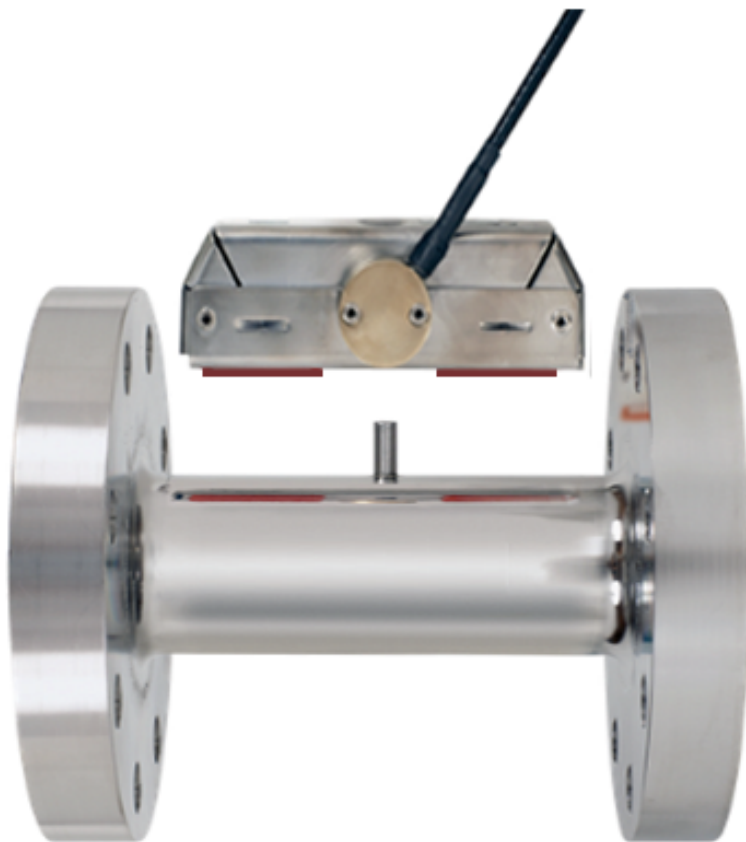


AMFLO[®] SONIC Dry-X II

Ultrasonic flow sensor
User manual



Legal notice

Document release index

Version	Date	Modification(s)
01	02/08/2021	First release
02	07/09/2022	Update range of measurement
03	12/09/2022	Update range of measurement
04	05/05/2023	Installing the measurement tube
05	23/05/2024	Installing the measurement tube

Original instructions

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The figures and information in these instructions are subject to technical changes that become necessary to improve the product.



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1 Introduction

1.1 About this product

1.1.1 Product description

The AMFLO[®] SONIC Dry-X II flow sensor is based on an innovative exchange concept and requires no in and out sections.

The sensor can be exchanged during operation:

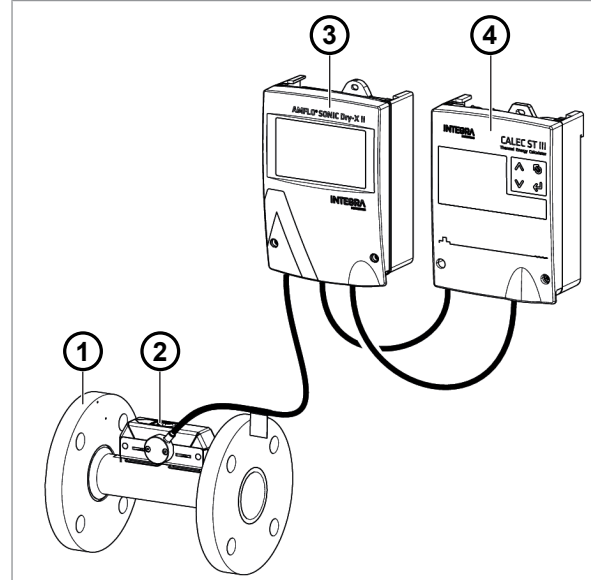
- Easy replacement or legal re-verification/calibration of the meter (no process interruption)
- Less planning
- Lower cost of ownership

The AMFLO[®] SONIC Dry-X II is designed for heat calculation applications. Flow is measured using ultrasound. The system consists of:

1. Measurement tube
2. Sensor head
3. Measurement electronics

The AMFLO[®] SONIC Dry-X II is designed and optimized to work together with the CALEC[®] ST III SMART energy calculator (4). The CALEC[®] ST III SMART energy calculator supplies the 24VDC power to the AMFLO[®] SONIC Dry-X II measurement electronics.

The AMFLO[®] SONIC Dry-X II pulse output is adapted to CALEC[®] ST III SMART abilities.

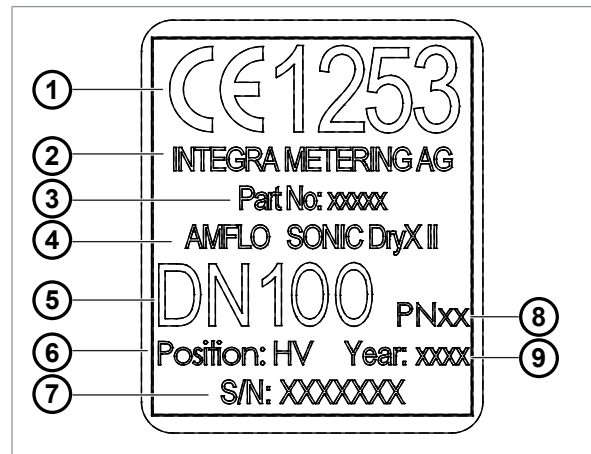


1.1.2 Product identification

The face plates of the AMFLO[®] SONIC Dry-X II state the following information:

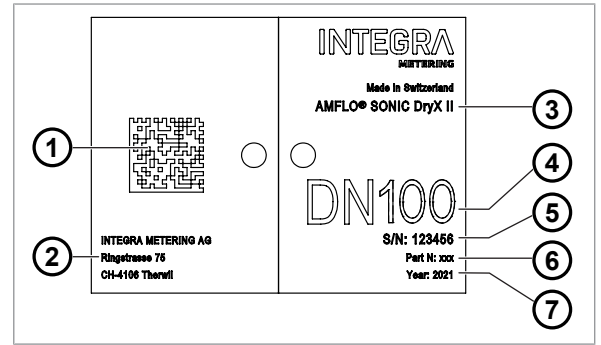
Type plate on the measurement tube

- 1 CE 1253
- 2 Manufacturer
- 3 Part number
- 4 Product name
- 5 Nominal diameter
- 6 Position
- 7 Serial number
- 8 Nominal pressure
- 9 Manufacturing year



