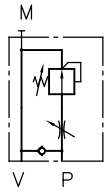
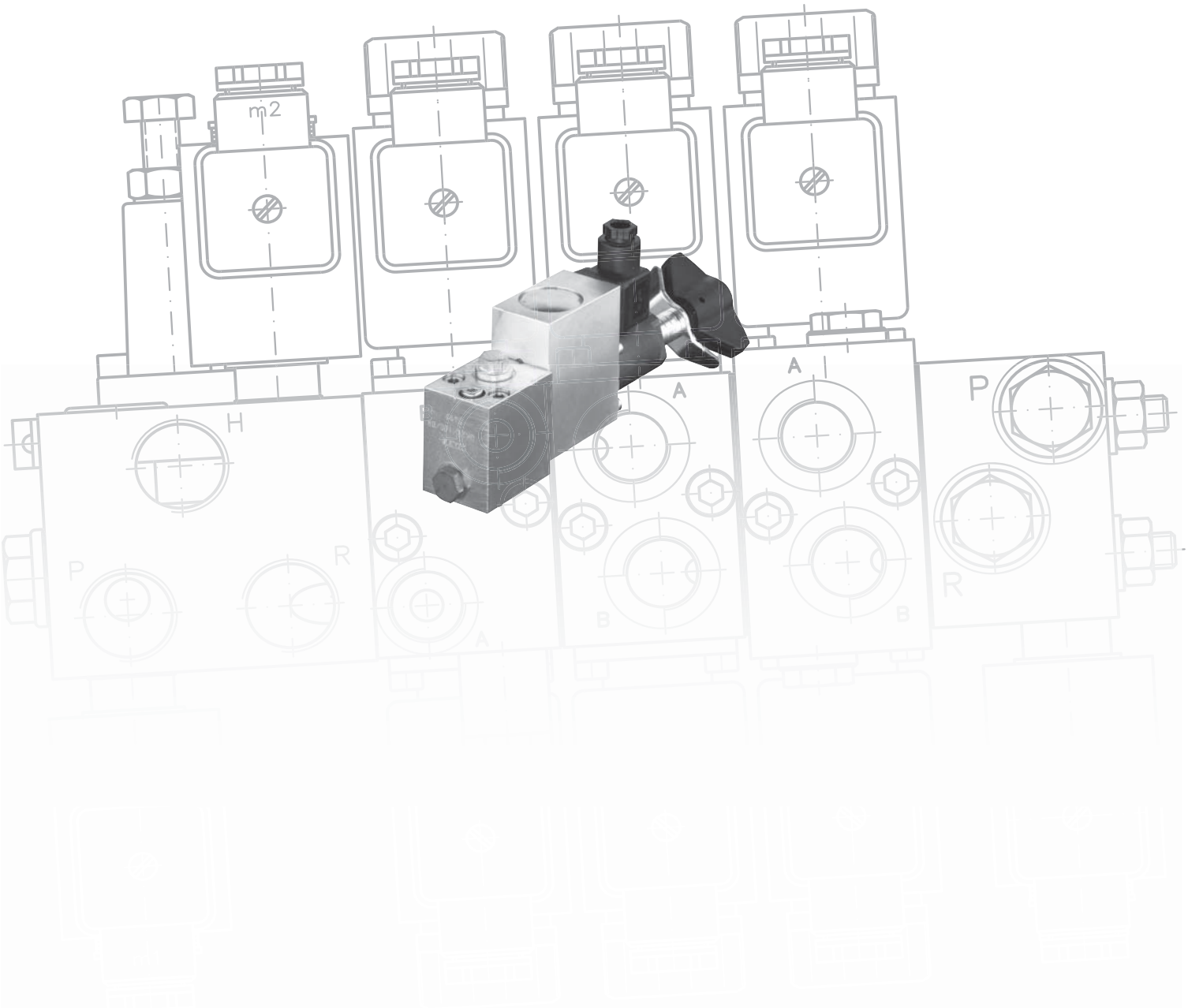
Pressure control valves type DK, DZ, DLZ and DE

No leakage, directly controlled

Operating pressure p_{max}:	500 bar
Flow Q_{max}:	22 lpm
Adjustability:	With tools Manually

Switching symbol:





Product documentation

D 7941

09-2013-1.0

HAWE Hydraulik SE - Streitfeldstr. 25 • 81673 München

Contents

1 Overview pressure control valves type DK, DZ, DLZ, DE

The task of pressure reducing valves is to maintain a largely constant outlet pressure despite a higher and changing inlet pressure. These valves are used when a secondary circuit has to be fed with a lower but constant pressure level by a main (primary) oil circuit with a higher and varying pressure level. The valve described here is directly controlled. Compared with conventional, piston-type pressure reducing valves suffering from leaking oil, where an additional drain port is required, this type is designed according to the two-way principle, i.e. it has zero leakage when in a closed state.
If the primary pressure level at P is below that of the secondary side at V, a reversal of the flow V→P is possible with little pressure loss via the bypass check valve.
The 2-way pressure-reducing valve is designed as an individual valve for manifold mounting. It is incorporated in one block together with a bypass check valve for reducing the flow resistance of V→P and optionally a throttle or orifice (retrofittable) if required.

