

**RE 29 064/01.03**

Replaces: 12.01

**4/3 proportional directional valves  
direct operated, with integrated control  
electronics, electrical position feedback  
and monitoring of the spool position,  
with test certificate  
Type 4WREEM**

Nominal sizes 6 and 10

Series 2X

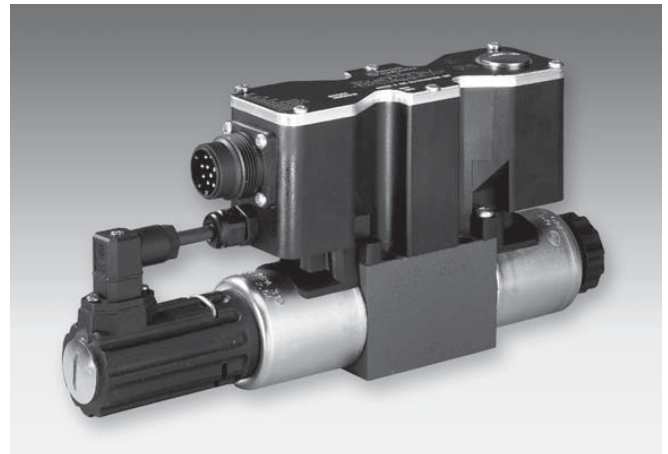
Maximum operating pressure 315 bar

Maximum flow 90 L/min (NS 6)

Maximum flow 180 L/min (NS 10)

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Type 4WREEM 6 ...-2X/G24K34/B6V with integrated control electronics

**Features**

- Directly operated proportional directional valve for the control of the direction and magnitude of a flow
- Operation is by proportional solenoids with central thread and removable coil
- Electrical position feedback
- Integrated control electronics with a B6 interface
- Monitoring the spool position
- With or without a step function
- Spring centred control spool
- For subplate mounting:  
Porting pattern to DIN 24 340 form A, ISO 4401 and CETOP-RP 121 H  
Subplates to catalogue sheets RE 45 052 and RE 45 054  
(separate order), see pages 13 and 14

**With the test certificate PB-168/00 from TÜV NORD** the direct operated proportional directional valves, type 4WREEM, nominal sizes 6 and 10, with spool position monitoring are accepted as a safety relevant component in controls for hydraulic presses. The requirements of the directive 98/37/EG, in line with prEN 12622, prEN 693, EN 954-1, prEN 954-2 and ZH 1/457 are complied with. The test certificate can be ordered under the Material No. **00726872**.



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## Ordering details

4WRE	E	M							- 2X / G24	K34/ B6	V	*
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With integrated control electronics

= E

Monitoring the spool positions

= M

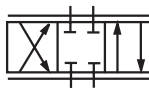
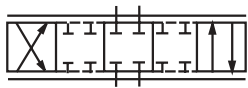
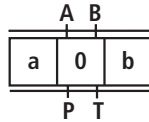
Nominal size 6

= 6

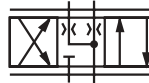
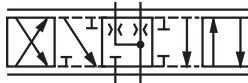
Nominal size 10

= 10

### Symbols



= E  
E1-



= W  
W1-

With symbols E1 and W1:

P → A:  $q_{VNom.}$  B → T:  $q_V/2$

P → B:  $q_V/2$  A → T:  $q_{VNom.}$

### Note:

For spools W and W1 there is, in the neutral position, a connection between A to T and B to T with approx. 3 % of the relevant nominal cross-section.

Further details in clear text

V = FKM rectangular rings, suitable for mineral oil (HL, HLP) to DIN 51 524

### B6 interface:

B6 = Command value input ± 10 VDC

### Electrical connection

K34 = Without plug-in connector with component plug to DIN 43 651-11+PE  
Plug-in connector – separate order, see page 6

G24 = Power supply voltage 24 VDC

2X = Series 20 to 29  
(20 to 29: unchanged installation and connection dimensions)

### Option:

No code = Without step function

J = Electrical compensation of the spool overlap

**Nominal flow** at a valve pressure differential  $\Delta p = 10$  bar

### NS6

04 = 4 L/min

08 = 8 L/min

16 = 16 L/min

32 = 32 L/min

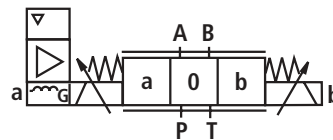
### NS10

25 = 25 L/min

50 = 50 L/min

75 = 75 L/min

## Symbols



## Function, section

The 4/3 proportional directional valves are designed as direct operated components for subplate mounting. They are operated by proportional solenoids with a central thread and removable coil. The control of the solenoids and the spool position is monitored by the control electronics which are integrated into the valve.

With version **4WREEM...** the valve is fitted with a symmetrical spool overlap and monitoring of the direction of function and spool mid position.

Additionally the version **4WREEM...J...** has a step function for compensating this overlap, this means that the spool overlap is quickly passed through.

This valve is mainly used in machines that place high demands with regard to safety, e.g. press controls.

### Design:

The valve basically comprises of the following:

- Housing (1) with mounting face
- Control spool (2) with compression springs (3 and 4)
- Solenoids (5 and 6) with central thread
- Position transducer (7)
- Integrated control electronics (8)

### Functional description:

- With the solenoids (5 and 6), de-energised, the control spool (2) is held in the central position by the compression springs (3 and 4)
- Direct operation of the control spool (2) by energising one of the proportional solenoids, e.g. control of solenoid "b" (6)
  - Movement of the control spool (2) to the left in proportion to the electrical input signal
  - Connection from P to A and B to T via orifice like cross-sections with progressive flow characteristics
- De-energising of solenoids (5 and 6)
  - The control spool (2) is returned to the central position via the compression spring (3)

If an enable signal is not being applied then the output stage is locked and the valve is not functional. Via Pin 8 it is possible to read

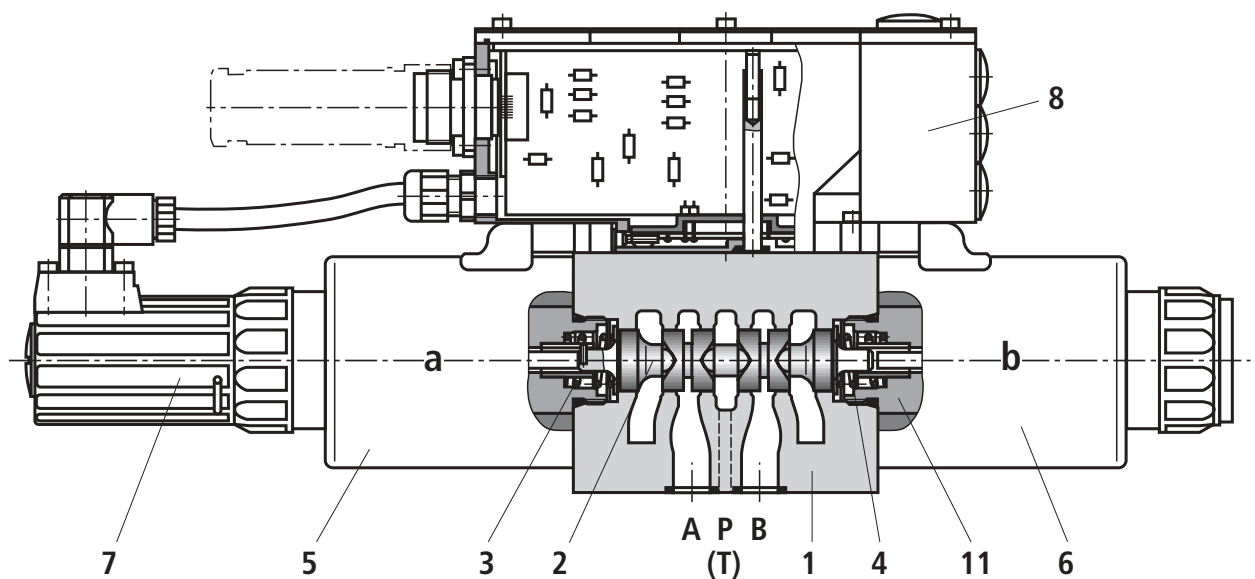
the functional status of the output stages. If the supply voltage fails or a command value is not being applied then the valve is held in its centre position by the centralising springs. In this position, for an E spool, ports A, B, P and T are blocked and with a W spool, A and B are connected to T.

