# 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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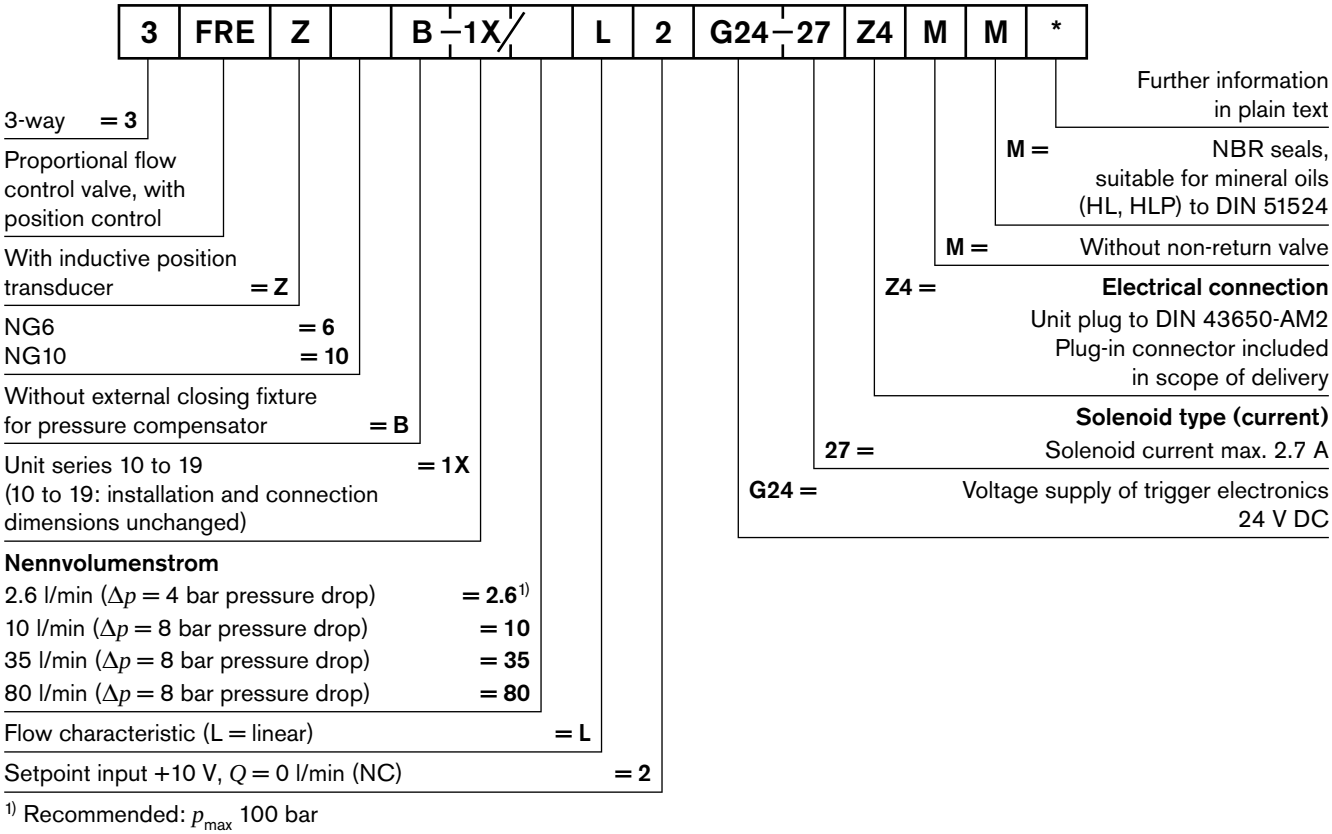
## Features

- 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 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 $V_{nom}$ DC
  - Adjustment of valve curve Np and gain with and without ramp generator
  - Europe card format, setpoint 0...+10 V (order separately)

## Ordering data




1) Recommended: $p_{max}$ 100 bar

## Preferred types

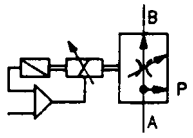
| NG6 Solenoid 2.7 A | | NG10 Solenoid 2.7 A | |
|---|---|---|---|
| **Type** | **Material Number** | **Type** | **Material Number** |
| 3FREZ6B–1X/2.6L2G24–27Z4MZ | 0 811 403 121 | 3FREZ10B–1X/80L2G24–27Z4MM | 0 811 403 012 |
| 3FREZ6B–1X/10L2G24–27Z4MM | 0 811 403 117 | | |
| 3FREZ6B–1X/35L2G24–27Z4MM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

