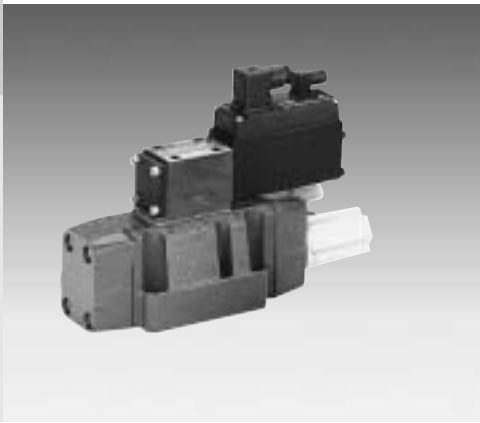
Servo solenoid valves with electrical position feedback (Lvdt DC/DC ±10 V)

RE 29086/01.05 1/16
Replaces: 05.04

Type 4WRL 10...35, symbols V/V1



Size 10, 16, 25, 35
Unit series 3X
Maximum working pressure P, A, B 350 bar, T, X, Y 250 bar
Nominal flow rate 55...1,000 l/min (Δp 10 bar)

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 NG10 to NG35
- Pilot valve NG6, 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 NG10 to ISO 4401-05-05-0-94, NG16 to ISO 4401-07-06-0-94, NG25 to ISO 4401-08-07-0-94 and NG32 to ISO 4401-10-08-0-94
- Subplates as per catalogue section, NG10 RE 45055, NG16 RE 45057, NG25 RE 45059 and NG32 RE 45060
- Line sockets to DIN 43560-AM2
  Solenoid 2P+PE/M16 x 1.5, position transducer 4P/Pg7 in scope of delivery, see catalogue section RE 08008
- External trigger electronics (order separately)
  - Electric amplifier for standard curve “M” 0 811 405 063, see catalogue section RE 30045
  - Electric amplifier for non-linear curve “P” 40 % – 0 811 405 068, see catalogue section RE 30043

Ordering data and scope of delivery

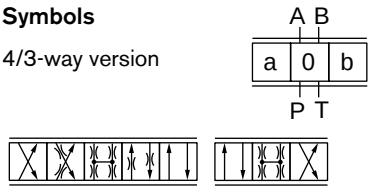
4WRL | | | | | **–3X H / G24** | | **Z4 / M** | *

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

Size 10 **= 10**
Size 16 **= 16**
Size 25 **= 25**
Size 35 [2] **= 35**

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] q_N: Flow characteristic "P"

[2] NG35 is a high flow version of the NG32, ports P, A, B and T have Ø 50 mm in the main stage. Contrary to the standard, ports P, A, B and T may be drilled to max. Ø 48 mm in the control block. These valves therefore provide higher flow rates $Q_A : Q_B$.

Further information in plain text

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

Electrical connection
Z4 = with line socket, with plug to DIN 43560-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" = internal

Voltage supply of trigger electronics
G24 = +24 V DC

H = High flow version (on request)

3X = Unit 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 [1] or 85 l/min
16 = 100 [1], 120, 150 [1] or 200 l/min
25 = 300 [1], 370 or 430 l/min
35 = 1,000 l/min

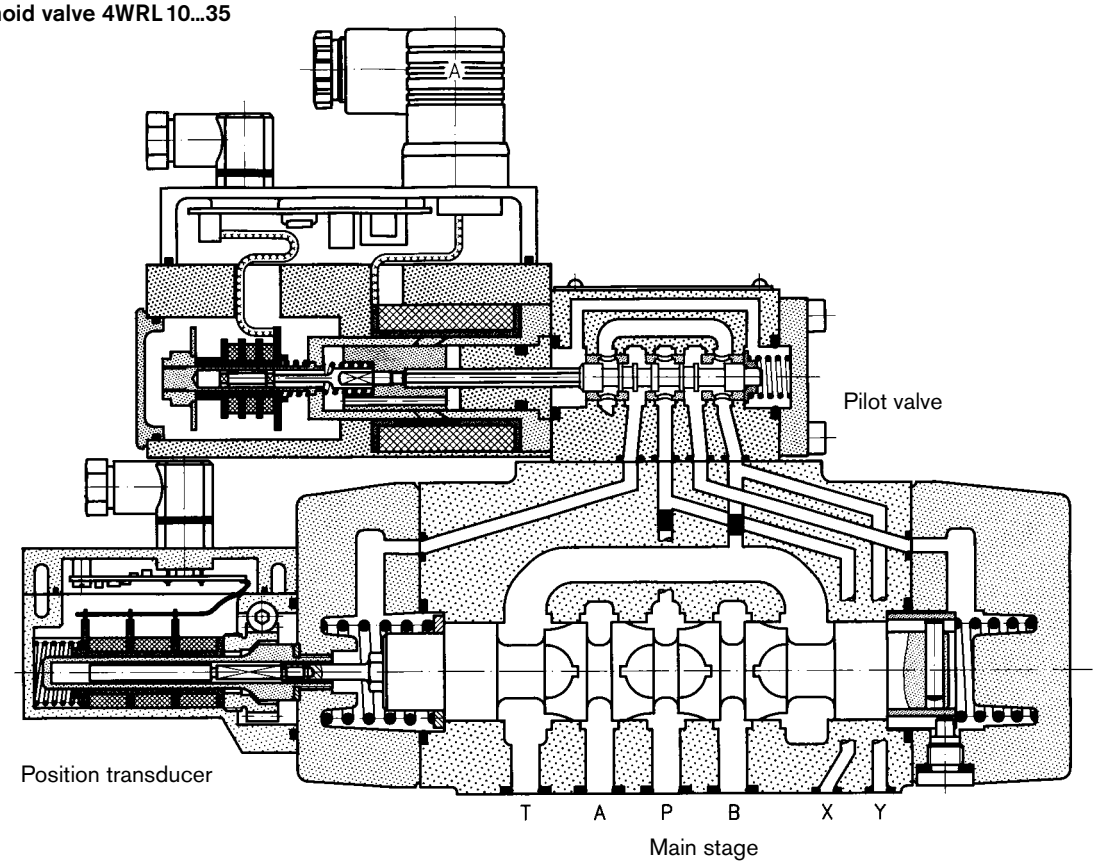
Preferred types (available at short notice)

Type 4WRL	Material No.
NG10	
4WRL 10 V–55M 3X/G24 Z4/M	**0 811 404 093**
4WRL 10 V–55M 3X/G24T Z4/M	**0 811 404 391**
4WRL 10 V–55M 3X/G24ET Z4/M	**0 811 404 392**
4WRL 10 V–85M 3X/G24 Z4/M	**0 811 404 094**
4WRL 10 V–85M 3X/G24T Z4/M	**0 811 404 393**
4WRL 10 V–85M 3X/G24ET Z4/M	**0 811 404 390**
4WRL 10 V1–85M 3X/G24 Z4/M	**0 811 404 394**
4WRL 10 V–70P 3X/G24 Z4/M	**0 811 404 095**
4WRL 10 V1–70P 3X/G24 Z4/M	**0 811 404 395**

