

RE 22 045/02.03

Replaces: 06.01

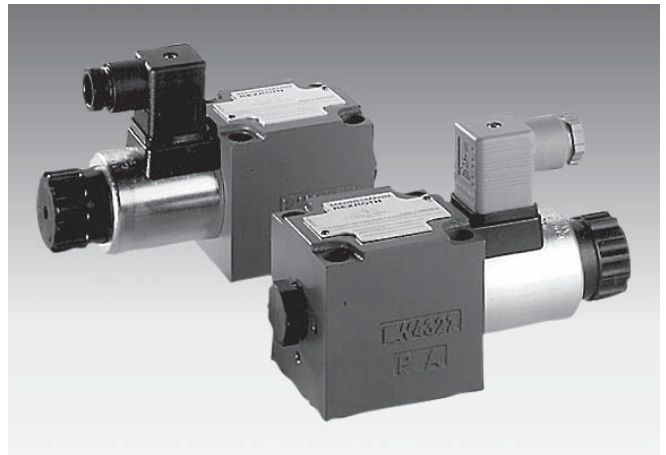
**3/2- and 4/2-way directional poppet
valves with solenoid operation
Type M-.SED 10**

Nominal size 10

Series 1X

Maximum operating pressure 350 bar

Maximum flow 40 L/min



H/A 4666/95

Type M-3SED 10^{UK}1X/...K4/... with plug-in connector
(separate order)^{CK}**Overview of contents**

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Features

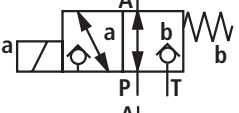
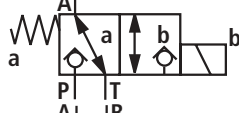
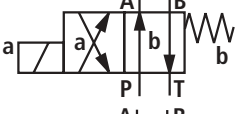
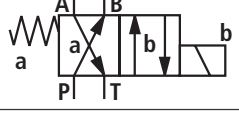
- Direct operated directional poppet valve with solenoid operation
- Porting pattern to DIN 24 340 Form A, ISO 4401 and CETOP-RP 121 H
Subplates to catalogue sheet RE 45 054 (separate order)
- Closed port is leak-free
- Switching is ensured even when under pressure for long periods of time
- Wet pin Dc solenoid with removable coil (AC voltages are possible by means of a 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 hand override, optional
- inductive limit switch (contact and contactless), optional, see page 12



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Ordering details

M	SED	10	1X/350	C	K4	/	*
3 actuator ports = 3							
4 actuator ports = 4							
Poppet valve							Further details in clear text
Nominal size 10 = 10							No code = NBR seals V = FKM seals (other seals on request)
Actuator ports	3	4					⚠ Attention! The compatibility of the seals and pressure fluid has to be taken into account!
Symbols							No code = Without cartridge check valve, without throttle insert P = With cartridge check valve
	●	-					B12 = Throttle Ø1.2 mm B15 = Throttle Ø1.5 mm B18 = Throttle Ø1.8 mm B20 = Throttle Ø2.0 mm B22 = Throttle Ø2.2 mm
	●	-					Accessories Inductive limit switch see page 12 and catalogue 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⁾ = Without plug-in connector, individual with component plug to DIN EN 175 301-803
	●						N9 = With protected hand override No code = Without hand override
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 details
110 V - 50/60 Hz	96 V	G96
120 V - 60 Hz	110 V	G110
230 V - 50/60 Hz	205 V	G205

