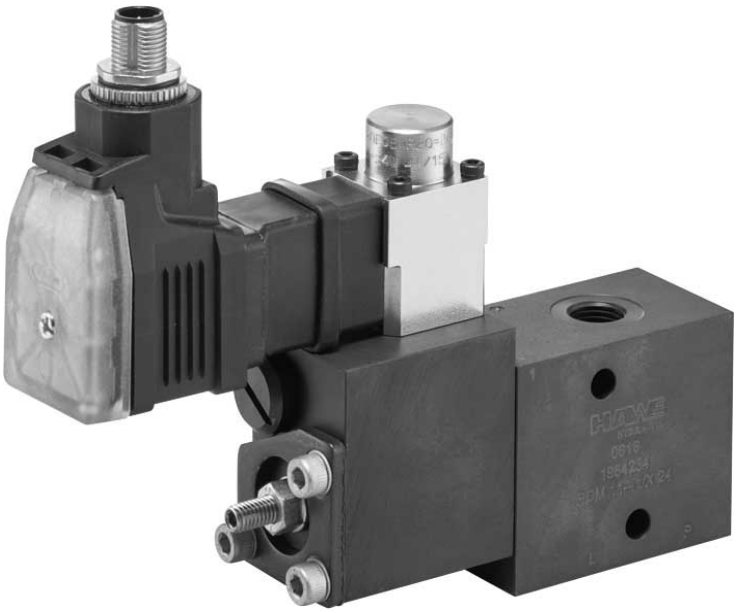
Proportional pressure-reducing valve type PDM and PDMP

Product documentation

Operating pressure p_{max}:	320 bar
Flow rate Q_{max}:	20 lpm



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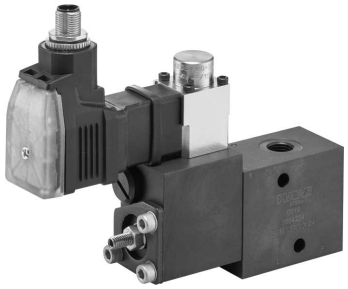
Contents

1 Overview – Proportional pressure-reducing valve types PDM and PDMP

Proportional pressure-reducing valves are a type of pressure control valve. They remotely control the pressure in hydraulic systems continually and electrically. The proportional pressure-reducing valve type PDM is a piloted valve with a piston and is controlled electro-proportionally. The valve has an external control oil drain. It continuously maintains a constant pressure on the secondary pressure side, independently of the inlet side. The pressure reducing valve is available as a single valve for pipe connection or as a manifold mounting valve. The proportional pressure-reducing valve PDM is particularly suitable for dynamic control of the pressure level in hydraulic systems.



Pipe connection type PDM

Features and benefits:

- Integrated overpressure function

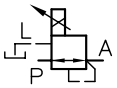
Intended applications:

- General hydraulic systems
- Equipment
- Test benches
- Hydraulic tools

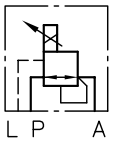
2 Available versions, main data

Circuit symbol:

PDM



PDMP



Order coding example:

PDM 21 | **- 43** | **- X 24**

Solenoid voltage Table 3 Solenoid voltage

Proportional actuator Table 2 Proportional actuator

Basic type and size Table 1 Basic type and size

Table 1 Basic type and size

Main valve

Type	Ports (ISO 228-1 (BSPP) or nominal width)		Flow rate Q_{max} (lpm) *
	P, A	L	
For pipe connection			
PDM 11	G 1/4	G 1/4	12
PDM 21	G 1/4	G 1/4	20
PDM 22	G 3/8	G 1/4	20
For manifold mounting			
PDMP 11	∅6		12
PDMP 22	∅8		20

* Guideline value; flow resistance at max. flow rate approx. 10 bar (with pressure set to 5 bar at 10% of max. flow rate)

Table 2 Proportional actuator

Pipe connection

Coding	Proportionally controllable pressure range (bar) p_{min} to p_{max} *		
	PDM 11	PDM 21	PDM 22
- 41	5 to 80	5 to 45	5 to 45
- 42	5 to 130	5 to 70	5 to 70
- 43	5 to 200	5 to 110	5 to 110
- 44	5 to 320	5 to 180	5 to 180

Manifold mounting

Coding	Proportionally controllable pressure range (bar) p_{min} to p_{max} *	
	PDMP 11	PDMP 22
- 41	5 to 80	5 to 45
- 42	5 to 130	5 to 70
- 43	5 to 200	5 to 110
- 44	5 to 320	5 to 180

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

Table 3 Solenoid voltage

Coding	Electrical connection	Nominal voltage	Protection class * (IEC 529)
- X 12 - X 24	DIN EN 175 301-803 A (Coding G..., e.g. G 24, with line connector, coding L..., e.g. L 24, with LED in the line connector)	12 V DC 24 V DC	IP 65

* For correctly installed line connector

Connection pattern

G .., X .., L ..

