Installation and operating instructions

CALEC ® energy master
The benchmark for energy measurement technology

Short version

Firmware Version 1.00

1 Contents

2 Information and references

2.1 Information

These installation and operating instructions describe the installation and commissioning of a standard device. The chapters describe the topics and tasks in the sequence in which they are needed during commissioning.

- Safety instructions
- Information about the device
- Installation
- Electrical connections
- Operation
- Fault clearance
- Technical data

⚠ **Always comply with the safety instructions.**

2.2 Documents

The installation and operating instructions VD 3-135 vary in scope, depending on the version and items covered by the delivery. The information required for ancillary modules and optional functions is described in additional document extracts (VD 3-136).

Parameterisation software AMBUS Win II

The parameterisation software AMBUS Win II is available for setting the parameters. It can be downloaded free of charge (see below).

Downloads

The current documents and AMBUS Win II are available as free downloads at
www.aquametro.com /downloads.

3 Safety notices

3.1 Symbols used

Important information

Non-observance can lead to malfunction.

General warning

Non-observance can lead to damage or malfunction.

Warning of dangerous electric voltage

Non-observance can lead to physical injury!

3.2 Intended use

The device is used as an energy calculator for heating, cooling and air conditioning applications in district heating or cooling, in building management services and in industrial energy metering.

It is part of a combined heating/cooling or air conditioning meter, consisting of a calculator, a pair of temperature sensors and a flow meter, or as a transducer for a flow meter.

The environmental conditions described in the technical specifications, as well as the installation and operating instructions must be complied with.

3.3 Inappropriate use

The device must not be used:

- In explosion-risk zones (no ex-risk protection!)
- In a wet environment (condensing, splashing or dripping water)
- Outdoors, without suitable protection
- In environmental conditions (temperature, humidity, vibrations, electromagnetic interference etc.) that do not comply with the technical specifications
- In all other instances that do not conform to its intended use

The device can be dangerous if it is not used as intended, or not in accordance with the installation and operating instructions. In order to avoid this, it is essential that the safety instructions, operating conditions (see technical specifications) and the relevant chapters of these instructions are strictly adhered to.

The manufacturer accepts no liability for damage arising from inappropriate use.

3.4   Installation guidelines

The installation should be performed by authorised, skilled personnel, in compliance with the regulations in force (EN1434 part 6 Regulations and recommendations for installation and operation) and the recommendations of the industry-specific associations (e.g. the AGFW series of leaflets on district heating supplies).

The skilled personnel must have read and understood these instructions. The requirements in the instructions and the applicable regulations on electrical installations must always be observed.

Work on electrical circuits with hazardous voltages (> 24 VAC or >42 VDC) may only be carried out by authorised, skilled people, in compliance with the locally applicable regulations!

4 View of device with protective housing

Device with closed protective housing
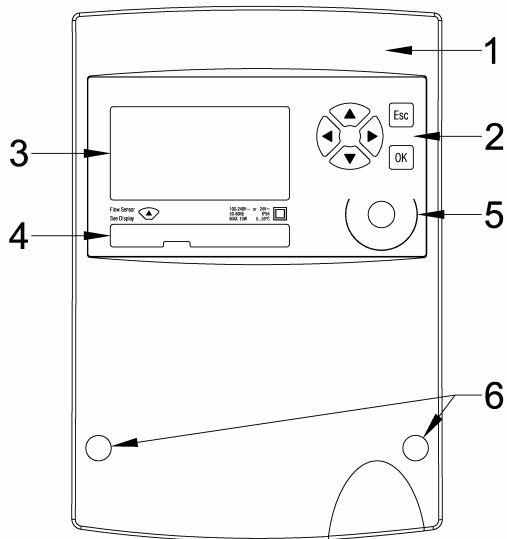
1 Housing cover
2 Operating keys
3 Dot-matrix LCD
4 Type plate with CE marking
5 IR interface on display module
  (EN13757-2 / -3 M-Bus)
  IrDA interface on CPU module
6 Housing screws, covered by security sealing
  caps

Device with opened protective housing
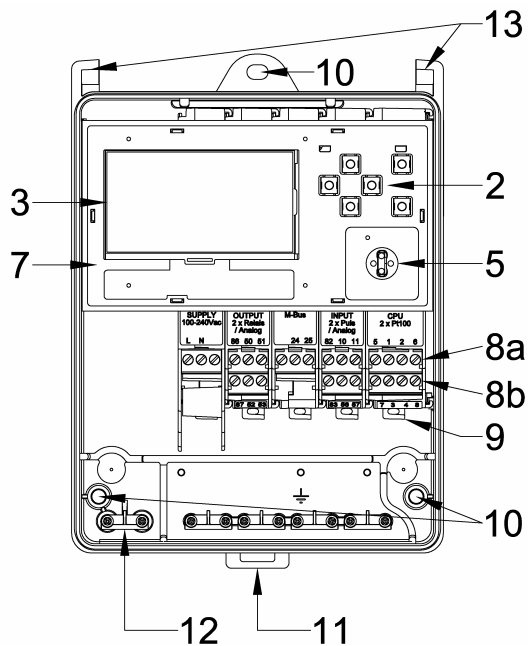
2 Operating keys
3 Display, LCD dot matrix
5 IR interface (EN13757-2 / -3 M-Bus)
  IrDA interface
7 Display module
8a Upper terminals, plug-in
8b Lower terminals, plug-in
9 Clip-on holder for modules
10 3 Fastening holes for wall mounting
11 Clip-on holder for rail mounting
12 Strain relief
13 Cover hinges

The wiring diagram is on the inside of the housing cover.

View of the protective housing from below
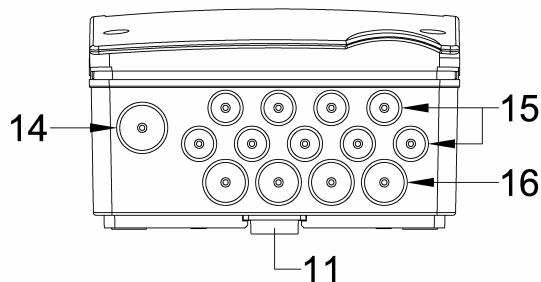
11 Clip for rail
14 Cable duct supply 14 mm
15 Cable ducts 10 mm
16 Cable ducts 14 mm

5 View of device without protective housing (Mod)

The following diagram shows the device without protective housing.
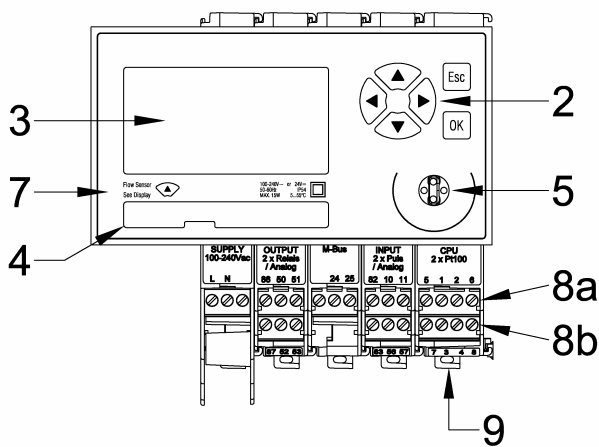
2 Operating keys

