

RE 29 583/10.02

Replaces: 03.99

**Servo directional valve of 4-way design
Type 4WS.2E...**

Nominal size 10

Series 5X

Maximum operating pressures 210 / 315 bar

Maximum flow 180 L/min

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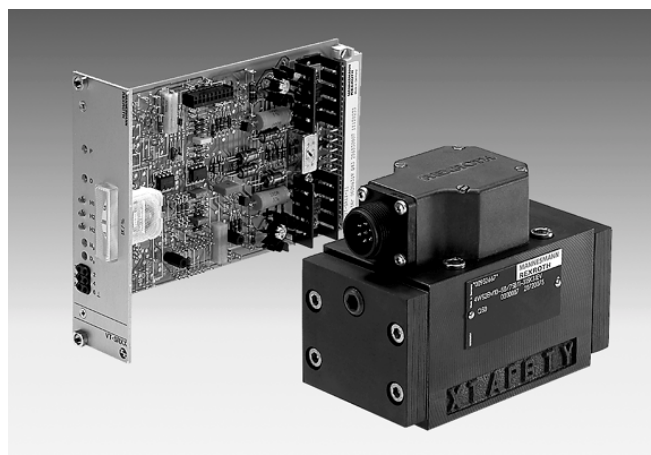
Features

- Valve control for closed loop position, force and speed control
- 2-stage servo valve with mechanical or mechanical and electrical feedback
- 1st stage as jet/flapper plate amplifier
- For subplate mounting,
Porting pattern to DIN 24 340 form A10 with ports X and Y
Subplates to catalogue sheet RE 45 054 (separate order)
- Dry torque motor, no contamination of the magnetic gap by the pressure fluid
- Can also be used as a 3-way version
- Wear-free spool return element
- Three control variants
- Control:
 - External electronics in Eurocard or modular format (separate order), see page 7
 - Or with the electronics integrated into the valve
- Valve and integrated electronics are adjusted and tested
- Pilot oil supply and drain, internal/external can be changed without dismantling the valve
- Spool with flow force compensation
- Exchangable control bush with central fixing
- Pressure chambers in the control bush have gap seals, no O-ring wear
- Filter for 1st stage is externally accessible



H/A/D 5892/97

Type 4WS2ED 10-5X/...B...K31EV with mechanical and electrical feedback and integrated control electronics



H/A/D 5893/97

Type 4WS2EM 10-5X/...B...K31EV with mechanical feedback and the relevant external control electronics (separate order)



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Ordering details

		10	-5X /	B			K31	E	V	*	
Electrically actuated 2-stage servo valve in a 4-way version										⑦	Further details in clear text
For external control electronics	= 4WS2E									⑥	FKM seals, suitable for mineral oil (HL, HLP) to DIN 51 524
With integrated control electronics	= 4WSE2E									⑤	Spool overlap
Mechanical feedback	= M									E =	0 to 0.5 % negative
Mechanical and electrical feedback (only available with integrated electronics)	= D									K31 =	Electrical connections
Nominal size 10	= 10										Without plug-in connector, with component plug to E DIN 43 563-AM6-3 Plug-in connector – separate order, see page 8
Series 50 to 59 (50 to 59: unchanged installation and connection dimensions)	= 5X									④	Inlet pressure range for the 1st stage
Nominal flow										210 =	10 to 210 bar
With a valve pressure differential $\Delta p = 70$ bar	①									315 =	10 to 315 bar
20 L/min	= 20									③	Pilot oil supply and drain
30 L/min	= 30									- =	External supply, external drain
45 L/min	= 45									E =	Internal supply, external drain
60 L/min	= 60									T =	External supply, internal drain
75 L/min	= 75									ET =	Internal supply, internal drain (standard)
90 L/min	= 90									②	Valves for external control electronics: Coil no. 11 (30 mA / 85 Ω per coil)
										11 =	Valves with integrated control electronics: Control:
											Com. value Act. value (only provided with 4WSE2ED...)
										9 =	± 10 V ± 10 V
										13 =	± 10 mA ± 10 mA

① Nominal flow

The nominal flow refers to a 100 % command value signal at a valve pressure differential of 70 bar (35 bar per control land). This valve pressure differential is to be considered as a reference value. Other values cause a change to the flow.

A possible nominal flow tolerance of ± 10 % (see flow signal function on page 10) must be taken into consideration.

② Electrical control data

Valves for **external** control electronics: The control signal has to be generated by a current regulated output stage. For servo amplifiers see page 7.

Valves with **integrated** control electronics: For valves with integrated control electronics the command value can be a voltage (ordering code „9“) or where there is extensive cabling (> 25 m between the control and valve) as a current (ordering code „13“).

③ Pilot oil

Care should be taken to ensure that the pilot oil supply pressure is as constant as possible. It is therefore often advantageous to provide an external pilot control via port X. To positively influence the dynamics, the valve can be operated with a higher pressure at port X than at port P.

④ Inlet pressure range

The system pressure should be held as constant as possible.

Pilot pressure range: 10 to 210 bar or 10 to 315 bar

With reference to the dynamics the frequency relationship within the permissible pressure range has to be taken into account.

⑤ Spool overlap

The spool overlap given in % relates to the nominal stroke of the control spool.

Further spool overlaps are available on request!

⑥ Seal materials

If a different seal material is required please consult us!

⑦ Further details in clear text

Here special requirements should be stated in clear text. Following the receipt of an order these requirements will be checked at the factory and valve code supplemented with an additional number.

Test unit

Test unit (battery operated, optionally with a power supply) to catalogue sheet RE 29 681

Attention:

- Only for valves with external control electronics

Test unit for proportional and servo valves with integrated control electronics

Type VT-VET-1, series 1X to catalogue sheet RE 29 685.

The test unit is used for the control and for functional testing of proportional and servo valves with integrated electronics. It is suitable for testing valves with an operating voltage of ± 15 V or 24 V.

The following modes of operation are possible:

- External operation → passing on the operating voltage and command values from the control cabinet to the valve
- Internal/external operation → command value via the test unit; operating voltage from the control cabinet
- Internal operation → operating voltage via a separate power supply; command value via the test unit
- Command values via the BNC socket → optional operational voltage

Preferred type (readily available)

Valves for external control electronics, mechanical feedback

Material No.	Type 4WS2EM
00909227	4WS2EM 10-5X/20B11ET315K31EV
00949285	4WS2EM 10-5X/30B11ET315K31EV
00909297	4WS2EM 10-5X/45B11ET315K31EV
00949286	4WS2EM 10-5X/60B11ET315K31EV
00909219	4WS2EM 10-5X/75B11ET315K31EV
00922801	4WS2EM 10-5X/90B11ET315K31EV

Valves with integrated control electronics, mechanical feedback

Material No.	Type 4WSE2EM
00946690	4WSE2EM 10-5X/20B9ET315K31EV
00949287	4WSE2EM 10-5X/30B9ET315K31EV
00949288	4WSE2EM 10-5X/45B9ET315K31EV
00946396	4WSE2EM 10-5X/60B9ET315K31EV
00949289	4WSE2EM 10-5X/75B9ET315K31EV
00909296	4WSE2EM 10-5X/90B9ET315K31EV

Preferred types and standard components are highlighted in the RPS (Standard Price list).

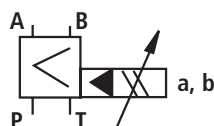
Valves with integrated control electronics, mechanical and electrical feedback

Material No.	Type 4WSE2ED
00918001	4WSE2ED 10-5X/20B9ET315K31EV
00918003	4WSE2ED 10-5X/30B9ET315K31EV
00921236	4WSE2ED 10-5X/45B9ET315K31EV
00944398	4WSE2ED 10-5X/60B9ET315K31EV
00927674	4WSE2ED 10-5X/75B9ET315K31EV
00918008	4WSE2ED 10-5X/90B9ET315K31EV

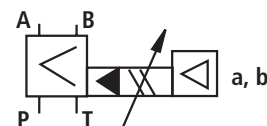
Symbols

Simplified

Valves for external control electronics

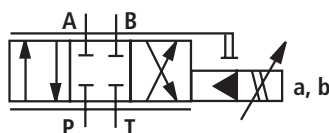


Valves with integrated control electronics

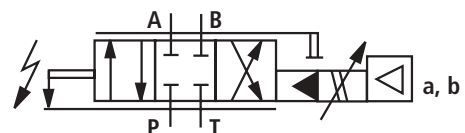


Detailed

Mechanical feedback



Electrical and mechanical feedback



Function, section

4WS(E)2EM10-5X/...

The valve types 4WS(E)2EM10-5X/... are electrically actuated, 2-stage servo directional valves with a porting pattern to DIN 24 340 form A10. They are primarily used for the closed loop control of position, force and velocity.

These valves comprise of an electro-mechanical convertor (torque motor) (1), a hydraulic amplifier (flapper jet principle) (2) and a control spool (3) in a bush (2nd stage), that is connected to the torque motor via a mechanical feedback.

Via an electrical input signal at the coils (4) of the torque motor, a force is generated via a permanent magnet at the armature (5), that in conjunction with a torque tube (6) generates a torque. Due to this the flapper plate (7), which is connected with the torque tube (6) via a rod, is moved out of the central position between the control orifices (8) a pressure differential now results which acts on the front face of the control spool. This pressure differential causes the spool to move, whereby the pressure connection is connected to an actuator connection and at the same time the other actuator connection is connected to the return connection.

The control spool is connected via a feedback spring (mechanical feedback) (9) to the flapper plate and torque motor. The control spool continues to change position until the torque feedback, via the feedback spring and the electro-magnetic torque of the torque motor are balanced, and the pressure differential at the flapper jet system becomes zero.

The stroke of the control spool and thus the flow through the pilot control valve is closed loop controlled in proportion to the electrical input signal. It has, however to be taken into account that the flow is dependent on the valve pressure differential.

External control electronics, type 4WS2EM10-5X/... (separate order)

External electronics, (servo amplifier), are used to control the valve, they so amplify the analogue input signal (command value) that the controlled current output signal is capable of driving the servo valve.

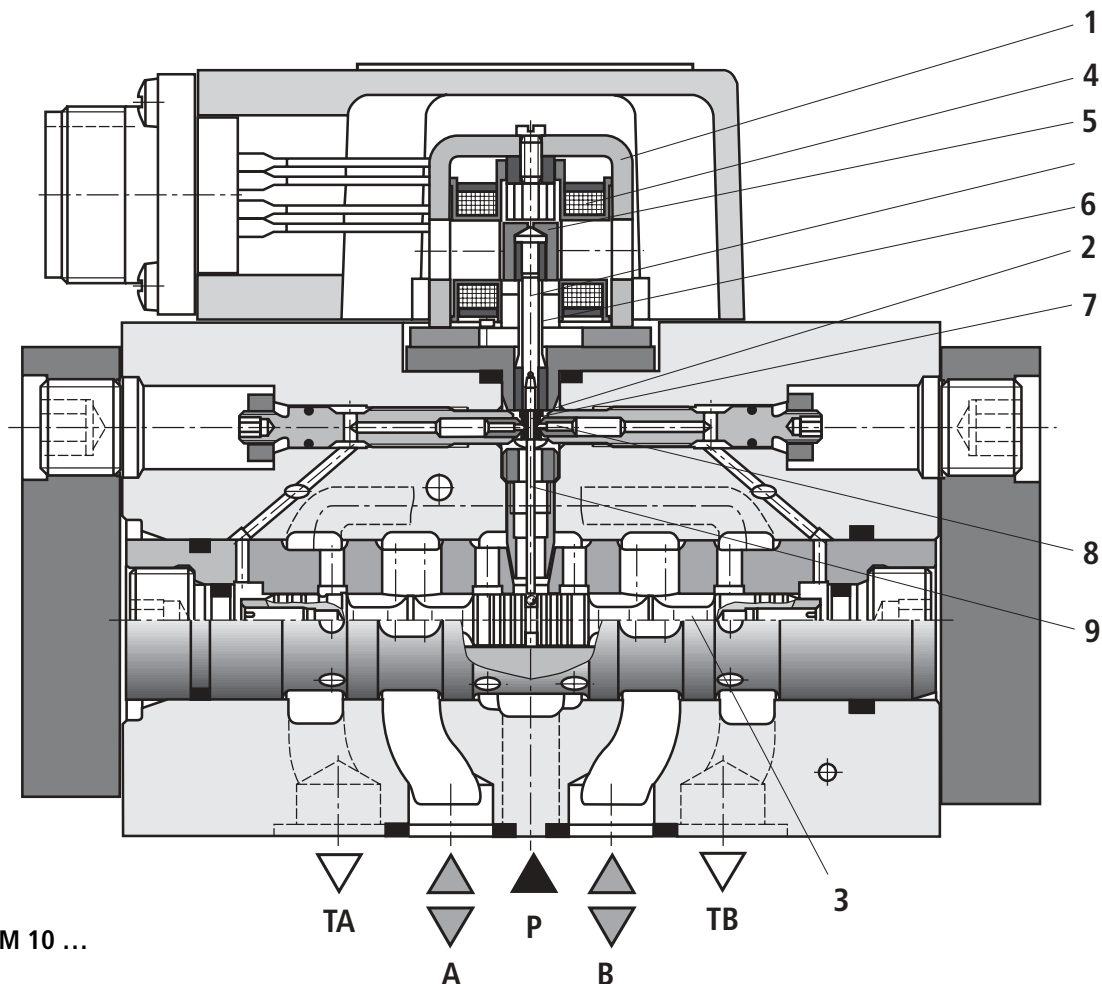
Integrated control electronics, types 4WSE2EM10-5X/... and 4WSE2ED10-5X/...

