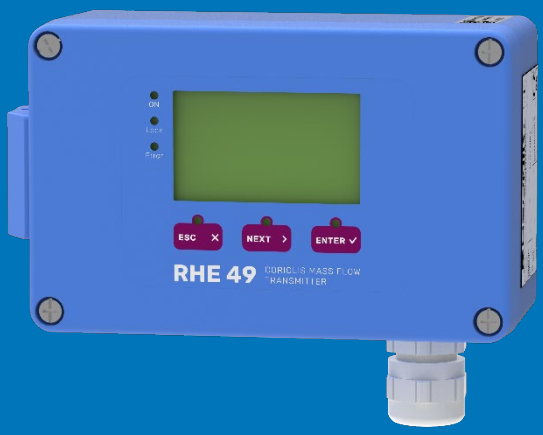
RHEONIK.



RHE49
User Manual

GET FLOW MEASURED

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RHE 49
Transmitter

User Manual

RHEONIK.

Foreword

This installation guide contains important information regarding how to install, start up, and safely operate the RHE49 Coriolis transmitter as intended together with an RHM Coriolis sensor. It supplements the information provided in the RHE40 Desktop Reference. The RHE40 Desktop Reference and further Information are available to download from the Rheonik Messtechnik GmbH website: ➦ https://www.rheonik.com.

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Disclaimer

Rheonik Messtechnik GmbH accepts no liability for personal injury, damage to property or accidents caused by the following:

- Failure to observe the installation guide
- Failure to observe the safety regulations
- Using the RHE49 Coriolis transmitter in an impermissible manner

Liability

Claims for compensation against Rheonik Messtechnik GmbH arising due to a breach of pre-contractual or contractual obligations or tortious acts shall exist only in the case of intent or gross negligence on the part of the seller, their representatives or vicarious agents.

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Other applicable documents

The following documents contain additional information regarding how to operate the RHE49 Coriolis transmitter:

- RHE40 Desktop Reference (operation manual)
- RHEComPro Tutorial (tutorial)
- RHE20 & RHE40 Transmitter Series HMI Tutorial (tutorial)
- RHE20/40 Addendum PID Control (operation manual)
- RHE40 Addendum Data Logging (operation manual)
- RHE40 Addendum Precision Flow Analysis (operation manual)
- RHE40 Addendum Statistics (operation manual)
- RHM Coriolis sensor (operation manual)

The documents are available to download from the Rheonik Messtechnik GmbH website: ➦ https://www.rheonik.com.

Table of Contents

1 About this manual

1.1 General information

This installation guide contains important information regarding how to install, start up, and safely operate the RHE49 Coriolis transmitter as intended. Carefully read the information in this installation guide before starting any work with or on the RHE49 Coriolis transmitter, and make sure you have understood everything.

1.2 Target group

This installation guide is aimed at operating personnel and at anyone who has been tasked with the installation and start-up work by the operating personnel.

1.3 Storage

This installation guide is an essential part of the RHE49 Coriolis transmitter and must be stored such that it always remains accessible to personnel.

1.4 Declaration of conformity

The versions of the RHE49 Coriolis transmitter described in this user manual comply with the applicable standards and guidelines/directives.

1.5 Symbols used in this manual

In this manual, sections containing particularly important information are identified in line with the type of information they contain, e.g. instructions, lists or references.

Symbol	Meaning
1. →	Instruction; step in a process
⇒	Result; outcome of a step
■	Lists of entries in no particular order
➦	References to figures, sections etc.
ⓘ	Additional information

2 Safety

To ensure that the RHE49 Coriolis transmitter is operated safely and as intended, it is essential to familiarize yourself with the basic safety instructions and safety regulations. It is also essential to comply with the rules and regulations on accident prevention that apply at the installation location.

This installation guide contains important information regarding how to safely operate the RHE49 Coriolis transmitter as intended. Carefully read the information in this installation guide before starting any work with or on the RHE49 Coriolis transmitter, and make sure you have understood everything.

2.1 How warnings are structured and what they mean

When performing different types of work either with the or on the RHE49 Coriolis transmitter, the personnel carry out steps that could entail hazards. These steps are therefore preceded by a warning.

Warnings are always structured as follows:

- Warning symbol 
- Signal word:
  - DANGER: high risk of death or serious injury if not prevented
  - WARNING: moderate risk of death or serious injury if not prevented
  - CAUTION: low risk of death or serious injury if not prevented
  - ATTENTION: risk of damage to property if information is not observed
- Description of the type of hazard and how it arises
- Description of the potential consequences of disregarding the hazard
- Description of measures for preventing the hazard

2.2 Safety and associated safety measures

DANGER

Risk to life if the information in this installation guide is not observed!

If the information in this installation guide is not observed, this will result in serious injury or death.

- Read and observe the information in this installation guide before working either with the or on the RHE49 Coriolis transmitter.

- Take the safety instructions and warnings seriously and follow the measures for preventing the hazard.
- Work carefully to prevent accidents resulting in personal injury or damage to property.
- Keep the installation guide safe and make it available to anyone working either with the or on the RHE49 Coriolis transmitter.

Modifications, attachments and conversions

Any modifications to or attachments and conversions on the RHE49 Coriolis transmitter may make the safety devices less effective or entirely ineffective, resulting in unforeseeable hazards.

WARNING / ATTENTION

Do not carry out any technical modifications or extensions on the RHE49 Coriolis transmitter.

Risk of injury from slipping, tripping or falling when carrying out installation work

There is a risk of serious injury from slipping on or tripping over electrical cables, supply lines, and tools that are lying around.

CAUTION / ATTENTION

Make sure that nobody could trip over or fall because of the electrical cables when carrying out installation work.
Route electrical cables and supply lines such that nobody could slip on or trip over them and fall.

2.3 Personnel qualifications

WARNING / ATTENTION

Damage to property due to inadequately qualified personnel.
All electrical work must only be performed by people who have in-depth expertise in electrical engineering (e.g. qualified electricians). These individuals must provide evidence that they have the requisite expertise for performing work on electrical systems and the associated components (e.g. by having passed an examination) and have been trained on the specific product(s) in question.
Mechanical work must only be performed by appropriately qualified and trained personnel.

Task	Party responsible	Qualification
Installation	Operating personnel	Mechanic
Work on electrical system	Operating personnel	Electrician
Start-up, Configuration	Operating personnel	Engineer
Dismantling work	Operating personnel	Mechanic, Electrician
Disposal	Waste disposal company	Waste specialist

3 Intended use

Rheonik Coriolis mass flow measuring instruments consisting of a sensor (RHM), a transmitter (RHE), and in some cases, an interconnecting cable, are intended for measuring liquids and gases.

The operator must ensure that the instrument is only used in a way that complies with limitations and certifications listed on the instrument type plates. These limitations/certifications include, but are not limited to:

- Pressure and temperature ranges
- Approval limits (e.g., explosion protection, pressure equipment directive)
- Suitability of the materials of construction in contact with the process

The instrument must be installed, operated, and maintained in accordance with the manufacturer's instructions and guidelines.

The instrument must not be modified or altered in any way that has not been approved by the manufacturer or certification body.

Regular inspections and preventive maintenance should be carried out to ensure ongoing safety and performance.

Use not in accordance with the intended purpose may impair and/or endanger safety.

3.1 Intended use of RHE49

The RHE49 Coriolis transmitter outputs the measured values for RHM Coriolis sensors. It can output the mass flow of liquids and gases as well as the medium density and medium temperature. In addition, the RHE49 Coriolis transmitter is able to calculate variables such as the volume.

Only install and operate the RHE49 Coriolis transmitter in locations with the following ambient conditions:

- Ambient temperature -40 to +65 °C
- Relative humidity of 0 to 95% (non-condensing)

- In shade, not exposed to direct sunlight
- In non-hazardous areas or in Zone 2, respectively in class 1 div 2 if approved accordingly (see type plate)

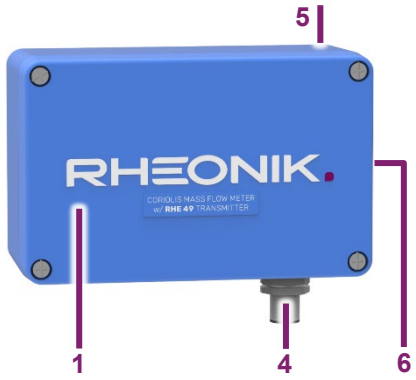
3.2 Impermissible use

The following are examples of impermissible use of the RHE49 Coriolis transmitter (i.e. use contrary to its intended use):

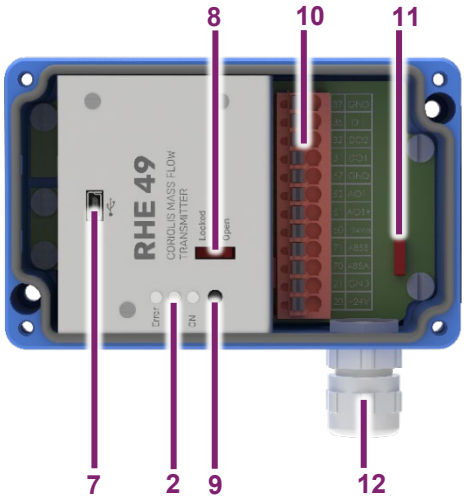
- Using the RHE49 Coriolis transmitter in locations other than those specified above.
- Using the device in life-support systems in the medical, motor vehicle, aircraft, watercraft, or mining industries.

4 Product description

RHE49-C1 (Aluminium enclosure)



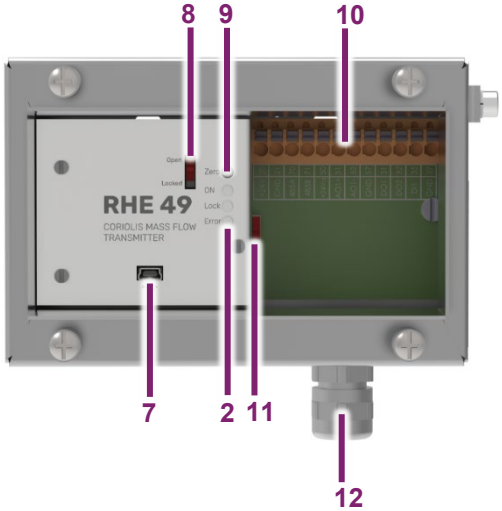
RHE49 Interior view of aluminum enclosure



RHE49-CD (Aluminium enclosure with display)

RHE49-S1 (Stainless steel enclosure)

RHE49 Interior view of stainless steel enclosure

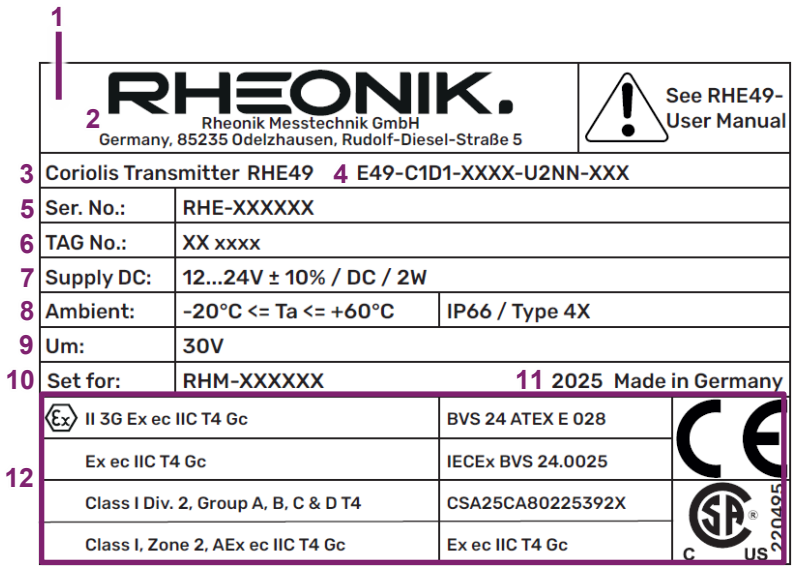


1 RHE49 Coriolis transmitter
2 Status LEDs
3 Display (optional)
4 M12 connector (optional)
5 QR code (download documentation)
6 Type label
7 Mini-USB port
8 Hardware lock switch (functionality optional)
9 Zero point calibration button
10 Terminals for power supply, inputs, outputs and interfaces
11 RS485 termination resistor switch
12 Cable gland

LED Status Indicator

LED	State	Meaning
Green	Off	RHE transmitter is not ready. The device is either initializing after a system reset, has no power, or is defective.
	On	RHE transmitter in operation.
	Flashing	Firmware update running. Do not disconnect power.
Yellow	Off	Hardware lock switch (Custody Transfer Lock) inactive.
	On	Hardware lock switch (Custody Transfer Lock) active.
	Flashing	When the yellow and the red LEDs flash together the Zeroing Process is in progress.
Red	Off	No errors are present and the instrument is operating as intended.
	On	There is at least one error being reported by the instrument. Details of the exact error(s) can be obtained by reading the error status screens Soft Error Stat and Error Status.
	Flashing	When the yellow and the red LEDs flash together, the Zeroing Process is in progress.

Type label



1 Type label
2 Manufacturer
3 Transmitter type
4 Order code
5 Serial number
6 TAG number
7 Permissible power supply
8 Permissible ambient temperature and protection class
9 Permissible maximum voltage
10 Serial number of corresponding RHM Coriolis sensor
11 Year of manufacture
12 Conformity mark, hazardous area classification and certification details

5 Transportation, storage and check of delivery

Transportation

Always transport the RHE49 Coriolis transmitter in its original packaging.

Storage

Store the RHE49 Coriolis transmitter under the following conditions until it is installed:

- In the original packaging
- Dust-free, dry and not exposed to direct sunlight
- Storage temperature of -40 to +65°C

Check of delivery

1. → Check the packaging of the RHE49 Coriolis transmitter for any damage.
   ⓘ If the packaging is damaged, immediately inform the freight forwarder and your local sales/support representative.
2. → Check the contents to make sure all the items you ordered are present.
3. → Check whether the model code on the type label matches the model code on the order.
4. → If the device comes with protective caps fitted, only remove these just before you start the installation work.
5. → Keep the packaging safe in case you need to ship the device at a later date.

6 Installing the RHE49 Coriolis transmitter

6.1 Mechanical installation

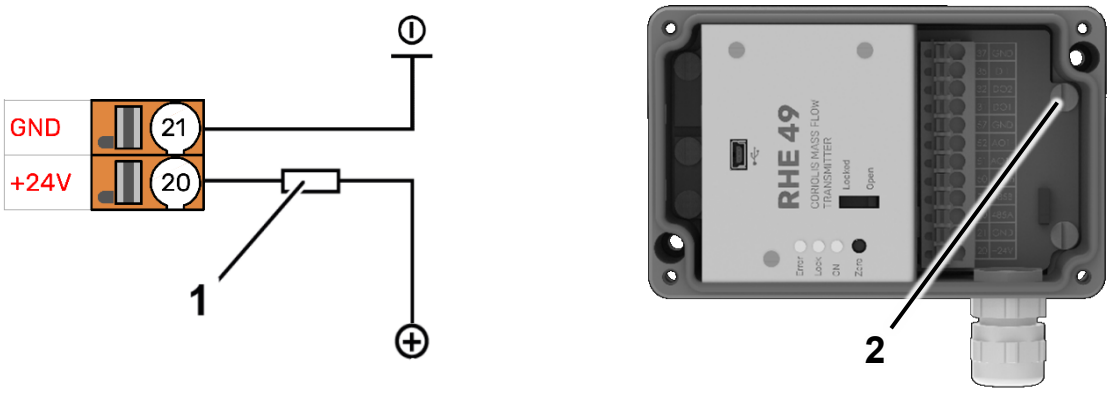
The RHE49 Coriolis transmitter is permanently mounted on the RHM flow sensor and does not need to be mounted separately.