3 Display, LCD dot matrix

5 IR interface (EN13757-2 / -3 M-Bus)
   IrDA interface

7 Display module

8a Upper terminals, plug-in

8b Lower terminals, plug-in

9 Clip-on holder for modules

The Display can be installed at a remote location e.g. in a control panel by using the two Remote Display Adapters:
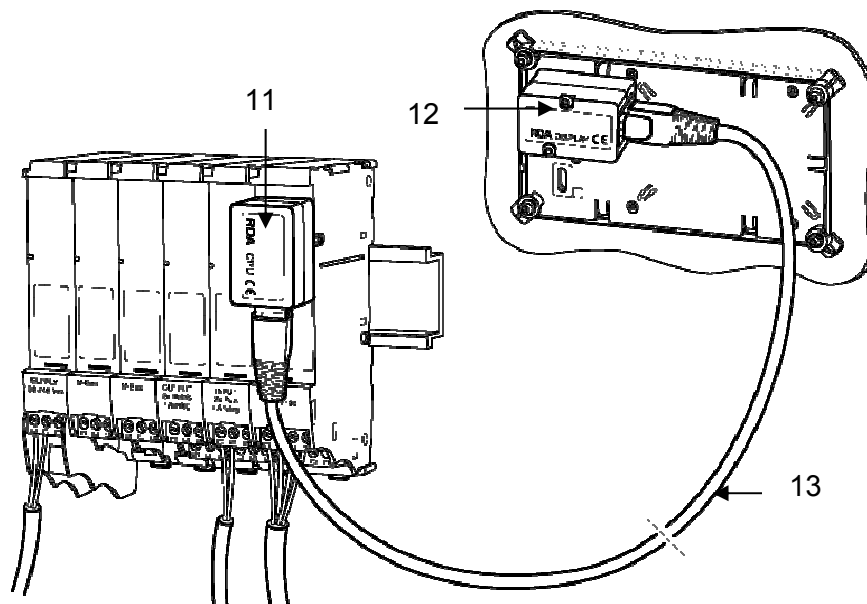
11 Remote Display Adapter RDA/CPU

12 Remote Display Adapter RDA/Display

13 Network cable

6 Mounting the device with protective housing (Prot)

6.1 Scope of supply, tools and mounting material (Prot)

Warning! Precision measuring devices! Protect against heat, humidity, dirt and vibration. Only unpack the device when ready to install. Non-observance can result in damage or malfunction.
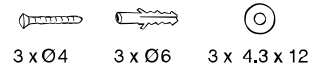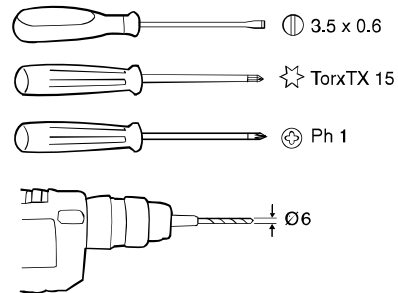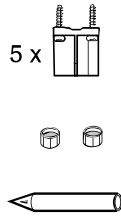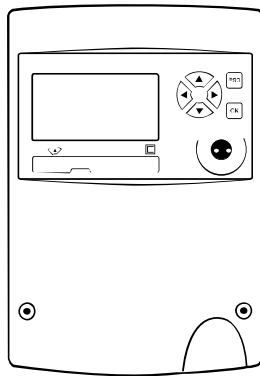
- One Installation and Operating Instructions manual

1) Support rail optional

6.2 Installation (Prot)

Opening the housing
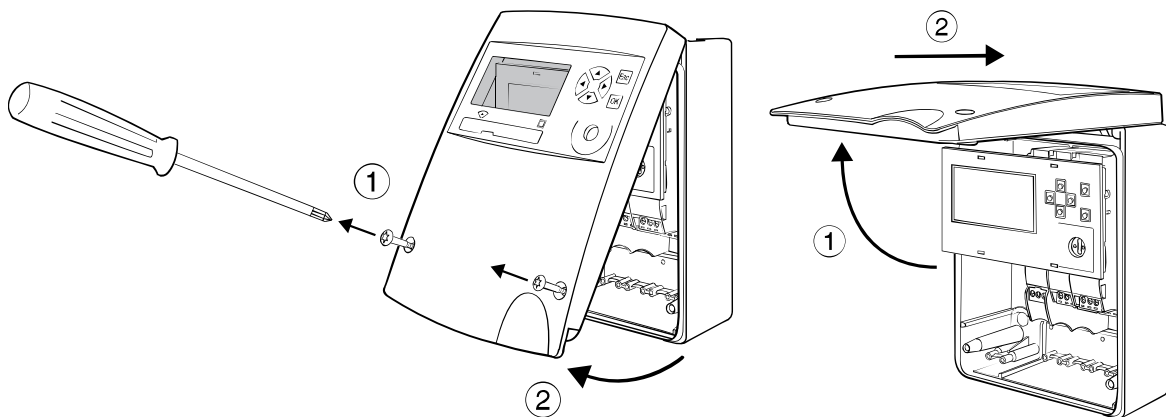
Mounting on support rail (DIN-EN 50222)

Choose the location for installation

- which is protected against humidity, heat, direct sunlight and damage
- with easy access for reading, operation and installation
- with sufficient distance from sources of electromagnetic interference
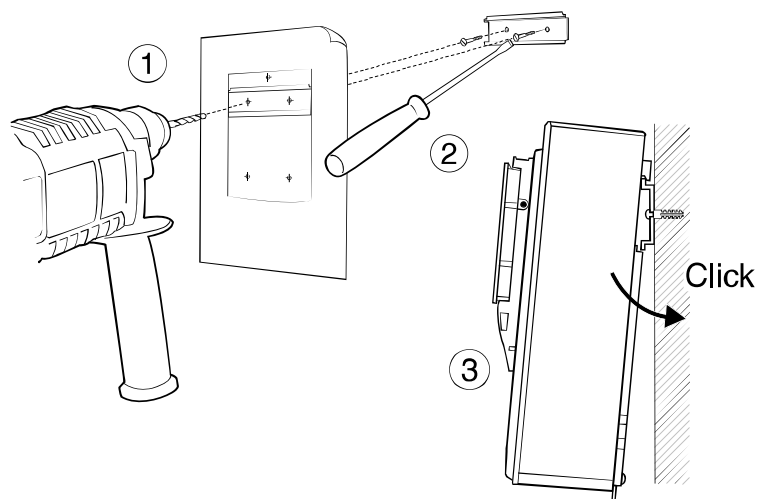
1. Drill holes
2. Screw on support rail
3. Clip device onto support rail

Wall mounting
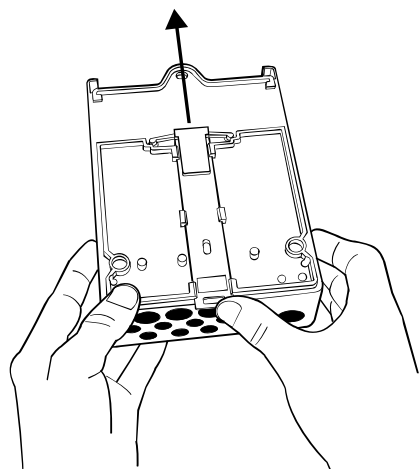
Remove clip-on holder to get a stable support.
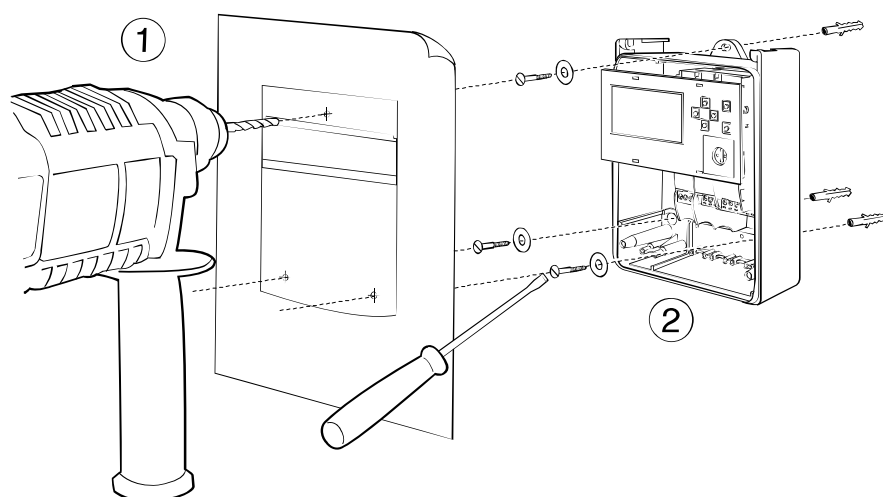
Only mount device on a flat surface!

