CALEC® light

Heat calculator

Contents

1. Advantages and applications

1.1

Applications

- A reliable charge meter for standard applications in the district and local heat supply sector, as well as for combined plant heating/power stations and cooling systems.
- For commercial and industrial use, and to monitor systems in energy installations.
- For the middle and lower performance ranges in heat production and distribution.
- Whenever there are demanding requirements for measuring accuracy and stability.
- As a transmitter of heat data for remote processing via the M-Bus communications channel.
- In inspection, testing and calibration systems.
- Suitable for use in building tenant metering and cooling systems with water ≥ 0°C.

1.2

Advantages

The CALEC® light complies 100% with the EN 1434 heat meter standard and EMC directives 89/336/EEC (CE certification).
Accuracy and long-term stability thanks to high quality engineering. Efficient microprocessor metering system with integral data backup by EEPROM.

Compact modular design
For wall or electrical control panel mounting. Compatible with all commercially available meter boards. Output options can be installed at a later stage without damaging the calibration seal.

Illuminated text display
Only one rated power type up to 30 MW/GJ/h, thanks to 8-digit totalisers for energy and volume.
For precise identification of measuring points, the unit has an electronic text display which can also be read by the M-Bus protocol (40-character ASCII string).

Data communications
Fast reading by hand-held terminal or PC via the built-in infrared interface or continuous reading via the M-Bus interface on the terminals. Remote reading via the M-Bus interface according to EN 1434-3 at any time.
Functions and parameters which are not relevant to calibration can also be newly entered or modified via the M-Bus interface at a later stage. These can also be partially protected against manipulation.

Datalogger
Monthly dates and billing date memory
15-month memory, with the respective month-end values for the energy and volume meters, monthly peak values for power and flow, and two billing date memories for the relevant energy meter readings.

In order to guarantee that the date-dependent datalogger functions correctly, we recommend that the optional realtime clock (2RWC) is installed.

Others
Any errors which occur are stored, together with the duration of the error (in seconds). This means that their significance in relation to measurements can be evaluated retroactively.

The meter is powered from the mains and **needs no battery**. In case of power failure, data are saved in an EEPROM. Data security is thus equivalent to electronic roller counter type meters.
With the realtime clock option, date and time will continue functioning even after a power failure. This option can be retrofitted at any time. The clock has a standby battery which guarantees 10-years operation.

M-Bus interface according to EN 1434
(M-Bus = meter bus)
The standard data communications interface for heat meters allows remote reading, control and calibration via the communications interface. Simultaneous remote reading of other types of meter, such as gas, water or electricity is also possible with M-Bus.

2. Heat metering system design

A heat metering system comprises a flow meter, two paired temperature sensors and the metering unit. Even the best metering unit cannot compensate for errors in sensor dimensioning and installation. It is therefore strongly recommended that great care is taken with the selection and specification of the metering point.

For detailed system layout information, please refer to our general installation guidelines and to heat meter standard EN 1434 Part 6.
Our specialists are at your disposal for system installation planning, thus saving you the unnecessary outlay and expense of subsequent alterations.

2.1

Flow metering

This value should be selected as low as possible, in the interests of high resolution and continuous measurement.

The point of installation is of crucial importance since the volume-to-mass conversion is performed at the temperature specified under "installation location".

Because flow/return definitions can lead to misunderstandings, above all in refrigeration systems, the terms "hot side" and "cold side" are used for greater clarity. In heating systems, for example, the return flow loop is the cold side of the heat circuit. Flow meters should preferably be installed in piping sections near room temperature. This makes for greater accuracy and extends service life.

2.2

Temperature measurement

The CALEC® light has two very accurate temperature measurement inputs, to which two approved, paired Pt100 temperature sensors (2- or 4-conductor technology) are connected. The best measuring accuracy with the CALEC® light will only be achieved by using temperature sensors paired to ≤0.05K.
By their very nature, temperature sensors paired to 0.1K will contribute a greater inherent error, which can no longer be compensated even by the best computing mechanisms.

This is why the installation and wiring of the temperature sensors must be carried out with the greatest of care.

For planning, please refer to the information provided at 3.3, Temperature Measurement, and to the Heat Meter Standard, EN 1434, Parts 2 and 6. EN1434-2 states that only sensors of the same design and length may be paired.

2.3

Heat calculators

Heat calculators are maintenance-free except for recalibration after expiry of the certified period. They must be easily accessible for reading, and protected against heat and electromagnetic interference.

Heat calculators must be clearly marked together with their flow meter and temperature sensor pair. This is extremely important at multiple metering points where confusion can arise.

2.4

Metering concept

Heat meters must be installed according to a systematic concept, depending on whether individual consumers are to be metered or an overall consumption balance is required.

