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ATEX

Vortex Measuring Tubes VA Di Ex-d

Instruction Manual



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1 Safety Symbols

Warning! Failure to observe the instructions can result in serious injury and damage to property!



Important notice!

Non-observance can result in serious damage to the equipment or performance restriction!

2 Operating Safety



All steps described below must be carried out by qualified personnel only!

Please read the Operating Instructions carefully before unpacking the equipment!

Safety can only be guaranteed if the equipment is operated in accordance with the regulations. Inappropriate handling can result in serious injury and damage to property.

3 Planning / Design



3.1 Ex-application



Only approved appliances may be used for applications in potentially explosive atmospheres. Special attention should be paid to Instruction Manual UVA-Ex-d VA Di, Chapter 5 in this document.



3.2 Choice of Installation Location

The place of installation must be chosen with care to make optimal use of the measurement accuracy. For this reason it is necessary to select a location so that in the measurement cross section a fully developed, turbulent flow profile and irrotational flow prevail. The minimum length of the input/output sections necessary for this depends on the individual pipeline positioning. For tips on installation see Fig. 3.2-1.



Should a suitably long input/output section not be available, then the existing section is to be divided into the same input/output section ratio as illustrated in Fig. 3.2-1. The input section can be significantly shortened by using a flow rectifier GL Di ... (see Data Sheet U349 or U350, Accessories)

