

Proportional pressure reducing valve type PDM, PDMP

Product documentation



Operating pressure p_{\max} :

350 bar

Flow rate Q_{\max} :

20 l/min



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1 Overview of proportional pressure reducing valve type PDM, 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.

Features and advantages

- Operating pressures up to 350 bar
- Precise control
- Integrated overpressure function

Intended applications

- Construction machines
- Machine tools
- General hydraulic systems
- Mining machinery



Proportional pressure reducing valve type PDM for pipe connection



Proportional pressure reducing valve type PDMP for manifold mounting

2 Available versions

Ordering example

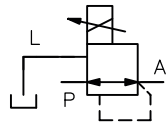
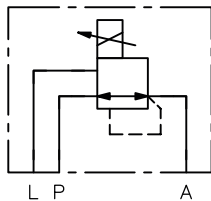
PDM 21 -43 /X 24

2.3 "Solenoid voltage and connector"

2.2 "Proportional actuator"

2.1 "Basic type and size"

2.1 Basic type and size

Type	Ports (ISO 228-1)		Flow rate Q_{max} (l/min) *	Pressure at port p_{max} (bar)			Circuit symbol
	P, A	L		P	A	L	
Single valve for pipe connection							
PDM 11	G 1/4	G 1/4	12	350	**	≤20	
PDM 21	G 1/4	G 1/4	20	350	**	≤20	
PDM 22	G 3/8	G 1/4	20	350	**	≤20	
Single valve for manifold mounting							
PDMP 11	∅6	∅6	12	350	**	≤20	
PDMP 22	∅8	∅8	20	350	**	≤20	

NOTICE

* Reference value; flow resistance at max. flow rate approx. 10 bar
(pressure setting of 5 bar at 10% of max. flow rate)

** see Chapter 2.2, "Proportional actuator"

2.2 Proportional actuator

Single valve for pipe connection

Coding	Controllable pressure range of proportional actuator p_{min} to p_{max} (bar)		
	PDM 11	PDM 21	PDM 22
-41	5 ... 80	5 ... 45	5 ... 45
-42	5 ... 130	5 ... 70	5 ... 70
-43	5 ... 200	5 ... 110	5 ... 110
-44	5 ... 320	5 ... 180	5 ... 180

Single valve for manifold mounting

Coding	Controllable pressure range of proportional actuator p_{min} to p_{max} (bar)	
	PDMP 11	PDMP 22
- 41	5 to 80	5 to 45
- 42	5 ... 130	5 to 70
- 43	5 to 200	5 ... 110
- 44	5 to 320	5 to 180



NOTICE

p_{min} (5 bar) is set at approx. 10% of the maximum flow Q_{max} , see Chapter 2.1, "Basic type and size"

2.3 Solenoid voltage and connector

Coding	Electrical connection	Nominal voltage	Protection class (IEC 60529)	Description
G 12 G 24	EN 175 301-803 B <ul style="list-style-type: none"> ▪ G: with male connector (MSD 6-209 to D 7163) ▪ X: without male connector 	12 V DC	IP 65	2-pin, connector position on side
X 12 X 24		24 V DC		
G 12 DIN X 12 DIN G 24 DIN X 24 DIN	EN 175 301-803 A <ul style="list-style-type: none"> ▪ G: with male connector (MSD 3-309 to D 7163) ▪ X: without male connector 	12 V DC	IP 65	3-pin, connector position on side
		24 V DC		
DT 12 DT 24	DEUTSCH (DT 04-2P)	12 V DC 24 V DC	IP 65	2-pin, connector position on side
S 12 S 24	Bayonet PA 6 Schlemmer	12 V DC 24 V DC	IP 67	3-pin, connector position at top
AMP 12 AMP 24	AMP Junior Power Timer	12 V DC 24 V DC	IP 65	2-pin, connector position at top

