# RHEONIK.



# RHE 27
## Rack/Panel Mount Multifunction Mass Flow Transmitter

General process flow measurement / Batching and Mixing / Feed stocks and transfers / Custody transfer

# Features

- Rack/Panel Mounting
- Operate with RHM sensor in hazardous area
- Selectable Units for Mass, Volume, Density and Temperature
- Positive, negative and net totalizers for both volume and mass flow
- Two configurable pulse/frequency/status outputs – double pulse available
- Two analog outputs
- Two configurable digital status outputs
- Configurable digital input
- Analog input configurable for pressure or density
- Advanced functions: Net Oil, Baume/Brix, % Solids, Standard Density and Standard Volume (API MPMS Ch. 11)
- Modbus RTU and HART
- Custody transfer lockout switch and seal point
- Backlit Color LCD display and 3 operator buttons with intuitive menu design
- USB connection for PC running Rheonik RHECom software
- Built-in Assurance View® Advanced Diagnostic Set – clear publication of measurement status with Assurance Factor® and/or color changing display
- Password Protected Setup
- Upload and download of configuration files
- Power consumption less than 5 W
- Optional lockable front cover

# General Specification Overview

| | |
|---|---|
| **Enclosure Material** | IEC61554 panel mount housing, PPE/PS-G20. Lockable front cover available; IP20 (front IP54 with optional lockable cover) |
| **Ambient Temperature** | -20°C to +60°C / -4°F to +140°F |
| **Dimensions** | 96 x 144 x 61/75 mm (3.78 x 5.67 x 2.4/2.95 in) |
| **Display** | Backlit color LCD. Screen changes color to indicate warning or error |
| **Weight** | 0.55 kg (1.2 lb) |
| **Operation** | 3 x front panel operator buttons for all menu navigation and settings |
| **Sensor Connection** | Pluggable terminal strip. Cable available in lengths up to 100m for connection to remote sensor |
| **Analog Outputs** | Up to 2 x 4-20mA outputs, active / passive<br>Uncertainty of the analog output +/- 0.1% of reading, +/- 10µA |
| **Digital Outputs** | Up to 2 x configurable status outputs (IEC60946) |
| **Pulse/Freq/Status Outputs** | Up to 2 x configurable pulse / frequency / status (IEC 60946), max 10 kHz |
| **Digital Inputs** | Up to 2 x configurable control inputs (IEC60946) |
| **Digital Data Communications** | Modbus RTU (RS485); Connection to a PC (USB) with Rheonik RHECom software<br>HART over analog output (optional) |
| **Power Supply** | 100-240 VAC (48 to 62 Hz), 5W and/or 12-24 VDC +/- 10%, 4W |
| **Hazardous Area Approvals** | ATEX / IECEx, cCSAus for RHE27 in ordinary area, RHM in all zones - please see Part Number Code page. Others available on request |

# Hazardous Area Installation Overview

| Zone 0 | Zone 1 / Class I, Div. 1 | Ordinary Area |
|:---:|:---:|:---:|
|  |  |  |

Sensor and transmitter must have matching approvals

# Software Function Packages and Features

## Standard Operation Package (Part Number Code SO)

The RHE27 Standard Operation Package provides the following measurement and function features:

### Direct Mass Flow Measurement

Mass flow is calculated using the Coriolis principle to provide a high accuracy Mass Flow measurement of the fluid flowing through an Omega Tube Coriolis Meter.
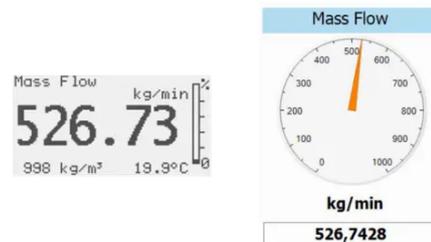


### Temperature Measurement

Each Omega Tube Coriolis Sensor provides a temperature measurement from built in sensors.
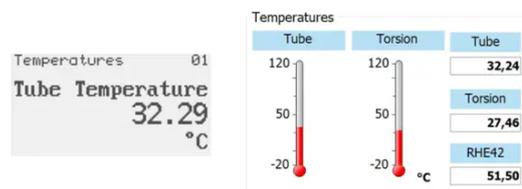


### Fixed and Calculated Density Function

The Fixed Density function allows to enter a fixed density value for volumetric flow calculations.

