höntzsch
flow measuring technology

Operating Instructions

Transducer UVA
integrated in the connection housing AS102 of the vortex probes VA40, VAT40 and vortex measuring tubes VA Di

Contents

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 restriction in performance!

2 Safety Precautions

Danger to life, risk of injury and damage to material or property.
Read the Operating Instructions carefully before initial operation.
Observe general safety precautions as well as those included in various sections of these Operating Instructions.

Hazard risks:
- non-observance of the Operating and Safety Instructions
- modifications to the device by the customer
- handling the device outside the specified operating conditions
- handling the transducers outside the specified operating conditions
- use of unsuitable power supplies and peripheral devices
- improper use of the device

Prevention of voltage hazards:
- use only the dedicated adapter plug for the mains supply
- make sure that the PC is correctly connected to the mains (earthed safety socket, earthing) when using a USB connection
- when connecting analog outputs or inputs to peripheral devices make sure that these are correctly connected to the mains (earthed safety socket, earthing)

Danger when installing the sensors in pressurized pipelines:
- sensors for use in pressurized pipelines are to be inserted or retracted only in depressurized conditions; non-observance may result in serious injuries to personnel
- when installing or removing under pressure, the appropriate protective equipment must be used, e.g. ball valve and probe guide pieces with chain guard or spindle probe guide pieces

3 Intended Use

The transducer UVA is an instrument for measuring flow velocity and flow rate:
UVA is for use with vortex flow sensors VA40 and measuring tubes VA Di. These instruments are designed for industrial applications. The AS102 is an aluminium housing in protection class IP65.
The manufacturer is not liable for damage caused by improper use and/or non-compliance with the regulations.
Do not carry out any structural modifications to the transducers.
Always follow the instructions on the type plate, especially the information regarding supply voltage.

4 Operating Safety

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

Please read the Operating Instructions carefully before unpacking theequipment!

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

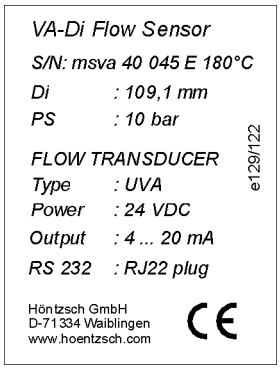
5 Scope of Delivery

- Transducer UVA integrated in the connection housing of the vortex sensor VA
- Operating Instructions U326
- Data sheet vortex flow sensor with integrated transducer UVA
- CD-ROM with PC configuration software UCOM (optional)
- Interface cable RS232 for PC connection COM interface (optional)
- USB adapter in addition to interface cable RS232 (optional)

Please check that everything listed in the Delivery Note / Technical Data Sheet is included in the delivery.

5.1 Description, Type Plates

Remove cover to reveal type plate:



VA-Di Flow Sensor	: measuring tube VA Di
VAT-Di Flow Sensor	: measuring tube VA Di with temperature measurement
VA40 Flow Sensor	: probe VA40
VAT40 Flow Sensor	: probe VA40 with integrated temperature measurement
S/N	: serial no.
Di	: inside diamter Di of measuring tube (VA Di and VAT Di only)
PS	: max. permissible pressure
FLOW TRANSDUCER	: integrated transducer
Type	: UVA (transducer for vortex sensors VA)
Power	: supply voltage 24 VDC = 24 V direct voltage 12 VDC = 12 V direct voltage
Output	: 4-20 mA = current output 4-20 mA 0-10 V = voltage output 0-10V
RS232	: RJ22 plug

6 Technical Specifications

6.1 Conformity with Standards

The transducer UVA is manufactured according to the best available technology, is safe and reliable and comply with the relevant regulations, EU directives and standards.

6.2 Storage Conditions

Storage conditions: -30 bis +70 °C

6.3 Operating Conditions

ambient air temperature	
of connection housing	
in use	: -25 ... +50 °C
with optional LCD display	: -20 ... +50 °C
protection class	: IP65
mounting attitude	: no restrictions

6.4 Housing and Connectors

protection	: housing IP65
material	: aluminium
external dimensions	: L/W/H = 150/100/80 mm
bush	: metallic screwed cable glands for cable diameter 5 ... 10 mm with contacting of the shielding
connections	: 'Push-in' circuit board terminals for wires with cross-section 0.14 ... 1.5 mm². No tools necessary for strand connection, simply insert the strand ends (twisted or with end sleeve) into the terminal. Separate strands by applying pressure to the terminal release spring with a pen or screwdriver.

6.5 Electrical Data

Supply voltage, mains supply	: 24 V DC (20 ... 27 V DC), power < 5 W

The mains supply is electrically isolated from the UVA outputs.

