

Pressure-limiting valve type DV, DVE and DF

Product documentation



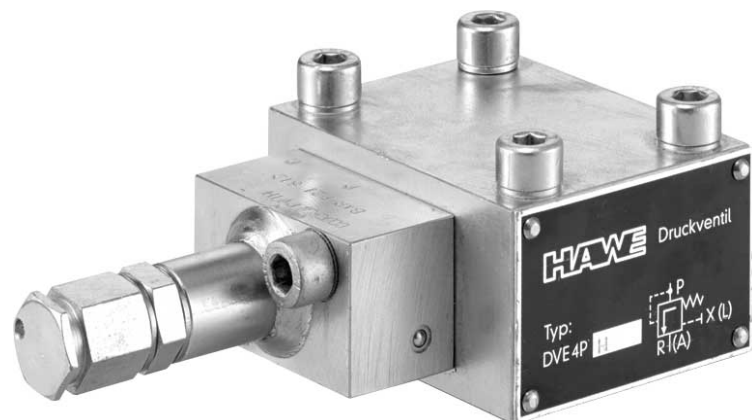
pilot-controlled

Operating pressure p_{\max} :

420 bar

Flow rate Q_{\max} :

120 lpm



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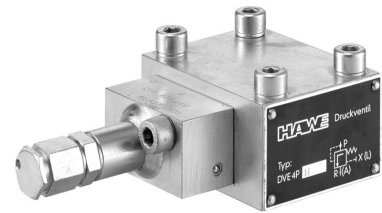
Pressure-limiting valves are a type of pressure control valve. They safeguard the system against excessive system pressure or limit the operation pressure.

Features and benefits:

- Various adjustment options
- Various additional functions

Intended applications:

- General hydraulic systems
- Test benches

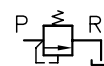


Pilot-controlled pressure control valve

2 Available versions, main data

2.1 Pilot-controlled pressure control valve

Circuit symbol:



Order coding example:

DV 3 G H R .. - WN 1 F - G 24 - 250

Pressure range [Table 4: Pressure range](#)

Solenoid voltage [Table 8: Solenoid voltage](#)

Arbitrarily switchable idle circulation [Table 7: Arbitrarily switchable idle circulation](#)

Orifices [Table 6: Orifices](#)

Adjustment [Table 5: Adjustment](#)

Pressure range [Table 4: Pressure range](#)

Line connection [Table 3: Line connection](#)

Size [Table 2: Size](#)

Basic type [Table 1: Basic type](#)

Table 1 Basic type

Basic type	Description
DV	Pressure control valve with internal control oil drain
DVE	Pressure control valve with external control oil drain
DF	Valve for remote control

Table 2 Size

Coding	Flow rate Q_{max} (lpm)
3	40
4	80
5	120

Table 3 Line connection

Coding	Description	Size		
		3	4	5
G	Pipe connection	G 1/2 (BSPP)	G 3/4 (BSPP)	G 1 (BSPP)
P	Manifold mounting	--	Ø13	Ø17

Table 4 Pressure range

Coding	Setting (bar)	Opening pressure for pump circulation (bar)
N	2 ... 100	2
H	5 ... 350 5 ... 420 (type DF)	5

For DF valves according to Table 1, the selection of "N" or "H" depends on the pressure range of the planned pilot valve PG 1 N or PG 1 H according to [Chapter 2.2, "Pilot valves"](#)

Table 5 Adjustment

Coding	Description
No designation	Series, fixed (tool adjustable)
R	Manually adjustable

Table 6 Orifices

Coding	Description
No designation	Normal design
B	with orifice disc (for DVE)

i NOTE
When using a DVE valve as switch-off valve, the amount of the control oil flow (see [Chapter 3, "Parameters"](#)) interferes, this can be reduced by the orifice disc to about 60%.

Table 7 Arbitrarily switchable idle circulation

Coding	Pump circulation, when	Pressure p_{max} (bar)
No designation	Without arbitrarily switchable idle circulation	--
WN 1 F	no current	350
WN 1 D	Valve at voltage	
WH 1 F	no current	420
WH 1 D	Valve at voltage	

i NOTE

- Directional seated valves, type WN 1 and WH 1 according to [D 7470 A/1](#) are used.

