

Proportional pressure-limiting valve type PMV, PMVP

Product documentation



Operating pressure p_{\max} :

700 bar

Flow rate Q_{\max} :

120 lpm



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1 Overview of proportional pressure-limiting valve type PMV, PMVP

Proportional pressure-limiting valves are a type of pressure control valve. They remotely control the pressure in hydraulic systems continuously and electrically.

The pressure-limiting valve type PMV is a pilot-controlled valve in a spring-loaded ball version. The pressure can be set to up to 700 bar. The pressure-limiting valve type PMV is available as a single valve for pipe connection or as a manifold mounting valve.

The proportional pressure-limiting valve is particularly suitable for maximum pressure limitation in hydraulic systems.

Features and advantages

- Operating pressures up to 700 bar
- Precise control over a wide control range

Intended applications

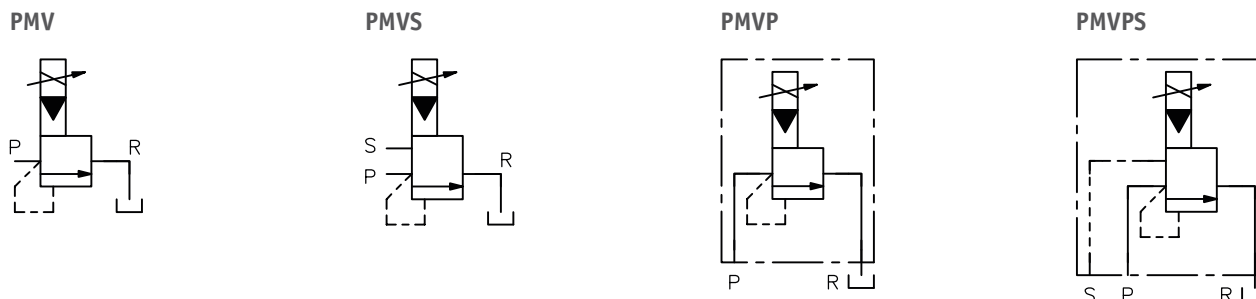
- General hydraulics
- Test benches
- Mining machinery



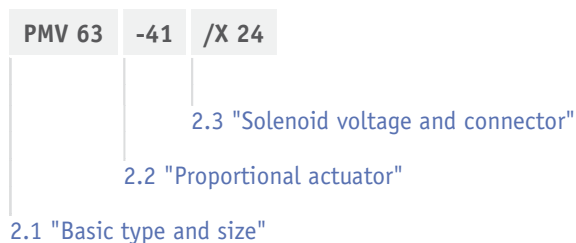
Proportional pressure-limiting valve type PMV

2 Available versions

Circuit symbol



Ordering example



2.1 Basic type and size

Main valve

Type	Connection	Flow rate Q_{max} (lpm)
For pipe connection		
PMV 41	G 1/4	16
PMV 42	G 3/8	16
PMV 51	G 1/4	16
PMV 52	G 3/8	40
PMV 53	G 1/2	60
PMV 62	G 3/8	60
PMV 63	G 1/2	75
PMV 64	G 3/4	75
PMV 84	G 3/4	120
PMV 85	G 1	120
PMVS 41		
PMVS 51	G 1/4	16
For manifold mounting		
PMVP 4	--	16
PMVP 45	--	16
PMVP 5	--	40
PMVP 56	--	60
PMVP 6	--	75
PMVP 65	--	60
PMVP 8	--	120
PMVPS 4	--	16
PMVPS 45	--	16
PMVPS 8	--	120

2.2 Proportional actuator

Pipe connection

Coding	Proportionally controllable pressure range (bar) p_{\min} to p_{\max} *)											
	PMV										PMVS	
	41	42	51	52	53	62	63	64	84	85	41	51
-41	5 ... 180		5 ... 110			5 ... 80			5 ... 45		(0) to 180	(0) to 110
-42	5 ... 290		5 ... 180			5 ... 130			5 ... 70		(0) to 290	(0) to 180
-43	5 ... 440		5 ... 270			5 ... 190			5 ... 110		(0) to 440	(0) to 270
-44	5 ... 700		5 ... 450			5 ... 320			5 ... 180		(0) to 700	(0) to 450

Manifold mounting

Coding	Proportionally controllable pressure range (bar) p_{\min} to p_{\max} *)											
	PMVP						PMVPS					
	4	45	5	65	56	6	8	4	45	8		
-41	5 ... 180		5 ... 110			5 ... 80		5 ... 45		(0) to 180	(0) to 110	(0) to 45
-42	5 ... 290		5 ... 180			5 ... 130		5 ... 70		(0) to 290	(0) to 180	(0) to 70
-43	5 ... 440		5 ... 270			5 ... 190		5 ... 110		(0) to 440	(0) to 270	(0) to 110
-44	5 ... 700		5 ... 450			5 ... 320		5 ... 180		(0) to 700	(0) to 450	(0) to 180

*) Pressure value p_{\min} of below 5 bar can only be achieved under approx. (0.1 to 0.2) Q_{\max}

