

5/3 Way proportional directional control valves
Nominal diameter 8
direct operated sliding valves with
 μ P-driven position control

Adjusted, linear flow characteristic
Zero-overlap-characteristic
High flow – low pressure drop
Free of lacquer affecting substances
Highly dynamic control
Diagnostic functions
Valve conforms to CE
ATEX approvals: 94/9/EG – Cat. II 3G/D,
Zone 2 for standard units



Technical data

Medium:

Compressed air, filtered and non-lubricated
 Due to the lubricants and their additives, use of lubricated compressed air can affect the dynamics and service life

Filter:

Recommended 5 μ m

Operation:

any, preferable solenoid upstairs

Pneumatic conductance:

$C = 290 \text{ NI}/(\text{min} \cdot \text{bar})$

Critically pressure ratio:

$b = 0,1 \text{ to } 0,4$

Flow rate:

1200 NI/min at $p_1 = 6 \text{ bar}$, $p_2 = 5 \text{ bar}$

Operating pressure:

(p_1): Vacuum to 16 bar

Leakage:

Middle position 16 l/min max.

($p_1 = 10 \text{ bar}$ and $p_2/4 = 0 \text{ bar}$)

Connection:

G1/4 and 1/4 NPT

Flow direction:

$1 \rightarrow 4 + 2 \rightarrow 3$; $1 \rightarrow 2 + 4 \rightarrow 5$

Operating temperature:

0 to +60°C

Fluid temperature:

0 to +60°C (no condensation permitted,
 consult our technical service for use below +2°C)

Hysteresis:

$\pm 0,5 \text{ (\% max. Q)*}$

Repeat accuracy:

$\pm 2,0 \text{ (\% max. Q)*}$

Response sensitivity:

$\pm 0,5 \text{ (\% max. Q)*}$

Linearity:

$\pm 5,0 \text{ (\% max. Q)*}$

Response time:

$p_1 = 6 \text{ bar}$, 100% stroke, exhaust to atmosphere

Dead time:

3 ms

Rise time:

5 ms (10% to 90%)*

Threshold frequency:

105 Hz at -3 db and 100% set point*

Service life:

> 250 Mio. operations (100% stroke)

Degree of protection:

IP 65

Vibration resistance:

DIN EN 60068-2-6, 10g at 12 – 500 Hz switched off.
 When working more than 1 g function interference.

Shock resistance:

DIN EN 60068-2-67, 30g/10 shocks

Electromagnetic compatibility:

EN61000-6-4, EN61000-6-2, EN61000-6-5

EN61000-4-4, EU conform according to standards
 89/336/EWG (CE-approval)

Materials:

Housing for electronics: plastic (PAA)

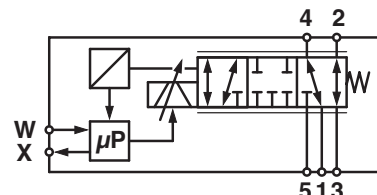
Housing and internal parts: aluminium anodised

Seals: NBR

Magnet: iron refined surface

*Values stated relate to 20°C

Dynamic values stated relate 24 V d.c. power supply



Short description

Function

The valve's aperture cross section is set by assigning an electrical set point signal, which generates a proportional flow rate, optimised to the characteristic curve, when the pressure ratios P1 and P2 are the same.

The absolute position of the valve spool is determined through the position transducer integrated within the housing; it is adjusted to the set point via the (integrated) electronic spool position feedback loop.

The proportional directional control valve enables continual, reversible airflow feed, e.g. for cylinder speed controllers.

The proportional directional control valve can be used as a control valve for positioning drives or as an electrically adjustable throttle.

Operation

Moving coil drive, failsafe position through return spring. By adjusting the set point to the spool position and the linearity of the spool position to the flow rate via optimised spool geometry, the VP60 offers linearised flow proportionality with sensitive control.

Optimum proportionality of set point to flow rate is achieved with constant environmental conditions (P1, P2), as it is the performance characteristics of the spool position that is regulated, not the flow rate. However, the ability to finely control the flow rate is maintained even when there are pressure variations. Optimising the performance characteristics produces what approximates to a zero overlap valve.

