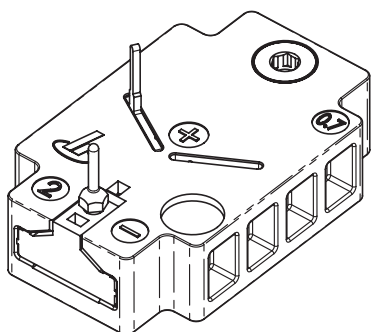


P9

Piezo-controlled pneumatic valve

Technical Data

EN



GENERAL PROPERTIES

P9

GENERAL PROPERTIES

Type	P9-NG-3P	P9-NG-3S	P9-NO-3S
Function	Proportional 3/2-way NC	Switching 3/2-way NC	Switching 3/2-way NO
Actuation type	Piezoelectric, directly controlled		
Constructive structure	Seat valve		
Connection type	Flange		
Weight	6.5 g		
Installation position	Any		
Protection type	IP 00 (DIN EN 60529 A1:2000) ¹⁾		
Storage temperature	-40 °C to +80 °C		
Ambient temperature	-30 °C to +80 °C ²⁾		
Medium temperature	-30 °C to +80 °C ²⁾		
Material housing	PAA		
Materials in contact with media	CuZn; CuNi		
Material seals	Silicone		
Behavior in case of electrical power failure	Port 2 venting ³⁾		Port 2 ventilating ³⁾
RoHS-Conformity	RoHS 2011/65/EU		

GENERAL PROPERTIES

Media ⁴⁾	Compressed air and neutral gases	
Media quality	According to ISO 8573-1:2010 (3:x:3); Pressure dewpoint 10K under ambient temperature	
Flow direction on	From 1 to 2	From 2 to 3
Flow direction off	From 2 to 3	From 1 to 2

¹⁾ Excluded is the component PZT (Lead-zinc-titanate). This component is excluded from the banned substances list according to annex III c.I and annex IV (14) of the current guideline.

²⁾ Special version up to -40°C on request

³⁾ Only in compliance with the control recommendation

⁴⁾ Other media only after approval by the manufacturer

PNEUMATIC AND ELECTRICAL PROPERTIES

P9

PNEUMATIC PROPERTIES

Type	P9-NG-3P	P9-NG-3S	P9-NO-3S
Nominal pressure (p ₁)	1.2 ± 0.05 bar ¹⁾		
Nominal flow rate 1 to 2 (Q _N) ²⁾	≥ 1.2 l/min	≥ 0.9 l/min	≥ 0.7 l/min
Nominal flow rate 2 to 3 (Q _N) ³⁾	≥ 1.7 l/min	≥ 1.5 l/min	≥ 1.7 l/min
Hysteresis (U _H) ⁴⁾	≤ 3.5 V DC	≤ 6 V DC	
Steepness (S _H) ⁴⁾	6.5 (+/-2) V/bar	0 (+3) V/bar	
Own air consumption	≤ 1.1 l/min	-	
Leakage U _{on} ⁵⁾	≤ 0.25 l/min	≤ 0.15 l/min	≤ 0.30 l/min
Leakage U _{off} ⁵⁾	≤ 0.15 l/min	≤ 0.10 l/min	≤ 0.15 l/min

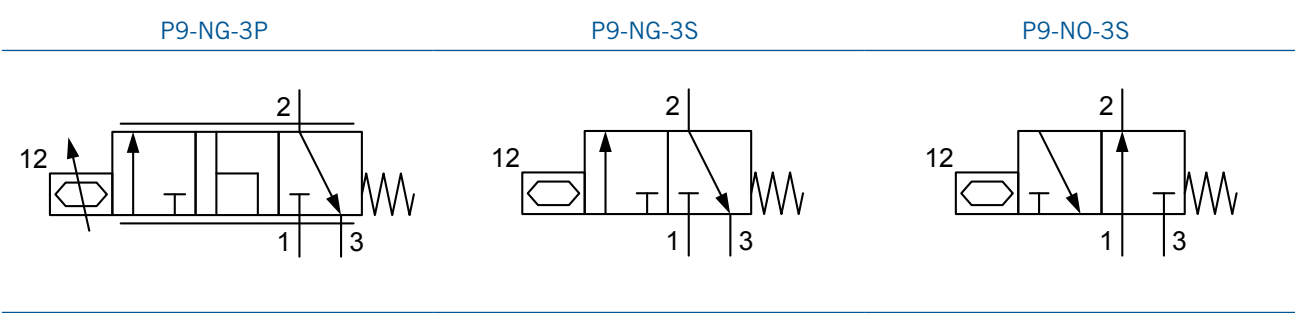
- ¹⁾ Other pressure ranges on request
- ²⁾ Measured at p₁ = nominal presssure and p₂ = 0 bar and room temperature
- ³⁾ Measured at p₂ = nominal presssure and p₃ = 0 bar and room temperature
- ⁴⁾ See section „Description transmission characteristic“
- ⁵⁾ Measured at p₁ = nominal presssure and room temperature