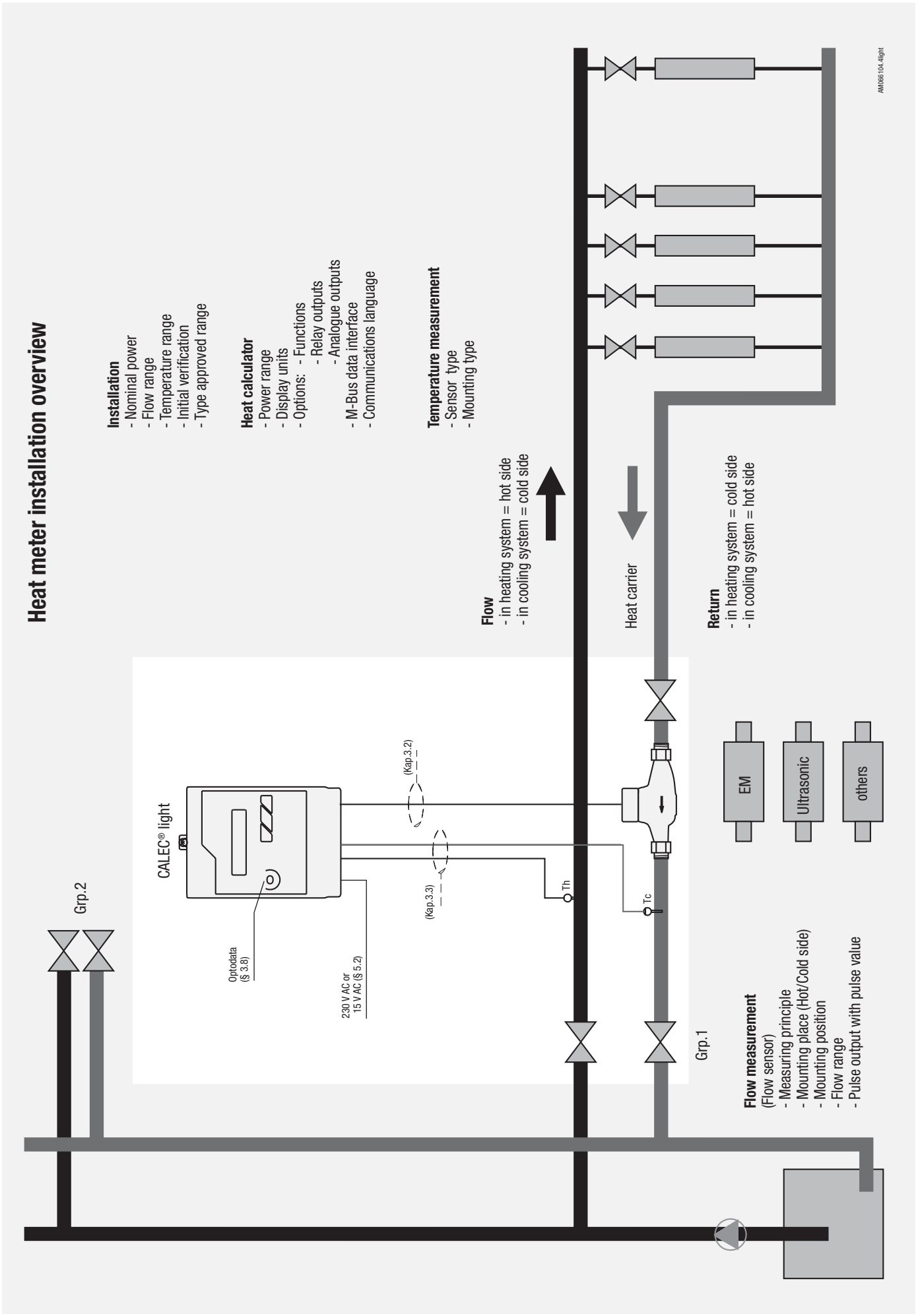
In the latter case, all part - consumers must be metered - extrapolation of unmetered components as a difference in the main measurement is not admissible since it usually causes significant errors.

2.5

Installation recommendations

The installation and commissioning of heat meters is a specialists task, demanding the greatest care and expertise. Apart from the recommendations set out here, compliance is also required with EN 1434 Part 6 guidelines and the product operating instructions. Precision requirements can only be met if the meter is installed correctly.

When meters are being installed for the first time, it is already worth remembering that, for reasons of maintenance or verification, all units comprising a system will need exchanging at a future date.


Heat meter installation overview
Installation
- Nominal power
- Flow range
- Temperature range
- Initial verification
- Type approved range
Heat calculator
- Power range
- Display units
- Options: - Functions
- Relay outputs
- Analogue outputs
- M-Bus data interface
- Communications language
Temperature measurement
- Sensor type
- Mounting type
Flow
- in heating system = hot side
- in cooling system = cold side
Heat carrier
Return
- in heating system = cold side
- in cooling system = hot side
Grp.2
CALEC® light
Optodata (§ 3.8)
230 V AC or 15 V AC (§ 5.2)
(Kap.3.2)
(Kap.3.3)
Th
Tc
EM
Ultrasonic
others
Grp.1
Flow measurement
(Flow sensor)
- Measuring principle
- Mounting place (Hot/Cold side)
- Mounting position
- Flow range
- Pulse output with pulse value
AM0065104.4light

3. CALEC® light heat calculator

3.1

Measuring principle

Thermal energy is calculated from the flow rate of the heat carrier, taking into account its physical characteristics (specific heat and density), and the difference between the forward and return flow temperatures.

3.2

Flow inputs

Flow input IN1 (terminals 10/11) allows connection of mechanical or electronical passive.

Mechanical pulsers (such as reed switches) must be fitted with debouncing filters to prevent double counting. The debounce filter is installed during factory programming and must therefore be specified when placing an order. It limits input frequencies to about 20 Hz, i.e. it requires a minimum volumetric pulse and interval time of 25 ms.

Passive pulsers, open collector switches and NAMUR transmitters (according to DIN 19234) are powered with 8.0 V, using a current of up to 8 mA from the meter supply. Important: observe the polarity indicated on the wiring diagramme! The minimum admissible pulse and interval time is 2.5 ms, allowing input frequencies of up to 200 Hz for symmetrical pulses.