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

3 Parameters

3.1 General data

Designation	Proportional pressure reducing valve
Design	Valve spool, pilot-controlled
Model	<ul style="list-style-type: none"> ▪ Single valve for pipe connection ▪ Manifold mounting valve
Material	<ul style="list-style-type: none"> ▪ Main valve for the main stage: nitrided ▪ Proportional actuator: electrogalvanised (electrogalvanised solenoid with olive passivation)
Attachment	Mounting thread or tapped holes, see Chapter 4, "Dimensions"
Installation position	any
Ports/connections	<ul style="list-style-type: none"> ▪ P = Pump ▪ L = Reflux ▪ A = Consumers <p>Connecting thread see Chapter 2.1, "Basic type and size"</p>
Flow direction	<ul style="list-style-type: none"> ▪ Working direction P → A ▪ Overdrive A → T <div style="border: 1px solid #ccc; padding: 10px; margin-top: 10px;"> <p>! NOTICE If the pressure associated with a specific control current p_A is defined at $Q_A = 0$ l/min (consumer in end position), it will experience a slight drop with an unchanged 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 (overdrive, $-Q_A \neq 0$).</p> </div>
Hydraulic fluid	<p>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 mm²/s Optimal operating range: approx. 10 - 500 mm²/s Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C.</p>
Cleanliness level	<p>ISO 4406</p> <hr style="width: 20%; margin-left: 0;"/> <p>20/17/14</p>
Temperatures	<p>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.</p> <div style="border: 1px solid #ccc; padding: 10px; margin-top: 10px;"> <p>! NOTICE Limitation with regard to the permissible duty cycle of the solenoids, see Chapter 3.5, "Electrical data"</p> </div>

3.2 Pressure and flow rate

Operating pressure

- Inlet **P**: $p_{\max} = 350$ bar
- Outlet **A**: p_{\max} see Chapter 2.2, "Proportional actuator"
- Reflux **L**: where possible depressurised to the tank, $p_{\max} = 20$ bar

Flow rate

Q_{\max} see Chapter 2.1, "Basic type and size"

