



**Vortex flow sensor VA40 with integrated, configurable transducer UVA-Ex-d in a flameproof enclosure for applications in explosive atmospheres**



UVA-Ex-d with flange guide piece SFB

**Measured variables**

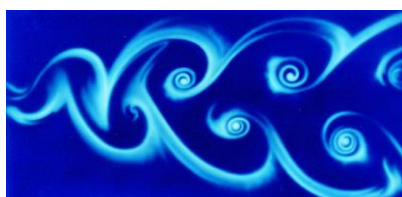
- actual flow velocity  $v$  [m/s]
- actual flow rate [m<sup>3</sup>/h]
- conversion to standard velocity/standard volume flow with input parameters pressure and temperature

**Measuring range**

- 0.5 ... 40 m/s

**Functional principle**

- vortex meter for measuring flow velocity, flow rate and volume
- ultrasonic measuring of the vortex shedding



Kármán vortex street

**Design**

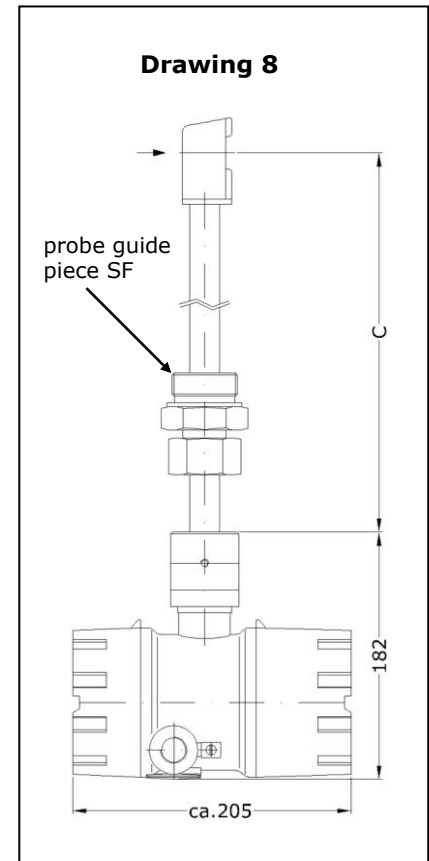
- insertion probe with probe guide piece and flameproof enclosure

**Media**

- primarily single-phase gas mixtures with air, nitrogen, oxygen, methane, natural gas, ammonia, argon, carbon monoxide, superheated steam, ... as dominant components; biogas
- Other gases and gas mixtures on request.

**Advantages**

- compact unit for explosive atmospheres with optional local display
- applications in Category 1 (Zone 0 and 20); transducer housing approved for Category 2 (Zone 1 and 21)
- applications up to SIL2
- no external isolation/supply unit necessary
- low starting value (0.5 m/s)
- high turndown (1 : 80)
- long-term stability
- no moving parts
- easy to clean
- high durability
- corrosion-resistant
- largely unaffected by gas composition
- marginal pressure loss
- easy adjustment of parameters with HART® interface



Probe with screw thread  
probe guide piece SF

**Examples of application**

- flow measurement in explosive atmospheres: air, outlet air, sludge activation air, engine intake air, natural gas, waste gas, process gas, biogas, car exhaust emissions, flare gas, water vapour, ...

**Particles, humidity and condensation**

- dust or fibre particles in the gas do not affect the measurement, as long as these are not abrasive or accumulate on the sensor
- measurement uncertainty remains unaffected by a relative gas humidity of less than 100 % and a slight accumulation of condensate on the sensor



### Model designation / order code (example)

|          |       |    |     |        |          |  |
|----------|-------|----|-----|--------|----------|--|
| UVA-Ex-d | -VA40 | -E | -10 | -C500  | with LCD |  |
| UVA-Ex-d | -VA40 | -H | -18 | -C1500 | with LCD |  |

### Types

| Type                | Article No. |
|---------------------|-------------|
| UVA-Ex-d-VA40-E- -- | HB09-a000   |
| UVA-Ex-d-VA40-H- -- | HB09-a001   |
| UVA-Ex-d-VA40-T- -- | HB09-a002   |

