

# Rheonics SRD Density and Viscosity Meter

## SENSOR OPERATOR MANUAL

Inline Process Density and Viscosity Meter

Doc. ID: SRD-OP-2412



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# 1 Before you begin

## 1.1 About the manual

This manual provides information for operating Rheonics SRD density and viscosity sensor. This manual refers to external pages and articles from Rheonics webpage and knowledge base. A **Links Reference Table** is included in Chapter 9. If a link is not working, please refer to the Rheonics webpage or contact Rheonics Support Team.

## 1.2 Contact

Contact the Rheonics team to help you with any inquiry.

For sales and delivery-related questions contact the Sales Team at [info@rheonics.com](mailto:info@rheonics.com)

For installation, integration, and troubleshooting contact the Support Team at [support@rheonics.com](mailto:support@rheonics.com).

## 1.3 Warning

The users should be trained in government and corporate safety standards that apply to their installation and use.

This installation manual is strictly for non-explosive atmospheres. If such installation is required, the user must refer to the Intrinsically Safe Installation Manual “EX-IM”.

## 1.4 Nomenclature

Abbreviation	Full-term	Meaning
SRD	Symmetric Resonator Density meter	Density and Viscosity sensor
SME	Smart Module Electronics	Sensor electronics
RFQ	Request for Quotation	Ordering file

## 1.5 Related Documentation

You can find all product documentation on the USB storage device that is integrated in the sensor or was shipped with the sensors. You can also find them on [Rheonics' Resource Library](#) (Reference Table - Entry 1).

For more information on the sensor, refer to the following documents on Rheonics website. Contact Rheonics Support Team if you cannot find a document online.

Title	Code	Description
<b>SRD Operator Manual</b>	<b>SRD-OP</b>	<b>SRD Sensor Operator Manual</b>
<b>RCP Software Manual</b>	RCP-OM	Rheonics Software Installation and User Manual
<b>SME Operator Manual</b>	SME-OP	Rheonics SME Sensor Module Electronics Manual
<b>Communication Protocol Manuals</b>	Various	Modbus TCP, Modbus RTU, HART, Profinet, Ethernet/IP, etc.
<b>EX installation Manual</b>	EX-IM	Installation Manual of Rheonics Intrinsically Safe Sensors
<b>SRD Datasheet</b>	SRD-DS	Rheonics SRD Datasheet

## 2 General Information

### 2.1 Scope of Delivery

The following items are delivered with Rheonics SRD sensor:

- SRD sensor probe with protective sleeve
- Sensor cable
- Sensor electronics SME (variant as ordered)
- RCP software tool installer
- Other accessories and items as ordered

**Notes:**

- The items listed may vary for your delivery and depend on the order code.
- Customer should inspect the goods upon arrival. In case of damage or missing items, contact Rheonics Sales Team at [info@rheonics.com](mailto:info@rheonics.com)
- The SRD sensor probe has different variants, and the protective sleeve changes accordingly. The protective sleeve is meant to protect the probe's sensing element when stored or handled and should be removed for sensor operation.
- Rheonics offers different sensor cable variants and lengths. Review all variants at [Rheonics sensor cable and connection variants](#) (See Table of References - Entry 2).
- The sensor electronics SME has different variants. The image below shows the SME-TRD. Review all variants on the electronics and communication at [Rheonics Electronics and Communications](#) (See Table of References - Entry 3).



Figure 1: Scope of delivery.

### 2.2 About SRD Inline Density and Viscosity Meter

SRD is Rheonics' inline process sensor for simultaneous density, viscosity and temperature measurement of a fluid. SRD is based on a Symmetric Torsional Resonator, which is the trademark for the patented technology underlying the sensor.

**The SRD sensor measures density, dynamic viscosity, kinematic viscosity and temperature of a fluid in real-time.**

Rheonics SRD operates with Newtonian and non-Newtonian fluids. Thanks to the sensor

electronics, additional outputs can be configured such as fluid's temperature-compensated viscosity, specific gravity, fluid's concentration, solid percentage, etc.

Rheonics SRD sensor is composed of three main parts, as in the next Figure, which are the electronics (SME), sensor cable, and sensor probe.



Figure 2: SRD Sensor Unit

SRD sensor probe is compact and light, yet robust and ready for harsh installation conditions in the industry. The probe is hermetically sealed and has no moving parts, which avoids requirements for maintenance or re-configurations during its life of service. The probe is also easy to clean and compatible with CIP (Cleaning in Place) procedures. The SRD probe has an IP rating of IP69K, only conditioned by the sensor cable IP rating which varies depending on the type of cable delivered. Modular design is one of the main advantages of Rheonics sensors like the SRD. This allows repeatable and reproducible readings if the fluid is the same even with different SRD probe variants, which can vary in design, process connection and length.

Visit [Rheonics SRD articles](#) to learn about SRD probe variants (See Table of References - Entry 4). Review [SRD operating principle whitepaper](#) for more information on the sensor operation (See Table of References - Entry 5).

## 2.3 Best practices

The following information can help you get the most from your SRD sensor.

- Handle the meter with care.
- Always store and transport the meter in its original packaging. The sensor probe can be stored in air but protection of the sensing element is recommended with the protective sleeve included in delivery.
- Have the RCP software installed. Refer to the *RCP Software Manual* for installation instructions. This software helps with the initial setup of the sensor but also for monitoring, further configuration, and troubleshooting if required.

- Do not use liquids incompatible with the wetted materials of the probe, i.e. highly corrosive chemicals when the wetted material is not specified for it. Follow the support article [Chemical Compatibility List](#) (See Table of References - Entry 6). Rheonics SRD standard wetted material for the probe is 316L (1.4404), alternatively, Hastelloy C22 (2.4602) can be ordered for highly corrosive applications. Prior to use, always ensure that the sensor wetted surface is compatible with your process fluid. Material certificates are available for the sensor when requested during ordering.
- Sensor Probe should always be used only for the pressure and temperature ratings specified for the sensor, which are often specified during the ordering process. Sensor electronics should be exposed to environmental conditions within its operational envelope to avoid performance issues.
- Ensure that all piping connections conform to the local and national regulations and codes of practice.
- Laboratory tests can be conducted before the final installation in process. Density readings should be the same for a fluid in motion or static as long as the fluid composition and temperature is the same. Refer to section 3.4 for sensor installation instructions.
- For non-Newtonian fluids viscosity readings can differ between different viscosity measurement technologies. This means that a laboratory or offline instrument can give different results than the SRD inline readings of viscosity. This is expected, and Rheonics explains the reasons for this on its web page and articles. Still, users do at times test the SRD sensor in controlled environments to compare, verify, and even correlate readings with other meters.
- For the SME-TRD and SME-TR, after internal wiring, properly tighten the transmitter housing cover with the inner seal correctly placed, to maintain ingress protection.
- Protect the M12 connection between the sensor cable and sensor probe from impacts. Avoid contact with fluids unless the operation is within the cable and connector ingress protection (IP) rating class.
- Prevent external machinery from colliding with the SRD sensor probe.
- For any further questions related to the SRD sensor probe, visit [Rheonics Support Portal](#) (See Table of References - Entry 7) or contact Rheonics Support Team at [support@rheonics.com](mailto:support@rheonics.com). Make sure to explain the issue or question, share pictures of the installation or setup, and share the sensor Serial Number (S/N).



