KeContact

E10

Energy meter

Operating instructions V 1.01

Translation of the original instructions

KEBA

Automation by innovation.

Document No.: 136269 | Published: 11.2024
Document: V 1.01
Pages: 32

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1 Introduction

This manual is valid for the KeContact E10.

The pictured devices used in this manual are visual examples. The figures and explanations contained in this manual refer to a typical device design. The devices used by you may differ in their appearance.

1.1 Representation of safety instructions

At various points in this manual, you will see notes and precautionary warnings regarding possible hazards. The symbols used have the following meaning:

DANGER!

Indicates an imminently hazardous situation, which will result in death or serious bodily injury if the corresponding precautions are not taken.

WARNING!

Indicates a potentially hazardous situation, which can result in death or serious bodily injury if the corresponding precautions are not taken.

CAUTION!

Means that if the corresponding safety measures are not taken, a potentially hazardous situation can occur that may result in slight bodily injury.

Caution

Means that damage to property can occur if the corresponding safety measures are not taken.

ESD

This symbol reminds you of the possible consequences of touching electrostatically sensitive components.

Information

Identifies practical tips and useful information. No information that warns about potentially dangerous or harmful functions is contained.

1.2 Purpose of the document

This document describes the complete installation and configuration of KeContact E10.

1.3 Requirements

This document contains information for persons who meet the following requirements:

Target group	Required knowledge and abilities
Electrician	Person who, due to their special training, expertise and experience as well as knowledge of current standards, is able to assess the work performed and the possible hazards. Knowledge about: ● Currently valid safety regulations ● The method of operation of an energy meter ● The display and operation ● Basics of network technology ● Diagnostic options ● Systematic fault analysis and rectification ● Setting options

1.4 Intended use

Information

This device is NOT an active electrical energy meter as defined by EU Directive 2004/22/EC (MID) and therefore the device may not be used for accounting purposes.

1.5 Additional documentation

Manuals and additional information are available on our website:

www.keba.com/emobility-downloads

2 Safety notes

WARNING!

Risk of electric shock and fire hazard!

- Installation, commissioning, maintenance or retrofitting of the device must be performed by correctly trained, qualified and authorized electricians[1)] who are fully responsible for the compliance with existing standards and installation regulations.
  Please observe that national regulations may be required.
- Do not install or use a damaged device.
- A damaged device must be taken out of commission and repaired or replaced by a qualified and authorized electrician.
- Repair of the device is not permitted and may only be carried out by the manufacturer.
- No unauthorized conversion work or modifications may be made.
- No markings (such as safety signs, warnings, wire markings, etc.) may be removed.
- Use the device only in a dry environment and keep it away from liquids.
- Only install the device in permitted housings or electrical distribution boards downstream of the PSC meter so that the connections for the phase conductor and neutral conductor are located behind a cover or contact protection.
- Comply with prescribed minimum spatial clearances between the network cable and live installation components or use suitable insulation.
- To restrict access to authorized personnel, the housing or electrical distribution board may only be accessible by means of a key or tool.
- Before installation or maintenance work, de-energize the electrical distribution board and secure it from accidentally being switched on again.
- It must be possible to de-energize the device by means of a freely accessible fuse or and additional circuit breaker.
- The voltage inputs of the device must be protected with fuses (16 A type B).
- De-energize the device before cleaning it, and only clean it using a dry cloth.

[1)] Persons who, due to their special training, expertise and experience as well as knowledge of current standards, are able to assess the work performed and the possible hazards.

Caution

Possible damage to property!

- When connecting and wiring the device, ensure that the connection area is clean so that no foreign objects (pieces of wire, etc.) get inside.
- Never clean the device with aggressive solvents and cleaning agents, abrasive materials, spray water (garden hose, high-pressure cleaner, etc.) or excessive pressure.

Caution

Damage in case of faulty data connection

Devices that process the measurement data from KeContact E10 must ensure that the absence of measured values or faulty measured values do not lead to any damage.

