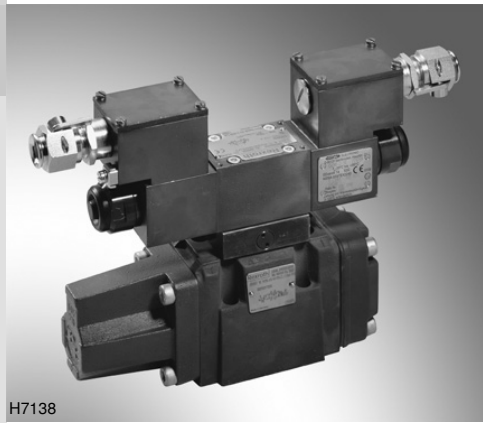
4/2, 4/3 proportional directional valves, pilot operated, without electrical position feedback

RE 29115-XE-B2/09.13
Replaces: 05.11

Type 4WRZ…XE...



Actual product may differ

Sizes 10, 16, 25, 32
Component series 7X
Maximum operating pressure 350 bar
Maximum flow 1600 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

Special features of seawater-resistant valves

- The exterior of the valve housing is galvanically coated.
- The seawater resistance is defined by "J" in the ordering code.

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 29115-XE-B2
Part III Product-specific instructions 29115-XE-B3

Operating instructions 29115-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

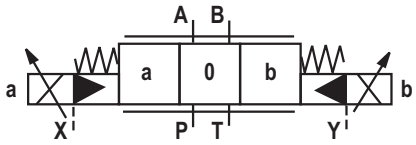
Features

- Pilot operated 2-stage proportional directional valves for controlling the flow direction and size
- Spring-centered control spool
- Actuation by means of the pilot control valve (3-way pressure reducing valve)
- Solenoid coil can be rotated by 90°
- For subplate mounting:
  Porting pattern according to ISO 4401 - … (information depending on the size)
  Subplates available in FE/ZN version (see pages 13 to 16)

Symbols (simplified)

with electrohydraulic actuation

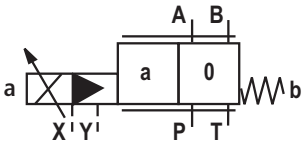
Type 4WRZ…-7X./…



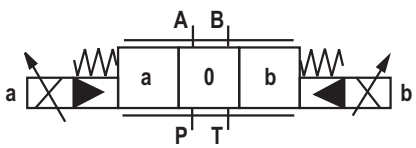
Pilot oil supply

X = external
Y = external

Type 4WRZ…A.-7X./…

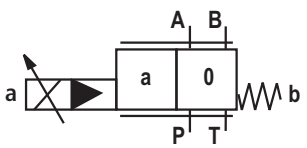


Type 4WRZ…-7X./…ET…



X = internal
Y = internal

Type 4WRZ…A.-7X./…ET…



Ordering code and scope of delivery

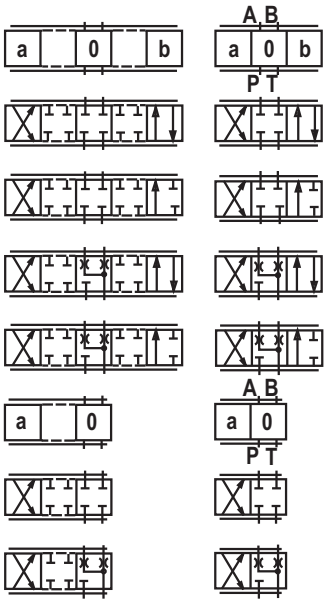
4WRZ			–	7X	/	6E	G24	XE	J		/	D3	

Electro-hydraulic actuation **= Z**

Size

Size 10	**= 10**
Size 16	**= 16**
Size 25	**= 25**
Size 32	**= 32**

Symbols



For control spools E1- and W8-:

P → A: $q_{V\,max}$ B → T: $q_V/2$

P → B: $q_V/2$ A → T: $q_{V\,max}$

For control spools E3- and W9-:

P → A: $q_{V\,max}$ B → T: Blocked

P → B: $q_V/2$ A → T: $q_{V\,max}$

(differential circuit, piston top at port A)

Important: In spool position "0", control spools W6-, W8-, W9-, W6A have a connection from A → T and B → T with approx. 2 % of the relevant nominal cross-section.

M = [1] NBR seals

V = FKM seals

Important: Observe compatibility of seals with hydraulic fluid used!

D3 = With pressure reducing valve (preset)

Pilot oil supply and return

no code = Pilot oil supply external, pilot oil return external

E = Pilot oil supply internal, pilot oil return external

ET = Pilot oil supply internal, pilot oil return internal

T = Pilot oil supply external, pilot oil return internal

For details, see page 17.

Surface protection

J = Seawater-resistant, galvanically coated

XE = Explosion protection, "increased safety", for details see information on the explosion protection, page 7

Supply voltage of the control electronics

G24 = 24 V direct voltage

6E = Proportional solenoid

7X = Component series 70 to 79 (70 to 79: Unchanged installation and connection dimensions)

Rated flow

25 =	25 l/min (size 10)
50 =	50 l/min (size 10)
85 =	85 l/min (size 10)
100 =	100 l/min (size 16)
150 =	150 l/min (size 16)
220 =	220 l/min (size 25)
325 =	325 l/min (size 25)
360 =	360 l/min (size 32)
520 =	520 l/min (size 32)

Characteristic curves, see pages 9 to 12

Included in the scope of delivery:

Valve operating instructions with declaration of conformity in Part III

[1] Suitable for mineral oils (HL, HLP) according to DIN 51524

Function, section

Pilot control valve type 3DREP 6…

The pilot control valve is a 3-way pressure reducing valve that is actuated by a proportional solenoid. It converts an electrical input signal into a proportional pressure output signal and is used for all valves type 4WRZ ...

The proportional solenoids are controllable wet-pin DC solenoids. The solenoids are actuated by external control electronics.

Set-up:

The valve basically consists of:

- Housing (1) with connection surface
- Control spool (2) with pressure measuring pins (3 and 4)
- Solenoids (5 and 6) with central thread

Functional description:

The pressure in A or B is set by means of the proportional solenoids. The amount of the pressure depends on the current.

With de-energized solenoids (5, 6), the control spool (2) is held in the central position by means of the compression springs (8). Ports A and B are connected with T so that the hydraulic fluid can flow off to the tank without obstructions.

