



MANUAL **SDM ECO** **SLURRY DENSITY METER**

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1. PREFACE

This user manual covers the following: the Slurry Density Meter ECO, or 'SDM ECO' for short.

Please read this manual carefully for important information and instructions before using the slurry density meter ECO. Save this manual for future reference.

The best results will be obtained when the SDM ECO is:

- Installed with reasonable care and caution;
- Configured and calibrated according to this manual;
- Regularly maintained by carrying out preventive maintenance instructions;
- Operated with reasonable care and caution;
- Maintained with Rhosonics-supplied parts.

When this manual refers to “the manufacturer”, this means: Rhosonics.

1.1 Purpose of this manual

The purpose of this user manual is to ensure that the above product is installed, configured, calibrated and used safely and correctly.

Adherence to the instructions herein will help to avoid personal injury, equipment damage and/or property damage. It will also increase the reliability and service life of all components.

This manual must be available at the site of operation. Operators and maintenance personnel are required to read this manual before working with/near the SDM ECO.

This user manual contains information and instructions regarding:

- General description of the product and its components;
- Safety of all personnel working with the product;
- Installation;
- Operation;
- Calibration;
- Troubleshooting;
- Maintenance;
- Disposal of the system.

For any questions or requests for information, please contact Rhosonics.

1.2 Target audience

This manual must be read and understood by:

- Distributors;
- Operators;
- Engineers installing the SDM ECO;
- Maintenance personnel.

The manual is primarily meant for the operators and engineers installing the SDM ECO.

1.3 Operators

Only operators that are properly trained and instructed by Rhosonics are allowed to work with the SDM ECO.

Operators should take the following into account.

1. Work on the electrical parts may only be performed by:
 - A competent and qualified electrician;
 - Trained personnel under the direct supervision of a qualified electrician.

All applicable local regulations should be observed.

2. Local disassembly and assembly may only be carried out by:
 - A competent and qualified engineer;
 - Trained personnel under the direct supervision of a qualified engineer.

Personnel that have not yet been fully educated or instructed in the use of the SDM ECO, may only work with the SDM ECO when under permanent supervision of a qualified and trained engineer (or a person authorized by Rhosonics).

1.4 Reading guide



READ THIS MANUAL CAREFULLY.

PAY CLOSE ATTENTION TO ALL SPECIAL SYMBOLS.

WHEN IN DOUBT, CONSULT YOUR SUPERVISOR ON HOW TO PROCEED.

Reading the instructions in this manual helps to avoid dangerous situations, repair costs and downtime. It also increases the reliability and service life of the SDM ECO.

This manual uses the following symbols to bring important safety information to the reader's attention:



DANGER

INDICATES AN IMMINENTLY HAZARDOUS SITUATION THAT, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.

**WARNING**

INDICATES A POTENTIALLY HAZARDOUS SITUATION THAT, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY. THIS WARNING INCLUDES HAZARDS THAT ARE EXPOSED WHEN GUARDS ARE REMOVED.

**CAUTION**

INDICATES A POTENTIALLY HAZARDOUS SITUATION THAT, IF NOT AVOIDED, MAY RESULT IN MINOR TO MODERATE INJURY AND/OR PRODUCT OR PROPERTY DAMAGE AND/OR LOSS OF INFORMATION.

**NOTE**

THIS SHOWS EXTRA INFORMATION THAT MAY HELP THE USER.

Other reading instructions:

- Text represented as **[Bold]** indicates a button to be pressed;
- Text in *ITALIC* refers to visible text on the screen display;
- Illustrations shown in this manual might differ from (parts of) the actual display.

1.5 Abbreviations

In this manual, the following abbreviations are used:

ABBREVIATION	MEANING
c	Velocity
CS	Carbon steel
DCS	Distributed control system
FDSC	Fluid Dynamic Spool Cell
HDPE	High density polyethylene
HMI	Human Machine Interface
mA	Milliamp
MPC	Multi-point calibration
OD	Outside diameter
PCB	Printed Circuit Board
PoE	Power over Ethernet
RHO	Density
SDM ECO	Slurry Density Meter ECO
SG	Specific Gravity
T	Temperature
UFTP	Ultrasonic Flow Through Cell
UHPE	Ultra-high polyethylene
UWC	Ultrasonic wafer cell
VDC	Volts Direct Current
WT	Wall thickness

Table 1-1: Abbreviations

1.6 Product naming conventions within this manual

Throughout this manual, these names will be used:

- SDM ECO (see chapter 1.6.1);
- Transmitter (see chapter 1.6.2);
- Sensor (see chapter 1.6.3);
- HMI (see chapter 1.6.4).

NOTE



WITHIN THIS MANUAL, SDM IS SPARSELY USED TO NAME THE TRANSMITTER AND SENSOR AS A WHOLE, AS A PART OF THE SDM ECO PRODUCT. THE SDM IN THIS SDM ECO MANUAL DIFFERS FROM OTHER SDM-PRODUCTS BY RHOSONICS THAT MIGHT HAVE SIMILAR NAMES. DO NOT INTERCHANGE THE SDM FROM THIS SDM ECO PRODUCT WITH SDM'S FROM OTHER PRODUCT LINES. CONSULT RHOSONICS FOR MORE INFORMATION.

1.6.1 SDM ECO

The SDM ECO (Figure 1-1) consists of a SDM ECO transmitter with sensor and a SDM ECO HMI.

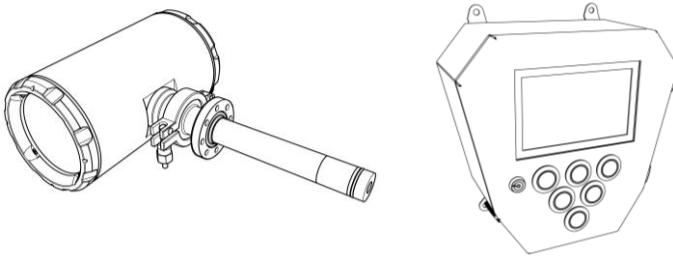


Figure 1-1: SDM ECO

1.6.2 Transmitter

The transmitter (Figure 1-2) (full name: SDM ECO transmitter) is the cylindrical housing which can be connected to the sensor.

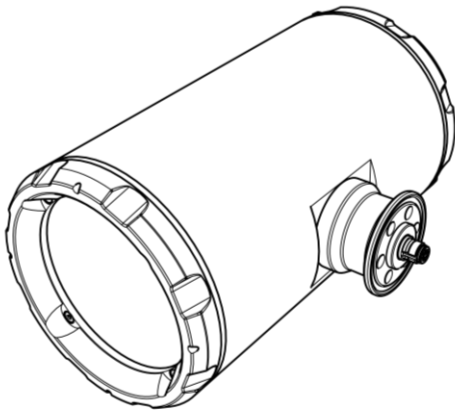


Figure 1-2: Transmitter

1.6.3 Sensor

The sensor (Figure 1-3) (full name: SDM ECO sensor) is the elongated metal cylinder which can be connected to the transmitter.

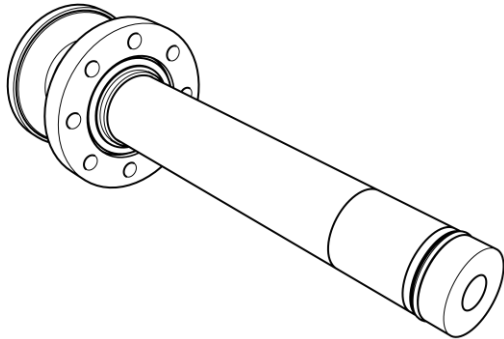


Figure 1-3: Sensor

1.6.4 HMI

The HMI (Figure 1-4) is the metal housing with the display and buttons.

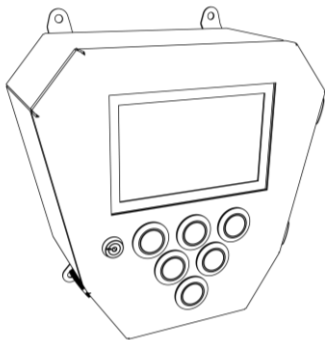


Figure 1-4: HMI

1.7 Identification

The identification plates contains information about the SDM ECO. The SDM ECO consist of a transmitter and a HMI (Human Machine Interface). Each has its own unique identification plate.

When contacting Rhosonics, please state the information supplied on the identification plate of the product regarding your contact request.

The identification plate (Figure 1-5, pos. 1) of the SDM is mounted on the side of the SDM.

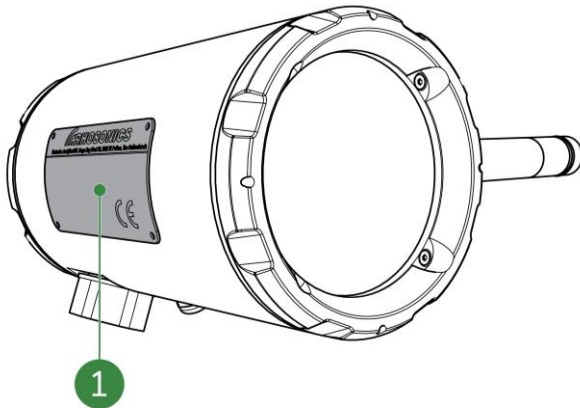


Figure 1-5: Identification plate transmitter

The identification plate (Figure 1-6, pos. 1) of the HMI is mounted on one of the sides of the HMI.

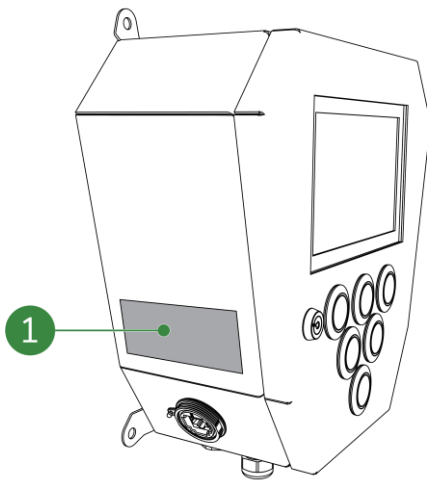


Figure 1-6: Identification plate HMI

Write down the information of the two identification plates in this manual. Rhosonics needs these numbers when ordering parts and / or when help is needed from Rhosonics.

2. INTRODUCTION

In this introduction, you can find general information on:

- Intended and non-intended use of the slurry density meter (SDM ECO);
- Lifespan of the product;
- Product specifications of the product.

2.1 Intended use

This product can only be used for measuring the density of slurry that flows through pipe systems.

2.2 Non-intended use

Under no circumstance should the product be used:

- as a tool other than its intended use;
- as a step for a person;
- as a temporary storage space to hang or lay items on.



CAUTION

USING THE SDM ECO AS A TOOL, STEP OR STORAGE SPACE CAN LEAD TO SERIOUS INJURIES OF THE PERSONS INVOLVED. IT CAN ALSO LEAD TO DAMAGE OF THE PRODUCT OR THE ENVIRONMENT.



NOTE

NON-INTENDED USE OF THE PRODUCT WILL VOID THE WARRANTY.

2.3 Lifespan

If properly maintained, the lifespan of the system can in principle be indefinite.



CAUTION

TO ENSURE PROPER AND SAFE OPERATION THROUGHOUT THE LIFESPAN OF THE SDM ECO, FOLLOW THE MAINTENANCE INSTRUCTIONS FOR CORRECT MAINTENANCE.

To ensure that the lifespan of the product will be as long as possible, never make any modifications or additions to the system other than described within this manual.

Modifications and additions could also affect safety. Modifications and/or additions include:

- Adding or removing parts other than described within this manual;
- Carrying out welding work on the SDM ECO;
- Making changes to the electrical system;
- Changing (re-programming) the software.



DANGER

NEVER MAKE MODIFICATIONS TO THE SDM ECO WITHOUT CONSULTATION AND WRITTEN PERMISSION FROM RHOSONICS. MODIFICATIONS WITHOUT CONSULTATION CAN LEAD TO LIFE THREATENING SITUATIONS.

Spare parts must always meet the technical specifications as laid down in the SDM ECO spare parts list. If in doubt, consult Rhosonics.

2.4 Product specifications

The product specifications of the SDM ECO can be found below.

2.4.1 Operation characteristics - Density

PROPERTY	SG	WT (in %)	Temperature (in °C)
Resolution	0.2 SGx1000	0.02 %	0,01 °C
Accuracy	Up to +/- 0.5% of reading	Up to +/- 0.5% of reading	0,01 °C
Reproducibility	0.2 SGx1000	0.1 % of reading	0,05 °C
Range	700 - 3000 SGx1000	0-80 %	0 – 150 °C

Table 2-1: Operation characteristics – density

2.4.2 Passive outputs

PROPERTY	VALUE / CHARACTERISTIC
Type	4-20mA (2x)

Table 2-2: Passive outputs

2.4.3 Operation characteristics - Interfaces

INTERFACE
Ethernet
USB
RS485

Table 2-3: Operation characteristics – Interfaces

2.4.4 Transmitter

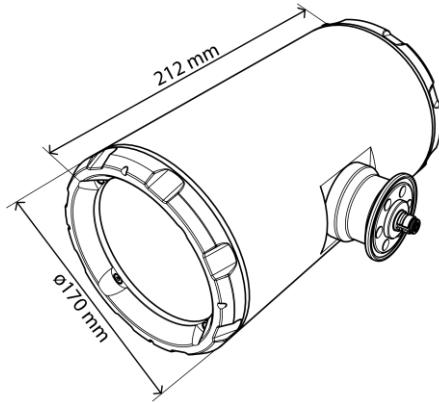


Figure 2-1: Transmitter housing dimensions

PROPERTY	VALUE
Dimensions transmitter housing	Ø170x212 mm (ØxL)
Power supply	Via PoE (Power over ethernet)
Cable entries	1x M20x1.5, 1x M25x1.5 split cable gland for ethernet cable
Ambient temperature	-5°C to +50°C
Humidity	< 95% at 40°C (noncondensing)
Protection, IP-rating	IP68, NEMA 6P
Weight	+/- 1.5 kg
Materials	Anonized Aluminum housing
Storage conditions	-5°C to + 50°C

Table 2-4: Transmitter housing properties

2.4.5 Sensor

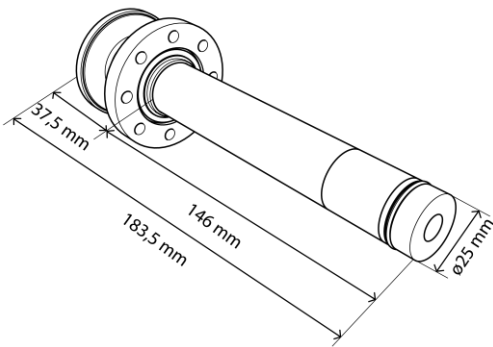


Figure 2-2: Sensor dimensions

PROPERTY	COMPOSITION / NORM
Max pressure	16 bar (see graph below)
Temperature range	0°C to 110°C (32°F to 230°F) (see graph below)
Body materials	Duplex 2205, SS316L
Wetted materials	Ceramics, Duplex 2205
Sensor surface radius	25 mm
Weight	+/- 1 kg
Length	183,5 mm (146 mm + 37,5 mm)

Table 2-5: Sensor properties

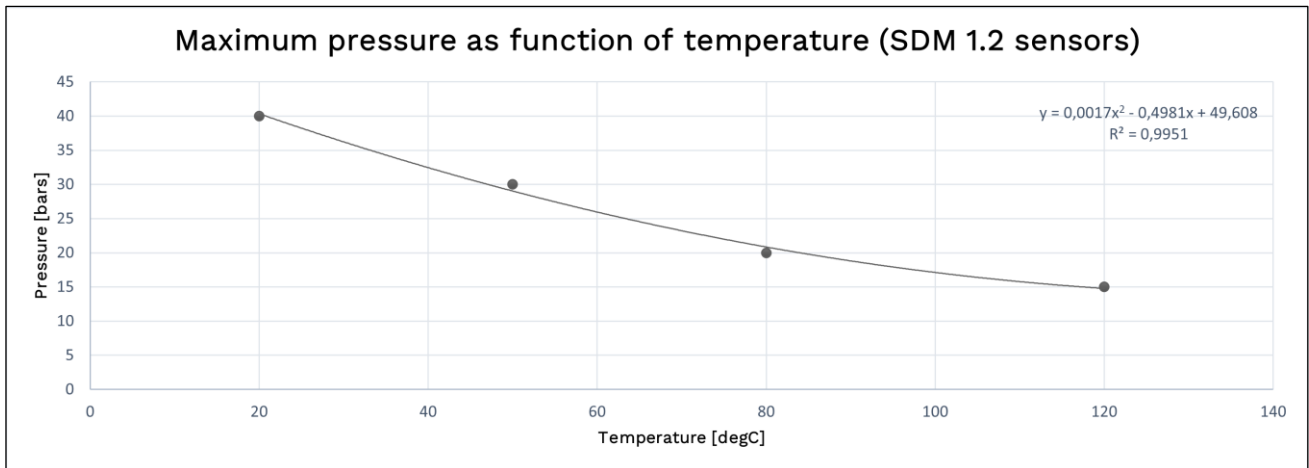


Figure 2-3: Sensor pressure/temperature graph

2.4.6 HMI

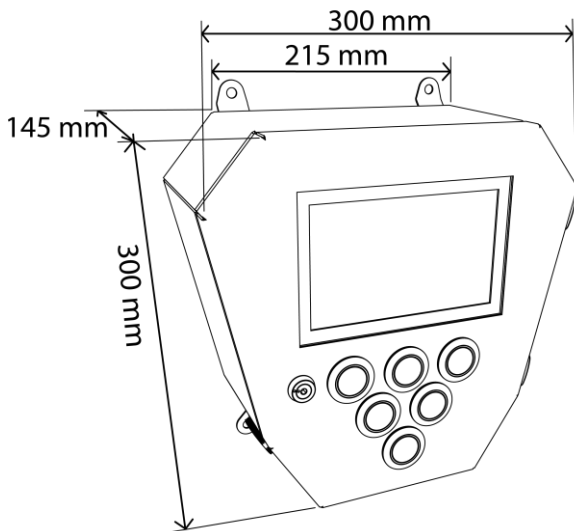


Figure 2-4: HMI dimensions

PROPERTY	VALUE
Power supply	18 – 32 VDC
Communication and output	2x 4-20mA, 1x RS485 with Modbus communication, 1x ethernet
Data logging	Continuous, retrievable via USB stick
Cable entries	2x M20X1.5, 1x M25x1.5 split cable gland for ethernet, 1x M16x1.5
Ambient Temperature	-5°C to +50°C (23°F to 122°F)
Humidity	< 95% at 40°C (noncondensing)
Protection, IP-rating	IP65, NEMA 4
Weight	+/- 3 kg
Materials	Stainless steel 316 housing
Dimensions	300 mm x 215 mm x 145 mm (LxWxH)
Display	7 inch touchscreen
Operation	6 push buttons
Fuses	630mA

Table 2-6: HMI properties

3. GENERAL DESCRIPTION

The slurry density meter ECO (SDM ECO) is a product that is used to measure the density of slurry that flows through pipe systems. Its main components are:

- a transmitter;
- a sensor for measuring slurry;
- a HMI (human machine interface) for displaying measurements and easy configuration access.

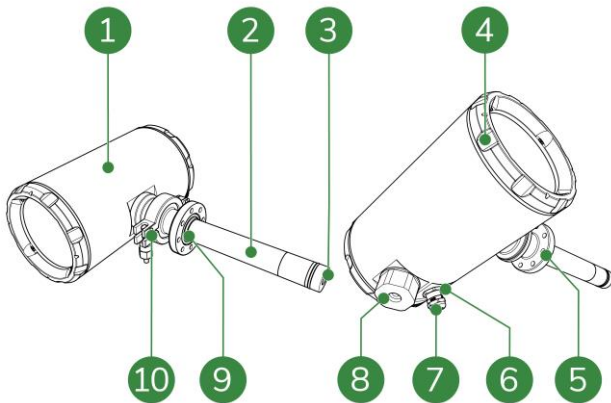


Figure 3-1: Transmitter and sensor

Legend

- | | |
|----|---|
| 1 | Transmitter |
| 2 | Sensor |
| 3 | Sensor surface |
| 4 | Frontal lid |
| 5 | Mounting flange |
| 6 | Earth connection |
| 7 | Cable gland at cable entry |
| 8 | Split cable gland for ethernet cable |
| 9 | O-ring sealing flange (for O-rings, see Figure 3-2) |
| 10 | Tri-clamp |

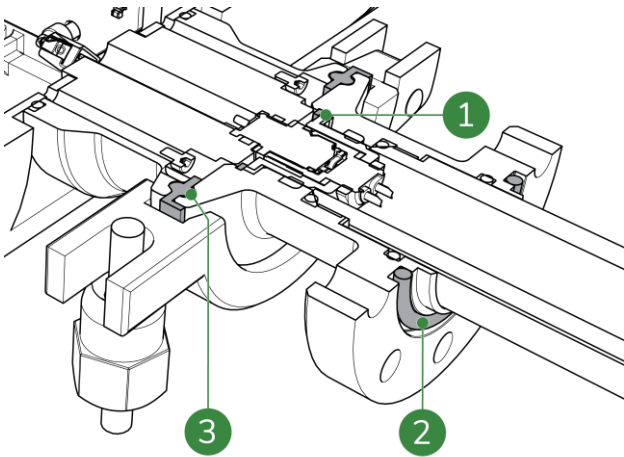


Figure 3-2: Sensor sealings

Legend

- 1 Rubber sealing for sensor contact
- 2 O-ring sealing flange
- 3 O-ring for sensor flange

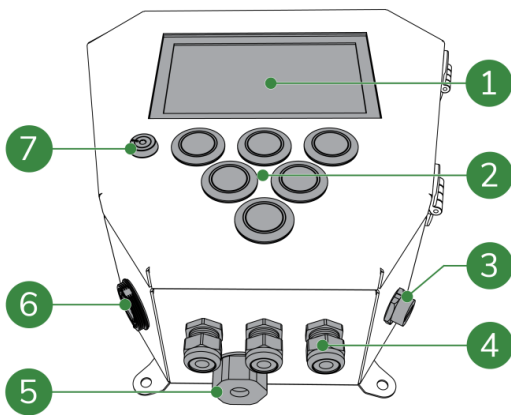


Figure 3-3: HMI

Legend

- 1 Transparent protective display cover
- 2 Buttons
- 3 USB-port
- 4 Cable glands at cable entry
- 5 Split cable gland for ethernet cable
- 6 Entry for ethernet cable
- 7 HMI door lock

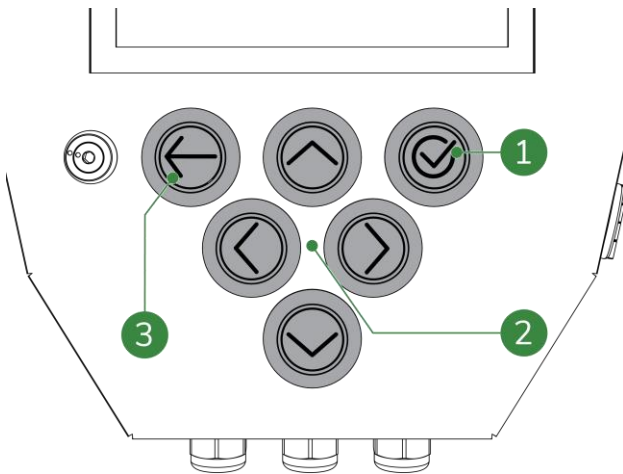


Figure 3-4: HMI control buttons

Legend

- 1 Confirm button
- 2 Navigation buttons
- 3 Back button

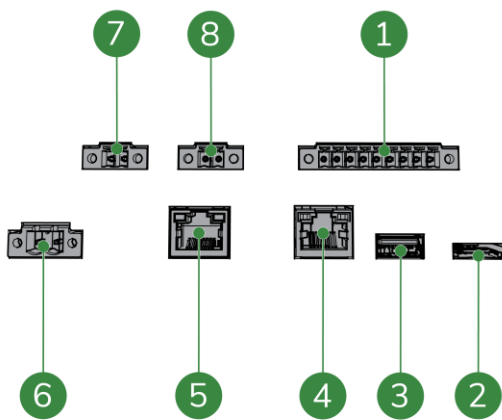


Figure 3-5: HMI internal connectors

Legend

- 1 RS485 connector
- 2 SD card input
- 3 USB connector (for the USB connection/terminal on the outside of the HMI)
- 4 Webserver ethernet connector
- 5 PoE connection to SDM ECO transmitter
- 6 Power connector
- 7 4-20 mA connector
- 8 4-20 mA connector

3.1 Components functionality


The sensor surface (Figure 3-6, pos. 3) connects to components within the transmitter (Figure 3-6, pos. 1) for processing measurements.

The tri-clamp (Figure 3-6, pos. 8) is pre-assembled and connects the sensor (Figure 3-6, pos. 2) to the transmitter (Figure 3-6, pos. 1).

The sensor (Figure 3-6, pos. 2) has a mounting flange (Figure 3-6, pos. 5) for mounting the SDM and sensor onto a pipe integration system (not shown).

The transmitter (Figure 3-6, pos. 1) houses a PoE ethernet cable connection, a USB connection and sensitive components on the inside.

The HMI (Figure 3-7) houses cable connections (Figure 3-5) and sensitive components on the inside. On the outside, the HMI has a display (Figure 3-7, pos. 1) and control buttons (Figure 3-4) for presenting and accessing measurements and configuration functionality.



