Sontex

■ Thermal Energy ■ Flow Metering ■

Manual

Electronic
Heat Cost Allocator

Sontex 565
Sontex 566 Radio
Sontex 868 Radio

- For heat cost allocator *Sontex 566 Radio*, the Sontex radio system (*Supercom*) is a bidirectional system. Reading and programmable by radio.
- For heat cost allocator *Sontex 868 Radio*, the radio module comprises a unidirectional radio transmitter.
  Two telegrams: short telegram, OMS compliant and long telegram for Walk-by reading.
- User-friendly operation by push button.
- 6-digit and high-contrast LCD display.
- Automatic commissioning during the mounting on the aluminium back plate (available when ordering).
- Check code for postcard mail-in method
- Possibility to connect a remote sensor on each version of heat cost allocator. The remote sensor will be automatically detected by the heat cost allocator.
- Remote sensor version with 1.75 m cable.
- Standard aluminium back plate for nearly all existing bolts with common dimensions and installation possibilities – thus easy installation (no cutting and welding of bolts necessary).
- Snap-on blind to cover colour shadows for increased aesthetics.
- Safe operation and fraud/manipulation detection.
- Lithium battery with a capacity of up to 10+1 year.
- Meets EN 834:2013.

1.1.4 Display

The heat cost allocator has a LCD-display with 6 large main digits on the right and 2 smaller digits on the left as well as two special symbols and one communication indicator. The main digits are separated by four decimal points. Below, please find the display segments:

Display with all active segments

Normally, the heat cost allocators *565 / 566 / 868* are supplied with switched-off LCD-display. On request, the heat cost allocators can also be supplied with permanent LCD- display.

1.1.5 Electronics

The device has an electrical circuitry with an 8-Bit-CMOS-micro controller of the latest generation STM8L with extremely low current consumption operating at a voltage as from 1.8 V.
The temperature measuring circuit with automatic self-calibration measures the discharging time of a capacitor. The accuracy of the measuring circuit is independent of the supply voltage.

1.1.6 Versions

Sontex 565 Standard:
- Heat cost allocator Sontex 565 with optical interface, standard device.
- Heat cost allocator Sontex 565 X with optical interface, standard device to substitute Kundo 201 / 202 devices.

Sontex 566 Radio (433.82 MHz):
- Heat cost allocator Sontex 566 with optical interface, standard device.
- Heat cost allocator Sontex 566 X with optical interface, standard device to substitute Kundo 201 / 202 devices.

Sontex 868 Radio wM-Bus (868.95 MHz):
- Heat cost allocator Sontex 868 with optical interface, standard device.

1.2 Operating mode

1.2.1 Cycle Time

The heat cost allocators *565 / 566 / 868* operate in a cycle of 4 minutes. Most of the time, the device is in sleeping mode. Every 4 minutes the device is set into operation and operates according to the adjoining diagram.
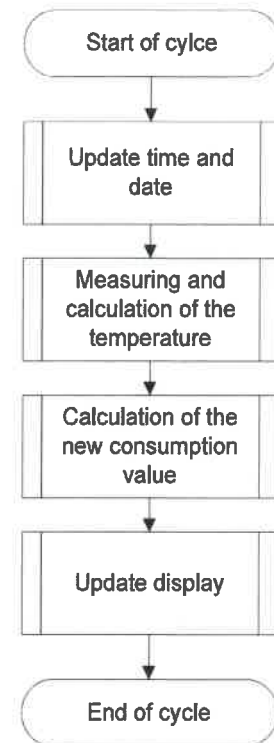
The clock-pulse generator is a counter which is completely independent from the rest of the program. This counter is designed in a way so that it is impossible to stall the cycle or to skip one or more cycles.

Each cycle follows the adjoining diagram. The measuring and calculating processes are explained in detail later.

