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RHE 46
CORIOLIS MASS FLOW
TRANSMITTER

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TRANSMITTER

RHE46
User Manual

GET FLOW MEASURED

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RHE 46
Transmitter

User Manual

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Foreword

This installation guide contains important information regarding how to install, start up, and safely operate the RHE46 Coriolis transmitter as intended together with an RHM Coriolis sensor. It supplements the information provided in the RHE 40 Desktop Reference. The RHE 40 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 RHE46 Coriolis transmitter in an impermissible manner

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Other applicable documents

The following documents contain additional information regarding how to operate the RHE46 Coriolis transmitter:

■   RHE 40 Desktop Reference (operation manual)

■   Tutorial RHEComPro (tutorial)

■   RHE20/40 Addendum PID Controller (operation manual)

■   RHE40 Addendum Data Logging (operation manual)

■   RHE40 Addendum Precision Flow Analysis (operation manual)

■   RHE40 Addendum Statistics (operation manual)

■   RHE16/20/40 Modbus Map (list of Modbus registers)

■   RHM Coriolis sensor (operation manual)

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

RHE46 User Manual – Doc. No. 8.2.1.34

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 RHE46 Coriolis transmitter as intended. Carefully read the information in this installation guide before starting any work with or on the RHE46 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 RHE46 Coriolis transmitter and must be stored such that it always remains accessible to personnel.

1.4 Declaration of conformity

The versions of the RHE46 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 RHE46 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 RHE46 Coriolis transmitter as intended. Carefully read the information in this installation guide before starting any work with or on the RHE46 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 RHE46 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 RHE46 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 RHE46 Coriolis transmitter.

Modifications, attachments and conversions

Any modifications to or attachments and conversions on the RHE46 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 RHE46 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 RHE46

The RHE46 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 RHE46 Coriolis transmitter is able to calculate variables such as the volume.

Only install and operate the RHE46 Coriolis transmitter in locations with the following ambient conditions:

■ Ambient temperature -20 to +65 °C
■ Relative humidity of 0 to 95% (non-condensing)
■ In shade, not exposed to direct sunlight
■ In non-hazardous areas – not in Zone 0, 1 or 2, respectively not in class 1, div 1 or 2

3.2　Impermissible use

The following are examples of impermissible use of the RHE46 Coriolis transmitter (i.e. use contrary to its intended use):

■ Using the RHE46 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

RHE46-RB (standard version)   **RHE46-RJ (version with RJ45 socket)**
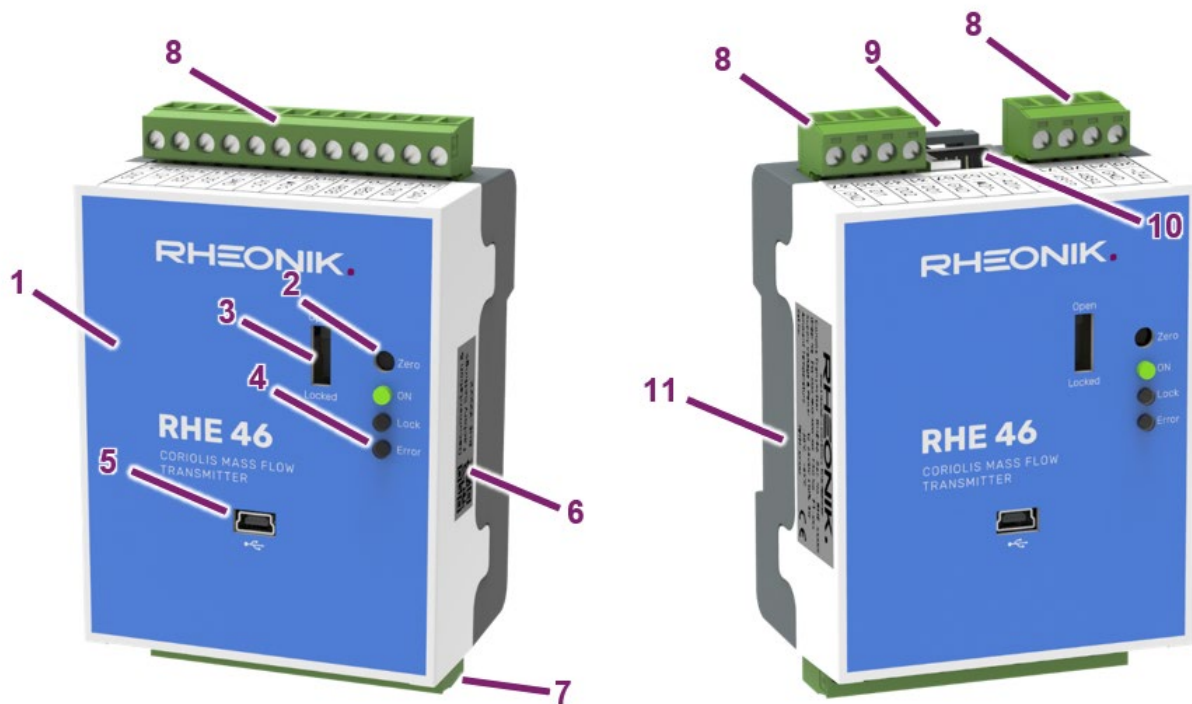
1   RHE46 Coriolis transmitter
2   Zero point calibration button
3   Hardware lock switch (functionality optional)
4   Status LEDs
5   Mini-USB port
6   QR code (download documentation)
7   Terminals for connection to RHM Coriolis sensor
8   Terminals for power supply, inputs, outputs and interfaces
9   DIN rail lock (top and bottom)
10 RJ45 socket for interfaces
11 Type label