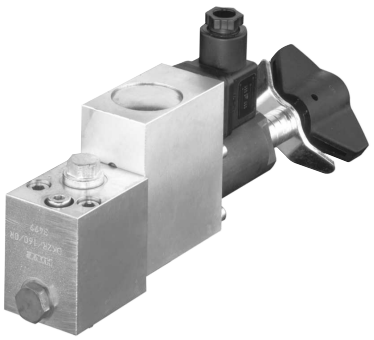


Figure 1: Pressure control valve type DK with tracked pressure switch

Figure 2: Pressure control valve type DZ

Features and benefits:
- Zero leakage in closed state
- Version with integrated overpressure function

Intended applications:
- General hydraulic systems
- Jigs
- Test benches

Design:
- Type DK - version with tracked pressure switch. The pressure switch monitors the closing movement of the pressure control valve on reaching the pressure value set on the consumer side. It can be connected as a normally closed or normally open contact to suit the application. The special feature is the common adjustment device for pressure control valve and pressure switch.
- Type DZ - on this type the pressure control valve type CDK in accordance D 7745 is used.
- Type DLZ - on this type the pressure control valve type CLK in accordance with D 7745 L is used. In contrast to type CDK, this type of valve features an overpressure function, intended to prevent creeping pressure increases or pressure peaks.
- Type DE - sealing plate. The sealing plate can be used instead of the types DK or DZ (same hole pattern). A pressure switch can also be fitted.

2 Versions available, main data

2.1 Pressure control valves type DK, DZ and DLZ

Switching symbol:

Order coding example:

DK 2 DZ 2	-08	R	/160 /450	/OR /4R	-P 1/4	-G

Device connector version Table 6 Device connector (only on type DK)

Connection block Table 5 Version

Additional elements Table 4 Additional element

Pressure setting Pressure setting within the various pressure ranges

Adjustment Table 2 Adjustment

Pressure ranges Table 3 Pressure ranges

Type Table 1 Type

Table 1 Type

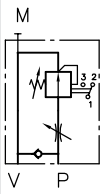
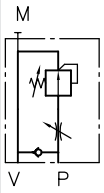
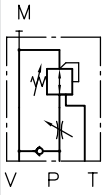
Coding	Description	Switching symbol
DK	2-way pressure control valve with tracked pressure switch	
DZ	2-way pressure control valve	
DLZ	Pressure control valve with overpressure function	

Table 2 Adjustment

Coding	Description	Switching symbol
No designation	Tool adjustable	
R	Manually adjustable, with lock nut	
H	Turn knob, lockable	

Table 3 Pressure ranges

Type	Flow Q_{max}(lpm)	Pressure range p_V from ... to (bar)								
		-08	-081	-1	-11	-2	-21	-5	-51	X
DK DZ DLZ	12	50 ... 450	50 ... 500	30 ... 300	30 ... 380	20 ... 200	20 ... 250	15 ... 130	15 ... 165	-
DK 2 DZ 2 DLZ 2	6	30 ... 450	30 ... 500	18 ... 300	18 ... 380	12 ... 200	12 ... 250	8 ... 130	8 ... 165	-
DK 5 DZ 5 DLZ 5	22	110 ... 450	110 ... 500	70 ... 300	70 ... 380	50 ... 200	50 ... 250	30 ... 130	30 ... 165	-

Coding **-08** and **-081**: not with type DLZ

Coding **X**: version with locking screw instead of type CDK or CLK, not with type DK

Table 4 Additional elements

Coding	Description	Switching symbol
0 R	Not included (throttle can be retrofitted)	
42 R **46 R**	Refined thread-type throttle For throttle characteristic see characteristics in Chapter 3, "Parameters"	

Table 5 Version

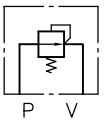
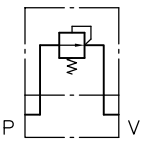
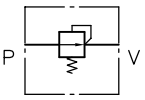
Coding	Port type	Switching symbols (examples)
No designation	For manifold mounting	
-P 1/4	For pipe connection (G 1/4)	
-1/4	For direct pipe connection (G 1/4) (only on type DK)	

Table 6 Plug (only at type DK)

Coding	Description	Version
G	With plug	Plug (DIN EN 175 301-803)
X	Wthout plug	
L	With plug with LED	
L5K **L10K**	With plug with LED and cable length 5 or 10 m	
M	Plug with LED with thread M12x1 (conf. DESINA)	

2.2 Sealing plates type DE

Order coding example:

DE	**0**	
DE	**2**	**/0**
DE	**4**	**/BE 1,0**

Orifices and throttles Table 9 Orifices and Table 9a Throttles

Pressure switch Table 8 Pressure switch

Sealing plate Table 7 Sealing plate

Table 7 Sealing plate

Type	Description
DE	Sealing plate with additional elements

Table 8 Pressure switch (type DG 3. in accordance with D 5440)

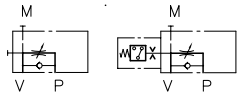
Coding	Description		Switching symbol
0	Version without ports; pure cover or bypass plate		
2	Prepared for pressure switch		DE 2/.. DE 3... 8/..
3	DG 33	(200 ... 450 bar)	
4	DG 34	(100 ... 400 bar)	
5	DG 35	(20 ... 250 bar)	
6	DG 36	(4 ... 12 bar)	
7	DG 364	(4 ... 50 bar)	
8	DG 365	(12 ... 170 bar)	

Table 9 Orifices

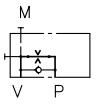
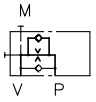
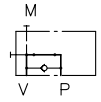
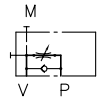
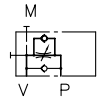
Coding	Description	Orifice diameter	Switching symbol
B 0,8 **B 1,0** **B 1,2** **B 1,4**	Orifice	∅0.8 ∅1.0 ∅1.2 ∅1.4	
BE 0,8 **BE 1,0**	Restrictor check valve (type BE 0 in acc. with D 7555 B)	∅0.8 ∅1.0	

Table 9a Throttles

Coding	Description	Switching symbol
No designation	Throttle not included (cannot be retrofitted), only on type DE 0	
0	Throttle not included (can be retrofitted)	
1	Throttle screw (Type Q 20 in acc. with D 7730)	
3	Throttle check valve (Type QV 20 in acc. with D 7730)	

3 Parameters

3.1 General

Description	Directly controlled pressure control valve
Design	Ball seated valve
Model	Valve for pipe connection, valve for manifold mounting
Material	Steel; nitrided valve housing, electrogalvanised sealing nuts and connection block, hardened and ground functional inner parts Balls made of rolling bearing steel
Installation position	As desired
Connections	■ P = inlet (pump or primary side) ■ V = consumer (secondary side) ■ M = pressure gauge connection ■ T = tank connection
Flow direction	P→V: Pressure reducing function V→P: Only possible if the pressure on the pump side is less than the consumer pressure.
Hydraulic fluid	Hydraulic oil conforming DIN 51 524 part 1 to 3; ISO VG 10 to 68 conforming DIN 51 519 Viscosity limits: min. approx. 4, max. approx. 1500 mm^2/s opt. operation approx. 10... 500 mm^2/s. Also suitable are biologically degradable pressure fluids types HEPG (Poly-alkylenglycol) and HEES (Synth. Ester) at service temperatures up to approx. +70°C.
Purity class	**ISO 4406** / **NAS 1638** / **SAE T 490** 21/18/15...19/17/13 / 12 ... 8 / ≥ 6
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

Operating pressure	■ $p_{P\ max}$ on the pump side = 500 bar ■ For $p_{V\ max}$ on the consumer side, see table for pressure range in Chapter 2, "Versions available, main data" ■ Return $p_T \leq 20$ bar
Static overload capacity	Approx. 2 x p_{max}

Pressure dependence

The pressure ratio as designed causes a slight change to the actual pressure p_A in conjunction with a variable pump pressure p_P.

Basic type	Pressure range				
	-08 **-081**	**-1** **-11**	**-2** **-21**	**-5** **-51**	$p_P \pm 10$ bar results in a pressure change for A of p_A
DK (DZ, DLZ)...	± 1.3 bar	± 0.9 bar	± 0.6 bar	± 0.4 bar	
DK (DZ, DLZ) 2	± 0.7 bar	± 0.45 bar	± 0.3 bar	± 0.23 bar	
DK (DZ, DLZ) 5	± 2.7 bar	± 1.7 bar	± 1.2 bar	± 0.8 bar	

Flow

$Q_{P \rightarrow A\ max}$	= 6 lpm	(DK 2, DZ 2, DLZ 2)
	= 12 lpm	(DK, DZ, DLZ)
	= 22 lpm	(DK 5, DZ 5, DLZ 5)

Note
Observe the Q_{max} of the valves in conjunction with valve banks type BVZP in accordance with D 7785 B!

Characteristics

Viscosity during measurements approx. 60 mm²/s
p_A - $Q_{P\rightarrow A}$ - characteristics

The setting applies if $Q_{P\rightarrow A} \rightarrow 0$ lpm. If Q > 0, i.e. the connected consumer is moving, the secondary pressure p_A drops slightly.
The pressure p_A is set according to the information in the order at $p_P \approx 1.1\ p_A$.

Caution
Risk of injury on overloading components due to incorrect pressure settings!
- Always monitor the pressure gauge when setting or changing the pressure.

