DS02
Miniature Variable Area Flowmeter and Switch—All Metal Version

- for low viscosity liquids and gases
- small mounting dimensions
- brass or stainless steel version
- robust design without a measuring glass tube
- universal installation position
- high switching accuracy
- optional Ex- version acc. to ATEX
- analogue transmitter 4...20 mA optional
- $P_{\text{max}}$: 350 bar, $T_{\text{max}}$: 160 °C

Description:
The flow switch model DS02 works according to a modified variable area principle. The float is guided in a cylindrical measuring tube by means of a spring. The flowing medium moves the float in the flow direction. A Reed contact is mounted outside the meter in a sealed housing. This reed contact is encapsulated in a continuously adjustable housing and thus protected from external influences. When the float reaches the position of the Reed contact the switch will close. With higher flows the float moves further upward until it reaches a built-in float stop, still keeping the switch closed. This ensures a bistable switch function at any time. An external pointing instrument is magnetically coupled to the float and indicates the flow rate.

Typical application:
The variable area flowmeters and monitors DS02 are used to measure and monitor continuous flow rates of low-viscosity liquids or gaseous media. Areas of applications are:
- cooling systems
- engineering
- medical technology
- pharmaceutical and chemical industries
- research and development
Models:

Measuring ranges:
- Water: 5...60 ml/min – 60...150 l/min (referenced to 1 bar abs, 20°C)
- Air: 0,6...2,2 Nl/min – 200...650 Nl/min

Materials: Brass or stainless steel versions

Technical Data:

Max. Pressure:

<table>
<thead>
<tr>
<th></th>
<th>DS02.1</th>
<th>DS02.2</th>
<th>DS02.3/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquids</td>
<td>200 bar (MS)</td>
<td>300 bar (MS)</td>
<td>300 bar (MS)</td>
</tr>
<tr>
<td>Gases</td>
<td>300 bar (VA)</td>
<td>350 bar (VA)</td>
<td>350 bar (VA)</td>
</tr>
</tbody>
</table>

Pressure loss:
- DS02.1: 0,02–0,2 bar
- DS02.2: 0,02–0,3 bar
- DS02.4: 0,02–0,4 bar

Max. media-temperature:
- 100 °C (optional 160 °C) for liquids
- 120 °C (optional 160 °C) for gases

Operating temp.: 70 °C with analogue transmitter AZ06

Electr. Connection:
- DS02.1 and DS02.2: angle plug acc. to EN 175301-803, form C (DIN 43650)
- DS02.3 and DS02.4: angle plug nach EN 175301-803, form A (DIN 43650), Ex-contact 3S and 3U with 2 m cable

Optional:
- cable connection round plug M12 x 1 acc. to EN 50044, angle plug with LED or glow lamp

Accuracy: ± 10 % of full scale (for vertical installation)

Materials:

Brass version:
- Wetted parts: brass (outside nickel plated)
  - Meas. tube: brass
  - Spring: st. steel 1.4571
  - Gaskets*: NBR, optional: EPDM, FKM
  - Magnet: ferrite
- all other wetted parts: brass

Stainless steel version 1.4571:
- Wetted parts: FKM, optional EPDM, NBR
- Magnet: ferrite
- all other wetted parts: stainless steel 1.4571

*only for reduced connection

Order Code:

Order Number: DS02.1

Connection female thread:
- 1 = G 1/4
- 2 = G 1/2
- 3 = G 3/4
- 4 = G 1

Material:
- 1 = brass
- 2 = stainless steel 1.4571

Scale:
- 1 = for water
- 2 = for air (at 1 bar abs., 20 °C)

Measuring ranges:
- Water (only DS02.1):
  - W101 = 5–60 ml/min
  - W102A = 40–130 ml/min
  - W106 = 0,1–0,6 l/min
  - W11 = 0,2–1,2 l/min
  - W12 = 0,4–2 l/min
  - W13 = 0,5–3 l/min
  - W15 = 1,0–5 l/min

