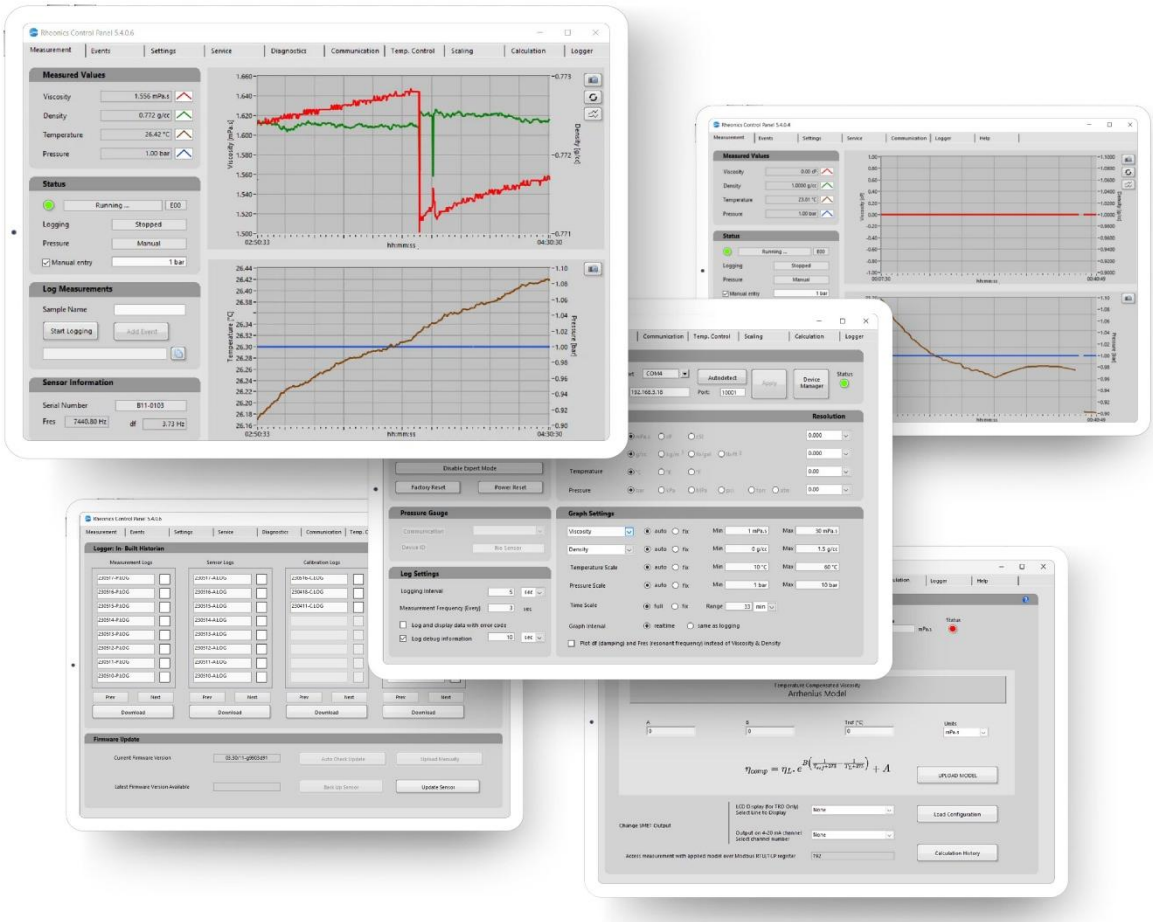
Rheonics RCP Software

SOFTWARE MANUAL

Rheonics Control Panel

Doc. ID: RCP-SM-2502



rheonics

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TRADEMARKS

Contents

1 Before you begin

1.1 About the manual

This manual describes the functions and features of the Rheonics Control Panel Software.

Important Instructions

This manual assumes that the following conditions apply:

- This manual is valid for RCP software version **V5.4.2.1 or later**, and compatible with Rheonics sensors with firmware **FW3 or later**. For previous versions contact Rheonics Support Team.
- The sensor has been installed correctly and completely according to the installation guidelines.
- The installation complies with all applicable safety requirements.
- The user is trained in relevant safety standards.

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
For installation, integration, and troubleshooting contact the Support Team at support@rheonics.com

1.3 Who should use this document?

This manual is designed to be a complete guide for using the Rheonics Control Panel software along with Rheonics inline density and viscosity sensors. This document assumes the reader is familiar with the sensor principle of operation, installation, and requirements.

1.4 Hazard Message

ATTENTION
This word indicates useful information for the operator but without risk for the operation of Rheonics products.

CAUTION
This word indicates a medium or highly recommended action to ensure the proper function of Rheonics products.

1.5 Nomenclature

Abbreviation	Full-term	Meaning
SRV	Symmetric Resonator Viscometer	Viscosity sensor
SRD	Symmetric Resonator Densitometer	Density and Viscosity sensor
DVP	Density Viscosity Probe	HPHT inline probe
DVM	Density Viscosity Module	HPHT inline module
DTCM	DVM Thermal Control Module	Module for thermal testing
RCP	Rheonics Control Panel	Software for data acquisition and configuration
SME	Smart Module Electronics	Sensor electronics
SME-TRD	SME in Transmitter Housing with Display	Sensor electronics housing with display
STCM	Sensor Thermal Control Module	Module for thermal testing

Table 1 Nomenclature

1.6 Related Documentation

You can find all product documentation on the USB storage device that was shipped with the sensor.
For more information on the RCP and Rheonics sensors, refer to the following documents on Rheonics website. Contact Rheonics Support Team if you cannot find a document online.

Title	Code	Description
RCP Software Manual	**RCP-SM**	**Rheonics Software Installation and User Manual**
SRV Operator Manual	SRV-OP	SRV Sensor Operator Manual
SRD Operator Manual	SRD-OP	SRD Sensor Operator Manual
DVM Operator Manual	DVM-OP	DVM Sensor Operator Manual
DVP Operator Manual	DVP-OP	DVP Sensor Operator Manual
SME Operator Manual	SME-OP	Rheonics SME Sensor Module Electronics Manual
Communication Protocol Manuals	Various	Modbus TCP, Modbus RTU, HART, Profinet, Ethernet/IP, etc.
EX installation Manual	EX-IM	Installation of Intrinsically Safe Sensors Manual

Table 2 Related Documentation

For up-to-date information on the RCP Software, please check the page:

https://support.rheonics.com/en/support/solutions/folders/81000211411

2 Installing the Rheonics Control Panel

2.1 Minimum System Requirements

Operating System:
Windows 7 or Higher (Windows 10 recommended)
Required:

- LabVIEW Run-Time Engine 2019, and NI-VISA Run-Time Engine 19.0. Both Included in the full installer "**RCPSetup_Vx.x.x.x_full.exe**"
- Both run-time engine installers are also available online at:
  - https://www.ni.com/en-us/support/downloads/software-products/download.labview-runtime.html#346222
  - https://www.ni.com/en-us/support/downloads/drivers/download.ni-visa.html#346210
- **Free Disk Space:** 2 GB (For full installation including run-time engines)
- **RAM:** 4 GB

2.2 Installation instructions

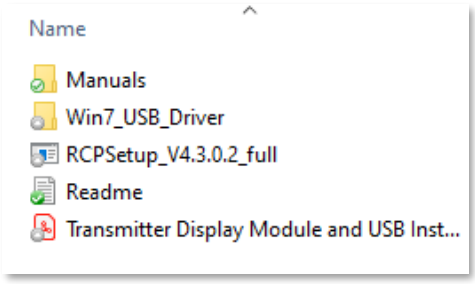
Notes

- The Setup program or installer file is supplied on the USB drive included with the rest of the equipment.
- If the USB drive is not available, users can contact Rheonics Support Team providing their sensor Serial Number to receive the link to download the RCP installer.
- Updates can also be downloaded from the Rheonics website, please refer to our contact section to contact support.

Procedure
To install the software, follow these steps:

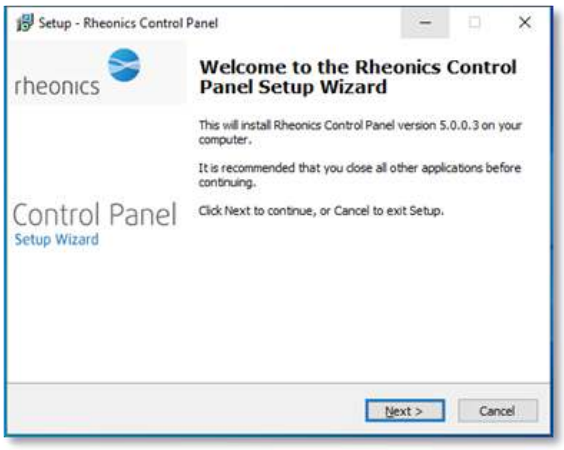
1. Insert the USB drive and copy the files to a local directory on the computer. If the system asks whether to repair the disk, select the "**Open without repairing"** option. Remove the USB drive and store it in a secure place.
2. The newly created installation folder will contain the setup files.
3. Start the Setup Wizard Application program by double-clicking the "**RCPSetup_Vx.x.x.x_full.exe**" file.

Figure 1: RCP Installer



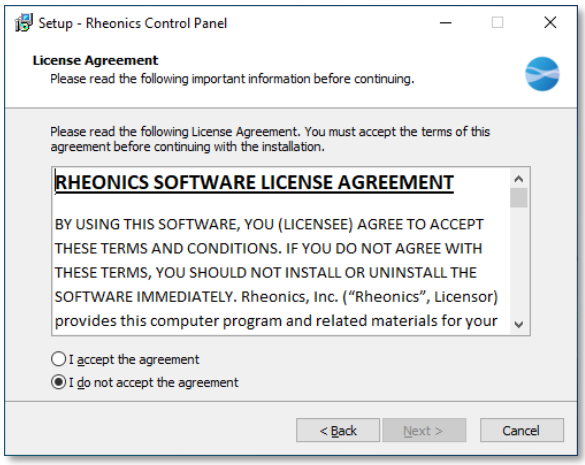
4. Click **"Next"** to continue the installation process.

Figure 2: RCP Installation Wizard



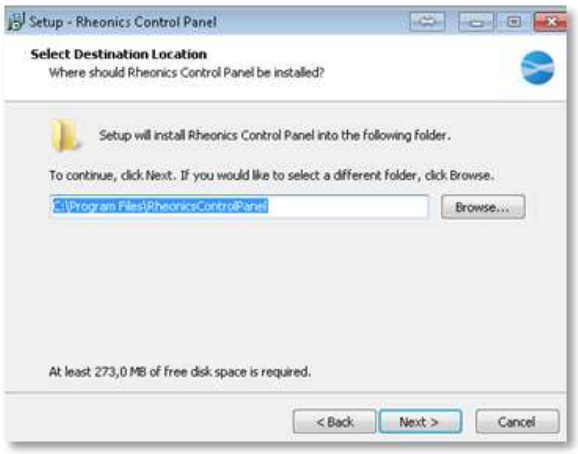
5. Review and accept the license agreement. Click **"Next".**

Figure 3: RCP Installation – License Agreement



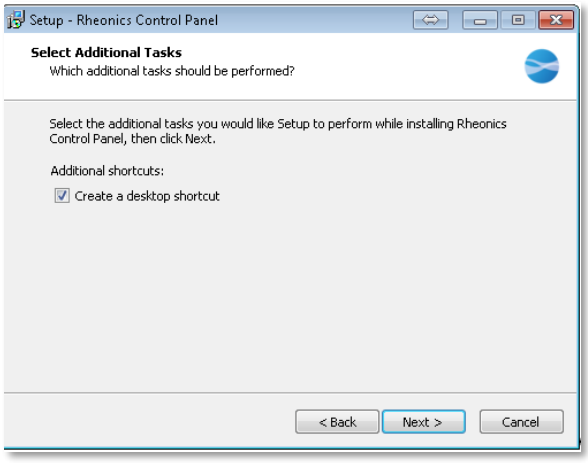
6. Select the installation directory (it is recommended to use the default location), then click **“Next”.**

Figure 4: RCP Installation – Destination Folder



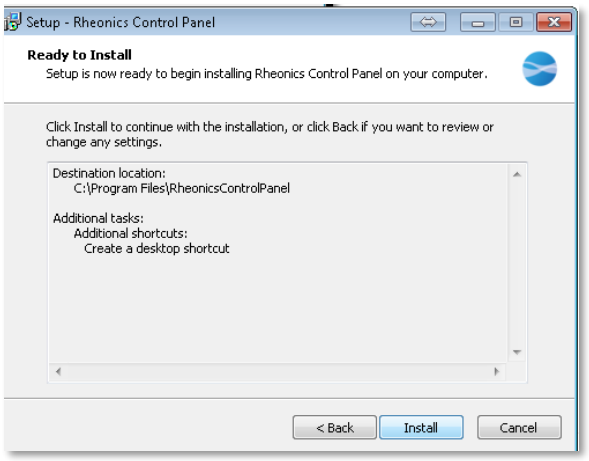
7. Choose whether you want to create a desktop shortcut or not, by selecting the checkbox next to “**Create a Desktop shortcut”**. Then click “**Next**”.

Figure 5: RCP Installation – Desktop Shortcut



8. Review the Installation settings, if you want to make any changes, click **“Back”,** otherwise Click **“Install”** to finish the installation process.

Figure 6: RCP Installation Complete

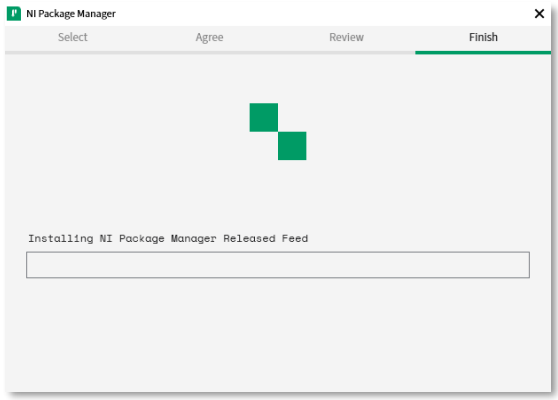


9. The installer will extract the files in the default destination. During the process, a command window will open. Do not close this window; it will close automatically once the process is complete.

Figure 7: RCP Installation – Files Extraction

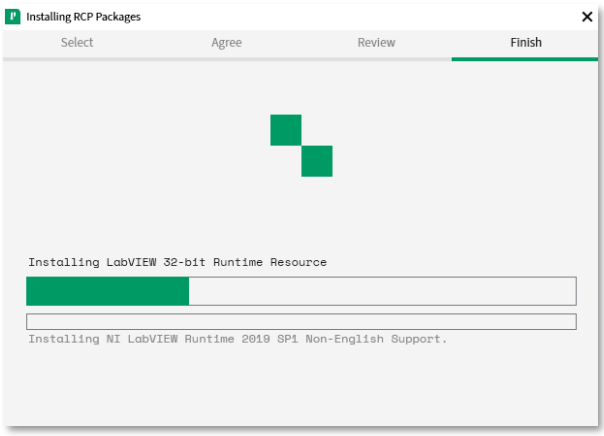
10. A window for installation of NI Package manager will be displayed. Wait until the process finishes.

Figure 8: RCP Installation – NI Package Manager



11. A window will be displayed showing the installation progress of RCP Packages. Wait for the progress bar to complete.

Figure 9: RCP Installation – NI Package Manager Installation



12. When the process is over, the installer will prompt for system restart. You are required to restart the computer for the installation to be completed.

Note

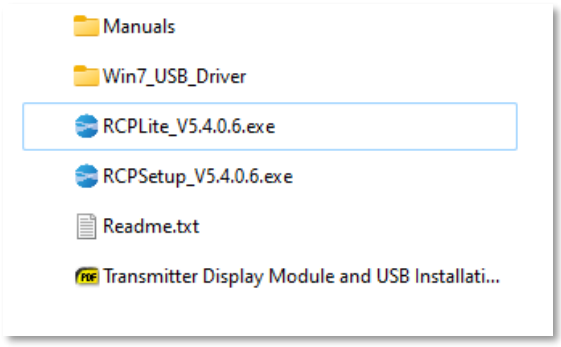
Once restarted, the RCP software and its dependencies will be installed on your system and ready for operation.

2.3 RCP Lite Installer

If you have installed an earlier version of RCP (from 4.2.0.5 onwards), and want to update to a newer version, use the "***RCP_Lite_Vx.x.x.x.exe***" installer provided by Rheonics and skip the full installation.

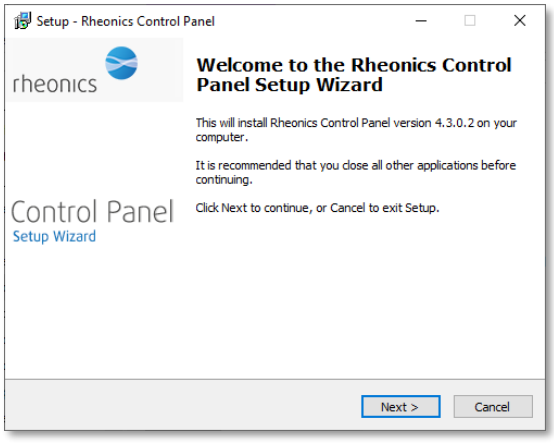
Double click on the file to start the installation process.

