

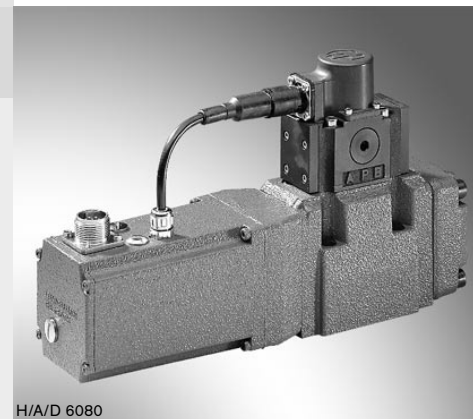
4/3-way high response directional control valve pilot operated with electrical feedback and integrated electronics (OBE)

RE 29093/09.07
Replaces: 08.04

1/20

Type 4WRDE

Nominal size 10 to 35
Component series 5X
Maximum operating pressure 350 bar
Maximum flow 3000 L/min



H/A/D 6080

Overview of contents

Contents	Page
Features	1
Ordering details	2
Preferred types	3
Symbols	3
Function, section, valve features	4
Technical data	5 and 6
Connection allocation / Block circuit diagram for the integrated electronics (OBE)	6
Electrical connection, plug-in connector	7 and 8
Characteristic curves	9 to 14
Unit dimensions	15 to 20

Features

- Pilot operated 3-stage high response directional control valve with electrical feedback of the main spool and integrated electronics (OBE)
- Acquisition of the main spool position by means of an inductive position transducer
- 2-stage pilot control valve, type 4WS2EM 6-2X/...
- Particularly suitable for closed loop position, velocity, pressure and force control with simultaneous high requirements in dynamic response and response sensitivity
- Subplate mounting:
Porting pattern to ISO 4401 (NS10 to 35)
- Signal integration of the valve's closed loop control circuit, the supply to the position measuring system and the control of the pilot control valve are carried out via the integrated control electronics

Information on available spare parts:
www.boschrexroth.com/spc

²⁾ Suitable for mineral oil (HL, HLP) according to DIN 51524

Preferred types

Type – NS10	Material No.
4WRDE 10 V50L-5X/6L24ETK9/MR	R900246718
4WRDE 10 V50L-5X/6L24K9/MR	R900948785
4WRDE 10 V100L-5X/6L24ETK9/MR	R900978379
4WRDE 10 V100L-5X/6L24K9/MR	R900966563
4WRDE 10 V100L-5X/6L24K9/WG152MR	R900963311
4WRDE 10 V1-100L-5X/6L24K9/WG152MR	R900964258

Type – NS16	Material No.
4WRDE 16 V125L-5X/6L24K9/MR	R900959699
4WRDE 16 V125L-5X/6L24K9/WG152MR	R900957525
4WRDE 16 V200L-5X/6L24ETK9/MR	R900951313
4WRDE 16 V200L-5X/6L24K9/MR	R900957581
4WRDE 16 V200L-5X/6L24K9/WG152MR	R900964249

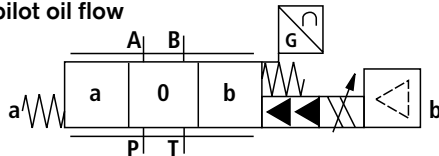
Type – NS25	Material No.
4WRDE 25 V220L-5X/6L24K9/MR	R900959210
4WRDE 25 V350L-5X/6L24K9/MR	R900978280
4WRDE 25 V350L-5X/6L24K9/WG152MR	R900962078
4WRDE 25 V1-350L-5X/6L24EK9/WG152MR	R900702612

Type – NS32	Material No.
4WRDE 32 V600L-5X/6L24K9/MR	R900757984
4WRDE 32 V600L-5X/6L24K9/WG152MR	R900945479
4WRDE 32 V1-600L-5X/6L24K9/WG152MR	R900956902

Symbols (simplified, detailed)

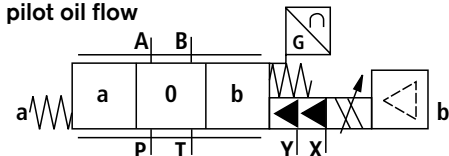
Type 4WRDE...-5X...ET.

Internal pilot oil flow



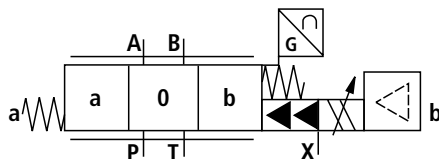
Type 4WRDE...-5X...

External pilot oil flow



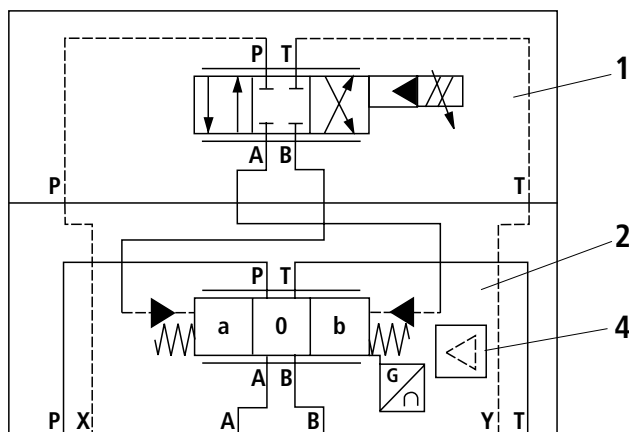
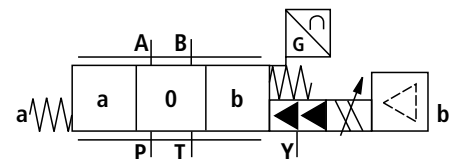
Type 4WRDE...-5X...T...

External pilot oil supply, internal pilot oil return



Type 4WRDE...-5X...E...

Internal pilot oil supply, external pilot oil return

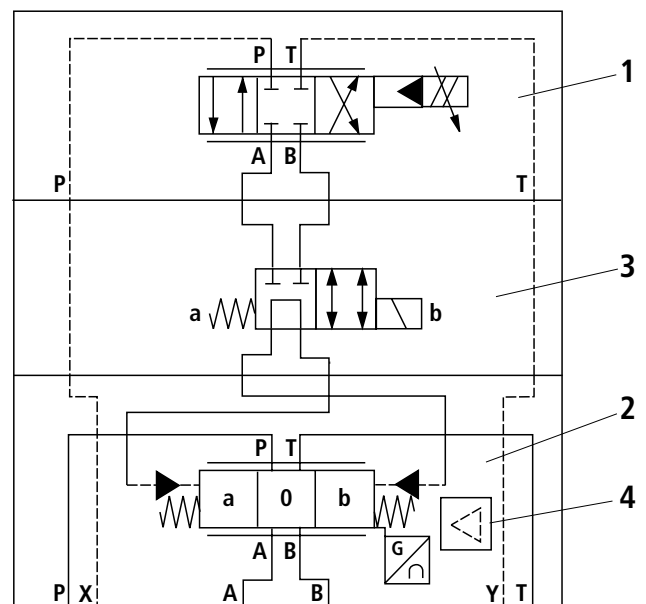


Detailed

Example: Type 4WRDE...-5X/...

External pilot oil supply, external pilot oil return

- 1 Pilot control valve
- 2 Main valve
- 3 Sandwich plate directional valve
- 4 Integrated electronics (OBE)



Example: Type 4WRDE...-5X/...WG152

Sandwich plate directional valve for centralising the main stage
External pilot oil supply, external pilot oil return

Function, section, valve features

Valves of the 4WRDE type are 3-stage high response directional control valves.

They control or regulate the rate and direction of a flow and are primarily used in closed loop circuits for various tasks.

These valves basically consist of the following assemblies:

- 2-stage pilot control valve comprising a torque motor (1) and a hydraulic amplifier (5) designed as a flapper jet valve and spool sleeve unit (6) as a flow amplifier stage for the control of the third stage (7).
- Third stage (7) for flow control.
- An inductive position transducer (8), the core (9) of which is attached to main spool (10) of the third stage.

The position of the spool (10) is acquired via the inductive position transducer (8). The signal integration of the valve closed loop control circuit, the supply to the position measuring system and the control of the pilot control valve are carried out via the control electronics which are integrated in the valve.

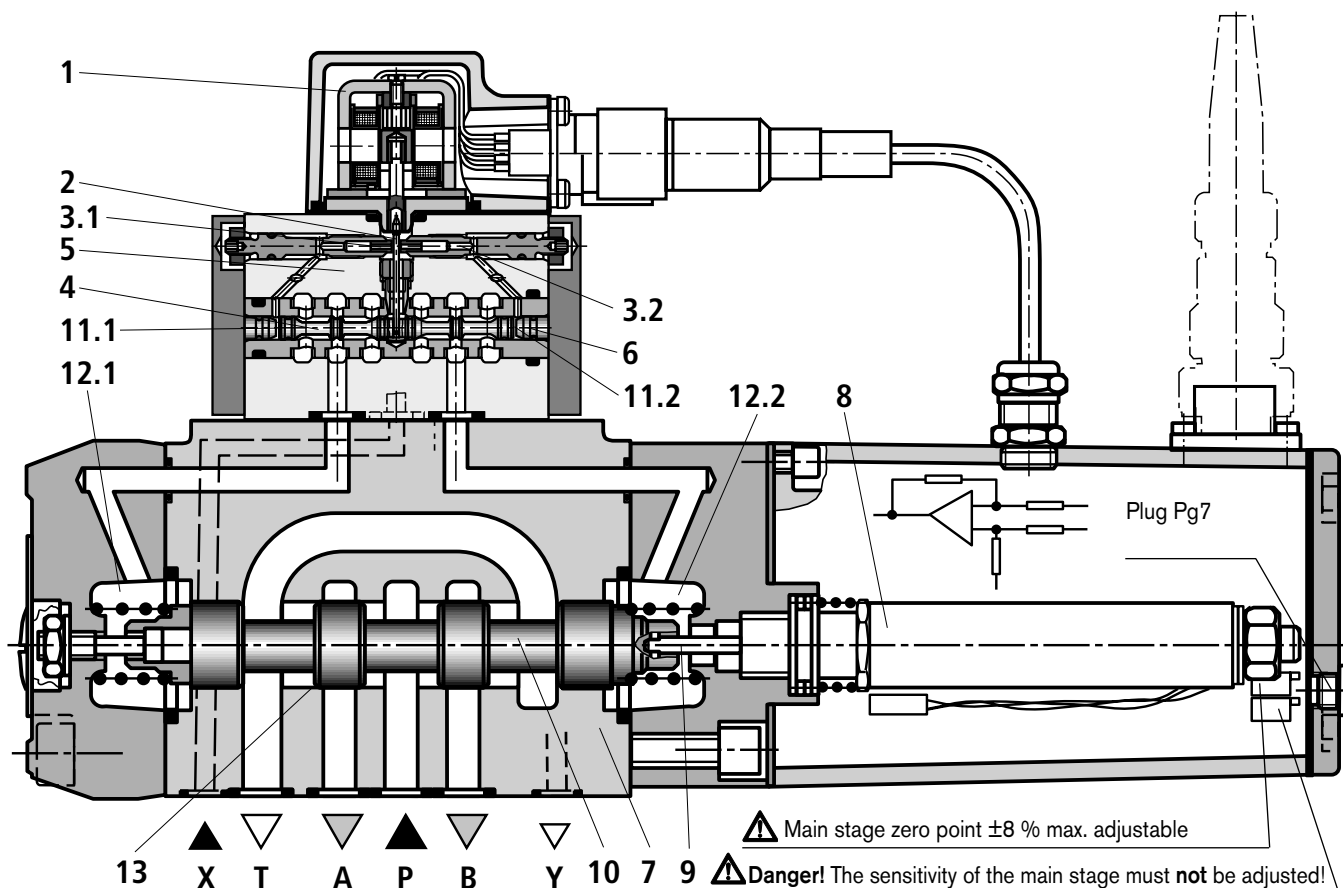
The differential voltage generated by the command/actual value comparison is amplified within the control electronics and passed on to the first stage of the valve as a control deviation. This signal moves the flapper plate (2) between the two control jets (3.1, 3.2). Thus, a pressure differential is generated between the two control chambers (11.1, 11.2). The control spool (4) is displaced and passes a corresponding oil flow into the control chamber (12.1 or 12.2). The spool (10) and the attached core (9) of the inductive position transducer (8) are displaced until the actual value signal once more tallies with the command value signal. In the controlled condition, the spool (10) is held in the position defined by the command value.