UVA analog output v	**:** 4 ... 20 mA = 0 ... x m/s (or m³/h), terminal value x configurable / burden max. 400 Ohm, alternative: 0 ... 10 V = 0 ... x m/s (or m³/h), terminal value x configurable / impedance 1 kOhm
Relay	: (potential-free normally open contact), max. 300 mA / 27 V DC, configurable as limit value v or quantity pulse (see under 8 Functional Description)
RS232 Schnittstelle	: for connection with PC programme UCOM (see under 8 Functional Description) 9600 Baud, 8Bit, no parity, 2 stop bits, Xon/Xoff
Connection for optional LCD display	: flat ribbon cable with 10-pin cable socket **Do not plug in or out when live!**
Optional analog output t	: 4 ... 20 mA = x ... y °C

burden max. 200 Ohm
x °C fixed preset initial value for measuring temperature
y °C fixed preset terminal value for measuring temperature
(see accompanying documentation)

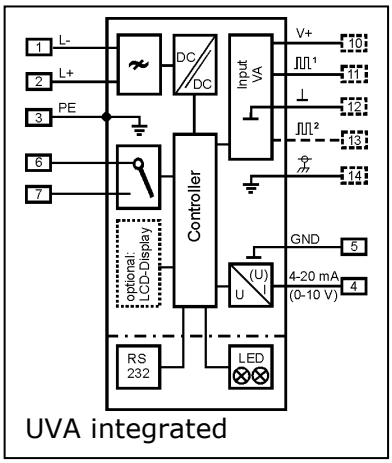
6.6 Measurement Uncertainty

Recording the measurement frequency (at 1000 Hz)	:	<0.1%
Analog output (terminal value)	:	<0.15%
Linearity error	:	<0.1%
Temperature coefficient	:	<20 ppm/K (at 25 °K temperature difference equivalent to <0.05%)

7 Installation

The current European Specifications for Assembly, the recognised standards of good practice and this Operating Instructions apply.

7.1 Block Diagram



UVA integrated

(Terminals 10 ... 14 are not populated and only accessible internally)

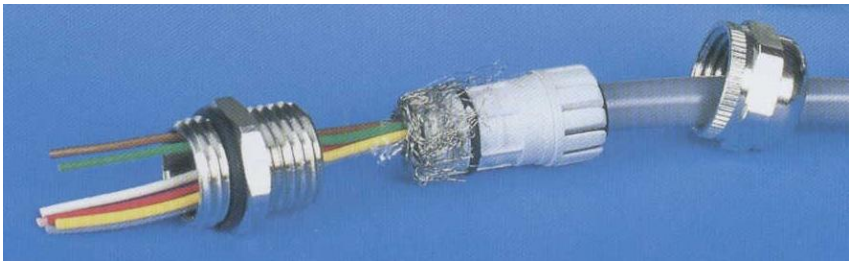
7.2 Wiring Diagrams

Electrical connection must be carried out according to the appropriate wiring diagram.
Faulty connection can cause damage to persons and destruction of the electronics.

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

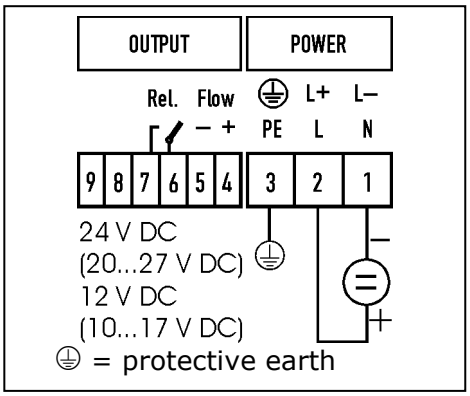
In this connection and depending on the configuration of the equipment, one of the following wiring diagrams must be taken into account. Wiring diagrams for measuring systems in customer-specific design will be supplied separately.

7.2.1 Shielding contact at cable bush

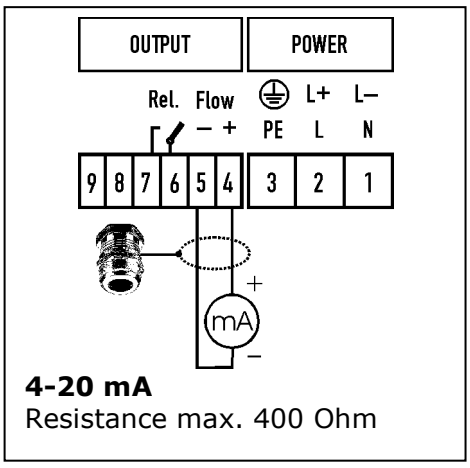


7.2.2 Power supply

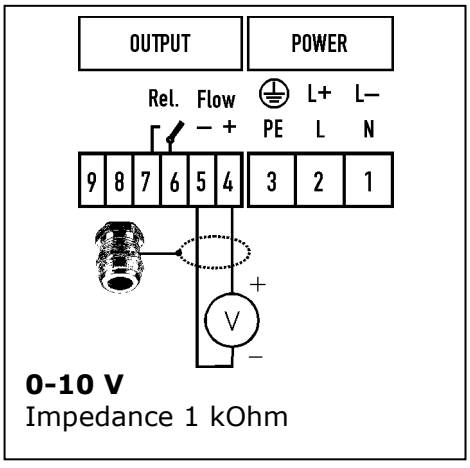
Before connecting please check that the power supply is within the specification. Remove the cover of the integrated UVA to reveal the type plate with the relevant information.



7.2.3 Analog output v



4-20 mA
Resistance max. 400 Ohm



0-10 V
Impedance 1 kOhm

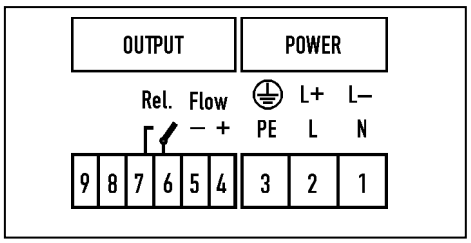
Remove the cover of the integrated UVA to reveal the type plate with the relevant information regarding analog output.

The terminal value of the analog output can be parameterised with the PC software UCOM via the RS232 interface. The customer-specific programmed value can be found in the accompanying documents.

