TIDALFLUX 4300 F Technical Datasheet

Electromagnetic flow sensor for partially filled pipes

- Measurement in partially filled pipes up to DN1600 / 64"
- Patented, non-contact level measurement
- Measurement possible down to 10% filling of pipe

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

CONTENTS

1 Product features 3

1.1 Solution for partially filled pipes ... 3
1.2 Options ... 5
1.3 Measuring principle ... 6

2 Technical data 8

2.1 Technical data ... 8
2.2 Dimensions and weights ... 12
2.3 Vacuum load ... 13
2.4 Measuring accuracy ... 14

3 Installation 16

3.1 Intended use ... 16
3.2 Installation conditions ... 16
3.2.1 Inlet and outlet ... 16
3.2.2 Mounting position ... 16
3.2.3 Flange deviation ... 17
3.2.4 Vibration ... 17
3.2.5 Magnetic field ... 17
3.2.6 Control valve ... 18
3.2.7 Slope ... 18
3.2.8 Mounting advice for difficult situations ... 18
3.2.9 Cleaning of flow sensor ... 19
3.2.10 Temperatures ... 19
3.3 Mounting ... 20
3.3.1 Mounting grounding rings ... 20
3.3.2 Torques and pressures ... 20

4 Electrical connections 22

4.1 Connection of cables ... 22
4.2 Cable lengths ... 24
4.3 Signal cable A (type DS 300), construction ... 26
4.4 Preparing signal cable A, connection to measuring sensor ... 27
4.5 Signal cable B (type BTS 300), construction ... 28
4.6 Preparing signal cable B, connection to measuring sensor ... 28
4.7 Preparing field current cable C, connection to measuring sensor ... 30
4.8 Interface cable ... 32
4.9 Grounding ... 33

5 Notes 34

1.1 Solution for partially filled pipes

The **TIDALFLUX 4000** flow sensor with integrated and non-contact capacitive level measuring system provides accurate flow measurement in partially filled pipes. TIDALFLUX is designed to measure reliably between 10% and 100% of the pipe cross section. The integrated level sensors in the liner are in no contact with the liquid and are therefore insensitive against fat and oil floating on the surface.

① Various flange norms
② Patented, capacitive and non-contact flow level measuring system integrated in the liner
③ Separate converter

Highlights

- For partially filled pipes in the water and wastewater industry
- Broad diameter range up to DN1600 / 64"
- High abrasion resistance and chemical resistance
- Measurement possible between 10% and 100% filling
- Electrodes for flow measurement are below 10% filling level, therefore no blind folding by fat and oil floating on the water surface
- Complete factory calibration - no on-site calibration necessary

Industries

- Water
- Wastewater

Applications

- For partially filled pipes instead of expensive siphon tube constructions
- Water and wastewater
- Surface water
- Biological and chemical wastewater

1.2 Options

The solution for the water and wastewater industry

Robust contruction
The TIDALFLUX 4000 has been designed for measuring all water and wastewater applications including groundwater, potable water, wastewater, sludges and sewage, industry water and salt water in partially filled pipes. The sensor is available for a wide diameter range of DN200 up to DN1600 for flow rates up to 90,000 m3/hr.
The TIDALFLUX 4000 causes no pressure loss and allows for bi-directional flow metering. Filters or straighteners are not required.
The flowmeter can be installed underground and allows for constant flooding (IP 68). A measurement chamber is not necessary, saving substantial costs.
The TIDALFLUX provides years or reliable measurements as it has no internal moving parts and nothing can wear. The flowmeter has a field proven and unsurpassed lifetime.
In addition, the TIDALFLUX 4000 in combination with the IFC 300 converter offers extensive diagnostic capabilities such as continuous monitoring of the converter, the sensor electrodes and electric functions.

Communication
The TIDALFLUX 4000 can be provided with state-of-the-art fieldbus communication systems. Data is transmitted by HART ® or Modbus and then forwarded to a management system.

1.3 Measuring principle

The TIDALFLUX 4000 is an electromagnetic flow sensor with an integrated capacitive level measurement system, designed for electrically conductive process liquids. The flow rate Q(t) through the tube is:
Q(t) = v(t) x A(t), in which
v(t) = Flow velocity of liquid product
A(t) = Wetted area of tube section.

The flow velocity is determined on basis of the known electromagnetic measurement principle. The two measuring electrodes are located in the lower part of the measuring tube, on a level of approx. 10% of the inner diameter of the pipe in order to get a reliable measurement to a level of 10%.

An electrically conductive fluid flows inside an electrically insulating 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. The signal voltage is quite small (typically 1 mV at v = 3 m/s / 10 ft/s and field coil power of 1 W). Finally, a signal converter is used to amplify the signal voltage, filter it (separate from noise) and convert it into signals for totalising, recording and output processing.

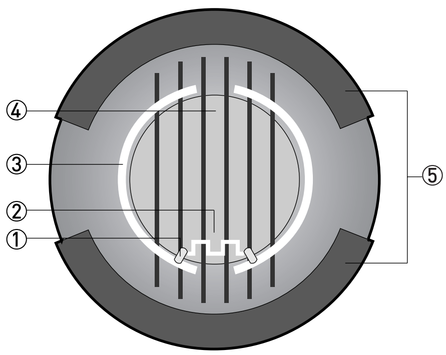


Figure 1-1: Measuring principle TIDALFLUX

① Electrodes
② Induced voltage (proportional to flow velocity)
③ Capacitive plates in liner for height measurement
④ Magnetic field
⑤ Field coils

The wetted area A is computed from the known inside diameter of the pipe by the patented capacitive level measurement system that is built into the measuring tube liner. The required electronics unit is accomodated in a compact housing that is mounted on top of the measuring sensor. This electronics is connected to the remote IFC 300 F converter by means of a digital communication line.

