



## IFC 100 Technical Datasheet

Signal converter for electromagnetic flowmeters

- Extended accuracy option
- Diagnostics of device and application
- Certified for use in hazardous areas



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

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## 1.1 The all-round solution

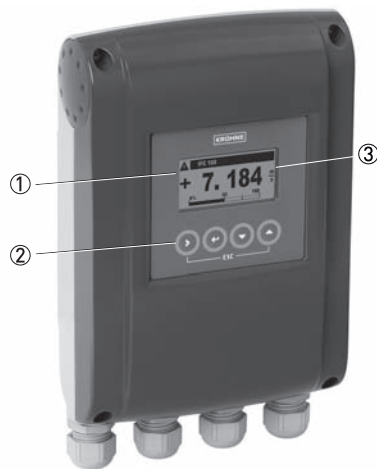
The **IFC 100** electromagnetic signal converter combines an attractive price with a wide range of features and benefits including an excellent measuring accuracy.

The signal converter is compatible with almost any flow sensor in the OPTIFLUX and WATERFLUX range.

The signal converter supplies the current required by two field coils to generate a magnetic field. It converts the flow proportional signal voltage into digital values and filters out noise and interference signals. From the filtered signal, the flow velocity, the volume flow and the mass flow are calculated.

The **IFC 100** signal converter provides a large variety of flowmeter and process diagnostic functions guaranteeing reliable measurements. Detection of deposits or coating on the electrodes, temperature and conductivity changes in the medium, gas bubbles or solids, and an empty pipe are good examples of process diagnostics functions.

The flow velocity and volume can be read from the display or in analogue form via the current output (4...20 mA) as well as by frequency, pulse and status outputs. Measuring values and diagnostic information can be transmitted via interfaces including HART<sup>®</sup>, RS485 Modbus, Foundation Fieldbus and Profibus.



(signal converter in wall-mounted aluminium housing)

- ① Large graphic display with backlight
- ② Push buttons (4) for operator control without opening the housing
- ③ Intuitive navigation and quick menu setup

### Highlights

- For operation with a wide range of OPTIFLUX and WATERFLUX flow sensors
- For flow sensors over a diameter range from DN2.5 up to DN1200
- Housing in aluminium with a polyester topcoat or in stainless steel (option)
- Tropicalized electronics to protect it from humidity (option)
- Available outputs: 4...20 mA current output, pulse/frequency output, status output/limit switch and Ex i I/O (option)
- HART® as standard
- Communication to third party systems via Foundation Fieldbus, Profibus PA/DP or Modbus
- Control input option
- Power supply via 100...230 VAC (standard) or 24 VDC or 24 VAC/DC (optional)
- Clearly readable values due to angle of the signal converter housing which prevents dirt and dust on the display
- Extended calibration option for higher measuring accuracy down to 0.2% of the measuring value
- Excellent price/performance ratio

### Industries

- Machinery
- Water & Wastewater
- HVAC, energy management
- Chemical
- Food and Beverages
- Metals and Mining

### Applications

- Flow in electrically conductive mediums with a minimum conductivity of 5  $\mu\text{S}/\text{cm}$
- Water flow measurements in a wide range of industries
- Water based chemicals
- Sludge and slurries
- Sanitary applications and (HoCIP, SIP) liquid food & beverages

## 1.2 Options and variants

### Compact or remote wall-mounted housing



(signal converter in wall-mounted aluminium housing)

For an optimal reading of the display, the compact variant comes in a 0° and a 45° version.

The signal converter can be rotated in 90° increments to suit different installation positions.

The compact 0° version is designed for flowmeters in vertical pipelines, the compact 45° version for horizontal installations.

The wall mounted signal converter can be installed remotely for locations where the sensor is difficult to access, or ambient temperature conditions or vibrations prevent a compact variant.

### Variant for use in hazardous areas



(Compact version as 0° version)

The IFC 100 signal converter is available in a variant suitable for hazardous areas with approvals to ATEX, IECEx, FM, CSA and NEPSI.

### Stainless steel housing (option)



(signal converter in wall-mounted stainless steel housing)

Whereas the standard housing material is aluminium with a polyester topcoat, the **IFC 100** can optionally be ordered in a stainless steel housing.

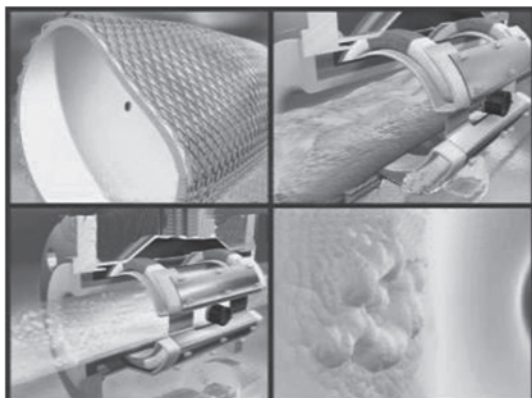
The robust housing is suitable for many applications in the food and beverage industry.

It is designed for environments where extreme chemicals or aggressive cleaning are used.

The housing is dual rated to IP67/69 protection category to resist wash down cleaning and no glass is used for the display window.

Thanks to the mounting angle for the compact housing and the rounding edges in wall-mount position nor dirt or water cannot compile on the surface.

### Diagnostics of device and application



The primary focus of a user for a flowmeter is that it delivers reliable measurements. To achieve this all our electromagnetic flowmeters are calibrated before leaving the factory.

In addition, the **IFC 100** provides a range diagnostic functions on the flow sensor, signal converter and process, integrated in the signal converter.

Potential problems including gas bubbles, solids, electrode corrosion, deposits on electrodes, conductivity changes, empty pipe can be detected by the diagnostics features.

### OPTICHECK tool for on-site verification



(Suitcase with OPTICHECK and all cables and accessories)

The OPTICHECK provides an inline health check of the device under test by an external tool.

When the tool is connected on site, it gathers measuring data to ensure that the flowmeter performs within 1% of its factory calibration.

The baseline can be historic repair data from the factory or on-site test results after performing a full verification.

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

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

### 1.3 Signal converter/flow sensor combination possibilities

Flow sensor	Flow sensor + signal converter IFC 100	
	Compact (0°/45° version)	Remote wall-mounted housing
OPTIFLUX 1000	OPTIFLUX 1100 C	OPTIFLUX 1100 W
OPTIFLUX 2000	OPTIFLUX 2100 C	OPTIFLUX 2100 W
OPTIFLUX 4000	OPTIFLUX 4100 C	OPTIFLUX 4100 W
OPTIFLUX 5000	OPTIFLUX 5100 C	OPTIFLUX 5100 W
OPTIFLUX 6000	OPTIFLUX 6100 C	OPTIFLUX 6100 W
WATERFLUX 3000	WATERFLUX 3100 C	WATERFLUX 3100 W

### 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 flowmeter

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 totalizing, recording and output processing.

