

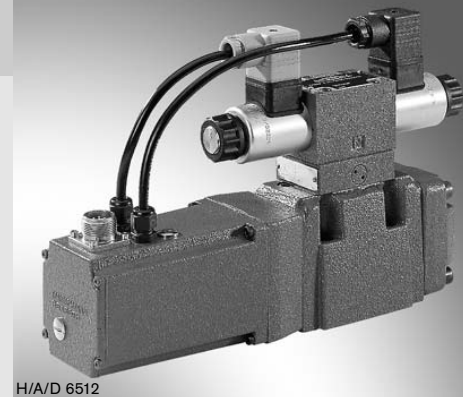
Proportional directional valve, pilot operated with electrical position feedback and integrated electronics (OBE)

RE 29075/08.04
Replaces: 05.02

1/22

Type 4WRKE

Nominal sizes 10 to 35
Component series 3X
Maximum operating pressure 350 bar
Maximum flow 3000 L/min



H/A/D 6512

Overview of contents

Contents

Features	1
Ordering details	2
Preferred types	3
Symbols (simplified)	3
Symbols (detailed)	4
Function, section, valve features	4, 5
Technical data	6
Electrical connections, plug-in connector	7
Connection allocation / Block circuit diagram for the integrated electronics (OBE)	8
Characteristic curves	9-14
• Transient function	
• Flow-command value function	
Unit dimensions	15-20
Pilot oil supply	21, 22

Features

- Pilot operated 2-stage proportional directional valve with electrical position feedback of the main spool and integrated electronics (OBE)
- The control of the size and direction of a flow
- Actuation via proportional solenoids
- For subplate mounting:
Porting pattern to ISO 4401 (NS10 to 35),
subplates to catalogue sheets RE 45054 to
RE 45060 (separate order), see pages 15 to 18
- Electrical position feedback
- Spring-centred main spool
- The pilot control is a single stage proportional directional control valve
- Main stage with closed loop position control
- Integrated control electronics

Preferred types

NS10

Type	Material No.
4WRKE 10 E50L-3X/6EG24ETK31/A1D3M	R900719754
4WRKE 10 W6-50L-3X/6EG24EK31/A1D3M	R900719667
4WRKE 10 W8-50L-3X/6EG24ETK31/A1D3M	R900616658
4WRKE 10 E100L-3X/6EG24ETK31/A1D3M	R900704216
4WRKE 10 E1-100L-3X/6EG24K31/A1D3M	R900706962
4WRKE 10 W6-100L-3X/6EG24ETK31/A1D3M	R900704245
4WRKE 10 W8-100L-3X/6EG24TK31/A1D3M	R900708991

NS16

Type	Material No.
4WRKE 16 E200L-3X/6EG24ETK31/A1D3M	R900704916
4WRKE 16 E1-200L-3X/6EG24K31/A1D3M	R900973370
4WRKE 16 W6-200L-3X/6EG24ETK31/A1D3M	R900979371
4WRKE 16 W8-200L-3X/6EG24ETK31/A1D3M	R900711320

NS25

Type	Material No.
4WRKE 25 E350L-3X/6EG24ETK31/A1D3M	R900704202
4WRKE 25 E1-350L-3X/6EG24K31/A1D3M	R900973368
4WRKE 25 W6-350L-3X/6EG24ETK31/A1D3M	R900249275
4WRKE 25 W8-350L-3X/6EG24K31/A1D3M	R900249554

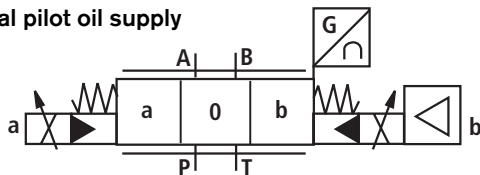
NS32

Type	Material No.
4WRKE 32 E600L-3X/6EG24K31/C1D3M	R900712759
4WRKE 32 W6-600L-3X/6EG24ETK31/A1D3M	R900249276

Symbols (simplified)

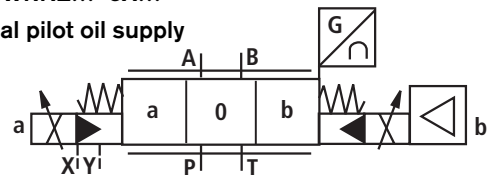
Type 4WRKE...-3X...ET.

Internal pilot oil supply



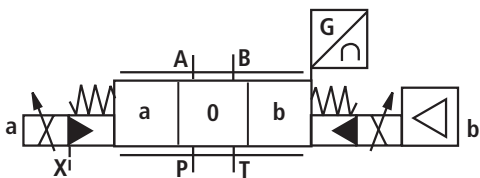
Type 4WRKE...-3X...

External pilot oil supply



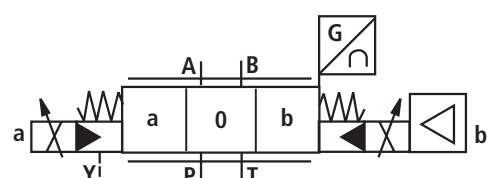
Type 4WRKE...-3X...T.

External pilot oil supply; internal pilot oil drain



Type 4WRKE...-3X...E.

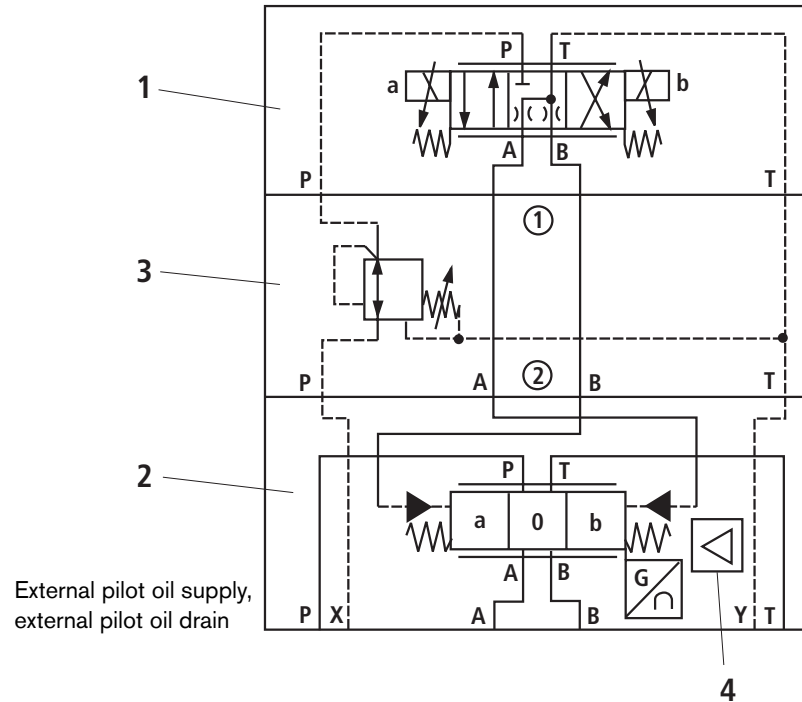
Internal pilot oil supply; external pilot oil drain



Symbols (detailed)

Example:

- 1 Pilot control valve type 4WRAP 6...
- 2 Main valve
- 3 Pressure reducing valve type ZDR 6 DP0-4X/40YM-W80
- 4 Integrated control electronics



Function, section

Pilot control valve type 4WRAP 6 W7.3X/G24... (1st stage)

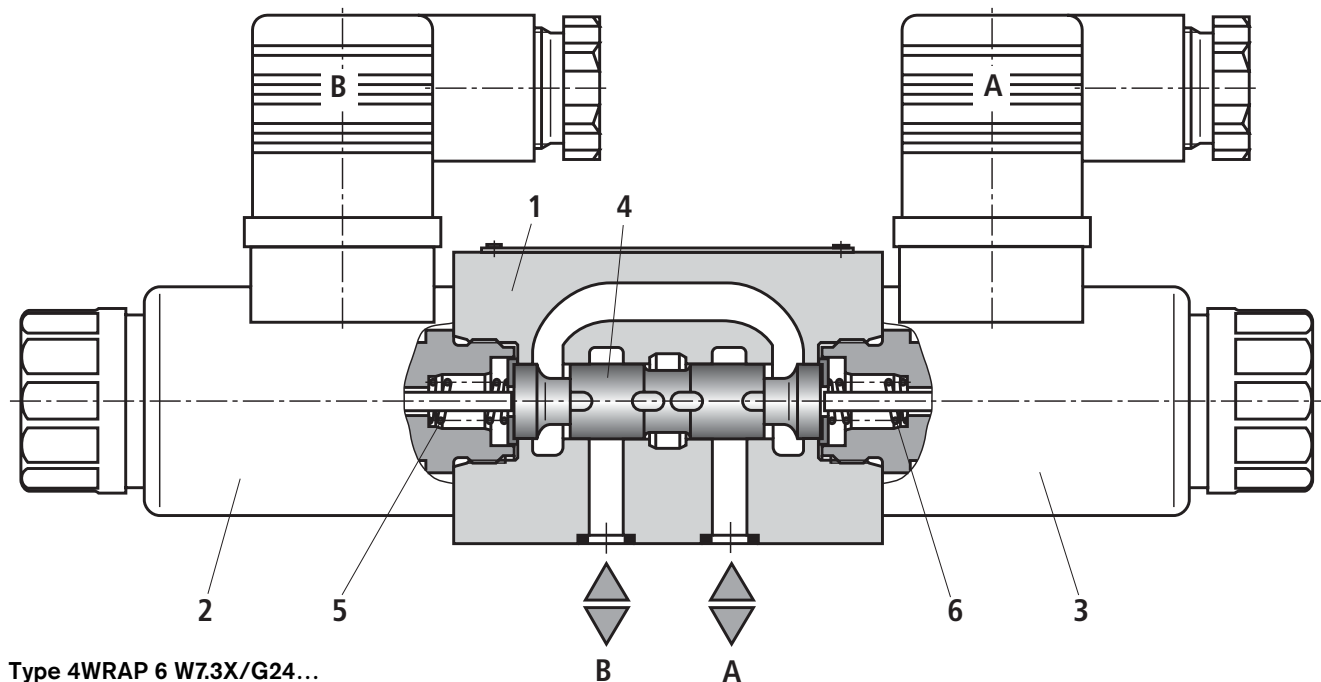
The pilot control valve is a direct operated proportional valve. The control edge geometry was designed and optimised for use as a pilot control valve for the proportional directional valves type 4WRKE.

The proportional solenoids are pressure tight, oil-immersed DC solenoids with removable coil. They convert an electrical current proportionally into a mechanical force. An increase in the current strength causes an appropriately higher solenoid force. The set solenoid force remains constant over the entire control stroke.

The pilot control valve basically consists of the housing (1), proportional solenoids (2 and 3), valve spool (4) and springs (5 and 6).

In the de-energised condition both actuator ports are connected to the tank. If one of the two solenoids (2 or 3) is energised, then the solenoid force moves the valve spool (4) against the spring (5 or 6).

Once the overlap area is overcome, the connection to tank of one of the two actuator ports is blocked and the connection pressure chamber is established. There is flow from P to the control chamber of the main stage.



Function, section, valve features

The type 4WRKE valves are 2-stage proportional directional control valves.

They control the size and direction of a flow.

The main stage is closed loop position controlled so that the spool position is also independent of flow forces at larger flows.

The valve basically consists of the pilot control valve (1), housing (8), main spool (7), covers (5 and 6), centering spring (4), inductive position transducer (9) and the pressure reducing valve (3).

If no input signal is being applied, then the main spool (7) is held in the centre position by the centering spring (4). The two control chambers in the covers (5 and 6) are connected via the valve spool (2) to the tank.