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 representative.*
- *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
Application range	Electrically conductive fluids
Measured value	
Primary measured value	Flow velocity
	Level
Secondary measured value	Volume flow

Design

Features	Flange version with full bore flow tube
	Standard as well as higher pressure ratings
	Broad range of nominal sizes
Modular construction	The measurement system consists of a flow sensor and a signal converter. It is available as remote version. More information about the signal converter can be found in the documentation of the signal converter.
Remote version	In field (F) version with IFC 300 converter: TIDALFLUX 4300 F.
Nominal diameter	DN200...1600 / 8...64"
Measurement range	-12...+12 m/s / -40...+40 ft/s

Measuring accuracy

Reference conditions	Slope: 0%
	Medium: water
	Electrical conductivity: 50...5000 μS/cm
	Temperature: 10...30°C / 50...86°F
	Inlet section: ≥ 10 DN
	Outlet section: ≥ 5 DN
	Flow velocity at full scale: > 1 m/s / 3 ft/s
	Operating pressure: 1 bar / 14.5 psig
	Wet calibrated on EN 17025 accredited calibration rig by direct volume comparison
Maximum measuring error	For detailed information on the measuring accuracy, see chapter "Measuring accuracy".
	Related to volume flow (MV = Measured Value, FS = Full Scale)
	These values are related to the pulse / frequency output
	The additional typical measuring deviation for the current output is ±10 μA
	Partly filled:
	v @ Full Scale ≥ 1 m/s / 3.3 ft/s: ≤ 1% of FS
	Fully filled:
	v ≥ 1 m/s / 3.3 ft/s: ≤ 1% of MV
	v < 1 m/s / 3.3 ft/s: ≤ 0.5% of MV + 5 mm/s / 0.2 inch/s
	Minimum level: 10% of inner diameter

Operating conditions

Temperature	
Process temperature	-5...+60°C / 23...+140°F
Ambient temperature	-40…+65°C / -40…+149°F (Protect electronics against self-heating with ambient temperatures above 55°C)
Storage temperature	-50…+70°C / -58…+158°F
Chemical properties	
Physical condition	Conductive liquids
Electrical conductivity	≥ 50 μS/cm
Permissible gas content (volume)	≤ 5%
Permissible solid content (volume)	≤ 70%

Installation condtitions

Installation	For detailed information see chapter "Installation"
Flow direction	Forward and reverse.
	Arrow on flow sensor indicates positive flow direction.
Inlet run	≥ 5 DN (without disturbing flow, after a single 90° bend)
	≥ 10 DN (after a double bend 2x 90°)
	≥ 10 DN (behind a control valve)
Outlet run	≥ 3 DN
Dimensions and weights	For detailed information see chapter "Dimensions and weights".

Materials

Sensor housing	Standard: sheet steel
	Other materials on request
Measuring tube	Austenitic stainless steel
Flange	Standard: Carbon steel, polyurethane coated
	Other materials on request
Liner	Polyurethane
Connection box	IP 67: polyurethane coated die-cast aluminium
	IP 68: Stainless steel
Measuring electrodes	Hastelloy® C
Grounding rings	Stainless steel
	Tailor made to innerdiameter of connecting pipeline.
	Necessary if innerside of connecting pipeline isn't electrically conductive.

Process connections

Flange	
EN 1092-1	DN200...1600 in PN 6...40 (others on request)
ASME	8...64" in 150...300 lb RF (others on request)
JIS	DN200...1600 in JIS 10...20 K (others on request)
Design of gasket surface	RF (others on request)

Electrical connections

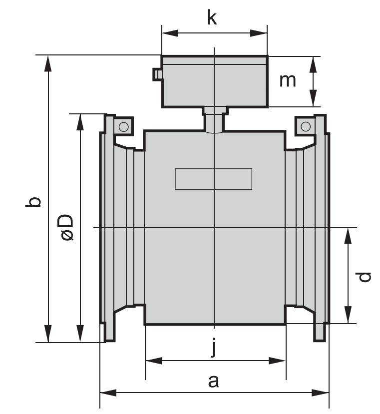
General	Electrical connection is carried out in conformity with the VDE 0100 directive "Regulations for electrical power installations with line voltages up to 1000 V" or equivalent national specifications.
Power supply	Standard: 110 / 220 VAC (-15% / +10%), 50/60 Hz settable by switch
	Option: 24 VAC, 50/60 Hz
Power consumption	14 VA
Field current cable	Shielded cable must be used, no part of delivery.
Signal cable	**DS 300 (type A)** Max. length: 600 m / 1950 ft (dependent on electrical conductivity).
	BTS 300 (type B) Max. length: 600 m / 1950 ft
Data interface cable	For transmission of measured level to IFC 300 F.
	Shielded Liycy cable, 3 x 0.75 mm^2
Cable entries	Standard: 2x M20 x 1.5 + 2x M16 x 1.5 EMC type
	Option: ½" NPT

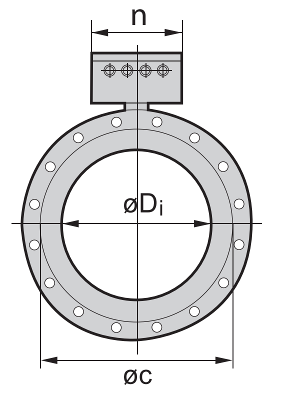
Approvals and certificates

CE	
	This device fulfills the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE mark.
Electromagnetic compatibility	Directive: 2004/108/EC, NAMUR NE21/04
	Harmonized standard: EN 61326-1 : 2006
Low voltage directive	Directive: 2006/95/EC
	Harmonized standard: EN 61010 : 2001
Pressure equipment directive	Directive: 97/23/EC
	Category I, II or SEP
	Fluid group 1
	Production module H
Hazardous areas	
ATEX	Option: Ex zone 2
	Ex zone 1 in preparation
Other approvals and standards	
Protection category acc. to IEC 529 / EN 60529	Standard: IP 66/67 (NEMA 4/4X/6)
	Option: IP 68 (NEMA 6P)
Vibration resistance	IEC 68-2-6
Random vibration test	IEC 68-2-34
Shock test	IEC 68-2-27

2.2 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										

2.3 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

2.4 Measuring accuracy

The measuring accuracy for partly filled pipes and completely filled pipes are different. In these graphs it is assumed that the velocity at full scale value is at least 1 m/s (is also the standard value for calibration, since it will result in the most accurate measurements).