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
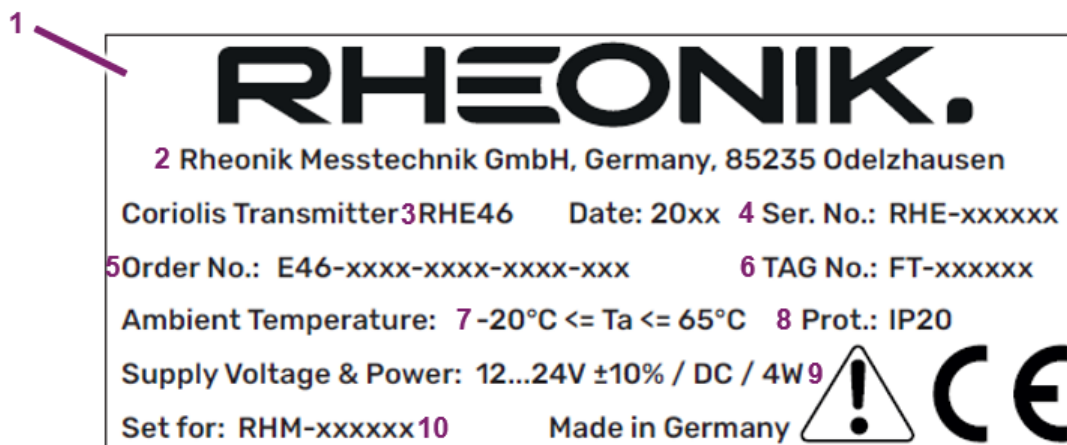
1 Type label
2 Manufacturer
3 Transmitter type
4 Serial number
5 Order code
6 TAG number
7 Permissible ambient temperature
8 Protection class
9 Permissible power supply
10 Serial number of corresponding RHM Coriolis sensor

5 Transportation, storage and check of delivery

Transportation

Always transport the RHE46 Coriolis transmitter in its original packaging.