The main spool (7) is connected to suitable control electronics via the inductive position transducer (9). The positional change of the main spool (7) as well as the alteration of the command value at the summation point of the amplifier produces a differential voltage.

With the command value/actual value comparison a possible

control deviation is recognised via the electronics and an electrical current is applied to the proportional solenoid of the pilot valve (1).

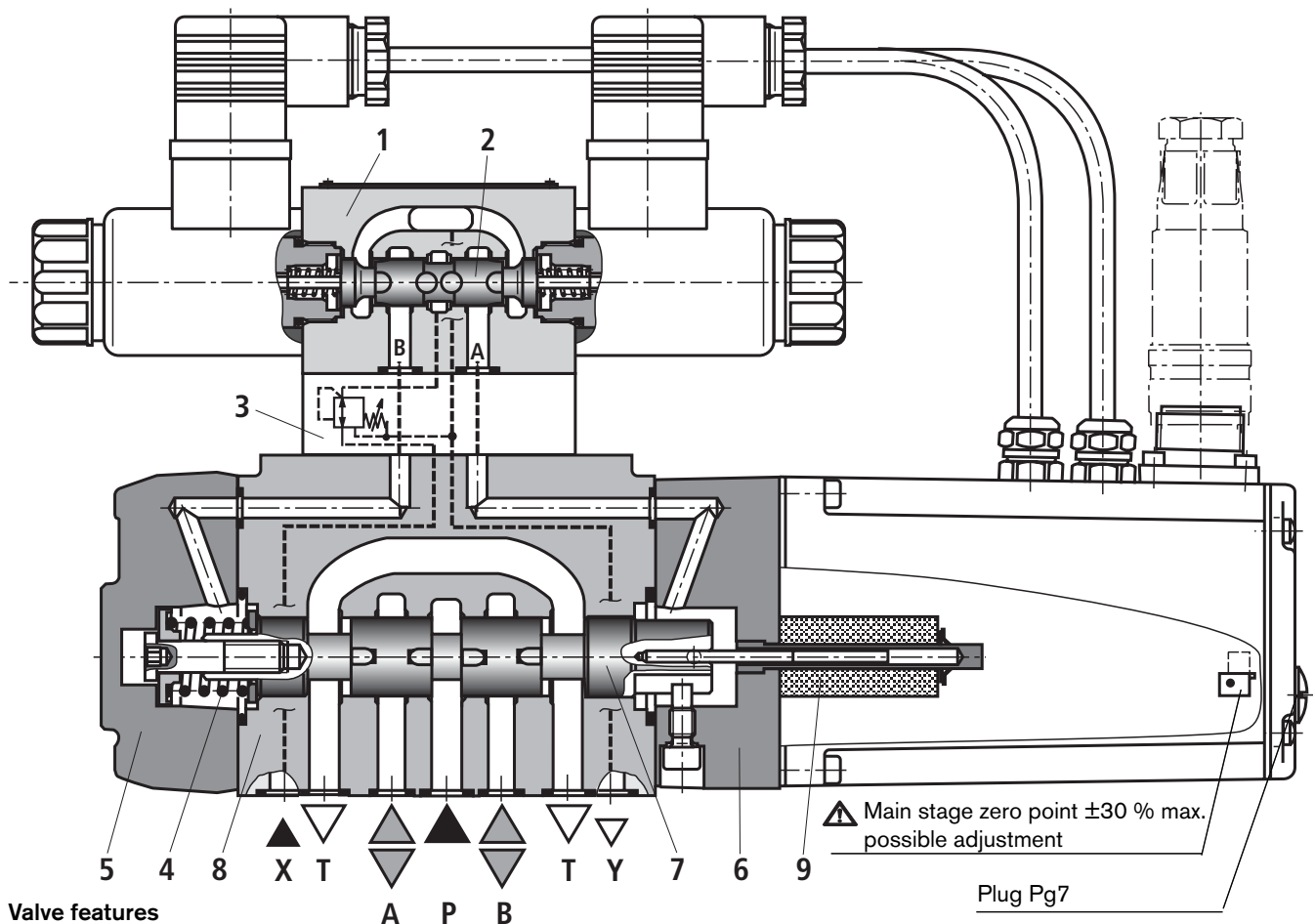
The current induces, within the solenoid, a force which is passed onto the solenoid pin which in turn actuates the control spool. The flow which is provided via the control cross-sections causes the main spool to move.

The main spool (7) with the attached core of the inductive position transducer (9) is moved until the actual value is equal to the command value. In the closed loop controlled condition the main spool (7) is force balanced and is held in this closed loop controlled position.

Spool stroke and control opening change in proportional to the command value.

The control electronics are integrated into the valve. By matching the valve and electronics the spread of the series units is kept low.

Prevent the tank lines from emptying; with appropriate installation conditions, a back pressure valve is to be installed (back pressure approx. 2 bar).



Valve features

- The 2nd stage basically comprises of components from our proportional valves.
- The zero point adjustment at the „main stage zero point“ is factory pre-set and can, via a potentiometer in the control electronics, be adjusted within a range of $\pm 30\%$ of the zero stroke. The integrated control electronics can be accessed by removing a plug in the housing.

- If the pilot control valve or the control electronics are exchanged then these have to be recalibrated. All calibrations must only be carried out by trained personnel.

⚠ Changing the zero point can lead to damage to the system and must only be carried out by trained personnel!

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

Nominal sizes	NS	10	16	25	27	32	35
Installation and commissioning guidelines	Preferably horizontal, see RE 07800						
Storage temperature range	°C	- 20 to + 80					
Ambient temperature range	°C	- 20 to + 50					
Weight	kg	8.7	11.2	16.8	17	31.5	34


Hydraulic (measured at $p = 100$ bar, with HLP46 at $40\text{ °C} \pm 5\text{ °C}$)

Operating pressure	Pilot control valve Pilot oil supply	bar	25 to 315					
	Main valve, ports P, A, B	bar	Up to 315	Up to 350	Up to 350	Up to 210	Up to 350	Up to 350
Return pressure	Port T	Pilot oil drain, internal	Static < 10 (pilot valve)					
		Pilot oil drain, external	bar	Up to 315	Up to 250	Up to 250	Up to 210	Up to 250
	Port Y	bar	Static < 10 (pilot valve)					
Nominal flow $q_{Vnom} \pm 10\%$ at $\Delta p = 10$ bar $\Delta p =$ valve pressure differential	L/min	25 50 100	- 125 180	- 220 350	- - 500	- 400 600	- - 1000	
Flow of main valve (max. permissible)	L/min	170	460	870	1000	1600	3000	
Pilot oil flow at ports X or Y with a step form of input signal from 0 to 100 % (315 bar)	L/min	4.1	8.5	11.7	11.7	13.0	13.0	
Pressure fluid	Mineral oil (HL, HLP) to DIN 51524 ¹⁾ Phosphate ester (HFD-R) ²⁾							
Max. permissible degree of pressure fluid contamination								
Cleanliness class to ISO 4406 (c)	Pilot control valve		Class 17/15/12 ³⁾					
	Main valve		Class 20/18/15 ³⁾					
Pressure fluid temperature range	°C	-20 to +80, preferably +40 to +50						
Viscosity range	mm ² /s	20 to 380, preferably 30 to 45						
Hysteresis	%	≤ 1						
Response sensitivity	%	≤ 0.5						

Electrical

Voltage type	DC						
Signal type	Analogue						
Power, max.	W	72 (average value = 24 W)					
Electrical connections	Plug-in connector to DIN EN 175201-804 ⁴⁾						
Valve protection to EN 60529	IP65 with mounted and fixed plug-in connector						
Control electronics	Integrated into the valve, see page 8						
Additional electronic components	Analogue com. value module		VT-SWMA-1-1X/...		see RE 29902		
	Analogue com. value module		VT-SWMKA-1-1X/...		see RE 29903		

¹⁾ Suitable for NBR and FKM seals²⁾ Only suitable for FKM seals³⁾ The cleanliness class stated for the components must be adhered to in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life. For the selection of filters see catalogue sheets: RE 50070, RE 50076, RE 50081; RE 50086 and RE 50088⁴⁾ Separate order

 **Note!** For details regarding the environmental simulation test covering EMC (electro-magnetic compatibility), climate and mechanical loading see RE 29075-U (declaration regarding environmental compatibility).

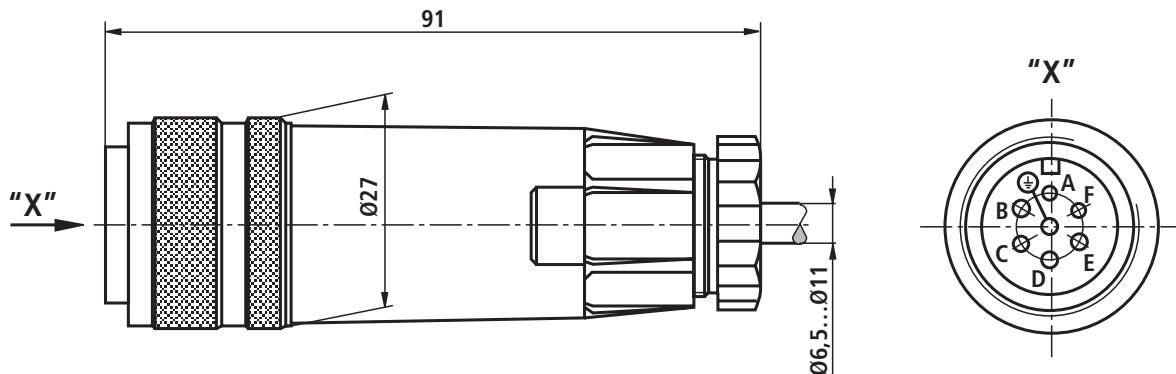
Electrical connections, plug-in connector

Plug-in connector

Plug-in connector to DIN EN 175201-804

Separate order under Material No. **R900021267** (plastic version)

For pin allocations see block circuit diagram on page 8

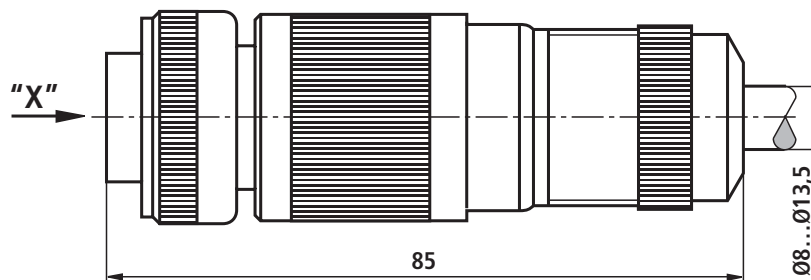


Plug-in connector

Plug-in connector to DIN EN 175201-804

Separate order under Material No. **R900223890** (metal version)

For pin allocation see block circuit diagram on page 8



Component plug allocation	Contact	Signal at A1 or F1	Signal at A5
Supply voltage	A	24 VDC (18 to 35 VDC); $I_{\max} = 1.5 \text{ A}$; impulse load $\leq 3 \text{ A}$	0 V
	B		
Ref. (actual value)	C	Ref. potential for actual value (contact F)	Enable 4 ... 24 V
Differential amplifier input (command value)	D	$\pm 10 \text{ V}$ or 4 – 20 mA	$\pm 10 \text{ V}$
	E	0 V ref. potential to D	0 V ref. potential to D + F
Measurement output (actual value)	F	$\pm 10 \text{ V}$ or 4 – 20 mA	$\pm 10 \text{ V}$
	PE	Connected with cooling body and valve housing	

