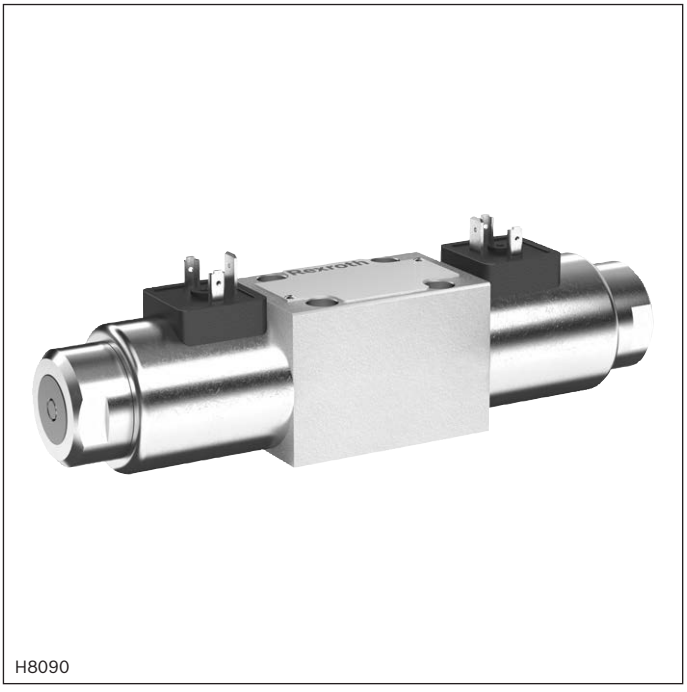
Directional spool valves, direct operated, with solenoid actuation

Type WE ...XN

RE 23178-XN
Edition: 2018-11
Replaces: 2018-07



H8090

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

ATEX units
For potentially explosive areas

Information on explosion protection:

- Area of application in accordance with the Explosion Protection Directive 2014/34/EU: **II 3G; II 3D**
- Area of application according to technical rules EAC TR CU 012/2011: **II 3G; II 3D**
- Type of protection of the valve solenoids:
  - Ex ec IIC T3 Gc acc. 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, optional

Contents

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 6	

Electrical connection

11	**Individual connection**	
	Solenoid without mating connector	**K4**
	For details of electrical connections, see page 10	

