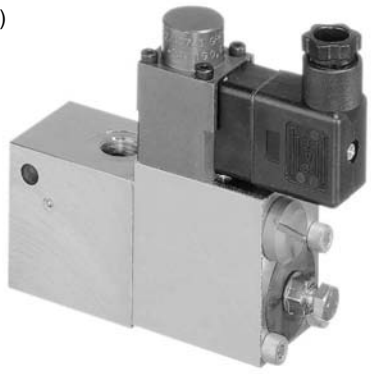
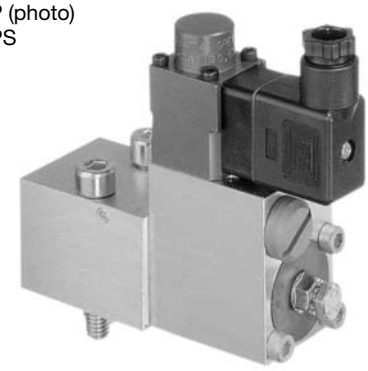
Proportional pressure limiting valve
Type PMV and PMVP
Type PMVS and PMVPS (with external control oil inlet)

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

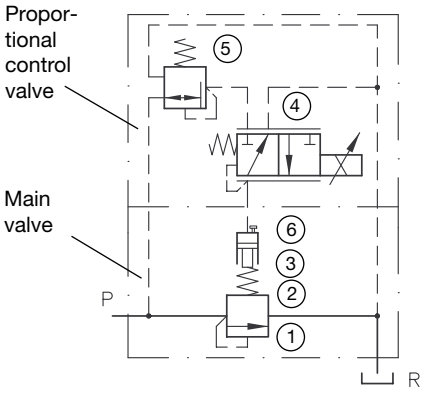
The proportional pressure limiting valves, type PMV (S) and PMVP (S) are designed for the electro-proportional adjustment of the system pressure in hydraulic circuits.
A min. pressure will be apparent in the deenergized state. This pressure figure depends on the flow (back pressure) or the min. setting 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 or EV1G1 acc. to D 7837) is necessary for the electric control of these valves.

Detailed flow pattern symbols

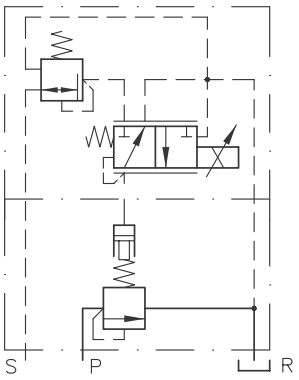
Type PMV and PMVP



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



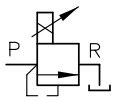
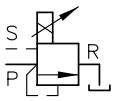
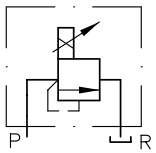
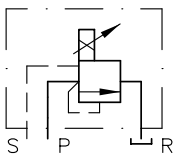
For simplified flow pattern symbols see page 2!

2. Type coding, main data

Order example: **PMV 63 - 41 / 24**

Nom. voltage proportional solenoid

Supply	24V DC	12V DC
Coding	**/ 24**	**/ 12**

Version	Flow pattern symbol (simplified)	Main valve: Coding for basic type, size and port size		Main valve: Port thread DIN ISO 228/1 or nom. width	Main valve: Flow Q_{max} (guideline) (lpm)	Proportional control section [2] Coding for pressure reducing section: **- 41** prop. controllable pressure range (bar) p_{min} ··· p_{max} [1]	**- 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

[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 DIN 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 passivized)

Mass (weight)

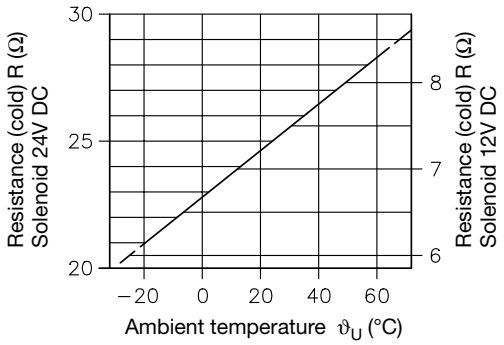
Type	approx. kg	Type	approx. kg
PMV(S) 41 (51)	1,2	PMVP(S) 4 (45)	1,1
PMV 42 (52, 62)	1,2	PMVP 5 (56)	1,2
PMV 53 (63)	1,3	PMVP 6 (65)	1,3
PMV 64 (84)	1,5	PMVP 8	1,7
PMV 85	1,9		

