IFC 100 Technical Datasheet

Signal converter for electromagnetic flowmeters

- Simple and easy to install and start-up
- Diagnostics of device and application
- Extremely fast signal conversion

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

1.1 The more than economical solution

The **IFC 100** electromagnetic signal converter is designed to measure the flow velocity, conductivity, volume and mass flow of electrically conductive, liquid media.

The signal converter can be combined with any measuring sensor, making it very widely used. In terms of available housing versions, there is a compact variant, in which the signal converter is connected to the measuring sensor, as well as a 0° and 45° version. If the measuring point is difficult to access or the ambient conditions prevent the use of the compact variant, the signal converter is available in a wall-mounted housing.

The **IFC 100** was designed for applications requiring an economical measuring solution with a high level of technology.

(signal converter in wall-mounted housing)

① Large backlit graphic display with 4 push buttons to operate the signal converter without having to open the housing
② Supply voltage: 100...230 VAC (standard) and 24 VDC or 24 VAC/DC (optional)
③ Communication with any third party system possible via Foundation Fieldbus, Profibus PA/DP or Modbus

Highlights

- Simple installation and start-up
- Available inputs and outputs: Current output (incl. HART®), pulse/frequency output, status output and control input
- Large backlit graphic display with intuitive operation
- A variety of operating languages integrated as standard
- Maintenance free
- Excellent price/performance ratio
- Extremely quick signal conversion
- Higher accuracy by extended calibration

Industries

- Water & Wastewater
- Agriculture
- Heating, Ventilation & Air Conditioning (HVAC)
- Machinery
- Power plants

Applications

- Measuring homogeneous media
- Water distribution networks and spray-irrigation systems
- Water treatment
- Environmental technology

1.2 Options and variants

Modular converter concept

(Compact version as 45° version)

Despite its somewhat different appearance, the IFC 100 has many of the same functions as its "big brother" IFC 300. Diagnostic function, conductivity measurement and simple navigation to name but a few.

This latest member of the converter family also has a large number of fully-developed functions:

- various power supply versions (AC, DC, AC/DC)
- HART® as standard
- Foundation Fieldbus, Profibus PA/DP or Modbus
- optional Ex version available

Compact design in various versions

(Compact version as 0° version)

The IFC 100 C in the 0° version is ideal for installation in vertical pipelines.

On the other hand, the 45° version improves the readability of the display in specific applications.

The backlit display provides excellent readability from long distances. The 4 push buttons make operation, start-up and configuration simple.

In the 0° version, the signal converter can be rotated in 90° increments allowing for customer-specific installation position. The 45° version can only be rotated in 180° increments.

Remote version in wall-mounted housing

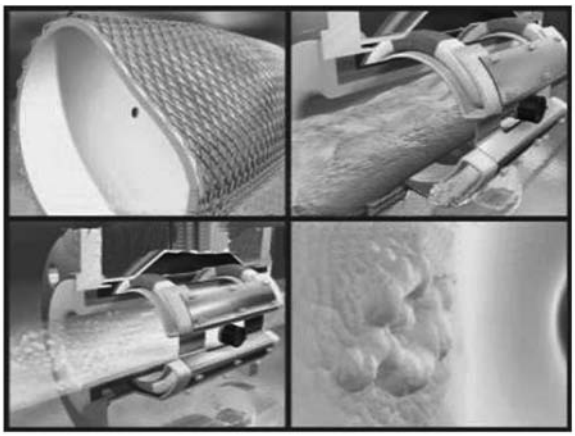
(signal converter in wall-mounted housing)

For temperature effects, vibration or in places that are difficult to access, remote installation is possible with the IFC 100 W.

A signal cable is used to connect the measuring sensor and the converter for the purposes of power supply and signal processing.

The electronics can be used in all housing versions without having to be reconfigurated.

Diagnostics



The IFC 100 has been equipped with a wide variety of diagnostic tools for device function and application check.

- Conductivity measurement
- Electrode error
- Process or ambient temperature too high

1.3 Signal converter / measuring sensor combination possibilities

Measuring sensor	Measuring 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 flow meter

The signal voltage U is picked off by electrodes and is proportional to the mean flow velocity v and thus the flow rate q. A signal converter is used to amplify the signal voltage, filter it and convert it into signals for totalising, recording and output processing.

