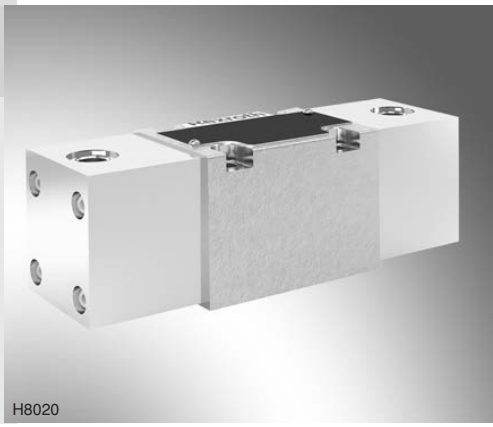
Rexroth
Bosch Group

Directional spool valves, direct operated, with fluidic actuation

RE 22282-XC/04.16
Replaces: 07.09

Type WP ...XC, WH ...XC



Size 6
Component series 6X (WP), 5X (WH)
Maximum operating pressure 315 bar
Maximum flow 60 l/min

CE

Safety valves – For potentially explosive areas

Information on explosion protection:

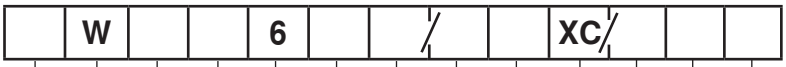
- Area of application in accordance with the Explosion Protection Directive 2014/34/EU: **IM2, II2G, II2D, II3G, II3D**
- Types of protection of the valve solenoids: c (EN 13463-5)

Table of contents

Features

- 4/3, 4/2 or 3/2 directional design
- For intended use in potentially explosive atmosphere
- Porting pattern according to ISO 4401-03-02-0-05 (with or without locating hole)
- Operating methods:
  - pneumatic (WP)
  - hydraulic (WH)

Ordering code



3 main ports **= 3**
4 main ports **= 4**

Directional valve **= W**

Type of actuation
pneumatic **= P**
hydraulic **= H**

Radial connections **= no code**

Size 6 **= 6**

Symbols, e.g. C, E, EA, EB etc.
possible versions see page 3

Type WP
Component series 60 to 69 **= 6X**
(60 to 69: unchanged installation and connection dimensions)

Type WH
Component series 50 to 59 **= 5X**
(50 to 59: unchanged installation and connection dimensions)

with spring return **= no code**
without spring return **= O**
without spring return, with detent **= OF**

without manual override **= no code**
with manual override **= N** [1]

no code = Without locating hole
/60 [3] **=** With locating hole
/62 = **With** locating hole and locking pin ISO 8752-3x8-St

Seal material
no code = NBR seals
V = FKM seals

Notice:
Observe compatibility of seals with hydraulic fluid used!

no code = Without throttle insert
B08 [2] **=** Throttle Ø 0.8 mm
B10 [2] **=** Throttle Ø 1.0 mm
B12 [2] **=** Throttle Ø 1.2 mm

XC = Valve in explosion-proof design
For details, see "Information on explosion protection", page 7

[1] Only with pneumatic actuation "P"

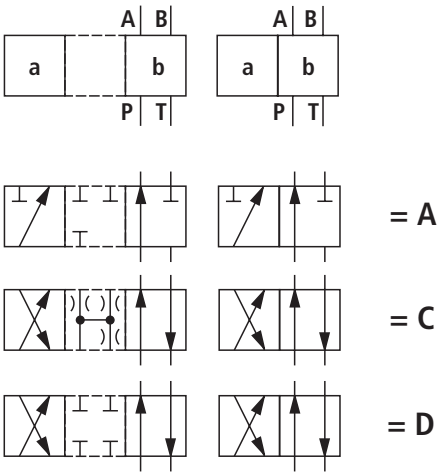
[2] Use if volume flow > performance limit of the valve, effective in channel P.

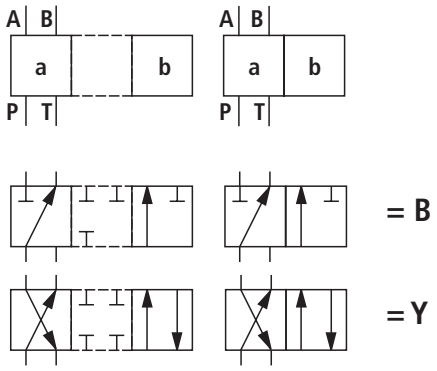
[3] Locking pin ISO 8752-3x8-St, material no. **R900005694**, separate order

