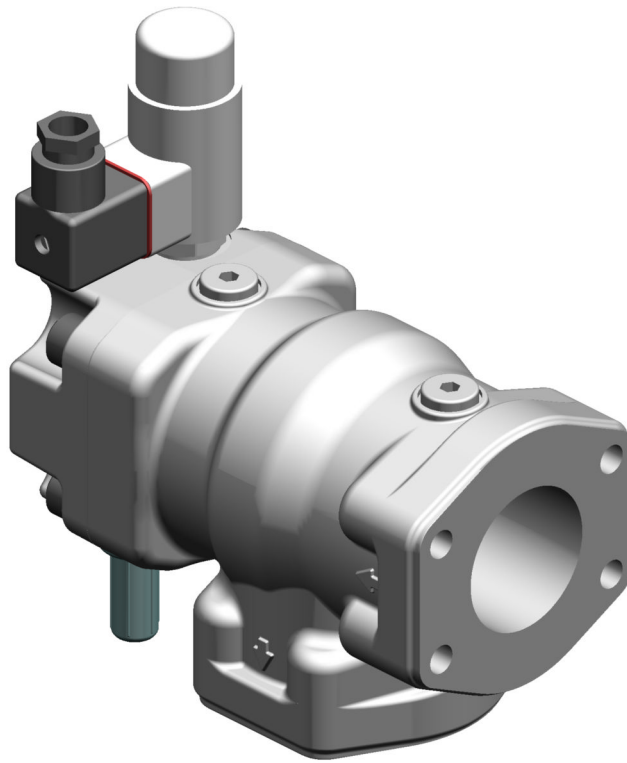


D.0029580002

Operating instructions (Translation)



Pressure valve DV .

88029580002-10

Englisch

2021-05-10

KRACHT

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1 General

1.1 About the documentation

These operating instructions describe the installation, operation and maintenance of the following device:

Pressure valve DV .

The device is manufactured in different versions. Information about the version concerned in the individual case can be found on the device's type plate.

These operating instructions are a component of the device and must be kept accessible for the personnel near the device at all times.

If you have any questions about these operating instructions, please contact the manufacturer.

1.2 Manufacturer's address

KRACHT GmbH
Gewerbestraße 20
DE 58791 Werdohl
phone: +49 2392 935-0
fax: +49 2392 935-209
email: info@kracht.eu
web: www.kracht.eu

1.3 Symbolism



Identification of an immediate hazard, which would result in death or severe bodily injury if not avoided.



Identification of a potential medium risk hazard, which would lead to death or severe bodily injury if not avoided.

 **CAUTION**

Identification of a low risk hazard, which could lead to minor or medium bodily injury if not avoided.

 **NOTICE**

Flagging of notices to prevent property damage.



Identification of basic safety instructions. Non-compliance can lead to hazards for people and the device.



Flagging of special user tips and other especially useful or important information.

2 Safety

2.1 Intended use

1. The device is determined for installation in pipes.
2. The device has been designed for operation with fluid. Dry operation is not permitted.
Excessive amounts of undissolved gases present in the medium are unacceptable as they may lead to extreme pressure fluctuations, vibrations, and noise emission levels.
3. The device may be operated in filled condition only.
The medium must be compatible with the materials used in the device. The chemical competence is necessary for this. Be careful with ethylene oxide or other cathalytic or exothermic or self-decomposing materials. Please consult the manufacturer in cases of doubt.
4. The device may be operated only in usual industrial atmospheres. If there are any aggressive substances in the air, always ask the manufacturer.
5. Operation of the device is only permissible when complying with the operating instructions and applicable documents.
Deviating operating conditions require the express approval of the manufacturer.
6. In case of any use of the device not according to specification, any warranty is voided.

2.2 Personnel qualification and training

The staff designated to assemble, operate and service the device must be properly qualified. This can be through training or specific instruction. Personnel must be familiar with the contents of this operating instructions.



Read the operating instructions thoroughly before use.

2.3 Basic safety instructions



1. Comply with existing regulations on accident prevention and safety at work along with any possible internal operator regulations.
2. Pay attention to the greatest possible cleanliness.
3. Wear suitable personal protection equipment.
4. Do not remove, make illegible or obliterate type plates or other references on the device.
5. Do not make any technical changes on the device.
6. Maintain and clean the device regularly.
7. Use spare parts approved by the manufacturer only.

2.4 Basic hazards



Hazardous fluids!

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.



Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Depressurise the device and all connection lines before doing any work.
2. Securely prevent the restoration of pressure while working on the device.



Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Use only connections and lines approved for the expected pressure range.
2. Securely prevent exceeding the permissible pressure, e.g. by using pressure relief valves or rupture discs.
3. Design pipework so that no tensions, e.g. caused by changes in length due to fluctuations in temperature, are transmitted to the device.

**WARNING****Failure of load-carrying parts due to overload!**

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Consider the permissible pressure setting range of the valve.
2. Check the pressure setting (the valve must not block).

