IFC 300 | Technical Datasheet

Signal converter for electromagnetic flowmeters

- Diagnostics: Process and device diagnostics, accuracy check
- One signal converter for all applications
- Exceeds requirements of VDI / VDE 2650 and NAMUR NE 107

The documentation is only complete when used in combination with the relevant documentation for the sensor.

KROHNE

CONTENTS

1.1 The signal converter with the highest performance

The electromagnetic signal converter **IFC 300** is designed to measure the flow velocity, conductivity, volume and mass flow of electrically conductive liquid media.

The signal converter can be combined with any measuring sensor, making it very widely used. In terms of available housing versions, there is a compact variant, in which the signal converter is connected to the measuring sensor, as well as the field, wall-mounted and 19" rack-mounted housing.

The electronics plug-in module is identical, regardless of the housing version, providing the same functionality and a standardized operating concept.

(signal converter in compact housing)

① Communication with any third party system possible via Foundation Fieldbus, Profibus PA/DP or Modbus
② Intuitive navigation and a wide variety of languages integrated as standard for ease of operation
③ Supply voltage: 100...230 VAC (standard) and 24 VDC or 24 VAC/DC (optional)

(signal converter in wall-mounted housing)

① Large backlit graphic display with 4 optical buttons to operate the signal converter without having to open the housing
② Any combination of up to 4 inputs and outputs is possible

Highlights

- High measuring accuracy and long-term stability : ±0.15% of measured value ± 1 mm/s
- Optimal zero point stability independent from product properties
- Superior process reliability thanks to standard integrated diagnostics: testing of device functions, check for compliance with specifications and application testing
- Available inputs and outputs: Current output (incl. HART®), pulse/frequency output, status output, control input and current input
- Suitable for both partially filled and fully filled pipelines
- Approved for custody transfer according to OIML R 49 and R 117-1, MI-001 and MI-005 (optional)
- Integrated temperature and conductivity measurement
- Optionally available virtual reference offers cost savings and increased process reliability as grounding electrodes and rings are no longer needed
- One converter for all applications, and thus advantages with regard to procurement, engineering and stock-keeping

Industries

- Water & Wastewater
- Chemicals
- Food & Beverage
- Minerals & Mining
- Pharmaceuticals
- Power plants
- Pulp & Paper

Applications

Flow measurement of conductive liquids, acids and bases right down to difficult applications such as:

- Products with low conductivity, high solid content or entrained air
- Inhomogeneous, abrasive and corrosive products
- Rapid product change
- Sudden change in pH value
- Pulsating or turbulent flows

1.2 Options and variants

Modular converter concept

The electromagnetic signal converter IFC 300 comes in different variants and gives the highest performance for all applications you can think of. From networking in the water & wastewater industry to blending in the chemical industry, from batching in the food & beverage industry to transport in the paper & pulp industry.

And not to forget all of the other applications where the flow of electrically conductive liquids is to be measured. The different versions of the signal converter and measuring sensor can be put together in modules and adapted to a wide variety of applications.

(signal converter in compact housing)

One signal converter for any application

The basic variant covers over 90% of all applications, featuring a current output with HART$^®$, pulse/frequency output, status output and control input.

In the modular input/output variant, up to four inputs and outputs an be combined in almost any way. You can also select whether they are passive or active inputs/outputs.
All inputs and outputs are galvanically isolated from each other and from the rest of the electronic equipment.

In addition, the electronics can be equipped with Fieldbus functionality (i.e. Foundation Fieldbus, Profibus PA/DP, Modbus, etc.) enabling communication to any third party system.

(signal converter in field housing)

Remote design in various versions

(signal converter in wall-mounted housing)

The signal converter in the wall-mounted housing is generally used when it is difficult to access the measuring point or when ambient conditions do not allow the use of the compact version.

(signal converter in 19" rack-mounted housing (28 TE))

The signal converter in the 19" rack-mounted housing is typically built into the central control room, away from the harsh ambient conditions that can be present at the measuring point.

(signal converter in 19" rack-mounted housing (21 TE))

Diagnostics

A part of the standard functionality is the comprehensive diagnosis, which consists of three different testing series.

Testing the device function
Checking the microcontroller, memory and outputs.

Out-of-spec diagnosis
Online and cyclical verification to determine whether the measuring device is still within its specifications regarding accuracy and linearity.

Application testing
The detection of potential problems such as gas bubbles, electrode deposits, low conductivity, liner damage, faulty flow profile etc.

1.3 Signal converter / measuring sensor combination possibilities

Measuring sensor	Measuring sensor + signal converter IFC 300			
	Compact	Remote field housing	Remote wall-mounted housing	Remote rack-mounted housing R (28 TE) or (21 TE)
OPTIFLUX 1000	OPTIFLUX 1300 C	OPTIFLUX 1300 F	OPTIFLUX 1300 W	OPTIFLUX 1300 R
OPTIFLUX 2000	OPTIFLUX 2300 C	OPTIFLUX 2300 F	OPTIFLUX 2300 W	OPTIFLUX 2300 R
OPTIFLUX 4000	OPTIFLUX 4300 C	OPTIFLUX 4300 F	OPTIFLUX 4300 W	OPTIFLUX 4300 R
OPTIFLUX 5000	OPTIFLUX 5300 C	OPTIFLUX 5300 F	OPTIFLUX 5300 W	OPTIFLUX 5300 R
OPTIFLUX 6000	OPTIFLUX 6300 C	OPTIFLUX 6300 F	OPTIFLUX 6300 W	OPTIFLUX 6300 R
OPTIFLUX 7000	OPTIFLUX 7300 C	-	-	-
WATERFLUX 3000	WATERFLUX 3300 C	WATERFLUX 3300 F	WATERFLUX 3300 W	WATERFLUX 3300 R
TIDALFLUX 4000	-	TIDALFLUX 4300 F	-	-

1.4 Measuring principle

An electrically conductive fluid flows inside an electrically insulated pipe through a magnetic field. This magnetic field is generated by a current, flowing through a pair of field coils. Inside of the fluid, a voltage U is generated:

U = v * k * B * D

in which:
v = mean flow velocity
k = factor correcting for geometry
B = magnetic field strength
D = inner diameter of flow meter

The signal voltage U is picked off by electrodes and is proportional to the mean flow velocity v and thus the flow rate q. A signal converter is used to amplify the signal voltage, filter it and convert it into signals for totalising, recording and output processing.
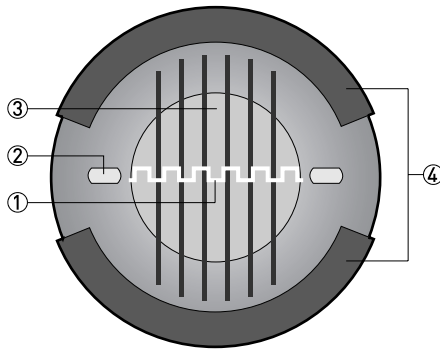
① Induced voltage (proportional to flow velocity)
② Electrodes
③ Magnetic field
④ Field coils

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 representative.*
- *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	Faraday's law of induction
Application range	Continuous measurement of current volume flow, flow velocity, conductivity, mass flow (at constant density), coil temperature of the measuring sensor

Design

Modular design	The measuring system consists of a measuring sensor and a signal converter.
Measuring sensor	
OPTIFLUX 1000	DN10...150 / 3/8...6"
OPTIFLUX 2000	DN25...3000 / 1...120"
OPTIFLUX 4000	DN2.5...3000 / 1/10...120"
OPTIFLUX 5000	Flange: DN15...300 / ½...12" Sandwich: DN2.5...100 / 1/10...4"
OPTIFLUX 6000	DN2.5...150 / 1/10...6"
OPTIFLUX 7000	Flange: DN25...100 / 1...4" Sandwich: DN25...100 / 1...4"
	This capacitive flowmeter is only available as compact version (OPTIFLUX 7300 C).
WATERFLUX 3000	DN25...600 / 1...24"
TIDALFLUX 4000	DN200...1600 / 8...64"
	This sensor for measurements in partly filled pipelines is only available as a remote field housing version (TIDALFLUX 4300 F).
	With the exception of the OPTIFLUX 1000, TIDALFLUX 4000 and WATERFLUX 3000 all measuring sensors are also available as Ex versions.
Signal converter	
Compact version (C)	OPTIFLUX x300 C (x = 1, 2, 4, 5, 6, 7) or WATERFLUX 3300 C
Field housing (F) - remote version	IFC 300 F
Wall-mounted housing (W) - remote version	IFC 300 W
	Compact and field housing versions are also available as Ex versions.
19" rack-mounted housing (R) - remote version	IFC 300 R

Options	
Outputs / inputs	Current (incl. HART®), pulse, frequency and/or status output, limit switch and/or control input or current input (depending on the I/O version)
Totalizer	2 (optional 3) internal counters with a max. of 8 counter places (e.g. for counting volume and/or mass units)
Verification	Integrated verification, diagnostic functions: measuring device, process, measured value, empty pipe detection, stabilization
Communication interfaces	Foundation Fieldbus, Profibus PA and DP, Modbus, HART®
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 keys for operator control of the signal converter without opening the housing.
	Infrared interface for reading and writing all parameters with IR interface (option) without opening the housing.
Remote control	PACTware® (incl. 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 display texts (as language package)	Standard: English, French, German, Dutch, Portuguese, Swedish, Spanish, Italian
	Eastern Europe: English, Slovenian, Czech, Hungarian
	Northern Europe: English, Danish, Polish
	China: English, German, Chinese
	Russia: English, German, Russian
Units	Metric, British and US units selectable as required from lists for volume / mass flow and counting, flow velocity, electrical conductivity, temperature, pressure

Measuring accuracy

Reference conditions	Depending on the measuring sensor version.
	Refer to technical data for the measuring sensor.
Maximum measuring error	±0.15% of the measured value ±1 mm/s, depending on the measuring sensor
	For detailed information and accuracy curves, refer to chapter "Accuracy".
	Current output electronics: ±5 µA
Repeatability	±0.06% acc. to OIML R117; Not valid for WATERFLUX 3000, OPTIFLUX 7000 and TIDALFLUX 4000

Operating conditions

Temperature	
Process temperature	Refer to technical data for the measuring sensor.
Ambient temperature	Depending on the version and combination of outputs.
	It is a good idea to protect the converter from external heat sources such as direct sunlight as higher temperatures reduce the life cycle of all electronic components.
	-40…+65°C / -40…+149°F
	Ambient temperatures below -25°C / -13°F, may affect the readability of the display.
Storage temperature	-50…+70°C / -58…+158°F
Pressure	
Medium	Refer to technical data for the measuring sensor.
Ambient pressure	Atmosphere: Height up to 2000 m / 6561.7 ft
Chemical properties	
Electrical conductivity	**Standard** All media except for water: ≥ 1 µS/cm (also refer to the technical data for the measuring sensor) Water: ≥ 20 µS/cm
	TIDALFLUX 4000 All media: ≥ 50 µS/cm (also refer to the technical data for the measuring sensor)
	OPTIFLUX 7000 All media except for water: ≥ 0.05 µS/cm (also refer to the technical data for the measuring sensor) Water: ≥ 1 µS/cm
Physical condition	Conductive, liquid media
Solid content (volume)	Can be used up to ≤ 70% for OPTIFLUX and TIDALFLUX measuring sensors
	The greater the solid content, the less accurate the measurements!
Gas content (volume)	Can be used up to ≤ 5% for OPTIFLUX and TIDALFLUX measuring sensors
	The greater the gas content, the less accurate the measurements!
Flow	For detailed information, refer to chapter "Flow tables".
Other conditions	
Protection category acc. to IEC 529 / EN 60529	C (compact version) & F (field housing): IP66/67 (acc. to NEMA 4/4X/6)
	W (wall-mounted housing): IP65/66 (acc. to NEMA 4/4X)
	R (19" rack-mounted housing (28 TE) or (21 TE)): IP20 (acc. to NEMA 1); Use: Indoor only, level of pollution 2 and relative humidity < 75%

Installation conditions

Installation	For detailed information, refer to chapter "Installation conditions".
Inlet/outlet runs	Refer to technical data for the measuring sensor.
Dimensions and weights	For detailed information refer to chapter "Dimensions and weights".

Materials

Signal converter housing	**Standard**
	Version C and F: die-cast aluminium (polyurethane coated)
	Version W: polyamide - polycarbonate
	Version R (28 TE): Aluminium, stainless steel and aluminium sheet, partially polyester-coated
	Version R (21 TE): Aluminium and aluminium sheet, partially polyester-coated
	Option
	Versions C and F: Stainless steel 316 L (1.4408)
Measuring sensor	For housing materials, process connections, liners, grounding electrodes and gaskets, refer to technical data for the measuring sensor.

Electrical connection

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 regulations.
Power supply	Standard: 100…230 VAC (-15% / +10%), 50/60 Hz 240 VAC + 5% is included in the tolerance range.
	Option 1: 12...24 VDC (-55% / +30%) 12 VDC - 10% is included in the tolerance range.
	Option 2: 24 VAC/DC (AC: -15% / +10%, 50/60 Hz; DC: -25% / +30%) 12 V is **not** included in the tolerance range.
Power consumption	AC: 22 VA
	DC: 12 W
Signal cable	Only for remote versions.
	DS 300 (type A) Max. length: 600 m / 1968 ft (depending on electrical conductivity and measuring sensor version)
	BTS 300 (type B) Max. length: 600 m / 1968 ft (depending on electrical conductivity and measuring sensor version)
	Type LIYCY (only FM, Class 1 Div. 2) Max. length: 100 m / 328 ft (depending on electrical conductivity and measuring sensor version)
Interface cable (only TIDALFLUX)	**Type LIYCY** Max. length: 600 m / 1968 ft (3 x 0.75 mm^2 shielded cable)
Cable entries (except TIDALFLUX)	Standard: M20 x 1.5 (8...12 mm) for C, F and W version; Terminal strip for R-version
	Option: ½" NPT, PF ½ for C, F and W version
Cable entries (only TIDALFLUX)	Standard: Converter: 2 x M20 x 1.5 metal + 1 x M20 x 1.5 EMC metal Sensor: 2 x M20 x 1.5 plastic + 1 x M16 x 1.5 EMC metal
	Option: NPT

Inputs and outputs

General	All outputs are electrically 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	Volume flow, mass flow, diagnostic value, flow velocity, coil temperature, conductivity		
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	$U_{int, nom}$ = 24 VDC $I \leq$ 22 mA $R_L \leq$ 1 kΩ		$U_{int, nom}$ = 20 VDC $I \leq$ 22 mA $R_L \leq$ 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 Linear characteristics
Passive	$U_{ext} \leq$ 32 VDC $I \leq$ 22 mA $U_0 \geq$ 1.8 V $R_L \leq (U_{ext} - U_0) / I_{max}$		$U_{ext} \leq$ 32 VDC $I \leq$ 22 mA $U_0 \geq$ 4 V $R_L \leq (U_{ext} - U_0) / I_{max}$
			U_i = 30 V I_i = 100 mA P_i = 1 W C_i = 10 nF $L_i \sim$ 0 mH

HART®	
Description	HART® protocol via active and passive current output
	HART® version: V5
	Universal HART® parameter: completely integrated
Load	≥ 250 Ω at HART® test point; Note maximum load for current output!
Multi-Drop operation	Yes, current output = 4 mA
	Multi-Drop address adjustable in operation menu 1…15
Device drivers	Available for FC 375/475, AMS, PDM, FDT/DTM
Registration (HART Communication Foundation)	Yes

Pulse or frequency output			
Output data	Pulse output: volume flow, mass flow		
	Frequency output: volume flow, mass flow, diagnostic value, flow velocity, coil temperature, conductivity		
Function	Adjustable as pulse or 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	–	U_{nom} = 24 VDC	–
		f_{max} in operating menu set to $f_{max} \leq 100$ Hz: $I \leq 20$ mA open: $I \leq 0.05$ mA closed: $U_{0, nom}$ = 24 V at I = 20 mA	
		f_{max} in operating menu set to 100 Hz < $f_{max} \leq 10$ kHz: $I \leq 20$ mA open: $I \leq 0.05$ 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	

Operating data	Basic I/Os	Modular I/Os	Ex i I/Os
Passive	$U_{ext} \leq 32$ VDC		–
	f_{max} in operating menu set to $f_{max} \leq 100$ Hz: $I \leq 100$ mA $R_{L, max} = 47$ kΩ $R_{L, min} = (U_{ext} - U_0) / I_{max}$ open: $I \leq 0.05$ mA at $U_{ext} = 32$ VDC closed: $U_{0, max} = 0.2$ V at $I \leq 10$ mA $U_{0, max} = 2$ V at $I \leq 100$ mA		
	f_{max} in operating menu set to 100 Hz $< f_{max} \leq 10$ kHz: $I \leq 20$ mA $R_{L, max} = 47$ kΩ $R_{L, min} = (U_{ext} - U_0) / I_{max}$ open: $I \leq 0.05$ mA at $U_{ext} = 32$ VDC closed: $U_{0, max} = 1.5$ V at $I \leq 1$ mA $U_{0, max} = 2.5$ V at $I \leq 10$ mA $U_{0, max} = 5.0$ V at $I \leq 20$ 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 $L_i \sim 0$ mH
Low flow cut-off			
Function	Switching point and hysteresis separately adjustable for each output, counter and the display		
Switching point	Current output, frequency output: 0…20%; set in increments of 0.1 Pulse output: Unit is volume flow or mass flow and not limited		
Hysteresis			
Time constant			
Function	The time constant corresponds to the elapsed time until 63% of the end value has been reached according to a step function.		
Settings	Set in increments of 0.1.		
	0…100 s		

Status output / limit switch			
Function and settings	Adjustable as automatic measuring range conversion, display of flow direction, counter 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 I/Os**
Active	-	U_{int} = 24 VDC $I \le 20$ mA open: $I \le 0.05$ mA closed: $U_{0, nom}$ = 24 V at I = 20 mA	-
Passive	$U_{ext} \le 32$ VDC $I \le 100$ mA $R_{L, max}$ = 47 kΩ $R_{L, min} = (U_{ext} - U_0) / I_{max}$ open: $I \le 0.05$ mA at U_{ext} = 32 VDC closed: $U_{0, max}$ = 0.2 V at $I \le 10$ mA $U_{0, max}$ = 2 V at $I \le 100$ mA	U_{ext} = 32 VDC $I \le 100$ mA $R_{L, max}$ = 47 kΩ $R_{L, min} = (U_{ext} - U_0) / I_{max}$ open: $I \le 0.05$ mA at U_{ext} = 32 VDC closed: $U_{0, max}$ = 0.2 V at $I \le 10$ mA $U_{0, max}$ = 2 V at $I \le 100$ 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, range change.		
	Start of dosing when dosing function is activated.		
Operating data	**Basic I/Os**	**Modular I/Os**	**Ex i I/Os**
Active	–	U_{int} = 24 VDC Ext. contact open: $U_{0, nom}$ = 22 V Ext. contact closed: I_{nom} = 4 mA Contact closed (on): $U_0 \geq 12$ V with I_{nom} = 1.9 mA Contact open (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	$U_{ext} \leq 32$ VDC $I \leq 6$ mA at U_{ext} = 24 V $I \leq 6.6$ mA at U_{ext} = 32 V On: $U_0 \geq 5.5$ V or $I \geq 4$ mA Off: $U_0 \leq 3.5$ V or $I \leq 0.5$ mA <hr>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 Terminals open: $U_{0, nom}$ = 8.7 V Contact closed (on): $U_{0, nom}$ = 6.3 V with $I_{nom} > 1.9$ mA Contact open (off): $U_{0, nom}$ = 6.3 V with $I_{nom} < 1.9$ mA Detection of cable break: $U_0 \geq 8.1$ V with $I \leq 0.1$ mA Detection of cable short circuit: $U_0 \leq 1.2$ V with $I \geq 6.7$ mA	–

| Current input			
Function	The following values can be delivered from the measuring sensor to the current input: temperature, pressure or current		
Operating data	**Basic I/Os**	**Modular I/Os**	**Ex i I/Os**
Active	–	$U_{int, nom}$ = 24 VDC $I \leq 22$ mA $I_{max} \leq 26$ mA (electronically limited) $U_{0, min}$ = 19 V at $I \leq 22$ mA No HART®	$U_{int, nom}$ = 20 VDC $I \leq 22$ mA $U_{0, min}$ = 14 V at $I \leq 22$ mA No HART® U_0 = 24.5 V I_0 = 99 mA P_0 = 0.6 W C_0 = 75 nF / L_0 = 0.5 mH No HART®
Passive	–	$U_{ext} \leq 32$ VDC $I \leq 22$ mA $I_{max} \leq 26$ mA (electronically limited) $U_{0, max}$ = 5 V at $I \leq 22$ mA No HART®	$U_{ext} \leq 32$ VDC $I \leq 22$ mA $U_{0, max}$ = 4 V at $I \leq 22$ mA No HART® U_i = 30 V I_i = 100 mA P_i = 1 W C_i = 10 nF L_i = 0 mH No HART®

PROFIBUS DP	
Description	Galvanically isolated acc. to IEC 61158
	Profile version: 3.01
	Automatic data transmission rate recognition (max. 12 MBaud)
	Bus address adjustable via local display at the measuring device
Function blocks	5 x analogue input, 3 x totaliser
Output data	Volume flow, mass flow, volume counter 1 + 2, mass counter, velocity, coil temperature, conductivity
PROFIBUS PA	
Description	Galvanically isolated acc. to IEC 61158
	Profile version: 3.01
	Current consumption: 10.5 mA
	Permissible bus voltage: 9…32 V; in Ex application: 9...24 V
	Bus interface with integrated reverse polarity protection
	Typical error current FDE (Fault Disconnection Electronic): 4.3 mA
	Bus address adjustable via local display at the measuring device
Function blocks	5 x analogue input, 3 x totaliser
Output data	Volume flow, mass flow, volume counter 1 + 2, mass counter, velocity, coil temperature, conductivity
FOUNDATION Fieldbus	
Description	Galvanically isolated acc. 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 5.1
Function blocks	3 x analogue Input, 2 x integrator, 1 x PID
Output data	Volume flow, mass flow, velocity, coil temperature, conductivity, electronics temperature
Modbus	
Description	Modbus RTU, Master / Slave, RS485
Address range	1…247
Supported function codes	03, 04, 16
Broadcast	Supported with function code 16
Supported Baudrate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud

Approvals and certificates

CE	The device fulfils the statutory requirements of the EC directives. The manufacturer certifies that these requirements have been met by applying the CE marking.
Electromagnetic compatibility (EMC)	2004/108/EC in conjunction with EN 61326-1 (A1, A2)
European Pressure Equipment Directive	PED 97/23 (only for compact versions)
Non-Ex	Standard
Hazardous areas	
Option (only version C)	
ATEX	II 2 GD Ex d [ia] IIC T6…T3
	II 2 GD Ex de [ia] IIC T6…T3
	II 2 GD Ex e [ia] IIC T6…T3
	II 3 G Ex nA [nL] IIC T4…T3
Option (only F version (except TIDALFLUX))	
ATEX	II 2 GD Ex de [ia] IIC T6
	II 2(1) GD Ex de [ia] IIC T6
NEPSI	Ex de [ia] IIC T6
Option (only C and F version (except TIDALFLUX))	
FM / CSA	Class I, Div. 2, Group A, B, C and D
	Class II, Div. 2, Group F and G
SAA (in preparation)	Aus Ex zone 1/2
TIIS (in preparation)	Zone 1/2
Custody transfer (except TIDALFLUX & OPTIFLUX 7300 C)	
None	Standard
Option	Cold drinking water (OIML R 49, KIWA K618, MI-001); liquids other than water (OIML R 117-1, MI-005)
VdS (only OPTIFLUX 2300 C, F and W)	
VdS	Use in fire and safety equipment
	Only valid for nominal diameters DN25…250 / 1…10"
Other standards and approvals	
Shock and vibration resistance	IEC 68-2-3
NAMUR	NE 21, NE 43, NE 53

2.2 Dimensions and weights

2.2.1 Housing
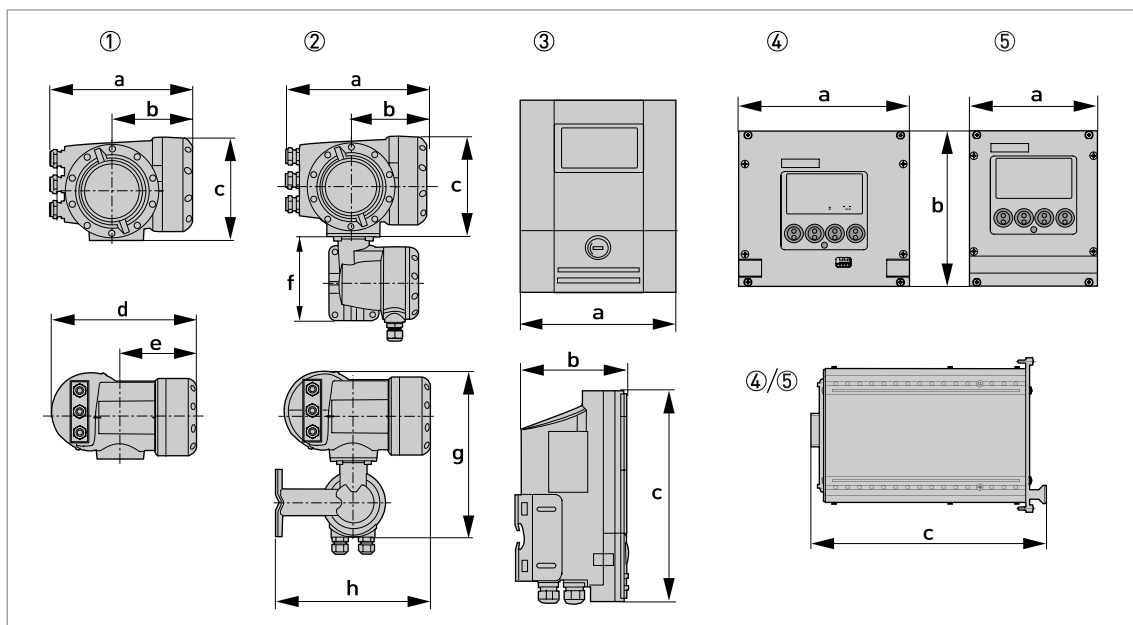
① Compact version (C)
② Field housing (F) - remote version
③ Wall-mounted housing (W) - remote version
④ 19" rack-mounted housing 28 TE (R) - remote version
⑤ 19" rack-mounted housing 21 TE (R) - remote version

Dimensions and weights in mm and kg

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
W	198	138	299	-	-	-	-	2.4
R	142 (28 TE)	129 (3 HE)	195	-	-	-	-	1.2
	107 (21 TE)	129 (3 HE)	190	-	-	-	-	0.98

Dimensions and weights in inch and lb

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
W	7.80	5.40	11.80	-	-	-	-	5.30
R	5.59 (28 TE)	5.08 (3 HE)	7.68	-	-	-	-	2.65
	4.21 (21 TE)	5.08 (3 HE)	7.48	-	-	-	-	2.16

2.2.2 Mounting plate, field housing
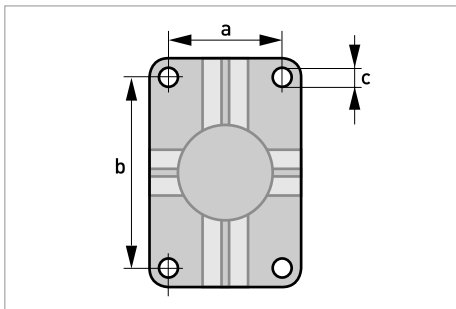
Dimensions in mm and inch

	[mm]	[inch]
a	60	2.4
b	100	3.9
c	Ø9	Ø0.4

2.2.3 Mounting plate, wall-mounted housing
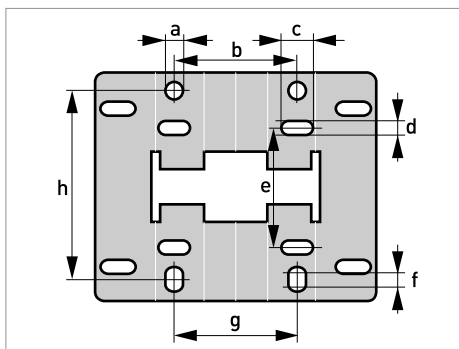
Dimensions in mm and inch

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

2.3 Flow tables

Flow rate in m/s and m^3/h

v [m/s]	Q$_{100\%}$ in m^3/h			
	0.3	1	3	12
DN [mm]	Min. flow	Nominal flow		Max. flow
2.5	0.005	0.02	0.05	0.21
4	0.01	0.05	0.14	0.54
6	0.03	0.10	0.31	1.22
10	0.08	0.28	0.85	3.39
15	0.19	0.64	1.91	7.63
20	0.34	1.13	3.39	13.57
25	0.53	1.77	5.30	21.21
32	0.87	2.90	8.69	34.74
40	1.36	4.52	13.57	54.29
50	2.12	7.07	21.21	84.82
65	3.58	11.95	35.84	143.35
80	5.43	18.10	54.29	217.15
100	8.48	28.27	84.82	339.29
125	13.25	44.18	132.54	530.15
150	19.09	63.62	190.85	763.40
200	33.93	113.10	339.30	1357.20
250	53.01	176.71	530.13	2120.52
300	76.34	254.47	763.41	3053.64
350	103.91	346.36	1039.08	4156.32
400	135.72	452.39	1357.17	5428.68
450	171.77	572.51	1717.65	6870.60
500	212.06	706.86	2120.58	8482.32
600	305.37	1017.90	3053.70	12214.80
700	415.62	1385.40	4156.20	16624.80
800	542.88	1809.60	5428.80	21715.20
900	687.06	2290.20	6870.60	27482.40
1000	848.22	2827.40	8482.20	33928.80
1200	1221.45	3421.20	12214.50	48858.00
1400	1433.52	4778.40	14335.20	57340.80
1600	2171.46	7238.20	21714.60	86858.40
1800	2748.27	9160.9	27482.70	109930.80
2000	3393.00	11310.00	33930.00	135720.00
2200	4105.50	13685.00	41055.00	164220.00
2400	4885.80	16286.00	48858.00	195432.00
2600	5733.90	19113.00	57339.00	229356.00
2800	6650.10	22167.00	66501.00	266004.00
3000	7634.10	25447.00	76341.00	305364.00

Flow rate in ft/s and US gallons/min

v [ft/s]	Q_{100 %} in US gallons/min			
	1	3.3	10	40
DN [inches]	Min. flow	Nominal flow		Max. flow
1/10	0.02	0.09	0.23	0.93
1/8	0.06	0.22	0.60	2.39
1/4	0.13	0.44	1.34	5.38
3/8	0.37	1.23	3.73	14.94
1/2	0.84	2.82	8.40	33.61
3/4	1.49	4.98	14.94	59.76
1	2.33	7.79	23.34	93.36
1.25	3.82	12.77	38.24	152.97
1.5	5.98	19.90	59.75	239.02
2	9.34	31.13	93.37	373.47
2.5	15.78	52.61	159.79	631.16
3	23.90	79.69	239.02	956.09
4	37.35	124.47	373.46	1493.84
5	58.35	194.48	583.24	2334.17
6	84.03	279.97	840.29	3361.17
8	149.39	497.92	1493.29	5975.57
10	233.41	777.96	2334.09	9336.37
12	336.12	1120.29	3361.19	13444.77
14	457.59	1525.15	4574.93	18299.73
16	597.54	1991.60	5975.44	23901.76
18	756.26	2520.61	7562.58	30250.34
20	933.86	3112.56	9336.63	37346.53
24	1344.50	4481.22	13445.04	53780.15
28	1829.92	6099.12	18299.20	73196.79
32	2390.23	7966.64	23902.29	95609.15
36	3025.03	10082.42	30250.34	121001.37
40	3734.50	12447.09	37346.00	149384.01
48	5377.88	17924.47	53778.83	215115.30
56	6311.60	21038.46	63115.99	252463.94
64	9560.65	31868.51	95606.51	382426.03
72	12100.27	40333.83	121002.69	484010.75
80	14938.92	49795.90	149389.29	597557.18
88	18075.97	60252.63	180759.73	723038.90
96	21511.53	71704.38	215115.30	860461.20
104	25245.60	84151.16	252456.02	1009824.08
112	29279.51	97597.39	292795.09	1171180.37
120	33611.93	112038.64	336119.31	1344477.23

2.4 Measuring accuracy (except TIDALFLUX)

Reference conditions

- Medium: water
- Temperature: 20°C / 68°F
- Pressure: 1 bar / 14.5 psi
- Inlet section: ≥ 5 DN
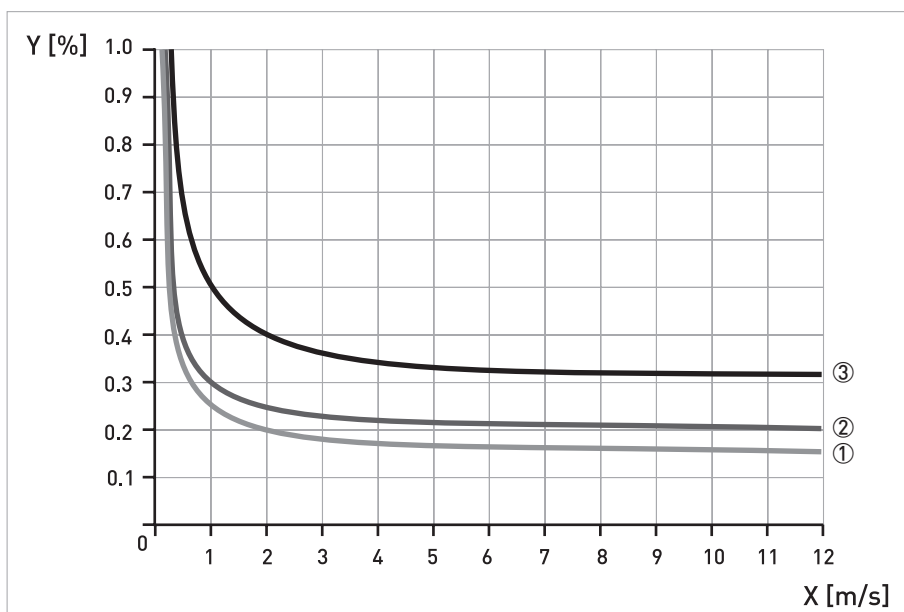
X [m/s]: flow velocity
Y [%]: deviation from the actual measured value (mv)

	DN [mm]	DN [inch]	Accuracy	Curve
OPTIFLUX 5300	10....100	3/8...4	0.15% of mv + 1 mm/s	①
	150...300	6...12	0.2% of mv + 1 mm/s	②
OPTIFLUX 2300 / 4300 / 6300	10....1600	3/8...80	0.2% of mv + 1 mm/s	②
OPTIFLUX 1300	10...150	3/8...6	0.3% of mv + 2 mm/s	③
OPTIFLUX 2300 / 4300	>1600	>64	0.3% of mv + 2 mm/s	③
OPTIFLUX 4300 / 5300 / 6300	<10	<3/8	0.3% of mv + 2 mm/s	③
OPTIFLUX 7300	25...100	1...4	v ≥ 1 m/s / 3.3 ft/s: ±0.5% of mv	-
			v < 1 m/s / 3.3 ft/s: ±0.5% of mv + 5 mm/s	
WATERFLUX 3300	25...600	1...24	0.2% of mv + 1 mm/s	②

2.5 Measuring accuracy (only TIDALFLUX)

The measuring accuracy for partly filled pipes and completely filled pipes are different. In these graphs it is assumed that the velocity at full scale value is at least 1 m/s (is also the standard value for calibration, since it will result in the most accurate measurements).

Maximum measuring error	Related to volume flow (mv = measured value, FS = Full Scale)
	These values are related to the pulse / frequency output
	The additional typical measuring deviation for the current output is ±10 µA
	Partly filled:
	v ≥ 1 m/s / 3.3 ft/s at Full Scale: ≤ 1% of FS
	Fully filled:
	v ≥ 1 m/s / 3.3 ft/s: ≤ 1% of mv
	v < 1 m/s / 3.3 ft/s: ≤ 0.5% of mv + 5 mm/s / 0.2 inch/s
	Minimum level: 10% of inner diameter

Fully filled pipes
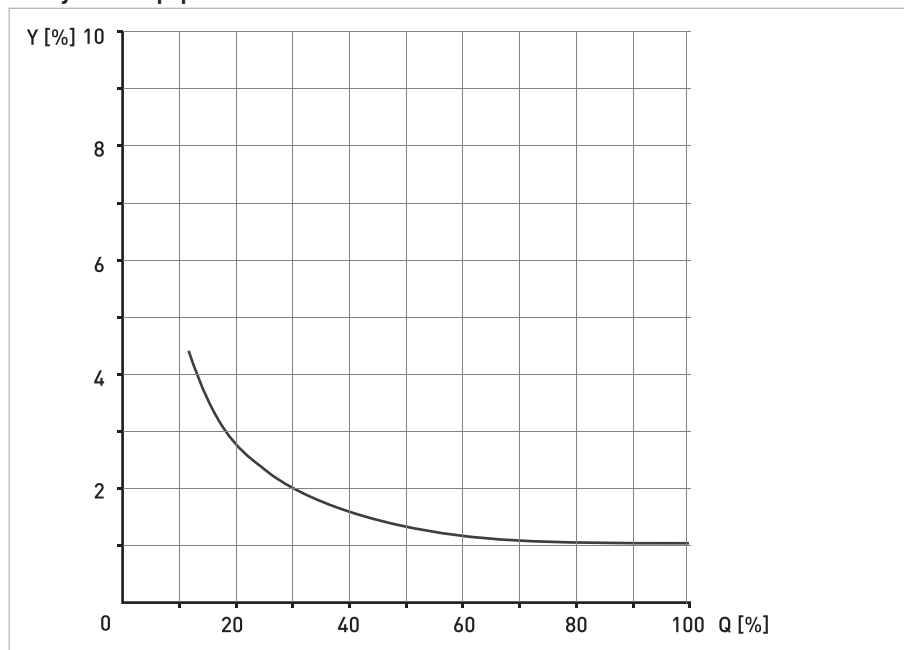
Figure 2-1: Maximum measuring error of measured value.

Partly filled pipes
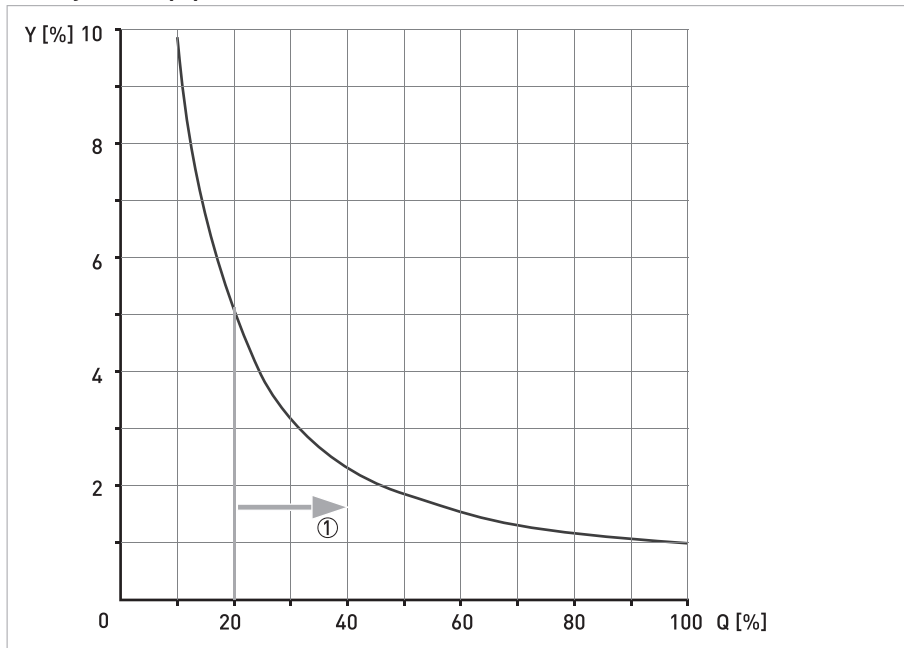
Figure 2-2: Maximum measuring error of measured value.

① Advised working area

3.1 Intended use

The electromagnetic flowmeters are designed exclusively to measure the flow and conductivity of electrically conductive, liquid media.

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

If the device is not used according to the operating conditions (refer to chapter "Technical data), the intended protection could be affected.

3.2 Installation specifications

The following precautions must be taken to ensure reliable installation.
- *Make sure that there is adequate space to the sides.*
- *Protect the signal converter from direct sunlight and install a sun shade 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 vibration. The flowmeters are tested for a vibration level in accordance with IEC 68-2-3.*

3.3 Mounting of the compact version

The signal converter is mounted directly on the measuring sensor. For installation of the flowmeter, please observe the instructions in the supplied product documentation for the measuring sensor.

3.4 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.
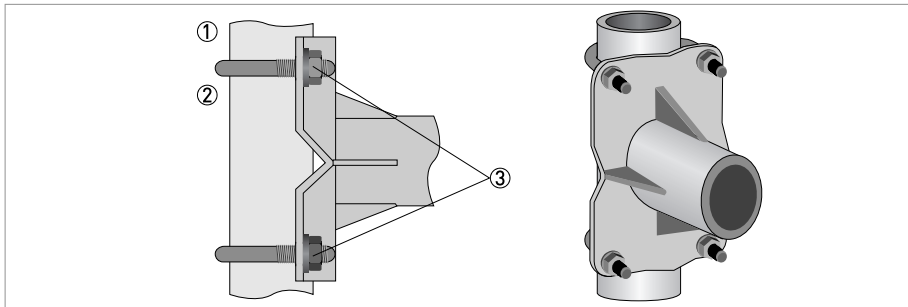
3.4.1 Pipe mounting

Figure 3-1: 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.
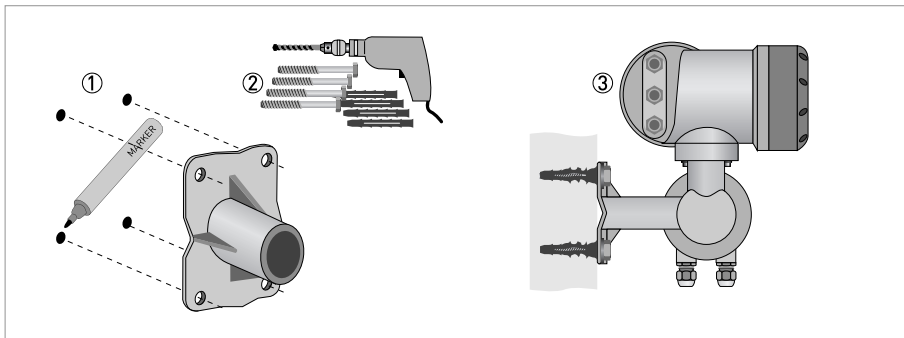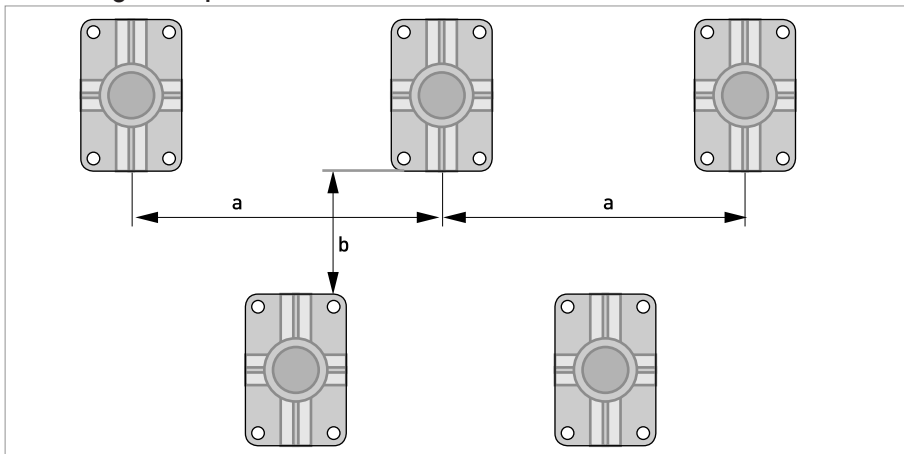③ Tighten the nuts.

3.4.2 Wall mounting

Figure 3-2: Wall mounting of the field housing

① Prepare the holes with the aid of the mounting plate. For further information refer to *Mounting plate*, *field housing* on page 23.
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.

Mounting multiple devices next to each other

a ≥ 600 mm / 23.6"
b ≥ 250 mm / 9.8"

3.5 Mounting the wall-mounted 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.
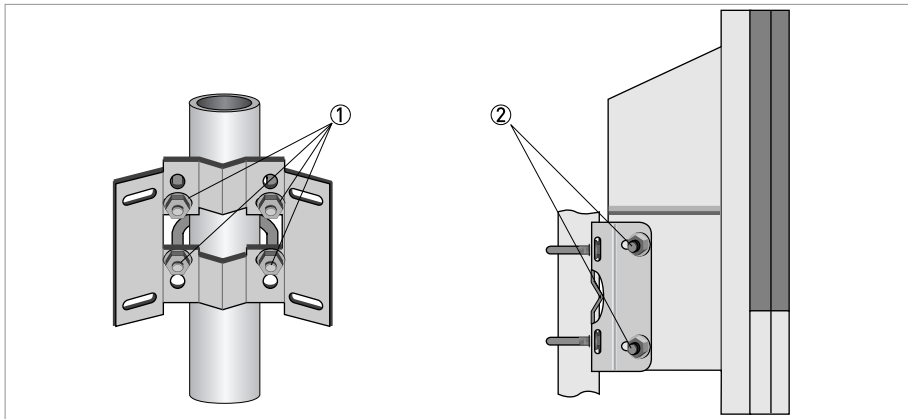
3.5.1 Pipe mounting

Figure 3-3: Pipe mounting of the wall-mounted housing

① Fasten the mounting plate to the pipe with standard U-bolts, washers and fastening nuts.
② Screw the signal converter to the mounting plate with the nuts and washers.
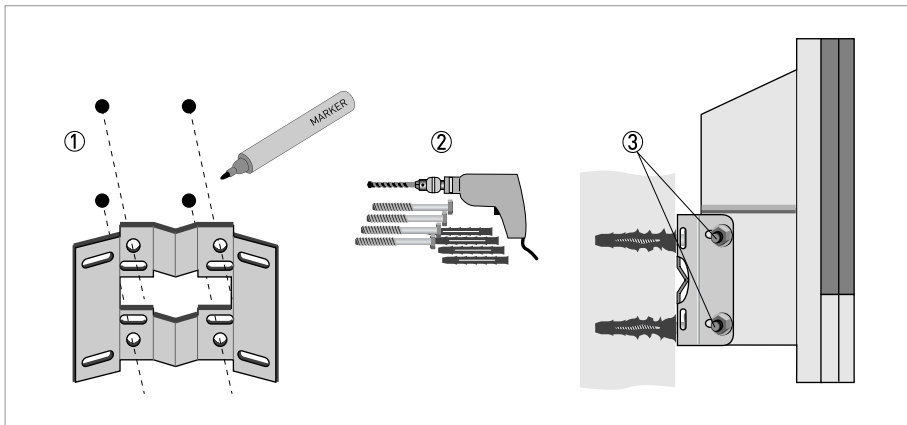
3.5.2 Wall mounting

Figure 3-4: 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, wall-mounted housing* on page 23.
② Fasten the mounting plate securely to the wall.
③ Screw the signal converter to the mounting plate with the nuts and washers.

Mounting multiple devices next to each other
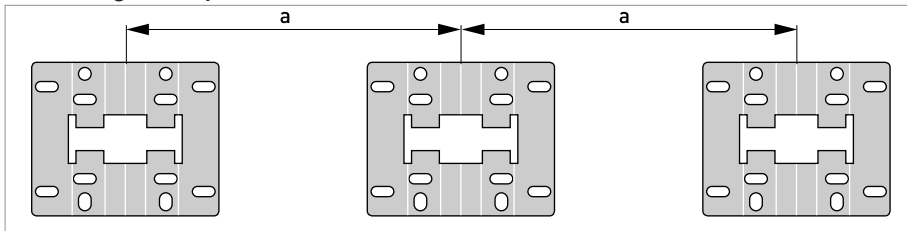
a ≥ 240 mm / 9.4"

4.1 Important notes on electrical connection

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 regulations.

- *Use suitable cable entries for the various electrical cables.*
- *The sensor and converter are configured together in the factory. For this reason, please connect the devices in pairs. Ensure that the sensor constant GK/GKL (see type plates) are identically set.*
- *If delivered separately or when installing devices that were not configured together, set the converter to the DN size and GK/GKL of the sensor.*

4.2 Preparing the signal and field current cables (except TIDALFLUX)

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.

The electrical connection of the outer shield is different for the various housing variants. Please observe the corresponding instructions.

4.2.1 Signal cable A (type DS 300), construction

- Signal cable A is a double-shielded cable for signal transmission between the measuring sensor and signal converter.
- Bending radius: ≥ 50 mm / 2"

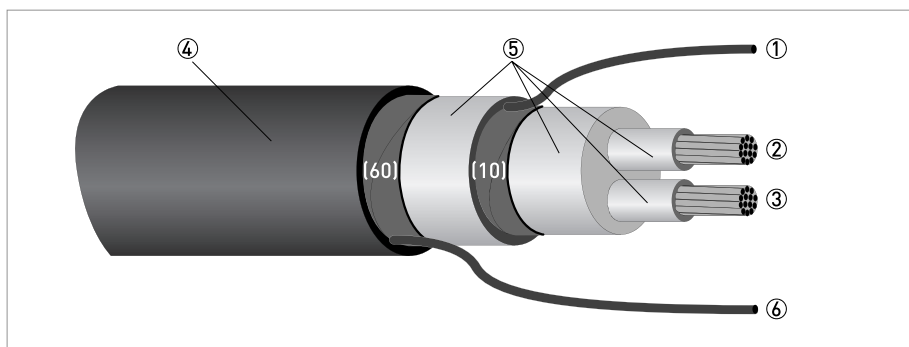Figure 4-1: Construction of signal cable A

① Stranded drain wire (1) for the inner shield (10), 1.0 mm^2 Cu / AWG 17 (not insulated, bare)
② Insulated wire (2), 0.5 mm^2 Cu / AWG 20
③ Insulated wire (3), 0.5 mm^2 Cu / AWG 20
④ Outer sheath
⑤ Insulation layers
⑥ Stranded drain wire (6) for the outer shield (60)

4.2.2 Length of signal cable A

For temperatures of the medium above 150°C / 300°F, a special signal cable and a ZD intermediate socket are necessary. These are available including the changed electrical connection diagrams.

Measuring sensor	Nominal size		Min. electrical conductivity [μS/cm]	Curve for signal cable A
	DN [mm]	[inch]		
OPTIFLUX 1000 F	10...150	3/8...6	5	A1
OPTIFLUX 2000 F	25...150	1...6	20	A1
	200...2000	8...80	20	A2
OPTIFLUX 4000 F	2.5...150	1/10...6	1	A1
	200...2000	8...80	1	A2
OPTIFLUX 5000 F	2.5...100	1/10...4	1	A1
	150...250	6...10	1	A2
OPTIFLUX 6000 F	2.5...150	1/10...6	1	A1
WATERFLUX 3000 F	25...600	1...24	20	A1

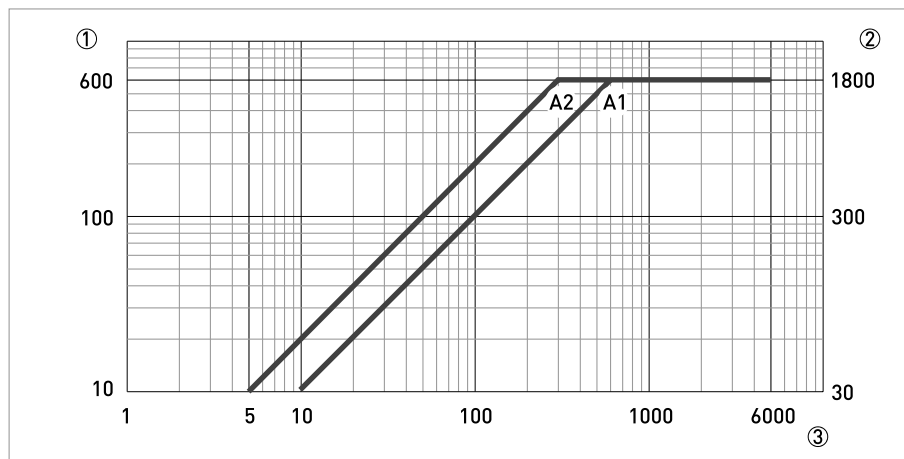**Figure 4-2: Maximum length of signal cable A**

①   Maximum length of signal cable A between the measuring sensor and signal converter [m]
②   Maximum length of signal cable A between the measuring sensor and signal converter [ft]
③   Electrical conductivity of the medium being measured [μS/cm]

4.2.3 Signal cable B (type BTS 300), construction

- Signal cable B is a triple-shielded cable for signal transmission between the measuring sensor and signal converter.
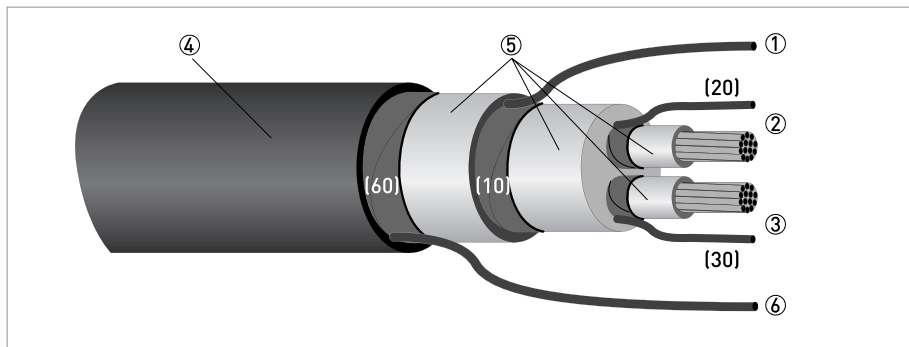
- Bending radius: ≥ 50 mm / 2"

Figure 4-3: Construction of signal cable B

① Stranded drain wire for the inner shield (10), 1.0 mm^2 Cu / AWG 17 (not insulated, bare)
② Insulated wire (2), 0.5 mm^2 Cu / AWG 20 with stranded drain wire (20) of shield
③ Insulated wire (3), 0.5 mm^2 Cu / AWG 20 with stranded drain wire (30) of shield
④ Outer sheath
⑤ Insulation layers
⑥ Stranded drain wire (6) for the outer shield (60), 0.5 mm^2 Cu / AWG 20 (not insulated, bare)

4.2.4 Length of signal cable B

For temperatures of the medium above 150°C / 300°F, a special signal cable and a ZD intermediate socket are necessary. These are available including the changed electrical connection diagrams.

| Measuring sensor	Nominal size		Min. electrical conductivity [μS/cm]	Curve for signal cable B
	DN [mm]	[inch]		
OPTIFLUX 1000 F	10...150	3/8...6	5	B2
OPTIFLUX 2000 F	25...150	1...6	20	B3
	200...2000	8...80	20	B4
OPTIFLUX 4000 F	2.5...6	1/10...1/6	10	B1
	10...150	3/8...6	1	B3
	200...2000	8...80	1	B4
OPTIFLUX 5000 F	2.5	1/10	10	B1
	4...15	1/6...1/2	5	B2
	25...100	1...4	1	B3
	150...250	6...10	1	B4
OPTIFLUX 6000 F	2.5...15	1/10...1/2	10	B1
	25...150	1...6	1	B3
WATERFLUX 3000 F	25...600	1...24	20	B1
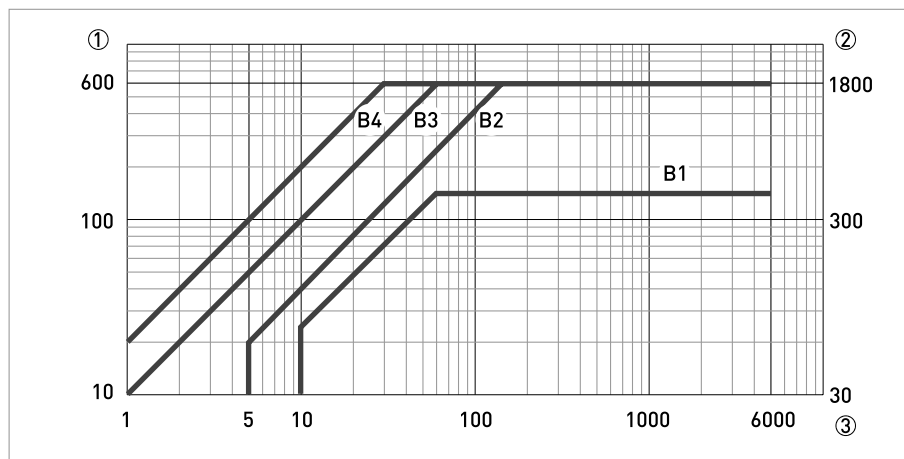
Figure 4-4: Maximum length of signal cable B

① Maximum length of signal cable B between the measuring sensor and signal converter [m]
② Maximum length of signal cable B between the measuring sensor and signal converter [ft]
③ Electrical conductivity of the medium being measured [μS/cm]

4.3 Connecting the signal and field current cables (except TIDALFLUX)

Cables may only be connected when the power is switched off.

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

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.

4.3.1 Connection diagram for measuring sensor, field housing

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

- If a shielded field current cable is used, the shield must **NOT** be connected in the housing of the signal converter.
- The outer shield of signal cable A or B in the signal converter housing is connected via the strain relief terminal.
- Bending radius of signal and field current cable: $\geq$ 50 mm / 2"
- The following illustration is schematic. The positions of the electrical connection terminals may vary depending on the housing version.
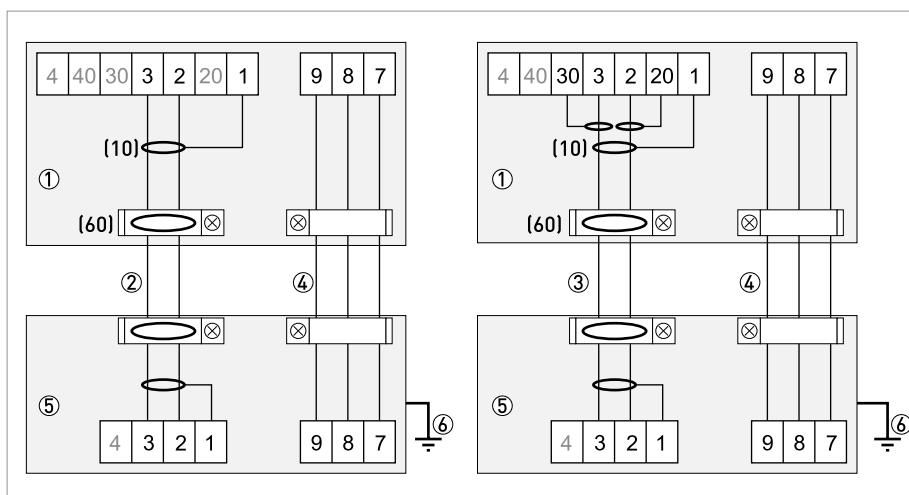

Figure 4-5: Connection diagram for measuring sensor, field housing

① Electrical terminal compartment in housing of the signal converter for signal and field current cable.
② Signal cable A
③ Signal cable B
④ Field current cable C
⑤ Connection box of measuring sensor
⑥ Functional ground FE

4.3.2 Connection diagram for measuring sensor, wall-mounted housing

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

- If a shielded field current cable is used, the shield must **NOT** be connected in the housing of the signal converter.
- The outer shield of the signal cable is connected in the signal converter housing via the stranded drain wire.
- Bending radius of signal and field current cable: ≥ 50 mm / 2"
- The following illustration is schematic. The positions of the electrical connection terminals may vary depending on the housing version.
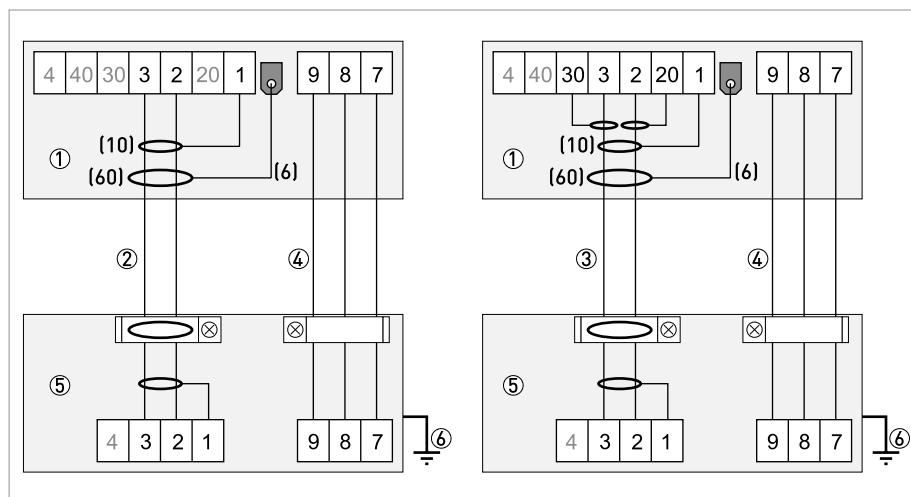

Figure 4-6: Connection diagram for measuring sensor, wall-mounted housing

① Electrical terminal compartment in housing of the signal converter for signal and field current cable.
② Signal cable A
③ Signal cable B
④ Field current cable C
⑤ Connection box of measuring sensor
⑥ Functional ground FE

4.3.3 Connection diagram for measuring sensor, 19" rack-mounted housing (28 TE)

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

- If a shielded field current cable is used, the shield must **NOT** be connected in the housing of the signal converter.
- The outer shield of the signal cable is connected in the signal converter housing via the stranded drain wire.
- Bending radius of signal and field current cable: $\geq$ 50 mm / 2"
- The following illustration is schematic. The positions of the electrical connection terminals may vary depending on the housing version.

Figure 4-7: Connection diagram for measuring sensor, 19" rack-mounted housing (28 TE)

① Electrical terminal compartment in housing of the signal converter for signal and field current cable.
② Signal cable A
③ Signal cable B
④ Field current cable C
⑤ Connection box of measuring sensor
⑥ Functional ground FE

4.3.4　Connection diagram for measuring sensor, 19" rack-mounted housing (21 TE)

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

- If a shielded field current cable is used, the shield must **NOT** be connected in the housing of the signal converter.
- The outer shield of the signal cable is connected in the signal converter housing via the stranded drain wire.
- Bending radius of signal and field current cable: $\geq$ 50 mm / 2"
- The following illustration is schematic. The positions of the electrical connection terminals may vary depending on the housing version.

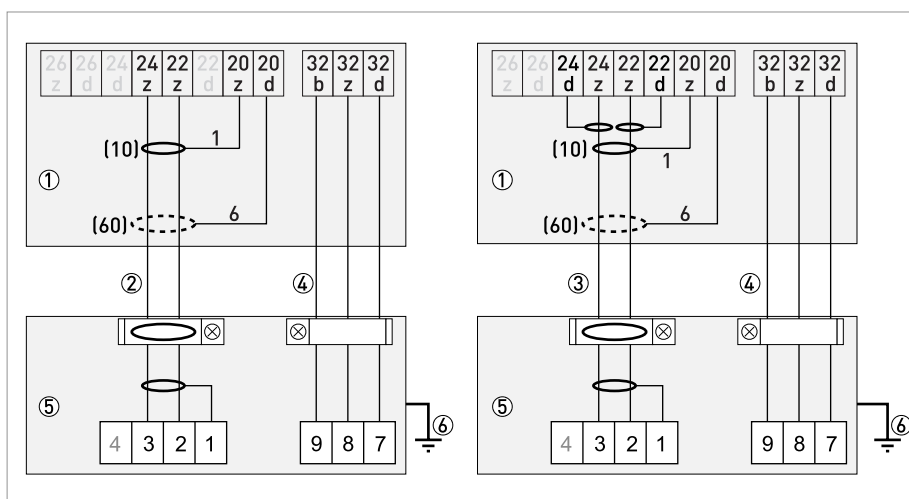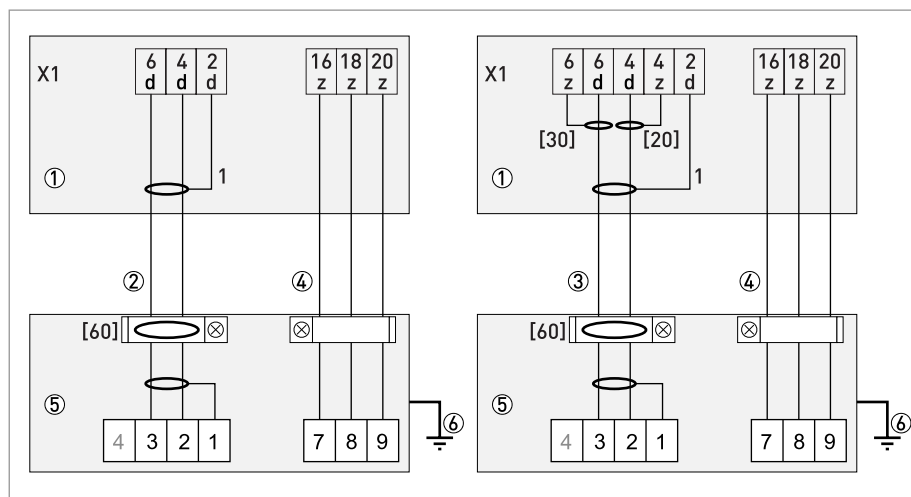**Figure 4-8: Connection diagram for measuring sensor, 19" rack-mounted housing (21 TE)**

① Electrical terminal compartment in housing of the signal converter for signal and field current cable.
② Signal cable A
③ Signal cable B
④ Field current cable C
⑤ Connection box of measuring sensor
⑥ Functional ground FE

4.4 Preparing and connecting the signal and field current cables (only TIDALFLUX)

Cables may only be connected when the power is switched off.

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

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.

4.4.1 Cable lengths

The maximum allowed distance between the flow sensor and the converter is determined by the shortest cable length.

Interface cable: maximum length is 600 m / 1968 ft.

Type B (BTS) signal cable: maximum length is 600 m / 1968 ft.

Type A (DS) signal cable: maximum length depends on the conductivity of the fluid:

Electrical conductivity	Maximum length	
[µS/cm]	[m]	[ft]
50	120	394
100	200	656
200	400	1312
≥400	600	1968

Field current cable: The cross section of the cable determines the maximum length:

Cross section		Maximum length	
[mm^2]	[AWG]	[m]	[ft]
2 x 0.75	2 x 18	150	492
2 x 1.5	2 x 14	300	984
2 x 2.5	2 x 12	600	1968

4.4.2 Interface cable

The data interface cable is a shielded, 3 x 1.5 mm^2 LIYCY cable. The standard length 10 m / 32.8 ft is included in the delivery.

Preparing the interface cable
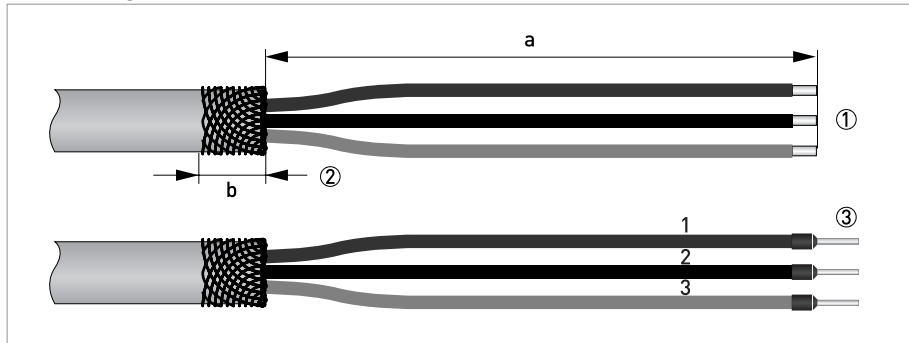
Figure 4-9: Preparing the interface cablePreparing the interface cable

a = 100 mm / 4"
b = 10 mm / 0.4"

① Strip the conductor to dimension a.
② Trim the outer shield to dimension b and pull it over the outer sheath.
③ Crimp the wire end ferrules onto the conductors 1, 2 and 3.

Connect the shielding at both sides of the cable via the special cable gland.

Connecting shielding via special cable gland
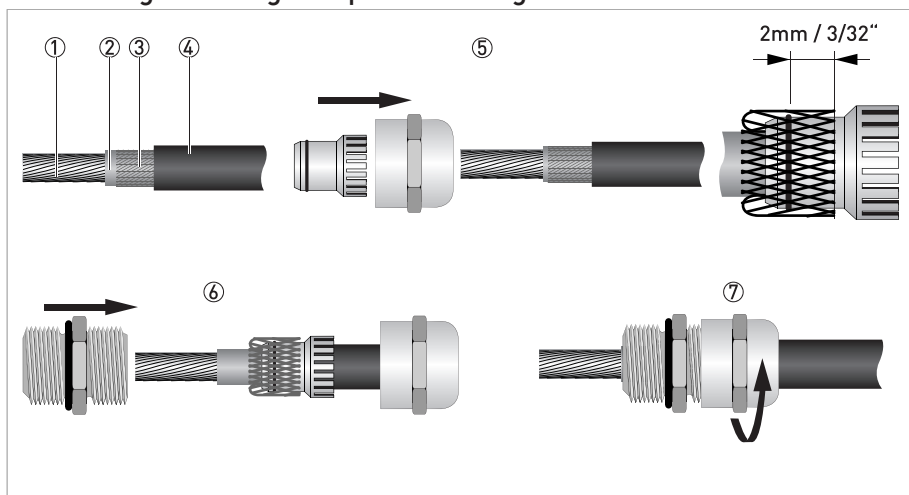
Figure 4-10: Connecting the shield within the cable gland

① Wires
② Isolation
③ Shielding
④ Isolation
⑤ Feed cable through dome nut and clamping insert and fold shielding over clamping insert. Make sure that the braided shield overlaps the O-ring by 2 mm / 3/32".
⑥ Push clamping insert into body.
⑦ Tighten the dome nut.

4.4.3 Connection of cables
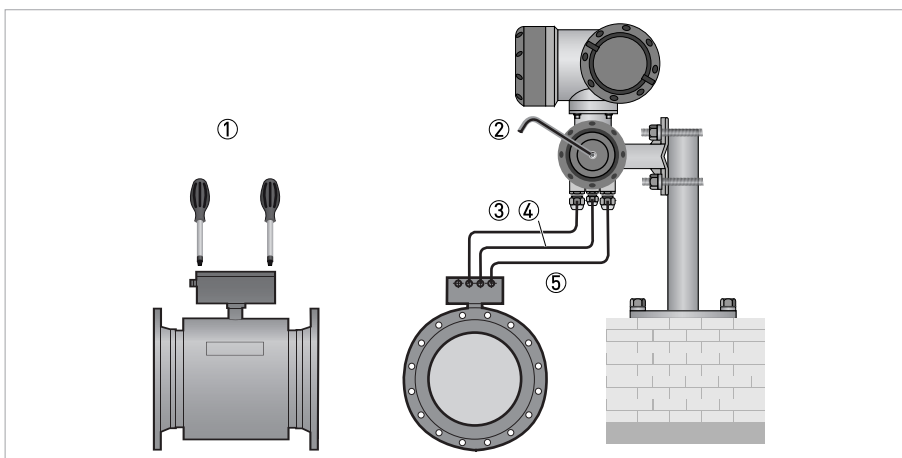
Figure 4-11: Electrical connection

① Unscrew the cover to reach the connectors
② Unscrew the cover to reach the connectors
③ Field current cable
④ Interface cable
⑤ Signal cable (DS or BTS)

Connection diagram
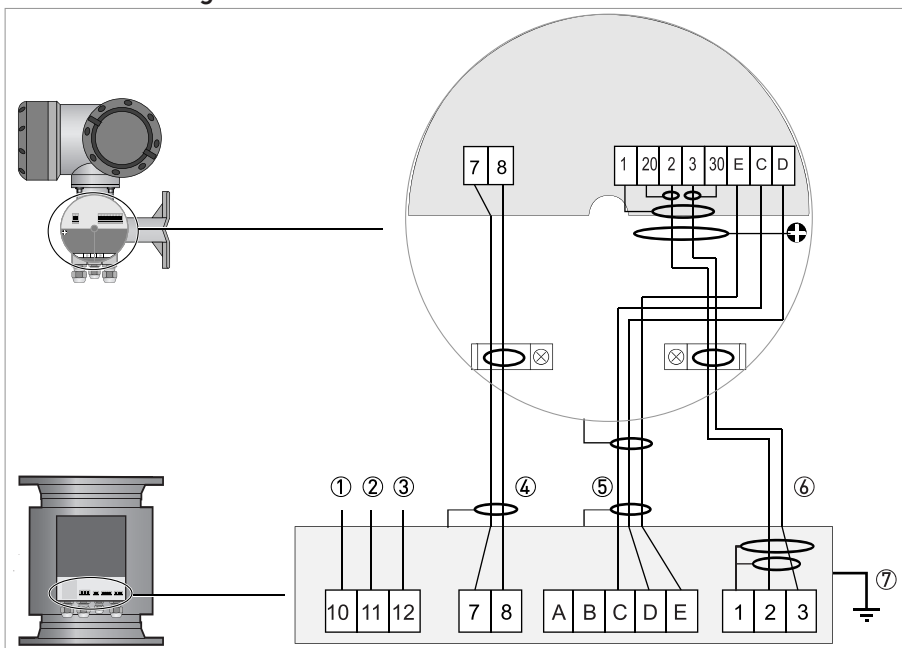
Figure 4-12: Connection diagram

① Protective Earth connection (PE)
② Mains power neutral (N)
③ Mains power live (L)
④ Field current cable
⑤ Interface cable
⑥ Signal cable. Shown is the BTS cable. In case of DS cable, do not use connectors 20 and 30.
⑦ Connect housing to PE

Flow sensors with protection class IP 68 can not be opened anymore. The cables are factory connected and labeled as follows.
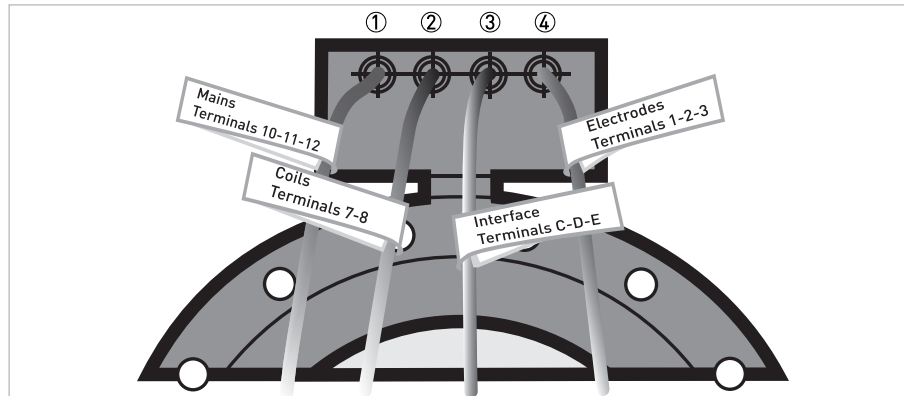
Figure 4-13: Labeled cables for IP 68 versions

① Mains power (10 = blank, 11 = blue, 12 = black)
② Field current (7 = white, 8 = green)
③ Data interface (black wires, C = marked "1", D = marked "2", E = marked "3")
④ Electrodes (1 = blank, 2 = white, 3 = red)

4.5 Power supply connection

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

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

- The protection category depends on the housing versions (IP65...67 to IEC 529 / EN 60529 or NEMA4/4X/6).
- The housings of the devices, which are designed to protect the electronic equipment from dust and moisture, should be kept well closed at all times. Creepage distances and clearances are dimensioned to VDE 0110 and IEC 664 for pollution severity 2. Supply circuits are designed for overvoltage category III and the output circuits for overvoltage category II.
- Fuse protection ($I_N \leq 16$ A) for the infeed power circuit, as well as a separator (switch, circuit breaker) to isolate the signal converter must be provided close to the device.
  The separator must conform to IEC 60947-1 and IEC 60947-3 and must be marked as the separator for this device.

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
For 19" rack-mounted housing please refer to the connection diagrams.

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

12...24 VDC (tolerance range: -55% / +30%)

• Note the data on the nameplate!
• When connecting to functional extra-low voltages, provide a facility for protective separation (PELV) (acc. to VDE 0100 / VDE 0106 and/or IEC 364 / IEC 536 or relevant national regulations).

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

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

• AC: Note the power supply voltage and frequency (50...60 Hz) on the nameplate.
• DC: When connecting to functional extra-low voltages, provide a facility for protective separation (PELV) (acc. to VDE 0100 / VDE 0106 and/or IEC 364 / IEC 536 or relevant national regulations).

*12 V is **not** included in the tolerance range.*

Power supply connection (excluding 19" rack-mounted housing)

① PE

② FE

③ FE

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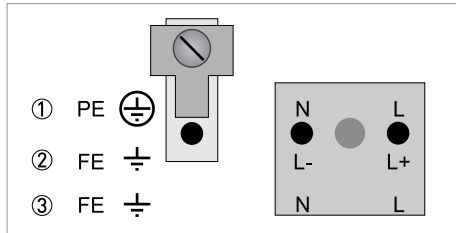
① 100...230 VAC (-15% / +10%), 22 VA
② 24 VDC (-55% / +30%), 12 W
③ 24 VAC/DC (AC: -15% / +10%; DC: -25% / +30%), 22 VA or 12 W

Power supply connection for 19" rack-mounted housing (28 TE)

L (L+)

PE (FE)

N (L-)

Power supply connection for 19" rack-mounted housing (21 TE)

X2

28   30   32   z

d

N   L
(L-)   (L+)
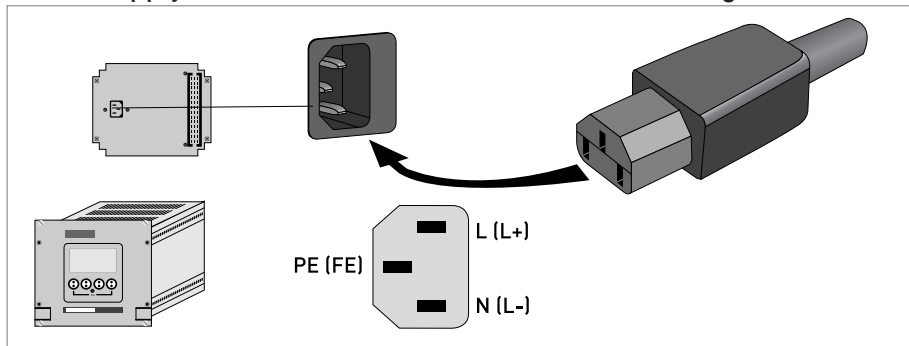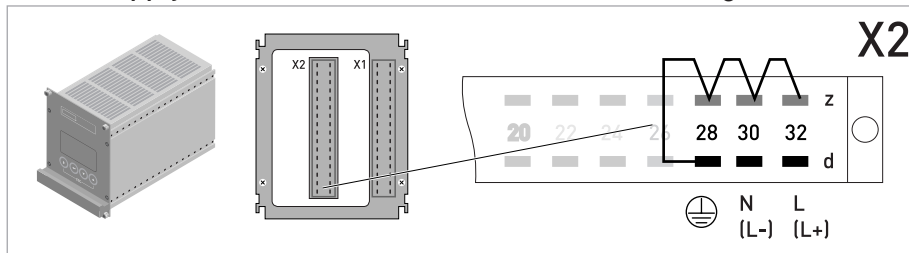
For safety reasons the manufacturer has connected the 28d contacts internally to the 28z, 30z and 32z contacts. You are advised to also connect contacts 28z, 30z and 32z to the external protective conductor.

The protective conductor contacts must not be used to loop through the PE connection.

4.6 Inputs and outputs, overview

4.6.1 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 output modules.
- Current outputs can be active or passive.
- Optionally available also with Foundation Fieldbus and Profibus PA

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 for the housing designs C and F 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.
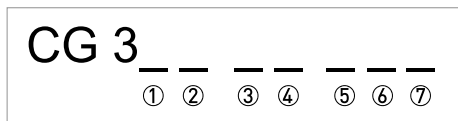
4.6.2 Description of the CG number

Figure 4-14: Marking (CG number) of the electronics module and input/output variants

① ID number: 0
② ID number: 0 = standard; 9 = special
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. Please see the following examples.

Examples for CG number

CG 300 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 300 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 300 81 4EB	24 VDC & standard display; modular I/O: I_a & P_a/S_a and optional module P_p/S_p & I_p

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, frequency, status output or limit switch (changeable)
P_p / S_p	E	Passive pulse, frequency, status output or limit switch (changeable)
P_N / S_N	F	Passive pulse, frequency, status output or limit switch according to NAMUR (changeable)
C_a	G	Active control input
C_p	K	Passive control input
C_N	H	Active control input to NAMUR Signal converter monitors cable breaks and short circuits acc. to 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
-	8	No additional module installed
-	0	No further module possible

4.6.3 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 IOs (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 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	

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

PROFIBUS PA (Ex i) (option)

CG no.	A+	A	A-	B	B-	C	C-	D	D-
D 0 0						PA+	PA-	PA+	PA-
						FISCO Device		FISCO Device	
D 1 0		I_a active		P_N / S_N NAMUR C_p passive ②		PA+	PA-	PA+	PA-
						FISCO Device		FISCO Device	
D 2 0		I_p passive		P_N / S_N NAMUR C_p passive ②		PA+	PA-	PA+	PA-
						FISCO Device		FISCO Device	
D 3 0		IIn_a active		P_N / S_N NAMUR C_p passive ②		PA+	PA-	PA+	PA-
						FISCO Device		FISCO Device	
D 4 0		IIn_p passive		P_N / S_N NAMUR C_p passive ②		PA+	PA-	PA+	PA-
						FISCO Device		FISCO Device	

FOUNDATION Fieldbus (Ex i) (option)

CG no.	A+	A	A-	B	B-	C	C-	D	D-
E 0 0						V/D+	V/D-	V/D+	V/D-
						FISCO Device		FISCO Device	
E 1 0		I_a active		P_N / S_N NAMUR C_p passive ②		V/D+	V/D-	V/D+	V/D-
						FISCO Device		FISCO Device	
E 2 0		I_p passive		P_N / S_N NAMUR C_p passive ②		V/D+	V/D-	V/D+	V/D-
						FISCO Device		FISCO Device	
E 3 0		IIn_a active		P_N / S_N NAMUR C_p passive ②		V/D+	V/D-	V/D+	V/D-
						FISCO Device		FISCO Device	
E 4 0		IIn_p passive		P_N / S_N NAMUR C_p passive ②		V/D+	V/D-	V/D+	V/D-
						FISCO Device		FISCO Device	

① function changed by reconnecting
② changeable

4.6.4 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.						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	

PROFIBUS PA (option)

CG no.						C	C-	D	D-
D _ _		max. 2 optional modules for term. A + B				PA+ (2)	PA- (2)	PA+ (1)	PA- (1)

FOUNDATION Fieldbus (option)

CG no.						C	C-	D	D-
E _ _		max. 2 optional modules for term. A + B				V/D+ (2)	V/D- (2)	V/D+ (1)	V/D- (1)

PROFIBUS DP (option)

CG no.									
F _ 0		1 optional module for term. A	Terminati on P	RxD/TxD-P(2)	RxD/TxD-N(2)	Terminati on N	RxD/TxD-P(1)	RxD/TxD-N(1)	

Modbus (Option)

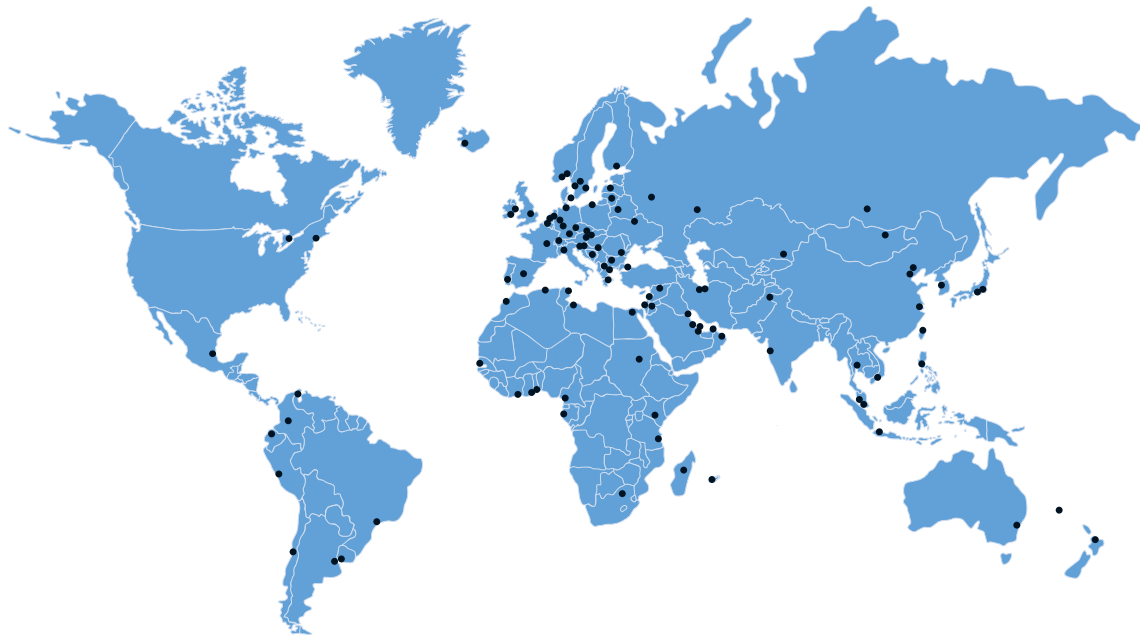| CG no.							C	C-	D
G _ _ ②		max. 2 optional modules for term. A + B					Common	Sign. B (D1)	Sign. A (D0)
H _ _ ③		max. 2 optional modules for term. A + B					Common	Sign. B (D1)	Sign. A (D0)

① changeable
② not activated bus terminator
③ activated bus terminator

KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Measuring systems for the oil and gas industry
- Measuring systems for sea-going tankers

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

The current list of all KROHNE contacts and addresses can be found at:
www.krohne.com

KROHNE