Figure 10: RCP Lite Installer



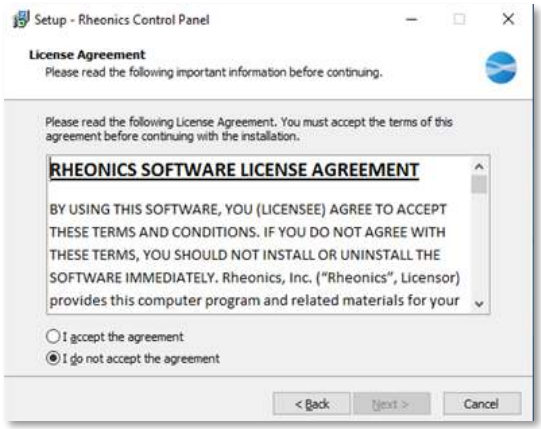
Click **"Next"** on the dialog below to start the installation process.

Figure 11: RCP Lite Installation – Wizard



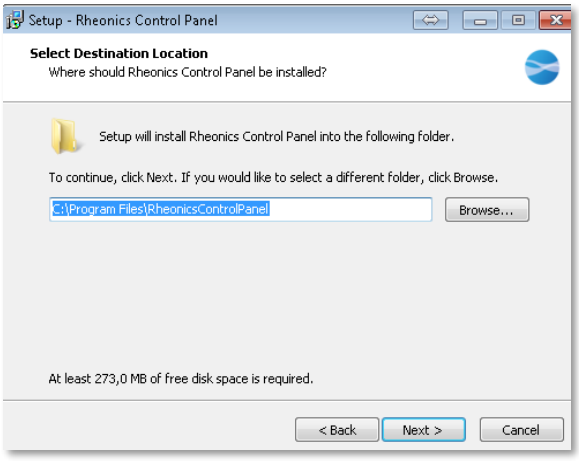
Review and accept the license agreement.

Figure 12: RCP Lite Installation – License Agreement



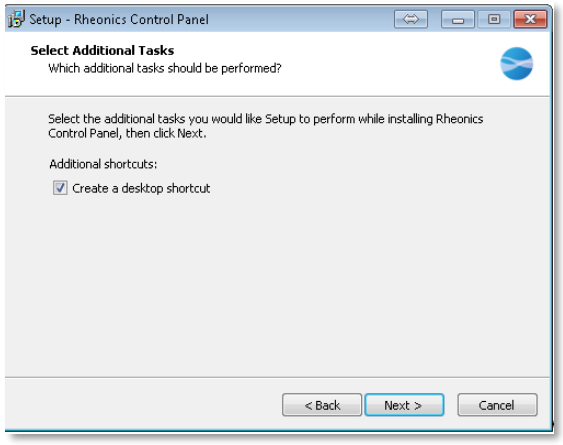
A dialog will appear to select the installation directory. Use the default, unless there is a reason to select a different location, then click **"Next"**.

Figure 13: RCP Lite Installation – Destination



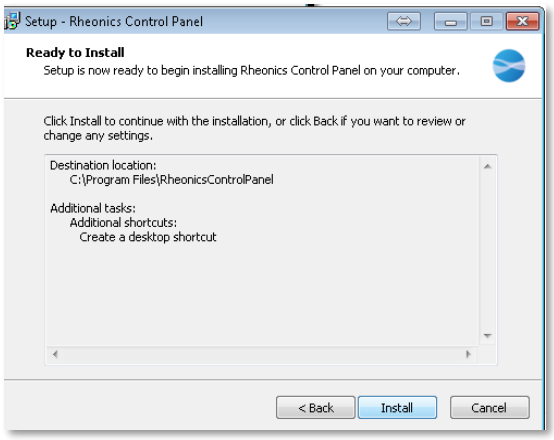
Select the checkbox to create a Desktop shortcut, and then click **“Next”**.

Figure 14: RCP Lite Installation – Desktop Shortcut



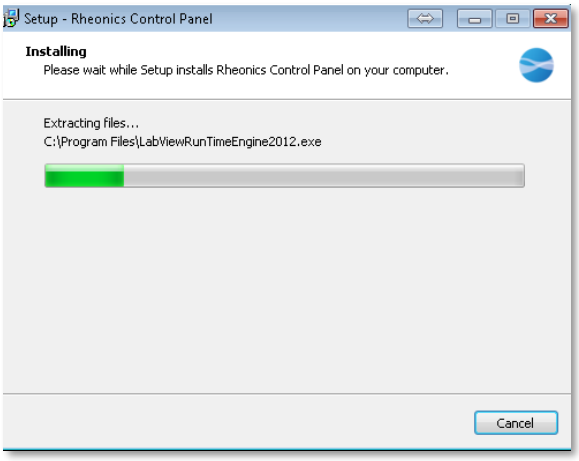
Click **“Install”** to complete the installation process of RCP.

Figure 15: RCP Lite Installation – Install



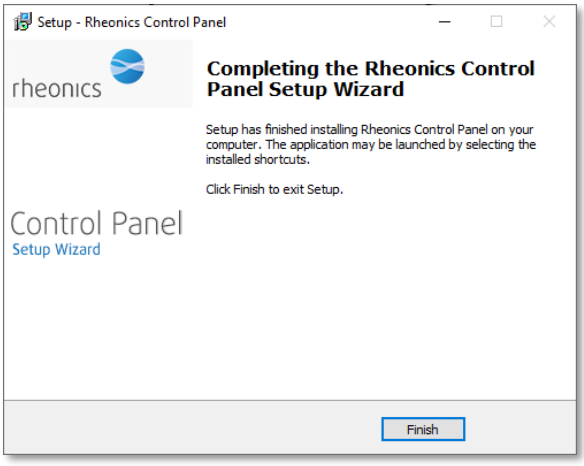
The installer will install the files in the default or selected destination.

Figure 16: RCP Lite Installation – Installation Process



Click **"Finish"** to finish the installation process.

Figure 17: RCP Lite Installation – Installation Completed



RCP software is now updated and ready to use.

2.4 Installing Sensor Module Electronics (SME) USB Drivers

The USB driver provides a virtual COM-Port on the computer used by the Rheonics Control Panel.

For Windows 10 and Windows 11 systems:
The Drivers should install automatically when the computer detects the sensor connected to the USB port (Device manager will show the sensor as a COM port).

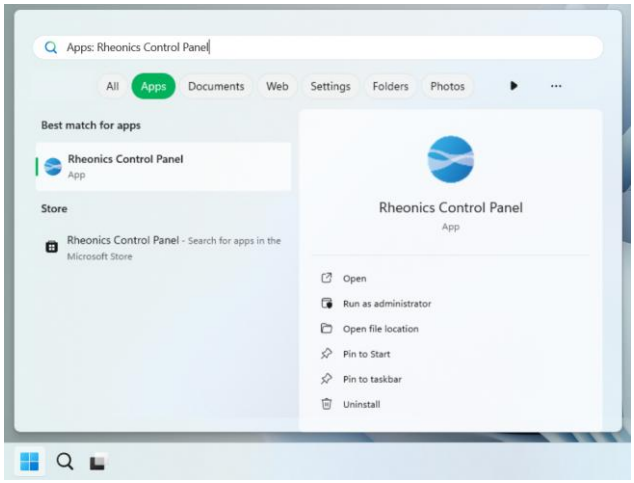
For Windows 7 systems:

1. Connect the SME to the computer with the USB cable.
2. If Windows does not find the drivers automatically, install the drivers manually.
3. The drivers are located in the folder **"WIN7_USB_DRIVERS"** on the USB drive. If you received a zip archive of the drivers, extract the zip folder to your computer. Select **"Browse my computer for driver software"** and navigate to the USB driver folder: "**WIN7_USB_DRIVERS\ USB\CDC"**
4. Ensure the "**Include subfolders"** checkbox is selected.
5. Click "**Next"** and the driver will be installed.
6. Upon successful installation, the Rheonics sensor will show up as "**SME"** in the Device Manager under the "**Ports (COM & LPT)"** list.

2.5 Starting the program

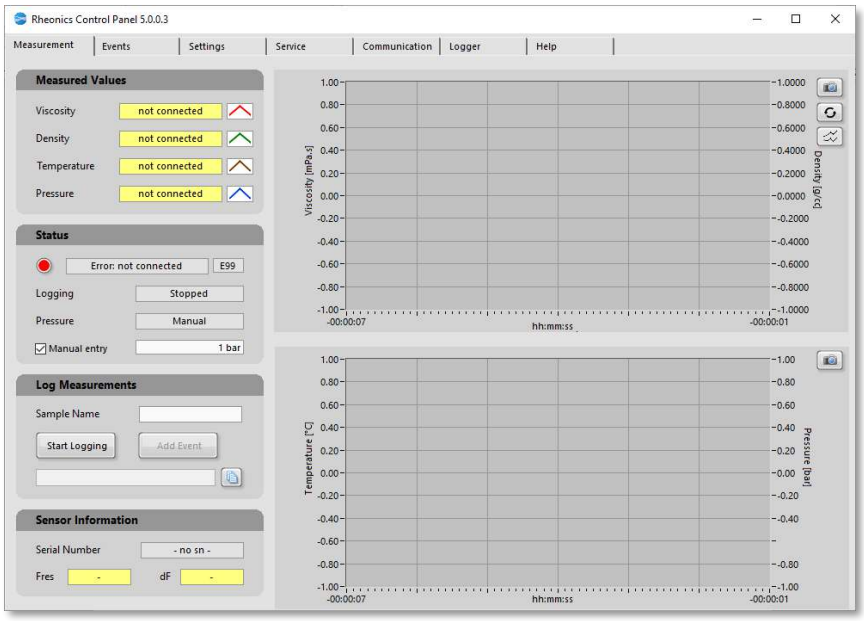
To start the Rheonics Control Panel go to the Windows Start menu, and select "**Rheonics Software"** > "**Rheonics Control Panel"**, or use the Desktop icon if it was created during the installation process.

Figure 18: Starting RCP



The program starts in the "**Measurement Tab"**, you will see a screen similar to the following:

Figure 19: RCP – Measurement Tab



Notice that the "**Status"** indicator will probably be colored red, indicating that the SME is not connected.

3 System overview

3.1 Product Overview

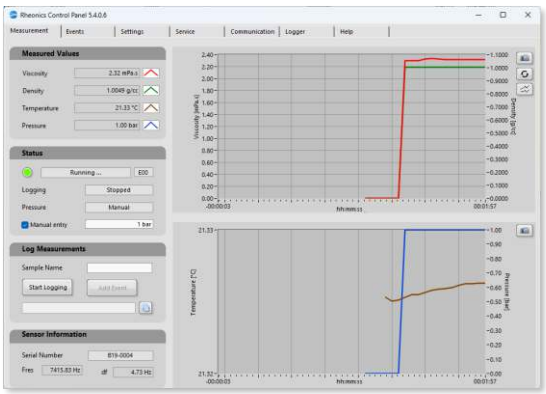
Rheonics Control Panel is the main software for monitoring, managing, and configuring the advanced settings of your Rheonics sensor. An overview of its features is provided bellow.

Figure 20: SME - USB & Ethernet Connection

Monitoring the measurements

RCP allows you to monitor the sensor's measurements in real-time , either through the main Measurement Tab or the Dataview Window.

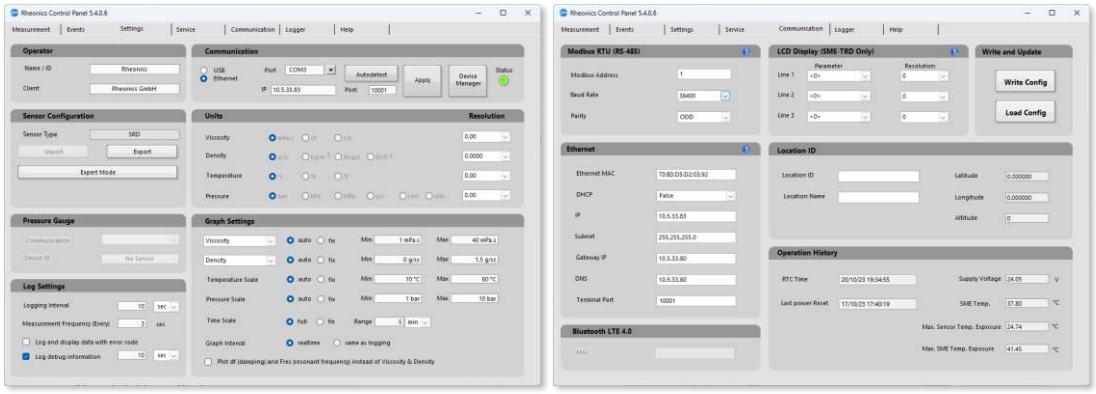
Figure 21: Measurement Tab and Dataview Window



Setting operation parameters

Users can configure multiple parameters through the RCP, including RCP data Visualization (Settings tab), 4 to 20 mA channels (Service tab), Ethernet and other communication protocols (Communication tab), etc.

Figure 22: RCP – Settings and Communication Tabs

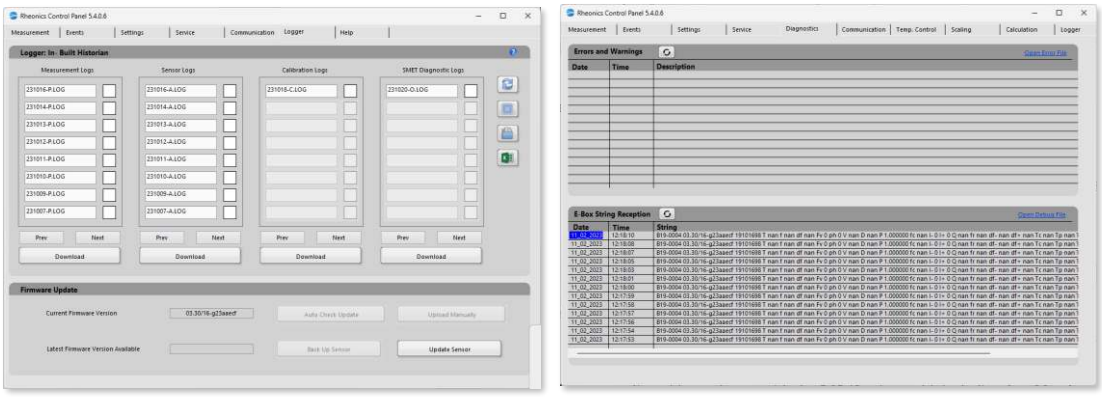


Logging and diagnostics

Automatic on-board logs saved by the SME on its SD card can be downloaded and managed in the Logger tab. These logs contain measurement data recorded by the sensor daily. Manual logging is also possible from the Measurement tab.

The Diagnostics tab shows useful data strings for evaluating sensor performance and troubleshooting, which are usually of interest to the Rheonics Support team.

Figure 23: Logger and Diagnostics Tabs

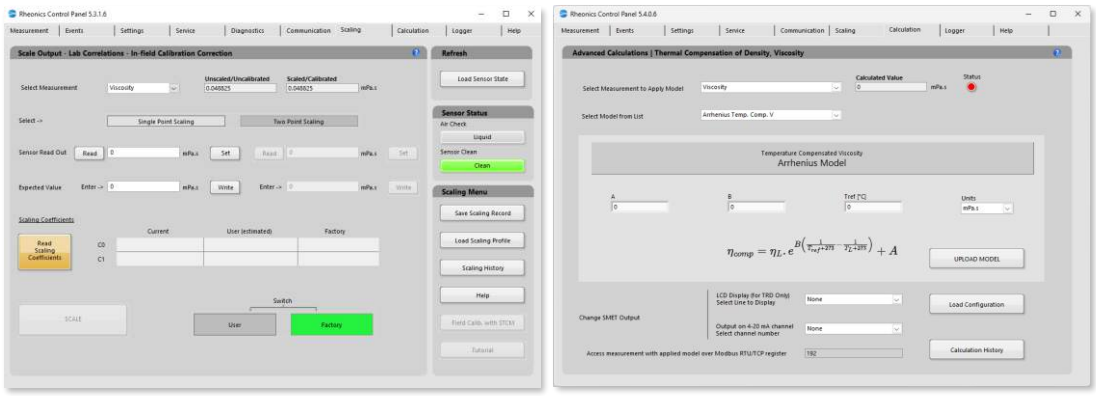


Advanced calculations and functions

RCP also allows users to scale and correlate the main measurement parameters with Single Point scaling (offset) and Two Point scaling (offset and slope). Additionally, it can also estimate more complex parameters, such as temperature-compensated viscosity and

temperature-compensated density (for Rheonics density meters), using the Calculation functions.

Figure 24: Scaling and Calculation Tabs

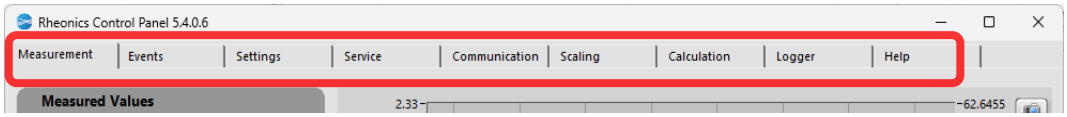


4 Using the Rheonics Control Panel

4.1 Navigation

The Rheonics Control Panel functions are organized in Tabs, you can navigate them by selecting the tab at the top of the window.

Figure 25: RCP – Navigation Tabs



Tab	Description
Measurement	Real-time measured values and charts, sensor status, and additional sensor information.
Events	Displays the log of events stored by the user.
Settings	Includes graph and communication settings of RCP and Sensor.
Service	Includes 4-20mA channel and density settings.
Communication	Configures the Communication protocols, settings and additional device information.
Logger	Allows to download the log files stored on the Sensor memory. Also includes Firmware update utility.
Help	Find Help and additional resources.