Circuit symbols

 Coding **WN 1 F, WH 1 F**

 Coding **WN 1 D, WH 1 D**

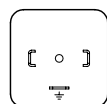

simplified circuit symbol for the total valve


Table 8 Solenoid voltage

Coding	Electrical connection	Nominal voltage	Protection class (IEC 529)
X 12	DIN EN 175 301-803 A (Coding G..., e.g. G 24, with line connector, coding L..., e.g. L 24, with LED in the line connector) Coding WG with alternating rectifier in the line connector	12 V DC	IP 65
X 24		24 V DC	
X 98		98 V DC	
X 205		205 V DC	
WG 110		110 V AC 50/60 Hz	
WG 230		230 V AC 50/60 Hz	

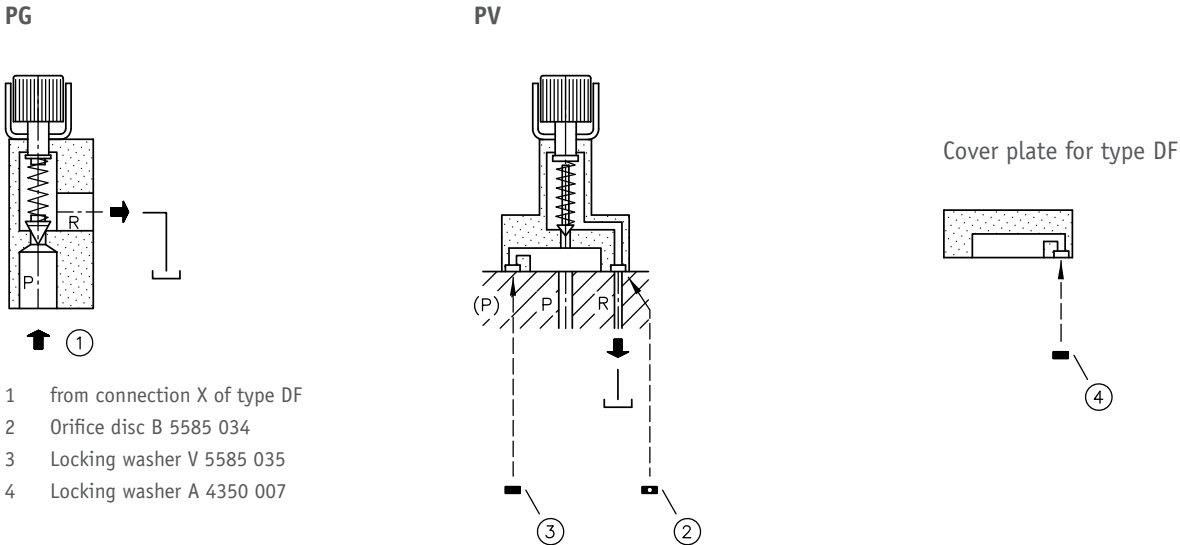
Electrical connection for actuating solenoid

G .., X .., L .., WG ..



2.2 Pilot valves

Structure (schematised)



Coding		Pressure	Pressure setting
Pipe connection	Manifold mounting	p_{max} (bar)	
PG 1 N	PV 1 N	2 ... 100	Fixed (tool adjustable)
PG 1 H	PV 1 H	5 ... 420	
PG 1 NR	PV 1 NR	2 ... 100	Manually adjustable
PG 1 HR	PV 1 HR	5 ... 420	

i NOTE

- Type PG 1.. for remote control of DF valves according to [Chapter 2.1, "Pilot-controlled pressure control valve"](#) via connection X ([Chapter 6.2, "Variations of pilot-controlled pressure control valves"](#), Figures 4a to 4c) and for additional pressure control for DV valves, see [Chapter 3, "Parameters"](#).
- Type PV 1.. is directly installed on DV, DVE valves according to [Chapter 2.1, "Pilot-controlled pressure control valve"](#), see also [Chapter 6.2, "Variations of pilot-controlled pressure control valves"](#), Figures 1a to 3b.
- If, with the use of switch-off valve DVE, the amount of the control oil flow interferes, it can be reduced to about 60% by orifice disc B 5585 034, see [Chapter 3, "Parameters"](#)
- When converting from DV to DVE valves, lock washer V 5585 035 must be used (see [Chapter 6.2, "Variations of pilot-controlled pressure control valves"](#), Figures 3a and 3b)

3 Parameters

General information

Designation	Type DV, DVE, DF: Pressure control valve, pilot-controlled Type PG, PV: Pressure-limiting valve
Design	Type DV, DVE, DF: Spool valve Type PG, PV: Seated valve
Model	Manifold mounting, pipe connection
Ports	P = Pressure oil inlet (pump) R = Reflux A = Consumer L = Drain port
Material	Steel; nitrided valve housing, hardened and ground functional inner parts
Installation position	As desired
Flow direction	from P → R (A)
Hydraulic fluid	Hydraulic oil: according to part 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity limits: min. approx. 4, max. approx. 1500 mm ² /s opt. operation approx. 10... 500 mm ² /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 <u>21/18/15...19/17/13</u>
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.
	<div style="border: 1px solid black; padding: 5px;"> <p>i NOTE With mounted solenoid valve and ambient temperature of above 35°C, observe the notes in D 7470 A/1 Chapter 2.2.1!</p> </div>

