

Electric Drives
and Controls

Hydraulics

Linear Motion and
Assembly Technologies

Pneumatics

Service

Rexroth
Bosch Group

Proportional flow control valve, with inductive position transducer

RE 29220/08.05

1/16

Type 3FREZ

Nominal size 6, 10
Unit series 1X
Maximum working pressure 250 bar
Nominal flow rate Q_{nom} 2.6...80 l/min



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Features

- Directly controlled flow control valves NG6 and NG10
- With position control, minimal hysteresis < 1 %, see Technical Data
- The 3-way function is determined by how the hydraulic ports are assigned (residual flow runs through port P, 3rd way).
- Adjustable by means of the controlled solenoid position, the position transducer and the external valve electronics
- Solenoid version $I_{max} = 2.7 \text{ A}$
- For subplate attachment, mounting hole configuration NG6 to ISO 4401-03-02-0-94, NG10 to ISO 4401-05-04-0-94
- Subplates as per catalog sheet, RE 45053 for NG6, RE 45055 for NG10 (order separately)
- Plug-in connector to DIN 43650-AM2 for the solenoid and plug-in connector for the position transducer, included in scope of delivery
- Data for the external trigger electronics
 - $U_B = 24 \text{ V}_{nom}$ DC
 - Adjustment of valve curve N_p and gain with and without ramp generator
 - Europe card format, setpoint 0...+10 V (order separately)

Ordering data

3	FRE	Z		B-1X/	L	2	G24-27	Z4	M	M	*
3-way = 3											Further information in plain text
Proportional flow control valve, with position control									M =		NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524
With inductive position transducer		= Z							M =		Without non-return valve
NG6		= 6							Z4 =		Electrical connection
NG10		= 10									Unit plug to DIN 43650-AM2
Without external closing fixture for pressure compensator			= B								Plug-in connector included in scope of delivery
Unit series 10 to 19 (10 to 19: installation and connection dimensions unchanged)				= 1X							Solenoid type (current)
Nennvolumenstrom									27 =		Solenoid current max. 2.7 A
2.6 l/min ($\Delta p = 4$ bar pressure drop)				= 2.6 ¹⁾					G24 =		Voltage supply of trigger electronics
10 l/min ($\Delta p = 8$ bar pressure drop)				= 10							24 V DC
35 l/min ($\Delta p = 8$ bar pressure drop)				= 35							
80 l/min ($\Delta p = 8$ bar pressure drop)				= 80							
Flow characteristic (L = linear)				= L							
Setpoint input +10 V, $Q = 0$ l/min (NC)					= 2						
¹⁾ Recommended: p_{max} 100 bar											

Preferred types

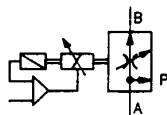
NG6 Solenoid 2.7 A		NG10 Solenoid 2.7 A	
Type	Material Number	Type	Material Number
3FREZ6B-1X/2.6L2G24-27Z4MZ	0 811 403 121	3FREZ10B-1X/80L2G24-27Z4MM	0 811 403 012
3FREZ6B-1X/10L2G24-27Z4MM	0 811 403 117		
3FREZ6B-1X/35L2G24-27Z4MM	0 811 403 114		

Symbols

For external trigger electronics

3-way, normally closed

NC

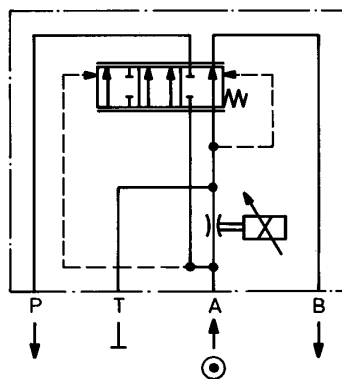


General

Flow control valves are directly actuated throttle valves with integrated pressure compensator.

3-way flow control valve

- A: Supply
- B: Discharge
- P: Residual flow, capacity up to 250 bar, or tank
- T: Closed



Function, sectional diagram

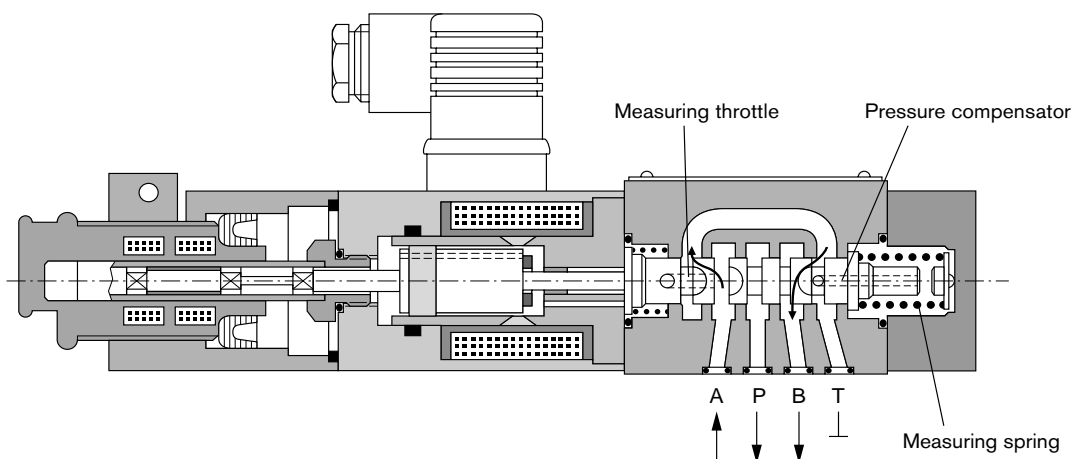
General

Type 3FREZ proportional flow control valves with position control are available in nominal sizes 6 and 10. They are actuated by means of a proportional solenoid with inductive position transducer. Hysteresis is $< 1\%$. The valve amplifier electronics are available in the form of a Europe card. The design of the valve body is such that the residual flow runs through port P.