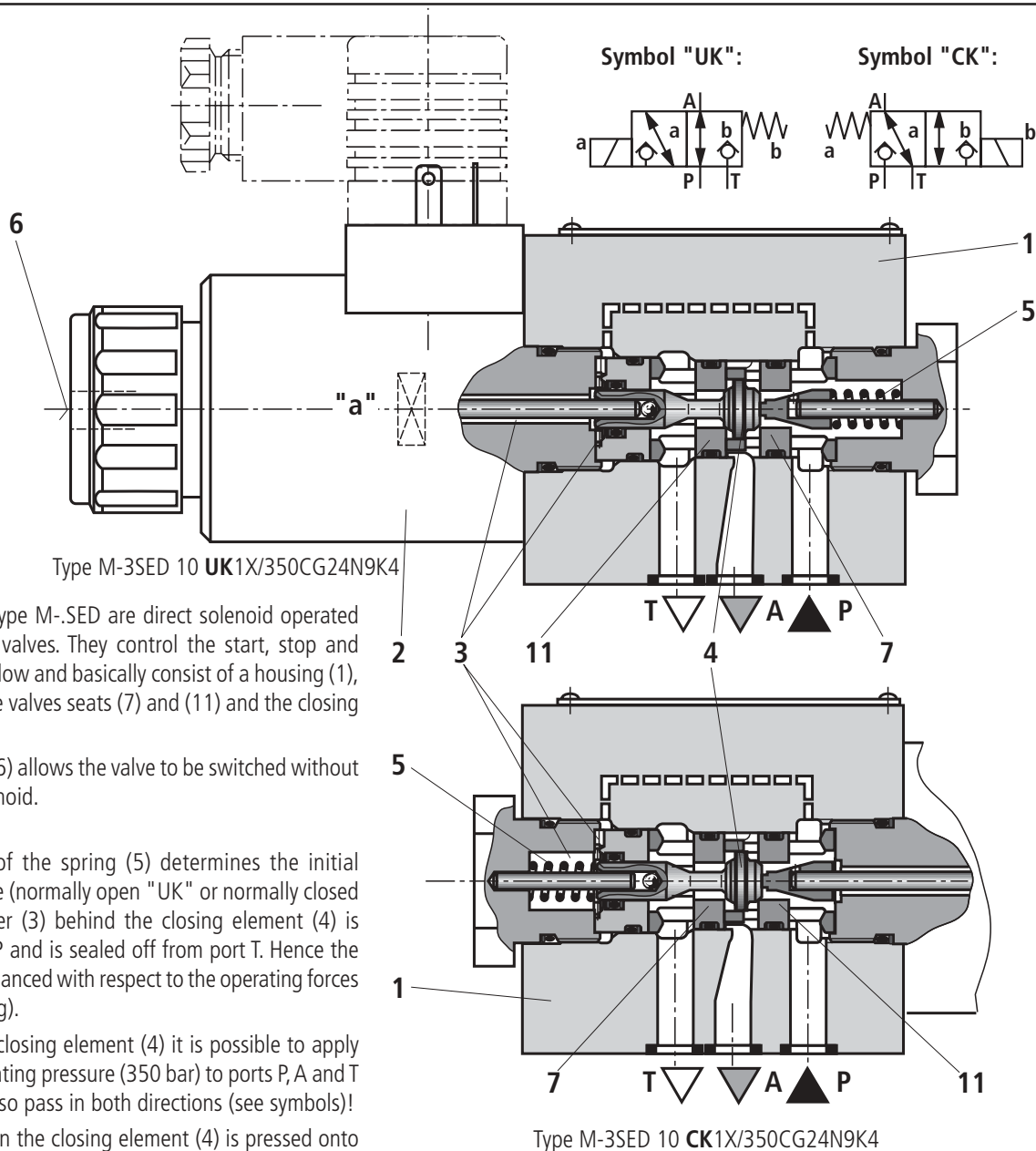
- 1) Plug-in connectors must be ordered separately (see page 13).
- 2) When connecting to an AC supply a DC solenoid **must** be used which is controlled via a rectifier (see table on the left).
For individual connections a large plug-in connector with integrated rectifier can be used (separate order, see page 13).

Preferred types (readily available)

Type	Material number
M-3SED 10 CK1X/350CG24N9K4	R900086685
M-3SED 10 UK1X/350CG24N9K4	R900051053

Further preferred types and standard components are shown in the EPS (standard price list).

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



General:

Directional valves type M-.SED are direct solenoid operated directional poppet valves. They control the start, stop and direction of a fluid flow and basically consist of a housing (1), the solenoid (2), the valves seats (7) and (11) and 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 and the flow can also pass in both directions (see symbols)!

In the initial position the closing element (4) is pressed onto the 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.

Examples:

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

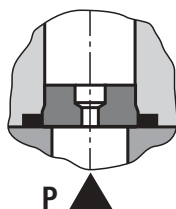
3/2-way directional poppet valve

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

4/2-way directional poppet valve

(see page 4)

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 14.

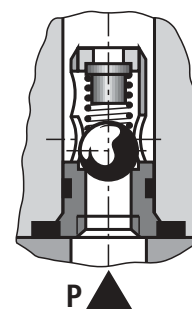
3/2-way directional poppet valve

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, symbols: 4/2-directional poppet valve

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

Function of the plus-1 plate:

Initial position:

The main valve is not actuated. The spring (5) holds the closing element (4) on its 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 piston (8) so that it is unloaded to tank. The pressure applied at P now moves the ball (9) onto seat (10). P is now connected to B and A to T.

Transition position:

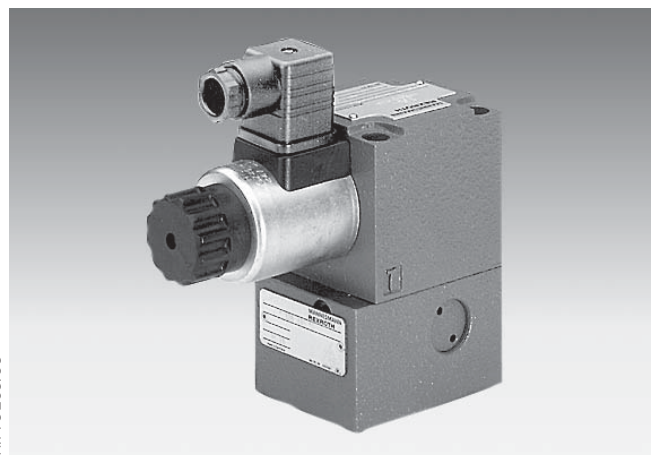
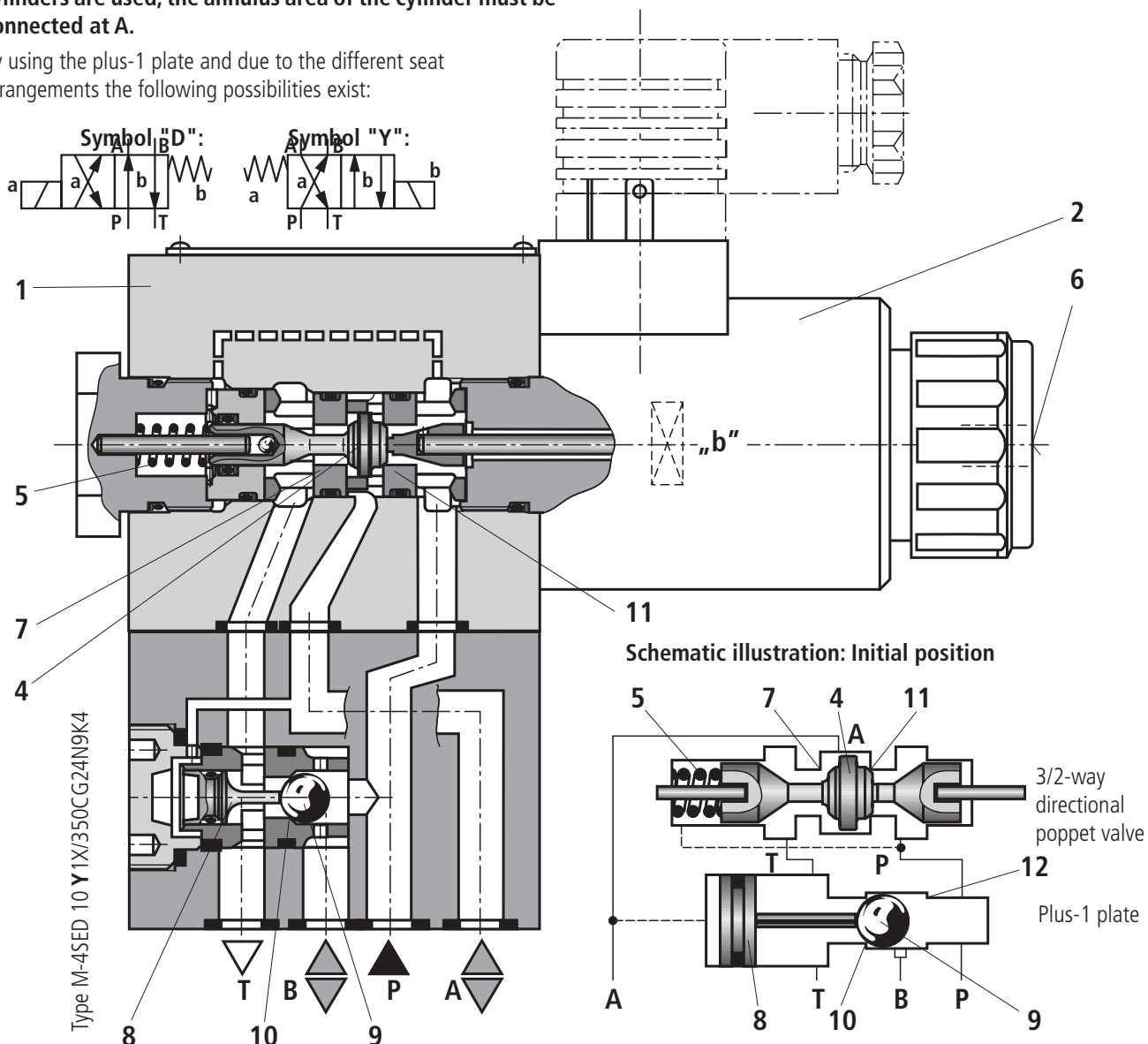
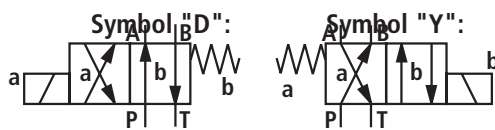
When the main valve is operated, the closing element (4) is pushed against the spring (5) and hence onto seat (7). Port T is, therefore closed and P, A and B are briefly connected.

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 at A.

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



Type M-4SED 10 D1X/...K4/... with plug-in connector (separate order)

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 2.6
	4/2-way directional poppet valve	kg 3.9

Hydraulic

Maximum operating pressure	bar	See table on page 7
Maximum flow	L/min	40
Pressure fluid		Mineral oil (HL, HLP) to DIN 51 524 ¹⁾ ; Fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90 221); HETG (rape seed oil) ¹⁾ ; HEPG (polyglycols) ²⁾ ; HEES (Synthetic ester) ²⁾ ; Other pressure fluids on request
Pressure fluid temperature range	°C	– 30 to + 80 (NBR seals)
		– 20 to + 80 (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 ⁵⁾

Electrical

Voltage type		DC	AC
Available voltages ³⁾	V	12, 24 , 42, 96, 110, 205, 220	Only possible via a 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 ⁴⁾	°C	150	

¹⁾ Suitable for NBR **and** FKM seals

²⁾ **Only** suitable for FKM seals

³⁾ Special voltages on request

⁴⁾ Due to the occurring surface temperature of the solenoid coils, the European standards EN563 and EN982 have to be taken into account!

⁵⁾ 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.