The Calculated Density function allows density to be generated based upon process temperature. A base/reference density at a known temperature is entered for the fluid being measured along with a coefficient describing the change in density per temperature unit. The firmware in the transmitter calculates flowing density based upon this information to use for volumetric flow calculations.
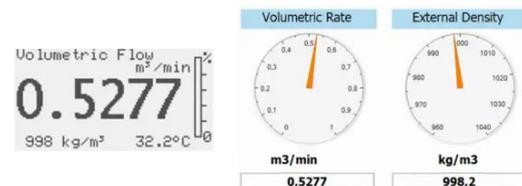


### Calculated Actual Volume Measurement for Liquids and Gas

Volume measurement is calculated by dividing direct mass flow measurement by the Fixed Density.
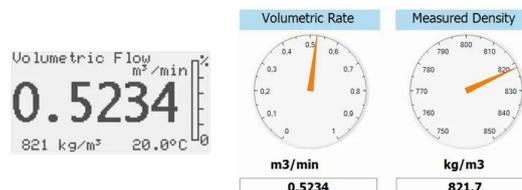


### Standardized/Normalized Volume Measurement for Gas

This function calculates the volume of gas passing through the meter at standard conditions. The density of the gas at standard conditions is entered into the transmitter and the volume is calculated using this in conjunction with the flowing mass.
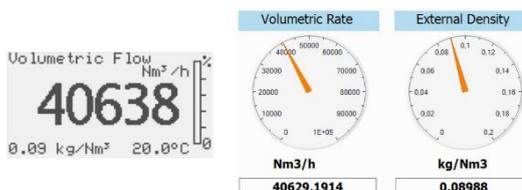
## Standard Package (Part Number Code SO) continue

### Password Protection

All setup and calibration parameters within the meter are protected with passwords to prevent unintentional or unauthorized change once installed.



### Batch Controller

The transmitter is equipped with an onboard batch controller that, in conjunction with external pumps and/or valves allows the precise delivery of a preset mass or volume of process fluid on demand. Operated from the instrument front panel, remotely via operator switches or through digital communication from a connected supervisory control system, the controller is configured to utilize either a one stage or a two stage delivery strategy in ensuring the right amount of fluid is batched through the meter. The electronics self-learns, adjusting shut off times as more and more batches are delivered to further refine the amount of delivery, saving material costs and improving quality.
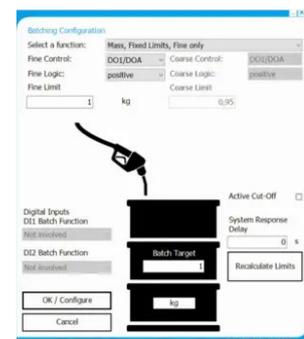


### Assurance View® Diagnostics

Inbuilt self-monitoring functions are available that can be used to determine the reliability of the flow meter readings at all times. Diagnostics are quickly accessed through dedicated menu displays, RHECom software and the MODBUS interface.



ASSURANCE
View ®
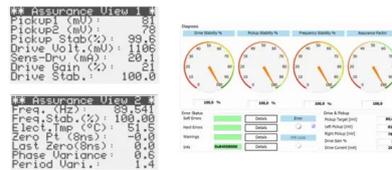
## Density Operation Package (Part Number Code DO)

The RHE27 Density Operation Package includes all features from the Standard Operation Package plus the following measurement and function features:

### Direct Density and Volume Measurement

The flowing density of the fluid in an Omega Tube Coriolis Sensor is determined from the measured resonant frequency of the sensor and used to calculate instantaneous volumetric flowrate.