3 Description

The energy meter KeContact E10 measures the power consumption of all consumers connected to it. As soon as a charging station is connected to the energy meter via the network, the charging station receives the measured values and can regulate the charging power based on them. 1- or 3-phase power measurement is possible.

3.1 Front view

Fig. 3-1: *Front side*

1 ... "Status" LED	2 ... "Network" LED
3 ... Not available	4 ... Reset button
5 ... Ethernet interface	

3.2 Top view

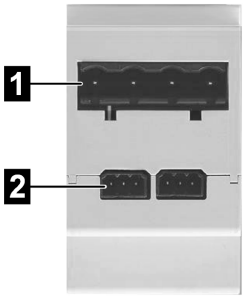


Fig. 3-2: *Top*

1 ... Power supply	2 ... Not available (internal service interface)

3.3 Bottom view

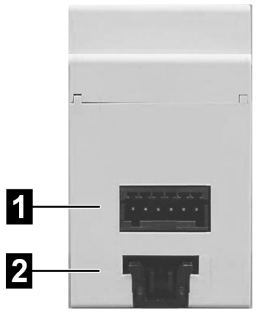


Fig. 3-3: *Bottom*

1 ... Plug-in point for current measurement inputs	2 ... Top hat rail lock

3.4 Type plate

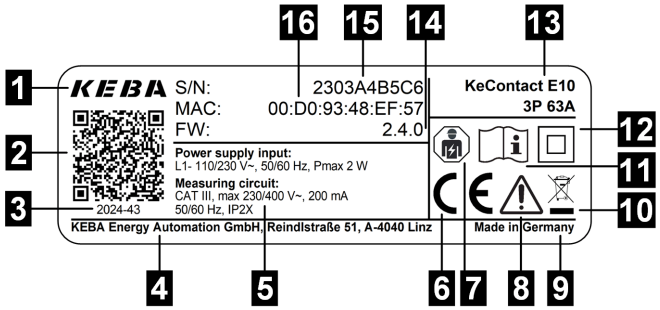


Fig. 3-4: *Example type plate 63 A variant*

1 ... Manufacturer	2 ... QR code
3 ... Production date (year - week)	4 ... Manufacturer's address
5 ... Technical data	6 ... CE conformity marking
7 ... Electrician symbol(according to IEC 60417-6182)	8 ... Reference to safety notes(according to ISO 7000-0434B)
9 ... Country of manufacture	10 ... WEEE marking
11 ... Reference to product manual	12 ... Equipment class II(according to IEC 60417-5172)
13 ... Product designation	14 ... Firmware version
15 ... Serial number	16 ... MAC address

4 Displays and operating elements

4.1 LED displays

The following multicolored LEDs are located on the front of the device:

- "Status" LED
- "Network" LED
- "Service interface" LED

"Status" LED

Display		Meaning
○	Dark	No power supply to the device.
●	Green	The device is switched on and ready for operation.
☀	Flashing green (slow)	The device is in software update mode and the web interface is active.
☀	Flashing orange (2x)	Confirmation for resetting to factory settings.
●	Red	A critical error has occurred.
☀	Flashing red (fast)	A software update is running.

"Network" LED

Display		Meaning
○	Dark	No connection.
●	Green	Ethernet link is active.
☀	Flashing green (fast)	Communication is in progress.
☀	Flashing red (slow)	Communication error.

"Service interface" LED

Display		Meaning
○	Dark	No activity on the interface.
☀	Flashing green (fast)	Communication is in progress.
☀	Flashing red (slow)	Communication error.

4.2 Reset button

The reset button is located on the front of the device and is required for the following purposes:

- Restarting the device (see 7.1 Restarting the device)
- Resetting the device to factory settings (see 7.2 Resetting the device to factory settings)
- Executing a software update (see 10.1 Software update via web server)

5 Mounting and installation instructions

5.1 Space requirement

The device must be installed with the following clearances to the surroundings.