<p>When connecting the electrics, the protective conductor (PE ≡) must be connected according to the relevant regulations.</p>

Switching time t in ms (installation: 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
70	40	40	30	40	35	10	10	35	30	40	35	40	40
140	40	40	30	40	35	10	10	40	30	40	35	40	40
210	40	45	35	45	35	10	10	45	35	45	35	40	40
280	40	45	35	45	35	10	10	45	35	45	35	40	40
315	40	50	35	50	35	10	10	50	40	50	40	40	40
350	40	50	45	50	45	10	10	50	45	50	45	40	40

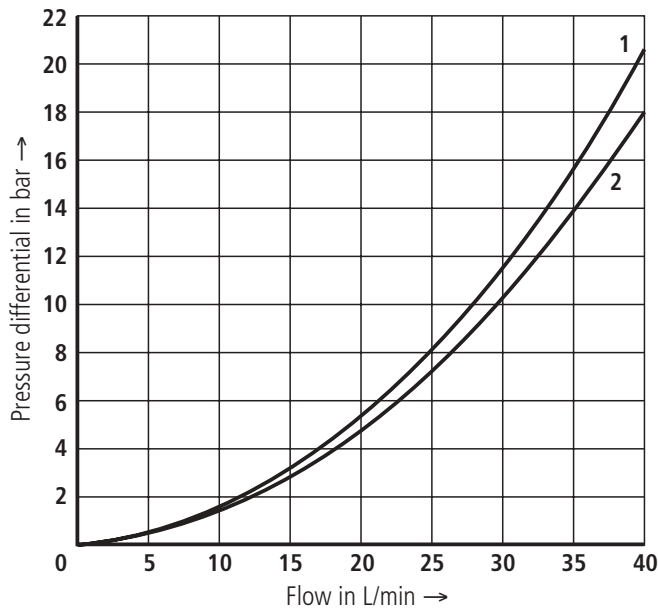
⚠ Attention!

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

With reversed flows deviations are possible!

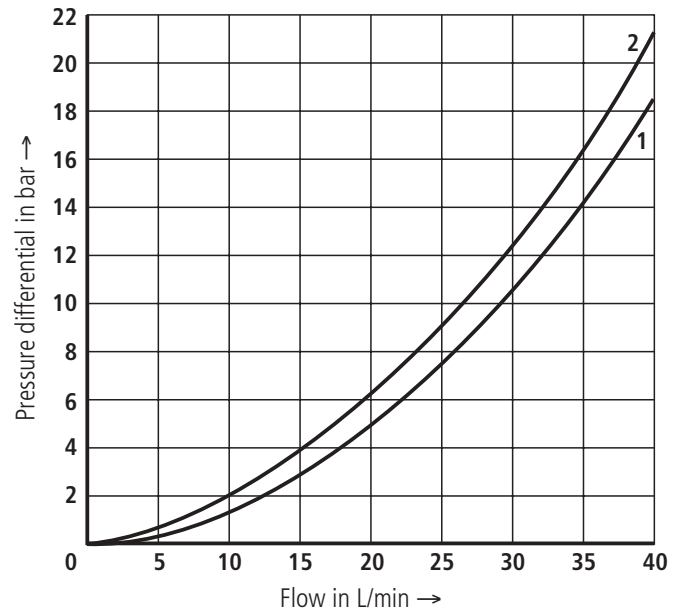
Characteristic curves (measured with HLP 46, $\vartheta_{oil} = 40 \text{ °C} \pm 5 \text{ °C}$)

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



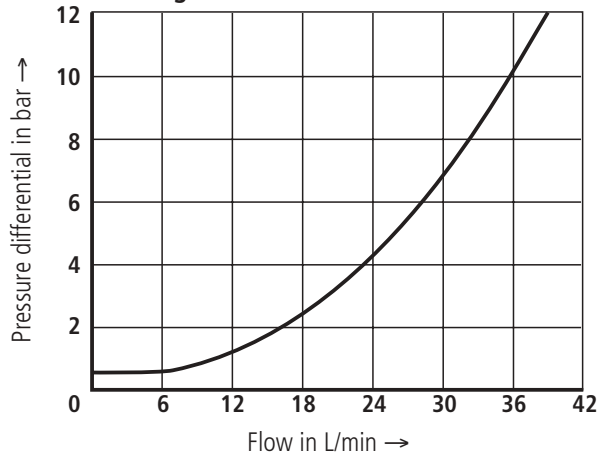
- 1 M-3SED 10 $\begin{matrix} UK \\ CK \end{matrix}$..., P to A
- 2 M-3SED 10 $\begin{matrix} UK \\ CK \end{matrix}$..., A to T

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

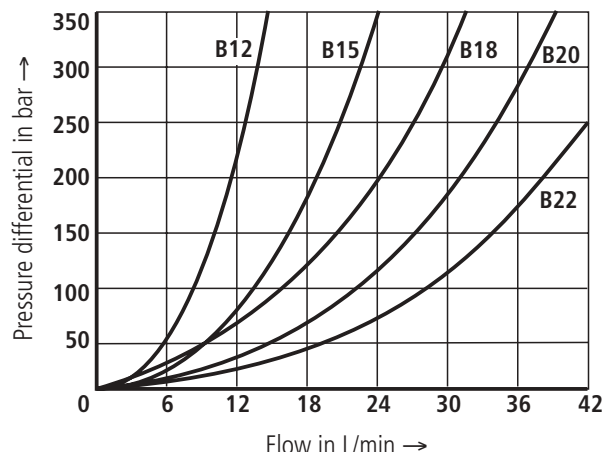


- 1 M-4SED 10 $\begin{matrix} D \\ Y \end{matrix}$..., P to B, A to T
- 2 M-4SED 10 $\begin{matrix} D \\ Y \end{matrix}$..., B to T, P to A

