**Proportional spool valve with integrated electronics and spool position control with LVDT**

**Flange construction**
- direct operated
- \( Q_{\text{max}} = 50 \text{ l/min} \)
- \( Q_{\text{N max}} = 40 \text{ l/min} \)
- \( p_{\text{max}} = 350 \text{ bar} \)

**DESCRIPTION**
Direct operated proportional spool valve with 4 connections in 5-chamber system. With the integrated spool position sensor (LVDT), the actual position of the spool is continuously recorded and made to follow the transmitted command value. By means of this internal position control, a minimum hysteresis and excellent dynamic characteristics are assured. The Plug & Play valves are factory set and adjusted and have therefore a high valve-to-valve reproducibility. With protection class IP67 for the electronics, these valves are suitable for harsh environmental conditions. Proportional to the electronically transmitted command value, the spool stroke, the spool opening and the valve volume flow increase. The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via fieldbus interface. The USB parameterisation interface is accessible through a screw plug. «PASO» is a Windows program in the flow diagram style which enables the intuitive setting and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSVs. As an option, these valves are available with integrated controller. As feedback value generators sensors with voltage or current output can be connected directly. The available controller structures are optimised for applications with hydraulic actuators.

**APPLICATION**
Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. They are used where good valve-to-valve reproducibility, easy installation, comfortable operation and high precision are very important. The integrated controller relieves the machine control and operates the axis (position, angle, pressure, etc.) in a closed control loop. The applications are in the industry as well as in the mobile hydraulics for the smooth control of hydraulic actuators. Some examples: control of the rotor blades of wind generators, forestry and earth moving machines, machine tools and paper production machines, simple position controls, robotics and fan control.

**SYMBOL**
- Symmetrical control

![Symbol diagram](ACB-S)

- Meter-in control

![Symbol diagram](ADB-V)

**ELECTRICAL SPECIFICATIONS**
- Protection class: IP67 with suitable mating connector and closed housing cover
- Ramps: Adjustable
- Parameterisation: Via fieldbus or USB
- Supply voltage: 24 VDC

**Note!** Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.

**ACTUATION**
- Actuation: Proportional solenoid, wet pin push type, pressure tight
- Connection: Via device receptacle
Proportional spool valve

**TYPE CODE**

- Spool valve
- Direct operated
- Proportional, spool position control
- Flange construction
- International standard interface ISO, NG6
- Designation of symbols acc. to table

<table>
<thead>
<tr>
<th>Nominal volume flow rate $Q_N$</th>
<th>5 l/min</th>
<th>10 l/min</th>
<th>16 l/min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- (only ADB-V)

- Nominal voltage $U_N$ 24 VDC

<table>
<thead>
<tr>
<th>Hardware configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog command value signal 12 pole A2 7 pole U2 (-10 ... 10 V preset)</td>
</tr>
<tr>
<td>Analog command value signal 12 pole A4 7 pole U4 (4 ... 20 mA preset)</td>
</tr>
<tr>
<td>CANopen according to DSP-408 C1</td>
</tr>
<tr>
<td>Profibus DP according to Fluid Power Technology P1</td>
</tr>
<tr>
<td>CAN J1939 (on request) J1</td>
</tr>
</tbody>
</table>

- Function

| Controller with current feedback value signal (0 ... 20 mA / 4 ... 20 mA) |
| Controller with voltage feedback value signal (0 ... 10 V) |
| Sealing material NBR FKM (Viton) |

- Design index (subject to change) 1.10-82

**GENERAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Proportional spool valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Direct operated</td>
</tr>
<tr>
<td>Mounting</td>
<td>Flange construction</td>
</tr>
<tr>
<td>Nominal size</td>
<td>NG6 according to ISO 4401-03</td>
</tr>
<tr>
<td>Actuation</td>
<td>Proportional solenoid</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20...+65 °C</td>
</tr>
</tbody>
</table>

The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“.

| Weight | 3,3 kg |

**HYDRAULIC SPECIFICATIONS**

- Working pressure $p_{max} = 350$ bar
- Tank pressure $p_T = 160$ bar
- Maximum volume flow $Q_{max} = 50$ l/min, see characteristics
- Nominal volume flow $Q_N = 5, 10, 16, 32, 40$ (ADB-V) l/min
- Leakage oil On request
- Hysteresis $< 0,4 \%$
- Repeatability $< 0,4 \%$
- Fluid Mineral oil, other fluid on request
- Viscosity range $12$ mm$^2$/s ... $320$ mm$^2$/s
- Temperature range fluid $-20...+70$ °C
- Contamination efficiency Class 18 / 16 / 13
- Filtration Required filtration grade $\beta$ 10...16 ≥ 75, see data sheet 1.0-50
- Step response Typical 25 ms from 10 to 90 %
- Frequency response See characteristics
## ELECTRICAL CONNECTION