3 Device description

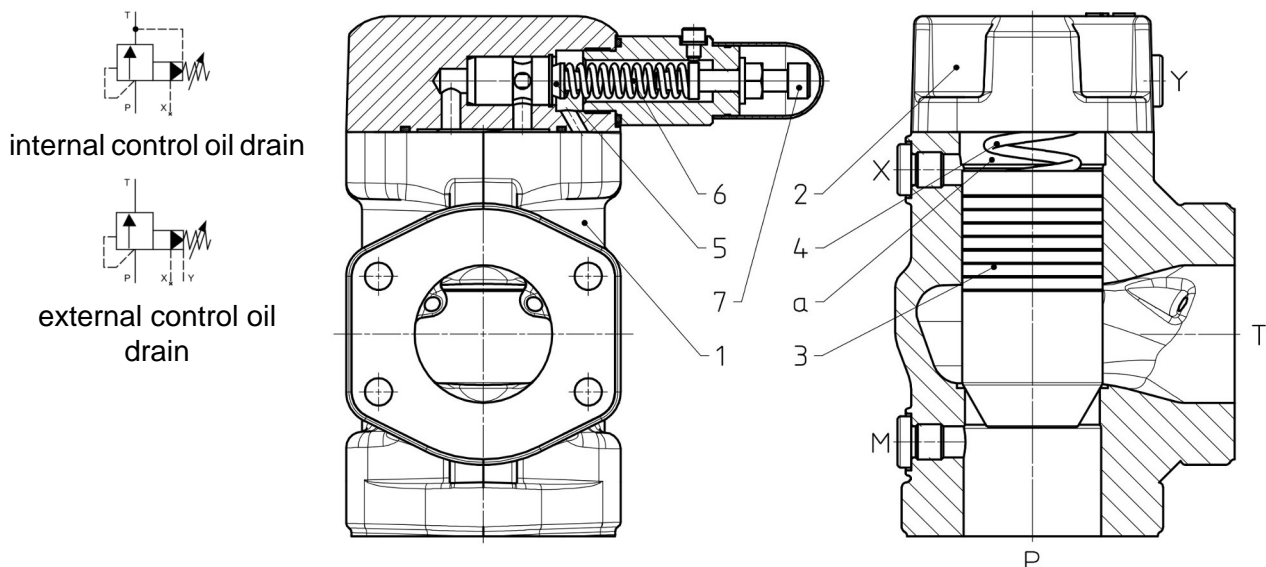
3.1 Functional principle

The Type DV pressure valves are hydraulically pilot-controlled pressure relief and pressure control valves for installation in hydraulic-system pipelines. The device consists of a main valve (1) and - depending on the version - one or more pilot valves (2) with different functions. The control oil flow can be drained optionally internally to the tank (T) or externally on the connector (Y). When using the internal version, please note that fluctuating pressures on the connector (T) cause a corresponding change in the pressure setting.

3.1.1 Pressure relief valve DV B

The DV B is a pilot-controlled pressure relief valve and is used to safeguard hydraulic circuits. The pressure adjusted at the adjustment spindle is kept mostly constant at the connection (P). The valve characteristics as a function of viscosity and flow rate must be taken into account here (see [section 4.3 "Characteristic curves pressure valve"](#)).

With the valve closed, both main valve piston (3) as well as pilot valve piston (5) are kept in the closed position by the force of the springs (4; 6). As soon as the pressure exceeds the pressure set with Setcrew (7), the pilot valve opens and the spring chamber (a) of the main valve is relieved to Tank (T). A pressure gradient arises between pressure port (P) and the spring chamber and the main valve piston opens, keeping the system pressure constant. The control oil can be drained internally or externally (Y) by choice. A measurement tap (M) and a port for external control oil regulation (X) are provided as standard.



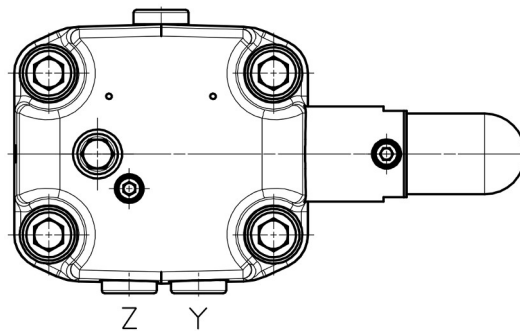
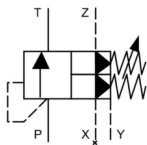
3.1.2 Pressure control valve DV R

The pressure control valve DV R is a pilot-controlled pressure relief valve with external hydraulic activation. Essentially, the function corresponds to that of the pressure relief valve DV B (see [section 3.2.1 "Pilot valve DV B"](#)). However, it allows for the system pressure to be adjusted irrespective of the pressure losses occurring between the valve and the point of the external control oil tap. For this purpose, the pressure adjusted at the adjustment spindle is kept constant at the connection (Z). The valve characteristics as a function of viscosity and flow rate must be taken into account here (see [section 4.3 "Characteristic curves pressure valve"](#)). In addition, the valve features a non-adjustable overpressure protection mechanism.



Pressure control valve DV R

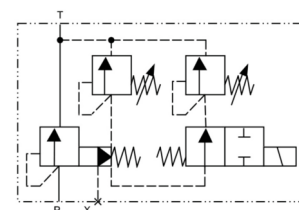
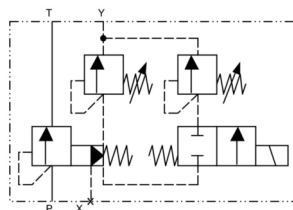
To ensure correct operation, an external control oil supply (pilot line) must be installed at the connection (Z).



3.1.3 Pressure stage control valve DV S

The pressure stage control valve is a pilot-operated pressure relief valve with minimum two or maximum three parallel arranged pilot valves which can be set to different pressures. The valve characteristics as a function of viscosity and flow rate must be taken into account here (see [section 4.3 "Characteristic curves pressure valve"](#)). The basic setup corresponds to the DV B pressure relief valve. The device comes with a solenoid valve. It is used to switch between the different pressure stages. The solenoid valve is available in normally open (NO) or normally closed (NC) design for the 2-stage version. For the three-stage variant, a built-in 4/3-directional control valve is used. The control oil can be drained internally or externally (Y) by choice.

Pressure stage 1

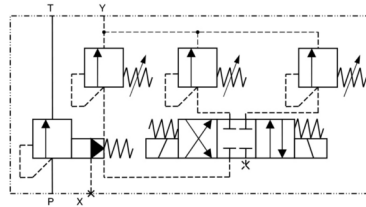


Pressure stage 1

external control oil drain (Y), Magnetic valve: normally closed

internal control oil drain, Magnetic valve: normally open

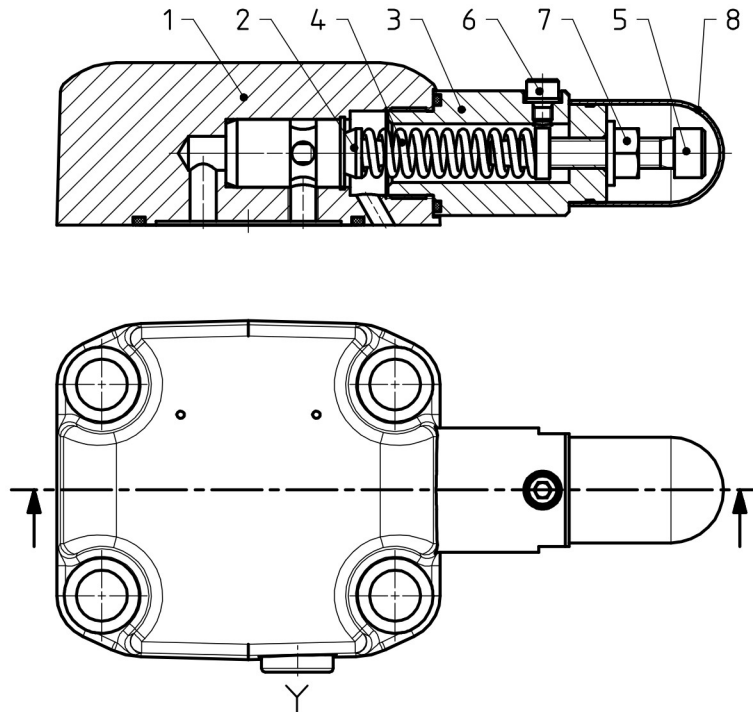
Pressure stage 2



external control oil drain (Y)

