# OPTISONIC 7300 Technical Datasheet

## Ultrasonic process gas flowmeter

- Large dynamic range (100:1), no pressure loss
- Measures starting from ambient pressure
- Accurate bi-directional measurement, independent of gas composition

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## 1.1 Ultrasonic gas flowmeter for process gases

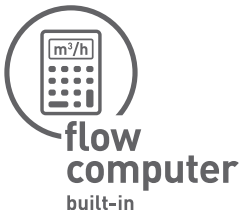
The **OPTISONIC 7300** offers accurate process gas flow measurement by applying differential transit time technology.

Unlike traditional gas flow technologies, the OPTISONIC 7300 measures with the same accuracy over a large flow range (100:1), independent of gas composition. For example the flowmeter can measure at ambient conditions regardless of the diameter.

Due to the full bore meter body, without any moving parts, the OPTISONIC 7300 does not provide any pressure loss and does not show any drift over time.

The OPTISONIC 7300 consists of an OPTISONIC 7000 flow sensor and a smart GFC 300 signal converter with integrated calculation to standard or normal flow conditions.
The flowmeter can be supplied as compact or remote version.

① Compact version
② Remote flow sensor
③ Field signal converter




**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

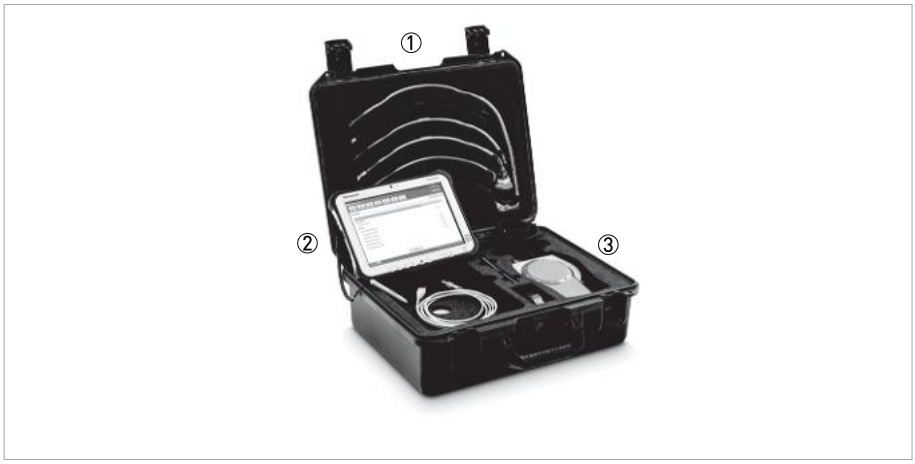
State-of-the-art measuring devices combine robust measuring principles and powerful electronics to produce a wide range of readings and device-specific data. OPTICHECK technology built-in leverages the features of the devices to translate their available comprehensive measuring system data into sophisticated 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

- Excellent long term stability, no drift over time
- Large flow range (100:1)
- Integrated calculation to standard – or normal flow conditions, using pressure – and temperature measurement
- Independent of gas composition and changing gas conditions
- Maintenance free full bore flow sensor

## Industries

- Oil & Gas
  - Natural gas production
  - Natural gas transport, storage and distribution
- Chemical plants
  - Process gases
  - Inert gases
  - Fuel/waste gases
- Petrochemical plants and refineries
  - Atmospheric distillation units
  - Gas processing units
- Energy and power plants
  - Natural gas fired plants

## Applications

- Non-custody transfer natural gas measurement (in production, transport and distribution)
- Natural gas measurement for industrial consumption
- Hydrocarbon gases
- Hydrogen and hydrogen mixtures
- Inert industrial gases
- Fuel/waste gas
- Compressed air
- Low pressure steam

## 1.2 Options and variants

The **OPTISONIC 7300** is a single (2" / DN50 and 3" / DN80) or dual path ( ≥ 4" / DN150) ultrasonic gas flowmeter designed to measure a large range of gases and gas mixtures.

The usage of patented transducer technology and the availability of multiple transducer types ensures suitability for almost any gas.

The used materials comply to the requirements of the oil and gas industry i.e. NACE MR 175/103.

- Available as compact or remote version
- Standard pressure ratings up to ASME B16.5: 900 lb RF / EN 1092-1: PN 40.
  Higher pressure ratings (up to 2500 lb / PN 400) on request.
- Aluminium or stainless steel GFC 300 signal converter – compact or remote
- Dry or air calibration

**GFC 300 signal converter – compact or remote**

- Display with 4 optical buttons
- I/O configurations available
- One universal software for all applications
- Monitoring Tool connection

**Online retractable transducers.**
By using a retractor the transducers can be exchanged under pressure.

**Redundant design**
Fitting of multiple flowsensors in one spool piece.

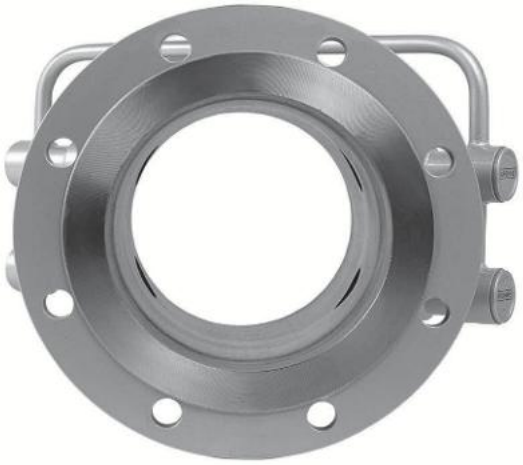
**Process connections**
Buttweld, hub or API flange connections are available on request.

## 1.3 Features

**Transducer design**
The standard transducer material is titanium, suitable for almost all applications. Alternative materials such as Inconel or epoxy filled transducers are available for applications with pure oxygen, hydrogen, or high pressures

With the patented design of the transducers, the OPTISONIC 7300 offers a superior application range. This design allows for a larger flow (-30...30 m/s / -100...100 ft/s) and diameter range (2" / DN50 up to 40" / DN1000).

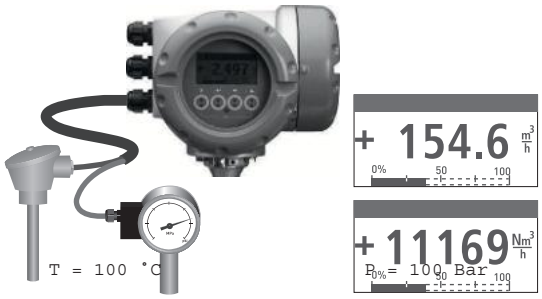
In addition the flow measurements are independent of pressure and temperature and gas composition.



**Full bore unobstructed flow sensor**
The OPTISONIC 7300 combines the advantages of ultrasonic flow measurement (free of maintenance, no recalibrations, free of obstructions and no moving parts) with a design that is dedicated for the process industry.

For applications in the process industry this combination offers the optimum value in both operational as in investment costs.

**OPTICHECK DTM**
With the OPTICHECK built-in function, an in-depth verification of the flowmeter can be carried out in a user-friendly way by using the OPTICHECK DTM together with freely available software such as PACTware. Via i.e. HART communication, the flowmeter can be read out easily, and a complete and periodic verification can be performed on request, including automatic generation of a verification report.




### Integrated calculation to standard or normal flow conditions

Gas flow is typically measured in standard units.

The GFC 300 signal converter can be equipped with two current inputs for pressure and temperature measurement.
If these inputs are used, the GFC 300 signal converter calculates volume flow to standard or normal flow conditions.

### Diagnostics

Because of the differential transit time technology, diagnostic information is available for free.

Diagnostic information provides information about the health of the instrument and can be utilised to verify/validate its measurement performance.

Also it provides insight about what is happening in the process e.g. pollution in the gas or changes in the gas composition.

### Features on request

- Retractable transducers
- Redundant design
- High pressure design

## 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.

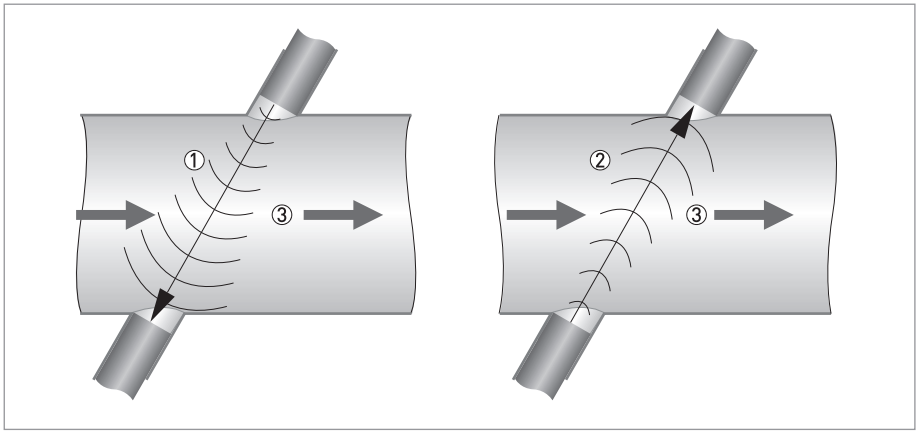



**Figure 1-1: Measuring principle**

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 process gases |
| **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 fraction. |

### Design

| | |
|---|---|
| Features | 1 or 2 parallel acoustic path(s), fully welded flow sensor with O-ring fitted transducers. |
| Modular construction | The measuring system consists of a flow sensor and a signal converter. |
| Compact version | OPTISONIC 7300 C |
| Remote version | OPTISONIC 7000 F flow sensor with GFC 300 signal converter |
| Nominal diameter | 1 path: DN50...80 / 2...3" |
| | 2 paths: DN100...600 / 4...24" |
| | Larger diameters on request. |
| Measuring range | 0.3... 30 m/s / 1... 100 ft/s (bi-directional) |
| **Signal converter** | |
| Outputs / inputs | Current output (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 |

| | |
|---|---|
| **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 optical buttons 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 from Emerson Process |
| | 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

| | |
|---|---|
| Dry calibration (standard) | DN100...600 / 4...24":<br>< ± 2% of actual measured flow rate, for 1...30 m/s (3...100 ft/s)<br>< ± 20 mm/s for 0.3...1 m/s (1...3 ft/s) |
| | DN50...80 / 2...3":<br>< ± 3% of actual measured flow rate, for 1...30 m/s (3...100 ft/s)<br>< ± 30 mm/s for 0.3...1 m/s (1...3 ft/s) |
| Air calibration (option) | |
| 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":<br>< ± 1% of actual measured flow rate, for 1...30 m/s (3...100 ft/s)<br>< ± 10 mm/s for 0.3...1 m/s (1...3 ft/s) |
| | DN50...80 / 2...3":<br>< ± 1.5% of actual measured flow rate, for 1...30 m/s (3...100 ft/s)<br>< ± 15 mm/s for 0.3...1 m/s (1...3 ft/s) |
| Repeatability | 1 path: ± 0.3%; 2 paths: ± 0.2% |

## Operating conditions

| | |
|---|---|
| **Temperature** | |
| Process temperature | Compact version:<br>-40...+125°C / -40...+257°F<br>-40...+180°C / -40...+356°F, max. ambient temperature: 40°C / 104°F |
| | Remote version:<br>-40...+180°C / -40...+356°F,<br>for Ex versions max. ambient temperature may be derated, see Ex manual for details |
| Carbon steel flanges according to EN 1092-1, min. process temperature: -10°C / +14°F | |
| Carbon steel flanges according to ASME, min. process temperature: -29°C / -20°F | |
| FFKM transducer O-rings, min. process temperature: -20°C / -4°F | |
| Ambient temperature | Flow sensor: -40...+70°C / -40...+158°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. |
| Temperature transducers | For details of the transducer temperatures refer to *Transducer overview* on page 22 |
| 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** | |
| All sensor designs at full rating according to below flange standards for standard materials. | |
| Max. pressure transducer | For details of the maximum transducer pressures refer to *Transducer overview* on page 22 |
| EN 1092-1 | DN50...80: PN 40 |
| | DN100...150: PN 16 |
| | DN200...600: PN 10 |
| | Larger diameters and higher pressures on request (up to DN1000: PN 420). |
| ASME B16.5 | 2...24": 150 lb RF |
| | 2...24": 300 lb RF |
| | 2...24": 600 lb RF |
| | 2...14": 900 lb RF |
| | Larger diameters and higher pressure ratings on request (up to 40": 2500 lb). |
| **Properties of medium** (other properties on request) | |
| Physical condition | Process gas, single phase |
| Density | Standard: 10...45 g/mol/ 1...150 kg/m$^3$ / 0.062...9.36 lb/ft$^3$ |
| | **Extended** (may impose limitations on other specifications):<br>2...80 g/mol / 0.2...250 kg/m$^3$ / 0.012...15.6 lb/ft$^3$ |

## Installation conditions

| | |
|---|---|
| Installation | For detailed information refer to *Installation* on page 30. |
| Inlet section (minimum) | DN50...80 / 2...3", 1 path: 20 DN (straight inlet) |
| | DN100...600 / 4...24", 2 paths: 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 23. |

## Materials

| | |
|---|---|
| **Flow sensor** | |
| Flanges (wetted) | Standard: carbon steel ASTM A105 N |
| | Option: stainless steel AISI 316 L, carbon steel A350 LF2 |
| | Other materials on request. |
| Measuring tube (wetted) | Standard: carbon steel ASTM A106 Gr. B or equivalent |
| | Option: stainless steel AISI 316 L, carbon steel A333 Gr. 6 |
| | Other materials on request. |
| Sensor conduits | Stainless steel AISI 316 L / 1.4404 |
| Sensor neck | Stainless steel AISI 316 / 1.4408 |
| Transducer nozzles (wetted) | Stainless steel AISI 316 L / 1.4404 |
| Transducer holders (wetted), incl. caps | Stainless steel AISI 316 L / 1.4404 |
| Transducers (wetted) | Titanium, Stainless Steel/composite, Inconel 625 |
| | For details refer to *Transducer overview* on page 22 |
| Transducer O-rings (wetted) | Standard: FKM / FPM / NBR |
| | Option: FFKM / Aflas |
| Connection box (remote version only) | Standard: die-cast aluminium, standard coated (stainless steel for Ex version) |
| | Option: stainless steel AISI 316 / 1.4408 |
| Coating (flow sensor) | Standard coating |
| | Option: Offshore coating |
| NACE conformity | For standard range, all wetted materials are conform NACE MR0175. |
| **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) | Standard coating |

## 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 VDC (-55% / +30%)<br>24 VAC/DC (AC: -15% / +10%; DC: -25% / +30%) |
| Power consumption | AC: 22 VA |
| | DC: 12 W |
| Signal cable<br>(remote version only) | Shielded cable with 2 triax cores, 1 cable per path: Ø 10.6 mm / 0.4" |
| | Class 1 Div1/2: single coax cables for fitting in conduit (2 per acoustic path) |
| | 5 m / 16 ft |
| | Option: 10...30 m / 33...98 ft |
| Cable entries | Standard: M20 x 1.5 |
| | Option: adapters for 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;<br>$V_0$ = terminal voltage; $I_{nom}$ = nominal current<br><br>Safety limit values (Ex i):<br>$V_i$ = max. input voltage; $I_i$ = max. input current; $P_i$ = max. input power rating;<br>$C_i$ = 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 | **Basic I/Os** | **Modular I/Os** | **Ex i I/Os** |
| Active | $V_{int, nom}$ = 24 VDC<br><br>I ≤ 22 mA<br><br>$R_L$ ≤ 1 kΩ | | $V_{int, nom}$ = 20 VDC<br><br>I ≤ 22 mA<br><br>$R_L$ ≤ 450 Ω |
| | | | $V_0$ = 21 V<br>$I_0$ = 90 mA<br>$P_0$ = 0.5 W<br>$C_0$ = 90 nF / $L_0$ = 2 mH<br>$C_0$ = 110 nF / $L_0$ = 0.5 mH<br>Linear characteristics |
| Passive | $V_{ext}$ ≤ 32 VDC<br><br>I ≤ 22 mA<br><br>$V_0$ ≥ 1.8 V<br><br>$R_L$ ≤ ($V_{ext}$ - $V_0$) / $I_{max}$ | | $V_{ext}$ ≤ 32 VDC<br><br>I ≤ 22 mA<br><br>$V_0$ ≥ 4 V<br><br>$R_L$ ≤ ($V_{ext}$ - $V_0$) / $I_{max}$ |
| | | | $V_i$ = 30 V<br>$I_i$ = 100 mA<br>$P_i$ = 1 W<br>$C_i$ = 10 nF<br>$L_i$ ~ 0 mH |

| | | | |
|---|---|---|---|
| **HART®** | | | |
| Description | HART® protocol via active and passive current output | | |
| | HART® version: 5 | | |
| | Universal HART® parameter: completely integrated | | |
| Load | ≥ 230 Ω at HART® test point;<br>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 | **Basic I/Os** | **Modular I/Os** | **Ex i I/Os** |
| Active | - | $V_{nom}$ = 24 VDC | - |
| | | $f_{max}$ in operating menu set to<br>$f_{max}$ ≤ 100 Hz:<br>I ≤ 20 mA<br><br>open:<br>I ≤ 0.05 mA<br><br>closed:<br>$V_{0, nom}$ = 24 V<br>at I = 20 mA | |
| | | $f_{max}$ in operating menu set to<br>100 Hz < $f_{max}$ ≤ 10 kHz:<br>I ≤ 20 mA<br><br>open:<br>I ≤ 0.05 mA<br><br>closed:<br>$V_{0, nom}$ = 22.5 V<br>at I = 1 mA<br>$V_{0, nom}$ = 21.5 V<br>at I = 10 mA<br>$V_{0, nom}$ = 19 V<br>at I = 20 mA | |

<table>
<tr><td rowspan="3">Passive</td><td colspan="2">$V_{ext}$ ≤ 32 VDC</td><td rowspan="3">-</td></tr>
<tr><td colspan="2">$f_{max}$ in operating menu set to<br>$f_{max}$ ≤ 100 Hz:<br>I ≤ 100 mA<br><br>$R_{L, max}$ = 47 kΩ<br>$R_{L, min} = (V_{ext} - V_0) / I_{max}$<br><br>open:<br>I ≤ 0.05 mA at $U_{ext}$ = 32 VDC<br><br>closed:<br>$V_{0, max}$ = 0.2 V at I ≤ 10 mA<br>$V_{0, max}$ = 2 V at I ≤ 100 mA</td></tr>
<tr><td colspan="2">$f_{max}$ in operating menu set to<br>100 Hz < $f_{max}$ ≤ 10 kHz:<br>I ≤ 20 mA<br><br>$R_{L, max}$ = 47 kΩ<br>$R_{L, min} = (V_{ext} - V_0) / I_{max}$<br><br>open:<br>I ≤ 0.05 mA at $U_{ext}$ = 32 VDC<br><br>closed:<br>$V_{0, max}$ = 1.5 V at I ≤ 1 mA<br>$V_{0, max}$ = 2.5 V at I ≤ 10 mA<br>$V_{0, max}$ = 5.0 V at I ≤ 20 mA</td></tr>
<tr><td rowspan="2">NAMUR</td><td rowspan="2">-</td><td rowspan="2">Passive to EN 60947-5-6<br><br>open:<br>$I_{nom}$ = 0.6 mA<br><br>closed:<br>$I_{nom}$ = 3.8 mA</td><td>Passive to EN 60947-5-6<br><br>open:<br>$I_{nom}$ = 0.43 mA<br><br>closed:<br>$I_{nom}$ = 4.5 mA</td></tr>
<tr><td>$V_i$ = 30 V<br>$I_i$ = 100 mA<br>$P_i$ = 1 W<br>$C_i$ = 10 nF<br>$L_i$ ~ 0 mH</td></tr>
</table>

| 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 | **Basic I/Os** | **Modular I/Os** | **Ex i I/Os** |
| Active | - | $V_{int}$ = 24 VDC<br><br>I ≤ 20 mA<br><br>open:<br>I ≤ 0.05 mA<br><br>closed:<br>$V_{0, nom}$ = 24 V<br>at I = 20 mA | - |
| Passive | $V_{ext}$ ≤ 32 VDC<br><br>I ≤ 100 mA<br><br>$R_{L, max}$ = 47 kΩ<br>$R_{L, min} = (V_{ext} - V_0) / I_{max}$<br><br>open:<br>I ≤ 0.05 mA at<br>$V_{ext}$ = 32 VDC<br><br>closed:<br>$V_{0, max}$ = 0.2 V at<br>I ≤ 10 mA<br>$V_{0, max}$ = 2 V at I ≤ 100 mA | $V_{ext}$ = 32 VDC<br><br>I ≤ 100 mA<br><br>$R_{L, max}$ = 47 kΩ<br>$R_{L, min} = (V_{ext} - V_0) / I_{max}$<br><br>open:<br>I ≤ 0.05 mA at<br>$V_{ext}$ = 32 VDC<br><br>closed:<br>$V_{0, max}$ = 0.2 V at<br>I ≤ 10 mA<br>$V_{0, max}$ = 2 V at I ≤ 100 mA | - |
| NAMUR | - | Passive to EN 60947-5-6<br><br>open:<br>$I_{nom}$ = 0.6 mA<br><br>closed:<br>$I_{nom}$ = 3.8 mA | Passive to EN 60947-5-6<br><br>open:<br>$I_{nom}$ = 0.43 mA<br><br>closed:<br>$I_{nom}$ = 4.5 mA<br><br>$V_i$ = 30 V<br>$I_i$ = 100 mA<br>$P_i$ = 1 W<br>$C_i$ = 10 nF<br>$L_i$ = 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 | **Basic I/Os** | **Modular I/Os** | **Ex i I/Os** |
| Active | - | $V_{int}$ = 24 VDC<br><br>Ext. contact open:<br>$V_{0, nom}$ = 22 V<br><br>Ext. contact closed:<br>$I_{nom}$ = 4 mA<br><br>Contact closed (on):<br>$V_0 \geq$ 12 V at $I_{nom}$ = 1.9 mA<br><br>Contact open (off):<br>$V_0 \leq$ 10 V at $I_{nom}$ = 1.9 mA | - |
| Passive | 8 V ≤ $V_{ext}$ ≤ 32 VDC<br><br>$I_{max}$ = 6.5 mA at<br>$V_{ext} \leq$ 24 VDC<br>$I_{max}$ = 8.2 mA at<br>$V_{ext} \leq$ 32 VDC<br><br>Contact closed (on):<br>$V_0 \geq$ 8 V at $I_{nom}$ = 2.8 mA<br><br>Contact open (off):<br>$V_0 \leq$ 2.5 V at<br>$I_{nom}$ = 0.4 mA | 3 V ≤ $V_{ext}$ ≤ 32 VDC<br><br>$I_{max}$ = 9.5 mA at<br>$V_{ext} \leq$ 24 V<br>$I_{max}$ = 9.5 mA at<br>$V_{ext} \leq$ 32 V<br><br>Contact closed (on):<br>$V_0 \geq$ 3 V at $I_{nom}$ = 1.9 mA<br><br>Contact open (off):<br>$V_0 \leq$ 2.5 V at<br>$I_{nom}$ = 1.9 mA | $V_{ext} \leq$ 32 VDC<br><br>$I \leq$ 6 mA at $V_{ext}$ = 24 V<br>$I \leq$ 6.6 mA at $V_{ext}$ = 32 V<br><br>On:<br>$V_0 \geq$ 5.5 V at $I \geq$ 4 mA<br><br>Off:<br>$V_0 \leq$ 3.5 V at $I \leq$ 0.5 mA<br><br>$V_i$ = 30 V<br>$I_i$ = 100 mA<br>$P_i$ = 1 W<br>$C_i$ = 10 nF<br>$L_i$ = 0 mH |
| NAMUR | - | Active to EN 60947-5-6<br><br>Terminals open:<br>$V_{0, nom}$ = 8.7 V<br><br>Contact closed (on):<br>$V_{0, nom}$ = 6.3 V at<br>$I_{nom}$ > 1.9 mA<br><br>Contact open (off):<br>$V_{0, nom}$ = 6.3 V at<br>$I_{nom}$ < 1.9 mA<br><br>Detection for open terminals:<br>$V_0 \geq$ 8.1 V at $I \leq$ 0.1 mA<br><br>Detection of cable short circuit:<br>$V_0 \leq$ 1.2 V at $I \geq$ 6.7 mA | - |

| Current input (Modular I/O) | | | |
|---|---|---|---|
| Function | A connected external sensor delivers the values (temperature, pressure or current) to the current input. | | |
| Operating data | **Basic I/Os** | **Modular I/Os** | **Ex i I/Os** |
| Active | - | $V_{int, nom}$ = 24 VDC<br>I ≤ 22 mA<br>$I_{max}$ ≤ 26 mA (electronically limited)<br>$V_{0, min}$ = 19 V at I ≤ 22 mA<br>No HART® | $V_{int}$ = 20 VDC<br>I ≤ 22 mA<br>$V_{0, min}$ = 14 V at I ≤ 22 mA<br>No HART® |
| | | | $V_0$ = 24.1 V<br>$I_0$ = 99 mA<br>$P_0$ = 0.6 W<br>$C_0$ = 75 nF / $L_0$ = 0.5 mH<br>No HART® |
| Passive | - | $V_{ext}$ ≤ 32 VDC<br>I ≤ 22 mA<br>$I_{max}$ ≤ 26 mA (electronically limited)<br>$V_{0, max}$ = 5 V at I ≤ 22 mA<br>No HART® | $V_{ext}$ ≤ 32 VDC<br>I ≤ 22 mA<br>$V_{0, max}$ = 4 V at I ≤ 22 mA<br>No HART® |
| | | | $V_i$ = 30 V<br>$I_i$ = 100 mA<br>$P_i$ = 1 W<br>$C_i$ = 10 nF<br>$L_i$ = 0 mH<br>No HART® |
| **Current input (Ex i I/O)** | | | |
| Function | A connected external sensor delivers the values (temperature, pressure or current) to the current input. | | |
| Operating data | **Basic I/Os** | **Modular I/Os** | **Ex i I/Os** |
| Active | - | - | $V_{int}$ = 20 VDC<br>I ≤ 22 mA<br>$V_{0, min}$ = 14 V at I ≤ 22 mA<br>No HART® |
| | | | $V_0$ = 24.1 V<br>$I_0$ = 99 mA<br>$P_0$ = 0.6 W<br>$C_0$ = 45 nF / 110 nF<br>$L_0$ = 2.0 mH / 0.2 mH<br>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** | |
| Non-Ex | 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 / LR 1338-11 |
| NEPSI | OPTISONIC 7300 C/F: GYJ23.1272X |
| | GFC 300: 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 4/4X/6 |
| NAMUR | NE 21, NE 43, NE 53, NE 80 |
| Shock resistance | IEC 60068-2-27 |
| | f = 20...2000 Hz, rms = 30g, t = 18min |
| Vibration resistance | IEC 60068-2-64; 1g up to 2000 Hz |
| | IEC 60721; 10g |

## 2.2 Transducer overview

In the following tables an overview of the transducer options available.

| Type | Application/ media | Wetted materials | Frequency [kHz] | Design temperature | Design pressure | Pressure Derating |
|---|---|---|---|---|---|---|
| G7.01 | Standard gas | Titanium grade 29 | 330 | -40...180°C | 159 bar | 159 bar /20°C \| 143 bar /180°C |
| G7.04 | Low gas density | Titanium grade 29 | 150 | -40...180°C | 102 bar | 102 bar /20°C \| 91 bar /180°C |
| G6.00 | Hydrogen / High Pressure | SS 316 / composite | 270 | -20...100°C | 260 bar | 260 bar /20°C \| 180 bar /100°C |
| G6.01 | High Pressure | Duplex / composite | 270 | -20...100°C | 616 bar | 616 bar /20°C \| 431 bar /100°C |
| G6.02 | Extended pressure | Duplex / composite | 270 | -20...100°C | 390 bar | 390 bar /20°C \| 270 bar /100°C |
| G11.04 | Corrosive / reactive | Inconel 625 | 150 | -40...180°C | 150 bar | 150 bar /20°C \| 75 bar /180°C |

Table 2-1: Overview of transducers [bar/°C]

| Type | Application/ media | Wetted materials | Frequency [kHz] | Design temperature | Design pressure | Pressure Derating |
|---|---|---|---|---|---|---|
| G7.01 | Standard gas | Titanium grade 29 | 330 | -40...356°F | 2306 psi | 2306 psi /68°F \| 2074 psi /356°F |
| G7.04 | Low gas density | Titanium grade 29 | 150 | -40...356°F | 1479 psi | 1479 psi /68°F \| 1320 psi /356°F |
| G6.00 | Hydrogen / High Pressure | SS 316 / composite | 270 | -4...212°F | 3771 psi | 3771 psi /68°F \| 2611 psi /212°F |
| G6.01 | High Pressure | Duplex / composite | 270 | -4...212°F | 8934 psi | 8934 psi /68°F \| 6251 psi /212°F |
| G6.02 | Extended pressure | Duplex / composite | 270 | -4...212°F | 5657 psi | 5657 psi /68°F \| 3916 psi /212°F |
| G11.04 | Corrosive / reactive | Inconel 625 | 150 | -40...356°F | 2176 psi | 2176 psi /68°F \| 1088 psi /356°F |

Table 2-2: Overview of transducers [psi/°F]

*For more details and information on the maximum design pressure versus each intermediate temperature please consult the factory.*

### 2.2.1 Transducer O-ring options

*Each transducer is equipped with two O-rings, typically made from standard NBR or FPM/FKM material. Other O-ring materials, such as PFPM/FFKM and Aflas, are available on request.*

| Transducer Type | O-ring |
|---|---|
| G7.01 | Viton * |
| G7.04 | Viton * |
| G6.00 | NBR ① |
| G6.01 | NBR ② |
| G6.02 | NBR ② |
| G11.04 | Viton * |

① Shore 70°
② Shore 90°

Note: * on request O rings can be changed into FKM (Viton) /FFKM (Kalrez)/AFLAS

## 2.3 Dimensions and weight

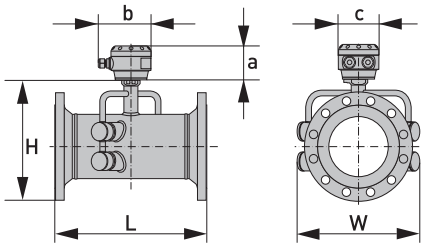
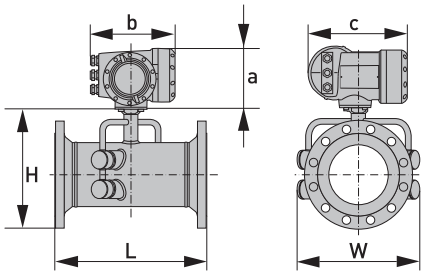
| | | |
|---|---|---|
| Remote version |  | a = 88 mm / 3.5"<br>b = 139 mm / 5.5" ①<br>c = 106 mm / 4.2" |
| Compact version |  | a = 155 mm / 6.1"<br>b = 230 mm / 9.1" ①<br>c = 260 mm / 10.2"<br>Total height = H + a |

Table 2-3: Dimension and weight

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

## 2.3.1 Flow sensor in carbon steel

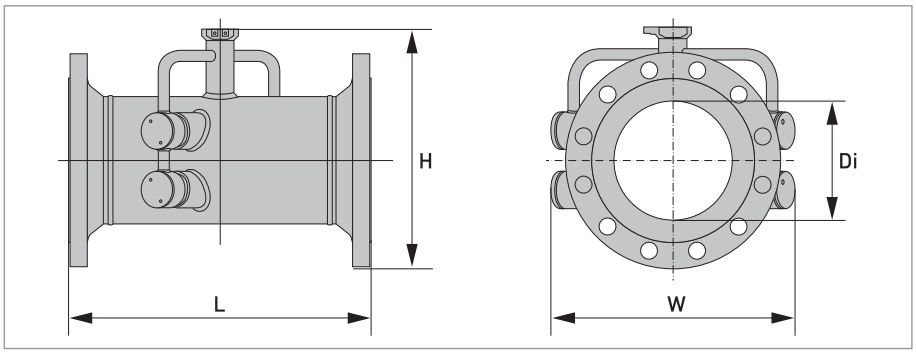



Figure 2-1: Dimensions of flow sensor

### EN 1092-1

| Nominal size | | Dimensions [mm] | | | | Approx. weight [kg] |
|---|---|---|---|---|---|---|
| DN | PN [bar] | L | H | W | Di ① | |
| 200 | PN 10 | 460 | 368 | 429 | 207 | 46 |
| 250 | PN 10 | 530 | 423 | 474 | 261 | 66 |
| 300 | PN 10 | 580 | 473 | 517 | 310 | 81 |
| 350 | PN 10 | 610 | 519 | 542 | 341 | 109 |
| 400 | PN 10 | 640 | 575 | 583 | 392 | 141 |
| 450 | PN 10 | 620 | 625 | 623 | 442 | 170 |
| 500 | PN 10 | 670 | 678 | 670 | 493 | 202 |
| 600 | PN 10 | 790 | 784 | 780 | 593 | 278 |

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

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

### PN 16

| Nominal size | | Dimensions [mm] | | | | Approx. weight [kg] |
|---|---|---|---|---|---|---|
| DN | PN [bar] | L | H | W | Di ① | |
| 100 | PN 16 | 490 | 254 | 337 | 107 | 24 |
| 125 | PN 16 | 520 | 283 | 359 | 133 | 32 |
| 150 | PN 16 | 540 | 315 | 387 | 159 | 35 |

Table 2-5: Dimensions and weight in mm and kg

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

## PN 40

| Nominal size | | Dimensions [mm] | | | | Approx. weight [kg] |
|---|---|---|---|---|---|---|
| DN | PN [bar] | L | H | W | Di ① | |
| 50 | PN 40 | 320 | 196 | 300 | 54.5 | 11 |
| 65 | PN 40 | 350 | 216 | 313 | 70.3 | 14 |
| 80 | PN 40 | 480 | 230 | 324 | 82.5 | 19 |

Table 2-6: Dimensions and weight in mm and kg

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

## ASME 150 lb

| Nominal size | Dimensions | | | | | | | | Approx. weight | |
|---|---|---|---|---|---|---|---|---|---|---|
| | L | | H | | W | | Di ① | | | |
| | [inch] | [mm] | [inch] | [mm] | [inch] | [mm] | [inch] | [mm] | [lb] | [kg] |
| 2" | 14.2 | 360 | 7.5 | 190 | 11.8 | 300 | 2.1 | 53 | 22 | 10 |
| 2½" | 15.0 | 380 | 8.3 | 210 | 12.2 | 310 | 2.5 | 63 | 33 | 15 |
| 3" | 20.5 | 520 | 8.9 | 226 | 12.8 | 324 | 3.1 | 78 | 44 | 20 |
| 4" | 21.7 | 550 | 10.1 | 258 | 13.3 | 337 | 4.0 | 102 | 64 | 29 |
| 5" | 23.2 | 590 | 11.2 | 285 | 14.1 | 364 | 5.1 | 128 | 84 | 38 |
| 6" | 24.4 | 620 | 12.2 | 312 | 15.2 | 387 | 6.1 | 154 | 90 | 41 |
| 8" | 21.2 | 540 | 14.5 | 369 | 16.9 | 429 | 8.1 | 206 | 130 | 59 |
| 10" | 24.0 | 610 | 16.9 | 428 | 18.7 | 474 | 10.3 | 260 | 185 | 84 |
| 12" | 26.4 | 670 | 19.4 | 492 | 20.4 | 512 | 12.2 | 311 | 266 | 121 |
| 14" | 28.7 | 730 | 21.0 | 534 | 21.3 | 540 | 13.4 | 340 | 352 | 160 |
| 16" | 30.3 | 770 | 23.3 | 591 | 23.5 | 597 | 15.4 | 391 | 462 | 210 |
| 18" | 30.7 | 780 | 25.0 | 635 | 25.0 | 635 | 17.5 | 441 | 570 | 259 |
| 20" | 32.7 | 830 | 27.3 | 693 | 27.5 | 699 | 19.3 | 489 | 607 | 304 |
| 24" | 35.8 | 910 | 31.5 | 801 | 32.0 | 813 | 23.3 | 591 | 904 | 411 |

Table 2-7: Dimensions and weight in inch / mm and lb / kg

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

## ASME 300 lb

| Nominal size | Dimensions | | | | | | | | Approx. weight | |
|---|---|---|---|---|---|---|---|---|---|---|
| | L | | H | | W | | Di ① | | | |
| | [inch] | [mm] | [inch] | [mm] | [inch] | [mm] | [inch] | [mm] | [lb] | [kg] |
| 2" | 15.0 | 380 | 7.7 | 196 | 11.8 | 300 | 2.1 | 53 | 27 | 12 |
| 2.5" | 15.4 | 390 | 8.5 | 217 | 12.2 | 310 | 2.5 | 63 | 38 | 17 |
| 3" | 21.3 | 540 | 9.3 | 235 | 12.8 | 324 | 3.1 | 78 | 53 | 24 |
| 4" | 22.4 | 570 | 10.7 | 271 | 13.3 | 337 | 4.0 | 102 | 86 | 39 |
| 5" | 24.0 | 610 | 11.7 | 298 | 14.1 | 364 | 5.1 | 128 | 115 | 52 |
| 6" | 25.2 | 640 | 13.0 | 331 | 15.0 | 387 | 6.1 | 154 | 146 | 66 |
| 8" | 22.0 | 560 | 15.3 | 388 | 16.6 | 429 | 8.0 | 203 | 207 | 94 |
| 10" | 25.2 | 640 | 17.6 | 448 | 18.3 | 474 | 10.0 | 255 | 309 | 140 |
| 12" | 28.0 | 710 | 20.1 | 511 | 20.5 | 521 | 11.9 | 303 | 452 | 205 |
| 14" | 29.9 | 760 | 22.0 | 559 | 23.0 | 584 | 13.1 | 333 | 609 | 276 |
| 16" | 31.9 | 810 | 24.3 | 616 | 25.5 | 648 | 15.0 | 381 | 785 | 356 |
| 18" | 33.1 | 840 | 26.5 | 673 | 28.0 | 711 | 16.9 | 428 | 926 | 420 |
| 20" | 36.6 | 930 | 28.8 | 731 | 30.5 | 775 | 18.8 | 478 | 1237 | 561 |
| 24" | 38.2 | 970 | 33.5 | 851 | 36.0 | 914 | 22.6 | 575 | 1715 | 778 |

Table 2-8: Dimensions and weight in inch / mm and lb / kg

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

## ASME 600 lb

| Nominal size | Dimensions | | | | | | | | Approx. weight | |
|---|---|---|---|---|---|---|---|---|---|---|
| | L | | H | | W | | Di ① | | | |
| | [inch] | [mm] | [inch] | [mm] | [inch] | [mm] | [inch] | [mm] | [lb] | [kg] |
| 2" | 15.7 | 400 | 7.7 | 196 | 11.5 | 300 | 1.9 | 49 | 33 | 15 |
| 2.5" | 16.1 | 410 | 8.5 | 217 | 12.0 | 310 | 2.3 | 59 | 44 | 20 |
| 3" | 22.0 | 560 | 9.3 | 235 | 12.5 | 324 | 2.9 | 74 | 66 | 30 |
| 4" | 24.4 | 620 | 11.1 | 281 | 13.1 | 337 | 3.8 | 97 | 119 | 54 |
| 5" | 26.0 | 660 | 12.7 | 323 | 14.1 | 359 | 4.8 | 122 | 183 | 83 |
| 6" | 27.2 | 690 | 13.8 | 350 | 15.0 | 374 | 5.8 | 146 | 223 | 101 |
| 8" | 24.4 | 620 | 16.1 | 408 | 16.5 | 421 | 7.6 | 194 | 333 | 151 |
| 10" | 27.2 | 690 | 18.3 | 479 | 20.0 | 508 | 9.6 | 243 | 531 | 241 |
| 12" | 28.3 | 720 | 20.9 | 530 | 22.0 | 559 | 11.4 | 289 | 655 | 297 |
| 14" | 29.9 | 760 | 22.4 | 568 | 23.7 | 603 | 12.5 | 317 | 798 | 362 |
| 16" | 32.7 | 830 | 25.0 | 635 | 27.0 | 686 | 14.3 | 364 | 1105 | 501 |
| 18" | 34.6 | 880 | 27.1 | 689 | 29.3 | 743 | 16.1 | 409 | 1389 | 630 |
| 20" | 35.4 | 900 | 29.5 | 750 | 32.0 | 813 | 17.9 | 456 | 1695 | 769 |
| 24" | 38.2 | 970 | 34.0 | 864 | 37.0 | 640 | 21.6 | 548 | 2438 | 1106 |

Table 2-9: Dimensions and weight in inch / mm and lb / kg

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

## ASME 900 lb

| Nominal size | Dimensions | | | | | | | | Approx. weight | |
|---|---|---|---|---|---|---|---|---|---|---|
| | L | | H | | W | | Di ① | | | |
| | [inch] | [mm] | [inch] | [mm] | [inch] | [mm] | [inch] | [mm] | [lb] | [kg] |
| 2" | 17.7 | 450 | 8.7 | 222 | 11.5 | 300 | 1.7 | 43 | 64 | 29 |
| 2.5" | 18.1 | 460 | 9.6 | 244 | 12.0 | 310 | 2.3 | 59 | 86 | 39 |
| 3" | 23.6 | 600 | 9.9 | 251 | 12.5 | 324 | 2.6 | 67 | 119 | 54 |
| 4" | 26.8 | 640 | 11.4 | 290 | 13.0 | 337 | 3.4 | 87 | 157 | 71 |
| 5" | 26.8 | 680 | 12.6 | 333 | 13.7 | 359 | 4.6 | 116 | 240 | 109 |
| 6" | 28.7 | 730 | 14.3 | 363 | 15.0 | 381 | 5.5 | 140 | 335 | 152 |
| 8" | 26.8 | 680 | 17.0 | 433 | 18.5 | 470 | 7.2 | 183 | 545 | 247 |
| 10" | 29.9 | 760 | 19.6 | 498 | 21.5 | 546 | 9.1 | 230 | 838 | 380 |
| 12" | 31.9 | 810 | 21.9 | 556 | 24.0 | 610 | 10.7 | 273 | 1168 | 530 |
| 14" | 33.9 | 860 | 23.1 | 588 | 25.2 | 641 | 11.8 | 300 | 1382 | 627 |

Table 2-10: Dimensions and weight in inch / mm and lb / kg

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

## 2.3.2 Signal converter housing

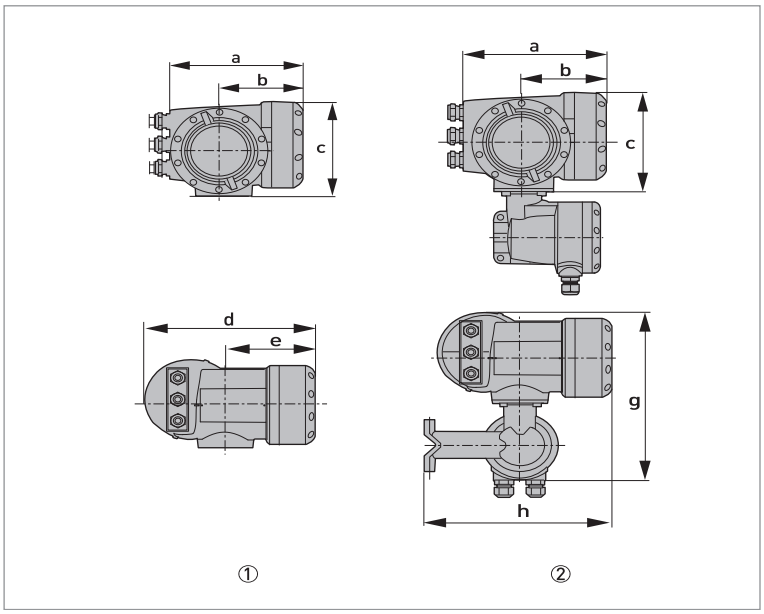



Figure 2-2: Dimensions of signal converter housing

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 2-11: 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 2-12: Dimensions and weight in inch and lb

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

### 2.3.3 Mounting plate of field housing

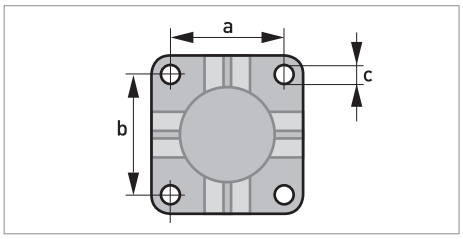



Figure 2-3: Dimensions for mounting plate of field housing

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

Table 2-13: 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 is designed exclusively for bi-directional measurement of process gases in closed completely filled pipeline circuits. Excess of contaminations (moisture, particles, 2 phases) disturb the acoustic signal and must be avoided.

The overall functionality of the gas flowmeter is the continuous measurement of actual volume flow, corrected volume flow, mass flow, molar mass, flow speed, velocity of sound, gain, SNR and diagnosis value.

## 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

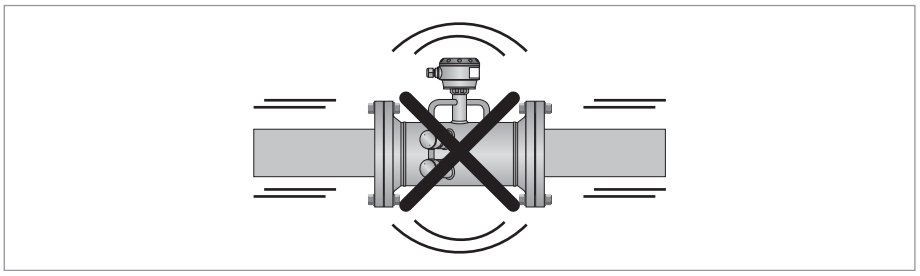


Figure 3-1: Prevent intense vibrations

*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.

The OPTISONIC 7300 is designed for the measurement dry gas flow. Excess of liquids may disturb the acoustic signals and should thus be avoided.
The following guidelines should be observed in case occasional small amounts of liquids are to be expected:

- 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

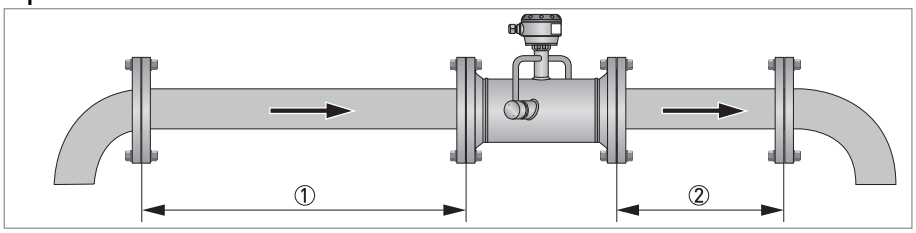



**Figure 3-2: Recommended inlet and oulet for ≤ DN80 / 3"**

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

#### 2 path flowmeter

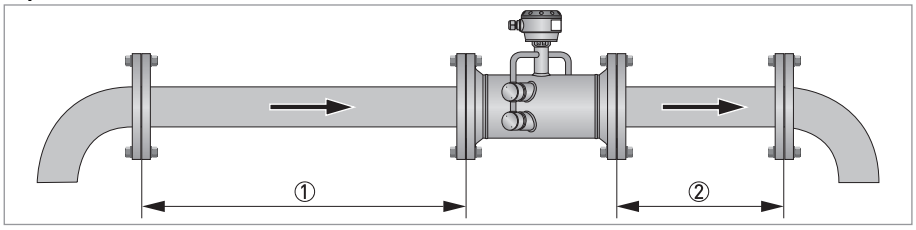



**Figure 3-3: Recommended inlet and oulet for ≥ DN100 / 4"**

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

## 3.5.2 Bends in 2 or 3 dimensions

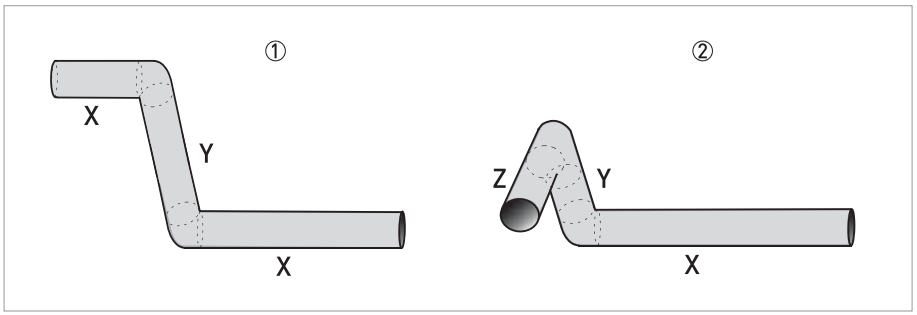



**Figure 3-4: 2 and/or 3 dimensional bends upstream of the flowmeter**

① 2 dimensions = X/Y
② 3 dimensions = X/Y/Z
Inlet length:
for 2 path using bends in 2 dimensions: ≥ 10 DN; when having bends in 3 dimensions: ≥ 15 DN
for 1 path using bends in 2 dimensions: ≥ 20 DN; when having bends in 3 dimensions: ≥ 25 DN

*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

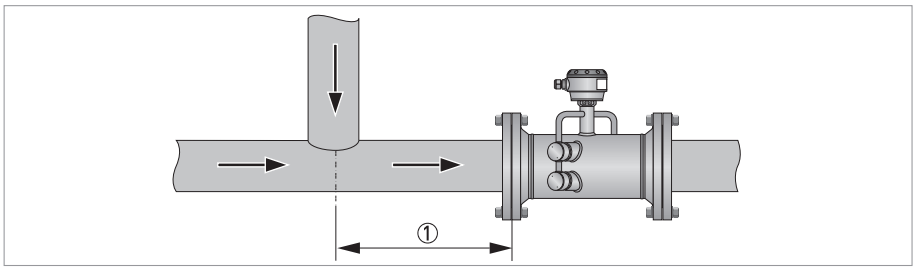



Figure 3-5: Distance behind a T-section

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.

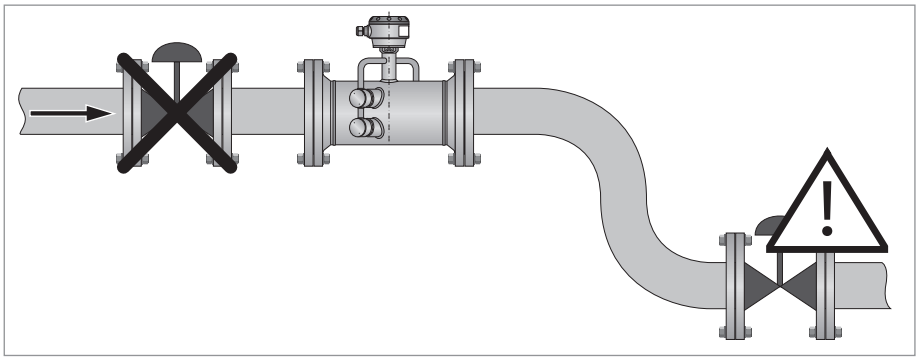


Figure 3-6: Installation of the flowmeter and a valve/reducer in the same pipeline

### 3.5.5 Flange deviation

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

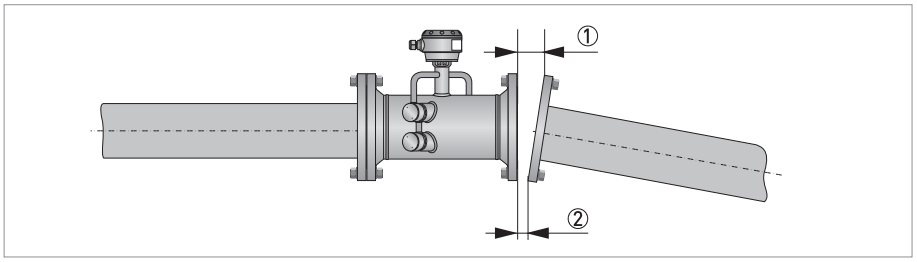



Figure 3-7: Flange deviation

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°**

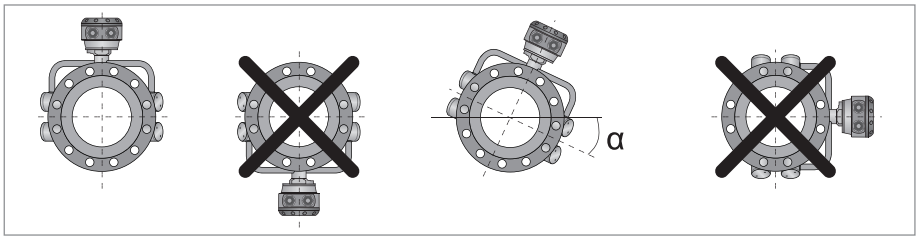



Figure 3-8: Installation position

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

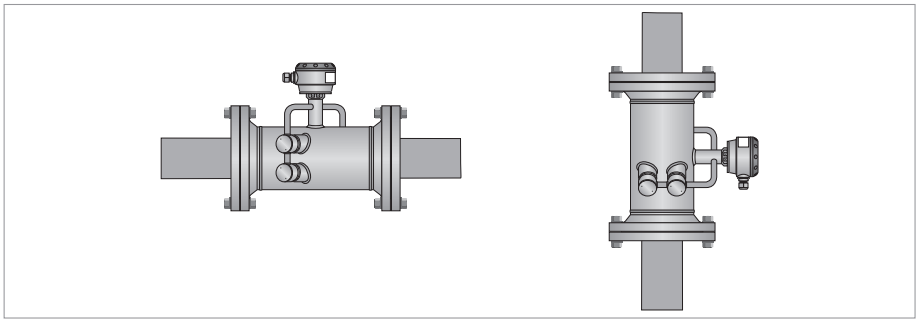


Figure 3-9: Horizontal and vertical installation

## 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.*

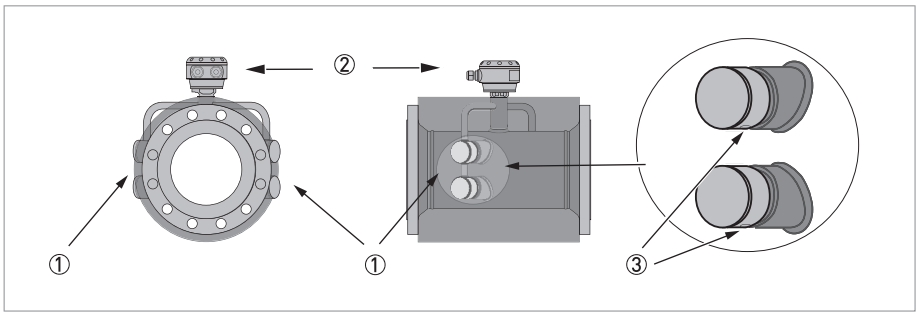



Figure 3-10: Leave vent holes free

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 (remote version only)

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.

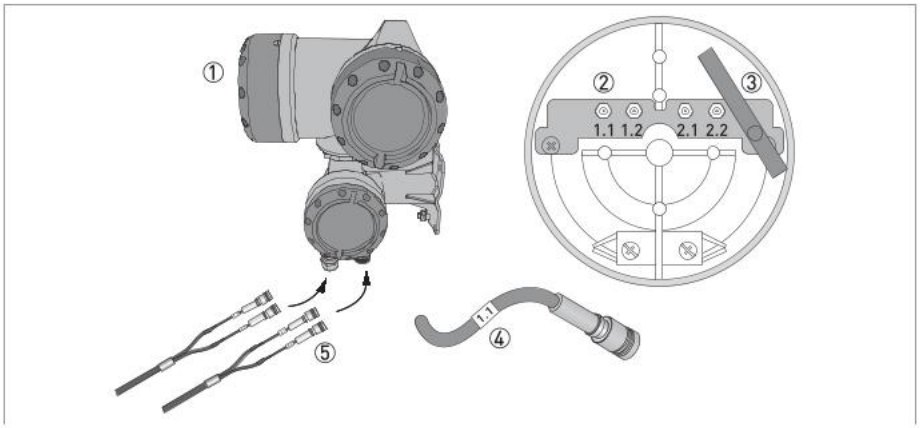



**Figure 4-1: Connection of signal cable to signal converter**

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

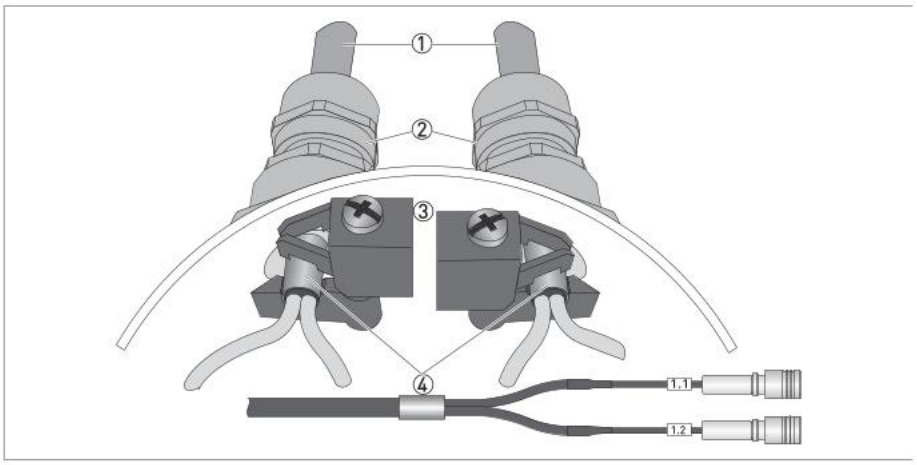



Figure 4-2: Clamp the cables on the shielding bush

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

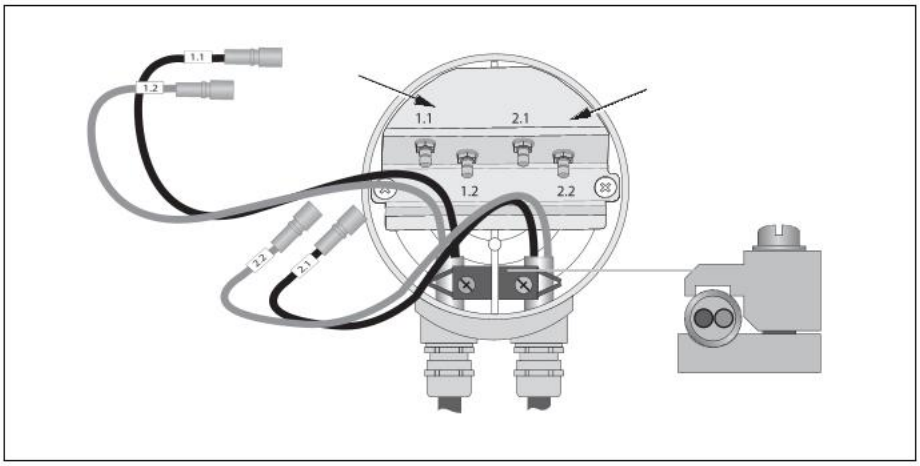



Figure 4-3: Connect the cables in the connection box of the sensor

*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.*

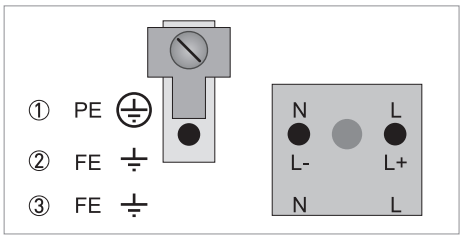



Figure 4-4: Power supply connection

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 option

- 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 connection and operation of Ex devices, note the supplementary instructions.

## 4.4.2 Description of the CG number

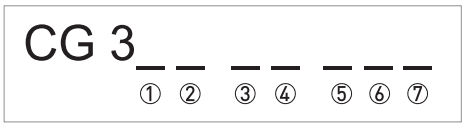



**Figure 4-5: Marking (CG number) of the electronics module and input/output variants**

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<br>Signal converter monitors cable breaks and short circuits according to EN 60947-5-6. Errors indicated on LC display.<br>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- |
| **Basic I/Os (standard)** | | | | | | | | | |
| 1 0 0 | | $I_p$ + HART® passive ① | | $S_p$ / $C_p$ passive ② | | $S_p$ passive | | $P_p$ / $S_p$ passive ② | |
| | $I_a$ + HART® active ① | | | | | | | | |
| **Ex i I/Os (option)** | | | | | | | | | |
| 2 0 0 | | | | | | $I_a$ + HART® active | | $P_N$ / $S_N$ NAMUR ② | |
| 3 0 0 | | | | | | $I_p$ + HART® passive | | $P_N$ / $S_N$ NAMUR ② | |
| 2 1 0 | | $I_a$ active | | $P_N$ / $S_N$ NAMUR<br>$C_p$ passive ② | | $I_a$ + HART® active | | $P_N$ / $S_N$ NAMUR ② | |
| 3 1 0 | | $I_a$ active | | $P_N$ / $S_N$ NAMUR<br>$C_p$ passive ② | | $I_p$ + HART® passive | | $P_N$ / $S_N$ NAMUR ② | |
| 2 2 0 | | $I_p$ passive | | $P_N$ / $S_N$ NAMUR<br>$C_p$ passive ② | | $I_a$ + HART® active | | $P_N$ / $S_N$ NAMUR ② | |
| 3 2 0 | | $I_p$ passive | | $P_N$ / $S_N$ NAMUR<br>$C_p$ passive ② | | $I_p$ + HART® passive | | $P_N$ / $S_N$ NAMUR ② | |
| 2 3 0 | | $IIn_a$ active | | $P_N$ / $S_N$ NAMUR<br>$C_p$ passive ② | | $I_a$ + HART® active | | $P_N$ / $S_N$ NAMUR ② | |
| 3 3 0 | | $IIn_a$ active | | $P_N$ / $S_N$ NAMUR<br>$C_p$ passive ② | | $I_p$ + HART® passive | | $P_N$ / $S_N$ NAMUR ② | |
| 2 4 0 | | $IIn_p$ passive | | $P_N$ / $S_N$ NAMUR<br>$C_p$ passive ② | | $I_a$ + HART® active | | $P_N$ / $S_N$ NAMUR ② | |
| 3 4 0 | | $IIn_p$ passive | | $P_N$ / $S_N$ NAMUR<br>$C_p$ passive ② | | $I_p$ + HART® passive | | $P_N$ / $S_N$ NAMUR ② | |
| 2 5 0 | | $IIn_a$ active | | $IIn_a$ active | | | | | |

① Function changed by reconnecting
② 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<br>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: | |

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Head Office KROHNE Messtechnik GmbH
Ludwig-Krohne-Str. 5
47058 Duisburg (Germany)
Tel.: +49 203 301 0
Fax: +49 203 301 10389
info@krohne.de

The current list of all KROHNE contacts and addresses can be found at:
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