7.2.4 Relay output

The normally open contact of the relay is shown in rest position (relay coil off).

The function of the relay output and the corresponding setting parameter are parameterable with the PC software UCOM via the RS232 interface. The customer-specific settings are in the parameter printout.



7.2.5 RS232 Interface

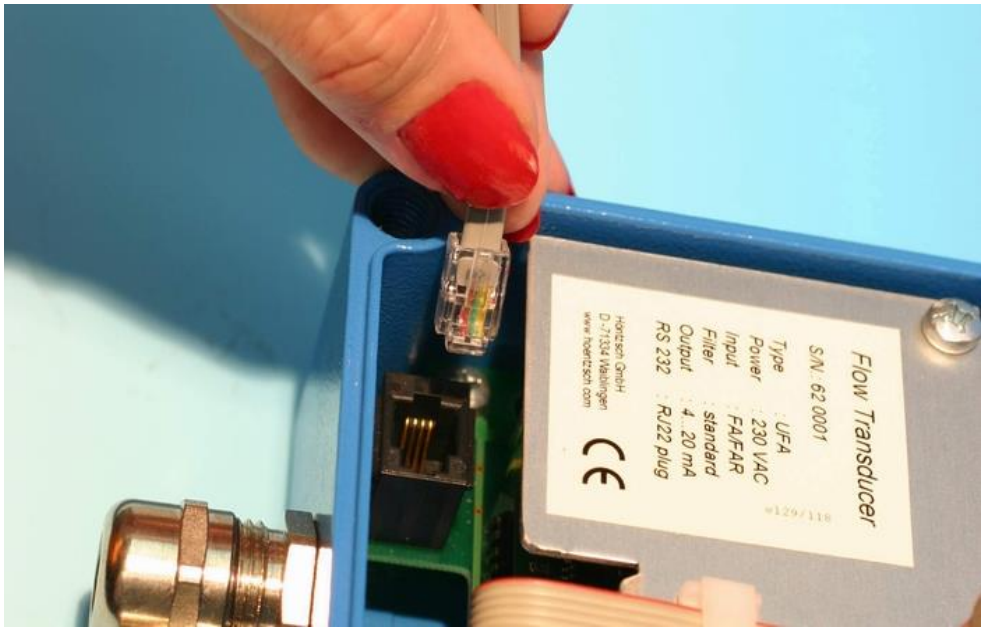


Fig. 1: PC connection with RJ22 plug with open cover

The RS232 interface connection is below left next to the connecting terminals.

The RJ22 plug of the PC connecting cable is plugged in to the socket (see Fig. 1). PC connection follows at a COM port or using an optional USB adapter.

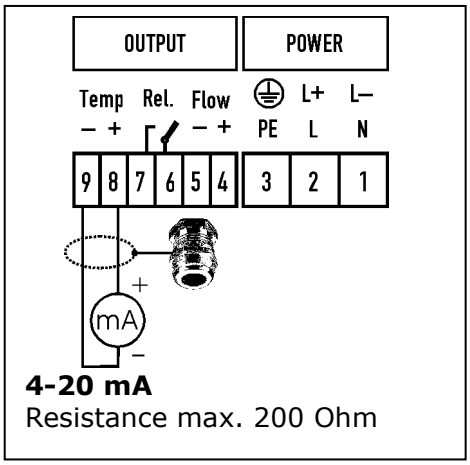
7.2.6 LCD display in housing cover (optional)

Abb. 2: LCD display connection with cover open

The flat ribbon cable with 10-pin connector should not be plugged in or out when live! Risk to persons and equipment!

Visible are the readout potentiometer for the contrast of the LCD display, the reset button for the quantity counter, the ST1 and ST2 jumpers (see under 8 Functional Description).

7.2.7 Analog output t (temp) (optional)



The initial value x °C (4 mA) and the terminal value y °C (20 mA) are permanent hardware settings and recorded in the Technical Data Sheet.

The negative terminal of the analog output t (terminal 9) is on the same potential as the negative terminal of the analog output v (terminal 5).
The analog output signal t is not used in the UVA (e.g. for conversion to standard values).

8 Functional Description

UVA transducers are designed for connection of vortex probes VA40 and vortex measuring tubes VA Di for measuring flow velocity or flow rate of air/gases.

The signal frequency generated from the flow sensor is converted to a linear **analog output signal 4-20 mA or 0-10 V**. The analog terminal value is parameterisable.

Current output : **4 ... 20 mA** = 0 ... x m/s (or m³/h)

alternatively:

Voltage output : **0 ... 10 V** = 0 ... x m/s (or m³/h)

The actual velocity or actual flow rate can converted to standard velocity or standard volume flow by entering the parameter 'temperature' and 'pressure' .

A **relay output** (normally open contact) can be parameterised for **1 of 2 functions**:

1. as **limit value** for the flow velocity or the flow rate:
   flow velocity < or = limit value : relay contact idle
   flow velocity > limit value : relay contact in working position

2. as **quantity pulse** for quantity measurement:
   max. pulse repetition frequency 1 Hz per unit of volume, pulse duration 0.5 s,
   e.g. 1 pulse per 1, 10 or 100 m³ or 1, 10 or 100 litre respectively

Self diagnosis according to NAMUR NE43:

For analog output 4 … 20 mA:
No error : analog output = 4 mA (flow velocity = 0)
or analog output > 4 mA (flow velocity > 0)

Error : analog output < 3.6 mA

For analog output 0 … 10 V:
No error : analog output = 0 V (flow velocity = 0)
or analog output > 0 V (flow velocity > 0)

Error : analog output < -0.2 V

Monitoring of power supply, data logging, sensor interface, parameter settings (see under 16 Troubleshooting)

PC serial port RS232
for changing calibration data and setting parameters.