The spool stroke is proportional to the command value. To control the flow, there is a relevant control opening to which the flow is proportional. This the result of the position of the control spool (10) with regard to the control lands (13). The valve dynamics are optimised via the electrical amplification. The control electronics are integrated in the valve (oscillator, demodulator).

Valve features

- The third stage basically consists of components from our proportional valves.
- The control lands of spool and housing for V spools are ground to match each other.
- 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 $\pm 8\%$ of the nominal 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. Any calibration must only be carried out by trained personnel.
- Maintenance work on the pilot control valve must only be carried out by Bosch Rexroth personnel. However, the replacement of the replacement part, consisting of a filter element and a seal, is excluded from this - Material no. **R961001949**. Care must be taken to ensure that the seal is correctly located and that the plugs are correctly tightened. The tightening torque of the cover screws is 20 Nm.

⚠ 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
Weight	kg	6,8	8,9	15,2	15,5	35,2	71
Installation and commissioning guidelines	Preferably horizontal, see RE 07700						
Storage temperature range	°C	-20 to +80					
Ambient temperature range	°C	-20 to +60					

Hydraulic (measured with HLP 46, $\vartheta_{Oil} = 40\text{ °C} \pm 5\text{ °C}$)

Max. operating pressure	Ports P, A, B	External pilot oil supply ¹⁾	bar	to 315	to 350	to 350	to 210	to 350	to 350
	Port X		bar	250 (min. 25)			210 (min. 25)	250 (min. 25)	
	Ports P, A, B	Internal pilot oil supply	bar	250 (min. 25)			210 (min. 25)	250 (min. 25)	
Max. Return pressure	Port T	Internal pilot oil return	bar	Pressure peaks < 100 permissible					
		External pilot oil return	bar	to 315	to 250	to 250	to 210	to 250	to 250
	Port Y	Internal pilot oil return	bar	Pressure peaks < 100 permissible					
Nominal flow $q_{Vnom} \pm 10\%$ at $\Delta p = 10\text{ bar}^{2)}$			L/min	25	–	–	–	–	–
Δp = valve pressure differential in bar				50	125	220	–	400	–
				100	200	350	500	600	1000
Flow in the main valve (max. permissible)			L/min	170	460	870	1000	1600	3000
Pilot oil flow at ports X or Y with a stepped form of input signal from 0 to 100 % (315 bar)			L/min	2,7	5,4	6,5	6,5	18,2	24,2
Pressure fluid				Mineral oil (HL, HLP) according to DIN 51524, other pressure fluids upon request					
Pressure fluid temperature range			°C	–20 to +80; preferably +40 to +50					
Viscosity range			mm ² /s	20 to 380					
Max. permissible degree of pressure fluid contamination									
Cleanliness class according to ISO 4406 (c)	Pilot control valve			Class 17/15/12 ³⁾					
	Main valve			Class 20/18/15 ³⁾					
Hysteresis			%	≤ 0,2					
Response sensitivity			%	≤ 0,1					
Zero point calibration (factory pre-set) ⁴⁾			%	≤ 1					
Zero point drift with change in:									
	Pressure fluid temperature	% / 20 °K		≤ 0,7					
	Operating pressure	% / 100 bar		≤ 0,5					
	Return flow pressure 0 to 10 % from p	%		≤ 0,2					

¹⁾ For optimum system characteristics we recommend, with pressures over 210 bar, an external pilot oil supply.

²⁾ q_{Vnom} = Nominal flow (of the entire valve) in L/min with a V spool

³⁾ The cleanliness classes stated for the components must be adhered too 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 50088.

⁴⁾ Referring to the pressure signal characteristic curve (V spool)

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

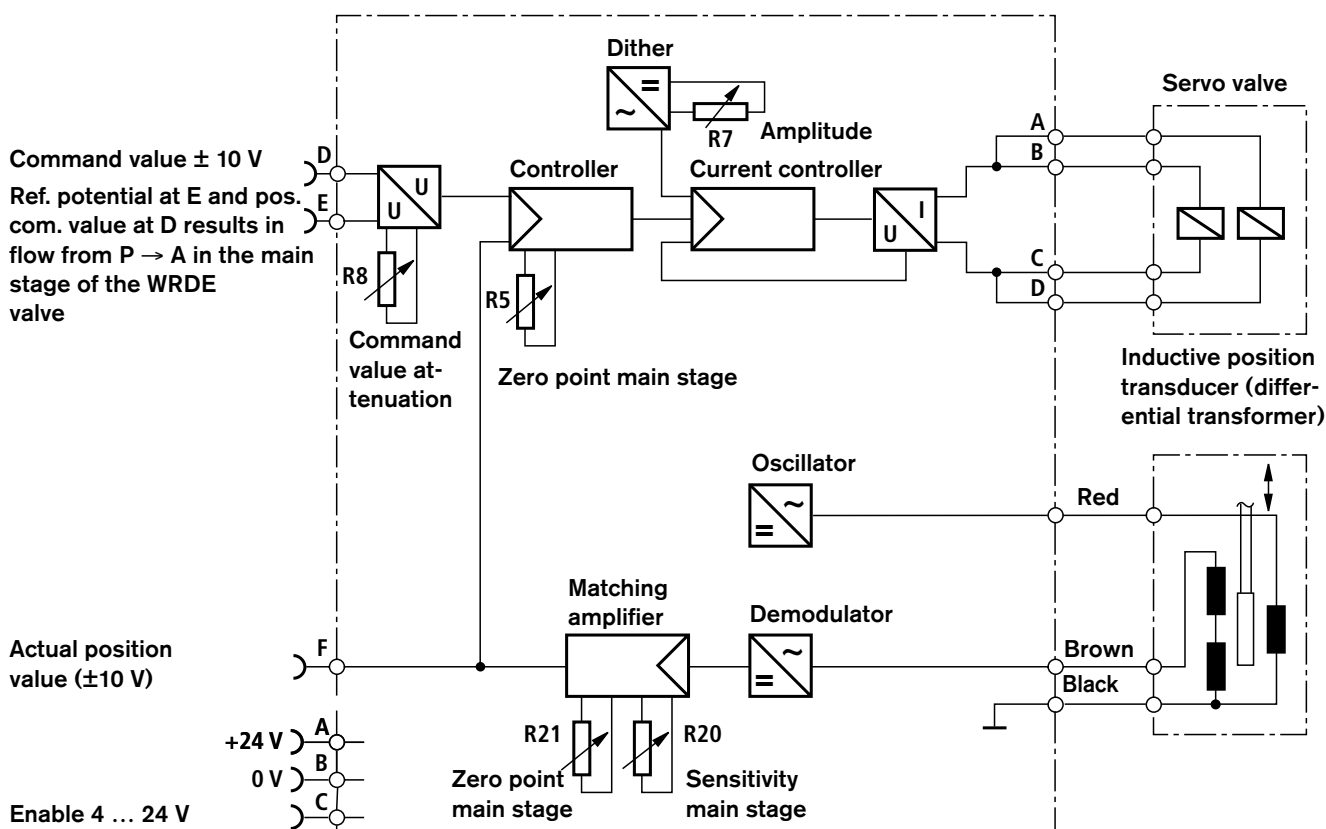
Electrical

Voltage type	DC
Signal type	Analogue
Valve protection according to EN 60529	IP65 with mounted and fixed plug-in connector
Control electronics	Integrated in the valve

 **Note!**
For details regarding the **environmental simulation test** covering EMC (electro-magnetic compatibility), climate and mechanical loading, see RE 29093-U (declaration regarding environmental compatibility).

Electrical connections

Block circuit diagram for the integrated electronics (OBE)



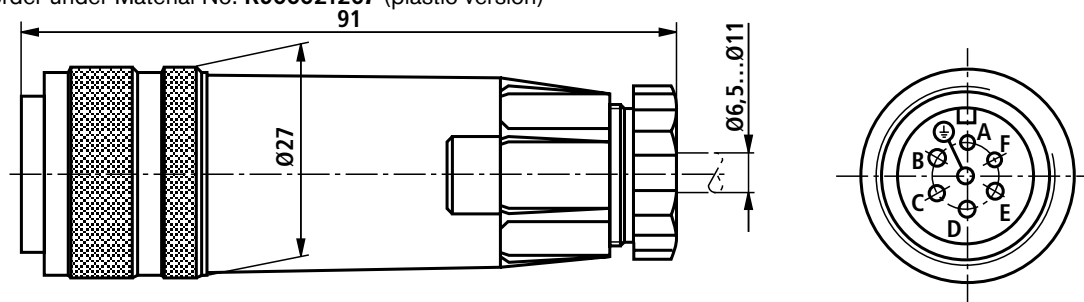
Note: Electrical signals (e.g. actual value or enable) led out via valve control electronics must not be used to switch off the machine's safety-relevant functions!
(See also the European Standard "Safety requirements of fluid technology systems and components – hydraulics", EN 982!)

Electrical connection, plug-in connector (dimensions in mm)

Plug-in connector for control valve

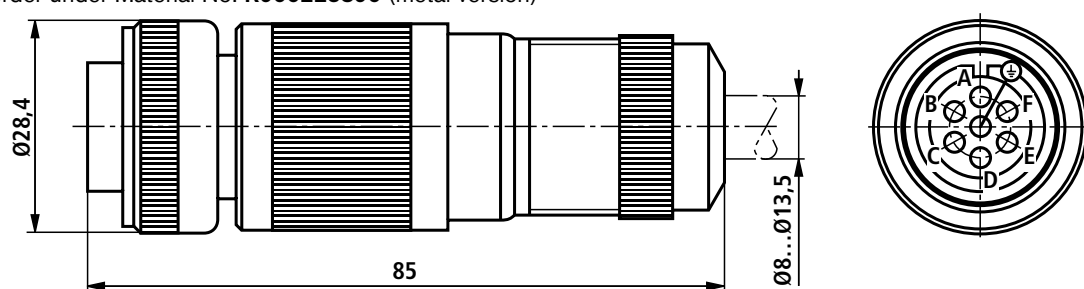
Plug-in connector according to DIN EN 175201-804

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



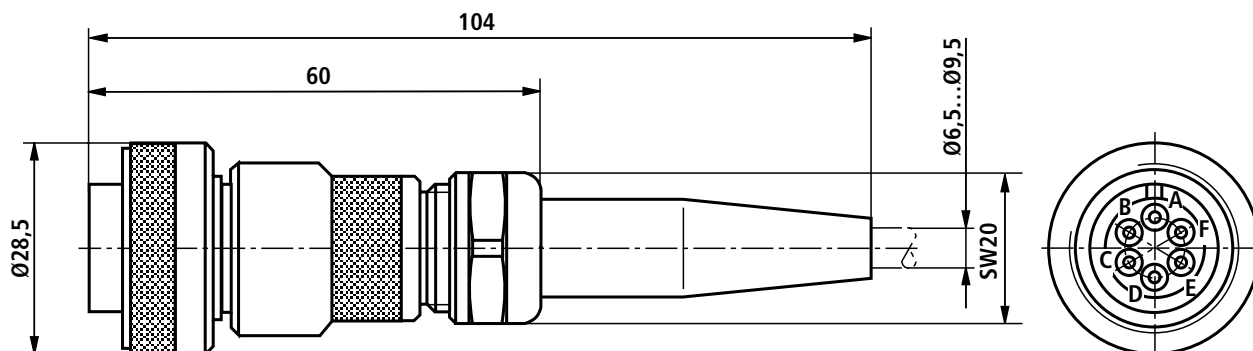
Plug-in connector according to DIN EN 175201-804

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



Plug-in connector compatible to VG 95 328, size 14-6S

Separate order under Material No. **R900013159** (metal version)



Component plug allocation	Contact	Signal
Supply voltage	A	24 VDC (20 to 28 VDC); full bridge rectification with 2200 µF smoothed; $I_{\max} = 270 \text{ mA}$
	B	0 V
¹⁾ Enable (the valve circuit is activated)	C	4 to 24 VDC
Differential amplifier input (command value)	D	$\pm 10 \text{ V}$ ^{2); 3)}
	E	
Actual value	F	$\pm 10 \text{ V}$ (to contact „B“)

¹⁾ With hydraulic pressure present and a **non activated enable**, the spool of the main stage is displaced into the end position and the cylinder axis moves out of its position with its **maximum velocity**. By using a WG152 sandwich plate directional valve between the pilot valve and main stage, one can unload the control chambers from the pilot control valve to the main spool, and the spool of the main stage is

centered in the middle position or held in a preferred position by springs. As a result, the cylinder axis moves out of its position at its **minimum velocity**.