Please refer to the RHM manual for the mechanical installation.

6.2 Electrical installation

6.2.1 Connecting the power supply

The RHE49 Coriolis transmitter requires a regulated DC power supply of 12 to 24V ±10%. The power consumption is max. 4W.

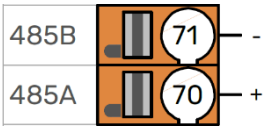


1	Fuse (suitable for the cable being used, max. 10 A)
2	Connection for PE / cable shield
20	+24 V connection
21	Ground connection

1. → Connect the positive DC power connection of the power supply to the +24V connection (20) and protect it with a fuse (1).
2. → Connect the negative DC power connection of the power supply to the ground connection (21).
3. → Connect the protective conductor to the corresponding junction point (2).

6.2.2 Connecting the RS485 interface

The RS485 interface is used for digital communications, for remote control purposes, and to exchange data. It uses the Modbus RTU protocol to establish a permanent connection to a monitoring control system.



RS485 / Modbus RTU

70	RS485 A / + / Rx+&Tx+ terminal
71	RS485 B / - / Rx-&Tx- terminal

1. → Connect the RS485 A / + / Rx+&Tx+ line of the local display / PLC to terminal 70.

2. → Connect the RS485 B / - / Rx-&Tx- line of the local display / PLC line to terminal 71.

The communication settings of the RS485 interface can be read and changed at the local display (➦ section 7) or the RHEComPro software (➦ section 8).

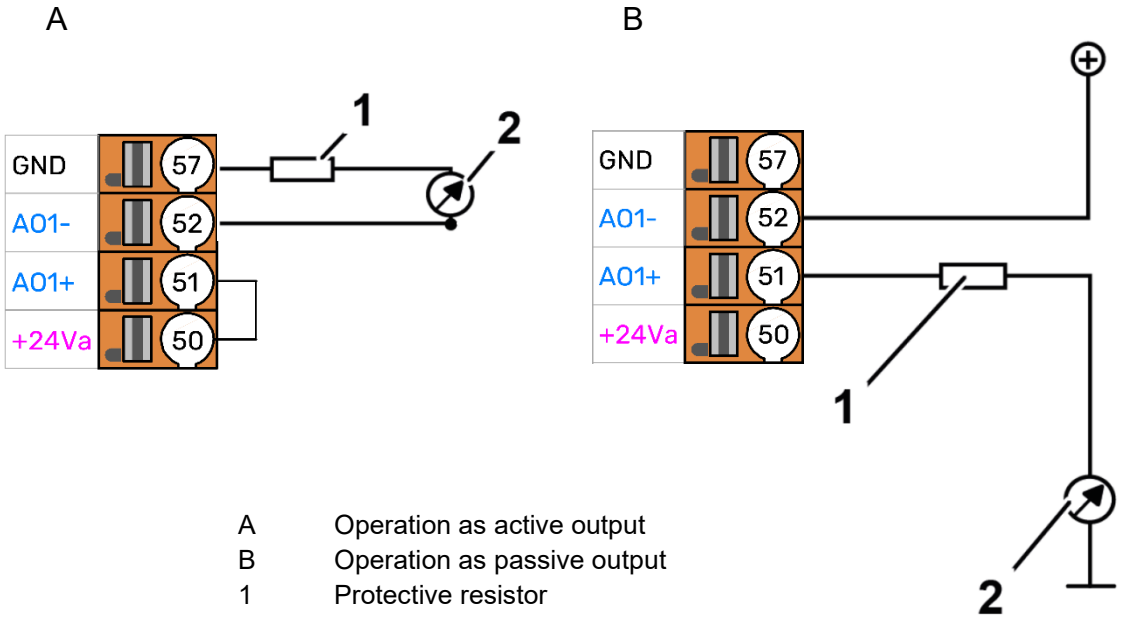
6.2.3 Connecting the Modbus TCP / EtherNet/IP / Profinet interface

The Modbus TCP / EtherNet/IP / Profinet interface is used for digital communications, for remote control purposes, and to exchange data.

For the wiring of the Modbus TCP / EtherNet/IP / Profinet interface, please refer to the wiring diagram (➦ Appendix A or QR code on the enclosure of the RHE49).

Once the RHE49 Coriolis transmitter has been connected, it is assigned an IP address, which is required to connect the RHE49 Coriolis transmitter with your own network. The IP address can be read out using the local display (➦ section 7) or the RHEComPro software (➦ section 8).

6.2.4 Connecting the analog output (optional)



A	Operation as active output
B	Operation as passive output
1	Protective resistor
2	Local display / PLC
50	Connection for +24V (output for active wiring of the analog outputs)
51	Connection for passive analog output 1 (+)
52	Connection for passive analog output 1 (-)
57	Ground connection (analog outputs)

Active output configuration (A)

1. → Connect the connection for passive analog output 1 (+) (51) to the +24 V connection (50).
2. → Connect the analog current input (4 - 20 mA) of the local display / PLC (2) to the connection for passive analog output 1 (-) (52).

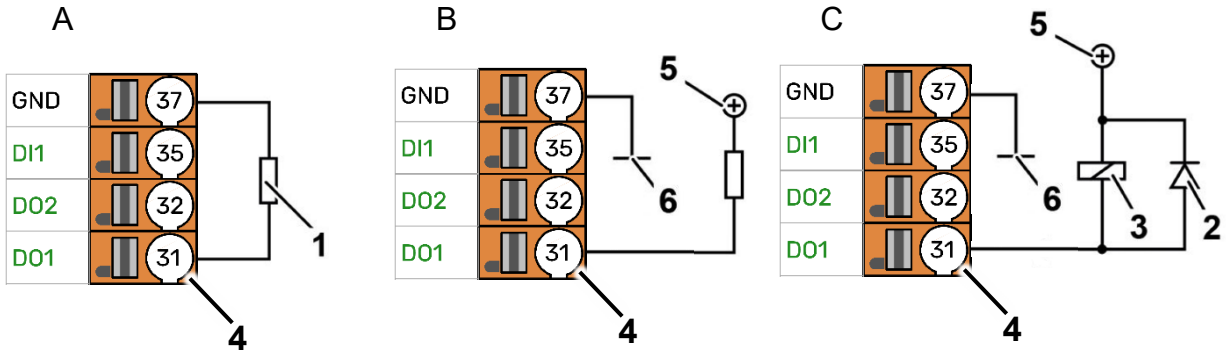
   ⓘ If you are using a 24V DC power supply, we recommend inserting a 510Ω protective resistor upstream of the local display / PLC.
3. → Connect the ground of your local display / PLC (2) to the ground connection (57).

Passive output configuration (B)

1. → Connect a suitable power supply (max. 24V DC) to the connection for passive analog output 1 (+) (51).
2. → Connect the analog current input (4 - 20 mA) of the local display / PLC (2) to the connection for passive analog output 1 (-) (52).

   ⓘ If you are using a 24V DC power supply, we recommend inserting a 510Ω protective resistor upstream of the local display / PLC.
3. → Connect the ground of your local display / PLC (2) to the ground connection of the external power source.

6.2.5 Connecting the digital outputs



A	Load to ground (I_{max} 20mA)
B	Load to +24V (I_{max} 100mA)
C	Relay to +24V (I_{max} 100mA)
1	Load
2	Free-wheeling diode for relay (essential)
3	Relay
4	Connection terminal
5	+24V DC power supply
6	Ground
31	Connection for active digital output 1
32	Connection for active digital output 2
37	Ground connection (digital inputs and outputs)

Load to ground (A)

1. → Connect the input of the connected load (1) to the connection for active digital output 1 (31).

2. → Connect the output of the load (1) to the ground connection (37).

Load to +24V (B)

1. → Connect the negative connection of the load (1) to the connection for active digital output 1 (31).

2. → Connect the +24V power supply (5) to the positive connection of the load (1).

3. → Connect the ground (6) of the external power source to the ground connection (37) (only if you are using an external +24V power supply (5)).

ⓘ If the power supply is being provided via the RHE49 Coriolis transmitter, do not connect the ground connection.

Relay to +24V (C)

1. → Connect the negative connection of the relay (3) to the connection for active digital output 1 (31).

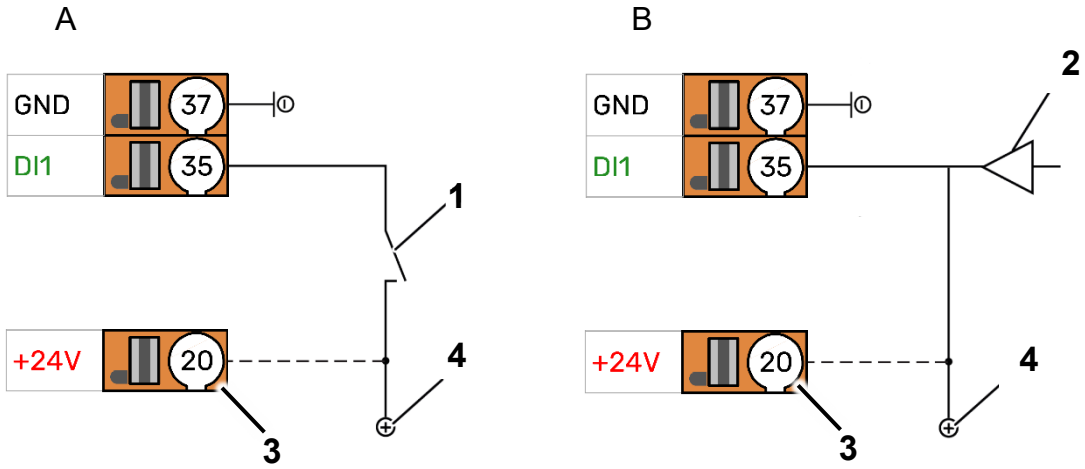
2. → Connect the +24V power supply (5) to the positive connection of the relay (3).

3. → Connect the load circuit of the relay (3) to the load that needs to be switched.

4. → Connect the ground (6) of the external power source to the ground connection (37) (only if you are using an external +24V power supply (5)).

ⓘ If the power supply is being provided via the RHE49 Coriolis transmitter, do not connect the ground connection.

6.2.6 Connecting the digital input



A	Connection for switch
B	Connection for driver
1	Switch
2	Driver
3	Connection terminal
4	+24V power supply
20	+24V connection
35	Connection for passive digital input 1
37	Ground connection (digital inputs and outputs)

Connection for switch (A)

1. → Connect a suitable +24V power supply (4) to the connection for passive digital input 1 (35).
2. → Connect the ground of the external +24V power supply (4) to the ground connection (37) (only if you are using an external +24V power supply (4)).

ⓘ If the power supply is being provided via the RHE49 Coriolis transmitter, do not connect the ground connection.

Connection for driver (B)

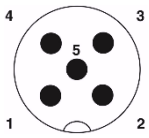
1. → Connect the output of your driver (2) to the connection for passive digital input 1 (35).
2. → Connect the ground for the driver (2) to the connection for ground (37) if the ground of the driver (2) and the ground of RHE49 Coriolis transmitter are not connected via the power supply.

ⓘ If the power supply is being provided via the RHE49 Coriolis transmitter, do not connect the ground connection.

6.2.7 Electrical connection via the M12 connector

As an alternative to the electrical connection via terminals, an external 5-pin M12 connector is optionally available instead of the cable gland. The configurations of the M12 connection are as follows:

M12 Connector



Pin	Connection type for RHE49 part number			Wire color of available accessory cable
	RHE49-**D1-**B1-****-BMN	RHE49-**D1-**H1-****-AMN	RHE49-**D1-**H1-****-HMN	
1	+24V DC power supply		+24V DC power supply	Brown
2	RS485+ interface		AO1 analog output 1, HART (active)	White
3	GND common ground		GND common ground	Blue
4	RS485- interface		DO1 digital output 1	Black
5	DO1 digital output 1	AO1 analog output 1, HART (active)	DI1 digital input	Gray

7 Start-up, Display Operation, Configuration and Maintenance

7.1 Initial Start-up

1. → Switch on the power supply.

   Once the device has run through a start-up sequence, the green status LED lights up and the display (optional) for the flow measurement appears.

   ⓘ If an error has occurred, the backlight will light up red.
   For detailed information on the error messages see ➦ section 9

2. → Calibrate the zero point, ➦ section 7.3.

3. → Configure required inputs, outputs and interfaces, ➦ section 7.5.

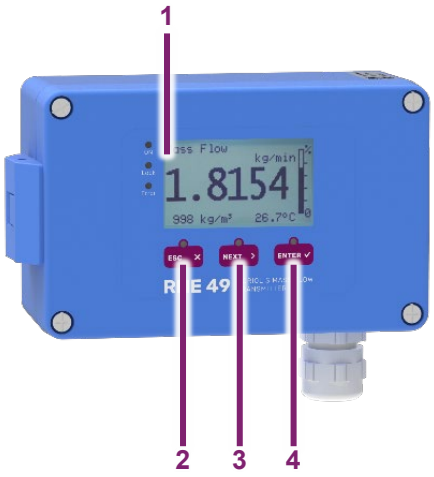
   ⓘ There are 5 ways to read out the data and configure the RHE49 Coriolis transmitter:

   - Use the local display on the front of the RHE49 Coriolis transmitter (optional). The data you enter will be shown on the color LCD display, ➦ section 7.2.
   - Use the RHEComPro PC software via the USB, RS 485 serial interface or Ethernet, ➦ section 8.
   - Use Modbus commands via the RS 485 serial interface or Ethernet, ➦ RHE40 Desktop Reference.
   - Use the HART interface AO1, ➦ RHE40 HART Manual.
   - Use the Profinet interface (restricted configuration), ➦ RHE40 Desktop Reference.

7.2 Display Operation

7.2.1 Function of the display buttons on the RHE49 Coriolis transmitter

There are three buttons for operating the RHE49 Coriolis transmitter, which are identified with “ESC”, “NEXT” and “ENTER”. The functions that these buttons control depend on what is currently being displayed.



1 Display (optional)
2 “ESC” button
3 “NEXT” button
4 “ENTER” button

Task	Button	Description
Select menu	ESC	Navigates to the menu one level higher.
	NEXT	Selects the next menu item.
	ENTER	Moves down one level in the menu or opens an input window.
Undo	ESC	Exits the input window and returns to the previous menu without saving your changes.
Enter numbers	NEXT	Increments the numerical value at the cursor position by one. Upon reaching 9, the numerical value jumps back to 0 (decimal numbers). Upon reaching F, the numerical value jumps back to 0 (hexa-decimal numbers) (used for the service password). ⓘ If you enter a numerical value that is outside the permissible range for the parameters, the input window will reverse the colours (light to dark instead of dark to light). If you want to change this numerical value, press the ENTER button after the final digit. The cursor will jump back to the left-hand position so that you can edit your entry again.
Change prefix	NEXT	Changes **+** to **-** and vice versa. If you enter a number with a prefix, the cursor will start at the first character to the right of the prefix. To change the prefix, press the ENTER button until the entire display starts flashing. You can now change the prefix by pressing the NEXT button.
Change position of decimal separator	NEXT	Moves the decimal separator and the cursor position one digit to the right.