Fig. 5-5: *Space requirement, specified in mm*

5.2 Mounting the device

The KeContact E10 is intended for installation on a horizontal mounting rail in a control cabinet.

To mount the device in the control cabinet, proceed as follows:

1) Hook the device into the upper edge of the top hat rail and press down until the housing latches completely.

The device has been mounted.

6 Connections and wiring

6.1 Connection overview

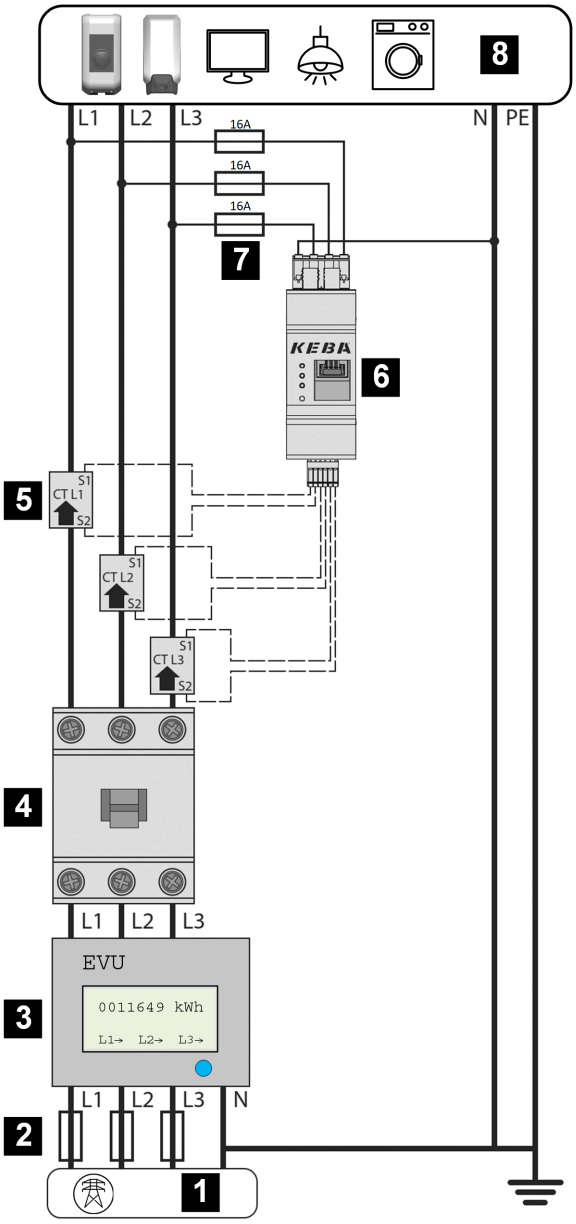


Fig. 6-6: *3-phase connection overview*

1 ... Power connection (power grid)	2 ... Pre-meter fuses
3 ... Energy meter of the power supply company (PSC)	4 ... Post-meter fuses
5 ... Split-core current transformer	6 ... KeContact E10
7 ... 16 A Type B fuses	8 ... Consumers (charging station)

Information

- The Split-core current transformers should be installed on the phases after the energy meter of the energy supply company (EVU)/post-meter fuse and in any case before all load outlets (consumers).
- In 1-phase operation, the split-core current transformers and voltage input are to be connected to the device for phase L1. At least phase (phase conductor) L1 and neutral conductor N must be connected, since they supply the device with power.

6.2 Connecting split-core current transformers

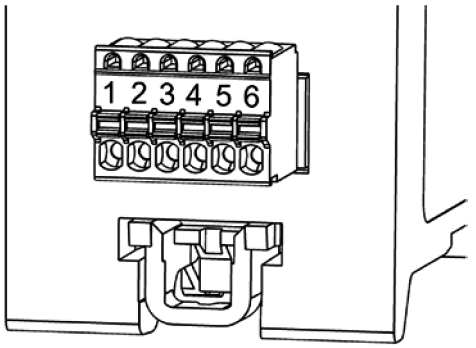


Fig. 6-7: *Energy meter with plug, bottom view*

Pin	Phase	Wire
1	L1	S1 (red)
2		S2 (black)
3	L2	S1 (red)
4		S2 (black)
5	L3	S1 (red)
6		S2 (black)

Caution

Damage to property!

