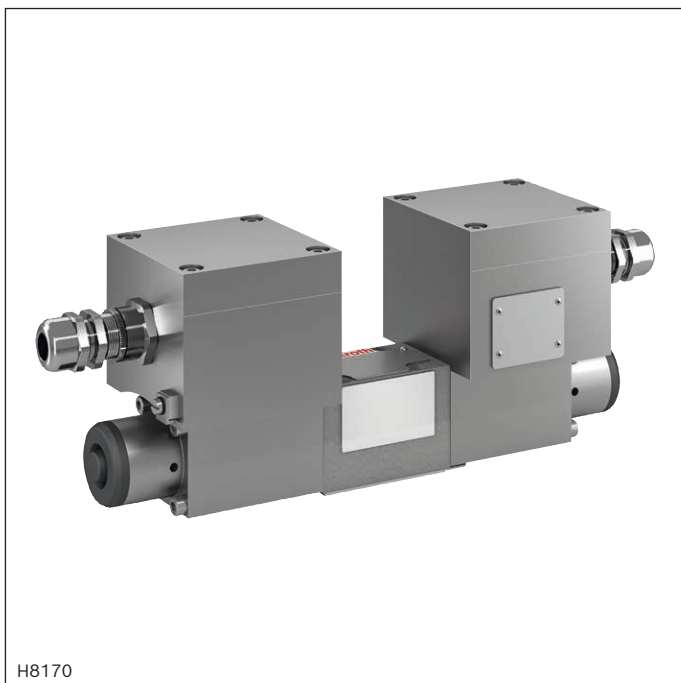


Directional spool valves, direct operated, with solenoid actuation

Type WE ...XD



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



Information on explosion protection



- Area of application in accordance with the Explosion Protection Directive 2014/34/EU: **I M2; II 2G**
- Type of protection of 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 of 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 atmospheres
- 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 supplied with the product shall be valid.

Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
	WE	6		6X	/		B	G24	N	XD	Z2	/		

01	3 main ports	3
	4 main ports	4
02	Directional valve	WE
03	Size 6	6
04	Symbols; possible versions, 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
09	With manual override	N

Explosion protection

10	"Flameproof enclosure"	XD
	For details, see information on explosion protection, page 7	

Electrical connection (see page 12 and 13 for details)

11	Individual connection	
	Solenoid with terminal box and cable gland	Z2
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)	

Control spool play

13	Standard (recommended)	no code
	Minimum (selection for reduced leakage values; higher oil cleanliness required)	T06

Seal material (observe compatibility of seals with hydraulic fluid used, see page 6)

