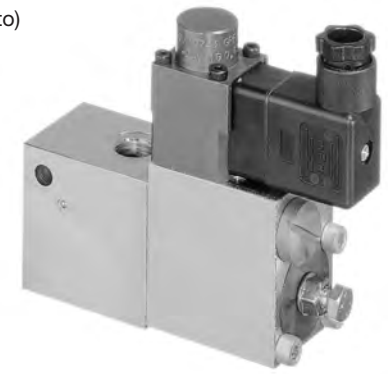
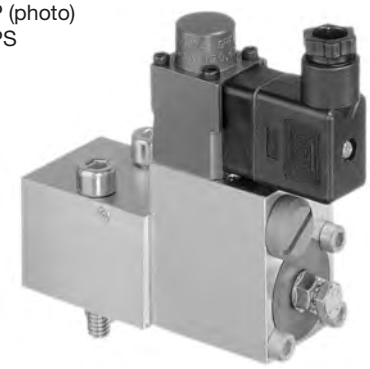
Proportional pressure limiting valve
Type PMV and PMVP
Type PMVS and PMVPS (with external control oil inlet)

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

Valve for pipe connection
Type PMV (photo)
PMVS



Valve for manifold mounting
Type PMVP (photo)
PMVPS



1. General information

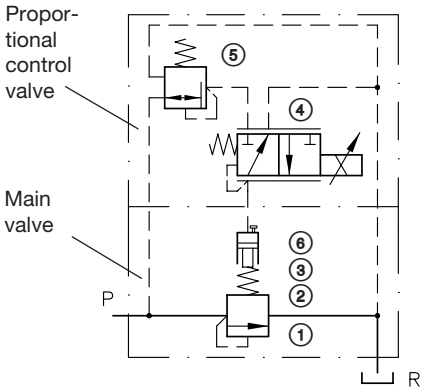
The proportional pressure limiting valves, type PMV(S) and PMVP(S) are designed for the electro-proportional adjustment of the system pressure in hydraulic circuits.
A min. pressure will be apparent in the deenergized state. This pressure figure depends on the flow (back pressure) or the min. setting 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.

Detailed flow pattern symbols

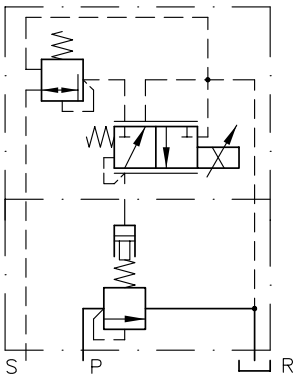
Type PMV and PMVP



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 an 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 .

Type PMVS and PMVPS



For simplified flow pattern symbols see page 2!

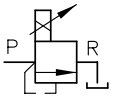
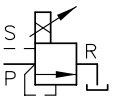
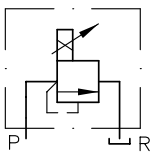
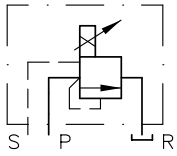
2. Type coding, main data

