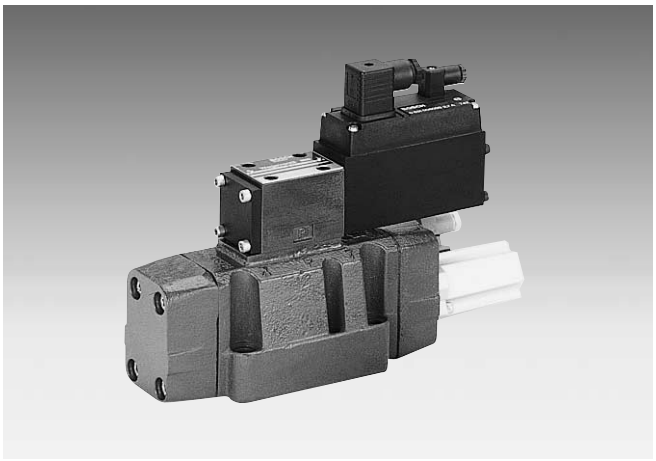
RE 29 086/01.03

Servo solenoid valves with electrical position feedback (Lvdt DC/DC ±10 V) Type 4WRL 10 ... 32

Size 10, 16, 25, 32
Series 3X
Maximum working pressure 315 bar
Maximum flow rate 1,000 l/min (Δp 10 bar)



Type 4WRL ...-3X/G24...

List of contents

Variants on request

- For standard applications
- Special symbols for plastic injection-moulding machines
- Sturdy "ruggedized" version for applications up to 40 *g*, valve with metal cap and central plug (7P).

Features

- Pilot operated servo solenoid valves NG 10 to NG 32
- Pilot valve NG 6, with control piston and sleeve in servo quality
- Actuated on one side, 4/4 fail-safe position when switched off
- Control solenoid with integral position feedback and electronics for position transducer (Lvdt DC/DC)
- 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)
- Suitable for electrohydraulic controllers in production and testing systems
- For subplate attachment, mounting hole configuration to DIN 24 340 Form A, ISO 4401 and CETOP-RP 121 H
- Subplates as per catalogue section, NG 10 RE 45 055, NG 16 RE 45 057, NG 25 RE 45 059 and NG 32 RE 45 060
- Line sockets to DIN 43 560-AM2
  Solenoid 2P + PE/Pg 11, position transducer 4P/Pg 7
  in scope of delivery, see catalogue section RE 08 008
- External trigger electronics (order separately)
  - Electric amplifier for standard curve "M"
    0 811 405 063, see catalogue section RE 30 045
  - Electric amplifier for non-linear curve "P"
    40 % – 0 811 405 068, see catalogue section RE 30 043

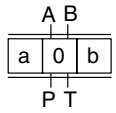
Ordering data

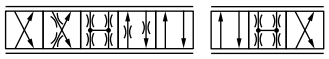
4WRL | | | | | | **-3X** | **/G24** | | **Z4/** | | **M** | ***

For **external** trigger electronics **= no desig.**

Size 10 **= 10**
Size 16 **= 16**
Size 25 **= 25**
Size 32[1] **= 32**

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]) Mounting hole configuration of size 32 with hole diameter 50 mm is equivalent to the RR mounting hole configuration of NG 35. P A B: max = 350 bar.
[2]) "H": Highflow version
– NG 25 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.
[3]) q_N: Flow characteristic "P"

Further information in plain text

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51 524

Electrical connection
Z4 = with line socket, with plug to DIN 43 560-AM2
Line socket in scope of delivery

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" = external

Voltage supply of trigger electronics
G24 = +24 V DC

H =[2] Highflow version (on request)

3X = Series 30 to 39 (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 = 55, 70[3] or 85 l/min
16 = 100[3], 120, 150[3] or 200 l/min
25 = 300[3], 370 or 430[2] l/min
32 = 1,000[1] l/min

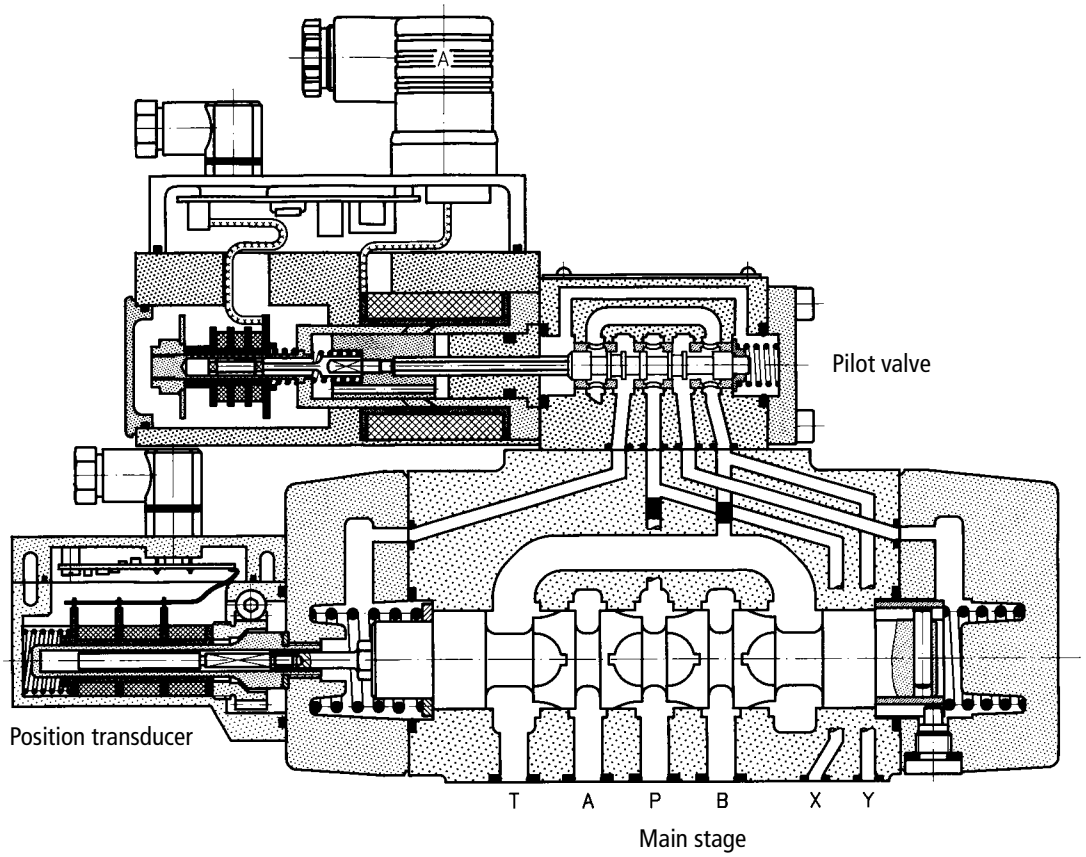
Preferred types (available at short notice)

Material no.	Type 4WRL
NG 10	**V / V1**
0 811 404 093	4WRL 10 V –55M 3X/G24 Z4/M
0 811 404 391	4WRL 10 V –55M 3X/G24T Z4/M
0 811 404 392	4WRL 10 V –55M 3X/G24ET Z4/M
0 811 404 094	4WRL 10 V –85M 3X/G24 Z4/M
0 811 404 393	4WRL 10 V –85M 3X/G24T Z4/M
0 811 404 390	4WRL 10 V –85M 3X/G24ET Z4/M
0 811 404 394	4WRL 10 V1–85M 3X/G24 Z4/M
0 811 404 095	4WRL 10 V –70P 3X/G24 Z4/M
0 811 404 395	4WRL 10 V1–70P 3X/G24 Z4/M