2.3 Solenoid voltage and connector

Coding	Electrical connection	Nominal voltage	Protection class (IEC 60529)
X 12 X 24	Industry standard version B (11 mm contact gap) <ul style="list-style-type: none"> ▪ X: without line connector 	12 V DC	IP 65
G 12 G 24		24 V DC	
G 12 G 24	<ul style="list-style-type: none"> ▪ G: with line connector MSD6-209 	12 V DC	
X 12 DIN X 24 DIN		24 V DC	
X 12 DIN X 24 DIN	EN 175 301-803 A <ul style="list-style-type: none"> ▪ X: without line connector 	12 V DC	
G 12 DIN G 24 DIN		24 V DC	
G 12 DIN G 24 DIN	<ul style="list-style-type: none"> ▪ G: with line connector MSD3-309 ▪ L: with LED connector 	12 V DC	
L 12 DIN L 24 DIN		24 V DC	
L 12 DIN L 24 DIN	<ul style="list-style-type: none"> ▪ L5K: with cast-on cable 5 m long 	12 V DC	
L5K 12 DIN L5K 24 DIN		24 V DC	
S 24	Bayonet coupling PA6 Schlemmer	24 V DC	
AMP 12 AMP 24	AMP Junior Timer 2-pole	12 V DC 24 V DC	
DT 12 DT 24	German (DT 04-2P)	12 V DC 24 V DC	IP 68

NOTICE

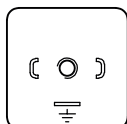
The specifications regarding the IP protection class apply for versions featuring a properly assembled male connector.

Connection pattern

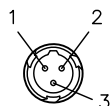
G.., X..



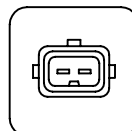
G.. DIN, X..DIN, L..DIN



S..



AMP..



DT..



3 Parameters

3.1 General data

Designation	Proportional pressure-limiting valve
Design	pilot-controlled ball seated valve
Model	Manifold mounting valve, valve for pipe installation
Material	Steel, nitrided actuator, electrogalvanised valve block
Installation position	Any
Ports/connections	<ul style="list-style-type: none"> ▪ P = pump pressure, system pressure ▪ R = Reflux ▪ S = control port
Attachment	Manifold mounting valve, version for pipe connection with through-bore
Hydraulic fluid	Hydraulic fluid, according to DIN 51 524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 4 - 1500 mm ² /s Optimal operating range: approx. 10 - 500 mm ² /s Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C.
Cleanliness level	ISO 4406 <u>20/17/14...18/15/12</u>
Temperatures	Environment: approx. -40 to +80 °C, hydraulic fluid: -25 to +80 °C, pay attention to the viscosity range. Start temperature: down to -40 °C is permissible (take account of the start viscosities!), as long as the steady-state temperature is at least 20 K higher during subsequent operation. Biologically degradable hydraulic fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C.

3.2 Pressure and volumetric flow

Operating pressure	<ul style="list-style-type: none"> ▪ P: p_{\max} according to pressure range ▪ R: $p_{\max R} \leq 20$ bar, see Chapter 3.4, "Characteristic lines" ▪ S: $p_{\max} = 700$ bar p_{\min} for type PMVS, PMVPS (for reaching the max. operating pressure p_{\max}): <ul style="list-style-type: none"> - 41 = 6 bar - 42 = 10 bar - 43 = 15 bar - 44 = 25 bar
Internal control oil consumption	Max. approx. 1.0 lpm

