



Annex

Operating Instructions

Transducers UFA / UVA / UTA integrated in vane wheel sensors, vortex sensors, or thermal sensors with Ex-d housing

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A1 Scope of Delivery

- Transducer UFA, UVA or UTA integrated in the connection housing of flow sensor FA, VA or TA
- Operating Instructions Flow Sensor FA, VA or TA;
Data Sheet flow sensor FA, VA or TA with integrated transducer UFA, UVA or UTA
- CD-ROM with PC configuration software UCOM (optional)
- HART modem for PC connection to COM or USB port (optional)

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

A1.1 Description, Type Plates

One of the following type plates (or similar) can be found on the connection housing:



FA, FAR	: vane wheel flow sensor
VA	: vortex flow sensor VA40
TA	: thermal flow sensor
UFA	: transducer for vane wheel sensors FA
UVA	: transducer for vortex sensors VA
UTA	: transducer for thermal sensors TA
PS	: max. permissible pressure (absolute)
S.No.	: serial number
Di	: inside diameter Di of the measuring tube
T _{amb}	: ambient air temperature range connection housing -20...+50 °C
T _{medium}	: temperature range of medium

Pin assignment of connecting terminals:

KL1 DC Power	L+	: +24 VDC	= supply voltage +24 VDC
	L-	: 0 VDC	= supply voltage 0 VDC
KL2 Output 4..20mA	+	: +4..20mA	= Output Flow
	-	: - 4..20mA	= Output Flow
KL3 Output relay (2 terminals)	:		= normally open contact potential-free



A2 Technical Specifications



A2.1 Operating Conditions

Ambient temperature
of connection housing
when in use : -20 ... +50 °C

Type of protection : IP68

A2.2 Housing and Connections

Type of protection : housing IP68
Setup : dual chamber system Ex-d = electronics, Ex-e = connection chamber

Material : aluminium

External dimensions : D/L/H = 110/205/182 mm

Connections : 2 cable bushings in Ex-e protection in the connection chamber, in which
6 terminals in Ex-e protection for wires with cross-section 0.14...1.5
mm² can be found

A2.3 Electrical Data

**Supply voltage,
mains supply
supply current** : 24 V DC (20 ... 27 V DC), power < 5 W
<150 mA

The mains supply is electrically isolated from the outputs.

The "-" connection of the analog output can be found on the housing and so on the equipotential bonding
PA, i.e. on EMC grounds the signal interpretation should have potential-free inputs.

The relay output is potential-free.

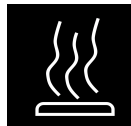
Analog output : 4 ... 20 mA = 0 ... x m/s (or m³/h)
4 ... 20 mA = -x ... 0 ... +x m/s (or m³/h) with FAR
function configurable;
terminal value x configurable / resistance max. 500 Ohm,
with HART interface 250 ... 500 Ohm

Digital output : (relay contact, normally open contact), max. 200 mA / 30 V DC,
configurable as limit value v, quantity pulse or
±direction of flow (see A4 Functional Description A4)

HART interface : for communication with PC programme UCOM
(see Functional Description A4)

Accessible by unscrewing the glass housing (optional):

**Connection
for optional LCD display** : flat ribbon cable with 10-pin cable socket
DO NOT PLUG IN OR OUT WHEN LIVE!



A2.4 Measurement Uncertainty

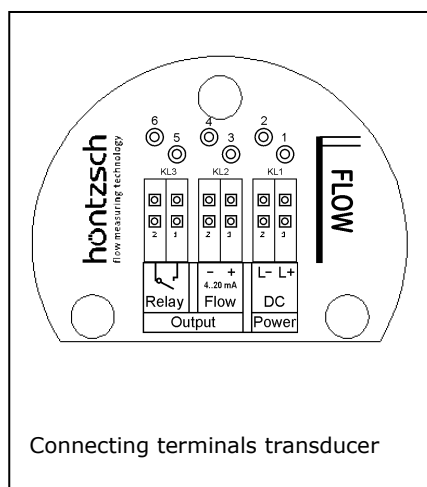
Acquisition of measurement frequency (at 1000 Hz)	: <0.1%
Analog output (terminal value)	: <0.15%
Linearity error	: <0.1%
Temperature coefficient	: <20 ppm/K (at 25 °K temperature difference equivalent to <0.05%)



A3 Installation

Authoritative here are the relevant national regulations for installing electrical equipment, the General Engineering Regulations and these Operating Instructions.