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. 0,5 lpm

3.2. Electrical (proportional solenoid)

Nom. voltage U_N	12V DC	24V DC
Coil resistance R_{20} +5%	6Ω	24Ω
Current, cold I_{20}	2A	1A
Nom. current I_N	1,26A	0,63A
Power, cold P_{20}	24W	24W
Nom. power P_N	9,5W	9,5W
Relative duty cycle	100% ED (reference temp. ϑ_{11} = 50°C)	
Electrical connection	Industrial standard (similar DIN 43650 B)	
Protection classification DIN 40050	IP 65 (with plug installed as instructed	
Required dither frequency	60 ... 150 Hz	
Dither amplitude	20 ... 40% of I_{20}	

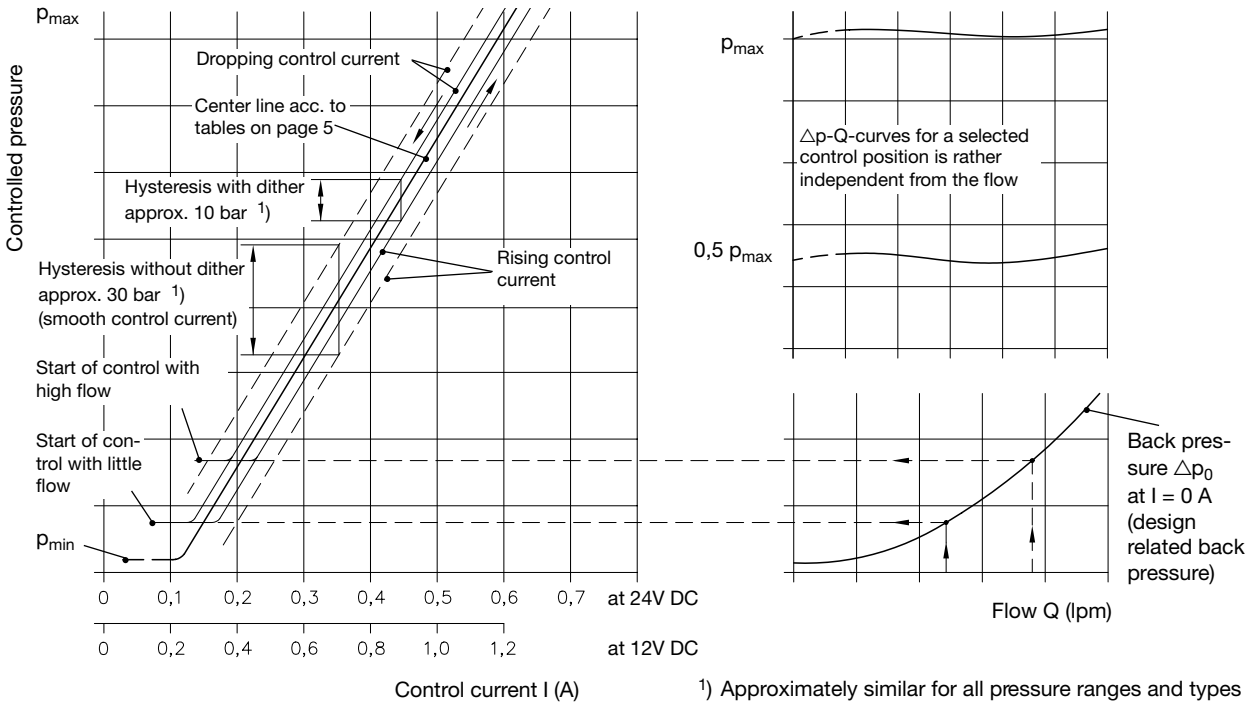
Reference value for the resistance (cold)



3.3. Curves

The resulting pressure △p (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 $\triangle p_0$-Q-curves.