Remove cover.
Plug PC connector cable (optional) with RJ22 into the socket in the UVA (see Fig. 1, under 7.2.5 RS232 Interface).
Connect other end of cable to RS232 PC socket.
If a USB connection is required, then an optional USB / RS232 interface converter must be inserted.

Changes to the setting can now take place after starting the PC programme UCOM (optional)
(see under 9 Settings).

Optional LCD display in housing cover:
2 x 16 digit, character height 5.5 mm.

Display line 1 : instantaneous value velocity or flow rate.
Display line 2 : 'quantity counter' or 'error code'.

Configuration (see Fig. 2, see under 7.2.6 LCD display in housing cover) via 2 jumper wrap connectors ST1 and ST2.

Display line 1:

ST1 = m/s	and ST2 = any:	velocity in (N)m/s *
ST1 = m³/h (lt/h)	and ST2 = A:	flow rate in (N)m³/h
ST1 = m³/h (lt/h)	and ST2 = B:	flow rate in (N)lt/h **

* standard values (N) only when parameter 'switching v/NV' =1 (see under 9 Settings)
** only when diameter Di < 75.0 mm, otherwise display in (N)m³/h

Display line 2:
Quantity counter in m³ with 0 ... 3 decimal places
(see under 9 Settings; 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 in cover: see Fig. 2, under 7.2.6
Reset the quantity counter by pressing the reset button for more than 3 seconds.

9 Settings

The following setting parameters can be read using the PC software UCOM and are also alterable.
The customer-specific settings are shown on the parameter print-out, which is included in the documents.

Please find operation instructions PC software UCOM in document U385.

10 Initial Operation

(Pay attention to 7.2.2 Power supply)
(Pay attention to 7.2.3 Analog output v)
After connecting the supply voltage the green LED lights up, the yellow LED is switched off.
No flow at sensor: the green LED is permanently on, the analog output supplies a value of 4 mA at flow output or at voltage output a value of 0 V (see under 8 Functional Description)
Flow at sensor: the green LED flashes, the analog output supplies an analog value other than the given values of the zero flow conditions (see above).

11 Operation

(see under 6.3 Operationg conditions)
(see under 6.5 Electrical Data)

12 Shut-down, Dismantling

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

13 Inspection

see under 8 Functional Description, Self diagnosis

14 Maintenance

Only use cleaning agents which dry without leaving any residue and which are compatible with the housing materials.
Any repair work is to be carried out solely by Höntzsch GmbH & Co. KG.

15 Meaning of LEDs

LED green	LED yellow	Description
off	off	no power supply
on	off	power supply ok, no error, no flow
flashing	off	power supply ok, no error, flow detected
on	on	power supply ok, parameter error and/or sensor error, no flow
flashing	on	power supply ok, parameter error, flow detected

16 Troubleshooting

Störung	Ursache	Störungsbehebung
green LED off	no power supply	check connecting cable, measure voltage at connecting terminals
	transducer electronics faulty	return to factory
analog output = error (< 3.6 mA or < -0.2 V), green LED on	cable break or short-circuit	check terminals; check cable for continuity and replace if necessary
	transducer or sensor electronics faulty	return to factory
analog output = error (< 3.6 mA or < -0.2 V), green LED flashes	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 measured value	sensor contaminated	clean sensor according to instructions
	profile factor set at 0.000	set profile factor to relevant nominal diameter and sensor type
measured value too low	sensor contaminated	clean sensor according to instructions
	profile factor setting too low	set profile factor 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 flow direction; install flow rectifier
	reduced acoustic coupling in the sensor elements as a result of intense vibration or a powerful impact	return sensor to factory for performance test
	burden 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 burden resistance
	incorrect scaling of analog output	check setting and amend if necessary
measured value too high	profile factor setting too hogh	set profile factor to relevant nominal diameter and sensor type
	EMC problem	see reference to electromagnetic compatibility (EMC)

17 Returns

When returning sensors, these should be cleaned thoroughly according to the instructions. A hazard warning or declaration of no objection must be supplied for substances which have been in contact with the sensor or possibly infiltrated the cavities in the sensor. If adhesion of hazardous substances cannot be ruled out, then detailed safety measures to be taken when handling the equipment must be itemised.

18 Disposal

The customer should assume the duty to dispose of the equipment at his own expense and according to statutory provisions (e.g. ElektroG in Germany).

19 Replacement Parts

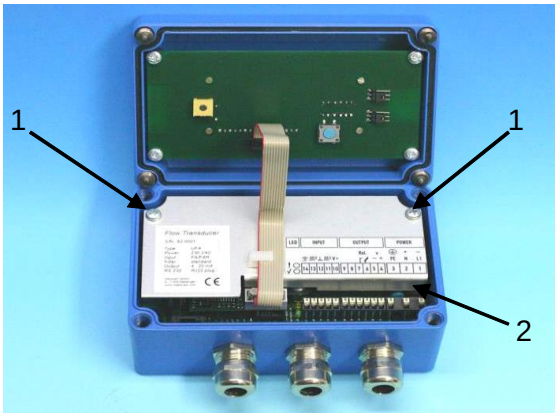


Fig. 3: Fuse TR5

Fuse TR5 (2) is situated in the base behind the power supply connecting terminals and is easily accessible by loosening the screws (1) to remove the cover plate:

for 230 V AC	TR5-T 100 mA	order no. e025/023
for 24 V DC	TR5-T 500 mA	order no. e025/024
for 12 V DC	TR5-T 500 mA	order no. e025/024

Always switch off before changing the fuse!

