Installing and starting up the EV Charge Control charging controller

User manual

PHOENIX CONTACT
INSPIRING INNOVATIONS

User manual

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UM EN EV-CC-AC1-M3-CBC-RCM-ETH, Revision 04 2020-09-17

This user manual is valid for:

Designation	Revision	Order No.
EV-CC-AC1-M3-CBC-RCM-ETH	1	1018701
EV-CC-AC1-M3-CBC-RCM-ETH-3G	1	1018702
EV-CC-AC1-M3-RCM-ETH-XP	0	1139449
EV-CC-AC1-M3-RCM-ETH-3G-XP	0	1139452

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1 For your safety

1.1 Correct use

The EV-CC-AC1-M3-CBC-RCM-ETH (-3G/-XP) charging controllers are designed exclusively for use in electric vehicle charging stations in accordance with IEC 61851-1, mode 3. The charging stations must be permanently connected to the power grid. No other uses are permitted. Observe all applicable national requirements and regulations pertaining to the design of charging stations.

This applies in particular when using charging connectors and infrastructure charging sockets in accordance with IEC 62196.

Always use suitable housing that meets all applicable national requirements, e.g., IEC 61439-7. When selecting the housing, take into account the local ambient conditions (temperatures, sunlight, humidity, pollution). Observe the limit values specified in the technical data (“Ambient conditions” on page 11) and the requirements for the charging controller. The housing design should satisfy these requirements.

When connecting to the power grid, observe all applicable national and regional requirements (e.g., IEC 60364-7-722).

1.2 Safety notes

WARNING: Startup only by specialist personnel

The charging controller must only be installed, operated, and maintained by qualified electricians. Follow the installation instructions as described. When installing and operating charging stations for electric vehicles, observe the applicable regulations and safety directives. The safety data can be found in this user manual and in the certificates, i.e., the conformity assessment and additional approvals where applicable.

For further information, visit phoenixcontact.com/product/1018701

WARNING: Dangerous contact voltage

You may only install/remove and configure the device when the power supply is disconnected. Only operate the device in closed housing that protects against electrical shock.

Provide a disconnecting device for disconnecting the charging station from the voltage.

NOTE: Electrostatic discharge

Electrostatic discharge can damage or destroy components. When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) in accordance with EN 61340-5-1 and IEC 61340-5-1.

Operation only in suitable housing

Only operate the device in a housing that meets the requirements for charging stations. Only operate the device in conjunction with adequate housing.

The IP20 degree of protection (IEC 60529/EN 60529) of the device is intended for use in a clean and dry environment. Only use the device in an environment that does not exceed pollution degree 2 in accordance with IEC 60664-1.

If the device is to be used for an outdoor charging infrastructure, you can achieve pollution degree 2 in the microenvironment, for example, by using housing with IP5X degree of protection in accordance with IEC 60529.

Do not subject the device to any strain or load that exceeds the limits described.

Do not open or modify the device

With the exception of configuration, opening or modifying the device is not permitted. Do not repair the device yourself; replace it with an equivalent device instead. Only the manufacturer is permitted to repair the device.

1.3 Shutdown and disposal

Shutdown

For shutdown, the device must be disconnected from the mains voltage. Only remove the device when disconnected from the voltage.

Provide a disconnecting device for disconnecting the charging station from the voltage.

Disposal

Do not dispose of the device with household waste; it should instead be disposed of in accordance with the currently applicable national regulations.

2 Properties of the charging controller

The EV Charge Control charging controller is used to control and monitor the charging of electric vehicles on the AC power grid in mode 3 in accordance with IEC 61851-1. It is integrated into a defined charging infrastructure which is permanently connected to the power grid. It monitors the **Control Pilot** and **Proximity Plug** signals in accordance with IEC 61851-1.

The charging controller is responsible for status-dependent control of the switching element which is used to establish the connection between the power grid and the electric vehicle. It is equipped with a residual current sensor that interrupts the charging process when residual DC currents occur.

The charging controller can be used to activate or deactivate the charging connector lock in the charging station according to the status. It features a serial interface that can be used to connect energy measuring devices and RFID card readers.

In addition, the charging controller is available in versions with Ethernet or 3G cellular interfaces. The charging controller can communicate with a central management system via an OCPP interface (via OCPP 1.6J, JSON).

Table 2-1 Interfaces

Charging controller	Communication		OCPP 1.6J communication	
	Ethernet	Cellular	Ethernet	Cellular
EV-CC-AC1-M3-CBC-RCM-ETH	x	–	–	–
EV-CC-AC1-M3-CBC-RCM-ETH-3G	x	x	–	x
EV-CC-AC1-M3-RCM-ETH-XP	x	–	x	–
EV-CC-AC1-M3-RCM-ETH-3G-XP	x	x	x	x

You can combine several charging controllers to create a master/slave group. This group can communicate with the central management system via the master using the OCPP protocol.

Technical features

- Evaluation and control of the Control Pilot signal in accordance with IEC 61851-1
- Evaluation of the Proximity signal in accordance with IEC 61851-1
- Connection and disconnection of the charging current to the vehicle
- 6 mA DC/30 mA AC residual current detection and automatic shutdown in the event of an error
- Activation of the charging connector lock and automatic release if voltage is interrupted
- RS-485 communication interface/Modbus/RTU (master) for connecting an energy measuring device and RFID card reader
- Ethernet interface (Modbus/TCP) for configuration, remote control, and status requests
- OCPP connection (OCPP 1.6J, JSON) via cellular or Ethernet interface
- Master/slave group for connecting several charging controllers via one OCPP connection
- Integrated load management in the master/slave group to protect the infrastructure against overload
- Maximum charging current that can be configured: 6 A … 80 A
- Optional monitoring of charging currents

- Digital inputs and outputs, can be configured
- Temperature range: -25°C ... +60°C
- Easy configuration directly at the device and via the integrated web server

2.1 Ordering data

Description	Type	Order No.	Pcs./Pkt.
Mode 3 charging controller, for charging electric vehicles in accordance with IEC 61851-1 for charging case B and C with integrated DC residual current monitoring and Ethernet communication interface	EV-CC-AC1-M3-CBC-RCM-ETH	1018701	1
Mode 3 charging controller, for charging electric vehicles in accordance with IEC 61851-1 for charging case B and C with integrated DC residual current monitoring, Ethernet and 3G cellular interface, OCPP 1.6J communication via cellular	EV-CC-AC1-M3-CBC-RCM-ETH-3G	1018702	1
Mode 3 charging controller, for charging electric vehicles in accordance with IEC 61851-1 for charging case B and C with integrated DC residual current monitoring, Ethernet and 3G cellular interface, OCPP 1.6J communication via Ethernet	EV-CC-AC1-M3-RCM-ETH-XP	1139449	1
Mode 3 charging controller, for charging electric vehicles in accordance with IEC 61851-1 for charging case B and C with integrated DC residual current monitoring, Ethernet and 3G cellular interface, OCPP 1.6J communication via Ethernet and cellular	EV-CC-AC1-M3-RCM-ETH-3G-XP	1139452	1