Type DK,DZ

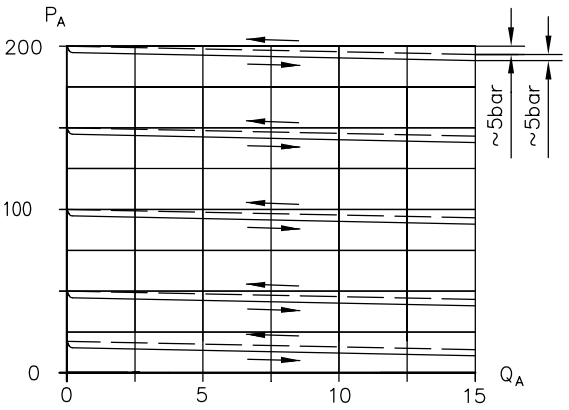


Figure 3: Q_A flow (lpm), p_A outlet pressure (bar)

Type DLZ

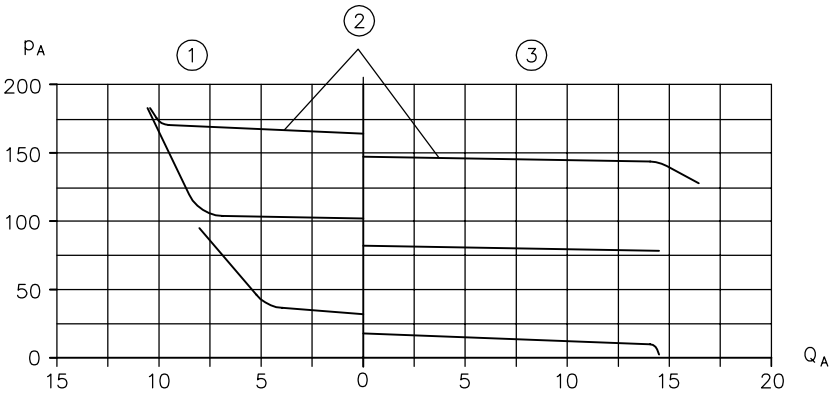


Figure 4: Q_A flow (lpm); p_A outlet pressure (bar)

1 Overpressure function
2 Same pressure setting
3 Pressure reducing function

Δp - Q characteristics P→A or A→P

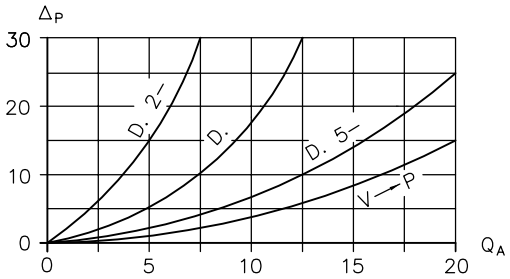


Figure 5: Q_A flow (lpm); Δp back pressure (bar)

Note

For this purpose, please also observe the additional information under the point "Flow direction".

Δp - Q characteristics, refined thread-type throttle, coded 42 R

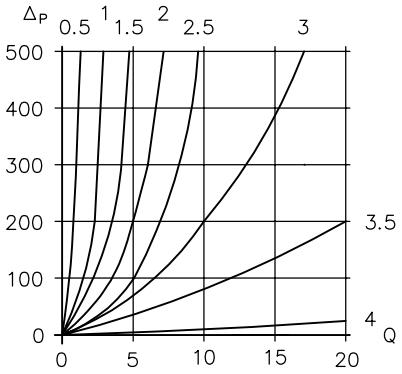


Figure 6: Q flow (lpm); $Δ_p$ throttle resistance (bar)

Mass

Basic version

Type DK	= 1.4 kg
Type DZ, DLZ	= 1.4 kg
Type DE 0	= 0.2 kg
Type DE ./..	= 0.7 kg

Pressure switch

Type DG 3..	= 0.3 kg

Version with single connection block

- P 1/4	+ 0.3 kg

Electrical data for contact switch

Electrical data for pressure switch

Type	XCG3 by SAIA-Burgess
Mechanical service life	10 x 10^6
Electrical service life (approx. switching actions)	12 V, 4 A = 0.35 x 10^6 (cos φ = 1)

Switching current

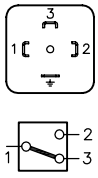
Nominal voltage U_N	Switching current (A)	IP protection class	Connection, device connector
12 V DC	5	65	DIN EN 175 301-803 A
24 V DC	5	65	DIN EN 175 301-803 A

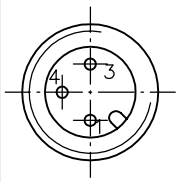
Note
Ensure the pipe screw connections are correctly fitted. In the event of strong vibrations, secure the accumulator to prevent it from coming loose.

