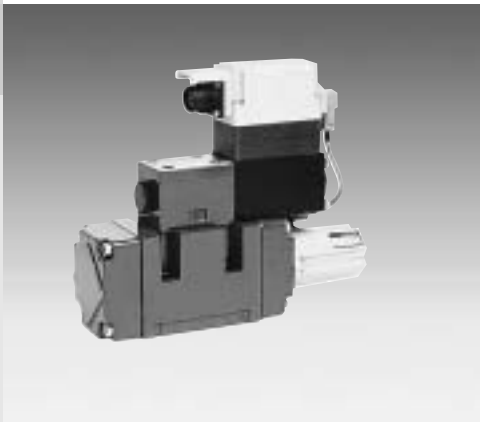
Servo solenoid valves with on-board electronics (OBE)

RE 29077/01.05 1/16
Replaces: 01.03

Type 4WRVE 10...25



Size 10, 16, 25
Unit series 2X
Maximum working pressure P, A, B 350 bar, T, X, Y 250 bar
Nominal flow rate 40...430 l/min (Δp 10 bar)

List of contents

Features

- Pilot operated High Response servo solenoid valves NG10 to NG25, with control piston and sleeve in servo quality
- On-board electronics (OBE) with position controller for the pilot and main stages, calibrated at the factory
- Main stage in servo quality with position feedback
- Flow characteristic
  - M = Progressive with fine metering notch
  - P = Non-linear curve
  - L = Linear (only available on request)
- Electrical connection 11P+PE
  Signal input difference amplifier with interface B5 ±10 V
- Suitable for electrohydraulic controllers in production and testing systems
- For subplate attachment, mounting hole configuration NG10 to ISO 4401-05-05-0-94, NG16 to ISO 4401-07-06-0-94 and NG25 to ISO 4401-08-07-0-94
- Subplates as per catalogue section, NG10 RE 45055, NG16 RE 45057 and NG25 RE 45059 (order separately)
- Line sockets to DIN 43563-AM6,
  see catalogue section RE 08008 (order separately)

Variants on request

- For standard applications
- Special symbols for plastic injection-moulding machines and for extending the module.

Ordering data and scope of delivery

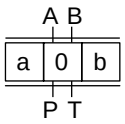
4WRV	E				–2X	H / G24		K0/B5	M	*

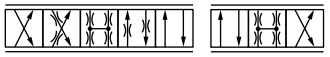
With **on-board** trigger electronics **= E**

Size 10 **= 10**
Size 16 **= 16**
Size 25 [1] **= 25**

Symbols

4/3-way version





= V, V1

With symbol V1:
P → A: q_v B → T: q_v/2
P → B: q_v/2 A → T: q_v

[1] "H": Highflow version
– NG25 standard version has 25 mm hole in "P A B T"
P A B: p_{max} = 350 bar.
– In the highflow version, the holes are enlarged to 32 mm
P A B: p_{max} = 280 bar.

[2] q_N: Flow characteristic "P"

Further information in plain text

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

Interface for trigger electronics
B5 = Setpoint input ±10 V

Electrical connection
K0 = without line socket, with plug to DIN 43563-AM6
Order line socket separately

Control oil inlet "x", control oil outlet "y"
No designation = "x" = external, "y" = external
E = "x" = internal, "y" = external
ET = "x" = internal, "y" = internal
T = "x" = external, "y" = internal

Voltage supply of trigger electronics
G24 = +24 V DC

H = Highflow version [1] (on request)

2X = Unit series 20 to 29 (installation and connection dimensions unchanged)

Flow characteristic
M = Progressive with linear fine metering
P = Non-linear curve, linear (kink at 40 %)

Nominal flow rate at 10 bar valve pressure difference

Size
10 = 40 [2], 55, 70 [2] or 85 l/min
16 = 90 [2], 120, 150 [2] or 200 l/min
25 = 370 or 430 [1] l/min

Preferred types (available at short notice)

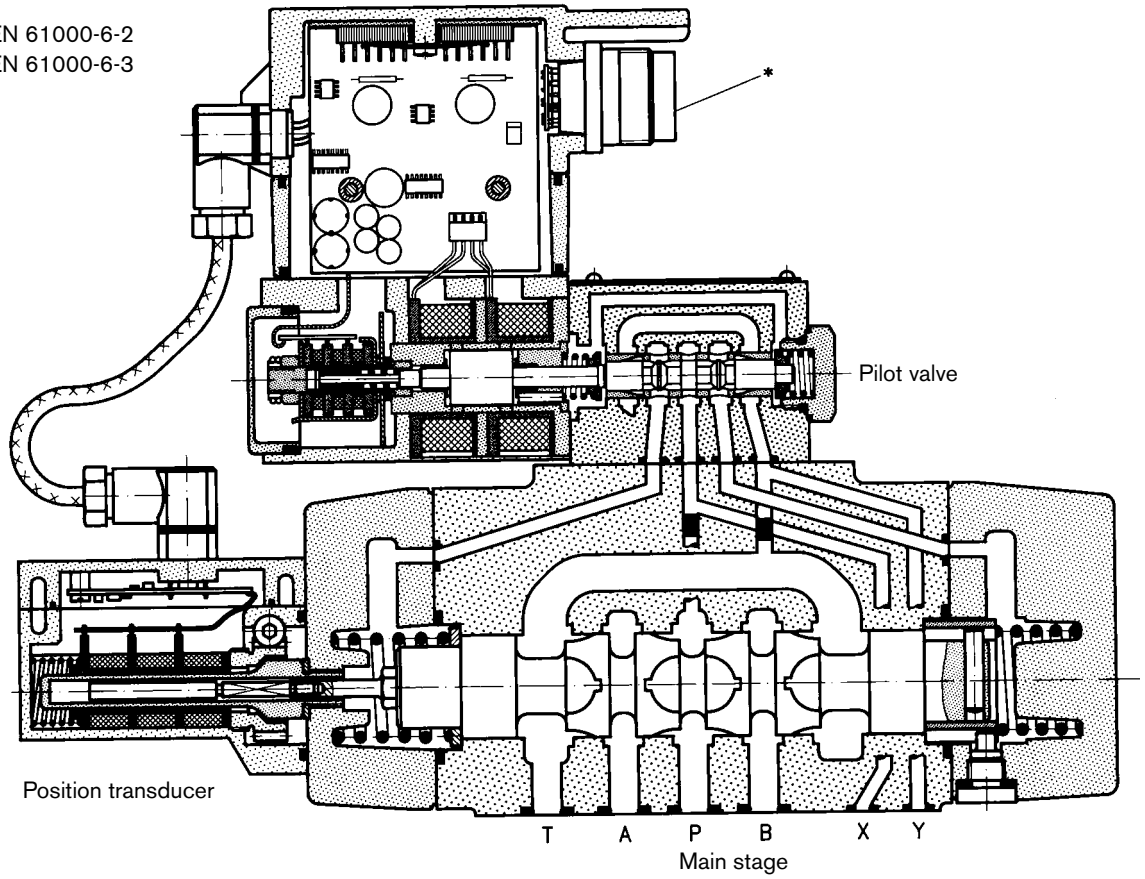
Type 4WRVE	Material No.
Size 10	
4WRVE 10 V – 55M 2X/G24 K0 / B5M	**0 811 404 690**
4WRVE 10 V1 – 55M 2X/G24 K0 / B5M	**0 811 404 699**
4WRVE 10 V – 85M 2X/G24 K0 / B5M	**0 811 404 691**
4WRVE 10 V1 – 85M 2X/G24 K0 / B5M	**0 811 404 697**
4WRVE 10 V – 40P 2X/G24 K0 / B5M	**0 811 404 693**
4WRVE 10 V1 – 40P 2X/G24 K0 / B5M	**0 811 404 695**
4WRVE 10 V – 70P 2X/G24 K0 / B5M	**0 811 404 694**
4WRVE 10 V1 – 70P 2X/G24 K0 / B5M	**0 811 404 696**