2.2 Technical data

General data	
Dimensions	161.6 mm x 90 mm x 61 mm
Weight	460 g

Power supply	
Nominal voltage	230 V AC
Tolerance	±10%
Mains frequency	50/60 Hz
Power consumption, maximum	10 W
Power consumption, no load	< 3 W

Vehicle interface/infrastructure charging socket	
Number of vehicle interfaces	1
Charging mode and case	Mode 3, case B and C
Control Pilot	IEC 61851-1, Edition 3, Annex A
Proximity	IEC 61851-1, Edition 3, Annex B
Output voltage for controlling the locking actuator (2 Ω source resistance)	12 V
Maximum current for locking control	1 A
Adjustable actuation time for locking actuator	500 ms (default), max. 3 s
Feedback signal for locking	Floating contact, closed if locking is successful
Locking behavior in the event of a power failure	Automatic unlocking

Relay output for contactor control	
Standard	IEC 61810-1
Switching capacity	4000 VA
Switching voltage, maximum	250 V AC
Maximum current	16 A
Switching cycles	50000

Residual current monitoring	
Rated frequency	0 Hz … 2000 Hz
Measuring range	±300 mA
Operate values for measuring sensors	
Residual current Id1, $I_{\Delta n1}$	6 mA DC
Residual current Id2, $I_{\Delta n2}$	30 mA AC
Response time t_{ae} (for DC or > 15 Hz), for:	
1 x $I_{\Delta n}$	< 180 ms
2 x $I_{\Delta n}$	< 70 ms
5 x $I_{\Delta n}$	< 20 ms
Measuring current transducer	
Cable feed-through diameter, measuring current transducer	15 mm
Length of connecting cable	0.2 m
Connection at main device (connector)	6-pos.
Load current, maximum	3 x 32 A (4 x 6 mm^2), maximum
Standards	IEC 60364-7-722 IEC 62752 DIN VDE 0100-722 (VDE 0100-722:2013-01)

Digital inputs	
Number	5
Nominal input voltage	12 V
Input resistance	3 kΩ
Input voltage range	< 3 V (off) / > 9 V (on)

Digital outputs	
Number	4
Output voltage, feed-in via 12 V	8 V … 30 V
Maximum output current per output, external feed-in	600 mA
Total maximum output current, internal 12 V feed-in	200 mA

RS-485 interface (RFID and energy measuring device)	
Protocol	Modbus/RTU
Transmission speed	4.8 kbps to 115.2 kbps, adjustable
Transmission mode (data bit, stop bit, parity)	8, N, 2

Ethernet interface, 100Base-TX in accordance with IEEE 802.3u / 10Base-T in accordance with IEEE 802.3	
Connection method	RJ45 jack
Protocol	Modbus/TCP **EV-CC-...-XP**: OCPP 1.6J (WebSockets)
Transmission speed	10/100 Mbps
Transmission distance	100 m

Cellular interface (EV-CC-AC1-M3-CBC-RCM-ETH-3G and ...3G-XP only)	
Frequency bands	
HSPA	900 MHz, 2100 MHz
GSM/GPRS/EDGE	850 MHz, 900 MHz, 1800 MHz, 1900 MHz
Maximum transmission power	
UMTS/HSPA	+24 dBm (power class 3)
GSM 850	Class 4 (2 W)
GSM 950	Class 4 (2 W)
GSM 1800	Class 1 (1 W)
GSM 1900	Class 1 (1 W)
Protocol	OCPP 1.6J (WebSockets)
SIM card	Micro SIM
Antenna connection	SMA

Connection data for power supply, power relay, CP, PP, locking	
Connection method	
Conductor cross section, rigid, min./max.	0.2 mm² ... 4 mm²
Conductor cross section, flexible, min./max.	0.2 mm² ... 2.5 mm²
Conductor cross section, flexible, with ferrule, without plastic sleeve, min./max.	0.25 mm² ... 1.5 mm²
Conductor cross section, flexible, with ferrule, with plastic sleeve, min./max.	0.25 mm² ... 1.5 mm²
Conductor cross section AWG	AWG 24 … 12

Connection data for digital inputs and outputs and RS-485	
Connection method	
Conductor cross section, rigid, min./max.	0.14 mm² ... 1.5 mm²
Conductor cross section, flexible, min./max.	0.14 mm² ... 1 mm²
Conductor cross section, flexible, with ferrule, without plastic sleeve, min./max.	0.25 mm² ... 0.5 mm²
Conductor cross section, flexible, with ferrule, with plastic sleeve, min./max.	0.25 mm² ... 0.5 mm²
Conductor cross section AWG	AWG 26 … 16

Ambient conditions	
Degree of protection	IP20
Ambient temperature range (operation)	-25°C … +60°C
Ambient temperature range (storage)	-40°C … +85°C
Humidity	30% … 95%, non-condensing
Overvoltage category / pollution degree	II / 2 (IEC 60664-1)
Altitude (storage/operation)	< 2000 m
Mounting position	Any

Conformance/approvals	
CE-compliant	
Low Voltage Directive	2014/35/EU
Function and safety tests	IEC 60950-1 / EN 60950-1
Air clearances and creepage distances	IEC 60950-1 / EN 60950-1
Housing conformance with standards	DIN 43880

Conformance with EMC Directive 2014/108/EU			
Immunity test in accordance with EN 61000-6-2	**Standard**	**Criterion**	**Test conditions**
Electrostatic discharge (ESD)	EN 61000-4-2	A	2 kV / 4 kV contact discharge 2 kV / 4 kV / 8 kV air discharge
Electromagnetic HF field	EN 61000-4-3	A	80 MHz … 1 GHz 10 V/m 1.4 GHz … 2 GHz 3 V/m 2 GHz … 2.7 GHz 1 V/m
Fast transients (burst)	EN 61000-4-4	A	AC mains input (L,N,PE) 0.5 kV / 1 kV / 2 kV Data cables, LAN 0.5 kV / 1 kV
Surge current loads (surge)	EN 61000-4-5	A	Mains input: 1 kV / 2 kV asymmetrical: cable to ground 0.5 kV / 1 kV symmetrical: cable to cable
Conducted disturbance variables	EN 61000-4-6	A	Frequency range: 150 kHz … 80 MHz, voltage: 10 V, 80% AM, 1 kHz
Immunity to magnetic fields with mains frequency	EN 61000-4-8	Met	Test level: 30 A/m, 50 Hz / 60 Hz
Immunity to brief interruptions and voltage fluctuations	EN 61000-4-11	 A met A met A met C met	Power cable: Reduction for 20 ms Reduction for 200 ms Reduction for 500 ms Reduction for 5000 ms
Noise emission test in acc. with EN 61000-6-3	**Standard**	**Result**	**Test conditions**
Radio interference voltage	EN 61000-6-3	Met	Network interconnection point: 150 kHz … 30 MHz
Radio interference voltage	EN 61000-6-3	Met	Telecommunications connections: 150 kHz … 30 MHz
Radio noise field strength	EN 61000-6-3	Met	30 MHz … 1 GHz 1 GHz … 6 GHz
Measurement of low-frequency harmonic currents	EN 61000-6-2	Met	Class A
Measurement of voltage fluctuations and flicker in low-voltage networks	EN 61000-6-3	Met	Pst < 0.25

2.3 Declaration of conformity in accordance with 2014/53/EU

Phoenix Contact hereby declares that wireless system type
EV-CC-AC1-M3-CBC-RCM-ETH-3G complies with Directive 2014/53/EU.
The complete text of the EU declaration of conformity is available at the following address:
phoenixcontact.net/products/1018702.

