

Directional spool valves, direct operated, with solenoid actuation

Type WE ...XD

RE 23178-XD
Edition: 2016-04
Replaces: 05.12



H7120

- ▶ Size 6
- ▶ Component series 6X
- ▶ Maximum operating pressure 315 bar
- ▶ Maximum flow 60 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:
I M2; II 2G
- ▶ Type of protection of the valve solenoids:
Ex db I Mb / Ex db IIC T4 Gb according to EN 60079-0 / EN 60079-1

Features

- ▶ 4/3-, 4/2- or 3/2-way version
- ▶ For intended use in potentially explosive atmosphere
- ▶ Porting pattern according to ISO 4401-03-02-0-05
- ▶ Wet-pin DC solenoids
- ▶ Electrical connection with individual connection and cable gland
- ▶ With manual override

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Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13
	WE	6		6X	/	B		N	XD	Z2	/	

01	3 main ports	3
	4 main ports	4
02	Directional valve	WE
03	Size 6	6
04	Symbols e.g. C, E, EA, EB, etc; possible version, see page 3	
05	Component series 60 ... 69 (60 ... 69: unchanged installation and connection dimensions)	6X
06	With spring return	no code
	Without spring return	O
	Without spring return with detent	OF
07	High-power solenoid, wet (wet-pin)	B

Voltage

08	Direct voltage 24 V	G24
	Direct voltage 110 V	G110
09	With manual override	N

Explosion protection

10	"Flameproof enclosure"	XD
	For details, see information on the explosion protection, page 6	

Electrical connection

11	Individual connection	
	Solenoid with terminal box and cable gland	Z2
	For details of electrical connections, see page 11 and 12	
12	Without throttle insert	no code
	Throttle Ø 0.8 mm	B08
	Throttle Ø 1.0 mm	B10
	Throttle Ø 1.2 mm	B12
	Use with flows which exceed the performance limit of the valve (see page 4)	