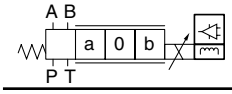
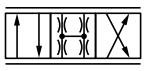
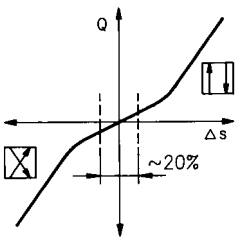
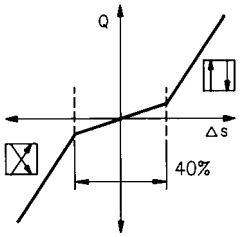
Material no.	Type 4WRL
NG 16	**V / V1**
0 811 404 206	4WRL 16 V –120M 3X/G24 Z4/M
0 811 404 239	4WRL 16 V1–120M 3X/G24 Z4/M
0 811 404 207	4WRL 16 V –200M 3X/G24 Z4/M
0 811 404 221	4WRL 16 V –200M 3X/G24T Z4/M
0 811 404 240	4WRL 16 V1–200M 3X/G24 Z4/M
0 811 404 241	4WRL 16 V –100P 3X/G24 Z4/M
0 811 404 242	4WRL 16 V1–100P 3X/G24 Z4/M
0 811 404 243	4WRL 16 V –150P 3X/G24 Z4/M
0 811 404 244	4WRL 16 V1–150P 3X/G24 Z4/M
NG 25	**V / V1**
0 811 404 405	4WRL 25 V –370M 3X/G24 Z4/M
0 811 404 495	4WRL 25 V1–370M 3X/G24 Z4/M
0 811 404 496	4WRL 25 V –300P 3X/G24 Z4/M
NG 32	**V / V1**
0 811 404 560	4WRL 32 V –1000M 3X/G24 Z4/M

Function, sectional diagram

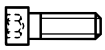
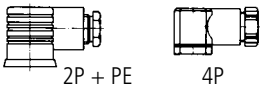
Servo solenoid valve 4WRL 10 ... 32



Symbols

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

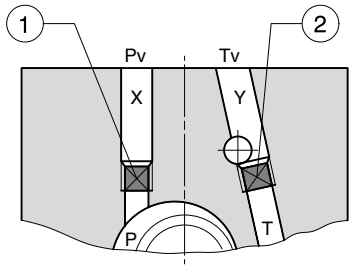
Accessories, not included in scope of delivery

Fastening screws 	NG 10	4 x M 6 x 40, DIN 912-10.9	2 910 151 209
	NG 16	2 x M 6 x 45, DIN 912-10.9	2 910 151 211
		4 x M 10 x 50, DIN 912-10.9	2 910 151 301
	NG 25	6 x M 12 x 60, DIN 912-10.9	2 910 151 354
	NG 32	6 x M 20 x 90, DIN 912-10.9	2 910 151 532
	VT-VRRA1-527-20 / V0/2STV, siehe RE 30 045		0 811 405 063
	VT-VRRA1-527-20 / V0/K40-AGC-2STV, see RE 30 043		0 811 405 068
	2P+PE (Pg 11) and 4P (Pg 7) included in scope of delivery, also see RE 08 008		

Testing and service equipment

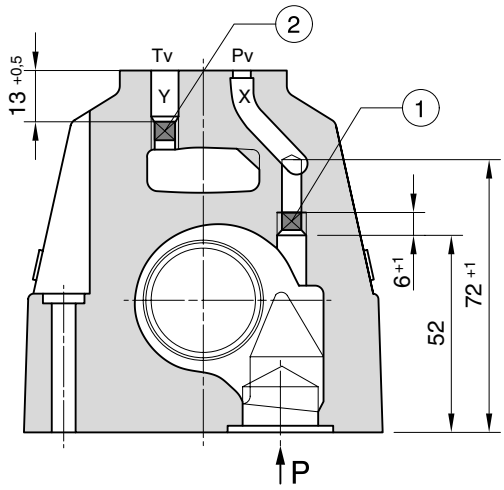
– Test box type VT-PE-TB2, see RE 30 064
– Test adapter type VT-PA-3, see RE 30 070

NG 10, 25, 32

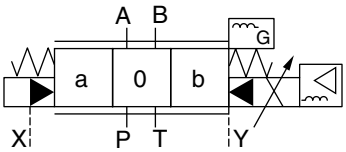


Plug ①②
NG 10 … 25 **1 813 464 007** SW 3
NG 32 **1 813 464 001** SW 4

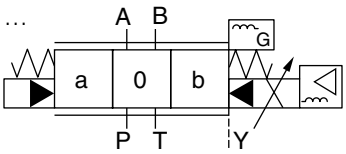
NG 16



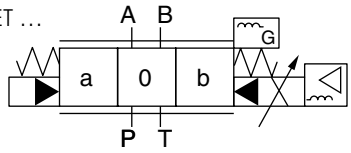
Type … –3X …



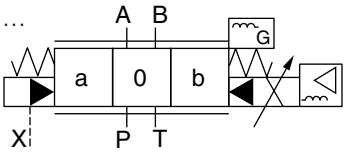
Type … –3X … E …



Type … –3X … ET …

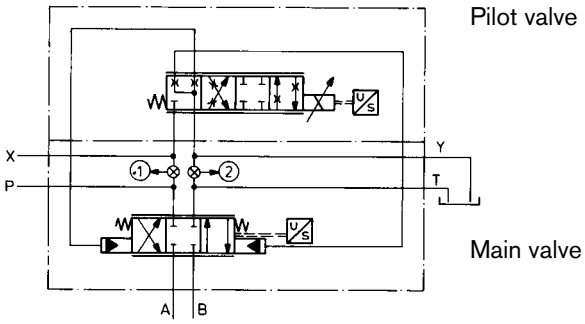


Type … –3X … T …



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

Symbol in detail



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

Hydraulic symbols are largely derived from the symbols of the switching valves. 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 (For device applications beyond the stated values, please consult us!)

General

Construction	Spool type valve, pilot operated			
Actuation	Servo solenoid valve NG 6, with position controller for pilot valve and main stage, external amplifier			
Type of mounting	Subplate, mounting hole configuration NG 10 … 32 (ISO 4401 and CETOP-RP 121 H)			
Installation position	Optional			
Ambient temperature range	–20 … +50 °C			
Weight	**NG 10** 8.35 kg	**NG 16** 10 kg	**NG 25** 18 kg	**NG 32** 80 kg
Vibration resistance, test condition	Max. 25 *g*, shaken in 3 dimensions (24 h)			

Hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

Pressure fluid	Hydraulic oil to DIN 51 524 … 535, other fluids after prior consultation										
Viscosity range, recommended max. permitted	20 … 100 mm²/s 10 … 800 mm²/s										
Pressure fluid temperature range	–20 … +80 °C										
Purity class to ISO code	Maximum permitted degree of contamination of pressure fluid to ISO 4406 (C) Class 18/16/13 [1]										
Flow direction	See symbol										
Nominal flow [l/min] at	**NG 10**			**NG 16**				**NG 25**		**NG 32 (50)**	
Δp = 5 bar per notch*	55	70	85	100	120	150	200	300	370	1,000	
Max. working pressure	Port P, A, B: 350 bar										
Max. pressure	Port T, X, Y: 250 bar										
$q_{max.}$ [l/min]	170			450				900		3500	
q_N pilot valve [l/min]	4			12				24		40	
Leakage [cm³/min] of pilot valve at 100 bar	<180			<300				<500		<900	
Leakage [cm³/min] of main stage at 100 bar	<400	<600		<1,000				<1,000		<6,000	
Control oil pressure "pilot stage"	min. 10 bar										
	max. 250 bar										

Static/Dynamic

Hysteresis	< 0.1 %, scarcely measurable				
Manufacturing tolerance for $q_{max.}$	≦10 %				
Response time for signal change (at X = 100 bar)	0 … 100 %	25	40	45	130
	0 … 10 %	15	18	20	60
Response time for signal change (at X = 10 bar)	0 … 100 %	85	90	150	500
	0 … 10 %	50	40	80	200
Switch-off behaviour	After electrical switch-off: pilot valve in "fail-safe" Main stage moves to spring-centred "offset position": 1 … 6 % P-B/A-T				
Thermal drift	Zero point displacement <1 % at ΔT= 40 °C				
Zero adjustment	Adjustable ±5 % via valve amplifier				

[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 50 070, RE 50 076 and RE 50 081.

