CC612 charge controller

Charge controller for electric vehicle charging stations, wallboxes or street light charging points

Service and support for Bender products

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Available on 365 days from 7.00 a.m. to 8.00 p.m. (MEZ/UTC +1)
* Landline German Telekom: Mon-Fri from 9.00 a.m. to 6 p.m.: 6.3 cents/30 sec.; remaining time: 6.3 cents/min.
Mobile phone: higher, depending on mobile phone tariff

Repair service
Repair, calibration and replacement service
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+49 6401 807-784, -785 (commercial issues)
Fax: +49 6401 807-789
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Field service
On-site service
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Fax: +49 6401 807-759
E-mail: fieldservice@bender-service.de
Mon-Thu 7.00 a.m. to 4.00 p.m., Fri 7.00 a.m. to 1 p.m. (MEZ/UTC +1)

Table of content

1 General instructions

1.1 How to use this manual

This manual is intended for qualified personnel working in electrical engineering and electronics! Part of the device documentation, in addition to this manual, is the enclosed "Safety instructions for Bender products".

Read the manual before mounting, connecting and commissioning the device. Always keep the manual within easy reach for future reference.

1.2 Indication of important instructions and information

DANGER! Indicates a high risk of danger that will result in death or serious injury if not avoided.

WARNING! Indicates a medium risk of danger that can lead to death or serious injury if not avoided.

CAUTION! Indicates a low-level risk that can result in minor or moderate injury or damage to property if not avoided.

Information can help to optimise the use of the product.

1.2.1 Signs and symbols

	Disposal		Temperature range		Protect from dust
	Protect from moisture		Recycling	RoHS	RoHS directives

1.3 Training courses and seminars

www.bender.de > Know-how-> Seminars.

1.4 Delivery conditions

The conditions of sale and delivery set out by Bender apply. These can be obtained from Bender in printed or electronic format.

The following applies to software products:

"Softwareklausel zur Überlassung von Standard- Software als Teil von Lieferungen, Ergänzung und Änderung der Allgemeinen Lieferbedingungen für Erzeugnisse und Leistungen der Elektroindustrie" (software clause in respect of the licensing of standard software as part of deliveries, modifications and changes to general delivery conditions for products and services in the electrical industry)

1.5 Inspection, transport and storage

Check the shipping and device packaging for transport damage and scope of delivery. The following must be observed when storing the devices:

1.6 Warranty and liability

Warranty and liability claims in the event of injury to persons or damage to property are excluded in case of:

Improper use of the device.

- Incorrect mounting, commissioning, operation and maintenance of the device.
- Failure to observe the instructions in this operating manual regarding transport, commissioning, operation and maintenance of the device.
- Unauthorised changes to the device made by parties other than the manufacturer.
- Non-observance of technical data.
- Repairs carried out incorrectly.
- Use of accessories and spare parts not recommended by Bender.
- Catastrophes caused by external influences and force majeure.
- Mounting and installation with device combinations not recommended by the manufacturer.

This operating manual and the enclosed safety instructions must be observed by all persons working with the device. Furthermore, the rules and regulations that apply for accident prevention at the place of use must be observed.

1.7 Disposal of Bender devices

Abide by the national regulations and laws governing the disposal of this device.

For more information on the disposal of Bender devices, refer to

www.bender.de -> Service & support.

1.8 Safety

If the device is used outside the Federal Republic of Germany, the applicable local standards and regulations must be complied with. In Europe, the European standard EN 50110 applies.

DANGER! Risk of electrocution due to electric shock! *Touching live parts of the system carries the risk of:*

- A fatal electric shock
- Damage to the electrical installation
- Destruction of the device

Before installing and connecting the device, make sure that the installation has been de-energised. The rules for working on electrical systems must be observed.

2 Function

2.1 Intended use

The CC612 charge controller, hereafter referred to as the charge controller, is the main component of a charging system and is designed for use in electric vehicle (EV) charging stations, wall boxes and street light charging points. The charge controller controls type 1 and type 2 plugs, and type 1 and type 2 sockets.It enables a setup that complies with the requirements of current standards, e.g. IEC 61851-1 and IEC 62955.

Any use other than that described in this manual is regarded as improper.

2.2 Product features (depending on the variant)

- Charge controller in accordance with IEC 61851-1 (mode 3 charging)
- Master and slave operation configurable
- Can be integrated in single- or three-phase systems up to 80 A
- Smart Grid enabled using standard OCPP functionality
- OCPP 1.5 and OCPP 1.6 compliant with JSON, SOAP and Binary implementation
- Supported mobile networks: 4G (LTE), 3G (UMTS) and 2G (GSM) with an integrated 4G modem
- 2 USB interfaces:
  - 1 CONFIG for local configuration
  - Extension port for peripheral USB devices (Ethernet/WiFi home applications)
- Master/slave hardware configuration
- Control Pilot and Proximity Pilot signal management
- Universal charge plug control (support for different vendors of sockets)
- Configurable support for one additional household socket
- Can connect to eHZ or Modbus meters and to meters with an S0 interface
- User interface board for customer-specific applications
- Configurable 3-channel input/output extension interface for additional functionality
- Only an external RCD type A is required
- Continuous monitoring of AC and DC fault currents using the patented DC fault current monitoring module
- Internal temperature sensors
- Dynamic load management to optimally distribute the available power among all charging points and signal the maximum power to the vehicle
- ISO/IEC 15118 power line communication (PLC) for plug & charge and load management systems
- Local and remote configurations

2.3 Product description

The charge controller monitors the internal hardware of charging systems such as the meter, the user interface module or the socket-outlet. It can be operated as an “always-on system” that is always connected to a mobile network. The master variant supports 4G mobile networks.

Communication with a backend system is possible via the OCPP application protocol. All specified messages in OCPP are supported as well as some vendor-specific extensions based on the DataTransfer message. Integration tests with the backend implementations of providers (e.g. has-to-be, Virta and NewMotion) have been carried out successfully. Refer to “Ordering details” for product variants..

2.4 Functional description

As well as the charge controller, a charging system also consists of a type A RCD, a relay contactor, which is directly connected to a type 1 or type 2 socket, or to an attached cable with a type 1 or type 2 plug (see „3.2.1 Charging system with Type 2 socket“ on page 10).

2.4.1 General functions

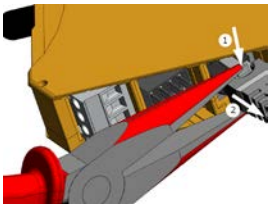
- A charging system may also consist of a meter, and if the meter should be read digitally, either a smart digital meter (EMH eHZ) or a digital Modbus meter is required.
- The charge controller reads the digital eHZ meter readings using a standard optical reader attached to the charge controller via an RJ10 cable.
- If the Modbus version is used, the Modbus wires are attached directly to the charge controller.
- Alternatively, any meter with an S0 interface can be attached to one of the available inputs.
- A 12 V power supply is needed to operate the charge controller and an RFID module can be used to facilitate simple user interaction. The RFID module is a separate PCB and is connected to the charge controller using a standard RJ45 cable.
- Power flow toward the vehicle is controlled by the contactor (using a signal voltage of up to 30 V), which is itself controlled by the the charge controller via a relay in the charge controller.
- The SIM card slot (available on charge controller Master variants only) is positioned on the charge controller front panel. The SIM card can have a PIN number which can be configured via an internal configuration web interface. The APN settings for the card can also be configured via an internal configuration web interface.
- Also positioned on the front panel are two USB interfaces:
- The interface known as CONFIG is used to configure the charge controller. Optionally, this interface can also be used to apply software updates.
- The USB Type-A interface allows the connection of peripheral USB devices.
- Only the front panel of data gateways with 4G modem variants features a connection for a 4G antenna.
- For fault current detection in an AC charging system, the charge controller features an integrated residual direct current monitoring module (RDC-M) which uses an externally connected current transformer. With the integrated monitoring of the DC fault current, only an RCD type A is required in the charging system.
- Data exchange between the EV and the charging system is possible via ISO 15118 compliant Powerline Communication (PLC).
- If a malfunction occurs, a report is sent to the backend system using the OCPP protocol.