Wiring diagram
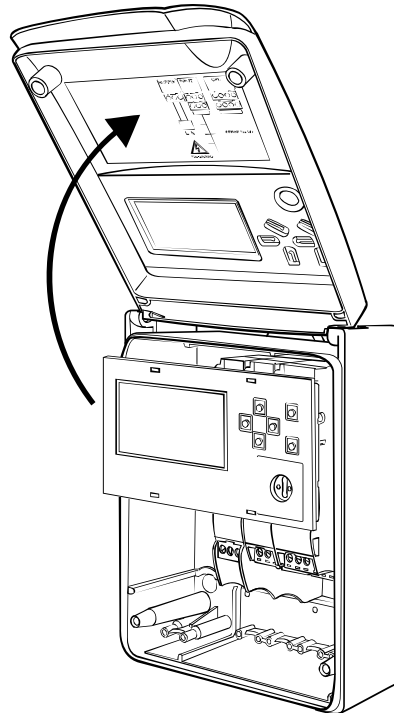
The wiring diagram is on the inside of the housing cover.

Connecting to mains power supply 100 - 240 VAC

The mains supply must be connected via a two-pole separator and be adequately protected against unauthorised interruption.

⚡	The mains supply 100 - 240 VAC may only be connected to the following terminals:	Terminals L, N (supply module) Terminals 110, 115 (relay module 2x240 VAC)
	The device must be protected by a 10 AT external fuse. The device is fully isolated and requires no grounding connections. Connection to other terminals is extremely dangerous and can permanently damage the instrument!	

Connecting to low voltage supply 24 VDC
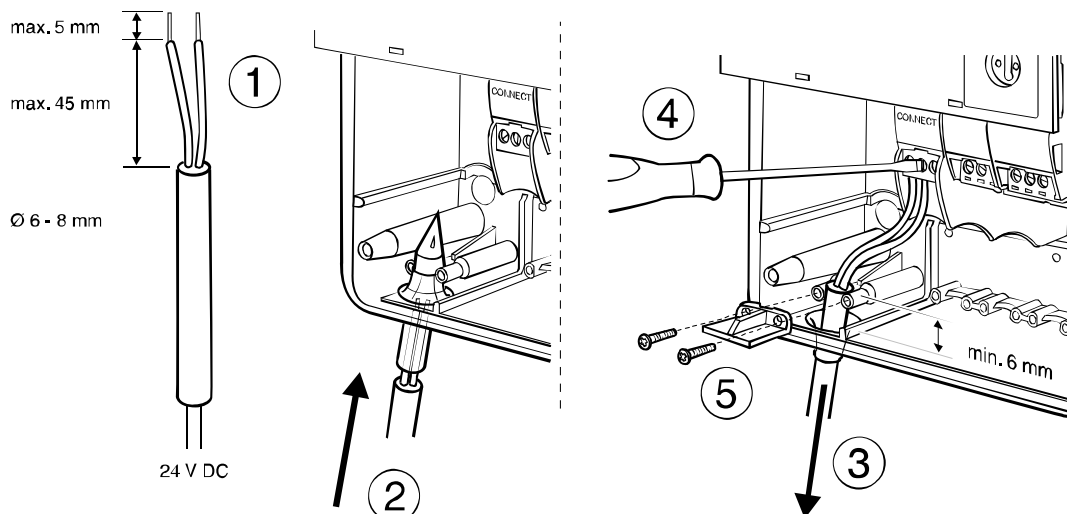
Connecting signal cables
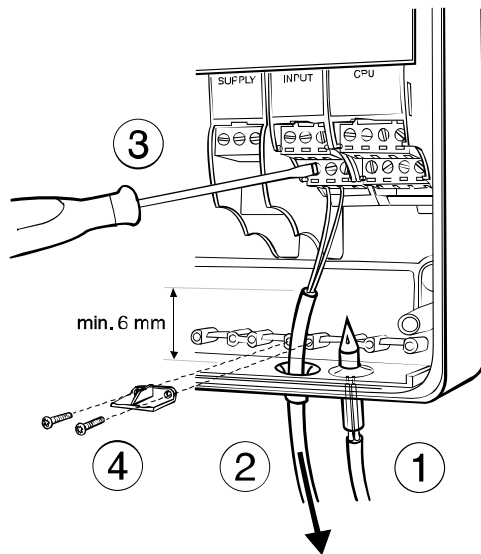
1. Pierce sealing membrane with enclosed awl
2. Insert cable
3. Attach cable to terminal screws according to wiring diagram on the inside cover
4. Affix strain relief clamp

Closing housing
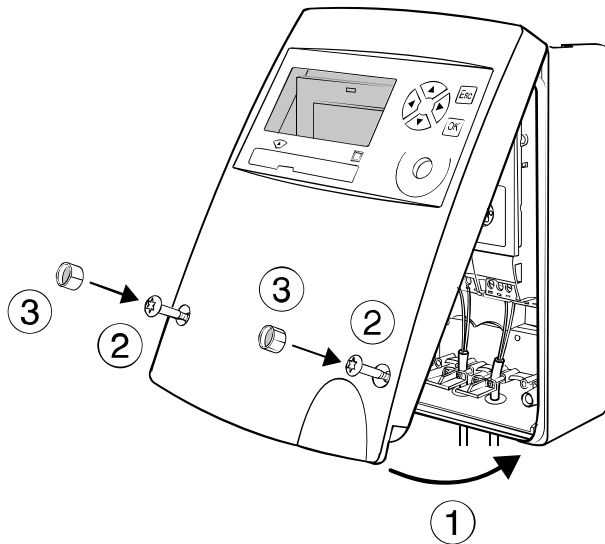
1. Insert the cover into the hinge from above and turn to close
2. Tighten the two fixing screws
3. Engage the **security sealing caps** with the smooth side on the outside.

Once the caps ③ have been fitted, any unauthorised opening of the device can be detected.

Removing the caps:
Insert a pointed tool and lever out. The cap is damaged as a result and must be replaced.

7   Mounting the device without protective housing (Mod)

7.1.1   Rail mounting
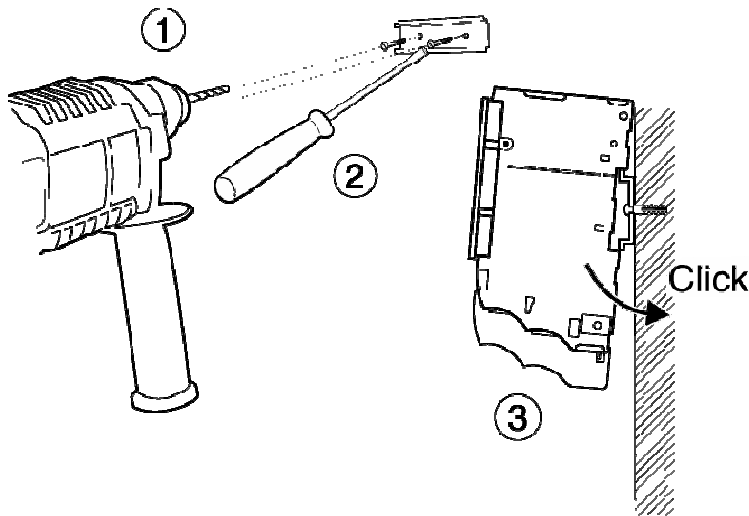
1. Drill fastening holes
2. Screw on support rail
3. Clip modules onto support rail

7.1.2   Connecting to mains power supply 230 VAC

Refer to the wiring diagram before starting wiring!

The mains supply may only be connected to terminals L and N!

The device is fully isolated and requires no grounding connections.