**ATTENTION:** For intrinsically safe installations of an EX-certified SRD sensor in hazardous environment locations, the user should follow the Rheonics EX Installation and Intrinsic Safety Manual that is included with the delivery and also available online.

## 2.4 Serial number, probe markings, and certifications

The SRD sensor probe and electronics have specific markings on their bodies that make the parts unique and traceable. The part's identifier is the Serial Number (S/N), which may be requested by Rheonics if the client contacts the Sales or Support Team about a probe or electronics. Examples of serial numbers are shown below, as well as images of where to find them.



The sensor electronics and probe are sent in the same delivery and configured to operate together. The user should not exchange the electronics or probe with other SRD units as this can invalidate warranty, create erroneous calibration, and may create safety hazard. Check with Rheonics support teams when you need to exchange probes. Replacement probes are verified to be a drop-in replacement and may come with a configuration upgrade if necessary. For information contact the Support Team.

Example of probe S/N: B09-1190

Example of electronics S/N: 19101399

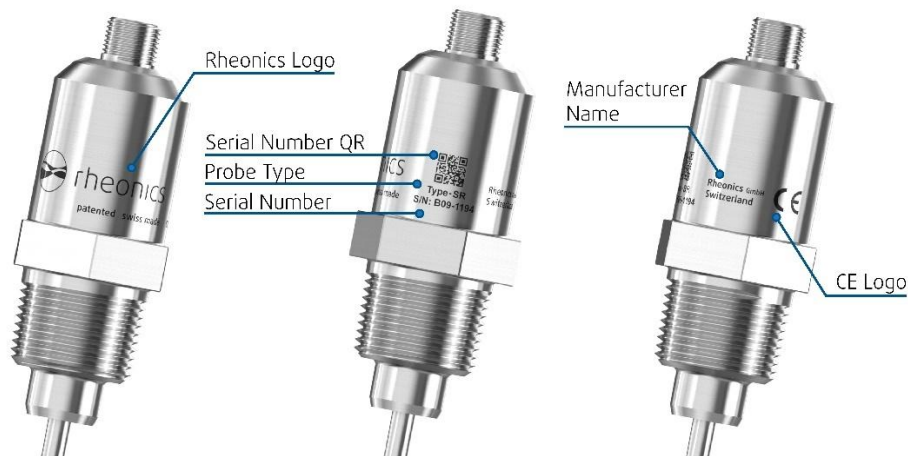


Figure 3: Sensor probe markings.

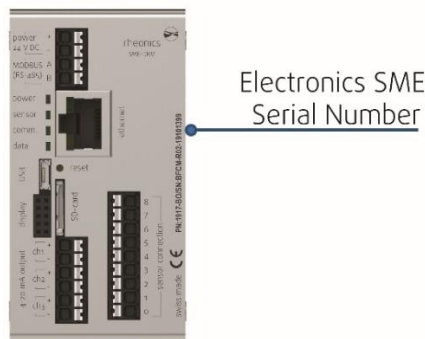


Figure 4: Sensor electronics markings.

Certifications of the sensor are marked on the probe and electronics as regulations require.

Certifications available for the sensor include:

- Hygienic EHEDG Certification
- Hygienic 3-A Certification
- ATEX, IECEx, JPEX, etc.
- Calibration certificate
- Material certificate
- ISO 9001 for Rheonics

Review all [Rheonics certifications](#) (See Table of References - Entry 8)

## 3 Technical Specifications

### 3.1 Sensor Specifications

Specifications of the sensor vary depending on the sensor configuration ordered through the [RFQ \(Request for Quotation\)](#) (See Table of References - Entry 9) by the user.

Confirm maximum temperature and pressure specifications for probe to avoid damage during operation.

**Table 1: SRD general specifications**

Specification		Value
Max. density range		0.0 - 4.0 g/cc 0.0 - 4000 kg/m <sup>3</sup> 0.0 - 33.38 lb/gal
Density accuracy	Default	0.01 g/cc
	Available	0.001 g/cc
Max. viscosity range		1.0 – 10,000 cP
Viscosity accuracy	Default	5% of actual
	Available	1% or higher
Reproducibility		Better than 0.1%
Temperature range		Specified in sensor order
Pressure range		Specified in sensor order, may be limited by process connection
Max. Flow velocity*		10 - 12 m/s
Wetted material available		Stainless Steel 316L
		Hastelloy C22
Sensor probe main variants available		Flush
		Short
		Long
		Slimline
		Reactor Probe
Process Connection		Specified in sensor order (e.g. Tri Clamp, NPT, G thread, Flange, Sanitary, etc.)
Sensor probe IP Rating		IP 69K
Cable IP Rating available		IP 68, IP69, IP69K
Sensor electronics IP Rating		IP40 (SME-DRM)
		IP66 (SME-TRD, SME-TR)
Certificates available		Ex, ATEX, JPEX: Intrinsically safe
		EHEDG: Hygienic Certificate
		3-A: Hygienic Certificate

\*For highly viscous fluid, even low flow velocities could impose very high bending force on the sensing element that can damage or break them. Installation should take this into consideration. Generally, flow orientation parallel to the probe will have significantly less force on the sensing element than when the flow is perpendicular to it. Sensors are also available with a reinforced sensing element which can undertake higher fluid flow induced forces. Discuss your high viscosity, high flow rate applications with the application engineering team for installation validation through the Support Team. Review more information [here](#) (See Table of References - Entry 10).

## 3.2 Sensor Wiring

This section describes the wiring of the sensor using the SME variants E1, E2, and E3. For information on SME Box (E4), review the SME-OP Manual.

Figure 5 below shows the typical connection of the SRD sensor, including the SME electronics and the sensor probe. These two devices are connected using the sensor cable included in delivery, the physical connection on the probe is with an M12 8-pin female A-coded connector.

SME electronics should be powered with 24V DC. Fuses are recommended to safeguard the sensor electronics.

