

Piloted pressure valves type DV, DVE, DF

and pilot valves type PV and PG

Pressure p_{max} = 420 bar
Flow Q_{max} = 120 lpm

1. General

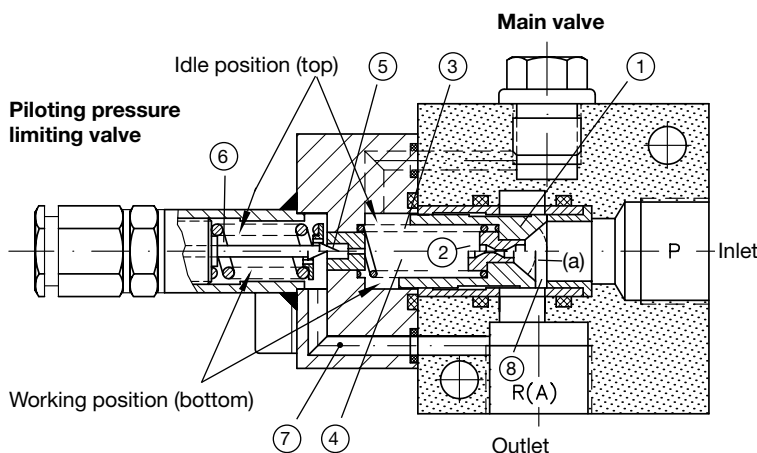
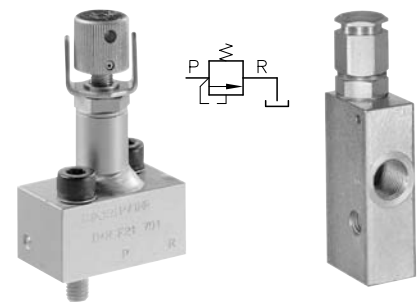
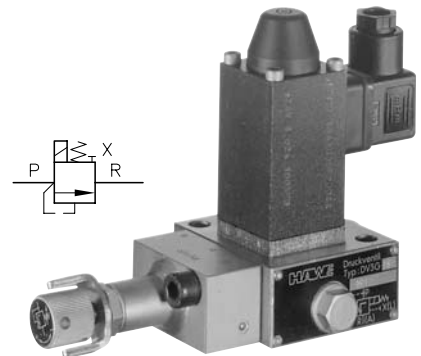
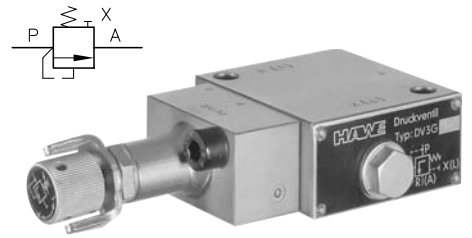
The main purpose of pressure valves is to rule the pressure in hydraulic systems (acc. to DIN ISO 1219-1).

- **Pressure limiting valves** serve to protect hydraulic systems from unpermissible peak pressures (safety valves) or to limit the max. permissible working pressure. They close the inlet to the outlet and only give way if the set pressure is achieved. This pressure setting is maintained rather constant, independent from the flow, due to the generous internal diameters.
- **Pressure sequence valves** maintain a constant pressure difference, rather independent from the flow quantity, between inlet and outlet.
- **Feed valves** block the flow until the set pressure is achieved and then when this figure is exceeded they do open and allow the flow to pass with very little back pressure.

Pressure valves type DV, DVE or DF are hydraulically piloted. They consist of a main and a pilot valve. The main valve has a spool ① sliding rather frictionless in a bushing and is pressure compensated via the throttle ②. It is forced in closed idle position via a spring ③ blocking inlet P to the outlet R(A).

The spring cavity (control cavity) ④ is blocked to the outlet duct ⑦ by means of valve cone ⑤ at the piloting valve. The spring ⑥ rules the response pressure of the valve. As soon as this pressure is reached oil starts to flow: Inlet P → throttle ② → valve cone ⑤ → outlet ⑦ (control oil flow). The pressure within the control cavity ④ is higher due to the back pressure generated at throttle ② which adds to the inlet pressure. This hydraulic force pushes the piston in direction of the spring until the spring force and the back pressure occurring ahead of the throttle are balanced again. The oil flow leaving port R(A) is depressurized to the set value by the throttling section ⑧ whose cross section area is ruled by the foresaid forces. This flow is only slightly reduced by the required control oil. The back pressure of the two pressure ranges (up to 100 and up to 420 bar) available is only 2 or 5 bar, due to the low pre-load of the spring.