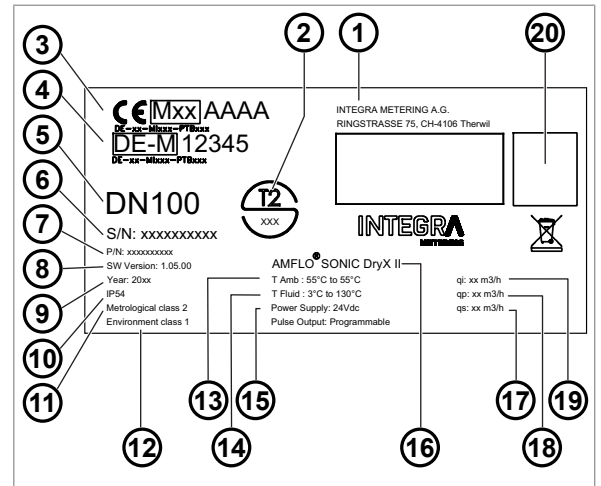
Identification label on the sensor head

- 1 Data matrix
- 2 Manufacturer
- 3 Product name
- 4 Nominal diameter of measurement tube
- 5 Serial number of electronics (sensor head and measurement electronics)
- 6 Part number
- 7 Manufacturing year



Face plate on the measurement electronics

- 1 Manufacturer
- 2 Marking cooling (CH)
- 3 Marking heating (Europe CE)
- 4 Marking cooling (DE)
- 5 Nominal diameter of measurement tube
- 6 Serial number of electronics (sensor head and measurement electronics)
- 7 Part number
- 8 Software version
- 9 Manufacturing year
- 10 IP protection code
- 11 Metrological class
- 12 Environmental class
- 13 Range of ambient temperature
- 14 Range of medium temperature
- 15 Power supply specification
- 16 Product name
- 17 Maximum flow q_s
- 18 Nominal flow q_p
- 19 Minimum flow q_i
- 20 Data matrix



1.1.3 Technical data

General

Nominal diameter	DN 32 - DN 250
Measurement tube	AISI 316 L
Medium	Water
Nominal pressure	PN 40 / PN 25 / PN 16
Degree of protection	Sensor head: IP 68 / Measurement electronics: IP 54
Medium temperature	0 - 130 °C
Ambient temperature	5 - 55 °C
Accuracy	Class 2 acc. to EN 1434
Sensor head cable dimension	<ul style="list-style-type: none"> Length: 10 m External diameter: 7 mm Bending radius: 100 mm
Sensor head cable description (*)	<ul style="list-style-type: none"> Core: x2 2 poles coaxial cable RG178 External shielding : mesh External jacket: black Measurement electronic side: x2 crimped SMB connectors Sensor head side: fixed

(*) The sensor head cable has a fixed length and is fitted with matching connectors. It cannot be cut, shortened, disconnected from the head or modified in any way. Refer to the instructions for electrical installation.

Measurement electronics input and output specification

Power supply (*)	24 VDC, 150 mA
Pulse output type	Open collector, bidirectional (3 ways)
Pulse length	4 ms
Pulse pause	4 ms

(*) A dedicated power supply must be used.

Range of measurement

Approved according to EN 1434 class 2, measurement dynamic $q_i/q_p = 1:250$, $q_s/q_p = 1.25$

Nominal diameter	DN	mm	32	40	50	65	80	100	125	150	200	250
Minimum flow	q_i	m ³ /h	0.048	0.08	0.12	0.2	0.32	0.48	0.8	1.2	2.0	3.2
Nominal flow	q_p	m ³ /h	12	20	30	50	80	120	200	300	500	800
Maximum flow	q_s	m ³ /h	15	25	37.5	62.5	100	150	250	375	625	1000
Velocity (q_i)		m/s	0.017	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Velocity (q_p)		m/s	4.15	4.42	4.24	4.19	4.42	4.24	4.52	4.71	4.42	4.53
Δp ($q_p/2$)*		mbar	37	46	46	44	51	49	55	63	58	62
Flow at $\Delta p=100$ mbar		m ³ /h	9.9	14.7	22.1	37.9	56.1	85	135	189	328	508
Kvs		m ³ /h	31.2	46.6	69.7	120	178	270	426	597	1038	1606
Pulse weight		ml	100	100	100	200	200	1000	1000	1000	2000	2000

* Equivalent to standard values of q_p acc. to EN 1434.



Appendix A: Approved according to EN 1434 class 2, measurement dynamic $q_i/q_p = 1:100$, $q_s/q_p = 1.25$

Nominal diameter	DN	mm	32	40	50	65	80	100	125	150	200	250
Minimum flow	q_i	m ³ /h	0.12	0.2	0.3	0.5	0.8	1.2	2.0	3.0	5.0	8.0
Nominal flow	q_p	m ³ /h	12	20	30	50	80	120	200	300	500	800
Maximum flow	q_s	m ³ /h	15	25	37.5	62.5	100	150	250	375	625	1000
Velocity (q_i)		m/s	0.041	0.044	0.042	0.042	0.044	0.042	0.045	0.047	0.044	0.045
Velocity (q_p)		m/s	4.15	4.42	4.24	4.19	4.42	4.24	4.52	4.71	4.42	4.53

* Equivalent to standard values of q_p acc. to EN 1434.

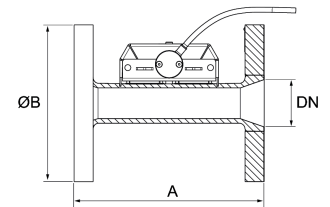
Appendix B: Approved according to EN 1434 class 2, measurement dynamic $q_i/q_p = 1:100$, $q_s/q_p = 2$

Nominal diameter	DN	mm	32	40	50	65	80	100	125	150	200	250
Minimum flow	q_i	m ³ /h	0.06	0.1	0.15	0.25	0.4	0.6	1.0	1.5	2.5	4.0
Nominal flow	q_p	m ³ /h	6	10	15	25	40	60	100	150	250	400
Maximum flow	q_s	m ³ /h	12	20	30	50	80	120	200	300	500	800
Velocity (q_i)		m/s	0.021	0.022	0.021	0.021	0.022	0.021	0.023	0.024	0.022	0.023
Velocity (q_p)		m/s	2.072	2.210	2.122	2.093	2.210	2.122	2.264	2.358	2.210	2.264

* Equivalent to standard values of q_p acc. to EN 1434.

Dimensions and device connection

All flange holes are according to EN 1092-1.

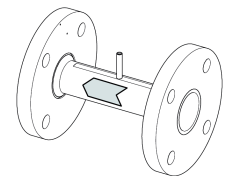


Nominal diameter	DN	mm	32	40	50	65	80
Minimum length*	A	mm	150	165	200	200	175
Flange diameter	ØB	mm	140	150	165	185	200
Weight		kg	5.5	6.5	8	10	12.5
Sensor head fixing screw (hexalobular, Torx)			T20	T20	T20	T20	T20

Nominal diameter	DN	mm	100	125	150	200	250
Minimum length*	A	mm	200	220	240	290	330
Flange diameter	Ø	mm	220	270	300	375	450
Weight		kg	19	18-27	28-35	35-61	86-97
Sensor head fixing screw (hexalobular, Torx)			T20	T30	T30	T30	T30

* The installation length can be customized to meet specific requirements.