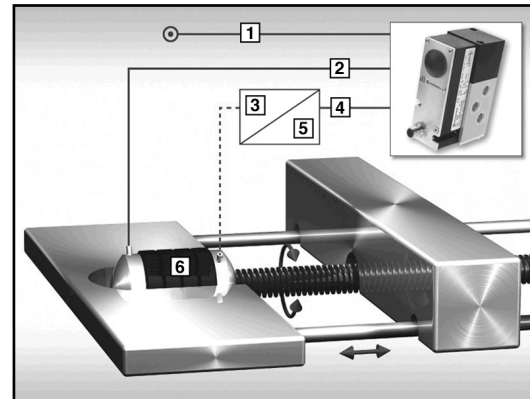
Features

- μ P digital controller achieves exceptional valve spool stability and the highest dynamics
- Optimised linearity relating to set point/flow and minimum hysteresis
- Good response sensitivity
- High flow rate
- Failsafe bleeding
- Zero overlap mode
- Low pressure drop
- PC configurable via V24 interface with VP tool
- adjustable setpoint 4 - 20 mA, ± 5 V, 0 - 10 V

Optional:

activation via field bus (Profibus DP)

Application example: Speed control spindle and torque



1	Compressed air
2	Output flow
3	Feedback
4	Set point
5	PLC
6	Air motor

The VP60 can also be operated as a 3/2 way proportional directional control valve with two different failsafe positions.

a) 3/2 Way proportional directional control valve NC

Pressurised connection Port 1 and consumer connection Port 2. When voltage is switched off, Port 2 is closed to the consumer. The Port 4 connection must be sealed using a blind plug.

b) 3/2 Way proportional directional control valve NO

Pressurised connection Port 1 and consumer connection Port 4. When voltage is switched off, the consumer receives the maximum flow rate. The Port 2 connection must be sealed using a blind plug.

c) Option: 2/2 Way proportional directional control

Valve Function. As an option, the set point range can be referenced 100% (0-10V, 4-20mA) to the respective port connection (1 $\rightarrow$ 2 or 1 $\rightarrow$ 4). When used in this way, only a dispensing mode is possible.

Options selector

VP6010L★★★★★1★★★★★

Pneumatic port

G1/4	J
1/4 NPT	K
ISO1	T

Set point

4 to 20 mA	4
-5 V to +5 V differential	6
0 to 10 V differential	7
Profibus DP	P

Option

Serial interface (RS 232)*	B200
----------------------------	------

Electrical connection

M12/8 pol.	M
Fieldbus specific	N

Substitute

0 to 10 V/4 to 20 mA	6
Profibus DP	P

Adjustable with VP tool
Preadjusted 0 to 10V

Ordering example

5/3 way proportional directional control valve,
pneumatic port: G1/4, set point: 0 to 10V,
quote: **VP6010LD761MB200**

Standard accessories

Connection cable

Description	Materials	Type	Type
M12*1; 8-pin; 5 m; 8 x 0.25 mm ²	PUR shielded	0250811	0250813
M12x1, 5-pin, 5 m, A-cod		0252087 / M*	0252086 / F*
M12x1, 8-pin, 5 m,		0250811 / F*	0250813 / F*
M12x1, 5-pin, 5 m, A-cod			0252088 / M*
M12x1, 5-pin, 5 m, B-cod			0251310 / F*
M12x1, 5-pin, 5 m, B-cod			0251312 / M*
M12x1, 5-pin, B-cod, konf.			0252089 / F*
M12x1, 5-pin, B-cod, konf.			0252090 / M*
M12x1, 5-pin, 5 m, B-cod			0252091 / M/F*
Terminating resistor		FD6710K5SM5S00	
Connector plug, 6-pin+PE		0660689 / F*	

*F = female, M = male
Materials: PUR shielded

Serial interface accessories

Interface adaptor, complete with
VP tool program on CD

Description	Type
Interface connector, inclusive software CD /VPTool	5988299

Electrical parameters
Supply

Supply voltage	UB (V d.c.)	21 to 32
Residual ripple max.	(%)	10
Current consumption at full stroke 50 Hz (A)	ca. 2.0 at 24 V d.c.	
Current consumption static (corrected) (A)	ca. 0.1 at 24 V d.c.	