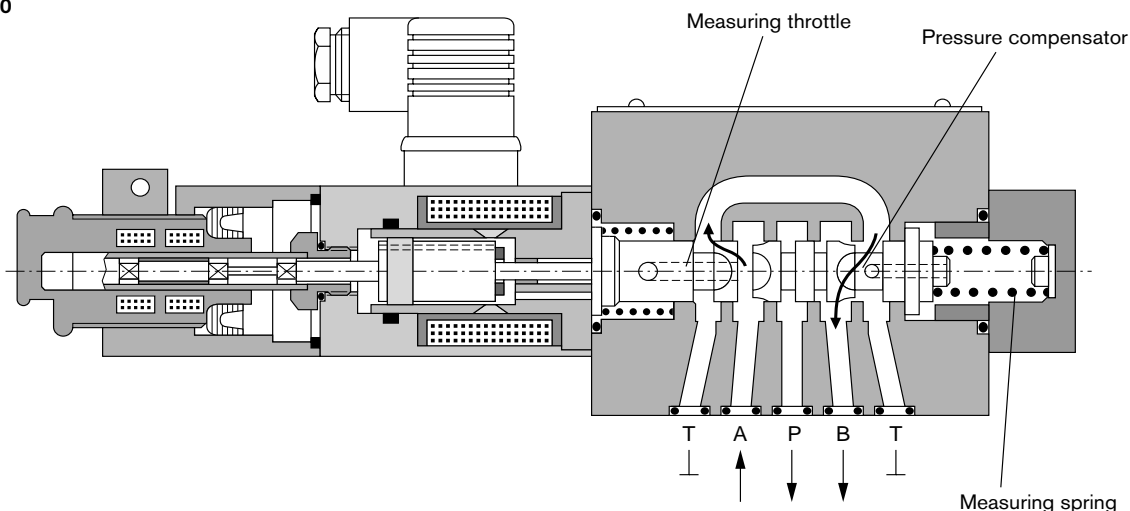
Basic principle

To adjust the oil flow rate from B, a setpoint is set in the trigger electronics. Based on this setpoint, the electronics control the solenoid coil as a function of the signal from the position transducer. The position control ensures very low hysteresis. The valve opening is determined by the metering edges on the spool, and the integrated pressure compensator compares the pressure drop by means of a 4 or 8-bar measuring spring. The pressure compensator with measuring spring regulates the pressure before the throttling edge according to the simplified formula: "Load pressure plus force of measuring spring". In this way, the pressure drop over the metering edge is maintained at a constant level.











NG6



NG10



Accessories

Type			Material Number
(4x)  ISO 4762-M5x30-10.9	Cheese-head bolts NG6		2 910 151 166
(4x)  ISO 4762-M6x35-10.9	Cheese-head bolts NG10		2 910 151 207
Europe card  	VT-VRPA1-527-10/V0/QV	RE 30052	0 811 405 098
Europe card  	VT-VRPA1-527-10/V0/QV-RTP	RE 30054	0 811 405 103
Europe card  	VT-VRPA1-527-10/V0/QV-RTS	RE 30056	0 811 405 177
Plug-in connector   2P+PE	Plug-in connector 2P+PE (M16x1.5) for the solenoid and plug-in connector for the position transducer, included in scope of delivery, see also RE 08008.		

Testing and service equipment

Test box type VT-PE-TB1, see RE 30063

Test adapter for Europe cards type VT-PA-5, see RE 30070

Technical data

General	
Construction	Spool-type valve with integrated pressure compensator
Actuation	Proportional solenoid with position control, external amplifier
Connection type	Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94), NG10 (ISO 4401-05-04-0-94)
Mounting position	Optional
Ambient temperature range	°C -20...+50
Weight	NG6 kg 2.2
	NG10 kg 6.0
Vibration resistance, test condition	Max. 25 g, shaken in 3 dimensions (24 h)

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

Pressure fluid		Hydraulic oil to DIN 51524...535, other fluids after prior consultation			
Viscosity range,	recommended mm ² /s	20...100			
	max. permitted mm ² /s	10...800			
Pressure fluid temperature range	°C	-20...+80			
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 18/16/13 ¹⁾			
Direction of flow, see symbol		NG6			NG10
Nominal flow rate Q_B with closed-loop control	l/min	2.6	10	35	80
Pressure drop Δp	bar	4	8	8	8
Supply flow rate $Q_{A\max}$	l/min	2.6	50	50	100
Minimum pressure drop $p_A > p_B$	bar	6	14	14	14
Max. working pressure	bar	Port A, B: 250 Port T: Closed Port P: Closed or residual flow 250 bar			