The tasks carried out during one cycle are taking approx. 100 ms. This means that the device is in sleeping mode more than 99.8 % of the time. It can be set into operation between two cycles over the optical probe or by pushing the button. In this case it carries out the requested task and then returns to sleeping mode.

In case an optical probe is connected or the button is pushed during the course of the cycle, the respective value is readout at the end of the cycle.

The button can be pushed for an indefinite period of time and the optical probe can be left in its position since the normal function of the device is not impaired by an influence from outside.

Start of cylce → Update time and date → Measuring and calculation of the temperature → Calculation of the new consumption value → Update display → End of cycle

1.2.2 Single Sensor Version with Start Sensor

The start sensor of the single sensor version serves as an ambient temperature sensor which mainly functions during the heating up period.
The start temperature is the threshold temperature of the radiator at which the device always starts to carry out energy ratings. For these ratings, the measured radiator temperature and an assumed ambient temperature of 20° C are used as calculation basis.

1.2.3 Double Sensor Version

For the double sensor version basically the same specifications apply as for the single sensor version with start sensor. However, for calculating the room temperature the real temperature, measured by the ambient temperature sensor (corrected via the corresponding radiator-dependent „K_{air}-value"), is used as the basis.

1.2.3.1 Heat Accumulation Mode

In order to avoid faulty measuring due to heat accumulation (e.g. in case the radiator is hidden by panels), the device switches from a defined ambient temperature (e.g. 28°C) to the one sensor mode and calculates with an ambient temperature of 20° C.

exact value is known, it is now possible to calculate the unknown resistance value R_x with the following equation:

$$\frac{t_{ref}}{R_{ref}} = \frac{t_x}{R_x} \implies R_x = \frac{t_x}{t_{ref}} \cdot R_{ref}$$

From this equation the self-calibration of the converter can be derived, which is given by measuring the discharging time through the reference resistance.

1.2.5.3 Measuring of the Radiator and Ambient Temperature

The following measurements are carried out during one cycle:
1. Measuring of the reference resistance R_{ref}
2. Measuring of the ambient temperature sensor NTC_A
3. Measuring of the radiator temperature sensor NTC_R

The measuring values are calculated with the following formula:

$$NTC_A = \frac{t_{NTC_A}}{t_{ref}} \cdot R_{ref} \qquad NTC_R = \frac{t_{NTC_R}}{t_{ref}} \cdot R_{ref}$$

The reference resistance value is defined ex works with a tolerance of 0.5% with 50 ppm. The reference resistance features an excellent temperature and long-term stability.

The capacitor value and the threshold voltage have to remain stable over the whole cycle. However, they can vary at the medium- or long term without causing any failures because the self-calibration of the converter is repeated in every cycle while measuring the reference resistance.

1.3 Display and Additional Functions

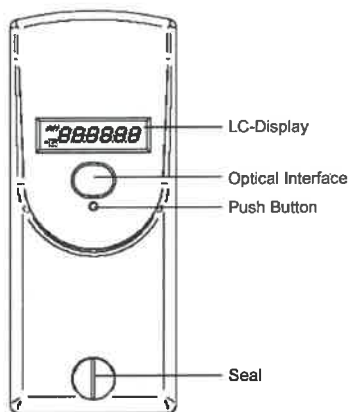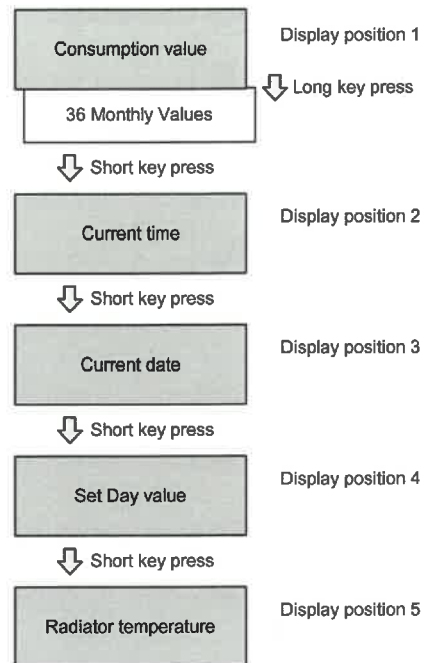## 1.3.1 The Menu Sequences of the Digital Display

