

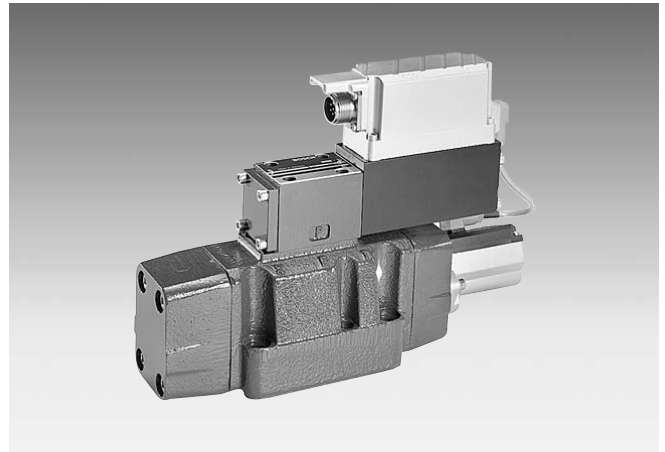
RE 29 088/01.03

**Servo solenoid valves with on-board electronics (OBE)
Type 4WRLE 10 ... 32**

Size 10, 16, 25, 32

Series 3X

Maximum working pressure 350 bar

Maximum flow rate 1,000 l/min (Δp 10 bar)

00001491

Type 4WRLE ...3X/G24...

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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 on-board electronics (OBE), 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 6P+PE
Signal input difference amplifier with interface A1 ± 10 V, or interface F1 4...20 mA (R_s 200 Ω)
- 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 (order separately)
- Line sockets to DIN 43 563-AM6, see catalogue section RE 08 008 (order separately)

Variants on request

- For standard applications
- Special symbols for plastic injection-moulding machines
- Possible valve electronics with 11P+PE line socket and extension of the module.



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We must reserve the right to make changes on the grounds of continual product development. No liability can be accepted for incomplete or inaccurate information.

Ordering data

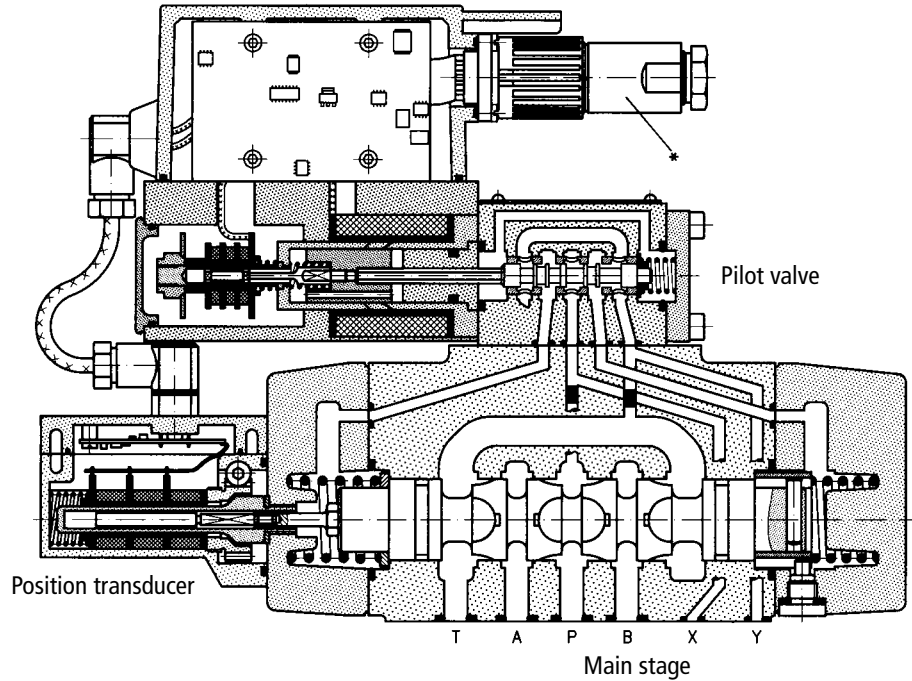
4WRL	E					-3X	/G24		KO		M	*
With on-board trigger electronics = E												Further information in plain text
Size 10	= 10											
Size 16	= 16											
Size 25 ¹⁾	= 25											
Size 32 ²⁾	= 32											
Symbols												
4/3-way version												
With symbol V1:												
P → A: q_v B → T: $q_v/2$												
P → B: $q_v/2$ A → T: q_v												
¹⁾ "H": Highflow version – 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.												
²⁾ 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.												
³⁾ Q_N : Flow characteristic "P"												
												Interface for trigger electronics
												M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51 524
												A1 = Setpoint input ± 10 V
												F1 = Setpoint input 4 ... 20 mA
												Electrical connection
												K0 = without line socket, with plug to DIN 43 563-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 = ¹⁾ 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 70 bar valve pressure difference
Size												
10 = 40 ³⁾ , 55, 70 ³⁾ or 85 l/min												25 = 300 ³⁾ , 370 or 430 ¹⁾ l/min
16 = 90 ³⁾ , 120, 150 ³⁾ or 200 l/min												32 = 1,000 l/min

Preferred types (available at short notice)

Material no.	Type 4WRLE	Material no.	Type 4WRLE
NG 10	V / V1	NG 16	V / V1
0 811 404 652	4WRLE 10 V –55M 3X/G24 KO / A1M	0 811 404 250	4WRLE 16 V –120M 3X/G24 KO / A1M
0 811 404 659	4WRLE 10 V –55M 3X/G24T KO / A1M	0 811 404 279	4WRLE 16 V1 –120M 3X/G24 KO / A1M
0 811 404 661	4WRLE 10 V –55M 3X/G24ET KO / A1M	0 811 404 281	4WRLE 16 V1 –120M 3X/G24ET KO / A1M
0 811 404 653	4WRLE 10 V –85M 3X/G24 KO / A1M	0 811 404 251	4WRLE 16 V –200M 3X/G24 KO / A1M
0 811 404 660	4WRLE 10 V –85M 3X/G24T KO / A1M	0 811 404 272	4WRLE 16 V –200M 3X/G24 KO / F1M
0 811 404 662	4WRLE 10 V –85M 3X/G24ET KO / A1M	0 811 404 280	4WRLE 16 V1 –200M 3X/G24 KO / A1M
0 811 404 671	4WRLE 10 V1 –55M 3X/G24 KO / A1M	0 811 404 282	4WRLE 16 V1 –200M 3X/G24ET KO / A1M
0 811 404 672	4WRLE 10 V1 –85M 3X/G24 KO / A1M	0 811 404 263	4WRLE 16 V – 90P 3X/G24 KO / A1M
0 811 404 673	4WRLE 10 V1 –85M 3X/G24ET KO / A1M	0 811 404 265	4WRLE 16 V1 – 90P 3X/G24 KO / A1M
0 811 404 686	4WRLE 10 V –40P 3X/G24 KO / A1M	0 811 404 264	4WRLE 16 V –150P 3X/G24 KO / A1M
0 811 404 688	4WRLE 10 V1 –40P 3X/G24 KO / A1M	0 811 404 266	4WRLE 16 V1 –150P 3X/G24 KO / A1M
0 811 404 687	4WRLE 10 V –70P 3X/G24 KO / A1M	NG 25	V / V1
0 811 404 689	4WRLE 10 V1 –70P 3X/G24 KO / A1M	0 811 404 430	4WRLE 25 V –370M 3X/G24 KO / A1M
		0 811 404 444	4WRLE 25 V1 –370M 3X/G24 KO / A1M
		0 811 404 565	4WRLE 25 V –300P 3X/G24 KO / A1M
		NG 32	V / V1
		0 811 404 579	4WRLE 32 V –1000M 3X/G24 KO / A1M

Function, sectional diagram

Servo solenoid valve 4WRLE 10 ... 32



Symbols

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

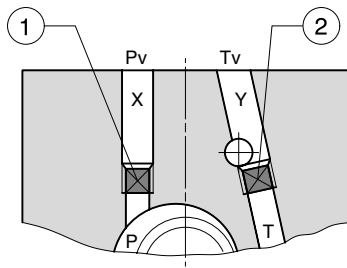
Accessories, not included in scope of delivery

