Installation and operating instructions

Electronic heat cost allocator (EHCA) EURIS 2 with LoRa-WAN™ radio "EURIS-2-2F-OL"

INNOTAS ELECTRONIK GMBH

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1 Table of Contents

2 Revision directory

REVISION	DATE	MODIFICATION
1.0	21 January 2020	First edition
1.1	07 October 2020	Small additions

3 Usage

The electronic heat cost allocator is a measuring device that measures the heat distribution when rooms are heated with radiators. With the help of the radiator parameters and the determined values of the EHCA's, the consumption of the individual radiators can be determined in relation to the energy supplied.

4 Variants

The EHCA EURIS 2 is available in different versions with or without a remote sensor. It is delivered with an optical parameterization interface and LoRa-WAN™ radio.

4.1 2-sensor device

As a 2-sensor device, the EHCA measures the room temperature used for the calculation via an extra room temperature sensor. The radiator design temperature is 35 ° C to 95 ° C. In combination with a remote radiator sensor, the upper radiator design temperature is 105 ° C.

4.2 Radio interface

LoRa-WAN™ Class-A is used as the radio interface.

4.3 Optical interface option

Measurement data and parameters can be read out and written to the EHCA via the optical interface (Irda interface). A commercially available IR optical head is used for communication. We recommend purchasing the opto head from Innotas, as not all devices on the market are fully compatible. The free LST "LoRa-Setup-Tool" is used as communication software. The interface in the EHCA is active for 15s after pressing a button. Communication is protected by a PIN. This is deactivated at the factory. This enables the customer to access the device to prevent unauthorized persons The PIN can also be set or reset via LoRa.

4.4 Remote sensor variant

In the variant with remote sensor, the very small radiator sensor is located on a 2 meter long cable. This variant is particularly suitable for paneled radiators with poor accessibility. The remote sensor is installed on the radiator according to the installation instructions and the EHCA can be installed next to the radiator.

5 Button

The EURIS 2 heat cost allocator is operated with a single, white button located on the front in the middle of the housing.

5-1 Button on the EHCA

The button has two operating modes: Briefly press the button once (short button) or press it for longer than 3 seconds (long button). The operator does not have to count the seconds. From every display, however, the device automatically jumps back to the initial state after 30 seconds without further pressing.

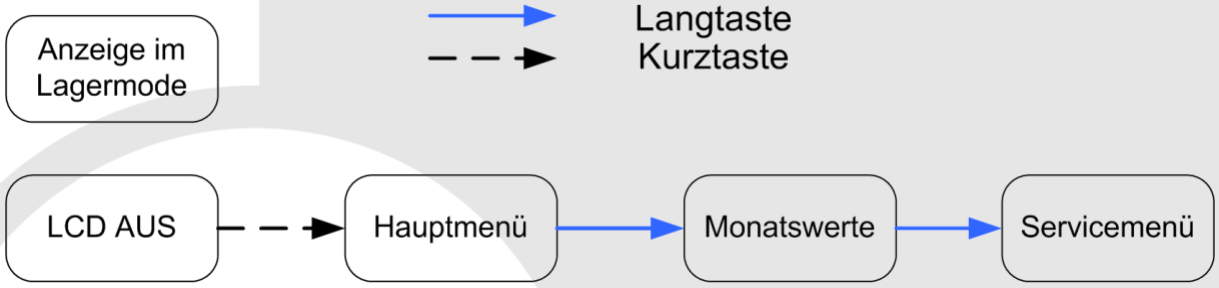
Abbreviations:
LT - long press (> 3 seconds)
KT - push button briefly

6 Display

The EHCA has a 7 1/2 digits LCD display. The display is OFF in normal operation. If the user wants to read values or communicate with the interface, he "wakes" the device up by briefly pressing the button (KT). If the button is not operated any further, the EHCA returns to the "idle state" after 30 seconds and switches the display OFF.

6.1 Structure of the menu

The display of the EHCA can be divided into 4 levels. Level 1 is the display in storage mode. This is the state it was in before it was installed and commissioned. The other levels can be reached by pressing a button in the installed state and are called the main menu, monthly values and service menu.