Fully filled:

- v ≥ 1 m/s / 3.3 ft/s: ≤ 1% of MV
- v < 1 m/s / 3.3 ft/s: ≤ 0.5% of MV + 5 mm/s / 0.2 inch/s
- Minimum level: 10% of inner diameter

Fully filled pipes

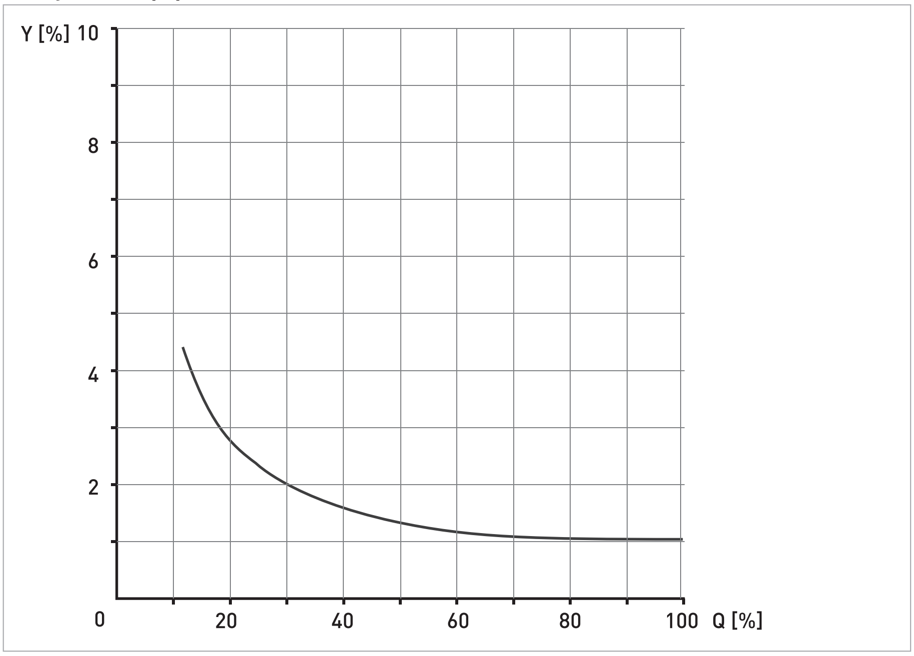


Figure 2-1: Maximum measuring error of measured value.

Partly filled:

- v @ Full Scale ≥ 1 m/s / 3.3 ft/s: ≤ 1% of FS

Partly filled pipes

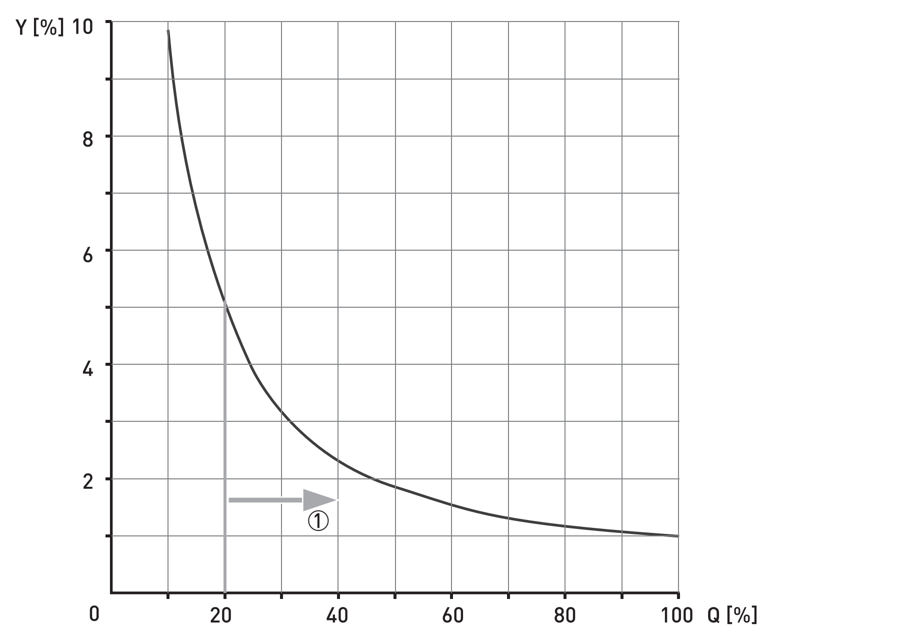


Figure 2-2: Maximum measuring error of measured value.

① Advised working area

3.1 Intended use

The TIDALFLUX 4300 F has been designed for measuring the flow of conductive fluids, even in partially filled pipes. It can be combined with the IFC 300 electromagnetic flow converter.

