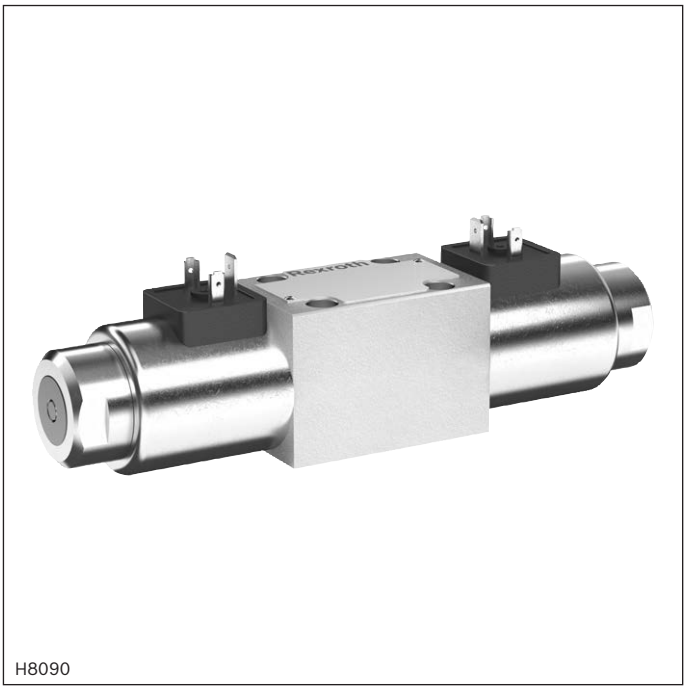
RE 23178-XN
Edition: 2023-08
Replaces: 2022-02
RA78487727_AF

rexroth
A Bosch Company

Directional spool valves, direct operated, with solenoid actuation

Type WE ...XN



- Size 6
- Component series 6X
- Maximum operating pressure 350 bar
- Maximum flow 80 l/min

Information on explosion protection

- Area of application in accordance with the Explosion Protection Directive 2014/34/EU: **II 3G; II 3D**
- Type of protection of valve:
  - Ex h IIC T3 Gc X according to EN 80079-36
  - Ex h IIIC T140°C Dc X according to EN 80079-36
- Type of protection of solenoid coil:
  - Ex ec IIC T3 Gc according to EN 60079-7
  - Ex tc IIIC T140°C Dc according to EN 60079-31

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
- Solenoid coil is rotatable by 90°
- Electrical connection with individual connection
- With concealed manual override

Contents

Features	1
Ordering code	2
Symbols	3
Function, section	4
Technical data	5 ... 7
Characteristic curves	8
Performance limits	8
Dimensions	9
Installation conditions	10
Electrical connection	11
Over-current fuse and switch-off voltage peaks	11
Further information	12

☞ **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
	WE	**6**		**6X**	**/**		**E**	**G24**	**N9**	**XN**	**K4**	**/**		

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) with detachable coil	**E**

Supply and mains voltage

08	Direct voltage 24 V	**G24**

Manual override

09	**With** concealed manual override	**N9**

Explosion protection

10	"Not igniting"	**XN**
	For details, see information on the explosion protection page 7	

Electrical connection

11	**Individual connection**	
	Solenoid without mating connector (plug-in connector according to EN 175301-803, design A)	**K4**
	For details of electrical connections, see page 11	

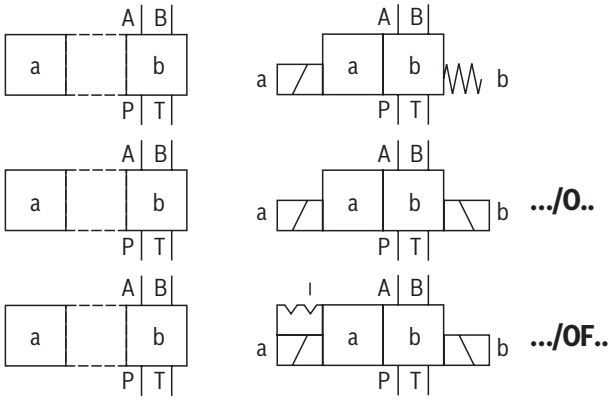
Throttle insert

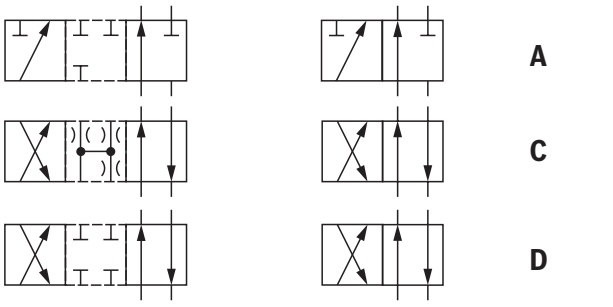
12	**Without** throttle insert (standard)	**no code**
	Throttle Ø 0.8 mm	**B08**
	Throttle Ø 1.0 mm	**B10**
	Throttle Ø 1.2 mm	**B12**
	Use if volume flow > performance limit of the valve, effective in channel P	

