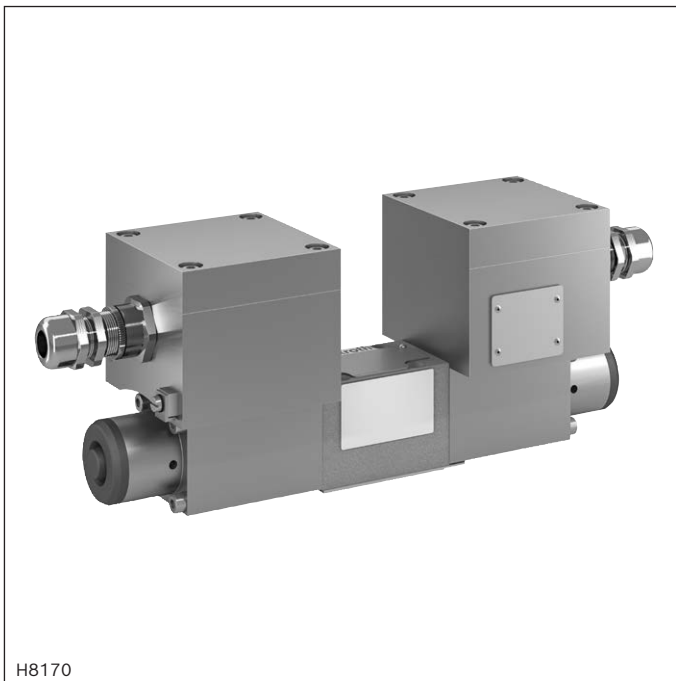


# Directional spool valves, direct operated, with solenoid actuation

## Type WE ...XD



H8170

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



### For potentially explosive atmospheres



#### 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 valve:
  - Ex h I Mb X according to EN 80079-38
  - Ex h IIC T4 Gb X according to EN 80079-36
- ▶ Type of protection valve solenoids:
  - Ex db I Mb according to EN 60079-1
  - Ex db IIC T4 Gb according to EN 60079-1
- ▶ Valve solenoid certified according to IECEx

### 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

### Contents

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**Notice:** The documentation version with which the product was supplied is valid.

## Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14
	<b>WE</b>	<b>6</b>		<b>6X</b>	<b>/</b>		<b>B</b>	<b>G24</b>	<b>N</b>	<b>XD</b>	<b>Z2</b>	<b>/</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 versions, 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 the 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>