3 Parameters

General and hydraulic

Designation	Proportional pressure-limiting valve
Design	Directly controlled, ball seat
Model	Manifold mounting valve, valve for pipe installation
Material	Main valve: Nitrided Control element: electrogalvanised (electrogalvanised solenoid with olive passivation)
Installation position	As desired
Ports	P = Pump pressure, system pressure L = Reflux, tank A = Consumer port
Hydraulic fluid	Hydraulic oil: according to DIN 51 524 Part 1 to 3; ISO VG 10 to 68 according to DIN 51 519 Viscosity range: min. approx. 4; max. approx. 1500 mm^2/s Optimal operating range: approx. 10 to 500 mm^2/s Also suitable for biologically degradable pressure fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C.
Cleanliness level	**ISO 4406** 20/17/14...18/15/12
Temperatures	Ambient: approx. -40 ... +80°C, Fluid: -25 ... +80°C, Note the viscosity range! Permissible temperature during start: -40°C (observe start-viscosity!), as long as the service temperature is at least 20K higher for the following operation. Biologically degradable pressure fluids: Observe manufacturer's specifications. By consideration of the compatibility with seal material not over +70°C.

Pressure and flow rate

Operating pressure	P = p_{max} = 350 bar L = $p_{max\ R} \leq$ 20 bar; reflux, tank A = p_{max} according to pressure range
Internal control oil consumption	Max. approx. 0.5 lpm

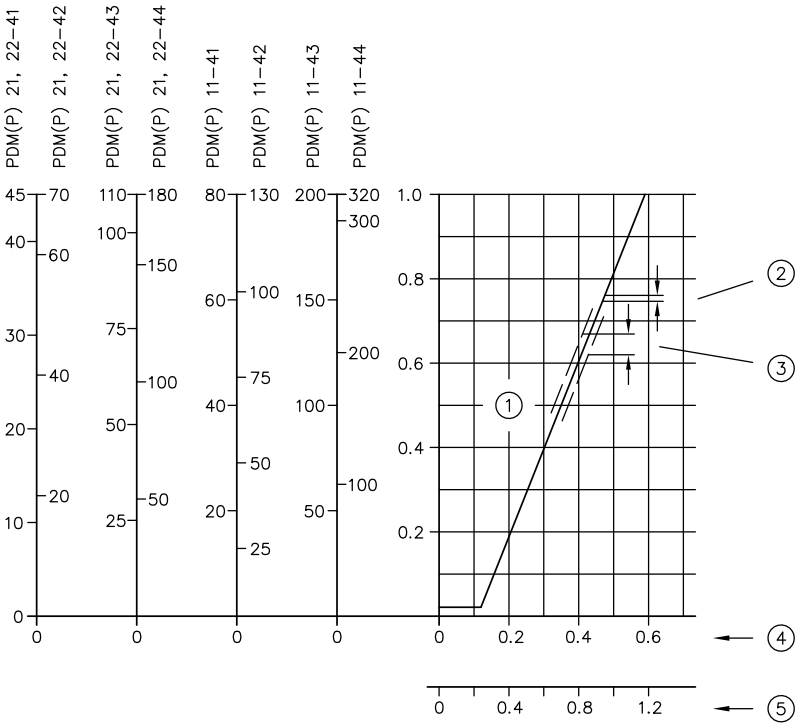
Weight

Type	
PDM 11	= 1.4 kg
PDM 21	= 1.5 kg
PDM 22	= 1.5 kg
PDMP 11	= 1.3 kg
PDMP 22	= 1.2 kg

Characteristics

Oil viscosity approx. 60 mm²/s

p_A - I - characteristics

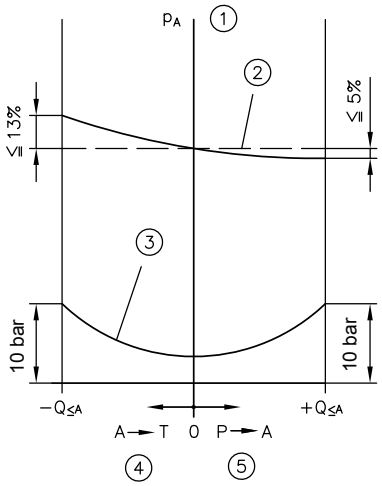


1 For all pressure ranges
2 Hysteresis with dither: < 8 bar
3 Hysteresis without dither: < 25 bar
4 Control current I (A) at 24 V DC
5 Control current I (A) at 12 V DC

Characteristics

Oil viscosity approx. 60 mm²/s

Δp-Q characteristics



1 Acc. to p_A - I - characteristic
2 Example PDM 22-42/24
I ≈ 0.36 A
≙ ~ 0.5 $p_{A\ max}$
3 Lower limit curve (intrinsic flow resistance)
4 Override
5 Consumer current

If the pressure associated with a specific control current is set to p_A at Q_A = 0 lpm (consumer in end position), it will experience a slight drop during the current feed if the consumer takes on oil in direction P → A (+ $Q_A \neq 0$). Likewise, the pressure will increase a little if the consumer is pushed back in direction A → T by external forces (override, - $Q_A \neq 0$).

