

Directional seat valves, direct operated, with solenoid actuation

RE 22075-XE/04.16
Replaces: 09.13

Type M-.SEW ...XE...

Size 10
Component series 1X
Maximum operating pressure 420 bar
Maximum flow 40 l/min



ATEX units – For potentially explosive atmospheres



Information on the explosion protection:

- ▶ Area of application in accordance with the Explosion Protection Directive 2014/34/EU: **II 2G**
- ▶ Type of protection of the valve solenoids:
Ex eb mb IIC T4 Gb according to EN 60079-7 / EN 60079-18

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Features

- 3/2- or 4/2-way version
- For intended use in potentially explosive atmosphere
- Porting pattern according to ISO 4401-05-04-0-05
- Blocked port is tight
- Safe switching also with longer standstill periods under pressure
- Air-gap DC and AC solenoids
- Solenoid coil rotatable by 90°
- Electrical connection as individual connection with cable gland
- With concealed manual override, optional

Ordering code

M	SEW	10	1X/420	M	XE	Z2	/		
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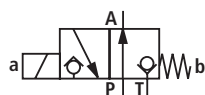
3 main ports = 3
 4 main ports = 4

Seat valve

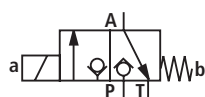
Size 10 = 10

Main ports 3 4

Symbols



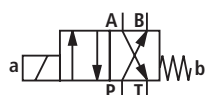
• - = U



• - = C



- • = D



- • = Y

• = available

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

Operating pressure up to 420 bar = 420

Solenoid (air-gap) = M

no code = NBR seals
 V = FKM seals

Notice:

Observe compatibility of seals with hydraulic fluid used!

no code = Without check valve insert, without throttle insert

P = With check valve insert

B12 = Throttle Ø 1.2 mm

B15 = Throttle Ø 1.5 mm

B18 = Throttle Ø 1.8 mm

B20 = Throttle Ø 2.0 mm

B22 = Throttle Ø 2.2 mm

Electrical connection

Z2 = Solenoid with terminal box and cable gland

For details, see chapter Electrical connection

XE = Explosion protection "Increased safety"
 For details see information on the explosion protection, page 6

N9 = With concealed manual override
 no code = Without manual override

G24 = Direct voltage 24 V

W230 R = AC voltage W 230 V, 50/60 Hz
 For further ordering codes for other voltages, see page 7

Notice:

Representation of the symbols according to DIN ISO 1219-1.

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

General

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

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

Basic principle

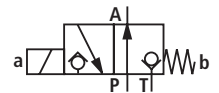
In the initial position, the control spool (8) is pressed onto the seat by the spring (9) and in spool position by the solenoid (2). The force of the solenoid (2) acts via the angled lever (6) and the ball (7) on the control spool (8) that is sealed on two sides. The chamber between the two sealing elements is connected to port P. Thus, the valve system (3) is pressure-compensated in relation to the actuating forces (solenoid or return spring).

Notice:

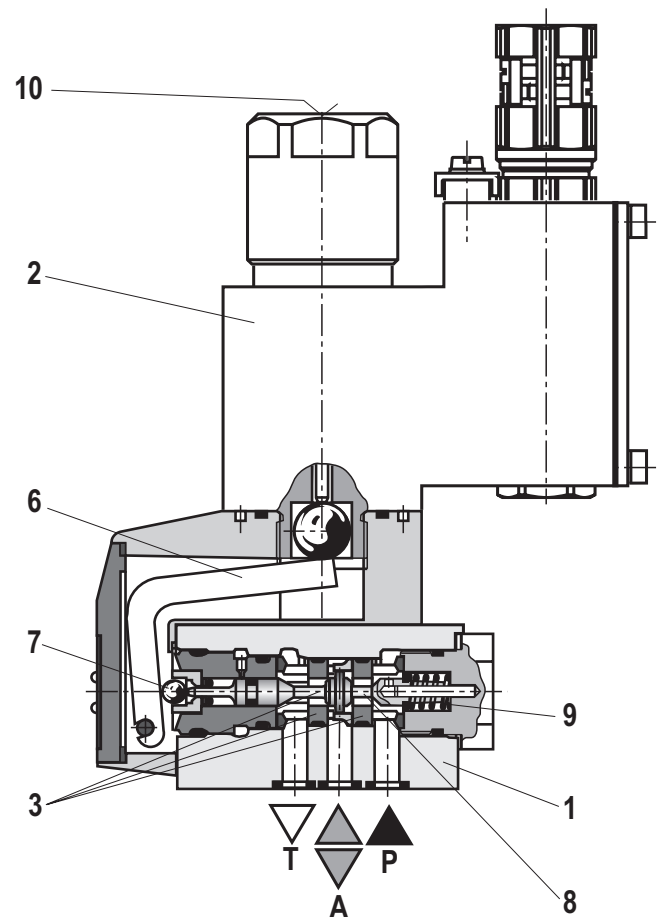
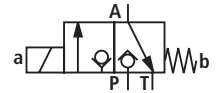
- The 3/2 directional seat valves have a "negative spool overlap". Therefore, port T must always be connected. This means that during the switching process – from the starting of the opening of one valve seat to the closing of the other valve seat – ports P–A–T are connected with each other. This process takes, however, place within such a short time that it is irrelevant in nearly all applications.
- The manual override (10) allows for the switching of the valve without solenoid energization.
- Make sure that the specified maximum flow is not exceeded. Use a throttle insert for flow limitation, if necessary (see below).

