OPTISONIC 7300 BIOGAS

Technical Datasheet

Ultrasonic gas flowmeter for biogas

- Measurement of dry and wet biogas with variable composition
- Integrated methane content measurement
- Integrated standard volume calculation

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1.1 Ultrasonic gas flowmeter for biogas

The **OPTISONIC 7300 Biogas** offers an ultrasonic flow measurement solution for biogas and landfill gas. Biogas, generated from bio feed stocks by fermentation, mainly contains methane and carbon dioxide in a variable composition. It contains also small amounts of other gasses like hydrogen sulphide, nitrogen and hydrocarbons or can be saturated with water.

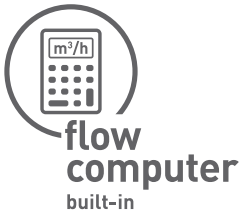
The flowmeter is specially designed to measure biogas and landfill gas and can measure this with high carbon dioxide content, saturated with water or with free condensation water present.

The flowmeter provides additional functions like calculation of standard volume, methane content measurement and diagnostics features.

The OPTISONIC 7300 Biogas does not have the limitations that are usually associated with traditional gas flowmeters like periodical recalibrations, maintenance, pressure loss and a limited flow range. The flowmeter combines the advantages of ultrasonic measurement in a way that it is efficient, reliable and easy to use.

(Example of compact version in Ex i design)

① 2 current inputs for calculation to standard conditions
② Integrated temperature sensor and pressure sensor (option)



Flow computer built-in

Many KROHNE flowmeters have a built-in flow computer that compensates for the effects of pressure and temperature on the flow measurement or to convert to standard volume. This saves both cost and installation efforts for an external flow computer and provides for additional benefits.

OPTICHECK technology built-in

OPTICHECK technology built-in

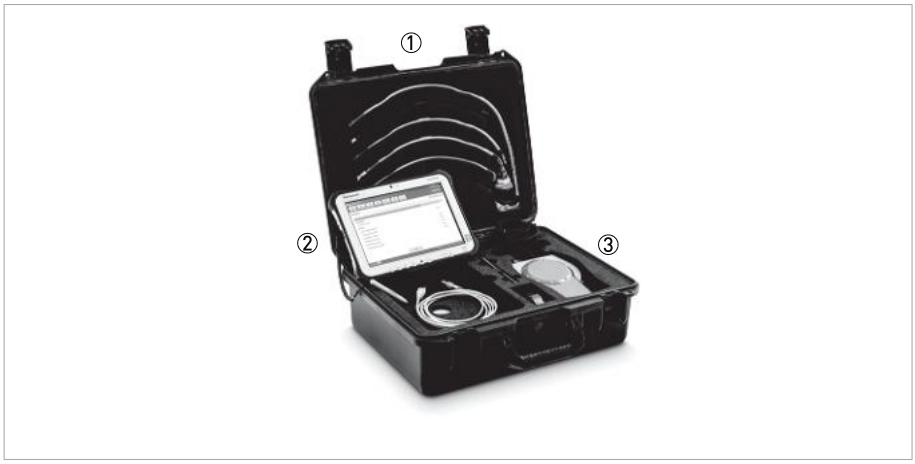
State-of-the-art measuring devices combine robust measuring principles and powerful electronics to produce a wide range of readings and device-specific data. OPTICHECK technology built-in leverages the features of the devices to translate their available comprehensive measuring system data into sophisticated diagnostics information for plant personnel. It goes beyond extensive device diagnostics, self-tests and on-site verification.
With measurement principle-specific application diagnostics, this technology also allows in-depth insights into the process and thus opens up far-reaching possibilities for device monitoring, condition-based maintenance and optimisation of measurement technology and systems.

OPTICHECK tool for on-site verification

The OPTICHECK provides an in-line health check of the device under test by an external tool.

A hard copy of the verification report can be printed for every flowmeter and verification data is digitally stored.

Contact us for more information or for an on-site service visit.



① Suitcase
② Tablet
③ OPTICHECK Master

Highlights

- Large measurement range; starts measuring from atmospheric pressure and zero flow
- Integrated flow computer for calculation to standard conditions
- Integrated methane content measurement
- All metal industrial construction; insensitive to corrosive components
- Standard factory calibration for accurate measurement results within +/- 1%

Industries

- Waste water treatment
- Agriculture
- Food
- Waste processing

Applications

Raw and dry biogas from digester plants for:

- Waste water sludge
- Manure
- Food waste
- Landfill gas

1.2 Options and variants

(Ex i design)

The **OPTISONIC 7300 Biogas** is a single or dual path ultrasonic gas flowmeter.

- Compact and remote version
- Diameter range DN50 / 2" up to DN200 / 8"
- Process connections according to DIN 2642 Form F / PN10 or ASME B16.5 150 lb RF ring flange
- Integrated temperature sensor and/or pressure sensor (option)
- Standard including hazardous area approval ATEX/IECEx
- Class 1/ Division 1 or 2 certified (delivered with P&T process ports on the flow sensor

(Ex d design)

GFC 300 signal converter

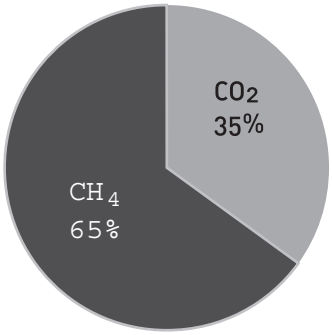
- Display with 4 optical buttons
- Compact version with aluminium housing
- Remote mounted converter with optional up to 30 meter signal cable
- Micro-USB connection for monitoring tool enabling flowmeter verification and validation
- With 1 or 2 inputs for integrated pressure and temperature measurement

1.3 Features

Transducer design
With the innovative patented design of the transducers, the OPTISONIC 7300 Biogas offers a superior measurement of biogas with a carbon dioxide content up to 50%, even at low pressure.

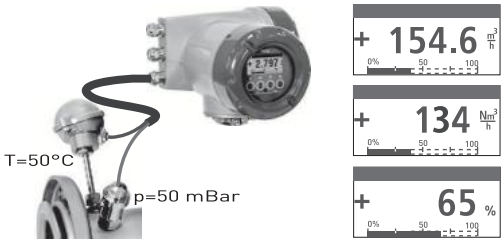
Also if the measured gas is saturated with water, when liquid water may appear in the tube measurement will continue.

The transducers are made from corrosion resistant titanium and will not be affected by hydrogen sulphide if present in the biogas.



Integrated measurement of methane content
Using the velocity of sound, which is a standard available measurement in the flowmeter and the input of the gas temperature, the methane content of biogas can be calculated and set on display and I/O. Correction for gas humidity is available based on the gas temperature and from this, the energy output can be derived.

This enables to monitor online the performance of the biogas installation



Calculation to standard conditions
Gas flow is often specified in standard conditions (15°C and 101.325 kPa or 59°F and 14.7 psi).

The build in flow computer can provide calculation of gas volume to standard conditions.
For this the signal converter GFC 300 has 2 current inputs for the measurement of pressure and temperature.

Diagnostics
Important information about both the process and the flow sensor can be provided by diagnostic values. Examples are gain for information about pollution in the sensor, velocity of sound for changes in the gas composition and signal to noise ratio for changes in the process.

1.4 Measuring principle

- Like canoes crossing a river, acoustic signals are transmitted and received along a diagonal measuring path.
- A sound wave going downstream with the flow travels faster than a sound wave going upstream against the flow.
- The difference in-transit time is directly proportional to the mean flow velocity of the medium.

