KA00289K/09/EN/04.21
71545304
2021-09-16

Brief Operating Instructions **EngyCal RH33**

Universal BTU meter

These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

For detailed information, refer to the Operating Instructions and other documentation.

Available for all device versions via:
- Internet: www.endress.com/deviceviewer
- Smart phone/Tablet: Endress+Hauser Operations App

Endress+Hauser
People for Process Automation

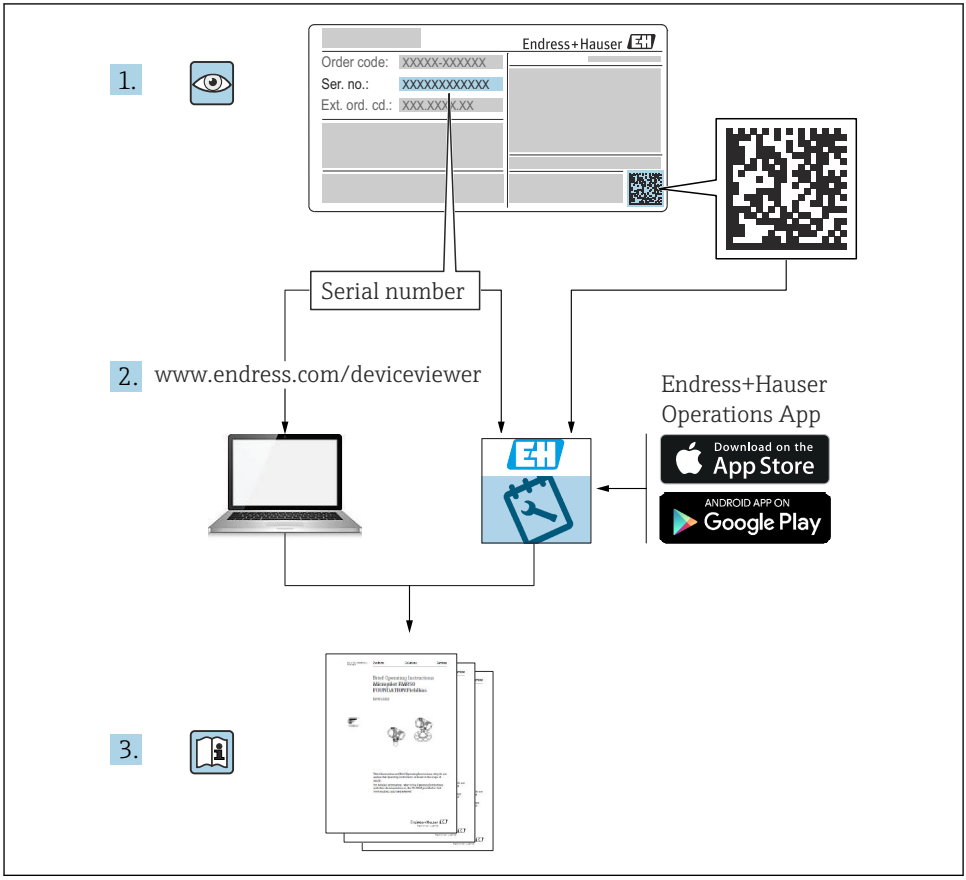
1.
Endress+Hauser
Order code: XXXXX-XXXXXX
Ser. no.: XXXXXXXXXXXX
Ext. ord. cd.: XXX.XXX-XXX
Serial number
2.
www.endress.com/deviceviewer
Endress+Hauser
Operations App
Download on the
App Store
ANDROID APP ON
Google Play
3.

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Table of contents

1 About this document

1.1 Document conventions

1.1.1 Safety symbols

⚠ DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

⚠ WARNING
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

⚠ CAUTION
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE
This symbol contains information on procedures and other facts which do not result in personal injury.

1.1.2 Electrical symbols

Symbol	Meaning
 A0011197	**Direct current** A terminal to which DC voltage is applied or through which direct current flows.
 A0011198	**Alternating current** A terminal to which alternating voltage is applied or through which alternating current flows.
 A0017381	**Direct current and alternating current** ▪ A terminal to which alternating voltage or DC voltage is applied. ▪ A terminal through which alternating current or direct current flows.
 A0011200	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
 A0011199	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.
 A0011201	**Equipotential connection** A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.
 A0012751	**ESD - electrostatic discharge** Protect the terminals from electrostatic discharge. Failure to observe this may result in the destruction of parts of the electronics.

1.1.3 Symbols for certain types of information

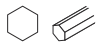
Symbol	Meaning	Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.		**Preferred** Procedures, processes or actions that are preferred.
	**Forbidden** Procedures, processes or actions that are forbidden.		**Tip** Indicates additional information.
	Reference to documentation		Reference to page

Symbol	Meaning	Symbol	Meaning
	Reference to graphic	1., 2., 3...	Series of steps
	Result of a step		Visual inspection

1.1.4 Symbols in graphics

Symbol	Meaning	Symbol	Meaning
1, 2, 3,...	Item numbers	1., 2., 3...	Series of steps
A, B, C, ...	Views	**A-A, B-B, C-C, ...**	Sections
	Hazardous area		Safe area (non-hazardous area)

1.1.5 Tool symbols

Symbol	Meaning
 A0011220	Flat-blade screwdriver
 A0011219	Phillips screwdriver
 A0011221	Allen key
 A0011222	Open-ended wrench
 A0013442	Torx screwdriver

2 Safety instructions

Safe operation of the device is only guaranteed if the Operating Instructions have been read and the safety instructions they contain have been observed.

2.1 Requirements for the personnel

The personnel must fulfill the following requirements for its tasks:
- ▶ Trained, qualified specialists must have a relevant qualification for this specific function and task.
- ▶ Are authorized by the plant owner/operator.
- ▶ Are familiar with federal/national regulations.
- ▶ Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- ▶ Follow instructions and comply with basic conditions.

2.2 Intended use

The BTU meter is a device for measuring energy flow in heating and cooling systems. The mains-powered arithmetic unit can be used universally in industry, long-distance heat and building systems.

- The manufacturer accepts no liability for damages resulting from incorrect use or use other than that designated. It is not permitted to convert or modify the device in any way.
- The device may only be operated when installed.

2.3 Workplace safety

For work on and with the device:
- ▶ Wear the required personal protective equipment according to national regulations.

If working on and with the device with wet hands:
- ▶ Due to the increased risk of electric shock, wear suitable gloves.

2.4 Operational safety

Risk of injury.
- ▶ Operate the device in proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for interference-free operation of the device.

2.5 Conversion and consequences of conversion

NOTICE

Repair/conversion/modification results in loss of approval for custody transfer
- ▶ Repair/conversion/modification is possible, but results in the device losing its current custody transfer approval. This means that following repair/conversion/modification, the customer is responsible for ensuring that the instrument is inspected on site by an approved calibration authority (e.g. calibration officer) for the purpose of recalibration.

2.6 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EC directives listed in the device-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

Furthermore, the device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards.

By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.

Contact address Endress+Hauser UK:
Endress+Hauser Ltd.
Floats Road
Manchester M23 9NF
United Kingdom
www.uk.endress.com

2.7 IT security

Our warranty is valid only if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

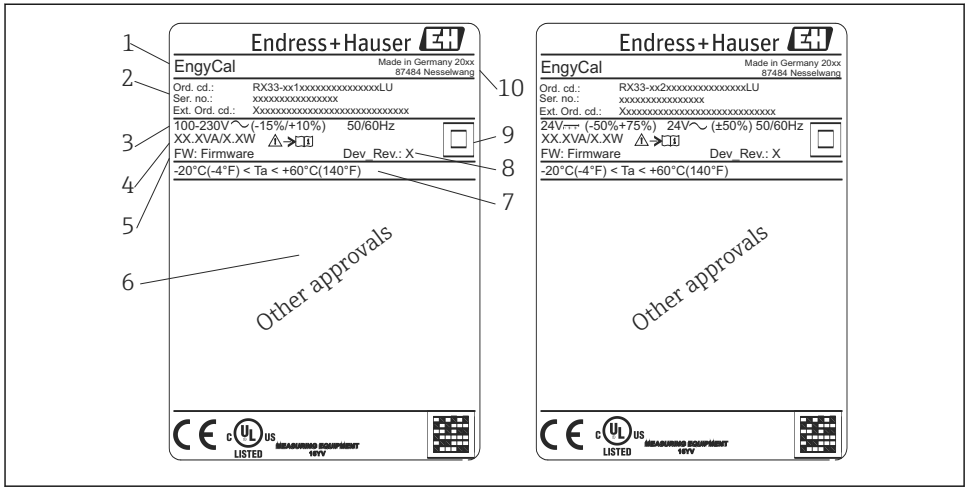
IT security measures, which provide additional protection for the device and associated data transfer, must be implemented by the operators themselves in line with their security standards.