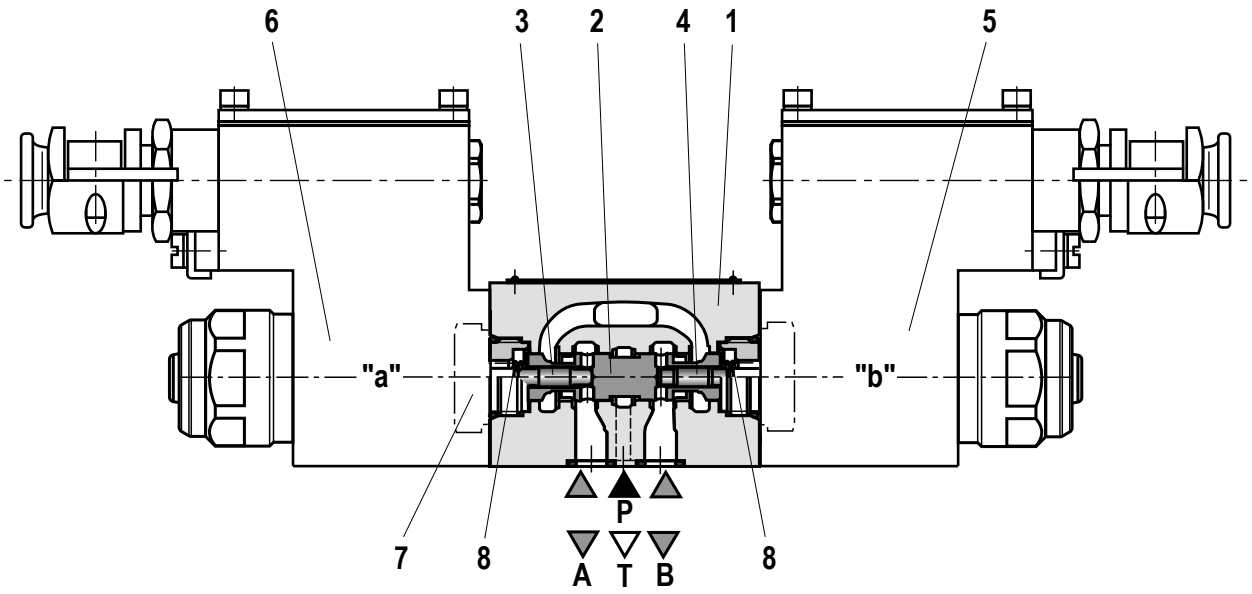
By actuating a proportional solenoid, e.g. solenoid "b" (5), the pressure measuring pin (4) and the control spool (2) with it are moved to the left. This opens the connection from P to A and B to T via orifice-type cross-sections with progressive flow characteristics. With the surface of the pressure measuring pin (3) the pressure that builds up in channel A acts on the control spool and against the solenoid force. The pressure measuring pin (3) is supported by the solenoid "a". If the pressure exceeds the value set at solenoid "b", the control spool (2) is pushed back against the solenoid force and connects A with T until the set pressure is achieved again. The pressure is proportional to the solenoid current.

When the solenoid is switched off, the control spool (2) is returned to the central position by the compression springs (8).

Important:

If valves version 3DREP 6 **C** are used, only one solenoid may be actuated at a time.

Type 3DREP 6..2X/..XE...



Valve with two spool positions

(type 3DREP 6…A…)

The function of this valve version basically corresponds to the valve with three spool positions. This 2 spool position valve is, however, only equipped with solenoid "b" (5). Instead of the 2nd proportional solenoid, there is a plug screw (7).

Important:

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.

Function, section

Pilot operated proportional directional valves

Type 4WRZ…-7X/..XE...

Valves of the type 4WRZ... are pilot operated 4-way directional valves that are actuated by means of proportional solenoids. Their function is to control the flow direction and size.

Set-up:

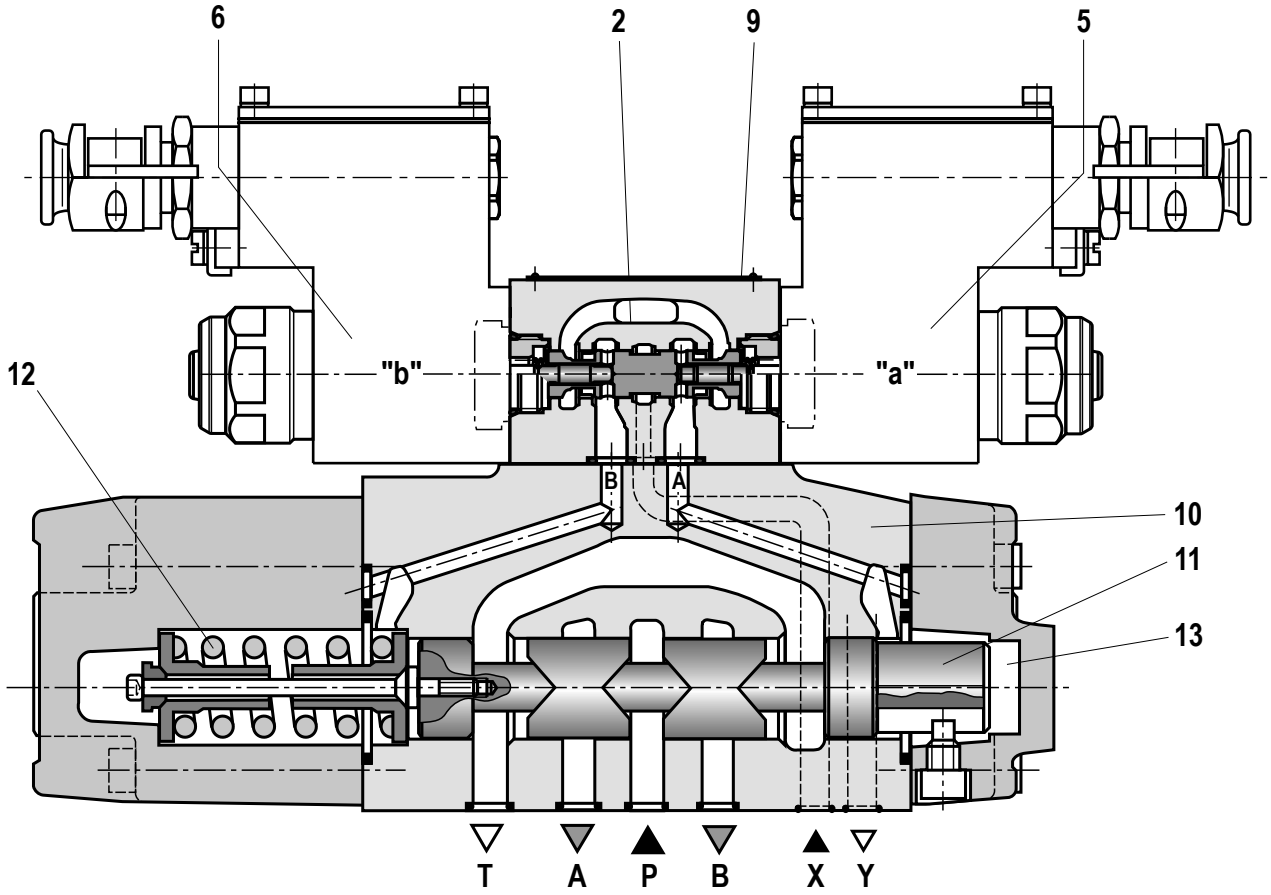
The valve basically consists of:

- Pilot control valve (9) with proportional solenoids (5 and 6)
- Main valve (10) with main control spool (11) and centering spring (12)

Functional description:

- With de-energized solenoids (5 and 6), the main control spool (11) is held in central position by means of a centering spring (12).
- Actuation of the main control spool (11) by means of the pilot control valve (9) – the main control spool is proportionally moved – e.g. actuation of solenoid "b" (6)
  - → Displacement of the control spool (2) to the right, pilot oil reaches the pressure chamber (13) pilot control valve (9) and displaces the main control spool (11) proportionally to the electrical input signal to the left
  - → Connection of P → A and B → T via orifice-type cross-sections with progressive flow characteristics
- Pilot oil supply to the pilot control valve internally via port P or externally via port X
- Switching off the solenoid (6)
  - → Control spool (2) and main control spool (11) are returned to central position
- Flow depending on spool position from P → A and B → T or P → B and A → T.

Type 4WRZ…-7X/..XE...