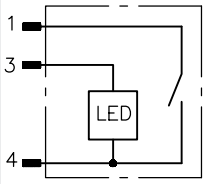
Note
To ensure a safe contact, the current must not fall below these minimum values;
I_{min} (12 V DC) = 10 mA, I_{min} (24 V DC) = 100 mA

Device connector, electrical connection, protection class

DIN EN 175 301-803	M12x1
IP 65 (in acc. with IEC 60529)	IP 67 (in acc. with IEC 60529)
Normal position 1-3 Switching position 1-2	(LED indicator reverse polarity protected) Switching position 1-4







4 Dimensions

All dimensions in mm, subject to change!

4.1 Dimensions type DK, DZ, DLZ

Type DK ../..

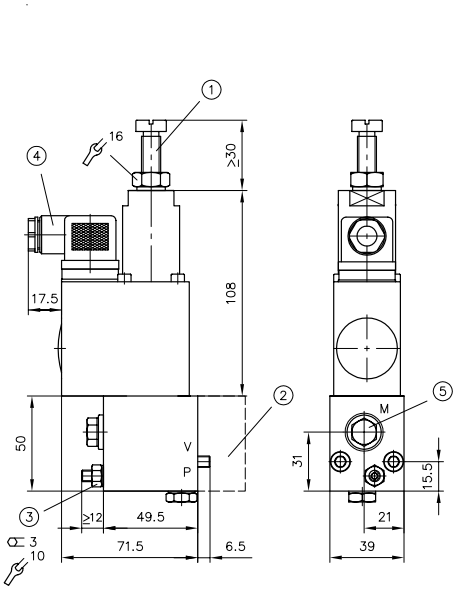


Figure 7: Coding not included, fixed setting

1 Screw with lock nut
2 Single connection block
3 Thread type throttle
4 Electrical connection (here: coding G to table 6)
5 Port for pressure gauge G 1/4 (BSPP)

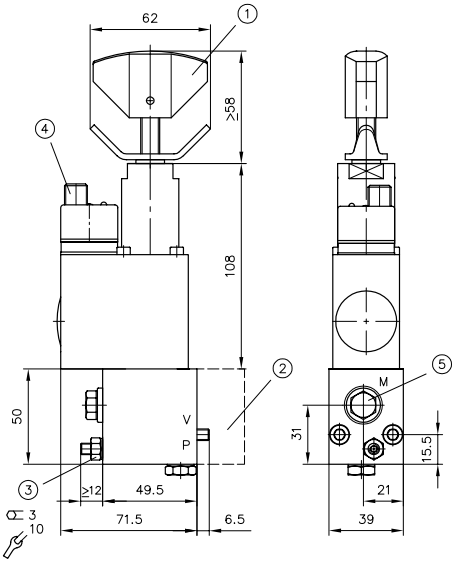


Figure 8: Coding R, adjustable

1 Turn knob
2 Single connection block
3 Thread type throttle
4 Electrical connection (here: coding M to table 6)
5 Port for pressure gauge G 1/4 (BSPP)

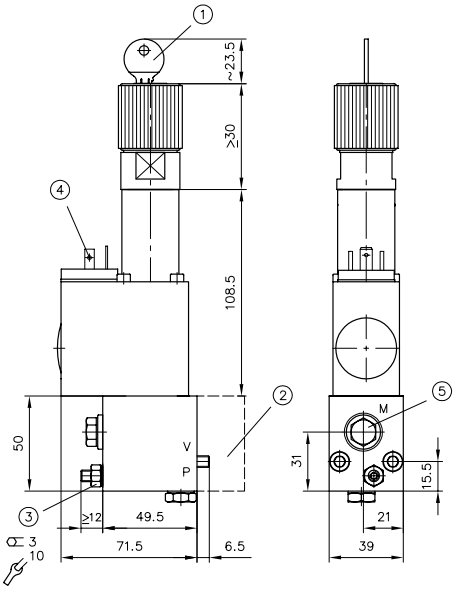


Figure 9: Coding H, lockable

1 Turn knob
2 Single connection block
3 Thread type throttle
4 Electrical connection (here: coding X to table 6)
5 Port for pressure gauge G 1/4 (BSPP)

Note
The throttle screw must not be screwed-out beyond the max. dimensions specified in the dimensional drawings. An internal mechanical stop can't be provided due to design reasons!