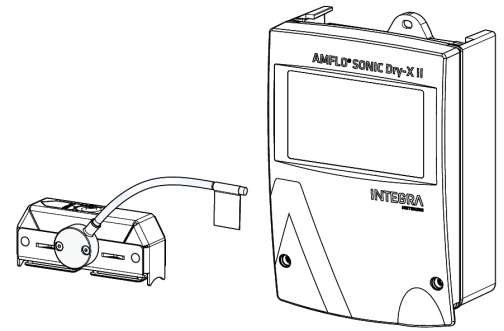
System component: Measurement tube



Nominal diameter	Length in mm	Art. No.		
		PN40	PN25	PN16
DN 32	150	98277		
	200	98278		
	260	98279		

Nominal diameter	Length in mm	Art. No.		
		PN40	PN25	PN16
DN 40	165	98280		
	200	98281		
	220	98361		
	300	98282		
DN 50	200	98283		
	270	98284		
	300	98350		
	465	98362		
	475	98363		
DN 65	200	98285		
	300	98286		
	460	98364		
	475	98365		
DN 80	175	98287		
	200	98288		
	225	98289		
	300	98290		
	350	98366		
	380	98367		
	400	98368		
DN 100	200	98291		98294
	250	98291		98295
	350	98351		98352
	360	98293		98296
	375			98369
	400	98370		
DN 125	250	98297		98300
	350	98298		98301
	375			98371
	400	98299		98302
DN 150	300	98303		98307
	350	98304		98308
	360			98372
	400	98305		98309
	500	98306		98310
DN 200	350	98311	98315	98319
	400	98312	98316	98320
	450			98373
	490	98313	98317	98321
	500	98314	98318	98322
DN 250	400	98323	98327	98331
	450	98324	98328	98332
	575	98325	98329	98333
	600	98326	98330	98334



System component: Sensor head and measurement electronics


Nominal diameter	Art. No.		Art. No.
	qi/qp=1:250, qs/qp=1.25	qi/qp=1:100, qs/qp=2	qi/qp=1:100, qs/qp=1.25
DN 32	98335	99060	99070
DN 40	98336	99061	99071
DN 50	98337	99062	99072
DN 65	98338	99063	99073
DN 80	98339	99064	99074
DN 100	98340	99065	99075
DN 125	98341	99066	99076
DN 150	98342	99067	99077
DN 200	98343	99068	99078
DN 250	98344	99069	99079

System component: Calculator

Device	Art. No.
CALEC® STIII Smart	See CALEC® STIII documentation.

1.1.4 Conformity

CE guidelines	
2014/32/EU	Measuring Instruments Directive (MID)
2014/30/EU	Electromagnetic Compatibility (EMC)
2014/35/EU	Low Voltage Directive (LVD)
2012/19/EU	Waste Electrical and Electronic Equipment (WEEE)
2011/65/EU	Restriction of hazardous substances in electrical and electronic equipment (RoHS), amended by directive 2015/863/EU
2014/53/EU	Radio Equipment Directive (RED)
Standards	
EN 1434	
EN 61010-1	
EN 62368-1	
DIN 43863-5	
EN 301 489-1	
EN 301 489-3	
EN 61326-1	
EN 300 220-2	
EN 50364	
Specific	
PTB K7.2, Ordonnance of FDJP 941.231 (CH)	

1.1.5 Calibration and verification

In most countries energy metering systems used for commercial purposes are subject to compulsory verification.

The devices comprising the metering system must all possess official pattern approval. AMFLO[®] SONIC Dry-X II has been approved according to both the European Measuring Instruments Directive 2014/32/EU and the German PTB K 7.2 directive for cooling meters.

Officially verified heat and cooling meters must be re-verified before the verification period has expired. The operator is responsible for compliance with this requirement. (Re-)verification includes all parts (temperature and flow sensors, calculator) forming the complete heat meter.

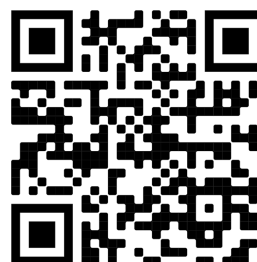
One of the benefits of the AMFLO[®] SONIC Dry-X II flow sensor is that the measurement tube stays in the system for three verification periods. After that it has to be unmounted and cleaned to ensure proper functioning.

Exchange or verification, when required, is only necessary for the sensor head and the measurement electronics, without intervention in the hydraulics.

To be sent to the suited laboratory, they have to be packed up together in a suited and solid packaging to prevent any transit damage. Ideally, the original packaging is used.

1.1.6 Declaration of conformity

The declaration of conformity is available by scanning the QR-Code.



1.2 About the instructions

1.2.1 Purpose of this instruction

This instruction is part of the product. Keep the instruction handy so that it is always accessible at all times. This instruction is intended to ensure that the product is used safely and for the intended purpose. The operator must ensure that the operating personnel have read and understood the instructions. The operator must ensure that the operating instructions of the associated products are also read and understood.

1.2.2 Structure of overall documentation

The following documents complete the documentation of this product:

- User manual (this document). Available for download on <https://integra-metering.com/downloads>
- Installation guide. Included in the product delivery.
- Technical data sheet. Available for download on <https://integra-metering.com/downloads>

1.2.3 Layout conventions

Symbols and text markups

This document contains various symbols and text markups.

Symbol	Name	Function
•	Enumeration	The grey dot marks a non-numbered list.
▶	Action	The grey triangle marks actions that must be performed in the corresponding order.
▷	Reaction	The white triangle marks the reaction to an action.
(1)	Item numbers	The numbers inside the brackets refer to the items in an image.
Legal notice [▶ p. 2]	Cross-reference	Cross-references are used to refer to a chapter within the document. They are linked and are accessible from the PDF by a mouse click.



Tips are used to support the reader in handling the product.

2 Safety

2.1 Explanation of warning notices

DANGER

**Danger**

This safety warning indicates a hazard of high risk that will lead to serious physical injury or death.

- ▶ Measures to avoid the hazard.

WARNING

**Warning**

This safety warning indicates a hazard of medium risk that may lead to serious injury or death.

- ▶ Measures to avoid the hazard.

CAUTION

**Caution**

This safety warning indicates a hazard of low risk that may lead to minor or moderate injury.

- ▶ Measures to avoid the hazard.

NOTICE

**Notice**

The notice indicates a situation which may cause damage to property.

- ▶ Measures to avoid the property damage.

2.2 Intended use

The product must only be used for applications in accordance with the specifications in the technical data. Any other use is prohibited and is considered inadmissible.



2.3 General safety instructions

Personal safety

Make sure that your actions do not expose anyone to risk.

Personnel requirements

Any work on the product may only be carried out by qualified personnel. Necessary instruction can be provided by the manufacturer.

Occupational safety

The operator is subject to the legal obligations of occupational safety. Compliance with all locally applicable accident prevention regulations and general rules is the responsibility of the operator.