Storage

Store the RHE46 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 -20 to +65°C

Check of delivery

1. → Check the packaging of the RHE46 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 RHE46 Coriolis transmitter

6.1 Mechanical installation

Mounting on the DIN rail

Open the DIN rail lock at the bottom (1). Place the RHE46 on top of the DIN rail (2) and press it down (2). Close the DIN rail lock (4) to fix the RHE46 on the DIN rail.
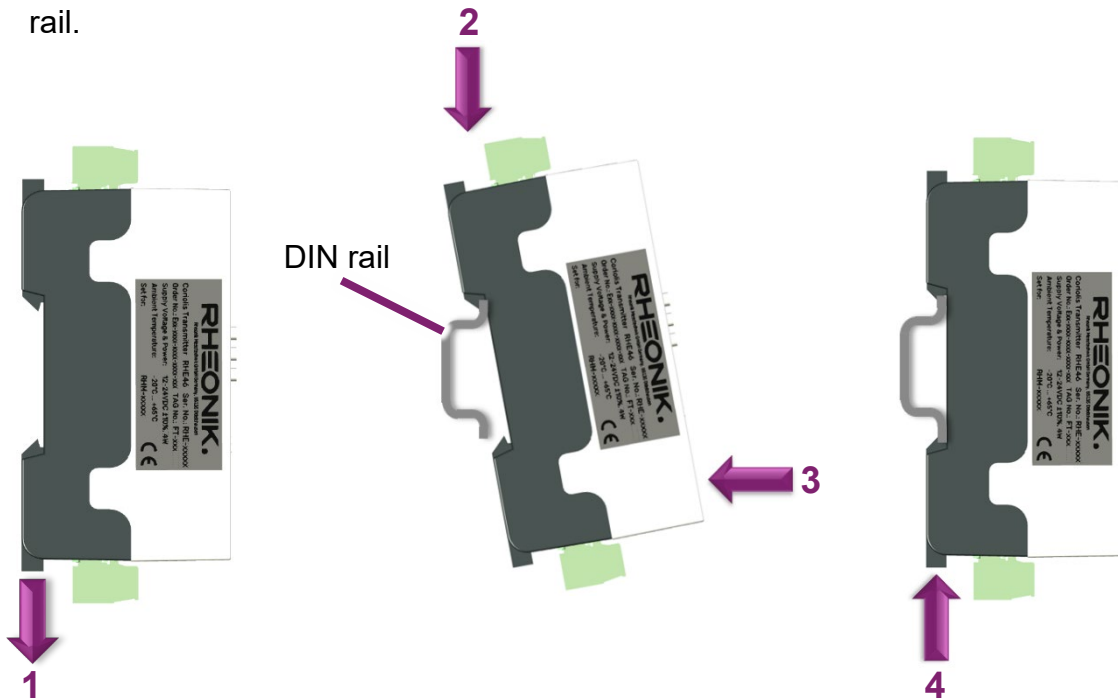
Dismounting from the DIN rail

Open the DIN rail lock (1), tilt the RHE46 forward (2) and lift it off the DIN rail (3).
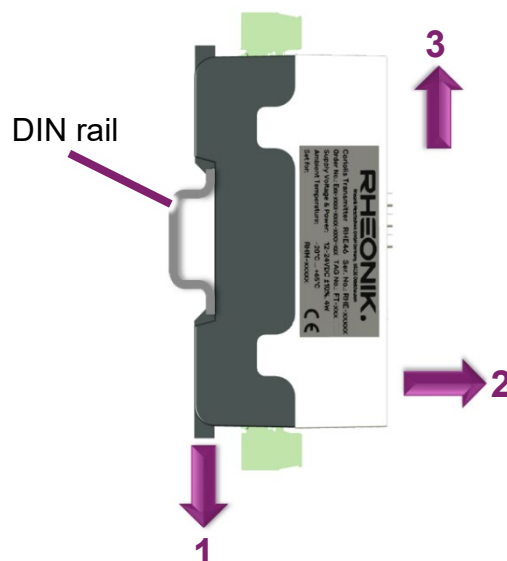
6.2 Electrical installation