3.2 Basic design

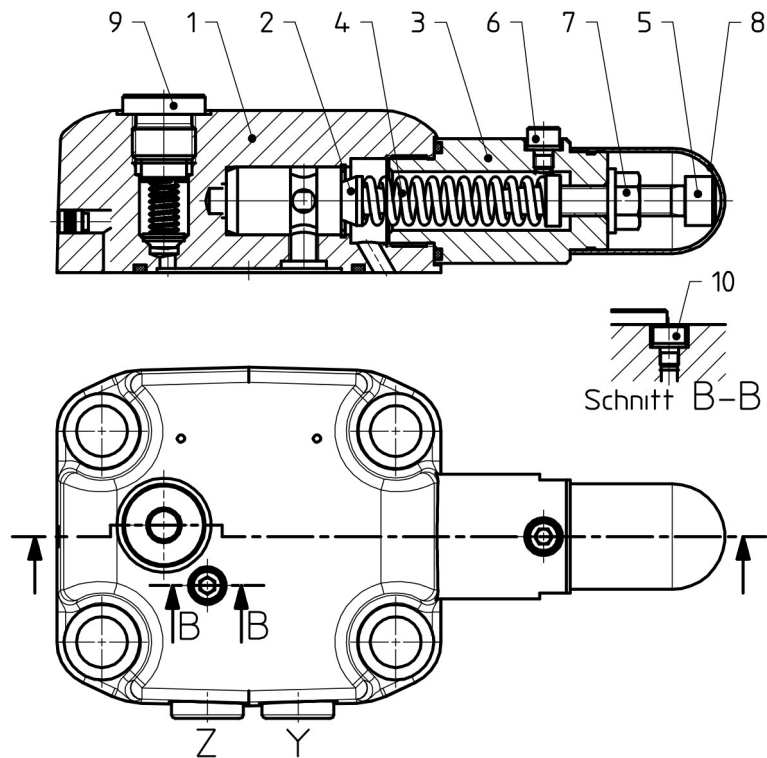
3.2.1 Pilot valve DV B



Explanation

- | | |
|----------------------|--------------------|
| 1 Housing | 5 Adjustment screw |
| 2 Pilot valve piston | 6 Venting screw |
| 3 Cap screw | 7 Union nut |
| 4 Compression spring | 8 Protective cap |

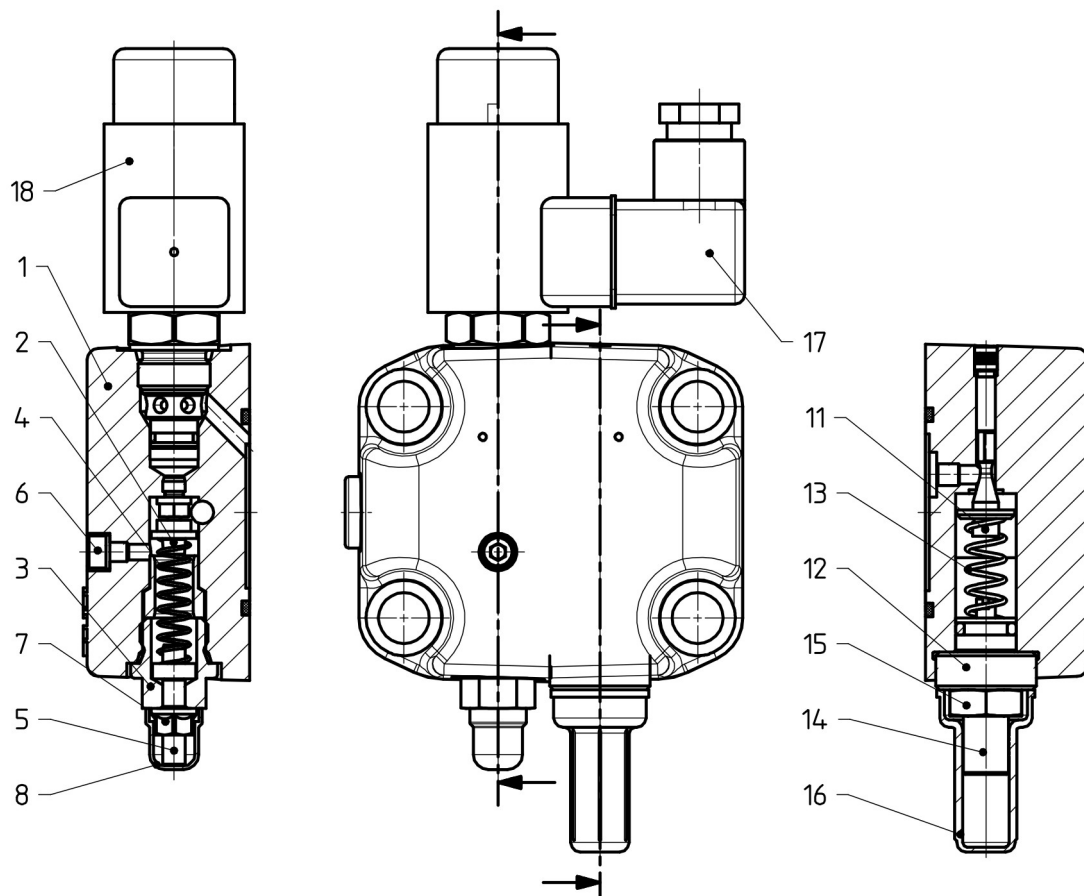
3.2.2 Pilot valve DV R



Explanation

- | | |
|----------------------|----------------------------|
| 1 Housing | 6 Venting screw |
| 2 Pilot valve piston | 7 Union nut |
| 3 Cap screw | 8 Protective cap |
| 4 Compression spring | 9 Max. pressure protection |
| 5 Adjustment screw | 10 Venting screw |

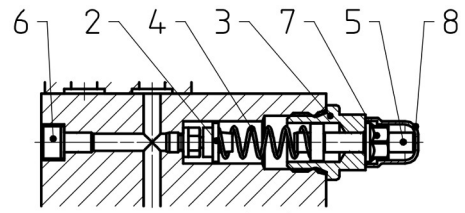
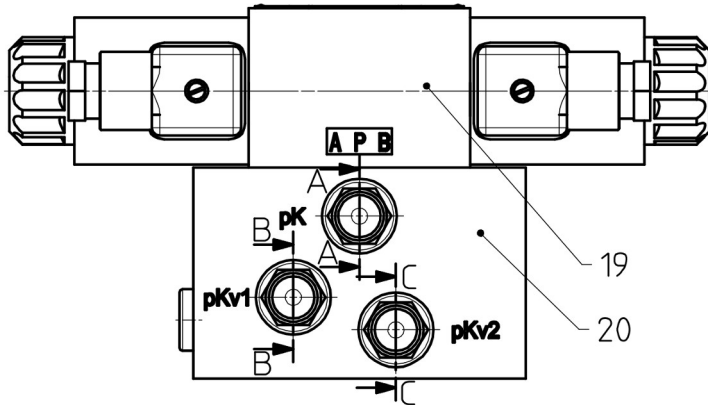
3.2.3 Pilot valve DV S (Pressure stage 1)



