



IFC 100 Quick Start

Signal converter for electromagnetic flowmeters

Electronic Revision:
ER 2.1.xx
(SW.REV. 3.0x)

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

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Warnings and symbols used



DANGER!

This information refers to the immediate danger when working with electricity.



DANGER!

These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.



WARNING!

Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.



CAUTION!

Disregarding these instructions can result in damage to the device or to parts of the operator's plant.



INFORMATION!

These instructions contain important information for the handling of the device.



HANDLING

- This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

RESULT

This symbol refers to all important consequences of the previous actions.

Safety instructions for the operator



CAUTION!

Installation, assembly, start-up and maintenance may only be performed by appropriately trained personnel. The regional occupational health and safety directives must always be observed.



LEGAL NOTICE!

The responsibility as to the suitability and intended use of this device rests solely with the user. The supplier assumes no responsibility in the event of improper use by the customer. Improper installation and operation may lead to loss of warranty. In addition, the "Terms and Conditions of Sale" apply. They appear on the back of the invoice and form the basis of the purchase contract.



INFORMATION!

- Further information can be found on the supplied CD-ROM in the manual, on the data sheet, in special manuals, certificates and on the manufacturer's website.
- If you need to return the device to the manufacturer or supplier, please fill out the form contained on the CD-ROM and send it with the device. Unfortunately, the manufacturer cannot repair or inspect the device without the completed form.

2.1 Intended use

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



DANGER!

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



WARNING!

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

2.2 Scope of delivery



INFORMATION!

Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.



INFORMATION!

Check the packing list to check if you received completely all that you ordered.



INFORMATION!

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

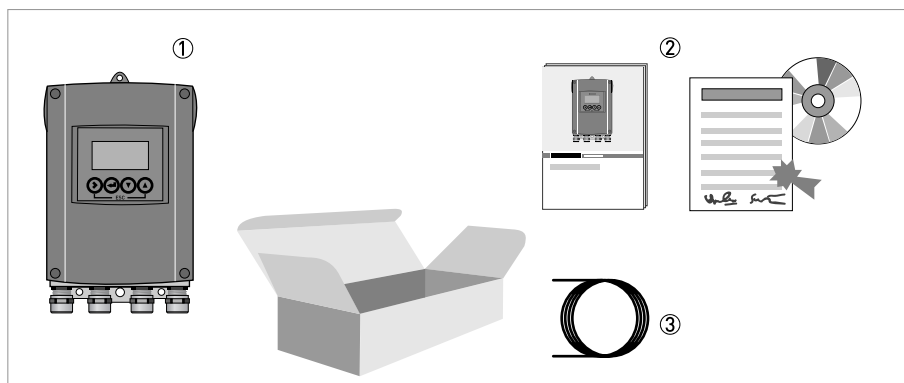


Figure 2-1: Scope of delivery

- ① Device in the version as ordered
- ② Documentation (calibration report, Quick Start, CD-ROM with product documentation for measuring sensor and signal converter)
- ③ Signal cable (only for remote version)

2.3 Storage

- Store the device in a dry, dust-free location.
- Avoid continuous direct sunlight.
- Store the device in its original packing.
- Storage temperature: -40...+70°C / -40...+158°F

2.4 Transport

Signal converter

- No special requirements.

Compact version

- Do not lift the device by the signal converter housing.
- Do not use lifting chains.
- To transport flange devices, use lifting straps. Wrap these around both process connections.

2.5 Installation specifications



INFORMATION!

The following precautions must be taken to ensure reliable installation.

- *Make sure that there is adequate space to the sides.*
- *Protect the signal converter from direct sunlight and install a sun shade if necessary.*
- *Signal converters installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.*
- *Do not expose the signal converter to intense vibration. The flowmeters are tested for a vibration level in accordance with IEC 68-2-3.*

2.6 Mounting of the compact version



INFORMATION!

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.

2.7 Mounting the wall-mounted housing, remote version



INFORMATION!

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.

