



Level



Pressure



Flow



Temperature



Liquid Analysis



Registration



Systems Components



Services



Solutions

Technical Information

EngyCal[®] RH33

BTU meter

Custody transfer BTU meter for recording and billing the heat/cold quantity given off by water, water/glycol mixtures or other liquids



Highlights

- Verified and certified reliability and accuracy
- Transparent energy consumption helps you save on energy costs
- Remote readout via Ethernet and fieldbuses

Application

Recording and billing the quantities of heat and cold in:

- Heating circuits
- Cooling circuits
- Combined heating and cooling circuits

Typical application areas in industry, long-distance heat networks and building automation.

Features and benefits

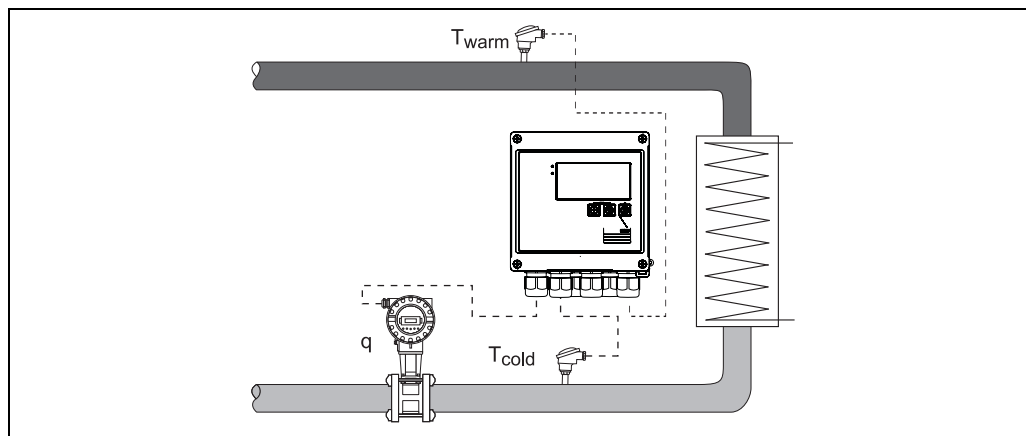
- Standard models are suitable for connecting and supplying all common volume flow transmitters and temperature measuring points
- Detailed data logging of current and counter values and of error messages, off-limit conditions and changes to operating parameters
- Industry-compliant compact housing for field or wall mounting, panel mounting or top-hat rail mounting
- Deficit counter for transparency in case of error or alarm
- Custody transfer logbook enables versatile device configuration in the field
- Tariff counter for requirements-based billing
- Calibrated, electronically paired temperature sensors ensure the highest accuracy and enable replacement of individual temperature sensors even for certified devices in the field (without reapproval!)

Function and system design

Measuring principle

The EngyCal® RH33 BTU meter is used to measure the heat and cold in systems with liquid heat transfer fluids. It is easy to install and read. Thanks to its verified long-term stability and high-precision measurements, the device helps optimize processes and control costs in the process. Comprehensive data analysis options in the Field Data Manager software MS20 (see accessories) identify potential areas for cost reduction.

Measuring system



Measuring system with EngyCal® RH33, 2x paired temperature sensors and flow sensor

Functions

Energy calculation

EngyCal® RH33 calculates the thermal energy of water, glycol/water mixtures or other liquids such as thermal oils in accordance with EN1434.

Calculation basis: IAWPS-IF97

Calculated values:

- Power
- Volume
- Density
- Enthalpy & enthalpy differential
- DP flow compensation
- Mass
- Temperature differential

Counters

Volume, mass, energy, deficit

Optional: tariff1, tariff2 or separate heat/cold energy, balance energy

Fault mode / deficit counter

The fault mode of the EngyCal® RH33 can be defined freely (no further calculation or calculation with error value). Thanks to the defined fault mode and the separate deficit counter, the device guarantees transparency for energy calculation and documentation for billing.

For the case of further calculation with an error value, the total calculated energy during the error condition is counted on a deficit counter.