- Data management and control functionality of the charge controller:
  - Termination of the charging process after tripping of the residual current device (RCD) due to a residual current.
  - Detection of critical fault currents by the RCM sensor. For the vehicle owner, this can be an early-warning, provided that the charge controller is connected to an energy management system and that it supports this function.
  - Load current and cooling control (via a temperature sensor)
    The charge controller has internal temperature sensors (on the inside of the controller housing) that allow the temperature in the ambient environment of the charge controller to be estimated. Based on this estimation it is possible to dynamically reduce the charging current or even suspend charging. This feature can serve to maintain an ambient temperature within the permissible range of the components used in a charging system. Two temperature thresholds can be set on the manufacturer configuration tab and are based on measurements in common housing scenarios. The first threshold reduces the charging current to the configured value if it is exceeded. The second threshold will suspend charging.

The temperature measurement is an estimation based on temperature sensors positioned on the inside of the controller housing where the actual temperature is affected by heat generated by the controller itself. Because the threshold values are based on measurements in common housing scenarios, each charging system vendor should undertake practical measurement experiments to validate the correctness of these thresholds and add offsets if necessary.

- Dynamic load management (DLM):
  The charge controller comes with a DLM software, which is fully usable independent of a backend connection. It detects which charging current is applied to which phase and thus avoids the occurrence of peak loads and unbalanced loads. Maximum number of charging points in a network: 250.
- Remote:
  - Software updates
  - Temperature and residual current monitoring
  - Remote login allows for remote maintenance options that reduce the number of maintenance personal deployments per charger
  - Load management through Modbus TCP, SMA SEMP, EEBUS, ASKI

Caution! Risk of damage when pulling out the measuring current transformer plug! *If the measuring current transformer plug is pulled out using too much force, the enclosure and the internal components may be damaged. Use needle-nose pliers to unlock the measuring current transformer plug.*



3 Dimensions and mounting

3.1 Dimensions

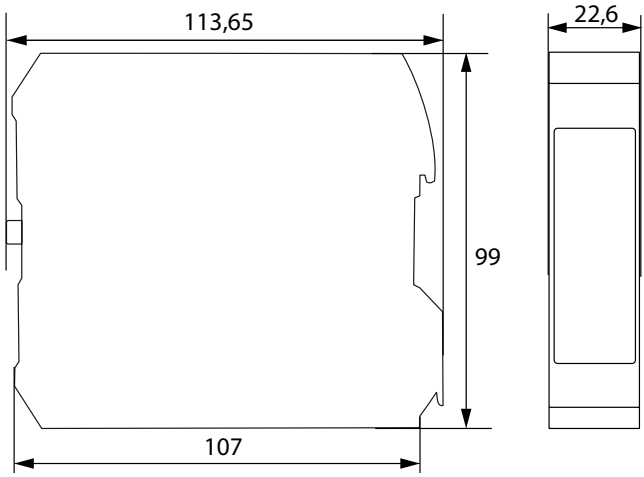
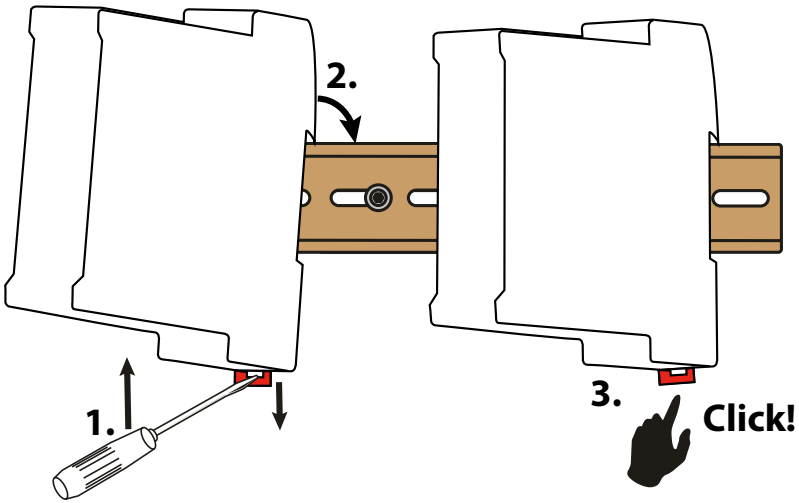


Abb. 3–1 Note: Dimensions in mm acc. to ISO 2768 - m
** Dimensions incl. antenna socket*

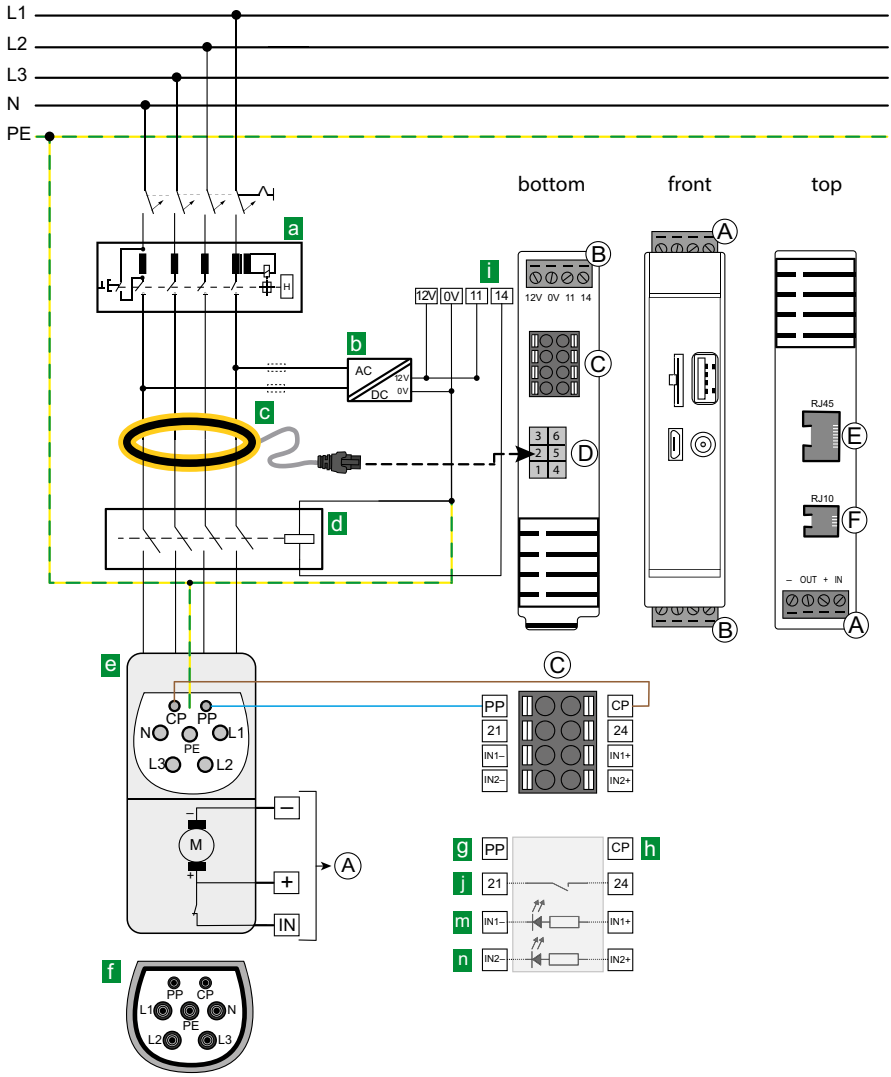
3.2 Mounting



DIN rail mounting
Example view

3.2.1 Charging system with Type 2 socket

Wiring diagram



Charge Controller CC612

The SIM card slot and antenna socket are available on Master variants only. Master variants are:
CC612-1M4PR
CC612-2M4PR
CC612-2M4R

Relay

The relay used to control the contactor is rated for 30 V/1 A. An intermediate relay may be required if this rating is inadequate.

Contactor

The relay contactor can also be connected to a cable with a type 1 or type 2 plug.