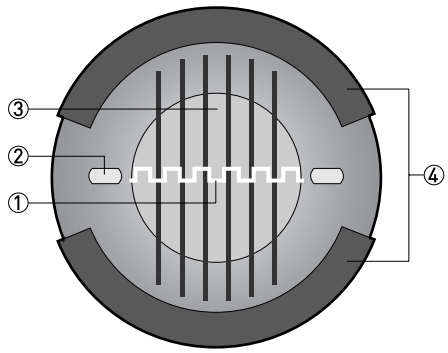


Figure 1-1: Measuring principle

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

2.1 Technical data

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

Measuring system

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

Design

Modular construction	The measuring system consists of a measuring sensor and a signal converter.
Measuring 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 / ½...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 measuring sensors are also available in an Ex version.
Signal converter	
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.
Options	
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

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™ (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 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

Reference conditions	Medium: water
	Temperature: +20°C / +68°F
	Pressure: 1 bar / 14.5 psi
	Inlet section: ≥ 5 DN
Maximum measuring error	Standard calibration: +0.3% of the measured value +1 mm/s, depending on the measuring sensor
	Extended calibration is selectable and special calibrations are available on request.
	For detailed information and accuracy curves, refer to chapter "Accuracy".
	Current output electronics: ±10 µA; ±100 ppm/°C (typically: ±30 ppm/°C)
Repeatability	±0.1%

Operating conditions

Temperature	
Process temperature	Refer to technical data for the measuring sensor.
Ambient temperature	Depending on the version and combination of outputs.
	It is a good idea to protect the converter from external heat sources such as direct sunlight as higher temperatures reduce the life cycle of all electronic components.
	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 technical data for the measuring sensor.
Ambient pressure	Atmospheric
Chemical properties	
Electrical conductivity	All media except for water: ≥ 5 µS/cm (also refer to the technical data for the measuring sensor)
	Water: ≥ 20 µS/cm
State of aggregation	Conductive, liquid media
Solid content (volume)	≤ 10% for OPTIFLUX measuring sensors
Gas content (volume)	≤ 3% for OPTIFLUX measuring sensors
Flow rate	For detailed information, refer to chapter "Flow tables".
Other conditions	
Protection category acc. to IEC 529 / EN 60529	IP66/67 (acc. to NEMA 4/4X)

Installation conditions

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

Materials

Signal converter housing	Aluminium with a polyester topcoat
Measuring sensor	For housing materials, process connections, liners, grounding electrodes and gaskets, refer to technical data for the measuring sensor.

Electrical connection

General	Electrical connection is carried out in conformity with the VDE 0100 directive "Regulations for electrical power installations with line voltages up to 1000 V" or equivalent national 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 / 1950 ft (dep. on electrical conductivity and measuring sensor)
Cable entries	Standard: M20 x 1.5 (8...12 mm)
	Option: ½ NPT, PF ½

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_{ext} = external voltage; R_L = load + resistance; U_o = 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	**Basic I/Os**	**Ex i I/Os**
Active	$U_{int, nom}$ = 20 VDC I ≤ 22 mA R_L ≤ 750 Ω	-
	HART® at terminals A	
Passive	U_{ext} ≤ 32 VDC I ≤ 22 mA U_0 ≥ 2 V at I = 22 mA $R_L \leq (U_{ext} - U_0) / I_{max}$	U_{ext} ≤ 32 VDC I ≤ 22 mA U_0 ≥ 4 V $R_L \leq (U_{ext} - U_0) / I_{max}$
		U_i = 30 V I_i = 130 mA P_i = 1 W C_i = 10 nF L_i ~ 0 mH
	HART® at terminals A	HART® at terminals C
HART®		
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	$U_{ext} \leq 32$ 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: $I_{nom} = 0.77$ mA closed: $I_{nom} = 4.7$ mA
		$U_i = 30$ V $I_i = 130$ mA $P_i = 1$ W $C_i = 10$ nF $L_i = 0$ mH
Operating data	**Modbus**	
Passive	$U_{ext} \leq 32$ VDC	
	f_{max} in the operating menu set to $f_{max} \leq 1$ kHz: $I \leq 100$ 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	