CAUTION

MAKE SURE THE CABLE GLANDS COMPLETELY SEAL THE CABLE ENTRIES TO PREVENT DAMAGE TO THE TRANSMITTER AND THE HMI FROM MOISTURE AND DUST.

The transmitter is powered via PoE connected to ethernet connectors on both the transmitter and the HMI. The cable entries of the transmitter and HMI are protected from moisture and dust:

- with a split cable gland for ethernet cable (Figure 3-7, pos. 5)
- with a cable gland (3x) (Figure 3-7, pos. 6).

The HMI is powered by a power cable.

One RS485, two 4-20mA and ethernet connectors provide data output to optional other equipment.

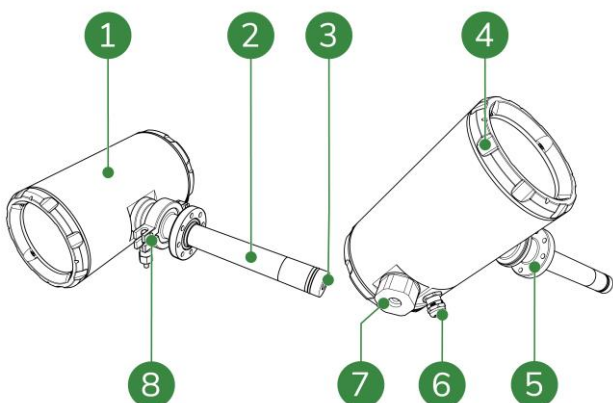


Figure 3-6: Components transmitter and sensor

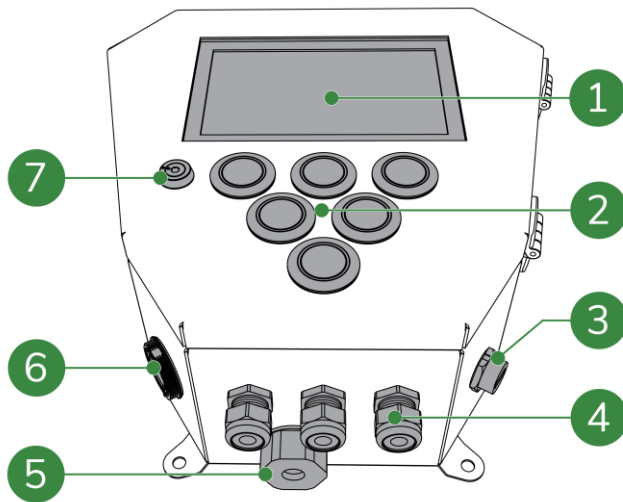


Figure 3-7: Components HMI

3.2 Pipe integration systems

To use the SDM ECO, it needs to be integrated within a pipe system. Several pipe integration systems are available. To get information on the best suited pipe integration system, contact Rhosonics.



NOTE

CONTACT RHOSONICS FOR MORE INFORMATION ON PIPE INTEGRATION SYSTEMS SUITABLE FOR YOUR PIPE INSTALLATION.

All pipe integration systems have an adapter with a receiving flange. To mount the SDM ECO, the sensor (Figure 3-6, pos. 2) slides into the adapter (Figure 3-8, pos. 3) after which the mounting flange is mounted onto the receiving flange of the adapter.

See chapter 5 for a complete instruction on the installation of the SDM ECO.

When the SDM (Figure 3-8, pos. 4) is correctly mounted onto the receiving adapter, the sensor surface will lay flush with the inner diameter of the connected pipes. This ensures reliable and consistent measurements.

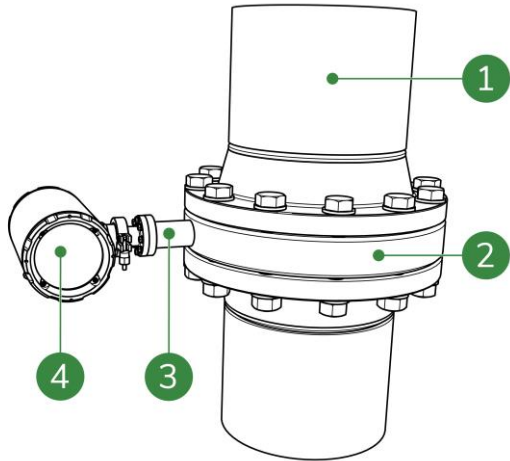


Figure 3-8: Example of a SDM ECO integrated within a vertical pipe system

Legend

- 1 Pipe
- 2 Pipe integration system
- 3 Adapter with receiving flange
- 4 SDM ECO transmitter

4. SAFETY



WARNING

FAILURE TO COMPLY WITH STANDING SAFETY RULES OR THE SAFETY RULES IN THIS MANUAL COULD RESULT IN POTENTIALLY LETHAL INJURY, EQUIPMENT DAMAGE AND/OR PROPERTY DAMAGE.

4.1 General safety rules

General safety rules for everyone working with the SDM ECO are:

- Always visually inspect the SDM ECO for damage before using. Do not use the SDM ECO if it has been damaged. In case of damage, arrange for an inspection by a qualified expert.
- Always wear personal protective equipment (PPE), see chapter 4.3 below for a list of PPE.
- Do not use the SDM ECO as a step, storage space or tool other than its intended use.
- If you suspect the SDM ECO has previously been misused, arrange for an inspection by a qualified expert.





4.2 Local safety rules

Users of the SDM ECO should make sure they are in compliance with all other relevant safety rules in force at the site of operation. These include:

- Safety rules following from local legislation;
- Safety protocols following from the installation or working site in which the SDM ECO has been integrated;
- Safety protocols coming from the user itself;
- Safety instructions found in other manuals that have a reference in this document.

4.3 Mandatory PPE

Ensure that the applicable safety regulations are observed and that everybody working with/on/near the SDM ECO wears the mandatory Personal Protection Equipment (PPE):

SYMBOL	DEFINITION	SYMBOL	DEFINITION
	Safety goggles		Coverall
	Safety shoes		Safety helmet






SYMBOL	DEFINITION	SYMBOL	DEFINITION
	Safety gloves		High visibility vest
	Hearing protection		Safety harness (when working more than 1.1 meters above ground level)

Table 4-1: Mandatory PPE

4.4 Warning symbols on/near the system




WARNING

MAKE SURE THAT STICKERS REMAIN LEGIBLE. REPLACE DAMAGED AND ILLEGIBLE STICKERS.

Always comply with safety instructions and hazard warnings. Always ensure that safety instructions and hazard warnings are well looked after and legible.

When working with the SDM ECO, a number of warning and prohibition symbols might present themselves on pipes and/or equipment surrounding or near the SDM ECO.

4.5 In case of any emergency



DANGER


NEVER USE WATER TO EXTINGUISH FIRE. WATER CONDUCTS ELECTRICITY AND ITS USE COULD LEAD TO ELECTROCUTION.

How to act in an emergency is determined by the regulations that are in force on site.

The minimum actions required are as follows:


- Report the emergency to the company emergency aid officer.
- The company emergency aid officer will alert the emergency services.
- When reporting an emergency, you must identify yourself, indicate where you are and describe the emergency.
- Extinguish small fires at an early stage using the extinguishing equipment on hand.
- If possible, turn off the power supply.
- Warn your colleagues.
- Leave the scene of the emergency and report to the meeting point.

4.6 Temperature ranges



WARNING

DO NOT WORK OUTSIDE THE TEMPERATURE RANGES AS GIVEN IN TABLE 4-2! DOING SO CAN CREATE A POTENTIALLY HAZARDOUS SITUATION, CAUSING DEATH OR SERIOUS INJURY.



WARNING

WHEN WORKING IN LOW TEMPERATURES, PREVENT HYPOTHERMIA AND INJURIES FROM FROSTBITE BY WEARING SUITABLE CLOTHES, SHOES, GLOVES AND HEAD PROTECTION.

The SDM ECO can operate safely with the following temperature ranges:

PROPERTY	TEMPERATURE RANGE IN °C	TEMPERATURE RANGE IN °F
Environmental temperature when in use	-5 °C to +50 °C	23 °F to 122 °F
Environmental temperature when not in use	-5 °C to +50 °C	23 °F to 122 °F
Slurry temperature	0 °C to +110 °C	32 °F tot 230 °F

Table 4-2: Temperature restrictions

When working outside these temperature ranges, the following hazards can occur:

High temperatures:

- Risk of burns on parts of the body;
- Expansion and deformation of materials;
- Accelerated combustion of flammable substances;
- Increase of pressure as a result of expansion in gases and fluids.

Low temperatures:

- Risk of burns on parts of the body;
- Hypothermia or frostbite in parts of the body;
- Materials becoming brittle, with the danger of breaking;
- Freezing of the skin to cold surfaces;
- Freezing of fluids, leading to blockages.

4.7 Preparations working area



WARNING

KEEP THE WORKSPACE AS CLEAN AND SAFE AS POSSIBLE TO PREVENT ACCIDENTS AND DANGEROUS SITUATIONS.

To prevent accidents and dangerous situations, it is very important that the working area is very well looked after:

- Keep the working area clean;
- Remove any obstacle that might be present.

5. INSTALLATION

5.1 Supplies and items for installation



CAUTION

IF ANY OF THE BASIC SUPPLIES DELIVERED BY RHOSONICS ARE DAMAGED OR COMPROMISED, CONTACT RHOSONICS FOR REPLACEMENTS OR FURTHER INSTRUCTIONS. NEVER USE DAMAGED SUPPLIES.



NOTE

IF AN OLDER INSTALLATION OF A SDM ECO IS BEING (PARTLY) REPLACED, OTHER INSTALLATION INSTRUCTIONS MIGHT APPLY. CONTACT RHOSONICS FOR FURTHER INSTRUCTIONS AND APPLICABLE MANUALS.

Before starting the installation, make sure that all the basic supplies needed are available, undamaged and clean:

- SDM ECO;
- Pipe integration system;
- Manual.

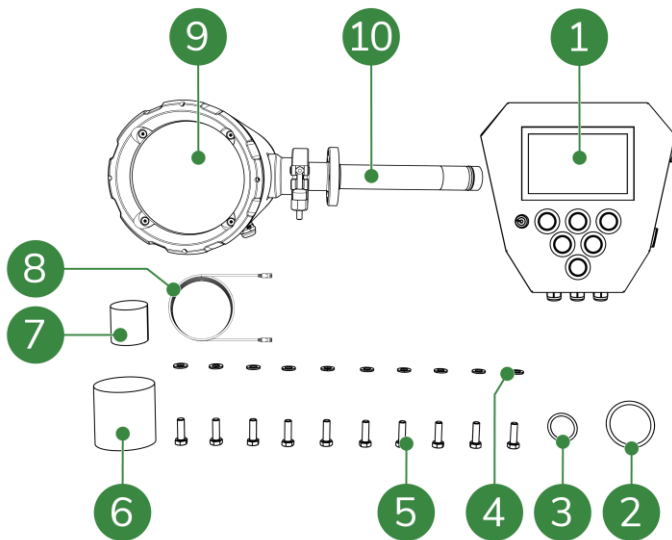


Figure 5-1: SDM ECO packaging contents

Legend

- 1 HMI
- 2 1x O-ring for sensor flange
- 3 1x Sealing for sensor contact
- 4 10x Washers for sensor flange
- 5 10x Bolts for sensor flange
- 6 1x Yellow protection cover
- 7 1x Black protection cover for sensor
- 8 10m Ethernet cable
- 9 SDM ECO transmitter
- 10 Sensor

The contents of the chosen pipe integration system are mentioned in its accompanying manual.



NOTE

DEPENDING ON THE AGREED UPON PIPE INTEGRATION SYSTEM, RHOSONICS MIGHT ADD COMPONENTS OF THAT PIPE INTEGRATION SYSTEM TO THE ORIGINAL SDM ECO-PACKAGING. IF THIS IS THE CASE, YOU WILL BE NOTIFIED BY RHOSONICS.

These items need to be available on site:

- Gasket mounting hardware: bolts, nuts, washers, gasket sealing;
- Power cable 24 VDC;
- Ethernet cable (type 3) (optional);
- 4-20mA cable (optional);
- RS485 cable (optional);
- Tools for mounting gasket hardware;
- Tools for connecting electrical wiring.

5.2 Guidelines for vertical pipe mountings



CAUTION

ALWAYS POINT THE CABLE GLANDS DOWNWARDS TO PREVENT INTRUDING LIQUIDS.

When selecting the SDM ECO location within a vertical pipe:

- Select a location that allows for an easy access for maintenance of the SDM ECO;
- Avoid installing in a pipe section where the sensor surface can wear quickly;
- Avoid installing near a dosing valve, flange or other ‘interruption’ of the straight pipe;
- For reliable measurements, make sure there is:
 - A straight pipe upstream with a uninterrupted length of at least 5 times the diameter of the pipe;
 - A straight pipe downstream with an uninterrupted length of at least 3 times the diameter of the pipe;
- The SDM ECO must be placed in a vertical pipe at an straight (90°) angle in relation to the connected horizontal pipe (Figure 5-2).

Vertical pipe mounting only results in reliable measurements if the flow goes in upstream direction.

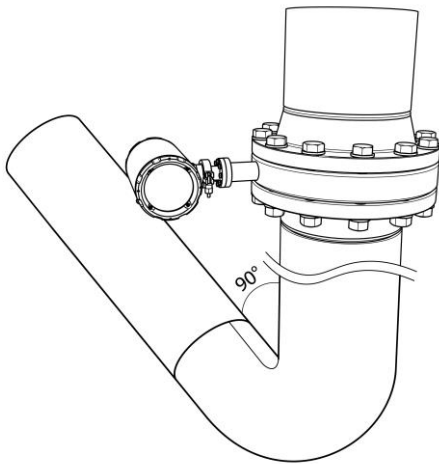


Figure 5-2: Vertical pipe mounting example

5.3 Guidelines for horizontal pipe mountings



CAUTION

ALWAYS POINT THE CABLE GLANDS DOWNWARDS TO PREVENT INTRUDING LIQUIDS.

When selecting the SDM ECO location within a horizontal pipe:

- Select a location that allows for an easy access for maintenance of the SDM ECO;
- Avoid installing in a pipe section where the sensor surface can wear quickly;
- Avoid installing near a dosing valve, flange or other ‘interruption’ of the straight pipe;
- For reliable measurements, make sure there is:
 - A straight pipe upstream with a uninterrupted length of at least 5 times the diameter of the pipe;
 - A straight pipe downstream with an uninterrupted length of at least 3 times the diameter of the pipe;
- For the most reliable measurements, an installation sidewise in a 45° angle, as seen/measured from the bottom of the pipe is recommended (Figure 5-3);
- The SDM ECO must be installed either on the left or the right side of the pipe.

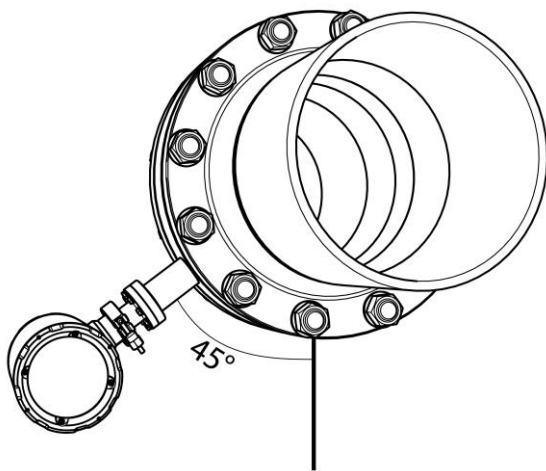



Figure 5-3: Horizontal pipe mounting example

5.4 Mounting the pipe integration system



CAUTION

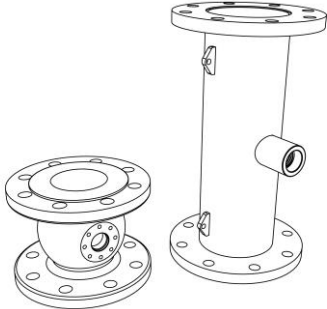
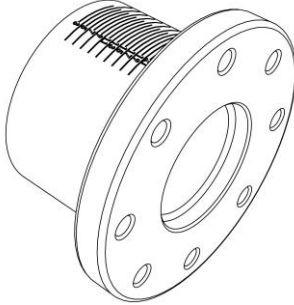
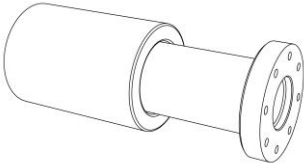
SEALING METAL FLANGES REQUIRES SKILLS, KNOWLEDGE AND EXPERIENCE. SPECIAL REQUIREMENTS MAY APPLY, DEPENDING ON THE PIPE SYSTEM IN WHICH THE PIPE INTEGRATION SYSTEM IS INSTALLED. WHEN YOU ARE NOT FAMILIAR WITH THE NECESSARY PROCEDURES, PLEASE CONSULT THE RESPONSIBLE PERSON BEFORE INSTALLATION.

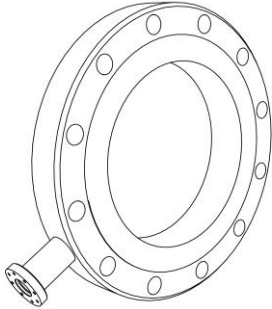
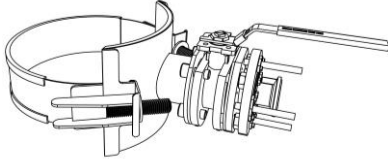


CAUTION

MATING COMPONENTS SHOULD BE CHECKED TO ENSURE THAT TOLERANCES AND COUPLINGS ARE COMPATIBLE. DO NOT USE PARTS THAT LOOK IRREGULAR OR DO NOT FIT PROPERLY. CONTACT THE APPROPRIATE MANUFACTURER OF THE PRODUCT IN QUESTION TO DETERMINE USABILITY.

There are five pipe integration systems:


PIPE INTEGRATION SYSTEM		SUITABLE PIPE TYPE
UFTP and FDSC spools	 <p style="text-align: center;">Figure 5-4: UFTP and FDSC</p>	<ul style="list-style-type: none"> - Pipes 1" – 20" - HDPE - 316 - CS
Weldolet	 <p style="text-align: center;">Figure 5-5: Weldolet</p>	<ul style="list-style-type: none"> - Steel pipes without liner - OD > 3" - For pipe with wall thickness 5-22 mm
Do it yourself (DIY) adapter	 <p style="text-align: center;">Figure 5-6: DIY Adapter</p>	<ul style="list-style-type: none"> - Pipes with a liner

PIPE INTEGRATION SYSTEM		SUITABLE PIPE TYPE
UWC wafer	 <p data-bbox="528 674 847 707">Figure 5-7: UWC Wafer</p>	<ul style="list-style-type: none"> - Pipes 4" - 60" - UHPE - 316 - 304 - 904
Clamp-in	 <p data-bbox="533 976 823 1010">Figure 5-8: Clamp-in</p>	<ul style="list-style-type: none"> - For every pipe material - OD pipe Ø88-365 mm - For pipe with wall thickness 3-23 mm

Each pipe integration system has a manual that contains instructions for a safe and proper installation. Always consult the manual before installing the pipe integration system.

5.5 Installation of the SDM ECO

5.5.1 Preparing the SDM installation



CAUTION

SEALING METAL FLANGES REQUIRES SKILLS, KNOWLEDGE AND EXPERIENCE. SPECIAL REQUIREMENTS MAY APPLY, DEPENDING ON THE PIPE SYSTEM INTO WHICH THE PIPE INTEGRATION SYSTEM IS INSTALLED. WHEN YOU ARE NOT FAMILIAR WITH THE NECESSARY PROCEDURES, PLEASE CONSULT THE RESPONSIBLE PERSON BEFORE INSTALLATION.

1. Install the chosen pipe integration system properly and completely, following the steps in its included manual.
2. Every pipe integration system has a receiving flange (Figure 5-9, pos. 1) with eight (8) threaded holes. Make sure that all eight (8) threaded holes of the receiving flange are clean and undamaged.

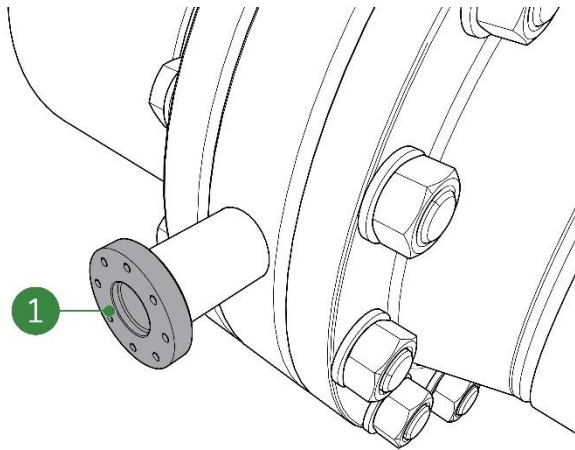



Figure 5-9: Receiving flange of pipe integration system


3. Make sure that the SDM ECO and its installation materials are complete, clean and undamaged.

5.5.2 Installing the SDM



CAUTION

THE CONTACTS OF THE SENSOR ARE SENSITIVE AND MUST ALWAYS BE PROTECTED AGAINST DAMAGE, MOISTURE AND DIRT. MAKE SURE TO ALWAYS PLACE THE PROTECTIVE YELLOW CAP ONTO THE CONTACTS OF THE SENSOR DURING INSTALLATION OR MAINTENANCE PROCEDURES.



CAUTION

ALWAYS POINT THE CABLE GLANDS DOWNWARDS TO PREVENT INTRUDING LIQUIDS.

Only use these materials to install the SDM ECO:

- Bolts (six-sided): M5x20mm, AISI 316L, 8 pieces;
- Washers: M5, AISI 316L, 8 pieces;
- O-ring: Viton, 29.82x2.62 mm, 2 pieces.

1. Ensure that no power is applied to the transmitter when installing the SDM ECO.
2. Place the washers onto the bolts and keep them within reach.
3. Remove the black protective cap (Figure 5-10, pos. 1) from the sensor.

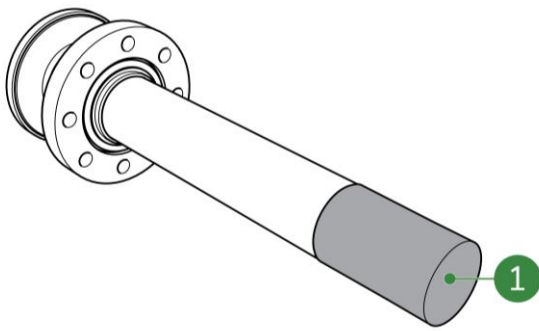


Figure 5-10: Black protective cap

	<p>CAUTION</p> <p>NEVER REUSE OLD O-RINGS OR SEALINGS OR USE OTHER PRODUCTS THAN THE ONES SUPPLIED WITH THE SDM ECO. ONLY NEW O-RINGS AND SEALINGS SUPPLIED BY RHOSONICS ARE SUITABLE FOR THE USED CHEMICALS AND LOCAL TEMPERATURES.</p>
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4. Slide the supplied O-ring (Figure 5-11, pos. 1) onto the sensor. Place it against the sensor flange, within the O-ring groove.
5. Slide the supplied O-ring (Figure 5-11, pos. 2) onto the sensor. Place it near the sensor end, within the O-ring groove.

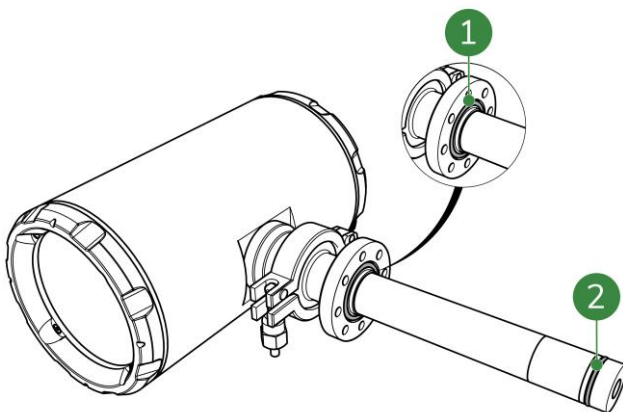


Figure 5-11: O-ring placement

6. Gently slide the SDM ECO as straight as possible into the pipe integration system and align the screw holes of both flanges (Figure 5-12, pos. 1). Choose the position in such a way that cable glands point downwards.

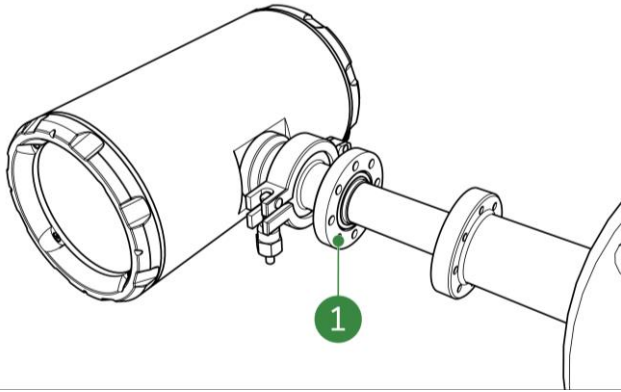


Figure 5-12: Aligning screw holes

7. Safely hold the SDM ECO in place while mounting the screws in the next step.
8. Place the eight bolts (with their washers) through the holes of the SDM ECO's flange, into the threaded holes of the receiving flange (Figure 5-13).