Fastening screws 	<table border="1"> <tr> <td>NG 10</td> <td>4 x M 6 x 40, DIN 912-10.9</td> <td>2 910 151 209</td> </tr> <tr> <td rowspan="2">NG 16</td> <td>2 x M 6 x 45, DIN 912-10.9</td> <td>2 910 151 211</td> </tr> <tr> <td>4 x M 10 x 50, DIN 912-10.9</td> <td>2 910 151 301</td> </tr> <tr> <td>NG 25</td> <td>6 x M 12 x 60, DIN 912-10.9</td> <td>2 910 151 354</td> </tr> <tr> <td>NG 32</td> <td>6 x M 20 x 90, DIN 912-10.9</td> <td>2 910 151 532</td> </tr> </table>	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	
NG 10	4 x M 6 x 40, DIN 912-10.9	2 910 151 209														
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	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														
* 	Line sockets 6P+PE	<table border="1"> <tr> <td>KS</td> <td>1 834 482 022</td> </tr> <tr> <td>KS</td> <td>1 834 482 026</td> </tr> <tr> <td>MS</td> <td>1 834 482 023</td> </tr> <tr> <td>MS</td> <td>1 834 482 024</td> </tr> <tr> <td>KS 90°</td> <td>1 834 484 252</td> </tr> </table>	KS	1 834 482 022	KS	1 834 482 026	MS	1 834 482 023	MS	1 834 482 024	KS 90°	1 834 484 252				
KS	1 834 482 022															
KS	1 834 482 026															
MS	1 834 482 023															
MS	1 834 482 024															
KS 90°	1 834 484 252															

Testing and service equipment

- Test box type VT-PE-TB3, see RE 30 065
- Test adapter 6P+PE type VT-PA-2, see RE 30 068

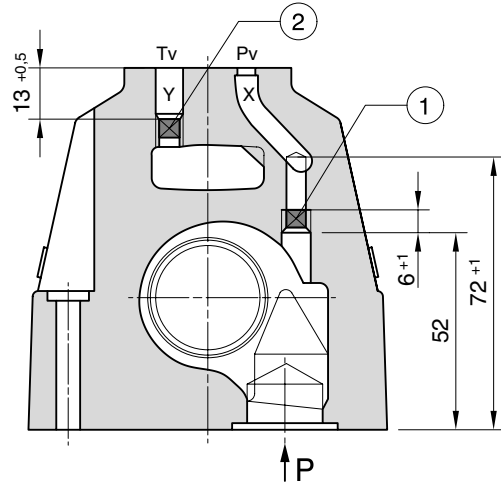
NG 10, 25, 32



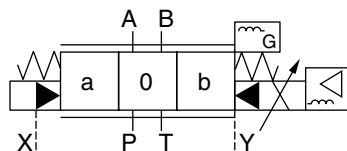
Plug

① ②
 NG 10 ... 25 1 813 464 007 SW 3
 NG 32 1 813 464 001 SW 4

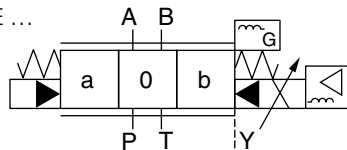
NG 16



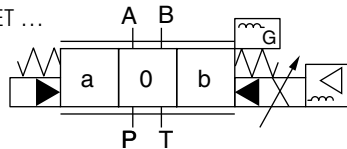
Type ... -3X ...



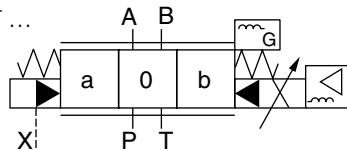
Type ... -3X ... E ...



Type ... -3X ... ET ...

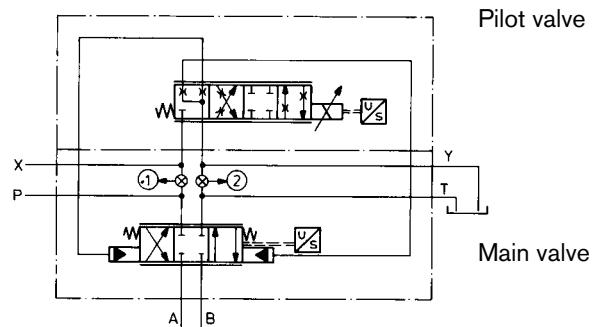


Type ... -3X ... T ...



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 variants 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 – OBE, with position controller for pilot valve and main stage			
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 8.7 kg	NG 16 10.6 kg	NG 25 18.4 kg	NG 32 81 kg
Vibration resistance, test condition	Max. 25 g, shaken in 3 dimensions (24 h)			

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

Pressure fluid	Hydraulic oil to DIN 51 524 ... 535, other fluids after prior consultation									
Viscosity range, recommended max. permitted	20 ... 100 mm ² /s 10 ... 800 mm ² /s									
Pressure fluid temperature range	–20 ... +70 °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 $\Delta p = 5 \text{ bar per notch}^*$	NG 10		NG 16		NG 25	NG 32 (50)				
	40	55	70	85	90	120	150	200	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 [cm ³ /min] of pilot valve at 100 bar			<180		<300	<500	<900			
Leakage [cm ³ /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}	$\leq 10 \%$				
Response time for signal change (at X = 100 bar)	0 ... 100 %	25	26	32	90
	0 ... 10 %	14	15	18	40
Response time for signal change (at X = 10 bar)	0 ... 100 %	85	80	120	350
	0 ... 10 %	50	30	50	150
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 $\Delta T = 40 \text{ °C}$				
Zero adjustment	Factory-set $\pm 1 \%$				
Conformity	 EN 50 081-1 EN 50 082-2				

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

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

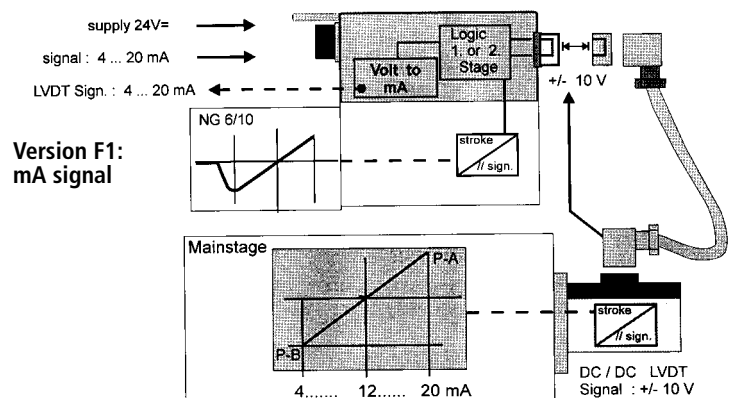
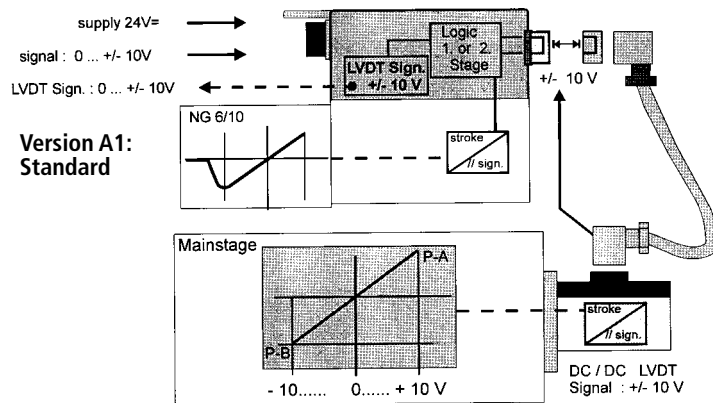
Important

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.