* Flow rate at a different Δp

$$q_x = q_{nom.} \cdot \sqrt{\frac{\Delta p_x}{5}}$$

Technical data (For device applications beyond the stated values, please consult us!)

Electrical

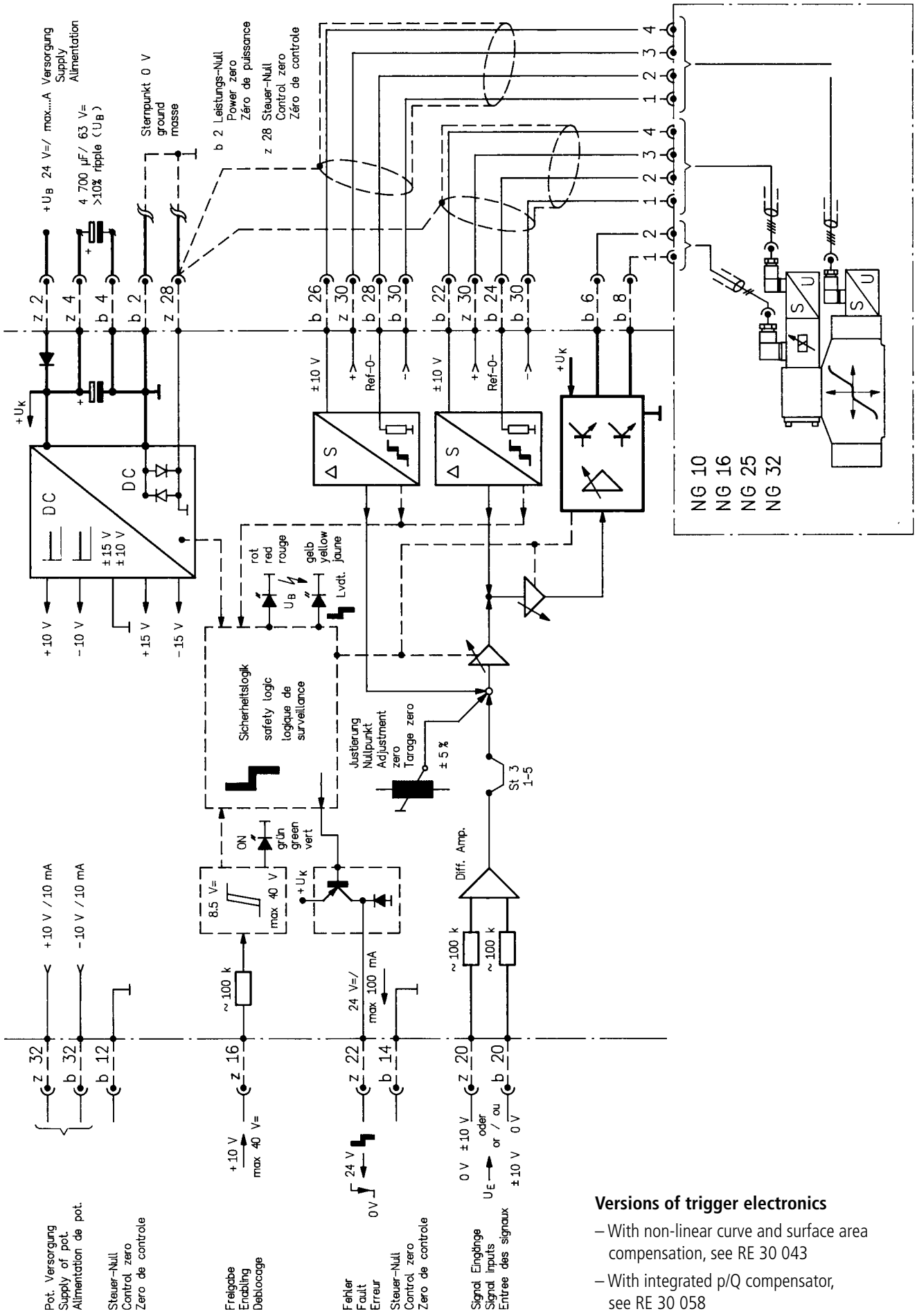
Cyclic duration factor	100 %	
Power supply	24 $VDC_{nom.}$ (external amplifier)	
Degree of protection	IP 65 to DIN 40 050	
Solenoid connector	Connector DIN 43 650/ISO 4400 Pg 11 (2P + PE)	
Position transducer connector	Connector Pg 7 (4P)	
Solenoid current	2.7 A max.	
Coil resistance R_{20}	2.5 Ω	
Max. power consumption at 100 % load and operational temperature	40 VA max.	
Position transducer DC/DC technology	Supply: + 15 V/35 mA −15 V/25 mA	Signal: 0 … +10 V (R_L ≧10 Ω)

All characteristics in connection with electric amplifier 0 811 405 063

Important

Pilot operated 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.