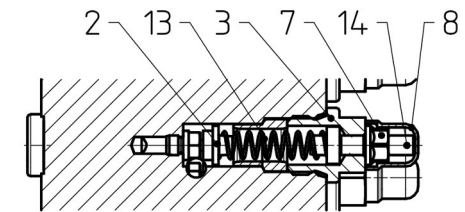
Explanation

- | | | | |
|---|--------------------|----|--------------------|
| 1 | Housing | 11 | Pilot valve piston |
| 2 | Pilot valve piston | 12 | Cap screw |
| 3 | Cap screw | 13 | Compression spring |
| 4 | Compression spring | 14 | Adjustment screw |
| 5 | Adjustment screw | 15 | Union nut |
| 6 | Venting screw | 16 | Protective cap |
| 7 | Union nut | 17 | Device plug |
| 8 | Protective cap | 18 | Magnet coil |

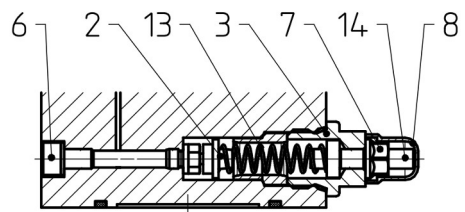
3.2.4 Pilot valve DV S (Pressure stage 2)



Schnitt A-A



Schnitt B-B



Schnitt C-C

Explanation

- | | | | |
|---|--------------------|----|--------------------|
| 2 | Pilot valve piston | 8 | Protective cap |
| 3 | Cap screw | 13 | Compression spring |
| 4 | Compression spring | 14 | Adjustment screw |
| 5 | Adjustment screw | 19 | Directional valve |
| 6 | Venting screw | 20 | Valve cover |
| 7 | Union nut | | |

3.3 Type key

Ordering example DV .													
DV	S	50	F	2	F	1	Y	A	-	NC	24	D	
1.	2.	3.	4.	5.	6.	7.	8.	9.		10.	11.	12.	
										(only: DV B .; DV S .)			

Explanation of type key DV .									
1.	Product name								
2.	Function								
	<table border="1"> <tr> <td>B</td> <td>Pressure relief valve</td> <td>S</td> <td>Pressure stage control valve</td> </tr> <tr> <td>R</td> <td>Pressure control valve</td> <td></td> <td></td> </tr> </table>	B	Pressure relief valve	S	Pressure stage control valve	R	Pressure control valve		
B	Pressure relief valve	S	Pressure stage control valve						
R	Pressure control valve								
3.	Nominal size								
	<table border="1"> <tr> <td>50</td> <td>Nominal width 50 resp. SAE 2"</td> <td>80</td> <td>Nominal width 80 resp. SAE 3"</td> </tr> </table>	50	Nominal width 50 resp. SAE 2"	80	Nominal width 80 resp. SAE 3"				
50	Nominal width 50 resp. SAE 2"	80	Nominal width 80 resp. SAE 3"						
4.	Sealing material								
	<table border="1"> <tr> <td>F</td> <td>FKM</td> <td>N</td> <td>NBR</td> </tr> </table>	F	FKM	N	NBR				
F	FKM	N	NBR						
5.	Material								
	<table border="1"> <tr> <td>2</td> <td>Ductil cast iron (EN-GJS-400-15)</td> </tr> </table>	2	Ductil cast iron (EN-GJS-400-15)						
2	Ductil cast iron (EN-GJS-400-15)								
6.	Connection								
	<table border="1"> <tr> <td>F</td> <td>SAE flange (SAE J518, Code 61)</td> </tr> </table>	F	SAE flange (SAE J518, Code 61)						
F	SAE flange (SAE J518, Code 61)								
7.	Pressure stage								
	see chapter 4 "Technical data"								
8.	Control oil discharge								
	<table border="1"> <tr> <td>Y</td> <td>external</td> <td>J</td> <td>internal</td> </tr> </table>	Y	external	J	internal				
Y	external	J	internal						
9.	Construction type								
	<table border="1"> <tr> <td>A</td> <td>Standard construction type</td> <td>B</td> <td>Valve cover rotated 180°</td> </tr> </table>	A	Standard construction type	B	Valve cover rotated 180°				
A	Standard construction type	B	Valve cover rotated 180°						
10.	Magnetic valve								
	<table border="1"> <tr> <td>NC</td> <td>2/2-Directional valve, normally closed</td> <td>F</td> <td>4/3-Directional valve for pressure stage 2 (applies only to DV S 50)</td> </tr> <tr> <td>NO</td> <td>2/2-Directional valve, normally open</td> <td></td> <td></td> </tr> </table>	NC	2/2-Directional valve, normally closed	F	4/3-Directional valve for pressure stage 2 (applies only to DV S 50)	NO	2/2-Directional valve, normally open		
	NC	2/2-Directional valve, normally closed	F	4/3-Directional valve for pressure stage 2 (applies only to DV S 50)					
NO	2/2-Directional valve, normally open								
11.	Supply voltage								
	<table border="1"> <tr> <td>24</td> <td>24 V DC</td> </tr> </table>	24	24 V DC						
24	24 V DC								
12.	Valve plug								
	<table border="1"> <tr> <td>D</td> <td>according to DIN 43650 / ISO 440</td> </tr> </table>	D	according to DIN 43650 / ISO 440						
D	according to DIN 43650 / ISO 440								