## Symbols

For external trigger electronics

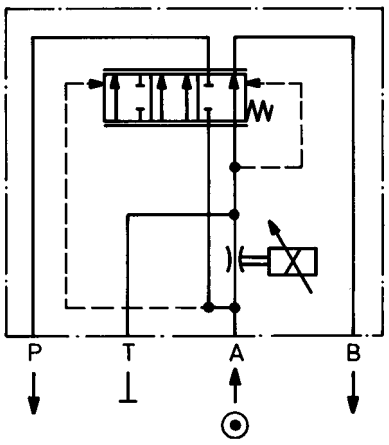
3-way, normally closed

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

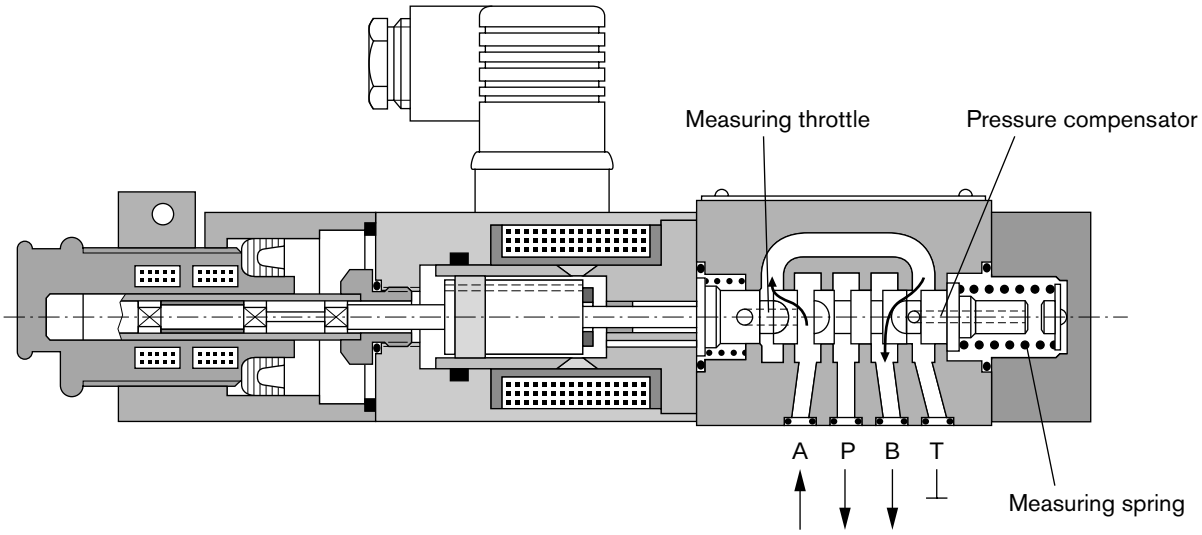
### General

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.

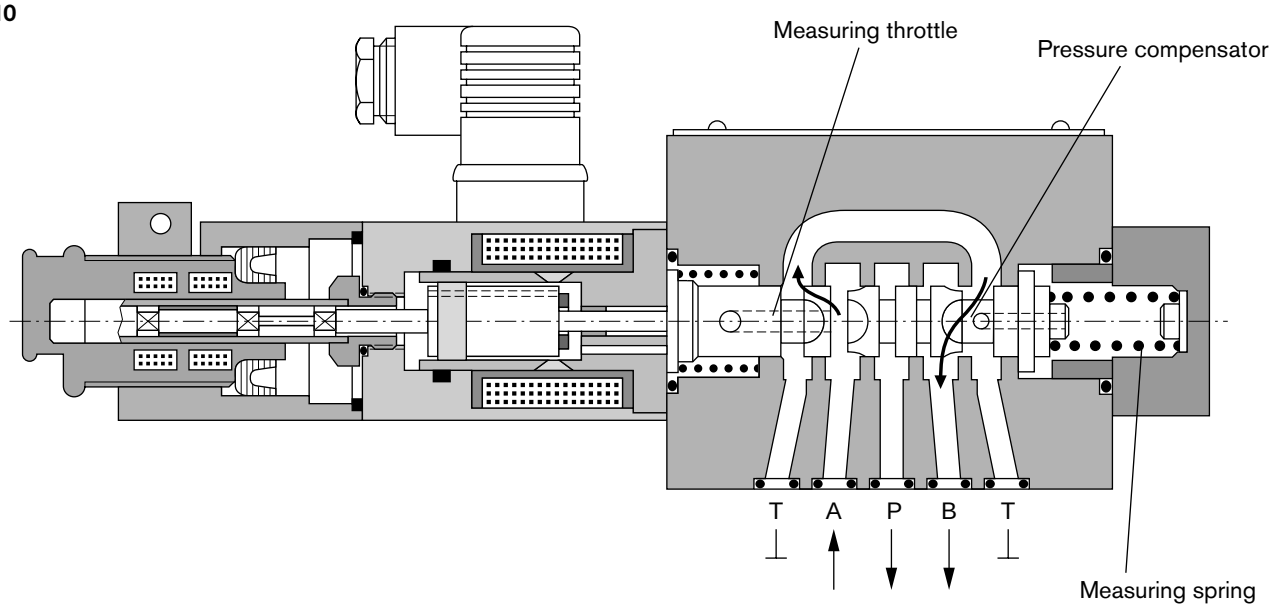
### Basic principle

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.

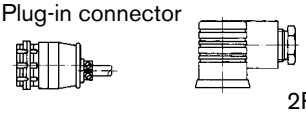
**NG6**




**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, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 $\Delta p$ | | 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<br>Port T: Closed<br>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/Dynamic [2]