### (1) Sensor type / diameter

Vortex flow sensor VA40; width across corners of sensor head 40 mm and shaft Ø 21.3 mm for insertion in openings with a diameter greater than 40 mm

### (2) Medium

|           |           |
|-----------|-----------|
| ... G ... | air/gases |
|-----------|-----------|

### (3) Materials in contact with the medium

| Design    | Material   |
|-----------|--|
| ... E ... | stainless steel, sensor housing 1.4581<br>connection tube 1.4404, ceramics<br>VITON® seals<br>silicone-free sensor |
| ... H ... | Hastelloy 2.4610 / HC4, ceramics<br>VITON® seals<br>silicone-free sensor   |
| ... T ... | titanium 3.7161, ceramics<br>VITON® seals<br>silicone-free sensor  |

### (4) Measuring range

| Design         | Range          |
|----------------|----------------|
| ... 40 m/s ... | 0.5 ... 40 m/s |

|                         |  |
|-------------------------|--|
| Measurement uncertainty | < 1.0 % of measured value + 0.03 m/s   |
| Repeatability           | ± 0.2 % of measured value + 0.025 % FS |


**Examples of measurable flow rates**

| measuring tube<br>inside diameter<br>Di [mm] | profile factor<br>PF*<br>[-] | smallest measurable<br>value<br>[m³/h] | terminal value<br>[m³/h] |
|--|------------------------------|--|--------------------------|
| 80   | 0.719                        | 6.5                                    | 520                      |
| 100  | 0.738                        | 10.4                                   | 835                      |
| 120  | 0.761                        | 15.5                                   | 1240                     |
| 150  | 0.796                        | 26                                     | 2030                     |
| 200  | 0.842                        | 48                                     | 3810                     |
| 300  | 0.845                        | 108                                    | 8600                     |
| 400  | 0.850                        | 193                                    | 15400                    |
| 500  | 0.850                        | 300                                    | 24000                    |
| 750  | 0.850                        | 680                                    | 54100                    |
| 1000   | 0.850                        | 1200                                   | 96100                    |
| 1250   | 0.850                        | 1880                                   | 150000                   |
| 1500   | 0.850                        | 2700                                   | 216000                   |

Flow rate measuring range specifications with centric positioning of sensor, non-rotational (vortex-free) inlet flow and amply dimensioned input/output sections (see Information for Use VA Probes U206).

\* The profile factor PF describes the ratio of average flow velocity in the measurement cross section and the flow velocity measured from the sensor. The afore-mentioned operating conditions apply.

**Working temperature range / seal material**

| Design                           | Material  | Working temperature<br>range of medium | Article No. |
|----------------------------------|-----------|--|-------------|
| <b>'t<sub>max</sub> +100 °C'</b> |           |  |             |
|                                  | VITON®    | -20 ... +100 °C                        | HB09-a080   |
|                                  | silicone  | -40 ... +100 °C                        | HB09-a081   |
|                                  | EPDM      | -40 ... +100 °C                        | HB09-a082   |
|                                  | **KALREZ® | 0 ... +100 °C                          | HB09-a083   |
| <b>'t<sub>max</sub> +180 °C'</b> |           |  |             |
|                                  | VITON®    | -20 ... +180 °C                        | HB09-a090   |
|                                  | silicone  | -40 ... +180 °C                        | HB09-a091   |
|                                  | **KALREZ® | 0 ... +180 °C                          | HB09-a092   |

**Permissible ambient  
temperature**

-20 ... +50 °C

\*\*Compound 4079



#### **(5) Maximum working pressure**

up to 3 bar / 300 kPa overpressure

#### **(6) Design**

as in Drawing 8 (Page 1)

#### **(7) ATEX protection**

for gas : ⚡ II 1/2 G Ex ia/d e [ia] IIC T6 Ga/Gb  
for dust : ⚡ II 1/2 D Ex ia/tb IIIC TX Da/Db  
sensor : Category 1 (Zone 0 or 20)  
transducer housing : Category 2 (Zone 1 or 21)