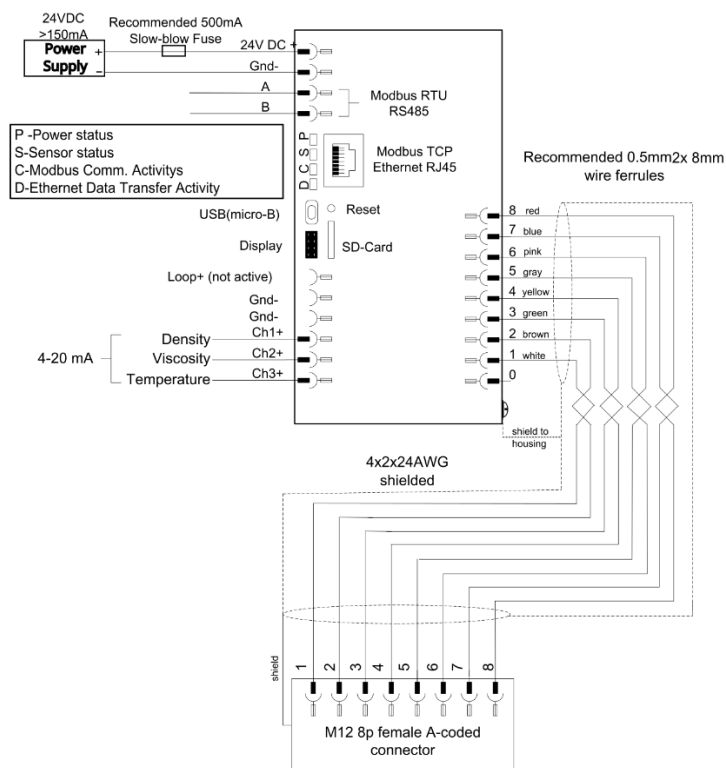


Figure 5: Rheonics sensor standard wiring.

The sensor supports multiple analog and digital communication interfaces and protocols. Refer to the communication manuals for details on each of the protocols and use. To download wiring drawings visit the Support Article: [Sensor electronics \(SME\) - Wiring drawing](#) (See Table of References - Entry 11).



**ATTENTION:** The sensor wiring shown above is not valid for intrinsically safe installations of an EX-certified SRD sensor in hazardous environment locations. Visit the correct manual at <https://rheonics.com/resources/manuals/> (See Table of References - Entry 12).

### 3.2.1 Connecting and disconnecting wires to the terminal blocks on SME electronics

SME electronics has terminal blocks for the power input, sensor cable (8 wires), 4-20mA output signals (Ch1 also used for HART 2-wire communication), and Modbus RTU. Care should be taken to avoid damage through use of excessive force while connecting and disconnecting wires to the terminal blocks.

The recommended wire gauge for the SME electronics is 0.5 mm<sup>2</sup> or 20 AWG. All wires connected to the SME should be crimped, 8 mm diameter crimps (white ferrules) are recommended. The sensor cable needs 8 wires with the correct ferrule for installation as shown in next Figure.

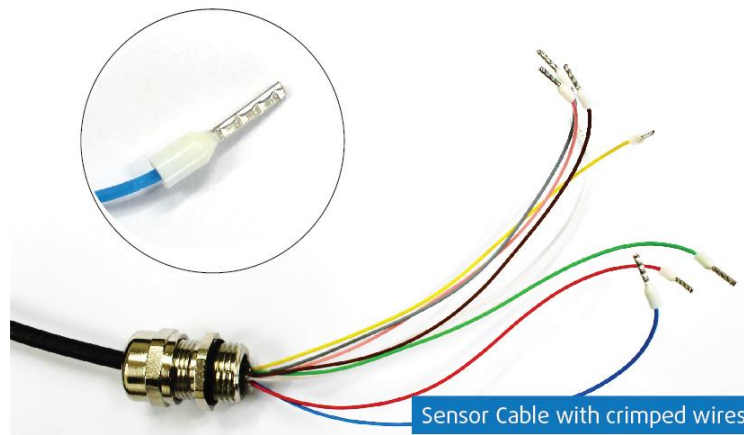


Figure 6: Sensor cable with crimped wires.

**To connect** wires to the SME, insert the crimped end in the correct port on the terminal block till it clicks firmly in place and cannot be pulled out when tugging on the wires (do not tug on the wires with a lot of force as that may damage the terminal block).

**To disconnect** the sensor wires, press the white tab for that specific port with a small flat screw driver as shown in the picture below where the user is removing wire connected to port 1. While pressing on the white part, pull out the cable connection with the other hand.



Figure 7: Disconnecting a wire from SME.

Review more on this article: [Cabling best practices](#) (See Table of References - Entry 13).

### 3.2.2 Connecting the sensor probe to sensor electronics

The sensor is connected to the transmitter electronics by a sensor cable. Follow the color code table below to connect the correct wires from the sensor cable to the sensor connection terminal strip on the transmitter. The leads are delivered with crimped ends; cable can be shortened if needed, but ferrules should be crimped onto the stripped ends.

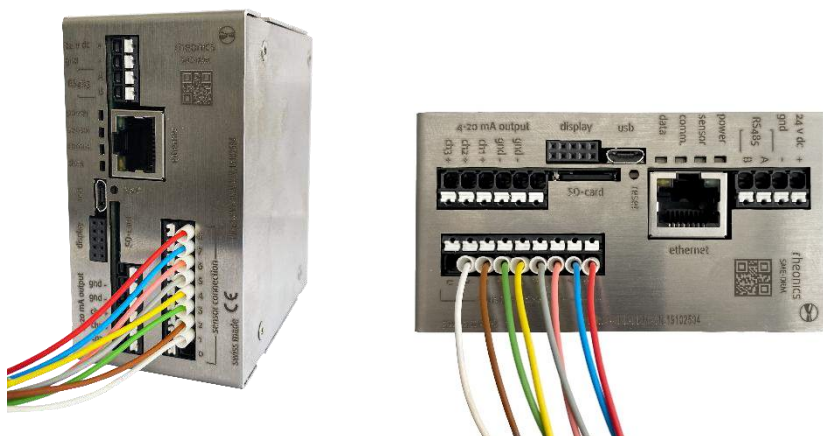


Figure 8: Sensor cable connection to the sensor electronics.

Table 2: SME terminal for sensor cable wires

Wire Color	Sensor connection terminal #
Red	8
Blue	7
Pink (Rose)	6
Grey	5
Yellow	4
Green	3
Brown	2
White	1
---not connected---	0



ATTENTION: The wiring color order shown in the table above is not valid for intrinsically safe installations of an EX-certified SRD sensor in hazardous environment locations. Visit the correct manual at <https://rheonics.com/resources/manuals/> (See Table of References - Entry 12).

### 3.3 Power requirements

The sensor power consumption is as follows:

- Voltage required: 24 V DC
- Voltage range acceptable: 18-36 V DC
- Current required (min): 120 mA
- Current recommended: 200 mA or higher
- Power required (maximum): 3 W
- Power recommended: at least 5 W
- Fuse (if required) rating: >500 mA Slow-blow fuse

Power input terminals are labeled with 24 V DC + and – GND.

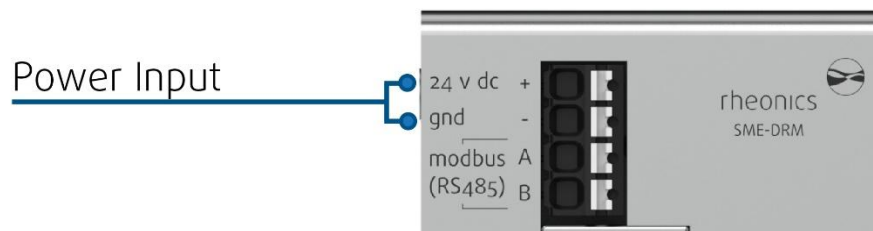


Figure 9: Power terminals in SME electronics.