Instructions

The operating personnel must have read and understood the instructions. All safety instructions and instructions for action must be strictly observed. The operating instructions must be kept within easy reach.

Further operating instructions

The instructions of the associated products must also be read and understood. All safety instructions and instructions for action must be strictly observed.

2.4 Technical condition of the product

Spare parts

Replace defective parts only with original spare parts from INTEGRA Metering.

Software

The software must not be modified.

Backfitting

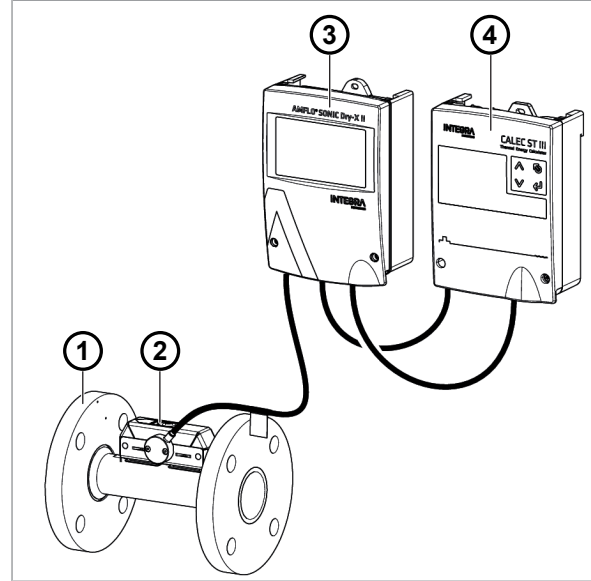
The product must not be backfitted. Changes of the operating mode must be agreed in writing with the manufacturer.

3 Product view

3.1 Product design

The AMFLO® SONIC Dry-X II system consists of the following components:

- 1 Measurement tube
- 2 Sensor head
The sensor head measures the flow rate in the measurement tube and sends it to a bidirectional pulse output.
- 3 Measurement electronics
The measurement electronics receives the pulses from the sensor head.
- 4 Calculator (CALEC® STIII Smart)
The pulse output of the measurement electronics is connected to the CALEC® STIII Smart, which is the central unit. The CALEC® STIII Smart can process the flow rate for display and/or to use it for energy calculation, together with its temperature sensors.
The CALEC® STIII Smart is also used as the 24V power supply for the measurement electronics.
The CALEC® STIII Smart is an optional device and is recommended for an optimum setup.



4 Transport / scope of delivery

NOTICE



Transport damage

Non-compliance with the required transport and environmental conditions can lead to transport damage and malfunctions.

- ▶ Protect the product from heat, moisture, dirt and vibration.
- ▶ Store the product in a cool and dry place.
- ▶ Do not remove the packaging until immediately before installation.

Check delivery

- ▶ Check delivery to ensure supply is complete.
- ▶ Check delivery for transport damage immediately upon receipt.

In case of externally visible transport damage, proceed as follows:

- ▶ Do not accept delivery or accept it under reserve.
- ▶ Note the extent of damage on the transport documents or on the delivery note of the carrier.
- ▶ Report any damage to INTEGRA Metering immediately.

5 Installation

5.1 Conditions

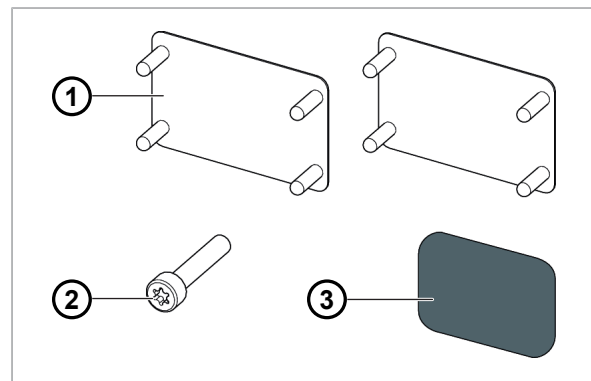
- ▶ Meet the following conditions according to the specifications in the Technical data [p. 6] to ensure a reliable operation.
 - Space requirements
 - Ambient conditions
 - Dimensions
 - Electrical connection

5.2 Mounting accessories

The device is delivered with two bags with mounting accessories.

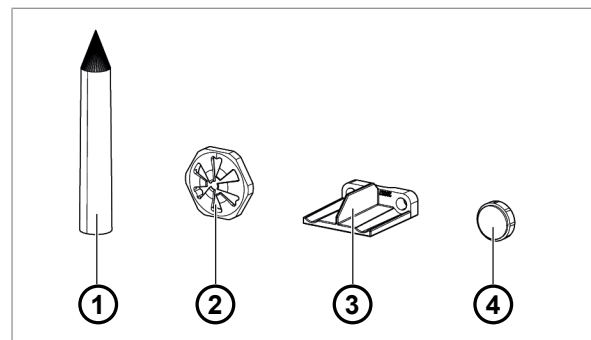
Sensor mounting accessories

1. Silicon pads (2x)
2. Sensor head mounting screw
3. Sealing adhesive



Electrical wiring accessories

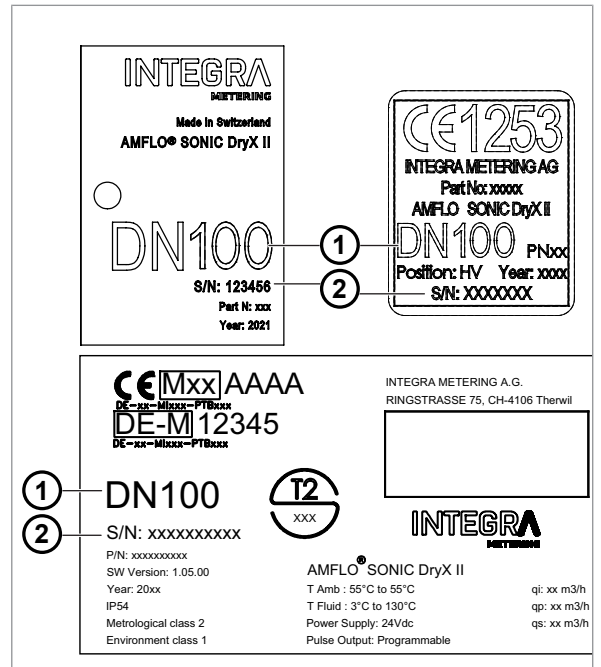
1. Awl
2. Cable nuts (5x)
3. Strain reliefs with screws (5x)
4. Safety caps



5.3 Matching diameters and serial numbers

The measurement tube, the sensor head and the measurement electronics form a self-contained system. The nominal diameters and the serial numbers of the individual components must match.

- ▶ Make sure that the nominal diameter (1) is identical at all three components.
- ▶ Make sure that the serial number (2) is identical on sensor head and measurement electronics.



NOTICE



Mismatching diameters and serial numbers

Mismatching diameters and / or serial numbers will lead to incorrect measurement results.

- ▶ Make sure that the nominal diameter and the serial number is identical on all system components.

