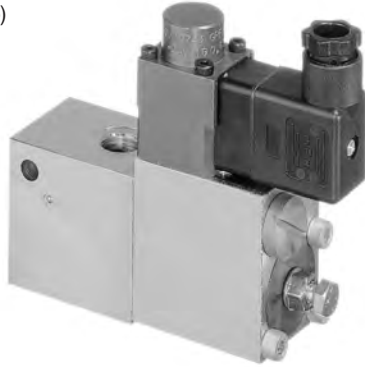


Proportional pressure limiting valve

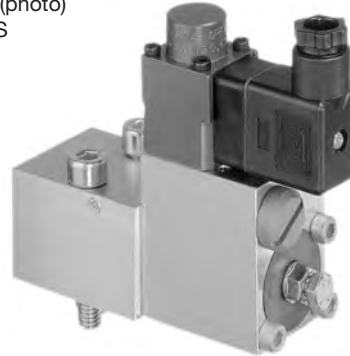
Type PMV and PMVP

Type PMVS and PMVPS (with external control oil inlet)

Valve for pipe connection
Type PMV (photo)
PMVS



Valve for manifold mounting
Type PMVP (photo)
PMVPS



Max. pressure = 700 bar
Max. flow = 120 lpm

1. General information

The proportional pressure limiting valves, type PMV(S) and PMVP(S) are designed for the electro-proportional adjustment of the system pressure in hydraulic circuits.

A min. pressure will be apparent in the deenergized state. This pressure figure depends on the flow (back pressure) or the min. setting adjusted via a set screw (see also sect. 2).

Type PMV(P)S features an inlet port for external control oil supply (approx. 20 bar). They are mainly intended for:

- High pressure applications, to increase the service life of control elements for the control pressure
- Very low pressure applications (0...5 bar), to maintain a good control characteristic
- Applications where it is mandatory to maintain a certain pressure in the main circuit (with higher pressure apparent there) over prolonged periods without any leakage losses.

The flow requirement for this control circuit is approx. 0,5 lpm. It may be supplied e.g. by an separate pressure outlet at radial piston pumps acc. to D 6010 S (also see example circuit in sect. 5.1).

A proportional amplifier (e.g. EV1M2 acc. to D 7831/1, EV1G1 acc. to D 7837 or EV1D1 acc. to D 7831 D) is necessary for the electric control of these valves.

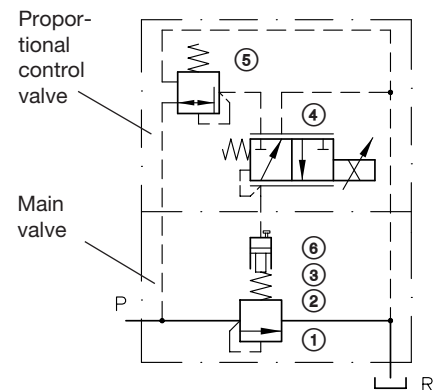
1.1 Design

Type PMV(P) and PMV(P)S are directly actuated proportional pressure limiting valves, which consist out of a main valve (seated ball valve ①, spring ② and control piston ③) and the directly mounted proportional control section (prop. pressure reducing valve ④ and a primary stage pressure reducing valve ⑤). The system pressure is picked-up from the pressure inlet port P (type PMV and PMVP) or induced via a separate control pressure inlet port S is reduced at the primary stage ⑤ down to a lower, constant pressure for the control valve ④. This pressure is converted into an electro-proportional control pressure by the control valve ④ and conducted to the operating piston ③. This piston accordingly loads again the valve ① via the spring ②. This results in the system pressure apparent at port P. The various pressure ranges are determined by the size of the prop. pressure reducing valve ④ and the main valve.