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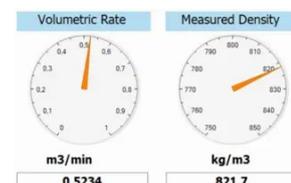
### Brix/Baume Units
The unit can be configured to read out in °Brix or Baume. °Brix or Baume are used extensively in the sugar and beverage industries.

$$\frac{°Brix}{°Bé}$$

## Assurance Factor Package with Assurance Diagnostics Suite (Part Number Code AF)
The RHE27 Assurance Factor Package includes all features from the Density Operation Package plus the following advanced diagnostic functions:

### Assurance Factor®
Assurance Factor® is a numeric value generated by an internal algorithm that indicates the overall health of the flow meter and measurement. Assurance Factor® value can be used to trigger changes in screen color when the optional display is fitted to the RHE27 (White – Amber – Blue – Red), providing highly visible wide area condition indication.

ASSURANCE
Factor®

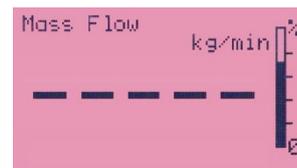| WHITE | AMBER | BLUE | RED |
|---|---|---|---|
| Normal Operation | Operation Not Optimal | Operation at Limit | Measurement Failure |
| No faults present. All parameters within expected limits. Meter fully operational | Sensor subject to noise / changing conditions in pipe. Measurement quality may be compromised | Sensor experiencing disturbance. Measurement quality compromised | Sensor experiencing extreme disturbance / meter in fault. Measurement offline |

## Oil and Gas Function Package (Part Number Code GV)

The Oil and Gas Function Package includes all features from the Assurance Factor Package plus the following advanced measurement applications:

### API Standard Density/Volume

When configured for this application, the transmitter will calculate density at standard conditions to API MPMS Chapter 11. All three product groups – crude oil, refined products and lubricants - can be metered using this built-in application. Precise calculation requires temperature and pressure inputs. Both inputs can be supplied through manual user menu entries or through Modbus updates to the transmitter or the internal tube temperature of the sensor. Volume flow and totalization at standard conditions are generated using the calculated standard density value.
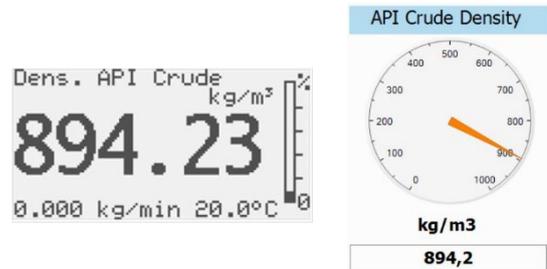


### Net Oil Calculation

Crude Oil is often mixture of oil and water and it is desirable to known the actual oil content. With this function, it is possible to calculate the net oil amount in a flowing stream using a live density measurement. The standard density (at standard temperature and pressure) of both the crude oil and the water/other portions of the stream must be provided as inputs for the calculation. These can be entered manually through the transmitter's user menu or digitally via Modbus.



### Percent Concentration Calculation

Percent concentration of a fluid in a mixture of two fluids (i.e. alcohol in water) or solids in liquid can be determined using the percent concentration function. With this function, the density of both components in the stream must be provided as inputs for the calculation. These values are entered manually through the transmitter's user menu or digitally via Modbus and should be updated as temperature conditions change to obtain the best performance.



Data View/Monitoring

| Address | Name | Value | Unit |
|---------|------|-------|------|
| 0x480C | VolPercentMainSubstance | 53,96152 | % |

## Custody Transfer Package (Part Number Code CT)

The Fluid Transfer or Custody Transfer Package includes everything from the Oil and Gas Function Package plus the following features:

### Precision Flow Analysis (PFA)

For fast fill applications down to 0.5s duration measurements, transmitter update time can be increased to 4ms. This allows a 250Hz totalizer update rate (50Hz is standard) to maintain very fast tracking of actual volume/mass delivered, and e.g. through the internal batch control function, results in a maximum signal delay of 10-20ms to a connected control valve once the batch set-point is reached. Depending upon the speed of operation of the fill valve, repeatable accuracies of better 1% are achievable for filling operations of 500ms duration and less.

### Hardware Lock Switch

For applications such as custody transfer where sealing is required. This switch, when engaged, prevents change of any setting within the transmitter through both the user panel interface and through a digital communications port. To accommodate some special customer needs the Lock Switch configured to leave a totalizer reset and/or a zero calibration possible.
Once the Lock Switch is set, a tamperproof seal can be applied to the transmitter case to indicate if the transmitter has not been opened since sealing.

