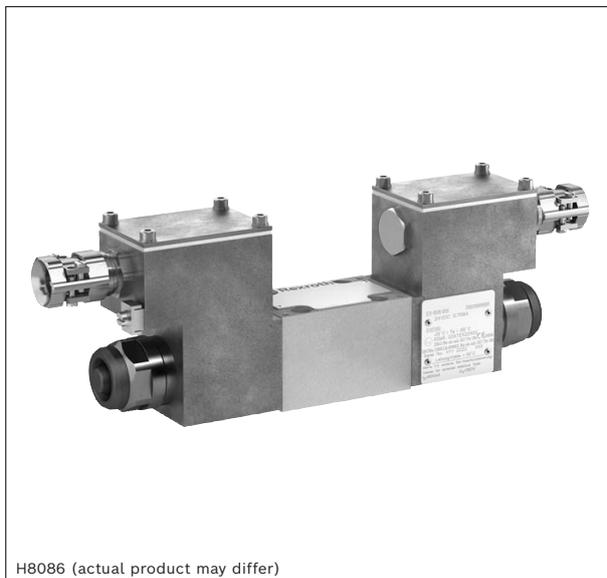


**RE 23178-XE**  
 Edition: 2020-11  
 Replaces: 2019-09  
 RA78485583\_AB

**rexroth**  
 A Bosch Company

## Directional spool valves, direct operated, with solenoid actuation

### Type WE ...XE



- ▶ Size 6
- ▶ Component series 6X
- ▶ Maximum operating pressure 350 bar
- ▶ Maximum flow 70 l/min



#### ATEX units For potentially explosive atmospheres



##### Information on explosion protection:

- ▶ Area of application in accordance with the Explosion Protection Directive 2014/34/EU: **II 2G; II 2D**
- ▶ Type of protection, valve:
  - Ex h IIC T4 Gb X according to EN 80079-36
  - Ex h IIIC T115°C Db X according to EN 80079-36
- ▶ Type of protection, solenoid coil:
  - Ex eb mb IIC T4 Gb according to EN 60079-7 / EN 60079-18
  - Ex tb IIIC T115°C Db according to EN 60079-31
- ▶ Solenoid coil certified according to IECEx

#### Features

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

#### Contents

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

RE 23178-XE, Edition: 2020-11, **Bosch Rexroth AG**

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HYQUIP Limited New Brunswick Street Horwich Bolton Lancashire BL6 7JB UK

2/16 WE ...XE | Directional spool valve

## Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13		
	WE	6		6X	/		E			XE	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)	E

### Voltage

08	For ordering codes, please refer to page 7	e.g. G24
09	Without manual override	no code
	With manual override	N

### Explosion protection

10	"Increased safety"	XE
	For details, see information on the explosion protection, page 7	

### Electrical connection

11	<b>Individual connection</b>	
	Solenoid with terminal box and cable gland	Z2
	For details of electrical connections, see page 14	
12	<b>Without throttle insert</b>	no code
	Throttle Ø 0.8 mm	B08
	Throttle Ø 1.0 mm	B10
	Throttle Ø 1.2 mm	B12
	Use with volume flows which exceed the performance limit of the valve (see page 5)	