Internal control oil consumption

\leq approx. 0.3 l/min

3.3 Weight

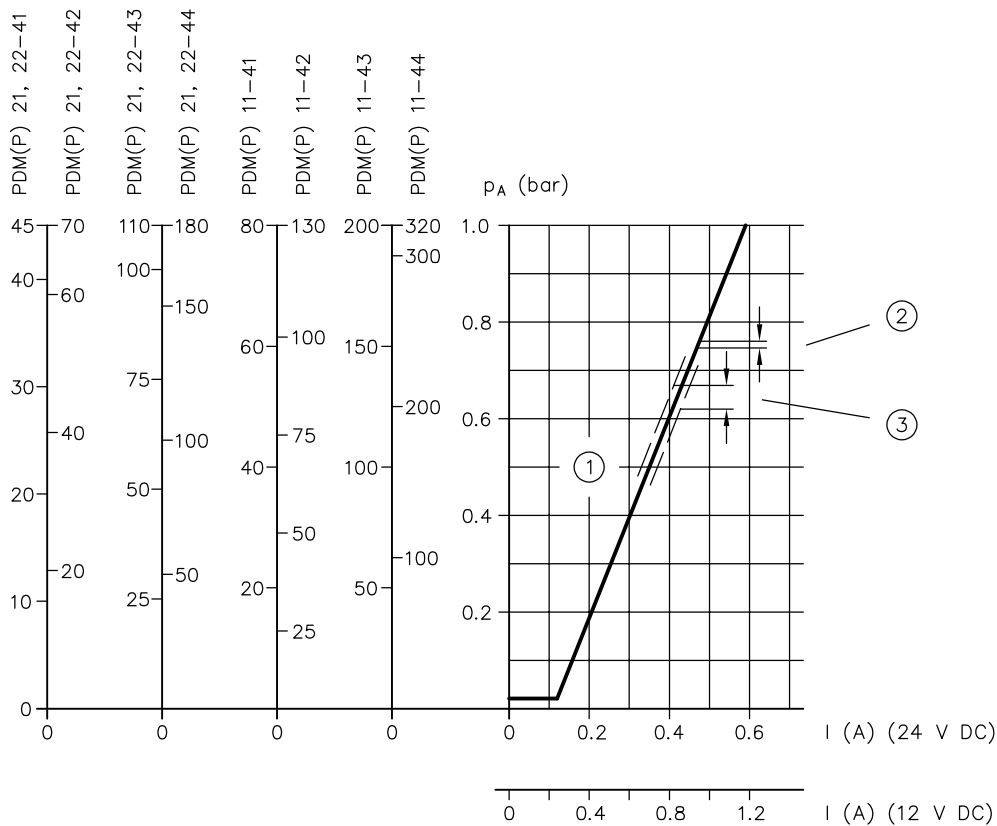
Type

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

3.4 Characteristic lines

Viscosity of the hydraulic fluid approx. 60 mm²/s

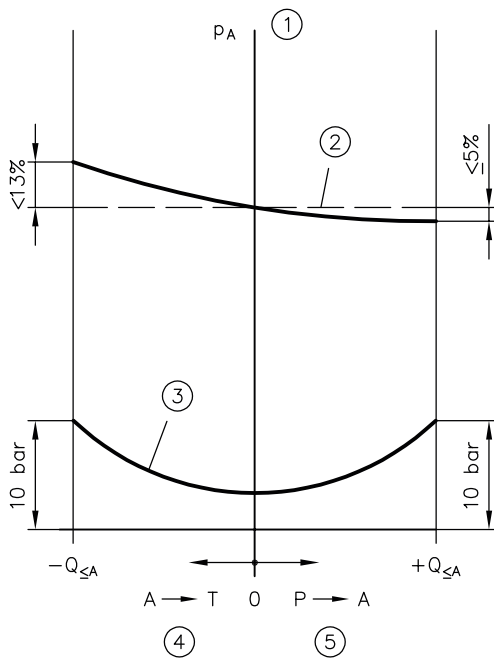
p_A-I characteristic lines



I control current (A); p_A pressure (bar)

- 1 For all pressure ranges
- 2 Hysteresis with dither: < 8 bar
- 3 Hysteresis without dither: < 25 bar

Δp-Q characteristic lines



- 1 Acc. to p_A - I - characteristic
- 2 Example PDM 22-42/24
 $I \approx 0.36 \text{ A}$
 $\Delta \sim 0.5 p_A \text{ max}$
- 3 Lower limit curve (inherent flow resistance)
- 4 Override
- 5 Consumer current

! NOTICE

If the pressure associated with a specific control current p_A is defined at $Q_A = 0 \text{ l/min}$ (consumer in end position), it will experience a slight drop with an unchanged current feed if the consumer takes on oil in direction $P \rightarrow A$ ($+ Q_A \neq 0$). Likewise, the pressure will increase a little if the consumer is pushed back in direction $A \rightarrow T$ by external forces (overdrive, $- Q_A \neq 0$).

3.5 Electrical data

Nominal voltage U_N	12 V DC	24 V DC
Resistance $R_{20 \pm 5\%}$	6 Ω	24 Ω
Current, cold I_{20}	2 A	1 A
Limit current I_G	1.26 A	0.63 A
Cooling power P_{20}	24 W	24 W
Limit power P_G	9.5 W	9.5 W
Relative duty cycle	100%	
Insulation material class	F	
Required dither frequency	60 ... 150 Hz	
Dither amplitude $A_D(\%) = \frac{I_{Peak-peak}}{I_G} \cdot 100$	$20 \leq A_D \leq 50\%$	

Electrical connection

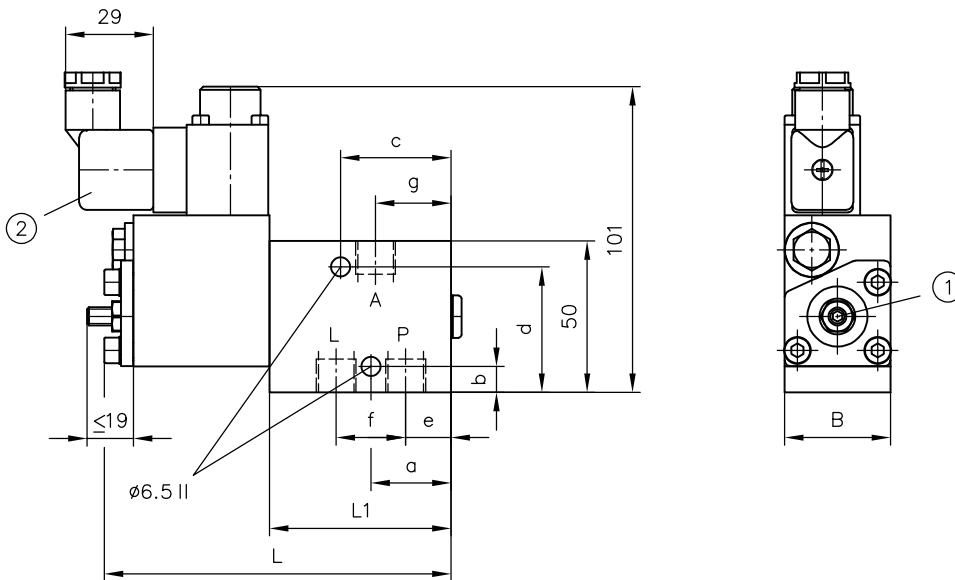
Coding	Specification	Port	Plug
G 12, G 24 X 12, X 24	EN 175 301-803 B 2-pin IP 65 (IEC 60529)		
G 12 DIN, G 24 DIN X 12 DIN, X 24 DIN	EN 175 301-803 A 3-pin IP 65 (IEC 60529)		
DT 12, DT 24	DEUTSCH (DT 04-2P) 2-pin IP 67		
S 12, S 24	Bayonet PA 6, Schlemmer 3-pin IP 67		
AMP 12, AMP 24	AMP Junior Power Timer 2-pin IP 65		