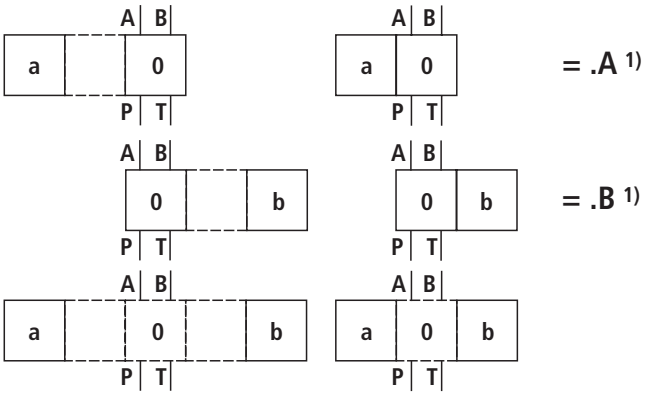
	Spool positions			
	2 pos.	3 pos.	Type WP	Type WH
no code	•	•	•	•
O	•		•	•
OF	•		•	•

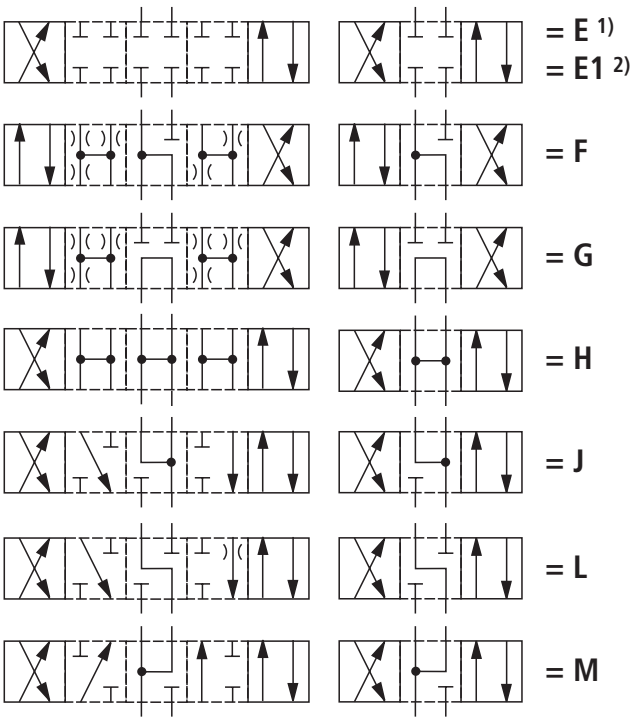
• = available

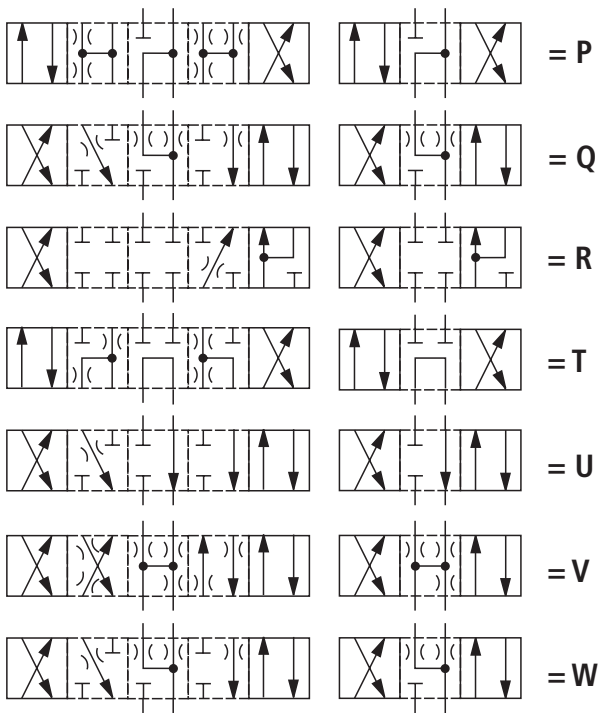
Symbols











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

2) **Symbol E1-**: P → A/B pre-opening

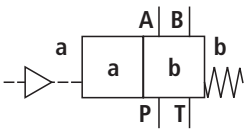
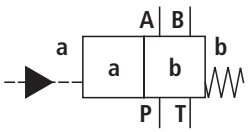
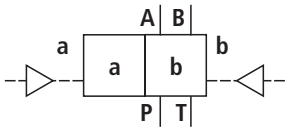
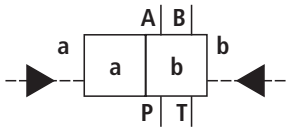
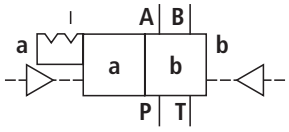
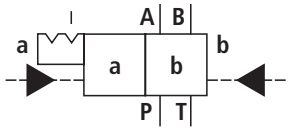
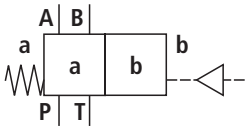
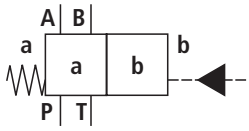
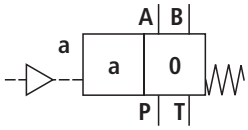
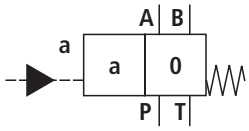
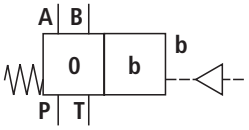
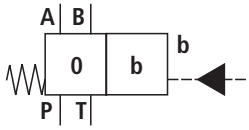
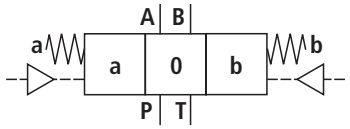
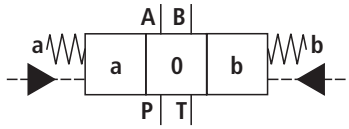
Caution in conjunction with differential cylinders due to pressure intensification!

