Load-holding valve type OSCA-D

Product documentation

Screw-in valve and single connection blocks

Pressure setting $p_{s\ max}$:	500 bar
Load pressure $p_{1\ max}$:	420 bar
Flow rate Q_{max}:	40 l/min

D 7920 D
11-2023 -1.2 en

HAWE HYDRAULIK

Printing date / document generated on: 2024-01-30

Table of Contents

1 Overview for load-holding valve type OSCA-D

Load-holding valves are a type of pressure valve. They prevent loads on cylinders or motors dropping in an uncontrolled manner. For this purpose they are pre-loaded with a pressure setting that is higher than the largest possible load. A hydraulic piston controls the opening of the valve to achieve the required lowering velocity.

The type OSCA-D load-holding valve is especially suitable for applications that are either particularly susceptible to vibration or that work with very high load pressures.

The valve is designed as a screw-in valve and is easy to install and remove. Choose from a range of connection blocks. Matching tools for producing your own blocks are available.

Load-holding valve type OSCA-D

Features and advantages

- Pressure settings up to 500 bar with 4-fold structural safety
- High stability to resist vibration
- Zero leakage holding in the working area
- Pressure adjustment is simple
- Zinc-nickel corrosion protection as standard

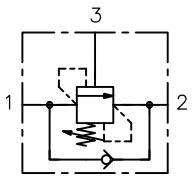
Intended applications:

- Cranes and lifting equipment
- Construction machines
- Municipal trucks

2 Available versions

2.1 Screw-in valve

Circuit symbol



1 Consumer port
2 Directional valve/pump port
3 Pilot pressure port

Ordering example

OSCA-D 2	0	020	A	4	D	-400	V

2.1.7 "Adjustability"
Pressure setting (bar)
2.1.6 "Pressure setting range"
2.1.5 "Pilot ratio"
2.1.4 "Flow rate"
2.1.3 "Bore hole"
2.1.2 "Connecting thread"
2.1.1 "Basic type and size"

2.1.1 Basic type and size

Type	Flow rate Q_{max} (lpm)	Load pressure $p_{1\ max}$ (bar)	Pressure setting $p_{S\ max}$ (bar)
OSCA-D 2	40	420	500

2.1.2 Connecting thread

Coding	Connecting thread
0	Spring cavity connected with port 2, no relief to atmosphere

2.1.3 Bore hole

Coding	Description
020	Metric M20x1

Dimension drawing for bore hole see Chapter 4, "Dimensions".

2.1.4 Flow rate

Coding	Flow rate Q_{max} (lpm)
A	40
B	28
C	24
D	16
E	8

Nominal flow rate see Chapter 3.4, "Characteristic lines"

INFORMATION
The indicated flow rates are designed for optimum operation with control spool valves type PSL as per D 7700-2.

2.1.5 Pilot ratio

Coding	Geometric pilot ratio
4	1:4,5
8	1:8

2.1.6 Pressure setting range

Coding	Pilot ratio	Pressure setting range p (bar)	Reference value for adjustment (bar/rev)
	Coding		
D	4	150 - 500	60
	8	150 - 500	83

NOTICE
The pressure setting should be at least 20% higher than the maximum load pressure.
Increase pressure clockwise.

WARNING
Overloading components due to incorrect pressure settings.
Risk of serious injury or death.
- Pay attention to the maximum operating pressure of the pump and the valves.
- Always monitor the pressure gauge when setting and changing the pressure.

2.1.7 Adjustability

Coding	Description
V	Fixed, tool adjustable
VA	Fixed, tool adjustable, with adjustment protection cap

2.1.8 Seal

Coding	Description
Without coding	Standard, NBR
	Other seal variants available on request

2.2 Connection block

Ordering example

2 GS-11	-5					
2 P-16	-5	-6	-250			
2 GS-22	-5	-8	-400	/-6	-9	-300

2.2.5 "Shock valve pressure setting"

2.2.4 "Outflow orifice D2"

2.2.3 "Inflow orifice D1"

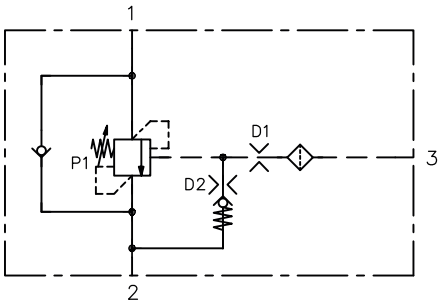
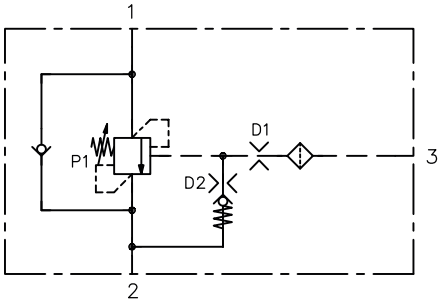
2.2.5 "Shock valve pressure setting"

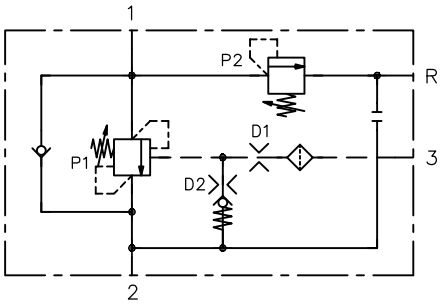
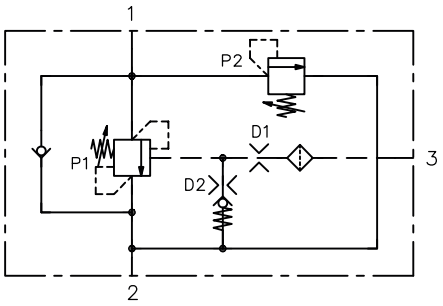
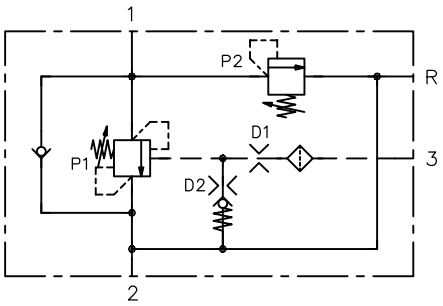
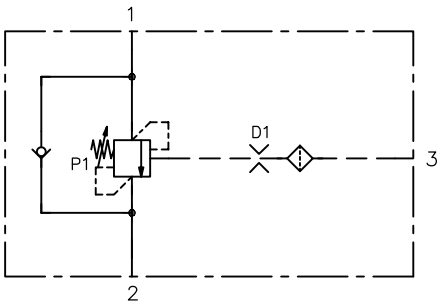
2.2.4 "Outflow orifice D2"