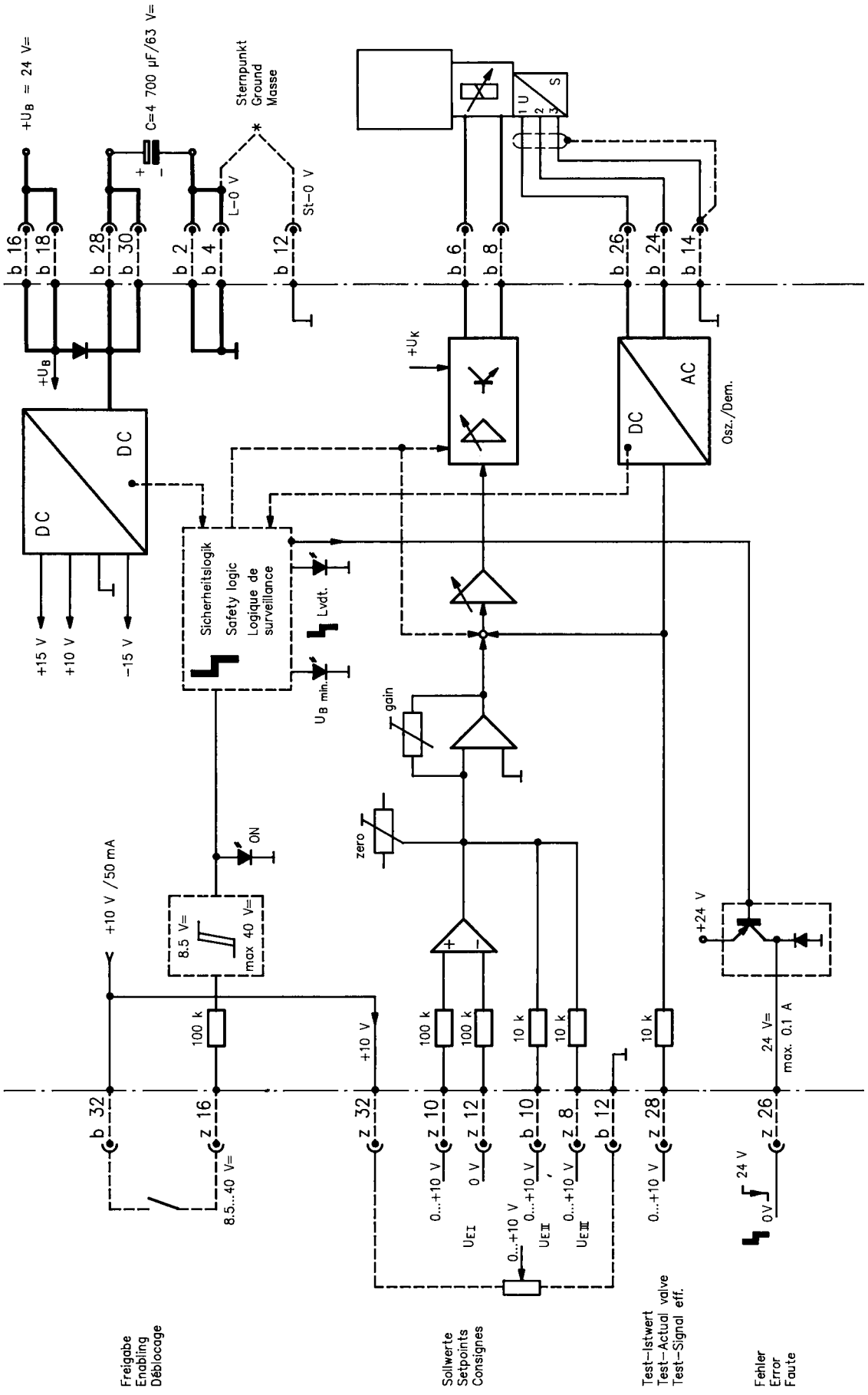
| | | |
|---|---|---|
| Hysteresis | % | ≤ 1 |
| Range of inversion | % | ≤ 0.5 |
| Manufacturing tolerance | % | ≤ 5 |
| Resp. time 100 %/signal change 10 % | ms | ≤ 35/25 |
| Correction time on max. load change (pressure compensator) | ms | NG6 ≤ 30<br>NG10 ≤ 45 |

[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.