Notes:

Representation according to DIN ISO 1219-1.

Hydraulic interim positions are shown by dashes.

Types of actuation

Ordering codes			Type of actuation	
Symbol	**Actuating side**	**Spool return**	**P** (pneumatic)	**H** (hydraulic)
A, C, D				
		../O..		
		../OF..		
B, Y				
E, E1, F G, H J, L M, P Q, R T, U V, W	**"a" [1] = .A**			
	"b" [1] = .B			
				

[1] see symbols page 3.

Function, section

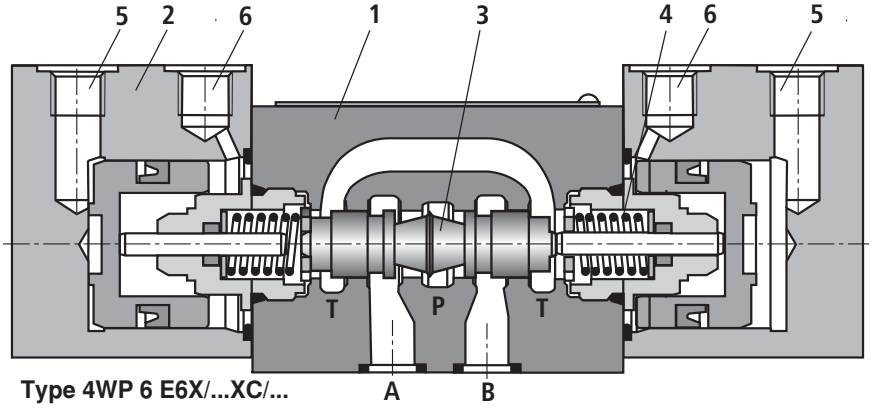
General

Valves of type WP ...XC and WH ...XC are fluidically operated directional spool valves. They control start, stop and direction of flow.

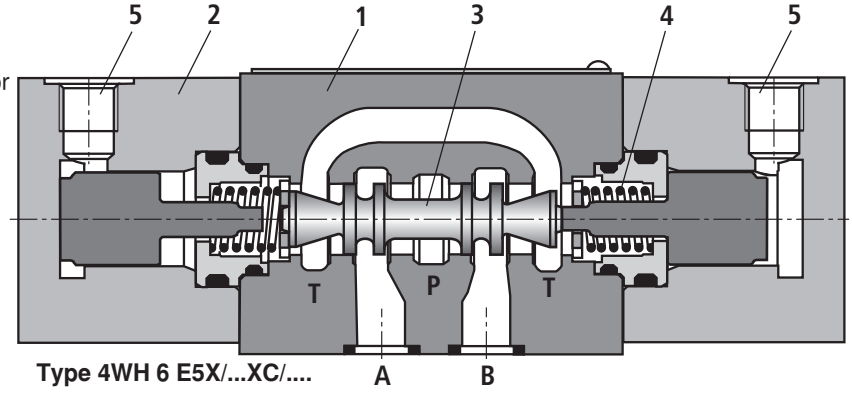
The directional valves basically consist of housing (1), one or two types of actuation (2) (hydraulic, pneumatic actuation cylinder), the control spool (3), and one or two return springs (4). The connections for the control are arranged radially (type WP) (5). The bleeding ports (6) must be connected and led to a place outside the potentially explosive area.

In the de-energized condition, the control spool (3) is held in the central or initial position by the return springs (4) (except for impulse spools).

The control spool (3) is moved to the desired spool position by means of the operating methods.



Type 4WP 6 E6X/...XC/...