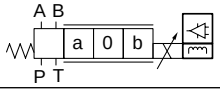
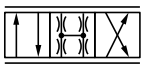
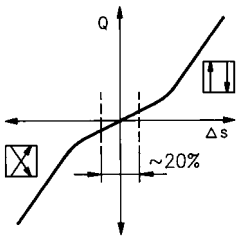
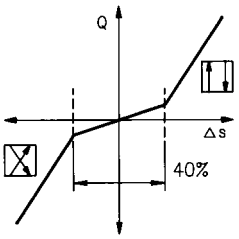
Type 4WRL	Material No.
NG16	
4WRL 16 V–120M 3X/G24 Z4/M	**0 811 404 206**
4WRL 16 V1–120M 3X/G24 Z4/M	**0 811 404 239**
4WRL 16 V–200M 3X/G24 Z4/M	**0 811 404 207**
4WRL 16 V1–200M 3X/G24 Z4/M	**0 811 404 240**
4WRL 16 V–100P 3X/G24 Z4/M	**0 811 404 241**
4WRL 16 V1–100P 3X/G24 Z4/M	**0 811 404 242**
4WRL 16 V–150P 3X/G24 Z4/M	**0 811 404 243**
4WRL 16 V1–150P 3X/G24 Z4/M	**0 811 404 244**
NG25	
4WRL 25 V–370M 3X/G24 Z4/M	**0 811 404 405**
4WRL 25 V1–370M 3X/G24 Z4/M	**0 811 404 495**
4WRL 25 V–300P 3X/G24 Z4/M	**0 811 404 496**
NG35	
4WRL 35 V–1000M 3X/G24 Z4/M	**0 811 404 560**

Function, sectional diagram

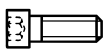
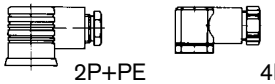
Servo solenoid valve 4WRL 10...35



Symbols

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

Accessories, not included in scope of delivery

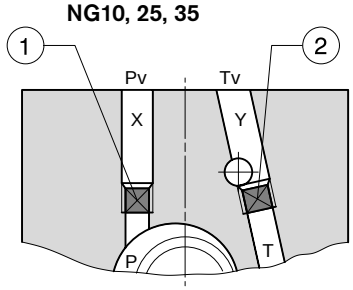
Fastening screws 	NG10	4 x M6 x 40, DIN 912-10.9	**2 910 151 209**
	NG16	2 x M6 x 45, DIN 912-10.9	**2 910 151 211**
		4 x M10 x 50, DIN 912-10.9	**2 910 151 301**
	NG25	6 x M12 x 60, DIN 912-10.9	**2 910 151 354**
	NG35	6 x M20 x 90, DIN 912-10.9	**2 910 151 532**
	VT-VRRA1-527-20/V0/2STV, see RE 30045		**0 811 405 063**
	VT-VRRA1-527-20/V0/K40-AGC-2STV, see RE 30043		**0 811 405 068**
 2P+PE 4P	2P+PE (M16 x 1.5) and 4P (Pg7) included in scope of delivery see also RE 08008		

Testing and service equipment

- Test box type VT-PE-TB2, see RE 30064
- Test adapter type VT-PA-3, see RE 30070

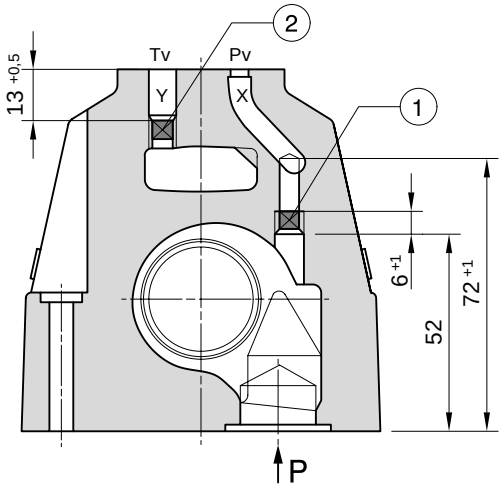
Control oil supply

NG10, 25, 35

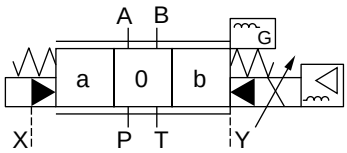


Plug ① ②
NG10 … 25 **1 813 464 007** SW 3
NG35 **1 813 464 001** SW 4

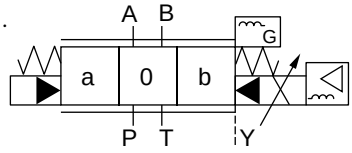
NG16



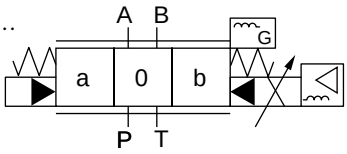
Type … –3X …



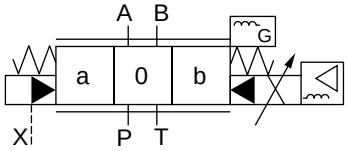
Type … –3X … E …



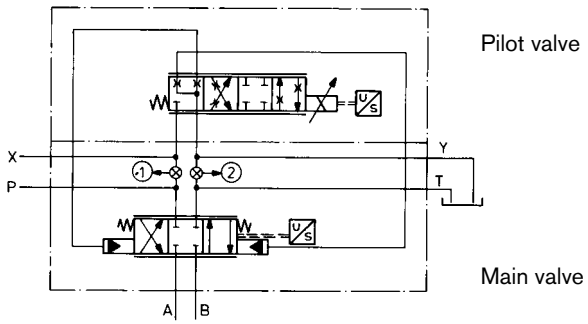
Type … –3X … ET …



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
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

General

Construction		Spool type valve, pilot operated										
Actuation		Servo solenoid valve NG6, with position controller for pilot valve and main stage, external amplifier										
Type of mounting		Subplate, mounting hole configuration NG10...35 (ISO 4401-...)										
Installation position		Optional										
Ambient temperature range	°C	–20 … +50										
Weight	kg	**NG10** 8.35			**NG16** 10				**NG25** 18		**NG35** 80	
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 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 … +80										
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** 55	70	85	**NG16** 100	120	150	200	**NG25** 300	370	**NG35** 1,000	
Max. working pressure	bar	Port P, A, B: 350										
Max. pressure	bar	Port T, X, Y: 250										
$q_{max.}$	l/min	170			450				900		3500	
q_N pilot valve	l/min	4			12				24		40	
Leakage of pilot valve at 100 bar	cm³/min	<180			<300				<500		<900	
Leakage of main stage at 100 bar	cm³/min	<400	<600		<1,000				<1,000		<6,000	
Control oil pressure “pilot stage”	bar	min. 10										
	bar	max. 250										

Static/Dynamic

Hysteresis	%	< 0.1, scarely 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 $\Delta T = 40\,°C$										
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 50070, RE 50076 and RE 50081.