3.3

Temperature measurement

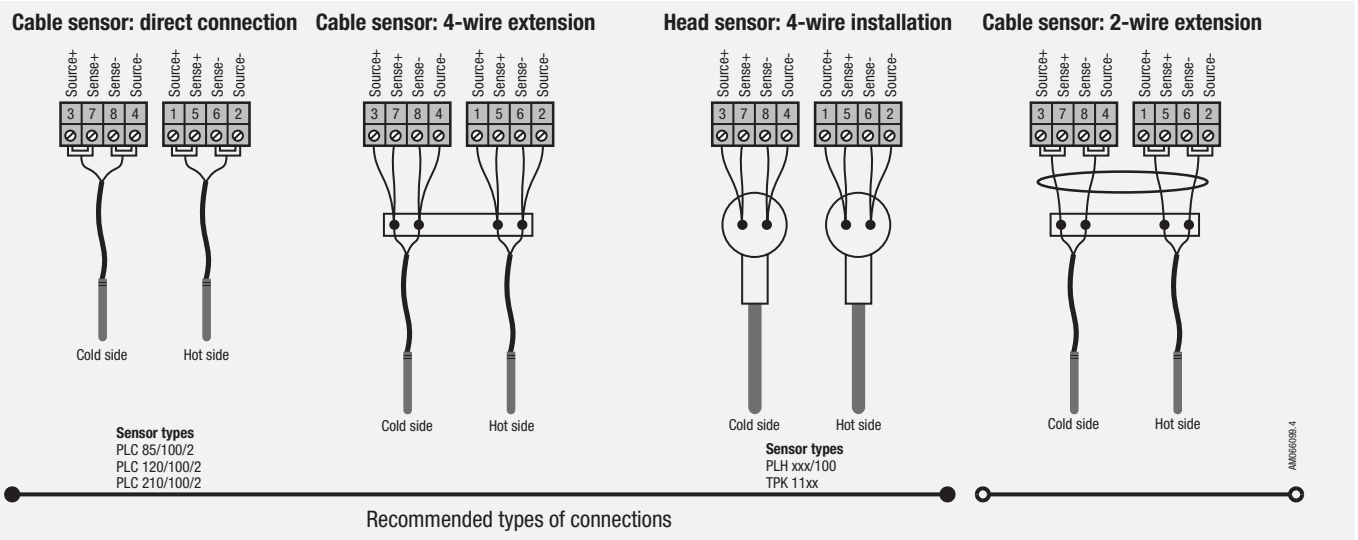
Temperature measurements are made with the well-proven dual slope principle which is extremely reliable. The two sensors (Pt100) receive current pulses in rapid succession. This prevents any intrinsic heating. Sensors can be connected with the 2-wire or preferably with the 4-wire technique.

2-wire circuits
Since the wire resistance is added to the temperature measurement resistance in 2-wire circuits, unequal wire lengths can cause significant errors and unusable results. 2-wire circuits should only be used with wire lengths below 10 m. Extension leads must be exactly the same length and pass through the same cable. In all other cases, only 4-wire circuits ensure adequate precision. Extension leads must have a cross-sectional area of at least 1 mm^2 or preferably 1.5 mm^2.

4-wire sensors
4-wire sensors are not absolutely necessary for a 4-wire circuit. A 4-wire connection between meter and sensor is sufficient, but this requires a 4-pole sensor connection box or head (see wiring diagramme).

For extensions, we recommend paired 0.8 mm Ø twisted telephone cable.
Extension is only admissible to 15 m, with spacing from other cables in compliance with EN 1434-6. Longer extensions are the responsibility of the operator, which must conform with the applicable CE requirements.

Connection of sensor head with threaded connection
All parallel wires (such as at terminals 3 and 7) can be connected together to the sensor head on the same terminal using a cable lug clamp.



Recommended types of connections

3.4

Factory configuration

If the unit is to be used as a verified (calibrated) measuring device, all the parameters relevant to calibration have to be entered during manufacture, after which they must not be modified.
A locking mechanism inside the verification section prevents any further access to these parameters.

Apart from the data used to compute heat consumption, this particularly applies to flow meter parameter changes such as pulse value, debounce filter and point of installation, as well as the capacity range with corresponding display units.

For factory programming, values for the above data to be supplied on the specification form, are therefore mandatory.

3.5

Field configuration

The term "field configuration" is used to cover all the functions which may be modified by the user at any time without affecting the energy calculation.

In order to prevent tampering of the tariff settings by unauthorised persons, additional security is provided by the following protection concept:

Authorised persons	Authorised pers. before verification	Supplier after verification		User after verification	
Method of protection (type of locking)	Hardware protection on calculator circuit board, sealed: Lock level 0	HW protection on basic circuit board. Lock level 1		Software without protection Lock level 2	
Possibility of setting device function	Settings with CALTOOL-P	Settings with	CALTOOL MBUSTOOL	Settings with	CALTOOL MBUSTOOL
Heat meterering functions					
Display units					
Entering pulse value	◆				
Installation point of flow sensor	◆				
Switching debounce filter on	◆				
Billing dates 1 and 2	◆		◆		
Registration period	◆		◆		
Integration period	◆		◆		
Text field input	◆		◆		◆
Date-time	as desired		as desired		limited corrections
Baud rate	◆		◆		◆
Bus address	◆		◆		◆
Output option OUT 1+2	◆		◆		◆
Event counter	◆		◆		◆
Smoothing factor for analogue output	◆		◆		◆

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3.6

Meter displays

The display consists of a 2-line liquid crystal unit which has a capacity of 2 x 20 characters, with alphanumeric 7 x 11 dot matrix presentation.

For mains powered units, the display is switched on by the first key pressed, and shuts off automatically five minutes after the last key has been pressed. The default display is the main window which shows energy and volume totals.