2.2.3 "Inflow orifice D1"

2.2.1 "Single connection block"

2.2.1 Single connection block

Coding	Screw-in valve pressure setting $p_{S\ max}$ (bar)	Shock valve	Ports (ISO 228-1)	Circuit symbol
Manifold mounting				
2 P-11	420	without	▪ 1 = ∅10 ▪ 2 = G 3/8 ▪ 3 = G 1/4	
2 PS-11	500	without	▪ 1 = ∅10 ▪ 2 = G 3/8 ▪ 3 = G 1/4	

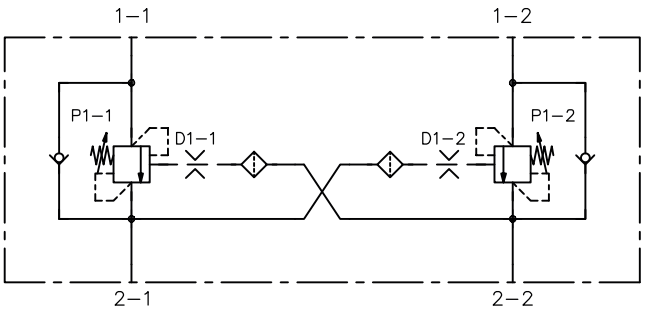
Coding	Screw-in valve pressure setting $p_{S\ max}$ (bar)	Shock valve	Ports (ISO 228-1)	Circuit symbol
2 PS-15	500	with	▪ 1 = ∅10 ▪ 2 = G 3/8 ▪ 3 = G 1/4 ▪ R = G 3/8	
2 P-16	420	with	▪ 1 = ∅10 ▪ 2 = G 3/8 ▪ 3 = G 1/4	
2 PS-16	500	with	▪ 1 = ∅10 ▪ 2 = G 3/8 ▪ 3 = G 1/4 ▪ R = G 3/8	
Pipe connection				
2 GS-11	500	without	▪ 1 = G 3/8 ▪ 2 = G 3/8 ▪ 3 = G 1/4	

NOTICE
Screw-in valve schematic for illustration purposes only. Precise specifications see Chapter 2.1, "Screw-in valve".

2.2.2 Dual connection block

Coding	Screw-in valve pressure setting $p_{S\ max}$ (bar)	Shock valve	Ports (ISO 228-1)
Pipe connection			
2 GS-21 **2 GS-22**	500	Without	▪ 1-1 = G 3/8 ▪ 1-2 = G 3/8 ▪ 2-1 = G 3/8 ▪ 2-2 = G 3/8

Circuit symbol



NOTICE
Screw-in valve schematic for illustration purposes only. Precise specifications see Chapter 2.1, "Screw-in valve".

2.2.3 Inflow orifice D1

Coding	Orifice D1 ∅ (mm)
5 (standard)	0,5
6	0,6
7	0,7

2.2.4 Outflow orifice D2

Coding	Orifice D2 ∅ (mm)	Actual pilot ratio with D1 = ∅ 0.5 mm for geometric control ratio:	
		1:4,5	1:8
0 (standard)	0 (undrilled)	equivalent to geometric pilot ratio	
4	0,4	1:3,2	1:5,7
5	0,5	1:2,3	1:4
6	0,6	1:1,5	1:2,6

Coding	Orifice D2 ∅ (mm)	Actual pilot ratio with D1 = ∅ 0.6 mm for geometric control ratio:	
		1:4,5	1:8
0 (standard)	0 (undrilled)	equivalent to geometric pilot ratio	
4	0,4	1:3,8	1:6,7
5	0,5	1:3	1:5,4
6	0,6	1:2,3	1:4

Coding	Orifice D2 ∅ (mm)	Actual pilot ratio with D1 = ∅ 0.7 mm for geometric control ratio:	
		1:4,5	1:8
0 (standard)	0 (undrilled)	equivalent to geometric pilot ratio	
4	0,4	1:4,1	1:7,2
5	0,5	1:3,6	1:6,4
6	0,6	1:2,9	1:5,2

NOTICE
Increasing orifice diameter increases hydraulic power loss in control line.

2.2.5 Shock valve pressure setting

Coding	for connection block Coding	Description	Adjustment range p (bar)	Reference value for adjustment (bar/rev)
-...	2 P-16	Pressure-limiting valve/shock valve	150 - 420	79

NOTICE
Turn clockwise to increase pressure.

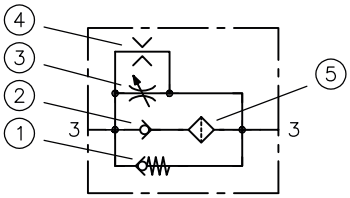
WARNING
Overloading components due to incorrect pressure settings.
Risk of serious injury or death.

- Pay attention to the maximum operating pressure of the pump and the valves.
- Always monitor the pressure gauge when setting and changing the pressure.

2.3 Damping element

Modular damping element for installation on a load-holding valve block. Mounted using a banjo bolt in control oil pressure port (for G 1/4).

Circuit symbol



1 Pre-load valve
2 Check valve
3 Thread type throttle
4 Parallel-circuit throttle orifice (integrated in threaded cartridge-type throttle)
5 Filter

NOTICE
Thread type throttle supplied as standard with minimal throttle effect (screwed out to at max. travel stop), see Chapter 6.2, "Damping element settings".
Before assembling damping, remove filter screw from port 3 in connection block.

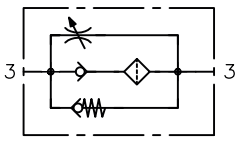
Ordering example

DEL	- 0

2.3.2 "Throttle orifice D3"

2.3.1 "Basic type"

2.3.1 Basic type

Type	Description	Port (ISO 228-1)	Simplified circuit symbol
DEL	Damping element	▪ 3 = G 1/4	

2.3.2 Throttle orifice D3

Coding	Orifice D3 ∅ (mm)
0 (standard)	0 (undrilled)
3	0,3
4	0,4

NOTICE
Throttle orifices with ∅ larger than 0.4 mm provide no damping effect.

3 Parameters

3.1 General data

Designation	Load-holding valve type OSCA-D
Design	▪ Load-holding valve: Cone-seated valve ▪ Bypass check valve: Ball seated valve
Model	Screw-in valve, with/without connection block
Material	▪ Screw-in valve: steel, ZnNi coated ▪ Connection blocks: steel, ZnNi coated ▪ Damping element: Steel; electro-galvanised
Attachment	see Chapter 4, "Dimensions"
Tightening torque	see Chapter 4, "Dimensions"
Installation position	any
Ports/connections	▪ Port 1: Consumer ▪ Port 2: Directional valve/pump ▪ Port 3: Pilot pressure
Flow direction	▪ Working direction (load-holding function): 1 → 2 ▪ Free flow: 2 → 1
Pilot ratio	see Chapter 2.1.5, "Pilot ratio"
Hydraulic fluid	Hydraulic fluid, according to DIN 51 524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 4 - 800 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.
Cleanliness level	**ISO 4406** 21/18/15...19/17/13
Temperatures	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.