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)	Main valve: Coding for basic type, size and port size		Main valve: Port thread ISO 228/1 or nom. width	Main valve: Flow Q_{max} (guideline) (lpm)	Proportional control section [2] Coding for pressure reducing section: prop. controllable pressure range (bar) p_{min} ··· p_{max} [1] **- 41**	**- 42**	**- 43**	**- 44**	Mass (weight) approx. (kg)
For pipe connection		**PMV**	**41**	G 1/4 *	16	5 ... 180	5 ... 290	5 ... 440	5 ... 700	1.2
			42	G 3/8 *						
			51	G 1/4 *	16	5 ... 110	5 ... 180	5 ... 270	5 ... 450	1.2
			52	G 3/8 *	40					
			53	G 1/2 *	60					1.3
			62	G 3/8 *	60	5 ... 80	5 ... 130	5 ... 190	5 ... 320	1.2
			63	G 1/2 *	75					1.3
			64	G 3/4 *						1.5
			84	G 3/4 *	120	5 ... 45	5 ... 70	5 ... 110	5 ... 180	1.5
			85	G 1 *						1.9
		**PMVS**	**41**	G 1/4 *	16	(0) ... 180	(0) ... 290	(0) ... 440	(0) ... 700	1.2
			51			(0) ... 110	(0) ... 180	(0) ... 270	(0) ... 450	1.2
For manifold mounting		**PMVP**	**4**	6	16	5 ... 180	5 ... 290	5 ... 440	5 ... 700	1.1
			45	6	16	5 ... 110	5 ... 180	5 ... 270	5 ... 450	1.1
			5	8	40					1.2
			65	10	60					1.3
			56	10	60	5 ... 80	5 ... 130	5 ... 190	5 ... 320	1.2
			6	12	75					1.3
			8	16	120	5 ... 45	5 ... 70	5 ... 110	5 ... 180	1.7
		**PMVPS**	**4**	6	16	(0) ... 180	(0) ... 290	(0) ... 440	(0) ... 700	1.1
			45	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 ⌀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. 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)

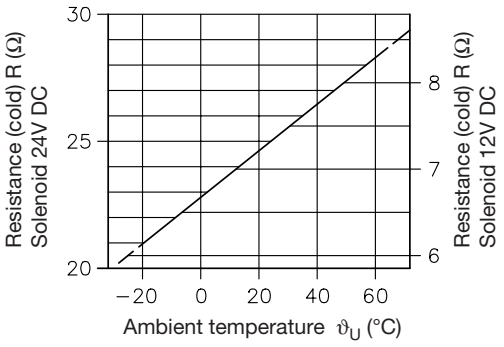
Type	approx. kg	Type	approx. kg
PMV(S) 41 (51)	1.2	PMVP(S) 4 (45)	1.1
PMV 42 (52, 62)	1.2	PMVP 5 (56)	1.2
PMV 53 (63)	1.3	PMVP 6 (65)	1.3
PMV 64 (84)	1.5	PMVP(S) 8	1.7
PMV 85	1.9		

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 mm²/s, Opt. operation range: 10... 500 mm²/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)

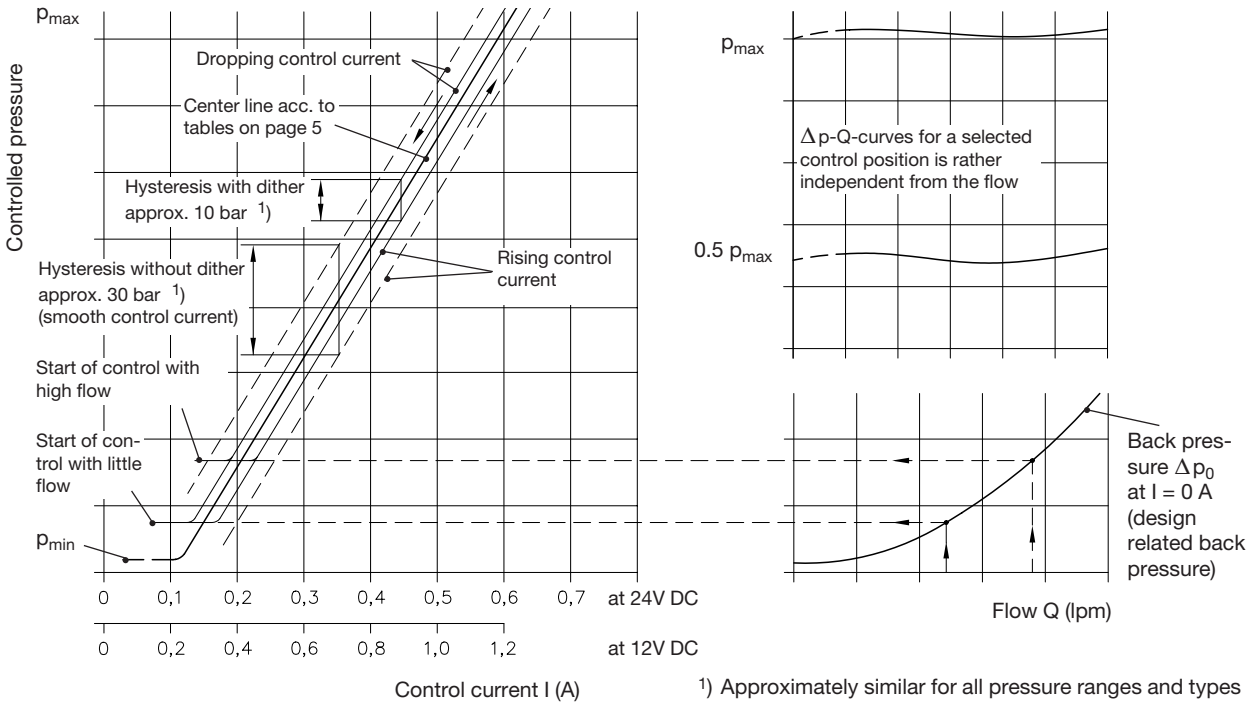
Nom. voltage U_N		12V DC	24V DC
Coil resistance	R_{20} ±5%	6 Ω	24 Ω
Current, cold	I_{20}	2 A	1 A
Nom. current	I_N	1.26 A	0.63 A
Power, cold	P_{20}	24 W	24 W
Nom. power	P_N	9.5 W	9.5 W
Relative duty cycle		100% ED (reference temp. ϑ_{11} = 50°C)	
Electrical connection		Industrial standard (terminal distance 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}	