3 Connections, indicators, and configuration switches

3.1 Connections on the charging controller

Figure 3-1 Connections on the charging controller

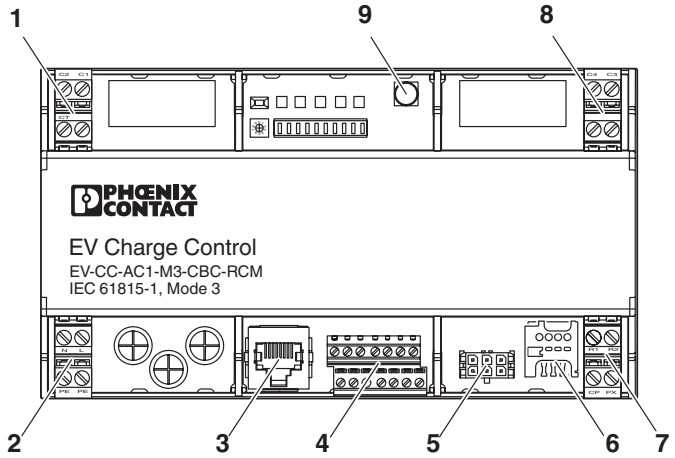


Table 3-1 Connections

No.	Name	Meaning	Description	
1	**C1**	Contactor 1	Control of load contactor	230 V AC, 16 A
	C2	Contactor 2		
	CT	Contactor test	Contactor monitoring, checks the output signal for voltages on completion of the charging process	
2	**L**	Line	Phase, power grid	230 V AC
	N	Neutral	Neutral conductor, power grid	
	PE	Protective earth	Functional ground connected to protective earth ground	
	PE			
3	Ethernet		RJ45 jack for 100Base-TX Ethernet interface	

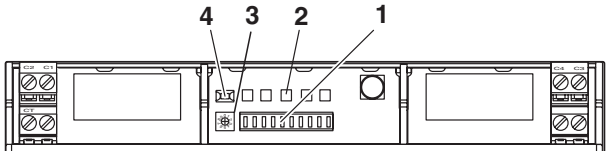
Table 3-1 Connections [...]

No.	Name	Meaning	Description	
4	**12 V**	Power	Output	12 V DC, max. 200 mA
	LD	Lock detection	Digital input, can be configured via web server or Modbus	Default: evaluation of locking feedback, activation via DIP D6
	EN	Enable		Default: enable charging process, activation via DIP D7
	ML	Manual lock		Default: manual locking, activation via DIP D9
	XR	External release		Default: charging station availability. Activation via DIP D8.
	IN	Input		Default: charging current 16 A
	A	RS-485 - A	Connection of external energy/power measuring devices and RFID card readers with Modbus/RTU protocol	
	B	RS-485 - B		
	GND	Ground	System ground	Connected to protective earth ground
	CR	Charger ready	Digital output, can be configured via web server or Modbus	Default: set when PWM is enabled
	VR	Vehicle ready		Default: set when the vehicle is ready (status C or D)
	LR	Lock request		Default: set as long as locking is to remain active
	ER	Error		Default: set when errors occur (status E or status F)
	12a	Auxiliary power	Supply input of the outputs	8 V DC… 30 V DC
5	Residual current monitoring		Dedicated connection for the supplied residual current sensor	
6	SIM		Micro SIM card slot for cellular	
7	**R1**	Retaining	Control voltage of locking actuator	
	R2			
	CP	Control Pilot	Pilot conductor signal	Communication between charging station and vehicle in accordance with IEC 61851-1
	PX	Proximity	Test signal	Current carrying capacity of the connected charging connector and charging cable in accordance with IEC 61851-1
8	**C3**	Contactor 3	Relay output, reserved for future applications	230 V AC, 16 A
	C4	Contactor 4		
9	Antenna		SMA antenna connector for cellular connection	

For further information on the configuration options for the digital inputs and outputs, please refer to “Status indicator and configuration via web server” on page 46.

3.2 Operating elements and indicators

Figure 3-2 Operating elements and indicators



1 DIP switch
2 LED indicators
3 Rotary coding switch
4 Reset button

Changes to the DIP configuration only take effect after a charging controller restart.

Table 3-2 DIP switches

No.	DIP	Name	Meaning	
1	1	Proximity	ON	Proximity value of the charging connector is evaluated (charging case B)
			OFF	Proximity value of the charging connector is **not** evaluated (charging case C)
	2	Reject charging cable	ON	Reject connector/cable with low current carrying capacity
			OFF	Reject connector/cable with low current carrying capacity
	3	Reject charging cable	Only relevant if DIP 2 = ON	
			ON	Reject 13 A connector/cable
			OFF	Reject 13 A and 20 A connector/cable
	4	Activate locking	ON	Lock charging connector
			OFF	Do **not** lock charging connector
	5	Reserved for future applications	ON	
			OFF	
	6	Locking feedback	ON	Evaluate locking feedback via digital input (default: input LD)
			OFF	Do **not** evaluate locking feedback
	7	Enable charging process	ON	Enable charging process via digital input (default: input EN)
			OFF	Enabling of charging process via digital input **not** required
	8	Charging station availability	ON	High signal at digital input (default: input XR) required, otherwise status F, charging station not available
			OFF	High signal at digital input **not** required
	9	Manual locking	ON	Manual locking through High signal at digital input (default: input ML)
			OFF	Automatic locking in status B, vehicle connected
	10	Enable via Ethernet	ON	Enable charging process and charging station availability via Ethernet (Modbus/web server), RFID card with locally stored release list or via OCPP backend
			OFF	Enabling of charging process and charging station availability via Ethernet (Modbus/web server) **not** required

Table 3-3 LED indicators

No.	Color	Meaning	
2	**Green**	Power	Flashes when charging controller is ready for operation
	Red	Error	Lights up in the event of errors
	Yellow	Connect	Flashes when valid charging connector is detected. Permanently on when the charging connector is locked in the charging socket.
	Green	Ready	Flashes 1 s: vehicle is connected Flashes 1/2 s: charging enabled (PWM signal on) Permanent: charging contactor closed
	Red/ green	Modem status	Red: no connection to server Green: connected to server

Table 3-4 Rotary coding switch

No.	Position	Meaning
3	**0**	PWM signal at 5%, necessary for digital communication
	1	Maximum current 6 A
	2	Maximum current 10 A
	3	Maximum current 13 A
	4	Maximum current 16 A
	5	Maximum current 20 A
	6	Maximum current 32 A
	7	Maximum current 63 A
	8	Maximum current 70 A
	9	Maximum current 80 A