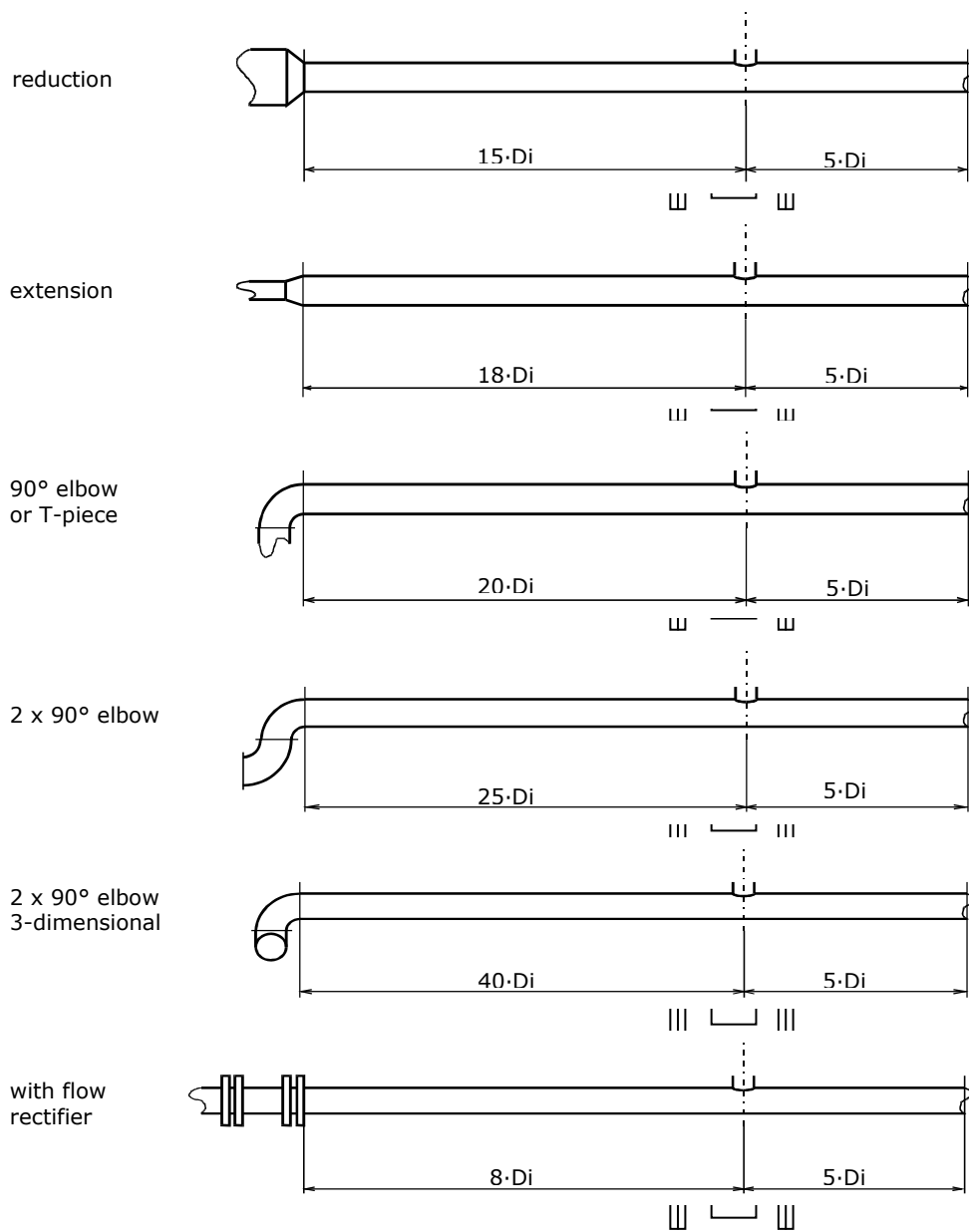


Fig. 3.2-1: necessary input/output sections depending on pipeline positioning



4 Scope of Delivery

Please check that everything listed in the Delivery Note / Technical Data Sheet is included in the delivery. Also look out for potential small parts such as screw sets, seals, etc.

4.1 Essential Components

An assembly kit is needed for mechanical assembly and this can be ordered from Höntzsch.

Sensor type	Screw size	Number of screws
VA Di 25 ...	M12	4
VA Di 40 ...	M16	4
VA Di 50 ...	M16	4
VA Di 80 ...	M16	8
VA Di 100 ...	M16	8

Screw length is dependent on the installation location. Sensor flange thickness is specified in Data Sheet U349 or U350.

The assembly kit consists of screws, nuts, washers and standard flange seal made of NBR rubber with aramide fibres. Should this seal prove unsuitable due to application conditions, an alternative seal with the appropriate properties must be used.



5 Instruction Manual UVA-Ex-d VADi with transducer electronics in pressure-proof enclosure



5.1 Electrical Apparatus

Vortex flow sensors VA designed as measuring tube VA Di with transducer electronics in pressure-proof enclosure with optional LCD display.

Ex-sensors UVA-Ex-d VA Di are intrinsically safe components for measuring the flow velocity and flow rate of gases with non-intrinsically safe transducer electronics in a pressure-proof enclosure. They are designed for application in areas in which Category 1 electrical apparatus is required. Installation is by flange. The enclosure for the electronics is located in areas which require Category 2 electrical apparatus.



5.2 Safety Tips

Read the Instruction Manual carefully before initial operation! Non-observance of the Instruction Manual can lead to explosion of the installation.

The electrical apparatus UVA-Ex-d VA Di is to be used solely in Category 1/2G and 2G or 1/2D and 2D areas, in which the ambient temperatures of -20°C to $+60^{\circ}\text{C}$ or -40°C $+60^{\circ}\text{C}$ for the TT version **for the enclosure of the electronics** is not exceeded. See also details on the type plate of the sensor as well as the relevant technical data. In the case of TT version the connection clamps must not be operated at temperatures under -20°C !

The **temperature of the medium** in Category 1/2G must not exceed $+60^{\circ}\text{C}$ under atmospheric pressure. The maximum admissible temperature of the medium in Category 2 locations corresponds to the temperature class. See also details on the type plate of the sensor as well as the relevant technical data.

In Category 1/2D and 2D areas self-heating does not need to be taken into account.
For maximum permissible temperatures: see type plate and relevant technical data.