The menu sequences

Ex factory all menu sequences are activated. With the software *Prog6* the order of the menu sequences 1 - 15 can be changed in any order. However the order within the individual menu sequences 1 – 15 cannot be changed. It is also possible to hide individual menu sequences so that they are not visible to the end-user.

When reading out over the optical interface or via radio the complete set of data is always readout and transferred.

Operation of the Push Button

When pushing the button briefly the digital display always goes to the next menu sequence.

When pushing the button in one menu sequence for 2 seconds the individual values within the selected menu sequence can be accessed. When the last value within one menu sequence has been displayed, the 1st position will be displayed by pushing the button again.

If the button is not pushed for 2 minutes, the digital display returns to the cumulated consumption value.

Consumption value — Display position 1
⇩ Long key press
36 Monthly Values
⇩ Short key press
Current time — Display position 2
⇩ Short key press
Current date — Display position 3
⇩ Short key press
Set Day value — Display position 4
⇩ Short key press
Radiator temperature — Display position 5

LC-Display
Optical Interface
Push Button
Seal

Time

~~~
    14h27
~~~

The current time (**always winter time**).

Date

~~~
    29.05. 15
~~~

The current date of the heat cost allocator.

Set Day

~~~
Sd
    29.05.--
~~~

It is possible to program an annual set day on which the cumulated consumption value as well as the maximal radiator temperature are recorded.
With the index **Sd** the programmed annual set day is displayed.

Date of Opening of the Device

~~~
od
  29.05. 15
~~~

Each heat cost allocator is equipped with a manipulation protection which detects an unauthorised opening of the device after installation to the radiator. The date of the last opening of the device is recorded and displayed with the index **od**.

Commissioning Date

~~~
Cd
  02.06. 15
~~~

With the index **Cd** the commissioning date is displayed, i.e. the date on which the device has been activated by pushing the button or during the mounting of the aluminium back plate if the function automatic commissioning is set.

Cumulated Duration of the Opening of the Device

~~~
du
    1568
~~~

With the index **du**, the cumulated duration in minutes during which the device was opened is detected. This display turns up only after commissioning in case the heat cost allocator was opened or removed.

Fraud Counter

~~~
FC
    32
~~~

This value indicates how many times the fraud / manipulation was activated.

Identification Number

~~~
15ι
   123456
~~~

With the index **/** an 8 digit identification number is displayed. Ex factory the serial number is identical with the identification number. The first two digits of the identification number are the two small digits on the left upper side of the digital display.

Running Hours

~~~
rh
    158
~~~

With the index **rh**, the running hours is displayed. This value can be compared to the battery use duration.

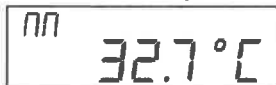## Maximum Radiator Temperature of the Current Heating Period

```
ПЧ
      35.9 °C
```
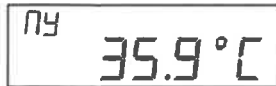
With the index **ПЧ** the maximum radiator temperature of the current heating period (since the Set Day) is displayed.

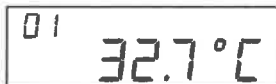## Maximum Radiator Temperature of the Previous Heating Period

```
Sd
      35.9 °C
```

With the index **Sd** the maximum radiator temperature of the previous heating period (before the Set Day) is displayed.

Monthly Value for Maximum Radiator Temperature

```
ПП
      32.7 °C
```

With the index **ПП** the maximum radiator temperature of the currently month is displayed.