In this case, the output continues to supply the calculated energy value. If values are communicated via buses, these are given the value "invalid". Optionally, an alarm relay can be switched.

Temperature sensor matching in the device

The pairing of temperature sensors takes place internally in the EngyCal® RH33 by storing the response curves via Callendar van Dusen coefficients. The Callendar van Dusen coefficients are determined by the calibration of the temperature sensor.

The internal alignment function makes it possible to use unpaired sensors, and to replace one sensor independently of the second sensor while maintaining or improving accuracy levels (compared to using paired sensors).

Compensation of differential pressure flow measurement

The flow calculation according to 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. The iterative solution of the calculation equations listed there allow the best possible accuracy (ca. 0.6 – 1 %) to be attained for DP flow measurements.

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

The measurement (orifice plate, nozzle, Venturi pipe) is carried out according to ISO5167. Flow measurements according to the dynamic pressure method are determined according to the relationship between the differential pressure and flow.

Data logging and logbook

Event logbook:

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

In the event logbook, all parameter changes, off-limit conditions, alarms and other events are documented with timestamp such that they are tamper-proof. At minimum, the last 1600 events are stored in non-volatile memory.

The data logging allows process values and calculated values, as well as counters, to be stored in freely definable intervals. Predefined analyses (Day, Month, Year, Billing dates) support the transparency of the process and sure a quick overview of all consumption values.

All entries into the event logbook and the logged data can be read out automatically via the visualization software (Field Data Manager Software) and backed up in an SQL database so that it is tamper-proof.

For fast and easy-to-understand analysis in case of service, an internal diagnostic memory with occurred error messages is also available.

Analysis	No. of analyses
Interval (1 min)	Approx. 1750
Day	260 days
Month/year/billing date	17 years
Events	At least 1600 (depending on the length of the message text)

Approval for custody transfer and custody transfer logbook

The device is equipped with a custody transfer switch, which disables configuration ranges that are relevant for custody transfer.

The custody transfer switch is located inside the device. The housing is lead-sealed.

The switch is enabled before delivery if the device is ordered with approval for custody transfer. Following this, it is possible to reconfigure relevant device settings three times. All changes to the parameters are logged in the custody transfer logbook and time-stamped.

The switch can only be reset by the manufacturer.

Thus the seamless documentation enables versatile commissioning and parameter configuration of the computer in the field (without loss of custody transfer approval).

Limit value monitoring

Three limits can be assigned as desired the following measured and calculated values:

Volume flow, temperature, pressure, mass flow, power (heat flow), density, enthalpy, operating volume, heat and tariff 1, tariff 2

In case of violation of the defined limits, an entry is made into the event logbook. In addition, relays can be switched and the off-limit condition can be indicated in the display. Limits are also visible via the integrated Web server.

Bidirectional measurement (optional)

EngyCal® RH33 enables bidirectional measurement, i.e. the combined measurement of heat and cold, for example when charging/discharging a heat accumulator, including calculation of the quantities of heat. The bidirectional measurement can be flow-dependent or temperature-dependent.

A digital input can be used to detect the flow direction.

This option cannot be combined with the tariff function.

Tariff counters (optional)

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

Two types of tariff counter are available: A defined tariff can be activated by an event or via the digital inputs. If the defined event occurs, the calculated energy is counted at this tariff.

Tariff counters enable, for example, invoicing on specific billing dates (due date invoicing), requirements-based billing (daytime/nighttime tariff) and analysis of counters when reaching set points, e.g. power-dependent.

Various tariff models are available for selection in the device, e.g. Energy; Power, warm; Power, cold; Time. The standard counters continue running at the same time, e.g. they are not affected by the activation of the tariff counters.

This option cannot be combined with the bidirectional measurement function.

Real time clock (RTC)

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

The real time clock continues running even in case of a power failure, the device documents power on and off; the clock switches automatically or (optionally) manually from daylight saving to standard time.

Display

To display measured values, counters and calculated values, 6 groups are available. Each group can be assigned up to 3 values or meter readings as desired.