Δp - q_v -characteristic curves
Cartridge check valve



Δp - q_v -characteristic curves
Throttle insert

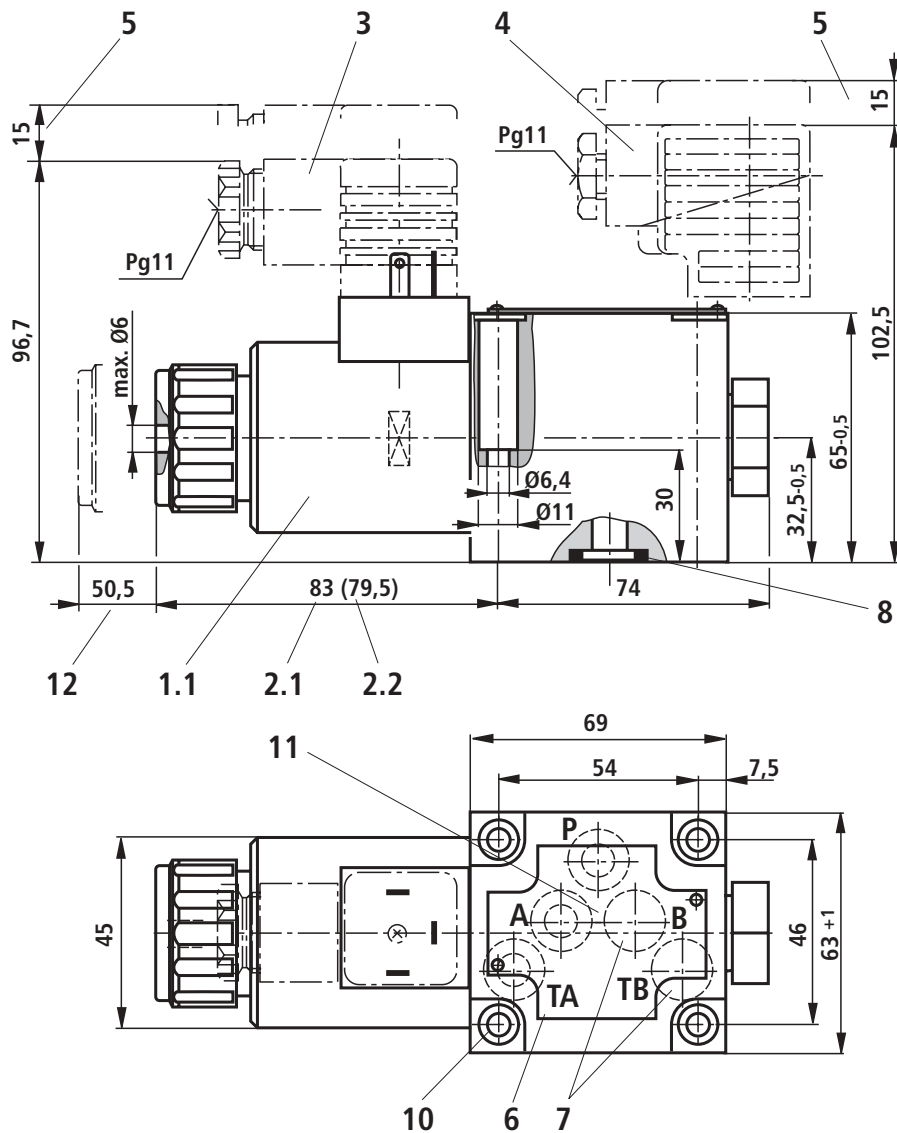


Characteristic curves (measured with HLP 46, $\vartheta_{oil} = 40 \text{ °C} \pm 5 \text{ °C}$)

	Symbol	Description	Operating pressure in bar				Flow in L/min
			P	A	B	T	
2-way circuit	"UK" 	With a 2/2-way circuit port P or T has to be plugged by the customer!	350	350		350	40
	"CK" 		350	350		350	40
3-way circuit	"UK" 		350	350		350	40
	"CK" 		350	350		350	40
4-way circuit (flow is only possible in the direction of the arrow)	"D" 	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	40
	"Y" 	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	40

⚠ Attention!

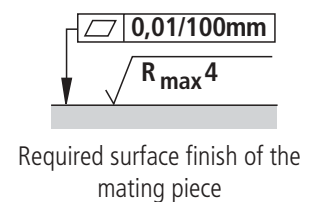
The performance limit was determined with the solenoids at operating temperature, 10% under voltage and with the tank not pressurised.