3.2 Weight

Screw-in valve	**Type**			
	OSCA-D 20	= 0.2 kg		
Single connection block (without screw-in valve)	**Coding**		**Coding**	
	2 P-11	= 1.09 kg	2 P-16	= 1.22 kg
	2 PS-11	= 1.0 kg	2 PS-16	= 1.25 kg
	2 PS-15	= 1.25 kg	2 GS-11	= 0.73 kg
Dual connection block (without screw-in valve)	**Coding**			
	2 GS-21	= 1.38 kg		
	2 GS-22	= 3.05 kg		
Damping	**Type**			
	DEL	= 0.32 kg		

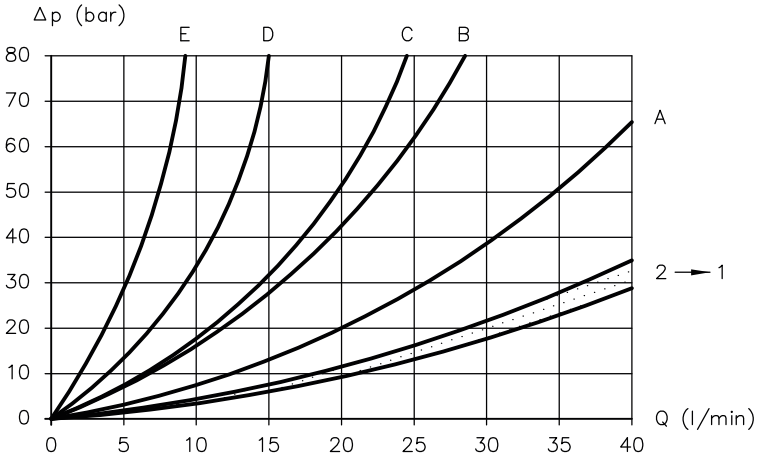
3.3 Pressure and volumetric flow

Pressure setting	$p_{S\ max}$ = 500 bar
Pressure setting range	see Chapter 2.1.6, "Pressure setting range"
Flow rate	Maximum flow rates see Chapter 2.1.4, "Flow rate"

3.4 Characteristic lines

Δp-Q characteristic lines

Viscosity of the hydraulic fluid approx. 40 mm²/s



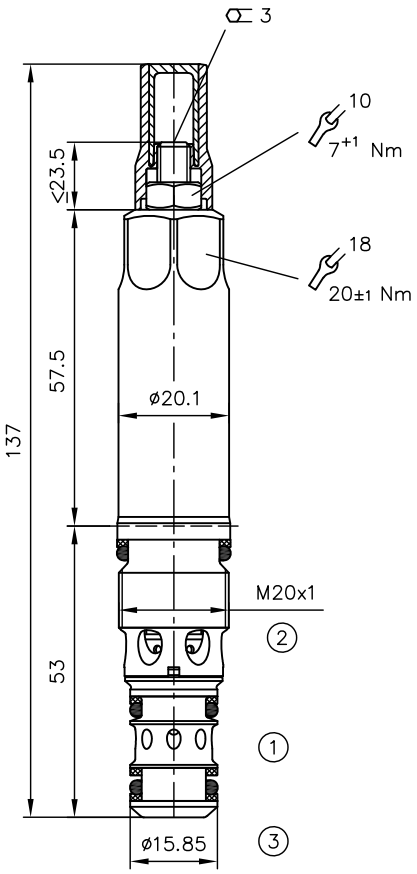
Q flow rate (l/min); Δp flow resistance (bar)

4 Dimensions

All dimensions in mm, subject to change.