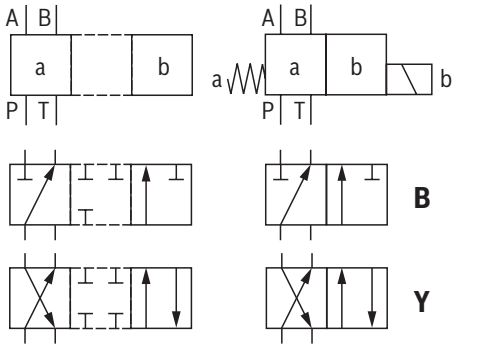
Seal material (observe compatibility of seals with hydraulic fluid used, see page 6)

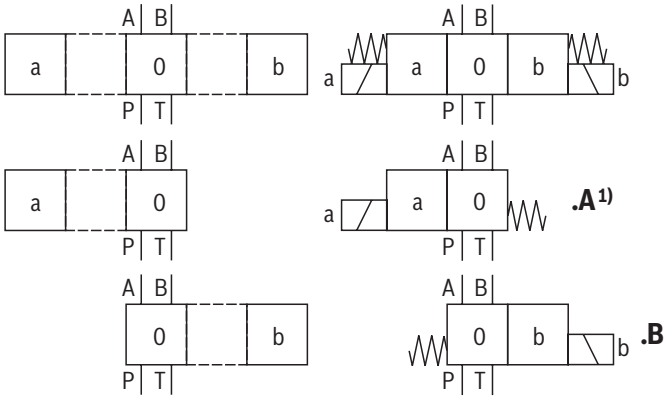
13	NBR seals	**no code**
	FKM seals	**V**

