

4WRZ(E)

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

Nominal sizes: 10, 16, 25, 32

Series: 7X

Maximum operating pressure: 350bar

Maximum flow: 1600L/min



Overview of contents

Contents
 Features
 Ordering details code
 Symbols
 Function, section
 Technical data
 Electrical connection
 Characteristic curves
 Unit dimensions

Features

- 1 - Pilot operated 2-stage proportional directional valve for the control of direction and rate of flow without electrical position feedback
- 1 - Proportional solenoid operation, with central thread and removable coil
- 3 - Hand override, optional
- 4 - For subplate mounting: Porting pattern according to ISO 4401
- 6 - Control electronics for type 4WRZ: electrical amplifier RT-PSDM2 or RT-MSPD2-30 or RT-PSDM2 in modular format(separate order)
- 7 - Type 4WRZE with integrated control electronics, interface A1 or F1
- 9 - It is interchangeable with the sametype of products in Europe and the United States.
- 14

Ordering code

4WRZ	E	16	E	125	-	7X	/		6E	G24	N9		ET	K31	A1	D3	M	*
01	02	03	04	05		06		07	08	09	10	11	12	13	14	15	16	17

01	4WRZ	4/3 proportional directional valves, pilot operated, without electrical position feedback
02	No code	Without integrated electronics
	E	With integrated electronics
03	10	NS 10
	16	NS 16
	25	NS 25
	32	NS 32

Symbols

04	E	E, E1-, E3-, W6-, W8-, W9- See hydraulic symbol table for details
----	----------	---

Nominal flow in L/m with valve pressure drop $\Delta p = 5$ bar

05	25	25 L/min	NS 10
	50	50 L/min	
	85	85 L/min	
	100	100 L/min	NS 16
	125	125 L/min	
	150	150 L/min	
	180	180 L/min	NS 25
	220	220 L/min	
	325	325 L/min	
	360	360 L/min	NS 32
	520	520 L/min	

4WRZ	E	16	E	125	-	7X	/		6E	G24	N9		ET	K31	A1	D3	M	*
01	02	03	04	05		06		07	08	09	10	11	12	13	14	15	16	17

06	7X	Series 70 to 79 (70 to 79: unchanged installation and mounting dimensions)
07	No code	For subplate mounting
08	6E	Proportional solenoid with removable coil
09	G24	24V DC (standard version)
10	No code	Without hand override
	N9	With protected hand override
11	No code	Without special protection

Pilot oil supply and drain

12	No code	Pilot oil supply external, Pilot oil drain external
	E	Pilot oil supply internal, Pilot oil drain external
	ET	Pilot oil supply internal, Pilot oil drain internal
	T	Pilot oil supply external, Pilot oil drain internal

Electrical connection

13	K4	Sockets conforming to DIN EN 175301-803 (plugs need to be ordered separately), see page 7	4WRZ
	K31	7 pin sockets conforming to DIN EN 175201-804 (plugs need to be ordered separately), see page 7	4WRZE

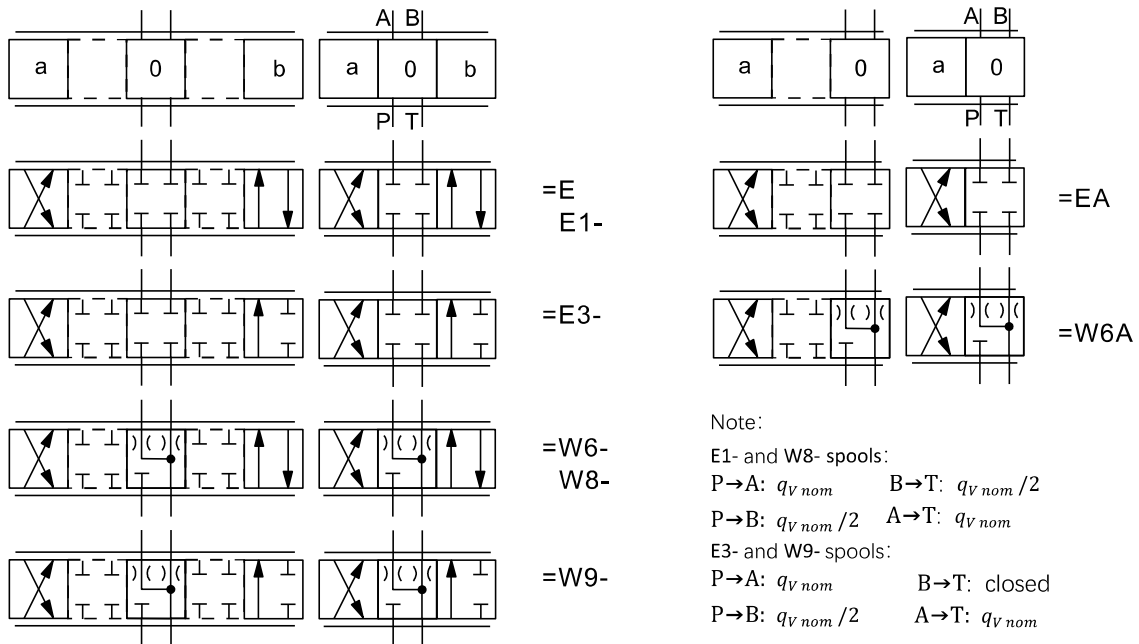
Command value

14	A1	Command value input ± 10 V
	F1	Command value input 4 to 20 mA
15	No code	Without pressure reducing valve
	D3	With pressure reducing valve ZDR6DP0-4X/40YM-W80 (fixed setting)

Sealing material

16	M	NBR seals
	V	FKM seals
17	*	Further details in clear text

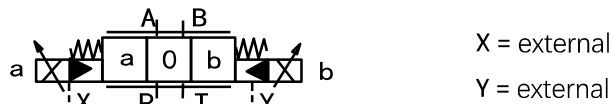
Symbols (Detailed)



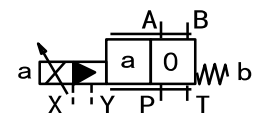
Symbols (simplified)

With electro-hydraulic actuation and for external electronics, type 4WRZ...-7X

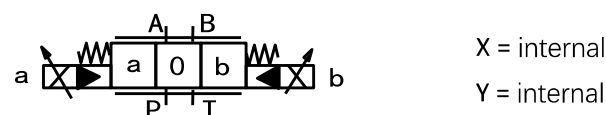
Type 4WRZ...-7X



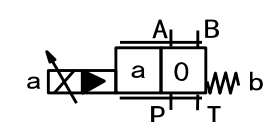
Type 4WRZ...A-7X



Type 4WRZ...-7X/...ET...

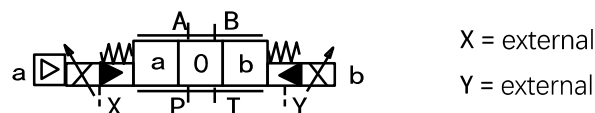


Type 4WRZ...A-7X/...ET...

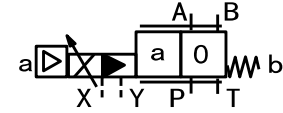


With electro-hydraulic actuation and for integrated electronics, type 4WRZE...

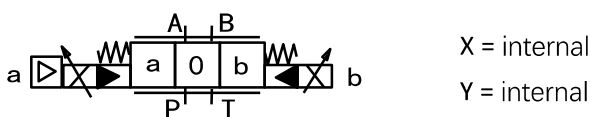
Type 4WRZE...-7X



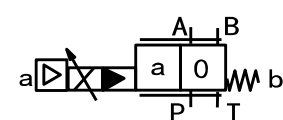
Type 4WRZE...A-7X



Type 4WRZE...-7X/...ET...



Type 4WRZE...A-7X/...ET...



Function, section

Pilot valve type 3DREP 6... /3DREPE 6...

The pilot valve is a proportional solenoid operated 3-way pressure reducing valve. It is used to convert an electrical input signal into a proportional pressure output signal.

The proportional solenoids are controllable DC wet pin solenoids with central thread and removable coil. The solenoid is optionally controlled by external control electronics (type .WRZ) or via integrated control electronics (type .WRZE).