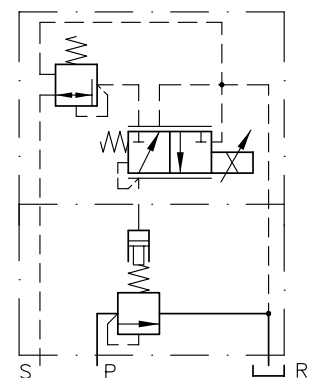
The pre-load of the spring ② can be adjusted via the set screw ⑥. This allows the adjustment of a min. figure p_{min} for the proportionally adjustable pressure range upwards from 3 bar. This set min. pressure is the figure to which the pressure will drop even if the control current is reduced down to 0 A (apart of flow related fluctuations, see also sect 3.3)

A min. pressure of 3 bar or more is necessary for the flawless function of the proportional pressure reducing valve type PMV(P) ④.

Detailed flow pattern symbols
Type PMV and PMVP



Type PMVS and PMVPS



For simplified flow pattern symbols see page 2!

2. Type coding, main data

Order example:

PMV 63 - 41 / G 24

Nom. voltage
proportional solenoid

Actuation solenoid

| Standard, with plug | without plug | with plug and LED | Nom. voltage |
|---------------------|--------------|-------------------|--------------|
| G 12 | X 12 | L 12 | 12V DC |
| G 24 | X 24 | L 24 | 24V DC |

| Version | Flow pattern symbol (simplified) | Coding for basic type, size and port size | Main valve | | Proportional control section ²⁾ Coding for pressure reducing section | | | | Mass (weight) approx. (kg) | | | | |
|-----------------------|----------------------------------|---|-------------------------------------|---|--|------------------|-------------|-------------|-----------------------------------|-----------|-----------|-----------|-----|
| | | | Port thread ISO 228/1 or nom. width | Flow Q _{max} (guideline) (lpm) | - 41 | - 42 | - 43 | - 44 | | | | | |
| | | | | | prop. controllable pressure range (bar) P _{min} ... P _{max} ¹⁾ | | | | | | | | |
| For pipe connection | | PMV | 41 ³⁾ | G 1/4 * | 16 | 5 ... 180 | 5 ... 290 | 5 ... 440 | 5 ... 700 | 1.2 | | | |
| | | | 42 ³⁾ | G 3/8 * | 16 | 5 ... 110 | 5 ... 180 | 5 ... 270 | 5 ... 450 | 1.2 | | | |
| | | | 51 | G 1/4 * | 16 | | | | | | | | |
| | | | 52 | G 3/8 * | 40 | 5 ... 80 | 5 ... 130 | 5 ... 190 | 5 ... 320 | 1.3 | | | |
| | | | 53 | G 1/2 * | 60 | | | | | | | | |
| | | | 62 | G 3/8 * | 60 | | | | | | | | |
| | | | 63 | G 1/2 * | 75 | 5 ... 45 | 5 ... 70 | 5 ... 110 | 5 ... 180 | 1.2 | | | |
| | | | 64 | G 3/4 * | | | | | | | | | |
| | | | 84 | G 3/4 * | 120 | (0) ... 180 | (0) ... 290 | (0) ... 440 | (0) ... 700 | 1.3 | | | |
| | | | 85 | G 1 * | | | | | | | | | |
| | | | For manifold mounting | | PMVP | 4 ³⁾ | 6 | 16 | 5 ... 180 | 5 ... 290 | 5 ... 440 | 5 ... 700 | 1.1 |
| | | | | | | 45 ³⁾ | 6 | 16 | 5 ... 110 | 5 ... 180 | 5 ... 270 | 5 ... 450 | 1.1 |
| | | | | | | 5 | 8 | 40 | | | | | |
| | | | | | | 65 | 10 | 60 | 5 ... 80 | 5 ... 130 | 5 ... 190 | 5 ... 320 | 1.2 |
| 56 | 10 | 60 | | | | | | | | | | | |
| 6 | 12 | 75 | | | | | | | | | | | |
| 8 | 16 | 120 | 5 ... 45 | 5 ... 70 | 5 ... 110 | 5 ... 180 | 1.3 | | | | | | |
| For manifold mounting | | PMVPS | 4 ³⁾ | 6 | 16 | (0) ... 180 | (0) ... 290 | (0) ... 440 | (0) ... 700 | 1.1 | | | |
| | | | 45 ³⁾ | 6 | 16 | (0) ... 110 | (0) ... 180 | (0) ... 270 | (0) ... 450 | 1.1 | | | |
| | | | 8 | 16 | 120 | (0) ... 45 | (0) ... 70 | (0) ... 110 | (0) ... 180 | 1.7 | | | |

* BSPP

1) Pressure figure p_{min} below 5 bar can only be achieved below 10 to 20% of Q_{max}, see sect. 3

2) Coding **-2, -3, -4**: Version with solenoid $\varnothing 35$ (ancestor) corresponds to current coding -42, -43, -44, therefore new design is directly interchangeable to the older design. The main valve body is unchanged.

