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.

Symbols

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

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
Example: VZP1 R4 WX2 - WG 230

2 x 3/2-way directional seated valves
Example: VZP1 H12 B1,2 H2 - G 24

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

For directional valve banks type BVZP 1 see D 7785 B
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:

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: VZP 1 G 22 - G 24

Table 1: Basic type

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VZP 1</td>
<td>Twin valve, size 1</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Standard, without DG... prepared for retrofitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 = Ports A and B with flow patterns E, G, D, and O</td>
</tr>
<tr>
<td>2 = Ports A with flow patterns P a, J, Ports A or B with symbols H, M, N, R, W, and WX</td>
</tr>
</tbody>
</table>

Table 4: Additional elements, inserted in port P (optional)

<table>
<thead>
<tr>
<th>Without</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orifice to limit the flow</td>
<td></td>
</tr>
<tr>
<td>Ø 0.8</td>
<td></td>
</tr>
<tr>
<td>Ø 1.0</td>
<td></td>
</tr>
<tr>
<td>Ø 1.2</td>
<td></td>
</tr>
<tr>
<td>Ø 1.4</td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Nom. voltage of the solenoid

With plug A conforming DIN EN 175 301-803

<table>
<thead>
<tr>
<th>With plug A</th>
<th>Without plug</th>
<th>Plug with LED</th>
<th>Plug incl. leads 5 m</th>
<th>Nom. voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>G 12</td>
<td>X 12</td>
<td>L 12</td>
<td>---</td>
<td>12 V DC</td>
</tr>
<tr>
<td>G 24</td>
<td>X 24</td>
<td>L 24</td>
<td>L 5 K 24</td>
<td>24 V DC</td>
</tr>
<tr>
<td>G 48</td>
<td>X 48</td>
<td>---</td>
<td>---</td>
<td>48 V DC</td>
</tr>
<tr>
<td>G 102</td>
<td>X 102</td>
<td>---</td>
<td>---</td>
<td>102 V DC</td>
</tr>
<tr>
<td>WG 110</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>110 V AC 50/60 Hz</td>
</tr>
<tr>
<td>WG 230</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>230 V AC 60 Hz</td>
</tr>
</tbody>
</table>

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: VZP 1 G22/D-G24 with pressure gauge 9/250-Y9 mounted at DG connection (port A).

2) Ordering for a throttle complete with filter section, see Ø in sect. 5.1.

3) May be used also for pressure switches, when mounted with plug A conforming DIN EN 175 301-803.
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) or 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>
<thead>
<tr>
<th>Port A</th>
<th>Port B</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VZP1H 2 N 2 - G 24</td>
<td>2 x 3/2-way directional seated valves, basic version</td>
<td></td>
</tr>
<tr>
<td>VZP1N1 2 M1 4 B1,2 - WG 230</td>
<td>2 x 3/2-way directional seated valves with pressure switch for port B as well as throttle in port P2</td>
<td></td>
</tr>
<tr>
<td>VZP1H 3 B0,8 F 2 - G 24</td>
<td>Combination of 3/2- and 2/2-way directional seated valves, with pressure switch for port A as well as throttle in port P1</td>
<td></td>
</tr>
<tr>
<td>VZP1W 4 B0,8 WX2 - WG 110</td>
<td>2 x 4/2-way directional spool valve, with pressure switch for port A1 as well as throttle in port P1</td>
<td></td>
</tr>
<tr>
<td>VZP1R 4 W 4 - G 12</td>
<td>Combination of 3/2-way directional seated valve and 4/2-directional spool valve with pressure switches for ports A1 and A2</td>
<td></td>
</tr>
</tbody>
</table>

Nom. voltage of the solenoid, see table 5 in sect. 2.1
Pressure switches, see table 3 in sect. 2.1
Throttle, see table 4 in sect. 2.1

