OPTISONIC 6300 Technical Datasheet

Ultrasonic clamp-on flowmeter

- Easy and accurate sensor mounting using a rail system
- Robust industrial design to provide maximum reliability
- Optimal accuracy due to factory sensor calibration

HART COMMUNICATION PROTOCOL

KROHNE

1.1 Introduction

The **OPTISONIC 6300** is a stationary ultrasonic clamp-on flowmeter for liquid applications.

Using the OPTISONIC 6300, flow measurement can be done anywhere. Start-up is immediate and can be done without any process interruption.
It provides a flexible and cost effective solution for retrofitting or for quickly adding a flow measurement.

Highlights

- Easy and accurate sensor mounting using a rail system
- Robust industrial design to provide maximum reliability
- Optimal accuracy due to factory sensor calibration
- Minimal maintenance using efficient re-greasing concept or solid coupling pads
- X-mode dual path sensor for extra accuracy and reliability

Industries

- Chemicals
- Petrochemicals
- Power plants
- Water
- Oil & Gas
- Semi-conductor
- Food & Beverages
- Pharmaceuticals

Applications

- Chemical addition
- General process control
- Cooling water circuits
- Refined hydrocarbons
- Potable water
- De-ionized and demineralized water
- Sanitary flow rate measurements
- Purified water

1.2 Variants

The **OPTISONIC 6300** flowmeters consists of a combination of one or two clamp-on sensor(s) and one ultrasonic signal converter:

OPTISONIC 6000 + UFC 300 = OPTISONIC 6300

Small sensor version, for small pipes diameters from DN15/½" to DN100/4".

Sensor material: aluminum (including cover) or stainless steel

Medium sensor version, for medium size pipes from DN50/2" to DN400/16".

Sensor material: aluminum (including cover) or stainless steel

Medium sensor in X mode for pipes from DN200/8" to DN1250/50".

Sensor material: stainless steel

Large sensor version for pipes up to large diameters. Applicable from DN200/8" up to DN4000/160"

Sensor material: aluminum, including cover

Multi path variants

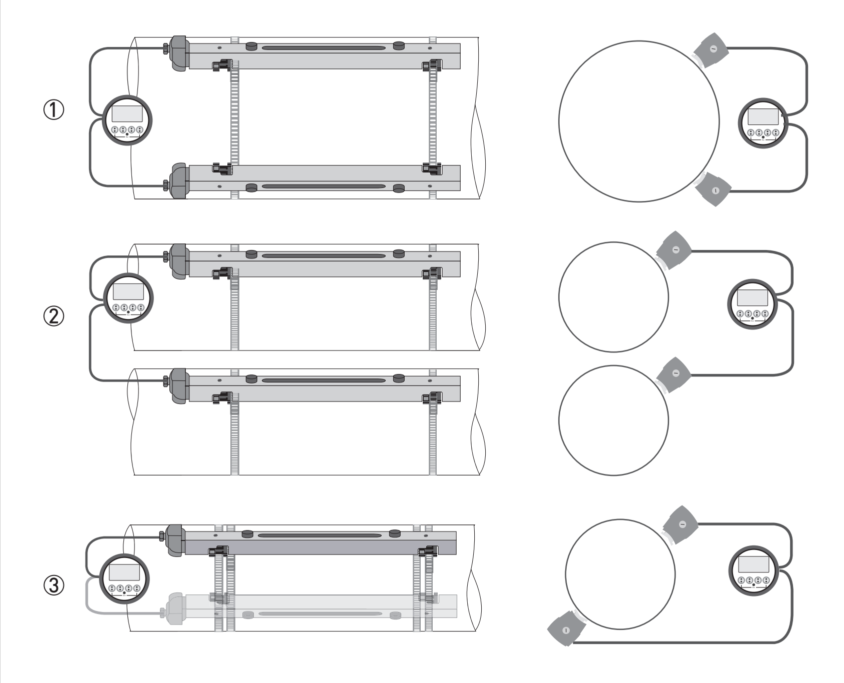

Figure 1-1: Multi path variants

① 2 path, one pipe
② 2 path, two pipes
③ 2 path, one pipe; X mode

UFC 300 ultrasonic signal converter

UFC 300 W
- wall mounted
- polyamide-polycarbonate housing
- non-Ex
- IP65/66

UFC 300 F
- field version
- die-cast aluminum or stainless steel housing
- (non-) Ex
- IP66/67

1.3 Features

For an easy installation, optimal accuracy, maximum reliability and reducing risk: X-mode

By positioning two rails opposite each other on the pipe a dual, direct path solution is established. This provides the following advantages:

- A direct path without reflection lowers measurement uncertainty and thus risk on path loss.
- Dual path provides redundancy. A failing path is automatically compensated by the dynamic path replacement.

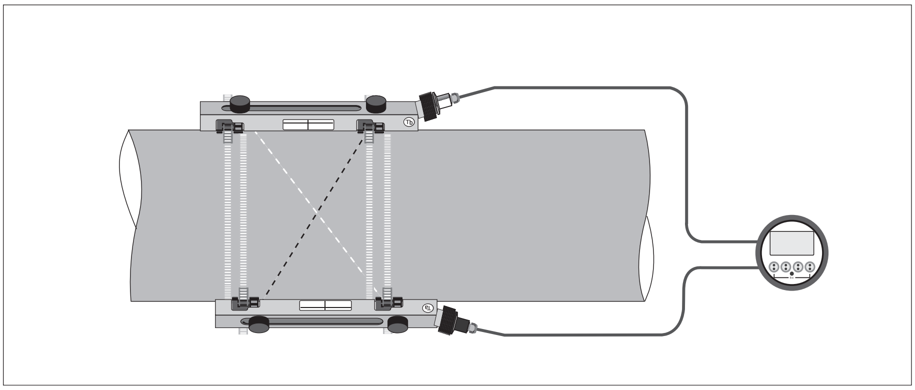

Figure 1-2: X beam configuration of medium version

Rail mounting

The measurement accuracy is largely determined by the quality of the installation the clamp-on flow sensor. It is important that the sensors are precisely installed and properly aligned.

The OPTISONIC 6000 sensor is always provided with rail mounted transducers. The rail allows for accurate fixation of the transducer distance and guarantees proper alignment of the transducers.

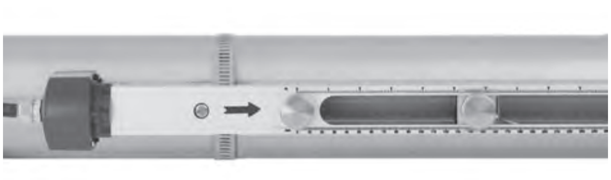

Figure 1-3: Top view OPTISONIC 6000 rail

Reduced maintenance effort

For a continuous accurate and reliable operation, cleaning and/or re-greasing of the transducers is required to ensure a good acoustic connection with the pipe. By being able to unlock and tilt the transducers without changing the transducer position, maintenance is simplified and less time consuming. After cleaning and re-greasing the rail is exactly put back in the same place avoiding any re-adjustment.

Optionally solid acoustic coupling pads may be used. In particular for high temperature applications (where contact grease may deteriorate quickly) these are the preferred choice over coupling grease. The coupling pads withstand these higher temperatures and can be applied at installation to reduce maintenance in time.

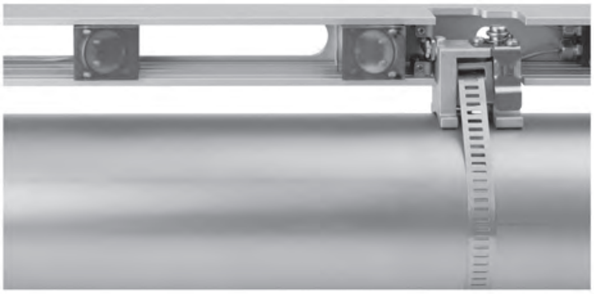

Figure 1-4: OPTISONIC 6000 rail in tilted position

Diagnostic features

By featuring several diagnostic options the quality of the measurement can be monitored over time. Signal quality parameters like signal to noise, signal strength and stability are available for this. This allows for condition based maintenance, keeping the flowmeter in optimal condition and avoiding unplanned down time.

1.4 Options

eXtended Temperature / offshore sensor (small / medium, stainless steel rail)

- Refineries
- Chemical plants
- Energy applications
- Offshore oil and gas applications

Energy (heat/cold) measurement

The OPTISONIC 6300 is available with an energy measurement option for heating or cooling. By connecting two temperature sensors to the converter, heating or cooling energy can be calculated.

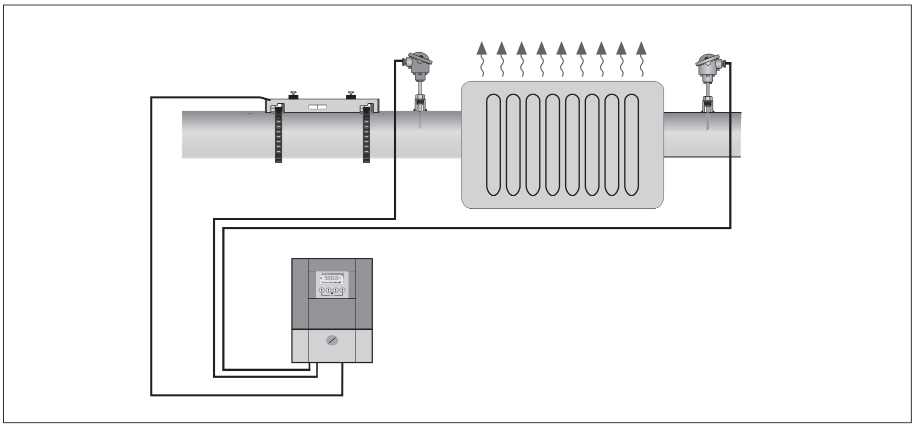

Figure 1-5: Installation option for energy measurement

1.5 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.

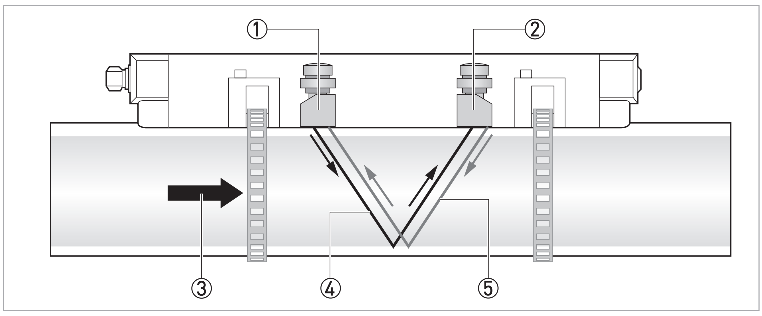

Figure 1-6: Measuring principle

① Transducer A
② Transducer B
③ Flow velocity
④ Transit time from transducer A to B
⑤ Transit time from transducer B to A

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 (Downloadcenter).*

Measuring system

Measuring principle	Ultrasonic transit time
Application range	Flow measurement of liquids
Measured value	
Primary measured value	Transit time
Secondary measured value	Volume flow, mass flow, flow speed, flow direction, speed of sound, gain, signal to noise ratio, diagnosis value, reliability of flow measurement, quality of acoustic signal. Optional: thermal power, thermal energy, temperature.