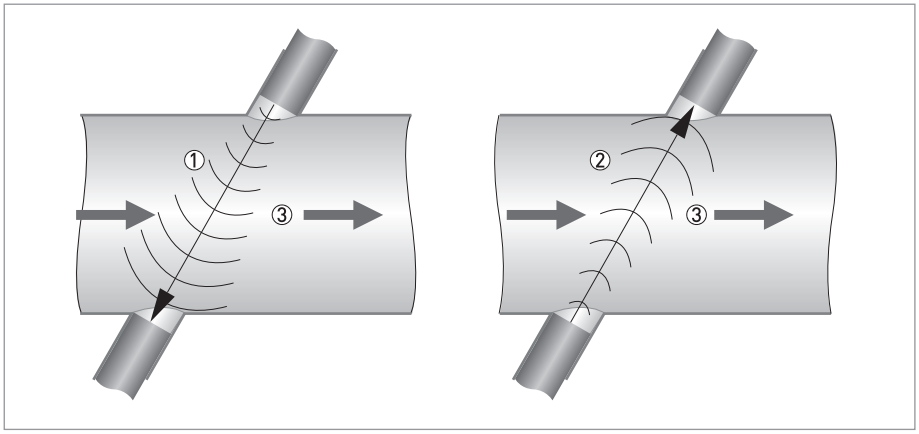


Figure 1-1: Measuring principle

① Sound wave against the flow direction
② Sound wave with the flow direction
③ Flow direction

2.1 Technical data

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Download Center).*

Measuring system

Measuring principle	Ultrasonic transit time
Application range	Flow measurement of low pressure gas, biogas, biomethane and natural gas
Measured value	
Primary measured value	Transit time
Secondary measured values	Volume flow, corrected volume flow, mass flow, molar mass, flow speed, flow direction, velocity of sound, gain, signal to noise ratio, reliability of flow measurement, totalised volume or mass, methane content

Design

Features	1 or 2 parallel acoustic path(s), fully welded flow sensor with double fitted transducers
Modular construction	The measuring system consists of a flow sensor and a signal converter.
Compact version	OPTISONIC 7300 C Biogas
Remote version	OPTISONIC 7000 F Biogas flow sensor with GFC 300 F signal converter
Nominal diameter	1 path: DN50 / 2", DN80 / 3"
	2 paths: DN100 / 4", DN150 / 6", DN200 / 8"
	Larger diameters on request.
Measuring range	0...30 m/s / 0...100 ft/s, specified accuracy curve from 0.3...30 m/s / 1...100 ft/s
Signal converter	
Outputs / inputs	Up to 3 current out- and inputs combinations possible (including HART®), pulse output, frequency output and/or status output, limit switch and/or control input, current inputs (depending on the I/O version)
Counters	2 internal counters with a max. of 8 counter places (e.g. for counting volume and/or mass units).
Self diagnostics	Integrated verification, diagnostic functions: flowmeter, process, measured values, bargraph, device configuration, etc.
Communication interfaces	HART® 5, Foundation Fieldbus, Modbus RS 485
Temperature sensor	
Type	PT100 with transmitter ATEX / IEC Ex Ex-i: OPTITEMP TRA-P10 with TT22C transmitter. ATEX / IEC Ex Ex-d(e): Ex-d PT100 with TT30C transmitter.
Measuring range	0...+100°C / +32...+212°F
Pressure sensor (optional)	
Type	OPTIBAR P1010, ultra-compact with recessed metallic diaphragm, ATEX/IEC-Ex Ex-i (IP65)
Measuring range	0...1.6 bara / 0...23.3 psia (typically biogas work range).

Display and user interface	
Graphic display	LC display, backlit white.
	Size: 128 x 64 pixels, corresponds to 59 x 31 mm = 2.32" x 1.22"
	Display can be rotated in 90° increments.
	Ambient temperatures below -25°C / -13°F, may affect the readability of the display.
Operating elements	4 push buttons (operator control with open housing) and 4 optical keys for operator control of the signal converter without opening the housing.
	Infrared interface for reading and writing all parameters with IR interface (option) without opening the housing.
Remote control	PACTware™ (including Device Type Manager (DTM))
	HART® Hand Held Communicator
	AMS® from Emerson Process
	PDM® from Siemens
	All DTMs and drivers are available free of charge from the manufacturer's website.
Display functions	
Operating menu	Setting the parameters using 2 measured value pages, 1 status page, 1 graphics page (measured values and graphics are freely adjustable)
Language of display texts	English, French, German, Russian
Measurement functions	**Units:** Metric, British and US units selectable as desired from lists for volume/mass flow and counting, velocity, temperature
	Measured values: volume flow, corrected volume flow, mass flow, flow speed, velocity of sound, gain, signal to noise ratio, flow direction, diagnostics

Measuring accuracy

Air calibration	
Reference conditions	Medium: Air
	Temperature: +20°C / +68°F
	Pressure: 1 bara / 14.5 psia
	Reynold > 10000
	Inlet section: 20 DN (for ≤ DN80 / 3"); 10 DN (for ≥ DN100 / 4")
Maximum measuring error	DN100...600 / 4...24": < ± 1% of actual measured flow rate, for 1...30 m/s (3...100 ft/s) < ± 10 mm/s for 0.3...1 m/s (1...3 ft/s)
	DN50...80 / 2...3": < ± 1.5% of actual measured flow rate, for 1...30 m/s (3...100 ft/s) < ± 15 mm/s for 0.3...1 m/s (1...3 ft/s)
Repeatability	± 0.2%

Operating conditions

Temperature	
Process temperature	Compact and remote version: 0...+100°C / +32...+212°F
Ambient temperature	Flow sensor: -40...+70°C / -40...+158°F
	Flow sensor with P1010 pressure transmitter: -20...+65°C / -4...+149°F
	Converter with aluminum housing: -40...+65°C / -40...+149°F
	Converter with a stainless steel housing: -40...+60°C / -40...+131°F
	Ambient temperatures below -25°C / -13°F may affect the readability of the display.
Protect the signal converter from external heat sources such as direct sunlight, as higher temperatures reduce the life cycle of all electronic components.	
Storage temperature	-50...+70°C / -58...+158°F
Pressure	
Design pressure	10 bara / 145 psia
DIN 2642F	DN50...300: PN 10, lap joint flange, pressed plate
ASME B16.5	2...12": 150 lb/ 145 psi, ring flange
Properties of medium (other properties on request)	
Density	Standard: 10...45 g/mol/ 1...150 kg/m^3 / 0.062...9.36 lb/ft^3

Installation conditions

Installation	For detailed information refer to *Installation* on page 25.
Inlet section (minimum)	1 path (≤ DN80 / 3"): 20 DN (straight inlet)
	2 paths (≥ DN100 / 4"): 10 DN (straight inlet)
	Larger in and outlet section will improve the stability of the measurement.
Outlet section	Minimal 3 DN (straight outlet)
Dimensions and weight	For detailed information refer to *Dimensions and weight* on page 21.