14	NBR seals	no code
	FKM seals	V

Special version

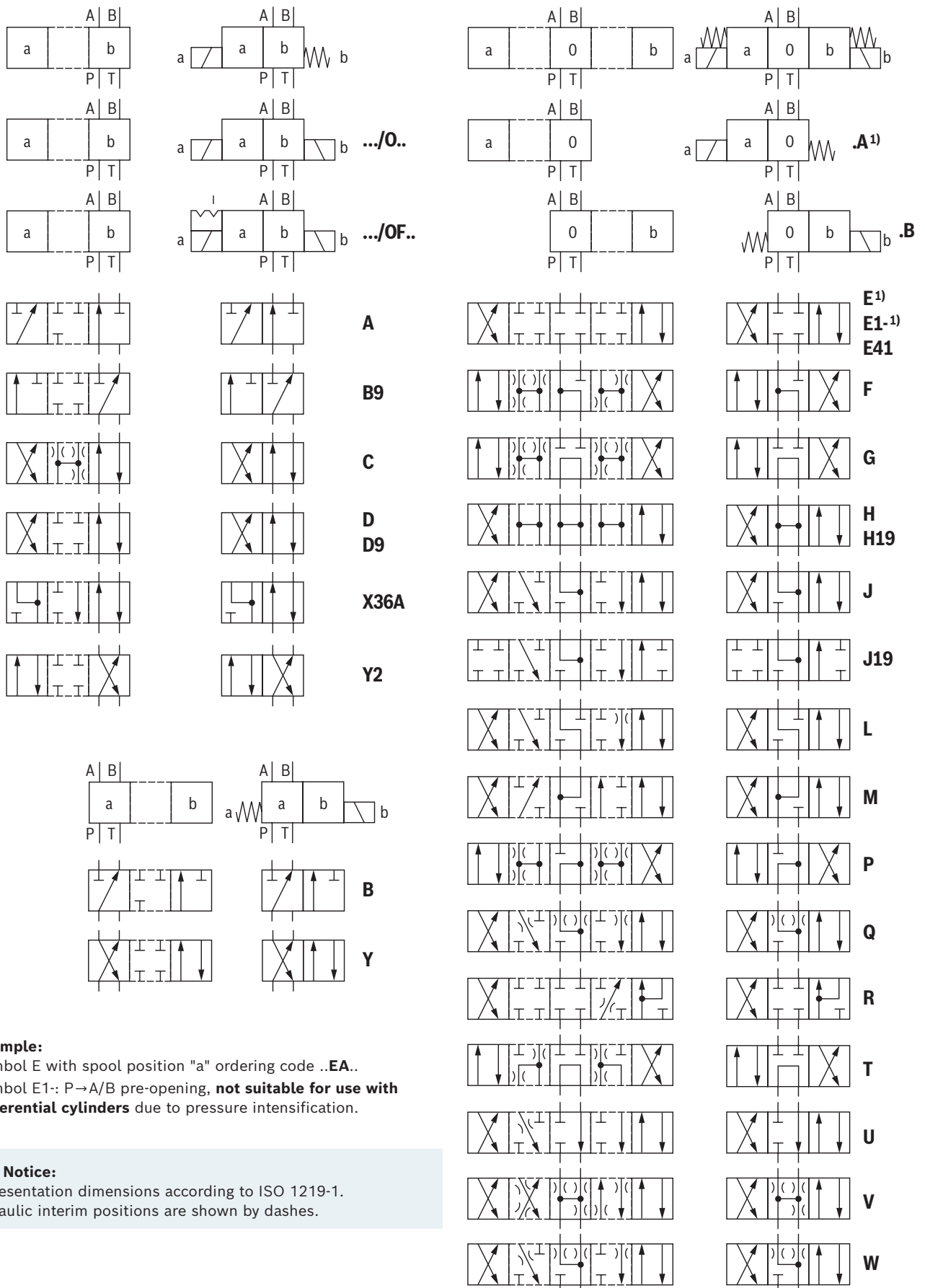
15	None	no code
	Reinforced compression spring (symbol X36A only)	S099



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

The directional control valves essentially consist of the housing (1), one or two solenoids (2), the 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).

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

The force of the solenoid (2) acts via the plunger (5) on the 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 the 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 control valve with two switching positions and two solenoids without detent. In the de-energized condition, there is no defined spool position.

Without spring return, with detent "OF"

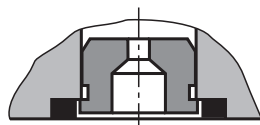
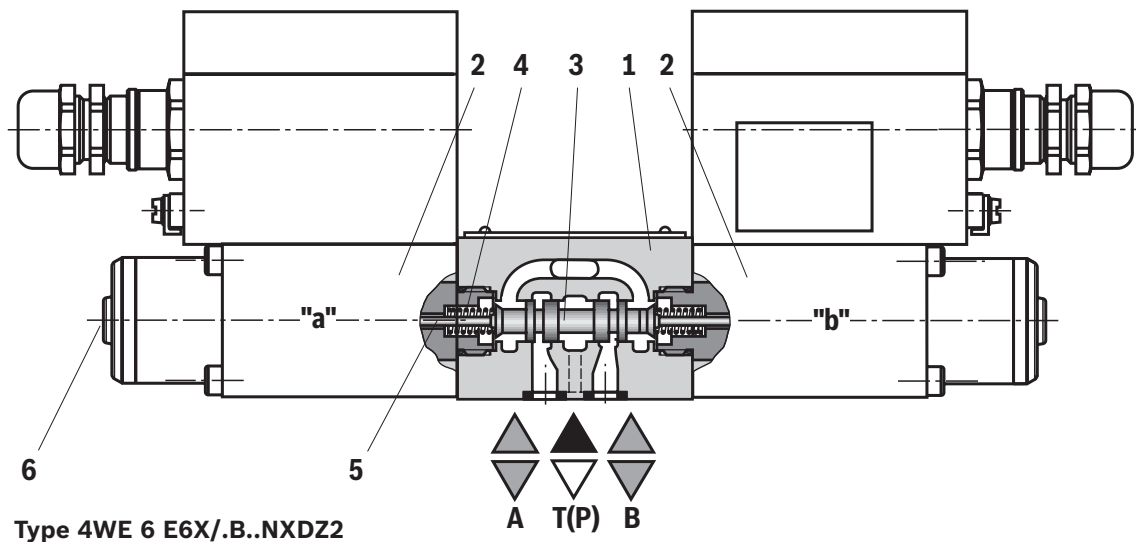
(impulse spool, only possible with symbols A, C and D)