Design:

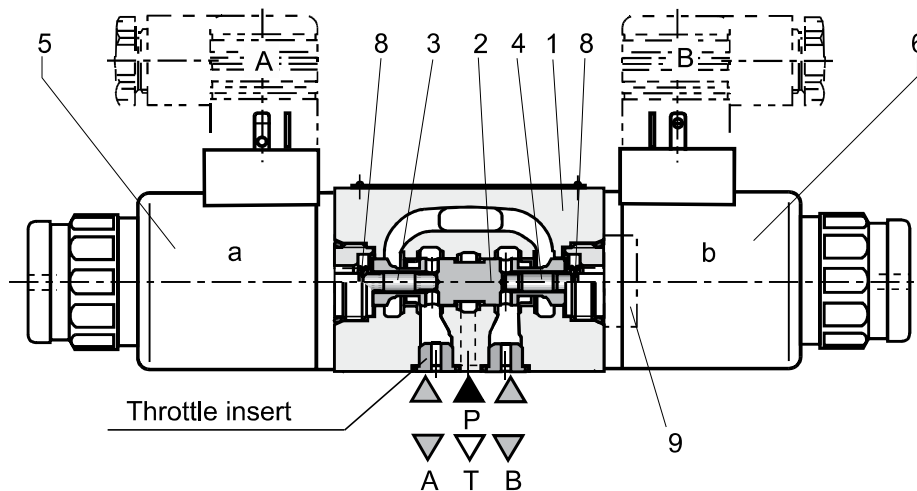
The valve basically consists of:

- Pilot control valve
- Control spool (2) with pressure measuring spools (3 and 4)
- Solenoids (5 and 6) with central thread
- Optionally with integrated electronics (7)

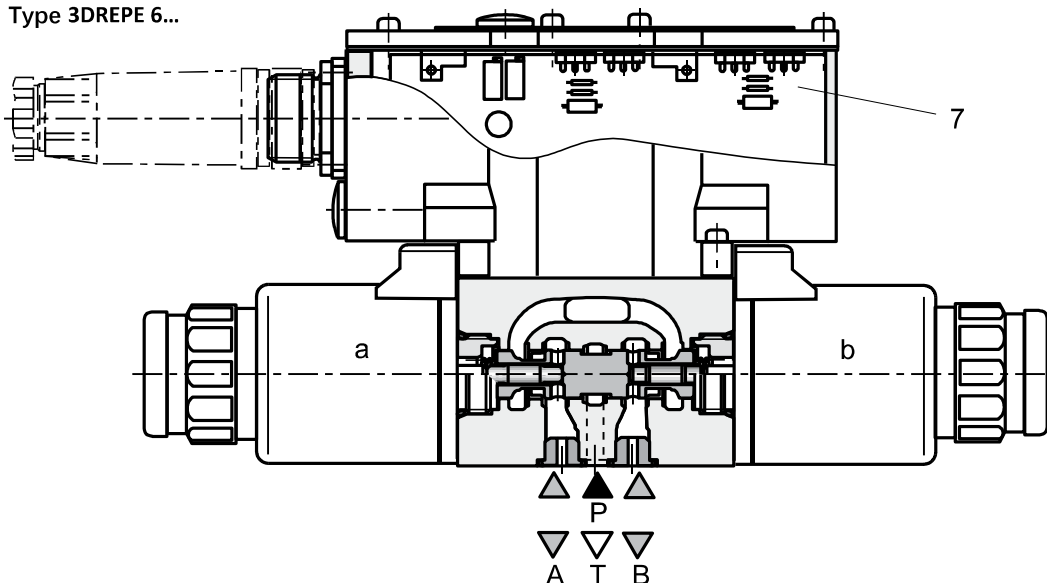
Functional description:

- The pressure at ports A or B is set proportionally via coil current. When coils (5,6) are de-energized, the control pilot spool (2) is maintained in the neutral position by compression springs (8), connecting ports A/B to T, allowing hydraulic fluid to return to tank under zero pressure condition.
- When a proportional solenoid (e.g. coil a (5)) is energized, Pressure feedback spool (3) and control pilot spool (2) move right proportionally to current input, P-B and A-T connections are established through progressive orifices formed between spool and valve body. The port B pressure generates feedback force on pressure feedback spool (4)'s surface, opposing solenoid thrust. Spool (4) is mechanically limited by coil b's end face. If pressure exceeds coil as set value, Control pilot spool (2) moves left, opening B-T orifice until pressure stabilizes, Pressure remains proportional to coil current.
- Upon de-energization: Control pilot spool (2) returns to neutral via compression springs (8).

Type 3DREP 6...



Type 3DREPE 6...



Valve with 2 switching positions (type 3DREP 6...B...)

The function of this version of the valve is basically the same as that of the valve with 3 switching positions. The 2 position valves are however only fitted with solenoid "a" (5). A plug (9) is fitted in place of the 2nd proportional solenoid.

Note

Draining of the tank line is to be prevented. With appropriate installation conditions a suitable back pressure valve is to be fitted (back pressure approx. 2 bar).

Function, section

Pilot operated proportional directional valve Types 4WRZ...

The type 4WRZ... valves are pilot operated 4-way valves that are actuated via proportional solenoids. they control the direction and rate of flow.

Design:

The valve basically consists of:

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

Note:

Due to the design principle, the inherent internal leakage in the valve may increase with the service life.

Functional description:

- With the solenoids (5 and 6) in the de-energised condition the control spool (11) is held in the centre position by the centering springs (12)
- The main spool (11) is actuated via the pilot valve (9) – the main spool is moved proportionally, e.g. actuation via solenoid "b" (6).
→ Movement of the main spool (2) to the right, pilot oil flows via

the pilot valve (9) into the pressure chamber (13) and moves the main spool (11) in proportion to the electrical input signal.

→ The connection from P to A and from B to T is via orifice type cross-sections with progressive flow characteristics.

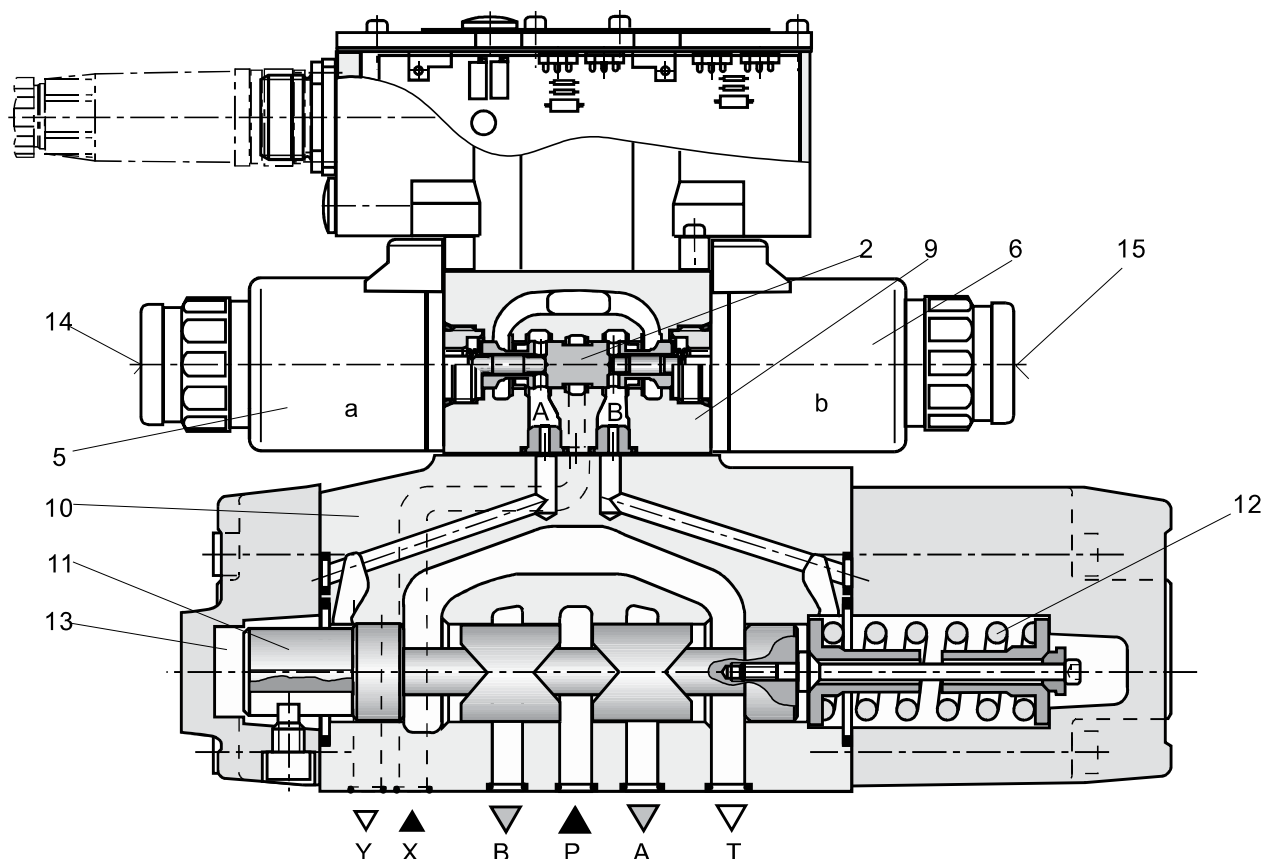
- The pilot oil supply to the pilot valve is internal via port P or external via port X.
- De-energisation of the solenoid (6)
→ The control spool (2) and pilot spool (11) are moved back into their centre positions
- Flow which is dependent on the switched position is either from P to A and B to T or P to B and A to T.