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

Technical data

Electrical

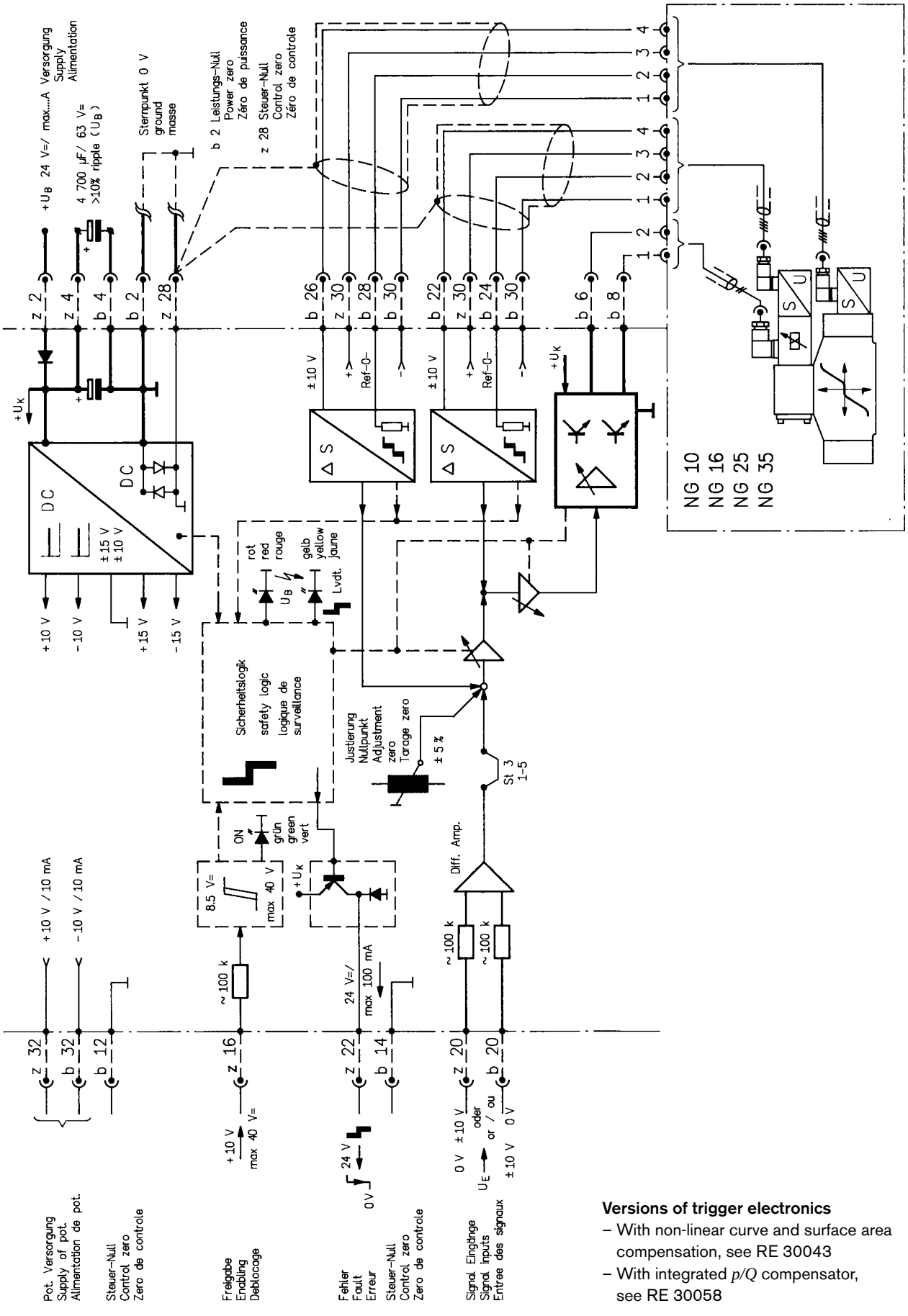
Cylic duration factor	%	100	
Power supply		24 V DC_{nom} (external amplifier)	
Degree of protection		IP 65 to DIN 40050	
Solenoid connector		Connector DIN 43650/ISO 4400 M16 x 1.5 (2P+PE)	
Position transducer connector		Connector Pg7 (4P)	
Max. solenoid current	A	2.7	
Coil resistance R_{20}	Ω	2.5	
Max. power consumption at 100 % load and operational temperature	VA	40	
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.

Valve with external trigger electronics (standard linear curve: M)

