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 electrical 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 the HART$^{®}$ interface.
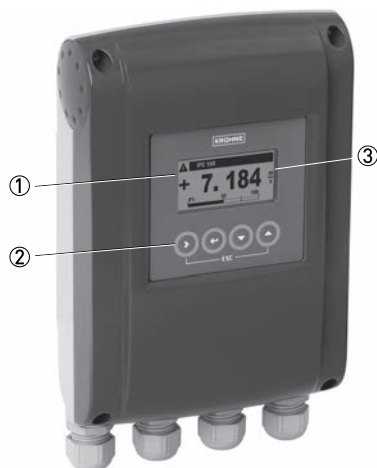
(signal converter in wall-mounted aluminium housing)

① Large graphic display with backlit
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 and status output/limit switch
- Control input option
- HART® as standard
- 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 µS/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 flow 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.

The mounting angle for the compact housing and the rounded edges in the wall-mount position prevent dirt and water from building up on the surface.

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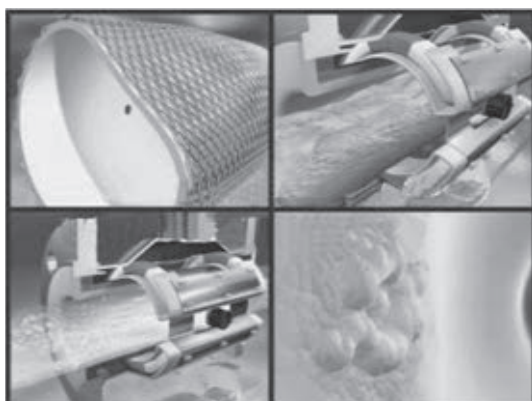
The primary focus of a user for a flowmeter is that it delivers reliable measurements. To achieve this all our electromagnetic flowmeters are calibrated before leaving the factory.

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
OPTIPROBE	OPTIPROBE 100 C	OPTIPROBE 100 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.
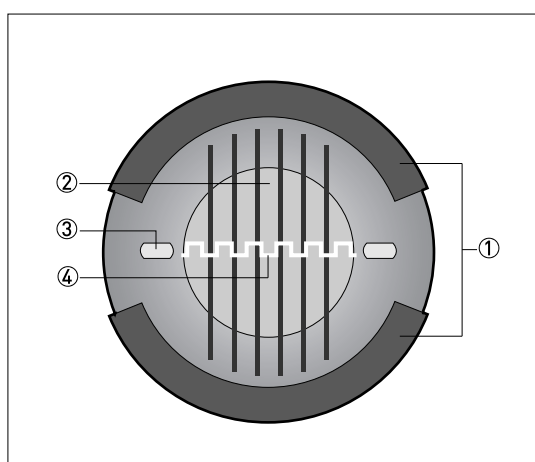

Figure 1-1: Measuring principle

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.
Flow sensor	
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"
OPTIPROBE	DN80...3200 / 3...128"
	This insertion type flow sensor is available in two models. Model A has a fixed insertion length of 25 mm / 1". Model B has a varying insertion length of 25...400 mm / 1...15.7".
	With the exception of the OPTIFLUX 1000 and WATERFLUX 3000 all flow sensors are also available as Ex versions.
Signal converter	
Compact version (C)	OPTIFLUX x100 C (x = 1, 2, 4, 5, 6) or WATERFLUX 3100 C or OPTIPROBE 300 C (0° & 45° version)
Remote version (W)	IFC 100 W
	With the exception of the OPTIFLUX 1000 and WATERFLUX 3000 all flow sensors are also available as Ex versions.
Options	
Outputs	Current output (including 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 interface	HART® as standard

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"
	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^{TM} (including Device Type Manager (DTM))
	HART$^®$ Hand Held Communicator from Emerson Process
	AMS$^®$ from Emerson Process
	PDM$^®$ from Siemens
	All DTMs and drivers are available free of charge from the manufacturer's website.

Display functions	
Operating menu	Setting the parameters using 2 measuring pages, 1 status page, 1 graphic page (measured values and graphics are freely adjustable)
Language of 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	**Standard:** ±0.3% of the measured value ±1 mm/s, depending on the flow sensor.
	Option (optimised accuracy with extended calibration): ±0.2% of the measured value ±1.5 mm/s, depending on the flow sensor.
	For further information refer to the technical data of the respective flow sensor.
	Special calibrations are available on request.
	Current output electronics: ±10 µA; ±100 ppm/°C (typically: ±30 ppm/°C)
Repeatability	±0.1%