All other terminals are only for low voltage (<50 V) and measuring signals. Connection to these terminals is extremely dangerous and can permanently damage the instrument!
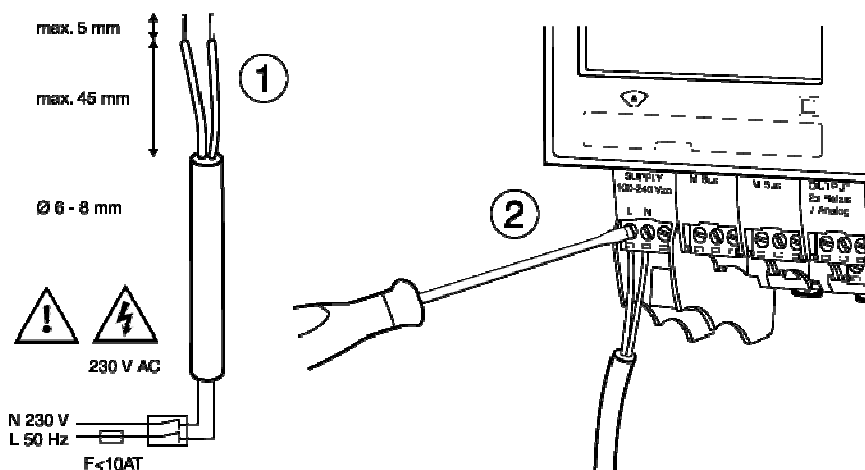
1. Strip the power cable as shown in drawing.
2. Connect power cable to supply module (see enclosed wiring diagram)

7.1.3　Connecting to low voltage supply 24 VDC

max. 5 mm

max. 45 mm

Ø 6 - 8 mm

24 V DC

1. Strip cable as shown in drawing
2. Attach cable to the connect module (see enclosed wiring diagram)

7.1.4　Connecting signal cables

1. Attach signal cables to terminal screws according to enclosed wiring diagram

2. The terminal blocks can be plugged in.

8 Electrical connections

8.1 Connection instructions

⚠ Devices with 100 - 240 VAC connections must have a safety fuse with a max. 10 AT, and must be capable of being made voltage-free by means of an isolating element!

⚠ The device must be connected to the same electric circuit and the same fusing, switching and isolating elements as the corresponding heating or cooling system.

If the device is additionally connected via fusing, switching and isolating elements, then these must be protected against unauthorised access (e.g. by security seals), so that the device cannot be put out of operation by unauthorised persons.

8.2 Wiring diagram, module and signal numbers

Below are two examples of wiring diagrams in which the module numbers and signal numbers or signal designations are shown:

Basic unit with 3 modules (right to left): M-101-Prot-AC[I]-CT	Fully assembled unit with 7 modules (right to left): EM-101-Prot-AC[MMOOI]-CT
• CPU module 2 x Pt100 • Input module for flow signal • Mains power supply (supply module)	• CPU module 2 x Pt100 • Input module for flow signal • 2 output modules for 4 analogue output signals, e.g. for a building services management system • 2 M-Bus modules for data reading with 2 M-Bus master units • Mains power supply (supply module)

• Designation: • Module numbers • Signal designation according to standard diagram of the application	• Designation: • Signal numbers, without signal designation • Signal designation according to the standard diagram of the application
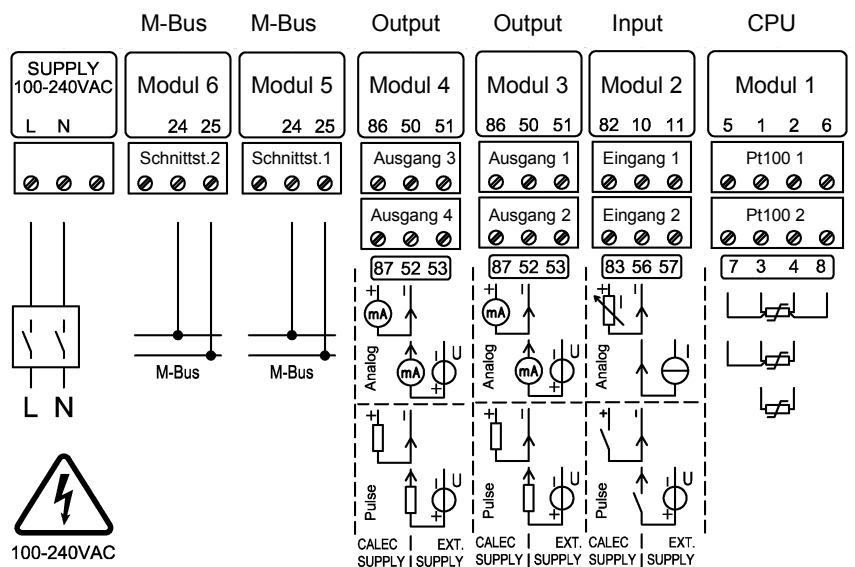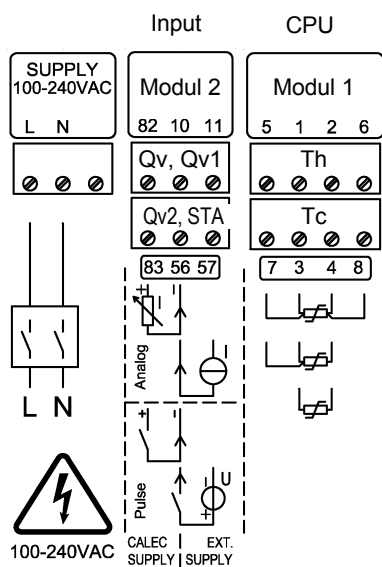
Note on input module: Left-hand pair of terminals: Power via calculator
Right-hand pair of terminals: External supply

8.3   Numbering rules

Basic rule: The signals are numbered from right to left and from the top down.

This table shows the elements that have a number, and their maximum number.

Element	Display/number	Explanation
Module	Mod-No.1… 6 (Prot) * Mod-No.1…15 (Mod) *	Numbers according to assembly from right to left No. 1 is the CPU module The module for power supply has no number
Input	Input 1…8	Pulse, current or frequency signal
Pt100 input	Pt100 No.1…6	Pt100 inputs for temperature measurement
Output	Output 1…8 (Prot) * Output 1…12 (Mod)	Output 1 …8, (short designation e.g. A1) Output 9 …12 can be used virtually
Terminals	Trm.No. 82-10-11	See terminal marking
Tariff register	R1 … R4	4 tariff registers per active calculator Display example: R 1 A2+ Tariff register 1 is active when output 2 is switched on.
Interfaces	Interface 1 … 5	1Internal bus between the modules 2Optical M-Bus interface in the display module 3IrDA interface in the CPU module 4M-Bus module 1 5M-Bus module 2

*:   Prot: Device version with protective housing

  Mod: Device version without protective housing

9 Operation

9.1   PC-Software AMBUS Win II

The parameters of the device can be set both via keys and display and via one of the data interfaces with the PC parameterising software AMBUS Win II.

With AMBUS Win II, the meter reading data can be saved, and parameter settings that have to be executed repeatedly can be stored as macros, which can then be reloaded and run. AMBUS Win II and the associated operating instructions can be downloaded free of charge at www.aquametro.com. The use of AMBUS Win II offers advantages if:

- large data records have to be read,
- several devices require identical or similar parameter settings,
- complex applications with inputs/outputs are to be parameterized.

AMBUS Win II and instructions are available as free downloads at www.aquametro.com.

9.2   Display

1 Operating keys
  see section 9.2.1 Key functions.
2 IR interface, M-Bus
3 LCD display, dot matrix 128 x 64
  (see section 18.3)
4 Title for display window
5 Display field, up to 4 values with
  identification and units
6 Status bar

Symbols on the status bar

	Currently available keys
✳	A flow signal is being detected
EDIT	Edit mode active, input possible
🔒, 🔓, no lock	Protection level (see section 0) user, service, programming mode

9.2.1 Key functions

Keys	Function in display mode	Function in edit mode
▲ ▼	Move line/image up or down	Setting of figures and/or characters Selection from a preset list
◀ ▶	No function in the main menu Change channel / input / output Change billing date / logger period	Select setting position in the edit window Change list inside a double-list

Keys	Short (< 0.5 s)	Long (> 0.5 s)	Key operation
OK	Confirm	Activate/deactivate the 3 additional decimal points in the meter settings	Accept set value Accept selected value Finish edit mode
Esc	Back to a previous level, abort process	Back to the standard display	Abort input / selection In double list: finish process

9.3 Right of access, security levels

The parameters for the device can be set entirely via the keys or via the interfaces. The security level (lock level) determines which parameters can be altered. At the time of delivery, the devices are in user mode.

Symbol	Security level	Settings	Code	At delivery
🔒	User mode	Only operating language		
🔓	Service mode	All values that are not relevant for calibration, e.g. initial parameter settings, date/time, measuring point designation etc.	S-Code	1111
no lock	Programming mode	All parameters can be set, e.g. initial settings, resetting/synchronising of meter readings etc.	P-Code	3132

The codes can be changed in the *Basic setting/System* submenu.