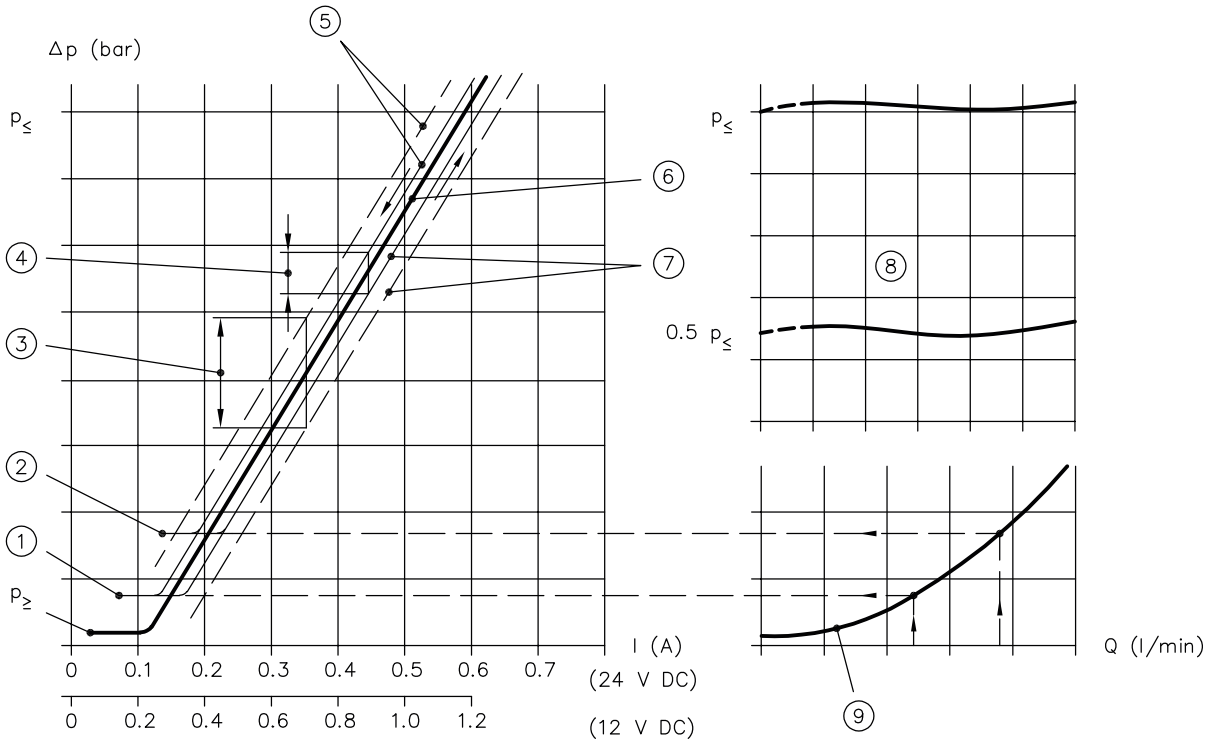
3.3 Weight

Type	
PMV 41, PMV 42, PMV 51, PMV 52	= 1.2 kg
PMV 53	= 1.3 kg
PMV 62	= 1.2 kg
PMV 63	= 1.3 kg
PMV 64, PMV 84	= 1.5 kg
PMV 85	= 1.9 kg
PMVS 41, PMVS 51	= 1.2 kg
PMVP 4, PMVP 45	= 1.1 kg
PMVP 5, PMVP 56	= 1.2 kg
PMVP 6, PMVP 65	= 1.3 kg
PMVP 8	= 1.7 kg
PMVPS 4, PMVPS 45	= 1.1 kg
PMVPS 8	= 1.7 kg

3.4 Characteristic lines

Interaction between Δp -I characteristic lines and Δp -Q characteristic lines (reference values)

The lowest usable control point depends on the flow rate and can be estimated from the Δp_0 -Q characteristic line for $I = 0$ A.



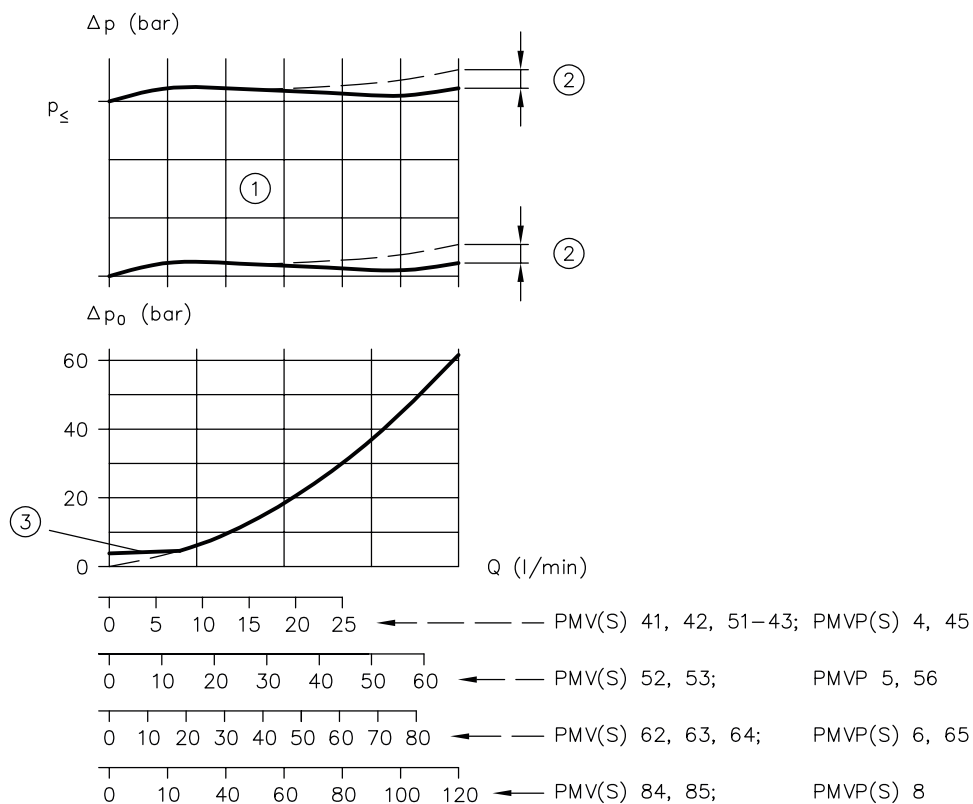
Q flow rate (lpm); control current I (A); Δp controlled pressure (bar)

- 1 Start of control for low flow rate
- 2 Start of control for high flow rate
- 3 Hysteresis without dither: approx. 30 bar (smooth supply)
- 4 Hysteresis with dither: approx. 2% of p_{max}
- 5 Control current, falling
- 6 Centre lines according to Δp -I characteristic lines (reference values)
- 7 Control current, rising
- 8 Δp -Q characteristics for selected control position largely independent of flow rate
- 9 Flow resistance Δp_0 at $I = 0$ A (inherent resistance)

Δp -Q characteristics (reference values)

Viscosity of the hydraulic fluid approx. 60 mm²/s

The pressure is largely independent of the flow rate.