Operating conditions

Temperature	
Process temperature	Refer to the technical data of the flow sensor.
Ambient temperature	-40...+65°C / -40...+149°F
	For compact devices is the maximum ambient temperature reduced depending on the flow sensor type and the process temperature. For details refer to the flow sensor manual.
	It is advised to protect the signal converter from external heat sources such as direct sunlight as higher temperatures reduce the life cycle of electronic components.
	Ambient temperatures below -25°C / -13°F may affect the readability of the display.
Storage temperature	-40...+70°C / -40...+158°F
Pressure	
Medium	Refer to the technical data of the flow sensor.
Ambient pressure	Atmosphere: altitude up to 2000 m / 6561.7 ft above sea level
Chemical properties	
Electrical conductivity	All media except for water: $\geq$ 5 µS/cm (also refer to the technical data of the flow sensor)
	Water: $\geq$ 20 µS/cm
Type of measurement	Electrical conductive liquids
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".
Other conditions	
Ingress protection according to IEC 60529	Standard version with aluminium housing: IP66/67 (according to NEMA 4/4X)
	Optional version with stainless steel housing: IP69

Installation conditions

Installation	For detailed information, refer to chapter "Installation".
Inlet/outlet runs	Refer to the technical data of 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 the technical data of 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 **not** included in the tolerance range.
Power consumption	AC: 7 VA
	DC: 4 W
Signal cable	Only necessary for remote versions.
	DS 300 (type A) 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

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 abbreviations	V_{ext} = external voltage; R_L = load + resistance; V_0 = terminal voltage; I_{nom} = nominal current
Current output	
Output data	Volume flow, mass flow, diagnostic value, flow velocity, coil temperature, conductivity
Settings	**Without HART®**
	Q = 0%: 0...20 mA; Q = 100%: 10...21.5 mA
	Error identification: 20...22 mA
	With HART®
	Q = 0%: 4...20 mA; Q = 100%: 10...21.5 mA
	Error identification: 3...22 mA
Operating data	
Active	$V_{int, nom}$ = 20 VDC
	$I \leq 22$ mA
	$R_L \leq 750\ \Omega$
	HART® at terminals A
Passive	$V_{ext} \leq 32$ VDC
	$I \leq 22$ mA
	$V_0 \geq 2$ V at I = 22 mA
	$R_L \leq (V_{ext} - V_0) / I_{max}$
	HART® at terminals A
HART®	
Description	HART® protocol via active and passive current output
	HART® version: V5
	Universal Common Practice HART® parameter: completely supported
Load	$\geq 230\ \Omega$ 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	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: adjustable as automatic, symmetric or fixed (0.05...2000 ms)

Operating data	
Passive	$V_{ext} \leq 32$ VDC
	f_{max} in operating menu set to $f_{max} \leq 100$ Hz: $I \leq 100$ mA open: $I \leq 0.05$ mA at $V_{ext} = 32$ VDC closed: $V_{0,\,max} = 0.2$ V at $I \leq 10$ mA $V_{0,\,max} = 2$ 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 $V_{ext} = 32$ VDC closed: $V_{0,\,max} = 1.5$ V at $I \leq 1$ mA $V_{0,\,max} = 2.5$ V at $I \leq 10$ mA $V_{0,\,max} = 5.0$ V at $I \leq 20$ mA

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) 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)

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 seconds.
	0...100 seconds

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	
Passive	$V_{ext} \leq 32$ VDC $I \leq 100$ mA open: $I \leq 0.05$ mA at $V_{ext} = 32$ VDC closed: $V_{0, max} = 0.2$ V at $I \leq 10$ mA $V_{0, max} = 2$ V at $I \leq 100$ mA
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	
Passive	$V_{ext} \leq 32$ VDC $I_{nom} = 6.5$ mA at $V_{ext} = 24$ VDC $I_{nom} = 8.2$ mA at $V_{ext} = 32$ VDC Contact open (off): $V_0 \leq 2.5$ V at $I_{nom} = 0.4$ mA Contact closed (on): $V_0 \geq 8$ V at $I_{nom} = 2.8$ mA

Approvals and certificates

Declaration of conformity	This device fulfils the statutory requirements of the relevant directives. The manufacturer certifies successful testing of the product by applying the conformity mark on the device.
	For more information on the directives, standards and the approved certifications, please refer to the declaration of conformity supplied with the device or downloadable from the manufacturer's website.
Marine certificate	
EU RO MR Type Approval	Certificate mutually recognized by: ABS, BV, CCS, CRS, DNG-GL, IRS, KR, ClassNK, PRS, RINA, RS
	For certificate and details refer to the manufacturer website.
Standard version	Non-Ex
Hazardous areas	
ATEX	**Option (only OPTIFLUX 2100 C and OPTIFLUX 4100 C)**
	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)
	Option (only W version)
	II 2 G Ex e [ia] mb IIC T4
	II 2 D Ex tD A21 IP64 T135°C
IECEx	**Option (only OPTIFLUX 2100 C and OPTIFLUX 4100 C)**
	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)
	Option (only W version)
	Ex e [ia] mb IIC T4
	Ex tD A21 IP64 T135°C
FM/CSA	**Option (only OPTIFLUX 2100 C and OPTIFLUX 4100 C)**
	Class I, Div 2, Group A, B, C and D
	Option (only W version)
	Class I, Div 2, Group A, B, C and D
	Ordinary location
Other standards and approvals	
Vibration resistance	Tested according to IEC 60068-2-64
NAMUR	NE 21, NE 43, NE 53