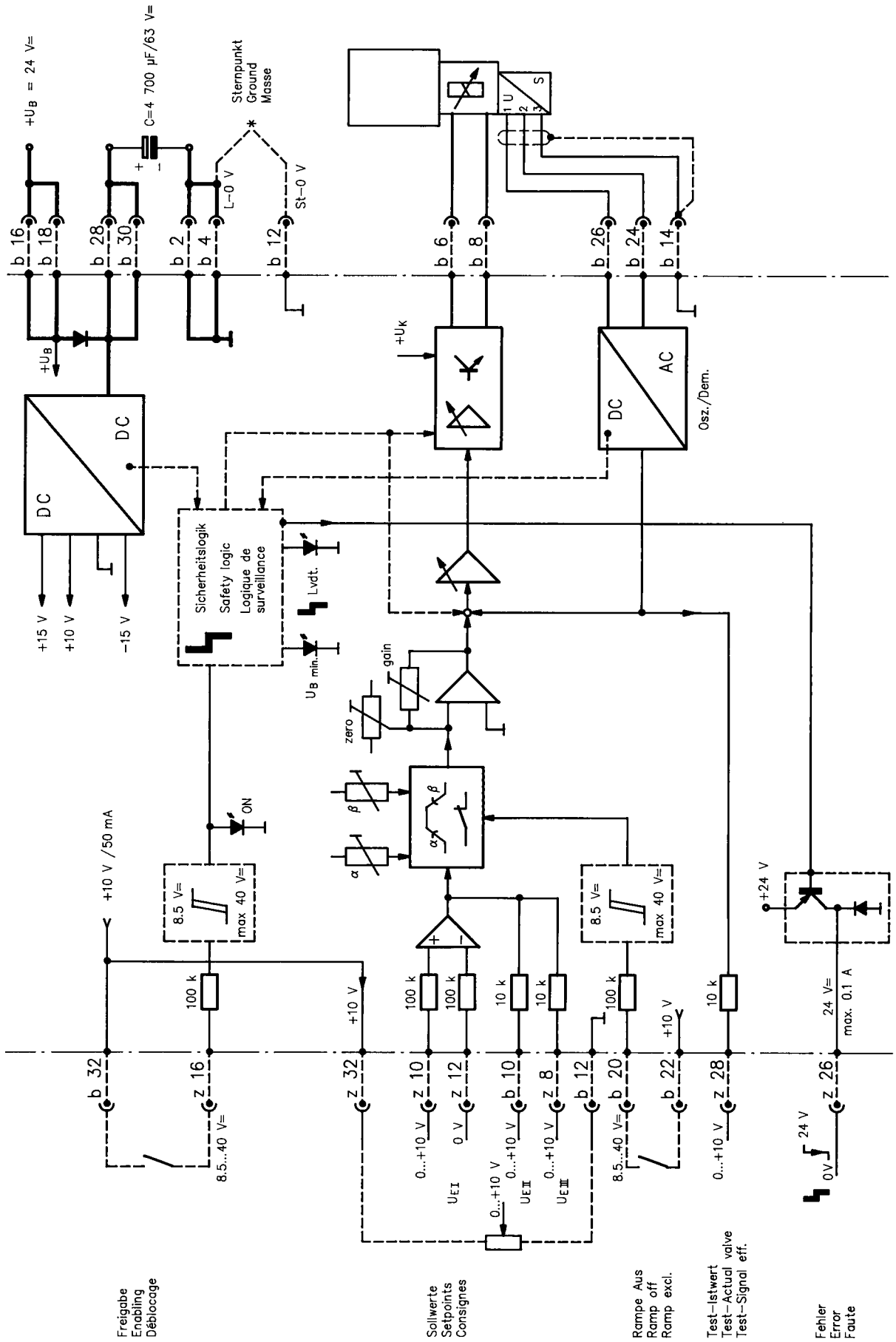
## **Valve with external trigger electronics** (europe card without ramp, RE 30052)

**Circuit diagram/pin assignment**



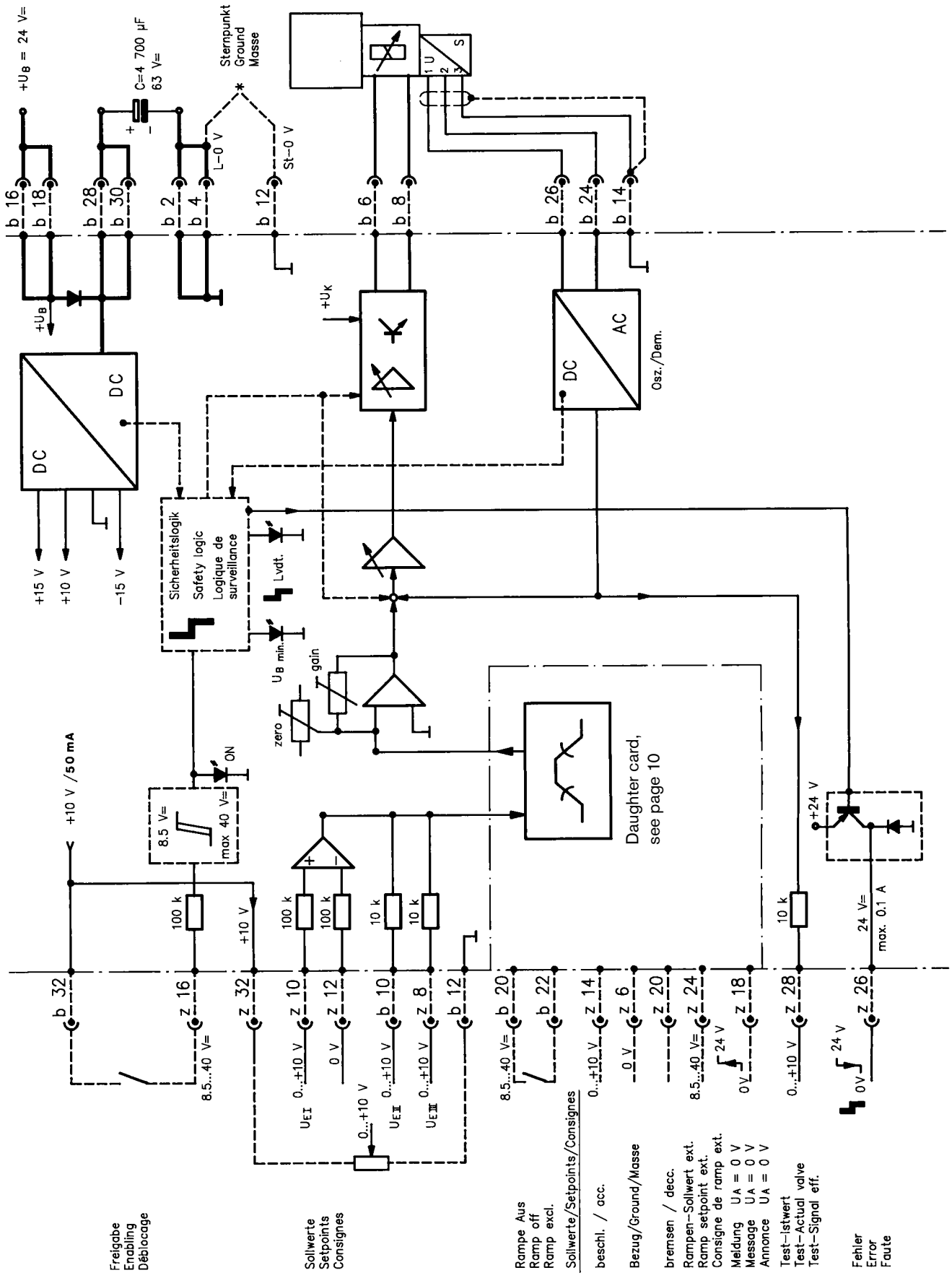
## **Valve with external trigger electronics** (europe card with ramp, RE 30054)