Technical data

general

Installation position			Any, preferably horizontal
Storage temperature range		°C	–20 … +50
Ambient temperature range		°C	–20 … +60
Weight, maximum	Size 10	kg	10
	Size 16	kg	16
	Size 25	kg	21
	Size 32	kg	45
Surface protection			Galvanized coating

hydraulic

Size		Size	**10**	**16**	**25**	**32**
Operating pressure range						
Pilot control valve	Pilot oil supply external or internal	bar	30 … 315	30 … 350	30 … 350	30 … 350
Main valve		bar	Up to 315	Up to 350	Up to 350	Up to 350
Return flow pressure	Port T (external pilot oil return)	bar	Up to 315	Up to 250	Up to 250	Up to 150
	Port T (internal pilot oil return)	bar	Up to 30	Up to 30	Up to 30	Up to 30
	Port Y	bar	Up to 30	Up to 30	Up to 30	Up to 30
Pilot volume for switching process 0 → 100 %		cm^3	1.7	4.6	10	26.5
Pilot flow at port X and Y with stepped input signal 0 → 100 %		l/min	3.5	5.5	7	15.9
Flow of the main valve		l/min	Up to 170	Up to 460	Up to 870	Up to 1600
Hydraulic fluid			Mineral oil (HL, HLP) according to DIN 51524 Additional hydraulic fluids upon request! Ignition temperature > 180 °C			
Hydraulic fluid temperature range		°C	–20 ... +80 (NBR seals)			
		°C	–15 ... +80 (FKM seals)			
Viscosity range		mm^2/s	20 ... 380 (preferably 30 ... 46)			
Maximum admissible degree of contamination of the hydraulic fluid						
Cleanliness class according to ISO4406 (c)	Pilot control valve		Class 17/15/12 [1)]			
	Main valve		Class 18/16/13 [1)]			
Hysteresis		%	≤ 6			

[1)] 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 current or pulse-width modulated signal with a pulse voltage ≤ 28 V and a frequency ≥ 160 Hz up to max. 500 Hz
Type of signal		Analog
Maximum current per solenoid	A	1.03
Duty cycle	%	100
Coil temperature	°C	Up to 125

Information on the explosion protection

Area of application in accordance with the Explosion Protection Directive 94/9/EC	II 2G
Type of protection Valve according to EN 13463-1:2009 / EN 13463-5:2011	c T4 X
Type of protection Valve solenoid according to EN 60079-7:2007 / EN 60079-18:2009	Ex e mb IIC T4 Gb [1]
Type examination certificate Solenoid	KEMA 02ATEX2240 X
"IECEx Certificate of Conformity" Solenoid	IECEx DEK 12.0068X
Special operating conditions for a safe application	– In case of bank assembly, only one solenoid of all valves may be energized at a time. – In case of valves with two solenoids, maximally one of the solenoids may be energized at a time. – Only direct current or a pulse-width modulated signal with a pulse voltage ≤ 28 V and frequency ≥ 160 Hz up to max. 500 Hz may be used.

Control electronics [2]

Amplifier module for the control of explosion-proof proportional directional valves 4WRA...XE, 3DREP 6...XE and 4WRZ...XE	VT-MSPA2-200-1X/V0/0 according to data sheet 30228-200
Module for monitoring and limiting the solenoid currents with proportional valves	VT-MUXA2-2-1X/V0/1A according to data sheet 30290

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

[2] **Important:**

A monitoring circuit is to be provided for the monitoring of the solenoid current. We recommend operating the valves with the assemblies described herein.

Electrical connection

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

The connection is polarity-independent.

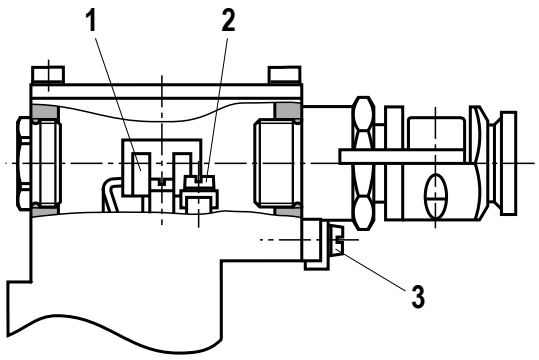
Important:

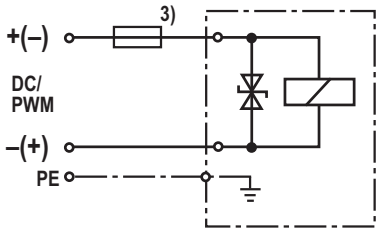
Corresponding to the rated current, a fuse according to DIN 41571 and EN / IEC 60127 has to be connected ahead of every valve solenoid (max. 3 x I_{rated}).

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.





Suppressor diode
47 V, 1.5 kW

[3] Recommended pre-fuse
Characteristics medium time-lag according to DIN 41571, 1.25 A

Properties of the connection terminals

Position	Function	Connectable line cross-section
1	Operating voltage connection	Single-wire 0.75 … 2.5 mm²
		Finely stranded 0.75 … 1.5 mm²
2	Connection for protective earthing conductor	Single-wire max. 2.5 mm²
		Finely stranded max. 1.5 mm²
3	Connection for potential equalization conductor	Single-wire 4 … 6 mm²
		Finely stranded 4 mm²

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

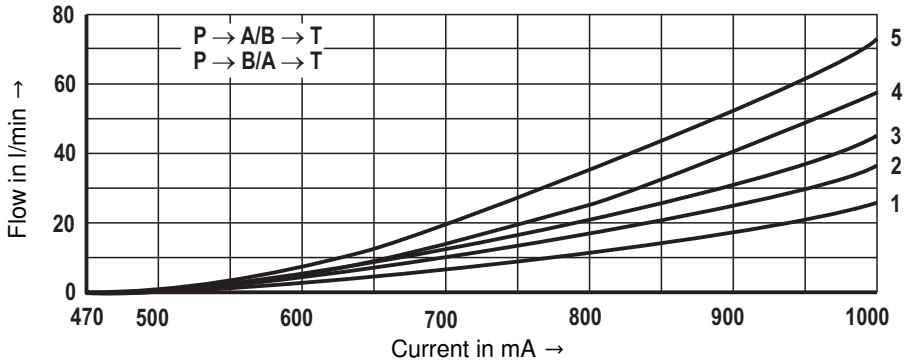
[1] If installed properly

Characteristic curves size 10

(measured with control spools E, W6-, EA, W6A as well as HLP46, ϑ_{oil} = 40 °C ± 5 °C)

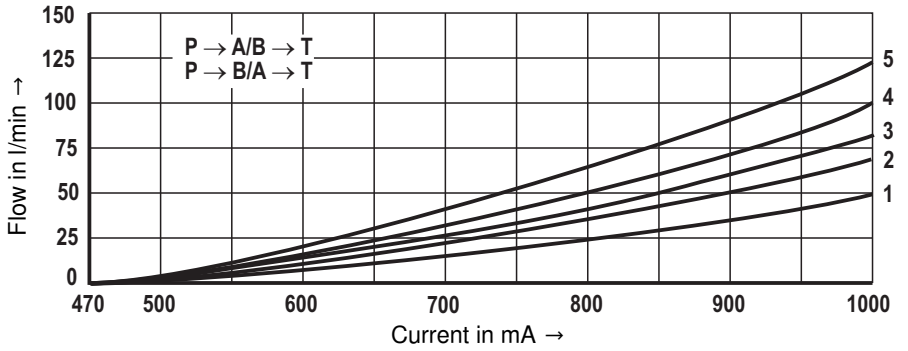
Ordering code 25: Flow

1 Δp = 10 bar constant
2 Δp = 20 bar constant
3 Δp = 30 bar constant
4 Δp = 50 bar constant
5 Δp = 100 bar constant