UPDATE RATE 4ms

```
Quick Setup          Q02

Zero Now
  No entry!
* Custody Lock *
```
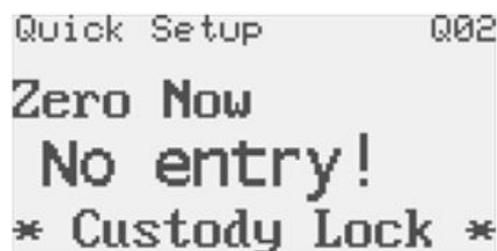
### Power Supply Options

The RHE27 can be configured with one of three power supply options:

- Universal AC Power - 100-240 VAC ±10%  (48 to 62 Hz) (Part Number Code A1)

- Wide Tolerance DC Power - 12-24 VDC ±10%, 4W (Part Number Code D1)

- Dual Supply - 100-240 VAC ±10%  (48 to 62 Hz) / 12-24 VDC ±10%, 4W (Part Number Code U1)
  This unique option provides inputs for simultaneous connection of both a universal AC and separate DC supply. The transmitter utilizes AC power when available but will switch to the DC supply in the event of AC power outage. The DC supply can be a battery source. As an example, an RHE27 transmitter and connected sensor will operate for 10 days or more on a typical automobile battery.

# Program Package Function Summary

| Feature | Program Package Code | | | | |
|---|---|---|---|---|---|
| | SO | DO | AF | GV | CT |
| Live Mass Flow Measurement | X | X | X | X | X |
| Live Temperature Measurement | X | X | X | X | X |
| Inferred Density by Reference Density and Temp. | X | X | X | X | X |
| Fixed or Norm Density Value (e.g. kg/Nm³) | X | X | X | X | X |
| Volumetric Flow from Inferred/ Fixed/Norm Density | X | X | X | X | X |
| Standardized Gas Volume Calculation | X | X | X | X | X |
| Resettable Mass / Volume Totalizers | X | X | X | X | X |
| Non-Resettable Mass / Volume Totalizers | X | X | X | X | X |
| Single and Two Stage Batch Control | X | X | X | X | X |
| Self Learning Batch Control | X | X | X | X | X |
| Assurance View® Diagnostics | X | X | X | X | X |
| Setup/Configuration Password Protection | X | X | X | X | X |
| Live Density Measurement | | X | X | X | X |
| Volume using Mass and Measured Density | | X | X | X | X |
| Brix / Baume Units | | X | X | X | X |
| Assurance Factor® Calculation and Diagnostics | | | X | X | X |
| PID Controller for Analog Output (e.g. Pump, Valve) | | | X | X | X |
| Partly Filled Pipe Management | | | X | X | X |
| API Standard Density/Volume | | | | X | X |
| Net Oil Calculation | | | | X | X |
| Concentration/Percent Substance Calculation | | | | X | X |
| Hardware Lock Switch | | | | | X |

# RHECom Software

The RHE27 transmitter is a fully featured device with many sophisticated functions and configuration is necessary for proper performance of these functions. RHECom software is available in three versions – Free, Pro and Pro+.