2.7.1 Wall mounting

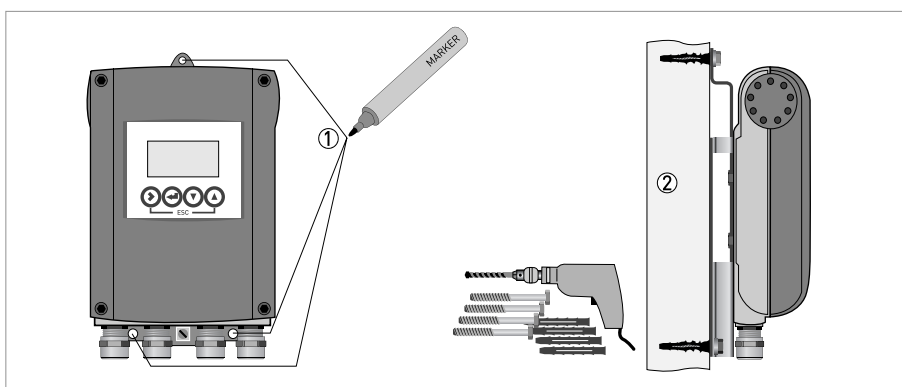
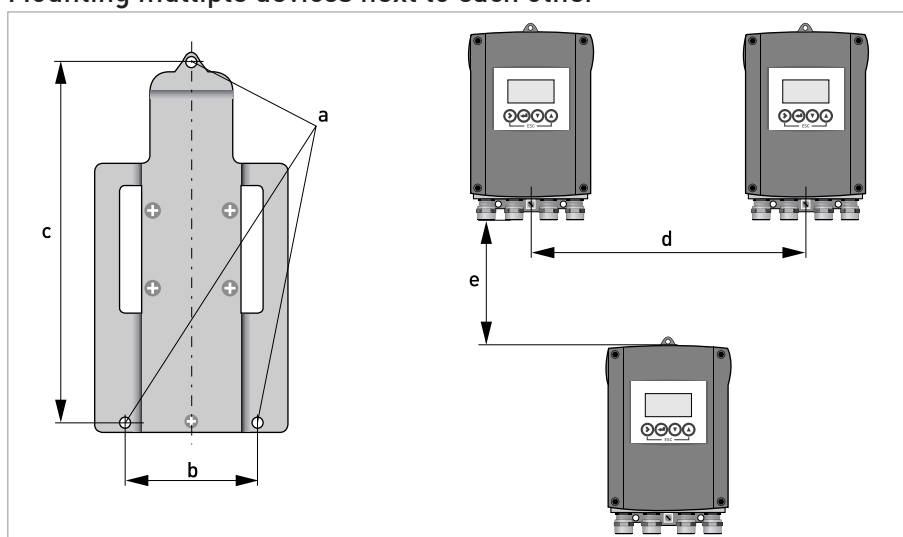


Figure 2-2: Mounting the wall-mounted housing



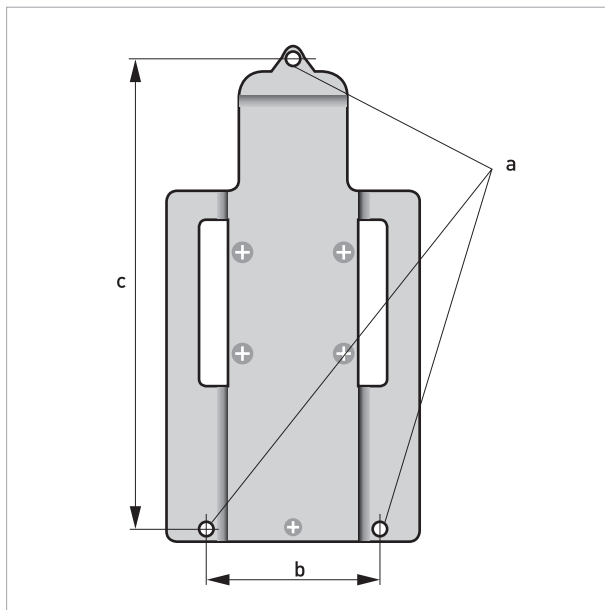
- ① Prepare the holes with the aid of the mounting plate. For further information refer to *Mounting plate, wall-mounted version* on page 8.
- ② Fasten the device securely to the wall with the mounting plate.

Mounting multiple devices next to each other



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

2.7.2 Mounting plate, wall-mounted version



Dimensions in mm and inches

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

3.1 Safety instructions

**DANGER!**

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

**DANGER!**

Observe the national regulations for electrical installations!

**DANGER!**

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

**WARNING!**

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

**INFORMATION!**

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.2 Important notes on electrical connection

**DANGER!**

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.

**CAUTION!**

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

3.3 Electrical cables for remote device versions, notes

3.3.1 Notes on signal cable A



INFORMATION!

Signal cable A (type DS 300) with double shielding ensures proper transmission of measured values.

Observe the following notes:

- Lay the signal cable with fastening elements.
- It is permissible to lay the signal cable in water or in the ground.
- The insulating material is flame-retardant to EN 50625-2-1, IEC 60322-1.
- The signal cable does not contain any halogens and is unplasticized, and remains flexible at low temperatures.
- The connection of the inner shield is carried out via the stranded drain wire (1).
- The connection of the outer shield (60) is carried out via the stranded drain wire (6).

3.3.2 Notes on field current cable C



DANGER!

*A shielded two-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.*



INFORMATION!

The field current cable is not part of the scope of supply.