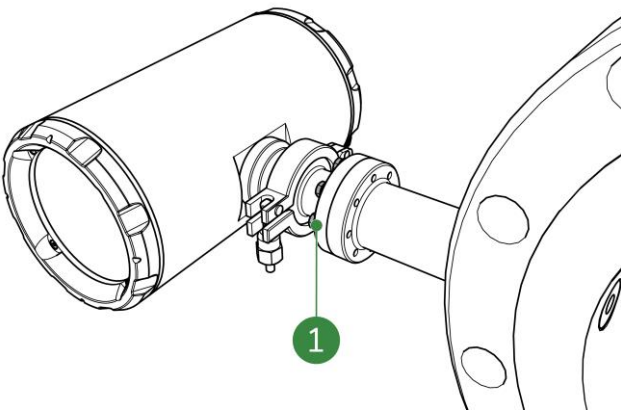


Figure 5-13: Placing the screws

9. Tighten the bolts and washers crosswise (Figure 5-14) until 4.2 Nm is reached for each bolt.

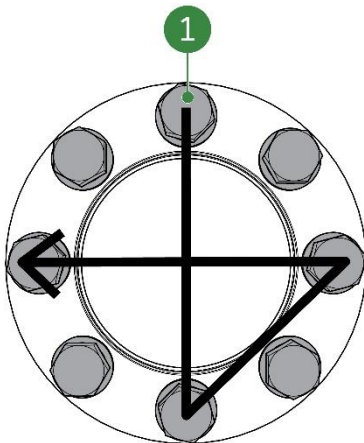



Figure 5-14: Crosswise tightening

5.5.3 Preparing the HMI installation


1. Choose a location that:
 - provides easy access to the display for reading measurements or for configuration or calibration purposes;
 - is in a location with little or no risk of (heavy) working equipment damaging the HMI.
2. Make sure that the surface the HMI is attached to is evenly flat and capable of holding the weight of the HMI.
3. Make sure that the HMI and its installation materials are complete, clean and undamaged.

5.5.4 Installing the HMI



CAUTION

ONLY USE THE ATTACHMENT METHODS AS DESCRIBED WITHIN THIS MANUAL. NEVER ATTACH THE HMI BY WELDING OR OTHER NON-DESCRIBED METHODS. THIS DAMAGES THE HMI AND ITS SENSITIVE INNER COMPONENTS.




CAUTION

ALWAYS POINT THE CABLE GLANDS DOWNWARDS TO PREVENT INTRUDING LIQUIDS.

Only choose materials to install the HMI that fit these requirements:

- Bolts, washers and nuts that fit the attachment point holes of the HMI;
- Bolts, washers and nuts that are suitable for both the surface it is being attached to and the environmental conditions;
- Bolts, washers and nuts that are suitable for securing objects that are similar in weight to the HMI.

1. Ensure that no power is applied to the HMI when installing it.
2. Place the washers onto the bolts and keep them within reach.
3. Take measurements and drill holes that correspond with the HMI's attachment points (Figure 5-15, pos. 1).



CAUTION

MAKE SURE TO INSTALL THE HMI WITH TWO PEOPLE IN ORDER TO PREVENT DAMAGE TO THE HMI.

4. Safely hold the HMI against the surface and align the screw holes of all four attachment points (Figure 5-15, pos. 1) with the drilled holes.

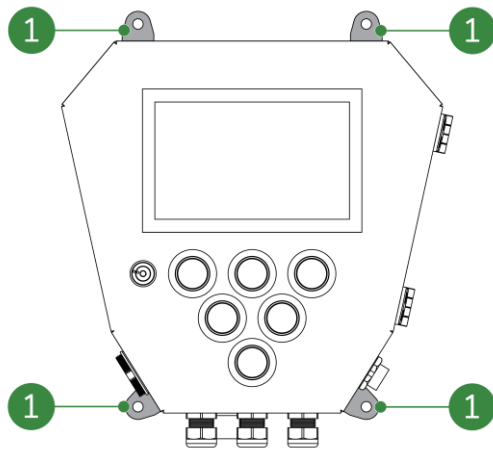


Figure 5-15: HMI attachment points

5. Place the four bolts (with their washers) through the holes of the attachment points (Figure 5-15, pos. 1), into the drilled holes and tighten them with nuts.
6. Make sure the HMI is safely and securely attached. No play is allowed.

5.6 Connecting the SDM ECO

Before connecting the SDM ECO, make sure that all supplies match the requirements as stated in the table in chapter 5.6.1.

5.6.1 Power supply requirements

ITEM	VALUE
PoE cable	CAT 6 ethernet



NOTE

THE PoE CABLE SHOULD NOT EXCEED THE MAXIMUM OF 100 METERS IN LENGTH.

5.6.2 Connecting the ethernet/PoE cable



CAUTION

MAKE SURE TO TIGHTEN THE CABLE GLANDS TO AVOID INTERNAL MOISTURE DAMAGE TO THE SDM ECO.



CAUTION

MAKE USE OF SAFE CABLE MANAGEMENT TO PREVENT CABLES HANGING LOOSE. LOOSE CABLES CAN CAUSE AN UNSAFE WORKING ENVIRONMENT. PEOPLE OR EQUIPMENT GETTING STUCK IN A LOOSE CABLE CAN DAMAGE THE SDM ECO, CABLE OR EQUIPMENT AND CAN CAUSE INJURIES.

1. Loosen the 4 socket head screws (Figure 5-16, pos. 1) on the outer side of the back lid.

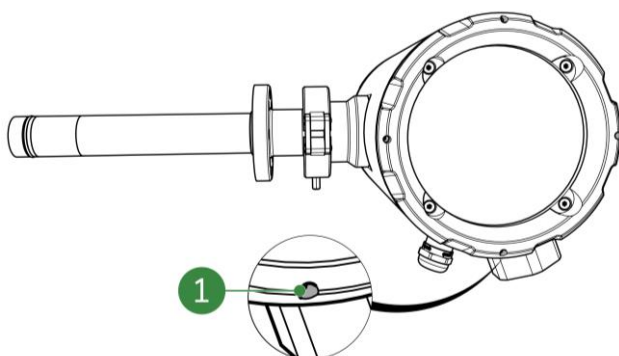


Figure 5-16: Back lid socket head screws

2. Remove the back lid (Figure 5-17, pos. 1).

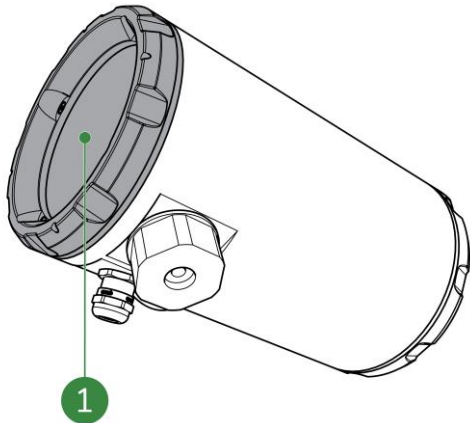


Figure 5-17: Back lid

	<p>CAUTION</p> <p>DO NOT USE POWER TOOLS TO SCREW/UNSCREW THE SPLIT CABLE GLAND. THE SPLIT CABLE GLAND IS A PLASTIC OBJECT THAT ONLY NEEDS TIGHTENING BY HAND.</p>
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3. Remove the split cable gland for ethernet cable (Figure 5-18, pos. 1) from the SDM ECO transmitter by unscrewing it.

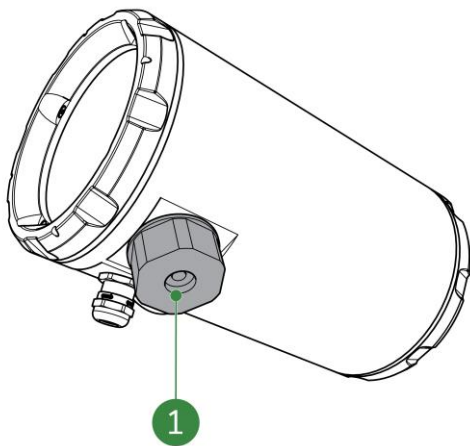


Figure 5-18: Split cable gland

4. Open the split cable gland.
5. Open the small cable holder inside the split cable gland.
6. Install the small cable holder onto the ethernet cable.
7. Install the small cable holder into the split cable gland.
8. Close the split cable gland.
9. Guide the ethernet cable through the cable gland opening in the SDM ECO.
10. Connect the ethernet cable to the SDM ECO ethernet connector (Figure 5-19, pos. 1).

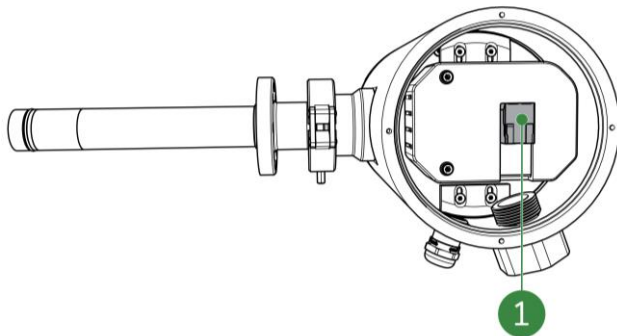


Figure 5-19: SDM ECO ethernet connector

11. Tighten the split cable gland (Figure 5-18, pos. 1) to prevent moisture and dirt entering the SDM ECO.
12. Apply cable management to the ethernet cable so that no loose cable remains.



NOTE

THE CABLE GLAND (FIGURE 5-20, POS. 1) CAN ALSO BE REPLACED BY A BLIND PLUG (STANDARD: M16X1.5) IF THE ENTRY IS NOT USED.

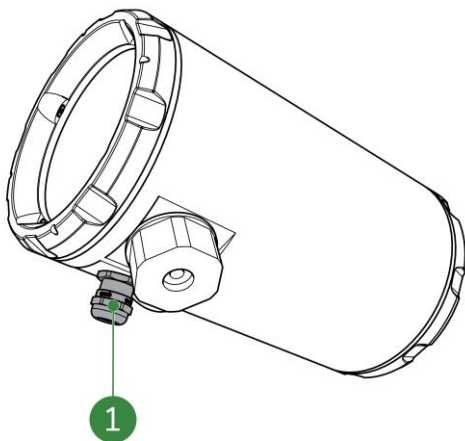


Figure 5-20: SDM ECO cable gland

13. Make use of the cable gland (Figure 5-20, pos. 1) to connect other cables if necessary.
14. Close the back lid (Figure 5-17, pos. 1).
15. Tighten the 4 socket head screws (Figure 5-16, pos. 1) on the outer side of the back lid.

5.7 Connecting the HMI

Before connecting the HMI, make sure that all supplies match the requirements as stated in the table in chapter 5.7.1.

5.7.1 Power supply requirements

ITEM	VALUE
Input voltage	18 - 32 VDC

5.7.2 Connecting the power cable



DANGER

ALWAYS MAKE SURE THAT POWER CABLES ARE NOT CONNECTED TO A POWER SUPPLY WHILE CREATING NEW CONNECTIONS. ONLY (RE)CONNECT THE POWER SUPPLY AFTER CONNECTIONS HAVE BEEN SAFELY MADE AND THE CABLE COMPARTMENT IS SAFELY CLOSED AND SEALED.



CAUTION

MAKE SURE TO TIGHTEN ALL CABLE GLANDS TO AVOID INTERNAL MOISTURE DAMAGE TO THE HMI.



NOTE

THE CABLE GLANDS CAN ALSO BE REPLACED BY A BLIND PLUG (STANDARD: M16X1.5) IF THE ENTRY IS NOT USED.

1. Unlock (Figure 5-22, pos. 2) and open the HMI door (Figure 5-21).

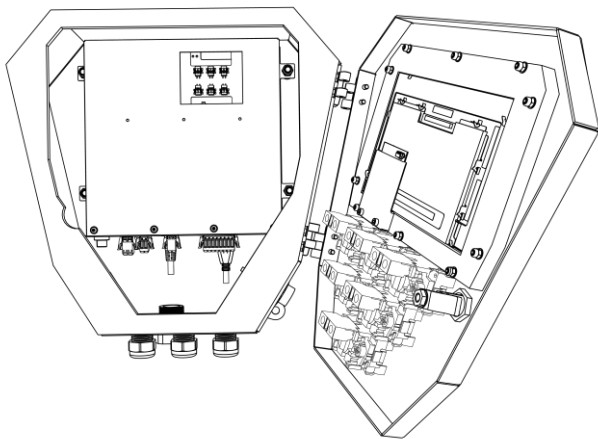


Figure 5-21: Opened door HMI

2. Loosen a cable gland and guide the power cable through (Figure 5-22, pos. 1).

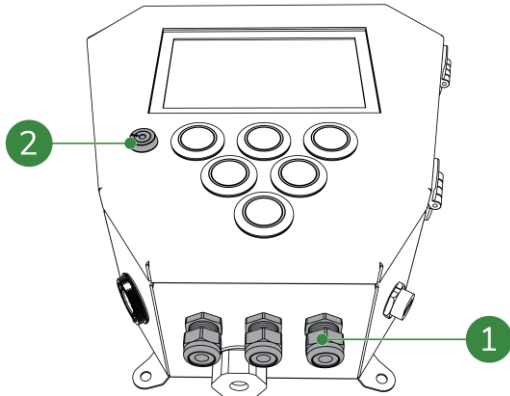


Figure 5-22: Cable gland for power cable

3. Connect the power cable to the HMI power connector (Figure 5-23, pos. 1).
The left connection is negative -, the right connection is positive +.

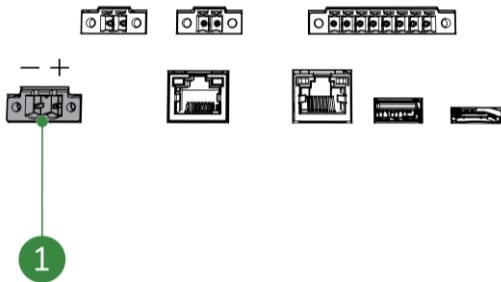


Figure 5-23: HMI power connector

4. Connect other cables if necessary.
5. Tighten the cable gland (Figure 5-22, pos. 1) to prevent moisture and dirt entering the HMI.
6. Close and lock the HMI door.

5.7.3 Connecting ethernet cables



DANGER

ALWAYS MAKE SURE THAT POWER CABLES ARE NOT CONNECTED TO A POWER SUPPLY WHILE CREATING NEW CONNECTIONS. ONLY (RE)CONNECT THE POWER SUPPLY AFTER CONNECTIONS HAVE BEEN SAFELY MADE AND THE CABLE COMPARTMENT IS SAFELY CLOSED AND SEALED.



CAUTION

MAKE SURE TO TIGHTEN ALL CABLE GLANDS TO AVOID INTERNAL MOISTURE DAMAGE TO THE HMI.



NOTE

THE CABLE GLANDS CAN ALSO BE REPLACED BY A BLIND PLUG (STANDARD: M16X1.5) IF THE ENTRY IS NOT USED.



NOTE

THE ETHERNET CABLES SHOULD NOT EXCEED THE MAXIMUM OF 100 METERS IN LENGTH.

1. Remove the split cable gland for ethernet cable (Figure 5-24, pos. 1) from the HMI by unscrewing it.

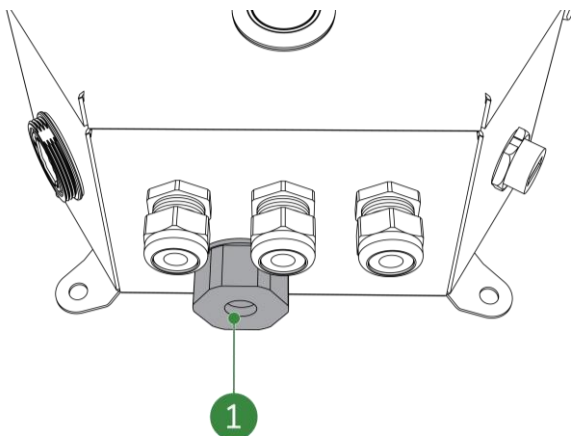


Figure 5-24: Split cable gland for ethernet cable

2. Open the split cable gland.
3. Open the small cable holder inside the split cable gland.
4. Install the small cable holder onto the ethernet cable.
5. Install the small cable holder into the split cable gland.
6. Close the split cable gland.
7. Unlock (Figure 5-22, pos. 2) and open the HMI door (Figure 5-25).

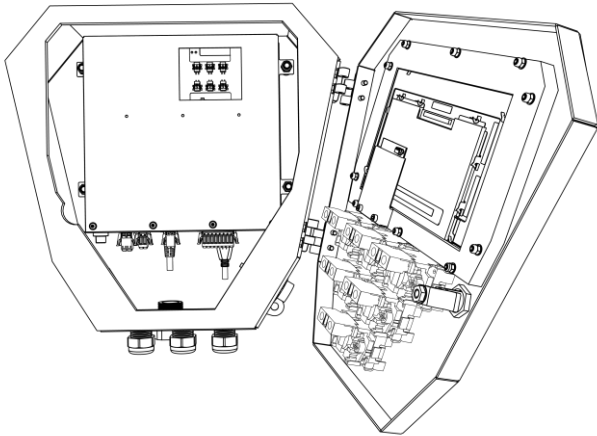



Figure 5-25: Opened door HMI



CAUTION

THERE ARE TWO ETHERNET CONNECTORS WITHIN THE HMI. USE THE CORRECT HMI ETHERNET CONNECTOR FOR THE TYPE OF CONNECTION YOU ARE ESTABLISHING.

8. Connect the ethernet cable to one of these ethernet connectors:
 - SDM ECO transmitter PoE connector (Figure 5-26, pos. 2);
 - Webserver ethernet connector (Figure 5-26, pos. 1).

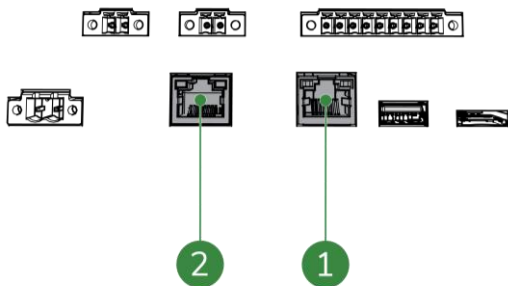


Figure 5-26: HMI ethernet connectors

9. Connect other cables if necessary.

10. Close and lock the HMI door.
11. Tighten the split cable gland for ethernet cable (Figure 5-24, pos. 1) to prevent moisture and dirt entering the HMI.

5.7.4 Connecting the RS485 or 4-20mA cables



DANGER

ALWAYS MAKE SURE THAT POWER CABLES ARE NOT CONNECTED TO A POWER SUPPLY WHILE CREATING NEW CONNECTIONS. ONLY (RE)CONNECT THE POWER SUPPLY AFTER CONNECTIONS HAVE BEEN SAFELY MADE AND THE CABLE COMPARTMENT IS SAFELY CLOSED AND SEALED.



CAUTION

MAKE SURE TO TIGHTEN ALL CABLE GLANDS TO AVOID INTERNAL MOISTURE DAMAGE TO THE HMI.



NOTE

THE CABLE GLANDS CAN ALSO BE REPLACED BY A BLIND PLUG (STANDARD: M16X1.5) IF THE ENTRY IS NOT USED.



NOTE

BOTH THE RS485 AND 4-20MA CABLES ARE OPTIONAL AND NOT NECESSARY FOR STANDARD OPERATING PROCEDURES.

1. Unlock (Figure 5-22, pos. 2) and open the HMI door (Figure 5-27).

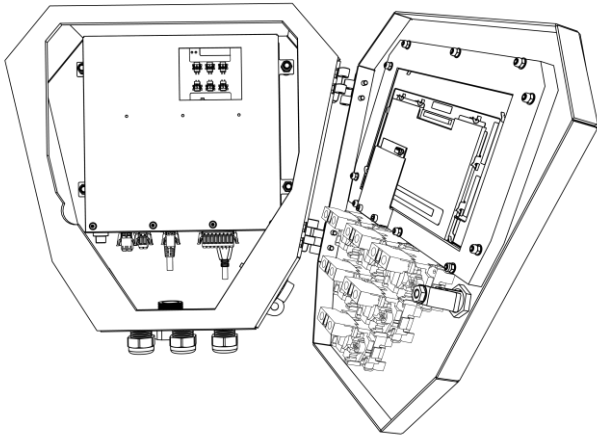


Figure 5-27: Opened door HMI

2. Guide the 4-20mA and/or RS485 cables each through a free cable gland (Figure 5-28, pos. 1).

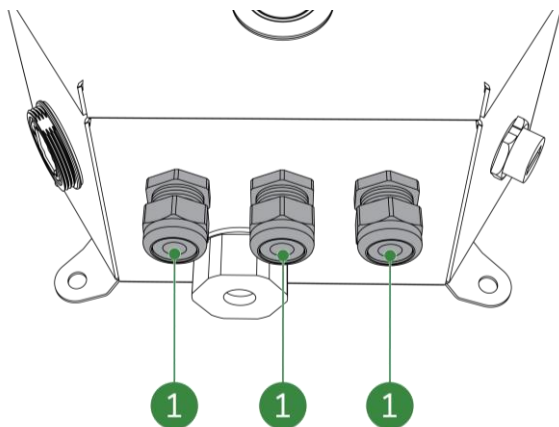


Figure 5-28: Cable glands

3. Connect the 4-20MA / RS485 cable to the corresponding connector:
 - 4-20MA connector (2x) (Figure 5-29, pos. 2 and pos. 3);
 - The left connection is negative -, the right connection is positive +.
 - RS485 connector (Figure 5-29, pos. 1).
 - When using a 4 cable connection, use pins 2, 3, 6 and 7.
 - When using a 2 cable connection, use pins 2 and 3 and place a bridge between pin 4 and 6 and between pin 5 and 7.

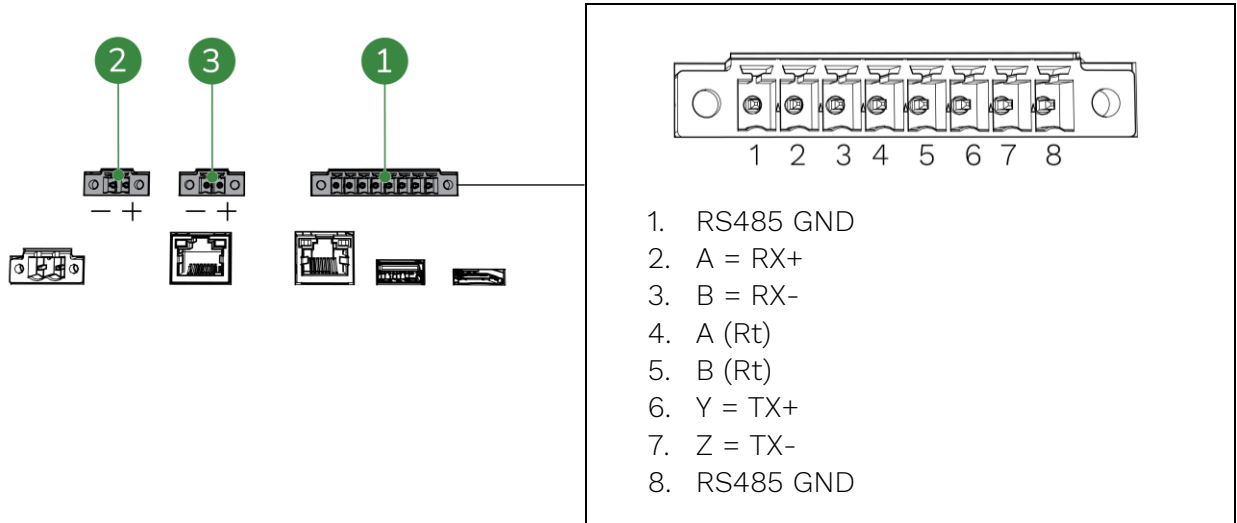


Figure 5-29: HMI 4-20MA (2x) and RS485 connector (with legend)

4. Connect other cables if necessary.
5. Tighten the cable gland (Figure 5-28, pos. 1) to prevent moisture and dirt entering the HMI.
6. Close and lock the HMI door.

6. OPERATION

6.1 Introduction and user levels

The SDM ECO is operated via the buttons for day-to-day use.

The touchscreen and webserver provide similar accessibility plus configuration and calibration options.

These are the levels of operation dependent on the type of user:

- Settings - Accessible for all users
- Calibration - Protected with PIN access
- Diagnostics - Protected with PIN access
- Factory - Protected with PIN access

An overview of the menu tree can be found in chapter 13.3 on page 115.

6.2 SDM ECO display and buttons

6.2.1 Accessibility and functionality

The SDM ECO display and its buttons support several access level functionalities. Setting time and date, setting the log interval and a minor system status icon displays the most relevant error in case of measurement problems.

To assure settings can only be changed by authorized personnel, most menus are hidden behind an access code. Except for the *Start page*, *Measured Value* and *Settings* pages.



NOTE

AN OVERVIEW OF THE COMPLETE MENU TREE IS AVAILABLE IN CHAPTER 13.3 ON PAGE 115.

6.2.2 Symbols, buttons and icons

During operation, several items can be visible on the display (Figure 6-1).