Reference value for the resistance (cold)



3.3 Curves

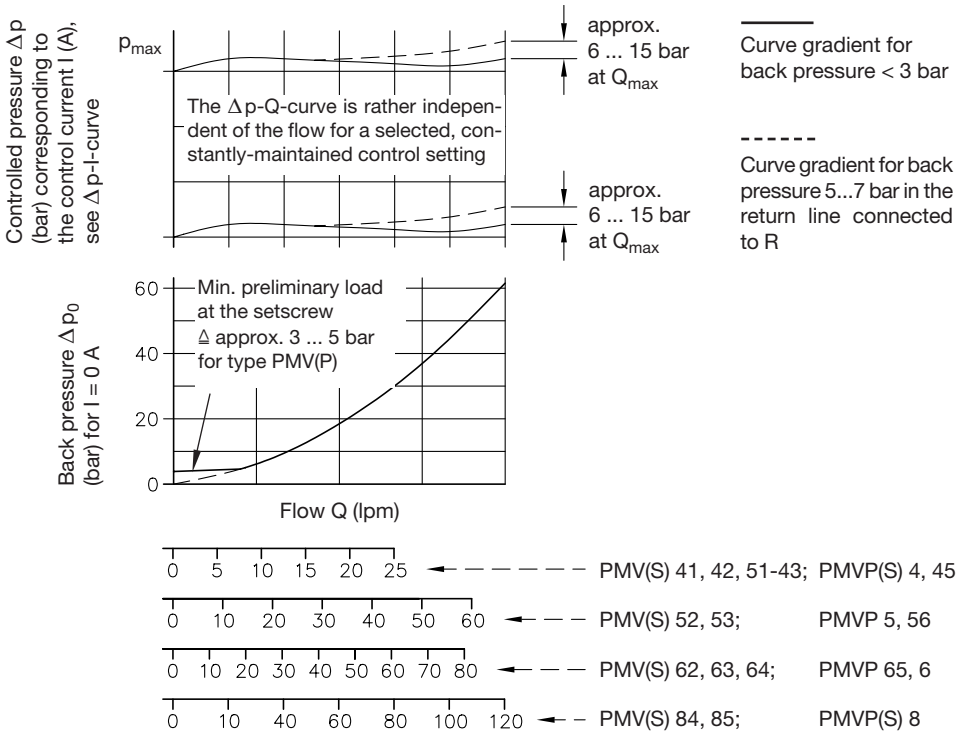
The resulting pressure Δp (bar) from a certain control current I (A), depending on type and size, can be read from the curves below. The control current range stretches from approx. 0.1 to 0.63 A at 24V DC or 0.2 to 1.26 A at 12V DC. The lowest pressure that can be controlled for I = 0 A can only be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



1) Approximately similar for all pressure ranges and types

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.