Table 3-5 Reset button

No.	Name	Function
4	Reset	Pressing once: device restart
		Pressing > 10 s: reset to factory default settings

3.3 Dimensions

Figure 3-3 Charging controller dimensions

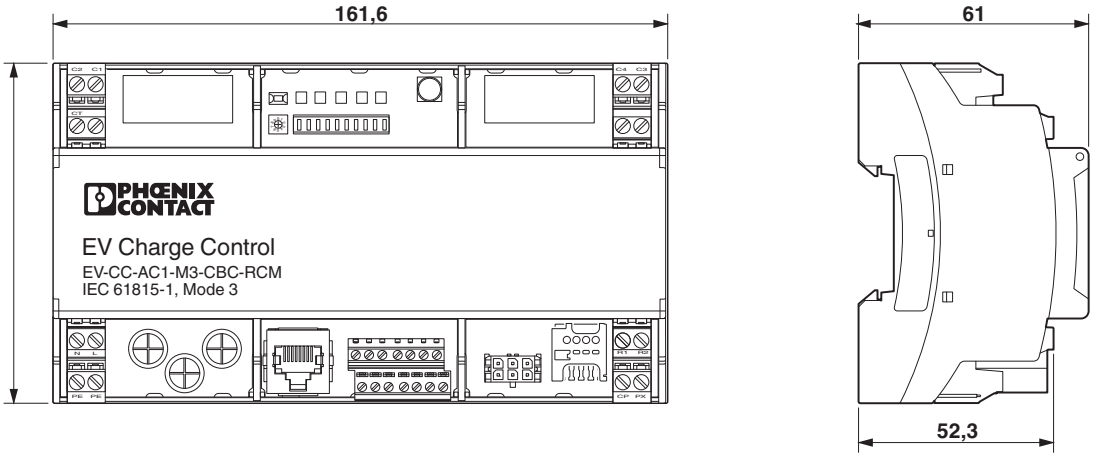
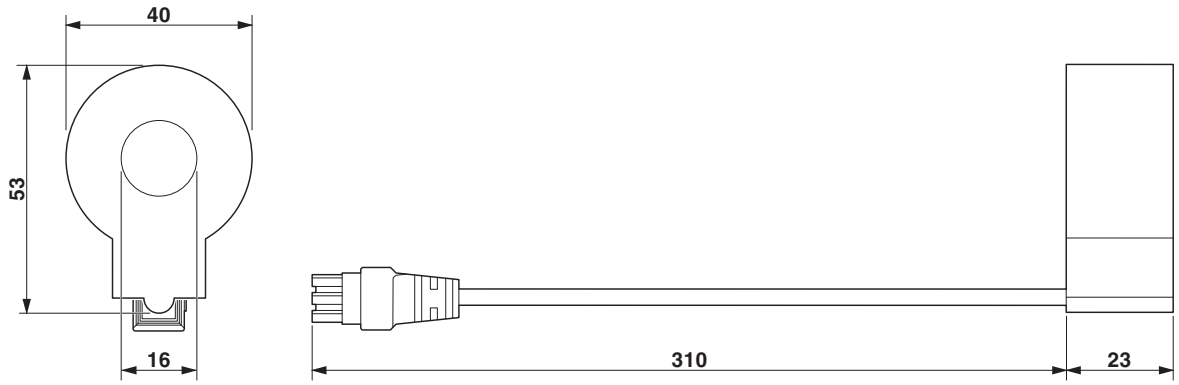


Figure 3-4 Measuring sensor dimensions



4 Mounting and startup

WARNING: Risk of electric shock

Only connect the charging controller or charging station to the supply line while it is disconnected from the power supply.

When installing the device, provide a circuit breaker which is marked as the disconnecting device for this device.

The circuit breaker must be suitably located and easily accessible to the user.

Only qualified personnel may set up and start up the device. The personnel must be familiar with the necessary safety precautions. Observe the relevant requirements for setting up and starting up a charging infrastructure, and, in particular, the applicable safety regulations.

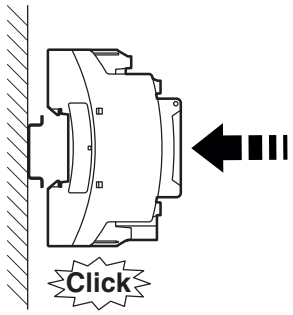
NOTE: Electrostatic discharge

Electrostatic discharge can damage or destroy components. When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) in accordance with EN 61340-5-1 and IEC 61340-5-1.

4.1 DIN rail mounting

4.1.1 Mounting

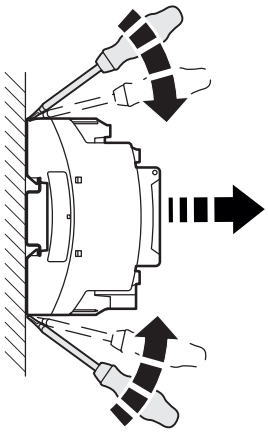
Figure 4-1 Mounting on a DIN rail



- Place the device onto the DIN rail from above.
- Push the front of the device toward the mounting surface until it audibly snaps into place.

4.1.2 Removal

Figure 4-2 Removal from the DIN rail



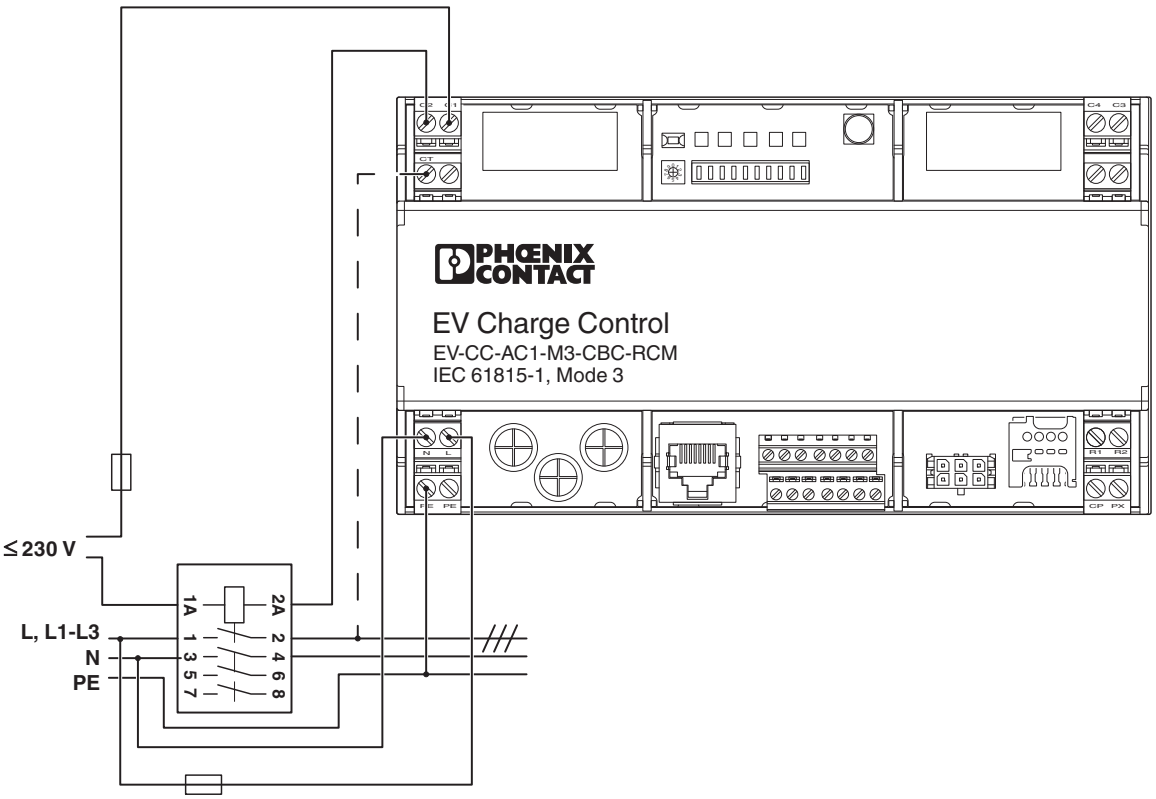
- Push down the locking latch using a screwdriver, needle-nose pliers or similar.
- Pull the bottom edge of the device slightly away from the mounting surface.
- Pull the device diagonally upward from the DIN rail.

