

# Directional spool valves, direct operated, with solenoid actuation

## Type WE ...XD

**RE 23178-XD**

Edition: 2019-05

Replaces: 2016-04



H7120

- ▶ Size 6
- ▶ Component series 6X
- ▶ Maximum operating pressure 315 bar
- ▶ Maximum flow 60 l/min

CE EAC

### ATEX units

#### For potentially explosive areas



#### Information on explosion protection:

- ▶ Area of application in accordance with the Explosion Protection Directive 2014/34/EU **I M2; II 2G**
- ▶ Area of application according to technical rules EAC TR CU 012/2011: **I M2; II 2G**
- ▶ Type of protection of the valve solenoids:
  - Ex db I Mb according to EN 60079-1
  - Ex db IIC T4 Gb according to EN 60079-1

### Features

- ▶ 4/3-, 4/2- or 3/2-way version
- ▶ For intended use in a 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

### Contents

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## Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	
	<b>WE</b>	<b>6</b>		<b>6X</b>	/		<b>B</b>	<b>G24</b>	<b>N</b>	<b>XD</b>	<b>Z2</b>	/	

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

### Voltage

08	Direct voltage 24 V	<b>G24</b>
09	<b>With</b> manual override	<b>N</b>

### Explosion protection

10	"Flameproof enclosure"	<b>XD</b>
	For details, see information on explosion protection, page 6	

### Electrical connection

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

### Seal material (observe compatibility of seals with hydraulic fluid used, see page 5)

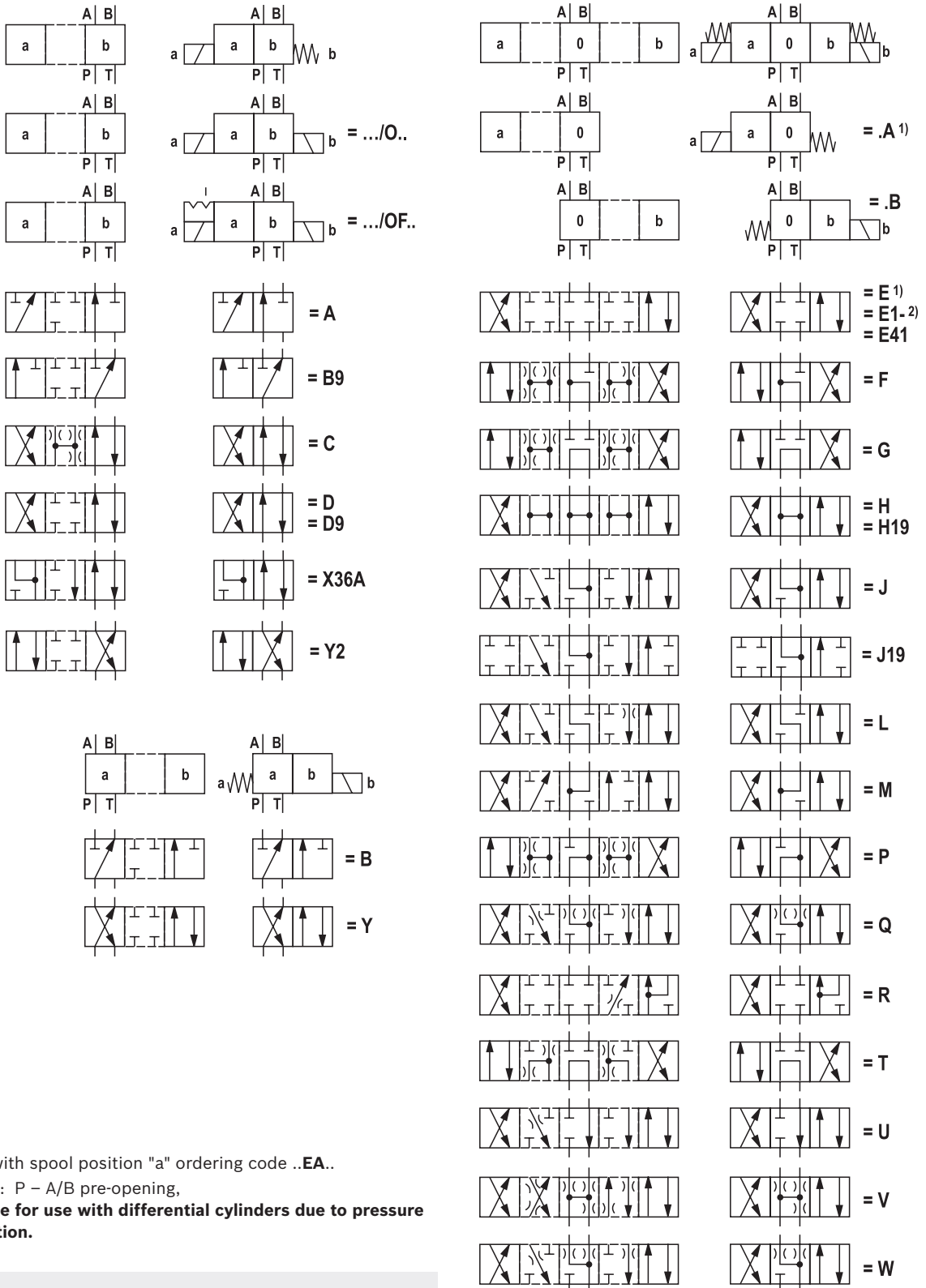
13	NBR seals	<b>no code</b>
	FKM seals	<b>V</b>