- Air (only DS02.1):
  - L1002 = 0,6–2,2 Nl/min
  - L1006 = 1,7–6,0 Nl/min
  - L1022 = 3–22 Nl/min

- Water (only DS02.2):
  - W201 = 0,02–0,2 l/min
  - W202 = 0,02–0,3 l/min
  - W206 = 0,02–0,4 l/min

- Air (only DS02.2):
  - L2010 = 2,5–10 Nl/min
  - L2020 = 5,5–20 Nl/min
  - L2030 = 8–30 Nl/min

- Water (only DS02.3 or DS02.4):
  - W3030 = 10–30 l/min

- Air (only DS02.3 or DS02.4):
  - L30180 = 60–180 Nl/min

- Water (only DS02.4):
  - W4150 = 60–150 l/min

Addition S...= special scale

Number of contacts:
- 0 = without contact (only for devices with indication and/or AZ06)
- 1 = 1 contact
- 2 = 2 contacts

Contact function / Analogue output:
- (contact or analogue transmitter available)
  - 0 = without
  - 1 = N/O
  - 2 = SPDT
  - 2X = SPDT for SPS application (for devices from 1/2")
  - 3ST5 = Ex-N/O, T5 (100 °C), with 2 m cabel, not for DS02.1
  - 3ST6 = Ex-N/O, T6 (80 °C), with 2 m cabel, not for DS02.1
  - 3UT5 = Ex-SPDT, T5 (100 °C), with 2 m cabel, not for DS02.1
  - 3UT6 = Ex-SPDT, T6 (80 °C), with 2 m cabel, not for DS02.1
  - 3SM = Ex-N/O, only DS02.1 and DS02.2
  - 3UM = Ex-SPDT, only DS02.1 and DS02.2
  - SU20 = analogue transmitter 4...20 mA and 0...10 V

Options:
- 0 = without
- 1 = please specify in plain text
- AZ = with pointer indication (not for DS02.1)
- HT = high temperature version 160 °C
- M12 = round plug M12 x 1 acc. to EN 50044 (Tmax. 85 °C)
- Kx = cable version 1 m, 2 m, 5 m or 10 m
**Dimensions:**

<table>
<thead>
<tr>
<th>Dimensions [mm]</th>
<th>Weight [g]</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW</td>
<td>D</td>
</tr>
<tr>
<td>DS02.1</td>
<td>17</td>
</tr>
<tr>
<td>DS02.2</td>
<td>27</td>
</tr>
<tr>
<td>DS02.3</td>
<td>41</td>
</tr>
<tr>
<td>DS02.4</td>
<td>41</td>
</tr>
</tbody>
</table>

