

# Technical Information

## EngyCal RS33

Steam calculator for recording and billing the steam mass and energy flow in applications with saturated or superheated steam



Transparent energy consumption generates energy cost savings

### Applications

Recording and billing energy quantities in steam applications. Typical applications include:

- Food industry
- Chemical industry
- Pharmaceutical industry
- Power plants
- Building technology and plant construction.

### Your benefits

- Compensation of differential pressure flow measurement
- Swift commissioning and easy operation with plain text in language of your choice
- Remote readout via Ethernet and fieldbuses
- Calculation in accordance with international steam tables
- Integrated data logging
- Tariff counter for requirements-based billing
- Standard models are suitable for connecting and supplying all common flow transmitters, temperature sensors and pressure sensors
- Deficit counter for transparency in case of error or alarm
- Detailed data logging of instantaneous values and counter values and of error messages, limit value violations and changes in operating parameters
- Industry-compliant compact housing for field or wall mounting, panel mounting or DIN rail mounting
- Electronic alignment of temperature sensor (sensor-transmitter matching) with the arithmetic unit enables high-accuracy temperature measurement

## Function and system design

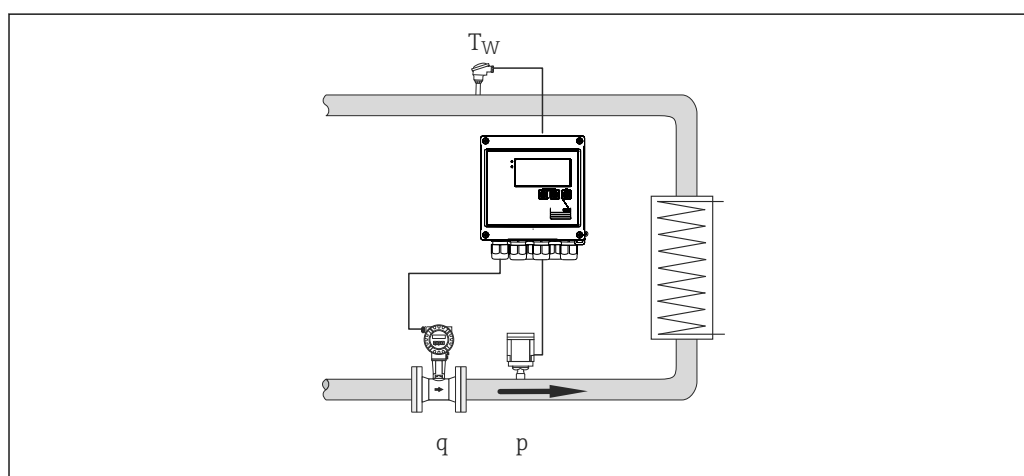
### Measuring principle

The EngyCal RS33 steam calculator is used to record steam mass and energy flow in systems with saturated or superheated steam. The calculation is based on the process values measured for volume flow, temperature and/or pressure. Depending on the installation position of the measuring devices, the heat quantity can be determined using different calculation methods. The standard heat quantity calculation can be used as well as a steam heat difference measurement. If steam heat difference measurement is used, attention must be paid to the installation position of the measuring devices.

The measured and calculated values can be output via Ethernet, fieldbuses or as an analog signal. The counters are easy to install and read. Thanks to its proven longterm stability and high-precision measurements, the device helps to optimize processes and control costs within the process. Comprehensive data analysis options in the Field Data Manager software MS20 (see accessories) identify potential areas for cost reduction.

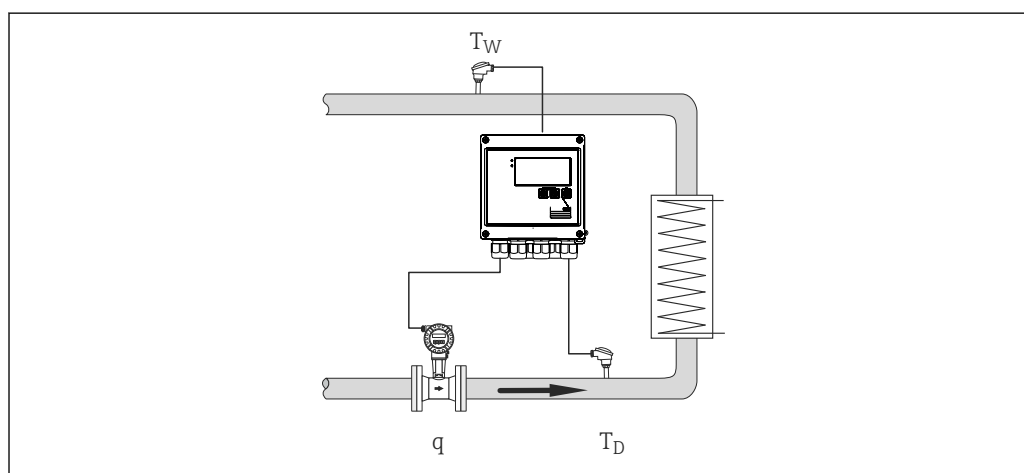
### Measuring system

Design of different applications such as heat quantity or heat differential with the steam calculator