Pressure and flow rate

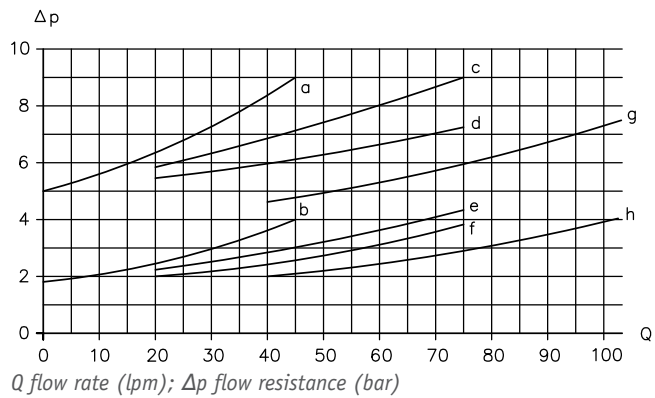
Operating pressure	P, R(A), X(L) = 420 bar
Flow rate	See " Table 2: Size "

Characteristics

Oil viscosity approx. 60 mm²/s

(= lowest pressure setting and circulation resistance DV...-WN(H)1F(D))

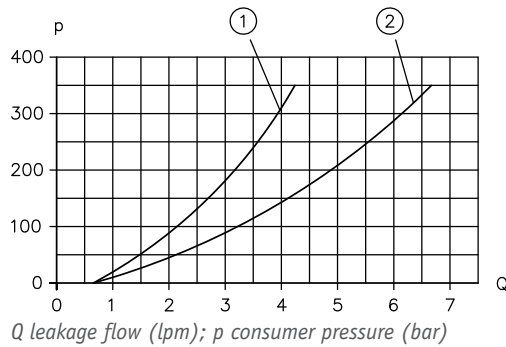
Δp -Q characteristics



- a) DV(E) 3 GH
- b) DV(E) 3 GN
- c) DV(E) 4 PH
- d) DV(E) 4 GH
- e) DV(E) 4 PN
- f) DV(E) 4 GN
- g) DV(E) 5 GH
DV(E) 5 PH
- h) DV(E) 5 GN
DV(E) 5 PN

Control oil flow in type DVE switch-off valve depends on consumer pressure.

The control oil flow increases with increasing consumer pressure, and in extreme cases with an opening pressure setting of 10 bar and a consumer pressure of 350 bar without orifice disc, it is approximately 6.5 lpm and with orifice disc approximately 4.3 lpm. Below the pressure setting, leakage is approximately 0.7 lpm regardless of the pressure setting.



- 1 Orifice disc in pilot valve
- 2 Normal design

Pressure adjustment

Coding	$\Delta p/U$
N	20 bar/U
H	70 bar/U

(see [Chapter 2.1, "Pilot-controlled pressure control valve"](#), Table 4)

Weight

Pilot-controlled pressure control valve

Type

DV 3 G, DVE 3 G, DF 3 G = 1.1 kg

DV 4 G, DVE 4 G, DF 4 G = 1.5 kg

DV 5 G, DVE 5 G, DF 5 G = 2.0 kg

DV 4 P, DVE 4 P, DF 4 P = 2.0 kg

DV 5 P, DVE 5 P, DF 5 P = 2.5 kg

with solenoid valve + 0.6 kg

Pilot valve

Type

PG 1 = 0.3 kg

PV 1 = 0.3 kg

4 Dimensions

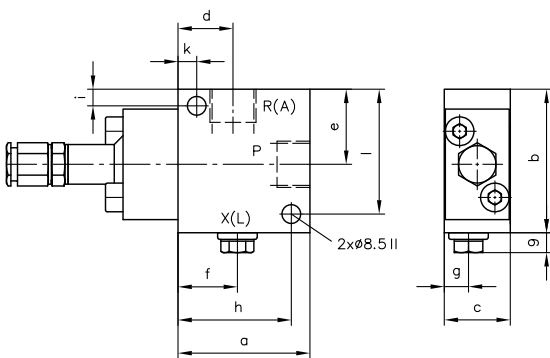
All dimensions in mm, subject to change.