Block diagram / pin assignment

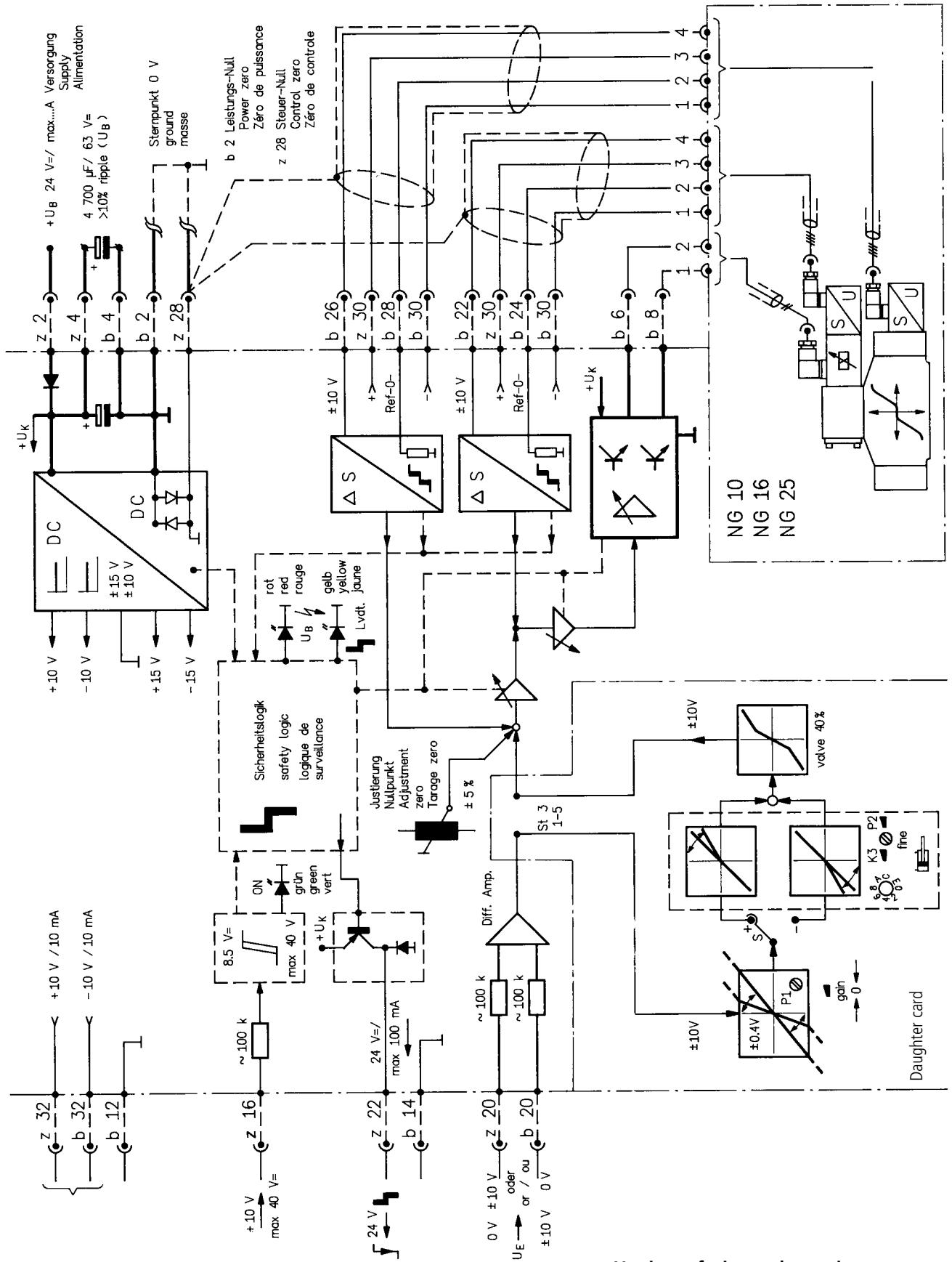


Versions of trigger electronics

– With non-linear curve and surface area compensation, see RE 30 043

– With integrated p/Q compensator, see RE 30 058

Block diagram / pin assignment



Versions of trigger electronics:

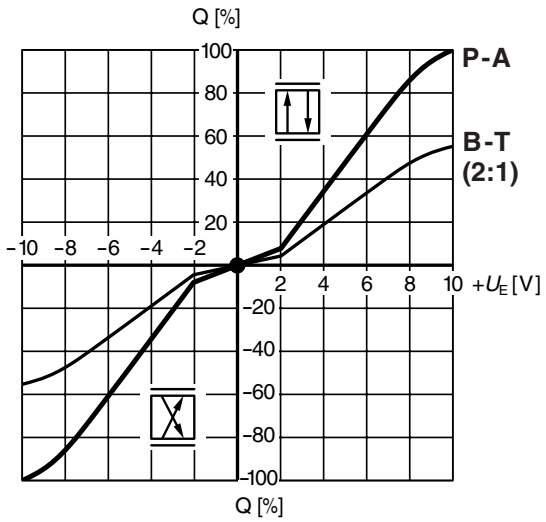
– With standard linear curve, see RE 30 045

– With integrated p/Q compensator, see RE 30 058

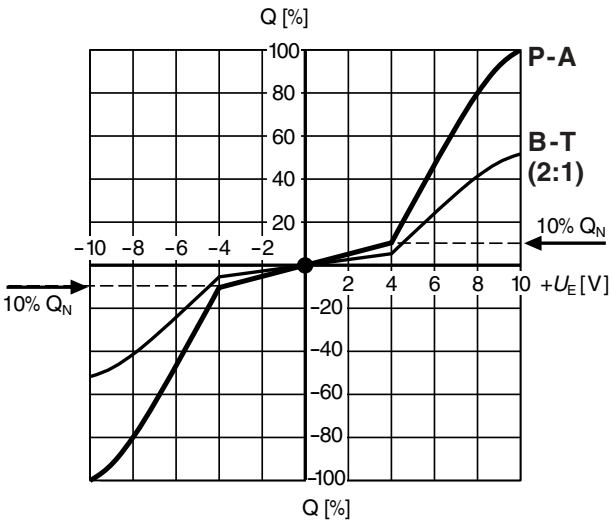
Performance curves (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

Flow rate/Signal function Q = f (U_E)

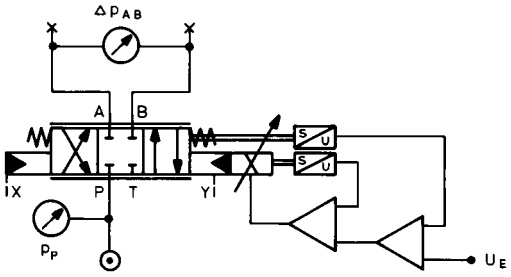
M: (standard 1:1, 2:1)

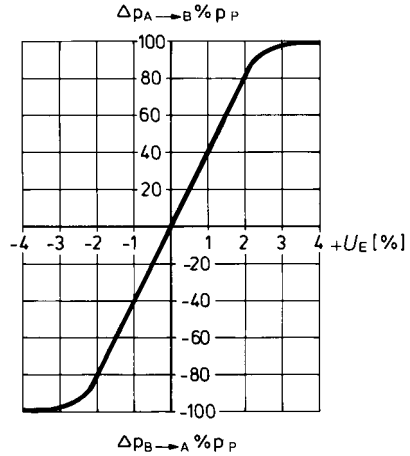


L: (non-linear 1:1, 2:1)

