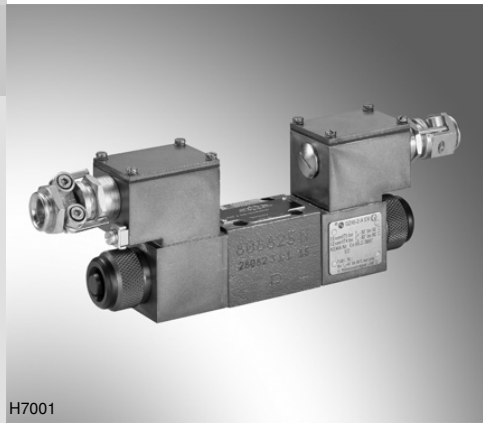
4/3, 4/2 and 3/2 directional valves with wet-pin DC or AC solenoids

RE 23178-XE-B2/09.13
Replaces: 11.09

Type WE 6 ../.E..XE...



Actual product may differ

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

ATEX units
For explosive areas

Part II Data sheet

Information on the explosion protection:

- Area of application in accordance with the Explosion Protection Directive 94/9/EC: **II 2G**
- Type of protection of the valve solenoid: Ex e mb IIC T4 Gb according to EN 60079-7:2007 / EN 60079-18:2009

What you need to know about these operating instructions

These operating instructions apply to the explosion-proof version of Rexroth valves and consist of the following three parts:

Part I General information 07010-X-B1
Part II Data sheet 23178-XE-B2
Part III Product-specific instructions 23178-XE-B3

Operating instructions 23178-XE-B0

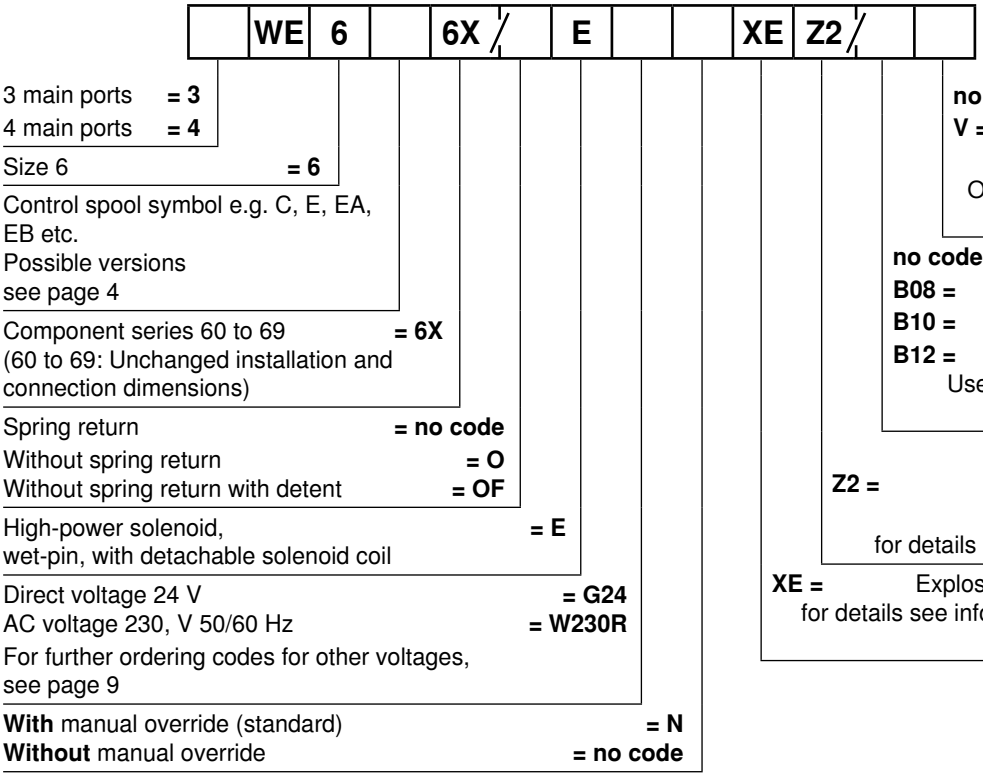
You can find further information on the correct handling of Rexroth hydraulic products in our publication "General product information on hydraulic products" 07008.