Type 4WRVE	Material No.
Size 16	
4WRVE 16 V – 120M 2X/G24 K0 / B5M	**0 811 404 290**
4WRVE 16 V1 – 120M 2X/G24 K0 / B5M	**0 811 404 294**
4WRVE 16 V – 200M 2X/G24 K0 / B5M	**0 811 404 291**
4WRVE 16 V1 – 200M 2X/G24 K0 / B5M	**0 811 404 295**
4WRVE 16 V – 90P 2X/G24 K0 / B5M	**0 811 404 296**
4WRVE 16 V1 – 90P 2X/G24 K0 / B5M	**0 811 404 298**
4WRVE 16 V – 150P 2X/G24 K0 / B5M	**0 811 404 297**
4WRVE 16 V1 – 150P 2X/G24 K0 / B5M	**0 811 404 299**
Size 25	
4WRVE 25 V – 370M 2X/G24 K0 / B5M	**0 811 404 445**
4WRVE 25 V1 – 370M 2X/G24 K0 / B5M	**0 811 404 447**

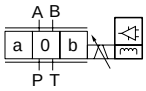
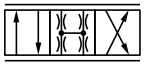
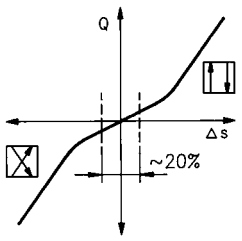
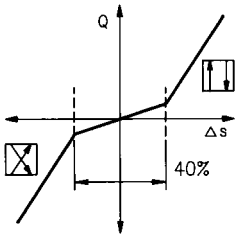
Function, sectional diagram

Servo solenoid valve 4WRVE 10...25

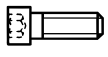
CE EN 61000-6-2
EN 61000-6-3



Symbols

	M: Progressive with fine metering	P: Non-linear, linear (40 %)
		

Accessories, not included in scope of delivery

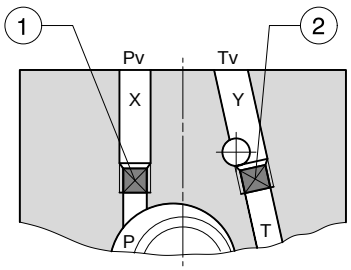
Fastening screws 	NG10	4 x M6 x 40, DIN 912-10.9	**2 910 151 209**
	NG16	2 x M6 x 45, DIN 912-10.9	**2 910 151 211**
		4 x M10 x 50, DIN 912-10.9	**2 910 151 301**
	NG25	6 x M12 x 60, DIN 912-10.9	**2 910 151 354**
*  Pg16	Line socket 11P+PE, see also RE 08008	KS	**1 834 484 142**

Testing and service equipment

- Test box type VT-PE-TB3, see RE 30065
- Test adapter 11P+PE type VT-PA-1, see RE 30067

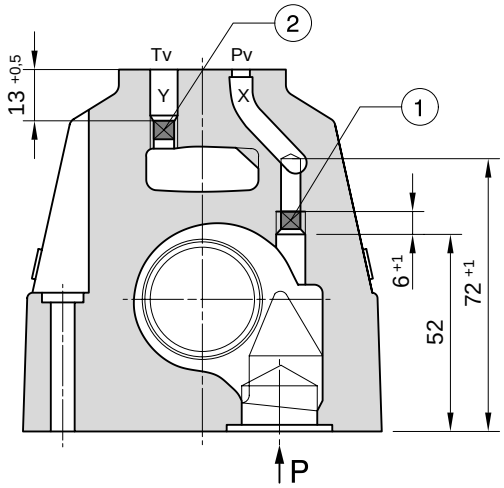
Control oil supply

NG10, 25

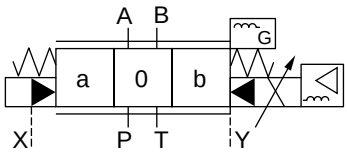


Plug ① ②
1 813 464 007 SW 3

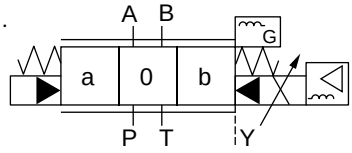
NG16



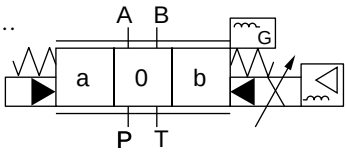
Type … –3X …



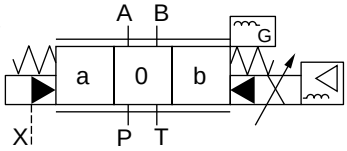
Type … –3X … E …



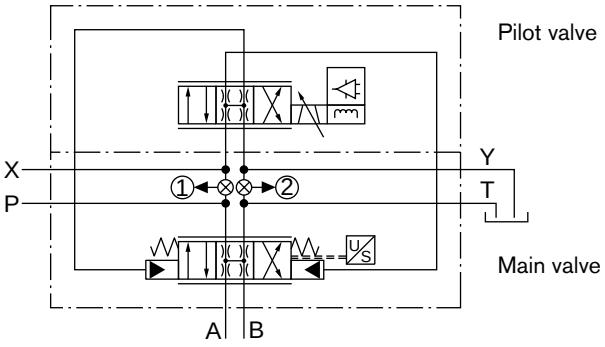
Type … –3X … ET …



Type … –3X … T …



Symbol in detail



No designation =	"x" = external, "y" = external
E =	"x" = internal, "y" = external
ET =	"x" = internal, "y" = internal
T =	"x" = external, "y" = internal

Conversion
The pilot valve can be supplied with oil both via ports X and Y (external) and from the main flow ducts P and T.
In the basic version, the valve is equipped with the plugs ① and ②, i.e. X and Y are external.
For valve versions with X and/or Y as internal, see ordering overview or carry out the conversion (see diagram above).
When the control oil supply or discharge is changed, the part number must also be changed.

Important
Servo solenoid valves (pilot operated) do not have a closed middle position when switched off! They only perform their function in an active, closed control loop, even when the pilot valve features a relief (fail-safe) 4th symbol.
For details on "switch-off behaviour", see Technical data.

Technical data

General

Construction		Spool type valve, pilot operated									
Actuation		4WREH servo solenoid valve NG6 – OBE, with position controller for pilot valve and main stage									
Type of mounting		Subplate, mounting hole configuration NG10...25 (ISO 4401-...)									
Installation position		Optional									
Ambient temperature range	°C	–20 … +50									
Weight	kg	**NG10** 8.0				**NG16** 10.4				**NG25** 18.2	
Vibration resistance, test condition		max. 25 g, shaken in 3 dimensions (24 h)									

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

Pressure fluid		Hydraulic oil to DIN 51524 … 535, other fluids after prior consultation									
Viscosity range	recommended mm²/s	20 … 100									
	max. permitted mm²/s	10 … 800									
Pressure fluid temperature range	°C	–20 … +65									
Maximum permissible degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 18/16/13 [1]									
Flow direction		See symbol									
Nominal flow at $\Delta p = 5$ bar per notch [2]	l/min	**NG10**				**NG16**				**NG25**	
		40	55	70	85	90	120	150	200	370	
Max. working pressure	bar	Port P, A, B: 350									
Max. pressure	bar	Port T, X, Y: 250									
$q_{max.}$	l/min	170				450				900	
q_N pilot valve	l/min	8				24				40	
Leakage of pilot valve at 100 bar	cm³/min	<180				<300				<500	
Leakage main valve at 100 bar	cm³/min	<400		<600		<1,000				<1,000	
Control oil pressure “pilot stage”	bar	min. 10									
		max. 250									

Static/Dynamic

Hysteresis	%	≦ 0.1, scarcely measurable									
Manufacturing tolerance for $q_{max.}$	%	<10									
Response time for signal change (at X = 100 bar)	0 … 100 %	12				15				23	
	0 … 10 %	6				7				10	
Response time for signal change (at X = 10 bar)	0 … 100 %	40				50				90	
	0 … 10 %	20				20				30	
Switch-off behaviour		After electrical switch-off: pilot valve undefined in P-B/A-T or P-A/B-T Main stage can be controlled 100 % (PB/AT or PA/BT)									
Thermal drift		Zero point displacement <1 % at $\Delta T = 40\,°C$									
Zero adjustment		Factory-set ±1 %									
Conformity		CE EN 61000-6-2 EN 61000-6-3									

[1] The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components. For a selection of filters, see catalogue sections RE 50070, RE 50076 and RE 50081.