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

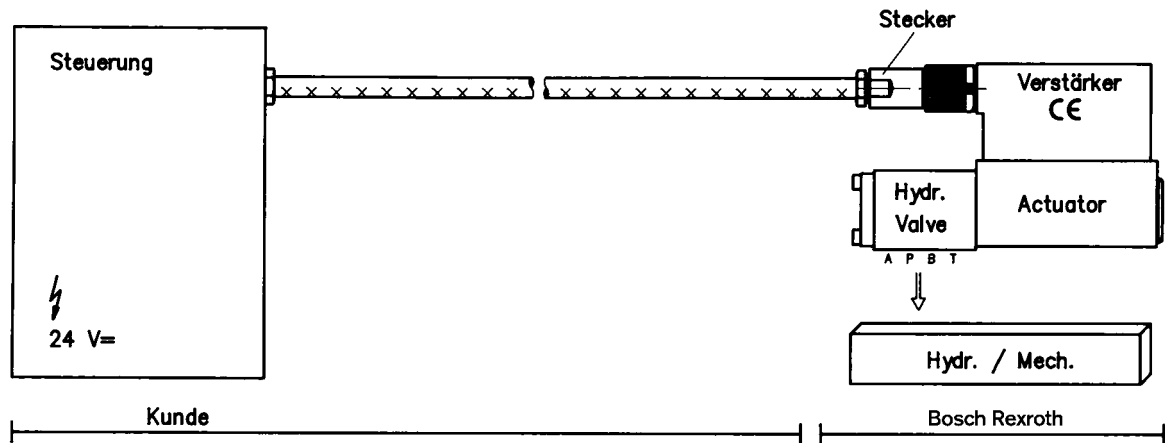
Electric pilot valve NG 6, trigger electronics integrated in the valve

Cyclic duration factor	100 %
Degree of protection	IP 65 to DIN 40 050 and IEC 14 434/5
Connection	Line socket 6P+PE, DIN 43 563
Power supply Terminal A: B: 0 V	24 V DC _{nom.} min. 21 V DC/max. 40 V DC Ripple max. 2 V DC
Power consumption	Solenoid \square 45 mm = 40 VA max.
External fuse	2.5 A _F
Input, "Standard" version Terminal D: U_E E:	Difference amplifier, $R_i = 100 \text{ k}\Omega$ 0 ... $\pm 10 \text{ V}$ 0 V
Input, "mA signal" version Terminal D: I_{D-E} E: I_{D-E}	Burden, $R_{sh} = 200 \Omega$ 4 ... (12) ... 20 mA Current loop I_{D-E} feedback
Max. differential input voltage at 0 V	$D \rightarrow B$ $E \rightarrow B$ } max. 18 V DC
Test signal, "Standard" version Terminal F: U_{test} C:	LVDT 0 ... $\pm 10 \text{ V}$ Reference 0 V
Test signal, "mA signal" version Terminal F: I_{F-C} C: I_{F-C}	LVDT signal 4 ... 20 mA at external load 200 ... 500 Ω max. 4 ... 20 mA output Current loop I_{F-C} feedback
Protective conductor and screen	See pin assignment (installation conforms to CE)
Recommended cable	See pin assignment up to 20 m 7 x 0.75 mm ² up to 40 m 7 x 1 mm ²
Calibration	Calibrated at the factory, see valve performance curve



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 up to 20 m length
 - 1.0 mm² up to 40 m length
- Outside Ø:**
- 9.4 ... 11.8 mm – Pg 11
 - 12.7 ... 13.5 mm – Pg 16

Important

Voltage supply 24 V DC nom., if voltage drops below 18 V DC, rapid shutdown resembling "Enable OFF" takes place internally.

In addition, with the "mA signal" version:

$I_{D-E} \cong 3 \text{ mA}$ – valve is active

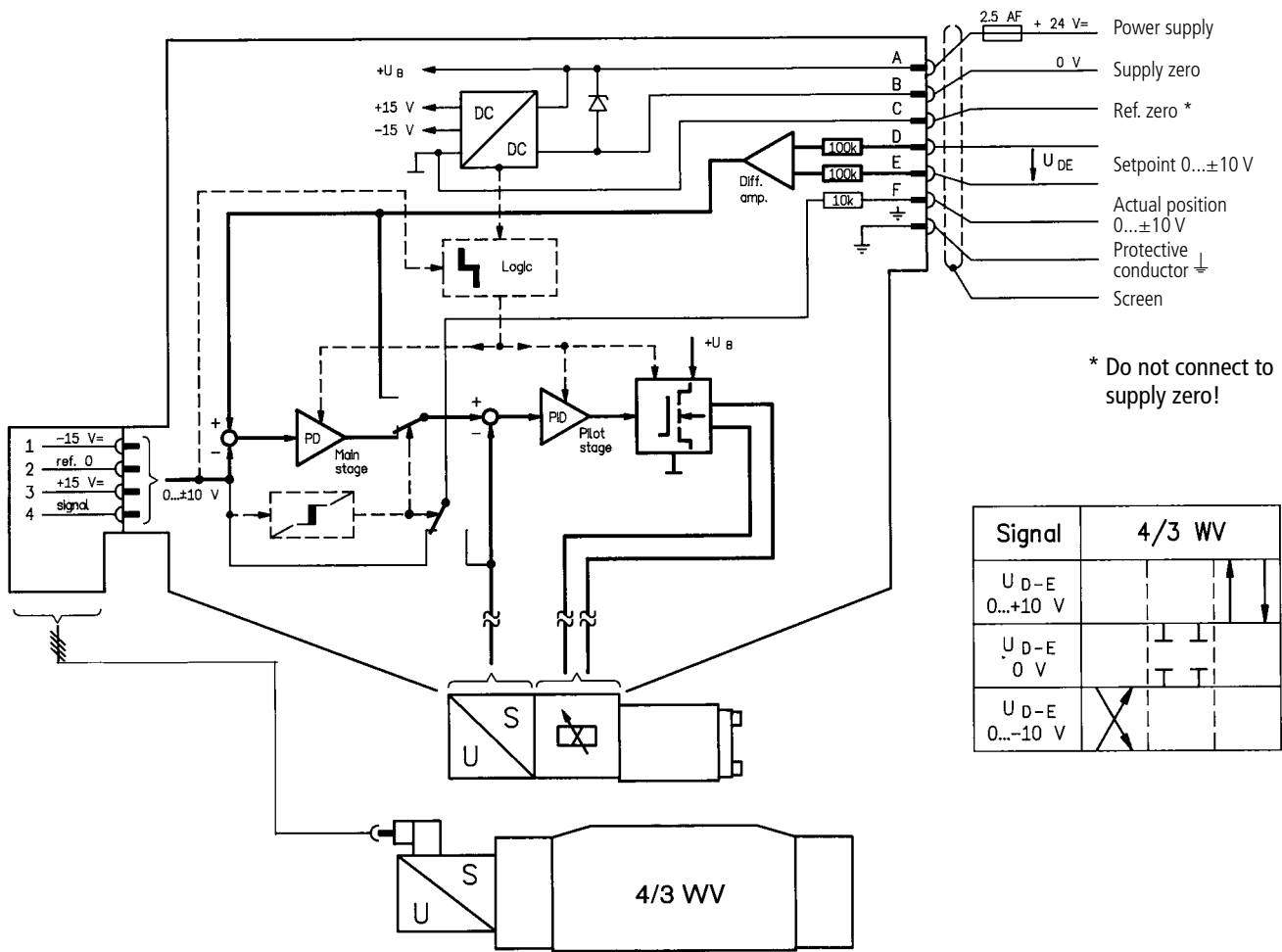
$I_{D-E} \cong 2 \text{ mA}$ – valve is deactivated.