Legend

A	Connection locking engine	d	Contactor
B	Connection socket User Interface	e	Type 2 socket*
C	Connection socket	f	Type 2 plug*
D	Connection Current Transformer (CT)	g	Connection Proximity Pilot
E	Connection User Interface (RJ45)	h	Connection Control Pilot
F	Connection Modbus/eHZ meter (RJ10)	i	Relay 1: Control pin contactor
a	RCD Type A	j	Output relay 2
b	Voltage supply DC 12V	m	Optocoupler input 1
c	Current Transformer (CT) with plug	n	Optocoupler input 2

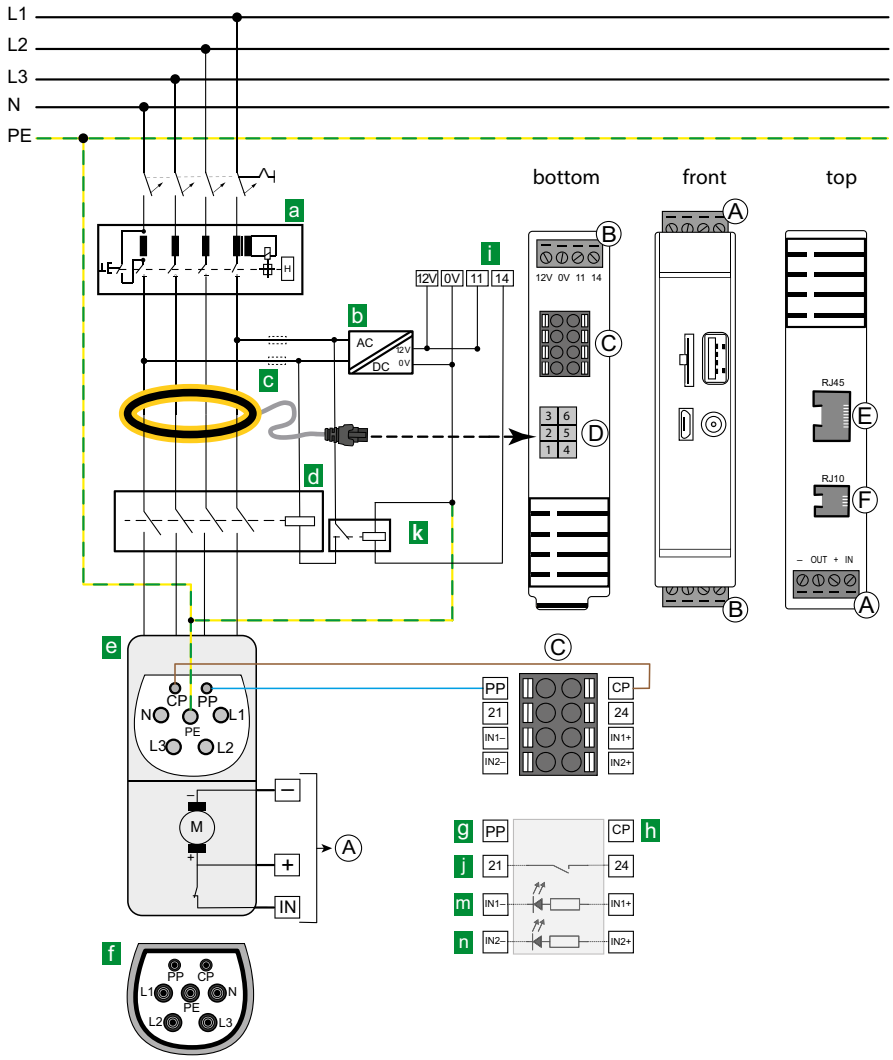
* Mennekes Typ-2-socket

Assignment of the terminals

A1	IN		C1	PP
A2	+		C2	CP
A3	OUT		C3	21
A4	-		C4	24
B1	12 V		C5	IN1-
B2	0 V		C6	IN1+
B3	11		C7	IN2-
B4	14		C8	IN2+

3.2.2 Charging system with a type 2 socket and an intermediate relay

Wiring diagram



Legend

A	Connection locking engine	d	Contactor
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E	Connection User Interface (RJ45)	h	Connection Control Pilot
F	Connection Modbus/eHZ meter (RJ10)	i	Relay 1: Control pin contactor
a	RCD Type A	j	Output relay 2
b	Voltage supply DC 12V	k	Intermediate relay
c	Current Transformer (CT) with plug	m	Optocoupler input 1
		n	Optocoupler input 2

* Mennekes Typ-2-socket

Assignment of the terminals

A1	IN		C1	PP
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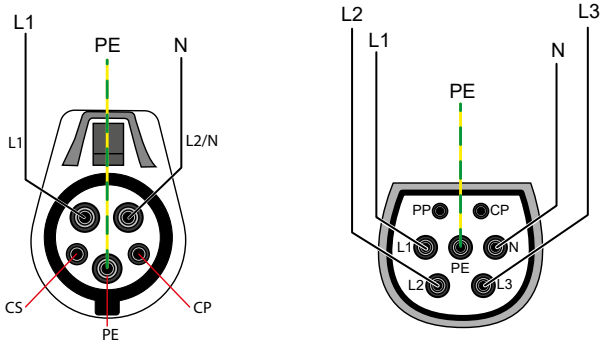
A3	OUT		C3	21
A4	-		C4	24
B1	12 V		C5	IN1-
B2	0 V		C6	IN1+
B3	11		C7	IN2-
B4	14		C8	IN2+

Connection Type 2 Socket

Supported Type 2 sockets*	-	OUT	+	IN
	Socket actuator wiring			
• Mennekes (31016, 31023, 31024, 31038) • Bals (801191-801195, 80300, 9743205000, 9743211000) • Walther Werke (9743211000) • Harting	Wire 3		Wire 1	Wire 2
• Walther Werke Eco Slim 32 A (9743205180) with connection cable (790000001)	Wire 1 (black)		Wire 3 (blue)	Wire 2 (red)
• Phoenix Contact (1405213, 1405214, 1405215, 1405216, • 1408171, 1408172)	BU/BN	BU/GN	BU/RD	BU/YE

* Each type 2 socket can also be used in conjunction with lock release modules from Mennekes and Phoenix Contact.

Connection to Type 1/Type 2 plug



4 Connection

4.1 Connection conditions

Risk of electric shock! *Parts of the system may be live (charge controller terminals up to 12 V, charging station 230 V). Before touching parts of the system, ensure that it has been de-energised.*

Caution! Risk of injury from sharp-edged terminals! *Handle enclosure and terminals with care.*

The RJ45 user interface is not intended as an Ethernet interface.

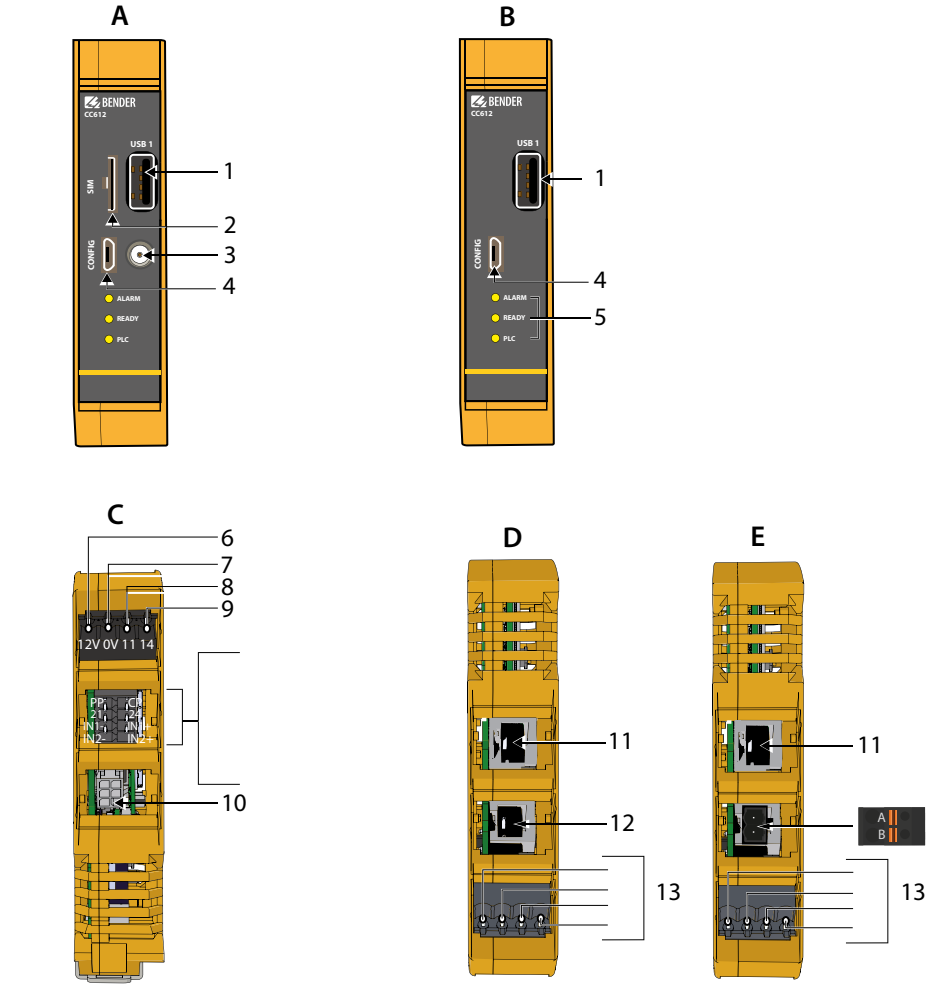
Information:

- Connect PE to "0V"; reference level for Control Pilot (CP communication) must be at same level as the power supply (IEC 61851 standard).
- Cable lengths (except Modbus, Power IN and charging cable) < 3 m; cables must be positioned inside the wallbox/charging station and should not be laid parallel to power cables.
- Modbus (A, B) must be connected using a shielded cable; connect shield to PE..

For further information on connection, refer to the manuals of the accessories (e.g. CTBC17).

4.2 Connectivity

Charge controller connections for all device variants



A	Front view	Data gateway (with modem)
B	Front view	Data gateway (without modem)
C	Bottom	
D	Top	Variant with eHz meter
E	Top	Variant with Modbus meter

Legend

1	USB interface for Ethernet/WLAN/connection to Master
2	SIM card slot
3	Antenna socket
4	Configuration interface/connection to Slave
5	LEDs for: • ALARM • READY (Online connectivity) • PLC (Power Line Communication)
6	12 V power supply
7	0 V
8	Relay 1 (Control voltage contactor)
9	Relay 1 (Contactor control pin)
10	Connection current transformer
11	Connection to user interface via RJ45 cable
12	Meter connection
13	Plug lock connections

4.2.1 Master/slave connection

The charge controller can function as a data gateway with 4G modem (the dedicated controller is switched into Master mode) or data gateway without 4G modem. Master/Slave operation can be configured by connecting the USB configuration interface of one charge controller (DLM Master) to a USB interface for Ethernet/WLAN of the second charge controller (DLM Slave) using a USB cable. For each DLM Master/DLM Slave variant, there are connections common to both (these are described in the following sections) and there are differences, which are described in „4.2.2 Master device features“ on page 25.

Currently one DLM Slave can connect to the DLM Master. The communication protocol is binary OCPP 1.6. Essentially the Master controller becomes the OCPP backend for the DLM Slave. The DLM Master exposes each DLM Slave as an additional connector to the backend.

A charge controller is assigned the Master and Slave role on the **Manufacturer** tab. Each DLM Slave controller then needs to be assigned the IP address of of the DLM Master as its binary OCPP hostname and needs to use port 1600 as the binary OCPP port to connect to the DLM Master. Multiple connectivity technologies to connect DLM Master and DLM Slave can be used, for example Ethernet and, where available, WLAN.

The configurations such as IP addresses port etc. are generated automatically.

The **Master** is assigned an additional IP address of **192.168.125.124** on the Settings tab without assigning a standard gateway. The **Slave** uses the IP address **192.168.125.125** to connect to the Master. Using USB as the connection technology is more cost efficient than using multiple Ethernet cables or WLAN, but limits the distance of the controllers to a few meters as the maximum length of a USB cable is 5 meters. The DLM Slave configuration web page (e.g. **http://192.168.123.123**) then offers links to access the Master and the Slave configuration.

4.2.1.1 Micro-USB configuration interface (CONFIG)

The USB configuration interface (CONFIG) on the charge controller front panel is connected to a conventional laptop, PC or tablet computer with a normal USB host interface via a micro USB cable. This interface allows the device to be configured locally. In addition, it also enables software updates. Configuration details are outlined in „5.1.1 Local configuration of parameters“ on page 27. In addition, Master/Slave operation can be configured by connecting the USB configuration interface of one charge controller (DLM Master) to a USB interface for Ethernet/WLAN of the second charge controller (DLM Slave) using a USB cable.

4.2.1.2 Type A USB interface for Ethernet/WLAN adapter

The USB Ethernet/WLAN interface provides a way of connecting the charge controller to an existing Ethernet/WLAN network. Refer to „5.1.6.3 via USB-Ethernet-Adapter oder USB-WLAN (USB 1)“ on page 31. In addition, Master/Slave operation can be configured by connecting the USB configuration interface of one charge controller (DLM Master) to a USB interface for Ethernet/WLAN of the second charge controller (DLM Slave) using a USB cable.

4.2.1.3 Front panel LEDs (ALARM, READY, PLC)

The LEDs located on the front panel are used to indicate:

- An error has occurred (ALARM)
- Online connectivity to a backend system (READY)
- Powerline Communication (PLC) acc. to ISO 15118
  (This LED is not shown on the front panel of variants which do not feature PLC.)

4.2.1.4 12 V power supply

The charge controller is supplied with power from a 12 V main voltage source at the +12V and 0V connections.

4.2.1.5 Contactor connection

The charge controller controls the contactor that in turn controls the power flow toward the vehicle. Contactor control is exercised by a relay in the charge controller whose contacts are rated up to 30 V/1 A. The actual power for the signal circuit has to be looped into the circuit by correct wiring, i.e. one pin of the charge controller relay 1 (**11**) has to be connected to the 12 V power supply, the second charge controller relay 1 pin (**14**) must be connected to the contactor control pin. The second contactor control pin must be connected to the other pole (**0V**) of the power source.

Relay 1 is rated for 30 V/1 A. *An intermediate auxiliary relay may be required if this rating is considered inadequate.*

If an intermediate relay is required, then the second charge controller relay 1 pin (**14**) must be connected to the intermediate relay control pin instead of to the contactor control pin. The second intermediate relay control pin must be connected to the other pole (0 V) of the power source. The contactor control pin is then connected to the supply voltage (e.g. 230 V) and the other pin is connected to the neutral conductor.

4.2.1.6 Control Pilot (CP) and Proximity Pilot (PP) connections

The Control Pilot (CP) and Proximity Pilot (PP) contacts connect the charge controller to the outlet, enabling it to communicate with the vehicle and the cable plug. The CP and PP contact allow the charge controller to determine whether a cord has been plugged into the socket (proximity) and to inform the vehicle about the amount of power it can draw (refer to IEC 61851).

The CP terminal is used for Power Line Communication (PLC) in charge controller variants with this integrated feature.

4.2.1.7 I/O extension

The CC612 has additional I/O interfaces available via a configurable 3-channel I/O interface (**connector C: 21, 24, IN1-, IN1+, IN2-, IN2+**) that can be used for multiple purposes, for example:

- Parking management interface (The supported communication protocol is proprietary to Scheidt & Bachmann and based on the available auxiliary relay and one available input)
- Additional household main socket outlet control
- Power outage monitoring (e.g. RCD trip monitoring)
- Cooling fan switch for over-temperature control
- Connection to a meter with an S0 interfaced.

4.2.1.8 Residual direct current monitoring module (RDC-M)

For fault current detection in an AC charging system, an integrated residual direct current monitoring module (RDC-M) is used. This module uses an external magnetically shielded measuring current transformer. This allows the use of a residual current device (RCD) type A instead of an RCD type B. The relay in the charge controller is de-energised if, during the charging process, a fault current $I_{\Delta n} \geq$ DC 6 mA flows. The measured fault currents RMS/DC are made available to the backend system via OCPP message. The use of device variants with an integrated 4G modem is only possible in member states of the European Union.

To ensure electrical safety, the switch-off times according to IEC 62955 are observed.