[2] Flow rate at a different Δp $\quad q_x = q_{nom} \cdot \sqrt{\frac{\Delta p_x}{5}}$

Important
Pilot operated 4WRLE servo solenoid valves only perform their function in an active closed control loop and do not have a safe basic position when switched off. For this reason, many applications require the use of “additional check valves”, which must be taken into account during the On/Off switching sequence.

Technical data

Electrical, trigger electronics integrated in the valve

Cyclic duration factor	%	100, max. current input 30 VA (24 V DC)	
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5	
Connection		Plug, 11P+PE	Daten
Power supply 24 V DC_{nom}	1)	1 2	+24 V DC_{nom}, fuse 2.5 A_F (output stages) 0 V power ground
	2)	9 10	+24 V DC_{nom} signal part 0 V signal ground
Input signal ±10 V	3)	4 5	$\frac{U_{IN}}{U_{IN}}$ } Difference amplifier, $R_i = 100\ k\Omega$
Feedback signal (LVDT)		6 7	±10 V DC, $R_a = 1\ k\Omega$ 0 V, reference point
Enabling input		3	> 8.5 V to 24 V DC_{nom} (max. 40 V DC) $R_i = 10\ k\Omega$
Signals	4)	8 11	Enabling acknowledgement +24 V DC Fault signal: no fault +24 V DC
Protective conductor		⏚	Only connect when transformer of 24 V DC system does not conform to standard VDE 0551
Connecting cable		Recommended Ø 12...14 mm: screened	max. 20 m 0.75 mm^2 max. 40 m 1.0 mm^2

24 V DC_{nom} – min. 21 V DC
– max. 40 V DC

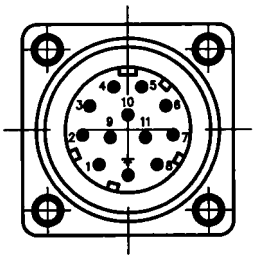
1) U_B (Pin 1) = output stage supply
– Valve "OFF" <13.4 V DC
– Valve "ON" >16.8 V DC
No fault signal (Pin 11)

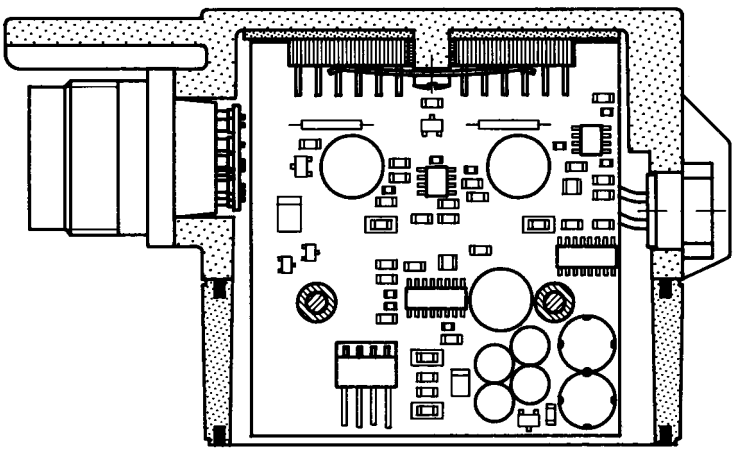
2) U_S (Pin 9) = signal electronics supply
– Valve "OFF" <16.8 V DC
Fault signal (Pin 11)
– Valve "ON" >19.5 V DC
No fault signal (Pin 11)

3) Inputs: dielectric strength to withstand up to max. 50 V.

4) Signals can bear a load of max. 20 mA and are resistant to shorts to ground.

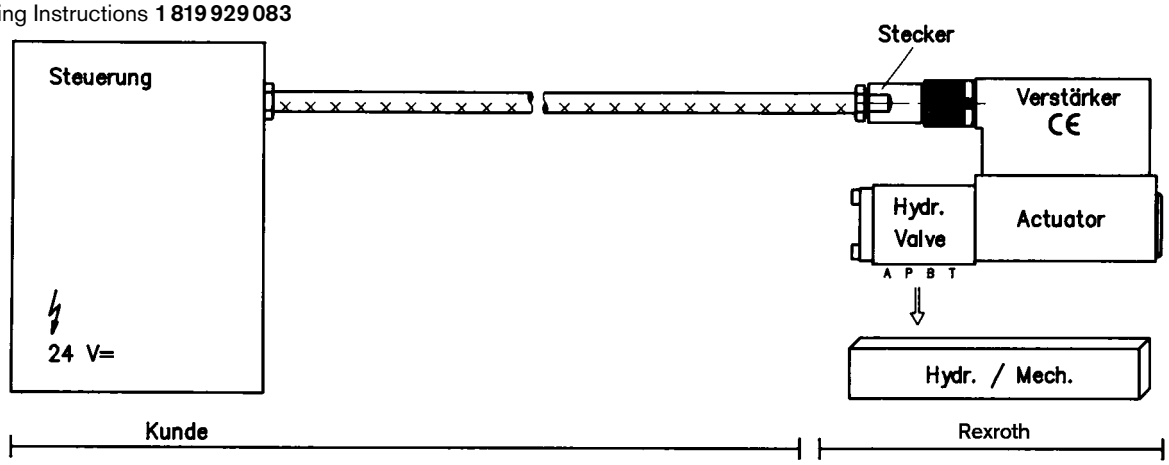
11P+PE





Connection

For electrical data, see page 6 and
Operating Instructions **1 819 929 083**



Technical notes on the cable

Version:
- Multi-wire cable
- Extra-finely stranded wire to VDE 0295, Class 6
- Protective conductor, green/yellow
- Cu braided screen

Types:
- e.g. Ölflex-FD 855 CP (from Lappkabel company)