3 Identification

3.1 Device designation

3.1.1 Nameplate

Compare the nameplate on the device with the following diagram:



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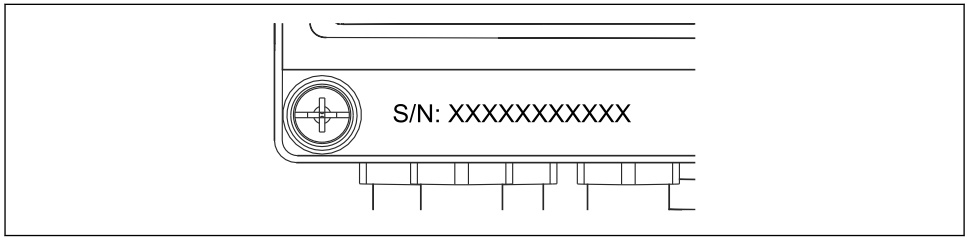
1 Device nameplate (example)

1 *Device tag name*
2 *Order code and serial number*
3 *Supply voltage*
4 *Power consumption*
5 *Firmware version*
6 *Approvals, if available*
7 *Ambient temperature range*
8 *Device revision*
9 *Device protected by double or reinforced seal*
10 *Place and year of manufacture*

3.1.2 Serial number on front of device



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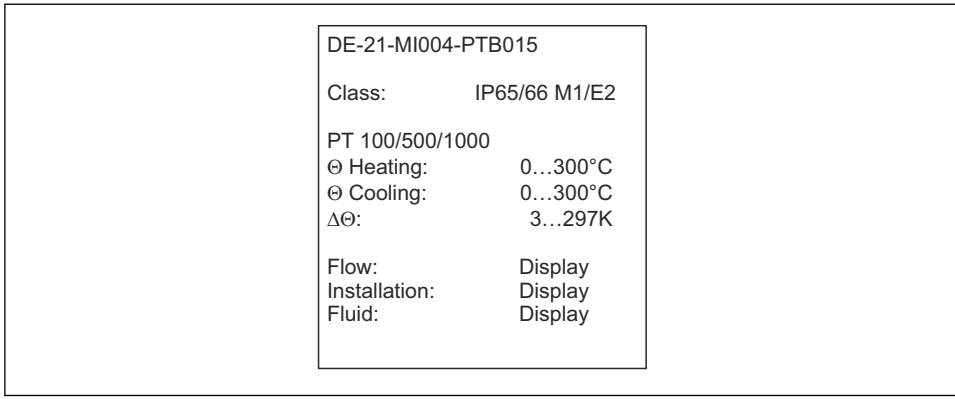
2 Serial number on front of device

3.1.3 Front foil for devices with approval for custody transfer

For devices with the option of approval for custody transfer, the front foil is imprinted with the following information:



3 Labeling of front foil for devices with approval for custody transfer

3.2 Scope of delivery

The scope of delivery comprises:
- EngyCal (field housing)
- Wall mounting plate
- Hard copy of Brief Operating Instructions
- Optional RTD assembly
- Optional 3 pc. connecting terminal (each 5-pin)
- Optional interface cable in a set with "FieldCare Device Setup" parameterization software
- Optional Field Data Manager software MS20
- Optional mounting hardware for DIN rail, panel mounting, pipe mounting
- Optional overvoltage protection

Please note the device accessories in the "Accessories" section of the Operating Instructions.

3.3 Certificates and approvals

The BTU meter and the pair of temperature sensors (optionally available) meet the requirements of Directive 2014/32/EU (L 96/149) (Measurement Instruments Directive, MID) and OIML R75 and EN-1434.

If the arithmetic unit with temperature sensors is to be used in commercial applications, the flow sensor must also have a type approval (incl. conformity assessment) according to MID.

Measuring devices with MID approval have the MID mark on the front foil. → 1, 8. This approval replaces the initial calibration on-site.

The calibrated arithmetic unit can be set individually onsite. Custody transfer-related parameters, such as the pulse value of the flow transmitter, can be changed up to three times. The changes to the custody transfer-related parameters are recorded in a custody transfer logbook. This allows individual defective sensors to be replaced in the field without losing the custody transfer status.

The device also has a national approval as a BTU meter for cooling or for combined heating/ cooling applications. The initial calibration of these devices is always carried out on-site by a calibration officer.

3.3.1 CE mark

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.

4 Mounting

4.1 Incoming acceptance, transport, storage

Compliance with the permitted environmental and storage conditions is mandatory. The exact specifications for this are provided in the "Technical Information" section of the Operating Instructions.

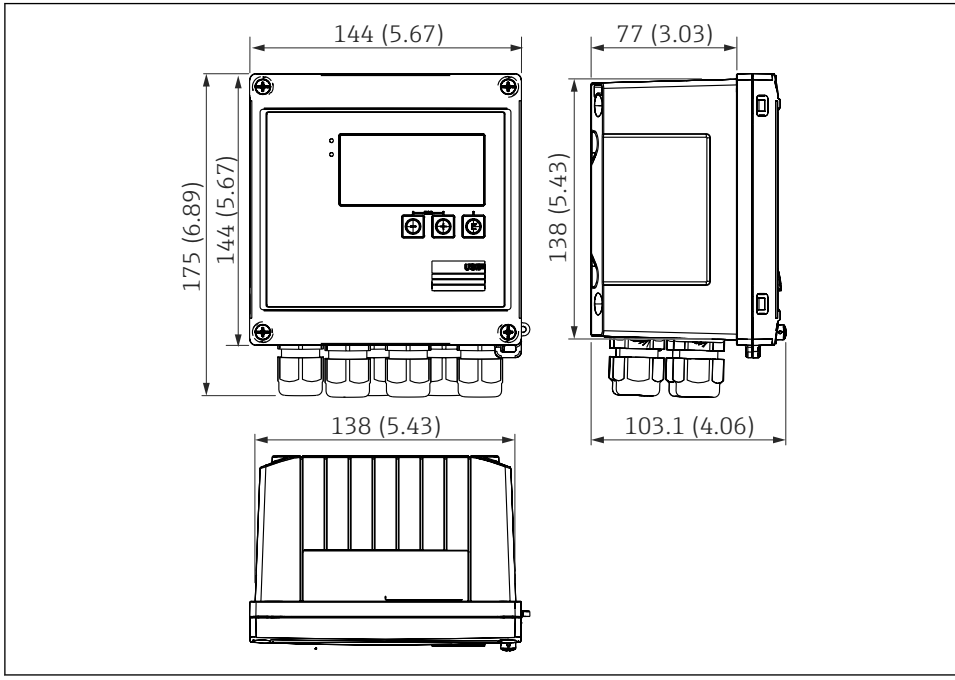
4.1.1 Incoming acceptance

On receipt of the goods, check the following points:
- Is the packaging or the content damaged?
- Is the delivery complete? Compare the scope of delivery against the information on your order form.

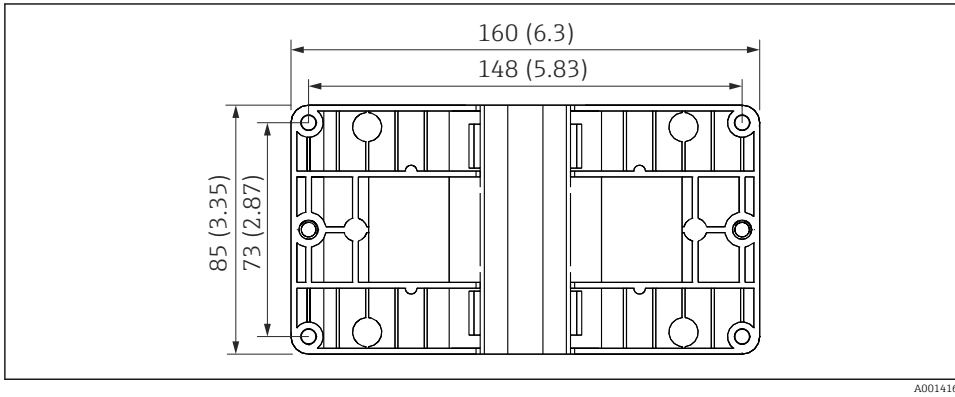
4.1.2 Transport and storage

Please note the following:
- Pack the device in such a way as to protect it reliably against impact for storage (and transportation). The original packaging provides optimum protection.
- The permitted storage temperature is −40 to +85 °C (−40 to +185 °F); it is possible to store the device at borderline temperatures for a limited period (48 hours maximum).