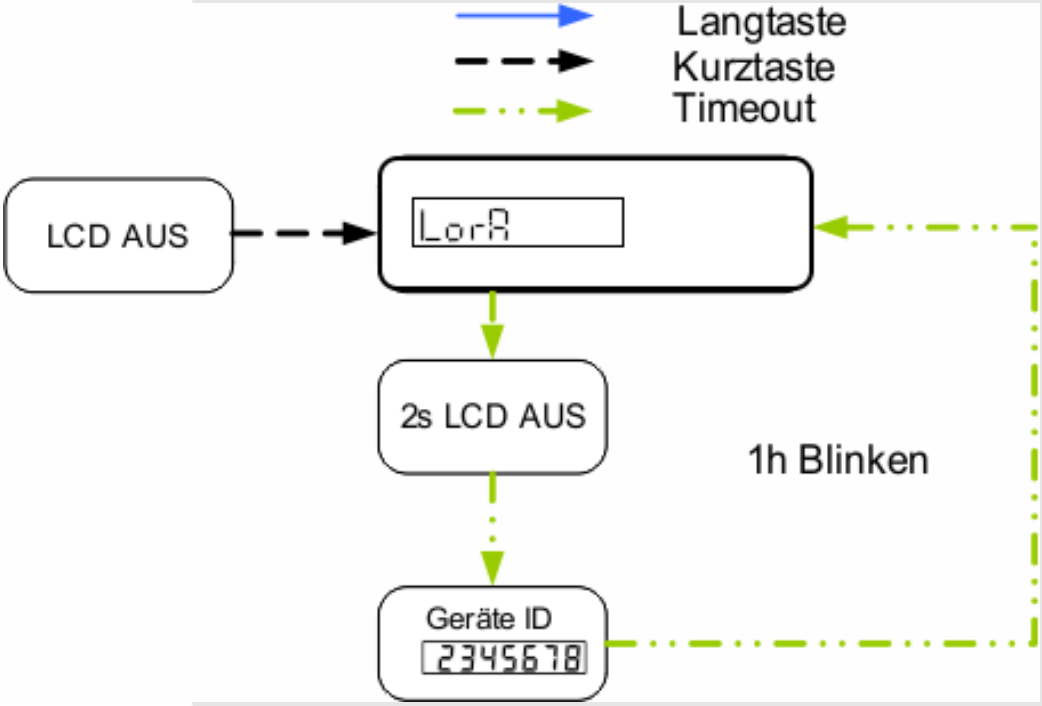


6-1 Menu structure

Press the long key to switch to the next menu.

6.1.1 Displays in storage mode

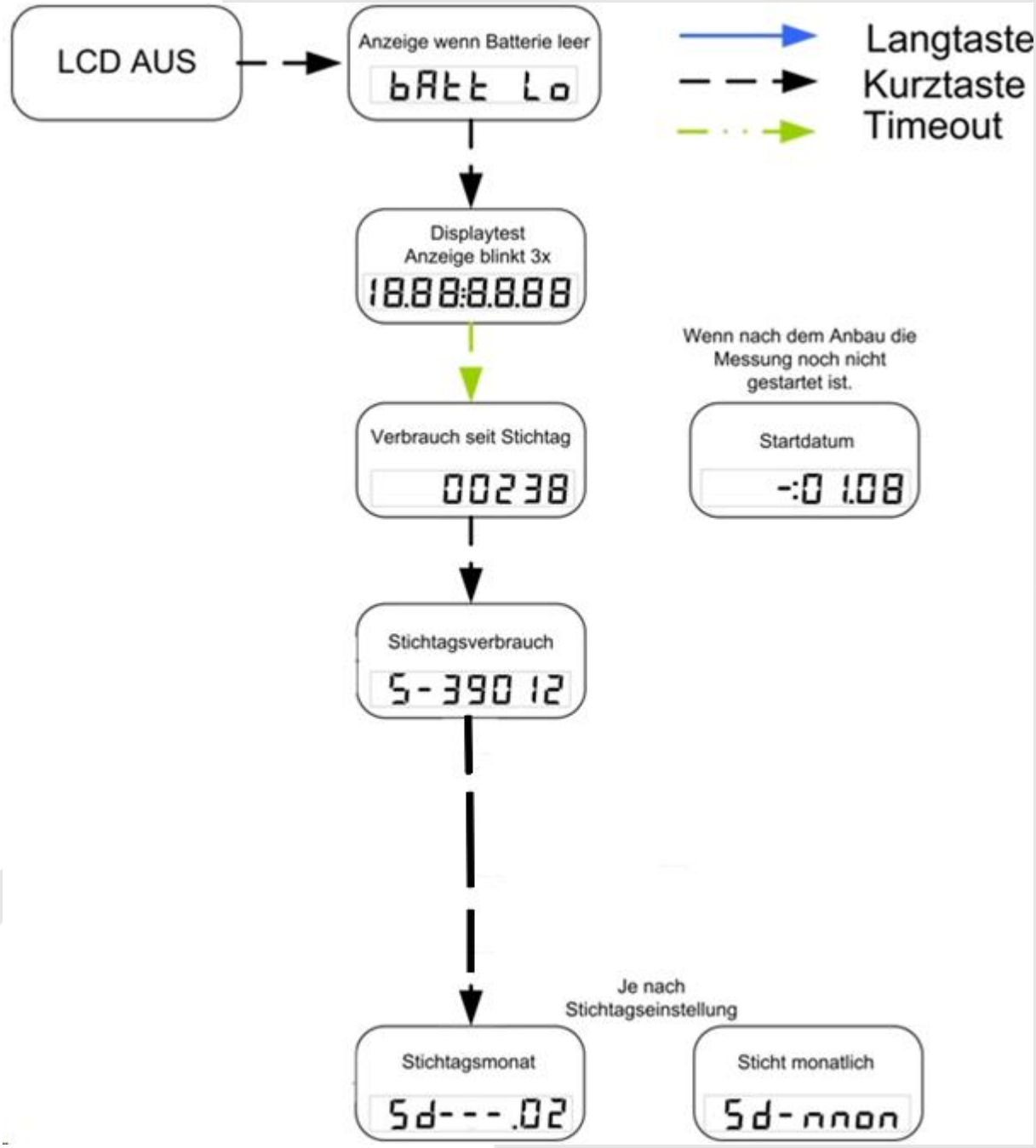
The EHCA is parameterized ex works with parameters according to customer requirements or with standard values. Then it is put into a transport mode (storage mode). In this state it is inactive and the display is off. After briefly pressing the button, the display flashes as follows:



6-2 DISPLAY IN STORAGE MODE

6.1.2 Displays in the main menu

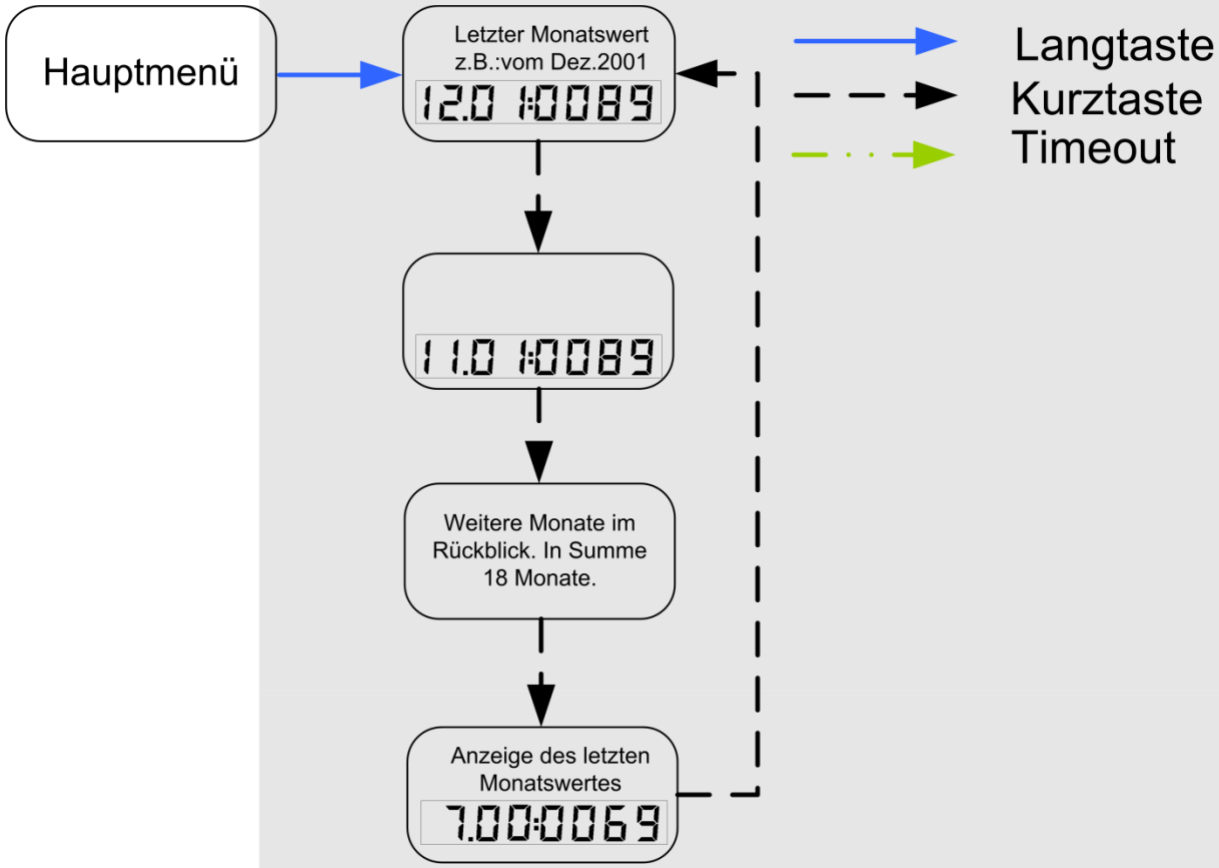
When the EHCA is installed and activated, the main menu is activated by briefly pressing the button. If no button is pressed for 30 seconds, the display switches off.