The following displays can be called up:

Display function	Contents	Remarks	Variants
Pulse value Installed side	IPW 1,0000 l/pulse EBS Cold side		
Main display	E....123456.12 MWh V.....1234567.1 m³	Energy total Volume total	EH 12345.6123456 MWh VH 123456.12345 m³
Text field for descriptions	North Central Heating Unit Main Boiler	Maximum 40 characters	
Error message	— Error —	See Error messages	
Billing date values	E 00731.089 MWh Billing date 1 30.06.99	Energy total on billing date 1 Billing date 1	
	E 01924.754 MWh Billing date 2 30.12.99	Energy total on billing date 2 Billing date 2	
Instantaneous values	P 1078.422 kW	Metering power	
	Q 15.345 m³/h	Flow rate	
	Temp. DT 63.2 K H 128.3 C 65.1 °C	Temperature difference Temp. hot side/cold side	
	K-fact. 1.112 Wh/l/K Density 1.00498 kg/l	K-factor Density at installation point	
	Date 23.03.99 Time 13.45	Date Time	
	00005815 h	Service hours counter	

Data Logger (History functions)	Periode 1 month Integration time 60 minutes	Recording period Integration period	
Date and number of the period now in progress	Date 23.03.99 00 Enter	Today's date Number of period now in progress	
	Date 23.03.99 E 00000.000 MWh	Energy total during period now in progress	
	Date 23.03.99 V 0000000.0 m³	Volume total during period now in progress	
	Time 04:45 15.03.99 P 2.14984 kW	Time of the maximum power in period 00	
	Time 06:13 15.03.99 Q 35.83210 m³/h	Time of highest flow rate in period 00	
	Date 28.02.99 01 Enter	Finish date of period 1	
	Date 28.02.99 E 12345.000 MWh	Energy total at end of period 01	
	Date 28.02.99 V 123456.0 m³	Volume total at end of period 01	
	Time 10:45 24.02.99 P 10191.3 kW	of the maximum output in period 01	
	Time 09:33 16.02.99 Q 37.46610 m³/h	Time of the highest flow rate in period 01	
Date and number of the penultimate period	Date 31.01.99 02 Enter	Finish date of period 02	
Date and number of period 03	Date 31.12.98 03 Enter	Finish date of period 03	
⇓ continues with 04 .. 13 ⇓			
Date and number of period 14	Date 31.01.98 14 Enter	Finish date of period 14	
	Date 31.01.98 E 00004.500 MWh	Energy total at end of period 14	
	Date 31.01.98 V 00456.0 m³	Volume total at end of period 14	
	Time 10:45 21.01.98 P 10191.3 kW	Time of the maximum power in period 14	
	Time 09:33 06.01.98 Q 37.46610 m³/h	Time of the highest flow rate in period 14	

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Display function	Contents		Remarks	Variants
Factory configuration	Serial number Man. date	03710971 05.03.99	Serial number Date of manufacture	
	CALEC light. Heat calculator	Ver. 203	Type and version number Designation	
	Fluid-Nr. 000 Water		Heat carrier no. 000 Fluid designation	
	Temp. sensor T	Pt100 0 ... 200°C	Sensor type Sensor range	
	IN1 Term. 10/11	Impuls passiv Enter	Volume input EN1 Connection terminals	
	Pulse value Max. frequency	1.00 l 20 Hz	Debounce filter switched on	Frequency 200 Hz
	Flow sensor location	 cold side	Installation location of the volume- tric flow sensor, programmed for:	
	Inhibition of low DT	 0.00 °C	Minimum temperature difference for energy calculation always 0.00°C	
Field configuration Output 1	OUT 1 Term. 50/51	Relay Enter	Output assignment Connection terminals	
	Pulse Pulse value	Energy1 1000. Wh	Function and assignment of its size and unit	
			Event counter	
Output 2	OUT 2 Term. 52/53	Relay Enter	Output assignment Connection terminals	
	Alarm	Inverse	Function and assignment	
	Alarm 12345678	Inverse s	Event counter	
Variant output 1	OUT 1 Term. 50/51	Analogue output Enter	Output assignment Connection terminals	
	Current1 Q1 0-30.0	0...20mA m^3/h	Current range Measuring range	
	Current1 16.08	0...20mA mA	Control field for output current	
Variant output 2	OUT 2 Term. 52/53	Analogue output Enter	Output assignment Connection terminals	
	Current2 P1 0-150	4...20mA kW	Current range Measuring range	
	Current2 12.8	4...20mA mA	Control field for output current	
M-Bus	M-Bus Baud = 2400 Term. 24/25 Adr. 000		Baud rate 2400 Terminals + M-Bus address	
Language	Language	English Change Enter	Language selection	
	Deutsch			
	Français			
	Italiano			
Status test	IN1 f = 4.88 Hz t = 00000000 s		Vol. pulse frequency at IN1 Time since last pulse	
	Lock Level 1 MBus access 00004371		Lock level status Access counter	
Display test	########## ##########			

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N.B. The listed parameters and values are by way of example only and do not necessarily represent standard settings.