#### **Installation length (see Drawing 8, Page 1)**

| Measurement C | stainless steel<br>'... E ...' | Hastelloy<br>'... H ...' | titanium<br>'... T ...' |
|---------------|--------------------------------|--------------------------|-------------------------|
|               | Article No.                    | Article No.              | Article No.             |
| 250 mm        | HB09-a050                      | HB09-a060                | HB09-a070               |
| 500 mm        | HB09-a051                      | HB09-a061                | HB09-a071               |
| 750 mm        | HB09-a052                      | HB09-a062                | HB09-a072               |
| 1000 mm       | HB09-a053                      | HB09-a063                | HB09-a073               |
| 1250 mm       | HB09-a054                      | HB09-a064                | HB09-a074               |
| 1500 mm       | HB09-a055                      | HB09-a065                | HB09-a075               |
| 1750 mm       | HB09-a056                      | HB09-a066                | HB09-a076               |
| 2000 mm       | HB09-a057                      | HB09-a067                | HB09-a077               |

Select the installation length so that the surface temperature of the transducer housing does not exceed +50 °C!

#### **Ex-d transducer housing**

|            |   |
|------------|---|
| Dimensions | outside diameter/length/height: ca. 110/205/182 mm  |
| Material   | aluminium cast alloy max. 0.5 % Mg, coated  |
| Protection | IP68, IEC 529 and EN 60 529   |
| Connection | glands for shielded cables with outside diameter 5 ... 9 mm;<br>contacting of overall screen on the ground terminal in the housing;<br>via screw terminals Ex-e for wires with cross-section 0.14 – 1.5 mm <sup>2</sup> |
| Alignment  | rotatable by approx. 350 ° and lockable   |
| Setup      | dual chamber system consisting of:<br>1) electronics in Ex-d protection (flameproof enclosure)<br>2) connections in Ex-e protection (increased safety) with<br>terminal block and cable glands                          |

#### **Electromagnetic Compatibility (EMC)**

according to EN 61 000-6-2 / IEC77

#### **Functional Safety / Safety Integrity Level (SIL)**

according to DIN EN 61508 part 1 to part 7 and DIN EN 61511 part 1 to part 3, SIL2;  
please pay attention to our document U400!

#### **Installation position**

|     |   |
|-----|---|
| any | horizontal positioning is recommended if condensate on the sensor cannot be ruled out |
|-----|---|


**Probe guide pieces\* (see also Page 6)**  
**Model designation (examples)**

|             |             |             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| SFB         | 21.3        |             | E           | 53          | G1 1/2"     | ZG5         |
| SFK         | 21.3        | /42         | E           | 150         | F-DN50PN16  | ZG3         |
| <b>(S1)</b> | <b>(S2)</b> | <b>(S3)</b> | <b>(S4)</b> | <b>(S5)</b> | <b>(S6)</b> | <b>(S7)</b> |

|  |                       |
|--|-----------------------|
| <b>(S1) Type</b>                                 |                       |
| SFB  | SF with clamping bush |
| SFK  | SF with clamping yoke |
| SFZ  | SF with collet        |
| <b>(S2) Diameter through hole [mm]</b>           |                       |
| ... 21.3 ...                                     | 21.3 mm through hole  |
| <b>(S3) Diameter insertion opening for probe</b> |                       |
|  |                       |
| <b>(S4) Material</b>                             |                       |
| ... E ...  | stainless steel       |
| ... H ...  | Hastelloy             |
| <b>(S5) Installation length L [mm]</b>           |                       |
|  |                       |
| <b>(S6) Process connection</b>                   |                       |
| ... G ...  | thread                |
| ... F ...  | flange                |
| <b>(S7) Design as in Drawing (ZG)</b>            |                       |