Materials

Flow sensor	
Flanges (wetted)	Stainless steel AISI 316 L / 1.4404
Measuring tube (wetted)	Stainless steel AISI 316 L / 1.4404
Sensor conduits	Stainless steel AISI 316 L / 1.4404
Sensor neck	Stainless steel AISI 316 / 1.4408
Transducer nozzles and holders (wetted), incl. caps	Stainless steel AISI 316 L / 1.4404
Transducers (wetted)	Titanium (replaceable), standard or low density / wet conditions version.
Transducer O-rings (wetted)	FKM / FPM
Temperature sensor (wetted)	Stainless steel AISI 316 Ti / 1.4571
Pressure sensor (wetted)	Stainless steel AISI 316 L / 1.4404
Connection box (remote version only)	Stainless steel AISI 316 / 1.4408
Coating (flow sensor)	Blasted (not coated)
Signal converter	
Housing	Compact version: housing in aluminium or stainless steel 316 / 1.4408
	Remote version: housing in aluminium or stainless steel 316 / 1.4408
	Console: stainless steel 316 / 1.4408
Coating (converter housing)	Aluminium: standard coating
	Stainless steel: uncoated

Electrical connections

General	Electrical connection is carried out in conformity with the VDE 0100 directive "Regulations for electrical power installations with line voltages up to 1000 V" or equivalent national specifications.
Power supply	Standard: 100...230 VAC (-15% / +10%), 50/60 Hz
	Option: 24 VAC/DC (AC: -15% / +10%; DC: -25% / +30%)
Power consumption	AC: 22 VA
	DC: 12 W
Signal cable (remote version only)	Shielded cable with 2 triax cores: Ø 10.6 mm / 0.4", 1 per acoustic path.
	Separate triax cables for Class 1, Division 2 (to be installed in conduits).
	5 m / 16 ft
	Option: 10...30 m / 33...98 ft
Cable entries	Standard: M20 x 1.5 (8...12 mm)
	Option: 1/2 NPT, PF 1/2 adapter

Inputs and outputs

General	All in-and outputs are galvanically isolated from each other and from all other circuits.	
	All operating data and output values can be adjusted.	
Description of used abbreviations	V_{ext} = external voltage; R_L = load + resistance; V_0 = terminal voltage; I_{nom} = nominal current Safety limit values (Ex i): V_i = max. input voltage; I_i = max. input current; P_i = max. input power rating; C_i = max. input capacity; L_i = max. input inductivity	
Current output		
Output data	Measurement of volume flow, corr. volume flow, mass flow, molar mass, flow speed, velocity of sound, gain, diagnostics 1, 2, 3, HART® communication.	
Temperature coefficient	Typically ± 30 ppm/K	
Settings	**Without HART®**	
	Q = 0%: 0...15 mA	
	Q = 100%: 10...20 mA	
	Error identification: 3...22 mA	
	With HART®	
	Q = 0%: 4...15 mA	
	Q = 100%: 10...20 mA	
	Error identification: 3.5...22 mA	
Operating data	**Modular I/Os**	**Ex i I/Os**
Active	$V_{int, nom}$ = 24 VDC I ≤ 22 mA R_L ≤ 1 kΩ	$V_{int, nom}$ = 20 VDC I ≤ 22 mA R_L ≤ 450 Ω
		V_0 = 21 V I_0 = 90 mA P_0 = 0.5 W C_0 = 90 nF / L_0 = 2 mH C_0 = 110 nF / L_0 = 0.5 mH Linear characteristics
Passive	V_{ext} ≤ 32 VDC I ≤ 22 mA V_0 ≥ 1.8 V R_L ≤ (V_{ext} - V_0) / I_{max}	V_{ext} ≤ 32 VDC I ≤ 22 mA V_0 ≥ 4 V R_L ≤ (U_{ext} - U_0) / I_{max}
		V_i = 30 V I_i = 100 mA P_i = 1 W C_i = 10 nF L_i ~ 0 mH

HART®		
Description	HART® protocol via active and passive current output	
	HART® version: V5	
	Universal HART® parameter: completely integrated	
Load	≥ 230 Ω at HART® test point; Note maximum load for current output!	
Multi-Drop operation	Yes, current output = 4 mA	
	Multi-Drop address adjustable in operation menu 1...15	
Device drivers	Available for FC 375/475, AMS, PDM, FDT/DTM	
Pulse output or frequency output		
Output data	Volume flow, corr. volume flow, mass flow	
Function	Adjustable as pulse of frequency output	
Pulse rate/frequency	Adjustable final value: 0.01...10000 pulse/s or Hz	
Settings	Pulses per volume or mass unit or max. frequency for 100% flow	
	Pulse width: setting automatic, symmetric or fixed (0.05...2000 ms)	
Operating data	**Modular I/Os**	**Ex i I/Os**
Active	U_{nom} = 24 VDC	-
	f_{max} in operating menu set to f_{max} ≤ 100 Hz: I ≤ 20 mA open: I ≤ 0.05 mA closed: $V_{0, nom}$ = 24 V at I = 20 mA	
	f_{max} in operating menu set to 100 Hz < f_{max} ≤ 10 kHz: I ≤ 20 mA open: I ≤ 0.05 mA closed: $V_{0, nom}$ = 22.5 V at I = 1 mA $V_{0, nom}$ = 21.5 V at I = 10 mA $V_{0, nom}$ = 19 V at I = 20 mA	

Operating data	Modular I/Os	Ex i I/Os
Passive	V_{ext} ≤ 32 VDC	-
	f_{max} in operating menu set to f_{max} ≤ 100 Hz: I ≤ 100 mA $R_{L, max}$ = 47 kΩ $R_{L, min} = (V_{ext} - V_0) / I_{max}$ open: I ≤ 0.05 mA at V_{ext} = 32 VDC closed: $V_{0, max}$ = 0.2 V at I ≤ 10 mA $V_{0, max}$ = 2 V at I ≤ 100 mA	
	f_{max} in operating menu set to 100 Hz < f_{max} ≤ 10 kHz: I ≤ 20 mA $R_{L, max}$ = 47 kΩ $R_{L, min} = (V_{ext} - V_0) / I_{max}$ open: I ≤ 0.05 mA at V_{ext} = 32 VDC closed: $V_{0, max}$ = 1.5 V at I ≤ 1 mA $V_{0, max}$ = 2.5 V at I ≤ 10 mA $V_{0, max}$ = 5.0 V at I ≤ 20 mA	
NAMUR	Passive to EN 60947-5-6 open: I_{nom} = 0.6 mA closed: I_{nom} = 3.8 mA	Passive to EN 60947-5-6 open: I_{nom} = 0.43 mA closed: I_{nom} = 4.5 mA
		V_i = 30 V I_i = 100 mA P_i = 1 W C_i = 10 nF L_i ~ 0 mH

Status output / limit switch		
Function and settings	Adjustable as automatic measuring range conversion, display of flow direction, overflow, error, switching point	
	Valve control with activated dosing function	
Operating data	**Modular I/Os**	**Ex i I/Os**
Active	V_{int} = 24 VDC I ≤ 20 mA open: I ≤ 0.05 mA closed: $V_{0, nom}$ = 24 V at I = 20 mA	-
Passive	V_{ext} = 32 VDC I ≤ 100 mA $R_{L, max}$ = 47 kΩ $R_{L, min} = (V_{ext} - V_0) / I_{max}$ open: I ≤ 0.05 mA at V_{ext} = 32 VDC closed: $V_{0, max}$ = 0.2 V at I ≤ 10 mA $V_{0, max}$ = 2 V at I ≤ 100 mA	-
NAMUR	Passive to EN 60947-5-6 open: I_{nom} = 0.6 mA closed: I_{nom} = 3.8 mA	Passive to EN 60947-5-6 open: I_{nom} = 0.43 mA closed: I_{nom} = 4.5 mA
		V_i = 30 V I_i = 100 mA P_i = 1 W C_i = 10 nF L_i = 0 mH

Control input		
Function	Hold value of the outputs (e.g. for cleaning work), set value of the outputs to "zero", counter and error reset, stop counter, range conversion, zero calibration	
	Start of dosing when dosing function is activated.	
Operating data	**Modular I/Os**	**Ex i I/Os**
Active	V_{int} = 24 VDC Ext. contact open: $V_{0, nom}$ = 22 V Ext. contact closed: I_{nom} = 4 mA Contact closed (on): $V_0 \geq$ 12 V at I_{nom} = 1.9 mA Contact open (off): $V_0 \leq$ 10 V at I_{nom} = 1.9 mA	-
Passive	3 V $\leq V_{ext} \leq$ 32 VDC I_{max} = 9.5 mA at $V_{ext} \leq$ 24 V I_{max} = 9.5 mA at $V_{ext} \leq$ 32 V Contact closed (on): $V_0 \geq$ 3 V at I_{nom} = 1.9 mA Contact open (off): $V_0 \leq$ 2.5 V at I_{nom} = 1.9 mA	$V_{ext} \leq$ 32 VDC I $\leq$ 6 mA at V_{ext} = 24 V I $\leq$ 6.6 mA at V_{ext} = 32 V On: $V_0 \geq$ 5.5 V at I $\geq$ 4 mA Off: $V_0 \leq$ 3.5 V at I $\leq$ 0.5 mA
		V_i = 30 V I_i = 100 mA P_i = 1 W C_i = 10 nF L_i = 0 mH
NAMUR	Active to EN 60947-5-6 Terminals open: $V_{0, nom}$ = 8.7 V Contact closed (on): $V_{0, nom}$ = 6.3 V at I_{nom} > 1.9 mA Contact open (off): $V_{0, nom}$ = 6.3 V at I_{nom} < 1.9 mA Detection for open terminals: $V_0 \geq$ 8.1 V at I $\leq$ 0.1 mA Detection of cable short circuit: $V_0 \leq$ 1.2 V at I $\geq$ 6.7 mA	-