Table of contents

Features

- Direct operated directional spool valve with solenoid actuation for proper use in explosive atmospheres
- Porting pattern according to ISO 4401-03-02-0-05
- Subplates available in FE/ZN version (see page 14)
- Wet-pin DC or AC solenoids
- Solenoid coil can be rotated by 90°
- Electrical connection with individual connection and cable gland
- With manual override, optional

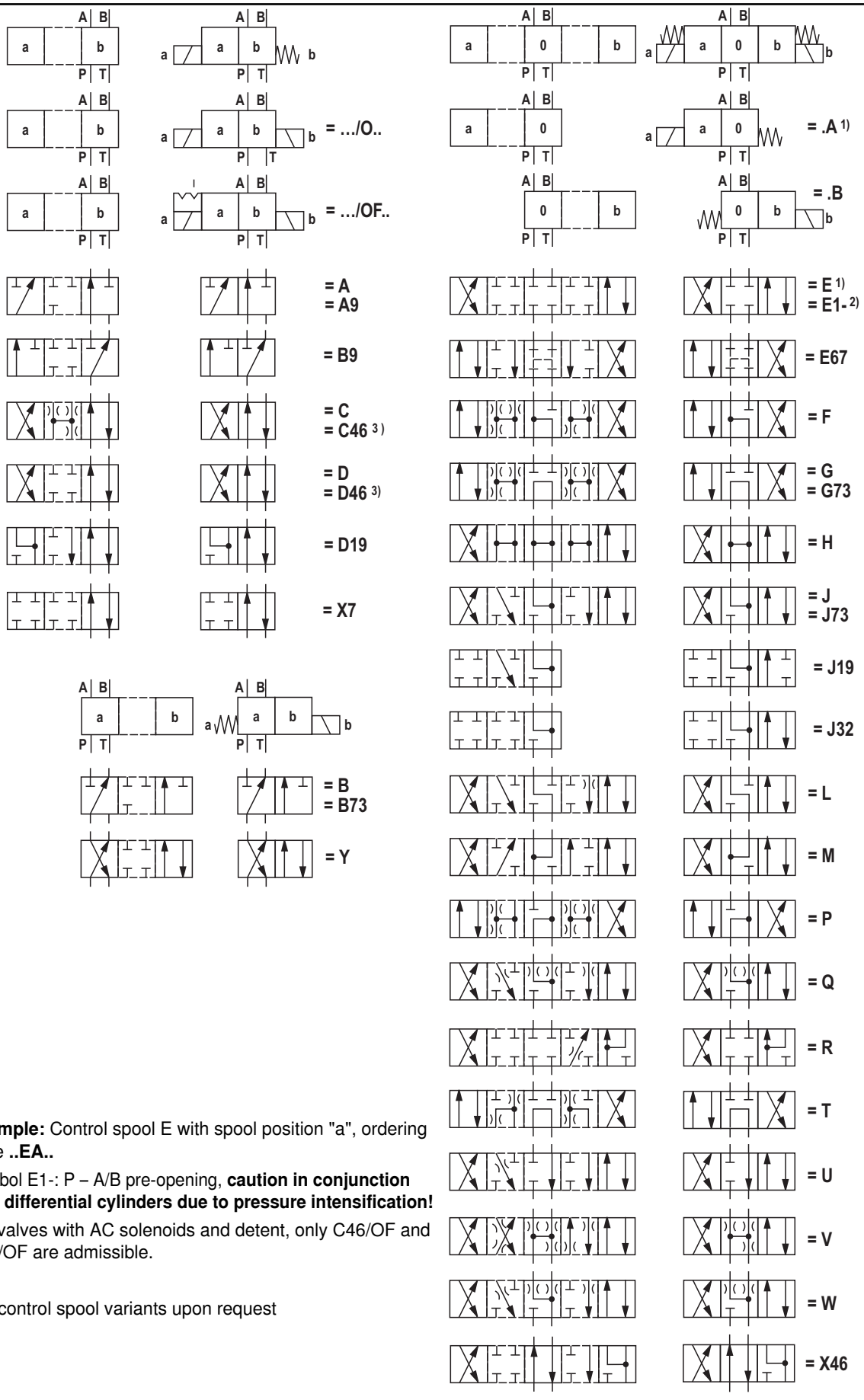
Ordering code and scope of delivery



Included in the scope of delivery:

Valve operating instructions with declaration of conformity in Part III

Control spool symbols



1) **Example:** Control spool 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!**

3) For valves with AC solenoids and detent, only C46/OF and D46/OF are admissible.

Other control spool variants upon request

Function, section

Directional valves of type WE are solenoid-actuated directional spool valves. They control the start, stop and direction of a fluid 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, 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 (2).

To ensure proper functioning, make sure that the pressure chamber of the solenoid is filled with oil.

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 required 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.

An optional manual override (6) allows the control spool (3) to be moved without solenoid energization.

Type 4WE 6.. 6X/O...XE... (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.

Type 4WE 6.. 6X/OF... XE... (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.