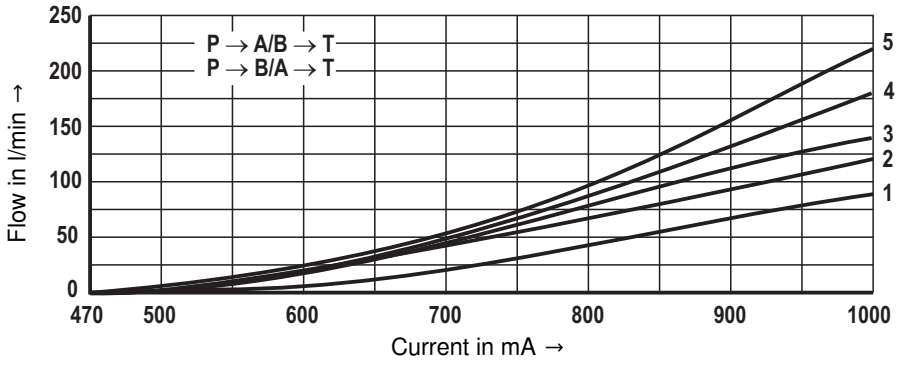
Ordering code 50: Flow

1 Δp = 10 bar constant
2 Δp = 20 bar constant
3 Δp = 30 bar constant
4 Δp = 50 bar constant
5 Δp = 100 bar constant



Ordering code 85: Flow

1 Δp = 10 bar constant
2 Δp = 20 bar constant
3 Δp = 30 bar constant
4 Δp = 50 bar constant
5 Δp = 100 bar constant

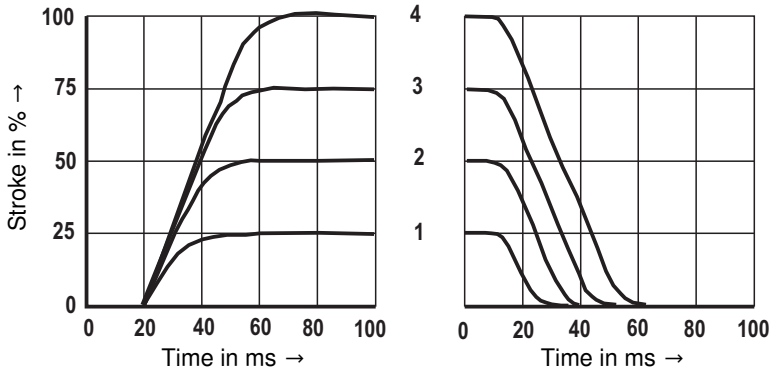


Δp = valve pressure differential according to DIN 24311 (inlet pressure p_P minus load pressure p_L minus return flow pressure p_T)

Transition function with stepped electric input signals

	Change of input signal [%]
1	0 → 25 → 0
2	0 → 50 → 0
3	0 → 75 → 0
4	0 → 100 → 0

Measured at pilot pressure
p_{ST} = 50 bar

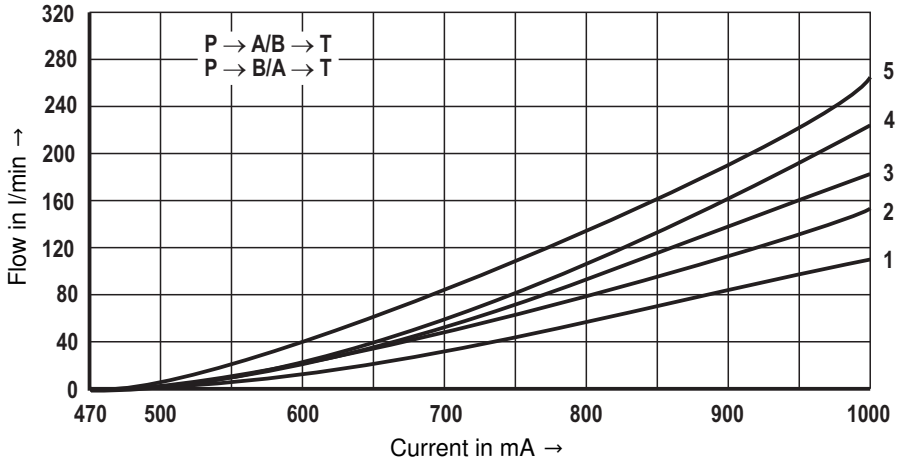


Characteristic curves size 16

(measured with control spools E, W6-, EA, W6A as well as HLP46, ϑ_{oil} = 40 °C ± 5 °C)

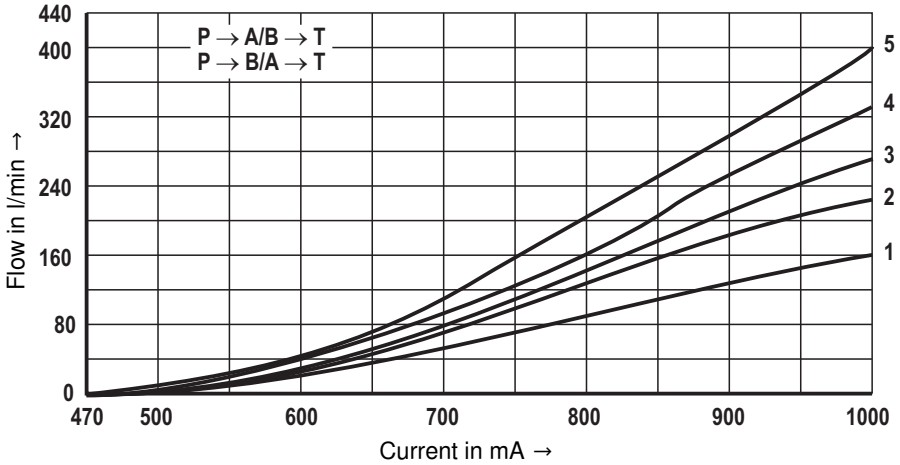
Ordering code 100: Flow

1 Δp = 10 bar constant
2 Δp = 20 bar constant
3 Δp = 30 bar constant
4 Δp = 50 bar constant
5 Δp = 100 bar constant



Ordering code 150: Flow

1 Δp = 10 bar constant
2 Δp = 20 bar constant
3 Δp = 30 bar constant
4 Δp = 50 bar constant
5 Δp = 100 bar constant

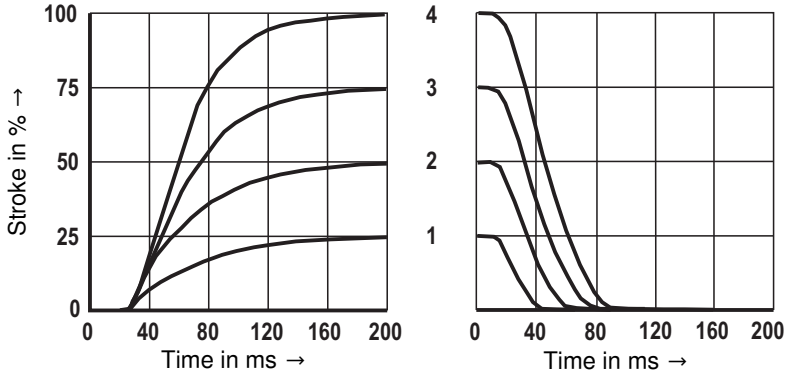


Δp = valve pressure differential according to DIN 24311 (inlet pressure p_P minus load pressure p_L minus return flow pressure p_T)