Table 3 RCP Main Tabs

Tab	Description
Scaling	Scale and correlate the main measurement parameters.
Calculations	Enables internal calculations for complex estimations like temperature, compensated viscosity, and density.
Diagnostics	Contains information about errors that occurred in the application and the last strings received.

Table 4 Advanced Section Tabs

Note

Help icons are located in different parts of the program to offer more detailed information about the functions and characteristics of each section of the panel. By clicking the icon, a window with the description of the section to configure will be displayed.

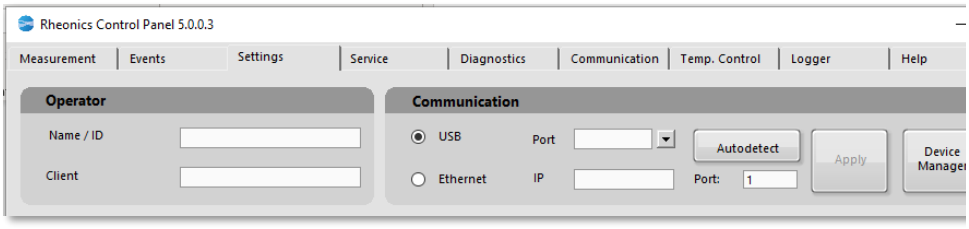
4.2 Establishing communications between RCP Software and SME

4.2.1 USB connection

Power up the SME by connecting a suitable power supply to the power input terminal block. Review sensor manuals for correct power supply characteristics. Make sure the USB cable is plugged into the micro-USB port on the SME and into a free USB port on your computer.

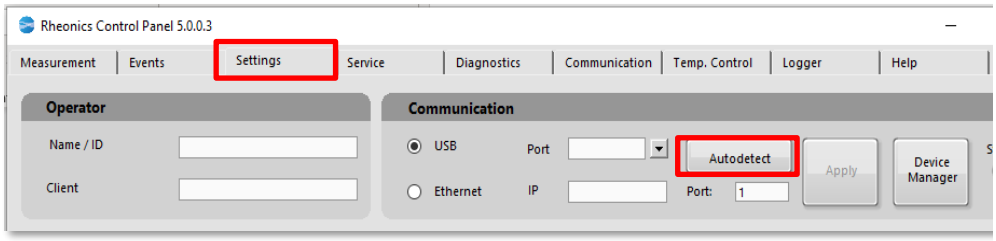
1. Go to **"Settings tab"** and select the **"USB"** radio button under the Communication panel.

Figure 26: RCP – USB Radio Button



2. Click the **"Autodetect"** button to automatically detect the sensor electronics and connect. The Status LED will turn green after successful connection.

Figure 27: RCP – Autodetect Button



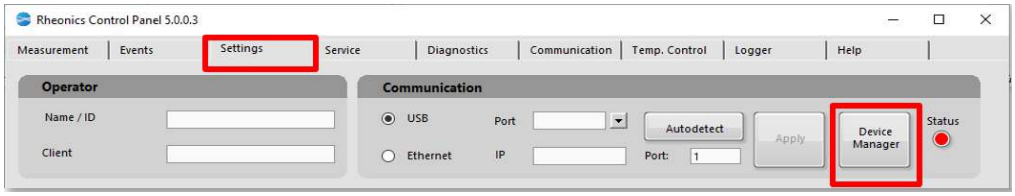
Note

If the electronics are not detected using the "Autodetect" button, you can proceed with a manual connection by following the steps bellow.

4.2.1.1 Finding the SME serial port in the Device Manager

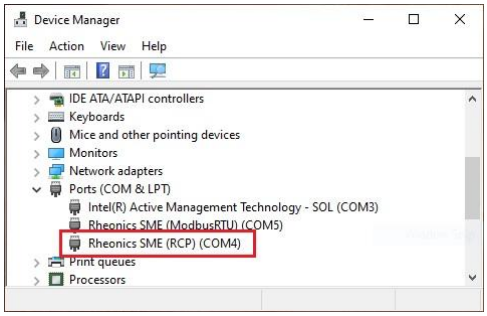
1. In settings, click the **"Device Manager"** button. This will open Windows Device Manager.

Figure 28: Device Manager Button



2. Navigate to **"Ports (COM & LPT)"** tab and expand it.

Figure 29: Device Manager



The interface used by the Sensor Electronics is labeled SME or as USB Serial Device and is here assigned to **COM4**. Make a note of the COM port number and close the Device Manager.

3. On the RCP, select the COM port you identified (**COM4** in this example) from the drop-down list. If you do not see the correct COM port in the dropdown list, click refresh and select the correct COM port.

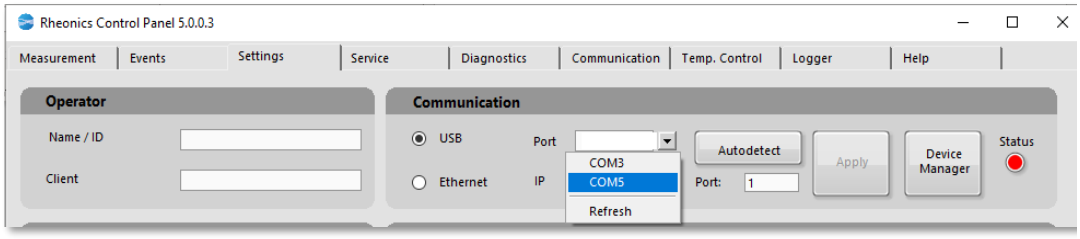
Note

If you do not see any COM port listed in the list but see them in the device manager, it is likely that the VISA runtime is missing from your installed version of RCP. Rerun the installation to install the runtime.

ATTENTION

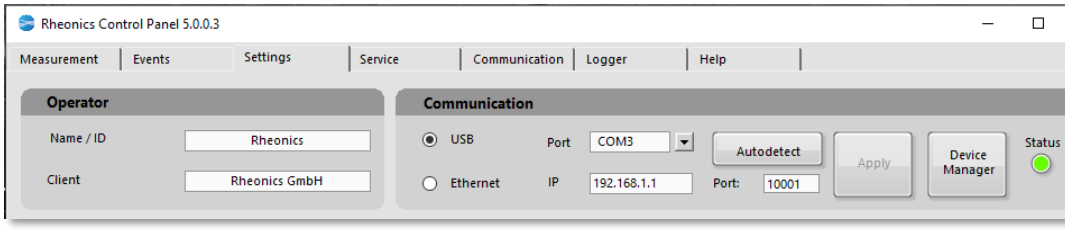
Do not try to manually write the COM port in the dropdown list. It will not work. The list needs to populate correctly to connect properly to the SME.

Figure 30: RCP - COM5 Port



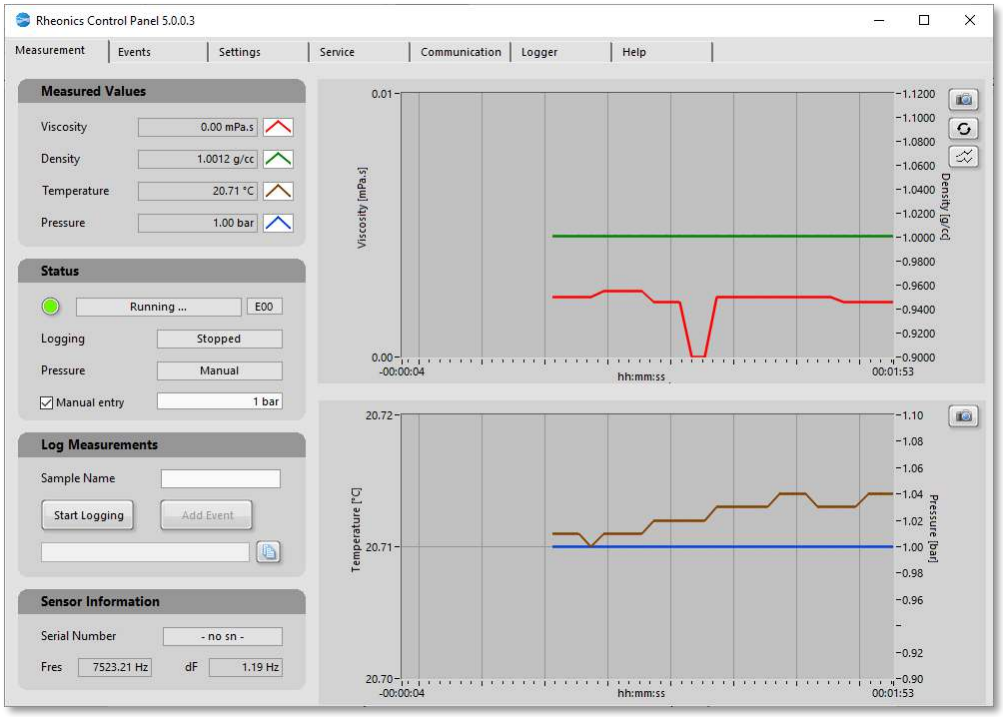
4. Press the **"Apply"** button to start the connection.
5. Wait until the **"Status"** indicator turns to green.

Figure 31: RCP – USB Connection Established



The communication over USB is now established and the configuration and measurement values from the SME are displayed on the Rheonics Control Panel.

Figure 32: RCP – Viscosity and Temperature Readings



4.2.2 Ethernet connection

This section describes how to connect the SME via Ethernet to the Rheonics Control Panel.

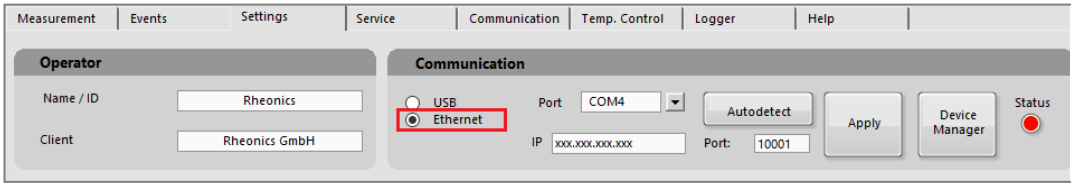
1. **Connect the Sensor Electronics to your LAN**
   a. Connect the Sensor Electronics to your network with an Ethernet cable.
   b. Power on the Sensor Electronics.

2. **Detect the Sensor Electronics on the network.**
   The Sensor Electronics are set by default to obtain an IP address from the network using DHCP. It is recommended to initially connect via USB to configure a static IP address.

3. **Enter the IP-Address on Rheonics Control Panel**
   a. Start the Rheonics Control Panel
   b. Go to the **"Settings tab"** and select the **"Ethernet"** radio button.

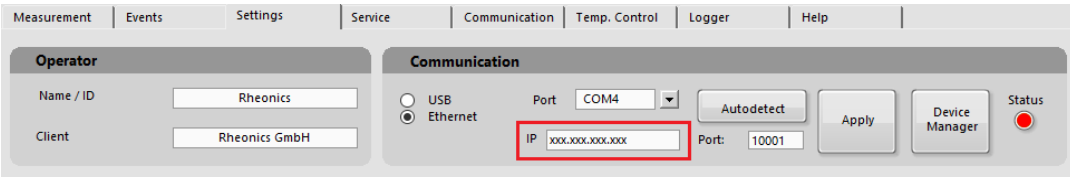
4. Select **“Ethernet”** on the Communication section.

Figure 33: RCP – Ethernet Option



5. Enter the **“IP-Address”** of the SME electronics.

Figure 34: RCP – IP Address



6. Press the **“Apply”** button to establish the connection and wait until the “**Status”** indicator turns green.

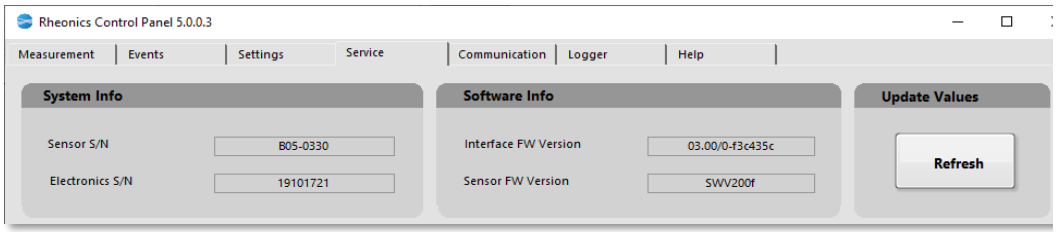
Communication over Ethernet is now established and the measurement values from the SME are displayed on the Rheonics Control Panel.

4.3 Loading configuration parameters

Rheonics Control Panel automatically loads the configuration for the specific sensor connected. Once the connection between the RCP and the SME is established, the RCP will automatically load the configuration parameters of the SME.

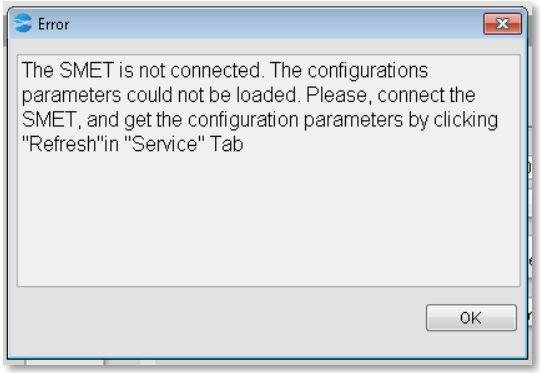
To check that the configuration parameters are loaded, go to the **"Service Tab"** and verify that the **"System Info"** panel shows the correct sensor serial number (S/N). A unique sensor serial number is printed on each Rheonics sensor.

Figure 35: RCP – System Info



If there is a problem loading the configuration parameters due to disconnection of the SME, you will see the following warning in the RCP:

Figure 36: RCP – Warning Message



You can attempt to load or refresh the configuration parameters by clicking the **"Refresh"** button in the **"Service Tab"**.

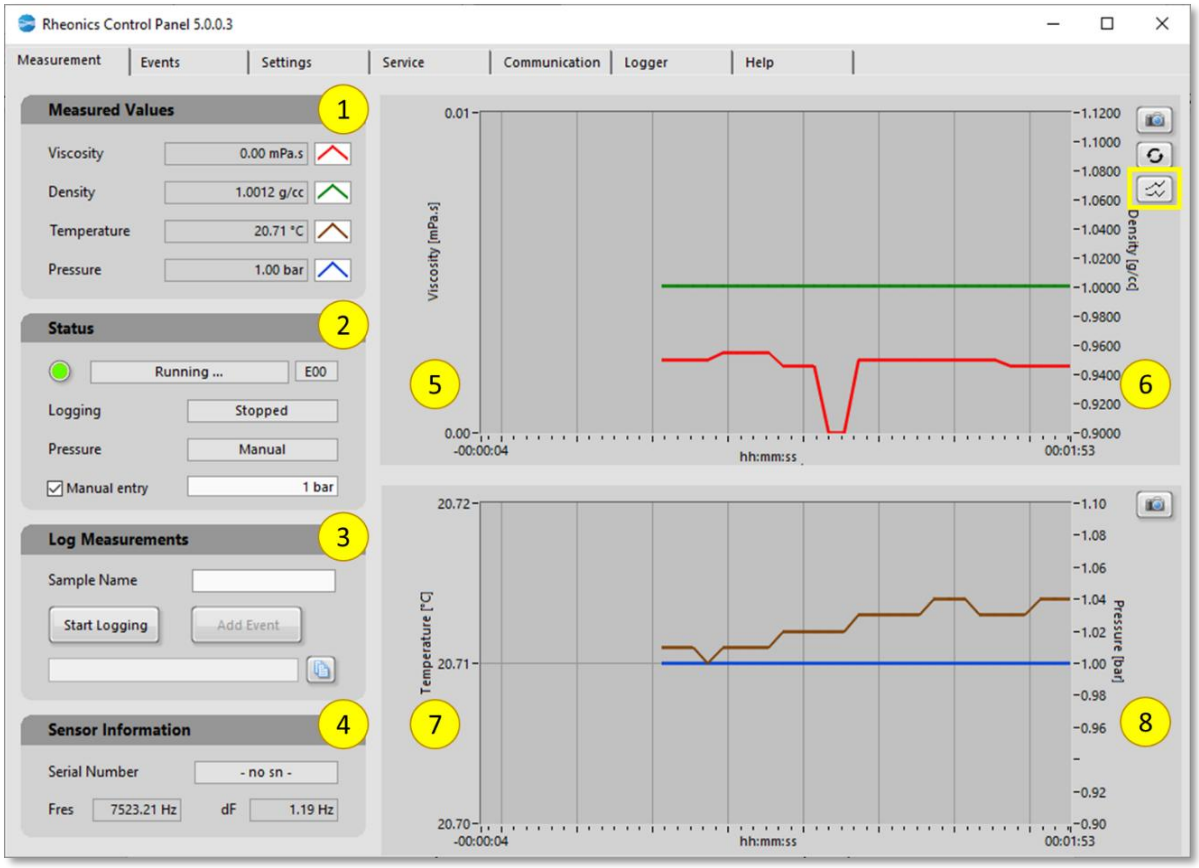
Note

Rheonics SME must be powered up and connected to the computer via a USB cable for the software to operate.

4.4 Measurements Tab

The measurements tab shows the sensor's real-time readings and units, sensor status, sensor information, manual logging information, and data plots.

Figure 37: RCP – Measurements Tab



4.4.1 Layout Overview

1. **Measured Values:** Displays the current readings of Viscosity, Density and Temperature. The displayed pressure is either manually input or read from an external pressure gauge over RS232 (more information in the **Pressure section** in the *Settings Tab section*).
2. **Status:** Shows the communication state to the sensor electronics, the logging state, and the type of data acquisition from the pressure sensor. *Refer to section 4.6.2 for a procedure on Pressure Settings.*
3. **Logging:** Has a set of buttons to start, pause, and end data logging. The Sample Name field must be filled in by the user before data logging can begin. *Refer to section 4.11 for more details on Rheonics In-Built Logger.*
4. **Sensor Information**: Displays sensor serial number as well as current sensor frequency and damping measurements.