An optional hand override (14 and 15), makes it possible to move the pilot spool (2) without energising the solenoids.

Attention!

Unintended use of the hand override can lead to uncontrolled machine movements!

Type 4WRZE...7X/...



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

General							
Nominal size			10	16	25	32	
Installation			optional, preferably horizontal				
Storage temperature range			°C -20 to +80				
Ambient temperature range	Type 4WRZ...	°C	-20 to +70				
	Type 4WRZE...	°C	-20 to +50				
Weight (for 4WRZE... additionally 0.2 kg)			Kg	7.8	11.9	18.2	42.2
For type 4WRZ...D3...			additionally 0.5 kg				
Hydraulic (measured at $p = 100$ bar, with HLP46 at $40\text{ °C} \pm 5\text{ °C}$)							
Max. operating pressure	Pilot oil pressure	Without "D3"	bar	30~100			
		With "D3"	bar	100-315	100-350		
	Ports A, B, P	bar	315	350	350	350	
	Port T	Pilot oil supply external	bar	315	250	250	150
		Pilot oil supply internal	bar	30			
	Port Y	bar	30				
Nominal flow $q_{V\text{ nom}}$ at $\Delta p=10\text{bar}^{1)}$		L/min	25	100	220	360	
			50	125	325	520	
			85	150			
			180				
Max. flow through main valve		L/min	170	460	870	1600	
Pilot oil flow (X/Y) , for stepped form of input signal 0 → 100 %		L/min	3.5	5.5	7	15.9	
Pressure fluid temperature range		°C	-20 to +80 (preferably +40 to +50)				
Viscosity range		mm²/s	20 to 380 (preferably 30 to 46)				
Degree of contamination	Pilot valve		ISO4406: 1999 18/16/13				
	Main valve		ISO4406: 1999 20/18/15				
Hysteresis		%	≤6				
Electrical parameters							
Valve type			4WRZ		4WRZE		
Voltage type			DC				
Command value overlap			15%				
Max. current		A	1.5		2.5		
Solenoid coil resistance	Cold value at 20 °C	Ω	4.8		2		
	Max. warm value	Ω	7.2		3		
Duty		%	100				
Max. coil temperature		°C	150				
Protection to EN 60529			IP65				
Control electronics parameters							
3DREP6	Digital		RT-MSPD2-2X				
3DREPE6	Digital		RT-3DREPE6C-2X-40/A1(F1)				
Supply voltage	Nominal voltage	VDC	24				
	Lower limit value	V	19.4				
	Upper limit value	V	35				
Current consumption	Max. current	A	1.8				
	Impulse current	A	3				

1) Flow under other Δp_x : $q_x = q_{V\text{ nom}} \cdot \sqrt{\frac{\Delta p_x}{5}}$

Electrical connections, plug-in connectors

For type 4WRZ... (for external control electronics): connector conforming to DIN EN 175301-803 (Need to order separately)

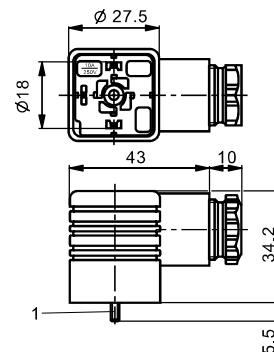
Solenoid a, colour grey

Separate order under material no. HP18110742

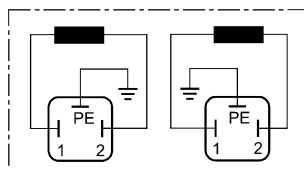
Solenoid b, colour black

Separate order under material no. HP18110741

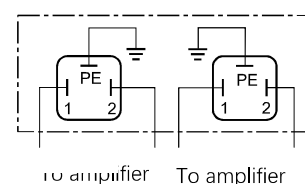
Fixing screw: M3, torque 0.5 Nm



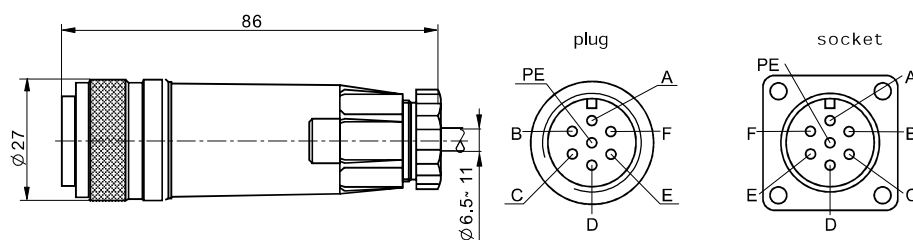
Connection on component plug



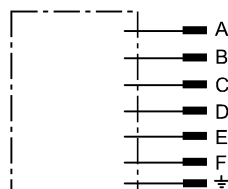
Connection on plug-in connector



For type 4WRZE... (with integrated electronics): connector conforming to DIN EN 175201-804 (Need to order separately)



Pin assignment of the plug



Metal nut structure (preferred model)

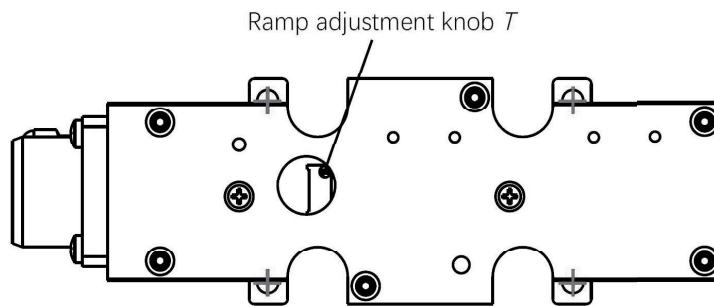
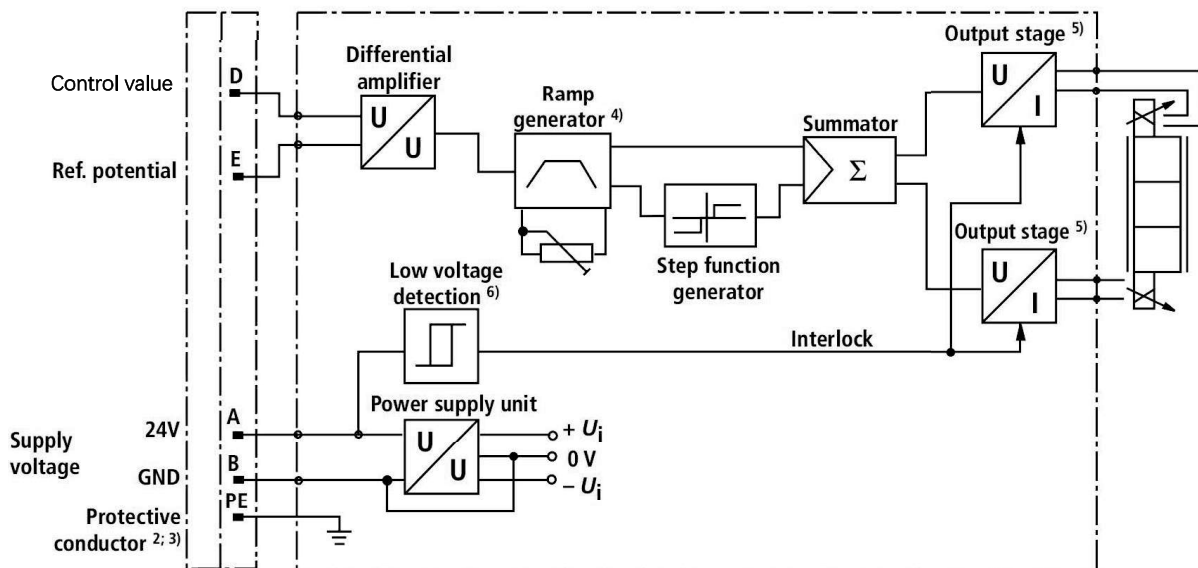
Order separately, Order No.: R00050406