This version is a directional control 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.



Throttle insert

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

Technical data

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

General			
Type of connection			Subplate mounting
Porting pattern			ISO 4401-03-02-0-05
Weight	► Valve with one solenoid	kg	5.3
	► Valve with two solenoids	kg	9.4
Installation position			Any
Ambient temperature range		°C	-20 ... +80 (NBR seals)
			-15 ... +80 (FKM seals)
Storage temperature range		°C	+5 ... +40
Maximum storage time		Years	1
Protection class according to EN 60529			IP65 (with correctly installed electrical connection)
Maximum surface temperature			See information on explosion protection, page 7
Maximum admissible acceleration $a_{\max}$		g	10
Surface protection			Galvanized (valve body and solenoid)

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 a leakage oil connection if the operating pressure exceeds the admissible tank pressure.
Hydraulic fluid			See table page 6
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 flow		l/min	60

¹⁾ 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.

Technical data

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

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 time 300 s).

Electric			
Voltage type		Direct voltage	
Supply voltage ³⁾	► Nominal value	V	24
	► Minimum	V	21.6
	► Maximum	V	26.4
	► Maximum residual ripple	%	<5
	► Maximum power consumption ²⁾	W	15.8
	► Nominal power according to VDE 0580 ³⁾	W	13
	► Fuse protection, external	A	See page 13
Relative duty cycle time according to VDE 0580		S1 (continuous operation)	
Maximum switching frequency		1/h	15000
Switching time range according to ISO 6403 ⁴⁾	► ON	ms	30 ... 70
	► OFF	ms	20 ... 30

²⁾ With 1.1 x nominal voltage and an ambient temperature of 20 °C

³⁾ At ambient temperature 20 °C

⁴⁾ 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.

Technical data

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

Information on explosion protection – Directive 2014/34/EU		
Area of application	I M2	II 2G
Type of protection of valve according to EN 80079-36 / EN 80079-38 ⁵⁾	Ex h I Mb X	Ex h IIC T4 Gb X
Type of protection of valve solenoid according to EN 60079-1	Ex db I Mb	Ex db IIC T4 Gb
Maximum surface temperature ⁶⁾	°C 105	
Temperature class	–	T4
Type examination certificate solenoid	BVS 03 ATEX E 300 X	
"IECEx Certificate of Conformity" solenoid	IECEx BVS 11.0091X	

⁵⁾ Ex h: structural safety c according to EN 80079-37.

⁶⁾ Surface temperature >50 °C, provide contact protection.



Notice:

- ▶ Connection lines must be installed in a way that they are strain-relieved. The first mounting point must be within 150 mm of the mating connector.
- ▶ The valve solenoid must not be installed close to charge generating processes.
- ▶ Contact of the connection cable with the surface of the jacket is to be prevented.

