Communication Protocol Manual

HART Field Device Specification

Rheonics, SME
DOC. ID: HART-OP-2511

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Contents

1 Before you begin

1.1 About the manual

This manual provides information on HART Protocol. This document specifies all the device-specific features and documents HART Protocol implementation details (e.g., the Engineering Unit Codes supported and output variables).

This manual assumes that the following conditions apply:

- The sensor has been installed correctly and completely according to the installation instructions.
- The installation complies with all applicable safety requirements.
- The user is trained in government and corporate safety standards.

1.2 Purpose

This specification is designed to complement the SME Installation Manual by providing a complete, unambiguous description of this Field Device for use in HART Communication networks

1.3 Who should use this document?

The specification is designed to be a technical reference for HART End Users. This document assumes the reader is familiar with HART Protocol requirements and terminology.

1.4 Warning

WARNING
Do not connect or disconnect the HART communicator in an explosive atmosphere unless all instruments in the loop are installed according to intrinsically safe or nonincendive field wiring practices.

1. Connect the HART communicator to **CH1** on the SME.
2. Make sure the loop has at least **250 ohms** resistance so the communicator works correctly.
3. The HART communicator does not measure loop current directly.

1.5 Warning Messages

ATTENTION

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

CAUTION

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

WARNING

This word indicates a hazard or mandatory action to ensure the proper function and safety of Rheonics product.

DANGER

This word indicates a hazard with a high degree of risk which, if not avoided, can result in death or severe injury.

Nomenclature

Item	Abbreviation (short form)	Full-term	Meaning
1	SRV	Symmetric Resonator Viscometer	Viscosity sensor
2	SRD	Symmetric Resonator Densitometer	Density and Viscosity sensor
3	DVP	Density Viscosity Probe	HPHT inline probe
4	DVM	Density Viscosity Module	HPHT inline module
5	RCP	Rheonics Control Panel	Software for data acquisition and configuration
6	SME	Smart Module Electronics	Sensor electronics

Table 1. Defined Acronyms

2 Product Overview

The **Rheonics SME** provides a HART interface, enabling clients to access digital data over the traditional 4–20 mA channel. This section explains the main features and shows how to make field connections.

Figure 1. SME – Sensor Electronics Unit

2.1 Process Interface

The SME is compatible with various Rheonics modules find below the ones that are compatibles.

Figure 2. SME – Rheonics Sensor for Viscosity and density measurements.

2.2 HART Operating Principle

The **HART** (**Highway Addressable Remote Transducer**) protocol is widely used in industrial process measurement and control.

Key points:

- Provides two-way communication between smart instruments and host systems.
- Uses the same wiring as the standard 4–20 mA analog output.
- Encodes digital signals on top of the analog current loop, enabling devices to exchange both analog and digital data at the same time.

2.3 Variables running in the SME

For HART communication, the SME provides four variables (PV, SV, TV, and QV) over Channel 1 (4–20 mA analog output).

Variable Type	Parameter	Unit
Primary Variable (PV)	Density	g/cc
Secondary Variable (SV)	Viscosity	cP
Tertiary Variable (TV)	Temperature	°C
Quaternary Variable (QV)	Sensor Status	-

Table 2. Variable list for Rheonics Sensors

2.4 HART commands

2.4.1 Command 0: Read Unique Identifier

Returns identity information about the field device, including Device Type, Revision Levels, and Device ID. This command is implemented by a field device in both short and long frame formats.

Command 0 is the only command that may respond to a short frame address.

2.4.1.1 Request Data bytes

Index	Type	Description
None		

Table 3. Command 0 – Request Data Bytes

2.4.1.2 Response Data bytes

Index	Type	Description
0	Unsigned-8	Reserved. Constant value "254"
1-2	Enum	Device Type Code
3	Unsigned-8	Minimum Number of Preambles required (Master to Slave)
4	Unsigned-8	HART Protocol Major Revision
5	Unsigned-8	Device Revision Level

6	Unsigned-8	Software Revision Level
7	Unsigned-8	Hardware Revision
8	Bits	HART Signal Flags
9-11	Unsigned-24	Device ID
12	Unsigned-8	Minimum Number of preambles (Slave to Master)
13	Unsigned-8	Maximum Number of Device Variables
14-15	Unsigned-16	Configuration Change Counter
16	Bits	Extended Field Device Status
17-18	Enum	Manufacturer - Identification Code -615D
19-20	Enum	Private Label Distributor - Identification Code
21	Enum	Device Profile Code

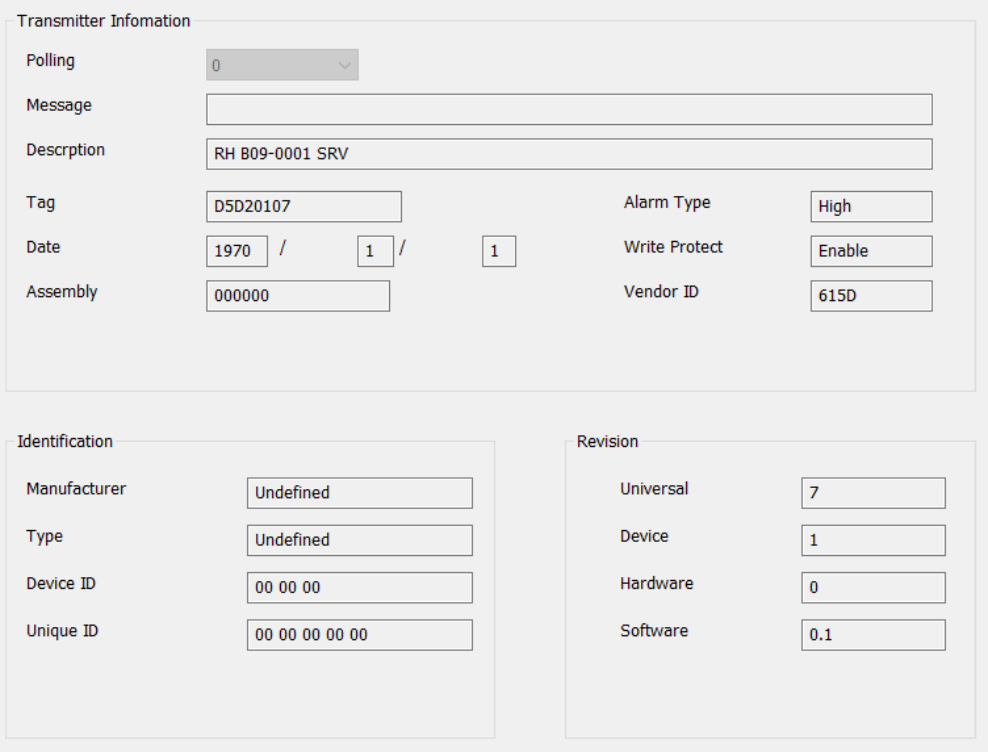
Table 4. Command 0 – Response Data Bytes

2.4.1.3 Command specific response codes

Code	Class	Description
0	Success	No Command-Specific Error

Table 5. Command 0 – Command specific response codes

Figure 3. Response with HARTmpt.



2.4.2 Command 1: Read Primary Variable

Returns the **Primary Variable (PV)** with its unit.

2.4.2.1 Request Data bytes

Index	Type	Description
None		

Table 6. Command 1 – Request Data Bytes

2.4.2.2 Response Data bytes

Index	Type	Description
0	Enum	Primary Variable - Unit Code
1-4	Float	Primary Variable - Value

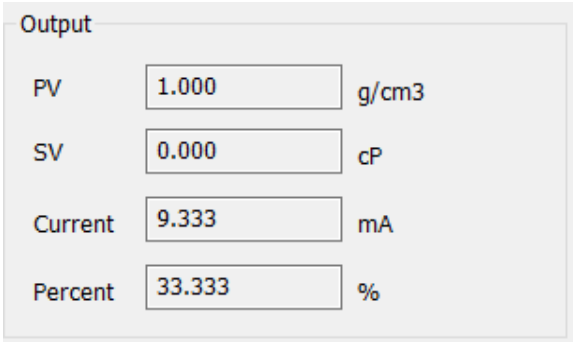
Table 7. Command 1 – Response Data Bytes

2.4.2.3 Command specific response codes

Code	Class	Description
0	Success	No Command-Specific Error
6	Error	Device-Specific Error
8	Warning	Update Failure
16	Error	Access Restricted

Table 8. Command 1 – Command specific response codes

Figure 4. Command 1 response with HARTmpt.



2.4.3 Command 2: Read Current Loop, Percent of Range

Returns the loop current and percent of range. Matches the actual loop current measured by an ammeter, including alarm states.