Current input		
Function	A connected external sensor delivers the values (temperature, pressure or current) to the current input.	
Operating data	**Modular I/Os**	**Ex i I/Os**
Active	$V_{int, nom}$ = 24 VDC I ≤ 22 mA I_{max} ≤ 26 mA (electronically limited) $V_{0, min}$ = 19 V at I ≤ 22 mA No HART®	V_{int} = 20 VDC I ≤ 22 mA $V_{0, min}$ = 14 V at I ≤ 22 mA No HART®
		V_0 = 24.1 V I_0 = 99 mA P_0 = 0.6 W C_0 = 45 nF / 110 nF L_0 = 2.0 mH / 0.2 mH No HART®
Passive	V_{ext} ≤ 32 VDC I ≤ 22 mA I_{max} ≤ 26 mA (electronically limited) $V_{0, max}$ = 5 V at I ≤ 22 mA No HART®	-

FOUNDATION Fieldbus	
Description	Galvanically isolated according to IEC 61158
	Current consumption: 10.5 mA
	Permissible bus voltage: 9...32 V; in Ex application: 9...24 V
	Bus interface with integrated reverse polarity protection
	Link Master function (LM) supported
	Tested with Interoperable Test Kit (ITK) version 5.2
Function blocks	6 x analogue input (AI), 2 x integrator, 1 x PID, 1 x arithmetic
Output data	Volume flow, corr. volume flow, mass flow, molar mass, enthalpy flow, spec. enthalpy, density, flow speed, process temperature, process pressure, electronic temperature, velocity of sound (av.), gain (av.), SNR (av.), velocity of sound 1-3, gain 1-3, SNR 1-3
Modbus	
Description	Modbus RTU, Master / Slave, RS485
Address range	1...247
Supported function codes	01, 03, 04, 05, 08, 16, 43
Supported Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud

Approvals and certificates

CE	
This device fulfils the statutory requirements of the relevant directives. The manufacturer certifies successful testing of the product by applying the conformity mark on the device.	
	For more information on the directives, standards and the approved certifications, please refer to the declaration of conformity supplied with the device or downloadable from the manufacturer's website.
Hazardous areas (standard)	
Ex zone 1 - 2	For detailed information, please refer to the relevant Ex documentation.
	According to European directive 2014/34/EU
IECEx	OPTISONIC 7300 C: IECEx KIWA 18.0004X
	OPTISONIC 7000 F: IECEx KIWA 18.0004X and GFC 300 F: IECEx KIWA 17.0001X
ATEX	OPTISONIC 7300 C: KIWA 18ATEX0005X
	OPTISONIC 7000 F: KIWA 18ATEX0005X and GFC 300 F: KIWA 17ATEX0002X
Class 1, Division 1/2	cQPSus LR 1338-6R1
NEPSI	OPTISONIC 7300 C/ OPTISONIC 7000 F: GYJ23.1272X
	GFC 300 F: GYJ23.1274X
Other standards and approvals	
Ingress protection according to IEC 60529	**Signal converter**
	Compact version (C): IP66/67, NEMA 4X/6
	Field version (F): IP66/67, NEMA 4X/6
	All flow sensors
	IP66/67, NEMA 4X/6
Vibration resistance	IEC 60068-2-64
	f = 20...2000 Hz, rms = 4.5g, t = 30 min
NAMUR	NE 21, NE 43, NE 53

2.2 Dimensions and weight

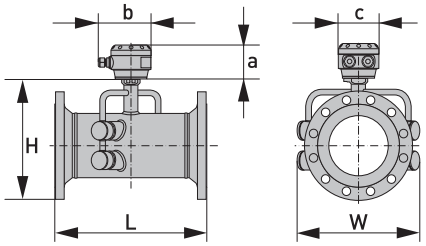
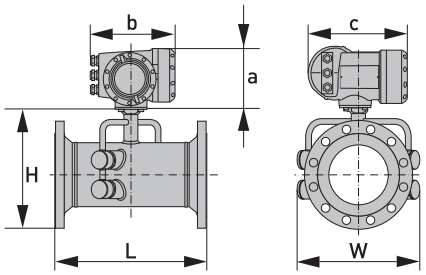
Remote version		a = 88 mm / 3.5" b = 139 mm / 5.5" ① c = 106 mm / 4.2"
Compact version		a = 155 mm / 6.1" b = 230 mm / 9.1" ① c = 260 mm / 10.2" Total height = H + a

Table 2-1: Dimension and weight

① The value may vary depending on the used cable glands.

2.2.1 Flow sensor in stainless steel

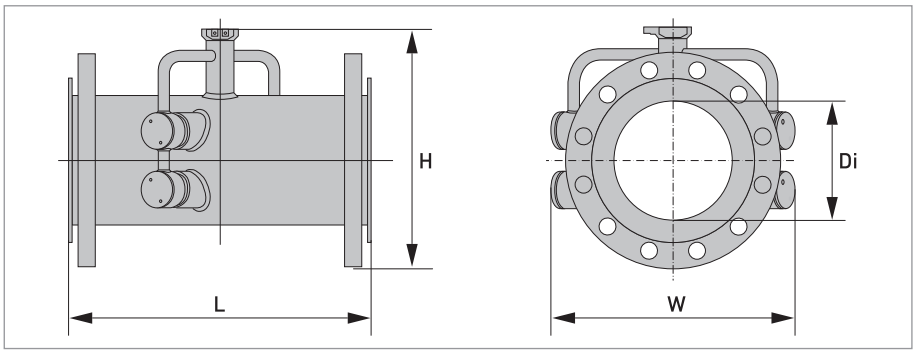


Figure 2-1: Dimensions of flow sensor

DIN 2642 F; lap joint flange, pressed plate

Nominal size		Dimensions [mm]				Approx. weight [kg]
DN	PN [bar]	L	H	W	Di	
50	10	420	196	304	53	6.5
80	10	480	230	331	81	10
100	10	490	254	345	106	14
150	10	540	315	392	160	21
200	10	460	368	436	211	25

Table 2-2: Dimensions and weight in mm and kg

ASME 150 lb; ring flange

Nominal size	Dimensions								Approx. weight	
	L		H		W		Di			
	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[lb]	[kg]
2	16.5	420	7.5	190	12	304	2.1	53	21	9.5
3"	20.5	520	8.9	226	13	331	3.2	81	34	15.5
4"	21.7	550	10.2	258	13.6	345	4.2	106	50	22.5
6"	24.4	620	12.3	312	15.4	392	6.3	160	70	32
8"	21.3	540	14.5	369	17.2	436	8.3	211	95	43