**Circuit diagram/pin assignment**



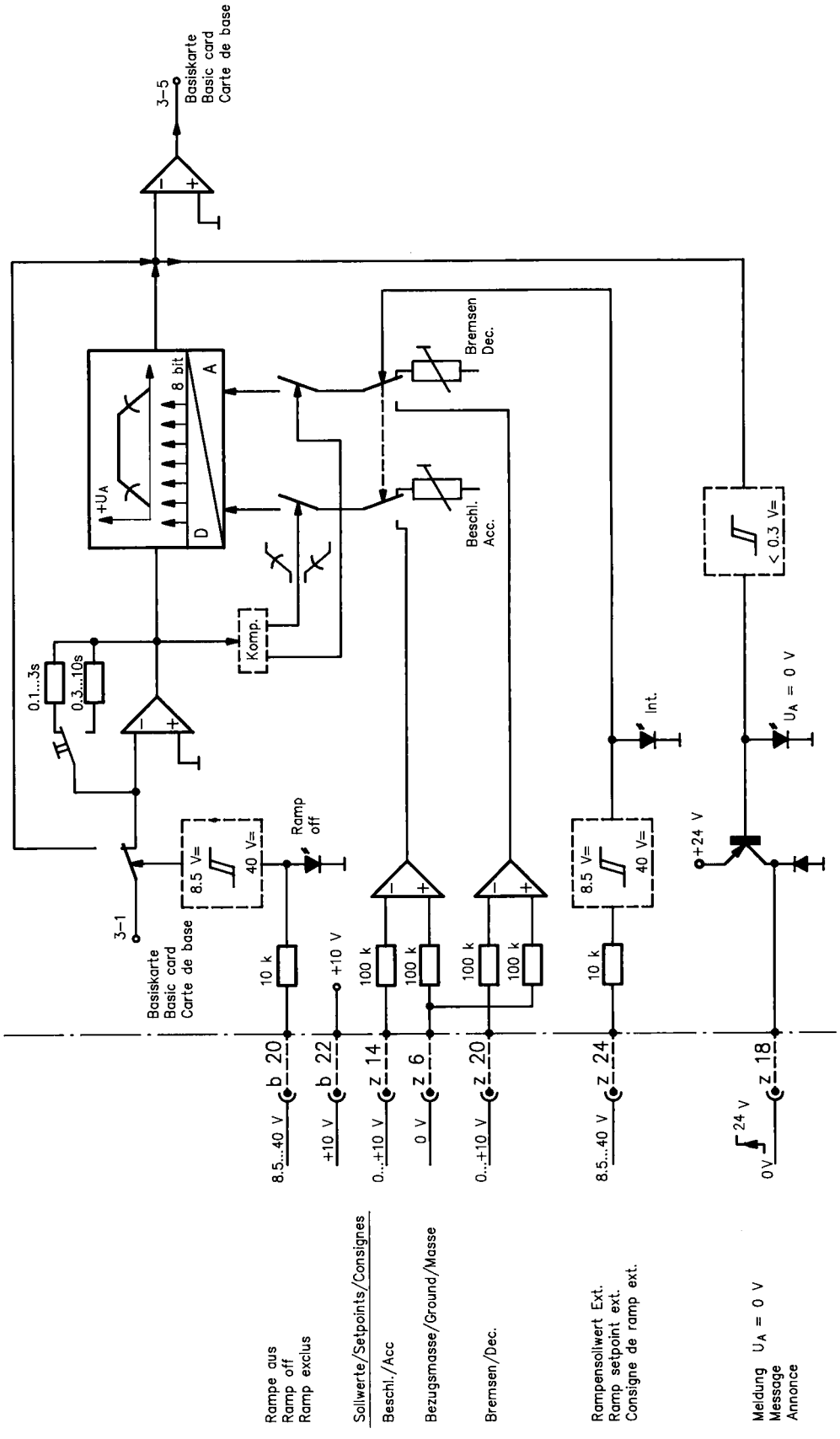
## Valve with external trigger electronics (europe card with ramp, RE 30056)