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 67% of the end value has been reached according to a step function.	
Settings	Set in increments of 0.1s.	
	0…100 s	
Status output / limit switch		
Function and settings	Adjustable as automatic measuring range conversion, display of flow direction, counter overflow, error, switching point or empty pipe detection	
	Valve control with activated dosing function	
	Status and/or control: ON or OFF	
Operating data	**Basic I/Os + Modbus**	**Ex i I/Os**
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	-
NAMUR	-	Passive to EN 60947-5-6 open: $I_{nom} = 0.77$ mA closed: $I_{nom} = 4.7$ mA
		$U_i = 30$ V $I_i = 130$ mA $P_i = 1$ W $C_i = 10$ nF $L_i = 0$ mH

Control input		
Function	Hold value of the outputs (e.g. for cleaning work), set value of the outputs to "zero", counter and error reset, range change.	
	Start of dosing when dosing function is activated.	
Operating data	**Basic I/Os**	**Ex i I/Os + Modbus**
Passive	$U_{ext} \leq 32$ VDC $I_{nom} = 6.5$ mA at $U_{ext} = 24$ VDC $I_{nom} = 8.2$ mA at $U_{ext} = 32$ 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	-
PROFIBUS DP		
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	
PROFIBUS PA		
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	
FOUNDATION Fieldbus		
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	

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

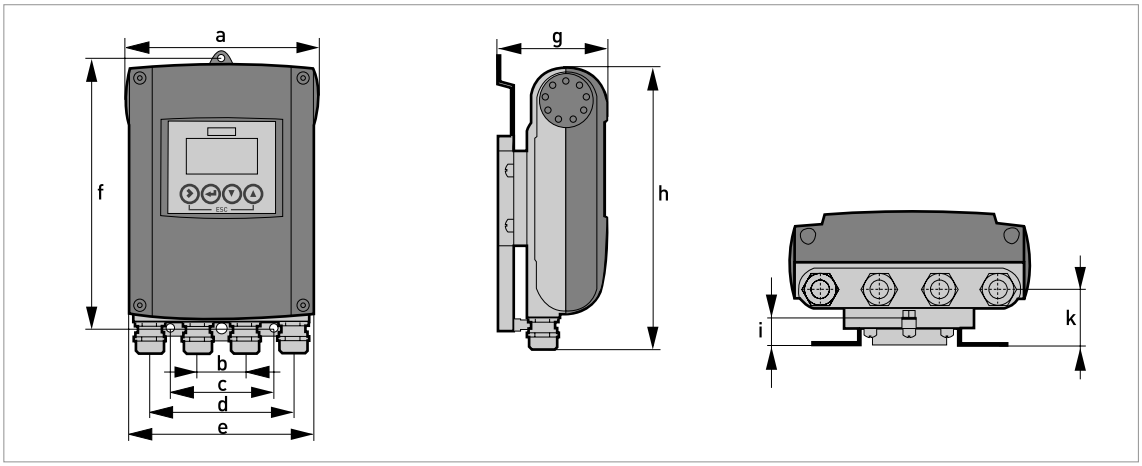
Approvals and certificates

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	
ATEX	**Optional (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 (W version only)
	II 2 G Ex e [ia] mb IIC T4
	II 2 D Ex tD A21 IP64 T135°C
IECEx	**Optional (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 (W version only)
	Ex e [ia] mb IIC T4
	Ex tD A21 IP64 T135°C
FM/CSA	**Optional (only OPTIFLUX 2100 C and OPTIFLUX 4100 C)**
	Class I, Div 2, Group A, B, C and D
	Option (W version only)
	Class I, Div 2, Group A, B, C and D
Other standards and approvals	
FM/CSA	Ordinary location
Shock and vibration resistance	IEC 68-2-27, IEC 68-2-64
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