20 Declaration of Conformity, Declaration of Incorporation

We Höntzsch GmbH & Co. KG
Gottlieb-Daimler-Str. 37
D-71334 Waiblingen

bearing sole responsibility, hereby declare that the product

Transducer UVA in AS102 housing

referred to in this declaration, is in conformity with the following standards or normative documents:

Provisions of the Directive	**Reference and date of issue**
2014/30/EU: Electromagnetic Compatibility	EN 61000-6-4 EN 61000-6-2
2014/68/EU: Pressure Equipment Directive	
2006/42/EC: Safety of Machinery	
Safety requirements for electrical equipment for measurement, control, and laboratory use	EN 61010

Waiblingen, 14.01.2021 Jürgen Lempp / Geschäftsführer

Höntzsch GmbH & Co. KG
Gottlieb-Daimler-Straße 37
D-71334 Waiblingen
Tel: +49 7151 / 17 16-0
E-Mail info@hoentzsch.com
Internet www.hoentzsch.com

Subject to alteration

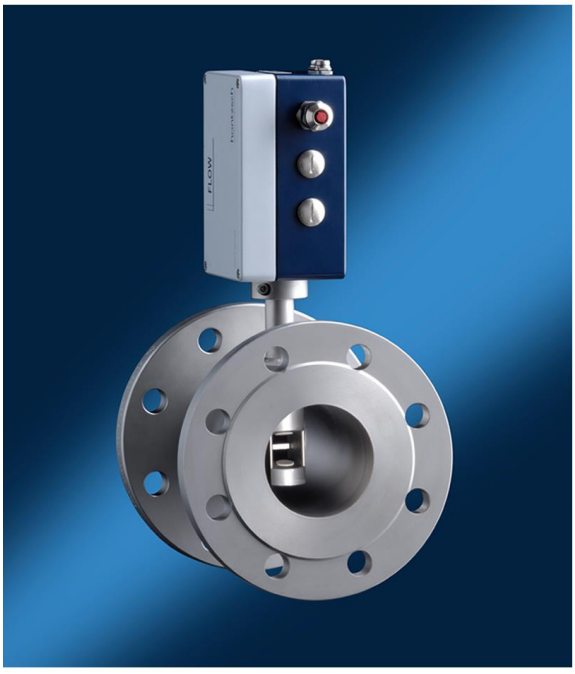
Safety Manual

- Probes VA40 ... ZG7 with integrated transducer UVA in AS80 housing
- Measuring tubes VA Di ... ZG1 with integrated transducer UVA in AS80 or AS102 housing

- Probes VA40 ... ZG8 Ex-d with integrated transducer UVA-Ex-d in Ex-d flameproof housing
- Measuring tubes VA Di ... ZG1 Ex-d with integrated transducer UVA-Ex-d in Ex-d flameproof housing

VA40 ... ZG7

VA40 ... ZG8 Ex-d



VA DI ... ZG1

VA DI ... ZG1 Ex-d

Contents

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. Improper handling can result in serious injury and damage to property.

The Safety Manual is only effective in connection with the relevant Operating Instructions or Instruction Manual for Ex-instruments.

3 Planning / Layout

3.1 Ex-application

Approved appliances only are to be used for applications in potentially explosive atmospheres. Special attention should be paid to Instruction Manual UVA-Ex-d.

3.2 Choice of Installation Location

The place of installation must be chosen with care to optimise measurement accuracy. For tips refer to the Operating Instructions.

3.3 Safety Instrumented Systems according IEC 61508 SIL 1, SIL 2 and SIL2/SC3 (SIL 3 with 1oo2)

Requirements:
- Operation in Low Demand Mode
- The analog output values ≥21 mA and ≤3.6 mA are diagnosed as faults by the subsequent control unit; the process goes into safe mode.
- Safety functions cannot be implemented with the digital output, as no fault tracking can be effected via this output.
- A measurement error of less than 10 % of the measured value has no impact on the safety function.
- The efficiency of the equipment must be checked at regular intervals by repeated inspection.

4 Scope of Delivery

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

For use in 'Safe Applications (SIL 1, SIL 2 und SIL 3 in 1oo2)' the device must have a SIL logo on the **electronics housing and the SIL conformity must be confirmed in the Technical Data Sheet.**

5 Conformity with Standards

In addition, the following standards apply for the functional safety:

DIN EN 61508 Part 1 to Part 7:
Functional safety of electrical/electronic/programmable electronic safety-related systems

DIN EN 61511 Part 1 to Part 3:
Functional safety - Safety instrumented systems for the process industry sector

The flow measuring equipment complies with DIN EN 61508 Part 1 to Part 7 and may be used in safety instrumented systems according to DIN EN 61511 Part 1 to Part 3