Electrical

Cyclic duration factor	%	100
Degree of protection	IP 65 to DIN 40050 and IEC 14434/5	
Solenoid connection	Unit plug DIN 43650/ISO 4400, M16x1.5 (2P+PE)	
Position transducer connection	Special plug	
Valve with solenoid type	A	2.7
Max. solenoid current I_{\max}	A	2.7
Coil resistance R_{20}	Ω	2.7
Max. power consumption at 100% load and operating temperature	VA	40

Static/Dynamic²⁾

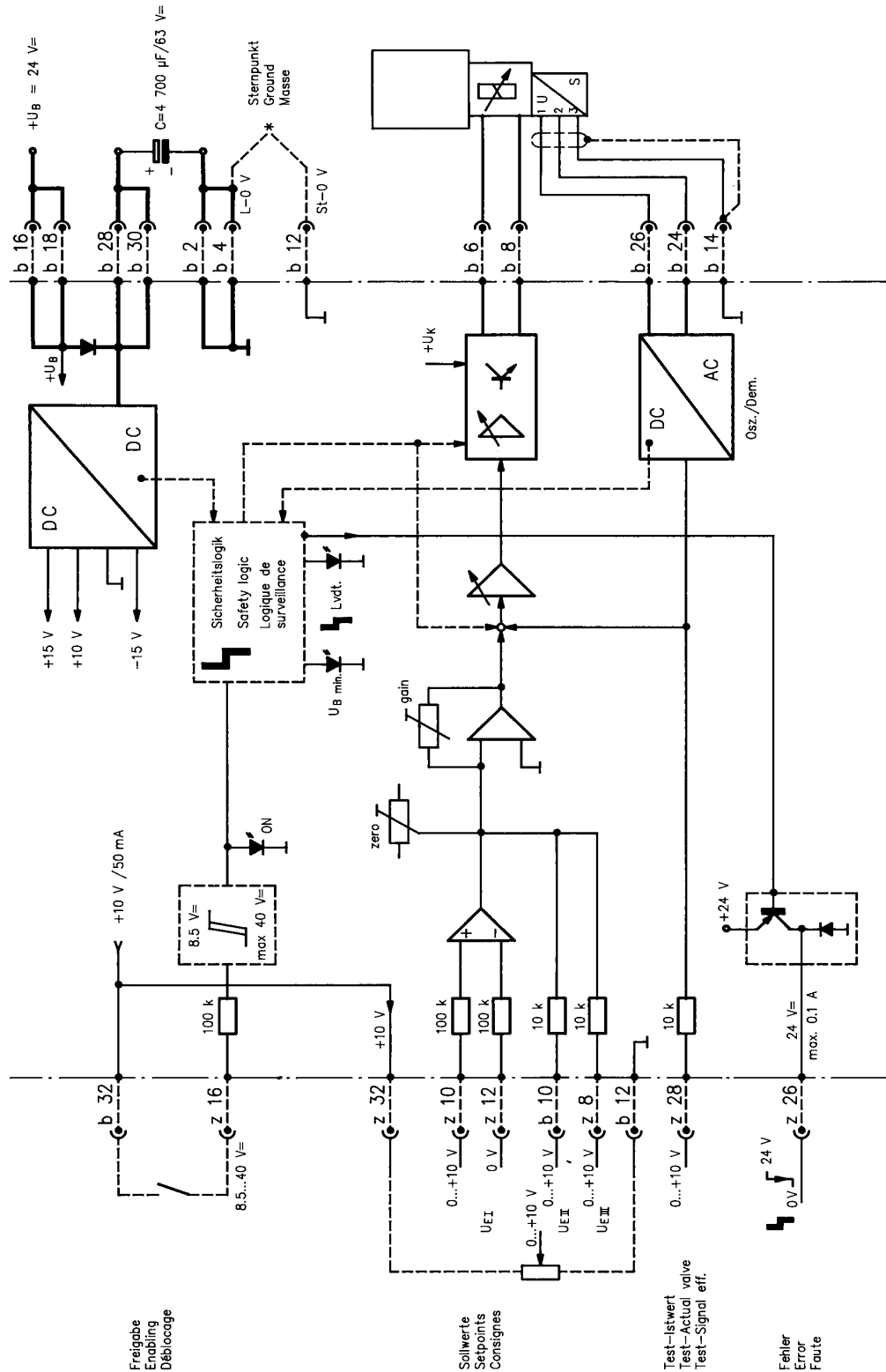
Hysteresis	%	≤ 1
Range of inversion	%	≤ 0.5
Manufacturing tolerance	%	≤ 5
Resp. time 100%/signal change 10%	ms	≤ 35/25
Correction time on max. load change (pressure compensator)	ms	NG6 ≤ 30 NG10 ≤ 45

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 catalog sheets RE 50070, RE 50076 and RE 50081.

²⁾ All characteristic values ascertained using amplifier 0 811 405 098 for the 2.7 A solenoid.