Valve type DV may be a pressure limiting, a pressure sequence or a feed valve only depending on whether the control oil flow is fed to R(A) or to X(L) (see above and schematic drawing at sect. 2.3). The valve can be arbitrarily operated, e.g. idle pump circulation, various pressure steps, etc. when additional valves are connected to the control cavity, see also sect. 5.1).



- ① Valve piston and bushing (mated)
 - ② Throttle
 - ③ Valve spring
 - ④ Control cavity
 - ⑤ Valve cone (piloting valve)
 - ⑥ Adjustment spring (piloting valve)
 - ⑦ Drain duct (piloting valve)
 - ⑧ Throttle section for pump delivery P → R(A)
- (a) Screen filter, protecting the throttle section from coarse contaminations that may occur

2. Types available, main data

2.1 Piloted pressure valves (For pilot valves see sect. 2.2)

Coding example: **DV 3 GHR .. - WN 1F - G 24 - 250**

Table 1: Basic type

Coding	Valve type
DV	Pressure valve with internal leakage oil drain
DVE	Pressure valve with external leakage oil drain
DF	Remote-control valve (remote-control press. compensator)

Table 2: Size

Coding	3	4	5
Flow Q_{max} (l/min)	40	80	120

Table 3: Connection mode

Coding	Connection	Size		
		3	4	5
G	Pipe connection	G 1/2 DIN ISO 228/1	G 3/4 (BSPP)	G 1 (BSPP)
P	Manifold mounting	---	For ports, see dimens. draw.	

Table 4: Pressure range (guideline figures) the lower figure depends on the flow (see sect. 3)

Coding	N	H	Piloting valve PG 1N(H) (acc. to sect. 2.2) determines the pressure range, when selecting „N“ or „H“ for valves type DF.
Setting ¹⁾ from ... to ... (bar)	2 ... 100	5 ... 350 5 ... 420 ²⁾	
Opening pressure in no-load operat. (bar) pump idle circulation	2	5	

2.2 Servo valves (pilot valves)

Layout (schematic)	Coding				Remarques
	Pipe connection	Manifold mounting	Pressure range (bar)	Pressure setting ¹⁾	
	PG 1 N	PV 1 N	2 ... 100	Tool adjustable, adjust. after loosening the lock nut	Type PG 1 ... serves for remote control of valves type DF acc. to 2.1 via port X (see sect. 2.3, illustrations 4a to 4c) and for additional pressure control of valves type DV (see sect. 3) Type PV 1 is mounted directly onto valve type DV(E) acc. to sect. 2.1, see also sect. 2.3, illustrations 1a to 3b
	PG 1 H	PV 1 H	5 ... 420		
	PG 1 NR PG 1 NF	PV 1 NR PV 1 NF	2 ... 100	Adjustable via turn knob or spherical push button (see table 5)	
	PG 1 HR PG 1 HF	PV 1 HR PV 1 HF	5 ... 420		
	When DV valves are changed over to DVE valves, a plug disk (V 5585 035) must be inserted (refer to sect. 2.3. illustrations 3a and 3b)				If type DVE is utilized as feed valve, orifice disc B 5585 034 will reduce the required control oil flow by approx. 40 % (see sect. 3).
	A 4350 007 Only necessary for converting versions DV or DVE to version DF, see also table 7 and ²⁾ from port X of version DF . .				