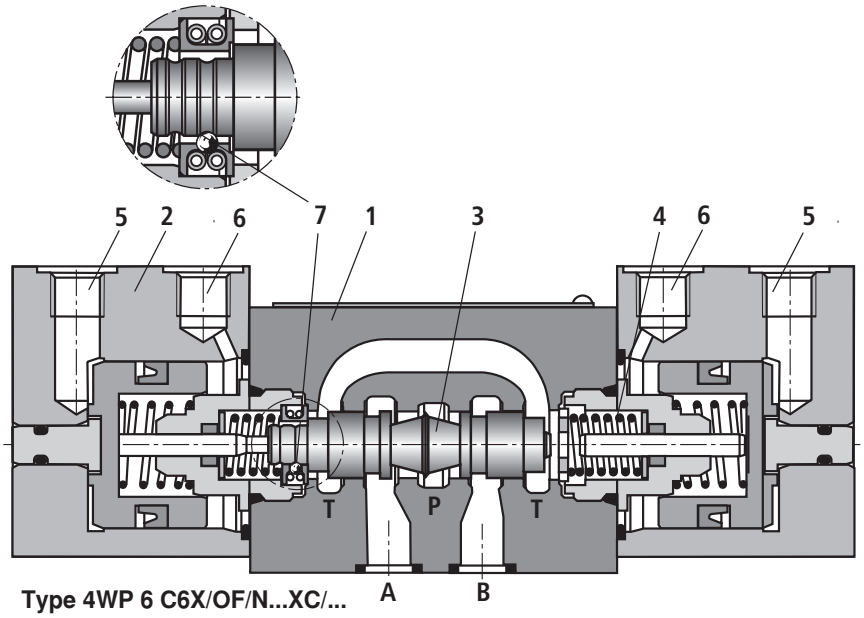
Type 4WH 6 E5X/...XC/....

Without spring return, with detent, version ..OF/..

Directional valves with hydraulic or pneumatic operation are also available as 2-spool position valve with detent (7). If actuation elements with detent are used, each spool position can be fixed.

Without spring return, version ..O/..

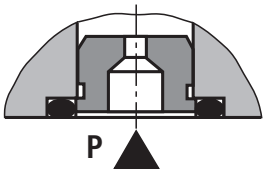
If actuation elements without return springs and without detent are used, there is no defined spool position in the non-operated condition.



Type 4WP 6 C6X/OF/N...XC/...

Throttle insert (version "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.



Technical data

general

Valve type			WP	WH
Weight	– Valve with one actuation cylinder	kg	approx. 1.8	approx. 2.0
	– Valve with two actuation cylinders	kg	approx. 2.0	approx. 2.2
Installation position			Any [1]	
Ambient temperature range		°C	–30 ... +80 (NBR seals) –20 ... +80 (FKM seals)	
Storage temperature range		°C	+5 … +40	
Maximum storage time		Years	1	
Surface protection			Galvanized	

hydraulics

Maximum operating pressure	– Ports A, B, P	bar	315	
	– Port T	bar	160 With symbols A or B, port T must be used as leakage oil connection if the operating pressure exceeds the admissible tank pressure. **2 bar minimum preload pressure required.**	
Maximum flow		l/min	60	
Flow cross-section (spool position 0)	– with symbol Q	mm^2	Approx. 6 % of nominal cross-section	
	– with symbol W	mm^2	Approx. 3 % of nominal cross-section	
Minimum pilot pressure [2]		bar	4 (see characteristic curve page 8)	6 … 10 > tank pressure [3]
Maximum pilot pressure [2]		bar	10	200
Pilot volume		cm^3	4.24	1.23
Hydraulic fluid			See table page 7	
Hydraulic fluid temperature range		°C	–30 ... +80 (NBR seals) –20 ... +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 [4]	
Maximum switching frequency		1/h	7200	
Maximum surface temperature		°C	See information on explosion protection, page 7	

[1] With version **../O..** (A, C, and D): horizontal

[2] With type WP: If possible, the control air must be free from oil and/or the oil share in the control air must be clearly below the explosion limit.

[3] Performance limits dependent on the minimum pilot pressure, see page 10

[4] 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.

Available filters can be found at www.boschrexroth.com/filter.

Technical data

Hydraulic fluid		Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	▶ Insoluble in water	HETG	NBR, FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Water-free	HFDU, HFDR	FKM	ISO 12922	90222
	▶ Containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	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 solenoid surface temperature.
- ▶ **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
  - – Life cycle as compared to operation with mineral oil HL, HLP 50 … 100 %

Information on explosion protection

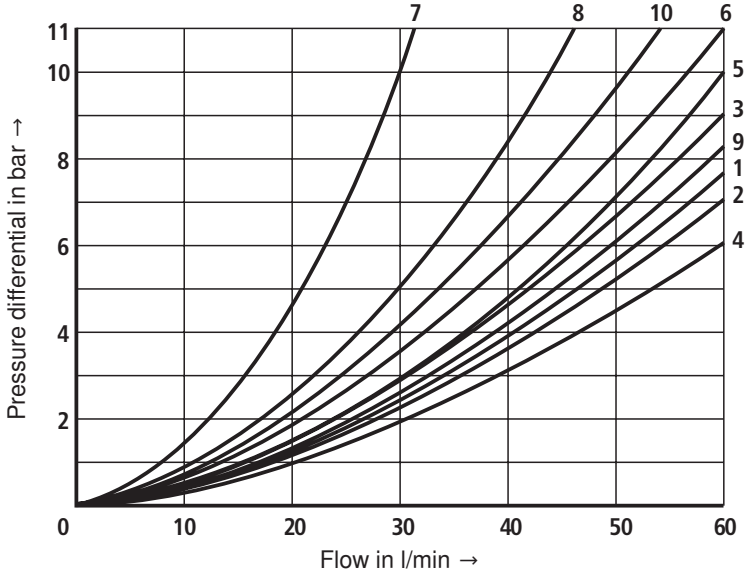
Area of application according to directive 2014/34/EU		IM2; II2G; II2D; II3G; II3D
Type of protection valve		c (EN 13463-5)
Maximum surface temperature [5; 6]	°C	100
Temperature class [5]		T4
Ambient temperature range	°C	–20 … +80