Inputs (signal)
Analogue set points W(U/I) referenced to GND

Current signal	IE (mA)	(0) 4 to 20
Load independence	(Ω)	500

Analogue differential set points W (+/-Ud)

Voltage signal	UE (V)	0 to 10
		-5 to +5
Input resistance	RI (kΩ)	110
Max. input voltage range	(V)	-10 to 40

Outputs (signal)
Output spool position X(U)

Voltage signal from the spool position	0 to 10 V = min. to max. stroke
UA (V)	
Output current max.	IA (mA) 1

Output spool position X(I)

Current signal from the valve position	IA (mA)	4 to 20 mA = min. to max. stroke
Load resistance	RL (Ω)	500 recommended

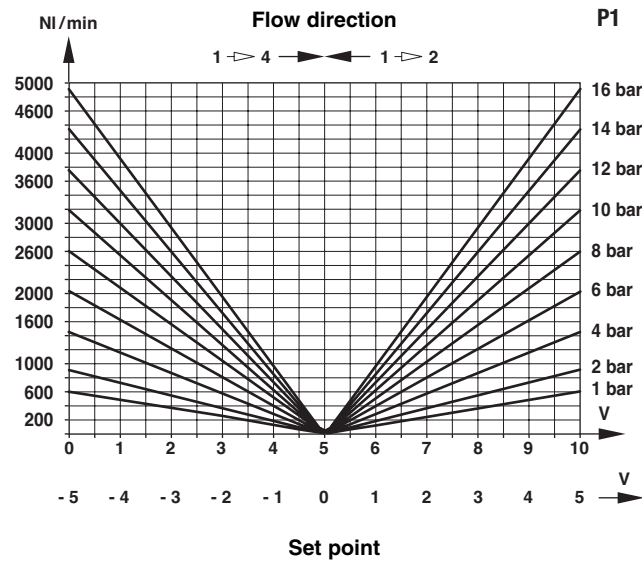
Output »Error: Position not reached« X (Komp)

Switching range (% max. stroke)	< +/-0.2 % after 10 sec.
Digital output signal	PLC level
Error signal*	Low
Function OK	High
Output current max. (mA)	3.3

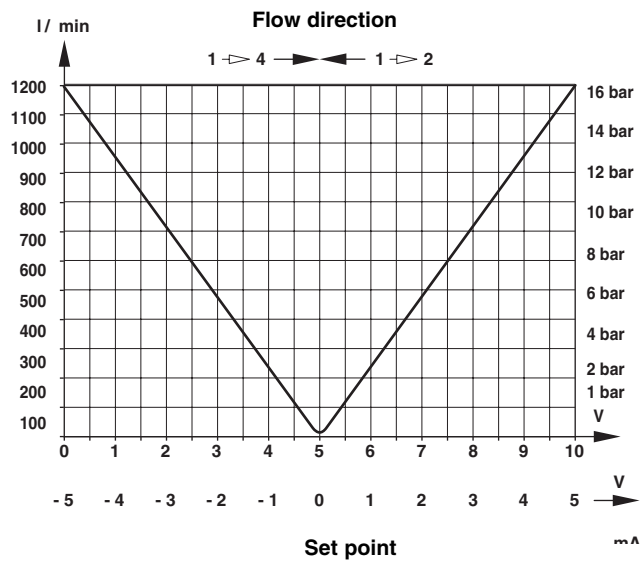
* Low voltage or current overshoot, µP error