Command value: Ref. potential at E and a positive command value at D results in a flow from P to A and B to T

Ref. potential at E and a negative command value at D results in a flow from P to B and A to T

Connection cable: Recommendation: – Up to 25 m cable length type LiYCY 7 x 0.75 mm²

– Up to 50 m cable length type LiYCY 7 x 1.0 mm²

External diameter: – 6.5 to 11 mm (plastic plug-in connector)

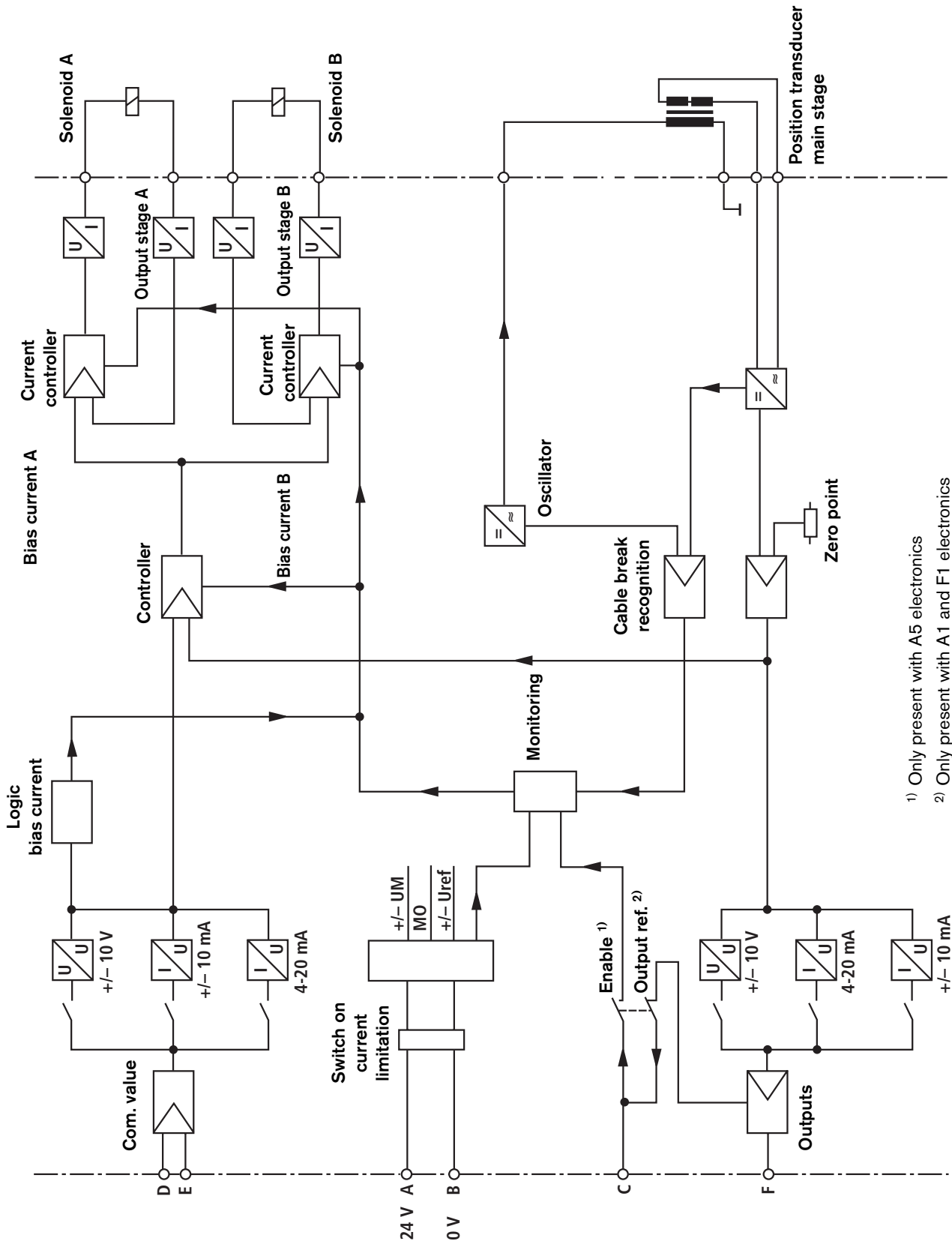
– 8 to 12 mm (metal plug-in connector)

Connect screen to \perp only on supply side.

Note: **Electrical signals (e.g. actual value or enable signals) taken via valve electronics must not be used to switch off the machine safety functions!**

(This is in accordance with the regulations to the European Standard „Safety requirement of fluid technology system and components – hydraulics“, EN 982!)

Connection allocation / Block circuit diagram for the integrated electronics (OBE)



¹⁾ Only present with A5 electronics

²⁾ Only present with A1 and F1 electronics

Characteristic curves (measured with HLP46 at $40\text{ °C} \pm 5\text{ °C}$)

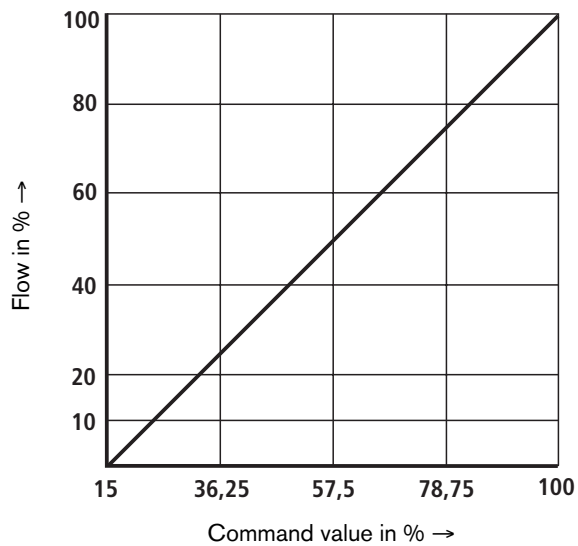
Flow-command value function for e.g.

P → A / B → T 10 bar valve pressure differential for spools without an area relationship (spools E; W6-)

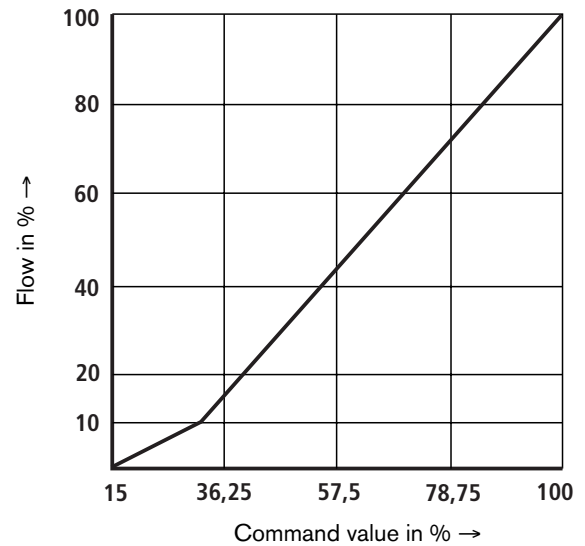
or P → A or A → T 5 bar per control land

Valid for all of the stated spool symbols E...; W... and R...

Spool with characteristic curve L



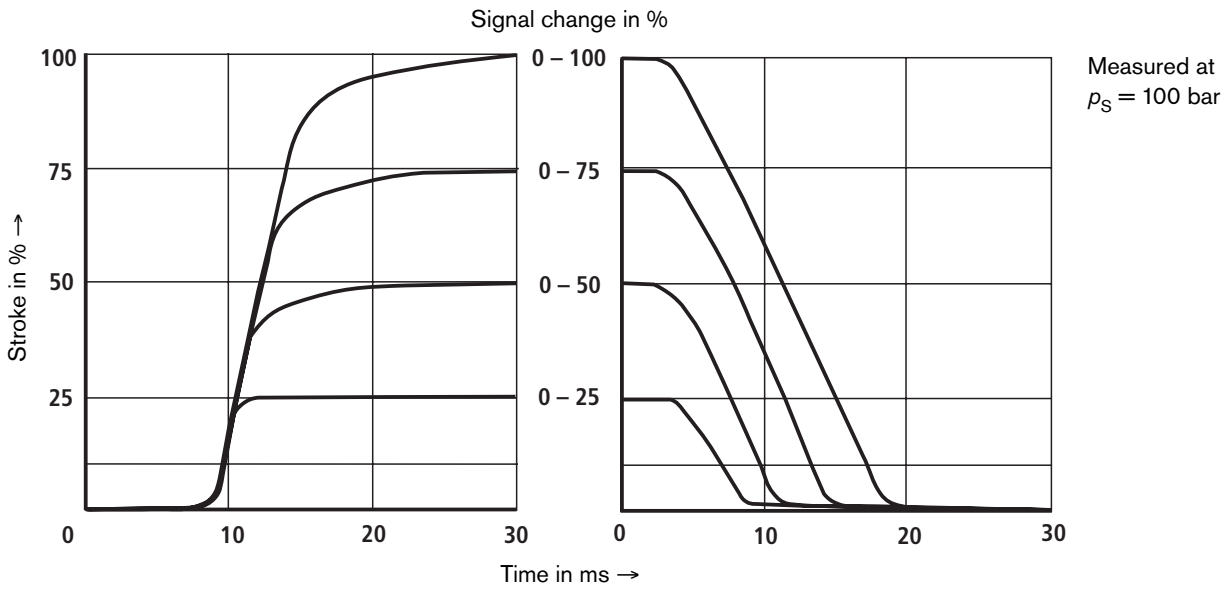
Spool with characteristic curve P



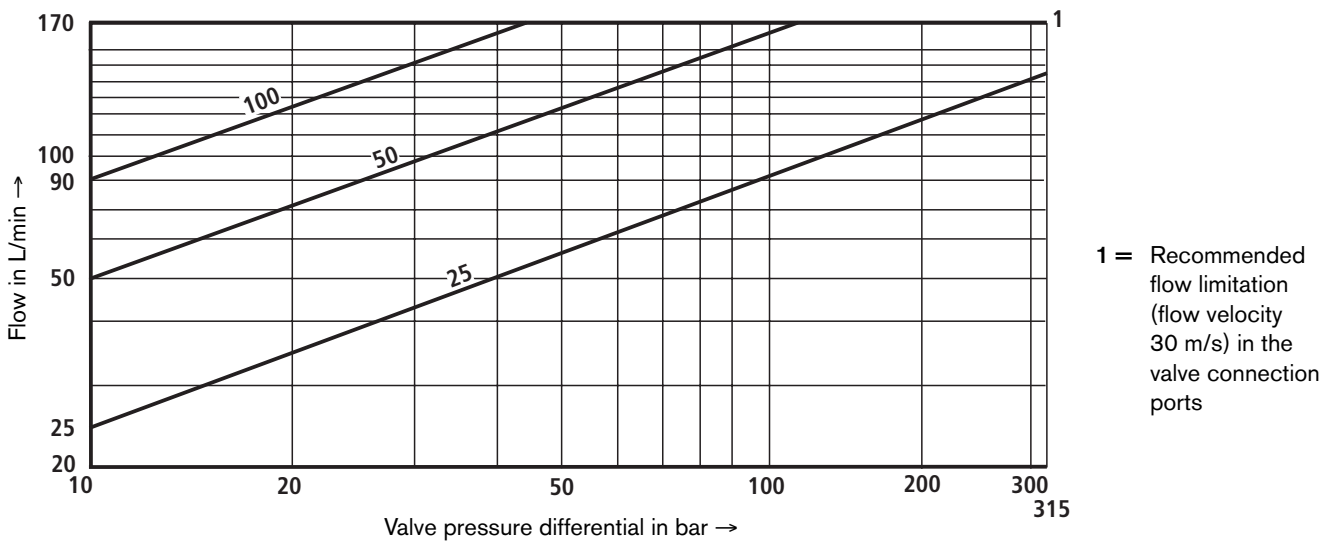
Characteristic curves (measured with HLP46 at 40 °C ± 5 °C)

