

# Directional seated valves in a twin compact design type VZP 1

solenoid actuated, zero leakage,  
mounting on manifolds

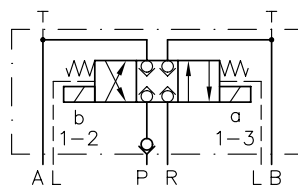
Operating pressure  $p_{\max}$  = 450 bar  
Flow  $Q_{\max}$  = 15 lpm

For directional valve banks type BVZP 1 see D 7785 B

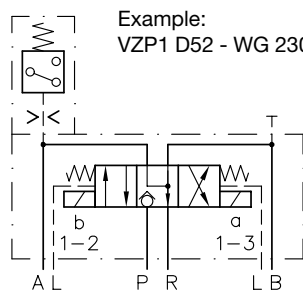


## Symbols

4/3- and 4/4-way directional seated valve  
Example: VZP1 G22 - G 24

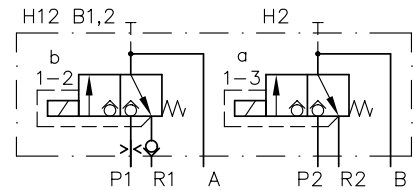


4/3-way directional seated valve with pressure switch  
Example: VZP1 D52 - WG 230



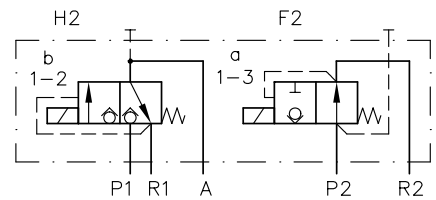
2 x 3/2-way directional seated valves

Example: VZP1 H12 B1,2 H2 - G 24



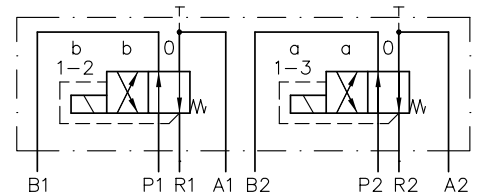
1 x 3/2- and 2/2-way directional seated valve (2/2-way for idle circulation)

Example: VZP1 H2 F2 - G 24

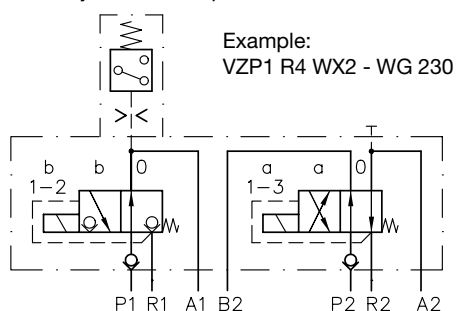


2 x 4/2-way directional spool valve

Example: VZP1 W2 W2 - G 24



1 x 3/2-way directional seated and 4/2-way directional spool valve



## 1. General information

The directional seated valves type VZP serve to control the movement direction (ahead -- stop -- back) of single and double acting consumers in hydraulic systems.

These valves are designed as manifold mounting valves.

Their compact design enables valve banks i.e. hydraulic controls with very little spatial requirements. The various versions of these valves as valve banks type BVZP 1 are detailed in D 7785 B.

The following flow pattern symbols are available with the directional valves type VZP 1:

- 4/3- and 3/3-way function, cone seated valve design
- Two independently acting 3/2- or 2/2-way functions, ball seated valve design
- Two independently acting 4/2-way functions, spool valve design

Main advantage, when compared to valves with similar function, is the unique two in one solenoid design (two coils share one housing). This allows significant downsizing of the complete valve.

All cone and ball seated valves show zero leakage in blocked state.

## 2. Available versions, main data

(for complete type overview, see sect. 6)

### 2.1 4/3 (4/4)- or 3/3 (3/4)-way directional seated valves up to 400 bar

For the actuation of a double or one single-acting consumer.

The control of the two solenoid coils takes place alternately to achieve either switching positions a (1-3) or b (1-2). When one coil is used only, it may be energized permanently, as long as the ambient temperature is below approx. 40°C. A reduced duty cycle applies if both coils are energized (switching position a (1-2) + b (1-3)) or the ambient temperature is higher (see sect. 3.2).

Order examples: **VZP 1 G 22 - G 24**

4/3(4/4)-way directional seated valve, basic version

**VZP 1 D 45 B1,2 - WG 230**

4/3(4/4)-way directional seated valve with pressure switches for ports A and B as well as throttle in port P

**VZP 1 J 2 - G 12**

3/3(3/4)-way directional seated valve, basic version

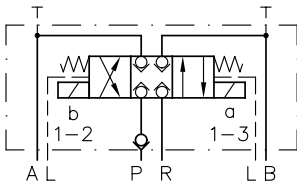
**VZP 1 P 4 B1,0 - WG 110**

3/3(3/4)-way directional seated valve with pressure switch for port A and throttle in port P

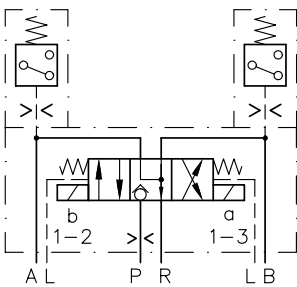
#### Symbols

according to above order examples

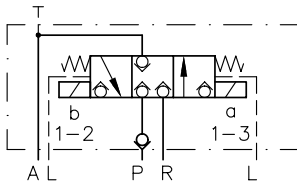
Type VZP1 G 22 - G 24



Type VZP1 D 45 B1,2 - WG 230



Type VZP1 J 2 - G 12



Type VZP1 P 4 B1,0 - WG 110

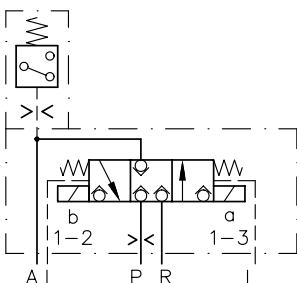


Table 1: Basic type

<b>VZP 1</b>	Twin valve, size 1
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Table 2: Symbols

The 4th switching position a+b is apparent, when both coils of the solenoid are energized simultaneously. It should be detailed in circuit diagrams only when really used, see also restrictions in sect. 3.2!