Curves

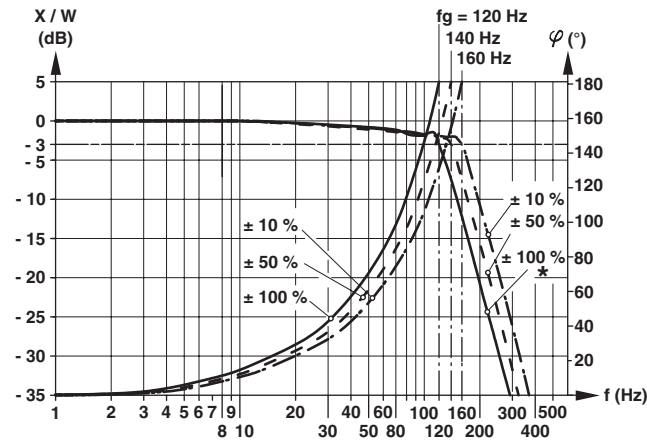
**1. Flow characteristics
(exhausting to atmosphere
different input pressures)**



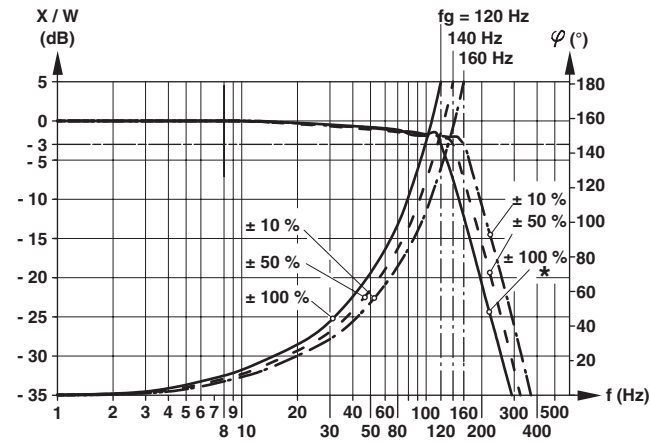
**2. Flow characteristics (DP= 1 bar)
p1 = 6 bar, p2 = 5 bar**



**Single side mode port 2 and
50% stroke (respective port 4)**



Center position in direction 2 and 4



X = Actual value
W = Set point
f = frequency

*) ± 100% corresponds to 1150 NI at
Δ p = 1 bar (6 → 5 bar)
- 100% corresponds to 0 NI

**) ± 100% corresponds to 1150 NI at Δ p = 1 bar (6 → 5 bar)

zero point adjustment

Zero point adjustment is only possible
by Vp tool program

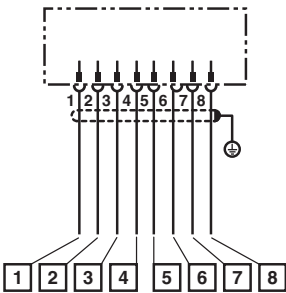
General status LED indicator

Status	Status LED
Device off	Off
Device running	Single-colour green
Valve fault*	Red*

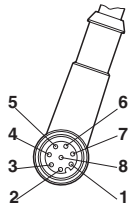
* Potential error sources:
- Current supply or internal references outside the permitted range
- Valve not adjustable ($X \neq W$ Time out)
- Program cycle interrupted

Connection diagrams

1. Standard connection (M12x1; 8-pin)



1	W (U/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 Supply voltage 21 to 32 V d.c.	pink
7	GND Power ground GND	blue

Inputs
Set point:

Pin	Description	Colour of connection cable
3	W(-Ud)* Analogue GND/set point input Voltage 0 to 10 V or +/- 5 V	green
4	W(+Ud)* Signal/set point input Voltage 0 to 10 V or +/- 5 V	yellow
1	W(I) Set point input current 4 to 20 mA	white

Depending on the order number, both outputs (U/I) but only the ordered input will be active.
* Differential input, input between pins 4 and 3
*** Current input, input between pins 1 and 6

Ausgänge
Ventilausgang:

Pin	Description	Colour of connection cable
5	X(I) Actual value output, current 4 to 20 mA	grey
8	X(U) Actual value output, voltage 0 to 10 V	red