Plastic nut structure Order separately, Order No.: R00050408

All-metal structure Order separately, Order No.: R00050407

Block circuit diagram/terminal allocation of the integrated control electronics (4WRZE)

Interface	Integrated control electronics	Valve
-----------	--------------------------------	-------

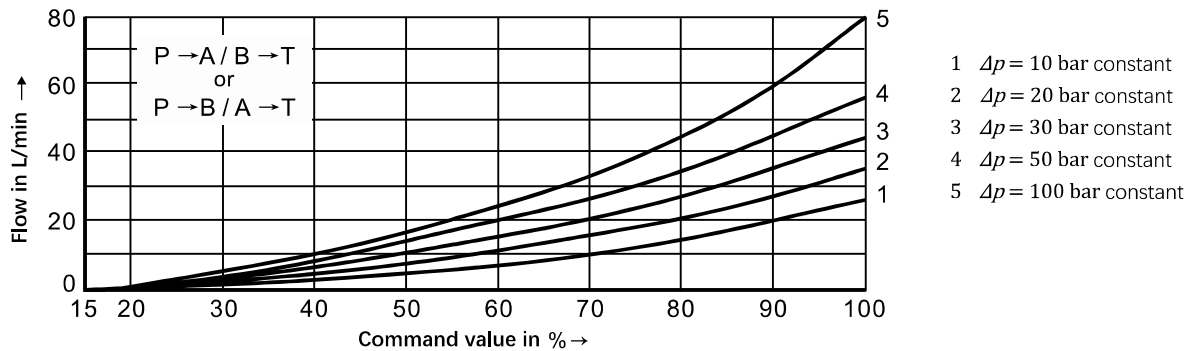


- 1) PE is connected to the cooling body and the valve housing
- 2) Protective conductor screwed to the valve housing and cover
- 3) Ramp can be externally adjusted from 0 to 5 s; the same applies for T_{up} and T_{down}
- 4) Output stages current regulated

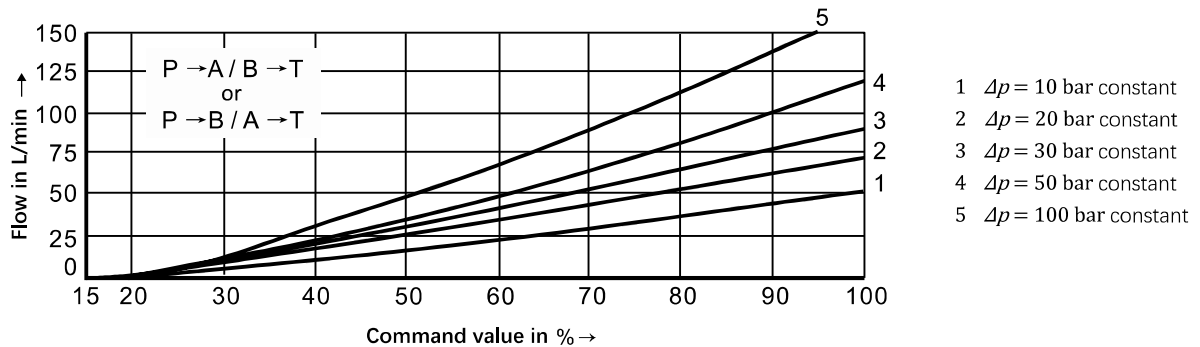
Characteristic curves NS 10 (HLP46 at 40 °C ± 5 °C, p=100bar)

Flow characteristic curve, Pp = 100 bar spools E/W

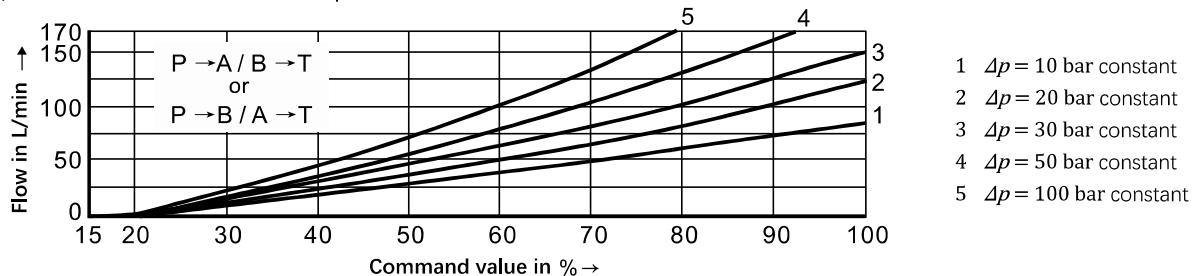
25 L/min nominal flow with a 10 bar valve pressure differential



50 L/min nominal flow with a 10 bar valve pressure differential

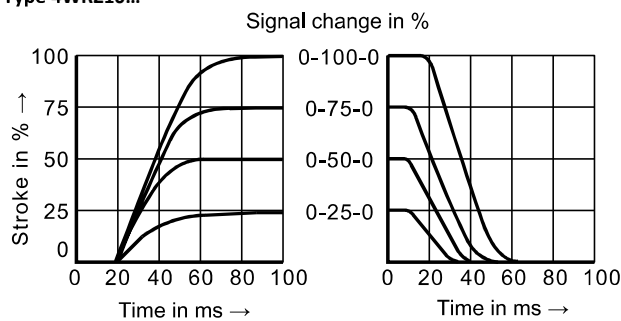


85 L/min nominal flow with a 10 bar valve pressure differential

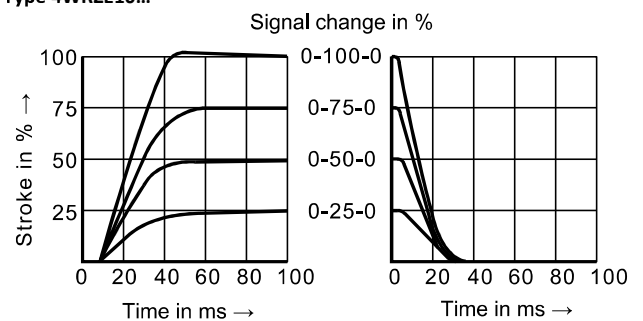


Transient function with a stepped form of electrical input signal $p_{st} = 50$ bar

Type 4WRZ10...



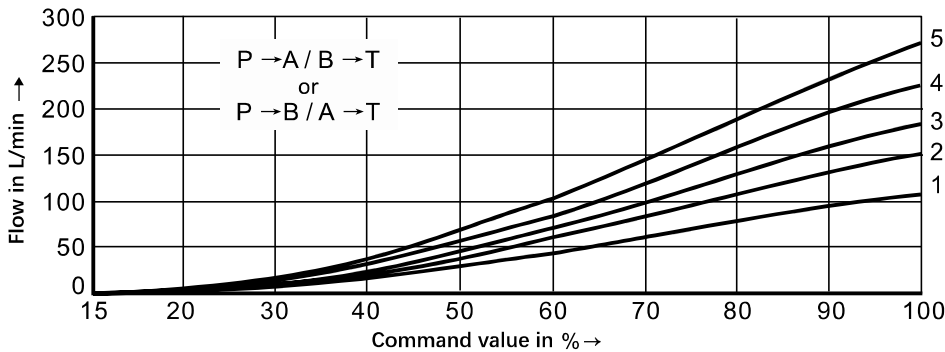
Type 4WRZE10...