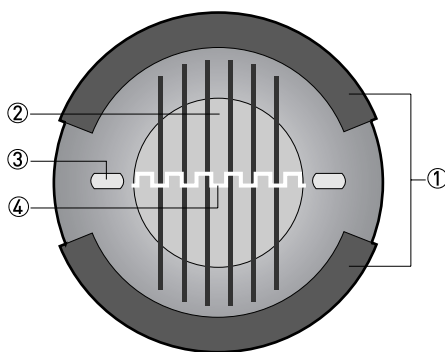


Figure 1-1: Measuring principle

- ① Field coils
- ② Magnetic field
- ③ Electrodes
- ④ Induced voltage (proportional to flow velocity)

## 2.1 Technical data

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

### Measuring system

Measuring principle	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 flow sensor

### Design

Modular construction	The measuring system consists of a flow sensor and a signal converter.
<b>Flow sensor</b>	
OPTIFLUX 1000	DN10...150 / 3/8...6"
OPTIFLUX 2000	DN25...1200 / 1...48"
OPTIFLUX 4000	DN2.5...1200 / 1/10...48"
OPTIFLUX 5000	Flange: DN15...300 / 1/2...12" Sandwich: DN2.5...100 / 1/10...4"
OPTIFLUX 6000	DN2.5...150 / 1/10...6"
WATERFLUX 3000	DN25...600 / 1...24"
	With the exception of the OPTIFLUX 1000 and WATERFLUX 3000 all flow sensors are also available in an Ex version.
<b>Signal converter</b>	
Compact version (C)	IFC 100 C (0° & 45° version)
Remote version (W)	IFC 100 W
	All signal converters are also available in an Ex version.
<b>Options</b>	
Outputs	Current output (incl. HART®), pulse output, frequency output, status output and/or limit switch
Counter	2 internal counters with a max. of 10 counter places (e.g. for counting volume and/or mass units)
Verification	Integrated verification, diagnostic functions: measuring device, empty pipe detection, stabilisation
Communication interfaces	HART® as standard
	Foundation Fieldbus, Profibus PA/DP or Modbus



<b>Display and user interface</b>	
Graphic display	LC display, backlit white.
	Size: 128 x 64 pixels, corresponds to 59 x 31 mm = 2.32" x 1.22"
	Ambient temperatures below -25°C / -13°F may affect the readability of the display.
Operating elements	4 push buttons for operator control of the signal converter without opening the housing.
Remote control	PACTware™ (including Device Type Manager (DTM))
	HART® Hand Held Communicator from Emerson Process
	AMS® from Emerson Process
	PDM® from Siemens
	All DTMs and drivers are available free of charge from the manufacturer's website.
<b>Display functions</b>	
Operating menu	Setting the parameters using 2 measuring pages, 1 status page, 1 graphic 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, Finnish, Norwegian
	Southern Europe: English, Turkish
	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

### Measuring accuracy

Max. measuring accuracy	<b>Standard:</b> ±0.3% of the measured value ± 1 mm/s; depending on the flow sensor
	<b>Option (optimised accuracy with extended calibration):</b> ±0.2% of the measured value ± 1.5 mm/s; depending on the flow sensor
	For detailed information and accuracy curves refer to <i>Measuring accuracy</i> on page 25.
	Special calibrations are available on request.
	Current output electronics: ±10 µA; ±100 ppm/°C (typically: ±30 ppm/°C)
Repeatability	±0.1%

### Operating conditions

<b>Temperature</b>	
Process temperature	Refer to technical data for the flow sensor.
Ambient temperature	Depending on the version and combination of outputs.
	It is a good idea to protect the signal converter from external heat sources such as direct sunlight as higher temperatures reduce the life cycle of all electronic components.
	Ambient temperatures below -25°C / -13°F may affect the readability of the display.
Storage temperature	-40...+70°C / -40...+158°F
<b>Pressure</b>	
Medium	Refer to technical data for the flow sensor.
Ambient pressure	Atmospheric
<b>Chemical properties</b>	
Electrical conductivity	All media except for water: $\geq 5 \mu\text{S/cm}$ (also refer to the technical data for the flow sensor)
	Water: $\geq 20 \mu\text{S/cm}$
State of aggregation	Conductive, liquid media
Solid content (volume)	$\leq 10\%$ for OPTIFLUX flow sensors
Gas content (volume)	$\leq 3\%$ for OPTIFLUX flow sensors
Flow rate	For detailed information, refer to chapter "Flow tables".
<b>Other conditions</b>	
Ingress protection acc. to IEC 529 / EN 60529	Standard version with aluminium housing: IP66/67 (acc. to NEMA 4/4X)
	Optional version with stainless steel housing: IP69

### Installation conditions

Installation	For detailed information, refer to chapter "Installation conditions".
Inlet / outlet sections	Refer to technical data for the flow sensor.
Dimensions and weight	For detailed information refer to chapter "Dimensions and weight".

### Materials

Signal converter housing	Standard: Aluminium with a polyester topcoat Option: Stainless steel 1.4404 / AISI 316L
Flow sensor	For housing materials, process connections, liners, grounding electrodes and gaskets, refer to technical data for the flow 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 specifications.
Power supply	100...230 VAC (-15% / +10%), 50/60 Hz; non-Ex: standard; Ex: optional 240 VAC + 5% is included in the tolerance range.
	24 VDC (-55% / +30%); only available as non-Ex version 12 VDC - 10% is included in the tolerance range.
	24 VAC/DC (AC: -15% / +10%; DC: -25% / +30%); non-Ex: standard; Ex: optional 12 V is <b>not</b> included in the tolerance range.
Power consumption	AC: 7 VA
	DC: 4 W
Signal cable	Only necessary for remote versions.
	<b>DS 300 (type A)</b> Max. length: 600 m / 1968 ft (depending on electrical conductivity and flow sensor version)
Cable entries	Standard: M20 x 1.5 (8...12 mm)
	Option: 1/2 NPT, PF 1/2

### 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 abbreviations	$U_{\text{ext}}$ = external voltage; $R_L$ = load + resistance; $U_o$ = terminal voltage; $I_{\text{nom}}$ = nominal current

