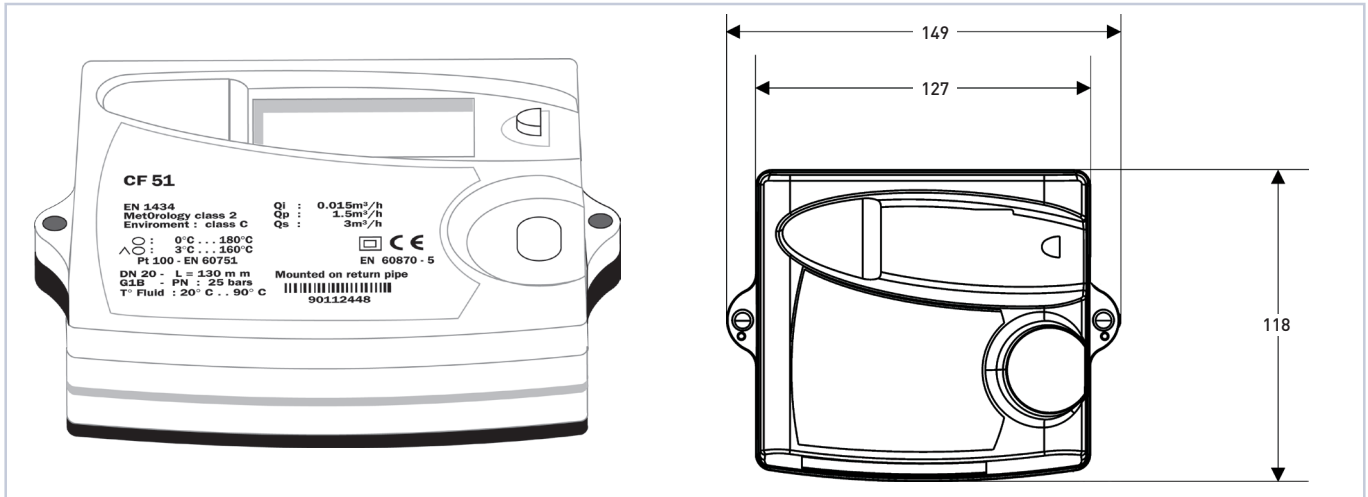




Installation and operating instructions CF-51/55 Integrator



1. Scope of delivery CF-51/55

- 1 integrator with battery (optionally with mains adapter)
- 1 x wall mounting bracket
- 1 x package, incl. meter sealing material, screws, wall plugs
- Installation and operating instructions

Required tools:

- 3 mm screwdriver
- Crosstip screwdriver

2. General information

The heat meter CF-51/55 is a high-quality electronic measuring instrument. The following instructions must be carefully observed to ensure correct installation and to fulfil all safety and guarantee conditions.



2.1 Safety information

Heating water circuits and mains power supplies are operated under high temperatures, high pressures or high voltages. If operated incorrectly, this may cause serious injuries. Therefore, the measuring instruments should only be installed by qualified and trained personnel. If the meter casing is subjected to strong vibrations and impacts, or dropped from a height of more than 60 cm, etc., the heat meter must be replaced. Pipes must be earthed. Disconnect the mains voltage (optional) before opening the integrator.

2.2 CE marks and protective classes

The measuring instrument CF-51/55 fulfils all requirements of CE guidelines and is approved for environmental class C (industrial applications) according to DIN EN 1434:

- Ambient temperature +5 to +55 °C (indoor installation)
- Storage temperature (without battery) -10 to +60 °C
- Relative atmospheric humidity <95%
- Absolute altitude <2000 m

- Protective class IP64 according to DIN 40050 (protection against dust and splashing)
- EMC protection according to DIN EN 50081-1/2, DIN EN 50082-1/2
- Double protective insulation
- Do not dispose of electronic devices or batteries in normal household waste. Please return our products to us free of charge after use for correct disposal in accordance with local regulations.
- The metrological class of a combined heat meter, consisting of a flow sensor, integrator and temperature sensors and installed according to the manufacturer's specifications, conforms to the metrological class of the flow sensor (see type plate).

2.3 Further important information

- Select a mounting position that ensures the connection cable of the volume measuring meter and the temperature sensor cables are not in the vicinity of mains cables or other sources of electromagnetic disturbances (minimum distance 50 cm).
- Do not install cables along hot pipes reaching temperatures above 55 °C.
- Opening of calibration seals will result in the loss of calibration validity and warranty.
- Only clean the casing on the outside with a soft, slightly damp cloth. Do not use detergents.
- Installation must be carried out according to DIN 4713 or DIN EN 1434.
- Certain special functions (e.g. when using the tariff and datalogger function for CF-55) demand the parameterization of the integrator via the M-Bus or the optical interface.

3. Mounting the volume integrator

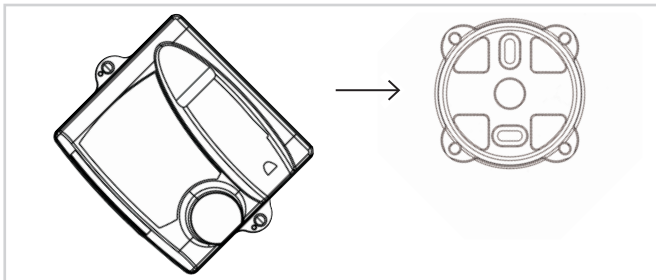
3.1 Installation information

- Never carry out welding or drilling work near the meter.