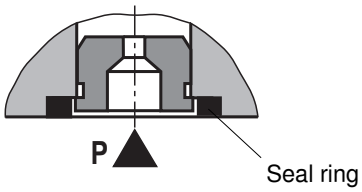
Important:
Pressure peaks in the tank line to two or several valves can result in unintended control spool movements in case of valves with detent! We therefore recommend that separate return lines be provided or a check valve installed in the tank line.

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.

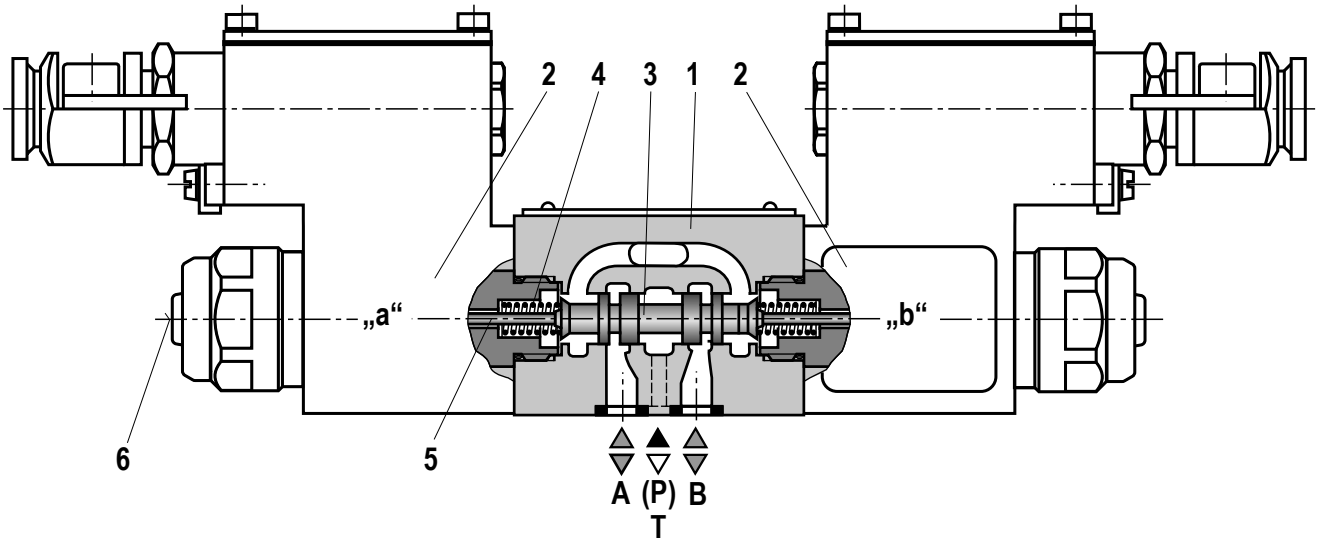
Throttle insert (type 4WE 6..6X/…XE../**B**..)

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

It is inserted in channel P of the directional valve.



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



Technical data

general

Installation position	Any
Ambient temperature range	–20 … +70 [1]
Storage temperature range	–20 ... +50
Admissible vibration load	20 … 2000 Hz amplitude 0.05 g^2/Hz (10 g RMS)
Weight	2.6 (with 1 solenoid); 4.0 (with 2 solenoids)
Surface protection	Galvanized coating

hydraulic

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 if the operating pressure exceeds the admissible tank pressure.
Maximum flow		l/min	70
Flow cross-section (spool position 0)	with symbol Q		Approx. 6 % of the nominal cross-section
	with symbol W		Approx. 3 % of the nominal cross-section
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524 [2]; fast bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [2]; HEPG (polyglycols) [3]; HEES (synthetic esters) [3]; flame-resistant hydraulic fluid HFC according to ISO 12922 [4], Other hydraulic fluids on request Ignition temperature > 180 °C
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 [5]

[1] Observe the "Special conditions for safe use" on page 7.

[2] Suitable for NBR **and** FKM seals

[3] Suitable **only** for FKM seals

[4] Only in connection with NBR seals, max. admissible pressure 210 bar, $\Delta p < 15$ bar, hydraulic fluid temperature max. 60 °C
More information is available from our sales staff.