4 Technical data

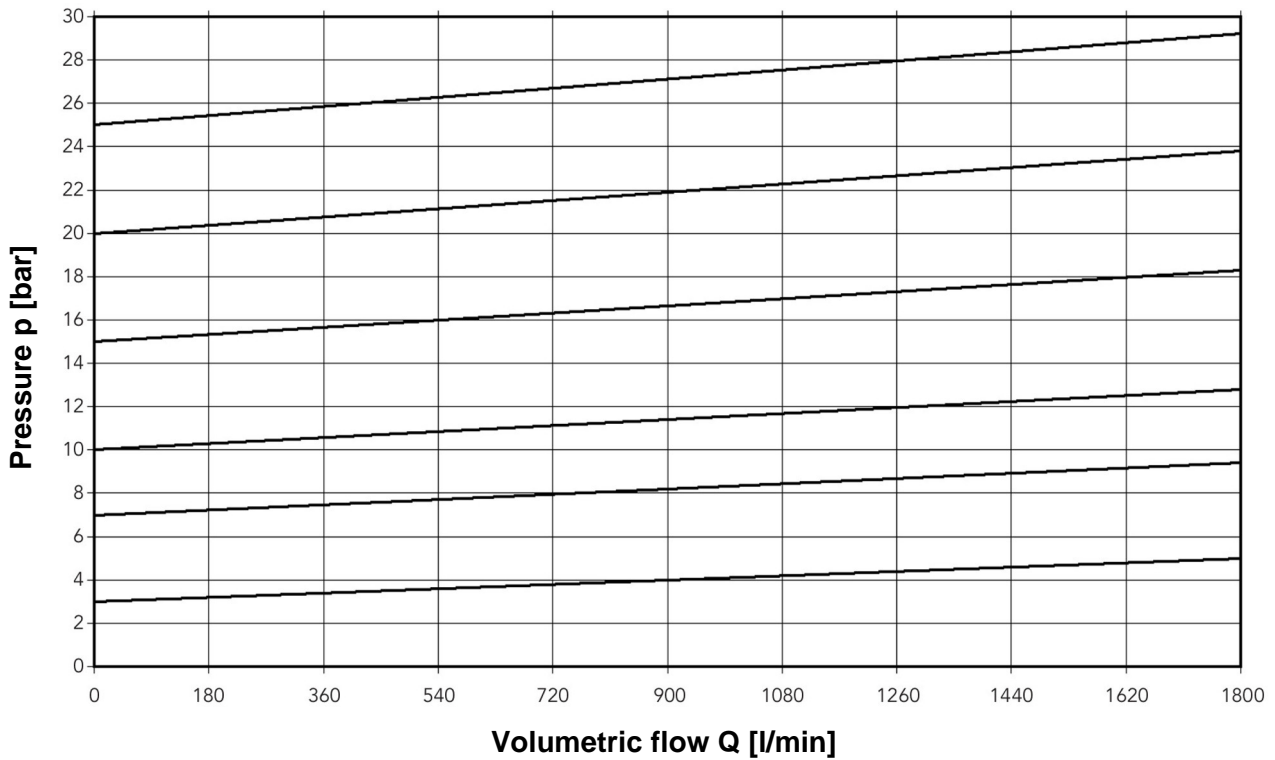
4.1 General

General information	
Design	Seat valve, hydraulically pilot controlled
Fixing type	Pipeline installation
Housing connection	SAE flange (SAE J518, Code 61)
Mounting position	Any
Actuation type	Mechanical, threaded pin
Housing material	EN-GJS-400-15
Sealing material	FKM, NBR
Oil cleanliness	NAS 1638 Class 9 ISO 4406:1999 Code 20/18/15
Permissible media	Hydraulic fluids according to DIN 51524/25 Lubricating fluids without abrasive components. (Petrols, solvents, etc. are not permissible.)

4.2 Hydraulic specifications Pressure valve

Hydraulic specifications			
Max. flow capacity	Q	max. 60% of the delivery rate [l/min]	
Fluid temperature (NBR)	$\vartheta_{m \text{ min.}}$	-20 °C	
	$\vartheta_{m \text{ max}}$	90 °C	
Fluid temperature (FKM)	$\vartheta_{m \text{ min.}}$	-20 °C	
	$\vartheta_{m \text{ max}}$	150 °C	
Ambient temperature	$\vartheta_{u \text{ min.}}$	-20 °C	
	$\vartheta_{u \text{ max.}}$	60 °C	
Viscosity	v_{min}	4 mm ² /s	
	v_{max}	1000 mm ² /s	
Max. operating pressure	p_{max}	DV . 50	210 bar
		DV . 80	140 bar

4.3 Characteristic curves pressure valve



4.4 Pressure setting ranges

Function	Nominal size	Pressure stage	Pressure setting ranges [bar]
DV B ⁽¹⁾	50 / 80	1	3...25
		2	8...70
	50 / 80	3	15...210
		5	3...12 ⁽³⁾
DV R ⁽²⁾	50 / 80	1	3...9
		5	3...12 ⁽³⁾
DV S	50 / 80	1	3...10 / 10...35
		2	6...20 / 8...22 / 10...30

⁽¹⁾ The DV B is optionally available with a fixed maximum limitation. This can be optionally delivered with 9 bar or 12 bar response pressure. In these case, it should be noted that only a limited pressure setting range is available up to the desired response pressure.

⁽²⁾ The DV R with pressure level 1 is supplied with a maximum pressure limit of 9 bar as standard.

⁽³⁾ Maximum pressure limit 12 bar

4.5 Weight

Nominal size	Pressure valve	Weight [kg]
50	DV B	9.7
	DV R	
	DV S Pressure stage 1	9.8
	DV S Pressure stage 2	13.7
80	DV B	21.2
	DV R	
	DV S	21.4

4.6 Dimensions

Dimensions of the device can be found in the relevant technical data sheets.

5 Transport and storage

5.1 General

- After receipt, check the device for transport damages.
- If transport damage is noticed, report this immediately to the manufacturer and the carrier. The device must then be replaced or repaired.
- Dispose of packing material and used parts in accordance with the local stipulations.

5.2 Transport



WARNING

Falling or overturning loads!

Danger of injury while transporting large and heavy loads.

1. Use only suitable means of conveyance and lifting tackle with sufficient load-bearing capacity.
2. Attach lifting tackle only to suitable load points.
3. Attach the lifting tackle in such a manner that it cannot slip.
4. Pay attention to the load balance point.
5. Always avoid jerks, impacts and strong vibrations during transportation.
6. Never walk under suspended loads, never work under suspended loads.

5.3 Storage

The device's function is tested in the plant with mineral hydraulic oil. Then all connections are closed. The remaining residual oil preserves the interior parts for up to 6 months.

Metallic exposed exterior parts are protected against corrosion by suitable conservation measures, also up to 6 months.

In case of storage, a dry, dust-free and low-vibration environment is to be ensured. The device is to be protected against influences from weather, moisture and strong fluctuations of temperature. The recommended storage conditions are to be adhered to.

Below the permissible ambient temperature ϑ_u elastomer seals lose their elasticity and mechanical loading capacity, since the glass transition temperature is fallen below. This procedure is reversible. A force action on the device is to be avoided in case of storage below the permissible ambient temperature ϑ_u .

Devices with EPDM seals are not mineral-oil resistant and are not tested for their function. There is no preservation of the interior parts. If the device is not taken into operation immediately, all corrosion-prone surfaces are to be protected by suitable conservation measures. The same applies for devices which are not tested for other reasons.

When storing for a long period of time (> 6 months), treat all surfaces at risk of corrosion again with suitable preserving agents.

If high air humidity or aggressive atmospheres are expected, take additional corrosion-preventing measures.



Storage in corrosion protection bags (VCI) maximum of 6 months.