A3.1 Pin Assignment



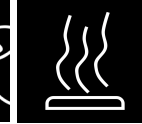
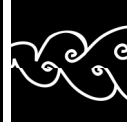
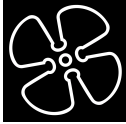
Connecting terminals are accessible after removing the housing cover of the connection chamber (housing cover on the cable bushing side).



A3.2 Wiring Diagrams

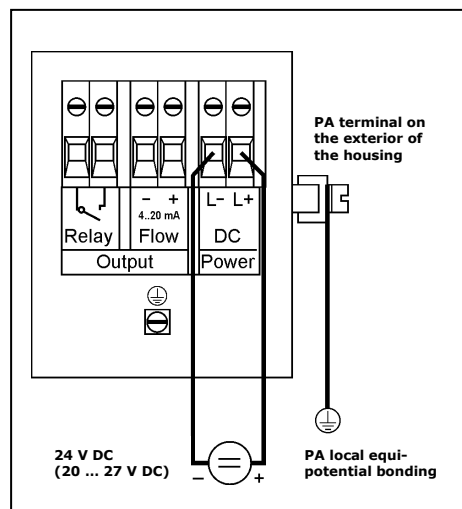
Electrical connection must be carried out according to the appropriate wiring diagram. **Faulty connection can cause damage to the electronics.**

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

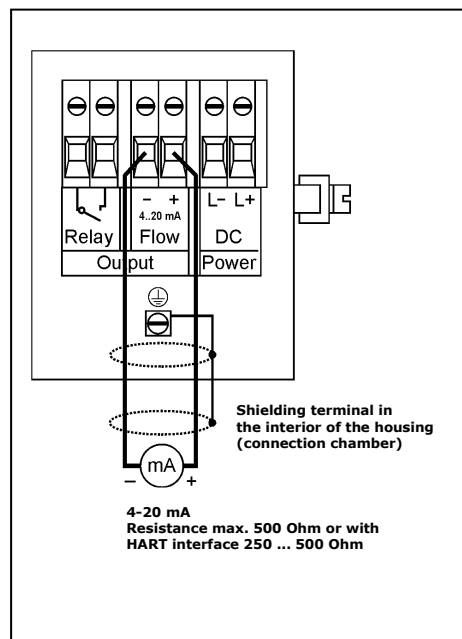


A3.2.1 Power supply

Before connecting please check that the power supply is within the specification. All relevant information can be found on the type plate.



A3.2.2 Analog output v



The analog output is configurable with the PC software UCOM via the HART interface. The factory-programmed values can be found in the accompanying documents.



A3.2.3 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.

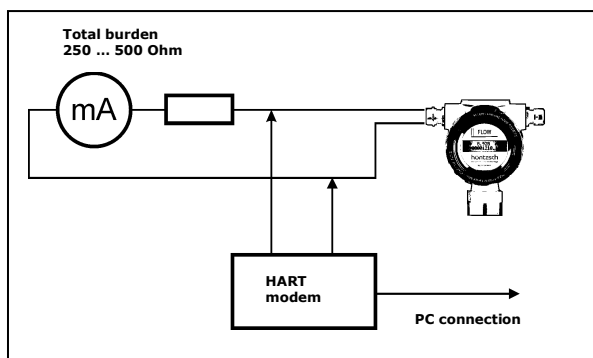
The **digital output** (relay contact) can be configured for **1 of 3 functions**:

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 (with FAR sensors: configurable for '+' or '-' amounts)
3. as **\pm direction of flow** ** (FAR sensors only):
 +direction: relay contact open
 - direction: relay contact closed
 ** analog output is then absolute value of flow only, without direction

A3.2.4 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.





A3.2.5 LCD display behind inspection glass in housing cover (optional)