3.3.3 Requirements for signal cables provided by the customer

**INFORMATION!**

If the signal cable was not ordered, it is to be provided by the customer. The following requirements regarding the electrical values of the signal cable must be observed:

Electrical safety

- To EN 60811 (Low Voltage Directive) or equivalent national regulations.

Capacitance of the insulated conductors

- Insulated conductor / insulated conductor < 50 pF/m
- Insulated conductor / shield < 150 pF/m

Insulation resistance

- $R_{iso} > 100 \text{ G}\Omega \times \text{km}$
- $U_{max} < 24 \text{ V}$
- $I_{max} < 100 \text{ mA}$

Test voltages

- Insulated conductor / inner shield 500 V
- Insulated conductor / insulated conductor 1000 V
- Insulated conductor / outer shield 1000 V

Twisting of the insulated conductors

- At least 10 twists per meter, important for screening magnetic fields.

3.4 Preparing the signal and field current cables



INFORMATION!

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 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: $\geq 50 \text{ mm} / 2''$

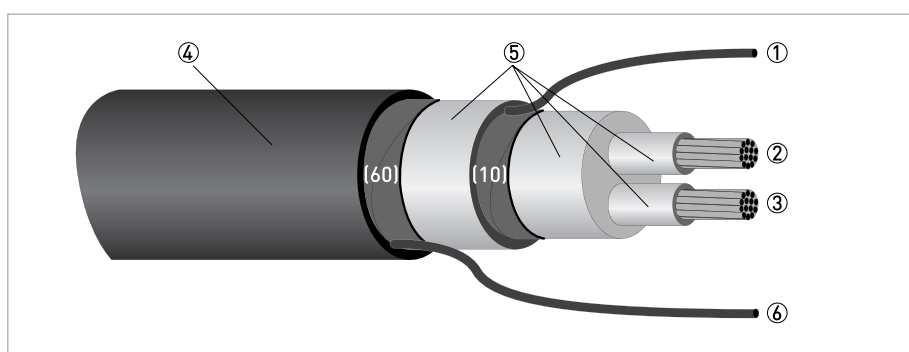


Figure 3-1: Construction of signal cable A

- 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)

3.4.2 Length of signal cable A



INFORMATION!

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

Measuring sensor	Nominal size		Min. electrical conductivity [μS/cm]	Curve for signal cable A
	DN [mm]	[inches]		
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	1	A1
	200...1200	8...48	1	A2
OPTIFLUX 5000 F	2.5...100	1/10...4	1	A1
	150...250	6...10	1	A2
OPTIFLUX 6000 F	2.5...150	1/10...6	1	A1
WATERFLUX 3000 F	25...600	1...24	20	A1

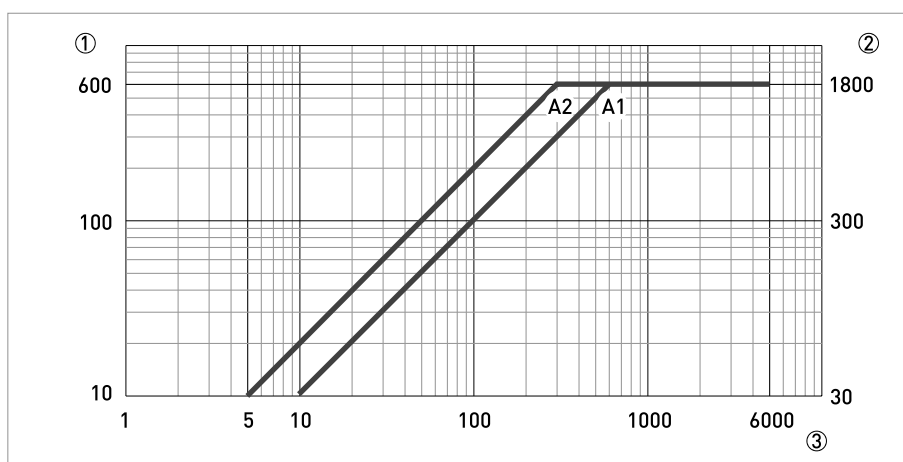


Figure 3-2: Maximum length of signal cable A

- 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]

3.4.3 Preparing signal cable A, connection to signal converter

**INFORMATION!**

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.

