VP23
3-way proportional pressure control valve
Directly-controlled seat valve with µP-driven pressure control
G 1/4 ... G 3/4

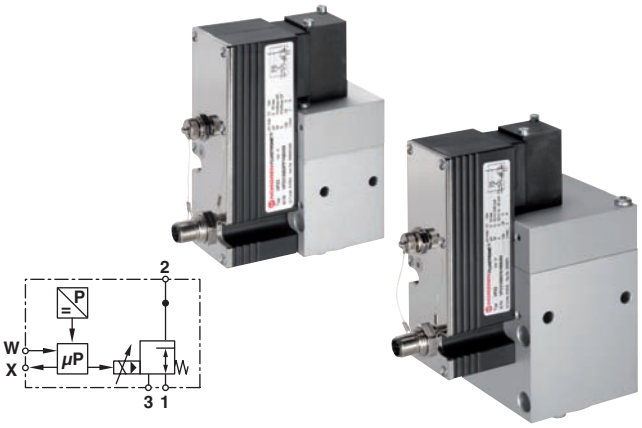
All-digital control electronics

Variable pressure control

Optional: serial interface with VP-Tool Software

Optional actuation via fieldbus (separate datasheet on request)

Free of lacquer affecting substances



Technical features

Medium:
Filtered (50 µm), unlubricated or lubricated condensate-free compressed air or neutral gases
Due to the lubricants and their additives, use of lubricated compressed air can affect the dynamics and service life
Operation:
Proportional solenoid
Pressure range:
Operating pressure P1 max:
7 bar, 12 bar, 17 bar
Operating pressure P2:
0 (0,02) ... 2 bar/0 (0,1) ...
10 bar/0 (0,16) ... 16 bar
Flowrate:
See flow characteristics

Flow direction:
1 –> 2, 2 –> 3
Service life:
> 10 Million operations, max. stroke
Linearity:
< ± 1,0 % (p2 max.)
Control accuracy:
< ± 1,0 % (p2 max.)
Response accuracy:
< ± 0,2 % (p2 max.)
Hysteresis:
< ± 0,5 % (p2 max.)
Repeat accuracy:
< ± 0,5 % (p2 max.)
values related to 20°C and 24 V d.c. power supply

Ambient:
Valve series is designed for indoor use at normal industrial ambient
Fluid/Ambient temperature:
-5 ... +50°C (Fluid)
(no condensation permitted)
-5 ... +60°C (Ambient)
Air supply must be dry enough to avoid ice formation at temperatures below +2°C.

Materials:
Valve housing: Aluminium
Electronic housing: PAA
Seals: NBR, HNBR on request
Internal parts : PBT
Springs : Steel

Option selector

VP23★★B★★★1★★★★★

Pressure range	Substitute
0 ... 2 bar	02
0 ... 10 bar	10
0 ... 16 bar	16
Nominal size	**Substitute**
8 mm	D
16 mm	E
Set point	**Substitute**
4 ... 20 mA	4
0 ... 10 V/Diff.	7
Profibus DP	P

Option	Substitute
Serial interface	B200
Serial interface + LED-display *	B201
Connector	**Substitute**
M12/8 pin	M
Fieldbus spec. (on request)	N
Actual value	**Substitute**
0 ... 10 V/4 ... 20 mA	6
Profibus DP	P

* LED-display for bus version not available

Function
The electronic pressure controller is used in conjunction with an electric set-point (control signal) to quickly and precisely set a pressure at the pressure connection (2). Even with consumption of the medium (compressed air or neutral gases) the output pressure is controlled (see flow rate characteristics)

Proportional valves are used in many different applications across all sectors of industry. They are used anywhere where precise and fast direct or indirect control of pressure, force, rotational speed etc. is required.

Application example: Contact pressure control of welding electrodes in automotive manufacture

Assembly
The electronic pressure controller consists of:
- Proportional solenoid
- An integrated pressure sensor
- µP-driven control electronics
- Serial interface
- A pneumatic control plunger
- Optional:
  Fieldbus interface
  Configuration software VP-Tool (please order separately)
  LED display for the size of the output pressure

Operating principle
The valve has a closed loop controller, meaning that the output pressure is constantly being measured by the internal pressure sensor and compared to the specified set-point.

If the output pressure is lower than the set pressure or if a higher pressure is desired, the pneumatic control plunger is actuated by the electric proportional solenoid. A connection is then established between connection 1 (input pressure) and 2 (output pressure) until the pressure is the same as the specified set-point.

If the output pressure is higher than the set pressure or if a lower pressure is desired, the pneumatic control plunger is actuated by the electric proportional solenoid. A connection is then established between connection 1 (input pressure) and 3 (ventilation connection) until the pressure is the same as the specified set-point.

In addition, after the supply voltage is switched off, the output pressure set last is vented down to 0 bar.