Fig. 1: optional LCD display behind glass

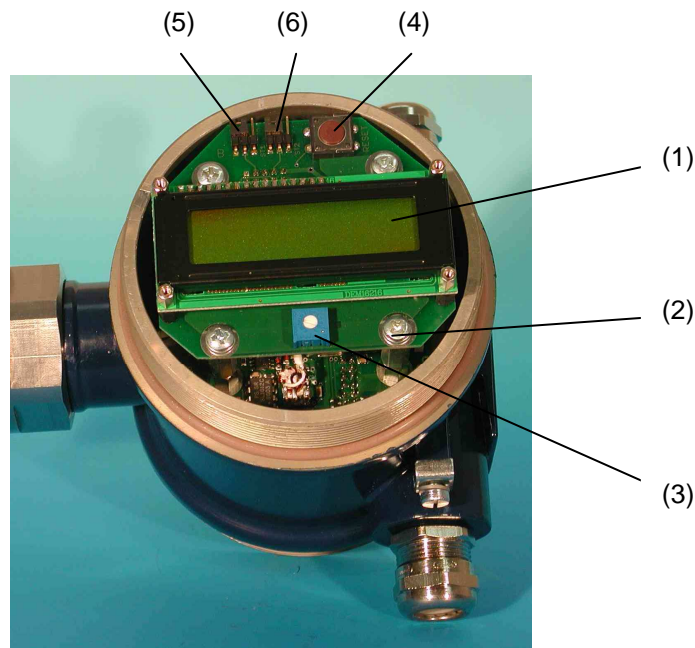
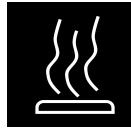
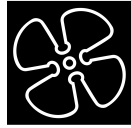


Fig. 2: LCD display with cover open

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 A4 Functional Description).



A4 Functional Description

UFA transducers for vane wheel probes FA and FAR (directional sensing) and vane wheel measuring tubes FA Di and FAR Di (directional sensing) for measuring flow velocity or flow rate of air/gases and water/liquids.

UVA transducers for vortex sensors VA for measuring flow velocity or flow rate of air/gases.

UTA transducers for thermal sensors TA for measuring standard flow velocity or standard flow rate of air/gases.

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:

for FA and FAR*:	4 ... 20 mA	=	0 ... x m/s (or m ³ /h)
for FAR:	4 ... 12 ... 20 mA	=	-x ... 0...+x m/s (or m ³ /h)
for VA:	4 ... 20 mA	=	0 ... x m/s (or m ³ /h)

* for FAR sensors configuration of the digital output (see below): \pm direction of flow

With transducers UFA and UVA 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.

A **digital output** (relay contact) can be configured for **1 of 3 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 (with FAR sensors: configurable for '+' or '-' amounts)
3. as **\pm direction of flow** ** (FAR sensors only):
+direction: relay contact open
- direction: relay contact closed
** analog output is then absolute value of flow only, without direction

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, parameter settings (see under A10: Troubleshooting)

HART interface

for changing calibration data and setting parameters.

Connect HART modem (optional) to transducer UFA/UVA/UTA 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 A5: Settings).



Optional LCD display behind inspection glass in the housing cover:

2 x 16 digit, character height 5.5 mm

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

Configuration (see Fig. 2, under A3.2.5) via 2 jumper wrap connections St1 m/s-m³/h and St2 A-B

Display line 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) UFA and UVA only, when parameter 'switching v/NV' =1 (see under A5)

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

Display line 2:

Quantity counter in m³ with 0 ... 3 decimal places
(see under A5: 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 A10: Troubleshooting)

Reset button on the LCD display module behind the glass of the housing cover: see Fig. 2,
A3.2.5:

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

A5 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.



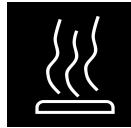
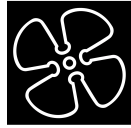
A6 Initial Operation

(Pay attention to A3.2.1 Power supply and A3.2.2 Analog output)

On connecting the supply voltage:

no flow at sensor: the analog output sends a value of 4 mA (or 12 mA depending on configuration with
FAR sensors, see under A4 Functional Description)

flow at sensor: the analog output sends an analog value deviating from the zero flow conditions (see
above).



A7 Operation

(Pay attention to A2.1 Operating Conditions)
(Pay attention to A2.3 Electrical Data)



A8 Shut-down, Dismantling

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

A9 Inspection

see under A4 Functional Description, self diagnosis.

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



A10 Troubleshooting

Fault	Cause	Troubleshooting
Analog output = 0 mA	No power supply	Check connecting 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 measured 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 flow direction; install flow rectifier
	VA sensors: Reduced acoustic coupling in the sensor elements as a result of intense vibration or a powerful impact	Return sensor 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 set too high	Set coefficient to relevant nominal diameter and sensor type
	EMC problem	See reference to electromagnetic compatibility (EMC)

A11 Replacement Parts

- Cable bush in Ex-e protection
- Inspection glass-housing cover
- Housing cover (without inspection glass)
- Seals for housing cover
- The fuse is self-restoring