6 Abbreviations and Definitions

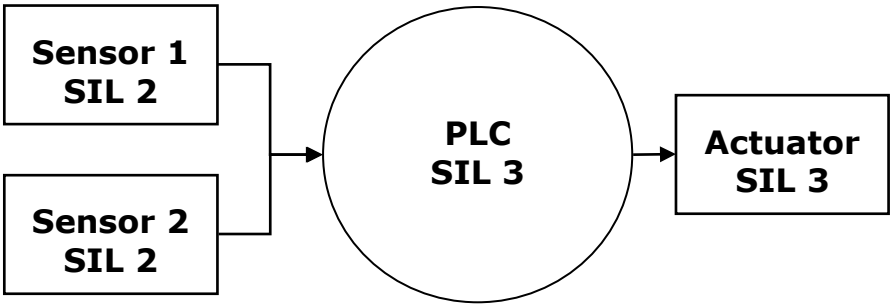
Abbreviation	Designation	Definition
	Functional Safety	Describes the part of the safety of a system that depends on the correct function of the safety-related (sub-) systems and external equipment for risk minimisation.
SIL	**S**afety **I**ntegrity **L**evel	To assess electrical / electronic / programmable electronic (E/E/PE) systems relating to the reliability of the safety functions. From the target level arises the safety-directed design principle, which must be observed to reduce the risk of failure. SIL 4 = highest level, SIL 1 = lowest level.
SIS	**S**afety **I**nstrumented **S**ystem	Safety instrumented system for carrying out one or more safety instrumented functions. A SIS consists of sensor(s), logic system and actuator(s).
	Mission Time	Mission time of the failure mode and effects analysis
PFDG/PFD_{avg}	**Av**era**g**e **P**robability of **F**ailure on **D**emand	Averaged probability of failure on demand of the safety function
PFS_{avg}	**Av**era**g**e **P**robability of **F**ail **S**afe	Averaged probability of causing a spurious trip of the process
OK		Probability product is running without any failures
FMEA	**F**ailure **M**ode and **E**ffects **A**nalysis	Failure mode and effects analysis
	Mode of operation	- operation in low demand mode, whereby the demand on the safety-related system is no more than once a year and not greater than the double frequency of the repeat test - operation in high demand or continuous mode, whereby the demand on the safety-related system is more than once a year or greater than the double frequency for the repeat test
SFF	**S**afe **F**ailure **F**raction	Fraction of safe failures relating to the total average failure rate
HFT	**H**ardware **F**ault **T**olerance	The capability of a functional unit to continue the execution of a demanded function in case of faults or deviations
FIT	**F**ailure **I**n **T**ime	1 FIT = 1 failure per 10^9 hours
λ	Failure rate	sd =safe detected su =safe undetected dd =dangerous detected du =danger undetected
MTTF	**M**ean **T**ime **T**o **F**ailure	s = safe d = dangerous
1oo2 SIL 3 (SC 3)	**1oo2 SIL 3 by redundancy setup, systematic capability (SC 3)**	Two identical devices are suitable for SIL 3 in architecture 1oo2. Each device can perform the safety function.
DC	**D**iagnostic **C**overage	s = safe d = dangerous

7 Safety Instrumented System (SIS)

A safety instrumented system generally consists of the three subsystems – input subsystem (sensor), Logic subsystem (PLC) and output subsystem (actuator).
The average probability of failure on demand PFDG/PFD_{avg} is usually distributed over the subsystems as follows:

Single-Channel SIS in 1oo1

Multi-Channel SIS in 1oo2



8 Average Probability of Failure on Demand (PFDavg)

This table indicates the attainable Safety Integrity Level (SIL) subject to average probability of failure on demand. The specified failure boundaries here are effective for a safety function in low demand mode.

Safety Integrity Level (SIL)	PFD_{avg} (low demand mode)
4	$\geq 10^{-5}$ bis $< 10^{-4}$
3	$\geq 10^{-4}$ bis $< 10^{-3}$
2	$\geq 10^{-3}$ bis $< 10^{-2}$
1	$\geq 10^{-2}$ bis $< 10^{-1}$

9 Safety Integrity of the Hardware

This table indicates the attainable Safety Integrity Level (SIL) for Type B devices (according to IEC61508-2) subject to Safe Failure Fraction (SFF) and the Hardware Fault Tolerance (HFT):

Safe Failure Fraction (SFF)	Hardware Fault Tolerance (HFT)		
	0	1 (0)*	2
< 60%	not allowed	SIL 1	SIL 2
60% to < 90%	SIL 1	SIL 2	SIL 3
90% to < 99%	SIL 2	SIL 3	SIL 4
≥ 99%	SIL 3	SIL 4	SIL 4

* With proof of operational reliability according to IEC / EN 61511 for SIL 1 to SIL 3

The certified equipment complies with SIL 2 with a systematic capability of SC3 according to IEC 61508 route 2. Deployment according to IEC 61511 for SIL 1 and SIL 2 in 1oo1 and for SIL3 in 1oo2 configurations.

10 Initial Operation

Initial operation is described in the respective Operating Instructions. For Ex-applications the respective Instruction Manual must also be observed.

11 Behaviour during Operation and in case of Failure

Behaviour during operation and in case of failure is described in the respective Operating Instructions.

12 Periodic Testing

12.1 Safety Checks

The safety function of the entire safety loop must be checked regularly in accordance with IEC 61508/61511. Check intervals are determined when calculating the individual safety loop.

12.2 Performance Check

The proper functional operability of the flow measuring device must be checked regularly at least every 5 years. This can only be carried out by the manufacturer.
In the case of unfavourable operating conditions shorter proof test intervals may be determined by the user.

13 Repairs

Defective devices should be returned to Höntzsch service and repairs department, preferably with a detailed breakdown of type of failure and possible reasons.