- Connection of the two shields in the signal converter is carried out via the stranded drain wires.
- Bending radius: $\geq 50 \text{ mm} / 2''$

Required materials

- PVC insulation tubing, $\varnothing 2.5 \text{ mm} / 0.1''$
- Heat-shrinkable tubing
- 2x wire end ferrules to DIN 46 228: E 1.5-8 for the stranded drain wires (1, 6)
- 2x wire end ferrules to DIN 46 228: E 0.5-8 for the insulated conductors (2, 3)

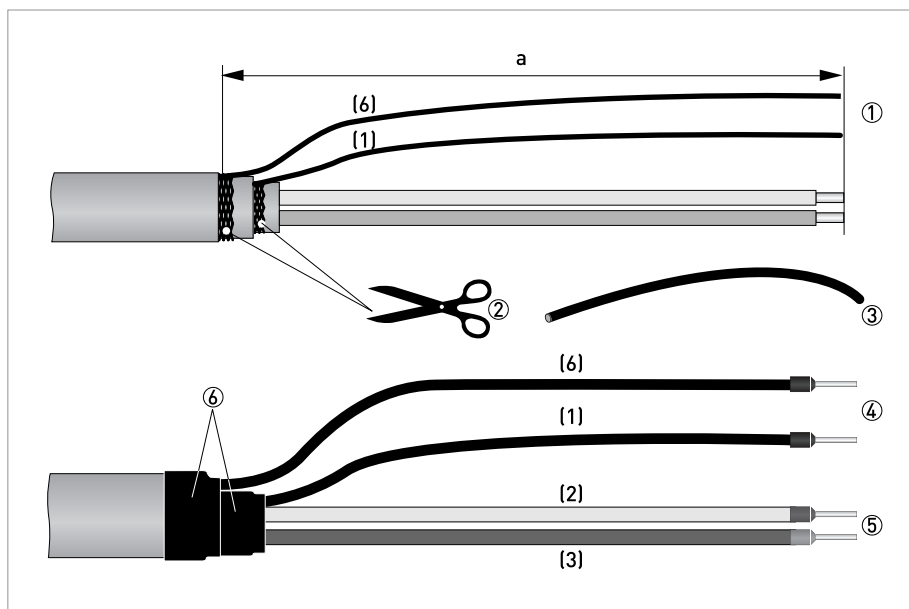


Figure 3-3: Preparation of signal cable A

$a = 80 \text{ mm} / 3.15''$



- ① Strip the conductor to dimension a.
- ② Cut off the inner shield (10) and the outer shield (60). Make sure not to damage the stranded drain wires (1, 6).
- ③ Slide the insulation tubing over the stranded drain wires (1, 6)
- ④ Crimp the wire end ferrules onto the stranded drain wire.
- ⑤ Crimp the wire end ferrules onto the conductors (2, 3).
- ⑥ Pull the heat-shrinkable tubing over the prepared signal cable.

3.4.4 Preparing field current cable C, connection to signal converter



DANGER!

A shielded two-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.



INFORMATION!

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.

- Field current cable C is not part of the scope of supply.
- Bending radius: $\geq 50 \text{ mm} / 2''$

Required materials:

- Shielded, at least 2-wire copper cable with suitable heat-shrinkable tubing
- Insulating tubing, size according to the cable being used
- DIN 46 228 wire end ferrules: size according to the cable being used

Length and cross-section of field current cable C

Length		Cross-section A _F (Cu)	
[m]	[ft]	[mm ²]	[AWG]
0...150	0...500	2 x 0.75 Cu ①	2 x 18
150...300	500...1000	2 x 1.50 Cu ①	2 x 14
300...600	1000...2000	2 x 2.50 Cu ①	2 x 12

① Cu = copper cross-section

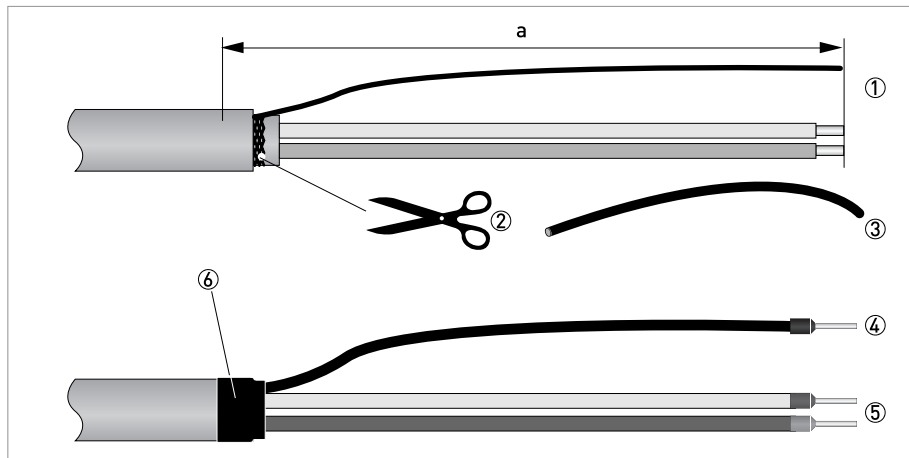


Figure 3-4: Field current cable C, preparation for the signal converter

a = 80 mm / 3.15"



- ① Strip the conductor to dimension a.
- ② If a stranded drain wire is present, remove the shield that is present. Make sure not to damage the stranded drain wire.
- ③ Slide an insulating tube over the stranded drain wire.
- ④ Crimp a wire end ferrule onto the stranded drain wire.
- ⑤ Crimp wire end ferrules onto the conductors.
- ⑥ Pull a shrinkable tube over the prepared cable.