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

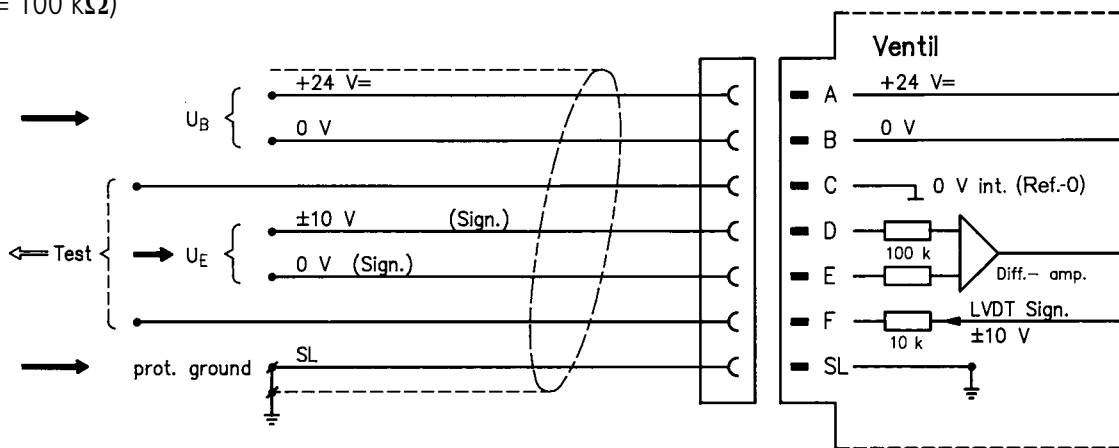
Version A1: $U_{D-E} \pm 10\text{ V}$



Pin assignment 6P + PE

Version A1: $U_{D-E} \pm 10\text{ V}$

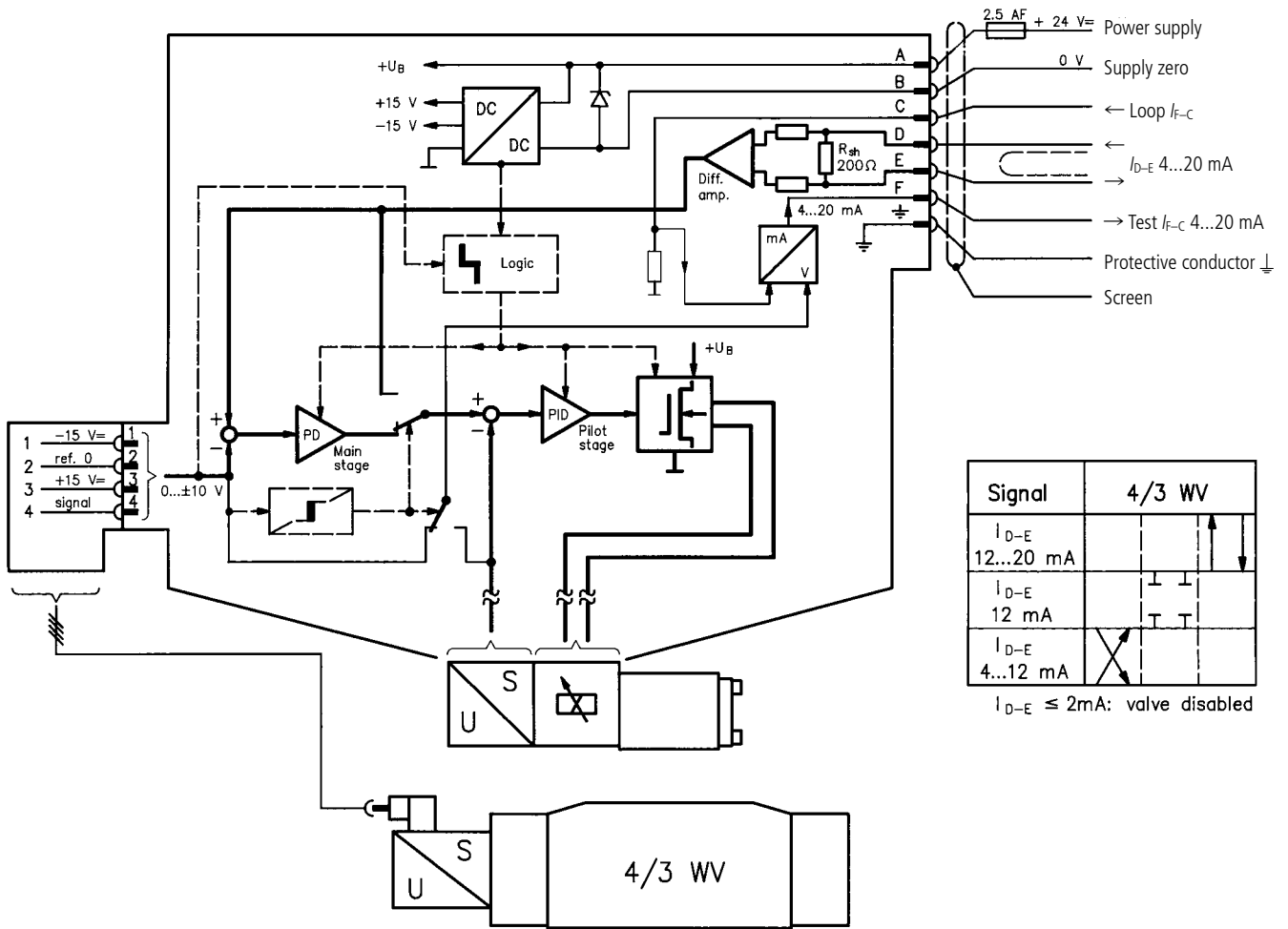
($R_i = 100\text{ k}\Omega$)



On-board trigger electronics

Block diagram / pin assignment

Version F1: I_{D-E} 4...12...20 mA



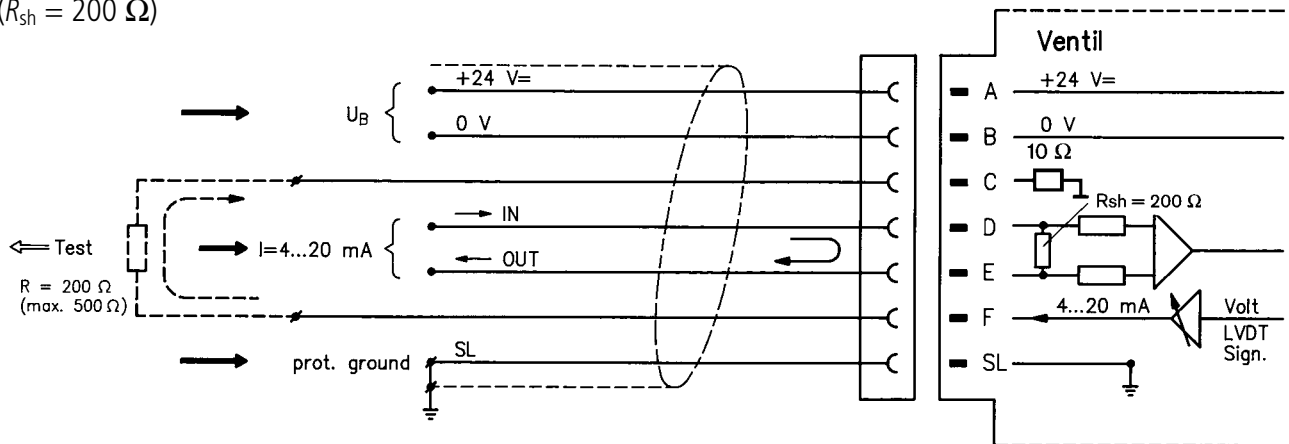
Signal	4/3 WV
I_{D-E} 12...20 mA	
I_{D-E} 12 mA	
I_{D-E} 4...12 mA	

$I_{D-E} \approx 2\text{mA}$: valve disabled

Pin assignment 6P + PE

Version F1: I_{D-E} 4...12...20 mA

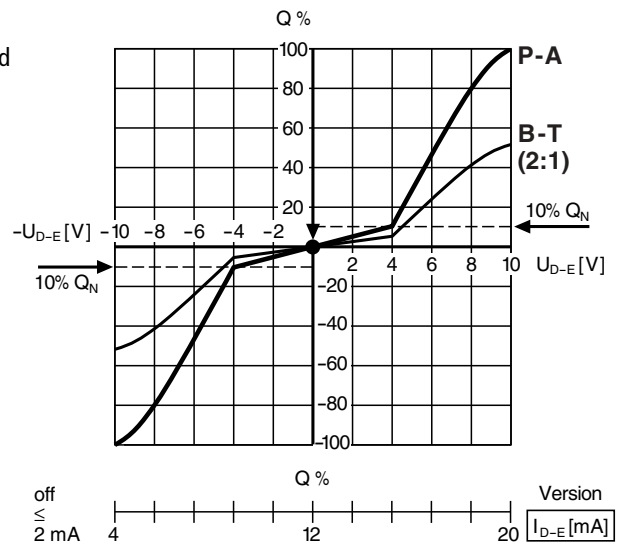
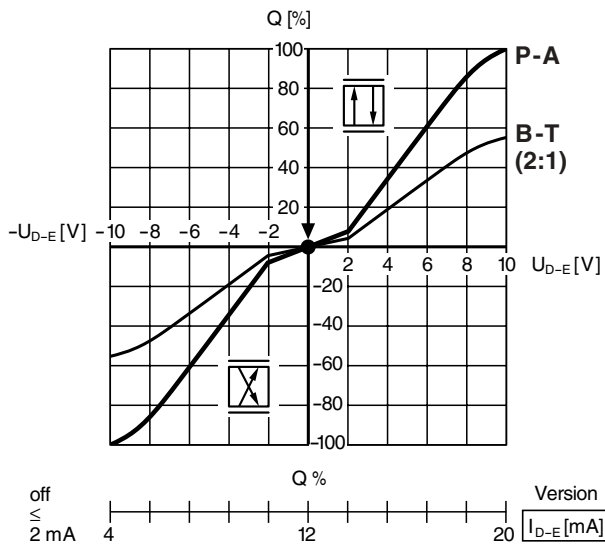
($R_{sh} = 200 \Omega$)