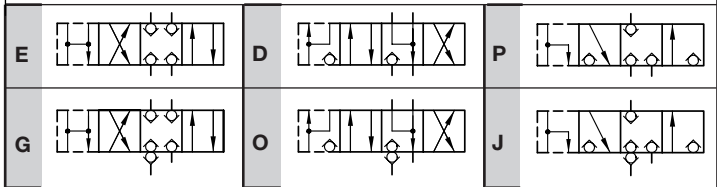


Table 3: Pressure switch type DG 3.. acc. to D 5440, optional for connection A and/or B <sup>1)</sup>

<b>22</b>	Standard, without DG..., prepared for retrofitting	22 = Ports A and B with flow patterns E, G, D, and O
<b>2</b>		2 = Ports A with flow patterns P a. J. Ports A or B with symbols H, M, N, R, W, and WX
<b>3</b>	DG 33 200...450 bar	Only for flow pattern E, G, D, and O respectively 1st or 2nd coding: DG... with A only = 32, 42 etc. DG... with B only = 23, 24 etc. DG... with A and B = 45, 73 etc.
<b>4</b>	DG 34 100...400 bar	
<b>5</b>	DG 35 20...250 bar	
<b>6</b>	DG 36 4... 12 bar	
<b>7</b>	DG 365 12...170 bar	For flow pattern P, J, H, M, N, R, W, and WX: Only one coding 3, 4 etc. for port A or B

Table 4: Additional elements, inserted in port P (optional) <sup>2)</sup>

Without	Standard	Only with flow patterns E, D, P, H, M, W. This orifice is not available for flow patterns G, O, J, N, R, and WX, because of the check valve installed.
<b>0,8</b>	Ø 0.8	
<b>1,0</b>	Ø 1.0	
<b>1,2</b>	Ø 1.2	
<b>1,4</b>	Ø 1.4	

Table 5: Nom. voltage of the solenoid

With plug A conforming DIN EN 175 301-803	Without plug	Plug with LED	Plug incl. leads 5 m	Nom. voltage
<b>G 12</b>	<b>X 12</b>	<b>L 12</b> <sup>3)</sup>	---	12 V DC
<b>G 24</b>	<b>X 24</b>	<b>L 24</b> <sup>3)</sup>	<b>L 5 K 24</b> <sup>3)</sup>	24 V DC
<b>G 48</b>	<b>X 48</b>	---	---	48 V DC
<b>G 102</b>	<b>X 102</b>	---	---	102 V DC
<b>WG 110</b>	---	---	---	110 V AC 50 /
<b>WG 230</b>	---	---	---	230 V AC 60 Hz

1) A pressure gauge (type 9/... D 7077 A) or a miniature accumulator (type AC.. acc. to D 7571) may be installed instead of a pressure switch, see also SK 7077A. This has to be added to the order in uncoded text.  
Example: VZP1 G22/0-G24 with pressure gauge 9/250-Y9 mounted at DG connection (port A)

2) Order coding for a throttle complete with filter section, see 9 in sect. 5.1

3) May be used also for pressure switches, when mounted

## 2.2 3/2 (2/2)-way directional seated valves for up to 450 bar and 4/2-way directional spool valve up to 300 bar

These valves are mainly intended for the actuation of single acting (3/2-way function) or double acting consumers (2 x 3/2-way functions ore 1 x 4/2-way function).

The simultaneous, permanent actuation of both solenoid coils is permissible up to an ambient temperature of approx. 40°C, beyond this the restricted duty cycle is to be observed, see sect. 3.2!

The 4/2-way directional spool valves are rated for 450 bar when one of the switching positions is achieved but only 300 bar during the switching operations. This enables use of these spool valves in combination with directional seated valves in circuits rated for 450 bar. Attention: Also the consumers connected must have a rating for such high system pressure! Otherwise some kind of pressure reduction to the consumer has to be provided. In case of valve banks type BVZP (acc. to D 7785 B ) there is the possibility to install a 2-way pressure reducing valve section (...CZ.../- ) upstream of the respective spool valve section.

Order examples:

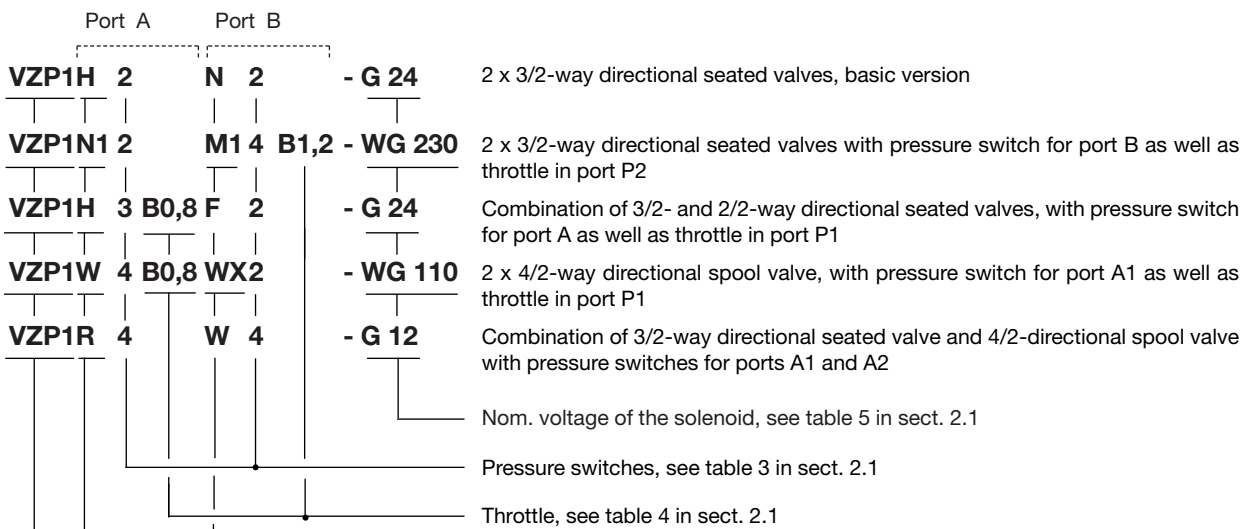


Table 6: Basic type

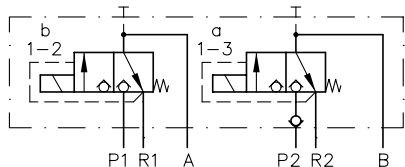
VZP 1	Twin valve, size 1
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Table 7: Symbols