#### 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 spool position "a" ordering code ..EA..
- 2) Symbol E1-: P – A/B pre-opening,  
**Not suitable for use with differential cylinders due to pressure intensification.**

**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, the 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, make sure 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 de-excitation of the solenoid (2), 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.

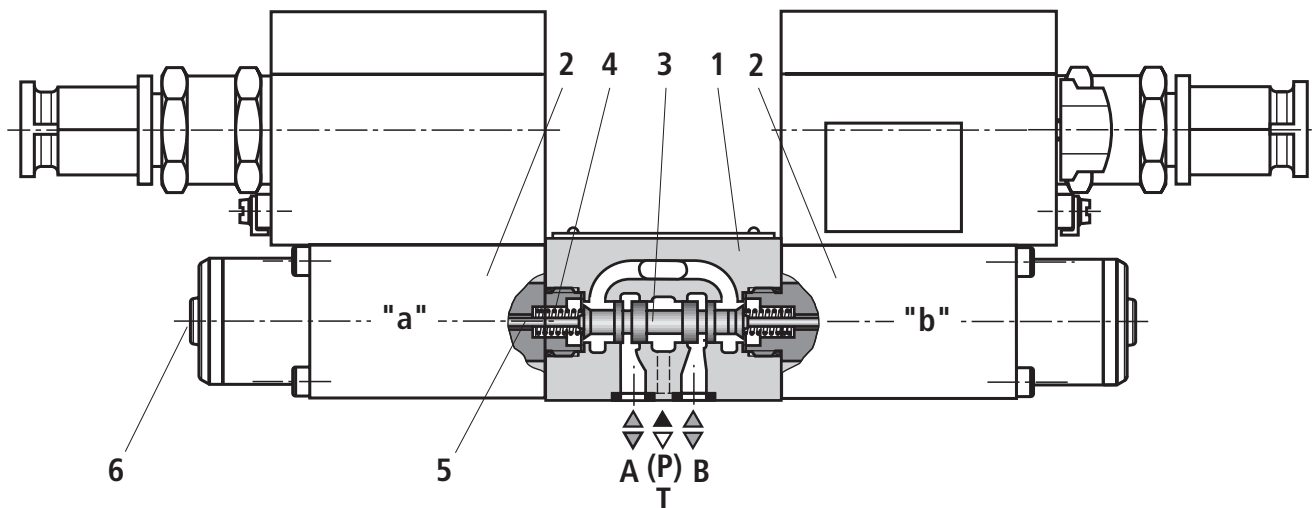
**Without spring return with "OF" detent** (impulse spool, only possible with symbols A, C and D)

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

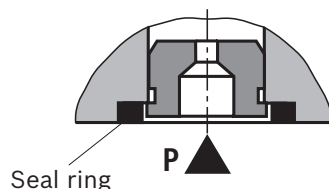
It alternately locks the two spool positions and the solenoid therefore does not need to be permanently energized.