Task	Button	Description
Repeat entry	NEXT	If you press the ENTER button on the right in an input window, the number will flash. If you press the NEXT button whilst the entry is flashing, the cursor will return to the start of the input window.
Continue after entering data	ENTER	Moves the cursor in an input window one character to the right.
End entry of numbers	ENTER	If the cursor is at the far right of the input window and you then press the ENTER button, the entire input window will flash. Pressing the ENTER button again will apply the modified number and the display will return to the previous menu.
Status information –bit status displays	ENTER	Increase the index of the individual bits in the status values. Repeatedly pressing the ENTER button in the “Error Status”, “Soft Error Status” or “Warnings” displays enables each individual bit value and its status description to be displayed and read out.

7.2.2 Password entry

You will need to enter a password before being able to configure and execute certain features on the display of the RHE49 Coriolis transmitter. The password protects the configuration and prevents it being changed accidentally.

There are two access levels with different passwords:

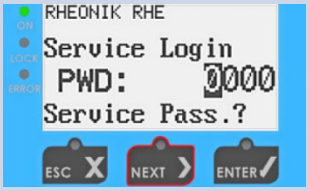
- User Login
- Service Login

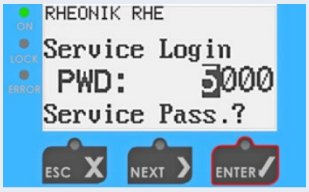
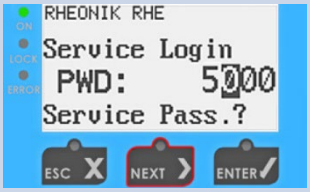
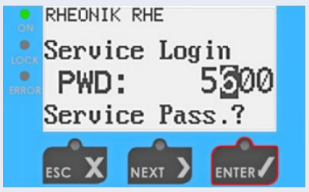
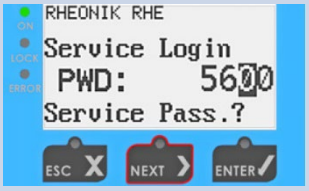
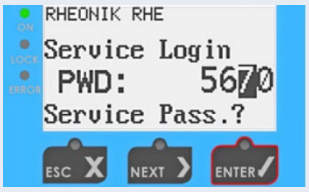
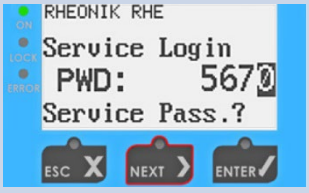
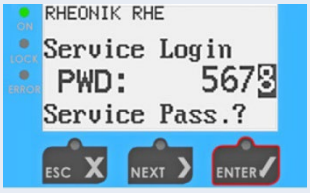
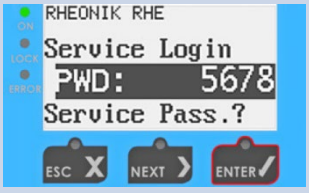
The User Login enables the user to access the features that relate to the day-to-day use of the RHE49 Coriolis transmitter, e.g. calibrating the zero point and resetting the totaliser.

The Service Login enables the user to configure the RHE49 Coriolis transmitter and adjust settings (e.g. relating to I/O).

The display will prompt the user to enter the password.

User password	1111
Service password	5678

Display shows	Steps to take	Description
	Press the NEXT button 5 times.	The number of actions performed depends on the character being selected.

	Press the ENTER button once.	The entry is confirmed.
	Press the NEXT button 6 times.	
	Press the ENTER button once	
	Press the NEXT button 7 times.	
	Press the ENTER button once	
	Press the NEXT button 8 times.	
	Press the ENTER button once	The entry of the last character is confirmed.
	Press the ENTER button once	The entry of the entire code is confirmed.

7.3 Zero point calibration

Calibrating the zero point ensures that the measurements are accurate within the permissible tolerance.

1. → Fill the RHM Coriolis sensor completely with the measuring liquid and make sure that there are no gas bubbles (liquid application) or liquid residues (gas application) in the sensor.

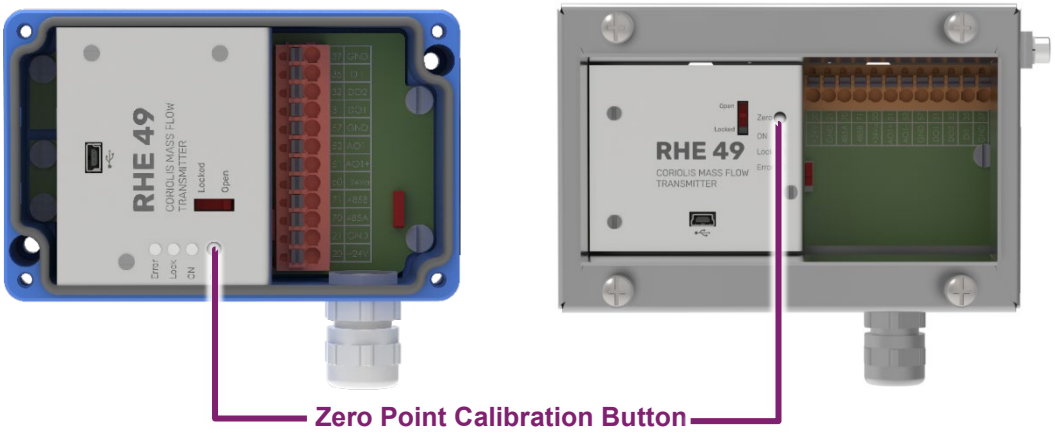
2. → Flush the sensor until the typical process temperature is reached at the sensor.

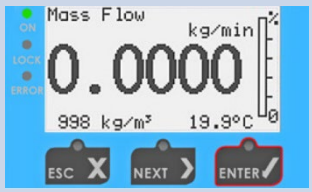
3. → Perform the zero calibration, remind the following points:

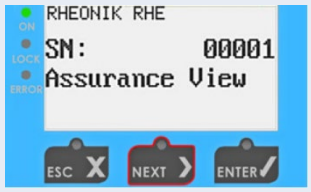
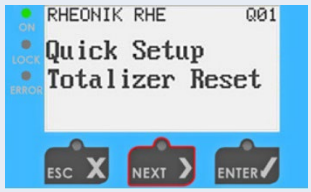
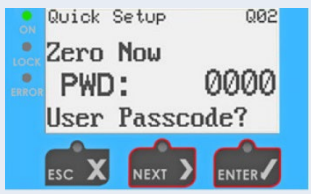
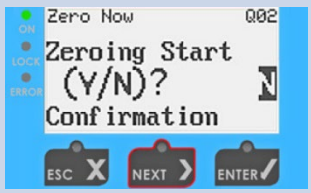
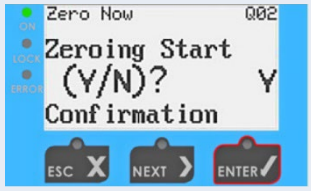
- Make sure that the typical process temperature and pressure values are present at the sensor.
- Make sure that there is no flow. In the best case, by closing valves before and after the sensor.

The zero-point calibration can be carried out using the button on the front of the RHE (➦ figure below), the local display (➦ table below) or the RHEComPro communications software (➦ section 8).

The zero-point calibration is signaled by the flashing of the yellow and red LED on the RHE and requires a maximum of 30 seconds. As soon as the flashing stops, the zero-point calibration is completed. The flowmeter is now ready for use



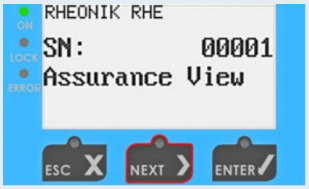
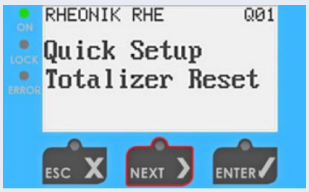
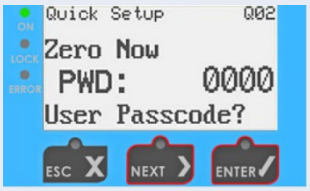
Display shows	Steps to take	Description
	Press the ENTER button once.	The valves upstream and downstream of the RHM Coriolis sensor must have been closed.

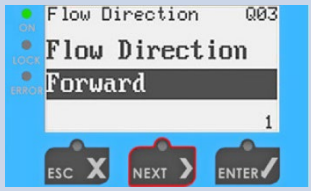
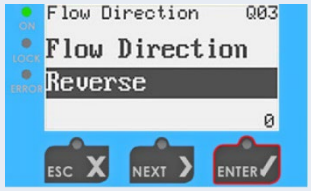
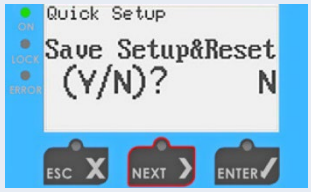
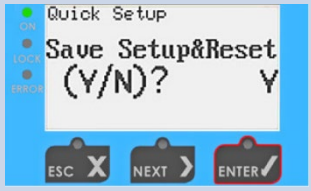
Display shows	Steps to take	Description
	Press the NEXT button 2 times.	
	Press the ENTER button once.	
	Press the NEXT button once.	
	Press the ENTER button once.	
	Enter the user password using the NEXT and ENTER buttons.	➦ section 7.2.2
	Press the NEXT button once.	Select “Y” to confirm.
	Press the ENTER button once.	The zero point will be calibrated. Once the process is complete, the display will switch to the “Zero Now” menu.
	Press the ESC button two times.	The display returns to the default screen.

7.4 Basic settings

7.4.1 Changing the flow direction

RHE49 Coriolis transmitters are bidirectional and can be operated in your desired flow direction. In certain circumstances, the RHE49 Coriolis transmitter may display negative values following installation as a result of the flow direction. If this happens, you can reverse how the flow direction is displayed in the RHE49 Coriolis transmitter.

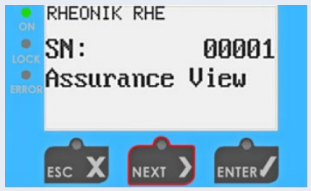
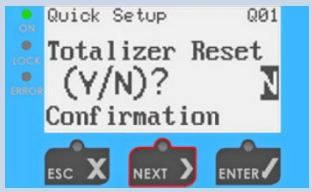
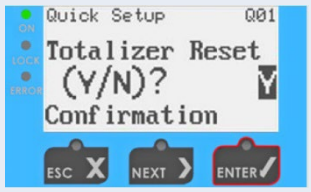
Display shows	Steps to take	Description
	Press the ENTER button once.	
	Press the NEXT button 2 times.	
	Press the ENTER button once.	
	Press the NEXT button 2 times.	
	Press the ENTER button once.	
	Enter the user password using the NEXT and ENTER buttons.	➦ section 7.2.2

Display shows	Steps to take	Description
	Press the NEXT button once.	
	Press the ENTER button once.	
	Press the ESC button once.	
	Press the NEXT button once.	Select “Y” to save the change.
	Press the ENTER button once.	The display returns to the default screen.

7.4.2 Resetting the mass and volume totalizers

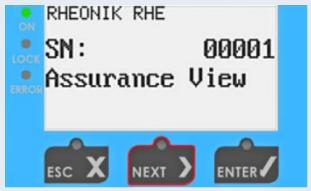
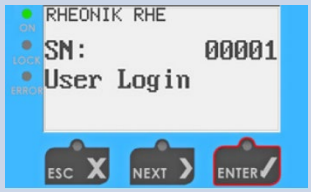
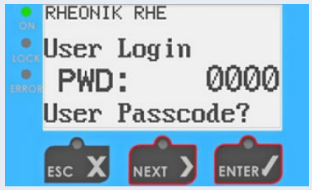
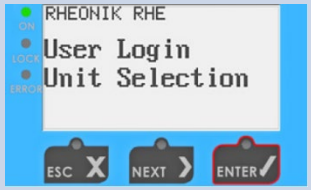
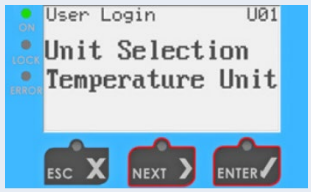
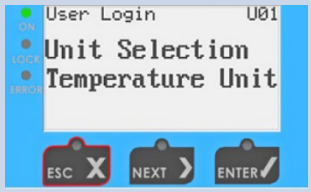
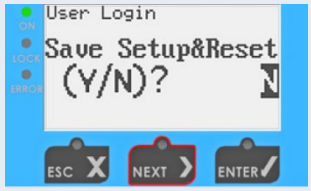
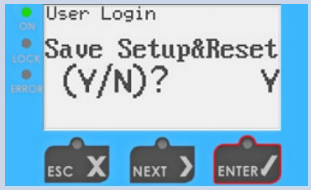
In the RHE49 Coriolis transmitter, the mass and volume meter readings are stored in a non-volatile memory, and are retained during restarts and if the RHE49 Coriolis transmitter is not energized. However, the meter readings can be reset either on the RHE49 Coriolis transmitter or using interfaces.

Display shows	Steps to take	Description
	Press the ENTER button once.	The valves upstream and downstream of the RHM Coriolis sensor must have been closed.

Display shows	Steps to take	Description
	Press the NEXT button 2 times.	
	Press the ENTER button once.	
	Press the ENTER button once.	
	Press the NEXT button once.	
	Press the ENTER button once	
	Press the ESC button once.	The display returns to the default screen.

7.4.3 Setting the units of measurement

Display shows	Steps to take	Description
	Press the ENTER button once.	

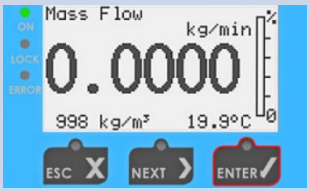
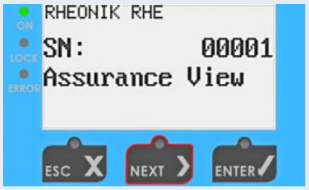
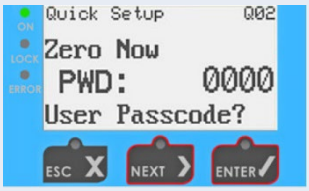
Display shows	Steps to take	Description
	Press the NEXT button 6 times.	
	Press the ENTER button once.	
	Enter the user password using the NEXT and ENTER buttons.	➦ section 7.2.2
	Press the ENTER button once.	
	Select the relevant menu for setting the measured values by pressing the NEXT button and confirm your entry by pressing the ENTER button. Pressing the ENTER button takes you to the units.	Selection: ■ Temperature Unit ■ Pressure Unit ■ Mass Unit ■ Mass Flow Unit ■ Density Unit ■ Volumetric Flow Unit ■ Volume Unit
	Press the ESC button 2 times.	The display returns to the default screen.
	Press the NEXT button once.	Select “Y” to save the changes.
	Press the ENTER button once.	The display returns to the default screen.

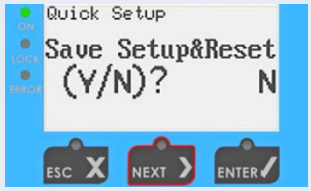
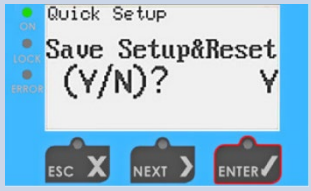
7.4.4 Setting the filters / damping

The Filter Settings menu enables you to set the stability of the measured values and the response time of the measuring device. Whilst increasing the filter values will result in more stable measured values, it will also extend the measuring device's response time.

To ensure the medium is filled quickly and accurately, use the lowest possible filter values.

In contrast, higher filter values can be used for long-term measurements in order to optimally stabilize the measured values.