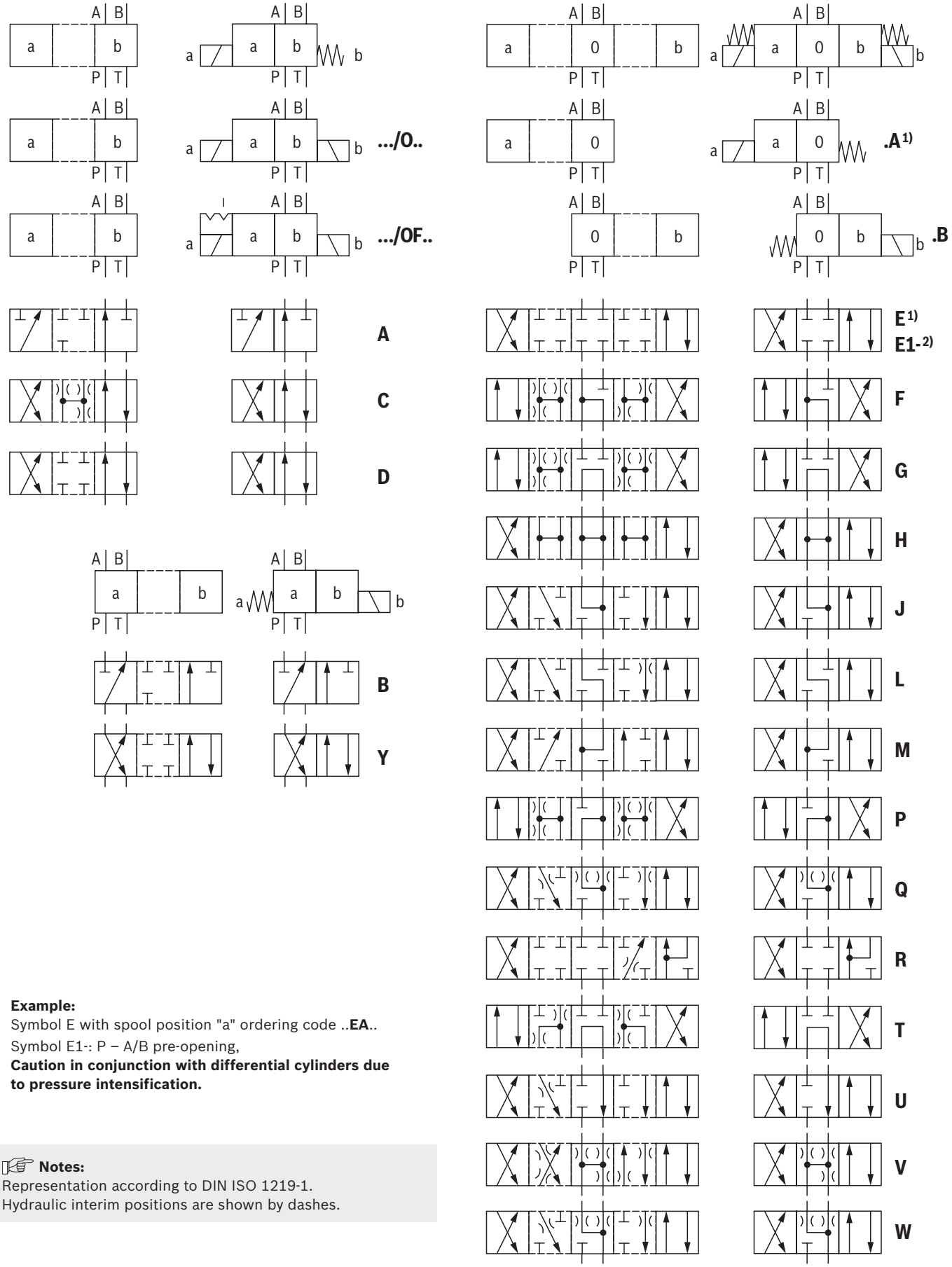
Throttle insert

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 8)

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.

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

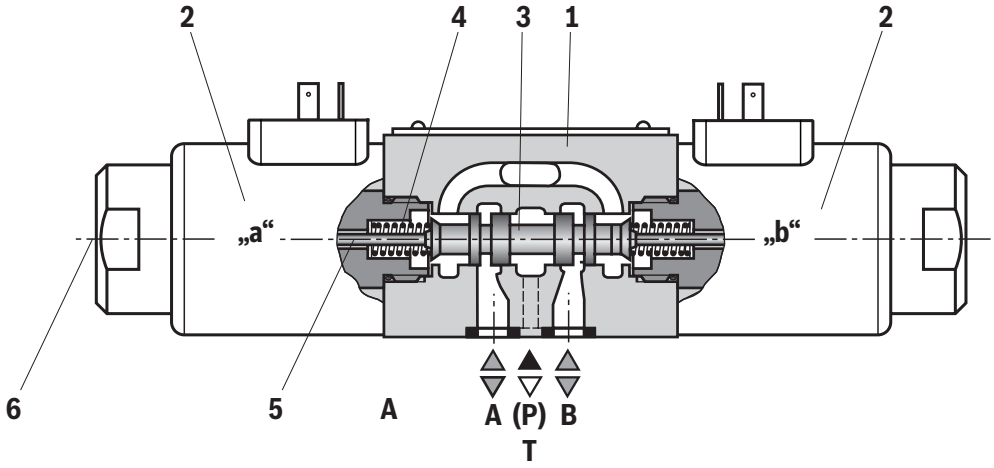
Function, section

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 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).
To ensure proper functioning, make sure that the pressure chamber of the electronic solenoid is filled with oil.
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.
An optional manual override (6) allows control spool (3) to be moved without solenoid energization.

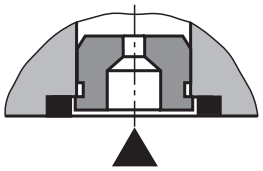
Without spring return "O" (only possible with symbols A, C and D)
This version is a directional valve with two spool positions and two electronic solenoids **without** detent. The valve without spring return at the control spool (3) does not have a defined basic position in de-energized condition**.**

Without spring return, with detent "OF" (only possible with symbols A, C and D)
This version is a directional 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. For energy-efficient operation, continuous application of current at the electronic solenoid is not required.

☞ **Notes:**
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.