For the amplification of the analogue input signal control electronics (10), which are specially matched to this valve, are integrated into the valve. They are built into the torque motor cover plate. The valve zero point can be adjusted by a potentiometer which is externally accessible.

4WSE2ED10-5X/...

This type of valve has in addition to the mechanical control via a feedback spring an electrical spool position acquisition and closed loop control. The spool position is obtained via an inductive position transducer (11). The position transducer signal is compared with the command value via the integrated control electronics (10). Any possible control deviation is electrically amplified and then passed onto the torque motor as a control signal. With the additional electrical feedback it is possible to obtain higher dynamic values in the small signal range than the mechanical version due to the electrical closed loop amplification. The mechanical feedback ensures that, in the case of failure of the electrical power supply, the spool is positioned in the zero range.

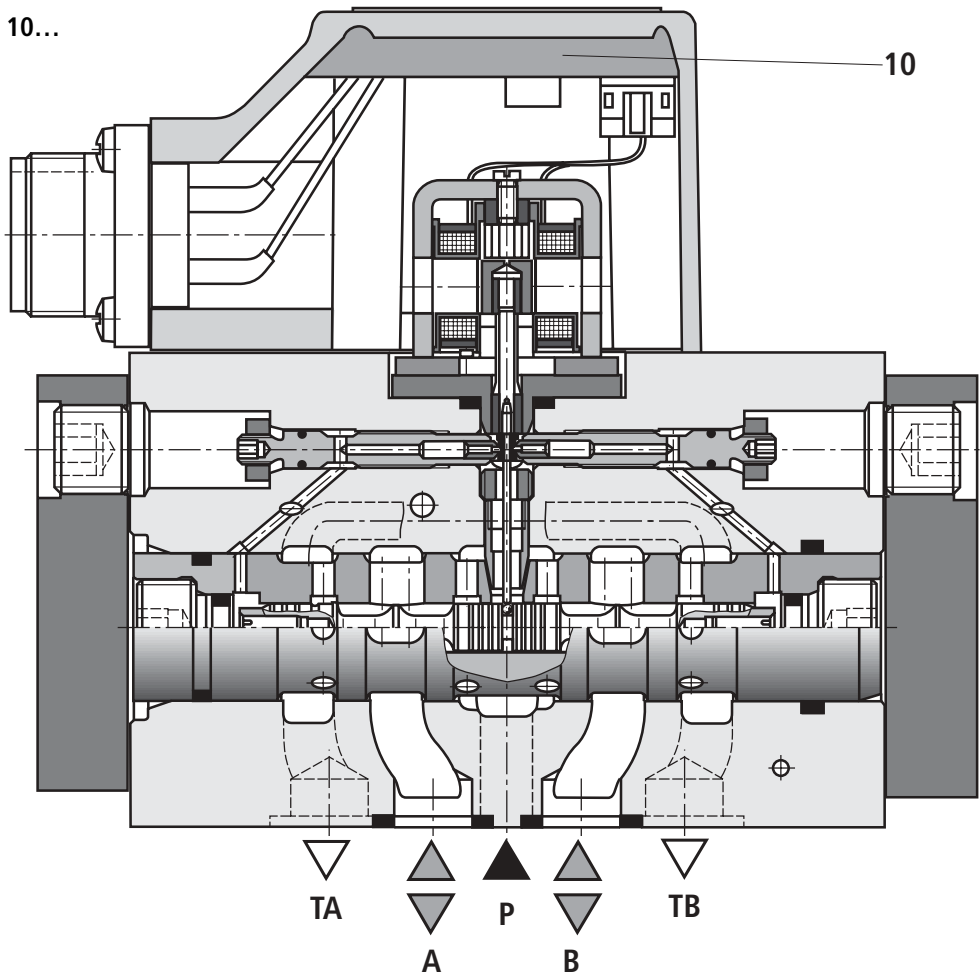
The valve is only available with integrated control electronics. The valve zero point can be adjusted by an externally accessible potentiometer.



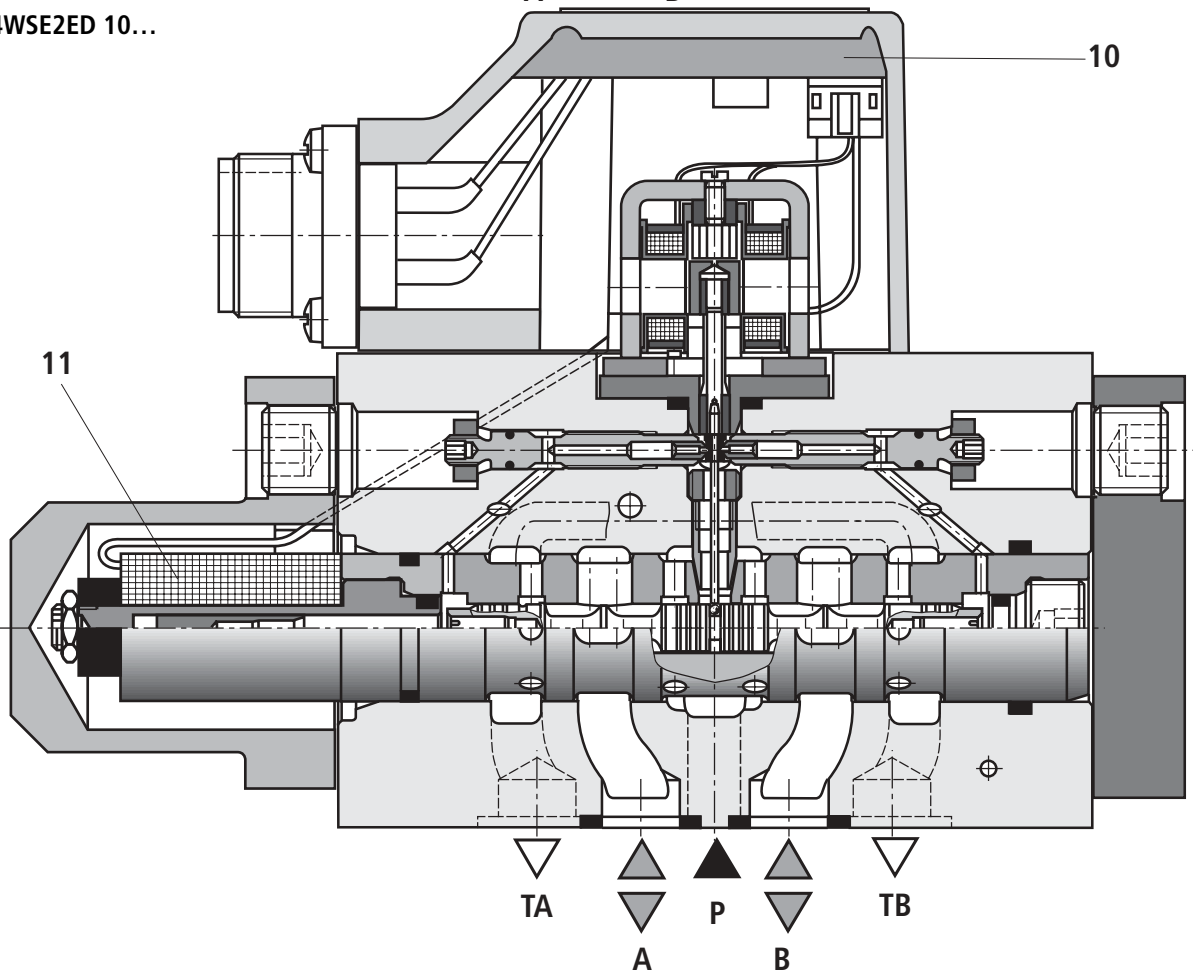
Type 4WS2EM 10 ...

Section

Type 4WSE2EM 10...



Type 4WSE2ED 10...



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

General

Porting pattern		DIN 24 340 form A10	
Installation		Optional, it has to be ensured the pilot control is supplied with adequate pressure, (≥ 10 bar) when starting-up the system!	
Storage temperature range		°C	-20 to +80
Ambient temperature range		°C	-30 to +70 valves with external control electronics -20 to +60 valve with integrated electronics
Weight	With mechanical feedback	kg	3.56
	With mechanical and electrical feedback and integrated electronics	kg	3.65

Hydraulic (measured with HLP 32, $\vartheta_{oil} = 40 \text{ °C} \pm 5 \text{ °C}$)

Operating pressure: Pilot control stage, pilot oil supply		bar	10 to 210 or 10 to 315					
Main valve, ports P, A, B		bar	Up to 315					
Return pressure: Port T	Internal pilot oil drain	bar	Permissible pressure peaks < 100					
	External pilot oil drain	bar	Up to 315					
Port Y		bar	Permissible pressure peaks < 100, static < 10					
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 ² /s	15 to 380; preferably 30 to 45					
Cleanliness class to ISO codes		Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 18/16/13 ¹⁾						
Zero flow $q_{V,L}$ ²⁾ measured without dither signal		L/min	$\sqrt{\frac{p_p^{4)}}{70 \text{ bar}}} \cdot 1.2 \frac{\text{L}}{\text{min}}$	$\sqrt{\frac{p_p^{4)}}{70 \text{ bar}}} \cdot 1.5 \frac{\text{L}}{\text{min}}$	$\sqrt{\frac{p_p^{4)}}{70 \text{ bar}}} \cdot 1.7 \frac{\text{L}}{\text{min}}$			
Nominal flow $q_{V, \text{nom}} \pm 10 \%$ ³⁾ with a valve pressure differential $\Delta p = 70 \text{ bar}$ ⁵⁾		L/min	20	30	45	60	75	90
Control spool stroke		mm	0.29	0.43	0.74	0.74	0.99	1.1
Max. possible control spool stroke at mechanical end stop referring to the nominal stroke (in the case of a fault)		%	120 to 170		120 to 150		120 to 150	
Feedback system			Mechanical (M)			Mechanical and electrical (D)		
Hysteresis (dither optimised)		%	≤ 1.5			≤ 0.8		
Reversal span (dither optimised)		%	≤ 0.3			≤ 0.2		
Response sensitivity (dither optimised)		%	≤ 0.2			≤ 0.1		
Pressure amplification 1 % spool stroke change (from the hydraulic zero point)		% of p_p	≥ 30		≥ 60		≥ 80	
Balance current over the entire operating pressure range		%	≤ 3 , long term ≤ 5			≤ 2		
Zero displacement with changes to:								
Pressure fluid temperature		%/20 °C	≤ 1			≤ 2		
Ambient temperature		%/20 °C	≤ 1			≤ 2		
Operating pressure 80 to 120 % of p_p		%/100 bar	≤ 2			≤ 2		
Return pressure 0 to 10 % of p_p		%/bar	≤ 1			≤ 1		

¹⁾ The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life. For the selection of filters see catalogue sheets RE 50 070, RE 50 076 and RE 50 081.