Block diagram/pin assignment

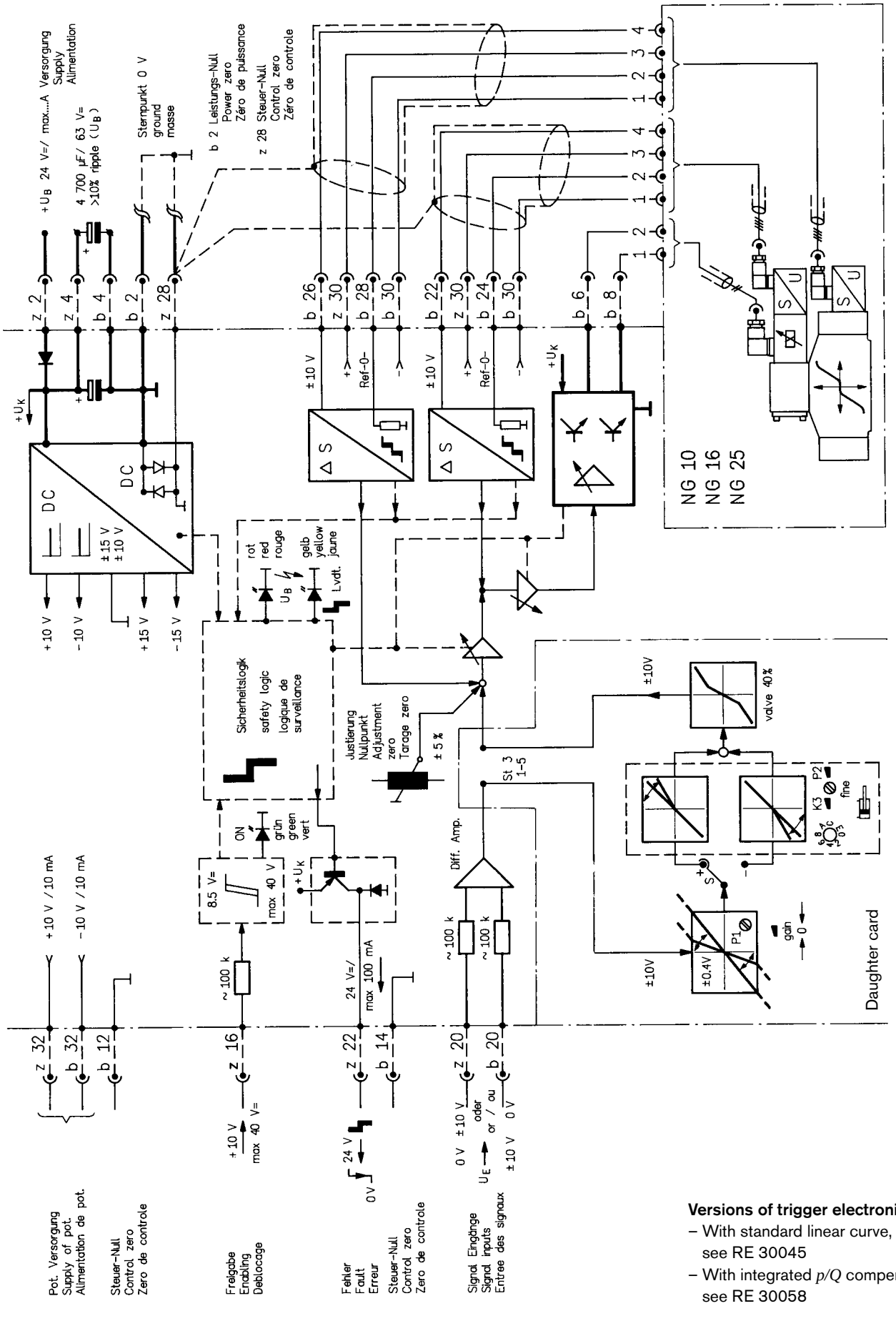


Versions of trigger electronics

- With non-linear curve and surface area compensation, see RE 30043
- With integrated *p/Q* compensator, see RE 30058

Valve with external trigger electronics (non-linear curve: P)

Block diagram/pin assignment



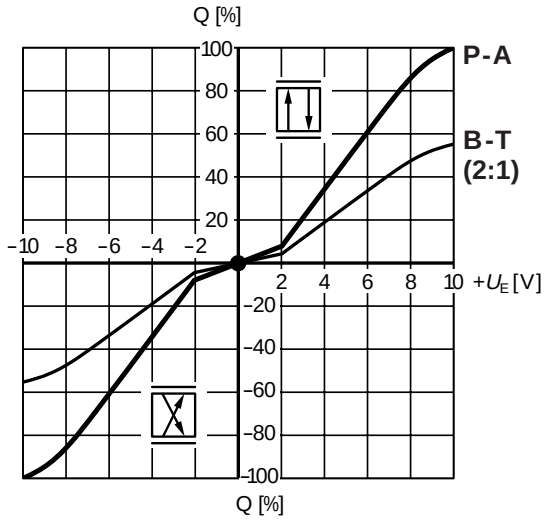
Versions of trigger electronics:

- With standard linear curve, see RE 30045
- With integrated *p/Q* compensator, see RE 30058

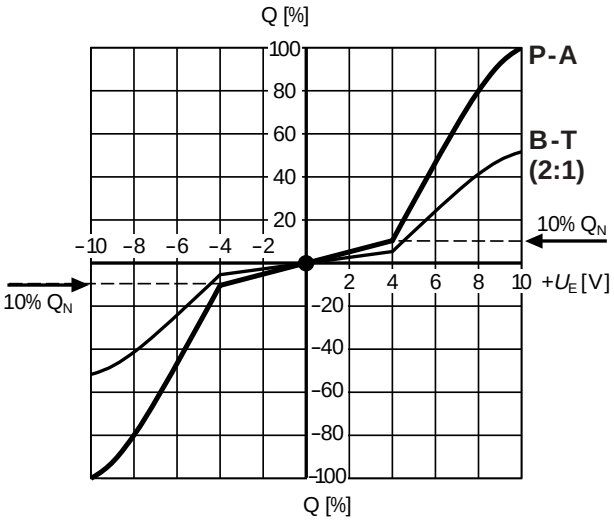
Performance curves (measured with HLP46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

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

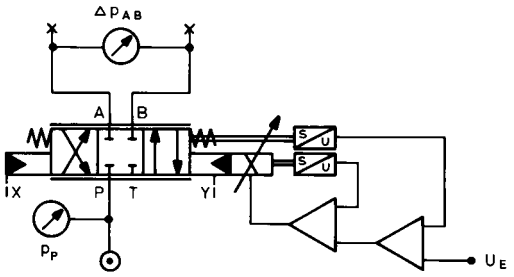
M: (standard 1:1, 2:1)

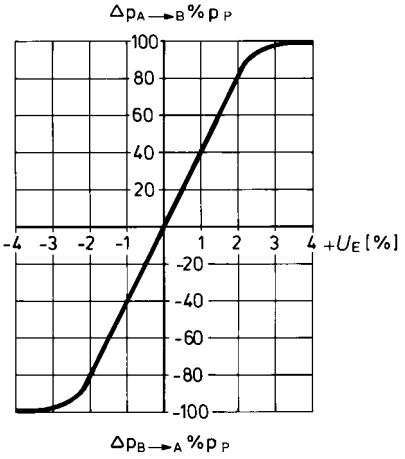


L: (non-linear 1:1, 2:1)