Wall-mounted version



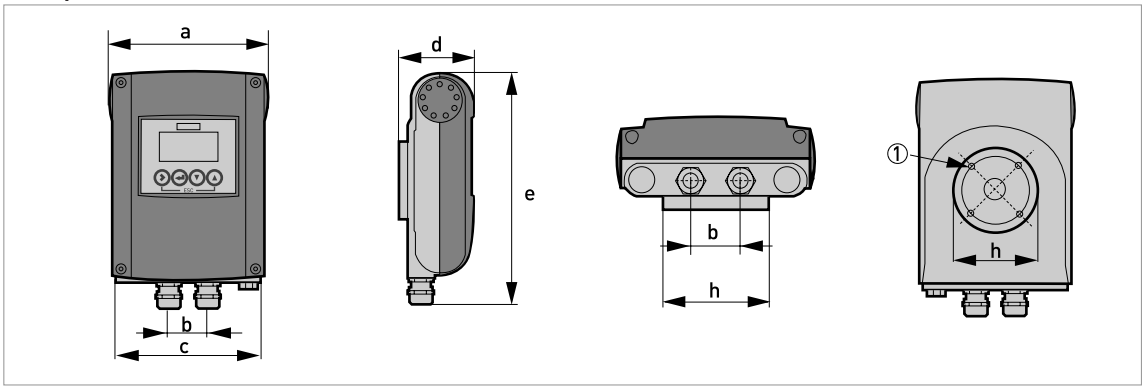
Dimensions and weights in mm and kg

	Dimensions [mm]										Weight [kg]
	a	b	c	d	e	f	g	h	i	k	
Wall-mounted version	161	40	87.2	120	155	241	95.2	257	19.3	39.7	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	i	k	
Wall-mounted version	6.34	1.57	3.43	4.72	6.10	9.50	3.75	10.12	0.76	1.56	Std: 4.2 Ex: 5.3