²⁾ $q_{V,L}$ = Zero flow in L/min

³⁾ $q_{V, \text{nom}}$ = Nominal flow (entire valve) in L/min

⁴⁾ p_p = Operating pressure in bar

⁵⁾ Δp = Valve pressure differential in bar


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

Electrical

Feedback system		Mechanical „M“	Mechanical and electrical „D“
Valve protection to EN 60 529		IP 65 with mounted and fixed plug-in connector	
Signal type		Analogue	
Nominal current per coil	mA	30	
Resistance per coil	Ω	85	
Inductivity at 60 Hz and 100% nom. current:	Serial connection	H	
	Parallel connection	H	
Recommended superimposed dither signal: $f = 400$ Hz		The amplitude is dependent on the hydraulic system: max. 5 % of the nominal current	

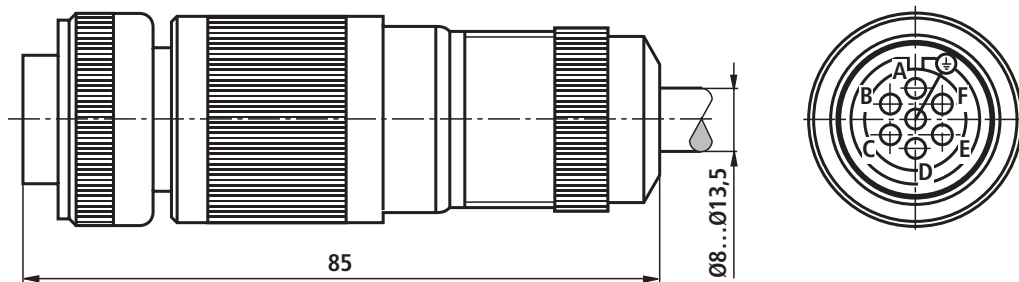
Electrical, external control electronics (only version „M“)

Amplifier in	Eurocard format	Analogue	Type VT-SR2-1X/... to catalogue sheet RE 29 980
(separate order)	Module format	Analogue	Type VT 11021 to catalogue sheet RE 29 743

 **Note:** For details regarding the **environmental simulation test** covering EMC (electro-magnetic compatibility), climate and mechanical loading see RE 29 583-U (Declaration regarding environmental compatibility).

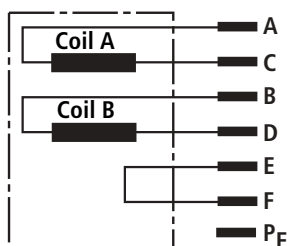
Plug-in connectors

Plug-in connector to E DIN 43 563-BF6-3/Pg11
Separate order under Material No. **00223890**
(metal version)



Electrical connections, external control electronics

Type 4WS2EM 10-5X...



The electrical connections can be made in either series or parallel. Due to operational safety reasons and the low coil inductivity, we recommend the parallel connection.

The bridge E-F can be used for the electrical recognition that the plug is correctly connected or for cable break recognition.

Parallel connection: In the plug-in connector connect contact A with B and C with D.

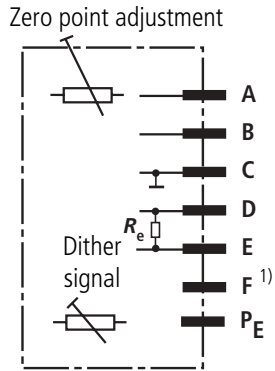
Serial connection: In the plug-in connector connect contact B with C.

Electrical control from A (+) to D (-) causes a flow direction of P to A and B to T. By reversing the electrical control the direction of flow is P to B and A to T.

E → F = Bridge

Electrical connections, integrated control electronics

Type 4WSE2EM 10-5X/...

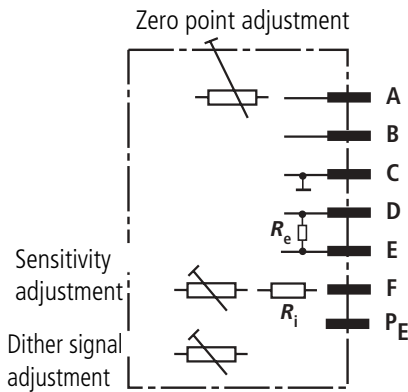


	Plug-in connector allocation	Current control	Voltage control
		Control "13"	Control "9"
Power supply ($\pm 3\%$)	A	+ 15 V	+ 15 V
	B	- 15 V	- 15 V
	C	\perp	\perp
Command value	D	± 10 mA	± 10 V
	E	$R_e = 100 \Omega$	$R_e \geq 50 \text{ k}\Omega$
Measurement output for control spool	F ¹⁾	± 10 mA ²⁾ max. ohmic load 1 k Ω	± 10 V against \perp ²⁾ $R_i \approx 4.7 \text{ k}\Omega$

¹⁾ For valves with mechanical feedback connection F is not allocated.

²⁾ With spool nominal stroke

Type 4WSE2ED 10-5X/...



Power consumption at plug-in connector connection	A	max. 150 mA	max. 150 mA
	B		
	D	0 to ± 10 mA	≤ 0.2 mA
E			

Power supply: $\pm 15 \text{ V} \pm 3\%$, residual ripple $< 1\%$

Command value: Command value at plug-in connector connection D = positive against plug-in connector connection E causes a flow from P to A and B to T. Measurement output F has a positive signal against \perp .
Command value at plug-in connector connection D = negative against plug-in connector connection E causes a flow from P to B and A to T. Measurement output F has a negative signal against \perp .

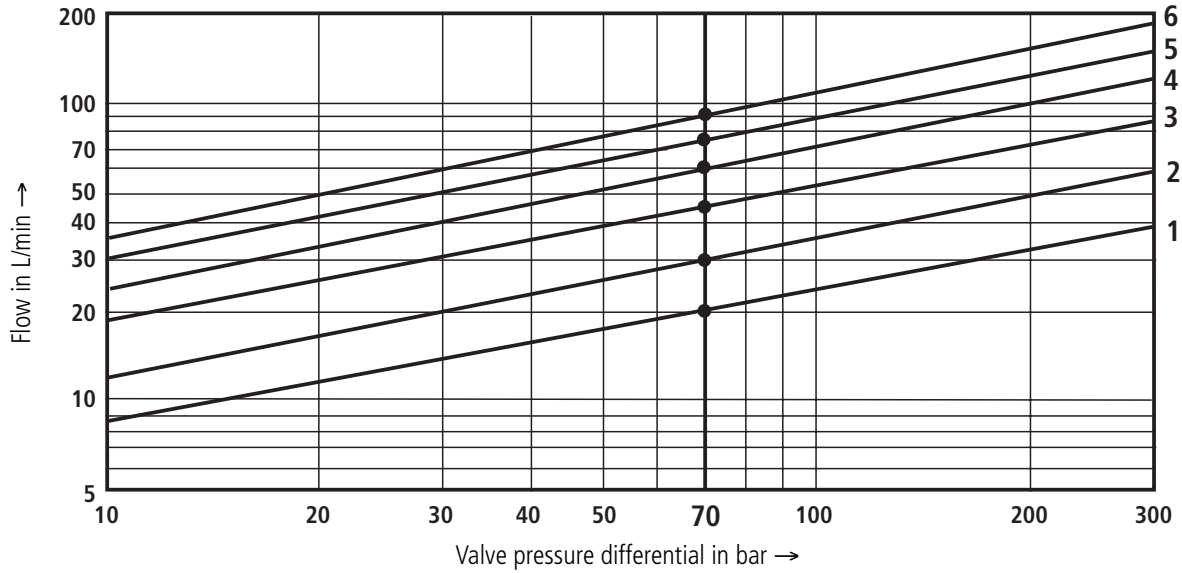
Measurement output: The voltage signal is proportional to the control spool stroke.

Note: Electrical signals (e.g. actual value) obtained via the valve electronics must not be used to switch-off the machine safety functions!
(Also see European standard regulations "Safety requirements of fluid technology systems and components – hydraulics" EN 982!)

Characteristic curves (measured with HLP 32, $\vartheta_{oil} = 40 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$)

Flow-load function (tolerance $\pm 10 \%$)
at 100 % command value signal

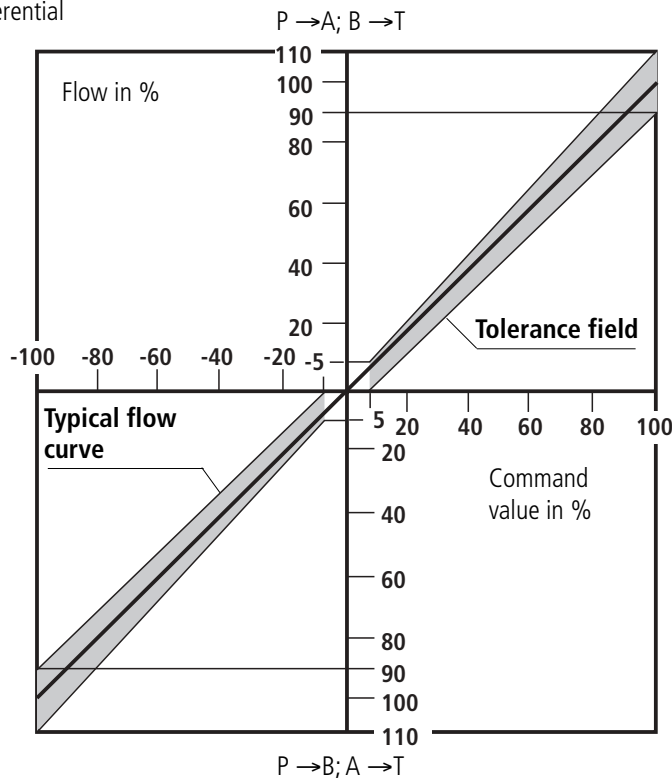
- Nominal flow
- 20 L/min $\hat{=}$ curve 1
- 30 L/min $\hat{=}$ curve 2
- 45 L/min $\hat{=}$ curve 3
- 60 L/min $\hat{=}$ curve 4
- 75 L/min $\hat{=}$ curve 5
- 90 L/min $\hat{=}$ curve 6



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

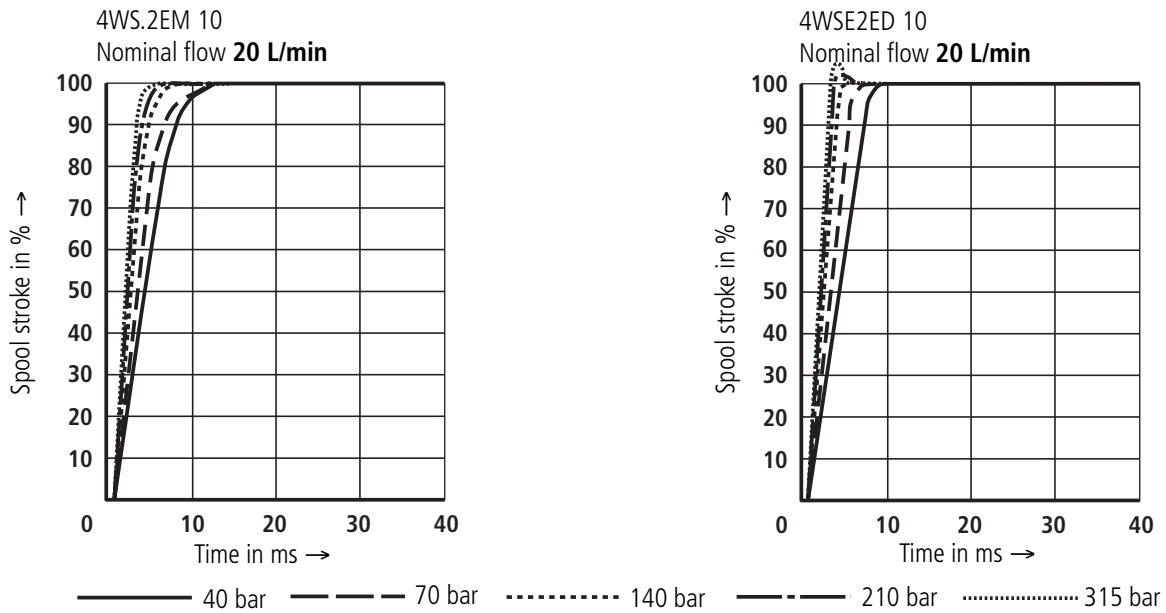
Tolerance field of the flow signal function