Table 2-1: Technical data
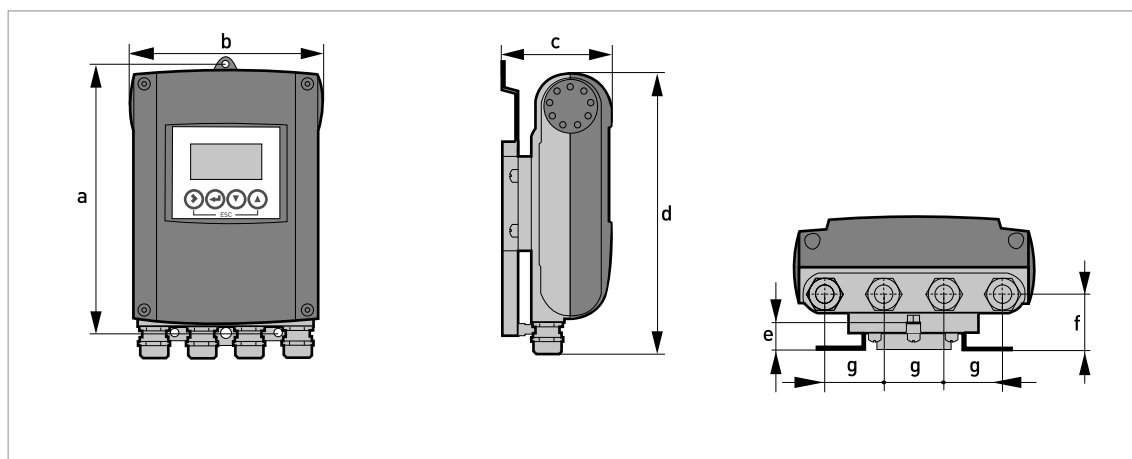
2.2 Dimensions and weight

2.2.1 Housing

Figure 2-1: Dimensions of the wall-mounted version, aluminium housing

	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

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

	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

Table 2-3: Dimensions and weight in inch and lb
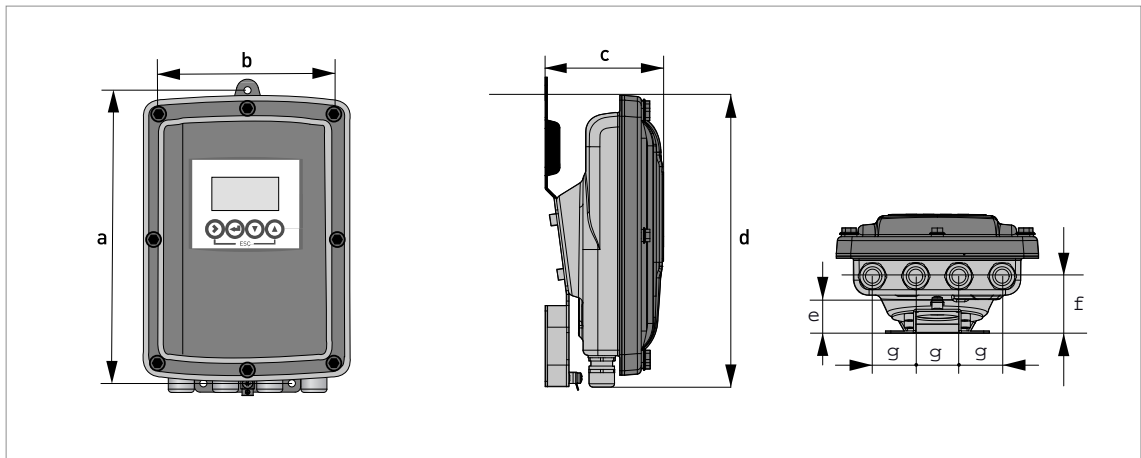
Figure 2-2: Dimensions of wall-mounted and compact 10° version, stainless steel housing