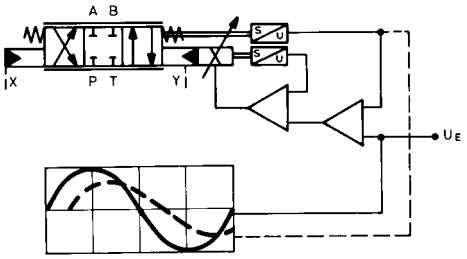


Pressure gain

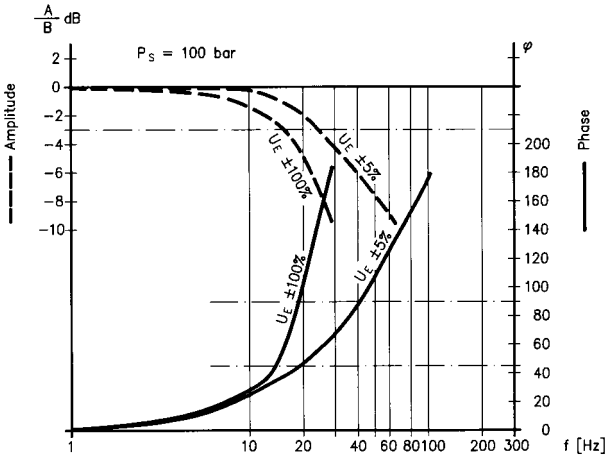




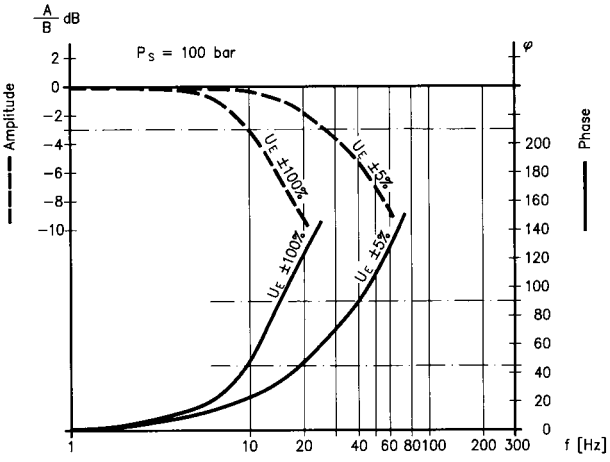
Bode diagram



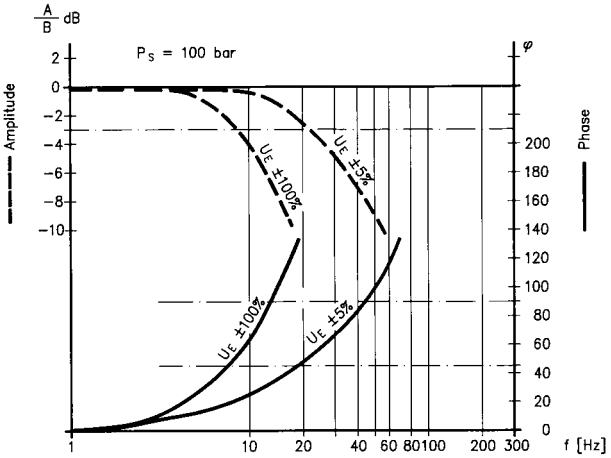
NG 10



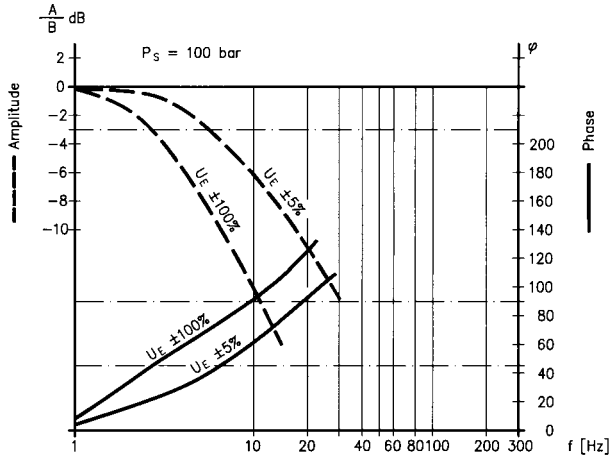
NG 16

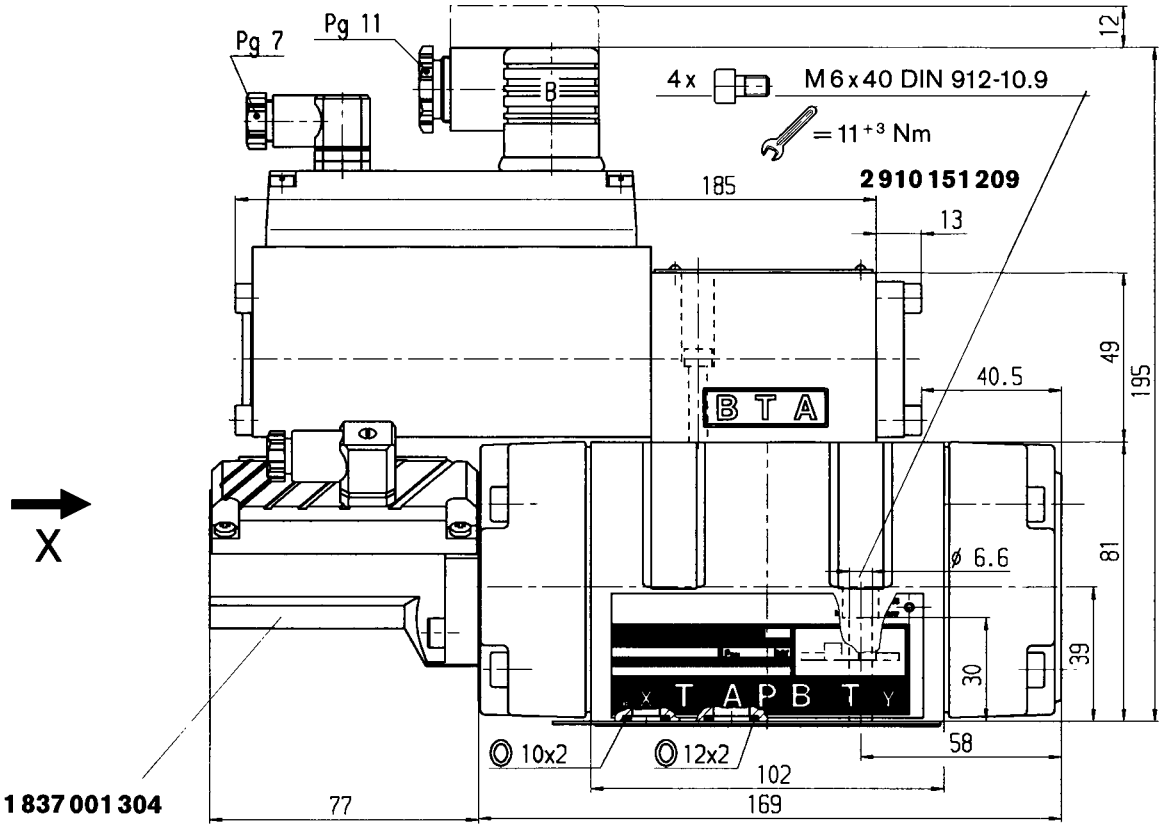


NG 25

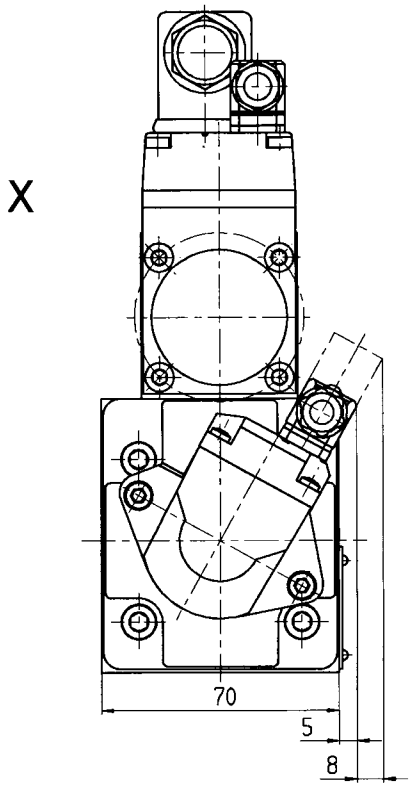


NG 32 (50)