5. **Real-time Viscosity Graph**
6. **Real-time Density Graph** (measured or user input depending on type of Rheonics sensor)
7. **Real-time Temperature graph**
8. **Pressure graph** (measured externally or manually input)

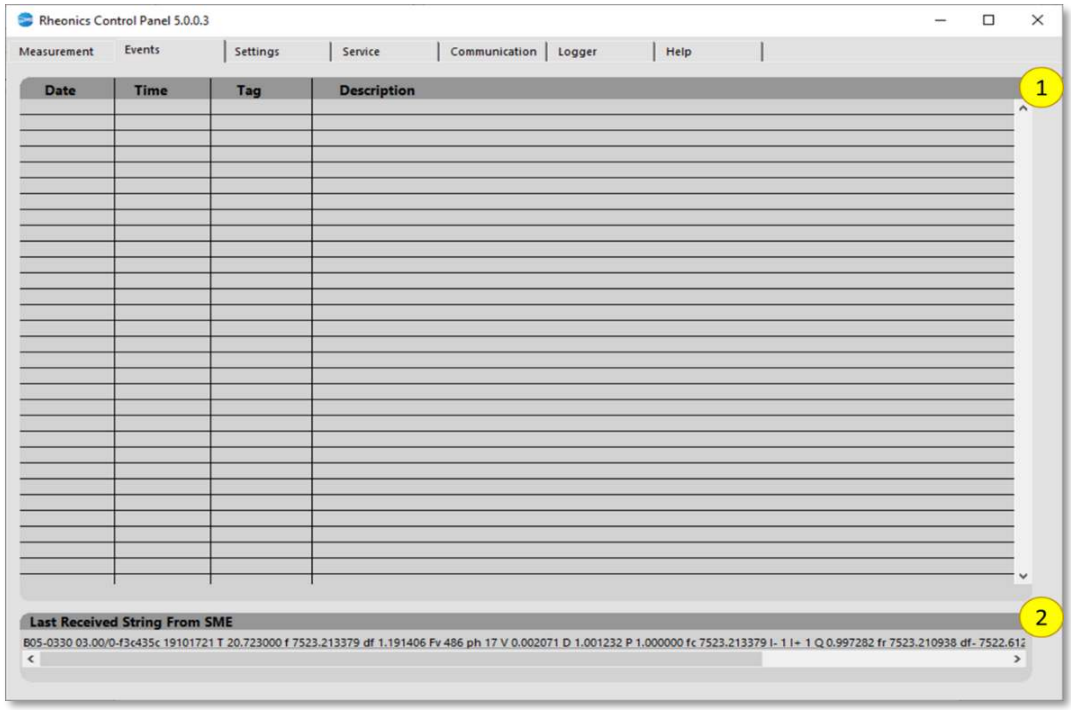
On each graph pane, press the save button in uppermost right corner to save a bitmap file of the graphs.

Rheonics **Dataview Window** is accessible by clicking the highlighted button in the density graph area. *See section 4.14*

4.5 Events Tab

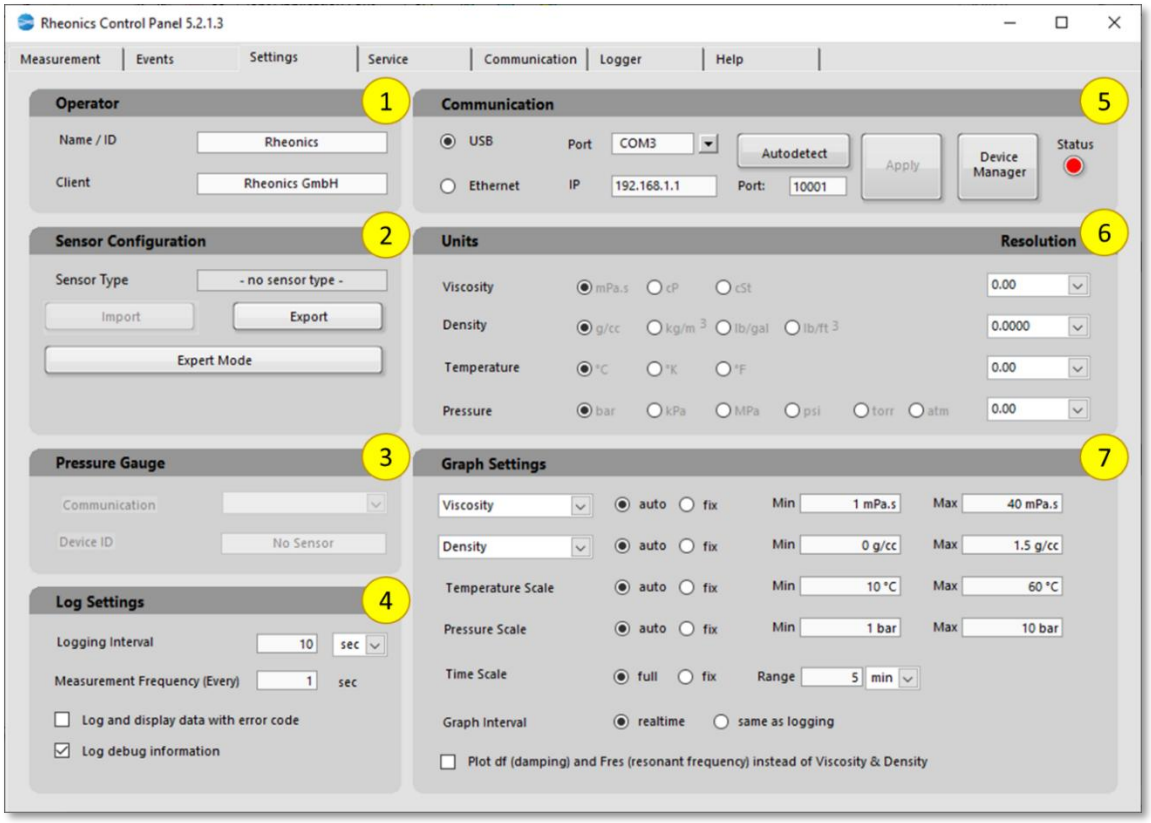
This tab shows the events logged by the user when manual logging is enabled. For more information about log configuration refer to the *Logging section*.

Figure 38: RCP – Events Tab



1. **Events list:** Shows the user events set during manual logging, with date and time.
2. **Last Received String From SME:** Shows the last string received from the SME, containing operational data such as the serial number (SN), firmware version, temperature, viscosity, density, frequency, damping, and other variables—most of which are relevant for troubleshooting or data analysis. This string is not logged in the Events file. To track received strings, enable the **"Log Debug"** option.

Figure 39: RCP – Settings Tab



4.5.1 Layout Overview

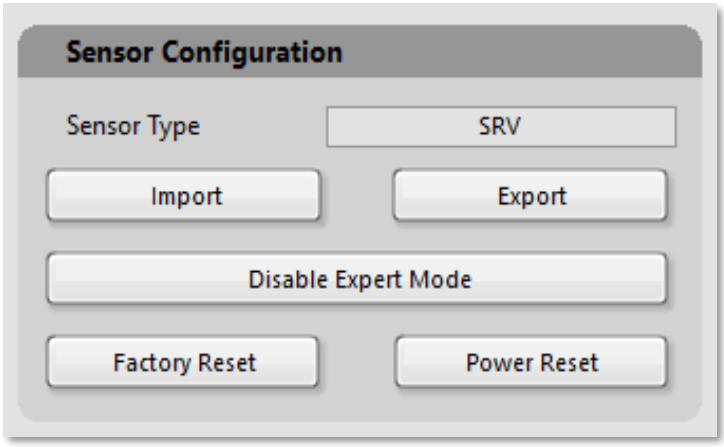
1. **Operator:** Has optional information that can be entered to be stored to the log file header
2. **Sensor Configuration:**
   a. **Export:** Use this function to export sensor diagnosis information. This will generate a file in a protected .zip folder. Rheonics Support Team can request users to send this .zip folder during a troubleshooting or reconfiguration process.
   b. **Expert Mode:** Enables advanced user features in RCP. These are scaling and calculation tabs. *To know more about these functions, go to sections 4.8 and 4.9.*

Note

The expert mode password is: **Jdc7bpPt**

Expert mode also enables some extra settings features like the ability to import configurations into the SME, restart the SME and factory reset the SME settings for scaling and calibration.

Figure 40: RCP – Sensor Configuration



c. **Import:** This feature allows you to upload new configurations into the SME. These settings should be provided by Rheonics Support Team in a special configuration file. To upload a configuration file:
   i. Click **"Import"**
   ii. Select the file provided by Rheonics and click **"OK"**.
   iii. Wait for the **"Import"** button to acknowledge a correct upload.
   iv. Select a path to export the file that will be generated after finalizing the process.
   v. Send the exported file to Rheonics to verify that configuration upload was successful.

d. **Factory Reset:** Use this button to ***restore to Factory Settings (SD card must be installed into the SME)***. Factory reset will change settings of analog signals, sensor configuration, filters and others. This feature requires a password. Contact Rheonics support for this password.

e. **Power Reset:** Click this button to restart the SME (power reset). This feature does not require special passwords since it does not affect the configuration of the sensor.

3. **Pressure gauge:** Disabling Manual entry, on Measurement tab, enables this tab. It allows to set the external sensor through a third-party library. See section 4.6.2 for a complete procedure.

4. **Log Settings:** Enter the logging interval desired for saving the data points in the manual log file as well as the Measurement Frequency, which is the rate at which the software acquires data from the SME.
   a. Selecting **"Log and display data with error codes"** shows data from sensor even when the sensor may not be in a stable measurement mode.

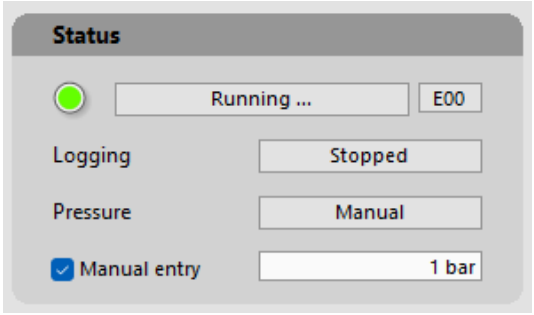
b. Selecting **"Log debug information"** creates a debug file with diagnostic data along with the log file. This is useful in case the sensor has an issue that needs investigation by the Rheonics technical support team.

5. **Communication:** Configure the connection type between the Rheonics Control Panel and the SME. *See section 4.2*
6. **Units and Resolution:** Select the desired units and resolution for Viscosity, Density, Temperature and Pressure.
   The selected units are also recorded along with measurement data in the log file.
7. **Graph Settings:** Control the formatting of the graphs on the Measurement panel.
   a. **Parameter:** For Viscosity and Density, you can choose the parameter that will be displayed in the chart and logged in the logfile.
      i. For Viscosity you may choose between "**Viscosity median value"**, "**Kinematic Viscosity"** or **"Calculated Viscosity"**.
      ii. For Density, you may choose between **"Density median value", "Calculated density"** and **"Concentration".**
      iii. Calculated viscosity and density values are configured in the calculation tab. For details go to *Calculation Tab section.*
   b. **Auto & Fix**: On each measurement axis, **"Auto"** enables automatic ranging of the Y-axis, while **"Fix"** allows the user to set the minimum and maximum Y-axis values. This can be used to zoom into a range of interest for that parameter.
   c. **Time Scale:** Selecting Full sets the X-axis to display all data in the buffer. The user can select **"Fix"** to define a specific time range by choosing a time unit and duration.
   d. **Graph Interval:** Controls the display of data as received from the sensor in "**Realtime"** or sampled and displayed at the time intervals set by "**Logging Interval"**.

4.5.2 Pressure Input Configuration

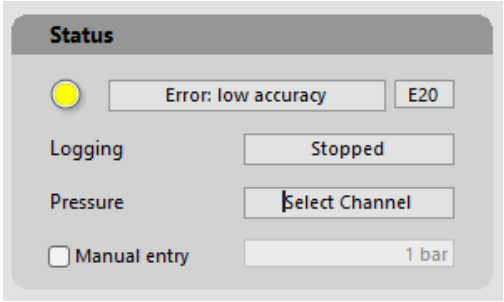
-Manual entry: Set the pressure in the **"Manual entry"** user input field. The default setting is **1 bar** and may be modified on the fly during a logging run.

Figure 41: RCP – Manual Entry Checked



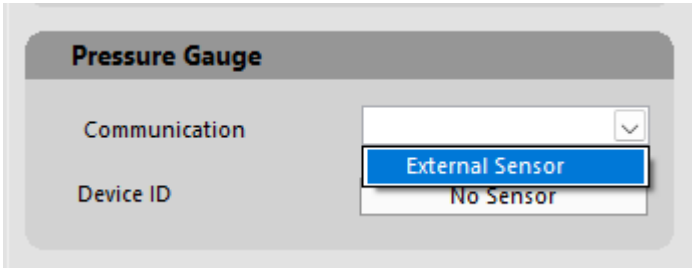
-External Pressure: Uncheck the **"Manual entry"** for using an external pressure instrument.

Figure 42: RCP – Manual Entry Unchecked



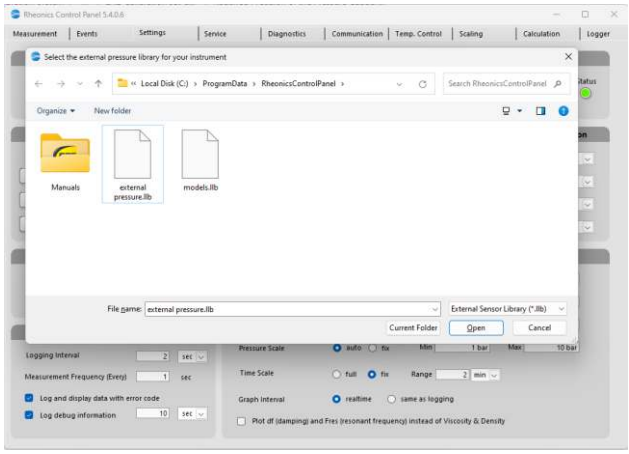
e. Click on **"Settings Tab"** and select **"External Sensor"** option from the dropdown list in **"Pressure Gauge"**.

Figure 43: RCP – External Sensor



f. Select the external pressure library from the directory: **C:\ProgramData\RheonicsControlPanel.**

Figure 44: RCP – Pressure Library

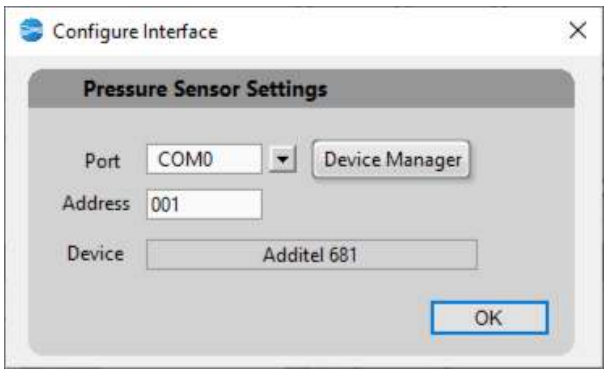


Note

For more information on the external pressure measurements libraries, contact Rheonics Sales team.

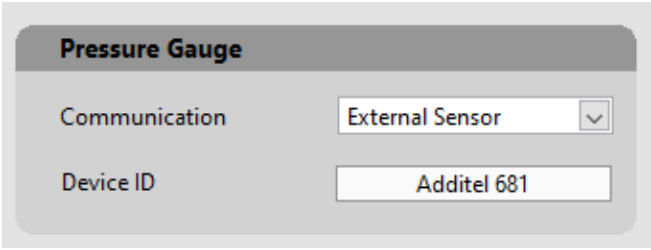
g. Configure the right **COM** port for RS232 communication between RCP and the external pressure instrument.

Figure 45: RCP – COM Port for External Pressure Instrument



h. RCP will continuously communicate with external pressure to read the pressure measurements.

