SIEMENS

# Electrical Charging Components

# SIPLUS ECC2000
# Charging controller CM-230

Operating Instructions


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## Legal information

### Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

**⚠ DANGER**

indicates that death or severe personal injury **will** result if proper precautions are not taken.

**⚠ WARNING**

indicates that death or severe personal injury **may** result if proper precautions are not taken.

**⚠ CAUTION**

indicates that minor personal injury can result if proper precautions are not taken.

**NOTICE**

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

### Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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### Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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# Introduction 1

## 1.1 About this documentation

### Purpose of this documentation

These Operating Instructions contain all the information you need for commissioning and using the CM-230 charging controller.

It is intended for use by electrically skilled persons who commission the device.

### Scope of validity of this documentation

This documentation is valid for all components of the SIPLUS ECC product line specified in these operating instructions and describes the delivery condition as of October 2012.

### The described product is based on the following standard

IEC 61851-1:2001, EN 61851-1:2011: Charging mode 3

In addition, functional expansions of draft IEC 61851-1:2010 are supported in charging mode 3 for connecting cables without proximity switches.

IEC 61010-1:2001 (2nd Ed.) with Corr. 1; EN 61010-1:2001 (2nd Ed.) and DIN EN 61010-1:2002 with "Correction 1": Safety

### History

Previous editions of these Operating Instructions:

| Edition | Comment |
|---|---|
| 04/2011 | First edition |
| 07/2012 | Firmware update |
| 10/2012 | Addition of version CM-230-C |

## 1.2 Recycling and disposal

The devices of the SIPLUS ECC product line are ecologically compatible, and thus suitable for recycling. For environmentally compliant recycling and disposal of your electronic waste, please contact a company certified for the disposal of such waste.

# Safety instructions

# 2

This device corresponds to the approvals printed on the type plate. If you have questions about the validity of the installation in the planned environment, please contact your service representative.

**⚠ WARNING**

**Electric shock hazard**

**May cause death or serious injury**

Contact with live components can result in serious injuries. Disconnect the system and all devices from the power supply before starting work.

## Connection via safety extra-low voltage

**⚠ WARNING**

**Electric shock hazard**

**May cause death or serious injury**

Connect the 24 V device only via safety extra-low voltage/protective extra-low voltage

The device is designed for operation using directly connectable safety extra-low voltage (SELV) or protective extra-low voltage (PELV).

Failure to observe this notice can result in electric shock or damage to property.

For this reason, only safety extra-low voltages (SELV) according to IEC 60950-1 / EN 60950-1 / VDE 0805-1 or protective extra-low voltages (PELV) according to EN 50178 may be connected to the power supply connections.

**Note**

When the CM-230 is connected to a safety extra-low voltage (SELV), it becomes a protective extra-low voltage (PELV). The physical connection point between ground (M connection) and PE (FE connection) is established through the device in accordance with the IEC 61851 standard.

It is necessary to check whether the connection between PE and 24 V ground has effects on other sections of the system.

## Grounding

**⚠ WARNING**

**Electric shock hazard**

**May cause death or serious injury**

In order to avoid the risk of electric shock, a SELV or PELV power supply must be used for the digital inputs.

If a power supply that does not meet the SELV or PELV requirements is used, dangerous voltages can occur on exposed parts.

Use only floating, safely isolated switching contacts for activating the inputs.

Failure to observe this notice can result in electric shock or damage to property.

## Fuses

**⚠ WARNING**

**Fire risk due to inadequate fuses**

**May cause death or serious injury**

The internal fuses are designed only to protect the device itself. The system installer and plant operator are responsible for the necessary line protection.

The relay outputs are not fused within the device.

Without appropriate protection of the relay outputs, overloading can cause unwanted heat generation or even fire.

The relay outputs are to be fused externally by the plant constructor.

## Digital inputs

**⚠ WARNING**

**Electric shock hazard**

**May cause death or serious injury**

In order to avoid the risk of electric shock, a SELV or PELV power supply must be used for the digital inputs.

If a power supply that does not meet the SELV or PELV requirements is used, dangerous voltages can occur on exposed parts.

The digital inputs are designed for an input voltage of 24 V DC and are isolated. This is, however, only a purely functional isolation for the internal logic. For this reason, only safely isolated potential circuits (SELV) can be connected at the digital inputs.

## Repairs

Repairs are not permitted. Defective devices must be disposed of in compliance with environmental requirements.

| ⚠ WARNING |
| --- |
| **Electric shock hazard**<br>**May cause death or serious injury**<br>Unauthorized opening of the device might place the user in danger or result in substantial damage to property. |

| NOTICE |
| --- |
| **Invalidation of the manufacturer's warranty due to unauthorized alterations to the device**<br>Alterations to the devices are not permitted. Failure to observe this requirement shall constitute a revocation of the manufacturer's warranty. |

# Description

# 3

The CM-230 charging controller is part of the SIPLUS ECC2000 (Electrical Charging Components) product line. CM-230 is a product which is intended for use in charging stations for electric vehicles. The CM-230 charging controller is available in three device versions.

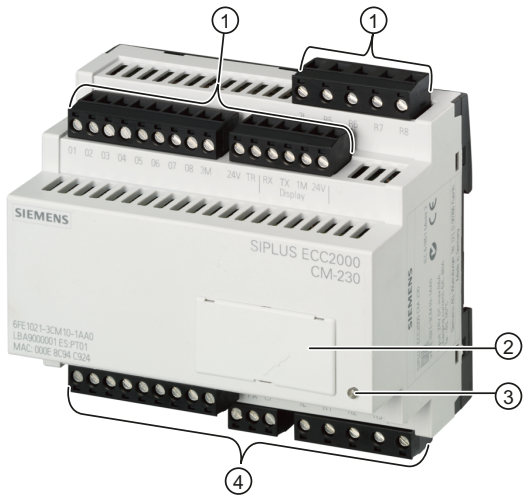
## 3.1 The CM-230 device versions at a glance

The following table details the main features of the CM-230 device versions:

| | CM-230 standalone | | CM-230 managed |
|---|---|---|---|
|  SIPLUS CM-230 | **CM-230 (standard)** | **CM-230-C (compact)** | |
| | The device itself controls a charging point according to IEC 61851. The control system response can be influenced by parameter settings via Ethernet. | | The device operates as a remote I/O control for a controller that controls the charging point via the CM-230 charging controller according to IEC 61851. |
| **Area of application** | • Communication with the electric vehicle in accordance with IEC 61851, charging mode 3<br>• Controlling the charging procedure of electric vehicles | | |
| **Communication** | Ethernet (10/100 Mbit/s) | | |
| **Load management** | Dynamic specification of charging current during operation | | |
| **Heating controller, monitoring of temperature and humidity** | ✓ | -- | ✓ |
| **TCP/IP addressing** | | | |
| • By means of DHCP/DCP | ✓ | ✓ | ✓ |
| • By means of DIP switches | ✓ | -- | ✓ |
| **Diagnostic functions** | Diagnostics via LED, web interface for diagnostics and parameter assignment | | |
| **Digital inputs** | 8 digital inputs 24 V DC, of which 3 are user-assignable | | |
| **Digital outputs** | 8, of which 3 are user-assignable | | |
| **Relays** | 8 relays, of which 3 are freely usable | | |
| **Mounting** | Mounting onto standard rail according to DIN EN 60715 | | |
| **Connection** | Wiring to removable terminals | | |

# 3.2 Structure

## Structure

| CM-230 charging controller | Item | Description |
|---|---|---|
|  | ① | Connecting terminals<br>• Trip signal (depending on model)<br>• RS232 interface<br>• Digital outputs<br>• Relay contacts |
| | ② | Service cover |
| | ③ | LED for displaying the operating state |
| | ④ | Connecting terminals<br>• Operating voltage input<br>• Vehicle interface<br>• Digital inputs<br>• Relay contacts<br>• Ethernet port (RJ-45) |

# 3.3 Ordering data

| Device version | Order No. |
|---|---|
| Standalone | 6FE1021-3CM10-2AA0 |
| Managed | 6FE1021-3CM10-1AA0 |
| Compact | 6FE1021-3CM10-3AA0 |

# 3.4 Application examples

Below, you will see schematic application examples of an EV charging post with CM-230 device versions and other Siemens components.