RHEComFree is available for download at no extra cost or on USB flash drive. RHEComFree allows full setup of transmitter parameters and includes a useful datalogging function for monitoring performance of the meter.
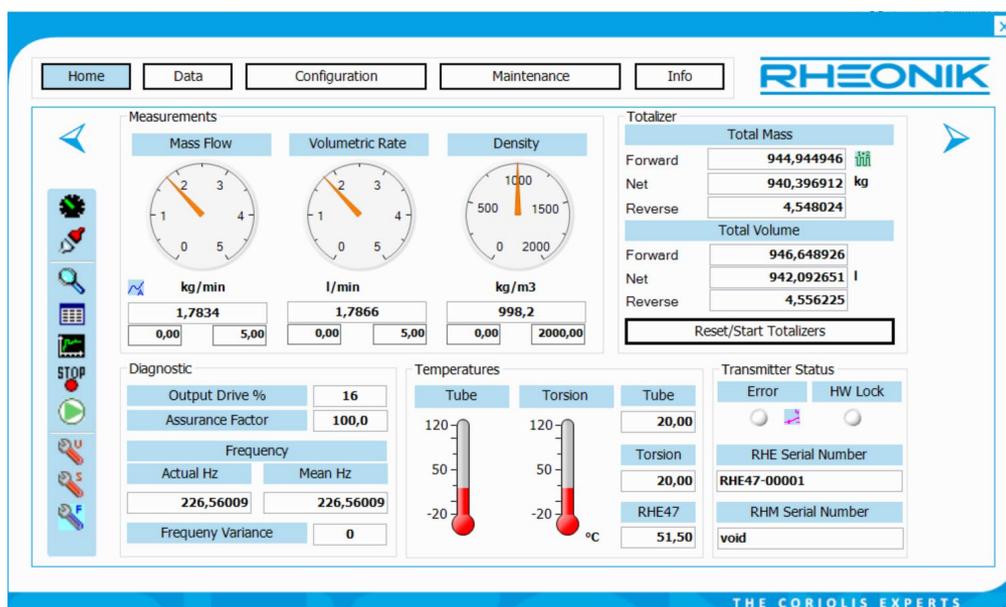


For a small one-time license fee, RHEComPro and RHEComPro+ offer additional insight and setup convenience menus. RHEComPro includes data logging, trending and broad diagnostic capabilities.

RHEComPro+ takes flow meter management one step further with a revolutionary fully functioning simulator application. With the simulator, you can trial run your application from the convenience of your office, adjusting transmitter settings, setting alarms and filters, and creating transmitter configuration files for upload into the actual unit. The simulator is also ideal for training - it exactly mimics the front panel of the instrument display and buttons when clicked and includes controls for adjusting flow, density and temperature readings just like the unit was in line!
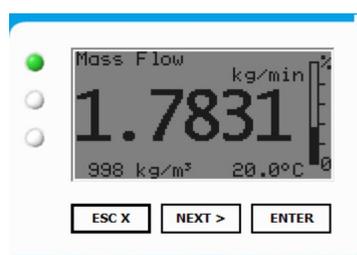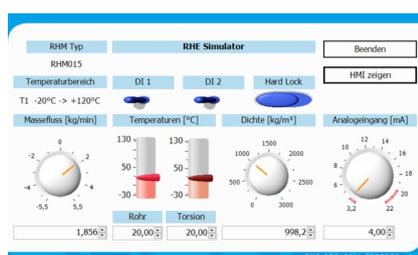