No. of wires:
- Determined by type of valve, plug types and signal assignment

Cable Ø:
- 0.75 mm² to 20 m length
- 1.0 mm² to 40 m length

Outside Ø:
- 9.4 ... 11.8 mm – Pg11
- 12.7 ... 13.5 mm – Pg16

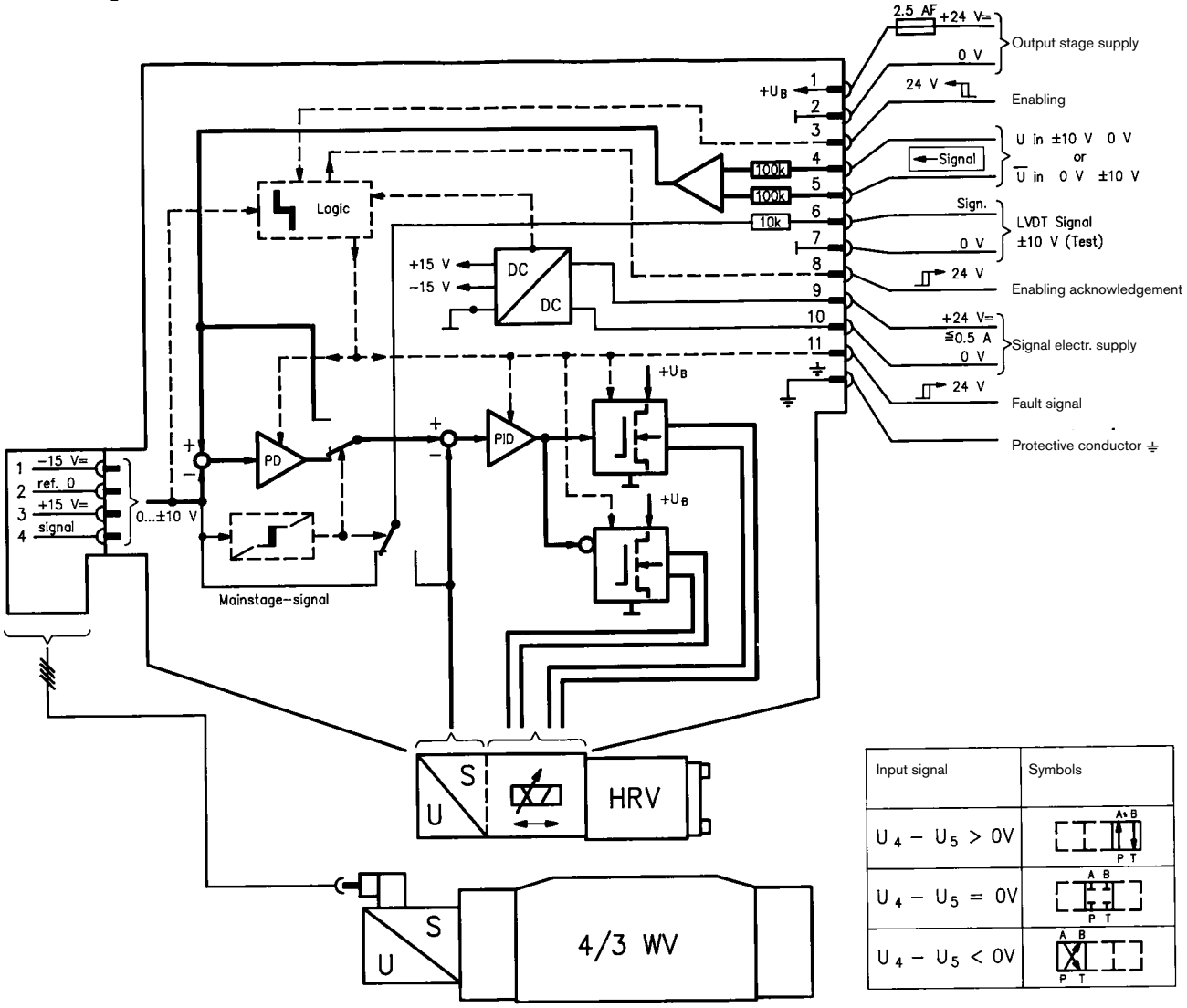
Important

Electrical signals emitted via the trigger electronics (e.g. actual values) must not be used to shut down safety-relevant machine functions! (See European Standard, "Technical Safety Requirements for Fluid-Powered Systems and Components – Hydraulics", EN 982.)

On-board trigger electronics

Block diagram/pin assignment

Version B5: U_E ±10 V

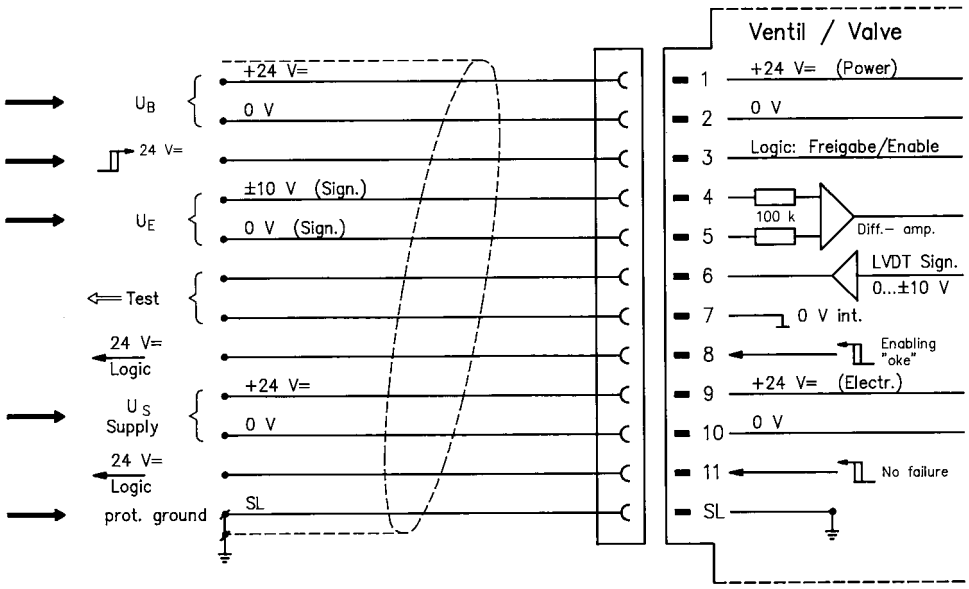


Input signal	Symbols
$U_4 - U_5 > 0V$	
$U_4 - U_5 = 0V$	
$U_4 - U_5 < 0V$	

Pin assignment 11P+PE

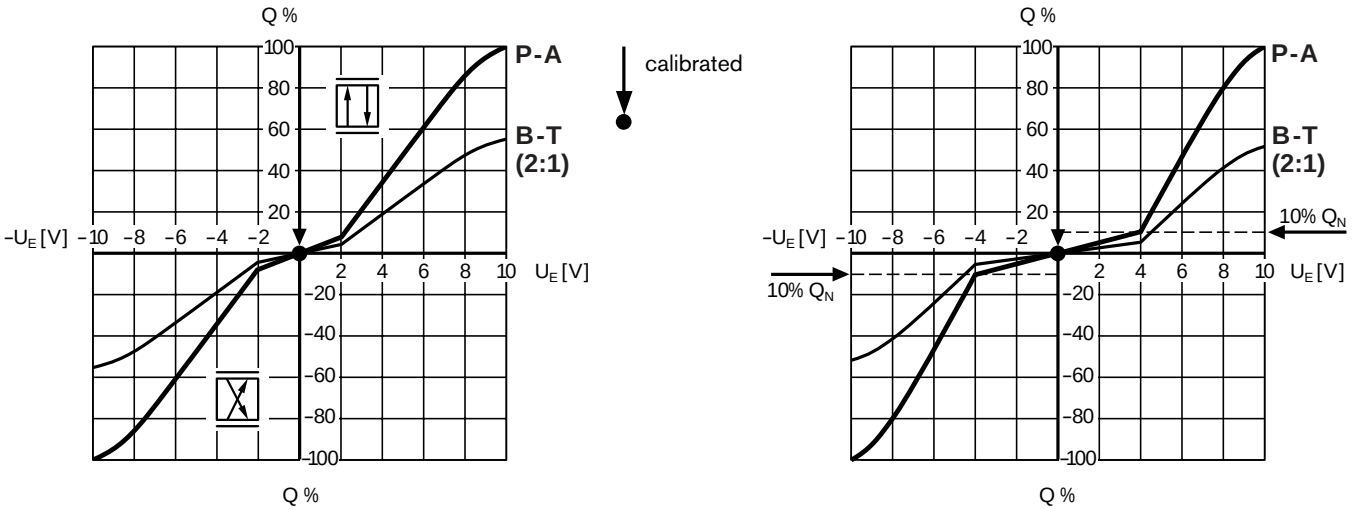
Version B5: U_E ±10 V

($R_i = 100\,k\Omega$)