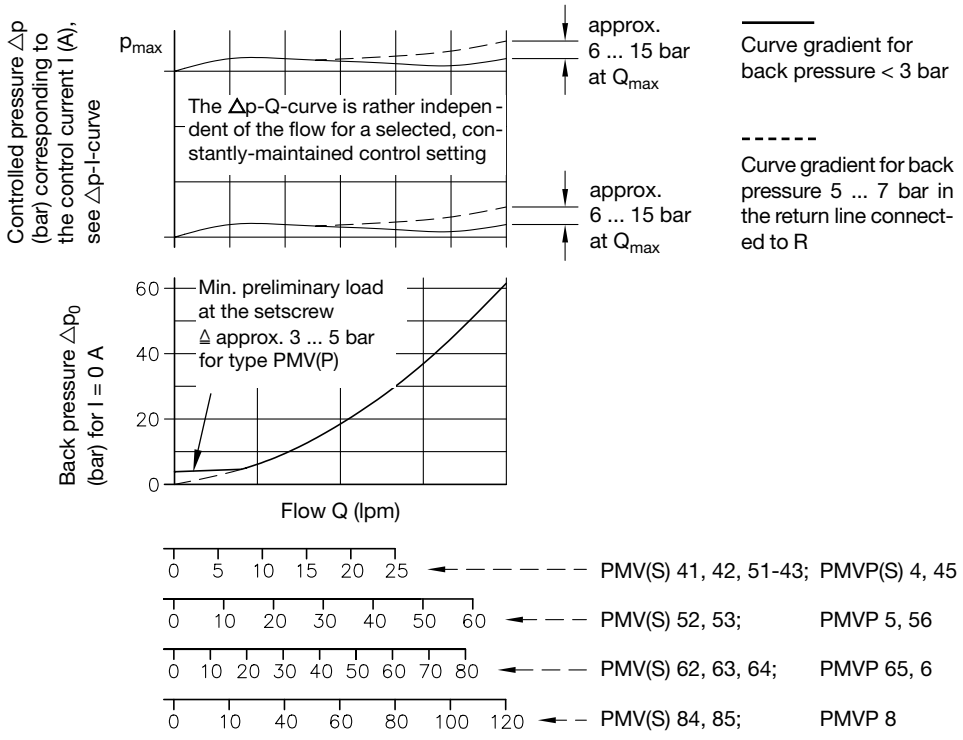
Example: For the relationship between △p-I- and △p-Q-curve, see below



1) Approximately similar for all pressure ranges and types

△p-Q-curve

The pressure selected via the control current is rather independent of the flow rate. The pressure figure △p (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 △p-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.

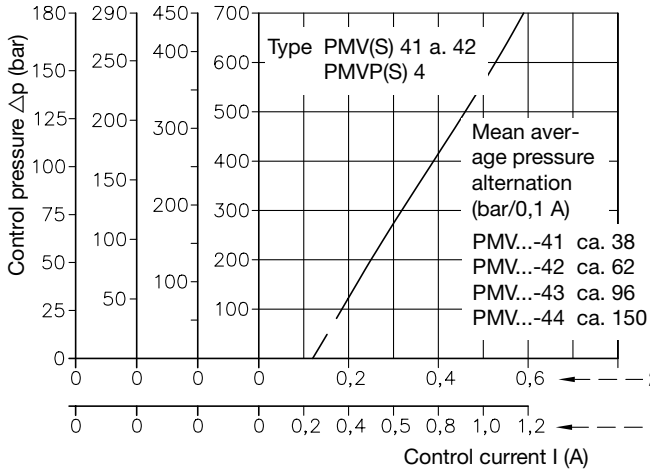


Fluid viscosity during measurement approx. 60 mm^2/s

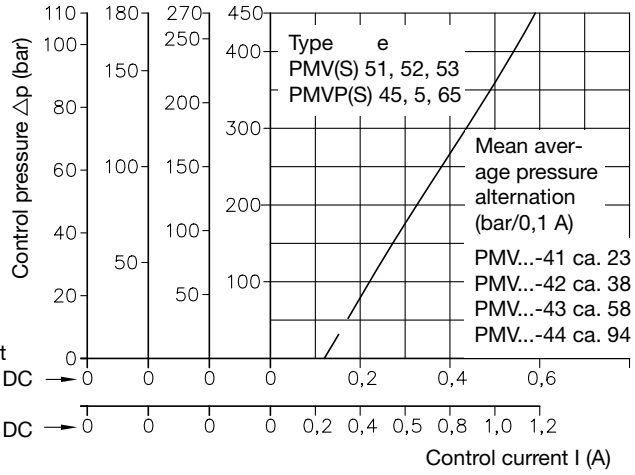
△p-I curve

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.