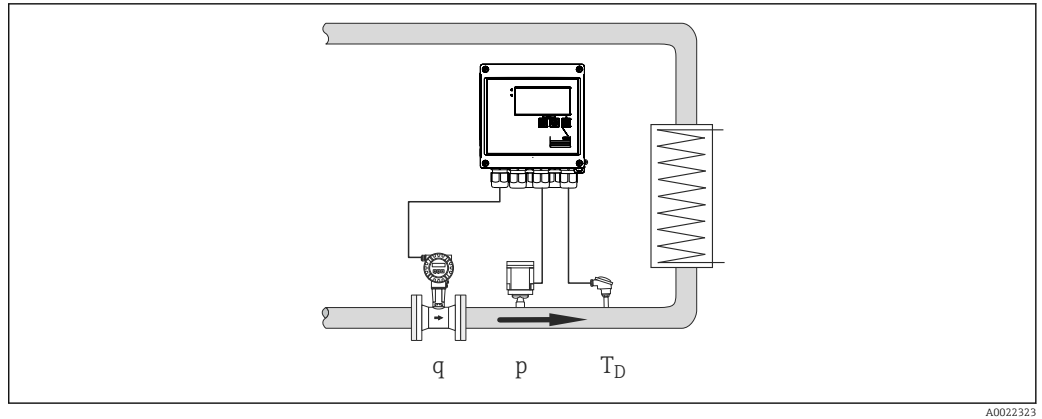
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1 Heat differential/p



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2 Heat differential/T



3 Heat quantity or heat differential/ $p+T$

### Energy calculation

The EngyCal RS33 uses the IAPWS IF97 standard to calculate the mass flow and energy flow of steam. Here, the input variables pressure and temperature are used to calculate the density and enthalpy of steam.

Calculated values:

- Power
- Volume
- Mass
- Density
- Enthalpy
- DP flow compensation

### Counters

Volume, mass, energy, deficit

Optional: Tariff1, Tariff2

### Fault mode / deficit counter

The EngyCal has a user-definable fault mode (no further calculation or calculation with error value). With its defined fault mode and separate deficit counter, the device guarantees transparent energy calculation and billing documentation. If calculation continues with an error value, the total energy calculated during the error condition (e.g. cable open circuit) is recorded on a deficit counter.

In this case, the output continues to supply the calculated energy value. If values are communicated via buses, they are assigned the value "invalid". An alarm relay can be switched if desired.

### Temperature-sensor-matching in the device

The pairing of temperature sensors takes place internally in the EngyCal by using Callendar-van-Dusen coefficients to store the sensor characteristics. The Callendar-van-Dusen coefficients are determined by calibrating the temperature sensor.

Internal adjustment enables the use of non-paired sensors and also allows one sensor to be replaced independently of the second sensor, while maintaining or increasing accuracy (compared to using paired sensors).

### Compensation of differential pressure flow measurement

The calculation of flow based on the differential pressure method is a special form of flow measurement. Volume or mass flow values measured according to the DP method require a specific correction. By iteratively solving the equations listed there, the best possible accuracies (approx. 0.6 – 1 %) for DP flow measurements can be achieved.

Compensation of flow measurement for throttle methods (orifice plate, nozzle).

The measurement (orifice plate, nozzle, Venturi pipe) is performed in accordance with ISO5167. Flow measurement based on the dynamic pressure method uses the interrelation between differential pressure and flow.

### Data logging and logbook

Event log:

The EngyCal RH33 BTU meter has a logbook for measured values and a logbook for events.

All parameter changes, limit value violations, alarms and other events are recorded with a timestamp in the event logbook in such a way that they are tamper-proof. At minimum, the last 1600 events are stored in non-volatile memory.

The measured value memory enables process values and calculated values, as well as counters, to be saved at freely definable intervals. Predefined analyses (day month, year, billing dates) support the transparency of the process flow and ensure a quick overview of consumption values.

All entries in the event logbook, along with the data in the measured value memory, can be read out automatically using the visualization software (Field Data Manager software) and backed up in an SQL database in such a way that they are tamper-proof.

For fast and easy analysis in case of service, an internal diagnostic memory is also available with the error messages that have occurred.

| Analysis                | No. of analyses                                      |
|-------------------------|------------------------------------------------------|
| Interval                | Approx. 875                                          |
| Day                     | 260 days                                             |
| Month/year/billing date | 17 years                                             |
| Events                  | ≥ 1600 (depending on the length of the message text) |

#### Wet steam alarm

If steam condenses, reliable and accurate calculation of the energy quantity is no longer guaranteed. The wet steam alarm indicates the condensation of steam. The aggregate state can be determined on the basis of pressure and temperature. This is required in order to trigger the wet steam alarm.

#### Limit value monitoring

Three limit values can be freely assigned to the following measured and calculated values: volume flow, temperature, pressure, mass flow, power (heat flow), density, enthalpy, operating volume as well as heat and tariff 1, tariff 2

If the defined limit values are violated, an entry is made in the event logbook. In addition, relays can be switched, and the limit value violation can be indicated on the display. Limit values are also available via the integrated web server.

#### Tariff counter (optional)

The tariff counters enable the analysis and recording of energy on an additional counter.

There are two tariff counters available. A specified tariff can be activated via an event or via the digital inputs. If the specified event occurs, the energy calculated is counted at this tariff.

Tariff counters enable, for example, invoicing on specific billing dates (due date invoicing), requirements-based billing (daytime/nighttime tariff), as well as the analysis of counters when limit values are reached.

Various tariff models are available for selection in the device, e.g. energy, power, time...

The standard counters continue running at the same time, i.e. they are not affected by the activation of the tariff counters.

#### Real time clock (RTC)

The device has a real-time clock, which can be synchronized via a free digital input or using the Field Data Manager software MS20.

The real-time clock continues running even in the event of a power outage; the device documents power on and off; the clock switches either automatically or manually from daylight saving to standard time.

#### Display

To display measured values, counters and calculated values, six groups are available. Each group can be assigned up to 3 values or counter readings as desired.