### Special version

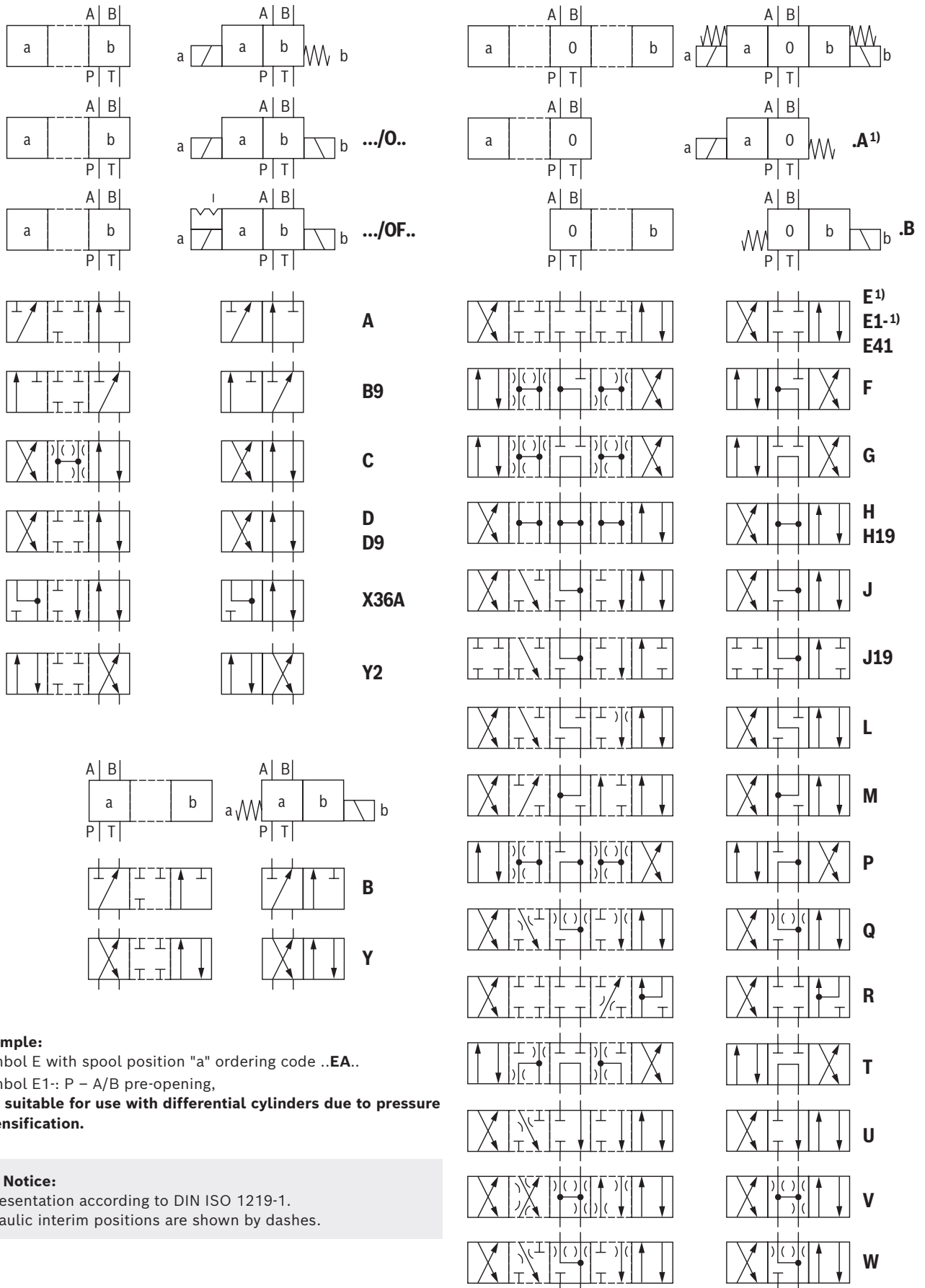
14	Without	<b>no code</b>
	Reinforced compression spring (symbol X36A only)	<b>S099</b>



#### Notice:

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

## Symbols



## 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).

**For unobjectionable functioning, the hydraulic system has to be bled properly.**

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.

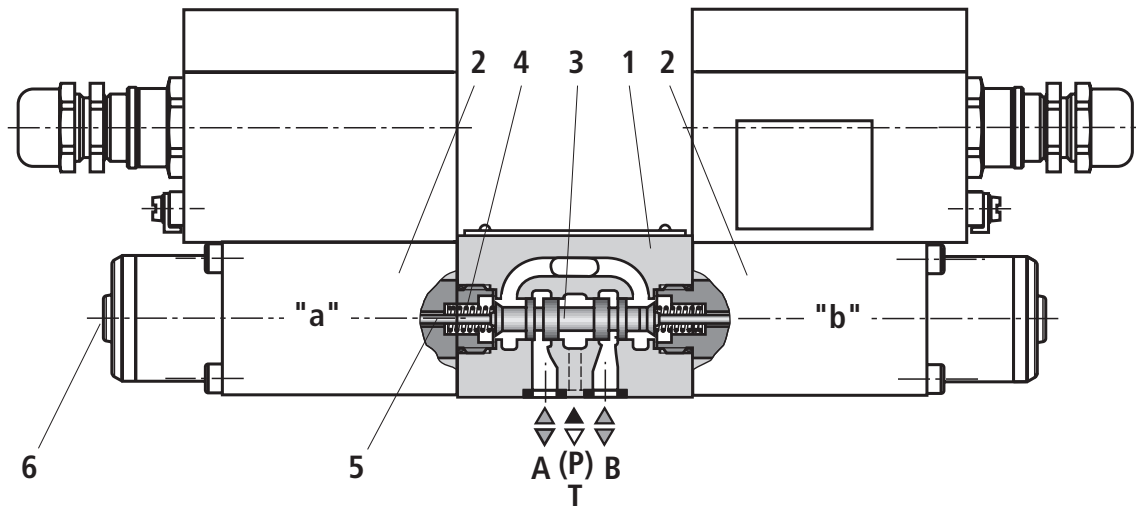
**Without spring return, with detent "OF"** (impulse spool, only possible with symbols A, C and D)

