TIDALFLUX 4300 F Quick Start

Electromagnetic flow sensor for partially filled pipes

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

KROHNE

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 Scope of delivery

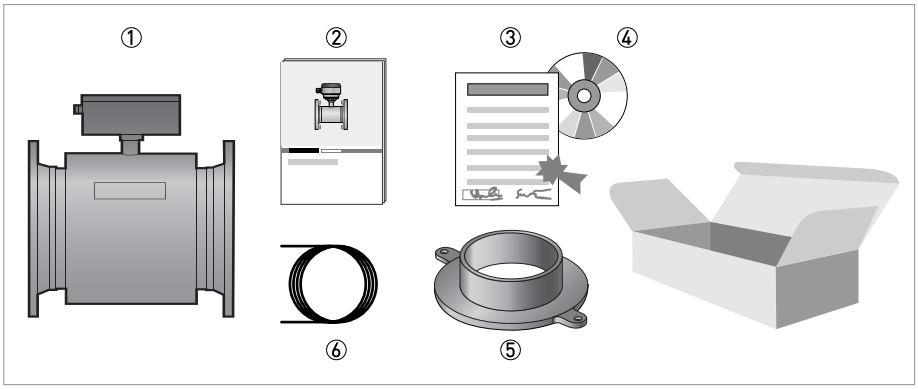


Figure 2-1: Scope of delivery

① Ordered flowmeter
② Product documentation
③ Factory calibration report
④ CD-ROM with product documentation
⑤ Grounding rings (optionally)
⑥ Cable

2.2 Transport

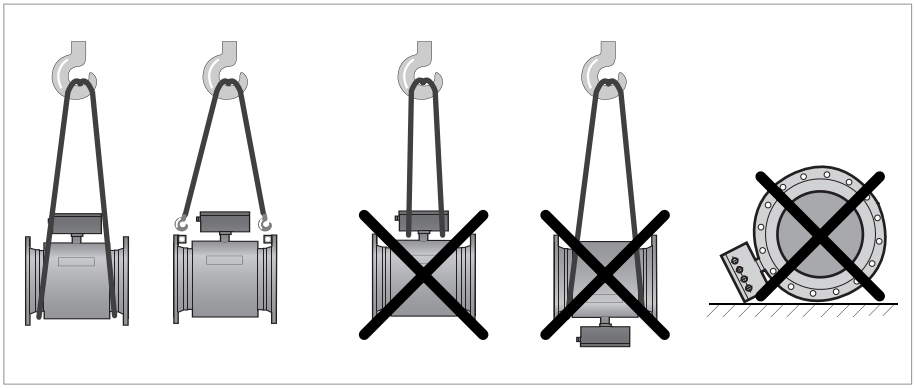


Figure 2-2: Transport

2.3 Installation conditions

2.3.1 Inlet and outlet

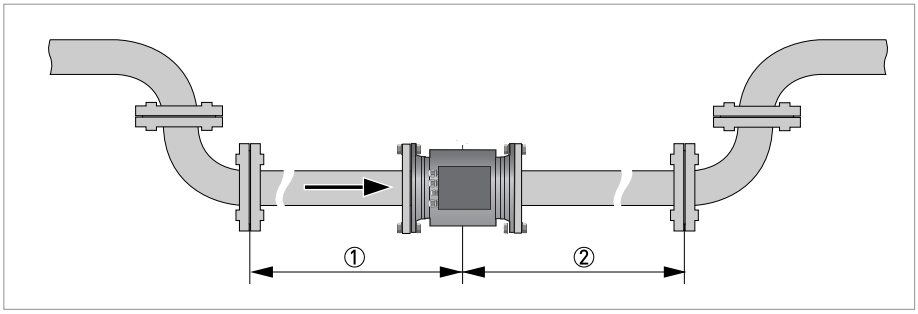


Figure 2-3: Recommended inlet and outlet sections, top view

① ≥ 5 DN
② ≥ 3 DN

2.3.2 Mounting position

CAUTION!
Only install the flow sensor in the shown position to keep the electrodes under water. Limit the rotation to ±2° to maintain the accuracy.

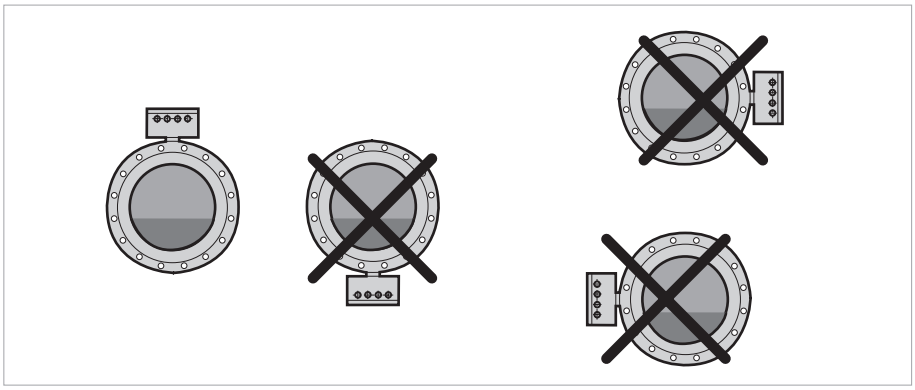


Figure 2-4: Mounting position

2.3.3 Flange deviation

CAUTION!
Max. permissible deviation of pipe flange faces:
$L_{max} - L_{min} \leq 0.5$ *mm / 0.02"*