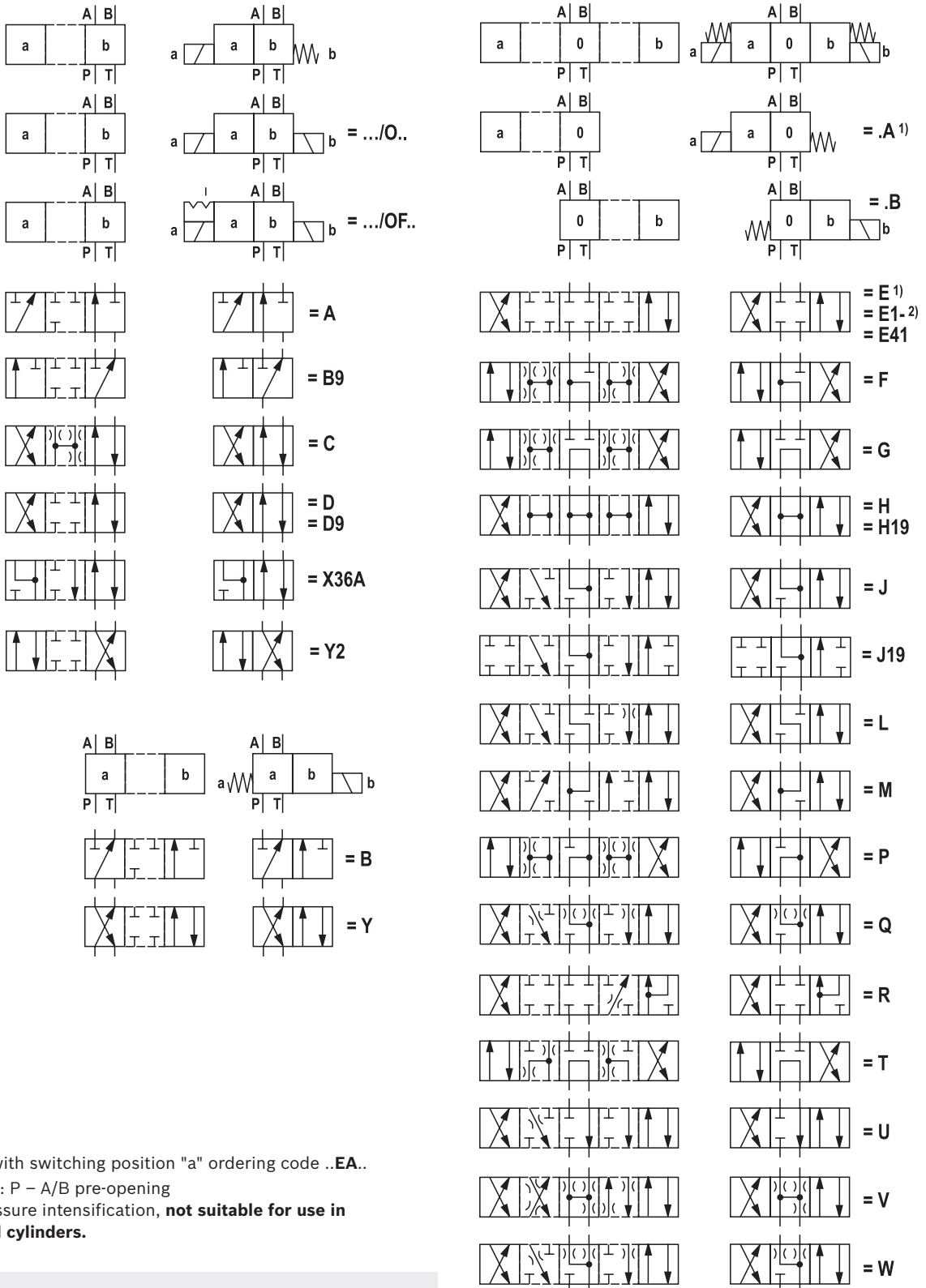
Seal material

13	NBR seals	no code
	FKM seals	V
	Observe compatibility of seals with hydraulic fluid used	

**Notice:**

The manual override cannot be allocated a safety function and may only be used up to a tank pressure of 50 bar.

Symbols



- 1) **Example:**
Symbol E with switching position "a" ordering code ..EA..
- 2) Symbol E1-: P – A/B pre-opening
Due to pressure intensification, **not suitable for use in differential cylinders.**

Notice:

Representation according to DIN ISO 1219-1.
Hydraulic interim positions are shown by dashes.

Function, section

Directional valves of type WE are solenoid-actuated directional spool valves. They control start, stop and direction of a flow.

The directional valves basically consist of housing (1), one or two solenoids (2), control spool (3), and one or two return springs (4).

In the de-energized condition, control spool (3) is held in the central position or in the initial position by the return springs (4) (except for impulse spools). The control spool (3) is actuated by wet-pin solenoids in hydraulic fluid (2).

To ensure proper functioning, care must be taken that the pressure chamber of the solenoid is filled with hydraulic fluid.

The force of solenoid (2) acts via plunger (5) on control spool (3) and pushes the latter from its rest position to the required end position. This enables the necessary direction of flow from P → A and B → T or P → B and A → T.

After solenoid (2) was de-excited, the return spring (4) pushes the control spool (3) back to its rest position.

A manual override (6) allows control spool (3) to be moved

without solenoid energization.

Without spring return "O" (only possible with symbols A, C and D)

This version is a directional valve with two spool positions and two solenoids without detent. In the de-energized condition, there is no defined spool position.