The seat arrangement offers the following options:

Symbol "U":



Symbol "C":



Type M-3SEW 10 U...N9XE...

Throttle insert

The use of a throttle insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

Examples:

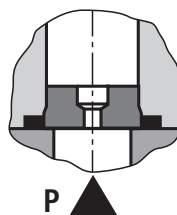
- Accumulator operation,
- Use as pilot control valve with internal pilot fluid tapping.

3/2 directional seat valve

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

4/2 directional seat valve (see page 4)

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



Check valve insert

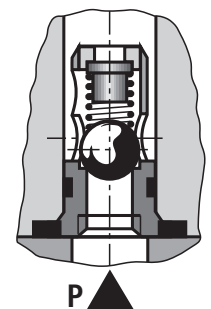
The check valve insert allows a free flow from P to A and closes A to P.

3/2 directional seat valve

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

4/2 directional seat valve (see page 4)

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



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

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

Function of the Plus-1 plate:

Initial position

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

Transition position

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

Spool position

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

Notice:

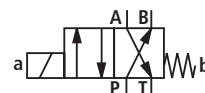
If the annulus area of differential cylinders is not connected to port A, a pressure peak is created in port B during the switching process. This pressure peak may exceed the maximum admissible operating pressure over the permissible limit!

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

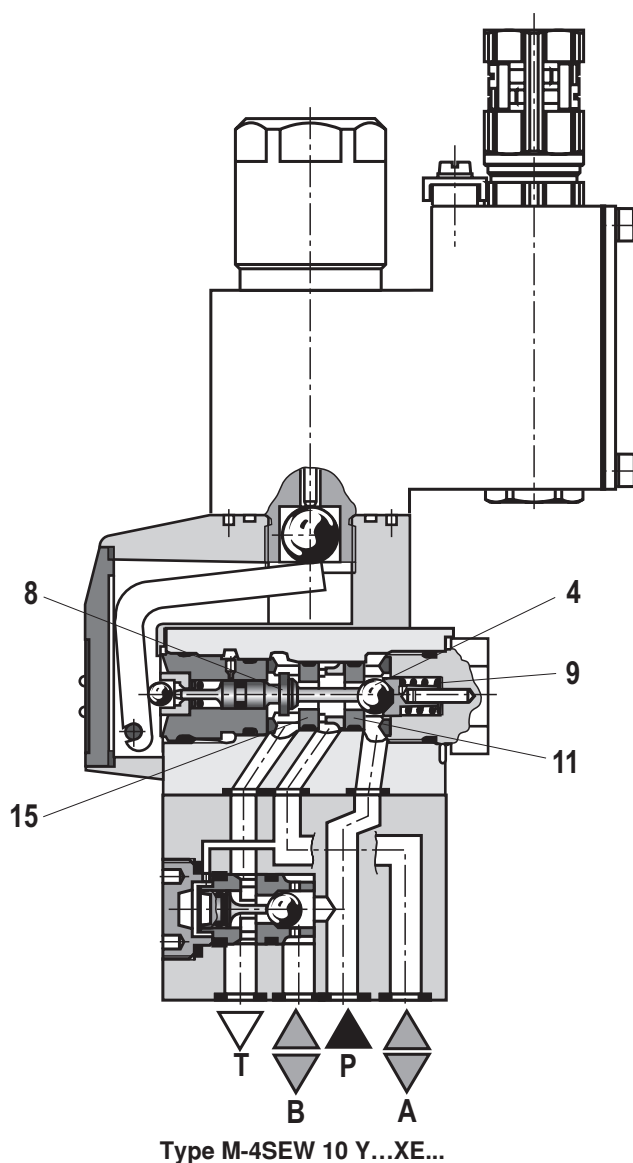
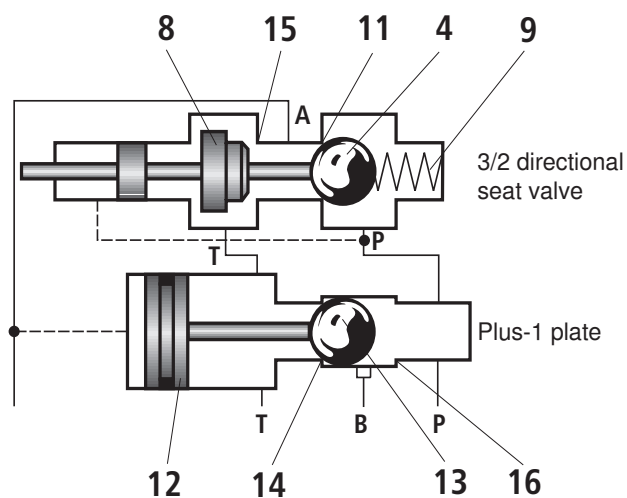
Symbol "D":