#### Analyzing the stored data– Field Data Manager software MS20

The Field Data Manager software allows the saved measured values, alarms and events, as well as the device configuration to be read out from the device (automatically) and backed up securely in an SQL database in such a way that they are tamper-proof. The software offers centralized data management with a variety of visualization functions. Using an integrated system service, analyses and reports can be compiled, printed and saved fully automatically. Security is guaranteed by the FDA-compliant audit trail of the software and by the extensive user management functionality. Simultaneous access to and analysis of data from different workstations or different users is supported (client-server architecture).

## Communication interfaces

A USB interface (with CDI protocol) and optional Ethernet, are used to configure the device and read out the values. ModBus and M-Bus are optionally available as communication interfaces.

None of the interfaces has a modifying effect on the device in accordance with PTB Requirement PTBA 50.1.

|                   |                    |                                 |
|-------------------|--------------------|---------------------------------|
| <b>USB device</b> | Terminal:          | Type B socket                   |
|                   | Specification:     | USB 2.0                         |
|                   | Speed:             | "Full Speed" (max. 12 MBit/sec) |
|                   | Max. cable length: | 3 m (9.8 ft)                    |

### Ethernet TCP/IP

The Ethernet interface is optional and cannot be combined with other optional interfaces. It is galvanically isolated (testing voltage: 500 V). A standard patch cable (e.g. CAT5E) can be used for the connection. A special cable gland is available for this purpose, which allows users to guide pre-terminated cables through the housing. Via the Ethernet interface, the device can be connected to office equipment using a hub or a switch.

|                    |                               |
|--------------------|-------------------------------|
| standard:          | 10/100 Base-T/TX (IEEE 802.3) |
| Socket:            | RJ-45                         |
| Max. cable length: | 100 m (328 ft)                |

### Web server

If the device is connected via Ethernet, it is possible to export the display values via the internet using a web server.

Data can be exported via the web server to HTML or XML format.

|              |                        |                             |
|--------------|------------------------|-----------------------------|
| <b>RS485</b> | Terminal:              | 3-pin plug-in terminal      |
|              | Transmission protocol: | RTU                         |
|              | Transmission rate:     | 2400/4800/9600/19200/38400  |
|              | Parity:                | choose from none, even, odd |

### Modbus TCP

The Modbus TCP interface is optional and cannot be ordered with other optional interfaces. It is used to connect the device to higher-order systems to transmit all measured values and process values. Form a physical point of view, the Modbus TCP interface is identical to the Ethernet interface.

### Modbus RTU

The Modbus RTU (RS-485) interface is optional, and cannot be ordered with other optional interfaces.

It is galvanically isolated (testing voltage: 500 V) and is used to connect to higher-order systems to transmit all measured values and process values. It is connected via a 3-pin plug-in terminal.

### M-Bus

The M-bus (meter bus) interface is optional and cannot be ordered with other optional interfaces. It is galvanically isolated (testing voltage: 500 V) and is used to connect to higher-order systems to transmit all measured values and process values. It is connected via a 3-pin plug-in terminal.

## Input

### Current/pulse input

This input can be used either as a current input for 0/4 to 20 mA signals or as a pulse or frequency input.

The input is galvanically isolated (500 V testing voltage towards all other inputs and outputs).

### Cycle time

The cycle time is 250 ms when using the RTD input.

### Response time

In the case of analog signals, the reaction time is the time between the change at the input and the time when the output signal is equivalent to 90 % of the full scale value. The reaction time is lengthened by 250 ms if an RTD with 3-wire measurement is connected.

| Input                             | Output                        | Reaction time [ms] |
|-----------------------------------|-------------------------------|--------------------|
| Current                           | Current                       | ≤ 600              |
| Current                           | Relay/digital output          | ≤ 600              |
| RTD                               | Current/ relay/digital output | ≤ 600              |
| Cable open circuit detection      | Current/ relay/digital output | ≤ 600              |
| Cable open circuit detection, RTD | Current/ relay/digital output | ≤ 1100             |
| Pulse input                       | Pulse output                  | ≤ 600              |

### Current input

|                           |                                            |
|---------------------------|--------------------------------------------|
| Measuring range:          | 0/4 to 20 mA + 10 % overrange              |
| Accuracy:                 | 0.1 % of full scale value                  |
| Temperature drift:        | 0.01 %/K (0.0056 %/°F) of full scale value |
| Loading capacity:         | Max. 50 mA, max. 2.5 V                     |
| Input impedance (load):   | 50 Ω                                       |
| HART® signals             | Not affected                               |
| A/D converter resolution: | 20 bit                                     |

### Pulse/frequency input

The pulse/frequency input can be configured for different frequency ranges:

- Pulses and frequencies up to 12.5 kHz
- Pulses and frequencies up to 25 Hz (filters out bounce contacts, max. bounce time: 5 ms)

| Minimum pulse width:                                                                         |                                  |
|----------------------------------------------------------------------------------------------|----------------------------------|
| Range up to 12.5 kHz                                                                         | 40 µs                            |
| Range up to 25 Hz                                                                            | 20 ms                            |
| Maximum permissible contact bounce time:                                                     |                                  |
| Range up to 25 Hz                                                                            | 5 ms                             |
| Pulse input for active voltage pulses and contact sensors as per EN 1434-2, Class IB and IC: |                                  |
| Non-conductive state                                                                         | ≤ 1 V                            |
| Conductive state                                                                             | ≥ 2 V                            |
| No-load supply voltage:                                                                      | 3 to 6 V                         |
| Current limiting resistance in the power supply (pull-up at input):                          | 50 to 2 000 kΩ                   |
| Maximum permissible input voltage:                                                           | 30 V (for active voltage pulses) |
| Pulse input for contact sensors as per EN 1434-2, Class ID and IE:                           |                                  |
| Low-level                                                                                    | ≤ 1.2 mA                         |
| High-level                                                                                   | ≥ 2.1 mA                         |
| No-load supply voltage:                                                                      | 7 to 9 V                         |