Transition function with stepped electric input signals

	Change of input signal [%]
1	0 → 25 → 0
2	0 → 50 → 0
3	0 → 75 → 0
4	0 → 100 → 0

Measured at pilot pressure
p_{ST} = 50 bar

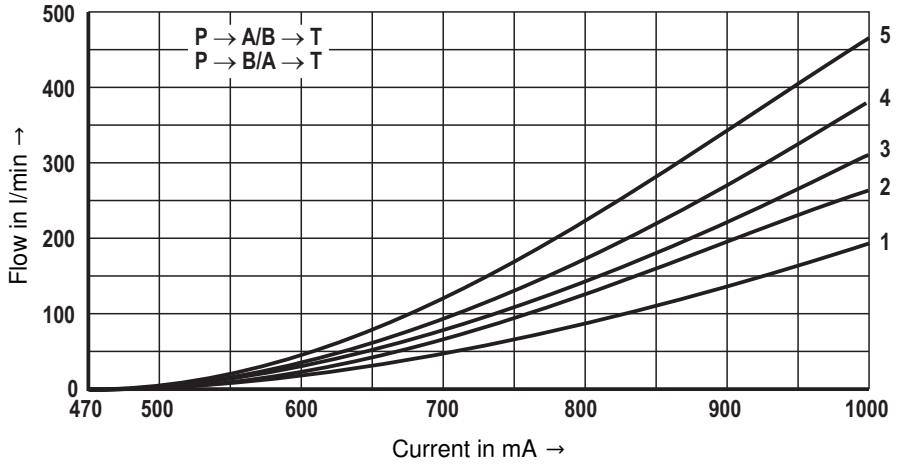


Characteristic curves size 25

(measured with control spools E, W6-, EA, W6A as well as HLP46, ϑ_{oil} = 40 °C ± 5 °C)

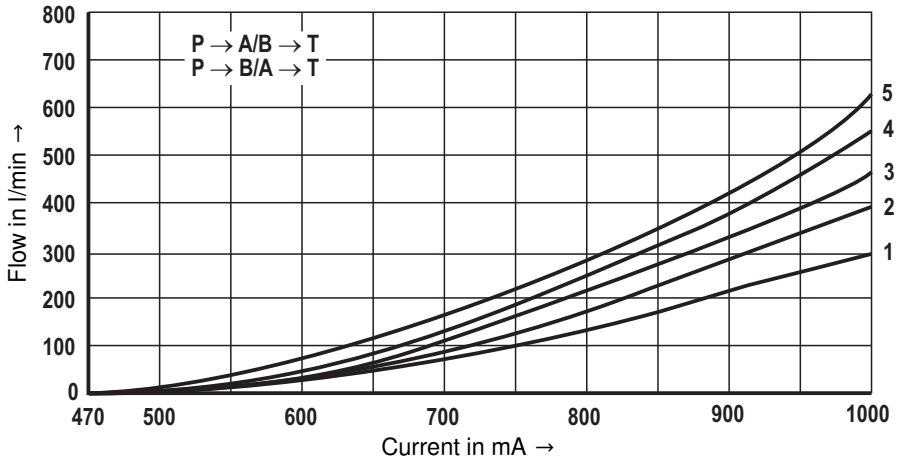
Ordering code 220: Flow

1 Δp = 10 bar constant
2 Δp = 20 bar constant
3 Δp = 30 bar constant
4 Δp = 50 bar constant
5 Δp = 100 bar constant



Ordering code 325: Flow

1 Δp = 10 bar constant
2 Δp = 20 bar constant
3 Δp = 30 bar constant
4 Δp = 50 bar constant
5 Δp = 100 bar constant

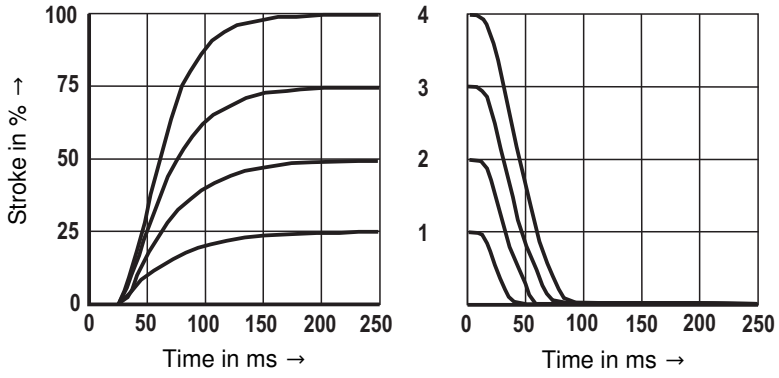


Δp = valve pressure differential according to DIN 24311 (inlet pressure p_P minus load pressure p_L minus return flow pressure p_T)

Transition function with stepped electric input signals

	Change of input signal [%]
1	0 → 25 → 0
2	0 → 50 → 0
3	0 → 75 → 0
4	0 → 100 → 0

Measured at pilot pressure
p_{ST} = 50 bar

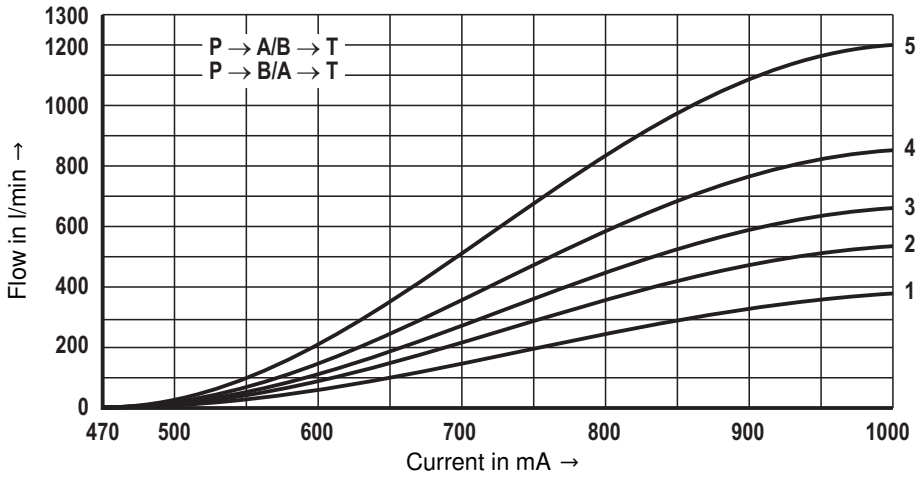


Characteristic curves size 32

(measured with control spools E, W6-, EA, W6A as well as HLP46, ϑ_{oil} = 40 °C ± 5 °C)

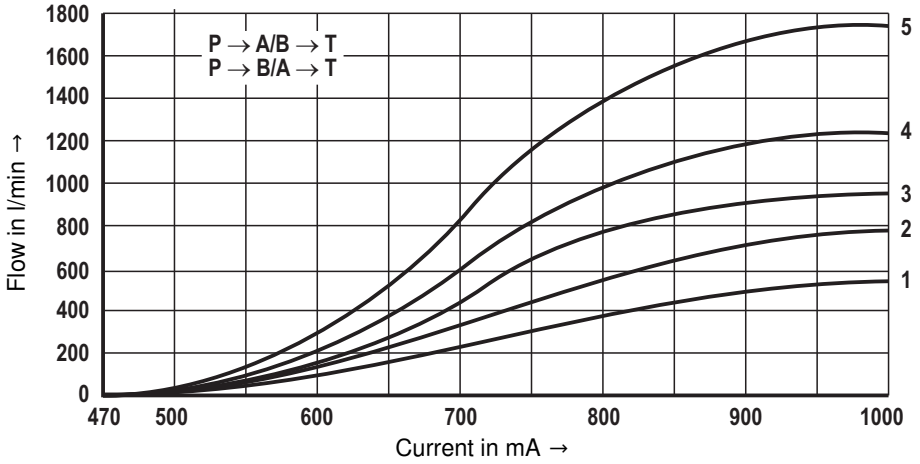
Ordering code 360: Flow

1 Δp = 10 bar constant
2 Δp = 20 bar constant
3 Δp = 30 bar constant
4 Δp = 50 bar constant
5 Δp = 100 bar constant



Ordering code 520: Flow

1 Δp = 10 bar constant
2 Δp = 20 bar constant
3 Δp = 30 bar constant
4 Δp = 50 bar constant
5 Δp = 100 bar constant