Note: Observe the insignificantly differing data of the solenoid as well as the slimmer plug design (DIN VDE 0470)!

3) Disponibile anche per tipo PMV 4.K, PMVP 4.K o PMVPS 4.K

- version with seated cone design, where the characteristic is more flow independent

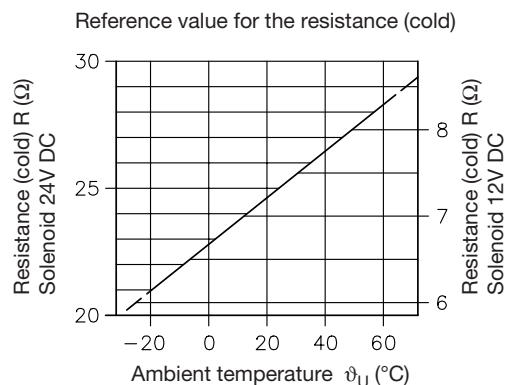
3. Other data

3.1 General and hydraulic

| | | | | |
|----------------------------------|---|------------|----------------|------------|
| Nomenclature | Proportional-pressure limiting valve, directly controlled, seated ball design | | | |
| Fastening | Through holes or on manifold depending on type, see dimensional drawings in sect. 4 ++ | | | |
| Installed position | Any | | | |
| Ports | Pipe thread ISO 228/1 (depending on size) or manifold mounting P = Pressurized oil inlet port R = Pressureless outlet port S = Control port | | | |
| Surface coating | Zinc galvanized (solenoid zinc galvanized and olive passivated) | | | |
| Mass (weight) | Type | approx. kg | Type | approx. kg |
| | PMV(S) 41 (51) | 1.2 | PMVP(S) 4 (45) | 1.1 |
| | PMV 42 (52, 62) | 1.2 | PMVP 5 (56) | 1.2 |
| | PMV 53 (63) | 1.3 | PMVP 6 (65) | 1.3 |
| | PMV 64 (84) | 1.5 | PMVP(S) 8 | 1.7 |
| | PMV 85 | 1.9 | | |
| Operation pressure | Port P p_{max} according to pressure range Port S $p_{max S} = 700$ bar Port R $p_{max R} \leq 20$ bar (Reflow, tank); see Δp -Q-curve on page 6 | | | |
| Pressure fluid | Hydraulic fluid (DIN 51524 part 1 to 3): ISO VG 10 to 68 conforming (DIN 51519) Viscosity range: min. 4, max. 1500 mm ² /s, Opt. operation range: 10... 500 mm ² /s. Also suitable for biodegradable pressure fluids types HEPG (Polyalkylenglycol) and HEES (Synth. Ester) at service temperatures up to +70°C. | | | |
| Temperature | Ambient: -40 ... +80°C Fluid: -25 ... +80°C, Note the viscosity range ! Permissible temperature during start: -40°C (Note start-viscosity!), as long as the service temperature is at least 20K (Kelvin) higher for the following operation. Biodegradable pressure fluids: Note manufacturer's specifications. By consideration of the compatibility with seal material not over +70°C. | | | |
| Rec. cleanliness level | ISO 4406 17/15/12 | | | |
| Internal control oil consumption | max. approx. 1 lpm | | | |