4.1 Pilot-controlled pressure control valve

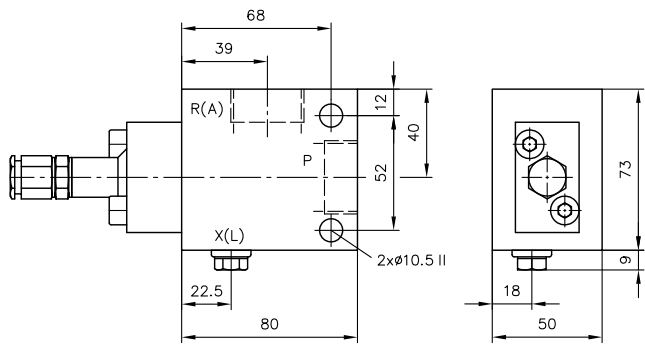
Pilot valve, see [Chapter 4.2, "Pilot valve for pressure control valves"](#)

4.1.1 Pipe connection

DV 3, DV 4
DVE 3, DVE 4
DF 3, DF 4



DV 5
DVE 5
DF 5

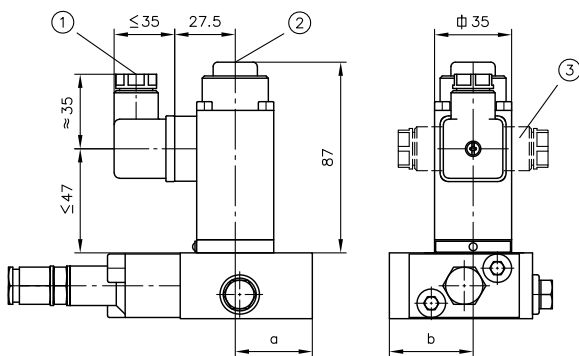


Size	a	b	c	d	e	f	g	h	i	k	l
3	60	65	30	25	34	27	11	51.5	7.5	8.5	56.5
4	65	71	40	26.5	39	25	15	55	10	7	60

Ports (ISO 228-1) (BSPP)

	P, R (A)	X (L)
3	G 1/2	G 1/4
4	G 3/4	
5	G 1	

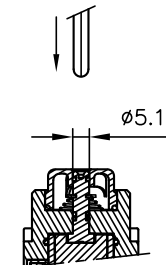
Version with arbitrarily switchable idle circulation valve



- 1 Cable fitting Pg 9
- 2 Manual override, see adjacent
- 3 Female connector can be mounted 90° to left or right

Manual override

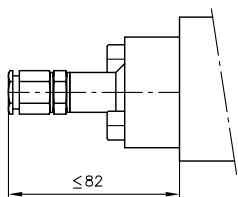
Auxiliary tool for actuation
(do not use any parts with sharp edges)