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

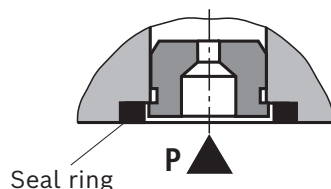
It alternately locks the two spool positions and the solenoid therefore does not need to be permanently energized.

### 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

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
Maximum admissible acceleration $a_{max}$	g	10
Weight	kg	5.3 (with 1 solenoid); 9.4 (with 2 solenoids)
Surface protection	► Valve body	galvanized
	► Solenoid	galvanized
Maximum surface temperature	°C	See information on explosion protection, page 6

Hydraulic		
Maximum operating pressure	► Port P, A, B	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>

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)	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 components with galvanic zinc coating (e.g. version "J3" or "J5") or parts containing zinc are used, small amounts of dissolved zinc may get into the hydraulic system and cause accelerated aging of the hydraulic fluid. Zinc soap may form as a chemical reaction product, which may clog filters, nozzles and solenoid valves – particularly in connection with local heat input.

### ► 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.  
Available filters can be found at [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 of valve according to EN 80079-36 / EN 80079-38 <sup>2)</sup>	Ex h I Mb X	Ex h IIC T4 Gb X
Type of protection valve solenoid according to EN 60079-1	Ex db I Mb	Ex db IIC T4 Gb
Maximum surface temperature <sup>3)</sup>	°C	105
Temperature class	–	T4
Type examination certificate solenoid	BVS 03 ATEX E 300 X	
"IECEx Certificate of Conformity" solenoid	IECEx BVS 11.0091X	

<b>Information on explosion protection – Technical rules EAC TR CU 012/2011</b>		
Area of application	I M2	II 2G
Type of protection marking of valve	PB Ex d Mb / I Mb c	1Ex d IIC T4 Gb / II Gb c II T4
Maximum surface temperature <sup>3)</sup>	°C	105
Temperature class	–	T4
Certificate of conformity	№ TC RU C-DE.ГБ08.B.02161	