## 3.4.1 Standalone version

### Single charging point with (optional) integration via Ethernet for evaluation/diagnostics

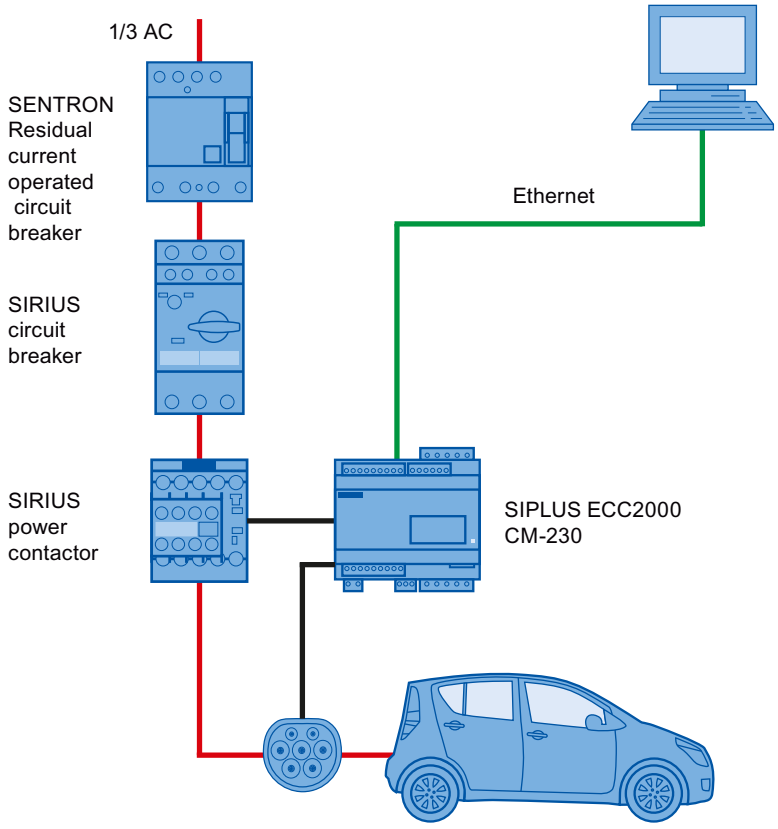



Figure 3-1 Application example of single charging point, standalone version

### 3.4.2 Managed version

**Multiple charging point with (optional) integration via Ethernet for evaluation/diagnostics**

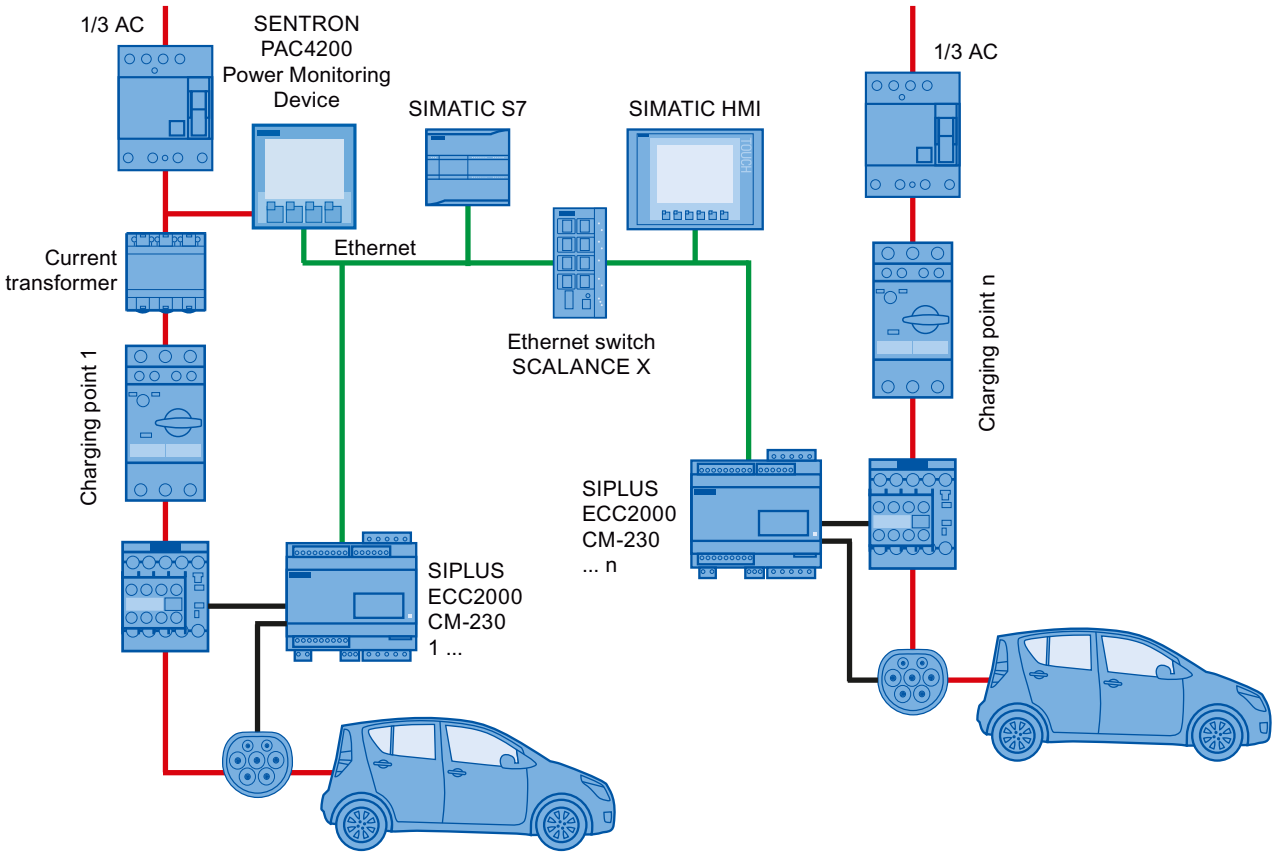



Figure 3-2 Application example of multiple charging point, managed version

## 3.5 Communication concept - controllers

Communication is based on the TCP/IP protocol and is implemented according to the client/server principle. The client (controller) sets up the connection and sends a request that the server (CM-230) answers within a specified time. A new request must not be sent until an answer is received.

You can find a detailed description of the communication protocol on the Internet (http://support.automation.siemens.com/WW/view/en/50739848).

There is a communication block / driver for integrating the CM-230 charging controller into SIMATIC S7 PLCs. You can also download this from the Internet (http://support.automation.siemens.com/WW/view/en/46476435/130000).

For more detailed information on the communication block and for integrating alternative controllers, please contact the following support address via E-mail (mailto:siplus-ecc.industry@siemens.com).

# 3.6 LED display

The CM-230 has an LED for displaying operating states and error states.

The LED can be lit in green, orange, or red.

The meaning of the individual LED displays is shown in the following tables:

## 3.6.1 Operating states

### Standalone version

| Signal LED | Description of operating state |
|---|---|
| Continuous OFF | Device is not active: Switched off or in the power-up phase |
| Orange flashing 5 Hz | Charging controller in the "Charging post preheating" state |
| Orange flashing 1 Hz | Charging controller in "Wait for enable" state |
| Green flashing 5 Hz | Waiting for connection of charging cable |
| Green flashing 1 Hz | Waiting for vehicle readiness |
| Green continuous ON | Device charging |
| Flashing red 5 Hz | Device in the "Emergency unlocking" state |
| Alternate red/green flashing 1 Hz | LED has been switched to test mode for device identification via Ethernet |

### Managed version

| Signal LED | Description of operating state |
|---|---|
| Continuous OFF | Device is not active: Switched off or in the power-up phase |
| Flashing red 5 Hz | Network configuration running or waiting for address assignment |
| Flashing red 1 Hz | Device is not connected to the Ethernet (link status negative) |
| Green flashing 1 Hz | Device ready/waiting for connection to client |
| Green continuous ON | Device is in operation |
| Alternate red/green flashing 1 Hz | LED has been switched to test mode for device identification via Ethernet |

### LEDs on the Ethernet connection (RJ45 socket)

| LED | Description of operating state |
|---|---|
| Green | Link status |
| Yellow | Activity |

**Note**

**Device identification using Primary Setup Tool**

You can use the Primary Setup Tool for device identification. You can use this tool to make the green "Link Status" LED flash.

You can download the Primary Setup Tool free of charge from the support page. For more information, see Addressing via DCP (Page 62).

## 3.6.2 Troubleshooting

### Standalone version

| LED | Fault/cause | Fault rectification |
|---|---|---|
| Off | LED remains off after applying the operating voltage | Charging controller defective ⇒ Replace charging controller |
| Red 1 flash, pause | Pilot signal short-circuit | Resolve short-circuit<br>Cause may be located in charging device, cable or connected vehicle |
| Red 2 flashes, pause | Pilot signal invalid | Charging cable or connected vehicle defective |
| Red 3 flashes, pause | Fault in residual current operated circuit breaker (if parameterized):<br>The RCCB has tripped. | Clear RCCB fault and reactivate RCCB. |
| Red 4 flashes, pause | Fault in line protection switch (if parameterized):<br>The line protection switch has tripped. | Clear line protection switch fault and reactivate line protection switch. |
| Red 5 flashes, pause | Undertemperature/overtemperature fault<br>Charging system (if parameterized):<br>The ambient temperature is outside the permissible operating range of the charging system. | • Correctly parameterize the shutdown thresholds<br>• Bring ambient temperature within operating range (cooling or heating) |
| Red 6 flashes, pause | Humidity fault in charging system (if parameterized):<br>The humidity is outside the permissible operating range of the charging system. | • Correctly parameterize the shutdown thresholds<br>• Bring air humidity within operating range of the charging system (dehumidify, heat) |
| Red 7 flashes, pause | Fault, incorrect charging cable, charging cable inadequately dimensioned (line protection) | Use adequately dimensioned charging cable. |

## Managed version

| LED | Fault/cause | Fault rectification |
|---|---|---|
| Off | LED remains off after applying the operating voltage | Charging controller defective ⇒ Replace charging controller |
| Orange | No valid firmware loaded in the device | Download firmware image via FTP |

# Functions

# 4

## 4.1 General functions

### Pilot circuit

The pilot circuit is used for the bi-directional exchange of information between the charging station and the vehicle.

Via this signal, the charging station indicates to the vehicle the maximum permitted charging current which the vehicle can call up. The operational readiness of the charging station is also indicated.

The vehicle indicates the charging states defined in standard IEC 61851 to the charging station by means of this signal: Connector plugged in, ready to charge, charging, charging with ventilation.

### Proximity

The CM-230 detects the maximum current carrying capacity of the connected charging cable by means of the proximity signal. The charging output is only activated if the current carrying capacity of the charging cable is greater than or equal to the maximum charging current that is coded in the pilot signal.

### Ethernet interface

CM-230 is equipped with an Ethernet interface. Depending on the device version, the Ethernet interface has the following functions:

| | Function | Standalone version | Managed version |
|---|---|---|---|
| **TCP control interface** | I/O control | ✓ | ✓ |
| | Diagnostic information | ✓ | ✓ |
| | Parameterization | ✓ | -- |
| **FTP interface** | Firmware update | ✓ | ✓ |
| **HTTP interface** | HTTP interface for accessing the web interface through a browser (e.g. IE 9) | ✓ | ✓ |

# 4.2 Functions of standalone version

## 4.2.1 Functional principle of standalone version

The CM-230 charging controller controls a charging point autonomously according to IEC 61851. The device also has an Ethernet connection for parameter assignment/diagnostic purposes (Ethernet interface) or connection of a higher-level controller. Free inputs/outputs can be operated by a higher-level controller.

The status model can be influenced by setting parameters at the following positions:

| Parameterizable functions | CM-230 | CM-230-C |
|---|---|---|
| Heating controller | ✓ | Not available |
| Temperature monitoring | ✓ | Not available |
| Humidity monitoring | ✓ | Not available |
| Circuit breaker monitoring | ✓ | ✓ |
| RCCB monitoring | ✓ | ✓ |
| Emergency unlocking | ✓ | ✓ |
| Electrical system parameters | ✓ | ✓ |

## Typical charging sequence

| Process step | | Description |
|---|---|---|
| 1 | Initialization | After the operating voltage has been applied, the CM-230 charging controller performs initialization and function tests. |
| | Monitoring of activation temperature / air humidity (not for CM-230-C) | If the heater controller is activated, a check is first made as to whether the configured activation temperature/air humidity has been reached. If not, the heating (terminal HT) is switched on. Provided the minimum temperature/air humidity has been reached, the controller waits for enabling. |
| 2 | Enable | The CM-230 charging controller is enabled when High level (H) is detected at the input (terminal EN). The controller can also be enabled by a higher-level controller if appropriately parameterized.<br>As long as the controller has not been enabled or an error state has been detected, state F (see table below: "States of the charged vehicle according to IEC 61851") is output via the pilot signal. |
| 3 | Connection of charging cable | In the enabled state, the controller waits for a charging cable or vehicle to be connected (state A). |
| 4 | Interlock | If a valid charging cable has been connected (see "Proximity" in Section General functions (Page 19)) and a vehicle has signaled state B, the controller activates the interlocking output H.<br>The controller detects whether the interlock has been activated by means of the High signal level at input HL. If no locking mechanism is implemented, HL must be permanently connected to 24 V.<br>If, during the charging process, the controller detects that the interlock is no longer active, the charging process is canceled. |
| 5 | Enable charging point P | After locking, the charging point P is released if the vehicle signals state C. If state D is signaled, fan enable V is activated in addition.<br>The charging process is activated. The maximum current which can be released is specified via the pilot signal. It can be between 6 A and 80 A. |

**⚠ WARNING**

**Suffocation hazard when charging indoors**

Without ventilation, a danger of suffocation can arise when charging indoors due to gas build-up in the batteries being charged.

If the charging process takes place indoors, forced-air ventilation, which can be activated by the CM-230 devices depending on the vehicle requirement, should be installed according to IEC 61851. The SIPLUS CM-230 devices do not monitor the functionality of the forced-air ventilation.

## Error state – cancellation of charging process

In the error state, the charge enable P, the interlock H and the fan enable V are deactivated and the signaling contact S is activated.

The status contact of the line protection can be connected to the LS input. After appropriate parameter assignment, the 24 V level at this input signals an error in the line protection and the charging process is aborted.

The status contact of the RCCB can be connected to the FI input. After appropriate parameter assignment, the 24 V level at this input signals an error of the RCCB and the charging process is aborted.

An emergency unlocking contact can be connected to the EO input. After appropriate parameter assignment, a 24 V level at this input terminates the charging process and unlocks the charging cable.

## Device statuses

The following device statuses are signaled via the digital switching outputs. These switching outputs can be used, for example, for displays:

| | |
|---|---|
| O1 (RC) | Active if controller is ready to charge |
| O2 (E) | Active if error is present (identical to relay output S) |
| O3 (CS) | Active if charging cable is connected |
| O4 (V) | Active if a vehicle is connected (states B,C,D) |
| O5 (VC) | Active if a vehicle is charging (states C,D) |

## Vehicle statuses

Table 4- 1 Statuses of the charging vehicle according to IEC 61851

| State | Description |
|---|---|
| A | Vehicle is not connected |
| B | Vehicle is connected /<br>not ready for energy input |
| C | Vehicle is connected /<br>ready for energy input /<br>ventilation of the charging area in buildings is not required |
| D | Vehicle is connected /<br>ready for energy input /<br>ventilation of the charging area in buildings is required |
| E | Short circuit /<br>power supply disconnected from electric vehicle /<br>electricity is not available /<br>other voltage supply problem |
| F | Power supply is not available / other power supply problem |

## 4.2.2 Default state

### Definition of default state

The default state for the standalone version is defined as follows:

- Ethernet is ready for operation, TCP server is waiting for client connection
- Device LED: Signaling of error state
- Digital outputs: Low level
- Pilot signal PWM: - 12 V level (provided that the enable signal is not active)

For the standalone version, the presence of a valid Ethernet connection is not a prerequisite for operating the charging controller. Since the charging controller itself has its own sequence control and contains the necessary parameters, the charging process can also take place without an Ethernet connection.