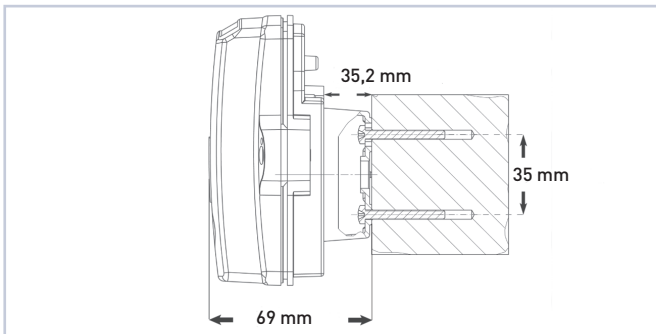
- Leave the meter in its original packaging until all connections, insulating, painting and cleaning tasks have been performed.
- The pulse value and installation position (supply or return) of the volume measuring meter must correspond with the data specified on the type plate of CF-51/55.
- Protect the heat meter against damage caused by impact or vibration which may occur at the installation position.
- The type and intrinsic value of the temperature sensors to be connected must correspond with the data specified on the type plate.
- The integrator can be mounted on a wall, on a cool pipe or – when using US-Echo II volume measuring meters – directly at the volume measuring meter.

3.2 Wall mounting

If the temperatures in the heating circuit are permanently above 90 °C or the ambient temperature is above 55 °C, it is recommended to mount the integrator on a wall. Screw the supplied wall bracket to the wall or fasten it to a cool pipe (e.g. with a plastic clamp).

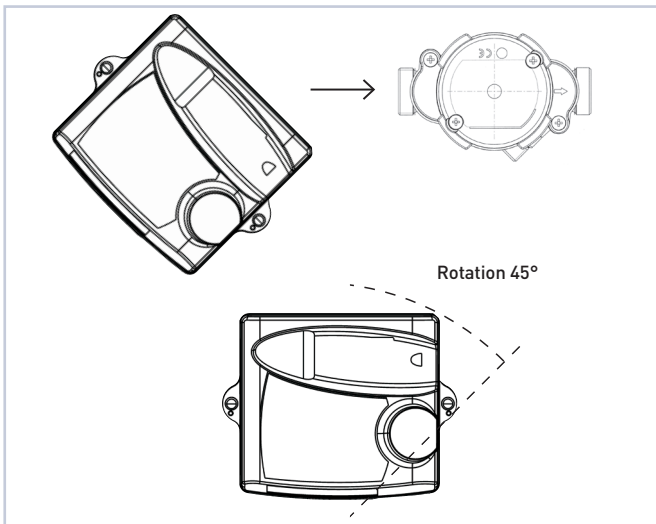


Position the integrator on the wall bracket at a 45° angle. Turn the integrator until it engages.



3.3 Mounting at the volume measuring meter US-Echo II

The integrator must not be installed at the volume measuring meter if the ambient temperature is permanently above 55 °C or in case of cooling operations.

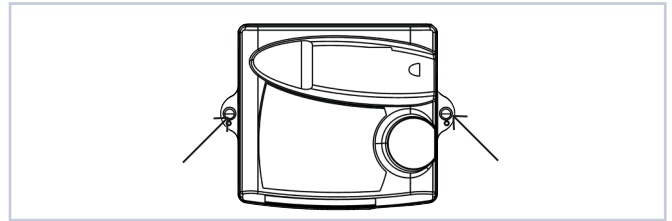


Position the integrator on the wall bracket at a 45° angle. Turn the integrator until it engages.

4. Connecting temperature sensors and volume measuring meter

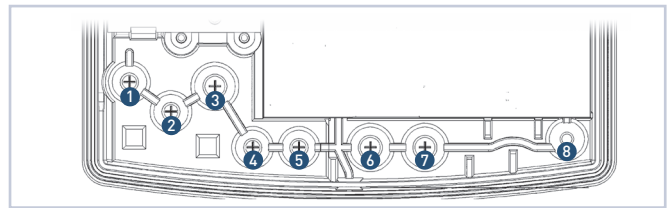
4.1 Preparation

- Unscrew the lateral casing screws and remove the upper part of the casing.
- All the cables are inserted through cable entries in the lower part of the casing.
- Allocation of cable entries depends on the actual cable diameter and use of option boards and mains adapter according to the following recommendation:



Cable entries:

1. $\varnothing 4,25 \pm 0,75 \text{ mm}^2$ - T. sensor (supply)
2. $\varnothing 4,25 \pm 0,75 \text{ mm}^2$ - T. sensor (return)
3. $\varnothing 6 \pm 1 \text{ mm}^2$ - Mains power supply – optional
4. $\varnothing 4,25 \pm 0,75 \text{ mm}^2$ - Optional
5. $\varnothing 4,25 \pm 0,75 \text{ mm}^2$ - Optional
6. $\varnothing 6 \pm 1 \text{ mm}^2$ - T. sensor (supply) /optional
7. $\varnothing 6 \pm 1 \text{ mm}^2$ - T. sensor (return) /optional
8. $\varnothing 3,75 \pm 0,75 \text{ mm}^2$ - Volume measuring meter



4.2 Temperature sensor

Only use pairs of temperature sensors with the same serial number. Do not shorten or lengthen sensor cables on site. Install the sensors in accordance with the guidelines of the German AGFW and DIN EN 1434.