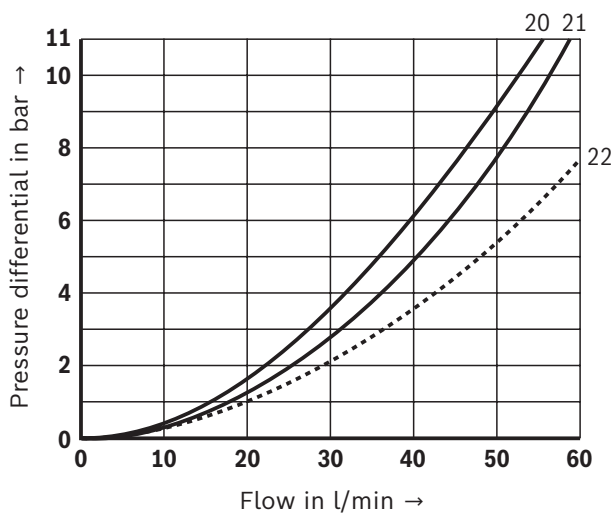
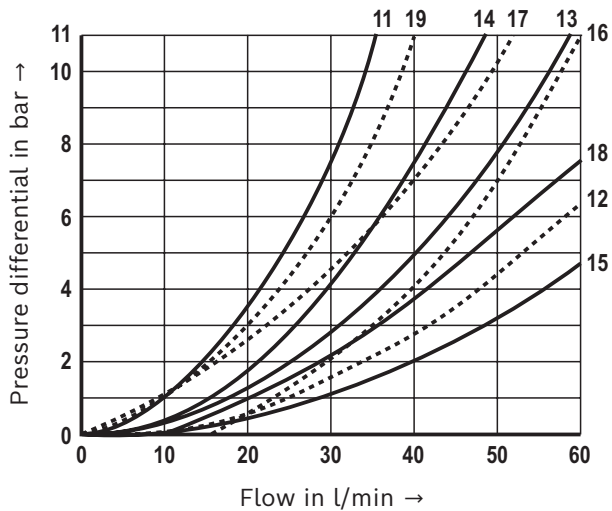
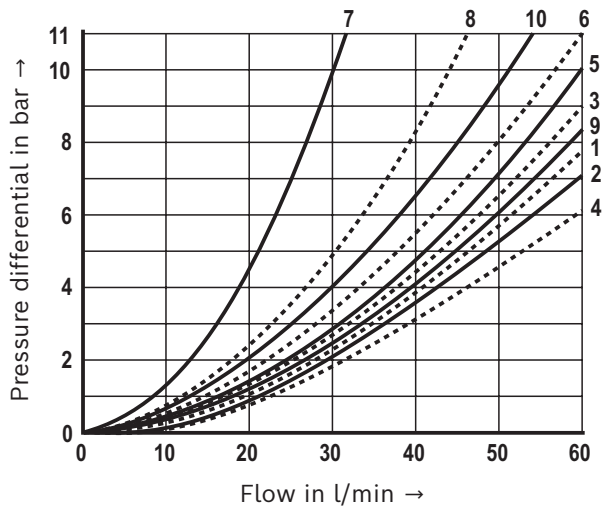
<sup>2)</sup> Ex h: structural safety c according to EN 80079-37.<sup>3)</sup> Surface temperature > 50 °C, provide contact protection.**Special application conditions for safe application:**

- Connection lines must be passed in a strain-relieved way. The first mounting point must be within 150 mm of the cable and line entry.
- 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 solenoid must not be installed close to charge generating processes.
- Contact of the connection cable with the casing surface is to be prevented.
- In case of bank assembly, only one solenoid of all valves may be energized at a time.

## 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	—	—
X36A...SO99	21	—	20	22	—	—

# Performance limits

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

**Notice:**

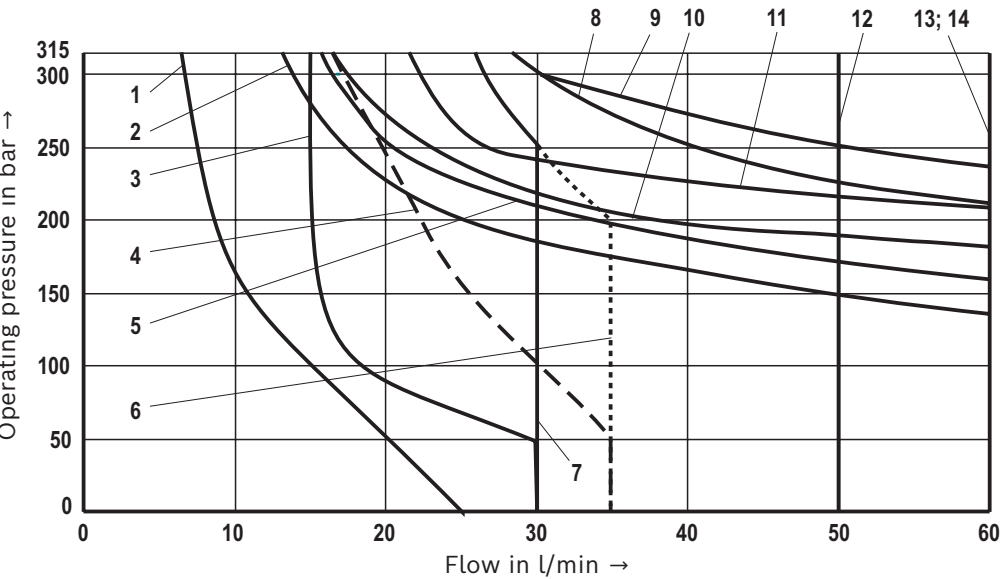
The specified performance limits are valid for use with two directions of flow (e.g. from P → A and simultaneous return flow from B to T).