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

Technical data

electric

Voltage type			Direct voltage	Alternating voltage 50/60 Hz
Available voltages		V	24, 48, 96, 110	110, 230
Voltage tolerance (nominal voltage)		%	±10	
Admissible residual ripple		%	< 5	–
Duty cycle/operating mode according to VDE 0580			S1 (continuous operation)	
Switching time according to ISO 6403	ON	ms	30 … 55	40 … 80
	OFF	ms	10 … 15	40 … 50
Switching frequency		1/h	up to 15000	up to 7200
Nominal power at ambient temperature 20 °C		W	17	
Maximum power with 1.1 x nominal voltage and ambient temperature 20 °C		W	20.6	
Protection class according to EN 60529			IP 66 [1]	

[1] If installed properly

Important:

Solenoids for AC voltage are DC solenoids with integrated rectifier

Information on the explosion protection

Area of application in accordance with the Explosion Protection Directive 94/9/EC	II 2G
Type of protection Valve	c (EN 13463-5: 2011)
Maximum surface temperature [2] °C (Temperature class)	135 °C (T4)
Type of protection Solenoid according to EN 60079-7:2007 / EN 60079-18:2009	Ex e mb IIC T4 Gb
Type examination certificate Solenoid	KEMA 02ATEX2240 X
"IECEx Certificate of Conformity" Solenoid	IECEx DEK 12.0068X
Special conditions for safe use	– In case of valves with two solenoids, maximally one of the solenoids may be energized at a time. – Simultaneously energizing 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 valve casing surface is 120 °C. This has to be considered when selecting the connection cable and/or contact of the connection cable with the casing surface is to be prevented.
Ambient temperature range °C	–20 … +70 [3]

[1] If the electrical connection is correctly installed

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

[3] Observe the "Special conditions for safe use"

Electrical connection

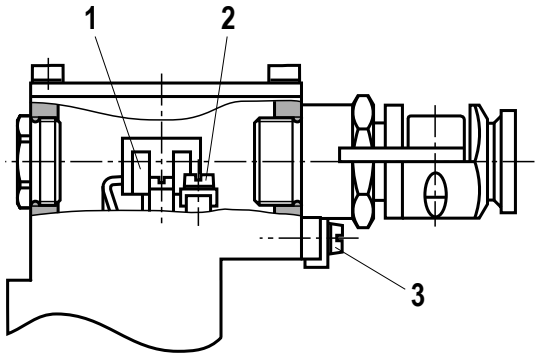
The type-examination tested valve solenoid of the valve is equipped with a terminal box and a type-tested cable gland.

The connection is polarity-independent.

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

Important:

When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected properly.



Properties of the connection terminals

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 earthing 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 4 mm^2

Cable gland

Type approval		II 2G Ex e IIC Gb
Threaded connection		M20 x 1.5
Protection class according to EN 60529		IP66 [1]
Line diameter	mm	9 … 11
Sealing		Outer sheath sealing

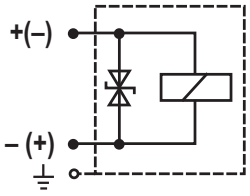
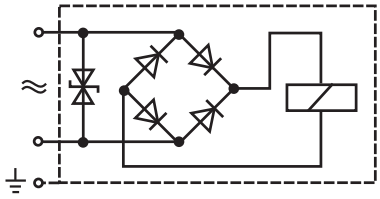
Connection line

Line type		**Non-armored** cables and lines (outer sheath sealing)
Temperature range	°C	–30 … > +110

[1] If installed properly

Electrical connection

Circuit diagrams

Direct voltage, polarity-independent	Alternating voltage
	

Over-current fuse and switch-off voltage peaks

Important:

Corresponding to the rated current, a fuse according to DIN 41571 and EN / IEC 60127 has to be connected ahead 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 explosive area or must be of an explosion-proof design.

When inductivities are switched off, voltage peaks are the result which may cause faults in the connected control electronics. For this reason, the valve solenoids comprise an interference protection circuit which dampens this voltage peak to the voltage value shown in the table.

Voltage data in the valve type code	Nominal voltage valve solenoid	Rated current valve solenoid	Rated current external miniature fuse: Medium time-lag (M) according to DIN 41571 and EN/IEC 60127	Rated voltage of external miniature fuse: Medium time-lag (M) according to DIN 41571 and EN/IEC 60127	Maximum voltage value upon switch-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	
G96	96 V DC	0.177 A DC	200 mA	250 V	–370 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	

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

Important:

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

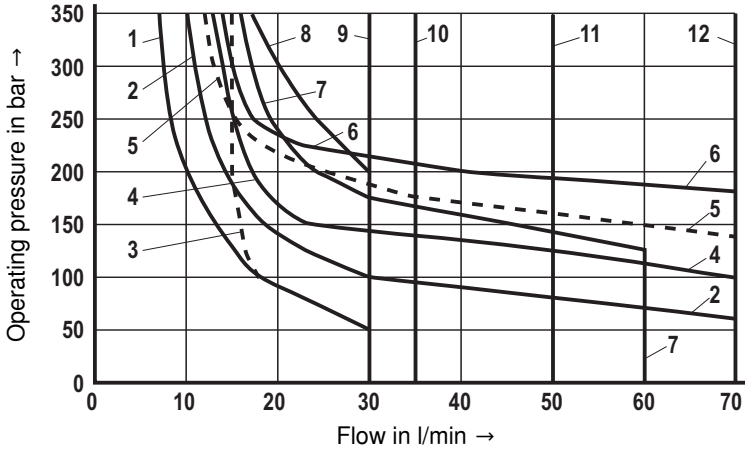
Due to the flow forces acting within the valves, the admissible switching power limit may be considerably lower with only one direction of flow (e.g. from P → A while port B is blocked).