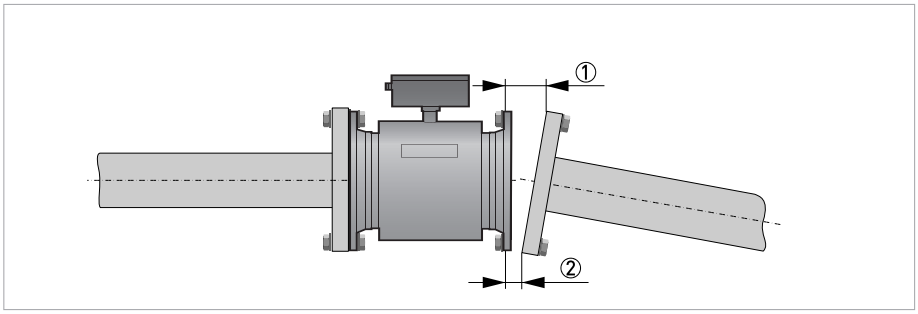


Figure 2-5: Flange deviation

① L_{max}
② L_{min}

2.3.4 Vibration

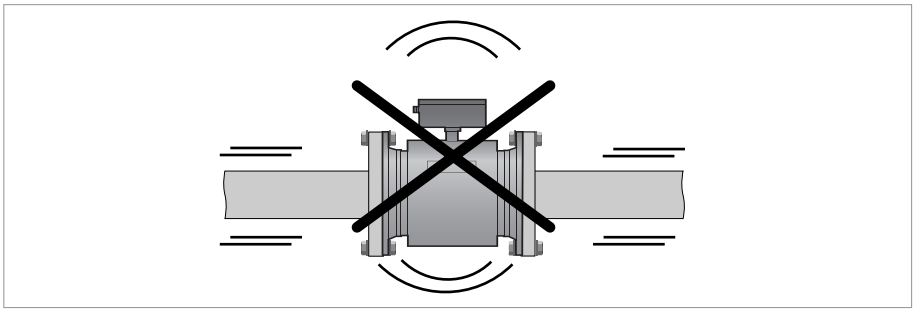


Figure 2-6: Avoid vibrations

2.3.5 Magnetic field

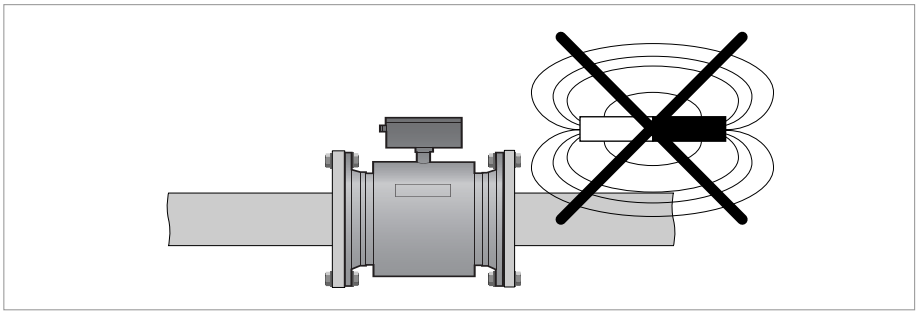


Figure 2-7: Avoid magnetic fields

2.3.6 Control valve

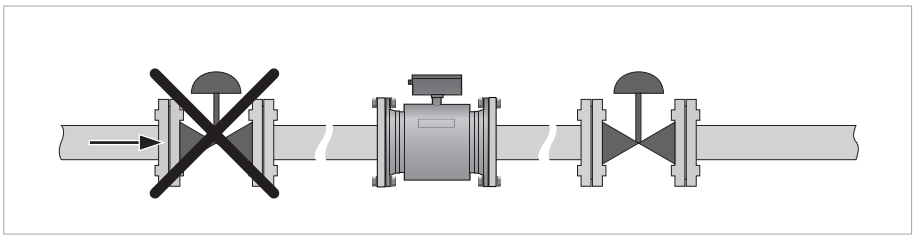


Figure 2-8: Installation before control valve

2.3.7 Slope

CAUTION!
The accuracy is influenced by the slope. Stay within ± 1% to get the most accurate measurements!

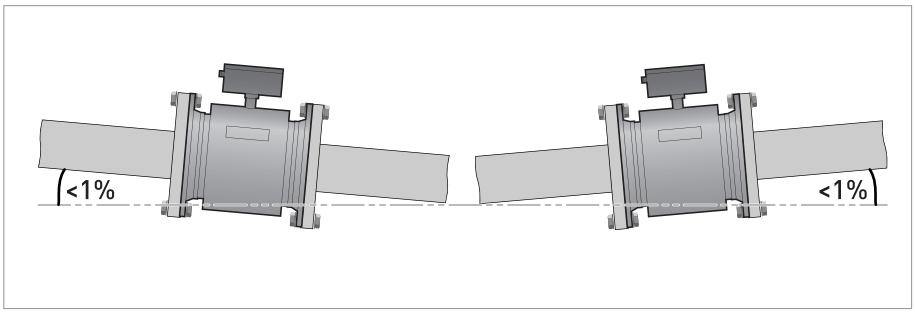


Figure 2-9: Recommended slope

2.3.8 Mounting advice for difficult situations

If you can not meet the installation conditions install the flowmeter between two containers. The inlet to the flowmeter must be higher than the outlet of the fluid. In this way you will have a calm flow into the flowmeter, resulting in a highly accurate measurement. The sizes of the containers must be proportional to the size of the flowmeter.