It is important to avoid ground loops in the setup/plant where the SME is used. Ground loops can lead to excessive currents on the ground/return wire of the SME 24 V power supply which can damage the unit.

If there is a risk of ground loops in installation, it is recommended that the SME is powered by a separate 24 V power supply with galvanic separation.

Once the SME is powered on and connected to the sensor probe with the sensor cable, the sensor will start to measure and save data. The LEDs on the SME will start blinking indicating start up.

Review SME wiring diagram at [Sensor electronics \(SME\) – Wiring drawing](#) (See Table of References - Entry 11).

### 3.4 Sensor Probe Installation Requirements

The SRD sensor probe is generally installed in pipes, trays, tanks, movable objects for intermittent measurements, etc.

For installation in pipes, two orientations can be distinguished, these are Perpendicular and Parallel orientations, as shown in Figure 110. Perpendicular orientation works better for low-viscosity fluids, but a specific alignment of the probe tip is recommended, read Requirement iii below for details. Parallel or axial orientation is recommended for high-viscosity fluids, when there is a possibility of deposits forming on the probe, or if the fluid has fibers. This orientation allows the fluid to flow over the sensing element axially (along the probe's axis) making the sensing element self-cleaning; any deposits on the sensing element are therefore removed or

washed off by the fluid flow, hence improving the cleanability of the SRD probe. A long insertion probe can be used to extend the sensing element further into the line.

Depending on the type of fluid, high-speed mixing processes or installations near pumps may add bubbles or air to the fluid, which can add noise to the SRD readings. If bubbles are expected in the fluid, contact Rheonics Support Team for further recommendations and solutions.

Four main requirements for installation of the SRD are given below:

**i. Ensure the whole sensing area is in contact with the fluid of interest**

Rheonics SRD sensor probe has a sensing element that is surrounded by the sensing area highlighted in red in Figure 11: SRD sensing area. Figure 11The SRD sensing area must be fully in contact with the fluid of interest, partial immersion must be avoided. This sensing area is the same across all variants of SRD probes. This allows repeatable and reproducible readings of density and viscosity for the same fluid and operating conditions, regardless of the probe variant (flush, short, long, slimline, reactor, etc.) or installation.

**ii. Avoid stagnation or dead zones in the sensing area**

Any zone prone to deposits or the presence of other fluids different from the one of interest (e.g. accumulation of deposits, bubbles, etc.) should be avoided within the sensing area. Dead zones susceptible to fluid plugging/deposit/sedimentation are common near the installation ports of tanks and pipes. It is important to ensure that the sensing area is away from stagnation or dead zones. A good solution against this is to immerse the probe further in the fluid with a long insertion probe variant or use a flush installation (dead zones are removed).

**iii. Probe tip orientation to the flow**

This is relevant only for Perpendicular installation orientation, as shown in Figure 11. SRD sensor probe's fluid end or tip has a pallet shape, with one axis longer than the other. For perpendicular installations, Rheonics recommends aligning the SRD sensor probe tip to the fluid flow, as detailed in Figure 12. This avoids possible recirculation zones that can lead to sedimentation behind the tip (shadow section). This is also a requirement for hygienic installations. Learn more [here](#) (See Table of References - Entry 14).

**iv. Thermal balance for highest accuracy**

Figure 13 shows the inner resonator of the SRD sensor probe. To ensure the highest accuracy in density and viscosity measurements, the resonator should be thermally balanced. This means that if the fluid's temperature and ambient temperature (back side of probe) differ by more than 15°C, a long insertion SRD is recommended to place the resonator completely in fluid and maintain expected accuracy. Learn more [here](#) (See Table of References - Entry 15).

**Rheonics SRD sensor measures what the sensing element is in contact with.** This means that any deposit or fluid around other parts of the sensor probe, outside of the sensing area, will not affect the measurements.

Contact Rheonics Support Team for recommendations on installation. Share your installation proposal and a representative will contact you.



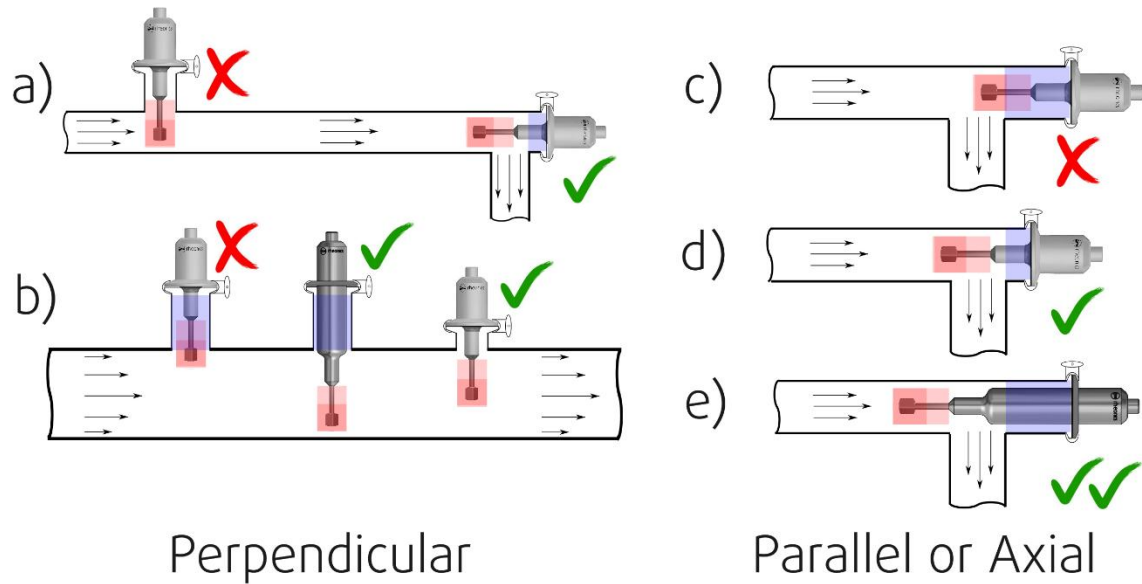


Figure 10: SRD Perpendicular and parallel installation orientations. a) Small lines (2", DN50, or smaller) generally require a parallel installation or the use of a Rheonics accessory e.g. flow cell, spool piece, etc. b) For perpendicular installations avoid long standpipes if these place the sensing area in a dead zone. Instead, use a long insertion probe (i.e. SRD-X5) or reduce the standpipe. Parallel installations: c) Wrong installation as the sensing area is located in a dead zone. d) Correct installation with a reduced dead zone. e) Very good installation with a long insertion probe (i.e. SRD-X5) avoiding the dead zone and placing the sensing area in the straight section of the pipe.