4.2 Supply voltage connection

NOTE: Risk of damage to the device

The power supply to the device must be protected against overcurrent up to 6 A, maximum.

Figure 4-3 Connecting the supply voltage and charging contactor



- Connect the supply voltage to the device via terminal blocks N, L, and PE (connection block 1, see Figure 3-1 on page 13).

4.3 Charging contactor connection

NOTE: Risk of damage to the device

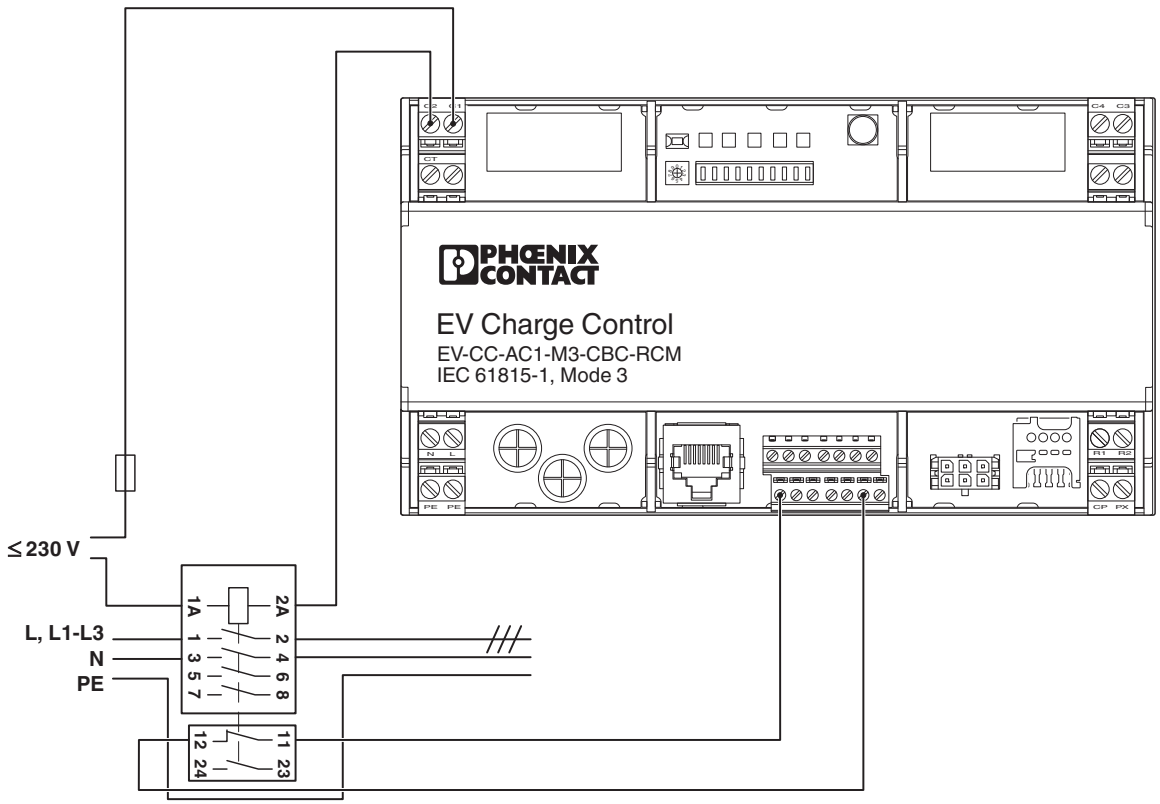
The power supply to the device must be protected against overcurrent up to 16 A, maximum. Activation of the mains voltage to the electric vehicle must be via a separate power contactor that meets the appropriate normative requirements. Switching the charging voltage directly via relay C1/C2 is not permitted.

- Connect the charging contactor to the device via terminal blocks C1 and C2, see Figure 4-3 on page 20 (connection block 3, see Figure 3-1 on page 13).

Monitoring the charging contactor

In single-phase charging stations, the phase downstream of the load contactor can be connected to connection CT as an option (see dashed line in Figure 4-3 on page 20). This detects whether a voltage is still present at the output of the load contactor on completion of the charging process. Configuration is performed via the web server ("Configuration" tab) or Modbus/TCP ("Modbus description" on page 70).

Figure 4-4 Load contactor monitoring with auxiliary contacts



In multi-phase charging stations, the charging contactor can be monitored by evaluating an auxiliary contact with force-guided contacts (see Figure 4-4 on page 21).

- Route the 12 V device voltage to a free digital input via a N/C (normally closed) or N/O (normally open) auxiliary contact.
- Assign the function to the corresponding input via the web server (see "Status" tab).
- Enable contactor monitoring (see "Configuration" tab).