¹⁾ Customer-made pressure settings or pressure adjustments must be monitored with a pressure gauge!
²⁾ See table 7 as well; if valve type DF.. acc. to table 1 is intended for this pressure range, pls. state: DF..-420

Pressure spec. in bar, refer also to table 4

Table 7: Optional directly mounted 2/2-way solenoid valve acc. to D 7470 A/1 for solenoid actuated, arbitrary idle pump circulation. no valve = coding superfluous

Coding	Idle pump circulation,	Pressure range up to ... (bar) (see table 4)	Tension nominale					
			G 12	G 24	G 98	G 205	WG 110	WG 230
WN 1F	valve de-energized	350	12V	24V	98V	205V	110V	230V
WN 1D	valve ener-gized		DC	AC 50 and 60 Hz				
WH 1F	valve de-energized	420	For other further voltages and plug versions see D 7470 A/1					
WH 1D	valve energized							

Table 6: Orifice disc

No coding	Standard version	If the leakage oil level causes difficulty when a DVE valve is employed as a sequence valve (refer to sect. 3), this can be reduced to approx. 60 % by the orifice plate.
B	With orifice disc (only DVE)	

Table 5: Adjustability during operation

No coding	Standard, tool adjustable
R	Manually adjustable
F	Pin head Spherical push button

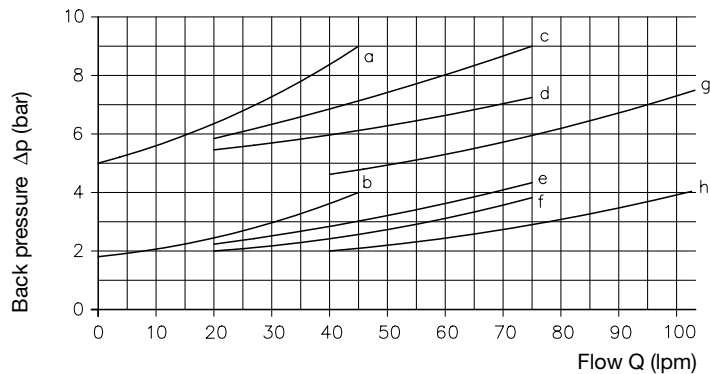
2.3 The various types of pilot-controlled pressure valves (see also circuit diagrams in appendix sect. 5.1)

Layout (schematic) Main valve and servo valve form a structural unit	Fig.	Function	Symbol	Control oil drain and notes
<p>Coding example: DV 4 PHR - 280</p>	1a	Pressure limiting valve		Control oil drain: internal Avoid back pressure at R, otherwise external control oil drain ill. 3a
	1b	Sequence pressure valve		Control oil drain: internal Valve ist installed in line to consumer
<p>Coding example: DV 5 GNR - WN1F - G 24 - 90</p>	2	Pressure limiting valve with 2/2-way valve for solenoid actuated, arbitrary idle pump circulation		Control oil drain: internal Avoid back pressure at R, if necessary do not connect to main return line but fit separate return line to tank
<p>Coding example: DVE 4 PHRB - 250</p>	3a	Pressure limiting valve		Control oil drain: external Back pressure at R does not affect value of pressure setting
	3b	Follow up valve (sequence valve)		Control oil drain: external Use orifice plate only if drain flow rate to high (sect. 3). Use adjust knob to set higher actuat. force!
<p>Coding example: DF 5 GN</p> <p>The function of the remote-controlled piston valve is determined by the type and connection of the servo valve (pressure- or direct. control valve)</p>	4a	Pressure limiting valve		Control oil drain: external The servo valve is a pressure valve to sect. 2.2. If the back pressure is high or variable run servo valve return line directly the oil reservoir.
	4b	Differential pressure valve		Control oil drain: external The servo valve is a pressure valve to sect. 2.2.
	4c	Follow up valve (sequence valve)		Control oil drain: external The servo valve is a pressure valve acc. to sect. 2.2.
	4d	2/2-way valve (drain or straight way valve)		Control oil drain: external The pilot valve is a 2/2-way-valve type WN(H)1D acc. D 7470 A/1