5.4 Mechanical installation

5.4.1 Installing the measurement tube

Mount the measurement tube with the flanges in accordance with the instructions for the used pipe system and pressure levels. Inlet and outlet sections are not required.

As an exception for heating systems with a lack of temperature mixing or temperature stratification, an inlet length of 10 DN must be provided at the installation site.

NOTICE

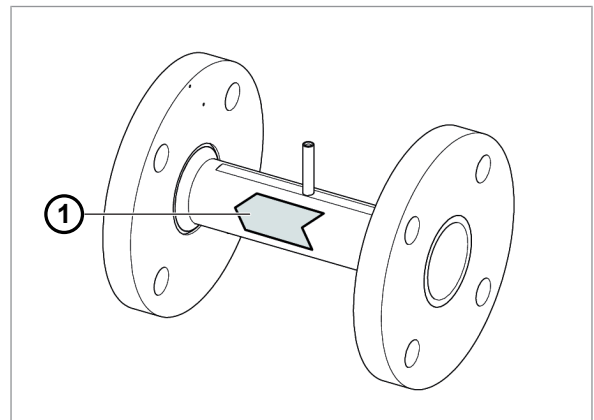
Incorrect measurement



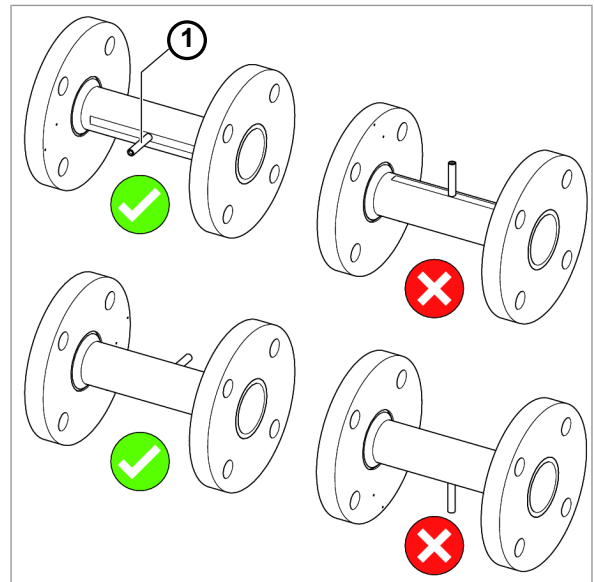
The flow sensor only measures correctly if the flow direction and the position of the pipes is correct.

- ▶ Observe the flow direction.
- ▶ The output pipe must not point downwards.

- ▶ Observe the flow direction indicator (1).

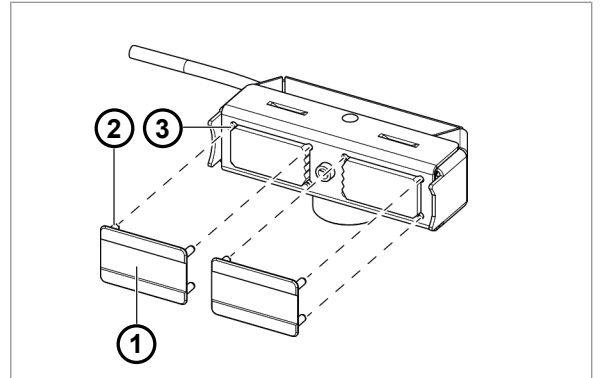


- ▶ Place the measurement tube in the pipe system.
- ▶ Check that the gaps between measurement tube and pipes are as small as possible.
- ▶ For horizontal installation, align the fastening screw (1) on the measurement tube to the side. The sensor head must be installed on the side. The measuring tube can also be mounted vertically.
- ▶ Insert and tighten the screws with the recommended torque of the used pipe system.

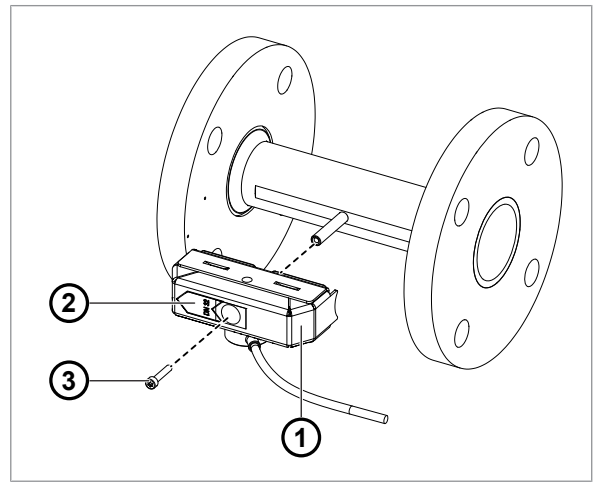


5.4.2 Installing the sensor head

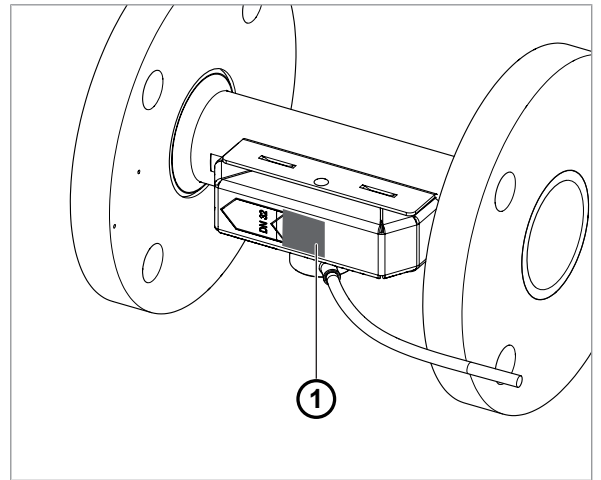
- ▶ Mount the silicone pads (1) on the sensor head.
- ▶ Make sure that all pins (2) on the silicone pads fit in the holes (3) of the sensor head.



- ▶ Install the sensor head (1) on the measurement tube.
- ▶ Refer to the arrow (2) on the sensor head to ensure the correct flow direction.
- ▶ Tighten the screw (3) until the ends of the sensor head are flush with the measurement tube. Apply a maximum torque of 2.4 Nm.



- ▶ Attach the sealing adhesive (1) above the mounting screw to prevent from unwanted manipulation. The sealing adhesive can be found in the sensor mounting accessories.