Characteristic curves NS 16 (HLP46 at 40 °C ± 5 °C)

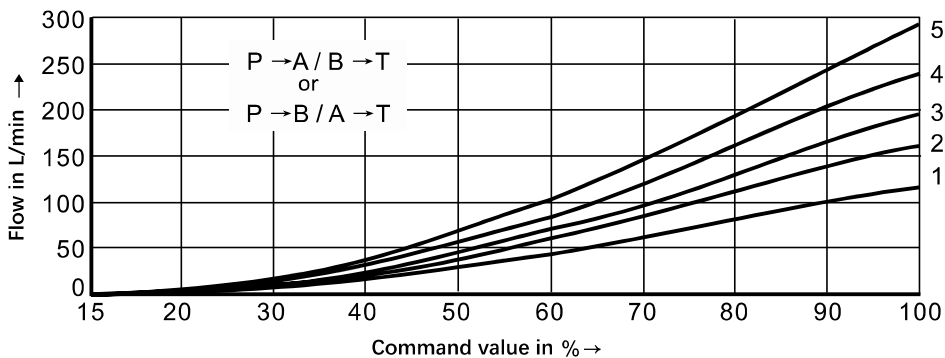
Flow characteristic curve, Pp = 100 bar spools E/W

100 L/min nominal flow with a 10 bar valve pressure differential



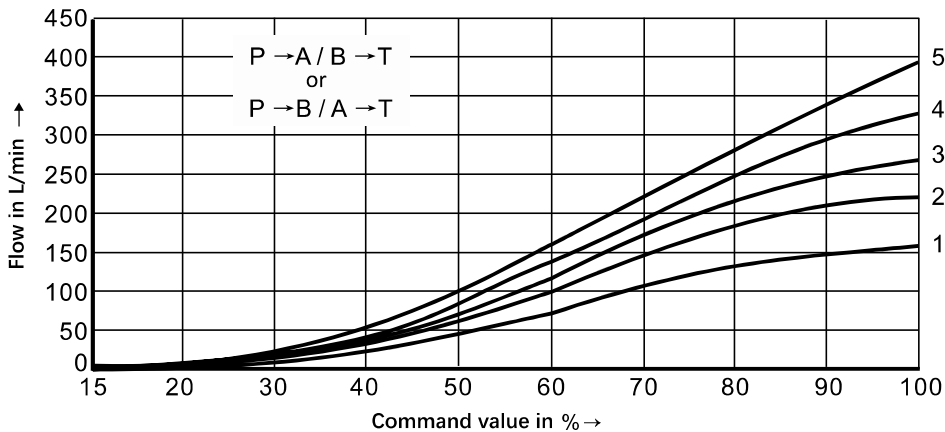
- 1 $\Delta p = 10$ bar constant
- 2 $\Delta p = 20$ bar constant
- 3 $\Delta p = 30$ bar constant
- 4 $\Delta p = 50$ bar constant
- 5 $\Delta p = 100$ bar constant

125 L/min nominal flow with a 10 bar valve pressure differential



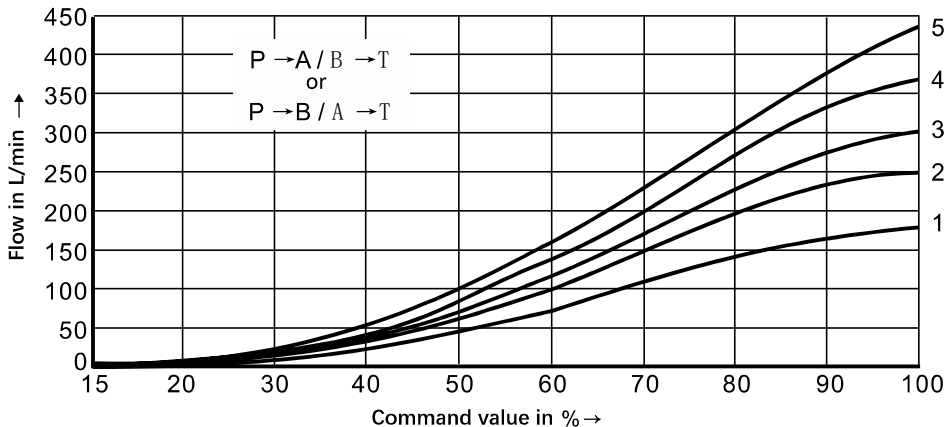
- 1 $\Delta p = 10$ bar constant
- 2 $\Delta p = 20$ bar constant
- 3 $\Delta p = 30$ bar constant
- 4 $\Delta p = 50$ bar constant
- 5 $\Delta p = 100$ bar constant

150 L/min nominal flow with a 10 bar valve pressure differential



- 1 $\Delta p = 10$ bar constant
- 2 $\Delta p = 20$ bar constant
- 3 $\Delta p = 30$ bar constant
- 4 $\Delta p = 50$ bar constant
- 5 $\Delta p = 100$ bar constant

180 L/min nominal flow with a 10 bar valve pressure differential

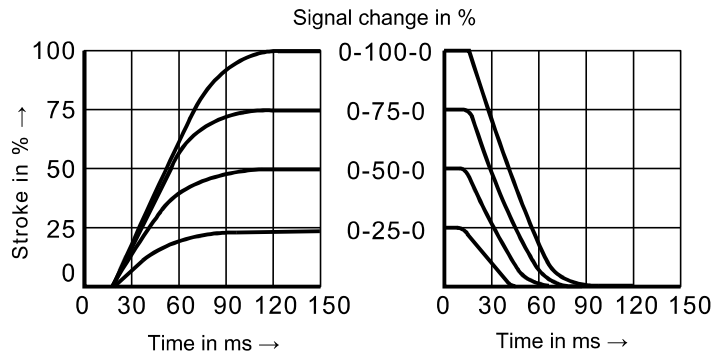


- 1 $\Delta p = 10$ bar constant
- 2 $\Delta p = 20$ bar constant
- 3 $\Delta p = 30$ bar constant
- 4 $\Delta p = 50$ bar constant
- 5 $\Delta p = 100$ bar constant

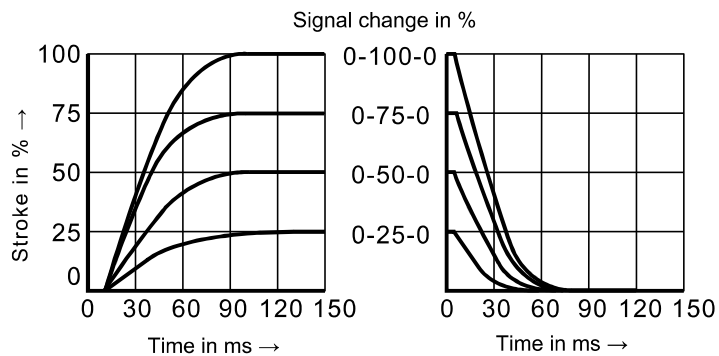
Characteristic curves NS 16 (HLP46 at 40 °C ± 5 °C)

Transient function with a stepped form of electrical input signal $p_{st} = 50 \text{ bar}$

Type 4WRZ16...



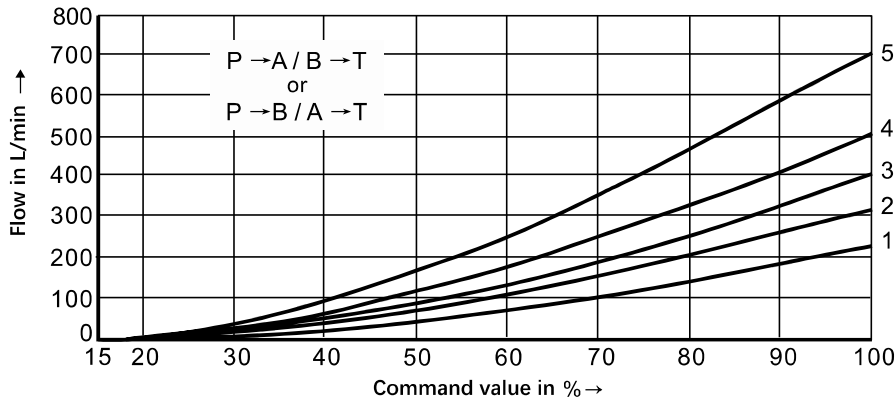
Type 4WRZE16...