### SRD Sensing Area

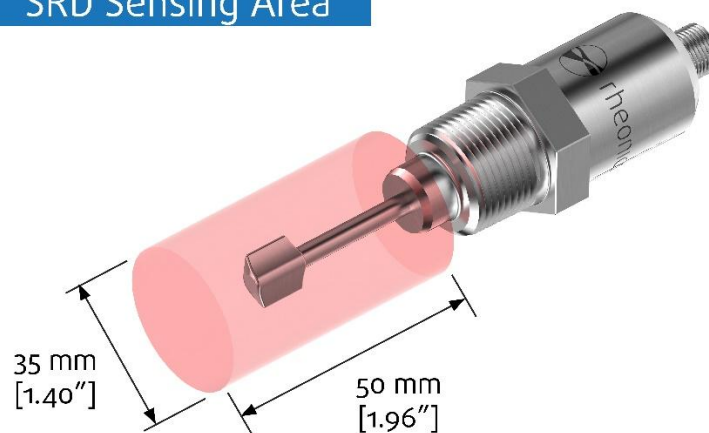


Figure 11: SRD sensing area.



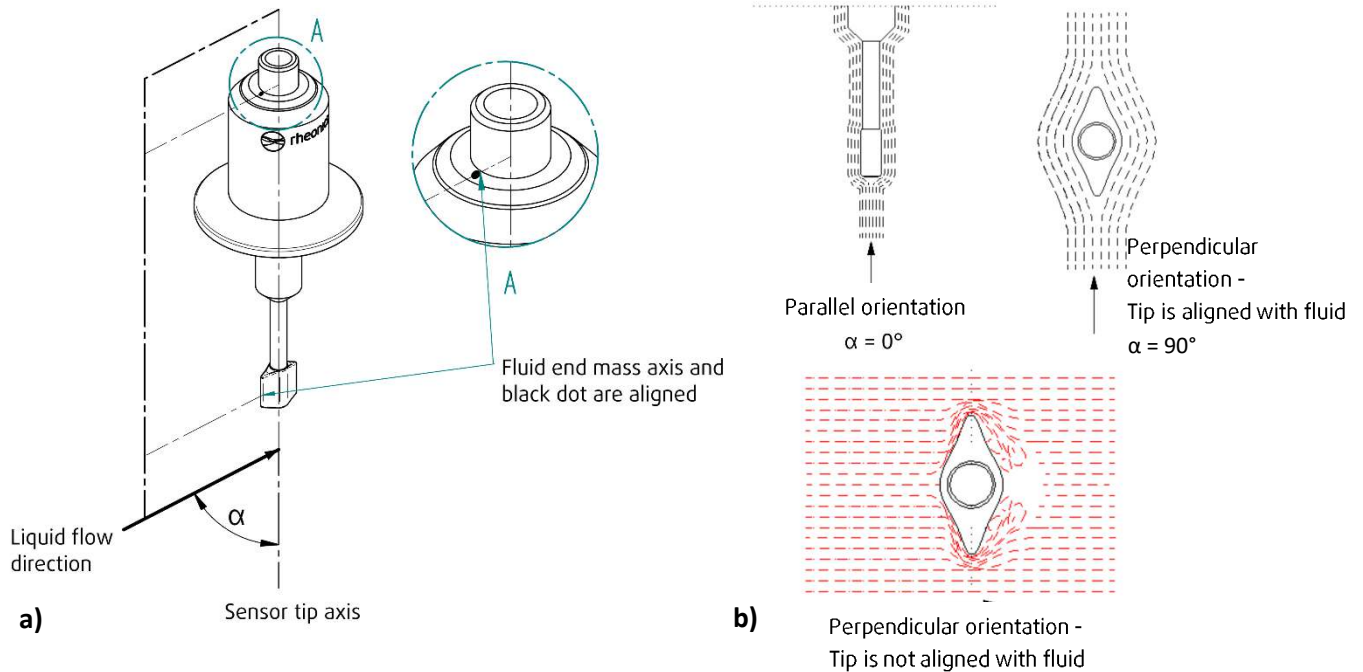


Figure 12: SRD sensor probe fluid end tip alignment with fluid. a) An indicator, i.e. black dot, marking, or notch, on the M12 connector base indicates the end mass tip axis on the SRD for proper installation. b) Rheonics recommends aligning the SRD probe tip with the fluid or using a parallel installation orientation. A not-aligned tip is not recommended because the recirculation zones hinder cleaning. These recommendations are mandatory for hygienic installations.

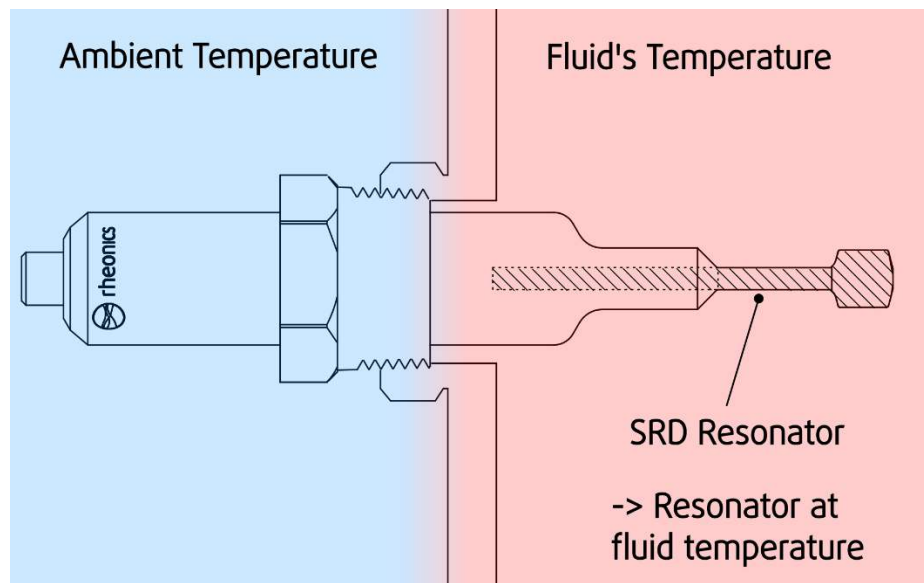


Figure 13: SRD Long insertion probe for thermal balance.

#### Additional installation notes:

- The SRD can be installed in lines as small as  $\frac{3}{4}$ " using Rheonics accessories like flow cells. Review all accessories [here](#) (See Table of References - Entry 16).
- There are no requirements on distance clearance upstream or downstream from the SRD probe, or pipe diameters of straight flow before and after the probe, to external equipment or instrumentation, i.e. valves, elbows, et. Installation will be correct, as long as the sensing

area is unobstructed and in contact with the fluid of interest.