3.2 Electrical (proportional solenoid)

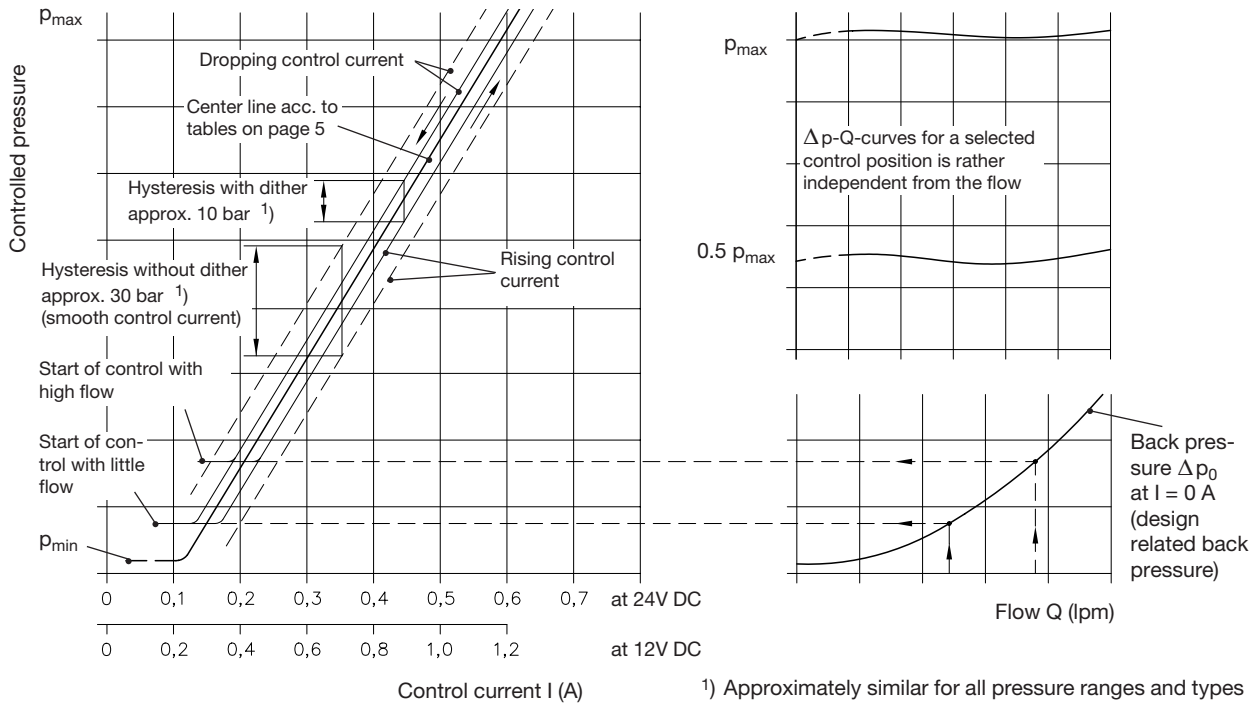
| | | |
|--|--|-------------|
| Nom. voltage U_N | 12V DC | 24V DC |
| Coil resistance $R_{20} \pm 5\%$ | 6 Ω | 24 Ω |
| Current, cold I_{20} | 2 A | 1 A |
| Nom. current I_N | 1.26 A | 0.63 A |
| Power, cold P_{20} | 24 W | 24 W |
| Nom. power P_N | 9.5 W | 9.5 W |
| Relative duty cycle | 100% ED (reference temp. $\vartheta_{11} = 50^\circ\text{C}$) | |
| Electrical connection | Industrial standard (terminal distance 11 mm) | |
| Protection classification DIN 40050 | IP 65 (IEC 60529) (with plug installed as instructed) | |
| Required dither frequency | 60 ... 150 Hz | |
| Dither amplitude | 20 ... 40% of I_{20} | |