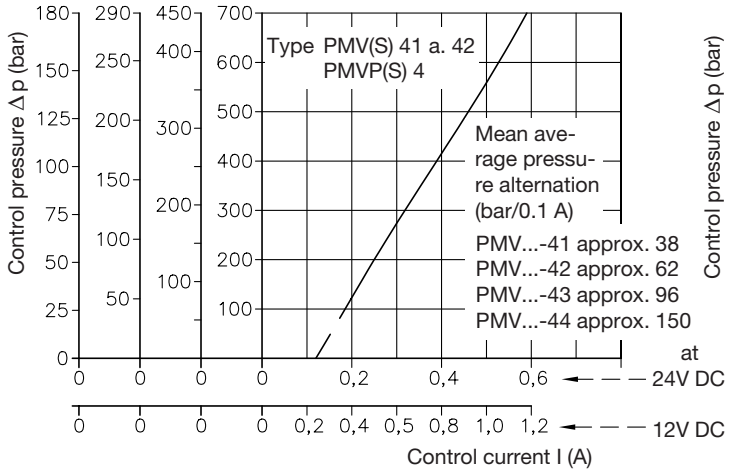


Fluid viscosity during measurement approx. 60 mm^2/s

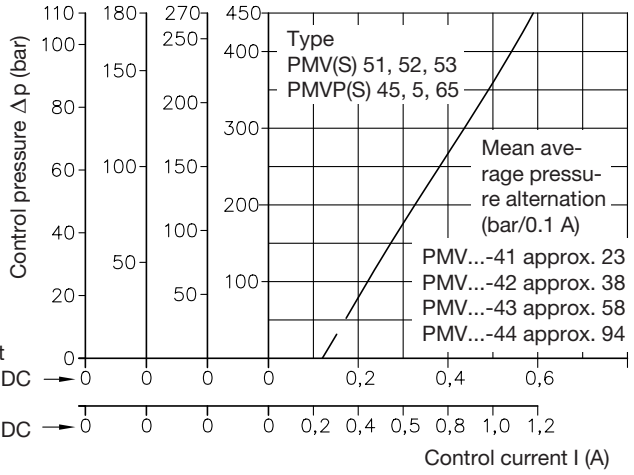
Δp-I curve

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.

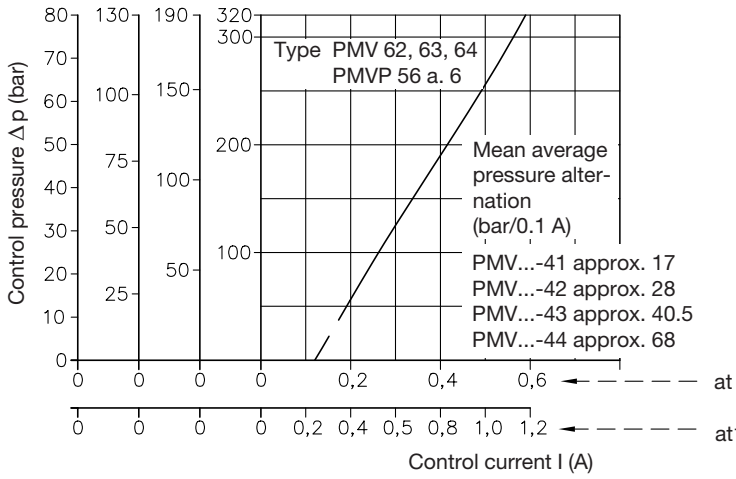
Type PMV(S) .. and PMVP(S) ..
..-41 ..-42 ..-43 ..-44