Symbol "Y":



Schematic illustration: Initial position



Technical data

general

Installation position	Any		
Ambient temperature range	°C	-20 ... +70 ¹⁾	
Storage temperature range	°C	+5 ... +40	
Maximum storage time	Years	1	
Weight	3/2 directional seat valve	kg	3.8
	4/2 directional seat valve	kg	5.3
Surface protection	Galvanized		

hydraulic

Maximum operating pressure	bar	See table page 9
Maximum flow	l/min	40
Hydraulic fluid	See table below	
Hydraulic fluid temperature range	°C	-20 ... +80 (NBR seals)
		-15 ... +80 (FKM seals)
Viscosity range	mm ² /s	2.8 ... 500
Maximum admissible degree of contamination of the hydraulic fluid Cleanliness class according to ISO 4406 (c)	Class 20/18/15 ²⁾	
Maximum surface temperature	°C	See information on the explosion protection on page 6

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP, HLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	▶ Insoluble in water	HETG	ISO 15380	90221
		HEES		
	▶ Soluble in water	HEPG	ISO 15380	
Flame-resistant	▶ Containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	ISO 12922	90223



Important information on hydraulic fluids:

- ▶ For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us!
- ▶ There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- ▶ Ignition temperature > 180 °C

▶ Flame-resistant – containing water:

- Maximum operating pressure 210 bar
- Pressure differential < 15 bar
- Pressure pre-loading at the tank port > 20 % of the pressure differential, otherwise increased cavitation
- Life cycle as compared to operation with mineral oil HL, HLP 50 to 100 %
- Maximum hydraulic fluid temperature 60 °C

¹⁾ Observe the "Special application conditions for safe application" on page 6.

²⁾ The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

For the selection of the filters, see
www.boschrexroth.com/filter.

Technical data

electric

Voltage type		Direct voltage	Alternating voltage 50/60 Hz
Available voltages	V	24, 48, 96, 110	110, 230
Voltage tolerance (nominal voltage)	%	-5 / +10	
Admissible residual ripple	%	< 5	-
Duty cycle / operating mode according to VDE 0580		100 % / S1 (continuous operation)	
Switching time according to ISO 6403 ³⁾		See table page 7	
Maximum switching frequency	1/h	15000	7200
Nominal power at ambient temperature 20 °C	W	17	
Maximum power with 1.1 x nominal voltage and ambient temperature 20 °C	W	20.6	
Protection class according to EN 60529		IP 66 with correctly installed connection line	

Information on the explosion protection

Area of application according to directive 2014/34/EU		II 2G
Type of protection valve		c (EN 13463-5)
Maximum surface temperature ⁴⁾	°C	135
Temperature class		T4
Type of protection valve solenoid according to EN 60079-7 / EN 60079-18		Ex eb mb IIC T4 Gb
Type examination certificate Solenoid		KEMA 02ATEX2240 X
"IECEX Certificate of Conformity" solenoid		IECEX DEK 12.0068X
Ambient temperature range	°C	-20 ... +70 ¹⁾
Special application conditions for safe application		<ul style="list-style-type: none"> - Maximum ambient temperature: In case of bank assembly, as long as only one solenoid is energized at a time, and in case of individual assembly: +70 °C In case of bank assembly when more than one solenoid is energized at a time: +60 °C - The maximum temperature of the surface of the valve jacket is 120 °C. This has to be considered when selecting the connection cable and/or contact of the connection cable with the surface of the jacket is to be prevented.

¹⁾ Observe the "Special application conditions for safe application" on page 6.

³⁾ The switching times were determined at a hydraulic fluid temperature of 40 °C and a viscosity of 46 cSt. Deviating hydraulic fluid temperatures can result in different switching times. Switching times change dependent on operating time and application conditions.