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

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

	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

Table 2-5: Dimensions and weight in inch and lb
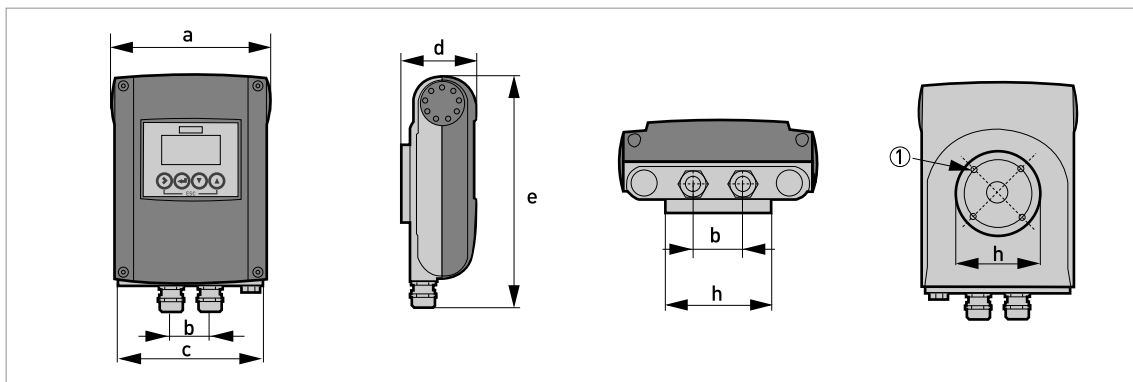
The compact 10° version is without mounting plate.

Figure 2-3: Dimensions of compact 0° version, aluminium housing

① 4 x M 6

	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

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

	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

Table 2-7: Dimensions and weight in inch and lb
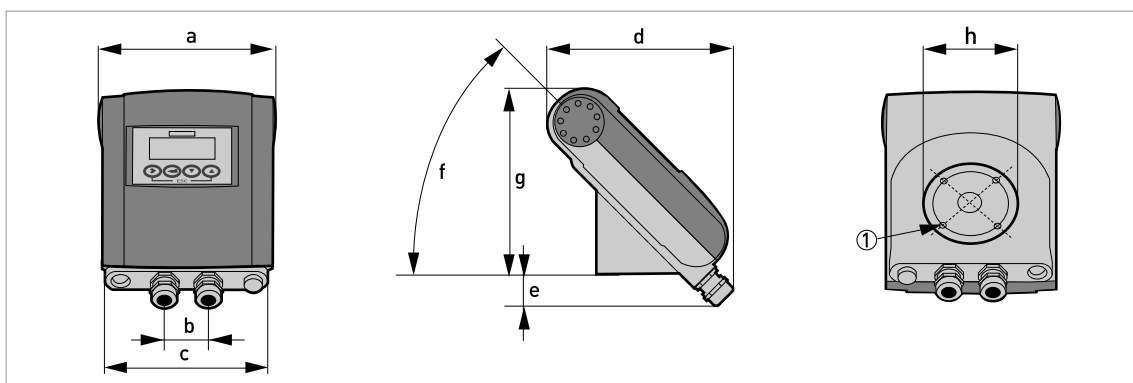
Figure 2-4: Dimensions of compact 45° version, aluminium housing

① 4 x M 6

	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

Table 2-8: Dimensions and weight in mm and kg

	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

Table 2-9: Dimensions and weight in inch and lb

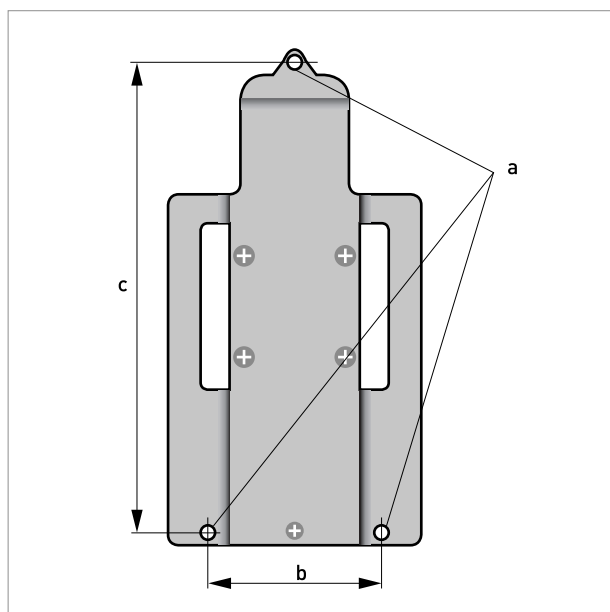### 2.2.2 Mounting plate of wall-mounted version, aluminium housing