3.3 Curves

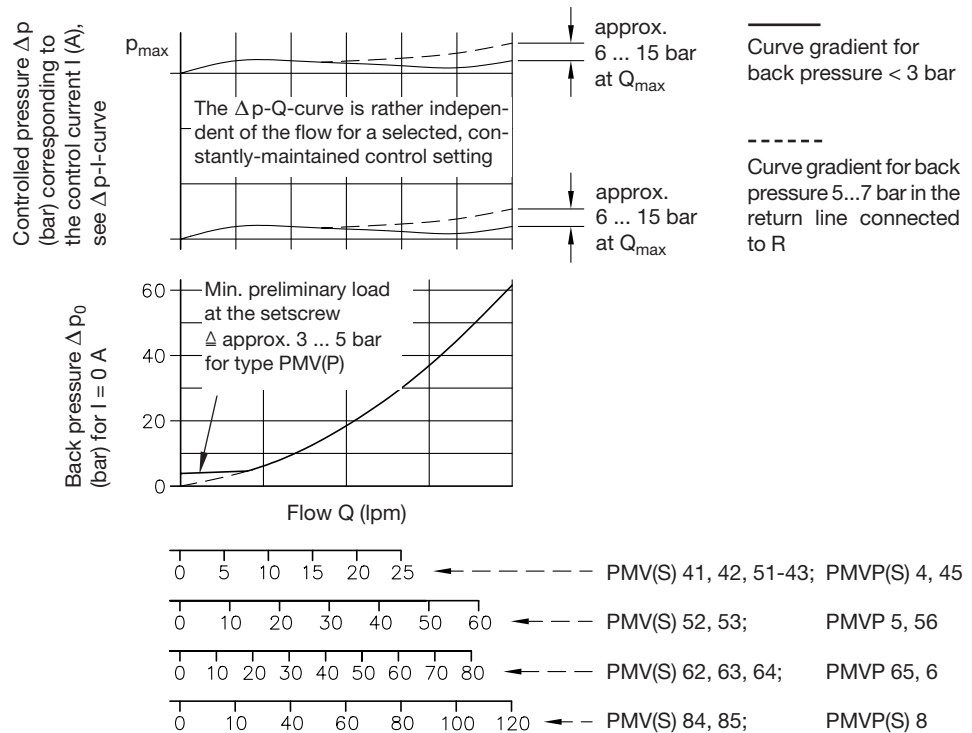
The resulting pressure Δp (bar) from a certain control current I (A), depending on type and size, can be read from the curves below. The control current range stretches from approx. 0.1 to 0.63 A at 24V DC or 0.2 to 1.26 A at 12V DC. The lowest pressure that can be controlled for $I = 0$ A can only be estimated by these Δp_0 -Q-curves.

Example: For the relationship between Δp -I- and Δp -Q-curve, see below



Δp -Q-curve

The pressure selected via the control current is rather independent of the flow rate. The pressure figure Δp (bar) which corresponds to a specific, constantly maintained control current I (A) remains rather constant, regardless whether the flow rate through the valve increases or decreases (within the perm. flow figures). This applies as long as the back pressure of the return line connected to R does not exceed approx. 2 ... 3 bar (within the perm. flow figures). The Δp -Q-curve will be increased slightly by approx. 6 ... 15 bar for Q_{max} , if the back pressure of the return pipe is approx. 5 ... 7 bar.