Faulty communication such as invalid requests or CRC errors therefore have no effect on the operational readiness of the CM-230.

### Setting of default state

On the standalone version, the default state is set only if the charging controller is not ready for operation as a result of the following conditions:

- Power-up not in the valid range
- Climatic conditions are not within the valid range (not for CM-230-C)
- CM-230 is in the error state

### See also

Troubleshooting (Page 16)

## 4.2.3 Process data specification by controller

The standalone version of the CM-230 generally operates autonomously, even without a communication link to a higher-level controller. The communication connection is only necessary for state and diagnostics information or for influencing the charging sequence.

Two possible communication scenarios are outlined below.

### Process data specification by controller

| | |
|---|---|
| 1 | Connection setup by controller (client). |
| 2 | Optional: Configuration request |
| 3 | Parameter data request, e.g. enable charging controller (the enable is parameterized via a controller) and maximum current of 32 A. This request is sent cyclically so that a charging operation can be detected. |
| 4 | Charging process is detected |
| 5 | Charging current may be set within the range of 6 A to the parameterized "Maximum system current": New lower current value is specified in data message frame. |

### Parameter assignment by controller

| | |
|---|---|
| 1 | Connection setup by controller (client). |
| 2 | Optional: Configuration request |
| 3 | Parameter data request |
| 4 | Comparison of the response data with the request data; if they match, the data is correctly stored in the flash memory of the charging controller. |
| 5 | Connection cleared by controller (client). |

## 4.2.4 Parameterization of charging current

### Parameter "Maximum system current"

The parameter "Maximum system current" sets the maximum current-carrying capacity of the charging point.

The value of the parameter "Maximum system current" must correspond to the miniature circuit breaker used in the charging system. The system integrator is responsible for compliance with this requirement.

**⚠ WARNING**

**Material damage to the charging cable and personal injury due to combustion**

Excessively high currents in the charging branch can damage the charging cable and combustion may occur.

Ensure that the parameter "Maximum system current" corresponds to the miniature circuit breaker used in the charging system.

### Parameter "Maximum charging current"

The parameter "Maximum charging current" defines the maximum permissible current input for the electrical vehicle.

This parameter is transferred to the vehicle via the pilot signal.

With this parameter, the actual current input for the vehicle can be influenced even after a charging procedure has begun, e.g. for implementing load management functions.

The load management functions are performed by means of the communication described in the "Communication concept - controllers (Page 14)" section or the process data specification listed in the"Process data specification via controller (example) (Page 42)" section.

In the case of standard-compliant electric vehicles, it must be ensured that the current input does not exceed the set value for the parameter "Maximum charging current".

The parameter "Maximum charging current" must be less than or equal to the parameter "Maximum system current". Incorrect entries will be automatically reduced to the value "Maximum charging current".

Depending on the operating mode (see Operating modes (Page 26)), the current carrying capacity of the charging cable must be greater than, or equal to, the value set for the "Maximum Charging Current".

## 4.2.5 Operating modes

The response of the device with regard to activation of the switching outputs in accordance with the charging cable used is selected in the "Operation Mode" in the view Configuration. The following 3 operating modes are available:

- No automatic charging cable adaption (default setting)
- Automatic charging cable adaption
- Enable load port

### No automatic charging cable adaption

In operating mode "No automatic cable adaption", the switching output P1 / P is only enabled when the current carrying capacity of the charging cable is greater than or equal to the parameterized value"Maximum charging current". This principle is explained in the table below:

| Parameter "Maximum charging current" | Function possible with charging cable type |
|---|---|
| 13 A | 13 A, 20 A, 32 A, 63 A |
| 20 A | 20 A, 32 A, 63 A |
| 32 A | 32 A, 63 A |
| 63 A | 63 A |

### Automatic charging cable adapation

In operating mode "Automatic charging cable adaption" the parameter "Maximum charging current" is reduced, if necessary, to the value for the connected cable, transferred to the electric vehicle, and switching output P / R1 is activated.

#### Notes on line protection

If a miniature circuit breaker with a fixed characteristic is installed in the charging station (e.g. for 32 A), the line protection cable will be inadequate if charging cables of a lower current carrying capacity are used. You must ensure that only charging cables are used that can be protected by the installed miniature circuit breaker.

The following table shows the permissible combinations of line protection / charging cable type in operating mode "Automatic charging cable adaption".

| Line protection used / parameter "Maximum system current" | Charging cable type / current carrying capability |
|---|---|
| 13 A | 13 A, 20 A, 32 A, 63 A |
| 20 A | 20 A, 32 A, 63 A |
| 32 A | 32 A, 63 A |
| 63 A | 63 A |

**⚠ WARNING**

**Material damage to the charging cable and personal injury due to combustion**

Excessively high currents in the charging branch can damage the charging cable and combustion may occur.

Operating mode "Automatic charging cable adaption" does not provide any line protection functions. Take appropriate measures (e.g. additional current monitoring, adaptive line protection, connection of unsuitable charging cable types) to ensure that line protection in compliance with the standards is assured. It is the responsibility of the system integrator to ensure compliance.

## Enable load port

In operating mode "Enable load port", different switching outputs are activated in accordance with the type of charging cable detected. The following relationship holds:

| Current carrying capacity of charging cable | Activated switching output |
|---|---|
| 13 A | P / R1 |
| 20 A | R6 |
| 32 A | R7 |
| 63 A | R8 |

**⚠ WARNING**

**Material damage to the charging cable and personal injury due to combustion**

Excessively high currents in the charging branch can damage the charging cable and combustion may occur.

Ensure that appropriate line protection components have been implemented in the respective charging point. The system integrator is responsible for compliance with this requirement.

The graphic below shows an example configuration of a charging point that can be used with a 13 A or 32 A charging cable.

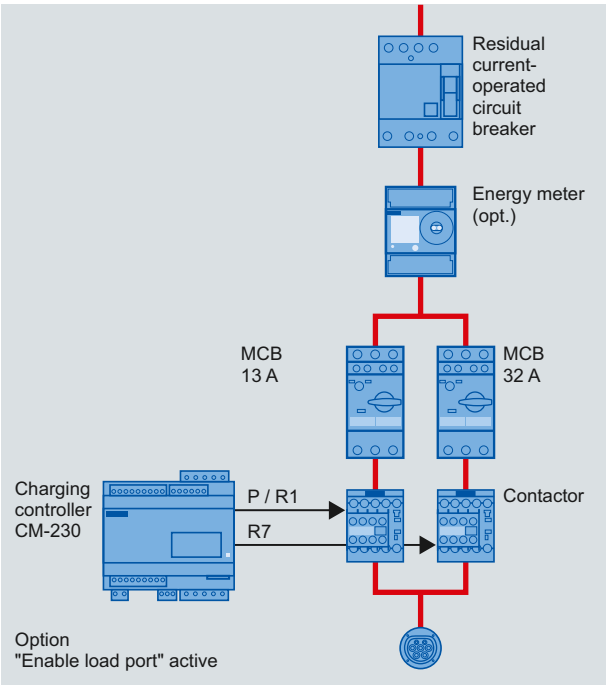



Figure 4-1 Block diagram for load management

## Comparison of operating modes

| Operating mode | Advantages | Disadvantages: | Comment / Use Case |
|---|---|---|---|
| No automatic charging cable adaption | • Reliable system response regardless of the charging cable used<br>• Simple, cost-effective system configuration | • Charging procedure is enabled only when the correct charging cable is used | • Home Charging / when the charging cable used is recognized |
| Automatic charging cable adaption | • Charging function is possible with all charging cable types | • If no additional protection / monitoring measures are taken, unstable system states are possible | • Test and commissioning / complex multi-charging systems with monitoring mechanisms |
| Enable load port | • System design can be implemented for the charging cable types to be supported using standard miniature circuit breakers | • Large space requirement – one miniature circuit breaker for each cable type to be supported | • Public charging systems / charging cable used not recognized<br>• Home-Charging / when the charging cable used is recognized |

## 4.2.6 Parameterization of the heating function (not for CM-230-C)

### Parameters of the heating function

If the heating function is enabled by means of parameterization, it is operated according to the following rules.

The device / the charging post is only ready for operation (after switching on), if:

- TempLS > Temp HeaterOff parameter
- Humidity < Humidity parameter error

During operation, the heating is always switched on if:

- TempLS < Temp HeaterOn parameter
- Humidity > Humidity parameter error

In all other cases the heating is switched off.

## 4.2.7 Configuration website explanations

### Configuration

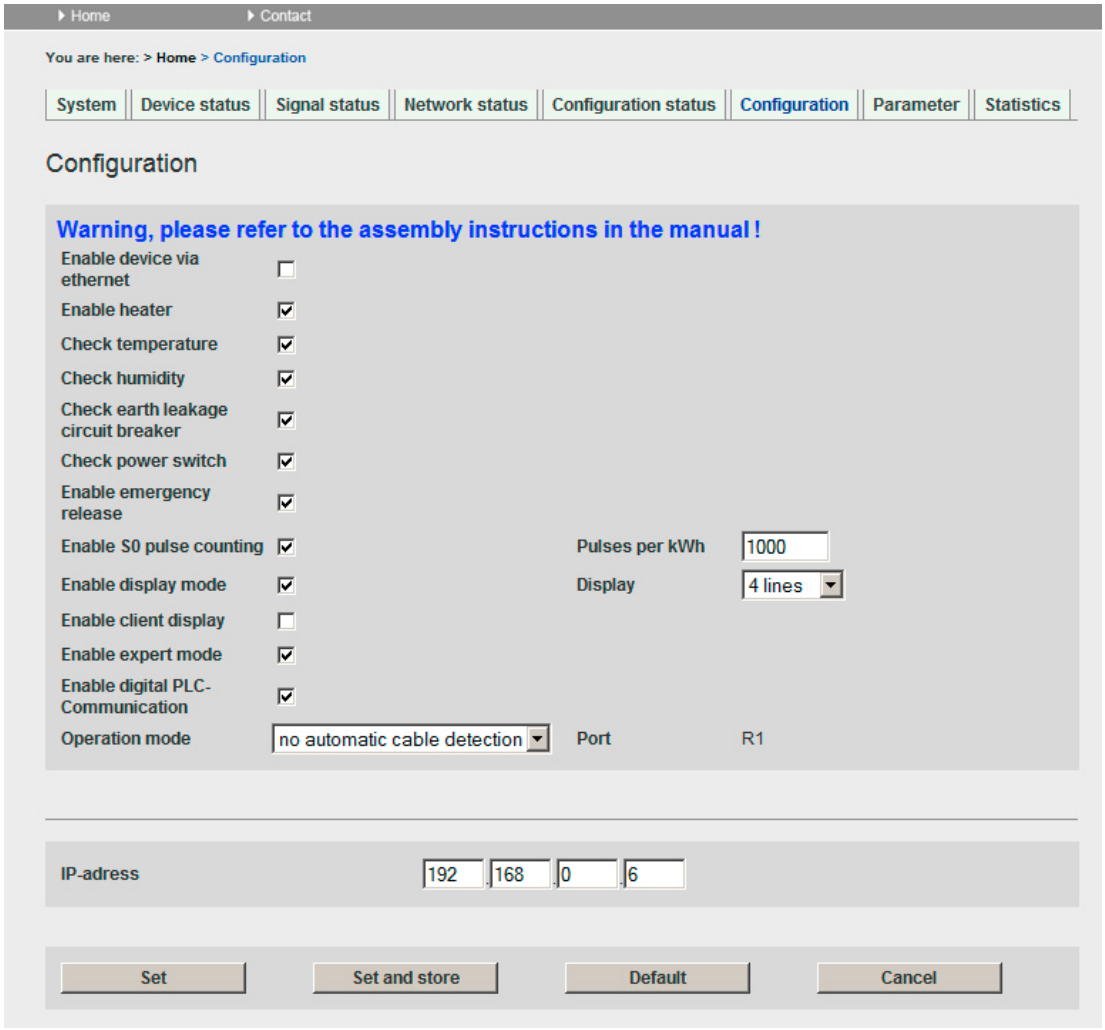



Figure 4-2 Configuration menu

### Enable device via Ethernet

Activate access/enable via Ethernet interface. Enabling must then be performed via Ethernet.