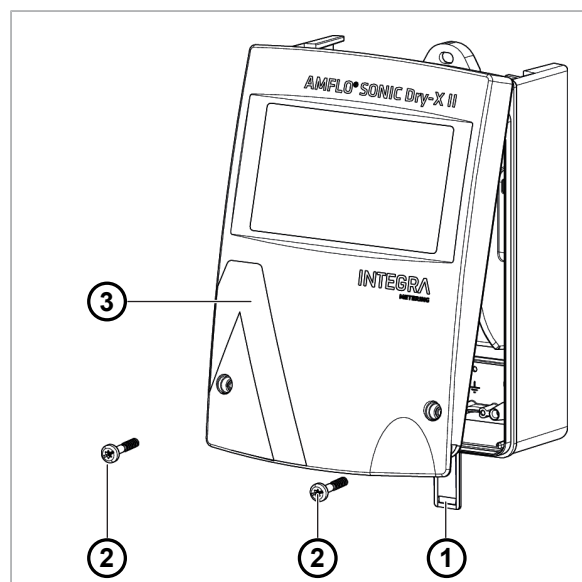
5.4.3 Installing the measurement electronics on a wall

Tools and installation material are not included in the delivery.

- Flat screwdriver 3.5×0.6
- Torx screwdriver T15
- Drill bit Ø6
- Screws 3×Ø4
- Dowels 3×Ø6
- Washers 3×4.3×12

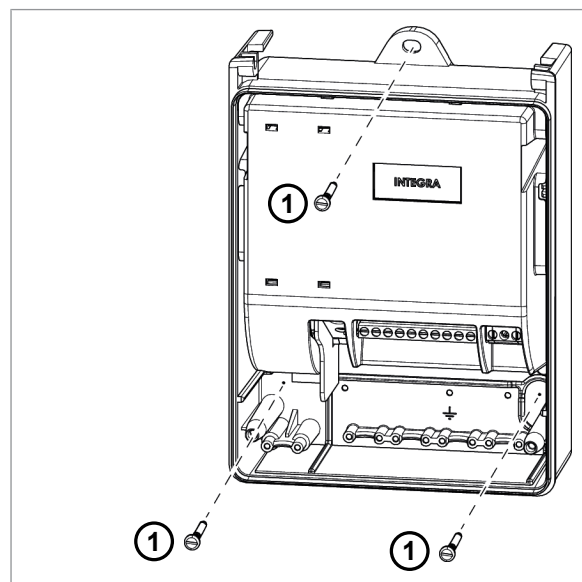
Take off the front cover

- ▶ Remove the clip-on holder (1).
- ▶ Remove the two screws (2).
- ▶ Remove the cover (3).



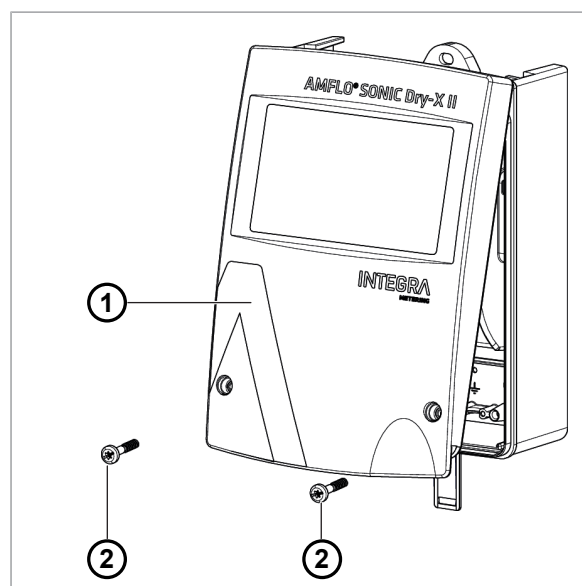
Drill holes

- ▶ Drill three holes $\varnothing 6$ mm into the wall.
- ▶ Mount dowels $3 \times \varnothing 6$.
- ▶ Mount the device with the three screws (1) and washers onto the wall.



Close the front cover

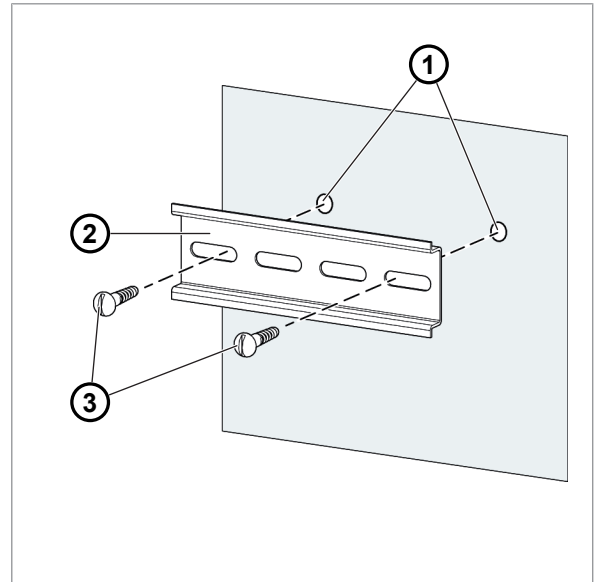
- ▶ Fit and close the cover (1).
- ▶ Do not yet insert and tighten the screws (2).



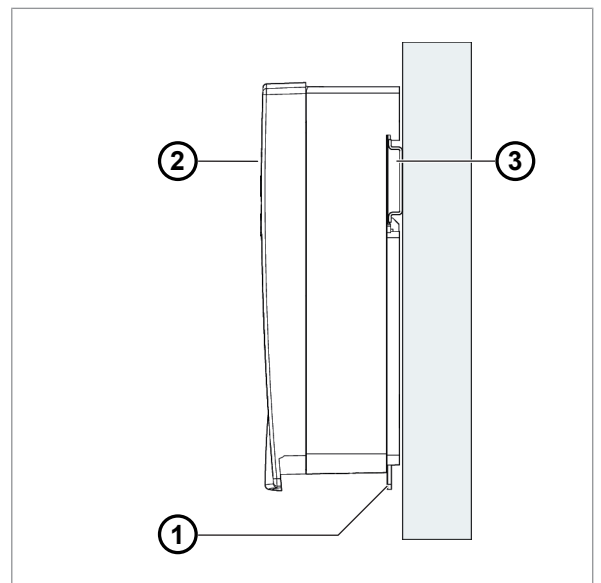
5.4.4 Installing the measurement electronics on a rail DIN EN 50222

Tools and installation material are not included in the delivery.

- Flat screwdriver 3.5×0.6
 - Drill bit Ø6
 - Screws 2×Ø4
 - Dowels 2×Ø6
 - Washers 2×4.3×12
- ▶ Drill two holes (1) Ø6 mm into the wall.
 - ▶ Mount dowels 2×Ø6.
 - ▶ Mount the rail (2) with the two screws (3) and washers onto the wall.



- ▶ Pull down the clip-on holder (1).
- ▶ Clip and fix the measurement electronics (2) on the rail (3).
- ▶ Push up the clip-on holder (1).



5.4.5 Installing the Calculator (CALEC® STIII Smart)

- ▶ See "Installation guide CALEC® STIII Standard & Smart".