3.2 Installation conditions

3.2.1 Inlet and outlet

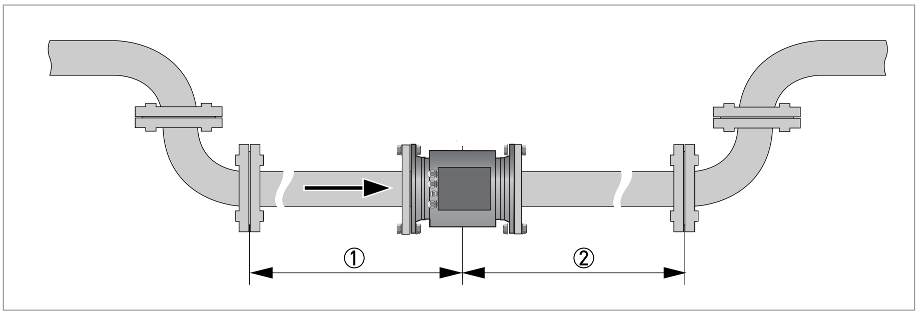


Figure 3-1: Recommended inlet and outlet sections, top view

① ≥ 5 DN
② ≥ 3 DN

3.2.2 Mounting position

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

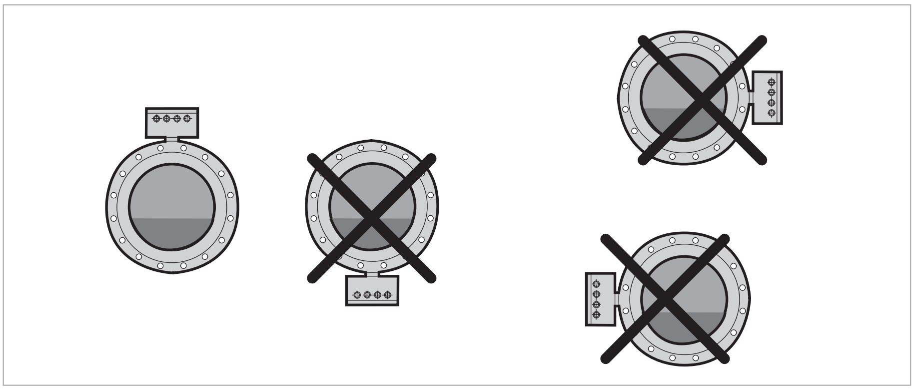


Figure 3-2: Mounting position

3.2.3 Flange deviation

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

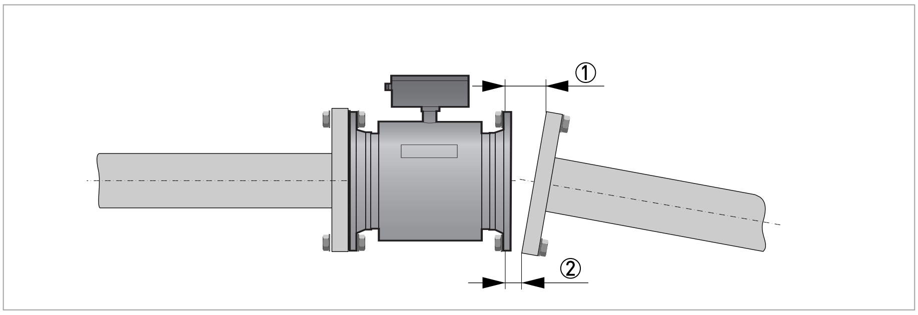


Figure 3-3: Flange deviation

① L_{max}
② L_{min}

3.2.4 Vibration

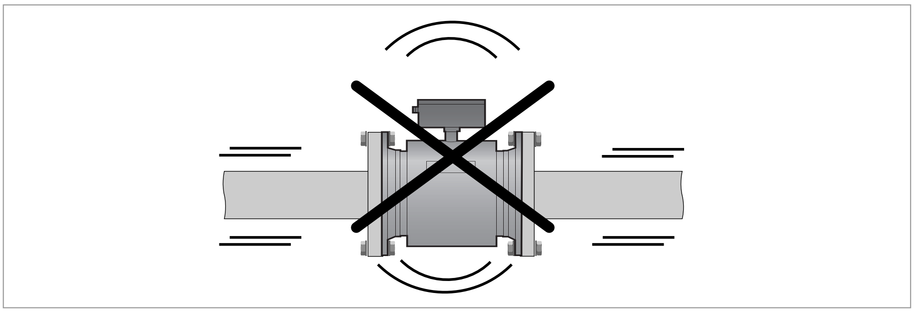


Figure 3-4: Avoid vibrations

3.2.5 Magnetic field

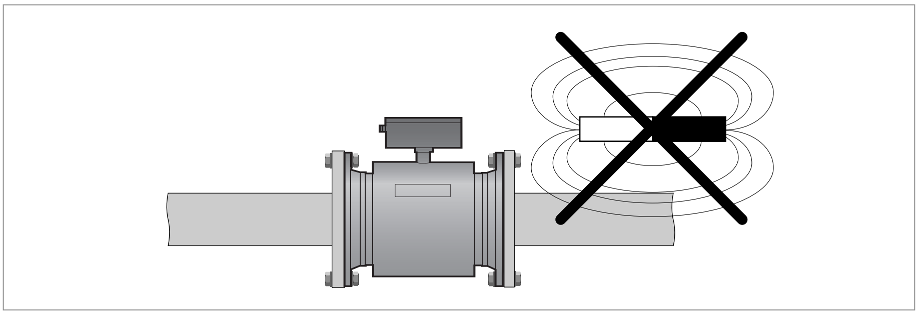


Figure 3-5: Avoid magnetic fields

3.2.6 Control valve

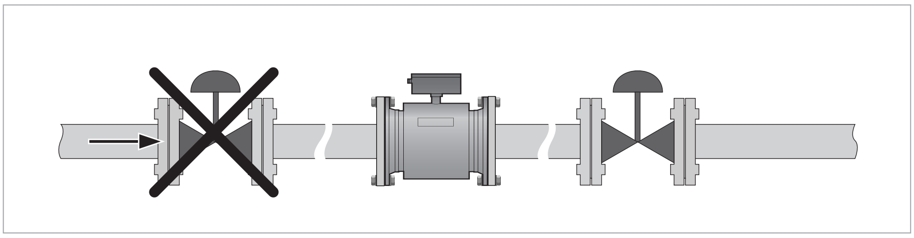


Figure 3-6: Installation before control valve

3.2.7 Slope

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

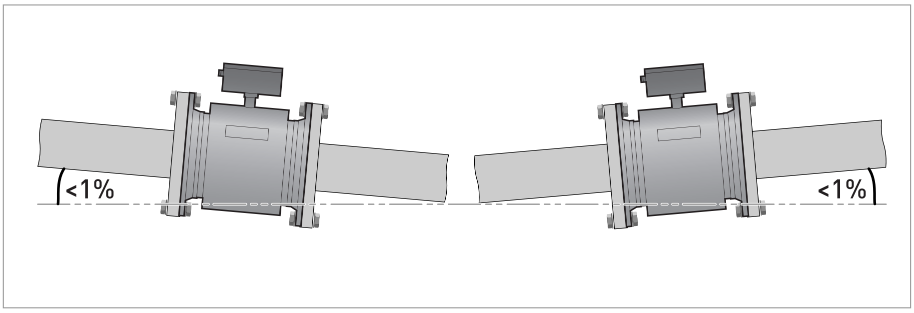


Figure 3-7: Recommended slope

3.2.8 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.