at a constant valve pressure differential

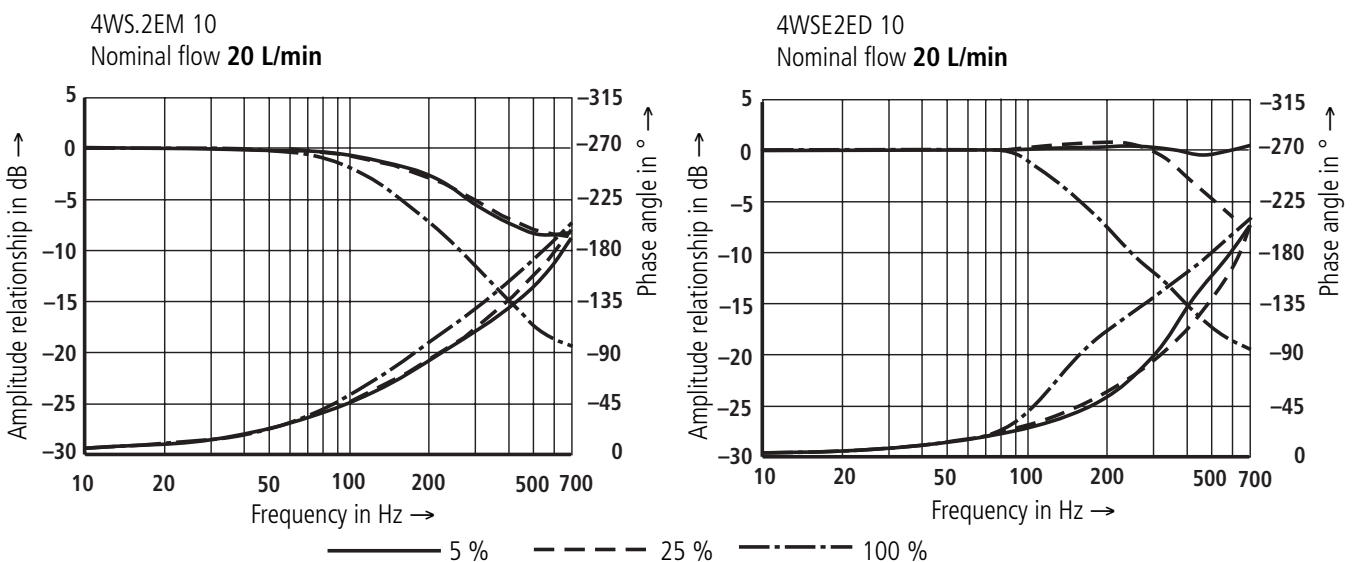


Characteristic curves: types 4WS.2EM 10 and 4WSE2ED 10 (measured with HLP 32, $\vartheta_{oil} = 40 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$)

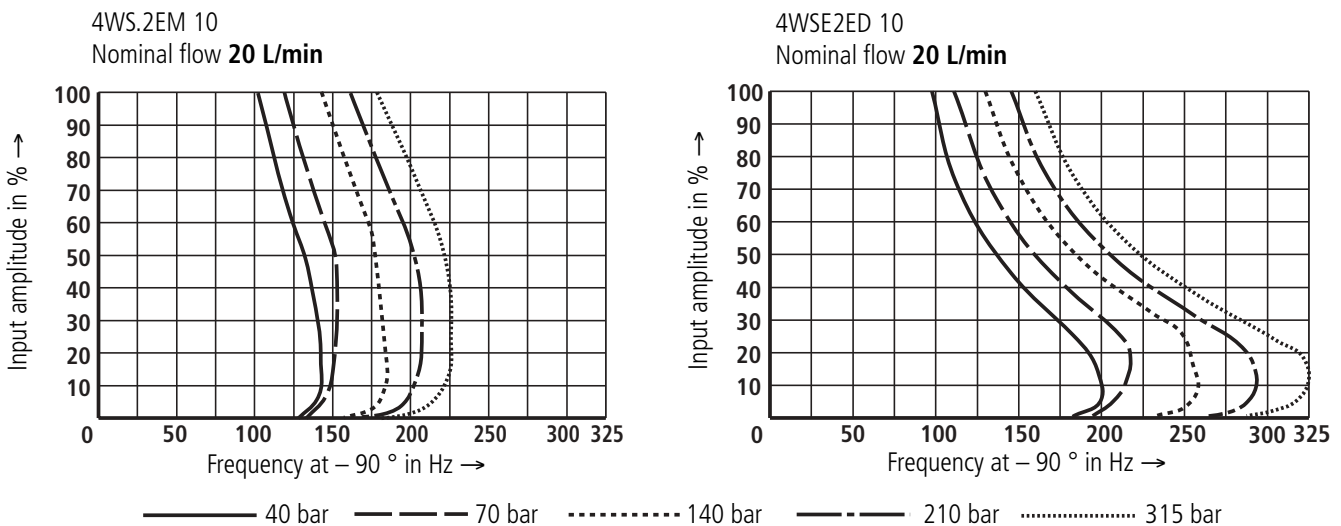
Transient functions with the 315 bar pressure stage, step response without flow



Frequency response with the 315 bar pressure stage, stroke frequency response without flow

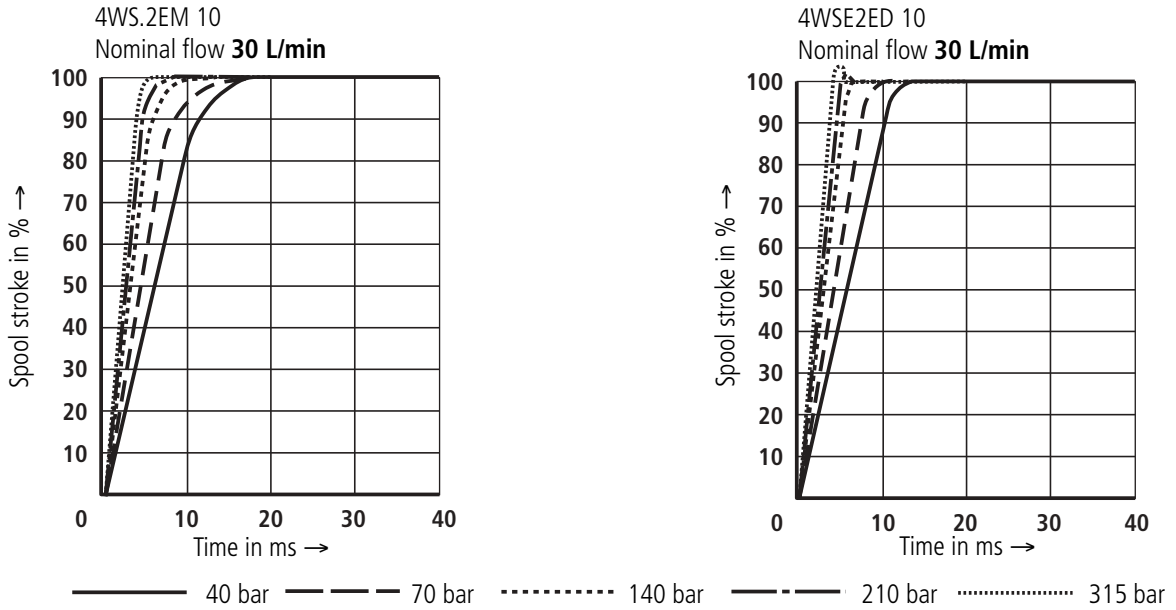


The relationship of the frequency f at -90° to the operating pressure p and the input amplitude

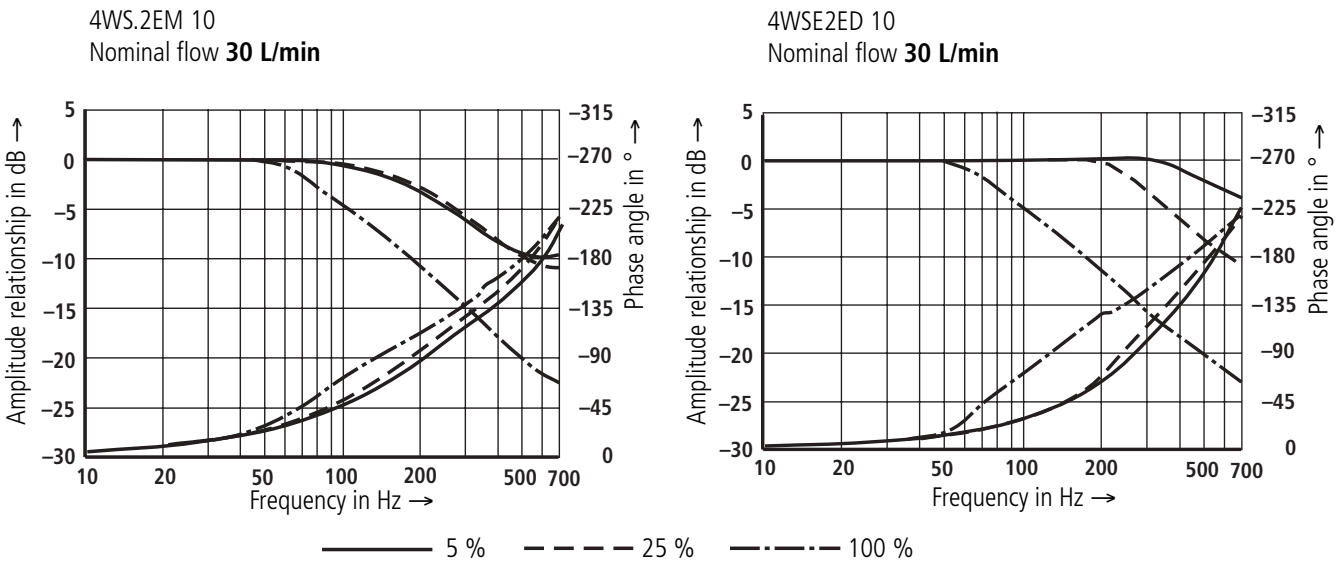


Characteristic curves: types 4WS.2EM 10 and 4WSE2ED 10 (measured with HLP 32, $\vartheta_{oil} = 40 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$)

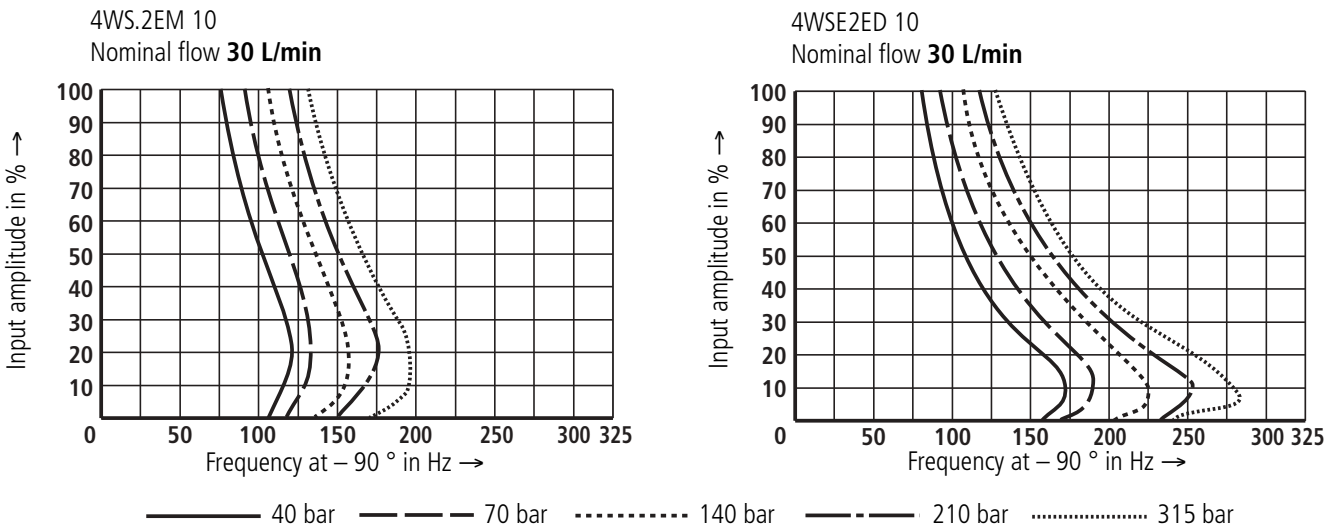
Transient functions with the 315 bar pressure stage, step response without flow



Frequency response with the 315 bar pressure stage, stroke frequency response without flow