Number of monthly values: 18

```
01
      32.7 °C
```

```
18
      32.7 °C
```

Recording of 18 monthly values for the maximum radiator temperature.
The small digits on the upper left side show the number of previous monthly values. Digit 01 stands for the recent full month and digit 18 stands for the least recent month.
All monthly values are set to 000000 when the device is commissioned.

Software Version

```
F ir.0.0.3
```

On the right side the software version x.x.x of the heat cost allocator is displayed.

Measuring Principle

```
--
    2 SENS
```

The index **--** or **FF** indicates the type of the radiator sensor:
-- = Standard device, compact sensor.
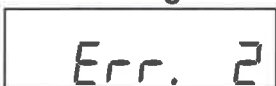**FF** = Remote sensor device, remote sensor.

1 SENS = single sensor device with start sensor.
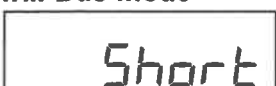**2 SENS** = double sensor device.

Segment Test

```
88 888888
```

Segment test of the display.

Error Message

```
Err.    2
```

If an error is detected, **Err** is displayed in the first display sequence with the corresponding error message.

wM-Bus mode

```
    Short
```

```
    LonG
```

Telegram defined into heat cost allocator.
Type of telegram must be defined when ordering.

Short telegram (**Short**) used.

Long telegram (**LonG**) used.

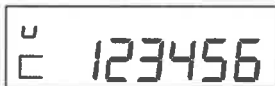## 1.3.4 Communication Indicator ⇄ and Measuring Indicator •

The communication indicator displays if the heat cost allocator is currently making a calculation and/or if it communicates internally or externally over the optical or wireless interface (only radio Supercom).
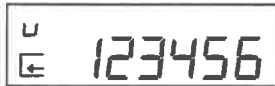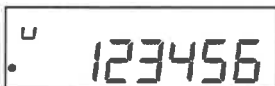
`⊔` `⊑←` `123456`	If the arrow of the communication indicator points inwardly internal communication takes place over the optical or wireless interface (only radio Supercom).
`⊔` `⊑→` `123456`	If the arrow of the communication indicator points outwards external communication takes place over the optical or wireless interface (only radio Supercom).
`⊔` `⊏` `123456`	If the frame of the communication indicator appears the heat cost allocator has detected a wake-up signal (optical or radio Supercom)
`⊔` `.` `123456`	If the point indicator appears the heat cost allocator is carrying out a measuring or a calculation.

1.3.5 Real Time Clock and Calendar

The device has a 24 h real time clock and a calendar. However, the change from summer to winter time is not taken into account. The calendar is programmed until December 31 2099, including all leap years. The real time clock as well as the date of the heat cost allocator can be readout over the optical interface or via radio and if necessary be updated.

If the current date and time have to be updated over the optical interface or via radio, it is necessary to check the date of the computer first. Date and time of the device aim at those of the computer. If the reading/programming device (computer/PDA/ Smart Phone) has a wrong time, this time will be programmed into the heat cost allocator and suddenly no longer be reached at the usual time, because the time of the heat cost allocator possibly is shifted by several hours.

The following parameters are transmitted by *Sontex 868 Radio wM-Bus*:

Short telegram, OMS compliant :
- Identification number (information in header).
- Date and time.
- Consumption value.
- Set Day.
- Set Day value.
- Error code.
- Current radiator temperature.
- Current ambient temperature
- State of parameters.

Long telegram for Walk-by reading:
- Identification number (information in header).
- Date and time.
- Consumption value.
- Set Day.
- Set Day value.
- 18 monthly values for the cumulated consumption.
- Rating factor K_C.
- Rating factor K_Q.
- Current radiator temperature.
- Current ambient temperature.
- Maximum radiator temperature of the current heating period.
- Maximum radiator temperature of the previous heating period.
- Manipulation protection:
    - Duration of the manipulations.
    - Date of the last manipulation.
    - Manipulation counter.
- Error code.
- Firmware version.
- Commissioning date
- State of parameters.