**Circuit diagram/pin assignment**



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

**Circuit diagram/pin assignment** **Daughter card**

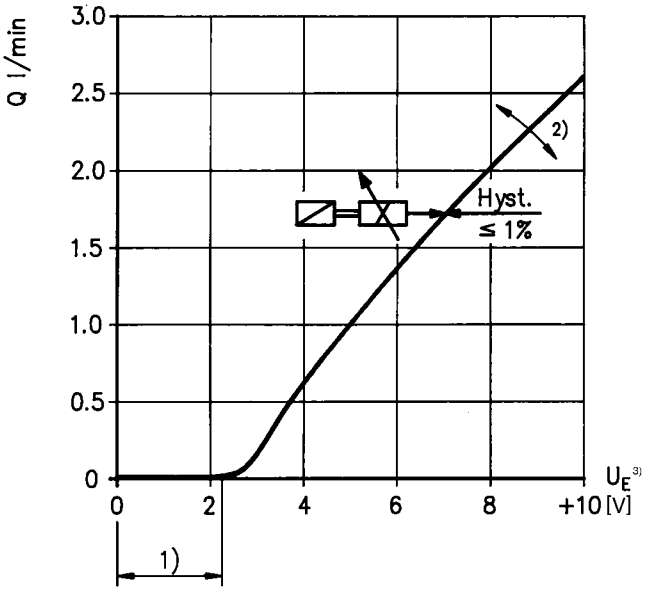


## Characteristic curves NG6 (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

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

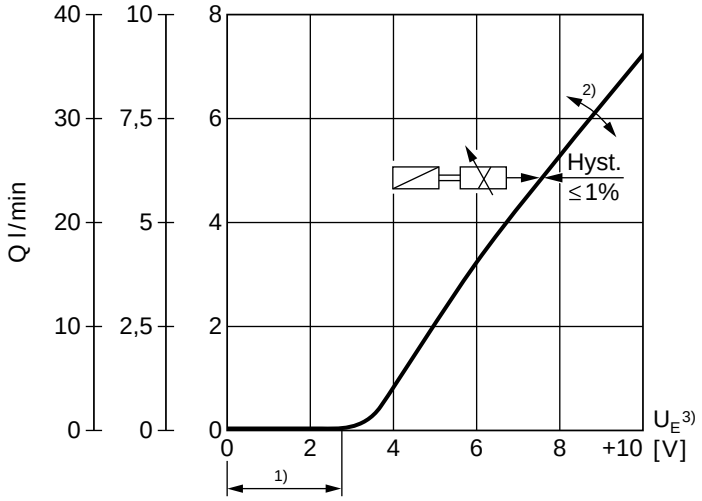
Special version for very low flow rates

Basic position closed “NC”




**$Q_{nom} = 10/35$ l/min**

Basic position closed “NC”




**Valve amplifier**

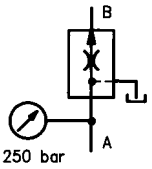
1) Zero adjustment

2) Sensitivity adjustment

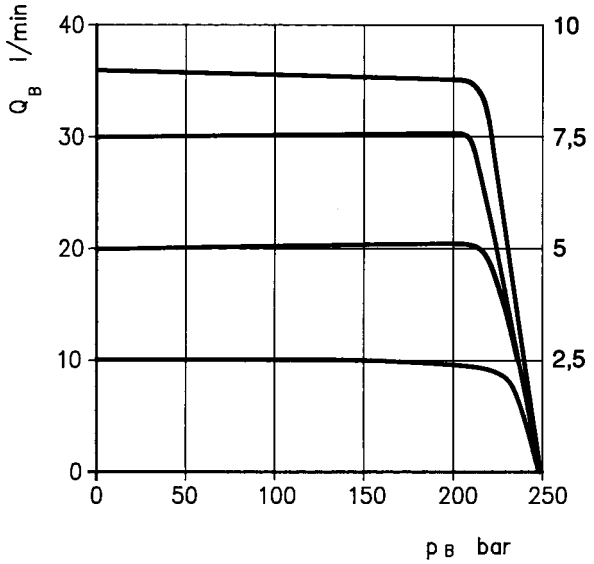
3) Version: $U_E = 0...+10$ V

## **Characteristic curves NG6** (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

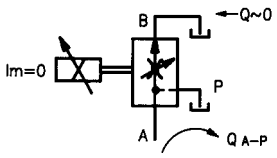
3-way version

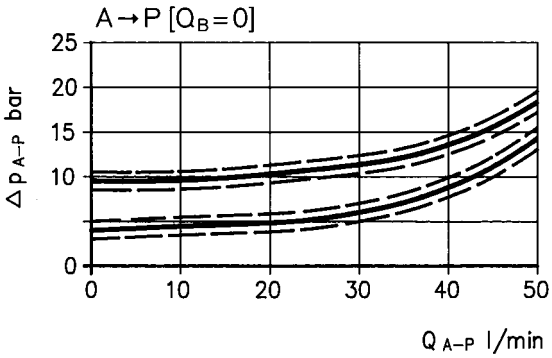



$Q_{nom}$ = **10/35 l/min**




Residual flow "A–P"
(pressure drop)

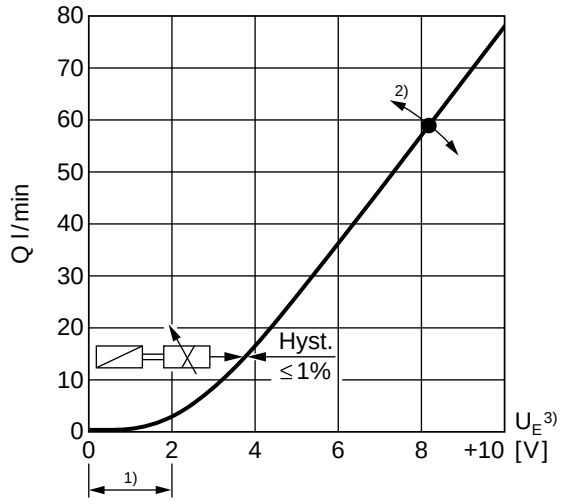


## Characteristic curves NG10 (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

**$Q_{nom}$ = 80 l/min**

Basic position closed “NC”