The container for the gases is to be insulated in such a way as to guarantee that the electronics enclosure does not absorb temperatures exceeding the above mentioned maximum ambient temperatures of the respective temperature class; at the same time radiant and convective heat must be taken into consideration.

Sensors UVA-Ex-d VA Di are to be used solely in areas in which the temperature for gas noted on the type plate, the ambient temperature and the maximum permissible pressure above atmospheric is not exceeded.

Sensors UVA-Ex-d VA Di for application in pressurized pipelines are to be inserted or retracted in depressurized conditions only. Non-observance can result in serious harm to personnel.

The cover of the pressure-resistant electronics enclosure may only be opened in the safe zone.

A standardised process connection ($>$ or $=$ IP67) guarantees the tightness of the zone separation during installation.



5.3 Conformity with Standards

The electrical apparatus meets the requirements of the European Standards:

EN 60079-0: 2010	General Requirements
EN 60079-1: 2008	Flameproof Enclosures "d"
EN 60079-7: 2007	Increased Safety "e"
EN 60079-26: 2012	Special Requirements Category 1G EPL Ga
EN 60079-11: 2012	Intrinsic Safety "i"
EN 60079-31: 2010	Equipment Dust Ignition Protection by Enclosures "t"

5.4 Technical Data

EC-type Examination Certificate: **IBExU 06 ATEX 1103 X**

Explosion protection: **Ex ia/d e [ia] IIC T6 Ga/Gb**
Marking

CE 0637 **Ex** II 1/2 G

Explosion protection: **Ex ia/tb IIIC TX Da/Db**
Marking

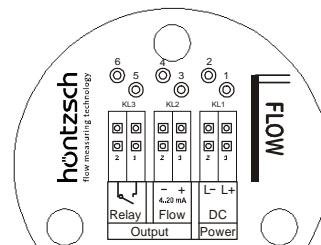
CE 0637 **Ex** II 1/2 D

5.4.1 Electrical Data

Power supply : 24 V DC (20...27 V DC) < 5 W
Current consumption : < 150 mA
Terminals KL1 : +24 V DC = Power DC L+
 : 0 V DC = Power DC L-

Analog output : 4...20 mA, resistance max. 500 Ohm
Terminals KL2 : + = Output Flow + 4..20mA
 : - = Output Flow - 4..20mA

Relay output : potential-free, max. 30 V DC, 100 mA
Terminals KL3 : output relay, normally open contact





5.5 Installation

The European Specifications for Assembly EN 60079-14: 2009 + Cor.: 2012, as well as the general rules of technology and this Instruction Manual are authoritative when installing the measuring equipment.

The equipment is to incorporate the local equipotential bonding system PA according to EN 60 079-14:2009 + Cor: 2012. A PA binder on the exterior of the flameproof enclosure serves this purpose.

The connector cables are fed through 2 screwed cable glands with increased safety "e" in the connection chamber and connected to the terminals with increased safety "e".

For the power supply we recommend a regular mains adapter with 24V DC $\pm 10\%$ output and rating > 6 W, current > 250 mA.



5.6 Maintenance

The sensor should be cleaned at regular intervals, especially in cases of operation in which the sensor can become soiled (see also 14).

Maintenance and repair of the electrical apparatus is to be carried out solely by Höntzsch GmbH.



6 Installation

Before separating the pipeline please ensure that it is in a depressurized state!
When installing the sensor the pipeline should be divided in such a way so that after fixing the mounting flange on the pipe side the notch width is $200 \text{ mm} + 2 \times \text{sealing thickness}$. The pipe-side flanges are to be fixed so that the borings are aligned to avoid discontinuous diameter variations in the pipe interior. Lapped flange with double-flanged butt joint is recommended.

Please ensure that the sensor is safely secured to avoid injury from falling parts.

Depending on sensor weight and pipeline size a support may be necessary.

The sensor is to be installed with the arrow on the connection housing pointing in the direction of flow.