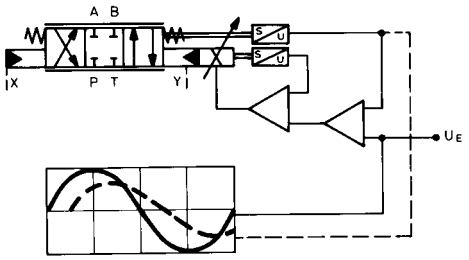
Pressure gain



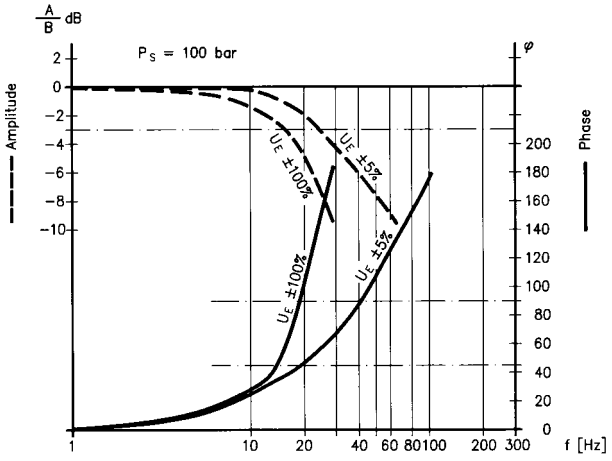


Performance curves (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

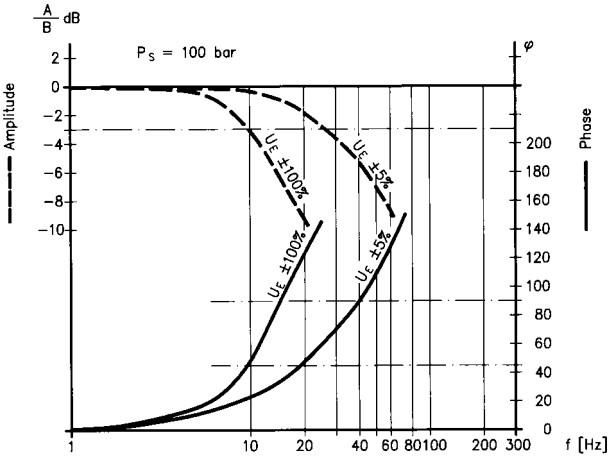
Bode diagram



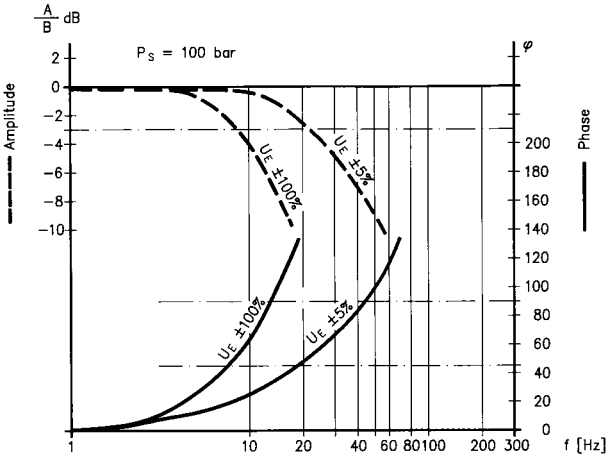
NG10



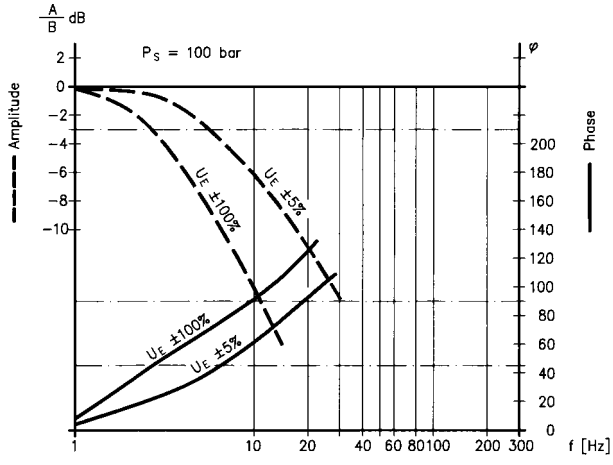
NG16



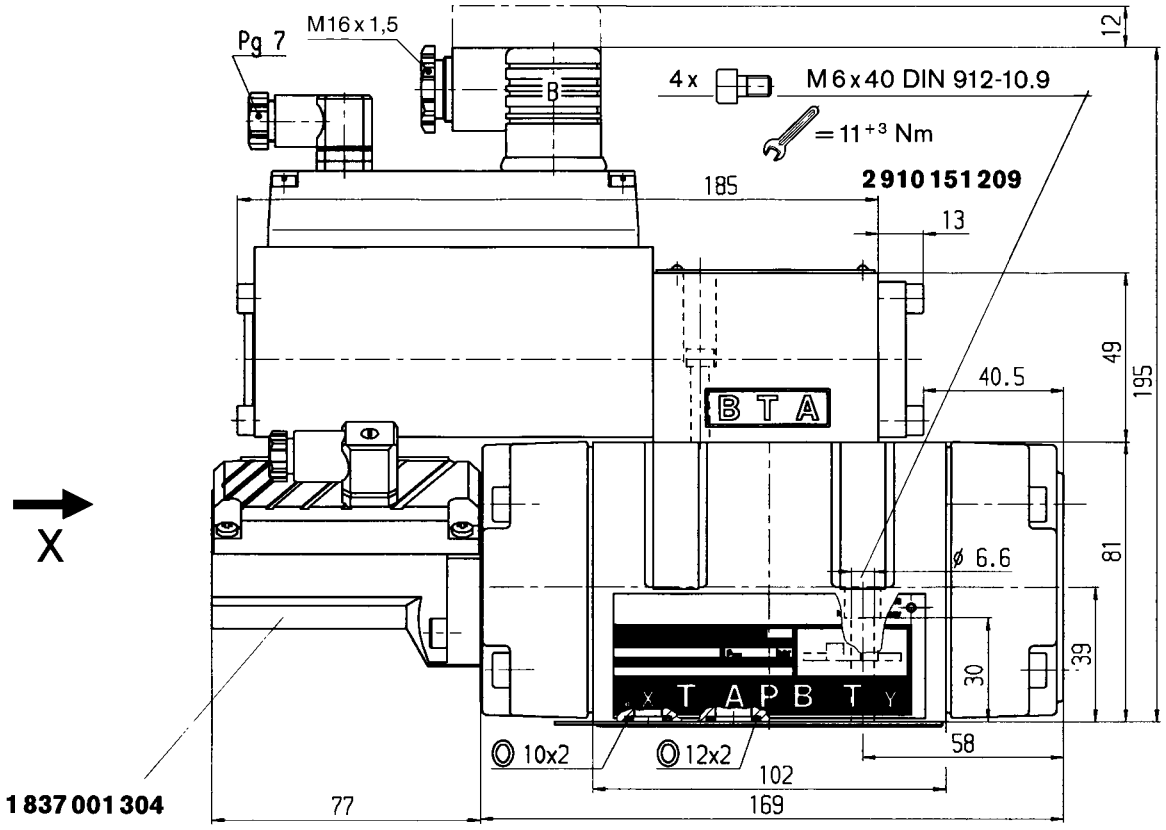
NG25



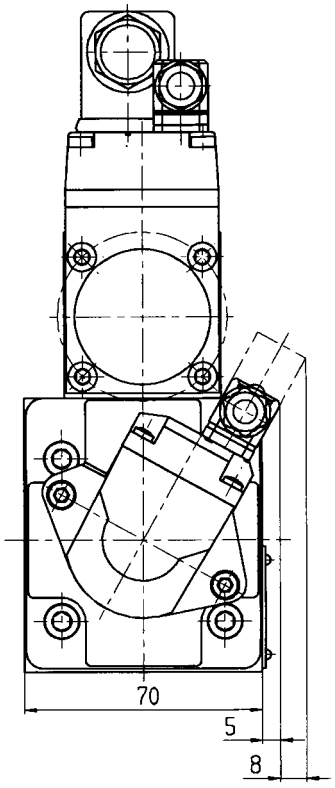
NG35



Unit dimensions NG10 (nominal dimensions in mm)