²⁾ A positive command value at D with respect to E results in a flow from P to A in the main stage!

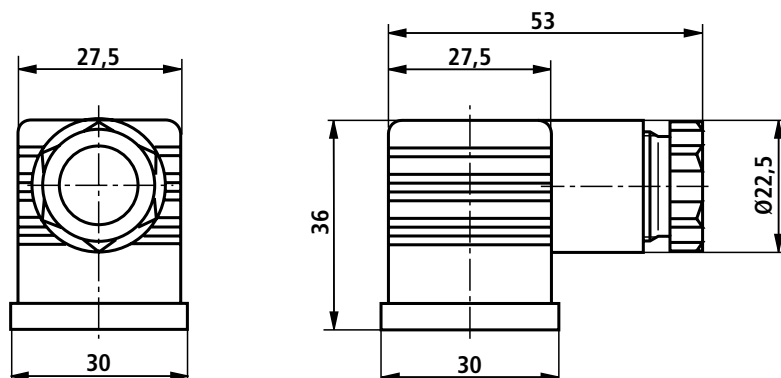
³⁾ Current input $\pm 10 \text{ mA}$ optional, input resistance 1 kΩ; state „- 280“ in the ordering details.

Electrical connection, plug-in connector (dimensions in mm)

Plug-in connector for sandwich plate directional valves e.g. WG152

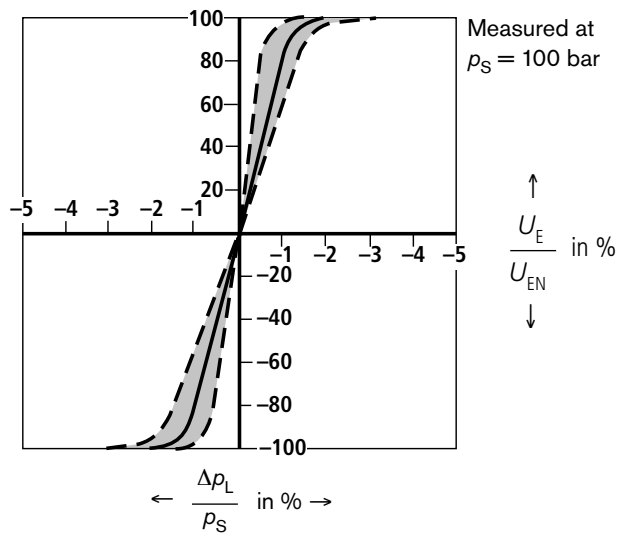
according to DIN EN 175301-803 and ISO 4400

Separate order under Material No. **R901017011** (plastic version)

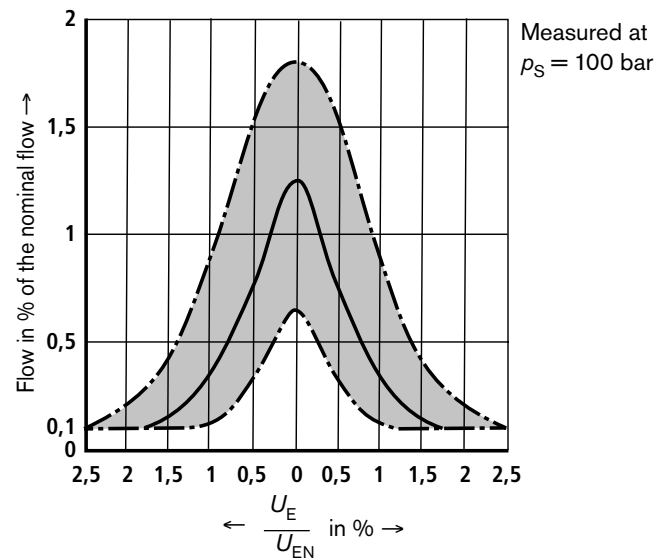


Characteristic curves (measured at $v = 32 \text{ mm}^2/\text{s}$ and $\vartheta = 40 \text{ }^\circ\text{C}$)

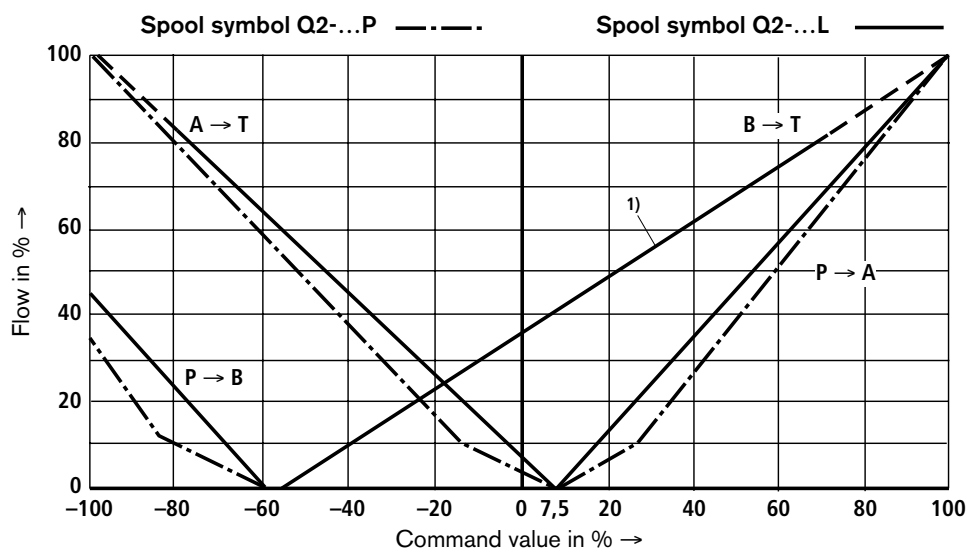
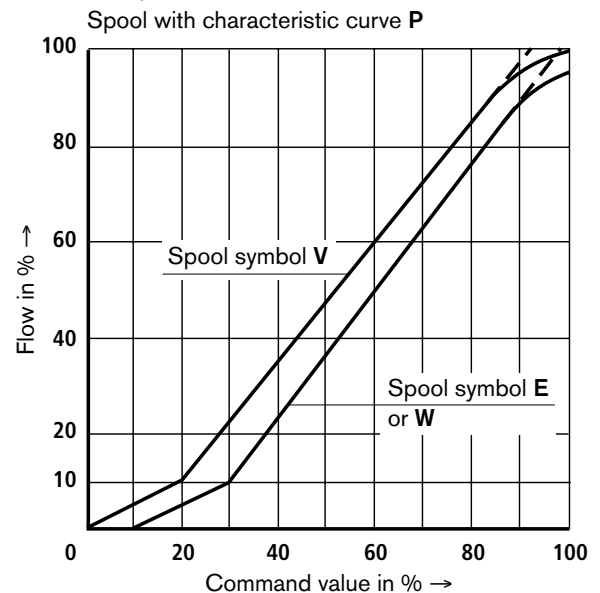
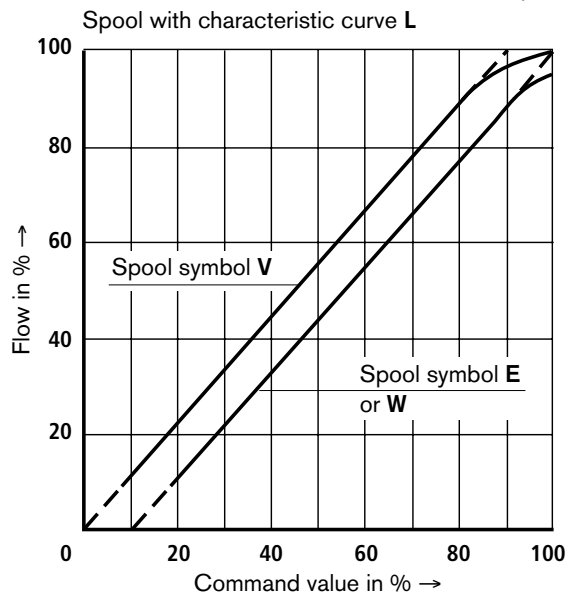
Pressure-signal-characteristic curves (V spool)



Zero flow of the main stage (V spool) without pilot control valve



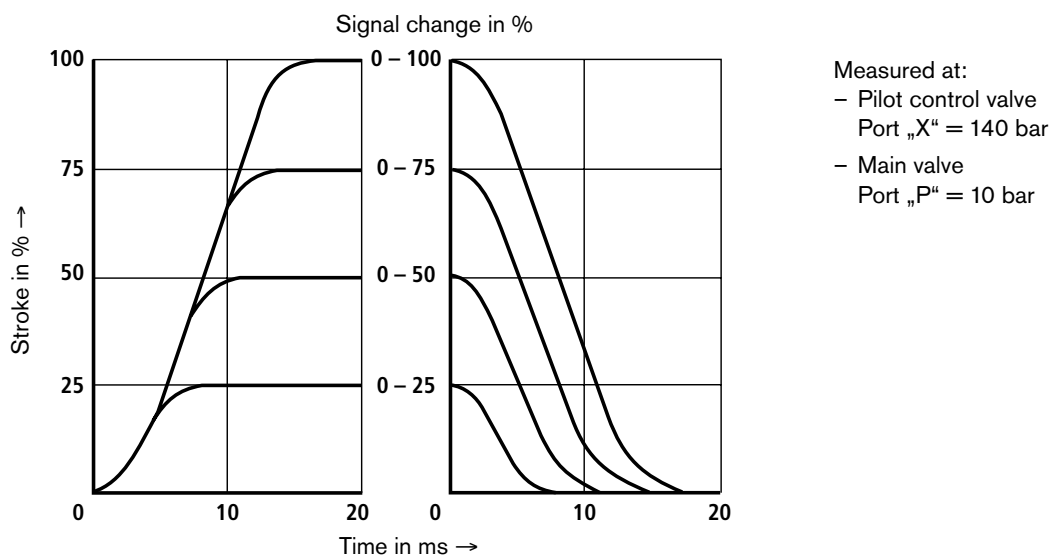
Flow-command value functions (at 10 bar valve pressure differential or 5 bar per control land)