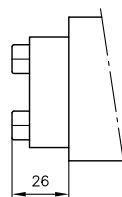
Size	a	b
3	35	38
4	41	46
5	41	49

Pilot valves

DV, DVE

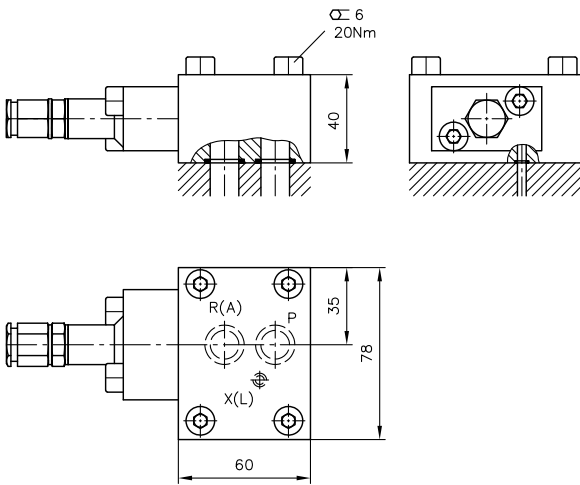


DF

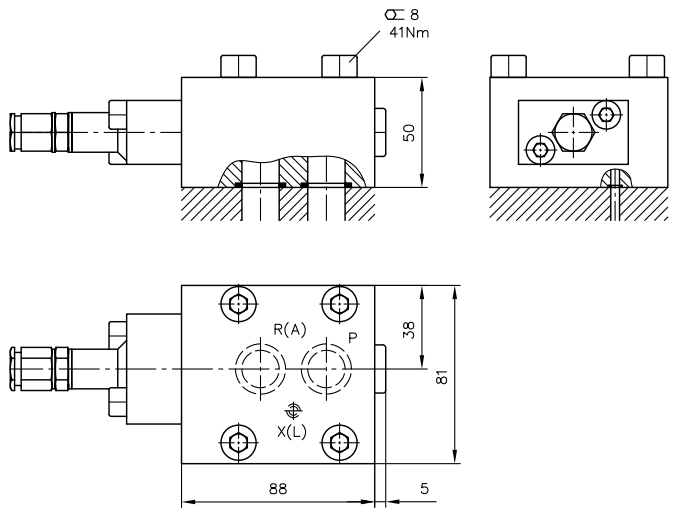


4.1.2 Manifold mounting

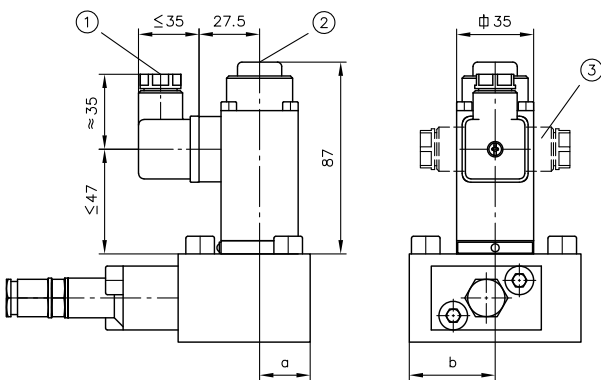
DV 4
DVE 4
DF 4



DV 5
DVE 5
DF 5



Version with arbitrarily switchable idle circulation valve

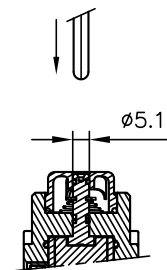


- 1 Cable fitting Pg 9
- 2 Manual override, see adjacent
- 3 Female connector can be mounted 90° to left or right

Size	a	b
4	23	39
5	38	44

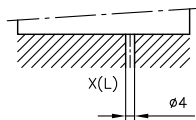
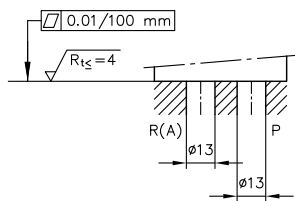
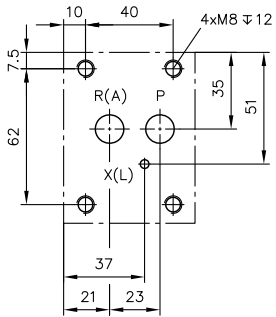
Manual override

Auxiliary tool for actuation
(do not use any parts with sharp edges)

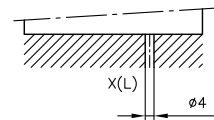
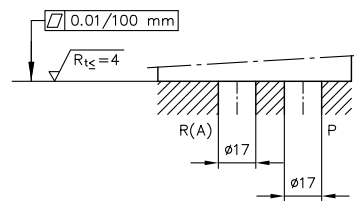
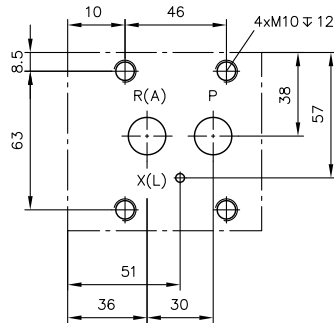


Base plate hole pattern

DV 4
DVE 4
DF 4

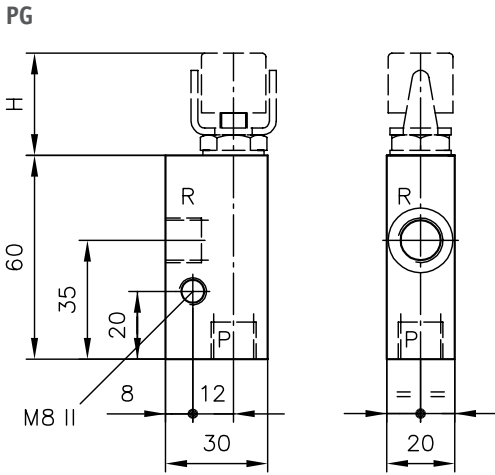


DV 5
DVE 5
DF 5

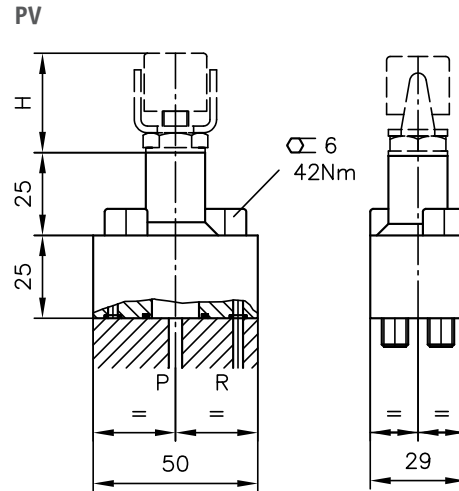


4.2 Pilot valve for pressure control valves

Pipe connection



Manifold mounting

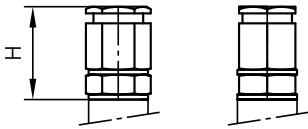


Ports (ISO 228-1) (BSPP)

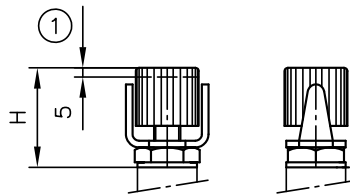
P, R	G 1/4
------	-------

Adjustment

Without designation
(fixed)