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

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

Table 2-10: Dimensions in mm and inch

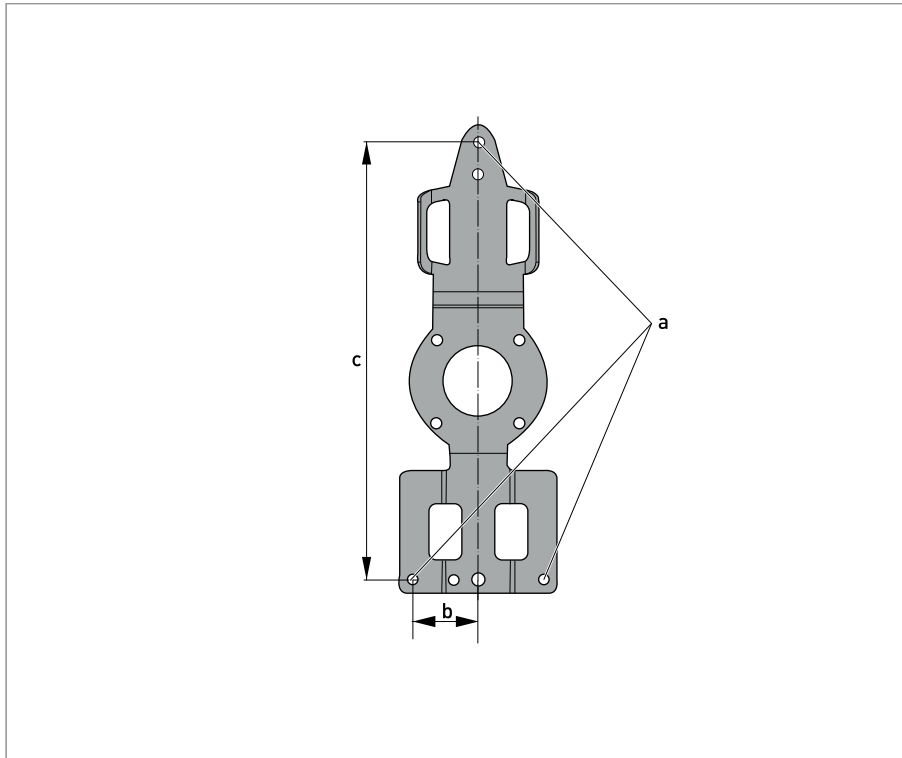### 2.2.3 Mounting plate of wall-mounted version, stainless steel housing

Figure 2-6: Dimensions of 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

Table 2-11: Dimensions in mm and inch

2.3 Flow tables

	$Q_{100\,\%}$ in m^3/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

Table 2-12: Flow rate in m/s and m^3/h

v [ft/s]	Q₁₀₀ % in US gallons/min			
	1	3.3	10	40
DN [inch]	Minimum flow	Nominal flow		Maximum flow
1/10	0.02	0.09	0.23	0.93
1/6	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

Table 2-13: Flow rate in ft/s and US gallons/min

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. 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.*
- *The device must not be heated by radiated heat (e.g. exposure to the sun) to an electronics housing surface temperature above the maximum permissible ambient temperature.*
  If it is necessary to prevent damage from heat sources, a heat protection (e.g. sun shade) has to be installed.
- *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 as described in the chapter "Technical data".*
- *Protect the device from excessive solar heat or UV light. Install an adequat protection (e.g. sun shade) to prevent damage to the housing and electronics.*

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.
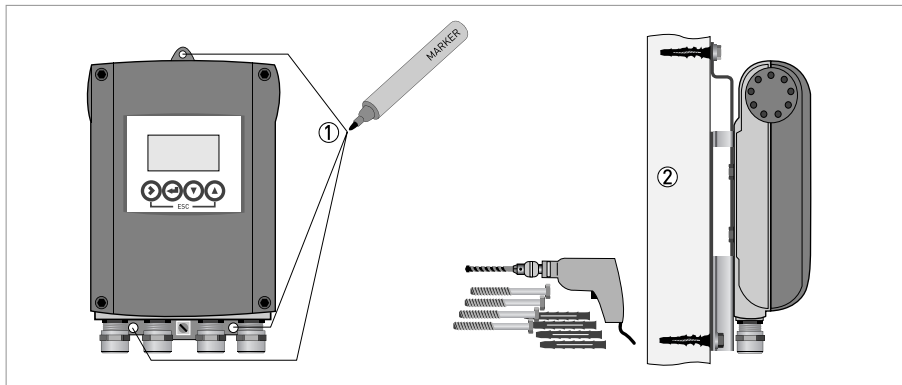
3.4.1 Wall mounting