|                                                                     |                                                        |
|---------------------------------------------------------------------|--------------------------------------------------------|
| Current limiting resistance in the power supply (pull-up at input): | 562 to 1000 $\Omega$                                   |
| Not suitable for active input voltages                              |                                                        |
| <b>Current/pulse input:</b>                                         |                                                        |
| Low-level                                                           | $\leq 8$ mA                                            |
| High-level                                                          | $\geq 13$ mA                                           |
| Loading capacity:                                                   | Max. 50 mA, max. 2.5 V                                 |
| Input impedance (load):                                             | 50 $\Omega$                                            |
| <b>Accuracy during frequency measurement:</b>                       |                                                        |
| Basic accuracy:                                                     | 0.01 % of measured value                               |
| Temperature drift:                                                  | 0.01 % of measured value over entire temperature range |

## 2 x current/RTD input

These inputs can be used either as current inputs (04 to 20 mA) or as RTD inputs (RTD = Resistance Temperature Detector = resistance thermometer). Here, one input is provided for the temperature signal, the other for the pressure signal.

The two inputs are galvanically connected but galvanically isolated from the other inputs and outputs (testing voltage: 500 V).

### Current input

|                                 |                                            |
|---------------------------------|--------------------------------------------|
| Measuring range:                | 0/4 to 20 mA + 10 % overrange              |
| Accuracy:                       | 0.1 % of full scale value                  |
| Temperature drift:              | 0.01 %/K (0.0056 %/°F) of full scale value |
| Loading capacity:               | Max. 50 mA, max. 2.5 V                     |
| Input impedance (load):         | 50 $\Omega$                                |
| A/D converter resolution:       | 24 bit                                     |
| HART® signals are not affected. |                                            |

### RTD input

Pt100, Pt500 and Pt1000 resistance temperature detectors can be connected to this input.

|                                                                         |                                                                                                |
|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| Measuring ranges:                                                       |                                                                                                |
| Pt100_exact:                                                            | -200 to 300 °C (-328 to 572 °F)                                                                |
| Pt100_wide:                                                             | -200 to 600 °C (-328 to 1112 °F)                                                               |
| Pt500:                                                                  | -200 to 300 °C (-328 to 572 °F)                                                                |
| Pt1000:                                                                 | -200 to 300 °C (-328 to 572 °F)                                                                |
| Connection method:                                                      | 2-, 3- or 4-wire connection                                                                    |
| Accuracy:                                                               | 4-wire:<br>0.06 % of measuring range<br>3-wire:<br>0.06 % of measuring range + 0.8 K (1.44 °F) |
| Temperature drift:                                                      | 0.01 %/K (0.0056 %/°F) of measuring range                                                      |
| Delta T measurement (differential measurement between both RTD inputs): | 0.03 °C (0.054 °F)                                                                             |
| Characteristic curves:                                                  | DIN EN 60751:2008 IPTS-90                                                                      |
| Max. cable resistance:                                                  | 40 $\Omega$                                                                                    |
| Cable open circuit detection:                                           | Outside the measuring range                                                                    |

### Digital inputs

Two digital inputs are available for switching the following functions.

| Digital input 1                                                                 | Digital input 2                                                                 |
|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Activate tariff counter 1<br>Time synchronization<br>Lock device (Block set up) | Activate tariff counter 2<br>Time synchronization<br>Lock device (Block set up) |

*Input level:*

As per IEC 61131-2 Type 3:

Logical "0" (corresponds to -3 to +5 V), activation with logical "1" (corresponds to +11 to +30 V)

*Input current:*

Max. 3.2 mA

*Input voltage:*

Max. 30 V (steady-state, without destroying input)

## Output

### Current/pulse output (option)

This output can be used either as a 0/4 to 20 current output or as a voltage pulse output.

The output is galvanically isolated (500 V testing voltage towards all other inputs and outputs).

#### Current output (active)

|                           |                                                       |
|---------------------------|-------------------------------------------------------|
| Output range:             | 0/4 to 20 mA + 10 % overrange                         |
| Load:                     | 0 to 600 $\Omega$ (as per IEC 61131-2)                |
| Accuracy:                 | 0.1 % of full scale value                             |
| Temperature drift:        | 0.01 %/K (0.0056 %/°F) of full scale value            |
| Inductive load:           | Max. 10 mH                                            |
| Capacitance load:         | Max. 10 $\mu$ F                                       |
| Ripple:                   | Max. 12 mVpp on 600 $\Omega$ for frequencies < 50 kHz |
| D/A converter resolution: | 14 bit                                                |

#### Impulse output (active)

|                         |                                   |
|-------------------------|-----------------------------------|
| Frequency:              | Max. 12.5 kHz                     |
| Pulse width:            | min. 40 $\mu$ s                   |
| Voltage level:          | Low: 0 to 2 V<br>High: 15 to 20 V |
| Maximum output current: | 22 mA                             |
| Short-circuit proof     |                                   |

2 x relay output

The relays are designed as NO contacts. The output is galvanically isolated (1 500 V testing voltage towards all other inputs and outputs).

|                                |                                 |
|--------------------------------|---------------------------------|
| Max. relay switching capacity: | AC: 250 V, 3 A<br>DC: 30 V, 3 A |
| Minimum contact load:          | 10 V, 1 mA                      |
| Min. Switching cycles:         | >10 <sup>5</sup>                |

2 x digital output, open collector (option)

The two digital inputs are galvanically isolated from one another and from all the other inputs and outputs (testing voltage: 500 V). The digital outputs can be used as status or pulse outputs.