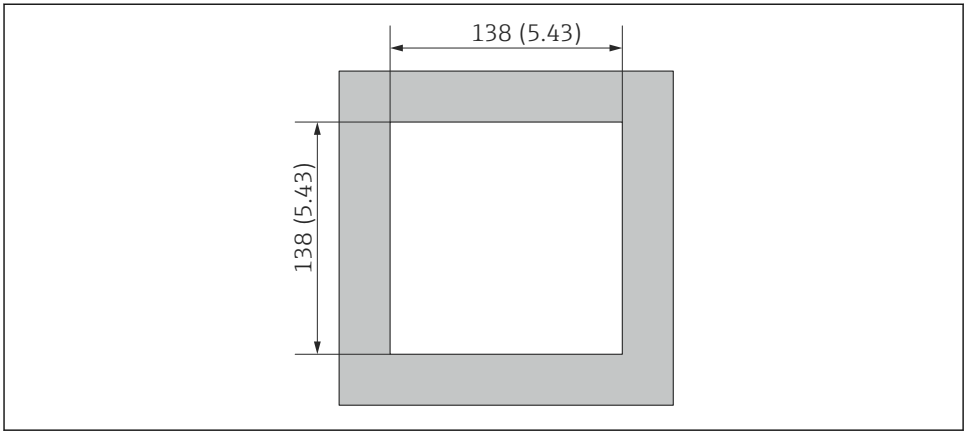
4.2 Dimensions



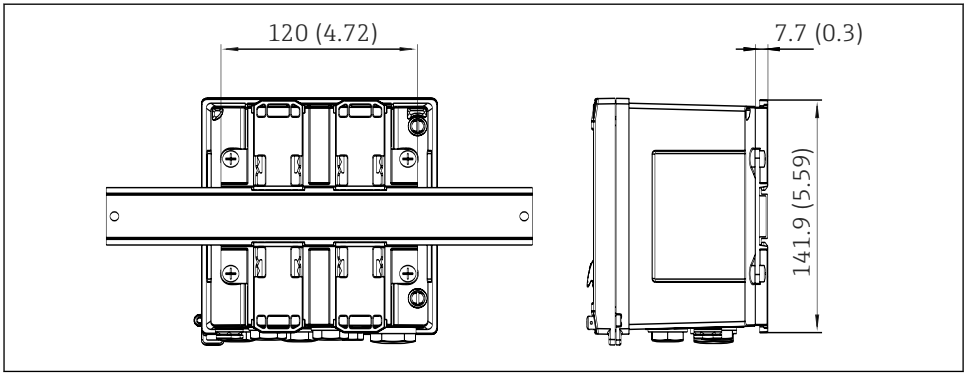
4 Dimensions of the device in mm (in)



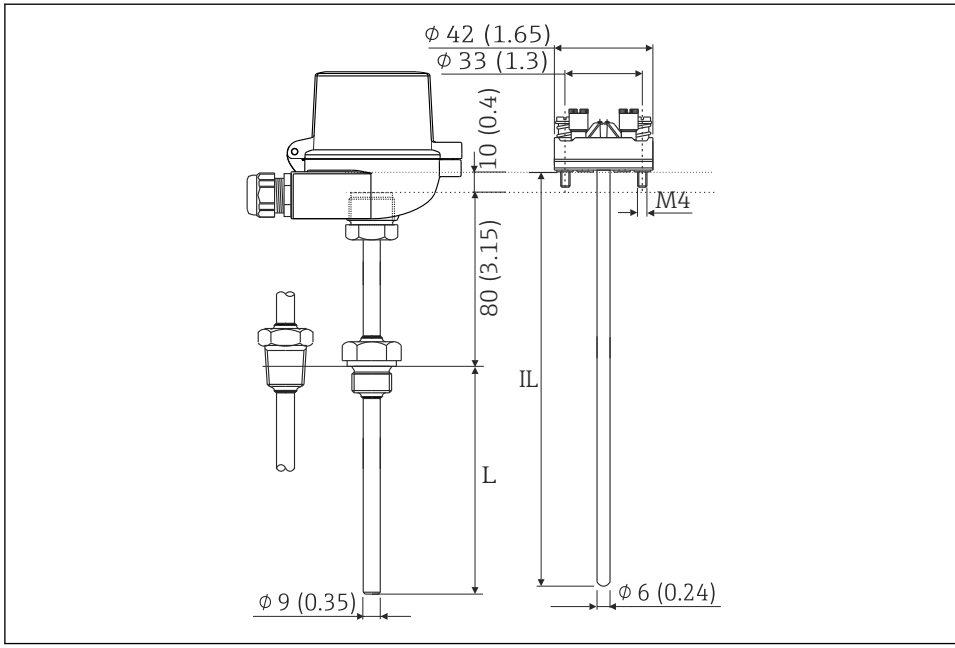
5 Dimensions of the mounting plate for wall, pipe and panel mounting in mm (in)



6 Dimensions of the panel cutout in mm (in)



7 Dimensions of DIN rail adapter in mm (in)



8 RTD assembly (optional accessory), dimensions in mm (in)

L Immersion length, specified when ordered
IL Insertion length = L + extension neck length (80 mm (3.15 in)) + 10 mm (0.4 in)

4.3 Mounting requirements

With the appropriate accessories, the device with field housing is suitable for wall mounting, pipe mounting, panel mounting and DIN rail installation.

The orientation is determined by the legibility of the display. Connections and outputs are fed out of the bottom of the device. The cables are connected via coded terminals.

Operating temperature range: –20 to 60 °C (–4 to 140 °F)

You can find more information in the "Technical data" section.

NOTICE

Overheating of the device due to insufficient cooling

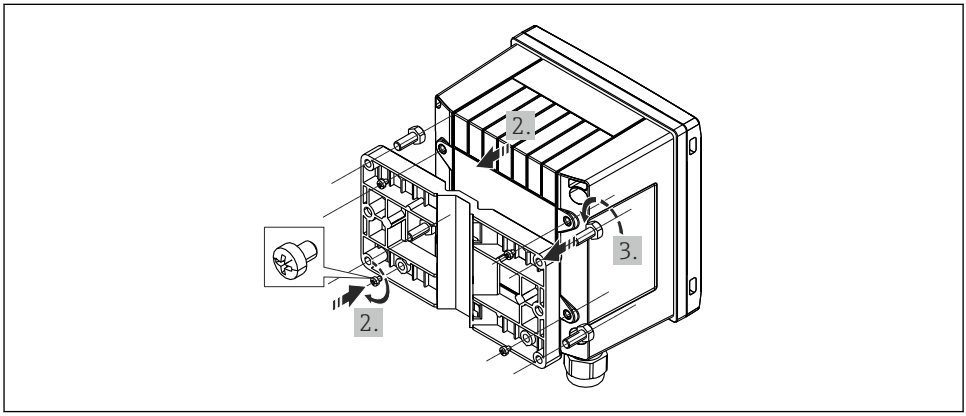
► To avoid heat buildup, please always ensure that the device is sufficiently cooled. Operating the device in the upper temperature limit range decreases the operating life of the display.

4.4 Mounting

4.4.1 Wall mounting

1. Use the mounting plate as the template for drilled holes, dimensions → 5, 11

2. Attach the device to the mounting plate and fasten it in place from the rear using 4 screws.
3. Fasten the mounting plate to the wall using 4 screws.



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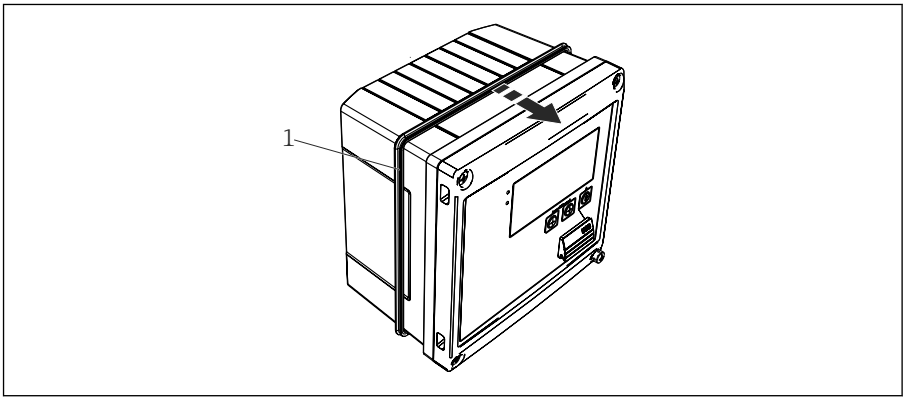
9 *Wall mounting*

4.4.2 Panel mounting

1. Make the panel cutout in the required size, dimensions → 6, 12
2. 

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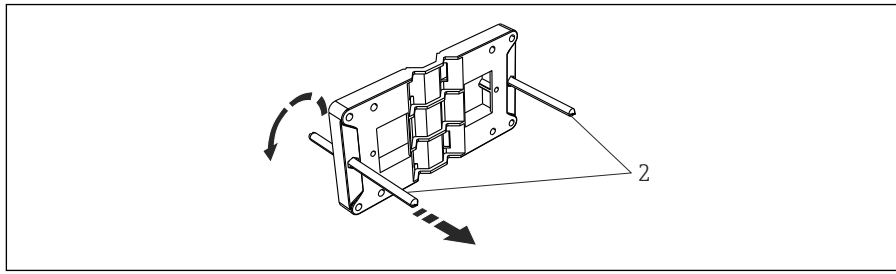
10 *Panel mounting*

Attach the seal (item 1) to the housing.