### Monitoring functions:

- Monitoring of the valve spool position via an inductive position transducer
- Recognition of a fault function via the integrated valve electronics
- Isolation of the power output stages takes place by switching off the voltage for the enable (Pin 3)
- Tripping the signals for the logical switching conditions when the limiting values are exceeded (+ Xw and – Xw)
- Directing the signals to the signal output Pins 9, 10 and 11 of the component plug
- Use of the switching signals in a higher control for monitoring functions
- The output stages are activated via the enable input (Pin 3). The status message results via Pin 8.

### The prerequisites for using safety relevant components in hydraulic circuits to category 4, EN 954-1 are:

- The entire control must meet the requirements of **category 4, EN 954-1** and the appropriate requirements of the standard drafts **prEN 12622** or **prEN 693**.
- The command **emergency off** must result in the valve supply voltage being switched off (Pins 1 and 2) and at the enable (Pin 3).
- The scan for valve compression must occur with each press cycle.
- A fault detected by the press control must result in the valve power supply and enable being switched off.
- The valve must not be operated with the spool position sensor hanging downwards.



Type 4WREEM...-2X/G24...

### Note

Draining of the tank line is to be prevented. Taking the installation conditions into account a back pressure valve is to be fitted (back pressure approx. 2 bar).

## Technical data (for applications outside these parameters, please consult us!)

General technical data		NS 6	NS 10
Installation		Horizontal, must not be vertically mounted	
Storage temperature range	°C	– 20 to + 80	
Ambient temperature range	°C	– 20 to + 50	
Weight	kg	2.4	6.5

## Hydraulic technical data (measured with HLP46, $\vartheta_{oil} = 40 \text{ °C} \pm 5 \text{ °C}$ and $p = 100 \text{ bar}$ )

Operating pressure	Ports A, B, P	bar	Up to 315	
	Port T	bar	Up to 210	
Nominal flow $q_{V \text{ nom}}$ at $\Delta p = 10 \text{ bar}$		L/min	4, 8, 16, 32	25, 50, 75
Max. permissible flow		L/min	90	180
Max. permissible leakage flow at $p_e = 100 \text{ bar}$		L/min	$\leq 0.3$	$\leq 0.6$
Pressure fluid	Mineral oil (HL, HLP) to DIN 51 524, other pressure fluids on request			
Pressure fluid temperature range		°C	– 20 to + 80, preferably + 40 to + 50	
Viscosity range		mm <sup>2</sup> /s	20 to 380, preferably 30 to 46	
Degree of contamination			Maximum permissible degree of contamination of the pressure fluid is to NAS 1638 Class 9	A filter is recommended that has a minimum retention rate of $\beta_x \geq 75$ x = 10
Hysteresis		%	$\leq 0.1$	
Reversal span		%	$\leq 0.05$	
Response sensitivity		%	$\leq 0.05$	
Zero displacement		%/10 K	0.15	
		%/100 bar	0.1	

## Electrical technical data

Solenoid coil resistance	Ω	2	4
Duty	%	100	
Max. coil temperature <sup>1)</sup>	°C	Up to 150	
Valve protection to DIN 40 050		IP 65 with mounted and fixed plug-in connector	

## Integrated control electronics

Supply voltage	Nominal voltage	VDC	24
	Lower limiting value	VDC	19
	Upper limiting value	VDC	35
Command value input	Voltage input "B6"	V	$\pm 10$ with $R_e \approx 100 \text{ k}\Omega$
Command value output		V	$\pm 10$
Amplifier power	$I_{\text{max}}$	A	2.0 plus the loading of the switched outputs
consumption	Impulse current	A	3 plus the loading of the switched outputs

<sup>1)</sup> Due to the occurring surface temperature of the solenoid coils, the European Standards EN 563 and EN 982 must be taken into account!



**Note:** For details regarding the **environmental simulation test** covering EMC (electro-magnetic compatibility), climate and mechanical loading see RE 29 064-U (declaration regarding environmental compatibility).

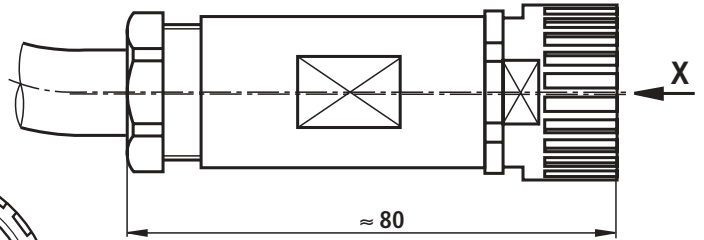
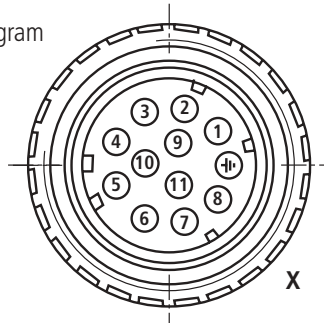
## Integrated control electronics

### Plug-in connector

Plug-in connector to DIN 43 561-11 + PE

Separate order under Material No. **00752278**  
(plastic version)

One cable entry:  $\varnothing$  12 to 14 mm,  
For Pin allocations see block circuit diagram  
on page 6

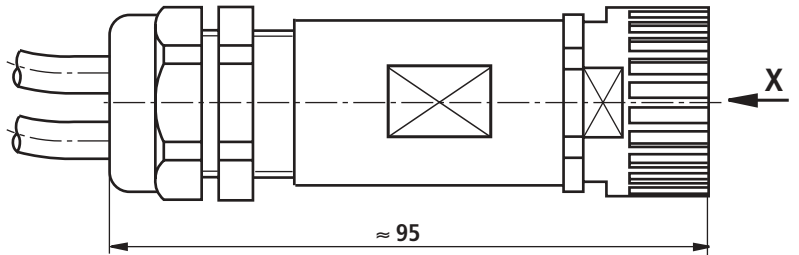


### Plug-in connector

Plug-in connector to DIN 43 561-11 + PE

Separate order under Material No. **00884671**  
(plastic version)

Two cable entries:  $\varnothing$  6 to 8 mm,  
For Pin allocations see block circuit diagram  
on page 6



### Component plug allocation

Contact	B6 interface contact allocation
1	24 VDC ( $u(t) = 19.0 \text{ V to } 35 \text{ V}$ ); $I_{\text{max}} = 2 \text{ A}$ supply voltage
2	0 V
3	Enable input 8.5 VDC to 35 VDC
4, 5	Differential amplifier input $\pm 10 \text{ V}$ command value
6, 7	Differential amplifier output $\pm 10 \text{ V}$ actual valve
8	Power output stages, signal output 0 V or $U_B$
9	Spool position P $\rightarrow$ B
10	Spool position P $\rightarrow$ A
11	Spool zero position
PE	Connected with cooling body and valve housing!