4.1 Screw-in valve

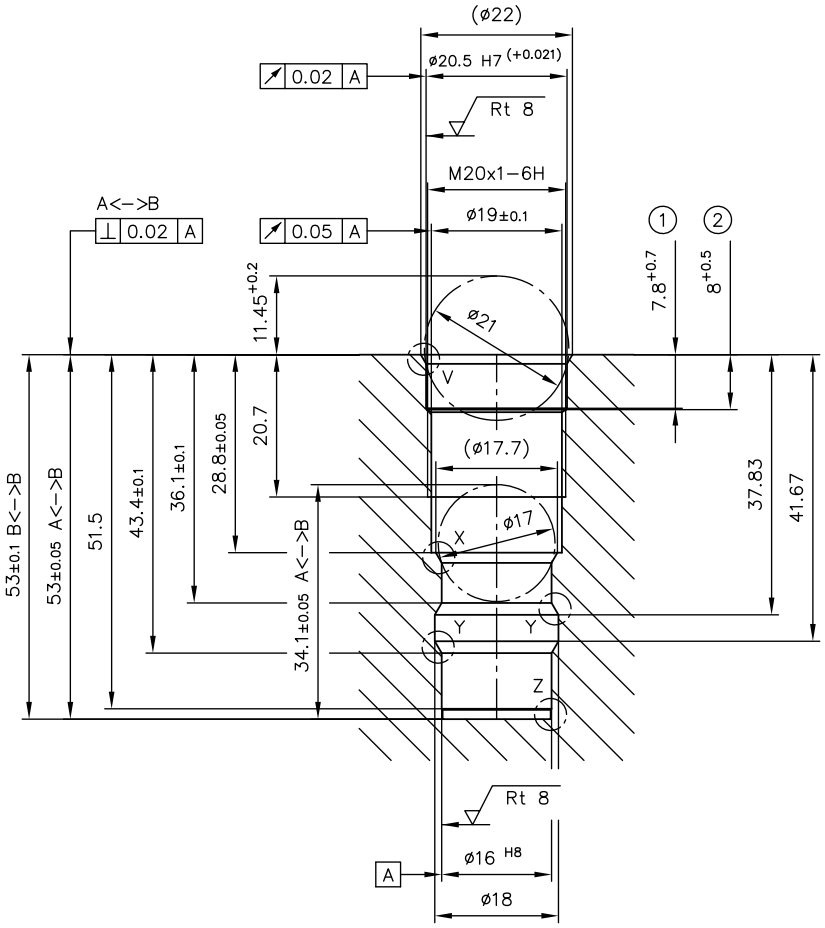
OSCA-D 20 020

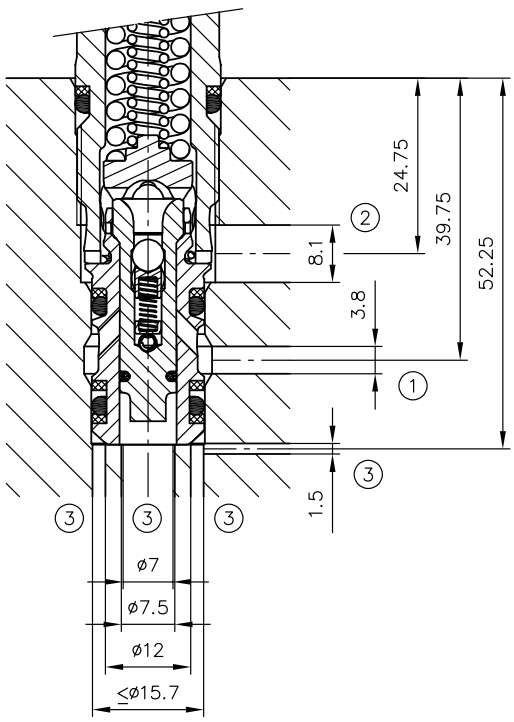


1 Consumer port
2 Directional valve/pump port
3 Pilot pressure port

Mounting hole

020 (M20x1)