Characteristic curves NS 25 (HLP46 at 40 °C ± 5 °C)

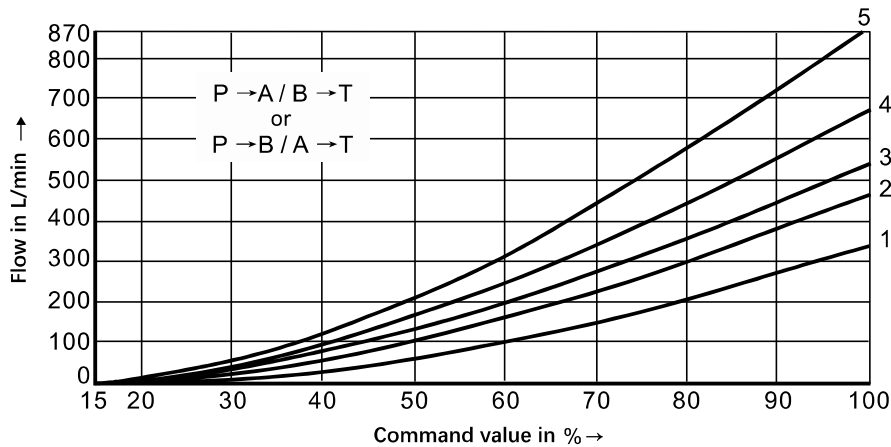
Flow characteristic curve, $P_p = 100$ bar spools E/W

220 L/min nominal flow with a 10 bar valve pressure differential



- 1 $\Delta p = 10$ bar constant
- 2 $\Delta p = 20$ bar constant
- 3 $\Delta p = 30$ bar constant
- 4 $\Delta p = 50$ bar constant
- 5 $\Delta p = 100$ bar constant

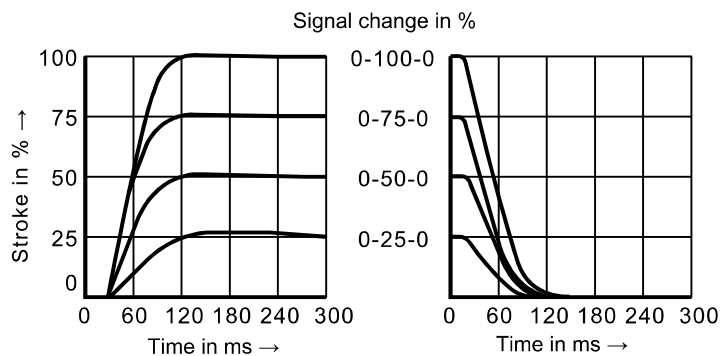
325 L/min nominal flow with a 10 bar valve pressure differential



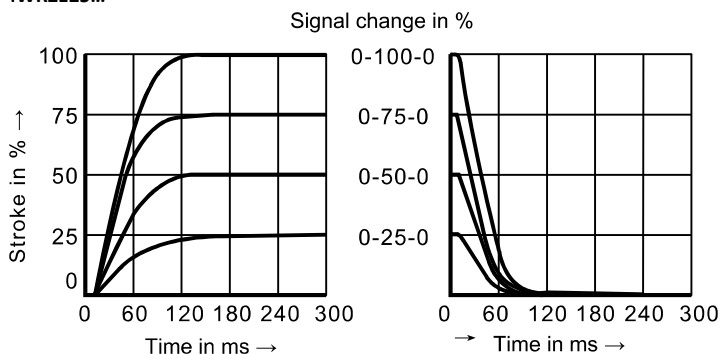
- 1 $\Delta p = 10$ bar constant
- 2 $\Delta p = 20$ bar constant
- 3 $\Delta p = 30$ bar constant
- 4 $\Delta p = 50$ bar constant
- 5 $\Delta p = 100$ bar constant

Transient function with a stepped form of electrical input signal $p_{st} = 50$ bar

Type 4WRZ25...



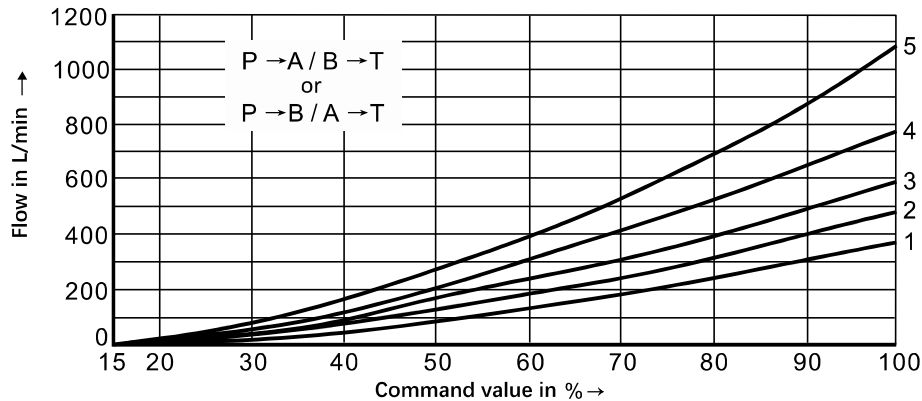
Type 4WRZE25...



Characteristic curves NS 32 (HLP46 at 40 °C ± 5 °C)

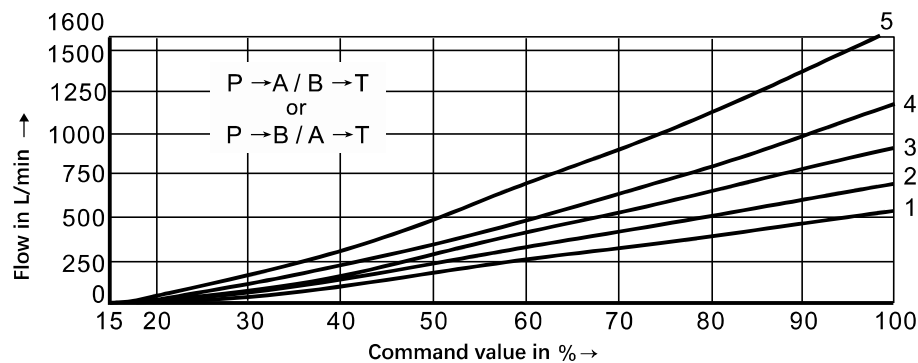
Flow characteristic curve, $P_p = 100$ bar spools E/W

360 L/min nominal flow with a 10 bar valve pressure differential



- 1 $\Delta p = 10$ bar constant
- 2 $\Delta p = 20$ bar constant
- 3 $\Delta p = 30$ bar constant
- 4 $\Delta p = 50$ bar constant
- 5 $\Delta p = 100$ bar constant

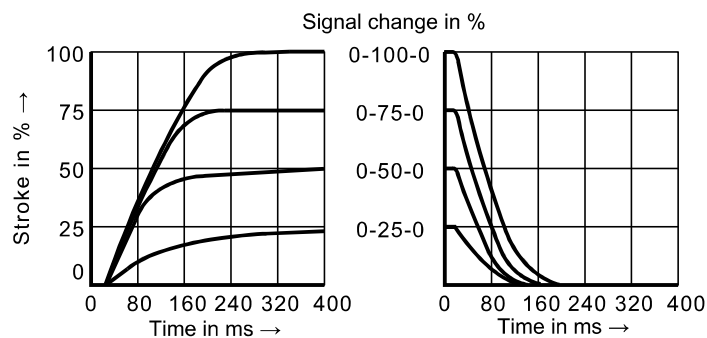
520 L/min nominal flow with a 10 bar valve pressure differential



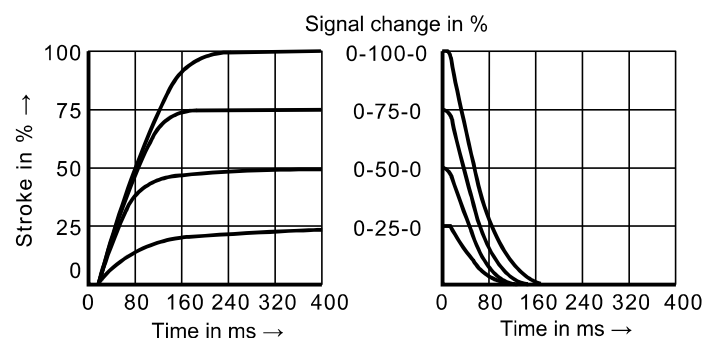
- 1 $\Delta p = 10$ bar constant
- 2 $\Delta p = 20$ bar constant
- 3 $\Delta p = 30$ bar constant
- 4 $\Delta p = 50$ bar constant
- 5 $\Delta p = 100$ bar constant

Transient function with a stepped form of electrical input signal $p_{st} = 50$ bar