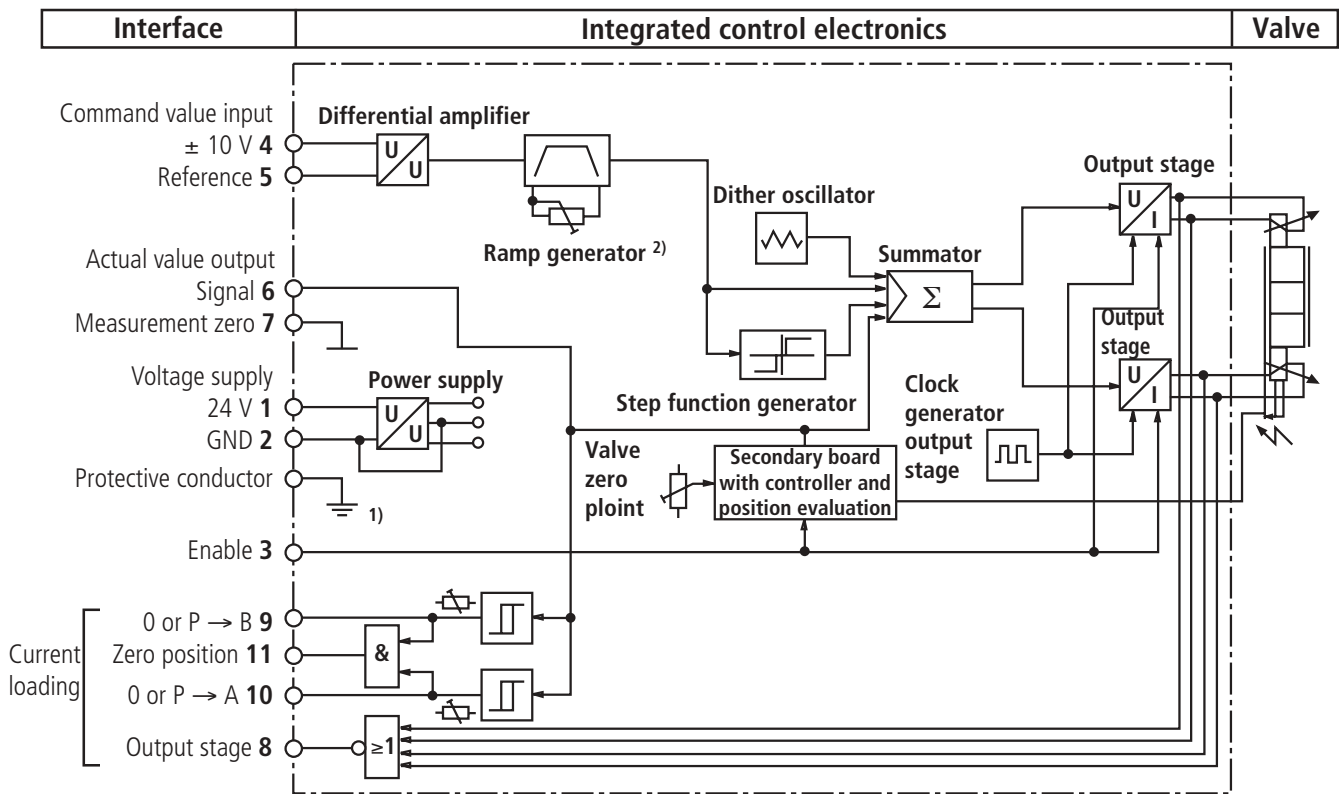
**Command value:** A positive command value (10 V) at 4 and the reference potential at 5 results in a flow from P to A and B to T.  
A negative command value ( $-10 \text{ V}$ ) at 4 and the reference potential at 5 results in a flow from P to B and A to T.

**Actual value:** A positive actual value (10 V) at 6 and the reference potential at 7 results in a flow from P to A.

**Connection cable:** Recommended: – Up to 25 m cable length type LiYCY 7 x 0.75 mm<sup>2</sup>  
– Up to 50 m cable length type LiYCY 7 x 1.0 mm<sup>2</sup>  
Outside diameter 6 to 8 mm (two cable entries) or 12 to 14 mm (one cable entry)  
Only connect the screen to PE on the supply side.

# Integrated control electronics

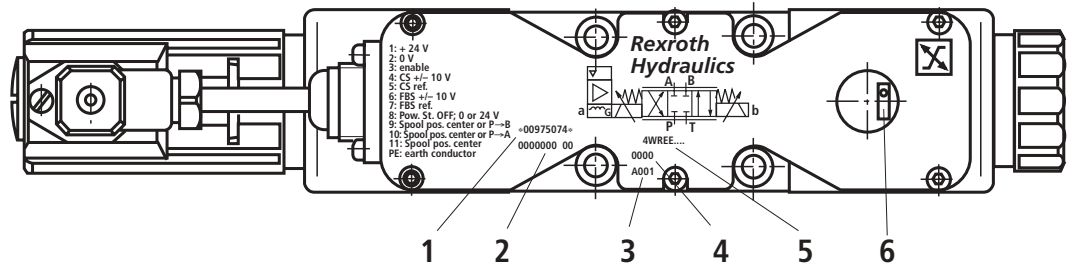
## Block circuit diagram/connection allocation for the integrated control electronics



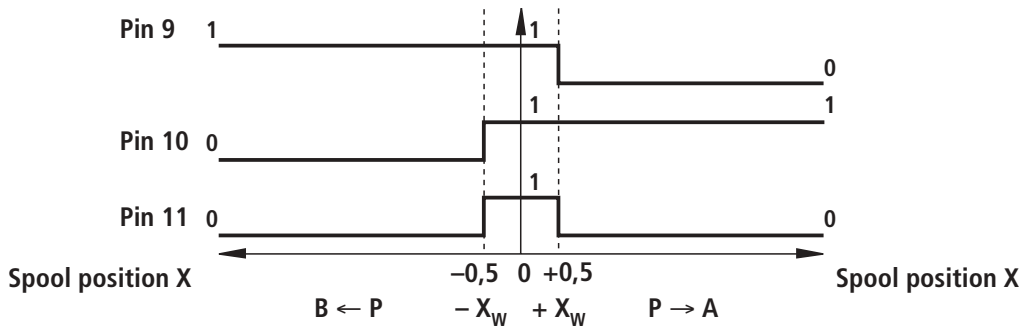
1) The protective conductor is connected to the cooling body and the valve housing

2) Ramp time, max. 2.5 s from 0...100 % spool stroke

- 1 Material number
- 2 Order number
- 3 Build week to RN 125.05
- 4 Consecutive number
- 5 Type code, e.g. 4WREEM...-2X/...
- 6 Ramp time adjustment



### Logical switched conditions for monitoring the spool position



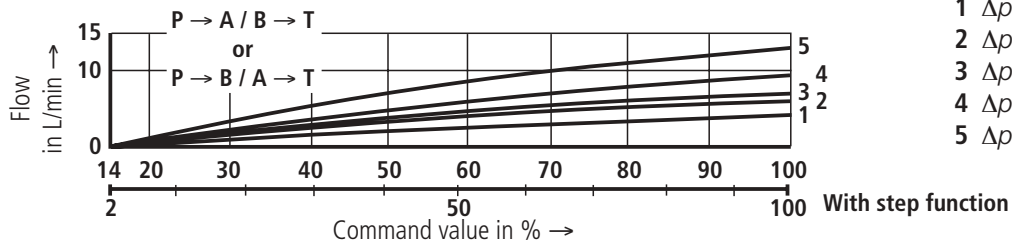
### Logical signal linkages

Spool position	Flow direction	Logical switched conditions		
		Pin 9	Pin 10	Pin 11
$X < -X_W$	B $\leftarrow$ P	1	0	0
$-X_W \leq X \leq X_W$	-	1	1	1
$X > X_W$	P $\rightarrow$ A	0	1	0