6-3 MAIN MENU

6.1.3 Displays in the monthly value menu

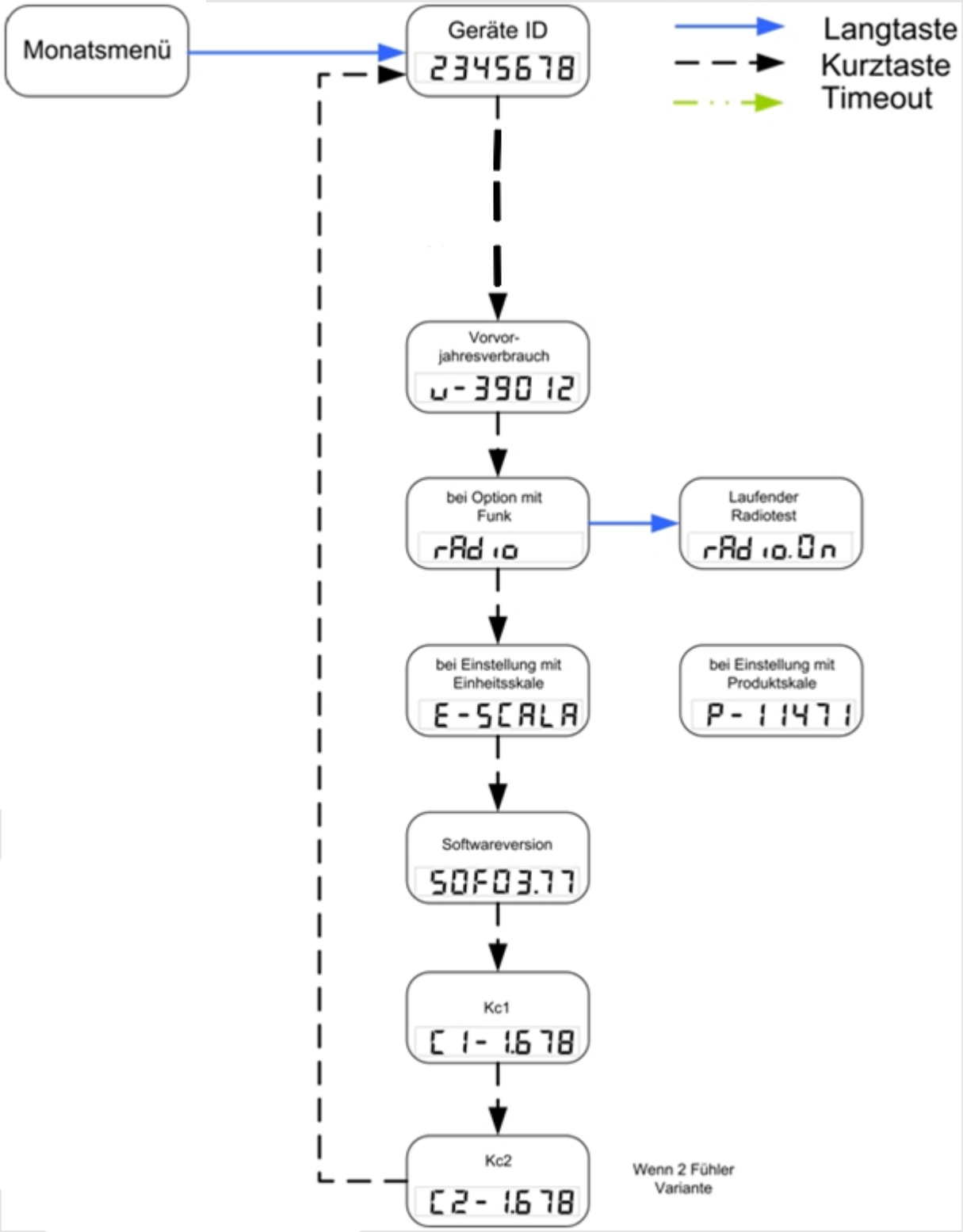
The monthly menu can be activated from a display in the main menu by pressing the long key. If no key is pressed for 30 seconds, the display switches off.



6-4 MONTHLY MENU

6.1.4 Displays in the service menu

The service menu can be activated by a long key from a display of the monthly menu. If no button is pressed for 30 seconds, the display switches off.



6-5 SERVICE MENU

7 Self-monitoring

The EHCA monitors the most important basic functions and elements during its operation in order to ensure proper functioning and to signal possible errors in good time.

7.1 Sabotage detection

The sabotage detection is used to register the removal of the attached EHCA from the radiator. The separation of the metallic back part from the EHCA is detected and signaled in an error bit. The EHCA continues to work independently. The error bit is registered in the device status, transmitted via LoRa-WAN™ or read out via an interface. The sabotage detection is activated within the next 24 hours after installation and commissioning. A detected sabotage error can be reset via the interface.

7.2 Sensor monitoring

The sensor monitoring is used to detect a possible sensor break or sensor short circuit. If one of the errors is recognized repeatedly, an error bit is set after approx. 40 minutes. The EHCA is now no longer able to deliver valid measured values. The error is indicated by switching on the LCD display and the message "Error". The error bit is registered in the device status, transmitted via LoRa-WAN™ or read out via an interface. The error can be reset via the interface. The sensor monitoring is only activated after commissioning the device.

7.3 Battery monitoring

The EHCA battery has a guaranteed service life of 10 years in normal operation and a further 2 years of power reserve. A "Batt lo" error is set either after 11 years of factory operation or if the battery voltage falls below the limit in radio mode. From this point on, the EHCA still has a power reserve that can vary depending on the battery load (due to radio, low ambient temperature, etc.). If the error bit is set, a “Batt lo” appears after pressing the button on the EHCA before the display test is displayed. The error bit is transmitted via LoRa-WAN™ or read out via an interface. The error can be reset via the interface. The battery monitoring is activated at the factory.

7.4 RESET monitoring

The EHCA registers a restart of the software in the event of an error. The error bit is registered in the device status and communicated via LoRa-WAN™ and the interface.

7.5 Storage monitoring

The EHCA monitors the consistency of the set parameters. If it detects an error, a checksum error is set. The error bit is registered in the device status and communicated via LoRa-WAN™ and the interface.