3.4.5 Prepare signal cable A, connect to measuring sensor



INFORMATION!

Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.

- The outer shield (60) is connected in the terminal compartment of the measuring sensor directly via the shield and a clip.
- Bending radius: $\geq 50 \text{ mm} / 2''$

Required materials

- PVC insulation tubing, $\varnothing 2.0 \dots 2.5 \text{ mm} / 0.08 \dots 0.1''$
- Heat-shrinkable tubing
- Wire end ferrule to DIN 46 228: E 1.5-8 for the stranded drain wire (1)
- 2x wire end ferrules to DIN 46 228: E 0.5-8 for the insulated conductors (2, 3)

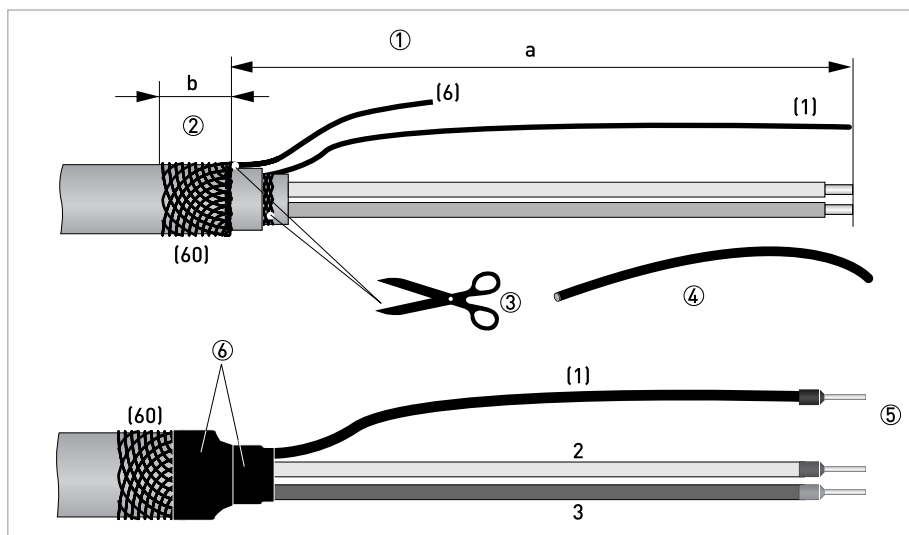


Figure 3-5: Prepare signal cable A, connect to measuring sensor

a = 50 mm / 2"

b = 10 mm / 0.39"



- ① Strip the conductor to dimension a.
- ② Trim the outer shield (60) to dimension b and pull it over the outer sheath.
- ③ Remove the stranded drain wire (6) of the outer shield and the inner shield (10). Make sure not to damage the stranded drain wire (1) of the inner shield.
- ④ Slide an insulating tube over the stranded drain wire (1).
- ⑤ Crimp the wire end ferrules onto conductors 2 and 3 and the stranded drain wire (1).
- ⑥ Pull the heat-shrinkable tubing over the prepared signal cable.

3.4.6 Preparing field current cable C, connection to measuring sensor



INFORMATION!

Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.

- The field current cable is not part of the scope of supply.
- The shield is connected in the terminal compartment of the measuring sensor directly via the shield and a clip.
- Bending radius: $\geq 50 \text{ mm} / 2''$

Required materials

- Shielded 2-wire insulated copper cable
- Insulating tubing, size according to the cable being used
- Heat-shrinkable tubing
- DIN 46 228 wire end ferrules: size according to the cable being used

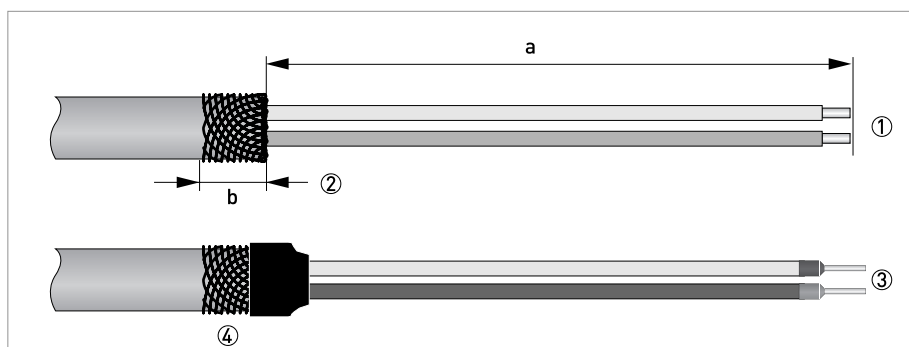


Figure 3-6: Preparation of field current cable C

$a = 50 \text{ mm} / 2''$

$b = 10 \text{ mm} / 0.4''$



- ① Strip the conductor to dimension a.
- ② Trim the outer shield to dimension b and pull it over the outer sheath.
- ③ Crimp wire end ferrules onto both conductors.
- ④ Pull a shrinkable tube over the prepared cable.