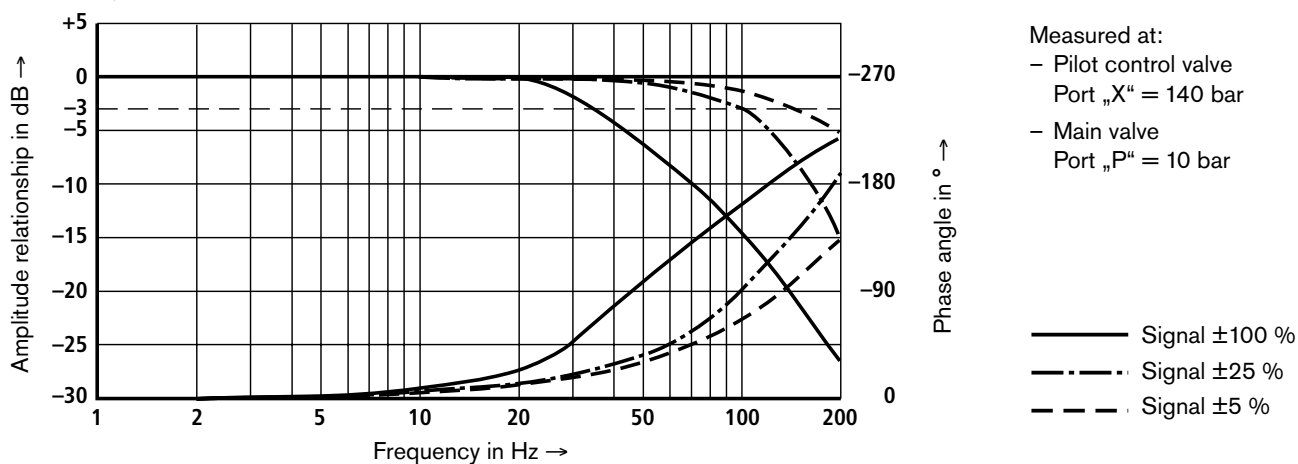
Characteristic curves (measured with HLP 46 at 40 °C ±5 °C)

NS10

Transient function with a stepped form of electrical input signal

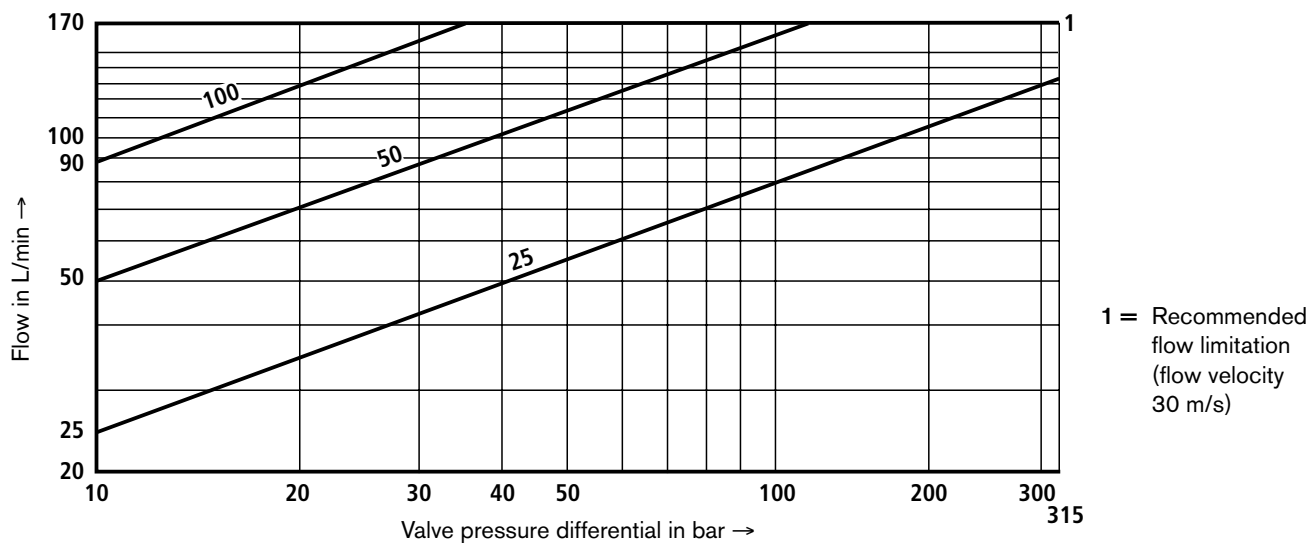


Frequency response characteristic curves



Flow-load function at max. valve opening

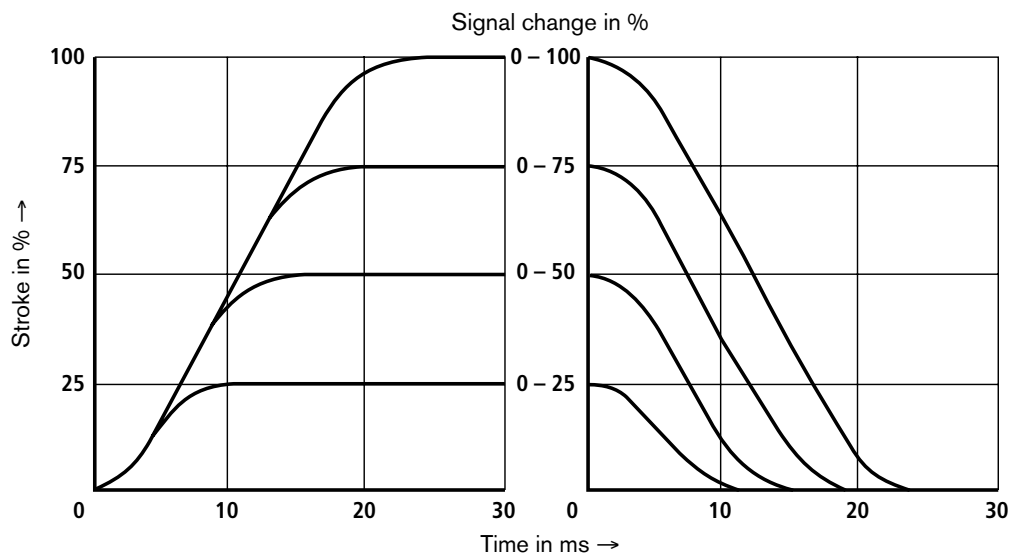
(tolerance ± 10 %)



Characteristic curves (measured with HLP 46 at 40 °C ± 5 °C)

NS16

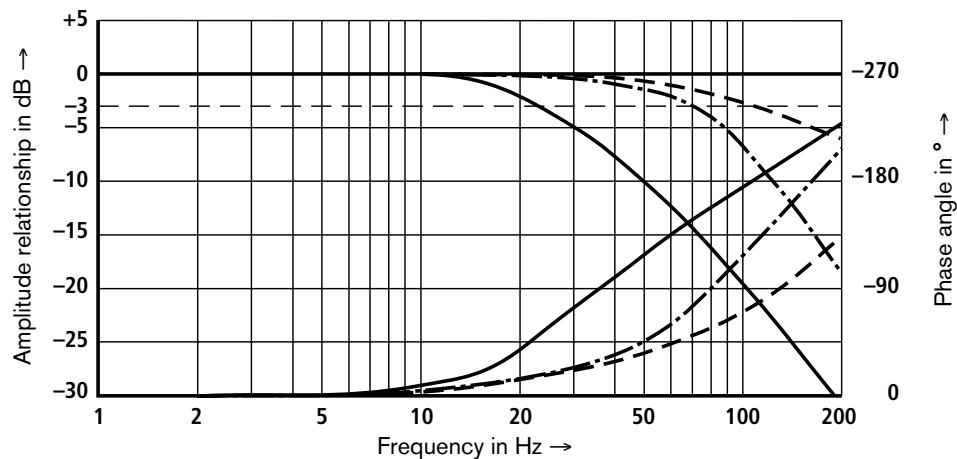
Transient function with a stepped form of electrical input signal



Measured at:

- Pilot control valve
Port „X“ = 140 bar
- Main valve
Port „P“ = 10 bar

Frequency response characteristic curves



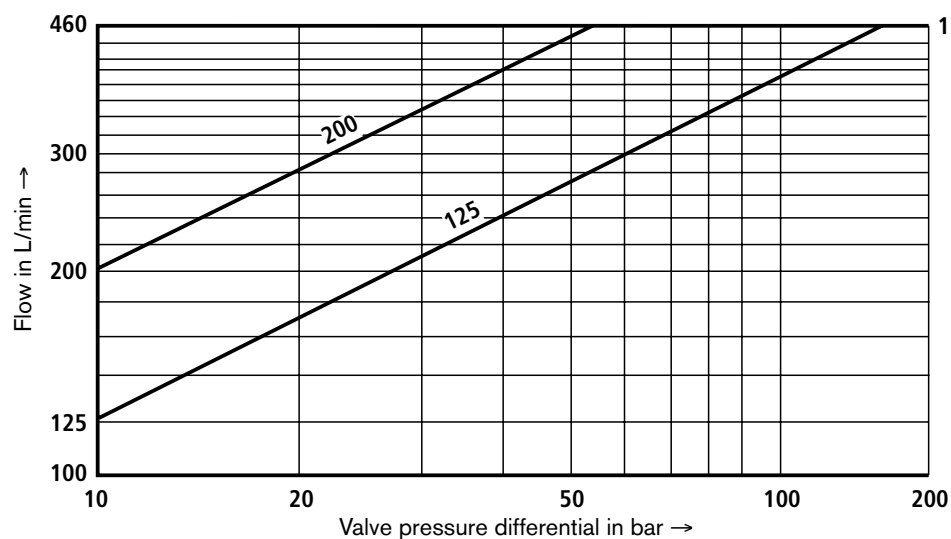
Measured at:

- Pilot control valve
Port „X“ = 140 bar
- Main valve
Port „P“ = 10 bar

- Signal ±100 %
- - - Signal ±25 %
- · - · Signal ±5 %

Flow-load function at max. valve opening

(tolerance ±10 %)

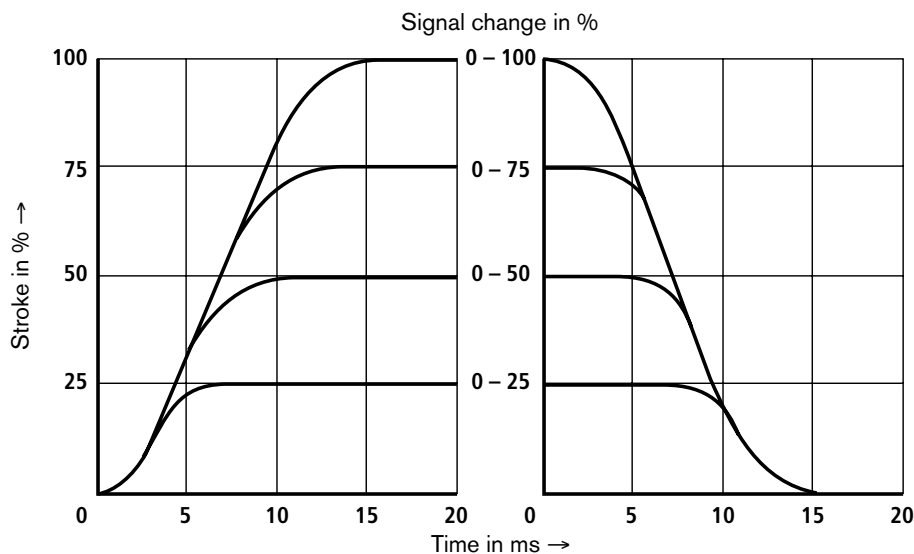


1 = Recommended
flow limitation
(flow velocity
30 m/s)

Characteristic curves (measured with HLP 46 at 40 °C ±5 °C)