- Only the included split-core current transformers may be connected.
- Always connect the split-core current transformers to the device first and then fold over the phase conductors.
- Make sure that the phases are each correctly assigned. Otherwise, the device will return false measured values.

To connect the split-core current transformers, proceed as follows:

1) Connect the connection cable of the split-core current transformers to the 6-pin plug (scope of delivery) according to the connection overview.
2) Connect the connection plug to the energy meter.

3) Open split-core current transformers for L1, place around phase conductor L1 and close again until it audibly latches. Observe the direction of the arrow!
4) If present: Repeat steps for phase conductors L2 and L3.

The split-core current transformers are connected.

6.3 Connecting the voltage supply

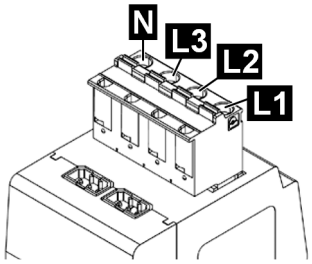


Fig. 6-8: *Energy meter with plug, top view*

L1-L3 ... Phase conductors L1, L2, L3 N ... Neutral conductor

WARNING!

Risk of injury from electrical voltage!

Switch off the power supply properly before installation and secure it against being switched on again.

To connect the power supply, proceed as follows:

1) Connect the phases (phase conductors) L1, L2, L3 and neutral conductor N to the terminals of the 4-pin plug (scope of delivery).
2) Connect the connection plug to the energy meter.

The power supply is connected.

Information

Make sure that the phases (phase conductors) on the connection plug are all correctly assigned. Otherwise, the energy meter will return false measured values.

6.4 Ethernet interface

Caution

Damage due to overvoltage!

The device can be destroyed or damaged by overvoltage on the data cable (Ethernet) or destination device (e.g. charging station). If the data cable or destination device is installed outdoors, it must have suitable overvoltage protection.

Modbus TCP factory settings

The measurement data can be read out via the Ethernet interface using the Modbus TCP protocol.

- TCP port: 502
- Modbus address: 1

Information

It is recommended to assign a fixed IP address to the KeContact E10 in the router.

7 Operating behavior

7.1 Restarting the device

To restart the device, the reset button must be pressed with a pointed object for at least 6 seconds. Then the device restarts. The measured values are not available for approx. 5 sec. after a restart.

A restart of the device can also be triggered using the Modbus TCP protocol. To do so, the value 1 must be written to Modbus register 61615 (`0xF0AF`).

7.2 Resetting the device to factory settings

To reset the device to factory settings, proceed as follows:

1) Press the reset button with a pointed object briefly 1x (approx. 0.5 seconds)
2) Then press and hold 1x (3 to 5 seconds) within 1 second.

If the input is successful, the status LED flashes orange twice and the device has been reset to the factory setting. If the input fails, you must wait 2 seconds before a new input attempt can be performed.

7.3 Behavior in the event of voltage drop

As soon as a lower power supply is detected, the device saves the measured energy values in non-volatile memory.

8 Configuration

The device can be configured using the Modbus TCP protocol. A detailed description of the Modbus protocol can be found in the official Modbus specification (see http://www.modbus.org).

The configurable values are described in this chapter.

mDNS

The device offers the `_mbap._tcp` service type and can be found under the instance name `MB_TCP[Seral number]`. The product name and unit ID can be read out using the instance name.