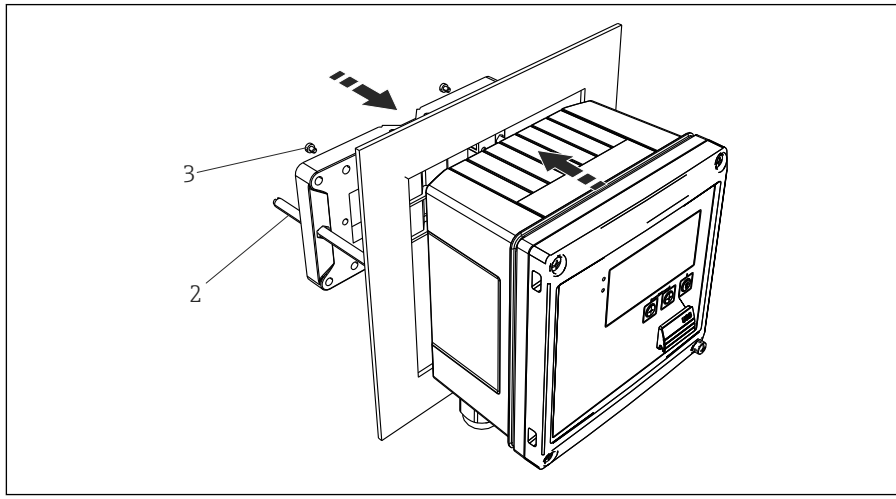
3.



11 Preparing the mounting plate for panel mounting

Screw the threaded rods (item 2) into the mounting plate (dimensions → 5, 11).

4.



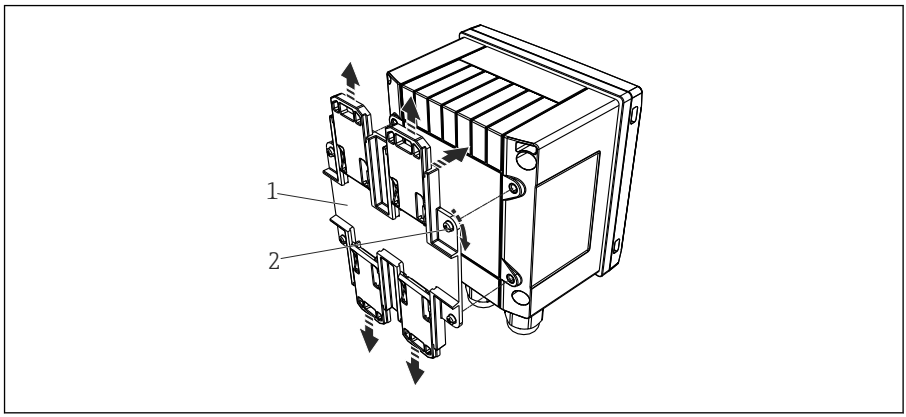
12 Panel mounting

Push the device into the panel cutout from the front and attach the mounting plate to the device from the rear using the 4 screws provided (item 3).

5. Fasten the device in place by tightening the threaded rods.

4.4.3 Support rail/DIN rail (to EN 50 022)

1.



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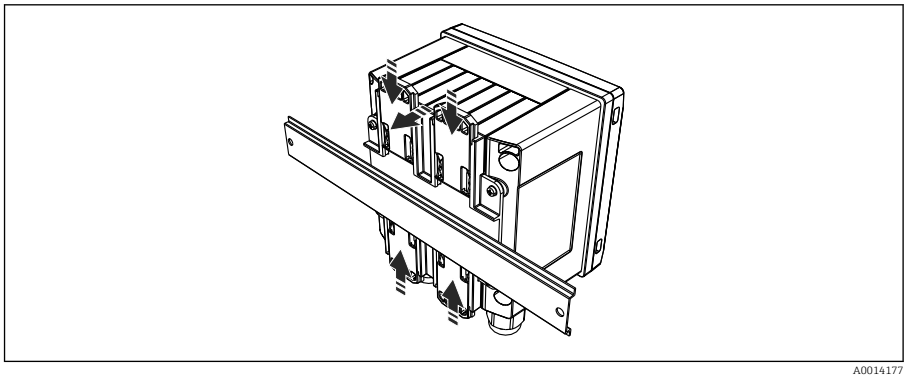
13 Preparing for DIN rail mounting

Fasten the DIN rail adapter (item 1) to the device using the screws provided (item 2) and open the DIN rail clips.

2.



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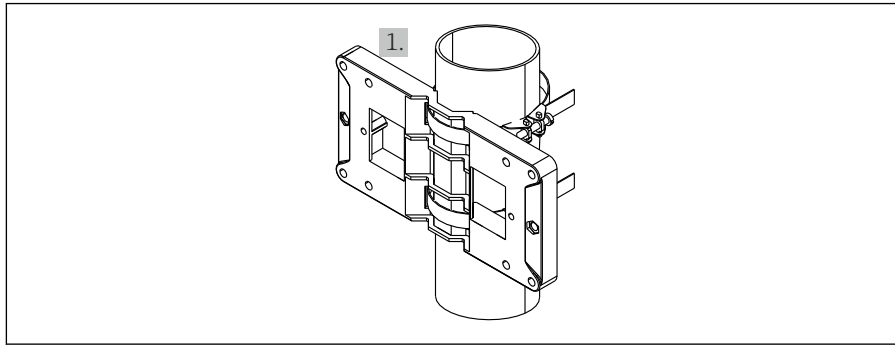
14 DIN rail mounting

Attach the device to the DIN rail from the front and close the DIN rail clips.

4.4.4 Pipe mounting

1.



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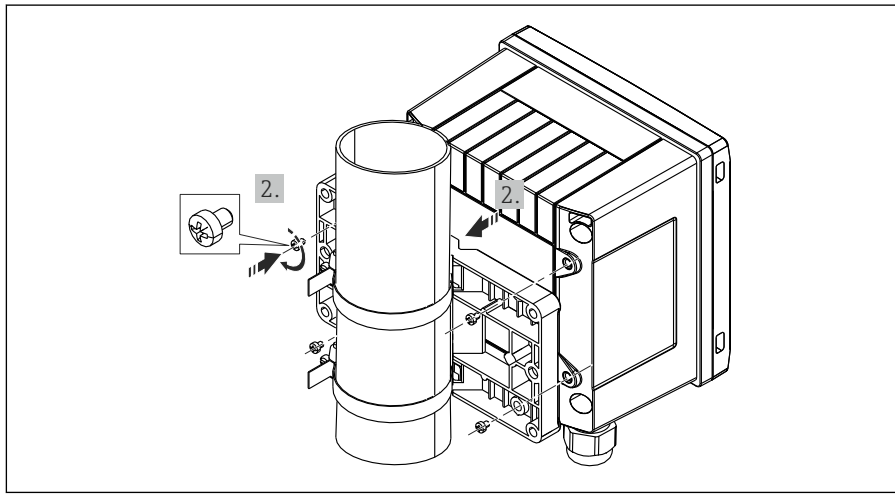
15 Preparing for pipe mounting

Pull the steel belts through the mounting plate (dimensions → 5, 11) and fasten them to the pipe.

2.