<b>Current output</b>		
Output data	Volume flow, mass flow, diagnostic value, flow velocity, coil temperature, conductivity	
Settings	<b>Without HART®</b>	
	Q = 0%: 0...20 mA; Q = 100%: 10...21.5 mA	
	Error identification: 20...22 mA	
	<b>With HART®</b>	
	Q = 0%: 4...20 mA; Q = 100%: 10...21.5 mA	
		Error identification: 3...22 mA
<b>Operating data</b>	<b>Basic I/Os</b>	<b>Ex i I/Os</b>
Active	U <sub>int, nom</sub> = 20 VDC I ≤ 22 mA R <sub>L</sub> ≤ 750 Ω	-
	HART® at terminals A	
Passive	U <sub>ext</sub> ≤ 32 VDC I ≤ 22 mA U <sub>0</sub> ≥ 2 V at I = 22 mA R <sub>L</sub> ≤ (U <sub>ext</sub> - U <sub>0</sub> ) / I <sub>max</sub>	U <sub>ext</sub> ≤ 32 VDC I ≤ 22 mA U <sub>0</sub> ≥ 4 V R <sub>L</sub> ≤ (U <sub>ext</sub> - U <sub>0</sub> ) / I <sub>max</sub>
		U <sub>i</sub> = 30 V I <sub>i</sub> = 130 mA P <sub>i</sub> = 1 W C <sub>i</sub> = 10 nF L <sub>i</sub> ~ 0 mH
	HART® at terminals A	HART® at terminals C
<b>HART®</b>		
Description	HART® protocol via active and passive current output	
	HART® version: V5	
	Universal Common Practice HART® parameter: completely supported	
Load	≥ 250 Ω at HART® test point; Note maximum load for current output!	
Multi-drop mode	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 output / frequency output		
Output data	Pulse output: volume flow, mass flow	
	Frequency output: volume flow, mass flow, diagnostic value, flow velocity, coil temperature, conductivity	
Function	Can be set as a pulse output or frequency output	
Pulse rate/frequency	0.25...10000 Hz	
	For Modbus I/O: 0.25...1000 Hz	
Settings	Pulses per volume or mass unit or max. frequency for 100% flow	
	Pulse width: adjustable as automatic, symmetric or fixed (0.05...2000 ms)	
Operating data	Basic I/Os	Ex i I/Os
Passive	$U_{\text{ext}} \leq 32 \text{ VDC}$  $f_{\text{max}}$ in operating menu set to $f_{\text{max}} \leq 100 \text{ Hz}$ :  $I \leq 100 \text{ mA}$  open: $I \leq 0.05 \text{ mA}$ at $U_{\text{ext}} = 32 \text{ VDC}$  closed: $U_{0, \text{max}} = 0.2 \text{ V}$ at $I \leq 10 \text{ mA}$ $U_{0, \text{max}} = 2 \text{ V}$ at $I \leq 100 \text{ mA}$	-
	$f_{\text{max}}$ in operating menu set to $100 \text{ Hz} < f_{\text{max}} \leq 10 \text{ kHz}$ :  $I \leq 20 \text{ mA}$  open: $I \leq 0.05 \text{ mA}$ at $U_{\text{ext}} = 32 \text{ VDC}$  closed: $U_{0, \text{max}} = 1.5 \text{ V}$ at $I \leq 1 \text{ mA}$ $U_{0, \text{max}} = 2.5 \text{ V}$ at $I \leq 10 \text{ mA}$ $U_{0, \text{max}} = 5.0 \text{ V}$ at $I \leq 20 \text{ mA}$	-
NAMUR	-	Passive to EN 60947-5-6  open: $I_{\text{nom}} = 0.77 \text{ mA}$  closed: $I_{\text{nom}} = 4.7 \text{ mA}$  $U_i = 30 \text{ V}$ $I_i = 130 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i = 0 \text{ mH}$
Operating data	Modbus	
Passive	$U_{\text{ext}} \leq 32 \text{ VDC}$	
	$f_{\text{max}}$ in the operating menu set to $f_{\text{max}} \leq 1 \text{ kHz}$ :  $I \leq 100 \text{ mA}$  open: $I \leq 0.05 \text{ mA}$ at $U_{\text{ext}} = 32 \text{ VDC}$  closed: $U_{0, \text{max}} = 0.2 \text{ V}$ at $I \leq 10 \text{ mA}$ $U_{0, \text{max}} = 2 \text{ V}$ at $I \leq 100 \text{ mA}$	

<b>Low flow cut off</b>		
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) or 0...±9.999 m/s (pulse output)	
Hysteresis	Set in increments of 0.1%.	
	0...5% (current output, frequency output) or 0...5 m/s (pulse output)	
<b>Time constant</b>		
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 seconds.	
	0...100 seconds	
<b>Status output / limit switch</b>		
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	
<b>Operating data</b>	<b>Basic I/Os + Modbus</b>	<b>Ex i I/Os</b>
Passive	$U_{\text{ext}} \leq 32 \text{ VDC}$ $I \leq 100 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ at $U_{\text{ext}} = 32 \text{ VDC}$ closed: $U_{0, \text{max}} = 0.2 \text{ V}$ at $I \leq 10 \text{ mA}$ $U_{0, \text{max}} = 2 \text{ V}$ at $I \leq 100 \text{ mA}$	-
	NAMUR	-

<b>Control input</b>		
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.	
<b>Operating data</b>	<b>Basic I/Os</b>	<b>Ex i I/Os + Modbus</b>
Passive	$U_{\text{ext}} \leq 32 \text{ VDC}$ $I_{\text{nom}} = 6.5 \text{ mA at } U_{\text{ext}} = 24 \text{ VDC}$ $I_{\text{nom}} = 8.2 \text{ mA at } U_{\text{ext}} = 32 \text{ VDC}$ Contact closed (on): $U_0 \geq 8 \text{ V at } I_{\text{nom}} = 2.8 \text{ mA}$ Contact open (off): $U_0 \leq 2.5 \text{ V at } I_{\text{nom}} = 0.4 \text{ mA}$	-
<b>PROFIBUS DP</b>		
Description	Galvanically isolated acc. to IEC 61158-2	
	PA profile version: class B, V3.02	
	Automatic data transmission rate recognition (max. 1.5 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	
<b>PROFIBUS PA</b>		
Description	Galvanically isolated acc. to IEC 61158-2	
	PA profile version: class B, V3.02	
	Current consumption: 10.5 mA	
	Permissible bus voltage: 9...32 VDC; in Ex application: 9...24 VDC	
	Bus interface with integrated reverse polarity protection	
	Typical error current FDE (Fault Disconnection Electronic): 6 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	
<b>FOUNDATION Fieldbus</b>		
Description	Galvanically isolated acc. to IEC 61158-2	
	Current consumption: 10.5 mA	
	Permissible bus voltage: 9...32 VDC; in Ex application: 9...24 VDC	
	Bus interface with integrated reverse polarity protection	
	Link Master function (LM) supported	
	Tested with Interoperable Test Kit (ITK) version 5.2	
Function blocks	3 x analogue input, 2 x integrator, 1 x PID	
Output data	Volume flow, mass flow, velocity, coil temperature, conductivity, electronics temperature	

<b>Modbus</b>	
Description	Modbus RTU, Master / Slave, RS485
Address range	1...247
Broadcast	Supported with function code 16
Supported Baud rate	1200, 2400, 3600, 4800, 9600, 19200, 38400, 57600, 115200 Baud

### Approvals and certificates

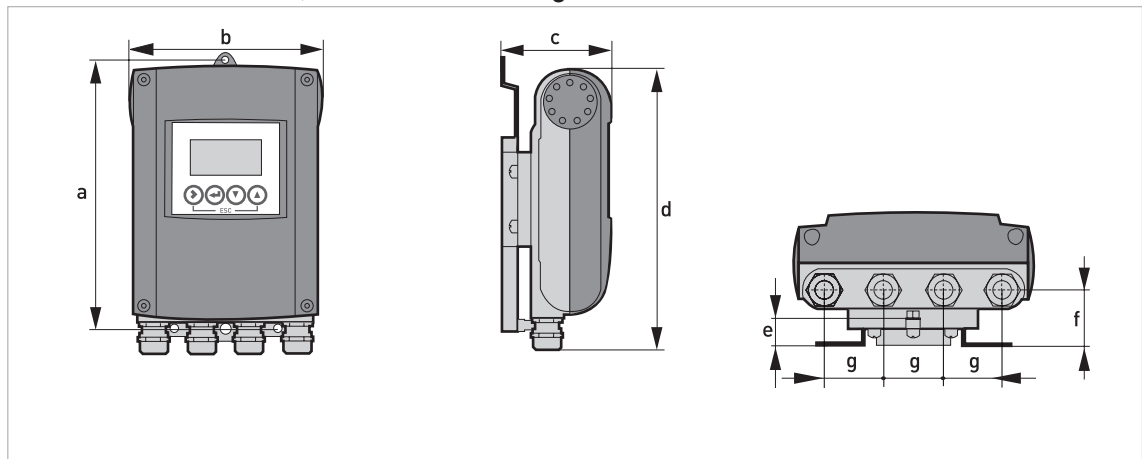
CE	This device fulfils the statutory requirements of the relevant EU directives. The manufacturer certifies successful testing of the product by applying the CE mark.
	For full information of the EU directives & standards and the approved certifications, please refer to the EU declaration or the manufacturer website.
Non-Ex	Standard
<b>Hazardous areas</b>	
ATEX	<b>Option (only OPTIFLUX 2100 C and OPTIFLUX 4100 C)</b>
	II 2 G Ex e [ia] mb IIC T4 (DN10...20; DN200...300; DN350...3000)
	II 2 G Ex d e [ia] mb IIC T4 (DN25...150)
	II 2 G Ex e [ia] mb q T4/T3 (DN25...150; DN200...300)
	II 2 D Ex tD A21 IP64 T120°C (all nominal sizes)
	<b>Option (only W version)</b>
	II 2 D Ex tD A21 IP64 T135°C
IECEx	<b>Option (only OPTIFLUX 2100 C and OPTIFLUX 4100 C)</b>
	Ex e [ia] mb IIC T4 (DN10...20; DN200...300; DN350...3000)
	Ex d e [ia] mb IIC T4 (DN25...150)
	Ex tD A21 IP64 T120°C (all nominal sizes)
	<b>Option (only W version)</b>
	Ex e [ia] mb IIC T4
	Ex tD A21 IP64 T135°C
FM/CSA	<b>Option (only OPTIFLUX 2100 C and OPTIFLUX 4100 C)</b>
	Class I, Div 2, Group A, B, C and D
	<b>Option (only W version)</b>
	Class I, Div 2, Group A, B, C and D Ordinary location
<b>Other standards and approvals</b>	
Electromagnetic compatibility (EMC)	2004/108/EC in conjunction with EN 61326-1 (A1, A2)
Shock and vibration resistance	IEC 68-2-27, IEC 68-2-64
NAMUR	NE 21, NE 43, NE 53