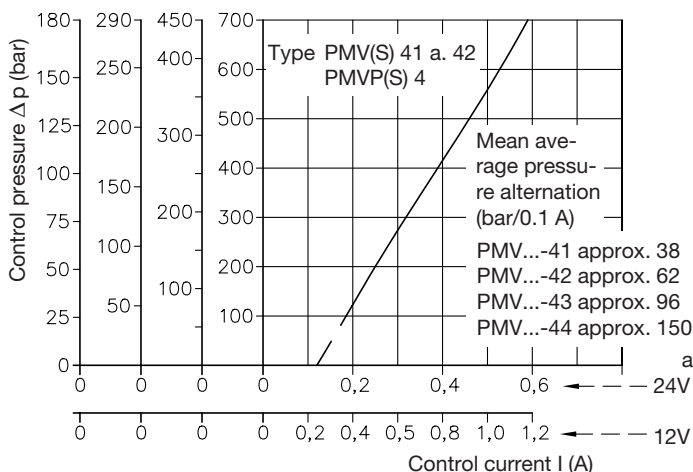


Fluid viscosity during measurement approx. 60 mm²/s

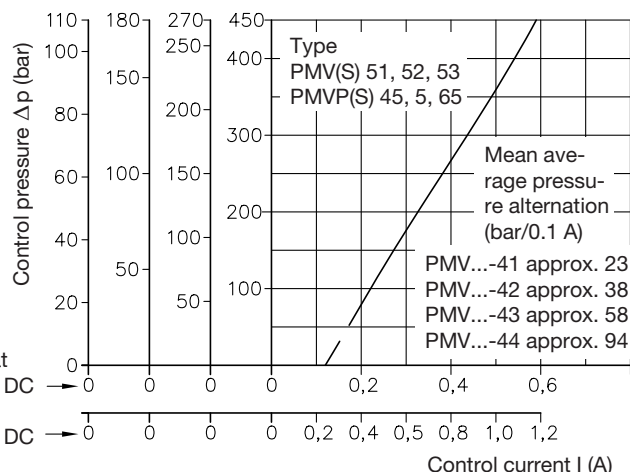
Δp-I curve

Mean average values without consideration of production or solenoid related spreads. The actual pressure, which is proportional to the control pressure, can be determined with an pressure gauge, if required.

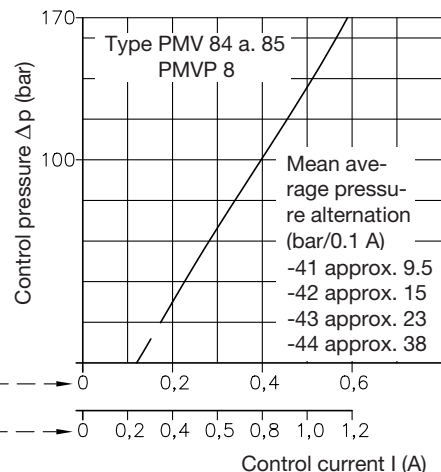
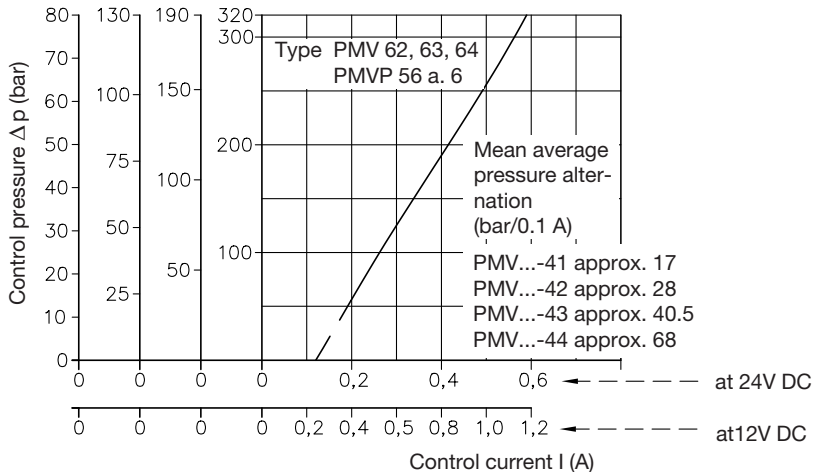
Type PMV(S) .. and PMVP(S) ..
 ..-41 ..-42 ..-43 ..-44