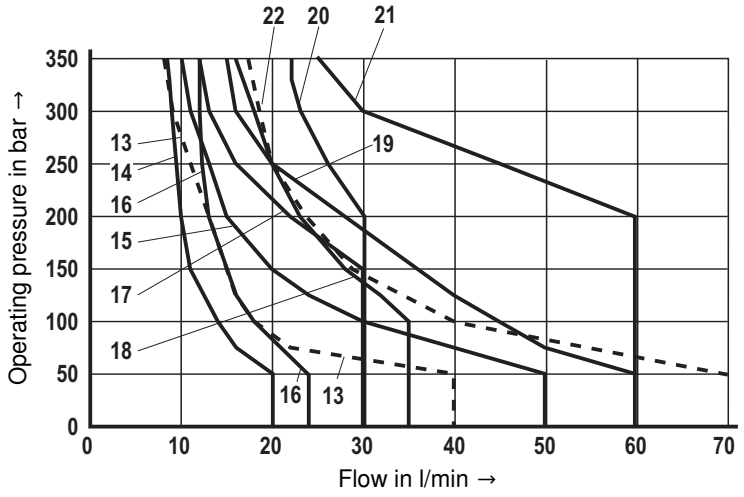
(In such cases, please consult us.)

The switching power limits were established while the solenoids were at operating temperature, at 10% undervoltage and without tank preloading.

Performance limits of the valves with DC solenoids "G24"

Characteristic curve	Control spool symbol
1	A, B
2	J32, L, U
3	V
4	D, C, Y
5	Q, W
6	E
7	A/O, A/OF
8	F, P
9	T
10	G
11	H, D/O
12	E1 [1], R [2], M
13	A9 / B9
14	E67
15	J19, B-T
16	B73
17	X46
18	J73
19	J19, (A-T)
20	G73
21	X7
22	J19 (P-A)





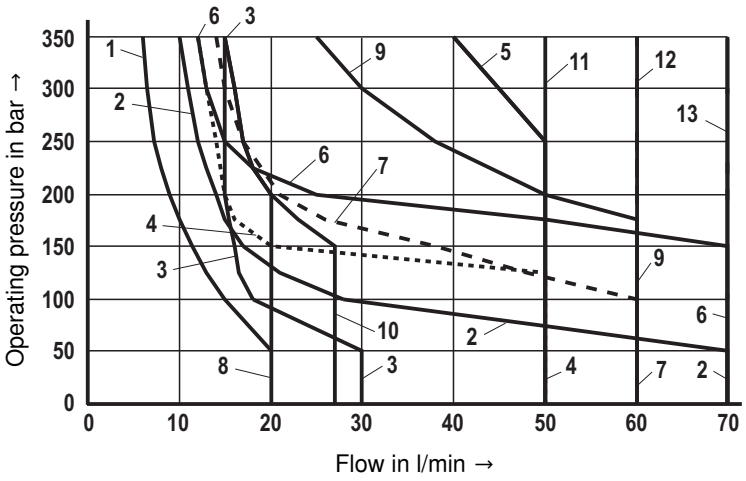
[1] P–A/B pre-opening

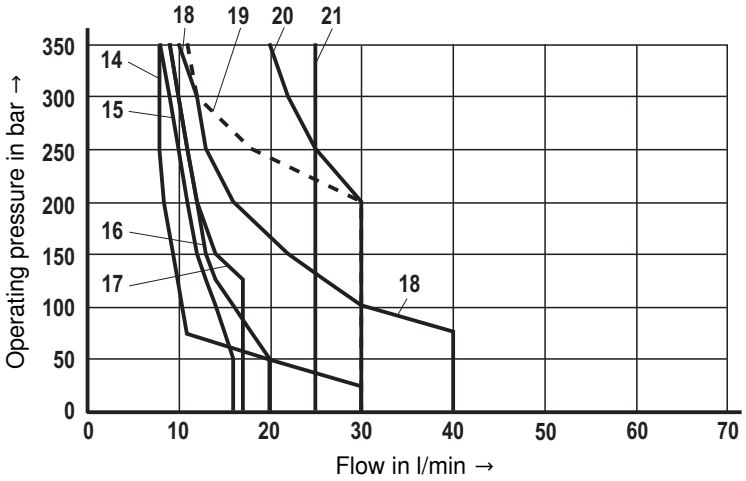
[2] Return flow from actuator to tank

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

Performance limits of the valves with DC solenoids "G48", "G96" and "G110" as well as with AC solenoids "W110R" and "W230R"