ITEM / ICON	EXPLANATION	LOCATION ON SCREEN
MENU ☰	Access main menu	Top right corner on main screen
	Warning (value out of range)	Central left
	Device is in maintenance / Check function is on	Central left
	Maintenance required	Central left
	Failure Functions	Central left
	Go right	Several locations
	Go back / go left	Several locations
	Go up	Several locations
	Go down	Several locations
	Accept	To the right of input buttons
	Back / Reset input	To the right of input buttons

Table 6-1: LCD screen icons and explanations

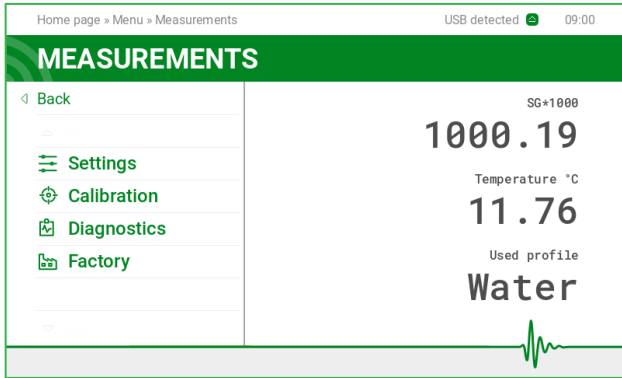


Figure 6-1: Display with icon positions

6.2.3 Status SDM ECO and display colors

The status of the SDM ECO is shown through different icons and backlight colors.

Time-out mode is optional.

The screen has two modes: active and time-out. The active mode is activated by pressing a button. If a button isn't pressed for 10 minutes the screen will return to the time-out mode.



NOTE

THE DEVICE STATUS IS DISPLAYED ACCORDING NAMUR RECOMMENDATION NE107.

The various states and modes are shown in Table 6-2, and Table 6-3.



NOTE

INDICATED VALUES MIGHT DIFFER FROM VALUES VISIBLE ON YOUR DEVICE.

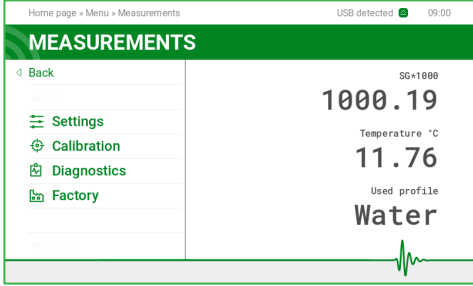
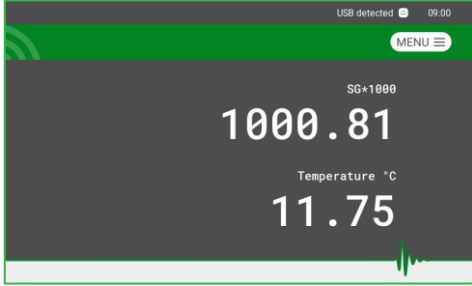
ACTIVE	TIME-OUT
<p>Color: Green Status: Normal operation Output: Valid</p> <p>Info: Device is operating within specified range.</p> 	<p>Color: Green Status: Normal operation Output: Valid</p> <p>Info: Device is operating within specified range.</p> 

Table 6-2: SDM ECO states and modes - Green colored

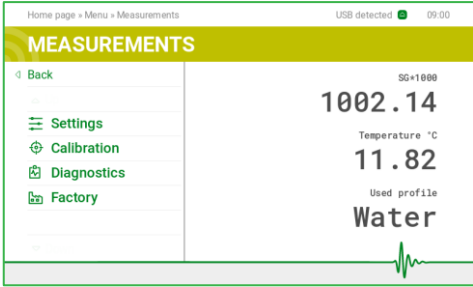
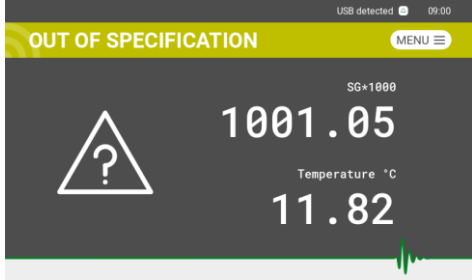

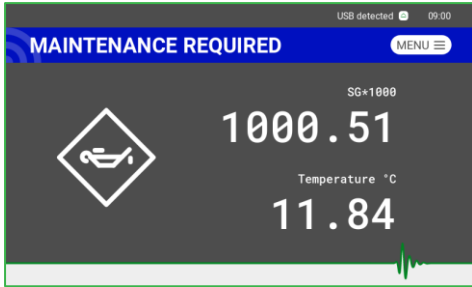
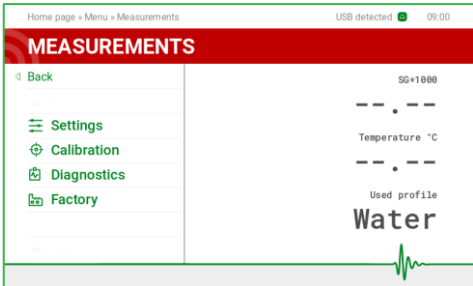
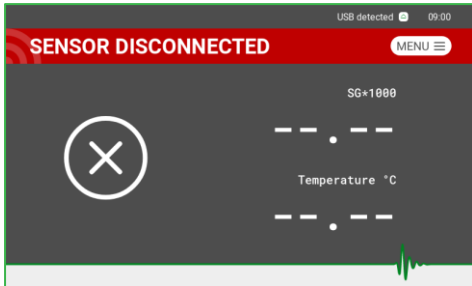
ACTIVE	TIME-OUT
<p>Color: Yellow Status: Value out of range Output: Valid</p> <p>Info: Device is operating outside specified range. Internal diagnoses indicate deviations from measured or set values.</p> 	<p>Color: Yellow Status: Value out of range Output: Valid</p> <p>Info: Device is operating outside specified range. Internal diagnoses indicate deviations from measured or set values.</p> 
<p>Color: Blue Status: Maintenance required Output: Valid</p> <p>Info: Maintenance is required.</p> 	<p>Color: Blue Status: Maintenance required Output: Valid</p> <p>Info: Maintenance is required.</p> 
<p>Color: Red Status: Failure Output: Invalid</p> <p>Info: Replace device.</p> 	<p>Color: Red Status: Failure Output: Invalid</p> <p>Info: Replace device.</p> 

Table 6-3: SDM ECO states and modes – Yellow, blue and red colored

6.3 Operation via SDM ECO display and buttons



NOTE

AN OVERVIEW OF THE COMPLETE MENU TREE IS AVAILABLE IN CHAPTER 13.3 ON PAGE 115.

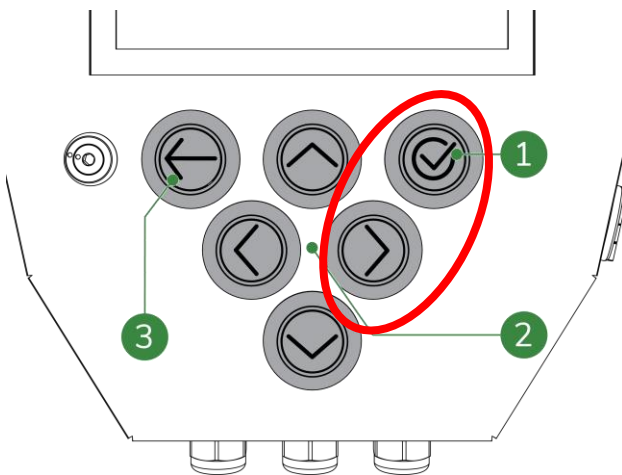


NOTE

THE SDM ECO SOFTWARE IS REGULARLY UPDATED. SCREEN IMAGES WITHIN THIS MANUAL MIGHT DIFFER FROM YOUR ACTUAL SCREEN IMAGE.

6.3.1 Power on the SDM ECO

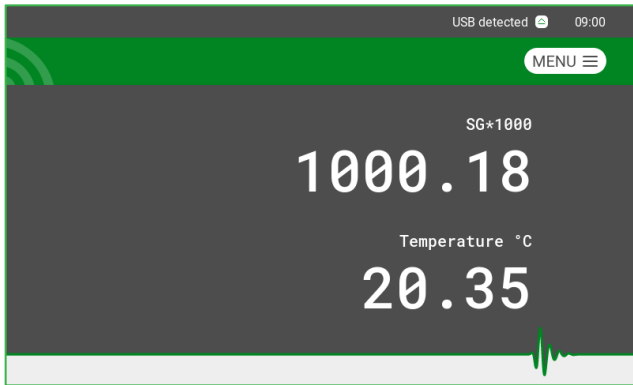
To power on the SDM ECO, press the two buttons below for 6 seconds. The screen will blink. Release the buttons and wait for the device to power on. This can take 60 seconds.




6.3.2 Home page

The first page seen when the SDM ECO is starting up is the *Software Page*, see Figure 6-6 on page 72. When a key is pressed in time-out mode, the *Home Page* will be shown. The *Home Page* contains measurement values.

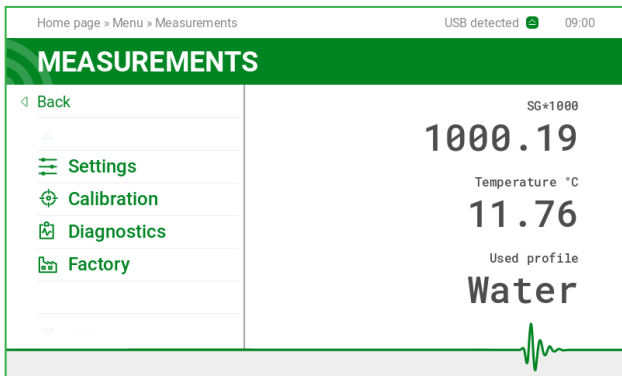
SDM ECO SG:



6.3.3 Main menu

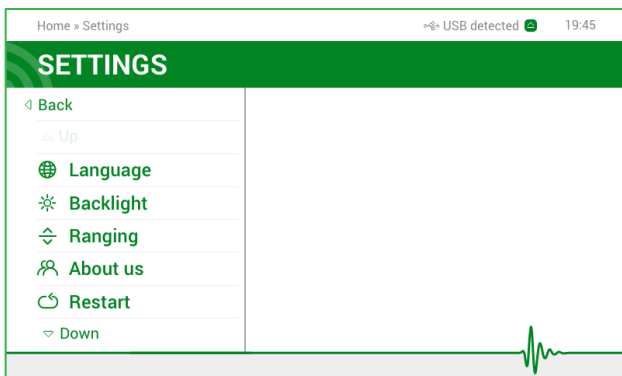
On the *Home Page* press **MENU**  to go to the *Main Menu*.
In the *Main Menu* you can choose from these options:

- Settings
- Calibration
- Diagnostics
- Factory



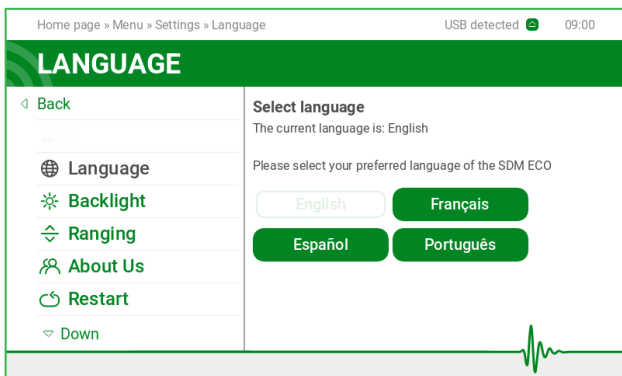
6.3.4 Settings

Main Menu -> *Settings*
Select a setting.



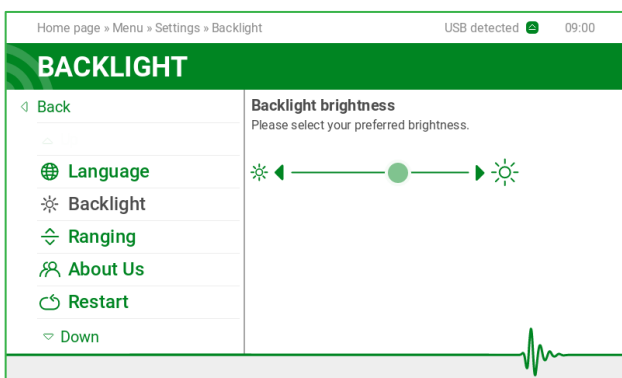
6.3.5 Language

Main Menu -> Settings -> Language.
Select a language.



6.3.6 Backlight

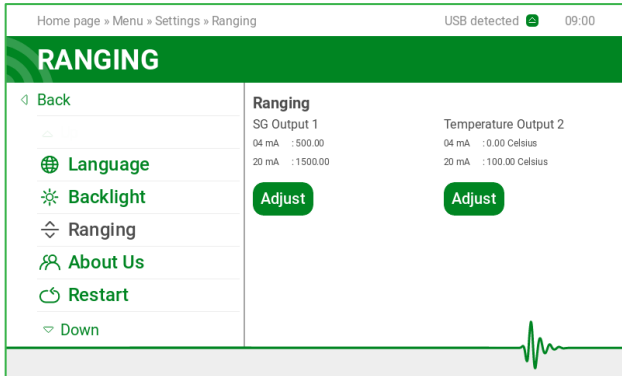
Main Menu -> Settings -> Backlight.
On the SDM ECO you can set *Backlight* brightness.



6.3.7 Ranging

Main Menu -> Settings -> Ranging.

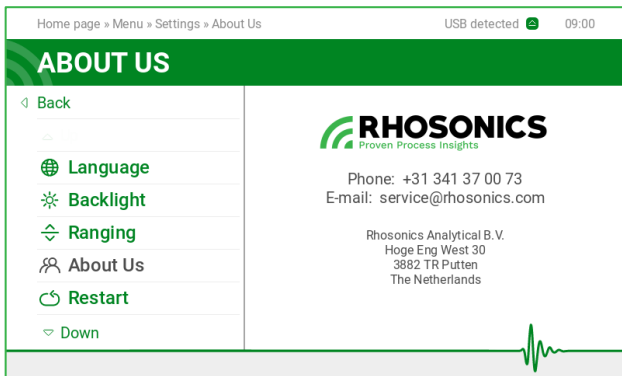
On the SDM ECO you can set *Ranging*. On this page the upper and lower range value can be set for two analog outputs. *Adjusting* output mA range is used to assign which value is corresponding to the 4mA and 20mA range of the analog output. As a consequence the mA out will go into the out of range modus, when the measured value will go out of this range.



6.3.8 About us

Main Menu -> Settings -> About us.

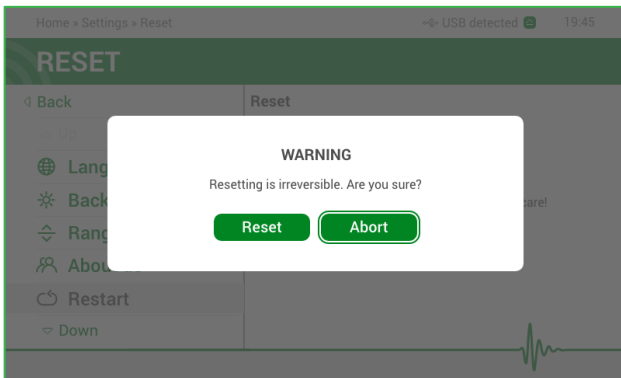
On the *About us* page, information on Rhosonics is displayed.



6.3.9 Restart

Main Menu -> Settings -> Restart.

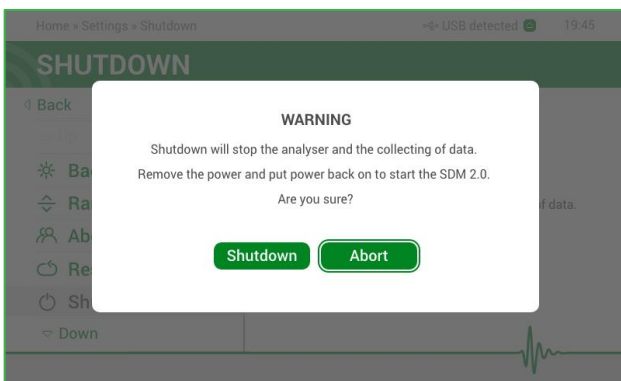
With the *Restart* option, the SDM ECO will be rebooted.



6.3.10 Shutdown

Main Menu -> Settings -> Shutdown.

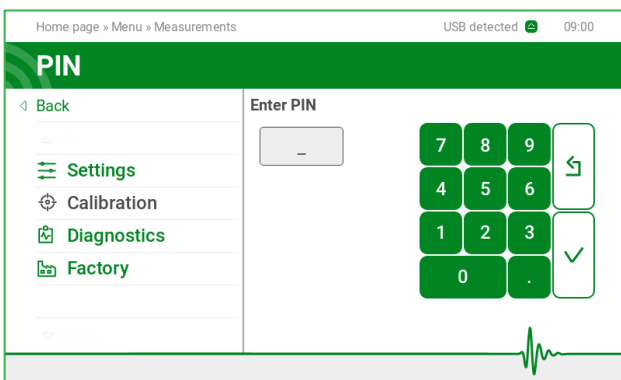
With the *Shutdown* option, the SDM ECO will be shut down.



6.3.11 Calibration

Main Menu -> Calibration.

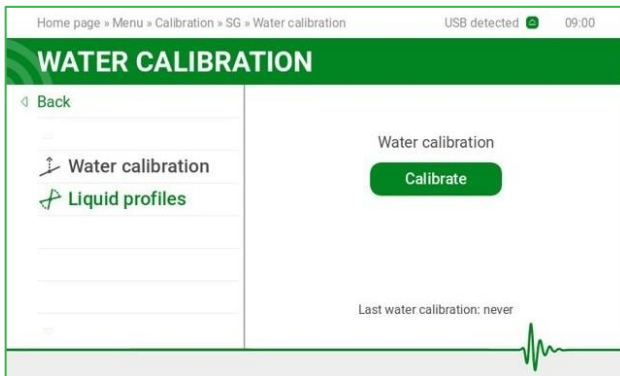
Within the *Calibration* menu, several calibration options are available. This menu is protected with PIN access to prevent unauthorized use (PIN: **20488**).



6.3.12 Multi-point calibration (MPC)

Main Menu -> Calibration -> SG -> Water calibration.

See chapter 7.2: Multi-point calibration for multi-point calibration.



6.3.13 Temperature

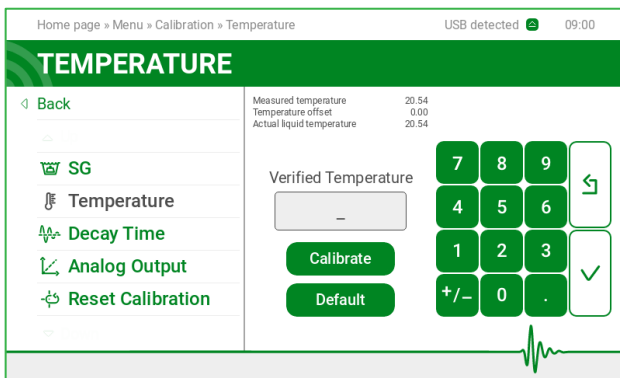


NOTE

FOR DETAILED INSTRUCTIONS ON HOW TO RETRIEVE THE MENTIONED VALUES FOR A CORRECT CALIBRATION, CONSULT CHAPTER 7.

Main Menu -> Calibration -> Temperature.

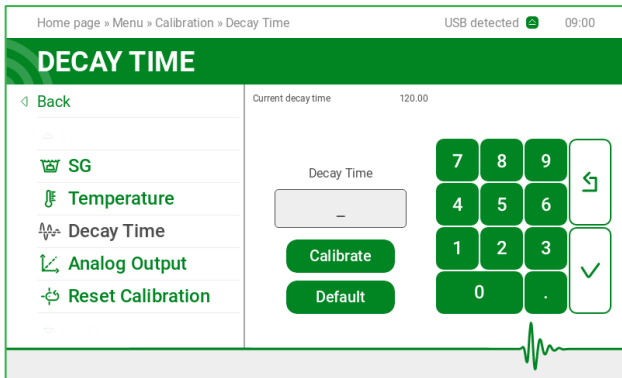
Within the *Temperature* menu, the calibration values for the temperature can be set.



6.3.14 Decay Time

Main Menu -> Calibration -> Decay Time.

A Decay Time of 20 seconds is the default setting. This setting is sufficient for most applications. For a faster response time the Decay Time should be set lower, resulting in higher noise. For lower noise the Decay Time should be set higher, resulting in a slower response time.

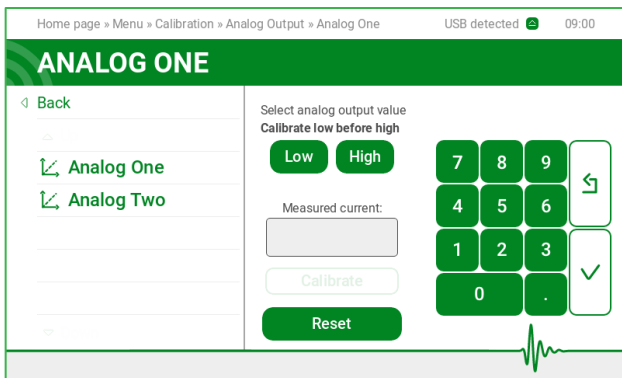


6.3.15 Analog Output


Main Menu -> Calibration -> Analog output.

With the Analog output the two analog outputs can be calibrated. Often, SG is chosen for output one and temperature is chosen for output two. For each output an upper and lower range value can be set. Setting Output mA range is used to assign which value is corresponding to the 4mA and 20mA range of the analog output. As a consequence the mA out will go into the out of range modus, when the measured value will go out of this range.

Use a multimeter for measurements needed to calibrate the 4-20mA values within this menu.



6.3.16 Reset Calibration

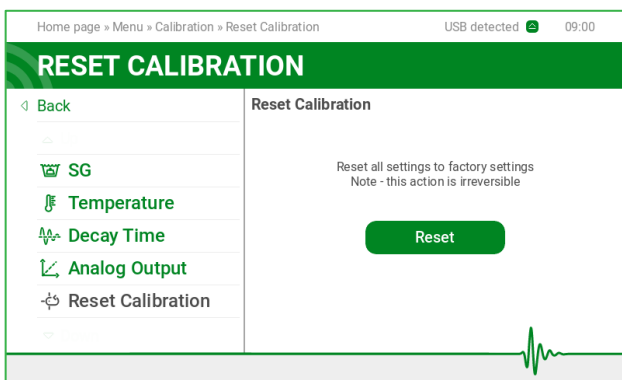


CAUTION

READ THIS SECTION CAREFULLY BEFORE STARTING. PAY ATTENTION BEFORE PRESSING *RESET*. IF ACCEPTED, ALL CALIBRATIONS WILL BE LOST AND RESET TO FACTORY SETTINGS.

Main Menu -> Calibration -> Reset calibration.

With the *Reset calibration* option, all the calibration values will be reset to the factory settings.



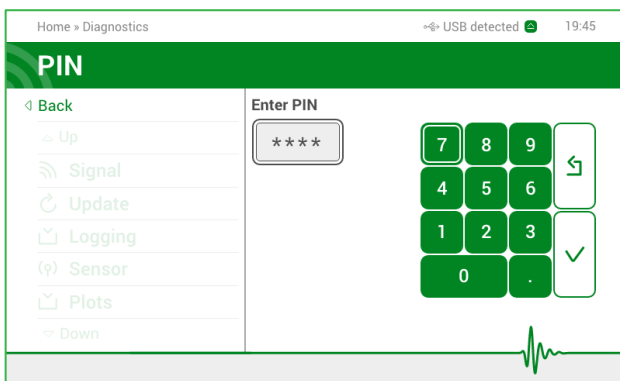
6.3.17 Diagnostics

Main Menu -> Diagnostics.

Within the *Diagnostics* menu, several diagnostic options are available to have a closer look at issues and performances. This menu is protected with PIN access to prevent unauthorized use (PIN: 20488).

Within the *Diagnostics* Menu you can choose from 8 options:

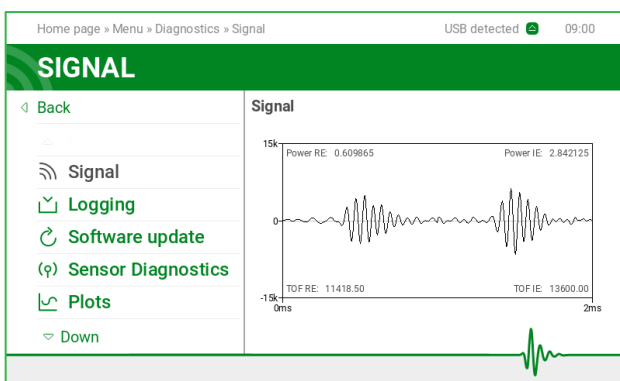
- Signal
- Logging
- Update
- Sensor
- Plots
- Date & time
- Diagnostic values
- Error log



6.3.18 Signal

Main Menu -> Diagnostics -> Signal.

Within the *Signal* screen, a line is displayed on a graph, visualizing the sensor's signal.