Design

The measurement system consists of a measuring sensor and a signal converter. It is only available as separate version.	
Signal converter	
Wall mounted housing (W); remote version	UFC 300 W (general purpose)
Field housing (F); remote version	UFC 300 F (option: Ex version)
Measuring sensor	
Standard	Small, medium or large version in aluminium.
Optional	Small or medium stainless steel version
	Small or medium XT (eXtended Temperature)
Diameter ranges	
Small	DN15...100 / ½...4"
	Outer diameter must be at least 20 mm/0.79"
Medium	DN50...400 / 2...16"
Medium X - mode	DN200...1250 / 8...50"
Large	DN200...4000 / 8...160"
	Outer diameter must be smaller than 4300 mm/169.29"
Signal converter	
Inputs/outputs	Current (incl. HART®), pulse, frequency and/or status output, limit switch and/or control input (depending on the I/O version).
Counters	Two internal counters with a maximum of 8 counter places (e.g. for counting volume and/or mass units).
Verification and self-diagnostics	Integrated verification, diagnostic functions: measuring device, process, measured values, device configuration, empty pipe detection, bar graph etc.
Communication interfaces	HART® 7, Foundation Fieldbus, Profibus, Modbus RS485 (option).

Display and user interface	
Graphic display	LCD; backlit white
	Size: 128x64 pixels; corresponds to 59 x 31 mm = 2.32" x 1.22"
	Display turnable in 90° steps
Operator elements	Four optical and mechanical push buttons for operator control of the signal converter without opening the housing
	Option: infrared interface (GDC)
Remote control	PACTware® including Device Type Manager (DTM)
	HART® hand-held communicator (Emerson), AMS (Emerson), PDM (Siemens).
	All DTM's and drivers are available at the internet homepage of the manufacturer
Display functions	
Operating menu	Programming of parameters at 2 measured value pages, 1 status page, 1 graphic page (measured values and descriptions adjustable as required).
Language of display texts	English, German, French, Russian.
Measurement functions	**Units:** Metric, British and US units selectable from list for volume/mass flow and counting, velocity, temperature.
	Measured values: Volume flow, mass flow, flow speed, velocity of sound, gain, signal to noise ratio, flow direction, diagnostics.
Diagnostic functions	**Standards:** VDI/NAMUR NE 107
	Status messages: output of status messages via display, current and/or status output, HART® or via other bus interface.
	Sensor diagnostics: per acoustic path velocity of sound, flow speed, gain, signal to noise ratio.
	Process diagnostics: empty pipe, signal integrity, cabling, flow conditions.
	Signal converter diagnostics: data bus monitoring, I/O connections, electronics temperature, parameter and data integrity.

Measuring accuracy

Reference conditions	Medium: water
	Temperature: 20°C/68°F
	Pressure: 1 bar/14.5 psi
	Straight inlet section: 10 DN
	Straight outlet section: 5 DN
Maximum measuring error	≥ DN50/2 inch < ± 1% of the actual measured flow rate; for 0.5…20 m/s /1.64…65.6 ft/s < ± 5 mm/s /0.2 inch/s for 0.1…0.5 m/s / 0.33…1.64 ft/s
	< DN50/2 inch < ± 3% of the actual measured flow rate; for 0.5…20 m/s /1.64…65.6 ft/s < ± 15 mm/s /0.6 inch/s for 0.1…0.5 m/s / 0.33…1.64 ft/s.
Repeatability	± 0.2%

Operating conditions

Temperature	
Process temperature	Standard version: -40...+120°C/ -40...+248°F
	XT version: -40...+200°C/ -40...+392°F
Ambient temperature	Sensor: -40...+70°C/ -40...+158°F
	Standard (die-cast aluminum converter housing): -40…+65°C/ -40…+149°F
	Option (die-cast stainless steel converter housing): -40...+60°C/ -40...+140°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
Pipe specifications	
Material	Metal, plastic, ceramic, asbestos cement, internal / external coated pipes (coatings and liners fully bonded to pipe wall).
Pipe wall thickness	< 200 mm/7.87"
Liner thickness	< 20 mm/0.79"
Media properties	
Physical condition	Liquid, single phase (well mixed, rather clean).
Viscosity	< 200 cSt (general guideline)
	For higher viscosities please contact your local representative
Permissible gas content (volume)	≤ 2%
Permissible solid content (volume)	≤ 5%
Flow range	0.1...20 m/s (turn down 200:1)

Installation conditions

Installation	For detailed information refer to *Installation and safety instructions* on page 26.
Measurement configuration	Single path, single pipe or dual path/dual pipe.
Inlet run	≥ 10 DN straight length
Outlet run	≥ 5 DN straight length
Dimensions and weights	For detailed information refer to *Dimensions and weight* on page 22.

Materials

Sensor	**Standard (small / medium / large version)**
	Rail cover: coated aluminum
	Rail construction: anodised aluminum
	Transducer: PSU/PA
	Cable connection: 1.4404; NPB
	Option stainless steel (small / medium version)
	Rail construction: 1.4404 (AISI 316L)
	Transducer: PSU/PA
	Cable connection: 1.4404; NPB
	Option stainless steel eXtended Temperature (small / medium version)
	Rail construction: 1.4404 (AISI 316L)
	Transducer XT: PAI 4203/PA
	Cable connection: 1.4404; PSU with FKM O-ring
Connection box	Coated aluminum
Coupling media	Coupling grease: mineral gel (standard); high temperature vacuum gel (XT)
	Coupling pads (recommended for high temperatures): FKM
Converter	**Standard**
	F version: die-cast aluminum; standard coating
	W version: polyamide-polycarbonate
	Option
	F version: stainless steel 316 L (1.4408)
	Coating: standard and offshore coating

Electrical connections

Description of used abbreviations; Q = flow rate; I_{max} = maximum current; U_{in} = input voltage; U_{int} = internal voltage; U_{ext} = external voltage; $U_{int, max}$ = maximal internal voltage	
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 (tolerance range: -55%/ +30%) 24 VAC/DC (AC: -15%/ +10%; 50/60 Hz,DC; -25%/ +30%)
Power consumption	AC: 22 VA
	DC: 12 W
Signal cable	Double shielded, 2 internal coax cables.
	Standard length: 5 meters/16 ft
	Optional lengths: 10...30 meters/33...98 ft; in steps of 5 meter; larger cable lengths on request; maximum length 30 meters/98 ft
Cable entries	For the large rail a cable connection box will be provided for cable lengths over 10 meters
	Standard: M20 x 1.5 (8...12 mm)
	Option: ½" NPT; PF ½

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	U_{ext} = external voltage; R_L = load + resistance; U_o = terminal voltage; I_{nom} = nominal current. Safety limit values (Ex i): U_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, mass flow, flow speed, velocity of sound, gain, SNR, diagnostics (flow speed, VoS, SNR, gain), NAMUR NE 107, HART® communication.		
Temperature coefficient	Typically ± 30 ppm/K		
Settings	**Without HART®**		
	Q = 0%: 0…20 mA; Q = 100%: 10…20 mA		
	Error identification: 0…22 mA		
	With HART®		
	Q = 0%: 4…20 mA; Q = 100%: 10…20 mA		
	Error identification: 3.5…22 mA		
Operating data	**Basic I/Os**	**Modular I/Os**	**Ex-i**
Active	$U_{int,nom}$ = 24 VDC I ≤ 22 mA R_L ≤ 1 kΩ		$U_{int,nom}$ = 20 VDC I ≤ 22 mA R_L ≤ 450 Ω
			U_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
Passive	U_{ext} ≤ 32 VDC I ≤ 22 mA U_0 ≥ 1.8 V $R_L \leq (U_{ext} - U_0) / I_{max}$		U_{ext} ≤ 32 VDC I ≤ 22 mA U_0 ≥ 4 V $R_L \leq (U_{ext} - U_o) / I_{max}$
			U_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: V7		
	Universal HART® parameter: completely integrated		
Load	≥ 230 Ω at HART® test point: please observe maximum value for current output!		
Multidrop	Yes, current output = 10% e.g. 4 mA		
	Multidrop addresses adjustable in operation menu 0...63		
Device drivers	DD for FC 375/475, AMS, PDM, DTM for FDT.		

Pulse or frequency output			
Output data	Volume flow, mass flow.		
Function	Adjustable as pulse or frequency output		
Pulse rate/frequency	0.01...10000 pulses/s or Hz		
Settings	For Q = 100%: 0.01...10000 pulses per second or pulses per unit volume		
	Pulse width: setting automatic, symmetric or fixed (0.05...2000 ms).		
Operating data	**Basic I/Os**	**Modular I/Os**	**Ex-i**
Active	-	U_{nom} = 24 VDC	-
		f_{max} ≤ 100 Hz: I ≤ 20 mA $R_{L, max}$ = 47 kΩ open: I ≤ 0.05 mA closed: $U_{0,nom}$ = 24 V at I = 20 mA	
		f_{max} in operating menu set to: **100 Hz < f_{max} ≤ 10 kHz:** I ≤ 20 mA R_L ≤ 10 kΩ for f ≤ 1 kHz R_L ≤ 1 kΩ for f ≤ 10 kHz open: I ≤ 0.05 mA closed: $U_{0,nom}$ = 22.5 V at I = 1 mA $U_{0,nom}$ = 21.5 V at I = 10 mA $U_{0,nom}$ = 19 V at I = 20 mA	
Passive	U_{ext} ≤ 32 VDC		-
	f_{max} in operating menu set to: **f_{max} ≤ 100 Hz:** I ≤ 100 mA $R_{L, max}$ = 47 kΩ $R_{L, min}$ = (U_{ext} - U_0) / I_{max} open: I ≤ 0.05 mA at U_{ext} = 32 VDC closed: $U_{0, max}$ = 0.2 V at I ≤ 10 mA $U_{0, max}$ = 2 V at I ≤ 100 mA		
	f_{max} in operating menu set to: **100 Hz < f_{max} ≤ 10 kHz:** I ≤ 20 mA $R_{L,}$≤ 10 kΩ for f ≤ 1 kHz $R_{L,}$≤ 1 kΩ for f ≤ 10 kHz $R_{L, min}$ = (U_{ext} - U_0) / I_{max} open: I ≤ 0.05 mA at U_{ext} = 32 VDC closed: $U_{0, max}$ = 1.5 V at I ≤ 1 mA $U_{0, max}$ = 2.5 V at I ≤ 10 mA $U_{0, max}$ = 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
			U_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 or empty pipe detection.		
	Valve control with activated dosing function		
	Status and/or control: ON or OFF		
Operating data	**Basic I/Os**	**Modular I/Os**	**Ex-i**
Active	-	U_{int} = 24 VDC I ≤ 20 mA $R_{L, max}$ = 47 kΩ open: I ≤ 0.05 mA closed: $U_{0, nom}$ = 24 V at I = 20 mA	-
Passive	U_{ext} ≤ 32 VDC I ≤ 100 mA $R_{L, max}$ = 47 kΩ $R_{L, min} = (U_{ext} - U_0) / I_{max}$ open: I ≤ 0.05 mA at U_{ext} = 32 VDC closed: $U_{0, max}$ = 0.2 V at I ≤ 10 mA $U_{0, max}$ = 2 V at I ≤ 100 mA	U_{ext} = 32 VDC I ≤ 100 mA $R_{L, max}$ = 47 kΩ $R_{L, min} = (U_{ext} - U_0) / I_{max}$ open: I ≤ 0.05 mA at U_{ext} = 32 VDC closed: $U_{0, max}$ = 0.2 V at I ≤ 10 mA $U_{0, max}$ = 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
			U_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	**Basic I/Os**	**Modular I/Os**	**Ex-i**
Active	-	U_{int} = 24 VDC Terminals open: $U_{0, nom}$ = 22 V Terminals bridged: I_{nom} = 4 mA On: $U_0 \geq$ 12 V with I_{nom} = 1.9 mA Off: $U_0 \leq$ 10 V with I_{nom} = 1.9 mA	-
Passive	8 V $\leq U_{ext} \leq$ 32 VDC I_{max} = 6.5 mA at $U_{ext} \leq$ 24 VDC I_{max} = 8.2 mA at $U_{ext} \leq$ 32 VDC Contact closed (On): $U_0 \geq$ 8 V with I_{nom} = 2.8 mA Contact open (Off): $U_0 \leq$ 2.5 V with I_{nom} = 0.4 mA	3 V $\leq U_{ext} \leq$ 32 VDC I_{max} = 9.5 mA at $U_{ext} \leq$ 24 V I_{max} = 9.5 mA at $U_{ext} \leq$ 32 V Contact closed (On): $U_0 \geq$ 3 V with I_{nom} = 1.9 mA Contact open (Off): $U_0 \leq$ 2.5 V with I_{nom} = 1.9 mA	5.5 V $\leq U_{ext} \leq$ 32 VDC I_{max} = 6 mA at $U_{ext} \leq$ 24 V I_{max} = 6.5 mA at $U_{ext} \leq$ 32 V Contact closed (On): $U_0 \geq$ 5.5 V or I $\geq$ 4 mA Contact open (Off): $U_0 \leq$ 3.5 V or I $\leq$ 0.5 mA
			U_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 Contact open: $U_{0, nom}$ = 8.7 V Contact closed (On): I_{nom} = 7.8 mA Contact open (off): $U_{0, nom}$ = 6.3 V with I_{nom} = 1.9 mA Identification for open terminals: $U_0 \geq$ 8.1 V with I $\leq$ 0.1 mA Identification for short circuited terminals: $U_0 \leq$ 1.2 V with I $\geq$ 6.7 mA	-

<table>
<tr><td colspan="4">MODBUS</td></tr>
<tr><td>Description</td><td colspan="3">Modbus RTU; Master/Slave; RS485</td></tr>
<tr><td>Address range</td><td colspan="3">1…247</td></tr>
<tr><td>Supported function codes</td><td colspan="3">01, 02, 03, 04, 05, 08, 16, 43.</td></tr>
<tr><td>Supported Baud rate</td><td colspan="3">1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud.</td></tr>
<tr><td colspan="4">Low-flow cutoff</td></tr>
<tr><td>On</td><td colspan="3">0...±9.999 m/s; 0...20.0%, settable in 0.1% steps, separately for each current and pulse output.</td></tr>
<tr><td>Off</td><td colspan="3">0...±9.999 m/s; 0...19.0%, settable in 0.1% steps, separately for each current and pulse output.</td></tr>
<tr><td colspan="4">Time constant</td></tr>
<tr><td>Function</td><td colspan="3">Can be set together for all flow indicators and outputs, or separately for: current, pulse and frequency output, and for limit switches and the 3 internal counters.</td></tr>
<tr><td>Time setting</td><td colspan="3">0…100 seconds; settable in 0.1 second steps</td></tr>
<tr><td colspan="4">Current input</td></tr>
<tr><td>Function</td><td colspan="3">For connection of temperature sensors 0(4)...20 mA for heat/cold measurement</td></tr>
<tr><td>Operating data</td><td>Basic I/Os</td><td>Modular I/Os</td><td>Ex i</td></tr>
<tr><td rowspan="4">Active</td><td rowspan="4">-</td><td rowspan="2">U_{int} = 24 VDC
I ≤ 22 mA
I_{max} ≤ 26 mA (electronically limited)
$U_{0, min}$ = 19 V at I ≤ 22 mA</td><td>U_{int} = 20 VDC
I ≤ 22 mA
$U_{0, min}$ = 14 V at I ≤ 22 mA</td></tr>
<tr><td>No HART®</td></tr>
<tr><td rowspan="2">No HART®</td><td>U_0 = 24.1 V
I_0 = 99 mA
P_0 = 0.6 W
C_0 = 75 nF / L_0 = 0.5 mH</td></tr>
<tr><td>No HART®</td></tr>
<tr><td rowspan="4">Passive</td><td rowspan="4">-</td><td rowspan="2">U_{ext} ≤ 32 VDC
I ≤ 22 mA
I_{max} ≤ 26 mA (electronically limited)
$U_{0, min}$ = 5 V at I ≤ 22 mA</td><td>U_{ext} ≤ 32 VDC
I ≤ 22 mA
$U_{0, min}$ = 4 V at I ≤ 22 mA</td></tr>
<tr><td>No HART®</td></tr>
<tr><td rowspan="2">No HART®</td><td>U_I = 30 V
I_I = 100 mA
P_I = 1 W
C_I = 10 nF
L_I = 0 mH</td></tr>
<tr><td>No HART®</td></tr>
</table>

Approvals and certificates

CE	
This device fulfils the statutory requirements of the EU directives. The manufacturer certifies successful testing of the product by applying the CE mark.	
	For full information of the EU directives and standards and the approved certifications, please refer to the EU Declaration of Conformity or the website of the manufacturer.
NAMUR	NE 04, 21, 43, 53, 80, 107.
Other approvals and standards	
Non-Ex	Standard
Hazardous areas	
Ex zone 1 - 2	For detailed information, please refer to the relevant Ex documentation.
	According to European directive 2014/34/EU (ATEX 100a)
IECEx	**Sensor:**
	Approval number sensor: IECEx KIWA 17.0017X
	Converter (F version only):
	Approval number converter: IECEx KIWA 18.0003X
ATEX	**Sensor:**
	Approval number: KIWA 17ATEX0034 X
	Converter (F version only):
	Approval number: KIWA 18ATEX0007 X
NEPSI	Approval number: GYJ151306 / GYJ151307
Class I, DIV 1/2.	Option (F version): Approval number; c**QPS**us LR1338-9
Protection category according to IEC 60529	**Signal converter**
	W (wall version) IP65/66, NEMA 4/4X
	F (field version) IP66/67, NEMA 4X/6
	Flow sensors
	Aluminum: IP66/67, NEMA 4X/6
	Stainless steel version: IP68
Shock resistance	IEC 60068-2-27
	30 g for 18 ms
Vibration resistance	IEC 60068-2-64
	1 g up to 2000 Hz

2.2 Dimensions and weight

2.2.1 Housing

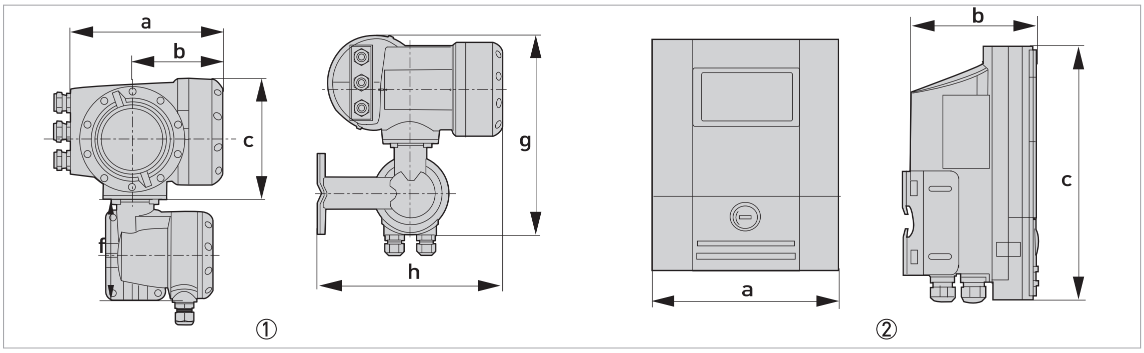

Figure 2-1: Dimensions of housing

① Field housing (F) - remote version
② Wall-mounted housing (W) - remote version

Version	Dimensions [mm]					Weight [kg]
	a	b	c	g	h	
F	202	120	155	296	277	6.0
W	198	138	299	-	-	2.4

Table 2-1: Dimensions and weight in mm and kg

Version	Dimensions [inch]					Weight [lb]
	a	b	c	g	h	
F	7.75	4.75	6.10	11.60	10.90	13.2
W	7.80	5.40	11.80	-	-	5.3

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

The weight of the F version in stainless steel is 13.5 kg / 29.8 lb.

2.2.2 Clamp-on sensor and cable box

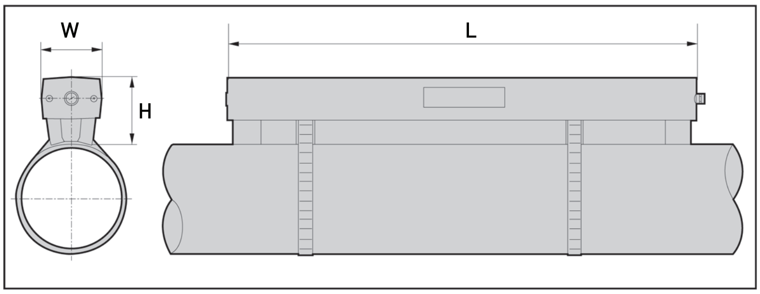

Figure 2-2: Dimensions clamp-on sensor

Version	Dimensions [mm]			Approx. weight (without cable / strip) [kg]
	L	H	W	
Small	496.3	71	63.1	2.5
Medium	826.3	71	63.1	3.4
Large	496.3 ①	71 ①	63.1 ①	4.6
Small - stainless steel / XT ②	493	65.5	48	2.0
Medium - stainless steel / XT ②	823	65.5	48	2.6

Table 2-3: Dimensions and weight clamp-on sensor (mm - kg)

① value for one of the 2 delivered rails
② delivered without cover

Version	Dimensions [inches]			Approx. weight (without cable / strip) [lbs]
	L	H	W	
Small	19.5	2.8	2.5	5.5
Medium	32.5	2.8	2.5	7.6
Large	19.5 ①	2.8 ①	2.5 ①	10.2
Small - stainless steel / XT ②	19.4	2.6	1.9	4.4
Medium - stainless steel / XT ②	32.4	2.6	1.9	5.7

Table 2-4: Dimensions and weight clamp-on sensor (inch - lb)

① value for one of the 2 delivered rails
② delivered without cover

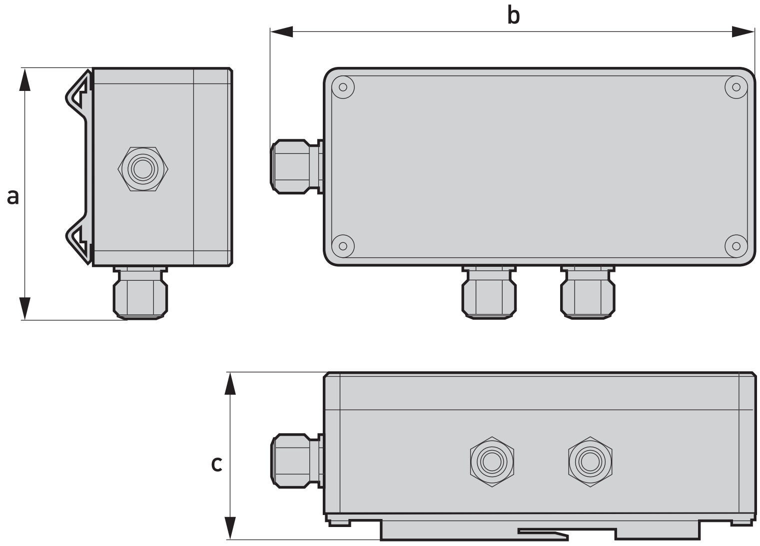

Figure 2-3: Dimension cable box

	Dimensions [mm]			Approximately weight without cable [kg]
	a	b	c	
Cable box	115	210	67	0.9

Table 2-5: Dimensions and weight cable box (mm - kg)

	Dimensions [inches]			Approximately weight without cable [lbs]
	a	b	c	
Cable box	4.53	8.27	2.64	2.0

Table 2-6: Dimensions and weight cable box (inch - lb)

2.2.3 Mounting plate of field housing

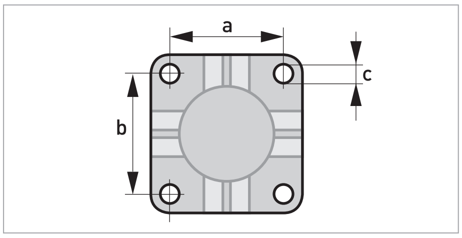

Figure 2-4: Dimensions for mounting plate of field housing

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

Table 2-7: Dimensions in mm and inch

2.2.4 Mounting plate of wall-mounted housing

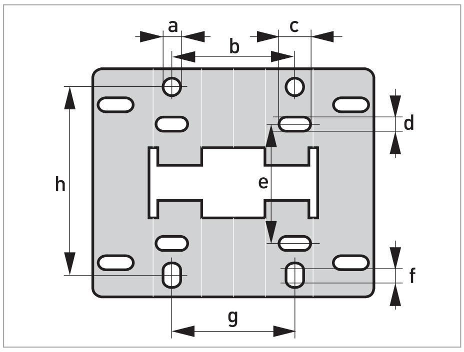

Figure 2-5: Dimensions of mounting plate of wall-mounted housing

	[mm]	[inch]
a	Ø9	Ø0.4
b	64	2.5
c	16	0.6
d	6	0.2
e	63	2.5
f	13	0.5
g	64	2.5
h	98	3.85

Table 2-8: 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 overall functionality of the clamp-on flowmeter is the continuous measurement of actual volume flow, mass flow, flow speed, velocity of sound, gain, SNR and diagnosis value.

3.2 Pre-installation requirements

To assure a quick, safe and uncomplicated installation, we kindly request you to make provisions as stated below.

Make sure that you have all necessary tools available:

- Allen key (4 and 5 mm)
- Small screwdriver
- Wrench for cable glands and for pipe mounting bracket (remote version only); refer to *Mounting the field housing, remote version* on page 35

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".*

3.4 Installation and safety instructions

To avoid measuring errors and malfunctioning of the flowmeter due to gas or air inclusions or an empty pipe, please observe the following precautions.

Since gas will collect at the highest point of a pipe, installation of the flowmeter at that location should be avoided at all times. Also, installation in a down going pipe should be avoided since a completely filled pipe may not be guaranteed due to cascading effects. Additionally, flow profile distortion is possible.

If you program the diameter, please note that you use the outer diameter of the pipe.

Specific for sensors

- *Be careful when locking the rail back onto the mounting units as your fingers may get stuck between rail and pipe it is mounted on. This may cause injury.*
- *Be careful when mounting the fixation units using the metal strap. The edge of the strap may cause injury.*

- *Do not bend the metal mounting strap. This may cause improper mounting of the fixation units of the sensor rails.*
- *Protect the pipe contact side of the transducer. Scratches or other damages may have a negative impact on its proper functioning.*
- *Before fitting the transducer to the transducer knob in the sensor rail, check the connection groove of the transducer cover for damages or dirt. Clean or replace when dirty or damaged.*
- *Check sensor cabling at regular intervals for damages and wear, as this may cause improper functioning. Replace when necessary.*
- *Check the sensor rail sliding area regularly for dirt or other pollution or excess coupling fat, that may cause improper functioning.*

- *Check the presence of sufficient grease on the transducer pipe contact side in case of acoustic signal failure.*
- *Excess of coupling fat may be removed from the sensor rails and transducers with a dry piece of cloth. Coupling fat on the converter housing may be removed using soapy water.*

The device should be protected from corrosive chemicals or gases and dust/particles accumulation.

3.5 Installation conditions

3.5.1 Inlet, outlet and recommended mounting area

To perform an accurate flow measurement preferably mount the sensor rail at least 10 DN downstream of a flow disturbance like elbow, valve, header or pump. Please follow the installation recommendations in the next installation position examples.

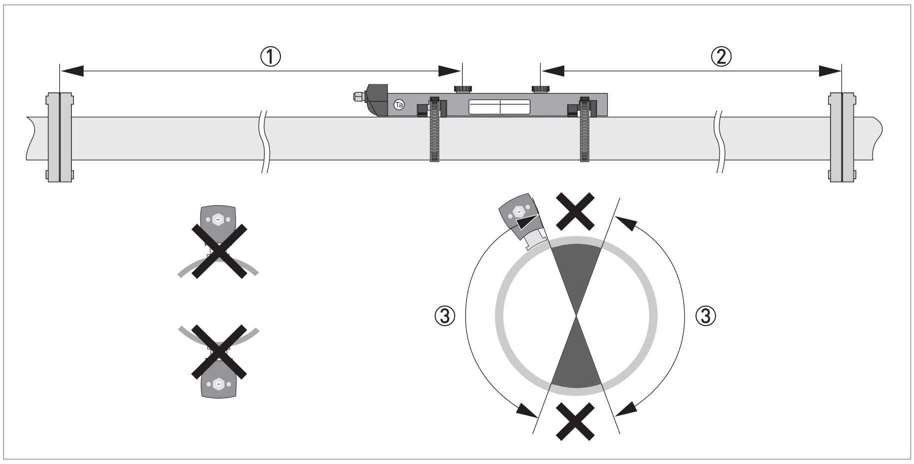

Figure 3-1: Inlet, outlet and recommended mounting area

① ≥ 10 DN
② ≥ 5 DN
③ OK, 120°

Note: especially for XT (eXtended Temperature) versions:

- *Always install the sensor at a non-insulated part of the pipe. Remove any insulation if necessary!*
- *After installation, the sensor can be completely insulated. The sensor cable must be kept away from the hot pipe surface.*
- *Always wear protective gloves.*

3.6 Long horizontal pipes

- Install on slightly ascending pipe section.
- If not possible, ensure adequate velocity to prevent air, gas or vapour from collecting in the upper part.
- In partially filled pipes, the clamp-on flowmeter will report incorrect or no flow rates.

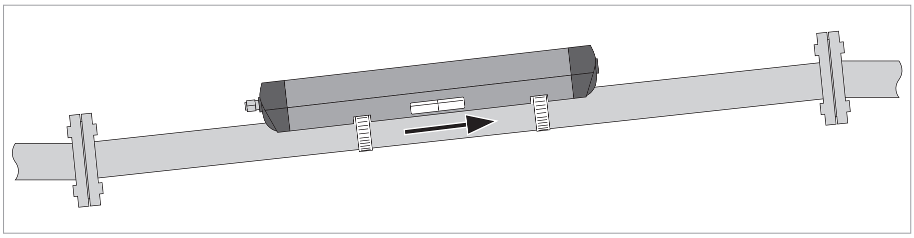

Figure 3-2: Long horizontal pipes

3.7 Bends in 2 or 3 dimensions

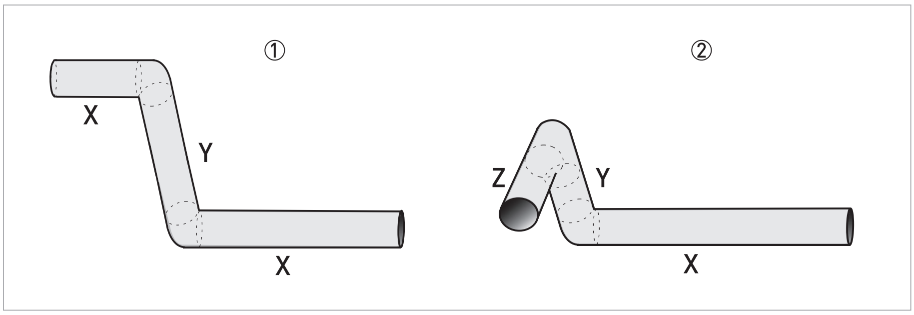

Figure 3-3: 2 and/or 3 dimensional bends upstream of the flowmeter

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

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).*

3.8 T-section

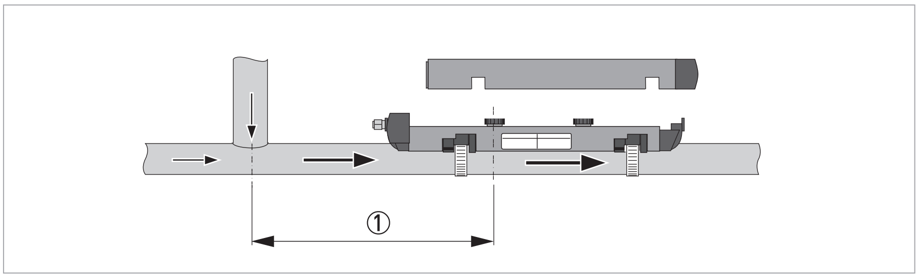

Figure 3-4: Distance behind a T-section

① ≥ 20 DN

3.9 Bends

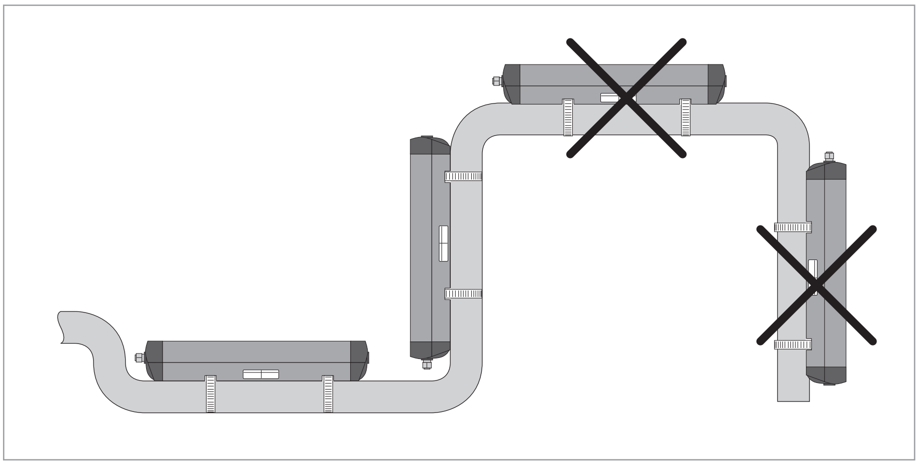

Figure 3-5: Installation in bending pipes

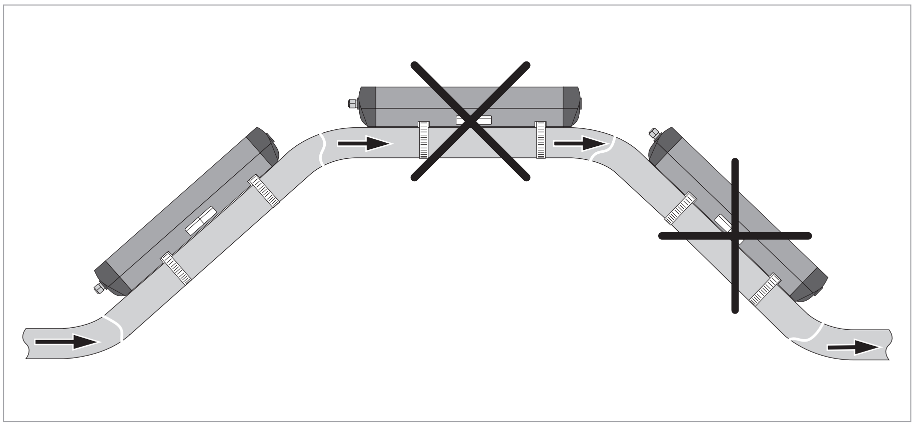

Figure 3-6: Installation in bending pipes

3.10 Open feed or discharge

Install the meter on a lowered section of the pipe to ensure a full pipe condition through the meter.

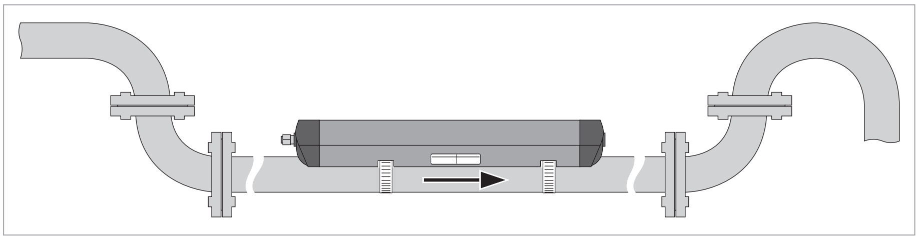

Figure 3-7: Open feed or discharge

3.11 Position of pump

Never install the flowmeter at a pump suction side in order to avoid cavitation or flashing in the flowmeter.

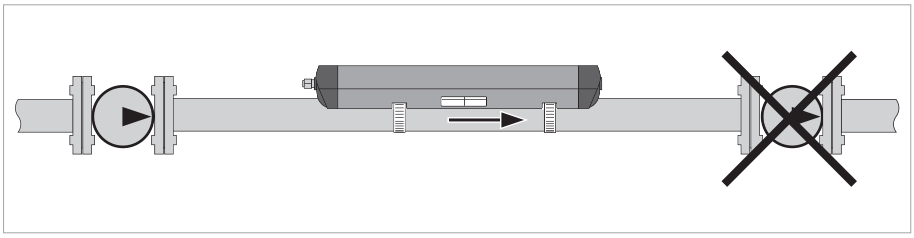

Figure 3-8: Position of pump

3.12 Position of control valve

Always install control valves downstream of the flowmeter in order to avoid cavitation or distortion of the flow profile.

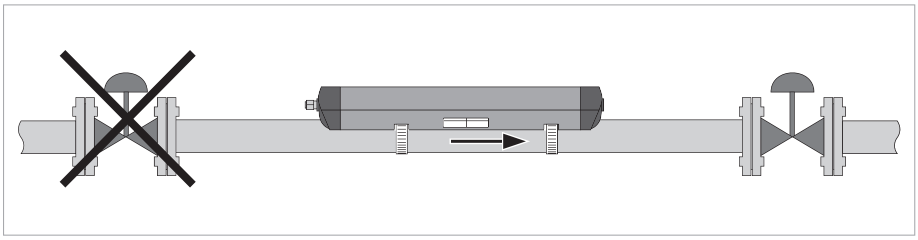

Figure 3-9: Position of control valve

3.13 Pipe diameters and sensor construction

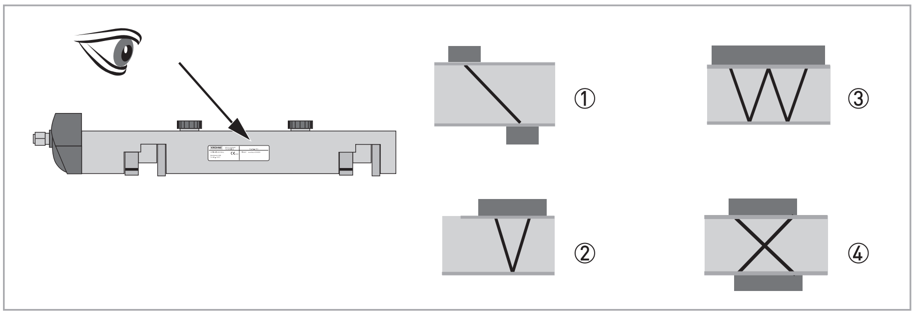

Figure 3-10: Measuring modes

① Z-mode
② V-mode
③ W-mode
④ X-mode

Overview version and measuring modes

Rail version	Diameter range	Preferred measuring modes	Possible measuring modes
Small	DN15...100 / 0.5...4"	< DN25: W-mode (4 traverses)	Small: V mode
		≥ DN25: V-mode (2 traverses)	
Medium	DN50...400 / 2...16"	V-mode (2 traverses)	
	DN200...1250 / 8...50"	X-mode (2 x 1 traverses)	
Large	DN200...4000 / 8...160"	Z-mode (1 traverse)	Large: V mode (2 traverses)

Table 3-1: Version and preferred measuring mode

3.14 Installation instructions for X mode configuration

The X mode measurement version of the unit is setup in a 2 path configuration, with a crossed wire connection of 2 sensors.

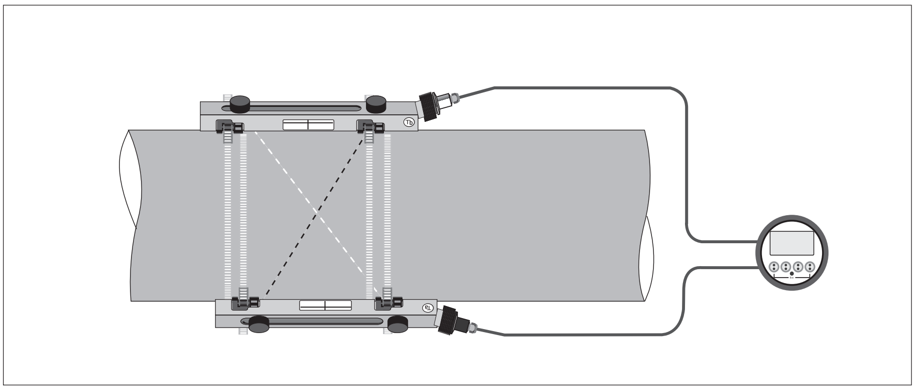

Figure 3-11: X beam configuration of medium version

Install the sensors according to the above image. Make sure that the two rails are installed exactly on opposite sides of the pipe.Check the OPTISONIC 6300 manual for detailed information. Connect the sensors according to the following instruction:

Sensor Ta

- Blue cable: U1
- Green cable: D2

Sensor Tb

- Blue cable: U2
- Green cable: D1

Set up

Programming of the sensor setup (transducer 1 settings) in the installation menu X :

- Set menu item X4.2 = number of paths → 2
- Set menu item X7.3 = number of traverses → change to 1 traverse
- Set menu item X7.4 = transducer distance →
  the exact distance between up transducer of Ta to the down transducer of Tb
- Repeat the process for transducer 2

3.15 Installation for energy measurement

The combination of the measured flow rate and a temperature difference over a heat/cold producer/consumer can be used to determine the amount of energy used by that device. The temperature difference can be measured with temperature transmitters, connected to the signal converter. In this case, the temperature difference is determined by measuring the temperature before and after the heat/cold producer/consumer.

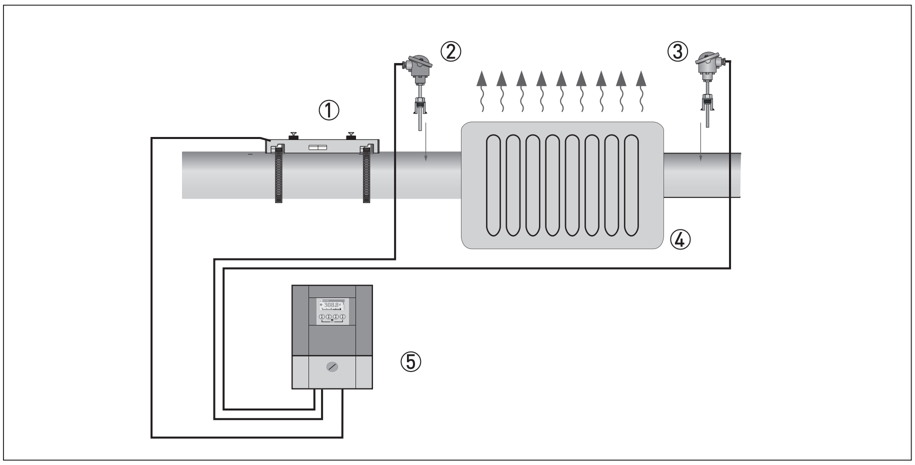

Figure 3-12: Energy measurement of heat/cold producer/consumer

① Mounted rail (in any measuring mode)
② PT 100 temperature sensor with 4-20 mA transmitter, upstream of the heat/cold producer/consumer
③ PT 100 temperature sensor with 4-20 mA transmitter, downstream of the heat/cold producer/consumer
④ Radiator
⑤ Converter

Please find more detailed information in the OPTISONIC 6300 manual.

3.16 Mounting the field housing, remote version

Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.

3.16.1 Pipe mounting

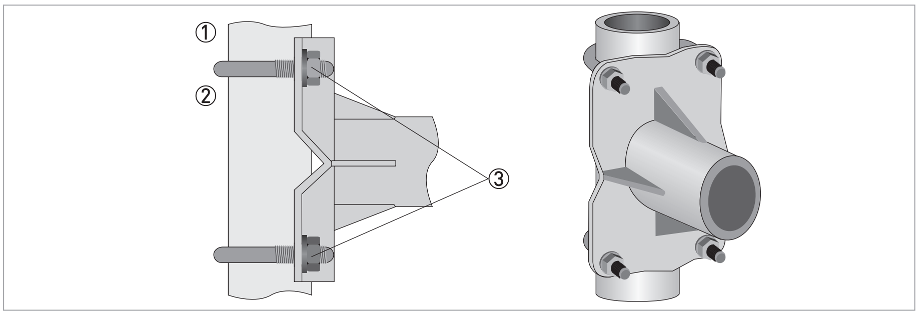

Figure 3-13: Pipe mounting of the field housing

① Fix the signal converter to the pipe.
② Fasten the signal converter using standard U-bolts and washers.
③ Tighten the nuts.

3.16.2 Wall mounting

Mounting the field version (F) on the wall

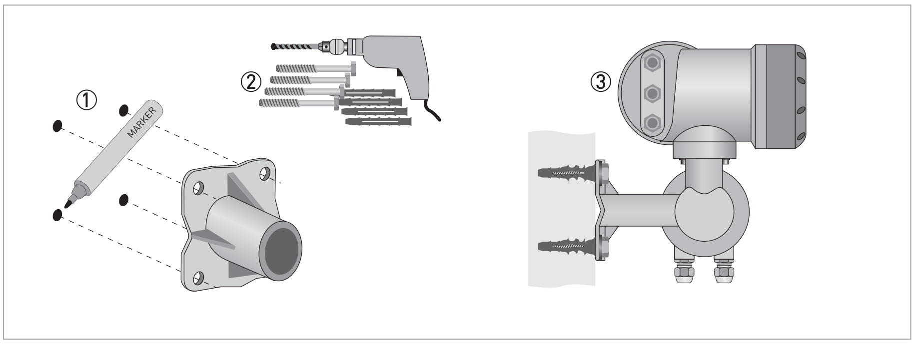

Figure 3-14: Wall mounting of the field housing

① Prepare the holes with the aid of the mounting plate.
further information refer to *Mounting plate of field housing* on page 25.
② Use the mounting material and tools in compliance with the applicable occupational health and safety directives.
③ Fasten the housing securely to the wall.
④ Screw the signal converter to the mounting plate with the nuts and washers.

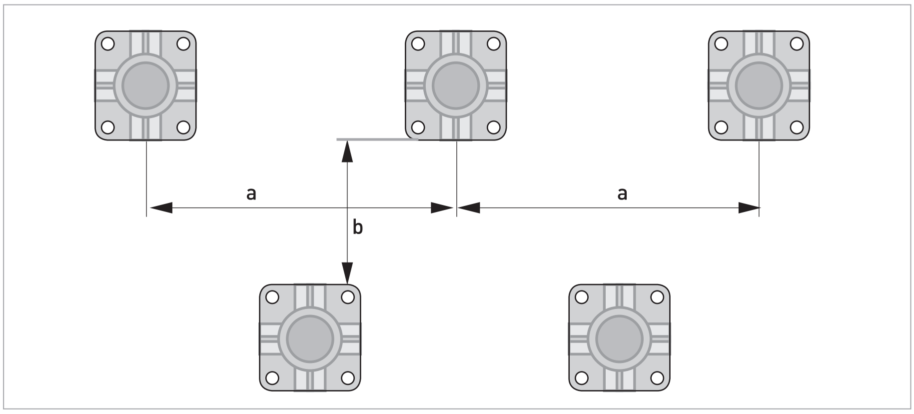

Figure 3-15: Mounting multiple devices next to each other

a ≥ 600 mm / 23.6"
b ≥ 250 mm / 9.8"

Mounting the wall version (W)

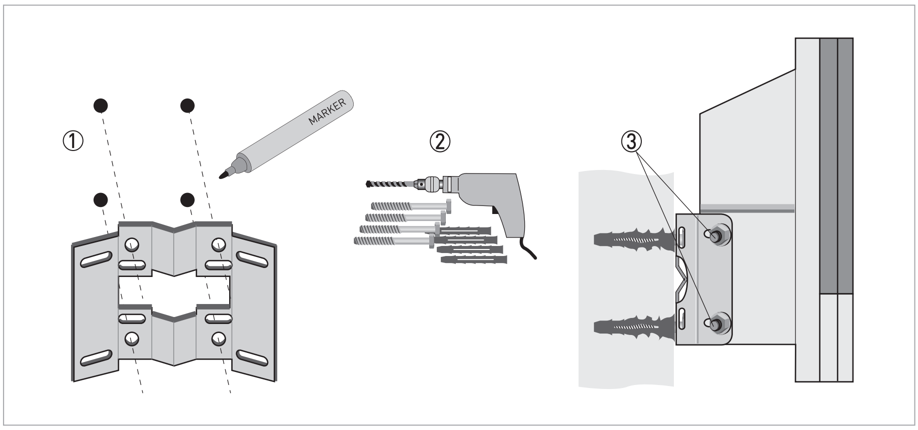

Figure 3-16: Wall mounting of the wall-mounted housing

① Prepare the holes with the aid of the mounting plate. For further information refer to *Mounting plate of wall-mounted housing* on page 25.
② Fasten the mounting plate securely to the wall.
③ Screw the signal converter to the mounting plate with the nuts and washers.

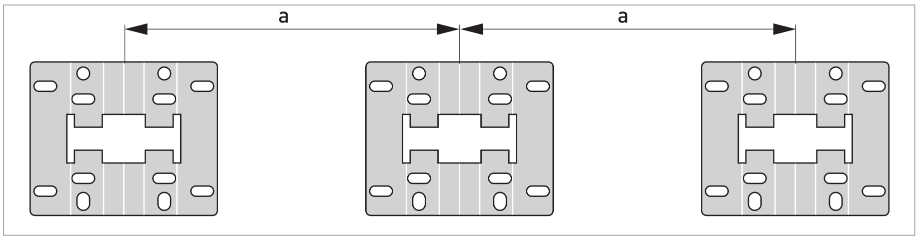

Figure 3-17: Mounting multiple devices next to each other

a ≥ 240 mm / 9.4"

3.16.3 Turning the display of the field housing version

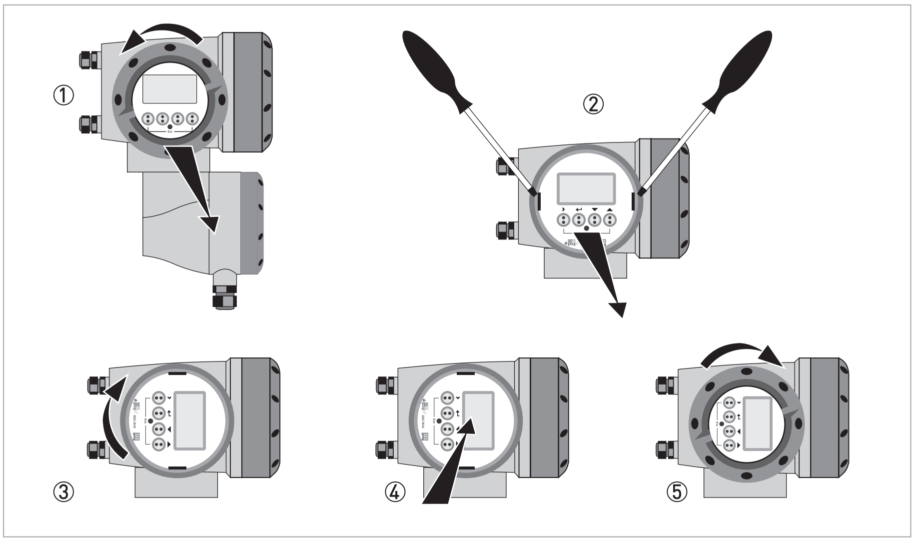

Figure 3-18: Turning the display of the field housing version

The display of the field housing version can be turned in 90° increments

① Unscrew the cover from the display and operation control unit.
② Using a suitable tool, pull out the two metal puller devices to the left and right of the display.
③ Pull out the display between the two metal puller devices and rotate it to the required position.
④ Slide the display and then the metal puller devices back into the housing.
⑤ Re-fit the cover and tighten it by hand.

The ribbon cable of the display must not be folded or twisted repeatedly.

Each time a housing cover is opened, the thread should be cleaned and greased. Use only resin-free and acid-free grease.
Ensure that the housing gasket is properly fitted, clean and undamaged.

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 Electrical connections signal converter

The connection of the flow sensor(s) to the signal converter depends on the version of the converter ordered.

Field version

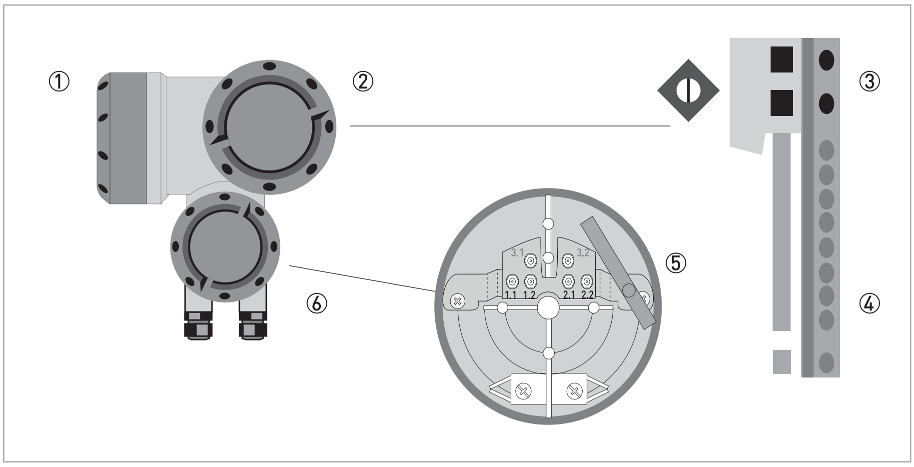

Figure 4-1: Construction of field version

① Cover, electronics compartment
② Cover, terminal compartment for power supply and inputs/outputs
③ Connectors for power
④ Connectors for inputs/outputs
⑤ Connectors for sensor cable
⑥ Cover, sensor terminal compartment

Wall version

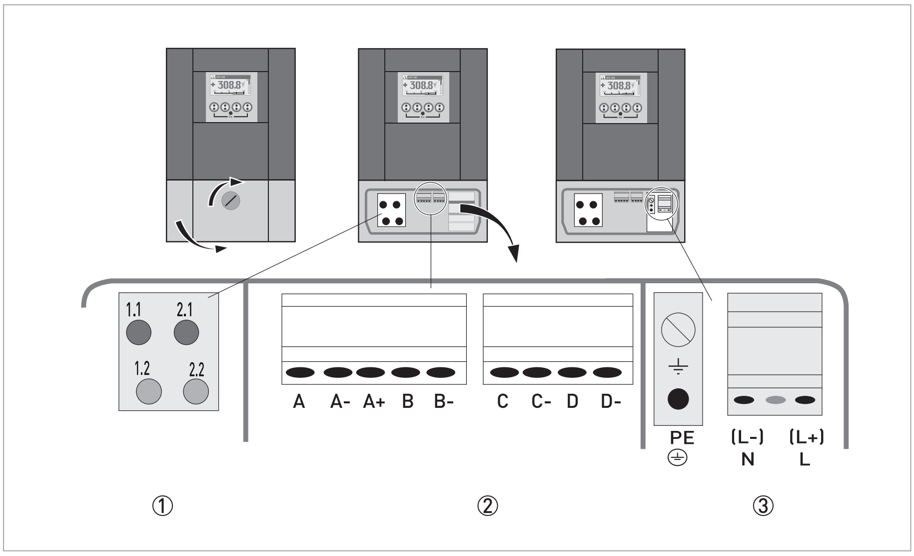

Figure 4-2: Construction of wall version

① Signal cable for sensors
② Communication I/O
③ Power supply: 24 VAC/DC or 100...230 VAC

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4.3 Power supply

If 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 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).

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

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

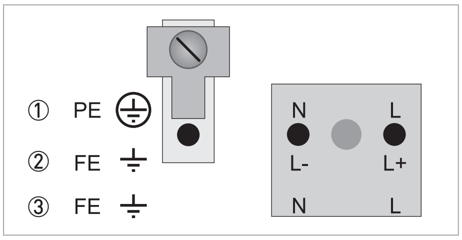

Figure 4-3: Power supply connection

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

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

100...230 VAC (tolerance range: -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 ranges: 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) (acc. to VDE 0100 / VDE 0106 and/or IEC 60364 / IEC 61140 or relevant national regulations).

For 24 VDC, 12 VDC-10% is included in the tolerance range.

4.3.1 Laying electrical cables correctly

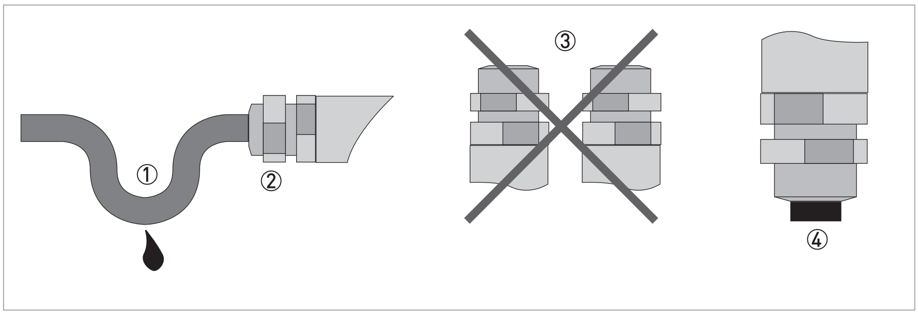

Figure 4-4: Protect housing from dust and water

① Lay the cable in a loop just before the housing.
② Tighten the screw connection of the cable entry securely.
③ Never mount the housing with the cable entries facing upwards.
④ Seal cable entries that are not needed with a plug.

4.3.2 Signal converter power supply connections

Field version

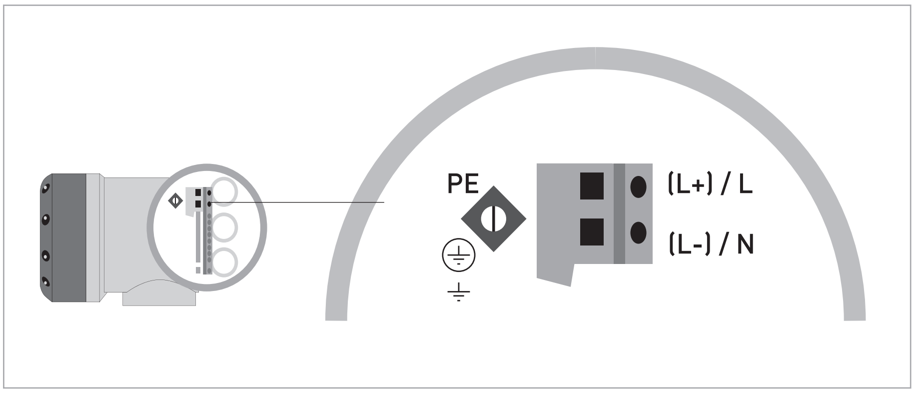

Figure 4-5: Signal converter field version, power supply connections

Wall version

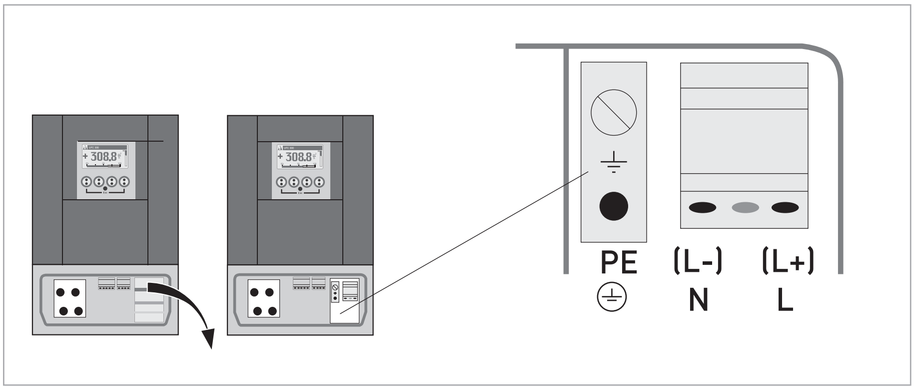

Figure 4-6: Signal converter wall version, power supply

4.4 Signal cable to flow sensor

The special EMC gland is mounted (hand tight) already on the signal cable and has to be fastened correctly after connecting both the coax signal cables and securing the cap on the flow sensor. Draw back the cable carefully and finish with tightening the EMC gland with a proper wrench.

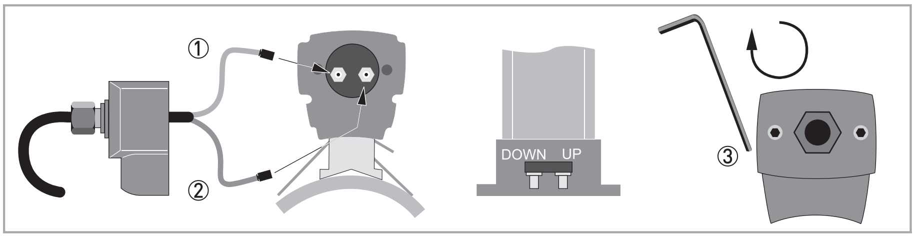

Figure 4-7: Connecting the signal cable to the rail (small and medium version)

① Connect the green cable to "DOWN"
② Connect the blue cable to "UP"
③ Turn the screws clockwise to secure the cap

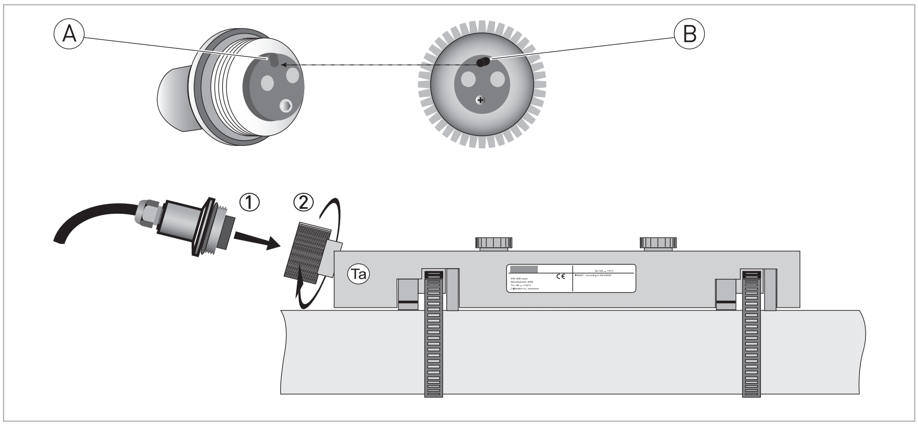

Figure 4-8: Connect the signal cable in case of stainless steel / XT version.

① Put in the connector
② Turn knob to secure the connector
A = positioning notch in connector (female) on cable
B = positioning cam in connector (male) on sensor device

When attaching the connector, make sure that the cam (B) is positioned correctly and fits into notch (A).

For XT versions: check if the signal cable is heat protected with the protection sleeve of 1 meter / 40".

The signal cable delivered with the device has to be connected correctly with a minimum bending radius of 100 mm / 4".

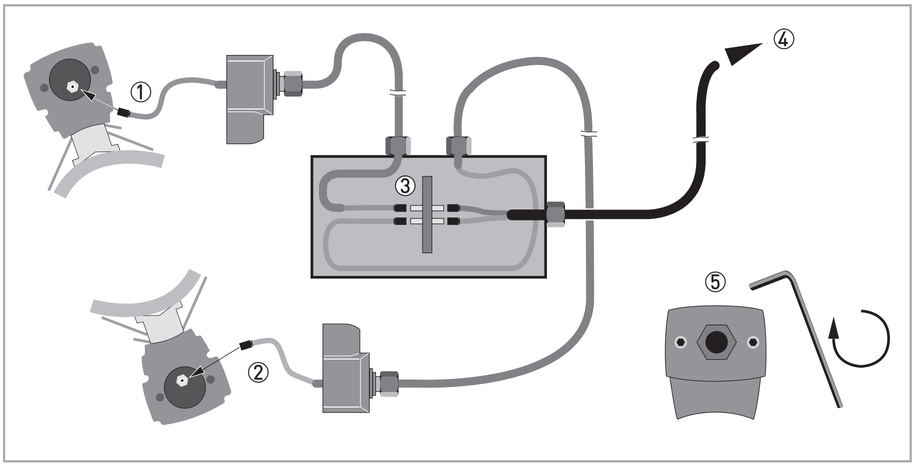

Figure 4-9: Connections in cable box (large version)

① Connect the blue cable to the UP rail
② Connect the green cable to the DOWN rail
③ Make connections in cable box
④ Cable to converter
⑤ Turn the screws clockwise to secure the caps

When installing the EMC gland, make sure that the shield of the cable has a good contact with the internal metalised insert of the EMC gland.

4.4.1 Signal cable to converter

The flow sensor is connected to the signal converter via one signal cable, with (labelled) inner coax cables for the connection of the acoustic paths.

Connect the cable to the connector with similar numeral marking.

Field version

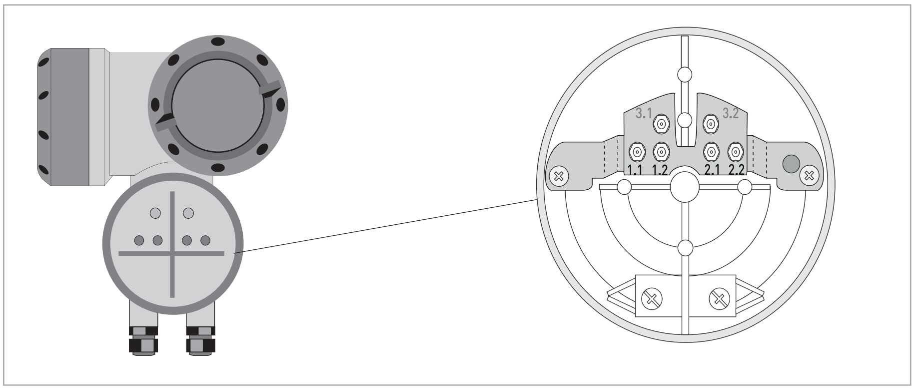

Figure 4-10: Connect signal cable

Construction of console (F-version)

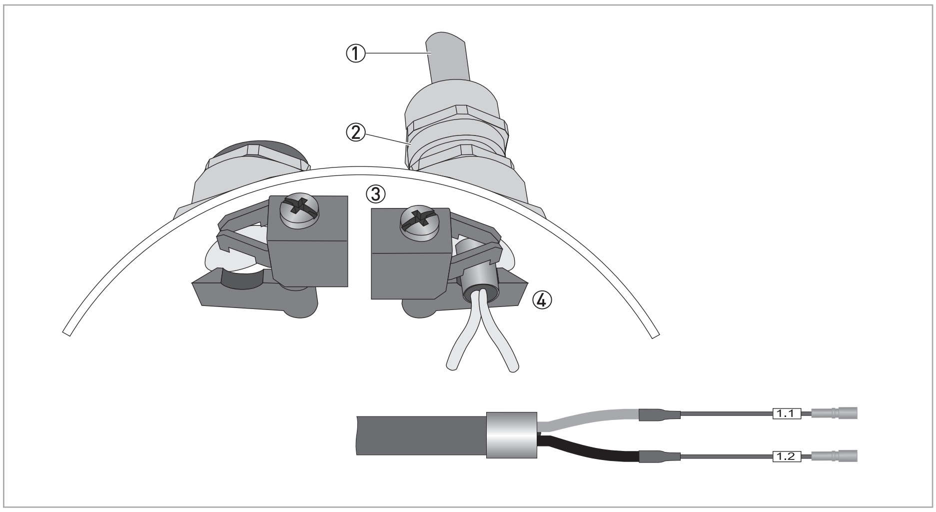

Figure 4-11: Inserting cable and secure with clamp on shielding bush

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

Re-connecting of the coax connectors is limited. Make sure that the male connector on the coax cable, is always put straight on the female connector in the connection terminal of the unit. Excessive dis- / re-connection and/or positioning the connectors skewed to each other will damage the inside clips of the connectors. This results in an improper contact and measurement errors.

Cable insert and usage connector tool

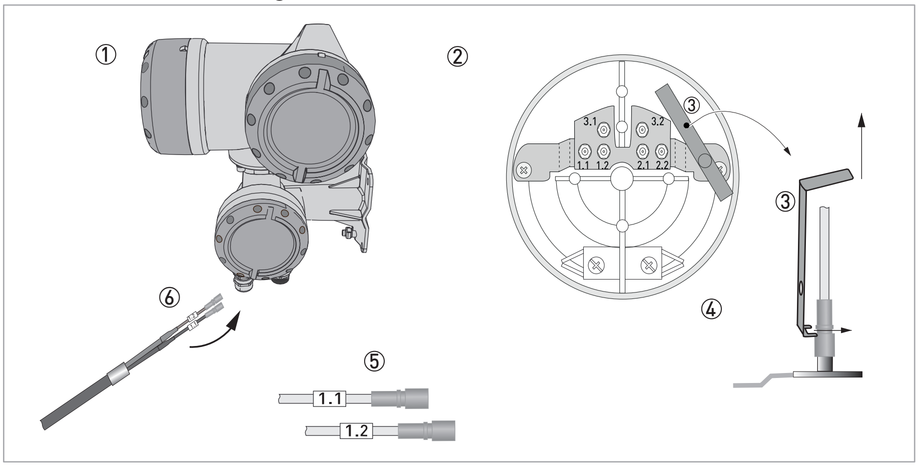

Figure 4-12: Construction of field version

① Signal converter
② open connection terminal
③ Tool for releasing connectors
④ How to use the release tool
⑤ Marking on the cables
⑥ Insert cable(s) into connection terminal

Construction of console (W-version)

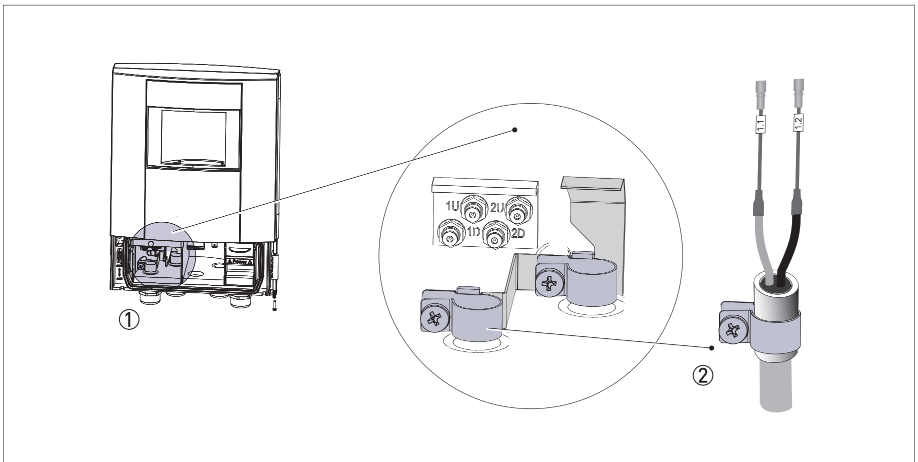

Figure 4-13: Inserting cable and secure with clamp on shielding bush

① Connection compartiment sensor cable(s)
② Grounding clamp with metal shielding bush of sensor cable

Wall version

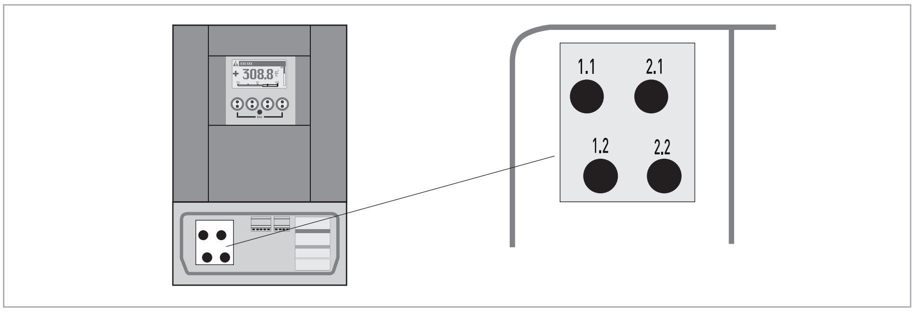

Figure 4-14: Connect signal cable

4.5 Modular inputs/outputs connections

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

For frequencies above 100 Hz, shielded cables are to be used in order to reduce effects from electrical interferences (EMC).

Observe connection polarity.

Field version

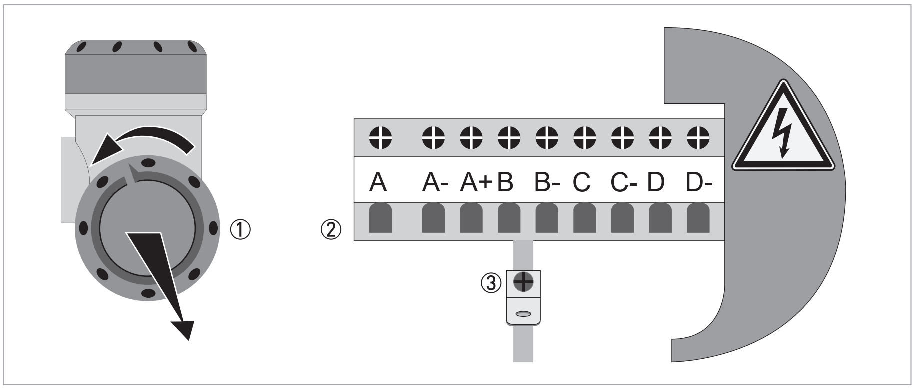

Figure 4-15: Terminal compartment for inputs and outputs of the field housing

Each time a housing cover is opened, the thread should be cleaned and greased. Use only resin-free and acid-free grease.
Ensure that the housing gasket is properly fitted, clean and undamaged.

- Open the housing cover ① and remove.
- Push the prepared cable through the cable entry and connect the necessary conductors ②.
- Connect the shield if necessary ③.

Wall version

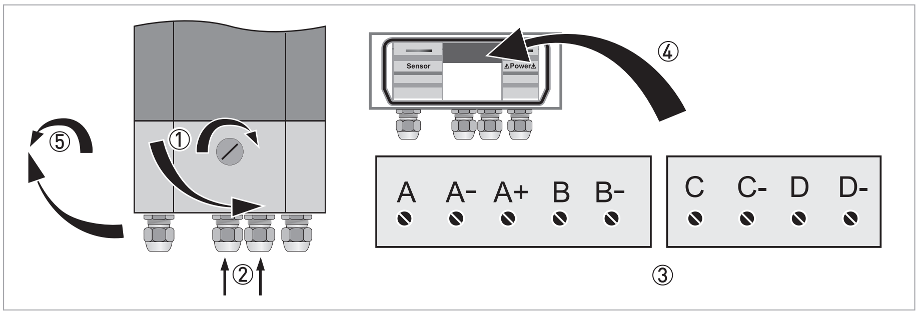

Figure 4-16: Terminal compartment for inputs and outputs of the wall-mounted housing

- Open the lock of the housing cover ① with screw driver (clockwise).
- Open bottom cover (terminal compartment).
- Push the prepared cable through the cable entry ② and connect the necessary conductors ③.
- Connect the shield if necessary ④.
- Close the cover of the terminal compartment.
- Lock ⑤ the housing cover with screw driver (counter clockwise).

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

This signal converter is available with the 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.

Modular version

- Depending on the task, the device can be configured with various output modules.

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 separate documentation.

Ex option

- For hazardous areas, all of the input/output variants with terminal compartment in the Ex d (pressure-resistant casing) or Ex e (increased safety) versions can be delivered.
- Please refer to the separate instructions for connection and operation of the Ex-devices.

4.5.2 Description of the CG-number

CG 3_ _ _ _ _ _ _
① ② ③ ④ ⑤ ⑥ ⑦

Figure 4-17: Marking (CG number) of the electronics module and input/output variants

① ID number:7
② ID number: 0 = standard
③ Power supply option / measuring sensor 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.

Examples for CG number

CG 370 x1 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 370 x1 7FK	100...230 VAC & standard display; modular I/O: I_a & P_N/S_N and optional module P_N/S_N & C_N

Description of abbreviations and CG identifier for possible optional modules on terminals A and B

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 acc. 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 acc. to NAMUR EN 60947-5-6. Errors indicated on LC display. Error messages possible via status output.
IIn_a	P	Active current input
IIn_p	R	Passive current input
2 x IIn_a	5	Two active current inputs (for Ex i I/O)
-	8	No additional module installed
-	0	No further module possible

4.5.3 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)

CG no.	A+	A	A-	B	B-	C	C-	D	D-
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)

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

- The grey boxes in the tables denote unassigned or unused connection terminals.
- Connection terminal A+ is only operable in the basic input/output version.

4.5.4 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)

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

Modbus (option)

CG no.	A+	A	A-	B	B-	C	C-	D	D-
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 representive. 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:	
Fluid:	
Flowrate	
Normal:	
Minimum:	
Maximum:	
Temperature	
Normal:	
Minimum:	
Maximum:	
Viscosity	
Normal:	
Maximum:	
Continuous / pulsating flow. Description:	
Entrained air percentage (volume):	
Entrained solids percentage (volume):	
Emulsion present (e.g. oil / water):	
Emulsion percentage product A:	
Emulsion percentage product B:	

Piping details

Nominal pipe size:	
Outer diameter:	
Wall thickness / schedule:	
Pipe material:	
Pipe condition (old / new / painted / internal scaling / exterior rust):	
Liner material:	
Liner thickness:	
Straight inlet / outlet section (DN):	
Upstream situation (elbows, valves, pumps):	
Flow orientation (vertical up / horizontal / vertical down / other):	

Environment details

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

Hardware requirements:

Accuracy requested (percentage of rate):	
Power supply (voltage, AC / DC):	
Analog 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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