Electrical parameters
Endurance limit in relation to oscillations to DIN EN 60068-2-6:
10g at 12-500Hz in switched-off-status

Durability under shock effect to DIN EN 68-2-67: 30 g/10 shocks
Valves should not be used in safety systems that require blocking or exhaust valves
Without power the pneumatic connection 2 -> 3 is open

Supply

Supply voltage	UB	18 ... 32 V d.c.
Residual ripple max.	[%]	10
Current consumption at 16 bar	NG 8,16 max. [A]	approx. 1,8 A at 24 V d.c.
	NG 8,16 static at 25°C (corrected) [A]	approx. 1,4 A at 24 V d.c.
Current consumption at 10 bar	NG 8,16 max. [A]	approx. 1,8 A at 24 V d.c.
	NG 8,16 static at 25°C (corrected) [A]	approx. 1,2 A at 24 V d.c.
Current consumption at 2 bar	NG 8,16 max. [A]	approx. 1,8 A at 24 V d.c.
	NG 8,16 static at 25°C (corrected) [A]	approx. 1,2 A at 24 V d.c.

Inputs (signal)
Set point W (+/-U d) analogue differential

Voltage signal UE (V)	0 ... 10
Input resistance RI (kΩ)	170
Set point W(I) analogue: Current signal UE (mA) Burden (Ω)	 4 ... 20 500
Max. input voltage (V)	-10 ... 40

Outputs (signal)
Output pressure actual value X(U)

Voltage signal of pneumatic output pressure UA (V)	0 ... 10 V = 0 ... max. p2
Output current max. IA (mA)	1

Output pressure actual value X(I)

Current signal of pneumatic output pressure IA (mA)	0 (4) ... 20 mA = 0 ... max. p2
Load resistance RL (Ω)	500 recommended

Output »pressure reached« X (comp)

Switching range (% max. p2)	+/-2%
Digital output signal	PLC-Level
Control pressure outside of switching range (X≠W)	Low
Pressure reached (X = W) (V)	High
Outout current max. (mA)	10

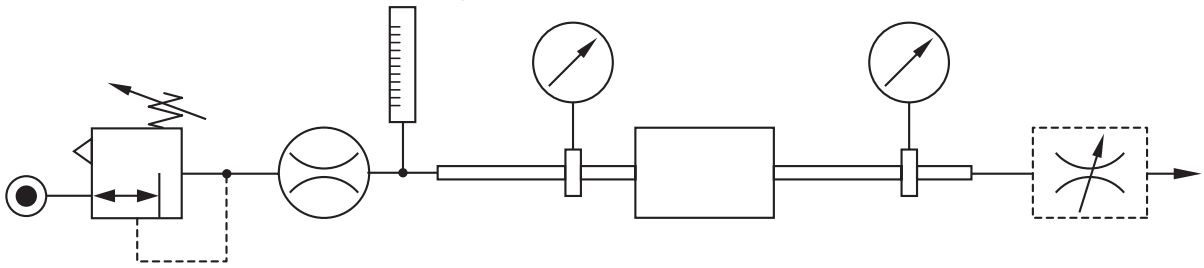
Pneumatic parameters

Recommended application area by nominal value:
NG8: Volume (closed) from 100 ... 1500 cm^3
NG16: Volume (closed) from 1000 ... 8000 cm^3

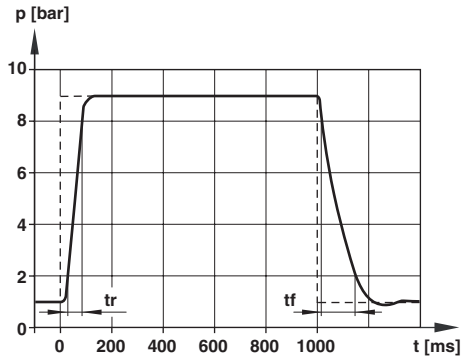
Residual ripple max.	[%]	10
Input pressure p1 max.	[bar]	17/12/7
Output pressure p2 max.	[bar]	0-16 / 0-10 / 0-2
Flow quantity NG 8	[l/min]	see diagram
Flow quantity NG16	[l/min]	see diagram
Switching times (10%-90%) nominal size 8 at volume 400 cm^3		
Typical values for P1=12 bar		
Pressure build-up (tr) 1 bar ... 9 bar	100 [ms]	
Pressure build-up (tf) 4 bar ... 5 bar	50 [ms]	
Pressure drop (tr) 9 bar ... 1 bar	250 [ms]	
Pressure drop (tf) 5 bar ... 4 bar	50 [ms]	
Switching times (10%-90%), nominal size 16 at volume 1000 cm^3		
Typical values for P1=12 bar		
Pressure build-up (tr) 1 bar ... 9 bar	100 [ms]	
Pressure build-up (tf) 4 bar ... 5 bar	50 [ms]	
Pressure drop (tr) 9 bar ... 1 bar	100 [ms]	
Pressure drop (tf) 5 bar ... 4 bar	50 [ms]	