[5] The specified values refer to the maximum hydraulic fluid and ambient temperature. Due to a maximum pressure drop across the valve, the surface temperature exceeds the hydraulic fluid temperature by 20 K, i. e. using the valve in T6 is possible if the hydraulic fluid temperature and the ambient temperature do not exceed 60 °C.

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

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

Δp-q_V characteristic curves



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

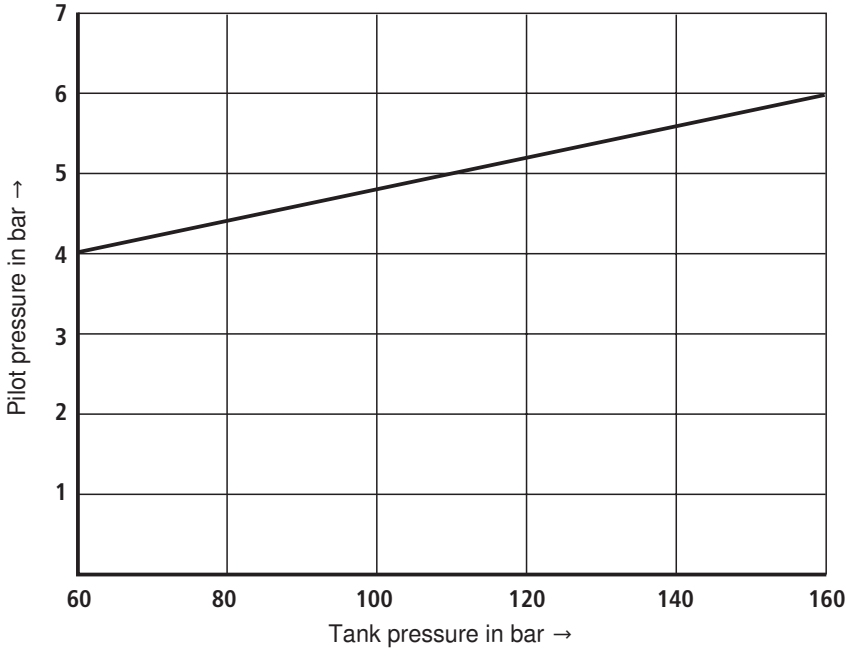
More characteristic curves:

7 Symbol "R" in spool position "b" (B → A)

8 Symbol "G" and "T" in central position (P → T)

9 Symbol "H" in central position (P → T)

Minimum pilot pressure dependent on the tank pressure



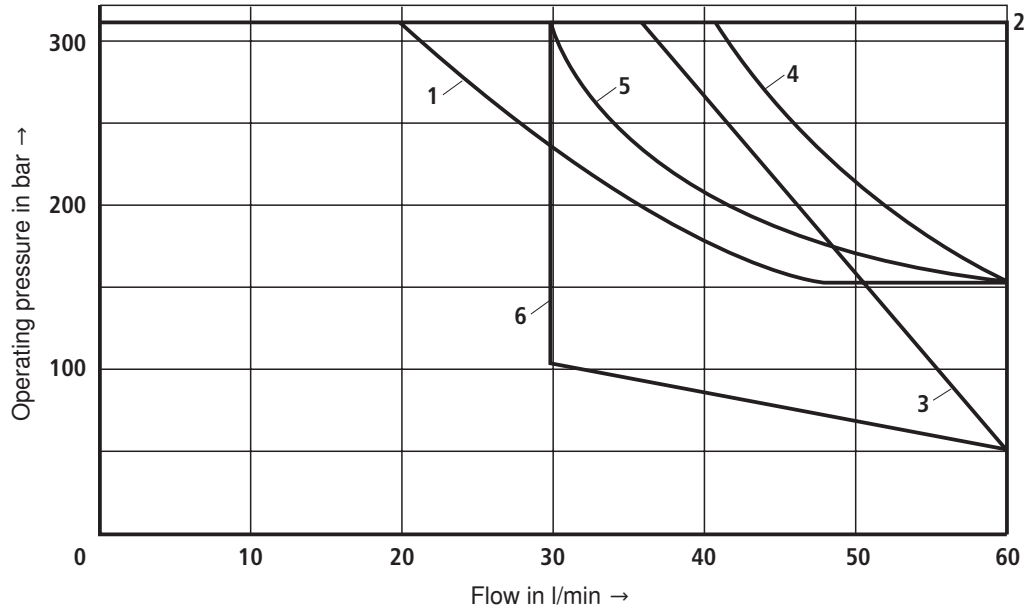
With higher tank pressures, the minimum pilot pressure must be raised according to this diagram.