Table 2-3: Dimensions and weight in inch / mm and lb / kg

2.2.2 Signal converter housing

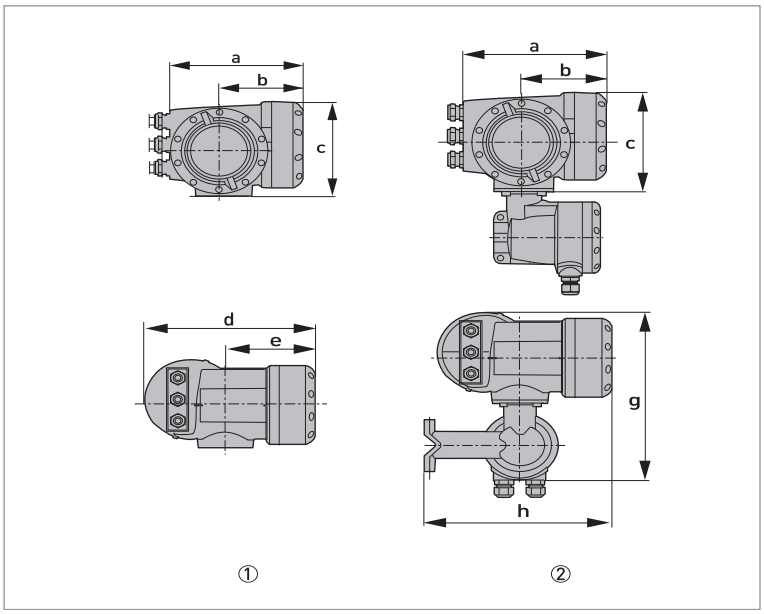


Figure 2-2: Dimensions of signal converter housing

① Compact version (C)
② Field housing (F) - remote version

Version	Dimensions [mm]							Weight [kg]
	a	b	c	d	e	g	h	
C	202	120	155	260	137	-	-	4.2
F	202	120	155	-	-	295.8	277	5.7

Table 2-4: Dimensions and weight in mm and kg

Version	Dimensions [inch]							Weight [lb]
	a	b	c	d	e	g	h	
C	7.75	4.75	6.10	10.20	5.40	-	-	9.30
F	7.75	4.75	6.10	-	-	11.60	10.90	12.60

Table 2-5: Dimensions and weight in inch and lb

The weight of a field stainless steel converter housing is 14 kg / 30.9 lb

2.2.3 Mounting plate of field housing

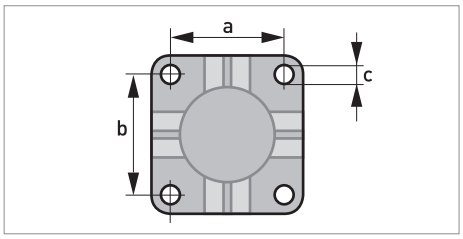


Figure 2-3: Dimensions for mounting plate of field housing

	[mm]	[inch]
a	72	2.8
b	72	2.8
c	Ø9	Ø0.4

Table 2-6: Dimensions in mm and inch

3.1 Intended use

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

The OPTISONIC 7300 Biogas offers an ultrasonic flow measurement solution for biogas and landfill gas. Biogas, generated from bio feed stocks by fermentation, mainly contains methane and carbon dioxide in a variable composition. It contains also small amounts of other gasses like hydrogen sulphide, nitrogen and hydrocarbons or can be saturated with water.

Landfill gas is generated by the decomposition of garbage, and mainly consists of methane and carbon dioxide. Because of climate change it is required to collect the landfill gas.

The flowmeter is specially designed to measure biogas and landfill gas under very low or ambient pressure conditions. It can accurately handle gases with high carbon dioxide content, even when they are saturated with water or contain free condensation water. The flowmeter provides additional functions like calculation of standard volume, methane content measurement and diagnostics features.

3.2 General notes on installation

Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

Do a check of the packing list to make sure that you have all the elements given in the order.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.3 General requirements

The following precautions must be taken to ensure a reliable installation.

- *Make sure that there is adequate space on the sides.*
- *Protect the signal converter from direct sunlight and install a sunshade if necessary.*
- *Signal converters installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.*
- *Do not expose the signal converter to intense vibrations and mechanical shocks. The measuring devices are tested for a vibration/shock level as described in the chapter "Technical data".*

3.3.1 Vibration

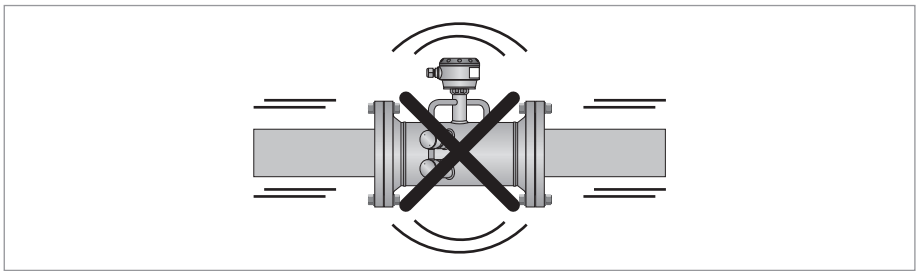


Figure 3-1: Prevent intense vibrations

In case of too many vibrations, please install supports on both sides of the flowmeter to minimize movement.

3.4 Installation requirements for the flow sensor

To secure the optimum functioning of the flowmeter, please note the following observations.

- Install the flow sensor in a horizontal position in a slightly descending line.
- Orientate the flow sensor such that the path of the acoustic signal is in the horizontal plane.

For exchanging the transducers, please keep a free space of 1 m / 39" around the transducer.

3.5 Installation conditions

3.5.1 Inlet and outlet

1 path flowmeter

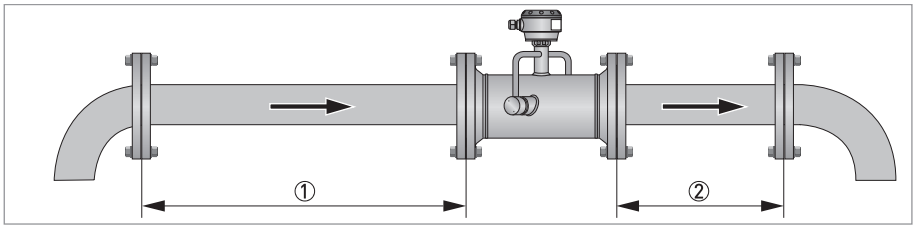


Figure 3-2: Recommended inlet and oulet for ≤ DN80 / 3"

① Refer to chapter "Bends in 2 or 3 dimensions"
② ≥ 3 DN

2 path flowmeter

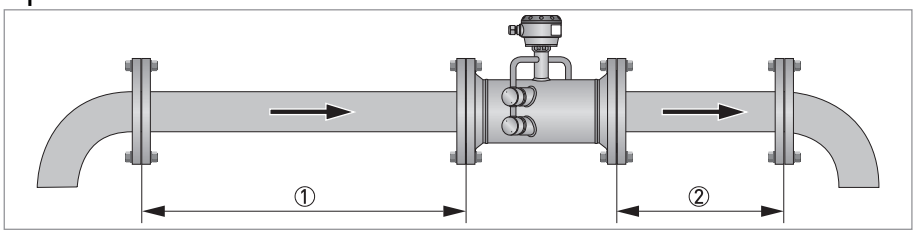


Figure 3-3: Recommended inlet and oulet for ≥ DN100 / 4"