Analyzing the stored data - Field Data Manager software MS20

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

Input

Current/pulse input

This input can be used either as a current input for 0/4 to 20 mA signals (not if the approval for custody transfer option has been selected) or as a pulse/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 or 500 ms respectively when using one or two RTD inputs.

Reaction 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 % over range
Accuracy:	0.1 % of full scale value
Temperature drift:	0.01 %/K (0.0056 %/°F) of the 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 V to 6 V
Current limiting resistance in the power supply (pull-up at input):	50 kΩ to 2 MΩ
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 V to 9 V
Current limiting resistance in the power supply (pull-up at input):	562 Ω to 1 kΩ
(Not suitable for active input voltages)	
Current/pulse input:	
Low-level	≤ 8 mA
High-level	≥ 13 mA
Loading capacity:	Max. 50 mA, max. 2.5 V
Input impedance (load):	50 Ω
Accuracy during frequency measurement:	
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 (0/4 to 20 mA; not if the approval for custody transfer option has been selected) or as resistance temperature detector (RTD = resistance thermometer) inputs. It is also possible to configure one input as a current input and the other as an RTD input.

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 % over range
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
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. As an option, Endress+Hauser resistance thermometers TR10 are available, see ordering information.

Measuring ranges:	
Pt100_exact:	-200 °C to 300 °C (-328 to 572 °F)
Pt100_wide:	-200 °C to 600 °C (-328 to 1112 °F)
Pt500:	-200 °C to 300 °C (-328 to 572 °F)
Pt1000:	-200 °C to 300 °C (-328 to 572 °F)
Connection method:	2-, 3- or 4-wire connection
Accuracy:	4-wire: 0.06% of measuring range 3-wire: 0.06% of the measuring range + 0.8 K (1.44 °F)
Temperature drift:	0.01 %/K (0.0056 %/°F) of the 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 Ω
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 Time synchronization Lock device (Block set up)	Activate tariff counter 2 Change flow direction Time synchronization Lock device (Block set up)

Output

Current/pulse output

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 (500 V testing voltage towards all other inputs and outputs).

Current output

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

Pulse output

Frequency:	Max. 12.5 kHz
Pulse width:	Min. 40 μ s
Voltage level:	Low: 0 to 2 V 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 (1500 V testing voltage towards all other inputs and outputs).

Max. relay switching capacity:	AC: 250 V, 3 A DC: 30 V, 3 A
Minimum contact load:	10 V, 1 mA
Min. switching cycles:	>10 ⁵

2 x digital output (open collector)

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 μ s
Current:	Max. 120 mA
Voltage:	Max. 30 V
Voltage drop:	Max. 2 V in conductive state
Maximum load resistance:	10 k Ω  Note! For higher values, the switching edges are flattened.

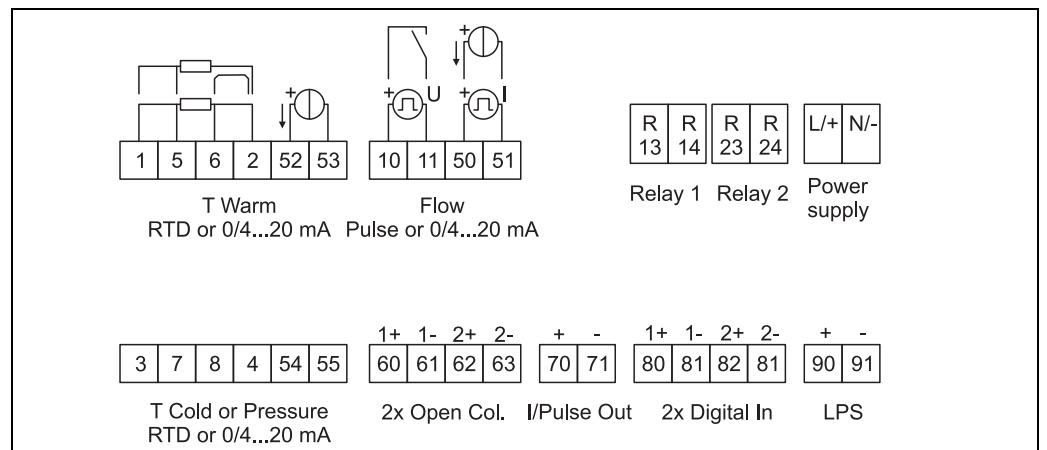
**Auxiliary voltage output
(transmitter power supply)**

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.	