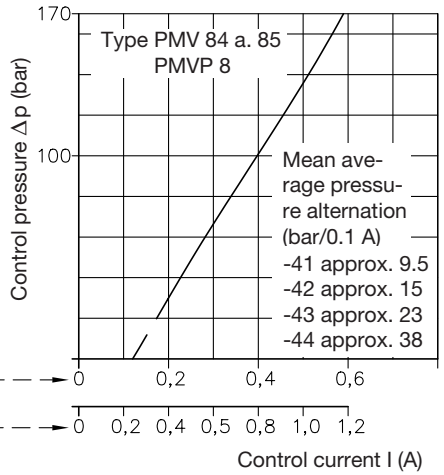


Type PMV(S) .. and PMVP(S) ..
..-41 ..-42 ..-43 ..-44



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



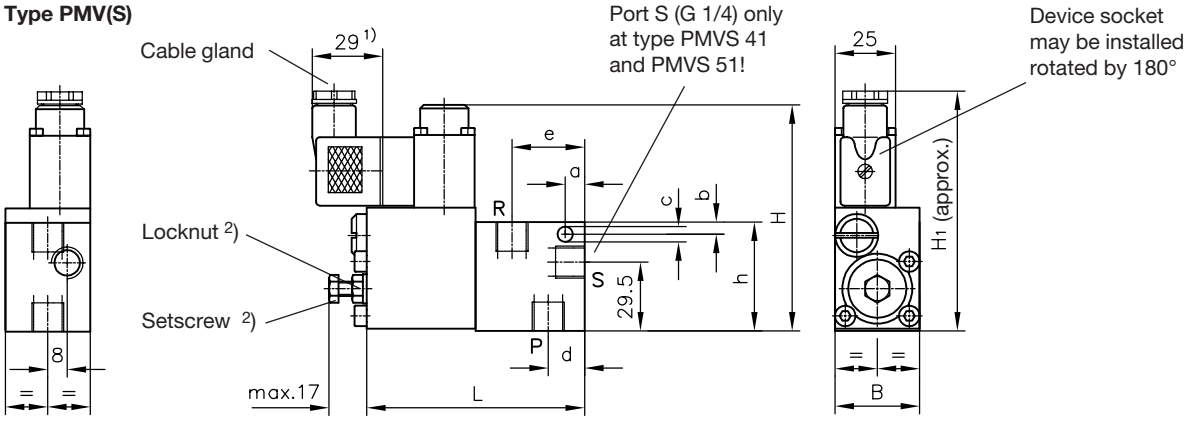


Fluid viscosity during measurement approx. 60 mm^2/s

4. Unit dimensions

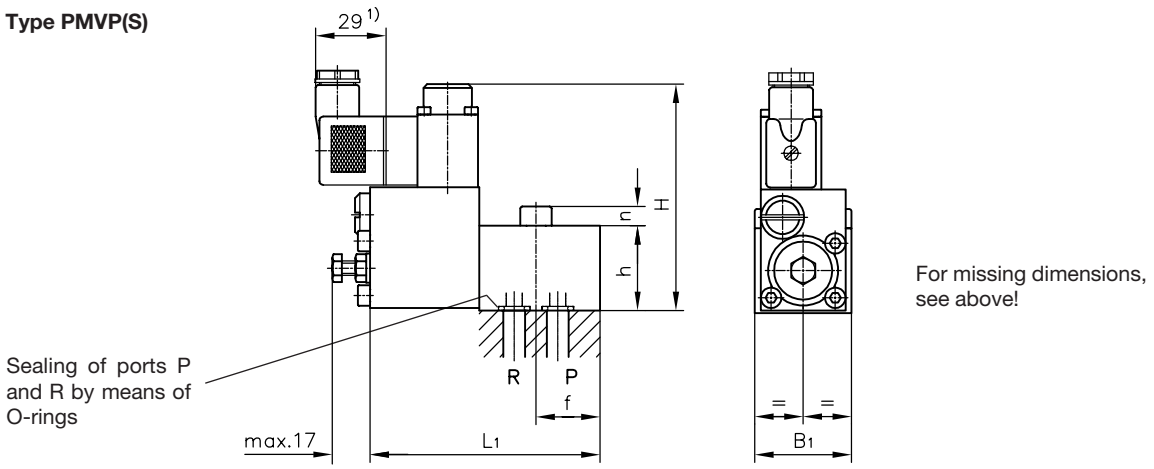
All dimensions in mm, subject to change without notice!