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 20.
② Fasten the device securely to the wall with the mounting plate.
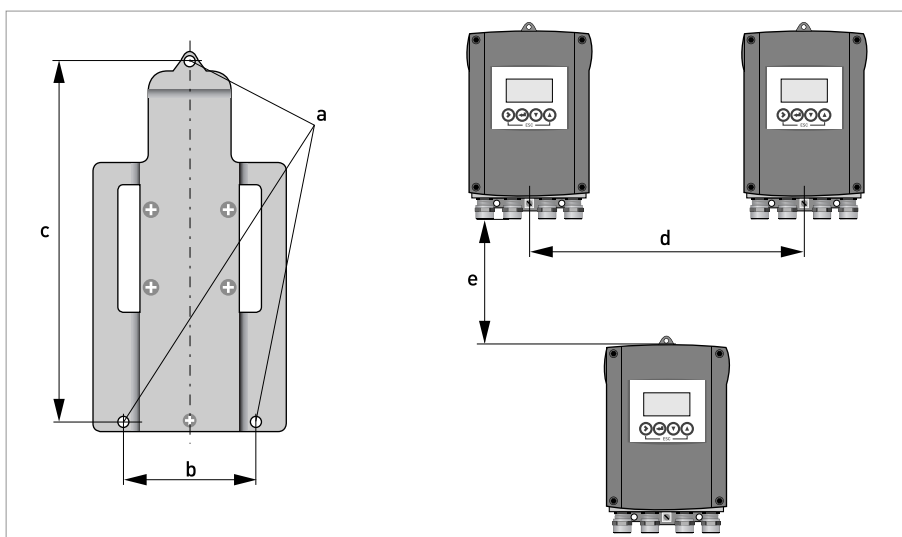
Figure 3-2: Wall mounting of multiple devices (aluminium housing)

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

Table 3-1: Dimensions in mm and inch
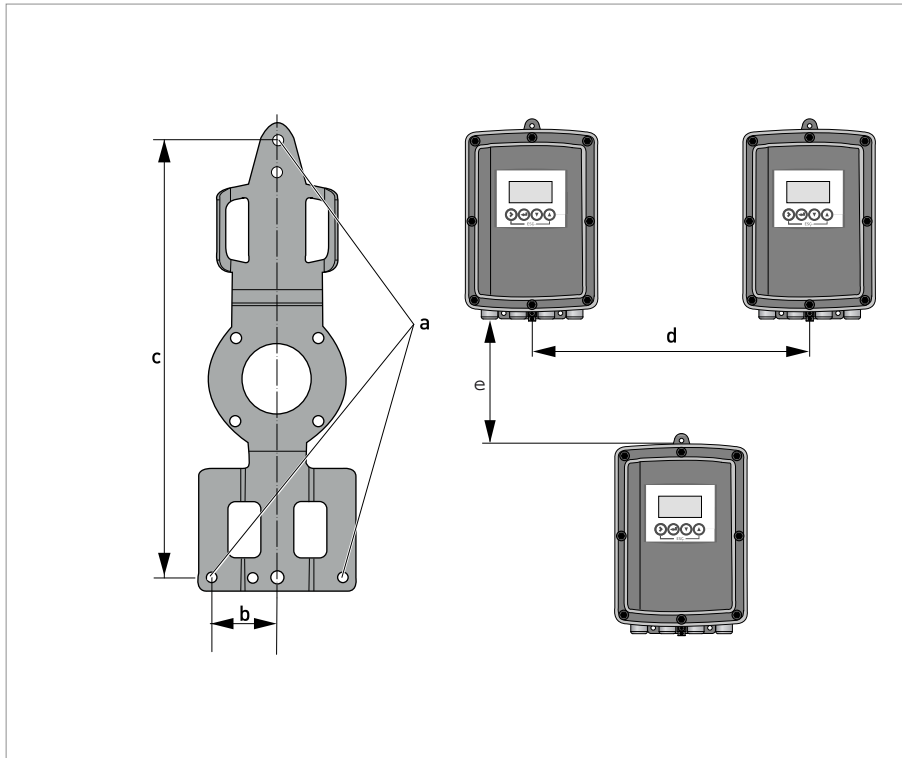
Figure 3-3: Wall mounting of multiple devices (stainless steel housing)

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

Table 3-2: Dimensions in mm and inch

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.