|                          |                                                                                                                                                  |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency:               | Max. 1 kHz                                                                                                                                       |
| Pulse width:             | min. 500 µs                                                                                                                                      |
| Current:                 | Max. 120 mA                                                                                                                                      |
| Voltage:                 | Max. 30 V                                                                                                                                        |
| Voltage drop:            | Max. 2 V in conductive state                                                                                                                     |
| Maximum load resistance: | 10 kΩ<br> For higher values, the switching edges are flattened. |

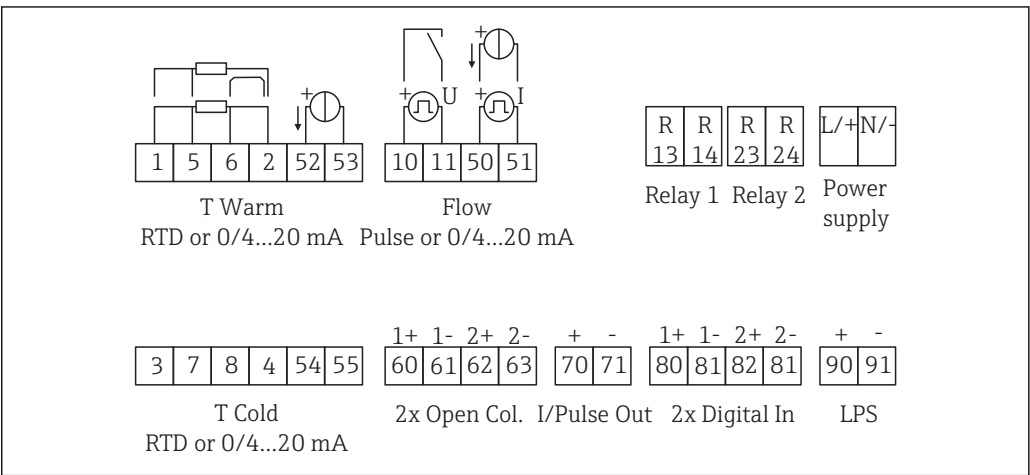
Auxiliary voltage output (transmitter power supply)

The auxiliary voltage output can be used to power the transmitter or control the digital inputs. The auxiliary voltage is short-circuit proof and galvanically isolated (500 V testing voltage towards all other inputs and outputs).

|                                 |                                |
|---------------------------------|--------------------------------|
| Output voltage:                 | 24 V DC ±15 % (not stabilized) |
| Output current:                 | Max. 70 mA                     |
| HART® signals are not affected. |                                |

Power supply

Terminal assignment



4 Terminal assignment of EngyCal

A0022341

Supply voltage

- Low voltage power unit: 100 to 230 V AC (–15 % / +10 %) 50<sub>60</sub> Hz
- Extra-low voltage power unit:  
24 V DC (–50 % / +75 %)  
24 V AC (±50 %) 50<sub>60</sub> Hz

An overload protection unit (rated current ≤ 10 A) is required for the power cable.

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**Power consumption**

15 VA

## Performance characteristics

### Reference operating conditions

- Power supply 230 V AC  $\pm 10\%$ ; 50 Hz  $\pm 0.5$  Hz
- Warm-up time > 2 h
- Ambient temperature 25 °C  $\pm 5$  K (77 °F  $\pm 9$  °F)
- Humidity 39 %  $\pm 10$  % RH

### Arithmetic unit

| Medium | Size                                 | Range                            |
|--------|--------------------------------------|----------------------------------|
| Steam  | Temperature measuring range          | 0 to 800 °C (32 to 1472 °F)      |
|        | Pressure measuring range             | 0 to 1 000 bar (0 to 14 500 psi) |
|        | Measurement and calculation interval | 500 ms                           |

### Calculation standard IAPWS IF97

Typical accuracy of steam mass and energy measurement in a complete steam measuring point: approx. 1.5 % (e.g. Cerabar S, TR 10, Prowirl 72, EngyCal RS33)

## Installation

### Mounting location

Wall/pipe mounting, panel or DIN rail as per IEC 60715

### Installation position

The only factor determining the orientation is the legibility of the display.

## Environment

**Ambient temperature range** –20 to +60 °C (–4 to +140 °F)

**Storage temperature** –30 to +70 °C (–22 to +158 °F)

**Climate class** as per IEC 60 654-1 Class B2, as per EN 1434 environmental class C

**Humidity** Maximum relative humidity 80 % for temperatures up to 31 °C (87.8 °F), decreasingly linearly to 50 % relative humidity at 40 °C (104 °F).

### Electrical safety

- As per IEC 61010-1 and CAN C22.2 No 1010-1.
- Class II equipment
  - Overvoltage category II
  - Pollution level 2
  - Overload protection  $\leq 10$  A
  - Installation height: up to 2 000 m (6 560 ft.) above MSL