Terminal assignment

Electrical connection



Terminal assignment of the EngyCal® RH33

Supply voltage

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

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

Power consumption

15 VA

Communication interfaces

A USB interface (with CDI protocol), and optionally 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 PTB-A 50.1.

USB device

Connection:	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 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 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

When the device is connected via Ethernet, the display values can also be read out via the Internet using a web server.

Data can be read out via the web server in HTML or XML format.

RS485

- Connection: 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. The Modbus TCP interface is physically 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 used to connect the device 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 used to connect the device to higher-order systems to transmit all measured values and process values. It is connected via a 3-pin plug-in terminal.

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 \pm 9 °F)
- Humidity 39% \pm 10% RH

Arithmetic unit

Medium	Variable	Range
Water	Temperature measuring range	0 to 350 °C (32 to 662 °F)
	Temperature differential range ΔT	0 to 350 K (0 to 630 °F)
	Measuring range approved for custody transfer	0 to 300 °C (32 to 572 °F) ΔT : 3...297 K (5.4...534.6 °F)
	Accuracy	3 to 20 K (5.4 to 36 °F) < 0.7% of the measured value 20 to 300 K (36 to 540 °F) < 0.2% of the measured value
	Accuracy acc. to EN1434/OIML75	$\pm (0.5 + \Delta\Theta \text{ min}/\Delta\Theta) \%$
Water/glycol	Glycol concentration	0-60 %
	Temperature measuring range	-40 to 350 °C (-40 to 662 °F)
	Maximum temperature differential range	ΔT 0 to 390 K (0 to 702 °F)
	Accuracy (0 - 40 % glycol)	3 to 20 K (5.4 to 36 °F) < 0.9% of the measured value 20 to 300 K (36 to 540 °F) < 0.4% of the measured value
Liquids	Temperature measuring range	-200 to 600 °C (-328 to 1112 °F)
	Maximum temperature differential range ΔT	ΔT 0 to 390 K (0 to 702 °F)
	Error limit for ΔT	see water
Measurement and calculation interval		500 ms

Installation

Installation instructions

Mounting location

Wall/pipe mounting, panel or top-hat rail as per IEC 60715¹⁾

Orientation

The orientation is only determined by 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 ambient class C

Humidity

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

Electr. safety

As per IEC 61010-1, UL61010-1 and CAN C22.2 No 1010-1.

- Protection class II
- Overvoltage category II
- Pollution degree 2
- Overload protection ≤ 10 A
- Operating altitude: up to 2000 m above MSL

Degree of protection

- Panel mounting: IP65 front panel, IP20 rear panel (not evaluated by UL)
- Top-hat rail: IP20
- Field housing: IP66, NEMA4x (for cable gland with double seal insert: IP65) (not evaluated by UL)