AES 128 bits encryption is available for all versions.

1.3.7 Check Code

A special additional feature of the electronic heat cost allocator *565 / 565 / 868* is the check code function for the postcard mail-in method.
With especially developed algorithms a 5 digit check code is generated out of several device data. With this check code the values stated on the postcards mailed-in by tenants can be cross checked.

For this check, the following parameters are required:
- Identification number.
- The date.
- The current consumption value.
- The check code.

For the verification of the check code Sontex places all necessary tools (programs, formulas) at the disposal of the authorized personnel.

1.3.8 Change of Battery

The battery of the heat cost allocator is soldered. The lithium battery is not rechargeable. A change of battery is not planned. Therefore the heat cost allocators have to be replaced after 10 years.

1.4.3 Unit Scale and Product Scale

For the heat cost allocators Sontex *565 / 566 / 868*, distinction is made between the unit scale and the product scale.

If heat cost allocators are used with the same scale on all radiators, this scale is called unit scale. The display values are the same on the different radiators if the heat cost allocators are exposed to the same temperature for the same period of time.
The evaluation of the display values is carried out arithmetically with the rating factors of the calculation software to receive the final consumption values.

1.4.3.1 Advantages of the Unit Scale

- Easy and quick installation of the heat cost allocator, no programming necessary.
- Possible errors by doing the scaling on site are avoided due to allocation by experts.

With the product scale, the radiator rating data are programmed in the heat cost allocator on site. The overall rating factor total (K_{Total}) is calculated directly in the heat cost allocator and thus the consumption value is displayed immediately.

1.4.3.2 Advantages of the Product Scale

- The actual consumption of each consuming point within one billing unit can be compared easily and quickly on site.

1.5 Parameterization

The software *Prog6* allows the parameterization over the optical interface.
To protect heat cost allocator against fraud, a password has been integrated into the *565 / 566 / 868* products, therefore also in the software. The default "installer" password ex-factory of the heat cost allocator is "00001234", and may be changed by the user.

1.6 Error

The heat cost allocator displays an error message with the 3 letters " Err. " and a code. If several errors occur at the same time, the different codes are added together.
The error is displayed in the first position of the display menu. It will still be possible to select all the other display menus by pressing the navigation button. If the navigation button is no longer pressed for a period of 2 minutes, the error code will automatically appear again in the first position of a display menu.
Display of an error automatically disappears when the error is no longer present.

1.6.1 List of Errors

- Err. 1   Manipulation (fraud).
- Err. 2   Measuring error.
- Err. 32   Push button constantly pushed.
- Err. 64   Measured temperature not within temperature range (0...105°C ; 0...120°C remote sensor).

- For heat cost allocator *868*, an installation telegram is activated during the installation phase. Data are transmitted each 30 seconds (short and long telegram) till at the end of the second day at midnight.

The radio heat cost allocator *566 / 868* switches automatically into operating mode at the end of the second day at midnight.

> If heat cost allocator is removed from the aluminium back plate during the installation mode, the heat cost allocator switches to the sleeping mode.

1.7.3 Operation Mode for Radio Supercom (Sontex 566 Radio)

1.7.3.1 Walk-by Radio Remote Readout
A walk-by remote readout of the data of the heat cost allocator 566 is possible **every day** from 6.00 to 17.59 (winter time).
No readout possible between 18.00 and 19.59 (winter time)

1.7.3.2 Readout over Radio Central (installed directly in the building)
For the readout over a radio central installed in the building, the following applies (see table below):

The device with the corresponding final numeral of the serial number is ready for radio transmission during the time stated in the table below.