0  $\triangleq$  0 V

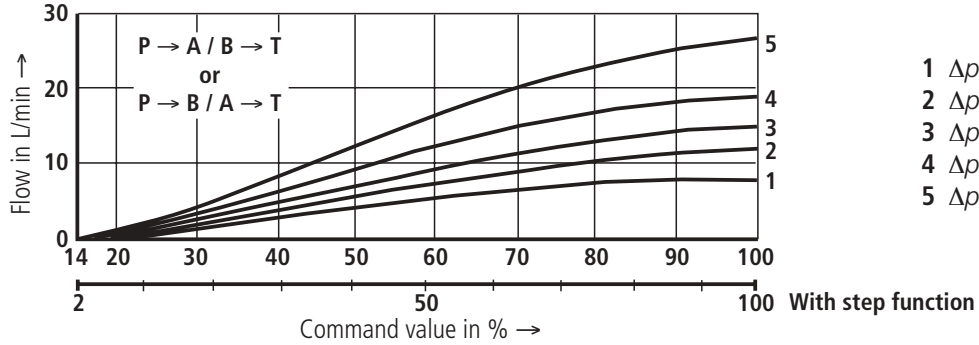
1  $\triangleq$  24 VDC (19.0 V to 35 V)

4 L/min nominal flow at a 10 bar valve pressure differential



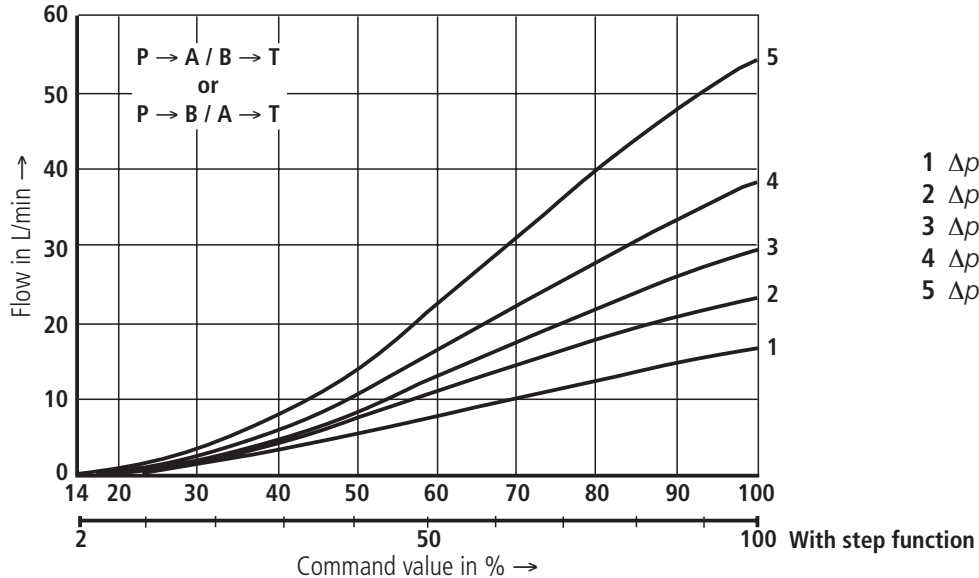
- 1  $\Delta p = 10 \text{ bar constant}$
- 2  $\Delta p = 20 \text{ bar constant}$
- 3  $\Delta p = 30 \text{ bar constant}$
- 4  $\Delta p = 50 \text{ bar constant}$
- 5  $\Delta p = 100 \text{ bar constant}$

8 L/min nominal flow at a 10 bar valve pressure differential



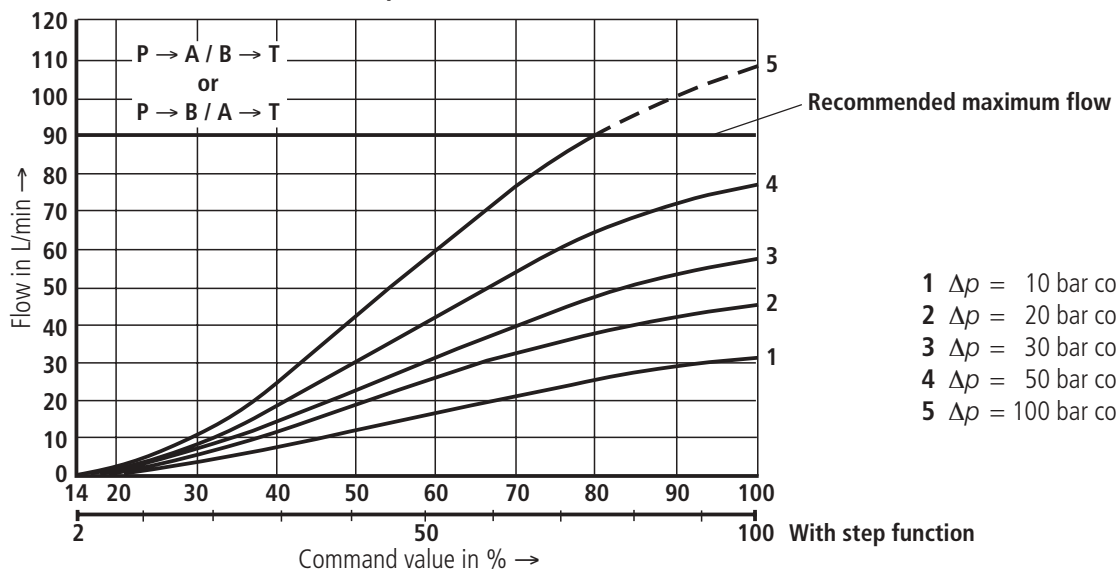
- 1  $\Delta p = 10 \text{ bar constant}$
- 2  $\Delta p = 20 \text{ bar constant}$
- 3  $\Delta p = 30 \text{ bar constant}$
- 4  $\Delta p = 50 \text{ bar constant}$
- 5  $\Delta p = 100 \text{ bar constant}$

16 L/min nominal flow at a 10 bar valve pressure differential



- 1  $\Delta p = 10 \text{ bar constant}$
- 2  $\Delta p = 20 \text{ bar constant}$
- 3  $\Delta p = 30 \text{ bar constant}$
- 4  $\Delta p = 50 \text{ bar constant}$
- 5  $\Delta p = 100 \text{ bar constant}$

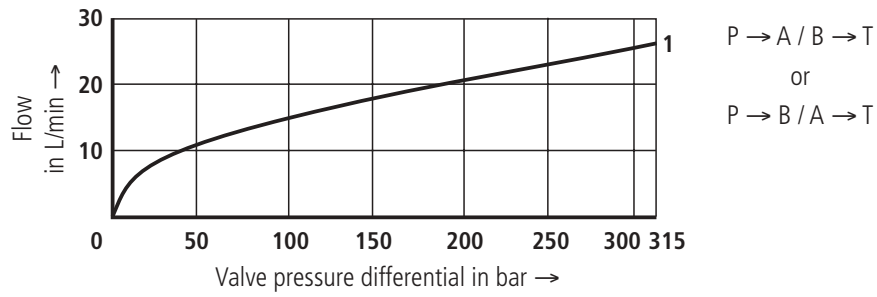
32 L/min nominal flow at a 10 bar valve pressure differential



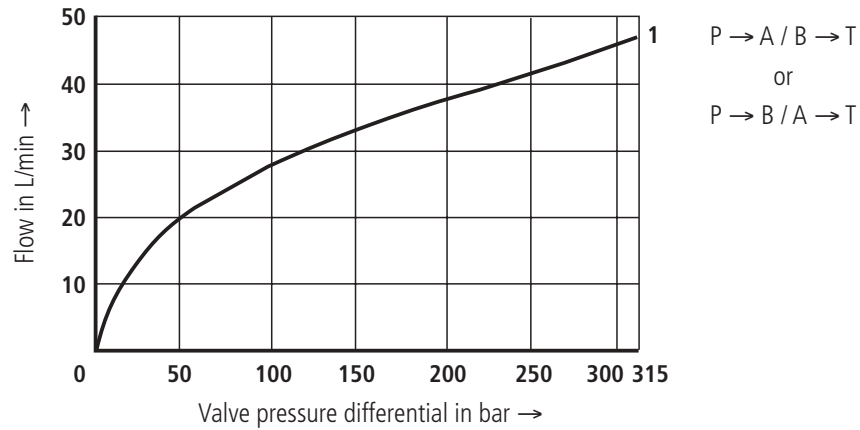
- 1  $\Delta p = 10 \text{ bar constant}$
- 2  $\Delta p = 20 \text{ bar constant}$
- 3  $\Delta p = 30 \text{ bar constant}$
- 4  $\Delta p = 50 \text{ bar constant}$
- 5  $\Delta p = 100 \text{ bar constant}$