The mounting attitude is unrestricted with vertical pipeline positioning. To ensure that the sensor with horizontal pipeline positioning remains operational even when affected by moderate condensation, the equipment should be so installed that the vortex bluff body, which is in the pipe centre, is aligned vertically.

The seal must be fitted concentrically. If fitted off-centre this can cause flow disturbance which can impair measurement accuracy.

The screws for securing the flange are to be tightened uniformly "crosswise" in two to three stages. The starting torque is to be selected so that the permissible surface pressure of the flat seal is not exceeded and maximum tightness is guaranteed.

Tightness of the flange connection is to be checked carefully before initial operation.

If the temperature of the medium is above $+80 \text{ °C}$, the outside of the pipeline is to be so insulated that the connection housing does not take on temperatures above $+80 \text{ °C}$. In addition, it can also be appropriate to install the sensor with horizontal connection housing at pipeline height. This ensures that the housing is not additionally heated by convection of the rising hot ambient air.



7 Electrical Connection

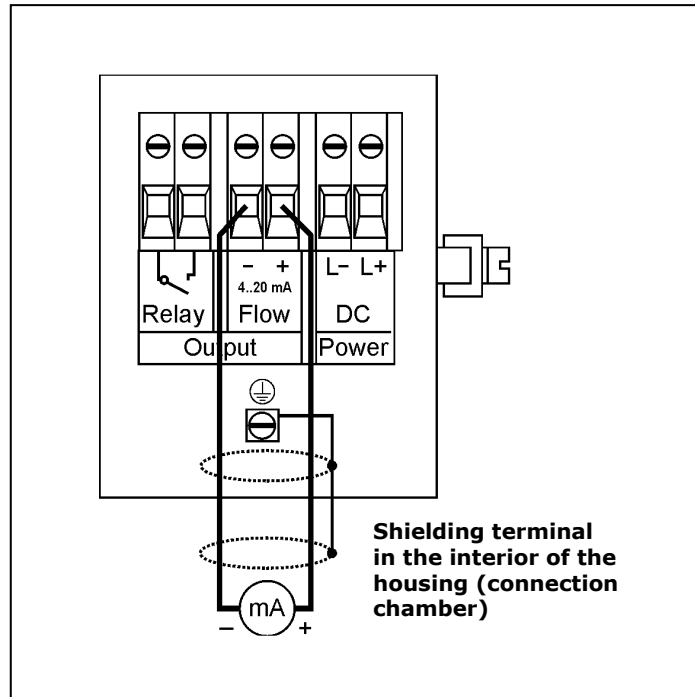
7.1 Wiring Diagrams

Before connecting the supply voltage, check if this is within the specification.

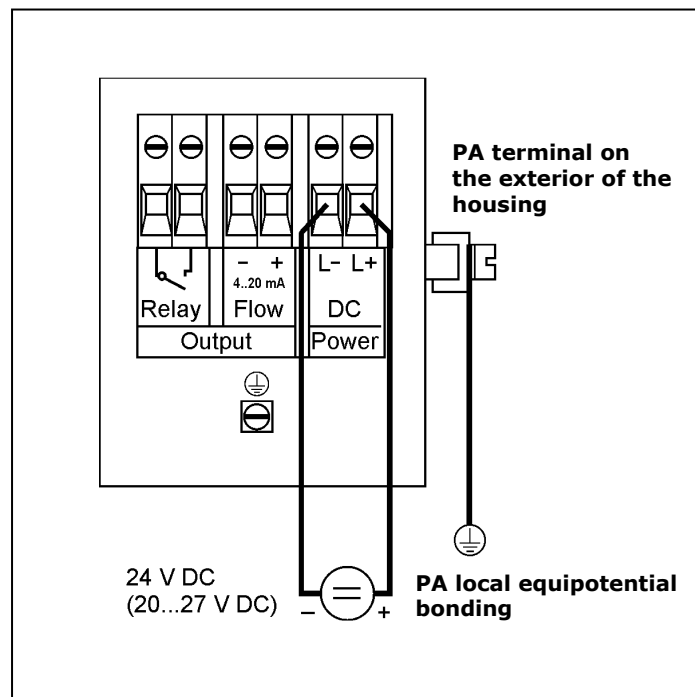
Data relating to the supply voltage is found on the type plate on the connection housing of the sensor.