- Consider that a clearance of 12 mm is needed from the sensor probe tip to any external equipment or pipe wall. This distance is considered in the sensing area.
- SRD sensor can operate in fluids with solids in the range of microns. Particles in the range of millimeters and centimeters will disrupt the readings (i.e. create spikes in readings) when the solids come in contact with the probe. If particles can harm the probe, it is recommended to use filters in pipes, probe protection sleeves in vessels (not recommended for high-viscosity fluids), or reduce or eliminate the presence of solids completely. SRD is not recommended for fluids with particles like gravels as these can harm the probe.
- SRD sensor is generally not recommended for fluids with a high percentage of bubbles or entrapped air, and not suitable for foam. In these cases, contact Rheonics Support Team for assistance.
- SRD operates in static and flowing fluids. In both cases, density measurements should be the same under the same temperature and pressure conditions. Even though flow rates do not influence the sensor operation, the viscosity measurement of a non-Newtonian fluid is dependent on the fluid's flow rate. A consistent flow rate in line for non-Newtonian fluids is recommended for low noise and stable readings. For Newtonian fluids, viscosity is not dependent on flow rate.
- External vibrations do not affect the sensor's operational performance. However, in high-vibration environments, the sensor reliability and lifetime can be compromised; therefore, regular checks are advised.

## 4 Communication Protocols

### 4.1 General Information

Rheonics sensors are extremely easy to integrate into user applications or projects, since the sensors have several industrial communication protocols available.

Rheonics provides extensive support resources on each communication protocol to enhance flexibility and convenience for our customers across diverse industries. **Some integration protocols come with the sensor by default, while others should be requested during sensor order.** Review all protocols at [Rheonics Electronics and Communications](#) (See Table of References - Entry 3). For the latest communication manuals on each protocol visit <https://rheonics.com/resources/manuals/> (See Table of References - Entry 12).

### 4.2 4-20mA (C1 - Default)

Rheonics sensors have 3 channels for 4-20 mA signals, as indicated in Figure 14. The 4-20mA signals are used mostly for the simplicity of using just 2 wires to transmit the sensor readings to an external device. However, users should be aware that these analog signals are susceptible to noise and are accurate only under certain field conditions.

By default, the SRD outputs density, viscosity, and temperature parameters through the 4-20mA ports, but these are customizable from the RCP, Rheonics Software.

Check these support articles: [4-20 mA](#) for more information (See Table of References - Entry 17).

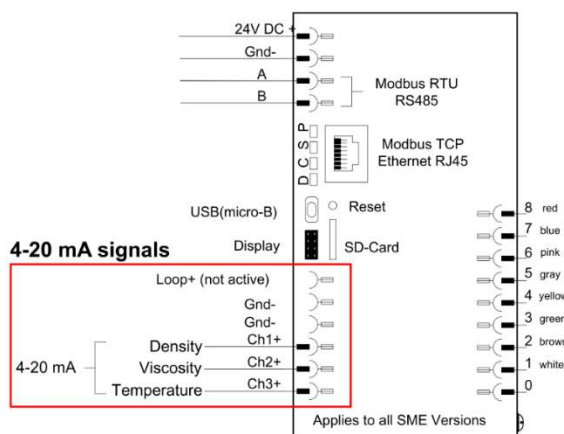


Figure 14. 4-20mA outputs available in the SME

### 4.3 Modbus RTU (C2 - Default)

Rheonics SME offers Modbus RTU over an RS485 interface. This protocol gives the user access to multiple parameters read by the sensor in real time. The data over Modbus is exchanged in the form of registers. This interface allows interoperability between devices from different manufacturers.

Modbus RTU communication is established with Rheonics sensors through two wires labeled on the sensor electronics, as shown in Figure 14. Check these support articles for more information on the integration and registers [Modbus RTU \(RS-485\)](#) (See Table of References - Entry 18) and review the manual “MRTU-OP” on Rheonics resources webpage.

## 4.4 Serial USB (C3 - Default)

All Rheonics sensor electronics (SME) come with a standard USB port for initial configuration and data monitoring. Check these [support articles](#) (See Table of References - Entry 19) for more information about communication over USB with Rheonics Sensors.

## 4.5 Bluetooth (C5)

Rheonics supports Bluetooth LTE 4.0 in the SME-TRD device only. By using this technology, the sensors can transmit measured data wirelessly. Rheonics provides various software for Windows, Linux, MacOS, iOS, and Android devices to connect the sensor over BLE. Contact Rheonics or visit the [Support Portal](#) (See Table of References – Entry 7) for more information.

## 4.6 Modbus TCP (C6)

The Rheonics SME offers Modbus TCP protocol over the Ethernet interface. This protocol gives the user access to multiple registers that contain the parameters read by the sensor.

Using Modbus TCP, allows the user to connect the sensor to the Ethernet TCP IP network through an Ethernet cable with Client-Server communication. Check Rheonics support articles for more information on the integration and registers [Modbus TCP \(Ethernet\)](#) (See Table of References - Entry 20) and review the manual “MTCP-OP” on the Rheonics resources webpage.

## 4.7 Ethernet/IP (C7)

All Rheonics SME variants can be ordered with Ethernet/IP. This communication protocol enables the fast delivery of extensive data from Rheonics SME sensors to external devices, like Allen-Bradley PLCs, through the SME Ethernet Port. Rheonics has extensive expertise with Ethernet/IP, hence comprehensive guidelines can be found on Rheonics Support Portal to ensure easy and effective integration. Check these support articles [Ethernet/IP](#) (See Table of References - Entry 21) and review the user manual “ENIP-OP” on Rheonics resources webpage.

## 4.8 HART (C8)

All Rheonics SME variants can be ordered with HART. Using the HART protocol, Rheonics sensors deliver 4 parameter readings as digital data, which are PV, SV, TV, and QV. By default, the output parameters are the following:

**Table 3: SRD HART Parameters**

SRD default configuration	
PV	Density
SV	Viscosity
TV	Temperature
QV	Sensor Status

Check these support articles on [HART](#) (See Table of References - Entry 22) and review the manual “HART-OP” on Rheonics resources webpage.

## 4.9 Profinet (C9)

All Rheonics SME variants can be ordered with Profinet. Rheonics sensors can transmit real-time data at 100 Mbps in full duplex communication through Profinet using the SME ethernet port. Check these support articles [PROFINET](#) (See Table of References - Entry 23) and review the manual “PNET-OP” on Rheonics webpage.

## 5 RCP Software

Rheonics SRD sensor is built to be a plug-and-play instrument. This means that the operator only needs to wire the probe and the electronics using the sensor cable, following the diagram in Section 3.2, and power the sensor electronics to start measurements.

Rheonics Control Panel (RCP) software allows the user to get the full potential of Rheonics sensors. The software is used for sensor configuration, measurement visualization, download of historical log files, and more. The software installer is included in the USB storage delivered with the sensor. If that is not the case, or you do not have the USB stick anymore, contact Rheonics Support Team and share the sensor serial number S/N to request the software.

Review the RCP Software Manual for complete instructions on installation and use. The software is included in the USB storage delivered with the sensor.