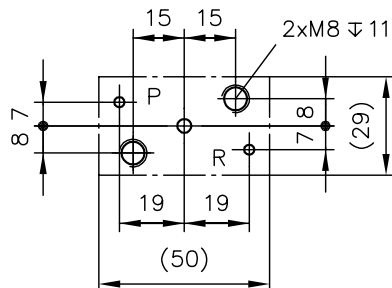
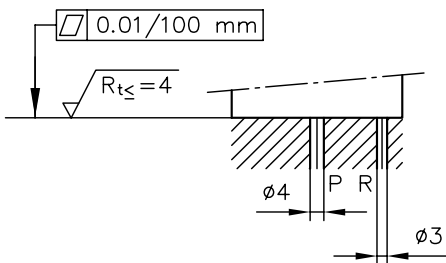
Coding R
(adjustable)



1 Adjustment travel

	H
Fixed	28
Adjustable	30

Base plate hole pattern



Sealing of the ports:

	O-ring
P	17.12x2.62 NBR 90 Sh
R	4.47x1.78 NBR 90 Sh

5 Assembly, operation and maintenance recommendations

5.1 Intended use

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

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

Essential requirements for the product to function correctly and safely:

- All information in this documentation must be observed. This applies in particular to all safety measures and warnings.
- The product must only be assembled and put into operation by qualified personnel.
- The product must only be operated within the specified technical parameters. The technical parameters are described in detail in this documentation.
- The operating and maintenance manual of the components, assemblies and the specific complete system must also always be observed.

If the product can no longer be operated safely:

1. Remove the product from operation and mark it accordingly.
- ✓ It is then not permitted to continue using or operating the product.

5.2 Assembly information

The product must only be installed in the complete system with standard and compliant connection components (screw fittings, hoses, pipes, fixtures etc.).

Reaction forces and reaction torques must not influence the valve.

The product must be shut down correctly prior to dismantling (in particular in combination with hydraulic accumulators).



DANGER

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

Risk of serious injury or death.

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

5.2.1 Creating the mounting hole

See description in [Chapter 4, "Dimensions"](#).

5.3 Operating instructions

Note product configuration and pressure / flow rate

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

i NOTE

- Read the documentation carefully before usage.
- The documentation must be accessible to the operating and maintenance staff at all times.
- Keep documentation up to date after every addition or update.

⚠ CAUTION

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

Risk of minor injury.

- Always monitor the pressure gauge when setting and changing the pressure.

Purity and filtering of the hydraulic fluid

Fine contamination can significantly impair the function of the hydraulic component. Contamination can cause irreparable damage.

Examples of fine contamination include:

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

i NOTE

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

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

Additionally applicable document: [D 5488/1](#) Oil recommendations

5.4 Maintenance information

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

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

6 Other information

6.1 Functional description

- **Pressure-limiting valves** serve as protection against impermissible maximum pressures (safety valves) or to limit the maximum permissible operation pressure. They keep the inlet closed against the outlet and release when the set pressure value is released. This pressure value remains largely constant due to the large, available flow cross sections, regardless of the amount of the flow rate.
- **Sequence valves** maintain a constant pressure difference between inlet and outlet, also largely independent of the amount of the passing oil flow.
- **Switch-off valves** block the volume flow until a set pressure value is reached, in order to allow passage above that pressure without any significant intrinsic resistance.

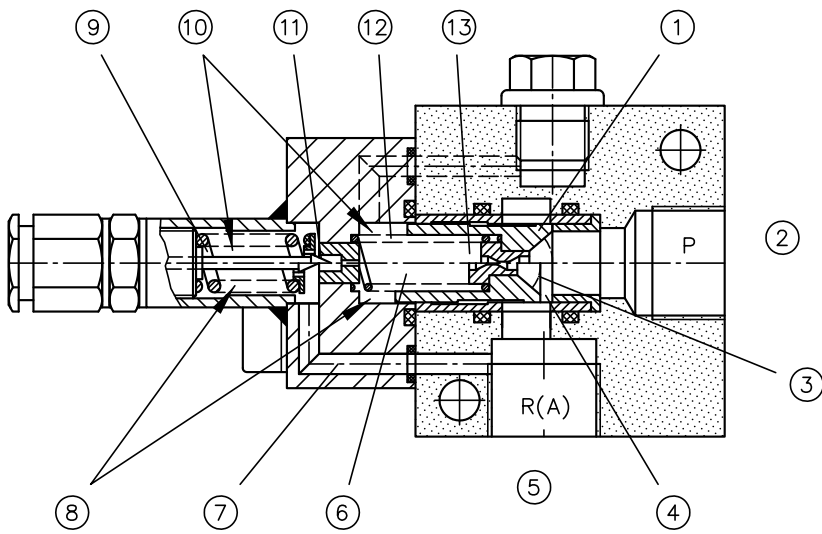
Type DV, DVE or DF pressure control valves are hydraulically pilot-controlled. They consist of main and pilot parts. The function elements of the main valve are the low friction guided piston **1**, which is in a sleeve with low friction and is pressure-compensated via a throttle point **13**. In the closed state it is held in the closed position by the spring **12**, blocking the inlet P against the radially discharged outlet R (A).