Compact 0° version



① 4 x M 6

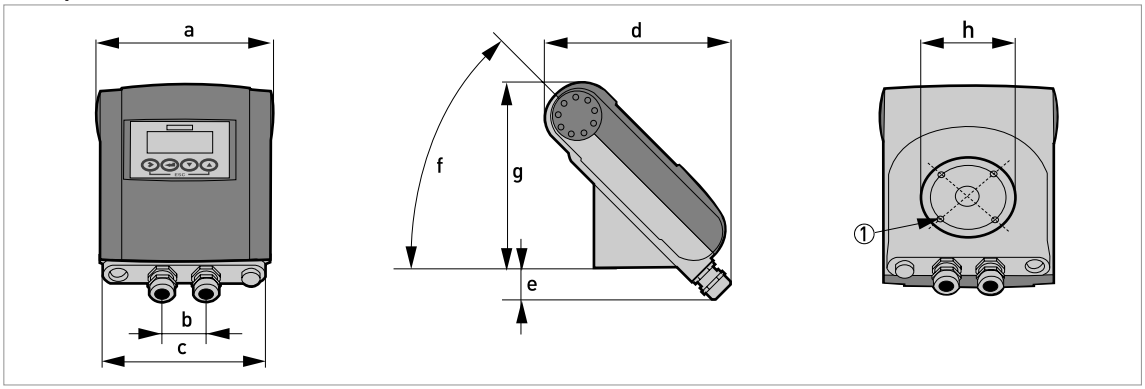
Dimensions and weights in mm and kg

	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



① 4 x M 6

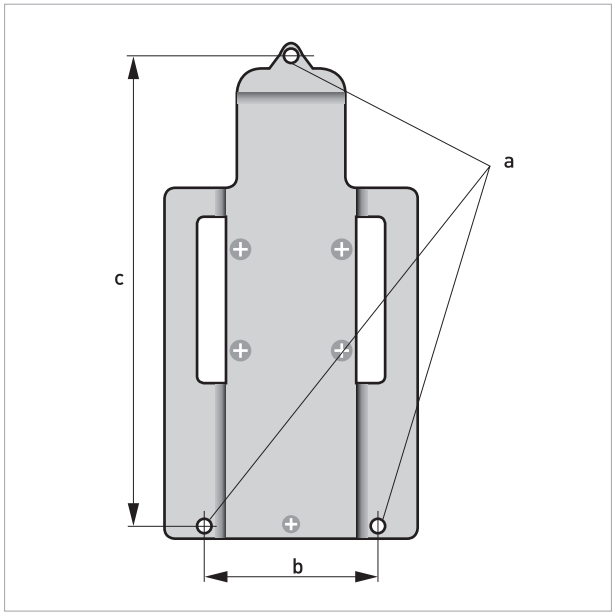
Dimensions and weights in mm and kg

	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, wall-mounted version



Dimensions in mm and inch

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

2.3 Flow tables

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

	$Q_{100\ \%}$ in m^3/h			
v [m/s]	0.3	1	3	12
DN [mm]	Min. flow	Nominal flow		Max. flow
2.5	0.005	0.02	0.05	0.21
4	0.01	0.05	0.14	0.54
6	0.03	0.10	0.31	1.22
10	0.08	0.28	0.85	3.39
15	0.19	0.64	1.91	7.63
20	0.34	1.13	3.39	13.57
25	0.53	1.77	5.30	21.21
32	0.87	2.90	8.69	34.74
40	1.36	4.52	13.57	54.29
50	2.12	7.07	21.21	84.82
65	3.58	11.95	35.84	143.35
80	5.43	18.10	54.29	217.15
100	8.48	28.27	84.82	339.29
125	13.25	44.18	132.54	530.15
150	19.09	63.62	190.85	763.40
200	33.93	113.10	339.30	1357.20
250	53.01	176.71	530.13	2120.52
300	76.34	254.47	763.41	3053.64
350	103.91	346.36	1039.08	4156.32
400	135.72	452.39	1357.17	5428.68
450	171.77	572.51	1717.65	6870.60
500	212.06	706.86	2120.58	8482.32
600	305.37	1017.90	3053.70	12214.80
700	415.62	1385.40	4156.20	16624.80
800	542.88	1809.60	5428.80	21715.20
900	687.06	2290.20	6870.60	27482.40
1000	848.22	2827.40	8482.20	33928.80
1200	1221.45	3421.20	12214.50	48858.00

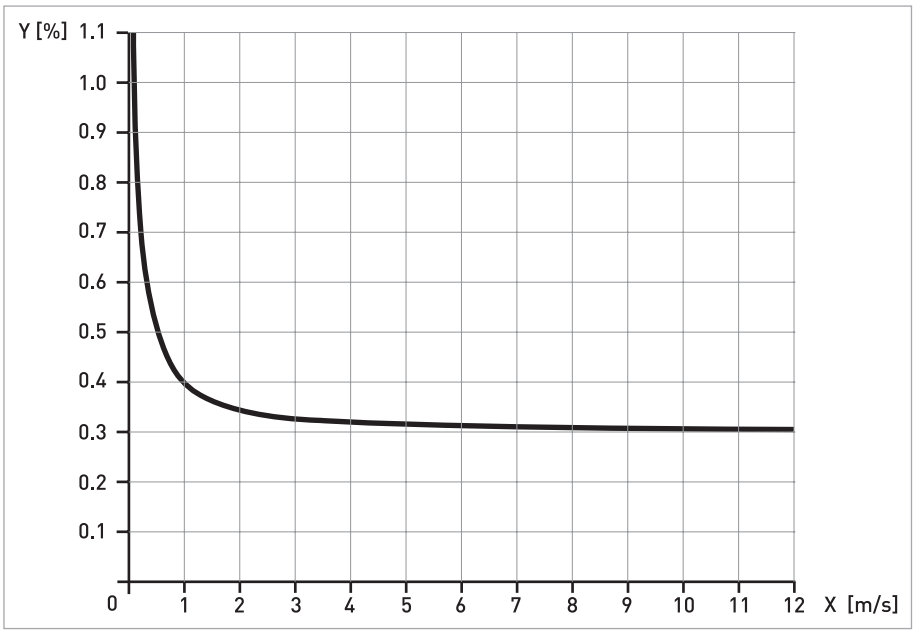
Flow rate in ft/s and US gallons/min

	$Q_{100\ \%}$ in US gallons/min			
v [ft/s]	1	3.3	10	40
DN [inch]	Min. flow	Nominal flow		Max. flow
1/10	0.02	0.09	0.23	0.93
1/8	0.06	0.22	0.60	2.39
1/4	0.13	0.44	1.34	5.38
3/8	0.37	1.23	3.73	14.94
1/2	0.84	2.82	8.40	33.61
3/4	1.49	4.98	14.94	59.76
1	2.33	7.79	23.34	93.36
1.25	3.82	12.77	38.24	152.97
1.5	5.98	19.90	59.75	239.02
2	9.34	31.13	93.37	373.47
2.5	15.78	52.61	159.79	631.16
3	23.90	79.69	239.02	956.09
4	37.35	124.47	373.46	1493.84
5	58.35	194.48	583.24	2334.17
6	84.03	279.97	840.29	3361.17
8	149.39	497.92	1493.29	5975.57
10	233.41	777.96	2334.09	9336.37
12	336.12	1120.29	3361.19	13444.77
14	457.59	1525.15	4574.93	18299.73
16	597.54	1991.60	5975.44	23901.76
18	756.26	2520.61	7562.58	30250.34
20	933.86	3112.56	9336.63	37346.53
24	1344.50	4481.22	13445.04	53780.15
28	1829.92	6099.12	18299.20	73196.79
32	2390.23	7966.64	23902.29	95609.15
36	3025.03	10082.42	30250.34	121001.37
40	3734.50	12447.09	37346.00	149384.01
48	5377.88	17924.47	53778.83	215115.30