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

- *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 (refer to 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.
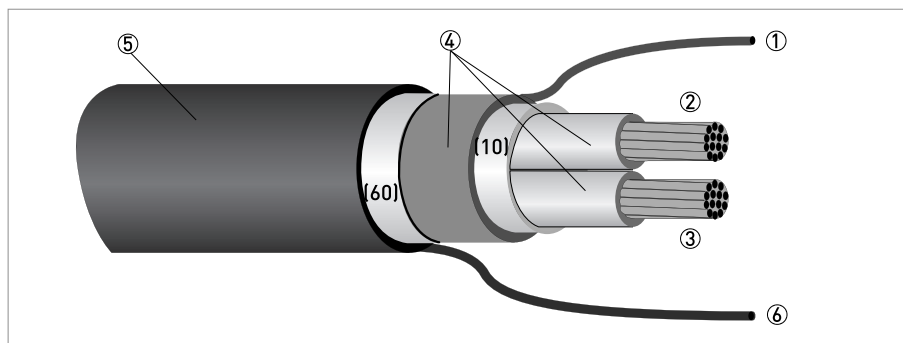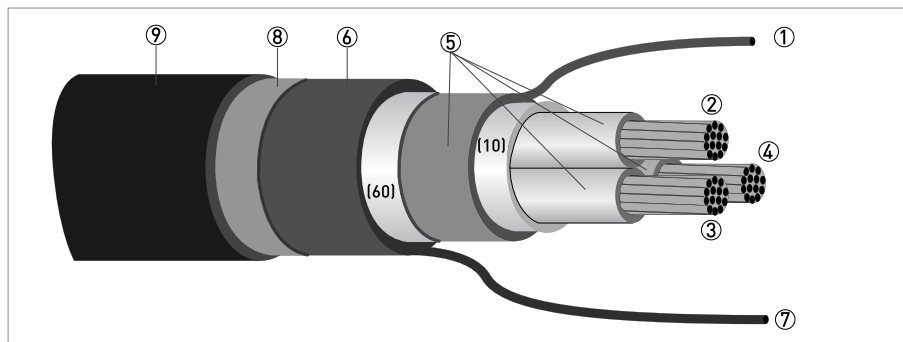- Bending radius: ≥ 50 mm / 2"

Figure 4-1: Construction of signal cable A (standard version)

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 Insulation layers
⑤ Outer sheath
⑥ Stranded drain wire (6) for the outer shield (60)

Figure 4-2: Construction of signal cable A (armoured version)

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 Insulated wire (4), 0.5 mm^2 Cu / AWG 20

⑤ Insulation layers

⑥ Outer sheath

⑦ Stranded drain wire (6) for the outer shield (60)

⑧ Armoured braiding layer

⑨ Outer jacket

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 [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...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
OPTIPROBE F	80...3200	3...128	300	A1

Table 4-1: Length of signal cable A
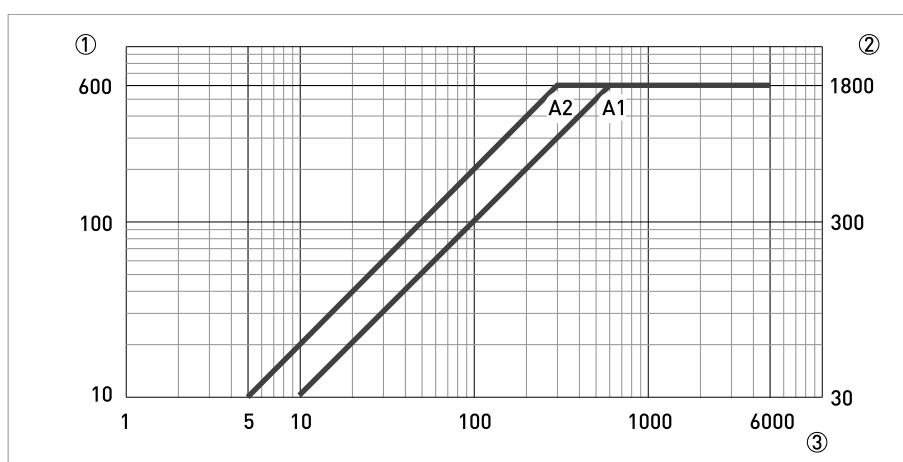
Figure 4-3: Maximum length of signal cable A

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 [μS/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: ≥ 50 mm / 2"
- The following illustration is schematic. The positions of the electrical connection terminals may vary depending on the housing version.
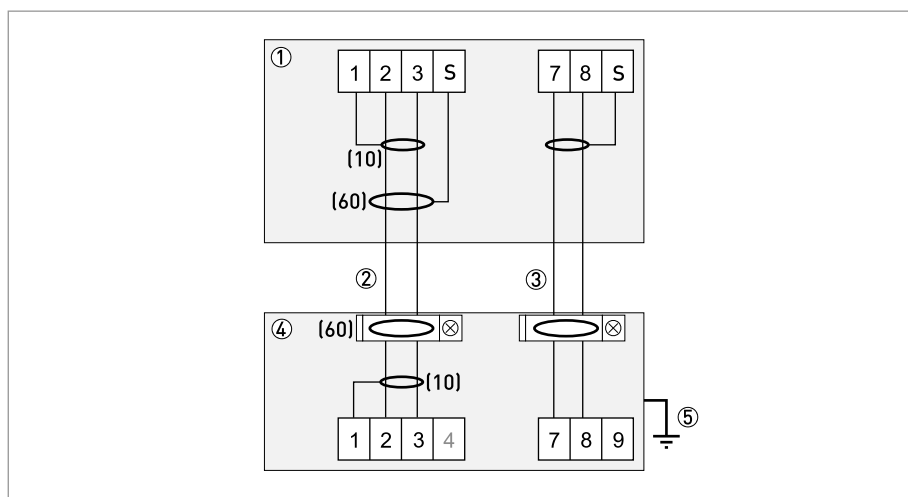
Figure 4-4: Connection diagram for signal and field current cable