At the flanged pilot valve, the valve cone **11** blocks the spring cavity (control cavity) **6** against the outlet channel **7**. The response pressure of the valve is specified with spring **9**. When it is reached, the valve cone **11** opens and oil begins to flow: Inlet P → throttle point **13** → Valve cone **11** → Outlet channel **7** (control oil flow). At the throttle point, this creates a flow resistance, by which the input-side pressure is higher than in the control cavity **6**. Its force moves the piston **1** against the spring **12** so far, until again the forces between the flow resistance before the throttle body **13** and the spring **12** reach equilibrium. The pump delivery flow then flows via throttle gap **4** released in this operating state to the outlet R(A), reduced by the control oil flow and is there relaxed at the pressure at R(A). The preload force of the spring **12** is chosen so small that for the two pressure ranges adjustable with the spring **9** up to 100 or 420 bar, a flow resistance of only 2 or 5 bar, respectively, occurs.

Depending on the discharge of the control oil flow internally to R(A) or externally via X(L), the function of the valve results as a pressure-limiting valve or sequence valve or as a switch-off (control) valve, see above and schematic diagrams in [Chapter 6.2, "Variations of pilot-controlled pressure control valves"](#). By connecting additional valves to the control cavity, the valves can also be switched arbitrarily, for example to pump circulation, different pressure stages, etc., see circuit examples [Chapter 6.3, "Circuit examples"](#).

Pilot-controlled pressure-limiting valve

Main valve



- 1 Valve piston with liner, paired
- 2 Input
- 3 Screen filter to protect the throttle body from occasional, coarse dirt particles
- 4 Throttle gap P → R(A) for pump delivery flow
- 5 Output
- 6 Control cavity
- 7 Outflow channel in pilot valve
- 8 Lower side drawn in operating position
- 9 Adjusting spring of the pilot valve
- 10 Upper side drawn at rest
- 11 Valve cone of pilot valve
- 12 Valve spring
- 13 Throttling point

6.2 Variations of pilot-controlled pressure control valves

Function	Image	Description	Circuit symbol	Assembly
Pressure-limiting valve	1a	Control oil discharge: internal Avoid backpressure at R, otherwise external control oil discharge as in Fig. 3a		Order coding example: DV 4 PHR - 280 1 Pilot valve type PV 2 Release (remote control)
Sequence valve	1b	Control oil discharge: internal The valve is placed in the load line		 1 Pilot valve type PV 2 Release (remote control)
Pressure-limiting valve with 2/2 directional valve for electrically controllable, arbitrary idle circulation	2	Control oil discharge: internal Avoid backpressure at R, otherwise do not connect to the main return, instead guide with own return around tank		Order coding example: DV 5 GNR - WN1F - G 24 - 90 1 Pilot valve type PV 2 Release (remote control) 3 solenoid valve
Pressure-limiting valve	3a	Control oil discharge: external Back pressure at R has no influence on pressure setting		Order coding example: DVE 4 PHRB - 250 1 Pilot valve type PV 2 leakage oil 3 Lock washer 4 Orifice disc possible for switch-off valve
Control valve (switch-off valve)	3b	Control oil discharge: external Orifice only if leakage flow too high (Chapter 3, "Parameters")		 1 Pilot valve type PV 2 leakage oil 3 Lock washer 4 Orifice disc possible for switch-off valve

Function	Image	Description	Circuit symbol	Assembly
Pressure-limiting valve	4a	Control oil discharge: external The pilot valve is a pressure control valve according to Chapter 2.2, "Pilot valves" . If the back pressure of the pilot valve is variable or high, guide directly into the oil container.		Order coding example: DF 5 GN The type and connection of the pilot valve (pressure control or directional valve) determine the function of the remote-controlled main valve
Sequence valve	4b	Control oil discharge: external The pilot valve is a pressure control valve according to Chapter 2.2, "Pilot valves" .		
Control valve (switch-off valve)	4c			
2/2 directional valve (drain valve or flow valve)	4d	Control oil discharge: external The pilot valve is a 2/2 directional valve, type WN (H) 1D according to D 7470 A/1 .		