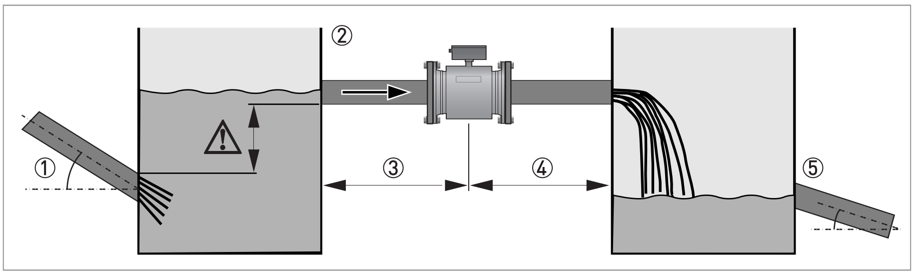


Figure 3-8: Installing in difficult situations

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%.

3.2.9 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.

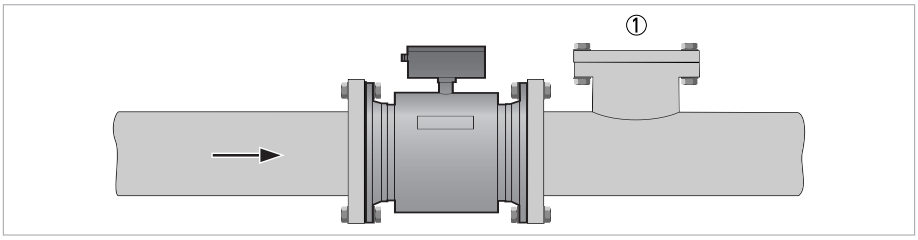


Figure 3-9: Option for cleaning of flow sensor

① Opening for cleaning

3.2.10 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

3.3 Mounting

3.3.1 Mounting grounding rings

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.*

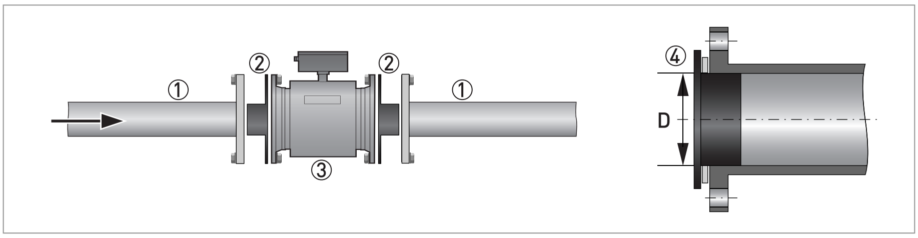


Figure 3-10: Grounding with grounding rings

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.

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

3.3.2 Torques and pressures

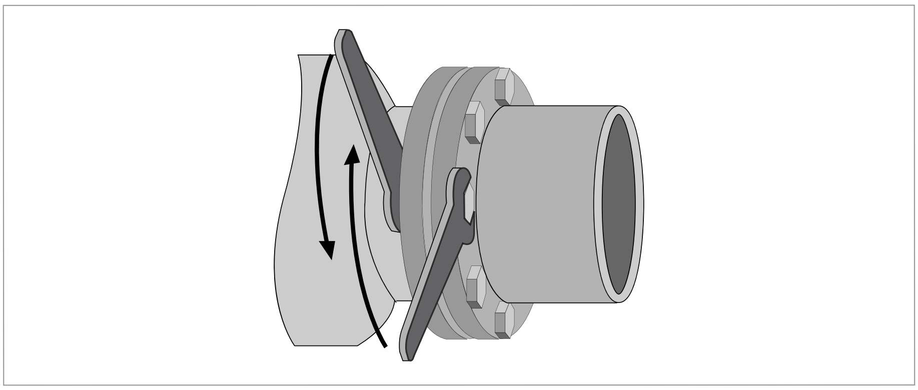


Figure 3-11: Tightening of bolts

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.

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 for bigger sizes is available on request.