Performance limits: Type WP ...XC (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Due to the adhesive effect, the switching function of the valves depends on the filtration. To achieve the specified admissible flow values, full flow filtration with 25 μm is recommended. The flow forces effective within the valves also influence the flow performance.

With 4-directional valves, the specified flow data is thus valid for the normal operation with 2 directions of flow (e.g. from P to A and simultaneous return from B to T) (see table).

If there is only one direction of flow, the admissible flow may be considerably less in critical cases (e.g. when using a 4-directional valve as 3-directional valve as port A or B is blocked).



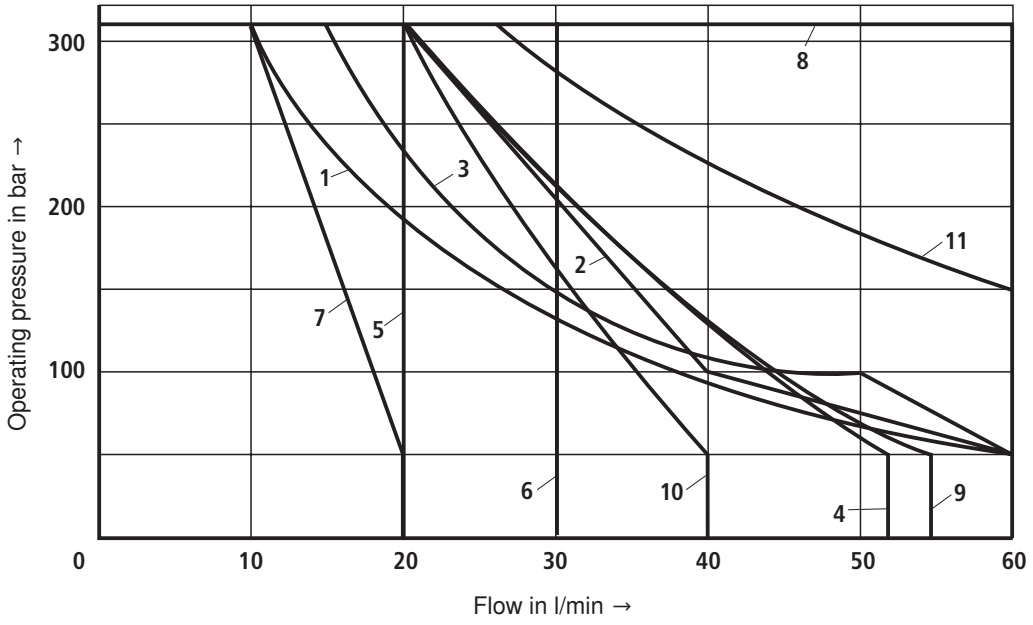
Characteristic curve	Symbol
1	A, B
2	A/O, C, C/O, D, D/O, E, E1-, G, H, J, L, M, Q, U, W, and Y
3	F, P
4	R
5	T
6	V

Performance limits: Type WH ...XC (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Due to the adhesive effect, the switching function of the valves depends on the filtration. To achieve the specified admissible flow values, full flow filtration with 25 μm is recommended. The flow forces effective within the valves also influence the flow performance.

With 4-directional valves, the specified flow data is thus valid for the normal operation with 2 directions of flow (e.g. from P to A and simultaneous return from B to T) (see table).