Time	Serial Number
20 : 00 - 20 :59	XXXXXXX0
21 : 00 - 21 :59	XXXXXXX1
22 : 00 - 22 :59	XXXXXXX2
23 : 00 - 23 :59	XXXXXXX3
00 : 00 - 00 :59	XXXXXXX4
01 : 00 - 01 :59	XXXXXXX5
02 : 00 - 02 :59	XXXXXXX6
03 : 00 - 03 :59	XXXXXXX7
04 : 00 - 04 :59	XXXXXXX8
05 : 00 - 05 :59	XXXXXXX9

After readout of the data from the radio heat cost allocator, the radio availability is deactivated again.

1.7.4 Operation Mode for Radio wM-Bus (Sontex 868 Radio)

1.7.4.1 Readout over the *short telegram* (OMS compliant)
With this operating mode, the heat cost allocator Sontex 868 Radio transmits data:
- Transmission interval each *120 seconds* (minimum).
- Radio reading, *24h/24h*.

1.7.4.2 Readout over the *long telegram* for Walk-by reading
With this operating mode, the heat cost allocator Sontex 868 Radio transmits data:
- Transmission interval each *120 seconds* (minimum).
- Radio reading and periods, *12h per day (programmable)*, *5days/7days*.

1.7.5 Short Telegram or Long Telegram for Radio wM-Bus (868)

Type of telegram must be defined when ordering. There is no possibility to select the type of telegram directly on the heat cost allocator.
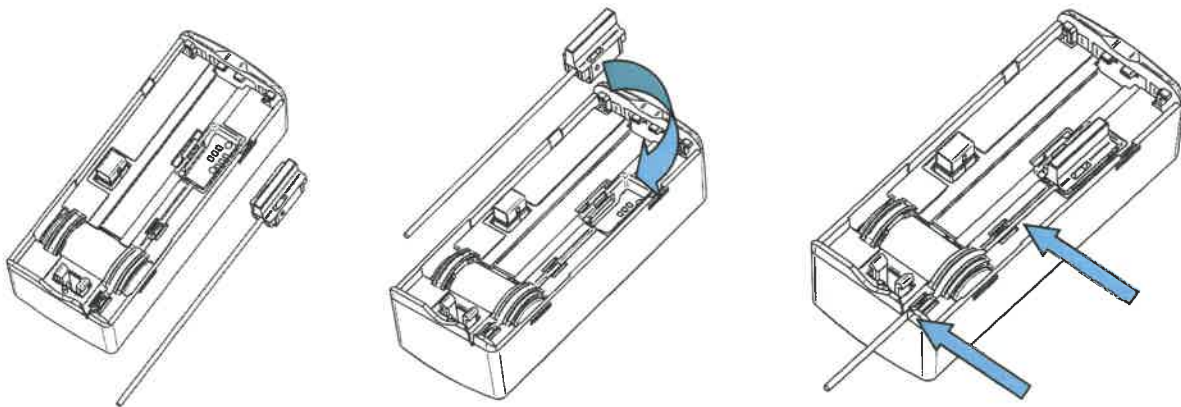
2.3 Mounting the Remote Sensor

For each version of heat cost allocator, it is possible to plug the connector of the remote sensor into an interface inside the heat cost allocator.

The remote sensor will be automatically detected by the heat cost allocator.

Once equipped with a remote sensor, the heat cost allocator will only work for an application with remote sensor.

Remote sensor version with 1.75 m cable.

Return the heat cost allocator and plug the connector of the remote sensor into the interface inside the heat cost allocator.

Insert the remote sensor cable into the groove provided up to the slot of housing.

Proceed to the commissioning of the heat cost allocator on the aluminium back plate. Take care not to stick the cable.

Respect the color code of the radiator sensor and the remote sensor:

- **Heat cost allocator Sontex 565 X, Sontex 566 X and Sontex 868 X**: the radiator sensor and the remote sensor are manufactured with a yellow color.
- **Heat cost allocator Sontex 565, Sontex 566 and Sontex 868:** the radiator sensor and the remote sensor are manufactured with a white color.

Once equipped with a remote sensor, the heat cost allocator will only work for an application with remote sensor.