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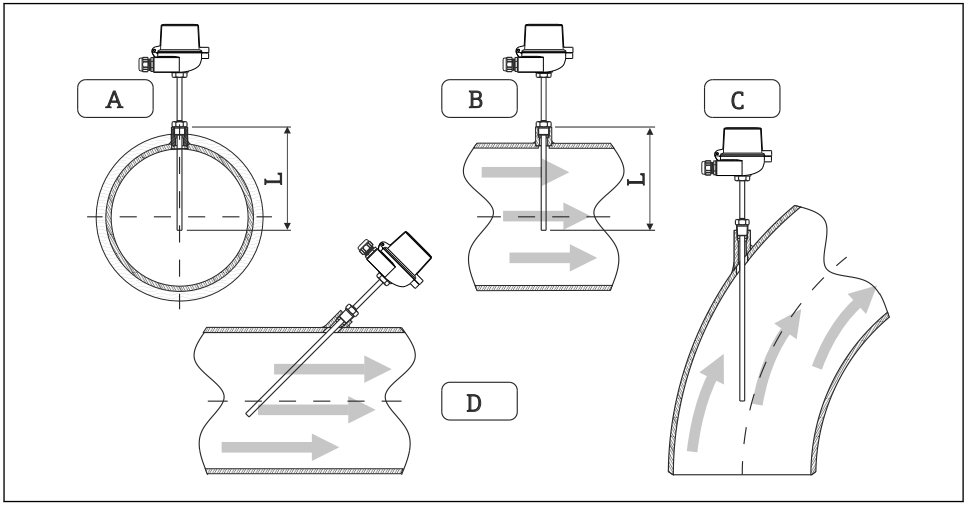
16 Pipe mounting

Attach the device to the mounting plate and fasten it in place using the 4 screws provided.

4.5 Installation instructions for temperature sensor(s)



17 Installation types for temperature sensors

A - B For cables with a small cross-section, the sensor tip must reach to the piping axis or a little farther (=L).
C - D Slanted orientation.

The immersion length of the thermometer influences the accuracy. If the immersion length is too small, errors in the measurement are caused by heat conduction via the process connection and the container wall. For installation in a pipe, therefore, the recommended installation depth ideally corresponds to half of the pipe diameter.

- Installation possibilities: Pipes, tanks or other plant components
- Minimum insertion depth = 80 to 100 mm (3.15 to 3.94 in)
  The insertion depth should be at least 8 times the diameter of the thermowell. Example: Thermowell diameter 12 mm (0.47 in) x 8 = 96 mm (3.8 in). We recommend a standard insertion depth of 120 mm (4.72 in).

For pipes with small nominal diameters, ensure that the tip of the thermowell extends far enough into the process so that it also protrudes past the axis of the pipe (→ 17, 18, item A and B). Another solution may be diagonal installation (→ 17, 18, item C and D). When determining the immersion length or installation depth, all the parameters of the thermometer and of the process to be measured must be taken into account (e.g. flow velocity, process pressure).

Refer also to the installation recommendations EN1434-2 (D), Figure 8.

4.6 Requirements for sizing

To avoid systematic errors, the temperature sensors must be installed shortly upstream and shortly downstream from the heat exchanger. If the pressure difference between the temperature measuring points is too large, this can result in an excessively large systematic error, see the table below.

	Temperature differential in [K]							
Diff in [bar]	**3**	**5**	**10**	**20**	**30**	**40**	**50**	**60**
0.5	0.2	0.2	0.1	0.1	0.1	0	0	0
1	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1
2	0.9	0.7	0.5	0.3	0.2	0.2	0.1	0.1
3	1.4	1.1	0.8	0.5	0.3	0.2	0.2	0.2
4	1.8	1.5	1.0	0.6	0.4	0.3	0.3	0.2
5	2.3	1.9	1.3	0.8	0.5	0.4	0.3	0.3
6	2.7	2.2	1.5	0.9	0.6	0.5	0.4	0.3
7	3.2	2.6	1.9	1.1	0.7	0.6	0.5	0.4
8	3.6	3.0	2.0	1.2	0.9	0.7	0.5	0.4
9	4.1	3.3	2.3	1.4	1.0	0.7	0.6	0.5
10	4.5	4.0	2.5	1.5	1.1	0.8	0.7	0.5

The values are indicated as factors of the maximum permitted error of the BTU meter (with $\Delta\Theta_{min}$ = 3 K (5.4 °F)). The values below the gray line are higher than 1/3 of the maximum permitted error of the BTU meter (with $\Delta\Theta_{min}$ = 3 K (5.4 °F)).

If 2 different heat carriers (e.g. room heating and household hot water) merge shortly upstream from the temperature sensor, the optimum position of this sensor is directly downstream from the flow measuring point.

4.7 Post-mounting check

To install the BTU meter and the associated temperature sensors, observe the general installation instructions according to EN 1434 Part 6 and the Technical Guidelines TR-K 9 of the PTB (the German National Metrology Institute). TR-K 9 is available to download from the PTB website.

5 Wiring

5.1 Connection instructions

WARNING

Danger! Electric voltage!

- The entire connection of the device must take place while the device is de-energized.

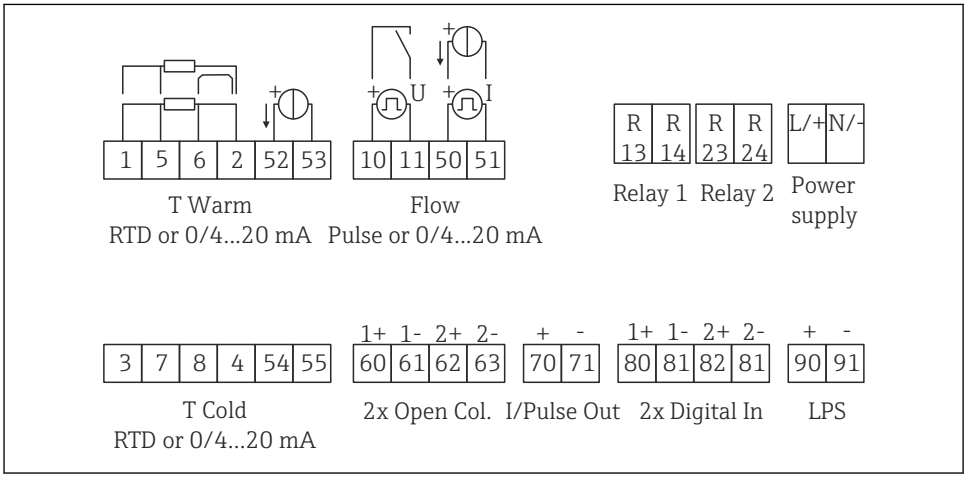
CAUTION

Pay attention to additional information provided

- Before commissioning, ensure that the supply voltage corresponds to the specification on the nameplate.
- Provide a suitable switch or power-circuit breaker in the building installation. This switch must be provided close to the device (within easy reach) and marked as a circuit breaker.
- An overload protection element (rated current ≤ 10 A) is required for the power cable.

To install the BTU meter and the associated components, observe the general installation instructions according to EN1434 Part 6.

5.2 Quick wiring guide



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18 Connection diagram of the device

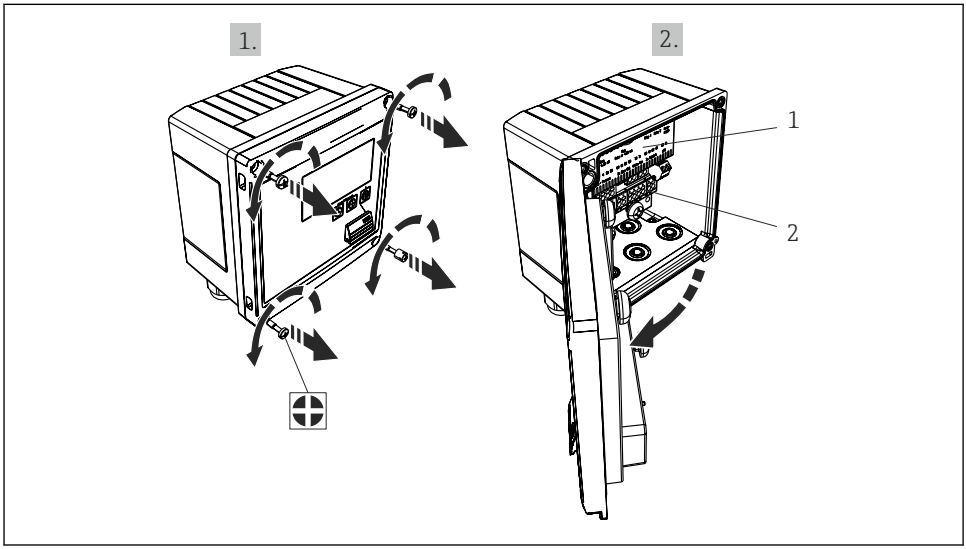
Terminal assignment

- In the case of heat differential /T, the temperature sensor for T condensate must be connected to the T Warm terminals and the temperature sensor for T steam to the T Cold terminals.
- In the case of heat differential /p, the temperature sensor for T condensate must be connected to the T Warm terminals.