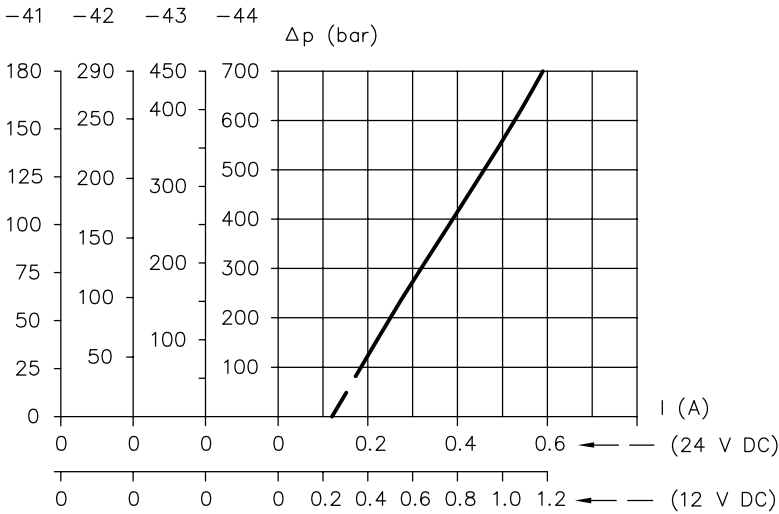


Q flow rate (lpm); Δp_0 flow resistance (bar) at $I = 0$ A; Δp controlled pressure (bar) according to the control current I (A)

- 1 Δp -Q characteristics for selected control position largely independent of flow rate
- 2 In the case of return pressure > 3 bar $\Delta p = +6$ to 15 bar at Q_{max}
- 3 Minimum pre-tension at the adjusting screw Δ approx. 3 to 5 bar

Δp-I characteristic curves (reference values)

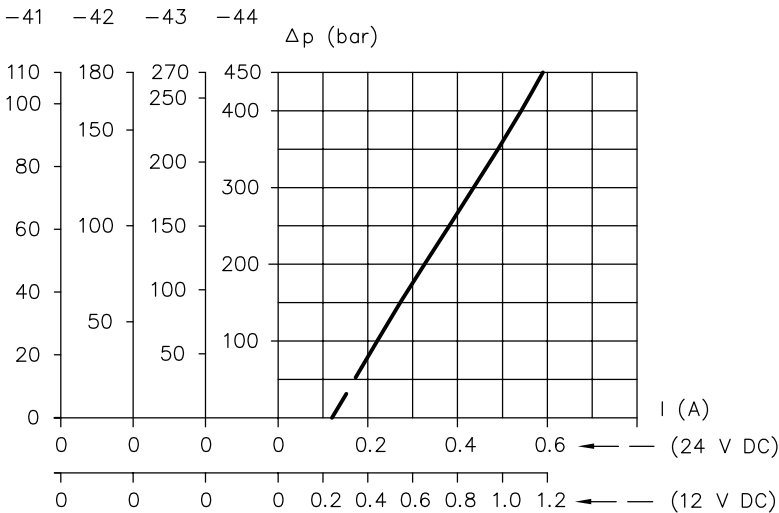
PMV(S) 41, PMV(S) 42, PMVP(S) 4



I control current (A); Δp controlled pressure (bar)

Type	Average pressure change (bar/0.1 A)
PMV..-41	approx. 38
PMV..-42	approx. 62
PMV..-43	approx. 96
PMV..-44	approx. 150

**PMV(S) 51, PMV(S) 52, PMV(S) 53
PMVP(S) 45, PMVP(S) 5, PMVP(S) 65**

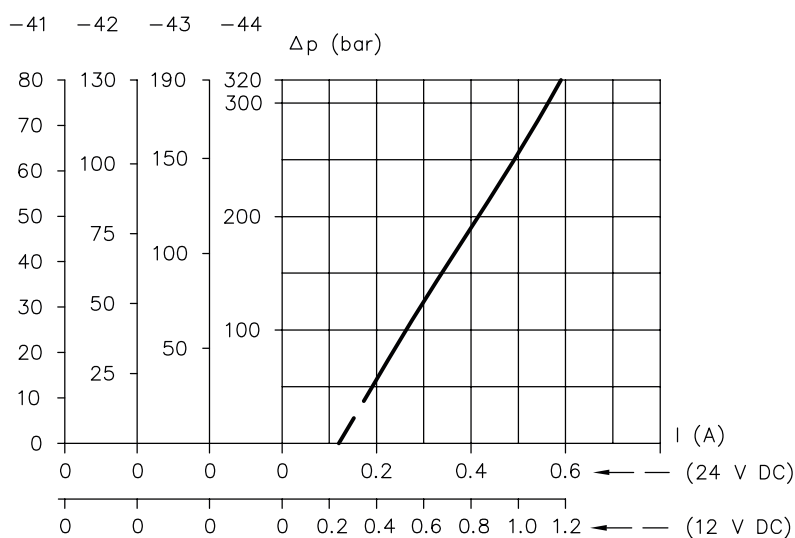


I control current (A); Δp controlled pressure (bar)

Type	Average pressure change (bar/0.1 A)
PMV..-41	approx. 23
PMV..-42	approx. 38
PMV..-43	approx. 58
PMV..-44	approx. 94

NOTICE
 For DIN and DT solenoids, an increase of around 4% in the start-up current should be expected.

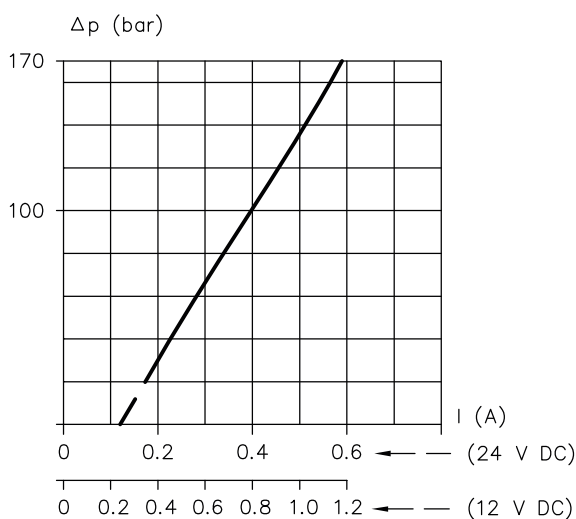
**PMV 62, PMV 63, PMV 64
PMVP 56, PMVP 6**