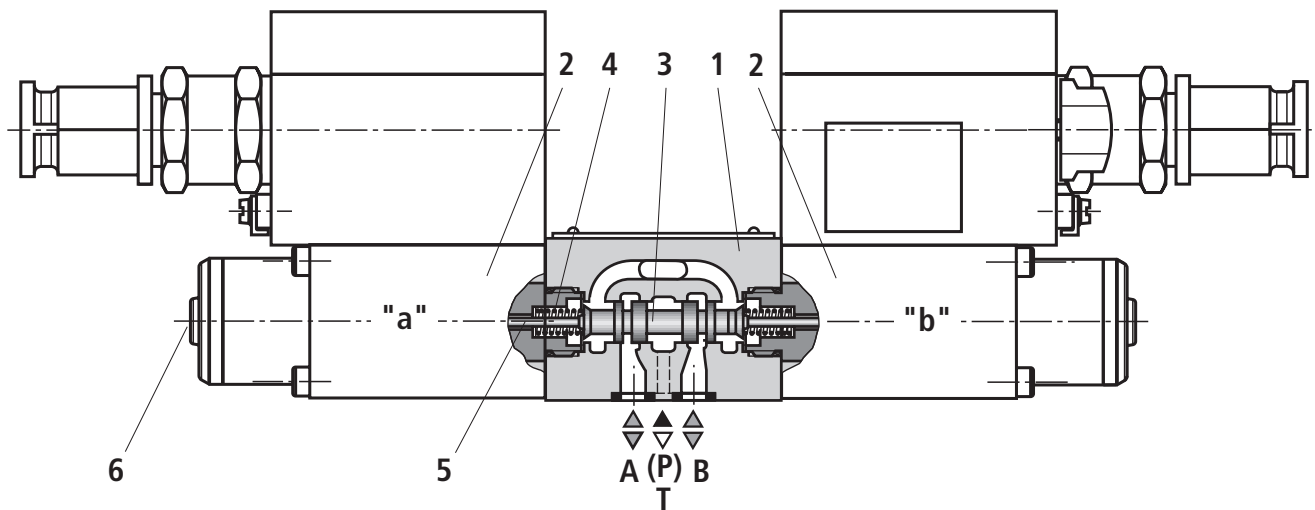
Without spring return, with detent "OF" (impulse spool, only possible with symbols A, C and D)

This version is a directional valve with two spool positions, two solenoids and one detent.

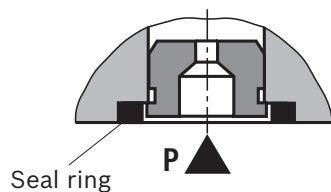
It alternately locks the two spool positions and the solenoid therefore does not need to be permanently energized.

Notice:

For design reasons, internal leakage is inherent to the valves, which may increase over the life cycle.



Type 4WE 6 E6X/.B..NXDZ2



Throttle insert "...B"

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

Technical data

(For applications outside these parameters, please consult us!)

general	
Installation position	Any
Ambient temperature range	°C -20 ... +50
Storage temperature range	°C +5 ... +40
Maximum storage time	Years 1
Weight	kg 5.3 (with 1 solenoid); 9.4 (with 2 solenoids)
Surface protection	▶ Valve body ▶ Solenoid
	Galvanized Galvanized

hydraulic	
Maximum operating pressure	▶ Port A, B, P ▶ Port T
	bar 315 bar 210
	With symbols A and B, port T must be used as leakage oil connection if the operating pressure exceeds the admissible tank pressure.
Maximum flow	l/min 60
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 ¹⁾
Maximum surface temperature	°C See information on the explosion protection, 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 pressure differential per control edge 50 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 ... 100%

Technical data

(For applications outside these parameters, please consult us!)

Electric	
Voltage type	Direct voltage
Available voltages	V 24, 110
Voltage tolerance (nominal voltage)	% ± 10
Admissible residual ripple	% < 5
Duty cycle / operating mode according to VDE 0580	S1 (continuous operation)
Switching times according to ISO 6403 ¹⁾	► ON ms 30 ... 70
	► OFF ms 20 ... 30
Maximum switching frequency	1/h 15000
Nominal power at ambient temperature 20 °C	W 13
Maximum power with 1.1 x nominal voltage and ambient temperature 20°C	W 15.8
Protection class according to EN 60529 ²⁾	IP 65 (with correctly installed electrical connection)