NS25 and 27

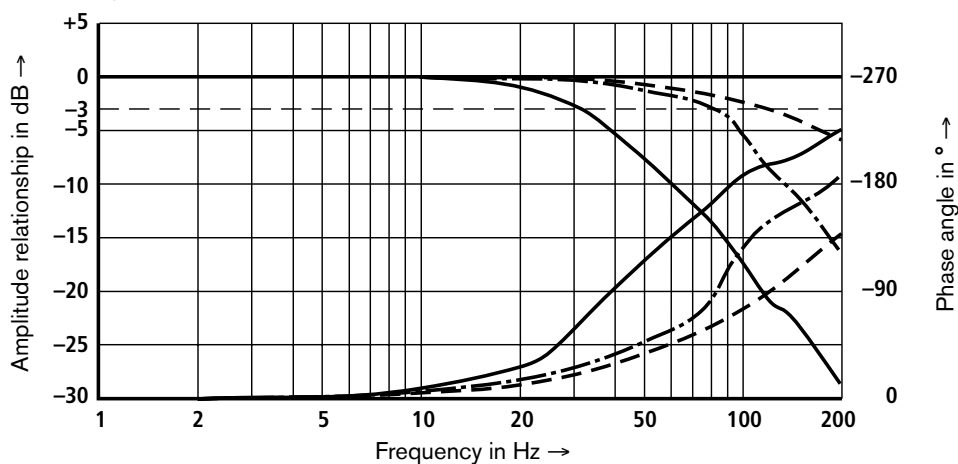
Transient function with a stepped form of electrical input signal



Measured at:

- Pilot control valve
Port „X“ = 140 bar
- Main valve
Port „P“ = 10 bar

Frequency response characteristic curves



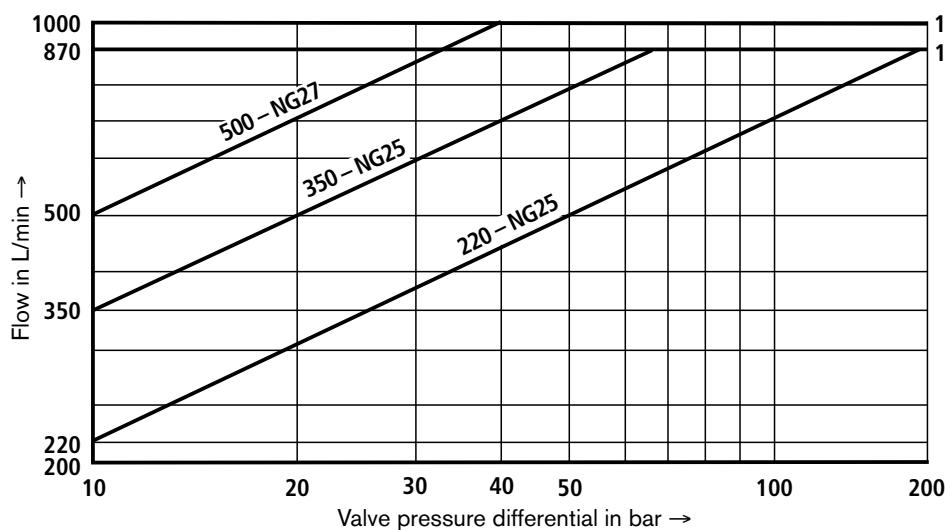
Measured at:

- Pilot control valve
Port „X“ = 140 bar
- Main valve
Port „P“ = 10 bar

- Signal ±100 %
- - - Signal ±25 %
- - - Signal ±5 %

Flow-load function at max. valve opening

(tolerance ±10 %)

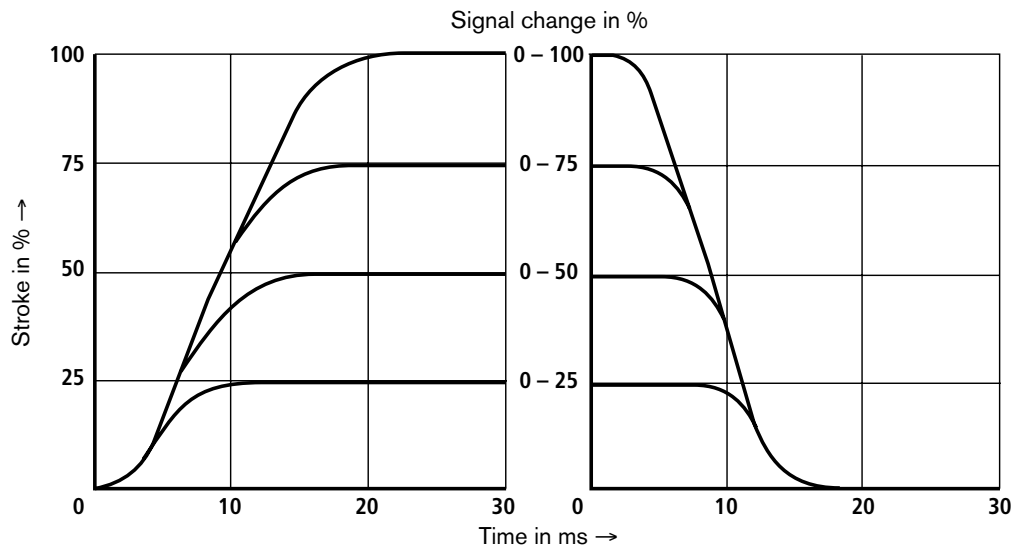


1 = Recommended
flow limitation
(flow velocity
30 m/s)

Characteristic curves (measured with HLP 46 at 40 °C ±5 °C)

NS32

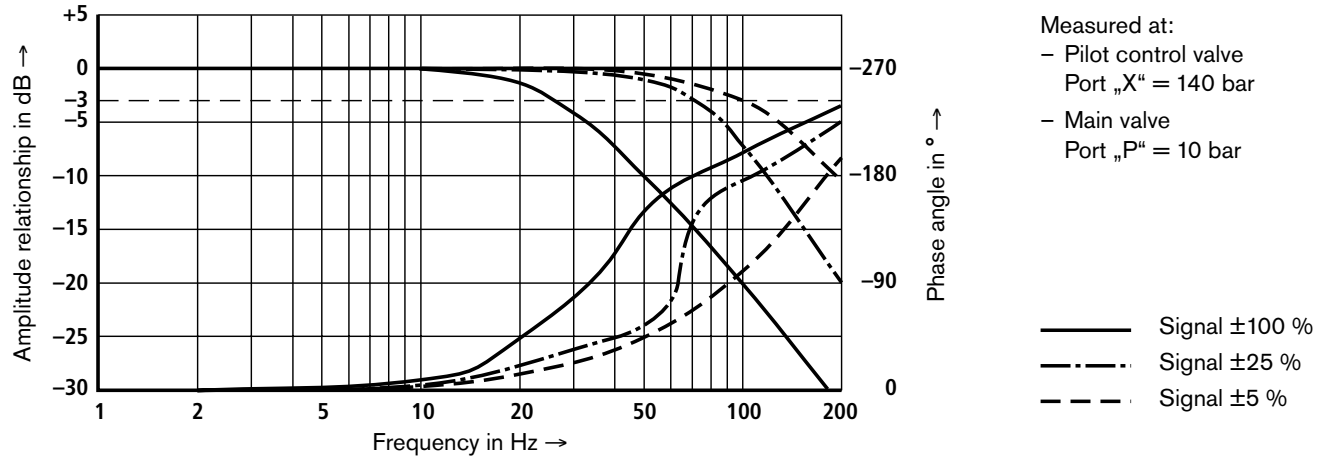
Transient function with a stepped form of electrical input signal



Measured at:

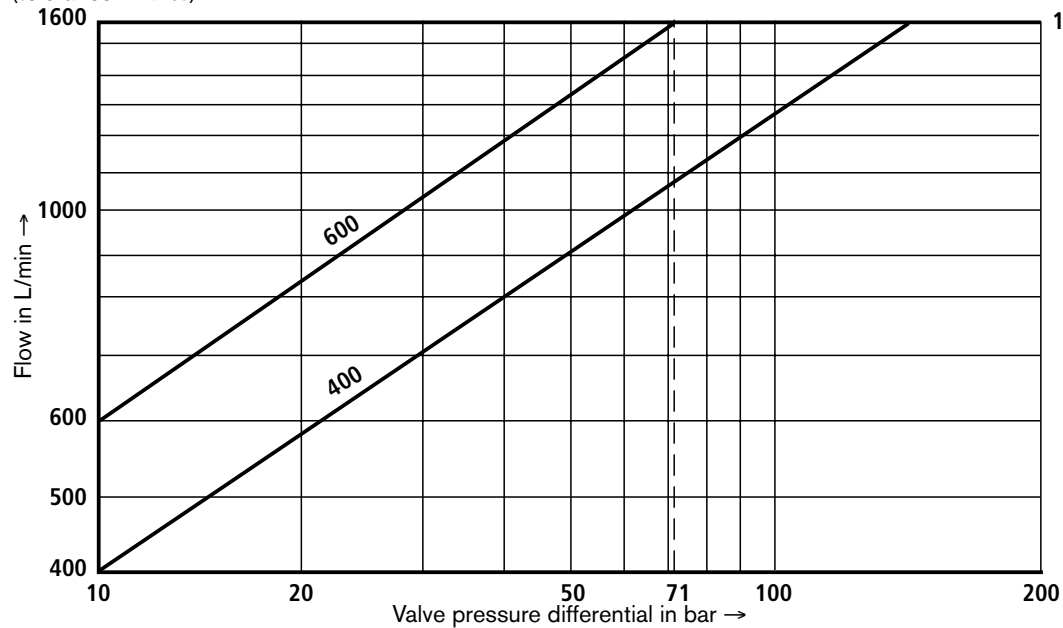
- Pilot control valve
Port „X“ = 140 bar
- Main valve
Port „P“ = 10 bar

Frequency response characteristic curves



Flow-load function at max. valve opening

(tolerance ±10 %)

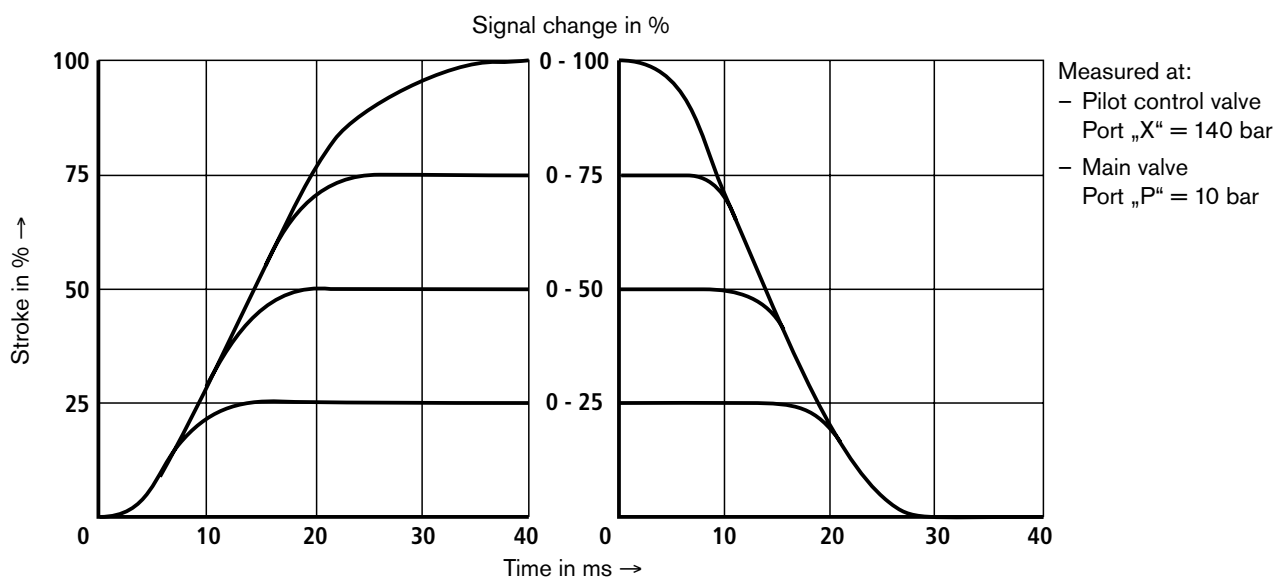


1 = Recommended
flow limitation
(flow velocity
30 m/s)