8 Attachment and commissioning

Before installation and activation, the dvices should be made known to the LoRa server (commissioning). To do this, the DEVEUI, APPEUI und DEVKEY must be made known to the server. To simplify the process, you will receive an „electronic delivery note“, a csv file with all the numbers of the devices delivered. The structure looks like this:
GID;DEVEUI;APPEUI;APPKEY

8.1 Attachment and assembly

The permissibe tolerance of the installation height is ± 10 mm.
If the exact installation location cannot be adhered to due to the radiator design, installation takes place with regard to

Radiator-midst	→	towards flow (valve)
Radiator-height (75%/50%)	→	offset upwards

To determine the exact installation location, please use the current version of the installation instructions.

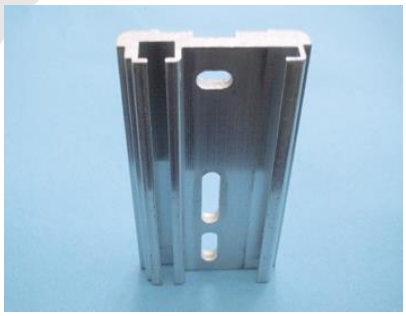
8.1.1 Mounting accessories

8.1.1.1 Thermal conductor adapter wide / 52

This additional adapter is required for special radiator types with special designs or large distances between sections. This is attached behind the standard heat conductor.

8-1 THERMAL CONDUCTOR ADAPTER

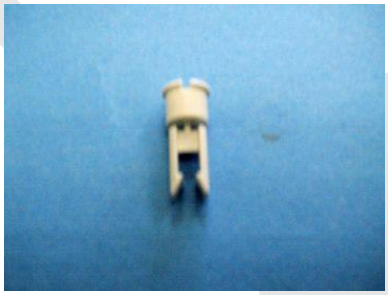
8.1.1.2 Aluminum heat conductor



Standard heat conductor (this is included with every EHCA).

8-2 ALUMINUM HEAT CONDUCTOR

8.1.1.3 seal



Each EHCA is supplied with a seal for proper assembly.

8-3 SEAL

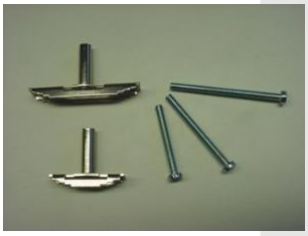
8.1.1.4 Plate and special radiators (welded assembly)

Welding stud:

M3x10
M3x12
M3x15
Shank nut M3
Slotted nut M3

8-4 ACCESSORIES FOR PLATES AND SPECIAL RADIATORS

8.1.1.5 Sectional radiators



Sliding nut 33/51 (55mm)
Sliding nut 14/32 (36mm)
To be installed with M4x35 / M4x45 / M4x55 screws as required!

8-5 ACCESSORIES FOR SECTIONAL RADIATORS

8.1.1.6 Tubular radiators

Sliding nut tube (36mm)
Sliding nut tube (45mm)
To be installed with M4x35 / M4x45 / M4x55 screws as required!

8-6 ACCESSORIES FOR TUBE RADIATORS

8.1.1.7 for convectors

Convector bracket complete

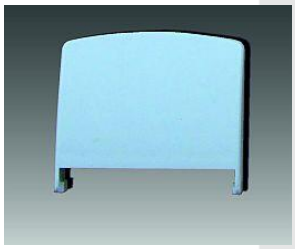
8-7 ACCESSORIES FOR CONVECTORS

8.1.1.8 Aluminum radiator

2 knobs for aluminum radiators to be fitted with
2 screws M3x25
alternatively: 2 self-tapping screws 4.2x25

8-8 ACCESSORIES FOR ALUMINUM RADIATORS

8.1.1.9 Optical extensions

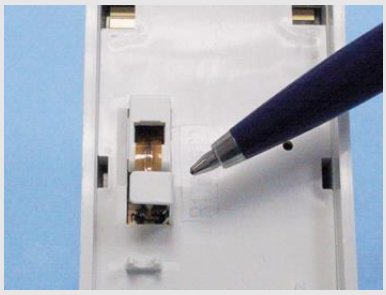


2 optical extensions to cover color damage after converting from tubes to HCA.

8-9 ACCESSORIES FOR TUBE CONVERSION

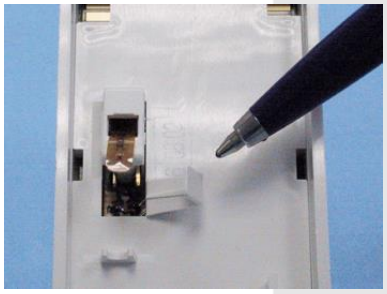
8.1.2 Assembly

8-11 ASSEMBLY OF HEAT CONDUCTORS

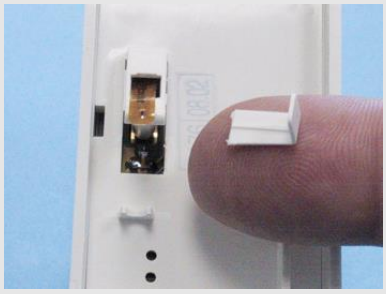


8-10 SENSOR PROTECTION POSITION

The heat conductor is installed on the radiator in accordance with the installation instructions (elongated holes facing down). The sensor protection must be removed from the rear of the EHCA (see Fig.8-12 Removal sensor protection 2)



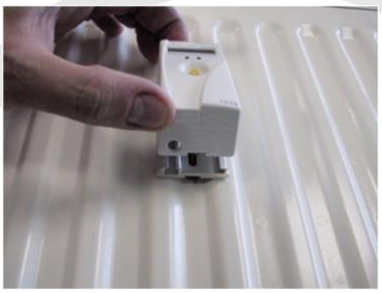
8-13 REMOVAL SENSOR PROTECTION 1



8-12 REMOVAL SENSOR PROTECTION 2

To do this, bend the sensor protection to the side and remove it by breaking it off.