3.5 Connecting the signal and field current cables

**DANGER!**

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

**DANGER!**

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

**DANGER!**

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

**WARNING!**

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

3.5.1 Connecting the signal and field current cables to the signal converter, remote version

**INFORMATION!**

The compact version is supplied preassembled from the factory.

Open housing

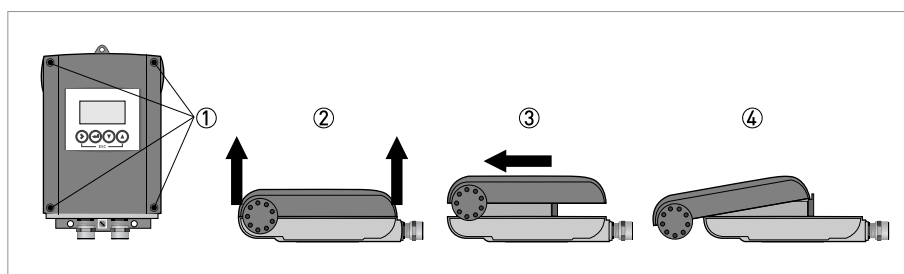


Figure 3-7: Open housing



- ① Loosen the 4 screws with a suitable tool.
- ② Lift the housing at the top and bottom at the same time.
- ③ Slide the housing cover upward.
- ④ The housing cover is guided and held by the inside hinge.

Connecting the signal and field current cables

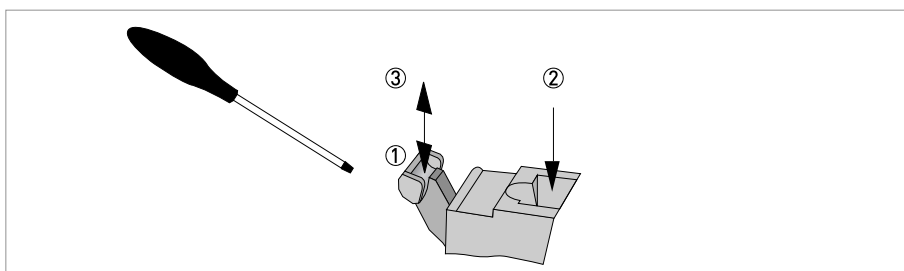


Figure 3-8: Function of the electrical connection terminal



Connect the electrical conductors as follows:

- ① Push the lever downwards with a screwdriver in good condition (blade: 3.5 mm wide and 0.5 mm thick).
- ② Insert the electrical conductor into the plug.
- ③ The conductor will be clamped as soon as the lever is released.

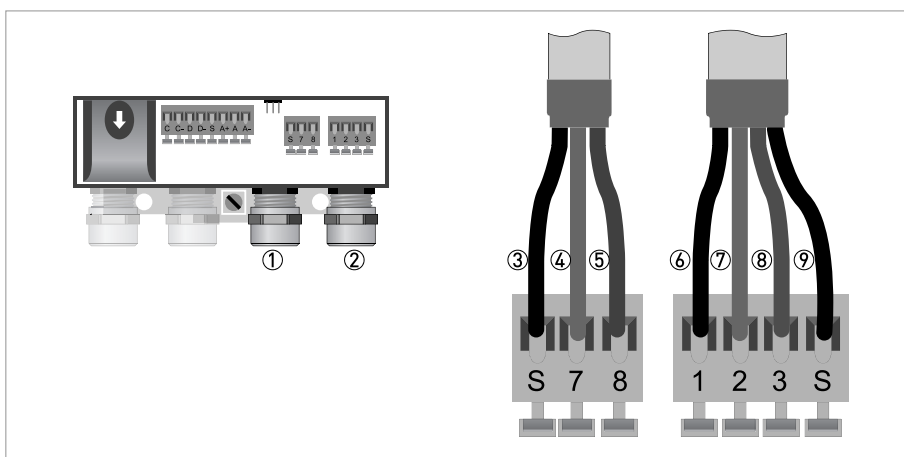


Figure 3-9: Connecting the signal and field current cables

- ① Cable entry for field current cable
- ② Cable entry for signal cable
- ③ Connecting the field current cable shield
- ④ Electrical conductor [7]
- ⑤ Electrical conductor [8]
- ⑥ Stranded drain wire (1) of the inner shield (10) of the signal cable
- ⑦ Electrical conductor (2)
- ⑧ Electrical conductor (3)
- ⑨ Stranded drain wire (S) of the outer shield (60)

3.5.2 Connection diagram for signal and field current cable



DANGER!