I control current (A); Δp controlled pressure (bar)

Type	Average pressure change (bar/0.1 A)
PMV..-41	approx. 17
PMV..-42	approx. 28
PMV..-43	approx. 40.5
PMV..-44	approx. 68

**PMV 84, PMV 85
PMVP 8**



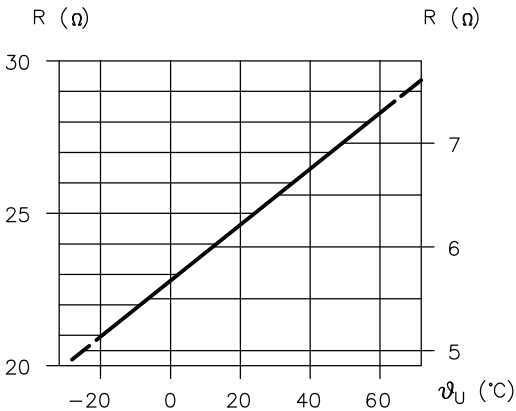
I control current (A); Δp controlled pressure (bar)

Type	Average pressure change (bar/0.1 A)
PMV..-41	approx. 95
PMV..-42	approx. 15
PMV..-43	approx. 28
PMV..-44	approx. 38

3.5 Electrical data

Coding	X 12 G 24	X 24 G 24	AMP 12 DT 12	AMP 24 DT 24 S 24	X 12 DIN G 12 DIN L 12 DIN L5K 12 DIN	X 24 DIN G 24 DIN L 24 DIN L5K 24 DIN
Nominal voltage U_n	12 V DC	24 V DC	12 V DC	24 V DC	12 V DC	12 V DC
Coil resistance $R_{20} \pm 5\%$	6 Ω	24 Ω	6 Ω	24 Ω	6 Ω	24 Ω
Current, cold I_{20}	2 A	1 A	2 A	1 A	2 A	1 A
Cooling power P_{20}	24 W	24 W	24 W	24 W	24 W	24 W
Limit current I_G	1.26 A	0.63 A	1.26 A	0.63 A	1.26 A	0.63 A
Limit power P_G	14.1 W	14.1 W	14.1 W	14.1 W	14.1 W	14.1 W
Relative duty cycle 100% duty cycle	Reference temperature $\vartheta_{11} = 50^\circ\text{C}$					
Required dither frequency	60 ... 150 Hz					
Dither amplitude	20 ... 40% of I_{20}					

Reference value for the cold resistance



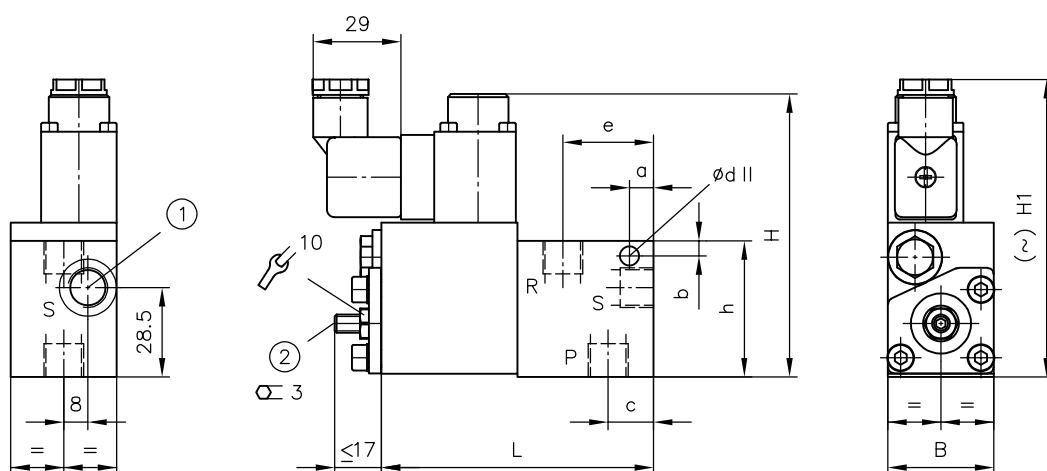
ϑ_U ambient temperature (°C); R cold resistance (Ω) solenoid 24 V DC; R cold resistance (Ω) solenoid 12 V DC

4 Dimensions

All dimensions in mm, subject to change.