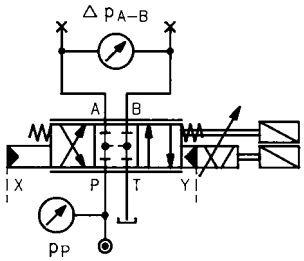


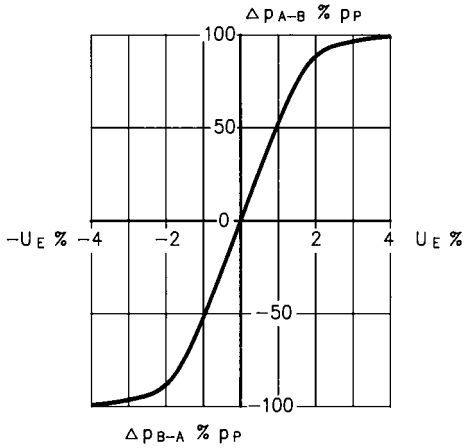
Performance curves (measured with HLP46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Flow rate/Signal function $Q = f(U_E)$



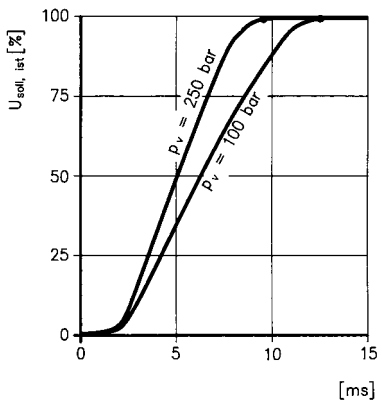
Pressure gain $\Delta = f(U_E)$



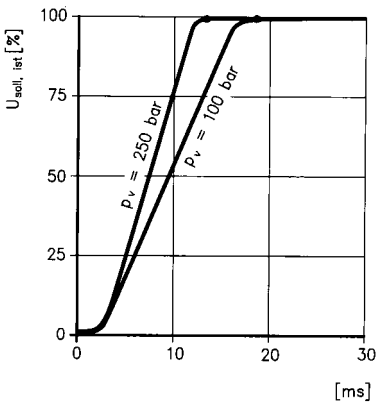


Response time $0 \rightarrow 100\,\%$

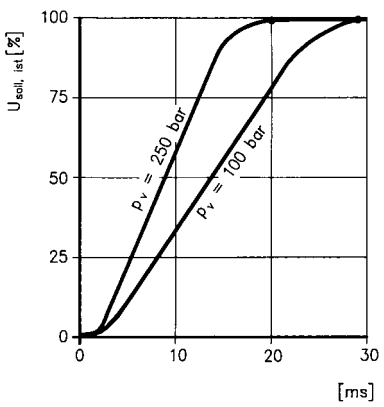
NG10



NG16

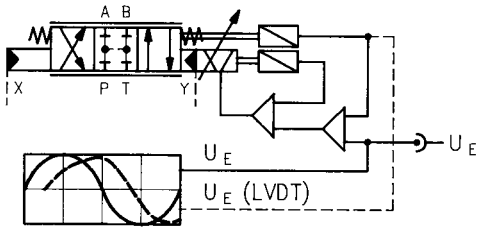


NG25

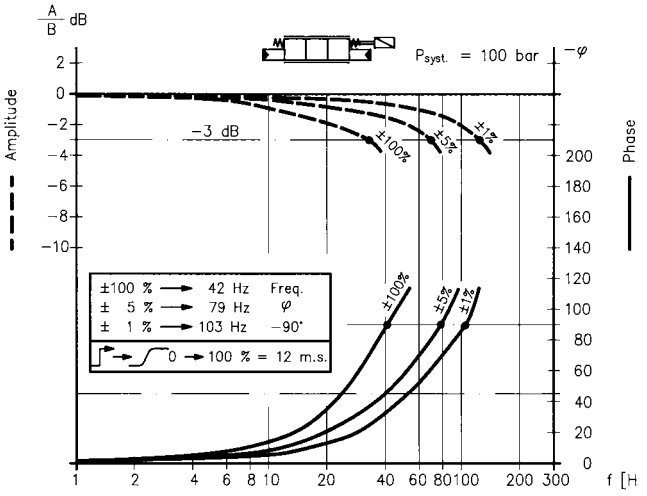


Performance curves (measured with HLP46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