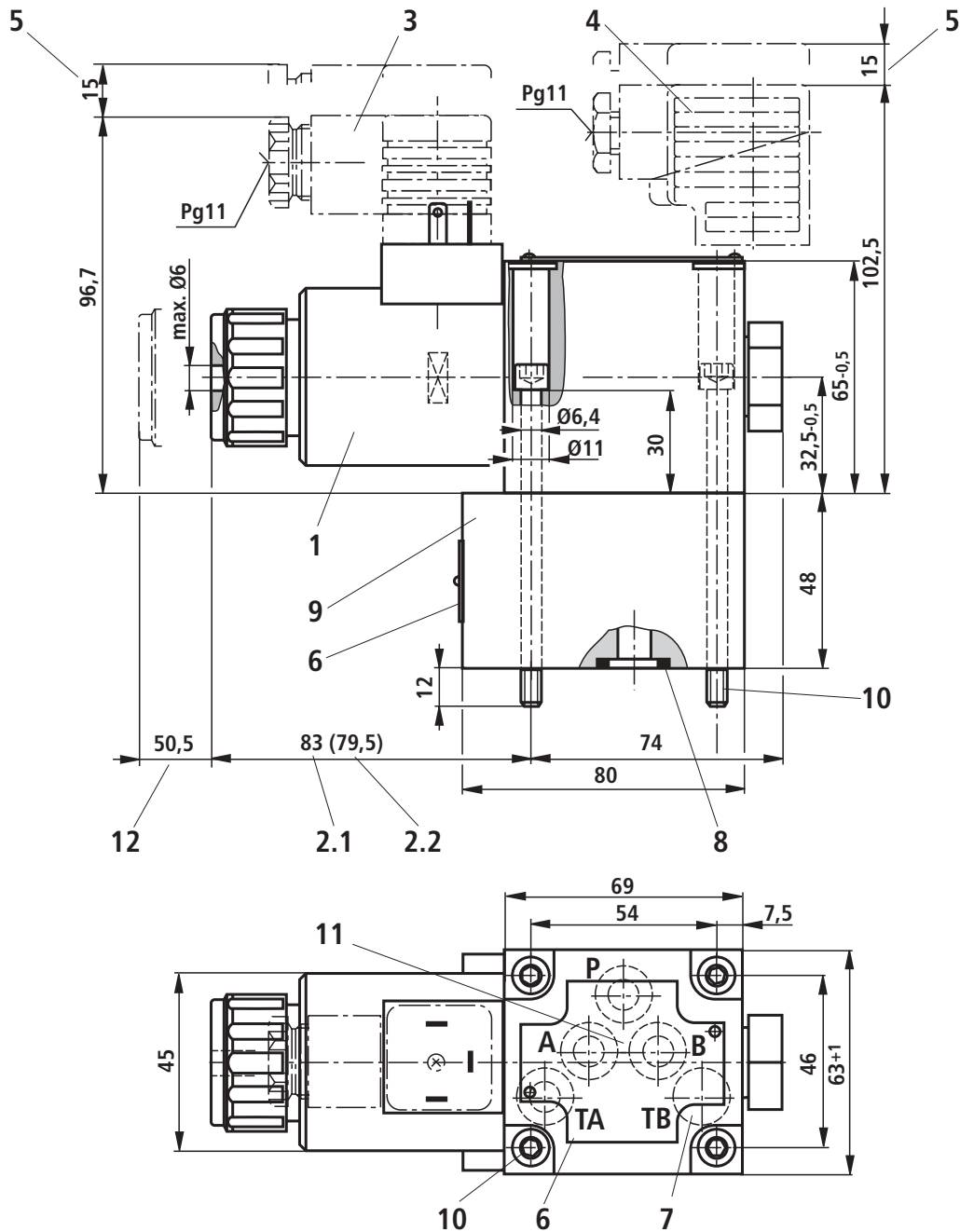
- 1.1 Solenoid "a" (plug-in connector colour grey)
- 1.2 Solenoid "b" (plug-in connector colour black)
- 2.1 Protected hand override "N9"
- 2.2 Without hand override
- 3 Plug-in connector **without** circuitry to DIN EN 175 301-803 ¹⁾
- 4 Plug-in connector **with** circuitry to DIN EN 175 301-803 ¹⁾
- 5 Space required to remove the plug-in connector
- 6 Name plate
- 7 **⚠ Attention!**
With 3/2 way directional poppet valves, ports B and TB are blind counterbores.

- 8 Identical seal rings for ports A, B and T
Seal ring for port P
- 10 **Valve fixing screws**
4 off, M6 x 40 DIN 912-10.9, $M_A = 15.5 \text{ Nm}$, must be ordered separately.
- 11 **Subplates** G 66/01 (G3/8)
G 67/01 (G1/2)
to catalogue sheet RE 45 054 must be ordered separately.
- 12 Space required to remove the coil

¹⁾ Must be ordered separately, see page 13.

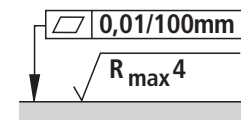


Unit dimensions: 4/2-way directional poppet valve, version "D" (dimensions in mm)



- 1 Solenoid "a" (plug-in connector colour grey)
- 2.1 Protected hand override "N9"
- 2.2 Without hand override
- 3 Plug-in connector **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!**
With 4/2 way directional poppet valves, port TB is a blind counterbore.