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

- A shielded two-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: $\geq 50 \text{ mm} / 2''$
- The following illustration is schematic. The positions of the electrical connection terminals may vary depending on the housing version.

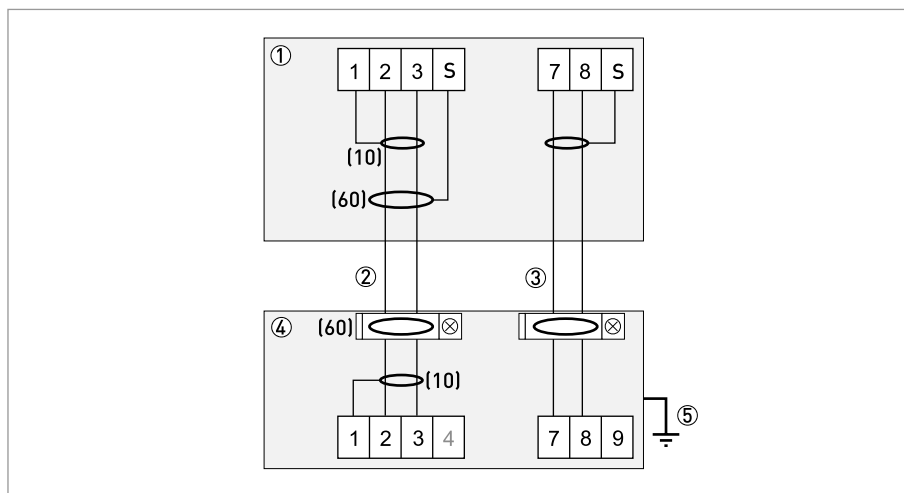


Figure 3-10: Connection diagram for signal and field current cable

- 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

3.6 Grounding the measuring sensor

3.6.1 Classical method



DANGER!

There should be no difference in potential between the measuring sensor and the housing or protective earth of the signal converter!

- The measuring sensor must be properly grounded.
- The grounding cable should not transmit any interference voltages.
- Do not use the grounding cable to connect more than one device to ground at the same time.
- The measuring sensors are connected to ground by means of a functional grounding conductor FE.
- Special grounding instructions for the various measuring sensors are provided in the separate documentation for the measuring sensors.
- The documentation for the measuring sensors also contain descriptions on how to use grounding rings and how to install the measuring sensors in metal or plastic pipes or in pipes which are coated on the inside.

3.7 Connecting the power



DANGER!

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

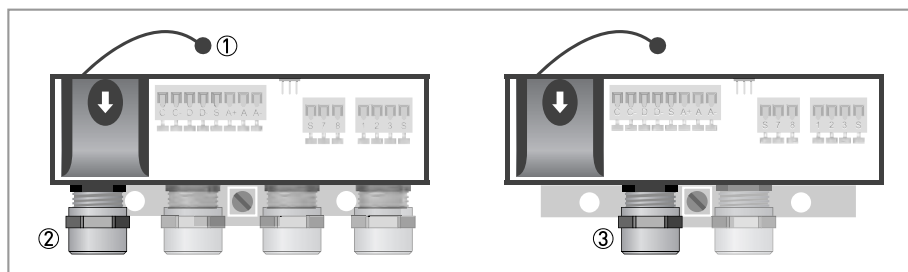


Figure 3-11: Terminal compartment for power

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

Version overview

Version	Non-Ex	Ex
100...230 VAC	Standard	Optional
12...24 VDC	Standard	-
24 VAC/DC	-	Standard



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

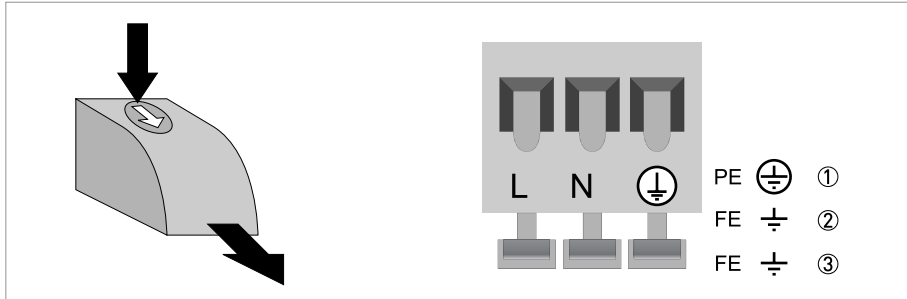


Figure 3-12: Power supply connection

- 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 and 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.



INFORMATION!

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

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

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



INFORMATION!