| Type   | Description  | Article No. |
|--|--|-------------|
| <b>with screw thread connection</b>  |  |             |
| SFB 21.3 E-53 /<br>G 1½" ZG5,<br>Drawing 5, Page 6                               | VITON® seal, TEFLON® clamping bush,<br>working temperature range -20 ... +240 °C,<br>max. working pressure 3 bar/300 kPa,<br>thread length GL 22 mm  | HB04-a504   |
| SFB 21.3 E-53 /<br>G 1½" ZG5<br>with metallic sealing edge,<br>Drawing 5, Page 6 | metallic sealing edge, TEFLON® clamping<br>bush,<br>working temperature range -40 ... +240 °C,<br>max. working pressure 3 bar/300 kPa,<br>thread length GL 22 mm                                 | HB04-a511   |
| SFB 21.3 E-53 /<br>NPT 1½" ZG5,<br>Drawing 5, Page 6                             | VITON® seal, PTFE clamping bush,<br>working temperature range -20 ... +240 °C,<br>max. working pressure 3 bar/300 kPa,<br>according to ANSI/ASME B1.20.1-1983,<br>thread length GL approx. 26 mm | HB04-a509   |
| <b>with flange connection</b>  |  |             |
| SFB 21.3 E-70 /<br>F-DN50 PN16 ZG1,<br>Drawing 1, Page 6                         | seal TEFLON® clamping bush,<br>working temperature range -20 ... +240 °C,<br>max. working pressure 3 bar/300 kPa   | HB04-a103   |
| SFB 21.3 H-70 /<br>F-DN50 PN16 ZG1,<br>Drawing 1, Page 6                         | seal TEFLON® clamping bush,<br>working temperature range -40 ... +240 °C,<br>max. working pressure 3 bar/300 kPa   | HB04-a105   |
| SFB 21.3 E-70 /<br>F-ANSI B16.5 2" 150 lbs ZG1<br>Drawing 1, Page 6              | seal TEFLON® clamping bush,<br>working temperature range -40 ... +240 °C,<br>max. working pressure 3 bar/300 kPa,<br>flange according to ANSI Standard B16.5                                     | HB04-a512   |

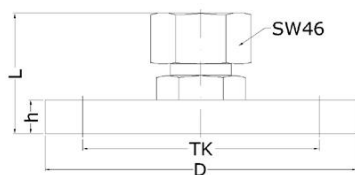


### Probe guide pieces\* (cont'd)

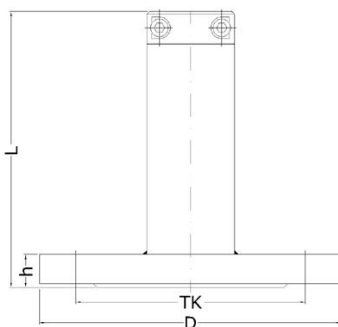
| Type  | Description   | Article No. |
|---|---|-------------|
| SFK 21.3 E-150 /<br>F-DN50 PN16 ZG3,<br>Drawing 3, Page 6                         | VITON® O-ring,<br>working temperature range -20 ... +240 °C,<br>max. working pressure 6 bar/600 kPa,<br>incl. hexagon cranked wrench key SW5  | HB04-a304   |
| SFK 21.3 E-150 /<br>F-DN40 PN16 ZG3,<br>Drawing 3, Page 6                         | VITON® O-ring,<br>working temperature range -20 ... +240 °C,<br>max. working pressure 6 bar/600 kPa,<br>incl. hexagon cranked wrench key SW5  | HB04-a303   |
| SFK 21.3 / 42 E-150 /<br>F-DN50 PN16 ZG3<br>with ball valve,<br>Drawing 3, Page 6 | 2 VITON® O-rings,<br>working temperature range -20 ... +240 °C,<br>max. working pressure 6 bar/600 kPa,<br>with ball valve,<br>installation length ball valve 150 mm,<br>incl. hexagon cranked wrench key SW5.<br>The probe guide piece can be retracted into<br>the probe to close the ball valve. | HB04-a313   |

\* Probe guide pieces are obligatory for process connection via screw socket or flange connector. They are adjustable, rotatable and permanently attached to the probe shaft. It is to be ensured that sensor length, screw socket or flange connector height as well as probe insertion depth match up. Other probe guide pieces are available on request.