2.4 Measuring accuracy

Reference conditions

- Medium: water
- Temperature: +20°C / +68°F
- Pressure: 1 bar / 14.5 psi
- Inlet section: ≥ 5 DN



X [m/s]: flow velocity
Y [%]: deviation from the actual measured value (mv)

Standard calibration	DN [mm]	DN [inch]	Accuracy	Curve
OPTIFLUX 2100 / 4100 / 5100 / 6100	10…1200	3/8…48	0.3% of mv + 1 mm/s	①
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		
WATERFLUX 3100	25…600	1…24	0.3% of mv + 1 mm/s	①

Extended calibration	DN [mm]	DN [inch]	Accuracy	Curve
OPTIFLUX 2100 / 4100 / 5100 / 6100	10…1200	3/8…48	0.2% of mv + 1 mm/s	as ① - 0.1%

3.1 Intended use

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

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

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

3.2 Installation specifications

The following precautions must be taken to ensure reliable installation.

- *Make sure that there is adequate space to the sides.*
- *Protect the signal converter from direct sunlight and install a sun shade if necessary.*
- *Signal converters installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.*
- *Do not expose the signal converter to intense vibrations. The measuring devices are tested for a vibration level in accordance with IEC 68-2-64.*

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 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

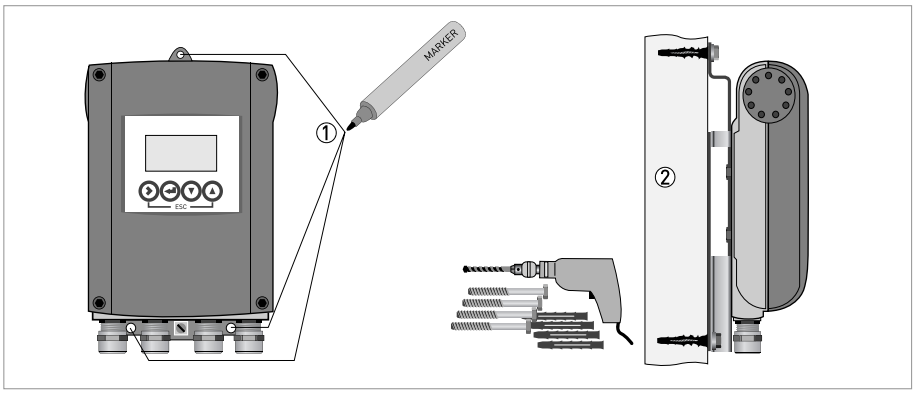
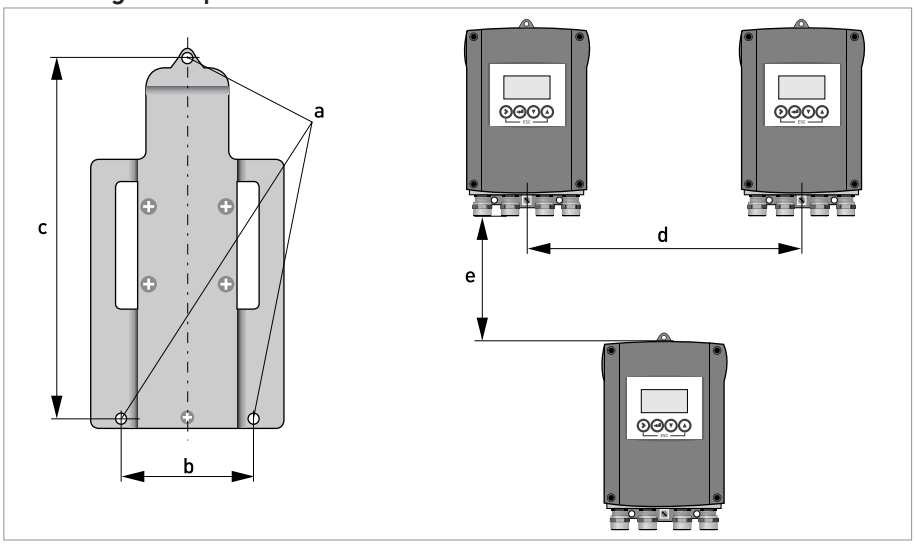


Figure 3-1: Mounting the wall-mounted housing

① Prepare the holes with the aid of the mounting plate. For further information refer to *Mounting plate, wall-mounted version* on page 20.
② Fasten the device securely to the wall with the mounting plate.