8.1 Measuring interval (register 256)

The measuring interval can be set using Modbus register 256 (`0x0100`). The following values can be set:

Value	Description
1	100 ms
2	200 ms (default)
3	500 ms
4	1000 ms

8.2 Network configuration (registers 259 - 267)

The network configuration can be performed using the following Modbus registers:

Static IP address (registers 259 - 262)

Register	Description
259 (`0x0103`)	1st octet (e.g. 192)
260 (`0x0104`)	2nd octet (e.g. 168)
261 (`0x0105`)	3rd octet (e.g. 1)
262 (`0x0106`)	4th octet (e.g. 55)

Subnet mask (registers 263 - 266)

263 (`0x0107`)	1st octet (e.g. 255)
264 (`0x0108`)	2nd octet (e.g. 255)
265 (`0x0109`)	3rd octet (e.g. 255)
266 (`0x010A`)	4th octet (e.g. 0)

DHCP server (register 267)

267 (0x010B)	0: DHCP not activated 1: DHCP activated

The settings are applied after restarting the device.

8.3 Read-only flag (register 268)

The read-only flag can be set by writing the value 1 to Modbus register 268 (0x010C). If the read-only flag is set, no other configuration can be performed. All Modbus configuration registers only allow read access (function code 0x3). Write access leads to Modbus exception code 0x03 Illegal Data Value.

To deactivate the read-only flag, the device must be reset to factory settings.

8.4 Error codes

The following error codes can occur:

Error code	Description
0x02 Illegal Data Access	A client tries to read unspecified registers.
0x03 Illegal Data Value	• Read or write access to a register that is not supported • Write access to parameters outside the permitted range • Write access to data block with activated read-only flag
0x04 Slave Device Failure	The device is in an error state

9 Data recording

The following data is calculated by the KeContact E10 in the specified measuring interval and made available:

- Total active power
- Total reactive power
- Total apparent power
- Total imported active energy
- Total exported active energy
- Total inductive reactive energy
- Total capacitive reactive energy
- Total imported apparent energy
- Total exported apparent energy
- Power factor
- Frequency

The following measured values are determined for each of the three phases:

- Current
- Voltage
- Active power
- Reactive power
- Apparent power
- Imported active energy
- Exported active energy
- Inductive reactive energy
- Capacitive reactive energy
- Imported apparent energy
- Exported apparent energy
- Power factor

10 Maintenance

The device is inherently maintenance free.

10.1 Software update via web server

A software update can be performed using the web server integrated in the device. For this purpose, a PC with the saved update file ("su100.up") in the same network is required.

To perform the software update, proceed as follows:

1) Press and hold the reset button using a pointed object for approx. 15 seconds or use the Modbus TCP protocol to write the value `0xA0B1` to the bootloader register. The status LED flashes green.
2) Open the web server by entering the IP address of the device in a web browser on the PC. The device must be in bootloader mode to do so.
3) Select the update file using "Select file."

4) Press "Upload." The "Update in Progress" message appears in the dialog window and the status LED flashes orange.

If the update is successful, the "Update successful" message appears in the dialog window. The device restarts automatically and the web browser can now be closed.

The software update has now been performed.

10.2 Troubleshooting

Error	Possible causes	Remedy
Status LED does not light up.	No supply voltage.	• Ensure that at least the phase conductor L1 and neutral conductor N are connected.
The status LED lights up red continuously.	An error has occurred.	• Restart the KeContact E10 (see 4.2 Reset button). • Contact a service technician or installation engineer.
The network LED does not light up or the device is not found in the network.	The network cable is not connected correctly to the network connection.	• Ensure that the network cable is connected correctly to the network connection.
	The KeContact E10 is not in the same local network.	• Connect the KeContact E10 with the same router/switch.
The device supplies unrealistic measured values.	Incorrect connections or faulty configuration	• Connection of voltages from L1, L2, L3, N. • Assignment of current transformers to the phases: CT L1 also measures current of phase L1? • Current transformer connected in correct direction (see 6.1 Connection overview). • Check whether the current transformers are configured correctly via Modbus.

Critical system errors and warnings are saved in internal non-volatile memory for service purposes and can be read out by KEBA.