3. Additional parameters

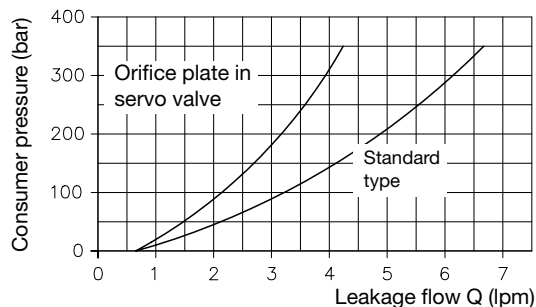
Nomenclature	Piloted pressure valve, symbol see section 2.3	Servo valve, symbol see section 2.3														
Design	Spool valve	Seated valve														
Type of mounting	2 thru-holes in housing	Tapped hole in housing														
Connection size conforming DIN ISO 228/1 (BSPP)	Pipe thread G 1/2, G 3/4, G 1 (BSPP) or manifold mounting	Pipe thread G 1/4 (BSPP) (PG 1..) manifold mounting (PV 1..)														
Mass (weight)	Size and design															
	<table border="1"> <tr> <td>...3G</td> <td>...4G</td> <td>...5G</td> <td>...4P</td> <td>...5P</td> <td>PG 1..</td> <td>PV 1..</td> </tr> <tr> <td>1.1 kg</td> <td>1.5 kg</td> <td>2.0 kg</td> <td>2.0 kg</td> <td>2.5 kg</td> <td>0.3 kg</td> <td>0.3 kg</td> </tr> </table>	...3G	...4G	...5G	...4P	...5P	PG 1..	PV 1..	1.1 kg	1.5 kg	2.0 kg	2.0 kg	2.5 kg	0.3 kg	0.3 kg	
...3G	...4G	...5G	...4P	...5P	PG 1..	PV 1..										
1.1 kg	1.5 kg	2.0 kg	2.0 kg	2.5 kg	0.3 kg	0.3 kg										
	add. 0.6 kg for solenoid valve															
Installed position	Any															
Direction of flow	P → R (A)															
Operating pressure	P, R(A) and X(L) = 420 bar															
Pressure 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 for biological degradable pressure fluids types HEPG (Polyalkylenglycol) and HEES (Synth. Ester) at service temperatures up to approx. +70 °C															
Temperature range	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 Biological degradable pressure fluids: Observe manufacturer's specifications. Considering the compatibility with seal material not over +70 °C. Observe the additional information in D 7470 A/1 sect. 2.2.1, when a solenoid valve is mounted and the ambient temperature is higher than 35 °C.															

Curves
(= lowest adjustable pressure as well as back pressure with valves DV...-WN(H)1F(D))



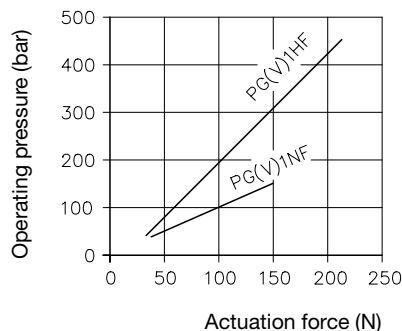
- a) DV(E) 3 GH
- b) DV(E) 3 GN
- c) DV(E) 4 PH
- d) DV(E) 4 GH
- e) DV(E) 4 PN
- f) DV(E) 4 GN
- g) DV(E) 5 GH
- DV(E) 5 PH
- h) DV(E) 5 GN
- DV(E) 5 PN

Control oil flow in feed valves depends on the consumer pressure.



The leakage flow increases as the consumer pressure rises, and in the extreme case amounts to about 6.5 lpm without the orifice disc, or about 4.3 lpm with the disc, (applies to a cracking pressure setting of 10 bar and a consumer pressure of 350 bar). At pressure below the set value, the leakage rate amounts to about 0.7 lpm, independant from the pressure setting.

Actuation force with spherical push button



Pressure adjustment (without coding or coding R acc. to table 5)

Coding (table 4)	Δp/turn
N	20 bar/turn
H	70 bar/turn

Oil viscosity during measurement 60 mm²/s

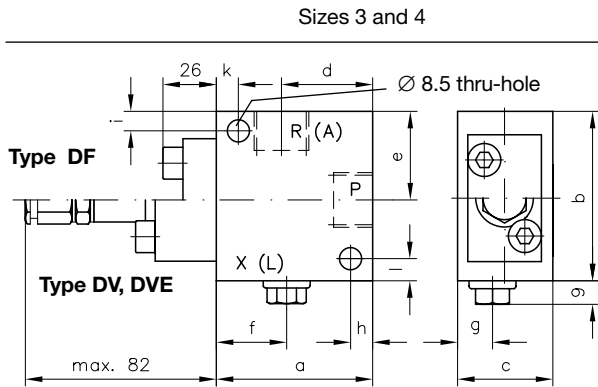
4. Dimensions of units

All dimensions in mm. Subject to change without notice!