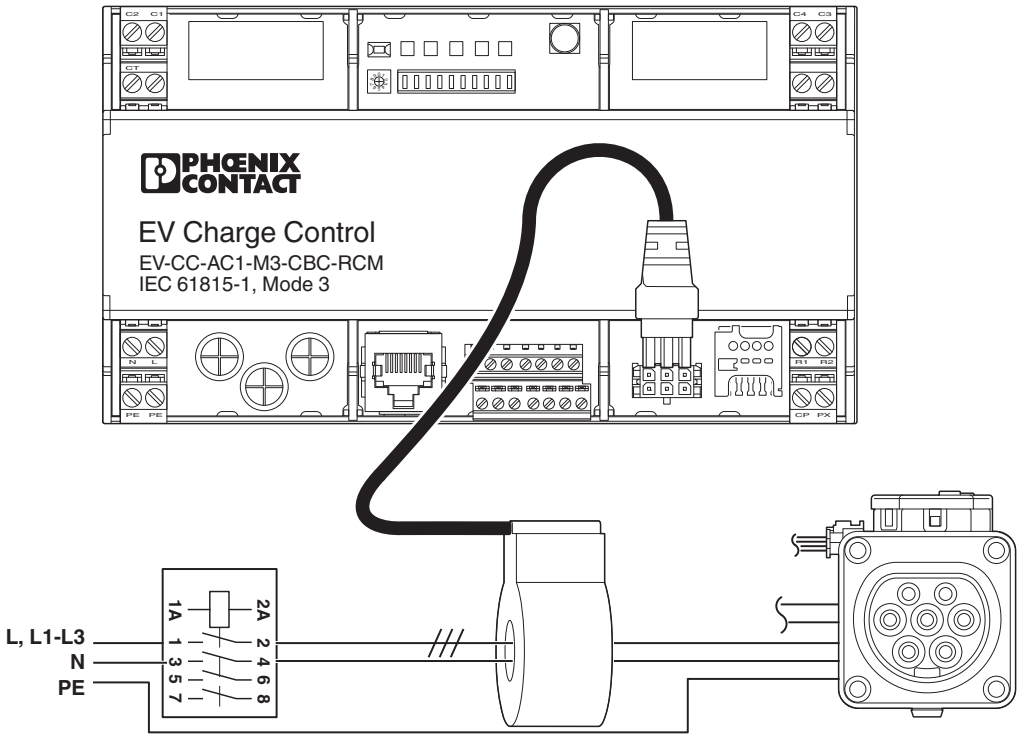
Alternatively, configuration can also be performed via Modbus (see “Modbus description” on page 70).

To disconnect the system from the power supply after a load contactor malfunction is detected on the output side, a digital output can be configured for the “Contactor Failure” event (see “Status” tab, “Configuration” tab or “Modbus description” on page 70).

The signal of this output can be used to open a redundant switching element or force the upstream RCD to trip.

4.4 Connection of the current measuring transducer for residual current detection

Figure 4-5 Connection of the current measuring transducer for residual current monitoring



- Connect the supplied measuring transducer to the charging controller via the appropriate connector (connector 6 in Figure 3-1 on page 13).
- Route all phases and line conductors as well as the neutral conductor of the infrastructure charging socket or the vehicle charging connector through the aperture of the measuring transducer.
- The protective conductor must not be routed through the measuring transducer.

  If the residual current is > 6 mA DC or > 30 mA AC, the charging process is terminated. The charging controller enters an error state. The error state is reset when the vehicle is disconnected from the charging station.

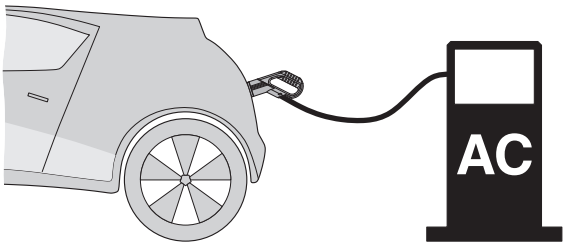
NOTE: Type A RCD required

Residual current detection does not release you from the obligation to provide a separate type A RCD for the charging station.

4.5 Connection of the vehicle charging connector and infrastructure charging socket

4.5.1 Vehicle charging connector

Figure 4-6 Charging case C, charging station with vehicle charging connector



- For charging case C, connect the Control Pilot conductor of the charging connector to the CP connection (connection block 2, Figure 3-1 “Connections on the charging controller”) of the charging controller.
- For charging case C, set DIP switch #1 to position 0 at configuration switch 1 (Figure 3-2 “Operating elements and indicators”).

4.5.2 Infrastructure charging socket

Figure 4-7 Charging case B, charging station with infrastructure charging socket

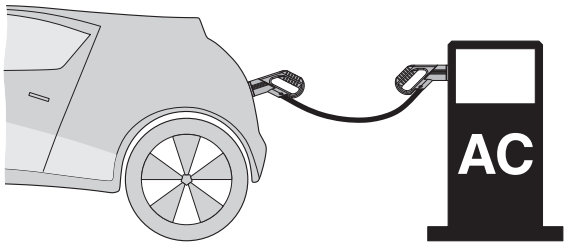
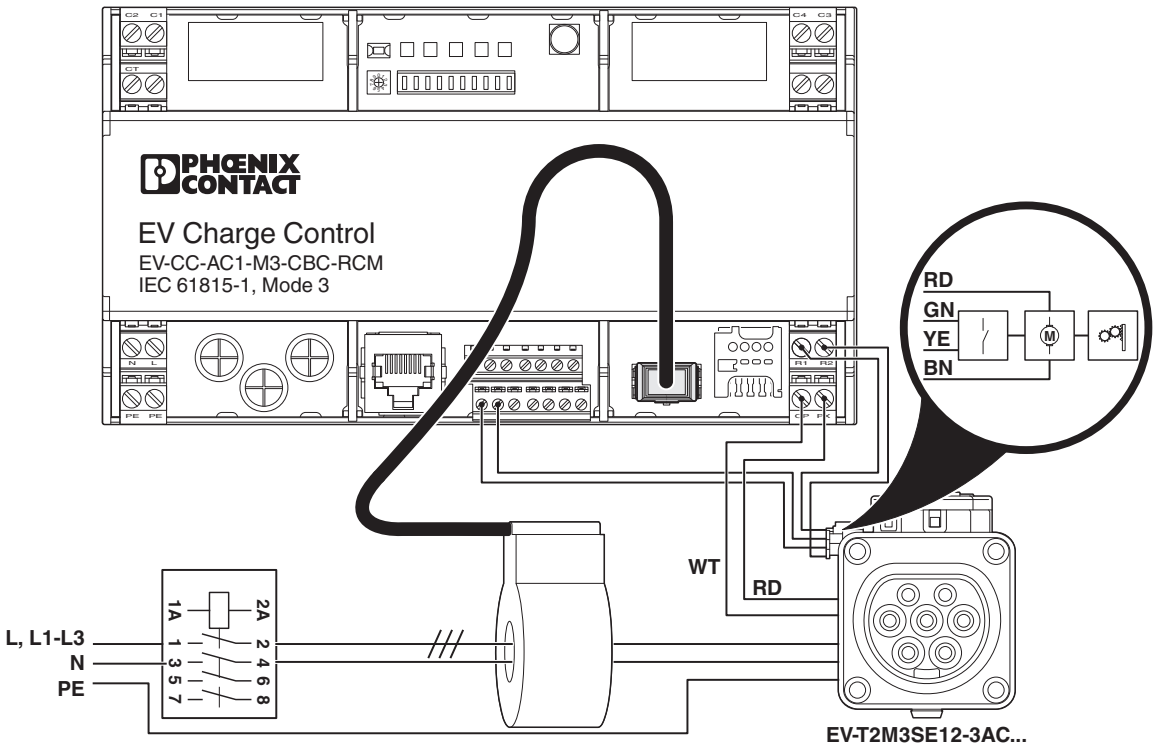


Figure 4-8 Connection of infrastructure charging socket



- For charging case B, connect the Control Pilot conductor of the infrastructure charging socket to the CP connection. Connect Proximity to the PX connection of the charging controller (connection block 2, Figure 3-1 “Connections on the charging controller”).