ELECTRICAL PROPERTIES

P9-NG-3P / P9-NG-3S / P9-NO-3S	
Electrical connection	Contact pins
Control voltage ON (U _{on})	+ 24 V DC ⁶⁾
Control voltage OFF (U _{off})	0 V DC ⁶⁾
Maximum switching voltage (U _{on max})	± 27 V DC ⁷⁾
On current (I _{hold})	0.00 mA ⁸⁾
Max. permissible current (I _{max})	≤ 30 mA
Switching time	< 2 ms
Switching energy (E _{Nmin})	≤ 57.6 µJ
Electrical capacity (C)	≤ 100 nF

- ⁶⁾ With P9-NG-3S and P9-NO-3S see „Control recommendation“
- ⁷⁾ Only in pulse modus max. 100 ms pulse width, permanent switching voltage max. 24.6 V DC
- ⁸⁾ Due to the capacitive character of the piezo ceramic virtually no energy consumption when switched on

CIRCUIT DIAGRAMS

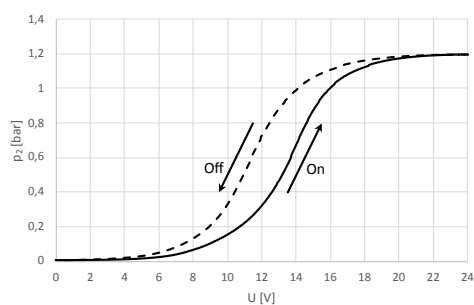


FLOW CURVES

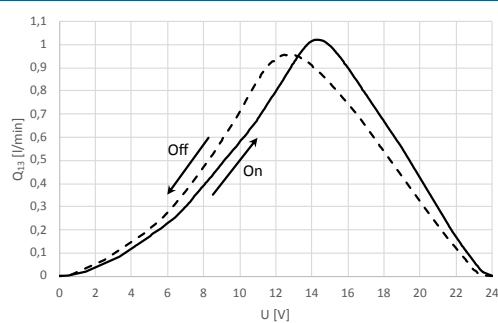
P9

P9-NG-3P

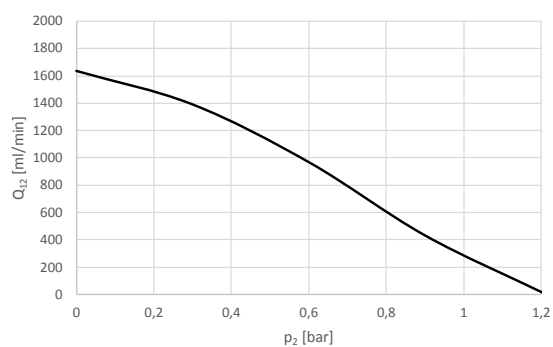
Transmission characteristic ¹⁾²⁾



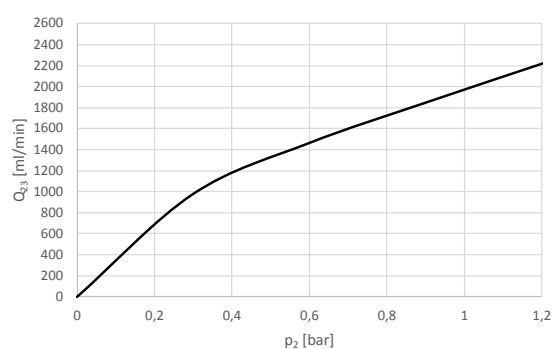
Flow 1 to 3 ¹⁾²⁾



Flow 1 to 2 ¹⁾

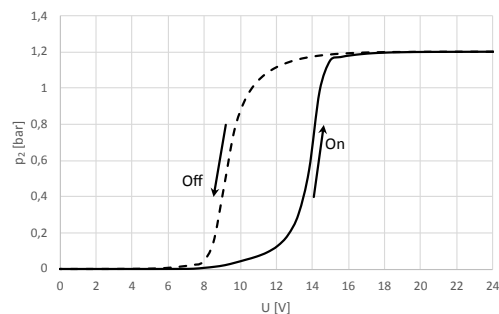


Flow 2 to 3 ¹⁾

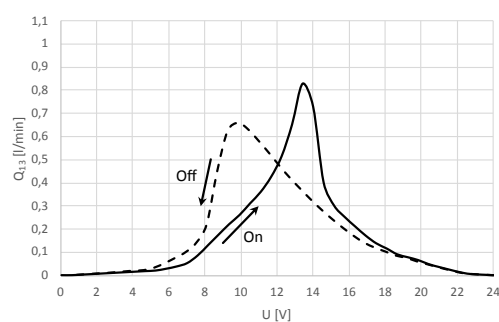


P9-NG-3S

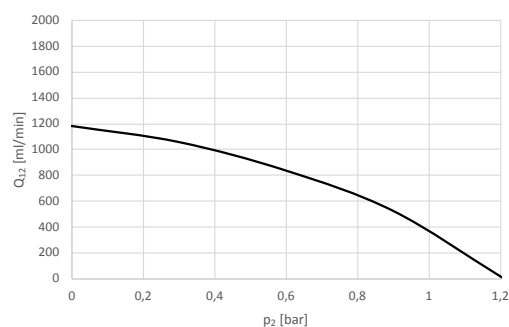
Transmission characteristic ¹⁾²⁾



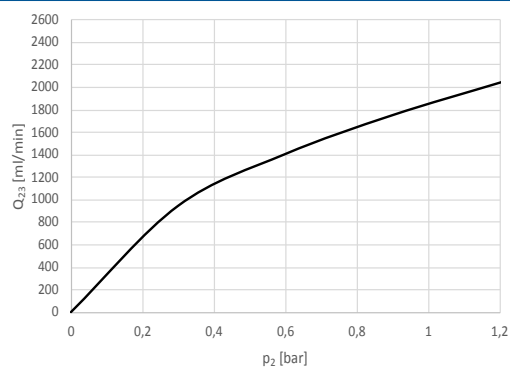
Flow 1 to 3 ¹⁾²⁾



Flow 1 to 2 ¹⁾

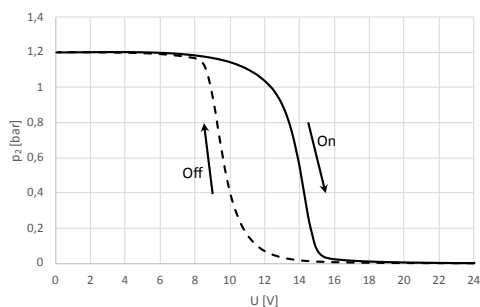


Flow 2 to 3 ¹⁾

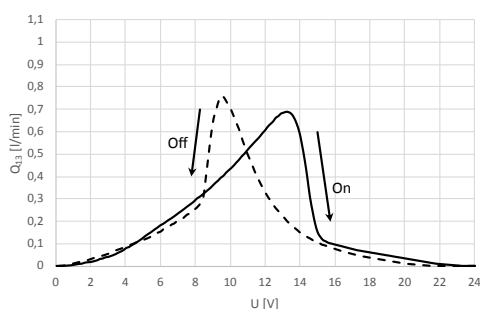


P9-N0-3S

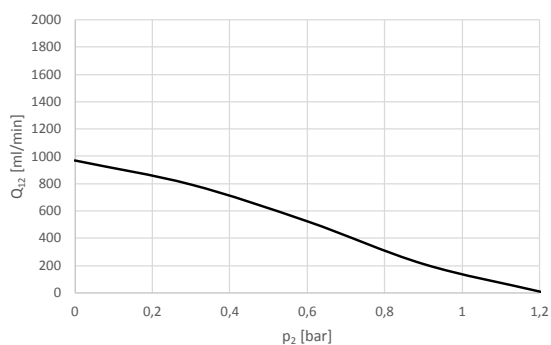