Connection specifications

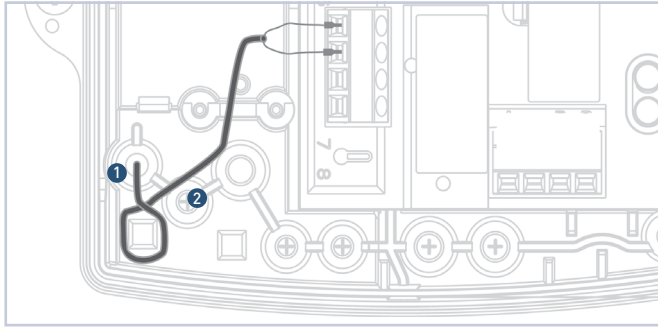
Connection: 2-wire technology, for CF-55 also 4-wire technology
Cable diameter: 3,5...6,5 mm
Max. wire cross section: 0,2...1,5 mm²
Type: Pt 100 or Pt 500 to DIN EN 60751
 Observe the rated value integrator – see type plate!

4.2.1 Connecting temperature sensors

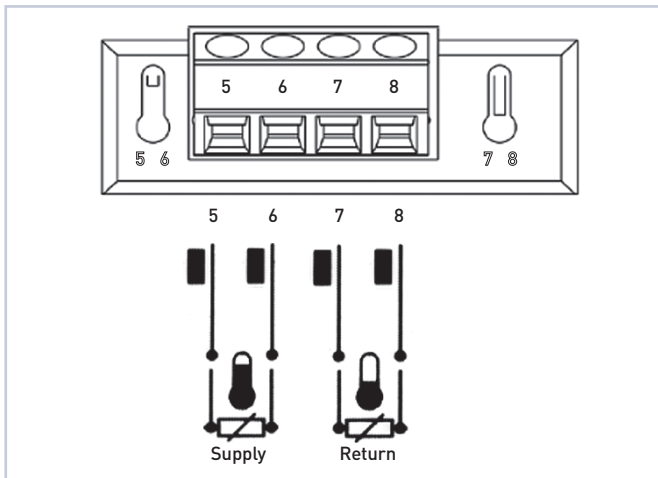
The following figures (4.2.2 and 4.2.3) and descriptions refer to connecting temperature sensors in heating circuits. Please observe the following instructions when connecting temperature sensors in cooling or in combined heating/cooling circuits:

	Terminal «heating»	Terminal «cooling»
Heating circuit	Supply sensor	Return sensor
Cooling circuit	Return sensor	Supply sensor
Combined heating/cooling circuit	Heating supply sensor	Heating return sensor

- Pierce cable entries ① and ② at the integrator.
- Pull the cable of the supply temperature sensor (=hotter line) ① and the cable of the return temperature sensor (=colder line) through the respective cable entry ②.
- Create a loop to form an effective cable strain relief and push it behind the respective fin (see figure).
- Wire connection according to the terminal configuration diagram.



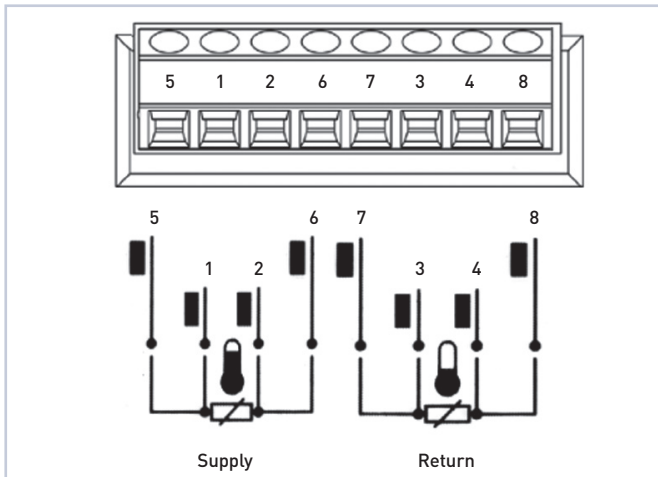
4.2.2 Terminal configuration for CF-51



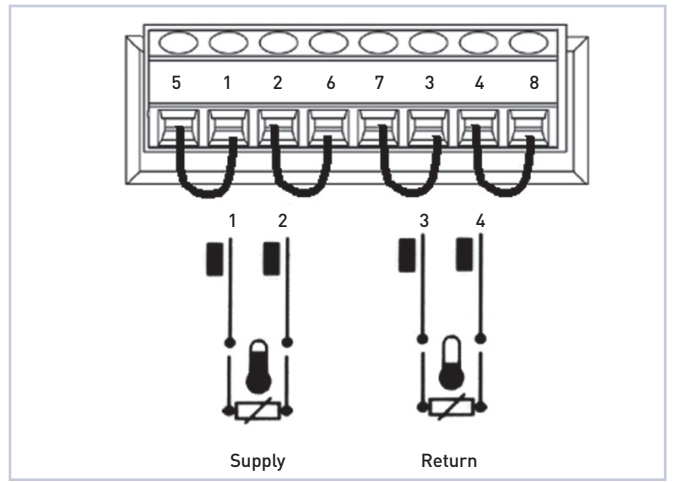
Sensor connection in 2-wire technology

4.2.3 Terminal configuration for CF-55 [Connection in 4 or 2-wire technology]

Note: When connecting temperature sensors in 2-wire technology at a CF-55 integrator, the terminals must be bridged as shown in the figure!



Sensor connection in 4-wire technology



Sensor connection in 2-wire technology

4.3 Volume measuring meter

Both conventional volume measuring meters with a 2-wire connection cable and US-Echo II volume measuring meters with a 4-wire connection cable can be connected to the integrator.