Test assembly flow

CETOP RP 84 P.: flow characteristic of pneumatic devices



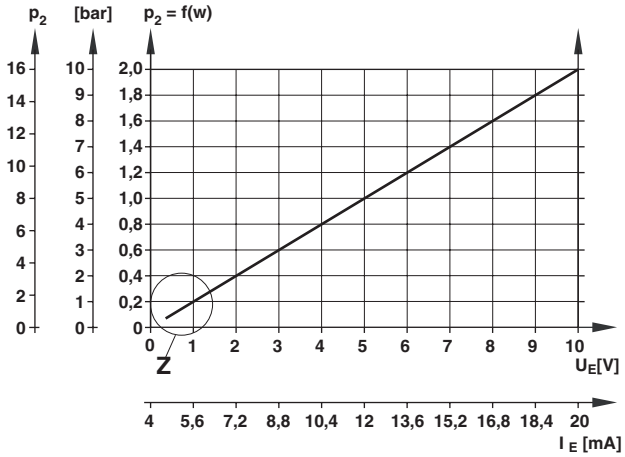
Step-response diagram

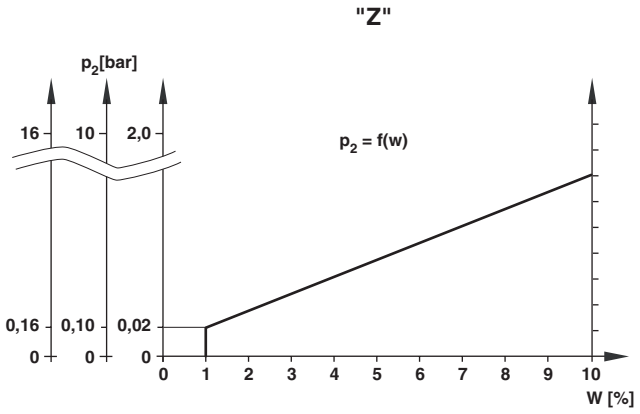


Pneumatic characteristics curves

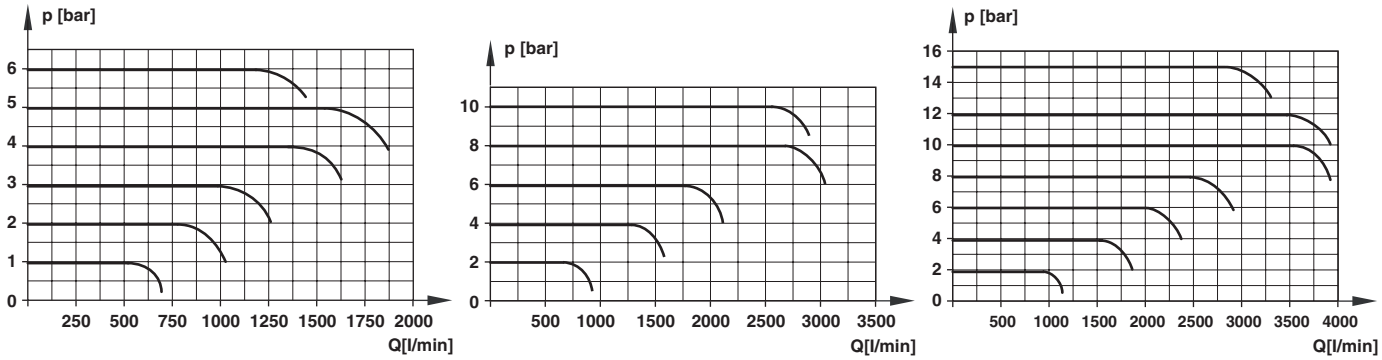
Flow rate characteristic as a function of the set-point (voltage/current) and input pressure 7 bar, 12 bar, 17 bar for nominal value 8 and 16