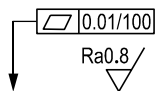
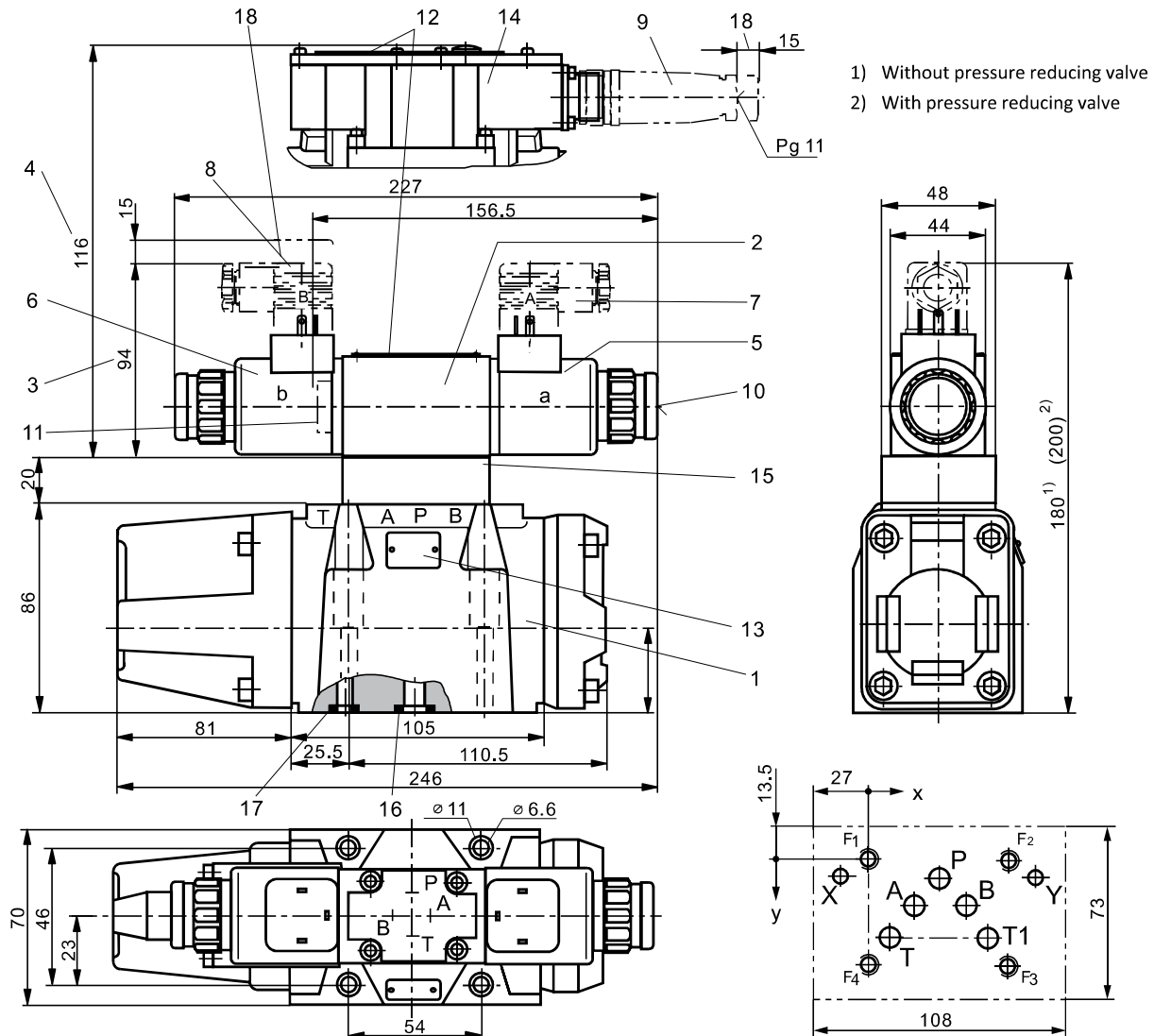
Type 4WRZ32...



Type 4WRZ32E...



Unit dimensions NS10 (Dimensions in mm)



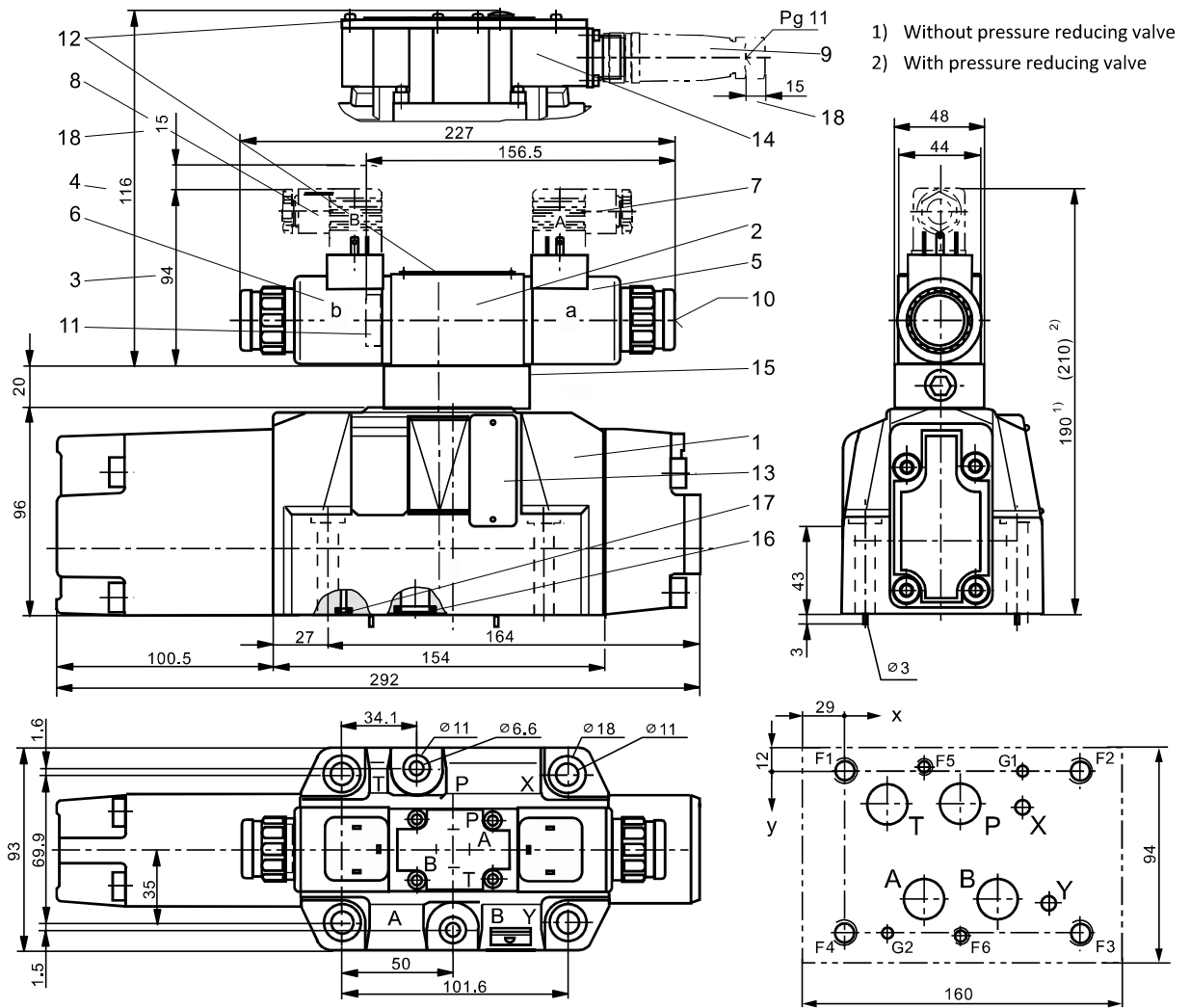
Required surface finish of mating piece

Dimensions in mm	P	A	T	T1	B	F1	F2	F3	F4	X	Y
Diameter/thread	Max. $\varnothing 11.2$	Max. $\varnothing 11.2$	Max. $\varnothing 11.2$	Max. $\varnothing 11.2$	Max. $\varnothing 11.2$	M6	M6	M6	M6	Max. $\varnothing 6.3$	Max. $\varnothing 6.3$
x	27	16.7	3.2	50.8	37.3	0	54	54	0	-8	62
y	6.3	21.4	32.5	32.5	21.4	0	0	46	46	11	11