① Electrical terminal compartment in the signal converter
② Signal cable A (type DS 300)
③ Field current cable C (type LiYCY)
④ Electrical terminal compartment in the flow sensor
⑤ Functional ground FE
(10) inner cable shield
(60) outer cable shield

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 60664 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 separator (switch, circuit breaker) to isolate the signal converter should be provided for the device in accordance with applicable regulations.
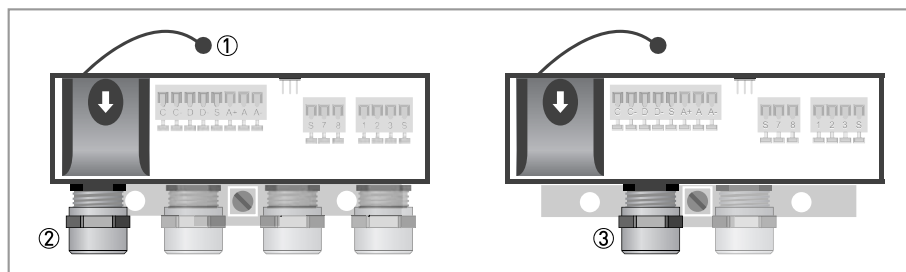

Figure 4-5: Terminal compartment for power supply

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

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

Table 4-2: Version overview

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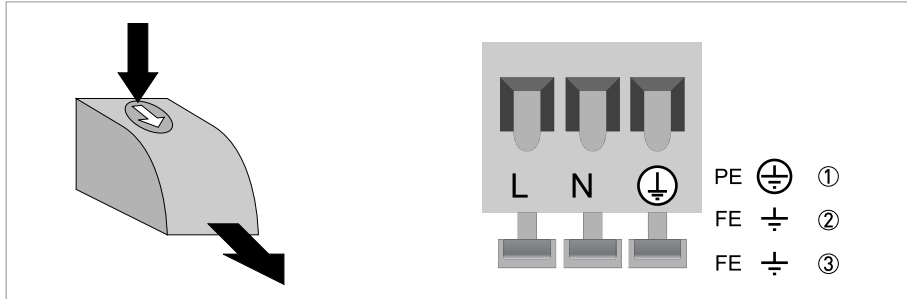

Figure 4-6: Power supply connection
① 100...230 VAC (-15% / +10%), 8 VA
② 24 VDC (-55% / +30%), 4 W
③ 24 VAC/DC (AC: -15% / +10%; DC: -25% / +30%), 7 VA or 4 W

• Close the cover after the power has been connected.

100...230 VAC (tolerance range for 100 VAC: -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!

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.

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

4.4 Inputs and outputs, overview

4.4.1 Description of the CG number

Figure 4-7: 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 Input/output version (I/O)

4.4.2 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 number are depicted.

CG no.	Connection terminals							
	C	C-	D	D-	S	A+	A	A-
1 0 0	S_p / C_p ①		P_p / S_p passive ①		②		I_p + HART® passive ③	
						I_a + HART® active ③		

Table 4-3: Fixed, non-alterable input/output versions

① Function change by software
② Shielding
③ Function changed by reconnecting

I_a	I_p	Current output active or passive
P_p		Pulse/frequency output passive
S_p		Status output / limit switch passive
C_p		Control input passive

Table 4-4: Description of used abbreviations

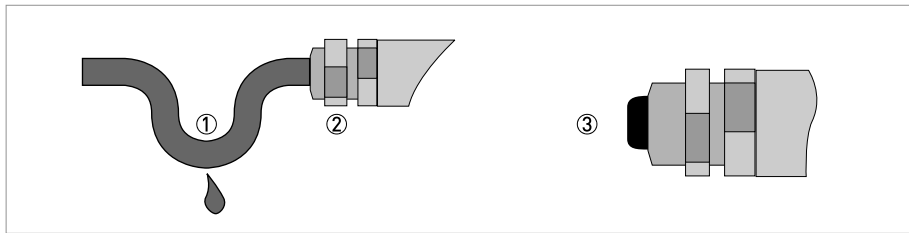## 4.5 Laying electrical cables correctly

Figure 4-8: 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.

The specifications contained herein are subject to change without notice and any user of said specifications should verify from the manufacture that the specifications are currently in effect. Otherwise, the manufacturer assumes no responsibility for the use of specifications which may have been changed and are no longer in effect.

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