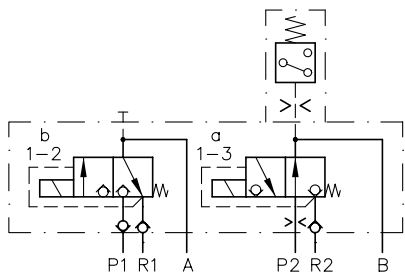
### Symbols

according to above order examples

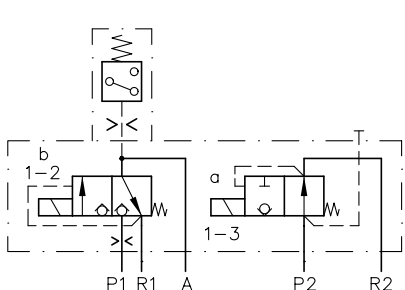
Type VZP1H 2 N 2 - G 24



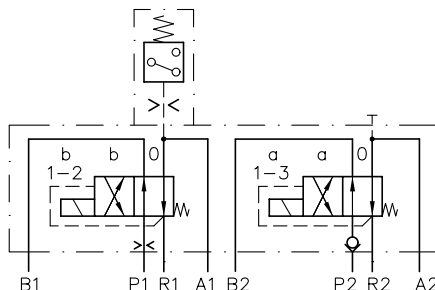
Type VZP1N1 2 M1 4 B1,2 - WG 230



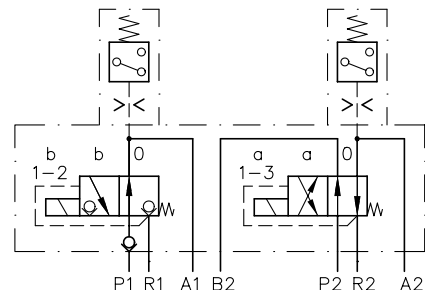
Type VZP1H 3 B0,8 F 2 - G 24



Type VZP1W 4 B0,8 WX 2 - WG 110



Type VZP1R 4 W 4 - G 12



Directional seated valves		Directional spool valves	
H H1		M M1	
N N1		R R1	
F		C	

Possible combinations:			
Port B \ Port A	H, M, N, R, H1...R1	W and WX	
H, M, N, R, H1, M1, N1, R1	●		1) The return pressure stop at flow pattern symbols H1, M1, N1 and R1. It prevents any pressure surges to migrate via port R to ports A or B, which otherwise might cause unintended movements of easily moving or unloaded consumers
F and C	●		
W and WX	●	●	

### 3. Technical data

#### 3.1 General information and hydraulic data

Nomenclature, design Directional seated valve, zero leakage, with 4/3- and 3/3-way function and with 2 x 3/2-or 3/2- plus 2/2-way functions in a twin lay-out per valve body  
Directional spool valve with 2 x 4/2-way function or combination of 4/2-way function (spool valve) and 3/2-way function (seated valve) in a twin lay-out per valve body

Unit surface Zinc galvanized

Pipe connection Manifold mounting  
Individual sub-plates have to be customer furnished  
For directional valve banks in parallel connection see type BVZP, acc. to D 7785 B

Ports P, P1, P2 = Inlet port (pump side) L = Relief line, led pressurelessly to  
A, B = Consumers the tank always (return)!  
R, R1, R2 = Return

Direction of flow Only in arrow direction in accordance with symbol

Over lapping Negative, i.e. the transition into the other switching positions is only completed at the end of stroke. All passages are interconnected during the switching operation, however this may be neglected because of the short switching time.

Directional spool valves (Coding W, WX): zero

Use in the open Directional seated valve:  
Possible, due to good surface protection of solenoid and valve body and the pressure and moisture proof coil design. Nevertheless the valves should be protected against direct sun and direct contact with water should be avoided.

Mass (weight) approx. kg Valves acc. to sect. 2.1: Coding E, G, P, J = 1.9 kg  
Coding D and O = 2.2 kg  
Valves acc. to sect. 2.2: Coding H ... R1, F and C = 2.2 kg  
Coding W and WX = 1.9 kg } add 0.3 kg per directly mounted pressure switch

Flow	Symbols	Solenoid Coding	Guideline for permissible, switchable flow in lpm at operating pressure up to approx.		
			250 bar	400 bar	450 bar
sect. 2.1	VZP 1 E, D, P, G, O, J 1)	G 24	12	8	---
		G 12, WG 110, WG 230	9	7	---
sect. 2.2	VZP 1 H, N, M, R, F, C VZP 1 W, WX	All solenoids G.. and WG..	9	7	5
			16	16 (300 bar)	---

Operating pressure Valves acc. to sect. 2.1: Port P, A, B  $p_{max} = 400$  bar with VZP 1 E, D, P, G, O, J  
Port R, L  $p_{max} = 20$  bar  
Valves acc. to sect. 2.2: Port P1(2); A1(2); B1(2)  $p_{max} = 450$  bar with VZP 1 H, N, M, R, F, C  
 $p_{max} = 300$  bar with VZP 1 W, WX  
(450 bar in achieved switching position)  
Port R1(2); L  $p_{max} = 20$  bar

Static overload capacity Approx. 2.5  $p_{max}$ , applies to the valve in idle position only

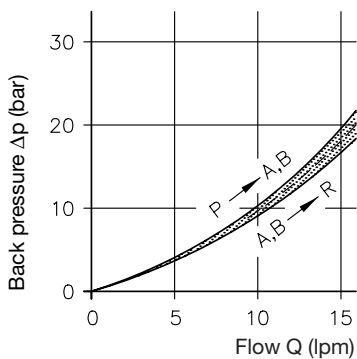
Pressure fluid Hydraulic oil conforming DIN 51524 part 1 to 3: ISO VG 10 to 68 conforming DIN 51519  
Viscosity limits: min. approx. 4; max. approx. 1500 mm<sup>2</sup>/s (Viscosity during start of operation)  
Optimal operation: approx. 10 ... 500 mm<sup>2</sup>/s  
Also suitable for biological degradable 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 (Kelvin) higher for the following operation  
Biological degradable pressure fluids: Observe manufacturer's specifications. Considering the compatibility with seal material not over +70°C.  
**Attention:** Observe the permissible operation time of the solenoids, see also sect. 3.2!

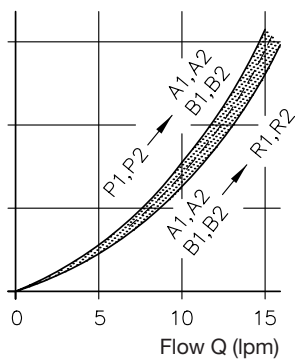
1) The perm. flow during switching operations may be 30...50% (G 24) or even 100 % (G 12, WG 110, and WG 230) higher, when the duty cycle is  $\leq 10\%$ , see also sect. 3.2.