## 2.2 Dimensions and weight

### 2.2.1 Housing

Wall-mounted version, aluminium housing



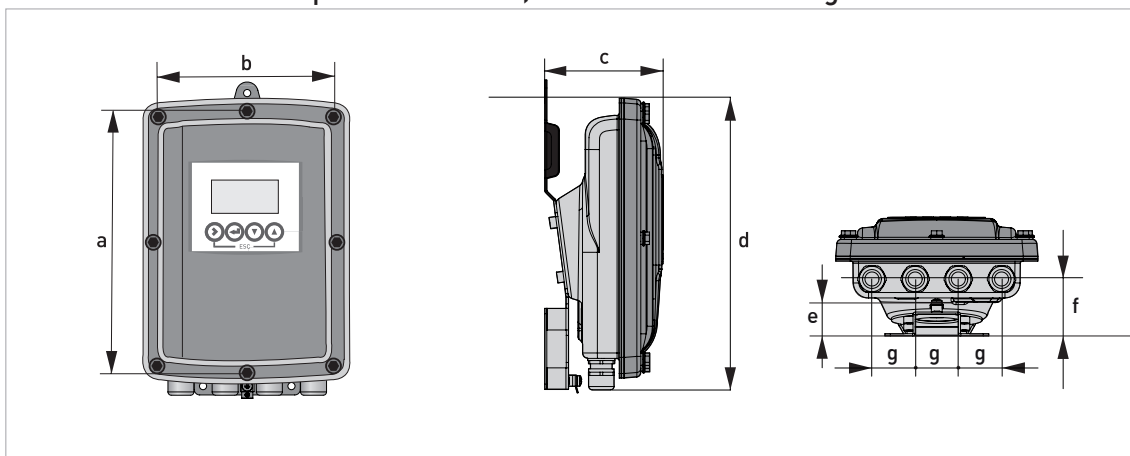
Dimensions and weights in mm and kg

	Dimensions [mm]							Weight [kg]
	a	b	c	d	e	f	g	
Wall-mounted version	241	161	95.2	257	19.3	39.7	40	1.9

Dimensions and weights in inch and lb

	Dimensions [inch]							Weight [lb]
	a	b	c	d	e	f	g	
Wall-mounted version	9.50	6.34	3.75	10.12	0.76	1.56	1.57	4.2

Wall-mounted and compact 10° version, stainless steel housing



Dimensions and weights in mm and kg

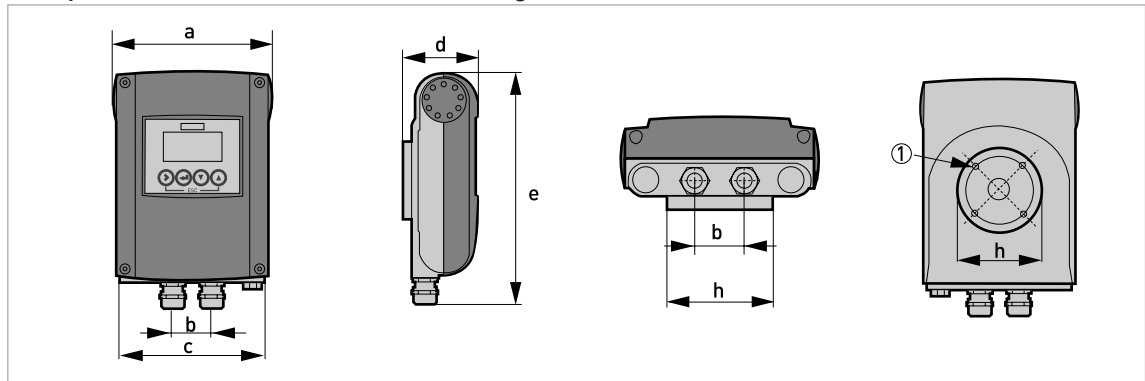
	Dimensions [mm]							Weight [kg]
	a	b	c	d	e	f	g	
Wall-mounted version	268	187	110	276	29	53	40	Approx. 3.5

Dimensions and weights in inch and lb

	Dimensions [inch]							Weight [lb]
	a	b	c	d	e	f	g	
Wall-mounted version	10.55	7.36	4.33	10.87	1.14	2.09	1.57	Approx. 7.2

*The compact 10° version is without mounting plate.*

## Compact 0° version, aluminium housing



① 4 x M 6

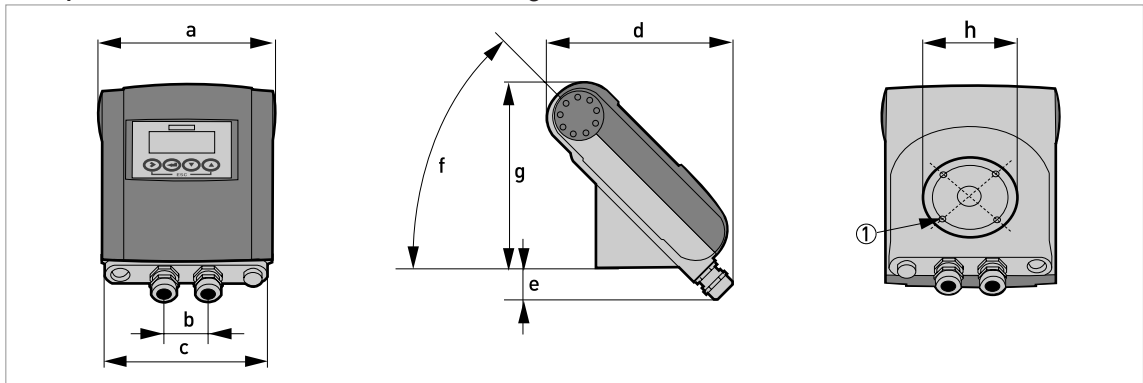
## Dimensions and weights in mm and kg

	Dimensions [mm]								Weight [kg]
	a	b	c	d	e	f	g	h	
0° version	161	40	155	81.5	257	-	-	Ø72	Std: 1.9 Ex: 2.4