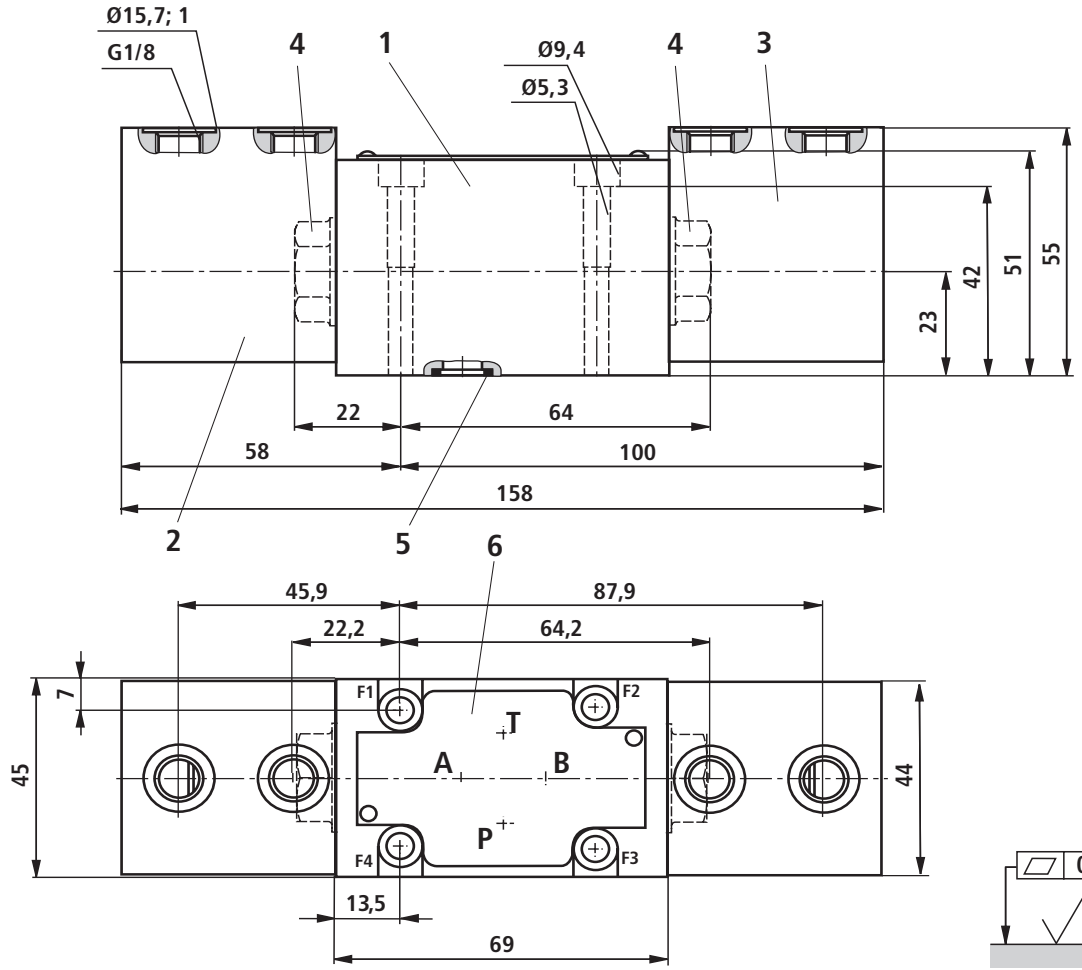
If there is only one direction of flow, the admissible flow may be considerably less in critical cases (e.g. when using a 4-directional valve as 3-directional valve as port A or B is blocked).

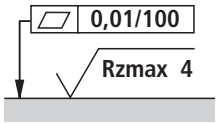


Pilot pressure 6 bar > tank pressure		
Spring return	**Characteristic curve**	**Symbol**
"no code" (with spring return)	1	A, B
	2	C, D, Y
	3	E, J, L, U, M, Q, V, W, E1-
	4	F, P
	5	T
	6	G, H
	7	R
../O..	8	A, C, D
../OF..		

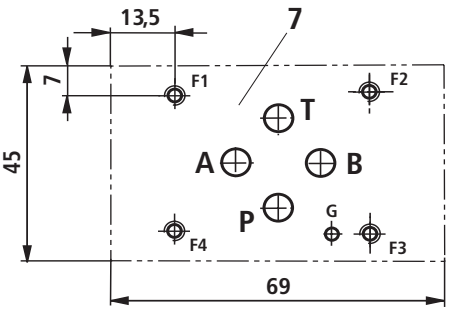
Pilot pressure 10 bar > tank pressure		
Spring return	**Characteristic curve**	**Symbol**
"no code" (with spring return)	1	A, B
	8	C, D, Y, E, G, H, J, L, U, M, Q, V, W, E1-
	9	F, P
	10	R
	11	T
../O..	8	A, C, D
../OF..		

Dimensions: Type WP ...XC (dimensions in mm)





Required surface quality of the valve contact surface



1 Valve with 2 spool positions and 2 actuation cylinders
Valve with 3 spool positions and 2 actuation cylinders
2 Actuation cylinder "a"
3 Actuation cylinder "b"
4 Plug screw for valve with 1 actuation cylinder (2 spool positions)
5 Identical seal rings for ports A, B, P, T
6 Name plate
7 Porting pattern according to ISO 4401-03-02-0-05 (with or without locating hole)