① Refer to chapter "Bends in 2 or 3 dimensions"
② ≥ 3 DN

3.5.2 Bends in 2 or 3 dimensions

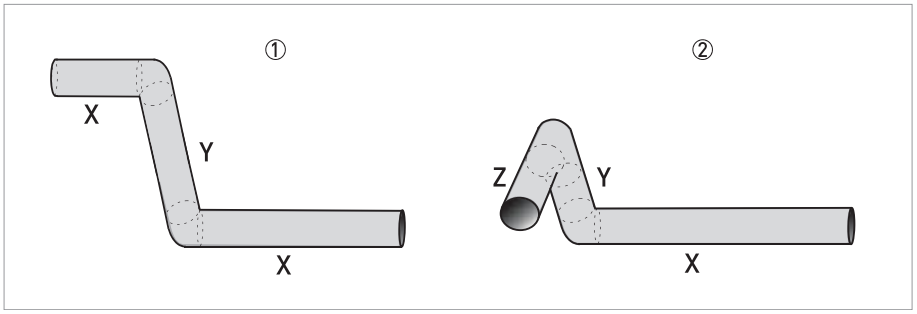


Figure 3-4: 2 and/or 3 dimensional bends upstream of the flowmeter

① 2 dimensions = X/Y
② 3 dimensions = X/Y/Z

*2 dimensional bends occur in a vertical **or** horizontal plane (X/Y) only, while 3 dimensional bends occur in both vertical **and** horizontal plane (X/Y/Z).*

3.5.3 T-section

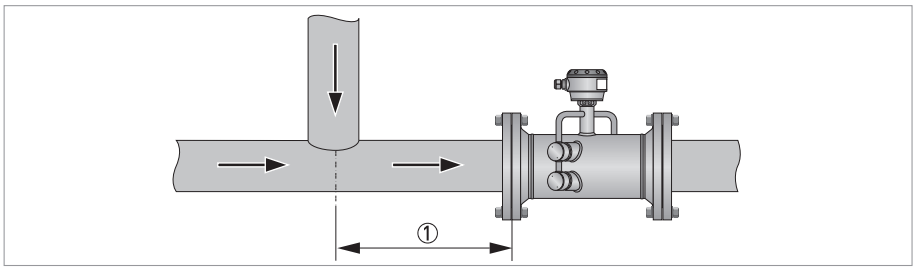


Figure 3-5: Distance behind a T-section

① 2 path ≥ 10 DN, 1 path ≥ 20 DN

3.5.4 Control valve

When a restriction (valve or reducer) is installed in the same pipeline with the flowmeter and noise is expected, please contact the manufacturer.

To prevent flow disturbances in the flowmeter a control valve is installed downstream of the flowmeter.

If a control valve is installed upstream of the flowmeter position, an extended straight inlet pipe (up to 50 DN) is recommended, depending on the process and control valve type.

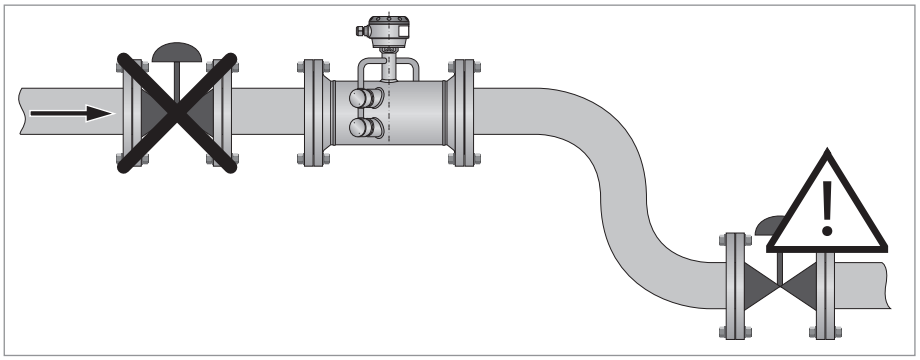


Figure 3-6: Installation of the flowmeter and a valve/reducer in the same pipeline

3.5.5 Flange deviation

Max. permissible deviation of pipe flange faces:
L_{max} - L_{min} ≤ 0.5 mm / 0.02"

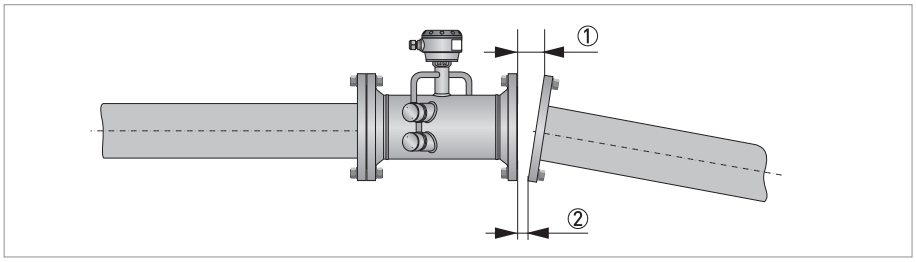


Figure 3-7: Flange deviation

① L_{max}
② L_{min}

3.5.6 Installation position

- Horizontal: install the flow sensor in a horizontal position in case of the presence of liquids.
- Vertically

+15° < α < -15°

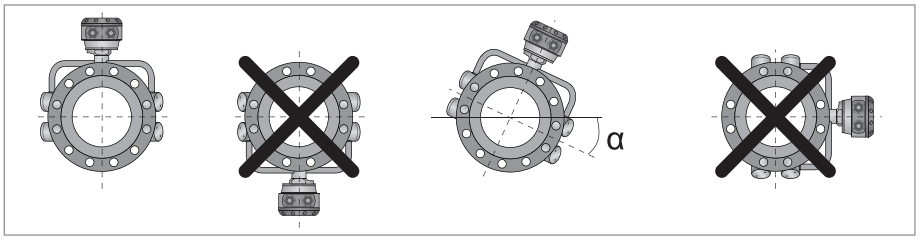


Figure 3-8: Installation position

- Horizontal or vertical: allowed installation position in case of dry gas.

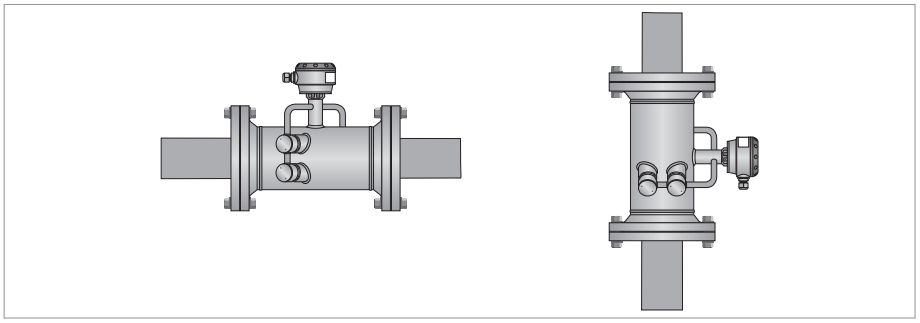


Figure 3-9:

3.5.7 Thermal insulation

For devices in hazardous area, additional maximum temperature and insulation precautions apply. Please refer to the Ex documentation.

Always leave vent holes ③ free!

The flow sensor can be insulated completely, except for the transducers ① and the connection box ② to allow cooling by free air convection.

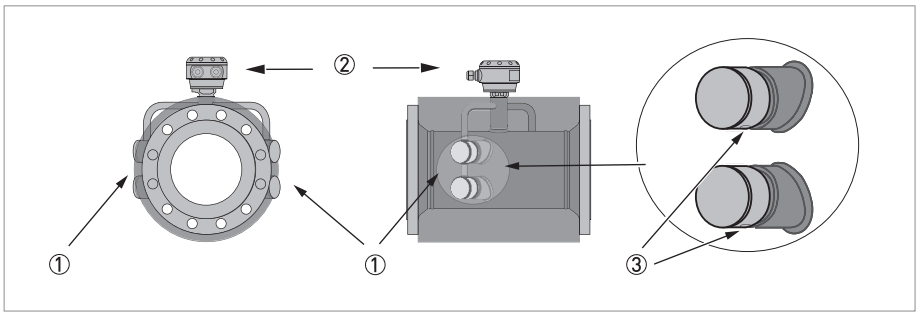


Figure 3-10: Leave vent holes free

① Transducers
② Connection box
③ Vent holes

4.1 Safety instructions

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

Observe the national regulations for electrical installations!