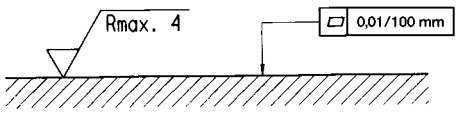
Set 1817010280

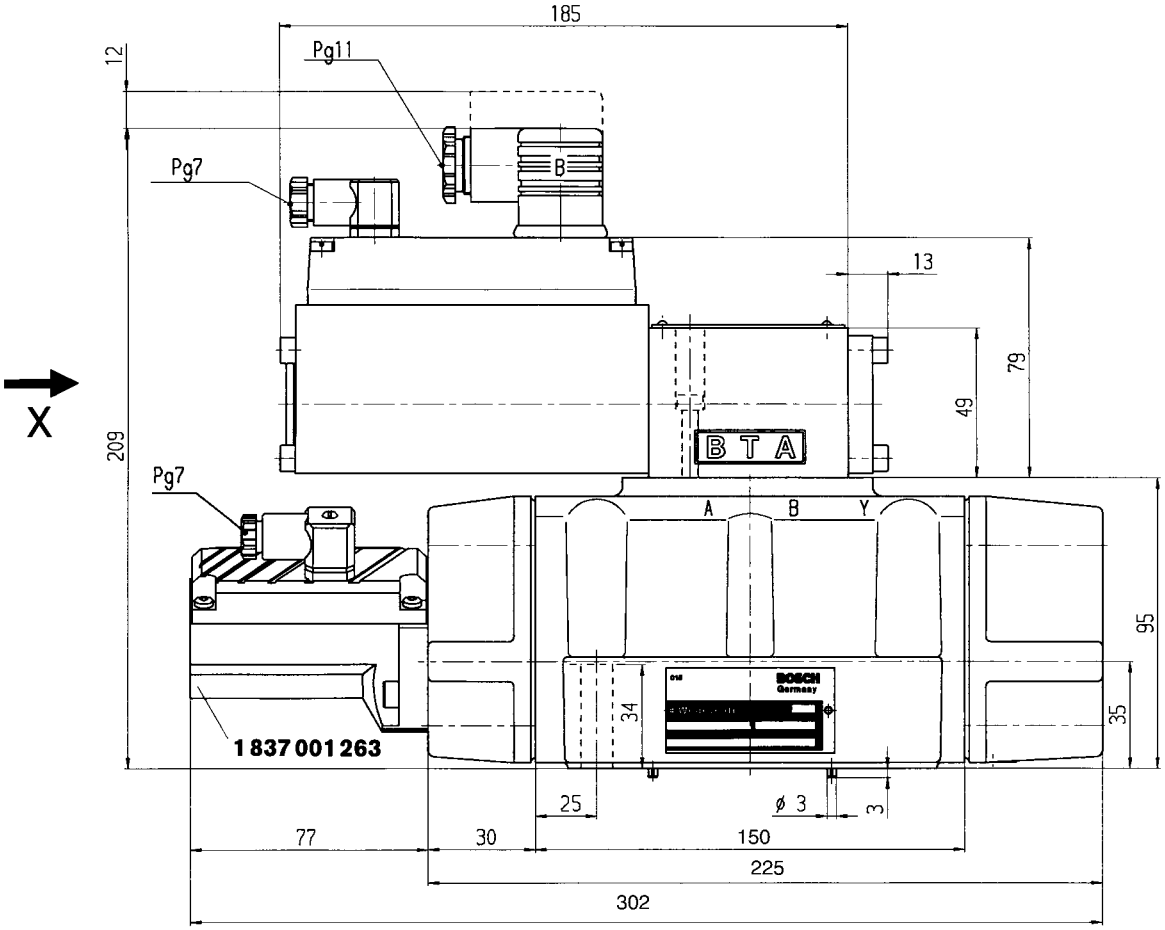


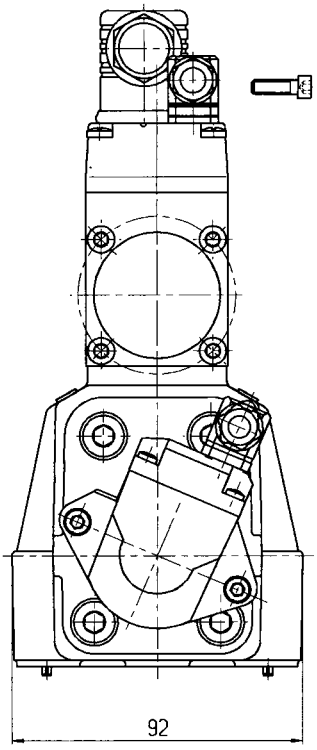
Mounting hole configuration: NG 10 (DIN 24 340 Form A, ISO 4401 and CETOP-RP 121 H), see page 15

For subplates, see catalogue section RE 45 055

Required surface quality of mating component







- L1, L2, X, Y Ø 9 x 2
- P, A, B, T Ø 23 x 2,5
- Set **1 817 010 275**

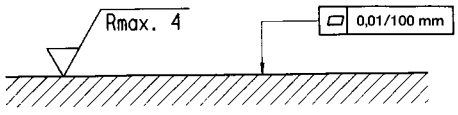
2 x M 6 x 45, DIN 912-10.9 — 11^{+3} Nm
4 x M 10 x 50, DIN 912-10.9 — 50^{+10} Nm

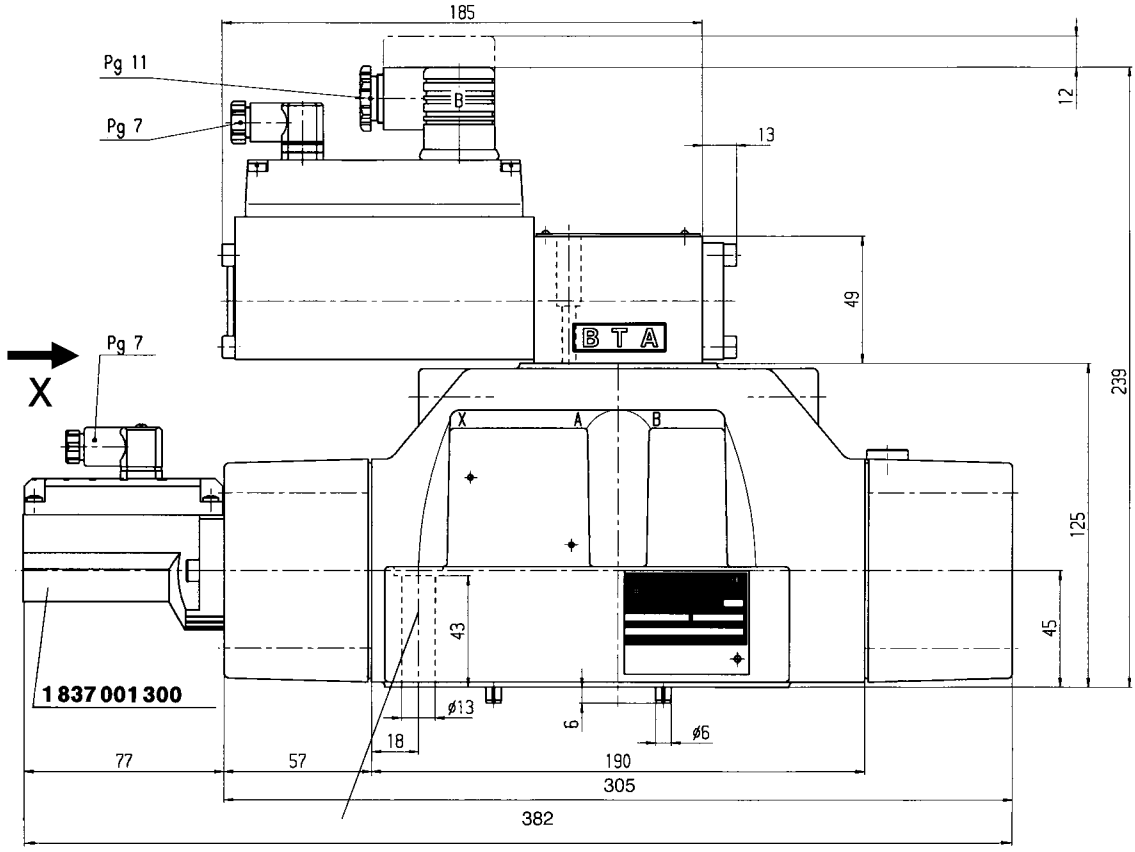
M 6 x 45 **2 910 151 211**
M 10 x 50 **2 910 151 301**