Type DK ../.. - 1/4

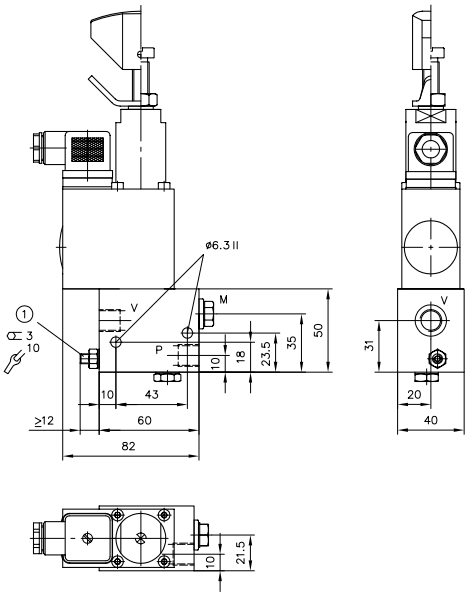


Figure 10: Pipe connection

1 Thread type throttle

Type DK ../.. P - 1/4

(Single connection block)

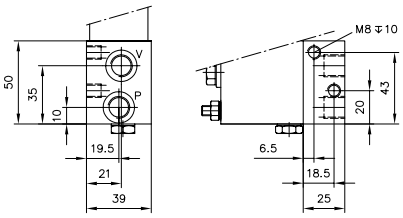


Figure 11: Pipe connection

Ports P, V and M (ISO 228/1): G 1/4

Type DZ, DLZ

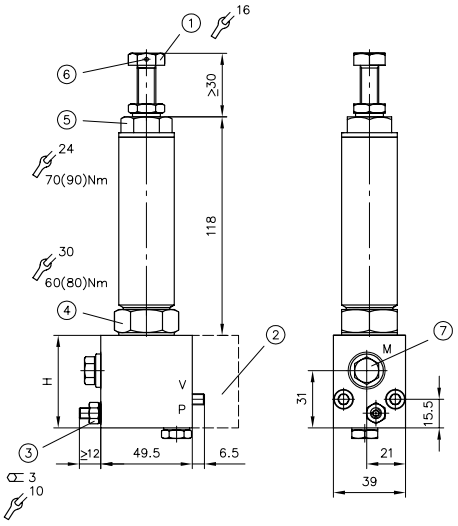


Figure 12: Fixed

1 Screw with lock nut
2 Single connection block
3 Thread type throttle
4 Sealing nut [1)]
5 Valve body [1)]
6 Provision for a lead seal
7 Port for pressure gauge G 1/4 (BSPP)

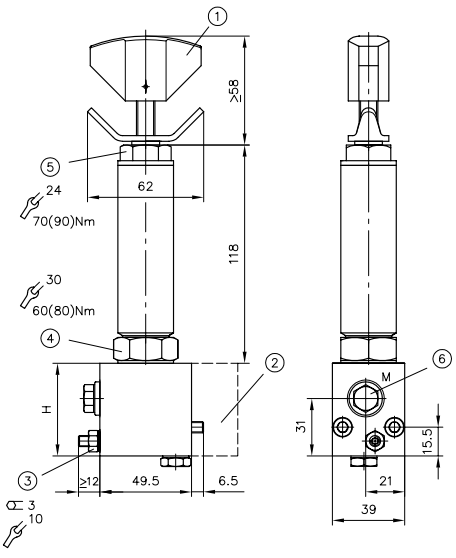


Figure 13: Adjustable

1 Turn knob
2 Single connection block
3 Thread type throttle
4 Sealing nut [1)]
5 Valve body [1)]
6 Port for pressure gauge G 1/4 (BSPP)

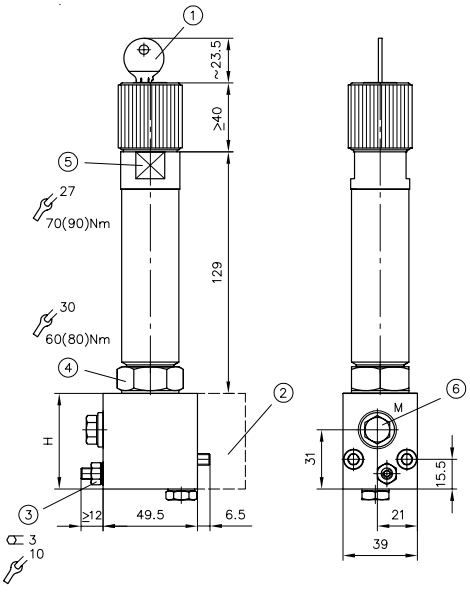


Figure 14: Lockable

1 Turn knob
2 Single connection block
3 Thread type throttle
4 Sealing nut [1)]
5 Valve body [1)]
6 Port for pressure gauge G 1/4 (BSPP)

[1)] Values in brackets apply for type DZ. -08 (-081)

Type DZ, DLZ ../.. P - 1/4

(Single connection block)

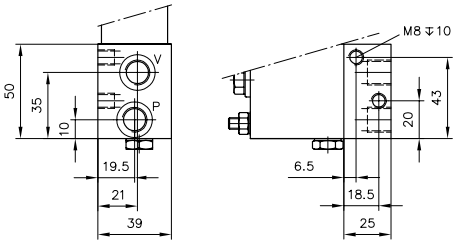


Figure 15: Direct line connection with connection block

4.2 Dimensions type DE

Type DE

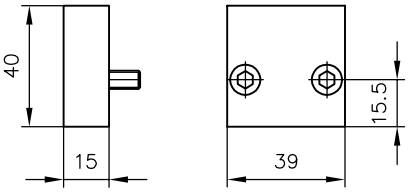


Figure 16: Type DE 0

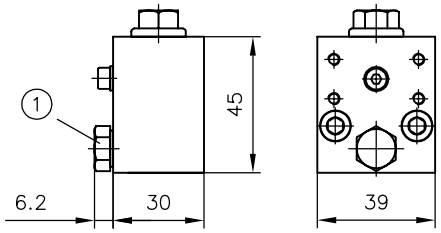


Figure 17: Type DE 2/B... DE 8/B...