### Notice:

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



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 values, please consult us!)

General		
Installation position	any	
Ambient temperature range	°C -20 ... +80	
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	galvanized
	▶ Solenoid	galvanized

Hydraulic		
Maximum operating pressure	▶ Port A, B, P	bar 315
	▶ Port T	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 <sup>2</sup> /s 2.8 ... 500	
Maximum admissible degree of contamination of the hydraulic fluid Cleanliness class according to ISO 4406 (c)	Class 20/18/15 <sup>1)</sup>	
Maximum surface temperature	°C See information on 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, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	NBR	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.).
- ▶ The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.
- ▶ **Bio-degradable and flame-resistant – containing water:** If this hydraulic fluid is used, small amounts of dissolved zinc may get into the hydraulic system.

### ▶ Flame-resistant – containing water:

- Due to increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended - if possible specific to the installation - to back up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.
- Dependent on the hydraulic fluid used, the maximum ambient and hydraulic fluid temperature must not exceed 50 °C. In order to reduce the heat input into the component, a maximum duty cycle of 50% in continuous operation has to be set for on / off valves (measuring period 300 s).

<sup>1)</sup> The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.

For the selection of filters, see [www.boschrexroth.com/filter](http://www.boschrexroth.com/filter).

**Technical data**


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

<b>Electric</b>		
Voltage type	Direct voltage	
Available voltages	V 24	
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	▶ 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	IP65 (with correctly installed electrical connection)	

<b>Information on explosion protection – Directive 2014/34/EU</b>		
Area of application	I M2	II 2G
Type of protection valve	c (EN 13463-1)	
Valve type of protection marking	I M2 c X	II 2 G c T4 X
Type of protection valve solenoid according to EN 60079-1	Ex db I Mb	Ex db IIC T4 Gb
Maximum surface temperature <sup>1)</sup>	°C 130	
Temperature class	T4	
Type examination certificate solenoid	BVS 03 ATEX E 300 X	

<b>Information on explosion protection – technical rules EAC TR CU 012/2011</b>		
Area of application	I M2	II 2G
Valve type of protection marking	PB Ex d Mb / I Mb c	1Ex d IIC T4 Gb / II Gb c II T4
Maximum surface temperature <sup>1)</sup>	°C 130	
Temperature class	T4	
Certificate of conformity	№ TC RU C-DE.ГБ08.В.02161	

<sup>1)</sup> Surface temperature > 50 °C, provide contact protection

 **Special application conditions for safe application:**

- ▶ Connection lines must be installed in a strain-relieved way.
- ▶ In order to avoid dangers caused by static charge, the base and / or subplate on which the valve is to be fitted must be electrically conductive and included in the equipotential bonding.
- ▶ The valve must not be installed close to charge generating processes.
- ▶ The maximum temperature of the surface of the valve jacket is 130 °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.
- ▶ In case of bank assembly, only one solenoid of all valves may be energized at a time.