Information on the explosion protection	
Area of application according to directive 2014/34/EU	I M2; II 2G
Type of protection valve	c (EN 13463-5)
Maximum surface temperature ²⁾	°C 130
Temperature class	T4
Type of protection valve solenoid according to EN 60079-0 / EN 60079-1	Ex db I Mb Ex db IIC T4 Gb
Type examination certificate solenoid	BVS 03 ATEX E 300 X
"IEC Certificate of Conformity" solenoid	IECEx BVS 11.0091 X
Special application conditions for safe application	► In case of bank assembly, only one solenoid of all valves may be energized at a time. ► In case of valves with two solenoids, maximally one of the solenoids may be energized at a time.
Ambient temperature range	°C -20 ... +80

¹⁾ 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.

²⁾ Surface temperature > 50°C, provide contact protection.

Performance limits

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

Notice:

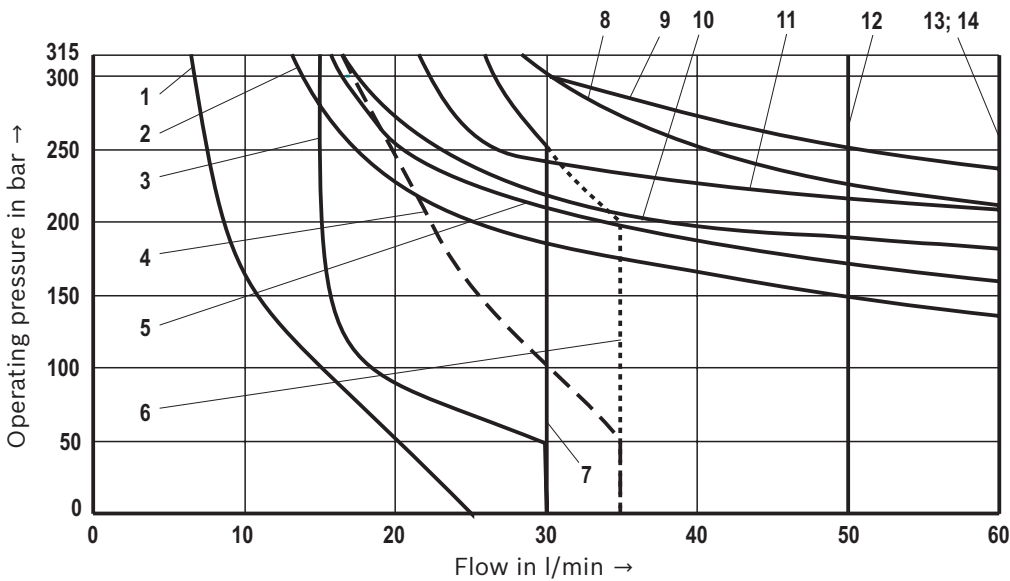
The specified performance limits are valid for use with two directions of flow (e.g. from P → A and simultaneous return flow from B to T).

Due to the flow forces acting within the valves, the admissible performance limit may be considerably lower