Character-istic curve	Control spool symbol
1	A, B
2	J, L, U, Q, W
3	V
4	D, C, Y
5	C46/OF, D46/OF
6	E
7	A/O
8	F, P, T
9	R [2]
10	G
11	H
12	M, D/O, C/O
13	E1 [1]
14	B9
15	J32 (B-T)
16	J19, B-T
17	D19
18	J19, (A-T)
19	X7
20	G73
21	J32 (A-T)





[1] P–A/B pre-opening

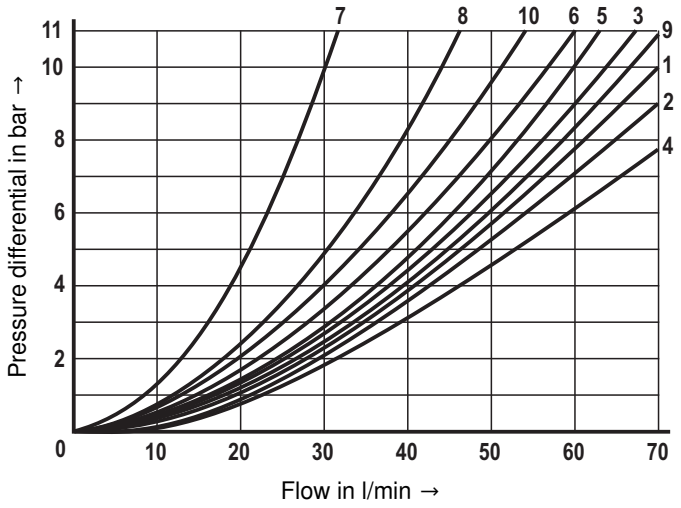
[2] Return flow from actuator to tank

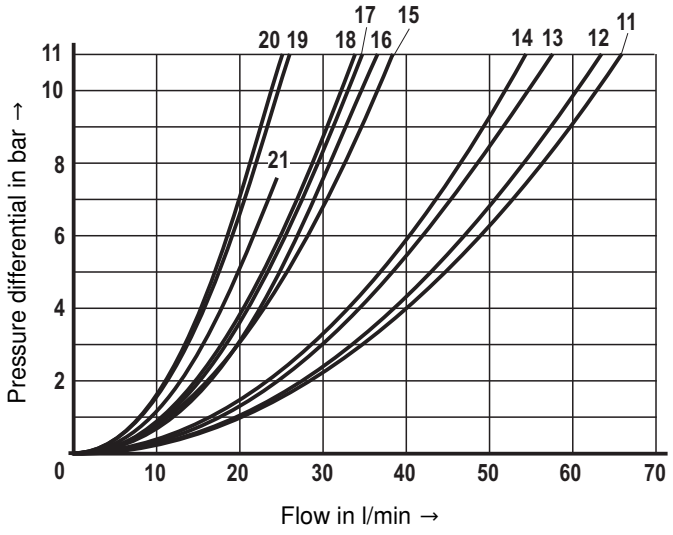
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and p = 100 bar)

Δp-q_V characteristic curves

Characteristic curve selection

Control spool 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
G73	20	20	19	19	–	16
E67	14	13	11	12	–	–
B9	17	15	–	–	–	–
B73	18	21	–	–	–	–