6.2.1 Connecting the RHE46 Coriolis transmitter to the RHM Coriolis sensor

Wire the RHE Coriolis transmitter to the RHM Coriolis sensor according to the corresponding wiring diagram (QR code on the side of the RHE46), e.g.:

| 1 | Best protection against electromagnetic interference is achieved by connection of the cable screens to PE. For special cases with longer cables and small differences in earth potential between RHM and RHE installation the screens can be connected to PE_C. In case of substantial potential differences a potential equalization cable is mandatory. |
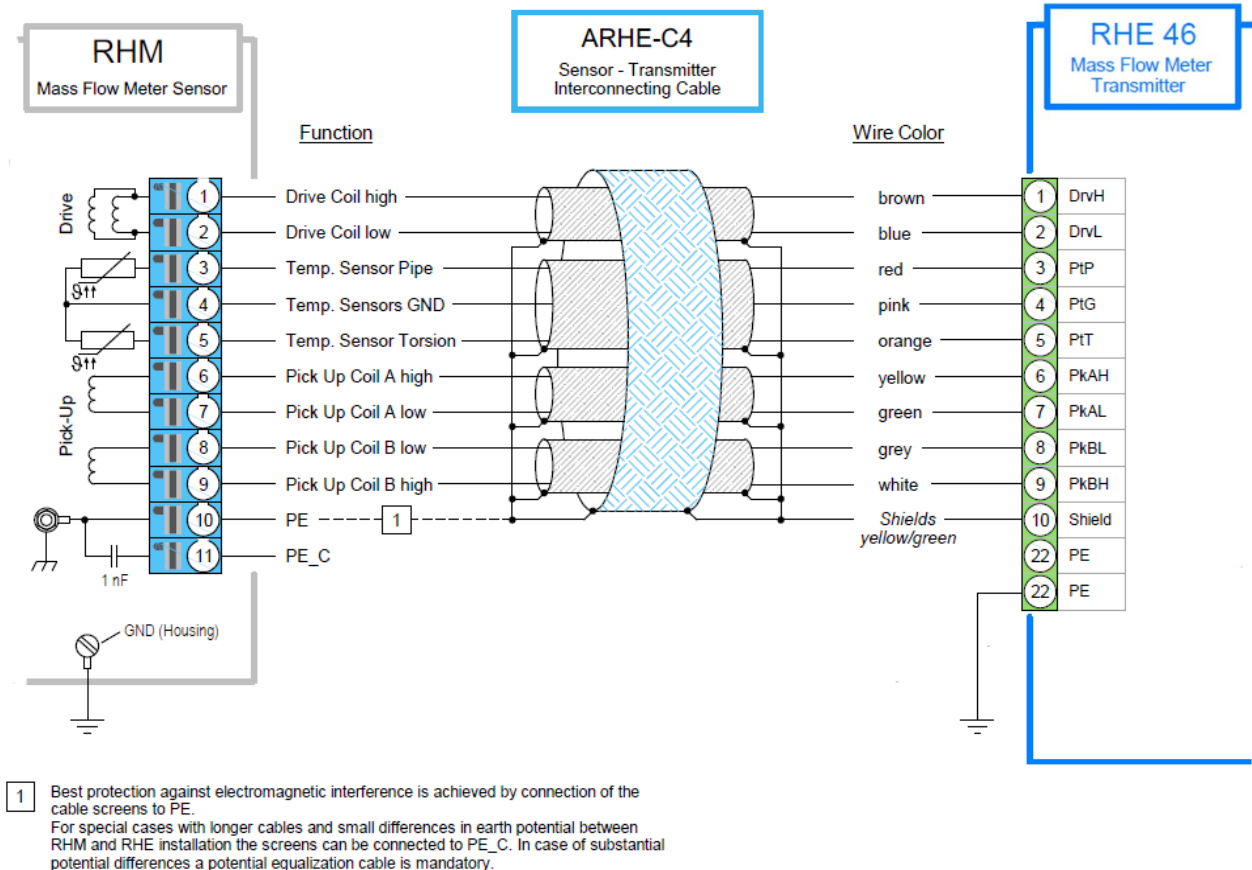
Make sure that you connect the associated RHM to the RHE. See type plate of the RHE for the serial number of the associated RHM at "Set for".