4.1 Pressure valves without built-on solenoid control valve

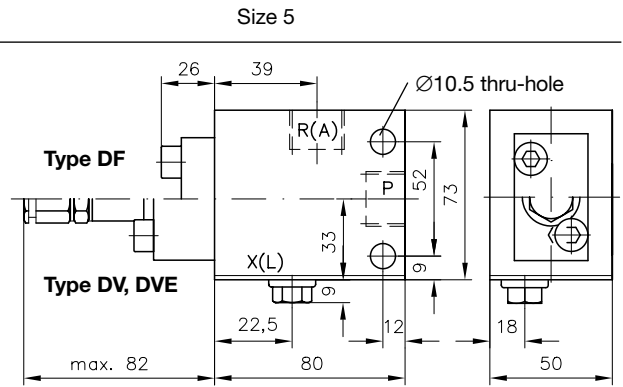
Servo valves or cover plates see section 4.3 and 4.4

For threaded connections



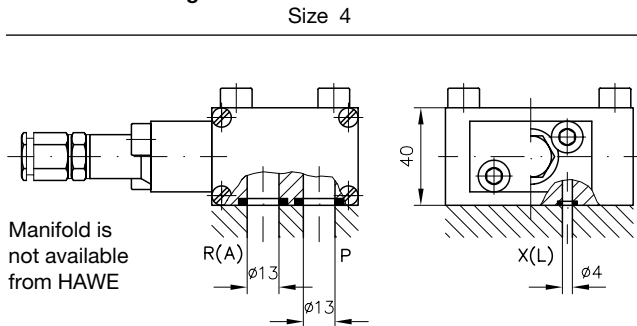
Size	a	b	c	d	e	f	g	h	i	k	l
3	60	65	30	35	34	27	11	8.5	7.5	8.5	8.5
4	65	71	40	38.5	39	25	15	10	10	7	11

Ports acc. to. P, R(A) = G 1/2 Size 3
 DIN ISO 228/1 G 3/4 Size 4
 (BSPP): X(L) = G 1/4 all sizes

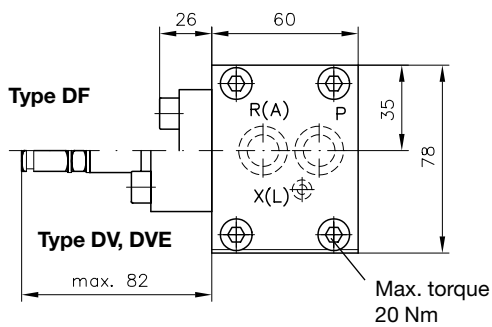


Ports acc. to. P, R(A) = G 1
 DIN ISO 228/1 X(L) = G 1/4
 (BSPP):

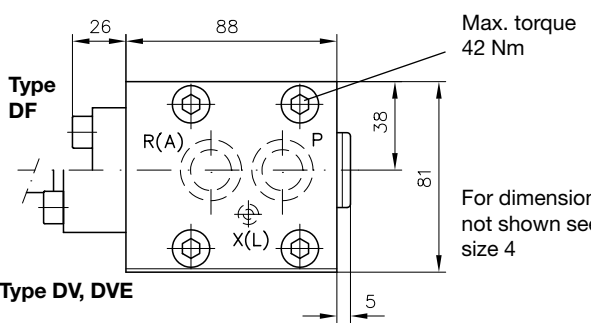
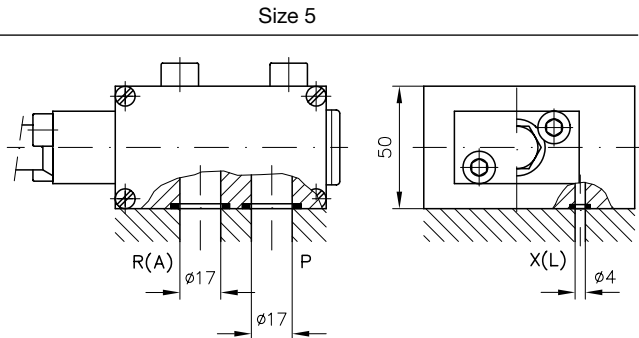
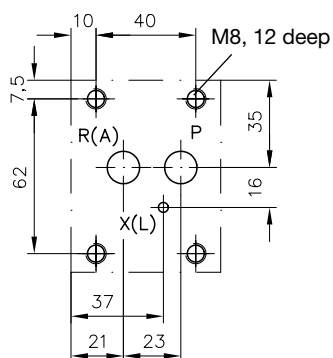
Manifold mounting