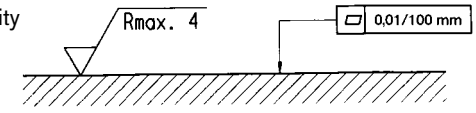


Set **1817010280**

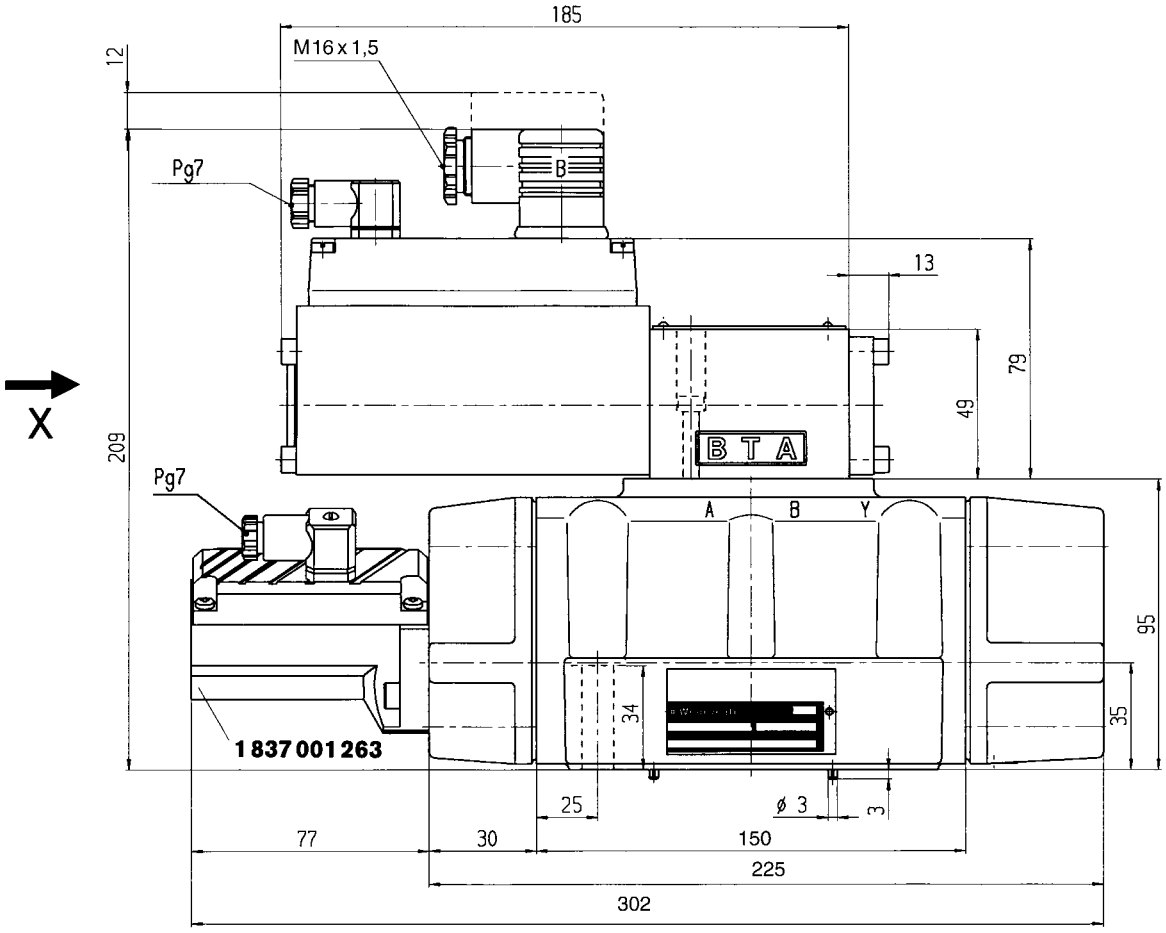


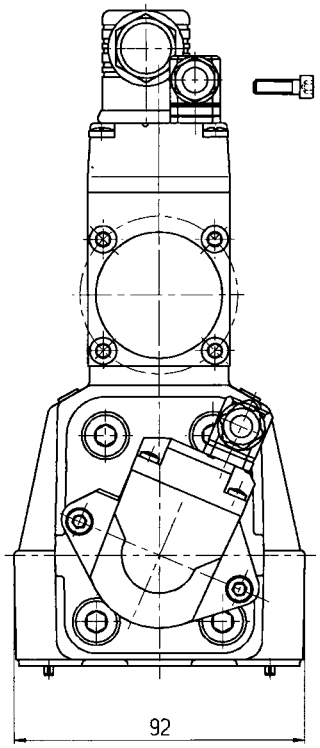
Mounting hole configuration: NG10
(ISO 4401-05-05-0-94), see page 15
For subplates, see catalogue section RE 45055

Required surface quality of mating component



Unit dimensions NG16 (nominal dimensions in mm)





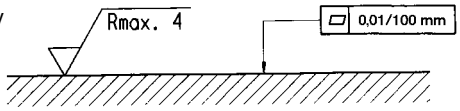
- L_1, L_2, X, Y Ø 9x2
- P, A, B, T Ø 23x2,5
- Set **1817010275**