NS10

Transient function with a step form of electrical input signal



Flow-load function at maximum valve opening
(tolerance ± 10 %)

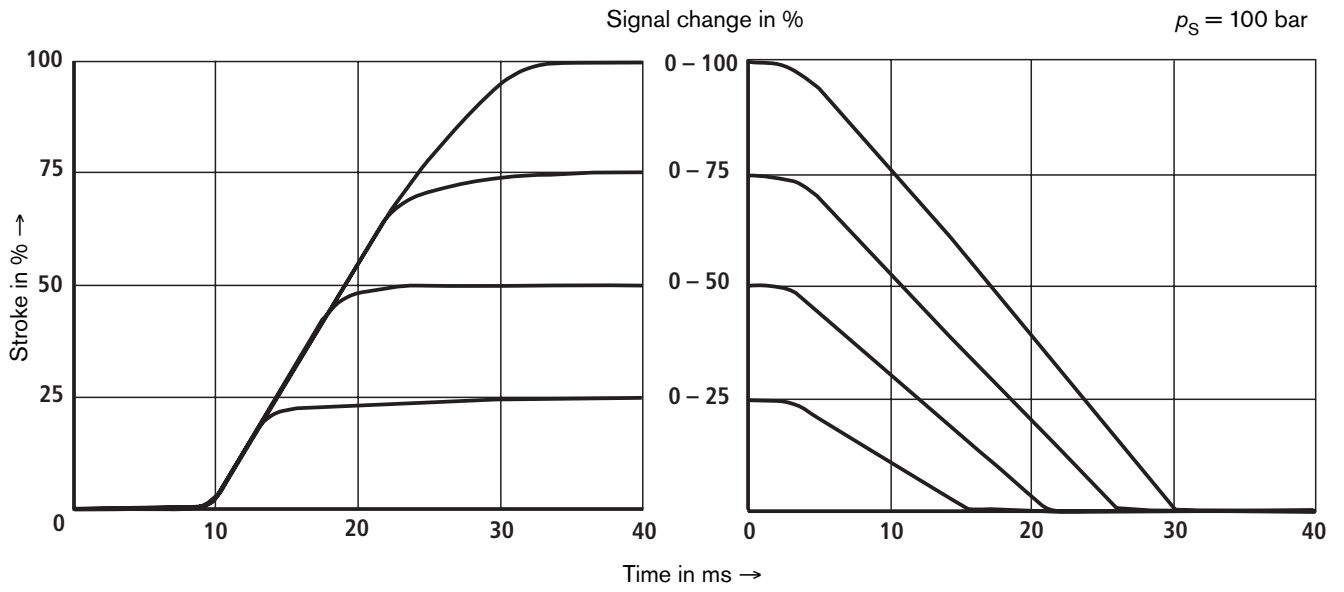


Characteristic curves (measured with HLP46 at 40 °C ± 5 °C)

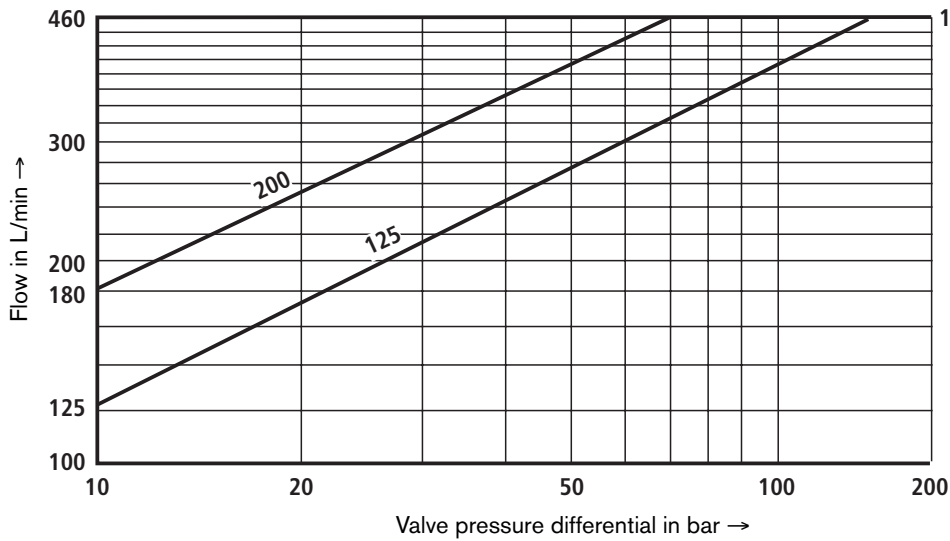
NS16

Transient function with a step form of electrical input signal

Measured at
 $p_S = 100 \text{ bar}$



Flow-load function at maximum valve opening
(tolerance ± 10 %)



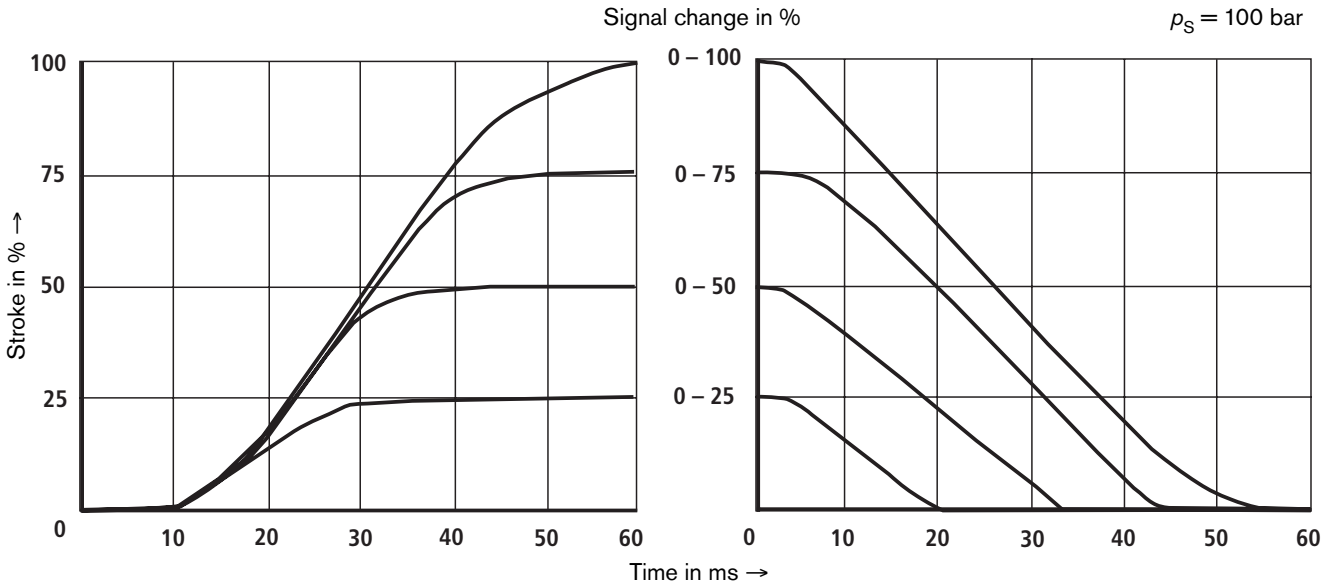
1 = Recommended flow limitation (flow velocity 30 m/s) in the valve connection ports

Characteristic curves (measured with HLP46 at 40 °C ± 5 °C)

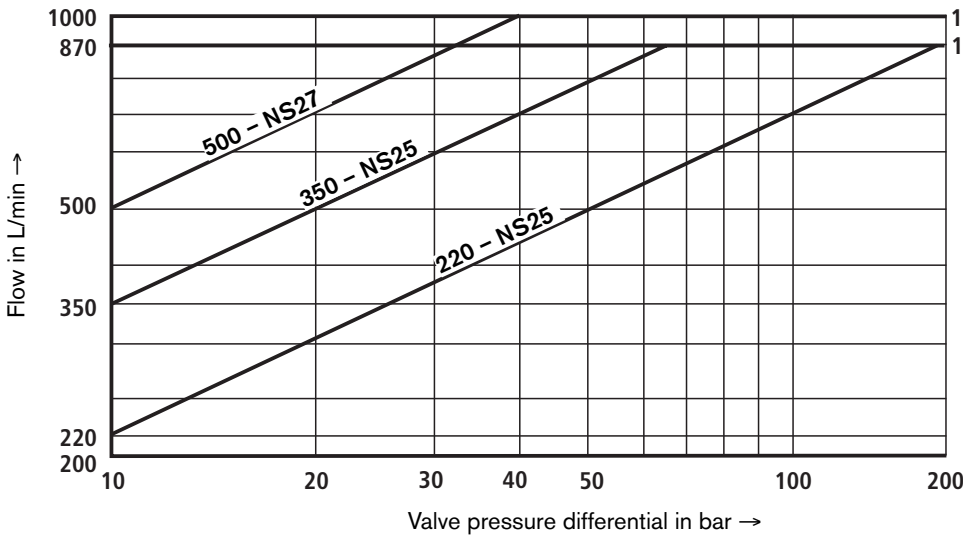
NS25 and 27

Transient function with a step form of electrical input signal

Measured at
 $p_S = 100 \text{ bar}$



Flow-load function at maximum valve opening
(tolerance ± 10 %)



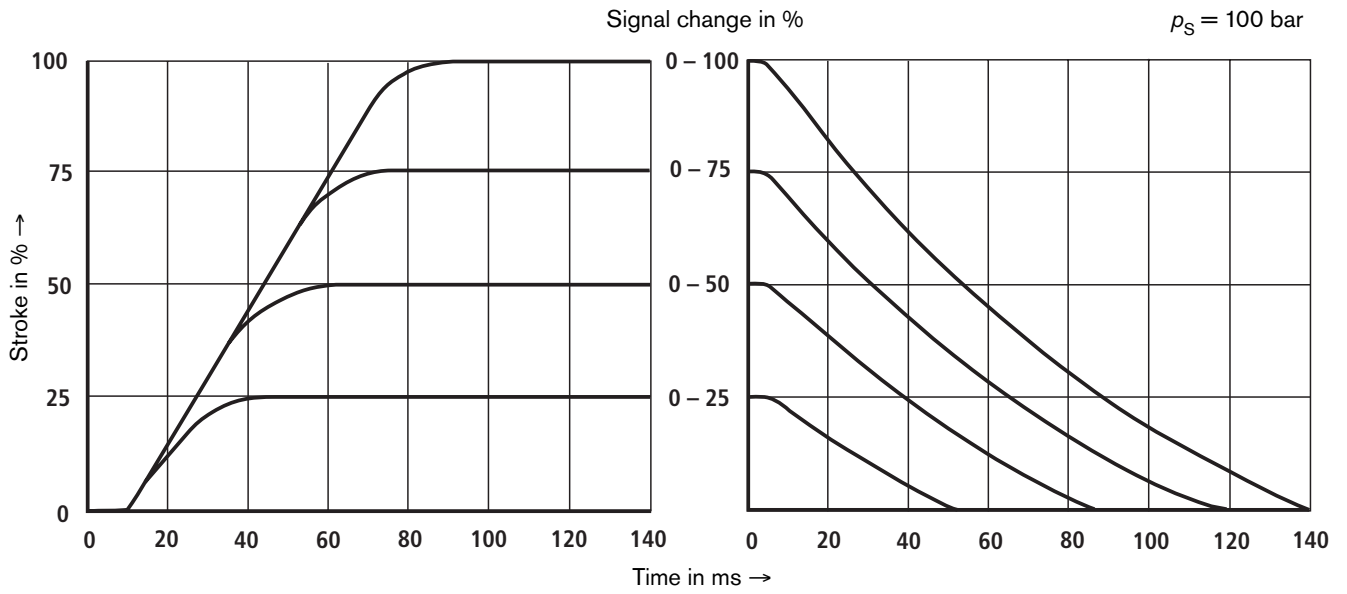
1 = Recommended flow limitation (flow velocity 30 m/s) in the valve connection ports