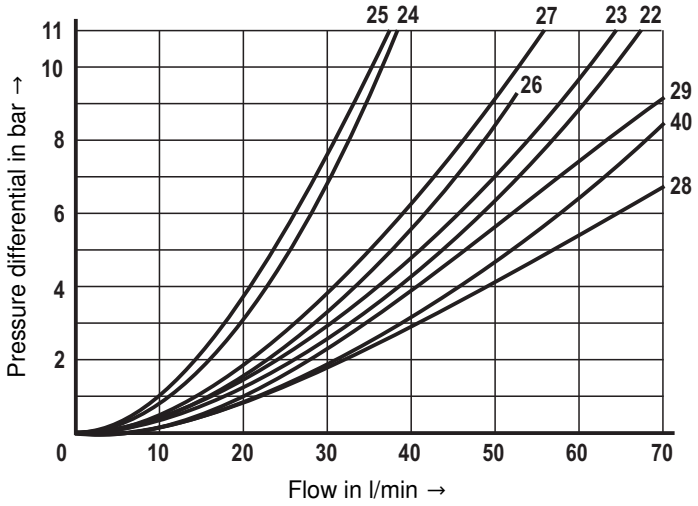


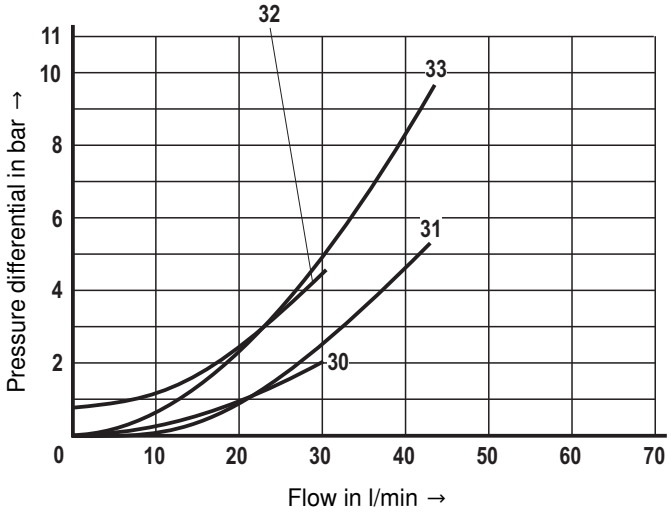
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and p = 100 bar)

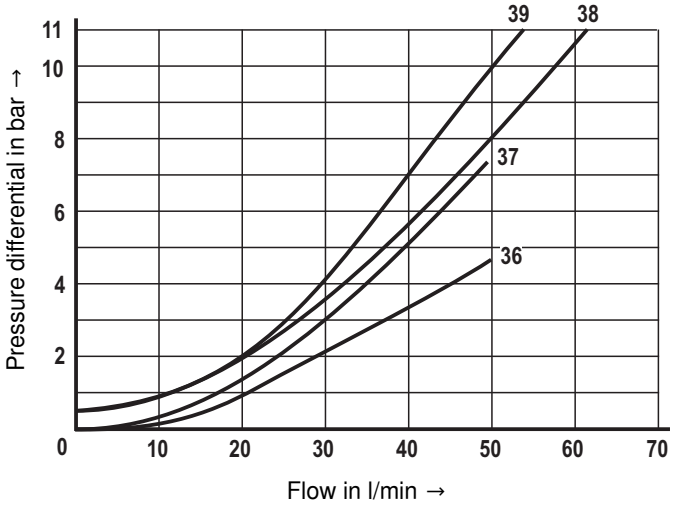
Δp-q_V characteristic curves (continued)

Characteristic curve selection

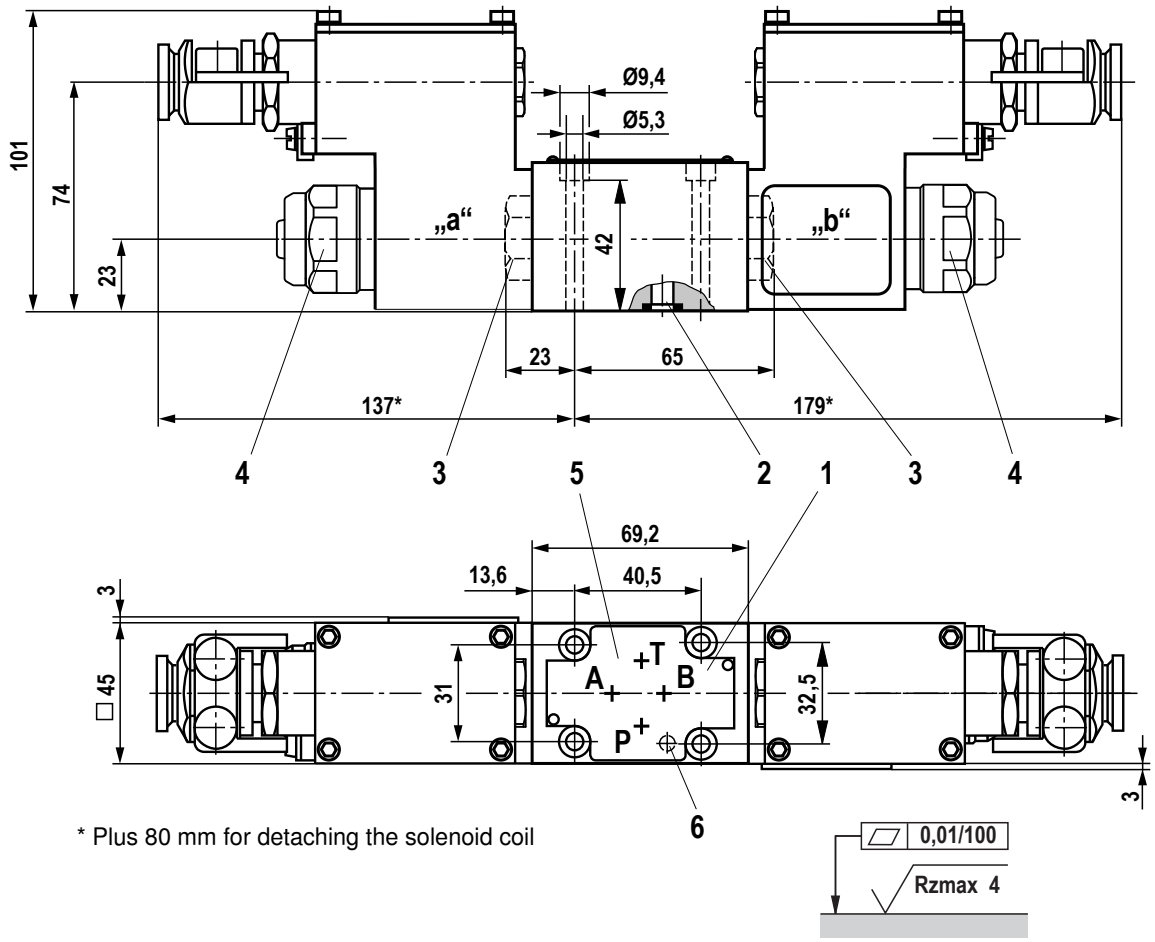
Control spool symbol	Direction of flow					
	P – A	P – B	A – T	B – T	B – A	P – T
J73	24	25	23	22	–	–
J19	27	–	39	39	–	–
X7	29	–	–	28	–	–
X46	32	33	31	30	–	–
J32	22	–	–	40	–	–
D19	36	–	38	37	–	–