Table 6: Basic type

| VZP 1 Twin valve, size 1 |

Table 7: Symbols

<table>
<thead>
<tr>
<th>Directional seated valves</th>
<th>Directional spool valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>H1</td>
</tr>
<tr>
<td>N</td>
<td>N1</td>
</tr>
<tr>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>R</td>
<td>R1</td>
</tr>
<tr>
<td>C</td>
<td>W</td>
</tr>
<tr>
<td>WX</td>
<td></td>
</tr>
</tbody>
</table>

Possible combinations:

<table>
<thead>
<tr>
<th>Port B</th>
<th>Port A</th>
<th>H, M, N, R, H1...R1</th>
</tr>
</thead>
<tbody>
<tr>
<td>H, M, N, R, H1, M1, N1, R1</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>F and C</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>W and WX</td>
<td>● ●</td>
<td></td>
</tr>
</tbody>
</table>

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.
### 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**
- \( P, P_1, P_2 = \text{Inlet port (pump side)} \)
- \( L = \text{Relief line, led pressurelessly to} \)
- \( A, B = \text{Consumers} \)
- \( R, R_1, R_2 = \text{Return} \)

**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
- Add 0.3 kg per directly mounted pressure switch
- Valves acc. to sect. 2.2: Coding H ... R1, F and C = 2.2 kg
- Coding W and WX = 1.9 kg

**Flow Symbols**

<table>
<thead>
<tr>
<th>Solenoid Coding</th>
<th>Guideline for permissible, switchable flow in lpm at operating pressure up to approx.</th>
</tr>
</thead>
<tbody>
<tr>
<td>G 24</td>
<td>12</td>
</tr>
<tr>
<td>G 12, WG 110, WG 230</td>
<td>9</td>
</tr>
<tr>
<td>All solenoids G.. and WG..</td>
<td>9</td>
</tr>
<tr>
<td>VZP 1 W, WX</td>
<td>16</td>
</tr>
<tr>
<td>VZP 1 E, D, P, G, O, J 1)</td>
<td>16</td>
</tr>
</tbody>
</table>

**Operating pressure**

<table>
<thead>
<tr>
<th>Valves acc. to sect. 2.1:</th>
<th>Port P, A, B, P max = 400 bar with VZP 1 E, D, P, G, O, J</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Port R, L, P max = 20 bar</td>
</tr>
<tr>
<td>Valves acc. to sect. 2.2:</td>
<td>Port P1(2); A1(2); B1(2), P max = 450 bar with VZP 1 H, N, M, R, F, C</td>
</tr>
<tr>
<td></td>
<td>Port R1(2); L, P max = 300 bar with VZP 1 W, WX (450 bar in achieved switching position)</td>
</tr>
<tr>
<td></td>
<td>Port R1(2); L, P max = 20 bar (300 bar)</td>
</tr>
</tbody>
</table>

**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 mm²/s (Viscosity during start of operation)
- Optimal operation: approx. 10 ... 500 mm²/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.
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, $Q_{out} = \frac{A_{out}}{A_{in}}$.

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

$\Delta p_{total} = \Delta p_{in} + \Delta p_{out} \cdot \frac{A_{out}}{A_{in}}$
3.2 Electric data

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

Solenoid

<table>
<thead>
<tr>
<th>Coding</th>
<th>G 12</th>
<th>G 24</th>
<th>WG 110 1)</th>
<th>WG 230 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom. voltage Uₙ (V)</td>
<td>12 DC</td>
<td>24 DC</td>
<td>110 AC/48 DC</td>
<td>230 AC/102 DC</td>
</tr>
<tr>
<td>Nom. power Pₙ (W)</td>
<td>24.5</td>
<td>27.4</td>
<td>29.8</td>
<td>29.6</td>
</tr>
<tr>
<td>Nom. current Iₙ₀ (A)</td>
<td>2.04</td>
<td>1.14</td>
<td>0.62</td>
<td>0.29</td>
</tr>
</tbody>
</table>

Switching time (guide-line)

<table>
<thead>
<tr>
<th>4/3- and 3/3-directional seated valves acc. to sect. 2.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>on</td>
</tr>
<tr>
<td>off</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3/2-, 2/2-way direct. seated valves and 4/2-way directional spool valves acc. to sect. 2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>on</td>
</tr>
<tr>
<td>off</td>
</tr>
</tbody>
</table>

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 %EDₐ + %EDₐ ≤ 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 | Ambient temp. > 40°C, e.g. 52°C
---------------------------------|---------------------------------|
%EDₐ + %EDₐ = 100 x 2 = 200 each single coil may be operated with 100% ED (100 + 100 = 200) | %EDₐ + %EDₐ = 100 x 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

IP 65 (IEC 60529), with properly mounted plug

Circuitry:

DC-voltage
Coding G.
Coding L5K 24 2)

DC-voltage
Coding WG..