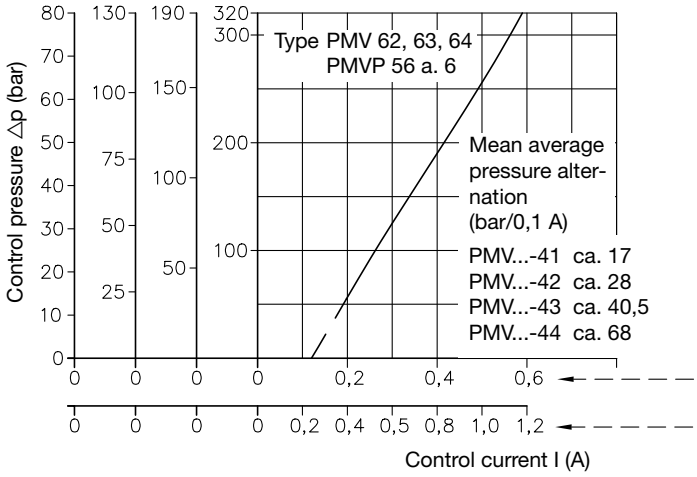
Type PMV(S) .. and PMVP(S) ..
..-41 ..-42 ..-43 ..-44

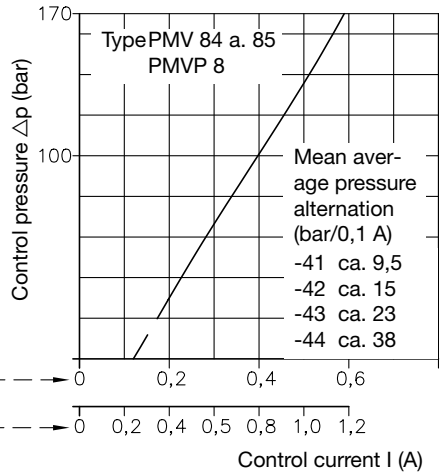


Type PMV(S) .. and PMVP(S) ..
..-41 ..-42 ..-43 ..-44



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



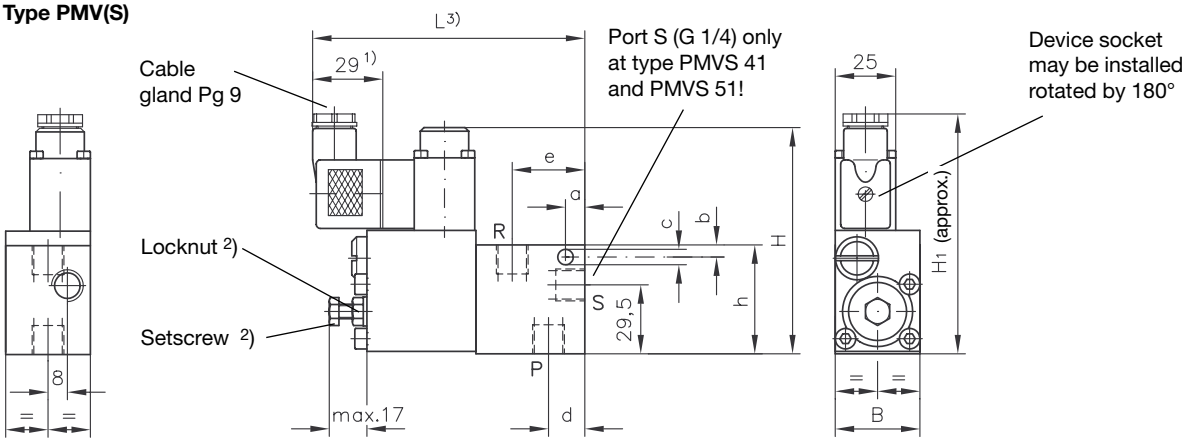


Fluid viscosity during measurement approx. 60 mm²/s

4. Unit dimensions

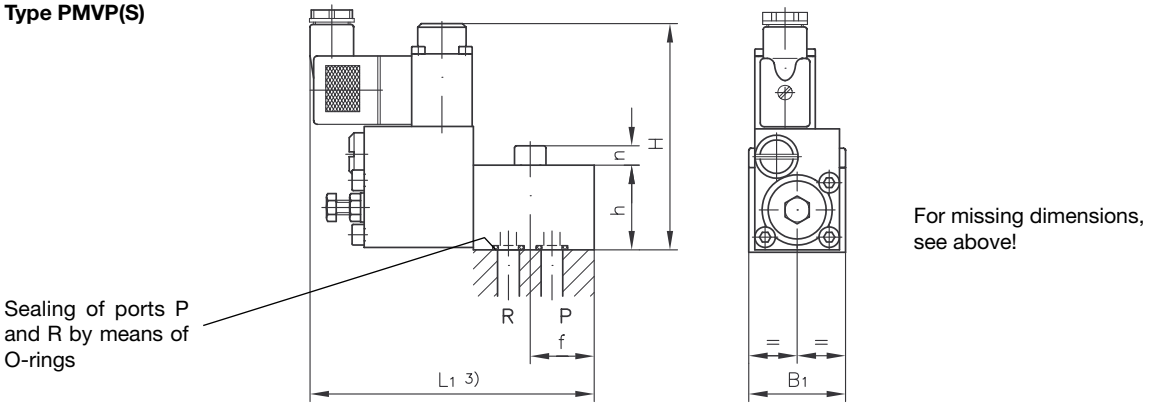
All dimensions in mm, subject to change without notice!

Type PMV(S)



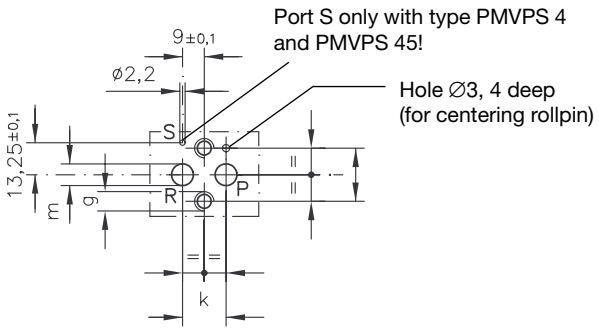
Type	Ports P and R	B	H	H1	L 3)	a	b	c	d	e	h	h1
PMV(S) 41 (51)	G 1/4	35	94	99,5	113	8	8	6,4	15	30	45	71
PMV 42 (52, 62)	G 3/8	35	96	101,5	118	10	10	6,4	17,5	35	45	73,5
PMV 53 (63)	G 1/2	35	97	102,5	118	10	8	6,4	15	31,5	50	74,5
PMV 64 (84)	G 3/4	40	101	106,5	128	15	15	8,5	17,5	40	60	78,5
PMV 85	G 1	45	106	111,5	138	15	15	8,5	25	44,5	70	88,5

Type PMVP(S)



For missing dimensions, see above!

Hole pattern of the manifold



Type	B1	L1 3)	H	f	g	h	i	k	m	n	O-ring NBR 90 Sh