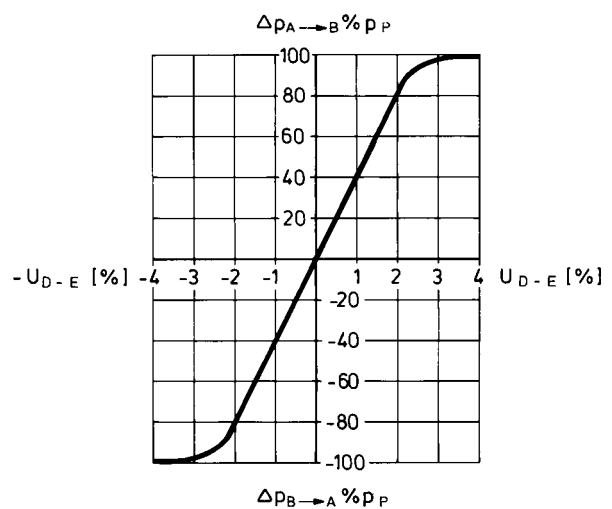
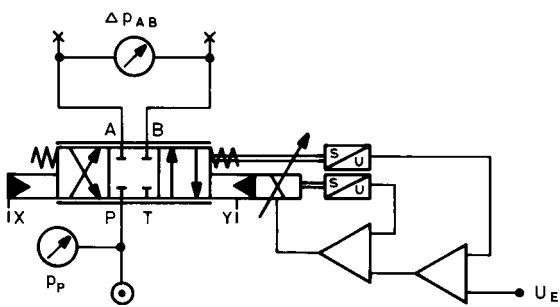
Flow rate/Signal function