The locking function of the infrastructure charging socket is controlled via connections R1/R2 (connection block 2, Figure 3-1 on page 13). A voltage of 12 V and a corresponding polarity are applied to the locking actuator for a specific period of time via terminal blocks R1 and R2. When a defined state is reached, the output is disconnected from the power supply. In the factory default settings, the switching times are matched to the infrastructure charging sockets from Phoenix Contact.

To detect the locking state, a High signal is expected at input LD, e.g., by means of a floating contact. The EV-T2M3SE12-... infrastructure charging sockets from Phoenix Contact feature this type of floating contact. A closed contact indicates locking. Connect the floating contact to connections 12 V and LD at connection block 5 (Figure 3-1 on page 13).

If no corresponding feedback is measured at LD after a locking or unlocking pulse, this process is automatically repeated five times. If locking is not detected, the charging controller enters an error state. The error state is exited again via status A (vehicle not connected).

For charging case B, the following configuration is required at configuration switch 1 (Figure 3-2 on page 15):

– DIP switch #1 = 1
– DIP switch #4 = 1
– DIP switch #6 = 1

In this case, locking starts automatically on detection of a connected vehicle (transition from status A to status B). Unlocking is performed on disconnection of the vehicle from the charging station (transition from status B to status A).

As an option, locking can be performed via a digital input or Modbus, or the web server. To do this, also set **DIP switch #9 = 1**. If locking is performed via a digital input, the function must be assigned to the corresponding input via the web server (“Status” tab). In the factory default settings, input ML is intended for this. Alternatively, configuration can also be performed via Modbus (“Modbus description” on page 70).

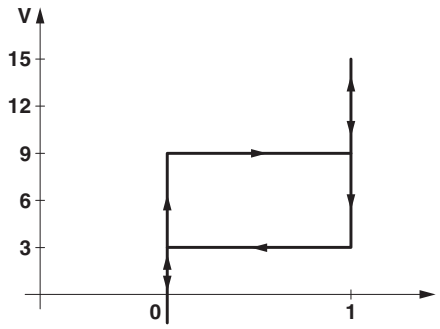
4.6 Wiring of the digital inputs

The inputs are designed as voltage dividers for a voltage of 0 V to +12 V. A current of < 4 mA flows across the resistor network at 12 V.

A switching hysteresis is implemented for evaluation purposes.

– Logic 0 is reliably detected at a voltage of 0 V to +3 V.
– Logic 1 is reliably detected at a voltage of +9 V to +15 V.

Figure 4-9 Switching hysteresis of digital inputs



The input circuits are only examples. The inputs with switches can be supplied by the internal voltage source (see Figure 4-10) as well as by an external 12 V voltage source that uses GND as the common reference point (see Figure 4-11).

The inputs can also be controlled by an external higher-level controller with 12 V outputs. Here too GND is used as the common reference point.

Figure 4-10 Wiring of the digital inputs, internal supply

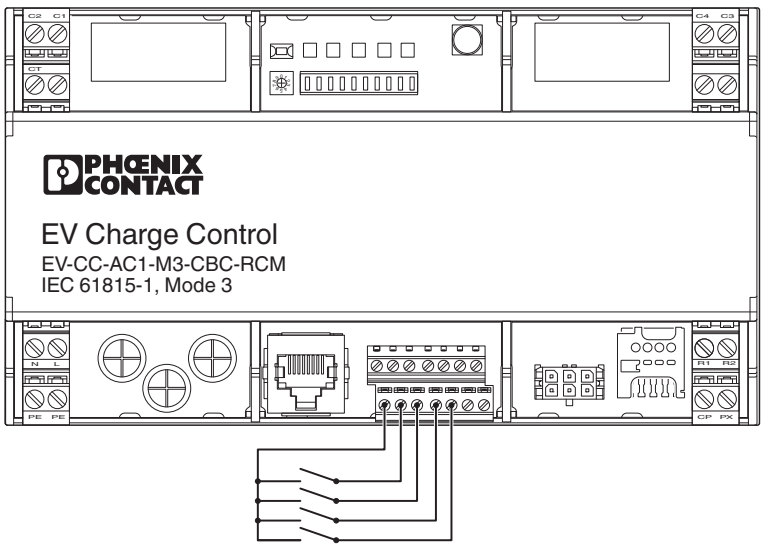
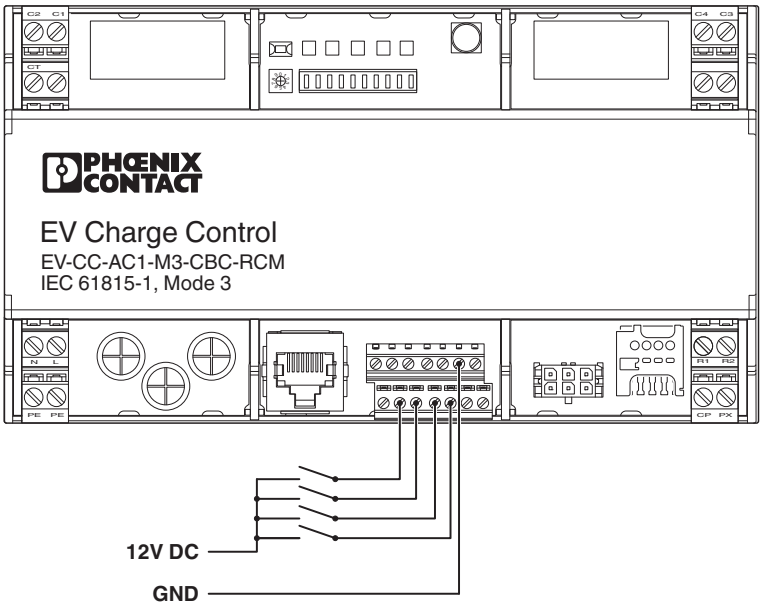


Figure 4-11 Wiring of the digital inputs, external supply



Configuration of the digital inputs

You can configure functions for the digital inputs that differ from the factory default settings. The charging controller can be configured via the web server or via Modbus/TCP.

For the configuration options for the digital inputs and outputs, refer to section “Status indicator and configuration via web server” on page 46, from “Status” tab, and “Modbus description” on page 70.

4.7 Wiring of the digital outputs

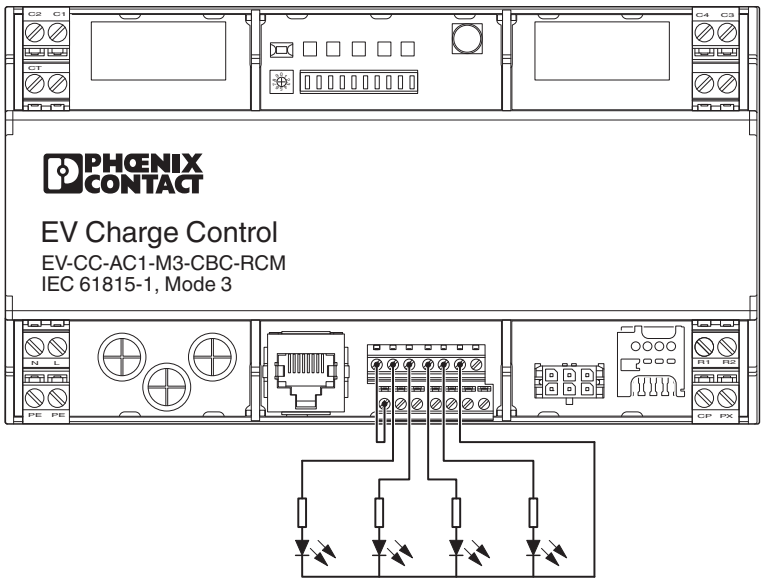
In status 0, the outputs are connected to GND and in status 1 they are connected to voltage input 12a. A power supply of 8 V to 30 V DC can be applied at voltage input 12a.