**Note**

If enabling is parameterized via the Ethernet interface, the charging procedure will be interrupted if there is no LAN connection:
- Unplug LAN cable
- Remove function block for S7 start
- Protocol timeout, if a timeout has been set; charging procedure will only start again following another enable (edge).

### Enable heater (not for CM-230-C)

Enable relay output for heater (HT).

The CM-230 charging controller activates "HT" when the measured temperature lies below the set limit "Temperature heater on" (see Explanations of parameter web page (Page 35)). The charging procedure is not interrupted.

HT is deactivated when the measured temperature lies above the set limit "Temperature heater off".

The CM-230 charging controller activates "HT" when the measured temperature lies below the set limit "Temperature heater on" at power-on (see Folder parameter). Charging will only start when the measured temperature is above the set limit value "Temperature heater off".

LED indication: Flashes orange at 5 Hz

### Check temperature (not for CM-230-C)

Activate temperature monitoring.

The CM-230 charging controller interrupts the charging procedure and indicates a fault (F) when the measured temperature lies outside the set limits ("Error over temperature on" or "Error under temperature on", see Explanations of parameter web page (Page 35)). When the measured temperature falls below or rises above the "Error over temperature off" or "Error under temperature off" set limits, the charging procedure starts again.
LED indication: 5 flashes red, pause

### Check humidity (not for CM-230-C)

Activate air humidity monitoring.

The CM-230 charging controller interrupts the charging procedure and indicates a fault (F) when the measured air humidity lies above the set limit "Error humidity on" (see Explanations of parameter web page (Page 35)). When the measured humidity falls below the set limit "Error humidity off" (see Folder parameter), charging is restarted.

LED indication: 6 flashes red, pause

### Check earth leakage circuit breaker

Activate RCCB monitoring.

The signaling contact of the RCCB used can be connected to digital input I4 (FI). The CM-230 charging controller interrupts the charging procedure and indicates a fault (F). When the fault is no longer present, charging is restarted.

LED indication: 3 flashes red, pause

### Check power switch

Activate monitoring of miniature circuit breaker.

The signaling contact of the MCB used can be connected to digital input I3 (LS). The CM-230 charging controller interrupts the charging procedure and indicates a fault (F). When the fault is no longer present, charging is restarted.

LED indication: 4 flashes red, pause

### Enable emergency release

Activate emergency unlocking.

A signal on input I5 (EO) sets the CM-230 charging controller to the emergency release state and remains there. Charging is interrupted and no fault (F) is indicated.

To restart the charging process, the enable (input: EN) has to be set again.

LED indication: Flashing red, 5 Hz

### Enable S0 pulse counting (S0 counter)

An S0 pulse signal connected to DI7 is evaluated when the function is configured.

Counting is implemented in the software, whereby an edge change 0 →1 is triggered at 250 µs intervals. This edge causes incrementation of the counter. Up to 2000 pulses/s can be detected in this way.

### Enable Display Mode

Activate RS232 interface.

The CM-230 charging controller supports 2-line and 4-line displays (20 characters per line) as well as one terminal for status signal output.

The interface parameters are permanently set:

| Output | Baud rate | Stop bit | Parity |
|---|---|---|---|
| 2-line | 9600 | 1 | None |
| 4-line | 38400 | 1 | None |
| Terminal | 115200 | 1 | None |

The parameters of the RS232 interface are displayed in expert mode in the "Configuration status" menu.

### Enable client display

User-defined texts can be displayed on a connected client (see RS232 interface (Page 57)).

### Enable expert mode

When expert mode is activated, further parameterization options are displayed in the web view. These are not normally required in a standard application and are therefore usually not visible.

### Enable digital PLC communication

Activate communication to ISO/IEC 15118 on the device (see section Digital communication according to ISO/IEC 15118 (Page 38)).

### Operation mode

The following three operating modes can be set:

- No automatic charging cable adaptation (default setting)
- Automatic charging cable adaptation
- Enable load port

You can find more detailed information on the operating modes in the Operating modes (Page 26) section.

### IP address

Display IP address of the device. For information about assigning/parameterizing IP addresses, see the TCP/IP addressing (Page 59) section.

## Notes on operation

| Button | Description |
|---|---|
| Set | The values are accepted into the cycle, but not stored in flash memory. |
| Set and Store | The values are accepted into the cycle and stored in flash memory. |
| Default | The default values (factory settings) are provided on the website. The displayed values can be loaded using "Set" and "Set and Store". |
| Cancel | The entries are discarded and the currently active values are displayed. |

In the case of the actions "Set" and "Set and Store", the input values are checked for plausibility and range limits.

Incorrect inputs are reset to default values.

After the action, the valid values for the process cycle are displayed.

## 4.2.8 Explanations of parameter web page

### Explanations of parameter web page

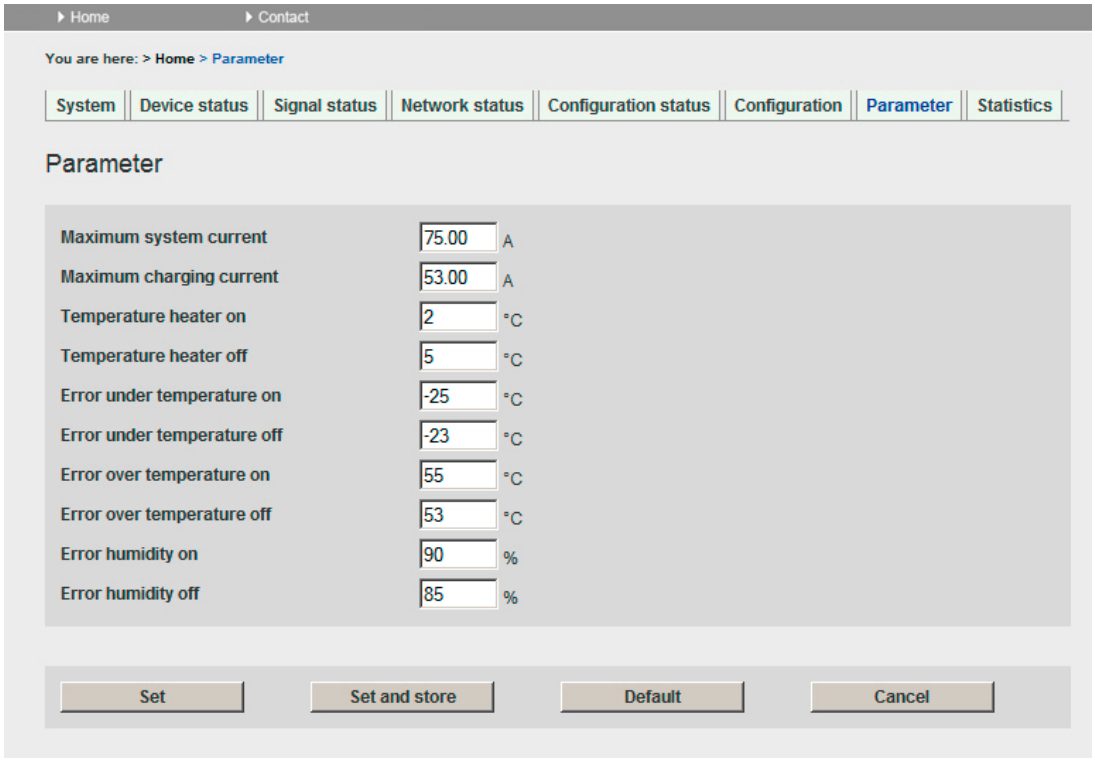



Figure 4-3 Parameter web page

### Maximum system current

Input of the maximum current for the charging branch.

The maximum possible current for the charging structure is set here (in accordance with the line protection for the branch).
The following condition must be fulfilled: 6 A ≤ Maximum current for charging branch ≤ 80 A

### Maximum charging current

Input of the maximum charging current
The following condition must be fulfilled: 6 A ≤ Maximum charging current ≤ 80 A

**Note**

If a value is entered that is too high, it is automatically limited to the maximum current for the charging branch by the CM-230 charging controller. If this value is higher than that of the connected charging cable, the CM-230 will limit the charging current (PWM signal) to the current-carrying capacity of the charging cable.

**Note**

After power up, the applicable charging current value is the last value stored in the flash memory (e.g. default value 13 A).

Change the level of charging current: "Set and store" the new value, or change it dynamically via the client interface.

### Temperature heater on

Value that must be undershot before the heater is activated.

The value must lie between -25 °C and 85 °C.

The following condition must be fulfilled: <Temperature heater on> ≤ <Temperature heater off>

### Temperature heater off

Value that must be overshot before the heater is deactivated.

The value must lie between -25 °C and 85 °C.

The following condition must be fulfilled: <Temperature heater off> ≥ <Temperature heater on>

### Error under temperature on

Threshold that must be undershot before the fault is triggered.

The value must lie between -25 °C and 85 °C.
The following condition must be fulfilled: "<Error under temperature on> ≤ <Error under temperature off>

### Error under temperature off

Threshold that must be overshot before the fault is deactivated.

The value must lie between -25 °C and 85 °C.
The following condition must be fulfilled: <Error under temperature off> ≥ <Error under temperature on>

### Error over temperature on

Threshold that must be overshot before the fault is deactivated.

The value must lie between -25 °C and 85 °C.
The following condition must be fulfilled: <Error over temperature on> ≥ <Error over temperature off

### Error over temperature off

Threshold that must be undershot before the fault is triggered.

The value must lie between -25 °C and 85 °C.
The following condition must be fulfilled: <Error over temperature off> ≤ <Error over temperature on>

### Error humidity on

Input of a humidity value so that the CM-230 charging controller indicates the "Humidity" fault.
Precondition: Humidity monitoring is activated (see Configuration website explanations (Page 30)).

The value is entered in percent: 0 % ≤ value ≤ 100 %

The following condition must be fulfilled: <Error humidity on> ≥ <Error humidity off>

### Error humidity off

Input of a humidity value so that the CM-230 charging controller resets the "Humidity" fault.

The value is entered in percent: 0 % ≤ value ≤ 100 %

The following condition must be fulfilled: <Error humidity off> ≤ <Error humidity on>

## 4.2.9 Digital communication according to ISO/IEC 15118

Based on future standard ISO/IEC 15118, the CM-230-C charging controller is prepared for digital communication with the vehicle.

### Preconditions for activating communication

Before you can activate communication on the device in accordance with ISO/IEC 15118, digital communication must be installed (Powerline Communication PLC over the pilot CP), and must operate correctly via an external controller.

You can set the PWM to a fixed PWM ratio of 5% via the web interface.

### Activate communication

To activate this function, you must check the box in the "Configuration > Enable digital PLC-Communication (Page 30)" menu.