Mounting hole configuration: NG 16 (DIN 24 340 Form A, ISO 4401 and CETOP-RP 121 H), see page 15

For subplates, see catalogue section RE 45 057

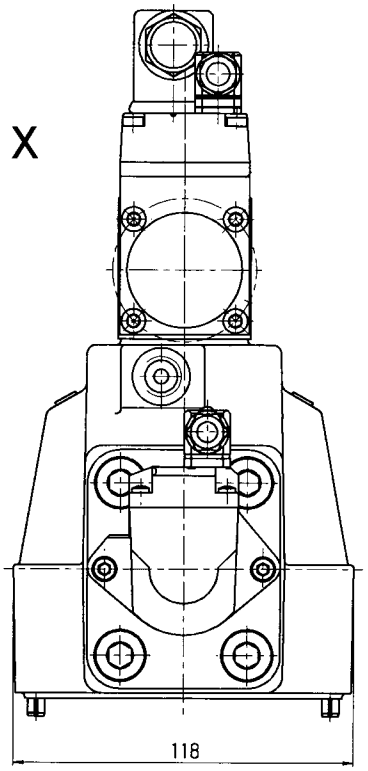
Required surface quality of mating component





6 x M 12 x 60 DIN 912-10.9
= 90 +30 Nm

2 910 151 354

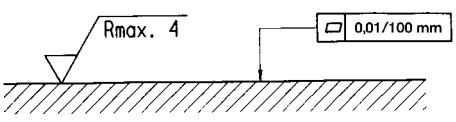


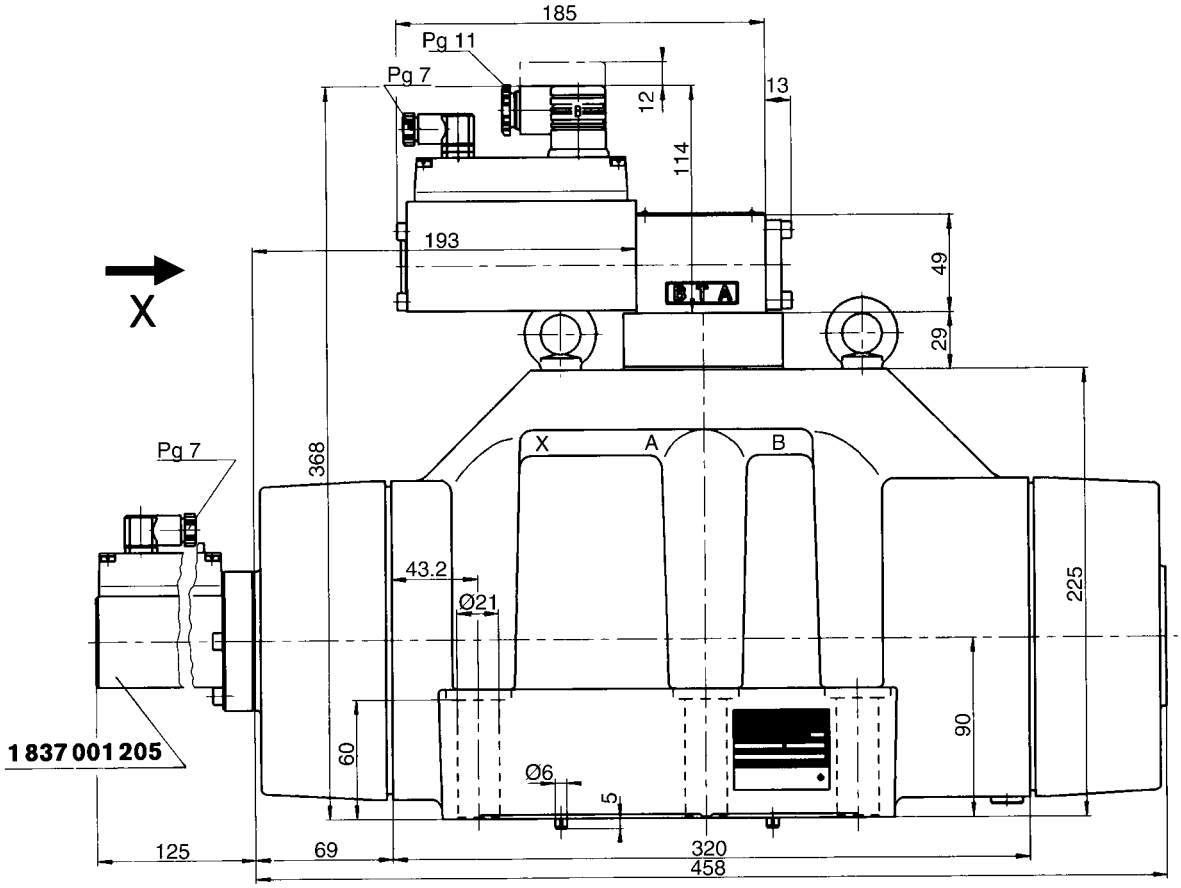
- O-ring L_1, L_2, X, Y Ø 15 x 2,5
- O-ring P, A, B, T Ø 28 x 3
- Set **1 817 010 273**

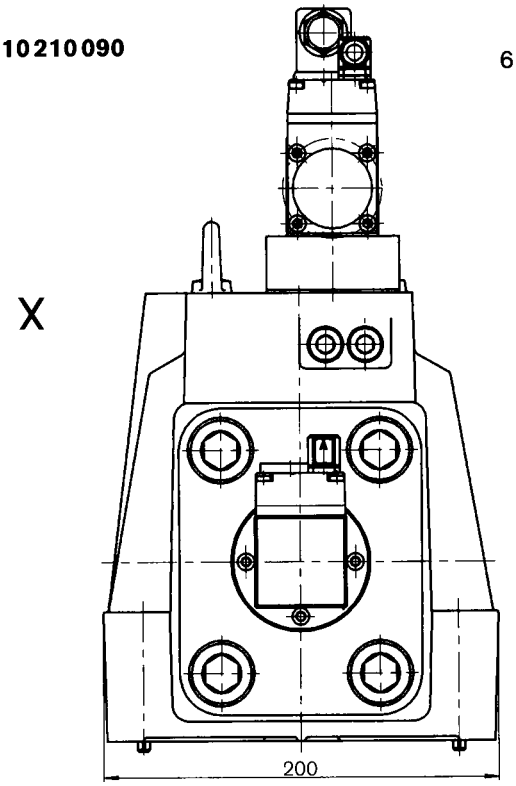
Mounting hole configuration: NG 25 (DIN 24 340 Form A, ISO 4401 and CETOP-RP 121 H), see page 16

For subplates, see catalogue section RE 45 059

Required surface quality of mating component







◎ L_1, L_2, X, Y Ø 14 x 2,5 **1 810 210 090**
◎ P, A, B, T Ø 53,57 x 3,53
◎ Set **1 817 010 297**

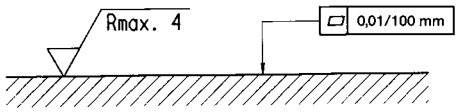
6 x M 20 x 90 DIN 912-10.9
= 450 +110 Nm