Transmission characteristic ¹⁾²⁾



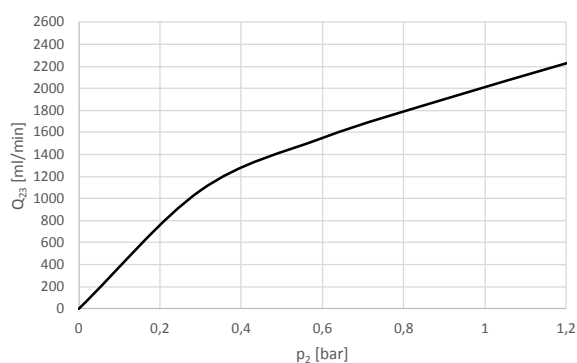
Flow 1 to 3 ¹⁾²⁾



Flow 1 to 2 ¹⁾



Flow 2 to 3 ¹⁾

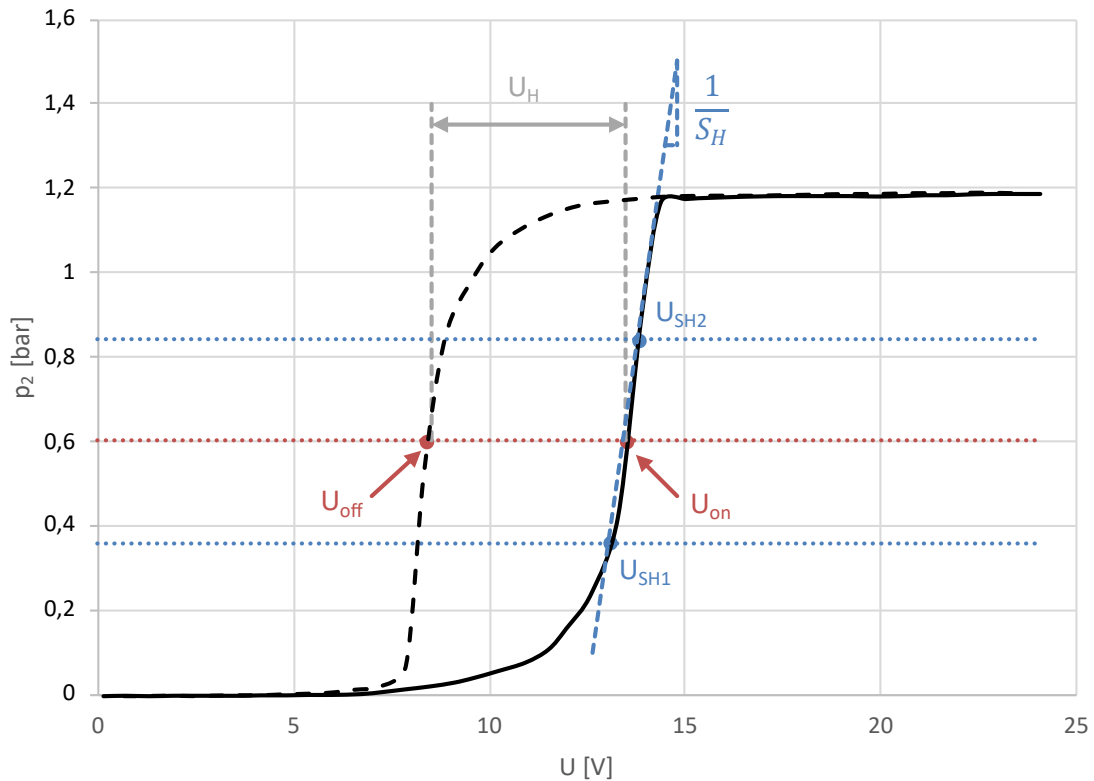


- ¹⁾ Characteristic values at room temperature, p_1 = nominal pressure and collected at the time of delivery
- ²⁾ Set value during EOL-test using the pressure characteristics $p(U)$: triangular driving voltage (0V/+24 V, 15 V/s, start of measurement at 0 V), p_1 =nominal pressure, dead volume at p_2 of approx. 0,5 ml, p_2 not connected.

DESCRIPTION TRANSMISSION CHARACTERISTIC

P9

PRESSURE CHARACTERISTIC



The above graph shows an exemplary pressure characteristic $p_2(U)$ at room temperature at the time of delivery.