Mounting multiple devices next to each other



	[mm]	[inch]
a	Ø6.5	Ø0.26
b	87.2	3.4
c	241	9.5
d	310	12.2
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 measuring sensor and signal converter have been configured together at the factory. For this reason, please connect the devices in pairs. Ensure that the measuring 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 measuring 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 measuring sensor and signal converter.
- Bending radius: ≥ 50 mm / 2"

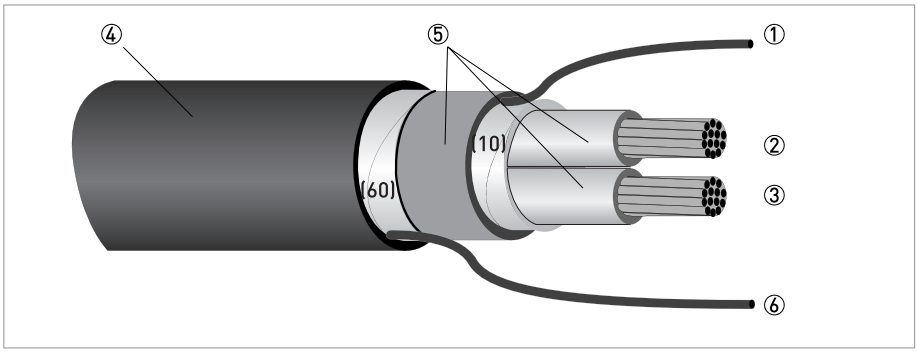


Figure 4-1: Construction of signal cable A

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

4.2.2 Length of signal cable A

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

Measuring sensor	Nominal 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

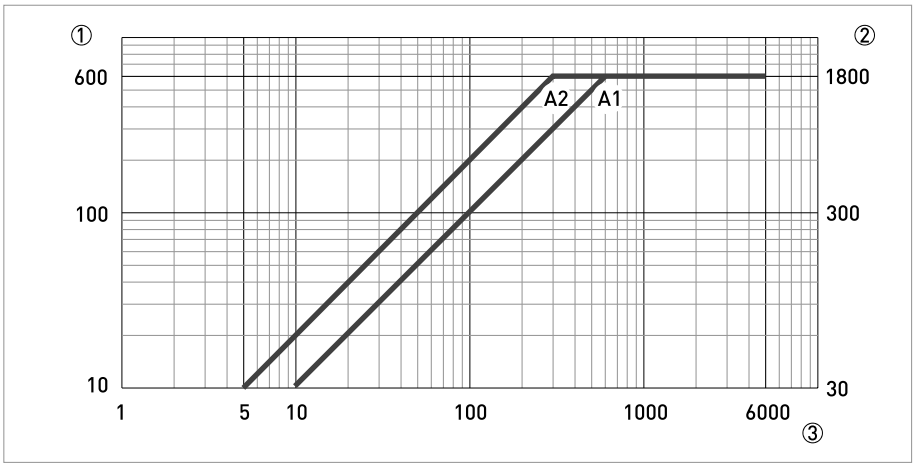


Figure 4-2: Maximum length of signal cable A

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

4.2.3 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 measuring sensor and signal converter.
- The outer shield (60) is connected in the terminal compartment of the measuring 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.