⁴⁾ Surface temperature > 50 °C, provide contact protection

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

Pressure p in bar	Flow q_V in l/min	DC solenoid						AC solenoid									
		Symbols U, C, D and Y								Symbols U, C, D and Y							
		t_{ON} without tank pressure				t_{OFF}		t_{ON} without tank pressure				t_{OFF}					
U	C	D	Y	U	D	U	C	D	Y	U	C	D	Y				
140	40	25	50	25	50	12	17	25	50	25	50	50	45	55	50		
280	40	25	55	25	55	15	20	25	70	25	70	70	45	75	50		
320	40	25	55	25	55	15	20	25	75	25	75	75	45	80	50		
420	40	30	60	30	60	20	25	30	75	30	75	75	45	80	50		

Electrical connection

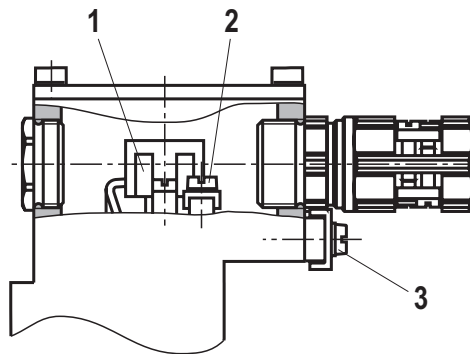
The type-examination tested valve solenoid of the valve is equipped with a terminal box and a type-tested cable gland.

The connection is polarity-independent.

Solenoids to be connected to AC voltage are equipped with an integrated rectifier.

Notice

When establishing the electrical connection, the protective earthing conductor (PE \perp) has to be connected properly.



Properties of the connection terminals

Position	Function	Connectable line cross-section
1	Operating voltage connection	Single-wire 0.75 ... 2.5 mm ² Finely stranded 0.75 ... 1.5 mm ²
2	Connection for protective earthing conductor	Single-wire max. 2.5 mm ² Finely stranded max. 1.5 mm ²
3	Connection for potential equalization conductor	Single-wire 4 ... 6 mm ² Finely stranded 4 mm ²

Cable gland

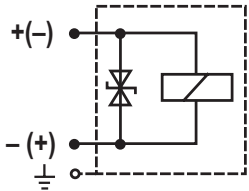
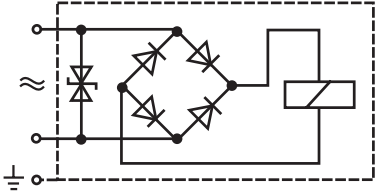
Type approval	II 2G Ex e IIC Gb
Threaded connection	M20 x 1.5
Protection class according to EN 60529	IP66 (if installed properly)
Line diameter	mm 7 ... 10.5
Sealing	Outer sheath sealing

Connection line

Line type	Non-armored cables and lines (outer sheath sealing)
Temperature range	°C -30 ... > +110

Electrical connection

Circuit diagrams

Direct voltage, polarity-independent	Alternating voltage
	

Over-current fuse and switch-off voltage peaks

Notice:

A fuse which corresponds to the rated current according to DIN 41571 and EN / IEC 60127 has to be connected upstream of every valve solenoid (max. $3 \times I_{rated}$).

The shut-off threshold of the fuse has to match the prospective short-circuit current of the supply source.

The prospective short-circuit current of the supply source may amount to a maximum of 1500 A.

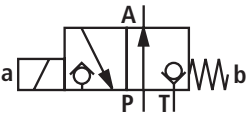
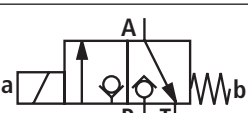
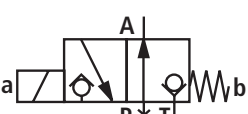
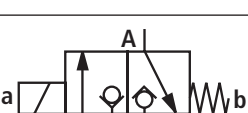
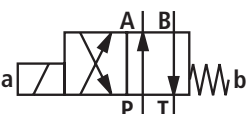

This fuse may only be installed outside the potentially explosive atmosphere or must be of an explosion-proof design.

When inductivities are switched off, voltage peaks result which may cause faults in the connected control electronics.

The voltage peak must be damped by a suitable external circuitry. We recommend a circuitry with a suppressor diode with a limitation voltage of approx. 50 V.

Voltage data in the valve type code	Nominal voltage valve solenoid	Rated current valve solenoid	Rated current external miniature fuse: medium time-lag (M) according to DIN 41571 and EN/IEC 60127	Rated voltage external miniature fuse: medium time-lag (M) according to DIN 41571 and EN/IEC 60127	Maximum voltage value upon switch-off	Suppression circuit
G24	24 V DC	0.708 A DC	800 mA	250 V	-90 V	Suppressor diode bi-directional
G48	48 V DC	0.354 A DC	400 mA	250 V	-200 V	
G96	96 V DC	0.177 A DC	200 mA	250 V	-370 V	
G110	110 V DC	0.155 A DC	200 mA	250 V	-390 V	
W110R	110 V AC	0.163 A AC	200 mA	250 V	-3 V	Bridge rectifier and suppressor diode
W230R	230 V AC	0.078 A AC	80 mA	250 V	-3 V	