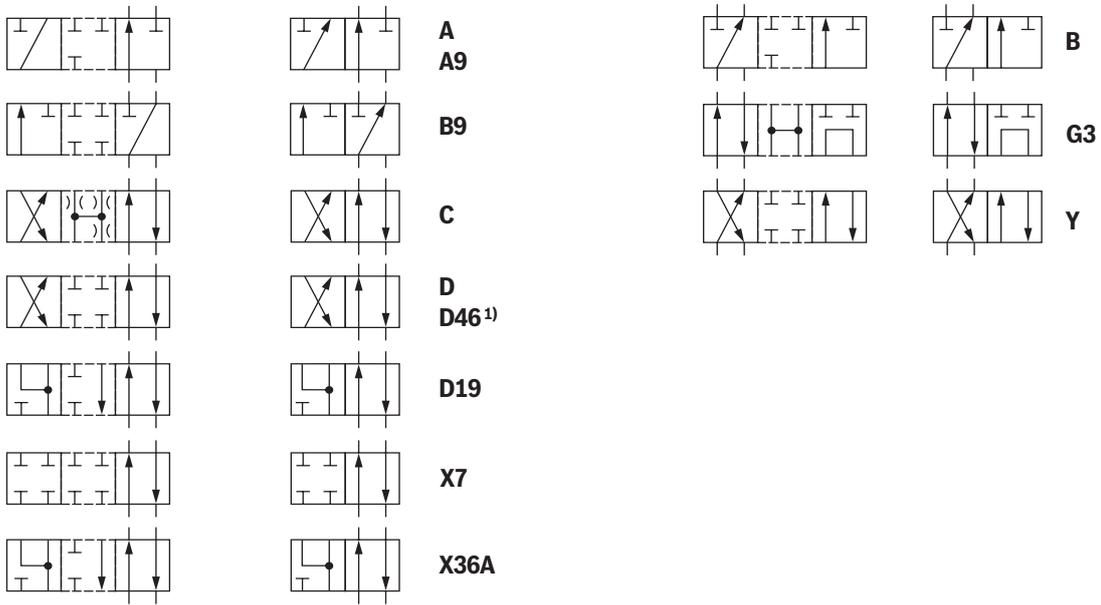
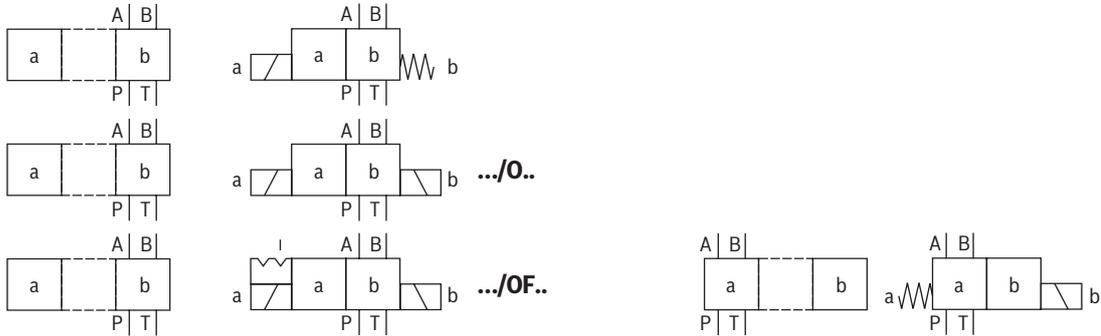
### Seal material (observe compatibility of seals with hydraulic fluid used, see page 6)

13	NBR seals	no code
	FKM seals	V

#### Notice:

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

**Symbols: 2 spool positions**

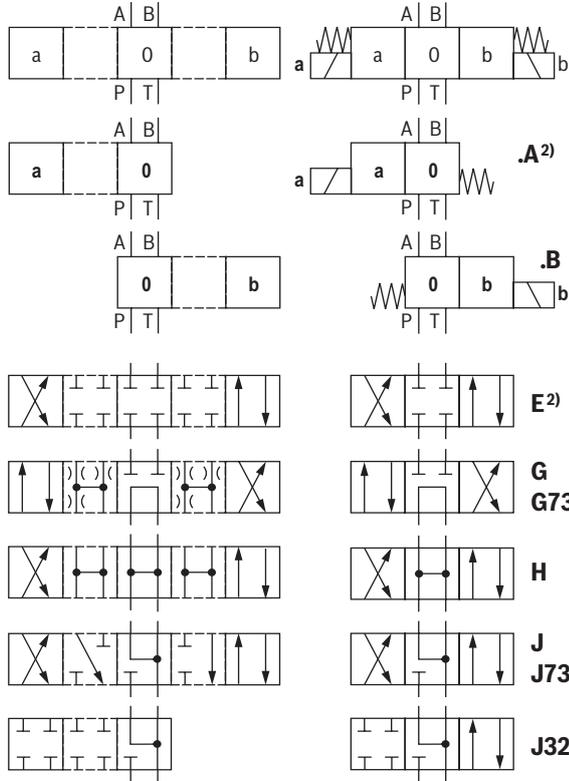


<sup>1)</sup> For valves with AC solenoids and detent, only D46/OF are admissible.

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

4/16 WE ...XE | Directional spool valve

**Symbols:** 3 spool positions



2) **Example:**  
 Symbol E with spool position "a" ordering code ..EA..

**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 spool). The control spool (3) is actuated by wet-pin solenoids (2).

**For unobjectionable 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 into the required end position. This enables the necessary direction of flow from P → A and B → T or P → B and A → T.