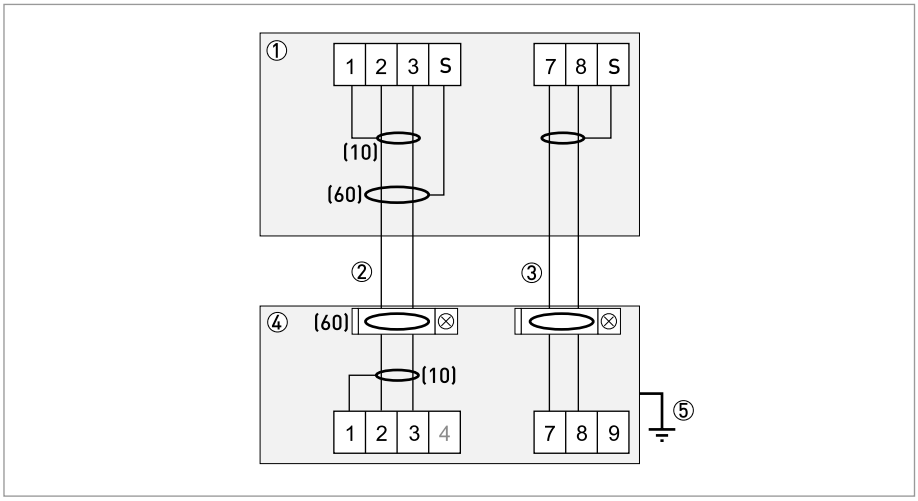


Figure 4-3: Connection diagram for signal and field current cable

① Electrical terminal compartment in signal converter
② Signal cable A
③ Field current cable C
④ Electrical terminal compartment in measuring 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 ($I_N \leq 16$ A) for the infeed power circuit, and also a separator (switch, circuit breaker) to isolate the signal converter must be provided.

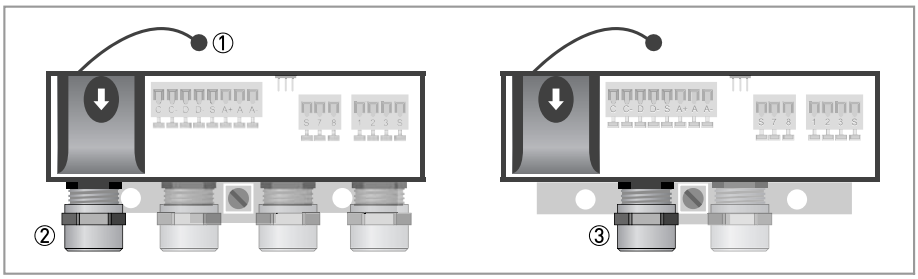


Figure 4-4: Terminal compartment for power supply

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.

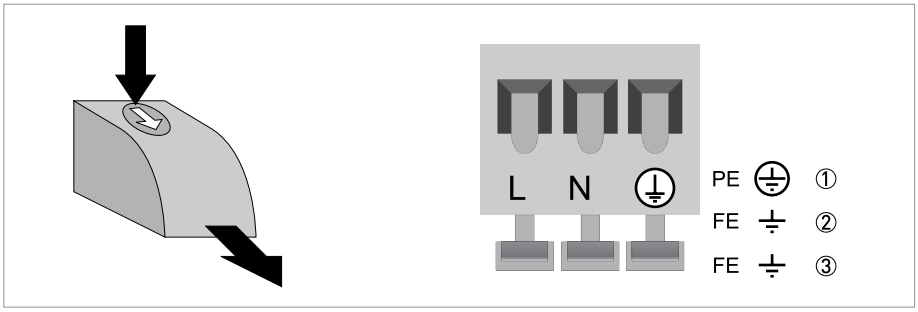


Figure 4-5: Power supply connection

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

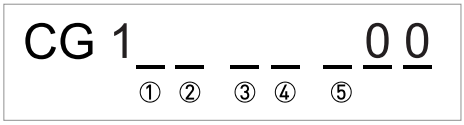


Figure 4-6: Marking (CG number) of the electronics module and output variants

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_p / C_p passive ①		P_p / S_p passive ①		②		I_p + HART® passive ③	
						I_a + HART® active ③		

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

Description of the used abbreviations

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

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_p / S_p passive ①		②	I_p + HART® passive			

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_p / S_p passive		②	+3.3 V; 560 Ω	Common	Sign. A (D0-)	Sign. B (D1+)

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

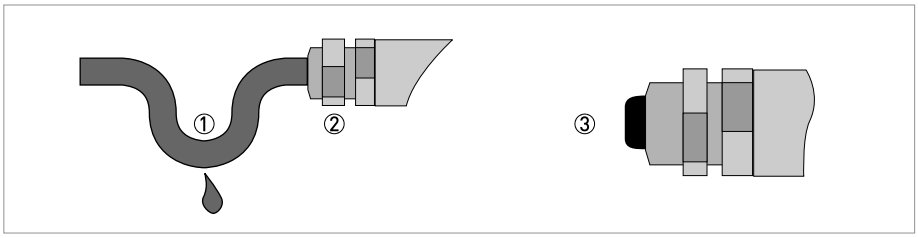


Figure 4-7: Protect housing from dust and water

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.

KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature assemblies
- Pressure transmitters
- Analysis products
- Products and systems for the oil & gas industry
- Measuring systems for the marine industry

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