Drift behavior of the piezo element and thus the characteristic curve via voltage possible.

Influencing factors:

- temperature
- switch-on duration
- input pressure

The indicated hysteresis(-width) U_H corresponds to the difference between the switch-on voltage and switch-off voltage.

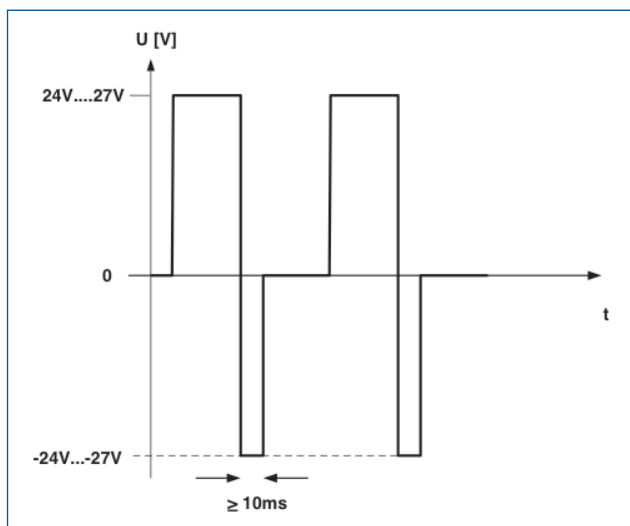
$$U_H = U_{on} - U_{off}$$

The switch-on voltage and switch-off voltage are determined when a certain pressure p_2 is reached at the output, which is for example 50% of the nominal input pressure.

The indicated steepness S_H corresponds to the reciprocal of the pressure characteristic slope when the valve is switched on and is determined using 2 points from the pressure characteristic. The voltage values of the points are determined when two different pressure levels p_2 are reached at the output, which are for example 30% and 70% of the nominal input pressure.

$$S_H = \frac{U_{SH2} - U_{SH1}}{p_2(U_{SH2}) - p_2(U_{SH1})}$$

SWITCHING VARIANTS P9-NG-3S AND P9-NO-3S



The physical characteristics of piezo ceramics lead to a shift in the original switch-on/switch-off voltages as a function of voltage and temperature (relaxation, drift effect). To keep this effect to a minimum we strongly recommend to use a negative switch-off pulse and a holding voltage in the regulated state.

Fig. 1

Pulse modulation (PWM), regular operation

Control voltage ON: +24...+27 VDC

Control voltage OFF: -24...-27 VDC → 0V

The negative switch-off pulse (-24 VDC) should be present for at least 10 ms.

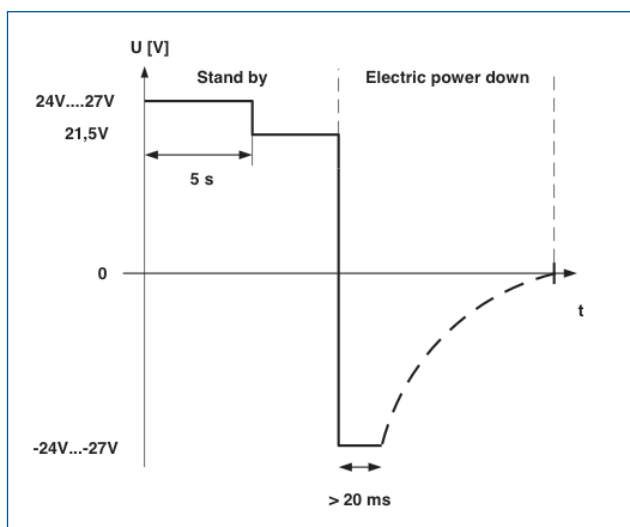


Fig. 2

Normal operation

Adjusted state: +24...+27 VDC → 21.5 V

After the position remains unchanged for approx. 5 seconds, the switch-on voltage can be lowered to +21.5 V.

Voltage OFF and power failure (Fail safe electrical):

-24...-27 VDC → 0V

If the voltage is to be switched off, the negative switch-off pulse (-24 VDC) must be present for at least 20 ms. In the event of a power failure the energy for the switch-off pulse must be permanently available (e.g. capacitor).