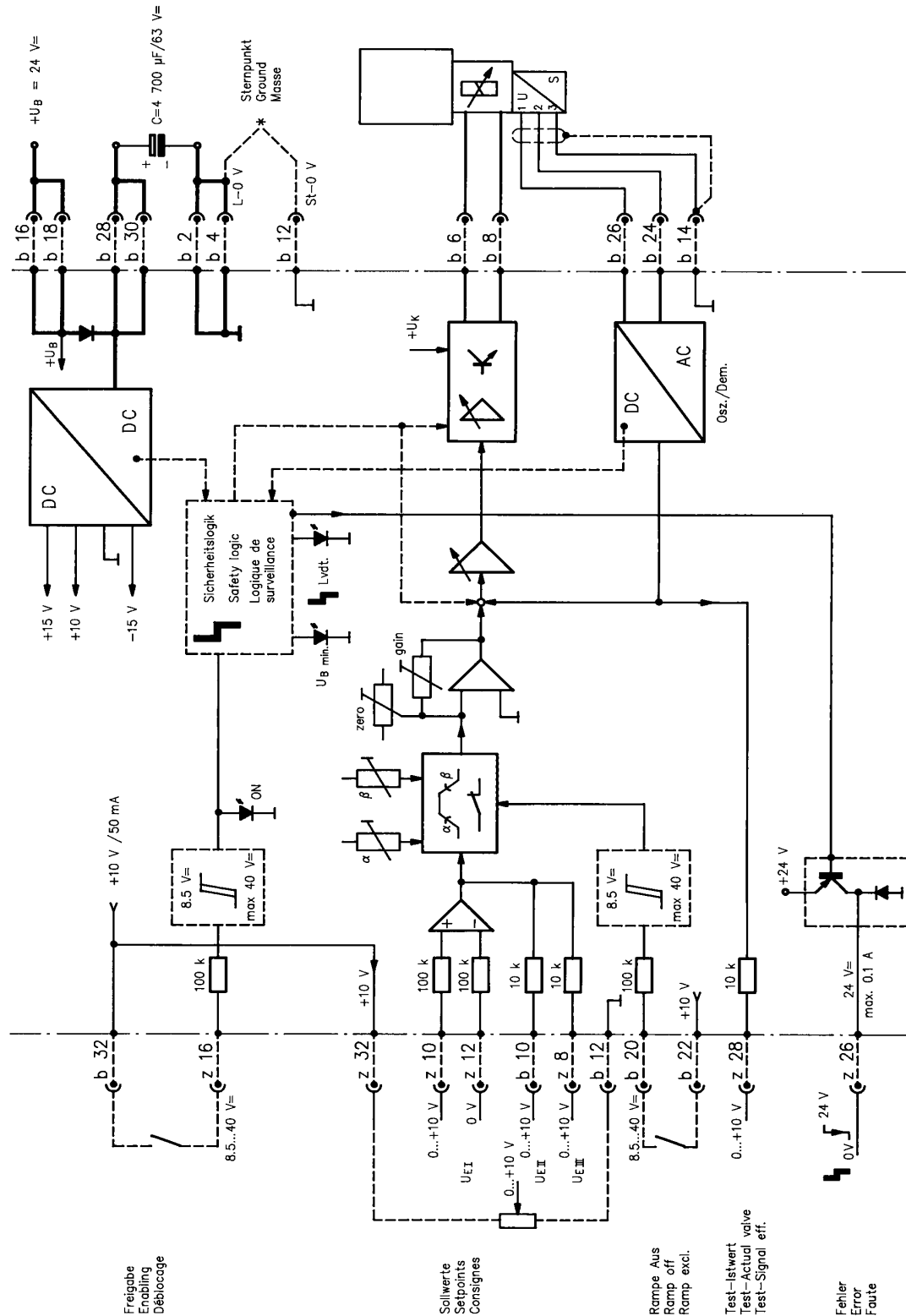
Valve with external trigger electronics (europe card without ramp, RE 30052)