4.1 Connection of cables

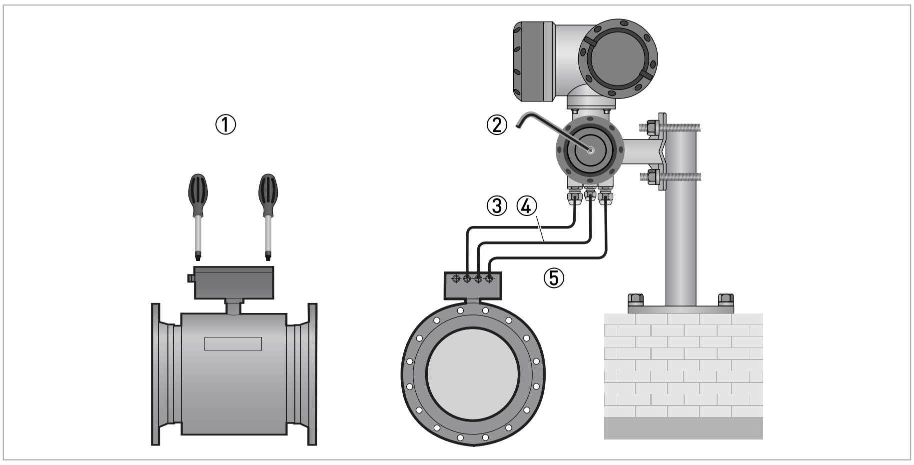


Figure 4-1: Electrical connection

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

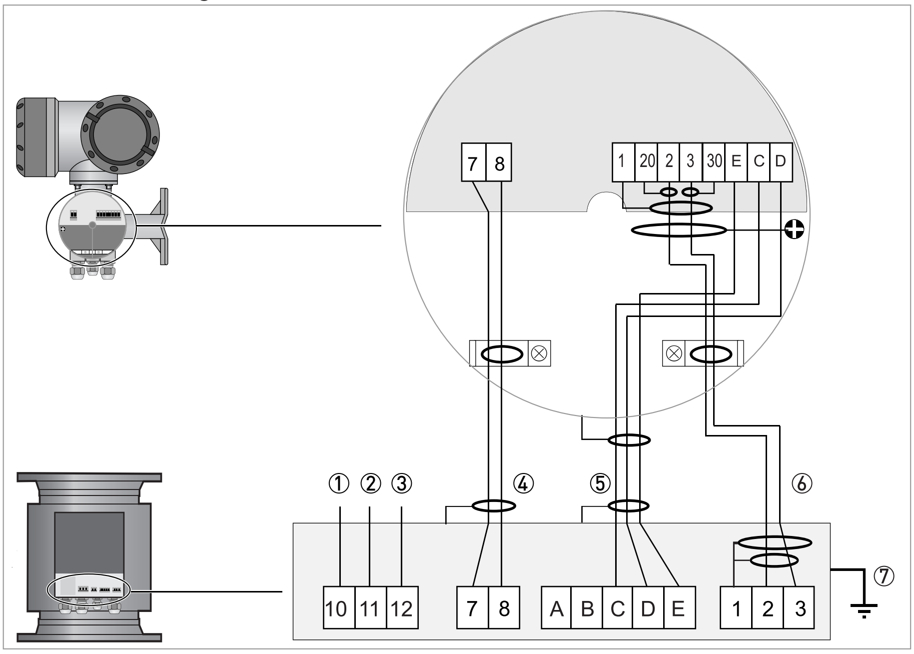


Figure 4-2: Connection diagram

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.

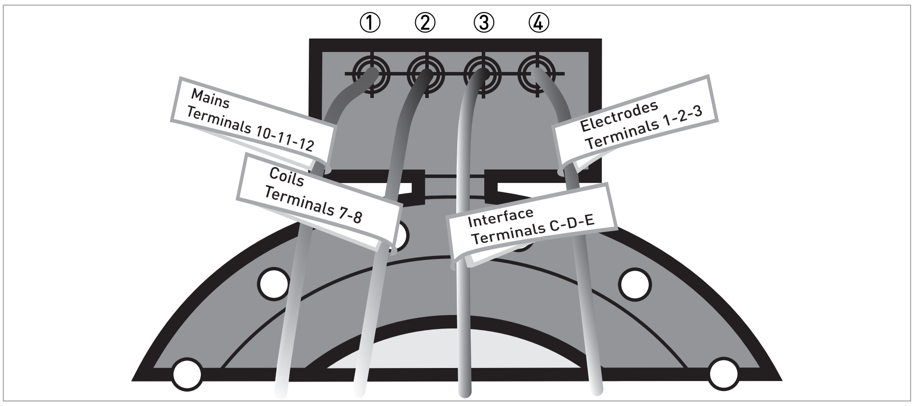


Figure 4-3: Labeled cables for IP 68 versions

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)

4.2 Cable lengths

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

4.3 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"

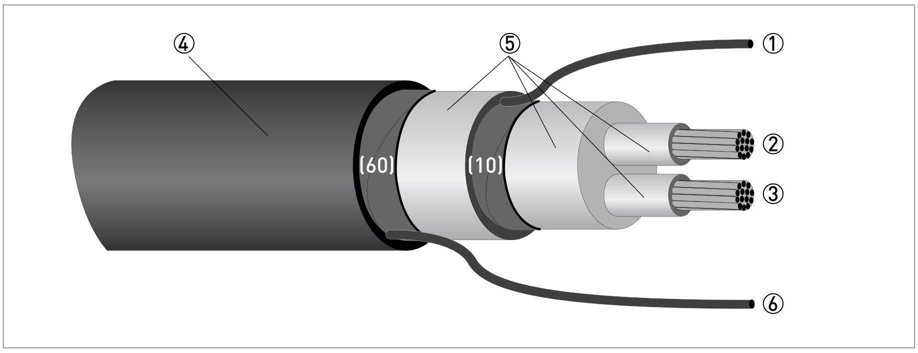


Figure 4-4: Construction of signal cable A

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)

4.4 Preparing signal cable A, connection to measuring sensor

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)