$\Delta p$ -Q-curves

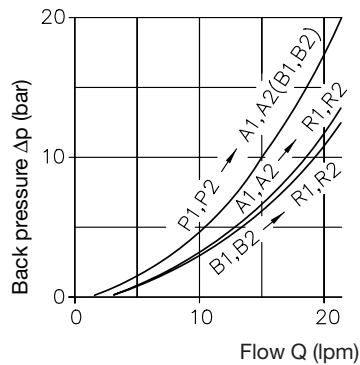
Directional seated valves  
Symbols E, D, P, G, O, and J acc. to sect. 2.1



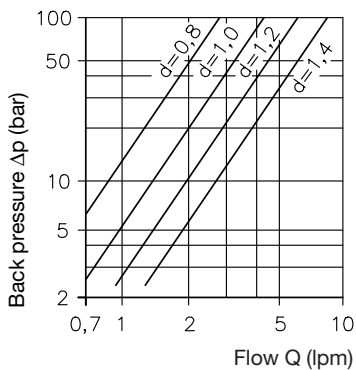
Directional seated valves  
Symbols H, M, N, R, F, and C acc. to sect. 2.2



4/2-way directional spool valve  
Symbols W and WX acc. to sect. 2.2



Orifice B 0.8...1,4



The curves apply to valves including a test manifold, which features a similar lay-out for gallery P and R as illustrated in sect. 5.1 or table 5 in sect. 2.3 of D 7785 B. The back pressure for fittings have to be added.

A common fitting for tube 8 mm shows approx. 1 bar at 10 lpm and 3 bar at 16 lpm.

Fluid viscosity approx. 60 mm<sup>2</sup>/s during measurements

A stronger increase of the back pressure at viscosities above approx. 500 mm<sup>2</sup>/s

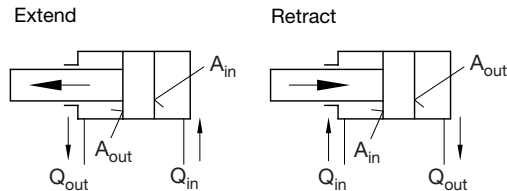
**Note regarding valves acc. to section 2.1:**

The flow in return direction  $Q_{out}$  is lower or higher than in inflow direction  $Q_{in}$  depending on motion direction of connected double acting consumers with unequal area ratio (differential cylinders, e.g. acc. to DIN ISO 7181) and, therefore the corresponding

figures acc. to the  $\Delta p$ -curve,  $Q_{out} = Q_{in} \frac{A_{out}}{A_{in}}$

The total back pressure is the sum of inflow and return shares

$$\Delta p_{total} = \Delta p_{in} + \Delta p_{out} \frac{A_{out}}{A_{in}}$$



### 3.2 Electric data

Solenoid

Twin solenoid, wet armature  
electrical design and tests conforming DIN VDE 0580

Nom. voltage,  
nominal power  
and switching times

Coding		G 12 X 12 L 12	G 24 X 24 L 24, L5K 24 <sup>2)</sup>	WG 110 <sup>1)</sup> X 48	WG 230 <sup>1)</sup> X 102
Nom. voltage $U_N$	(V)	12 DC	24 DC	110 AC/48 DC	230 AC/102 DC
Nom. power $P_N$	(W)	24.5	27.4	29.8	29.6
Nom. current $I_{20}$	(A)	2.04	1.14	0.62	0.29
Switching time (guide-line)	4/3- and 3/3-directional seated valves acc. to sect. 2.1	on	70	70	110
		off	40	40	155
	3/2-, 2/2-way direct. seated valves and 4/2-way directional spool valves acc. to sect. 2.2	on	50	50	70
		off	65	65	130

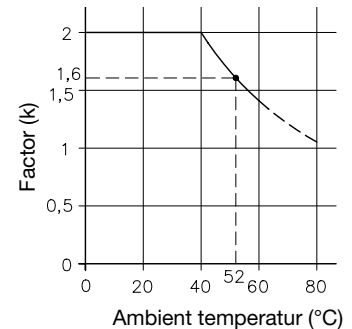
Switching frequency

Approx. 2000/h, approx. evenly distributed

Duty cycle

The permissible duty cycle of switching position a, b or a+b with alternating or simultaneously operated solenoids may be estimated for applications with continuous cycles by  $\%ED_a + \%ED_b \leq 100$  k.

The factor k in accordance with the diagram below takes into account the ambient fluid and the oil temperature.



Example 1: VZP1 H2 N2 - G 24 (sect. 2.2, example 1)

Ambient temperature of < 40°C

$\%ED_a + \%ED_b = 100 \times 2 = 200$   
each single coil may be operated with 100% ED (100 + 100 = 200)

Ambient temp. > 40°C, e.g. 52°C

$\%ED_a + \%ED_b = 100 \times 1.6 = 160$   
each single coil may be operated with max. 80% ED (80 + 80 = 160) or with a differing distribution with a %ED sum of 160

Example 2: VZP1 G22 - G 24

Only alternating actuation of a or b usually makes recalculation usually superfluous. With actuation mode a + b acc. to above scheme.

Protection class  
IEC 70 (Co)13

IP 65 (IEC 60529), with properly mounted plug

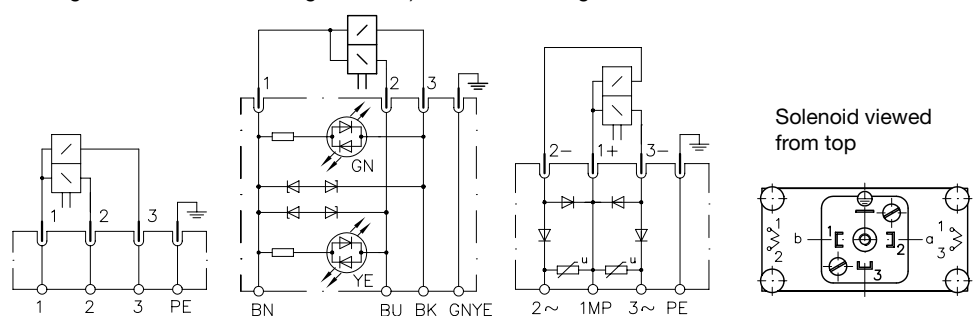
Circuitry:  
Plug shape  
DIN EN 175 301-803  
3-terminals + PE (gnd)

DC-voltage  
Coding G..

Coding L5K 24 <sup>2)</sup>

DC-voltage  
Coding WG..

All plugs feature  
a cable gland  
(except type L5K 24)



Insulation material class

H

Contact temperature

max. approx. 100°C at 20°C ambient temperature and max. performance

Switch-off energy

$W = 0.5$  Ws (guideline for max. + approx. 10% acc. to tests with nom. voltage  $U_N$ )

Mounting

In case of an electrical defect the twin solenoid may be removed from the valve body by undoing the four mounting screws. Remove the armature together with the actuation parts and the armatures from the unscrewed solenoid body and correctly reassemble everything, together with the new coil housing, in its original position (do not interchange!).

<sup>1)</sup> Solenoids equipped with plugs including a double one-way rectifier circuit feature coils 48 V DC (WG 110) or 102 V DC (WG 230), see also circuitry.