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

Observe without fail the local occupational health and safety regulations.
Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 Connection of signal cable to signal converter

The flow sensor is connected to the signal converter via one or two signal cables, with 2 inner Triax cables for the connection of one or two acoustic path(s). A flow sensor with one acoustic path has one cable. A flow sensor with two acoustic paths has two cables.

For the North American market and its Ex d design, separate Triax cables are supplied, to be connected to a green connection strip.

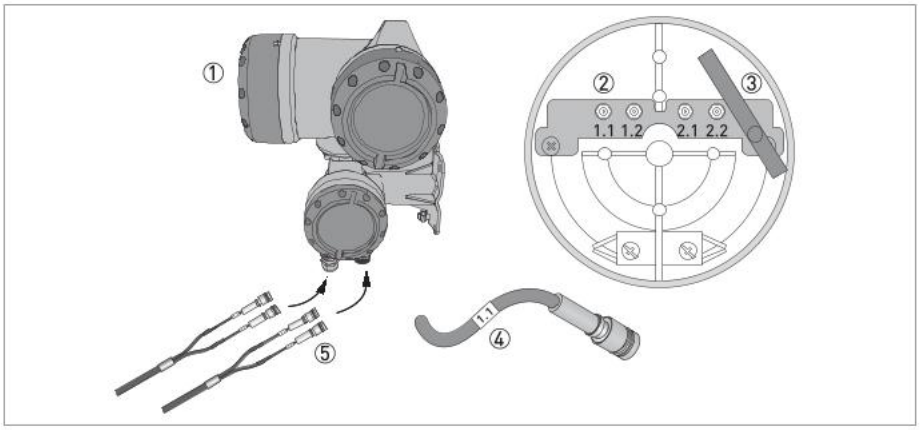


Figure 4-1: Connection of signal cable to signal converter

① Signal converter
② Open connection box
③ Tool for releasing connectors
④ Marking on cable
⑤ Insert cable (1 path flowmeter) or cables (2 path flowmeter) through cable glands

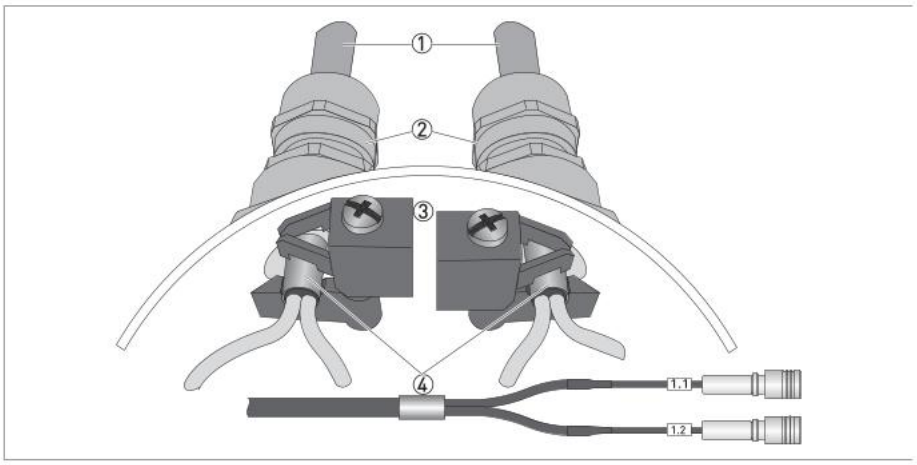


Figure 4-2: Clamp the cables on the shielding bush

① Cables
② Cable glands
③ Grounding clamps
④ Cable with metal shielding bush

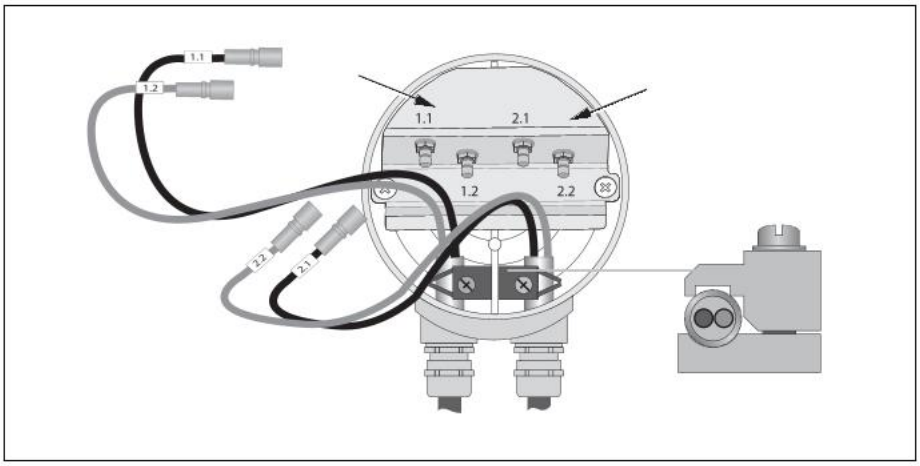


Figure 4-3: Connect the cables in the connection box of the sensor

Connect the cable on connector with similar numeral marking

4.3 Power supply connection

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

When this device is intended for permanent connection to the mains.
It is required (for example for service) to mount an external switch or circuit breaker near the device for disconnection from the mains. It shall be easily reachable by the operator and marked as the disconnecting the device for this equipment.
The switch or circuit breaker and wiring has to be suitable for the application and shall also be in accordance with the local (safety) requirements of the (building) installation (e.g. IEC 60947-1/-3)

The power terminals in the terminal compartments are equipped with additional hinged lids to prevent accidental contact.

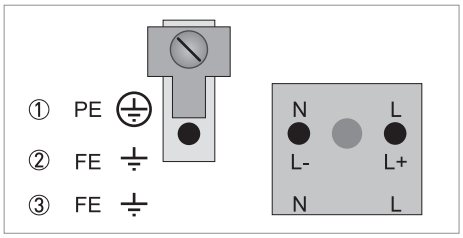


Figure 4-5: Power supply connection

① 100...230 VAC (-15% / +10%), 22 VA
② 24 VDC (-55% / +30%), 12 W
③ 24 VAC/DC (AC: -15% / +10%; DC: -25% / +30%), 22 VA or 12 W

Grounding of remote version

The device must be grounded in accordance with regulations in order to protect personnel against electric shocks.

For EMC reasons, connect the converter housing to a sufficiently low impedance grounding. If necessary, the external U-clamp (size M5) of the converter housing can be used for this purpose.

100...230 VAC (tolerance range for 100 VAC: -15% / +10%)

- Note the power supply voltage and frequency (50...60 Hz) on the nameplate.
- The protective ground terminal **PE** of the power supply must be connected to the separate U-clamp terminal in the terminal compartment of the signal converter

240 VAC + 5% is included in the tolerance range.

24 VDC (tolerance range: -55% / +30%)
24 VAC/DC (tolerance range: AC: -15% / +10%; DC: -25% / +30%)

- Note the data on the nameplate!
- For measurement process reasons, a functional ground **FE** must be connected to the separate
  U-clamp terminal in the terminal compartment of the signal converter.
- When connecting to functional extra-low voltages, provide a facility for protective separation (PELV) (according to VDE 0100 / VDE 0106 and/or IEC 60364 / IEC 61140 or relevant national regulations)

4.4 Input and outputs, overview

4.4.1 Combinations of the inputs/outputs (I/Os)

This signal converter is available with various input/output combinations.

Basic version

- Has 1 current output, 1 pulse output and 2 status outputs/limit switches.
- The pulse output can be set as status output/limit switch and one of the status outputs as a control input.

Ex i version

- Depending on the task, the device can be configured with various input and output modules.
- Current outputs can be active or passive.
- Current inputs are active.
- Optionally available with Foundation Fieldbus.