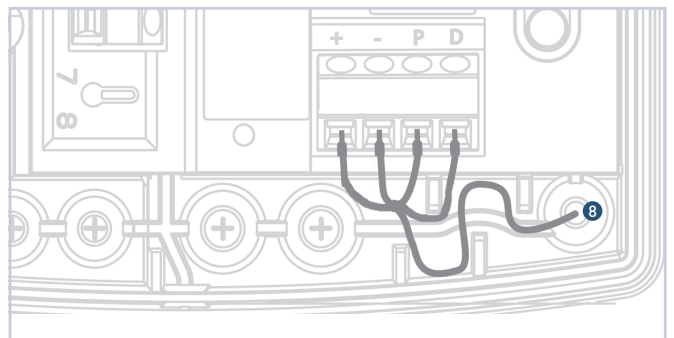
Besides simple pulse transmission, utilization of US-Echo II volume measuring meters enables the transfer of fault messages to the integrator via a data cable and a supply of power to the ultrasonic volume measuring meter through the integrator

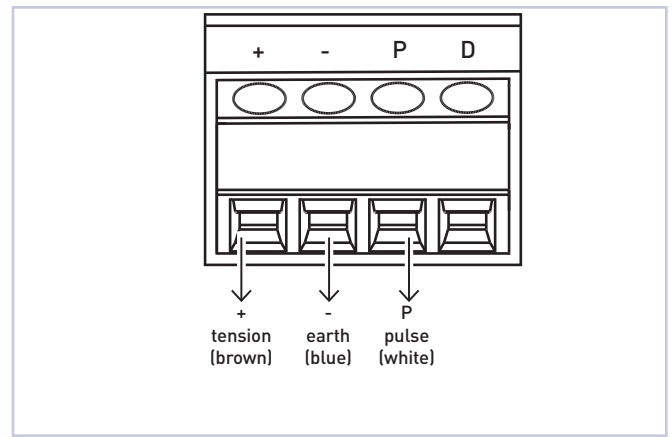
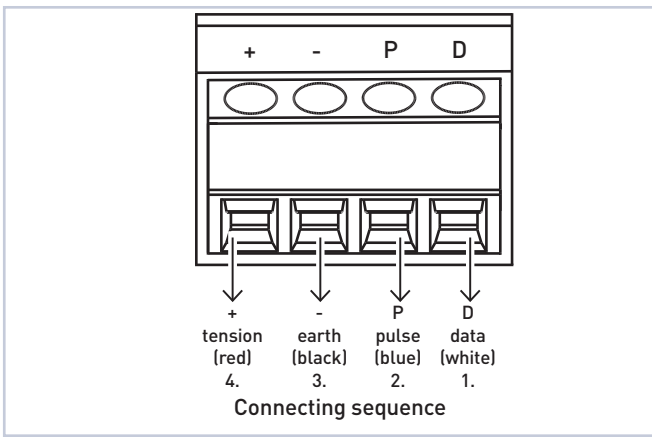
Pulse input specification	
Pulse input	Characteristics according to EN1434-2 – 7.1.5 Class IB
Pulse pick-ups	Reed contact, open collector, open drain or static relays
Pulse value	Observe the rated value of the integrator (see type plate)!
Pulse frequency CF-51	max. 16 Hz
Pulse frequency CF-55	max. 128 Hz
Resistance R_{on}/R_{off}	$\leq 150 \Omega / \geq 2 M\Omega$
Cable diameter	$3,75 \pm 0,75 \text{ mm}$
Wire cross section	$0,2 \dots 1,5 \text{ mm}^2$

4.3.1 Connecting a US-Echo II or Axonic volume measuring meter


- Pierce cable entry ③ at the integrator (see figure in 4.1).
- Push the cable behind the respective fin to form an effective cable strain relief.
- Connect the individual wires according to the colour coding and the connecting sequence.

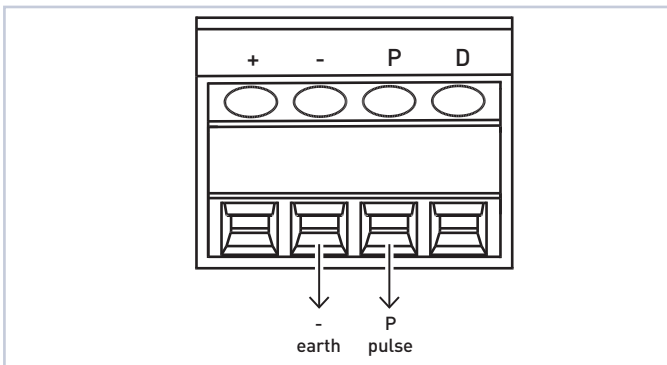
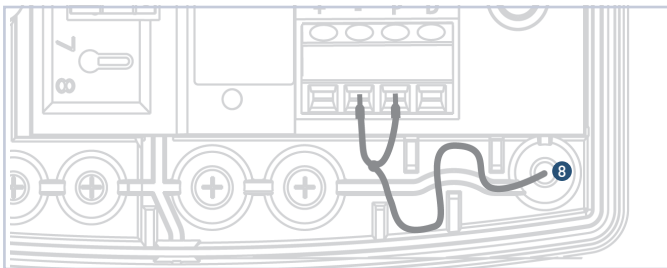
Note: Connect US-Echo II versions with an additional pulse box for the power supply as described in Section 4.3.2. For further details, please refer to the US-Echo II documentation.