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

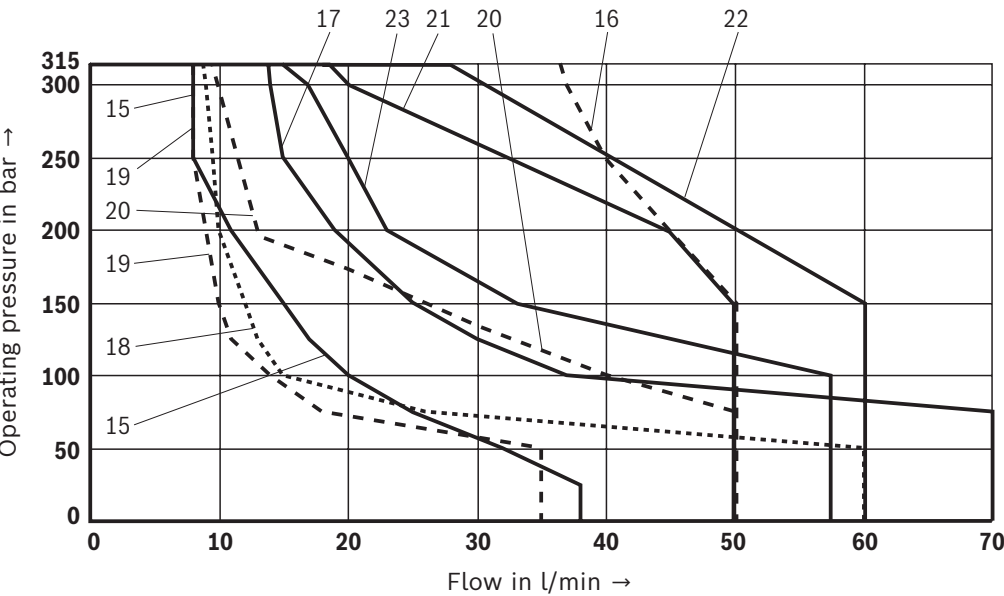
with only one direction of flow (e.g. from P → A while port B is blocked)!

In such cases, 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
23	X36A...SO99