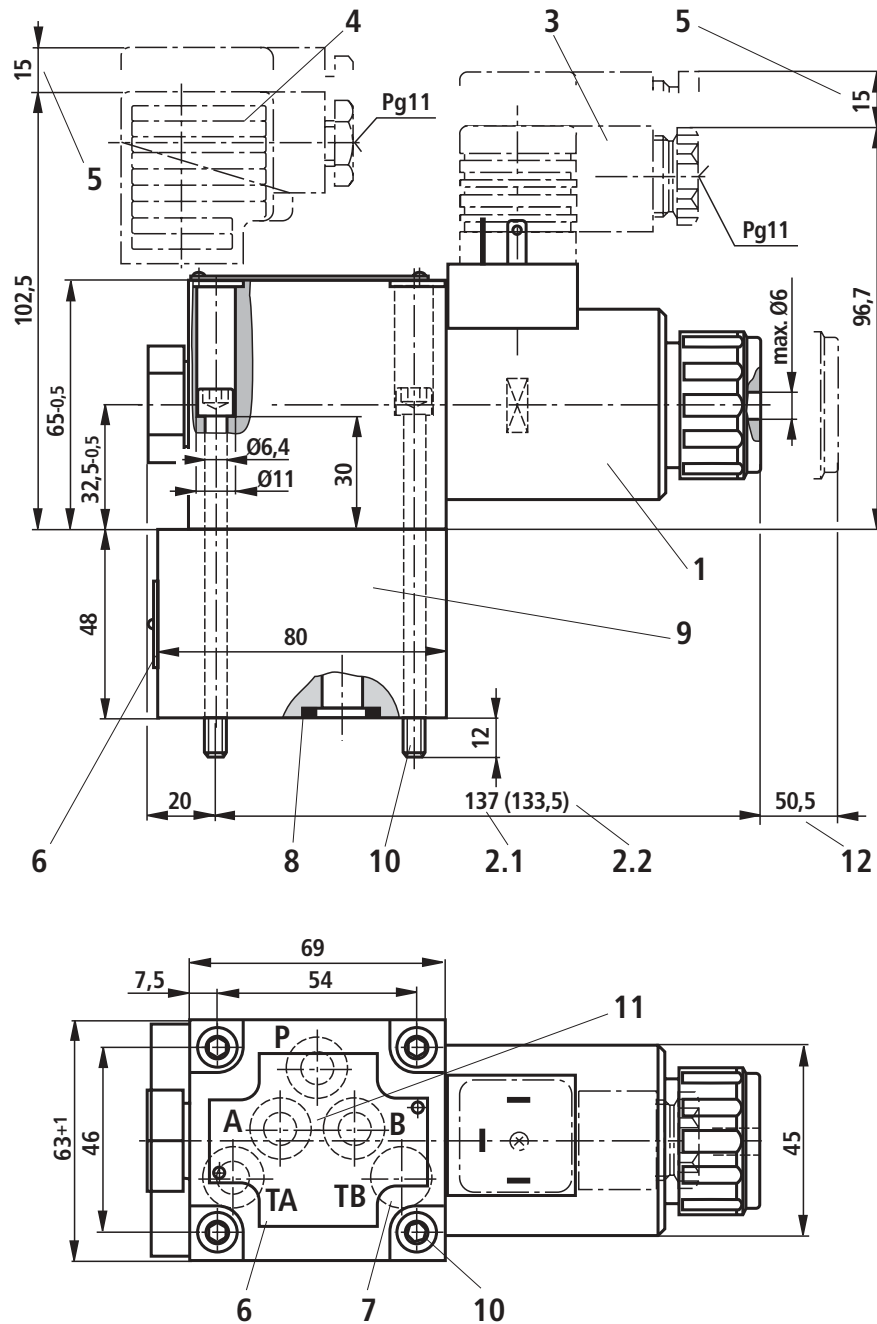
- 8 Identical seal rings for ports A, B and T
Seal ring for port P
- 9 Plus-1 plate
- 10 **Valve fixing screws**
4 off, M6 x 90 DIN 912-10.9, $M_A = 15.5 \text{ Nm}$
are included within the scope of supply.
- 11 **Subplates** G 66/01 (G3/8)
G 67/01 (G1/2)
to catalogue sheet RE 45 054
must be ordered separately.
- 12 Space required to remove the coil



Required surface finish of the mating piece

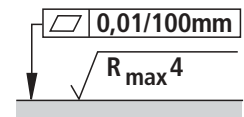
¹⁾ Must be ordered separately, see page 13.

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



- 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!**
With 4/2-way directional poppet valves, port TB is a blind counterbore.

- 8 Identical seal rings for ports A, B and T
Seal ring for port P
- 9 Plus-1 plate
- 10 **Valve fixing screws**
4 off, M6 x 90 DIN 912-10.9, $M_A = 15.5 \text{ Nm}$
are included within the scope of supply.
- 11 **Subplates**
G 66/01 (G3/8)
G 67/01 (G1/2)
to catalogue sheet RE 45 054
must be ordered separately.
- 12 Space required to remove the coil



Required surface finish of the mating piece

¹⁾ must be ordered separately, see page 13.

Accessories: Inductive limit switch (dimensions in mm)

Monitored switched position	Ordering details	Limit switch for versions	
		CK, Y	UK, D
Switched position „a” is monitored	QMAG24	Undamped	Damped
Switched position „b” is monitored	QMBG24	Damped	Undamped

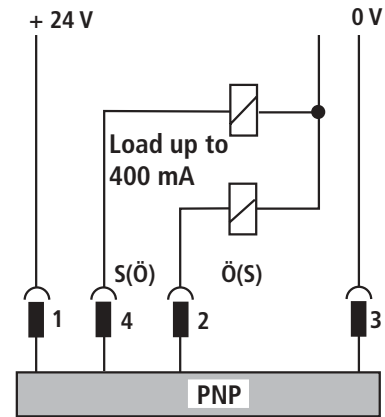
The electrical connection is via a 4-pin plug-in connector with an M12 x 1 connection thread.