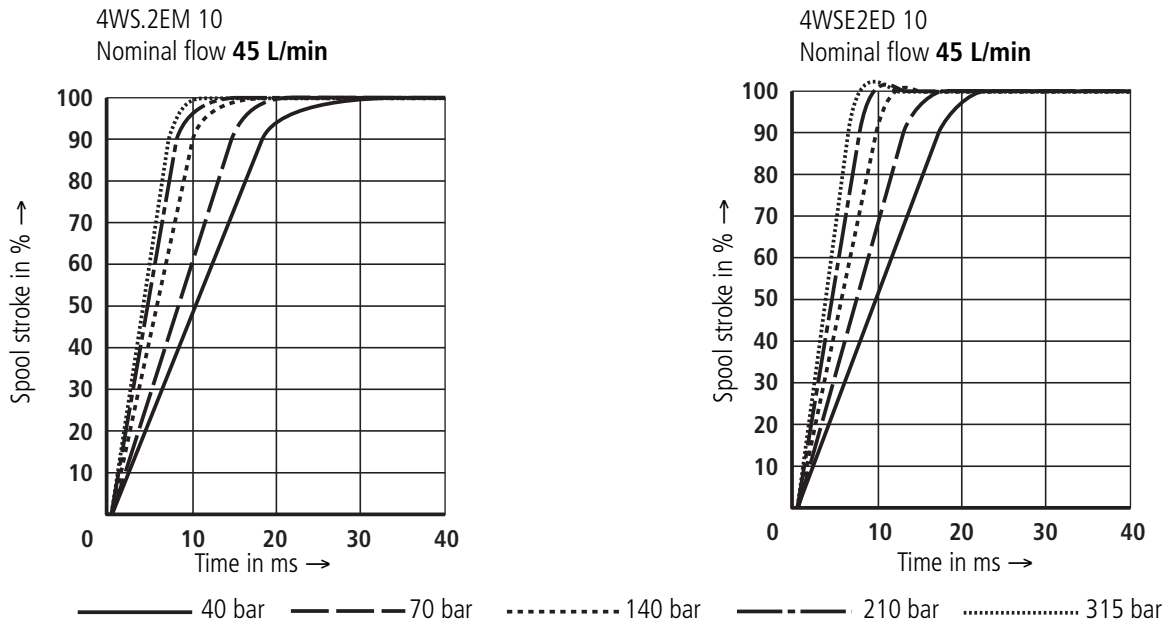


The relationship of the frequency f at -90° to the operating pressure p and the input amplitude

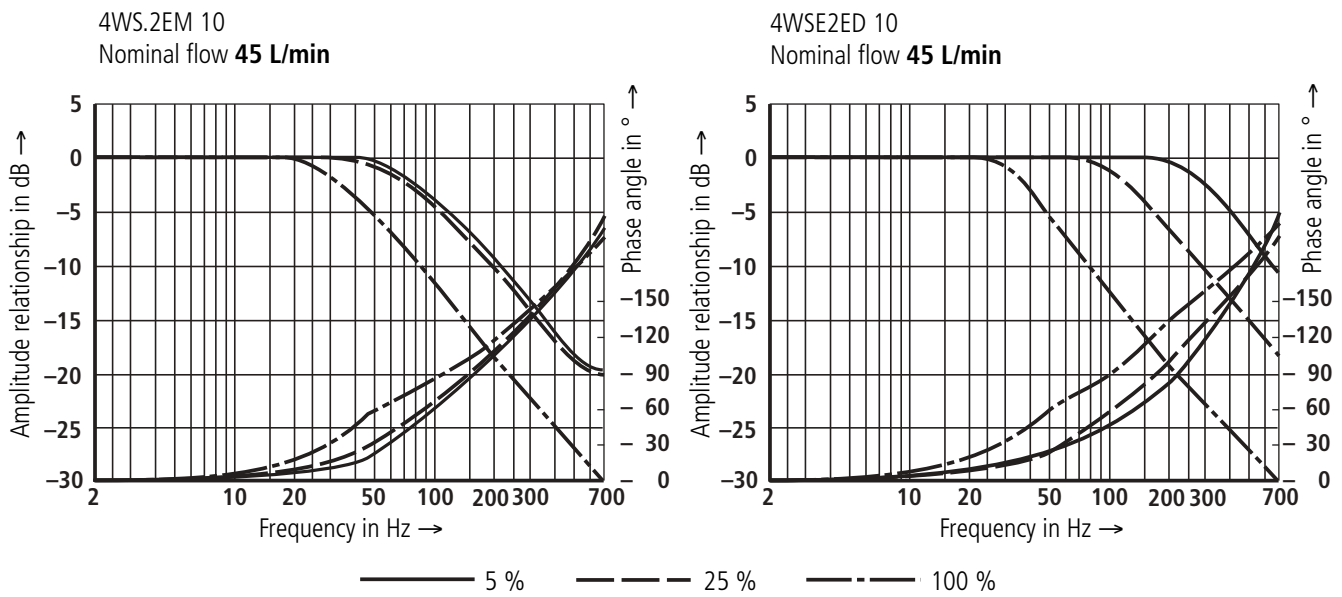


Characteristic curves: types 4WS.2EM 10 and 4WSE2ED 10 (measured with HLP 32, $\vartheta_{oil} = 40 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$)

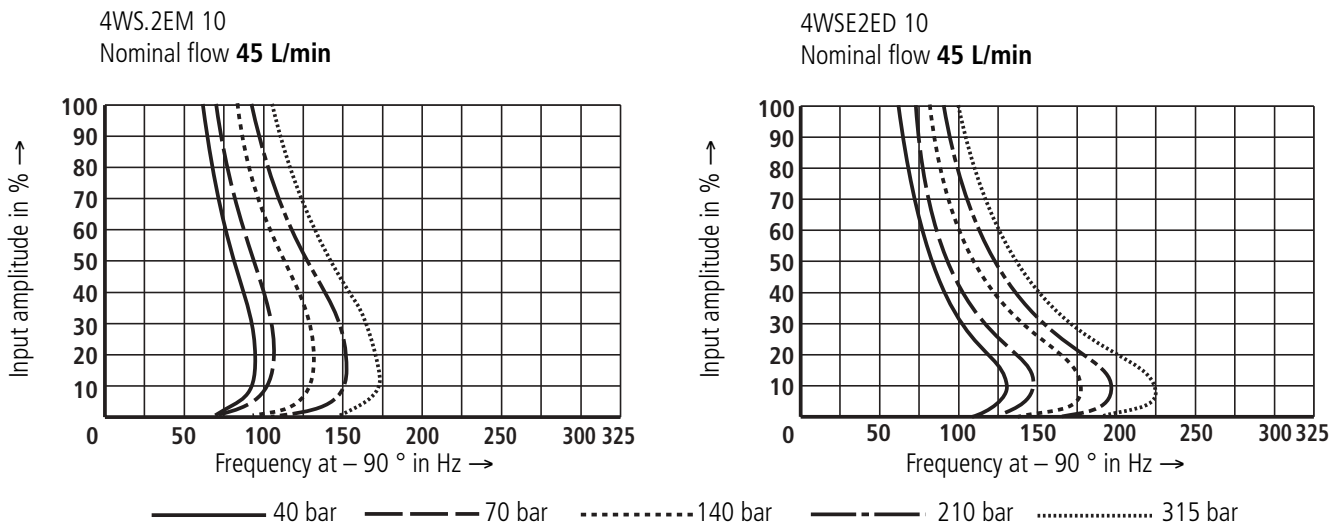
Transient functions with the 315 bar pressure stage, step response without flow



Frequency response with the 315 bar pressure stage, stroke frequency response without flow

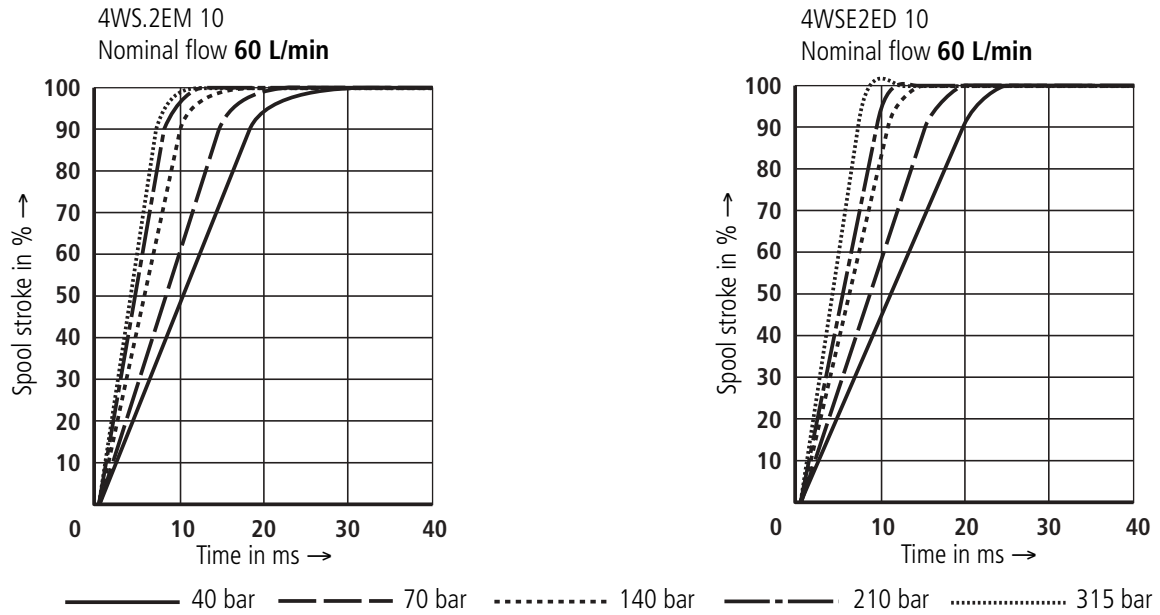


The relationship of the frequency f at -90° to the operating pressure p and the input amplitude

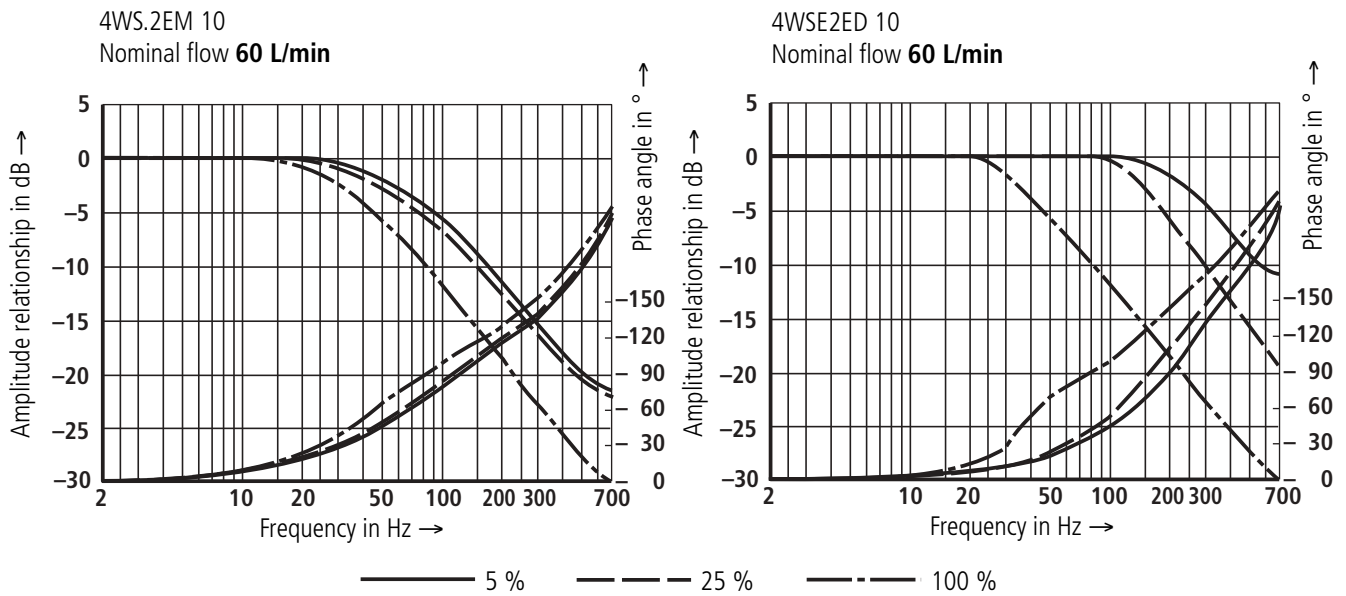


Characteristic curves: types 4WS.2EM 10 and 4WSE2ED 10 (measured with HLP 32, $\vartheta_{oil} = 40 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$)