Note: DS02.2...AZ and DS02.3(4)...AZ: square housing

**Contacts:**
The contact opens/changes, if the flow level has fallen under the adjusted value

**Switching capacity**

<table>
<thead>
<tr>
<th>Type</th>
<th>Contact function</th>
<th>Angle plug IP65</th>
<th>M12x1 plug IP67**</th>
<th>Cable connection (1 m) IP67</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS02.1</td>
<td>1 = N/O</td>
<td>140 VAC / 0,7 A / 20 VA</td>
<td>125 VAC / 0,7 A / 20 VA</td>
<td>140 VAC / 0,7 A / 20 VA</td>
</tr>
<tr>
<td></td>
<td>2 = SPDT</td>
<td>200 VDC / 1 A / 20 VA</td>
<td>125 VDC / 1 A / 20 VA</td>
<td>200 VDC / 1 A / 20 VA</td>
</tr>
<tr>
<td></td>
<td>3SM = Ex-N/O*</td>
<td>150 VAC/DC / 1 A / 20 VA</td>
<td>125 VAC/DC / 1 A / 20 VA</td>
<td>-/ -</td>
</tr>
<tr>
<td></td>
<td></td>
<td>gas: &lt; 30 V / 0,101 A / 0,76 W</td>
<td>dust: &lt; 30 V / 0,25 A / 0,75 W</td>
<td>gas: &lt; 30 V / 0,101 A / 0,76 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dust: &lt; 30 V / 0,25 A / 0,75 W</td>
<td>dust: &lt; 30 V / 0,25 A / 0,75 W</td>
<td>dust: &lt; 30 V / 0,25 A / 0,75 W</td>
</tr>
<tr>
<td></td>
<td>3UM = Ex-SPDT*</td>
<td>-/ -</td>
<td>-/ -</td>
<td>-/ -</td>
</tr>
<tr>
<td>DS02.2</td>
<td>1 = N/O</td>
<td>230 V / 3 A / 60 VA</td>
<td>125 V / 3 A / 60 VA</td>
<td>230 V / 3 A / 60 VA</td>
</tr>
<tr>
<td></td>
<td>2 = SPDT</td>
<td>250 V / 1,5 A / 50 VA, min load: 3 VA</td>
<td>125 V / 1,5 A / 50 VA, min load: 3 VA</td>
<td>-/ -</td>
</tr>
<tr>
<td></td>
<td>2X = SPDT for SPS</td>
<td>250 V / 1 A / 60 VA</td>
<td>-/ -</td>
<td>-/ -</td>
</tr>
<tr>
<td></td>
<td>3SM = Ex-N/O*</td>
<td>gas: &lt; 30 V / 0,101 A / 0,76 W</td>
<td>gas: &lt; 30 V / 0,101 A / 0,76 W</td>
<td>gas: &lt; 30 V / 0,101 A / 0,76 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dust: &lt; 30 V / 0,25 A / 0,75 W</td>
<td>dust: &lt; 30 V / 0,25 A / 0,75 W</td>
<td>dust: &lt; 30 V / 0,25 A / 0,75 W</td>
</tr>
<tr>
<td></td>
<td>3ST5 = Ex-N/O T5*</td>
<td>-/ -</td>
<td>-/ -</td>
<td>250 V / 2 A / 60 VA (2 m cable)</td>
</tr>
<tr>
<td></td>
<td>3ST6 = Ex-N/O T6*</td>
<td>-/ -</td>
<td>-/ -</td>
<td>250 V / 2 A / 60 VA (2 m cable)</td>
</tr>
<tr>
<td></td>
<td>3UT5 = Ex-SPDT T5*</td>
<td>-/ -</td>
<td>-/ -</td>
<td>250 V / 1 A / 30 VA, min load: 3 VA (2 m cable)</td>
</tr>
<tr>
<td></td>
<td>3UT6 = Ex-SPDT T6*</td>
<td>-/ -</td>
<td>-/ -</td>
<td>250 V / 1 A / 30 VA, min load: 3 VA (2 m cable)</td>
</tr>
<tr>
<td>DS02.3</td>
<td>1 = N/O</td>
<td>250 V / 3 A / 100 VA</td>
<td>-/ -</td>
<td>-/ -</td>
</tr>
<tr>
<td></td>
<td>2 = SPDT</td>
<td>250 V / 1,5 A / 50 VA, min load: 3 VA</td>
<td>-/ -</td>
<td>-/ -</td>
</tr>
<tr>
<td></td>
<td>2X = SPDT for SPS</td>
<td>250 V / 1 A / 60 VA</td>
<td>-/ -</td>
<td>-/ -</td>
</tr>
<tr>
<td></td>
<td>3ST5 = Ex-N/O T5*</td>
<td>-/ -</td>
<td>-/ -</td>
<td>250 V / 2 A / 60 VA (2 m cable)</td>
</tr>
<tr>
<td></td>
<td>3ST6 = Ex-N/O T6*</td>
<td>-/ -</td>
<td>-/ -</td>
<td>250 V / 2 A / 60 VA (2 m cable)</td>
</tr>
<tr>
<td></td>
<td>3UT5 = Ex-SPDT T5*</td>
<td>-/ -</td>
<td>-/ -</td>
<td>250 V / 1 A / 30 VA, min load: 3 VA (2 m cable)</td>
</tr>
<tr>
<td></td>
<td>3UT6 = Ex-SPDT T6*</td>
<td>-/ -</td>
<td>-/ -</td>
<td>250 V / 1 A / 30 VA, min load: 3 VA (2 m cable)</td>
</tr>
</tbody>
</table>