4 Dimensions

All dimensions in mm, subject to change.

4.1 Single valve for pipe connection

PDM

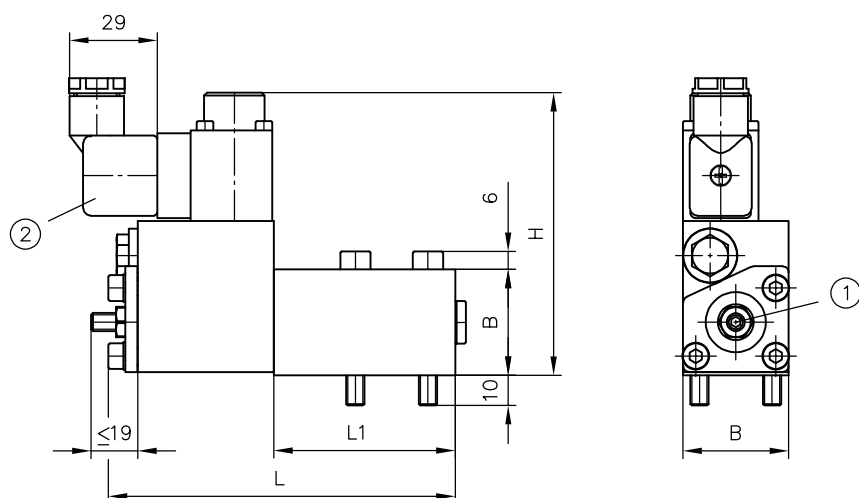


- 1 Set screw for adjusting the minimum pressure
- 2 Line connector of proportional actuator see Chapter 4.3, "Solenoid version"

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

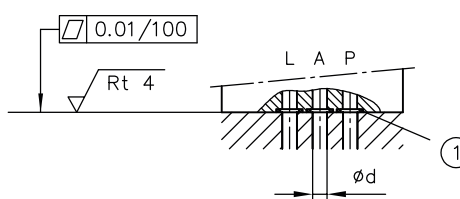
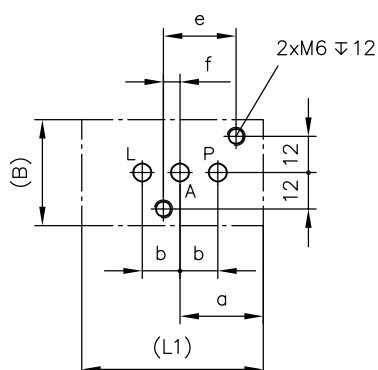
4.2 Single valve for manifold mounting

PDMP



- 1 Set screw for adjusting the minimum pressure
- 2 Line connector of proportional actuator see Chapter 4.3, "Solenoid version"

Hole pattern of the base plate

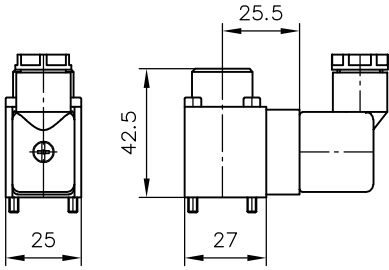


- 1 O-ring NBR 90 Sh

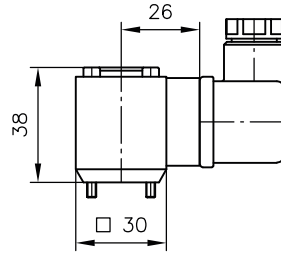
Type	B	L	L1	H	a	b	e	f	$\varnothing d$	O-ring NBR 90 Sh
PDMP 11	35	114.7	60	93.5	27.5	12.5	24	5.5	6	7.65x1.78
PDMP 22	40	121.2	66.5	96	32	14	26	6	8	9.25x1.78

4.3 Solenoid version

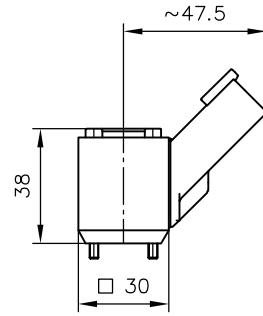
X., G..