After the de-excitation of the solenoid (2), the return spring (4) pushes the control spool (3) back into 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)

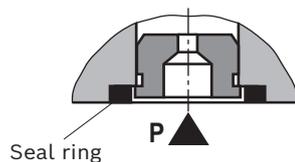
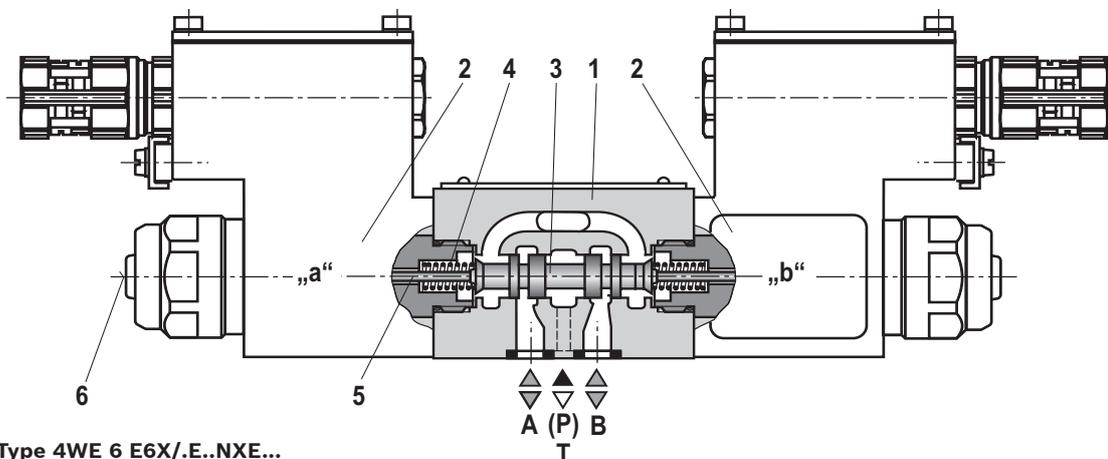
This version is a directional valve with two spool positions and two solenoids without detent. In the de-energized condition, there is no defined spool position.

**With spring return "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:

Please observe a possible pressure conversion in the event of a differential cylinder. If pressure is led to the chamber on the piston side and the outflow of hydraulic fluid is blocked from the chamber on the rod side, it might lead to a pressure intensification and inadmissible high pressure on the rod side. This can damage cylinders, supply lines and connected valves.



### 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.

6/16 WE ...XE | Directional spool valve

## Technical data

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

General	
Installation position	any
Ambient temperature range	°C -20 ... +70 <sup>1)</sup>
Storage temperature range	°C +5 ... +40
Maximum storage time	Years 1
Maximum admissible acceleration $a_{max}$	g 10
Weight	kg 2.6 (with 1 solenoid); 4.0 (with 2 solenoids)
Surface protection	Galvanized
Maximum surface temperature	°C see information on explosion protection, page 7

Hydraulic			
Maximum operating pressure	▶ Port P, A, B	bar	350
	▶ 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	70
Flow cross-section (spool position O)	▶ Symbol Q	mm <sup>2</sup>	approx. 6% of nominal cross-section
	▶ Symbol W	mm <sup>2</sup>	approx. 3% of nominal cross-section
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>2)</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). If this is not possible due to the function, an energy-reducing control of these components is recommended, e.g. via a PWM plug-in amplifier.

1) Please observe the "Special application conditions for safe application" on page 7.

2) 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!)

Electric			
Voltage type		Direct voltage	Alternating voltage
Available voltages	V	24, 48, 110	110, 230
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 <sup>3)</sup>	▶ ON	ms	30 ... 55
	▶ OFF	ms	10 ... 15
Maximum switching frequency	1/h	15000	7200
Nominal power at ambient temperature of 20 °C	W	17	
Maximum power with 1.1 x nominal voltage and an ambient temperature of 20 °C	W	20.6	
Protection class according to EN 60529		IP66 (With correctly installed electrical connection)	

### Notice:

Solenoids for AC voltage are DC solenoids with integrated rectifier.