* Exact max. switching capacity: see ATEX documents
** Protection class M12x1 plug for DS02.1 and DS02.2: IP65

**ATEX-designations:**

**Contacts 3SM and 3UM for DS02.1/2.:**

ATEX II 2 G Ex ib IIC and ATEX II 2 D Ex ib IIC for connection to a certified intrinsically safe circuit, temperature range -5 °C < T_{Service} < 45 °C, L=0, C=0

**Contacts 3ST5, 3ST6, 3UT5, 3UT6 for DS02.2/3/4.:**

ATEX II 2 G Ex mb IIC T6 Gb, ATEX II 2 D Ex tb IIC T80 °C Db
ATEX II 2 G Ex mb IIC T5 Gb, ATEX II 2 D Ex tb IIC T100 °C Db
(with cable connection, Standard 2 m only)

PKP Prozessmesstechnik GmbH
Borsigstr. 24 • D-65205 Wiesbaden
Tel +49 (0) 6122-7055-0 • Fax +49 (0) 6122 7055-50
info@pkp.de • www.pkp.de
Analogue Transmitter SU20:

The position of a magnetic float / piston is detected by means of Hall sensors and converted into an analogue signal.

- analogue signal 4...20 mA and 0...10 V
- operating temperature: -20... +70 °C
- accuracy: +/- 10 % of full scale
- Aluminium housing, anodized

Technical Data:

Accuracy*: +/- 1 % of full scale
Operating temperature: -20...+70 °C
Storage temperature: -20...+80 °C
Repeatability: tbd.
Housing material: Aluminium, blue anodized
Protection class: IP67

* The actual accuracy depends on the flow sensor used. On request the accuracy of the flow sensor used can be significantly increased by a customized calibration.

Electrical Data:

Analogue output: 4...20 mA and 0...10 V
Power supply: 24 V/DC (19...30 V/DC)
Power consumption: < 1 W
Current output: max. load 600 Ohm
Voltage output: max. current 10 mA
Connection: round plug M12x1, 5-pole

Notes:

Flowmeter and analogue transmitter SU20 have been optimally adjusted to each other and may not be exchanged.

Electrical Connection:

<table>
<thead>
<tr>
<th>Pin</th>
<th>Color</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>brown</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>white</td>
<td>Out 1 (4...20 mA)</td>
</tr>
<tr>
<td>3</td>
<td>blue</td>
<td>0 V</td>
</tr>
<tr>
<td>4</td>
<td>black</td>
<td>Out 2 (0...10 V)</td>
</tr>
<tr>
<td>5</td>
<td>gray</td>
<td>Test</td>
</tr>
</tbody>
</table>

Attention: Pin 5 must not be electrically connected! We strongly recommend use of a four core cable.

Dimensions:

Current-Flow characteristic:

Voltage-Flow characteristic:

LL: lower limit of measuring range
UL: upper limit of measuring range

PKP Prozessmesstechnik GmbH
Borsigstr. 24  •  D-65205 Wiesbaden
+49 (0) 6122-7055-0  •  +49 (0) 6122 7055-50
info@pkp.de  •  www.pkp.de
Accessories (see separate data sheets):

• Needle valves SNV01, SNV02

• Ball valves SKG01, SKG02

• Dirt traps SF00, SF01

• Protection relay MSR01

• M12 Plug connector PVC-cable SM12

Notes:

The specified measuring/switching ranges apply when the instrument is installed vertically and the flow rate is from bottom to top. Other installation positions or operating densities deviating from the specified specifications increase the specified measuring error.

Special scales for different media and operating conditions are available on request.

The specified switching points are shut-off points at falling flow rates. Please note that the switch-on points are higher due to the hysteresis.

For applications where pressure surges are to be expected, please contact PKP!