6.2.2 Connecting the power supply

The RHE46 Coriolis transmitter requires a regulated DC power supply of 12 to 24V ±10%. The power consumption is max. 4W.
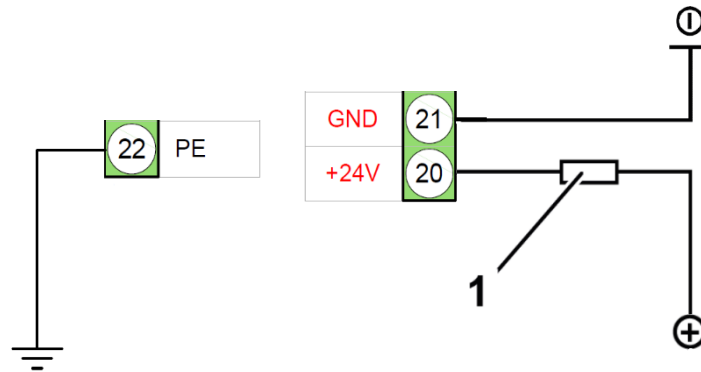
1	Fuse (suitable for the cable being used, max. 10 A)
20	+24 V connection
21	Ground connection
22	Connection for protective conductor

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 a protective conductor to a corresponding junction point and to the connection for the protective conductor (22).

6.2.3 Connecting the RS485 interface

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

For the wiring of the RS485 interface, please refer to the wiring diagram (QR code on the side of the RHE46).

The communication settings of the RS485 interface can be read and changed via the RHEComPro software, see section 8.

6.2.4 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 (QR code on the side of the RHE46).

Once the RHE46 Coriolis transmitter has been connected, it is assigned an IP address, which is required in order to connect the RHE46 Coriolis transmitter with your own network. The IP address can be read out using the RHEComPro software, see section 8.

6.2.5 Connecting the analog output

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 analogue outputs)
51	Connection for passive analogue output 1 (+)
52	Connection for passive analogue output 1 (-)
57	Ground connection (analogue outputs)
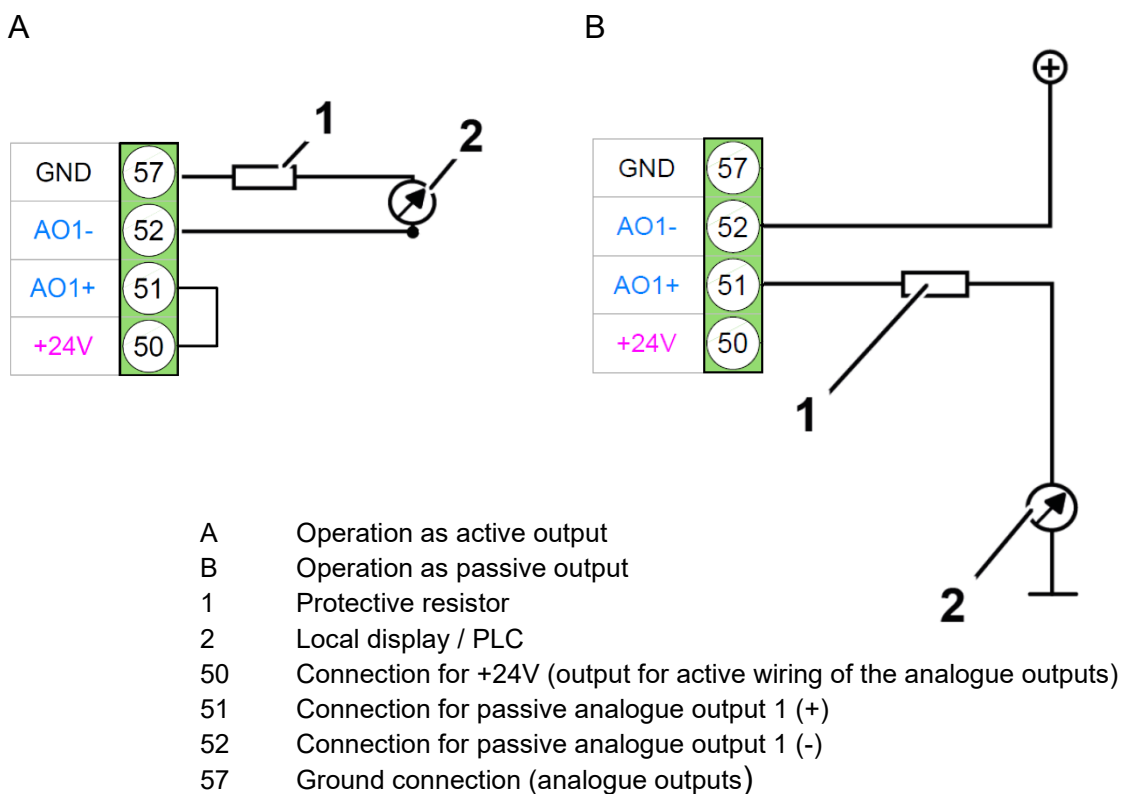
Active output configuration (A)