Attention: The probe must not be bent!



8-14 MOUNTING EHCA ON HEAT CONDUCTOR

8-15 INSERTING THE SEAL

Then the EHCA is hooked into the heat conductor from above, pressed on and sealed on the underside. The seal must click into place.

8.1.2.1 Notes on welding assembly

During welding assembly, sound impulses can arise to which pets react sensitively. Therefore, no pets should be in the assembly room.

8.1.2.2 General restrictions

The EHCA EURIS 2 must not be used for steam, floor and ceiling radiant heating or for combined valve and flap controlled radiators. Unless the flap control has been removed or shut down. In the

case of radiators with additional blowers or heating cartridges, installation is only permitted when this additional electrical device is shut down.

8.2 Installation

8.2.1 Activation of the device

The EHCA is delivered packaged from the factory. He is in "storage mode". The display is initially off. Only after pressing the button does the display according to point 6.1.1 appear for one hour. The EHCA is inactive in storage mode, only the internal clock is running. If no special customer settings are required, the EHCA is delivered with the following standard settings:

- German winter time (UTC + 1h)
- Unit scale
- no measurement-free summer months
- Immediate measurement start after commissioning
- Cut-off time annually on December 31st at midnight
- LoRa-WAN™ activation via OTAA

After the EHCA has been installed, it can be put into operation. To do this, the button on the EHCA is held down for more than 3 seconds. The EHCA now switches to operating mode, it starts to flash with a display test and is now in the display menu according to point6-3 main menu. Depending on the previous or the factory setting, it now starts measuring. The connection establishment set at the factory is OTAA. The EHCA now begins to start the JOIN process. After successful activation, the device sends several hours every 2 minutes. This enables the fitter to promptly inquire about successful integration into the LoRa network from the server. The EHCA then sends at the set intervals.

9 Parameterization

The EHCA can be parameterized either via the optical interface or the contact interface.

The contact interface for parameterization is located on the back of the heat cost allocator on the left above the temperature sensor.

It can only be used with the appropriate adapter!

9-1 INTERFACE CONTACTS ON THE EHCA

The adapter contains a power supply and a connection cable to the RS232 or USB interface of the computer.

Attention! This interface can only be used if the heat cost allocator is not mounted on the heat conductor. You must also have the appropriate adapter and software!

Before data can be exchanged between the computer and the distributor, the interface must be activated by briefly pressing a

button. After pressing the button, the interface is active for about 15 seconds. For further details, please refer to the description of the parameterization software.

9-2 CONTACT INTERFACE ADAPTER

The parameterization and data readout can also take place via the optical interface (with optical read / write head). This optical head can be connected to a PC. If you have an optical head and EHCA with an optical interface, the contact interface is superfluous and data can also be exchanged with the EHCA attached.

9-3 EHCA WITH OPTICAL HEAD

9.1 Parameterization via IrDa opto head

The EHCA can be parameterized using a standard IrDa optical head. In connection with the software LST (LoRa-Setup-Tool) the following parameters can be changed:

- Date and Time
- Meter reading
- Due date (monthly, yearly)
- Reference date month (annually for reference date)
- Measurement-free months
- Device PIN
- LoRa settings:
    - Connection type OTAA / ABP
    - APPEUI, DEVKEY, NETID, NetSKEY, AppSKEY
    - ADR, link check
    - Send interval
- Kc values, product or standard scales

9.2 Factory configuration

The EHCAs are delivered configured according to customer requirements. To do this, the customer fills out an order form. The following settings can be specified:

- Time zone
- Connection setting OTAA
- Deadline, monthly or yearly
- Reference month if annually
- APPEUI DEVKEY
- Measurement parameters such as measurement-free months, start month, Kc values, etc.
- Device PIN "0000" (deactivated) or customer-specific

9.3 Radio settings

9.3.1 ADR setting

The setting ADR (Automatic Data Rating) means that the data rate or the spreading factor of the radio transmission are controlled dynamically and automatically. The LoRa device sends a radio protocol with an acknowledgment request to the server. If the acknowledgment is not received, the device will first repeat the protocol and then increase the spreading factor. If the server receives the protocol properly and with good quality, it sends the device a command to reduce the spreading factor. Large spreading factors lengthen the protocol and thus the probability of a collision with another radio protocol and more energy is consumed.

9.3.2 Link check setting

The device checks cyclically whether there is still a connection to the server.

9.3.3 JOIN process

In the connection setting OTAA (factory setting), the device requests a connection to the LoRa-WAN™ network with its device ID of DEVEUI and the application ID of APPEUI. The protocol is encrypted with the DEVKEY. The server responds to the device if it knows it. The server is now negotiating new private keys with the device. These are the NetSKey and the AppSKey. From this point on, communication is encrypted privately.