2.4.3.1 Request Data bytes

Index	Type	Description
None		

Table 9. Command 2 – Request Data bytes

2.4.3.2 Response Data bytes

Index	Type	Description
0-3	Float	Primary Variable - Loop Current [mA]
4-7	Float	Primary Variable - Percent of Range [%]

Table 10. Command 2 – Response Data bytes

2.4.3.3 Command specific response codes

Code	Class	Description
0	Success	No Command-Specific Error
6	Error	Device-Specific Error
8	Warning	Update Failure
16	Error	Access Restricted

Table 11. Command 2 – Command specific response codes

Figure 5. Command 2 response in HARTmpt.

2.4.4 Command 3: Read Dynamic Variable, Loop Current

Returns the loop current plus up to four dynamic variables (**PV, SV, TV, QV**). Matches the actual loop current measured by an ammeter, including alarm states.

2.4.4.1 Request Data bytes

Index	Type	Description
None		

Table 12. Command 3 – Command Request Data bytes

2.4.4.2 Response Data bytes

Index	Type	Description
0-3	Float	Primary Variable - Loop Current [mA]
4	Enum	Primary Variable - Unit Code
5-8	Float	Primary Variable - Value
9	Enum	Secondary Variable - Unit Code
10-13	Float	Secondary Variable - Value
14	Enum	Tertiary Variable - Unit Code
15-18	Float	Tertiary Variable - Value
19	Enum	Quaternary Variable - Unit Code
20-23	Float	Quaternary Variable - Value

Table 13. Command 3 – Command Response Data bytes

2.4.4.3 Command specific response codes

Code	Class	Description
0	Success	No Command-Specific Error
6	Error	Device-Specific Error
8	Warning	Update Failure
16	Error	Access Restricted

Table 14. Command 3 – Command specific response codes

2.4.5 Command 7: Read Loop Configuration

Reads the polling address and loop current mode.

2.4.5.1 Request Data bytes

Index	Type	Description
None		

Table 15. Command 7 – Command Request Data bytes

2.4.5.2 Response Data bytes

Index	Type	Description
0	Unsigned-8	Polling Address
1	Enum	Loop Current Mode

Table 16. Command 7 – Command Response Data bytes

2.4.5.3 Command specific response codes

Code	Class	Description
0	Success	No Command-Specific Error
16	Error	Access Restricted

Table 17. Command 7 – Command specific response codes

2.4.6 Command 8: Read Dynamic Variable Classification

Returns the classification of **PV**, **SV**, **TV**, and **QV**. The classification determines the Unit Code Expansion Table that must be used by a Host.

2.4.6.1 Request Data bytes

Index	Type	Description
None		

Table 18. Command 8 – Command Request Data bytes

2.4.6.2 Response Data bytes

Index	Type	Description
0	Enum	Primary Variable Classification
1	Enum	Secondary Variable Classification
2	Enum	Tertiary Variable Classification
3	Enum	Quaternary Variable Classification

Table 19. Command 8 – Command Response Data bytes

2.4.6.3 Command specific response codes

Code	Class	Description
0	Success	No Command-Specific Error
16	Error	Access Restricted

Table 20. Command 8 – Command specific response codes

2.4.7 Command 11: Read Unique Identifier Associated with Tag

This command may be issued with either the device's long frame address or the broadcast address.

- The device responds only if the tag matches.
- With the long frame address, both the address and the tag must match.

2.4.7.1 Request Data bytes

Index	Type	Description
0-5	Packed	Device Tag (6 Byte as 8-character Packed ASCII)

Table 21. Command 11 – Command Request Data bytes

2.4.7.2 Response Data bytes

Index	Type	Description
0	Unsigned-8	Reserved. Constant value "254"
1-2	Enum	Device Type Code
3	Unsigned-8	Minimum Number of Preambles required (Master to Slave)
4	Unsigned-8	HART Protocol Major Revision
5	Unsigned-8	Device Revision Level
6	Unsigned-8	Software Revision Level
7	Unsigned-8	Hardware Revision
8	Bits	HART Signal Flags
9-11	Unsigned-24	Device ID
12	Unsigned-8	Minimum Number of preambles (Slave to Master)
13	Unsigned-8	Maximum Number of Device Variables
14-15	Unsigned-16	Configuration Change Counter
16	Bits	Extended Field Device Status
17-18	Enum	Manufacturer - Identification Code
19-20	Enum	Private Label Distributor - Identification Code
21	Enum	Device Profile Code

Table 22. Command 11 – Command Response Data bytes

2.4.7.2.1 Command specific response codes

Code	Class	Description
0	Success	No Command-Specific Error

Table 23. Command 8 – Command specific response codes

2.4.8 Command 12: Read Message

Reads the message stored in the device.

2.4.8.1 Request Data bytes

Index	Type	Description
None		

Table 24. Command 12 – Command Request Data bytes

2.4.8.2 Response Data bytes

Index	Type	Description
0-23	Packed	Device Message (24 Byte as 32 characters Packed ASCII)

Table 25. Command 12 – Command Response Data bytes

2.4.8.3 Command specific response codes

Code	Class	Description
0	Success	No Command-Specific Error
16	Error	Access Restricted
32	Error	Busy

Table 26. Command 11 – Command specific response codes

2.4.9 Command 13: Read Device Tag, Descriptor, Date

Returns the device tag, descriptor, and date. To read the long tag (32 characters), use **Command 20**.

2.4.9.1 Request Data bytes

Index	Type	Description
None		

Table 27. Command 13 – Command Request Data bytes

2.4.9.2 Response Data bytes

The **Descriptor** contains the sensor serial number and type.

Index	Type	Description
0-5	Packed	Device Tag (6 Byte as 8 characters Packed ASCII)
6-17	Packed	Descriptor (12 Byte as 16 characters Packed ASCII)
18-20	Date	Date of next/last device action

Table 28. Command 13 – Command Response Data bytes

2.4.9.3 Command specific response codes

Code	Class	Description
0	Success	No Command-Specific Error
16	Error	Access Restricted
32	Error	Busy

Table 29. Command 13 – Command specific response codes

2.4.10 Command 15: Read Device Information

Reads the Alarm Selection Code, Transfer Function Code, Range Values Unit Codes, Upper/Lower Range Values, Damping Value, and Write Protection Code.

2.4.10.1 Request Data bytes

Index	Type	Description
None		

Table 30. Command 15 – Command Request Data bytes

2.4.10.2 Response Data bytes

Index	Type	Description
0	Enum	Primary Variable - Alarm Selection Code
1	Enum	Primary Variable - Transfer Function Code
2	Enum	Primary Variable - Upper/Lower Range Unit Code
3-6	Float	Primary Variable - Upper Range Value
7-10	Float	Primary Variable - Lower Range Value
11-14	Float	Primary Variable - Damping Value [s]
15	Enum	Write Protection Code
16	Enum	Reserved
17	Bits	Primary Variable - Analog Channel Flag

Table 31. Command 15 – Command Response Data bytes

2.4.10.3 Command specific response codes

Code	Class	Description
0	Success	No Command-Specific Error
16	Error	Access Restricted
32	Error	Busy

Table 32. Command 13 – Command specific response codes

2.4.11 Command 20: Read Device Long Tag

Returns the long tag (32 ISO Latin-1 characters). This includes the sensor serial number and type.

2.4.11.1 Request Data bytes

Index	Type	Description
None		

Table 33. Command 20 – Command Request Data bytes

2.4.11.2 Response Data bytes

Index	Type	Description
0-31	Latin-1	Long Tag (32 Byte - Latin-1)

Table 34. Command 20 – Command Response Data bytes

2.4.11.3 Command specific response codes

Code	Class	Description
0	Success	No Command-Specific Error
16	Error	Access Restricted
32	Error	Busy

Table 35. Command 20 – Command specific response codes

2.5 HART specific commands

2.5.1 Command 128: Write SRV density

(HART-7 only) Writes six float coefficients (Do0–Do5) for temperature-compensated density. Refer to Device Specific HART commands.

2.5.1.1 Request Data Bytes

Bytes	Format	Data
0-3	Float	Do0
4-7	Float	Do1
8-11	Float	Do2
12-15	Float	Do3
16-19	Float	Do4
20-23	Float	Do5

Table 36. Command 128 – Command Request Data bytes

2.5.1.2 Response data bytes

Same as request data bytes.

2.5.1.3 Command specific response codes

Code	Class	Description
0	Success	Command accepted, does not guarantee that data will be accepted by the sensor
5	Error	Command frames too short
7	Error	The device is not an SRV and thus does not accept density parameters
64	Error	Command not implemented (it's only available in HART-7)

Table 37. Command 128 – Command specific response codes

2.5.2 Command 129: Read SRV density

(**HART-7 only**) Reads the six float coefficients (**Do0–Do5**) for temperature-compensated density.