$\Delta p =$  Valve pressure differential (inlet pressure differential  $p_p$  minus the load pressure  $p_L$  minus the return pressure  $p_T$ )

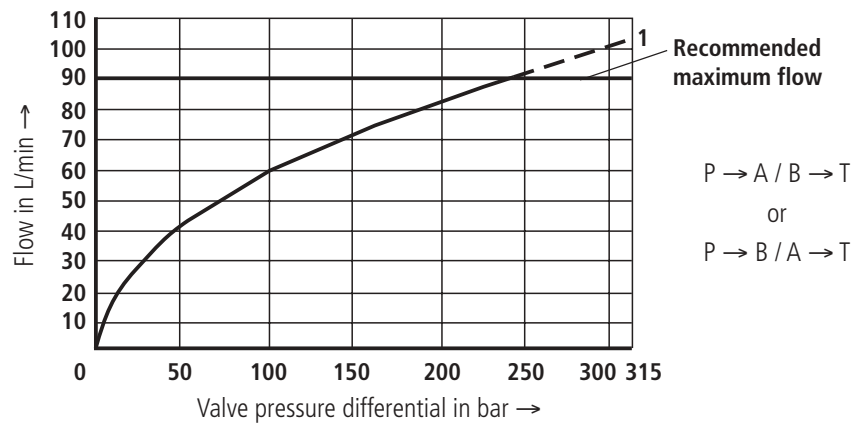
Nominal flow 4 L/min



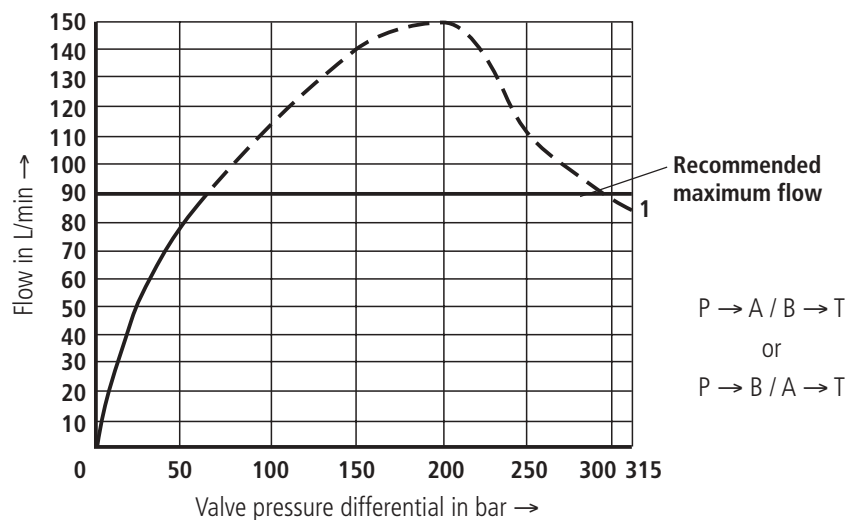
Nominal flow 8 L/min



Nominal flow 16 L/min



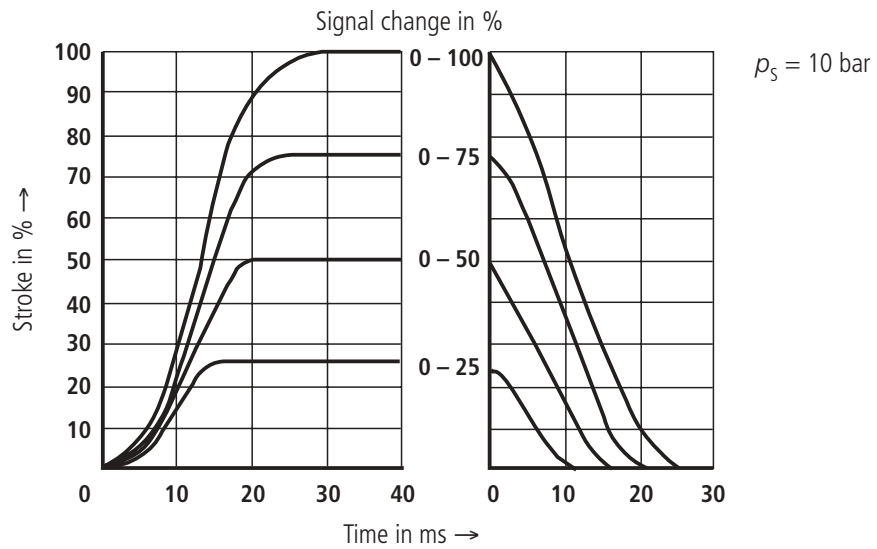
Nominal flow 32 L/min



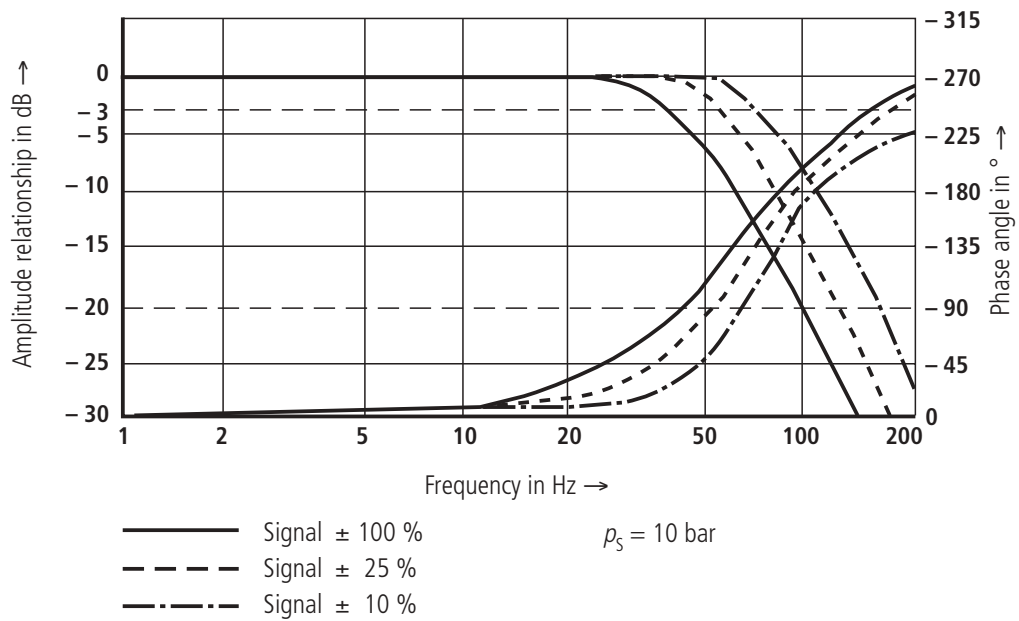
1 Command value = 100 %



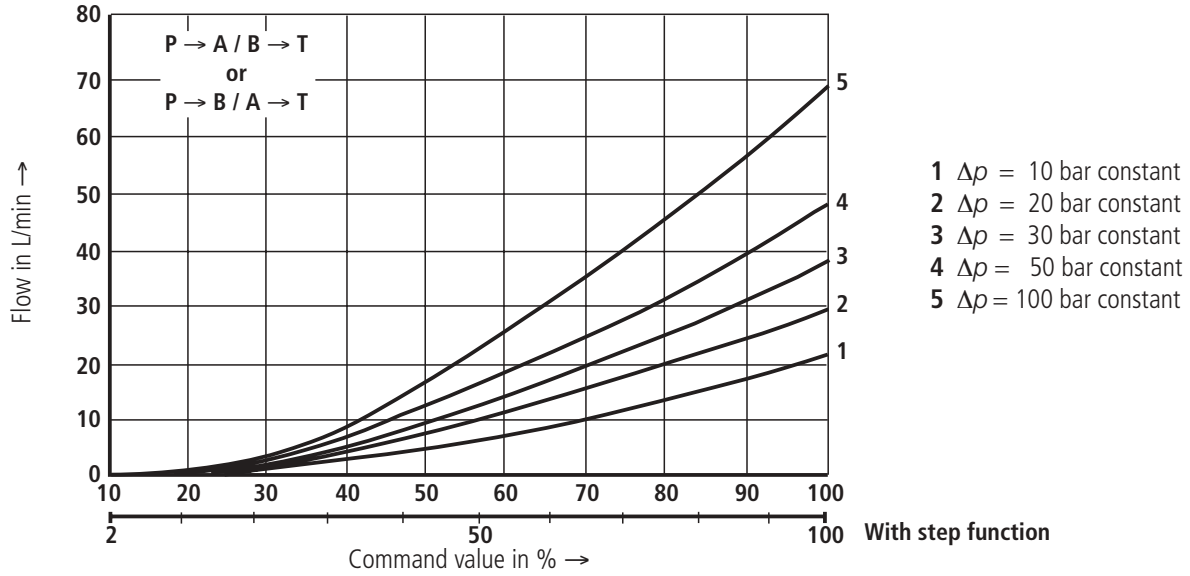
(measured with HLP46 and  $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ )



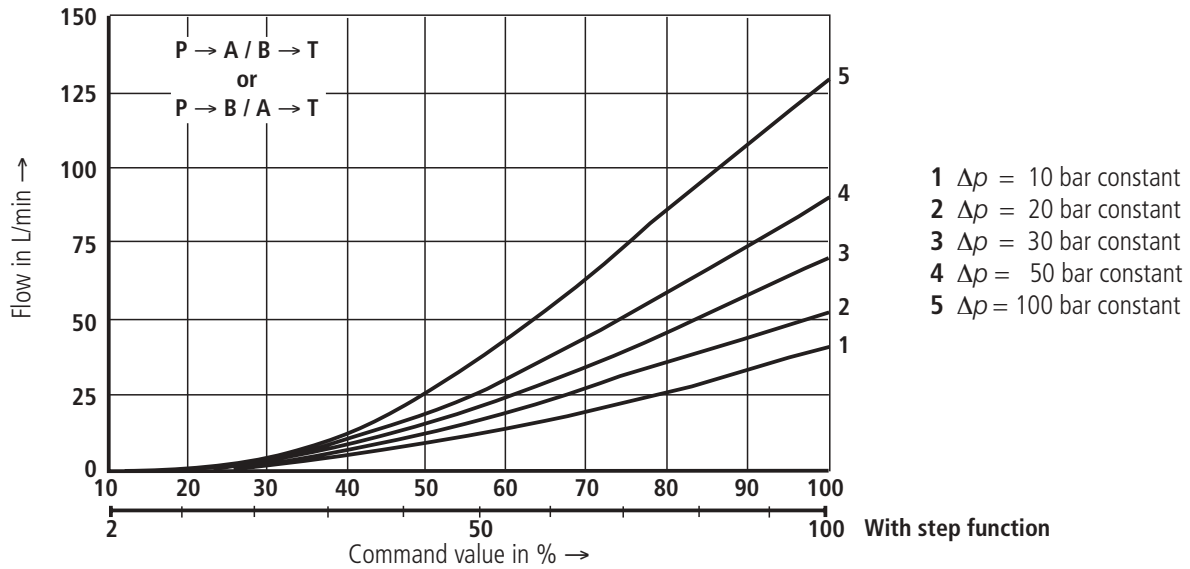