Dimensions (dimensions in mm)



* Plus 80 mm for detaching the solenoid coil

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 hexagon SW32
tightening torque M_A = 4 + 1 Nm
5 Porting pattern according to ISO 4401-03-02-0-05
6 Receiving hole for locating pin according to ISO 4401-03-02-0-05, locating pin, mat. no. **R900005694** (must be ordered separately)

Valve mounting screws

For reasons of stability, exclusively use the following valve mounting screws:
4 hexagon socket head cap screws
ISO 4762-M5x50-10.9-flZn-240h-L
(friction coefficient 0.09 – 0.14 according to VDA 235-101)

Material no. **R913000064**
(must be ordered separately)

Subplates

(**without** locating hole)	G 341/01 FE/ZN (G1/4)
	G 342/01 FE/ZN (G3/8)
	G 502/01 FE/ZN (G1/2)
(**with** locating hole)	G 341/60 FE/ZN (G1/4)
	G 342/60 FE/ZN (G3/8)
	G 502/60 FE/ZN (G1/2)

with dimensions as in the data sheet 45052
(must be ordered separately)

Important:

Subplates are no components in the sense of directive 94/9/EC and can be used after the manufacturer of the overall system has assessed the risk of ignition.

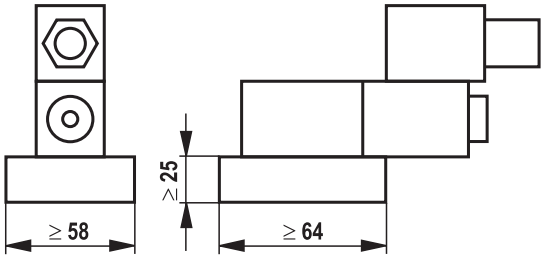
The G...FE/ZN versions are free from aluminum and/or magnesium and galvanized.

Installation conditions (dimensions in mm)

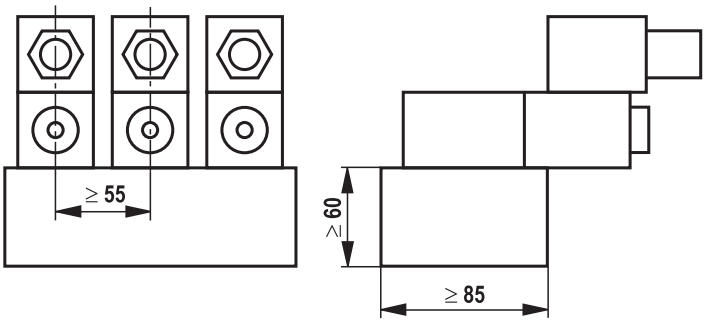
	Individual assembly	Bank assembly
Subplate dimensions	Minimum dimensions Length ≥ 64, width ≥ 58, height ≥ 25	Minimum cross-section Height ≥ 60, width ≥ 85
Thermal conductivity of the subplate	≥ 38 W/mK (EN-GJS-500-7)	
Minimum distance between the longitudinal valve axes	≥ 55 mm	

Schematic diagram

Individual assembly



Bank assembly



Important:

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

Notes

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