Error messages on the display
On the main display, errors are indicated alternately on line 1 and line 2. The error menu provides a more detailed plain text description. The table which follows contains a selection of possible error types:

HW Temp Alarm (Cold)	Sensor error, cold side (short circuit, breakage, jumpers missing)
HW Temp Alarm (Hot)	Sensor error, hot side (short circuit, breakage, jumpers missing)
Delta-T Alarm	Temperature difference outside of range -10 ... +200°C
SW Temp Alarm (Cold)	Temperature alarm, cold side (value outside of the measuring range)
SW Temp Alarm (Hot)	Temperature alarm, hot side (value outside of the measuring range)
Option overflow	Relay switching frequency exceeded or RTC daa invalid
Option Alarm	Programming does not match hardware
Overflow Alarm	Power or flow capacity exceeded
Undervoltage Alarm	Supply voltage is too low, e.g. for bus supply
Overvoltage Alarm	Supply voltage is too high
Namur breakage	Namur pulser is faulty or broken, I<0.2 mA
Serial EEprom alarm	Faulty component / Problems on I ^{2}C-bus
Backup alarm	Faulty component / Problems on I ^{2}C-bus
RAM alarm	Faulty component
EPROM/FLASH alarm	Faulty component

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M-Bus error messages
The M-Bus protocol contains error messages in coded form.

3.7

M-Bus communications interface

The CALEC® light incorporates the standardised M-Bus interface (in conformity with EN 1434-3), featuring variable data format which enables all the parameters to be read out. The same interface can also be used to program the enabled auxiliary functions and options with the help of the Aquametro-CALTOOL and MBUSTOOL software.
Bidirectional optocouplers are used to isolate the bus with the interface from the unit. The M-Bus connection is made to terminals 24 / 25, regardless of polarity.

The optical interface conforms electrically and mechanically with the ZVEI standard, IEC 1107 (EN61107), but it supports the M-Bus protocol in conformity with EN 1434.

4. Options

Slot is provided on the base circuit board for one option card which, when inserted, have no effect on the calibrated part of the meter.
The unit recognizes each option card inserted and indicates the type and terminal allocation on the display.

Socket No.	Output	Terminals	Output	Terminals
Socket 1	OUT 1	No. 50 / 51	OUT 2	No. 52 / 53

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4.1

Relay card 2RNC

This incorporates two switching contacts to which any parameters can be allocated via the interface.
These solid state relays have a switching capacity of up to 100 mA AC or DC at 50 V .
Function allocations can be modified at any time via the M-Bus interface.

The following programming options are available:
- Pulse functions: as output contact for adjustable energy and flow volume pulses. Pulse duration is about 1 second. For fast pulse trains, the pulse duration is decreased to the max. pulse frequency of 16 Hz with equal pulse and interval times (see "Option overflow" error message). If the temporary memory overflows in spite of maximum output frequency, a fault will be indicated and you will see the „Relay overflow“ message in the „Error messages“ sub-menu.
- Alarm function: as alarm contact for signalling a heat meter error, optionally as closing (AE) or opening (AA) alarm contact.

4.2

Relay card with realtime clock 2RWC

The function of this card is identical to relay card 2RNC except that it has an additional battery-powered clock module for data and time recording (without automatic switchover between winter and summer time) making it mains power failure proof. The battery is soldered onto the card and lasts about ten years. The date and time are set via the M-Bus interface.

Time deviations without change of date can be corrected once per month with the keypad on the front panel (e.g. summer/winter time changeover). The card (including battery) can be installed and removed without damaging the calibration seals.

4.3

Analogue output card 2AOU (passive)

Contains two power outputs which are electrically isolated from the heat meter and can be freely programmed. The electrical isolation means that the outputs require a separate voltage supply, which is connected to the output terminals and carries a load of 25mA per channel.

The maximum load resistance depends on the supply voltage.
Parameters and ranges can be programmed at any time via the interface. These are not subject to verification.

Technical specifications	
Voltage range	5...25 VDC from external auxiliary source
Current range	4...20 mA (0...20 mA with limitations [1])
Maximum load	R_L(Ohm) max. = (Us - 5)/0,02 A
Resolution	12 bits
Max. converter error	0.15% of actual value + 0.15% of full scale
Measured variable	Power, flow rate, temperature H, C, D

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1) Operation with 0 to 20 mA (e.g. for generating a 0 to 10 V output on a 500 Ohm resistor) is possible but subject to one limitation: Due to residual current requirements of the output circuit, the minimum current cannot be less than 200µA, thus raising the zero point.

5. Technical data

Heat meter calculator	
Measurement operating temperature range	T 0°C ... 200°C
Temperature difference range	ΔT 0 ... 200 K
Type approved operating range	T 5°C ... 180°C
Approved temperature difference range	ΔT 3 ... 175 K
Temperatur sensor type, Connection style Sensor cable length	Pt100 according to IEC 751, Two or four-wire type Tested to 15 m
Energy display units Display capacity	MWh / GJ 99'999'999
Maximum thermal power	30 MW / GJ/h
Volume display units Display capacity	m^3 9'999'999.9
Measuring and calculation time interval	~ 2 sec.
Time between revisions	10 years
Accuracy class Measuring and calculation error	EN 1434-1 / OIML Cl. 4 ≤ 0.5% at ΔT ≥ 3K

Power supply and interfaces	
Mains supply	230 V (+10-15%) 50 Hz, 15 VA, ⧈ fully isolated
Supply via AMBUS®-network	16...24 V DC or 12...18 V AC 50/60Hz
Communications interface on the calculator panel	Optical interface acc. to EN1434-3 with M-Bus protocol IEC 870-5
Communications interface at the M-Bus terminals	M-Bus protocol according to EN 1434-3 (IEC 870-5), galvanic isolation

Flow rate input	
Flow pulse input for - Contact pulser - Open collector pulser - Namur pulser (DIN 19234)	 Duration of pulse ≥ 25 ms Duration of pulse ≥ 2.5 ms Duration of pulse ≥ 2.5 ms
Programmable pulse values	0.001 ml ... 1 m^3 with a resolution of 0.001 ml
Maximum flow rate	3'000 m^3/h
Flow transmitter mounting position	Cold or hot side