Frequency response characteristic curves for type 4WREEM (measured with HLP46 and  $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ )



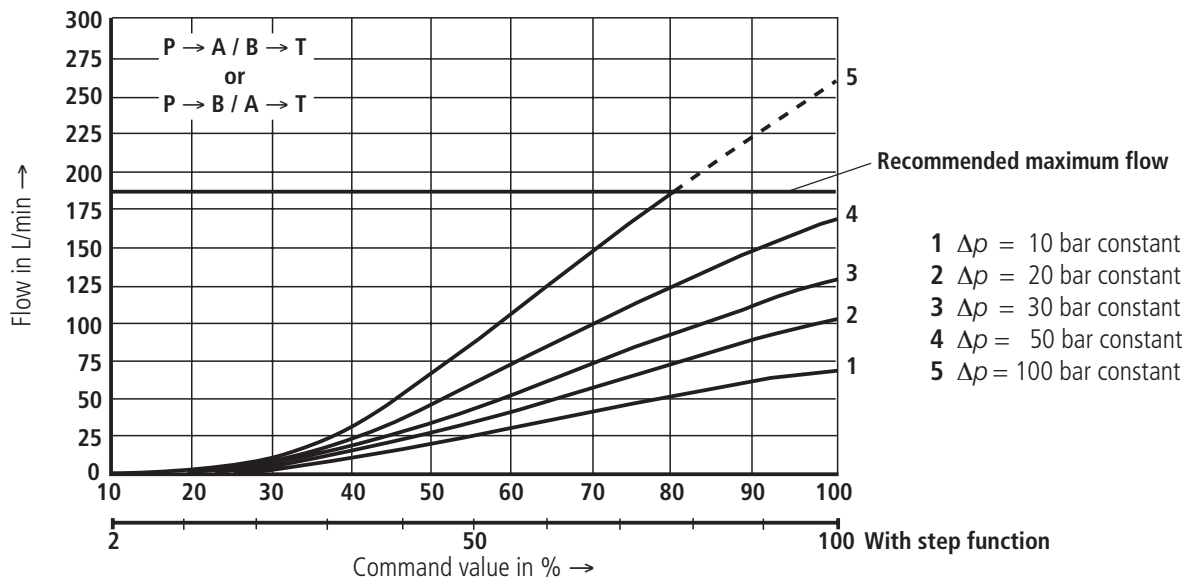
25 L/min nominal flow at a 10 bar valve pressure differential



50 L/min nominal flow at a 10 bar valve pressure differential

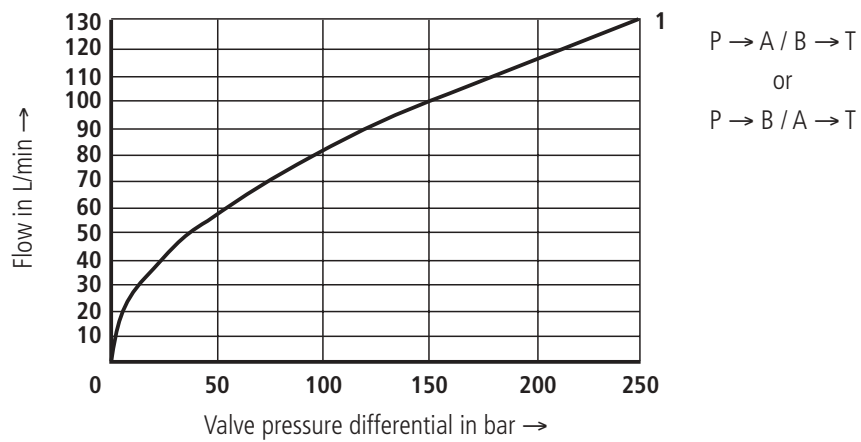


75 L/min nominal flow at a 10 bar valve pressure differential

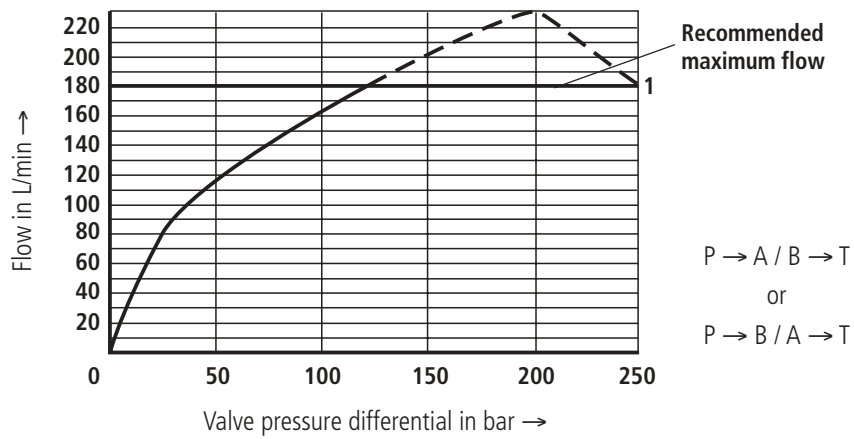


$\Delta p =$  Valve pressure differential (inlet pressure  $p_p$  minus load pressure  $p_L$  minus the return pressure  $p_T$ )