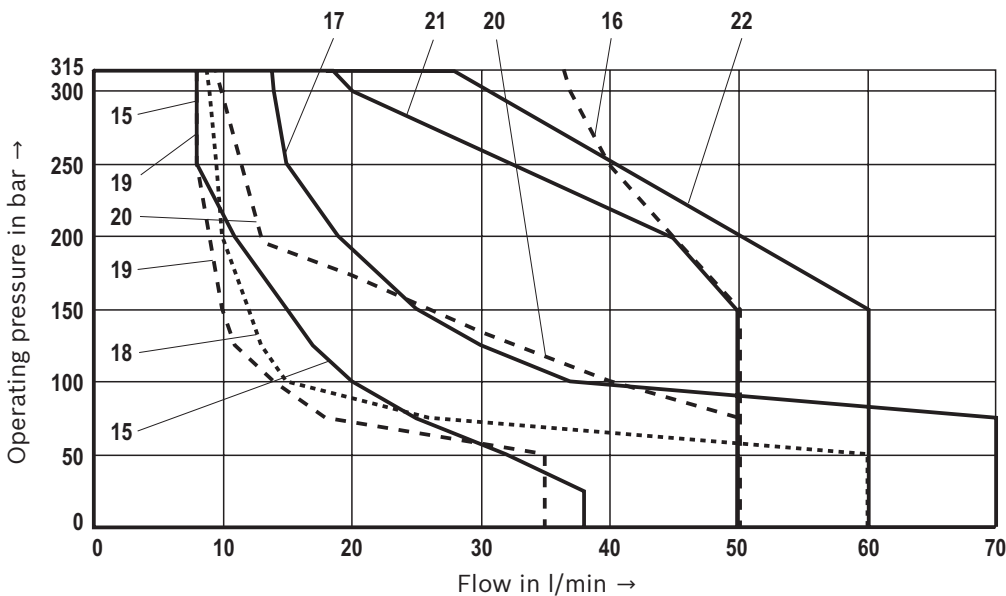
with only one direction of flow (e.g. from P → A while port B is blocked)!

In such cases, please consult us.

The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank preloading.



Characteristic curve	Symbol
1	A, B
2	J, L, U
3	V
4	F, P
5	A/O, A/OF
6	G
7	T
8	R ²⁾
9	E
10	Q, W
11	D, C, Y, Y2
12	H
13	M
14	E1 ¹⁾ , D/OF, C/OF, D/O, C/O



Characteristic curve	Symbol
15	B9
16	H19
17	J19, P-A
18	J19, A-T
19	J19, B-T
20	X36A
21	D9
22	E41

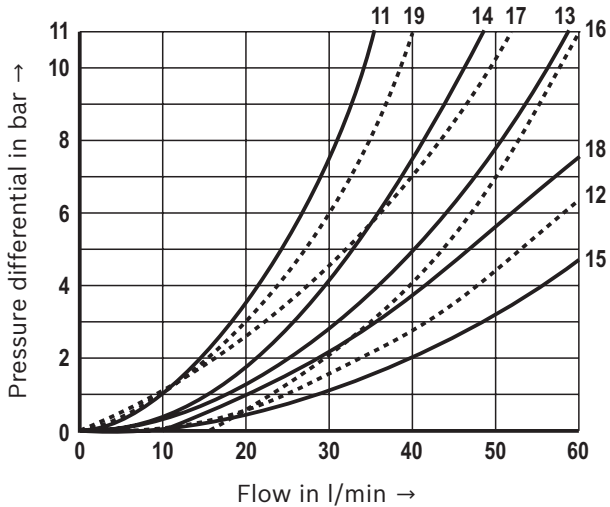
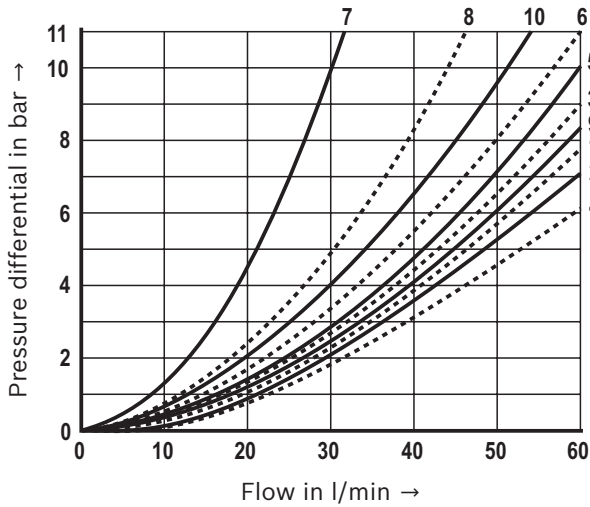
¹⁾ P – A/B pre-opening

²⁾ Return flow from actuator to tank

Characteristic curves

(measured with HLP46, $\vartheta_{oil} = 40 \pm 5^\circ\text{C}$, $p = 100 \text{ bar}$)