## Dimensions and weights in inch and lb

	Dimensions [inch]								Weight [lb]
	a	b	c	d	e	f	g	h	
0° version	6.34	1.57	6.1	3.21	10.12	-	-	Ø2.83	Std: 4.2 Ex: 5.3

Compact 45° version, aluminium housing



① 4 x M 6

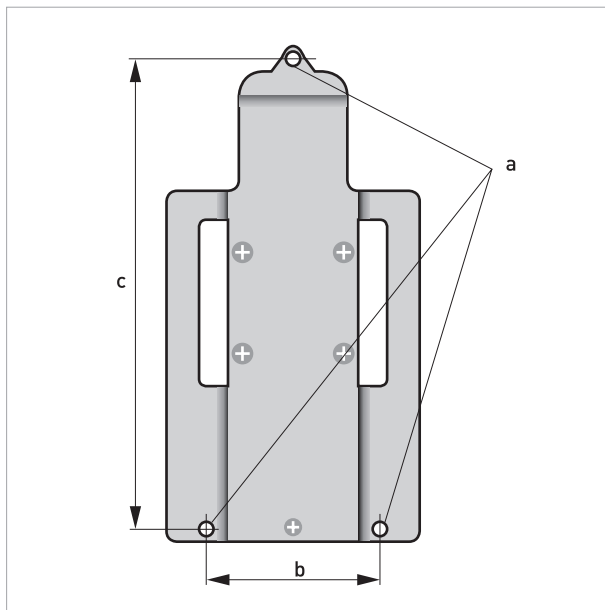
Dimensions and weights in mm and kg

	Dimensions [mm]								Weight [kg]
	a	b	c	d	e	f	g	h	
45° version	161	40	155	184	27.4	45°	186	Ø72	Std: 2.1 Ex: 2.6

Dimensions and weights in inch and lb

	Dimensions [inch]								Weight [lb]
	a	b	c	d	e	f	g	h	
45° version	6.34	1.57	6.10	7.24	1.08	45°	7.32	Ø2.83	Std: 4.6 Ex: 5.7

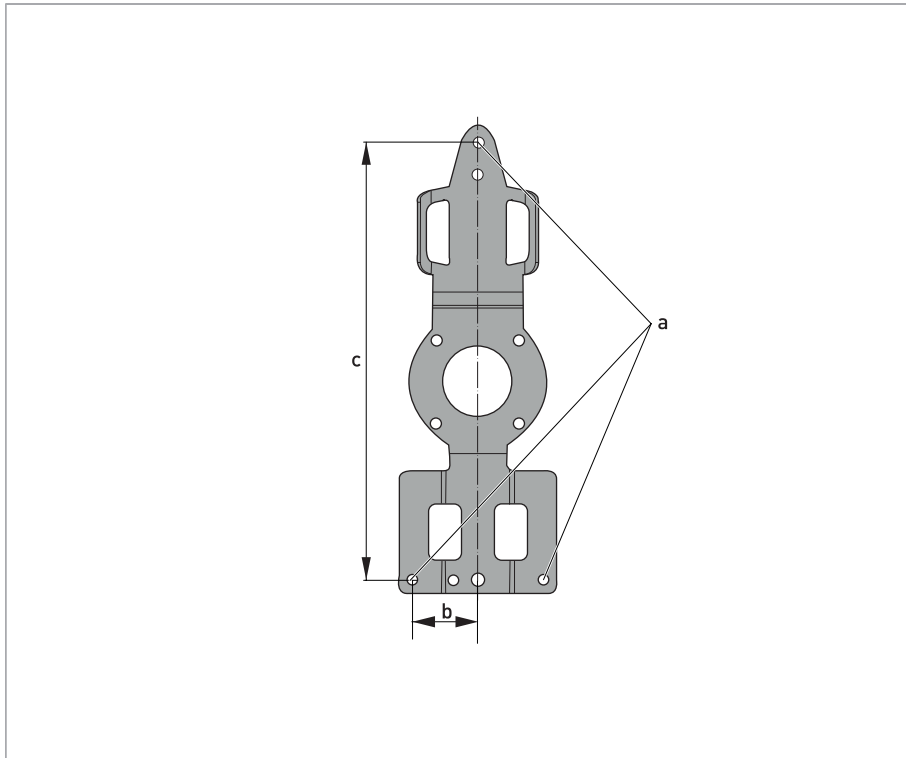
### 2.2.2 Mounting plate of wall-mounted version, aluminium housing



Dimensions in mm and inch

	[mm]	[inch]
a	Ø6.5	Ø0.26
b	87.2	3.4
c	241	9.5

## 2.2.3 Mounting plate of wall-mounted version, stainless steel housing



	[mm]	[inch]
a	Ø6.5	Ø0.26
b	40	1.6
c	267.9	10.55

## 2.3 Flow tables

Flow rate in m/s and m<sup>3</sup>/h

	Q <sub>100%</sub> in m <sup>3</sup> /h			
v [m/s]	0.3	1	3	12
DN [mm]	Minimum flow	Nominal flow		Maximum 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

## Flow rate in ft/s and US gallons/min

	Q <sub>100</sub> % in US gallons/min			
v [ft/s]	1	3.3	10	40
DN [inch]	Minimum flow	Nominal flow		Maximum 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



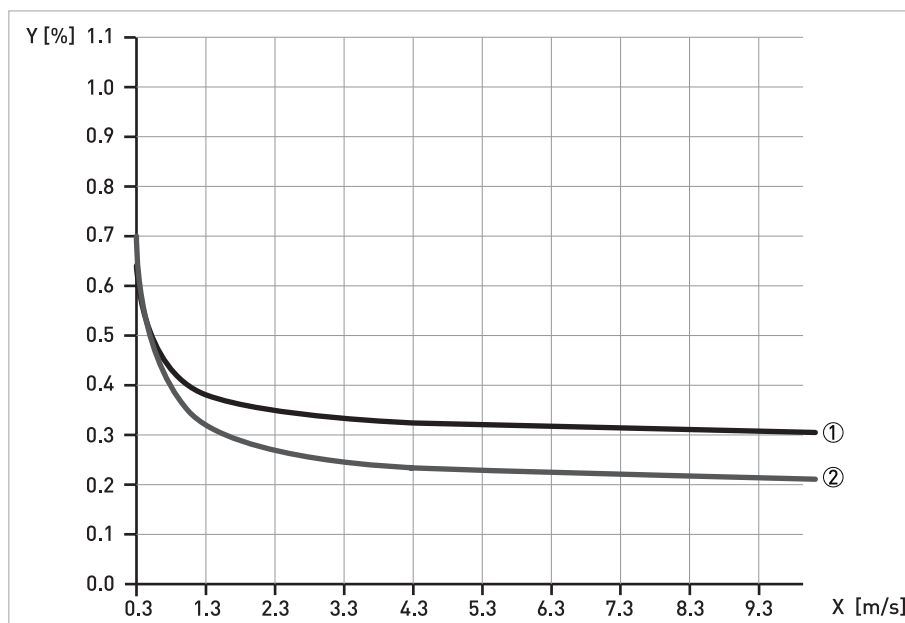
## 2.4 Measuring accuracy

Every electromagnetic flowmeter is calibrated by direct volume comparison. The wet calibration validates the performance of the flowmeter under reference conditions against accuracy limits.

The accuracy limits of electromagnetic flowmeters are typically the result of the combined effect of linearity, zero point stability and calibration uncertainty.