**RHEONICS SME ELECTRONICS MUST BE CONNECTED TO THE COMPUTER WITH THE USB CABLE AND POWERED UP CORRECTLY TO ESTABLISH THE FIRST COMMUNICATION WITH RCP SOFTWARE**

To start using the sensor and Rheonics software, the following should be done:

1. Connect the sensor probe to the SME transmitter
2. Connect the power supply to the transmitter
3. Connect the USB cable to the transmitter electronics. Connect the other end to a free USB port on the computer.
4. Run the Rheonics Control Panel software. The software can be opened from the PC's start menu.
5. Go to the Settings tab and select the correct USB port to detect the sensor by clicking in the button "Apply". Wait for the Status LED to turn green.
6. Go to the Measurements tab to visualize the readings in real time.

Find further steps on the RCP Software Manual "RCP-OM" and on Rheonics articles at [RCP – Rheonics Control Panel - Articles](#) (See Table of References - Entry 24).

When the software is running, you will see a screen similar to the following:

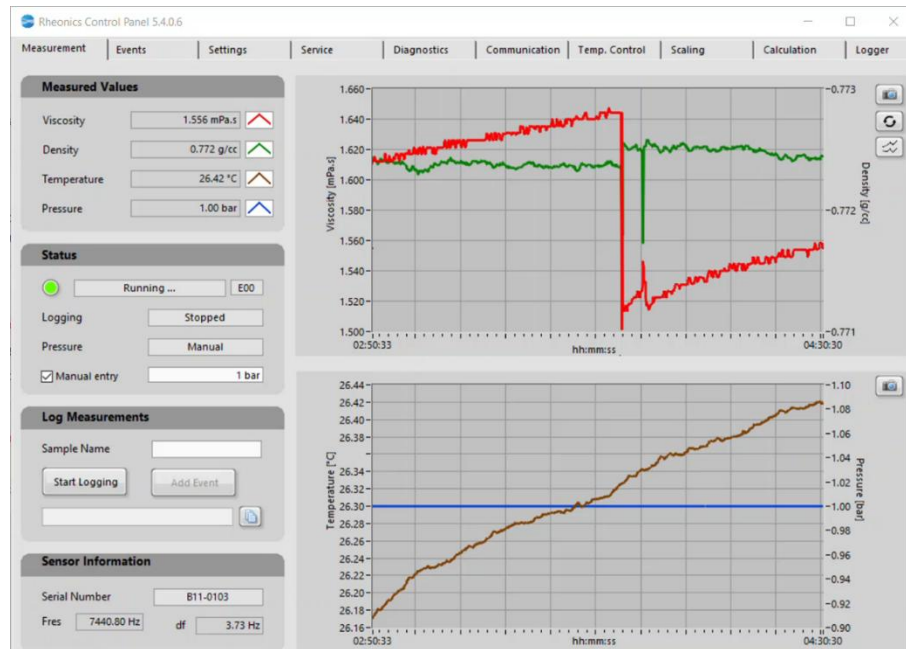


Figure 15: RCP Measurement tab.

For help with Rheonics Control Panel (RCP) and its settings, user can navigate to the Help tab within the software and access manuals or contact Rheonics Support Team at [support@rheonics.com](mailto:support@rheonics.com).

## 6 Handling the sensor

### 6.1 Cleaning

SRD sensor probe is CIP compatible, meaning it can be cleaned in-line with solvents and water as part of the customer's standard cleaning procedure. Solvents used for cleaning must be compatible with the sensor probe material.

General recommendations for cleaning are:

- Check your sensor material and ensure only chemicals compatible with the material are used. Sometimes sensors have two materials and chemicals used must therefore be compatible with both, or appropriate safeguards should be in place to ensure that cleaning chemicals do not come in contact with incompatible materials on the sensor.
- Inline cleaning is generally sufficient.
- Only remove the sensor probe from the line when needed or when dismantling the line is the standard cleaning procedure. For example, manual cleaning of adherent films from pipes and probe.
- Cleaning can be done with appropriate solvents and/or by wiping the probe with a solvent-saturated cloth or paper. Vinegar or diluted caustic soda could also be used.
- Do not let fluid solidify on the probe. If this occurs, soak the probe in water for some hours to dissolve the solid.
- Under no circumstances should abrasives be used to clean the resonator since these will change its geometry and destroy its calibration.
- Never use ultrasonic cleaning methods like ultrasonic baths. They can damage the sensor.

Review more information on cleaning instructions [here](#) (See Table of References - Entry 25).

### 6.2 Calibration

All Rheonics sensors are factory calibrated and do not need recalibration for use. Customer-specific calibration that is NIST traceable can be ordered.

However, clients may require calibration or verification for instruments used in their industry. This can be part of Quality Control (QC) for ensuring expected accuracy, uncertainty, and reliability on readings, and/or Compliance with regulations or standards governed by law, such as ISO 17025 or FDA, for food and pharmaceutical industries. These regulations designate a standardized verification of sensor operation to ensure safety, quality, and correct production.

Rheonics offers the next following verification methods:

**a. Quick verification of SRD in air**

1. Remove the SRD from process
2. Clean the SRD of residual fluid or dirt
3. Leave the SRD in the air, and verify that nothing is in contact with the sensing element
4. Verify density and viscosity reading are zero. This can be checked through the SME-TRD display, RCP software, or any external integration system (e.g. PLC).

This “air check” is useful as a quick verification of the SRD correct operation. The sensor does not use moving parts, so if readings in the air are zero, then the sensor is both clean and within calibration. However, this is not a replacement for the formal calibration verification required by ISO or FDA guidelines.

**b. Calibration verification to NIST traceable density and viscosity reference in field**

This method follows Rheonics factory calibration procedure by measuring with the SRD a Newtonian fluid of known certified density and viscosity at prescribed temperatures. Then compare the SRD readings to the expected values and verify the accuracy is within the expected range.

**1. Calibration setup preparation:**

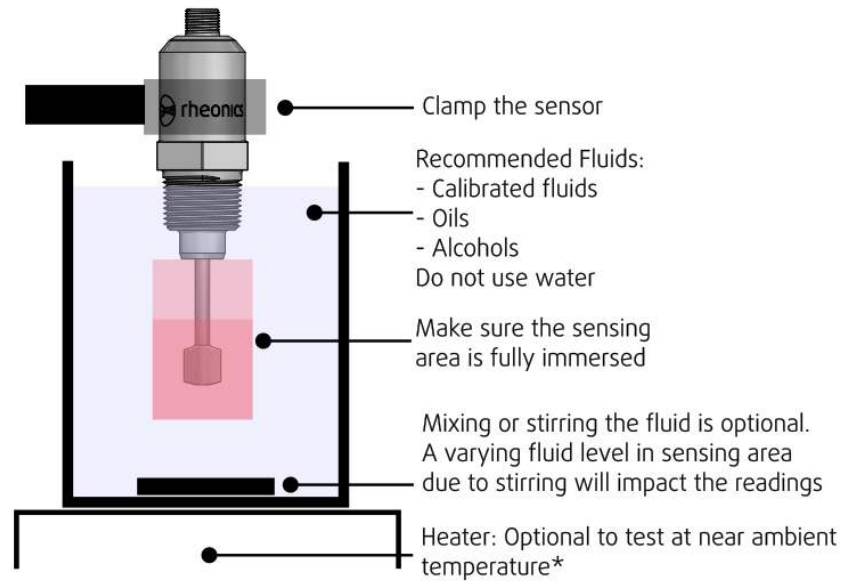
- Clamp the sensor probe firmly on its body to avoid movement during measurement. Do not perform a calibration by holding the probe by hand or fixing the sensor at the cable.
- Have enough space and fluid to surround the sensor sensing element (red zone in Figure 11). Have fluid level higher than the minimum level required. Consider the thermal equilibrium required, as described in section 3.4.
- Control the temperature. To register the density and viscosity readings, wait for sensor to output stable temperature values.
- Mixing the fluid allows for uniform temperature. However, mixing can also cause fluid swirling, make sure this doesn't affect the immersion of the sensing element in the fluid.