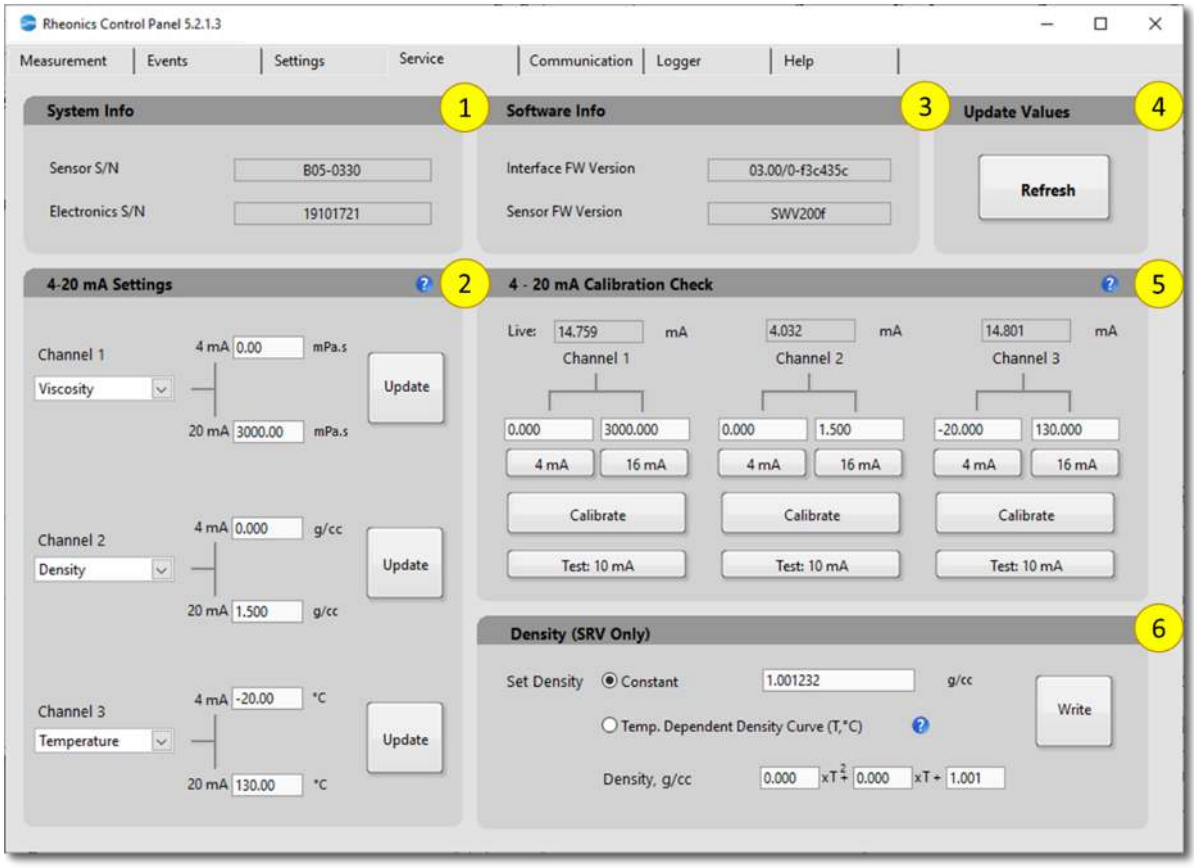
Figure 46: RCP – Pressure Gauge Configured



4.6 Service Tab

The Service Tab is used to configure sensor settings, including 4-20 mA signal calibration and density settings, as well as to display system information and software version details.

Figure 47: RCP – Events Tab



Correct execution of a function will turn the button GREEN. While the command is executing the button will be YELLOW. A fault with the execution will turn the button RED. In case a button turns RED, verify that the correct configuration parameters are set by clicking the **Refresh** button. In case of an error repeat the steps again.

4.6.1 Layout Overview

1. **System Info**: Shows the sensor serial number and the SME electronics serial number.
2. **4-20 mA Settings**: Reads and sets the upper and lower limits for each 4-20 mA channel. A detailed procedure can be found at section 4.7.3.

3. **Software Info**: Displays Interface Firmware Version and Sensor Firmware Version
4. **Refresh** the configuration parameters in the tab.
5. **Shows the current 4-20mA channel calibration**. Verify and calibrate each 4-20mA output channel. A detailed calibration procedure can be found at section 4.7.2**.** The "Live" or actual current output value is displayed on top of each channel.
6. **Density (SRV Only)**. Set a constant or second-order polynomial for density. SRV measures the product of density and viscosity and outputs the result as dynamic viscosity. Hence, if density is changed, SRV calculated viscosity will change too. The SRV measures the density-viscosity product of the fluid:

$$Density\ Viscosity\ Product = \rho * \eta$$
$$\rho = Density\ [g/cc]$$
$$\eta = Dynamic\ Viscosity\ [mPa.s]$$

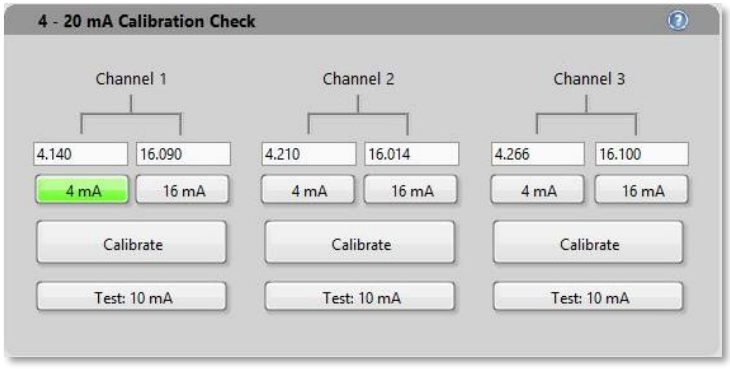
For an in-depth procedure, refer to section 4.7.4

4.6.2 4-20 mA Current Calibration Check Procedure

The SME has three 4-20 mA outputs; to output measured Viscosity, Density and Temperature. Each channel can be calibrated individually. To calibrate one channel (**"CH1"** for example) follow these steps:

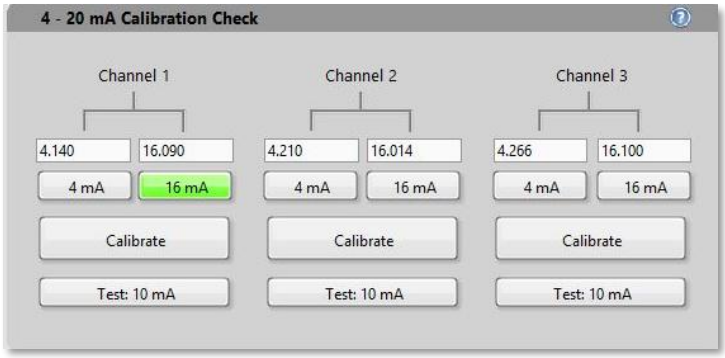
1. Attach a current measurement instrument to measure the current on **"Channel 1"**, connecting it between **"GND (-)"** and **"CH1"**. Ensure the instrument has a measurement accuracy better than desired accuracy. By default, the channels are factory calibrated to better than 1% absolute accuracy.
2. Click the **"Service Tab"**.
3. In **"Service Tab"** click the **"4 mA"** button. This will output a 4 mA current through "**CH1"**. The "**4 mA"** button will turn green to indicate that the SME is in "4 mA mode"

Figure 48: 4 mA current on CH1



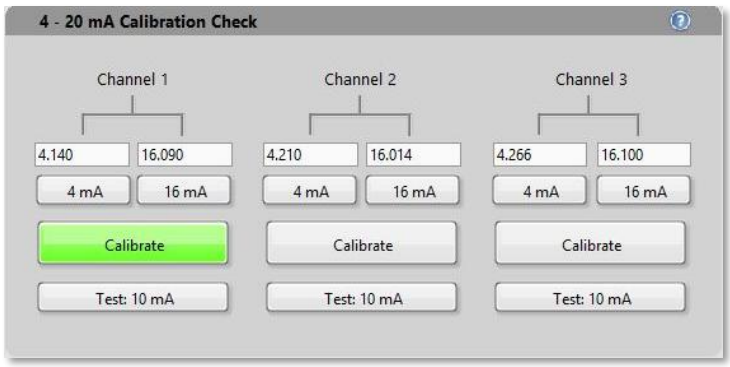
4. Register the value measured with the milliammeter in the box above the "**4 mA"** button.
5. Click the **"16 mA"** button, under **"Channel 1"** tag, to output a 16 mA current through **"Channel 1"**. The **"16 mA"** button will turn green to indicate that the SME is in "16 mA mode". Also, the **"4 mA" button** will go back to gray color, since the SME is no longer in that state.

Figure 49: 16 mA current on CH1



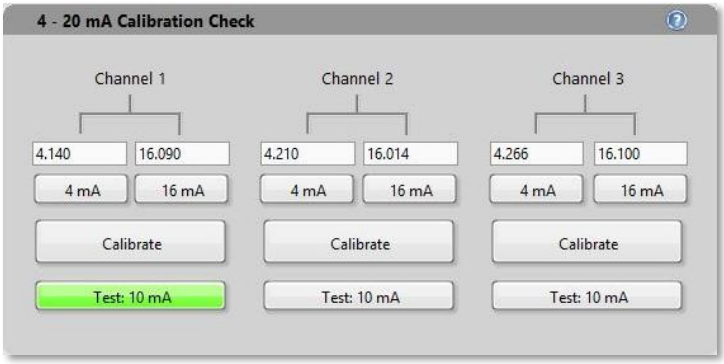
6. Register the measured value in the box above the **"16 mA"** button.
7. Click the **"Calibrate"** button to send the measured values to the SME. If the command was correct, the button will turn green for two seconds and go back to gray, to indicate that the SME is in "measurement mode".

Figure 50: Calibrate Button



8. To verify the calibration, click on the **"Test: 10 mA"** button, to output a calibrated 10 mA current through the channel. The button will remain green until you press it again, and then the system will go back to measurements mode.

Figure 51. 10 mA Test



Repeat this process for each channel.

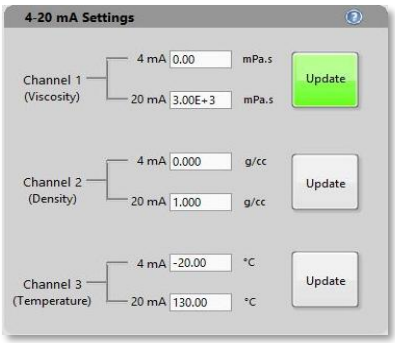
4.6.3 4-20 mA Settings: Upper and Lower Calibration Limits Procedure

RCP allows you to scale the 4-20 mA output for each channel to match the desired measurement range in the units selected in the **"Settings Tab"** for Viscosity, Density, and Temperature. Scaling defines how the sensor maps the measured values to the 4 mA and 20 mA output signal. To adjust the scaling (upper and lower limits), follow these steps:

1. Enter the desired lower limit on the box labeled **"4 mA"**. *This represents the measurement value corresponding to the 4 mA output*.
2. Write the desired upper limit on the box labeled **"20 mA"**. *This represents the measurement value corresponding to the 20 mA output*.
3. Click the **"Update"** button to send the new values to the SME. If the write operation succeeds, the **"Write"** button will turn green for a few seconds; otherwise, it will turn red and the boxes will go back to their previous values.

Repeat the process for each channel.

Figure 52: Update button on 4-20 mA Settings



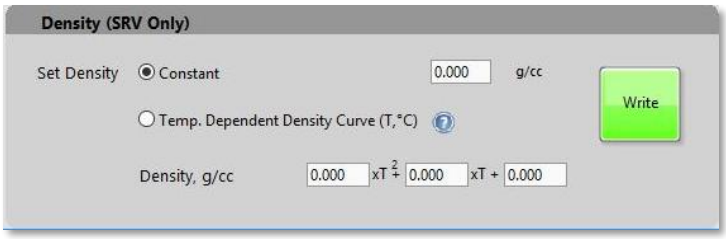
4.6.4 Density Configuration: Setting Constant or Temperature-Dependent Density

The Rheonics Control Panel allows you to enter the appropriate fluid density to obtain the dynamic viscosity (η, in mPa.s) or kinematic viscosity (η/ρ, in cSt). By default, the electronics and software use **1 g/cc** as density. To input the actual density of the fluid in the software you can choose a constant density or a second order, temperature dependent polynomial.

Entering a constant Density

1. Select **"Constant Density"** radio button in the **"Service Tab"**.
2. Update the constant density in the box on the right of the radio button, with the measurement units that you set in **"Settings Tab".**
3. Click **"Write"** to write the density value. If the command succeeds, the button will turn green for a few seconds. Otherwise, the button will turn red.

Figure 53: Density Settings for SRV



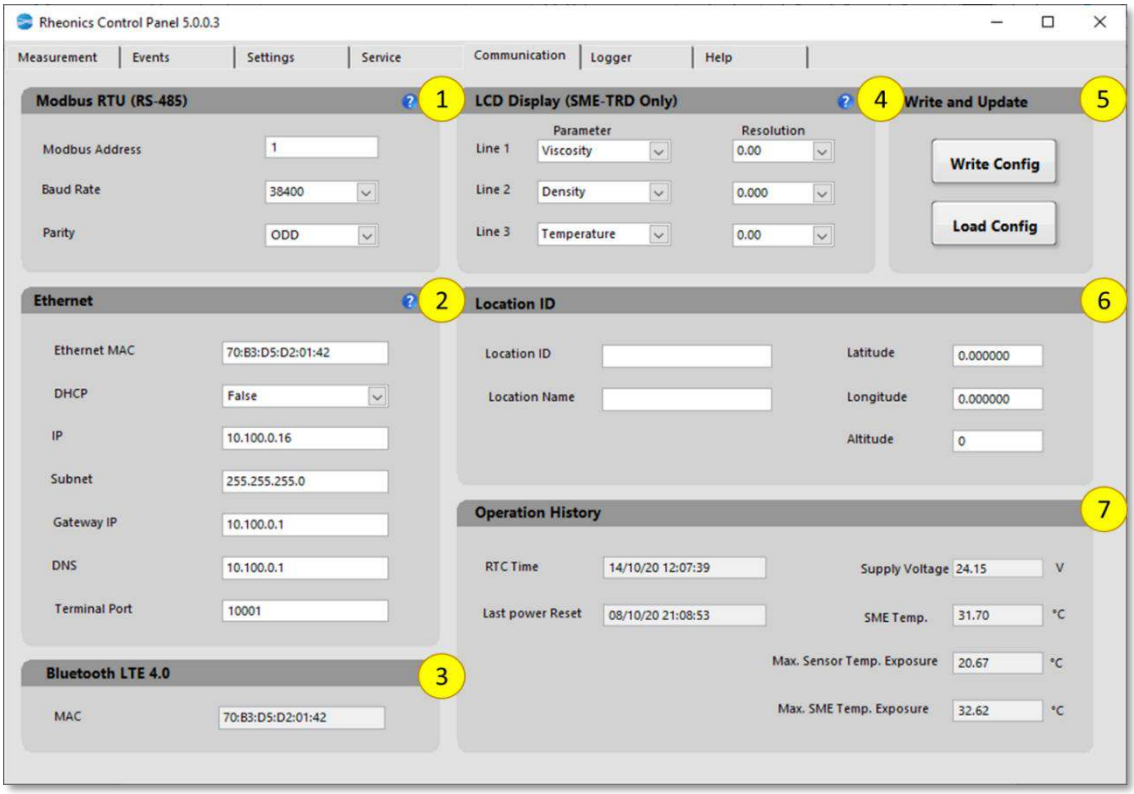
Setting a second order polynomial

1. Select the **"Temp. Dependent Density"** radio button.
2. Enter the polynomial coefficients. A second-order polynomial can be used; setting the higher-order coefficients to **0.0** reduces the polynomial to a lower order. Temperature is in °C.
3. Click the **"Write"** button to write the new values in the SME. If successful, the button will turn green; otherwise, it will turn red for a few seconds to indicate an error.

4.7 Communication Tab

This tab can be used to configure the communication settings of the SME, as well as interface characteristics, and operation information. This tab will be enabled if the connected device is an SME and after the configurations are correctly loaded from the sensor.

Figure 54: RCP – Events Tab



4.7.1 Layout Overview

1. **Modbus RTU (RS-485):** Modbus configurations can be set; including address, baud rate and parity. Refer to Modbus manual for more information.
2. **Ethernet**: This panel will be active if the SME has Ethernet connection enabled. This panel shows the MAC address of the device and allows user to enable or disable DHCP.
   - **i.** When DHCP is enabled, the IP address, gateway, subnet mask and DNS, will be automatically assigned by the network's DHCP server and will be read only by the RCP (not modifiable by user).
   - **ii.** If DHCP is disabled, these parameters can be manually configured.
3. **Bluetooth LTE 4.0:** If the device has Bluetooth capabilities, this panel shows the device MAC address**.**

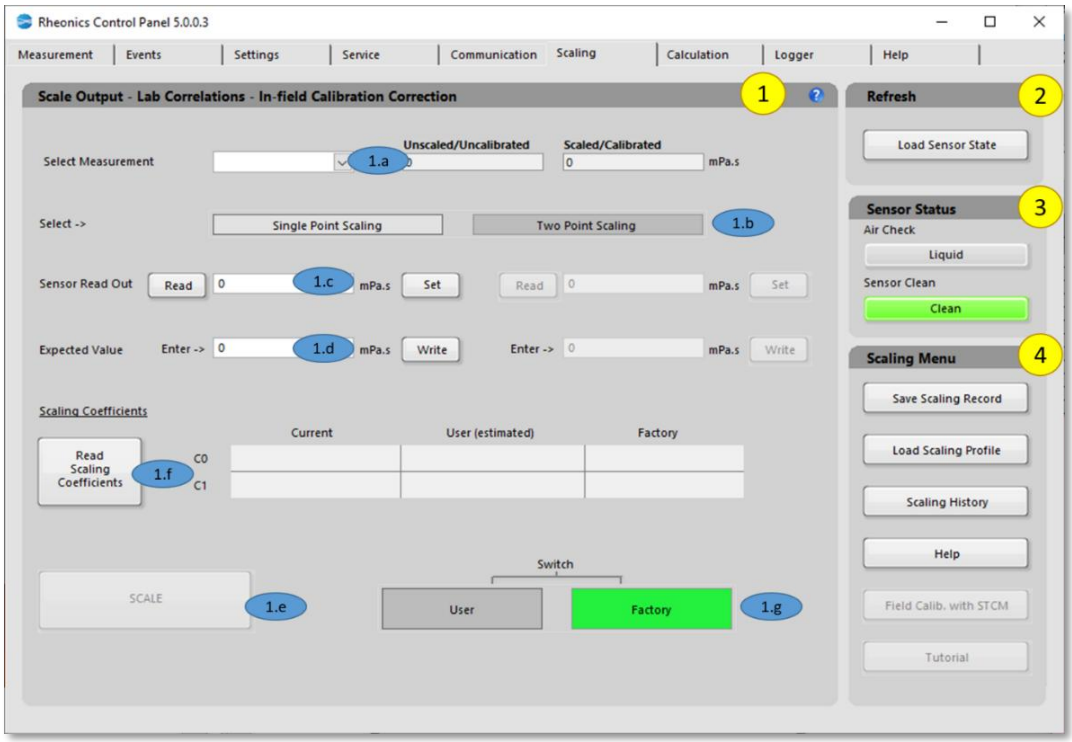
4. **LCD Display (SME-TRD Only):** If the SME has an LCD display enabled, this section will be active. On this section user can set the parameter to be displayed on each one of the three lines of the LCD. The resolution of each parameter can also be modified in the dropdown menu.
5. **Write and Update:** In this section all the configurations input by user on the Comm configure tab can be written to the SME by clicking the **"Update SME"** button. If the writing operation is successful the button will show a green light, otherwise will show a red light. The panel can be refreshed by clicking the **"Refresh"** button, reading all the configurations from the SME. When the reading is complete and the panel is updated, the buttons show a green light, and if there is an error it will show a red light.
6. **Location ID:** The user can configure relevant location information for the device in this section, including location ID, location name, latitude, longitude, and altitude.
7. **Operation History:** This is a read-only panel that displays relevant information about the SME's operation, including RTC time, last SME power reset, hardware version, supply voltage, SME temperature, and the maximum temperature exposure for both the sensor and the SME.