Circuit diagram/pin assignment



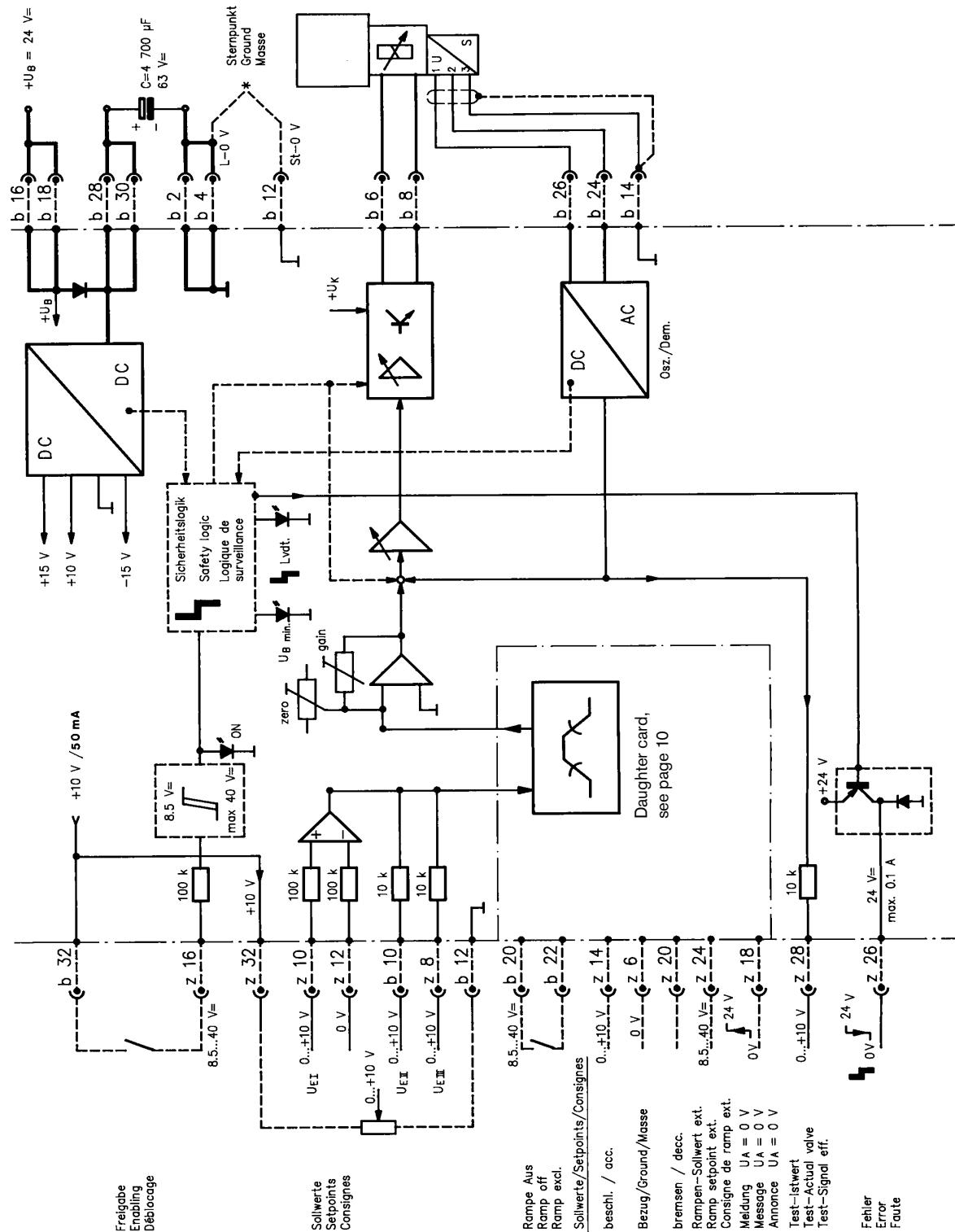
Valve with external trigger electronics (europe card with ramp, RE 30054)

Circuit diagram/pin assignment



Valve with external trigger electronics (europe card with ramp, RE 30056)