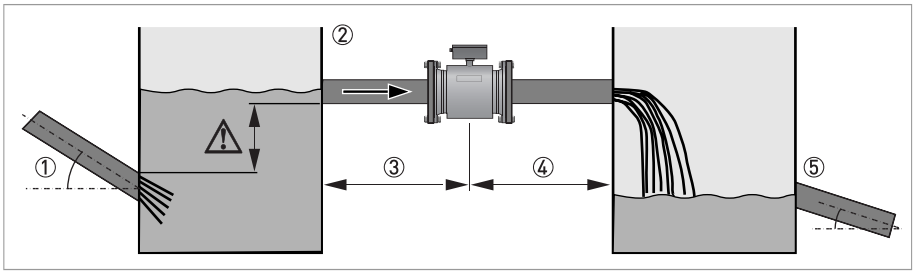


Figure 2-10: Installing in difficult situations

① Use a container ② if the Inlet pipe has a slope > 1%. Make sure that the outlet level of this pipe is below the inlet to the flowmeter.
② Inlet container
③ Inlet section of 10 DN
④ Outlet section of 5 DN
⑤ Outlet container advisable if outlet pipe has a slope > 1%.

2.3.9 Cleaning of flow sensor

The TIDALFLUX flow sensor is highly resistant against dirt and the measurement will rarely be influenced by anything. However, it is advisable to create a possiblity for cleaning just before or after the sensor.

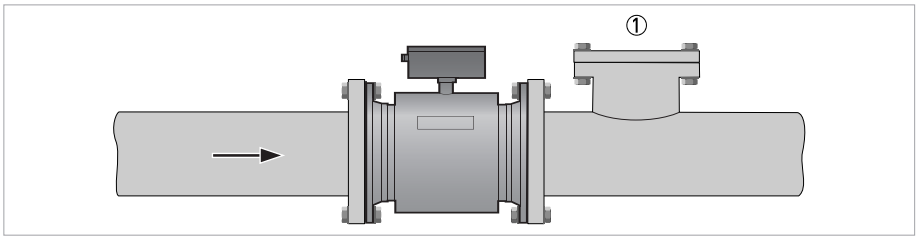


Figure 2-11: Option for cleaning of flow sensor

① Opening for cleaning

2.3.10 Temperatures

Temperature range	Process [°C]		Ambient [°C]		Process [°F]		Ambient [°F]	
	min.	max.	min.	max.	min.	max.	min.	max.
All versions	-5	60	-25	60	23	140	-13	140

2.4 Mounting

2.4.1 Mounting grounding rings

CAUTION!
*In order to get a reliable height measurement it is **absolutely necessary** that the inner side of the connecting pipeline is electrically conductive and connected to ground. If not, tailor-made grounding rings with a cylindrical part can be delivered. Please contact your local agency in case of doubt.*

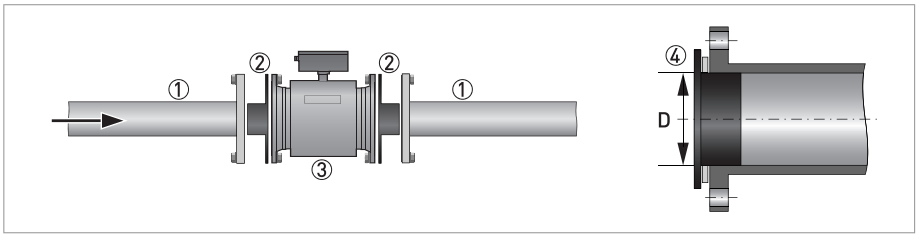


Figure 2-12: Grounding with grounding rings

① Existing pipeline
② Grounding rings, custom made to inner diameter of pipeline
③ TIDALFLUX
④ Insert the cylindrical part of the grounding ring into the pipeline. Use an appropiate gasket between the grounding ring and the flange.

INFORMATION!
Sizes of the grounding rings are diameter dependent and available on request.

2.4.2 Torques and pressures

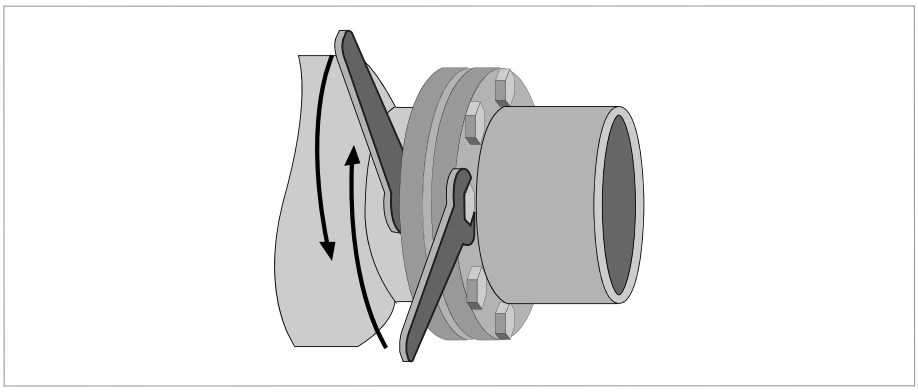


Figure 2-13: Tightening of bolts

Tightening of bolts

① Step 1: Apply approx. 50% of max. torque given in table.
② Step 2: Apply approx. 80% of max. torque given in table.
③ Step 3: Apply 100% of max. torque given in table.

INFORMATION!
Tighten the bolts uniformely in diagonally opposite sequence.

Nominal size DN [mm]	Pressure rating	Bolts	Max. torque [Nm]
200	PN 10	8 × M 20	68
250	PN 10	12 × M 20	65
300	PN 10	12 × M 20	76
350	PN 10	16 × M 20	75
400	PN 10	16 × M 24	104
500	PN 10	20 × M 24	107
600	PN 10	20 × M 27	138
700	PN 10	20 × M 27	163
800	PN 10	24 × M 30	219
900	PN 10	28 × M 30	205
1000	PN 10	28 × M 35	261

Nominal size [inch]	Flange class [lb]	Bolts	Max. torque [Nm]
8	150	8 × 3/4"	69
10	150	12 × 7/8"	79
12	150	12 × 7/8"	104
14	150	12 × 1"	93
16	150	16 × 1"	91
18	150	16 × 1 1/8"	143
20	150	20 × 1 1/8"	127
24	150	20 × 1 1/4"	180
28	150	28 × 1 1/4"	161
32	150	28 × 1 1/2"	259
36	150	32 × 1 1/2"	269
40	150	36 × 1 1/2"	269

INFORMATION!
Information for bigger sizes is available on request.