5.5 Electrical installation

⚠ DANGER

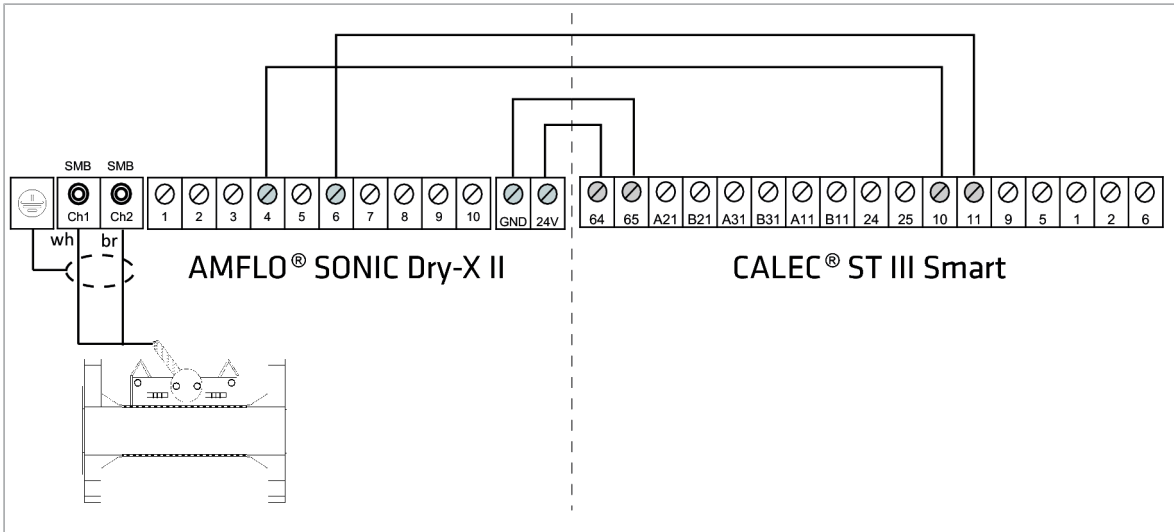
Electric shock

Touching energized system parts can cause immediate death or serious injury.



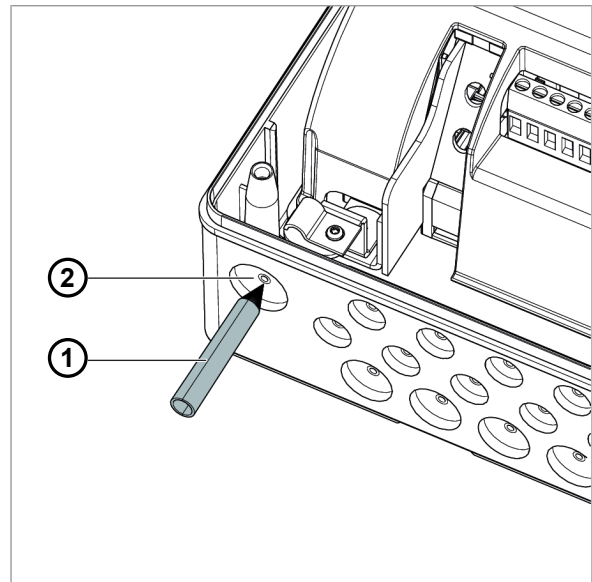
- ▶ Make sure that installation work is only carried out by authorized specialists.
- ▶ Before carrying out any work on the system, disconnect the power supply and check that no voltage is present.
- ▶ If an insulation is damaged, disconnect the power supply immediately and arrange for immediate repair.

5.5.1 Schematic diagram

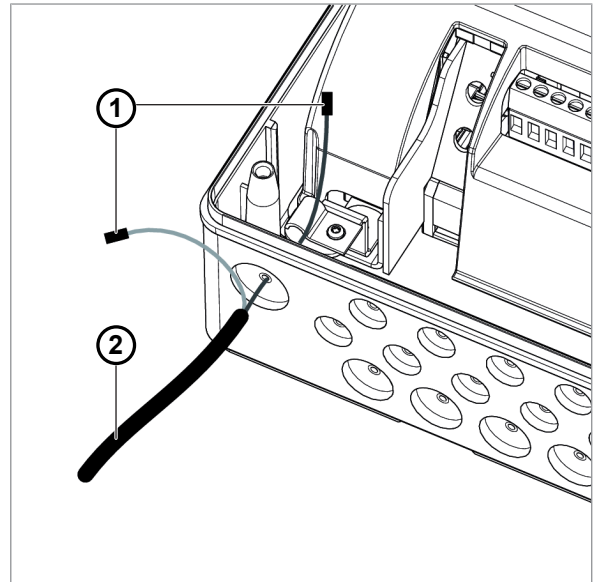


5.5.2 Connecting the flow sensor to the measurement electronics

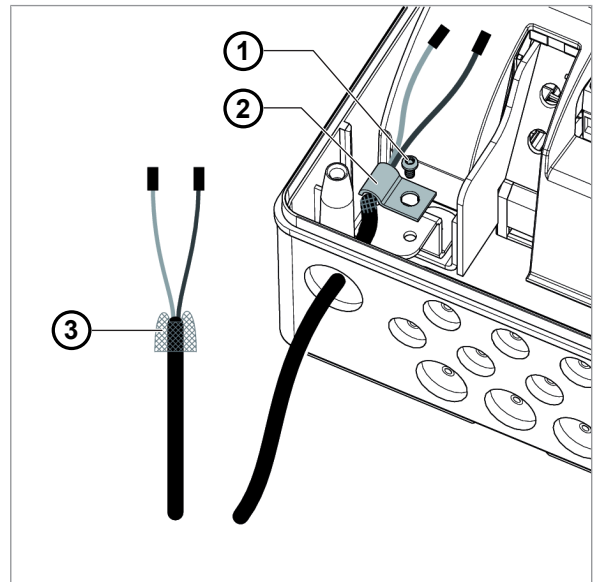
- ▶ Using the awl (1), pierce the cable gland (2).



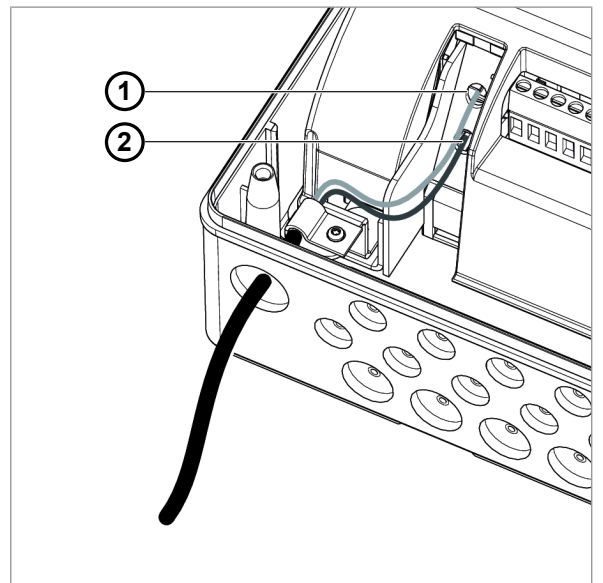
- ▶ Pull the two BNC connectors (1) through the cable gland one after the other.
- ▶ Pull the sensor cable until the black cable sheath (2) is inside the housing.