RHECom software is designed to ensure simple and expedient setup of Rheonik transmitter features and functions – a real time saver and a valuable tool.
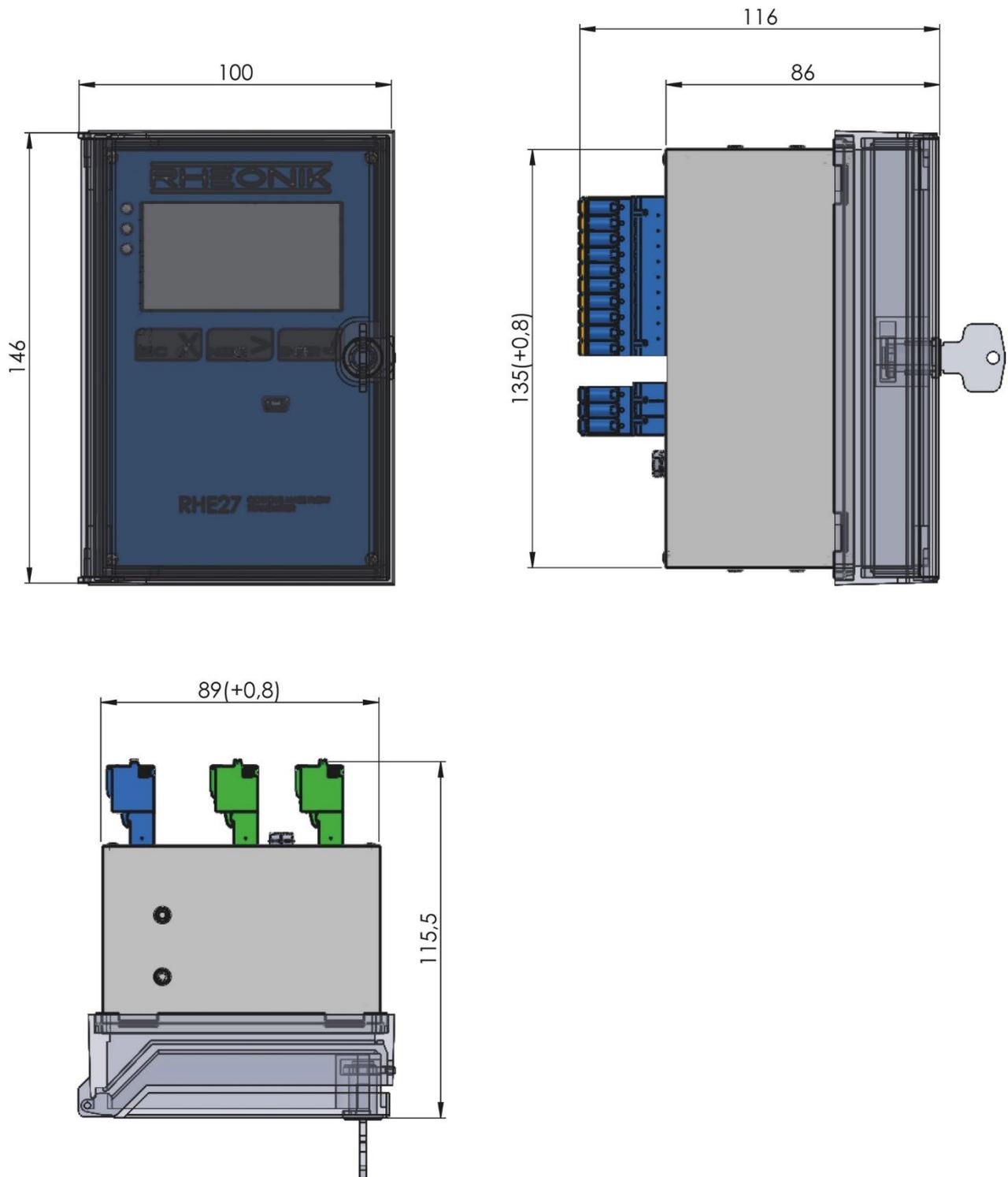
# Mechanical Construction

## RHE27 Dimensions Type E1

96

144

62,4

135(+0,8)