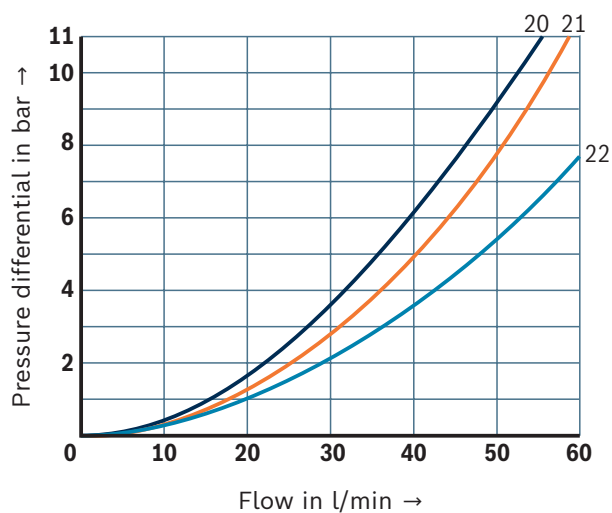
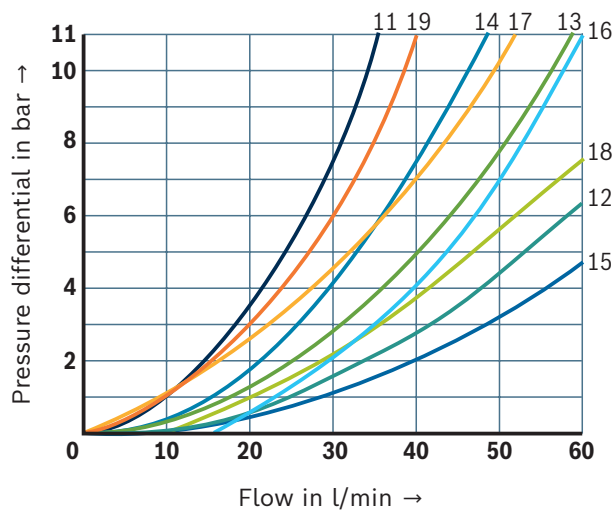
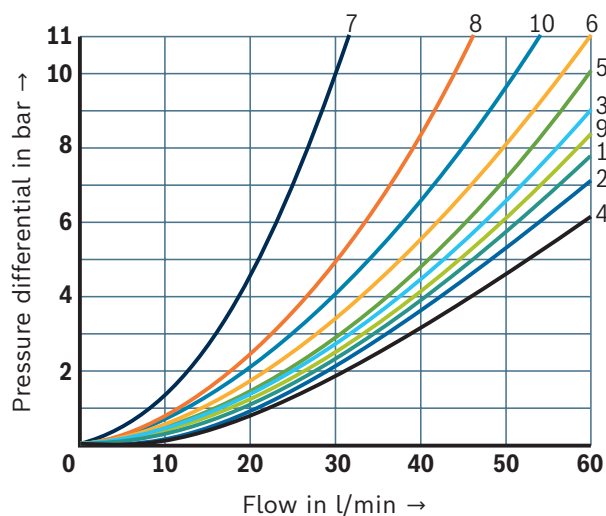
⚠ Special application conditions for safe application

- ▶ 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.
- ▶ Maximum power supply:
 - In case of bank assembly, only one solenoid of all valves may be energized at a time.
 - Only one solenoid may be supplied with current at a time at each valve.
- ▶ The valve must be completely filled with hydraulic fluid.
- ▶ Only the proper installation of the cable ensures the "flameproof enclosure".
- ▶ Do not open cover under electrical voltage. Cover closes the "flameproof enclosure".
- ▶ No damage, contamination and coloring is admissible on surfaces forming a pressure-resistant gap.
- ▶ Ambient temperature range:
 - 20 ... +80 (NBR seals)
 - 15 ... +80 (FKM seals)

Characteristic curves

(measured with HLP46, $\vartheta_{oil} = 40 \pm 5$ °C, $p = 100$ 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	–	–
X36A...SO99	21	–	20	22	–	–