6.3.19 Logging



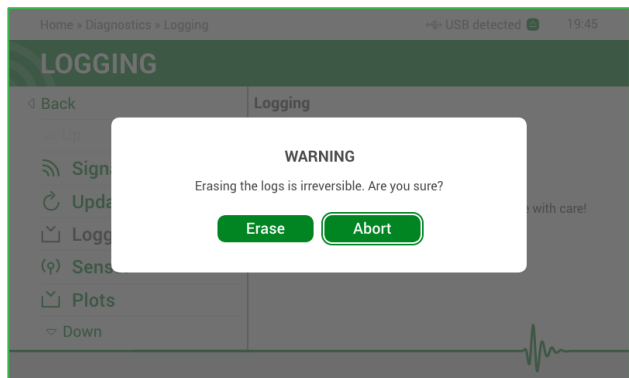
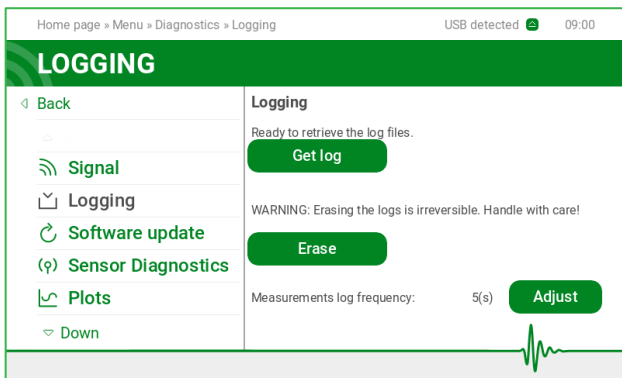
NOTE

THE LOGGING FILE CAN CONTAIN A MAXIMUM OF 65000 DATA ENTRIES .

Main Menu -> Diagnostics -> Logging.

The SDM ECO is constantly logging. This has the advantage that the log can be accessed after an incidental measurement error. When starting a test, it may be necessary to clear the log data. To make sure the time settings are correct, check the date and time, see chapter 6.3.22. Use an USB stick with flashing light and max capacity of 16GB.

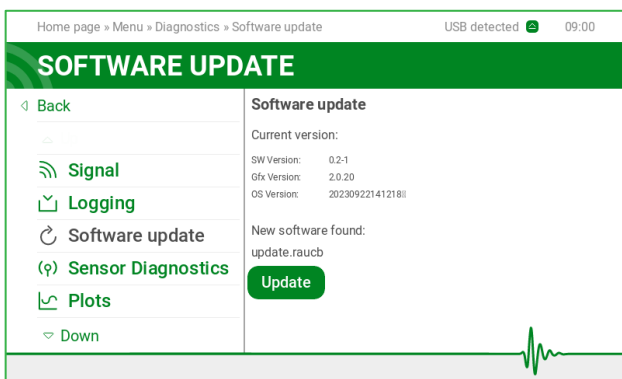
- *Get log* This function is used to retrieve the log by inserting an USB stick, see chapter 6.4.
- *Erase* This function is used to permanently erase the existing log data.
- *Adjust* This function is used to adjust the logging interval.



6.3.20 Update

Main Menu -> Diagnostics -> Update.

The *Update* menu displays the current software version. With the *Update* button, a software update via USB stick can be executed. For updating software via USB stick, see chapter 6.4.1.

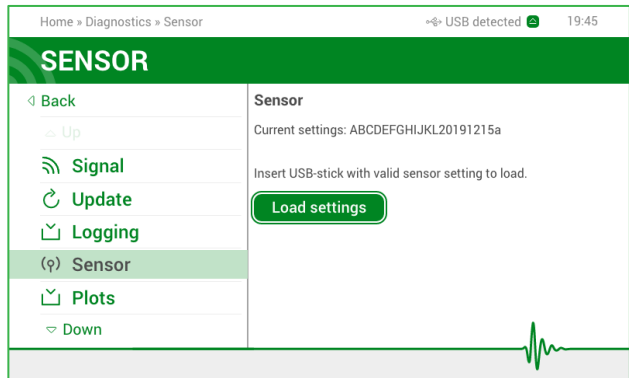
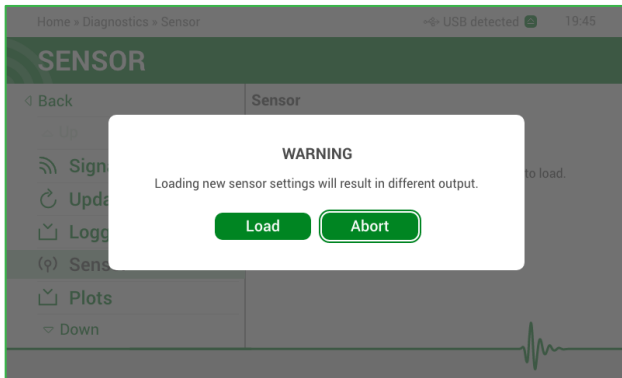


6.3.21 Sensor

Main Menu -> Diagnostics -> Sensor.

On this page you will find information on the sensor settings.

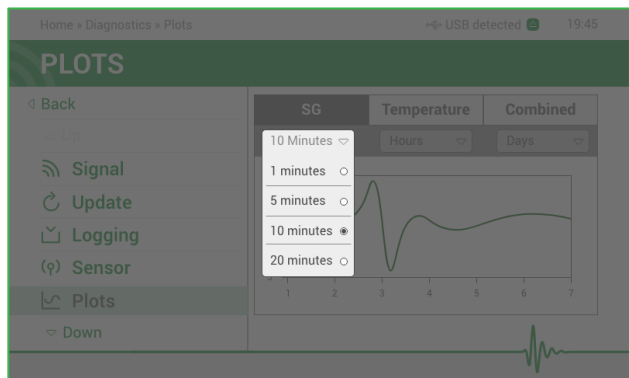
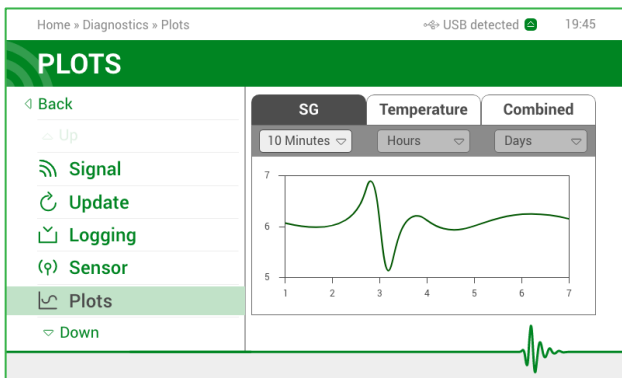
Optionally, new sensor setting can be loaded, see chapter 6.4.3.



6.3.22 Plots

Main Menu -> Diagnostics -> Plots.

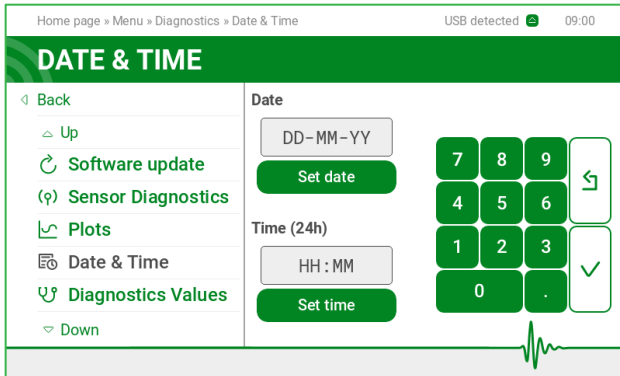
With *Plots*, detailed analyses can be done on measurements concerning SG, temperature and these two combined. Several time intervals are available to select.



6.3.23 Date & time

Main Menu -> Diagnostics -> Date & time.

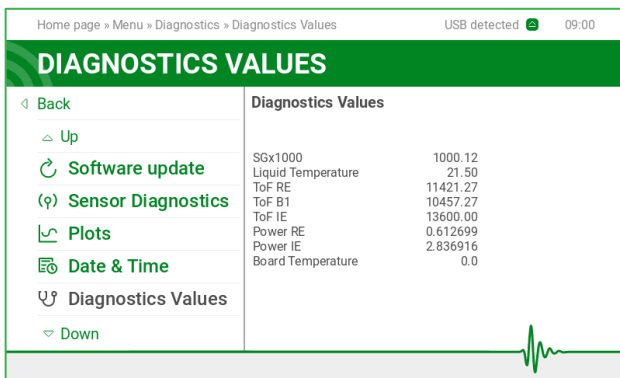
Although the time and date are set automatically, errors might occur. Within the menu *Date & time*, these values can be set. Please set to the local date and time. The timestamps are used in calibration, troubleshooting and to interpret the log files.



6.3.24 Diagnostic values

Main Menu -> Diagnostics -> Diagnostic values.

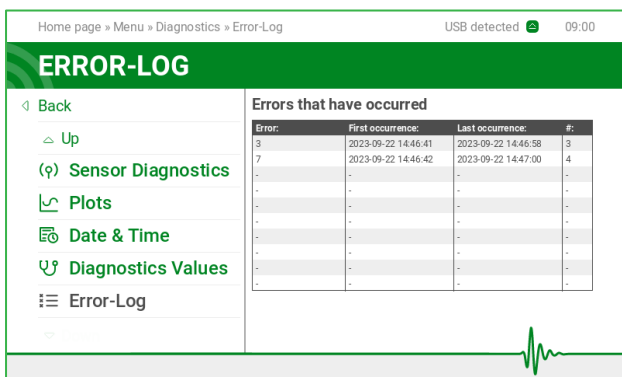
If an error or colored screen appeared, the *Diagnostic values* menu lists this occurrence and the source.



6.3.25 Error log

Main Menu -> Diagnostics -> Error log.

If an error or colored screen appeared, it is collected and stored within the *Error log*.



6.3.26 Factory



NOTE

THE *FACTORY* MENU OPTIONS ARE NOT APPLICABLE FOR DAILY USERS AND/OR OPERATORS.

6.4 Operation via USB

The SDM ECO has two USB-ports:

- a HMI USB-port (Figure 6-2, pos. 1) is located on the bottom side of the HMI;
- a SDM ECO USB-port (Figure 6-3, pos. 1) is located behind the front lid of the SDM ECO.

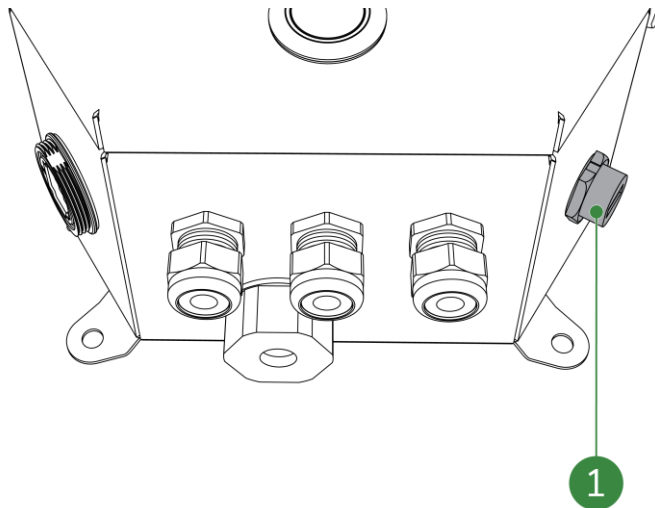


Figure 6-2: HMI USB-port

The HMI USB-port is used for:

- software updates;
- saving settings and log data;
- load sensor settings.

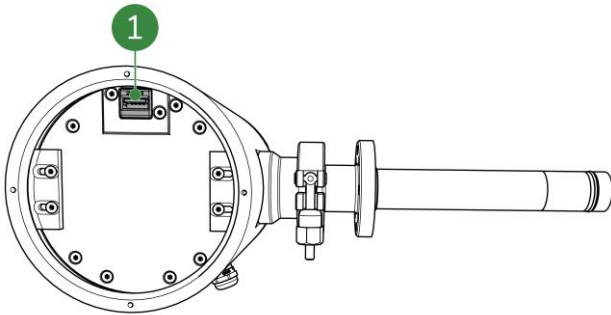


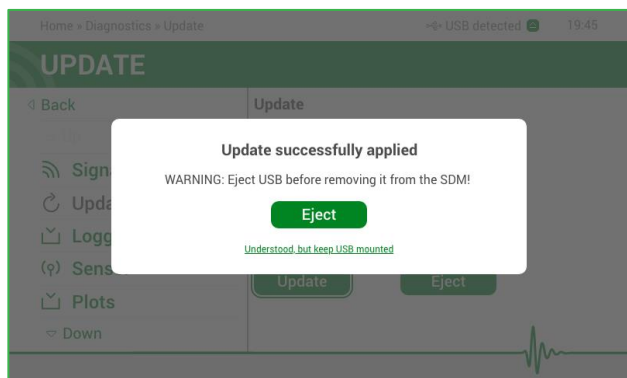
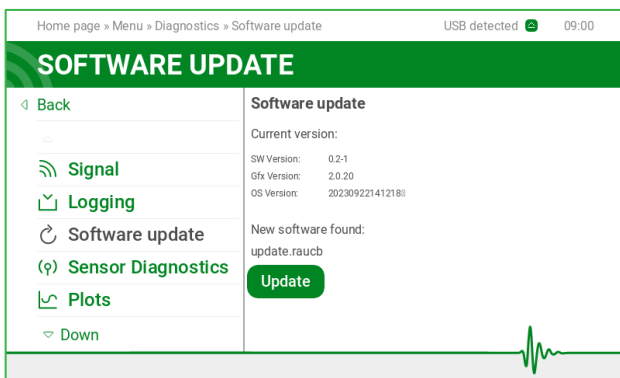
Figure 6-3: SDM ECO USB-port

The SDM ECO USB-port is used for updating software transmitter.

6.4.1 Updating the HMI software via USB

To update the software on the HMI:

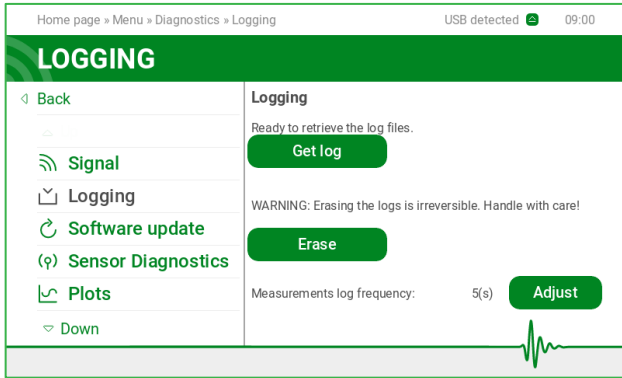
1. On the HMI, choose: *Main Menu -> Diagnostics -> Update.*
2. Insert an USB stick with the latest software and the file bootscript.img.
3. Select *Update.*
4. Wait until the *Update successfully applied* screen appears.
5. Select *Eject* to eject the USB stick.
6. Disconnect the USB stick.




6.4.2 Saving log data via USB

To log data onto an USB stick:

1. On the HMI, choose: *Main Menu -> Diagnostics -> Logging.*
2. Insert the supplied empty Rhosonics USB stick for collecting log files.
3. Select *Get log.*



4. Wait until a confirmation appears. This might take several minutes.
5. Select the  icon in the top right corner to safely eject the USB stick.
6. Disconnect the USB stick.

The table below shows the files that are saved:

Filename	Description
Data_debuglog.log	Data for Rhosonics to debug by problems
Data_measurementlog.log	Log file of the measured data
Guilog.log	Log of the interaction on the screen Folder settings_GUI
Factorysettings.json	Factory settings file
Sessionsetting.json	Settings regarding the model and sensor
Usersettings.json	User settings such as span and offset

Send all the files to service@rhosonics.com when you need any service of the SDM ECO.


Saving settings and logging can be done for diagnostics evaluation and for troubleshooting. When a log-file is stored to the USB stick the settings from the SDM ECO will be stored as well. The settings from the SDM ECO can then be interpreted by the factory.

6.4.3 Load sensor settings


Before uploading the sensor file, you need to make sure:

- To restore the calibrations, see chapter 6.3.12.
- To erase the log data, see chapter 6.3.18.
- The Sessionsetting.json file has the same software version as the SDM ECO transmitter:
 - To check the current software version of the SDM ECO transmitter, see chapter 6.5 (see chapter 6.3.8 for rebooting);
 - To check the software version of the file, open the Sessionsetting.json file from the supplied USB stick on a computer in excel and compare column B1 with the software version of the transmitter.

1. Select *Main Menu* -> *Diagnostics* -> *Sensor*.
2. Place the USB stick with Sessionsetting.json file.
3. Select *Load settings*.
4. Accept overwrites sensor settings by selecting *Load*.

5. Wait until the process finishes and press back.
6. Click the  icon in the top right corner to safely eject the USB stick.
7. Remove the USB stick.

6.4.4 Updating the SDM ECO software via USB

	<p>CAUTION</p> <p>ONLY UPDATE THE SDM ECO SOFTWARE IF INSTRUCTED BY RHOSONICS.</p>
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To update the software on the SDM ECO:

1. Power off the SDM ECO by interrupting the power supply.
2. Loosen the 4 socket head screws (Figure 6-4, pos. 1) on the outer side of the frontal lid.

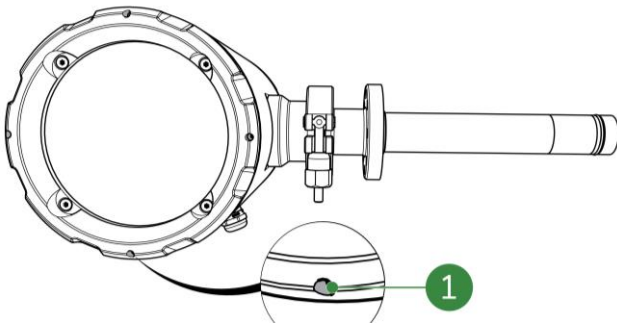


Figure 6-4: Frontal lid socket head screws

3. Remove the frontal lid.
4. Insert an USB stick into the USB connector (Figure 6-5, pos. 1) with the latest software.

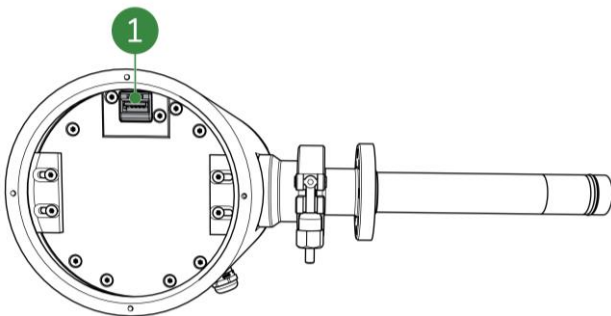


Figure 6-5: SDM ECO USB connector

5. Power on the SDM ECO by restoring the power supply.
6. Wait a few minutes.

7. Disconnect the USB stick.
8. Place the frontal lid.
9. Tighten the 4 socket head screws (Figure 6-4, pos. 1) on the outer side of the frontal lid.

6.5 Checking the software version

To check the software version:

1. On the HMI, select *Main Menu* -> *Diagnostics* -> *Update*.
The software version displays on the right side of the screen.

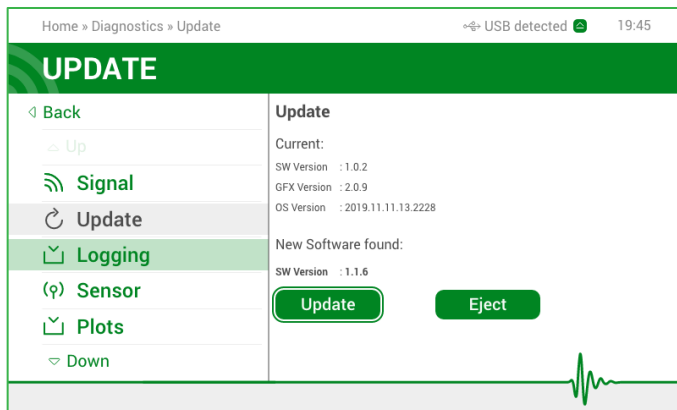


Figure 6-6: Software version

7. CALIBRATION

CAUTION



THE SDM-SG MUST BE CALIBRATED FOLLOWING THE SDM-SG CALIBRATION METHOD. THE SDM-WT% MUST BE CALIBRATED FOLLOWING THE SDM-WT% CALIBRATION METHOD.

MIXING UP CALIBRATION METHODS WILL RESULTS IN INCORRECT READINGS.

7.1 How ultrasonic sound is transformed into density values

The density of slurry is measured through acoustic impedance, see Figure 7-1.

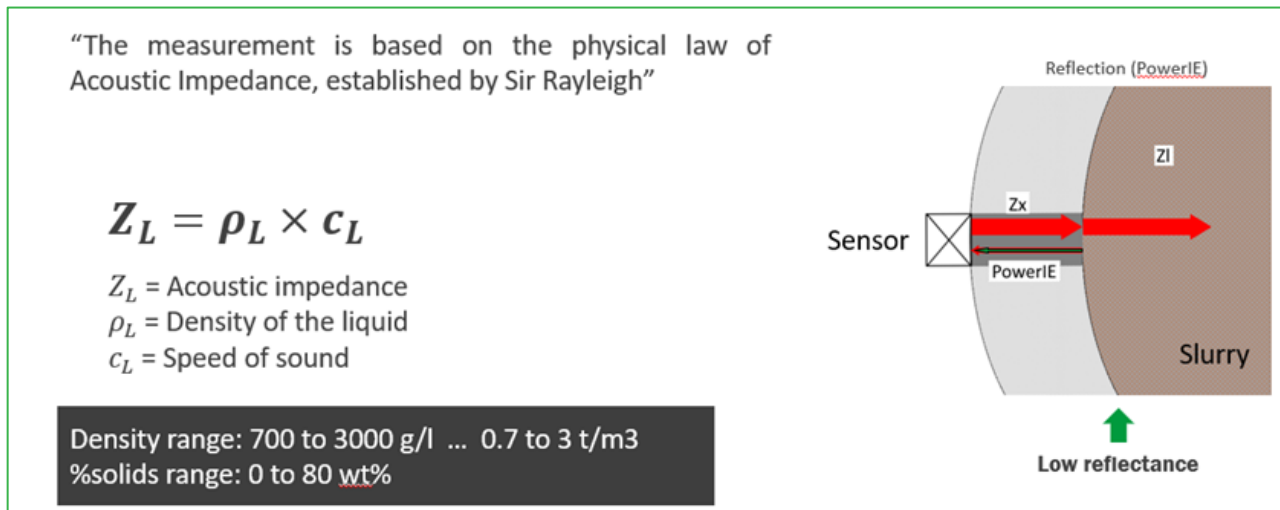


Figure 7-1: Basics of acoustic impedance

7.2 General description Multi-point calibration

MPC (Multi-point calibration) is a system that allows you to create liquid profiles using one or more calibration points, for improved accuracy. Using MPC you can:

- perform water calibration (on distilled water), without invalidating already-created liquid profiles (see chapter 7.3.2);
- create and maintain liquid profiles (see chapter 7.3.3);
- sample calibration points (see chapter 7.3.6);
- configure a super profile (see chapter 7.3.8).

7.3 MPC GUI interface

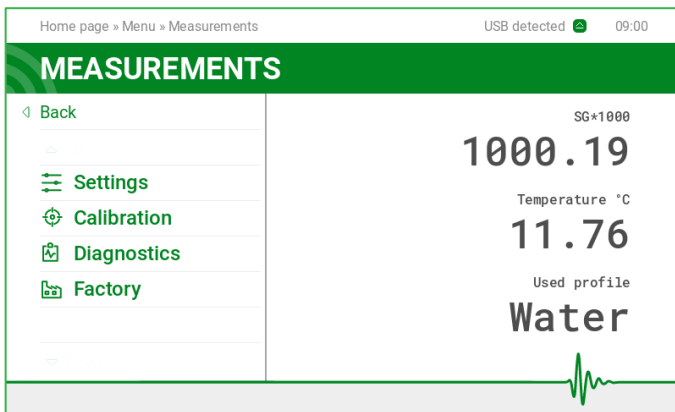
7.3.1 Used profile

The used profile is the profile used for calculating SG. By default and until another profile is created, it is the water profile, which is a system-managed profile.

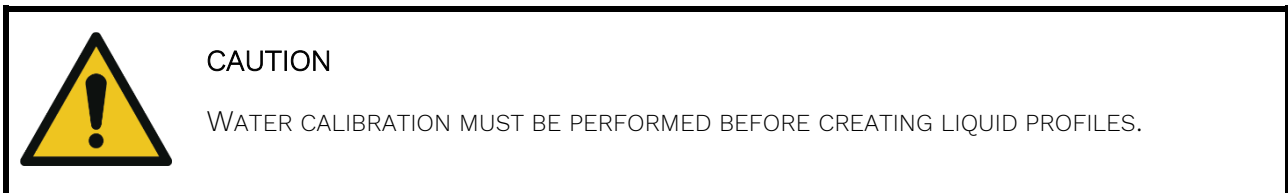
To check which profile is currently used for the SG calculations:

1. On the HMI, choose: *Main Menu -> Measurements*.

The current measurements (SG and temperature) as well as the used profile will be displayed.

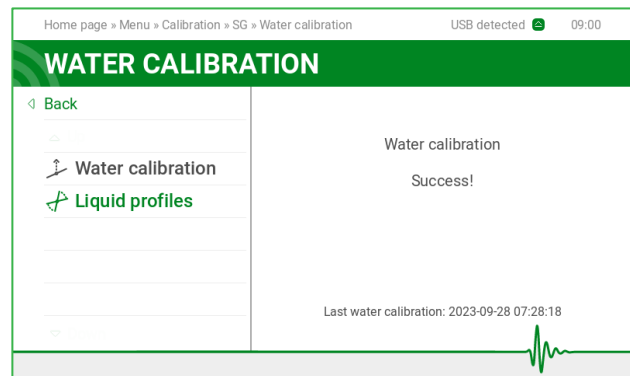
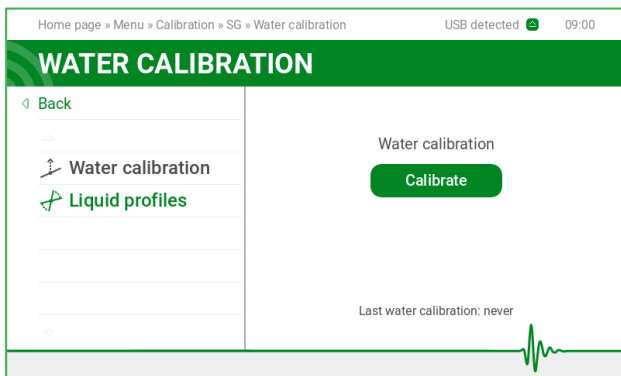


7.3.2 Water calibration



1. On the HMI, choose: *Main Menu -> Calibration -> SG -> Water Calibration*.
2. Run distilled water through its pipes or submerge the sensor tip in distilled water.
3. Click 'Calibrate'.