11 Disposal

Caution

Please observe the regulations regarding disposal of electric appliances and electronic devices!

- The symbol with the crossed-out waste container means that electrical and electronic devices including their accessories must not be disposed of in the household garbage.
- The materials are recyclable in accordance with their labeling. You can make an important contribution to protecting our environment by reusing, renewing and recycling materials and old appliances.

12 Technical data

12.1 General

Protection class:	II
Type of protection:	IP2X
Degree of soiling:	2
Casing material:	Polyamide, glass fiber reinforced
Flammability class:	V0 (according to UL94)

12.2 Power supply

Supply voltage:	230 V AC
Frequency range:	50 / 60 Hz
Internal consumption:	2 W
Overvoltage category:	III in accordance with EN 60664
Cable cross-section:	0.2 - 2.5 mm^2

12.3 Ambient conditions

Use:	Indoor
Access limitations at set-up location:	Limited access (control cabinet)
Installation (stationary):	On a top hat rail
Operating temperature:	-25 °C to +55 °C
Storage temperature:	-25 °C to +70 °C
Relative humidity:	Up to 75% non-condensing
Altitude:	max. 2000 m above sea level

12.4 Interfaces

Ethernet interface

Number:	1
Ethernet:	RJ45 (shielded)
Data transfer rate:	10/100 Mbps
Protocol:	Modbus TCP

12.5 Dimensions, weight

Height / width / depth:	88 mm / 35 mm / 65 mm
Weight:	< 0.2 kg

12.6 Split-core current transformer

General

Flammability class:	UL94-V0
Cable length:	1 m (63 A variant) 2 m (200 A variant)
Cable cross-section:	0,2 mm^2

Nominal data

Rated voltage:	0,66 kV
Rated frequency:	50/60 Hz
Rated current:	63 A / 200 A
Limit current I_N / phase:	Max. 200 mA
Measurement category:	CAT III

Ambient conditions

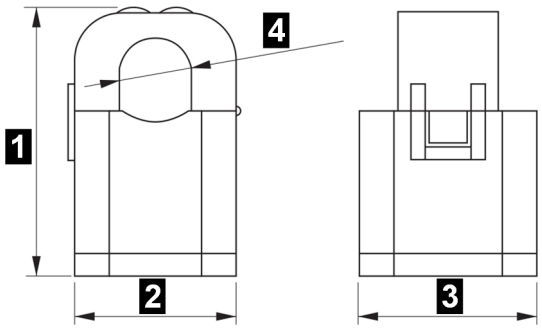
Use:	Indoor
Access limitations at set-up location:	Limited access (control cabinet)
Operating temperature:	-25 °C to +55 °C
Storage temperature:	-25 °C to +70 °C
Relative humidity:	Up to 75% non-condensing
Altitude:	Max. 2000 m above sea level

Dimensions, weight (63 A variant)

Height (1) / width (2) / depth (3):	40 mm / 23 mm / 26 mm
Opening (4):	10 mm
Weight:	65 g

Dimensions, weight (200 A variant)

Height (1) / width (2) / depth (3):	65,4 mm / 46 mm / 35 mm
Opening (4):	24 mm
Weight:	250 g



12.7 Measuring accuracy

Phase current:	1,5 %
Voltage:	0,5 %
Total active power:	2,0 %
Total reactive power:	2,0 %
Total active energy:	2,0 %
Power factor:	2,0 %
Frequency:	0,1 %

The standard measurement accuracy refers to the full scale value, applies to a power factor of 0.8 - 1 and uses a standard measurement interval of 200 ms.

13 Directives, standards and regulations

Electromagnetic compatibility

EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements (IEC 61326-1:2012)

13.1 EU Directives and Standards

2014/35/EU	Low-voltage Directive
2014/30/EU	Electromagnetic Compatibility Directive
2011/65/EU	Directive on the restriction of the use of certain hazardous substances (RoHS)
2012/19/EU	Directive for waste electrical and electronic equipment (WEEE)

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