91

89(+0,8)
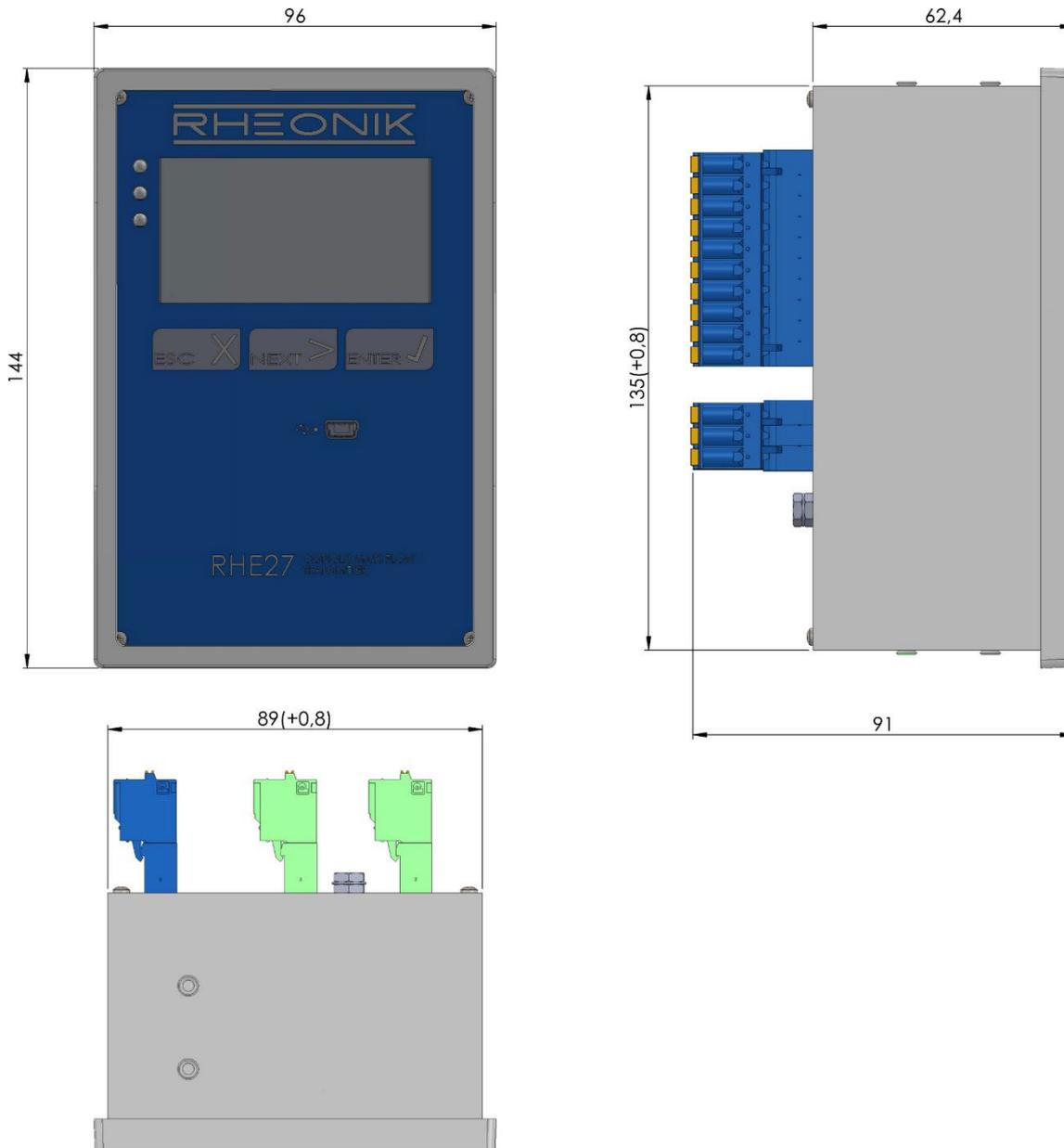
All dimensions in mm

# Mechanical Construction

## RHE27 Dimensions Type E2



All dimensions in mm

# Transmitter Range

Any Rheonik Mass Flow Transmitter model can be combined with any Rheonik Mass Flow Sensor to provide an overall mass flow measurement system to suit any requirement. Rheonik Coriolis Transmitters are available in versions specifically designed for process, industrial and OEM applications. Economical blind front versions of some transmitters are available where displays and keypads are not required. The wide range of sensors and transmitters provide tremendous options for system designers and end users alike.
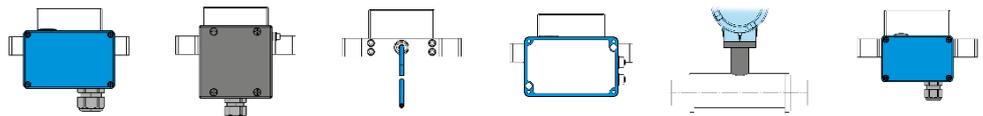
| Product Code | JM | SM | TM | J5 | C2 | PM |
|---|---|---|---|---|---|---|
| RHE 21 | ✓ | ✓ | ✓ | – | – | ✓ |
| RHE 26 | ✓ | ✓ | ✓ | – | – | ✓ |
| RHE 27 | ✓ | ✓ | ✓ | – | – | ✓ |
| RHE 28 | ✓ | ✓ | ✓ | – | – | ✓ |
| RHE 42 | ✓ | ✓ | ✓ | – | ✓ | ✓ |
| RHE 45 | – | – | – | ✓ | – | – |

# RHE 27 Part Number Code

**Construction Type**

E1 Standard Version Panel Mount (IP20)

E2 Panel Mount with Lock/Cover (IP20 / IP54 front)

    **Supply Voltage**

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

    A1 100 to 240 VAC (48 to 62 Hz)

    U1 12 to 24 VDC (+/- 10%) and/or 100 to 240 VAC (48 to 62 Hz)

        **Software Function Package**

        SO Standard OP system - mass flow, normalized density / volume

        DO Enhanced OP system - mass flow, measured density / volume - requires RHM density calib.