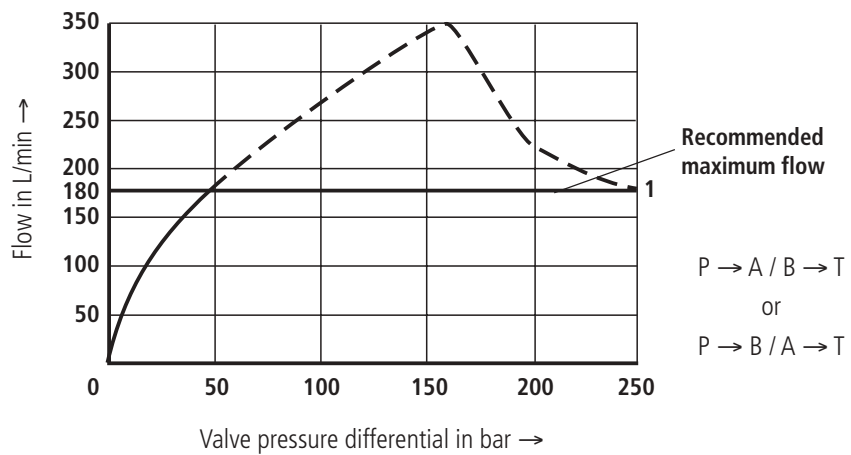
Nominal flow 25 L/min



Nominal flow 50 L/min

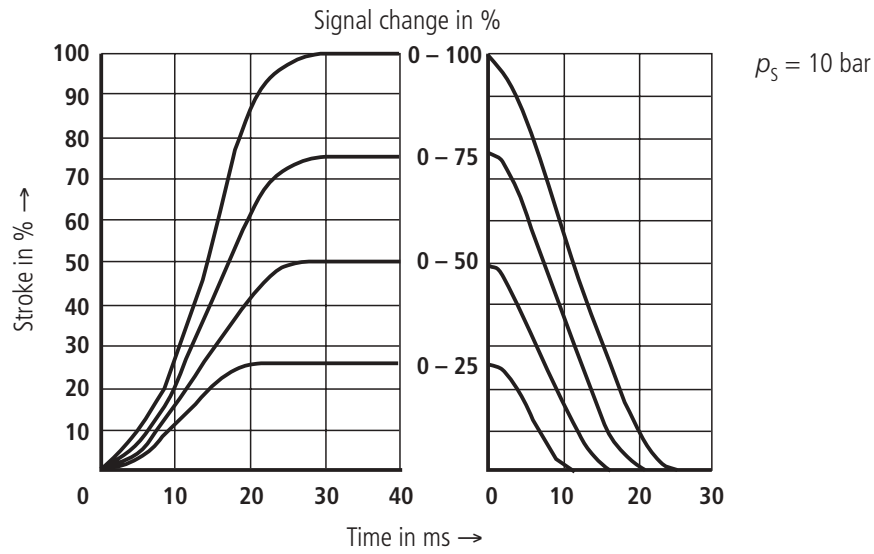


Nominal flow 75 L/min

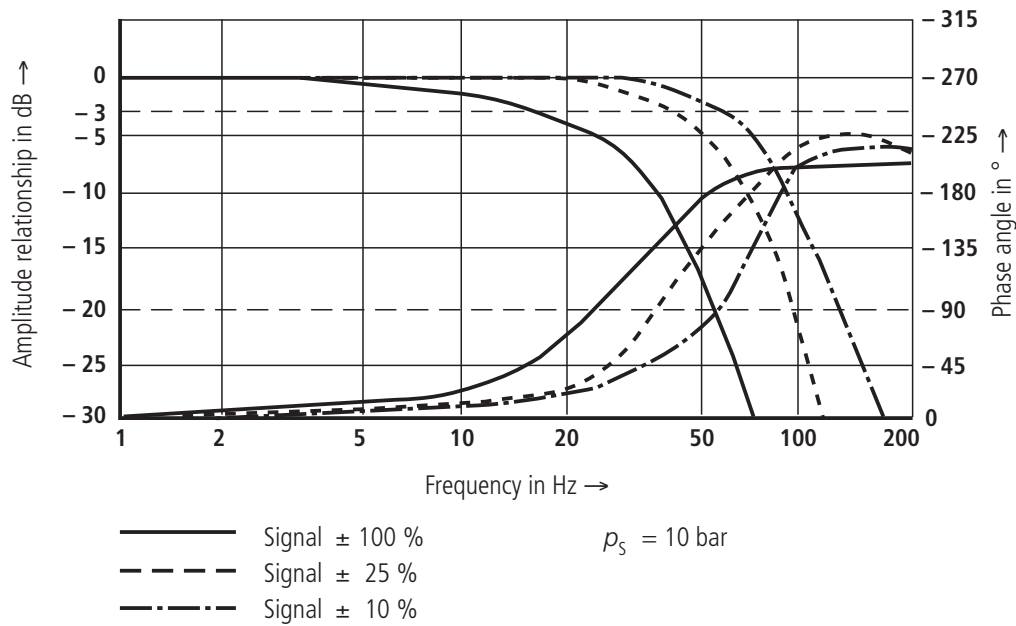


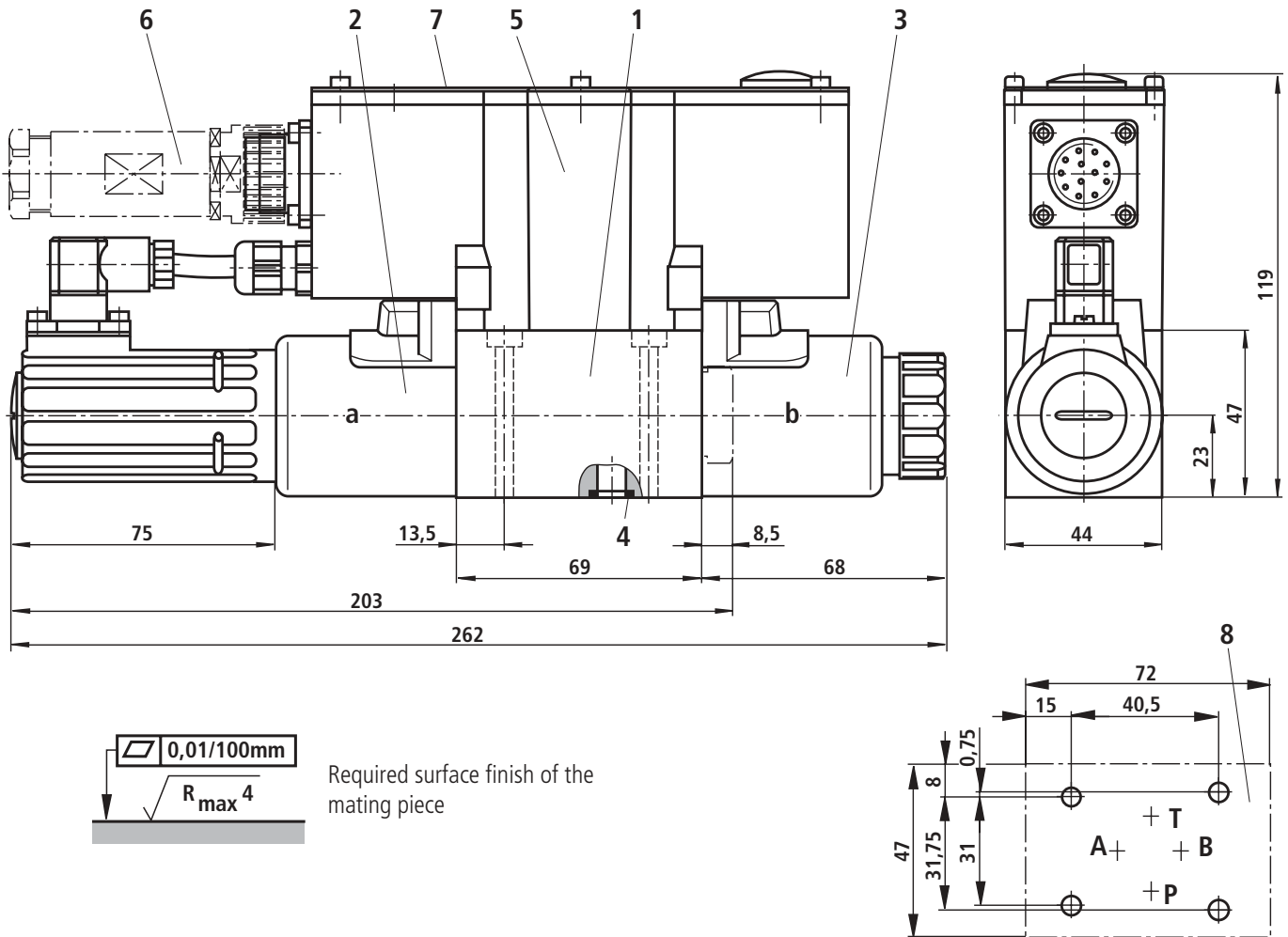
1 Command value = 100 %

(measured with HLP46 and  $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ )



Frequency response characteristic curves for type 4WREEM (measured with HLP46 and  $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ ) NS 10



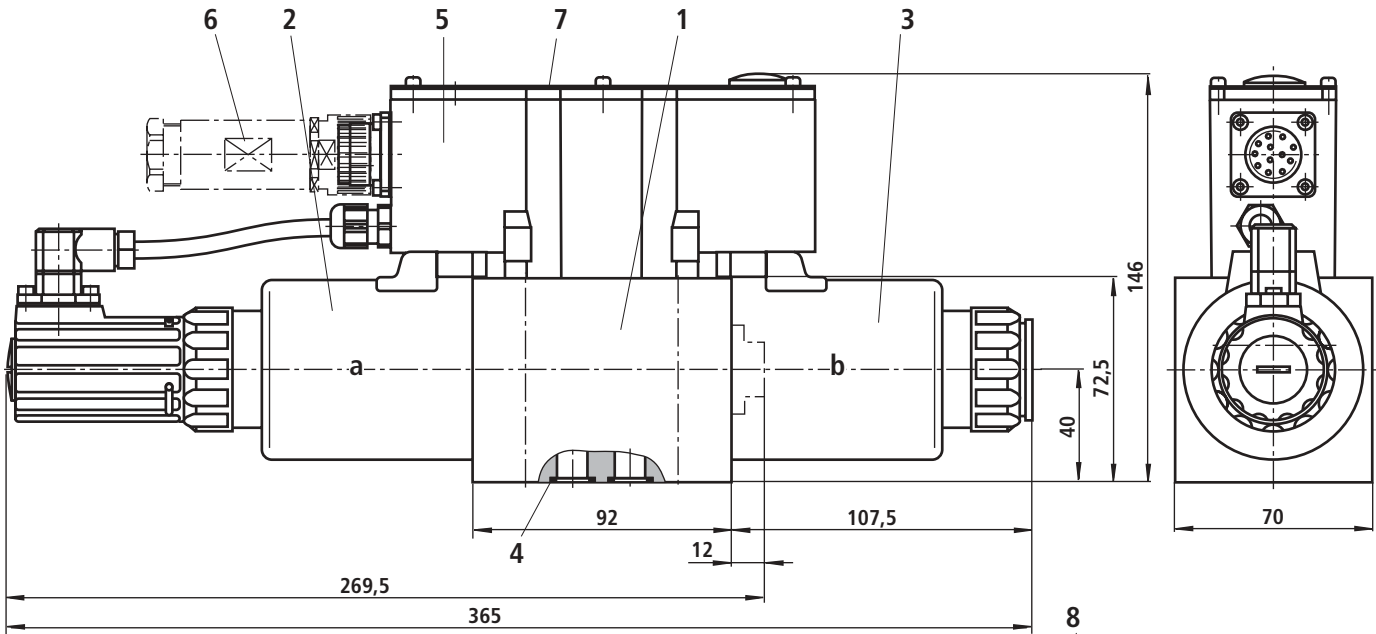


Subplates to catalogue sheet RE 45 052 and valve fixing screws must be ordered separately.

**Subplates:**  
 G341/01 (G1/4)  
 G342/01 (G3/8)  
 G502/01 (G1/2)

**Valve fixing screws:**  
 4 off M5 x 50 DIN 912-10.9;  $M_A = 8.9 \text{ Nm}$

- 1 Valve housing
- 2 Proportional solenoid "a" with inductive position transducer
- 3 Proportional solenoid "b"
- 4 R-ring 9.81 x 1.5 x 1.78 (ports A, B, P, T)
- 5 Integrated control electronics
- 6 Plug-in connector to DIN 43 561-11 + PE (separate order, see page 5)
- 7 Name plate
- 8 Machined valve mounting surface and location of the connections to DIN 24 340 form A, ISO 4401 and CETOP-RP121H

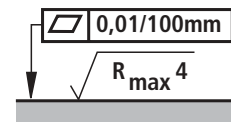
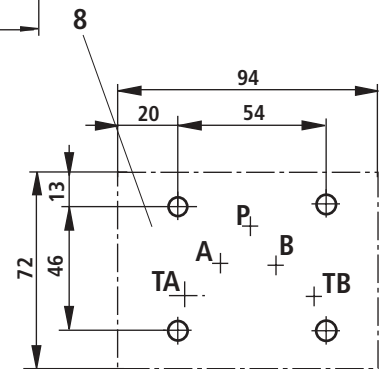


Subplates to catalogue sheet RE 45 054 and valve fixing screws must be ordered separately.

**Subplates:** G66/01 (G3/8)  
G67/01 (G1/2)  
G534/01 (G3/4)

**Valve fixing screws:**  
4 off M6 x 40 DIN 912-10.9;  
 $M_A = 15.5 \text{ Nm}$

- 1 Valve housing
- 2 Proportional solenoid "a" with inductive position transducer
- 3 Proportional solenoid "b"
- 4 R-ring 13.0 x 1.6 x 2.0 (ports A, B, P, TA, TB)
- 5 Integrated control electronics
- 6 Plug-in connector to DIN 43 561-11 + PE (separate order, see page 5)
- 7 Name plate
- 8 Machined valve mounting surface and location of the connections to DIN 24 340 form A, ISO 4401 and CETOP-RP121H



Required surface finish of the mating piece

**Bosch Rexroth AG  
Industrial Hydraulics**

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Tel: 0 14 80/22 32 56  
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E-mail: info@boschrexroth.co.uk

The data specified above only serves to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The details stated do not release you from the responsibility for carrying out your own assessment and verification. It must be remembered that our products are subject to a natural process of wear and ageing.

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