Display shows	Steps to take	Description
	Press the ENTER button once.	
	Press the NEXT button 2 times.	
	Press the ENTER button once.	
	Press the NEXT button 5 times.	
	Press the ENTER button once.	
	Enter the user password using the NEXT and ENTER buttons.	➦ section 7.2.2

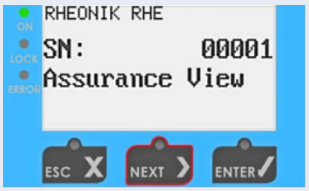
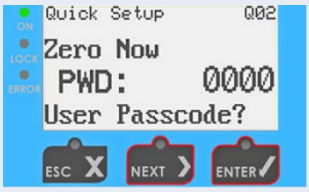
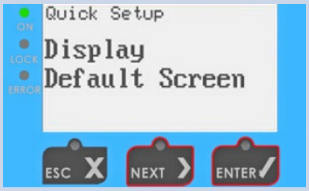
Display shows	Steps to take	Description
	Select the menu you need by pressing the NEXT button and confirm your entry by pressing the ENTER button.	Settings selection: ■ Display Filter ■ Freq. Out Filter ■ Ana 1 Out Filter ■ Ana 2 Out Filter ■ Modbus Filter
	Enter the value you need by pressing the NEXT button and confirm your entry by pressing the ENTER button.	
	Press the ESC button 2 times.	
	Press the NEXT button once.	Select “Y” to save the changes.
	Press the ENTER button once.	The display returns to the default screen.

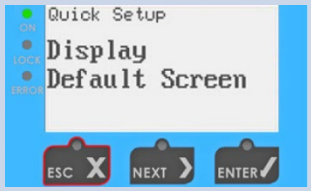
7.4.5 Adjusting the display settings

The display settings enable you to configure the following:

- Default view for the display
- Display illumination
- Colour settings for error messages

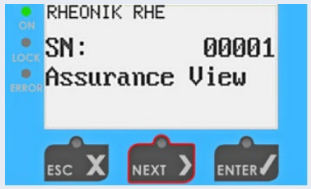
Display shows	Steps to take	Description
	Press the ENTER button once.	

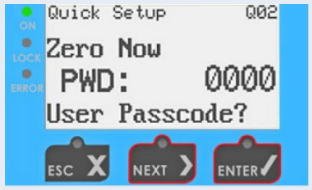
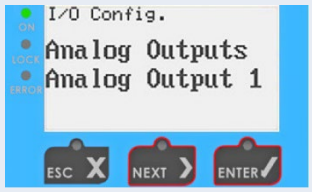
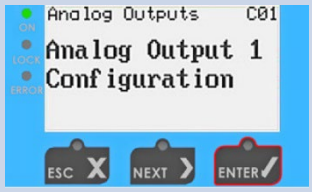
Display shows	Steps to take	Description
	Press the NEXT button 2 times.	
	Press the ENTER button once.	
	Press the NEXT button 7 times.	
	Press the ENTER button once.	
	Enter the user password using the NEXT and ENTER buttons.	➥ section 7.2.2
	Select the setting you need by pressing the NEXT button and confirm your entry by pressing the ENTER button.	Settings selection: ■ Default Screen For selecting the measured value that should be displayed in the default screen. ■ Lighting Config. – Permanent on (permanently illuminated) – Set on-time (illumination period after the user operates the device) – On at flow (illuminated when the device is recording a flow) ■ Background Color – Namur Colors (white (OK), yellow (warning), red (error), violet (incorrect configuration) – White / Off only (illuminated whilst the user is operating the device) – Assurance Factor (detailed information is provided in the RHE40 Desktop Reference)

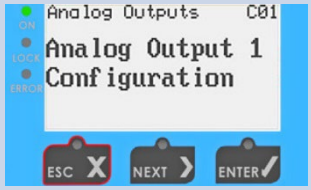
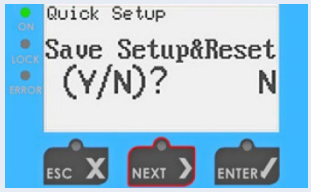
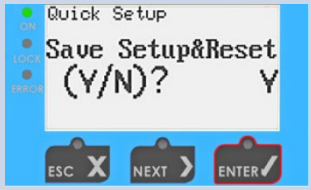
Display shows	Steps to take	Description
	Select the default screen or the display lighting by pressing the NEXT button and confirm your entry by pressing the ENTER button.	
	Press the ESC button 2 times.	The display returns to the default screen.

7.5 Configuration of inputs, outputs and interfaces

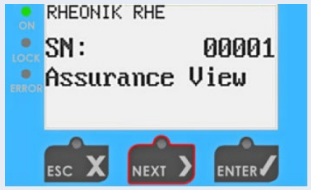
7.5.1 Configuring analog outputs

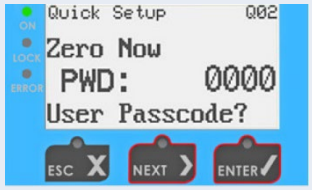
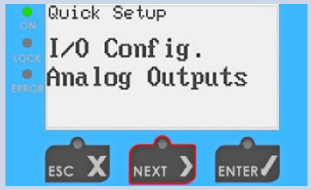
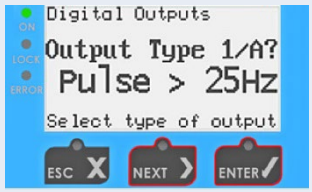
Display shows	Steps to take	Description
	Press the ENTER button once.	
	Press the NEXT button 2 times.	
	Press the ENTER button once.	
	Press the NEXT button 3 times.	

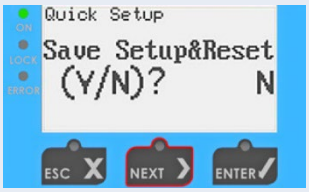
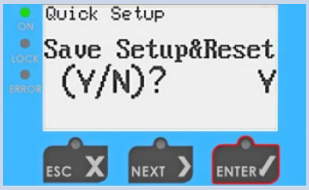
Display shows	Steps to take	Description
	Press the ENTER button once.	
	Enter the user password using the NEXT and ENTER buttons.	➦ section 7.2.2
	Press the ENTER button once.	
	Select the analog output you want to configure by pressing the NEXT button and confirm your entry by pressing the ENTER button.	Selection: ■ Analog Output 1
	Press the ENTER button once.	
	Select the measured value you need by pressing the NEXT button and confirm your entry by pressing the ENTER button. You can change the digits of the individual values by pressing the NEXT button. To confirm the selected digit, press the ENTER button.	Selection: ■ Mass Flow ■ Volumetric Flow ■ Density ■ Tube Temp(measured liquid/gas) ■ Torsion Temp. ■ Drive Gain ■ Assurance Factor ■ Percent Main Sub ■ Off Depending on which measured value you select, you can successively set the maximum value (Max), minimum value (Min), and how the analog output should respond in certain situations (Fire State). The sequence and input options may vary depending on the measured value in question.

Display shows	Steps to take	Description
	Press the ESC button 3 times.	
	Press the NEXT button once.	Select “Y” to save the changes.
	Press the ENTER button once.	The display returns to the default screen.

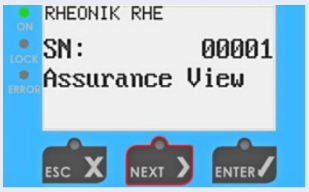
7.5.2 Configuring digital outputs

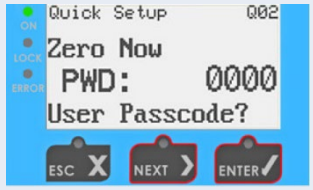
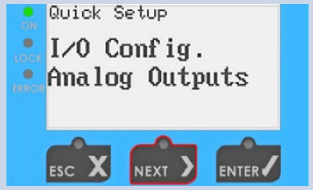
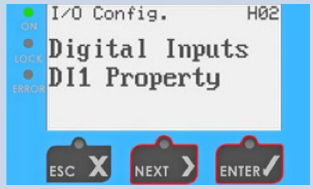
Display shows	Steps to take	Description
	Press the ENTER button once.	
	Press the NEXT button 2 times.	
	Press the ENTER button once.	
	Press the NEXT button 3 times.	

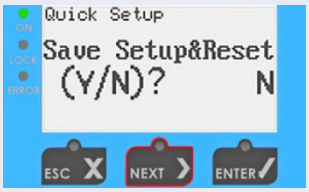
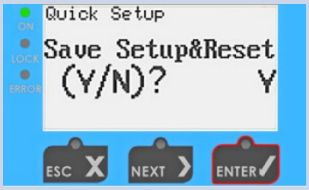
Display shows	Steps to take	Description
	Press the ENTER button once.	
	Enter the user password using the NEXT and ENTER buttons.	➦ section 7.2.2
	Press the NEXT button once.	
	Press the ENTER button once.	
	Select the digital output you want to configure by pressing the NEXT button and confirm your entry by pressing the ENTER button.	Selection (depends on the device configuration): ■ Output Type 1/A ■ Output Type 2/B
	Select the measured value you need by pressing the NEXT button and confirm your entry by pressing the ENTER button. You can change the digits of the individual values by pressing the NEXT button. To confirm the selected digit, press the ENTER button.	Settings selection: ■ Pulse > 25 Hz – Mass – Volume ■ Pulse < 50 Hz – Mass – Volume ■ Frequency – Mass – Volume ■ Status/Configuration – Mass Flow Limit – Volume Flow Limit – Density Limit – Tube Temp Limit – Tors. Temp Limit – Volume Rev Flow – Mass Fwd Tot Lmt – Volume Fwd Tot L – Error/Zero Low – Error/Zero High – Assurance Factor – Flow Direction (“Type 2/B” only) – Error (“Type 1/A” only)

Display shows	Steps to take	Description
	Press the ESC button 3 times.	The display returns to the default screen.
	Press the NEXT button once.	Select “Y” to save the changes.
	Press the ENTER button once.	The display returns to the default screen.

7.5.3 Configuring digital inputs

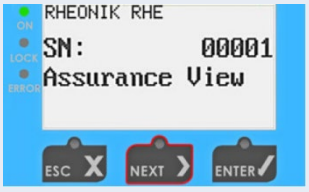
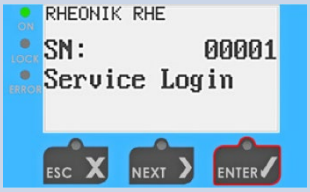
Display shows	Steps to take	Description
	Press the ENTER button once.	
	Press the NEXT button 2 times.	
	Press the ENTER button once.	
	Press the NEXT button 3 times.	

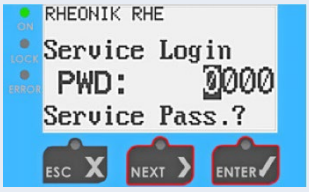
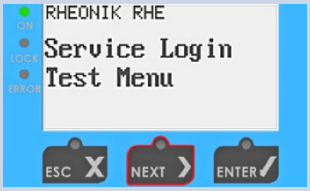
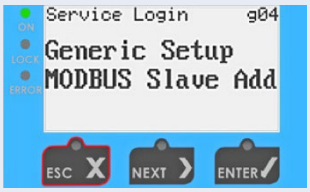
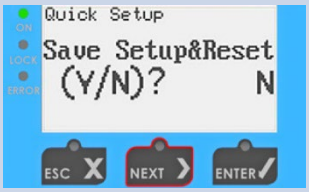
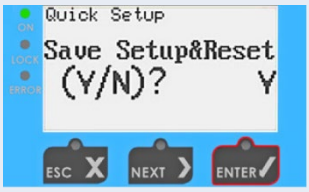
Display shows	Steps to take	Description
	Press the ENTER button once.	
	Enter the user password using the NEXT and ENTER buttons.	➦ section 7.2.2
	Press the NEXT button 2 times.	
	Press the ENTER button once.	
	Select the digital input you want to configure by pressing the NEXT button and confirm your entry by pressing the ENTER button.	Selection (depends on the device configuration): ■ DI1 Property ■ DI2 Property
	Select the setting you need by pressing the NEXT button and confirm your entry by pressing the ENTER button.	Settings selection: ■ Start Zero LO-HI ■ Start Zero HI-LO ■ Reset Tot LO-HI ■ Reset Tot HI-LO ■ Stp/Strt Tot L-H ■ Stp/Strt Tot H-L ■ Spec. Fct 1 L-H ■ Spec. Fct 1 H-L ■ Batch Stop LO-HI ■ Batch Stop HI-LO ■ Batch Restrt L-H ■ Batch Restrt H-L ■ Tot Reset&Hold L-H ■ Tot Reset&Hold H-L ■ Off

Display shows	Steps to take	Description
	Press the ESC button 3 times.	The display returns to the default screen.
	Press the NEXT button once.	Select “Y” to save the changes.
	Press the ENTER button once.	The display returns to the default screen.

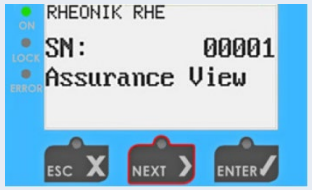
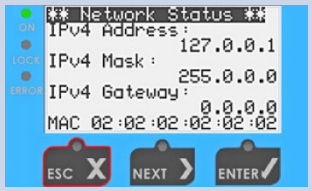
7.5.4 Setting up the RS485 interface

Once the RHE49 Coriolis transmitter has been connected, the RS485 interface may be set up before it can be used.

Display shows	Steps to take	Description
	Press the ENTER button once.	
	Press the NEXT button 7 times.	
	Press the ENTER button once.	

	Enter the uservice password using the NEXT and ENTER buttons.	➦ section 7.2.2
	Press the NEXT button 8 times.	
	Press the ENTER button once.	
	Select the relevant menus one after the other by pressing the NEXT button and confirm your entry by pressing the ENTER button.	The RS485 interface settings need to be configured in all four of the following menus: ■ MODBUS Baud Rate ■ MODBUS Parity ■ MODBUS Stop Bits ■ MODBUS Slave Add The following three setting options are available for the MODBUS Parity menu: ■ 0 (None) ■ 1 (Odd) ■ 2 (Even)
	Press the ESC button once.	
	Press the NEXT button once.	Select “Y” to save the changes.
	Press the ENTER button once.	The display returns to the default screen.

7.5.5 Reading out the IP address

Display shows	Steps to take	Description
	Press the ENTER button once.	
	Press the NEXT button once.	
	Press the ENTER button once.	
	Press the NEXT button 3 times.	
	Press the ESC button 2 times to return to the default screen.	The IP addresses are shown on the display. To connect the RHE49 Coriolis transmitter with your own network, you need the address listed under “IPv4 Address:”. The address shown here is merely an example. The actual correct address will be shown on the display.

7.6 Maintenance and Troubleshooting

RHE49 Coriolis transmitters and the associated RHM Coriolis sensors do not require regular maintenance. Under normal operating conditions, there is also no need to calibrate the device.