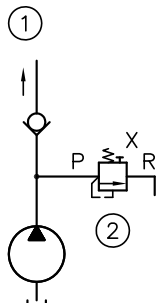
- 1 Pilot valve PG 1 (see [Chapter 2.2, "Pilot valves"](#))
- 2 Feed line
- 3 Discharge
- 4 End plate with orifice disc

- 1 Pilot valve according to [D 7470 A/1](#)
- 2 Feed line
- 3 Discharge
- 4 End plate with orifice disc

6.3 Circuit examples

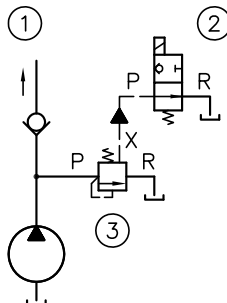
for [Chapter 6.2, "Variations of pilot-controlled pressure control valves"](#)

Example for Figure 1a



- 1 To the consumer
- 2 Type DV

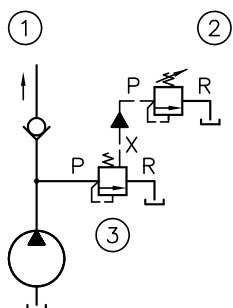
Use as a pressure-limiting valve



- 1 To the consumer
- 2 Pilot valve, type WN1F according to [D 7470 A/1](#)
- 3 Type DV

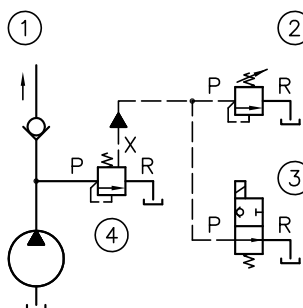
Use as a pressure-limiting valve with remote-controlled idling circuit for the pump

Example for Figure 4a



- 1 To the consumer
- 2 Type PG 1..
- 3 Type DF

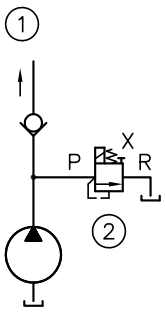
Pilot valve installed, for example, on the control panel



- 1 To the consumer
- 2 Type PG 1..
- 3 Pilot valve, type WN1F according to [D 7470 A/1](#)
- 4 Type DF

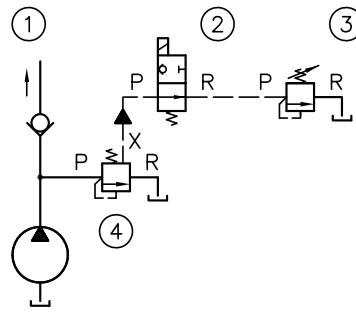
Use as a pressure-limiting valve with pressure fine setting and remote-controlled idling circuit for the pump

Example for Figure 2



- 1 To the consumer
- 2 Type DV

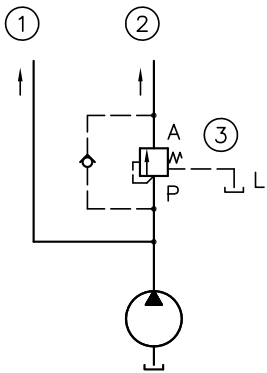
Use as a pressure-limiting valve with additional electrical idle circuit



- 1 To the consumer
- 2 Pilot valve, type WN1F according to [D 7470 A/1](#); type WN1F-1/4V(R)- .. can also be used
- 3 Low pressure type PG 1 ..
- 4 High pressure type DV

Electrical control of two pressures and additional electrical idle circuit

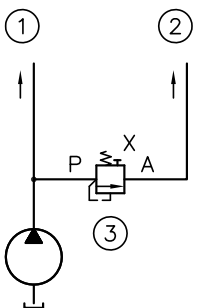
Example for Figure 3b



- 1 Consumer circuit 1
- 2 Consumer circuit 2
- 3 Type DVE

If the two consumer circuits are controlled by a common directional valve, the return flow to consumer circuit 2 must be enabled by a check valve (dot-dash line).

Example for Figure 1b



- 1 Consumer circuit 1
- 2 Consumer circuit 2
- 3 Type DV

Generation of a constant pressure difference between consumer circuit 1 and 2. If at X a 2/2 directional pilot valve (for example, according to [D 7470 A/1](#) with orifice!) is connected in the direction of the tank, then consumer circuit 2 can optionally be operated at the same pressure as 1 (minus the opening resistance according to Δp -Q characteristics)

Further information

Additional versions

- Pressure-limiting valve type MV, SV and DMV: D 7000/1
- Pressure control valve type CMV, CMVZ, CSV and CSVZ: D 7710 MV
- Proportional pressure-limiting valve type PMV and PMVP: D 7485/1
- Proportional pressure-limiting valve type NPMVP: D 7485 N
- Proportional pressure-limiting valve type PDV and PDM: D 7486