Type PMV(S) .. and PMVP(S) ..
 ..-41 ..-42 ..-43 ..-44



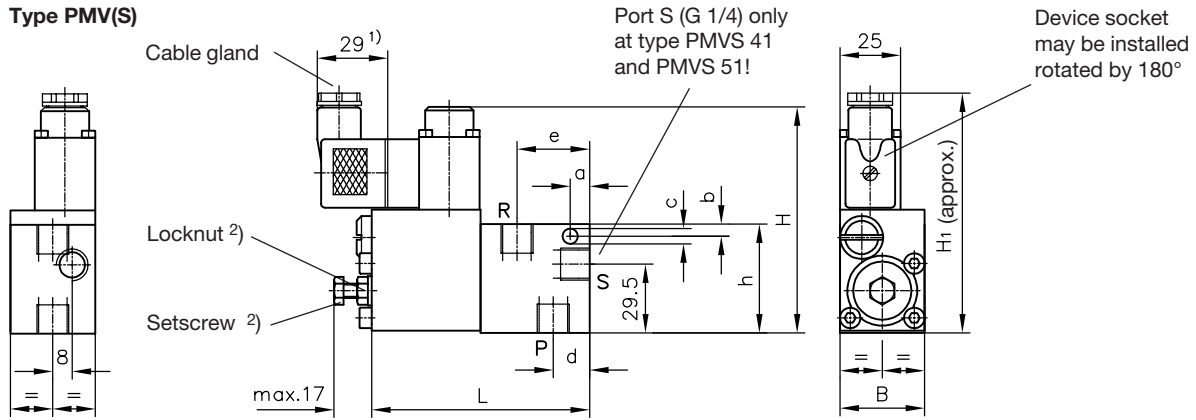
Type PMV(P) ..
 ..-41 ..-42 ..-43 ..-44



Fluid viscosity during measurement approx. 60 mm²/s

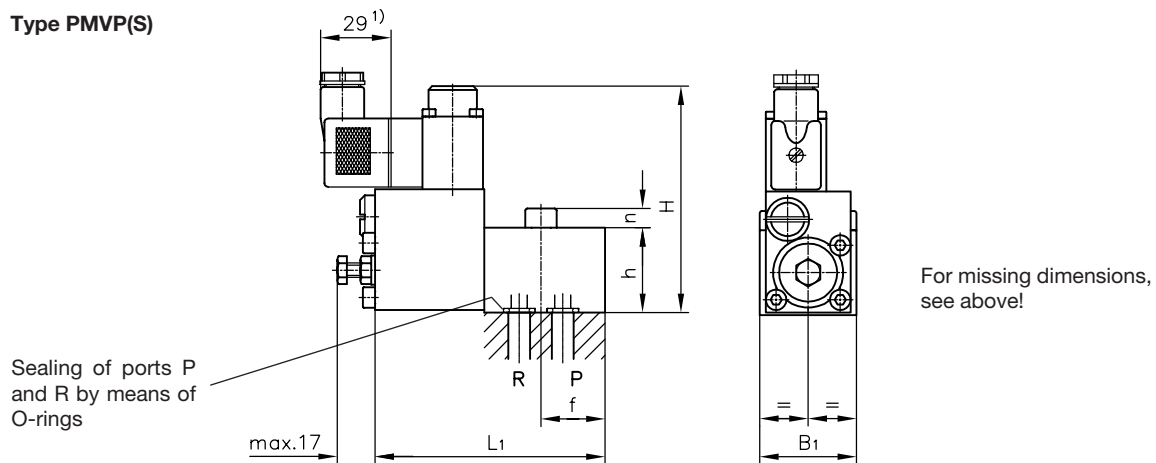
4. Unit dimensions All dimensions in mm, subject to change without notice!

Type PMV(S)

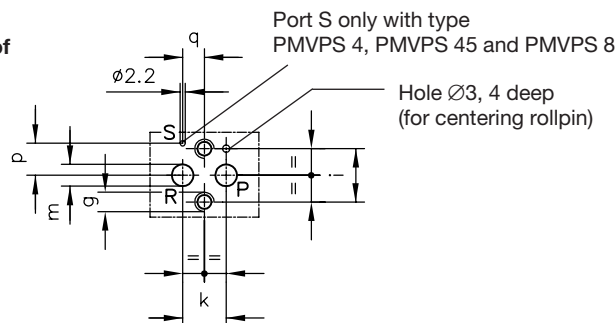


| Type | Ports P and R (BSPP) | B | H | H ₁ | L | a | b | c | d | e | h | h ₁ |
|-----------------------|----------------------|----|-----|----------------|-------|----|----|-----|------|------|----|----------------|
| PMV(S) 41(51) | G 1/4 | 35 | 94 | 99.5 | 90.1 | 8 | 8 | 6.4 | 15 | 30 | 45 | 71 |
| PMV 42(52, 62) | G 3/8 | 35 | 96 | 101.5 | 95.1 | 10 | 10 | 6.4 | 17.5 | 35 | 45 | 73.5 |
| PMV 53(63) | G 1/2 | 35 | 97 | 102.5 | 95.1 | 10 | 8 | 6.4 | 15 | 31.5 | 50 | 74.5 |
| PMV 64(84) | G 3/4 | 40 | 101 | 106.5 | 105.1 | 15 | 15 | 8.5 | 17.5 | 40 | 60 | 78.5 |
| PMV 85 | G 1 | 45 | 106 | 111.5 | 115.1 | 15 | 15 | 8.5 | 25 | 44.5 | 70 | 88.5 |