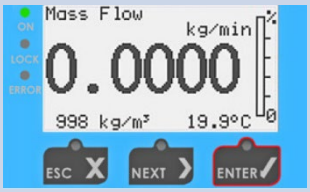
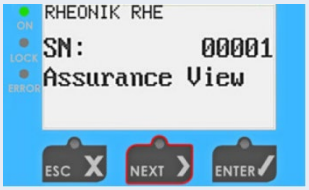
If required by law or for operational reasons, you can calibrate the device as a one-off or at regular intervals as follows:

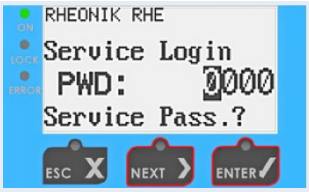
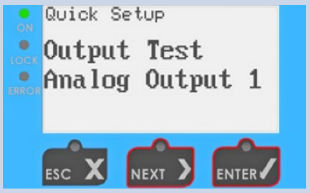
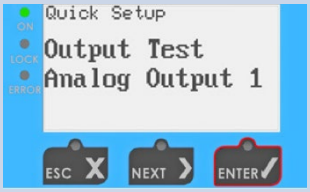
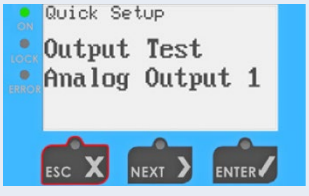
- On-site calibration against a reference meter or reference measuring system
- In a calibration laboratory

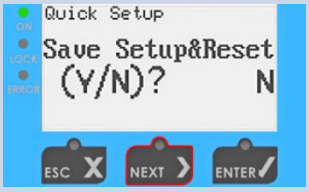
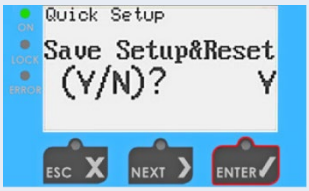
The local regulations or contractual/operational requirements will determine what type of calibration work is required and how often it should be performed. Detailed information on calibrating the RHE49 Coriolis transmitter can be found in the RHE40 Desktop Reference. To ensure that the measuring accuracy remains consistent and within the permissible tolerance, we recommend regularly checking the calibration of the zero point; ➦ section 7.3. The density measurements of an RHE49 Coriolis transmitter can be calibrated on site. For instructions on how to do this, please see the relevant section in the RHE 40 Desktop Reference.

7.6.1 Performing an output test

The output test enables you to check the output signals of the analogue and digital outputs of the RHE49 Coriolis transmitter.

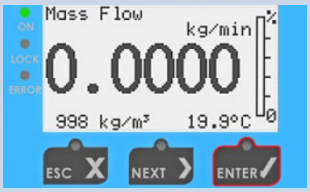
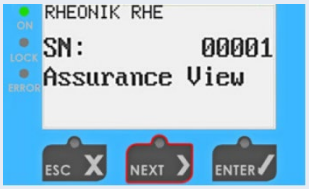
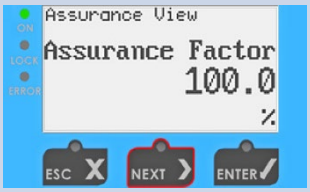
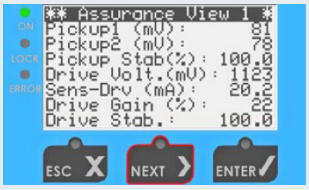
Display shows	Steps to take	Description
	Press the ENTER button once.	
	Press the NEXT button 2 times.	
	Press the ENTER button once.	
	Press the NEXT button 4 times.	
	Press the ENTER button once.	

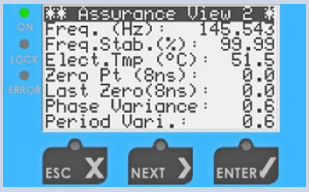
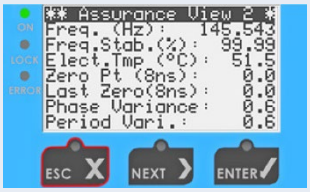
Display shows	Steps to take	Description
	Enter the uservice password using the NEXT and ENTER buttons.	➦ section 7.2.2
	Select the output you wish to test by pressing the NEXT button and confirm your entry by pressing the ENTER button.	Selection (depends on the device configuration): ■ Analog Output 1 ■ Analog Output 2 ■ Digital Output 1/A ■ Digital Output 2/B
	Press the ENTER button once to start the output test. Select the sub-menu you need by pressing the NEXT button and confirm your entry by pressing the ENTER button.	When you start the output test, the following sub-menus will be available for selection depending on the output in question: ■ Test calib. val (Analog Output) ■ Enable test. (Digital Output) After selecting the sub-menu you need and confirming your entry, you can set the output value by pressing the NEXT and ENTER buttons.
	Once the test is complete, select the output that was tested again and confirm your entry by pressing the ENTER button.	
	Press the ENTER button once.	
	Press the ENTER button once	The test is ended.
	Press the ESC button 2 times.	

	Press the NEXT button once.	Select “Y” to save the changes.
	Press the ENTER button once.	The display returns to the default screen.

7.6.2 Reading out the Assurance Factor and displaying the Assurance View

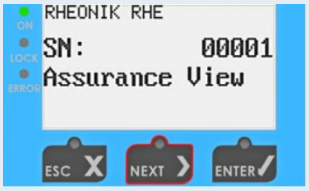
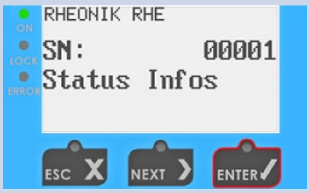
The Assurance Factor and Assurance View provide information about the status of the RHE49 Coriolis transmitter and the associated RHM Coriolis sensor.

Display shows	Steps to take	Description
	Press the ENTER button once.	
	Press the ENTER button once.	
	Press the NEXT button once to switch to the Assurance View 1 display.	**Assurance Factor (optional)** This feature is only available on devices that come with the advanced diagnos-tics package (Assurance Factor) AF. A percentage of less than 70 indicates an impaired measurement.
	Press the NEXT button once to switch to the Assurance View 2 display.	**Assurance View 1** Pickup1 (mV): 60-135 mV Pickup2 (mV): 60-135 mV Pickup Stab (%): At least 90% Drive Stab.: At least 90%

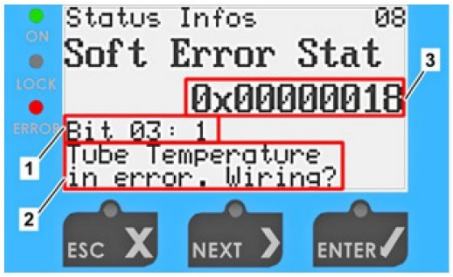
		**Assurance View 2** Freq. Stab.: At least 90%
	Press the ESC button 2 times.	The display returns to the default screen.

7.6.3 Displaying errors and troubleshooting

Each status display shows a specific code, e.g. 0x00000000. Pressing the ENTER button will move the cursor through this code from right to left. The respective error bit or warning bit is explained at the lower edge of the display.
This section contains comprehensive information to help you understand and resolve errors, warnings and connection problems relating to the RHE49 Coriolis transmitter. The RHECom software can also be used to read out error codes, ➦ section 8

Display shows	Steps to take	Description
	Press the ENTER button once.	
	Press the NEXT button once.	
	Press the ENTER button once.	
	Press the NEXT button to display the various status displays.	Any active warnings and errors will be displayed directly after opening the “Status Infos” menu. To switch between the various status displays, repeatedly press the NEXT button.

Display shows	Steps to take	Description
		"Info Status" display
		"Error" display
		"Soft Error" display
	Press the ESC button 2 times	The display returns to the default screen.



ⓘ Pressing the ENTER button will move the cursor through the error code or info code (3) from right to left.

1 Error, warning or info bit
2 Explanation
3 Error, warning or info code

Warning Bit(s)	Warning Message	Possible Cause	Solution
0,1,2,3,4,8,9,11,16,17,18,19,20, 24,25	Mass flow / density / volume flow / temperature / totalizer / pressure lower or upper warning limit exceeded	Mass flow / density / volume flow / temperature / totalizer / pressure warning limits configured incorrectly	Check and reconfigure the warning limits ("Lower Warn Lim", "Upper Warn Lim") under e.g. *Main Screen* > *User Login* > *Mass Flow*
		Specified operating values of the RHM flow sensor are exceeded	- Operate the RHM flow sensor within its specified operating ranges - Use a RHM flow sensor suitable for the process conditions

Warning Bit(s)	Warning Message	Possible Cause	Solution
15,21	Current output 1/2 range exceeded	Current output configuration wrong, operating values outside the configured range	Check and reconfigure the analog output configuration.
		Negative flow rate, flow direction configured incorrectly	Change the flow direction configuration.
26	Multi-Phase Flow Condition detected	Two phases (gas or liquid) in the RHM flow sensor	Make sure that only one phase (either gas or liquid) passes through the sensor.
29	Software performance problem detected	Hardware failure	Contact your local partner or Rheonik
30,31	Mass flow / density change exceeds set limit	Change of mass flow / density changes faster than the set limit	Increase the change limit under e.g. *Main Screen* > *Service Login* > *Mass Flow* > *MsFlwChange*

Soft Error Bit(s)	Warning Message	Possible Cause	Solution
1	Current output readback failed	Hardware failure	Contact your local partner or Rheonik
2	Pulse output range exceeded	Pulse rate or frequency at operating conditions too high, max. possible output frequency must be <10kHz	Check and reconfigure the pulse/frequency output configuration
3,4	Tube or torsion bar measurement error	Wiring incorrectly, damaged wire or contact problem at RHM sensor or RHE transmitter	Connect RHM sensor and RHE transmitter according wiring diagram, check the functionality of the wires and the contacts on the terminal strip(s)
		Temperature measurement configuration incorrect	Correct the temperature measurement under *Main Screen* > *Service Login* > *Temperature Meas* > *Configuration* to: 7
5	Transmitter electronics temperature reading error	Hardware failure	Contact your local partner or Rheonik

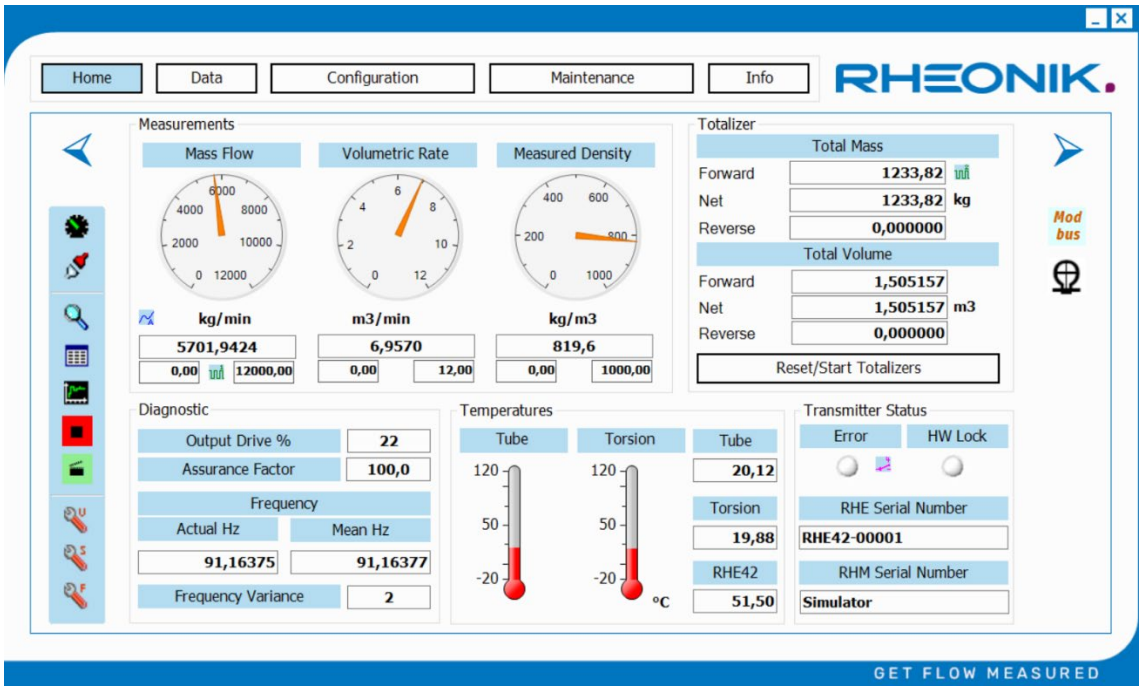
Soft Error Bit(s)	Warning Message	Possible Cause	Solution
6	ADS1248 failure. Internal hardware error	Hardware failure	Contact your local partner or Rheonik
7,8,9,15,16	Mass flow / density / volume flow / volume limits exceeded	Specified operating values of the RHM flow sensor are exceeded	- Operate the RHM flow sensor within its specified operating ranges - Use a RHM flow sensor suitable for the process conditions
10	Zero point calibration not successful	Instability during zero point calibration, sensor not fully filled, multiphase condition, leaking valve and subsequent small flow	- Perform another zero point calibration - Make sure that the measuring device is not disturbed too much by external vibrations - assure fully filled pipe (or gas only for gas applications) and true zero flow
11	Analog input exceedance	Technical problem with connected external device (e.g. pressure sensor)	Check connected external device
12,13,14, 17,22	Sensor signals out of range	Wiring incorrectly, damaged wire or contact problem at RHM sensor or RHE transmitter	Contact your local partner or Rheonik
18,19	RHE transmitter firmware performance problem / self-test failure	Hardware failure	Contact your local partner or Rheonik
20	CRC error in flash memory used for Zeroing	Hardware failure	Repeat zero point calibration. Contact your local partner or Rheonik if the problem persists
21	CRC error found in flash memory used for totalizer	Hardware failure	Repeat totalizer reset. Contact your local partner or Rheonik if the problem persists
24	Inconsistent calibration information for the analog input	Calibration incorrect	Analog input calibration has to be repeated. Contact your local partner or Rheonik for assistance
25	Pickup voltage below threshold. Multi-phase flow assumed	Two phases (gas or liquid) in the RHM flow sensor	Make sure that only one phase (either gas or liquid) passes through the sensor

Error Bit(s)	Warning Message	Possible Cause	Solution
0	Internal EEPROM error.	Hardware failure	Contact your local partner or Rheonik
1,10	Analog output 1/2 configuration is invalid.	Incomplete or incorrect analog output configuration	Check and reconfigure the analog output configuration
2	Pulse/frequency output configuration is invalid	Incomplete or incorrect pulse/frequency output configuration	Check and reconfigure the pulse/frequency output configuration
3	Temperature measurement time out (no response)	Hardware failure	Restart the transmitter. Contact your local partner or Rheonik if the problem persists
4	Zeroing data lost	Software/hardware failure	Perform a zero point calibration. Contact your local partner or Rheonik if the problem persists
5	Internal totalizer data lost	Software/hardware failure	Perform a totalizer reset. Contact your local partner or Rheonik if the problem persists
6	Sensor signals out of range	Please see Soft Errors troubleshooting table, Soft Error bits 12,13,14,17,22	
7	EEPROM data lost	Software/hardware failure	Restart the transmitter and check all setup data, especially calibration information, if the error is resolved. Contact your local partner or Rheonik if the problem persists
8	Non-volatile memory error	Software/hardware failure	
9	Density configuration error	Incomplete or incorrect density configuration	Check and reconfigure the density configuration
12	Batch configuration invalid	Incomplete or incorrect batch configuration	Check and reconfigure the batch configuration, please see section 4.2

8 RHEComPro Communication Software

The RHE49 Coriolis transmitter can be configured using the RHEComPro software. The software can be downloaded from the Rheonik website or directly from the following link:

https://www.rheonik.com/fileadmin/Software/RHEComPro.zip



Please refer to the RHEComPro tutorial for more details on connecting the transmitter to your PC and using the software.

The RHE49 Coriolis transmitter can be connected to the PC and RHEComPro software via the mini-USB port on the front of the RHE49, the RS485 interface or the Ethernet interface.