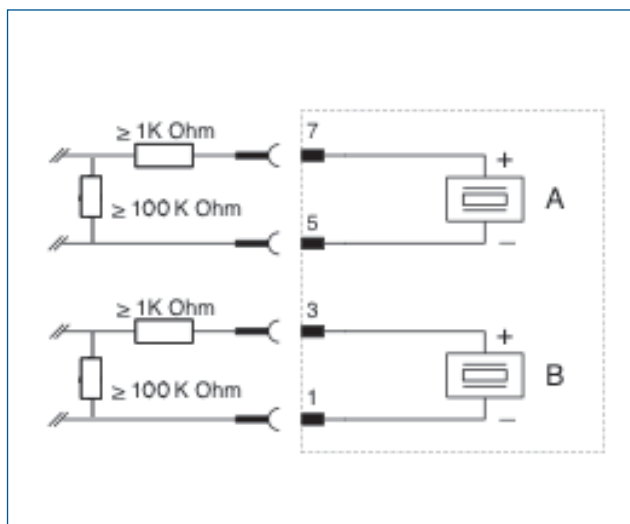


Fig. 3:

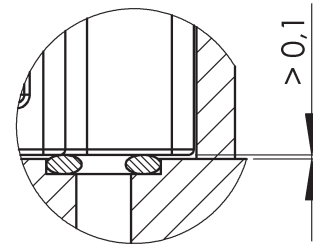
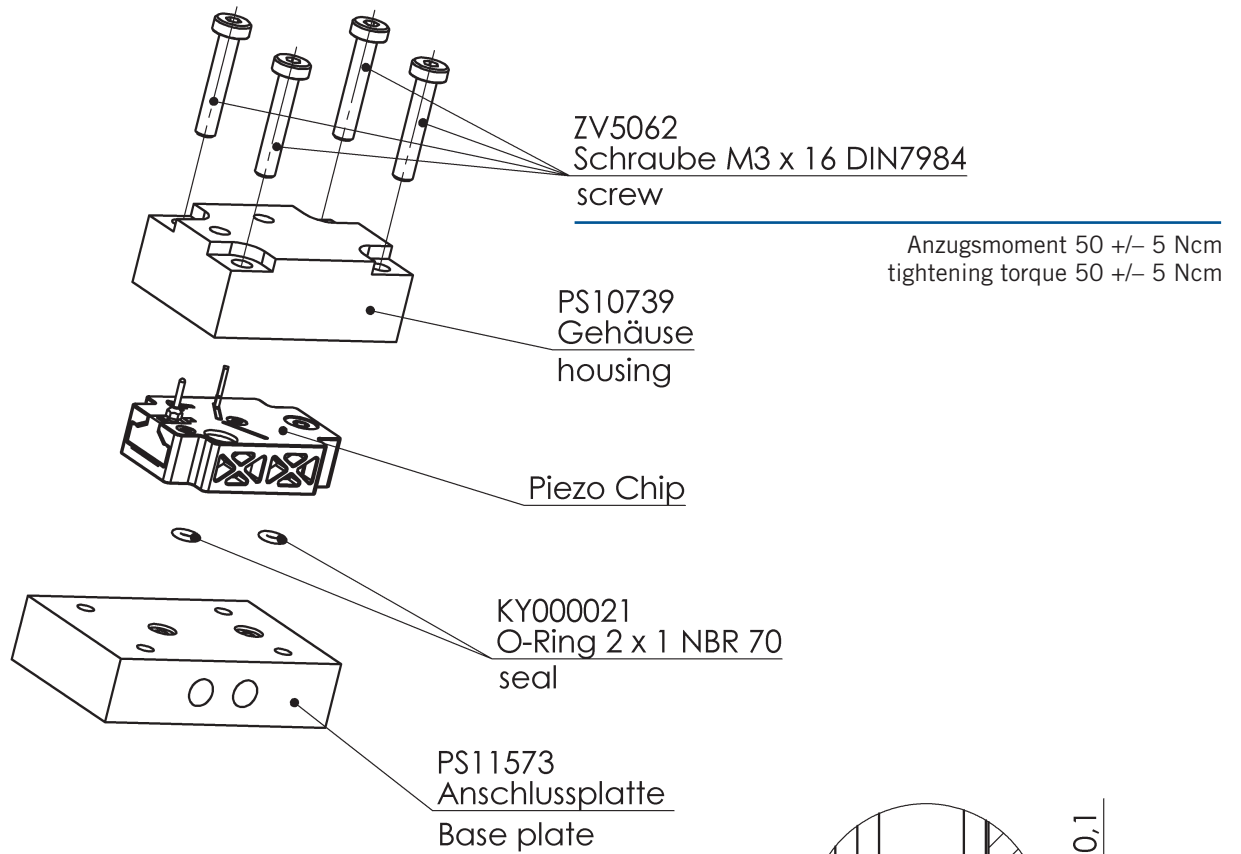
Current limitation via a serial resistor circuit
≥ 1 K Ohm

For discharging a parallel resistor
≥ 100 K Ohm must be provided.