2.5.2.1 Request Data Bytes

There are no request data bytes

2.5.2.2 Response data bytes

See response from the status from each coefficient from density

2.5.2.3 Command specific response codes

There are not command specific responses

3 Product interfaces

3.1 Components used for each test

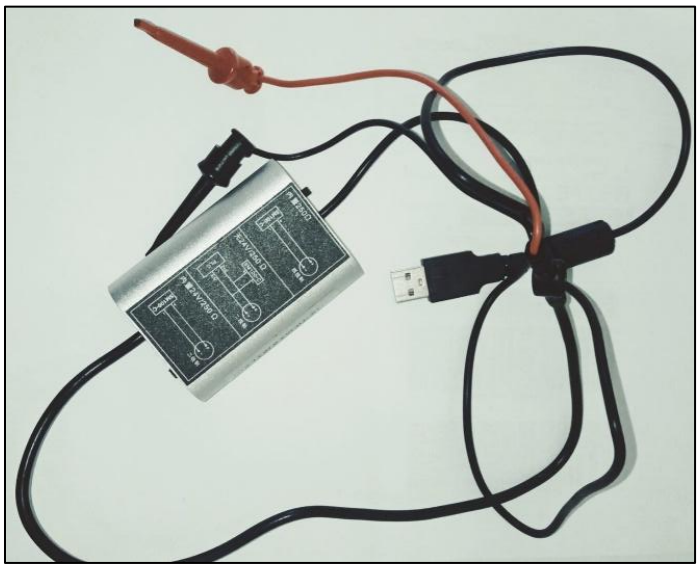
- Rheonics SRV, SRD, DVP or DVM w/ Firmware V03.30/0 or higher
- HART modem
- HART data communication software
- Rheonics Control Panel (RCP) software
- Windows 10, 64 bits

3.2 HART Modem

The HART communicator provides a common link to all HART-compatible, microprocessor-based instruments. At startup, the communicator automatically searches for a HART signal and displays the result.

Note
See Appendix A: HART modem.

Figure 6. HART Modem SM100-C(III).



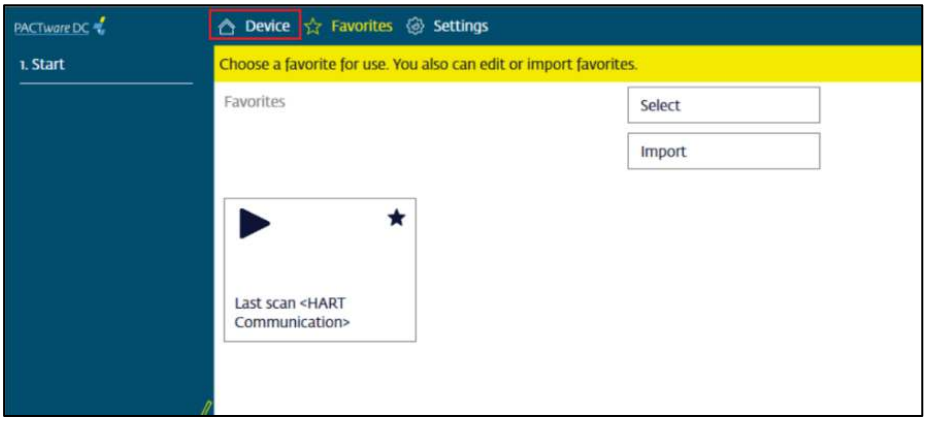
3.3 Connection with PACTWARE DC software

PACTware is a vendor-independent software tool for configuring and operating field devices.

Note
See Appendix B: PACTware DC software.

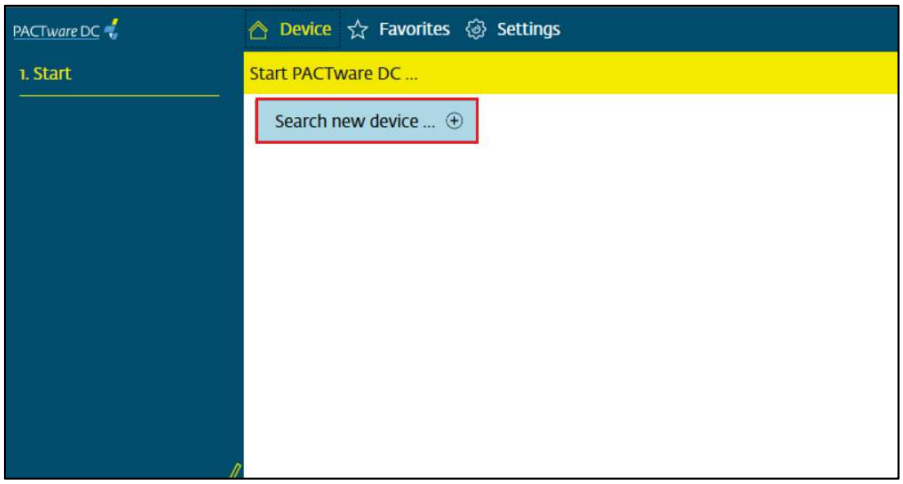
1. Open **PACTware DC 5.0**
2. Click **Device**.

Figure 7. PACTware – Device Tab.



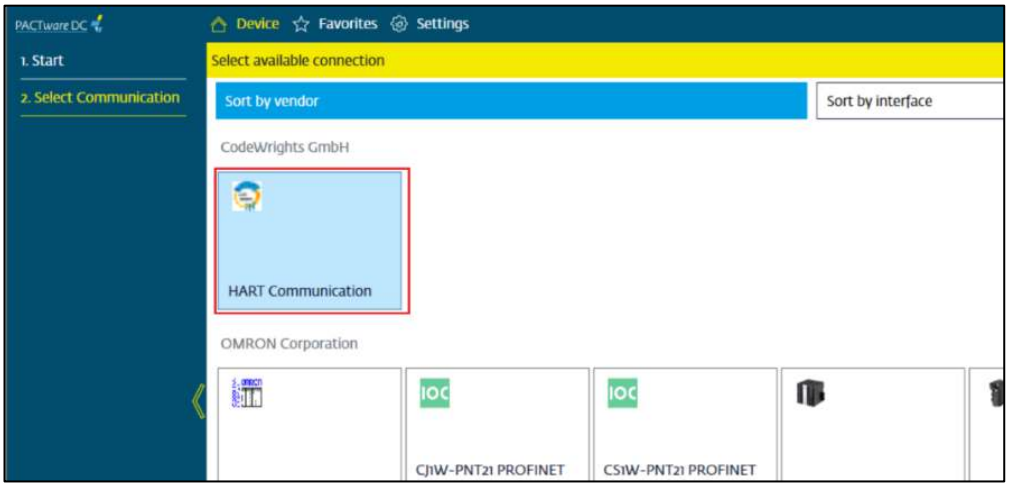
3. Search for a new device.

Figure 8. PACTware - Search for new device



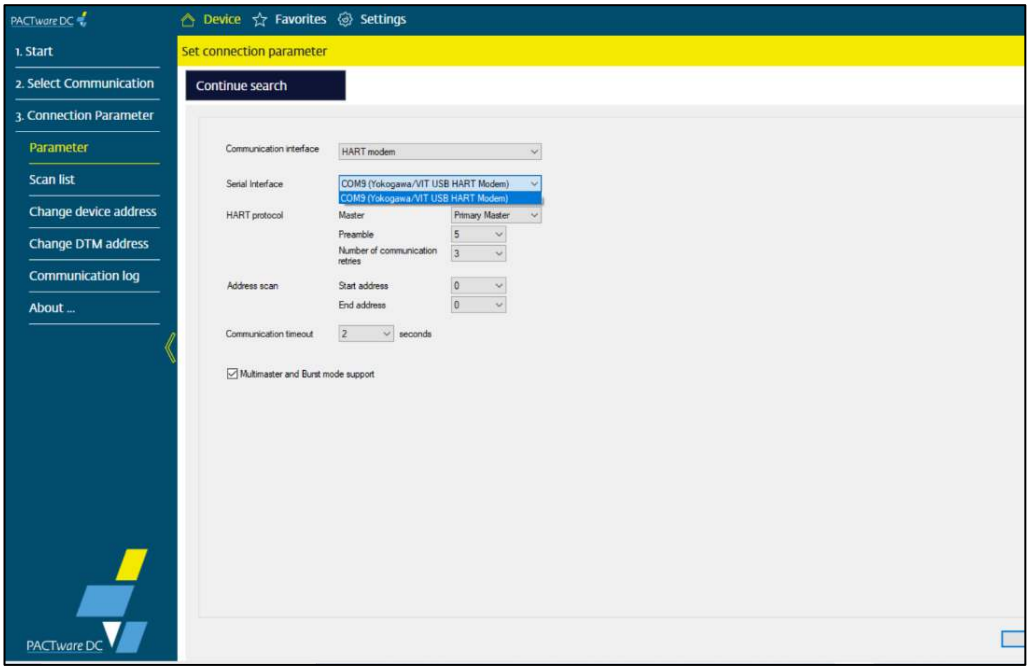
4. Select **HART communication**.