9 Accessories

For the RHE49 Coriolis transmitter the following accessories are offered:

Order Code	Description	Picture
ARHE-RS	Interconnection cable to PC, 5m (Mini-USB to PC USB)	
ARHE-MO	Adapter Modbus RS485 to USB with 2m interface cable	
ARHE49-CA	M12 plug (5-pin) with 2m cable	
ARHE49-CE	M12 plug (5/4-pin) with 2m cable, Ex certified for use in Zone 2, **4-wire configuration – Pin 5 cannot be used!**	

10 Order code

Construction Type

C1 Compact mount at sensor IP66, with M20*1.5 cable gland - requires J9 option at RHM

CD Compact mount at sensor IP66, with display, M20*1.5 cable gland - requires J9 option at RHM

S1 Compact mount at sensor IP66, SS316 enclosure with M16*1.5 cable gland - requires S9 option at RHM

Supply Voltage

D1 12 to 24 VDC (+/- 10%)

Software Function Package

SO Standard OP system - mass flow, normalized density / volume, Assurance View® Diagnostics

DO Enhanced OP system - SO plus measured density / volume

AF Enhanced OP System plus Assurance Factor®, ZP History, Data Recording, PID Controller, PFPM

OG Enhanced OP System plus AF, API Standard Density/Volume, Net Oil Calculation, Concentration

CT Enhanced OP System plus OG, Precision Flow Analysis, Hardware Lock Switch

FR Enhanced OP System plus CT, Super Fast Response Firmware with 4 kHz Update Rate

I/O Configuration

B1 RS485 (Modbus), 2 x DO (pulse/freq./status), 1 x DI

EB Modbus TCP, 2 x DO (pulse/freq./status), 1 x DI, RS485 (Modbus)

EP ProfiNet RT/Class B, 2 x DO (Pulse/Freq/Status), 1 x DI, RS485 (Modbus)

EN EtherNet/IP, 2 x DO (pulse/freq./status), 1 x DI, RS485 (Modbus)

S1 1*4/20mA (a/p) acc. NAMUR NE43, 2*DO (pulse/freq./status), 1*DI, RS485 (Modbus)

1H 1*4/20mA (a/p) acc. NAMUR NE43, 2*DO (pulse/freq./status), 1*DI, RS485 (Modbus), HART

Hazardous Area Certifications (details see page 16)

NN Without - RHM and RHE in ordinary locations

A2 ATEX/IECEx <Ex> II 3G Ex ec IIC T4 Gc

C2 cCSAus Class I, Div. 2/Ex ec IIC T4 Gc

Performance Certification

NN Without

Options for RHE49

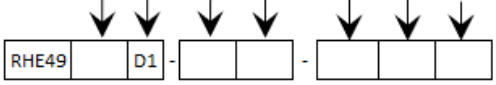
NNN None / All standard

N67 Enhanced enclosure dual rating IP66/67 NEMA 4X/6, ambient -40°C to +65°C

BMN Base Configuration with M12 connector (5-pin) - 1*RS485, 1*DO

AMN Analog Configuration with M12 connector (5-pin) - 1*RS485, 1* 4-20 mA (a), HART

HMN Analog Configuration with M12 connector (4-pin) - 1* 4-20 mA (a), HART, 1*DO, 1*DI



11 Returns and disposal

Returns

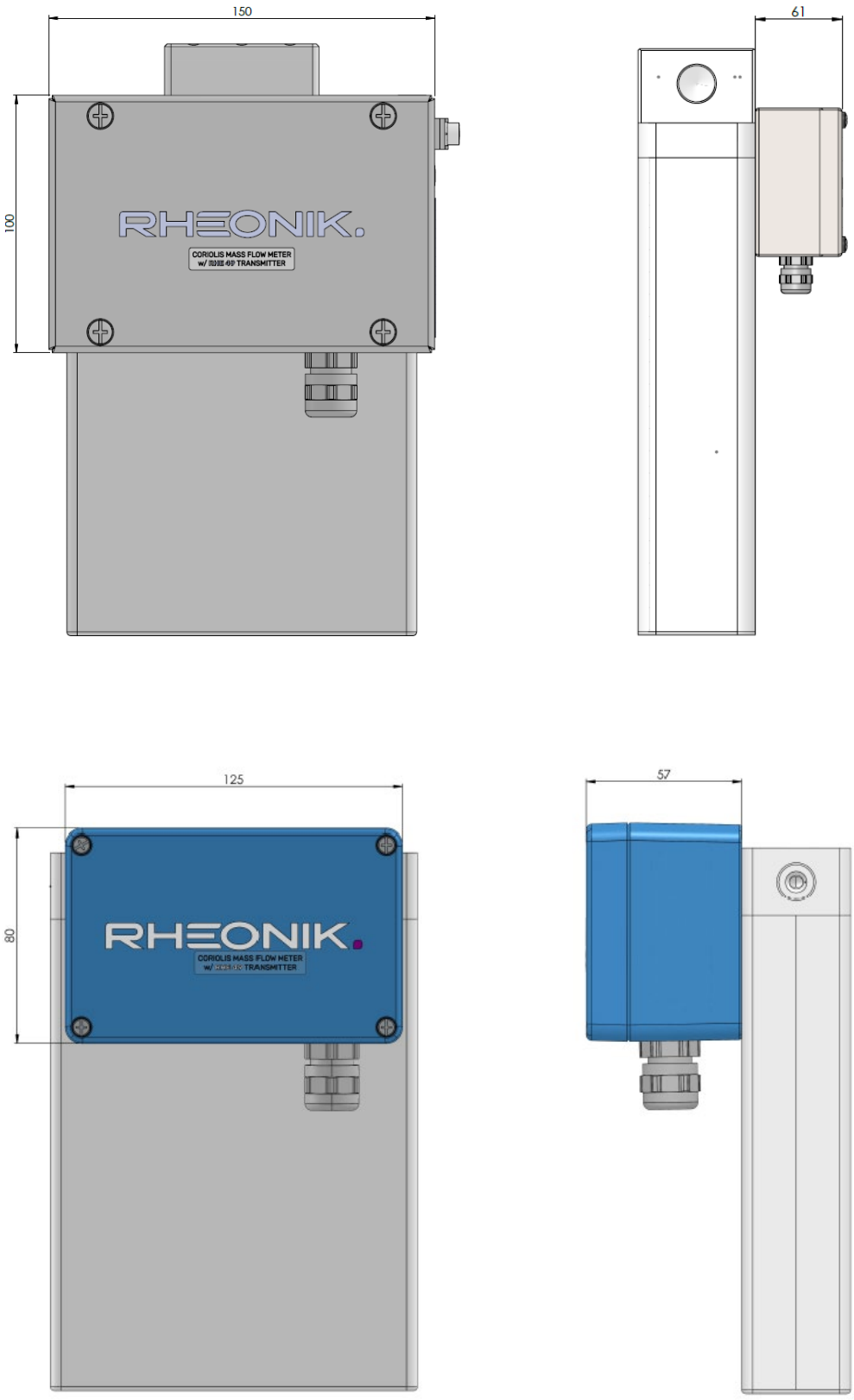
Do not ship any measuring devices if you are unsure whether you have been able to fully remove harmful substances, e.g. substances that have penetrated into cracks/crevices or diffused through plastic.
If the measuring device has been inadequately cleaned, any costs incurred for disposal or personal injury (e.g. chemical burns) will be charged to the device operator.

Disposal

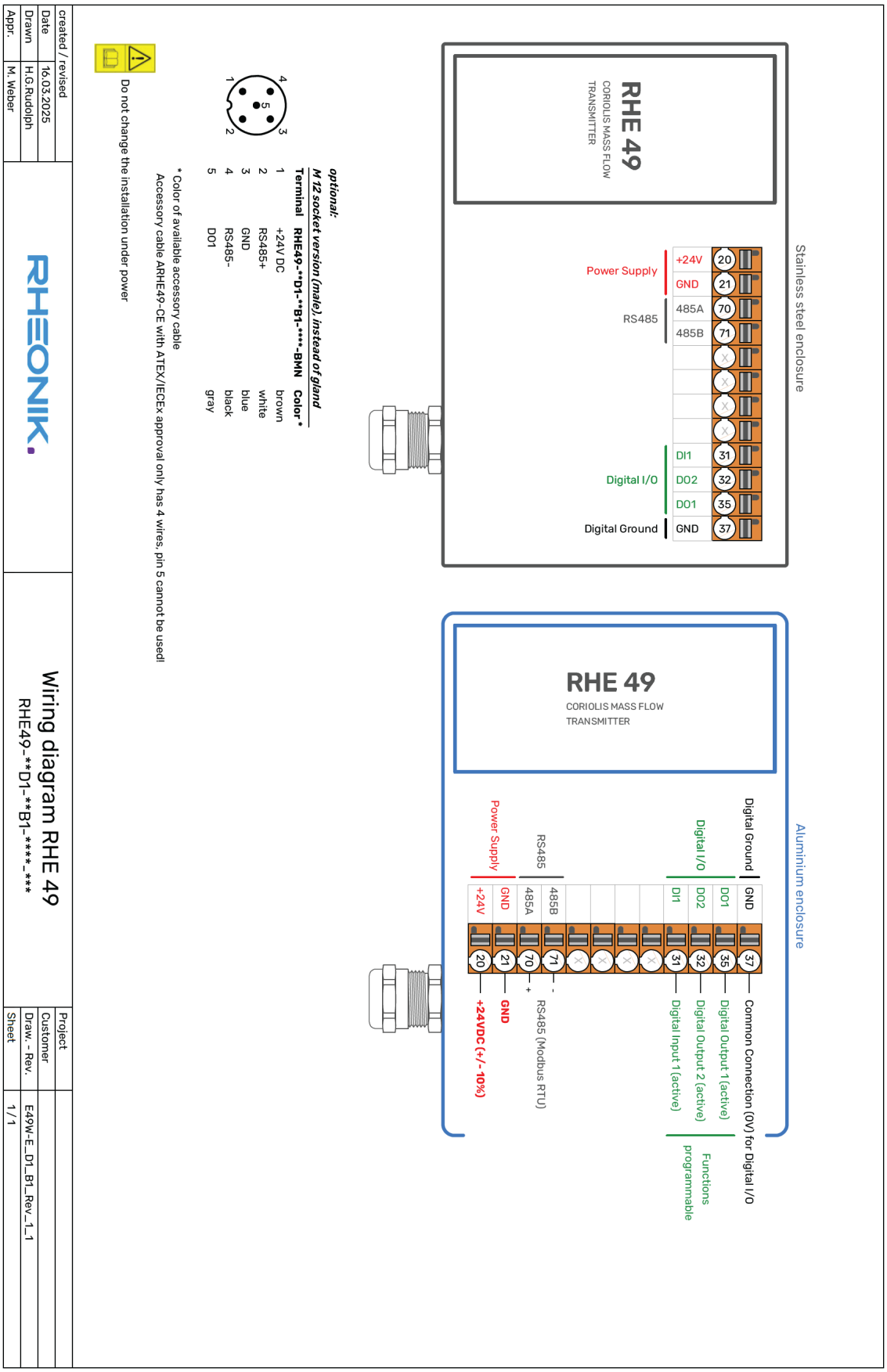
The RHE49 Coriolis transmitters are not subject to the WEEE Directive 2012/19/EU on the prevention of waste electrical and electronic equipment and the reduction of this waste through reuse, recycling and other forms of recovery.
The RHE49 Coriolis transmitters comply with EU Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
Observe the regulations in force in your country!

12 Technical data

Housing material	Coated aluminum or SS 316
Protection class	Alu IP66 / NEMA 4, optional SS 316 w/ IP66
Ambient temperature	-20 to +60°C / -4 to +140°F (enhanced -40 to +65°C)
Relative humidity	0 – 95% (non-condensing)
Dimensions	Up to 150 x 100 x 61 mm / 5.91 x 3.94 x 2.40 in – for details see next page
Power supply & power	12-24 VDC +/- 10%, 1.5W typical, 2W maximum (DO unloaded)
Analog output (optional)	One 4-20mA output, active or passive, as an option All analog outputs acc. to NAMUR NE43
Pulse/frequency/status outputs	2 pulse/frequency or status outputs (IEC60946) w/ max. 10 kHz
Digital input	1 configurable control input (IEC60946)
Digital data interfaces	Modbus RTU, Ethernet (Modbus TCP/IPv4), ProfiNet, EtherNet/IP, HART
Display	Optional high contrast backlit LCD color display available
User Interface and Configuration	Plug and play set-up by factory. Change configuration by RHECom software package or display (if ordered)
Cable Entries	M20 x 1.5 cable gland (Alu), M16 x 1.5 cable gland (SS 316) standard
Computer Connection	Via Modbus RTU, TCP, ProfiNet, EtherNet/IP or USB to PC
Electrical Connection	Via M12 male connector instead of cable gland
Totalizers	6 x resettable forward, reverse and net totalizers for mass and volume, 2 x non-resettable totalizers for mass and volume
Hazardous Area Approvals	Zone 2 or Class 1 Div 2


150
100
61
RHEONIK.
CORIOLIS MASS FLOW METER
125
80
57
RHEONIK.
CORIOLIS MASS FLOW METER

Appendix A Wiring diagrams



optional:
M 12 socket version (male), instead of gland

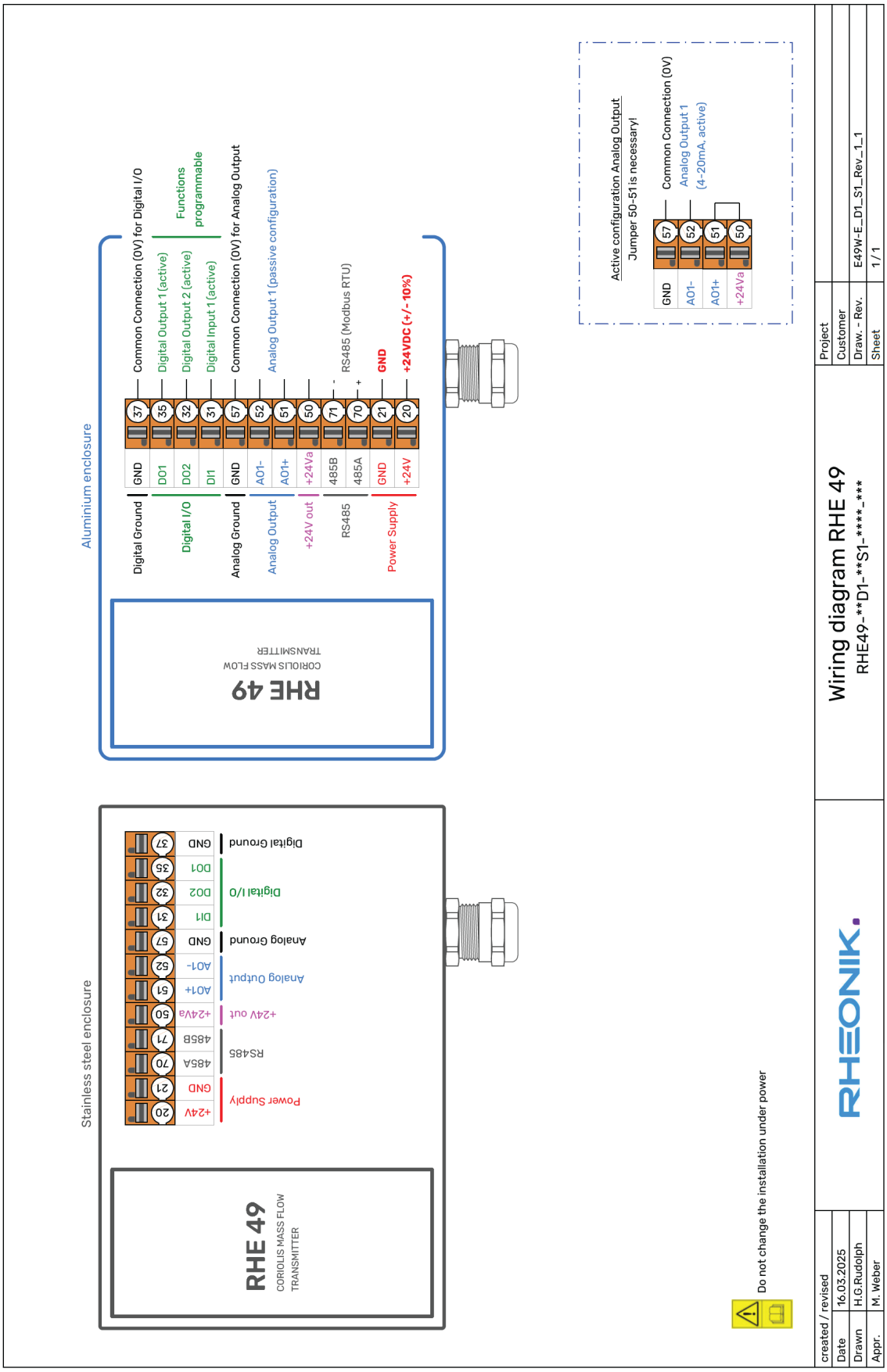
Terminal	RHE49-**D1-**B1-****_BMN	Color *
1	+24V DC	brown
2	RS485+	white
3	GND	blue
4	RS485-	black
5	DO1	gray