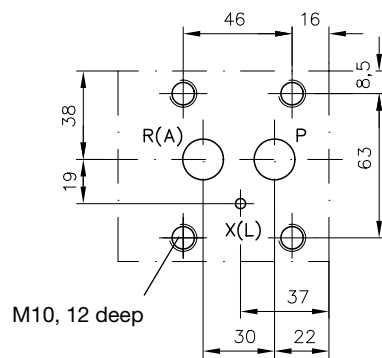
Manifold is not available from HAWE



Hole pattern of the base plate (top view)



Hole pattern of the base plate (top view)



4.2 Pressure valves with built-on solenoid valve type WN(H) 1F(D) acc. to D 7470 A/1

Missing dates: Main valves see sect. 4.1
2/2-way solenoid valve see D 7470 A/1

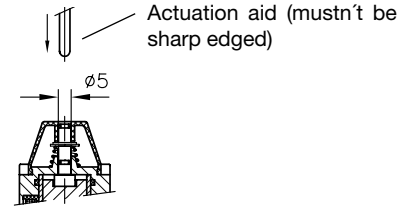
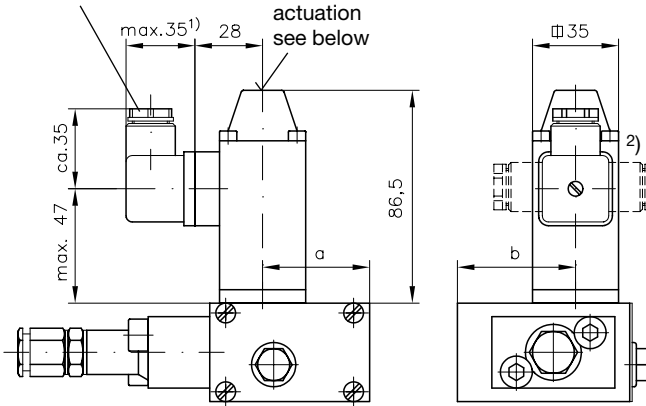
Pipe connection

Size 3, 4 and 5

Cable gland
Pg 9

For manual
emergency
actuation
see below

Manual emergency actuation



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

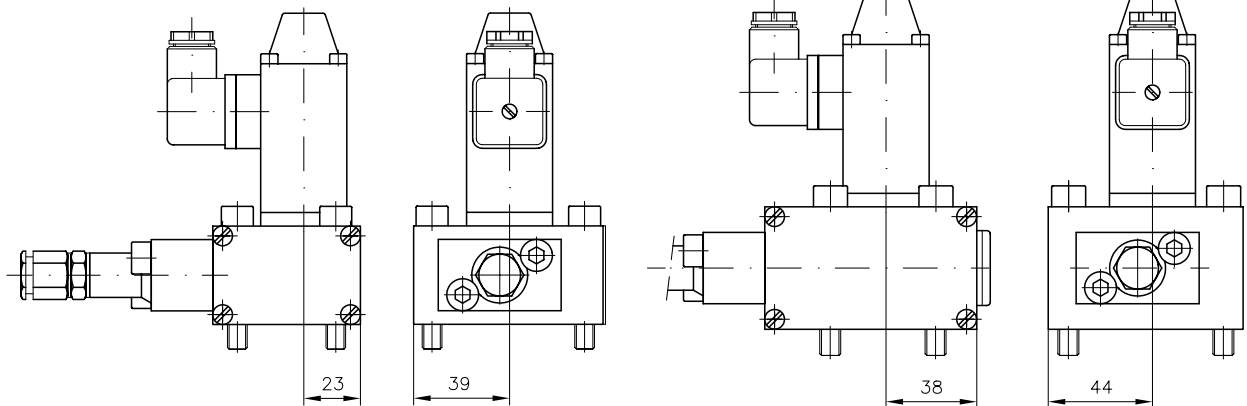
1) This dimension depends on the manufacturer and may be up to 40 mm acc. to DIN 43650