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.

6.2.6 Connecting the digital outputs
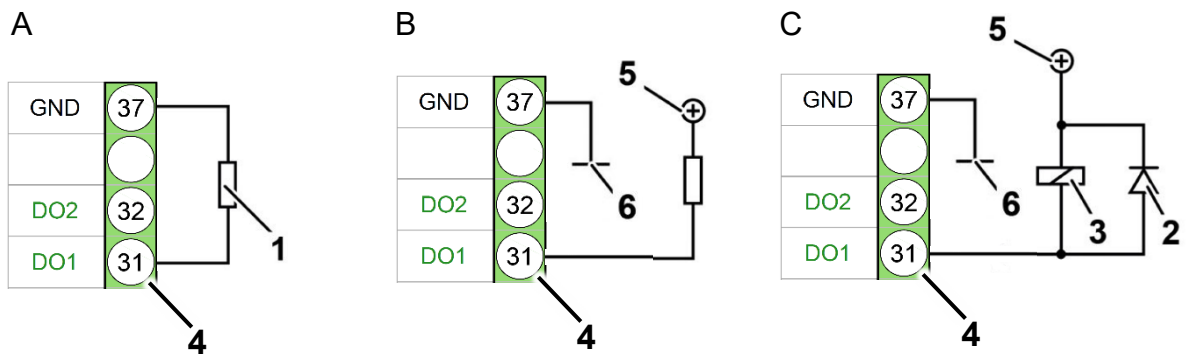
A	Load to ground (I_{max} 20mA)
B	Load to +24V (I_{max} 100mA)
C	Relay to +24V (I_{max} 100mA)
1	Load
2	Free-wheeling diode for relay (essential)
3	Relay
4	Connection terminal
5	+24V DC power supply
6	Ground
31	Connection for active digital output 1
32	Connection for active digital output 2
37	Ground 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 RHE46 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)).
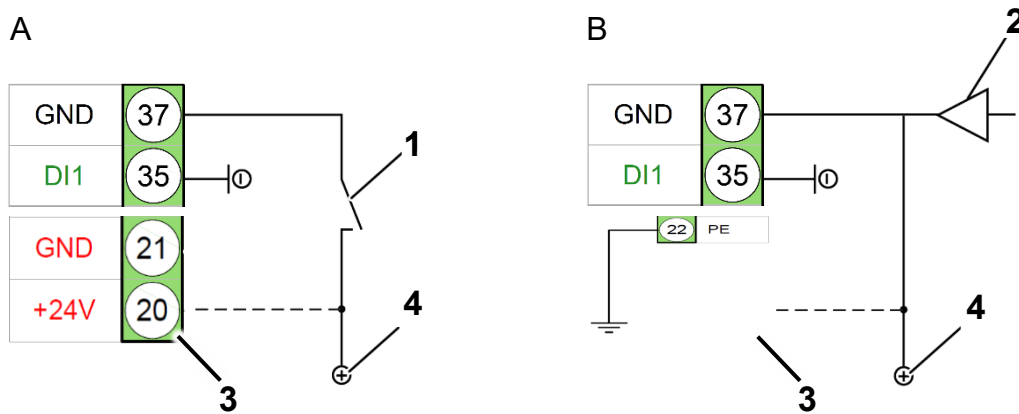
ⓘ If the power supply is being provided via the RHE46 Coriolis transmitter, do not connect the ground connection.