The operation should take between 10-50 seconds (depending on MPC settings).





NOTE

TEMPERATURE MUST BE CALIBRATED TO PERFORM WATER CALIBRATION CORRECTLY.



NOTE

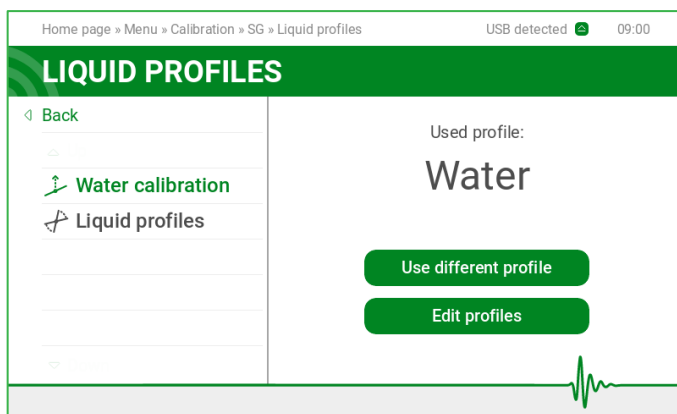
MAKE SURE NO BUBBLES ARE COVERING THE TIP OF THE SENSOR WHEN PUT IN DISTILLED WATER.

7.3.3 Liquid profiles homepage

After performing the system’s first water calibration, the liquid profile homepage becomes accessible. This screen shows the currently used profile with the water profile as default.

From this screen you can:

- change the used profile to a different profile;
- edit profiles;
- create new profiles.



7.3.4 Creating a new profile

To create a new profile:

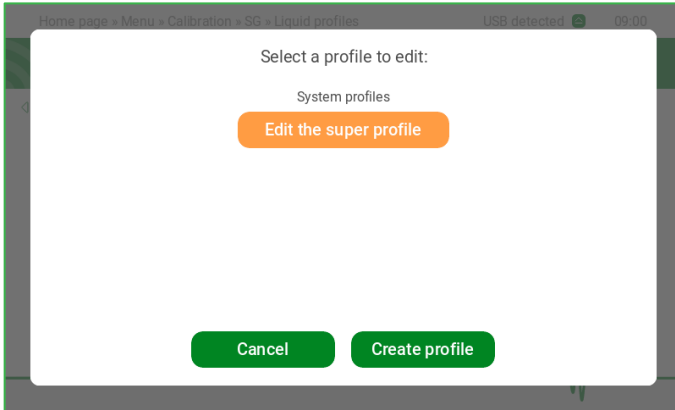
1. On the HMI, choose: *Main Menu -> Calibration -> SG -> Liquid profiles.*
2. Click on the ‘Edit profiles’ button.

The system will show a list of user and system profiles to edit.

Profiles that are ready to be used, are marked with green. Profiles that are not ready to be used, are marked with orange. The orange profiles require action in order to make them usable.



3. Select the profile that you want to edit.
4. Click the ‘Create profile’ button.



NOTE

YOU CAN CREATE UP TO 5 DIFFERENT USER LIQUID PROFILES.

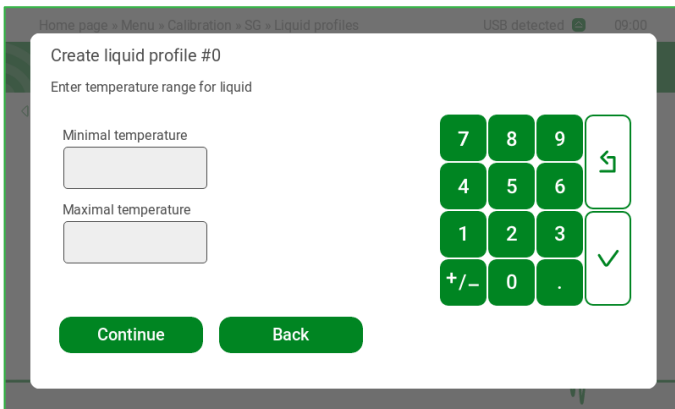


NOTE

THE WATER PROFILE CANNOT BE EDITED.

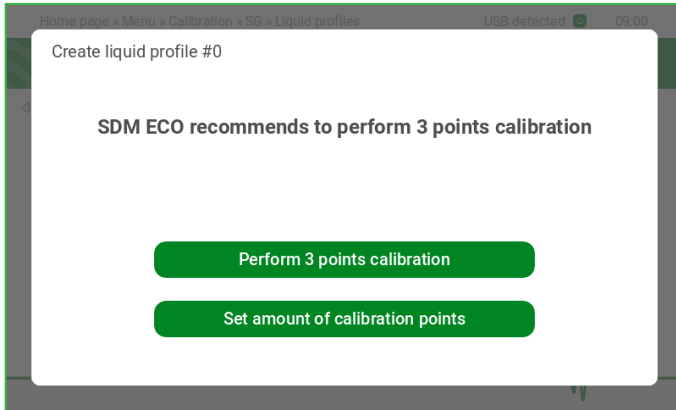
The next screen will ask you to insert a temperature range in which the liquid will be measured. That range will help the SDM ECO define how many calibration points are required to cover the temperature range, and at which temperature each calibration point should be sampled.

5. Insert the minimal and maximal temperature.
6. Click the ‘Continue’ button.



The following screen will show the amount of calibration points the SDM ECO recommends you to perform, based on the given temperature range. Here you can either agree to the recommendation or set the amount of calibration points manually.

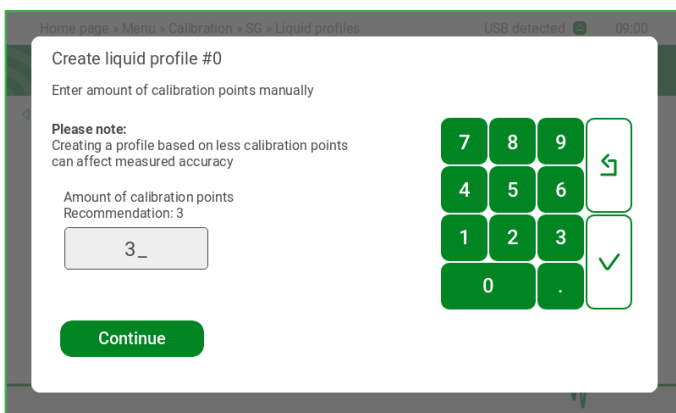
7. Click the ‘Perform x points calibration’ button, or



8. Click the ‘Set amount of calibration points’ button.

A new screen opens. Here you can enter the amount of calibration points you want (between 1 and 5).

9. Enter the amount of calibration points.
 10. Click the ‘Continue’ button.



The following screen will be the new profile dashboard, showing information about the profile, and the state of the liquid’s calibration points.

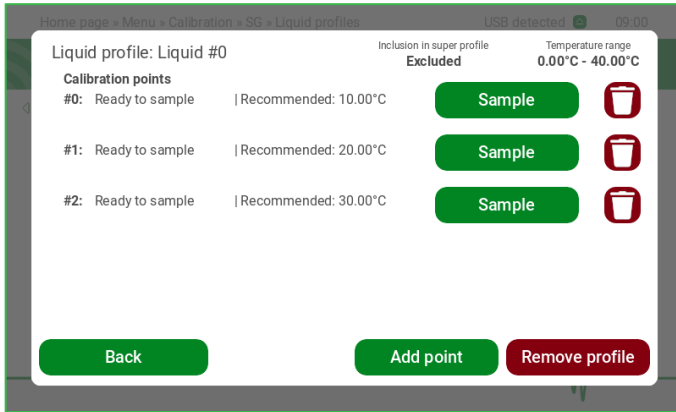
7.3.5 The profile dashboard

The profile dashboard shows you useful information regarding the profile, such as:

- whether the profile is included or excluded from the super profile (excluded as default);
- the temperature range of the liquid profile;
- the profile’s calibration points status;
- the recommended temperature to sample the calibration point.

From this dashboard you can perform operations relevant to the calibration points:

- sample the calibration points;
- remove a calibration point (for example, in case of bad sampling);
- add a calibration point (up to 5);
- remove the profile entirely.

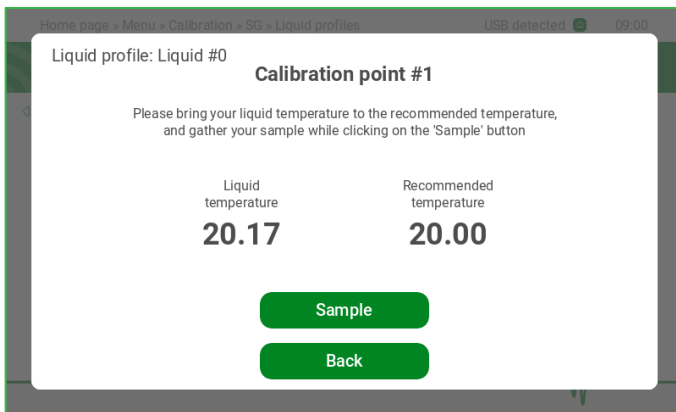


7.3.6 Sampling a calibration point

1. On the profile dashboard: click the ‘Sample’ button.

A screen will appear asking you to bring the liquid temperature as close to the recommended temperature as possible.

2. Bring the liquid temperature as close to the recommended temperature as possible.
3. Click the ‘Sample’ button.

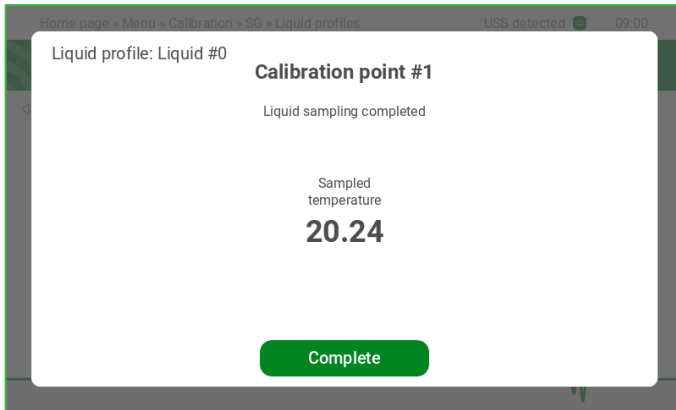


NOTE

THE SAMPLE MUST BE GATHERED AT THE SAME TIME THE SDM ECO SAMPLES THE LIQUID.

The sampling process should take about 10-50 seconds, depending on MPC settings.

After completing the sampling process, the next screen will show the sample temperature.

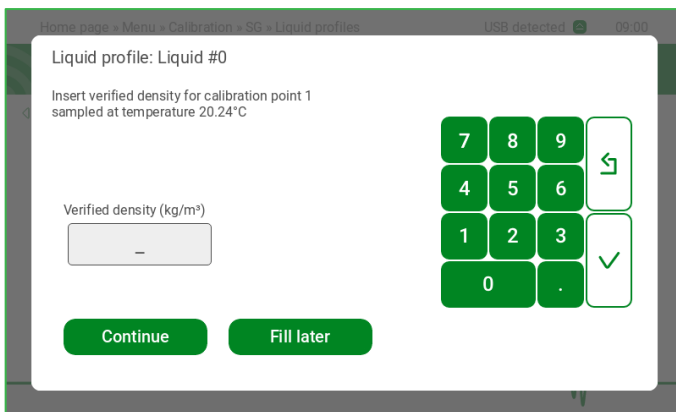


4. Click the 'Complete' button.

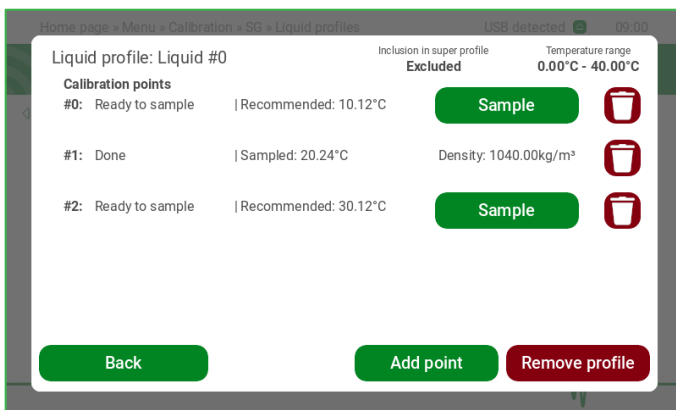
A new screen will appear. In order to complete the calibration point's calibration you have to test the density of your gathered sample with the noted temperature, and fill it in.

5. Enter the value of the verified density.

6. Click the 'Continue' button.



The following screen will appear. The calibration point's calibration is completed.



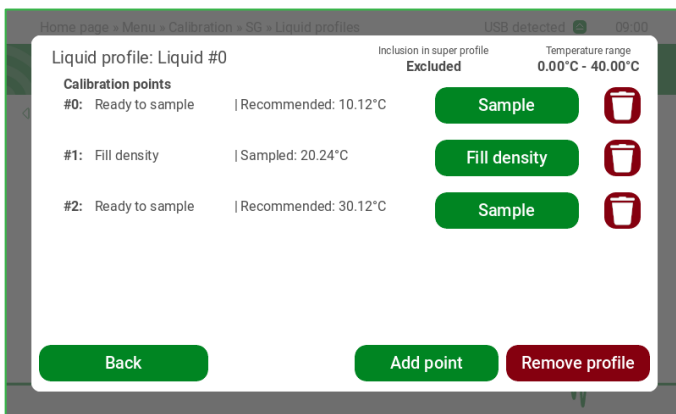


NOTE

YOU CAN DECIDE TO ENTER THE DENSITY VALUE LATER (FOR EXAMPLE, IN CASE THE DENSITY IS YET UNKNOWN).

In case you decide to enter the density at a later time, you can always return to this screen from the profile’s dashboard, by selecting ‘Fill density’. In this case you will have to click the ‘Fill later’ button.

The following screen shows you the profile dashboard from where you can select ‘Fill density’.

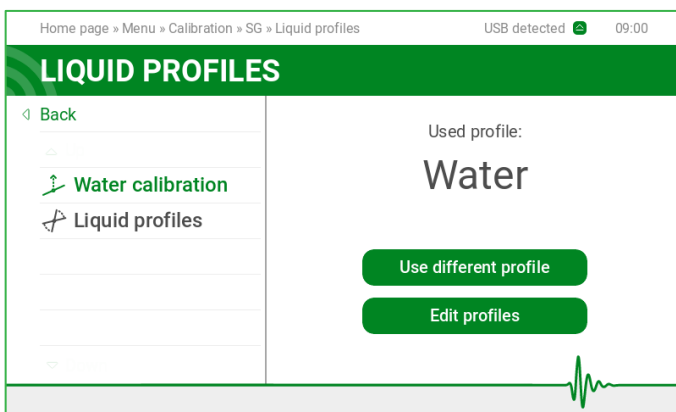


7.3.7 Using an available profile

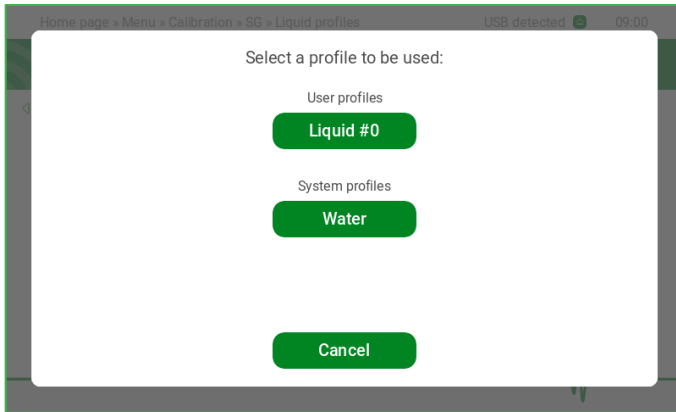
An available profile is a profile which has at least one calibration point that has been calibrated (state of “done”). Since that profile has at least one calibration point, it has coefficients calculated for it by MPC, and can be used as the active profile.

On the liquid profiles homepage, you can select ‘Use different profile’.

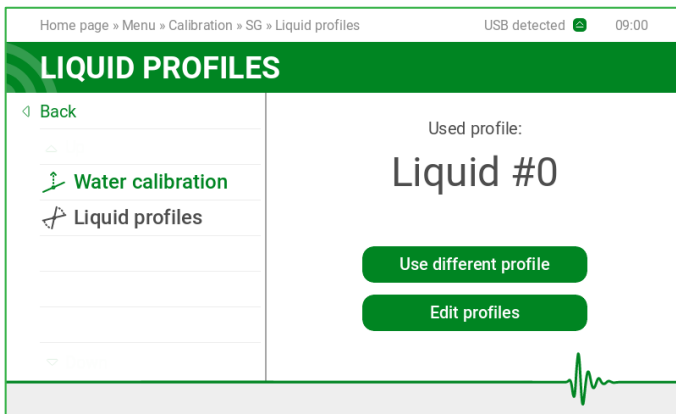
1. On the HMI, choose: *Main Menu -> Calibration -> SG -> Liquid profiles.*
2. Click on the ‘Use different profile’ button.



The following screen lists all ready profiles. You can now select the profile to be used.



Once selected, the used profile will appear on the liquid profiles homepage screen, and will be used for SG calculations.



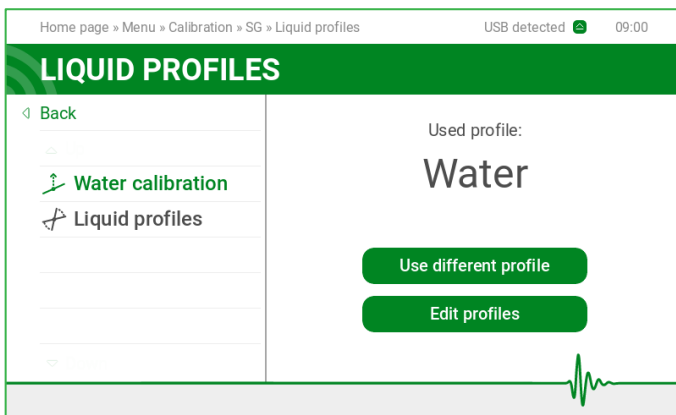
7.3.8 Configure and use the super profile

The super profile feature enables you to merge multiple user profiles into a single unified profile. This eliminates the requirement to switch between different user profiles each time the liquid being measured changes.

Additionally, the super profile significantly enhances measurement accuracy. By aggregating data from the calibrated user profiles, it generates a complex 3D plot that encompasses all calibration points. This results in improved accuracy both when measuring specific liquids and during transitions between different liquids.

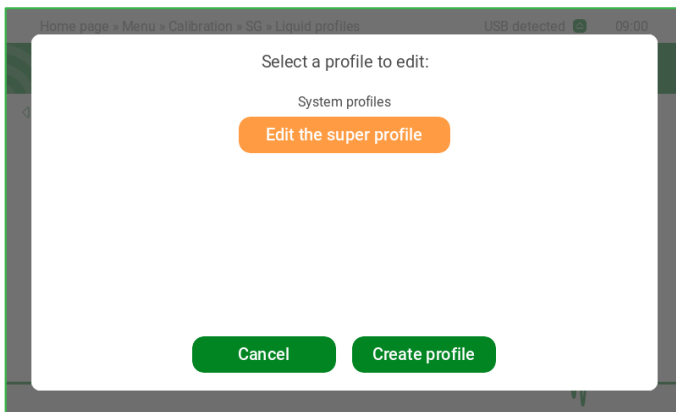
To enable the super profile:

1. On the HMI, choose: *Main Menu -> Calibration -> SG -> Liquid profiles.*
2. Click on the 'Edit profiles' button.



A new screen appears.

3. Select 'Edit the super profile'.



In the following screen, you can:

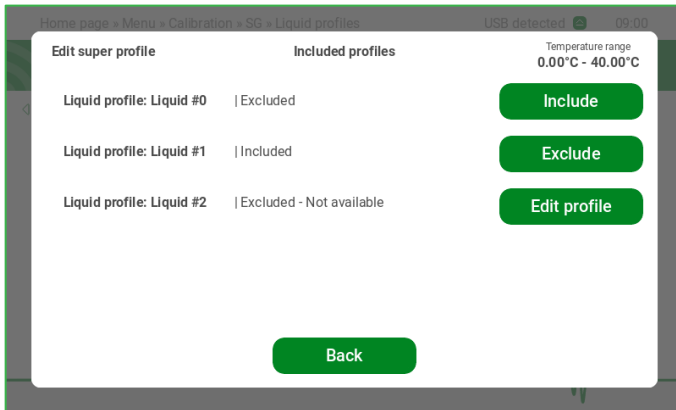
- view which profiles are used for the super profile;
- include liquid profiles;
- exclude liquid profiles.



NOTE

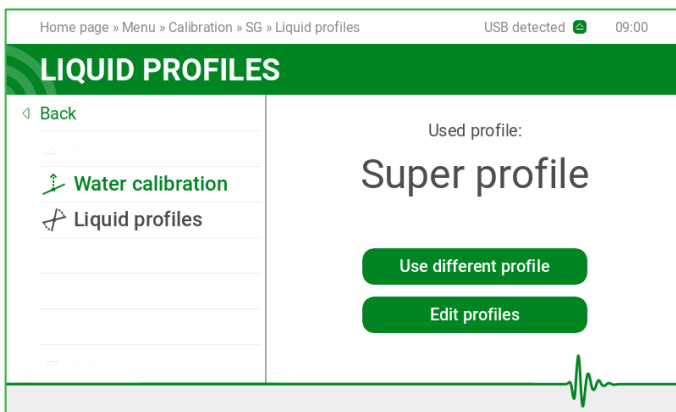
INCLUDED PROFILES ARE USED TO CREATE THE SUPER PROFILE, WHILE EXCLUDED PROFILES ARE NOT.

In the following example, there are 3 different user liquid profiles. The first one is excluded from the super profile, the second one is included and the third one is not a ready profile – therefore it cannot be included yet.



The super profile becomes available to be used once it has at least one included profile in it.

To select the super profile as the active profile, you have to navigate to the liquid homepage, select 'Use different profile' and select the super profile, see chapter 7.3.3.

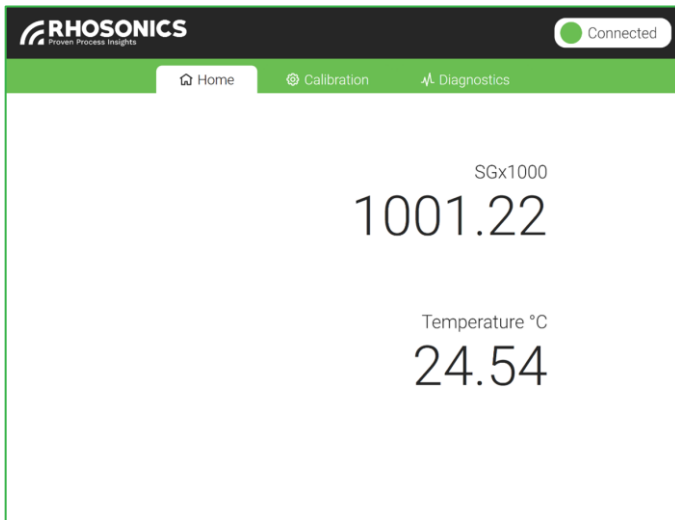


7.4 Webservice interface

The webservice is another method to interact with MPC. It enables you to:

- perform basic operations;
- change profile names to prevent confusion;
- identify profiles.

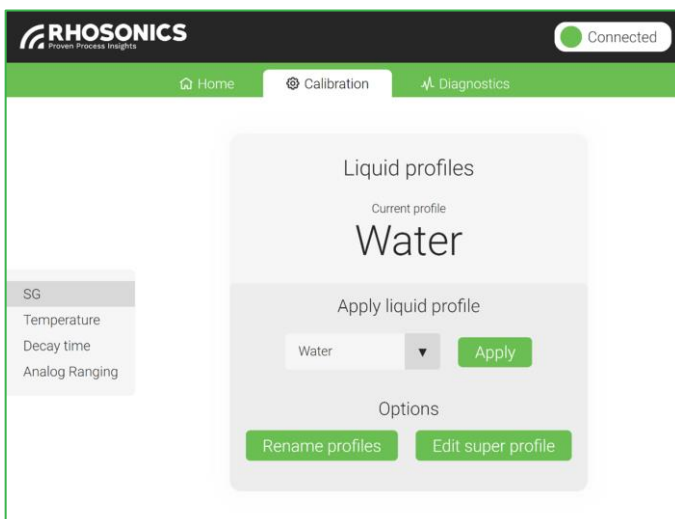
Below is an example of the webservice homepage with a clear reading of the current SG and temperature measurements.