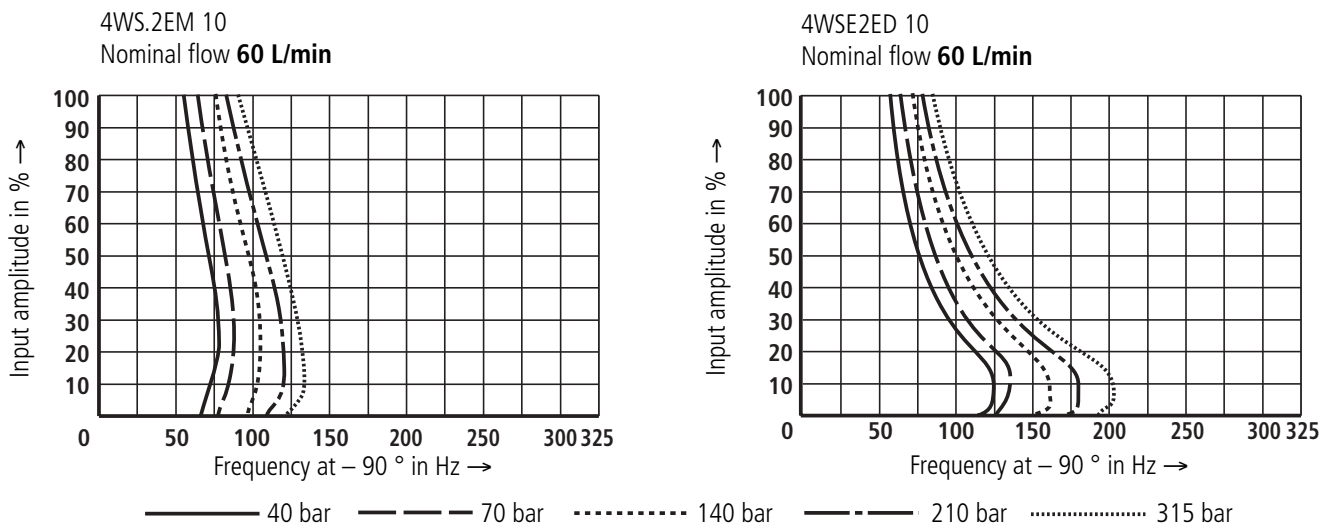
Transient functions with the 315 bar pressure stage, step response without flow



Frequency response with the 315 bar pressure stage, stroke frequency response without flow

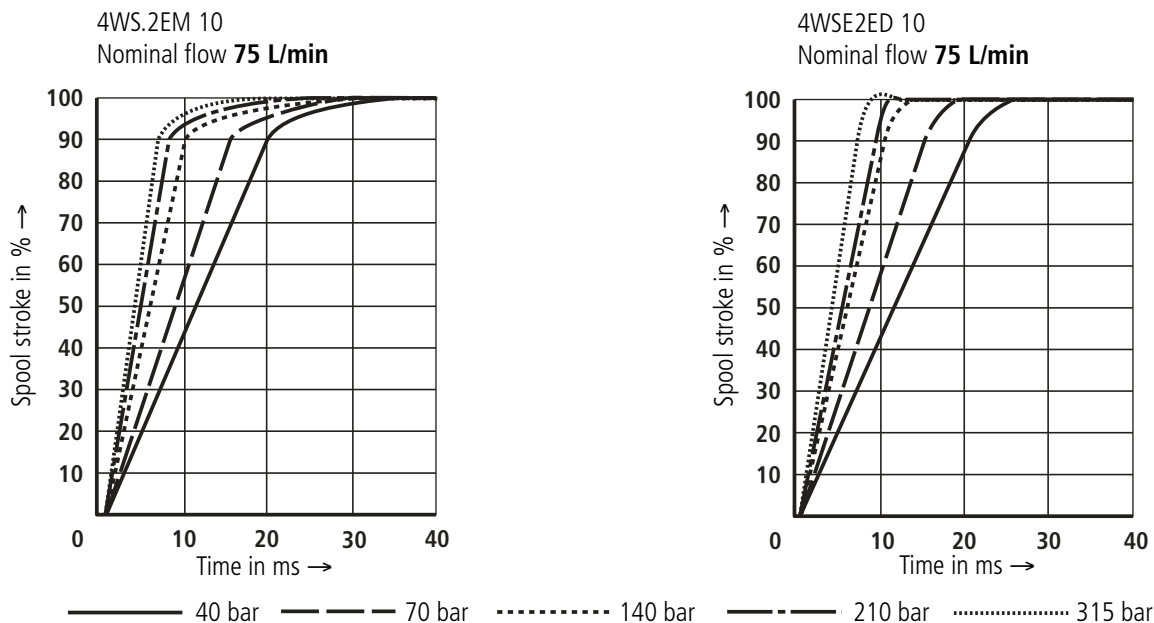


The relationship of the frequency f at -90° to the operating pressure p and the input amplitude

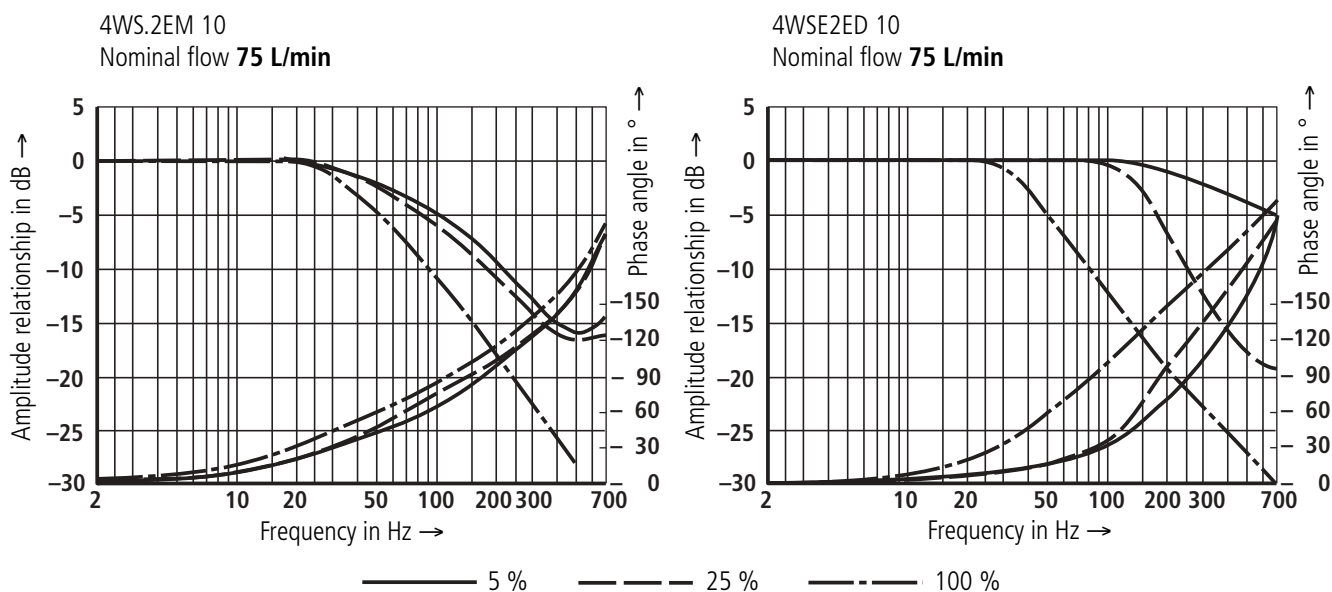


Characteristic curves: types 4WS.2EM 10 and 4WSE2ED 10 (measured with HLP 32, $\vartheta_{oil} = 40 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$)

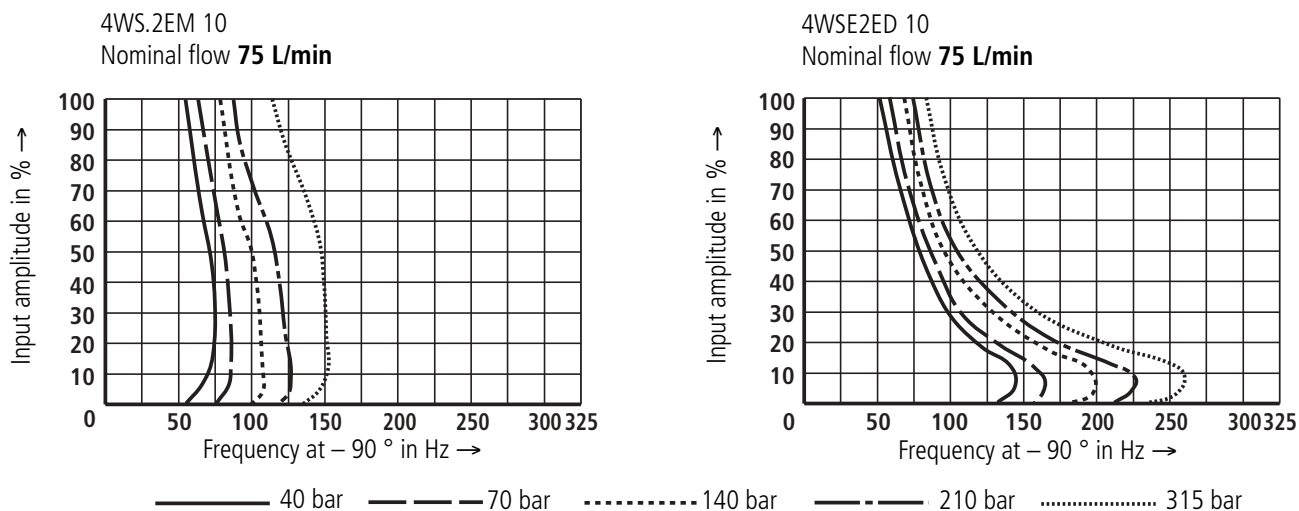
Transient functions with the 315 bar pressure stage, step response without flow



Frequency response with the 315 bar pressure stage, stroke frequency response without flow

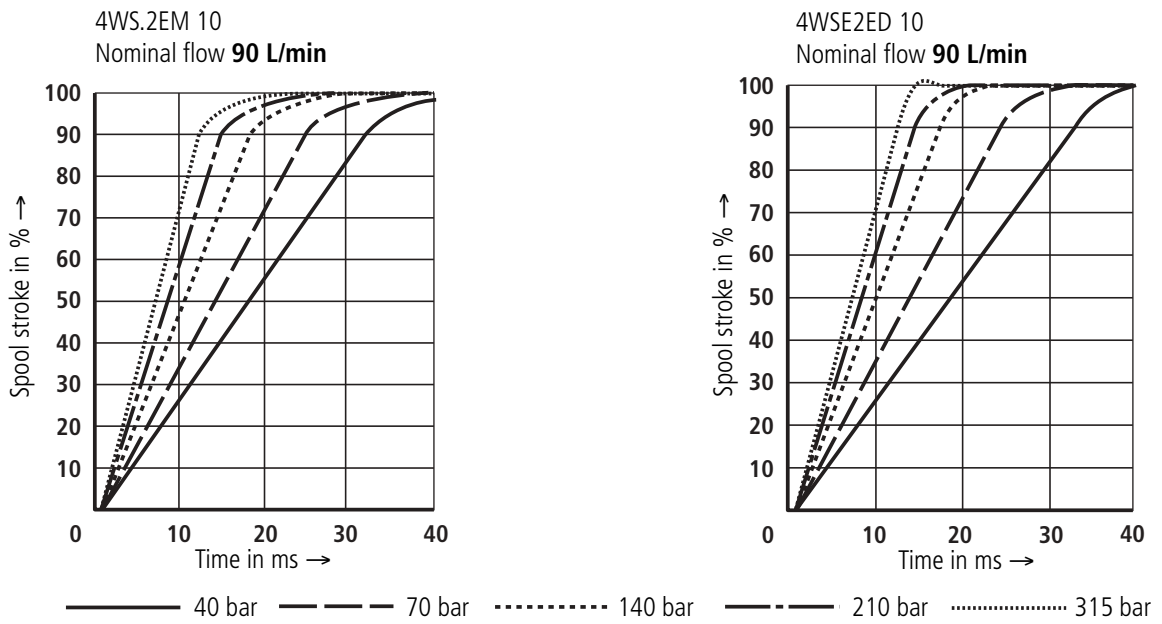


The relationship of the frequency f at -90° to the operating pressure p and the input amplitude