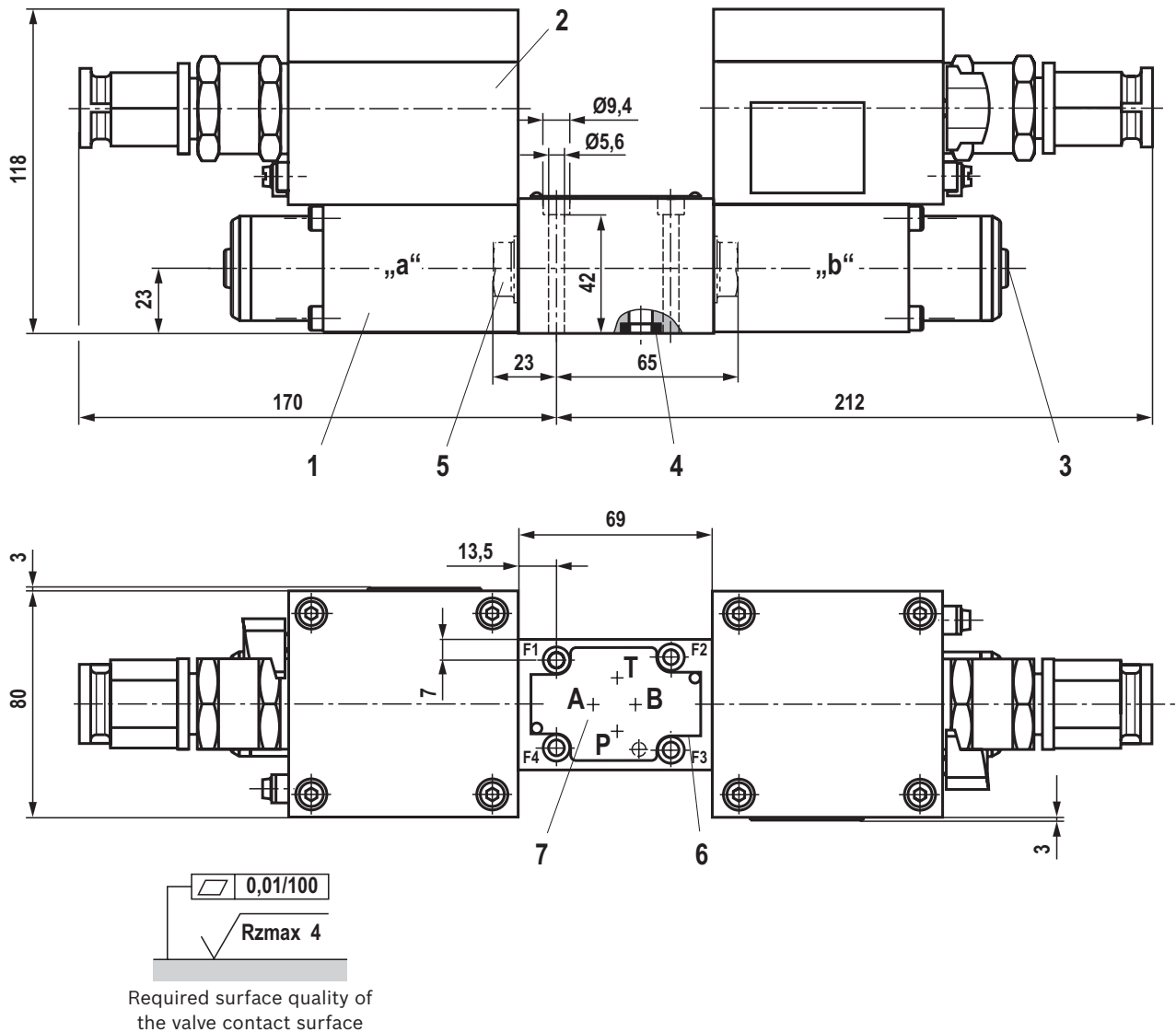
Δp - q_v characteristic curves



Symbol	Direction of flow					
	P - A	P - B	A - T	B - T	B - A	P - T
A, B	3	3	-	-	-	-
C	1	1	3	1	-	-
D, Y, Y2	5	5	3	3	-	-
E	3	3	1	1	-	-
F	1	3	1	1	-	-
T	10	10	9	9	-	8
H	2	4	2	2	-	9
J, Q	1	1	2	1	-	-
L	3	3	4	9	-	-
M	2	4	3	3	-	-
P	3	1	1	1	-	-
R	5	5	4	-	7	-
V	1	2	1	1	-	-
W	1	1	2	2	-	-
U	3	3	9	4	-	-
G	6	6	9	9	-	8
B9	11	11	-	-	-	-
H19	13	13	12	12	14	-
J19	13	-	15	12	-	-
X36A	16	-	17	18	-	-
D9	8	19	8	14	-	-
E41	19	19	8	8	-	-

Dimensions

(dimensions in mm)



- 1 Solenoid
- 2 Terminal box
- 3 Manual override "N"
- 4 Identical seal rings for ports P, A, B, T
- 5 Plug screw for valves with one solenoid
- 6 Name plate
- 7 Porting pattern according to ISO 4401-03-02-0-05 (with locating hole for locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order)

Valve mounting screws (separate order)