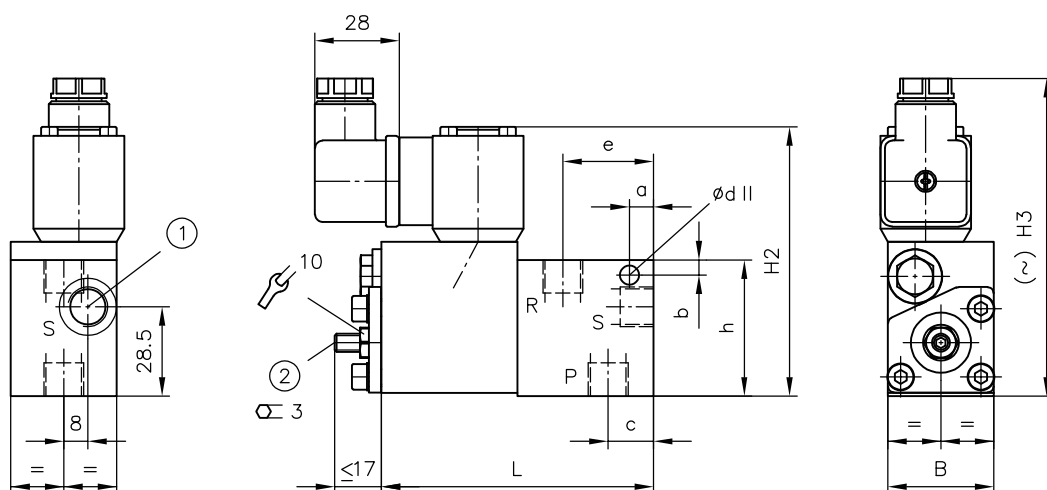
4.1 Pipe connection

PMV, PMVS



- 1 Port S (G 1/4) for type PMVS.. only
- 2 Adjusting screw for min. operating pressure p_{min} ; the adjustment value depends on the flow rate

PMV-DIN, PMVS-DIN

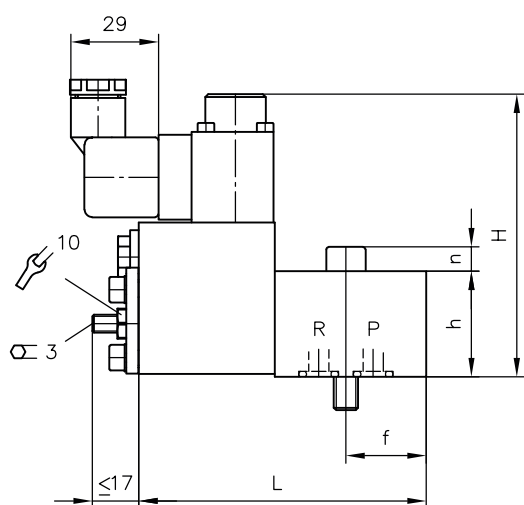


- 1 Port S (G 1/4) for type PMVS.. only
- 2 Adjusting screw for min. operating pressure p_{min} ; the adjustment value depends on the flow rate

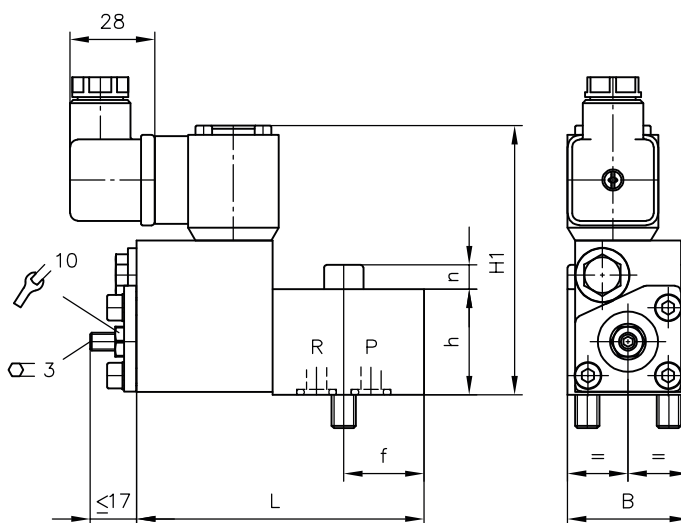
Type	B	H	H1	H2	H3	L	a	b	c	Ød	e	h	Ports (ISO 228-1) P, R
PMV 41 PMV 51	35	94	99,5	89,5	105,5	90,1	8	8	15	6,4	30	45	G 1/4
PMVS 41 PMVS 51								5					
PMV 42 PMV 52 PMV 62	35	96	101,5	91,5	107,5	95,1	10	10	17,5	6,4	35	45	G 3/8
PMV 53 PMV 63	35	97	102,5	92,5	108,5	95,1	10	8	15	6,4	31,5	50	G 1/2
PMV 64 PMV 84	40	101	106,5	96,5	112,5	106,1	15	15	17,5	8,5	40	60	G 3/4
PMV 85	45	106	111,5	101,5	117,5	115,1	15	15	25	8,5	44,5	70	G 1