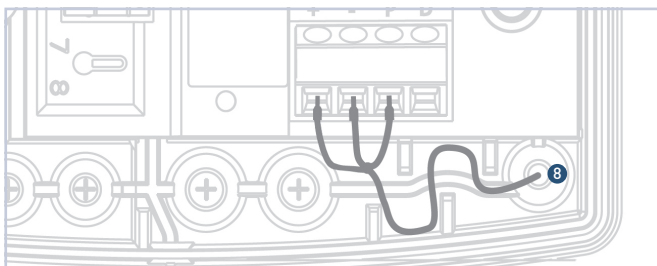
4.3.2 Connecting conventional volume measuring meters

- Pierce cable entry  at the integrator (see figure in 4.1).
- Push the cable behind the respective fin to form an effective cable strain relief.
- When connecting reed contact-based pulse pick-ups (as standard for volume measuring meters with mechanical counters), polarity does not have to be observed!
- Always observe the polarity when connecting electronic pulse-pick-ups (e.g. open collector)!
- Connect the individual wires according to the wiring diagram.



4.3.3 Connecting a US-Echo BR 473 volume measuring meter

- Pierce cable entry  at the integrator (see figure in 4.1).
- Push the cable behind the respective fin to form an effective cable strain relief.
- Connect the individual wires according to the colour coding. Do not connect the yellow wire.
- Caution: A US BR 473 volume measuring meter is not compatible with the mains-operated version of the CF-51 volume integrator




5. Volume integrator power supply

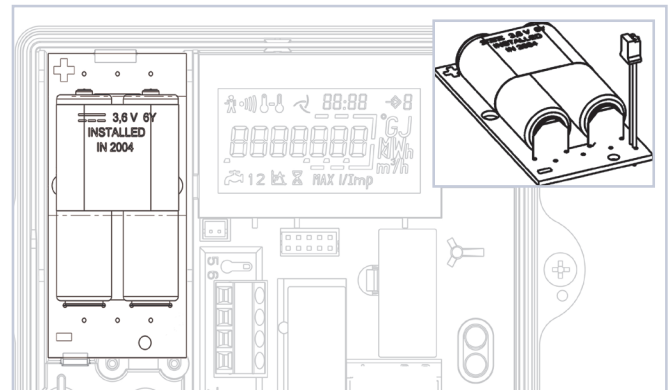
Two types of power supply are available.

5.1 Battery for 12 years

Type 1 x lithium 3,6 V-C, soldered to an insert board

- Only use original battery.
- Do not recharge, open, heat to more than 100 °C, expose to an open flame or immerse in water.
- Do not dispose of with household waste. Dispose of product correctly in accordance with relevant regulations.
- Connect the battery using plug-in connectors.
- Place the battery in the corresponding recess in the integrator casing and engage.

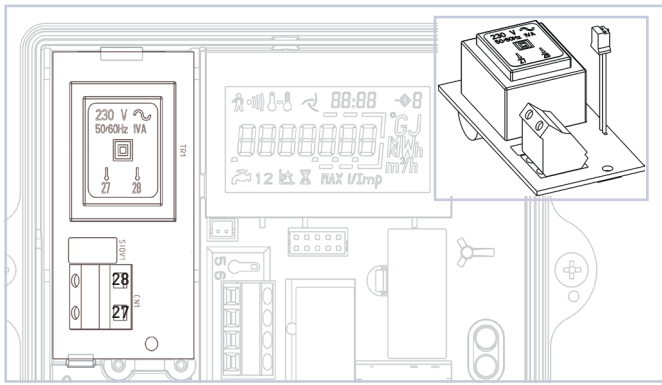
 **Caution:** When switching from battery to mains operation and vice versa, disconnect the integrator power supply for at least 5 minutes. Subsequently check the internal clock and reset it, if necessary; also monitor the update time of the temperature difference recording (display 2). The update time is 20 seconds and 2 seconds for battery-powered and mains-powered operation respectively.



Lithium 3,6 V-C

5.2 Mains module

Mains voltage	230 V ±15%
Mains frequency	50 Hz ±2%
Maximum power consumption	1 VA
Type of cable	2 wires (no earth)
Cable diameter	4,5 mm ... 7,0 mm
Wire cross section	0,5 mm ² ... 2,5 mm ²



Mains module

Heat meters with mains power supply must be connected according to the installation instructions. The mains power supply must be protected against unintentional voltage failures. Protective systems (circuit breakers) must be used in order to ensure secure disconnection of the instrument from the mains in the event of electric problems (breaking current < 1 A).

An emergency circuit breaker must:

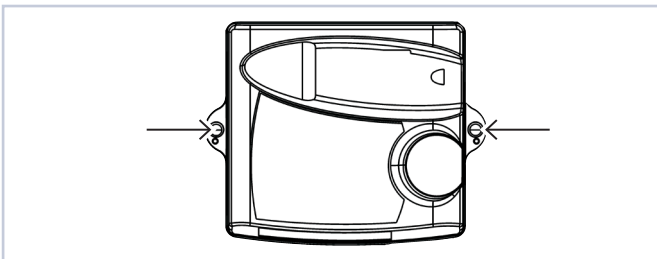
- be installed within reach
- be clearly recognizable as an emergency circuit breaker
- cut off both wires
- clearly show the on/off position

The connection cable of the mains module must be directly connected to the circuit breaker.

- Disconnect the mains voltage (circuit breaker).
- Open the integrator casing and connect the mains power supply to the integrator using the plug.
- Insert the mains module into the corresponding recess in the casing.
- Pierce the third cable entry from the right and pull through the mains cable.
- Mount the cable strain relief.
- Connect wires to terminals no. 27 and 28 (protected against reverse polarity, strip 8 mm of insulation).
- Close the casing lid and switch on the mains voltage.