Electromagnetic compatibility

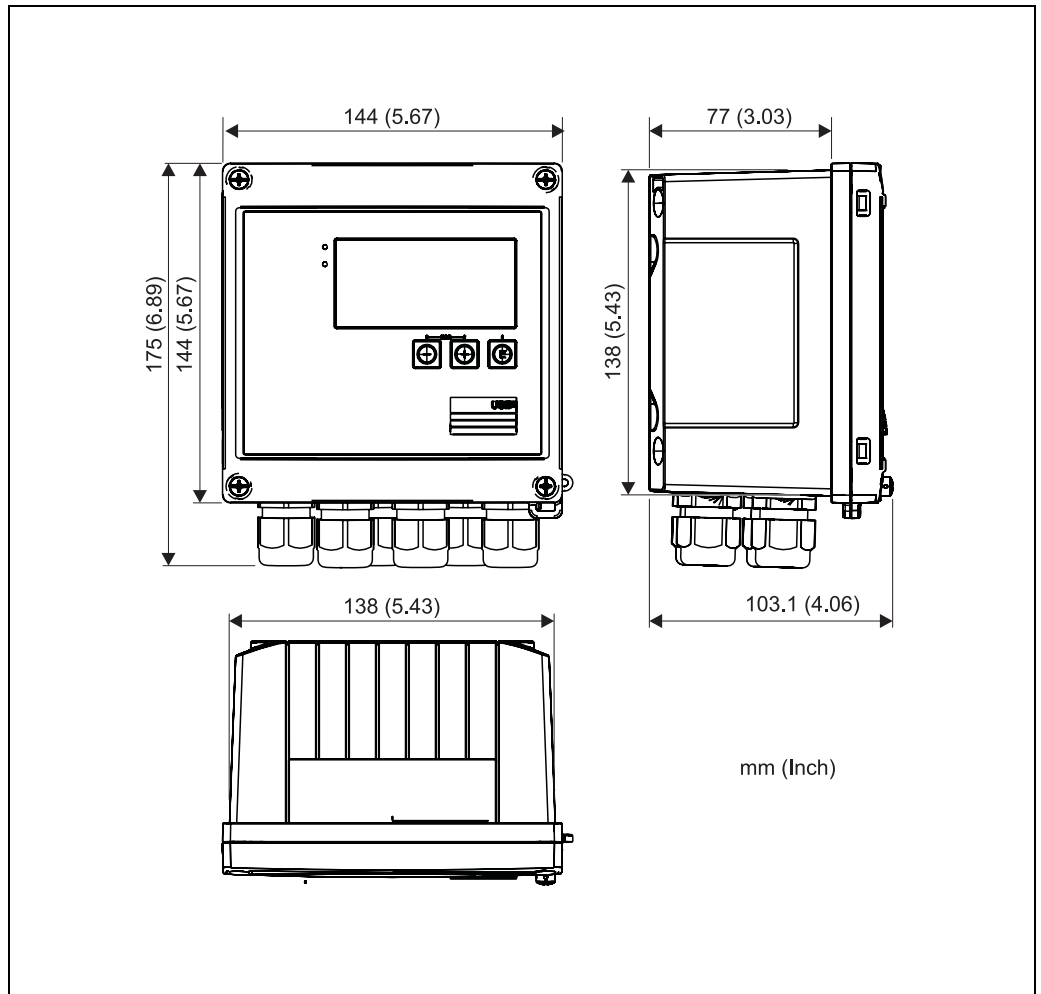
As per EN 1434-4, EN 61326 series and NAMUR NE21