Figure 9. PACTware - HART Communication.



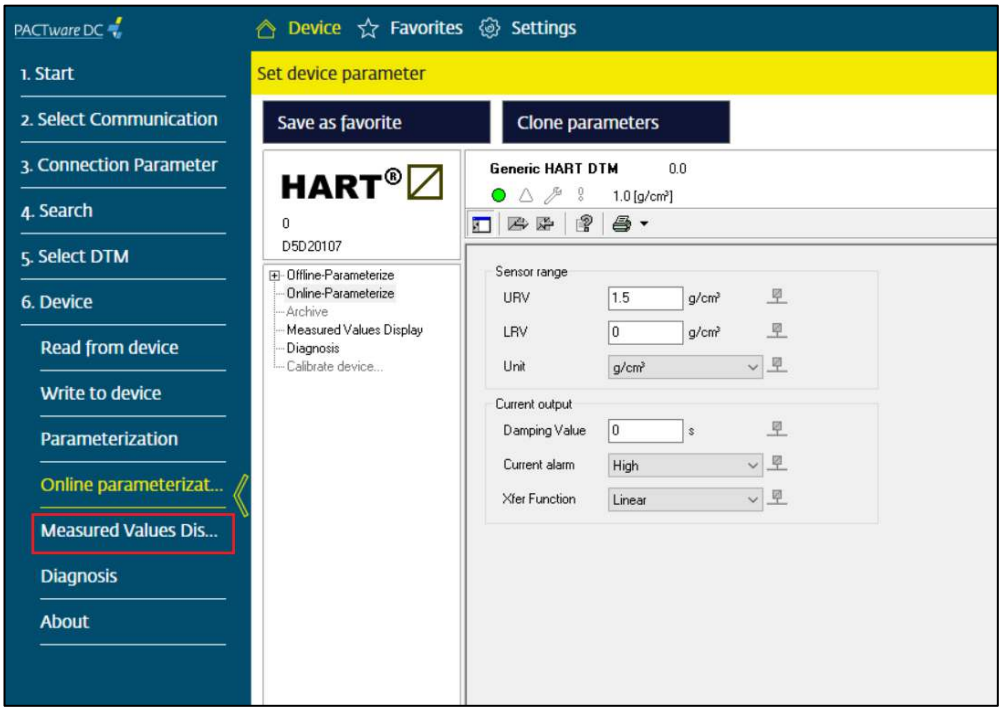
5. Select the HART modem communication port and then click **OK**.

Figure 10. PACTware - Selecting Serial interface.



6. From the Device menu, select **Measured Values Display**.

Figure 11. PACTware – Measured Values Display



7. Read parameters from the SME.

Figure 12. PACTware - Measured values display.

3.4 Device Specific HART commands

The SRV density output can be described as a polynomial :

$$D_{out} = D_{o5} * T^5 + D_{o4} * T^4 + D_{o3} * T^3 + D_{o2} * T^2 + D_{o1} * T + D_{o0}$$

Equation 1. SRV density output model (temperature-compensated polynomial)

3.4.1 Constant density input

For a constant density, set coefficient **Do0** equal to the constant density value, and set all other coefficients to zero.

3.4.2 Temperature-dependent density input

For a temperature-dependent density, assign values to the coefficients that reflect the density-temperature relationship of your fluid. If you have a reference table (e.g., Cannon fluids, Nippon grease), you can fit the tabulated density values to a polynomial model to obtain the coefficients.

> **Note**
> All tests below use the HARTmpt software. See Appendix C: HARTmpt software.

3.4.3 Command 128: Write SRV Density

SRV HART devices support editing coefficients using **Command 128**. Values must be entered in hexadecimal format.

1. Define the coefficient values based on a polynomial model, for example:

Coefficient	Value
Do_0	1
Do_1	0.003
Do_2	0.001

Table 38. Write SRV Density – Coefficients

2. Convert the coefficients to IEEE-754 hexadecimal representation before sending (based on 3.4.3Section 3.4.3). All six coefficients (**Do0–Do5**) must be included, even if unused, otherwise the command will return an error

Coefficient	Hex Value
Do_0	0x3f800000
Do_1	0x3b449ba6
Do_2	0x3a83126f

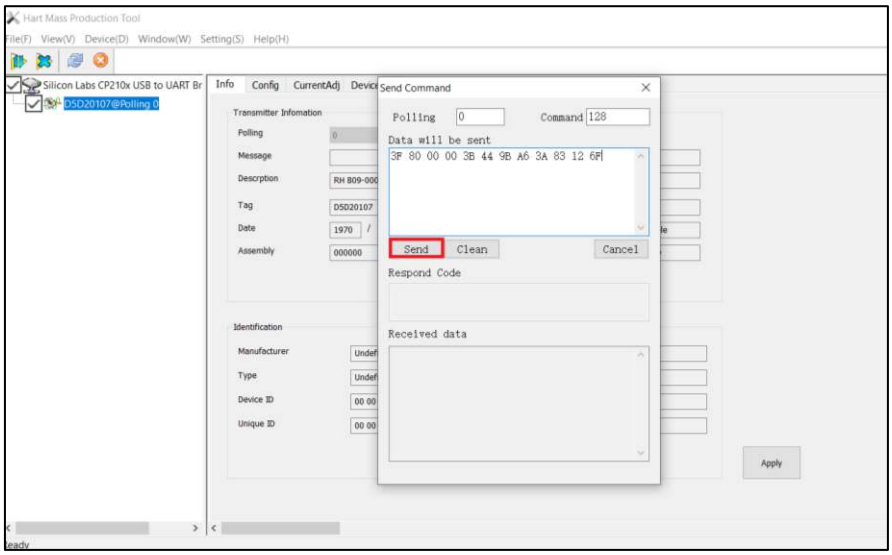
Table 39. Write SRV Density – Hex Values

3. Input the hex value for all the coefficients. Note how Do_3, Do_4 and Do_5 are also included as 00.

```
3F 80 00 00 3B 44 9B A6 3A 83 12 6F 00 00 00 00 00 00 00
00 00 00 00 00
```

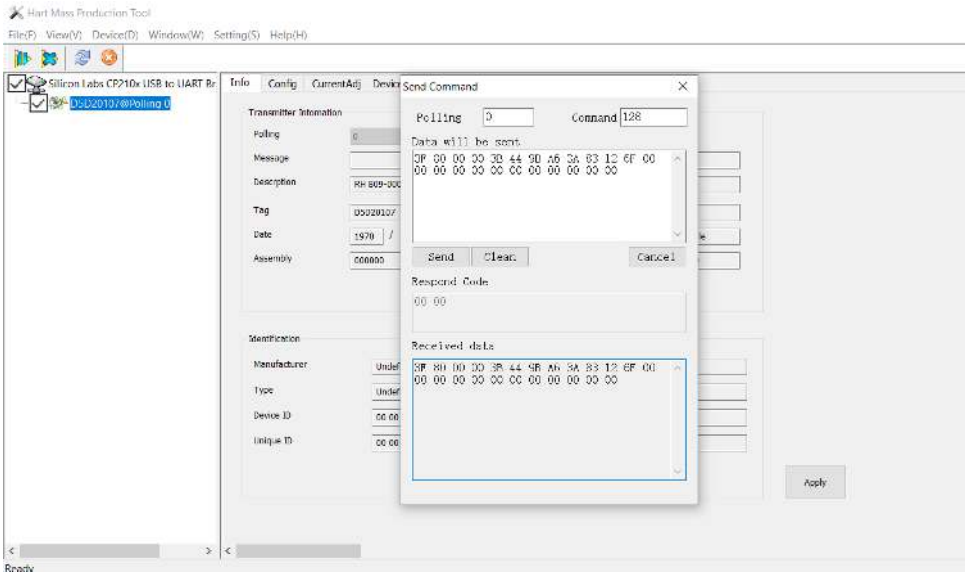
4. Send the command using **HARTmpt**.

Figure 13: PACTware – Command 128: Write Density.