⚠ In EU-compliant devices, activating programme mode will result in the invalidation of the calibration! The date and time will be recorded in the calibration log and the device displays an error.

⚠ **Warning:** If you change a code, make sure that you keep it in a safe place. If the code ist lost, reprogramming is necessary by a service technician on site or in the factory.

10 Menu overview

10.1   Main display and main menu
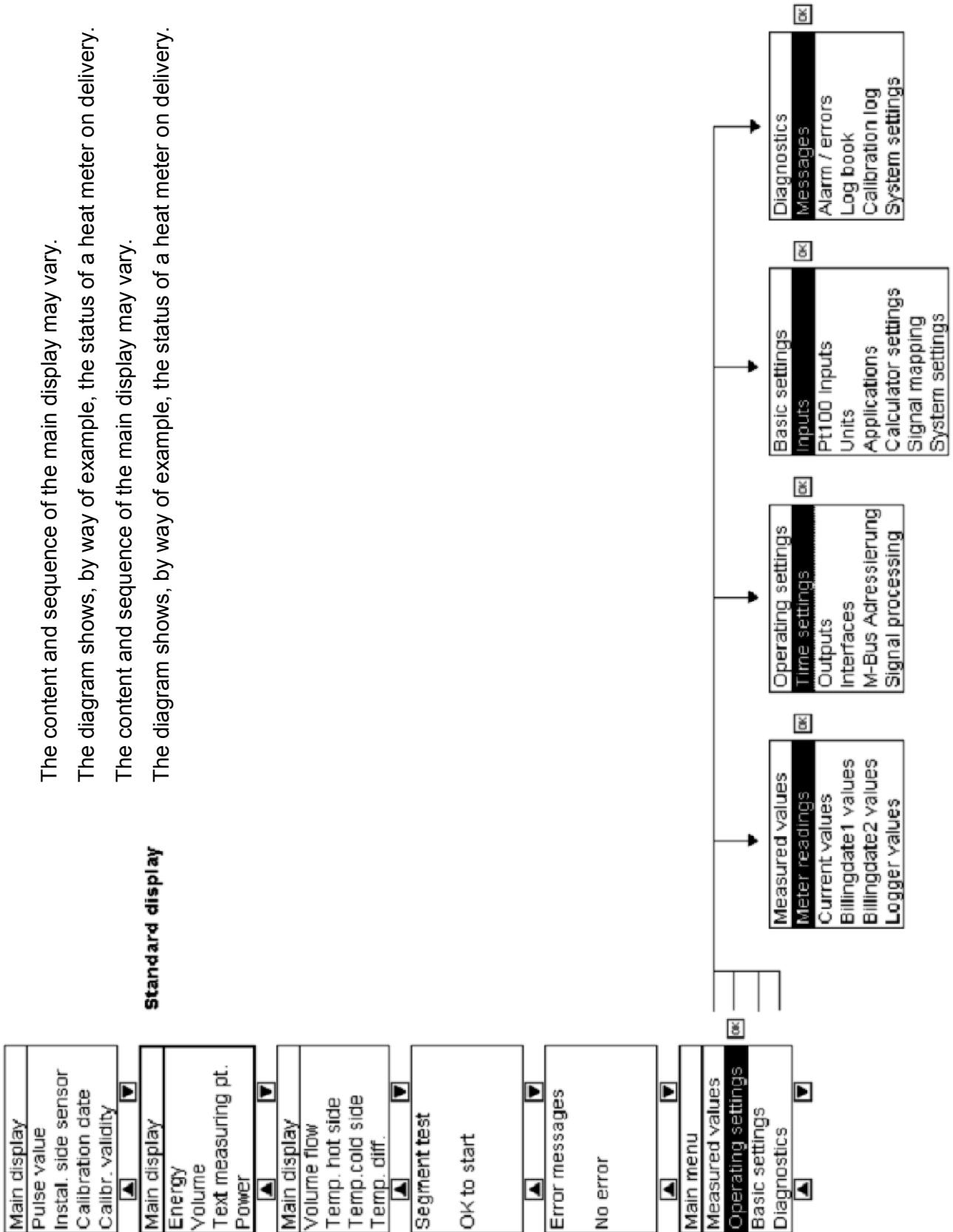
The content and sequence of the main display may vary.
The diagram shows, by way of example, the status of a heat meter on delivery.

Standard display

Main display
Pulse value
Instal. side sensor
Calibration date
Calibr. validity

Main display
Energy
Volume
Text measuring pt.
Power

Main display
Volume flow
Temp. hot side
Temp. cold side
Temp. diff.

Segment test
OK to start

Error messages
No error

Main menu
Measured values
Operating settings
Basic settings
Diagnostics

Measured values
Meter readings
Current values
Billingdate1 values
Billingdate2 values
Logger values

Operating settings
Time settings
Outputs
Interfaces
M-Bus Adressierung
Signal processing

Basic settings
Inputs
Pt100 inputs
Units
Applications
Calculator settings
Signal mapping
System settings

Diagnostics
Messages
Alarm / errors
Log book
Calibration log
System settings

10.2 Submenus

Overview Submenu *Measured values*

Measured values
- Meter readings
- Current values
- Billingdate1 values
- Billingdate2 values
- Logger values

Meter readings [OK]
- Energy
- Volume
- Mass

Current values [OK]
- Power
- Temp.cold side
- Power
- Temp. hot side
- Temp. cold side
- Temp. difference
- Specific density
- K - factor
- Enthalpy hot side
- Enthalpy cold side

Billingdate1 values [OK]
- Date / time
- Energy
- Volume
- Mass

Billingdate2 values [OK]
- Date / time
- Energy
- Volume
- Mass

Logger values [OK]
- Date / time
- Energy
- Volume
- Mass

Overview Submenu *Operating mode*

Operating settings [OK]
- Time settings
- Outputs
- Interfaces
- Bus-Adresse
- Signal processing

Time settings [OK]
- Date / time
- Operating time
- Error time
- Billing date 1
- Billing date 2
- Logger function
- Calibration date
- Calibr. validity

Outputs [OK]
- Module no.
- Terminal no.
- Output function
- Output variable
- Actual output value
- Pulse value
- Limit value 1
- Value at 0/4mA
- Pulse duration
- Limit value 2
- Value at 20mA
- Hysteresis
- Message relay on
- Message relay off
- Setpoint output
- Output polarity
- Current during error
- Hardware lot no.
- Pcb no.

Interfaces [OK]
- Module no.
- Terminal no.
- Communication type
- Baudrate
- Access-Counter
- Hardware lot no.
- Pcb no.

Bus-Adresse [OK]
- Primary adress
- Secundary adress

Signal processing [OK]
- Reset time
- Attenuation factor

Overview Submenu *Basic setting*

Basic settings
- Inputs
- Pt100 Inputs
- Units
- Applications
- Calculator settings
- Signal mapping
- System settings

Inputs
- Module no.
- Terminal no.
- Signal type select.
- Input function
- Measured variable
- Instal. side sensor
- Actual status input
- Input value
- Pulse value
- Value at fmin
- Value at 0 mA
- Value at 4 mA
- Value at fmax
- Value at 20 mA
- Minimum frequency
- Maximum frequency
- Low Q cut off value
- Q @ flowmeter error
- Linearisation
- Input filter
- Open/short circuit
- Simulated value
- Aux. power supply
- Input impedance
- Hardware lot no.
- Pcb no.

Pt100 Inputs
- Module no.
- Terminal no.
- Type of connection
- Install.side T-sens
- Instantaneous temp.
- Temp. range min.
- Temp. range max.
- Value at Pt100 err.
- Hardware lot no.
- Pcb no.

Units
- Energy
- Volume
- Mass
- Temperature
- Temp. difference
- Power
- Volume flow
- Normal volume flow
- Mass flow
- Pression
- Density
- Enthalpy
- Kinematic viscosity
- Dynamic viscosity
- Calorific value

Applications
- Basic function
- Text measuring pt
- Text measuring pt
- Temp. range min.
- Temp. range max.

Calculator settings
- Calculator function
- Heat transfer fluid
- Concentration
- Minimum dT value
- dT low cut off val.