9.3.4 Behavior in the event of a connection failure

After activation, the device tries to JOIN with the LoRa-WAN™ network. If this does not succeed, it is repeated after a while with a higher spreading factor. If there is no connection, the radio goes into idle mode for 24 hours. Then the JOIN sequence is run through again. If there is another unsuccessful attempt, the device pauses again for 24 hours, etc. If the device is already integrated, but the server does not answer the acknowledgment requests, because e.g. For example, the telegrams do not arrive at the server, the acknowledgment does not arrive at the device or the server is switched off, then the device first increases the spreading factor. Arrived at SF12 and a few unsuccessful repetitions, the device falls back into the JOIN sequence and tries to establish a new connection to the LoRa-WAN™ network every 24 hours from then on.

10 Radiator rating

The radiator assessment can only be carried out by qualified personnel.

10.1 KC values

The read-out value is converted into a billable value via the
Kc - weighting factor. This factor depends on the type of radiator. Only the use of a corresponding Kc value guarantees correct billing. A Kc value table is available on the Innotas Elektronik website.

10.2 Scaling

The device can be configured in a unit or product scale. Devices are delivered with a standard scale. In the case of the variant with a product scale, each heat cost allocator must be parameterized depending on the respective radiator.

10.3 Calculation of consumption values

Each with: $K_1 = \frac{1}{(1-C_{1F})}$ and $K_2 = \frac{1}{(1-C_{2F})}$ as well as with Q60 in watts: $K_Q = \frac{Q_{60}}{1000W}$

10.3.1 The following applies to unit assessment

1F compact version and 1F remote sensor version (1FF)

The internal unit evaluation is carried out with $K_Q * K_T = 1$, $K_{1F} = 1$
The readings are corrected using the following formula:

$$\textbf{consumption value} = \textbf{reading value} * \mathbf{K_Q} * \mathbf{K_T} * \left(\frac{\mathbf{K_1}}{\mathbf{1,0}}\right)^{1,15}$$

The value for K1 of the radiator used can be found in the C value table of the EURISII.
K_T is the evaluation factor for rooms with low design indoor temperatures
KT = [(60K + 20 ° C-ti) / 60K] ^ 1.15 ti: design internal temperature <20 ° C

2F compact version (2F)

The internal unit evaluation is carried out with KQ = 1, K1 = 1.538, K2 = 2.5
The readings are corrected using the following formula:

$$\textbf{consumption value} = \textbf{reading value} * \mathbf{K_Q} * \left(\frac{\mathbf{K_2}}{\mathbf{2,5}}\right)^{1,15}$$

The value for K2 of the radiator used can be found in the C value table of the EURISII.

2F remote sensor version (2FF)

The internal unit evaluation is carried out with $K_Q = 1$, K_1 and $K_2 = 1.538$
The readings are corrected using the following formula:

$$\textbf{consumption value} = \textbf{reading value} * \mathbf{K_Q} * \left(\frac{\mathbf{K_2}}{\mathbf{1,538}}\right)^{1,15}$$

The value for K2 of the radiator used can be found in the C value table of the EURISII.

10.3.2 The following applies to product reviews

1F and 2F versions

The EHCA is rated internally with K_Q, K_1 and K_2. The values for K1 and K2 of the used Radiators can be found in the C-value table of EURIS 2.
The values K_Q K_1 K_2 in the EHCA are to be entered extended by 1000.

$$\textbf{consumption value} = \textbf{reading value}\ [\mathbf{kW}]$$

10.4 Calculation example

It is assumed that a 2F compact device with a standard scale is used.

- After installation, the radiator type must be determined by the next billing time. Data sheets from the manufacturer or detection services such as WeBeS or Thermosoft2000 are used to determine the type.
- With the determined radiator type and its output K_Q, the K_C values are determined, for example, from the K_C value table of the EHCA-EURIS2.
- For example, the radiator type from Buderus Sanilo was determined. According to the table, the values for K1 = 1.03 and for K2 = 1.75 result. The determined size or output of the radiator is at Q60 = 1200W. $K_Q = \frac{Q_{60}}{1000W}$
- The due date consumption value read is 2345.
- The formula to use is:

$$\textbf{consumption value} = \textbf{reading value} * \mathbf{K_Q} * \left(\frac{\mathbf{K_2}}{\mathbf{2,5}}\right)^{\mathbf{1,15}}$$

- With inserted values we get:

$$\mathbf{1867} = \mathbf{2345} * \frac{1200W}{1000W} * \left(\frac{\mathbf{1,75}}{\mathbf{2,5}}\right)^{\mathbf{1,15}}$$

$$\mathbf{1867} = \mathbf{2345} * \mathbf{0,79624}$$

ATTENTION! The value K1 from the KC value table is not required for two-sensor devices to calculate the consumption value.
The EHCA requires the factory-set value for K1 = 1.538 for internal processing.

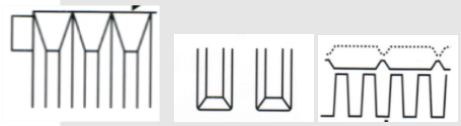
If the EHCA-EURIS 2 is operated in the product scale mode, the values determined for K1, K2 and KQ must be entered before the first measurement. The EHKV offsets the values internally. The value read is then the consumption value.