**Valve amplifier**

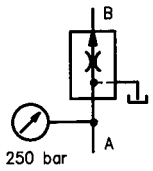
1) Zero adjustment

2) Sensitivity adjustment

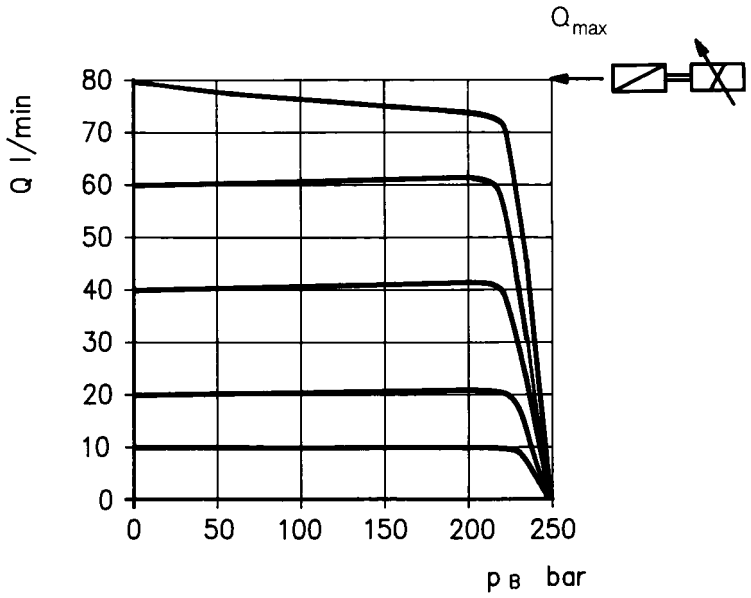
3) Version: $U_E$ = 0...+10 V

## **Characteristic curves NG10** (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

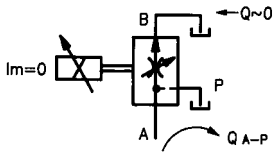
3-way version

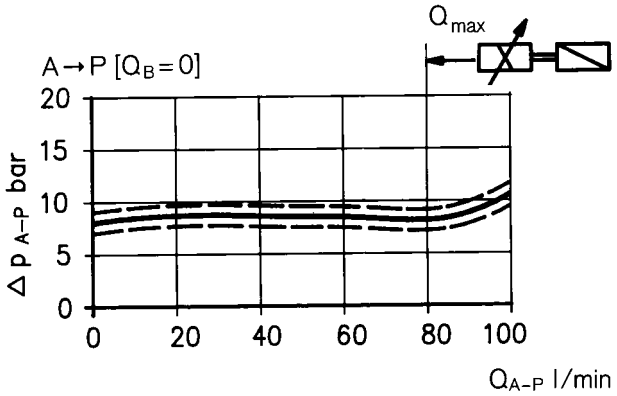



$Q_{nom}$ = **80 l/min**

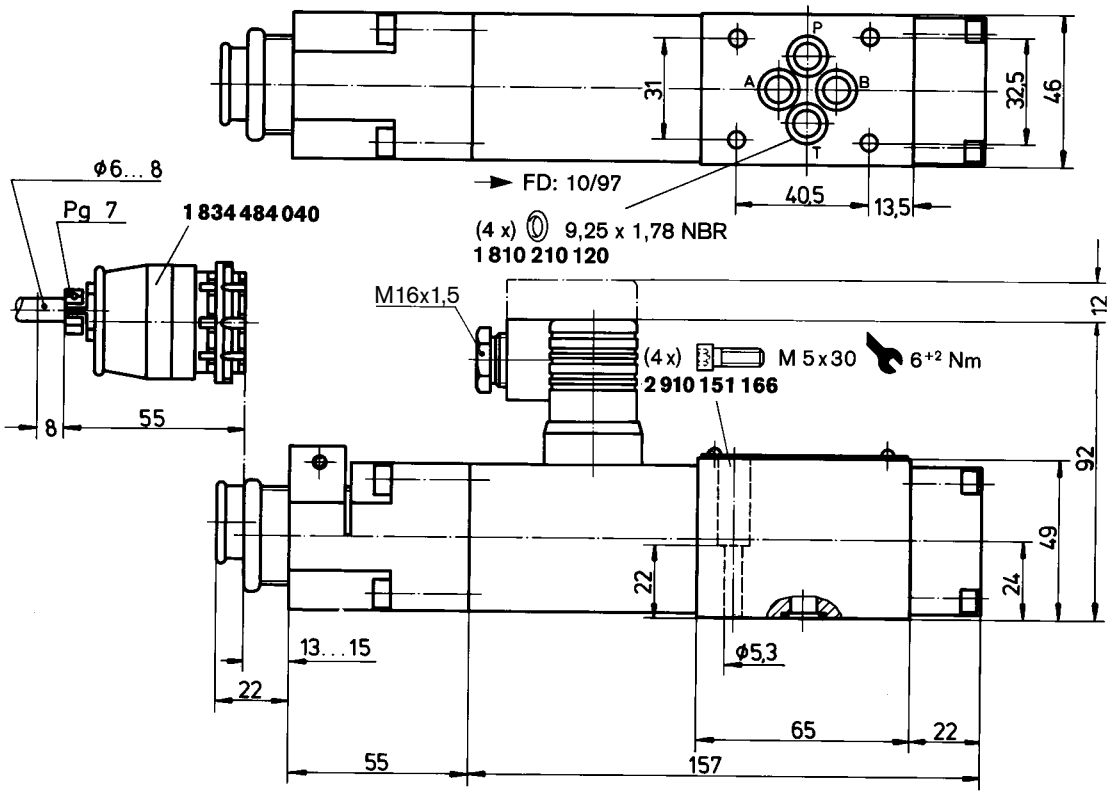



Residual flow "A–P"
(pressure drop)