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

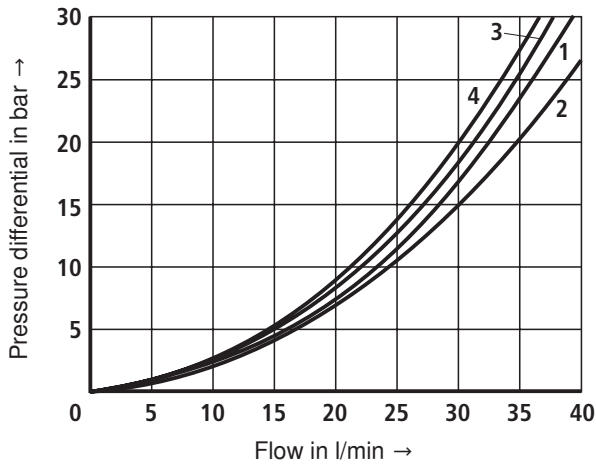
	Symbol	Comment	Operating pressure in bar				Flow in l/min
			P	A	B	T	
3-way circuit	"U" 	Pressure at $P \geq A \geq T$	420	420		100	40
	"C" 		420	420		100	40
2-way circuit (only for unloading)	"U" 	Before switching from the initial position to the spool position, pressure must be applied to port A. Pressure at $A \geq T$		420		100	40
	"C" 	Pressure at $A \geq T$		420		100	40
4-way circuit (flow only possible in the direction of arrow)	"D" 	Valve (symbol "U") in connection with Plus-1 plate $P > A \geq B > T$	420	420	420	100	40
	"Y" 	Valve (symbol "C") in connection with Plus-1 plate $P > A \geq B > T$	420	420	420	100	40

Notice

The switching power limits were established while the solenoids were at operating temperature, at 10 % undervoltage and without tank preloading.

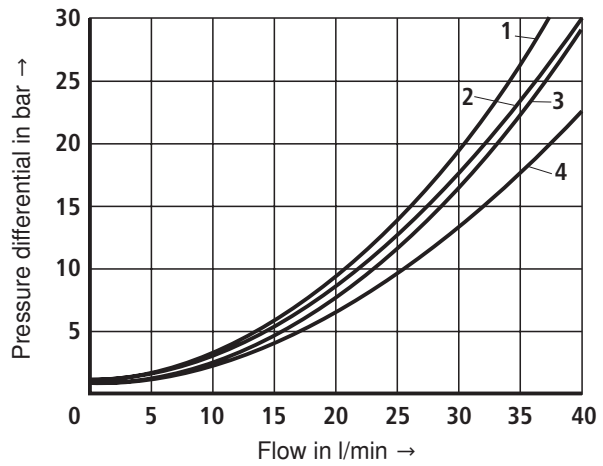
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$)

$\Delta p - q_v$ characteristic curves – 3/2 directional seat valve



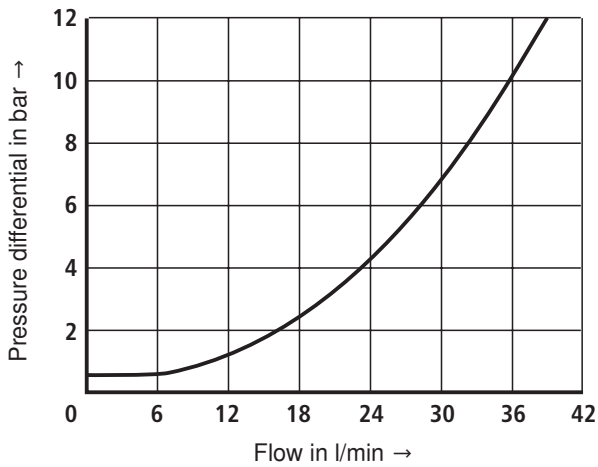
- 1 Version "C", P → A
- 2 Version "C", A → T
- 3 Version "U", P → A
- 4 Version "U", A → T