6. Commissioning

- Check all the functions, especially plausibility of the displayed temperatures and volume flow.
- Replace the upper casing and screw tight.
- Secure the screws with user seals (supplied plastic seals or wire seals).



7. Operating instructions CF-51/55

A heat meter is a measuring instrument for recording the energy released in a heating or cooling system. A split heat meter consists of the following components: temperature sensor pair, volume measuring meter and integrator. The integrator records the measured values for the sensor pair and the volume measuring meter and enables the display of various data on three separate display levels.

Display level 1:

Billing level (cumulated energy and volume flow display)

Display level 2:

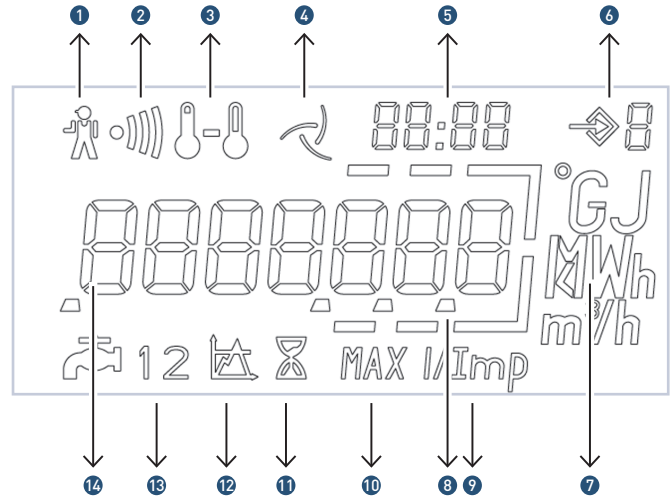
Service level (current operating data of the heat meter)

Display level 3:

Due date level (12/24* monthly values for cumulated energy and volume flow)

*Software version 12-28 (CF-51) / 10-24 (CF-55) and higher

7.1 LC display and meaning of the segments



1. **Alarm symbol:** Energy measurement stopped. For cause of error, see 7.3.6.
2. **Soiling warning:** Energy measurement continues; the volume measuring meter must, however, be cleaned.
3. **Temperatures:** Shown for temperature-related displays or for cooling energy in case of combined heating/cooling meters.
4. **Flow display:** Permanent symbol: Flow is present / Flashing symbol: No flow
5. **Time and date:** Shows the time and date in relation to time-related displays, e.g. due day values and maximum values.
6. **Display level:** Currently selected display level
7. **Unit:** Physical unit
8. **Decimal point**
9. **Pulse value of externally connected water meters** (only when using a corresponding option board)
10. **Maximum value:** Is shown when maximum values are displayed
11. **Operating time:** Is shown when the operating time is displayed
12. **Threshold value (only with CF-55):** Display relates to threshold/tariff function (1 or 2)
13. **Water meter 1 or 2:** Display concerns external water meter (1 or 2)
14. **Main display section:** Seven digits for displaying all cumulated and current values

7.2 All display levels and levels in detail

Depending on the device version, the actual display range can deviate from the one shown here. Press the push button to activate the LC display. Press the push button ◀ for a longer period (2 s) to change the level and briefly press the push button ◀ to change the display.

Function	Display	Level
Energy (MWh, kWh or GJ)	755.13 MWh	1
Cooling energy (MWh, GJ or kWh) (optional)	765.43 MWh	1
Volume	6809.7 m³	1
LCD test	88.88 °C 8888888 MWh/m³h MAX 1/Imp	1
Water meter 1 (optional)	7649.0 m³	1
Water meter 2 (optional)	16.130 m³	1
Threshold 1 (only CF-55)	1500 m³/h	1
Energy above threshold 1 (only CF-55)	2.135 MWh	1
Volume above threshold 1 (only CF-55)	28.13 m³	1
Threshold 2 (only CF-55)	1000 kW	1
Energy above threshold 2 (only CF-55)	175.3 MWh	1
Volume above threshold 2 (only CF-55)	23.13 m³	1

Function	Display	Level
Flow	1389 m³/h	2
Power	908.3 kW	2
Supply temperature	150.0 °C	2
Return temperature	29.9 °C	2
Temperature difference	208.9 °C	2
Operating time	03-186	2
Maximum power display day + month/year/time permanent change of display	220.1 906.3 kW MAX 200.1 08:30	2

Function	Display	Level
Maximum flow value day + month/year/time permanent change of display	19.99 303.4 m³/h MAX 19.99 10:30	2
Maximum supply temperature value day + month/year/time permanent change of display	20.04 150.0 °C 200.1 10:30	2
Failure hours	382h C1	2
Error code temperature measurement	1234 b R0	2
Error code flow measurement (optional)	1234567 R1	2
Overload times (optional)	290h C2	2
Mains voltage failure times	0h C3	2
M-Bus primary address (optional)	8 U5 Adr 238	2
M-Bus secondary address (optional)	8 U5 12345678	2
M-Bus secondary address (optional) digits 5 - 8	8 U5 1235678	2
M-Bus baudrate	8 U5 bdr 2400	2
Pulse weight water meter	250 1/Imp	2
Pulse weight water meter 1/2 (optional)	25 1/Imp	2

Function	Display	Level
Due day values energy, month 1...13/24*	07.05 680.76 MWh	3
Due day values cooling energy, month 1...13/24* (optional)	07.05 70.135 MWh	3
Due day values volume, month 1...13/24*	07.05 5773.1 m³	3
Due day values water meter 1/2 month 1...13/24*(optional)	07.05 62.125 m³	3
Software version	50 Ft 19-38	3

*Software version 12-28 (CF-51) / 10-24 (CF-55) and higher

7.3 Information on special display functions

(partly optional, depending on the device version).