2xM 6x45, DIN 912-10.9 11^{+3} Nm
4xM 10x50, DIN 912-10.9 50^{+10} Nm

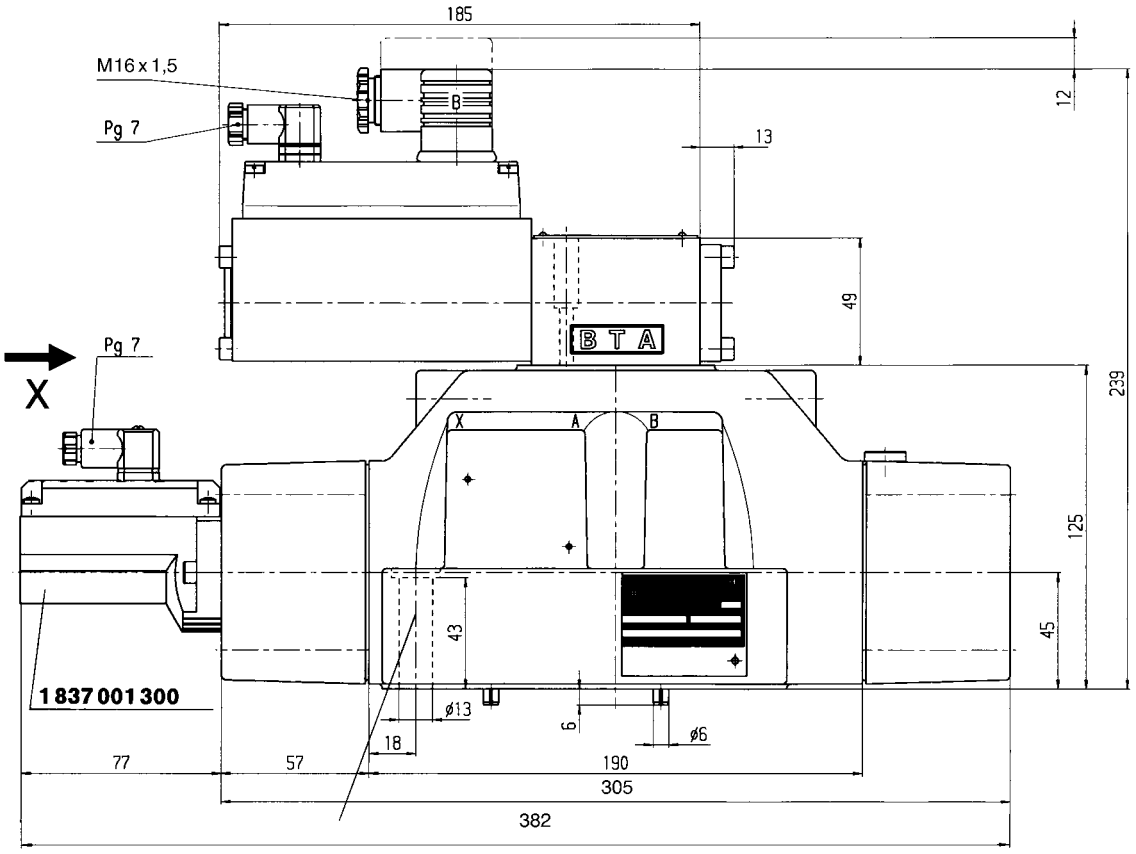
M 6x45 **2910151211**
M 10x50 **2910151301**

Mounting hole configuration: NG16
(ISO 4401-07-06-0-94), see page 15
For subplates, see catalogue section RE 45057

Required surface quality of mating component

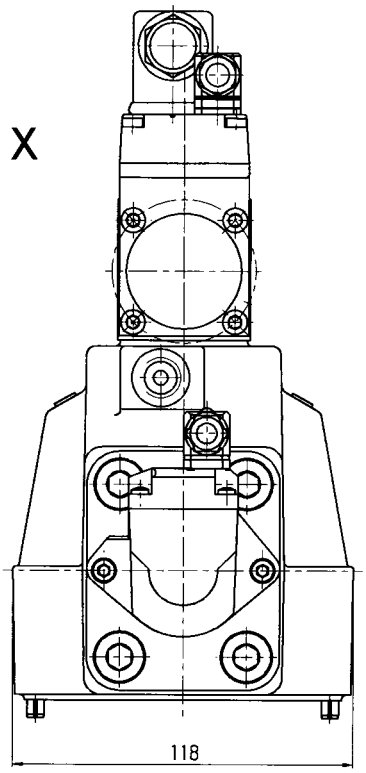


Unit dimensions NG25 (nominal dimensions in mm)



6x M 12x60 DIN 912-10.9
$= 90^{+30}$ Nm

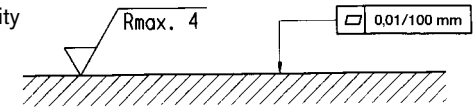
2 910 151 354



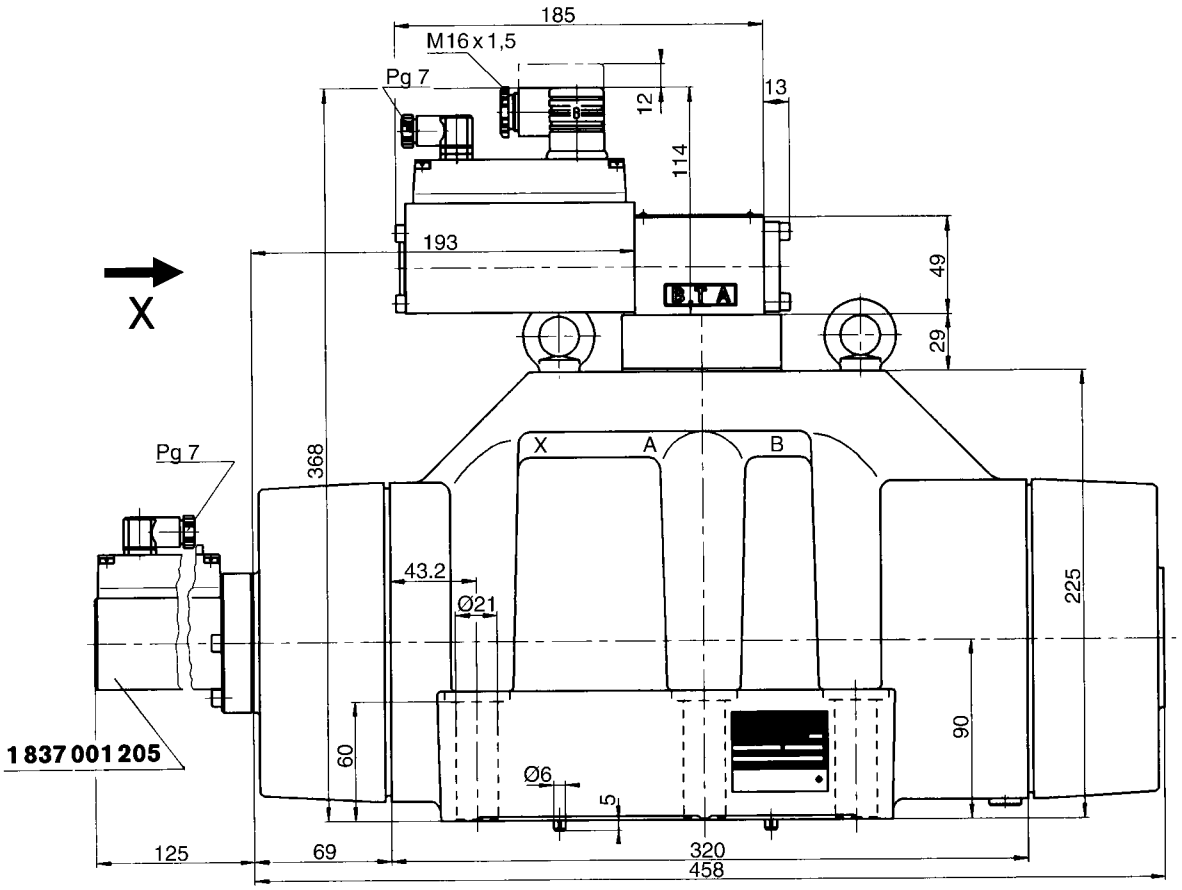
- L_1, L_2, X, Y Ø 15x2,5
- P, A, B, T Ø 28x3
- Set **1 817 010 273**