1 Version with orifice

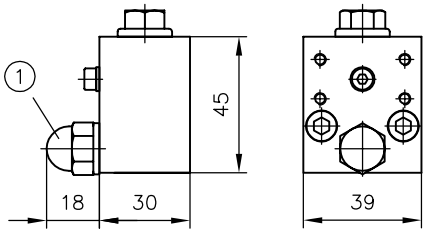


Figure 18: Type DE 2/(0 ... 3) DE 8/(0 ... 3)

1 Version with thread type throttle

Note

Please pay attention to the information on adjusting the throttles in Chapter 5, "Installation, operation and maintenance information".

4.3 Base plate hole pattern

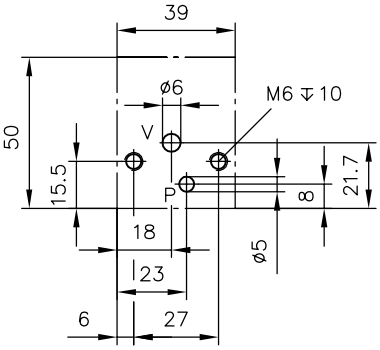


Figure 19: Hole pattern type DE, DK, DZ

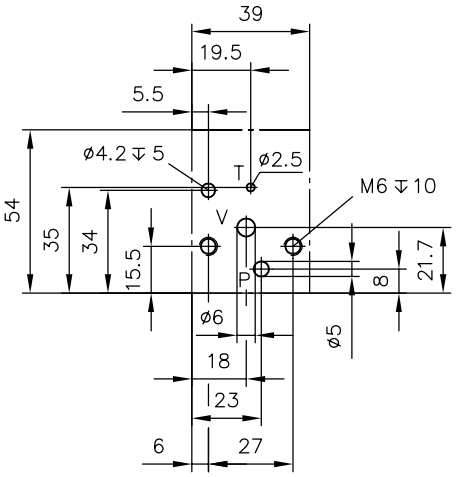


Figure 20: Hole pattern type DLZ

5 Installation, operation and maintenance information

5.1 Designated use

This fluid-power product has been designed, manufactured and tested using standards and regulations generally applicable in the European Union and left the plant in a safe and fault-free condition.

To maintain this condition and ensure safe operation, operators must observe the information and warnings in this documentation.

This fluid-power product must be installed and integrated in a hydraulic system by a qualified specialist who is familiar with and adheres to general engineering principles and relevant applicable regulations and standards.

In addition, application-specific features of the system or installation location must be taken into account if relevant.

This product may only be used as a pressure control valve within oil-hydraulic systems.

The product must be operated within the specified technical parameters. This documentation contains the technical parameters for various product versions.

Note
Non-compliance will void any warranty claims made against HAWE Hydraulik.

5.2 Assembly information

The hydraulic system must be integrated in the equipment with standard connection components that comply with market requirements (screw fittings, hoses, pipes, etc.). The hydraulic system must be shut down as a precautionary measure prior to dismounting; this applies in particular to systems with hydrostatic accumulators.

5.2.1 Making base plate

See hole pattern in Chapter 4.3, "Base plate hole pattern"

5.3 Operating instructions

The product is generally set by the manufacturer, although this can also be done by the customer. If the customer is setting the product, the information in this documentation must be observed in full.

Always monitor the pressure gauge when setting or changing the pressure!

The pressure ratio as designed causes a slight change to the actual pressure p_A in conjunction with a variable pump pressure. See Table Pressure dependence in Chapter 3, "Parameters".

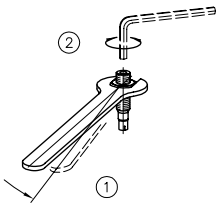
5.4 Maintenance information

This product is largely maintenance-free.

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

Check the device surfaces for dust deposits at regular intervals (but at least once per year) and clean the device if required.

5.4.1 Adjusting throttle



1 Loosening
2 Adjustment

1. Only loosen the seal-lock nut slightly (1).
2. Adjust the throttle screw using a hex wrench (2).

✓ If the seal-lock nut is only loosened slightly, oil is prevented from escaping drop-by-drop.

Note

For the largest adjustment travel, the ring markings are visible. Unscrewing further does not change (decrease) the flow cross section any more. Therefore the Δp value is no longer affected.