### Performance limits

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

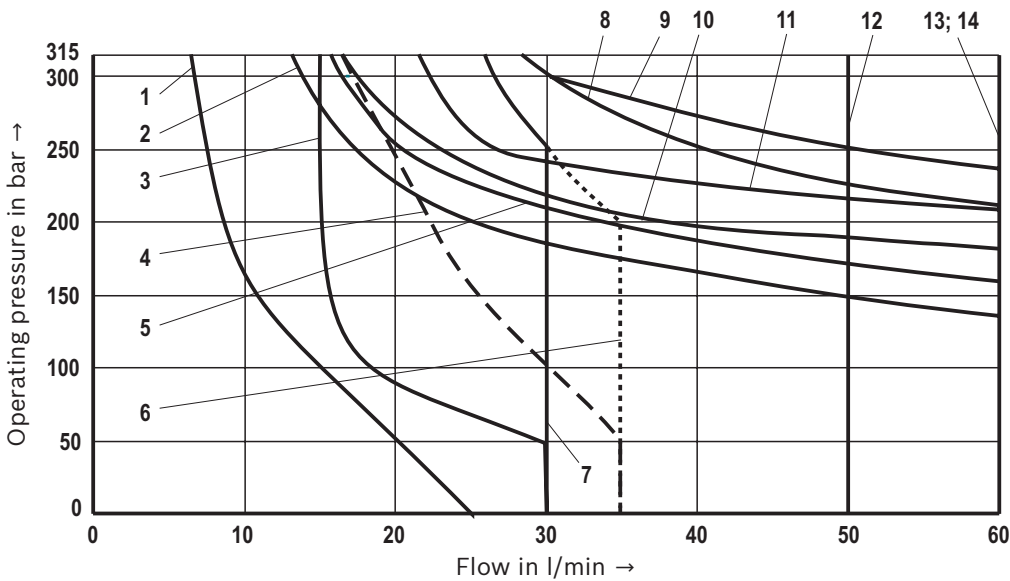
**Notice:**

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).

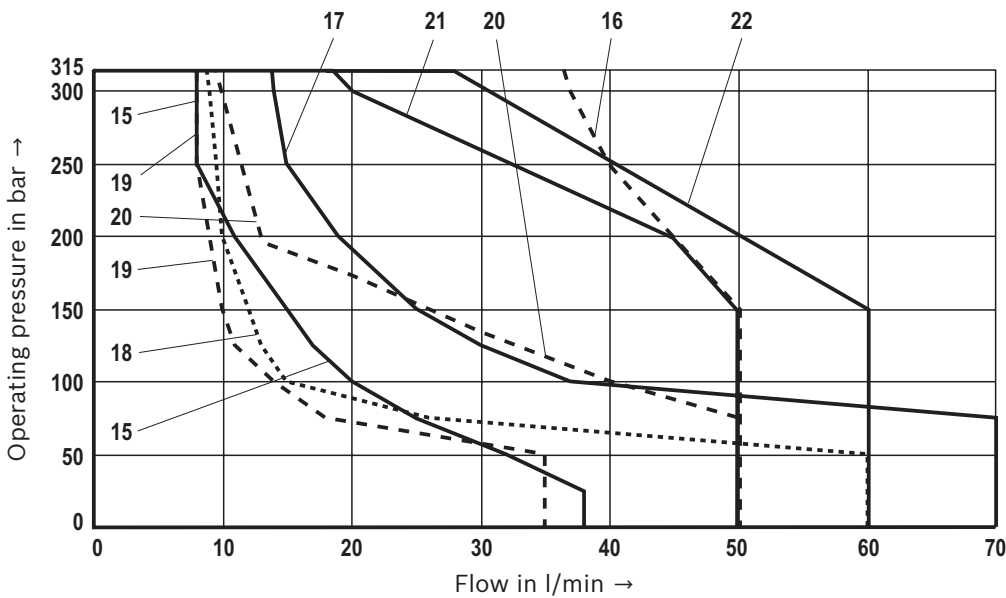
Due to the flow forces acting within the valves, the admissible performance limit may be considerably lower

with only one direction of flow (e.g. from P → A while port B is blocked)! In such cases of use, 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 <sup>2)</sup>
9	E
10	Q, W
11	D, C, Y, Y2
12	H
13	M
14	E1 <sup>1)</sup> , 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