Modular version

- Depending on the task, the device can be configured with various input and output modules.
- Current inputs and outputs can be active or passive.
- Optionally available with Foundation Fieldbus or RS 485 Modbus.

Bus systems

- The device allows intrinsically safe and non intrinsically safe bus interfaces in combination with additional modules.
- For connection and operation of bus systems, please note the supplementary documentation.

Ex

- For hazardous areas, all of the input/output variants for the housing designs with a terminal compartment in the Ex d (pressure-resistant casing) or Ex e (increased safety) versions can be delivered.
- For North America; Class 1, Division 1 has an explosion safe design with dual seal and a warning light on the transducer housing. Class 1, Division 2 is available without dual seal and explosion safe conduits requirement for cabling.
- For connection and operation of Ex devices, note the supplementary instructions.

4.4.2 Description of the CG number

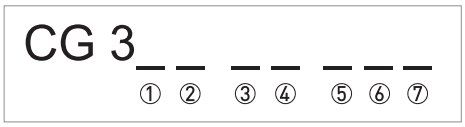


Figure 4-4: Marking (CG number) of the electronics module and input/output variants

① ID number: 6
② ID number: 0 = standard
③ Power supply option
④ Display (language versions)
⑤ Input/output version (I/O)
⑥ 1st optional module for connection terminal A
⑦ 2nd optional module for connection terminal B

The last 3 digits of the CG number (⑤ , ⑥ and ⑦) indicate the assignment of the terminal connections. Please see the following examples.

Examples for CG number

CG 360 11 100	100...230 VAC & standard display; basic I/O: I_a or I_p & S_p/C_p & S_p & P_p/S_p
CG 360 11 7FK	100...230 VAC & standard display; modular I/O: I_a & P_N/S_N and optional module P_N/S_N & C_N
CG 360 81 4EB	24 VDC & standard display; modular I/O: I_a & P_a/S_a and optional module P_p/S_p & I_p

Abbreviation	Identifier for CG no.	Description
I_a	A	Active current output
I_p	B	Passive current output
P_a / S_a	C	Active pulse output, frequency output, status output or limit switch (changeable)
P_p / S_p	E	Passive pulse output, frequency output, status output or limit switch (changeable)
P_N / S_N	F	Passive pulse output, frequency output, status output or limit switch according to NAMUR (changeable)
C_a	G	Active control input
C_p	K	Passive control input
C_N	H	Active control input to NAMUR Signal converter monitors cable breaks and short circuits according to EN 60947-5-6. Errors indicated on LC display. Error messages possible via status output.
IIn_a	P	Active current input (for Modular I/O)
IIn_p	R	Passive current input (for Modular I/O)
2 x IIn_a	5	Two active current inputs (for Ex i I/O)
-	8	No additional module installed
-	0	No further module possible

Table 4-1: Description of abbreviations and CG identifier for possible optional modules on terminals A and B

4.4.3 Fixed, non-alterable input/output versions

This signal converter is available with various input/output combinations.

- The grey boxes in the tables denote unassigned or unused connection terminals.
- In the table, only the final digits of the CG no. are depicted.
- Connection terminal A+ is only operable in the basic input/output version.

CG no.	Connection terminals								
	A+	A	A-	B	B-	C	C-	D	D-

Ex i I/Os (option)

2 0 0				I_a + HART® active	P_N / S_N NAMUR ①
3 0 0				I_p + HART® passive	P_N / S_N NAMUR ①
2 1 0		I_a active	P_N / S_N NAMUR C_p passive ①	I_a + HART® active	P_N / S_N NAMUR ①
3 1 0		I_a active	P_N / S_N NAMUR C_p passive ①	I_p + HART® passive	P_N / S_N NAMUR ①
2 2 0		I_p passive	P_N / S_N NAMUR C_p passive ①	I_a + HART® active	P_N / S_N NAMUR ①
3 2 0		I_p passive	P_N / S_N NAMUR C_p passive ①	I_p + HART® passive	P_N / S_N NAMUR ①
2 3 0		IIn_a active	P_N / S_N NAMUR C_p passive ①	I_a + HART® active	P_N / S_N NAMUR ①
3 3 0		IIn_a active	P_N / S_N NAMUR C_p passive ①	I_p + HART® passive	P_N / S_N NAMUR ①
2 4 0		IIn_p passive	P_N / S_N NAMUR C_p passive ①	I_a + HART® active	P_N / S_N NAMUR ①
3 4 0		IIn_p passive	P_N / S_N NAMUR C_p passive ①	I_p + HART® passive	P_N / S_N NAMUR ①
2 5 0		IIn_a active	IIn_a active	I_a + HART® active	P_N / S_N NAMUR ①

① Changeable

4.4.4 Alterable input/output versions

This signal converter is available with various input/output combinations.

- The grey boxes in the tables denote unassigned or unused connection terminals.
- In the table, only the final digits of the CG no. are depicted.
- Term. = (connection) terminal

CG no.	Connection terminals								
	A+	A	A-	B	B-	C	C-	D	D-
Modular IOs (option)									
4 _ _		max. 2 optional modules for term. A + B				I_a + HART® active		P_a / S_a active ①	
8 _ _		max. 2 optional modules for term. A + B				I_p + HART® passive		P_a / S_a active ①	
6 _ _		max. 2 optional modules for term. A + B				I_a + HART® active		P_p / S_p passive ①	
B _ _		max. 2 optional modules for term. A + B				I_p + HART® passive		P_p / S_p passive ①	
7 _ _		max. 2 optional modules for term. A + B				I_a + HART® active		P_N / S_N NAMUR ①	
C _ _		max. 2 optional modules for term. A + B				I_p + HART® passive		P_N / S_N NAMUR ①	
FOUNDATION Fieldbus (option)									
E _ _		max. 2 optional modules for term. A + B				V/D+ (2)	V/D- (2)	V/D+ (1)	V/D- (1)
Modbus (option)									
G _ _ ②		max. 2 optional modules for term. A + B					Common	Sign. B (D1)	Sign. A (D0)

① Changeable

② Not activated bus terminator

Please fill in this form and fax or email it to your local representative.
Please include a sketch of the pipe layout as well, including the X, Y, Z dimensions.

Customer information:

Date:	
Submitted by:	
Company:	
Address:	
Telephone:	
Fax:	
E-mail:	

Flow application data:

Reference information (name, tag etc):	
New application Existing application, currently using:	
Measurement objective:	
Flow application data / Medium	
Gas type / composition:	
CO_2 content:	
CH_4 content:	
H_2S content:	
Moisture content:	
Density or molecular weight:	
Velocity of sound:	
Flow rate	
Normal:	
Minimum:	
Maximum:	
Temperature	
Normal:	
Minimum:	
Maximum:	
Pressure	
Normal:	
Minimum:	
Maximum:	

Piping details

Nominal pipe size:	
Inner / outer diameter:	
Wall thickness / schedule:	
Pipe material:	
Straight inlet / outlet section (DN):	
Upstream situation (elbows, valves, pumps):	
Type of valve or reducer:	
Pressure drop over the valve or reducer:	
Position of the valve or reducer compared to flowmeter:	
Flow orientation (vertical up / horizontal / vertical down / other):	

Environment details

Corrosive atmosphere:	
Sea water:	
High humidity (% R.H.)	
Nuclear (radiation):	
Hazardous area:	
Additional details:	

Hardware requirements:

Accuracy requested (percentage of rate):	
Power supply (voltage, AC/DC):	
Analogue output (4..20 mA)	
Pulse (specify minimum pulse width, pulse value):	
Digital protocol:	
Options:	
Remote mounted signal converter:	
Specify cable length:	
Accessories:	

KROHNE – Products, Solutions and Services

- Process instrumentation for flow, level, temperature, pressure measurement and process analytics
- Flow metering, monitoring, wireless and remote metering solutions
- Engineering, commissioning, calibration, maintenance and training services

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