If the remote sensor is disconnected from the heat cost allocator, an error message will be displayed.


During the commissioning of the heat cost allocator on the aluminium back plate, there are 2 possibilities to turn on the heat cost allocator:

1. By an automatic commissioning during the mounting on the aluminium back plate.
   See chapter **3.1 Automatic commissioning during the installation**

2. By pushing the push button.
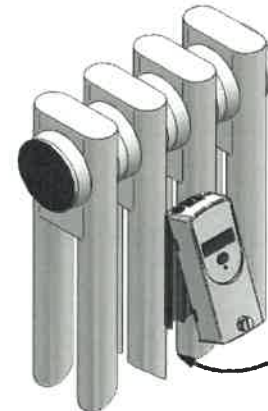   See chapter **3.2 Commissioning by pressing push button.**

2.6 Mounting and Sealing

After installation of the respective fastening-parts kit to the radiator, the heat cost allocator can be mounted and sealed by the installer as described below:

The heat cost allocator is placed at the upper end of the aluminium back plate. Move the heat cost allocator down so that the hooks in the housing fit in the aluminium back plate.
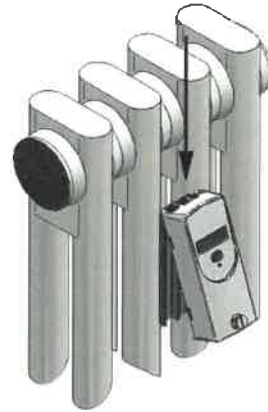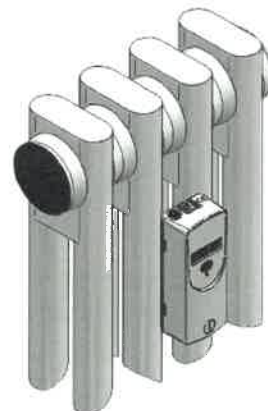
The heat cost allocator is placed on the aluminium back plate in the direction of the arrow.

Push the seal pre-installed by Sontex in the slot of the housing, then press until the seal clicks into the aluminium back plate.
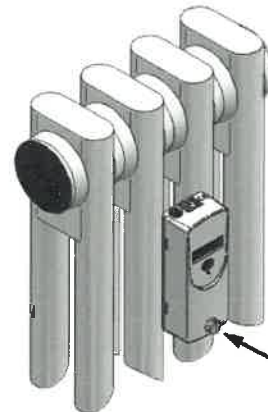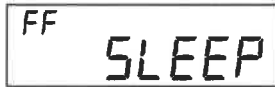
Now the heat cost allocator can only be opened by destroying the seal.

3.2 Commissioning by pressing push button

Once heat cost allocator is fixed with/against the aluminium back plate, the LCD-display will show the following message:
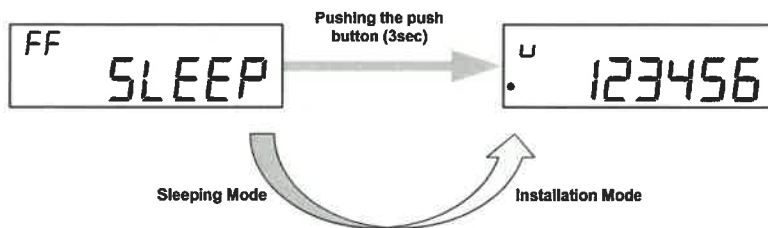

The index **FF** indicates that the heat cost allocator has recognized the remote sensor.
If the remote sensor is not detected by the device, the index -- will be displayed.

The index -- indicates also a standard device with a compact sensor.

This message will be displayed during **2 minutes** before the LCD-display will switch off.

Transition from sleeping to installation mode is achieved by pushing the push button during **3 seconds**:

The ● symbol indicates that the heat cost allocator is in installation mode.

Once installed on the back plate or the wall, the heat cost allocator switches automatically into operating mode at the second transition of midnight.