4.2 Manifold mounting

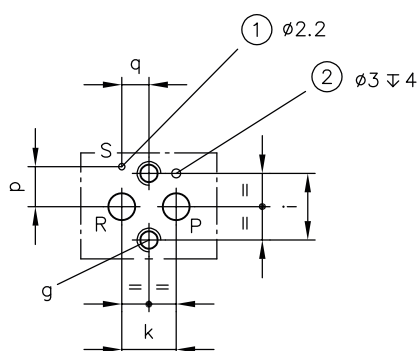
PMVP, PMVPS



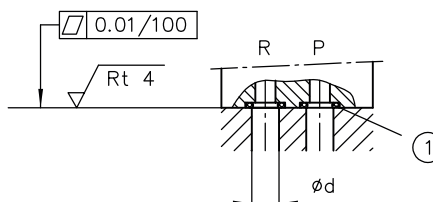
PMVP-DIN, PMVPS-DIN



Hole pattern of the base plate



- 1 Port S for type PMVPS.. only
- 2 Mounting hole for assembly centring pin

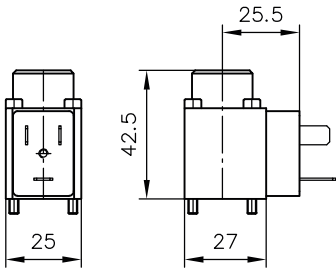


- 1 Sealing of ports P and R with O-rings

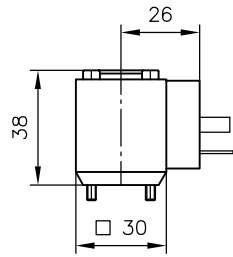
Type	B	H	H1	L	f	g	h	i	k	$\varnothing d$	n	p ± 0.1	q $+0.1$	O-ring NBR 90 Sh
PMVP 4 PMVP 45 PMVPS 4 PMVPS 45	35	94	89,5	90,1	21	M8x11	35	22	14	6	8	13,25	9	8x2 (2.9x1.78)
PMVP 5 PMVP 56	40	94	89,5	95,1	26,5	M8x11	35	27	18	9	8	--	--	10x2
PMVP 6 PMVP 65	50	94	89,5	95,1	25	M10x11	35	34	22	12	10	--	--	13.95x2.62
PMVP 8 PMVPS 8	60	96	91,5	105,1	33	M12x16	40	40	26	16	12	20	13	18.75x2.62 (2.9x1.78)

4.3 Solenoid versions

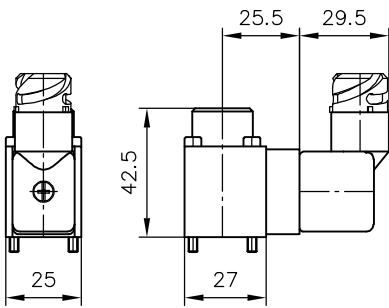
X., G..



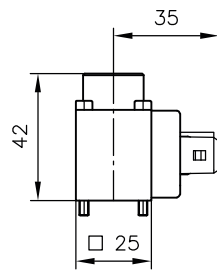
X..DIN, G..DIN, L..DIN



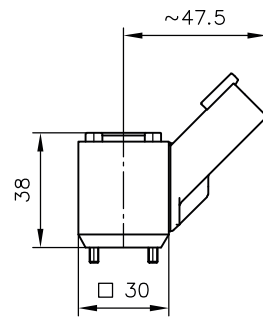
S..



AMP..



DT..



5 Installation, operation and maintenance information

Observe the document B 5488 "General operating instructions for assembly, commissioning, and maintenance."

5.1 Intended use

This product is intended exclusively for hydraulic applications (fluid technology).

The user must observe the safety measures and warnings in this document.

Essential requirements for the product to function correctly and safely:

- ▶ All information in this documentation must be observed. This applies in particular to all safety measures and warnings.
- ▶ The product must only be assembled and put into operation by specialist personnel.
- ▶ The product must only be operated within the specified technical parameters described in detail in this document.
- ▶ All components must be suitable for the operating conditions when using an assembly.
- ▶ The operating instructions for the components, assemblies and the specific complete system must also always be observed.

If the product can no longer be operated safely:

1. Remove the product from operation and mark it accordingly.
 - ✓ It is then not permitted to continue using or operating the product.

5.2 Assembly information

The product must only be installed in the complete system with standard and compliant connection components (screw fittings, hoses, pipes, fixtures etc.).

The product must be shut down correctly prior to disassembly (in particular in combination with hydraulic accumulators).



DANGER

Sudden movement of the hydraulic drives when disassembled incorrectly

Risk of serious injury or death

- ▶ Depressurise the hydraulic system.
- ▶ Perform safety measures in preparation for maintenance.

5.2.1 Creating the mounting hole

see Chapter 4, "Dimensions"

5.3 Operating instructions

Observe product configuration and pressure/flow rate.

The statements and technical parameters in this document must be strictly observed.

The instructions for the complete technical system must also always be followed.



NOTICE

- ▶ Read the documentation carefully before usage.
- ▶ The documentation must be accessible to the operating and maintenance staff at all times.
- ▶ Keep documentation up to date after every addition or update.

⚠ CAUTION**Overloading components due to incorrect pressure settings.**

Risk of minor injury.

- Pay attention to the maximum operating pressure of the pump, valves and fittings.
- Always monitor the pressure gauge when setting and changing the pressure.

Purity and filtering of the hydraulic fluid

Fine contamination can significantly impair the function of the product. Contamination can cause irreparable damage.

Examples of fine contamination include:

- Swarf
- Rubber particles from hoses and seals
- Dirt due to assembly and maintenance
- Mechanical debris
- Chemical ageing of the hydraulic fluid

! NOTICE**New hydraulic fluid from the manufacturer may not have the required purity.**

Damage to the product is possible.

- ▶ Filter new hydraulic fluid to a high quality when filling.
- ▶ Do not mix hydraulic fluids. Always use hydraulic fluid that is from the same manufacturer, of the same type, and with the same viscosity properties.

For smooth operation, pay attention to the cleanliness level of the hydraulic fluid (cleanliness level see [Chapter 3, "Parameters"](#)).

Additionally applicable document: [D 5488/1](#) Oil recommendations

5.4 Maintenance information

This product is largely maintenance-free.

Check regularly (at least once a year) by visual inspection whether the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

Clean the surface of the device regularly (at least once a year) (dust deposits and dirt).

Check that the product is securely fastened in the mounting hole at regular intervals, but at least once per year.

6 Other information

6.1 Basic design

The proportional pressure-limiting valves type PMVP are pilot-controlled devices consisting of the main valve (ball seated valve **1**, spring **2** and set piston **3**) and the flange-mounted proportional control part (proportional pressure reducing valve **4** and pressure reducing valve preliminary stage **5**).