Performance limits

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

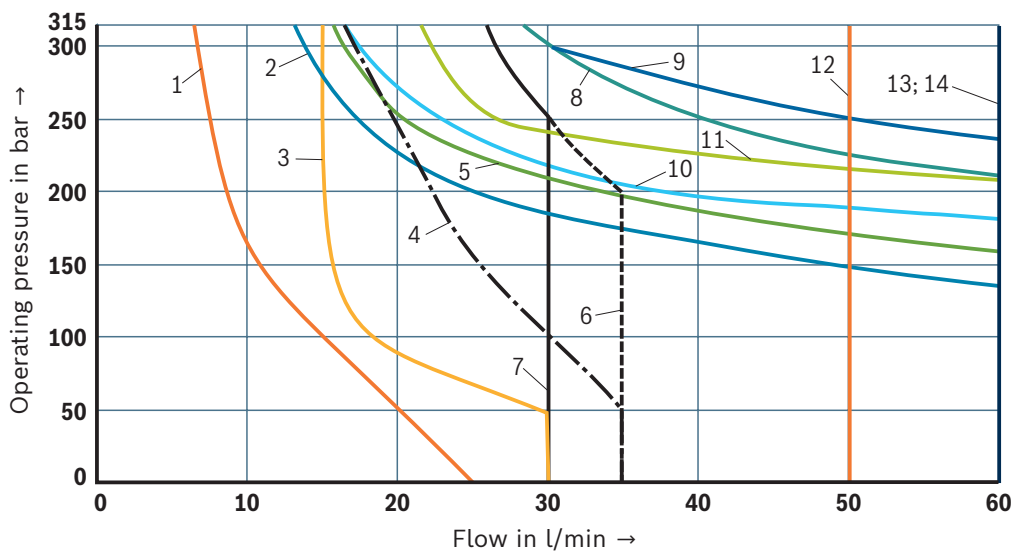
Notice:

The specified performance limits are valid for use with two directions of flow (e.g. from P→A and simultaneous return flow from B→T). Due to the flow forces acting within the valves, the admissible performance limit may be considerably lower

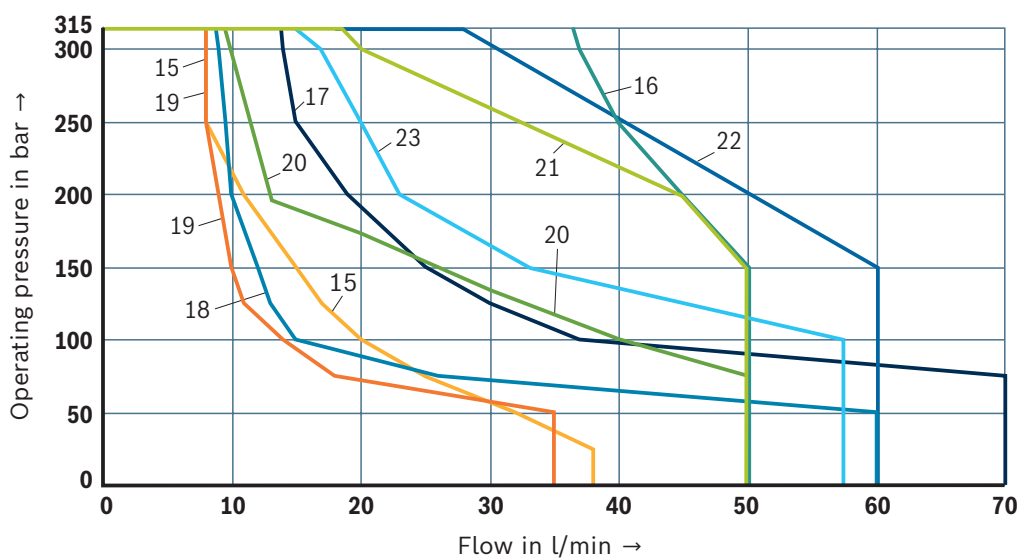
with only one direction of flow (e.g. from P→A while port B is blocked).