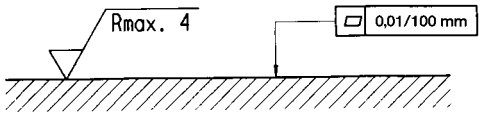


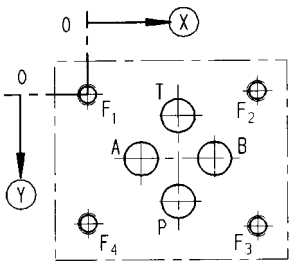
## Unit dimensions NG6 (nominal dimensions in mm)




Required surface quality of mating component



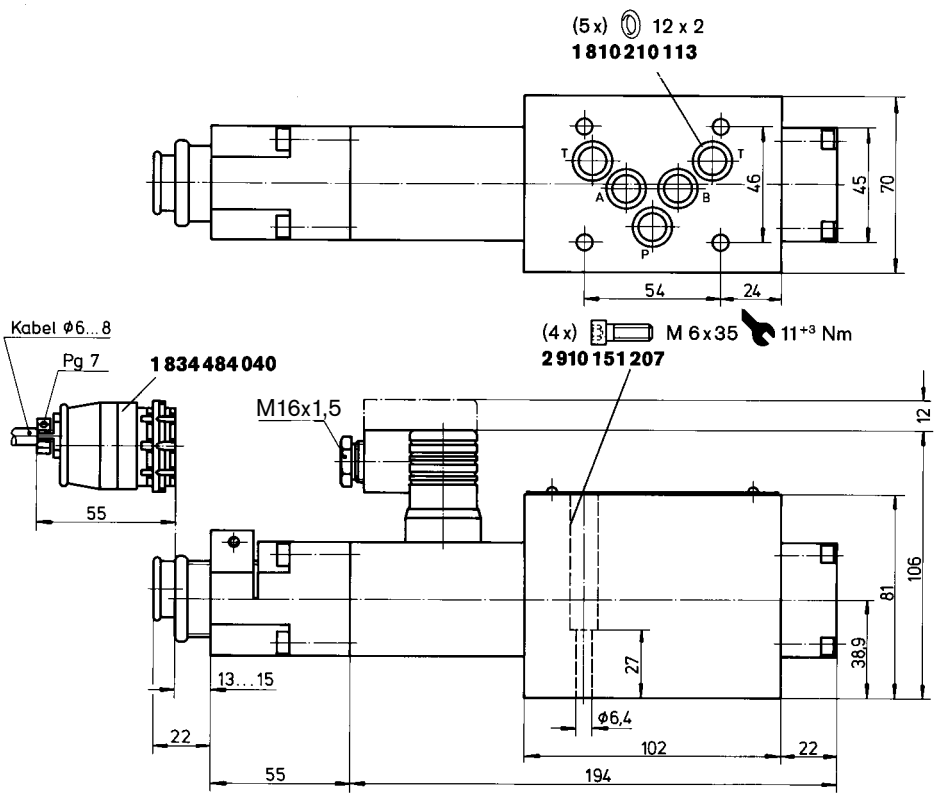

**Mounting hole configuration: NG6** (ISO 4401-03-02-0-94)
For subplates see catalog sheet RE 45053



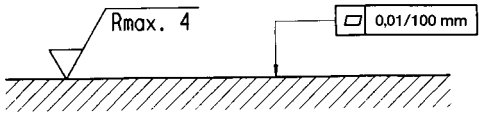

[1] Deviates from standard
[2] Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

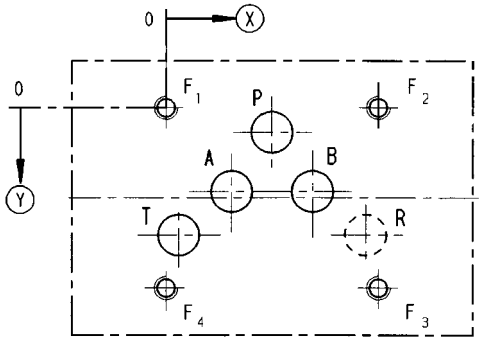
| | P | A | T | B | $F_1$ | $F_2$ | $F_3$ | $F_4$ |
|---|---|---|---|---|---|---|---|---|
| Ⓧ | 21.5 | 12.5 | 21.5 | 30.2 | 0 | 40.5 | 40.5 | 0 |
| Ⓨ | 25.9 | 15.5 | 5.1 | 15.5 | 0 | –0.75 | 31.75 | 31 |
| ∅ | 8 [1] | 8 [1] | 8 [1] | 8 [1] | M5 [2] | M5 [2] | M5 [2] | M5 [2] |

## **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) |