- Main valve
- Pilot valve
- Dimension for 4WRZ...
- Dimension for 4WRZE...
- Proportional solenoid "a"
- Proportional solenoid "b"
- Plug-in connector "A", separate order
- Plug-in connector "B", separate order
- Seven-pin socket according to DINEN 175201-804 (plug to be ordered separately)
- Protected hand override "N9"
- Cover for valve with one solenoid
- Name plate for pilot valve
- Name plate for main valve
- Integrated control electronics
- Pressure reducing valve "D3"
- R-ring 13 x 1.6 x 2; ports A, B, P, T
- R-ring 11.18 x 1.6 x 1.78; ports X, Y
- Space required to remove plug-in connector
- Machined valve mounting face, connection locations to ISO4401-05-05-0-05

Fixing screws: 4 GB/T 70.1 - M6 x 45 10.9
 Torque: 15.5 Nm $\pm$ 10 %

Unit dimensions NS16 (Dimensions in mm)



Dimensions in mm	P	A	T	B	X	Y	G1	G2	F1	F2	F3	F4	F5	F6
Diameter/ thread	$\phi 17.5$ MAX	$\phi 17.5$ MAX	$\phi 17.5$ MAX	$\phi 17.5$ MAX	$\phi 6.3$ MAX	$\phi 6.3$ MAX	$\phi 4$	$\phi 4$	M10	M10	M10	M10	M6	M6
x	50	34.1	18.3	65.9	76.6	88.1	76.6	18.3	0	101.6	101.6	0	34.1	50
y	14.3	55.6	14.3	55.6	15.9	57.2	0	69.9	0	0	69.9	69.9	-1.6	71.5

Required surface finish of mating piece

$0.01/100$
Ra0.8

1. Main valve
2. Pilot valve
3. Dimension for 4WRZ...
4. Dimension for 4WRZE...
5. Proportional solenoid "a"
6. Proportional solenoid "b"
7. Plug-in connector "A", separate order
8. Plug-in connector "B", separate order
9. Seven-pin socket according to DIN EN 175201-804(plug to be ordered separately)
10. Protected hand override "N9"
11. Cover for valve with one solenoid
12. Name plate for pilot valve
13. Name plate for main valve
14. Integrated control electronics
15. Pressure reducing valve "D3"
16. R-ring 22.53 x 2.3 x 2.62; ports A, B, P, T
17. R-ring 10 x 2 x 2; port X, Y
18. Space required to remove plug-in connector
19. Machined valve mounting face, connection locations to ISO4401-07-07-0-05

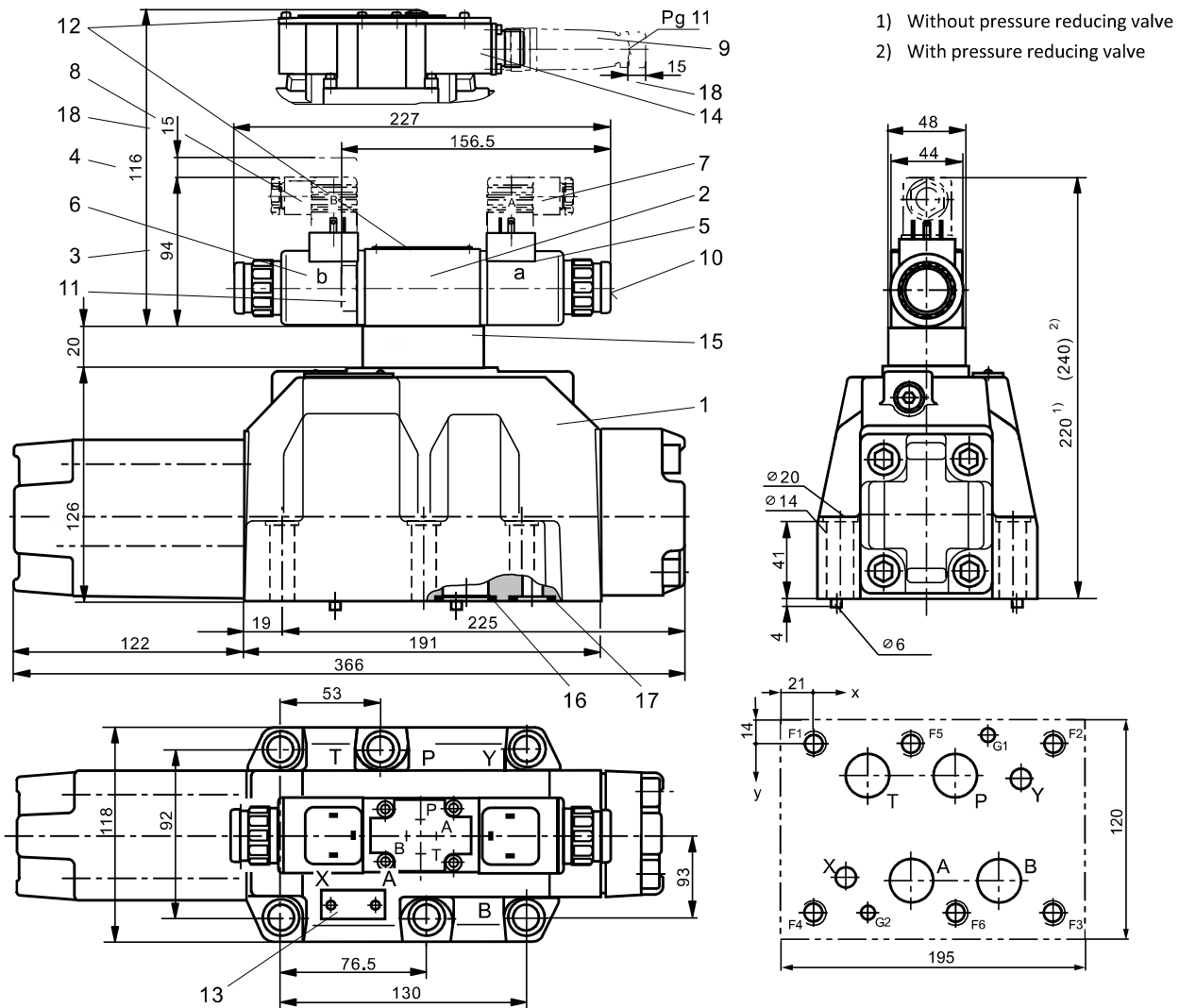
Fixing screws: 4 GB/T 70.1 - M10 x 60 10.9

Torque: 75 Nm $\pm$ 20 %

Fixing screws: 2 GB/T 70.1 - M6 x 60 10.9

Torque: 15.5 Nm $\pm$ 20 %

Unit dimensions NS25 (Dimensions in mm)



0.01/100

Ra0.8

Required surface
finish of mating piece

Dimensions in mm	P	A	T	B	X	Y	G1	G2	F1	F2	F3	F4	F5	F6
Diameter/ thread	ø25 MAX.	ø25 MAX.	ø25 MAX.	ø25 MAX.	ø11.2 MAX.	ø11.2 MAX.	ø7.5	ø7.5	M12	M12	M12	M12	M12	M12
x	77	53.2	29.4	100.8	17.5	112.7	94.5	29.4	0	130.2	130.2	0	53.2	77
y	17.5	74.6	17.5	74.6	73	19	-4.8	92.1	0	0	92.1	92.1	0	92.1

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Main valve 2. Pilot valve 3. Dimension for 4WRZ... 4. Dimension for 4WRZE... 5. Proportional solenoid "a" 6. Proportional solenoid "b" 7. Plug-in connector "A", separate order 8. Plug-in connector "B", separate order 9. Seven-pin socket according to DIN EN 175201-804(plug to be ordered separately) 10. Protected hand override "N9" 11. Cover for valve with one solenoid 12. Name plate for pilot valve | <ol style="list-style-type: none"> 13. Name plate for main valve 14. Integrated control electronics 15. Pressure reducing valve "D3" 16. R-ring 27.8 x 2.6 x 3; ports A, B, P, T 17. R-ring 19 x 3 x 3; ports X, Y 18. Space required to remove plug-in connector 19. Machined valve mounting face, connection locations to ISO4401-08-08-0-05 |
|--|---|

Fixing screws: 6 GB/T 70.1 - M12 x 60 10.9

Torque: 130 Nm ± 20 %