Static characteristics

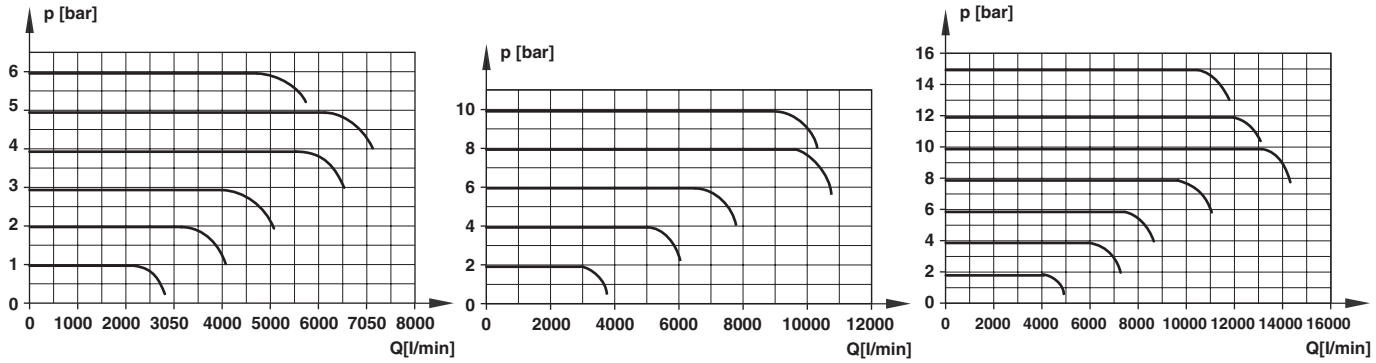




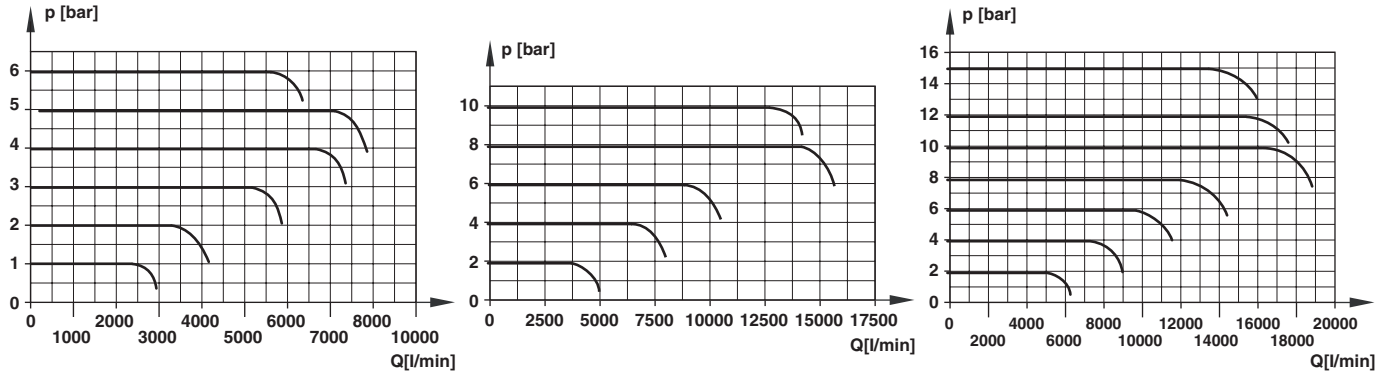
Flow rate characteristics NG 8/P1=7 bar, 12 bar, 17 bar



Flow rate characteristics NG 16/connection plat ae 1/2" (NG12); P1=7 bar, 12 bar, 17 bar



Flow rate characteristics NG 16/connection plate 3/4" (NG20); P1=7 bar, 12 bar, 17 bar



Functional descriptions, status LED and amplification degree setting
General Status LED indicator

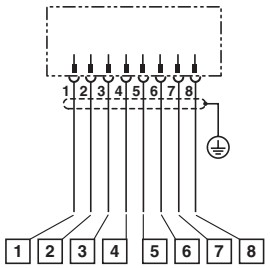
Status	Status-LED
Device off	off
Device running	single-colour green
Valve fault*	red*

* Potential error sources:
- Current supply or internal references outside the permitted range
- Valve not adjustable (X≠W Time out)
- Program cycle interrupted

Setting controller gain via PC with VP-Tool

The gain of the integrated controller is set in the factory to a value which allows universal use of the valve. If necessary, the controller gain can be varied to suit a specific pneumatic application of the valve. When the screw plug is opened the interface connector can connected and via VP-Tool the controller gain can be adjusted. Adjustment by VP-Tool via serial interface

Connection diagrams
1. Standard connection (M12x1; 8-pin)



1 W (I), white
2 X (komp), brown
3 W (-Ud), green
4 W (+Ud), yellow
5 X (I), grey
6 Ub pink
7 GND blue
8 X (U), red

Assignment
Supply:

Pin		Description	Colour of connection cable
6	Ub	power supply 18 ... 32 V d.c.	Pink
7	GND	power ground/PGND	Blue

Input
Set point:

Pin		Description	Colour of connection cable
3	-W	Analogue GND/set point input voltage 0 ... 10 V	Green
4	+W	Signal/set point input voltage 0 ... 10V	Yellow
1	W(I)	Set point input current 4 ... 20 mA	White

Depending on the order number, both outputs (U/I) but only the ordered input will be active.

Voltage input 0 ... 10 V between pins 4 and 3 Current input between pins 1 and 7

Comparator output/pressure switch*
Pressure reached:

Pin		Description	Colour of connection cable
2	X (comp)	Digital output signal PLC level (I max) =3,3 mA	Brown
		High : pressure reached devation Iw-xI < ± 2%	
		Low: pressure not reached devation Iw-xI > ± 2%	

The output relates to Gnd Pin 7

* selectable via VP-Tool

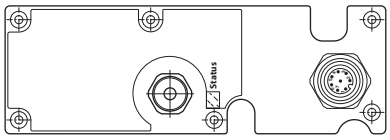
Function
Option LED indicator

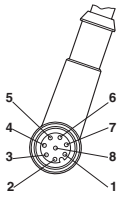
Pressure range	Display values
0 ... 2 bar	0,00 ... 2,00
0 ... 10 bar	00,0 ... 10,0
0 ... 16 bar	00,0 ... 16,0

2 coloured LED-display

LED indicator green	pressure devation from setpoint < +/- 2%
LED indicator red	pressure devation from setpoint > +/- 2%

After energizing power supply of the valve the LED display will be initialised. Therefore the LED shows 2 seconds red light and after that 2 seconds green light





Output

Pin		Description	Colour of connection cable
5	X(I)	Actual value current 4 ... 20 mA	Grey
8	X(U)	Actual value voltage 0 ... 10V	Red

Voltage output refers to Gnd Pin 7.