4.2.1.9 Plug lock connection

Under normal operating conditions, the type 2 socket automatically locks the plug when a vehicle is connected to the charging system. The locking action can be heard. After disconnecting the plug from the vehicle, the charging system socket automatically unlocks the charging system socket and the cable can be removed. If both locking and unlocking work, the socket was correctly attached to the charging system controller. Via terminals IN , +, OUT, - (i.e. plug lock connections), the charge controller can interface to different socket/actuator types. Type 2 sockets from various manufacturers and their corresponding connection to the charge controller are shown in „Connection Type 2 Socket“ on page 15:

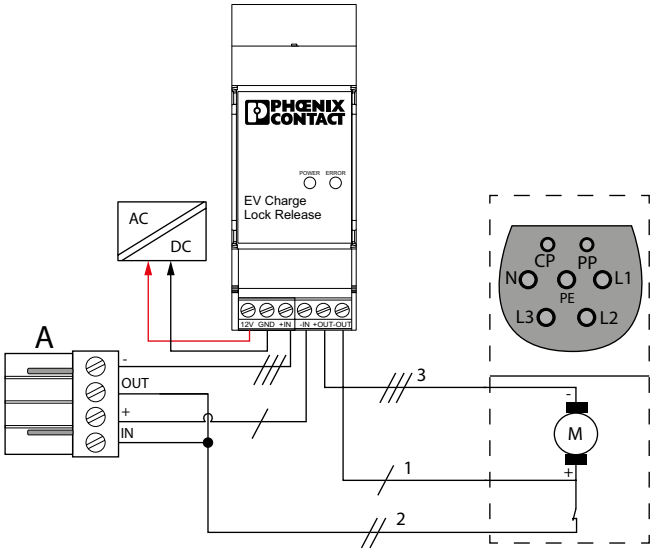
4.2.1.10 Connection to lock release modules

When using the Mennekes Actuator Control Type 30537-A, the full force is not available for the locking and unlocking process.

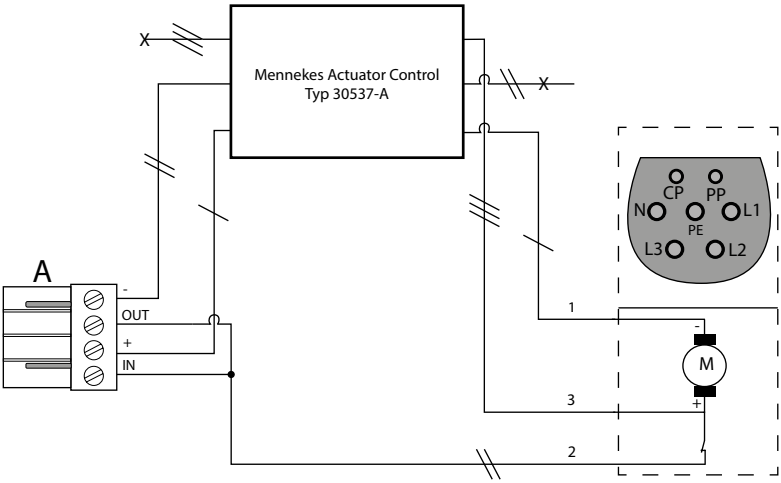
The following legend refers to the corresponding connection examples:

A	Connection A of the charge controller
1, 2, 3	Wire
M	Aktuator

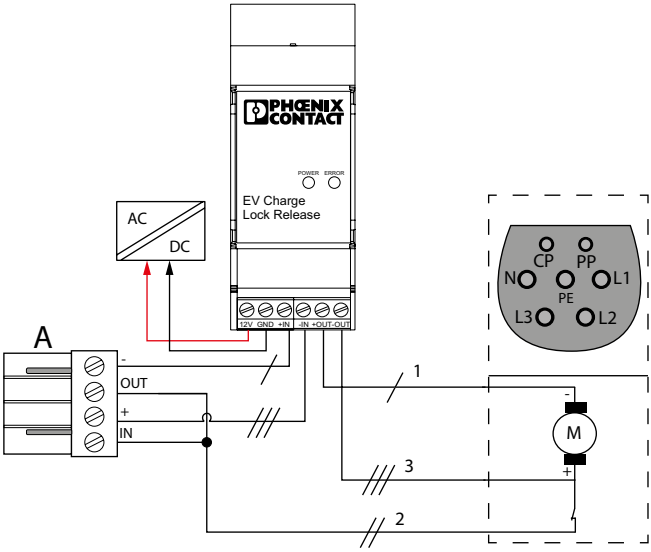
Each type 2 socket can also be used in conjunction with lock release modules from various manufacturers. A typical wiring diagram illustrating the connection between the charge controller, a Mennekes/Bals/Walther Werke/Harting socket actuator and a lock release module (EM-EV-CLR-12V) from Phoenix Contact is shown below:



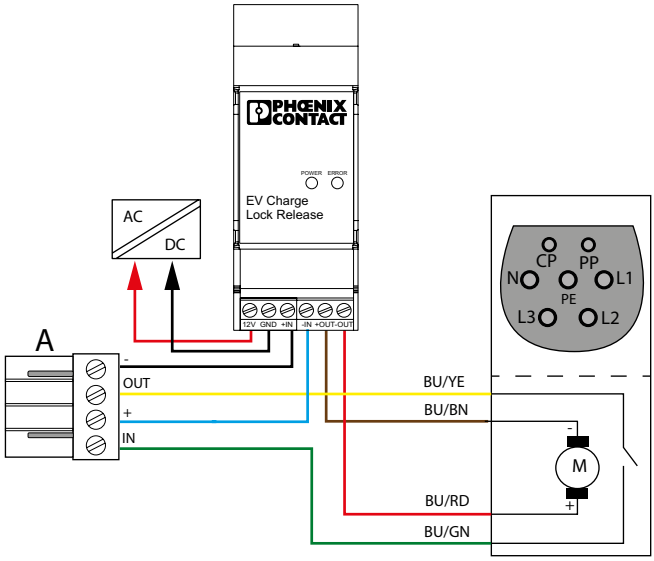
Socket actuator Walther Werke Eco Slim 32 A (9743205180) with Mennekes lock release module:



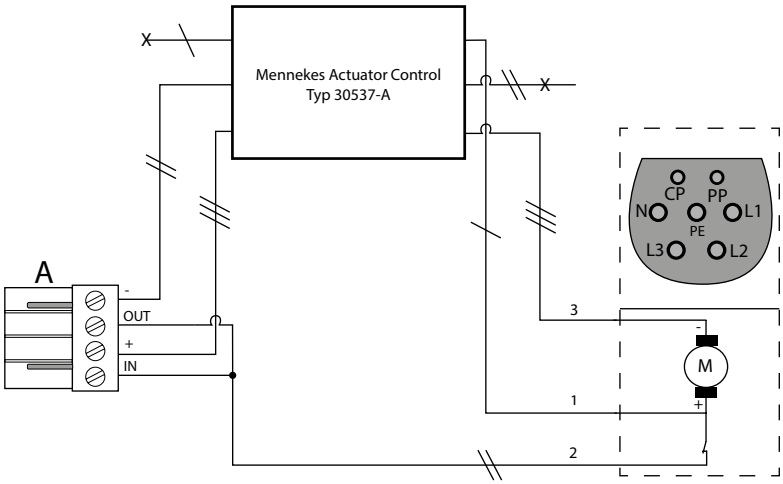
Socket actuator Walther Werke Eco Slim 32 A (9743205180) with Phoenix Contact lock release module:



A typical wiring diagram illustrating the connection between the charge controller, a Phoenix Contact socket actuator and a lock release module (EM-EV-CLR-12V) from Phoenix Contact is shown below:



A typical wiring diagram illustrating the connection between the charge controller, a Mennekes socket actuator and a lock release module from Mennekes is shown below:



4.2.1.11 Connectivity to eHZ or Modbus meters and (optionally) meters with an S0 interface

The use of a meter is not mandatory. However, a meter should be used when meter readings are required during normal operation. An EMH eHZ meter can be used if the meter should be digitally read. The meter is read by an optical reader attached to the mounting plate of the meter so that it can interface with the optical interface on the back of the meter. The optical reader is then connected to the charge controller with a RJ10 cable.