Information on explosion protection		
Area of application according to Directive 2014/34/EU	II 2G	II 2D
Type of protection of valve according to EN 80079-36 <sup>4)</sup>	Ex h IIC T4 Gb X	Ex h IIIC T115°C Db X
Maximum surface temperature <sup>5)</sup>	°C 115	
Temperature class	T4	–
Type of protection, solenoid coil according to EN 60079-7 / EN 60079-18 / EN 60079-31	Ex eb mb IIC T4 Gb	Ex tb IIIC T115°C Db
Type examination certificate, solenoid coil	BVS 20 ATEX E 009 X	
"IECEX Certificate of Conformity" for solenoid coil	IECEX BVS 20.0007 X	

- <sup>3)</sup> 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.
- <sup>4)</sup> Ex h: structural safety c according to EN 80079-37.
- <sup>5)</sup> Surface temperature > 50 °C, provide contact protection.

### Special application conditions for safe application:

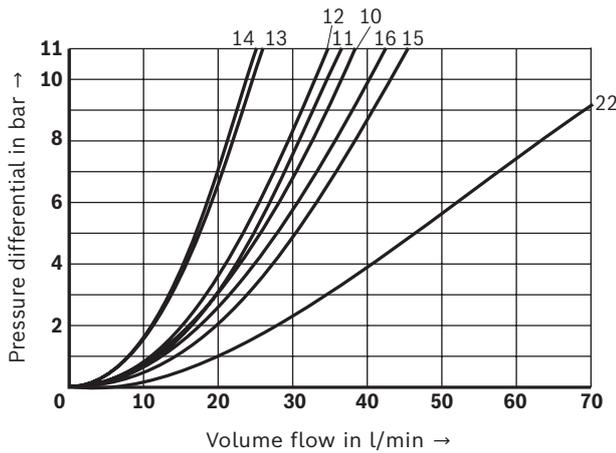
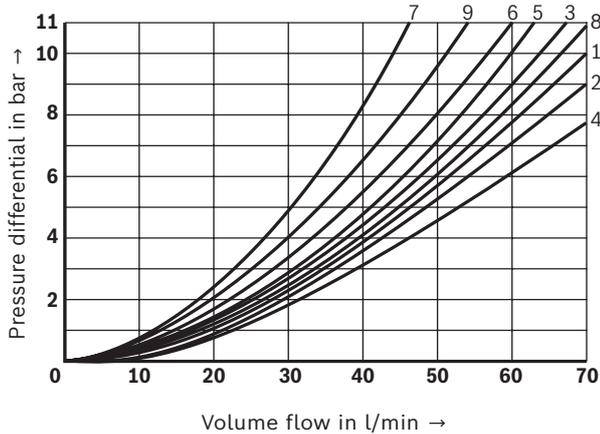
- ▶ Connection lines must be passed in a strain-relieved way. The first mounting point must be within 150 mm of the cable and line entry.
- ▶ In case of valves with two solenoids, maximally one of the solenoids may be energized at a time.
- ▶ A simultaneous power supply of several valves in bank assembly is possible if the ambient temperature does not exceed 60 °C.
- ▶ In case of bank assembly, if only one of the solenoids is energized at a time, and during individual operation, the maximum ambient temperature may not exceed 70 °C.
- ▶ The maximum temperature of the surface of the valve jacket is 115 °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.

8/16 WE ...XE | Directional spool valve

### Characteristic curves

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

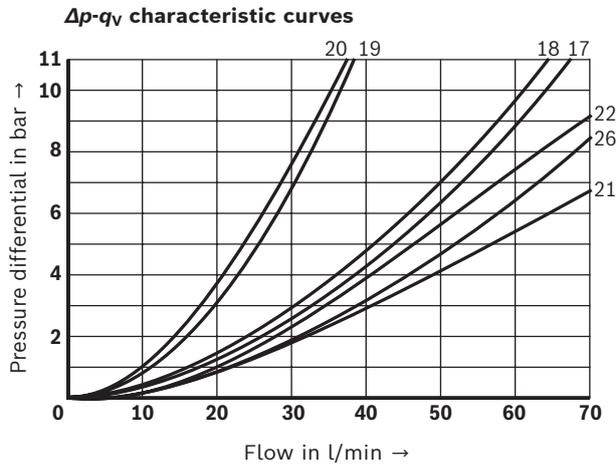
$\Delta p$ - $q_v$  characteristic curves