### X1 (Analog interface (Main))

<table>
<thead>
<tr>
<th>Device receptacle</th>
<th>7 pole male</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Supply voltage +</td>
</tr>
<tr>
<td>B</td>
<td>Supply voltage 0 VDC</td>
</tr>
<tr>
<td>C</td>
<td>Analog output -</td>
</tr>
<tr>
<td>D</td>
<td>Command value signal +</td>
</tr>
<tr>
<td>E</td>
<td>Command value signal -</td>
</tr>
<tr>
<td>F</td>
<td>Analog output +</td>
</tr>
<tr>
<td>G</td>
<td>Chassis</td>
</tr>
</tbody>
</table>

Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO.

Factory setting: voltage (-10…+10 V), (PIN 4/5)

### X1 (Fieldbus interface (Main))

<table>
<thead>
<tr>
<th>Device receptacle</th>
<th>M12, 4 pole male</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supply voltage +</td>
</tr>
<tr>
<td>2</td>
<td>Reserved for extensions</td>
</tr>
<tr>
<td>3</td>
<td>Supply voltage 0 VDC</td>
</tr>
<tr>
<td>4</td>
<td>Chassis</td>
</tr>
</tbody>
</table>

### X2 (Parameterisation interface)

USB, Mini B

Under the screw plug of the housing cover

Factory set

### X3 (Profibus interface according to IEC 947-5-2)

<table>
<thead>
<tr>
<th>Device receptacle</th>
<th>M12, 5 pole male B-coded</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VP</td>
</tr>
<tr>
<td>2</td>
<td>RxD / TxD - N</td>
</tr>
<tr>
<td>3</td>
<td>DGND</td>
</tr>
<tr>
<td>4</td>
<td>RxD / TxD - P</td>
</tr>
<tr>
<td>5</td>
<td>Shield</td>
</tr>
</tbody>
</table>

### X4 (controller only) (Feedback value interface (sensor))

<table>
<thead>
<tr>
<th>Device receptacle</th>
<th>M12, 5 pole female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supply voltage (output) +</td>
</tr>
<tr>
<td>2</td>
<td>Feedback value signal +</td>
</tr>
<tr>
<td>3</td>
<td>Supply voltage 0 VDC</td>
</tr>
<tr>
<td>4</td>
<td>Not connected</td>
</tr>
<tr>
<td>5</td>
<td>Stabilised output voltage</td>
</tr>
</tbody>
</table>

Feedback value signal: current (R1) or voltage (R2) to specify when placing the order

---

**Note!** The mating connector is not included in the delivery
PERFORMANCE SPECIFICATIONS

Oil viscosity $\nu = 30 \text{ mm}^2/\text{s}$

**Volume flow pressure characteristics**

<table>
<thead>
<tr>
<th>$Q = f(p)$</th>
<th>$s = 100%$</th>
<th>ACB-S</th>
</tr>
</thead>
</table>

**Pressure drop volume flow characteristics**

$\Delta p = f(Q)$  
$s = 100\%$  
ACB-S

**Volume flow adjustment characteristics**

$Q = f(s,x)$  
$\Delta p = 10\text{ bar}$, $s =$ Command value signal, $x =$ spool stroke  
ACB-S

**Frequency response**

$\Delta p = 10\text{ bar}$  
$p_c < 1\text{ bar}$

Note! All values were measured over two control edges. The connections A and B were short-circuited.
FACTORY SETTINGS

Dither set for optimum hysteresis
◆ = Deadband: Both solenoids switched off
   at command value signal -2%…2%
● = Opening pressure at command value signal + / - 4%
■ = Flow at ∆p = 10 bar over two control edges + / - 70% command value signal

Type: ACB-S

<table>
<thead>
<tr>
<th></th>
<th>at nominal volume flow rate Qₙ</th>
<th>32 l/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.0 l/min</td>
<td>Qₙ</td>
<td></td>
</tr>
<tr>
<td>9.4 l/min</td>
<td>Qₙ</td>
<td></td>
</tr>
<tr>
<td>4.4 l/min</td>
<td>Qₙ</td>
<td></td>
</tr>
<tr>
<td>2.7 l/min</td>
<td>Qₙ</td>
<td></td>
</tr>
</tbody>
</table>