3.1 Electrical data

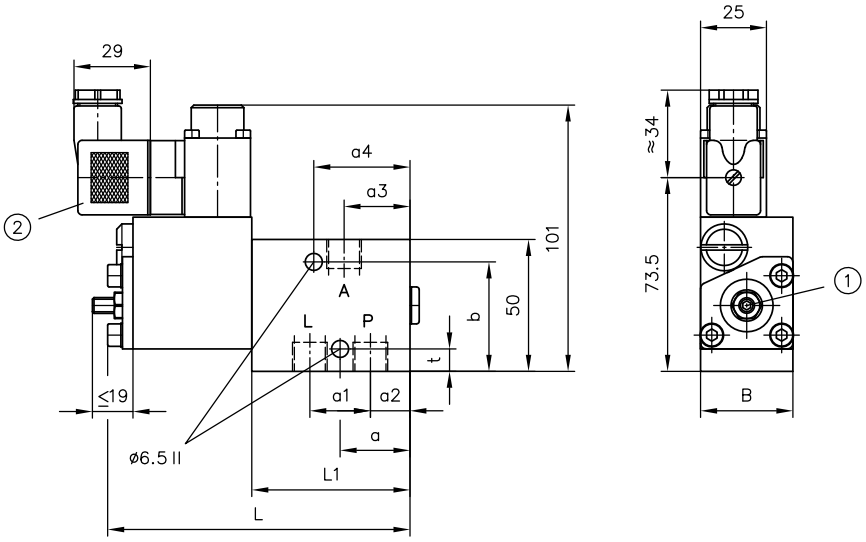
Proportional solenoid

Nominal voltage U_N	**12 V DC**	**24 V DC**
Coil resistance R_{20} ± 5 %	6 Ω	24 Ω
Current, cold I_{20}	2 A	1 A
Nominal current I	1.26 A	0.63 A
Cooling power P_{20}	24 W	24 W
Nominal power P_N	9.5 W	9.5 W
Relative duty cycle	100% duty cycle (reference temperature ϑ_{11} = 50°C)	
Protection class	IP 65 (according to DIN VDE 0470 / EN 60529 / IEC 529) (with connector installed properly)	
Electrical connection	Industry standard (similar to DIN 43650 B)	
Required dither frequency	60 to 150 Hz	
Dither amplitude (peak-peak)	20 to 40% of I_{20}	

4 Dimensions

All dimensions in mm, subject to change.

PDM

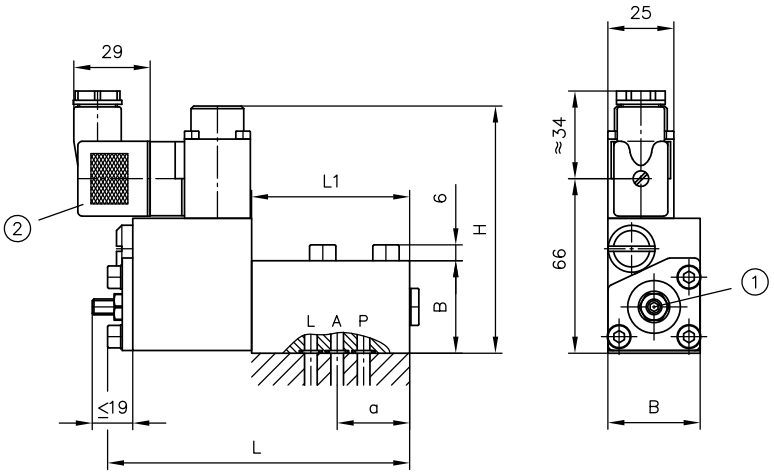


1 Set screw for adjusting the minimum pressure

2 Line connector coding -G.., -L..

Type	Ports (ISO 228-1) (BSPP)		B	L	L1	a	a1	a2	a3	a4	b	t
	A, P	L										
PDM 11	G 1/4	G 1/4	35	114.7	60	26.5	23	15	25	36.5	41.5	8.5
PDM 21			40	121.2	66.5	32	26	18	28	42	44	6
PDM 22	G 3/8											