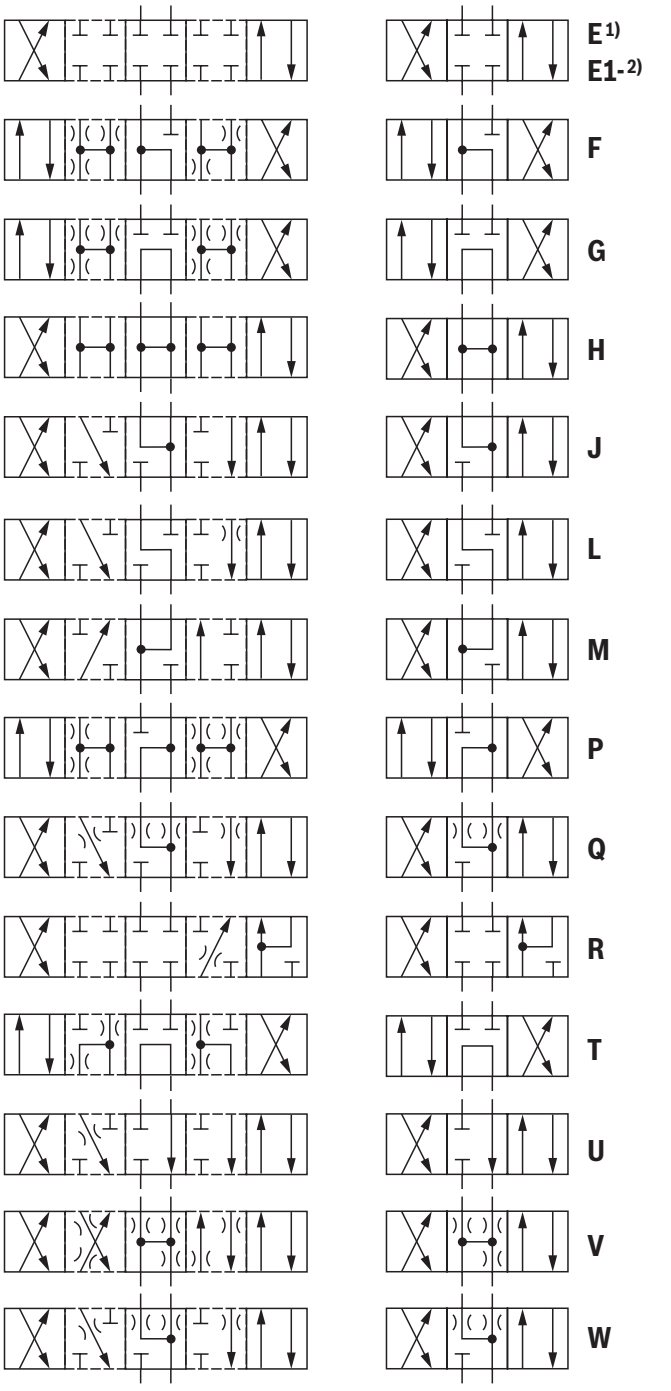
Symbols











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

2) Symbol E1-: P – A/B pre-opening,
Caution in conjunction with differential cylinders due to pressure intensification.

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

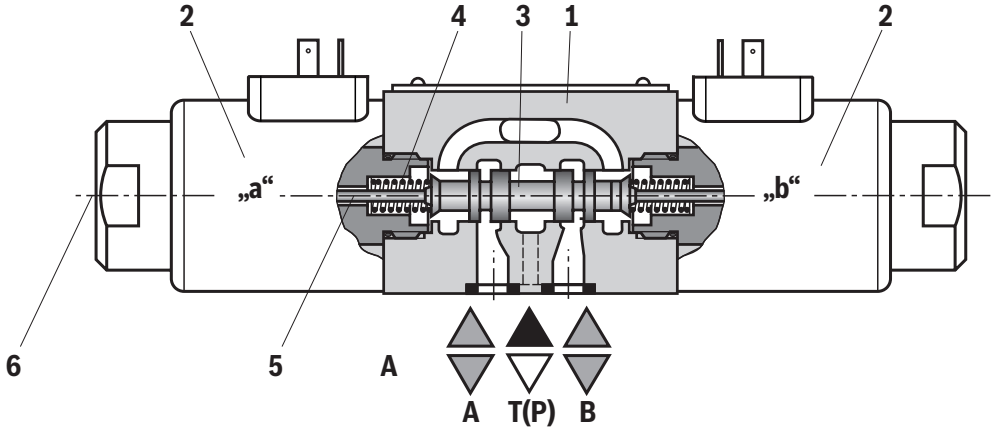
Function, section

Directional control valves of type WE are solenoid-actuated directional spool valves. They control start, stop and direction of a flow.
The directional control valves basically consist of housing (1), one or two electronic 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 electronic solenoids (2).
For unobjectionable functioning, the hydraulic system has to be bled properly.
The force of the electronic 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 to A and B to T or P to B and A to T.
After electronic solenoid (2) was de-excitated, 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.

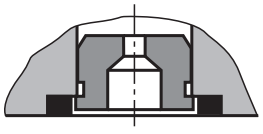
Without spring return "O" (only possible with symbols A, C and D)
This version is a directional control valve with two spool positions and two electronic solenoids **without** detent. The valve without spring return at the control spool (3) has no defined basic position in the de-energized condition.

Without spring return, with detent "OF" (only possible with symbols A, C and D)
This version is a directional control valve with two spool positions and two electronic solenoids **with** detent. Due to the detent, the control spool (3) is fixed in its respective spool position. During operation, continuous application of current to the electronic solenoid can thus be omitted which contributes to energy-efficient operation.

☞ **Notice:**
- Pressure peaks in the tank line to two or several valves can result in unintended movements of the control spool in case of valves with detent.
  We therefore recommend that separate return lines be provided or a check valve installed in the tank line. The tank line must not be allowed to run empty With corresponding installation conditions, a preload valve (preload pressure approx. 2 bar) must be installed.
- Due to the design principle, internal leakage is inherent to the valves, which may increase over the life cycle.
- Please observe 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.
  It can damage cylinders, supply lines and connected valves.



Type 4WE 6 E6X/...E..XNK4...



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			
Type of connection			Subplate mounting
Porting pattern			ISO 4401-03-02-0-05
Weight	▶ Valve with one solenoid	kg	2.3
	▶ Valve with two solenoids	kg	2.85
Installation position			Any
Ambient temperature range		°C	–20 ... +50 (NBR seals) –15 ... +50 (FKM seals)
Storage temperature range		°C	+5 ... +40
Maximum storage time		Years	1
Protection class according to EN 60529			IP65 (if suitable and correctly mounted mating connectors are used)
Maximum admissible acceleration a_{max}		g	10
Surface protection			Galvanized

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.
Hydraulic fluid			See table on page 6
Hydraulic fluid temperature range [2] (at the valve working ports)		°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 [2]
Maximum flow		l/min	80
Flow cross-section (spool position 0)	▶ Symbol Q	mm^2	approx. 6% of nominal cross-section
	▶ Symbol W	mm^2	approx. 3% of nominal cross-section

[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 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	FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Containing water	HFC (Fuchs: Hydrotherm 46M, Fuchs 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 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.

Electrical			
Supply voltage	▶ Nominal value	VDC	24
	▶ Voltage tolerance (nominal value)	%	±10
	▶ Admissible residual ripple	%	<5
	▶ Maximum power consumption [3]	W	28.8
	▶ Nominal power according to VDE 0580 [4]	W	23
Relative duty cycle time according to VDE 0580			S1 (continuous operation)
Switching time according to ISO 6403 [5]	▶ ON	ms	25 ... 45
	▶ OFF	ms	10 ... 25
Maximum switching frequency		1/h	15000
Maximum switch-off voltage peaks Solenoid		V	500, suitable damping by user required

[3] With 1.1 x nominal voltage and an ambient temperature of 20 °C

[4] At ambient temperature 20 °C

[5] 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		II 3G	II 3D
Type of protection of valve according to EN 80079-36 [6]		Ex h IIC T3 Gc X	Ex h IIIC T140°C Dc X
Type of protection valve solenoid according to EN 60079-7 / EN 60079-31		Ex ec IIC T3 Gc	Ex tc IIIC T140°C Dc
Maximum surface temperature [7]	°C	140	
Temperature class		T3	–
Type examination certificate solenoid		BVS 12 ATEX E 062 X	

[6] Ex h: structural safety c according to EN 80079-37.

[7] Surface temperature > 50 °C, provide contact protection.

⚠ Special application conditions for safe application:

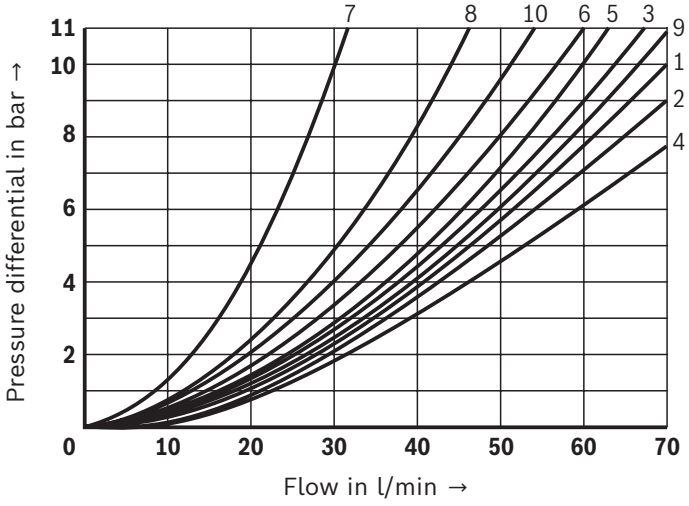
- A mating connector suitable for category 3G ("Gc") or 3D ("Dc") which ensures protection class IP65 in combination with the solenoid coil socket must be used.
- The valve is to be installed so that no impact stresses > 4 J can take effect.
- In order to avoid dangers caused by static charge, the base and/or subplate on which the valve is to be fitted must be electrically conductive and included in the equipotential bonding.
- Maximum admissible dust layer thickness 5 mm.
- Maximum hydraulic fluid temperature:
  In case of bank assembly, as long as only one solenoid is energized at a time, and in case of individual assembly +80 °C.
  In case of bank assembly when more than one solenoid is energized at a time +65 °C.
- The valve must be completely filled with hydraulic fluid.
- Ambient temperature range:
  –20 ... +50 (NBR seals)
  –15 ... +50 (FKM seals)

☞ 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.
- The maximum temperature of the surface of the valve jacket is 110 °C. This has to be considered when selecting the connection cable and/or any contact of the connection cable with the surface of the jacket is to be prevented.
- The transfer temperature from the connector of the valve solenoid to the mating connector is 100 °C at an ambient temperature of 50 °C.