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 parameters, please consult us!)

general			
Installation position			any
Ambient temperature range		°C	–20 ... +50 [1]
Storage temperature range		°C	+5 ... +40
Maximum storage time		Years	1
Weight	▶ Valve with one solenoid	kg	2.3
	▶ Valve with two solenoids	kg	2.85
Surface protection			galvanized

hydraulics			
Maximum operating pressure	▶ Port A, B, P	bar	350
	▶ Port T	bar	210 With symbols A and B, port T must be used as leakage oil connection.
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
Hydraulic fluid			see table below
Hydraulic fluid temperature range (at the working ports of the valve)		°C *[°F]*	–20 ... +80 (NBR seals) [2] –15 ... +80 (FKM seals) [2]
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 [3]

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	

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.).
- ▶ Ignition temperature > 190 °C.
- ▶ **Flame-resistant – containing water**:
  - – Maximum pressure differential per control edge 50 bar
  - – Pressure pre-loading at the tank port >20% of the pressure differential, otherwise increased cavitation erosion
  - – Life cycle as compared to operation with mineral oil HL, HLP 50 ... 100 %

[1] Maximum 40 °C when using the cable sets DS2513 (see page 11)

[2] Observe the "Special application conditions for safe application" on page 6.

[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.
For the selection of the filters, see www.boschrexroth.com/filter.

Technical data
(For applications outside these parameters, please consult us!)

electric			
Voltage type			Direct voltage (DC)
Nominal voltage		V	24
Voltage tolerance		%	± 10
Admissible residual ripple		%	< 5
Duty cycle / operating mode according to VDE 0580			100 % / S1 (continuous operation)
Rated current		mA	950
Switching times according to ISO 6403 [4]	▶ 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
Nominal power at ambient temperature 20 °C		W	23
Maximum power with 1.1 x nominal voltage and ambient temperature 20 °C		W	28.8
Protection class according to EN 60529			IP 65 (with mating connector mounted and locked) [5]

Information on explosion protection – Directive 2014/34/EU			
Area of application		II 3G	II 3D
Type of protection valve		c (EN 13463-5)	
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 [6]	°C	140	
Temperature class		T3	
Type examination certificate of solenoid		BVS 12 ATEX E 062 X	
Requirements for the mating connector			
Temperature rating	°C	≥ 100 [7]	
Area of application according to directive 2014/34/EU		II 3G; II 3D	

Information on explosion protection – Technical rules EAC TR CU 012/2011			
Area of application		II 3G	II 3D
Type of protection marking of valve		2Ex nA II T3 Gc X	Ex tc IIIC T140°C Dc X
Maximum surface temperature [6]	°C	140	
Temperature class		T3	
Certificate of conformity		№ TC RU C-DE.ГБ08.В.02161	

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.

5) If a suitable mating connector and a correctly mounted electric connection are used.

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

7) Transfer temperature at the connector of the valve solenoid 85 °C at ambient temperature 40 °C.

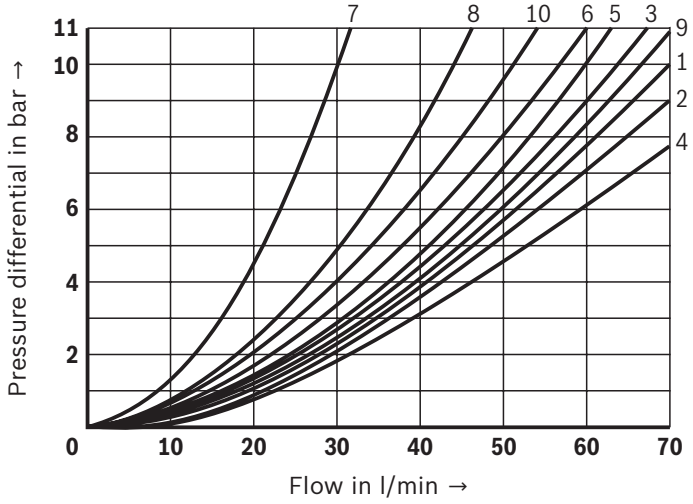
Special application conditions for safe application:

- Connection lines must be passed in a strain-relieved way.
- 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.
- The valve solenoid must not be installed close to charge generating processes.
- Dust layers with a thickness > 50 mm are not admissible.
- 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 simultaneously: +65 °C
- 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 contact of the connection cable with the surface of the jacket is to be prevented.