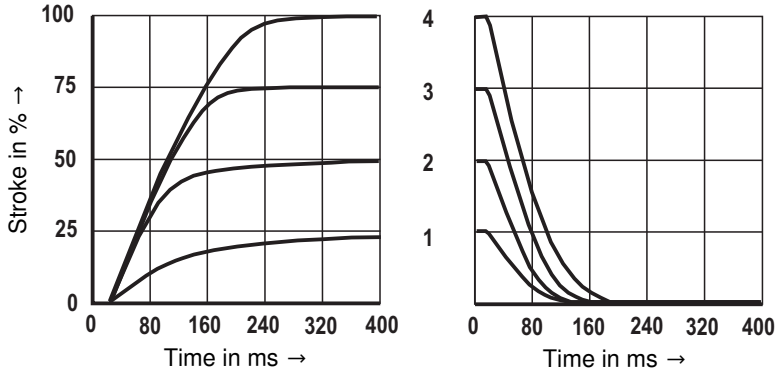


Δp = valve pressure differential according to DIN 24311 (inlet pressure p_P minus load pressure p_L minus return flow pressure p_T)

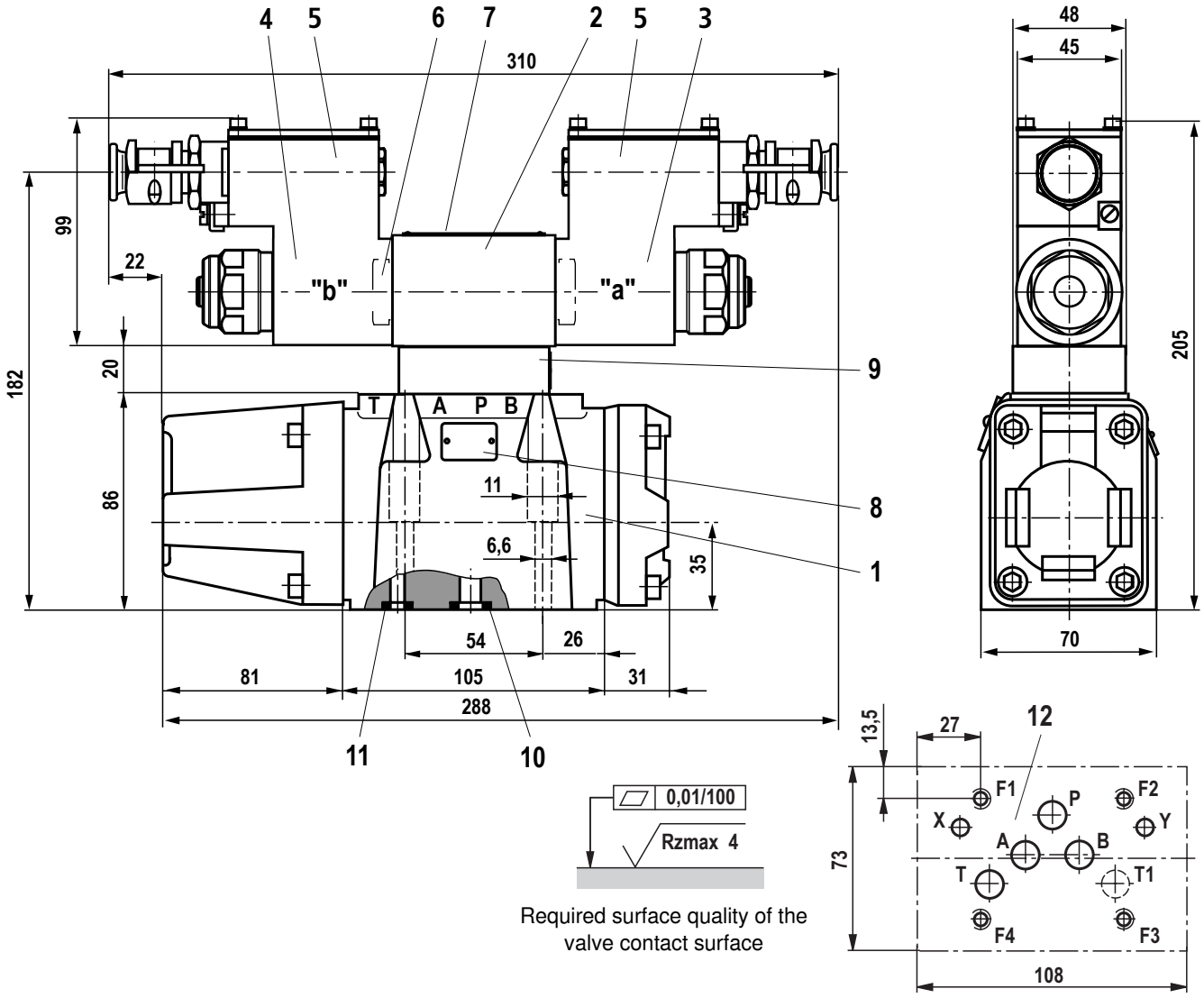
Transition function with stepped electric input signals

	Change of input signal [%]
1	0 → 25 → 0
2	0 → 50 → 0
3	0 → 75 → 0
4	0 → 100 → 0

Measured at pilot pressure
p_{ST} = 50 bar



Dimensions size 10 (dimensions in mm)



Required surface quality of the valve contact surface

1 Main valve
2 Pilot control valve
3 Proportional solenoid "a"
4 Proportional solenoid "b"
5 Terminal box
6 Plug screw for valves with one solenoid
7 Name plate for pilot control valve
8 Name plate for main valve
9 Pressure reducing valve (always available)
10 Identical seal rings for ports P, A, B, T and T1
11 Identical seal rings for X and Y
12 Machined valve contact surface, porting pattern according to ISO 4401-05-05-0-05 (X, Y as required, T1 is available at the valve and can optionally be provided)

Deviating from the standard:
- Locating pin not available

Subplates

G 534/01 FE/ZN (G3/4) **without** ports X and Y
G 535/01 FE/ZN (G3/4) **with** ports X and Y
G 536/01 FE/ZN (G1) **with** ports X and Y

with dimensions as in the data sheet 45054 must be ordered separately.