4.8 Scaling Tab

This Tab allows you to scale, correlate and/or calibrate the main measurement parameters: Viscosity, Density, Temperature and Kinematic Viscosity. Two options are available: Single Point scaling (offset) and Two Point scaling (for Offset and Slope).

> **Note**
> This feature is not available for SME firmware version below 3.00/1

Figure 55: RCP – Events Tab



4.8.1 Layout Overview

1. **Scale Output:** This section allows you to scale the sensor measurements for different parameters (viscosity, density, temperature, kinematic Viscosity). The action buttons "**Read"**, "**Set"**, "**Write"**, "**SCALE"** and "**Read Scaling Coefficients"** should turn GREEN after successful operation. Otherwise, they will turn RED. If a button turns red, it indicates that the action was not completed or stored in the SME, and you should repeat the process.
   a. **Select the measurement:** from the dropdown list select the measurement parameter to scale. When selected, the scaled and unscaled values for that measurement will be populated.

b. **Select scaling method: "Single Point"** for offset scaling, or **"Two Point"** for offset and slope scaling.
c. **Sensor Read Out:** Click "**Read"** to read the current *unscaled* sensor measurement or enter the SRV output value that should be scaled. Click "**Set"** to save that measurement as *Sample 1*. Repeat for the two samples if a two-point scaling is selected.
d. **Expected value:** Write the expected value for the measurement. Click "**Write"** to store the value in SME. Repeat the process for two-point scaling.
e. **SCALE:** Click "**SCALE"** to use the stored samples to scale the SME output.
f. **Read Scaling Coefficients:** Reads from SME the current, user and factory scaling coefficients. If "current" value coefficients are equal to user coefficients, then the SME is using the last loaded user scaling. If are equal to Factory scaling the SME is using factory coefficients, meaning no scaling is applied.
g. **Switch:** Click "**Factory"** or "**User"** to change between factory scaling and user scaling coefficients.

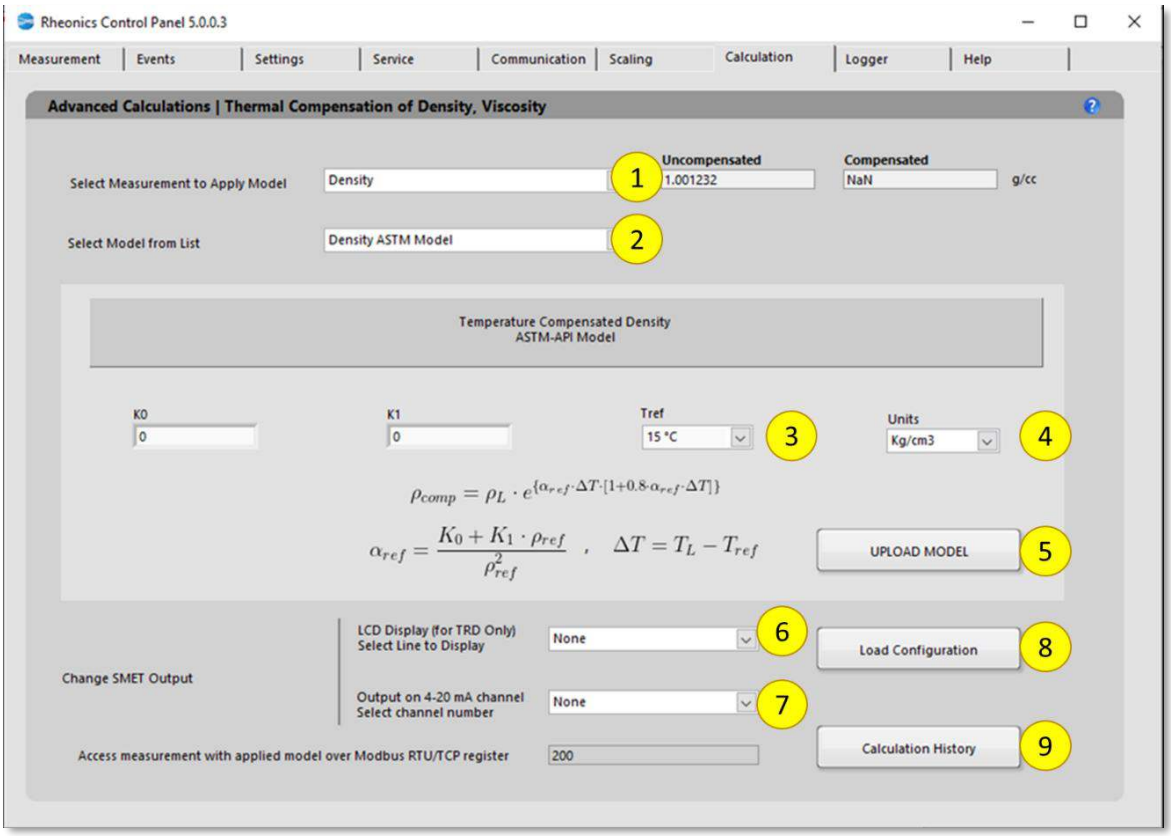
2. **Load Sensor State:** Reads the measurements, measurements status and sensor status. Click this button to refresh the sensor status.
3. **Sensor Status:** Displays whether the sensor is in air, or if it is in a fluid. If the sensor is in air, "**Air Check**" LED light will be GREEN, otherwise it will show a gray color. If the sensor is in fluid, a GREEN light in the Sensor Clean LED indicates that the sensor is clean, if sensor is not clean, it will display a RED color.
4. **Scaling Menu:** Use these buttons to access:
   a. **Save Scaling Record:** Use this button to store the scaling measurements in a file for future use. It's recommended this file is created after you've scaled all the desired parameters.
   b. **Load Scaling Record:** Loads a scaling file into memory. This will load the measurements for previous scaling processes into the software. Then these measurements must be loaded into the SME by following the scaling procedure; that is, clicking "**Set"**, to store the actual measurement, "**Write"** to store the laboratory samples or expected values, and "**SCALE"** to change the scaling.
   c. **Field Calib. With STCM.** Available for users with Temperature control
   d. **Scaling History:** Opens a "**.csv**" file with the scaling history. This shows a list of scaled parameters and coefficients.
   e. **Help:** Click help to display scaling help.

4.9 Calculation Tab

Calculation tab allows you to configure the SME, to use the internal parameters; Viscosity, Density, Temperature etc., to estimate more complex parameters like temperature compensated viscosity and temperature compensated density.

> **Note**
> **This feature is not available for SME firmware versions below 3.00.**

Figure 56: RCP – Events Tab



Once you set up a model, the calculation results can be output in any of the 4-20 mA channels, in Modbus registers and in the SME display (for SME-TRD only).

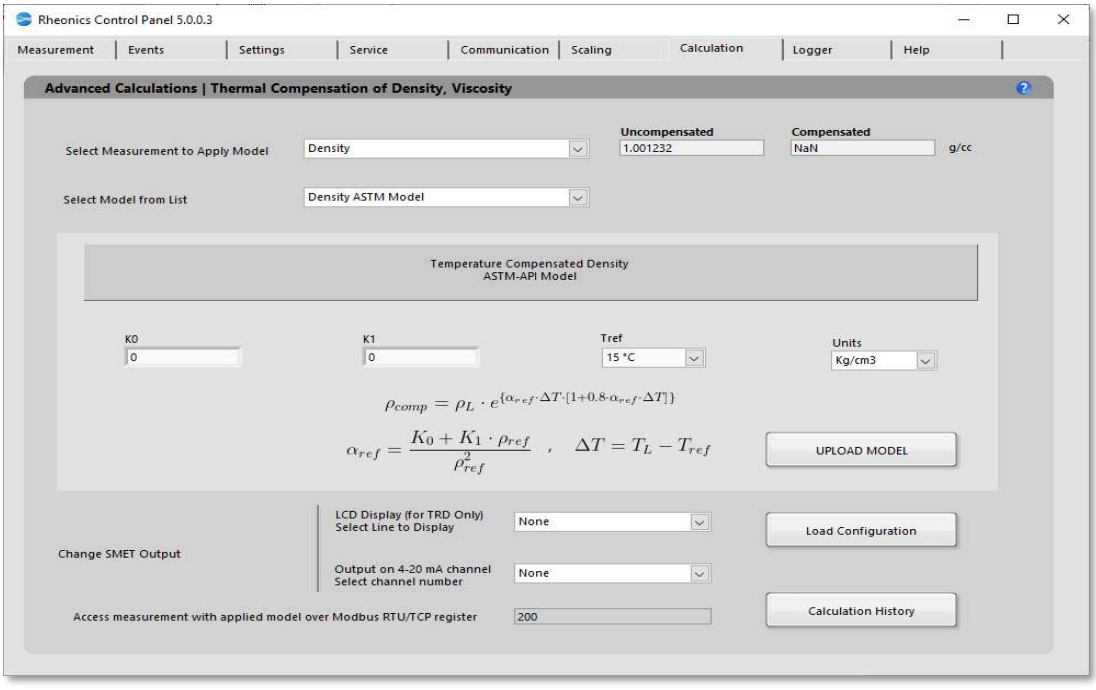
To configure a calculation model, follow these steps:

1. In the dropdown list, select **"Measurement to Apply Mode"** and switch between Density, Viscosity, and Concentration**.** This will modify the values in the **"Select Model from List"** dropdown menu. For example, if you select **"Density"**, the list will refresh to display models available for density. In "**Select Model from list**" select the model you would like to use for the specific parameter. When you select the model, you will get more information about the specific

equation used and the coefficients you will need to apply that model. For example, in "**Density**", the "**API-ASTM Model for Compensation**" is available.

2. Input the coefficients needed for the model estimation. For example, in the case of API-ASTM Model, you would need the **K0** and **K1** coefficients for the conversion tables.
3. Select the measurement units you would like the parameter to be displayed or output from the SME.
4. Click "**UPLOAD MODEL**" to load the model settings into SME. The button should turn GREEN for a couple of seconds if the action was successful or turn RED if the operation was unsuccessful. This action will refresh the values for the Uncompensated and Compensated indicators. Here you can verify if the model is calculating the expected values. If not, you can correct and repeat the process.
5. Select from the dropdown list "**LCD Display**", the line where the calculation should be displayed. This only applies for SME-TRD. For others, leave as "**None**".
6. Select the 4-20 mA channel (from Channels 1 to 3), where the values should be scaled and output. Leave as "**None**" if the parameter is not going to be output in any channel. Ensure you set the correct range for the 4-20 mA channel in the service tab. Channel limits will turn red until you configure the proper limits.
7. Click "**Load Configuration**" to update the display and channel configurations in SME.
8. "**Calculation History**" button allows you to open a file where the last uploaded models and coefficients for these models are stored. This is for user reference.

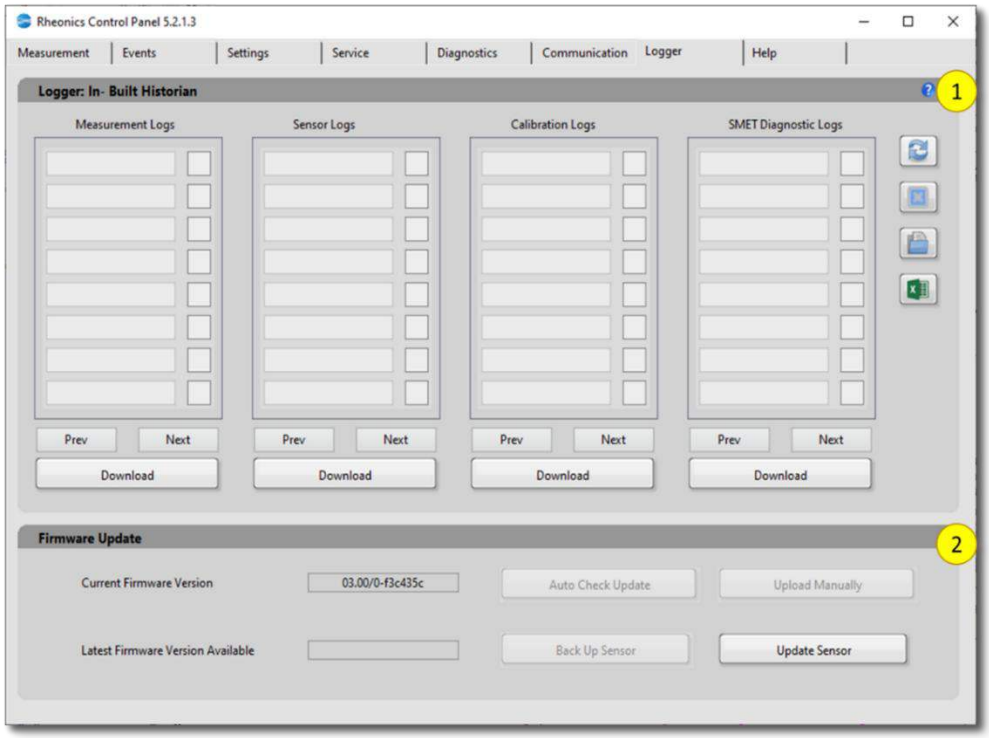
Figure 57: RCP – Events Tab



4.10 On-Board Logger Tab

This tab allows users to download on-board logs saved automatically by the SME when the sensor is powered on. On-Board measurement logging has a fixed data sampling frequency of approximately 45 seconds, which cannot be modified by the user. In this tab users can also use the "**Update Sensor**" function to upgrade the SME firmware.

Figure 58: RCP – Events Tab



4.10.1 Download Log Files using the Logger

1. Click the "Refresh"  button to populate the different file names according to its type. The name format corresponds with the date the file was created. This is every day a set of new files is created.
   a. **Measurement logs**: contains the measurement processed by the SME in a ".csv" format.
   b. **Sensor logs**: contains the sensor measurements ASCII string with relevant sensor operational information.
   c. **Calibration Logs**: These files store the calibration information, as parameters calibrated and coefficients.
   d. **Diagnostics Logs**: Relevant sensor and electronics diagnostics information for Rheonics support.
2. After refreshing, select the files you want to download. You can navigate to older files using "**Next**" button and return to most recent using "**Prev**" Button.

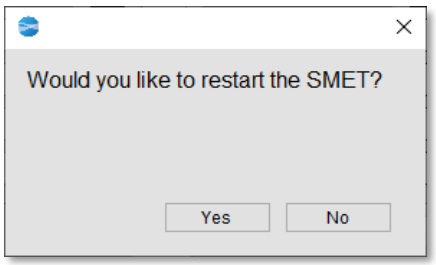
3. Click “**Download**” to start downloading the file. You will be prompted to select the target folder where the files will be stored and get a notification after successful or unsuccessful transfer.
4. Click the “**Clear All**”  button to uncheck all the selected files.
5. Click “**Open Folder**”  to open the target folder that contains the downloaded log files.
6. **Export files to Excel**: Use this button  to export the SME measurement logfiles and the RCP logfiles to Microsoft excel. By clicking this button, a file dialog will prompt you to choose a file to export. The files available will be of the -P type (corresponding to downloaded SME measurement logfiles), or of the type “**Filename_log.txt**”, where “**Filename**” is the name of an RCP measurements logfile created on a previous run. The PC where RCP is running, should have a valid license to MS Excel, for this function to be used.
   a. For -P files, the software will export on the first two columns the date and time of each data sample on UTC and local time, respectively. Other columns will display the measured values of all the measurement parameters.
   b. For RCP logfiles, RCP will copy the data of the logfile and assign each “.csv” column into an excel column with no further modifications.