5. Command 128 response, the response is as expected based on Table 37.

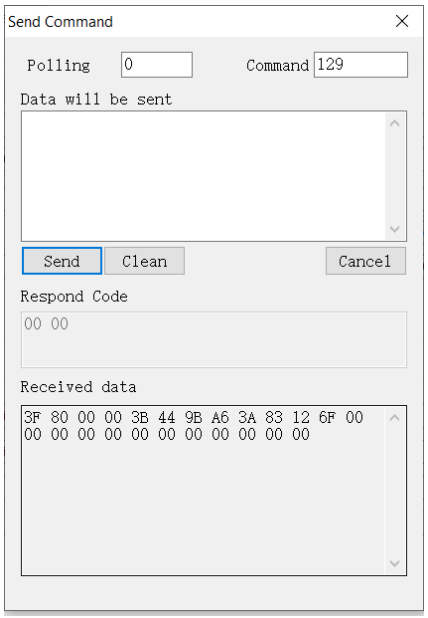
Figure 14: PACTware – Command 128: Response



3.4.4 Command 129: Read SRV Density

This command returns the density coefficients currently loaded in the SRV.

Figure 15: Command 129: Response

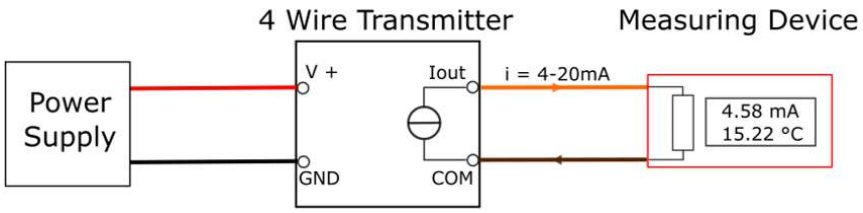


3.5 Host interface

3.5.1 Analog Output 1: 4-20mA

The SME supports HART communication on an active two-wire 4–20 mA current loop.

Figure 16. Electrical Wiring

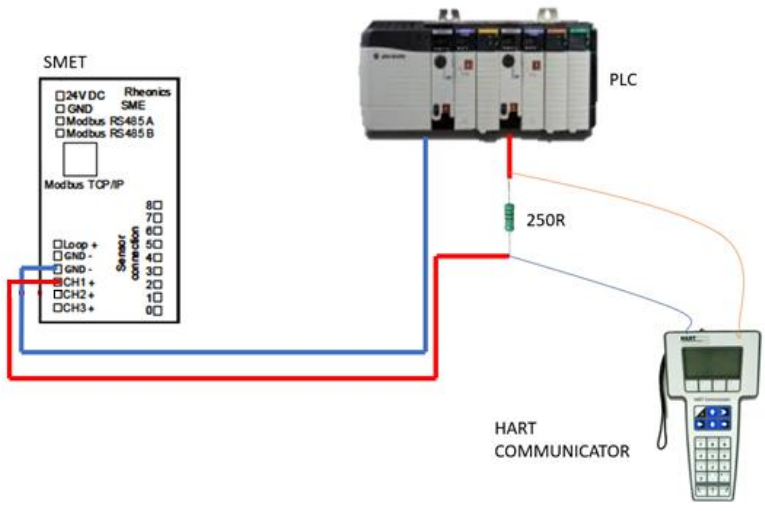


Note
SME 4-20 mA outputs are self-powered. No external supply is required for the 4-20 mA channels.

3.6 Wiring Diagram

The SME generates HART-compatible signals through its **Channel 1 analog output**. A resistor of approximately **250 Ω** is required to connect a modem or communicator to the HART board.

Figure 17. SME connection to PLC and HART communicator



3.7 Setting the SME with the RCP

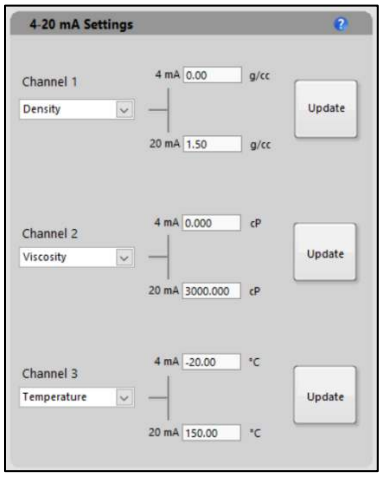
Rheonics Control Panel (RCP) is used to monitor and record viscosity, density and temperature. It also provides the tools to configure the sensor electronics and to manage the communication protocols available on Rheonics sensors.

By default, Channel 1 is configured as follows:

- **SRD**: density with a 4–20 mA range of 0 - 1.5 g/cc
- **SRV**: viscosity with a 4–20 mA range of 0 - 3,000 cP

These limits can be modified in RCP. Changing them also redefines the range of the primary variable, and the primary variable always follows Channel 1.

Figure 18. RCP - Density parameters in SME.



The SME-TRD includes a **HART LED** in the top-right corner of the display. The LED indicates communication status.

Figure 19: SME-TRD HART LED

LED State	Meaning
Always OFF	HART disabled
Always GREEN	HART enabled, idle state
Blinking GREEN	Bytes received; command not completed yet
Blinking RED	Bytes received; data corrupted
Always RED	Loop is open, no HART communication possible

Table 40. HART LED patterns

4 Sensor Status

All Rheonics sensors (SRV, SRD, DVP, and DVM) include an internal status function for inline viscosity and density monitoring. The sensor status is always available as the **fourth variable (QV).**

4.1 Sensor Error Status

The sensor status is represented as a **WORD** data type. Each bit corresponds to a specific error condition.

Bit	Hex	Name	Comment
0	0x0001	PLL frequency mismatch	The PLL frequency does not match the sensor frequency. Derived from the ASB string (E10)
1	0x0002	PLL not locked	The PLL is not locked. Derived from the ASB string (E01)
2	0x0004	PLL lock incorrect	The PLL has locked on a wrong frequency. Derived from the ASB string (E02)
3	0x0008	ASB communication error	Issues with sensor electronics
4	0x0010	Temperature sensor failed	The temperature sensor has failed. Derived from the ASB string if the temperature is -273.0
5	0x0020	Sensor too hot	If the temperature is above the hardcoded physical temperature limit.
6	0x0040	ASB communication error	Communication issue between two electronics board in the SME
7	0x0080	Serial Changed	
8	0x0100	Status not clean	Sensor is not clean (only SRV)
9	0x0200	Status in Air	Determines if sensor is in air
10-15	Unused		

Table 41. Sensor error status bit code and description.

4.2 How to read sensor status?

Sensor status is transmitted as a **WORD**. Individual bits can be checked to identify whether the sensor is operating correctly or has issues.

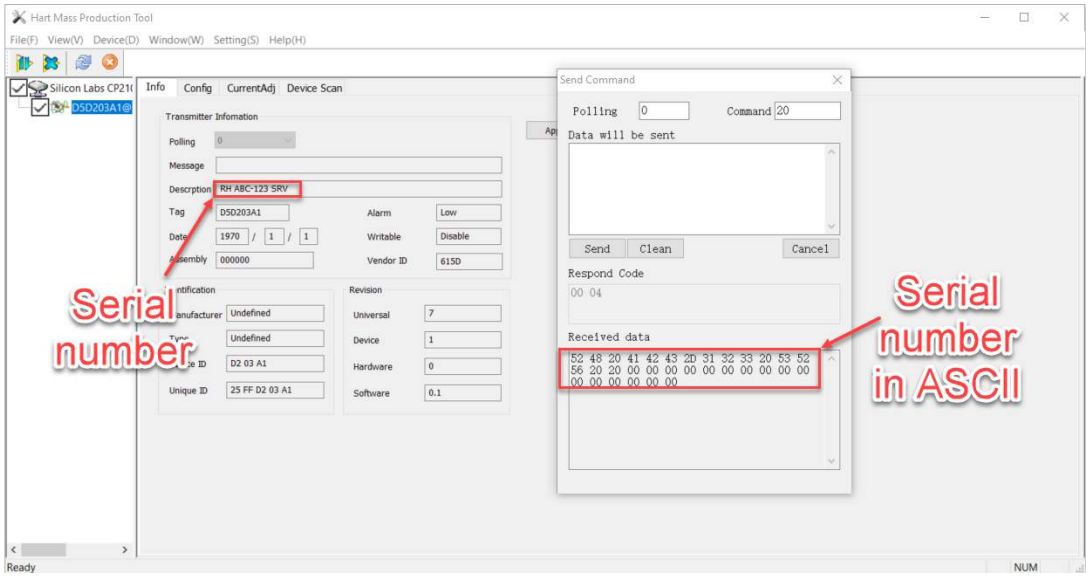
Figure 20. Sensor error status shown in the fourth variable (QV).