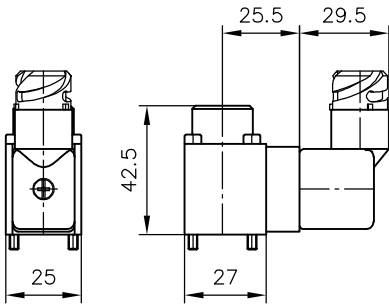
X..DIN, G..DIN



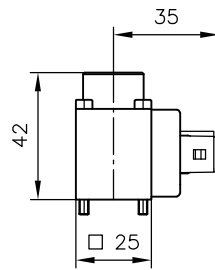
DT..



S..



AMP..



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.

5.3 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. Parts may burst or fly off, and uncontrolled leakage of hydraulic fluid.

- 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

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).

6 Other information

6.1 Functional description

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

- Proportional actuator
- Main stage

① Proportional actuator

1.1 Pressure reducing valve type AM according to [D 7458](#) (pilot stage): reduces the pilot pressure at P to a constant, low level (outlet a).

1.2 Proportional pressure reducing valve type PM according to [D 7625](#) (with solenoid for pressure setting): reduces the pilot pressure in proportion to the electric 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):
 $\text{pilot pressure } b \times \text{piston area } 2.3 = \text{outlet pressure } A \times \text{piston area } 2.1$

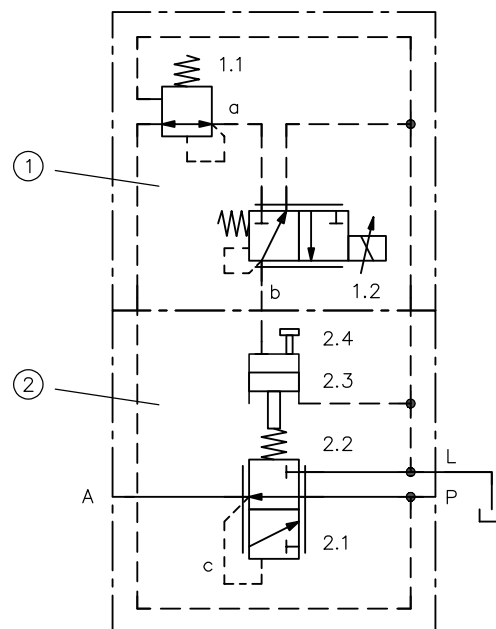
The proportional pressure reducing valve **1.2** and the size of the main stage determine the proportionally adjustable outlet pressure range at A. The minimum value is 5 bar. A set screw **2.4** with a lock nut can be used to limit this minimum pressure to higher values, which the pressure must then never drop below (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 valve will act as a pressure-limiting valve. The valve spool **2.1** opens connection A - L. Port P is locked.

Control

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.



- 1 Proportional actuator
- 2 Main stage

6.2 Accessories, spare and individual parts

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

Line connectors and cylinder screws of the proportional actuator

Version	Order coding	Part number
Line connector (black)	MSD 6-209	6236 5004-00
Line connector (black) for DIN solenoid	MSD 3-309	6217 0002-00
Cylinder screw (tightening torque: 8 Nm)	CYLINDER SCREW ISO 4762-M5.00x55.00-12.9	6005 0480-00

Sealing of the proportional actuator

Version	Part number
O-RING 12.42x1.78 NBR 90 SH	6096 9196-00
DS 7485 800 SEAL KIT NBR	6801 2062-00
DS 7485 800 SEAL KIT PYD	6801 2063-00
DS 7485 800 SEAL KIT AT	6801 2064-00

References

Additional versions

- Proportional pressure-limiting valve type PDV and PDM: D 7486
- Proportional pressure-reducing valve type PM and PMZ: D 7625
- 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
- Pressure reducing valve type ADC, ADM, ADME, AM: D 7458