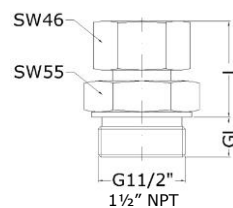
**Drawing 1**



**Drawing 3**



**Drawing 5**



Probe guide pieces SF


**Transducer UVA integrated in the connection housing**

|   |  |
|---|--|
| Analog output flow  | 4 ... 20 mA<br>resistance max. 500 Ohm   |
| Output limit value or quantity pulse                            | potential-free relay contact (normally-open),<br>max. 300 mA / 27 VDC  |
| Communication port  | HART® via modem adapter for PC connection<br>and UCOM software (see Accessories)   |
|   | output signals are electrically isolated from the power supply   |
| Self-monitoring   | parameter settings, sensor interface;<br>in the case of error: analog output < 3.6 mA  |
| Power supply  | 24 V DC (20 ... 27 V DC)   |
| Power consumption   | less than 5 W  |
| Setting parameters<br>(selection depending on<br>parameter set) | analog output, time constant, profile factor, tube inside diameter,<br>limit value or quantity pulse (rating adjustable),<br>switchover actual/standard flow with parameters 'working pressure'<br>and 'working temperature' |

**Accessories (optional)**

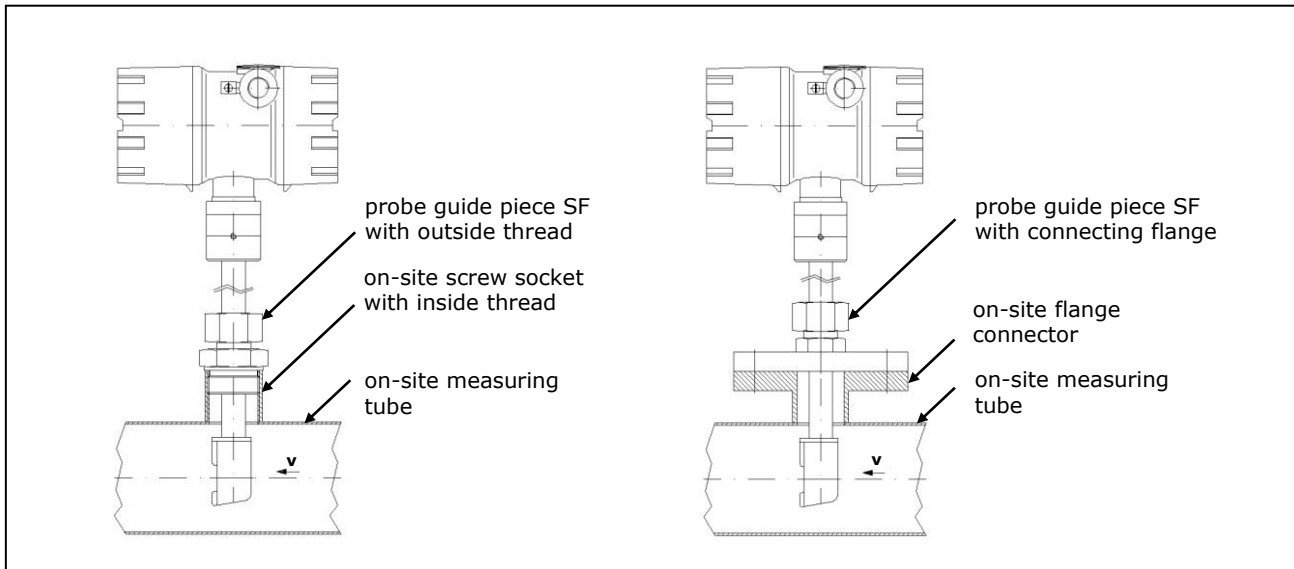
|                              | Description  | Article No. |
|------------------------------|--|-------------|
| LCD display                  | 1 <sup>st</sup> row: 'instantaneous value':<br>flow rate or flow velocity<br>2 <sup>nd</sup> row: 'counter' or 'error code'<br>2 x 16-digit, character height 5.5 mm,<br>working temperature range -20 ... +50 °C<br>display rotatable in 90 °-stages on<br>removing the Ex-d housing window cover | HB10-b520   |
| Calibration certificate v/VA |  | KLB         |
| HART® modem adapter          | for changing setting parameters,<br>for PC-USB connection  | HB10-101    |
| PC software UCOM             | for configuring the UVA via RS232  | HB10-052    |



Ex-d transducer housing with  
optional LCD display



## Probe installation



Probe installation with screw thread probe guide piece (left) and flange probe guide piece (right)

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Dupont: VITON, TEFLON, KALREZ  
HART: HART Communication  
Foundation

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