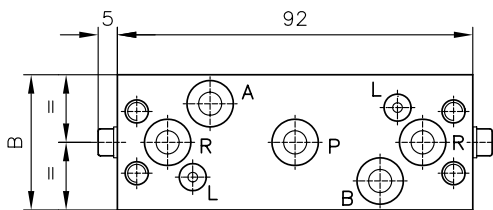
<sup>2)</sup> Plug coding L5K, features LED's and a lead 5 m, for detailed specifications see D 7163.

### 4. Unit dimensions

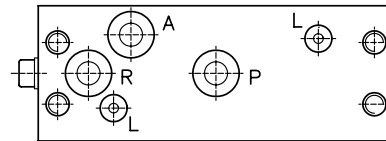
All dimensions are in mm and are subject to change without notice!

#### 4.1 4/3 (4/4)- or 3/3 (3/4)-directional seated valves acc. to sect. 2.1

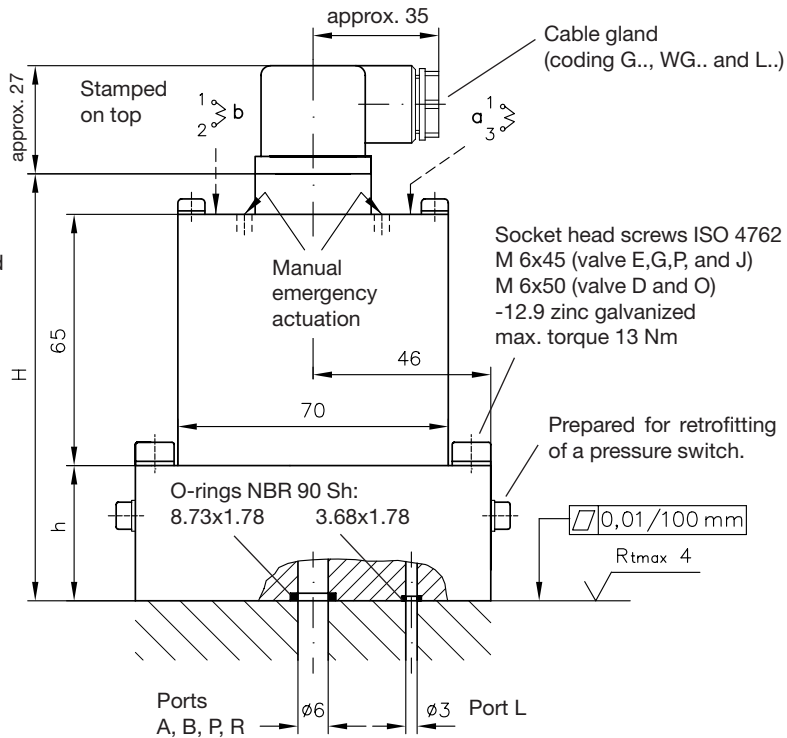
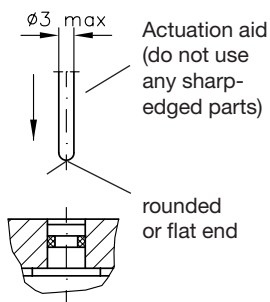
Type VZP 1 E, G, D, and O



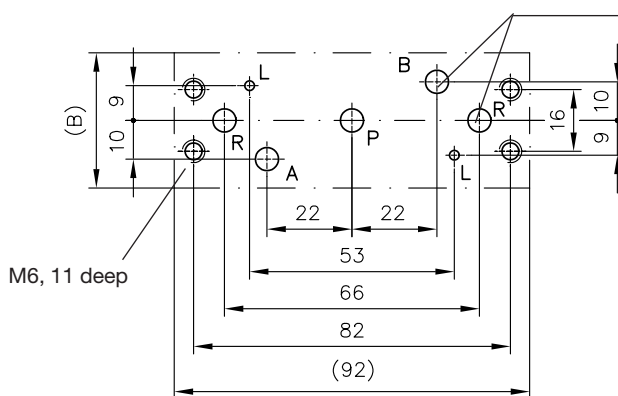
Type VZP 1 P and J



#### Manual emergency actuation



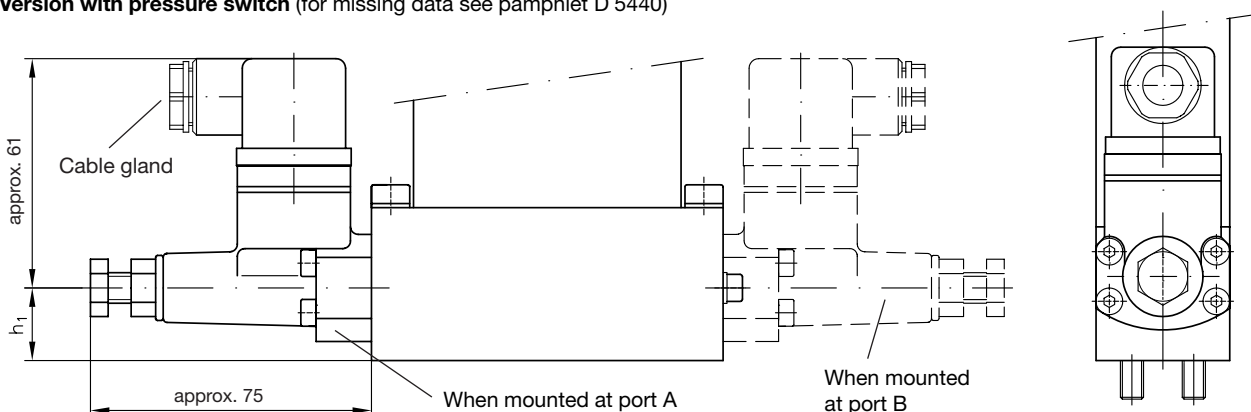
#### Hole pattern of the manifold (view from top)



These ports are not required with VZP 1 P and J

Type	H	B	h	h <sub>1</sub>
VZP1E a. G	110	35	35	21.5
VZP1D a. O	115	39	40	18.5
VZP1P a. J	110	35	35	21.5

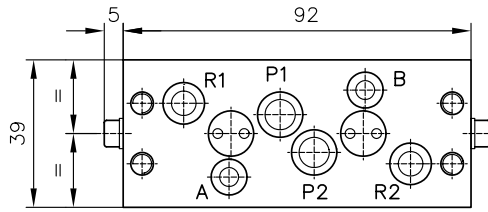
#### Version with pressure switch (for missing data see pamphlet D 5440)