Modbus RTU can be used instead of an RS-485 based eHZ interface to connect to Modbus meters. Various Modbus meters are currently supported, see: www.bender.de/en/supported-energy-meters.

Additional Modbus meters can be added upon customer request and may be added with each software release. Supported Modbus meters are listed on the webserver Operator tab.

The Modbus meter interface on the charge controller is shown below:

The system periodically queries the relevant registers of the Modbus meters and uses the meter values to fulfill the charge controller functionality. Depending on support by the meter, current, voltage and power are also obtained directly from the meter as opposed to being calculated based on the increasing energy amounts reported. If meter readings are required, the baud rate and the slave ID need to be configured directly on the Modbus meter as follows:

- Baud rate: 9,600 Bd
- Slave ID: 1
- 8N1 (8 data bits, no parity, 1 stop bit)
- For Saia ALE3: 8E1 (8 data bits, even parity, 1 stop bit)

The charge controller can optionally read meters with an S0 interface. These meters can be attached to one of the available inputs

4.2.1.12 Connection with display and authorization modules

The charge controller features a simple user interface for customer-specific applications.

This interface can connect to the:

- RFID module RFID110-L1 - The RFID module is a separate PCB with status and lighting LEDs and is designed according to ISO14443A/MIFARE. It is connected to the charge controller using a standard RJ45 cable.
- RFID module RFID114 - The RFID module is a separate PCB without status and lighting LEDs and is designed according to ISO14443A/MIFARE. It is connected to the charge controller using a standard RJ45 cable.
- Display module DPM2x16FP - The display module is also a separate PCB that is used to indicate the charge controller status information as well as the charging status. It features two RJ45 cable sockets, one which connects to the charge controller and the other which can connect to the RFID module.

Information on the corresponding manuals can be viewed in the order details.

4.2.2 Master device features

Only datagateways with 4G modem feature a SIM card/SIM card slot and an antenna socket.

4.2.2.1 SIM card and SIM card slot

- The charge controller supports 4G mobile networks and an integrated modem is included. It uses a wireless module, which supports the following European frequency bands:
  - LTE FDD: 800 MHz band 20, 900 MHz band 8, 1,800 MHz band 3, 2,100 MHz band 1 and 2,600 MHz band 7
  - GSM: 900 MHz band 8 and 1,800 MHz band 3
  - WCDMA: 850 MHz band 5, 900 MHz band 8, and 2,100 MHz band 1
- The charge controller can be operated as an „always-on" system when connected to a mobile phone data network, • Connection is only possible when a SIM card is inserted into the SIM card slot located on the charge controller front panel. SIM must be provided in micro SIM format.
- The SIM card can have a PIN number which can be configured via the **Operator** configuration web interface.
- The APN settings for the card can also be configured via the **Settings** configuration web interface.

Connection to the mobile network (and subsequently the backend system) usually lasts between 6 to 48 hours after which the connection may be terminated by the mobile net work. The charging system detects this disconnection and automatically reconnects.

The SIM card is not included within the scope of delivery.
The use of Nano SIM cards with a corresponding SIM card adapter may damage the SIM card slot. Therefore, it is recommended to use only Micro SIM cards.

Geographical application

An integrated 4G modem may be operated in the following countries only. If 4G mobile networks are not supported, GSM mobile networks may also be used.

Austria	Ireland, Italy
Belgium, Bulgaria	Latvia, Lithuania, Luxembourg
Croatia, Cyprus, Czech Republic, Canary Islands	Malta, Madeira
Denmark	Poland, Portugal
Estonia	Romania
Germany, Great Britain, Greece	Slovakia, Slovenia, Spain, Sweden
Finland, France	The Azores
Netherlands, Hungary	

4.2.3 Antenna socket

The antenna socket allows connection to a 4G antenna (not included in the scope of delivery).

i *The following approved antenna type must be used:*
Panorama Antennas B4BE-7-27-05SP.

5 Configuration and testing

5.1 Configuration

The following options are available for configuring the charging system:

- Locally whereby the charge controller provides a web interface (i.e. Charge Point Control Interface) via the USB configuration interface (CONFIG)
- USB Ethernet/WLAN interface via a USB Ethernet adapter, USB WLAN (USB 1) or via the 4G Modem
- Remotely by utilizing the ChangeConfiguration command of the OCPP protocol.

More information on how to configure the charge controller, see here: www.bender.de/controller-wiki

5.1.1 Local configuration of parameters

In order to locally configure the charging system via the charge controller, it is necessary to connect a micro USB cable to a laptop, PC or tablet computer with a standard USB host interface. Once connected, the charge controller is recognised as a USB network adapter.

The charge controller USB configuration interface (CONFIG) emulates a Remote Network Driver Interface Specification (RNDIS) network when it is plugged into Windows, Linux or Mac OS computers. In a Linux and Mac OS, this virtual network interface is automatically detected and a driver is not necessary. On a Windows host machine, however, the driver for the RNDIS network adapter needs to be manually selected. Details on how to do this are given in „6.1.1 USB configuration interface“ on page 32 .

The charge controller uses the local IP address 192.168.123.123 with the subnet mask 255.255.255.0 via the configuration interface. The connected device automatically receives a corresponding IP address via the Dynamic Host Configuration Protocol (DHCP) after the connection has been established. The communication with the charging system is based on this IP address.

An example of a local configuration Charge Point Control Interface **State, Manufacturer and Operator** tab is shown on the following pages. Each of the parameters to be set is adequately described on the respective web interface pages. Please refer to these pages for further information:

- The **State** tab of the charging system control interface can be accessed via the URL http://192.168.123.123. It only provides status information.
- The **Operator** tab of the charging system control interface can be accessed via the URL http://192.168.123.123/operator. As well as showing status information, operator parameters can be set. To access this tab, user name and password are required:
  - User name: operator
  - Password: yellow_zone
- The **Manufacturer** tab of the charging system control interface can be accessed via the URL http://192.168.123.123/manufacturer. As well as showing status information, operator and manufacturer parameters can
- be set. To access this tab, user name and password are required:
  - User name: manufacturer
  - Password: orange_zone

These default passwords can be changed. The manufacturer can also change the user passwords and operating parameters.

The URL for the Manufacturer tab should not be shared with the operator.

The **State, Operator and Manufacturer** tabs each have an identical **Settings** tab and a **Documentation** tab.

On the Settings tab, all Backend relevant information, supplied by the Backend provider, can be entered including:

- **OCPP Mode** (e.g. OCPP-B 1.5, OCPP-J 1.6)
- **SOAP OCPP URL** of Backend (i.e. the HTTP URL of the OCPP backend system)
- **Hostname (Binary OCPP)** - The DNS hostname or IP address of the binary OCPP proxy server for the Backend system
- **Portnumber (Binary OCPP)** - TCP port of the proxy server for binary OCPP communication with the Backend system
- **Websockets JSON OCPP URL** of the Backend - Only used if OCP-J 1.6 mode is selected

The Documentation tab contains:

- Information concerning OCPP status notification error messages (e.g. codes, activation and resolution messages, notes and corrective actions)
- OCPP configuration keys for OCPP 1.5 and 1.6 (e.g key name and description))

Application of changed parameters

Parameter changes are not necessarily applied after submission. To submit all changed parameters, click the "Save & Restart" button at the bottom of the tab. A message indicating a necessary restart may appear.

5.1.1.1 Periodicle reboot of the charge controller

As part of the normal periodicle reboot, the charge controller carries out system resets to recover from situations in which connectivity with the backend system cannot be obtained and no vehicle is currently charging. This behaviour is intentional and serves to ensure that the charge controller recovers from as many situations as possible without intervention. In a situation in which no SIM card is inserted or the configuration does not yet match the SIM card, a system reset can be easily mistaken for erroneous behaviour.

After the web configuration interface has been accessed or while a vehicle is connected, the charging point will suppress system reboots for at least 2 minutes to allow all parameters to be configured.

5.1.2 Remote configuration of parameters

The charging system or charging system controller enables the configuration of many parameters using the OCPP GetConfiguration and ChangeConfiguration commands. With these commands, locally configured communication parameters can be changed. The exception is the SIM parameters, which require local intervention when the SIM card is replaced.

Any backend system can be used.

5.1.3 Factory settings

Resetting to factory settings deletes all settings except the serial number.