### Reference conditions

- Medium: water
- Temperature: +5...+35°C / +41...+95°F
- Operating pressure: 0.1...5 barg / 1.5...72.5 psig
- Inlet section:  $\geq 5$  DN
- Outlet section:  $\geq 2$  DN



X [m/s]: flow velocity

Y [%]: deviation from the actual measured value (mv)

	DN [mm]	DN [inch]	Standard accuracy ①	Optimised accuracy ②
OPTIFLUX 1100	10...150	3/8...6	±0.4% of mv ± 1 mm/s; as ① + 0.1%	-
OPTIFLUX 4100 / 5100 / 6100	2.5...6	1/10...1/4		
OPTIFLUX 2100 / 4100 / 5100 / 6100	10...1200	3/8...48	±0.3% of mv ± 1 mm/s	±0.2% of mv ± 1.5 mm/s Extended calibration at 2 points
WATERFLUX 3100	25...600	1...24	±0.3% of mv ± 1 mm/s	-

### 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.*

*This device is a Group 1, Class A device as specified within CISPR11:2009. It is intended for use in industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.*

### 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 vibrations. The measuring devices are tested for a vibration level in accordance with IEC 68-2-64.*

### 3.3 Mounting of the compact version

*Turning the housing of the compact version is not permitted.*

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

### 3.4 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.*

#### 3.4.1 Wall mounting

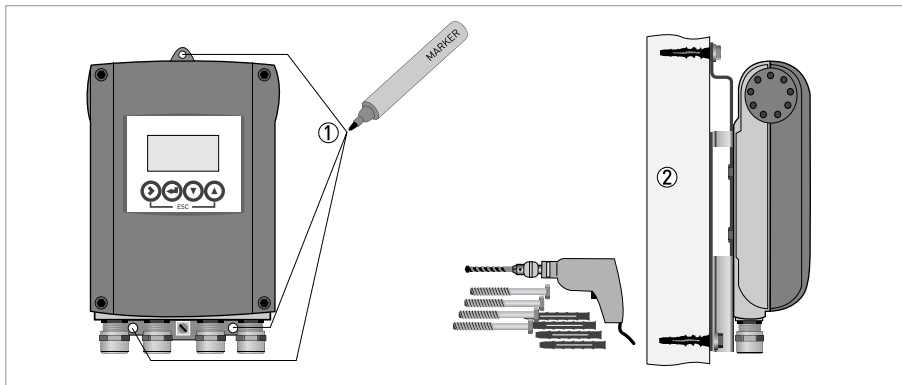
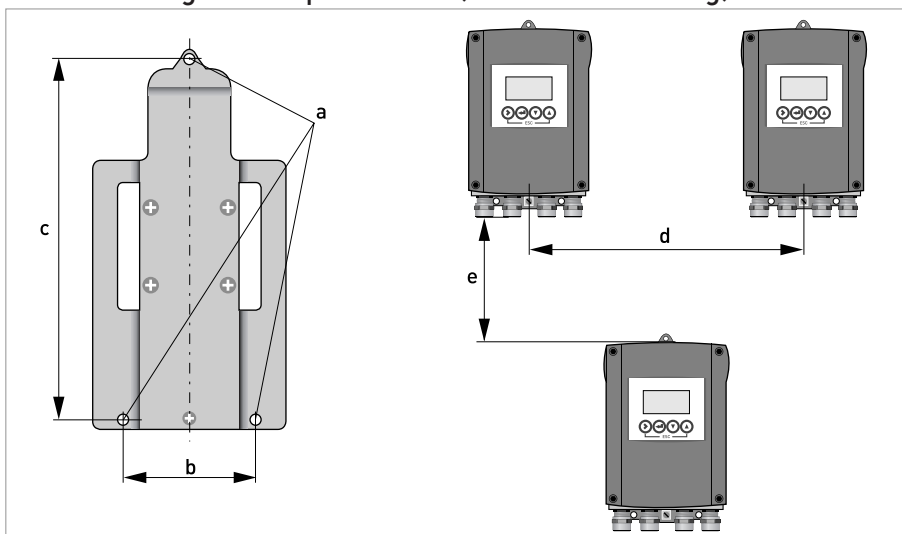


Figure 3-1: Mounting the wall-mounted housing

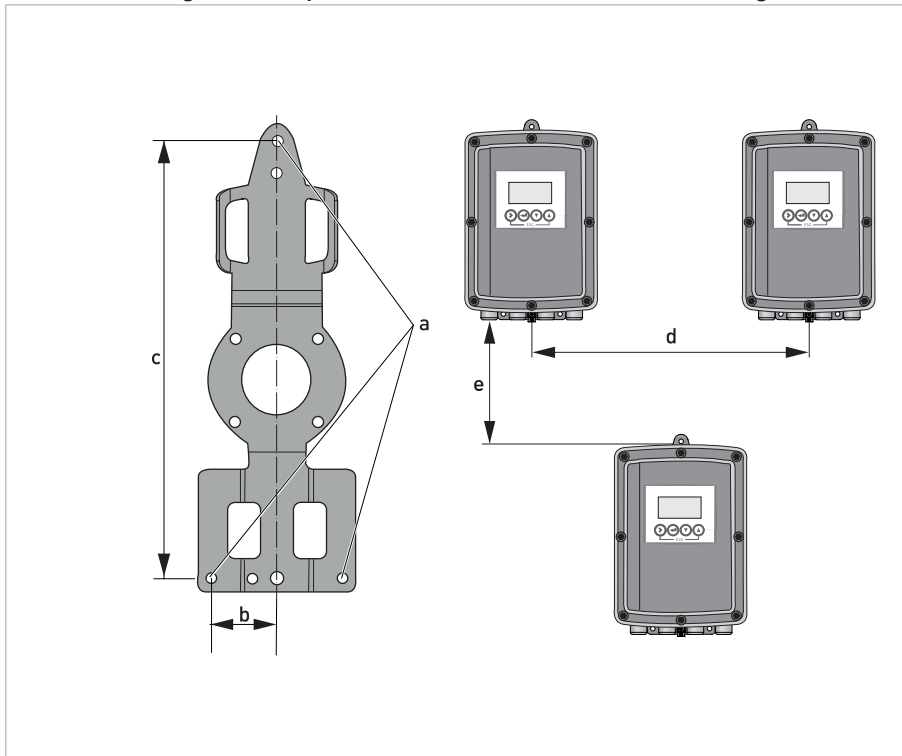
- ① Prepare the holes with the aid of the mounting plate. For further information refer to *Mounting plate of wall-mounted version, aluminium housing* on page 21.
- ② Fasten the device securely to the wall with the mounting plate.

Wall mounting of multiple devices (aluminium housing)



	[mm]	[inch]
a	Ø6.5	Ø0.26
b	87.2	3.4
c	241	9.5
d	310	12.2
e	257	10.1

## Wall mounting of multiple devices (stainless steel housing)



	[mm]	[inch]
a	Ø6.5	Ø0.26
b	268	10.5
c	40	1.6
d	336	13.2
e	257	10.1

## 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 flow sensor and signal converter have been configured together at the factory. For this reason, please connect the devices in pairs. Ensure that the flow sensor constant GK/GKL (see nameplates) are identically set.
- If delivered separately or when installing devices that were not configured together, set the signal converter to the DN size and GK/GKL of the flow sensor.