2. Use a calibration reference fluid with a known density and viscosity at given temperatures. Rheonics recommends using the same or similar NIST traceable fluid used for factory calibration that is specified in the Custom Calibration Certificate.

3. Check the readings from the SRD, and wait for stable readings of temperature, density and viscosity.

4. Compare the SRD density and viscosity readings with the calibration reference fluid values. Then calculate the error percent and verify this is within the expected range.





\*If the process fluid temperature differs by more than 15 °C from the ambient temperature, then thermal equilibrium along the probe should be considered, i.e. an oven or a long insertion probe for deeper immersion is recommended.

*Figure 16: SRD calibration setup example.*

Review more information on calibration [here](#) (See Table of References - Entry 26).

Rheonics offers a Calibrator device to simplify the on-site calibration procedure. Contact Rheonics Sales Team for more information.

## **7 Notes/Errata:**

## 8 Revision and Approvals

Version	Nature of changes	Approvals	Date
1.0	Original version	PP, CA, SK	08.12.2024

## 9 References and links

Entry	Type	Title/Description	URL
1	Webpage	Rheonics' Resource library	<a href="https://rheonics.com/resources">https://rheonics.com/resources</a>
2	Support Article	Rheonics sensor cable and connection variants	<a href="https://support.rheonics.com/en/support/solutions/articles/81000412899">https://support.rheonics.com/en/support/solutions/articles/81000412899</a>
3	Webpage	Electronics and Communications	<a href="https://rheonics.com/electronics-and-communication/">https://rheonics.com/electronics-and-communication/</a>
4	Support Portal	SRD Density Meter Installation articles	<a href="https://support.rheonics.com/en/support/solutions/folders/81000297659">https://support.rheonics.com/en/support/solutions/folders/81000297659</a>
5	Resources	Rheonics vibrational sensor technology: demystified	<a href="https://rheonics.com/whitepapers/">https://rheonics.com/whitepapers/</a>
6	Support Article	Process Viscometer and Density Meter Chemical Compatibility	<a href="https://support.rheonics.com/en/support/solutions/articles/81000412247">https://support.rheonics.com/en/support/solutions/articles/81000412247</a>
7	Support Portal	Rheonics Support Portal	<a href="https://support.rheonics.com/en/support/home">https://support.rheonics.com/en/support/home</a>
8	Resources	Rheonics Certifications	<a href="https://rheonics.com/resources/certificates/">https://rheonics.com/resources/certificates/</a>
9	Webpage	SRD - Request for Quote Form	<a href="https://rheonics.com/request-for-quotation/srd/">https://rheonics.com/request-for-quotation/srd/</a>
10	Support Article	SR probes for highly viscous fluids and high fluid speeds	<a href="https://support.rheonics.com/en/support/solutions/articles/81000416567">https://support.rheonics.com/en/support/solutions/articles/81000416567</a>
11	Support Article	Sensor electronics (SME) - Wiring drawing	<a href="https://support.rheonics.com/en/support/solutions/articles/81000393097">https://support.rheonics.com/en/support/solutions/articles/81000393097</a>
12	Resources	Rheonics Manuals	<a href="https://rheonics.com/resources/manuals/">https://rheonics.com/resources/manuals/</a>
13	Support Article	Best Practices for Cabling Installation	<a href="https://support.rheonics.com/en/support/solutions/articles/81000408323">https://support.rheonics.com/en/support/solutions/articles/81000408323</a>
14	Support Article	SRD fluid end orientation	<a href="https://support.rheonics.com/en/support/solutions/articles/81000408815">https://support.rheonics.com/en/support/solutions/articles/81000408815</a>
15	Support Article	Maintaining the SRD's temperature balance for high density accuracy	<a href="https://support.rheonics.com/en/support/solutions/articles/81000412500">https://support.rheonics.com/en/support/solutions/articles/81000412500</a>
16	Support Article	SRD flow through cells	<a href="https://support.rheonics.com/en/support/solutions/articles/81000411678">https://support.rheonics.com/en/support/solutions/articles/81000411678</a>
17	Support Portal	Communication connections / 4-20 mA	<a href="https://support.rheonics.com/en/support/solutions/folders/81000217004">https://support.rheonics.com/en/support/solutions/folders/81000217004</a>
18	Support Portal	Communication connections / Modbus RTU (RS-485)	<a href="https://support.rheonics.com/en/support/solutions/folders/81000217005">https://support.rheonics.com/en/support/solutions/folders/81000217005</a>
19	Support Portal	Communication connections / USB	<a href="https://support.rheonics.com/en/support/solutions/folders/81000219065">https://support.rheonics.com/en/support/solutions/folders/81000219065</a>

20	Support Portal	Communication connections / Modbus TCP (Ethernet)	<a href="https://support.rheonics.com/en/support/solutions/folders/81000217062">https://support.rheonics.com/en/support/solutions/folders/81000217062</a>
21	Support Portal	Communication connections / Ethernet/IP	<a href="https://support.rheonics.com/en/support/solutions/folders/81000288489">https://support.rheonics.com/en/support/solutions/folders/81000288489</a>
22	Support Portal	Communication connections / HART	<a href="https://support.rheonics.com/en/support/solutions/folders/81000284399">https://support.rheonics.com/en/support/solutions/folders/81000284399</a>
23	Support Portal	Communication connections / PROFINET	<a href="https://support.rheonics.com/en/support/solutions/folders/81000292663">https://support.rheonics.com/en/support/solutions/folders/81000292663</a>
24	Support Portal	RCP - Rheonics Control Panel	<a href="https://support.rheonics.com/en/support/solutions/folders/81000211411">https://support.rheonics.com/en/support/solutions/folders/81000211411</a>
25	Support Article	How to clean your Rheonics probe?	<a href="https://support.rheonics.com/en/support/solutions/articles/81000410289">https://support.rheonics.com/en/support/solutions/articles/81000410289</a>
26	Support Article	Calibration for the Type-SR sensors in field, verification and re-calibration	<a href="https://support.rheonics.com/en/support/solutions/articles/81000390161">https://support.rheonics.com/en/support/solutions/articles/81000390161</a>