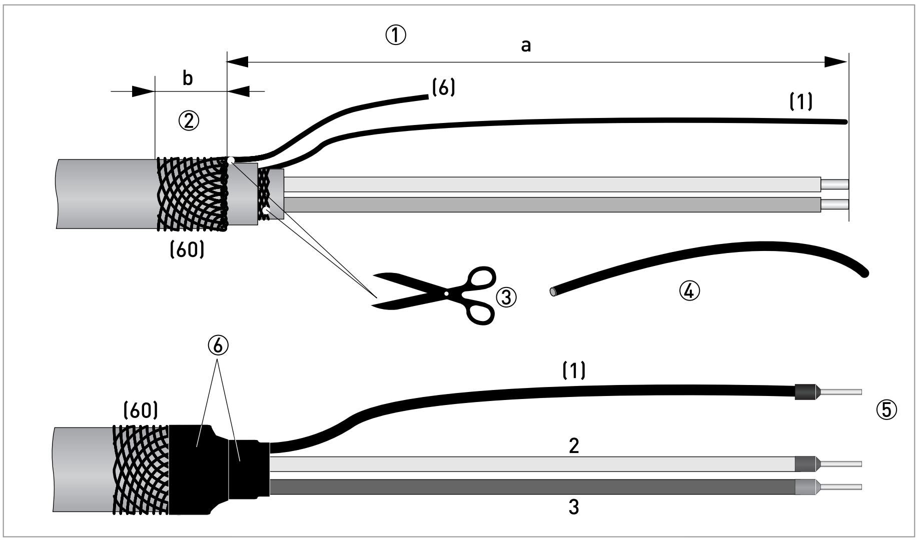


Figure 4-5: Preparing signal cable A, connection to measuring sensor

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.

4.5 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"

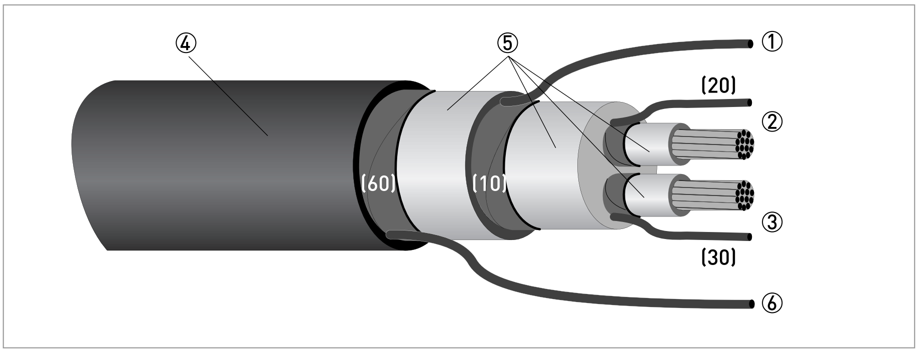


Figure 4-6: Construction of signal cable B

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)

4.6 Preparing signal cable B, connection to measuring sensor

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)

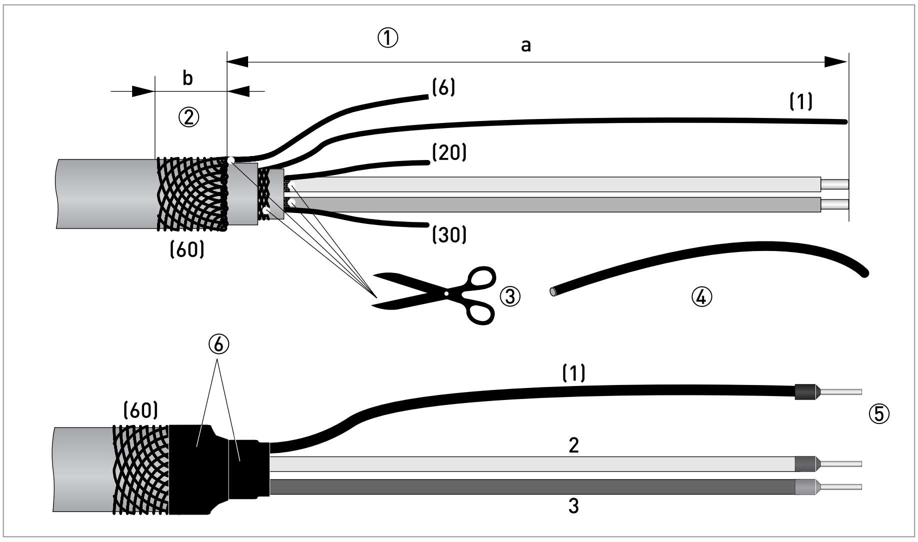


Figure 4-7: Preparing signal cable B, connection to measuring sensor

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.