PMVP(S) 4 (45)	35	113	94	21	M 8	35	22	14	6	8	8x2
PMVP 5 (56)	40	118	94	26.5	M 8	35	27	18	9	8	10x2
PMVP 6 (65)	50	118	94	25	M 10	35	34	22	12	10	13.95x2.62
PMVP 8	60	128	96	33	M 12	40	40	26	16	12	18.75x2.62

1) This dimension is depending on the manufacturer (illustrated Co. K&B Inc., D-84056 Rottenburg a.d.L.) and may be up to max. 40 mm (acc. to 43650).

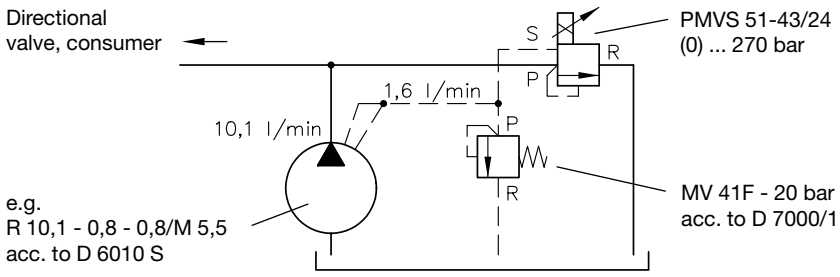
2) The min. pressure p_{min} (sect. 3.1) can be either reduced or increased via this setscrew. This p_{min} setting cannot be reduced further even if the control current is decreased further.
Setting procedure: Slacken the locknut a/f 10 (Seal-Lock-Nut) prior to adjusting the setscrew, thus preventing the vulcanized seal-ring to be damaged by the thread. Attention: A min. pressure pmin of 3...5 bar is required at type PMV and PMVP, due to design.

3) Dimension L and L1 may be up to 11 mm longer, depending on the plug manufacturer (see foot note 1).

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: