MFC 300 Technical Datasheet

Signal converter for mass flowmeters

- Modular signal converter concept and the same hardware for all housing designs
- Double redundancy of the calibration data
- Stainless steel housing for applications in the food, beverage and offshore industry

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

KROHNE

1.1 The signal converter with the highest performance

The **MFC 300** is a universal Coriolis mass flow signal converter suitable for a wide range of applications and installations. The common platform for the modular hardware allows easy selection for the required output options, and is suitable for mounting in various housing configurations.

The **MFC 300** is also suitable for all current and future mass flow sensors. The split architecture solution for the mass flow family ensures maximum security and redundant back-up of calibration parameters, should a failure occur. There is no need for reprogramming after a failed unit is replaced.

(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

- Modular versions from a basic signal converter to a high-end option with multiple output options
- Advanced diagnostic functions
- Excellent long term stability
- Easy to install and program due to improved user interface
- Maximum process safety
- Tropicalised and Stainless Steel versions for harsh environmental conditions

Industries

- Water & Wastewater
- Chemicals
- Power plants
- Food & Beverage
- Machinery
- Oil & Gas
- Petrochemicals
- Pulp & Paper
- Pharmaceutical

Applications

- Liquids and gases
- Slurries and viscous products
- Concentration measurement for quality control
- Measurement of volume flow
- Measurement of density and reference density
- Custody transfer loading/unloading
- Custody transfer measurements

1.2 Options and variants

Modular converter concept

(signal converter in compact housing)

The MFC 300 mass flow signal converter is available in different variants and offers superior performance in any conceivable application.
From process control in chemistry, to density and concentration measurements in the food and beverage industry, to custody transfer filling and transport measurements for oil and gas right down to conveyor systems in the pulp and paper industry.

Coriolis mass flow measuring systems measure the mass and volume flow, the density and the temperature of liquids and gases. In addition, the concentration in mixtures and slurries can also be determined.

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)

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 for any application

(signal converter in field housing)

The basic variant covers many 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 can be combined in almost any way. You can also select passive or active inputs/outputs. All inputs and outputs are galvanically isolated from each other and from the rest of the electronic equipment.

Dual-phase pulse outputs are available for custody transfer measurements.

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. For devices without Fieldbus functionality, HART® is standard on the first current output.

Diagnostics

The default functionality includes extensive self-diagnosis of the device, its installation and its application. This is done without any additional sensors, providing you with valuable information about the current status of the device, its measurement and its application. One example is the 2-phase flow signal which can display interferences caused by outgassing.

For difficult applications, a toolbox is offered. That allows you to record all measuring and diagnostic values online over a longer period of time and then evaluate them using toolbox software.

As a result, we offer you peace of mind and reduction of operational and maintenance costs.

1.3 Signal converter/measuring sensor combination possibilities

Measuring sensor	Measuring sensor + signal converter MFC 300			
	Compact	Remote field housing	Remote wall-mounted housing	Remote rack-mounted housing
OPTIMASS 1000	OPTIMASS 1300 C	OPTIMASS 1300 F	OPTIMASS 1300 W	OPTIMASS 1300 R
OPTIMASS 2000	OPTIMASS 2300 C	OPTIMASS 2300 F	OPTIMASS 2300 W	OPTIMASS 2300 R
OPTIMASS 3000	OPTIMASS 3300 C	OPTIMASS 3300 F	OPTIMASS 3300 W	OPTIMASS 3300 R
OPTIMASS 7000	OPTIMASS 7300 C	OPTIMASS 7300 F	OPTIMASS 7300 W	OPTIMASS 7300 R
OPTIMASS 8000	OPTIMASS 8300 C	OPTIMASS 8300 F	OPTIMASS 8300 W	OPTIMASS 8300 R

1.4 Measuring principle (single tube)

Static meter not energised and with no flow
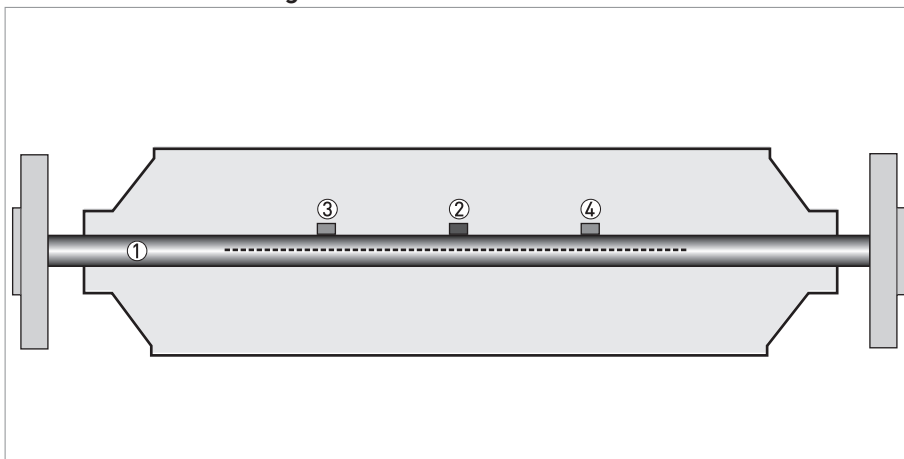
① Measuring tube
② Drive coil
③ Sensor 1
④ Sensor 2

A Coriolis single tube mass flowmeter consists of a single measuring tube ① a drive coil ② and two sensors (③ and ④) that are positioned either side of the drive coil.

Energised meter
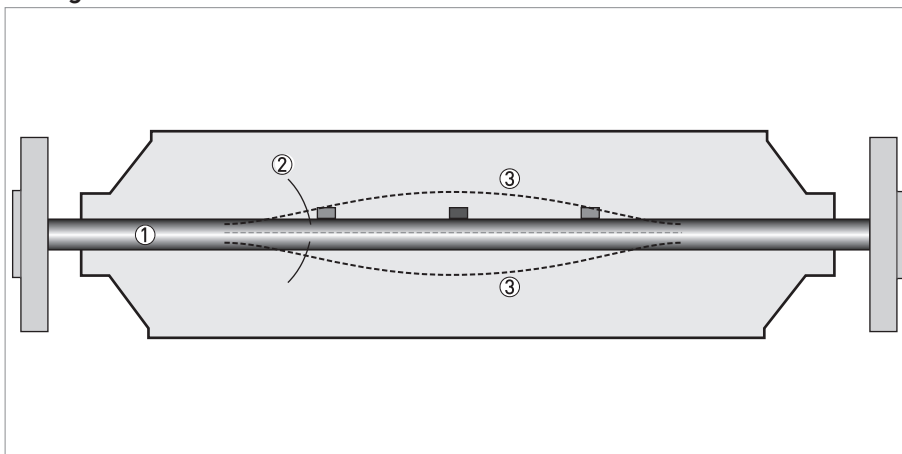
① Measuring tubes
② Direction of oscilation
③ Sine wave

When the meter is energised, the drive coil vibrates the measuring tube causing it to oscillate and produce a sine wave ③. The sine wave is monitored by the two sensors.

Energised meter with process flow
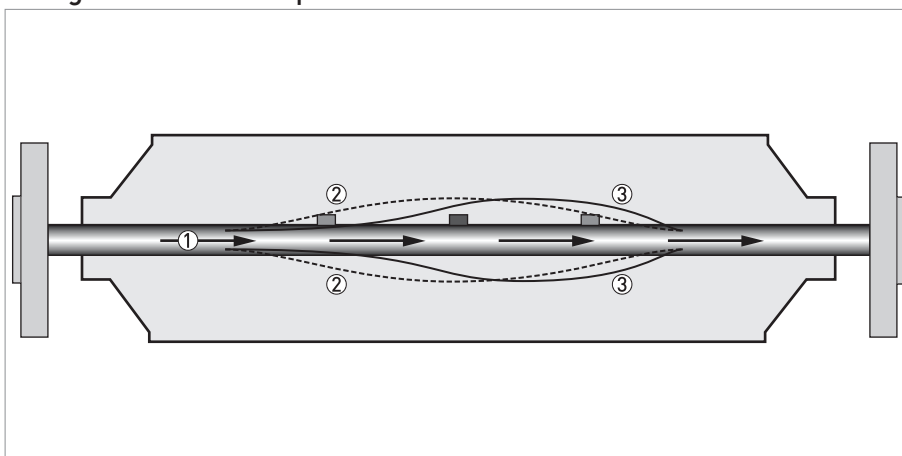
① Process flow
② Sine wave
③ Phase shift

When a fluid or gas passes through the tube, the coriolis effect causes a phase shift in the sine wave that is detected by the two sensors. This phase shift is directly proportional to the mass flow.

Density measurement is made by evaluation of the frequency of vibration and temperature measurement is made using a Pt500 sensor.

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	Coriolis principle
Application range	Measurement of mass flow, density, temperature, volume flow, flow velocity, concentration

Design

Modular construction	The measuring system consists of a measuring sensor and a signal converter.
Measuring sensor	
OPTIMASS 1000	DN15…50 / ½…2"
OPTIMASS 2000	DN100…250 / 4…10"
OPTIMASS 3000	DN01…04 / 1/25...4/25"
OPTIMASS 7000	DN06…80 / ¼…3"
OPTIMASS 8000	DN15…100 / ½…4"
	All sensors are also available in Ex-versions.
Signal converter	
Compact version (C)	OPTIMASS x300 C (x = 1, 2, 3, 7 or 8)
Field housing (F) - remote version	MFC 300 F
Wall-mounted housing (W) - remote version	MFC 300 W
19" rack-mounted housing (R) - remote version	MFC 300 R
	Compact and field housing versions are also available in Ex versions.
Options	
Outputs / inputs	Current- (incl. HART®), pulse, frequency, and/or status output, limit switch and/or control input (depending on the I/O version)
Counters	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, stabilization
Concentration measurement	Concentration and concentration flow
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 turned in steps of 90°.
	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 (in preparation): English, Slovenian, Czech, Hungarian
	Northern Europe (in preparation): English, Danish, Polish
	China (in preparation): English, Chinese
	Russia: English, Russian
Measurement functions	**Units:** Metric, British and US units selectable as desired from lists for volume/mass flow and counting, velocity, temperature, pressure
	Measured values: Mass flow, total mass, temperature, density, volume flow, total volume, velocity, flow direction (not displayed unit — but available via outputs), BRIX, Baume, NaOH, Plato, API, mass concentration, volume concentration
Diagnostic functions	**Standards:** according to VDI / NAMUR / WIB 2650 (pending) and functions going beyond that
	Status messages: Output of status messages optional via display, current and/or status output, HART® or bus interface
	Sensor diagnostics: Sensor values, drive level, measuring tube frequency, MT (measuring tube) strain, IC (inner cylinder) strain, sensor electronics/board electronics temperature, 2-phase flow signal

Measuring accuracy

Reference conditions	Medium: water
	Temperature: 20°C / 68°F
	Pressure: 1 bar / 14.5 psi
Maximum measuring error	±0.10% of the measured value ± zero point stability (depending on the measuring sensor)
	Current output electronics: ±5 µA
Repeatability	±0.05% ± zero point stability (depending on the measuring sensor)

Operating conditions

Temperature	
Process temperature	Refer to technical data for the measuring sensor.
Ambient temperature	Depends 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
	Stainless Steel housing: -40…+55°C / -40…+131°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
Chemical properties	
Physical condition	Liquids, gases and slurries
Flow rate	Refer to technical data for the measuring sensor.
Other conditions	
Protection category acc. to IEC 529 / EN 60529	C (compact version) & F (field housing): IP66/67 (acc. to NEMA 4/4X)
	W (wall-mounted housing): IP 65 (acc. to NEMA 4/4x)
	R (19" rack-mounted housing): IP 20 (acc. to NEMA 1)

Installation conditions

Installation	For detailed information, refer to chapter "Installation conditions".
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: Aluminium, Stainless Steel and Aluminium sheet, partially polyester-coated
	Option
	Versions C and F: Stainless Steel 316 L (1.4408)
Measuring sensor	See the technical data for the measuring sensor for housing materials, process connections, measuring tubes, accessories and gaskets.

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
	Option 1: 24 VDC (-55% / +30%)
	Option 2: 24 VAC/DC (AC: -15% / +10%, 50/60 Hz; DC: -25% / +30%)
Power consumption	AC: 22 VA
	DC: 12 W
Signal cable	Only for remote versions.
	4 core shielded cable. Detailed specifications available on request.
	Length: max. 300 m / 1000 ft
Cable entries	Standard: M20 x 1.5 (8...12 mm)
	Option: ½" NPT, PF ½

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, temperature, density, flow velocity, diagnostic value, 2-phase signal		
	Concentration and concentration flow are also possible with available concentration measurement (optional).		
Temperature coefficient	Typically ±30 ppm/K		
Settings	**Without HART®**		
	Q = 0%: 0…20 mA; Q = 100%: 10…20 mA		
	Error identification: 3…22 mA		
	With HART®		
	Q = 0%: 4…20 mA; Q = 100%: 10…20 mA		
	Error identification: 3…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 ≤ (U_{ext} - U_0) / I_{max}		U_{ext} ≤ 32 VDC I ≤ 22 mA U_0 ≤ 4 V R_L ≤ (U_{ext} - U_0) / 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: V5
	Universal HART® parameter: completely integrated
Load	$\geq$ 250 Ω at HART® test point; Note maximum load for current output!
Multidrop operation	Yes, current output = 4 mA
	Multidrop address adjustable in operation menu 1…15
Device driver	Available for FC 375, AMS, PDM, FDT/DTM
Registration (HART Communication Foundation)	Yes
Pulse or frequency output	
Output data	Pulse output: volume flow, mass flow, mass or volume of dissolved substance with activated concentration measurement
	Frequency output: flow velocity, mass flow, temperature, density, diagnostic value Optional: concentration, flow of the dissolved substance
Function	Adjustable as pulse or frequency output
Pulse rate/frequency	0.01…10000 pulses/s or Hz
Settings	Mass or volume per pulse 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
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	

Passive	$U_{ext} \leq 32$ VDC		-
	f_{max} in operating menu set to $f_{max} \leq 100$ Hz: $I \leq 100$ mA 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 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	Set in increments of 0.1.
	0…20% (current output, frequency output)
Hysteresis	Set in increments of 0.1.
	0…5% (current output, frequency output)

Time constant

Function	The time constant corresponds to the elapsed time until 67% 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, overflow, error, switching point		
	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 $I \leq$ 20 mA open: $I \leq$ 0.05 mA closed: $U_{0,\,nom}$ = 24 V at I = 20 mA	–
Passive	$U_{ext} \leq$ 32 VDC $I \leq$ 100 mA 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	U_{ext} = 32 VDC $I \leq$ 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	–
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 output values (e.g. when cleaning), set value of outputs to "zero", counter and error reset, hold counter, range conversion, zero point calibration.		
	Start of dosing when dosing function is activated.		
Operating data	**Basic I/Os**	**Modular I/Os**	**Ex i**
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 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	–

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	8 x analogue input, 3 x totaliser
Output data	Mass flow, volume flow, mass counter 1 + 2, volume counter, product temperature, several concentration measurements and diagnostic data

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	8 x analogue input, 3 x totaliser
Output data	Mass flow, volume flow, mass counter 1 + 2, volume counter, product temperature, several concentration measurements and diagnostic data

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	6 x analogue Input, 3 x integrator, 1 x PID
Output data	Mass flow, volume flow, density, temperature of tube, several concentration measurements and diagnostic data

Modbus	
Description	Modbus RTU, Master / Slave, RS485
Address range	1…247
Supported function codes	01, 03, 04, 05, 08, 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.
Non-Ex	Standard

Hazardous areas

Option (only version C)

ATEX	II 2 G Ex d [ib] IIC T6....T1
	II 2 G Ex de [ib] IIC T6....T1
	II 2 D Ex tD A21 IP6x T160°C (dep. on the measuring sensor) without heating jacket or sensor insulation
	II 2 D Ex tD A21 IP6x T170°C (dep. on the measuring sensor) with heating jacket and sensor insulation
	II 2(1) G Ex d [ia/ib] IIC T6....T1
	II 2(1) G Ex de [ia/ib] IIC T6....T1
	II 2(1) D Ex tD [iaD] A21 IP6x T160°C (dep. on the measuring sensor) without heating jacket or sensor insulation
	II 2(1) D Ex tD [iaD] A21 IP6x T170°C (dep. on the measuring sensor) with heating jacket and sensor insulation

Option (only version F)

ATEX	II 2 G Ex d [ib] IIC T6
	II 2 G Ex de [ib] IIC T6
	II 2(1) G Ex d [ia/ib] IIC T6
	II 2(1) G Ex de [ia/ib] IIC T6
	II 2 D Ex tD [ibD] A21 IP6x T80°C
	II 2(1) G Ex tD [iaD/ibD] A21 IP6x T80°C
Nepsi	Ex de ib [ia/ib] IIC T6
	Ex d ib [ia/ib] IIC T6

Optional (only versions C and F)

FM / CSA	Class I, Div 1 groups B, C, D
	Class II, Div 1 groups E, F, G
	Class III, Div 1 hazardous areas
	Class I, Div 2 groups B, C, D
	Class II, Div 2 groups F, G
	Class III, Div 2 hazardous areas
IECEx (pending)	Ex zone 1 + 2
TIIS (in preparation)	Zone 1/2

Custody transfer

Without	Standard
Option	Liquids other than water 2004/22/EC (MID) acc. to OIML R 117-1

Other standards and approvals

Shock and vibration resistance	IEC 68-2-3
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)
NAMUR	NE 21, NE 43, NE 53

2.2 Dimensions and weights

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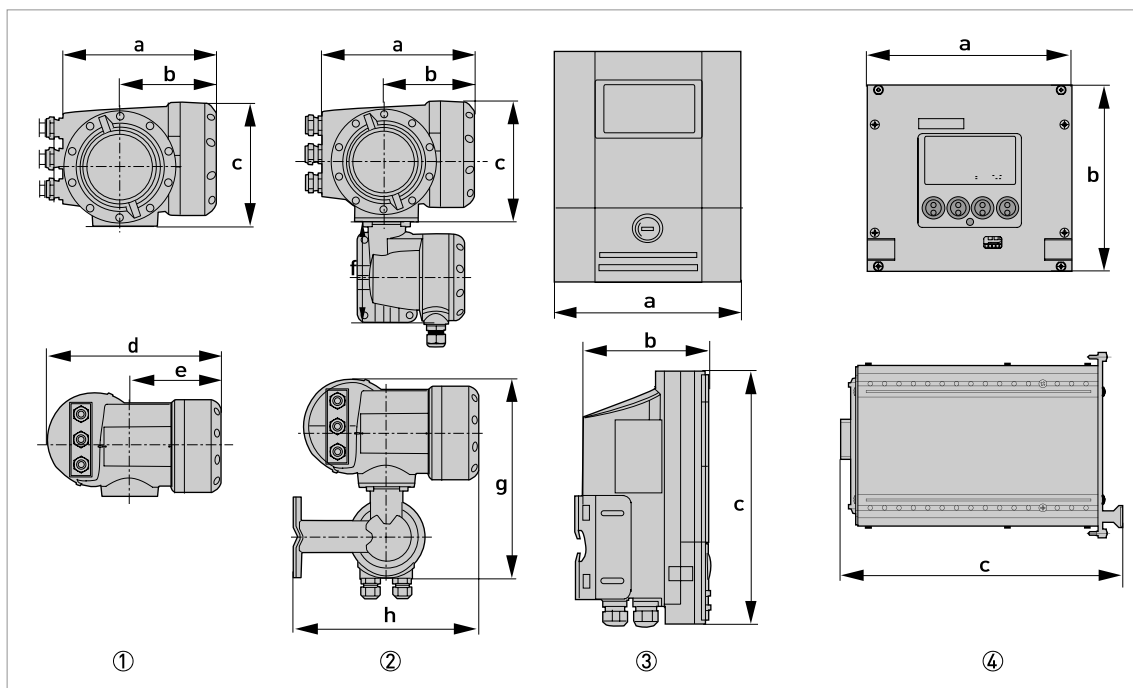
① Compact version (C)
② Field housing (F) - remote version
③ Wall-mounted housing (W) - remote version
④ 19" rack-mounted housing (R) - remote version

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

Dimensions and weights in inches and lb

Version	Dimensions [inches]							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

2.2.2 Mounting plate, field housing
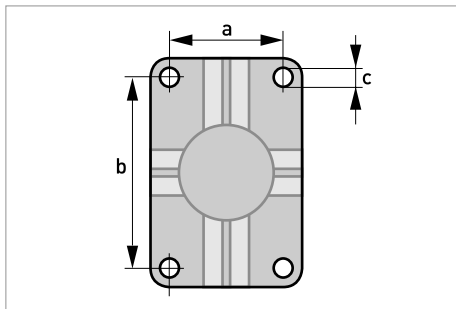
Dimensions in mm and inches

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

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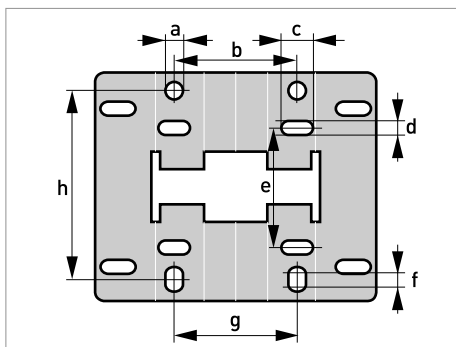
Dimensions in mm and inches

	[mm]	[inches]
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

3.1 Intended use

The mass flowmeters are designed exclusively to directly measure mass flow rates, product density and temperature as well to indirectly measure parameters such as the total volume and concentration of dissolved substances as well as the volume flow rate.

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

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.
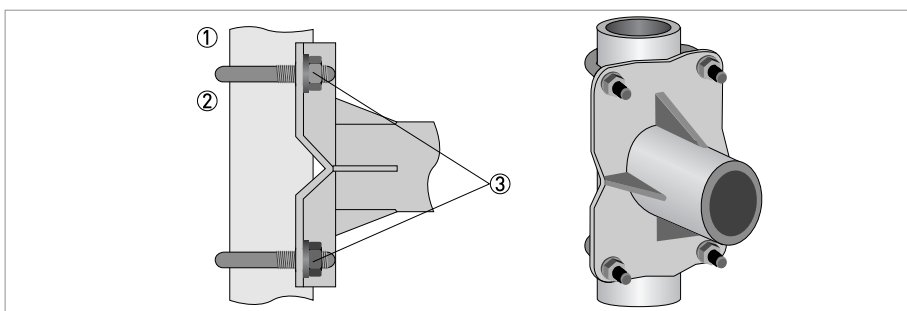
3.4.1 Pipe mounting

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.
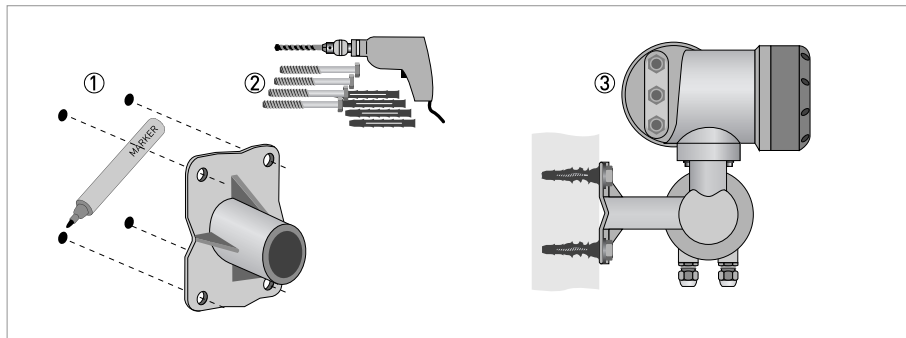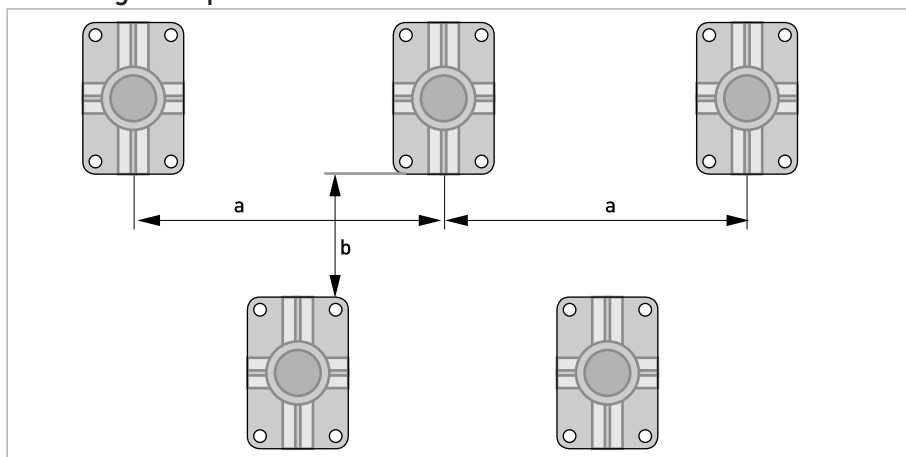③ Tighten the nuts.

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 21.
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.
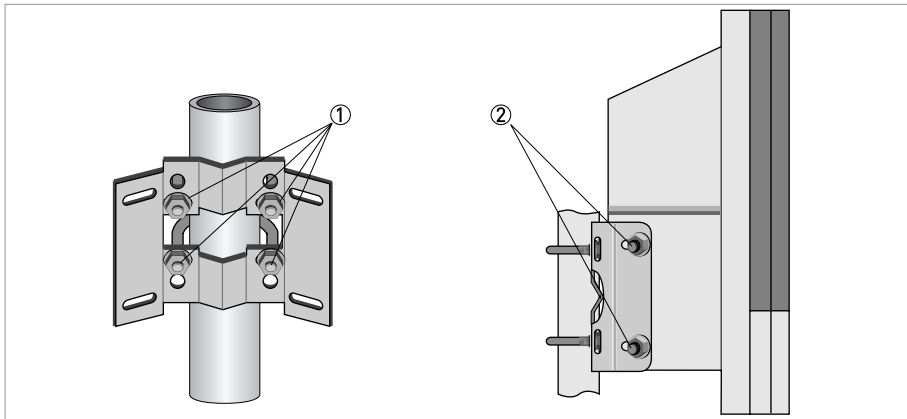
3.5.1 Pipe mounting

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
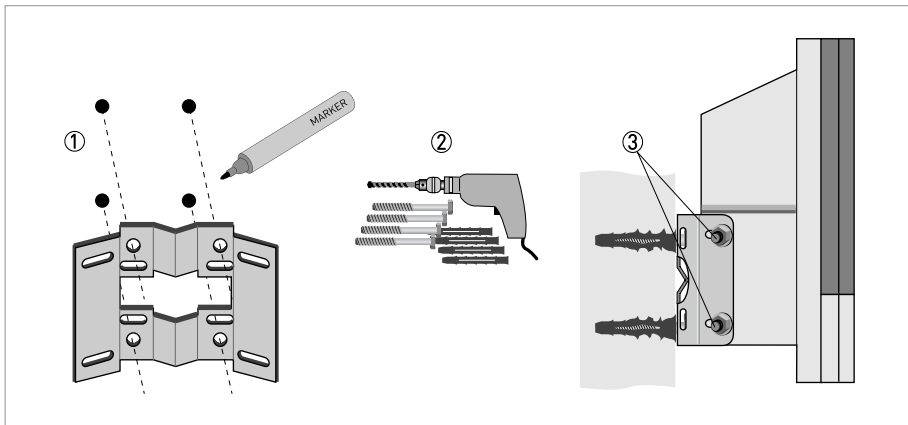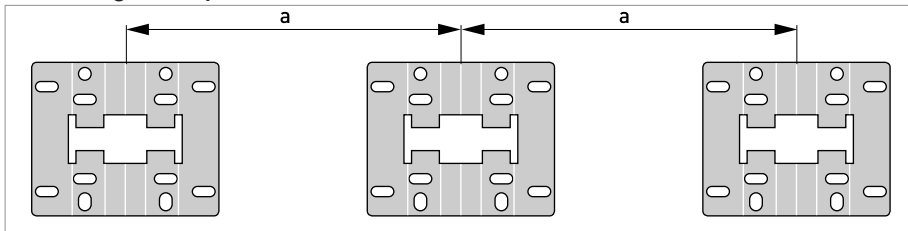

Figure 3-4: Wall mounting of the wall-mounted housing

① Prepare the holes with the aid of the mounting plate. For further information refer to *Mounting plate, wall-mounted housing* on page 21.
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.*

4.2 Connection diagram

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

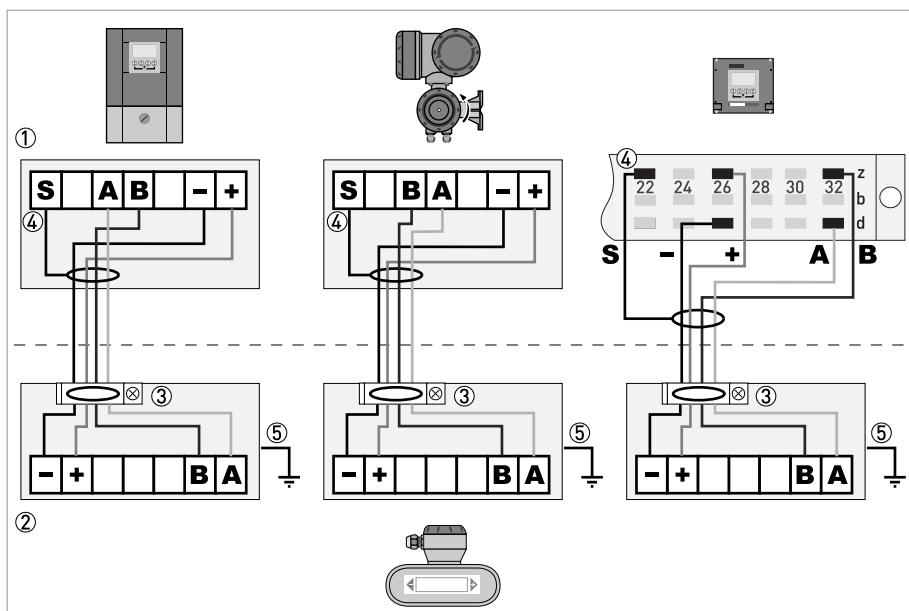**Figure 4-1: Connection diagram for remote versions, wall, field and 19" rack-mounted version**

① Terminal compartment for signal converter
② Terminal compartment for measuring sensor
③ Connect shielding to spring terminal
④ Connect shielding to terminal S
   (with 19" rack-mounted housing, the shielding can be connected to 22z, 22d, 24z or 24d)
⑤ Functional ground

4.3 Connecting power, all housing variants

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, and also a disconnecting device (switch, circuit breaker) to isolate the signal converter must be provided.

Power supply connection (excluding 19" rack-mounted housing)
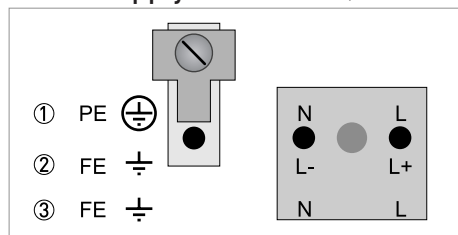
① 100...230 VAC (-15% / +10%)
② 24 VDC (-55% / +30%)
③ 24 VAC/DC (AC: -15% / +10%; DC: -25% / +30%)

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) (as per VDE 0100 / VDE 0106 and IEC 364 / IEC 536 or relevant national regulations).

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

Power supply connection for 19" rack-mounted housing
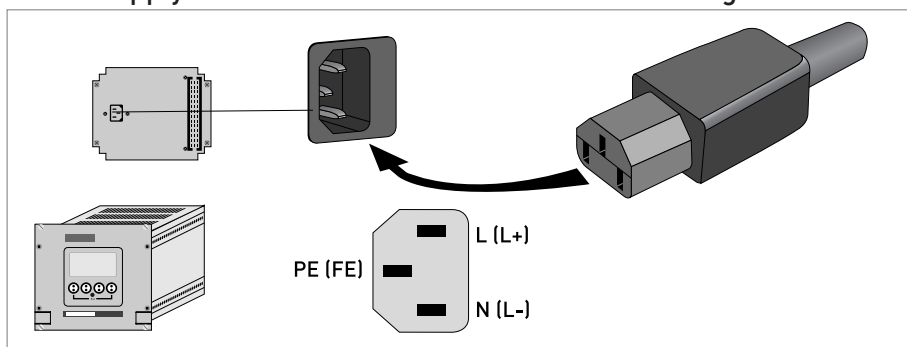
4.4 Inputs and outputs, overview

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

This signal converter is available with various in-/output combinations.

Basic version

- Has 1 current, 1 pulse 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.

4.4.2 Description of the CG number

Figure 4-2: Marking (CG number) of the electronics module and input/output variants

① ID number: 2
② ID number: 0 = standard; 9 = special
③ Power supply option
④ Display (language versions)
⑤ Input/output version (I/O)
⑥ 1st optional module for connection terminal A
⑦ 2nd optional module for connection terminal B

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

Examples for CG number

CG 320 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 320 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 320 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

4.4.3 Fixed, non-alterable input/output versions

This signal converter is available with various in-/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 in-/output (I/O) (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 inputs/outputs (optional)

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	

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	

FOUNDATION Fieldbus (Ex-i) (Option)

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	

① function changed by reconnecting
② changeable

4.4.4 Alterable input/output versions

This signal converter is available with various in-/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 inputs/outputs (option)

4 _ _		max. 2 optional modules for term. A + B			I_a + HART® active	P_a / S_a active ①
8 _ _		max. 2 optional modules for term. A + B			I_p + HART® passive	P_a / S_a active ①
6 _ _		max. 2 optional modules for term. A + B			I_a + HART® active	P_p / S_p passive ①
B _ _		max. 2 optional modules for term. A + B			I_p + HART® passive	P_p / S_p passive ①
7 _ _		max. 2 optional modules for term. A + B			I_a + HART® active	P_N / S_N NAMUR ①
C _ _		max. 2 optional modules for term. A + B			I_p + HART® passive	P_N / S_N NAMUR ①

PROFIBUS PA (Option)

D _ _		max. 2 optional modules for term. A + B			PA+ (2)	PA- (2)	PA+ (1)	PA- (1)

FOUNDATION Fieldbus (Option)

E		max. 2 optional modules for term. A + B			V/D+ (2)	V/D- (2)	V/D+ (1)	V/D- (1)

PROFIBUS DP (Option)

F _ 0		1 optional module for term. A	Termina-tion P	RxD/TxD-P(2)	RxD/TxD-N(2)	Termina-tion N	RxD/TxD-P(1)	RxD/TxD-N(1)

Modbus (Option)

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
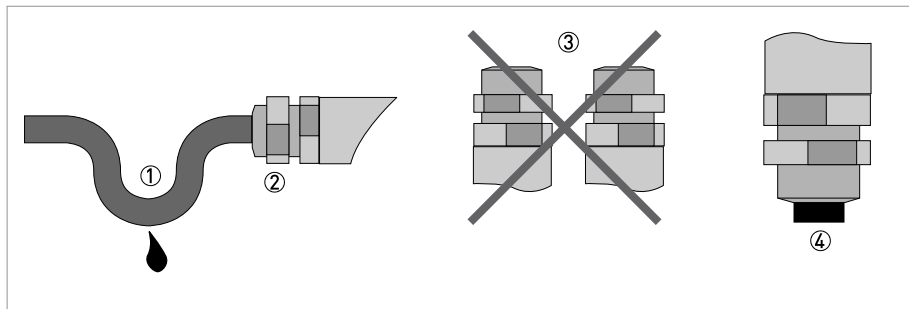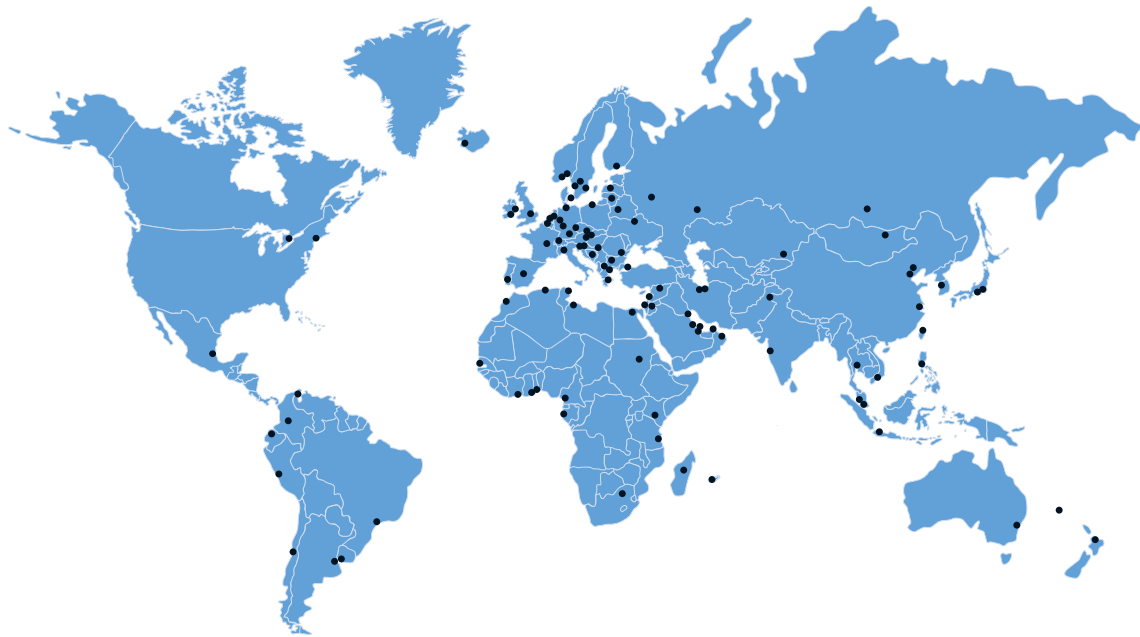
4.5 Laying electrical cables correctly

Figure 4-3: 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.

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

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