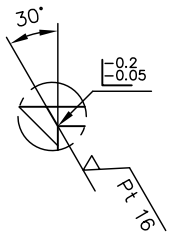




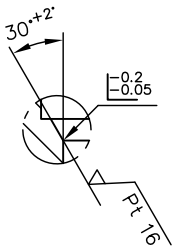
1 Reaming depth
2 Pre-drilled depth

1 Consumer port
2 Directional valve port
3 Pilot pressure port

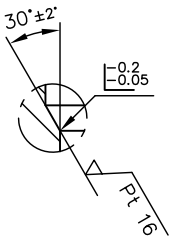
View V



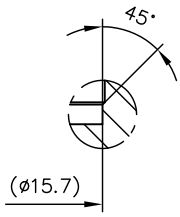
View X



View Y



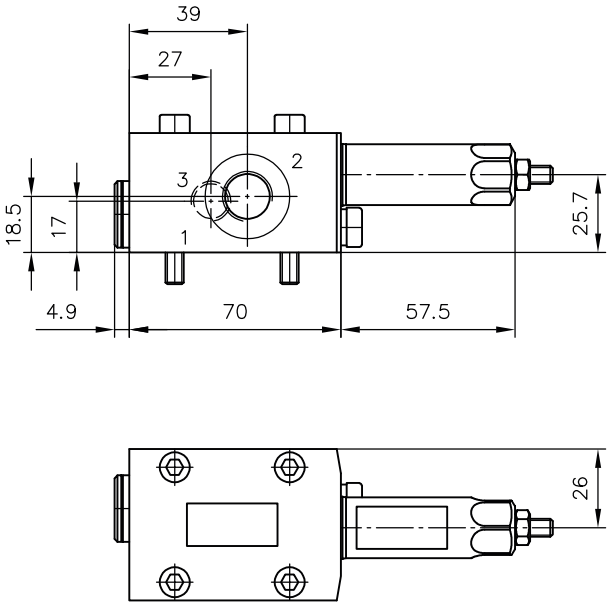
View Z



4.2 Single connection block

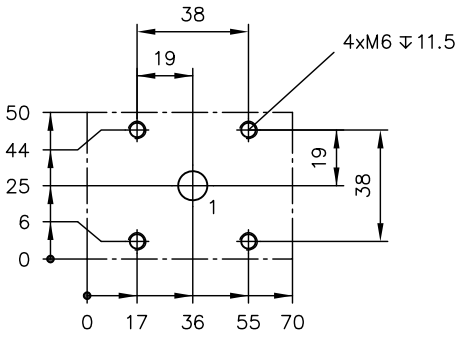
Manifold mounting without shock valve

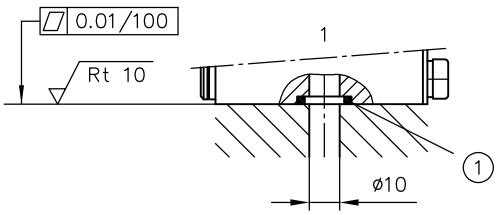
2 P-11



	Ports (ISO 228-1)
2	G 3/8
3	G 1/4

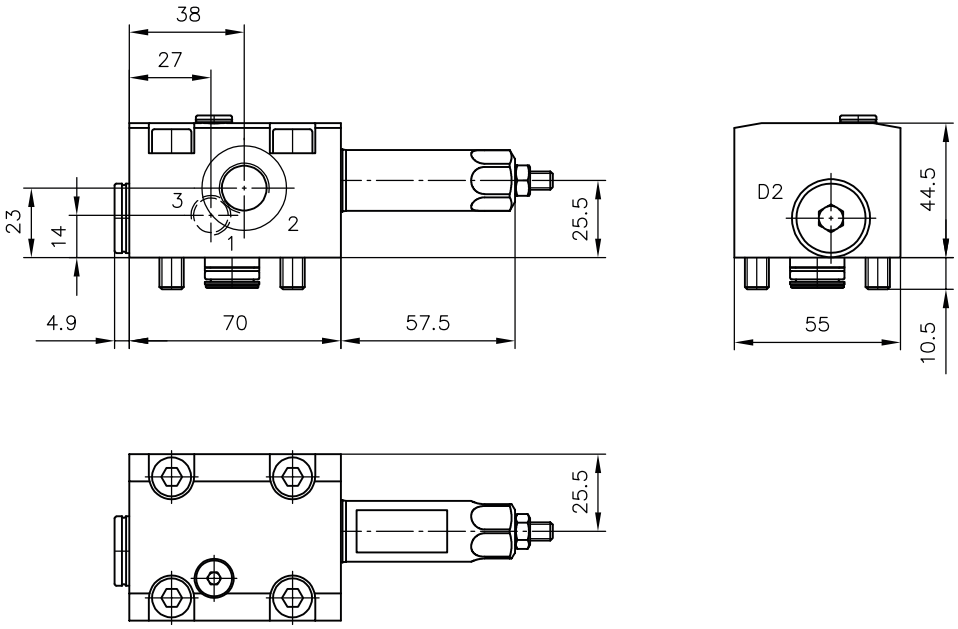
Hole pattern of the base plate





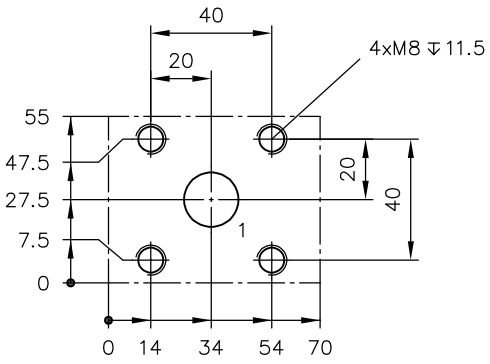
1 O-ring 12.37x2.62 NBR 90 Sh

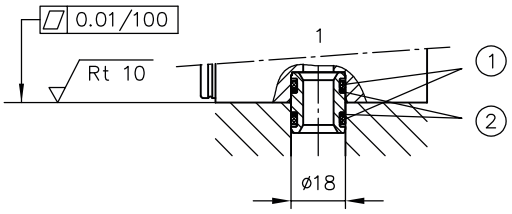
2 PS-11



	Ports (ISO 228-1)
2	G 3/8
3	G 1/4

Hole pattern of the base plate

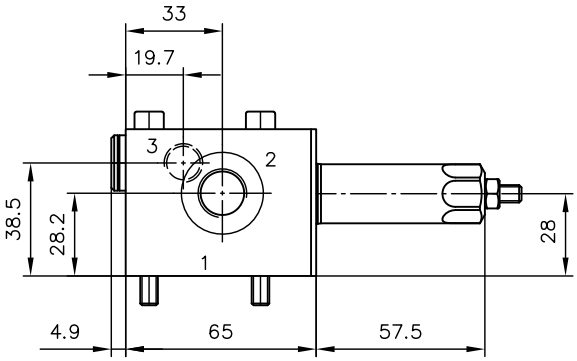


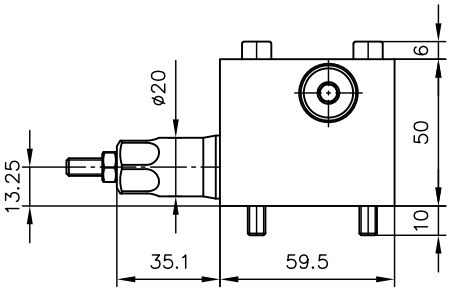


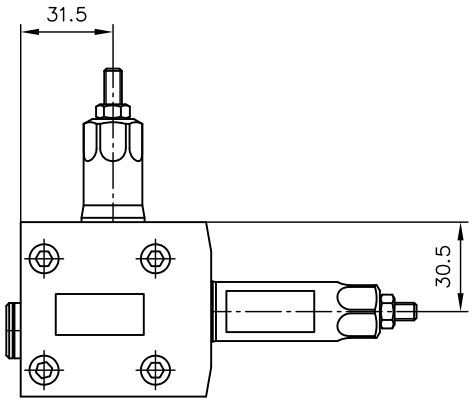
1 O-ring 13.94x2.62 NBR 70 Sh
2 Supporting ring