7.4.1 Selecting a used profile

To select a used profile:

1. Navigate to the calibration tab.
2. Select 'SG' on the side panel.



The screen that appears shows the currently used profile.

To select a different profile:

1. Open the drop-down menu.
2. Select a different profile.
3. Click the ‘Apply’ button.

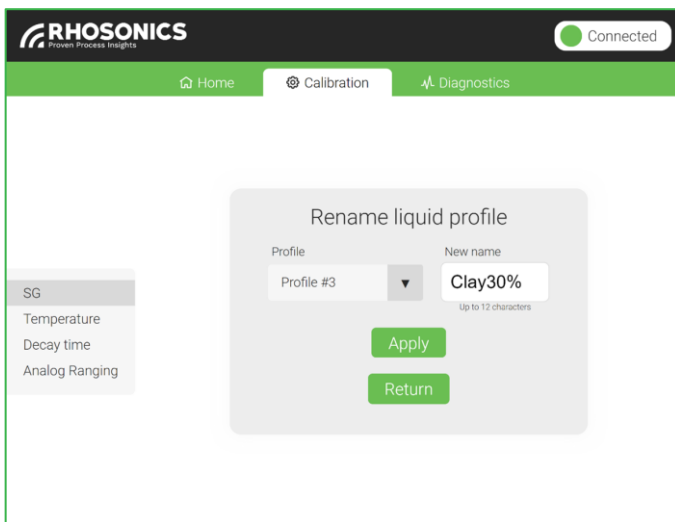
7.4.2 Renaming a profile

To rename a user profile:

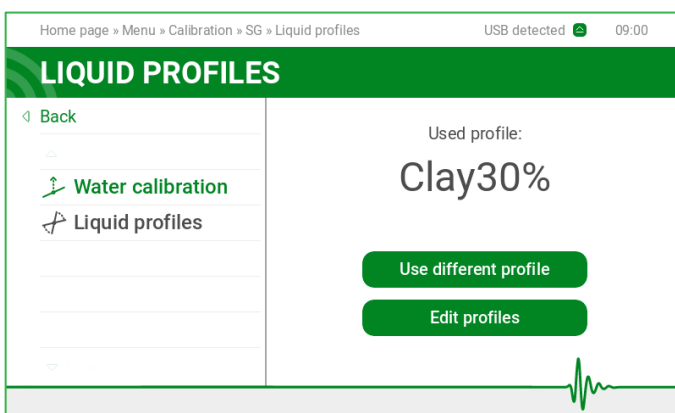
1. Navigate to the calibration tab.
2. Select ‘SG’ on the side panel.
3. Click on the ‘Rename profiles’ button.

The screen that appears allows you to rename the liquid profile.

4. Open the drop-down menu.
5. Select the profile you want to rename.
6. Enter the new name.
7. Click the ‘Apply’ button.



The new name also applies to the use of the HMI.

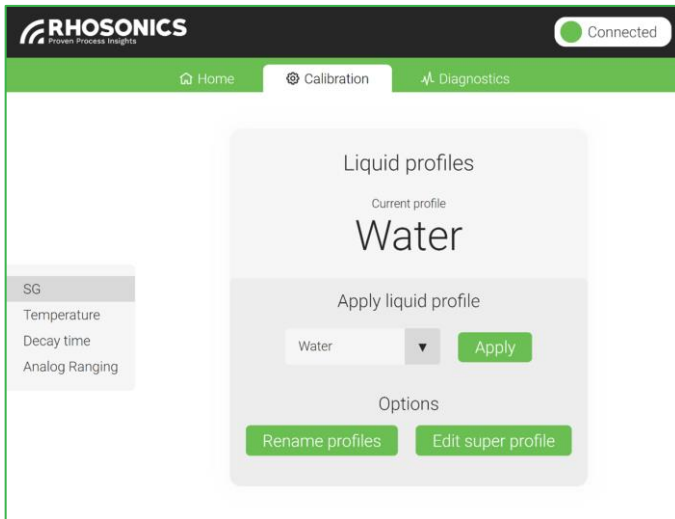


7.4.3 Editing the super profile

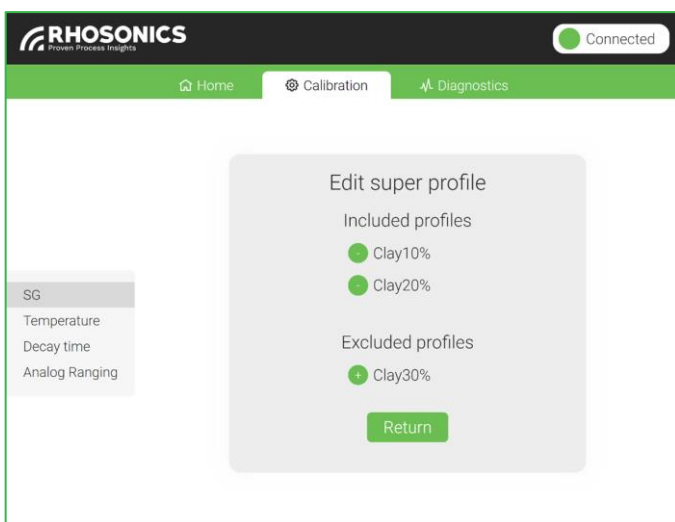
To include or exclude ready profiles from the super profile, you should select 'Edit super profile' from the SG calibration page.

To edit the super profile:

1. Navigate to the calibration tab.
2. Select 'SG' on the side panel.
3. Click on the 'Edit super profile' button.



The screen that appears shows you the current status of the super profile and what liquid profiles are included or excluded from the super profile. On this screen you can include or exclude profiles from the super profile, by clicking on the '+' or '-' symbols next to a profile name.



Only ready profiles can be included in the super profile. A ready profile is a profile which has at least one calibration point that has been calibrated.

8. MAINTENANCE

8.1 General maintenance tasks

The SDM ECO needs general maintenance every 3 – 6 months. Follow the general maintenance tasks below:

1. Check if the cable glands (Figure 8-1, pos. 2 and pos. 3) are tightened.
2. Check if the front and back lid (Figure 8-1, pos. 1 and pos. 4) are tightened.

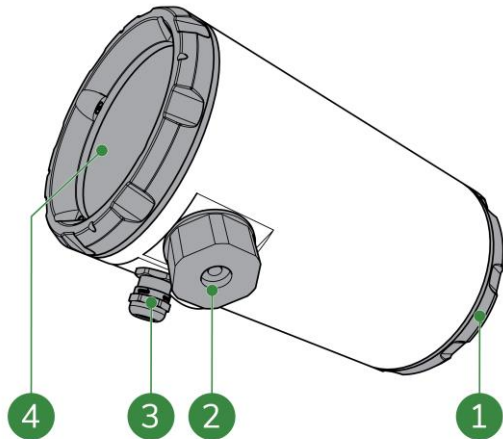


Figure 8-1: SDM ECO general maintenance parts



NOTE

FOR INFORMATION AND INSTRUCTIONS CONSIDERING SAMPLING METHODS, CONSULT THE MANUAL 'RHOSONICS SAMPLING PROCEDURE'.

3. Check the SDM ECO values. Take reference samples during a stable process / reading. Consult the manual 'Rhosonics sampling procedure'. In case of a deviation, take the following actions:
 - check the process temperature. Validate the set temperature of the SDM ECO;
 - pump water and perform a water calibration;
 - pump slurry and perform a slurry calibration;
 - remove the sensor and check for scaling and fouling, see chapter 8.2.3.

8.2 Detailed maintenance tasks

The SDM ECO needs detailed maintenance every 3 – 6 months for the:

- tri clamp, see chapter 8.2.1;
- transmitter and sensor connections, see chapter 8.2.2;
- sensor, see chapter 8.2.3;
- sensor settings, see chapter 8.2.4.

8.2.1 Tri-clamp

Check if the tri-clamp (Figure 8-2, pos. 1) is:

- free of damage;
- free of moisture;
- free of dirt;
- free of dust;
- tightened at 10 Nm.

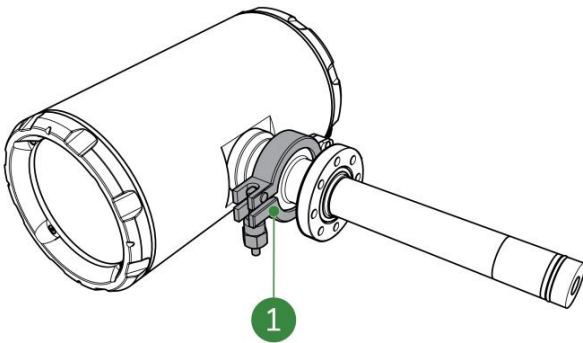


Figure 8-2: Tri-clamp

8.2.2 Transmitter and sensor connections



CAUTION

BE AWARE THAT THE TRANSMITTER AND SENSOR (CONNECTIONS) ARE FRAGILE.

To check and maintain the transmitter and sensor connections:

1. Disconnect the transmitter from the power supply.
2. Remove the ethernet cable (Figure 8-3, pos. 1).

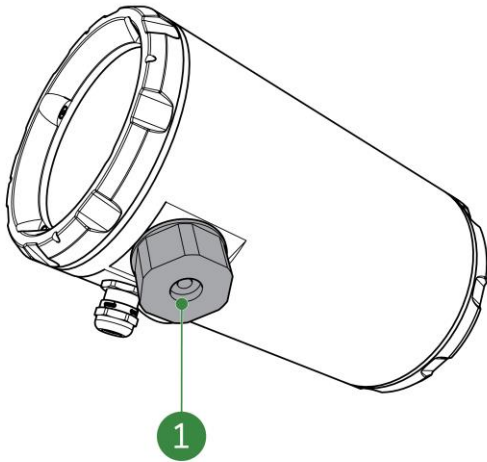


Figure 8-3: Split cable gland for ethernet cable

3. Support the transmitter by hand.



NOTE

BE AWARE THAT THE TRANSMITTER WEIGHS APPROXIMATELY 1,5 KG. THE TRANSMITTER WILL DETACH FROM THE SENSOR WHEN THE TRI CLAMP IS LOOSENED.

4. Loosen the nut of the tri clamp (Figure 8-4, pos. 1).

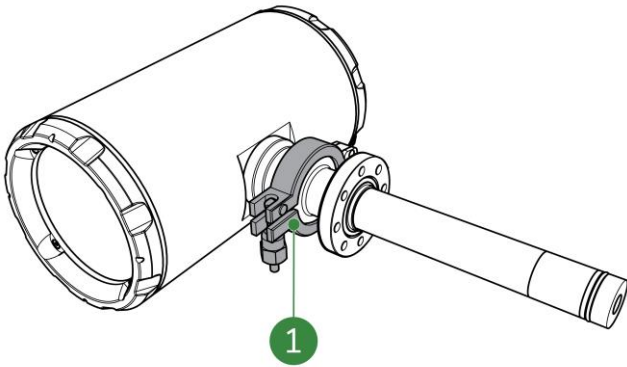


Figure 8-4: Tri-clamp nut loosening

5. Remove the transmitter and the tri clamp.
6. If needed, clean the:
 - tri clamp;
 - sensor connections (Figure 8-5, pos. 1 and 2).
 - transmitter connections (Figure 8-5, pos. 3 and 4);
7. If needed, clean the sensor connections:
 - the sensor connection pins (Figure 8-5, pos. 2) and small cam (Figure 8-5, pos. 1);
 - the transmitter contact points (Figure 8-5, pos. 3) and small notch (Figure 8-5, pos. 4).

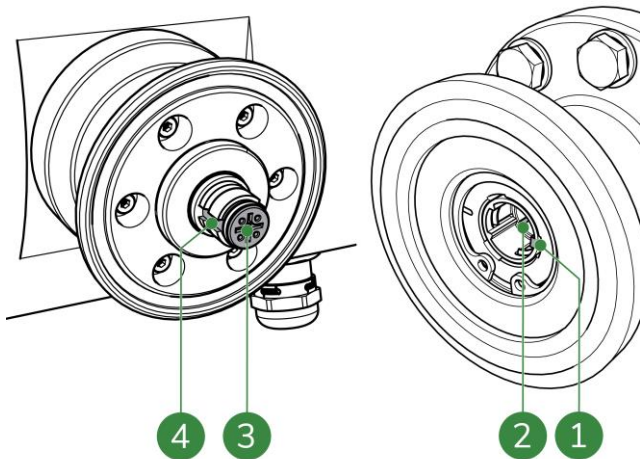


Figure 8-5: Sensor contact pins

8. If the SDM ECO remains disassembled; protect the sensor or transmitter:
 - place a yellow protection cap (Figure 8-6, pos. 1) on the transmitter;
 - or place a yellow protection cap (Figure 8-7, pos. 1) on the sensor.

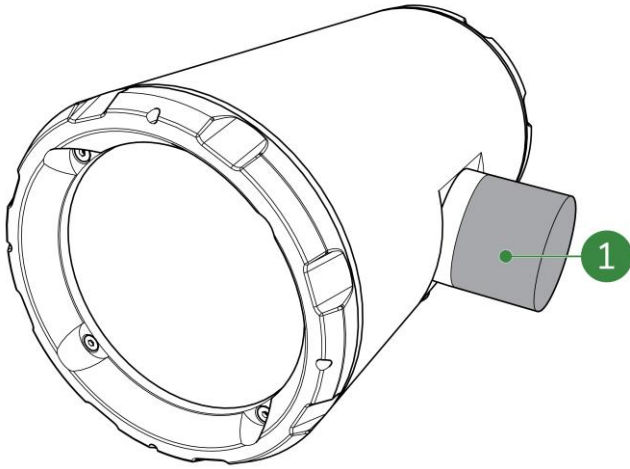


Figure 8-6: Yellow protection cap on transmitter

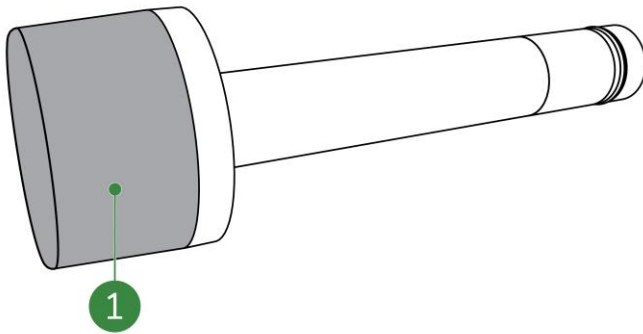


Figure 8-7: Yellow protection cap on sensor

9. If the SDM ECO needs to be re-assembled, make sure that the 2 sealings are present in the transmitter and sensor, see Figure 8-8, pos. 1 and 2.

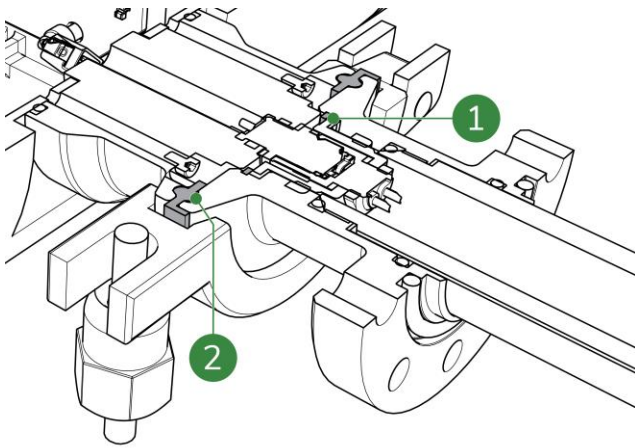


Figure 8-8: Sensor sealings

10. Assemble the SDM ECO in reversed order.

8.2.3 Sensor



NOTE

BEFORE REMOVING THE SDM ECO FROM THE INSTALLATION (FIGURE 8-9, POS. 2), MARK THE POSITION OF THE SENSOR ON THE FLANGES (FIGURE 8-9, POS. 1). THE SENSOR MUST BE PLACED IN THE EXACT SAME POSITION (FIGURE 8-9, POS. 3) DUE TO WEAR.

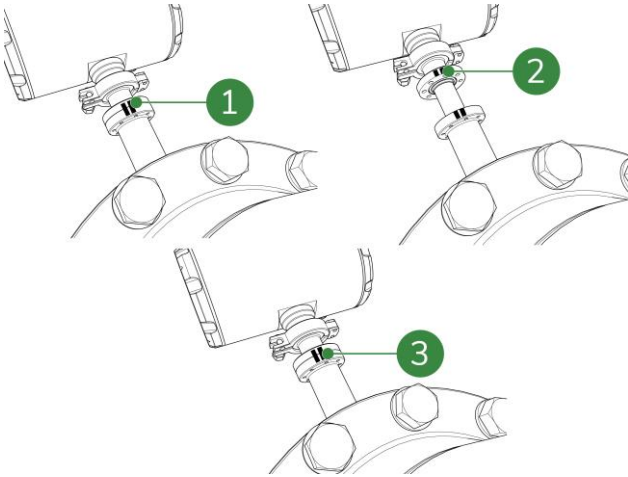


Figure 8-9: Sensor position markings

1. Disconnect the transmitter from the power supply (PoE cable).
2. Remove the PoE cable (Figure 8-10, pos. 1).

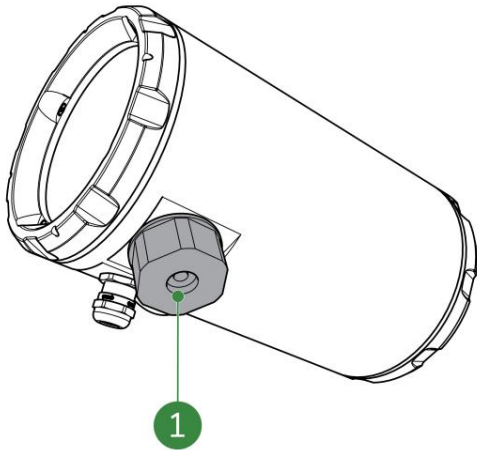


Figure 8-10: Split cable gland for PoE cable

- Support the transmitter by hand.
-



NOTE

BE AWARE THAT THE TRANSMITTER WEIGHS APPROXIMATELY 1,5 KG. THE TRANSMITTER WILL DETACH FROM THE SENSOR WHEN THE TRI CLAMP IS LOOSENED.

- Loosen the nut of the tri clamp (Figure 8-11, pos 1).

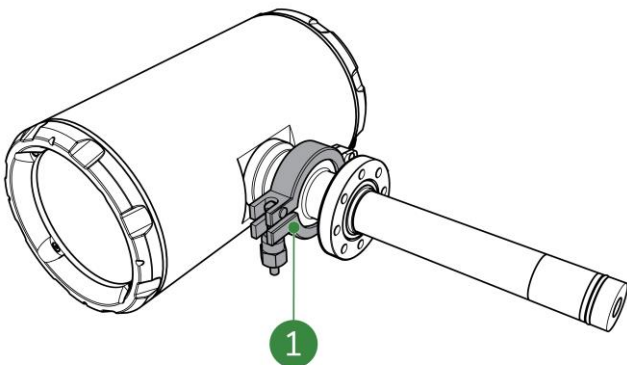


Figure 8-11: Tri-clamp nut loosening

- Remove the tri clamp and then the transmitter.

6. Remove the bolts and washers (Figure 8-12, pos. 1).

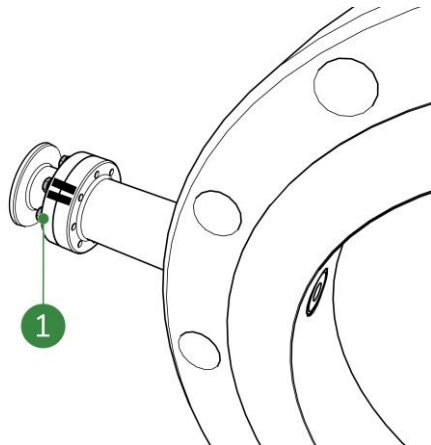


Figure 8-12: M5 bolts and washers

7. Remove the sensor from the pipe integration system.



NOTE

BE AWARE TO ONLY ROTATE THE SENSOR IN CLOCKWISE DIRECTION.

8. Check and (if needed) clean the connection pins and recess (Figure 8-13, pos. 1 and pos. 2).

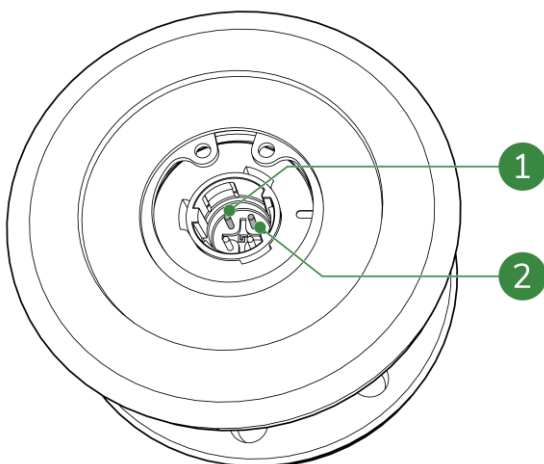


Figure 8-13: Connection pins and recess



NOTE

IN DOUBT OF THE CONDITION, TAKE PICTURES AND CONTACT RHOSONICS.

9. Place back the sensor in the exact same position (Figure 8-14, pos. 3).

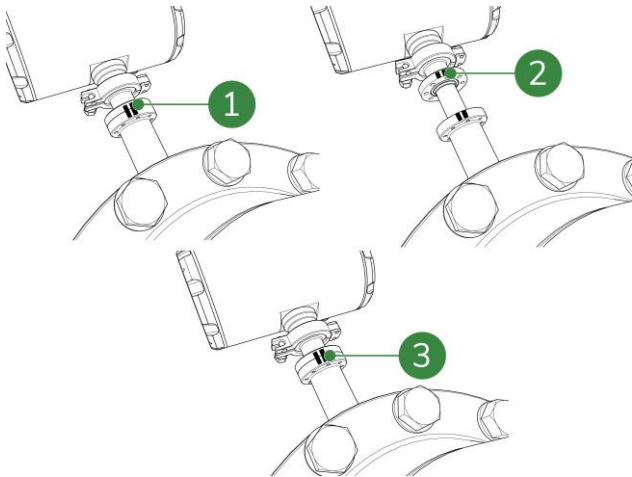


Figure 8-14: Sensor position markings

NOTE



WHEN PLACING BACK THE SENSOR, USE THE MARKINGS FOR THE SENSOR POSITION.

INSERT THE SDM ECO AS STRAIGHT AS POSSIBLE INTO THE PIPE INTEGRATION SYSTEM, WITH RESPECT TO THE AXIAL ORIENTATION OF THE SDM ECO PORT AND DISPLAY POSITION.

10. Clean and inspect the grooves for the 2 sealings (Figure 8-15, pos. 1 and 2).
11. If needed, apply high vacuum grease to the grooves.

12. Make sure that the 2 sealings are present in the transmitter and sensor (Figure 8-15, pos. 1 and 2).

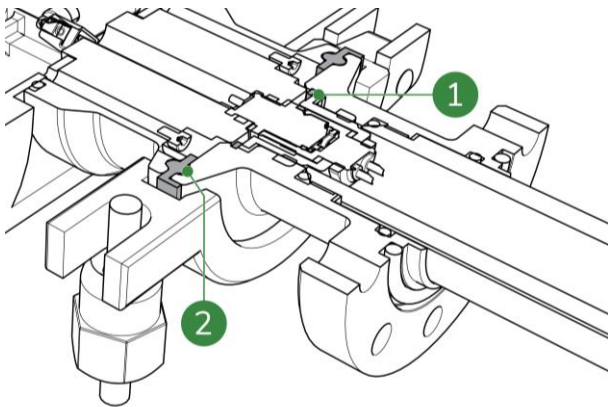


Figure 8-15: O-rings

13. Place the transmitter back on the sensor.
14. Place and tighten (crosswise) (Figure 8-16, pos. 1) the bolts and washer at 4.2 Nm (8x).

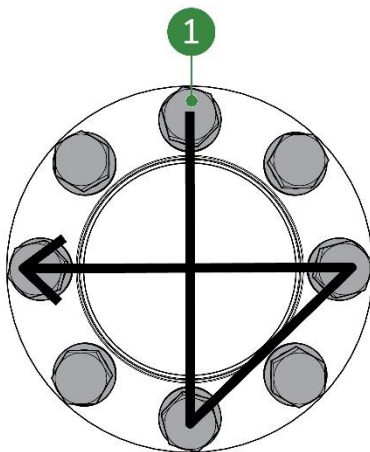


Figure 8-16: Crosswise tightening

15. Tighten the tri-clamp nut (10 Nm).

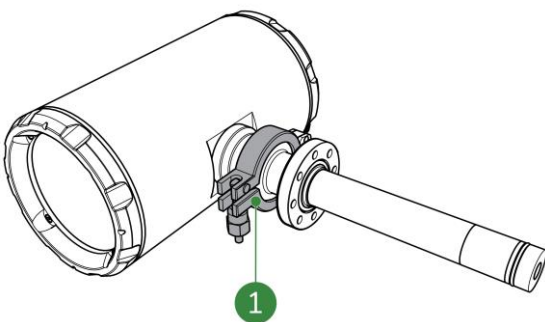


Figure 8-17: Tri-clamp nut

8.2.4 Sensor settings

Before uploading the sensor file, make sure:

- to restore the calibrations, see chapter 6.3.12;
- to erase the log data, see chapter 6.3.18;
- that the Sessionsetting.json file has the same software version as the SDM ECO transmitter:
 - check the current software version of the SDM ECO transmitter, see chapter 6.5. For rebooting see chapter 6.3.8.
 - Check the software version of the file. Open the Sessionsetting.json file from the supplied USB stick in excel. Compare column B1 with the software version of transmitter.