Characteristic curves

(measured with HLP46, ϑ_{oil} = 40 ±5 °C *[104 ±9 °F]*)

***Δp-q*$_V$ characteristic curves**

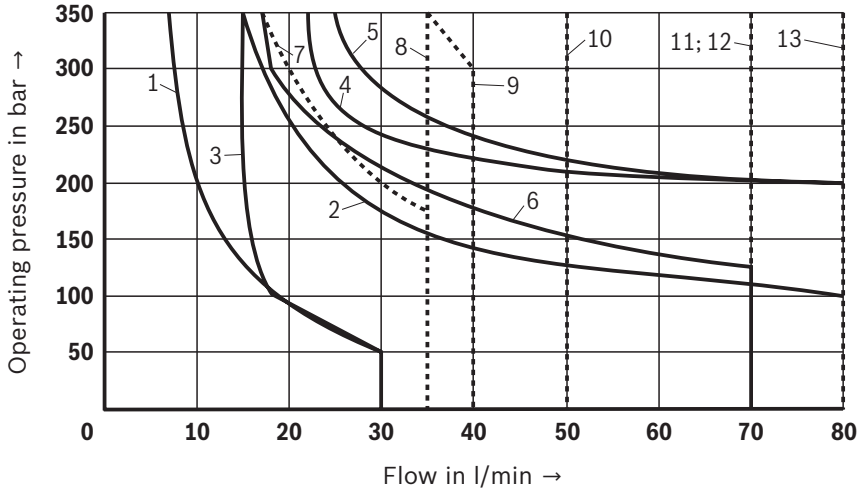


Symbol	Direction of flow					
	P – A	P – B	A – T	B – T	B – A	P – T
A, B	3	3	–	–	–	–
C46, C	1	1	3	1	–	–
D46, D, Y	5	5	3	3	–	–
E	3	3	1	1	–	–
F	1	3	1	1	–	–
T	10	10	9	9	–	8
H	2	4	2	2	–	9
J, Q	1	1	2	1	–	–
L	3	3	4	9	–	–
M	2	4	3	3	–	–
P	3	1	1	1	–	–
R	5	5	4	–	7	–
V	1	2	1	1	–	–
W	1	1	2	2	–	–
U	3	3	9	4	–	–
G	6	6	9	9	–	8

Performance limits

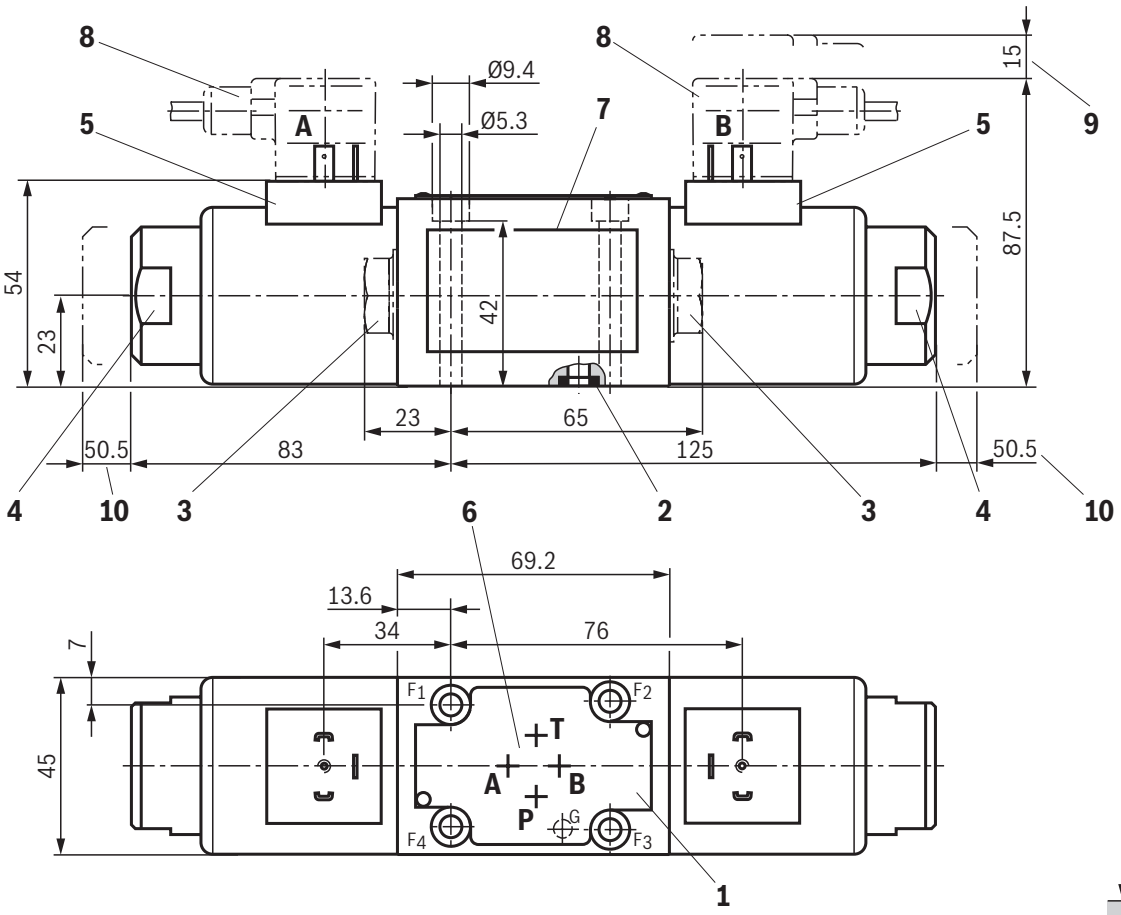
(measured with HLP46, ϑ_{oil} = 40 ±5 °C *[104 ±9 °F]*)