Do not install or wire up the transducer under mains voltage. **Non-compliance can cause damage to the electronics.**



Analog output connection



Power supply connection



7.2 Digital Output (relay contact)

The digital output is a potential-free relay contact (normally open contact).

The function of the digital output and the corresponding setting parameter are configurable using the FCOM software via the HART interface. The factory-programmed settings can be found in the parameter printout included with delivery.

The **digital output** (relay contact) can be configured for **1 of 2 functions**:

1. as **limit value** for the flow velocity or flow rate:
 flow velocity < or = limit value: relay contact open
 flow velocity > limit value: relay contact closed
2. as **quantity pulse** for quantity measurement:
 max. pulse repetition frequency 1 Hz per unit of volume,
 configurable, e.g. 1 pulse per 1, 10 or 100 (norm)-m³ or (norm)-litre
 pulse duration 0.5 s

7.3 HART Interface

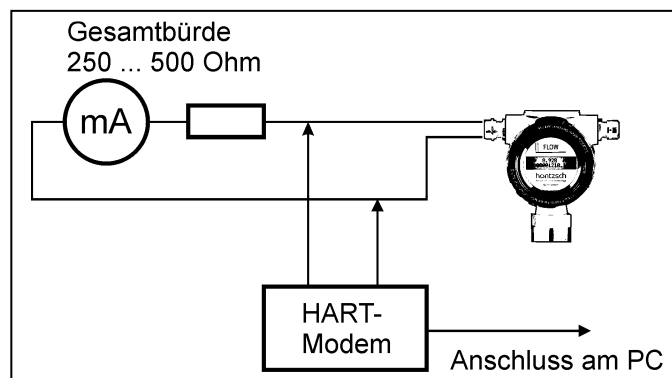
To connect the HART interface an optional HART modem is connected to the closed circuit of the analog output 4..20 mA (connect to +4..20mA terminal and -4..20mA terminal). The polarity of the HART modem connection is irrelevant. The resistance of the 4...20 mA circuit must not fall below 250 Ohm and not exceed 500 Ohm.

Connection to PC is via a COM port or a USB connection, depending on the type of HART modem.

Total resistance

HART modem

PC connection





7.4 LCD display behind inspection glass in housing cover (optional)



Fig. 1: optional LCD display behind glass

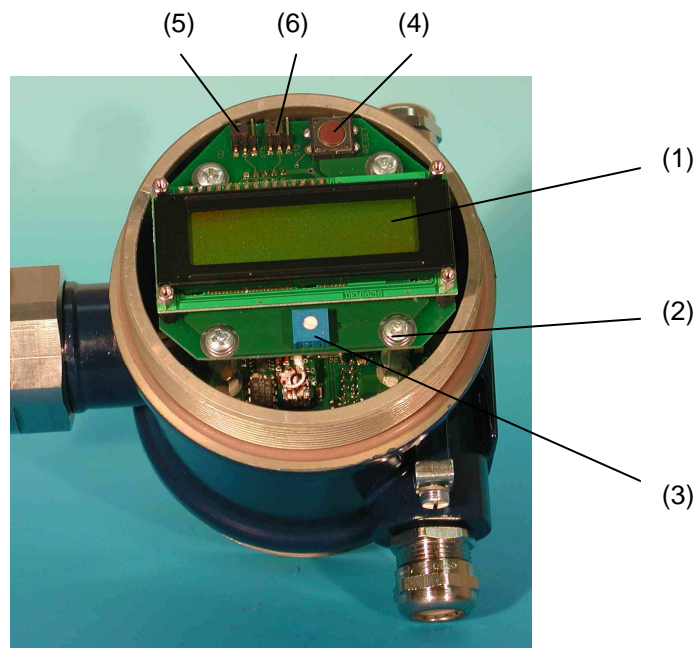


Fig. 2: LCD display with cover open

After unscrewing the housing cover with inspection glass and the display cover plate, the complete display module (1) can be rotated in steps of 90° after loosening the 4 retaining screws (2).