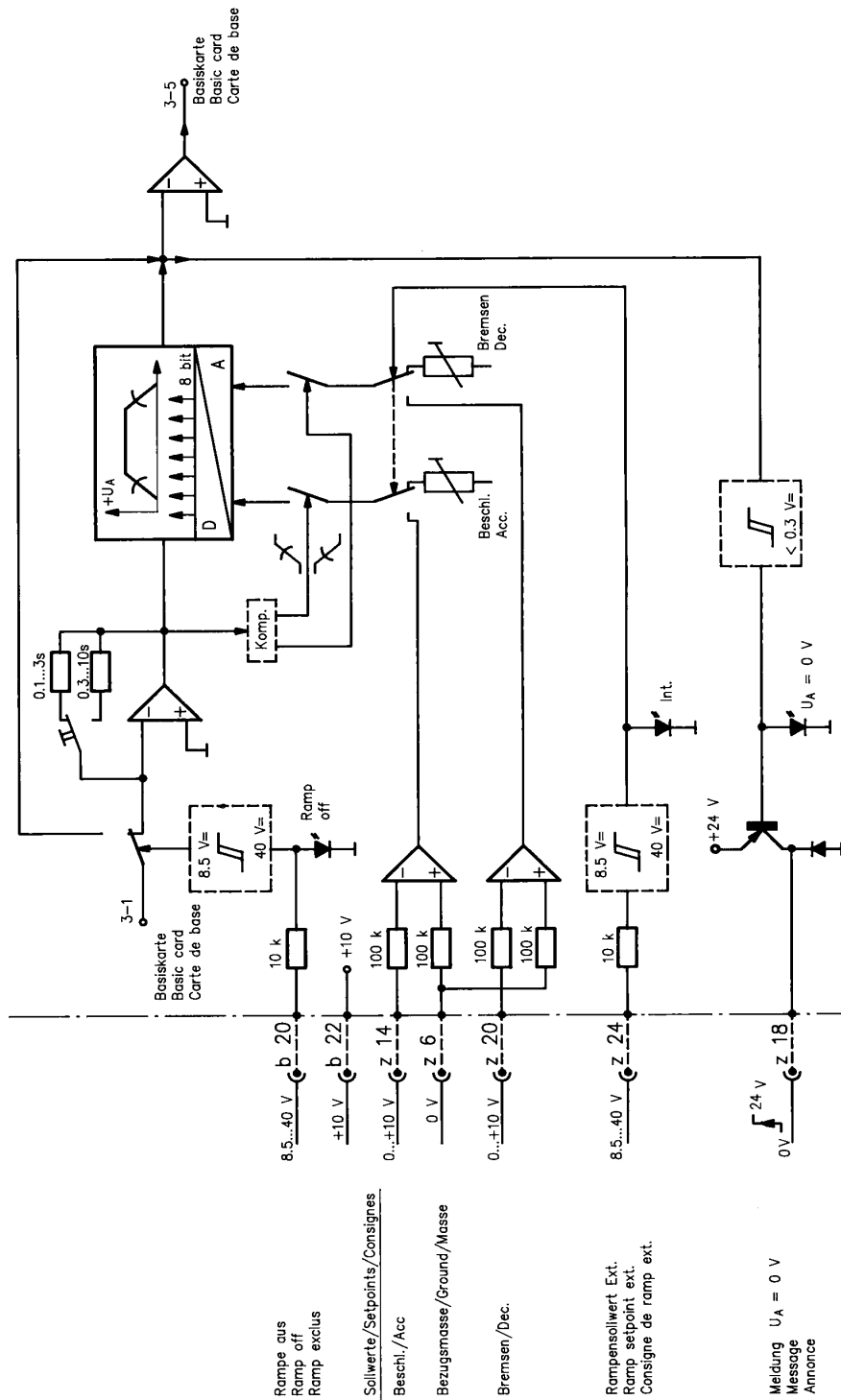
Circuit diagram/pin assignment



Valve with external trigger electronics (europe card with ramp, RE 30056)

Circuit diagram/pin assignment

Daughter card

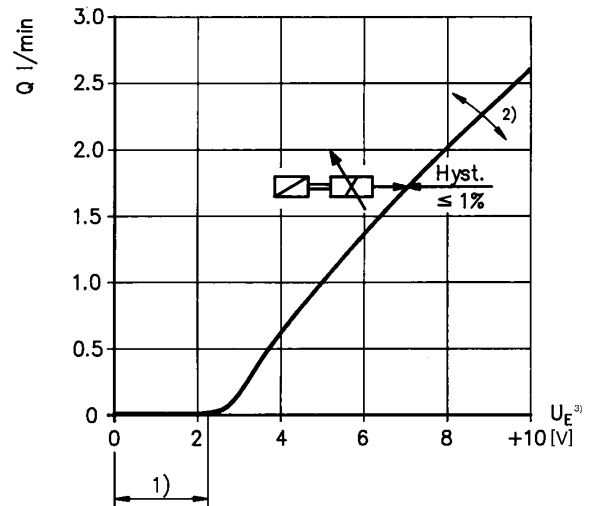


Characteristic curves NG6 (measured with HLP 46, $\vartheta_{oil} = 40^\circ\text{C} \pm 5^\circ\text{C}$)

$Q_{nom} = 2.6 \text{ l/min}$, $p_{max} = 100 \text{ bar}$

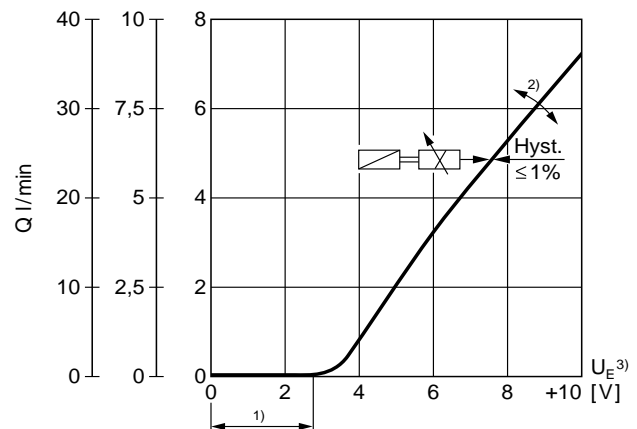
Special version for very low
flow rates

Basic position closed "NC"



$Q_{nom} = 10/35 \text{ l/min}$

Basic position closed "NC"



Valve amplifier

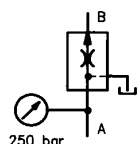
¹⁾ Zero adjustment

²⁾ Sensitivity adjustment

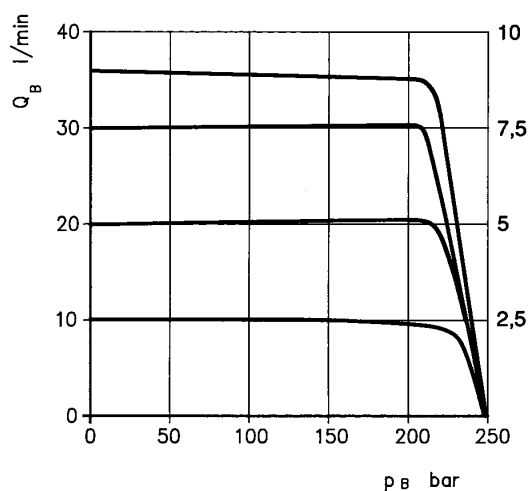
³⁾ Version: $U_E = 0 \dots +10 \text{ V}$

Characteristic curves NG6 (measured with HLP 46, $\vartheta_{oil} = 40^\circ\text{C} \pm 5^\circ\text{C}$)