### Degree of protection

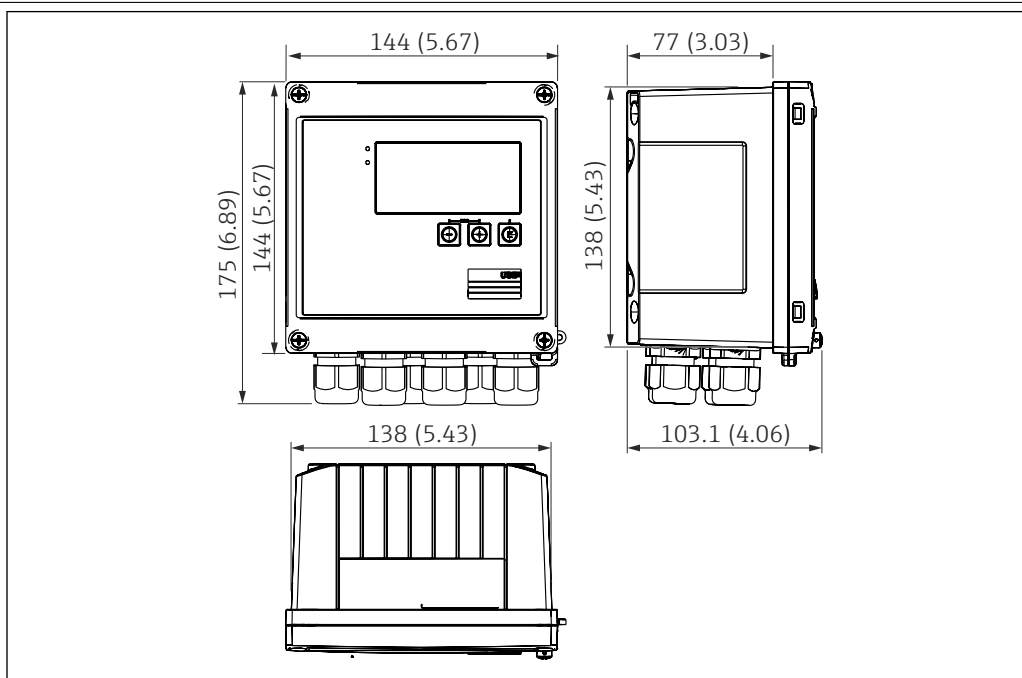
- Panel mounting: IP65 at front, IP20 at rear
- DIN rail: IP20
- Field housing: IP66, NEMA4x (for cable gland with double seal insert: IP65)

### Electromagnetic compatibility

as per EN 1434-4, EN 61326 and NAMUR NE21

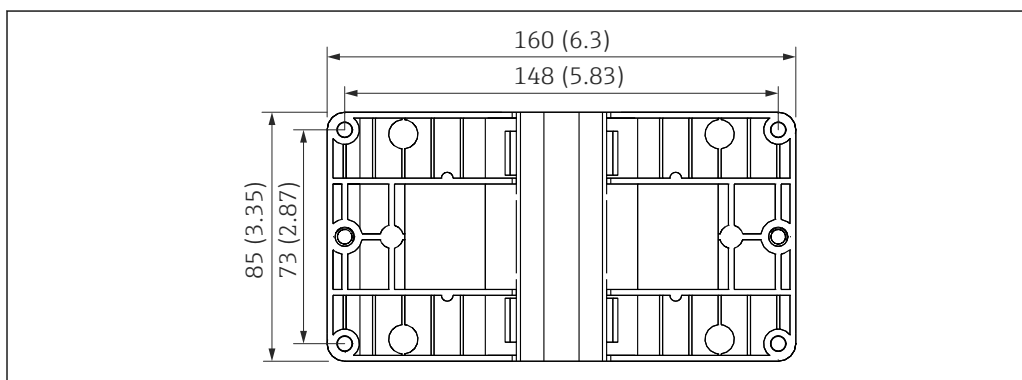
## Mechanical construction

### Design, dimensions



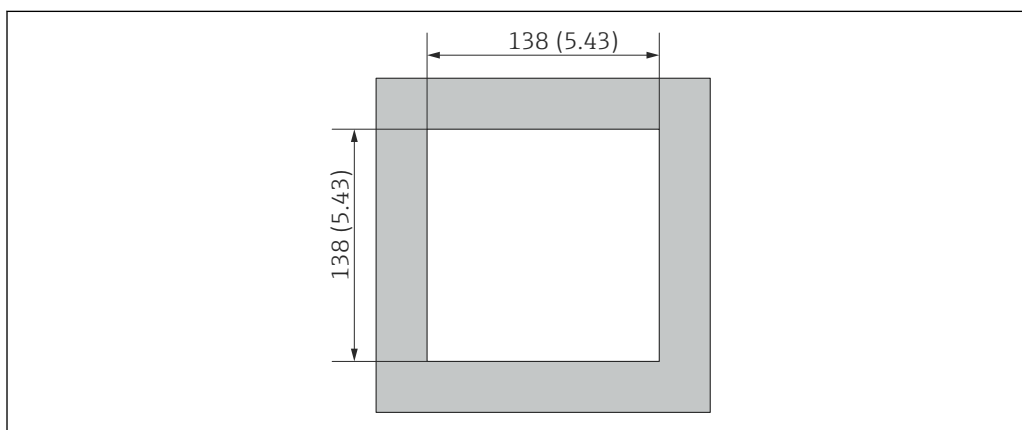
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5 EngyCal housing; dimensions in mm (in)



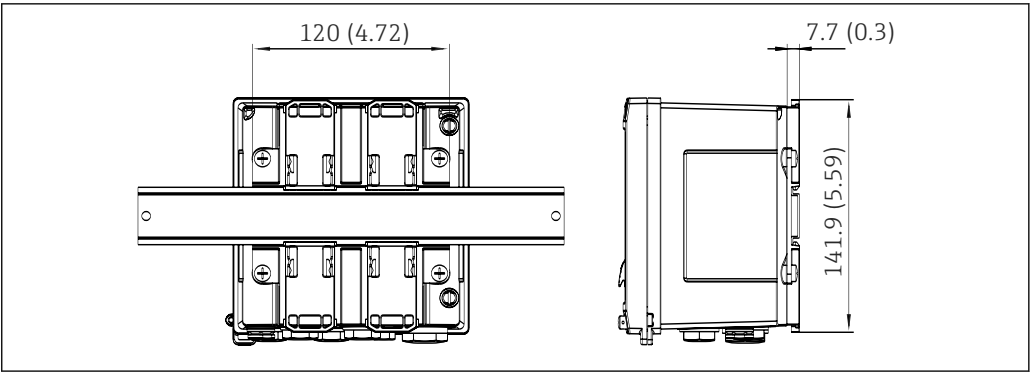
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6 Mounting plate for wall, pipe and panel mounting; dimensions in mm (in)