MOUNTING ADVICE

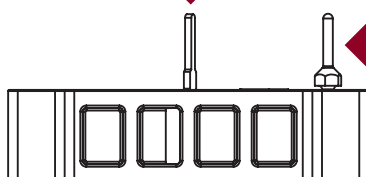
P9

CONNECTION SET



Die Kontaktstifte dürfen keiner Zug-, Druck- oder Querbelastung ausgesetzt werden!

The contact pins must not be subjected to any tensile, compressive or transverse loads!



Die Anschlussbuchse darf keine Kräfte auf den Anschlusspin ausüben!

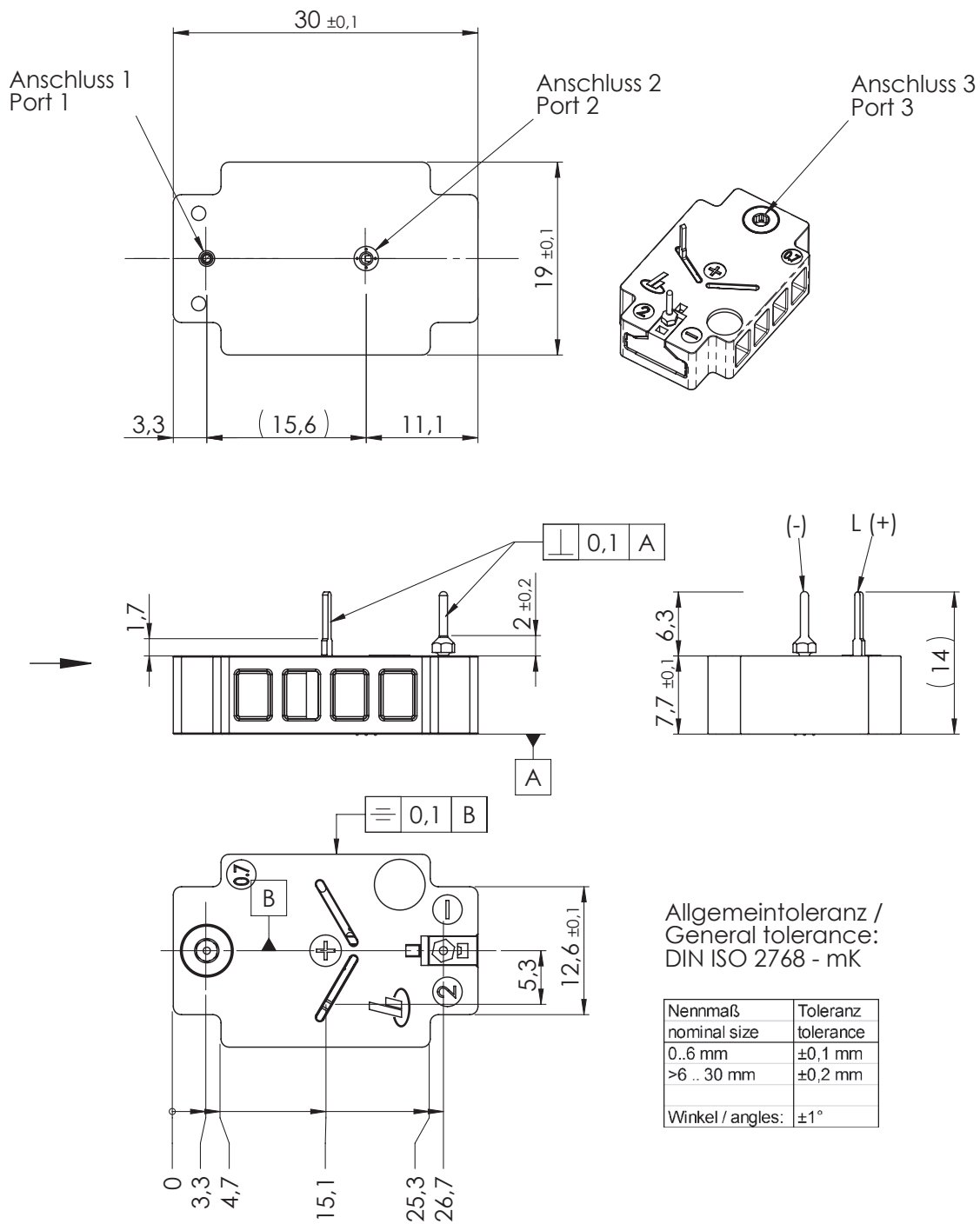
The connection socket must not exert any force on the connection pin!