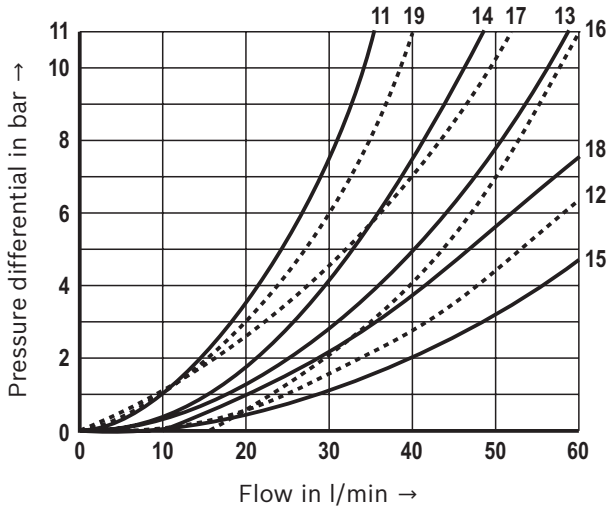
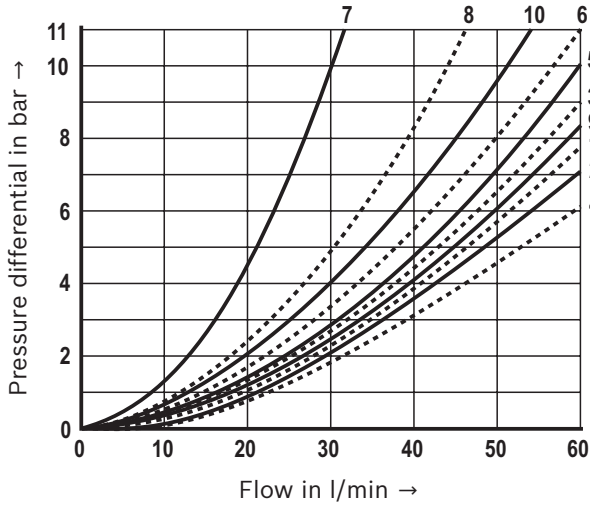
<sup>1)</sup> P – A/B pre-opening

<sup>2)</sup> Return flow from actuator to tank

**Characteristic curves**

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

**$\Delta p$ - $q_v$  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	-	-



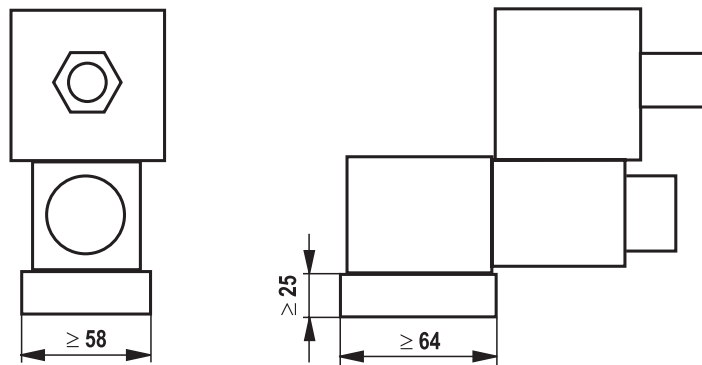


## Installation conditions (dimensions in mm)

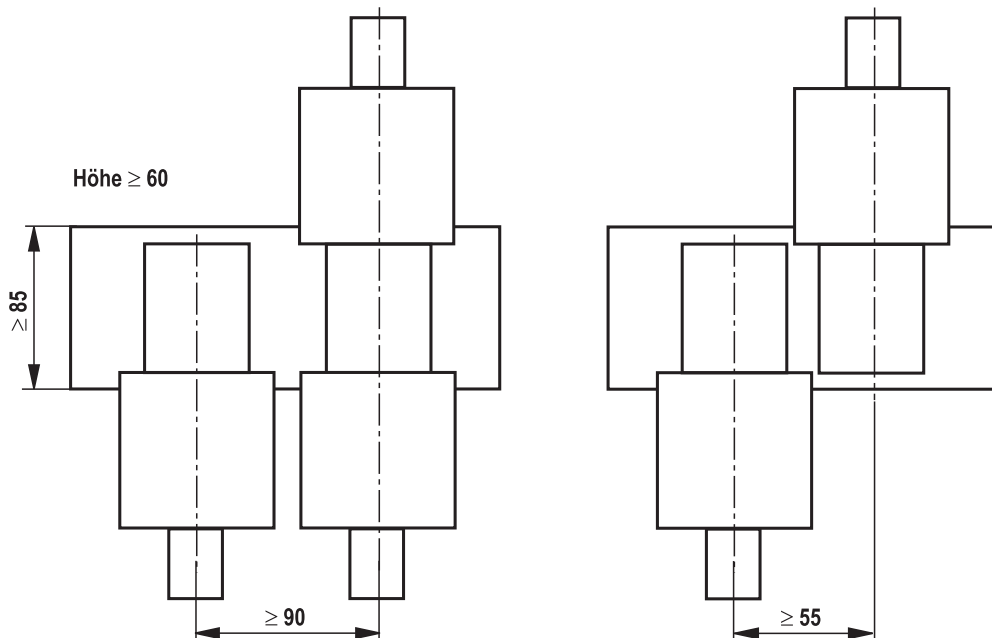
	Individual assembly	Bank assembly
Subplate dimensions	Minimum dimensions length $\geq 64$ , width $\geq 58$ , height $\geq 25$	Minimum cross-section height $\geq 60$ , width $\geq 85$
Thermal conductivity of the subplate	$\geq 36.2$ W/mK (EN-GJS-500-7)	
Minimum distance between the longitudinal valve 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