For reasons of stability, use exclusively the following valve mounting screws:

4 hexagon socket head cap screws

ISO 4762 - M5 x 50 - 10.9-fIZnnc-L-240h-C

(friction coefficient $\mu_{total} = 0.09$ to 0.14);

material no. **R913000064**

Subplates (separate order) with porting pattern according to ISO 4401-03-02-0-05, 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.

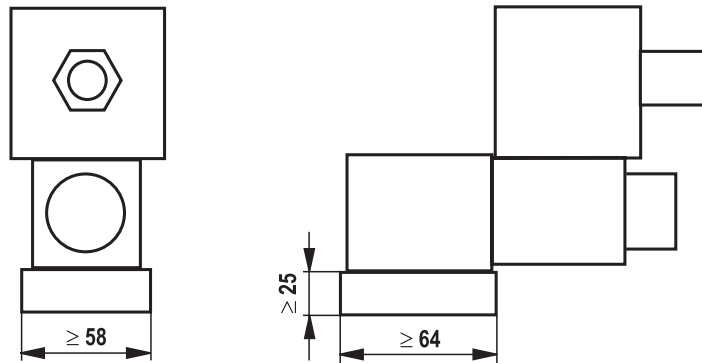
The "G...J3" versions are free from aluminum and/or magnesium and galvanized.

Installation conditions
(dimensions in mm)

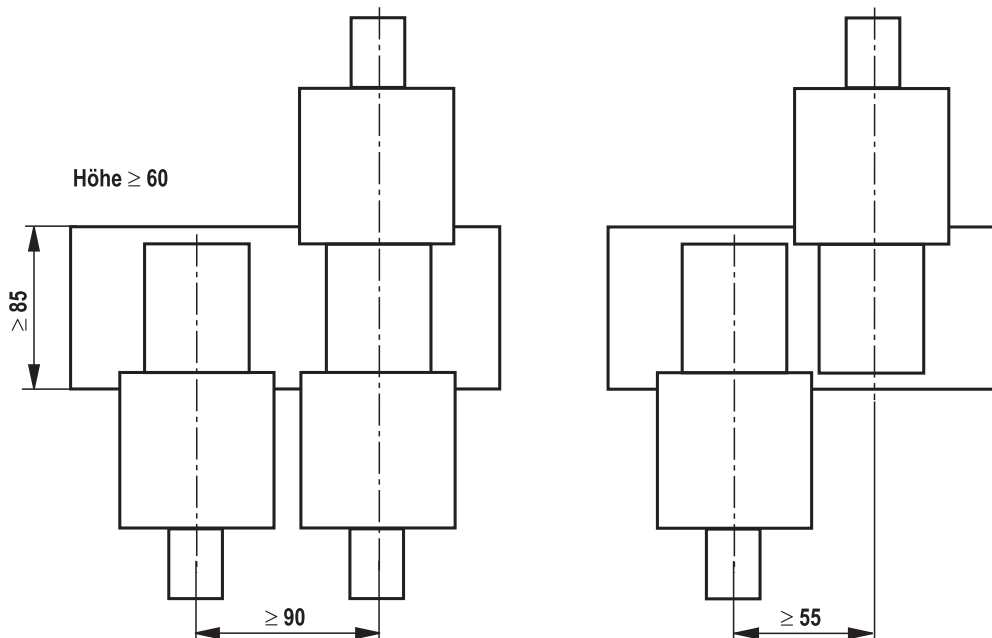
	Individual assembly	Bank assembly
Subplate dimensions	Minimum dimensions Length ≥ 64 , width ≥ 58 , height ≥ 25	Minimum cross-section Height ≥ 60 , width ≥ 85
Thermal conductivity of the subplate	≥ 38 W/mK (EN-GJS-500-7)	
Minimum distance between the longitudinal valve axes	See schematic diagram below	