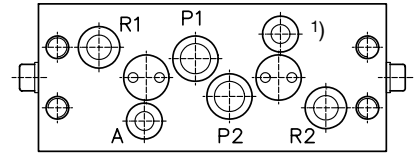


**4.2 3/2- and 2/2-directional seated valves acc. to sect. 2.2**

**Type VZP 1 H, N, M, R**  
for ports A and B

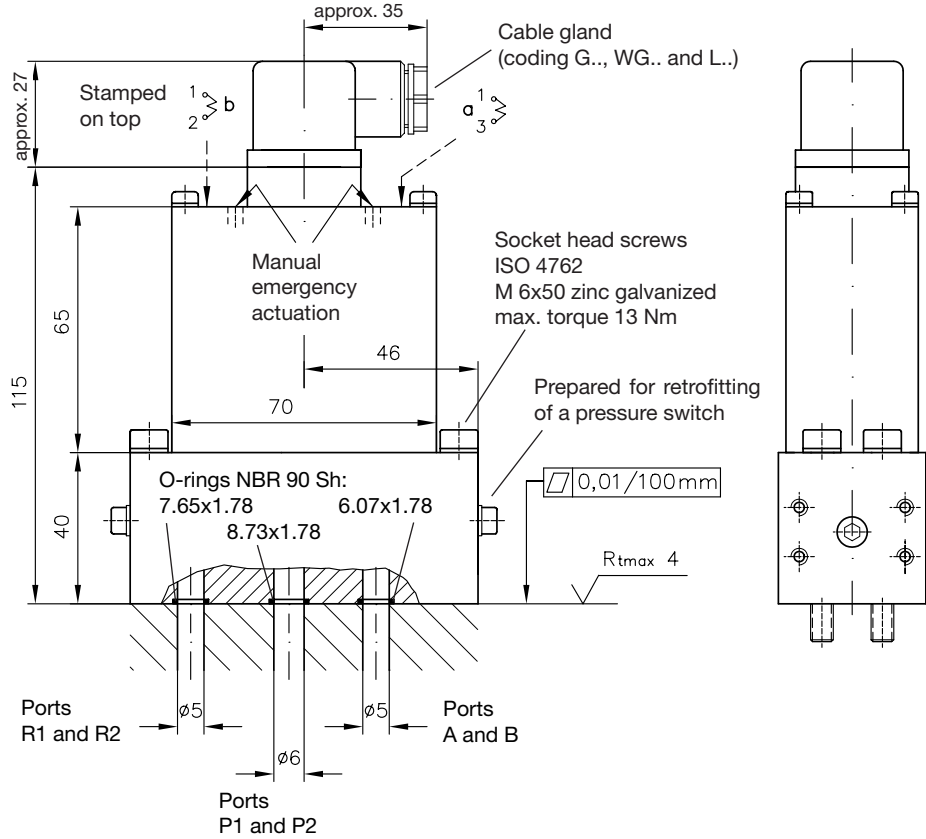
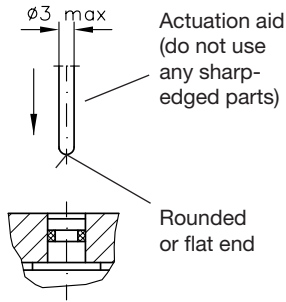


**Type VZP 1 F and C**  
with idle circulation P2→R2

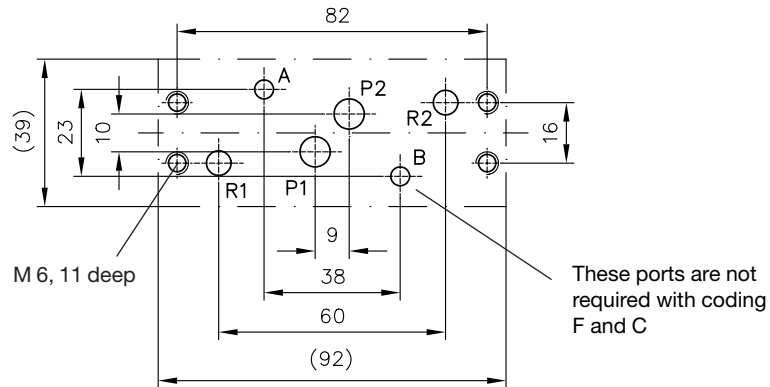


1) Port plugged

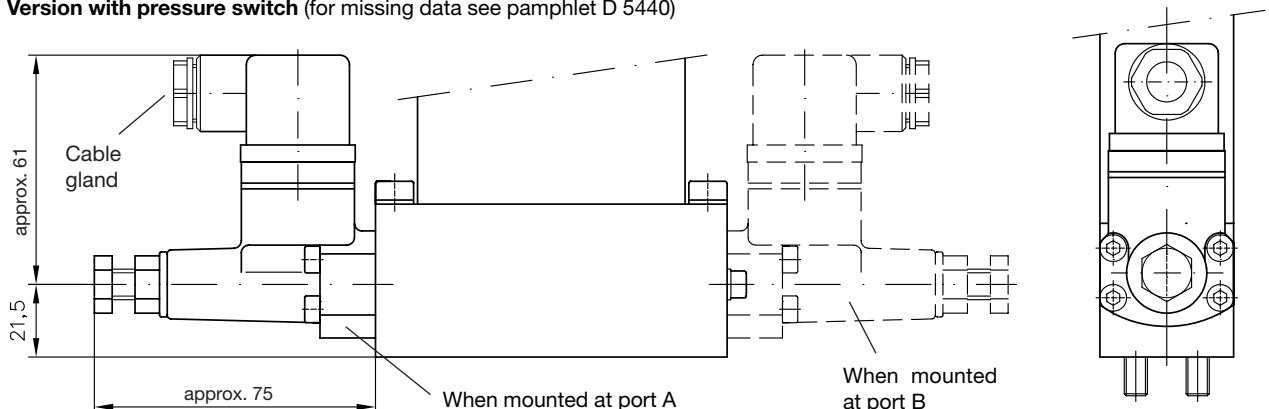
**Manual emergency actuation**



**Hole pattern of the manifold (view from top)**



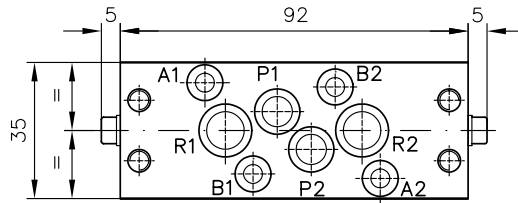
**Version with pressure switch (for missing data see pamphlet D 5440)**