Signal mapping
- Calculator function
- Flowmeter
- Temp. hot side
- Temp. cold side
- Rate register 1
- Rate register 2
- Rate register 3
- Rate register 4

System settings
- Service-Code
- Programm-Code
- Default lock ID
- Reset Level
- Display language
- LCD contrast
- Activation code

These parameters are only displayed if they are relevant for the selected function

Overview Submenu *Diagnosis*

Diagnostics
- Messages
- Alarm / errors
- Log book
- Calibration log
- System settings

Messages

Alarm / errors
- No error
- Event 1/1

Log book
- User mode active
- ON: 08.08.07 10:37

Calibration log
- Invalid calibration
- 18.11.2007 18:08

System settings
- Unit type
- Manufacturing no.
- Manufacturing date
- Firmware version
- RCM Checksum
- Hardware lot no.
- Pcb no.

11 Use under operating conditions

11.1 The main display

```
  Main display
ImpVal  1.00000 L
Side Q  cold side
C.-Dat. 21.04.09
Valid   31.12.13
```

```
   Main display
E     12345678 kWh
U     00075.701 m³
P      678.238 kW
Main road 8a App.3
🔒    ✳        ▲▼
```

```
   Main display
P      678.238 kW
Qv        45.8 m3/h
Th       123.6 °C
To        24.6 °C
🔒    ✳        ▲▼
```

```
 Segment test

OK for Start


🔒      OK    ▲▼
```

```
 Error messages

no error


🔒            ▲▼
```

```
 Main menu
Measured values
Operating adjustm.
Base settings
Diagnosis
🔒   ✳ OK    ▲▼
```

Start

Submenus

After switching on the device, the page marked 'start' of the main display appears.

The arrow keys can be used to move between a maximum of 4 pages of the main display:

▲ 1: Calibration-relevant data

  2: Meter readings and designation

▼ 3: Current values

▼ 4: other values, if configured

▼ Segment test (display test)

▼ Error display

▼ Main menu

The segment test shows a chequerboard pattern to test the display.

In the error message window, an error message is displayed if an error occurs

In the main menu, the submenus can be selected and displayed to show or set further values.

If no operation is carried out for approx. 5 min., the device will display the main menu page marked 'Start'.

Notes:

The content of the main display depends on the device version. The main display can contain up to four pages with up to four values (i.e. up to 16 values). In standard CALEC® energy master devices, only three pages are displayed with the values shown above.

The display values of the main display are predefined at delivery. These values and their sequence can be altered in a non-CE conformity assessed device using the software AMBUS Win II.

11.2   The measured values submenu

11.2.1 Measured values

Measured values	
Meter readings	Meter readings for energy, volume (mass)
Current values	Current values: temperatures, volume/mass flow rates, power
Billing date 1 values	Meter readings on the set billing dates
Billing date 2 values	
Logger values	Meter readings per calculator at the set times

11.2.2 Meter readings

Meter	Display	calc1, calc2 and 3		Explanation
Energy	E	2: E	3: E	Energy meter reading, positive
	E	2: E-	3: E-	Energy meter reading negative, in options BDE / BDV
Volume	V, V-	2: V, 2: V-	3: V, 3: V-	Volume meter reading, E, E- respectively
Mass	M, M-	2: M, 2: M-	3: M, 3: M-	Mass meter reading E, E- respectively

11.2.3 Current values

Current value	Display	Explanation
Power	P	Thermal power
Volume flow	Qv	Volume flow rate
Mass flow	Qm	Mass flow rate
Temperatures	Th, Tc	Temperature of the heat transfer medium hot / cold side
Temp. difference	dT	Temperature difference: dT = Th - Tc
Density	Den	Density of the heat transfer medium (Den: Density)
K-factor	K-F	Heat coefficient
Enthalpy	Hh, Hc	Enthalpy of the heat transfer medium hot / cold side

Current values of calc2 and 3, or with a negative prefix, are displayed similarly (2: P or P-).
If a current value exceeds 999 999 (6 digits), Overflow is displayed

11.2.4 Billing date values

Shows the meter readings saved on the two set billing dates. The billing dates can be set under
*Operating settings/time settings/Billing* and *Billing2.* The meter readings are saved at 23:59 each
time.

11.2.5 Logger values

In version 1.0, only the meter readings can be recorded.

Logger values 1	
Date/T 01.05.08	
E 24.567 MWh	
V 1000.12 m3	
M 982.1 t	
M 982.1 t	

1. Logger value, select with keys ◀ ▶
Date/time when the value was chosen
Energy meter reading at this time
Volume meter reading at this time
Mass meter reading at this time
Mass meter reading at the displayed time

The time interval for the logger function can be set under *Operating settings/ Time settings/Logger*.

12 Dimensional drawings and technical specifications

12.1 Drawings of device with protective housing (Prot)
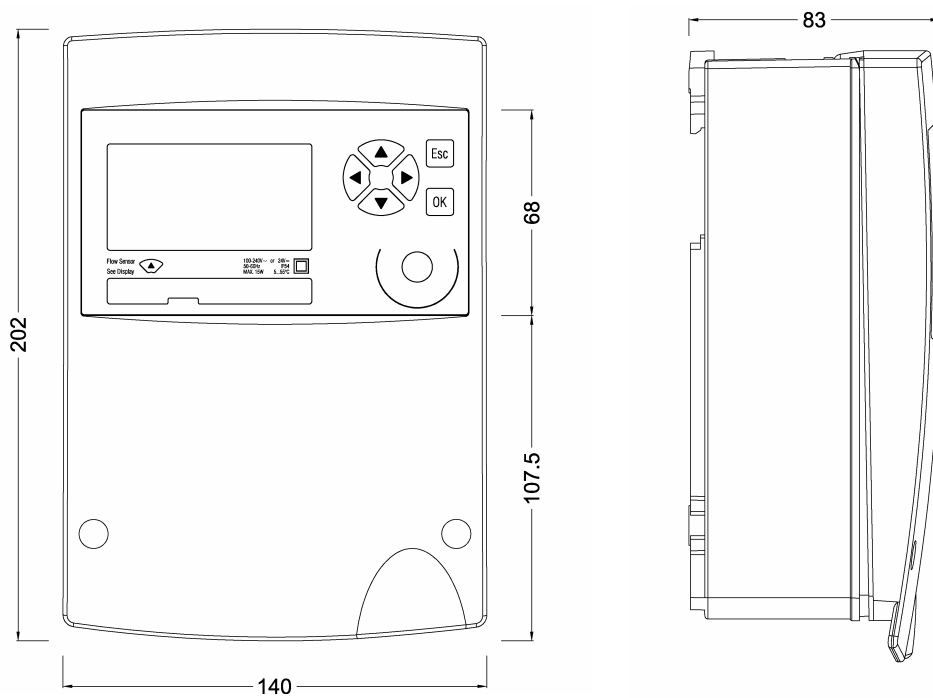
12.2 Drawings of device without protective housing (Mod)
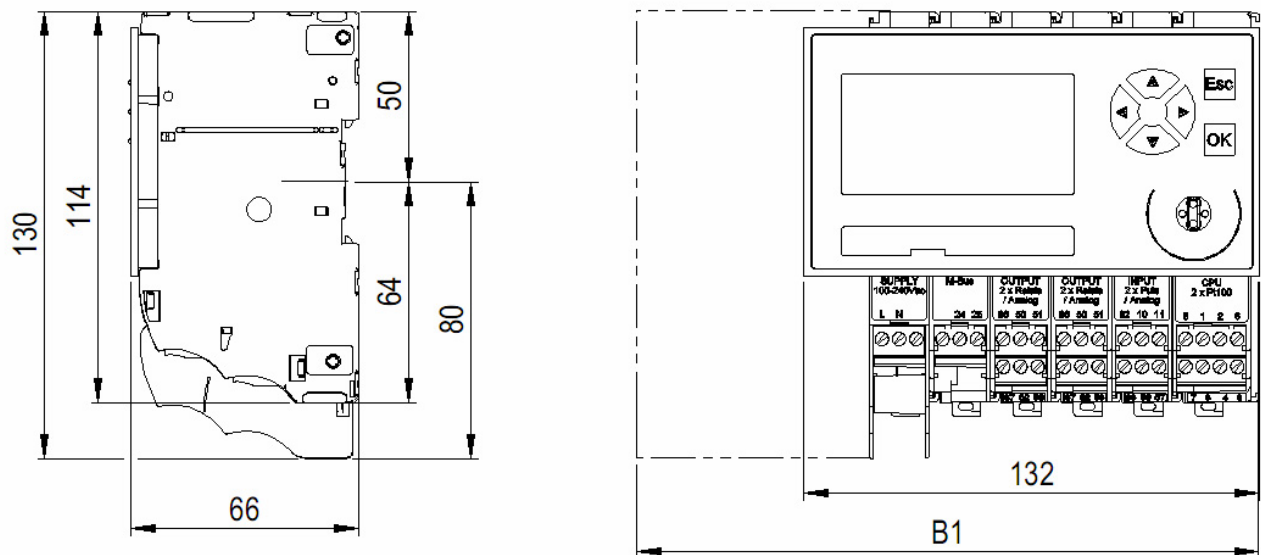
Dimensional drawings of modules with low voltage