**The flat ribbon cable with 10-pin connector should not be plugged in or unplugged when live!
Risk of damage to equipment!**

Visible are the readout potentiometer (3) for the display contrast, the reset button (4) for the counter, the jumpers St1 m/s-m³/h (5) and St2 A-B (6) (see 7.5 Functional Description).



7.5 Functional Descriptions

The signal frequency or voltage generated from the flow sensor is converted to a linear **analog output signal 4-20 mA**. The analog terminal value is configurable.

When logging directional sensing data, the zero point can be selected in the middle of the analog range, or display of flow direction takes place with the aid of the digital output:

$$4 \dots 20 \text{ mA} = 0 \dots x \text{ m/s (or m}^3\text{/h)}$$

The actual velocity / actual flow rate can be converted to standard velocity / standard flow rate by entering the parameters 'temperature' and 'pressure'. Working temperature and pressure should be constant.

Self-diagnosis according to NAMUR NE43:

No error	:	analog output	=	4 mA	(flow velocity = 0)
or	:	analog output	>	4 mA	(flow velocity > 0)
error	:	analog output	<	3.6 mA	

For monitoring of power supply, data logging, sensor interface and parameter settings (see under 16: Troubleshooting)

HART interface

for changing calibration data and setting parameters.

Connect HART modem (optional) to transducer UVA-Ex-d on the closed circuit of the analog output (connect to both terminals of the analog output 4..20 mA, polarity of the connecting terminals of the HART modem is irrelevant, resistance min. 250 Ohm, max. 500 Ohm to be strictly observed). Connect Sub-D to the PC RS232 socket or USB plug to the USB PC connection.

Changes to the settings can now take place after starting the PC programme UCOM (optional) (see under 8: Settings).

Optional LCD display:

2 x 16 digit, character height 5.5 mm

Display row 1	:	instantaneous value velocity or flow rate
Display row 2	:	'counter' or 'error code'

Configuration (see under 7.4, Fig. 2) via jumpers St1 m/s-m³/h u. St2 A-B

Display row 1:

m/s-m ³ /h = m/s	and A-B = any:	velocity in (N)m/s *
m/s-m ³ /h = m ³ /h	and A-B = A:	flow rate in (N)m ³ /h
m/s-m ³ /h = m ³ /h	and A-B = B:	flow rate in (N)lt/h **

* standard values (N) with UVA only if parameter 'switching v/NV' =1

** only if Di < 75.0 mm, otherwise display in (N)m³/h

Display row 2:

counter in m³ with 0 ... 3 decimal places.

parameter 'switching pulse m³(cbm) / l (litre)' and

parameter 'm³ (cbm) / l (litre) per pulse' and

parameter 'decimal places quantity display')

with error	:	error 01 = parameter error
		error 02 = sensor error

(see under 16: Troubleshooting)

Reset button on the LCD display module behind the glass of the housing cover: see under 7.4, Fig. 2

Reset the counter by pressing the reset button for more than 3 seconds. This can also be done via the HART interface.