# 4.3 Managed version functions

## 4.3.1 Managed version functional principles

The managed version is used as a remote I/O device of a higher-level controller connected via Ethernet. The charging controller receives the following signals from the controller:

- Logic of the digital outputs
- Pilot current default
- Unlocking of trip signal

The charging controller sends the following signals to the controller:

- Status of the digital inputs
- Status of the vehicle interface (pilot, proximity)
- Status trip signal
- Ambient temperature of CM-230
- Ambient humidity of CM-230
- State of the charging controller

### Typical charging sequence

| Process step | | Description |
|---|---|---|
| 1 | Initialization | After the operating voltage has been applied, the charging controller performs initialization and function tests.<br>Provided no valid communication connection exists to a higher-level controller, all outputs of the device are deactivated. |
| 2 | Operation | After the connection has been established to the higher-level controller, the device records the status of the vehicle interface, of the inputs and sensors. By sending a process data request, the controller can control the outputs or read out the status information. |

**⚠ WARNING**

**Suffocation hazard when charging indoors**

Without ventilation, a danger of suffocation can arise when charging indoors due to gas build-up in the batteries being charged.

If the charging process takes place indoors, forced-air ventilation, which can be activated by the CM-230 devices depending on the vehicle requirement, should be installed according to IEC 61851. The SIPLUS CM-230 devices do not monitor the functionality of the forced-air ventilation.

## 4.3.2 Default state

### Definition of default state

The default state for the managed version is defined as follows:

- Ethernet is ready for operation, TCP server is waiting for a client connection, or possibly the termination of an existing connection.
- Trip cable: Active
- Device LED: Signaling of error state
- Digital outputs: Low level
- Pilot signal PWM: -12 V level

### Setting of default state

In the managed version, the default state is always set when no error-free connection to the control exists. A faulty connection can have the following causes:

- The controller (TCP Client) has not yet set up any connection with the CM-230 (TCP server) (phase of the system initialization or failure of the controller)
- A connection at TCP level has been aborted by the controller
- A connection at the TCP level has been aborted by CM-230 due to:
  - Timeout (controller)
  - Frame error (invalid data detected)

### See also

Troubleshooting (Page 16)

## 4.3.3 Trip

The CM-230 charging controller, as a managed version, is equipped with an additional signaling output, the trip signal. The trip signal can be used to implement the 100-ms shutdown of the charging process required in IEC Standard 61851, where signaling of this state via Ethernet and of the entire subsequent impact chain is too slow.

If the vehicle charging controller recognizes the need to shut down the charging process, the trip cable becomes active (low level). This signal can now be evaluated by the controller or it can influence the power outlet directly.

In parallel, the status of the trip signal is reported via the Ethernet communication.

The charging controller activates the trip cable until the controller causes the charging controller to cancel the signal via the communication. The effect of this procedure should be that a restart can only be caused via the controller.

### Workflow trip signal in the default state

| Process steps | |
|---|---|
| 1 | In the default state (e.g. no connection to the controller), the trip cable is activated in order to prevent activation of the charging process.<br>This state is retained until a fault-free connection of the controller has been established. |
| 2 | The controller switches off the trip again via the communication. |
| 3 | The controller can reactivate the charging process. |

### Workflow trip signal on completion of charging process

| Process steps | |
|---|---|
| 1 | The vehicle signals completion of the charging process by means of pilot and proximity signal. |
| 2 | CM-230 activates the trip cable. |
| 3 | The load outlet is isolated (by the controller if controller is evaluating trip, or directly if trip is acting on a circuit breaker). Trip remains active. |
| 4 | The controller switches off the trip again via the communication. |
| 5 | The controller can reconnect the load outlet. |

### Workflow trip signal in the event of an error

| Process steps | |
|---|---|
| 1 | The vehicle or charging cable signals an error by means of pilot or proximity signal. |
| 2 | CM-230 activates the trip cable. |
| 3 | The load outlet is isolated (by the controller if controller is evaluating trip, or directly if trip is acting on a circuit breaker). Trip remains active. |
| 4 | The controller switches off the trip again via the communication. |
| 5 | When the error event is no longer present, CM-230 resets the trip signal. |
| 6 | The controller can reconnect the load outlet. |

## 4.3.4 Process data specification via controller (example)

### Process data specification via controller (example)

| Process step | | Process data request | Process data response |
|---|---|---|---|
| 1 | Connection setup by controller (client). | | |
| 2 | Optional: Configuration request: Timeout 2 s, CRC enabled | | |
| 3 | No cable inserted. | Pilot signal static, current default 0 A, circuit breaker off | State A, no cable inserted |
| 4 | 32 A cable is connected. | Pilot signal static, current default 0 A, circuit breaker off | State invalid, 32 A cable inserted. |
| 5 | Charging in progress. | Pilot signal PWM, current specification 6-32 A, circuit breaker on | State B, C or D, 32 A cable inserted. |
| 6 | Cable is removed | Pilot signal PWM, current specification 6-32 A, circuit breaker on | State A, cable not connected |
| 7 | Cable is removed<br>(max. 100 ms elapses between steps 5 and 6) | Pilot signal static, current specification 0 A, circuit breaker off. | State A, cable not connected |

# Application planning

# 5

## Shipping

| NOTICE |
| --- |
| **Securing the device during transportation**<br>Transport the device only in the original packaging which will give it the necessary protection against shock and impact. |

## Scope of delivery CM-230

- CM-230 device
- 2-pole plug-in terminal block (for power supply)
- 3-pole plug-in terminal block (for vehicle interface)
- 2 x 5-pin plug-in terminal block (digital outputs relay)
- 2 x 9-pin plug-in terminal block (digital inputs or digital outputs)
- 6-pin plug-in terminal block (for trip (optional) or RS232 interface)
- Compact Operating Instructions

## Unpacking and checking the delivery

1. Unpack the device and the supplied components.
2. Make sure that the package is complete.
3. Check the device and the components for transport damage by visual inspection.

## Selection of the location of use

Make sure the permissible ambient temperature range of -25 °C to +55 °C is observed (see also section Technical data (Page 69)).

## Temperature/humidity sensors (not for CM-230-C)

The CM-230 devices are equipped with sensors for recording the ambient temperature and air humidity.

| NOTICE |
| --- |
| To guarantee proper functioning, care should be taken with the mounting location of the CM-230 or its parameter assignment, to ensure that the measured value recording or the triggered protective functions are designed according to the most critical plant components.<br>For example, free circulation air should be ensured at the ventilation slots in the relevant system area. The parameters (threshold values) must be selected so that they take into account any difference in temperature/humidity distribution in the system and the different environmental characteristics of system components.<br>Corresponding measurements and tests are recommended when defining the system. |

### Managed version

In the managed version, these measured values can be evaluated and processed by a higher-level controller, e.g. for system shutdown if these environmental parameters are outside the permissible system limits.

### Standalone version

In the standalone version these measured values are taken into account according to corresponding parameter assignment by the integrated execution system and on detection of illegal environmental values, corresponding functions are activated, e.g. activation of the heating contact or shutdown of the system.

To guarantee proper functioning, care should be taken with the mounting location of the CM-230 or its parameter assignment, to ensure that the measured value recording or the triggered protective functions are designed according to the most critical plant components. For this purpose, temperature measurements are recommended within the location of use, as well as a corresponding parameter setting.

# Mounting

# 6

## 6.1 Mounting onto standard rail

1. Clip the device ① vertically onto the horizontal DIN rail ②
2. Swing the device downward until the unlocking slider on the DIN rail clicks into place.

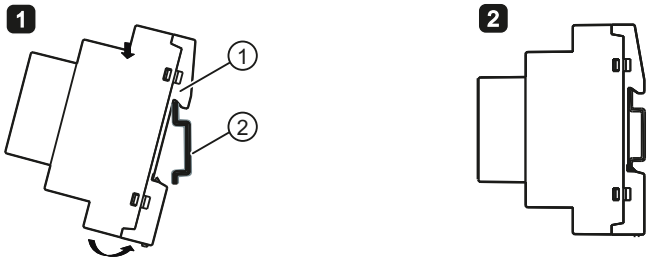



Figure 6-1 Mounting onto standard rail

# Connection

# 7

**WARNING**

By means of the pilot signal, the CM-230 module specifies the maximum charging current that can be called up by the vehicle. This current specification must agree with the configured line protection of the charging device.

Failure to observe this can result in injury to persons or property damage. There is also a risk of fire.

**Note**

Plug in the terminal (L+/M or L/N) with the connecting cables of the power supply last.

## 7.1 Connecting terminals and terminal assignment

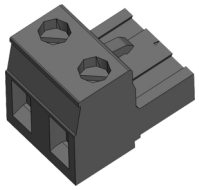
### 7.1.1 Connecting terminals

#### Removable connecting terminals


Figure 7-1 CM-230 connecting terminals

CM-230 is supplied with removable connecting terminals.

These connecting terminals allow you to replace the device easily without having to disconnect and reconnect the wiring.

| Removable terminals | Screwdriver  | Tightening torque |
|---|---|---|
|  | PZ2 / Ø 3 mm | 0.5 ... 0.6 Nm |

| Stripped length | Permissible conductor cross-sections of terminals | Line types according to AWG |
|---|---|---|
|   single-core | 0,5 ... 2.5 mm² | 20 ... 14 |
|   finely stranded | • with core ends prepared: 0.5 ... 2.5 mm²<br>• without core ends prepared: 0,5 ... 2.5 mm² | 20 ... 14 |

**Note**

This device is permitted only for factory wiring. Retrofitting in existing plants is not provided for. When replacing a device, pull the connectors and replace CM-230, without undoing the screw terminals.

**⚠ WARNING**

Use only cables with a temperature stability of at least 75 °C.

Failure to observe this can result in injury to persons or property damage.

**⚠ WARNING**

The conductor cross-sections must be designed corresponding to a standard-compliant system configuration.

Failure to observe this can result in injury to persons or property damage.

## 7.1.2 Terminal assignment of standalone version

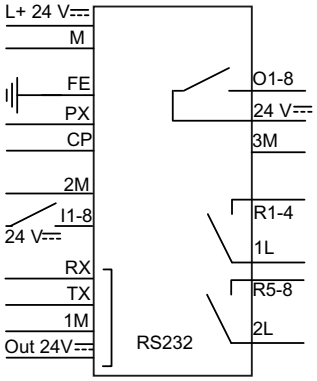



Figure 7-2 Terminal assignment of standalone version

| Terminal | Description |
|---|---|
| L+ 24 V | 24 V DC plus (SELV/PELV) connection (input) |
| M | 24 V DC minus (SELV/PELV) connection (input) |

| | |
|---|---|
| FE | Functional grounding (part of the vehicle interface, connection to connector according to IEC 61851) |
| PX | Proximity (part of the vehicle interface, connection to connector according to IEC 61851) |
| CP | Control pilot (part of the vehicle interface, connection to connector according to IEC 61851) |

| | |
|---|---|
| I1 (EN) | 24 V DC digital input for module enable |
| I2 (HL) | 24 V DC digital input for interlock status |
| I3 (LS) | 24 V DC digital input for circuit breaker status |
| I4 (FI) | 24 V DC digital input for RCCB status |
| I5 (EO) | 24 V DC digital input for emergency unlocking |
| I6 | 24 V DC digital input, freely usable |
| I7 | 24 V DC digital input, freely usable / S0 counter input |
| I8 | 24 V DC digital input, freely usable |
| 2M | DC 24 V Minus (SELV/PELV) connection for digital inputs |