$\Delta p - q_v$ characteristic curves – 4/2 directional seat valve

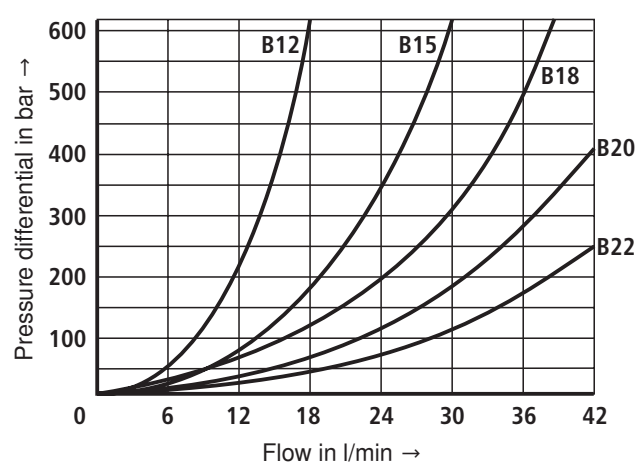


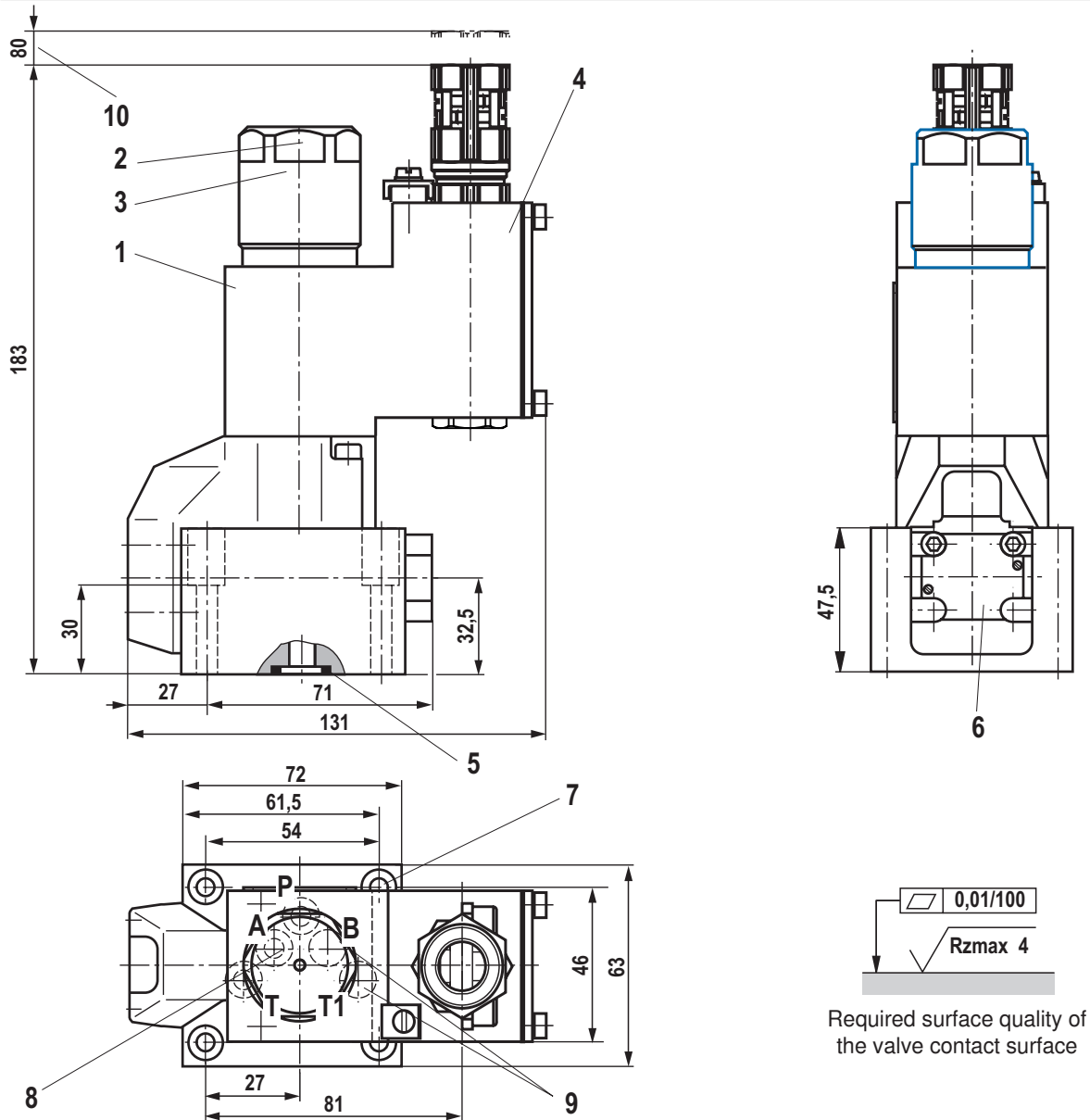
- 1 Version "D" and "Y", A → T
- 2 Version "D" and "Y", P → A
- 3 Version "D" and "Y", P → B
- 4 Version "D" and "Y", B → T

$\Delta p - q_v$ characteristic curves – check valve insert



$\Delta p - q_v$ characteristic curves – throttle insert



Dimensions: 3/2 directional seat valve (dimensions in mm)

- 1 Solenoid coil
- 2 Concealed manual override "N9"
- 3 Mounting nut with hexagon, wrench size 32
- 4 Terminal box
- 5 Identical seal rings for ports A, B, T and T1
Seal ring for port P
- 6 Name plate
- 7 **Valve mounting screws** (separate order)

For reasons of stability, exclusively the following valve mounting screws are to be used:

4 hexagon socket head cap screws
ISO 4762-M6x40-10.9-fIZn-240h-L
(friction coefficient $\mu_{\text{total}} = 0.09$ to 0.14)
material no. **R913000058**

- 8 Porting pattern according to ISO 4401-05-04-0-05
- 9 With 3/2 directional seat valves, ports B and T1 are designed as blind counterbore.
- 10 Space required to remove the solenoid coil