Output functions (optional)	only one output card possible
Relay output card 2RWC, 2RNC	two solid state contacts, potential-free max. values 50 V AC/DC, 100 mA, R_{ON} ≤ 20 Ω, R_{OFF} ≥ 1 MΩ
Analogue output card 2AOU	galvanically isolated, to be operated passively, output current 0...4 mA or 4...20 mA Supply 5...24 VDC, R_L max at 24 V = 950 Ω

Housing, environmental conditions	
Wall housing	for installation on DIN rail (35 mm) or tree-hole fixture
Protection class	IP 54
Ambient temperature range, Environmental class	5 ... 55°C, EN 1434 Class "C"
Storage temperature range	-20 ... 65°C

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5.1

Heat calculator

The CALEC® light heat calculator is completed as a combined heat meter with water as the heat conveying liquid by adding the subassemblies of two separately matched and approved platinum temperature sensors and a separately verified flow sensor.

The amount of water flowing is recorded by means of volume proportional pulses or flow rate. It is converted into mass units by the calculator using the temperature of the water in the flow sensor.

From the resistance values of the temperature sensors and the heat carrier properties, the enthalpy difference is calculated and multiplied by the previously determined mass. The result is stored in a data-secured memory (EEPROM) and at the same time appears on the 8-digit LC display as total energy consumption in MWh or GJ.

The calculator is equipped as standard with a galvanically isolated M-Bus interface, complying with the EN 1434-3 (IEC 870-5 protocol) standard, which is available both on the housing cover as an infra-red transmitter and on connecting terminals.

5.2

Voltage supply

According to choice, voltage can be supplied to the CALEC® light either at 230V AC, or via the AMBUS® network. Both types of supply may be provided at the same time. The display, the auxiliary voltage, and the RS232 and RS485 options cannot be supplied over the AMBUS® network.

5.3

Connection of flow sensor

Flow input IN1 (terminals 10/11) allows connection of passive pulsers.
Units are configured according to order.
Freely programmable from 0.000001 l to 1 m^3.

5.4

Connection of temperature sensors

2-wire connections
The temperature sensor wires are connected to terminals 7/8 (cold side) or terminals 5/6 (hot side).

Important: The four metal jumpers on the sensor terminals must be connected according to the wiring diagramme, otherwise temperature measurements cannot be made.

4-wire connections
The temperature sensor wires are connected to terminals 3+7/4+8 (cold side) or terminals 1+5/2+6 (hot side). The metal jumpers on the sensor terminals must be removed and individual wires connected to all 8 sensor terminals.
Reversal of the "source" and "sense" wires on the same side of the sensor has no detrimental effect.

5.5

Installation modes

The following standard installation modes are available:
- Wall mounting with supplied DIN rail
- Wall mounting directly with screws
- Wall mounting on existing CALEC® bracket
- Panel mounting with panel mounting bracket
- Panel mounting as replacement for CALEC® MCL/MCP

6. Testing / calibration

6.1

Testing

For testing and verification purposes the meter is fitted with a high-resolution display for total energy and flow. By pressing the "UP" and "DOWN" keys simultaneously, the display changes to high-resolution mode, with four extra digits corresponding to an additional factor of 10000. Pressing any key returns the display to standard mode.

Testing can also take place via the optical interface on the housing cover or terminals 24/25 using the M-Bus protocol according to EN 1434-3. In both cases the M-Bus interface is galvanically isolated and free of any electrical feedback.

6.2

Sealing and verification points

The verification mark is placed on the front panel of the meter (outer surface of cover).
The calibration seal prevents unauthorized access to the verified part of the meter by covering the interior cover fixing screws.

Factory seals protect the connection zone of the meter after commissioning by covering the access screws on the outside of the cover.

6.3

Official calibration approval

The CALEC® light has been approved according to EN 1434.
In Switzerland and Germany, it has been authorised for commercial use in applications requiring mandatory calibration.

Approval testing also covers all currently valid safety and electromagnetic compatibility requirements. The meter is therefore designated with the CE mark.

6.4

Note regarding official calibration requirements

Verified heat meters are subject to supervision by national calibration authorities and must be re-verified before expiry of the calibration validity period (usually 5 years).
In some countries (such as Germany and Switzerland) large-scale meters >10 MW are exempted from calibration.

Verification covers all units comprising a heat meter, i.e. the calculator unit, flow sensor and both temperature sensors.
The heat meter operator is responsible for complying with recalibration requirements.

7. Miscellaneous

7.1

Accessories

- Installation accessories according to order list (section 8).
- Temperature sensors, sensor immersion sleeves, sensor connection sockets according to separate documentation.
- Flow sensors for heat meters according to separate documentation.
- Reading heads and units (HHU) including software.
- Accounting software available on request.
- M-Bus communications software for reading and parameterizing by PC.
- MBUSTOOL, CALTOOL, CALTOOL-P

7.2

Guarantee and operating life

The period for which a CALEC® light can be used until the first inspection is 10 years. Even heat meters which are not subject to mandatory calibration should be checked after a 5-year period in use since, in particular, wear and contamination of the flow sensor can cause substantial measuring errors. The information about the periods of use is based on experience.
Warranty is according to the general terms of delivery.

8. Ordering data

8.1

Basic unit (does not include any relays !)