A0014171

7 Panel cutout in mm (in)



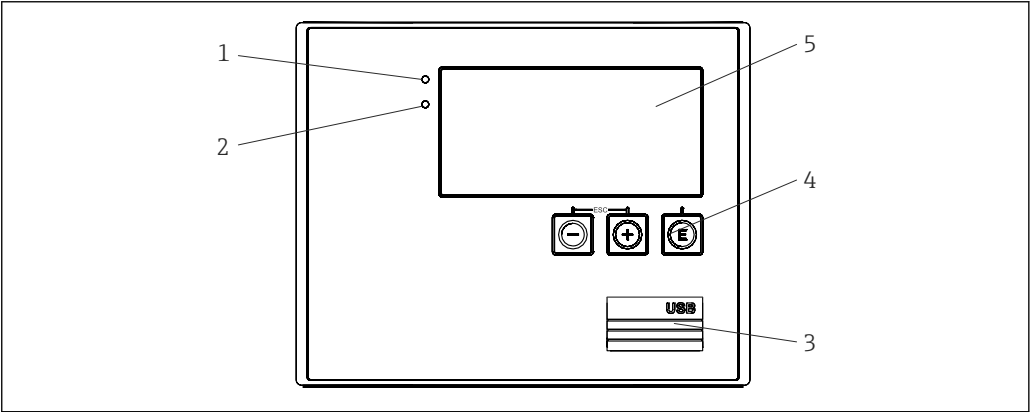
A0014610

8 Dimensions of DIN rail adapter in mm (in)

|           |                                                                                                                                   |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------|
| Weight    | Approx. 700 g (1.5 lbs)                                                                                                           |
| Materials | Housing: fiber-glass reinforced plastic, Valox 553                                                                                |
| Terminals | Spring terminals, 2.5 mm <sup>2</sup> (14 AWG); auxiliary voltage with plug-in screw terminal (30-12 AWG; torque 0.5 to 0.6 Nm) . |

## Operability

|                  |                                                                                                                                                                                                                                                                                             |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Languages        | You can choose from one of the following operating languages on the device: English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Czech                                                                                                                            |
| Display elements | <ul style="list-style-type: none"><li>Display:<br/>160 x 80 dot-matrix LCD with white backlighting, color changes to red in the event of an alarm, active display area 70 x 34 mm (2.76" x 1.34")</li><li>LED status display:<br/>Operation: 1 x green<br/>Fault message: 1 x red</li></ul> |



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9 Display and operating elements

- 1 Green LED, "Operation"
- 2 Red LED, "Fault message"
- 3 USB connection for configuration
- 4 Operating keys: -, +, E
- 5 160x80 dot-matrix display

|                 |                        |
|-----------------|------------------------|
| Local operation | 3 keys, "-", "+", "E". |
|-----------------|------------------------|

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Configuration interface</b> | USB interface at front, optional Ethernet: configuration via PC with FieldCare Device Setup configuration software.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Data logging</b>            | <b>Real-time clock</b> <ul style="list-style-type: none"> <li>■ Deviation: 15 min per year</li> <li>■ Power reserve: 1 week</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Software</b>                | <ul style="list-style-type: none"> <li>■ <b>Field Data Manager software MS20:</b> visualization software and database for analyzing and evaluating the measured data and calculated values as well as tamper-proof data logging.</li> <li>■ <b>FieldCare Device Setup:</b> The device can be configured with the FieldCare PC software. FieldCare Device Setup is included in the scope of delivery for RXU10-G1 (see "Accessories") or can be downloaded free of charge from <a href="http://www.produkte.endress.com/fieldcare">www.produkte.endress.com/fieldcare</a>.</li> </ul> |

## Certificates and approvals

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CE mark</b>                        | The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EC directives. The manufacturer confirms successful testing of the product by affixing to it the CE-mark.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Other standards and guidelines</b> | <ul style="list-style-type: none"> <li>■ IEC 60529:<br/>Degrees of protection provided by enclosures (IP code)</li> <li>■ IEC 61010-1: 2001 cor 2003<br/>Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures</li> <li>■ IEC 61326 series:<br/>Electromagnetic compatibility (EMC requirements)</li> <li>■ NAMUR NE21, NE43:<br/>Association for Standards for Control and Regulation in the Chemical Industry</li> <li>■ IAPWS-IF 97:<br/>Internationally applicable and recognized calculation standard (since 1997) for steam and water. Issued by the International Association for the Properties of Water and Steam (IAPWS).</li> <li>■ OIML R75:<br/>International design and test recommendation for heat meters for water applications issued by the International Organization of Legal Metrology.</li> <li>■ EN 1434</li> <li>■ EN ISO 5167<br/>Measurement of fluid flow by means of pressure differential devices</li> </ul> |
| <b>CSA GP</b>                         | CAN/CSA-C22.2 No. 61010-1, 2 <sup>nd</sup> edition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser website: [www.endress.com](http://www.endress.com) -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: [www.addresses.endress.com](http://www.addresses.endress.com)



### Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
  - Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
  - Automatic verification of exclusion criteria
  - Automatic creation of the order code and its breakdown in PDF or Excel output format
  - Ability to order directly in the Endress+Hauser Online Shop

## Scope of delivery

The scope of delivery comprises:

- EngyCal (field housing)
- Wall mounting plate
- Hard copy of Brief Operating Instructions
- Optional 3 pcs connecting terminal (each 5-pin)
- Optional interface cable and DVD set with FieldCare Device Setup configuration software
- Optional Field Data Manager software MS20
- Optional mounting hardware for DIN rail, panel mounting, pipe mounting
- Optional overvoltage protection

## Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website:

[www.endress.com](http://www.endress.com).