6.2.7 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 RHE46 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) when the ground of the driver (2) and the ground of RHE46 Coriolis transmitter are not connected via the power supply.

ⓘ If the power supply is being provided via the RHE46 Coriolis transmitter, do not connect the ground connection.

7 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 (see figure below) or the RHEComPro communications software.

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.

8 Configuration

The RHE46 Coriolis transmitter is 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
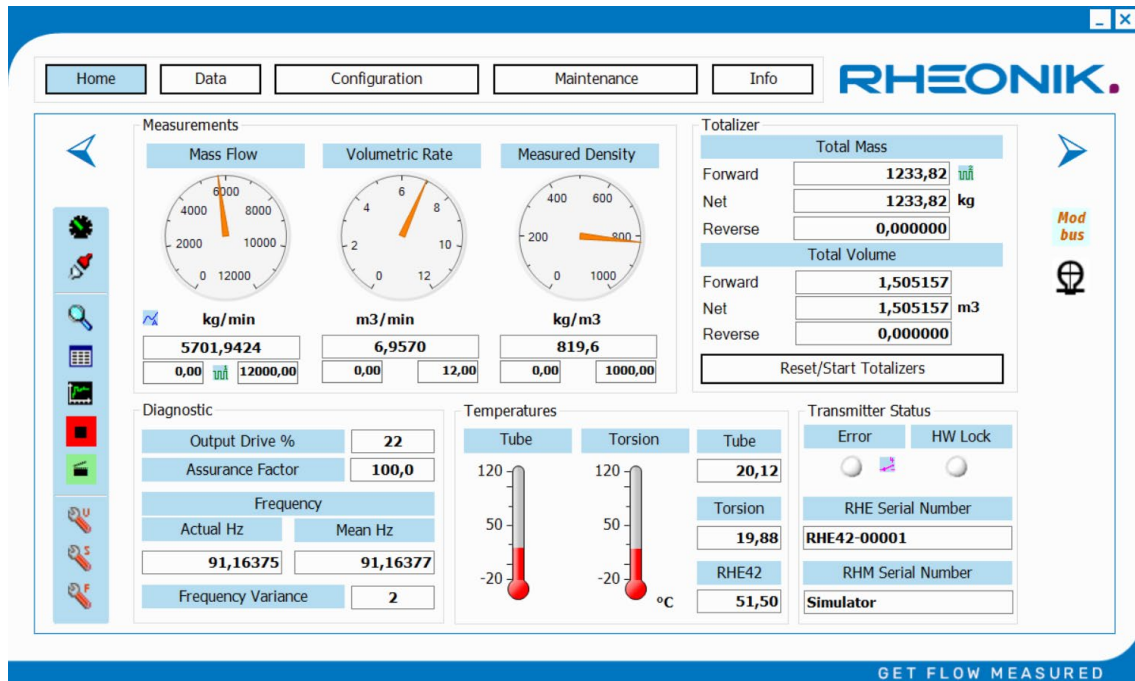
Please refer to the RHEComPro tutorial for more details on connecting the transmitter to your PC and using the software.

The RHE46 Coriolis transmitter can be connected to the PC and RHEComPro software via the mini-USB port on the front of the RHE46 or the RS485 interface at the top terminals.

9 Accessories

For the RHE46 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	

10 Order code

Construction Type

RB   DIN Rail Mount Version (IP20)

RJ   DIN Rail Mount Version (IP20), w/ RJ45 Socket / No 4-20 mA (S1) possible

   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   Base Configuration - 2 x DO (Pulse/Freq/Status), 1 x DI, RS485 (Modbus)

         EB   Base TCP Configuration - 2 x DO (Pulse/Freq/Status), 1 x DI, Modbus TCP / IPv4, RS485 (Modbus)

         EN   EtherNet/IP, 2 x DO (Pulse/Freq/Status), 1 x DI, RS485 (Modbus RTU)

         EP   Profinet, 2 x DO (Pulse/Freq/Status), 1 x DI, RS485 (Modbus RTU)

         S1   1 x 4/20mA (a/p), 2 x DO (Pulse/Freq/Status), 1 x DI, RS485 (Modbus)