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,**

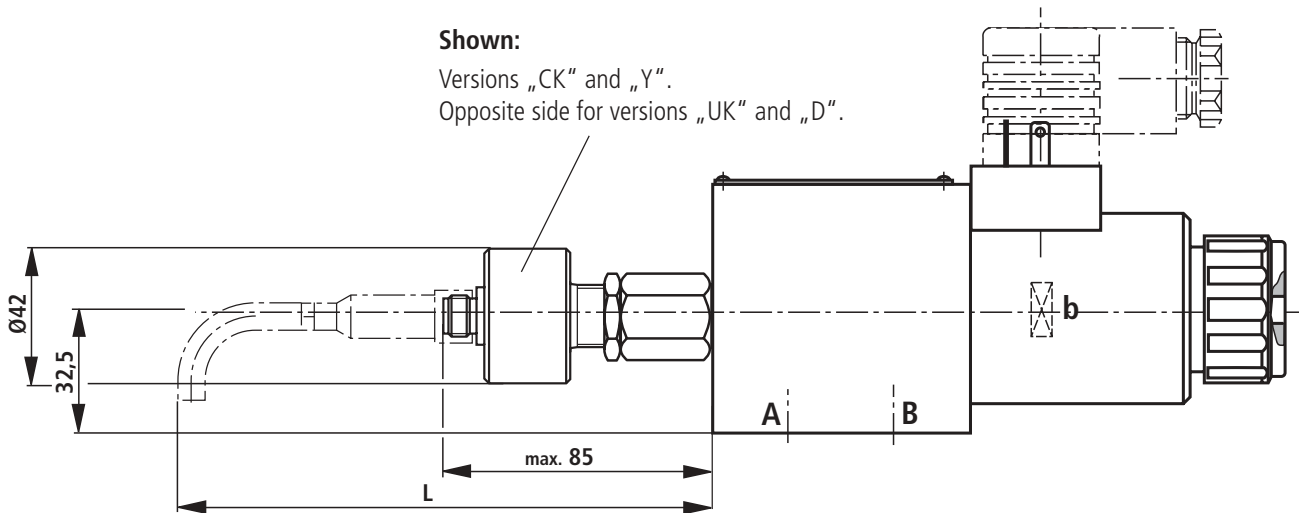
see RE 24 830.



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

Shown:

Versions „CK” and „Y”.
Opposite side for versions „UK” and „D”.



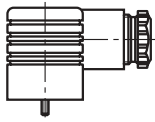
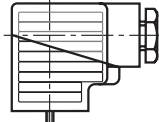
⚠ Attention!

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). Plug-in connectors see RE 08 006.

Straight plug-in connector Material No. R900031155	183
Angled plug-in connector Material No. R900082899	114
Plug-in connector with moulded-on cable Material No. R900064381	153

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 light 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:

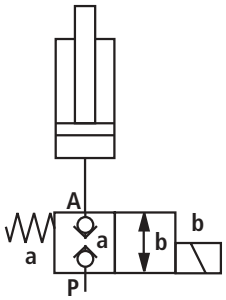
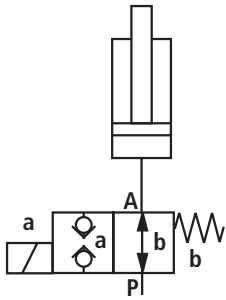
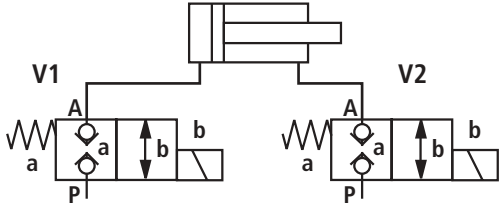
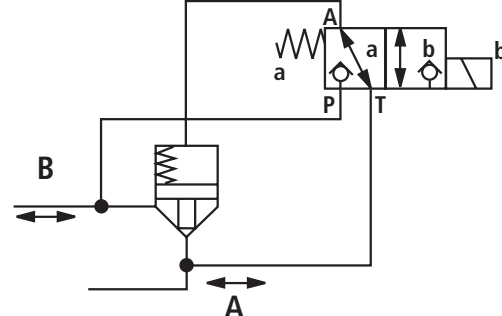
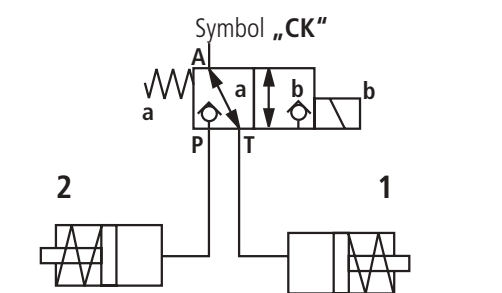
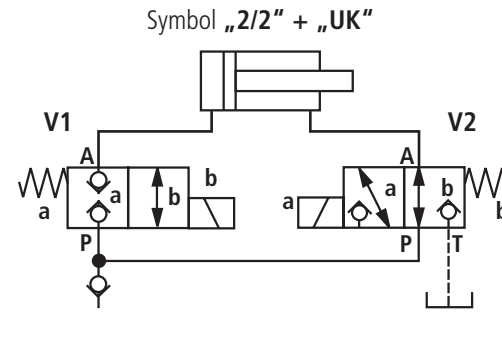
- Poppet valves have a negative overlap, therefore during switching, leakage oil occurs. This process however takes place in such a short period of time that in most cases it is without meaning.
- The stated maximum flows must not be exceeded (if necessary a throttle insert for flow limitation has to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

Plus-1 plate:

- When using the plus-1 plate (4/2-way function) 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.
- Pressures and pressure distribution is to be taken into account!
- The direction of flow is only permissible in the direction of the arrow!

Application examples

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 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: Hold cylinder.</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 is held closed from side A.</p> <p>Switched position: Logic is held closed from side B.</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>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 right.</p> <p>V1 in its switched position and V2 is in its initial position: Cylinder moves to the left, 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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