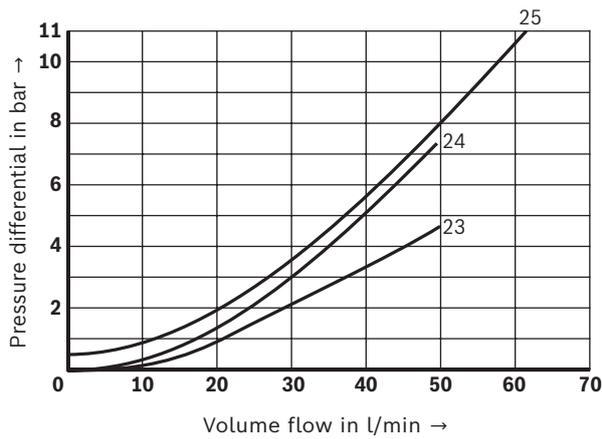
Symbol	Direction of flow					
	P - A	P - B	A - T	B - T	B - A	P - T
A, B	3	3	-	-	-	-
A9	15	16	-	-	-	-
B9	12	10	-	-	-	-
C	1	1	3	1	-	-
D46, D, Y	5	5	3	3	-	-
E	3	3	1	1	-	-
G	6	6	8	8	-	7
G3	6	-	-	8	-	7
G73	14	14	13	13	-	11
H	2	4	2	2	-	8
J, Q	1	1	2	1	-	-
M	2	4	3	3	-	-
P	3	1	1	1	-	-
U	3	3	8	4	-	-
T	9	9	8	8	-	7
V	1	2	1	1	-	-
W	1	1	2	2	-	-
X36A	6	-	9	22	-	-

### Characteristic curves

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



Symbol	Direction of flow					
	P - A	P - B	A - T	B - T	B - A	P - T
J73	19	20	18	17	-	-
X7	22	-	-	21	-	-
J32	17	-	-	26	-	-
D19	23	-	25	24	-	-



10/16 WE ...XE | Directional spool valve

**Performance limits:** Version "G24"  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

**Notice:**

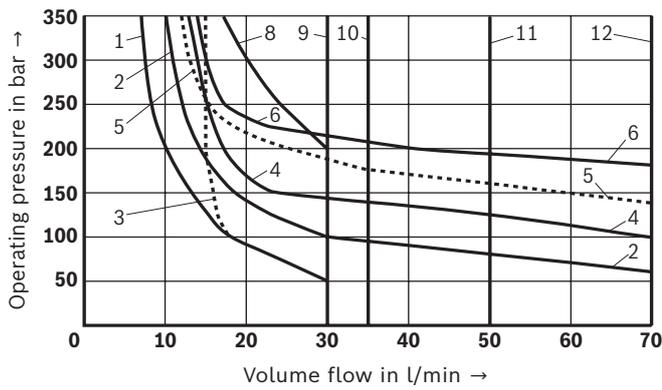
The specified performance limits are valid for use with two directions of flow (e.g. from P → A and simultaneous return flow from B to T).

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

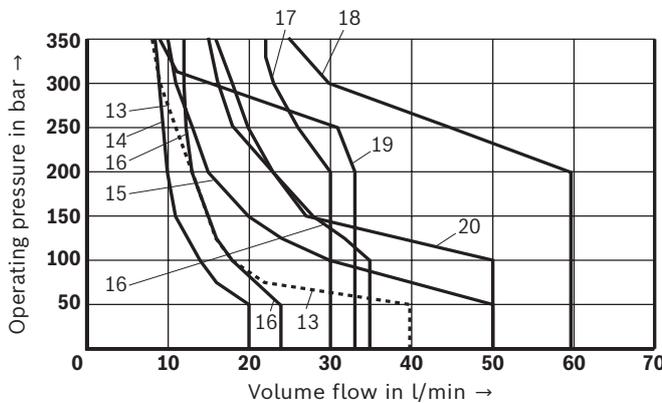
lower with only one direction of flow (e.g. from P → A while port B is blocked)!

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, U
3	V
4	D, C, Y
5	Q, W
6	E
8	P
9	T
10	G
11	H, D/OF, C/OF
12	M, D/O, C/O



Characteristic curve	Symbol
13	A9 / B9
14	E67
15	J19
16	J73
17	G73
18	X7
19	X36A
20	G3

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**Performance limits:** Version "G48", "G110", "W110" and "W230"  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