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

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

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



INFORMATION!

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

3.8 Overview of outputs

3.8.1 Description of the CG number



Figure 3-13: 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

3.8.2 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.

CG-No.	Connection terminals						
	A+	A	A-	C	C-	D	D-

Basic outputs (I/O) Standard

1 0 0		I _p + HART® passive ①	S _p passive	P _p / S _p passive ②
	I _a + HART® active ①			

① function changed by reconnecting

② changeable

Description of used abbreviations

I _a	I _p	Current output active or passive
P _p		Pulse/frequency output passive
S _p		Status output / limit switch passive

3.9 Electrical connection of the outputs


INFORMATION!

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.

3.9.1 Electrical connection of the outputs


DANGER!

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

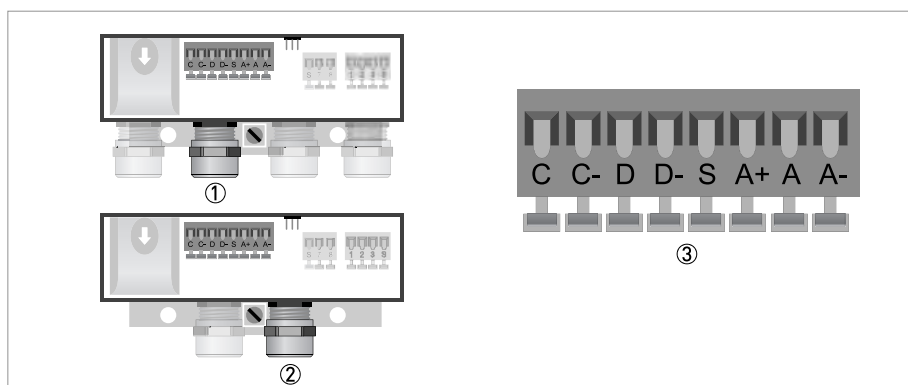


Figure 3-14: Connection of outputs

- ① Cable entry, remote version
- ② Cable entry, compact version
- ③ Terminal S for shield



- Open the housing cover
- Push the prepared cables through the cable entries and connect the necessary conductors.
- Connect the shield.
- Close the housing cover.


INFORMATION!

Ensure that the housing gasket is properly fitted, clean and undamaged.

3.9.2 Laying electrical cables correctly

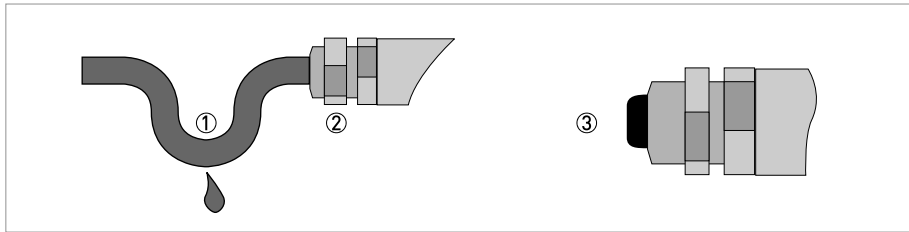


Figure 3-15: Protect housing from dust and water



- 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.

4.1 Switching on the power

Before connecting to power, please check that the system has been correctly installed. This includes:

- The device must be mechanically safe and mounted in compliance with the regulations.
- The power connections must have been made in compliance with the regulations.
- The electrical terminal compartments must be secured and the covers have been screwed on.
- Check that the electrical operating data of the power supply are correct.



- Switching on the power.

4.2 Starting the signal converter

The measuring device, consisting of the measuring sensor and the signal converter, is supplied ready for operation. All operating data have been set at the factory in accordance with your order specifications.

When the power is switched on, a self test is carried out. After that the device immediately begins measuring, and the current values are displayed.

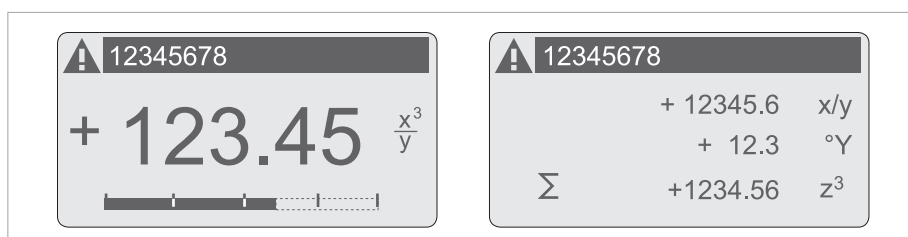


Figure 4-1: Displays in measuring mode (examples for 2 or 3 measured values)
x, y and z denote the units of the measured values displayed

It is possible to change between the two measured value windows, the trend display and the list with the status messages by pressing the keys \uparrow and \downarrow .







KROHNE product overview

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

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