Type PMV(S)

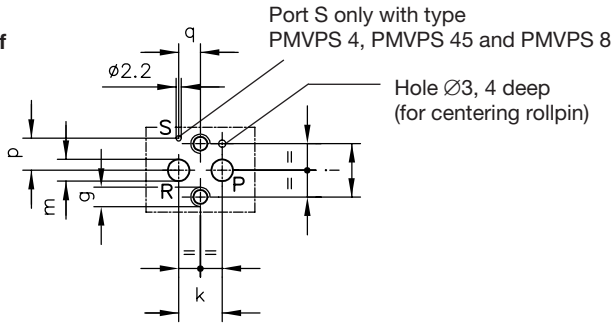


Type	Ports P and R (BSPP)	B	H	H_1	L	a	b	c	d	e	h	h_1
PMV(S) 41(51)	G 1/4	35	94	99.5	90.1	8	8	6.4	15	30	45	71
PMV 42(52, 62)	G 3/8	35	96	101.5	95.1	10	10	6.4	17.5	35	45	73.5
PMV 53(63)	G 1/2	35	97	102.5	95.1	10	8	6.4	15	31.5	50	74.5
PMV 64(84)	G 3/4	40	101	106.5	105.1	15	15	8.5	17.5	40	60	78.5
PMV 85	G 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	$p^{\pm 0.1}$	$q^{+0.1}$	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

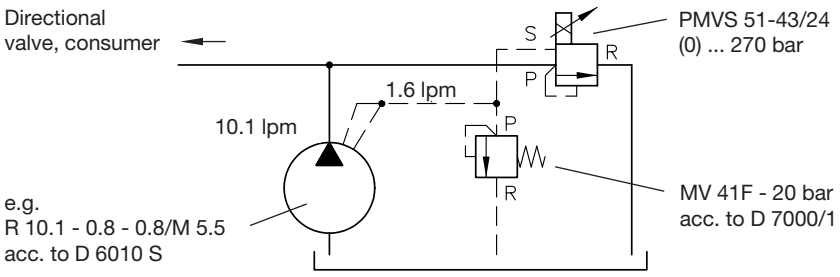
1) This dimension is depending on the manufacturer and may be up to max. 40 mm (acc. to DIN EN 175 301-803 B).

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

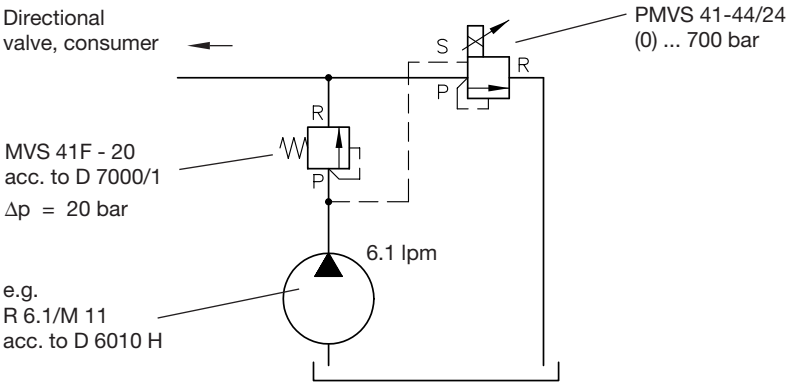
5.1 Example circuits for type PMVS

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