For example, **Figure 18** shows a decimal error code of **512**, which is equivalent to hex 0x200. This value corresponds to **Bit 9: Status in air**. In this case, the error indicates that the sensor is not immersed in fluid.

4.3 How to read sensor serial number and sensor type?

The Description message includes both the sensor serial number and the sensor type. This information is available through HART Command 20.

Figure 21. Sensor serial number and sensor Type



5 WirelessHART Communication

5.1 Overview

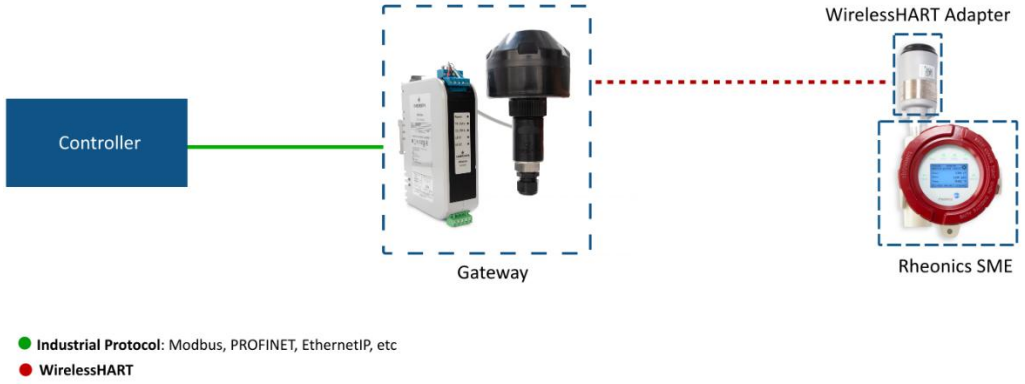
WirelessHART is a wireless extension of the HART protocol. It provides a self-organizing mesh network while maintaining full compatibility with HART variables and commands.

The SME acts as the HART field device, while an external WirelessHART adapter bridges the SME interface to the wireless network.

Key features:

1. Backward-compatible with standard HART commands **(PV, SV, TV, QV**).
2. Secure mesh networking (**Network ID**, **Join Key**).
3. Data aggregation through a WirelessHART Gateway, with output to Modbus TCP, EtherNet/IP, PROFINET, or OPC UA.

Figure 22. WirelessHART Setup



5.2 System Components

Component	Function	Example
SME	HART field device (PV, SV, TV, QV).	SRV, SRD, DVP, DVM.
WirelessHART Adapter	Bridges SME HART interface to mesh network.	e.g., Emerson 775 THUM™.
WirelessHART Gateway	Collects and publishes data to host system.	Vendor-specific.

Table 42. WirelessHART System Components

5.3 WirelessHART Adapter

When supplied by Rheonics, the WirelessHART adapter is delivered preconfigured with the correct Network ID and Join Key. No additional configuration is required.

Figure 23. Rheonics SME TRD with WirelessHART Adapter

If the adapter is ordered separately or needs reconfiguration, follow one of the methods below. The menus and options are the same regardless of the interface used. The following parameters must always be configured:

- Network settings
- HART device polling (communication with SME)
- Update rate (broadcast information)

There are several methods. This section covers two of them:

1. PACTware DC software: see Section 5.3.1.
2. Emerson Trex Device Communicator: see Section 5.3.2.

5.3.1 Configuration with PACTware

The Emerson 775 THUM™ WirelessHART adapter can be configured using PACTware DC software and a HART modem.

Prerequisites:

- PACTware installed on a Windows PC.
- HART modem connected to the PC and wired to the THUM™ adapter.
- Network ID and Join Key defined in the WirelessHART gateway.

5.3.1.1 Finding and Detecting the WirelessHART Adapter

1. Follow the steps described on Connection with PACTWARE DC software
2. Emerson 775 THUM™ Adapter address is 63.

5.3.1.2 Loading the Device DTM

1. Install the Device DTM from the manufacturer's website.

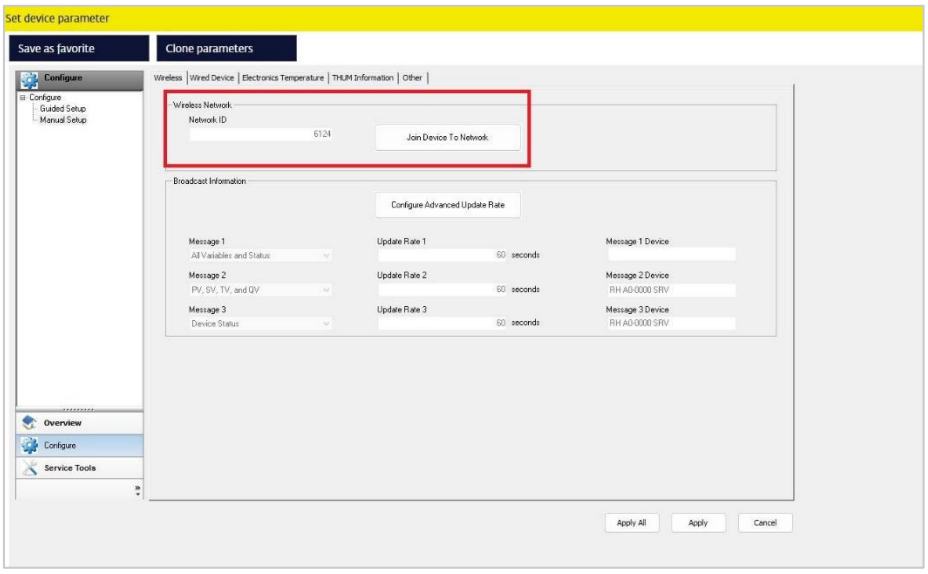
> **Note**
> Contact Rheonics Support if you encounter issues installing or loading the DTM.

2. When the THUM™ adapter is detected. Click on **Change DTM Address**
3. Select the Emerson 775 THUM™ Adapter DTM.
4. Once loaded, the adapter parameters will be accessible.

5.3.1.3 Configuring Network Settings

1. Navigate to **Manual Setup** → **Wireless** → **Join Device to Network**

Figure 24. PACTware – Join Device To Network



2. You will be prompted for **Network ID** and **Join Key**

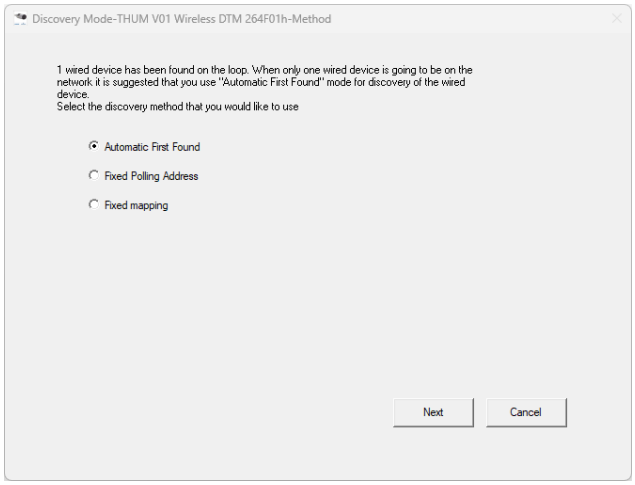
> **ATTENTION**
> Make sure the **Network ID** and **Join Key** are the same as the ones configured on the WirelessHART gateway

5.3.1.4 Setting Up HART Device Polling

5.3.1.4.1 Discovery Mode

1. Navigate to **Manual Setup → Wired Device**
2. Click on **Discovery Mode**
3. Select **Automatic first Found** (Recommended)

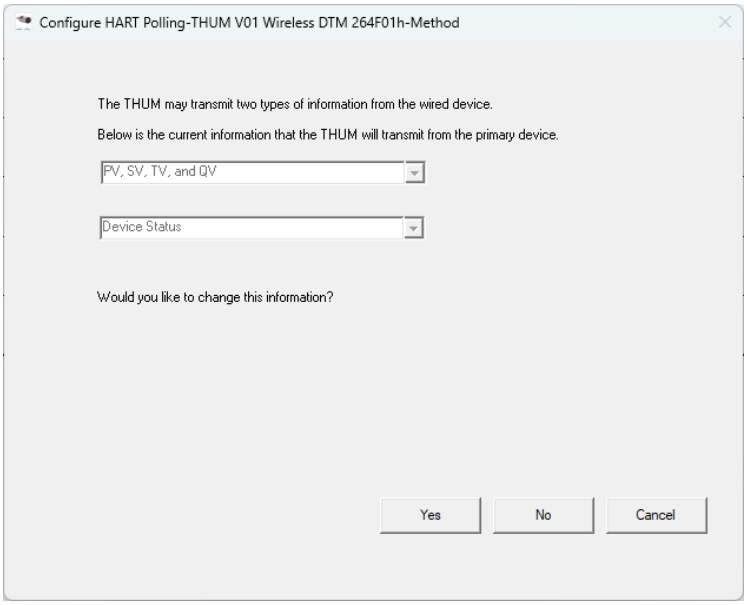
Figure 25. PACTware – Discovery Mode



5.3.1.4.2 HART Polling

1. Navigate to **Manual Setup → Wired Device**
2. Click on **Configure HART Polling**
3. Select **Command 3 (PV, SV, TV, QV)** and **Device Status**