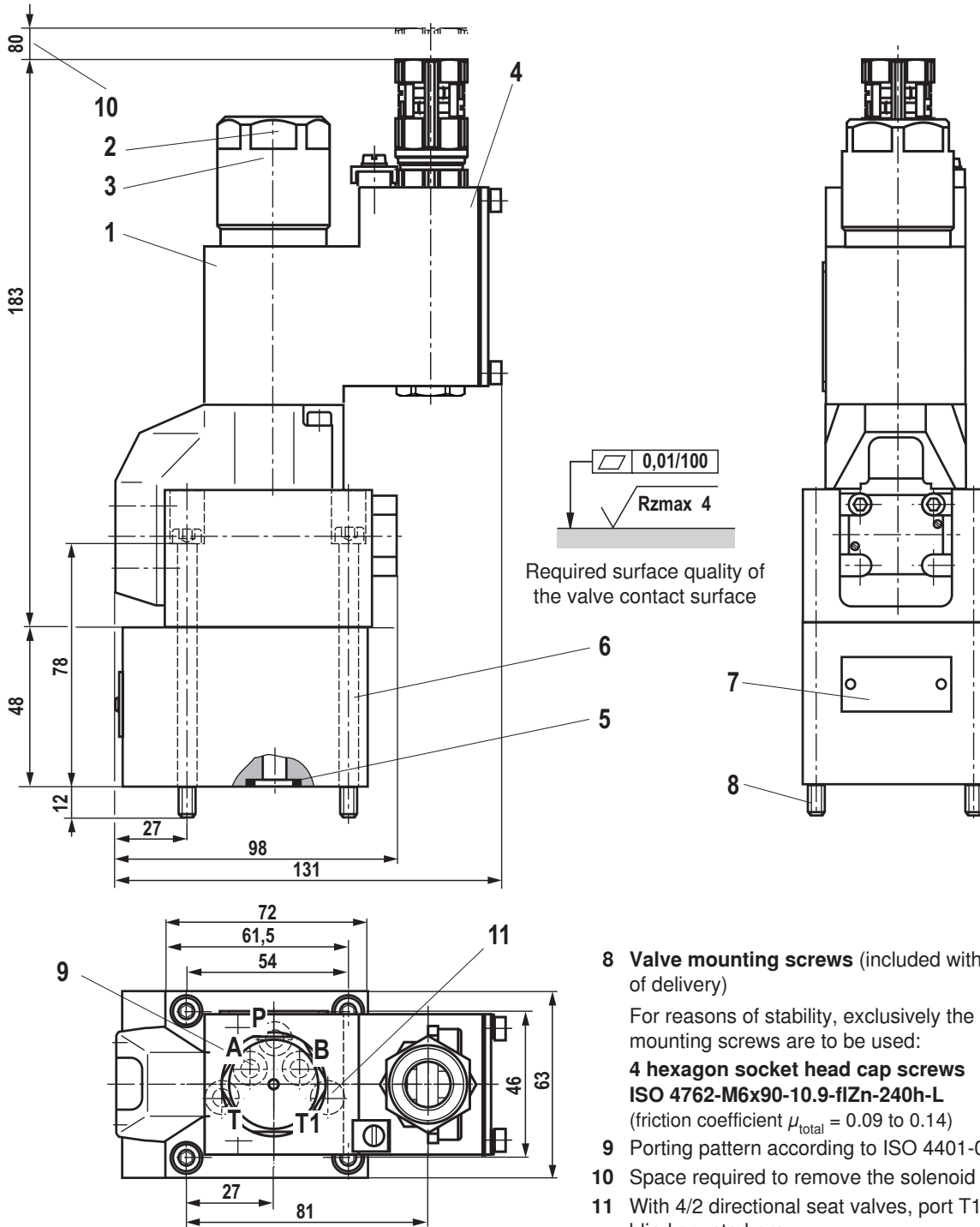
Subplates (separate order) with porting pattern according to ISO 4401-05-04-0-05, see data sheet 45100.

Notice:

Subplates are no components in the sense of directive 2014/34/EU and can be used after the manufacturer of the overall system has conducted an assessment of the risk of ignition.

The "G...J3" versions are free from aluminum and/or magnesium and galvanized.

Dimensions: 4/2 directional seat valve (dimensions in mm)



0,01/100
Rzmax 4
Required surface quality of the valve contact surface

- 8 Valve mounting screws** (included within the scope of delivery)
For reasons of stability, exclusively the following valve mounting screws are to be used:
4 hexagon socket head cap screws
ISO 4762-M6x90-10.9-flZn-240h-L
(friction coefficient $\mu_{total} = 0.09$ to 0.14)
- 9** Porting pattern according to ISO 4401-05-04-0-05
- 10** Space required to remove the solenoid coil
- 11** With 4/2 directional seat valves, port T1 is designed as blind counterbore.