Valve mounting screws

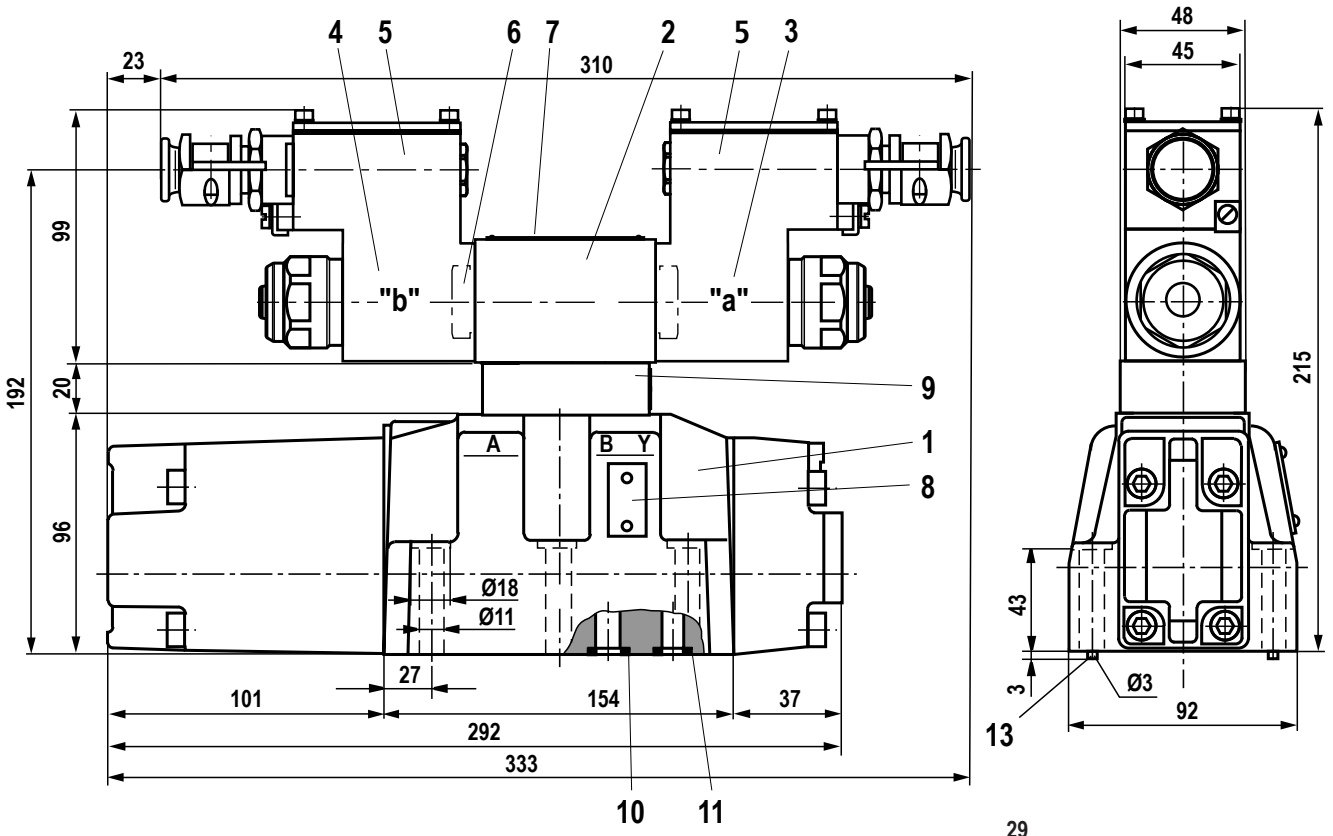
For reasons of stability, exclusively use the following valve mounting screws:
4 hexagon socket head cap screws
ISO 4762-M6x45-10.9-flZn-240h-L
(friction coefficient total: 0.09-0.14 according to VDA 235-101)
(must be ordered separately)

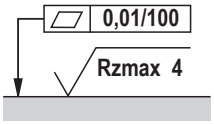
Important:

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.

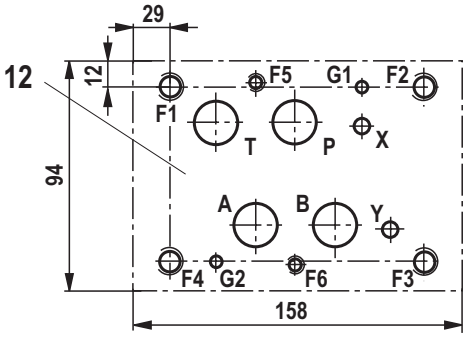
The G...FE/ZN versions are free from aluminum and/or magnesium and galvanized.

Dimensions size 16 (dimensions in mm)





Required surface quality of the valve contact surface



1 Main valve
2 Pilot control valve
3 Proportional solenoid "a"
4 Proportional solenoid "b"
5 Terminal box
6 Plug screw for valves with one solenoid
7 Name plate for pilot control valve
8 Name plate for main valve
9 Pressure reducing valve (always available)
10 Identical seal rings for ports P, A, B and T
11 Identical seal rings for X and Y
12 Machined valve contact surface valve contact face, porting pattern according to ISO 4401-07-07-0-05 (X, Y as required)
Deviating from the standard:
– Ports P, A, B and T with Ø 20 mm
13 Locating pin

Subplates

G 172/01 FE/ZN (G3/4) G 172/02 FE/ZN (M27 x 2)
G 174/01 FE/ZN (G1)
G 174/02 FE/ZN (M33 x 2) G 174/08 FE/ZN (flange)

with dimensions as in the data sheet 45056 must be ordered separately.

Valve mounting screws

For reasons of stability, exclusively use the following valve mounting screws:

2 hexagon socket head cap screws
ISO 4762-M6x60-10.9-flZn-240h-L
(friction coefficient total: 0.09-0.14 according to VDA 235-101)
(must be ordered separately)

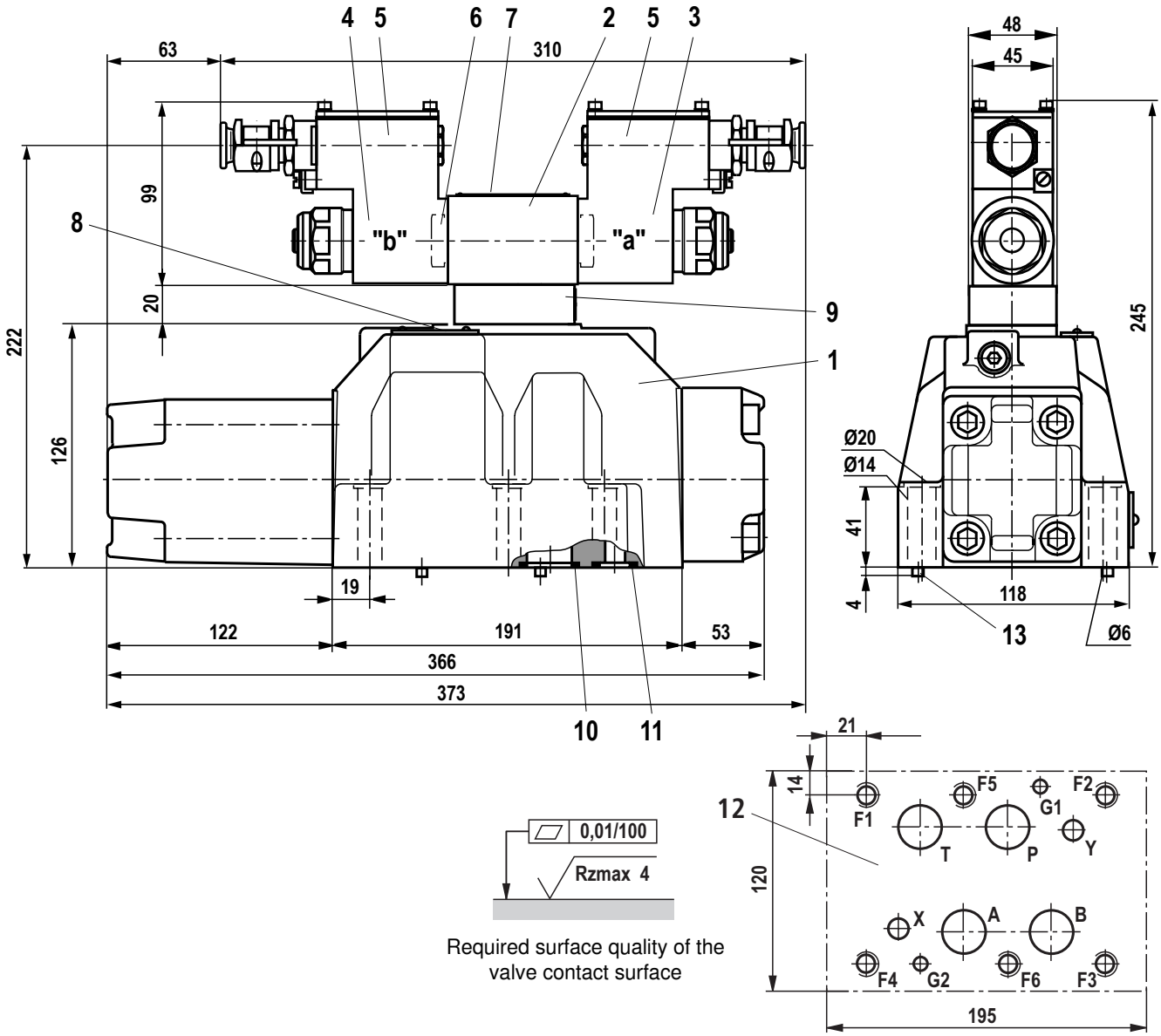
4 hexagon socket head cap screws
ISO 4762-M10x60-10.9-flZn-240h-L
(total friction coefficient: 0.09-0.14 according to VDA 235-101)
(must be ordered separately)

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.