63.5

17.5

Maxxbilder Module mit Netzspannung

63.5

22.5

117.4

63.5

17.5

129.5
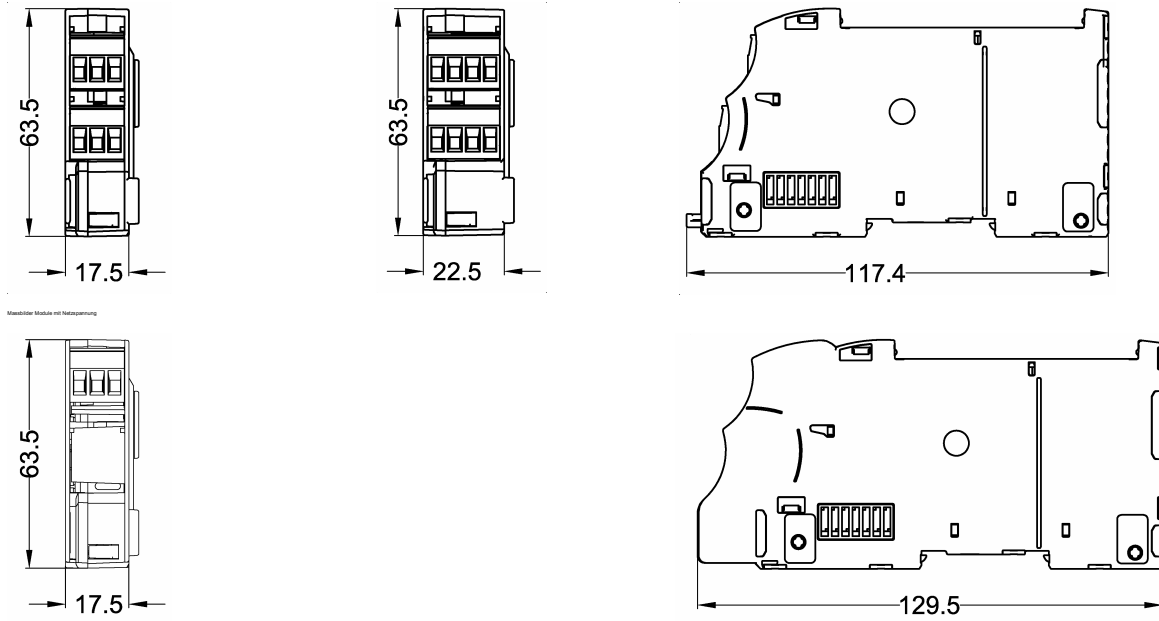
In supply module 100-240 VAC and output module 2 x relays 240 VAC, the terminals are protected against accidental contact by two lateral partition walls.

Dimensional drawing of display module

The dimensions in the diagram refer to the size of the section.

Dimensions of the module are:
W x H x D: 132 x 72 x 7.8 mm

128

68

Flow Sensor
See Display

100-240V~ or 24V~
50-60Hz   IP54
MAX. 15W   0...55°C

12.3   Technical specifications

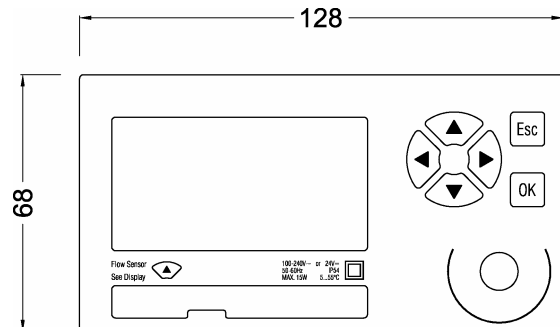| Standards	
CE Directives	2004/22/EG (MID) Measuring Instruments Directive 2004/108/EG (EMC) Electromagnetic compatibility 2006/95/EG (LVD) Low voltage directive
Standards	EN 1434, EN 61000-6-2, EN 61000-6-3, EN 60950
EC comformity assessment	Module B, DE-07-MI004-PTB029

Housing, modules	With protective housing	Without protective housing
Mounting	On support rail or wall	On support rail
Protective housing size W x H x D	140 x 202 x 83 mm	
Module housing size W x H x D		3 poles: 17.5 x 117.4 x 63.5 mm 3 poles: 240 V: 17.5 x 129.5 x 63.5 mm 4 poles: 22.5 x 117.4 x 63.5 mm
Type of ingress protection according to EN60529	IP54	IP20
Maximum number of modules	6 – 7, including 1 CPU and 1 supply module, max. 2 communications modules	16, including 1 CPU and 1 supply module, max. 2 communications modules

Environmental conditions	
Ambient temperature during operation	+ 5… +55 °C, EN 1434 class C
Storage temperature	0 °C … 60 °C
Humidity	Max. 95% rel. humidity, without producing condensation
Cable cross-sections	
Power supply	0.8 …2.5 mm^2
Pulses, frequency, analogue	0.35 …2.5 mm^2
Pt100	0.8 … 2.5 mm^2 (preferably large)

Power supply	Supply module 100-240VAC
Nominal voltage	100 … 240 VAC, 50 … 60 Hz
Operating voltage	86 … 265 VAC, 47 … 63 Hz
Current input	Max. 300 mA
Protection class	II
Isolat.-voltage primary/secondary	3000 VAC
additional approvals	UL 60950, EN 60950 (via CSA-NRTL/C)

CPU module 2*Pt100			
Accuracy of energy calculation	Energy error in % Ec <= 20 mK / ΔT (mK) Significantly below EN 1434-1: Ec <= 0.5% + (ΔT/ΔTmin)		
	ΔT [K]	Ec CALEC energy master	Ec EN 1434-1
	3	0.7%	1.5%
	6	0.3%	1%
	20	0.07%	0.65%
	100	0.02%	0.53%

CPU module 2*Pt100	
Data backup in case of power failure	EEPROM > 10 years
Backup battery (button cell)	Lithium 3 V, 48 mAh, Type CR1225, soldered
Life of backup battery	Typically >10 years in normal operation (T < 45 °C) Typically > 6 years without mains supply
Data logger	100 values of all meter readings with time stamp in the ring memory Logger interval: 15 min.., 30 min., 1 hr., 1 day, 15 days, 1 month
Billing dates	2 billing dates, dates adjustable
Optical interface	IrDA V1.0 with 57600 baud and M-Bus protocol, max. distance 70 m
Measuring and calculating cycle	1 second

Temperature measurement	CPU-module 2*Pt100 and Input-module 2*Pt100
Temperature range Temperature deviation	-50 … +550 °C according to MID/EN1434: 1 … 200 °C < ± 10 mK
Temperature differential range Deviation ΔT (Ta = 5 … 55°C)	0 … 550 K according to MID/EN1434: 3 … 198 K < ± 15 mK
Temperature sensor type	Pt 100 (IEC751, paired according to EN1434), 2-, 3- or 4-wire cable
Resolution ADC	24 Bit