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



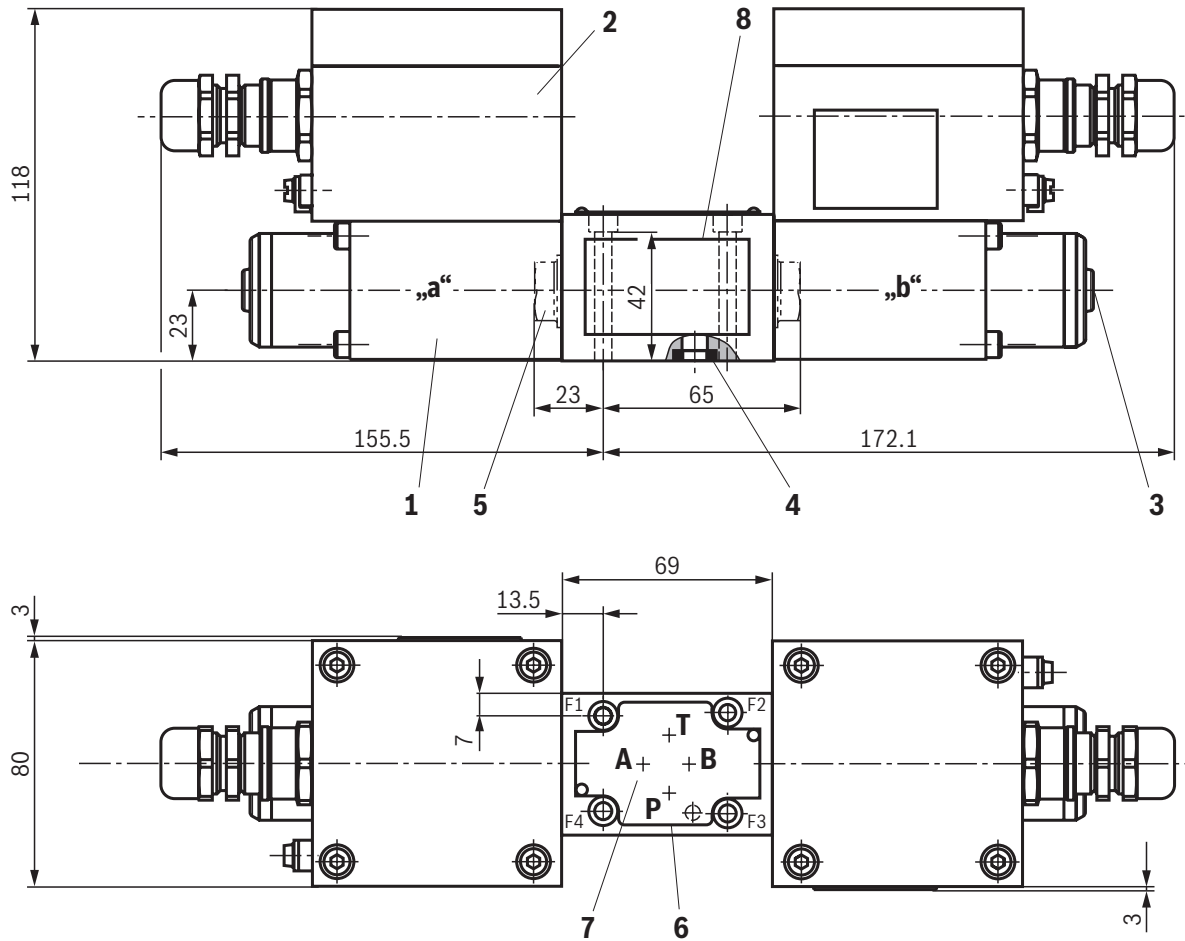
Characteristic curve	Symbol
15	B9
16	H19
17	J19, P-A
18	J19, A-T
19	J19, B-T
20	X36A
21	D9
22	E41
23	X36A...SO99

¹⁾ P – A/B pre-opening

²⁾ Return flow from actuator to tank

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 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

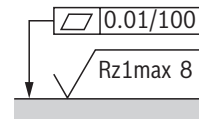
(friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$);

Material no. **R913043758**

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

Notice:

- ▶ Subplates are not regarded as 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.