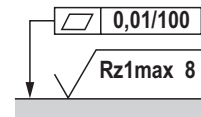
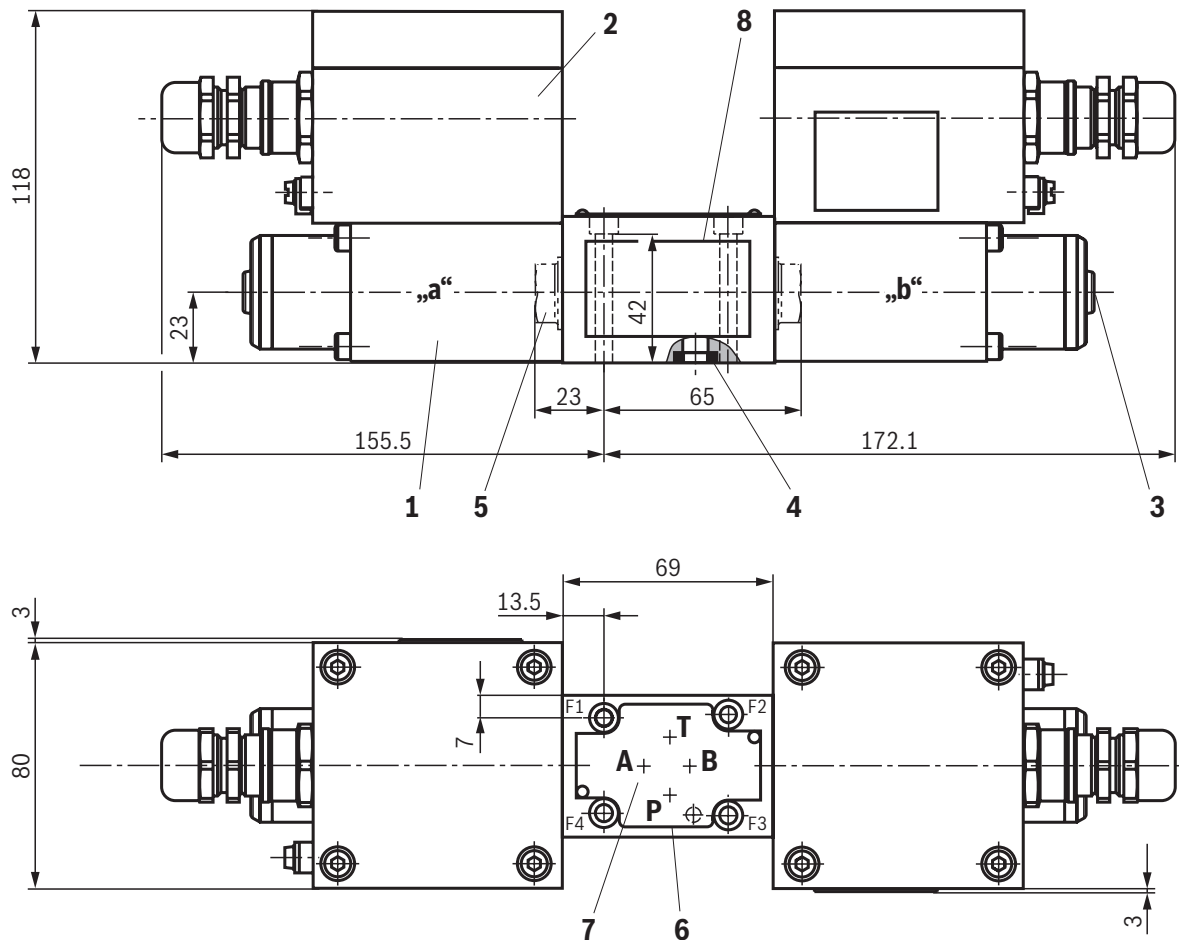
<sup>1)</sup> P – A/B pre-opening

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



## Dimensions

(dimensions in mm)



Required surface quality of the valve contact surface

- 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 of valve
- 7 Porting pattern according to ISO 4401-03-02-0-05
- 8 Name plate sticker

### Valve mounting screws (separate order)

Only use valve mounting screws with the subsequently listed thread diameters and strength properties. Observe the screw-in depth.

### 4 hexagon socket head cap screws ISO 4762 - M5 x 50 - 10.9

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

Material no. **R913043758**

**Subplates** (separate order) with porting pattern according to ISO 4401-03-02-0-05, see data sheet 45100.



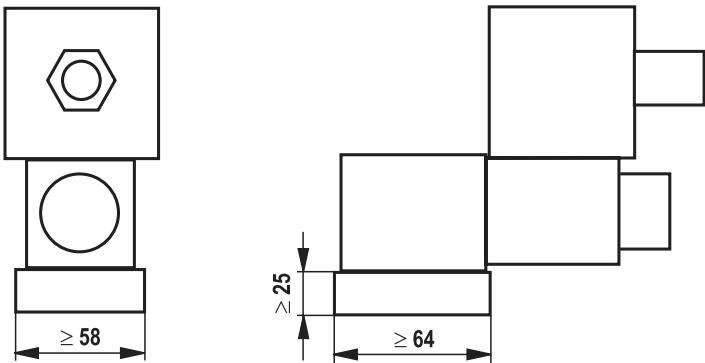
### Notices:

- 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.
- The dimensions are nominal dimensions which are subject to tolerances.