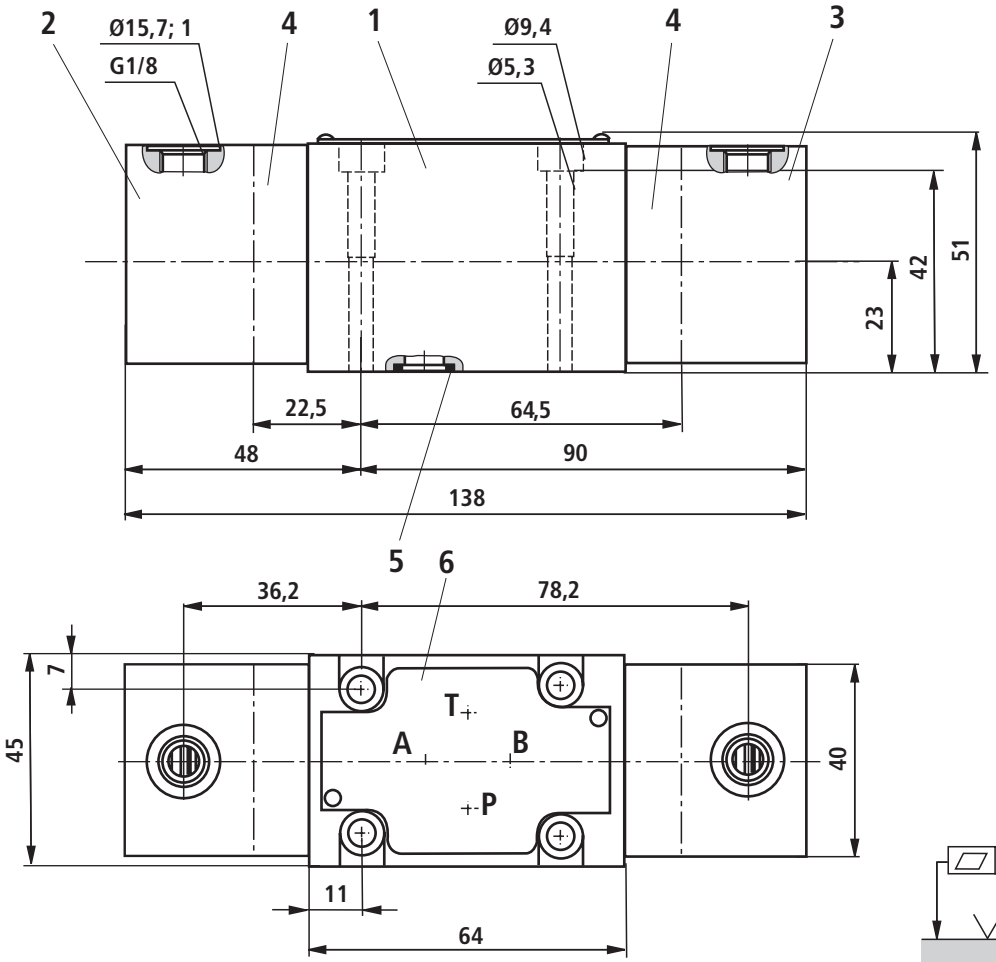
Valve mounting screws (separate order)
For reasons of stability, exclusively the following valve mounting screws are to be used:
4 hexagon socket head cap screws
ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
(friction coefficient 0.09 … 0.14 according to VDA 235-101)
Material no. **R913000064**

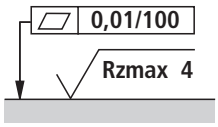
Subplates (separate order) with porting pattern according to ISO 4401-03-02-0-05 see data sheet 45100.

Notice:

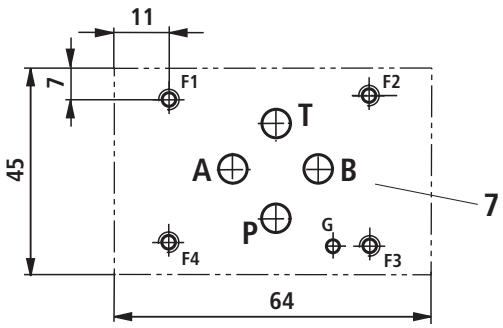
Subplates are no components in the sense of directive 2014/34/EU and can be used after the manufacturer of the overall system has conducted an assessment of the risk of ignition. The "G...J3" versions are free from aluminum and/or magnesium and galvanized.

Dimensions: Type WH ...XC (dimensions in mm)





Required surface quality of the valve contact surface



1 Valve with 2 spool positions and 2 actuation cylinders
Valve with 3 spool positions and 2 actuation cylinders

2 Actuation cylinder "a"

3 Actuation cylinder "b"

4 Cover for valve with 1 actuation cylinder (2 spool positions)

5 Identical seal rings for ports A, B, P, T

6 Name plate

7 Porting pattern according to ISO 4401-03-02-0-05 (with or without locating hole)

Valve mounting screws (separate order)
For reasons of stability, exclusively the following valve mounting screws are to be used:
4 hexagon socket head cap screws
ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
(friction coefficient 0.09 … 0.14 according to VDA 235-101)
Material no. **R913000064**

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 magnesium and galvanized.

Further information

Subplates	Data sheet 45100
Hydraulic fluids on mineral oil basis	Data sheet 90220
Environmentally compatible hydraulic fluids	Data sheet 90221
Flame-resistant, water-free hydraulic fluids	Data sheet 90222
Flame-resistant hydraulic fluids - containing water (HFAE, HFAS, HFB, HFC)	Data sheet 90223
Directional spool valves, direct operated, with fluidic actuation	Operating instructions 22282-XC-B
Selection of the filters	www.boschrexroth.com/filter
Information on available spare parts	www.boschrexroth.com/spc

Notes

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