NOTICE

Corrosion/chemical impact

Improper storage can render the device useless.

1. Protect endangered surfaces by means of suitable conservation measures.
2. Comply with recommended storage conditions.



Recommended storage conditions

1. Storage temperature: 5 °C - 25 °C
2. Relative air humidity: < 70 %
3. Protect elastomer parts from light, especially direct sunlight.
4. Protect elastomer parts from oxygen and ozone.
5. Comply with maximum storage times of elastomeric parts:
 - 5 Years: AU (Polyurethane rubber)
 - 7 Years: NBR, HNBR, CR
 - 10 Years: EPM, EPDM, FEP/PTFE, FEP, FKM, FFKM, VMQ, FVMQ

6 Installation

6.1 Safety instructions for installation

DANGER

Hazardous fluids!

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.

WARNING

Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Depressurise the device and all connection lines before doing any work.
2. Securely prevent the restoration of pressure while working on the device.

WARNING

Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Use only connections and lines approved for the expected pressure range.
2. Securely prevent exceeding the permissible pressure, e.g. by using pressure relief valves or rupture discs.
3. Design pipework so that no tensions, e.g. caused by changes in length due to fluctuations in temperature, are transmitted to the device.

6.2 Mechanical installation

6.2.1 Preparation

- Check the device for transport damage and dirt.
- Remove existing preservatives.
 - Use only those cleaning agents that are compatible with the materials used in the device.
 - Do not use cleaning wool.
- Compare the environmental and ambient conditions at the place of installation to the permissible conditions.
 - Expose the device only to small vibrations, see IEC 60034-14.
 - Secure sufficient access for maintenance and repair.

6.2.2 Pressure valve

- Whenever possible, install the device in a horizontal position, i.e., the pilot valve and connections in a lateral position.
- Take measures against accidental touching of hot surfaces (> 60 °C).

6.2.3 Mounting Connection lines



Pressure control valve DV R

To ensure correct operation, an external control oil supply (pilot line) must be installed at the connection (Z).

- Clean all lines.
 - Do not use cleaning wool.
 - Pickle and flush welded pipes.
- Remove the protective plugs.
- Mount the lines.
 - Comply with the manufacturer's information.
 - Do not use any sealing materials such as hemp, Teflon tape or putty.

7 Operation start-up

7.1 Safety instructions for start-up

DANGER

Hazardous fluids!

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.

WARNING

Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Consider the permissible pressure setting range of the valve.
2. Check the pressure setting (the valve must not block).

WARNING

Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Use only connections and lines approved for the expected pressure range.
2. Design pipework so that no tensions, e.g. caused by changes in length due to fluctuations in temperature, are transmitted to the device.

CAUTION

Hot surfaces!

Burn injury to skin if touched.

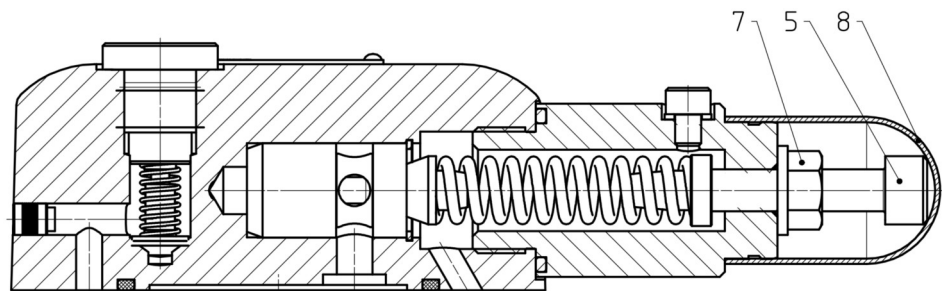
1. At temperatures $\geq 48^{\circ}\text{C}$ the device must be allowed to cool down first.

7.2 General

The pilot valves come factory-set to the pressure desired by the customer. If applicable, the pressure needs to be corrected during commissioning as differing flow volumes and oil viscosities can cause changes in the valve characteristics.

Do not install the valve at the crest of the hydraulic system as air may accumulate and cause dysfunctions.

7.2.1 Pressure setting DV B and DV R



5 Adjustment screw

8 Protective cap

7 Union nut

Pressure setting:

- Remove the protective cap
- Unscrew flange nut
- Adjust pressure setting via the setscrew.
 - Clockwise rotation = Pressure increase
 - Counter-clockwise rotation = Pressure decrease
- Secure setscrew with union nut
- Attach the thread protective cap



WARNING

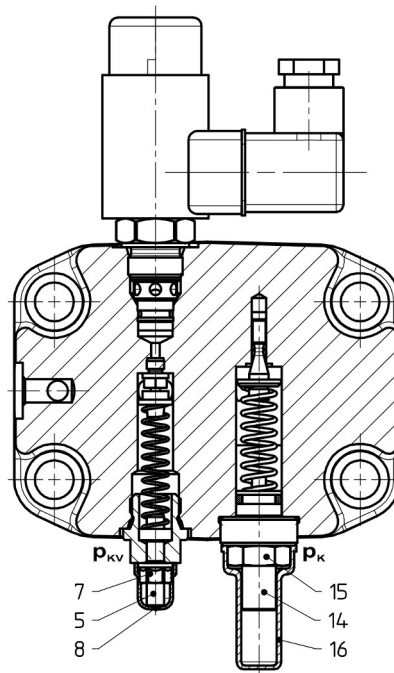
Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Consider the permissible pressure setting range of the valve.
2. Check the pressure setting (the valve must not block).

7.2.2 Pressure setting DV S (Pressure stage 1)



Explanation

- | | |
|--------------------|---------------------|
| 5 Adjustment screw | 14 Adjustment screw |
| 7 Union nut | 15 Union nut |
| 8 Protective cap | 16 Protective cap |

Pressure setting ranges

- | | |
|---------------------|-------------------|
| p_{KV} 3...10 bar | p_K 10...35 bar |
|---------------------|-------------------|

Pressure setting:

- Remove the protective cap
- Unscrew flange nut
- Adjust pressure setting via the setscrew.
 - Clockwise rotation = Pressure increase
 - Counter-clockwise rotation = Pressure decrease
- Secure setscrew with union nut
- Put on the protective cap