In order to create a reliable cost accounting from the consumption values, the consumption values of all EHCAs in the system must be weighted with the consumption costs to be billed. There are corresponding regulations in the ordinance on heating billing.

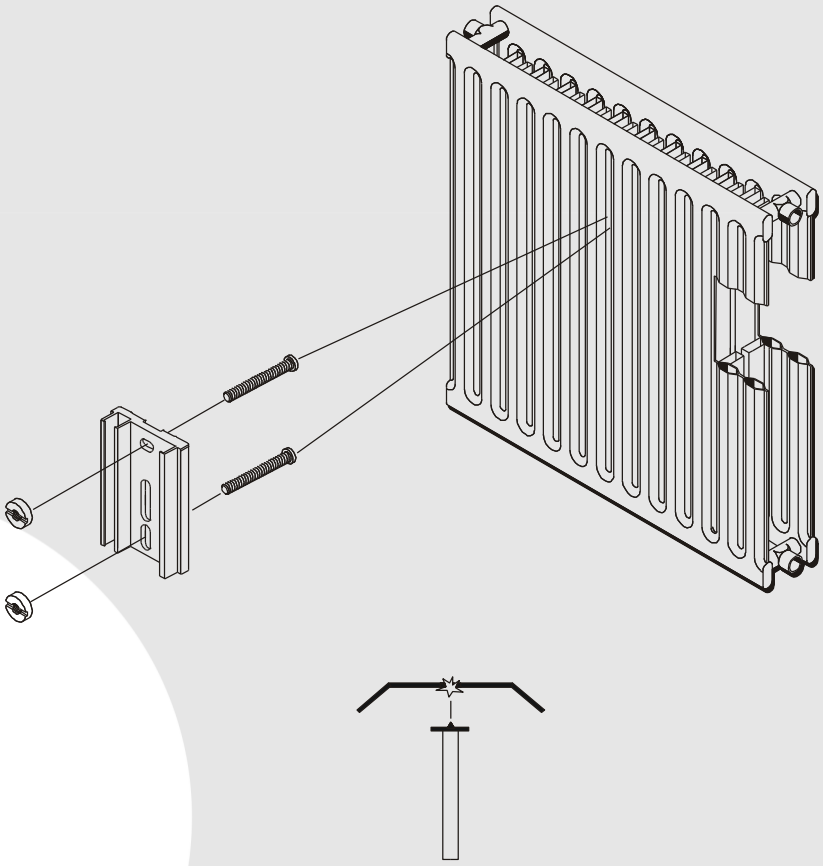
10.5 Procedure for finding the correct Kc values

To determine the correct Kc value for the respective radiator, proceed as follows:

- Determination of the group or design of the radiator (sectional radiator, panel radiator, etc.)
- Determination of individual structural features such as:



  Rib shape, water connections, lamella shape, etc.
- Since this is quite complex and complicated, the companies Thermosoft 2000 www.thermosoft2000.de and the company WeBeS Wärmeenergie + Beratung + Service GmbH www.webes-berlin.de have specialized in determining the radiators.
- The correct Kc value of this radiator for the EHCA EURIS 2 can now be determined from the database using the determined type of radiator.
- If the corresponding radiator is not listed in the Kc value table, this radiator can in most cases be derived from the extensive database by the companies in question.



11 Technical specifications

Norms	EN 61000-4-2, EN 61000-4-3, EN 55011
Measuring principle	2-sensor system / (1-sensor system)
Operating temperature limits 2-sensor (1-sensor)	Compact tmin / tmax = 35°C / 95°C (55 ° C / 95 ° C) Remote sensor tmin / tmax = 35°C / 105°C.
operating temperatur	0 ° C ... 55 ° C
Storage temperature	-25 ° C… 55 ° C for a short time 70 ° C
Processor	8 bit controller
Temperature sensor	2 sensors NTC
Display	7 1/2 digit LCD
Service	Button and contact interface as well as optical interface
Opening detection	mechanically via seal; electronically via contact
Scaling	Unit or product scale
Power supply	3 V DC lithium battery
Delivery	Storage mode (measurement and radio not active)
Operating time with one battery	10 + 2 years reserve
Radiator output	up to 10,000 W with product scale
Storage	last 18 monthly values
Measuring cycle	4 minutes
Error display	in the service menu and via radio
Reading	via LCD / optical interface or radio
Radio interface	LoRa-WAN™ 868-870MHz frequency band
Radiated power	<14dBm
Specification LoRa-WAN™	V1.0.2
Number of telegrams per day	<= 12 / day, 1 / day, 1/7 days, 1/14 days
Data security	Radio 2-way AES 128, optics via PIN
Self-monitoring	Sabotage, sensor, operating time, reset, data
Certification mark	Approved according to HKVO, CE according to directive 2014/53 / EU (RED)
Degree of protection according to DIN 40050	IP 41

12 Warning and safety information

The EHCA EURIS 2 must not be used for steam, floor and ceiling radiant heating or for combined valve and flap-controlled radiators. Unless the flap control has been removed or shut down. In the case of radiators with additional blowers or heating cartridges, installation is only permitted when this additional electrical device is shut down.

The EHCA contains a battery and must be disposed of properly.

13 List of figures