mm withdrawal room and minimum bend radius for the connection cable). For 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 moulded on cable Material-Nr. R900064381	156

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.			
Valve side	Colour	Without circuitry	With indicator lamp 12 ... 240 V	With rectifier 12 ... 240 V	With indicator lamp and Z-diode protective circuit 24 V
a	Grey	R900074683	–	–	–
b	Black	R900074684	–	–	–
a/b	Black	–	R900057292	R900313933	R900310995

General guidelines

Poppet valves are to be applied in accordance with symbols as well as the operating pressures and flows (see performance limits on page 7).

To guarantee the safe function, the following points must be taken into account:

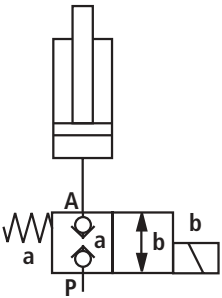
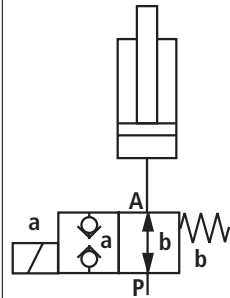
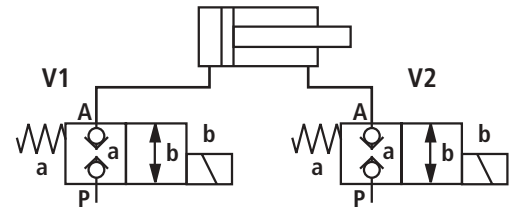
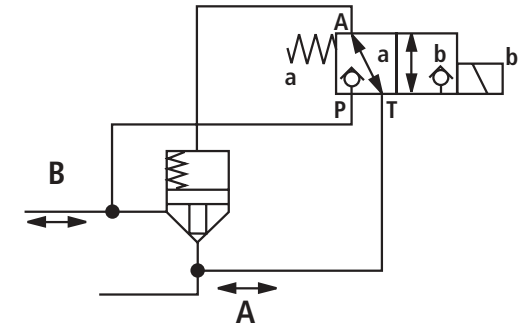
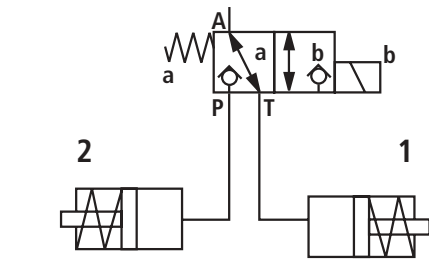
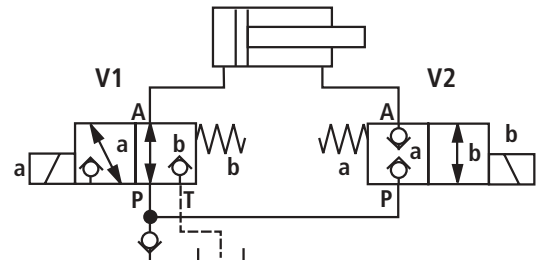
- Poppet valves have a negative overlap, therefore during switching, leakage oil occurs. This process however takes place in such a short period of time that in most cases it is without meaning.
- The stated maximum flows must not be exceeded (if necessary a cartridge throttle for flow limitation has to be fitted)!

Plus-1 plate:

- When using the plus-1 plate (4/2-way functions) the following function values have to be taken into account: $p_{\min} = 8 \text{ bar}$, $q_v > 3 \text{ L/min}$.
- Ports P, A, B and T are defined in accordance with their functions. They must not be changed or plugged!
- Port T must always be connected.
- Pressure and pressure distribution is to be taken into account!
- The direction of flow is only permissible in the direction of the arrow!

Examples of application

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

	<p>2/2-way circuit</p> <p>Initial position: Flow path is blocked, maximum pressure is permissible. The pressure at the actuator is held constant even when the pump is switched off.</p> <p>Switched position: Flow path is open, maximum pressure is permissible.</p>		<p>2/2-way circuit</p> <p>Initial position: Lifting Holding only due to limitation of travel and pressure in port P.</p> <p>Switched position: Closed</p>
		<p>2/2-way circuit with 2 valves</p> <p>Initial position: Cylinder held.</p> <p>Switched position: Flow path in both directions. The travel direction is determined by actuating V1 and V2.</p>	
		<p>3/2-way circuit</p> <p>Initial position: Logic held closed from side A.</p> <p>Switched position: Logic held closed from side B.</p>	
<p>Symbol „CK“</p> 		<p>3/2-way circuit</p> <p>Initial position: P closed, pressure at A and T. Cylinder 1 moves to the right, unloaded at A. Cylinder 1 moves to the left.</p> <p>Switched position: T closed, pressure at A and P. Cylinder 2 moves to the left, unloaded at A. Cylinder 2 moves to the right.</p>	
<p>Symbol „2/2“ + „UK“</p> 		<p>4/2-way circuit with a 2/2- and a 3/2-way poppet valve</p> <p>V1 and V2 are in the initial position: Piston is externally locked in position.</p> <p>V1 and V2 in their switched position: Piston moves to the left.</p> <p>V1 in its initial position and V2 is in its switched position: Cylinder moves to the right, both sides of the cylinder are connected to the pump connection.</p> <p>⚠ Attention! When using differential cylinders the performance limits (double flow) and the maximum operating pressure (pressure intensification) of the valve have to be taken into account!</p>	

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The data specified above only serves to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. It must be remembered that our products are subject to a natural process of wear and ageing.