Schematic diagram

Individual assembly



Bank assembly



Notice:

In case of bank assembly, only one solenoid of all valves may be energized at a time.

Electrical connection

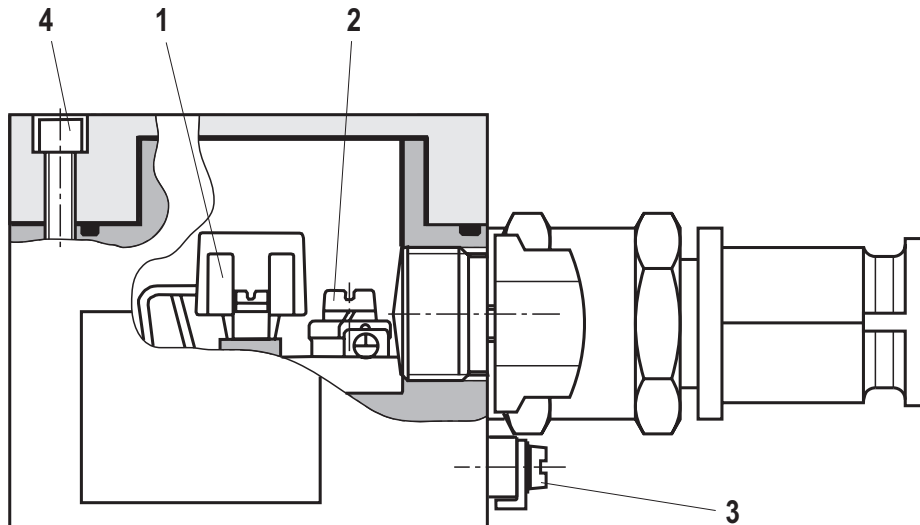
The type-examination tested valve solenoid of the valve is equipped with one terminal box and a type-tested cable entry.

The connection is polarity-independent.



Notice:

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



Properties of the connection terminals and mounting elements

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

Cable gland

Line diameter	mm	9 ... 12
Sealing		Outer sheath sealing

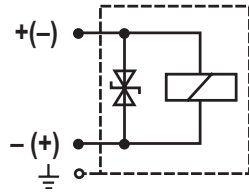
Connection line

Line type		Non-armored cables and lines (outer sheath sealing)
Temperature range	°C	-20 ... > +110

Electrical connection

Circuit diagram

Direct voltage, polarity-independent



Over-current fuse and switch-off voltage peaks

Voltage data in the valve type code	Nominal voltage valve solenoid	Rated current valve solenoid	Recommended pre-fuse characteristics medium time-lag according to DIN 41571	Maximum voltage value upon switching off	Interference protection circuit
G24	24 V DC	0.542 A DC	630 mA	-90 V	Suppressor diode bi-directional
G110	110 V DC	0.118 A DC	125 mA	-390 V	

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.