Terminal	Terminal assignment	Inputs
1	+ RTD power supply	Temperature warm (Optionally RTD or current input)
2	- RTD power supply	
5	+ RTD sensor	
6	- RTD sensor	
52	+ 0/4 to 20 mA input	
53	Ground for 0/4 to 20 mA input	
3	+ RTD power supply	Temperature cold (Optionally RTD or current input)
4	- RTD power supply	
7	+ RTD sensor	
8	- RTD sensor	
54	+ 0/4 to 20 mA input	
55	Ground for 0/4 to 20 mA input	
10	+ pulse input (voltage)	Flow (Optionally pulse or current input)
11	- pulse input (voltage)	
50	+ 0/4 to 20 mA or current pulse (PFM)	
51	Ground for 0/4 to 20 mA input flow	
80	+ digital input 1 (switch input)	▪ Start tariff counter 1 ▪ Time synchronization ▪ Lock device
81	- digital input (terminal 1)	
82	+ digital input 2 (switch input)	▪ Start tariff counter 2 ▪ Time synchronization ▪ Lock device ▪ Change flow direction
81	- digital input (terminal 2)	
		Outputs
60	+ pulse output 1 (open collector)	Energy, volume or tariff counter. Alternative: limits/alarms
61	- pulse output 1 (open collector)	
62	+ pulse output 2 (open collector)	
63	- pulse output 2 (open collector)	
70	+ 0/4 to 20 mA/pulse output	Current values (e.g. power) or counter values (e.g. energy)
71	- 0/4 to 20 mA/pulse output	
13	Relay normally open (NO)	Limits, alarms
14	Relay normally open (NO)	
23	Relay normally open (NO)	
24	Relay normally open (NO)	

90	24V sensor power supply (LPS)	24 V power supply (e.g. for sensor power supply)
91	Power supply ground	
		Power supply
L/+	L for AC + for DC	
N/-	N for AC - for DC	

5.2.1 Opening the housing



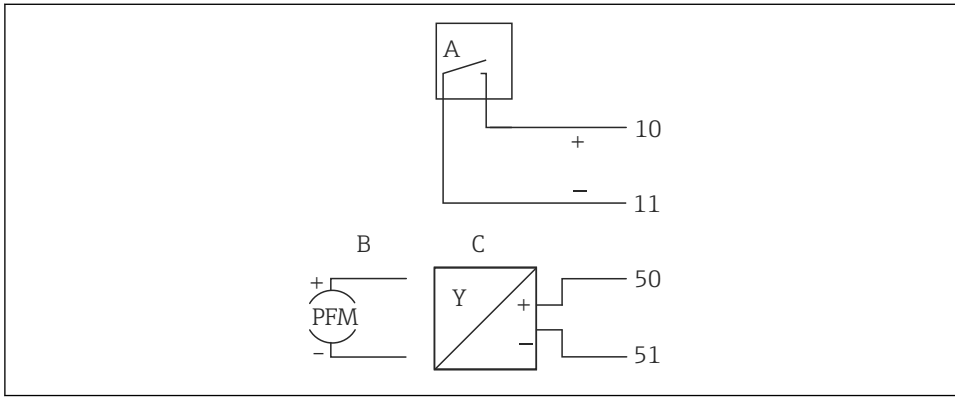
19 Opening the housing of the device

1 Terminal assignment labeling
2 Terminals

5.3 Connecting the sensors

5.3.1 Flow

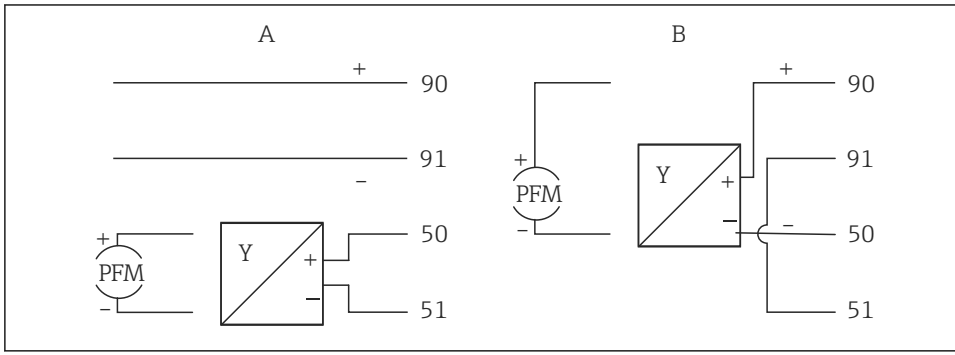
Flow sensors with external power supply



20 Connecting a flow sensor

A Voltage pulses or contact sensors including EN 1434 Type IB, IC, ID, IE
B Current pulses
C 0/4 to 20 mA signal (not in combination with MID approval option)

Flow sensors with power supply via the BTU meter

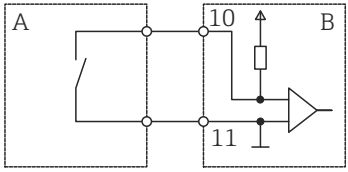
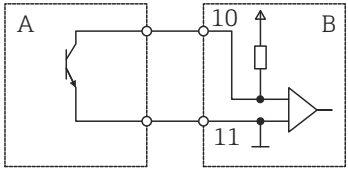
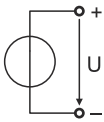
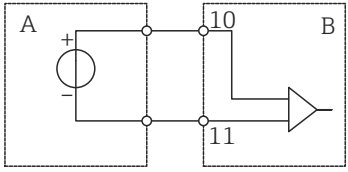


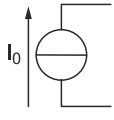
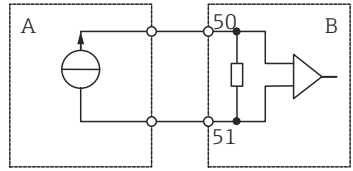
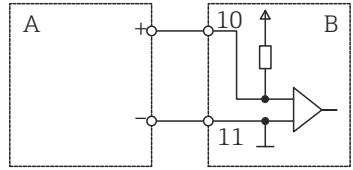
21 Connecting active flow sensors

A 4-wire sensor
B 2-wire sensor

Settings for flow sensors with pulse output

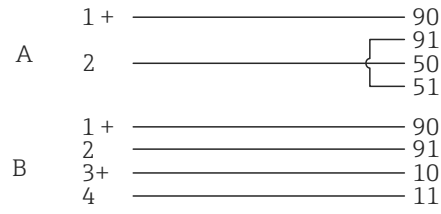
The input for voltage pulses and contact sensors is divided into different types according to EN1434 and provides a supply for switching contacts.

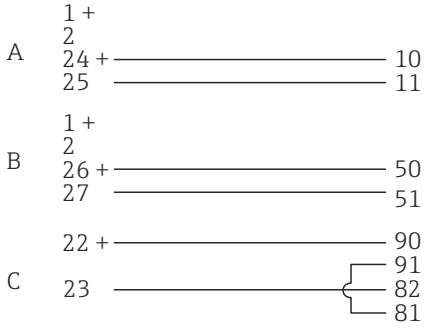
Pulse output of the flow sensor	Setting at the Rx33	Electrical connection	Comment
Mechanical contact  A0015360	Pulse ID/IE up to 25 Hz	 A0015354 *A Sensor* *B Rx33*	As an alternative, it is possible to choose "Pulse IB/IC+U" up to 25 Hz. The current flow via the contact is then lower (approx. 0.05 mA instead of approx. 9 mA). Advantage: lower power consumption, disadvantage: less immunity to interference.
Open collector (NPN)  A0015361	Pulse ID/IE up to 25 Hz or up to 12.5 kHz	 A0015355 *A Sensor* *B Rx33*	As an alternative, it is possible to choose "Pulse IB/IC+U". The current flow via the transistor is then lower (approx. 0.05 mA instead of approx. 9 mA). Advantage: lower power consumption, disadvantage: less immunity to interference.
Active voltage  A0015362	Pulse IB/IC+U	 A0015356 *A Sensor* *B Rx33*	The switching threshold is between 1 V and 2 V

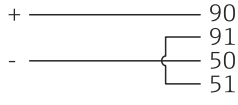
Pulse output of the flow sensor	Setting at the Rx33	Electrical connection	Comment
Active current  A0015363	Pulse I	 A0015357 *A Sensor* *B Rx33*	The switching threshold is between 8 mA and 13 mA
Namur sensor (as per EN60947-5-6)	Pulse ID/IE up to 25 Hz or up to 12.5 kHz	 A0015359 *A Sensor* *B Rx33*	No monitoring for short circuit or line break takes place.