	Power supply	Temp. sensors	Output options	Type designation	Order No.
CALEC® light	230 V AC or AMBUS®	Pt100	1 socket	light	93366

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8.2

Hardware options (as additional order items)

Outputs	Cards	2 Relays with clock	2RWC	81620
		2 Relays without clock	2RNC	81621
		2 analogue outputs	2AOU	81622
Mounting accessories		Mounting kit for front panel	MPM	81627
		Conversion kit, wall CALEC® MCL/MCP to light	CWM	81628
		Conversion kit, front panel CALEC® MCL/MCP to light	CPM	81629
Optical head		Optical reading head	OCI 9600	93376

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8.3

Software options (additional order items)

PC software	Reading and programming software	CALTOOL	81648
	ditto, with Lock level 0 functions	CALTOOL-P	81657
	M-Bus meter read-out, recording and parameterisation software	MBUSTOOL	81631

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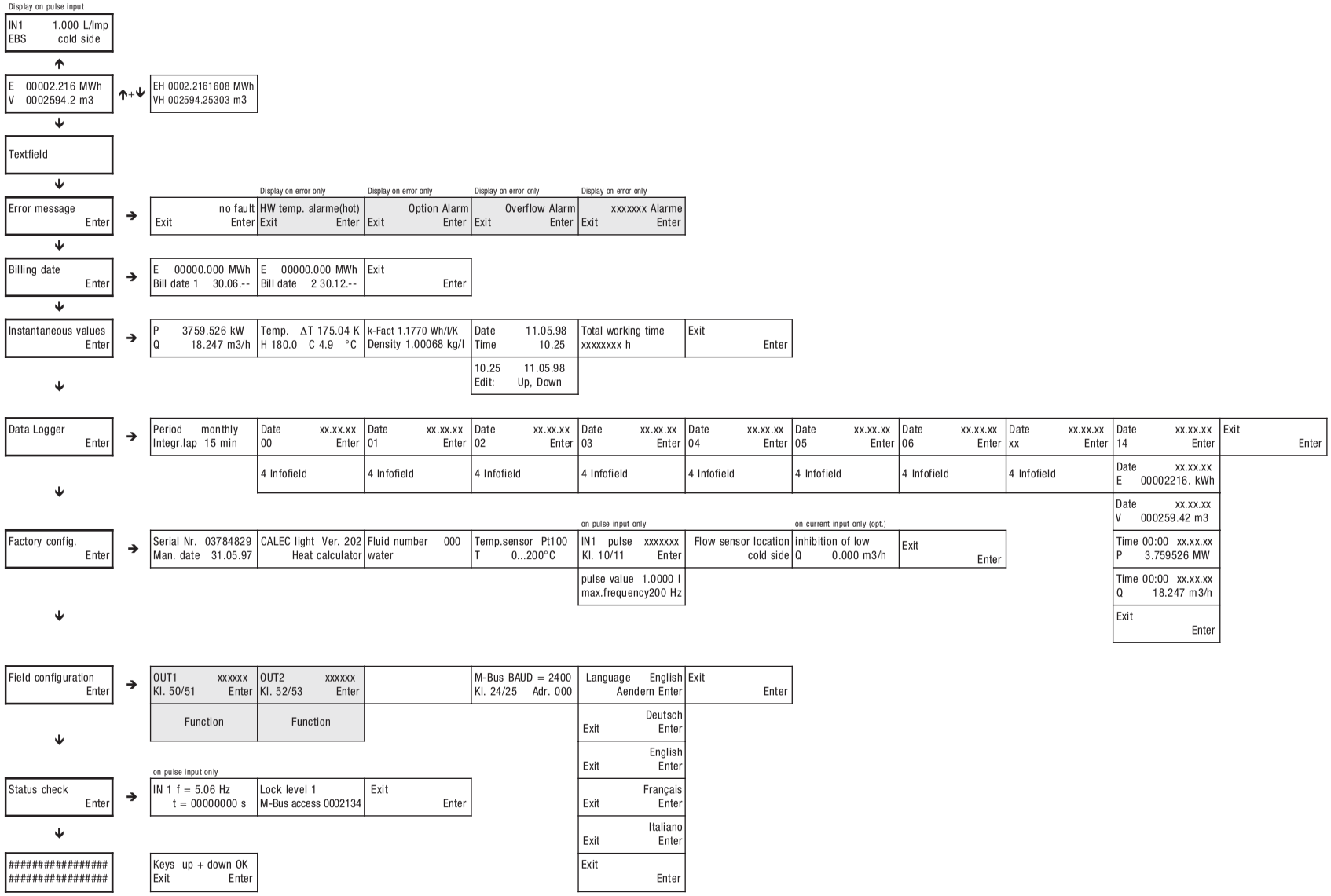
All other device and programming data must be indicated on the CALEC® light specification form.

9. Menu structure

Standard

Mainmenu **Sub-menu**



Optional fields

10. Programming sheet

Customer _____ (for description on packaging)
Object _____ (indication on display)
Order-No. _____ Date _____
Measuring point _____ (indication on display)
Distributor _____ (indication on nameplate)
Salesman _____ Date _____
Remarks _____
Date of delivery _____

CALEC® light	Pcs Part No. 93366	
2 RWC	Pcs Part No. 81620	
2 RNC	Pcs Part No. 81621	
2AOU	Pcs Part No. 81622	
MPM Rack	Pcs Part No. 81627	
MS Wall	Pcs Part No. 81628	MCP/L => light
MS Rack	Pcs Part No. 81629	MCP/L => light

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Heat carriers water

Approval ❒ D ❒ CH ❒ D/CH ❒ A ❒ others

Initial verification ❒ no ❒ yes

Language

Nameplate ❒ D ❒ E ❒ F ❒ I ❒ other:

Display text ❒ D ❒ E ❒ F ❒ I _____

Input 1

❒ Reed ❒ open collector, NAMUR (passive)

pulse value _____ ❒ m^3 ❒ l ❒ ml

Mounting place of flow meter

❒ cold side ❒ hot side

Adress M-Bus

❒ standard 000 ❒ (1-250) _____

Energy: power range and display units

❒ up to 30 MW 00000▪000 MWh

❒ up to 30 GJ/h 00000▪000 GJ

Other resolutions can be supplied on request.