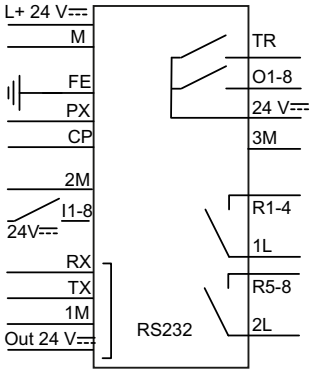
| | |
|---|---|
| 1L | Root relay group 1 |
| R1 (P) | Relay for enabling power outlet |
| R2 (V) | Fan relay |
| R3 (H) | Interlock relay |
| R4 (S) | Signaling relay |

| | |
|---|---|
| 2L | Root relay group 2 |
| R5 (HT/P) | For CM-230: Relay heater<br>For CM-230-C: Relay for enabling power outlet |
| R6 | Freely usable relay (not available in "LoadPortMode") |
| R7 | Freely usable relay (not available in "LoadPortMode") |
| R8 | Freely usable relay (not available in "LoadPortMode") |

| | |
|---|---|
| O1 (RC) | 24 V switching output for "Ready to charge" state |
| O2 (E) | 24 V switching output for Error state |
| O3 (CS) | 24 V switching output for "Cable connected" state |
| O4 (V) | 24 V switching output for "Vehicle connected" state |
| O5 (VC) | 24 V switching output for "Vehicle charging" state |
| O6 | 24 V switching output for free use |
| O7 | 24 V switching output for free use |
| O8 | 24 V switching output for free use |
| 3M | 24 V DC minus (SELV/PELV) connection (input) |

| | |
|---|---|
| 24 V | 24 V DC Plus (SELV/PELV) connection for 24 V switching outputs (input) |
| -- | Not used. (Leave connection open) |
| Rx | RS232: Receive signal |
| Tx | RS232: Send signal |
| 1M | RS232: 24 V DC Minus (SELV/PELV) connection (output) |
| 24 V | RS232: 24 V DC Plus (SELV/PELV) connection (output) |

## 7.1.3 Terminal assignment, managed version




| Terminal | Description |
|---|---|
| L+ 24 V | 24 V DC plus (SELV/PELV) connection (input) |
| M | 24 V DC minus (SELV/PELV) connection (input) |

| | |
|---|---|
| FE | Functional grounding (part of the vehicle interface, connection to connector according to IEC 61851) |
| PX | Proximity (part of the vehicle interface, connection to connector according to IEC 61851) |
| CP | Control pilot (part of the vehicle interface, connection to connector according to IEC 61851) |

| | |
|---|---|
| I1 - I8 | 24 V DC digital inputs |
| 2M | 24 V DC Minus (SELV/PELV) connection |

| | |
|---|---|
| 1L | Root relay group 1 |
| R1 – R4 | Relays 1 - 4 |

| | |
|---|---|
| 2L | Root relay group 2 |
| R5 – R8 | Relays 5 - 8 |

| | |
|---|---|
| O1 - O8 | 24 V switching outputs |
| 3M | 24 V DC minus (SELV/PELV) connection (input) |

| | |
|---|---|
| 24 V | 24 V DC Plus (SELV/PELV) – connection for 24 V switching outputs and trip |
| TR | Trip signal |
| Rx | RS232: Receive signal |
| Tx | RS232: Send signal |
| 1M | RS232: 24 V DC Minus (SELV/PELV) connection (output) |
| 24 V | RS232: 24 V DC Plus (SELV/PELV) connection (output) |

# 7.2 24 V DC power supply

**DANGER**

**Connect the 24 V device only via safety extra-low voltage/protective extra-low voltage**

The device is designed for operation using directly connectable safety extra-low voltage (SELV) or protective extra-low voltage (PELV).

Failure to observe this notice can result in electric shock or damage to property.

For this reason, only safety extra-low voltages (SELV) according to IEC 60950-1 / EN 60950-1 / VDE 0805-1 or protective extra-low voltages (PELV) according to EN 50178 may be connected to the power supply connections.

### Wiring example of standalone version

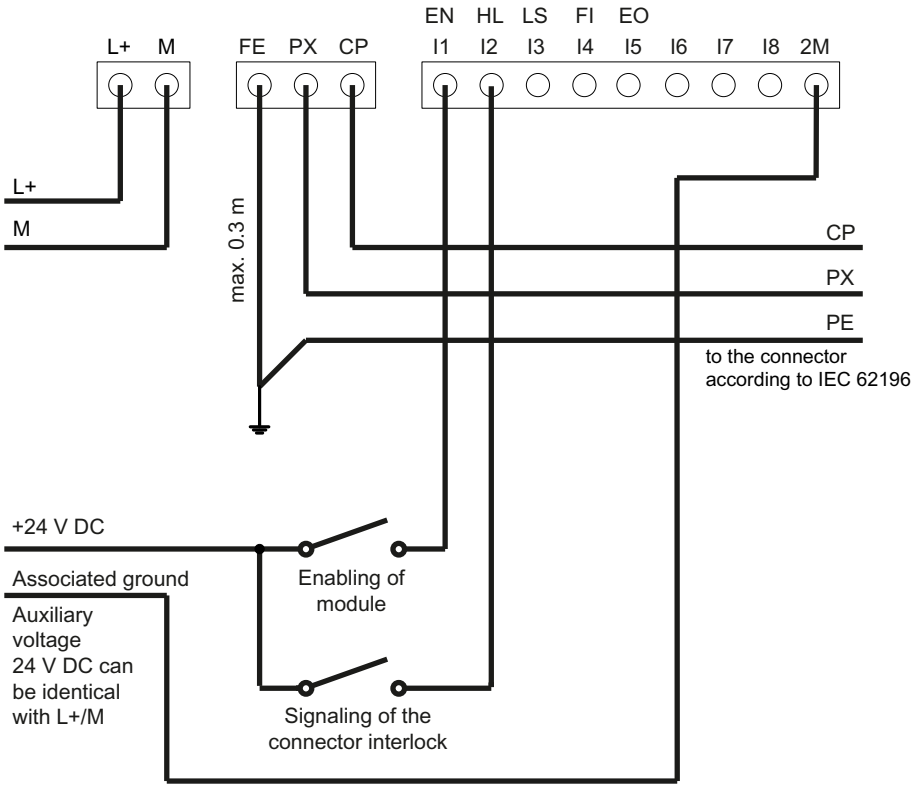



Figure 7-3 Wiring example of standalone version

## Wiring example of managed version

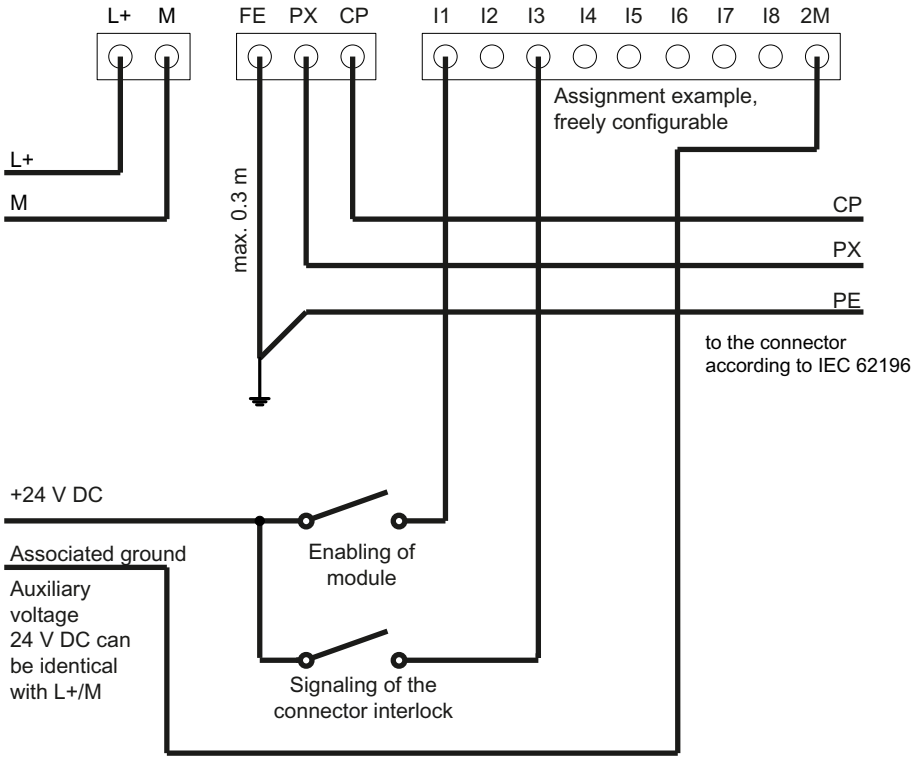



Figure 7-4 Wiring example of managed version

**WARNING**

The external contact blocks used must be floating and safely separated from unsafe circuits. Failure to observe this can result in injury to persons or property damage.

**Note**

The backup fuse for the power supply of the device is to be designed for the line protection, but should have at least 2 A, characteristic B, in order not to impair the operation of the device.

## 7.3 Ethernet

The device has an 10BASE-T/100BASE-T Ethernet connection.

Connect the device to an Ethernet hub or Ethernet switch using an RJ45-to-Ethernet cable of at least CAT 5.

**⚠ WARNING**

The devices offer no effective protection against unauthorized network access. For this reason, use the CM-230 devices only within shielded intranets with defined communications relationships.

## 7.4 Functional grounding

### Vehicle interface according to IEC 61851

1. Connect the terminals "PX" and "CP" directly to the vehicle connector.

   Using the shortest path possible, connect the "FE" terminal to the "PE" reference point in the charging post (preferably directly at the CM-230 device).

2. First connect the "PE" connection of the vehicle interface to the "PE" reference point and then route this potential from there.

**⚠ DANGER**

Never use the terminals of the CM-230 as a PE reference point. Always route this externally from the device! The PE reference point within the plant must be rated according to the anticipated current of the plant itself. The CM-230 connection to the PE is only designed as a functional ground.

Failure to observe this notice can result in electric shock or damage to property.

## 7.5 Digital inputs

**⚠ WARNING**

**Electric shock**

In order to avoid the risk of electric shock, a SELV or PELV power supply must be used for the digital inputs.

If a power supply that does not meet the SELV or PELV requirements is used, dangerous voltages can occur on exposed parts.

The digital inputs are designed for an input voltage of 24 V DC and are isolated. This is, however, only a purely functional isolation for the internal logic. For this reason, only safely isolated potential circuits (SELV) can be connected at the digital inputs.

## 7.6 24 V switching outputs and trip

For operation of the switching outputs and of the trip output, a voltage of 24 V DC must be applied to "24 V" and "3M". The power supply must be designed according to the connected loads.

**⚠ WARNING**

**Electric shock**

For operating the switching outputs and the trip output, a SELV or PELV power supply must be used. Failure to observe this notice can result in electric shock or damage to property.

**Note**

**Device failure due to excessive current value at switching outputs or trip output**

The switching outputs and the trip output are designed for a maximum 300 mA. If this value is exceeded at several outputs, it can lead to triggering of a device-internal fuse that is not replaceable and therefore failure of the device itself!

The applied auxiliary voltage can be identical to the input voltage of the device. In this case, a short connection between the two voltage inputs must be ensured.

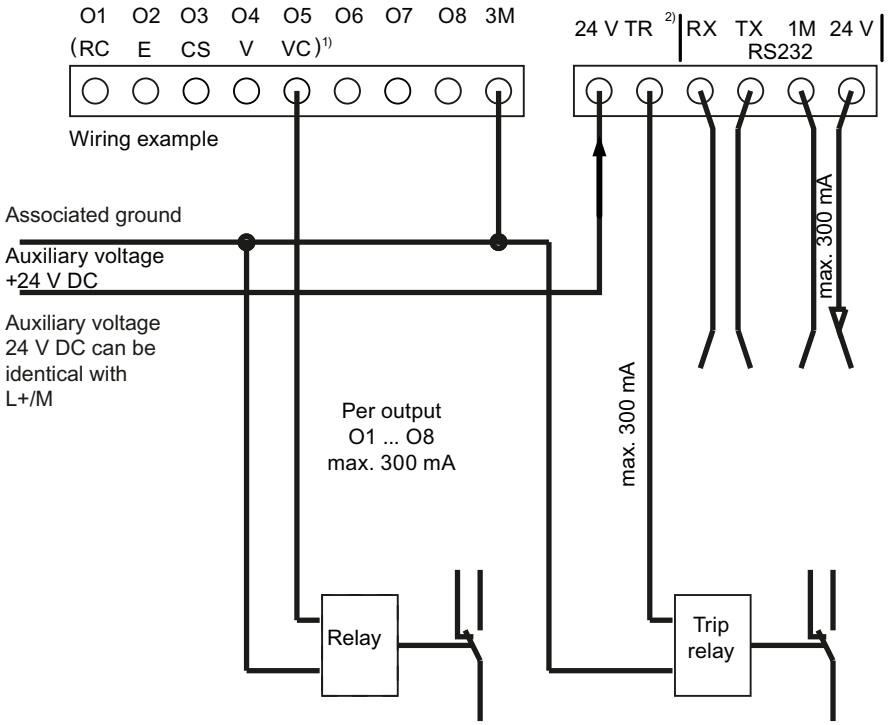
A display can be connected to the device. For this purpose the supply connection delivers a voltage of 24 V (depending on the input voltage) and is designed for a 300 mA current output.