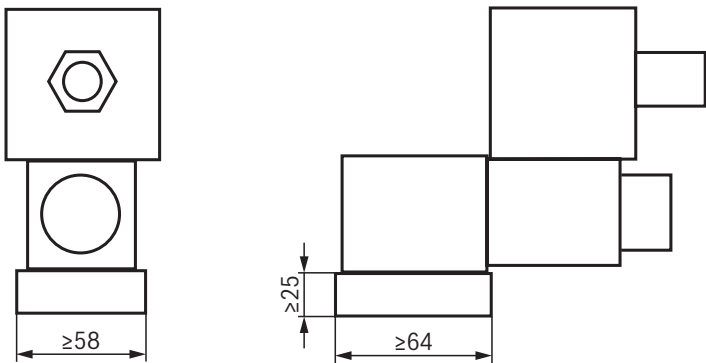


Required surface quality of the valve contact surface

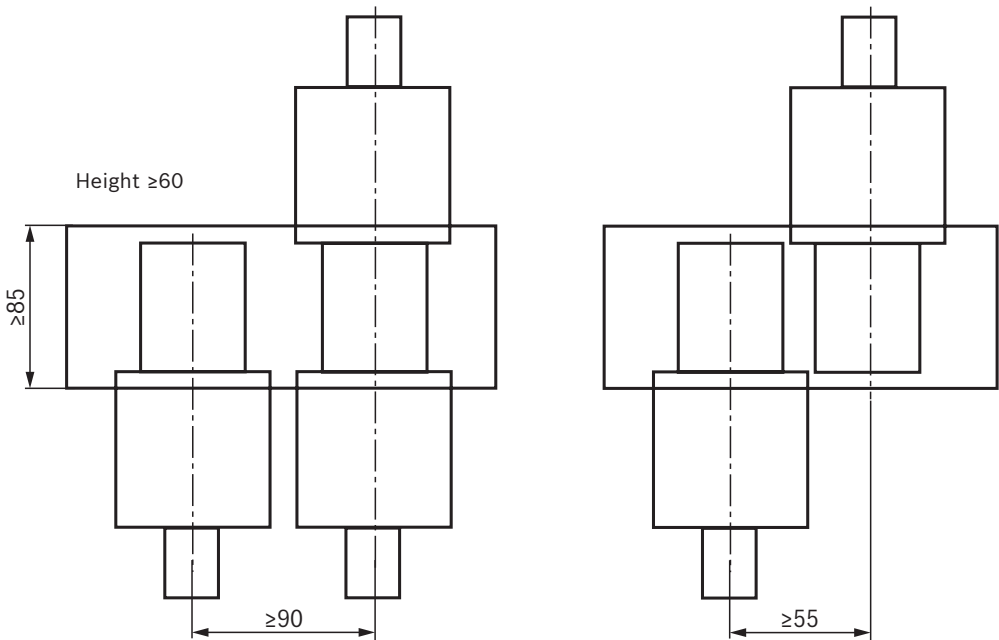
Installation conditions
(dimensions in mm)

	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



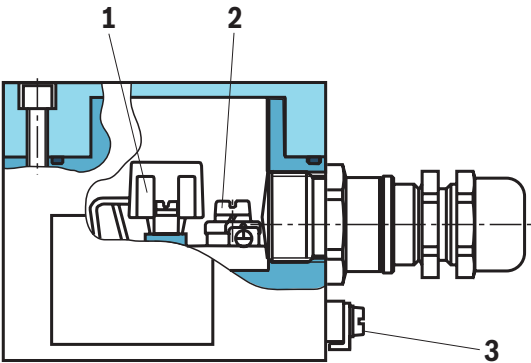
Bank assembly



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 ² finely stranded 0.75 ... 1.5 mm ²
2	Connection for protective grounding 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 min. 4 mm ²

Cable gland		
Line diameter	mm	6.1 ... 11.7
Sealing		Outer sheath sealing

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



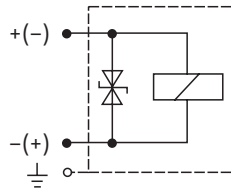
Notice:

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 of valve solenoid	Rated current of valve solenoid	Recommended back-up fuse Characteristics medium time-lag according to DIN 41571	Maximum voltage value when switching off	Interference protection circuit
G24	24 VDC	0.542 ADC	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. $3 \times I_{rated}$).
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 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; UK-EX)	Data sheet 07011
► Hydraulic fluids based on mineral oils	Data sheet 90220
► Environmentally compatible hydraulic fluids	Data sheet 90221
► Flame-resistant hydraulic fluids – containing water	Data sheet 90223
► Hydraulic valves...XD...	Operating instructions 22102-XD-B
► Information on available spares	www.boschrexroth.com/spc

Notes

Notes

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