Click the **"Operator Default & Restart"** button on the **Operator** tab to reset changed parameters of the operator configuration to default.

Click the **"Settings Default & Restart**" button on the **Settings** tab to reset changed parameters to default.

Click the **"Manufacturer Default & Restart"** button on the **Manufacturer** tab to reset changed parameters of the manufacturer configuration to default.

Click the **"Factory Reset & Restart"** button to reset the charge controller to factory settings.

5.1.4 Testing

After completing the configuration, the charge controller must be tested for operability. The following is checked:

- Successful boot process
- If intended, establishment of backend connection
- Connection to meter possible
- Plug locking and unlocking works.
- Charging is possible

5.1.5 Successful boot-up

The boot-up process begins once 12 V is supplied to the charge controller. After about 30 s, the ALARM and READY LEDs - and the PLC LED when available - on the front panel light up. After some time, the LEDs are turned off and only the „READY“ LED blinks, indicating a successful boot-up. At the same time, the „Free LED“ on the RFID module (if configured) lights continuously, marking the end of the boot up sequence

5.1.6 Connectivity to the backend

5.1.6.1 Connection of the charge controller to the backend

Go to the **Settings** tab (http://192.168.123.123/operator/settings). To access this tab, enter the following user name and password:

- User name: operator
- Password: yellow_zone

The following options are available at "Connection Type":

- No backend
- GSM (4G modem)
- Ethernet
- USB
- WiFi

5.1.6.2 via GSM (4G modem)

The "Access Point Name (APN)" of the mobile network to be used is required when a connection to the backend system is made via the integrated 4G modem.

A user name ("APN Username") and password ("APN Password") may be required to authenticate the access point.

APN information such as user name and password is provided by your mobile network operator.

The system should be able to establish an online connection to the backend system after 20 to 120 seconds. In case of connection problems, the received signal strength (RSSI) can be checked via the **State** tab. If a SIM card PIN number is required, it must be configured via the Operator tab (http://192.168.123.123/operator) of the charging system. Otherwise, a connection to the backend will not possible. With a data network connection established, the charging system is now available.

The connection to the mobile network (and thus to the backend system) usually lasts from 6 to 48 hours. The connection may then be terminated by the mobile network. The charging system detects the disconnection and automatically reconnects. During reconnection, the "STATUS" LED on the charge controller front panel flashes at regular intervals.

5.1.6.3 via USB-Ethernet-Adapter oder USB-WLAN (USB 1)

If the charge controller is connected to a valid network via Ethernet during the boot process and a DHCP server exists in the network, the charge controller obtains an IP address from the DHCP server. This IP address, which is assigned to the charge controller, can be determined by assigning a fixed IP address at the DHCP server in your network. This IP address can then be used to establish a connection.

In addition, the charge controller always uses a second IP address: 192.168.124.123 in the subnet mask 255.255.255.0 (at the Ethernet interface).

If there is no DHCP server, it is possible to assign a host address from the subnet 192.168.124.x. to a PC. The charge controller is accessed via the IP address 192.168.124.123.

The main settings for Ethernet/WiFi are made via the **Operator** tab (http://192.168.123.123/operator):

- Network configuration mode (e.g. automatic or manual configuration with DHCP)
- Static IP address for network configuration (of the charging station)
- Static subnet mask for network configuration (i.e. 255.255.255.0)

5.1.7 eHZ/Modbus/S0 meter connectivity

Refer to the webserver State tab to check if the eHz and Modbus meters have been successfully connected. In the case of meters with an S0 interface, values are only displayed when charging takes place.

5.1.8 Plug locking and unlocking

After boot-up and a successful online connection, plug locking and unlocking can be tested to see if the type 2 socket-outlet is correctly connected to the charge controller.

- Insert the plug of a vehicle charging system into the type 2 socket-outlet. The socket-outlet should automatically lock the plug. This locking action can normally be heard. Test by gently pulling on the plug.
- To unlock the plug, first disconnect the plug from the vehicle. This action automatically unlocks the socket-outlet of the charging system, allowing the cable to be removed.

5.1.9 Authorisation and charging

The charging process can be initiated by holding an RFID card registered with the backend system or included in the whitelist close to the RFID module, the contactor is switched on and a current flow takes place. The charge controller enables two modes of operation:

- Authorisation BEFORE connecting
- Authorisation AFTER connecting

The modes of operation are briefly described in the respective RFID module manual, which can be downloaded from www.bender.de/en/service-support/downloads.

The connection to the mobile phone data network and subsequently the backend system usually lasts anywhere between 6 and 48 hours. It is normal that after this period, a connection may be terminated by the mobile network. The charging system detects this disconnection and automatically reconnects. During the reconnect, all three LEDs on the charge controller front panel flash frequently.

6 Connecting to the charge controller

The charge controller runs the Linux operating system (OS). The easiest way to connect to the system is to connect through a TCP/IP network connection. This can be done by establishing a network connection.

6.1 Establishing a network connection to the charge controller

Establishing a network connection with the USB configuration interface (CONFIG). This interface can be found on the charge controller front panel.

6.1.1 USB configuration interface

The USB configuration interface, CONFIG, emulates a so-called Remote Network Driver Interface Specification (RNDIS) network when it is plugged into Windows, Linux or Mac OS computers. In a Linux and Mac OS, this virtual network interface is automatically detected and a driver is not necessary. On a Windows host machine, however, the driver for the RNDIS network adapter usually needs to be manually selected. To do this:

- Open the device manager from the control panel
- Right click the „RNDIS/Ethernet Gadget“ menu item located under „Other devices“ and select „Update Driver Software“
- Select the option „Browse my computer for driver software“.
- Then click on the option „Select from a list of device drivers on my computer“.
- From the list presented, select the „Network adapters“ category.
- In the window that appears, select the manufacturer Microsoft Corporation and the network adapter „Remote NDIS Compatible Device“. The device driver is then installed and the system recognises the charge controller as a network adapter.

The charging system controller uses the local IP address **192.168.123.123** with a subnet mask of 255.255.255.0 on the virtual network interface corresponding to the USB configuration interface. A DHCP server is running on the target and automatically assigns a corresponding IP address to the host machine once it is connected. Therefore, communication with the charge controller is based on this IP address.

The charge controller must be powered with 12 V when the CONFIG interface is being used.

7 Technical data

7.1 Tabular data

Insulation coordination acc. to IEC 60664-1/IEC 60664-3

Rated voltag ..... 12.5 V
Overvoltage category/Pollution degree III/3
Rated impulse withstand voltage. ..... 800 V
Operating altitude ..... ≤ 2000 m AMSL

Supply voltage

Nominal voltage ..... DC 12 V
Operating range of the supply voltage ..... DC 11.4 V…12.6 V
Nominal current ..... 1 A

Residual direct current monitoring module*

Measuring range ..... 100 mA

Response values:
Residual current $I_{\Delta n}$ ..... DC 6 mA
Response tolerance $I_{\Delta n}$ ..... -50…0 %

Restart sequence value:
DC 6 mA ..... < 3 mA
* patented 6 mA DC residual current tripping
(Patents: EP 2 571 128 / US 9,397,494 / ZL 201210157968.6 / CN 103001175, EP 2 813 856)

Wireless parameters (Optional for data gateways with 4G modem only)

Frequency bands ..... 800 MHz/850 MHz/900 MHz/1800 MHz/2100 MHz/2600 MHz
Impedance ..... 50 Ω
Data rate ..... **GSM**:
..... GPRS: UL 85.6 kBit/s; DL 107 kBit/s
..... EDGE: UL 236.8 kBit/s; DL 296 kBit/s
..... **UMTS**:
..... WCDMA: UL 384 kBit/s; DL 384 kBit/s
..... DC-HSDPA: DL 42 MBit/s
..... HSUPA: UL 5.76 MBit/s
..... **LTE**:
..... LTE FDD: UL 5 MBit/s; DL 10 MBit/s
..... LTE TDD: UL 3.1 MBit/s; DL 8.96 MBit/s
Specified antenna ..... Panorama Antennas B4BE-7-27-05SP