Type PMVP(S)



Hole pattern of the manifold



| Type | B ₁ | L ₁ | H | f | g | h | i | k | m | n | p ^{±0.1} | q ^{+0.1} | O-ring NBR 90 Sh |
|----------------------|----------------|----------------|----|------|-----|----|----|----|----|----|-------------------|-------------------|------------------|
| PMVP(S) 4(45) | 35 | 90.1 | 94 | 21 | M8 | 35 | 22 | 14 | 6 | 8 | 13.25 | 9 | 8x2 (2.57x1.78) |
| PMVP 5(56) | 40 | 95.1 | 94 | 26.5 | M8 | 35 | 27 | 18 | 9 | 8 | -- | -- | 10x2 |
| PMVP 6(65) | 50 | 95.1 | 94 | 25 | M10 | 35 | 34 | 22 | 12 | 10 | -- | -- | 13.95x2.62 |
| PMVP(S) 8 | 60 | 105.1 | 96 | 33 | M12 | 40 | 40 | 26 | 16 | 12 | 20 | 13 | 18.75x2.62 |

1) This dimension is depending on the manufacturer and may be up to max. 40 mm (acc. to DIN EN 175 301-803 B).

2) The min. pressure p_{min} (sect. 3.1) can be either reduced or increased via this setscrew. This p_{min} setting cannot be reduced further even if the control current is decreased further.

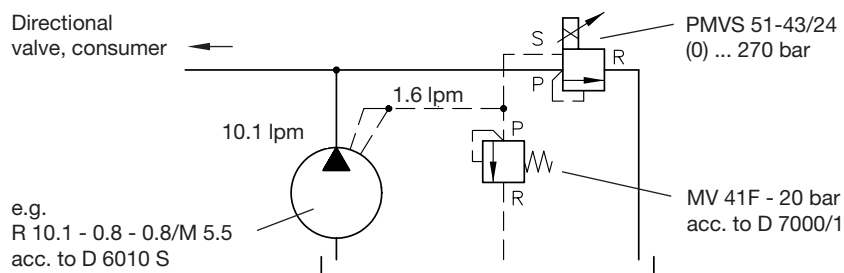
Setting procedure: Slacken the locknut a/f 10 (Seal-Lock-Nut) prior to adjusting the setscrew, thus preventing the vulcanized seal ring to be damaged by the thread.

Attention: A min. pressure p_{min} of 3...5 bar is required at type PMV and PMVP, due to design.

5. Appendix

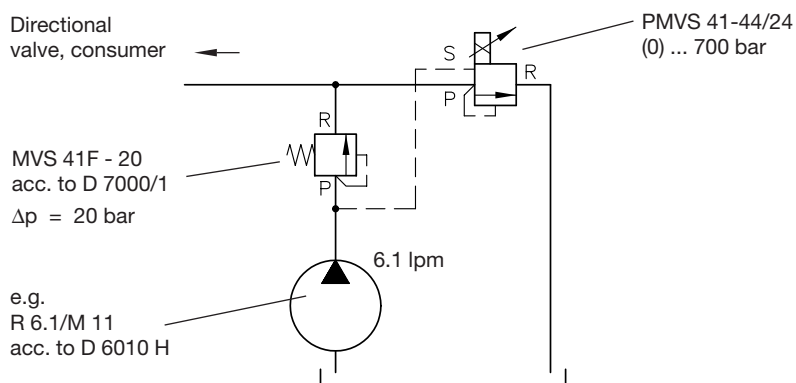
5.1 Example circuits for type PMVS

Example 1:



It is recommended to connect two individual control oil ports to minimize pump pulsation with pumps type R (acc. to D 6010 S). Otherwise pulsation may occur but it can be also reduced via a miniature accumulator and a throttle installed downstream.

Example 2:



5.2 Accessory

Test block for type PMVP(S) 8 order-No. 3406 872 000