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 Uₙ₀)

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!).

---

1) 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.
2) 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**
Actuation aid (do not use any sharp-edged parts)

O-rings NBR 90 Sh:
- 8.73x1.78
- 3.68x1.78

Ports:
- A, B, P, R
- Port L

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

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

<table>
<thead>
<tr>
<th>Type</th>
<th>H</th>
<th>B</th>
<th>h</th>
<th>h₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>VZP1E a. G</td>
<td>110</td>
<td>35</td>
<td>35</td>
<td>21.5</td>
</tr>
<tr>
<td>VZP1D a. O</td>
<td>115</td>
<td>39</td>
<td>40</td>
<td>18.5</td>
</tr>
<tr>
<td>VZP1P a. J</td>
<td>110</td>
<td>35</td>
<td>35</td>
<td>21.5</td>
</tr>
</tbody>
</table>

These ports are not required with VZP 1 P and J

Socket head screws ISO 4762
- M 6x45 (valve E, G, P, and J)
- M 6x50 (valve D and O)
- -12.9 zinc galvanized max. torque 13 Nm

Prepared for retrofitting of a pressure switch.
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

Manual emergency actuation

O-rings NBR 90 Sh:
- 7.65x1.78
- 6.07x1.78
- 8.73x1.78

Ports R1 and R2

Ports P1 and P2

Ports A and B

These ports are not required with coding F and C

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

Cable gland

Socket head screws
ISO 4762
M 6x50 zinc galvanized
max. torque 13 Nm

Prepared for retrofitting of a pressure switch

Hole pattern of the manifold
(view from top)

M 6, 11 deep

When mounted at port A

When mounted at port B
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..-..!

Manual emergency actuation

Actuation aid
(do not use any sharp-edged parts)

When mounted at port A1

When mounted at port A2

O-rings
all ports

For type VZP1 W.., W..-..

For type VZP1 H.., W..-.. etc.

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

Hole pattern of the manifold
(view from top)

Port O-ring

NBR 90 Sh

A1 a. A2 6.07x1.78
B1 a. B2 8.73x1.78
P1 a. P2 10.82x1.78
R1 a. R2

approx. 75

approx. 35
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 A and B
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
Symbols (see sect. 2.1 and 2.2)

- F, C  2/2-way function (directional seated valve, together with an other 3/2-way directional valve)
- H, N, M, R  3/2-way function (directional seated valve, together with an other 2/2-, 3/2- or 4/2-way directional valve)
- P, J  3/3-way function (directional seated valve)
- E, G, D, O  4/3-way function (directional seated valve)
- W, WX  4/2-way function (directional spool valve, together with an other 3/2- or 4/2-way directional valve)

Additional elements (see sect. 2.1 and 2.2)

1. Return pressure stop optional for 3/2-way directional valves (symbols H, N, M, R)
22. Prepared for retrofitting of two pressure switches (type DG 3. acc. to D 5440) with 4/3-way directional valves (symbols E, G, D, O)
33 ... 77. Two pressure switches (DG 3. acc. to D 5440) in the consumer ports A and B with 4/3-way directional valves (symbols E, G, D, O) also available 32, 27 etc.

B.. Orifice insert Ø0.8; Ø1.0; Ø1.2; Ø1.4 mm (symbols E, D, P, H, M, W)

Nominal voltage (see sect. 2.1, table 5)
- G 12, G 24, WG 110, and WG 230
- X 12, X 24, X 48, and X 102
- L 12, L 24 and L5K24

Basic valve type and size
VZP 1

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