$$Q = f(U_{D-E})$$

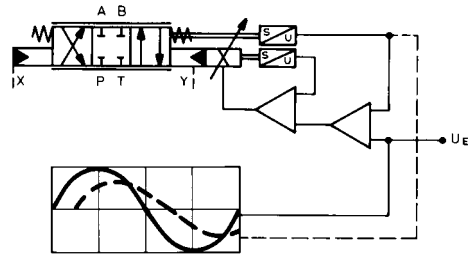
$$Q = f(I_{D-E})$$



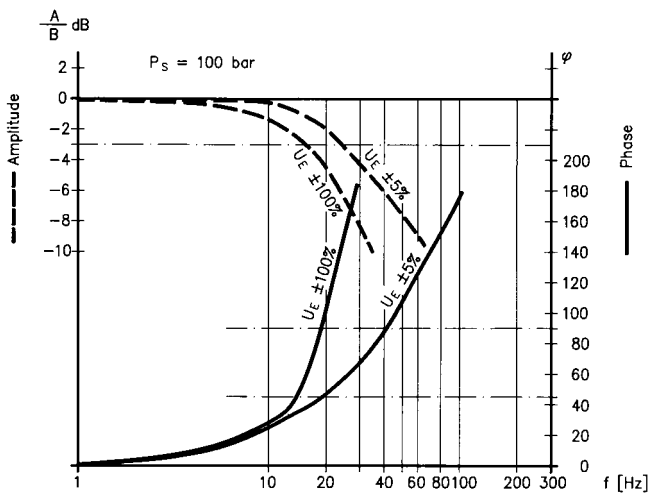
Pressure gain



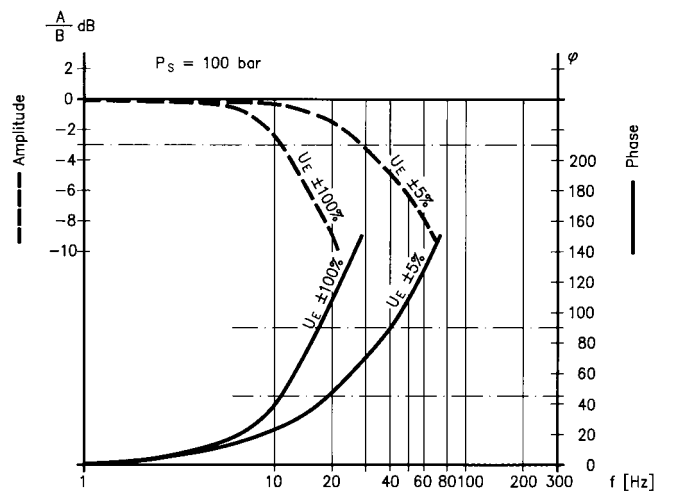
Bode diagrams



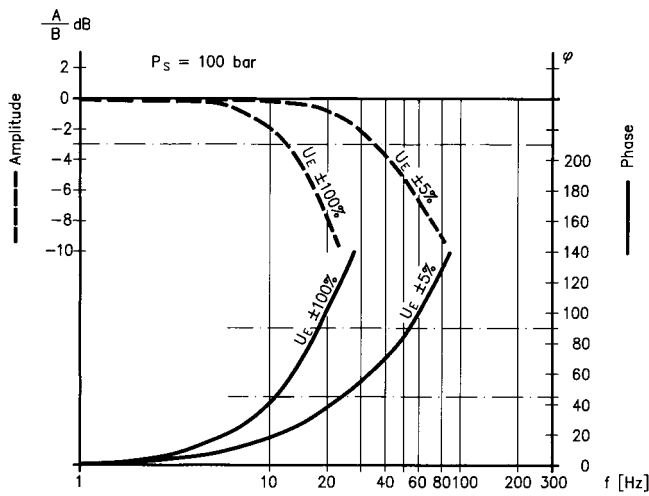
NG 10



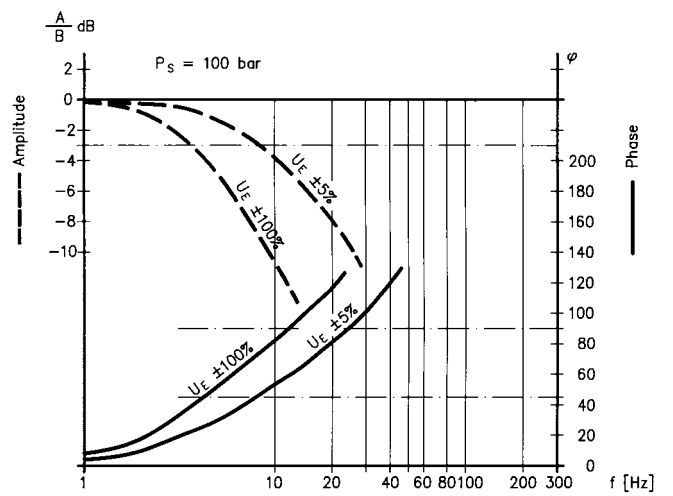
NG 16

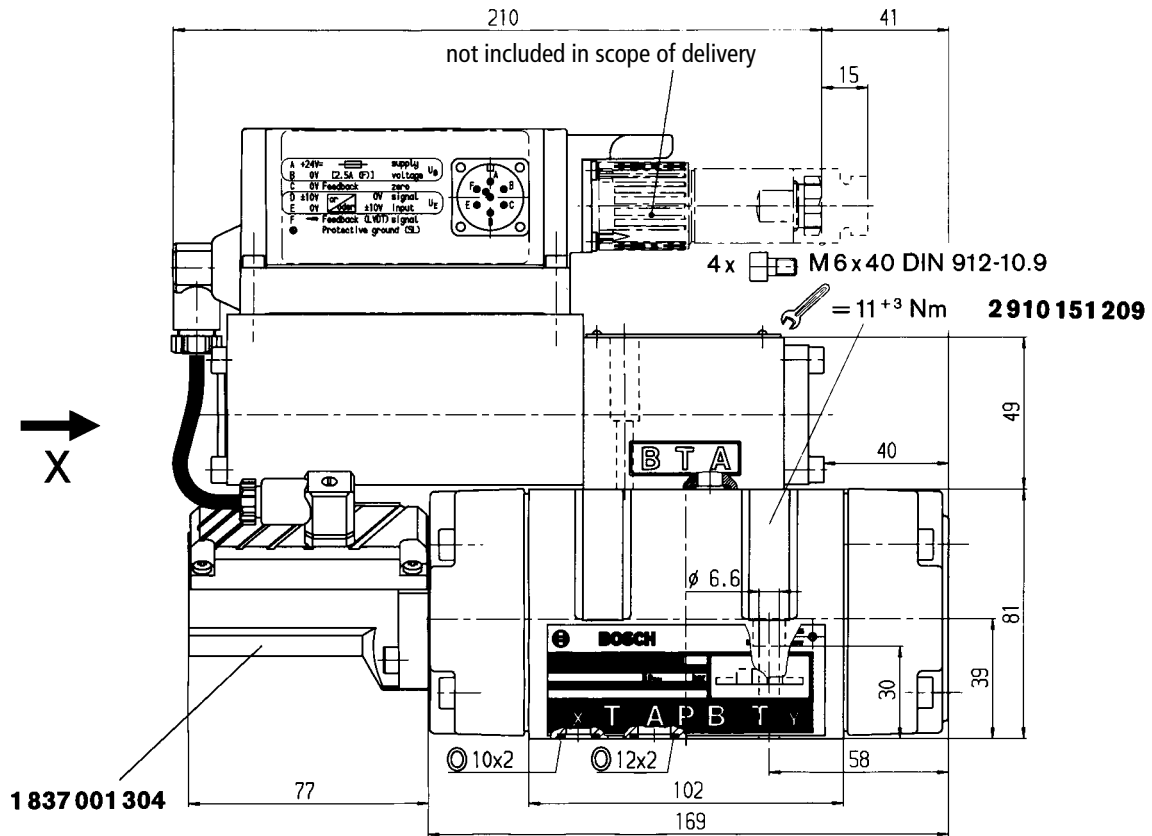


NG 25

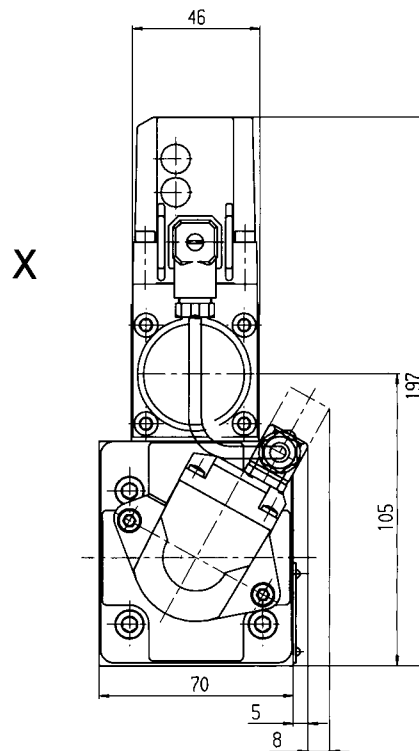


NG 32 (50)





Set 1817010280

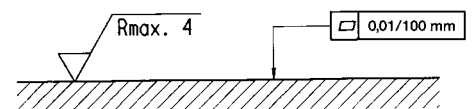


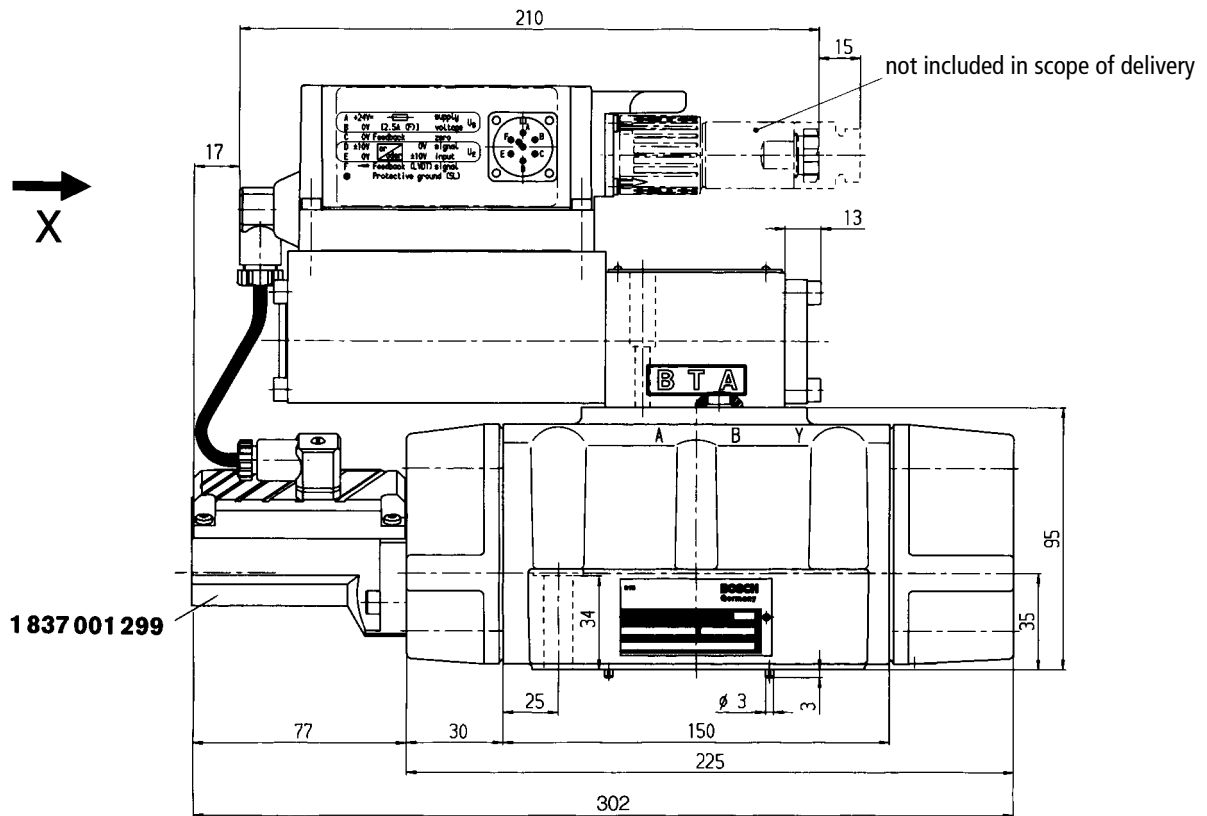
Mounting hole configuration: NG 10

(DIN 24 340 Form A, ISO 4401 and CETOP-RP 121 H), see page 16

For subplates, see catalogue section RE 45 055

Required surface quality of mating component

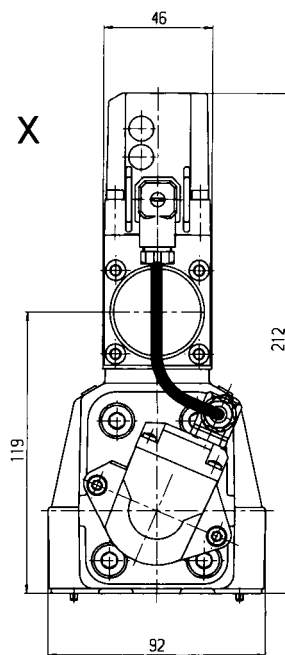




- ⊙ X, Y $\varnothing 9 \times 2$
- ⊙ P, A, B, T $\varnothing 23 \times 2,5$
- ⊙ Set **1817 010 275**

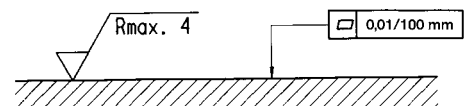
- 2 x M 6 x 45, DIN 912-10.9 11^{+3} Nm
- 4 x M 10 x 50, DIN 912-10.9 50^{+10} Nm