Inputs/outputs and display

LED ALARM ..... yellow
LED READY ..... green
LED PLC ..... green
USB Extension interface (Ethernet, WLAN,...) ..... USB socket type A
CONFIG (Configuration interface) ..... Micro USB socket type AB
SIM card (For data gateways with 4G modem only) ..... micro SIM

Terminal A:

IN ..... .Aktuator IN
+ ..... Aktuator +
OUT ..... Aktuator pull-up output
- ..... Aktuator -

Terminal B:

12V ..... +12 V IN*
0V ..... 0 V IN
11 ..... Relay 1 NO
14 ..... .Relay 2 NO

Terminal C:

PP ..... .Proximity Pilot
CP ..... .Control Pilot (Powerline Communication PLC acc. to ISO/IEC 15118)
Max. cable length (PP, CP) ..... < 15 m
21 ..... Relay 2 NO
24 ..... Relay 2 NO
IN1- ..... Input 1-
IN1+ ..... Input 1+
IN2- ..... Input 2-
IN2+ ..... Input 2+
CT ..... Current transformer

Input 1 and Input 2

Input voltage ..... DC 11.4 V . . . 25.2 V
Input current ..... 1.7 . . . 3.8 mA
Meter ..... Meter interface
User interface ..... User interface RJ45
Max. cable length to RFID module ..... < 3 m

Switching elements

Relay 1 ..... configurable
Relay 2 ..... charging contactor
Switching elements. ..... 2 x 1 N/O contacts
Operating principle ..... N/C operation
Electrical service life ..... 10.000 switching cycles

Contact data acc. to IEC 60947-5-1:

Rated operational voltage U_e ..... 30 V
Rated operational current I_e ..... 1 A
Minimum contact rating ..... 1 mA ≥ 10 V
Rated voltage U_i ..... 32 V

Environment/EMC

EMC ..... see CE declaration
Operating temperature ..... -30 . . . +70 °C

Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3) ..... 3K23 (except condensation and formation of ice)
Transport (IEC 60721-3-2) 2K11
Long-term storage (IEC 60721-3-1) 1K21

Classification of mechanical conditions acc. to IEC 60721:
Stationary use (IEC 60721-3-3) 3M11
Transport (IEC 60721-3-2) 2M4
Long-term storage (IEC 60721-3-1) 1M12

Connection

Connection cable RJ45
Max. connection cable length ..... < 3 m
Connection type (terminal block C) ..... push-wire terminal

Connection specifications:
rigid /flexible ..... 0.2 . . . 1.5 mm² (AWG 24 . . . 16)
flexible with ferrule without plastic sleeve ..... 0.25...1.5 mm² (AWG 24 . . . 16)
flexible with ferrule with plastic sleeve ..... 0.14...0.75 mm² (AWG 24 . . . 20)
Stripping length ..... 10 mm
Opening force ..... 0.5 - 0.6 Nm (4 - 5 lb-in)
Connection type (terminal block A and B) ..... push-wire terminal

Connection specifications:
rigid /flexible ..... 0.2 . . . 2.5 mm² (AWG 24 . . . 12)
flexible with ferrule without plastic sleeve ..... 0.25...2.5 mm² (AWG 24 . . . 14)
flexible with ferrule with plastic sleeve ..... 0.25 . . . 1.5 mm² (AWG 24 . . . 16)
Stripping length ..... 7 mm

Other

Operating mode ..... continuous operation
Degree of protection IP20
DIN rail ..... IEC 60715
Weight ..... 160 g

* Surge test is carried out at Phoenix power supply STEP-PS/1AC/12DC/1.5. The 12V cable length is less than1 meter.

7.2 Standards, approvals, certifications

The charge controller has been developed in compliance with the following standards:

- EN 50581: 2012
- EN 61851-1: 2011
- EN 301 489-1: V2.2.0 Draft
- EN 301 511 V12.5.1
- EN 301 908-13 V11.1.2
- EN 62311: 2008
- EN 61851-22: 2002
- EN 301 489-52 V1.1.0 Draft
- EN 301 908-1 V11.1.1

7.3 Declaration of conformity

Bender GmbH & Co. KG
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BENDER
The Power in Electrical Safety

CE

EU-Konformitätserklärung
EU-Declaration of Conformity

Hersteller: **Bender GmbH & Co. KG**
Manufacturer:

erklärt in alleiniger Verantwortung, dass das Produkt
declare under our sole responsibility that the product

Produktbezeichnung: **Ladekontroller CC612-4G (siehe Anlage)**
Product name: *Charge Controller CC612-4G (see annex)*

auf das sich diese Erklärung bezieht, mit den Vorschriften folgender Europäischen Richtlinien übereinstimmt.
to which this declaration relates, is in conformity with the following European directives.

Richtlinien: *Directives:*	**2011/65/EU**	**RoHS-Richtlinie**	*RoHS directive*
	2014/53/EU	**RED-Richtlinie**	*RED directive*

Zur Beurteilung der Konformität wurden folgende Normen herangezogen:
The assessment of this product has been based on the following standards:

Angewandte Normen / *Applied standards:*

EN IEC 63000	**:2018**	**EN IEC 62311**	**:2020**
EN IEC 61851-1	**:2019**	**EN 61851-22**	**:2002**
EN 301 489-1	**V2.2.3**	**EN 301 489-52**	**V1.1.0 Draft**
EN 301 511	**V12.5.1**	**EN 301 908-1**	**V13.1.1**
EN 301 908-13	**V13.1.1**	**EN 301 908-2**	**V13.1.1**

Grünberg, den 10.12.2020

(H. Nowicki, CSO) (J. Schäfer, Quality Manager)

Anmerkung: Die Anlagen sind Bestandteil dieser EU-Konformitätserklärung.
*Evtl. Normen Einschränkungen sind gerätespezifisch in der Typenliste gekennzeichnet.

Remark: *The annexes are part of this EU declaration.*
**Limitation of standards are marked with a sign in the attached type list.*

7.4 Ordering details

Type	Modem	Meter	RDC-M	PLC*	User interface	LED	Art.-No.	Manual-No.
CC612 -1M4PR	4G	eHZ-, S0-inteface	✓	✓	✓	Ready, Alarm, PLC	B94060011	D00325
CC612 -2M4PR	4G	Modbus, S0-interface	✓	✓	✓		B94060013	D00325
CC612 -1S0PR	---	eHZ-, S0-interface	✓	✓	✓		B94060005	D00325
CC612 -2S0PR	---	Modbus, S0-interface	✓	✓	✓		B94060007	D00325
CC612 -2M4R	4G	Modbus, S0-interface	✓	---	✓	Ready, Alarm	B94060015	D00325
CC612 -2S0R	---	Modbus, S0-interface	✓	---	✓		B94060010	D00325

** Powerline Communication acc. to ISO/IEC 15118*

For further variants, refer to our website.

The charge controller with residual direct current monitoring module (RDC-M) only works in combination with the measuring current transformer (to be ordered separately).
Different cable lengths are available.

Accessories	Art.-No.	Manual-No.
RFID114 with RJ45 cable (length 500 mm)	B94060114	D00328
RFID117-L1 with RJ45 cable (length 500 mm)	B94060117	D00422
Measuring current transformer CTBC17 (PCB variant)*	B98080070	D00421
Measuring current transformer CTBC17 (cable variant, cable length 325 mm)*	B98080071	D00421
Connection cable CTBC17-Cable1470 incl. clip housing (cable length 1470 mm)	B98080542	D00421
Connection cable CTBC17-Cable 325 incl. clip housing (cable length 325 mm)	B98080541	D00421
Connection cable CTBC17-Cable 180 incl. clip housing (cable length 180 mm)	B98080540	D00421
DPM2x16FP (display moduel)	B94060120	D00296

**Internal diameter: 15 mm*

7.5 Document revision history

Date	Document version	Valid from software version	State/Changes
10/2019	05	---	
06/2021	06		Added: Chapter 2.3.1 / Chapter 4.2.1.8: Residual direct current monitoring modulel (RDC-M) Changed: Content to IEC 62955, new layout, all graphics Deleted: Chapter 6.2 Register card State Chapter 6.3 Register card Settings Chapter 6.4 Operator Chapter 6.5 Manufacturer
10/2022	07		Changed: Wiring diagrams

BENDER
The Power in Electrical Safety©

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