7.3.1 Energy and volume index (display levels 1 and 3)

The energy unit is programmed in the factory. As standard, energy is displayed in MWh, kWh or GJ are optionally also possible.

7.3.2 Cooling energy (display level 1)

Display of the cumulated cooling energy with instrument versions for application in combined heating/cooling circuits (for detailed information, please refer to point 10).

7.3.3 Water meters 1 and 2 (display level 1)

Display of the meter readings of additionally connected water meters with pulse output when using a corresponding option board (for detailed information, please refer to point 9).

7.3.4 Threshold display (display level 1 – only for CF-55)

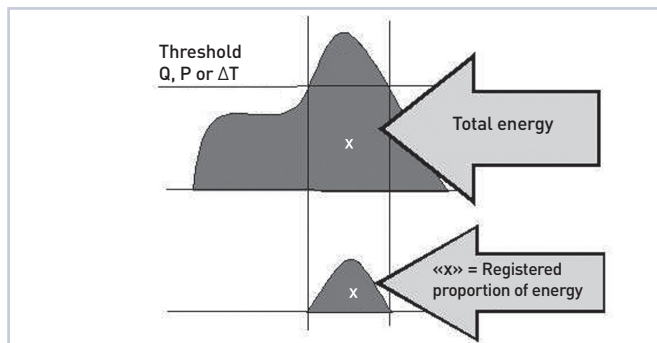
The threshold value, energy content, volume and duration are displayed in two separate threshold registers (tariff registers). Selecting the threshold parameters, programming the threshold values and resetting the data occurs via the M-Bus or the optical interface. As soon as the respective current value is greater than the selected threshold value, the energy and volumetric content are recorded in the threshold registers. The total volume that flowed through the meter while the threshold was exceeded is cumulated in the volume threshold register – the time exceedance is recorded in the time-threshold register.

Operation of the energy-threshold value register depends on the selected threshold:

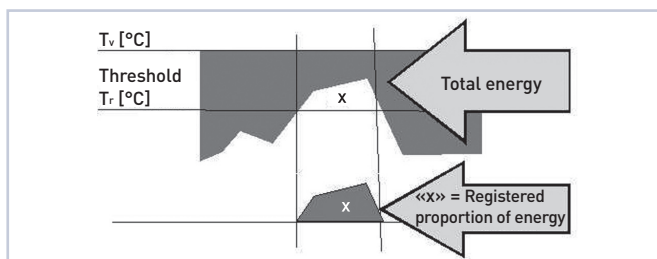
Flow (Q > Q_s)

Power (P > P_s)

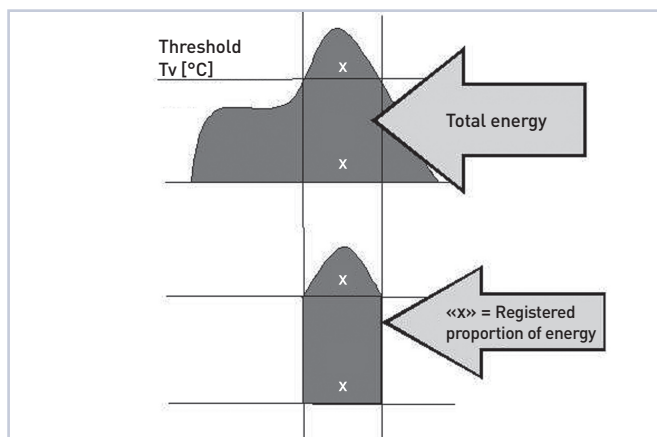
Temperature difference (ΔT > ΔT_s)



Return temperature ($T_R > T_{RS}$)



Supply temperature ($T_V > T_{VS}$)




7.3.5 Maximum value display (Display level 2)

These displays show the current monthly maximum values for power output, flow and supply temperature with time stamp. Internally, 13/24* monthly maximum values are stored which can be read via the M-Bus or the optical interface. The period for determining the maximum values is 15 minutes.

*Software version 12-28 (CF-51) / 10-24 (CF-55) and higher

7.3.6 Malfunction messages (display level 2)

In the event of malfunctioning, CF-51/55 displays a symbol «  ». If this fault message is displayed, contact the responsible technician. CF-51/55 shows detailed information on malfunctions in special display levels (see display description).

Display level 2 Operation shutdown code

A0 = Temperature recording faults

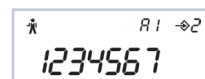


- 1 = Supply temperature sensor is not connected, pipe is interrupted or broken
- 2 = Return temperature sensor is not connected, pipe is interrupted or broken
- 3 = Negative temperature difference; temperature sensors have been exchanged (except for combined heating/cooling metering)
- 4 = Analogue / Digital converter is broken (replace the instrument)
- b = Low battery voltage (replace the battery)*

*Software version 12-28 (CF-51) / 10-24 (CF-55) and higher

Display level 2 Operation shutdown code (optional)

A1 = Flow rate measuring faults



- 1 = Return in the meter or pipe system
- 2 = Air in the pipe system, broken ultrasound sensors or very heavy deposits (cleaning or inspection required)
- 3 = The maximum admissible flow rate has been exceeded
* This message is a warning and does not mean that the measurement is terminated.
- 4 = Connection cable to the volume measuring meter or connection to the ultrasound sensors has been disconnected.
- 5 = No flow for > 24 h, but ΔT > 15 K
- 6 = No data communication between integrator and volume measuring meter (=usual for 2-wire pulse pick-ups)
- 7 = Option board fault

7.3.7 M-Bus parameters (display level 2)

Presentation of characteristic data for remote data readout via M-Bus or optical interface.