Characteristic curves (measured with HLP46 at 40 °C ± 5 °C)

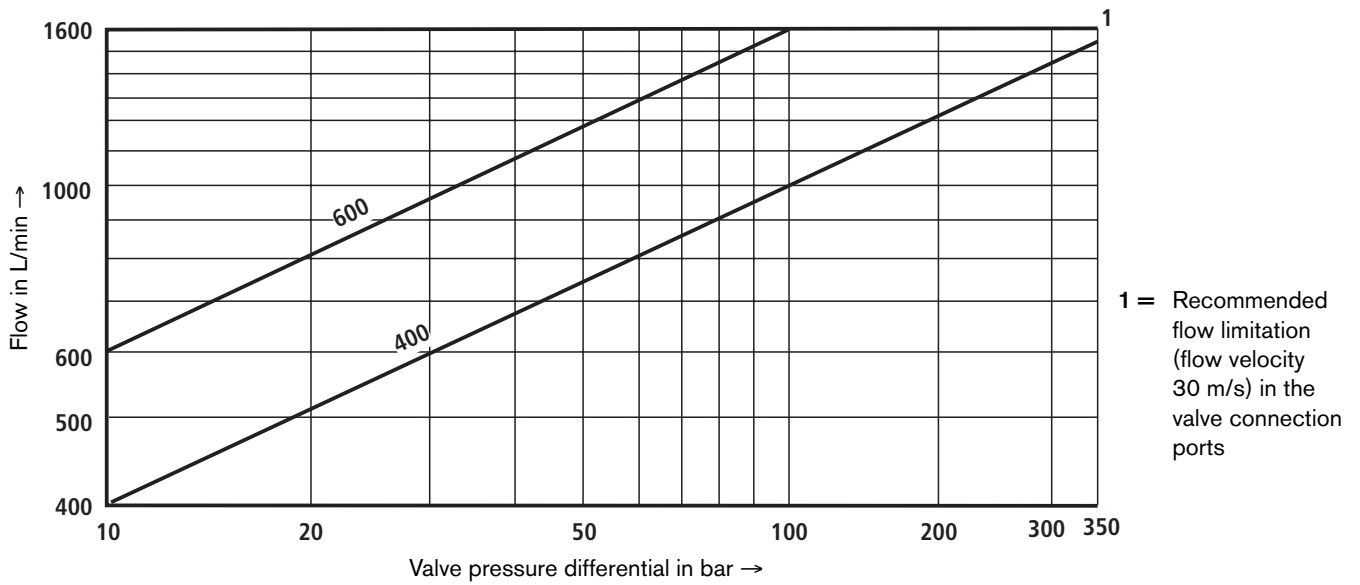
NS32

Transient function with a step form of electrical input signal

Measured at
 $p_S = 100 \text{ bar}$



Flow-load function at maximum valve opening
(tolerance ± 10 %)

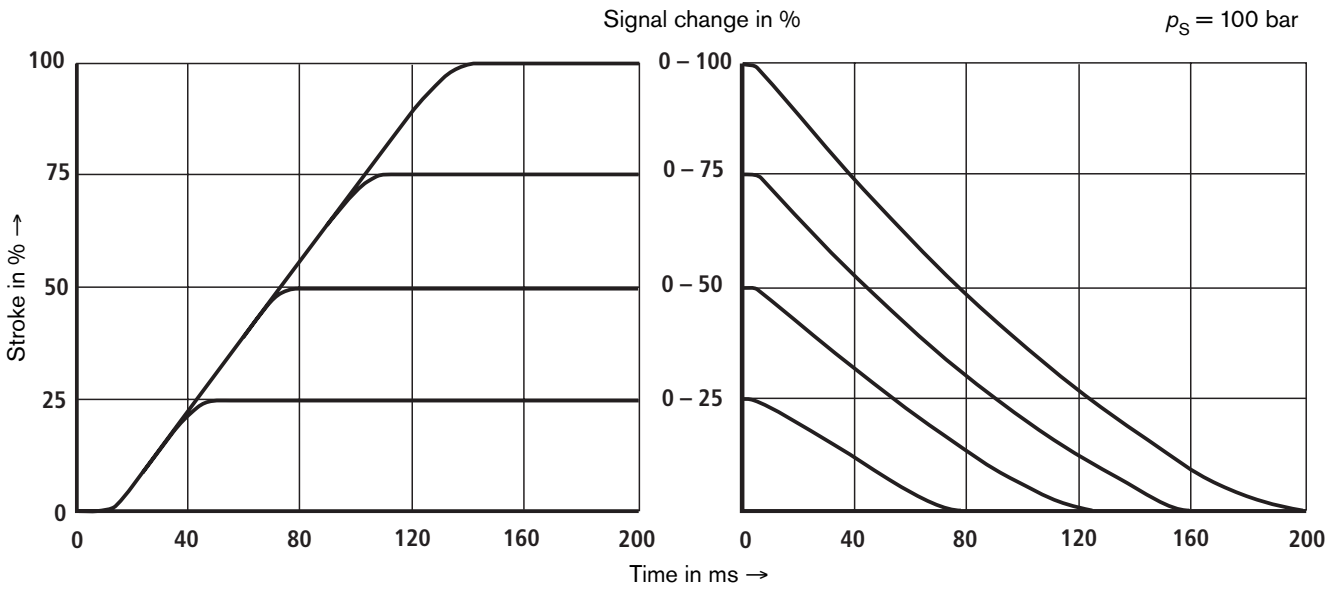


Characteristic curves (measured with HLP46 at 40 °C ± 5 °C)

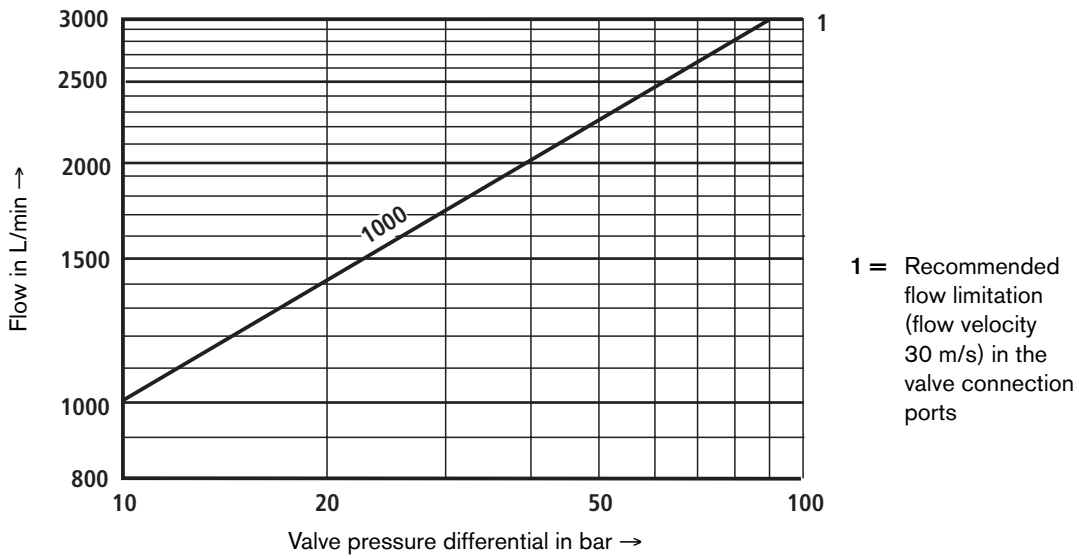
NS35

Transient function with a step form of electrical input signal

Measured at
 $p_S = 100 \text{ bar}$

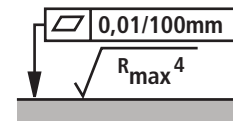
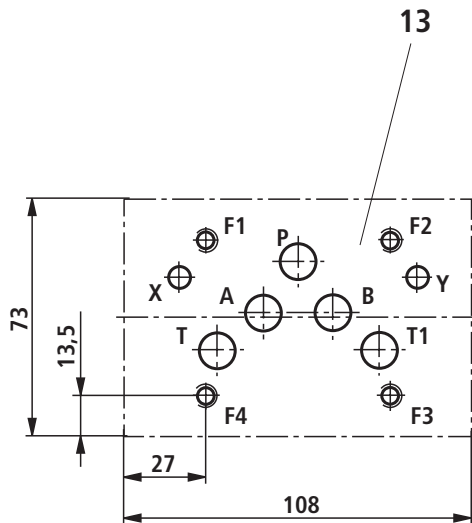
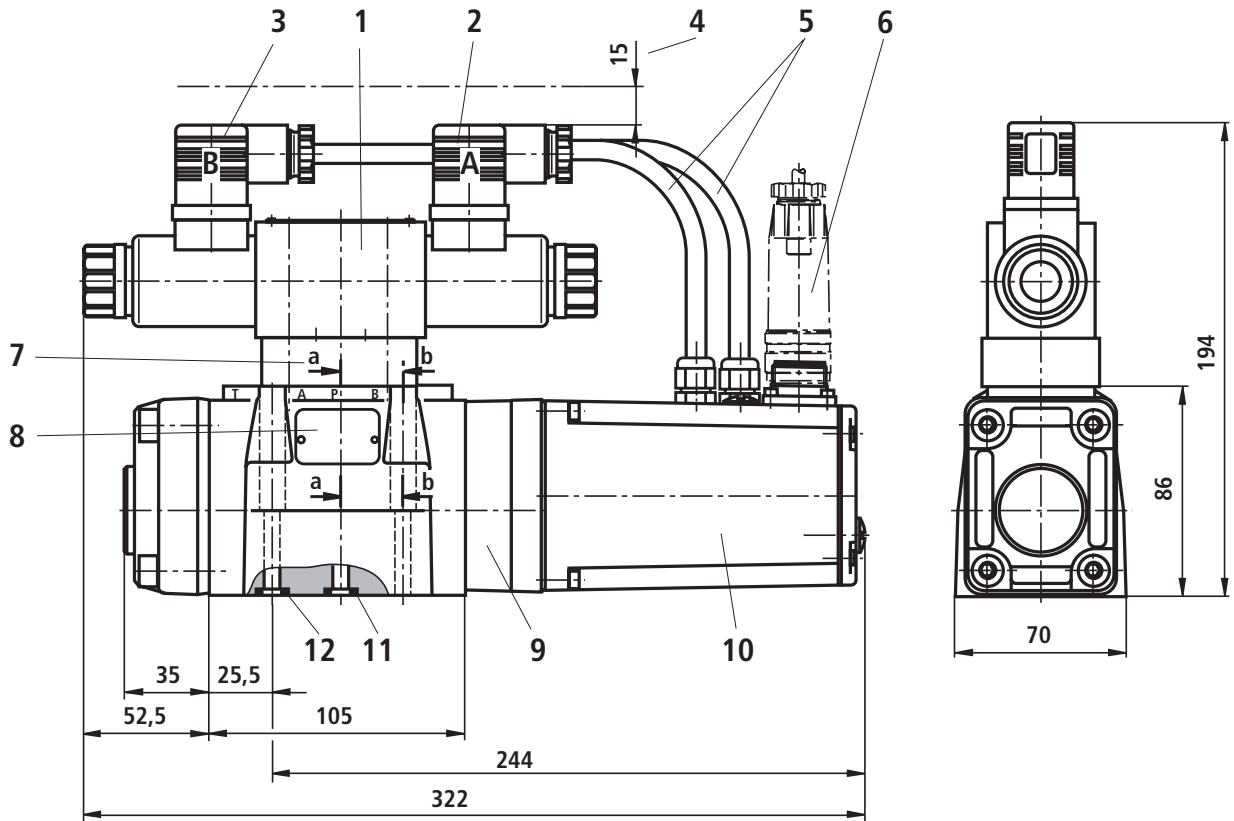