1.1.1 Firmware Update

Fellow these steps to update the SME firmware:

1. Click “**Update Sensor**” to upload a new firmware to the SME
2. When prompted, select the firmware file provided by Rheonics.
3. The software will upload it to the SME
4. Once the upload is successful, a dialog box will appear, asking if you wish to reset the electronics.
5. Click “**Yes**” to reset the electronics and apply the new firmware, completing the update process

Figure 59: Restart Message



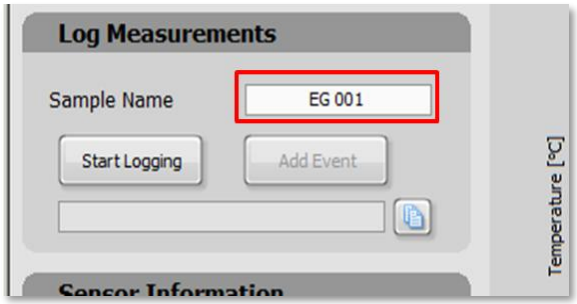
CAUTION
Send the SME configuration file to Rheonics Support after a firmware update to address any misconfigurations that may affect sensor

4.11 Manual logging data and set events

Manual logging is useful for clients to store periods of measurement data for further analyses. User can edit the data sampling frequency in the "**Settings tab**".

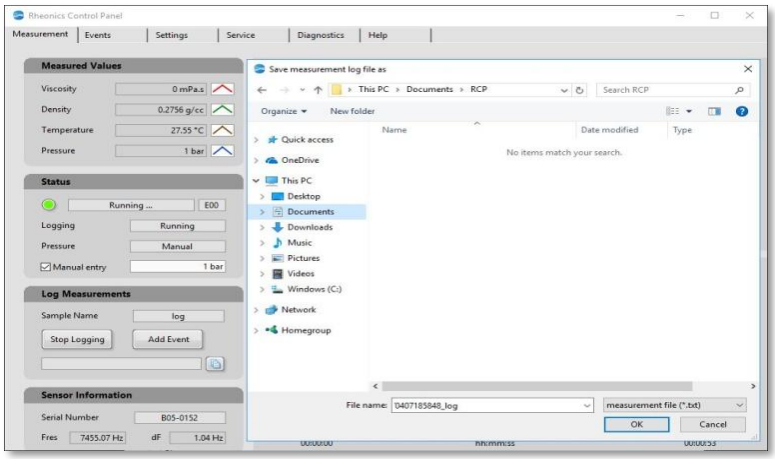
1. Before starting data logging, enter a sample name in the appropriate box.

Figure 60: Manual Logging - Sample Name



2. When the **"Start Logging"** button is clicked, a file dialog pops up asking for a log file path. The default name is "**YYYYMMDDHHMMSS**" where the first eight characters represent the date, and the next six represent the time. This can be changed to a user provided name: Navigate to the desired folder and click "**OK**".
3. A data log file will be created, and will start logging data.

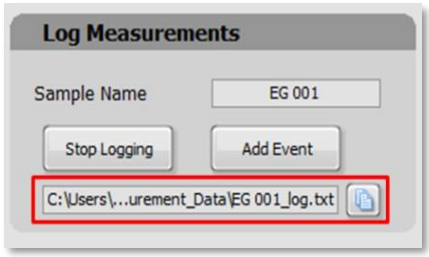
Figure 61: Manual Logging - Log Creation



For more detail about the log files look up on "**Help**" -> "**Log file description**".

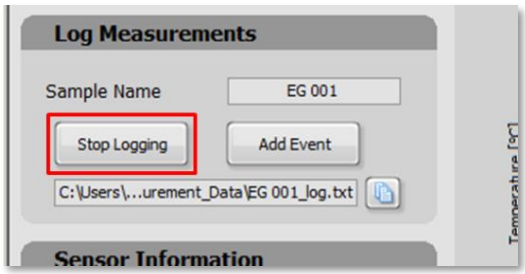
4. The folder and the log file name are shown in the path box.

Figure 62: Manual Logging - Log file path



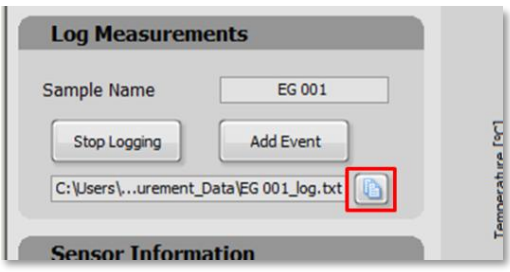
5. Clicking the "**Stop Logging**" button will stop the logging.

Figure 63: Manual Logging - Stop Logging Button



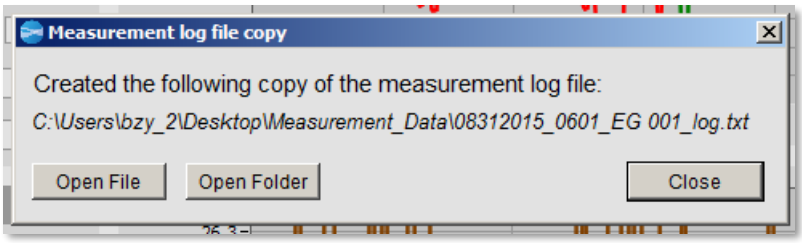
6. Especially when performing long logging runs, it may be desirable to see a "**snapshot**" of the data collected up to a given time without interrupting the logging process. This can be done by clicking on the button to the right of the log file path box:

Figure 64: Manual Logging – Snapshot



This will automatically store a copy of the log file with the name reported by the pop-up dialog that follows:

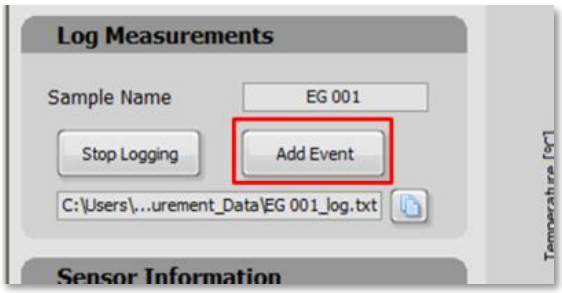
Figure 65: Manual Logging - Log File Copy



You can directly open the file by clicking the "**Open File**" button or opening the folder where the copy is saved - by clicking the **"Open Folder**" button.

7. You can add events to log file - for example a change in the measurement condition as changing the sensor or modifying the fluid under test. To enter an event, click on the **"Add Event"** button,

Figure 66: Manual Logging - Add Event Button

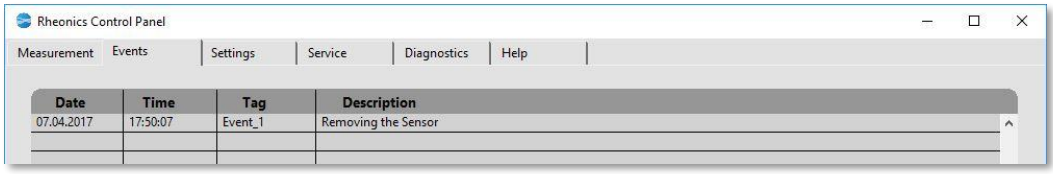


8. Type in a description of the event

Figure 67: Manual Logging - Event Description

The entered events are shown in the "**Event**" panel and are stored in a log file with suffix "**_events.txt**". For more detail about the log files look up on "**Help**" -> "**Log file description**".

Figure 68: Manual Logging - Event on Events Tab



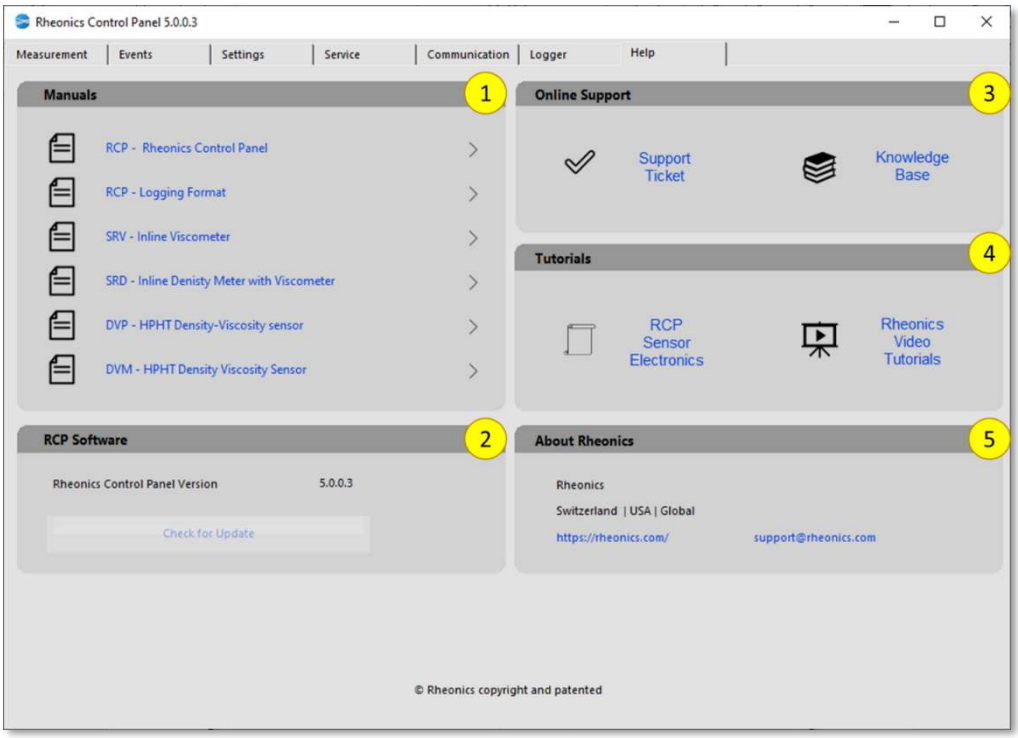
Note

Each time a new data point is logged (set by the logging interval), the log file is closed, saved, and reopened. This guarantees that even in the event of computer crashes, power failures and other interruptions, that the previously logged data will be safeguarded. This is particularly important during long runs lasting hours or even days.
You can find more detailed information about the logfiles in the Logfile Description Manual.

4.12 Help Tab

The Help tab shows links to help files, and the main information of the application.

Figure 69: Help Tab



1. **Manuals**: A list of links to the main help files of the application and the different types of sensors. You can click on the "**>**" icon to be directed to the website to request respective manual. For the latest Rheonics manual, users should visit Rheonics webpage.
2. **RCP Software:** Information about RCP software version**.**
3. **Online Support:**
   a. Click on "**Support Ticket**" to get redirected to the Rheonics support site, where you can generate a support ticket with your specific request.
   b. Click on "**Knowledge Base**" to access Rheonics support articles with relevant information about sensors, software and solutions.
4. **Tutorials**:
   a. On RCP sensor electronics, you will be redirected to the Rheonics support site, where you will find more documentation about SME.
   b. Click on "**Video Tutorials**" to be redirected to the Rheonics YouTube support channel.
5. **About Rheonics:** Rheonics main Web site link and support email address.

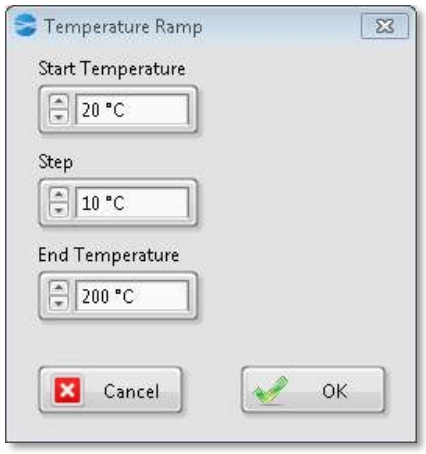
4.13 Temperature Control Tab.

The “Temperature Control” tab controls and monitors Rheonics Thermal Chambers (e.g. DTCM and STCM). This tab has five sections:

- **Constant temperature**: Sets the constant temperature in constant mode operation (see Constant Temperature Mode
- below), and allows user to select the thermal control unit (DTCM by default). The “connection” indicator turns GREEN once the test is started and the control unit is connected. If no connection can be stablished the LED will turn RED, and if a controller error occurs the led will turn YELLOW.

- **Temperature Profile:** Sets the range of temperatures and wait times to operate in temperature profile mode (see Temperature Profile Mode below). By clicking the “**Temperature Ramp**” the test will run in this mode. The “Temperatures” can be manually input or can be filled automatically with the “**Auto Fill Ramp**” function, setting only the start temperature, the end temperature and the step. The **“Dwell Times”** can also be filled manually; if **“Use same dwell time”** is enabled, the same dwell time will be used for each temperature, otherwise, a dwell time should be written for each step.

Figure 70: Temperature Control - Temperature Ramp

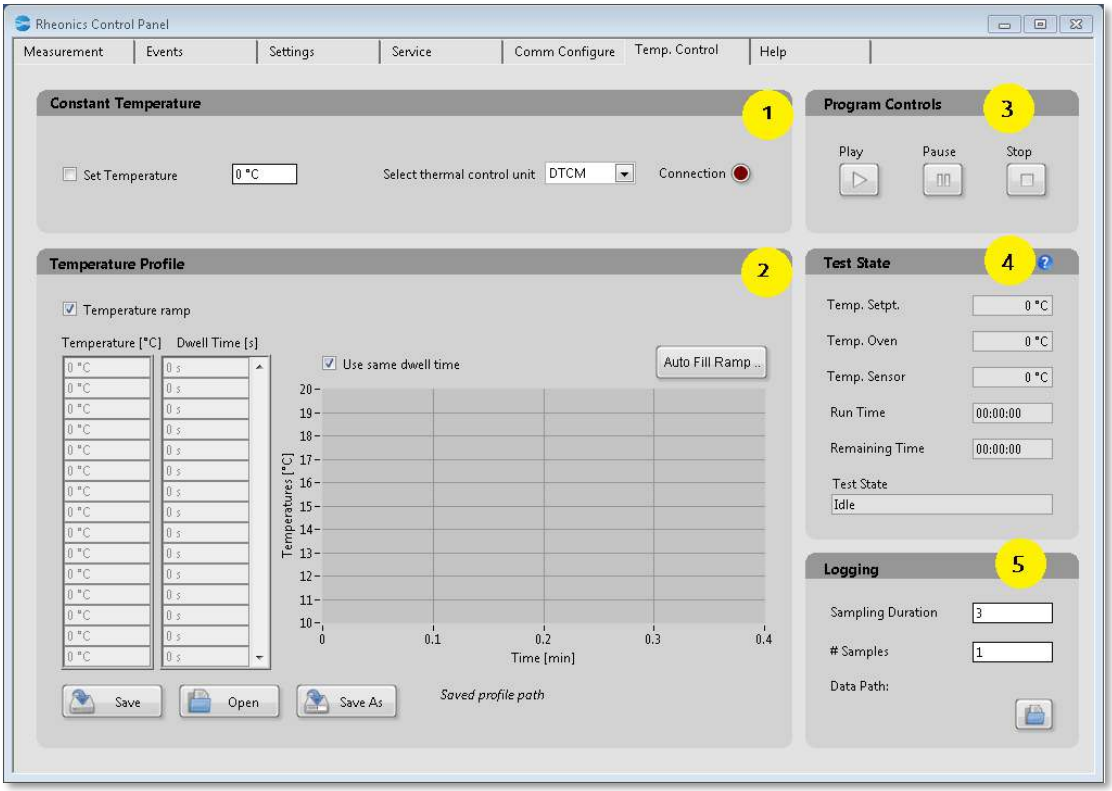


The test configuration can be saved into a configuration file (*.tcg) using the “**Save**” button. Also, a previously created configuration file can be loaded by means of the “**Open**” button. By clicking the “**Save As**” button, a configuration previously loaded can be saved in a new file.

1. **Constant Temperature** Explained below.
2. **Temperature Profile** Explained below.

3. **Program Controls:** To Play (Start), Pause or Stop a test.
4. **Test State:** Shows the parameters values read during the test.
    a. "**Temp. Setpt**." Shows the value in °C of the temperature setpoint read from the controller.
    b. "**Temp. Oven**" indicates the Peltier temperature.
    c. "**Temp. Sensor**" shows the sensor temperature read from the DVM string.
    d. By clicking the help icon, a window is displayed showing more parameters read from the TEC, as offset, sink temperature, PWM % of the fan controllers, output current and output voltage.
5. **Logging:** The "**sampling duration**" is a parameter used during temperature profile operation to calculate the "#samples" that should be taken on each step of the test. These parameters are not considered during constant temperature operation. The "**Data Path**" shows the path of the folder where the logfiles are being kept and the button next to it opens the folder where these files are located.

Figure 71: RCP - Temp. Control Tab

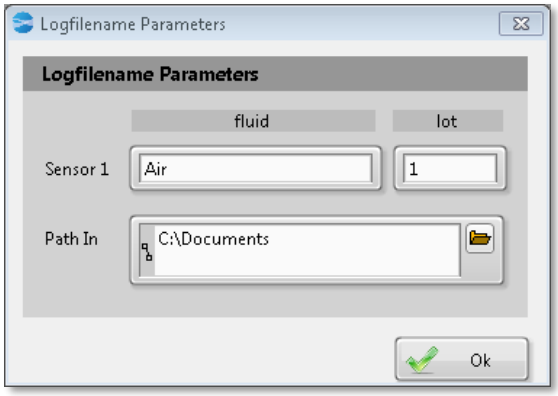


Constant Temperature Mode

In constant temperature mode a constant temperature value is written to the TEC at the start of the test. The RCP will log during all the test, taking samples of the Peltier element

and sensor temperature on each logging RCP interval. The test will last until the user clicks the "**Stop**" button. At the start of the test the user is prompted to select the path where the logfile, events file, debug file and temperature log file will be saved. The temperature logfile keeps the most relevant parameters, measured every 10 seconds from the TEC. The name format is in the form "**Date_Time_SensorType_Fluid_Lot**".