2) Plug may be rotated by 90° to the right or left side

Manifold mounting

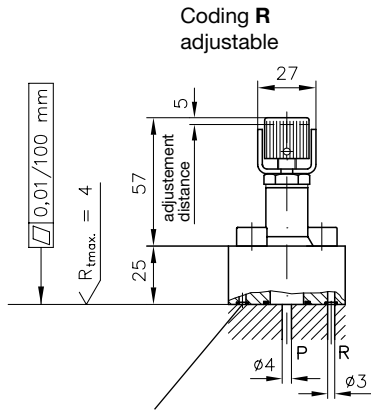
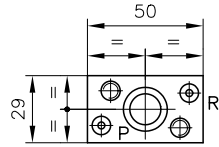
Size 4

Size 5



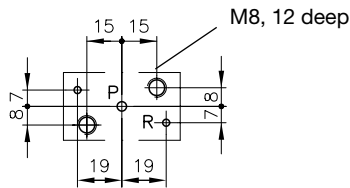
4.3 Servo valve for pressure valves

Manifold mounting (type PV 1..)

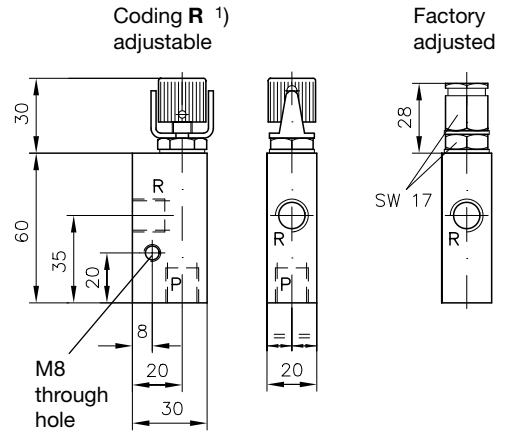
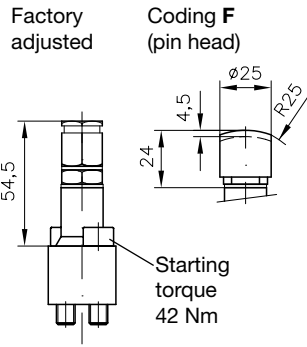


P = 17.12x2.62 NBR 90 Sh
R = 4.47x1.78 NBR 90 Sh (2 x)

Hole pattern of the manifold (top view)



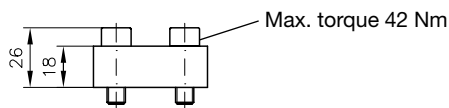
Pipe connection (type PG 1..)



Ports DIN ISO 228/1 (BSPP):
P and R = G 1/4

1) For missing dimensions (also coding F), see below !

4.4 Blanking plate (A 4350 007)

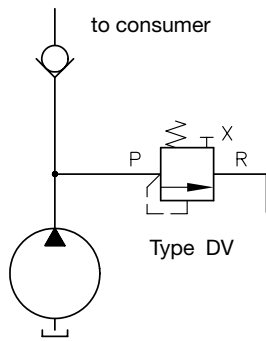


For missing dimensions, see above !