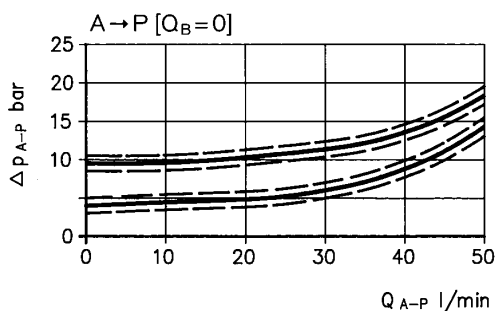
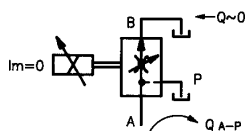
3-way version



$Q_{nom} = 10/35 \text{ l/min}$



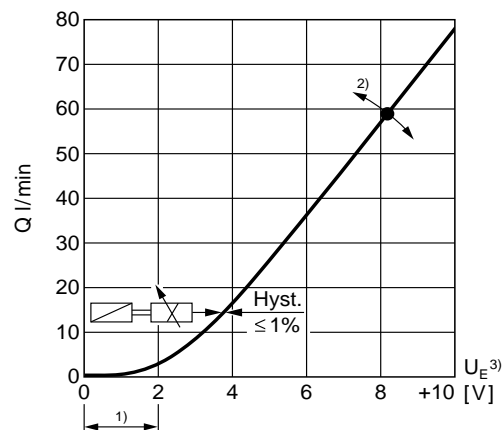
Residual flow "A-P"
(pressure drop)



Characteristic curves NG10 (measured with HLP 46, $\vartheta_{oil} = 40^\circ\text{C} \pm 5^\circ\text{C}$)

$Q_{nom} = 80 \text{ l/min}$

Basic position closed "NC"



Valve amplifier

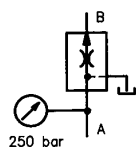
¹⁾ Zero adjustment

²⁾ Sensitivity adjustment

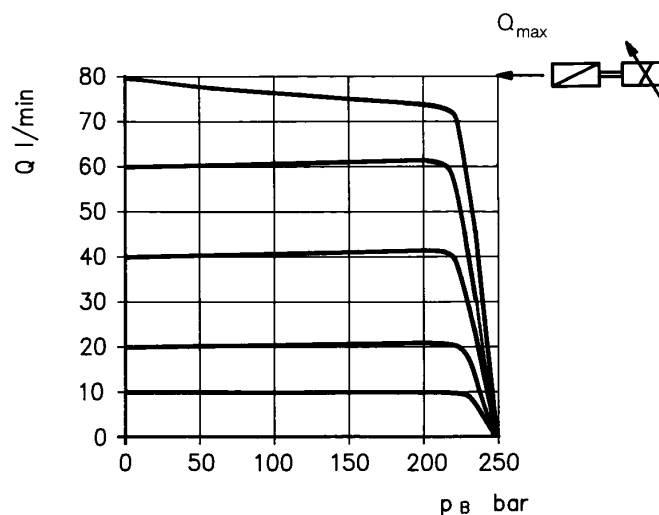
³⁾ Version: $U_E = 0 \dots +10 \text{ V}$

Characteristic curves NG10 (measured with HLP 46, $\vartheta_{oil} = 40^\circ\text{C} \pm 5^\circ\text{C}$)

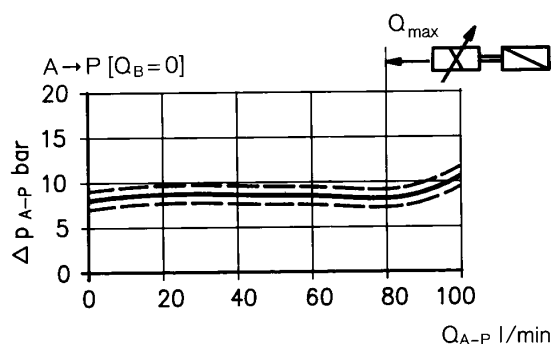
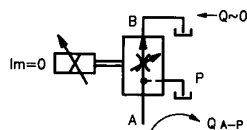
3-way version