Due to the voltage drop on the ground wire you should consider an accuracy loss of the voltage output.

Both outputs are active as standard.

3. Serial interface connection

Connection of serial interface

Remove fitting, plug in the interface cable, establish communication with VP-Tool.

Connecting plugs


Description	Page Specification	Model
Connecting plug	M12x1; 8-pin; 5 m, 8 x 0,25 mm2, straight	0250811
Connecting plug	M12x1; 8-pin; 5 m, 8 x 0,25 mm2, 90°	0250813
Connecting plug	M12x1; 8-pin; screw terminals, 90°	0252383
Connector (Bus only)	M12x1, 5-pin, 5 m, 90°, A-Coded, open (power)	0252086
Connector (Bus only)	M12x1, 5-pin, 5 m, straight, A-Coded, open (power)	0252087
Connector (Bus only)	M12x1, 5-pin, 5 m, 90°, A-Coded, open (power)	0252088
Connector (Bus only)	M12x1, 5-pin, 5 m, 90°, B-Coded, open (Bus in)	0251310
Connector (Bus only)	M12x1, 5-pin, 5 m, 90°, B-Coded, open (Bus out)	0251312
Connector (Bus only)	M12x1, 5-pin, convertible, 90°, B-Coded (Bus in)	0252089
Connector (Bus only)	M12x1, 5-pin, convertible, 90°, B-Coded (Bus out)	0252090
Connector with cable (Bus only)	Plug M12x1, 5-pin, 5m, 90°, B-Coded, (Bus in/out)	0252091

Note: Cable material PUR shielded

Connection plates

Description	Ports	Model
Connection plate NG 8	G1/4	0542636
Connection plate NG 8	G3/8	0543705
Connection plate NG16	G1/2	0542814
Connection plate NG16	G3/4	0542840