Output functions

2 relay outputs (2RWC, 2RNC) or 2 passive analogue outputs (2AOU) according to choice.

Relay outputs	Relay	Pulses			Alarm
		E = Energy V = Volume			AA = off by alarm AE = on by alarm
	2RNC 2RWC	E / V	Pulse value	Units	Function AA or AE
Socket					
No. 1					

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Analogue outputs	Instantaneous value functions						
	Measured variables: P=Power Q=Flow rate H=Temp. hot side C=Temp. cold side D=Temp. difference						
	Analogue	Output signal 0-20 / 4-20 mA	Output	Meas. variable	0 or 4 mA corresponds to	20 mA corresponds to	Units
Socket	2AOU	-20 mA	passive				
No. 1							
	Analogue outputs reaction time		❒ 2 sec (standard)	❒ 15 sec	❒ 30 sec	❒ 1 min	❒ 3 min ❒ 20 min

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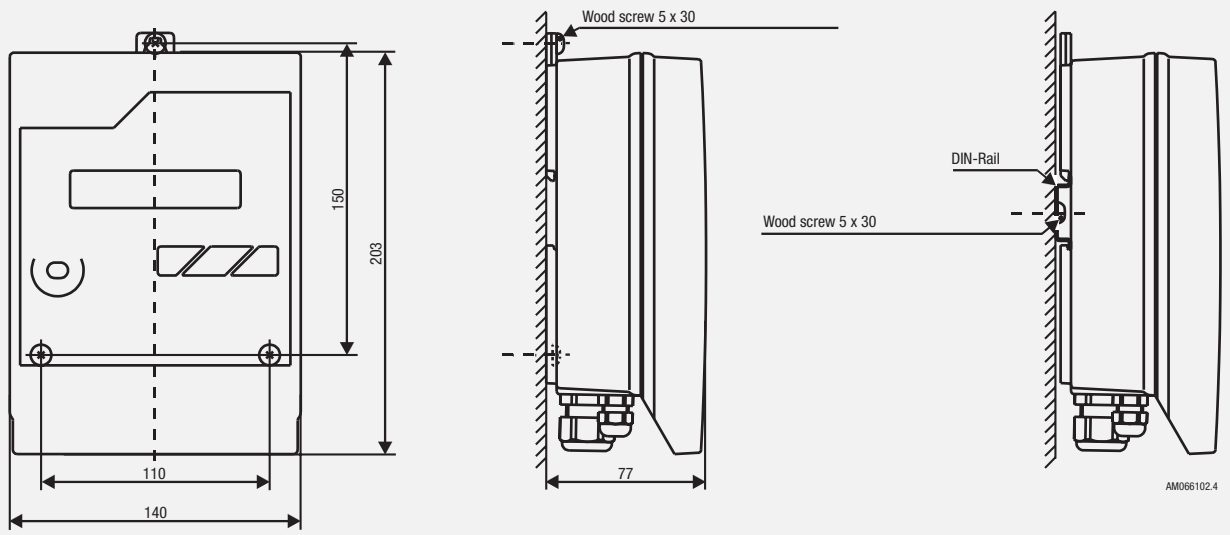
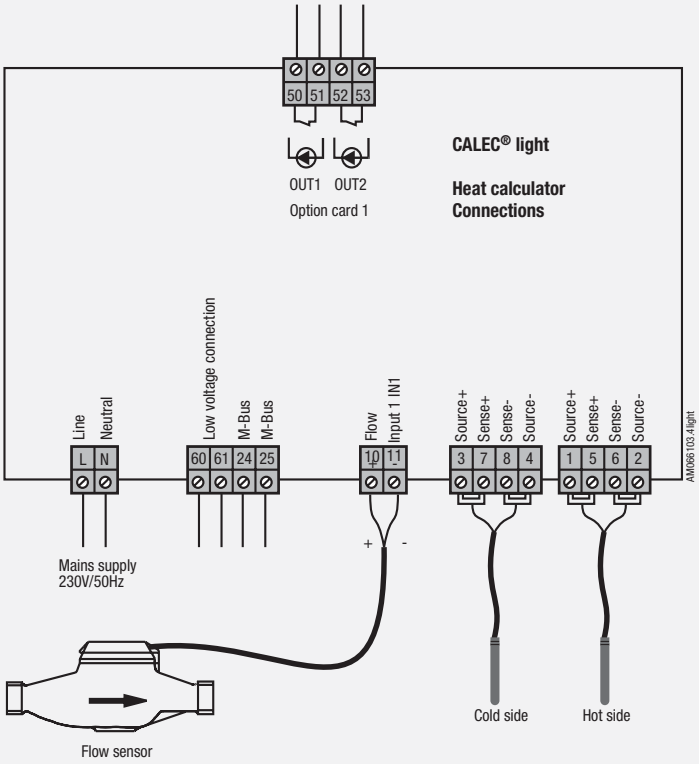
Fixed set values

Flow rate	up to 3'000 m^3/h	Volume display	0000000.0 m^3
Billing date 1	30.06.	Billing date 2	31.12.
Datalogger	15 months	Peak value acquisition integration time	60 min

11. Device dimensions



12. Connections



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