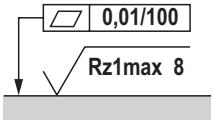
☞ **Notice:**
The specified performance limits are valid for operation with two directions of flow (e.g. from P to A and simultaneous return flow from B to T).
Due to the flow forces acting within the valves, the possible performance limit may be considerably lower with only one direction of flow (e.g. from P to 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
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 (cable sets, separate order, see page 11 and data sheet 08006.
6 Porting pattern according to ISO 4401-03-02-0-05
7 Name plate sticker
8 Mating connector or cable set DS2513 **without** circuitry for connector "K4" (separate order, see page 11 and data sheet 08006)
9 Space required to remove the cable sets
10 Space required to remove the coil

Valve mounting screws (separate order)
For reasons of stability, use exclusively the following valve mounting screws:
4 hexagon socket head cap screws
ISO 4762 - M5 x 50 - 10.9
(friction coefficient μ_{total} = 0.09 ... 0.14);
material no. **R913043758**

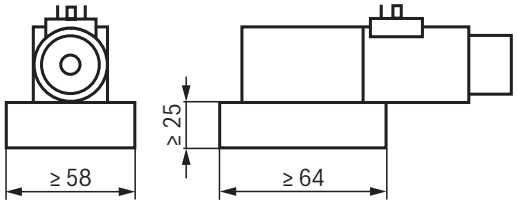
Subplates (separate order) with porting pattern according to ISO 4401-03-02-0-05, see data sheet 45100.

Notes:
- 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.

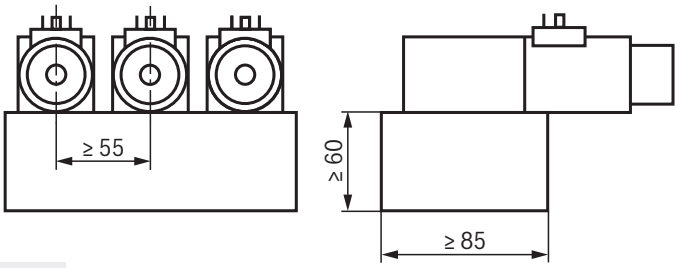
Installation conditions
(dimensions in mm)

	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	≥ 38 W/mK (EN-GJS-500-7)	
Minimum distance between the longitudinal valve axes	≥ 55	

Individual assembly



Bank assembly

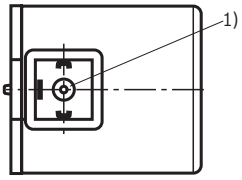
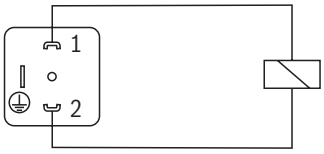


☞ **Notice:**
With regard to the hydraulic fluid temperature, observe the "Special conditions for safe use" on page 6.

Electrical connection

The type-examination tested valve solenoid 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

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

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

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 EN 60127-1
G24	24 V DC	0.95 A DC	1 A

☞ **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_{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 areas 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.

Accessories (separate order)

Mating connectors and cable sets

Item [1]	Designation	Version	Short designation	Material number	Data sheet
5, 8	Cable sets; for ATEX valves with "K4" connector, 2-pole + PE, design A (large cubic connector)	3.0 m	DS2513...ATEX	**R901200418**	08006
		5.0 m		**R901200460**	
		12.0 m		**R901200582**	

[1] See dimensions on page 8.

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
- Directional spool valves, direct operated, with solenoid actuation — Operating instructions 23178-XN-B
- Selection of filters — www.boschrexroth.com/filter
- Information on available spare parts — www.boschrexroth.com/spc

Notes

Bosch Rexroth AG
Industrial Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52/40 30 20
my.support@boschrexroth.de
www.boschrexroth.de

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