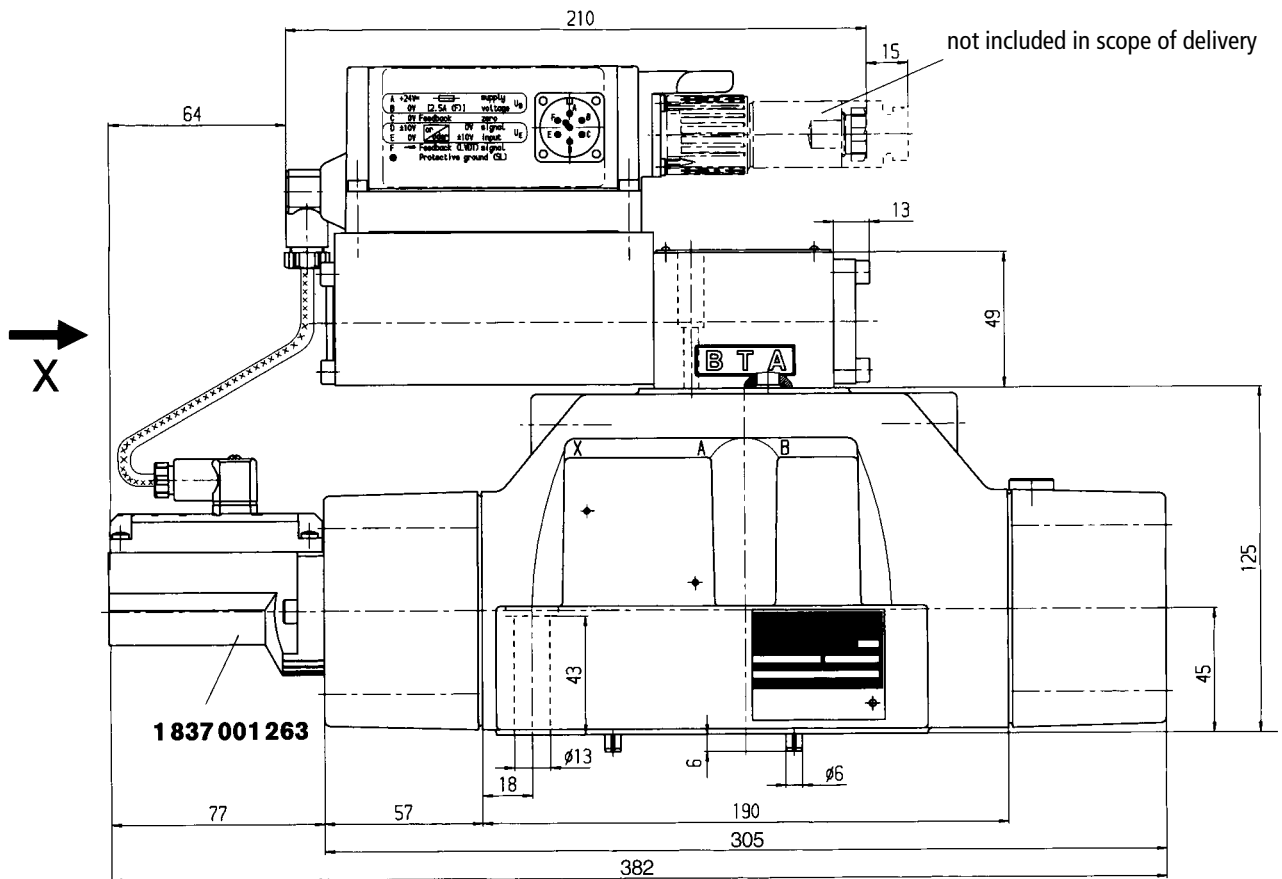
- M 6x45 **2910 151 211**
- M 10x50 **2910 151 301**



Mounting hole configuration: NG 16
 (DIN 24 340 Form A, ISO 4401 and CETOP-RP 121 H),
 see page 16
 For subplates, see catalogue section RE 45 057

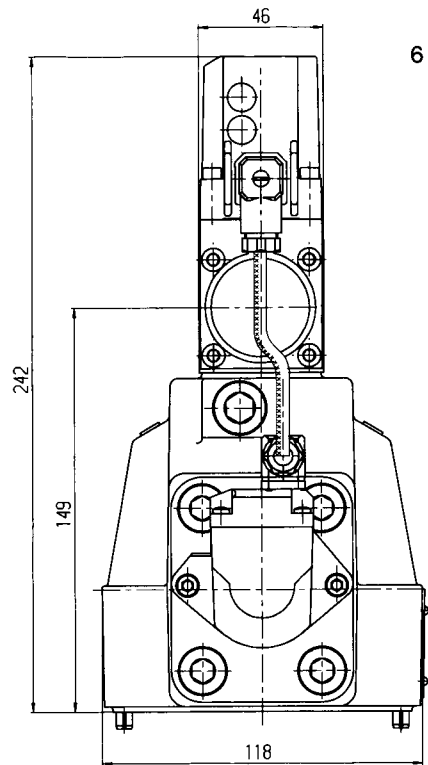
Required surface quality of
 mating component







- ⊙ X, Y $\varnothing 15 \times 2,5$
- ⊙ P, A, B, T $\varnothing 28 \times 3$
- ⊙ Set **1817010273**

X



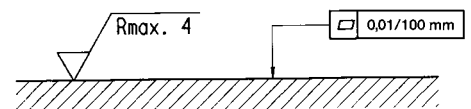
6 x  M 12x60 DIN 912-10.9
 = 90⁺³⁰ Nm
2910151354

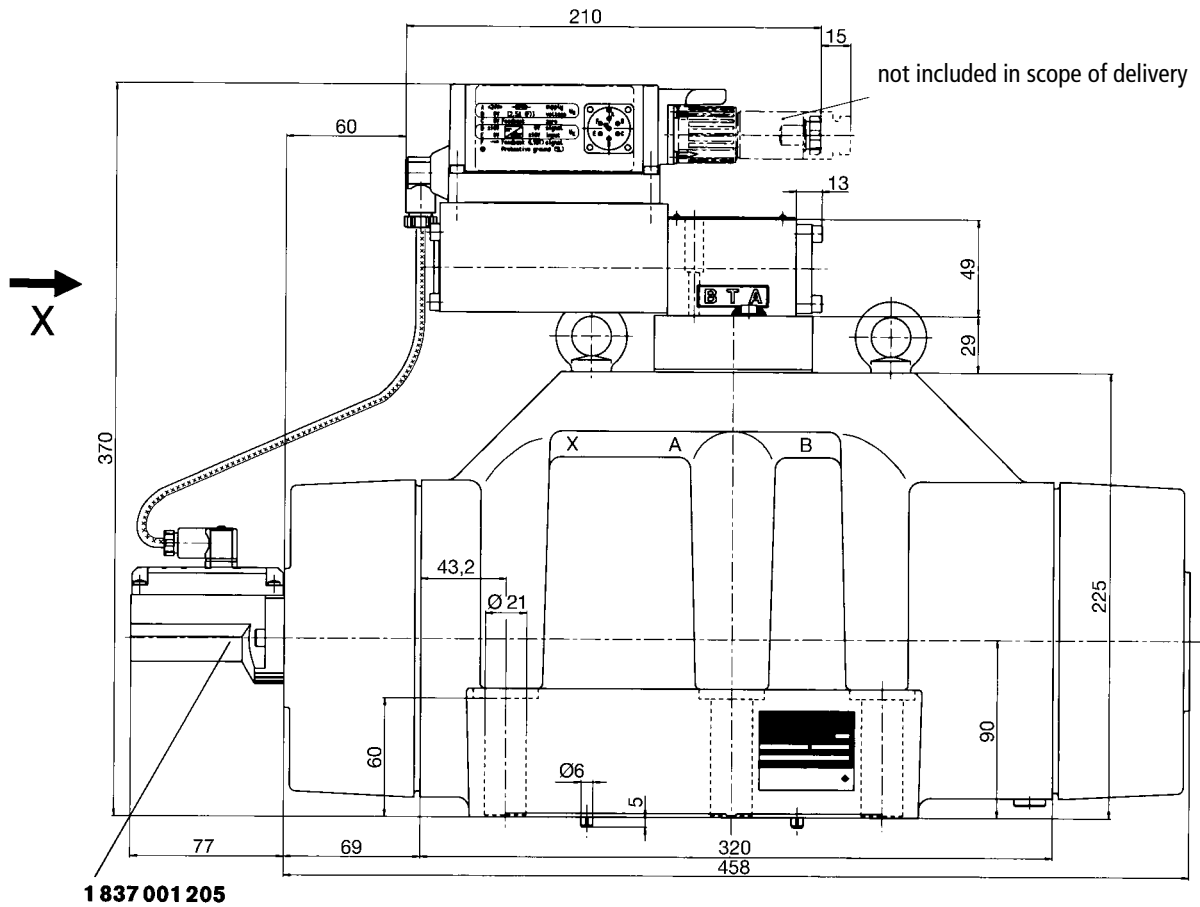
Mounting hole configuration: NG 25

(DIN 24 340 Form A, ISO 4401 and CETOP-RP 121 H), see page 17


For subplates, see catalogue section RE 45 059


Required surface quality of mating component





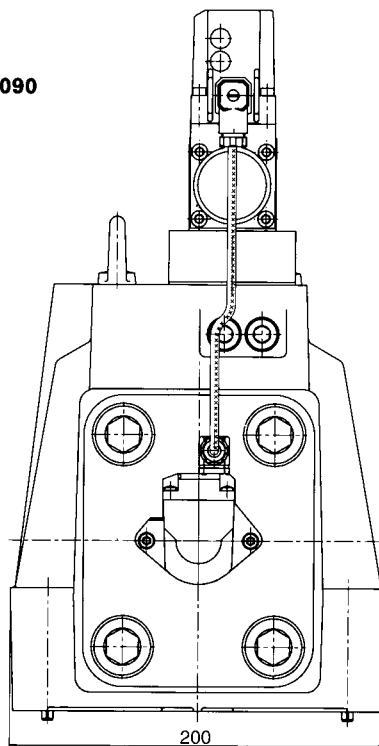
- ⊙ L₁, L₂, X, Y Ø 14x2,5 ⊕ 1810210090
- ⊙ P, A, B, T Ø 53,57x3,53
- ⊙ Set 1817010297