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!

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 (see type plates) are identically set*

3.3 Connection of cables

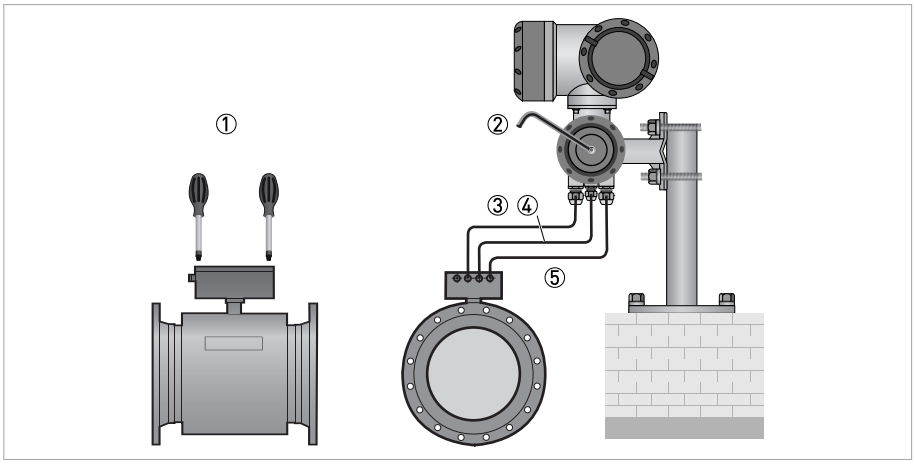


Figure 3-1: Electrical connection

① Unscrew the cover to reach the connectors
② Unscrew the cover to reach the connectors
③ Field current cable
④ Interface cable
⑤ Signal cable (DS or BTS)

Connection diagram

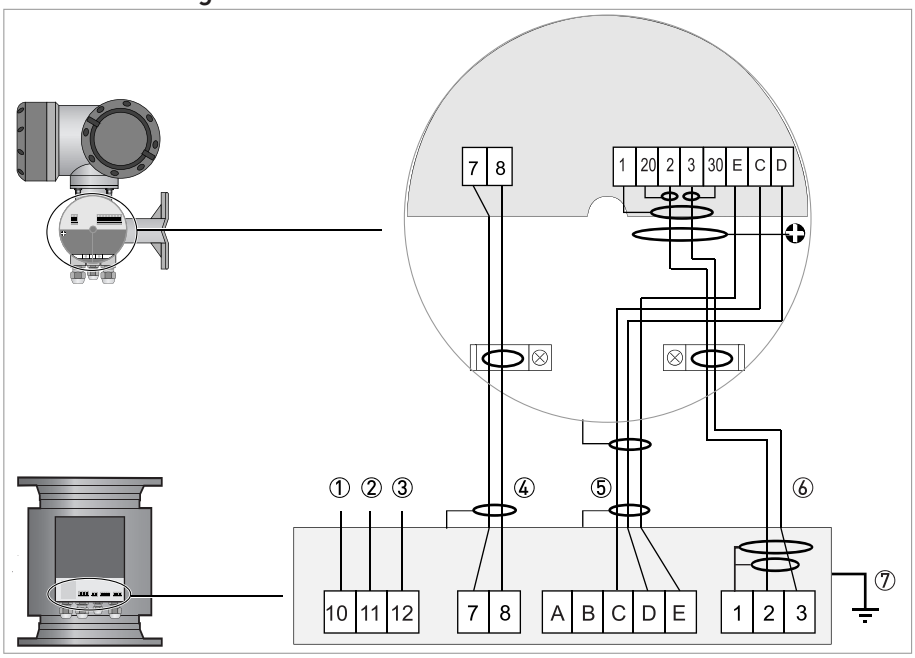


Figure 3-2: Connection diagram

① Protective Earth connection (PE)
② Mains power neutral (N)
③ Mains power live (L)
④ Field current cable
⑤ Interface cable
⑥ Signal cable. Shown is the BTS cable. In case of DS cable, do not use connectors 20 and 30.
⑦ Connect housing to PE

Flow sensors with protection class IP 68 can not be opened anymore. The cables are factory connected and labeled as follows.

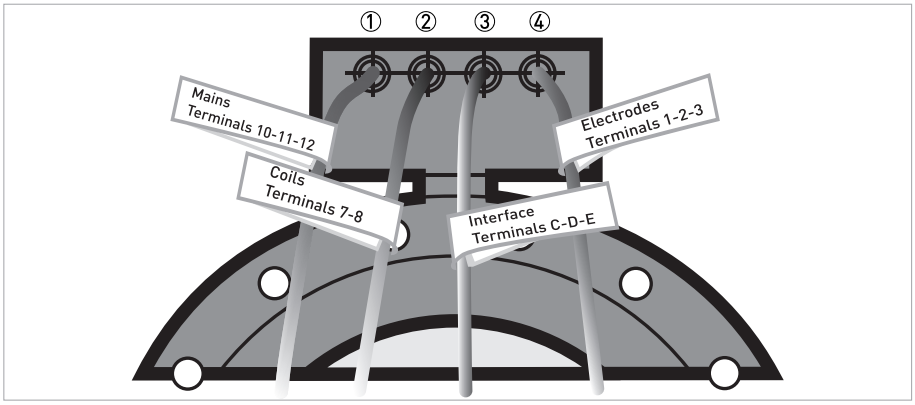


Figure 3-3: Labeled cables for IP 68 versions

① Mains power (10 = blank, 11 = blue, 12 = black)
② Field current (7 = white, 8 = green)
③ Data interface (black wires, C = marked "1", D = marked "2", E = marked "3")
④ Electrodes (1 = blank, 2 = white, 3 = red)

3.4 Cable lengths

CAUTION!
The maximum allowed distance between the flow sensor and the converter is determined by the shortest cable length.