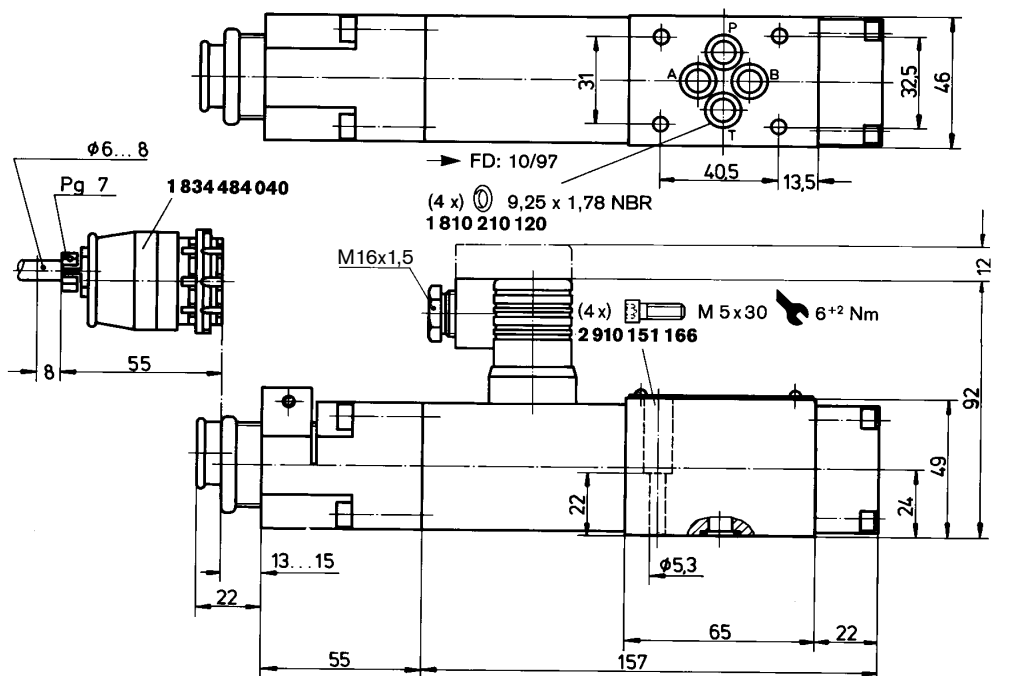
$Q_{nom} = 80 \text{ l/min}$



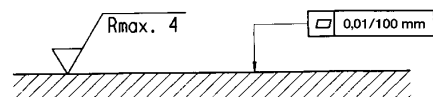
Residual flow "A-P"
(pressure drop)



Unit dimensions NG6 (nominal dimensions in mm)



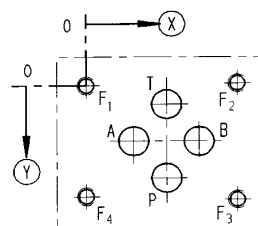
Required surface quality
of mating component



Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)

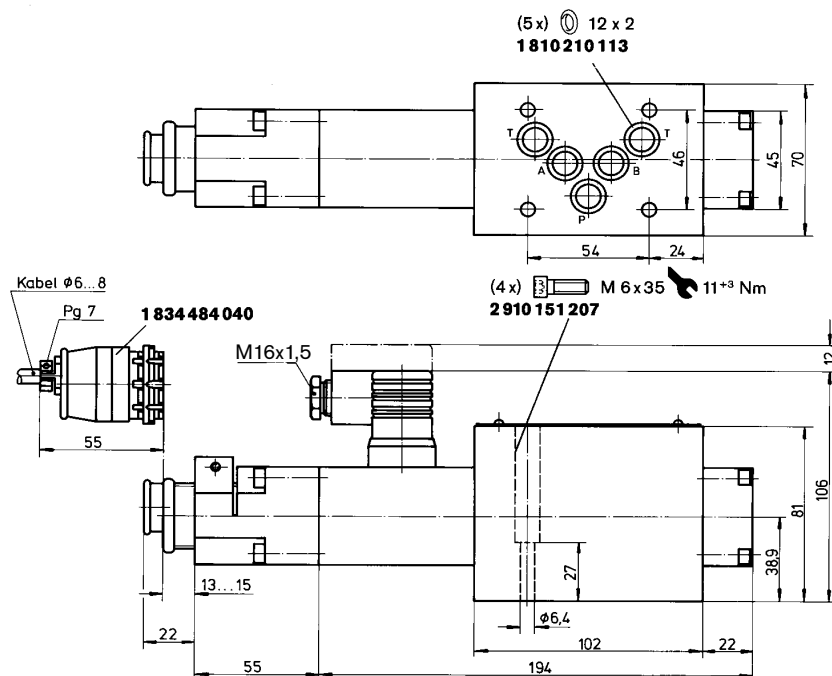
For subplates see catalog sheet RE 45053

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

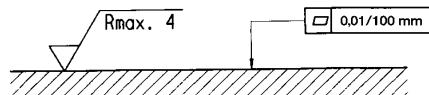


	P	A	T	B	F ₁	F ₂	F ₃	F ₄
⊗	21.5	12.5	21.5	30.2	0	40.5	40.5	0
⊙	25.9	15.5	5.1	15.5	0	−0.75	31.75	31
⊘	8 ¹⁾	8 ¹⁾	8 ¹⁾	8 ¹⁾	M5 ²⁾	M5 ²⁾	M5 ²⁾	M5 ²⁾

Unit dimensions NG10 (nominal dimensions in mm)



Required surface quality
of mating component



Mounting hole configuration: NG10 (ISO 4401-05-04-0-94)

For subplates see catalog sheet RE 45055

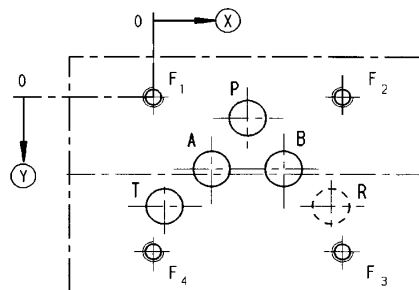
1) Deviates from standard

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	R
⊗	27	16.7	3.2	37.3	0	54	54	0	50.8
⊙	6.3	21.4	32.5	21.4	0	0	46	46	32.5
⊘	10.5 ¹⁾	10.5 ¹⁾	10.5 ¹⁾	10.5 ¹⁾	M6 ²⁾	M6 ²⁾	M6 ²⁾	M6 ²⁾	10.5 ¹⁾