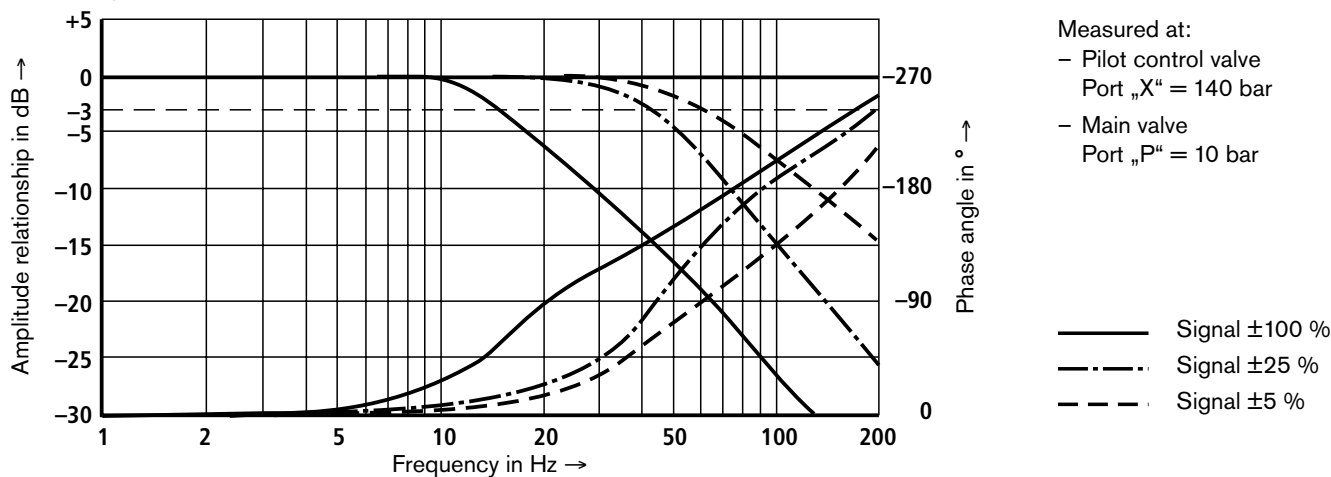
Characteristic curves (measured with HLP 46 at 40 °C ±5 °C)

NS35

Transient function with a stepped form of electrical input signal

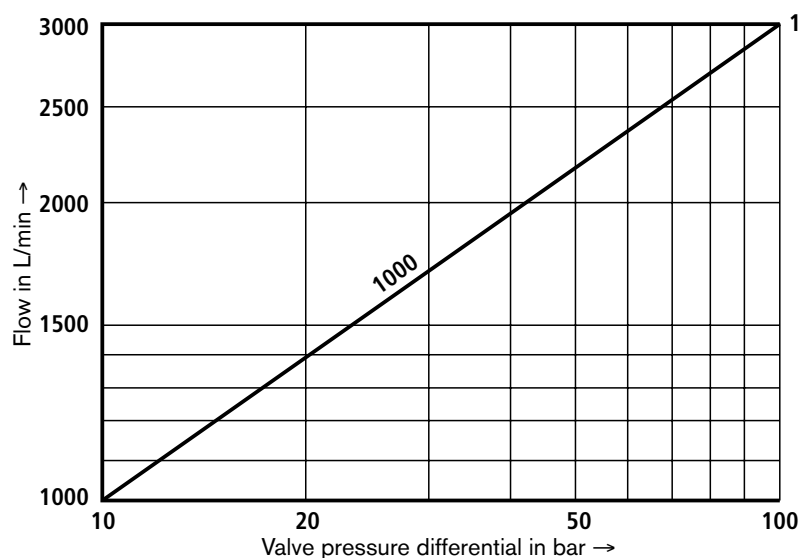


Frequency response characteristic curves



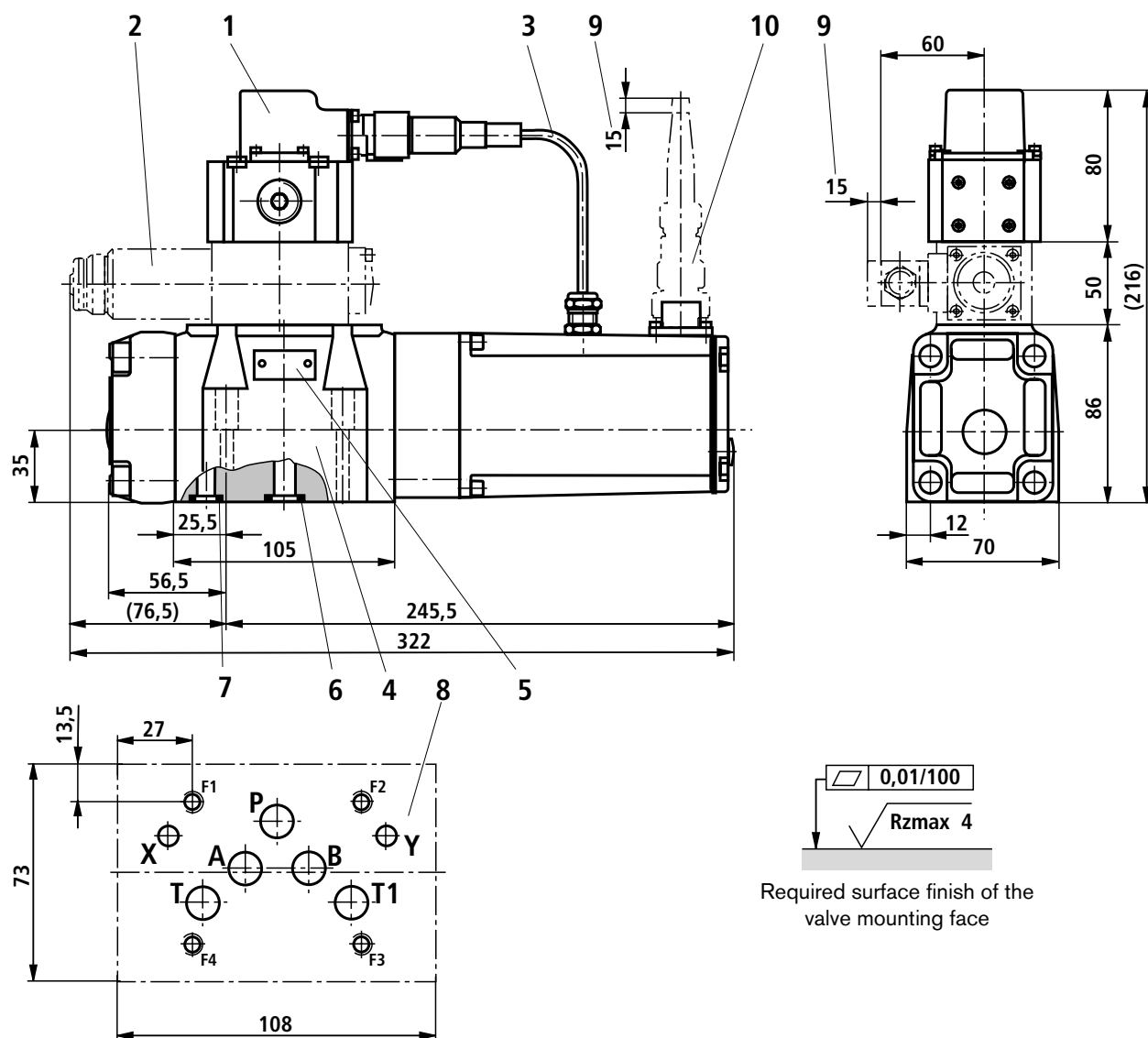
Flow-load function at max. valve opening

(tolerance ±10 %)



1 = Recommended
 flow limitation
 (flow velocity
 30 m/s)

Unit dimensions NS10 (dimensions in mm)



- 1 Pilot control valve
- 2 Sandwich plate directional valve
(only included in version "...WG152")
- 3 Cabling
- 4 Main valve
- 5 Name plate
- 6 Identical seal rings for ports A, B, P, T and T1
- 7 Identical seal rings for ports X and Y
- 8 Machined valve mounting surface,
position of the ports according to ISO 4401-05-05-0-05
(ports X, Y as required)
- 9 Space required to remove the plug-in connector
- 10 Plug-in connector, separate order, see page 7

Suplates according to catalogue sheet RE 45054
(separate order)

G 534/01 (G3/4)

G 535/01 (G3/4) with ports X and Y

G 536/01 (G1) with ports X and Y

Valve fixing screws (separate order)

The following valve fixing screws are recommended:

4 S.H.C.S. ISO4762-M6x45-10.9-flZn-240h-L

(friction value 0.09 - 0.14 according to VDA 235-101)

Tightening torque $M_A = 13.5 \text{ Nm} \pm 10 \%$

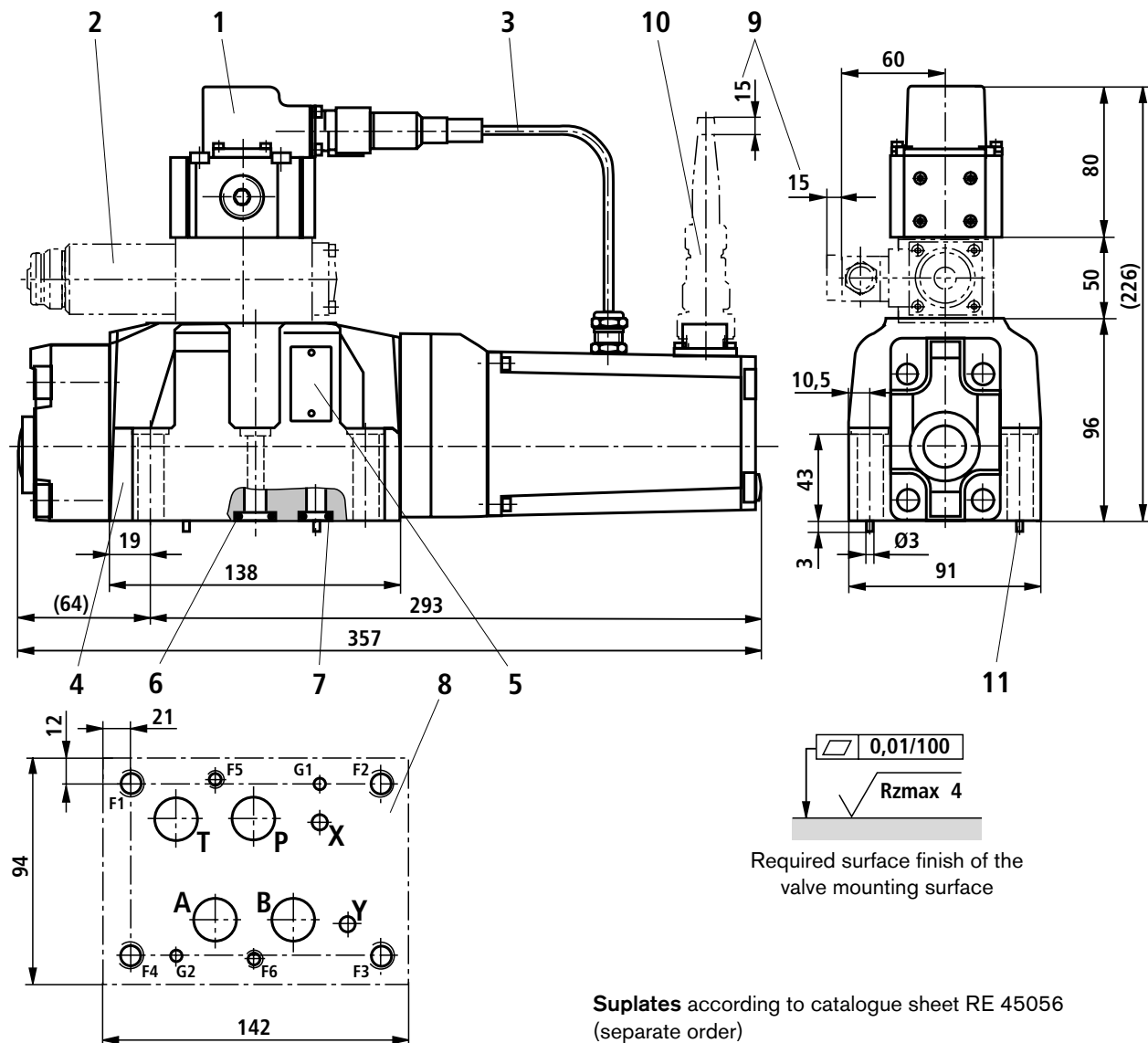
Material no. **R913000258**

The tightening torques given are guiding values, if the screws with the given friction coefficients are used and if they are tightened by means of a torque wrench.