### Device-specific accessories

#### For the transmitter

| Accessories              | Description                                                                                                                                                                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Weather protection cover | Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight or extreme cold in winter.<br> For details, see Installation Instructions SD00333F |
| Pipe mounting set        | Mounting plate for pipe mounting                                                                                                                                                                                                                                                                   |
| DIN rail mounting set    | DIN rail adapter for DIN rail mounting                                                                                                                                                                                                                                                             |
| Panel mounting set       | Mounting plate for panel mounting                                                                                                                                                                                                                                                                  |

#### For the sensor

| Accessories    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Heating jacket | Is used to stabilize the temperature of the fluids in the sensor.<br>Water, water vapor and other non-corrosive liquids are permitted for use as fluids.<br>If using oil as a heating medium, please consult with Endress+Hauser.<br>Heating jackets cannot be used with sensors fitted with a rupture disk.<br> For details, see Operating Instructions BA00099D |

### Communication-specific accessories

|                           |                                                                                                                                                                                                                                                                                        |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FDM software              | Visualization software and SQL-based database "Field Data Manager software (FDM)" MS20<br> For details, see "Technical Information" TI01022R                                                        |
| RXU10-G1                  | USB cable and FieldCare Device Setup configuration software incl. DTM library                                                                                                                                                                                                          |
| Commubox FXA195 HART      | For intrinsically safe HART communication with FieldCare via the USB interface.<br> For details, see "Technical Information" TI00404F                                                               |
| HART Loop Converter HMX50 | Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.<br> For details, see "Technical Information" TI00429F and Operating Instructions BA00371F |

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wireless HART adapter SWA70 | <p>Is used for the wireless connection of field devices.</p> <p>The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity.</p> <p> For details, see Operating Instructions BA061S</p> |
| Fieldgate FXA320            | <p>Gateway for the remote monitoring of connected 4-20 mA measuring devices via a Web browser.</p> <p> For details, see "Technical Information" TI00025S and Operating Instructions BA00053S</p>                                                                                                                                                                           |
| Fieldgate FXA520            | <p>Gateway for the remote diagnostics and remote configuration of connected HART measuring devices via a Web browser.</p> <p> For details, see "Technical Information" TI00025S and Operating Instructions BA00051S</p>                                                                                                                                                    |
| Field Xpert SFX100          | <p>Compact, flexible and robust industry handheld terminal for remote configuration and for obtaining measured values via the HART current output (4-20 mA).</p> <p> For details, see Operating Instructions BA00060S</p>                                                                                                                                                  |

## Service-specific accessories

| Accessories | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicator  | <p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> <li>■ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections.</li> <li>■ Graphic illustration of the calculation results</li> </ul> <p>Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.</p> <p>Applicator is available:</p> <ul style="list-style-type: none"> <li>■ Via the Internet: <a href="https://wapps.endress.com/applicator">https://wapps.endress.com/applicator</a></li> <li>■ On CD-ROM for local PC installation.</li> </ul>                                                                                                     |
| W@M         | <p>Life cycle management for your plant</p> <p>W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle.</p> <p>The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records.</p> <p>W@M is available:</p> <ul style="list-style-type: none"> <li>■ Via the Internet: <a href="http://www.endress.com/lifecyclemanagement">www.endress.com/lifecyclemanagement</a></li> <li>■ On CD-ROM for local PC installation.</li> </ul> |
| FieldCare   | <p>FDT-based plant asset management tool from Endress+Hauser.</p> <p>It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.</p> <p> For details, see Operating Instructions BA00027S and BA00059S</p>                                                                                                                                                                                                                                                                                                                                                                                                   |

## System components

| Accessories                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Memograph M graphic data manager | <p>The Memograph M graphic data manager provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.</p> <p> For details, see "Technical Information" TI00133R and Operating Instructions BA00247R</p> |

|                                                |                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overvoltage protection<br>HAW562 DIN rail      | To protect against overvoltage in the power supply and signal/communication cables, Endress+Hauser provides a surge arrester HAW562 for DIN rail mounting.<br> For details, see "Technical Information" TI01012K                                           |
| Overvoltage protection<br>HAW569 field housing | To protect against overvoltage in the power supply and signal/communication cables, Endress+Hauser provides a surge arrester HAW562 for field mounting.<br> For details, see "Technical Information" TI01013K                                              |
| RN221N                                         | Active barrier with power supply for safe separation of 4-20 mA standard signal circuits. Offers bidirectional HART transmission.<br> For details, see "Technical Information" TI00073R and Operating Instructions BA00202R                                |
| RNS221                                         | Supply unit for powering two 2-wire measuring devices solely in the non-Ex area. Bidirectional communication is possible via the HART communication jacks.<br> For details, see "Technical Information" TI00081R and Brief Operating Instructions KA00110R |

## Supplementary documentation

- Operating Instructions "EngyCal RS33 Steam calculator" (BA00294K)
- Brief Operating Instructions "EngyCal RS33 Steam calculator" (KA00293K)
- Technical Information "Overvoltage protection HAW562" (TI01012K)
- Technical Information "Overvoltage protection HAW569" (TI01013K)
- Brief Operating Instructions "Field Data Manager software" (KA00466C)
- "System Products and Data Managers: Solutions for the loop" brochure (FA00016K)

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