Characteristic curves
(measured with HLP46, ϑ_{oil} = 40±5 °C)

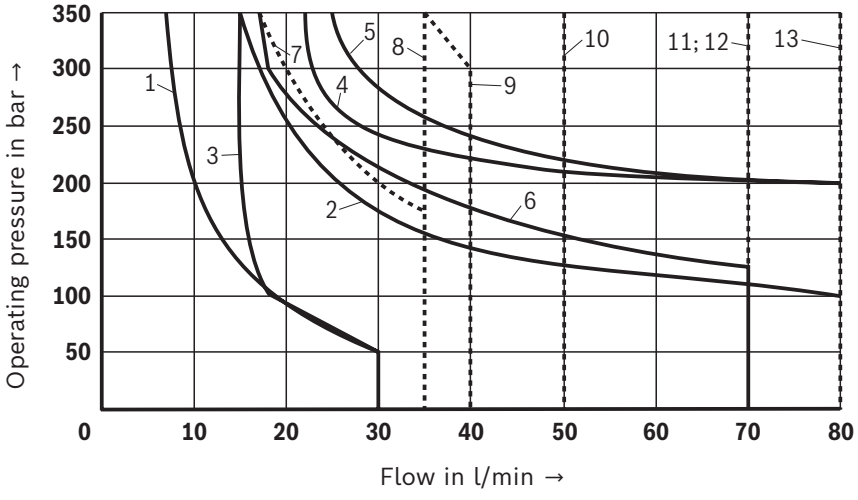
***Δp-q*$_V$ characteristic curves**



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	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

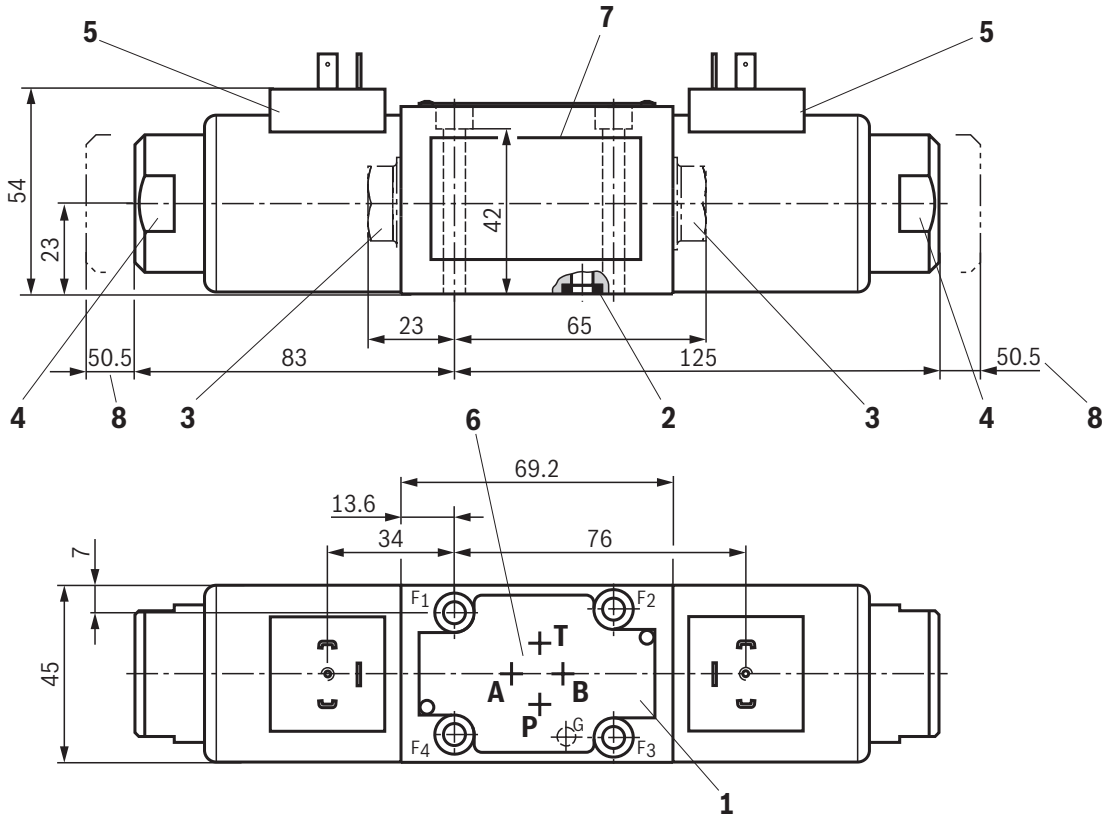
Performance limits
(measured with HLP46, ϑ_{oil} = 40±5 °C)

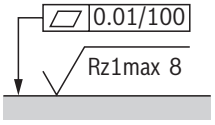
☞ **Notice:**
The specified performance limits are valid for operation with two directions of flow (e.g. from P to A and simultaneous return flow from B→T).
Due to the flow forces acting within the valves, the possible performance limit may be considerably lower with only one direction of flow (e.g. from P→A while port B is blocked)!
The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank preloading.