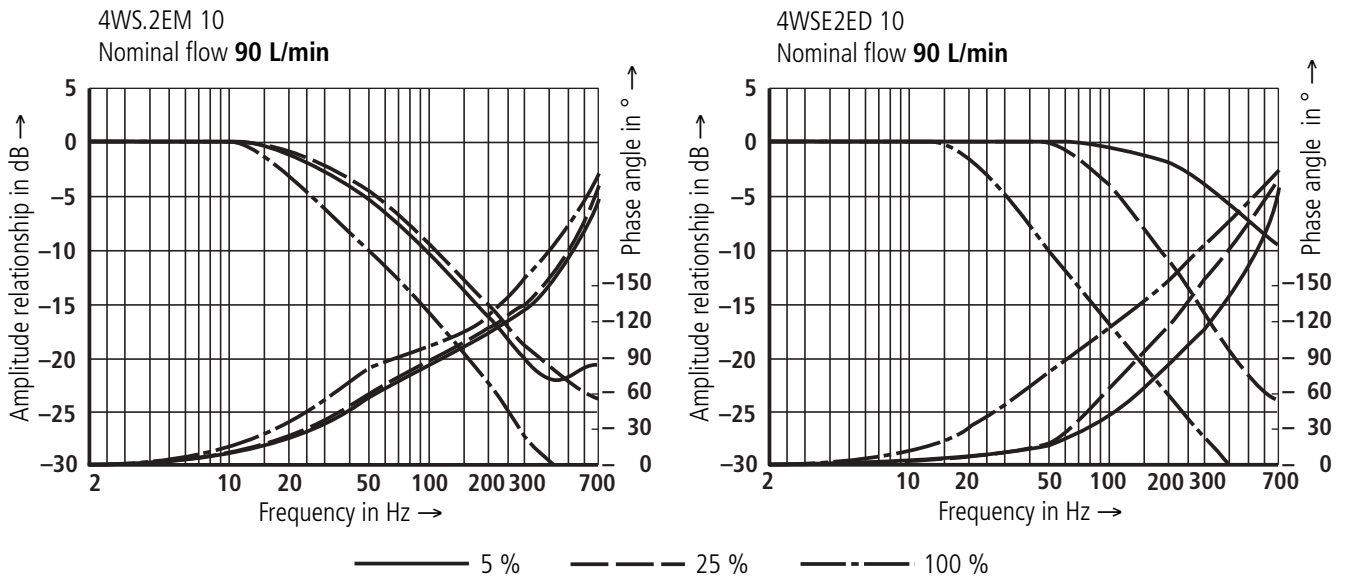


Characteristic curves: types 4WS.2EM 10 and 4WSE2ED 10 (measured with HLP 32, $\vartheta_{oil} = 40 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$)

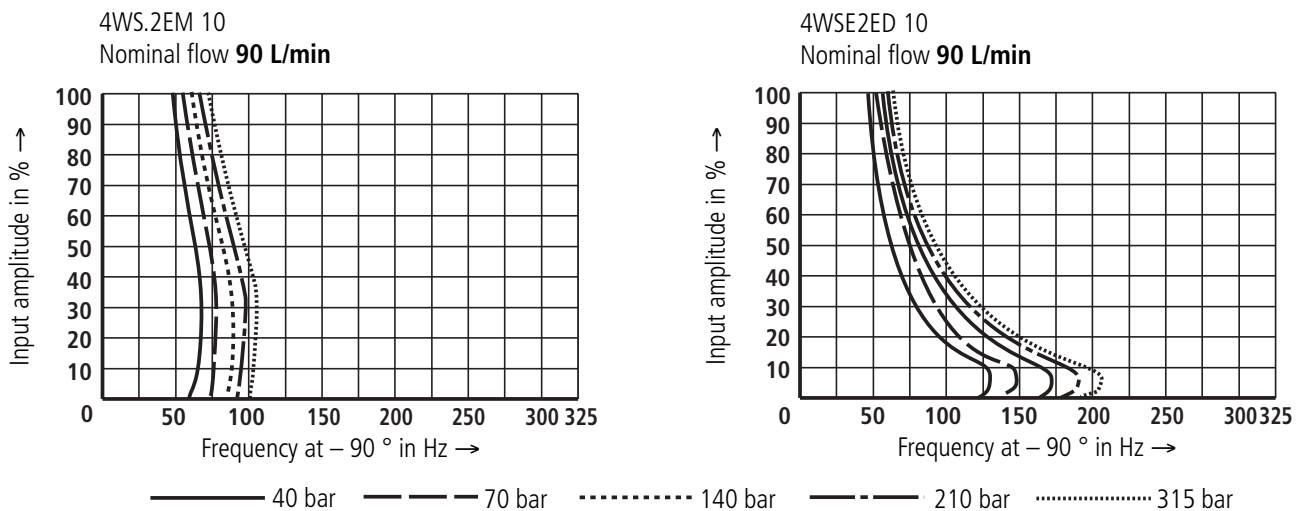
Transient functions with the 315 bar pressure stage, step response without flow



Frequency response with the 315 bar pressure stage, stroke frequency response without flow

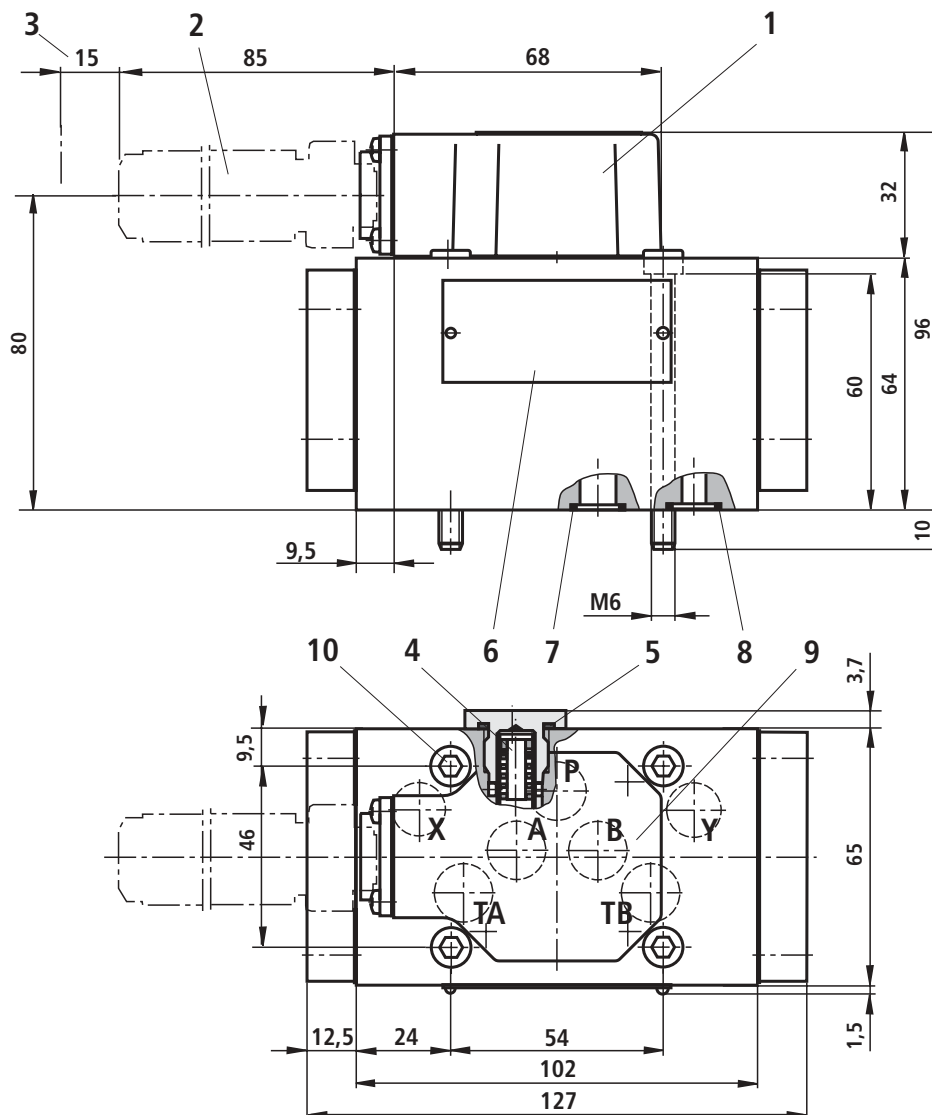


The relationship of the frequency f at -90° to the operating pressure p and the input amplitude

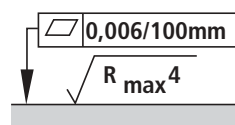


Unit dimensions: type 4WS2EM 10 (dimensions in mm)

**Mechanical feedback / external control electronics,
Type 4WS2EM 10-5X/...**



- 1 Cap can be turned through 180°
- 2 Plug-in connector
(separate order, see page 8)
- 3 Space required to remove the plug-in connector,
take connection cable into account!
- 4 Exchangeable filter element
Material No.: **00306843** with FKM seal
22A/F, $M_A = 30$ Nm
- 5 Profile seal for filter screw 16 x 1.5
Material No.: **00012503** (FKM seal)
- 6 Name plate
- 7 Identical seal rings for ports A, B, P, TA and TB
- 8 Identical seal rings for ports X and Y
Ports X and Y are also pressurised with the option
"internal" pilot oil.
- 9 Porting pattern to DIN 24 340, form A10
- 10 Valve fixing screws
4 off M6 x 70 DIN 912-10.9 NEL, $M_A = 16$ Nm
(are included within the scope of supply)



Required surface finish of the
mating piece

Subplates to catalogue sheet RE 45 054 must be ordered separately.

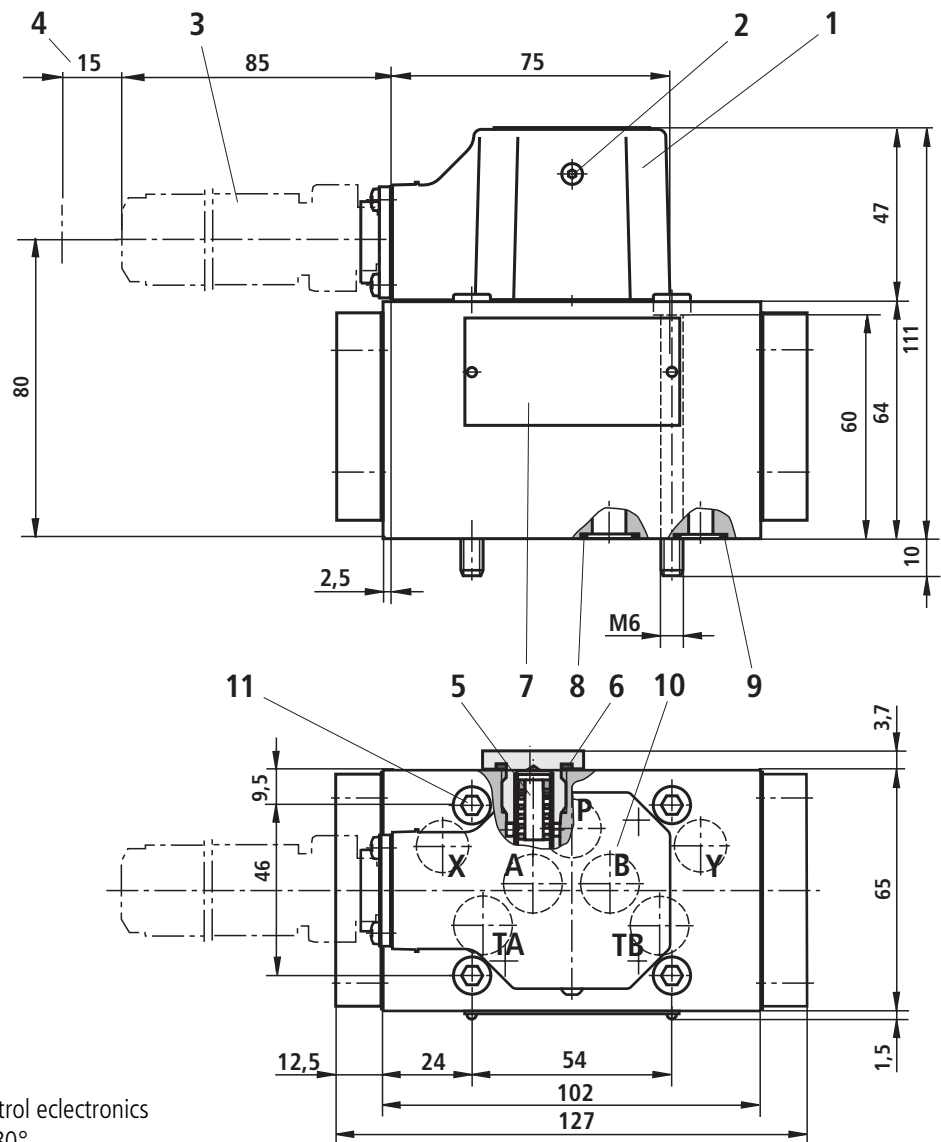
- G 66/01 (G 3/8)
- G 67/01 (G 1/2)
- G 535/01 (G 3/4)
- G 535/02 (M 27 x 2)
- G 536/01 (G 1)
- G 536/02 (M 33 x 2)

With ports X
and Y

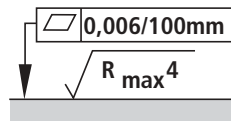
Unit dimensions: type 4WSE2EM 10 (dimensions in mm)

Mechanical feedback / integrated control electronics

Type 4WSE2EM 10-5X/...