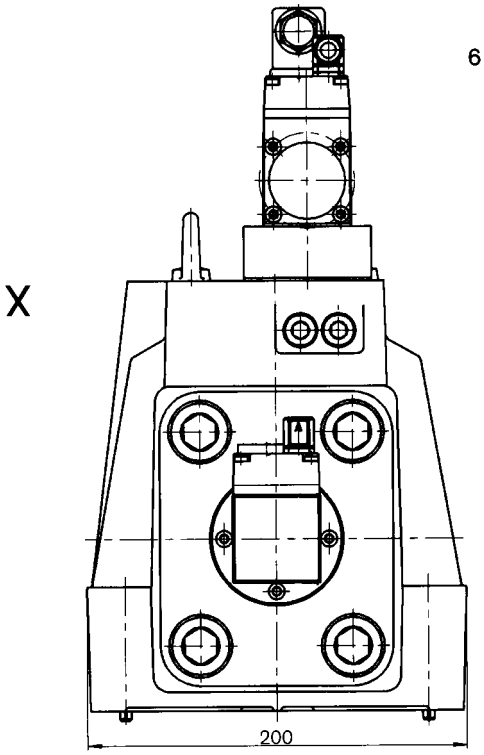
Mounting hole configuration: NG25
(ISO 4401-08-07-0-94), see page 16
For subplates, see catalogue section RE 45059

Required surface quality of mating component



Unit dimensions NG35 (nominal dimensions in mm)





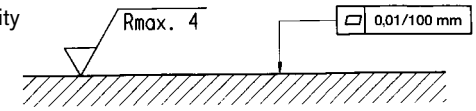
◎ L_1, L_2, X, Y Ø 15 x 2,5
◎ P, A, B, T Ø 53,57 x 3,53
◎ Set **1 817 010 297**

6 x M 20 x 90 DIN 912-10.9
= 450 $^{+110}$ Nm

2 910 151 532

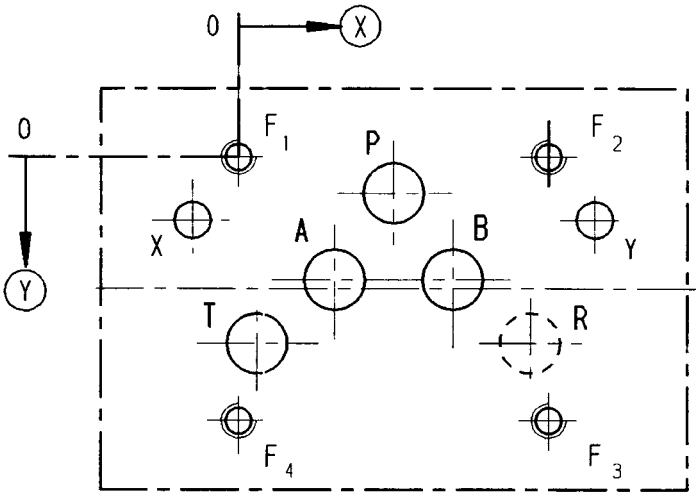
Mounting hole configuration: NG32
(ISO 4401-10-08-0-94), see page 16
For subplates, see catalogue section RE 45060

Required surface quality of mating component



Mounting hole configurations (nominal dimensions in mm)

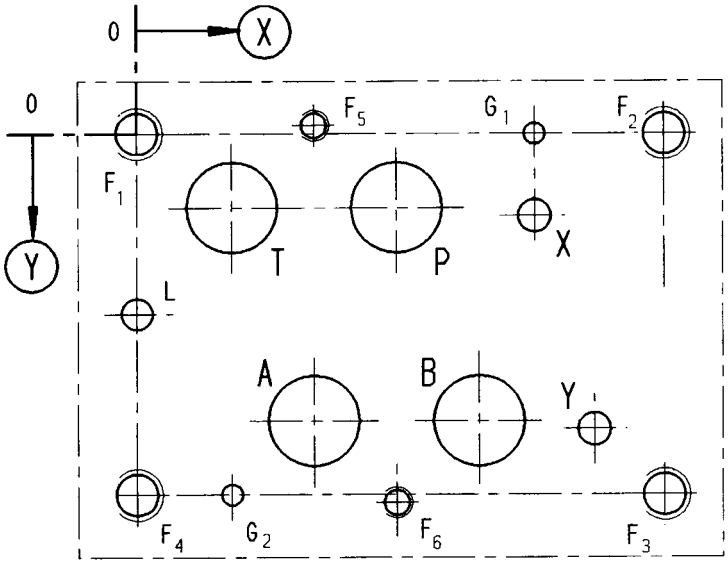
NG10 – ISO 4401-05-05-0-94



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

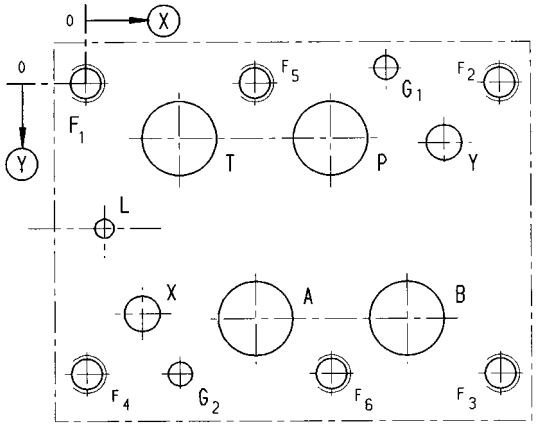


1) Deviates from standard
2) Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	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)

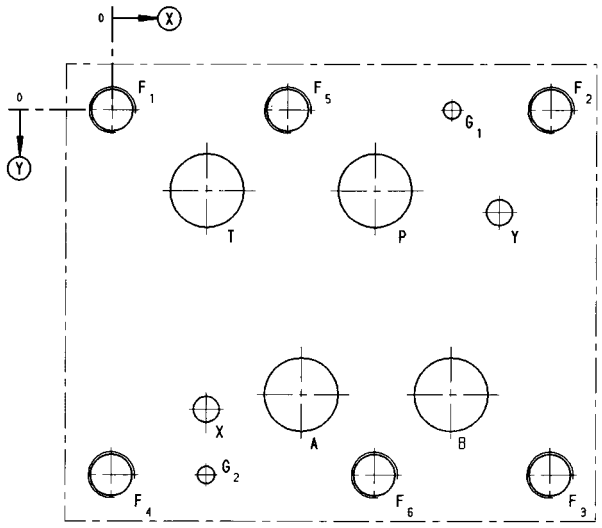
NG25 – ISO 4401-08-07-0-94



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)

NG32 – ISO 4401-10-08-0-94



1) Deviates from standard (NG35)
2) Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	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	M20 2)	M20 2)	M20 2)	M20 2)	M20 2)	M20 2)

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