**Note**

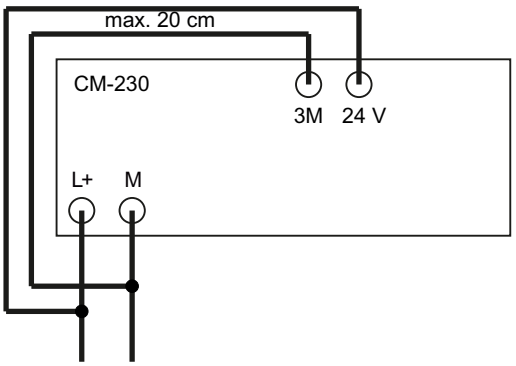
**Device failure due to excessive current value at the RS232 interface**

Exceeding the specified current value of 300 mA at the RS232 serial interface can cause the device to fail.

## 24 V switching outputs and trip connection




If the auxiliary voltage is identical with L+/M (input voltage), it is to be connected briefly on the device.




1) only for standalone version
2) only for managed version

Figure 7-5 24 V switching outputs and trip connection

## 7.7 Relay outputs

### Relay contacts

- DC max. 30 V; 1 A resistive (resistive load only)
- DC max. 30 V; 0.75 A pilot duty (inductive load permitted)
- AC max. 240 V; 0.75 A pilot duty (inductive load permitted)
- Each relay contact must be fused in such a way that the maximum current is not exceeded.

We recommend individual protection with miniature circuit breakers, order number 5SY4102-7 (230 V/400 V; 10 kA; 1-pole C, 2 A, T = 70 mm)

#### Shutdown of power branch

According to IEC 61851, a shutdown of the power branch on completion of the charging process within 100 ms is required. CM-230 activates the relay output "P" in less than 5 ms after detecting the shutdown criterion.

**WARNING**

The shutdown of the power branch, in particular the power contactor, is to be designed in such a way that the entire impact chain does not exceed the required 100 ms.

Failure to observe this notice can result in death or serious physical injury.

## 7.8 RS232 interface

The CM-230 charging controller is already equipped with an RS232 interface, so that other devices such as displays can subsequently be connected as options with later firmware versions.

Information on the current firmware versions and supported devices can be found on the Internet (http://support.automation.siemens.com/WW/view/en/46476364). (Title: Updates)

If you are interested the integration of individual devices via the RS232 interface, please contact us underE-mail (mailto:siplus-ecc.industry@siemens.com).

# Addressing

# 8

## 8.1 Mac address

The CM-230 is factory-set with a unique MAC address. This address cannot be changed.

The MAC address is printed on the front of the housing.

## 8.2 TCP/IP addressing

The TCP/IP addressing of the CM-230 device can be performed by means of the following processes:

| Addressing process | CM-230 | CM-230-C |
|---|---|---|
| DHCP / DCP | ✓ | ✓ |
| DIP switches | ✓ | Not available |

**Note**

**Default address**

If neither DHCP nor DCP is available, the following default address will be used: 192.168.168.168.
This also applies to the standard version of the CM-230 if the DIP switches have not been set.

### Setting the process for address setting: CM-230 (standard version)

You can set the process for address setting using the DIP switches.

| DIP switches | Address setting process |
|---|---|
| 0 | Addressing via DHCP or DCP (factory setting) |
| 1 ... 254 | Addressing via DIP switch |
| 255 | Addressing via DHCP or DCP |

**Note**

The DIP switches are located behind the front cover ②, see sectionStructure (Page 12). Open these by inserting the screwdriver in accordance with printed indication and push the cover upward.

### Address setting process: CM-230-C

The CM-230-C charging controller does not have a DIP switch. Address setting is always performed via DCP or DHCP. As an alternative, you can also set the IP address via the web interface.

## 8.2.1 Addressing via DIP switch

By means of the DIP switches, you can select the least significant binary digit of the IP address. All other data are permanently stored in the firmware. The advantage of this method is that you can replace the charging controller without additional tools or addressing effort.

The individual DIP switches are labeled "1 ... 8" in accordance with their value. A switch is activated if it is in position "1". The address is calculated according to the following formula:

$$\sum_{\text{Switch number } 1 \ldots 8} [\text{Position} \cdot 2^{(\text{switch number} - 1)}]$$

### Example

Position 11000001

$1 \cdot 2^0 + 1 \cdot 2^1 + 0 \cdot 2^2 + 0 \cdot 2^3 + 0 \cdot 2^4 + 0 \cdot 2^5 + 0 \cdot 2^6 + 1 \cdot 2^7 = 131$

| | |
|---|---|
| IP address | 192.168.168.xxx, xxx = DIP setting, 1 ≤ xxx ≤ 254 |
| Net mask | 255.255.255.0 |
| Gateway | 0.0.0.0 |

The DIP switches are only evaluated on power-up of the charging controller. This means that changes to the DIP switch during operation only take effect after a restart of the charging controller.

## 8.2.2 Addressing via DHCP

CM-230 features a DHCP client. If the DIP switch is set to "0", the charging controller attempts during startup to contact a DHCP server in order to obtain the address data.

The address data assigned via DHCP is stored in the device.

An address assigned by means of DHCP is only stored in the application mode. In the boot loader mode (no valid application firmware available), an address assigned via DHCP is not stored.

### No valid address stored

If no valid address is stored in the device, the charging controller attempts cyclically to receive the address data via DHCP – until a DHCP server assigns valid data.

If an address has not been assigned via DCP, or no address has been parameterized (WEB-IF, configuration) and no active DHCP server can be found within a 10 second search, the default address 192.168.168.168 stored in the device is used.
The IP address can then be freely assigned using WEB-IF.

### Valid address stored

If a valid address is stored in the device, then the charging controller tries during startup to contact a DHCP server in an attempt to get other address data assigned. If no DHCP server is detected within ten seconds, the stored address information is used.

If a DHCP server is available, the assigned address data is used. This allows you modify saved address data or change the address data storage.

### Advantage of address assignment via DHCP

The advantage of address assignment via DHCP is that you can automatically assign all address data in the entire standardized range.

### Disadvantage of address assignment via DHCP

In the event of replacement of the CM-230, however, you must change the MAC address of the old device to the MAC address of the new device in the assignment table of the DHCP server.

### Activity of the DHCP mechanism

The DHCP mechanism is only started during power-up of the charging controller. As soon as address parameters are assigned, no further DHCP communication is supported.

**Note**

An address assigned by means of DHCP is only stored in the application mode. In the boot loader mode (no valid application firmware available), an address assigned via DHCP is not stored.

### 8.2.3 Addressing via DCP

CM-230 also supports addressing via the DCP protocol. To do this, the DIP switch must be set to "0". In this state, the module can be accessed at any time (power-up or normal operation) by means of a DCP tool. We recommend the "Primary Setup Tool" (PST), that is available for downloading free of charge from Internet (http://support.automation.siemens.com/WW/view/en/19440762).

The following actions can be started using the PST:

- Scan (Identify) all DCP-compatible devices present in the network
- Assignment of IP parameters
- Assignment of a logical device name
- Resetting of the IP parameters and the device name
- Identification of a device by activating the flashing mode of the "Link Status" LED on the RJ-45 plug

Note that changes to the IP parameters and the device name become valid immediately. Existing connections are interrupted and must be set up again.

**Note**

In the boot loader mode (no valid application firmware available) DCP is not supported.

# Service and maintenance

# 9

## 9.1 Firmware update

### 9.1.1 Introduction

The firmware of the CM-230 consists of the following two areas:

- the bootloader
- the application firmware

The application firmware can be changed via FTP. For this purpose, CM-230 includes an FTP server according to RFC 959.

As a reference, the standard FTP client (console application) from Microsoft is used, which is shipped with each Windows operating system.

Other FTP client applications, such as Internet Explorer or Windows Explorer are not supported.

The FTP server only supports one active client session.

The FTP server terminates an inactive session automatically after 120 s.

**Note**

Depending on the version or application firmware version, the image is shipped with a file name such as "cm230xxx.app". Prior to updating the firmware, this file must be renamed "cm230.app".

You can find information about firmware updates on the Siemens support pages (http://support.automation.siemens.com/WW/view/en/46477093/133100).

## 9.1.2 Sequence firmware update via standard FTP client

Typical firmware update procedure:

1. Establishment of connection to the FTP server (application):

   Defined access data:

| | |
|---|---|
| USER: | admin |
| PASS: | *cm230# |

2. Indication of the installed firmware version:

   You can use the command "ls" to display the firmware version that is installed on the charging controller with its creation data, e.g.

```
--wx-wx-wx 1 root sys 185539 Feb 28 15:08 cm230.app
---x--x--x 1 root sys 49931 Feb 25 15:38 cm230.bl
```

3. Firmware deletion request using the command "del cm230.app".
4. CM-230 terminates the existing FTP connection and performs a reset.
5. New establishment of connection to the FTP server (bootloader).

   Defined access data:

| | |
|---|---|
| USER: | admin |
| PASS: | *cm230# |

6. Transfer of firmware

   The image must have the file name "cm230.app " Use the command "put cm230.app" to start the firmware transfer. After this, CM-230 terminates the existing FTP connection and performs a reset.

7. If a valid application is detected during a restart, it is started; if not, the bootloader in the FTP mode is active again.

## 9.2 Replacing the device

### Maintenance

The CM-230 is maintenance-free.

**WARNING**

The internal equipment fuses must not be replaced.

**Note**

**Only remove the terminals when replacing devices**

You can conveniently replace SIPLUS ECC devices by removing the removable terminals along with the wiring from the components. You do not have to remove the wiring of the terminals.

### Replacing CM-230

**Requirement:**

Ensure that the plant and the device itself are de-energized.

**DANGER**

**Voltage hazards**

Contact with live components can result in serious injuries. Disconnect the system and all devices from the power supply before starting work.

**Procedure:**

1. Remove all removable terminals without disconnecting the wiring.
2. Disassemble the device by pulling the locking slider on the back of the device down and swivel the device away from the DIN rail and remove it.
3. Open the cover for the DIP switches and adjust the IP address using DIP according to the old device [see also Section Addressing (Page 59)].
4. Install the new device by clipping the top locking guide onto the DIN rail and swinging it down until the locking slider clicks into place.
5. Connect the removable terminals to the new device with the wiring.
6. Switch on the power supply for the device and the main power for the unit feeder again.

## 9.3 Cleaning

Cleaning of the device is not intended or permissible.