Interface cable: maximum length is 600 m / 1968 ft.

Type B (BTS) signal cable: maximum length is 600 m / 1968 ft.

Type A (DS) signal cable: maximum length depends on the conductivity of the fluid:

Electrical conductivity	Maximum length	
[µS/cm]	[m]	[ft]
50	120	394
100	200	656
200	400	1312
≥400	600	1968

Field current cable: The cross section of the cable determines the maximum length:

Cross section		Maximum length	
[mm^2]	[AWG]	[m]	[ft]
2 x 0.75	2 x 18	150	492
2 x 1.5	2 x 14	300	984
2 x 2.5	2 x 12	600	1968

3.5 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"

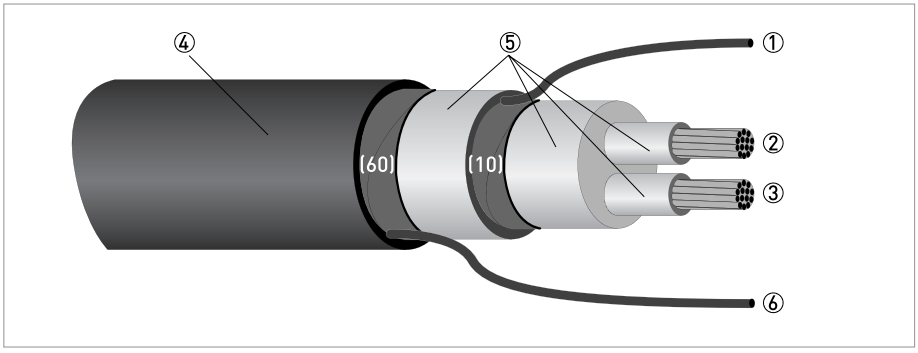


Figure 3-4: Construction of signal cable A

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)

3.6 Preparing signal cable A, 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 outer shield (60) is connected in the terminal compartment of the measuring sensor directly via the shield and a clip.
- Bending radius: ≥ 50 mm / 2"

Required materials

- PVC insulating tube, Ø2.0...2.5 mm / 0.08...0.1"
- Heat-shrinkable tubing
- Wire end ferrule to DIN 46 228: E 1.5-8 for the stranded drain wire (1)
- 2 wire end ferrules to DIN 46 228: E 0.5-8 for the insulated conductors (2, 3)

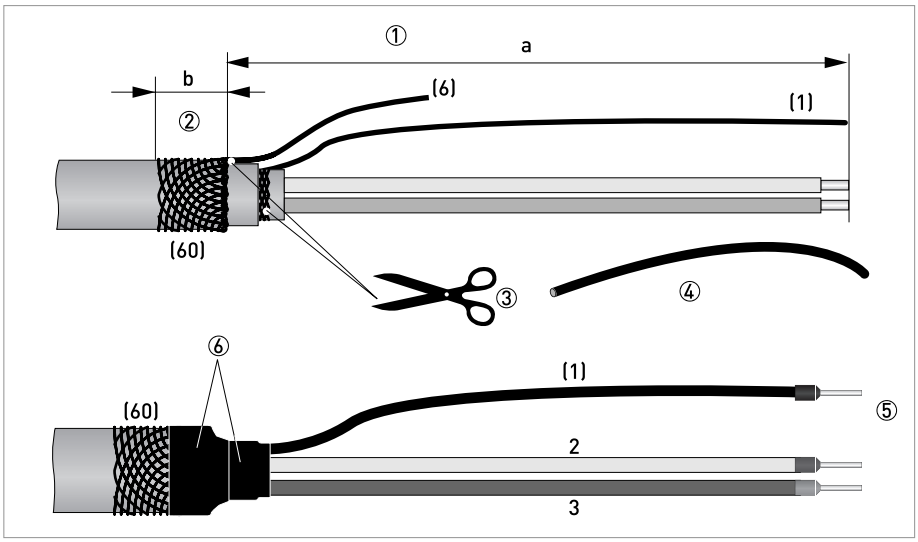


Figure 3-5: Preparing signal cable A, connection to measuring sensor

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.

3.7 Signal cable B (type BTS 300), construction

- Signal cable B is a triple-shielded cable for signal transmission between the measuring sensor and signal converter.
- Bending radius: ≥ 50 mm / 2"