7.6 Tips on Electromagnetic Compatibility (EMC)

- Keep all transmission cables as **short as possible**.
- In the case of electromagnetic disturbance in the cable path the use of **shielded cable** is recommended.
- **Lay free strands** at both ends **on protection potential!**
- **Lay cables as close to the reference potential as possible**, for example side panels, mounting plates or steel girders.
- When using **frequency converters** there is a risk of **interference by HF transient emissions**. Therefore, decouple the power input of the frequency converter via an interference filter against active transient emissions. In addition, this increases the passive interference resistance of the equipment.
- Use only shielded motor cables with shield support on both sides between **motors** and **converters**.
- **Cables which transmit interference** should be **kept as far away as possible** from measuring lines and evaluation units. If necessary, lay measuring lines in a metallic protective conduit.
- Ensure large area and low resistance connection of **metallic parts in control cabinets**, such as subracks with control electronics or subplates.
- Relays, contactors and electro valves in the **same electric circuit**, are to be wired with **spark quenching combinations** or surge-limiting components.
- Lay the shielding of **analog signal lines** on one side only – preferably on the evaluation unit - and low resistive. Twist unshielded lines to counteract balanced interference to source terminals.
- Lay the shielding of **digital signal lines** on both sides across a wide area. In the case of potential differences between these points it is advisable to lay a separate **equipotential bonding conductor**.
- Preferably provide shielded connector for **connections to connector cable separation points**. If using **terminals**, these should be in a HF-shielded housing, in which EMC-compatible cable bushes should be used. Connect outer shielding of the connector cables to the cable bush.

8 Settings

see separate Operating Instructions Software UCOM U385

9 Performance Test

Current output

After connecting the supply voltage the analog output with zero flow should yield 4 mA. The value on evaluation units with display must be '0 m/s' or rather '0 m³/h'. When flow exceeds the lowest measurable value, linear detection of the output current must follow the flow modifications. If the output current is 20 mA or a few mA more, the output scaling should be checked and modified if necessary (for more details please refer to the evaluation unit Instruction Manual).



10 Initial Operation

- Before initial operation ensure that the sensor materials which come into direct contact with the medium (see Data Sheet U349 or U350, Technical Data Sheet) are resistant against the medium.
- Also ensure that the operating conditions in Data Sheet U349 or U350 and in the Technical Data Sheet comply with the measuring point parameters. In this connection pay particular attention to the application limits regarding working pressure and temperature. At any rate, the sensor may only be used in strict accordance with its specifications. In case of doubt it is imperative that you contact Höntzsch!
- After connecting the supply voltage the equipment is ready for use. With flow below the lowest measurable value, 4 mA is present at the analog output. In the case of evaluation units with display, '0 m/s', '0 m³/h' or '0 Nm³/h' is displayed at zero flow, depending on the setting. With flow values above the initial value the output signal must alter proportional to the subsequent flow. This applies to the display value for evaluation units with display.



11 Operation

Risk of burns

Through external heating the surface temperature of the sensor can become so hot to cause burns to the skin. In such cases it is recommended to wear suitable protective clothing.



12 Shut-down, Dismantling

Before dismantling the sensor always ensure that the pipeline interior is depressurized.

Check carefully that no harmful, toxic, corrosive, caustic, flammable or explosive hazardous substances

- have come into contact with the sensor
- adhere to the surface of the sensor
- have infiltrated any voids in the sensor or
- have been released when dismantling the sensor

In these cases the relevant safety measures must be strictly adhered to. Non-compliance with these regulations can lead to serious injury to persons and damage to property!

Before disconnecting the cable please ensure that the supply voltage is switched off!



13 Inspection

To guarantee optimal performance of the sensor, the vortex bluff body must be kept free from deposits. The same applies to the circular orifice around the ceramic caps of the ultrasonic transmitter.

Inspect the sensor at short intervals during first-time operation for particle deposits. Subsequent inspection / cleaning intervals should be defined as required.

The screw threads of the housing cover have been treated with graphite as protection against corrosion.



14 Maintenance

Use only residue-free cleaning agents which are compatible with the sensor materials. Clean sensors with a slightly damp brush or cloth. Hardened deposits can be removed with a metal brush. Should the sensor still not be fully functional after taking these measures, please contact Höntzsch for further assistance.