14 Safety-related Characteristics

Extract from Reliability Study No. 2266.465.1 Version 1 - Vortex Sensors

Properties:

Device Type: B
Mode of operation: low demand mode
Hardware fault tolerance: 0

Table 1 - Results FMEDA at +55 °C

Properties	VA40 ... ZG7 VA40 ... ZG8 Ex-d VA Di ... ZG1 VA Di ... ZG1 Ex-d		
	FMEDA	Proven In Use	90% Confidence
Safe failure rate	248	40	62
Safe detected failure rate	0	n.a.	n.a.
Safe undetected failure rate	248	n.a.	n.a.
Dangerous failure rate	56	5.7	18
Dangerous detected failure rate	34	n.a.	n.a.
Dangerous undetected failure rate	22	n.a.	n.a.
DC	61%	n.a.	n.a.
Safe failure fraction	93%	n.a.	n.a.
MTTFd [years]	1768		

Notes:
Failure rates are in FIT 10^{-9}/h.
Confidence interval according to IEC 61508 route 2h.
IEC 61508 requires a minimum DC of 60% for Type B products for route 2h, 2s.

Table 2 - Results PFDG Calculations (1oo1)

	VA40 ... ZG7 VA40 ... ZG8 Ex-d VA Di ... ZG1 VA Di ... ZG1 Ex-d				
Years	1	2	5	10	20
PFDG	9.8E-05	1.95E-04	4.9E-04	9.7E-04	2E-03
%SIL 2	1%	2%	5%	10%	20%
PFSavg			9.7E-05		

MRT, MTTR 8h

Table 3 - Results PFDG Calculations (1oo2)

	VA40 ... ZG7 VA40 ... ZG8 Ex-d VA Di ... ZG1 VA Di ... ZG1 Ex-d				
Years	1	2	5	10	20
PFDG	5.7E-06	1.12E-05	2.77E-05	5.52E-05	1.10E-04
%SIL 2	1%	2%	5%	10%	20%

MRT, MTTR 72h, β 5% (common cause)

Summary results
The proven in use analysis demonstrates that the hardware of the Vortex Sensors VA40 ... ZG7/ZG8 and VA Di ... ZG1/Ex-d are corresponding with SIL 2 safety properties according to IEC 61508, route 2h and route 2s SIL 3 in 1oo2 configuration.

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RISKNOWLOGY
SIL Certified Product

Certificate of compliance
Product

Holder	Höntzsch GmbH, Waiblingen, Germany
Compliant Item	Vortex Sensors VA40 ... ZG7 and VA40 ... ZG8 Vortex Sensors VA Di...ZG1 and VA Di...ZG1 Ex-d
Basis of Certification	IEC 61508:2010
Certification Include(s)	☑ Safety requirements specification ☑ Hardware requirements ☑ Reliability requirements ☑ Software requirements ☑ Basic safety ☑ User documentation

Functional Safety Data

Safety function:	See report
Mode:	Low demand
Type:	B
HFT:	0
Hardware compliance route:	2_H
Systematic compliance route:	2_S
Systematic capability:	SC3
Failure rates (FIT):	SD=0, SU=248, DD=34, DU=22
Safe failure fraction:	93%
Diagnostic coverage:	61%
Fit for use up to:	SIL 3
Fit for use up to:	STL 5

Certification Results	Risknowlogy certifies that the above Compliant Item meets the requirements of the Basis of Certification for the selected assessment(s). The Risknowlogy report 2266.465.1 are an integral part of this certificate.
Certificate Number	2266.465.2
Issue Date	2019-06-09
Expiry Date	After modification of Compliant Item

Certifier Dr. Michel Houtermans

RISKNOWLOGY www.risknowlogy.com

Höntzsch GmbH & Co. KG
Gottlieb-Daimler-Straße 37
D-71334 Waiblingen
Telefon +49 7151 / 17 16-0
E-Mail info@hoentzsch.com
Internet www.hoentzsch.com

Subject to alterations

Instruction Manual Flow Sensors Category 3G and 3D

Failure to comply with the specifications of the operating manual can result in an explosion.

1 Apparatus

- Vane wheel flow sensors FA and measuring tubes FA Di with integrated or separate evaluation unit and optional integrated temperature probe Pt100
- Vortex flow sensors VA40 and measuring tubes VA Di with integrated or separate evaluation unit and optional integrated temperature probe Pt100
- Thermal flow sensors TA10 and measuring tubes TA Di with integrated or separate evaluation unit

This apparatus is designed for measuring the flow velocity and flow rate of gases in areas in which category 3G or 3D equipment is required.
During normal operation within the boundaries of the technical specifications the equipment is safe and does not generate sparks. Provision for self-heating does not need to be made in the case of vane wheel and vortex sensors. This also applies to thermal sensors in category 3G. The maximum additional surface temperature for category 3D areas is 135 °C.

Do not use the sensors

- in areas in which category 1G or 2G apparatus is required
- in areas in which category 1D or 2D apparatus is required

2 Safety Precautions

2.1 General

Hazard risks:
- modifications to the device by the customer
- handling the device outside the specified operating conditions
- handling the sensors outside the specified operating conditions
- improper use of the equipment

Danger when installing the sensors in pressurized pipelines:
- sensors for use in pressurized pipelines are to be inserted or retracted only in depressurized conditions; non-observance may result in serious harm to personnel
- when installing or removing under pressure, the appropriate protective equipment must be used, e.g. ball valve and probe guide pieces with chain guard or spindle probe guide pieces

The medium container for the measurement gases must be insulated in a way that it is ensured that the electronics housing of the apparatus does not assume a higher temperature than the aforementioned maximum ambient temperature. The radiation and convection heat has to be considered also.