Manifold mounting with shock valve

2 P-16

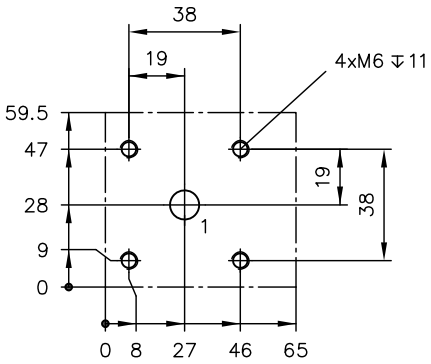


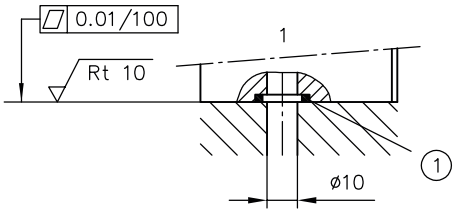




	Ports (ISO 228-1)
2	G 3/8
3	G 1/4

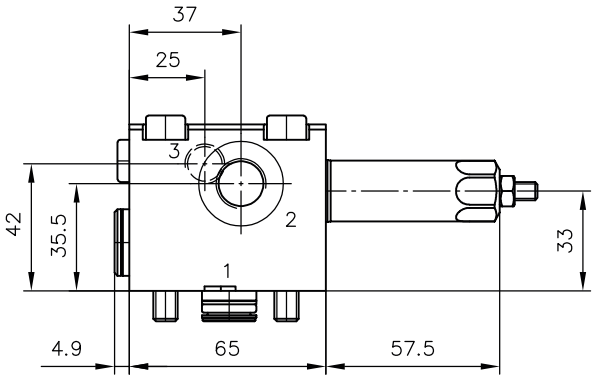
Hole pattern of the base plate

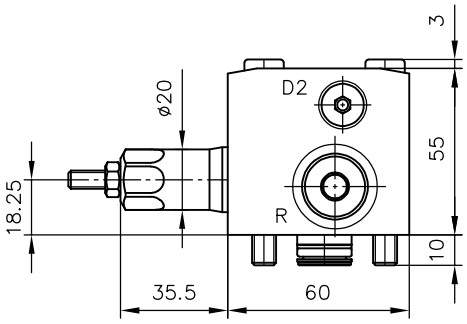


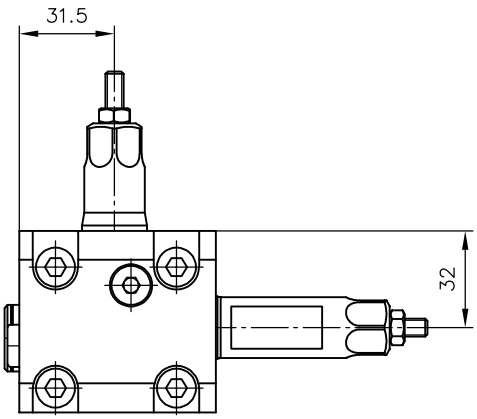


1 O-ring 12.37x2.62 NBR 90 Sh

2 PS-15
2 PS-16

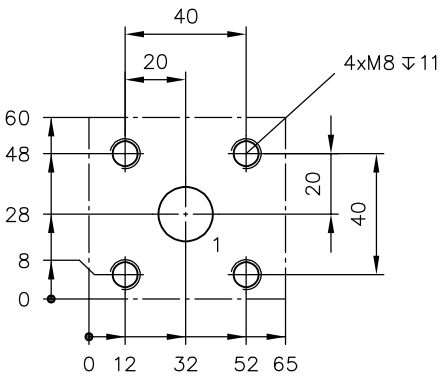


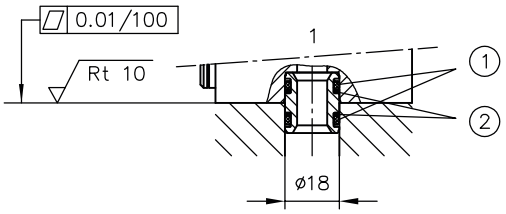




	Ports (ISO 228-1)
2	G 3/8
3	G 1/4
R	G 3/8

Hole pattern of the base plate

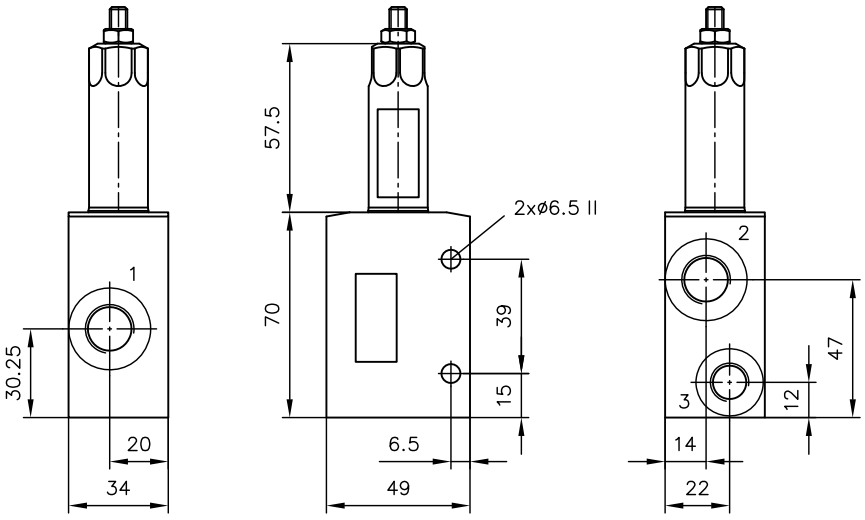




1 O-ring 13.94x2.62 NBR 70 Sh
2 Supporting ring

Pipe installation without shock valve

2 GS-11

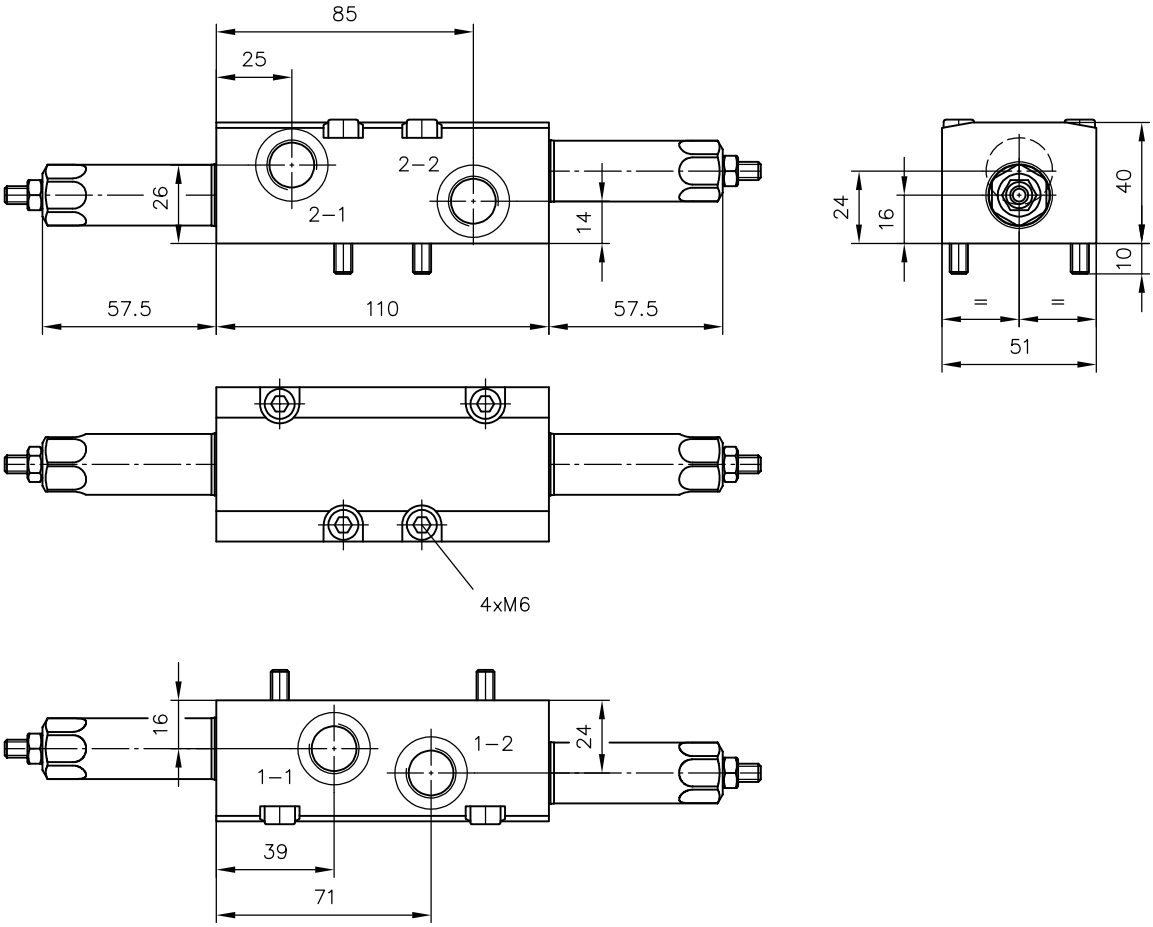


	Ports (ISO 228-1)
1, 2	G 3/8
3	G 1/4

4.3 Dual connection block

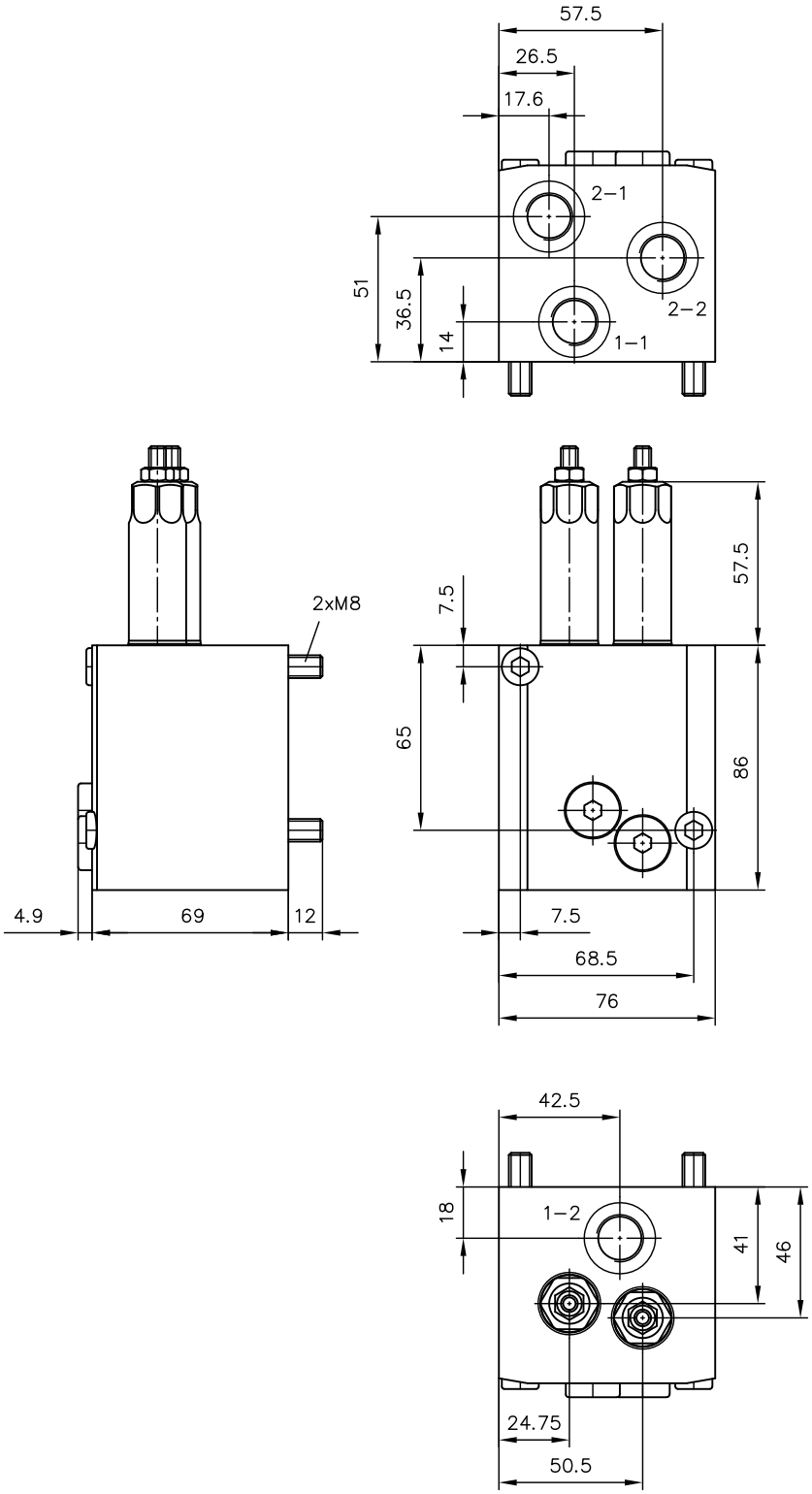
Pipe installation without shock valve

2 GS-21



	Ports (ISO 228-1)
1-1, 1-2, 2-1, 2-2	G 3/8

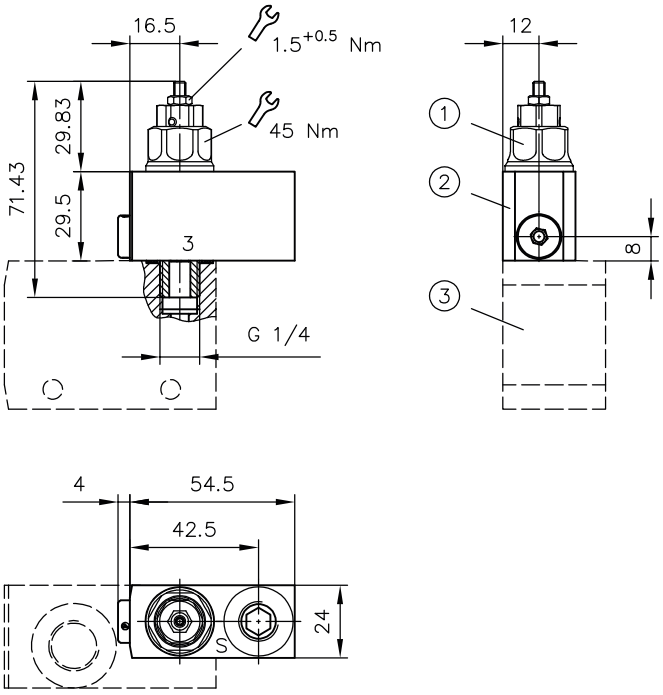
2 GS-22



	Ports (ISO 228-1)
1-1, 1-2, 2-1, 2-2	G 3/8

4.4 Damping element

DEL



1 Thread type throttle
2 Damping unit
3 Block load-holding valve

	Port (ISO 228-1)
S	G 1/4

NOTICE