- 1 Cap **with** integrated control electronics can be turned through 180°
- 2 Electrical zero point adjustment:
After removing the 2.5A/F plug, a correction, via a potentiometer, to the zero point is possible.
- 3 Plug-in connector
(separate order, see page 8)
- 4 Space required to remove the plug-in connector, take connection cable into account!
- 5 Exchangeable filter element
Material No.: **00306843** with FKM seal, 22 A/F, $M_A = 30$ Nm
- 6 Profile seal for filter screw 16 x 1.5
Material No.: **00012503** (FKM seal)
- 7 Name plate
- 8 Identical seal rings for ports A, B, P, TA and TB
- 9 Identical seal rings for ports X and Y
Ports X and Y are also pressurised with the option "internal" pilot oil.
- 10 Porting pattern to DIN 24 340, form A10
- 11 Valve fixing screws
4 off M6 x 70 DIN 912-10.9 NEL, $M_A = 16$ Nm
(are included within the scope of supply)



Required surface finish of the mating piece

Subplates to catalogue sheet RE 45 054 must be ordered separately.

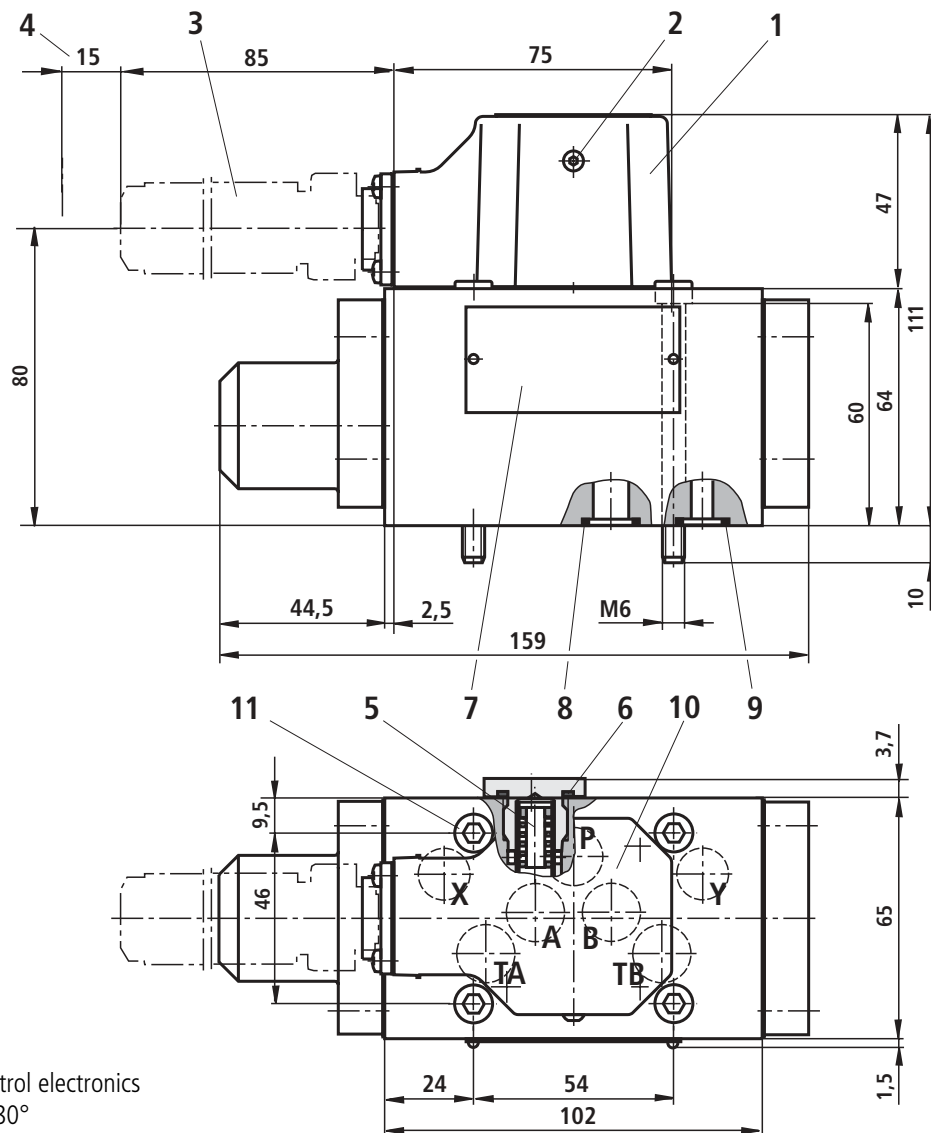
- G 66/01 (G 3/8)
- G 67/01 (G 1/2)
- G 535/01 (G 3/4)
- G 535/02 (M 27 x 2)
- G 536/01 (G 1)
- G 536/02 (M 33 x 2)

With ports X and Y

Unit dimensions: type 4WSE2ED 10 (dimensions in mm)

Electrical and mechanical feedback / integrated control electronics

Type 4WSE2ED 10-5X/...



- 1 Cap **with** integrated control electronics can be turned through 180°
- 2 Electrical zero point adjustment:
After removing the 2.5A/F plug, a correction, via potentiometer, to the zero point is possible.
- 3 Plug-in connector
(separate order, see page 8)
- 4 Space required to remove the plug-in connector, take connection cable into account!
- 5 Exchangeable filter element
Material No.: **00306843** with FKM seal, 22A/F, $M_A = 30$ Nm
- 6 Profile seal for filter screw 16 x 1.5
Material No.: **00012503** (FKM seal)
- 7 Name plate
- 8 Identical seal rings for ports A, B, P, TA and TB
- 9 Identical seal rings for ports X and Y
ports X and Y are also pressurised with the option "internal" pilot oil.
- 10 Porting pattern to DIN 24 340, form A10
- 11 Valve fixing screws
4 off M6 x 70 DIN 912-10.9 NEL, $M_A = 16$ Nm
(are included within the scope of supply)

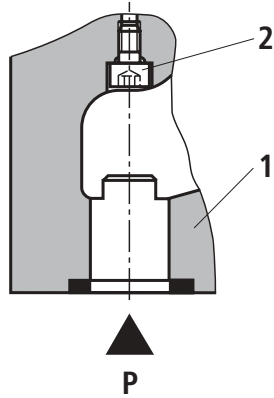
0,006/100mm
R max 4
Required surface finish of the mating piece

Subplates to catalogue sheet RE 45 054 must be ordered separately.

G 66/01 (G 3/8)] With ports X and Y
G 67/01 (G 1/2)	
G 535/01 (G 3/4)	
G 535/02 (M 27 x 2)	
G 536/01 (G 1)	
G 536/02 (M 33 x 2)	

Pilot oil – conversion from internal/external

Pilot oil supply



External pilot oil supply

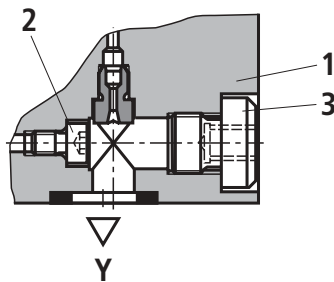
S.H.C.S. item 2 is fitted.

Internal pilot oil supply

S.H.C.S. item 2 is removed

- 1 Valve housing
- 2 S.H.C.S. M3 x 5 DIN 912-10.9, $M_A = 1.4 \text{ Nm}$

Pilot oil drain



External pilot oil drain

S.H.C.S. item 2 is fitted.

Internal pilot oil drain

S.H.C.S. item 2 is removed

- 1 Valve housing
- 2 S.H.C.S. M3 x 5 DIN 912-10.9, $M_A = 1.4 \text{ Nm}$
- 3 Plug M8 x 1 with seal, Material No. **00017829**
 $M_A = 5 \text{ Nm}$

Flushing plate to DIN 24 340 form A10 (dimensions in mm)

Symbol



With FKM seals, Material No. **00912450**

Weight: 2 kg

- 1 R-ring 13 x 1.6 x 2 (A, B, P, TA and TB)
- 2 R-ring 11,18 x 1.6 x 1.78 (X, Y)
- 3 4 off S.H.C.S. M6 x 50 DIN 912-10.9, $M_A = 16 \text{ Nm}$
(are included within the scope of supply)

In order to guarantee that the servo valves function correctly, it is absolutely necessary to flush the system before commissioning.

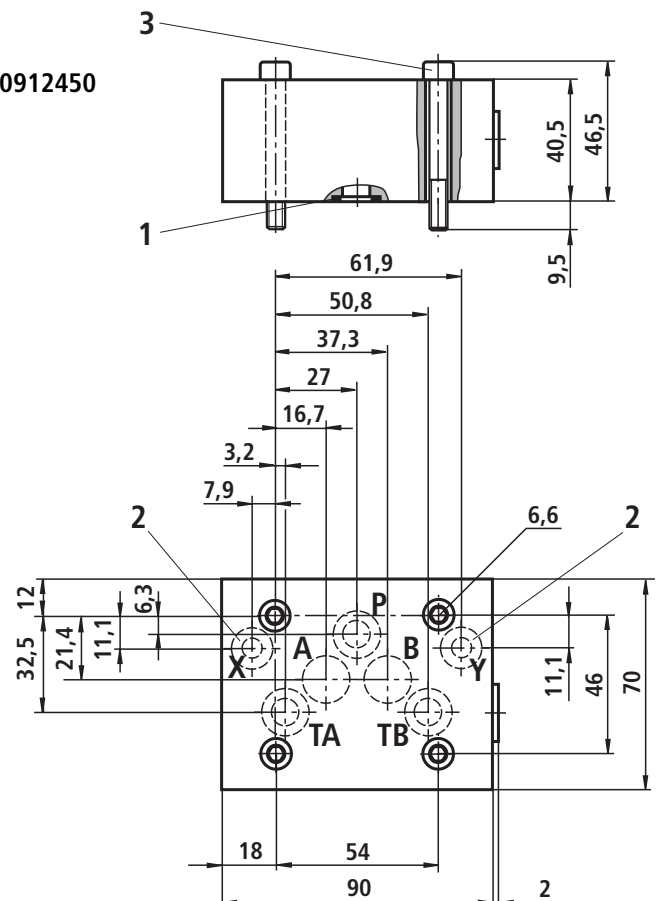
The following is a guide to the flushing time necessary for the installation:

$$t \geq \frac{V}{q_v} \cdot 5$$

t = Flushing time in hours
 V = Tank contents in litres
 q_v = Pump flow in litres per minute

If the tank needs to be refilled with more than 10 % of its capacity it will be necessary to reflush the system.

A directional control valve with a porting pattern to DIN 24 340 form A10 is more suitable than a flushing plate for the flushing operation, as the actuator lines can also be flushed. Also see catalogue sheet RE 07 700.



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