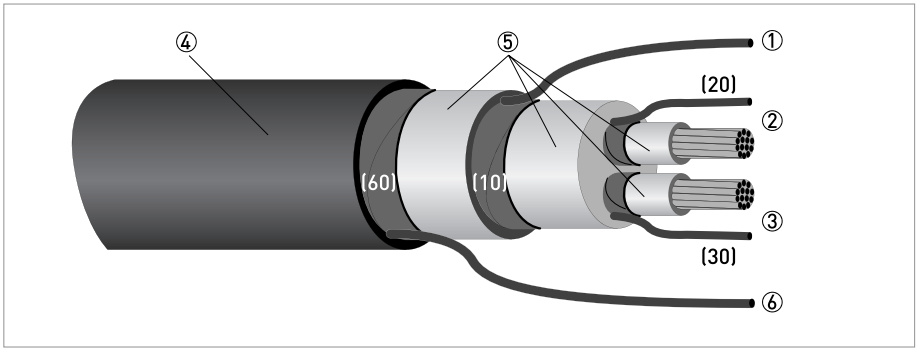


Figure 3-6: Construction of signal cable B

① Stranded drain wire 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 with stranded drain wire (20) of shield
③ Insulated wire (3), 0.5 mm^2 Cu / AWG 20 with stranded drain wire (30) of shield
④ Outer sheath
⑤ Insulation layers
⑥ Stranded drain wire (6) for the outer shield (60), 0.5 mm^2 Cu / AWG 20 (not insulated, bare)

3.8 Preparing signal cable B, 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 outer shield (60) is connected in the terminal compartment of the measuring sensor directly via the shield and a clip.
- Bending radius: ≥ 50 mm / 2"

Required materials

- PVC insulation tubing, Ø2.0...2.5 mm / 0.08...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)

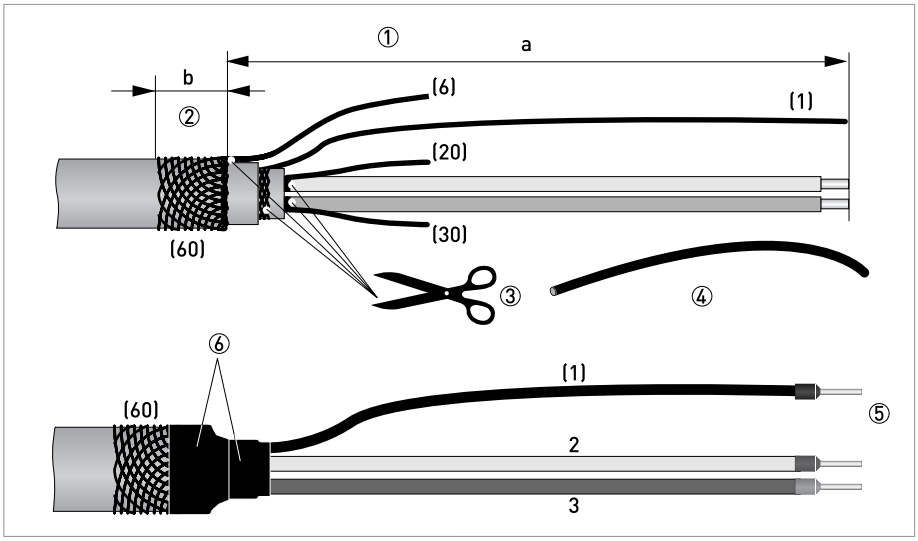


Figure 3-7: Preparing signal cable B, connection to measuring sensor

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 shields and stranded drain wires of the insulated conductors (2, 3). Remove the inner shield (10). Be sure not to damage the stranded drain wire (1).
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.

3.9 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 delivery.
- The shield is connected in the terminal compartment of the converter directly via the shield and a clip.
- The shield is connected in the sensor via the special cable gland.
- Bending radius: ≥ 50 mm / 2"

Required materials

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

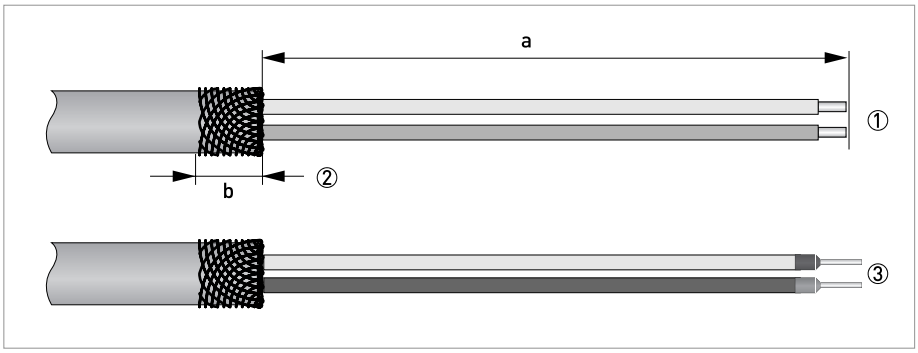


Figure 3-8: Preparation of field current cable C

a = 125 mm / 5"
b = 10 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.

At flow converter side:

Connecting shielding under clamp in connection box of converter

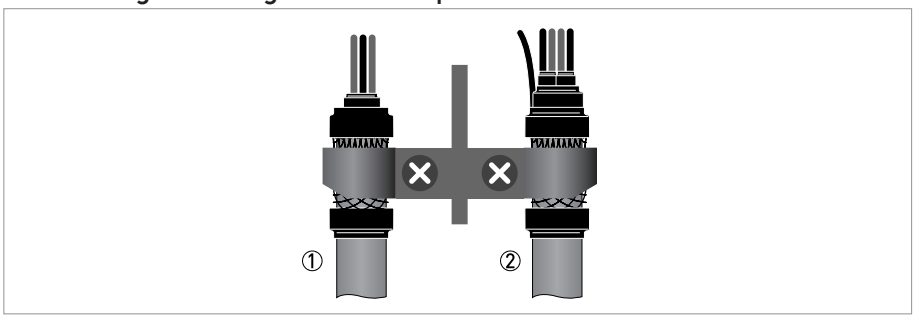


Figure 3-9: Clamping of shields

① Field current cable
② Signal cable

At flow sensor side:

Connecting shielding via special cable gland

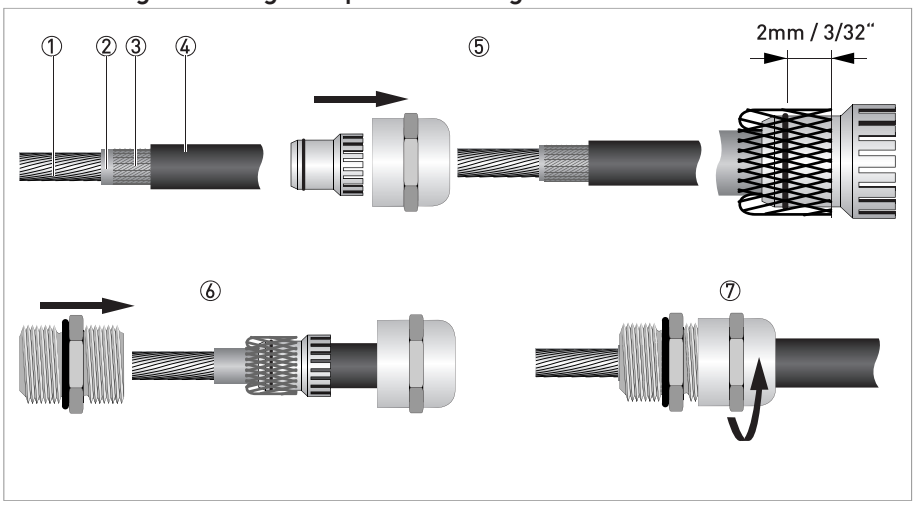


Figure 3-10: Connecting the shield within the cable gland

① Wires
② Isolation
③ Shielding
④ Isolation
⑤ Feed cable through dome nut and clamping insert and fold shielding over clamping insert. Make sure that the braided shield overlaps the O-ring by 2 mm / 3/32".
⑥ Push clamping insert into body.
⑦ Tighten the dome nut.

3.10 Interface cable

The data interface cable is a shielded, 3 x 1.5 mm^2 LIYCY cable. The standard length 10 m / 32.8 ft is included in the delivery.

Preparing the interface cable

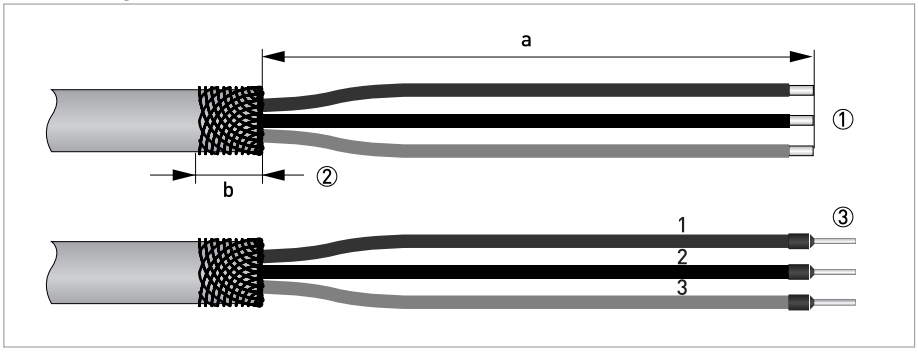


Figure 3-11: Preparing the interface cable

a = 100 mm / 4"
b = 10 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 the wire end ferrules onto the conductors 1, 2 and 3.

Connect the shielding at both sides of the cable via the special cable gland.

Connecting shielding via special cable gland

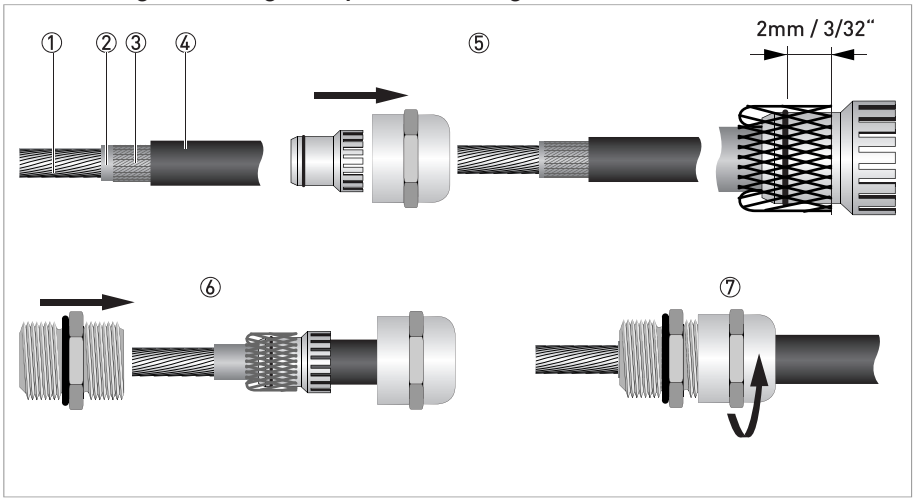


Figure 3-12: Connecting the shield within the cable gland

① Wires
② Isolation
③ Shielding
④ Isolation
⑤ Feed cable through dome nut and clamping insert and fold shielding over clamping insert. Make sure that the braided shield overlaps the O-ring by 2 mm / 3/32".
⑥ Push clamping insert into body.
⑦ Tighten the dome nut.