15 Calibration

The VA Di measuring tubes have an excellent long-term stability. However, it makes sense to have them calibrated at regular intervals. The time lapse between calibrations depends on the individual operating conditions and the tolerable measurement error. Therefore, as a precautionary measure, shorter calibration cycles are recommended in the beginning. As a general rule and under 'normal' operating conditions we suggest a cycle of approx. 2 years.

The sensor must be returned to the manufacturer for calibration (see under 17).



16 Troubleshooting

Fault	Cause	Troubleshooting
Analog output = 0 mA	No power supply	Check cable, measure voltage at connecting terminals
	Transducer electronics faulty	Return to factory
Analog output = error (<3.6 mA)	Parameter error	Check parameter with UCOM software, save new checksum (or return to factory)
	Transducer electronics faulty	Return to factory
Analog output = 4 mA, no value	Sensor contaminated	Clean sensor according to instructions
	Coefficient set at 0.000	Set coefficient to relevant nominal diameter and sensor type
Measured value too low	Sensor contaminated	Clean sensor according to instructions
	Coefficient setting too low	Set coefficient to relevant nominal diameter and sensor type
	Input/output section too short	Change sensor position; improve flow conditions with a flow rectifier
	Rotational flow	Reposition sensor in direction of flow; install flow rectifier
	VA sensors: reduced acoustic coupling in the sensor elements as a result of intense vibration or powerful impact	Return to factory for performance check
	Resistance at current output is greater than specified in the Technical Data Sheet. This results in correct output values in the lower range and no longer increasing output values at the top end of the measuring range	Reduce resistance value
	Incorrect scaling of analog output	Check setting and amend if necessary
Measured value too high	Coefficient setting too high	Set coefficient to relevant nominal diameter and sensor type
	EMC problem	See reference to electromagnetic compatibility (EMC)



17 Returns

Clean the appliance thoroughly before returning to the manufacturer (see under 13).

A hazard warning or declaration of harmlessness for substances which have come into contact with or infiltrated the sensor, must be submitted with all returns. If adhesion of hazardous substances on the surface of the equipment cannot be ruled out, a detailed description of safety measures to be taken when handling the equipment must be submitted.

18 Disposal

Before disposal, please ensure that no hazardous substances are on or in the appliance. Should it not be possible to remove all traces of such substances then orderly disposal according to the Ordinance on Hazardous Substances must be carried out.

Mandatory for disposal by Höntzsch is a declaration of harmlessness from the customer. In case of doubt, Höntzsch reserves the right to return equipment to the customer for disposal.

19 Replacement Parts

- Cable bush in Ex-e protection
- Inspection glass housing cover
- Housing cover (without inspection glass)
- Seals for housing cover



20 European Declaration of Conformity for UVA-Ex-d VA Di with ATEX approval

We, Höntzsch GmbH
Gottlieb-Daimler-Str. 37
D-71334 Waiblingen

declare under sole responsibility that the product

flow measuring equipment
UVA-Ex-d VA Di

with EC-type Examination Certificate IBExU 06 ATEX 1103 X

to which this declaration relates is in conformity with the provisions of the following standards or normative documents:

Provisions of the Directive	Reference number and date of issue
94/9/EG: Equipment and Protective Systems in Potentially Explosive Atmospheres	EN 60079-0: 2010 EN 60079-1: 2008 EN 60079-7: 2007 EN 60079-26: 2012 EN 60079-11: 2012 EN 60079-31: 2010
89/336 EWG: Electromagnetic Compatibility	EN 61000-6-4: 2011 EN 61000-6-2: 2006 + Cor.: 2011
97/23/EG: Pressure Equipment Directive	29.05.1997

One or more of the standards referred to the EC type examination certificate have been replaced by new versions. We declare that we are also in agreement with these new versions.

Waiblingen, 18.04.2012

Itte
legally binding signature