1) According to UL approval panel or surface mountable only

Mechanical construction

Design, dimensions

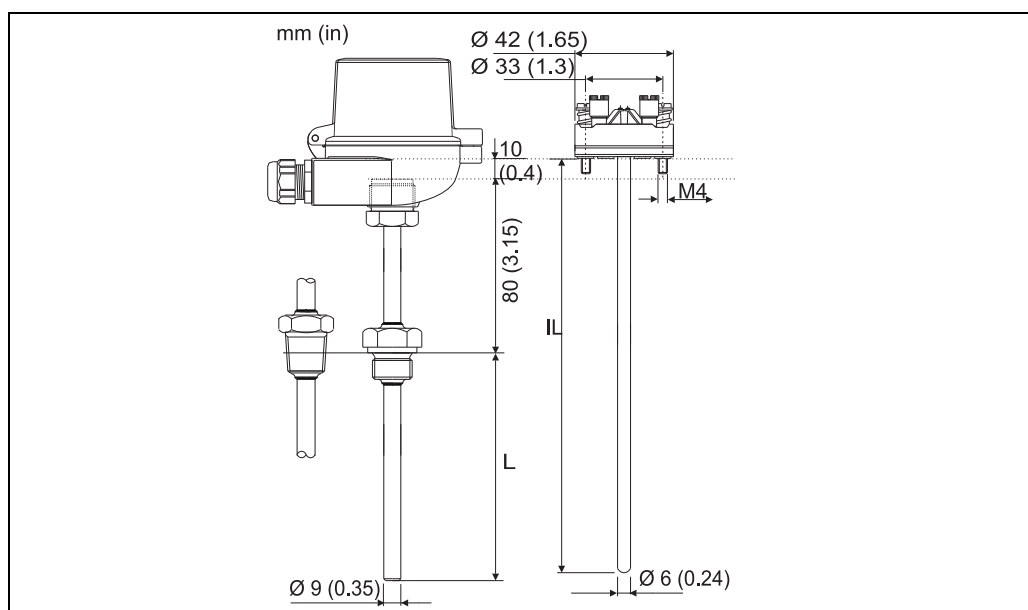
EngyCal® RH33



BTU meter housing; dimensions in mm (dimensions in inches in brackets)

a0013438

Resistance thermometer TR10 (option)



Optional resistance thermometer TR10; dimensions in mm (dimensions in inches in brackets)

IL Insertion length
L Immersion length

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

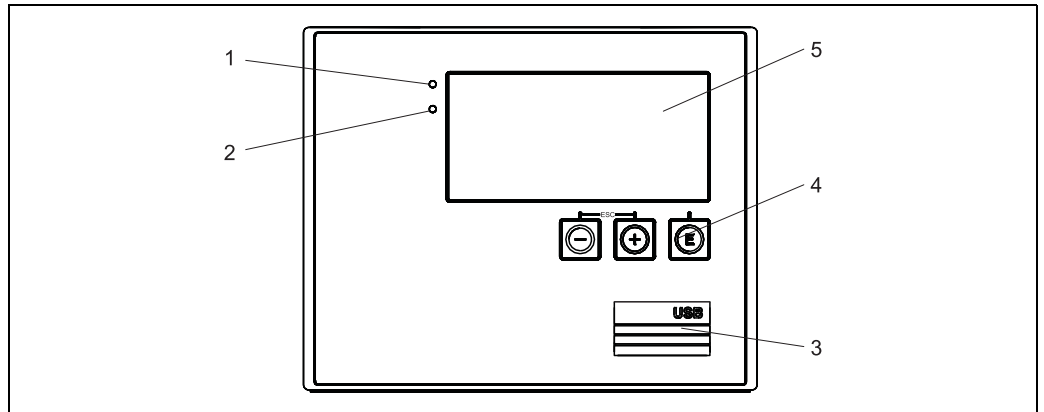
Process connection of resistance thermometer TR10 (option)

Process connection		Version		Thread length TL in mm (in)
Cylindrical	Conical	G	G1/2"	15 (0.6)
		NPT	NPT1/2"	8 (0.32)

Human interface

Display elements

- Display:
160 x 80 dot matrix LCD with white background, color switches to red in an alarm condition, active display area 70 x 34 mm (2,76 x 1,34 ")
- LED status display:
Operation: 1 x green
Fault indication: 1 x red



Display and operating elements of the BTU meter

- 1 LED green, "Operation"
 2 LED red, "Fault indicator"
 3 USB connection for configuration
 4 Operating keys: -, +, E
 5 160x80 DOT matrix display

Local operation

3 keys, "-", "+", "E".

Configuration interface

USB interface, front-panel, optional Ethernet interface: configuration via PC with PC operating software.

Data logging

Real time clock

- Drift: 15 min per year
- Power reserve: 1 week

Software

- **Field Data Manager software:** visualization software and database for analyzing and evaluating the measuring data and calculated values, as well as tamper-proof data logging
- **FieldCare Device Setup:** The device can be programmed using the FieldCare PC software. FieldCare Device Setup is included in the scope of supply of the Commubox FXA291 or RXU10-G1 (see 'Accessories') or can be downloaded at no charge from www.endress.com.