To load sensor settings:

1. Go to Load sensor settings.
Main Menu -> Diagnostics -> Sensor.
2. Place the USB stick into the USB-port (Figure 8-18, pos. 1) with the Sessionsetting.json file.

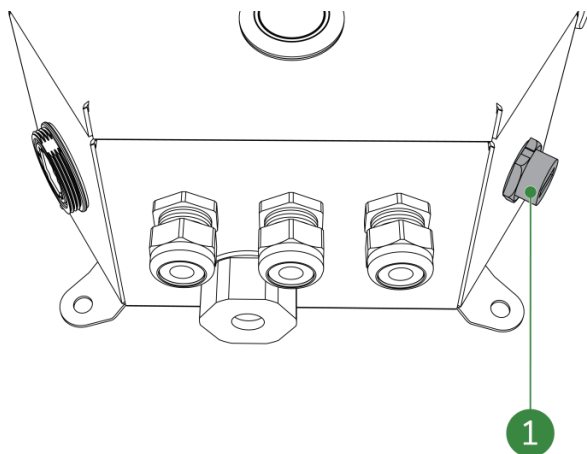



Figure 8-18: USB-port

3. Select *Load settings*.
4. Wait until a confirmation appears. This might take several minutes.
5. Select the  icon in the top right corner to safely eject the USB stick.
6. Disconnect the USB stick.

9. TROUBLESHOOTING

The SDM ECO is designed to work maintenance free for a long time. Of course, as in every technical unit, an issue may occur. Here are some tips on how to find a solution. If this does not solve your problem or if your problem is not listed, contact Rhosonics.

9.1 Gather situation information

The first step is always to gather information from the SDM ECO and the situation. This is needed for the supplier and / or Rhosonics:

- note the problem and situation when the problem occurred.;
- log files from the SDM ECO;
- check the system status and performance;
- note process / application information such as:
 - flow;
 - composition;
 - temperature;
 - etc....
- gather installation information such as:
 - pictures;
 - drawings;
 - etc....

When all the necessary information is gathered, send it to service@rhosonics.com. A Rhosonics service engineer will contact you and help you to solve the issue.

9.2 Issues and solution

The most common SDM ECO issues and their problems are listed below:

Issue	Possible cause	Possible solution
Display is black / off.	No power.	Check power supply, see chapter 5.6.1.
		Check polarization of the power cable.
		Check the voltage on the power cable. The voltage must be 18-36 V.
	Burnt fuse.	Replace the fuse, see chapter 2.4.6.
No response.	Software is frozen.	Reboot the SDM ECO, see chapter 6.3.8.
Value on DCS system / PLC is incorrect.	Setting 4-20 mA output of SDM ECO is not equal with DCS /PLC 4-20 mA input.	Change SDM ECO 4-20 mA output to same 4-20 mA range input DCS / PLC, see chapter 6.3.6.
No (4 to 20 mA value) to DCS system / PLC.	No contact between SDM ECO and DCS / PLC.	Check the current on the 4-20 mA connection of the SDM ECO.
Density value on SDM ECO is incorrect.	Calibration is incorrect or not executed.	Do a calibration, see chapter 7.
SDM ECO has a red screen with a cross.	No connection between sensor and transmitter.	Check the Tri clamp, see chapter 8.2.1.
		Disconnect the power. Check the transmitter connection, see chapter 8.2.3.
		Check resistance, see chapter 9.2.1.
		Disconnect the power. Check the golden pins on the sensor, see chapter 8.2.3.

Issue	Possible cause	Possible solution
SDM ECO shows a yellow screen with a question marker.	Value is out of range due to incorrect 4-20 mA setting.	Change SDM ECO 4-20 mA output to same 4-20 mA range input DCS / PLC, see chapter 6.3.14.
	Value is out of range due to air in front of the sensor.	Relocate the SDM ECO to a point without air.
	Value is out of range due to incorrect calibration.	Do a calibration, see chapter 7.
SDM ECO shows correct WT% but incorrect SGx1000.	This is correct. It's a SDM ECO WT%.	No further action is needed.
SDM ECO is leaking at the sensor flange.	O-ring failure.	Install new O-ring , see chapter 5.4.
	Bolts are not correctly tightened.	Place new O-rings and tighten bolts, see chapter 8.2.1.
Date and / or time is incorrect.	Not adjusted to local time.	Set correct date and time, see chapter 6.3.22.
SDM ECO reading / response is slow.	Decay time is set too low or too fast.	Change the decay time, see chapter 6.3.5.
SDM ECO reading is reacting to fast.	Decay time is set too low or too fast.	Change the decay time, see chapter 6.3.5.
SDM ECO is not accurate.	Incorrect calibration.	Do a calibration, see chapter 7 calibration procedure.
SDM ECO log period is too short or too long	Log interval is not set optimal	Adjust the log interval setting, see chapter 6.3.17.
USB port unresponsive	Incorrect USB stick.	Use a different USB stick.
	USB port defect.	Contact Rhosonics.
SDM ECO needs multiple calibrations.	Unstable process during calibration.	Calibrate the SDM ECO, see chapter 7.

Issue	Possible cause	Possible solution
	Sensor is worn out.	Check the sensor, see chapter 8.2.3.
	Calibration is incorrect.	Calibrate the SDM ECO, see chapter 7.
Sensor has (strange) wear/abrasion.	Sensor was installed intrusive instead of flush with the wall.	Gather information and contact Rhosonics, see chapter 9.1.
SDM ECO is always out of range.	Air in the process.	Gather information and contact Rhosonics, see chapter 9.1.
SDM ECO is measuring water while pumping slurry.	Water in front of the sensor.	Gather information and contact Rhosonics, see chapter 9.1.
SDM ECO value incorrect while pumping water	No water in front of the sensor.	Gather information and contact Rhosonics, see chapter 9.1.
	Calibration is incorrect.	Calibrate the SDM ECO, see chapter 7.
	Water not clean.	Check if water is clean.
SDM ECO value is always deviating.	It's a chemical slurry (dissolved solids) instead of water-based slurry.	Gather information and contact Rhosonics, see chapter 9.1.
	Sensor is worn out.	Check the sensor, see chapter 8.2.3.
	Process is unstable and SDM ECO is measuring correct.	Gather information and contact Rhosonics, see chapter 9.1.
	Incorrect validation.	Calibrate the SDM ECO, see chapter 7.

Issue	Possible cause	Possible solution
SDM ECO value is drifting of over time.	Incorrect calibration.	Calibrate the SDM ECO, see chapter 7.
	Sensor is worn out.	Remove sensor and check on wear / abrasion, see chapter 8.2.3.

9.2.1 Resistance check

To measure the resistance of the transmitter and sensor:

1. Remove the split cable gland (Figure 9-1, pos. 1). Make sure to not damage the ethernet cable.

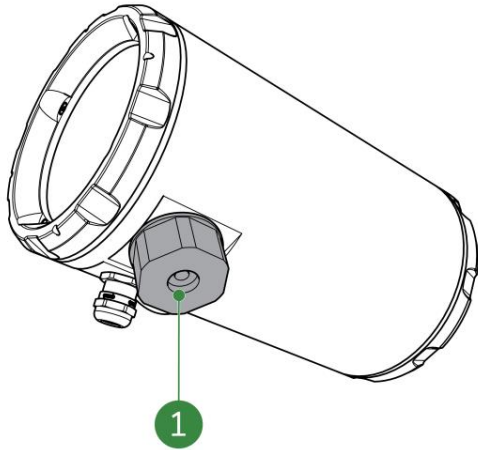


Figure 9-1: Cable gland for PoE cable

2. Disconnect the ethernet cable.
3. Remove the Tri-clamp.

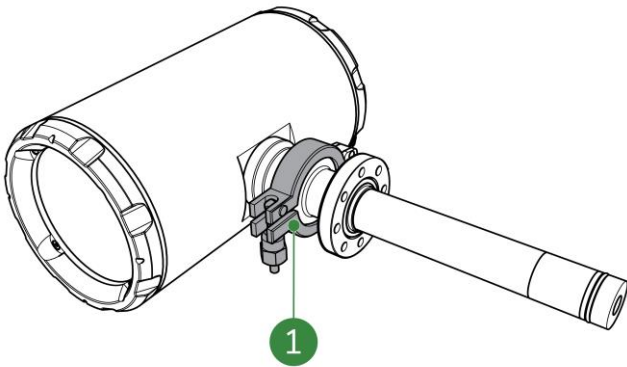


Figure 9-2: Tri-clamp on transmitter

4. Check if the connection points are clean and free of moisture.

5. Measure the resistance of the transmitter connection points. The resistance is overload. Measure between the inner and outer connection point (Figure 9-2, pos. 1 and 2).

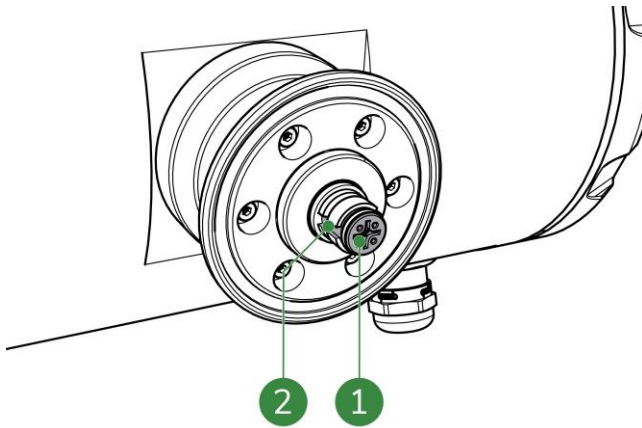


Figure 9-3: Transmitter connection

6. Measure the resistance of the sensor connection pins. The resistance is overload. Measure between the inner and outer connection pin (Figure 9-3, pos. 1 and 2).

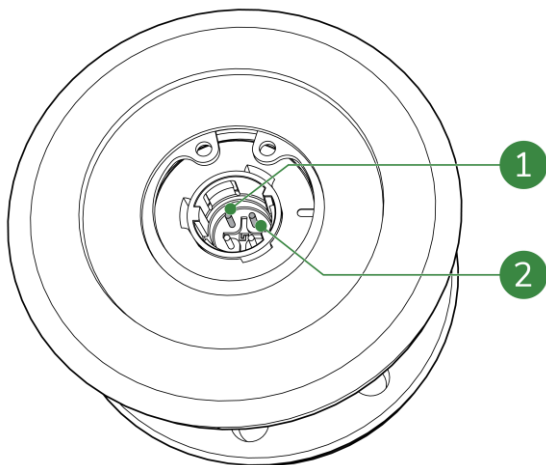


Figure 9-4: Sensor connections for resistance measurement

7. Measure the resistance of the sensor. The resistance must be lower than 50 ohms. Measure between the inner connection point (Figure 9-4, pos. 1) and the end of the sensor (Figure 9-4, pos. 1 and 2).

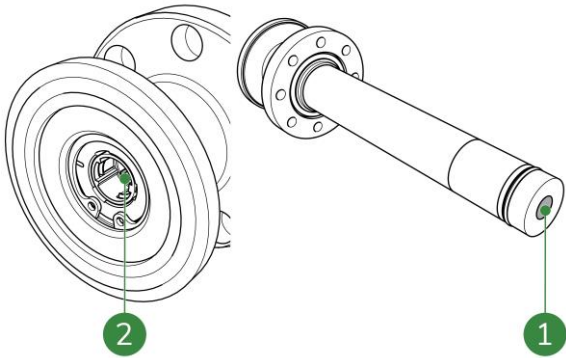


Figure 9-5: Sensor connections for resistance measurement

8. Contact Rhosonics if the resistance is not correct.

9.2.2 Red screen



NOTE

FOR MORE INFORMATION ABOUT THE RED SCREEN, SEE CHAPTER 6.2.3.

A red screen indicates a problem with the transmitter or the sensor, see Figure 9-6.

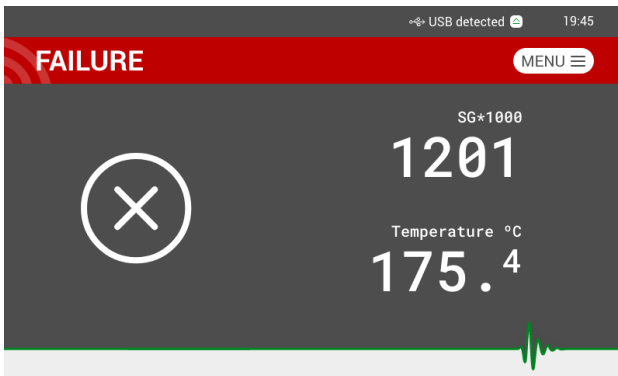


Figure 9-6: Red screen

To solve the red screen:

1. Check if the tri clamp is installed properly.

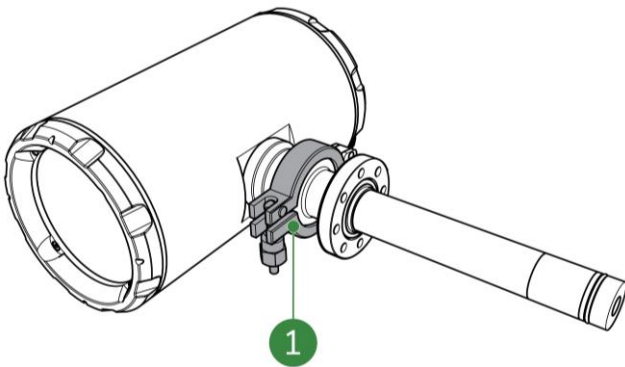


Figure 9-7: Tri-clamp on transmitter

If the issue is not solved, go to step 2.

2. Disconnect and reconnect the power supply, see chapter 5.6.2.

If the issue is not solved, go to step 3.

3. Contact Rhosonics.

9.2.3 Yellow screen



NOTE

FOR MORE INFORMATION ABOUT THE YELLOW SCREEN, SEE CHAPTER 6.2.3.

The measured density is lower or higher than the set 4-20mA value, see Figure 9-6.

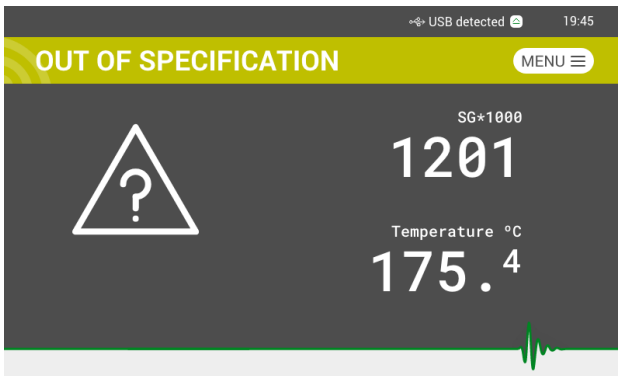


Figure 9-8: Yellow screen

To solve the yellow screen:

1. Check the process conditions.
2. Check the 4-20mA settings, see chapter 6.3.6.

If the issue is not solved, contact Rhosonics.

Examples:

1. 4-20 mA has been set to 4 mA = 1000 ; 20 mA = 2000.
2. If the sensor detects air, the SG x 1000 value will drop below 1000 and the yellow screen with the question mark will appear.
3. If scaling occurs, the SG x 1000 value will rise above 2000 SG x 1000 and the yellow screen with the question mark will appear.

10. FREQUENTLY ASKED QUESTIONS

FAQ	Answer
Where or how can I find the SDM ECO software version?	See chapter 6.5.
Where can I find the serial number of the SDM ECO?	The serial number can be found: <ul style="list-style-type: none"> • on the outside of the SDM ECO (ID plate); • in the S-file of the log files.
What type of SDM ECO do I have?	The type can be found on the outside of the SDM ECO (ID plate), see chapter 1.7.
How do I perform a software update?	See chapter 6.4.1.
How to get the log file from the SDM ECO?	See chapter 6.4.2.
How much data points can the SDM ECO store in its memory?	65 535 entries.
How to set the time and date?	See chapter 6.3.22.
How to set the decay time?	See chapter 6.3.5.
How to set 4mA to 20 mA output range?	See chapter 6.3.14.
How to adjust the temperature?	See chapter 6.3.11.
How to perform the offset / water calibration?	See chapter 7.
How to perform the span / slurry calibration?	See chapter 7.
How many samples do we need for the slurry calibration?	We advise to take at least 3 samples. These are needed to determine if the sample taking is as expected and consistent.
How to restore the calibration?	See chapter 6.3.12.
How to install the sensor?	See chapter 5.5 or 8.2.3
How to deinstall the sensor?	See chapter 8.2.3.

FAQ	Answer
How do I remove the tri clamp?	See chapter 8.2.1
How accurate is the SDM ECO?	<p>We mention an accuracy of 0.5% of reading. The accuracy is dependent of the:</p> <ul style="list-style-type: none"> • accuracy of the samples that are taken; • process conditions. <p>This means the more accurately you work with the SDM ECO, the better results will be achieved.</p>
What kind of USB stick do I need to use?	<p>USB stick with:</p> <ul style="list-style-type: none"> • a flashing light; • a max capacity of 16GB (preferably use the 8GB USB stick provided with the SDM ECO by Rhosonics).
How do I format the USB stick?	<p>File system: FAT 32 (standard)</p> <p>Cluster size: 4096 bytes</p>

11. TRANSPORT AND STORAGE

11.1 Transport

When transporting the SDM ECO, the SDM ECO must be safely packed into a strong box – preferably in its original box – that protects it from outside moisture and dust. Make sure to add material inside the box and around the SDM ECO that protects it from damage in case the box bumps or drops.

11.2 Shipment

For shipment of the SDM ECO, follow the transport procedures mentioned in 11.1. Make sure the box is properly sealed to ensure a safe and secure transport of the package.

11.3 Storage

When not in use, store the SDM ECO in an environment that:

- is free from dust and moisture;
- has a temperature that is within the range of 0 °C to +50 °C;
- has features to prevent the SDM ECO from falling.

Preferably store the SDM ECO in its original box when not in use.

12. DISPOSAL

When disposing the SDM ECO after its use, it can be sent to Rhosonics for proper disposal. It is the user's responsibility to safely ship the SDM ECO to Rhosonics. The shipping address of Rhosonics is mentioned on the last page of this manual.

13. APPENDICES

13.1 List of spare parts

DESCRIPTION	PART NUMBER	CONSISTS OF
SDM ECO Sensor only (no transmitter included) - spare part	SDM ECO Sensor	SDM ECO Sensor
SDM ECO transmitter	SDM ECO transmitter	SDM ECO transmitter
Back lid	SDM ECO Back lid	Back lid
Front lid	SDM ECO Front lid	Front lid
Tri clamp set for SDM ECO	SDM ECO-TRI-CLAMP-SET-1½"	1 x Stainless Steel tri clamp 1½" 1 x NBR seal 1½"
SDM ECO Mounting Kit	MONTAGE-KIT-SDM ECO	1 x Cable gland M16x1.5, Nickel cable Ø2-6 mm 10 x Hexagonal head bolt M5 x 16 RVS 1 x O-ring Viton 51414 Ø17x2 1 x O-ring 29.82x2.62 - FKM - FPM - Viton - 80 Shore A - Black 10 x Spacer M5 cylinder screws, RVS
Cable gland ½"NPT set	SDM ECO-CABLE-GLAND-½"NPT-SET	3 x SS316L reducing plug M16X1.5 outside; ½" NPT inside 2 x cable gland ½"NPT, Nickel coated, for cables Ø5-9 mm 2 x cable gland ½"NPT, Nickel coated, for cables Ø6-12 mm
Cable gland M20 set	SDM ECO-CABLE-GLAND-M20-SET	3 x SS316L reducing plug M16X1.5 outside; M20x1.5 inside 2 x cable gland M20x1.5, Nickel coated, for cables Ø6-12 mm 2 x cable gland M20x1.5, Nickel coated, for cables Ø10-14 mm
Cable gland M16 set	SDM ECO-CABLE-GLAND-M16-SET	2 x cable gland M16x1.5, Nickel coated, for cables Ø2-6 mm 2 x cable gland M16x1.5, Nickel coated, for cables Ø4-8 mm 2 x cable gland M16x1.5, Nickel coated, for cables Ø5-10 mm

Table 13-1: List of spare parts

13.2 List of options

DESCRIPTION	PART NUMBER	CONSISTS OF
Blind Plug (for the installation tool)	BP-60T13-HDPE-UNIVERSAL-VITON	HDPE blind plug 16-146 mm with 1 x O-ring Viton® 51414 Ø20,3x2,62 and 1 x O-ring 29.82x2.62 Viton 80S

Table 13-2: List of options

13.3 Menu tree

MENU*	→ Settings	→ Language	→ English	
			→ Spanish	
			→ French	
			→ Portuguese	
		→ Backlight		
		→ Ranging	→ SG	
			→ Temperature	
		→ About us		
		→ Restart		
		→ Shutdown		
	<hr/>			
	→ Calibration	→ SG	→ Water calibration	
			→ Liquid profiles	
		→ Temperature		
		→ Reset calibration		
		→ Decay time		
		→ Analog output	→ Output one	
			→ Output two	
<hr/>				
→ Diagnostics	→ Signal			
	→ Logging			
	→ Update			
	→ Sensor			
	→ Plots			
	→ Date & time			
	→ Diagnostic values			
	→ Error log			

* The menu items ‘Calibration’ and ‘Diagnostics’ are password-protected.

13.4 Appendix A: Sound speed of water at 0 to 100 °C

T [°C]	c [m/s]	T [°C]	c [m/s]	T [°C]	c [m/s]	T [°C]	c [m/s]
0	1402.388	25	1496.687	50	1542.551	75	1555.133
1	1407.367	26	1499.323	51	1543.619	76	1555.081
2	1412.232	27	1501.883	52	1544.636	77	1554.991
3	1416.985	28	1504.37	53	1545.601	78	1554.862
4	1421.628	29	1506.784	54	1546.517	79	1554.696
5	1426.162	30	1509.127	55	1547.382	80	1554.492
6	1430.589	31	1511.399	56	1548.199	81	1554.251
7	1434.912	32	1513.603	57	1548.967	82	1553.974
8	1439.132	33	1515.738	58	1549.687	83	1553.66
9	1443.251	34	1517.806	59	1550.36	84	1553.31
10	1447.27	35	1519.81	60	1550.986	85	1552.924
11	1451.191	36	1521.745	61	1551.566	86	1552.504
12	1455.016	37	1523.618	62	1552.101	87	1552.048
13	1458.747	38	1525.428	63	1552.59	88	1551.558
14	1462.384	39	1527.176	64	1553.035	89	1551.034
15	1465.931	40	1528.863	65	1553.437	90	1550.476
16	1469.387	41	1530.489	66	1553.794	91	1549.884
17	1472.755	42	1532.066	67	1554.109	92	1549.259
18	1476.036	43	1533.564	68	1554.381	93	1548.602
19	1479.231	44	1535.015	69	1554.611	94	1547.912
20	1482.343	45	1536.409	70	1554.799	95	1547.19
21	1485.372	46	1537.746	71	1554.947	96	1546.436
22	1488.319	47	1539.028	72	1555.053	97	1545.651
23	1491.187	48	1540.256	73	1555.12	98	1544.834
24	1493.976	49	1541.43	74	1555.146	99	1543.987
						100	1543.109

Table 13-3: Sound speed of water [m/s] at different temperatures [°C]

13.5 Appendix B: Density of water at 0 to 100 °C

T [°C]	RHO [g/l]	T [°C]	RHO [g/l]	T [°C]	RHO [g/l]	T [°C]	RHO [g/l]
0	999.86341	25	997.04784	50	988.00825	75	974.85658
1	999.91390	26	996.78615	51	987.55238	76	974.25961
2	999.94857	27	996.51495	52	987.09017	77	973.65750
3	999.96773	28	996.23442	53	986.62172	78	973.05025
4	999.9717	29	995.94474	54	986.14709	79	972.43790
5	999.96082	30	995.64608	55	985.66636	80	971.82046
6	999.93537	31	995.33859	56	985.17959	81	971.19794
7	999.89566	32	995.02246	57	984.68686	82	970.57037
8	999.84198	33	994.69781	58	984.18822	83	969.93776
9	999.77462	34	994.36483	59	983.68373	84	969.30013
10	999.69386	35	994.02363	60	983.17346	85	968.65748
11	999.59998	36	993.67438	61	982.65745	86	968.00984
12	999.49325	37	993.31720	62	982.13577	87	967.35721
13	999.37393	38	992.95224	63	981.60845	88	966.69961
14	999.24227	39	992.57962	64	981.07555	89	966.03705
15	999.09854	40	992.19946	65	980.53711	90	965.36954
16	998.94297	41	991.81189	66	979.99318	91	964.69708
17	998.77580	42	991.41702	67	979.44379	92	964.01969
18	998.59727	43	991.01497	68	978.88899	93	963.33739
19	998.40761	44	990.60585	69	978.32881	94	962.65017
20	998.20703	45	990.18976	70	977.76328	95	961.95804
21	997.99576	46	989.76681	71	977.19245	96	961.26103
22	997.77400	47	989.33709	72	976.61633	97	960.55912
23	997.54196	48	988.90070	73	976.03496	98	959.85235
24	997.29984	49	988.45772	74	975.44837	99	959.14070
						100	958.42421

 Table 13-4: Density of water [g/l or kg/m³] at different temperatures [°C]



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