Figure 72: Temp. Control - Logfilename Parameters



Temperature Profile Mode

In this mode, a temperature profile can be obtained by setting a range of temperatures and taking a determined number of samples after the "Dwell Time" elapses for each temperature step. The "**number of samples**" is defined as:

$$number\ of\ samples = \frac{Sampling\ Duration}{Sensor\ Sample\ Period}$$

where:

- **Sampling Duration** is set in the front panel.
- **Sensor Sample Period** is defined in the DTCM.ini file (3 seconds by default).

At the start of the test, the user is prompted to input a data path, and six files are created:

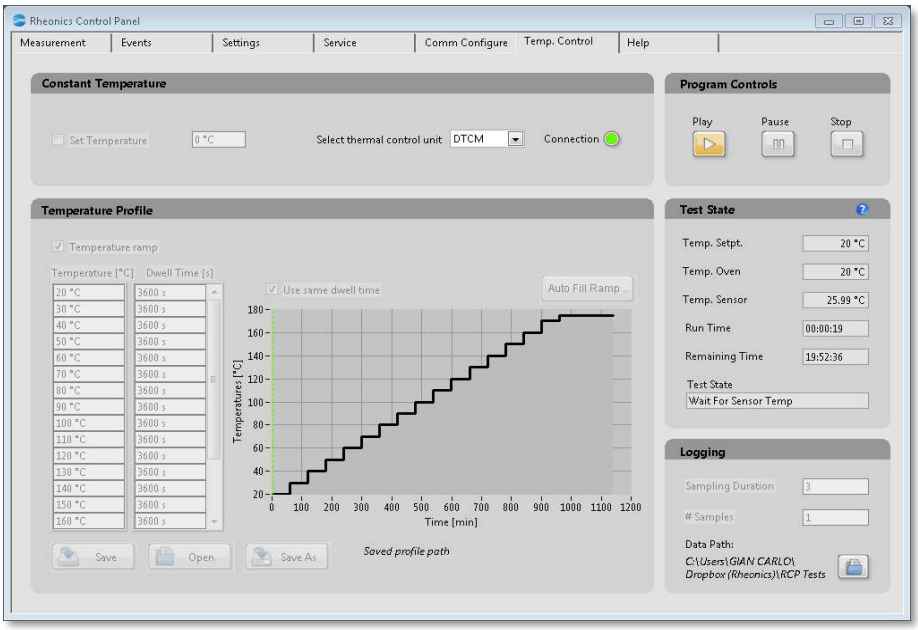
- **Logfile**
- **Debug file**
- **Events file**
- **Measurements file**: Stores all recorded samples for each temperature step.
- **Average file**: Calculates and records the average of measured parameters at each temperature step.
- **Temperature logfile**

The total test duration depends on:

- Dwell time per step
- Temperature difference between steps
- Number of samples per step
- Logging interval between samples

If there are no errors, the test will complete once all samples from the final temperature step are recorded.

Figure 73: Temp. Control - Temp. Profile



4.14 Rheonics Dataview Windows

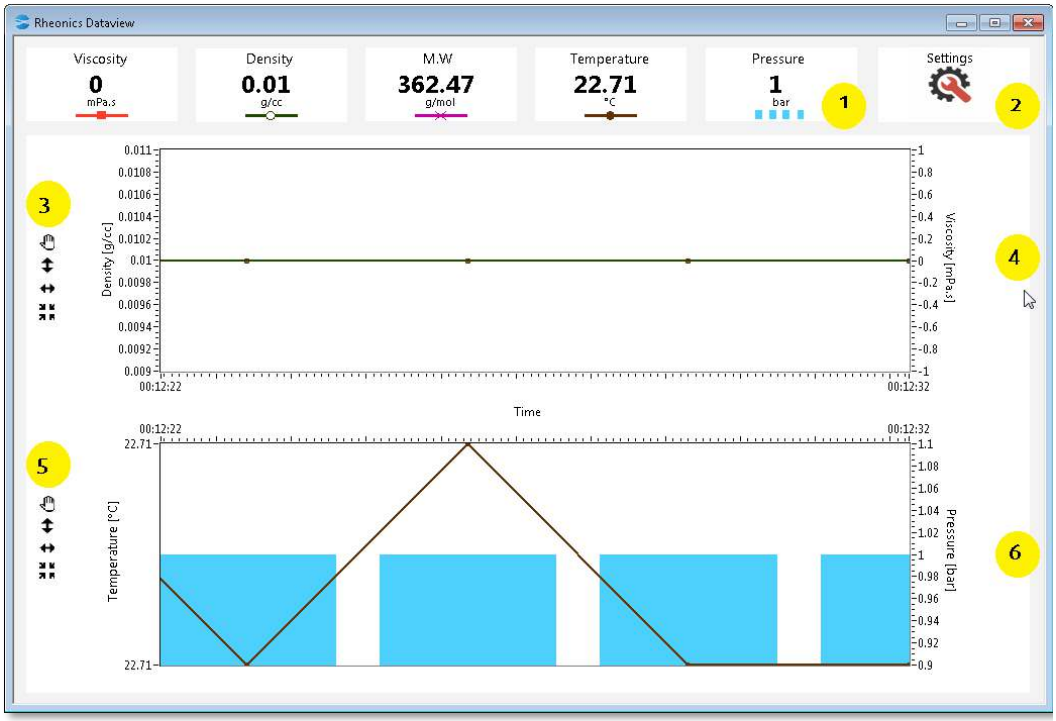
Rheonics Dataview Windows offers an extended and customized view of measured parameters. When the "**Dataview**" button is clicked from the "**Measurements Tab**", a new window is opened. This window has two views, with the **"Measurements"** page displayed by default.

4.14.1 Measurements View

The measurements window by default shows two graphs, as shown in picture below; the first one plots density and viscosity, the second plots temperature and pressure.:

1. On the top of the window, current measurement values are shown.
2. By clicking the "**Settings"** button, the "**Settings**" page is viewed.
3. On the left side of the first plot, a tools palette provides options for moving, vertical zoom, horizontal zoom, and fitting the plot. When a tool is selected, its control is highlighted, and the mouse pointer changes when hovering over the plot area. To disable a tool, simply click it again.
4. Shows the plot area of the first plot.
5. Tools palette of the second plot.
6. Plot area of the second plot.

Figure 74: Dataview Window - Measurements View



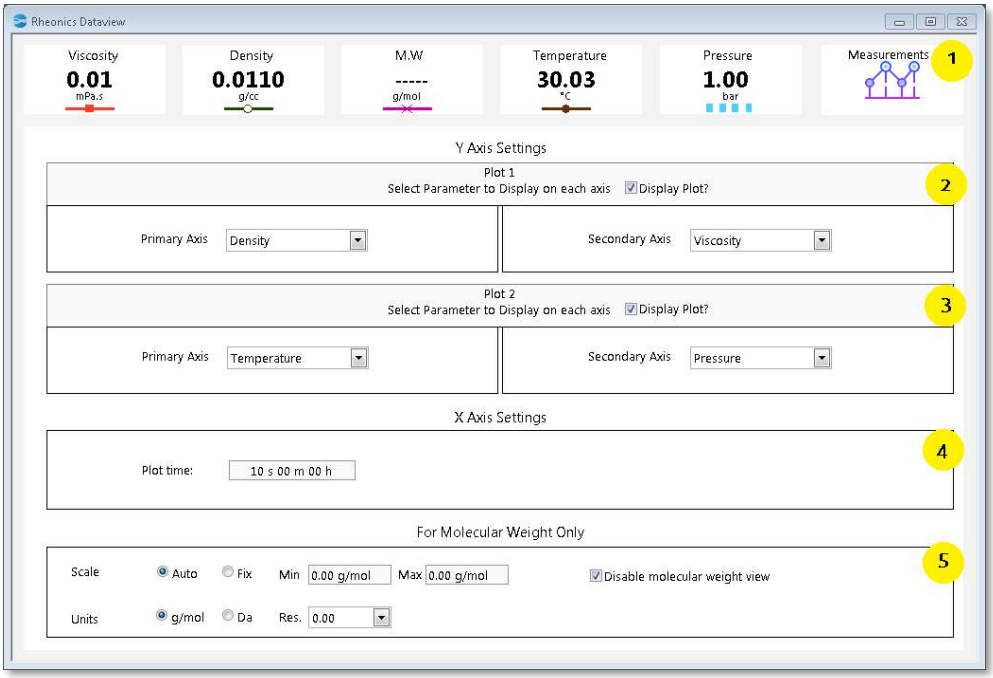
4.14.2 Settings View

When the "**Settings**" button is clicked the windows switches to a settings page (*Refer to image below).*

1. Click this button to go back to "**Measurements**" page.
2. **Y axis settings for plot 1**; the parameters to be plotted on each one of the two axes can be selected. Also, the graph itself can be made visible or not visible by checking the "Display plot" control.
3. **Y axis settings for plot 2.**
4. **X axis settings**: in this section the plot time can be modified. Top is 24 hours for real time plot update. It is independent of the time of the RCP graphs.
5. **For Molecular Weight Only**: The Dataview window has the capability of calculating the molecular weight for ideal gases. If Molecular weight is plotted on any of the charts, the y axis range, units, and resolution can be modified. The calculation of molecular weight can be disabled.

For viscosity, density, temperature and pressure units and ranges, and for time interval, the Dataview takes the settings from the "**Settings**" tab of RCP.

Figure 75: Dataview Window - Settings View

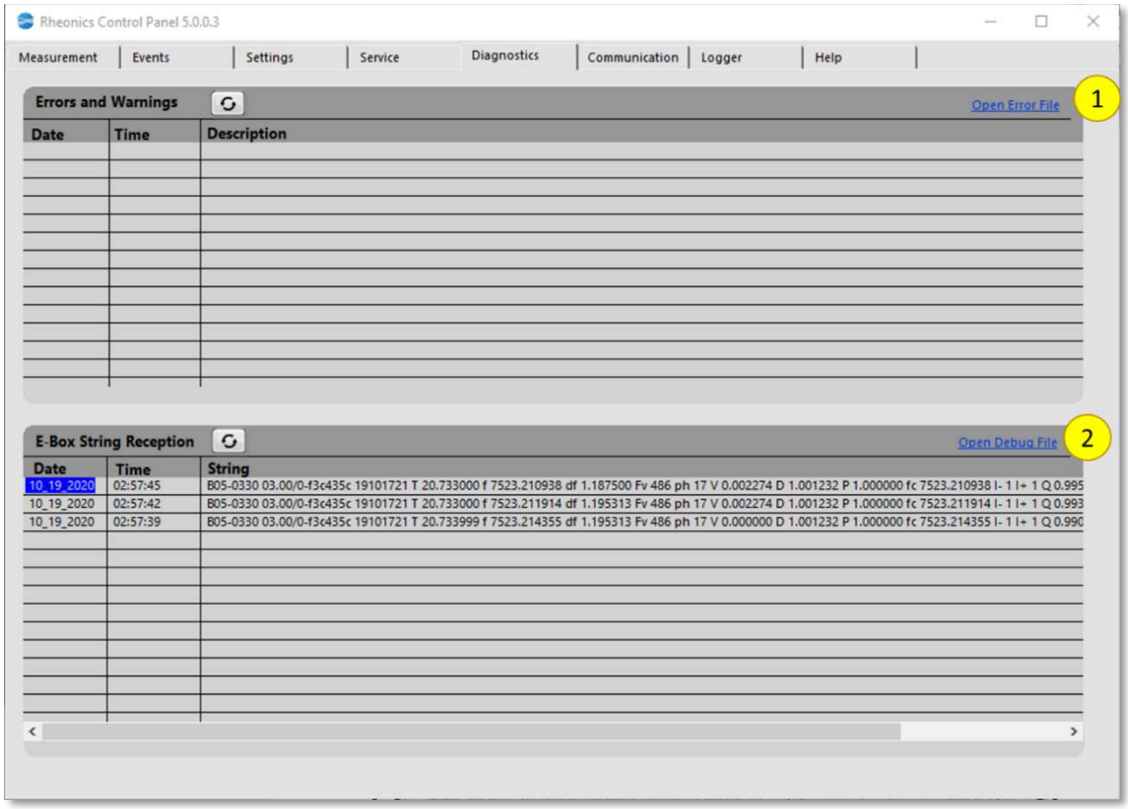


4.15 Diagnostics Tab (Service Mode)

This tab contains useful information about errors that occurred in the application and the last strings received from the SME. By default, this tab is disabled and can be enabled by contacting Rheonics Support Team.

1. **Errors and Warnings**: Shows a list of last application errors and warnings. This information is useful to set or restore the normal functionality of the application, in case of any error or wrong configuration. Please refer to section 5.1 to see the most common codes and warnings and possible solutions.
   i. Click the "**Open Error File**" link, to open the error file and get more information about errors and warnings.
   ii. Click the "↻" button to clear the error list.
2. **E-Box String Reception:** Shows a list of the last received strings from the SME.
   i. Click the "**Open Debug File**" link, to open the debug file and get more information about the received strings. To open this file, you must be logging the measurements. Please refer to Section 4.13 to log and set events.
   ii. Click the "↻" to clear the strings list.

Figure 76: RCP - Diagnostics Tab



5 Troubleshooting

5.1 Error Codes and warnings

Errors and warnings that can appear during the software operation.

Code	Tag	Description	Suggestions
8	"Unexpected Error"	The application does not have enough permissions to modify a system file.	Restart the application as "administrator"
-1073807194	"Communication Error"	The connection for the given serial session has been lost.	Disconnect and reconnect the SME to the PC
-1073807246	"Communication Error"	The port is valid, but the application can't access it	The USB could be disconnected, or other applications may be using the serial port. Ensure that the USB cable is properly connected, and no other application is using the port.
No error code	"Parameter File Not Found"	The application couldn't find the "program.ini" file in the directory "C:\Users\(Username)\Documents\RheonicsControlPanel"	Check if the "program.ini" file is in the directory. If not, contact Rheonics support to obtain the configuration file.
No error code	"Sensor File Not Found"	The program couldn't find any configuration file for a specific sensor. The default configuration is loaded.	Import the configuration file that corresponds with your sensor. Refer to section 4.3
No error code	"Default Sensor File Not Found"	The program couldn't find the default sensor configuration file. Default system values are loaded.	Check if the "sensor_default.config" file is in the directory "C:\ProgramData\RheonicsControlPanel" If not, contact Rheonics support to obtain the sensor default configuration file.
No error code	"Measurement File Not Created"	The user is trying to access a measurement, event or debug file but no logging has been started.	Create a measurement file by starting a data log. Refer to section 4.13
No error code	"Import failed"	The import of the sensor configuration file failed.	Retry and make sure that the file type is .config
No error code	"File Creation Error"	There was an error creating the measurement, file.	Please make sure that the selected name and path are available and valid.
No error code	"File Write Error"	There was a problem updating the measurement file	Make sure that the measurement file has not been deleted or isn't opened in another application

Table 5 RCP Error codes

Temperature controller (TEC) common errors.

Code	Tag	Description	Suggestions
30-37	"Power Supply error"	There is an error with the TEC power supply.	Check that the power source is connected and within the correct
60	Overtemperature	The Peltier temperature is too high	Check is the fans are connected
130-151	Object temp. Measurement errors	Circuit measurement failures	
140-144	Sink Temp. errors	Errors with sink measurements	Check the fans and sink temperature.

Table 6 TEC Controller error codes

For other error codes please contact Rheonics.

5.2 Common Sensor Errors

Code	Tag	Description	Suggestions
E10, E20, E30	Low Accuracy	Sensor is Locked but measurement may not be stable for accuracy	Make sure sensor is not stable and not touching any surface
E01, E02, E11, E12, E21, E22	Sensor Unlocked	The sensor is not locking properly to a measurement value	Check the sensor position and wiring
E13, E99	Sensor is not connected	The sensor is not connected to the SME	Check sensor wiring
E20	No power	No 24 V power supply connected to sensor	Connect the power source or check the power connections

Table 7 Sensor error codes

5.3 Sensor Status Bits (found in -P files)

Bit	Hex	Name	Comment
Bit 0	0x0001	Frequency mismatch	The measured frequency does not match the sensor frequency. Derived from the string (E10)
Bit 1	0x0002	Not locked	The frequency is not locked. Derived from the string (E01)
Bit 2	0x0004	Lock incorrect	The sensor has locked on the wrong frequency. Derived from the string (E02)
Bit 3	0x0008	Analog sensor board communication error	Contact Rheonics support.
Bit 4	0x0010	Temperature sensor failed	The temperature sensor has failed. Derived from the string if temperature is -273.0
Bit 5	0x0020	Sensor too hot	If temperature is above the hardcoded physical temperature limit
Bit 6	0x0040	Sensor communication error	Contact Rheonics support.
Bit 7	0x0080	Serial Changed	Contact Rheonics support.
Bit 8	0x0100	Status not clean	Sensor is not clean.
Bit 9	0x0200	Status in Air	Determines if sensor is in air
Bit 10 -15	Unused		

Table 8 Sensor status bits

The error status may contain the OR of the different bits, if various errors are present at the same time.

6 Where to Go from Here

For further reading, you can check the following manuals and articles.

1. **Rheonics Support Portal (Main RCP Section)**
   - **Support Portal**: RCP Support Articles

2. **Managing Log files**
   - **Manuals**
     - Rheonics Control Panel Software: Log File Description
   - **Articles**
     - Onboard data historian access on the Rheonics inline density meters and viscometers
     - Software logging and importing data into Excel

3. **Scaling parameters**
   - **Articles**
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8 License Agreement

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9 Notes/Errata

This section is for corrections in further editions.

Notes

Contact Rheonics support for customization of system settings.

10 Changelog

Date	Changes	Responsible
03.2020	Original File	MH
04.2022	Updates on Factory Reset information	CA
02.2025	Updated format	JR