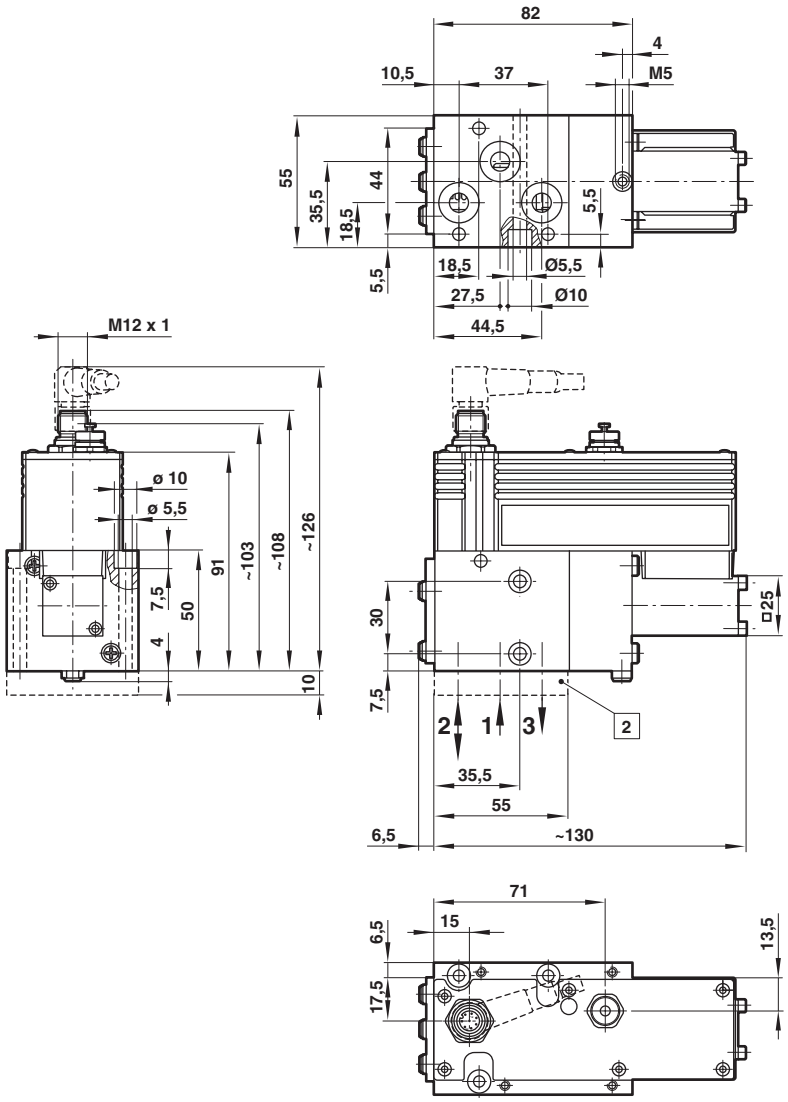
Serial interface accessories

Adaptor cable

Description	Model
Adaptor cable with software CD VP tool	5988319

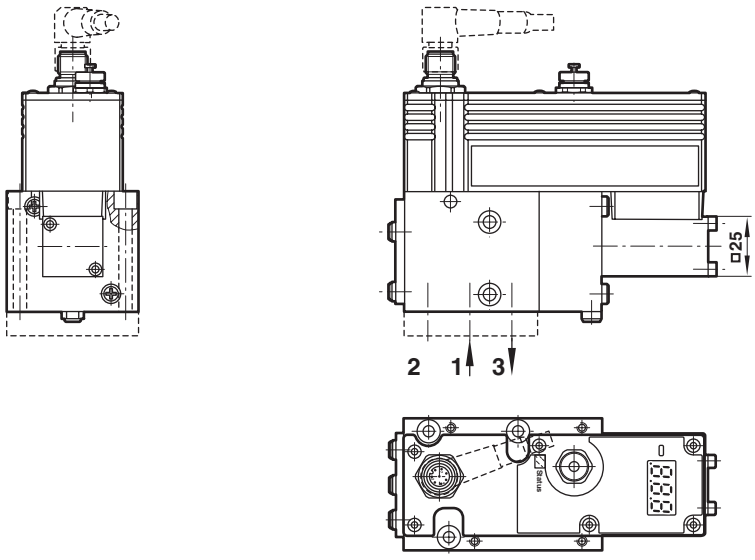
Basic dimensions

Standard ND8

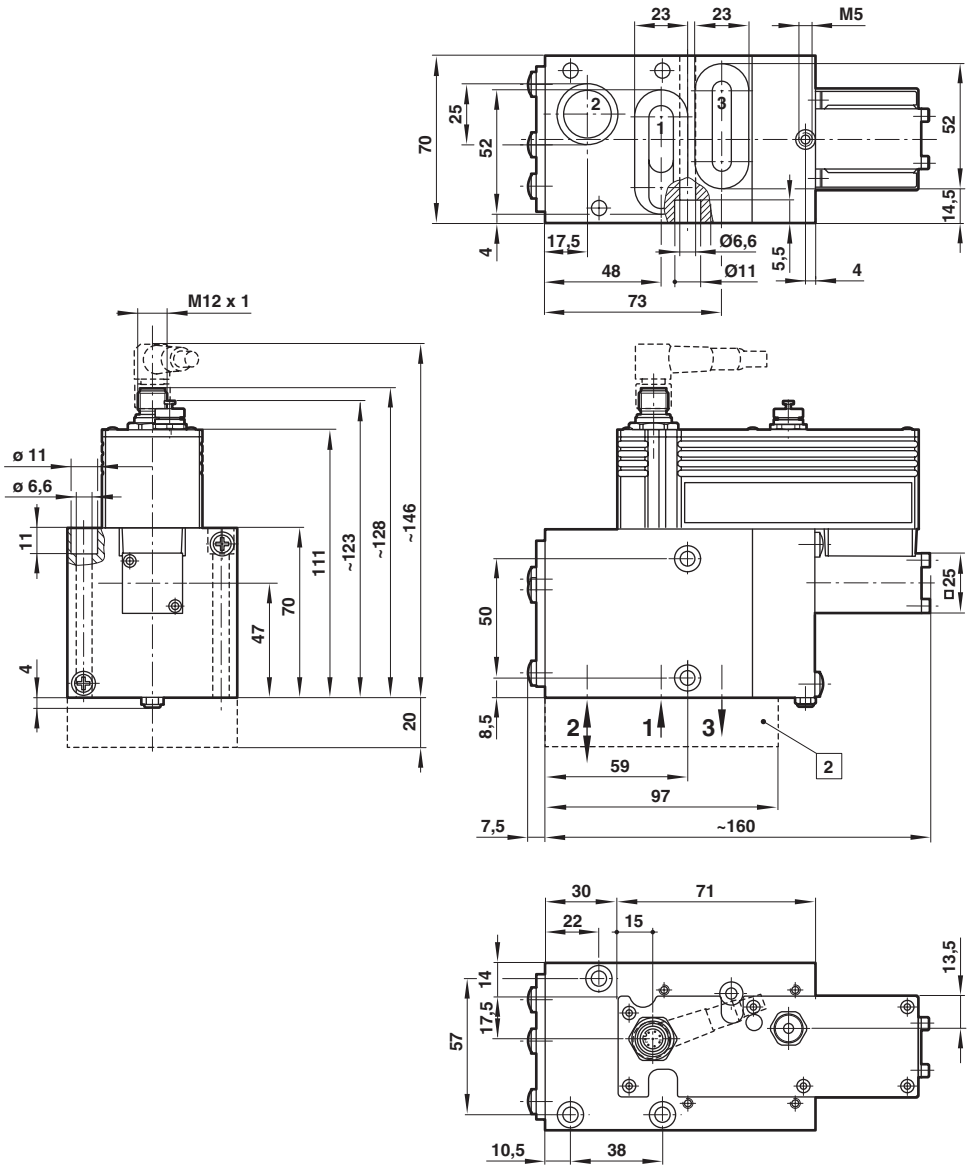