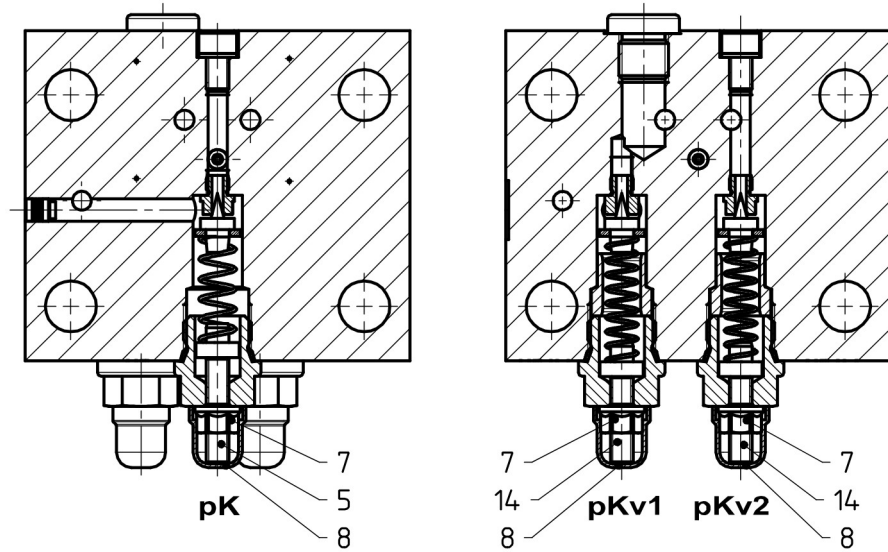


Failure of load-carrying parts due to overload!

Danger of injury from flying parts.
 Danger of injury from spurting fluids.

1. Consider the permissible pressure setting range of the valve.
2. Check the pressure setting (the valve must not block).

7.2.3 Pressure setting DV S (Pressure stage 2)



Explanation

- 5 Adjustment screw
- 7 Union nut

- 8 Protective cap
- 14 Adjustment screw

Pressure setting ranges

- p_{Kv1} 6...20 bar
- p_{Kv2} 8...22 bar

- p_K 10...30 bar

Pressure setting:

- Remove the protective cap
- Unscrew flange nut
- Adjust pressure setting via the setscrew.
 - Clockwise rotation = Pressure increase
 - Counter-clockwise rotation = Pressure decrease
- Secure setscrew with union nut
- Put on the protective cap

WARNING

Failure of load-carrying parts due to overload!
 Danger of injury from flying parts.
 Danger of injury from spurting fluids.

1. Consider the permissible pressure setting range of the valve.
2. Check the pressure setting (the valve must not block).

7.3 Further operation start-up

- Open existing shut-off elements upstream and downstream of the device.
- Vent the system at the highest possible point.
- Check the operating data such as:
 - Response pressure
 - System pressure (as close as possible to device)
 - Fluid temperature (as close as possible to device)
 - ...
- Document the operating data of the initial start-up for later comparison.
- Check the device for leaks.
- Check all threaded connections for leaks and retighten if necessary.



Existing venting and drain plugs must always be closed during operation according to specification.

8 Removal

8.1 Safety instructions for removal

DANGER

Hazardous fluids!

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.

WARNING

Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Depressurise the device and all connection lines before doing any work.
2. Securely prevent the restoration of pressure while working on the device.

CAUTION

Hot surfaces!

Burn injury to skin if touched.

1. At temperatures $\geq 48^{\circ}\text{C}$ the device must be allowed to cool down first.

8.2 Preparation

A "disassembly kit" is required to disassemble and reassemble the valve.

The valve can be opened while attached to the piping by using the disassembly kit. However, to clean the valve it is recommended to remove the device from the piping.

- Depressurise and de-energize the system.
- Close existing shut-off elements upstream and downstream of the device.
- Open existing drain elements and loosen connection lines. Collect and dispose of discharging medium so that no hazard arises for persons or environment.
- Close the device connections and lines to prevent dirt penetration.

8.3 Removal / Mounting

Fig. 8.1:

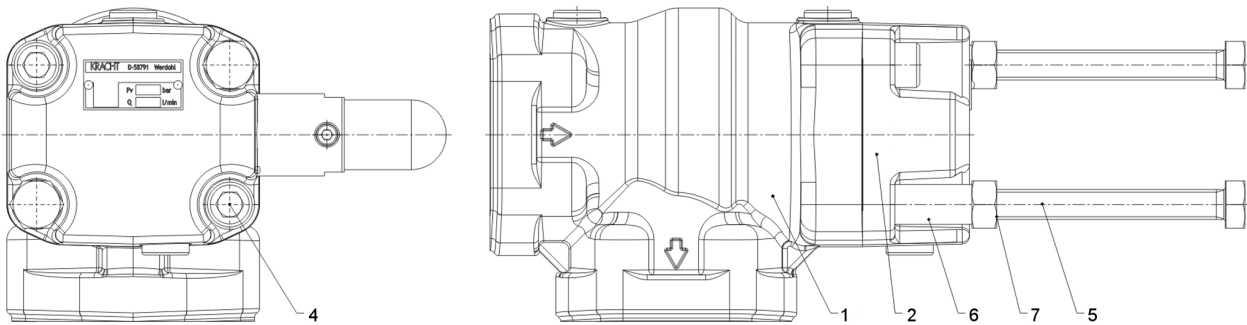
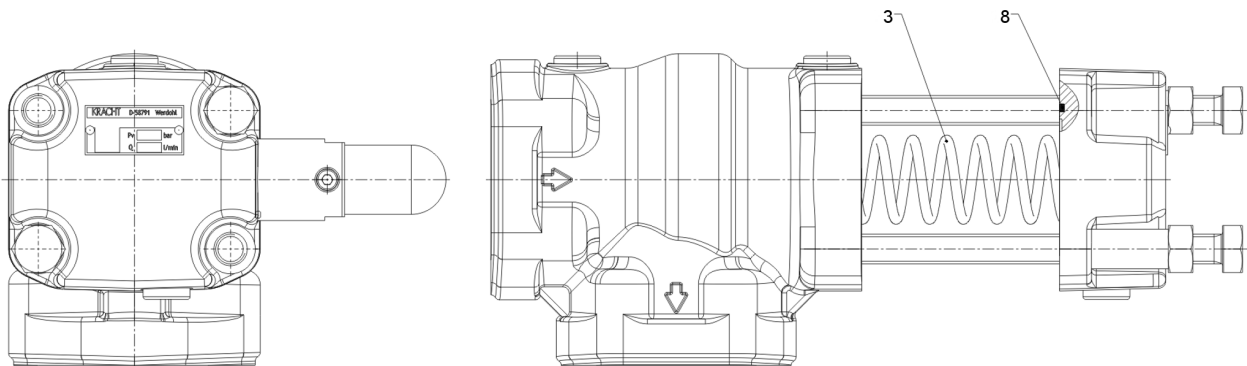


Fig. 8.2:



- | | |
|------------------------|-------------------|
| 1 Main valve | 5 Hexagonal screw |
| 2 Pilot valve | 6 Spacer sleeve |
| 3 Compression spring | 7 Hexagonal nut |
| 4 Hexagon socket screw | 8 O-Ring |

Removal:

- Loosen and remove two opposite hexagon socket screws.
- Screw the hexagon screw together with the spacer sleeve and hexagon nut into the free threaded holes of the main valve (see figure 8.1)
- Manually tighten the hexagon screws and hexagon nuts
- Loosen and remove the remaining hexagon socket screws
- Loosen the hexagon nuts alternately by roughly 5 mm increments to detach the pilot valve from the main valve (see figure 8.2)
- Remove the hexagon screw from the main valve while the pressure spring is relaxed.
- Remove the pilot valve from the main valve

Mounting:

- Pass two hexagon screws fitted with spacer sleeves and hexagon nuts through two diagonally opposite bores on the pilot valve and screw into the proper threaded bores of the main valve. Tighten manually.
- Tighten the hexagon nuts alternately roughly by 5 mm increments to attach the pilot valve to the main valve
- O-ring seal must installed correctly into the groove
- When the pilot valve is abutting the main valve, insert two hexagon socket screws into the free threaded holes and tighten manually.
- Remove the hexagon screws together with the spacer sleeves and hexagon nuts
- Install the remaining hexagon socket screws
- Tighten the hexagon socket screw to a torque of 115 Nm.

9 Maintenance

9.1 Safety instructions for maintenance

DANGER

Hazardous fluids!

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.

DANGER

Danger when dismantling the valve cap

The valve cover stands under high spring pressure. Parts flying around uncontrolled or fluids squirting out lead to accidents with severe injuries or even result in death.

1. The removal of the valve or the valve cover is not allowed.

WARNING

Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Depressurise the device and all connection lines before doing any work.
2. Securely prevent the restoration of pressure while working on the device.

CAUTION

Hot surfaces!

Burn injury to skin if touched.

1. At temperatures $\geq 48^{\circ}\text{C}$ the device must be allowed to cool down first.

9.2 Maintenance work



Checking and documentation of the operating data

Regular checking and documentation of all operating data such as pressure, temperature, current consumption, degree of filter soiling, etc. contributes to early problem detection.

- Perform maintenance according to specification.
- Replace defective and worn components.
- If required, request spare parts lists and assembly drawings from the manufacturer.
- Document the type and scope of the maintenance work along with the operating data.
- Compare the operating data with the values of the first commissioning. Determine the cause in case of major non-compliances (> 10 %).
- Dispose of packing material and used parts in accordance with the local stipulations.



Barriers and instructions

All barriers and warning signs removed during this must be attached to their original position on completing maintenance and/or repairs.

9.3 Maintenance instructions

The following information provides recommendations on maintenance work and maintenance intervals for the device being used.

Depending on the actually occurring loads in operation, the type, scope and interval of the maintenance work can deviate from the recommendations. The equipment builder/operator shall write an obligatory maintenance plan.



Within the framework of preventive maintenance, it is appropriate to replace wear parts before reaching the wear limit.

With corresponding expertise and sufficient equipment, the replacement can be carried out by the equipment builder/operator. Please consult the manufacturer about this.

- Use spare parts approved by the manufacturer only.
- Dispose of packing material and used parts in accordance with the local stipulations.
- If required, request spare parts lists and assembly drawings from the manufacturer.



Warranty

In case of improper implementation, any warranty is voided.

Maintenance recommendations Pressure valve			
Interval	Maintenance work	Employees	Duration approx. [h]
Daily	Audiometric monitoring: Unusual noise	1	0.1
	Cleaning: Remove dust deposits and dirt with a moist, clean cloth		
	Visual inspection: Leakages		
Firstly: after max. 24 h - - - 3000 Operating hours	Inspection: Operating pressure	1	1
	Inspection: Fluid temperature		
	Inspection: Device temperature		
	Inspection: Valve function		
	Inspection: Condition of operating fluid		

10 Repairs

10.1 Safety instructions for repair

DANGER

Hazardous fluids!

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.

WARNING

Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Depressurise the device and all connection lines before doing any work.
2. Securely prevent the restoration of pressure while working on the device.

CAUTION

Hot surfaces!

Burn injury to skin if touched.

1. At temperatures $\geq 48^{\circ}\text{C}$ the device must be allowed to cool down first.

10.2 General

The repairs covers:

1. Troubleshooting
Determination of damage, pinpointing and localisation of the damage cause.
2. Elimination of damage
Elimination of the primary causes and replacement or repair of defective components. The repair is generally made by the manufacturer.

Repairs by manufacturer

- Before returning the device, fill in the *return notification* form. The form can be filled in online and is available as a pdf file download.

**Device contains hazardous material**

If the device was operated with dangerous liquids, it must be cleaned before the return. If this should not be possible, the safety data sheet of the hazardous material is to be provided beforehand.

Repair by equipment builder/operator

If corresponding expertise and sufficient equipment is available, the equipment builder/operator can also make the repairs. Please consult the manufacturer about this.

- If required, request spare parts lists and assembly drawings from the manufacturer.
- Use spare parts approved by the manufacturer only.
- Dispose of packing material and used parts in accordance with the local stipulations.

**Warranty**

In case of improper implementation, any warranty is voided.

**Barriers and instructions**

All barriers and warning signs removed during this must be attached to their original position on completing maintenance and/or repairs.

10.3 Detecting and eliminating failures

Failure	Potential causes	Possible measures
1 Increased noise <i>Mechanical vibrations</i>	Air in system	Bleed the valve and/or system
2 System pressure too high	Main valve piston tight or jammed	Clean and, where necessary, replace the main valve
	Pilot valve piston tight or jammed	Clean and, where necessary, replace the pilot valve
	Pilot valve clogged	Clean and, where necessary, replace the pilot valve
	External control-oil discharge (Y) clogged	Check the external control-oil discharge (Y) and clean or replace as applicable
	Pressure setting too high	Decrease pressure setting
3 System pressure too low	Main valve piston tight or jammed	Clean and, where necessary, replace the main valve
	Pilot valve piston tight or jammed	Clean and, where necessary, replace the pilot valve
	Main or pilot valve pressure spring broken	Dismantle the device. Replace pressure spring
	Valve seat leaky	Clean and, where necessary, replace the main valve
	Main valve nozzle clogged	Disassemble and clean the the main valve's control nozzles
	Pressure setting too low	Increase pressure setting
	The pilot valve's adjustment spindle becomes misaligned during operation	Reset pressure, tension hexagon nut
4 System pressure fluctuating	Air in system	Bleed the valve and/or system
	Pressure fluctuations in tank pipe	Discharge the control oil (Y) externally toward the tank
5 Leakages <i>Seal failure</i>	Poor maintenance	Comply with maintenance plan Replace seals
	Mechanical damage	Replace seals
	Thermal overload	Check the operating datas Replace seals
	Corrosion/chemical impact	Check the material compatibility Replace seals
	Flange faces broken	Replace the device and/or flanges