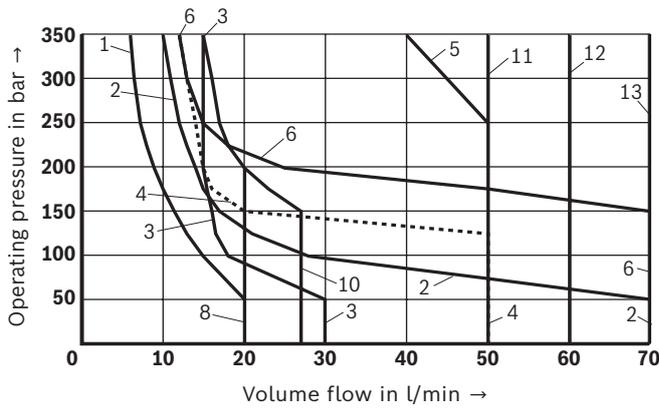
**Notice:**

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

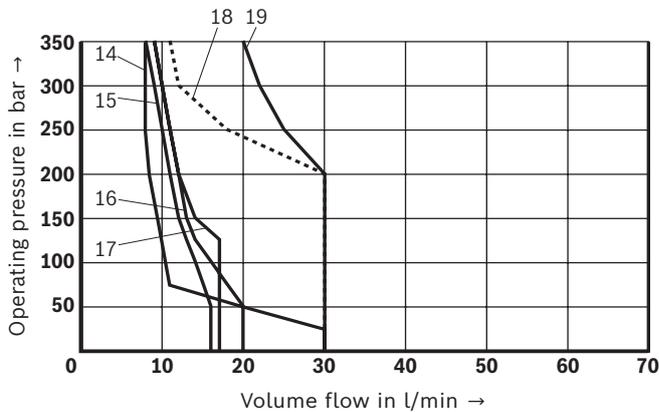
lower with only one direction of flow (e.g. from P → A while port B is blocked)!

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.**



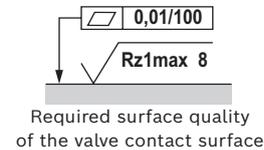
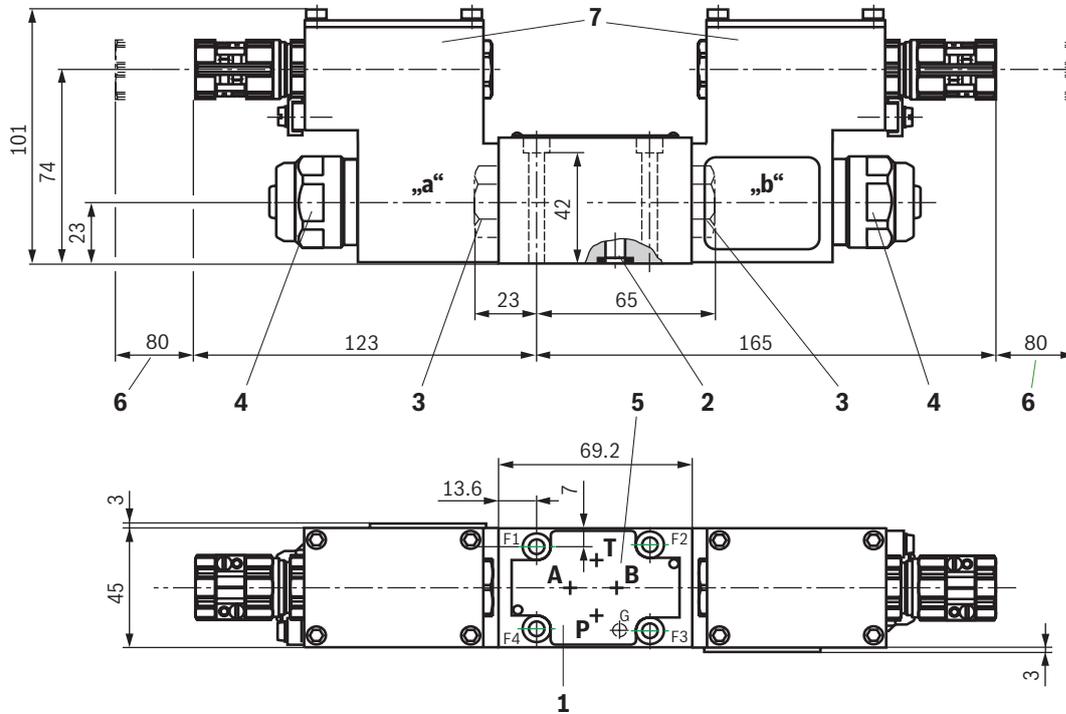
Characteristic curve	Symbol
1	A, B
2	J, U, Q, W
3	V
4	D, C, Y
5	D46/OF
6	E
8	P, T
10	G
11	H
12	D/OF, C/OF
13	M, D/O, C/O