2 Connection plate

ND8 with serial interface, LED indicator

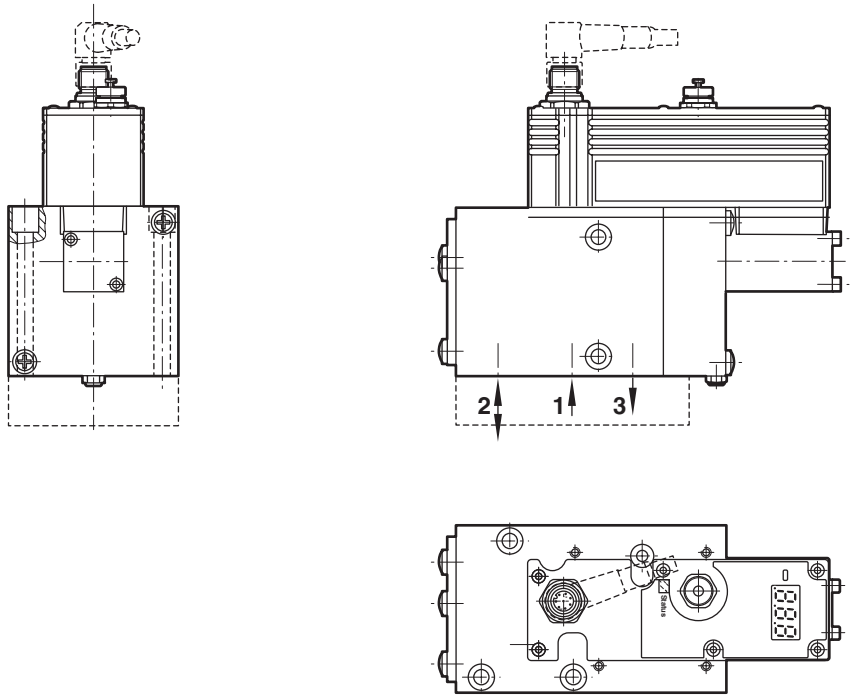


Dimensions ND16

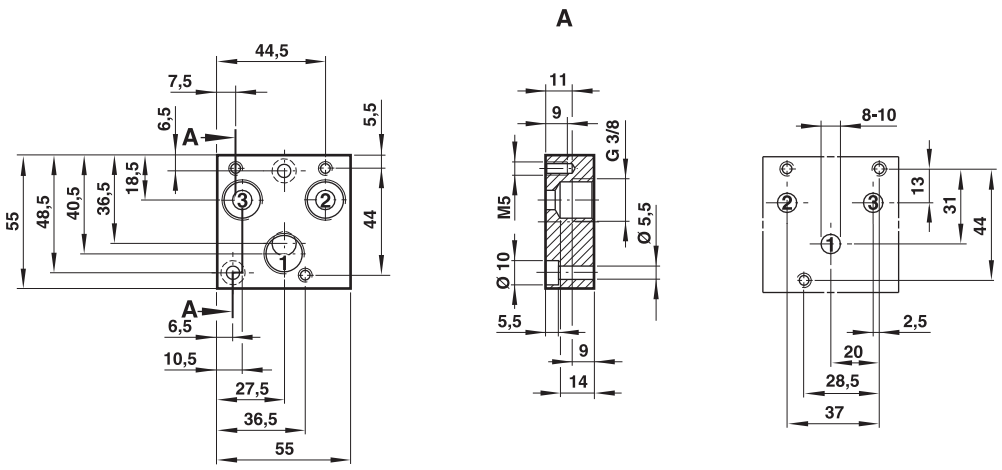


2 Connection plate

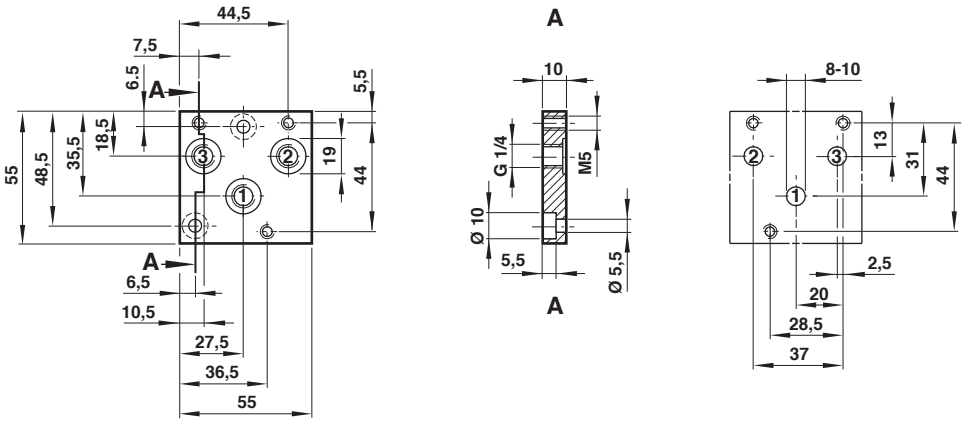
Dimensions optional serial interface, LED indicator ND16