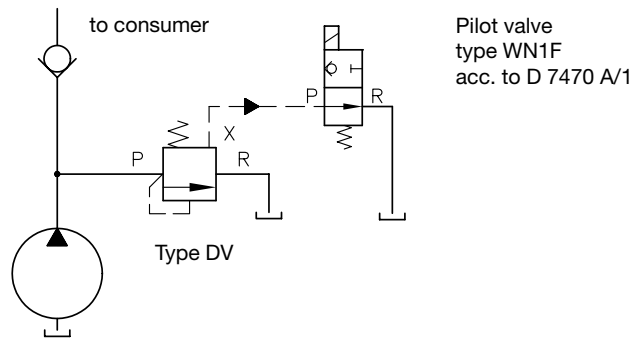
5. Appendix

5.1 Typical circuit diagrams for sect. 2.3

Circuit diagram for picture 1a

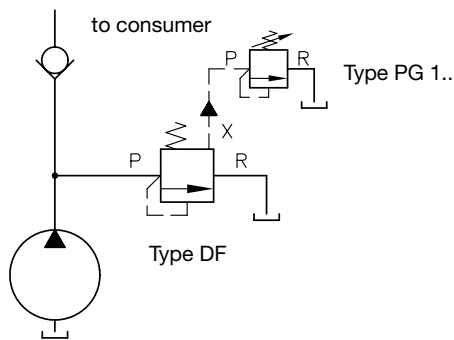


Use as pressure limiting valve

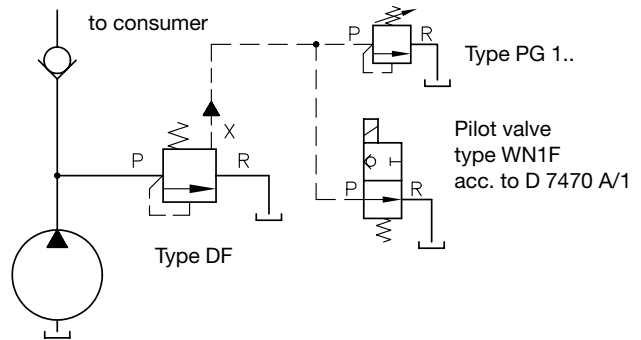


Use as a pressure limiting valve with remote-controlled idle connection for the pump

Circuit diagram for picture 4a

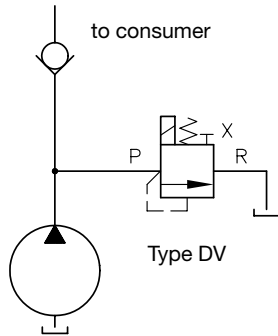


The pilot valve can be installed at the control desk for example

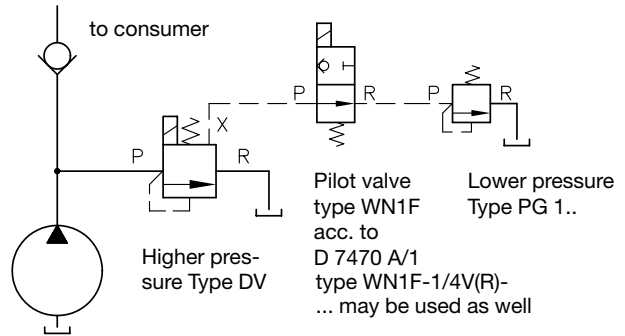


Use as a pressure limiting valve with remote adjustment of pressure and idle connection for the pump

Circuit diagram for picture 2

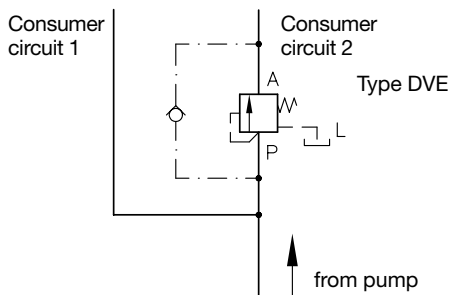


Use as a pressure limiting valve with additional electrical idle connection



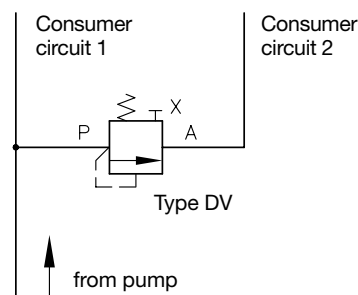
Electrical control of two different pressures and additional electrical idle connection

Circuit diagram for picture 3b



If the two consumer circuits are controlled by a common directional control valve, a check valve (dot-dash line) should be fitted to provide for the return flow from circuit 2.

Circuit diagram for picture 1b



Provision of a constant pressure difference between consumer circuit 1 and 2, if a 2/2-way pilot valve (e.g. to 7470 A/1 with orifice!) is fitted at X leading to the tank, consumer circuit 2 can be operated at same pressure as circuit 1 if required (less the opening resistance in accordance with the $\Delta p - Q$ characteristics).