Flow-load function at maximum valve opening
(tolerance ± 10 %)



Unit dimensions (in mm)

NS10



Required surface finish of the mating piece

For sectional drawing see page 21

- 1 Pilot control valve
- 2 Plug-in connector "A", colour grey
- 3 Plug-in connector "B", colour black
- 4 Space required for the connection cable and to remove the plug-in connector
- 5 Cabling
- 6 Plug-in connector, separate order, see page 7
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Integrated control electronics
- 11 Identical seal rings for ports A, B, P, T

12 Identical seal rings for ports X, Y

13 Machined valve mounting surface, position of the ports is to ISO 4401-05-05-0-94 (ports X, Y as required)

Deviation from the standard:

- Ports A, B, T, T1 and P \varnothing 11 mm

Subplates to catalogue sheet RE 45054 and valve fixing screws must be ordered separately.

Subplates:

G 534/01 (G 3/4)

G 535/01 (G 3/4) with ports X and Y

G 536/01 (G 1) with ports X and Y

Valve fixing screws:

4 S.H.C.S. DIN 912 - M6 x 45 - 10.9;

Coating to DIN EN ISO 10683 fZn - 240h - L

(friction value 0.09 - 0.14 to VDA 235-102)

$M_A = 13.5 \text{ Nm}$,

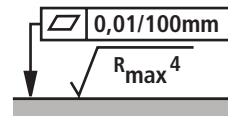
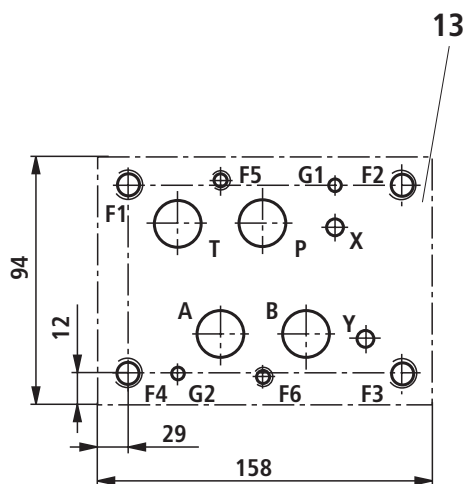
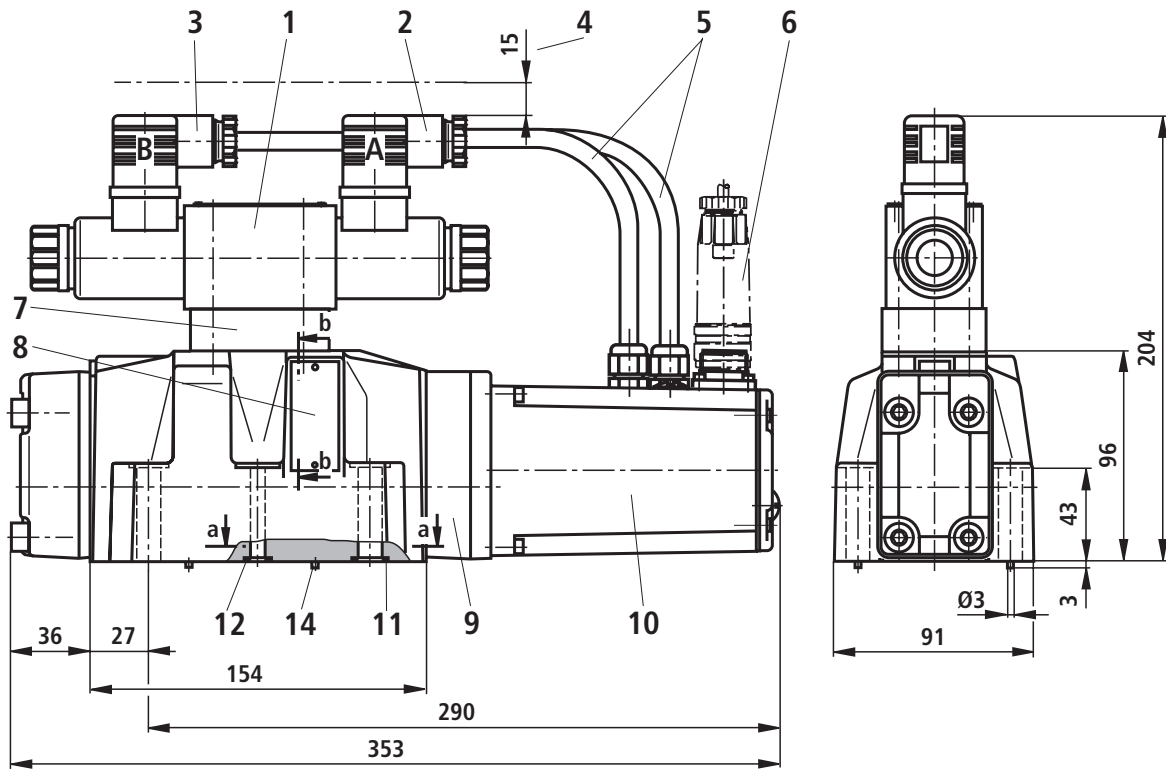
Tighten with a torque wrench with an accuracy of $\pm 10\%$

Note:

The tightening torque relates to the maximum operating pressure!

Unit dimensions (in mm)

NS16



Required surface finish of the mating piece

For sectional drawing see page 21

- 13** Machined valve mounting surface, position of the ports is to ISO 4401-07-06-0-94 (ports X, Y as required)
Deviation from the standard:
- Ports A, B, T and P \varnothing 20 mm

- 14** Locating pin

Subplates to catalogue sheet RE 45056 and valve fixing screws must be ordered separately.

Subplates:

- G 172/01 (G 3/4)
- G 172/02 (M27 x 2)
- G 174/01 (G 1)
- G 174/02 (M33 x 2)

Valve fixing screws:

- 2 S.H.C.S. DIN 912 - M6 x 60 - 10.9; $M_A = 14$ Nm
 - 4 S.H.C.S. DIN 912 - M10 x 60 - 10.9; $M_A = 58$ Nm to DIN EN ISO 10683 fZn - 240h - L (friction value 0.09 - 0.14 to VDA 235-102)
- Tighten with a torque wrench with an accuracy of $\pm 20\%$

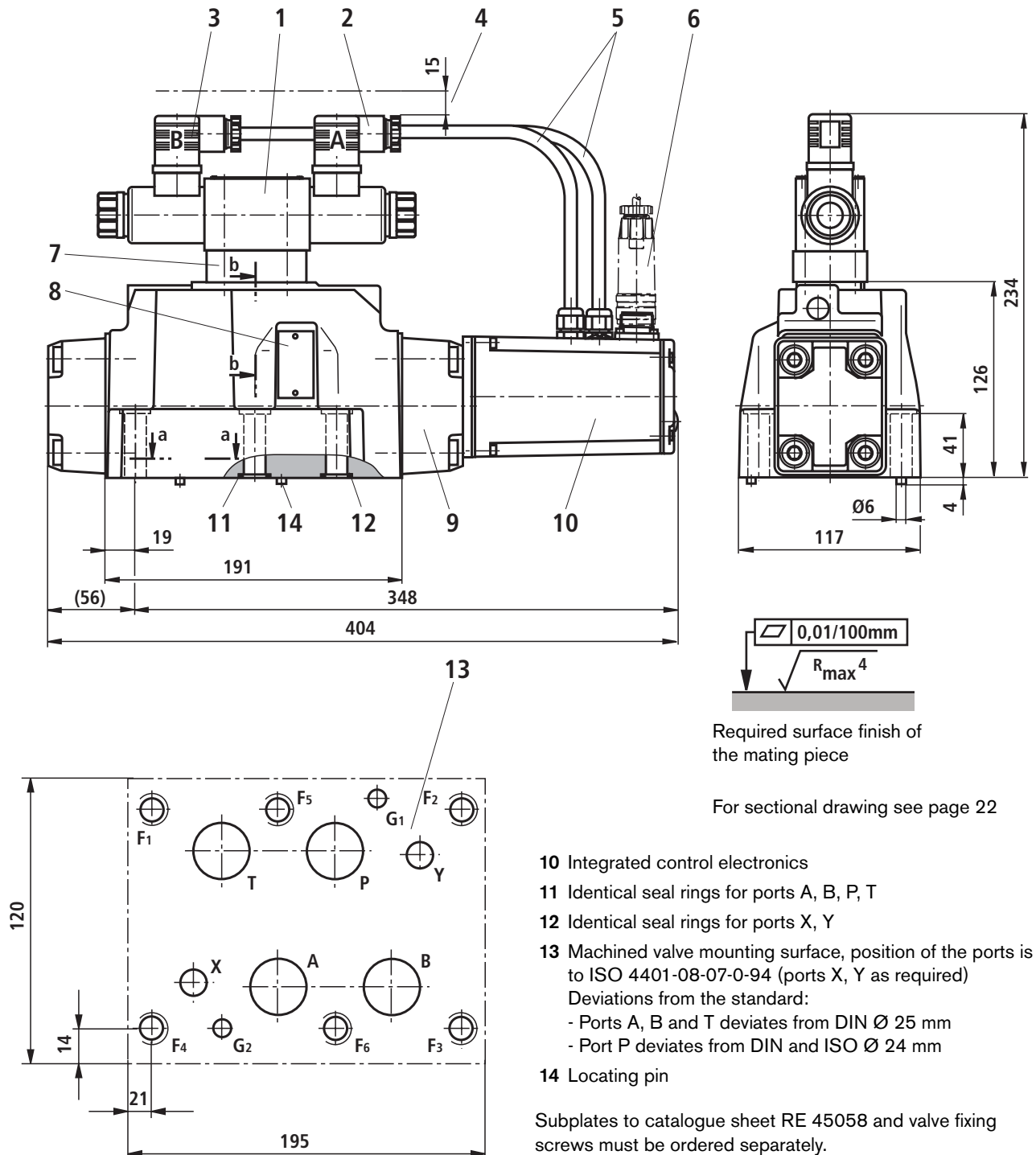
Note:

The tightening torque relates to the maximum operating pressure!