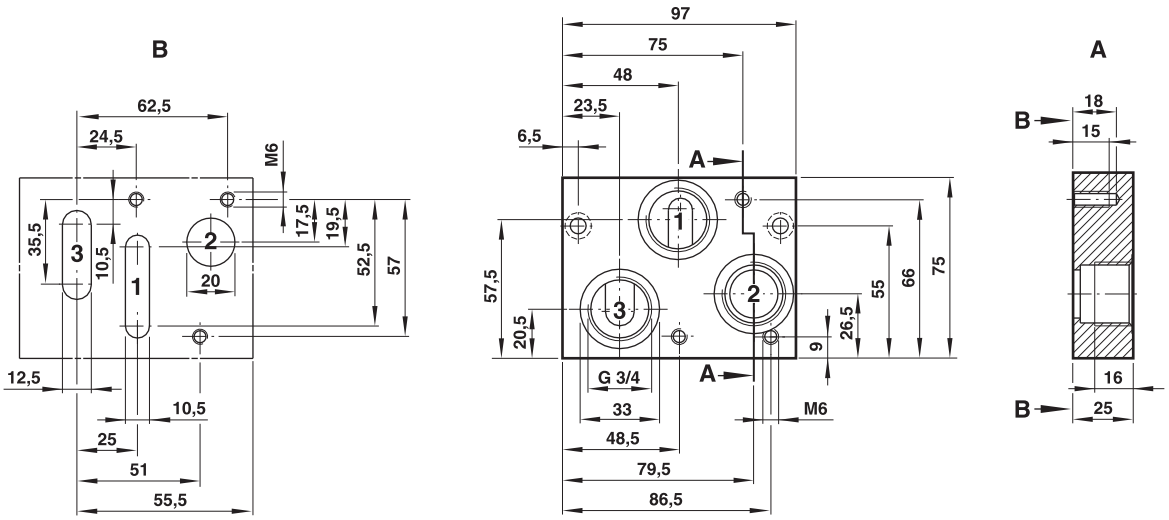
Connection plate
0543705, G3/8 ports preferable for VP23xxBDxx1xxxxx valve



0542636, G1/4 ports optional for VP23xxBDxx1xxxxx valve

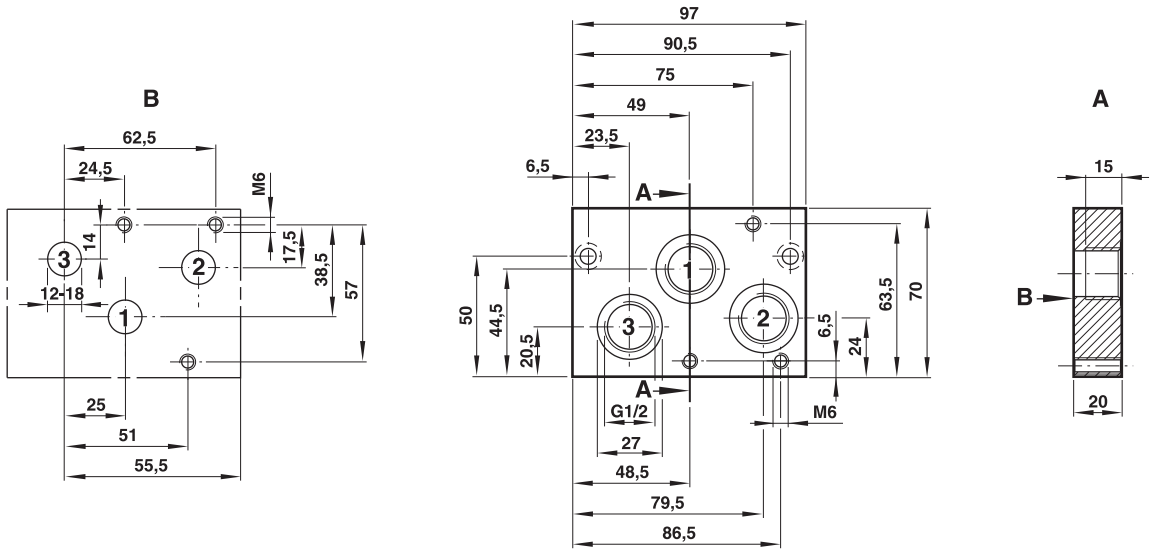


0542840, G3/4 ports preferable for VP23xxBExx1xxxxx valve



Connection plate

0542814, G1/2 ports optional for VP23xxBExx1xxxxx valve



Warning

These products are intended for use in industrial compressed air and rail transport systems only. Do not use these products where pressures and temperatures can exceed those listed under 'Technical features'.
Before using these products with fluids other than those specified, for non-industrial applications, life-support systems, or other applications not within published specifications, consult NORGREN.

Through misuse, age, or malfunction, components used in fluid power systems can fail in various modes.

The system designer is warned to consider the failure modes of all component parts used in fluid power systems and to provide adequate safeguards to prevent personal injury or damage to equipment in the event of such failure.
System designers must provide a warning to end users in the system instructional manual if protection against a failure mode cannot be adequately provided.
System designers and end users are cautioned to review specific warnings found in instruction sheets packed and shipped with these products.