2.2 Use in potentially explosive atmospheres

Danger when use of the device in potentially explosive atmospheres:
- The flow sensors may only be used in areas specified for category 3G (zone 2) or category 3D (zone 22) apparatus.
- The apparatus is to be connected to the local equipotential bonding system according to the currently valid regulations. The earth terminal is designed for cross-sections of 1,5 … 4 mm² mm². Use a cable lug. The torque for fixture to the earth terminal must amount to 2 … 3 Nm.
- If severe variations in temperature are to be expected, the device should be left to adapt to the ambient temperature for at least one hour before use to avoid problems with condensation.
- The housing cover may only be opened and connection cables may only be connected or disconnected after the supply voltage has been disconnected.
- Instrument sensors with a separate evaluation unit may only be connected or disconnected when voltage-free. Protect the connection cables against opening.
- Before starting measurement in an explosive atmosphere, check whether the housing cover has been screwed down correctly.
- Mechanical shocks are to be avoided.
- Damaged instruments must not be used. This also applies to damage on the housing.
- The connection cable used must be approved for the temperature range of the evaluation electronics as a minimum.
- Any covering of dust on the electronic housing may not exceed 5 mm.
- Only the manufacturer's cable glands ducts included in the scope of delivery or permitted, identical cable glands may be used.
- TA10C sensors may only be operated with a connection cable supplied by Höntzsch.
- **The electronic housing** must be protected from strokes and shocks.

Category 3G and category 3D vane wheel flow sensors FA and vortex flow sensors VA listed in chapter 1 are to be used solely in areas in which the ambient temperature range **for the electronic housing** does not exceed -20 to +50 °C. For sensors with integrated LCD display the ambient temperature range is limited from -5 to +50 °C. Consult the information in the appendant technical documentation.

Category 3G and category 3D thermal flow sensors TA listed in chapter 1 are to be used solely in areas in which the ambient temperature range **for the electronic housing** does not exceed -20 to +50 °C.

Category 3G apparatus listed in chapter 1 is to be used solely in areas with the temperatures marked on the type plate for the measuring medium and ambient atmosphere and for the maximum permissible overpressure.

The maximum permissible **surface temperature** for vane wheel and vortex sensors in category 3D areas is the maximum temperature of the medium and for thermal sensors 135 °C in addition to the maximum temperature of the medium. The maximum permissible temperature of the medium can be checked on the type plate and corresponding technical documents.

VAT and FT probes may be used in category 3G or 3D solely with a Höntzsch-approved evaluation unit specifically for these probes. Other combinations and categories are not permissible. Always check that the sensor is connected correctly. A wrongly connected sensor can increase the risk of explosion.

3 Technical Data

Marking: CE Ex II 3 G

Explosion protection: vane wheel sensors FA and vortex sensors VA
Ex ec IIC T6 Gc X
Explosion protection: thermal sensors TA
Ex ec IIC T4 Gc X

Marking: CE Ex II 3 D

Explosion protection: vane wheel sensors FA and vortex sensors VA
Ex tc IIIC TX Dc X
Explosion protection: thermal sensors TA
Ex tc IIIC T135°C Dc X

X: There are certain special factors to be observed for applications in explosive atmospheres (see chapter 2.2)

3.1 Electrical Data

For power supply, power input, current consumption, refer to the details on the type plate and corresponding technical documents.

4 Installation

The current European Specifications for Assembly, the recognised standards of good practice and this Instruction Manual apply.
We recommend a cable with a 4 … 6 mm² cross section for connection to the earth terminal. Use a cable lug.
The earth terminal must be tightened with a torque of 2 … 3 Nm.

5 Cleaning / Maintenance

Sensors should be cleaned at regular intervals.

Any other maintenance or repair work is to be carried out solely by Höntzsch GmbH & Co. KG.

Declaration of Conformity, Declaration of Incorporation Category 3G and 3D for

- Vane wheel flow sensors FA and measuring tubes FA Di with integrated or separate evaluation unit and optional integrated temperature probe Pt100
- Vortex flow sensors VA40 and measuring tubes VA Di with integrated or separate evaluation unit and optional integrated temperature probe Pt100
- Thermal flow sensors TA10C and measuring tubes TA Di with integrated or separate evaluation unit

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

bearing sole responsibility, hereby declare that the above-mentioned products referred to by this declaration are in conformity with the following standards or normative documents:

Provisions of the Directive	**Reference and date of issue**
2014/34/EU: Equipment and Protective Systems in Potentially Explosive Atmospheres	EN 60079-0: 2018 EN 60079-7: 2015 EN 60079-31: 2014
2014/30/EU: Electromagnetic Compatibility	EN 61000-6-4: 2007 + A1: 2011 EN 61000-6-2: 2006 + Corrigendum 1: 2011
2014/68/EU: Pressure Equipment	

Waiblingen, 25.06.2021

Jürgen Lempp / Managing Director

Höntzsch GmbH & Co. KG
Gottlieb-Daimler-Straße 37
D-71334 Waiblingen
Telefon +49 7151 / 17 16-0
E-Mail info@hoentzsch.com
Internet www.hoentzsch.com

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