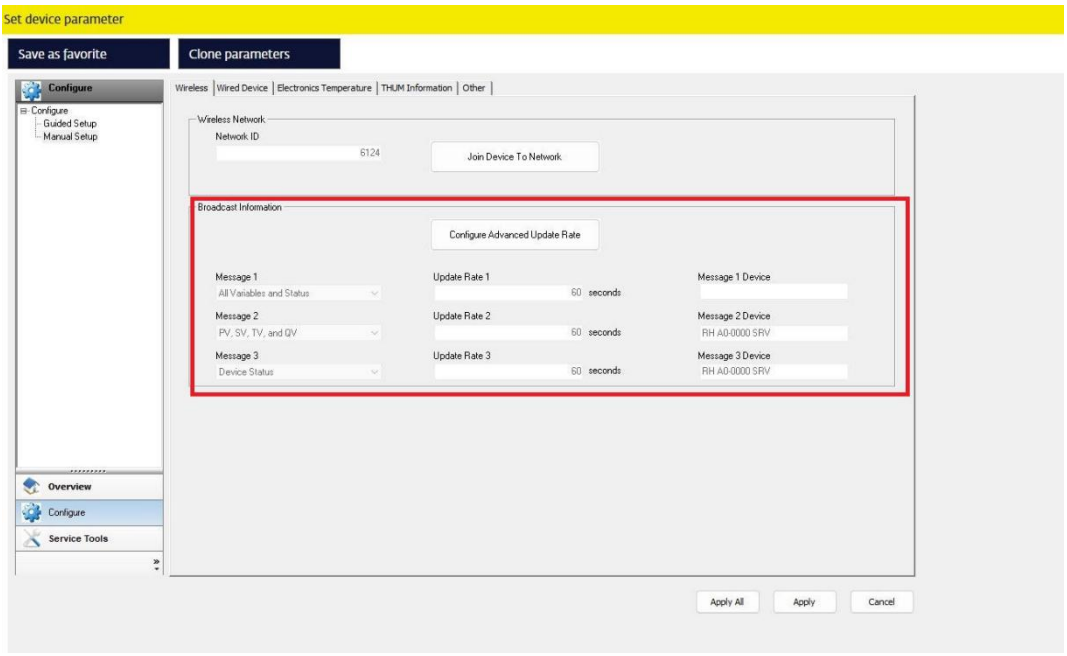
Figure 26. PACTware – Configure HART Polling



5.3.1.5 Configure Advanced Update Rate (Broadcast Information)

1. Navigate to **Manual Setup → Wireless**
2. Select **Configure Advanced Update Rate**
3. Select Assign update rates for each message.

Figure 27. PACTware – Configure Avanced Update Rate



5.3.2 Configuration with Field Communicator

The Emerson Trex Device Communicator can be used instead of PACTware to configure the THUM™ WirelessHART Adapter.

Prerequisites

- Trex communicator with latest device descriptors (DDs) for the Emerson 775 THUM™ Adapter.
- Wired HART connection from Trex to the loop containing the THUM Adapter.
- Network ID and Join Key available from the WirelessHART gateway.

Each menu option can be accessed using Fast Key combinations. The most commonly used menus are listed in Table 43. For the complete HART menu tree, see Appendix D: HART Menu Tree.

ATTENTION

The settings provided in this manual are recommendations. Users can adjust the configuration to best fit their specific application requirements.

5.3.2.1 Fast Keys Reference

Action	Fast Keys
Join device to network (Guided Setup)	2,1,1
Join device to network (Wireless Setup)	1,4
Discovery Mode	2,2,2,3
Configure HART Polling	2,2,2,4
Configure Advanced Update Rate	2,2,1,3

Table 43. Fast Keys Reference

5.3.2.2 Join Device to Wireless Network

1. On the Field Communicator, go to **Guided Setup** or **Wireless Setup**:
    a. Guided Setup: press keys **2,1,1**.
    b. Wireless Setup: press keys **1,4**.
2. Enter the **Network ID** and **Join Key**.

5.3.2.3 Configure HART Device Polling

5.3.2.3.1 Discovery Mode

1. Go to **Discovery Mode Menu**:
    a. Press fast keys **2,2,2,3**
2. Select **Automatic First Found.**

5.3.2.3.2 HART Polling

1. Go to **Configure HART Polling**:
    a. Press fast keys **2,2,2,4**
2. Choose Command 3 (PV, SV, TV, QV) and Device Status.

5.3.2.4 Configure Advanced Update Rate

1. Go to Configure Advanced Update Rate:
    a. Press keys **2,2,1,3.**
2. Set the update rates for each message.

> **Note**
> Only one update rate can be set to the minimum value of 8 seconds.

6 Troubleshooting

6.1 Common Issues and Checks

Issue	Possible cause / check
No device found	1. Verify all connections and check for open circuits, shorts, or faulty wiring. 2. Confirm that the loop resistance is at least **250 Ω** (maximum 720 Ω). 3. Check the polling address and confirm that there are no duplicate addresses.
Erratic readings	1. Verify that the SME is properly grounded. 2. Check for external electrical interference.
Power issues	1. Verify that the correct power levels are applied to the transmitter. 2. Verify wiring integrity. 3. Check the voltage drop.

Table 44. Troubleshooting Guide

6.2 Support Resources

Resource	Link / Contact	QRCode
HART Troubleshooting Guide	support.rheonics.com/hart-troubleshooting	
Rheonics Support Desk	**Email**: support@rheonics.com **Portal**: support.rheonics.com	
Rheonics Support Home	support.rheonics.com/home	

Table 45. Support Resources.

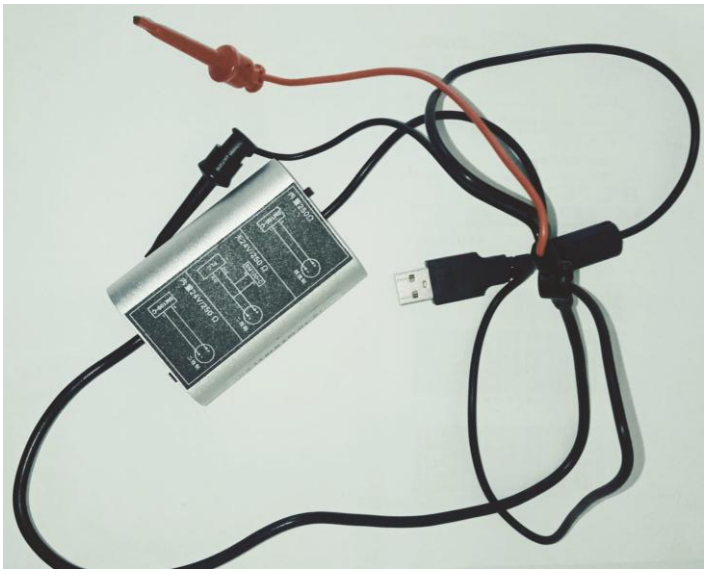
7 Appendix A: HART Modem

The SM100-C is a HART intelligent communicator designed by Jiaxing Songmao. It complies with industrial standards and communicates with HART instruments from various manufacturers such as Rosemount, Endress+Hauser, Siemens, Yokogawa, and others.

The device features an integrated, portable design and supports USB interface and serial bus power supply.

Note
Website: http://www.hart-rs232.com/

Figure 28. SM100-C HART Modem.