- 1** Pilot control valve
- 2** Plug-in connector "A", colour grey
- 3** Plug-in connector "B", colour black
- 4** Space required for the connection cable and to remove the plug-in connector
- 5** Cabling
- 6** Plug-in connector, separate order, see page 7
- 7** Pressure reducing valve
- 8** Name plate
- 9** Main valve
- 10** Integrated control electronics
- 11** Identical seal rings for ports A, B, P, T
- 12** Identical seal rings for ports X, Y

Unit dimensions (in mm)

NS25



- 1 Pilot control valve
- 2 Plug-in connector "A", colour grey
- 3 Plug-in connector "B", colour black
- 4 Space required for the connection cable and to remove the plug-in connector
- 5 Cabling
- 6 Plug-in connector, separate order, see page 7
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve

- 10 Integrated control electronics
- 11 Identical seal rings for ports A, B, P, T
- 12 Identical seal rings for ports X, Y
- 13 Machined valve mounting surface, position of the ports is to ISO 4401-08-07-0-94 (ports X, Y as required)
Deviations from the standard:
 - Ports A, B and T deviates from DIN Ø 25 mm
 - Port P deviates from DIN and ISO Ø 24 mm
- 14 Locating pin

Subplates to catalogue sheet RE 45058 and valve fixing screws must be ordered separately.

Subplates:

G 151/01 (G 1) G 156/01 (G 1 1/2)
G 154/01 (G 1 1/4)

Valve fixing screws:

6 S.H.C.S. DIN 912 - M12 x 60 - 10.9;
Coating to DIN EN ISO 10683 flZn - 240h - L
(friction value 0.09 - 0.14 to VDA 235-102)

$M_A = 100 \text{ Nm}$,

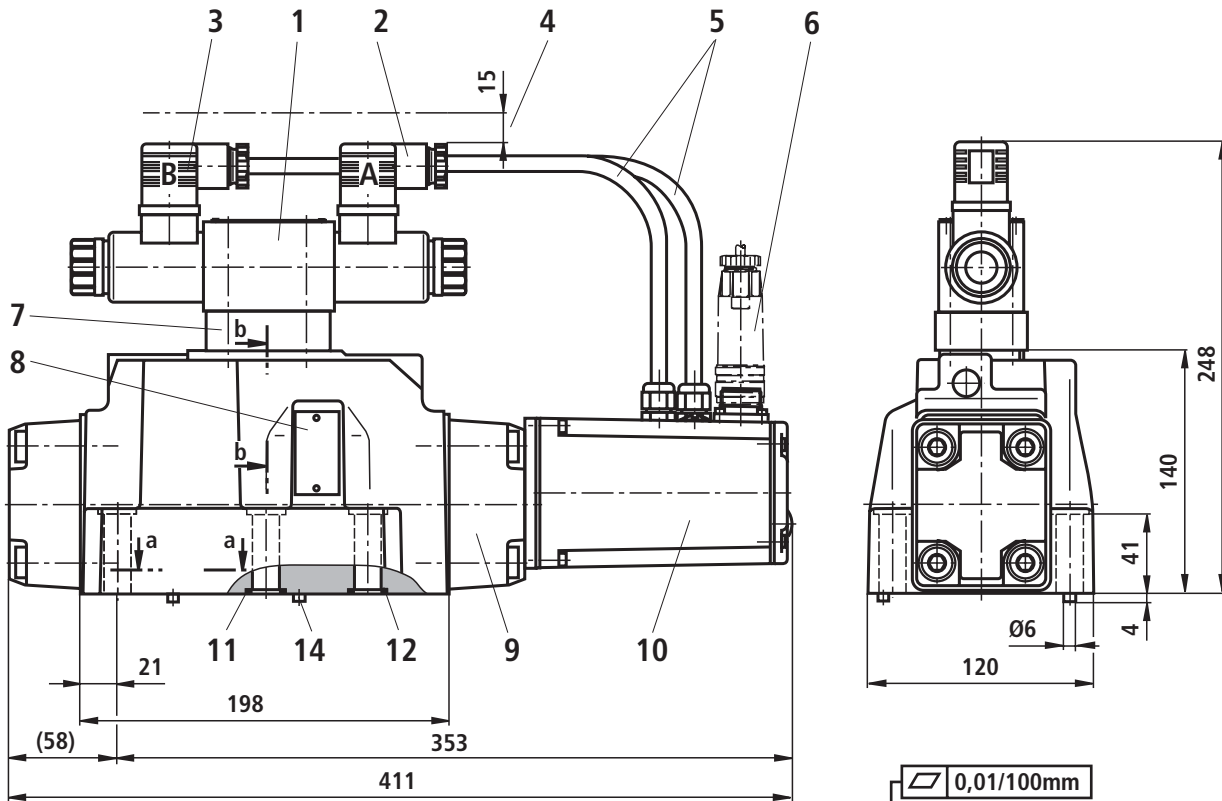
Tighten with a torque wrench with an accuracy of $\pm 20\%$

Note:

The tightening torque relates to the maximum operating pressure!

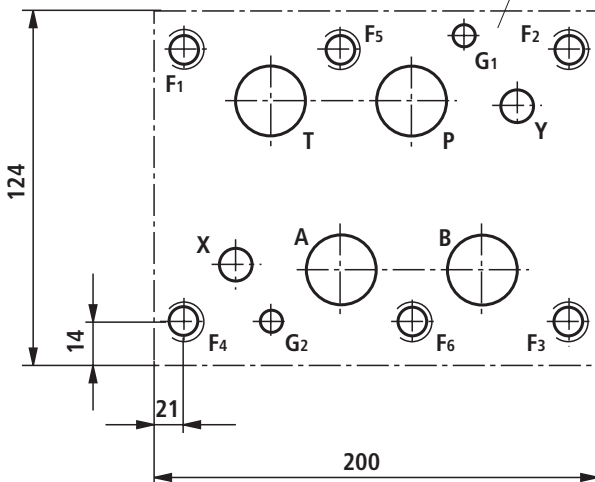
Unit dimensions (in mm)

NS27



Required surface finish of the mating piece

For sectional drawing see page 22



- 1 Pilot control valve
- 2 Plug-in connector "A", colour grey
- 3 Plug-in connector "B", colour black
- 4 Space required for the connection cable and to remove the plug-in connector
- 5 Cabling
- 6 Plug-in connector separate order, see page 7
- 7 Pressure reducing valve
- 8 Name plate

- 9 Main valve
- 10 Integrated control electronics
- 11 Identical seal rings for ports A, B, P, T
- 12 Identical seal rings for ports X, Y
- 13 Machined valve mounting surface, position of the ports is to ISO 4401-08-07-0-94 (ports X, Y as required)
Deviation from the standard:
- Ports A, B, T and P \varnothing 32 mm
- 14 Locating pin

Subplates to catalogue sheet RE 45058 and valve fixing screws must be ordered separately.

Subplates:

- G 151/01 (G 1)
- G 154/01 (G 1 1/4)
- G 156/01 (G 1 1/2)

Valve fixing screws:

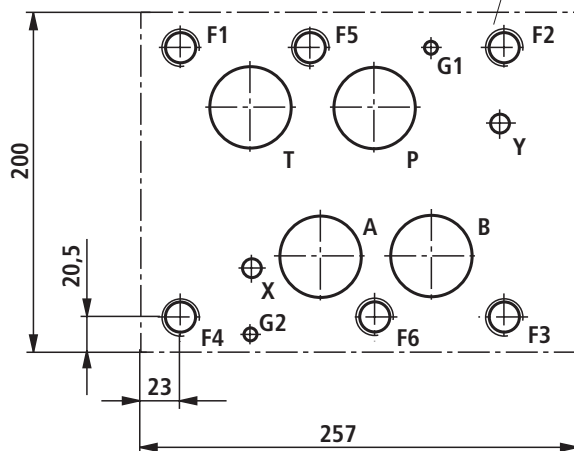
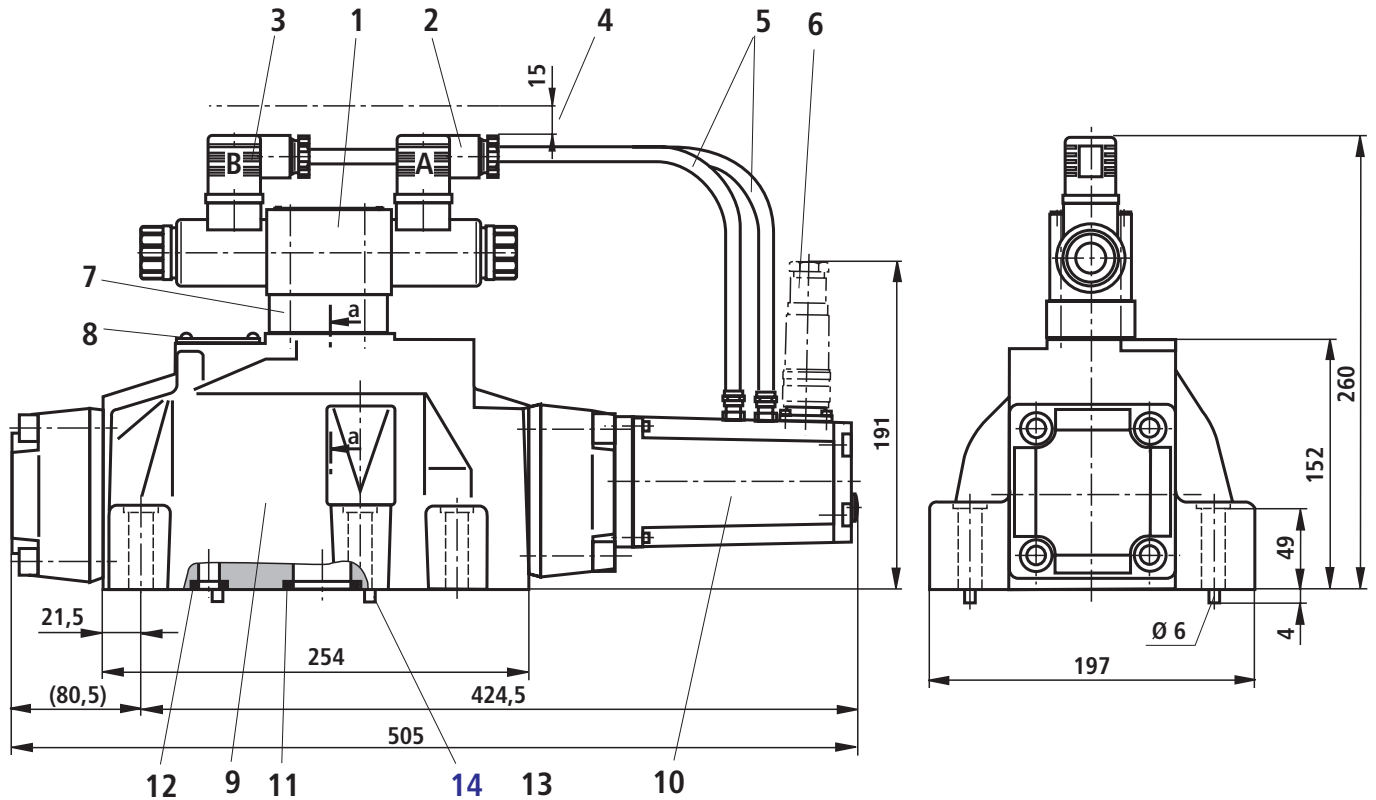
- 6 S.H.C.S. DIN 912 - M12 x 60 - 10.9;
- Coating to DIN EN ISO 10683 flZn - 240h - L (friction value 0.09 - 0.14 to VDA 235-102)
- $M_A = 100$ Nm,
- Tighten with a torque wrench with an accuracy of $\pm 20\%$

Note:

The tightening torque relates to the maximum operating pressure!

Unit dimensions (in mm)

NS32



- 1 Pilot control valve
- 2 Plug-in connector "A", colour grey
- 3 Plug-in connector "B", colour black
- 4 Space required for the connection cable and to remove the plug-in connection
- 5 Cabling
- 6 Plug-in connector, separate order, see page 7
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Integrated control electronics
- 11 Identical seal rings for ports A, B, P, T

Required surface finish of the mating piece

For sectional drawing see page 22

12 Identical seal rings for ports X, Y

13 Machined valve mounting surface, position of the ports is to ISO 4401-10-08-0-94 (ports X, Y as required)
Deviation from the standard:
- Ports A, B, T and P Ø 38 mm

14 Locating pin

Subplates to catalogue sheet RE 45060 and valve fixing screws must be ordered separately.