Dimensions size 25 (dimensions in mm)



Required surface quality of the valve contact surface

1 Main valve
2 Pilot control valve
3 Proportional solenoid "a"
4 Proportional solenoid "b"
5 Terminal box
6 Plug screw for valves with one solenoid
7 Name plate for pilot control valve
8 Name plate for main valve
9 Pressure reducing valve (always available)
10 Identical seal rings for ports P, A, B and T
11 Identical seal rings for X and Y
12 Machined valve contact surface, porting pattern according to ISO 4401-08-08-0-05 (X, Y as required)
13 Locating pin

Subplates

G 151/01 FE/ZN (G1)
G 154/01 FE/ZN (G1 1/4) G 154/08 FE/ZN (flange)
G 156/01 FE/ZN (G1 1/2)

with dimensions as in the data sheet 45058 must be ordered separately.

Valve mounting screws

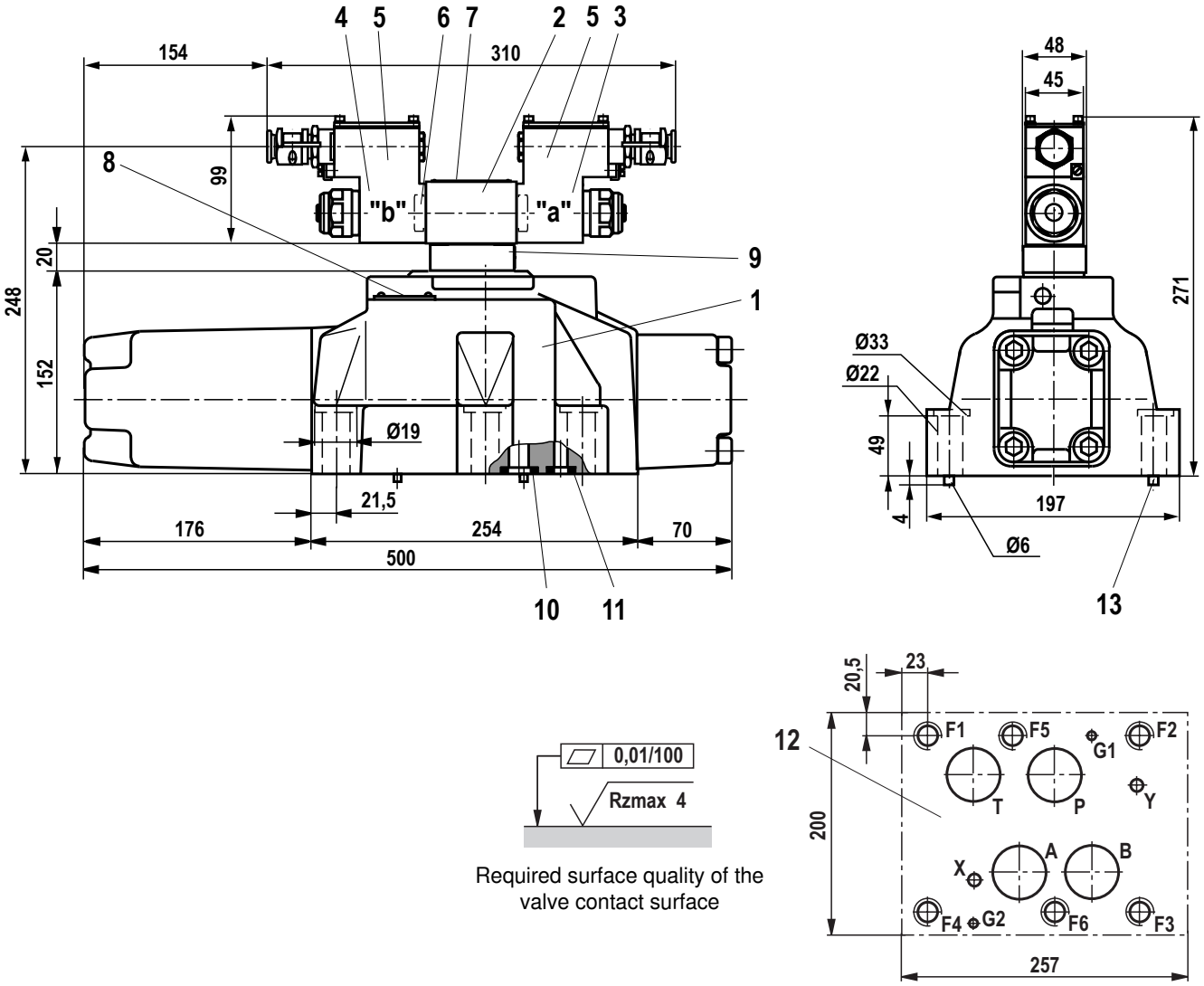
For reasons of stability, exclusively use the following valve mounting screws:
6 hexagon socket head cap screws
ISO 4762-M12x60-10.9-flZn-240h-L
(friction coefficient total: 0.09-0.14 according to VDA 235-101)
(must be ordered separately)

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.

Dimensions size 32 (dimensions in mm)



Required surface quality of the valve contact surface

1 Main valve
2 Pilot control valve
3 Proportional solenoid "a"
4 Proportional solenoid "b"
5 Terminal box
6 Plug screw for valves with one solenoid
7 Name plate for pilot control valve
8 Name plate for main valve
9 Pressure reducing valve (always available)
10 Identical seal rings for ports P, A, B and T
11 Identical seal rings for X and Y
12 Machined valve contact surface, porting pattern according to ISO 4401-10-09-0-05 (X, Y as required)
Deviating from the standard:
– Ports P, A, B and T with Ø 38 mm
13 Locating pin

Subplates

G 157/01 FE/ZN (G1 1/2)
G 157/02 FE/ZN (M48 x 2)
G 158/10 FE/ZN (flange)

with dimensions as in the data sheet 45060 must be ordered separately.

Valve mounting screws

For reasons of stability, exclusively use the following valve mounting screws:
6 hexagon socket head cap screws
ISO 4762-M20x80-10.9-flZn-240h-L
(friction coefficient total: 0.09-0.14 according to VDA 235-101)
(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.

Pilot oil supply

Type 4WRZ…-…/…

Pilot oil supply external
Pilot oil return external

In this version, the pilot oil is supplied from a separate pilot circuit (external).

The pilot oil return is not directed into the T channel of the main valve, but is separately directed to the tank via port Y (external).

Type 4WRZ…-…/…E…

Pilot oil supply internal
Pilot oil return external

In this version, the pilot oil is supplied via the P channel of the main valve (internal).

The pilot oil return is not directed into the T channel of the main valve, but is separately directed to the tank via port Y (external).

In the subplate, port X is to be closed.

Type 4WRZ…-…/…ET…

Pilot oil supply internal
Pilot oil return internal

In this version, the pilot oil is supplied via the P channel of the main valve (internal).

The pilot oil is directly returned to channel T of the main valve (internal).

In the subplate, ports X and Y are to be closed.

Type 4WRZ…-…/…T…

Pilot oil supply external
Pilot oil return internal

In this version, the pilot oil is supplied from a separate pilot circuit (external).

The pilot oil is directly returned to channel T of the main valve (internal).

In the subplate, port Y is to be closed.

Notes

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Notes

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