2 910 151 532

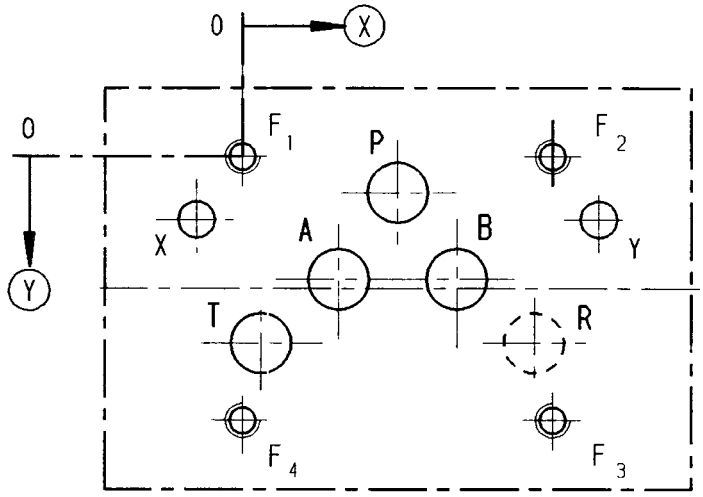
Mounting hole configuration: NG 32 (DIN 24 340 Form A, ISO 4401 and CETOP-RP 121 H), see page 16

For subplates, see catalogue section RE 45 060

Required surface quality of mating component



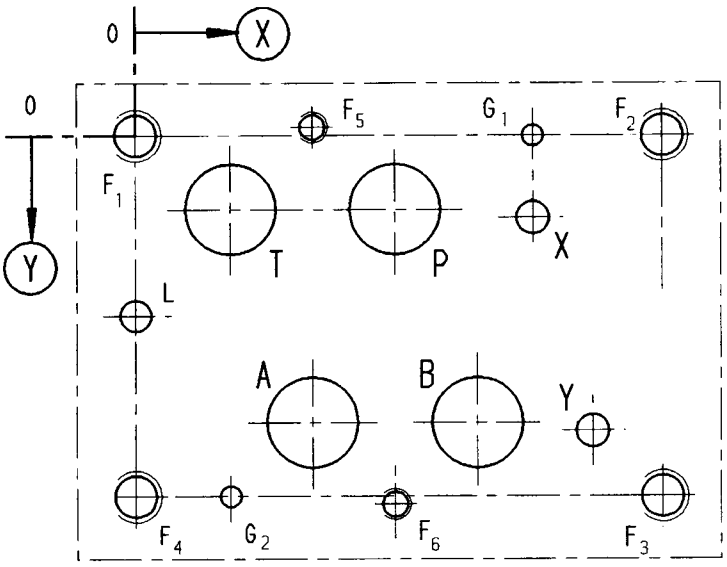
NG 10 – ISO 4401



[1] Deviates from standard
[2] Thread depth: Ferrous metal 1.5 x ∅*
Non-ferrous 2 x ∅
+ (NG 10 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]	M 6[2]	M 6[2]	M 6[2]	M 6[2]	6.3	6.3	10.5[1]

NG 16 – ISO 4401

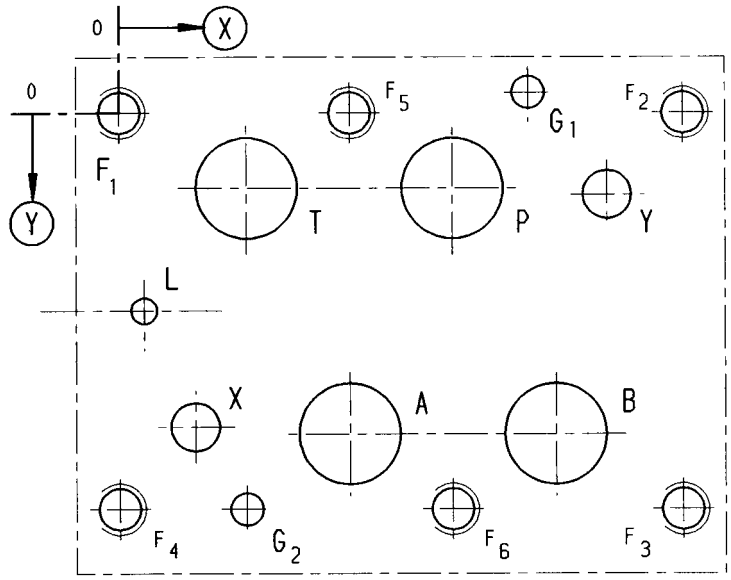


[1] Deviates from standard
[2] Thread depth: Ferrous metal 1.5 x ∅*
Non-ferrous 2 x ∅
+ (NG 10 min. 10.5 mm)

	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 (dimensions in mm)

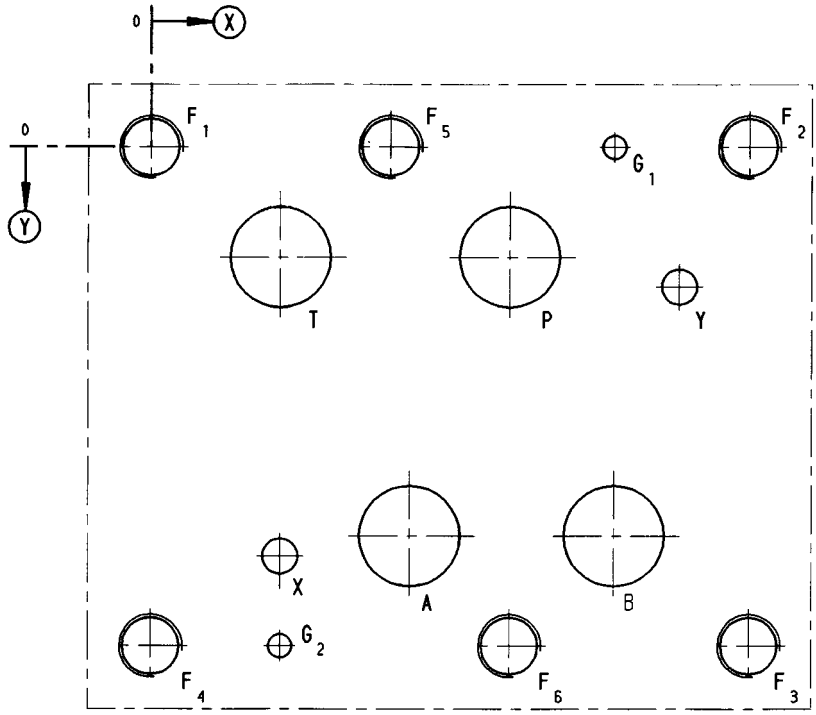
NG 25 – ISO 4401



[1] Deviates from standard
[2] Thread depth: Ferrous metal 1.5 x ∅*
Non-ferrous 2 x ∅
+ (NG 10 min. 10.5 mm)

	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]

NG 32 – ISO 4401



[1] Deviates from standard
[2] Thread depth: Ferrous metal 1.5 x ∅*
Non-ferrous 2 x ∅
+ (NG 10 min. 10.5 mm)

	P	A	T	B	X	Y	G_1	G_2	F_1	F_2	F_3	F_4	F_5	F_6
⊗	114.3	82.5	41.3	147.6	41.3	168.3	147.6	41.3	0	190.5	190.5	0	76.2	114.3
Ⓨ	35	123.8	35	123.8	130.2	44.5	0	158.8	0	0	158.8	158.8	0	158.8
∅	48[1]	48[1]	48[1]	48[1]	11.2	11.2	7.5	7.5	M 20[2]	M 20[2]	M 20[2]	M 20[2]	M 20[2]	M 20[2]

Bosch Rexroth AG
Industrial Hydraulics

D-97813 Lohr am Main
Zum Eisengießer 1 • D-97816 Lohr am Main
Telefon 0 93 52/18-0
Telefax 0 93 52/18-23 58 • Telex 6 89 418-0
eMail documentation@boschrexroth.de
Internet www.boschrexroth.de