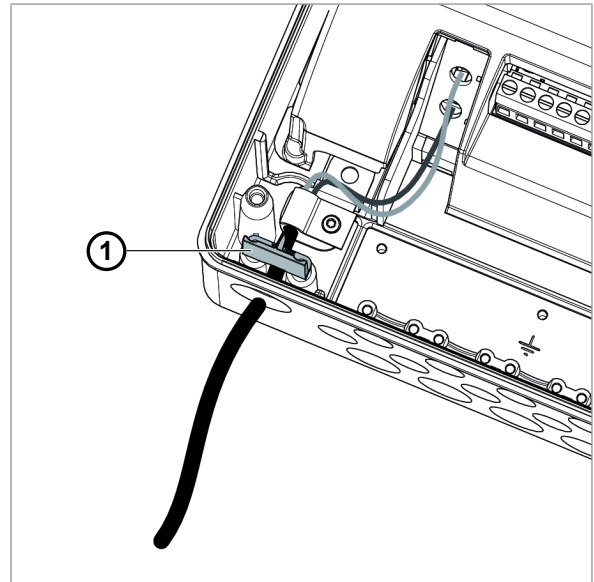
- ▶ Loosen the screw (1).
- ▶ Open the cable clamp (2).
- ▶ Fold back the shielding (3) of the sensor cable.
- ▶ Place the shielding (3) in the cable clamp.
- ▶ Tighten the screw (1).



- ▶ Connect the sensor cable to the electronic module:
 - white cable (CH1) to the top connector (1)
 - brown cable (CH2) to the bottom connector (2).



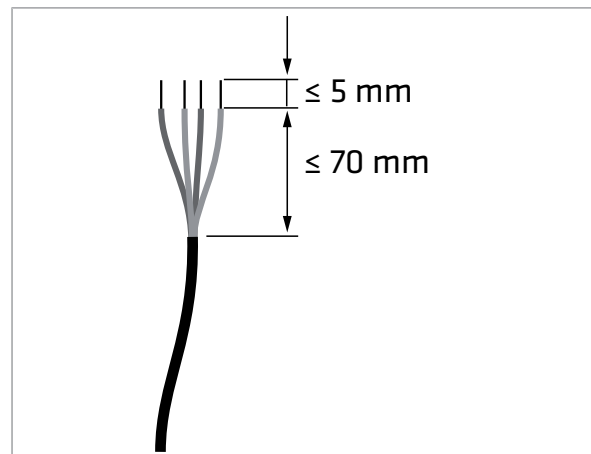
- ▶ Install the cable relief (1).



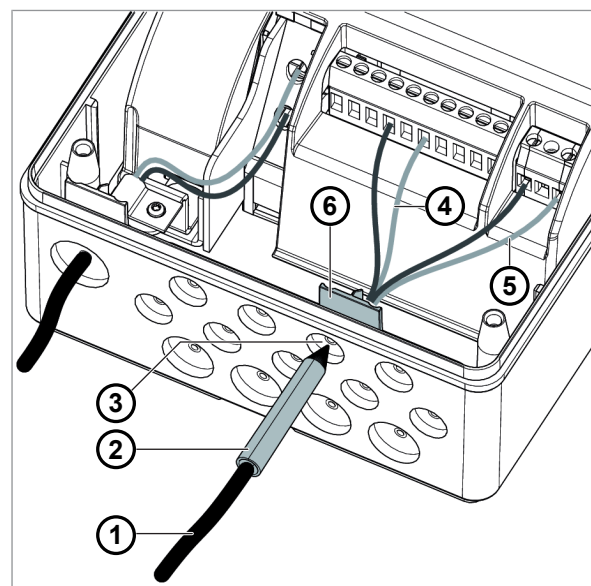
5.5.3 Connecting the CALEC® STIII Smart to the measurement electronics

For connecting the CALEC® STIII Smart, the cable must have the following properties:

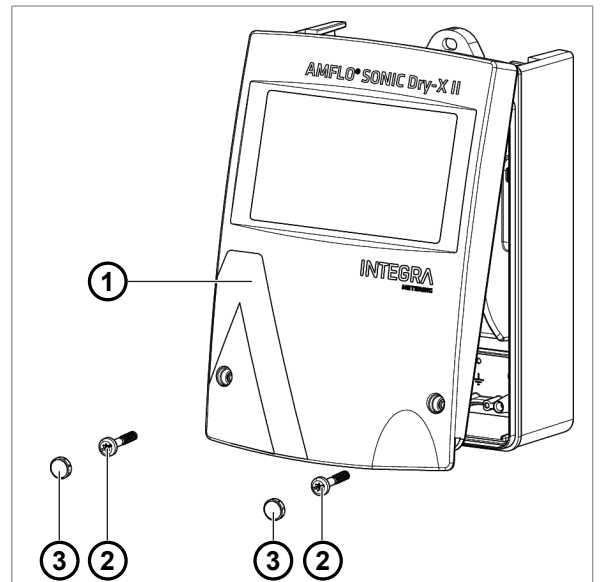
- Minimum cross section of each wire: 0.75 mm²
- 1x4 wires or 2x2 wires
- Maximum length: 25 m
- ▶ Strip the connection cable as illustrated.



- ▶ Insert the connection cable (1) into the awl (2).
- ▶ Pull the connection cable (1) together with the awl (2) through the cable gland (3).
- ▶ Connect the connection cable according to the schematic diagram:
 - Pin 4: Pulse input
 - Pin 6: Pulse common
 - GND: Power ground
 - 24V: Power 24 VDC
- ▶ Install the cable relief (4).
- ▶ Connect the connection cable at the CALEC® STIII Smart according to the schematic diagram.



- ▶ Fit and close the cover (1).
- ▶ Insert and tighten the screws (2).
- ▶ Attach the safety caps (3) with the smooth side facing outwards.



6 Operation

6.1 Reading meter values

The flow sensor does not feature a display. Meter values can be read in two different ways:

- On the calculator to which the flow sensor is connected (e.g. CALEC® STIII Smart).
- Using a smartphone and the ParamApp application.
- ▶ Refer to the corresponding documentation for details.



7 Decommissioning / storage / disposal

7.1 Decommissioning

WARNING



High pressure

The pressure of the medium in the pipe can be higher than atmospheric pressure. Removing a flow sensor while under pressure can lead to serious injury.

- ▶ Ensure that the pressure in the pipe is equal to atmospheric pressure.

- ▶ Empty the pipe at the installation position.
- ▶ Remove the flow sensor.

7.2 Storage

- ▶ Decommissioning according to chapter Decommissioning [[p. 27](#)].
- ▶ Select a suitable storage location.

7.3 Disposal

INTEGRA products must be disposed of in accordance with applicable local regulations. Improper disposal can have harmful effects on the environment and health.

- ▶ Decommissioning according to chapter Decommissioning [[p. 27](#)].
- ▶ Disassemble the product, sort according to material and dispose of the materials in accordance with applicable local regulations.

Your service partner