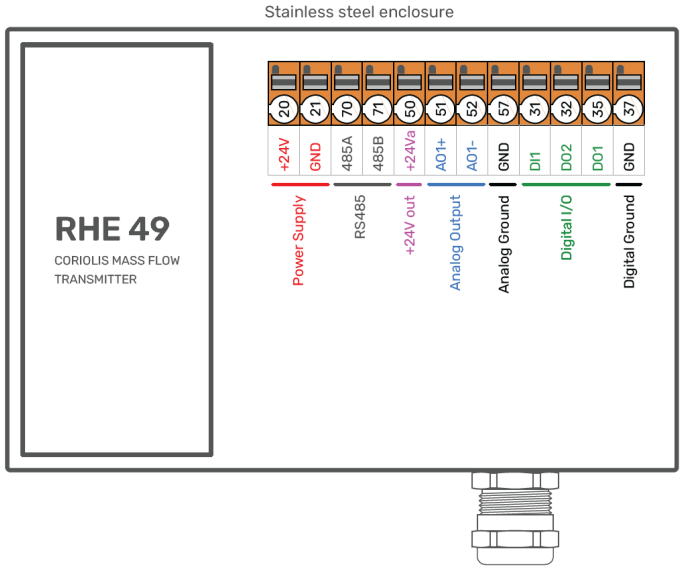
* Color of available accessory cable
Accessory cable ARHE49-CE with ATEX/IECEx approval only has 4 wires, pin 5 cannot be used!

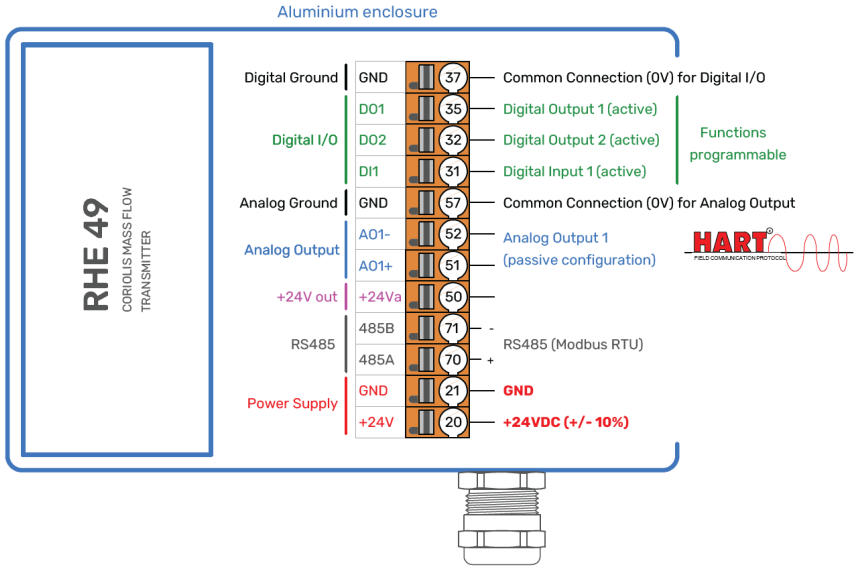
Do not change the installation under power

created / revised			
Date	16.03.2025		
Drawn	H.G.Rudolph	RHEONIK	Wiring diagram RHE 49 RHE49-**D1-**B1-****_***
Appr.	M. Weber		

Project	
Customer	
Draw. - Rev.	E49W-E_D1_B1_Rev_1_1
Sheet	1 / 1


Wiring diagram RHE 49
RHE49-**D1-**S1-****_***
RHEONIK
created / revised
Date 16.03.2025
Drawn H.G.Rudolph
Appr. M. Weber
Project
Customer
Draw. - Rev. E49W-E_D1_S1_Rev_1_1
Sheet 1/1
Do not change the installation under power
Stainless steel enclosure
RHE 49
CORIOLIS MASS FLOW
TRANSMITTER
Digital Ground
Digital I/O
Analog Ground
Analog Output
+24V out
RS485
Power Supply
GND
DO1
DO2
DI1
GND
AO1-
AO1+
+24Va
485B
485A
GND
+24V
37
35
32
31
57
52
51
50
71
70
21
20
Aluminium enclosure
RHE 49
CORIOLIS MASS FLOW
TRANSMITTER
Common Connection (0V) for Digital I/O
Digital Output 1 (active)
Digital Output 2 (active)
Digital Input 1 (active)
Functions programmable
Common Connection (0V) for Analog Output
Analog Output 1 (passive configuration)
RS485 (Modbus RTU)
GND
+24VDC (+/- 10%)
Active configuration Analog Output
Jumper 50-51 is necessary!
GND
AO1-
AO1+
+24Va
Common Connection (0V)
Analog Output 1
(4-20mA, active)





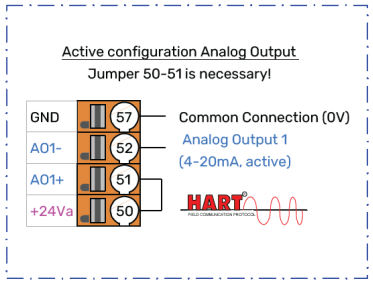
optional:

M 12 socket version (male), instead of gland

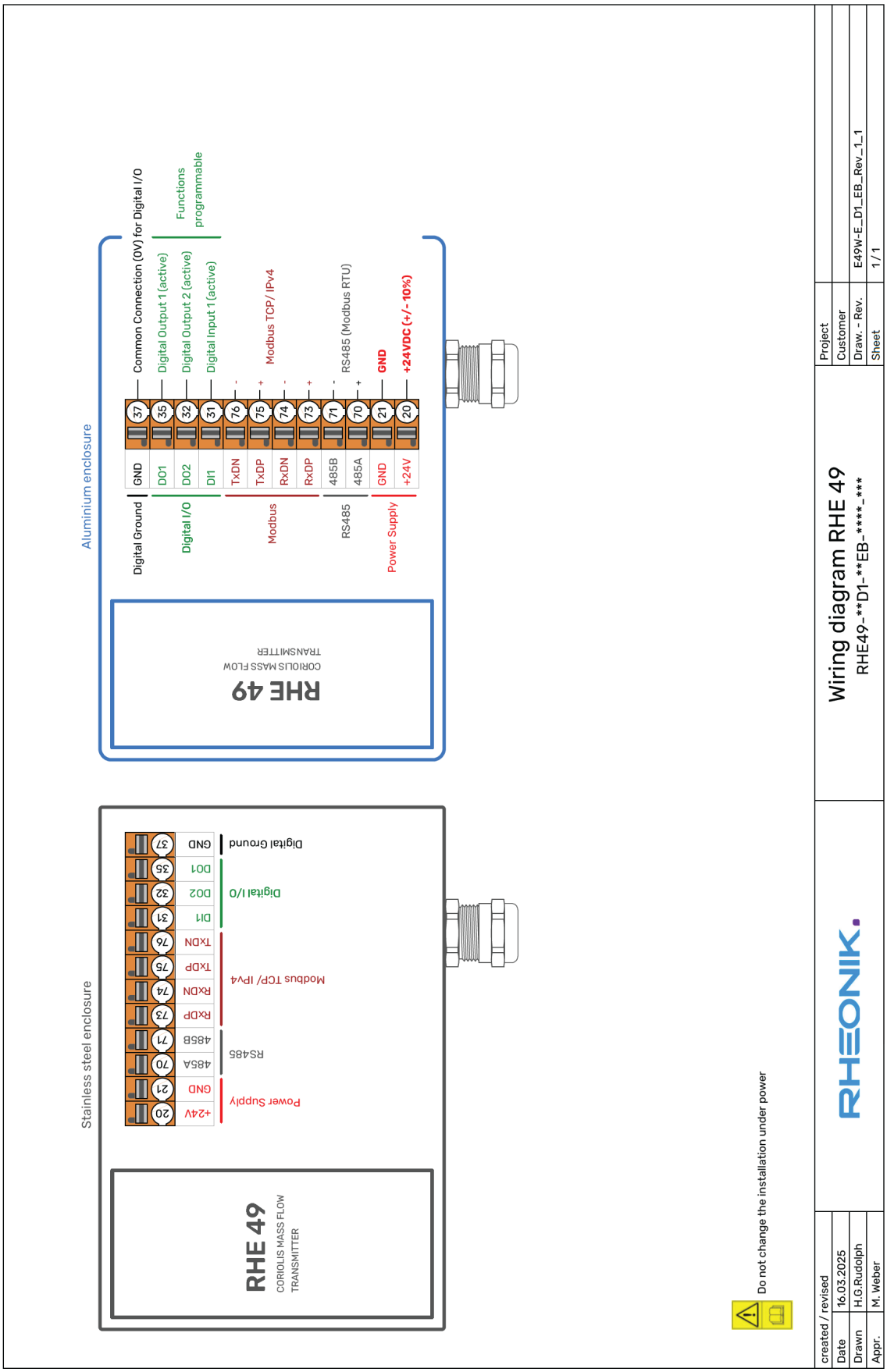
Terminal	RHE49-**D1-**1H-****-AMN	RHE49-**D1-**1H-****-HMN	Color *
1	+24V DC	+24V DC	brown
2	RS485+	AO1 (active), HART	white
3	GND	GND	blue
4	RS485-	DO1	black
5	AO1 (active), HART	DI1	gray

* Color of available accessory cable
Accessory cable ARHE49-CE with ATEX/IECEx approval only has 4 wires, pin 5 cannot be used!

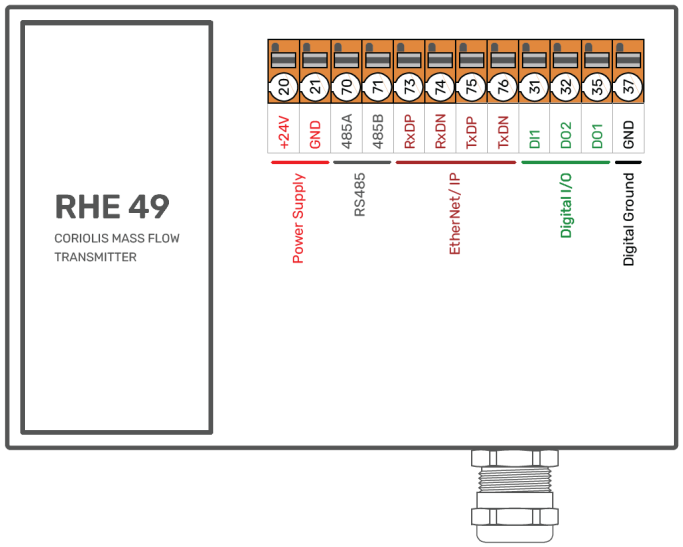
Do not change the installation under power



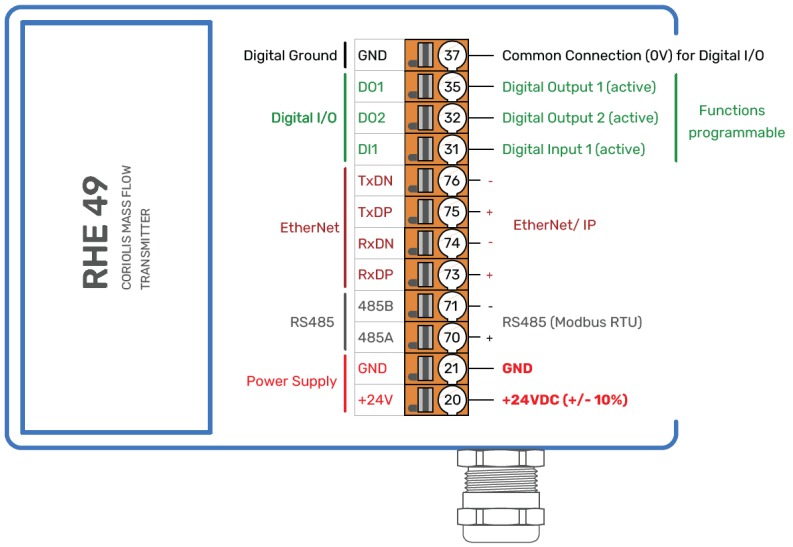
created / revised				
Date	16.03.2025	RHEONIK.	Wiring diagram RHE 49 RHE49-**D1-**1H-****_***	Project	
Drawn	H.G.Rudolph			Customer	
Appr.	M. Weber			Draw. - Rev.	E49W-E_D1_1H_Rev_1_1
				Sheet	1 / 1


Aluminium enclosure
RHE 49
CORIOLIS MASS FLOW
TRANSMITTER
Digital Ground
GND
Digital I/O
DO1
DO2
DI1
Modbus
TxDN
TxDP
RxDN
RxDP
RS485
485B
485A
Power Supply
GND
+24V
Common Connection (0V) for Digital I/O
Digital Output 1 (active)
Digital Output 2 (active)
Digital Input 1 (active)
Functions programmable
Modbus TCP/ IPv4
RS485 (Modbus RTU)
GND
+24VDC (+/- 10%)
37
35
32
31
76
75
74
73
71
70
21
20
Stainless steel enclosure
RHE 49
CORIOLIS MASS FLOW
TRANSMITTER
Digital Ground
GND
Digital I/O
DO1
DO2
DI1
Modbus TCP/ IPv4
TXDN
TXDP
RXDN
RXDP
RS485
485B
485A
Power Supply
GND
+24V
Do not change the installation under power
Wiring diagram RHE 49
RHE49-**D1-**EB-****_***
RHEONIK
created / revised
Date 16.03.2025
Drawn H.G.Rudolph
Appr. M. Weber
Project
Customer
Draw. - Rev. E49W-E_D1_EB_Rev_1_1
Sheet 1/1