## 4.2 Preparing the signal and field current cables

*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.*

### 4.2.1 Signal cable A (type DS 300), construction

- Signal cable A is a double-shielded cable for signal transmission between the flow sensor and signal converter.
- Bending radius:  $\geq 50 \text{ mm} / 2''$

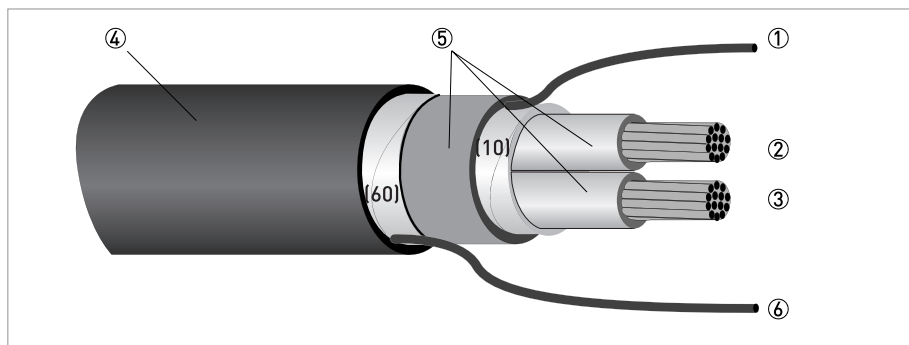


Figure 4-1: Construction of signal cable A

- ① Stranded drain wire (1) for the inner shield (10),  $1.0 \text{ mm}^2 \text{ Cu}$  / AWG 17 (not insulated, bare)
- ② Insulated wire (2),  $0.5 \text{ mm}^2 \text{ Cu}$  / AWG 20
- ③ Insulated wire (3),  $0.5 \text{ mm}^2 \text{ Cu}$  / 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.

Flow sensor	Nominal diameter		Min. electrical conductivity [ $\mu\text{S}/\text{cm}$ ]	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...1200	8...48	20	A2
OPTIFLUX 4000 F	2.5...150	1/10...6	5	A1
	200...1200	8...48	5	A2
OPTIFLUX 5000 F	2.5...100	1/10...4	5	A1
	150...250	6...10	5	A2
OPTIFLUX 6000 F	2.5...150	1/10...6	5	A1
WATERFLUX 3000 F	25...600	1...24	20	A1

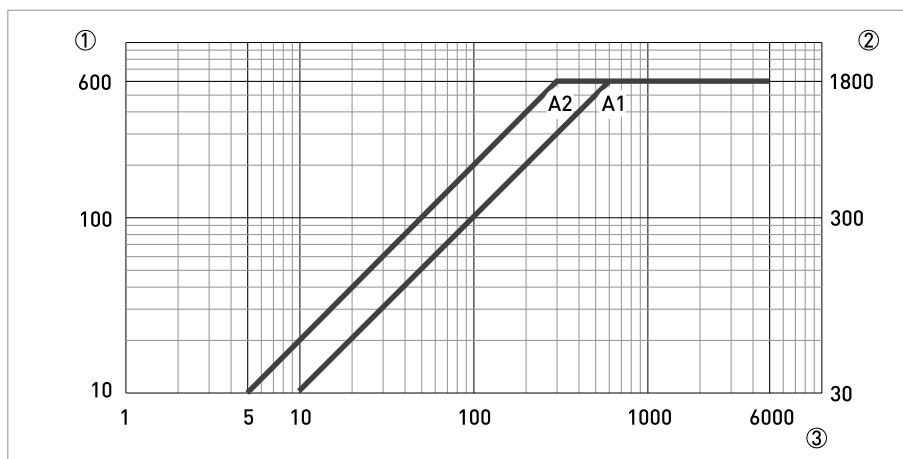


Figure 4-2: Maximum length of signal cable A

- ① Maximum length of signal cable A between the flow sensor and signal converter [m]
- ② Maximum length of signal cable A between the flow sensor and signal converter [ft]
- ③ Electrical conductivity of the medium being measured [ $\mu\text{S}/\text{cm}$ ]

### 4.2.3 Connection diagram for signal and field current cable

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

- A shielded 2-wire copper cable is used as the field current cable. The shielding **MUST** be connected in the housing of the flow sensor and signal converter.
- The outer shield (60) is connected in the terminal compartment of the flow sensor directly via the shield and a clip.
- Bending radius of signal and field current cable:  $\geq 50 \text{ mm} / 2''$
- The following illustration is schematic. The positions of the electrical connection terminals may vary depending on the housing version.

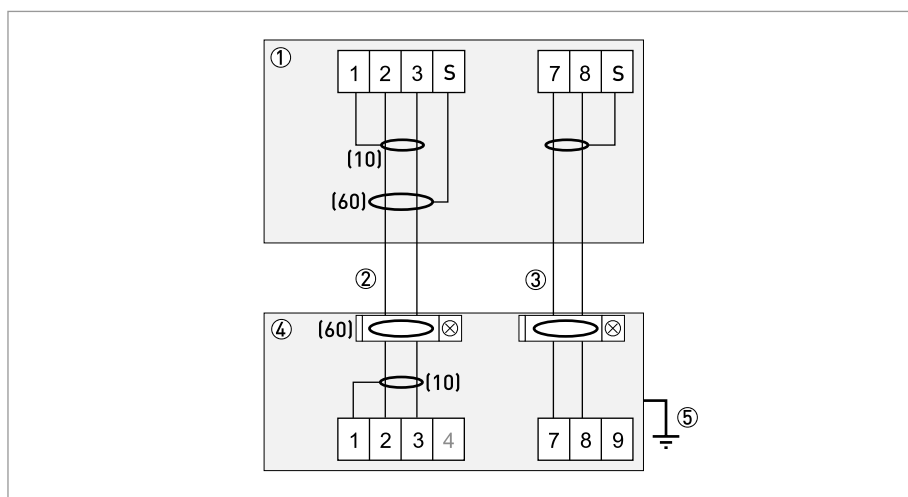


Figure 4-3: Connection diagram for signal and field current cable

- ① Electrical terminal compartment in the signal converter
- ② Signal cable A
- ③ Field current cable C
- ④ Electrical terminal compartment in the flow sensor
- ⑤ Functional ground FE



### 4.3 Connecting the power supply

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

- 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 ( $I_N \leq 16 \text{ A}$ ) for the infeed power circuit, and also a separator (switch, circuit breaker) to isolate the signal converter must be provided.

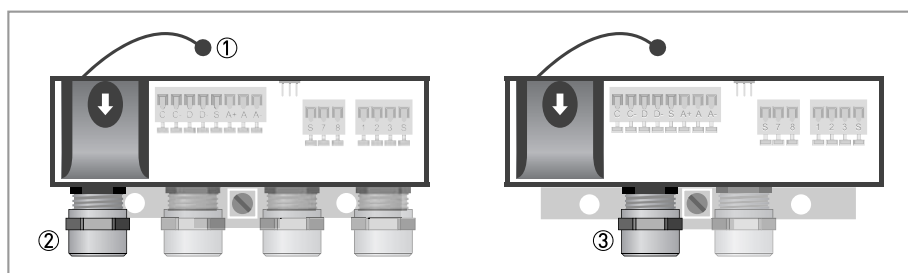


Figure 4-4: Terminal compartment for power supply

- ① Retaining band of the cover
- ② Cable entry for power supply, remote version
- ③ Cable entry for power supply, compact version

#### Version overview

Version	Non-Ex	Ex
100...230 VAC	Standard	Optional
24 VDC	Standard	-
24 VAC/DC	Standard	Optional

- Open the cover of the electrical terminal compartment by pressing down and pulling forwards at the same time.