Note:

The tightening torque relates to the maximum operating pressure!

Unit dimensions NS16 (dimensions in mm)



Required surface finish of the
valve mounting surface

Suplates according to catalogue sheet RE 45056
(separate order)

G 172/01 (G3/4) G 172/02 (M27 x 2)

G 174/01 (G1) G 174/02 (M33 x 2)

Valve fixing screws (separate order)

The following valve fixing screws are recommended:

2 S.H.C.S. ISO4762-M6x60-10.9-fIZn-240h-L

(friction value 0.09 - 0.14 according to VDA 235-101)

Tightening torque $M_A = 12,2 \text{ Nm} \pm 20 \%$

Material no. **R913000115**

4 S.H.C.S. ISO4762-M10x60-10.9-fIZn-240h-L

(friction value 0.09 - 0.14 according to VDA 235-101)

Tightening torque $M_A = 58 \text{ Nm} \pm 20 \%$

Material no. **R913000116**

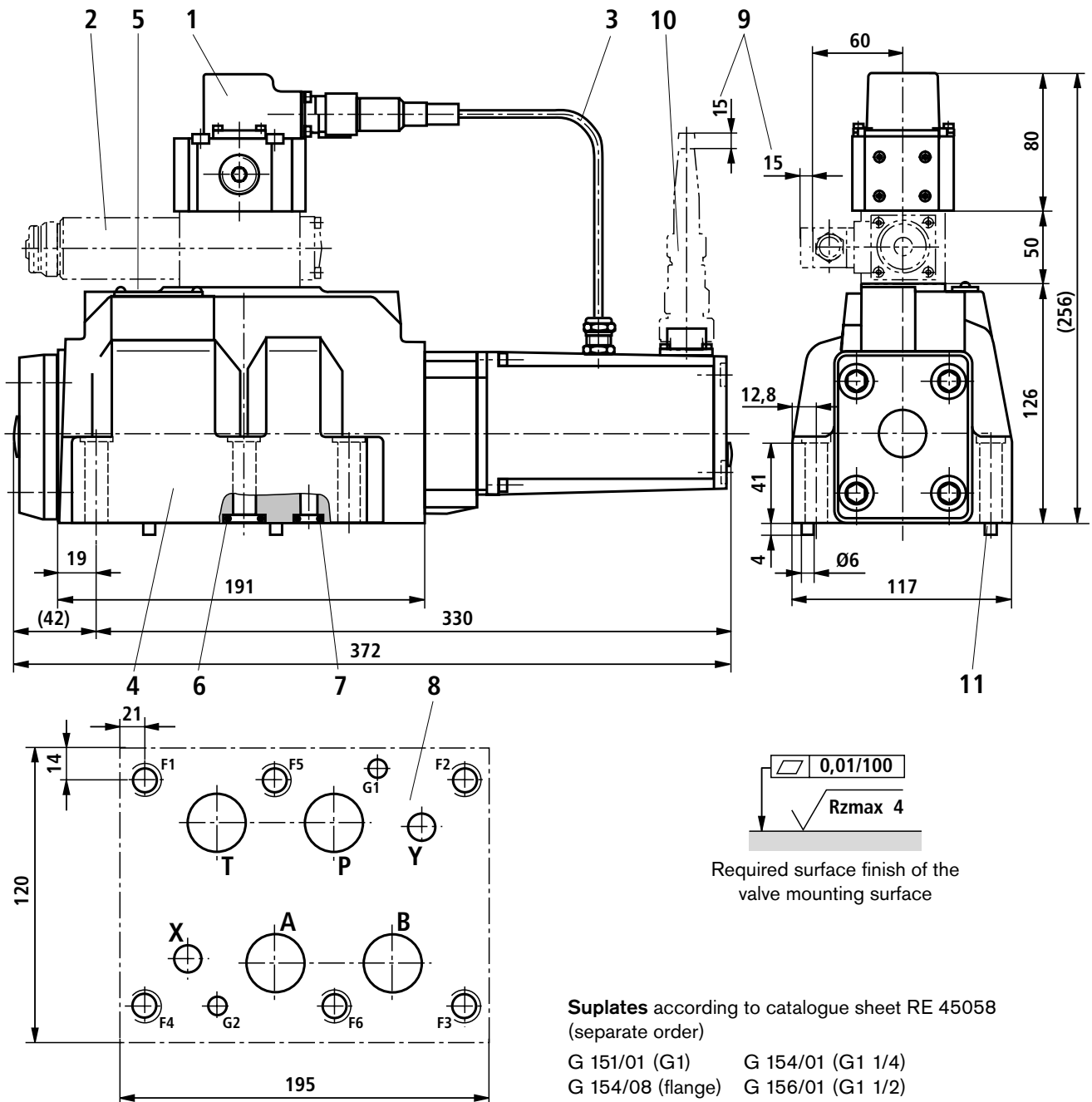
The tightening torques given are guiding values, if the screws with the given friction coefficients are used and if they are tightened by means of a torque wrench.

Note:

The tightening torque relates to the maximum operating pressure!

- 1 Pilot control valve
- 2 Sandwich plate directional valve
(only included in version "...WG152")
- 3 Cabling
- 4 Main valve
- 5 Name plate
- 6 Identical seal rings for ports A, B, P and T
- 7 Identical seal rings for ports X and Y
- 8 Machined valve mounting surface,
position of the ports according to ISO 4401-07-07-0-05
(ports X, Y as required)
- 9 Space required to remove the plug-in connector
- 10 Plug-in connector, separate order, see page 7
- 11 Locating pin (2 pieces)

Unit dimensions NS25 (dimensions in mm)



- 1 Pilot control valve
- 2 Sandwich plate directional valve
(only included in version "...WG152")
- 3 Cabling
- 4 Main valve
- 5 Name plate
- 6 Identical seal rings for ports A, B, P and T
- 7 Identical seal rings for ports X and Y
- 8 Machined valve mounting surface, position of the ports to ISO 4401-08-08-0-05 (ports X, Y as required)
- 9 Space required to remove the plug-in connector
- 10 Plug-in connector, separate order, see page 7
- 11 Locating pin (2 pieces)

Suplats according to catalogue sheet RE 45058 (separate order)

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

Valve fixing screws (separate order)

The following valve fixing screws are recommended:

6 S.H.C.S. ISO4762-M12x60-10.9-fIZn-240h-L
(friction value 0.09 - 0.14 according to VDA 235-101)
Tightening torque $M_A = 100 \text{ Nm} \pm 20 \%$

Material no. **R913000121**

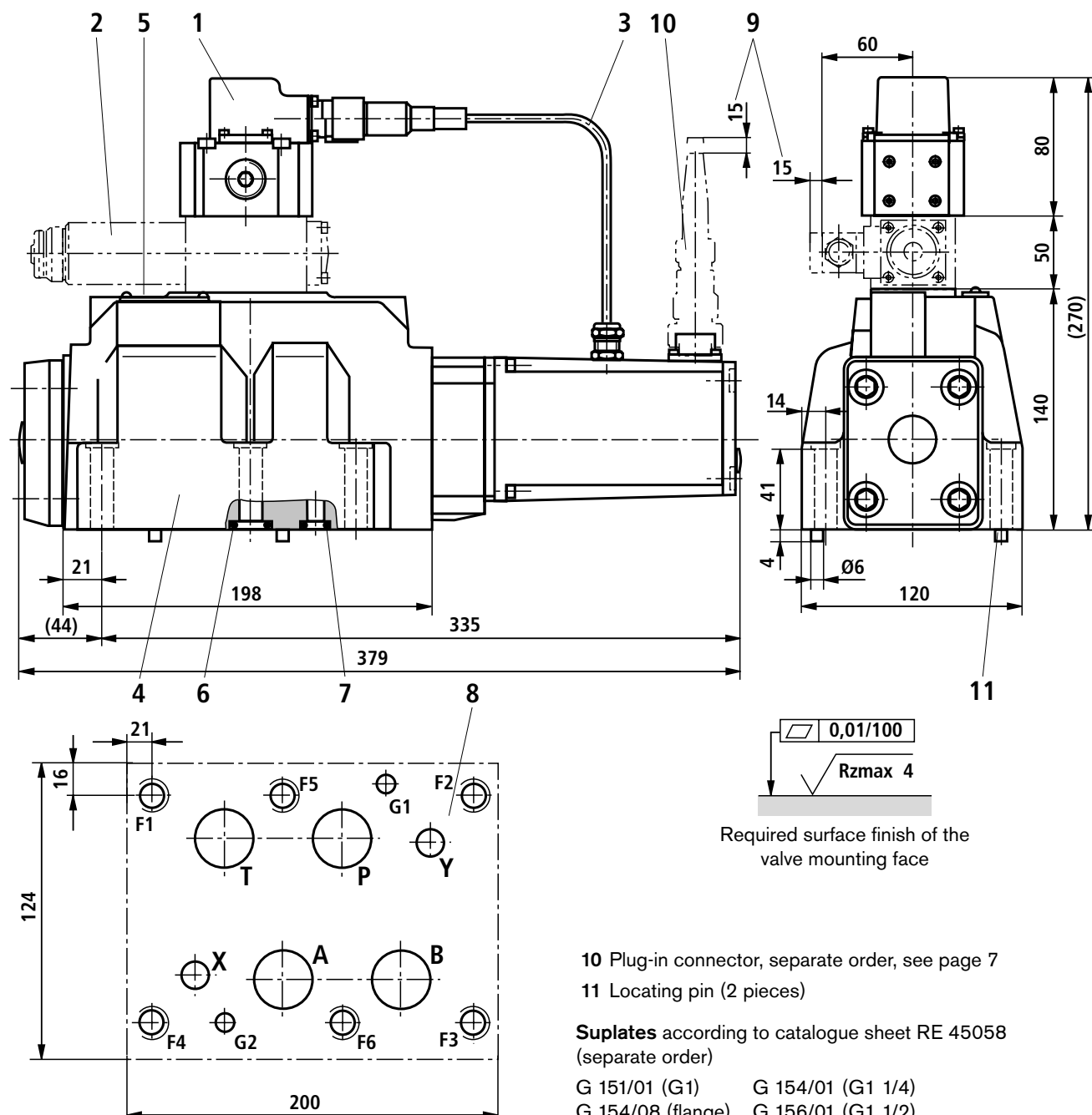
The tightening torques given are guiding values, if the screws with the given friction coefficients are used and if they are tightened by means of a torque wrench.