When using the damping with external piping that is separate from the valve block, the damping effect is amplified by the oil volume in the added line length.

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.

All installation, set-up, maintenance and repairs must be performed by authorised, qualified and trained staff.

The use of this product beyond the specified performance limits, operation with non-specified fluids and/or use of non-genuine spare parts will invalidate the warranty.

NOTICE
When assembling and disassembling the valve, it must be ensured that no transverse forces occur.

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.

WARNING

Overloading components due to incorrect pressure settings.
Risk of serious injury or death.

- Pay attention to the maximum operating pressure of the pump and the valves.
- 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

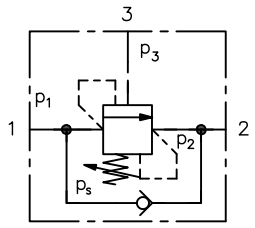
This product is largely maintenance-free.

6 Other information

6.1 Calculating pilot pressure

For type OSCA-D, pilot pressure depends on load pressure. Type OSCA-I provides an alternative that is independent of load pressure (on request).

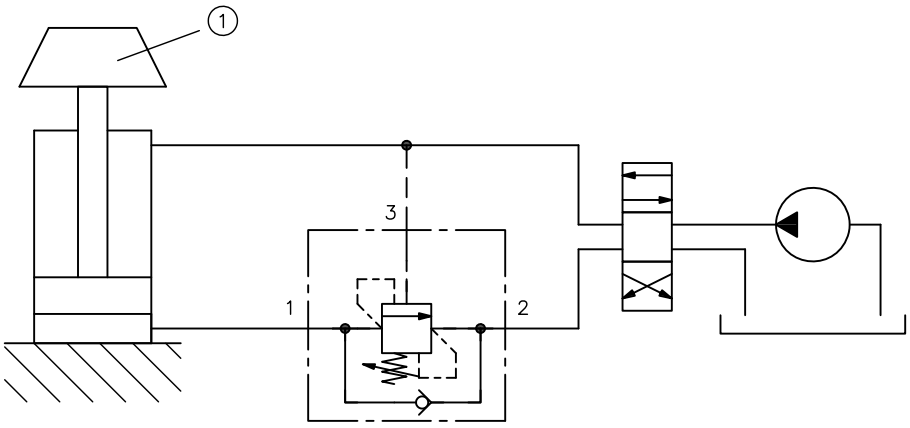
Equilibrium of forces on valve:



R - real pilot ratio
p_3 - pilot pressure
p_1 - load pressure
p_2 - return pressure
p_s - valve pressure setting (spring)
φ - cylinder area ratio

Pressing load

Calculating pilot pressure p_3:



1 Load

$$p_3 = \frac{p_s + p_2 \times (R+1) - p_1}{R + \frac{1}{\varphi}}$$

Where return pressure is low, its effect as well as the cylinder ratio can be ignored:

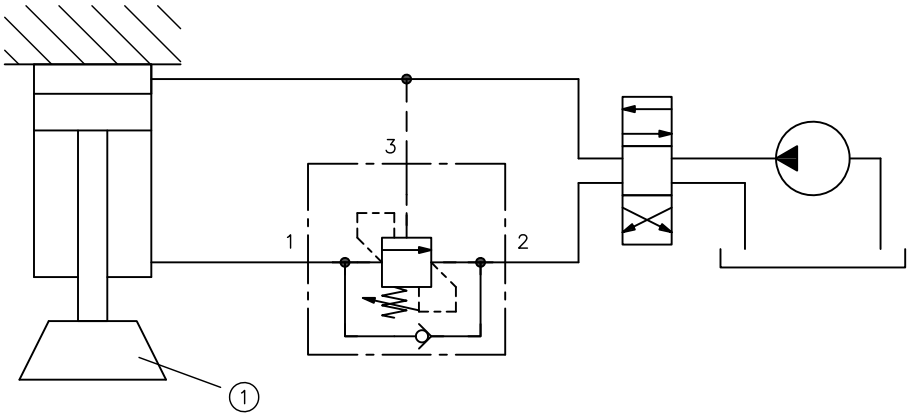
$$p_3 = \frac{p_s - p_1}{R}$$

Example: Load pressure = 100 bar, pilot ratio: 1 : 4.5; valve pressure setting: 210 bar

$$p_3 = \frac{210\,bar - 100\,bar}{4{,}5} = 24{,}4\,bar$$

Pulling load

Calculating pilot pressure p_3:



1 Load

$$p_3 = \frac{p_s + p_2 \times (R + 1) - p_1}{R + \varphi}$$

Where return pressure is low, its effect can be ignored:

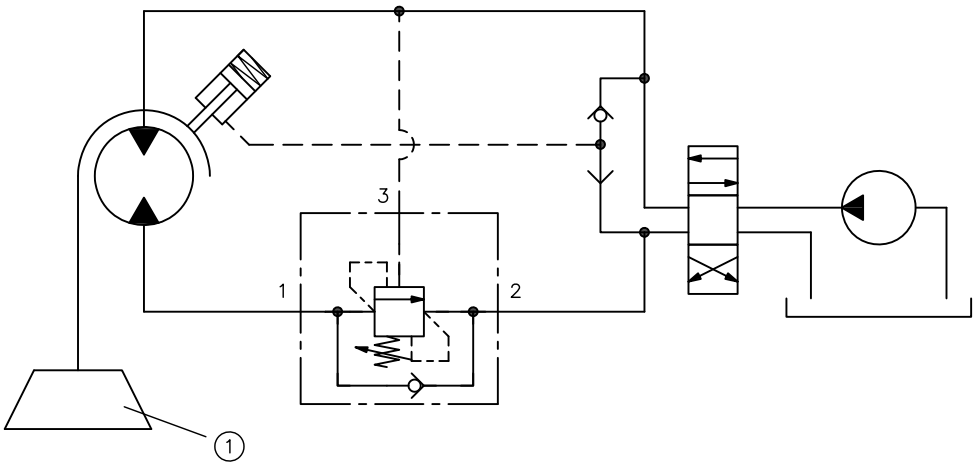
$$p_3 = \frac{p_s - p_1}{R + \varphi}$$

Example: Load pressure = 100 bar, pilot ratio: 1 : 4.5; valve pressure setting: 210 bar, cylinder area ratio = 1 : 1.6

$$p_3 = \frac{210\,bar - 100\,bar}{4{,}5 + 1{,}6} = 18\,bar$$

Motor or synchronizing cylinder (φ1) with pulling load

Calculating pilot pressure p_3:



1 Load

$$p_3 = \frac{p_s + p_2 \times (R + 1) - p_1}{R + 1}$$

Where return pressure is low, its effect can be ignored:

$$p_3 = \frac{p_s - p_1}{R + 1}$$

Example: Load pressure = 100 bar, pilot ratio: 1 : 4.5; valve pressure setting: 210 bar, cylinder area ratio = 1 : 1

$$p_3 = \frac{210\,bar - 100\,bar}{4{,}5 + 1} = 20\,bar$$

6.2 Damping element settings

Type OSCA valves offer several options for damping. These can be individually adjusted to match the respective application (even retroactively).

If vibrations occur, proceed as follows:

1. Change the orifice(s) in the block, if there are any.

> **NOTICE**
> Chaining orifices also changes the pilot ratio.

2. Install a cartridge with a different taper:
   - Tapers for low flow rates are less susceptible to vibration.
   - Tapers for greater flow rates supply greater efficiency.
3. Use an additional DEL damping element:
   - Adjust via thread type throttle first. Screw throttle screw in to increase damping effect.

> **NOTICE**
> Stronger damping will cause the valve to close more slowly. Test in application to prevent insufficient response times.

   - If the damping effect is too strong, you can replace the standard orifice D3 (closed) with a smaller orifice ∅ 0.3 or ∅ 0.4 mm (see Chapter 2.3.2, "Throttle orifice D3").

References

Additional versions

- Proportional directional spool valve, type PSL and PSV size 2: D 7700-2
- Proportional directional spool valves types PSL/PSV/PSM, size 3: D 7700-3
- Proportional directional spool valve, type PSL, PSM and PSV size 5: D 7700-5
- Proportional directional spool valve type PSLF, PSVF and SLF: D 7700-F
- Proportional directional spool valve banks type PSLF and PSVF size 7: D 7700-7F
- Load-holding valve type LHT: D 7918
- Load-holding valve type LHDV: D 7770
- Load-holding valve type CLHV: D 7918-VI-PIB
- Load-holding valve type CLHV: D 7918-VI-C

D 7920 D 11-2023-1.2

HAWE Hydraulik SE
Einsteinring 17 | 85609 Aschheim/Munich | P.O. Box 11 55 | 85605 Aschheim | Germany
Phone +49 89 379100-1000 | info@hawe.de | www.hawe.com

hawe.com/contact