            Hazardous Area Certifications

            NN   Without - RHM in ordinary locations or Zone 2 and RHE in ordinary locations

            Performance Certification

            NN   Without

               Options for RHE46

               NNN None / All standard

               NNH Hardware Lock Switch Function (included in CT, FR Software Function Package)

RHE46		D1	-			-			

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 RHE46 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 RHE46 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	Polycarbonate
Protection class	IP20 / Type 1
Ambient temperature	-20…65°C (-4…149°F)
Relative humidity	0 – 95% (non-condensing)
Dimensions	width x height x depth: 72.5 x 110.5 x 47.8 mm (2.86 x 4.35 x 1.89 in)
Power supply & power	12 - 24 V DC ±10%, max. 4W
Analog output (optional)	1 x 4-20mA output, active and passive, nominal voltage 24 V DC
Pulse/frequency/status outputs	2 x configurable pulse/frequency/status outputs acc. to IEC 60946, max. 10kHz, nominal voltage 24 V DC
Digital input	1 x configurable control input acc. to IEC 60946, nominal voltage 24 V DC
Digital data interfaces	Modbus RTU (standard) Modbus TCP/IPv4, EtherNet/IP, ProfiNet RT (optional)
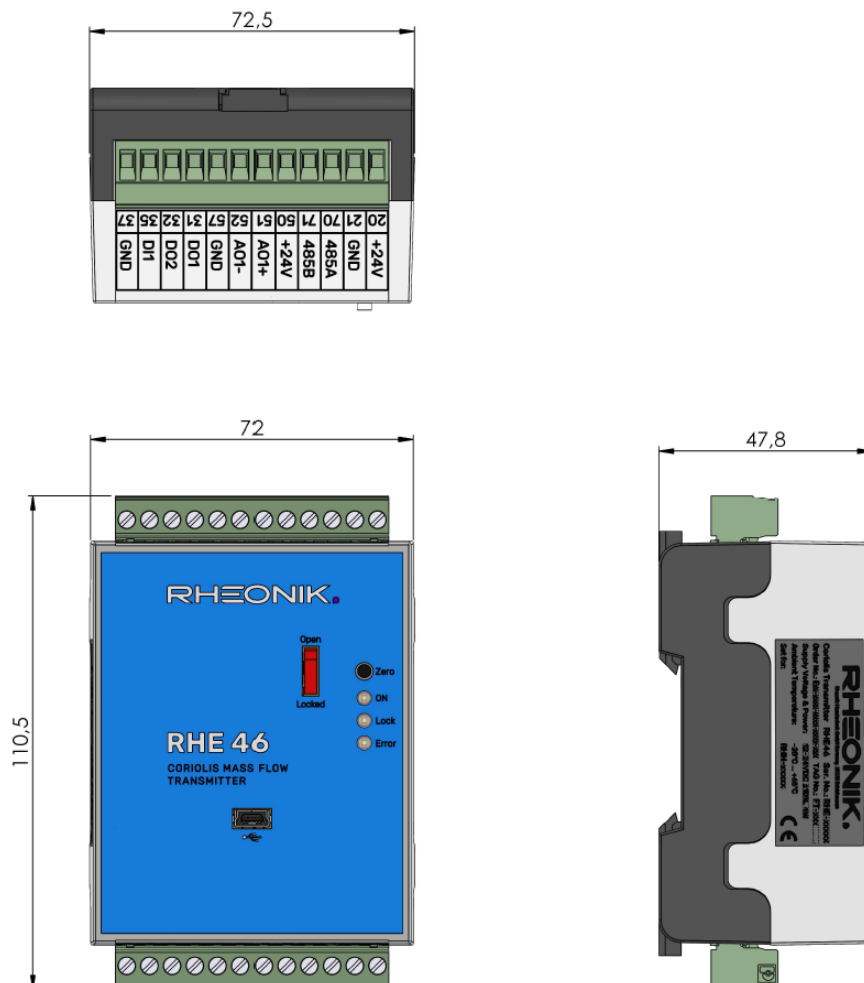
About Rheonik

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.