DIMENSTIONS

P9

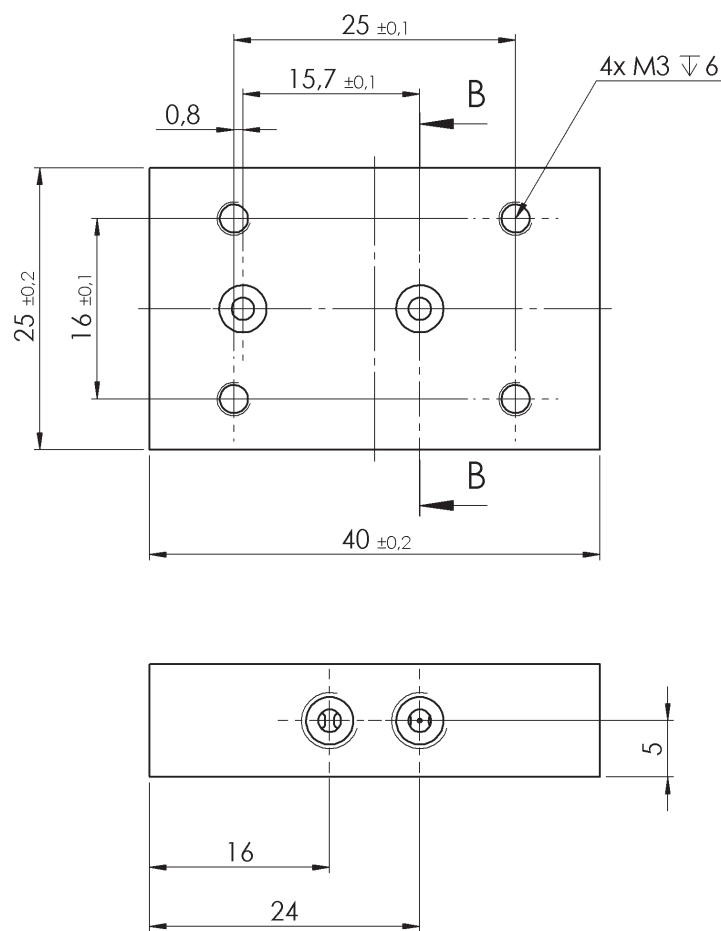
VALVE



ACCESSORIES

P9

BASE PLATE PS11573 WITH FLANGE CONNECTION



ACCESSORIES		ORDER NO.
	Connection set - 1 x Housing - 4 x Screws M3 x 16 DIN7984 - 2 x O-ring	PS11779
	Base plate	PS11573

CONVERSION FACTORS

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CONVERSION FACTORS

VALUE	UNIT	CONVERSION UNIT	FACTOR
Length	mm	in	0.03934
	in	mm	25.4
	m	ft	3.28084
	ft	m	0.3048
Weight	kg	lb	2.204622
	lb	kg	0.453592
Pressure	bar	psi	14.5035
	psi	bar	0.06895
	MPa	psi	145.035
	psi	MPa	0.006895
	bar	MPa	0.1
	MPa	bar	10
Temperature	°C	°F	1.8 °C + 32
	°F	°C	0.5556 °F – 32
Torque	Nm	ft/lbs	0.7375
	ft/lbs	Nm	1.3558

ADDITIONAL DOCUMENTATION

P9

WWW.HOERBIGER.COM

This data sheet and additional documentation is available in the download area of the company's website.



www.hoerbiger.com

NOTES

P9

[illegible]

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