An internal stopper to prevent further or complete unscrewing is not structurally possible. The red ring marking thus represents the end of the permissible adjustment travel. If this is exceeded, the number of the load-bearing threads is reduced and if it is unscrewed too far the throttle screw may rip out under high pressure.

Where necessary, this should be considered in the documentation for the complete system.

Designation	Value
Width across flats hex wrench	SW 5
Width across flats seal-lock nut	SW 17
General figure for adjustment travel	5 mm

6 Other information

6.1 Planning information

Due to the leak-free sealing in the closed state, on usage in control circuits with long pressure retention times without switching processes (e.g. with separate pallet clamping) pressure changes may occur under certain circumstances. Pressure increases can occur, for instance, on temperature rises (e.g. sunlight) or the additional action of external loads, pressure drops (with pump switched off) due to temperature drops (cooling at night) or load removal.

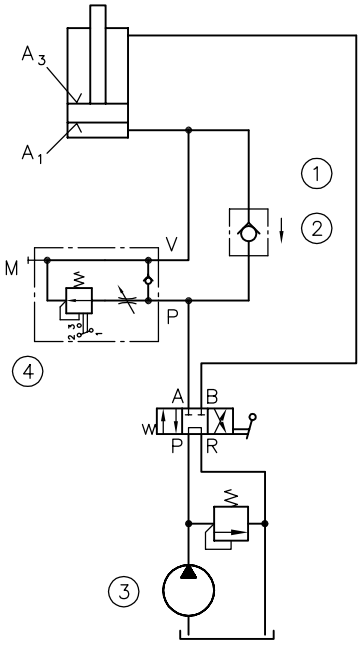
These effects are particularly noticeable with short, rigid pipe connections. Hoses and additional volume (e.g. AC 13 miniature accumulator in accordance with D 7571) help to compensate such (negative) pressure fluctuations.

The ratio of thermal expansion coefficient to coefficient of compressibility (theoretically 1:10, i.e. $\Delta T = 1K \rightarrow \Delta p \approx 10$ bar) is based on the fact described above. As consumers, pipes and hoses will yield in reality (based on experience) a ratio of approx. 1:1 can be assumed.

The integrated overpressure function in the pressure control valve is intended to prevent creeping pressure increases or pressure peaks.

6.2 Application examples

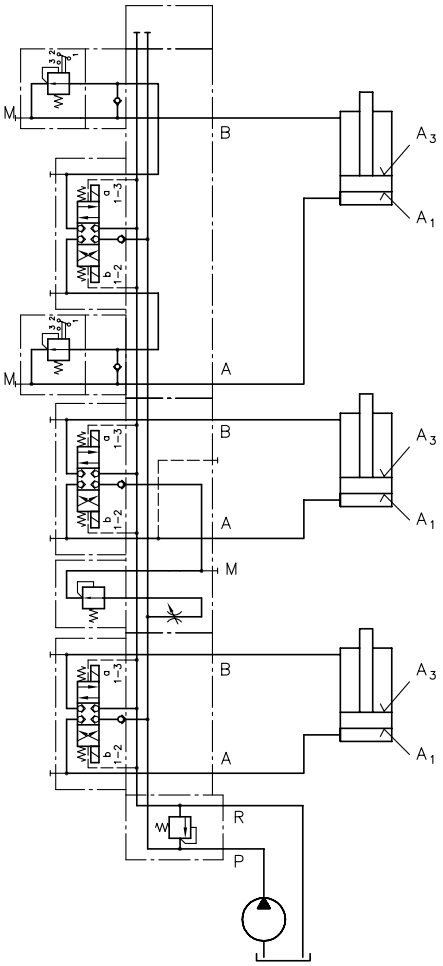
Example for a design with large flows $Q_{V \rightarrow P}$ (return flow via bypass check valve)
Example: Q_p = 15 lpm
A1 / A3 = 3 $\rightarrow Q_{Return}$ = 45 lpm



1 e.g. RK 2G acc. to D 7445
2 Q_{return} = 45 lpm
3 Q_p = 15 lpm
4 DK 2 R/200/4 R -1/4

Usage in a valve bank, shown here with seated valves type BVZP 1 in acc. with D 7785 B

BVZP 1 A - 1/300 - G 22/0
- G 22/CZ 2/100/4/2
- G 22/G/ADK 2/200/0 R/BDK 2/160/0 R
- 1 - 1 - G 24



Additional versions

- Pressure reducing valve, type CDK: D 7745
- Pressure reducing valve, type CLK: D 7745 L

Use

- Directional seated valve banks type BVZP 1: **D 7785 B**

HAWE Hydraulik SE
Streitfeldstr. 25
81673 Munich, Germany
Postfach 800804
81608 Munich, Germany
Tel. +49 (0)89 37 91 00-0
Fax +49 (0)89 37 91 00-12 69
e-mail: info@hawe.de
www.hawe.de