Display module	
Dimensions W x H x D	132 x 72 x 7.8 mm
Dimension of cut-out W x H	128 x 68 mm
Display	Alphanumeric LCD, 128 x 64 pixel
Backlight	White, flashes red when fault occurs
Display	Title bar, 4 lines each of 21 characters, status line
Language	Settable: German, English, French, Italian
Keys	6 keys: 4 arrow keys for navigation, OK, Esc
Detachable display module	Max 100 m with Remote Display Adapters (RDA)
Optical interface (Display module)	IEC 870-5, 300, 2400 or 9600 baud, M-Bus protocol

Input-Module 2*Pulse/frequency/analogue		
Number of inputs	2	
Pulse input	Pulse input:	0.003 … 12.5 kHz
	Min. pulse width	40 μs
	Types settable according to EN 1434, see below	
Frequency input	Frequency input	0 … 10 kHz (PFM)
	Measuring error:	typ. < 0.1%
Analogue input	Measuring range	0 or 4 … 20 mA
	absolute measuring range	0 … 22 mA
	Accuracy	0.025% full scale, drift 15ppm / K
	Load	50 Ω
	Measuring transducer power supply 24V	

Input-Module 2*Pulse/frequency/analogue	
Measuring transducer power supply	6, 8 or 24 VDC, settable, max. 25 mA, short-circuit proof
Error detection	Short circuit and interruption (settable)

Pulse input type according to EN 1434

	Max. pulse freq.	Pulse length	Input resistance Ri	Meas. transducer power supply
Class IB	5Hz	≥ 100 ms	100 kΩ	6 V
Class IC	200 Hz	≥ 2 ms	100 kΩ	6 V
Class ID	200 Hz	≥ 2 ms	1 kΩ	8 V
Class IE	12.5 kHz	≥ 0.04 ms	1 kΩ	8 V
PFM	12.5 kHz	≥ 0.04 ms	150 Ω	24 V

Switching level: low < 1.5 V, high > 2.1 V, 0.6 V Hysteresis

Output module 2*relays 24V, analogue		
Number of outputs	Two	
Output type settable	Relay functions:	Pulse / status / limit value / limit value 2
	Analogue functions:	0 … 20 mA / 4 … 20 mA
	Test functions:	Relay test / analogue test
Relay output (solid state relay)	Max. contact voltage:	24 VDC
	Max. current:	100 mA
	Frequency:	max. 50 Hz at *
	* Pulse width:	10 ms, 50 ms, 250 ms, 1 s, settable
	Duty cycle:	50%
	Normal state:	Contact closed or open, settable
	Leak current:	< 30 μA corresp. to > 800 kOhm at 24 VDC
Analogue output	Current range	0 … 20 mA or 4 … 20 mA
	Accuracy	0.1% full scale, drift 50 ppm / K
	Max. load	R = (Uext - 4V) / 22 mA
Galvanic isolation	50 V	
Measuring transducer power supply	24 VDC, max. 25 mA, short-circuit proof	

M-Bus module	M-Bus interface EN1434-3, 2007
Transmission rate	300, 2400, 9600 Baud
Current requirements	1.5 mA (1 M-Bus load)
Addressing	Point-to-point, primary address, secondary address
	One address per active calculator (max. 3)
Galvanic isolation	Max. 50 V

13 EC declaration of conformity

$C\epsilon$	**EG-Konformitätserklärung** **EC declaration of conformity** **Déclaration CE de conformité** **Dichiarazione CE di conformità**

AQUAMETRO AG, Ringstrasse 75, CH-4106 Therwil

erklärt, dass das Produkt declares that the product déclare que le produit dichiara che il prodotto	Energie-Rechenwerk Energy calculator Calculateur d'énergie Calcolatore d'energia	**CALEC® energy master**

mit den Vorschriften folgender Europäischer Richtlinien übereinstimmt:
conforms with the regulations of the following European Council Directives:
est conforme aux prescriptions des suivantes directives Européennes :
è conforme alle prescrizioni delle seguenti direttive Europee

2004/108/EG	EMV Richtlinie EMC directive Directive CEM Direttiva CEM
2006/95/EG	Niederspannungsrichtlinie Low voltage directive Directive sur la tension basse Direttiva bassa tensione

Folgende harmonisierte Normen wurden angewendet:
The following harmonised standards or normative documents have been applied
Les normes harmonisées ou documents normatifs ont été appliqués
è conforme alle prescrizioni delle seguenti direttive Europee

EN 61000-6-3: 2005 / 2007
EMV Fachgrundnorm - Störfestigkeit für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe
Generic EMC standards - Immunity for residential, commercial and light-industrial, environments
Standards CEM génériques -Immunité pour les environnements résidentiels, commerciaux et de petite industrie
Compatibilità elettromagnetica. Norma generica sull'emissione - Ambienti residenziali, commerciali e dell'industria leggera

EN 61000-6-2: 2005
Fachgrundnormen - Störfestigkeit für Industriebereiche
Generic EMC standards - Immunity for industrial environments
Standards CEM génériques - Immunité pour les environnements industriels
Norma specifica - grado di protezione per zone industriali

EN 61010-1: 2001
Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte; Allgemeine Anforderungen
Safety requirements for electrical equipment for measurement, control, and laboratory use; General requirements
Règles de sécurité pour appareils électriques; Prescriptions générales
Prescrizioni di sicurezza per apparecchi elettrici di misura, regolazione e da laboratorio; Esigenze generali

Prüfstelle, Bericht Testing laboratory, report Laboratoire d'essai, rapport Centro analisi, rapporto	Electrosuisse	06-EL-0061.01, 08. 5.2008
	Montena	15087 / 20.11.2007
	Montena	15118 / 19.11.2007
	Montena	15298 / 17.4.2008

CE

EG-Konformitätserklärung
EC declaration of conformity
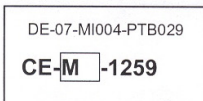## Déclaration CE de conformité
Dichiarazione CE di conformità

aqua metro

AQUAMETRO AG, Ringstrasse 75, CH-4106 Therwil

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mit dem Kennzeichen with the label avec le signe con il contrassengno	DE-07-MI004-PTB029 **CE-M -1259**	mit den Vorschriften folgender Europäischer Richtlinien übereinstimmt: conforms with the regulations of the following European Council Directives: est conforme aux prescriptions des suivantes directives Européennes : è conforme alle prescrizioni delle seguenti direttive Europee:
2004/22/EG		Messgeräterichtlinie Measuring Instruments Directive Directive sur les équipements de mesure direttiva europea relativa agli strumenti di misura

Folgende harmonisierte Normen wurden angewendet:
The following harmonised standards or normative documents have been applied:
Les normes harmonisées ou documents normatifs ont été appliqués:
Sono state applicate le seguenti norme armonizzate o i seguenti documenti normativi:

EN 1434: 2007	Wärmezähler Heat meters Compteurs de chaleur Contatori di calore

Die vorliegende Konformitätserklärung gilt nur in Verbindung mit dem auf dem Messgerät angebrachten CE-Zeichen, gefolgt von der metrologischen Zusatzkennung M und Produktionsjahr, sowie der Ordnungsnummer der Benannten Stelle.

This declaration applies only in conjunction with the CE mark followed by the metrological mark M with the year of manufacture, and the serial number of the notified body both of which are to be found on the measuring device.

La présente déclaration de conformité est valable uniquement en combinaison avec le marquage CE sur l'appareil, suivie par l'adjonction de métrologie identifiant M et l'année de production, ainsi que le numéro d'ordre de l'organisme notifié.

La presente dichiarazione è valida solo in combinazione con il contrassegno CE, seguito dal simbolo metrologico M, anno di fabbricazione e numero di serie dell'organizzazione notificata, predisposto sull'apparecchio.

Benannte Stelle, Bericht, Zulassung Notified body, report, approval Organisme notifié, rapport, homologation Centro verifica, rapporto	**PTB** **Asbeststrasse 2-12** **10587 Berlin**	**DE-07-MI004-PTB029** **Notified body Nr. 0102**

Therwil, 22.9.2008

Hannes Bock
Leiter Qualitätsmanagement
Head Quality Management
Responsable gestion de qualité
Direttore gestione qualità

Reinhold Vollmer
Produkt Management
Product Management
Management des produits
Gestione del prodotto

CE-08-010 - CALEC® energy master

2/2

CALEC® energy master installation and operating

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