- 1** Solenoid coil
- 2** concealed manual override "N9"
- 3** Mounting nut with hexagon wrench size 32
- 4** Terminal box
- 5** Identical seal rings for ports A, B, T and T1
Seal ring for port P
- 6** Plus-1 plate
- 7** Name plate

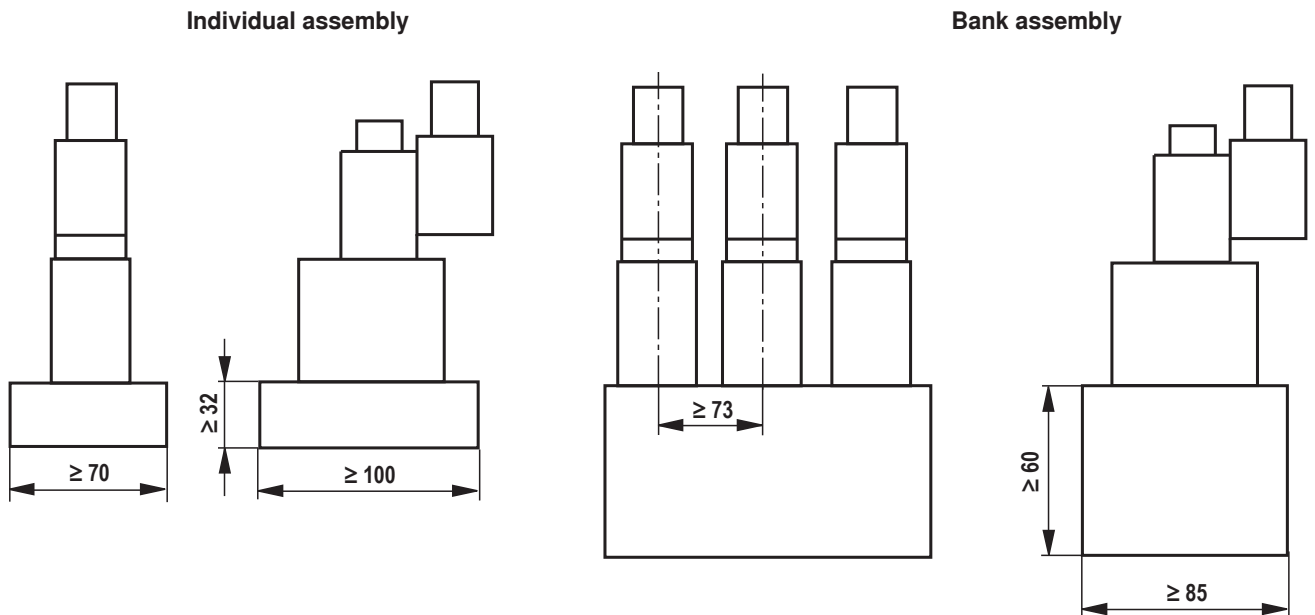
Subplates (separate order) with porting pattern according to ISO 4401-05-04-0-05, see data sheet 45100.

Notice:
Subplates are no components in the sense of directive 2014/34/EU and can be used after the manufacturer of the overall system has conducted an assessment of the risk of ignition. The "G...J3" versions are free from aluminum and/or magnesium and galvanized.

Installation conditions (dimensions in mm)

	Individual assembly	Bank assembly
Subplate dimensions	Minimum dimensions Length ≥ 100 , width ≥ 70 , height ≥ 32	Minimum cross-section Height ≥ 60 , width ≥ 85
Thermal conductivity of the subplate	≥ 38 W/mK (EN-GJS-500-7)	
Minimum distance between the longitudinal valve axes	≥ 73 mm	

Schematic diagram



Notice:

Observe the "Special application conditions for safe application" on page 7.

General information:

- In order to switch the valve safely or maintain it in its spool position, the pressure situation must be as follows: $P \geq A \geq T$ (for design reasons).
- The ports P, A and T (3/2 directional seat valve) as well as P, A, B and T (4/2 directional seat valve) are clearly determined according to their tasks. They must not be exchanged or closed. The flow is only permitted in the direction of arrow.
- When the Plus-1 plate (4/2 directional function) is used, the following minimum operating values have to be observed: $p_{\min} = 8$ bar; $q_v > 3$ l/min.
- The specified maximum flow must not be exceeded (if necessary, use a throttle insert for flow limitation)!

Further information

Subplates	Data sheet 45100
Use of non-electrical hydraulic components in an explosive environment (ATEX)	Data sheet 07011
Hydraulic fluids on mineral oil basis	Data sheet 90220
Environmentally compatible hydraulic fluids	Data sheet 90221
Flame-resistant hydraulic fluids - containing water (HFAE, HFAS, HFB, HFC)	Data sheet 90223
Directional seat valves, direct operated, with solenoid actuation	Operating instructions 22075-XE-B
Selection of filters	www.boschrexroth.com/filter
Information on available spare parts	www.boschrexroth.com/spc

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

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Notes