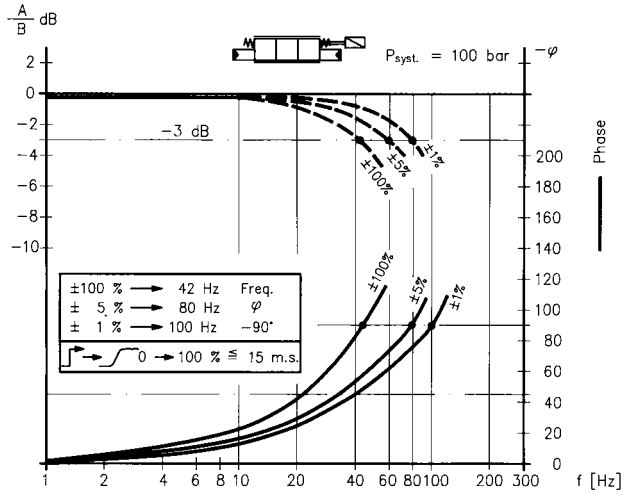
Bode diagrams



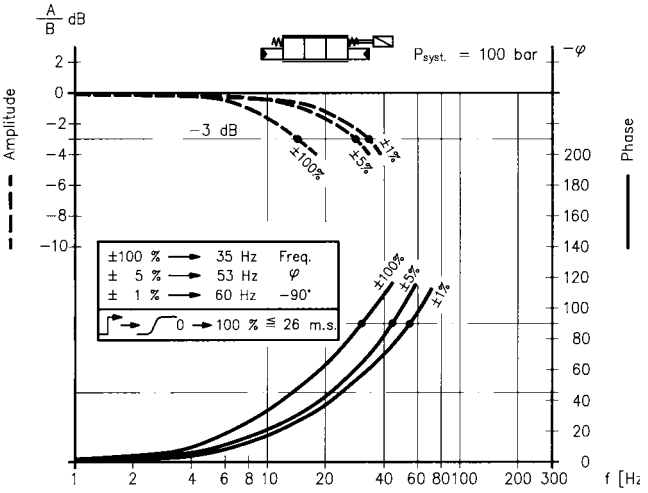
NG10



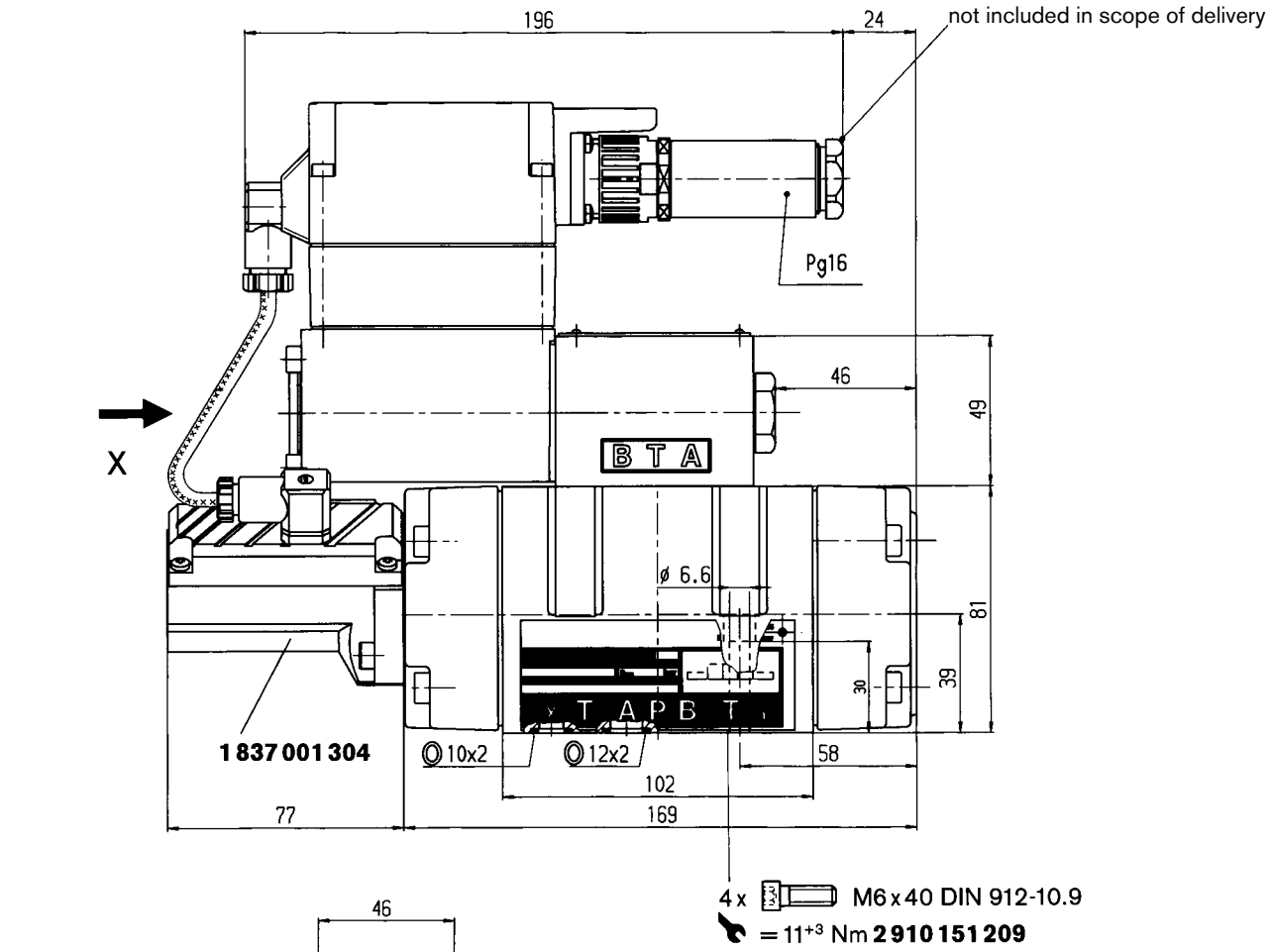
NG16

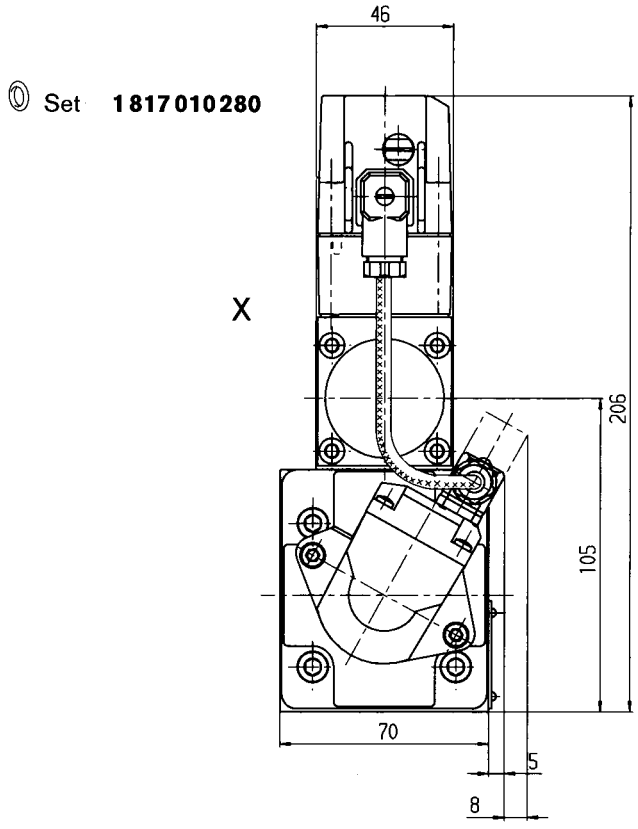


NG25



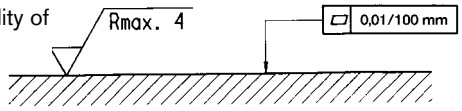
Unit dimensions NG10 (nominal dimensions in mm)