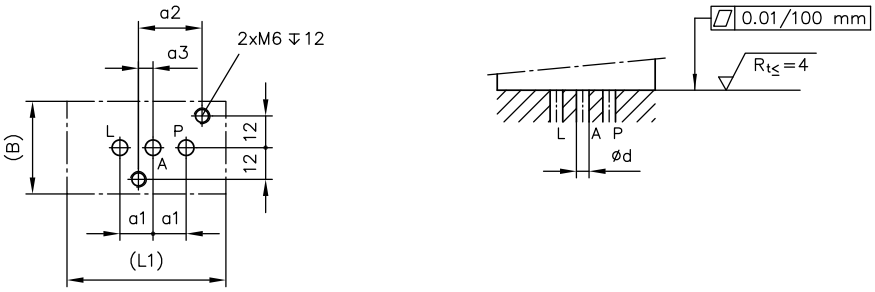
PDMP



1 Set screw for adjusting the minimum pressure

2 Line connector coding -G.., -L..

Base plate hole pattern



Type	B	H	L	L1	a	a1	a2	a3	∅d	O-ring NBR 90 Sh
PDMP 11	35	93.5	114.7	60	27.5	12.5	24	5.5	6	7.65x1.78
PDMP 22	40	96	121.2	66.5	32	14	26	6	8	9.25 x 1.78

5 Assembly, operation and maintenance recommendations

5.1 Intended use

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

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

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 qualified personnel.
- The product must only be operated within the specified technical parameters. The technical parameters are described in detail in this documentation.
- The operating and maintenance manual of 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 be shut down correctly prior to dismounting (in particular in combination with hydraulic accumulators).

⚠ **DANGER**

Risk to life caused by sudden movement of the hydraulic drives when dismantled incorrectly!

Risk of serious injury or death.

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

5.3 Operating instructions

Note product configuration and pressure / flow rate

The statements and technical parameters in this documentation must be strictly observed.
The instructions for the complete technical system must also always be followed.

NOTE

- 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

Risk of injury on overloading components due to incorrect pressure settings!
Risk of minor injury.

- 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 hydraulic component. Contamination can cause irreparable damage.

Examples of fine contamination include:

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

NOTE

Fresh hydraulic fluid from the drum does not always have the highest degree of purity. Under some circumstances the fresh hydraulic fluid must be filtered before use.

Adhere to the cleanliness level of the hydraulic fluid in order to maintain faultless operation.
(also see cleanliness level in Chapter 3, "Parameters").

Additionally applicable document: D 5488/1 Oil recommendations

5.4 Maintenance information

Conduct a visual inspection at regular intervals, but at least once per year, to check if the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

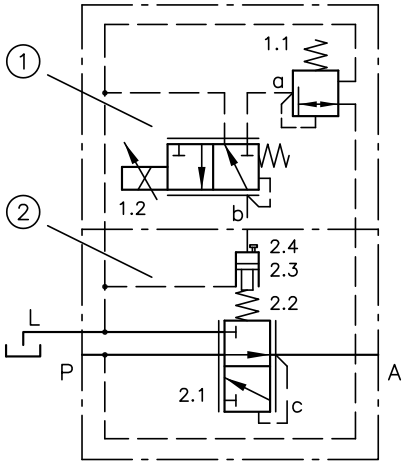
Clean the device surface of dust deposits and dirt at regular intervals, but at least once per year.

6 Other information

Functional description

The PDM-type proportional pressure-reducing valve in an indirectly actuated device comprising the following components:

- Proportional actuator
- Main stage



1 Proportional actuator
2 Main stage

① **Proportional actuator:**

1.1 Pressure reducing valve (pilot stage): reduces the pilot pressure at P to a constant, low level (outlet a).

1.2 Proportional pressure-reducing valve (with solenoid for pressure setting): reduces the pilot pressure for the electrical current signal at the solenoid (outlet b).

② **Main stage:**

2.3 Set piston

2.2 Spring

2.1 Valve spool: receives load from the set piston with spring.

The outlet pressure A (secondary pressure) is in proportion to the electrical signal at the proportional pressure-reducing valve **1.2**.
The forces in the system are balanced **2.1c - 2.2 - 2.3** (regulation position):
pilot pressure b x piston area **2.3** = outlet pressure A x piston area **2.1**

The proportional pressure-reducing valve **1.2** and the size of the main stage determine the proportionally adjustable outlet pressure range at A. The minimum value is 5 bar. A set screw **2.4** with a lock nut can be used to limit this minimum pressure to higher values, which the pressure must then never drop below (characteristics See Chapter 3, "Parameters")

Override compensation:

If an external force that is greater than the pressure setting at the proportional pressure-reducing valve **1.2** is applied to the consumer, the vale will act as a pressure-limiting valve. The valve spool **2.1** opens connection A-L. Port P locked.

Actuation:

A proportional amplifier (e.g. EV1M3 in accordance with D 7831/2 or EV2S in accordance with D 7818/1) is required for the electric actuation of the valve.

Further information

Additional versions

- 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
- Pressure-reducing valve type ADM: D 7120

D 7584/1 - 11-2018-1.1

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