        AF Enhanced OP system plus Assurance Factor® Function (AF)

        GV Enhanced OP system plus AF and API std. Vol. and Net Oil (add CH for all functions)

        CT Enhanced OP system as GV plus hardware lock switch function

            **I/O Configuration**

            S1 Standard One - 1*4/20mA (a/p), 2*DO (Pulse/Freq/Status), 1*DI, RS485 (Modbus)

            S2 Standard Two - 2*4/20mA (a/p), 2*Pulse/Freq, 2*DO, 2*DI, RS485 (Modbus)

            SH HART - as Standard Two plus HART

            CH Premium - as Standard Two plus HART and analogue input

                **Hazardous Area Certifications (details see page 16)**

                NN Without

                AS ATEX/IECEx approval Ex II (1)G [Ex ia Ga] IIC - RHE in ordinary locations

                CS cCSAus Class I, Associated Equipment [Ex ia Ga] - RHE in ordinary locations

                    **Performance Certification**

                    NN Without

                    MH OIML R137 approval incl. special labelling and docu. - only with E2* and hardware lock switch function

                    R9 OIML R139 approval incl. special labelling and docu. - only with E2* and hardware lock switch function

                        **Options for RHE27**

                        NNN None / all standard

                      NNH Hardware lock switch function (included in CT Software Package)

RHE27 ☐☐ - ☐☐ - ☐☐☐

# Options and Accessories

| Part Number | Description |
|---|---|
| ORHE-SI | Pre-setting of pulse, analog outputs according to setting instructions. |
| ARHE27-TN | Terminal Adapter Set for I/Os and Power (spare part for RHE without Ex approval) |
| ARHE27-TA | Terminal Adapter Set for I/Os and Power (spare part for RHE with Ex approval) |

# General Options

| Part Number | Description |
|---|---|
| ARHE-C4 | Standard sensor cable, halogen free, -50 to +105°C, 9 wires - not for RHE16 |
| ARHE-C6 | Steel armoured sensor cable, halogen free, -50 to +105°C, 9 wires - not for RHE16 |
| ARHE-P3 | 3m pre-assembled C4 cable (cable ends ready for connection terminals) - not for RHE16 |
| ARHE-P0 | 10m pre-assembled C4 cable (cable ends ready for connection terminals) - not for RHE16 |
| ARHE-RS | 5m PC cable (Mini USB to PC USB) - to connect PC / RHECom PC software for RHE16/2x/4x |
| ARHE-SO | USB flash drive with PC software RHEComFree, operation manual, calibration certificate(s), csv configuration file(s). One USB drive per order is sufficient. For RHE16/2X/4X |
| ARHE-PW | DIN Rail Power Supply Module 85 to 250 V to 24 VDC / 15 W (Non Ex) for RHE16/26/27/42 |
| ARHE-MO | Modbus RS485 terminals to PC USB Converter for RHE16/2X/4X |
| ARHE-PR | PC Software RHEComPRO license key (upgrade for two years are included) |
| ARHE-PP | PC Software RHEComPRO+ license key (upgrade for two years are included) |
| ORHE-TP | Plate with TAG number in Stainless Steel (other labelling standard) |
| ORHE-TP-C | Complete labelling (type information, TAG, Ex label) in Stainless Steel |
| MAN- | Additional RHE manual printout |

# Hazardous Area Certifications

| Code | Zone / Division | Approval | Labeling |
|------|-----------------|----------|----------|
| AS | safe area | ATEX | ⟨Ex⟩ II (1)G [Ex ia Ga] IIC |
| AS | safe area | IECEx | [Ex ia Ga] IIC |
| CS | safe area | USA | [Ex ia] |
| CS | safe area | Kanada | [Ex ia Ga] IIC |

## 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.