Voltage pulses and transmitters according to Class IB and IC (low switching thresholds, small currents)	≤ 1 V corresponds to Low level ≥ 2 V corresponds to High level U max 30 V, U no-load: 3 to 6 V	Floating contacts, reed transmitters
Transmitters to Class ID and IE for higher currents and power supplies	≤ 1.2 mA corresponds to Low level ≥ 2.1 mA corresponds to High level U no-load: 7 to 9 V	

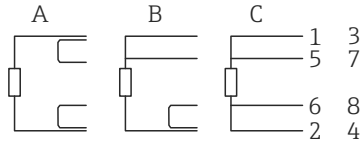
Endress+Hauser flowmeters

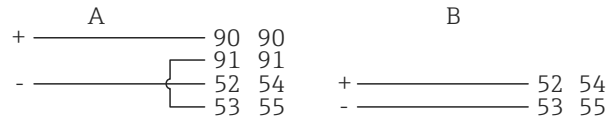
Flow sensors with PFM or pulse output: Proline Prowirl 72 and Proline Prosonic Flow 92F	Prowirl 72 Prosonic Flow 92F — EngyCal  A0014181 A = PFM B = pulse: Terminals 90/91 transmitter power supply, alternatively via external supply unit

Flow sensors with current or pulse output: Proline Promag 10 W Proline Promag 50 W Proline Promag 51W	Promag 10 W Promag 50 W Promag 51 W  A = Pulse input, B = Current input, C = Direction signal via open collector The Promag devices must be powered by an external power supply using terminals 1+ and 2.

DP sensors: Deltabar M PMD55, Deltabar S PMD 70/75	

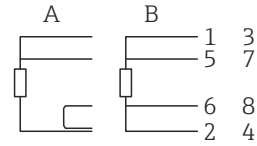
5.3.2 Temperature

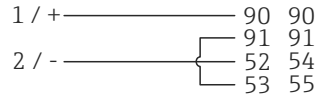
Connecting the RTD sensors	 A = 2-wire connection B = 3-wire connection C = 4-wire connection Terminals 1, 2, 5, 6: T warm Terminals 3, 4, 7, 8: T cold

Temperature transmitter connection	 A0014186 A = without external power supply of the transmitter, B = with external power supply of the transmitter Terminals 90, 91: transmitter power supply Terminals 52, 53: T warm Terminals 54, 55: T cold

To ensure the highest level of accuracy, we recommend using the RTD 4-wire connection, as this compensates for measurement inaccuracies caused by the mounting location of the sensors or the line length of the connecting cables.

Endress+Hauser temperature sensors and transmitters

Connection of RTD assembly	 A0014187 A = 3-wire connection B = 4-wire connection Terminals 1, 2, 5, 6: T warm Terminals 3, 4, 7, 8: T cold

Connection of TMT181, TMT121 temperature transmitter	 A0014188 Terminals 90, 91: transmitter power supply Terminals 52, 53: T warm Terminals 54, 55: T cold

5.4 Outputs

5.4.1 Analog output (active)

This output can be used either as a 0/4 to 20 mA current output or as a voltage pulse output. The output is galvanically isolated. Terminal assignment, → 20.

5.4.2 Relays

The two relays can be switched in case of fault messages or a limit violation.

Relay 1 or 2 can be selected under **Setup** → **Advanced setup** → **System** → **Fault switching**.

Limit values are assigned under **Setup** → **Advanced setup** → **Application** → **Limits**. Possible settings for limit values are described in the "Limits" section of the Operating Instructions.

5.4.3 Pulse output (active)

Voltage level:
- 0 to 2 V corresponds to Low level
- 15 to 20 V corresponds to High level

Maximum output current: 22 mA

5.4.4 Open collector output

The two digital outputs can be used as status or pulse outputs. Make the selection in the following menus **Setup** → **Advanced setup** or **Expert** → **Outputs** → **Open collector**

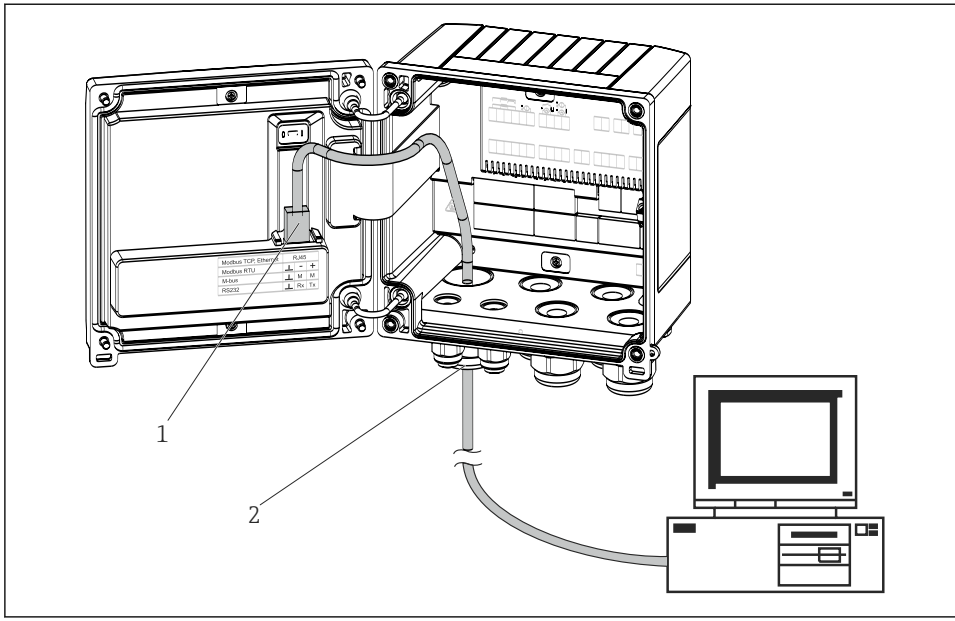
5.5 Communication

The USB interface is always active and can be used independently of other interfaces. Parallel operation of multiple optional interfaces, e.g. fieldbus and Ethernet, is not possible.

5.5.1 Ethernet TCP/IP (optional)

The Ethernet interface is galvanically isolated (test voltage: 500 V). A standard patch cable (e.g. CAT5E) can be used to connect the Ethernet interface. 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 using a hub or a switch or directly to office equipment.

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



22 *Connection of Ethernet TCP/IP, Modbus TCP*

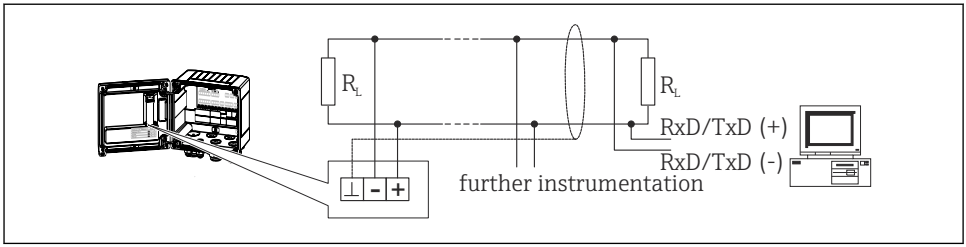
1 Ethernet, RJ45
2 Cable entry for Ethernet cable

5.5.2 Modbus TCP (optional)

The Modbus TCP interface is used to connect the device to higher-order systems to transmit all measured values and process values. The Modbus TCP interface is physically identical to the Ethernet interface → 22, 29

5.5.3 Modbus RTU (optional)

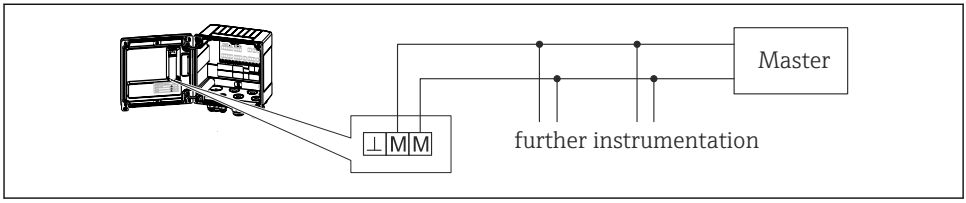
The Modbus RTU (RS-485) interface is galvanically isolated (test voltage: 500 V) and used to connect the device to higher-level systems to transmit all measured values and process values. It is connected via a 3-pin plug-in terminal in the housing cover.



23 Connection of Modbus RTU

5.5.4 M-Bus (optional)

The M-Bus (Meter Bus) interface is galvanically isolated (test voltage: 500 V) and used to connect the device to higher-level systems to transmit all measured values and process values. It is connected via a 3-pin plug-in terminal in the housing cover.