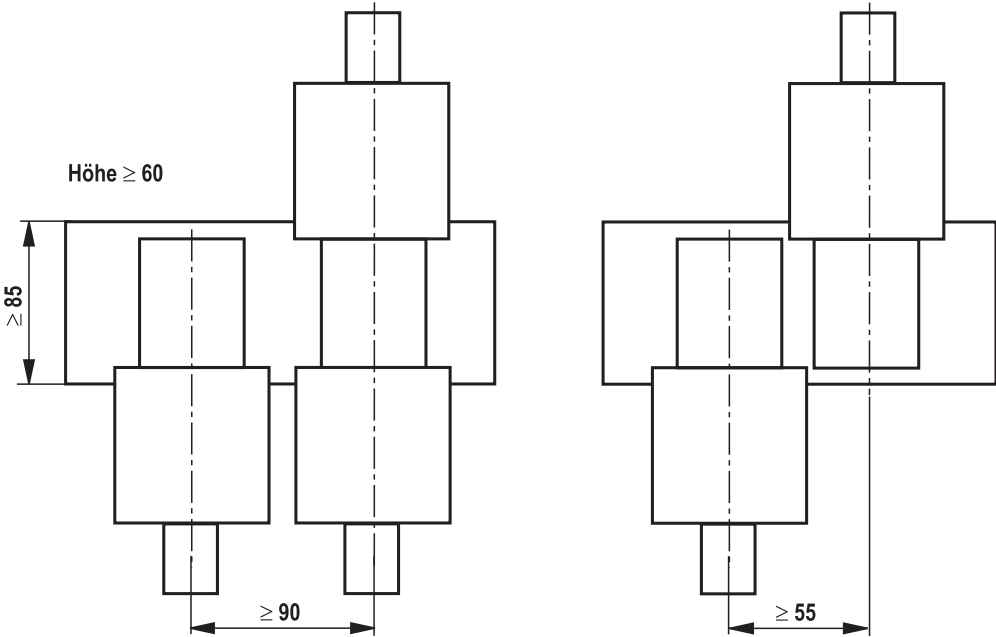
Installation conditions  
(dimensions in mm)

	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	≥ 36.2 W/mK	
Minimum distance between the longitudinal valve axes	see below	

Individual assembly



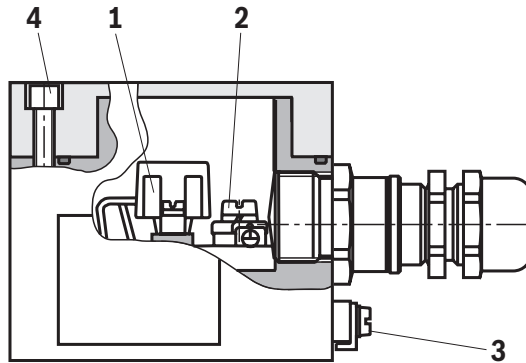
Bank assembly



**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 is equipped with a terminal box and a type-tested cable and line entry. The connection is polarity-independent.



### Properties of the connection terminals and mounting elements

Position	Function	Connectable line cross-section
1	Operating voltage connection	single-wire 0.75 ... 2.5 mm <sup>2</sup> finely stranded 0.75 ... 1.5 mm <sup>2</sup>
2	Connection for protective grounding conductor	single-wire max. 2.5 mm <sup>2</sup> finely stranded max. 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	6.1 ... 11.7
Sealing		Outer sheath sealing

Connection line		
Line type		<b>non-armored</b> cables and lines (outer sheath sealing)
Temperature range	°C	–20 ... > +110



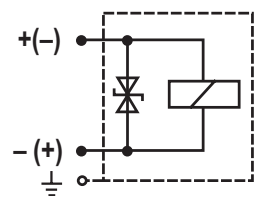
#### Notice:

Only use finely stranded conductors if they have pressed-on wire end ferrules.

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 when switching off	Interference protection circuit
G24	24 V DC	0.542 A DC	630 mA	−90 V	Suppressor diode bi-directional



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 x I<sub>rated</sub>).  
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 atmospheres 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.

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 spool valves, direct operated, with solenoid actuation	Operating instructions 23178-XD-B
► Selection of filters	<a href="http://www.boschrexroth.com/filter">www.boschrexroth.com/filter</a>
► Information on available spare parts	<a href="http://www.boschrexroth.com/spc">www.boschrexroth.com/spc</a>

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