Stainless steel enclosure

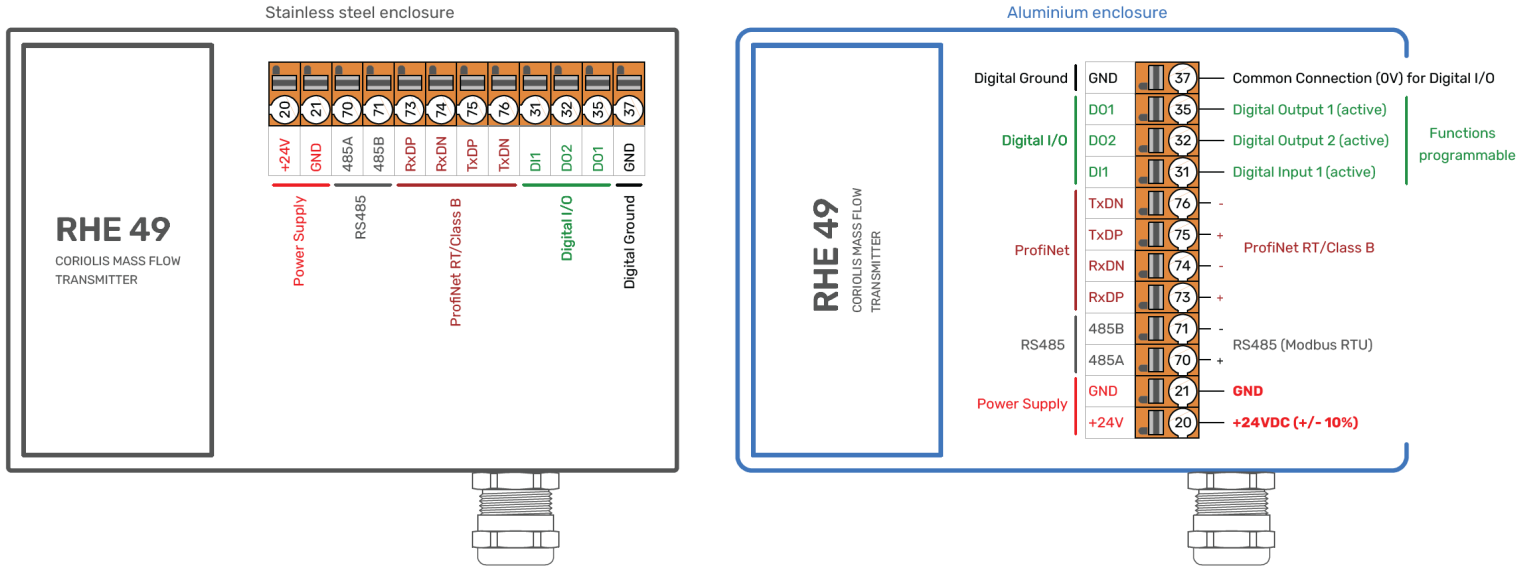


Aluminium enclosure



Do not change the installation under power

created / revised		RHEONIK.	Wiring diagram RHE 49 RHE49-**D1-**EN-****-***	Project	
Date	16.03.2025			Customer	
Drawn	H.G.Rudolph			Draw. - Rev.	E49W-E_D1_EN_Rev_1_1
Appr.	M. Weber			Sheet	1 / 1



Do not change the installation under power

created / revised	
Date	16.03.2025
Drawn	H.G.Rudolph
Appr.	M. Weber

RHEONIK.

Wiring diagram RHE 49

RHE49-**D1-**EP-****-***

Project	
Customer	
Draw. - Rev.	E49W-E_D1_EP_Rev_1_1
Sheet	1 / 1

Appendix B Ex-Safety Instructions

B.1 Safety instructions for the installation in a hazardous area:

- The measurement system shall be installed & maintained according to the applicable standards regarding electrical installations in hazardous areas.
- Before installation, carefully read the installation and operating manual of the RHEONIK Coriolis Flowmeter.
- The mounting, electrical installation, commissioning, and maintenance are to be carried out by qualified personal only who are trained in explosion protection.
- All national regulations concerning the installation, maintenance, and repair of instruments in explosion hazardous areas must be observed.
- Always close unused cable glands and openings with certified dummy plugs.
- When installed in the hazardous area the RHE49 must not be opened with any power connection alive or when hot.
- The USB interface must not be used in hazardous areas.
- In accordance with details indicated on the type label, the equipment may be used under conditions where ignitable atmospheres composed of a mixture of air and other gases, steam or dust are present. The equipment is not suitable for mines.
- The transmitter RHE49 is available for zone 2 and for div. 2. Refer to the type label of the RHE49 for the individual classification.
- Regarding the installation of the sensor RHM refer to the corresponding manual.
- Special conditions for CSA certified units:
  Warning: Do not open in an explosive atmosphere!
  Avertissement: Ne pas ouvrir en atmosphère explosive!
  On units with aluminum housing additionally:
  Warning: Potential electrostatic discharge hazard, see instruction!
  Avertissement: Risque potentiel de charge électrostatique, voir les instructions!


Read the manual before connecting or operating the unit!


Potentially hot surface (when hot liquids get measured)

B.2 System Description:

A Rheonik Coriolis mass flow meter system for hazardous areas consists of a mass flow sensor RHM and a transmitter RHE. The RHE49 is mounted directly on the RHM.

With order code A2 the combination of RHE49 and RHM may be mounted in zone 2. For the American market versions for div 2 are available.

Depending on the certification the transmitter RHE49 may be mounted in the following areas:

Code	Mountable in	Certified according / by
A2, AB	zone 2; safe area	ATEX, IECEx
C2, CB	zone 2; div 2; safe area	CSA, for USA and Canada
U2, UB	zone 2; safe area zone 2; div 2; safe area	ATEX, IECEx CSA, for USA and Canada

B.3 Electrical Safety Limits

Power supply and I/O:

Signal	Terminals	Type	Nominal Voltage	Um
DC supply	20 (+24V) + 21 (GND)	Supply	12 – 24V (±10%)	30V
Supply for analog out	50 (+24V) + 57 (GND)	Supply out	24V[1)]	30V
Digital Out	31+37, 32+37	Out	24V[2)]	30V
Analog Out	51+52	Passive Out	24V	30V
Digital In	35+37	In	24V	30V
RS485	70+71	Interface	70 to 71: ±3.3V	[3)]
Ethernet	73 … 76	Interface	±2.5V	30V[4)]
USB	(Connector)	Interface	3.3V	[5)]

1) Directly connected to terminal 20, (+24V supply input).
2) A short circuit to any voltage between 0V and 30V should be avoided but will not damage the output.
3) The counterpart must comply with the RS485 standard. The DC voltage must not exceed +12V / -5V referred to GND.
4) The interface is floating respect to GND. The line-to-line voltages must not exceed the maximum values specified for Ethernet.
5) The counterpart must comply with the USB standard. The applied voltages must not exceed +5V referred to GND. The USB interface must not be used in explosive atmospheres.

Applied voltages above the nominal voltage may damage the corresponding input.

B.4 Thermal Safety Limits

The RHE49 with Ex-code A2 or C2 have the temperature class T4.

If the fluid or gas temperature rises above 65°C, temperature class and maximum ambient temperature are limited by the RHM. See RHM manual.

The ambient temperature must under no circumstances exceed the limits specified in chapter B.10.

B.5 Grounding and Shielding

The RHE49 must be grounded.

The minimum cross section of the ground wire is 2.5mm². Wires with 2.5mm² can be connected via suitable ring crimps to the M4 screw type terminal.

Power supply and I/O circuits:

I/O and supply cables should be shielded when fed outside the control cabinet. When unshielded wires are used outside a building, dedicated surge suppressors must be used.

B.6 Installation

All cable entries are for fixed installation only. Cables must be clamped close to RHE49 to prevent pulling or twisting.

The standard versions have one cable gland M16 for cables with an outer diameter of 7mm to 10mm. Depending on the certification of the RHE49 diameters down to 5mm and up to 11mm are possible.

Units with connector M12 instead of the cable glands and the internal cage clamp terminals are available as well (not all certifications). In that case certified counterparts are required.

Special conditions for CSA certified units

RHE49 marked **Class I, Div. 2, Group A, B, C, D** and/or **Class I, Zone 2, A/Ex ec IIC T4 Gc**

1. Shall be installed in class I, Division 2 / Zone 2 location. No seal required.
2. Units with aluminum housing shall not be installed in a location where the external conditions can cause build-up of electrostatic charge on such surfaces. In addition, the enclosure shall only be cleaned with a damp cloth.

B.7 Electrical connection of power supply and I/O

For maintaining Um = 30V on power supply and I/O the installation must comply with at least one of the following points:

- The complete installation is an SELV or PELV system.
- All signals are isolated via an isolating transformer complying with the requirements of IEC 61558-2-6
- All connected apparatus comply with IEC61010-1, IEC 60950 or IEC 62368-1
- The complete installation is fed from cells or batteries.

General:

National and local standards regarding electrical installations must be observed.

For information regarding function and usage of the different I/O and supply circuits refer to the corresponding chapters of the main manual.

The USB interface must not be connected and used in hazardous areas.

The cage clamp terminals are located in the housing. For proper connections the following requirements must be fulfilled:

Conductor cross-section: 0.2 – 2.5mm²

Stripping length: 6 – 9mm

Stranded wires should be equipped with cable end sleeves.

The COT of the connection cable should be 80°C or higher.

Connection cables with COT below 80°C may be used if it can be assured that the temperature of the cable stays at least 5°C below the COT.

For units with connector M12 certified counterparts must be used.

Analog output:

When operating the 4 – 20 mA analog outputs with 24V DC, a minimum load resistance of 500 Ω shall be used for limiting the internal power dissipation. With 12V supply no dedicated output resistor is required.

B.8 Electrical connection to RHM

The RHE49 is connected to the RHM ex work and must not get disconnected.

B.9 Ordering Code

The following extract of the ordering code shows the information relevant for hazardous areas.

E49-EEPP-SSOO-HHCC-OOO

E49	RHE49	
EE	Housing Options	
	C1 = aluminum housing w/o Display	1)
	CD = aluminum housing with Display	2)
	S1 = stainless steel housing w/o Display	3)
PP	Power supply options	
	D1 = 12 to 24V DC	
SS	SW Options	
OO	I/O Configuration Options	
HH	Hazardous areas approvals	
	A2 = II 3G Ex ec IIC T4 Gc	
	AB = II 3G Ex ec IIB T4 Gc	
	C2 = Class I, Div. 2, Group A, B, C & D, T4 / II 3G Ex ec IIC T4 Gc	
	CB = Class I, Div. 2, Group C & D, T4 / II 3G Ex ec IIB T4 Gc	
	U2 = A2 + C2	
	UB = AB + CB	
CC	Measurement Certifications	
OOO	Special Options	

1) Requires option “J9” at the RHM
2) Requires option “J9” at the RHM, not available with Ex certification
3) Requires option “S9” at the RHM

Not all combinations are possible. For available combinations see datasheet or ask Rheonik.

Where no versions for the place holders are specified, these parameters are not relevant for the Ex-certification.

For the complete ordering code refer to the respective datasheets.

B.10 Technical Data

The following limits are valid for safe operation:

Electrical data:	Refer to chapter B.3 and to the information on the type label
Operating temperatures:	-20°C (optionally -40°C, see type label) to +65°C
Humidity:	10 to 95% relative humidity, non-condensing
Altitude:	up to 3000m, higher maximum altitude upon request
Pollution degree:	3
Installation category:	I
Installation:	Indoor and outdoor use

For the complete technical data refer to the chapter “Technical Data”.

B.11 Compliance

The RHE49 certified according to ATEX / IECEx comply with the following standards for hazardous areas:

IEC 60079-0
IEC 60079-7

The RHE49 certified by CSA comply with the following standards:

C22.2 No 61010-1 / UL 61010-1

C22.2 No 60079-0 / UL 60079-0

C22.2 No 60079-7 / UL 60079-7

C22.2 No 60529 / ANSI/ISA 60529

C22.2 No. 94.2

UL 50E

For the list of standards relevant for a certain unit and for the release date refer to the certificate.

B.12 Service and repair

The unit does not contain any user serviceable parts.

If the unit gets modified in any way, the Ex-certification gets void.

In case of malfunction connect your dealer or directly Rheonik Messtechnik GmbH

B.13 Contact address

Rheonik Messtechnik GmbH

Rudolf-Diesel-Str. 5

85235 Odelzhausen

Germany

www.rheonik.com

info@rheonik.com

About Rheonik

Rheonik has but one single purpose: to design and manufacture the very best Coriolis meters available.

Our research and engineering resources are dedicated to finding new and better ways to provide cost effective accurate mass flow solutions that provide value to our customers. Our manufacturing group care for each and every meter we produce from raw materials all the way to shipping, and our service and support group are available to help you specify, integrate, start-up and maintain every Rheonik meter you have in service. Whether you own just one meter or have hundreds, you will never be just another customer to us. You are our valued business partner.

Need a specific configuration for your plant? Don't compromise with a "standard" product from elsewhere that will add extra cost to your installation. If we can't configure it from our extensive and versatile product range, our exclusive **AnyPipeFit Commitment** can have your flow sensor customized with any size/type of process connection and face to face dimension you need.

No matter what control system you use as the backbone in your enterprise, with our **AnyInterface Commitment**, you can be sure that connection and communication will not be a problem. Alongside a wide variety of discrete analog and digital signal connections, we can also provide just about any network/bus interface available (for example: HART, ProfibusDP, ProfiNet, EtherCAT, PowerLink, EtherNet/IP, CAN, ….) with our RHE 40 Series family of transmitters. Rheonik RHE 40 Series transmitters can connect to your system – no headache and no conversion needed.

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Addendum to:

RHE21 User Manual – Doc. No. 8.2.1.04 Version 1.35
RHE28 User Manual – Doc. No. 8.2.1.07 Version 1.37
RHE49 User Manual – Doc. No. 8.2.1.36 Version 1.10

Additional information to chapter 3 for RHE21:

3.3 Cable glands

Note for devices in hazardous areas:
The pressure screw must be tightened so that the sealing insert is flush with its upper edge.
Do not exceed the maximum tightening torques (see Table 1).
Lower torques are possible, however.

CAUTION: It is essential to avoid excessive swelling of the sealing insert!

Cable gland (Size)	Maximum tightening torques pressure
Pflitsch bg216**HTex (M16)	8 Nm

*Table 1: Maximum tightening torques for the cable glands used by Rheonik. ** is used as a placeholder for the material.*

Additional information to chapter 3 for RHE28:

3.3 Cable glands

Note for devices in hazardous areas:
The pressure screw must be tightened so that the sealing insert is flush with its upper edge.
Do not exceed the maximum tightening torques (see Table 2).
Lower torques are possible, however.

CAUTION: It is essential to avoid excessive swelling of the sealing insert!

Cable gland (Size)	Maximum tightening torques pressure
Pflitsch bg216**HTex (M16)	8 Nm

*Table 2: Maximum tightening torques for the cable glands used by Rheonik. ** is used as a placeholder for the material.*

Additional information to chapter 6 for RHE49:

6.3 Cable glands

Note for devices in hazardous areas:
The pressure screw must be tightened so that the sealing insert is flush with its upper edge.
Do not exceed the maximum tightening torques (see Table 3).
Lower torques are possible, however.

CAUTION: It is essential to avoid excessive swelling of the sealing insert!

Cable gland (Size)	Maximum tightening torques pressure
Pflitsch bg220**HTex (M20)	10 Nm
Pflitsch bg216**HTex (M16)	8 Nm

*Table 3: Maximum tightening torques for the cable glands used by Rheonik. ** is used as a placeholder for the material.*