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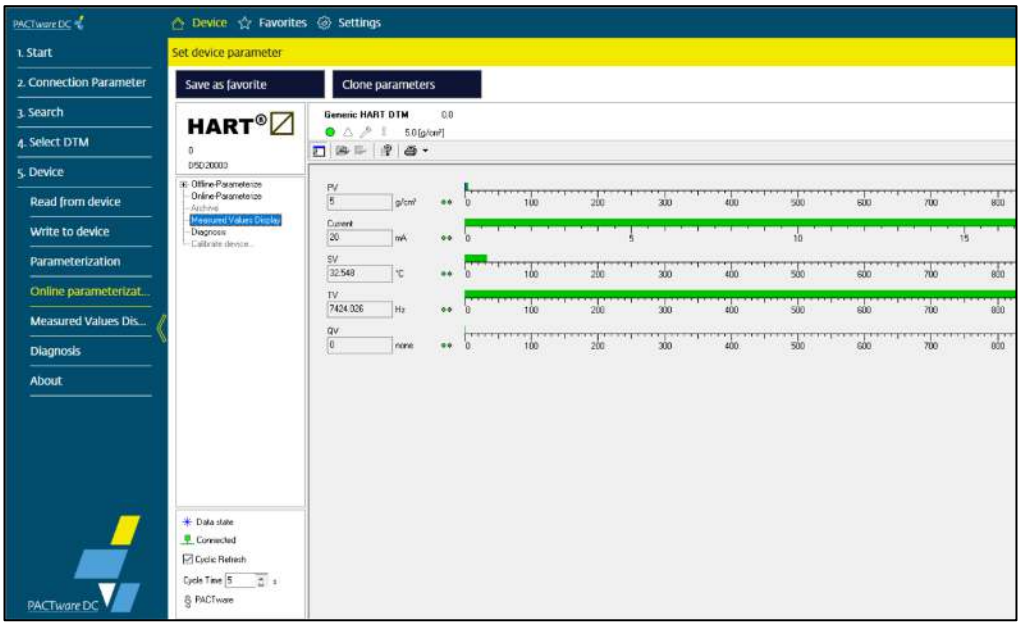
8 Appendix B: PACTWARE DC

PACTware is a manufacturer and Fieldbus-independent operating software used to configure and operate a wide range of field devices and protocols. Each PACTware installation can operate all HART devices. The setup package includes a communication driver for common HART modems and a generic HART device DTM.

- **Website:** pactware.com
- **Licensing:** PACTware is freely available for download. However, only member companies of the PACTware consortium are authorized to host PACTware for download on their websites.

Figure 29. PACTWare



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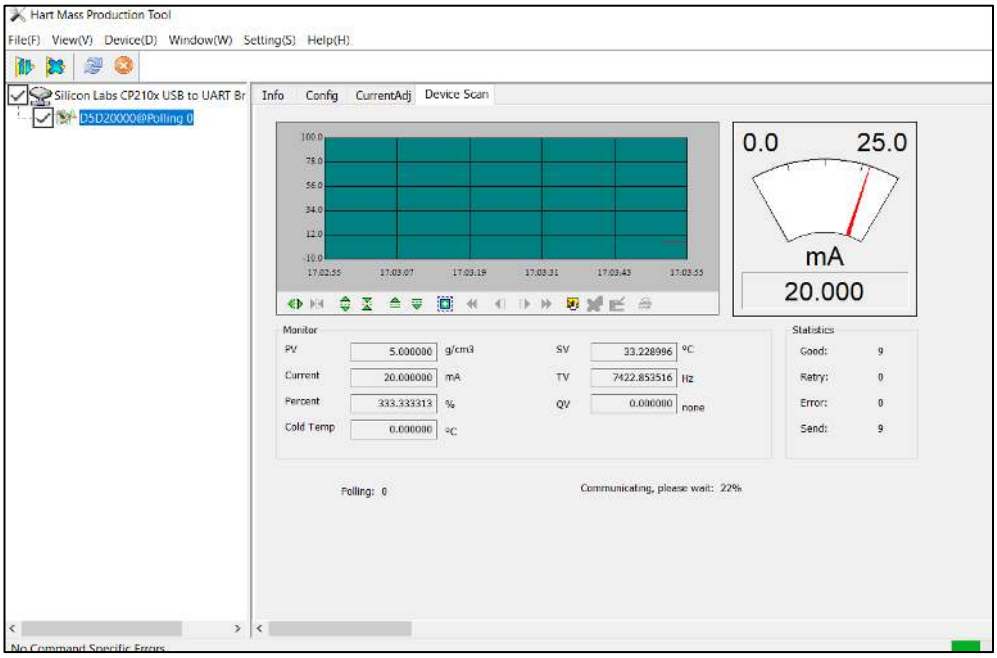
9 Appendix C: HARTmpt

HARTmpt is a configuration and universal software tool for HART devices. It incorporates standard HART universal commands and allows users to send custom commands as needed.

- **Website:** microcyber.cn
- **Licensing:** HARTmpt can be downloaded from the Microcyber *Download Center* under the name **HART PC Configuration Tool**.

Figure 30. HARTmpt



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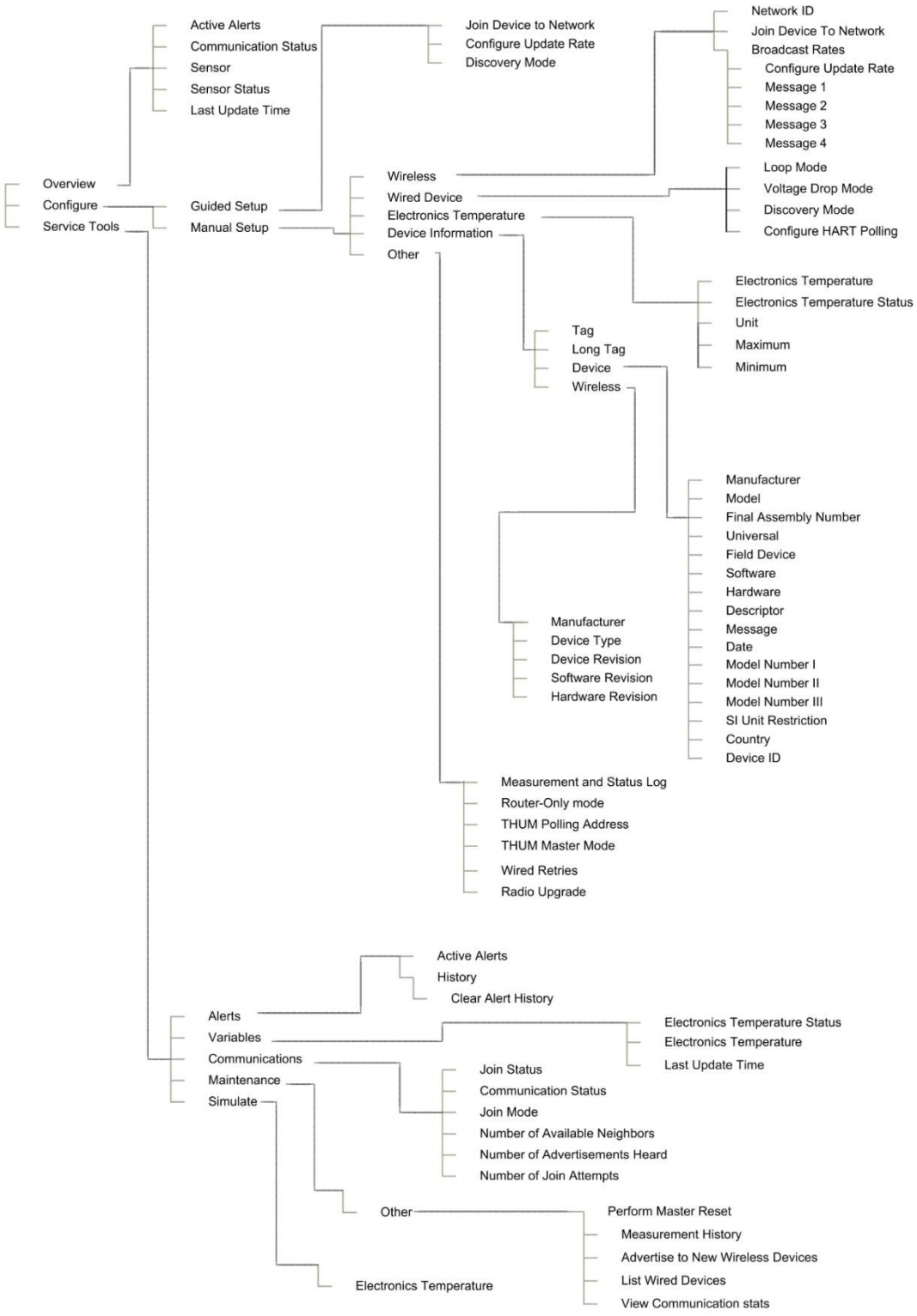
10 Appendix D: HART Menu Tree



11 List of Tables

12 List of Figures

13 Revision and Approvals

Version	Nature of changes	Approval	Doc. Id	FW version	Date
1	Original.	C.A	HART-OP-2022	3.30/15	06.02.2024
1.1	Template Update		HART-OP-2509		29.09.2025
1.1	Added Caption to Figures and Tables		HART-OP-2509		29.09.2025
1.1	Added WirelessHART communication chapter		HART-OP-2509		29.09.2025

For more information: https://support.rheonics.com/en/support/home

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