Type: ADB-V

<table>
<thead>
<tr>
<th></th>
<th>at nominal volume flow rate Qₙ</th>
<th>40 l/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.5 l/min</td>
<td>Qₙ</td>
<td></td>
</tr>
<tr>
<td>16.5 l/min</td>
<td>Qₙ</td>
<td></td>
</tr>
<tr>
<td>10.5 l/min</td>
<td>Qₙ</td>
<td></td>
</tr>
<tr>
<td>5.5 l/min</td>
<td>Qₙ</td>
<td></td>
</tr>
</tbody>
</table>

DIMENSIONS

With analog interface, 12 pole connector
Amplifier and controller

HYDRAULIC CONNECTION

With analog interface, 7 pole connector
Amplifier and controller

With fieldbus interface
Amplifier

With fieldbus interface
Controller

* For amplifier
** For controller
*** Only controller
PORTIONAL SPOOL VALVE

ACCESSORIES

Parameterisation software
See start-up

Parameterisation cable for interface
USB
(from plug type A on Mini B, 3 m)

Mating connector (plug female) for analog interface
straight, soldering contact M23, 12 pole

angled, soldering contact M23, 12 pole

straight, soldering contact, 7 pole

Article no. 219.2896

Article no. 219.2330

Article no. 219.2331

Article no. 219.2335

Threaded subplates
Data sheet 2.9-30

Multi-station subplates
Data sheet 2.9-60

Horizontal mounting blocks
Data sheet 2.9-100

Technical explanations
Data sheet 1.0-100

Hydraulic fluids
Data sheet 1.0-50

Filtration
Data sheet 1.0-50

Relative duty factor
Data sheet 1.1-430

INSTALLATION NOTES

Mounting type
Flange mounting
4 fixing holes for
socket head screws M5 x 50

Mounting position
Any, preferably horizontal

Tightening torque
Fixing screws M₉₀ = 5,2 Nm (screw
quality 8.8, zinc coated)

Note!
The length of the fixing screw depends on the base
material of the connection element.

SURFACE TREATMENT

◆ The valve body is painted with a two component paint
◆ The solenoids are zinc nickel coated
◆ The electronics housing / chassis is made of aluminium

COMMISSIONING

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».

Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B). Further information can be found on: «www.wandfluh.com».

Free- of charge download of the «PASO» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

Note!
The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».

STANDARDS

CANopen
DRP 303-1

Profibus DP
IEC 947-5-2

Mounting interface
ISO 4401-03

Protection class
EN 60 529

Contamination efficiency
ISO 4406

Wandfluh AG
Postfach
CH-3714 Frutigen
Tel. +41 33 672 72 72
Fax +41 33 672 72 12
sales@wandfluh.com

PARTS LIST

<table>
<thead>
<tr>
<th>Position</th>
<th>Article</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>223.1317</td>
<td>Dummy plug M16 x 1,5</td>
</tr>
<tr>
<td>21</td>
<td>160.6131</td>
<td>O-ring ID 13,00 x 1,5 (FKM)</td>
</tr>
<tr>
<td>25</td>
<td>062.0102</td>
<td>Cover</td>
</tr>
<tr>
<td>30</td>
<td>072.0021</td>
<td>Gasket 33,2 x 59,9 x 2</td>
</tr>
<tr>
<td>40</td>
<td>208.0100</td>
<td>Socket head screw M4 x 10</td>
</tr>
<tr>
<td>50</td>
<td>160.2093</td>
<td>O-ring ID 9,25 x 1,78 (NBR)</td>
</tr>
<tr>
<td></td>
<td>160.6092</td>
<td>O-ring ID 9,25 x 1,78 (FKM)</td>
</tr>
<tr>
<td>60</td>
<td>246.2160</td>
<td>Socket head screw M5 x 60 DIN 912</td>
</tr>
<tr>
<td>65</td>
<td>246.2190</td>
<td>Socket head screw M5 x 90 DIN 912</td>
</tr>
</tbody>
</table>

Note!
Auxiliary conditions for the cable:
– External diameter 12 pol: 3,5…14,7 mm
– External diameter 7 pol: 8…10 mm
– Wire cross section max. 1 mm²
– Recommended wire cross section:
0…25 m = 0,75 mm² (AWG18)
25…50 m = 1 mm² (AWG17)

MANUAL OVERRIDE

None

SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

Wandfluh AG
Postfach
CH-3714 Frutigen
Tel. +41 33 672 72 72
Fax +41 33 672 72 12
sales@wandfluh.com

www.wandfluh.com Illustrations are not binding Data subject to change Edition: 18 12 1.10-82E