3.11 Grounding

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

CAUTION!
*In order to get a reliable height measurement it is **absolutely necessary** that the inner side of the connecting pipeline is electrically conductive and connected to ground. If not, tailor-made grounding rings with a cylindrical part can be delivered. Please contact your local agency in case of doubt.*

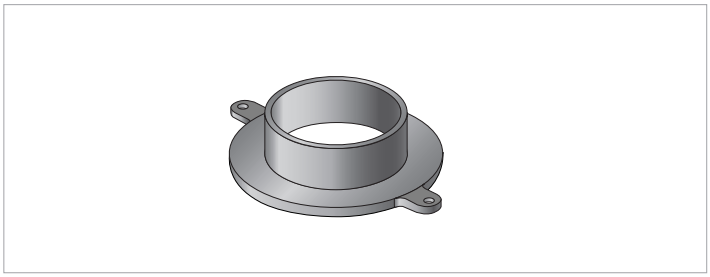


Figure 3-13: Grounding ring number 3

4.1 Switching on the power

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

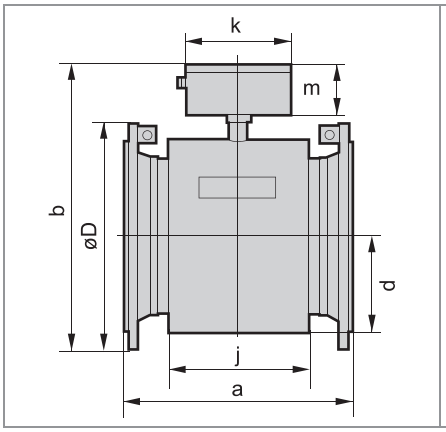
- The device must be mechanically mounted safely in compliance with the regulations.
- The power connections must be in compliance with the regulations.
- Make sure that all electrical connections are made and that the covers of the terminal compartments are closed.
- Check that the electrical operating data of the power supply are correct.

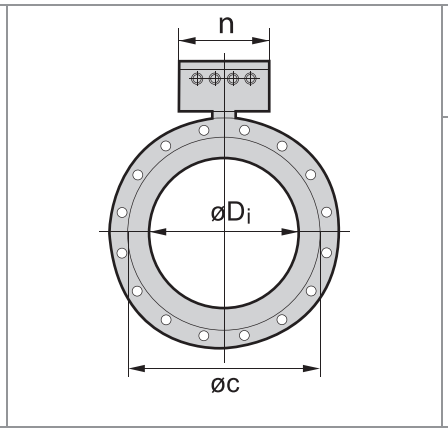
- Switch on the power.

INFORMATION!
The sensor can not be programmed or changed in any way. All settable functions are included in the converter. Please see the relevant documentation of the converter for more information.

5.1 Dimensions and weights

The inner pipe diameter should match the inner diameter of the flowmeter. Since the inner diameter is not a standard DN size, choose the inner pipe diameter to be just a little bit bigger than the flow meter diameter. If a lot of sediment or fat is expected the optimal solution is to produce a diameter compensation ring on both sides to have smooth transits.





IP 67 versions:
k = 232 mm / 9.1"
m = 110 mm / 4.3"
n = 202 mm / 7.95"

IP 68 versions:
k = 344 mm / 13.54"
m = 155 mm / 6.1"
n = 284 mm / 11.18"

EN 1092-1

Nominal size		Dimensions [mm]								Approx. weight [kg]
DN	PN	a	b		Øc	d	j	ØD	$ØD_i$	
			IP 67	IP 68						
200	10	350	473	532	291	146	177	340	189	40
250	10	400	521	579	331	166	205	395	231	54
300	10	500	571	629	381	191	235	445	281	66
350	10	500	623	682	428	214	306	505	316	95
400	10	600	681	739	483	242	386	565	365	115
500	10	600	784	843	585	293	386	670	467	145
600	10	600	894	952	694	347	386	780	567	180
700	10	700	1010	1069	812	406	455	895	666	265
800	10	800	1125	1184	922	461	535	1015	768	350
900	10	900	1246	1305	1064	532	625	1115	863	425
1000	10	1000	1338	1396	1132	566	695	1230	965	520
1200	6	1200	1529	1588	1340	670	854	1405	1169	659
1400	6	1400	1732	1791	1521	761	1034	1630	1367	835
1600	6	1600	1932	1991	1721	861	1234	1830	1549	1659

150 lb flanges

Nominal size		Dimensions [inches]								Approx. weight [lb]
ASME ①	PN [psi]	a	b		Øc	d	j	ØD	$ØD_i$	
			IP 67	IP 68						
8	284	13.78	19.02	20.9	11.46	5.75	6.97	13.39	7.44	90
10	284	15.75	21.06	22.8	13.03	6.54	8.07	15.55	9.09	120
12	284	19.69	23.54	24.8	15	7.52	9.25	17.52	11.06	145
14	284	27.56	25.43	26.8	16.85	9.8	12.05	19.88	12.44	210
16	284	31.5	27.72	29.1	19.02	9.53	15.2	22.24	14.37	255
20	284	31.5	31.73	33.2	23.03	11.54	15.2	26.38	18.39	320
24	284	31.5	36.14	37.5	27.32	13.66	15.2	30.71	22.32	400
28	Class D	35.43	40.4	42.7	31.97	15.98	17.87	36.50	26.22	692
32	Class D	39.37	45.2	47.5	36.3	18.15	21.06	41.75	30.24	1031
36	Class D	43.31	50.1	52.4	41.89	20.94	24.61	46.0	33.98	1267
40	Class D	47.24	53.8	56.1	44.57	22.28	27.36	50.75	37.99	1554
48	Class D	55.12	62.3	64.6	52.76	26.38	33.62	59.50	46.02	2242
① Nominal size ≤ 24": ASME; > 24": AWWA										

5.2 Vacuum load

Diameter	Vacuum load in mbar abs. at a process temperature of	
[mm]	40°C	60°C
DN200...1600	500	600

Diameter	Vacuum load in psia at a process temperature of	
[inches]	104°F	140°F
8...64"	7.3	8.7

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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