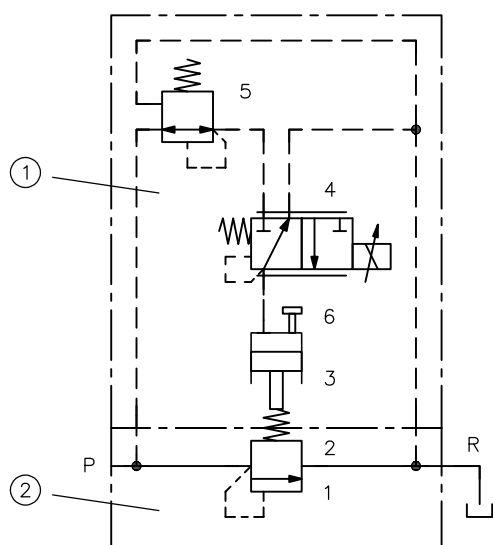
The system pressure tapped in the main valve, port P, is reduced in the preliminary stage **3** to a low, constant inlet pressure for the control valve **4**. In the control valve **4**, this pressure is converted into the electrical-proportional pilot pressure and directed to the set piston **3**, which uses the spring **2** to load the valve **1** accordingly. This results in the current system pressure at inlet P. The various pressure ranges are determined by the size of the proportional pressure reducing valve **4** and main valve.

Adjusting screw **6** for pre-tensioning the spring **2**. As a result, the lower threshold value p_{\min} of the proportionally controllable pressure range of approx. 7 bar can be raised. This means that, when below the corresponding control current, this increased pressure value remains constant, even in the case of a reduction to 0 A, apart from the flow-related deviation (see Chapter 3.4, "Characteristic lines").

A minimum pressure of 7 bar or more is required for proper functioning of the proportional pressure reducing valve type PMVP **4**.

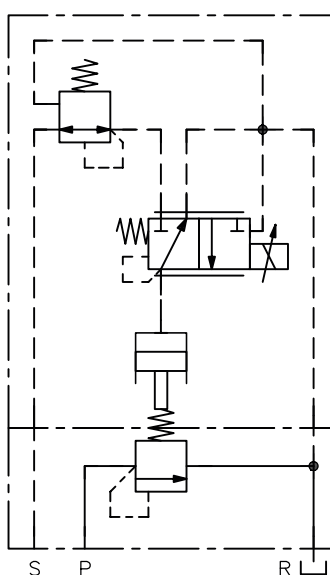
Detailed circuit symbols

PMV, PMVP



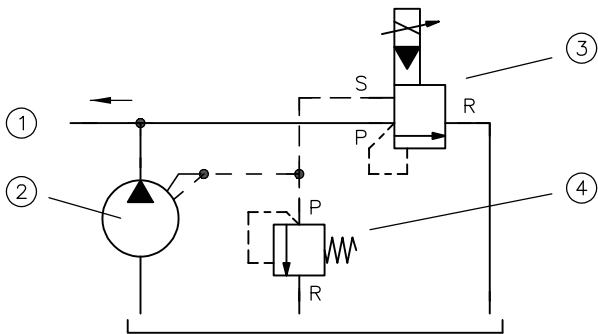
- 1 Proportional control valve
- 2 Main valve

PMVS, PMVPS



6.2 Circuit examples for type PMVS

Example 1:



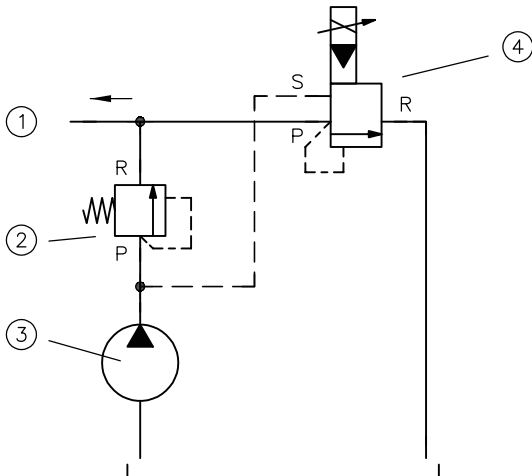
- 1 Directional valve, consumer
- 2 e.g. R 10.1 - 0.8 - 0.8/M 5.5 according to D 6010 S
- 3 PMVS 51-43/G 24
(0) ... 270 bar
- 4 MV 41F - 20 bar according to D 7000/1

In the case of R pumps according to D 6010 S, it is advisable to choose and combine two single ports for the control oil.

The pump pulsation will then be lower.

Otherwise, the pulsation could be damped with a small accumulator and downstream throttle.

Example 2:



- 1 Directional valve, consumer
- 2 MVS 41F - 20 bar according to D 7000/1
 $\Delta p = 20$ bar
- 3 e.g. R 6.1/M 11 according to D 6010 H
- 4 PMVS 41-43-G 24
(0) ... 440 bar

6.3 Accessories, spare and individual parts

To purchase spare parts, please see [HAWE Hydraulik interactive contact map](#).

Line connector

Description	Type	Material number
No additional function	MSD 6-209	6236 5004-00
With LED	SVS 3129720	6217 8027-00
Adapter to EN 175 301-803 A	--	6217 0238-00

References

Additional versions

- Proportional pressure-limiting valve type NPMVP: D 7485 N
- Proportional pressure-limiting valve type PDV and PDM: D 7486
- Proportional amplifier type EV1M3: D 7831/2
- Proportional amplifier type EV1D: D 7831 D
- Proportional amplifier type EV2S: D 7818/1