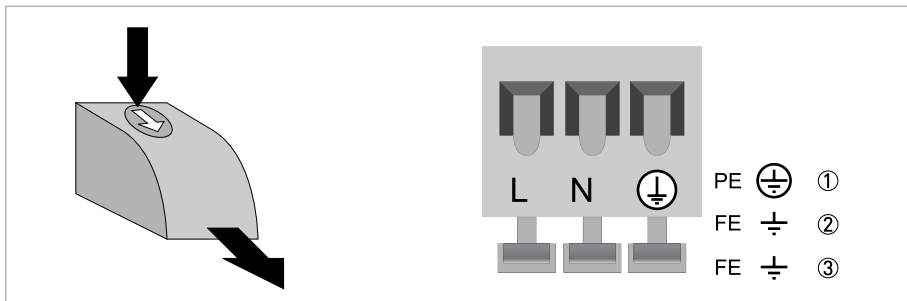


Figure 4-5: Power supply connection

- ① 100...230 VAC (-15% / +10%), 8 VA
- ② 24 VDC (-55% / +30%), 4 W
- ③ 24 VAC/DC (AC: -15% / +10%; DC: -25% / +30%), 7 VA or 4 W

- Close the cover after the power has been connected.

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

- Note the power supply voltage and frequency (50...60 Hz) on the nameplate.

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

### 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.
- AC/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.*

## 4.4 Inputs and outputs, overview

### 4.4.1 Description of the CG number

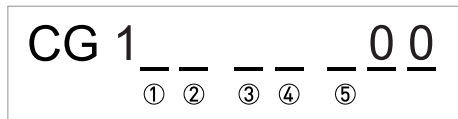


Figure 4-6: Marking (CG number) of the electronics module and output variants

- ① ID number: 0
- ② ID number: 0 = standard; 9 = special
- ③ Power supply
- ④ Display (language versions)
- ⑤ Output version

### 4.4.2 Fixed, non-alterable output versions

This signal converter is available with various 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 output version.

#### Basic outputs (I/O) (Standard)

CG no.	Connection terminals							
	C	C-	D	D-	S	A+	A	A-
1 0 0	S <sub>p</sub> / C <sub>p</sub> passive ①		P <sub>p</sub> / S <sub>p</sub> passive ①		②		I <sub>p</sub> + HART <sup>®</sup> passive ③	
							I <sub>a</sub> + HART <sup>®</sup> active ③	

① Function change by software

② Shielding

③ Function changed by reconnecting

#### Description of the used abbreviations

I <sub>a</sub>	I <sub>p</sub>	Current output active or passive
P <sub>p</sub>		Pulse/frequency output passive
S <sub>p</sub>		Status output / limit switch passive
C <sub>p</sub>		Control input passive

Ex i, Profibus PA + DP, Foundation Fieldbus and Modbus (I/O) (Option)

CG no.	Connection terminals						
	D	D-	S	C	C-	B	B-

Ex i (Option)

3 0 0	P <sub>p</sub> / S <sub>p</sub> passive ①	②	I <sub>p</sub> + HART® passive	
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PROFIBUS PA (Option)

D 0 0	PA+ (1)	PA+ (2)	②	PA- (1)	PA- (2)	
-------	---------	---------	---	---------	---------	--

FOUNDATION Fieldbus (Option)

E 0 0	V/D+ (1)	V/D+ (2)	②	V/D- (1)	V/D- (2)	
-------	----------	----------	---	----------	----------	--

PROFIBUS DP (Option)

F 0 0	RxD/TxD+ / P / +B (1)	RxD/TxD- / N / -A (1)	②	Termination N / -T	Termination P / +T	RxD/TxD+ / P / +B (2)	RxD/TxD- / N / -A (2)
-------	-----------------------	-----------------------	---	--------------------	--------------------	-----------------------	-----------------------

Modbus (Option)

G 0 0	P <sub>p</sub> / S <sub>p</sub> passive	②	+3.3 V; 560 Ω	Common	Sign. A (D0-)	Sign. B (D1+)
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① Function change by software

② Shielding

*Supplementary instructions related to the communication busses Foundation Fieldbus, Profibus PA/DP and Modbus are available on the website (Download Center).*

4.5 Laying electrical cables correctly

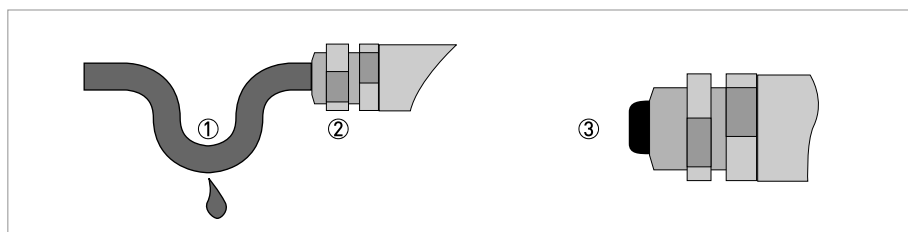


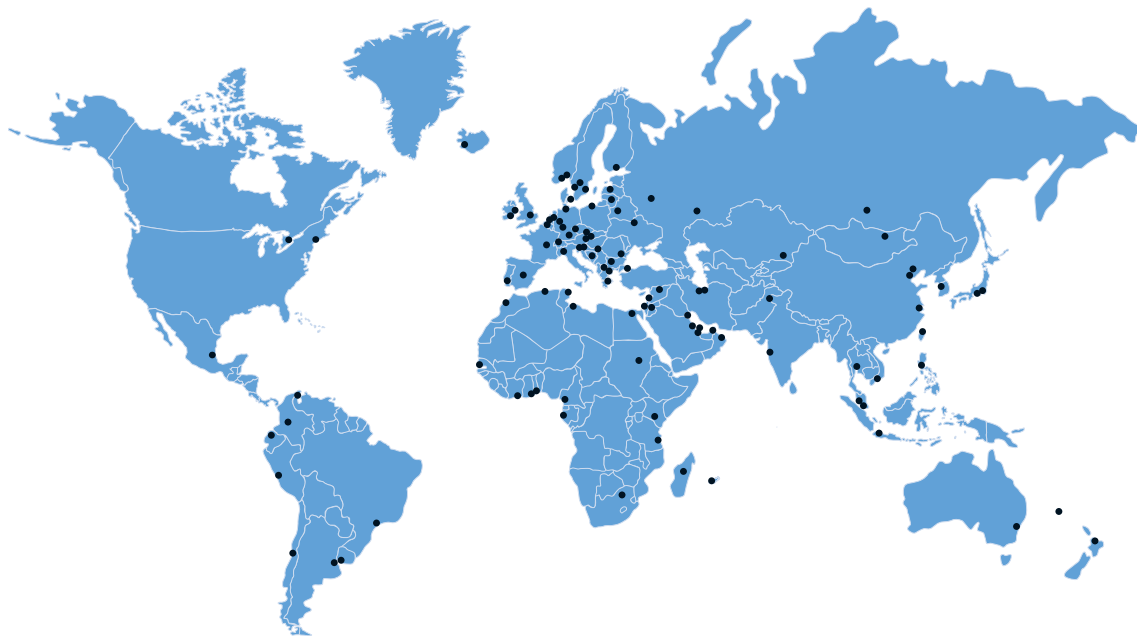
Figure 4-7: Protect housing from dust and water

- ① For compact versions with nearly horizontally-oriented cable entries, lay the necessary electric cables with a drip loop as shown in the illustration.
- ② Tighten the screw connection of the cable entry securely.
- ③ Seal cable entries that are not needed with a plug.









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