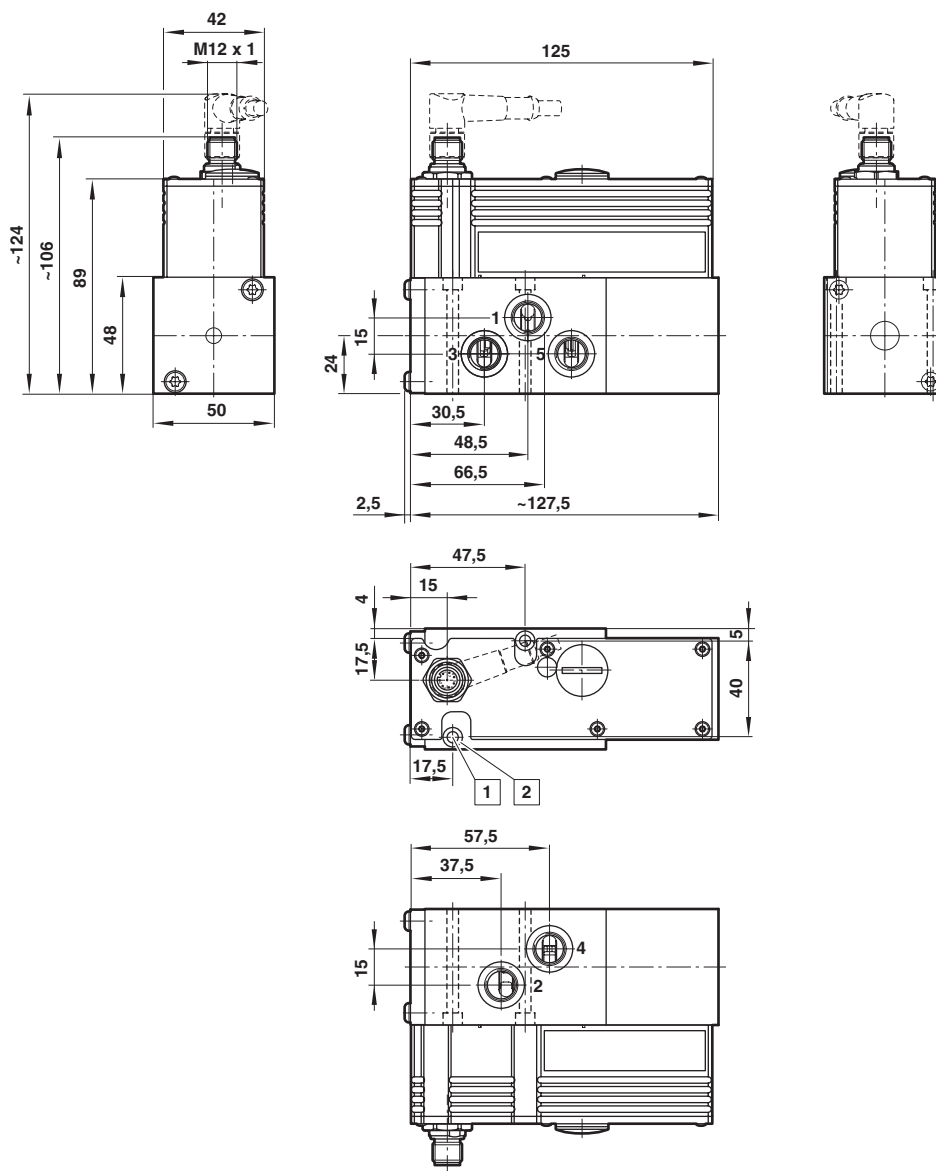
The voltage output relates to Gnd Pin 6.
Some loss in accuracy needs to be accounted for on the voltage output
due to the voltage drop on the earth line
Both outputs are active as standard.