Note:

The tightening torque relates to the maximum operating pressure!

Note: Only install the sandwich plate directional valve between the main valve and the adaptor plate!

Unit dimensions NS27 (dimensions in mm)



- 1 Pilot control valve
- 2 Sandwich plate directional valve (only included in version "...WG152")
- 3 Cabling
- 4 Main valve
- 5 Name plate
- 6 Identical seal rings for ports A, B, P and T
- 7 Identical seal rings for ports X and Y
- 8 Machined valve mounting surface, position of the ports to ISO 4401-08-07-0-05 (ports X, Y as required)
- 9 Space required to remove the plug-in connector

10 Plug-in connector, separate order, see page 7

11 Locating pin (2 pieces)

Suplates according to catalogue sheet RE 45058 (separate order)

G 151/01 (G1) G 154/01 (G1 1/4)

G 154/08 (flange) G 156/01 (G1 1/2)

Valve fixing screws (separate order)

The following valve fixing screws are recommended:

6 S.H.C.S. ISO4762-M12x60-10.9-flZn-240h-L

(friction value 0.09 - 0.14 according to VDA 235-101)

Tightening torque $M_A = 100 \text{ Nm} \pm 20 \%$

Material no. **R913000121**

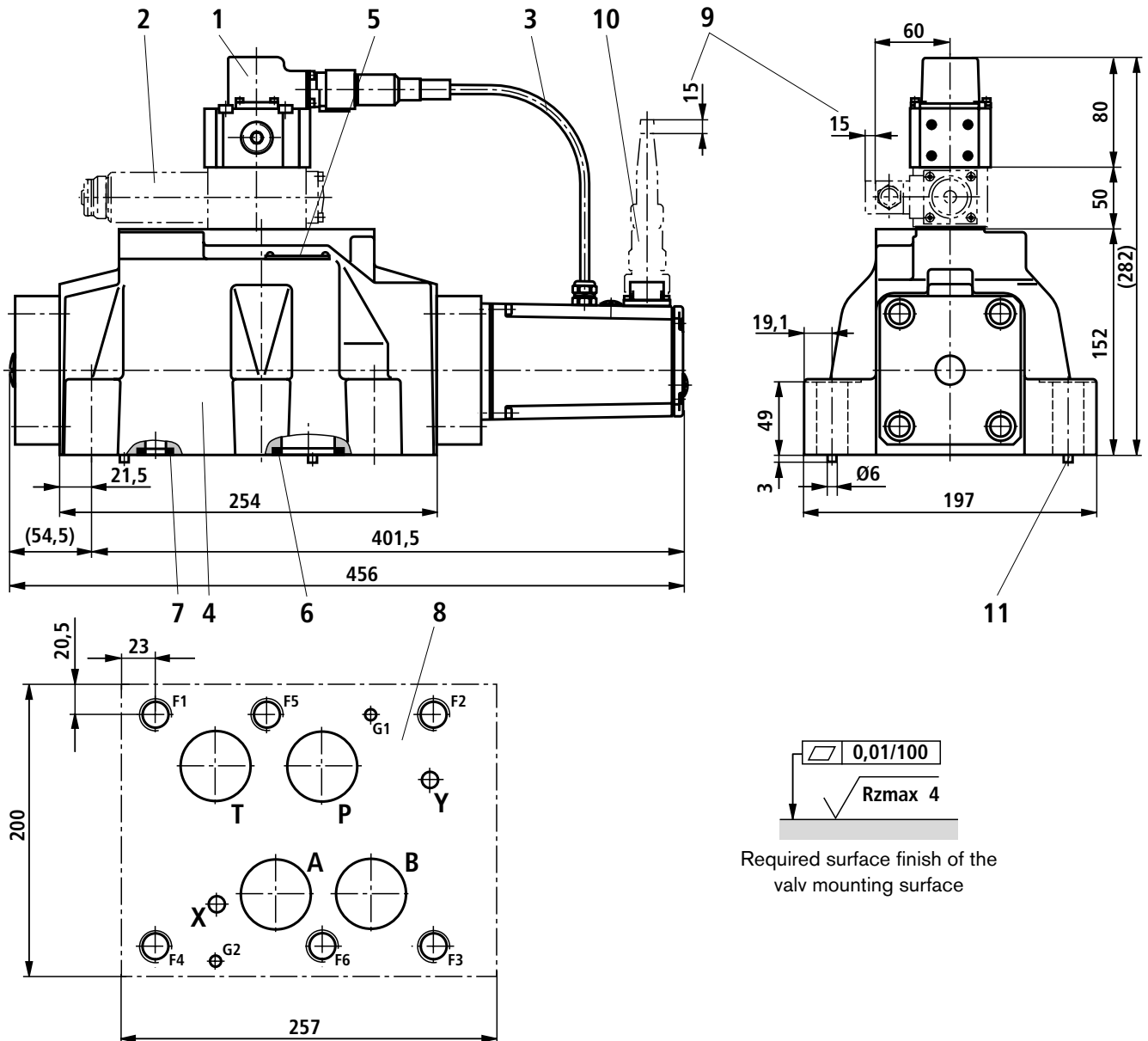
The tightening torques given are guiding values, if the screws with the given friction coefficients are used and if they are tightened by means of a torque wrench.

Note:

The tightening torque relates to the maximum operating pressure!

Note: Only install the sandwich plate directional valve between the main valve and the adaptor plate!

Unit dimensions NS32 (dimensions in mm)



- 1 Pilot control valve
- 2 Sandwich plate directional valve
(only included in version "...WG152")
- 3 Cabling
- 4 Main valve
- 5 Name plate
- 6 Identical seal rings for ports A, B, P and T
- 7 Identical seal rings for ports X and Y
- 8 Machined valve mounting surface,
position of the ports according to ISO 10/9/4401-0-05
(ports X, Y as required)
- 9 Space required to remove the plug-in connector
- 10 Plug-in connector, separate order, see page 7
- 11 Locating pin (2 pieces)

Suplates according to catalogue sheet RE 45060
(separate order)

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

Valve fixing screws (separate order)

The following valve fixing screws are recommended:

6 S.H.C.S. ISO4762-M20x80-10.9-fIZn-240h-L
(friction value 0.09 - 0.14 according to VDA 235-101)

Tightening torque $M_A = 340 \text{ Nm} \pm 20 \%$

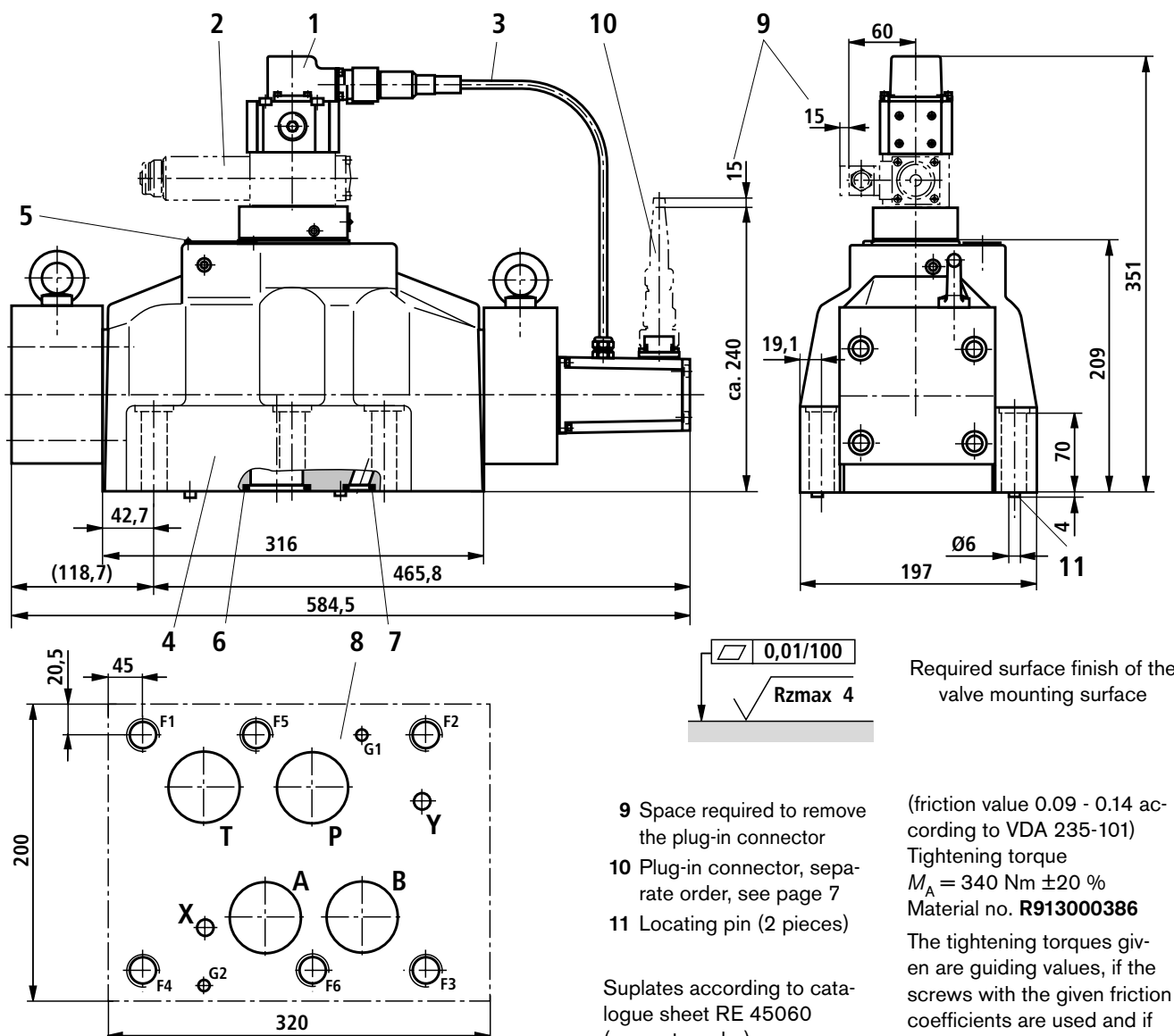
Material no. **R901035246**

The tightening torques given are guiding values, if the screws with the given friction coefficients are used and if they are tightened by means of a torque wrench.

Note:

The tightening torque relates to the maximum operating pressure!

Unit dimensions NS32 (dimensions in mm)



- 1 Pilot control valve
- 2 Sandwich plate directional valve (only included in version "...WG152")
- 3 Cabling
- 4 Main valve
- 5 Name plate
- 6 Identical seal rings for ports A, B, P and T

- 7 Identical seal rings for ports X and Y
- 8 Machined valve mounting surface, position of the ports according to ISO 4401-10-09-0-05 (ports X, Y as required) in deviation from the standard:
 - Ports A, B, T and P Ø 50 mm

- 9 Space required to remove the plug-in connector
- 10 Plug-in connector, separate order, see page 7
- 11 Locating pin (2 pieces)

Suplates according to catalogue sheet RE 45060 (separate order)

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

Valve fixing screws (separate order)

The following valve fixing screws are recommended:

6 S.H.C.S. ISO4762-M20x100-10.9-flZn-240h-L

Required surface finish of the valve mounting surface

(friction value 0.09 - 0.14 according to VDA 235-101)
Tightening torque
 $M_A = 340 \text{ Nm} \pm 20 \%$
Material no. **R913000386**

The tightening torques given are guiding values, if the screws with the given friction coefficients are used and if they are tightened by means of a torque wrench.

Note:

The tightening torque relates to the maximum operating pressure!