7.3.8 Due day values (display level 3)

Representation of 13/24* monthly end values of the cumulated values for energy, volume, cooling energy (optional) and volume of the connected water meters with time stamp, starting with the end value of the previous month.

*Software version 12-28 (CF-51) / 10-24 (CF-55) and higher

8. Integrated datalogger (only CF-55)

The CF-55 volume integrator has an integrated datalogger that allows the field analysis of operating parameters in cooling and heating systems with the following range of functions:

- Logger frequency: Programmable between 1 minute and 7 days

- Memory depth: 1008 memory spaces for each value
- Data: 6 selectable registers (cumulated values and current values)
- Additional display of the error status
- Programming and reading of the datalogger via the M-Bus or the optical interface.

9. Plug-in option boards

The function range of the integrator may be extended for data communication and remote data display using different plug-in option boards. The following option boards are available:

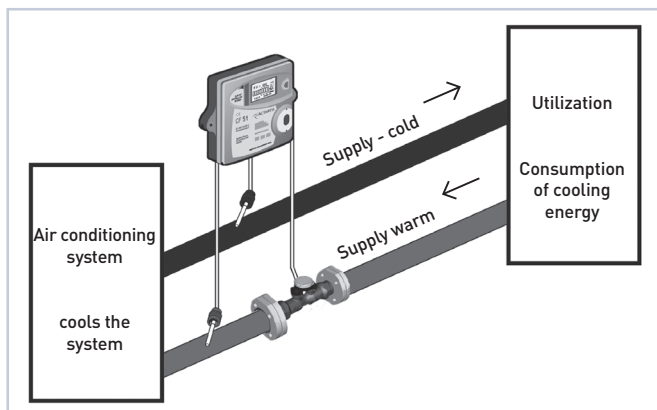
- M-Bus / 2 water meter inputs
- M-Bus / 2 pulse outputs for energy + volume
- M-Bus Power / 2 water meter inputs
- LonWorks / 2 water meter inputs
- Double M-Bus (only CF-55)

Details on installation and commissioning are described in the installation and operating instructions of the respective option board.

10. Special version for application in cooling and combined heating/cooling circuits

10.1 Integrator for application in cooling circuits

With this product version, the heat meter integrator has been specifically labelled and programmed in the factory for application in cooling systems.



Operation, LC display and application of the option boards are similar to the heat meter integrator; however, all energy and output-related displays, M-Bus data as well as remote display pulses refer to the cooling energy in this case.

The integrator has been programmed for the installation of the volume measuring meter in the «warm» pipe of the cooling system (= return of the cooling system). A version programmed for installation of the volume measuring meter in the cold pipe is also available as an option.

10.2 Integrator for application in combined heating / cooling circuits

With these product versions, the integrator has been specifically labelled and programmed in the factory for application in air conditioning systems with combined heating and cooling operation.

Operation, LC display and application of the option board are generally similar to the heat meter integrator; the following special characteristics must, however, be observed:

Basic conditions for metering heating and cooling energy

- Heating energy is measured as soon as the temperature difference ΔT exceeds a value of 0,5 K and the supply temperature exceeds 25 °C. (ΔT = supply temperature T_v - return temperature T_r).
- Cooling energy is measured as soon as the temperature difference ΔT remains below -0,5 K and the supply temperature T_v is below 25 °C.
- A version with switched off supply temperature threshold is available as an option.

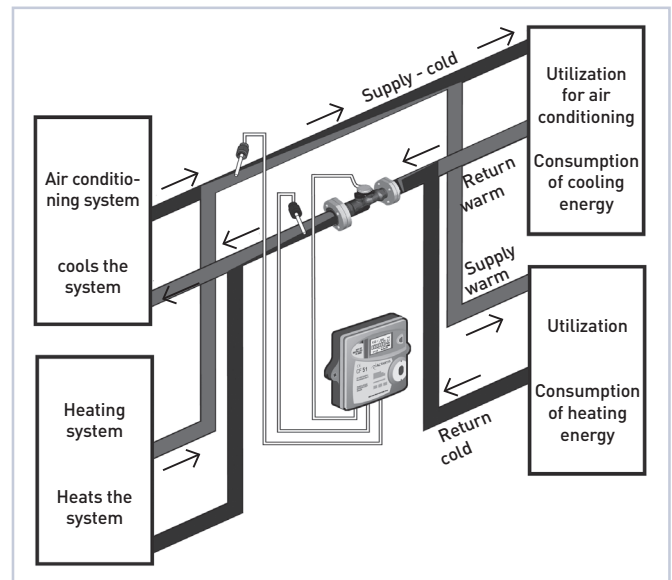
LC display

- Cooling energy is displayed on an additional tab in the 1st display level. A thermometer symbol is displayed simultaneously to differentiate heating energy.
- 13/24* due day values (monthly end values) of cooling energy can be called in the 3rd display level.

*Software version 12-28 (CF-51) / 10-24 (CF-55) and higher

Option boards for remote display

- The option board outputs are marked with «E» (for energy) and «V» (for volume). With this product version, pulses proportional to the cooling energy are output at the output marked «V».



This product version has been programmed for installation of the volume measuring meter in the return pipe of the air conditioning system (= cold pipe in heating operation, warm pipe in cooling operation). A version programmed for installation of the volume measuring meter in the supply pipe is also available as an option.