24 Connection of M-Bus

5.6 Post-connection check

After completing the device's electrical installation, carry out the following checks:

Device condition and specifications	**Notes**
Is the device or cable damaged (visual inspection)?	-
Electrical connection	**Notes**
Does the supply voltage match the specifications on the nameplate?	100 to 230 V AC/DC (±10 %) (50/60 Hz) 24 V DC (–50 % / +75 %) 24 V AC (±50 %) 50/60 Hz
Do the cables have adequate strain relief?	-
Are the power supply and signal cables correctly connected?	See wiring diagram on the housing

6 Operation

6.1 General information regarding operation

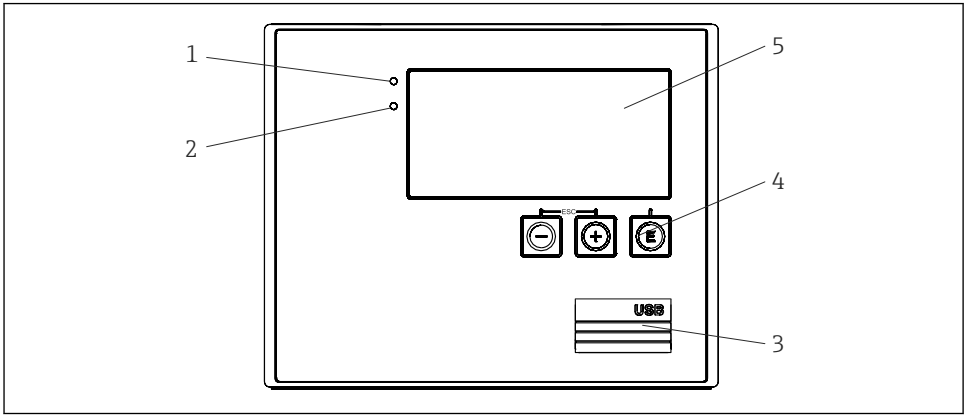
The BTU meter can be configured using operating keys or with the help of the "FieldCare" operating software.

The operating software, including the interface cable, is available as an order option, i.e. it is not included in the basic scope of delivery.

Parameter configuration is locked if the device is locked by the write protection switch → 33, the custody transfer switch, the user code or digital input. For devices locked by the custody switch, custody transfer-related parameters can only be changed a maximum of three times. After that, these parameters can no longer be accessed.

For details, see "Access protection" section in the Operating Instructions.

6.2 Display and operating elements



25 *Display and operating elements of the device*

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

Green LED if voltage present, red LED in the event of an alarm/error. Green LED is always lit once the device is supplied with power.

Red LED flashing slowly (approx. 0.5 Hz): The device has been set to the bootloader mode.

Red LED flashing quickly (approx. 2 Hz): In normal operation: maintenance required. During firmware update: data transmission in progress.

Red LED remains lit: Device error.

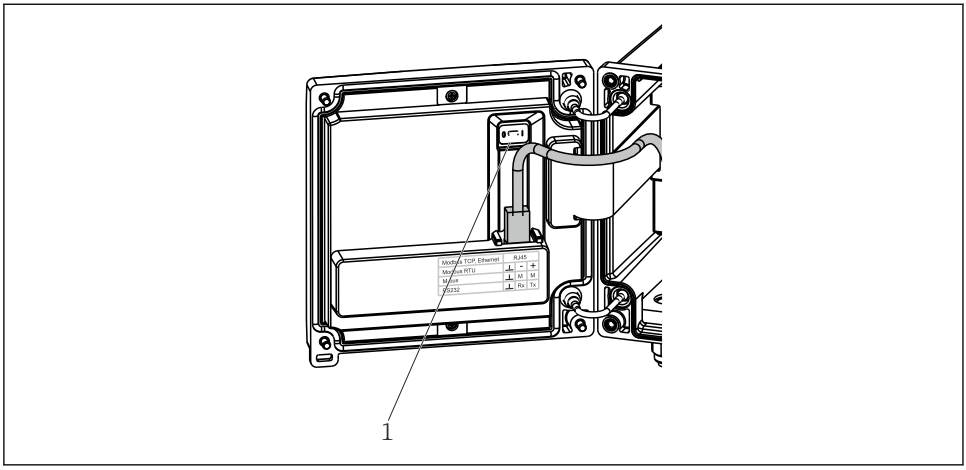
6.2.1 Operating elements

3 operating keys, "-", "+", "E"

Esc/Back function: Press "-" and "+" simultaneously.

Enter/Confirm entry function: Press "E"

Write protection switch

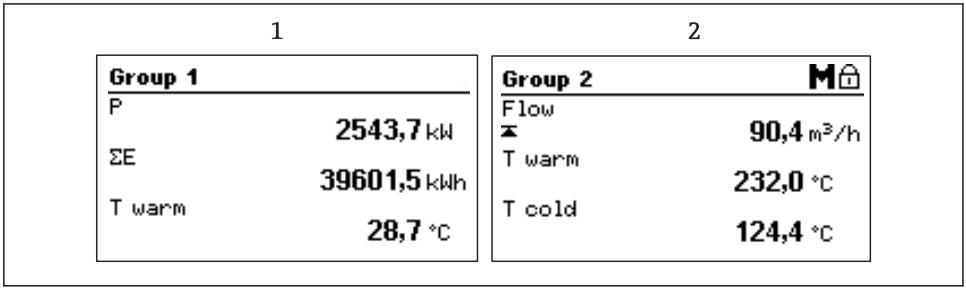


A0015168

26 Write protection switch

1 Write protection switch on rear of housing cover

6.2.2 Display



A0024095

27 BTU meter display (example)

1 Group 1 display
2 Group 2 display, maintenance required, setup is locked, upper limit value for flow was violated

6.2.3 "FieldCare Device Setup" operating software

To configure the device using the FieldCare Device Setup software, connect the device to your PC via the USB interface.

Establishing a connection

1. Start FieldCare.

2. Connect the device to the PC via USB.
3. Create project in File/New menu.
4. Select Communication DTM (CDI Communication USB).
5. Add device EngyCal RH33.
6. Click Connect.
7. Start parameter configuration.

Continue with device configuration in accordance with these Operating Instructions for the device. The complete Setup menu, i.e. all of the parameters listed in these Operating Instructions, can also be found in the FieldCareDevice Setup.

NOTICE

Undefined switching of outputs and relays

- During configuration with FieldCare, the device may assume undefined statuses! This may result in the undefined switching of outputs and relays.

6.3 Operating matrix

A complete overview of the operating matrix, incl. all of the configurable parameters, can be found in the appendix of the Operating Instructions.

Language	Picklist with all available operating languages. Select the language of the device.

Display/operation menu	▪ Select the group for display (alternate automatically or fixed display group) ▪ Configure brightness and contrast of display ▪ Display saved analyses (day, month, year, billing date, totalizer)

Setup menu	The parameters for quick commissioning of the device can be configured in this setup. The advanced setup contains all of the essential parameters for configuring the device function. ▪ Units ▪ Pulse value, value ▪ Mounting location of flow sensor ▪ Date and time Parameters for quick commissioning Advanced setup (settings that are not essential for the basic operation of the device) Special settings can also be configured via the "Expert" menu.

Diagnostics menu	Unit information and service functions for a swift unit check. ▪ Diagnostic messages and list ▪ Event and calibration logbook ▪ Device information ▪ Simulation ▪ Measured values, outputs

Expert menu	The Expert menu provides access to all of the operating positions of the device, including fine-turning and service functions. ▪ Skip directly to the parameter via Direct Access (on device only) ▪ Service code to display service parameters (via PC operating software only) ▪ System (settings) ▪ Inputs ▪ Outputs ▪ Application ▪ Diagnostics

7 Commissioning

Make sure that all post-connection checks have been carried out before putting your device into operation:
- See 'Post-mounting check' section, → 19.
- Checklist, 'Post-connection check' section, → 30.

After the operating voltage is applied, the display and the green LED are illuminated. The device is now operational and can be configured via the keys or the "FieldCare" parameterization software → 33.

Remove the protective film from the display as this would otherwise affect the readability of the display.

7.1 Quick commissioning

For quick commissioning of the "standard" BTU meter application, you only have to enter five operating parameters in the **Setup** menu.

Prerequisites for quick commissioning:

- Flow transmitter with pulse output
- RTD temperature sensor, 4-wire direct connection

Menu/setup
- **Units**: Select unit type (SI/US)
- **Pulse value**: Select the unit of the pulse value of the flow transmitter
- **Value**: Enter the pulse value of the flow sensor
- **Mounting location**: Determine the mounting location of the flow transmitter
- **Date/time**: Set the date and time

The device is now operational and ready to measure heat energy (cold energy).

You can configure device functions, such as data logging, tariff function, bus connection and the scaling of current inputs for flow or temperature, in the **Advanced setup** menu or in the **Expert** menu. Descriptions of these menus can be found in the Operating Instructions.

- Inputs/flow:
  Select the signal type and enter the start and end of the measuring range (for current signal) or the pulse value of the flow transmitter.
- Inputs/temperature warm
- Inputs/temperature cold

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