Fault output

Pin	Description	Colour of connection cable
2	X (comp) Digital output signal PLC level (I (max) =3.3 mA) High: Function ok Deviation: $I_w - I_x < \pm 0.2 \%$ Low: Position not reached Deviation: $I_w - I_x > \pm 0.2 \%$	brown

The output relates to Gnd Pin 6

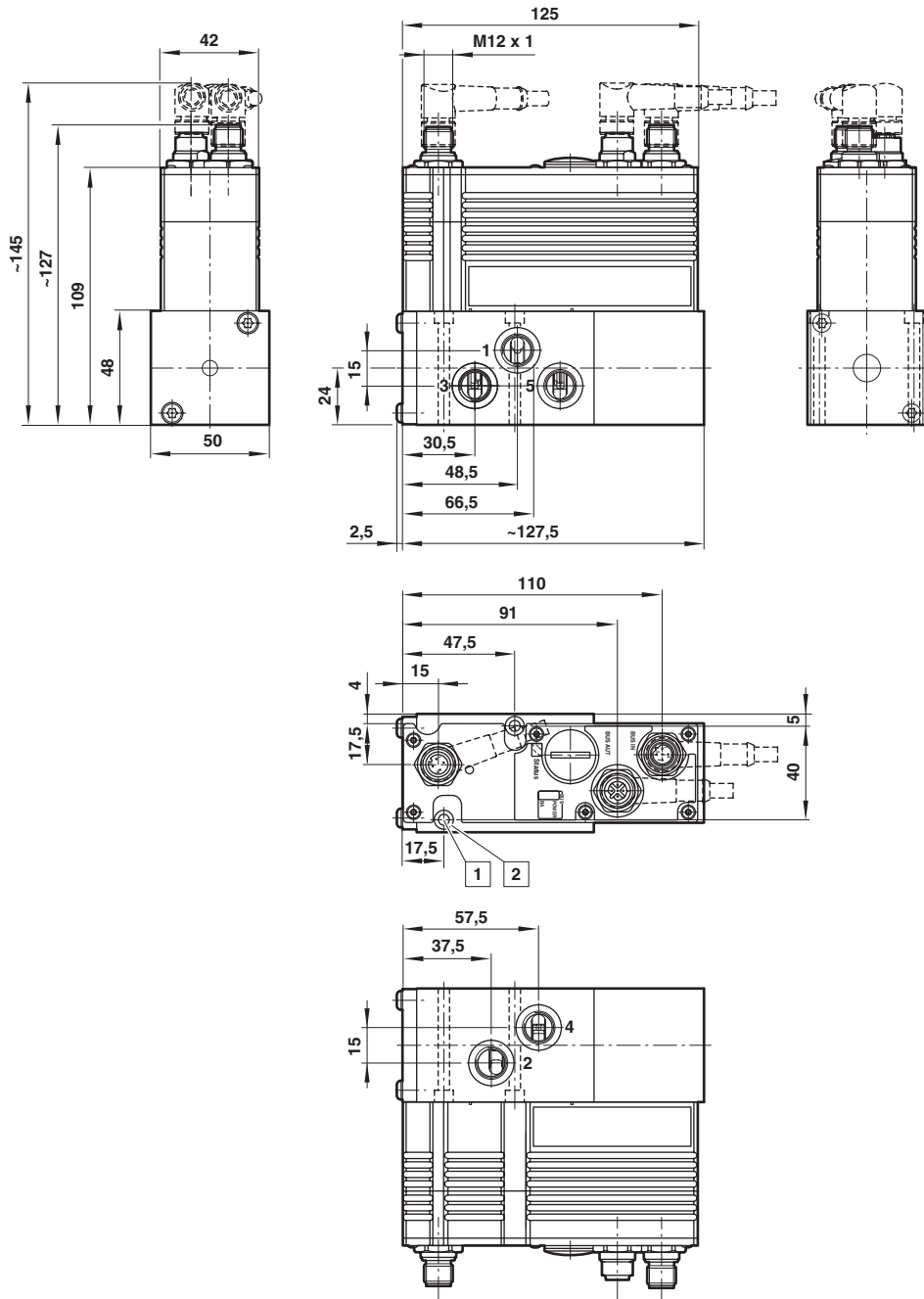
Dimensions VP60 – standard version



1

Valves are delivered with M4 x 50 mounting screws

Dimensions VP60 – Profibus



1

Valves are delivered with M4 x 50 mounting screws

Warning

These products are intended for use in industrial compressed air systems only. Do not use these products where pressures and temperatures can exceed those listed under **‘Technical data’**.

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.