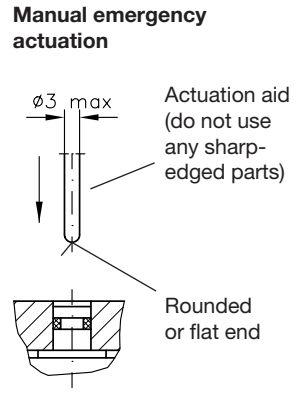
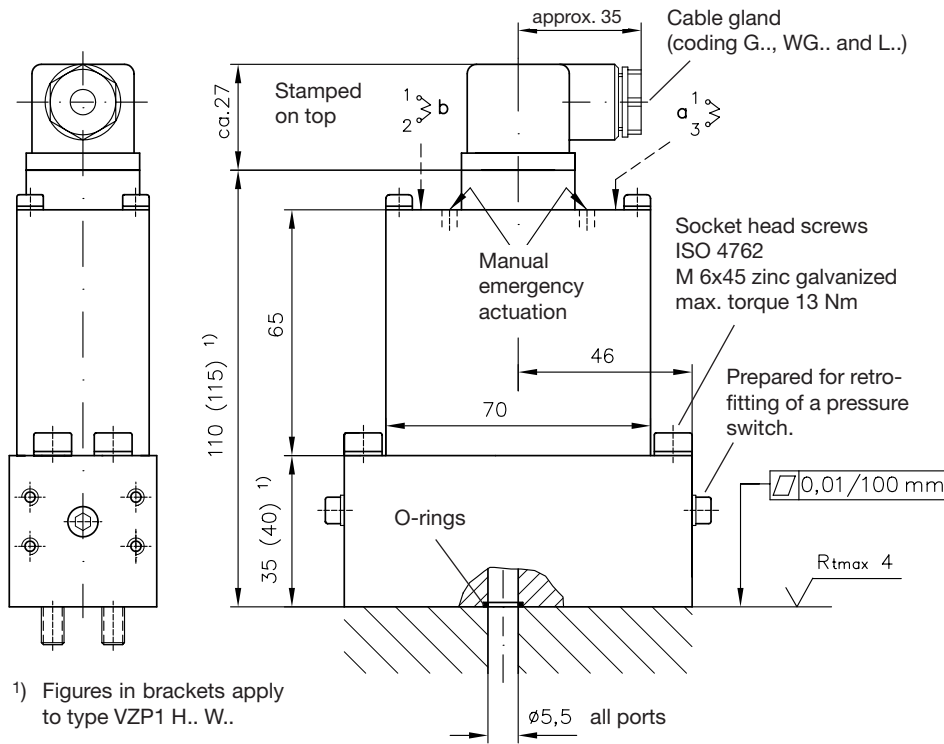
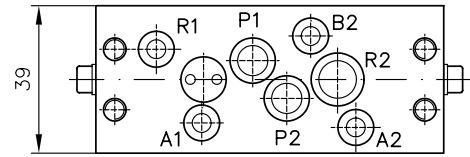


**4.3 4/2-way directional spool valve, also available in combination with a 3/2-way directional seated valve acc. to sect. 2.2**

**Type VZP 1 W.. W.-..**  
2 x 4/2-way directional spool valve



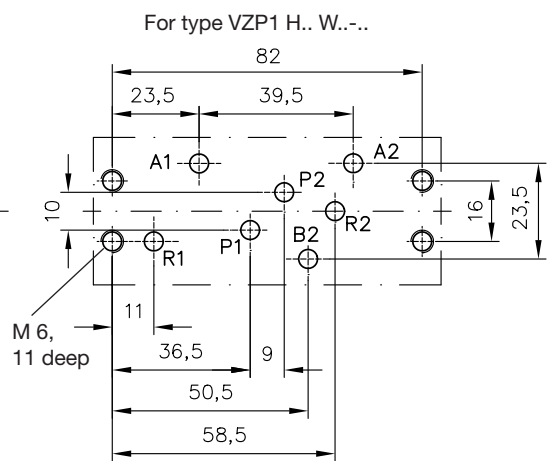
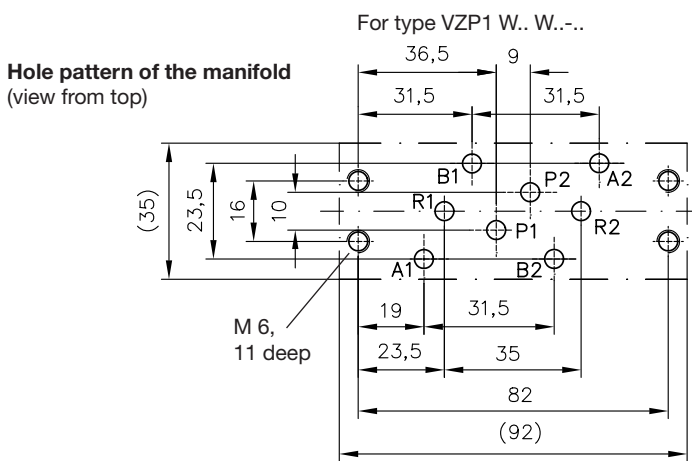
**Type VZP 1 H.. W.-.. etc.**  
Combination of a 3/2-way directional seated valve and a 4/2-way directional spool valve, for missing data see VZP1 W.. W.-..!



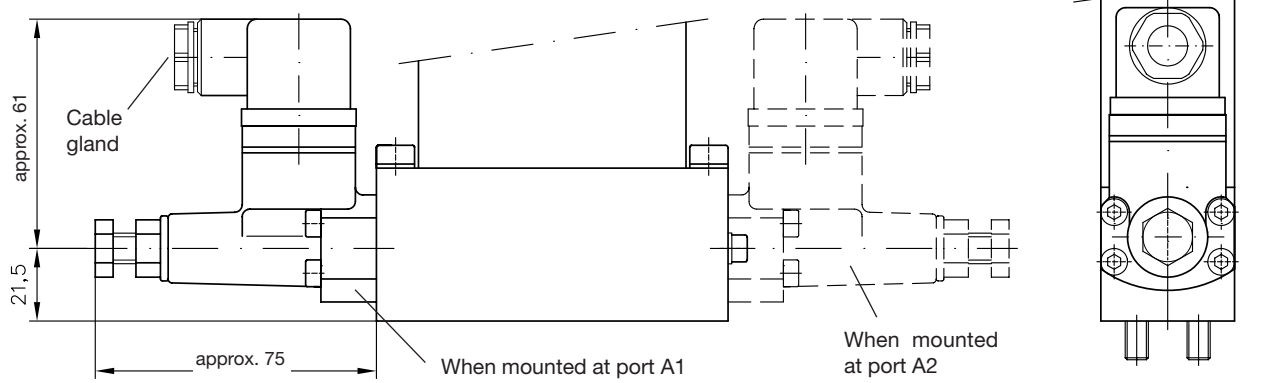
Port	O-ring NBR 90 Sh
A1 a. A2 B1 a. B2	6.07x1.78
P1 a. P2	8.73x1.78
R1 a. R2	10.82x1.78

For complete seal kits, see E 7785 a, table 2

1) Figures in brackets apply to type VZP1 H.. W.-..