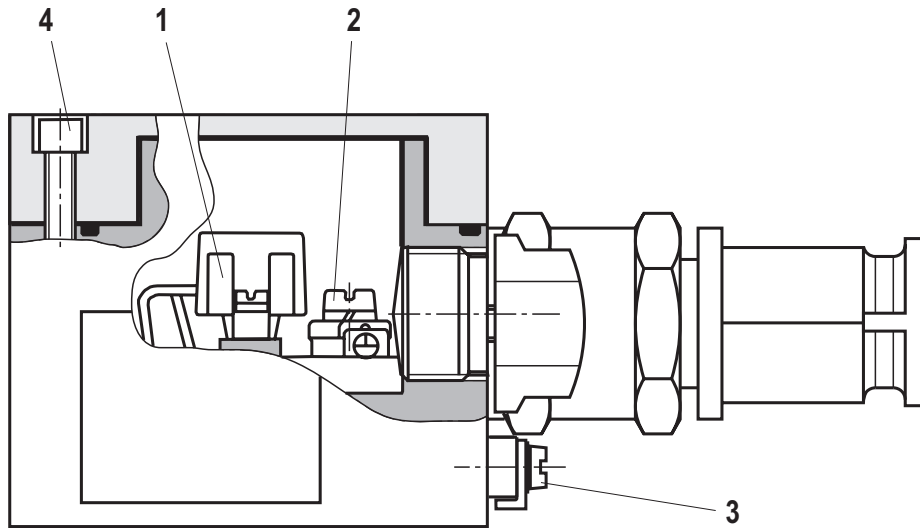
The type-examination tested valve solenoid of the valve is equipped with one terminal box and a type-tested cable entry.

The connection is polarity-independent.



### Notice:

When establishing the electrical connection, the protective grounding 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 <sup>2</sup> finely stranded max. 2.5 mm <sup>2</sup>
2	Connection for protective grounding conductor	single-wire 0.75 ... 2.5 mm <sup>2</sup> finely stranded 0.75 ... 1.5 mm <sup>2</sup>
3	Connection for potential equalization conductor	single-wire 4 ... 6 mm <sup>2</sup> finely stranded min. 4 mm <sup>2</sup>
4	Screws for cover	–

#### Cable gland

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

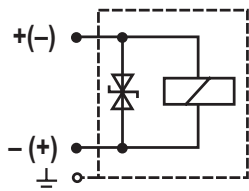
#### Connection line

Line type		<b>non-armored</b> 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 characteristic medium time-lag according to DIN 41571	Maximum voltage value when switching off	Interference protection circuit
G24	24 V DC	0.542 A DC	630 mA	-90 V	Suppressor diode bi-directional

### Notice:

Corresponding to the rated current, a fuse 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 short-circuit current of the supply source to be expected may

amount to a maximum of 1500 A.

This fuse may only be installed outside the potentially explosive area 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.

## 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, water-free hydraulic fluids Data sheet 90222
- ▶ Flame-resistant hydraulic fluids - containing water (HFAE, HFAS, HFB, HFC) Data sheet 90223
- ▶ Directional spool valves, direct operated, with solenoid actuation Operating instructions 23178-XD-B
- ▶ Selection of filters [www.boschrexroth.com/filter](http://www.boschrexroth.com/filter)
- ▶ Information on available spare parts [www.boschrexroth.com/spc](http://www.boschrexroth.com/spc)

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