Characteristic curve	Symbol
14	B9
15	J32
16	J19
17	D19
18	X7
19	G73

12/16 WE ...XE | Directional spool valve

## Dimensions (dimensions in mm)



- 1 Name plate
- 2 Identical seal rings for ports A, B, P, T
- 3 Plug screw for valves with one solenoid
- 4 Mounting nut with hexagon SW32
- 5 Porting pattern according to ISO 4401-03-02-0-05
- 6 Space required to remove the solenoid coil
- 7 Terminal box

### 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  $\mu_{\text{total}} = 0.09 \dots 0.14$ );

Tightening torque  $M_A = 7 \text{ Nm} \pm 10\%$ ,

Material no. **R913043758**

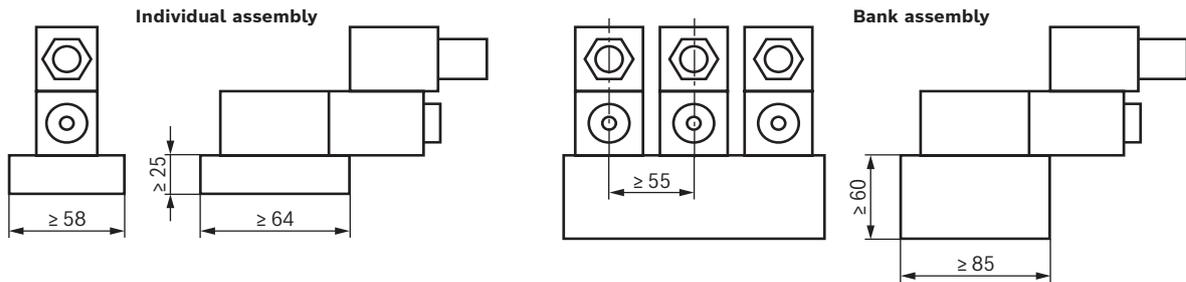
**Subplates** (separate order) with porting pattern according to ISO 4401-03-02-0-05, see data sheet 45100.

### 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 free from 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 $\geq 64$ , 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	
Minimum distance between the longitudinal valve axes	$\geq 55$	



 **Notice:**

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

14/16 WE ...XE | Directional spool valve

## Electrical connection

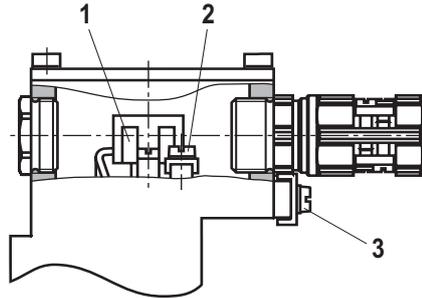
The type-examination tested solenoid coil of the valve is equipped with a terminal box, a type-examination tested cable entry and a type-examination tested blind plug.

The connection is polarity-independent.

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

 **Notice:**

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



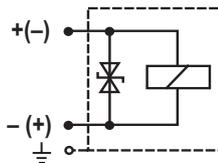
### Properties of the connection terminals and mounting elements

Position	Function	Connectable line cross-section
1	Operating voltage connection	single-wire 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 max. 6 mm <sup>2</sup> finely stranded max. 4 mm <sup>2</sup>

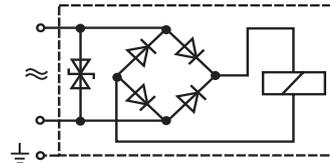
### Connection line

Line type	Non-armored and non-shielded connection lines	
Temperature rating	°C	≤-20 ... ≥+110
Line diameter	mm	7 ... 10.5

#### Direct voltage, polarity-independent



#### Alternating voltage



 **Notice:**

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

## Over-current fuse and switch-off voltage peaks

Voltage data in the valve type code	Nominal voltage valve solenoid	Rated current Valve solenoid	Rated current for external miniature fuse: Medium time-lag (M) according to DIN 41571 and EN/IEC 60127	Rated voltage for external miniature fuse: Medium time-lag (M) according to DIN 41571 and EN/IEC 60127	Maximum voltage value when switching off	Interference protection 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	
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	



### 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 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
- ▶ Selection of filters
- ▶ Information on available spare parts

16/16 WE ...XE | Directional spool valve

## Notes

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