Symbol	Characteristic curve
A,B	1
J,L,U	2
V	3
D,C,Y	4
Q,W	5
A/0, A/0F	6
F,P	7
T	8
G	9
H	10
D/0F, C/0F	11
M, D/0, C/0	12
E1, R, E	13

Dimensions
(dimensions in mm)





Required surface quality of the valve contact surface

1 Name plate of valve
2 Identical seal rings for ports A, B, P, T
3 Plug screw for valves with one solenoid
4 Mounting nut with double edge, wrench size 32
5 Plug-in connector according to EN 175301-803, design A
6 Porting pattern according to ISO 4401-03-02-0-05
7 Name plate sticker
8 Space required to remove the coil

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 μ_{total} = 0.09 ... 0.14);
Material no. **R913043758**

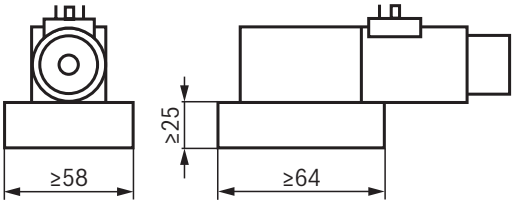
Subplates (separate order) with porting pattern according to ISO 4401-03-02-0-05, see data sheet 45100.

Notice:
- Subplates are not 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.

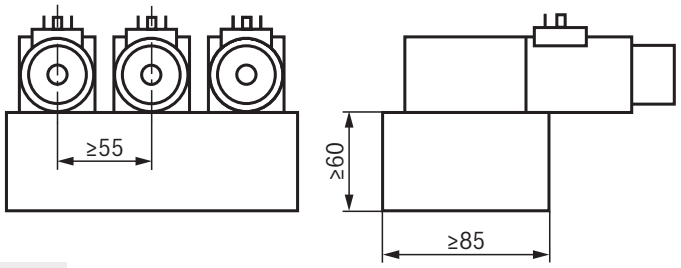
Installation conditions
(dimensions in mm)

	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	≥55	

Individual assembly



Bank assembly

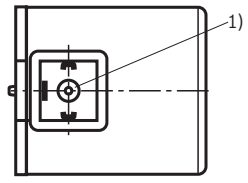
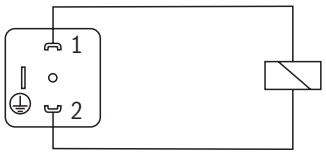


☞ **Notice:**
Observe the "Special application conditions for safe application" on page 7 with regard to the hydraulic fluid temperature.

Electrical connection

The type-examination tested solenoid coil of the valve is equipped with an electrical connection according to the following table. The electrical connection of the solenoid is polarity-independent.

Electrical connections and coil connection combinations

Ordering code connector		Top view	Circuit diagram	Pin	Connections, assignment
3-pole connector (2+PE) according to EN 175301-803 (IP65)	**K4**			1 2 ⏚	Solenoid coil, polarity-independent Grounding

1) M3, maximum tightening torque $M_{A\,max}$ = 1 Nm

Requirement for cable sets and mating connectors

Temperature rating (cables, connectors, seals)	°C	≤-30 ... ≥+100
Minimum wire cross-section	mm²	0.75
Protection class according to EN 60529		IP65

☞ **Notice:**
All three contacts of the solenoid coil (1, 2 and grounding) must be properly connected (3-wire line).

Over-current fuse and switch-off voltage peaks

Voltage data in the valve type code	Nominal voltage valve solenoid	Rated current valve solenoid	Recommended back-up fuse characteristics medium time-lag according to EN 60127-1
G24	24 VDC	0.95 ADC	1 A

☞ **Notice:**
Corresponding to the rated current, a fuse according to DIN 41571 and EN / IEC 60127 has to be connected upstream of every solenoid coil (max. 3 x 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.
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 hydraulic fluids - containing water (HFAE, HFAS, HFB, HFC)	Data sheet 90223
▶ Hydraulic valves...XN...	Operating instructions 22106-XN-B
▶ Information on available spares	www.boschrexroth.com/spc

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