# Dimensional drawings

# 10

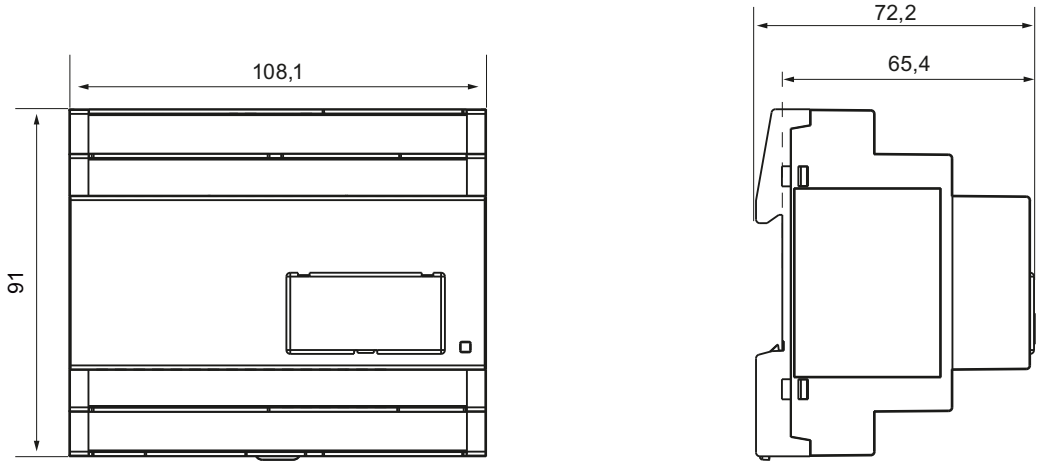



Figure 10-1 CM-230 dimension drawings

# Technical data

# 11

Table 11- 1 CM-230 technical data

| General specifications | |
|---|---|
| The CM-230 / CM-230-C product is developed and designed for | applications according to IEC/EN 61851 Part 1 and Part 22 (conductive charging systems for electric vehicles), charging mode 3 |
| Electrical safety<br>according to IEC 61010-1/EN 61010-1 (2nd ed.) or UL61010-1 (2nd ed.) | • All voltage supplies (24 V DC) must be must be safely isolated (requirements according to SELV/PELV)<br>• Contamination degree 2 for device<br>• Contamination degree 3 for connectors<br>• Overvoltage category 2 (only relay outputs)<br>• Overvoltage category 3 (for limiting the maximum voltage at the relay outputs by placing an external 5 SD 7 overvoltage limiter upstream)<br>• The control inputs (PX, CP, FE), the digital inputs and outputs (I1 to I8; O1 to O8) and the RS232 interface (Rx, Tx) may only be connected with safely isolated circuits (SELV/PELV). |
| Protection against foreign bodies and water<br>according to IEC/EN 60529 | IP20<br>(when installing the device behind a distribution panel cover) |
| EMC emitted interference in accordance with IEC/EN 61000-6-3 | suitable for operation in industrial and residential areas |
| Immunity to EMI in accordance with IEC/EN 61000-6-2 | suitable for operation in industrial and residential areas |
| Immunity against electrostatic discharge (ESD) in accordance with IEC/EN 61000-4-2 | • 4 kV contact discharge<br>• 8 kV air discharge<br>• Evaluation criterion B |
| Immunity to radiated narrow-band electromagnetic fields according to IEC/EN 61000-4-3 | • 80 MHz ... 1.0 GHz 10 V/m<br>• Modulation 80 % AM with 1 kHz<br>• Evaluation criterion B<br>• 80 MHz ... 1.0 GHz 3 V/m<br>• 1.4 GHz ... 2.0 GHz 3 V/m<br>• 2.0 GHz ... 2.7 GHz 1 V/m<br>• Modulation 80 % AM with 1 kHz<br>• Evaluation criterion A |

| General specifications | |
|---|---|
| Immunity against very steep impulses (bursts) according to IEC/EN 61000-4-4 | • DC supply lines: 2 kV / 5 kHz<br>• Relay outputs: 1 kV / 5 kHz<br>• Ethernet cable (shield): 1 kV / 5 kHz<br>• Control cables (PX, CP, FE; ): 1 kV / 5 kHz<br>• Digital inputs and outputs (I1 to I8; O1 to O8): 1 kV / 5 kHz<br>• RS232 interface (Rx, Tx): 1kV / 5 kHz<br>• Evaluation criterion B |
| Immunity to high-energy pulses (surges, lightning strikes) according to IEC/EN 61000-4-5 | • Asymmetric interference<br>• DC supply lines: 0.5 kV / 12 Ohm<br>• Relay outputs: 2 kV / 42 Ohm<br>• Ethernet cable (shield): 1 kV direct coupling<br>• Control cables (PX, CP, FE; ): 1 kV/42 Ohm<br>• Digital inputs and outputs (I1 to I8; O1 to O8): 1 kV/42 Ohm<br>• RS232 interface (Rx, Tx): 1 kV/42 Ohm<br>• Evaluation criterion B |
| Immunity to high-energy surges (surge, lightning) in accordance with IEC/EN 61000-4-5 | • Symmetric interference<br>• DC supply lines: 0.5 kV / 2 Ohm<br>• Evaluation criterion B |
| Immunity to conducted interference, induced by HF fields (HF current feed) according to IEC/EN 61000-4-6 | • 3 $V_{rms}$<br>• 0.15 to 80.0 MHz<br>• Modulation 80% AM with 1 kHz<br>• Evaluation criterion A |
| Immunity to magnetic fields with energy frequencies according to IEC/EN 61000-4-8 | • 100 A/m<br>• 50 to 60 Hz<br>• Evaluation criterion A |
| Voltage withstand capabilities of the relay outputs | • Withstand voltage LN SELV = 3.2 kV rms<br>• Surge voltage 1.2 u/50 u LN-SELV = 4 kV<br>• Surge voltage 1.2 u/50 u relay-relay = 6 kV<br>• Surge voltage 1.2 u/50 u SELV-relay = 6 kV |
| Resistance to mechanical vibrations during operation according to IEC/EN 60068-2-6 | • 5 to 8.4 Hz sine / 3.5 mm deflection<br>• 8.4 to 150 Hz sine/ 1 g acceleration |
| Resistance to physical shock during operation according to IEC/EN 60068-2-27 | • 3 shocks/axis<br>• 15 g half-sine acceleration<br>• 11 ms duration of each shock |
| Resistance to mechanical vibrations when packaged (original packaging) according to IEC/EN 60068-2-6 | • 5 to 8.4 Hz sine / 3.5 mm deflection<br>• 8.4 to 500 Hz sine/ 1 g acceleration |

| General specifications | |
|---|---|
| Resistance to physical shock when packaged (original packaging) according to IEC/EN 60068-2-29 | • 1000 shocks/axis<br>• 25 g half-sine acceleration<br>• 6 ms duration of each shock |
| Max. response time at TR (managed) or enabling contact R1 (standalone) on completion of a charging process | < 5 ms |

| Ethernet | |
|---|---|
| Contacting | RJ45, CAT-5, 10BASE-T, 100BASE-T |
| Data rate | 10 Mbit/s half duplex, 10 Mbit/s full duplex, 100 Mbit/s half duplex, 100 Mbit/s full duplex |
| Autonegotiation | Yes |
| Auto-crossover / MDIX | No |
| Addressing | DIP switch[1)], DHCP or DCP |
| Firmware update | Yes, via FTP |
| Web Interface | Yes |
| Control protocol | TCP-based |

1) Not with CM-230-C

| Enclosure | |
|---|---|
| Material | Top section and bottom section 1 PA66 (Wellamid) or 915R (LEXAN); acc. to model |
| Mounting | Snap-mounting on a 35 mm DIN rail according to DIN EN 60715 |
| Dimensions (W x H x D) in mm | • 108 x 91 x 72 |
| Weight in g | |
| • Without connector | • 250 g |
| • With connector | • 350 g |

| Permitted ambient temperature ranges/ambient conditions observing the notes in chapter | |
|---|---|
| During operation | -25 °C ... +55 °C |
| During transport | -25 °C ... +70 °C |
| Relative humidity during operation | < 95 % |
| At altitudes higher than 1500 m above sea level: | +50 °C to 2000 m |

| Electrical data | |
|---|---|
| Power supply | 24 V DC (±20%) |
| Maximum power loss | 4 W |
| Maximum current consumption | 0.3 A (with optional device on the RS232 interface 0.6 A) |
| Charging current | Adjustable in the range 6 A … 80 A |
| Optional display (at 24 V input voltage) | Up to 0.3 A/7 W possible |
| Overvoltage protection at input | |

| Connections | |
|---|---|
| Electrical connection version | |
| • of inputs and outputs | • Combicon connection GMSTB 2.5 |
| • for auxiliary and control circuit | • Combicon connection MSTB 2.5 |
| Type of pin assignment | |
| • of outputs | • Combicon connection MSTB 2.5 |
| • of inputs | • Combicon connection MSTB 2.5 |

**Note**

The listed operating temperatures apply to the vertical mounting on a horizontal DIN rail.

The temperature stability of the cable used must be designed for at least for 75 °C.

# Appendix A

## A.1 Approvals

**Note**

**Approvals are only valid when marked on the product**

The specified approvals apply only when the corresponding mark is printed on the product. You can check which of the following approvals have been granted for your product by the markings on the type plate.

### EC directives

SIPLUS ECC products conform to the requirements and safety objectives of the EC Directives listed below.

### Low-voltage directive

SIPLUS ECC products meet the requirement of the EC Directive:

2006/95/EC "Electrical Safety". The product is designed in accordance with EN 61010-1

### EMC directive (electromagnetic compatibility)

SIPLUS ECC products meet the requirements of EC Directive:
2004/108/EC "Electromagnetic Compatibility"

The product is designed for operation in **industrial and residential areas** with the following requirements:

- Interference suppression to EN 61000-6-3
- Noise immunity according to EN 61000-6-2

  Also see Technical data (Page 69).

**⚠ WARNING**

**Personal injury and damage to equipment when unapproved expansions are used**

The installation of expansions that are not approved for SIPLUS ECC products or their target systems may violate the protective objectives of electromagnetic compatibility and the regulations for electrical safety.

Always use expansions approved for the system.

- Compliance with installation guidelines

  The product meets the requirements if you adhere to the installation and safety instructions contained in this documentation and in the following documentation when installing and operating the product.

- The very latest documentation is available on the Internet!

  Operating Instructions for SIPLUS ECC2000 CM-230 (http://support.automation.siemens.com/WW/view/en/48460217).

**Note**

The product features can only be guaranteed if the system environment at least meets the requirements of the technical data.

If the product is operated with a device that does not comply with these standards, adherence to the respective values cannot be guaranteed.

## Note for the manufacturers of machines

This product is not a machine in the sense of the EC Machinery Directive. There is therefore no declaration of conformity relating to the EC Machinery Directive 89/392/EEC for this product.

## Approvals

| Certifications | Standard | Marking |
|---|---|---|
| C-TICK | AS/NZS 2064 (Class A) | |
| CE | EN 61000-6-2<br>EN 61000-6-3<br>EN 61010-1<br>In addition, developed and suitable for applications that are subject to the EN 61851-1 and EN 61851-22 standards. | |

# A.2 List of abbreviations

| Abbreviation | Meaning |
|---|---|
| AWG | American Wire Gauge |
| CM | Communication Module |
| DCP | Discovery and basic Configuration Protocol. |
| DHCP | Dynamic Host Configuration Protocol |
| DIN | German Institute for Standardization |
| DIP | Dual in-line package |
| DO | Digital Output |
| ECC | Electrical Charging Components |
| EV | Electric Vehicle |
| EN | European standard |
| RCCB | Residual current operated circuit breaker |
| FTP | File Transfer Protocol |
| H | High |
| IEC | International Electrotechnical Commission |
| L | Low |
| LED | Light Emitting Diode |
| LS | Line protection |
| PELV | Protective Extra Low Voltage |
| PST | Primary Setup Tool |
| SELV | Safety Extra Low Voltage |
| VDE | Association for Electrical, Electronic and Information Technologies (Germany) |

# A.3 Service & Support

## Manufacturer's address

Siemens AG
Industry Sector
Postfach 48 48
90026 NÜRNBERG
GERMANY

## Service & Support

Support homepage (http://www.siemens.com/lowvoltage/technical-support)

## Online catalog and ordering system

The online catalog and the online ordering system can also be found on the Industry Mall Homepage (http://www.siemens.de/industrial-controls/mall).

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