**Version with pressure switch (for missing data see pamphlet D 5440)**

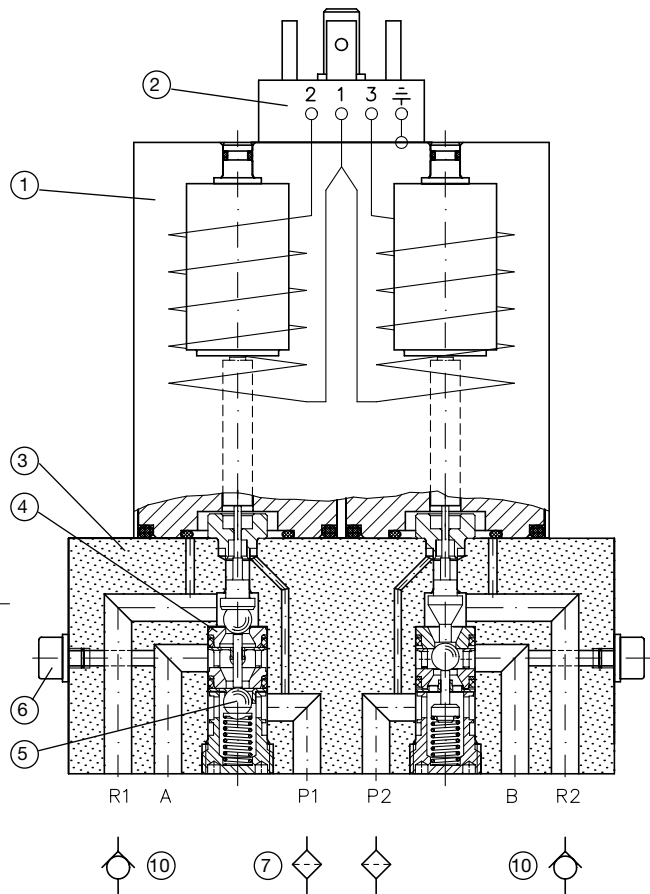
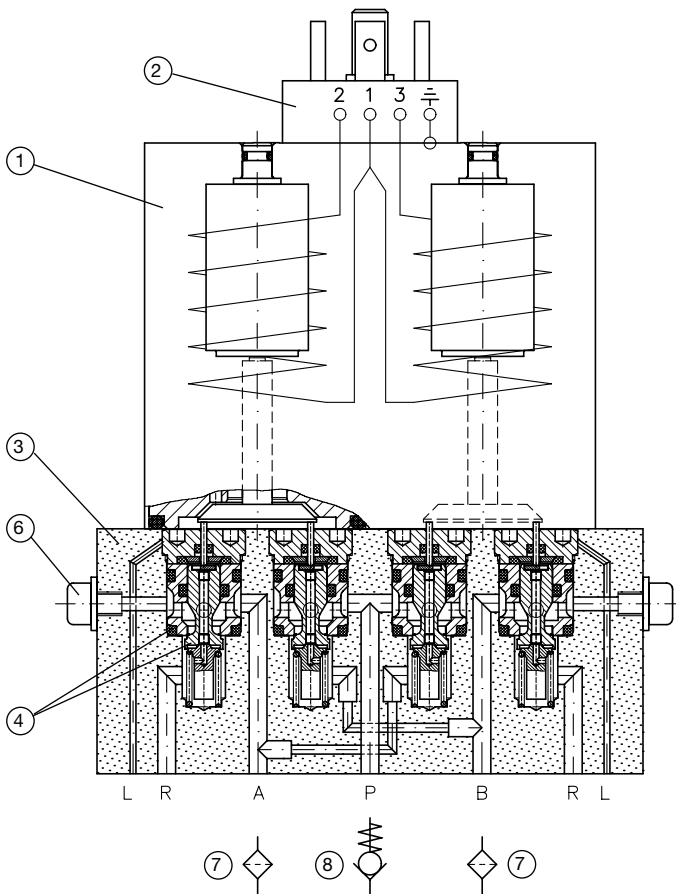


## 5. Appendix

### 5.1 Schematic cross sectional views

**4/3-way directional seated valve (cone seated valve)**  
example VZP1 G22-G...

**2 x 3/2-way directional seated valves (ball seated valve)**  
example VZP1 H2 M2-G...



- ① Twin solenoid, housing surface zinc galvanized
- ② Terminals for plug, 3 pins + PE, DIN EN 175 301-803
- ③ Valve body, housing surface zinc galvanized
- ④ Functional valve seat parts hardened and ground
- ⑤ Bearing quality steel, DIN 5401 class I (ISO 3290G5)
- ⑥ Consumer sides A and B prepared for retrofitting of a pressure switch type DG 3.. as standard
- ⑦ Fine screen filter element, protecting the functional valve parts from sporadically washed up coarse contamination (wire mesh 0.25x0.16 DIN 4189 made from stainless wire).

Seated valves (sect. 2.1) flow pattern E, D: in ports P, A, and B  
 flow pattern G, O: in ports A and B  
 flow pattern P: in ports P and A  
 flow pattern J: in port A  
 Seated valves (sect. 2.2) flow pattern H, M, W: in ports P1 and P2

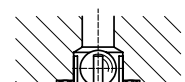
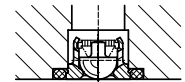
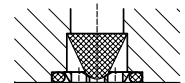
- ⑧ Check valve type ER 12 acc. to D 7325  
 Seated valves (sect. 2.1) flow pattern G, O: in P  
 Seated valves (sect. 2.2) flow pattern N, R, WX: in ports P1 and P2

- ⑨ Orifice (optional) with inflow sided fine screen filter element, protecting the orifice from sporadically washed up coarser contamination particles (wire mesh 0.25x0.16 DIN 4189 made from stainless wire).

flow pattern E, D, P: in port P  
 flow pattern H, M, W: in ports P1 and P2

Order coding for a throttle complete with filter element:  
 B 0.8 = 7785 021  
 B 1.0 = 7785 022  
 B 1.2 = 7785 023  
 B 1.4 = 7785 024

- ⑩ When several valves are operating in parallel, the return pressure stop prevents pressure surges out of the common return pipe from entering unoperated, unloaded or easily moving consumers, when there is a connection A→R1 or B→R2. Thus preventing uncontrolled movements.  
 Only for ball seated directional valves (sect. 2.2), with flow pattern H1, N1, M1, R1: in ports R1 and R2



## 6. Type overview

Order examples: **VZP1 G 22** - G 24  
**VZP1 D 45 B1,2** - WG 230  
**VZP1 H 12 B1,0 M 14 B0,8 - G 12**