6 x  M 20x90 DIN 912-10.9

 = 450⁺¹¹⁰ Nm

2910151532

X

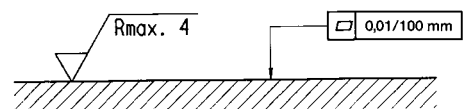


Mounting hole configuration: NG 32

(DIN 24 340 Form A, ISO 4401 and CETOP-RP 121 H), see page 17

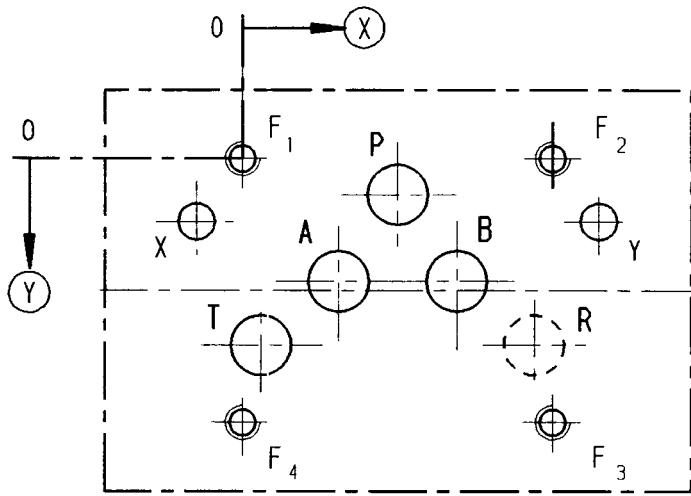
For subplates, see catalogue section RE 45 060

Required surface quality of mating component



Mounting hole configurations (dimensions in mm)

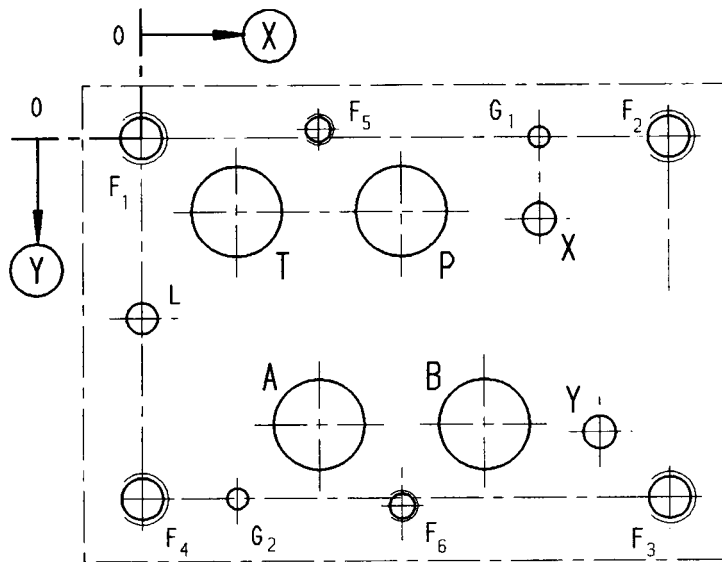
NG 10 – ISO 4401



- 1) Deviates from standard
- 2) Thread depth: Ferrous metal $1.5 \times \varnothing^*$
Non-ferrous $2 \times \varnothing$
+ (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

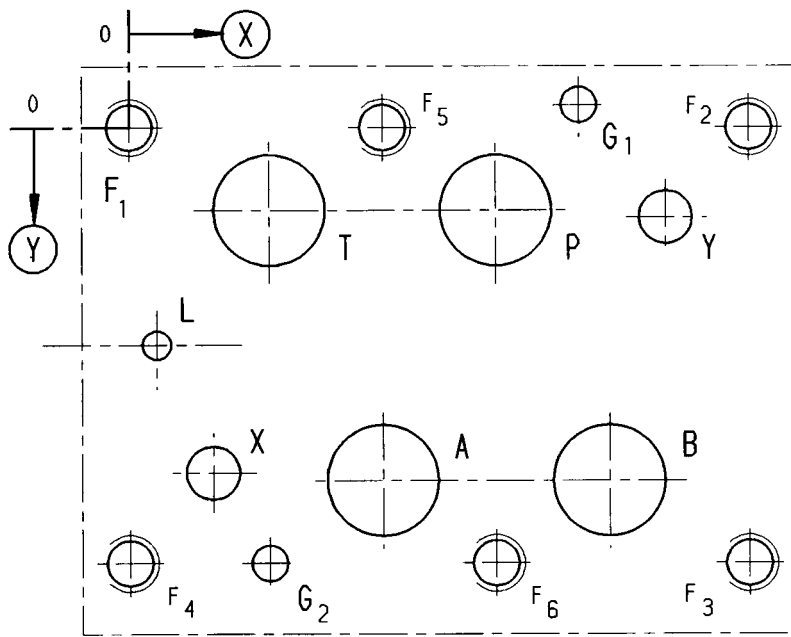


- 1) Deviates from standard
- 2) Thread depth: Ferrous metal $1.5 \times \varnothing^*$
Non-ferrous $2 \times \varnothing$
+ (NG 10 min. 10.5 mm)

	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)

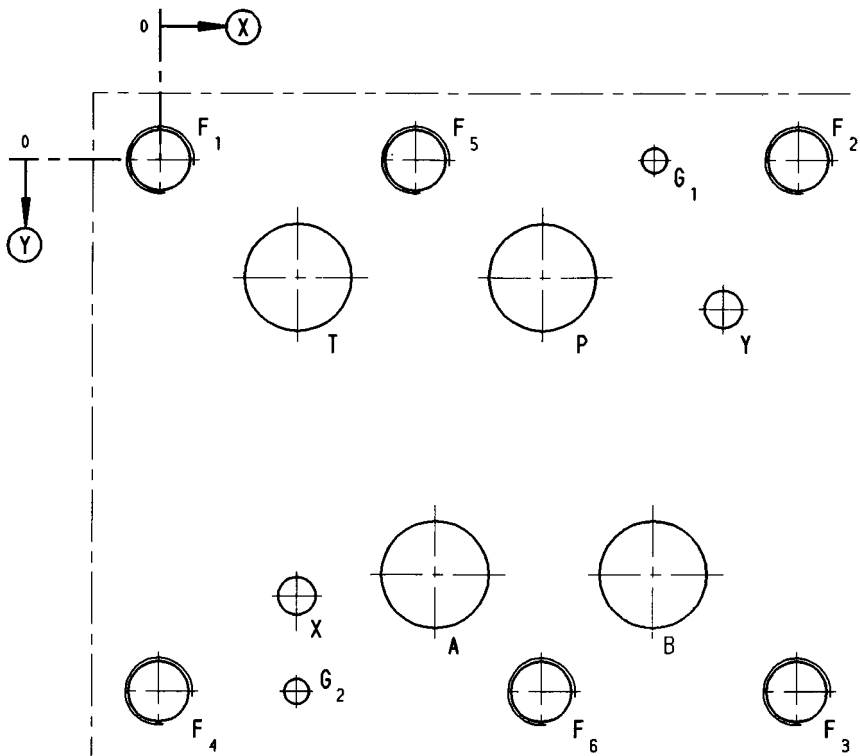
NG 25 – ISO 4401



- 1) Deviates from standard
- 2) Thread depth: Ferrous metal $1.5 \times \varnothing^*$
Non-ferrous $2 \times \varnothing$
+ (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 $1.5 \times \varnothing^*$
Non-ferrous $2 \times \varnothing$
+ (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⁾

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