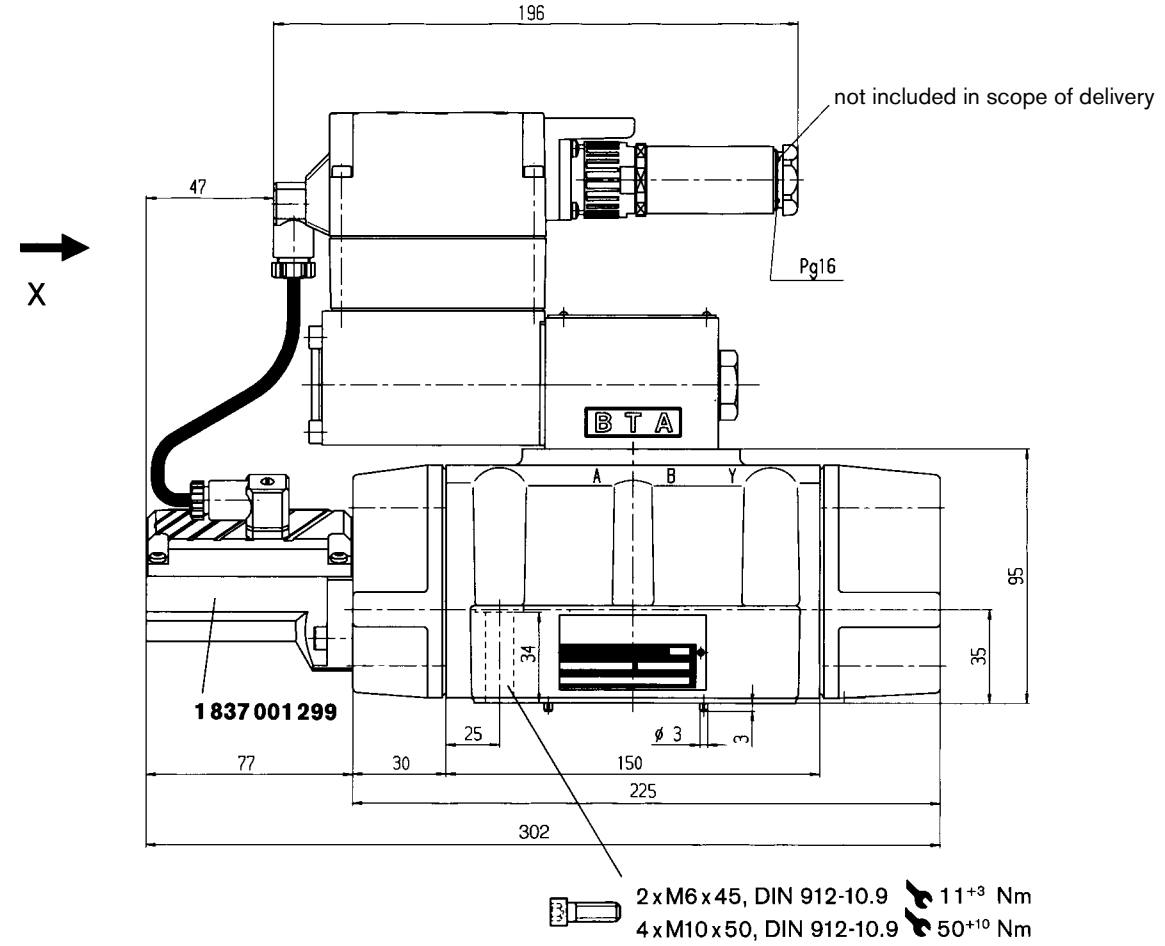


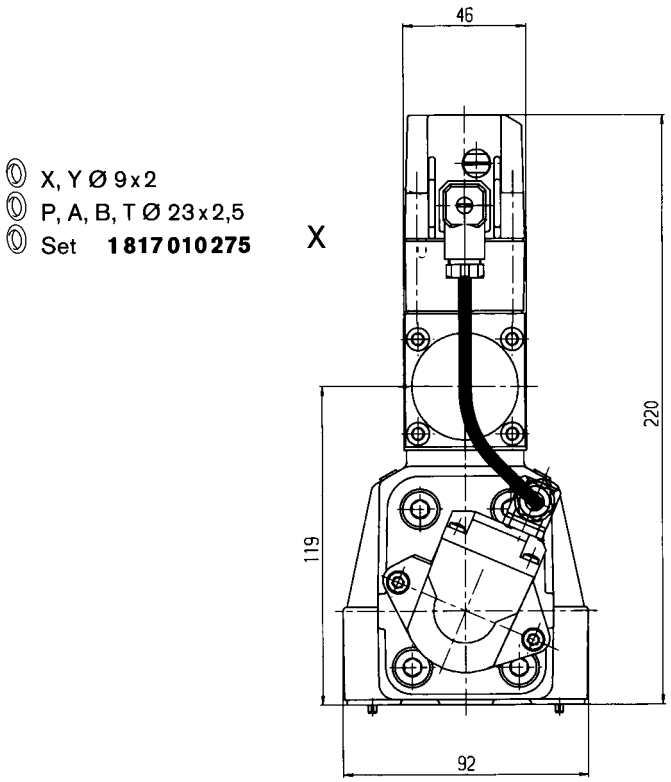
Mounting hole configuration: NG10
(ISO 4401-05-05-0-94), see page 14
For subplates, see catalogue section RE 45055

Required surface quality of mating component



Unit dimensions NG16 (nominal dimensions in mm)

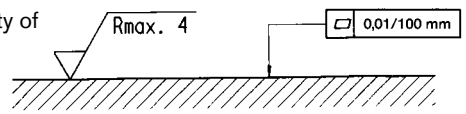




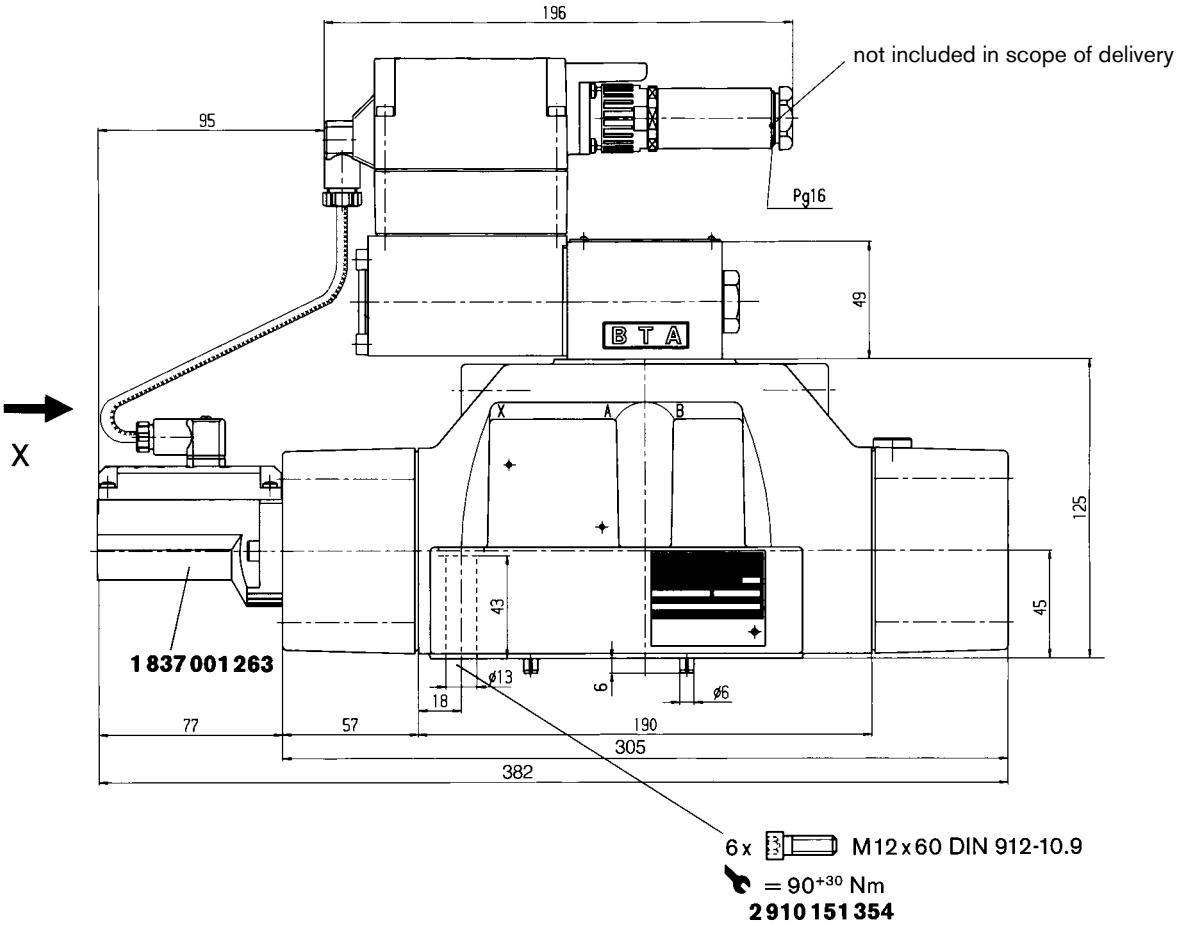
M6 x 45 **2 910 151 211**
M10 x 50 **2 910 151 301**

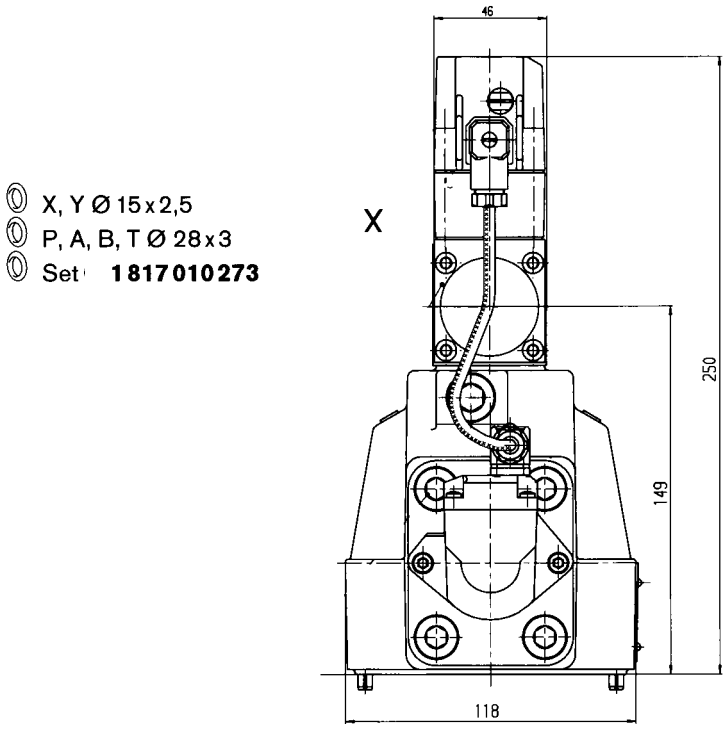
Mounting hole configuration: NG16
(ISO 4401-07-06-0-94), see page 14
For subplates, see catalogue section RE 45057