4.7 Preparing field current cable C, connection to measuring sensor

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

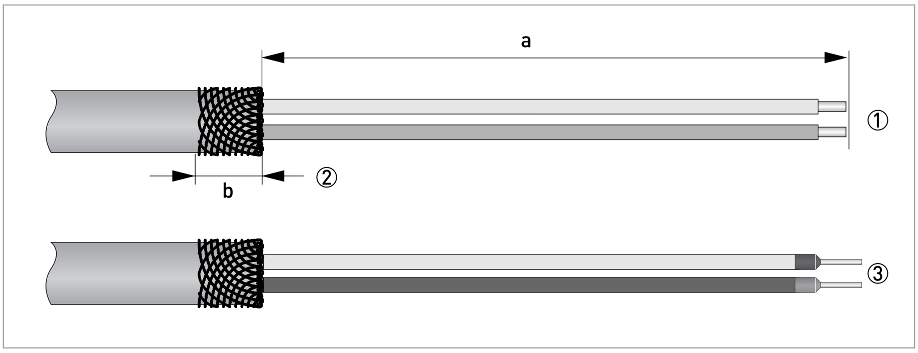


Figure 4-8: Preparation of field current cable C

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

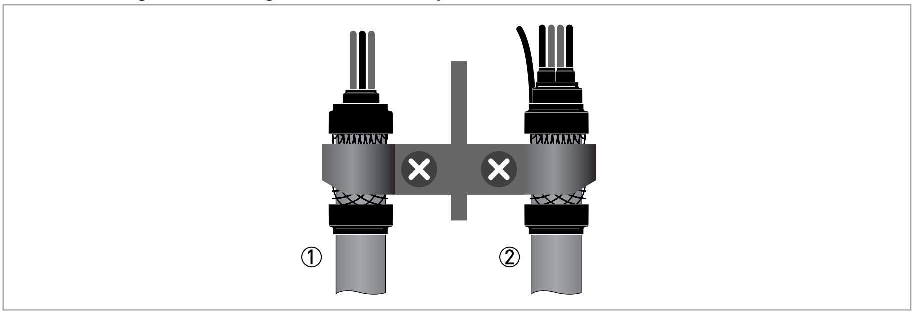


Figure 4-9: Clamping of shields

① Field current cable
② Signal cable

At flow sensor side:

Connecting shielding via special cable gland

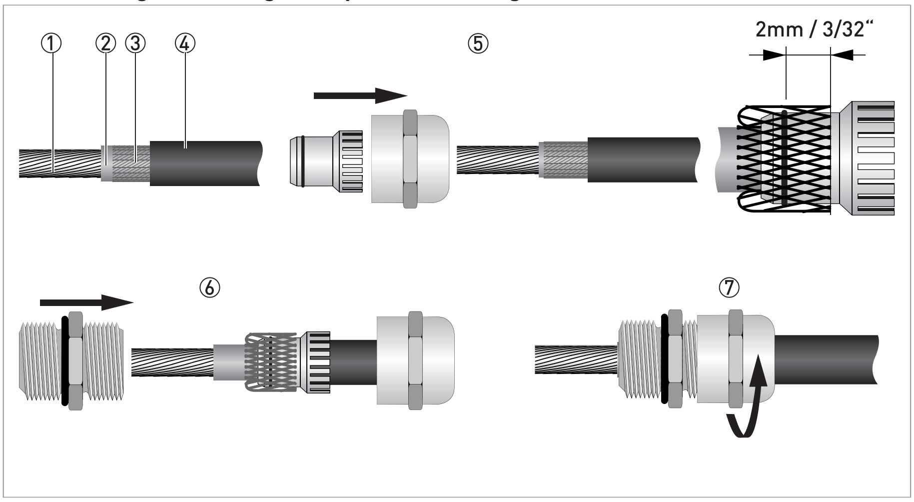


Figure 4-10: Connecting the shield within the cable gland

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.

4.8 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

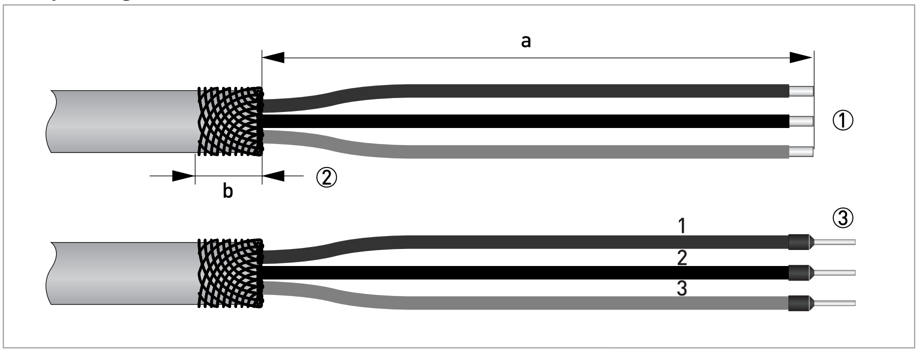


Figure 4-11: Preparing the interface cable

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

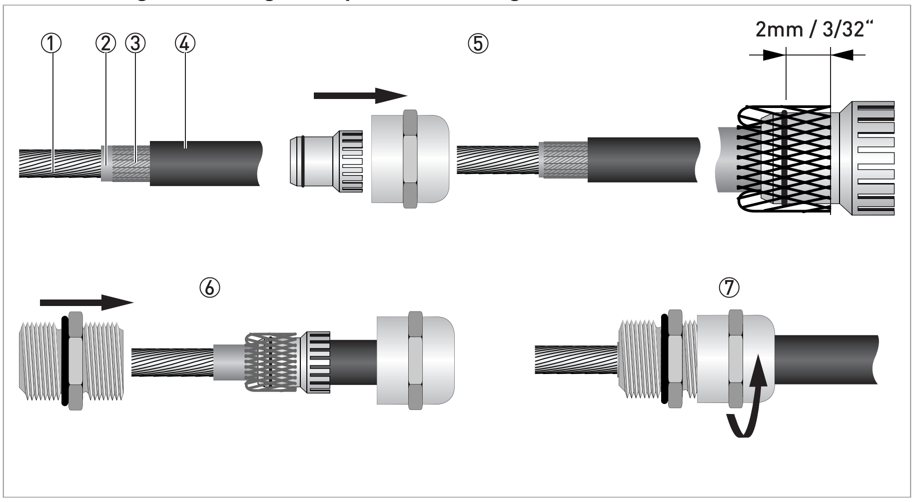


Figure 4-12: Connecting the shield within the cable gland

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.

4.9 Grounding

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

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.*

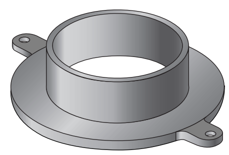


Figure 4-13: Grounding ring number 3

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

Head Office KROHNE Messtechnik GmbH
Ludwig-Krohne-Str. 5
D-47058 Duisburg (Germany)
Tel.:+49 (0)203 301 0
Fax:+49 (0)203 301 10389
info@krohne.de

The current list of all KROHNE contacts and addresses can be found at:
www.krohne.com