Subplates:

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

Valve fixing screws:

6 S.H.C.S. DIN 912 - M20 x 80 - 10.9;
Coating to DIN EN ISO 10683 flZn - 240h - L
(friction value 0.09 - 0.14 to VDA 235-102)

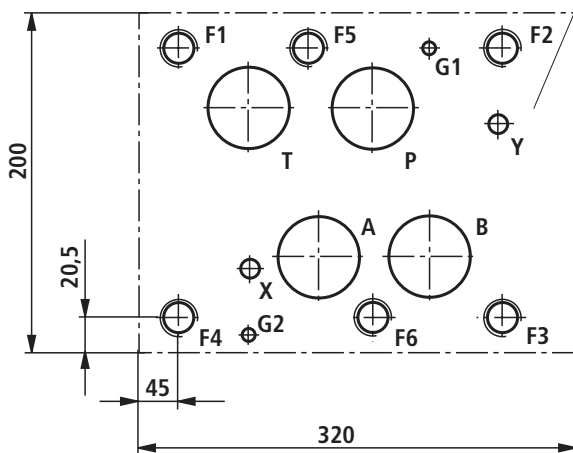
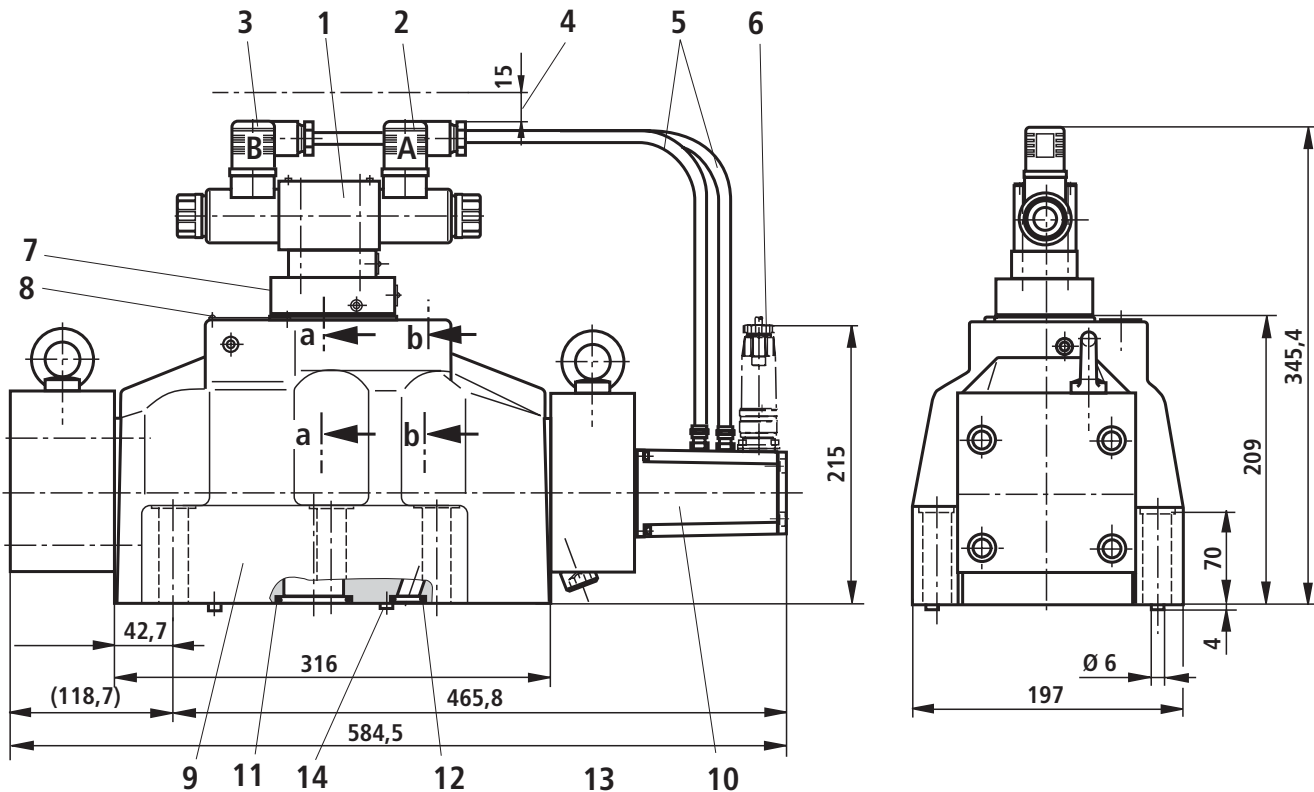
$M_A = 340 \text{ Nm}$,
Tighten with a torque wrench with an accuracy of $\pm 20\%$

Note:

The tightening torque relates to the maximum operating pressure!

Unit dimensions (in mm)

NS35



Required surface finish of the mating piece

For sectional drawing see page 22

- 1 Pilot control valve
- 2 Plug-in connector "A", colour grey
- 3 Plug-in connector "B", colour black
- 4 Space required for the connection cable and to remove the plug-in connector
- 5 Cabling
- 6 Plug-in connector, separate order, see page 7
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Integrated control electronics

- 11 Identical seal rings for ports A, B, P, T
- 12 Identical seal rings for ports X, Y
- 13 Machined valve mounting surface, position of the ports is to ISO 4401-10-08-0-94 (ports X, Y as required)
Deviation from the standard:
- Ports A, B, T and P \varnothing 50 mm
- 14 Locating pin

Valve fixing screws

6 S.H.C.S. DIN 912 - M20 x 100 - 10.9;
Coating to DIN EN ISO 10683 flZn - 240h - L
(friction value 0.09 - 0.14 to VDA 235-102)
 $M_A = 360$ Nm,
Tighten with a torque wrench with an accuracy of $\pm 20\%$

Note:

The tightening torque relates to the maximum operating pressure!

Pilot oil supply

Type 4WRKE...-3X/... External pilot oil supply external pilot oil drain

In this version the pilot oil supply is from a separate pilot pressure circuit (external).

The pilot oil drain is not into the T port of the main valve but separately into tank via port Y (external).

Type 4WRKE...-3X/...E... Internal pilot oil supply external pilot oil drain

In this version the pilot oil supply is from the P port of the main valve (internal).

The pilot oil drain is not into the T port of the main valve but separately into tank via port Y (external).

Port X must be plugged in the subplate.

Type 4WRKE...-3X/...ET... Internal pilot oil supply internal pilot oil drain

In this version the pilot oil supply is from the P port of the main valve (internal).

The pilot oil drain is directly into the T port of the main valve (internal).

Port Y must be plugged in the subplate.

Type 4WRKE...-3X/...T... External pilot oil supply internal pilot oil drain

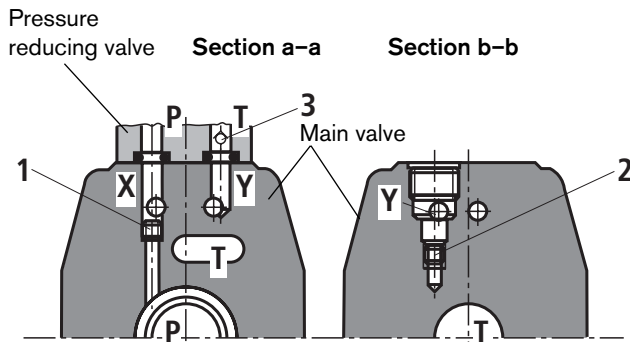
In this version the pilot oil supply is from a separate pilot pressure circuit (external).

The pilot oil drain is directly into the T port of the main valve (internal).

Port Y must be plugged in the subplate.

Pos. 1 and 2: Plug M6 DIN 906-8.8 3A/F

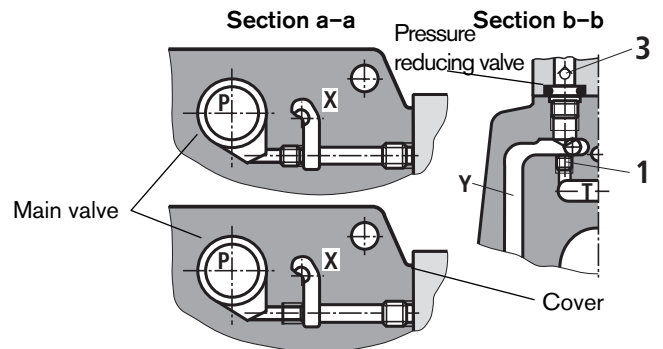
NS10 Sectional diagram, see page 15



Pilot oil supply	external:	1	closed
	(section a-a)	internal:	1
Pilot oil drain	external:	2	closed (Pos 3 not present)
	(section b-b)	internal:	2

3 Check valve

NS16 Sectional diagram, see page 16



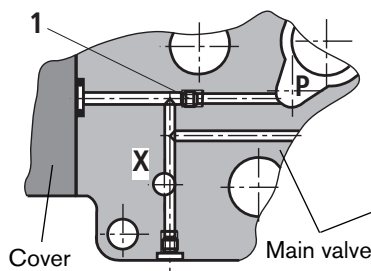
Pilot oil supply	external:	P	closed
	(section a-a)	internal:	P
Pilot oil drain	external:	1	closed (Pos 3 not present)
	(section b-b)	internal:	1

3 Check valve

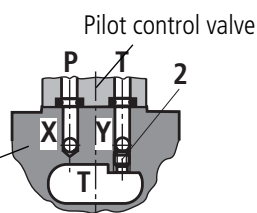
Pilot oil supply

NS25 Sectional diagram, see page 17

and 27 **Section a-a**

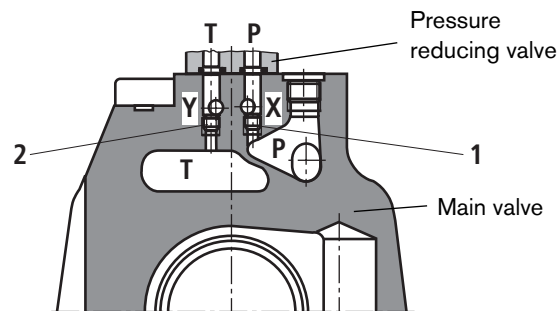


Section b-b



Pilot oil supply	external: 1	closed
(section a-a)	internal: 1	open
Pilot oil drain	external: 2	closed
(section b-b)	internal: 2	open

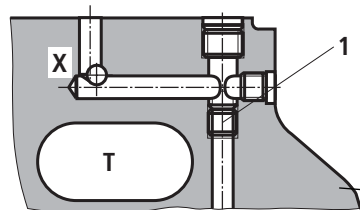
NS32 Sectional diagram, see page 18



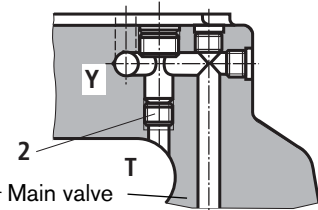
Pilot oil supply	external: 1	closed
	internal: 1	open
Pilot oil drain	external: 2	closed
	internal: 2	open

NS35 Sectional diagram, see page 19

Section a-a



Section b-b



Pilot oil supply	external: 1	closed
(section a-a)	internal: 1	open
Pilot oil drain	external: 2	closed
(section b-b)	internal: 2	open

Notes

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Notes