Certificates and approvals

Approval for custody transfer	As per MID (EN1434 water/liquids) and OIML R75
CE mark	The measuring system meets the legal requirements of the EU directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
Other standards and guidelines	<ul style="list-style-type: none"> ■ IEC 60529: Degrees of protection provided by enclosures (IP code) ■ IEC 61010-1: 2001 cor 2003 Safety requirements for electrical equipment for measurement, control and laboratory use ■ IEC 61326 series: Electromagnetic compatibility (EMC requirements) ■ NAMUR NE21, NE43 Association for Standards for Control and Regulation in the Chemical Industry ■ IAWPS-IF 97 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). ■ OIML R75 International construction and testing regulation for water energy managers by the Organisation Internationale de Métrologie Légale. ■ EN 1434 ■ EN ISO 5167 Measurement of fluid flow by means of pressure differential devices
CSA GP	<ul style="list-style-type: none"> ■ CAN/CSA-22.2 No. 61010-1, 2nd Edition
UL approval	<ul style="list-style-type: none"> ■ UL 61010-1, 2nd Edition

Ordering information

Product structure

RH33	Compact Device BTU meter with display. 3 button operation, data storage (min/h/d/m/y, min/max, alarms), configuration socket for connection to PC (USB). 1 Analog/Puls input (Flow), 2 RTD/analog inputs (Temperature), 2 Digital input (reset counter), 2 Relay (limit monitoring, alarm). In a compact field housing.				
Approval:					
	AA	Non-hazardous area			
	CP	CSA GP			
Power Supply:					
	1	100-230V (AC: -15%/+10%,50/60 Hz)			
	2	24V (DC: -50%/+75%; AC: +/-50%,50/60 Hz)			
Medium:					
	A	Water			
	B	Glycol + water + other fluids			
RH33-					← Order code (part 1; 1 attribute per category must be selected.)
Additional selection (as option; no selection or multiple selection is possible)					
					Operation Language Display: AA English AB German AC French AD Spanish AE Italian AF Dutch AG Portuguese AH Polish AI Russian AR Czech
					Output: B1 1x analog/puls (active), 2x open collector
					Additional Sensoric: C1 mm, head: M20, process: G1/2", 2x Pt100 (+ paired via CvD-calibration) C2 mm, head: M20, process: 1/2" NPT, 2x Pt100 (+ paired via CvD-calibration) C3 mm, head: NPT1/2, process: G1/2", 2x Pt100 (+ paired via CvD-calibration) C4 mm, head: NPT1/2, process: 1/2" NP 2x Pt100 (+ paired via CvD-calibration) CY Special version, TSP-no. to be spec.
					Communication: D1 Ethernet TCP/IP, Modbus D2 Modbus RTU RS485 D3 M-Bus
					Application Package: E1 T-Sensor-Matching via CvD E2 Tariff function, 2 counters E3 Bidirectional measurement E4 DP-Flow calculation/compensation
					Calibration: F1 Works calib. certificate 5-point fixed FY Special version, TSP-no. to be spec
					Service: H1 Application specific pre-configured HY Special version, TSP-no. to be spec
RH33-				+	← Order code (Teil 1 + 2)

Accessories

- Software and communication**
- USB cable and FieldCare Device Setup calibration software incl. DTM library
 - RXU10-G1
 - FXA291
 - Visualization software with Field Data Manager MS20, SQL-based database software
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- Overvoltage protection**
- Overvoltage protection for sensors and devices:
HAW569 surge arrester to screw into field housing, M20
HAW562 surge arrester limiting high voltages on signal cables and components
-

Documentation

- Operating Instructions for 'EngyCal® RH33 BTU Meter' (BA00290K/09)
- Technical Information 'Surge arrester HAW562' (TI01012K/09)
- Technical Information 'Surge arrester HAW569' (TI01013K/09)
- Brochure 'System components: Indicators with and without control unit for field and panel mounting, power supplies, barriers, transmitters, energy managers and surge arresters' (FA016K/09)

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