Required surface quality of mating component



Unit dimensions NG25 (nominal dimensions in mm)

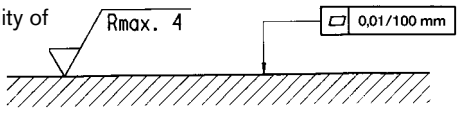




X, Y Ø 15x2,5
P, A, B, T Ø 28x3
Set **1817010273**

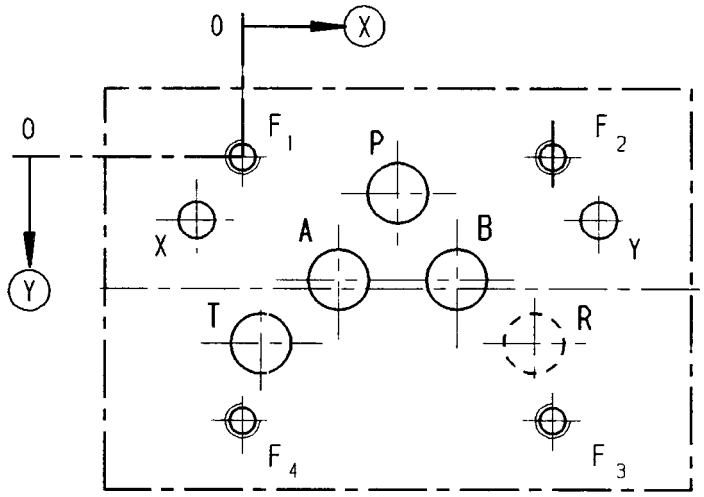
Mounting hole configuration: NG25
(ISO 4401-08-07-0-94), see page 15
For subplates, see catalogue section RE 45059

Required surface quality of mating component



Mounting hole configurations (nominal dimensions in mm)

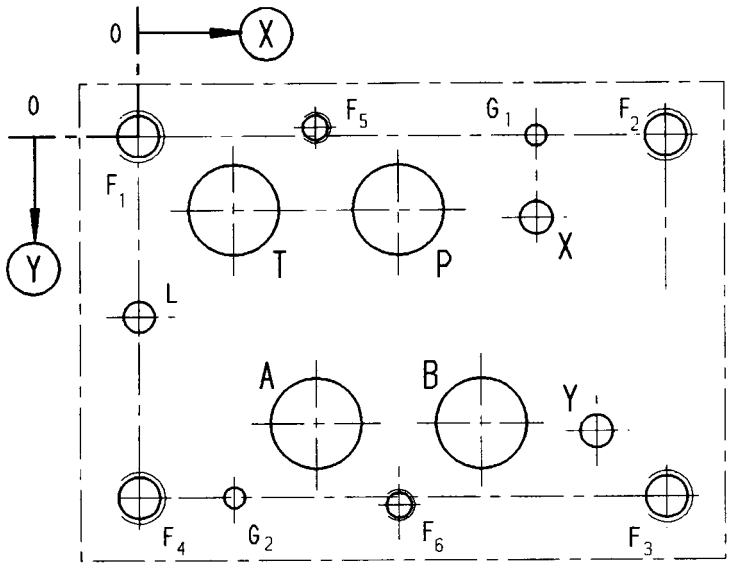
NG10 – ISO 4401-05-05-0-94



1) Deviates from standard
2) Thread depth:
Ferrous metal 1.5 x Ø*
Non-ferrous 2 x Ø
* (NG10 min. 10.5 mm)

	P	A	T	B	F_1	F_2	F_3	F_4	X	Y	R
⊗	27	16.7	3.2	37.3	0	54	54	0	–8	62	50.8
⊙	6.3	21.4	32.5	21.4	0	0	46	46	11	11	32.5
∅	10.5 1)	10.5 1)	10.5 1)	10.5 1)	M6 2)	M6 2)	M6 2)	M6 2)	6.3	6.3	10.5 1)

NG16 – ISO 4401-07-06-0-94

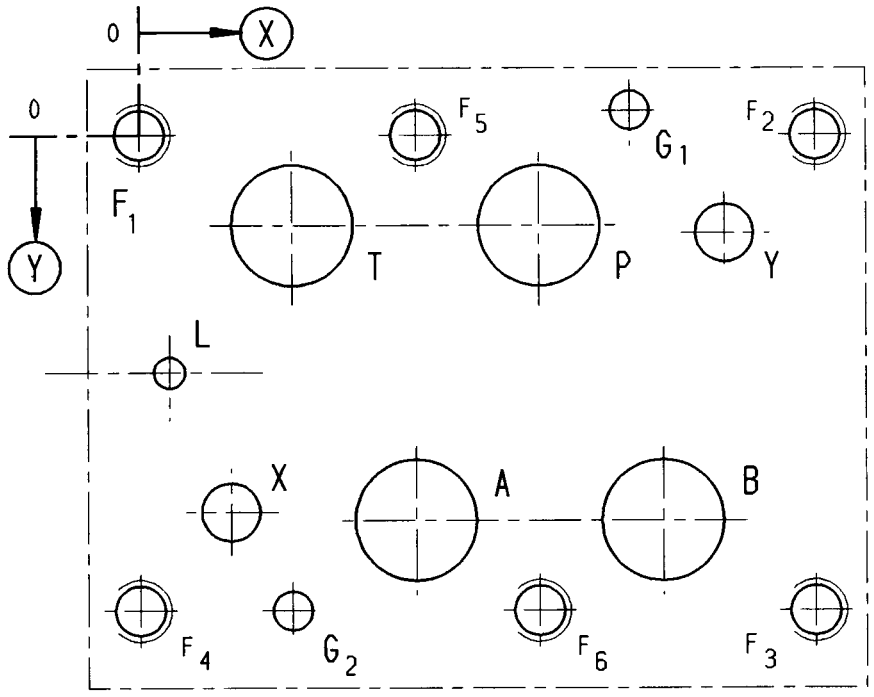


1) Deviates from standard
2) Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	P	A	T	B	L	X	Y	G_1	G_2	F_1	F_2	F_3	F_4	F_5	F_6
⊗	50	34.1	18.3	65.9	0	76.6	88.1	76.6	18.3	0	101.6	101.6	0	34.1	50
⊙	14.3	55.6	14.3	55.6	34.9	15.9	57.2	0	69.9	0	0	69.9	69.9	–1.6	71.5
∅	20 1)	20 1)	20 1)	20 1)	6.3	6.3	6.3	4	4	M10 2)	M10 2)	M10 2)	M10 2)	M6 2)	M6 2)

Mounting hole configurations (nominal dimensions in mm)

NG25 – ISO 4401-08-07-0-94



[1] Deviates from standard
[2] Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	P	A	T	B	L	X	Y	G_1	G_2	F_1	F_2	F_3	F_4	F_5	F_6
⊗	77	53.2	29.4	100.8	5.6	17.5	112.7	94.5	29.4	0	130.2	130.2	0	53.2	77
Ⓨ	17.5	74.6	17.5	74.6	46	73	19	–4.8	92.1	0	0	92.1	92.1	0	92.1
∅	25 [1]	25 [1]	25 [1]	25 [1]	11.2	11.2	11.2	7.5	7.5	M12 [2]	M12 [2]	M12 [2]	M12 [2]	M12 [2]	M12 [2]

Notes

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