The maximum current carrying capacity of the switching transistors is 600 mA. If voltage input 12a is supplied via the 12 V connection, then a maximum of 200 mA in total are available at all outputs.

Connection of consumers with low current consumption (e.g., LEDs)

– The output stages are supplied with the required voltage of 12 V DC from voltage output 12 V via voltage input 12a.
– Voltage output 12 V can carry a maximum of 200 mA.
– In status 0 (OFF), the outputs are connected to GND and in status 1 (ON), they are connected to the potential of 12a.
– GND is connected to PE internally.

Figure 4-12 Wiring of the digital outputs, internal feed-in



Connection of high-power consumers (e.g., lamps)

The output stages are supplied with the required voltage of 8 V DC to 30 V DC maximum via voltage input 12a.

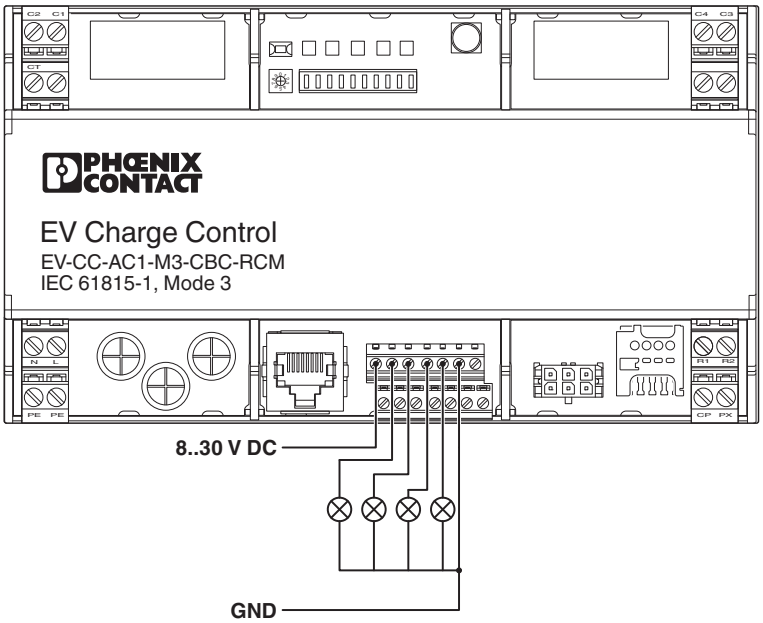
• Connect the GND of the external feed-in to the GND of the charging controller.

In status 0 (OFF), the outputs are connected to GND and in status 1 (ON), they are connected to the potential of 12a. GND is connected to PE internally.

NOTE: Observe the current capacity per output

Please note the maximum current capacity of 600 mA per output.

Figure 4-13 Wiring of the digital outputs, external feed-in



Configuration of the digital outputs

You can configure functions for the digital outputs that differ from the factory default settings. The charging controller can be configured via the web server or via Modbus/TCP.

For the configuration options for the digital inputs and outputs, refer to Figure 8-1 on page 47 and Table 9-2 on page 71.

NOTE: Possible damage to the transistors

Never connect a supply voltage to the outputs. One of the transistors is always activated. This means that the transistors may be destroyed.

The outputs are not short-circuit-proof or protected against overload.

4.8 RS-485 interface

You can connect energy measuring devices and RFID card readers that have an RS-485 interface and support the Modbus/RTU protocol to the serial interface. For some devices, it may be necessary to terminate the cable with a 120 ohm termination resistor.

4.8.1 Connecting the energy measuring device

Factory-configured energy measuring devices

Charging controllers **up to firmware 1.11** are set to this energy measuring device by default: EEM-350-D-MCB, 2905849.

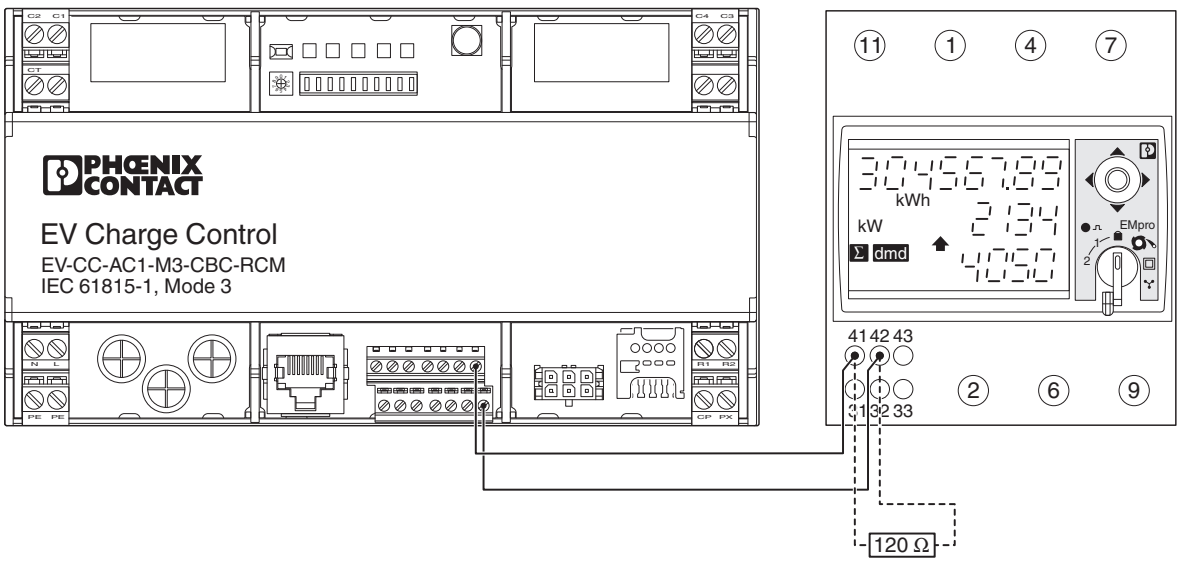
Charging controllers with **firmware 1.12** or later are set to this energy measuring device by default: EEM-EM357, 2908588.

NOTE: Display change from KWh to Wh

For **firmware** 1.12 or later, the **energy measuring device** values of the charging controllers are displayed in Wh. Following an update to firmware 1.12 or later, you need to manually adjust the configuration of the **energy measuring devices** (on the "Energy Meter" tab).

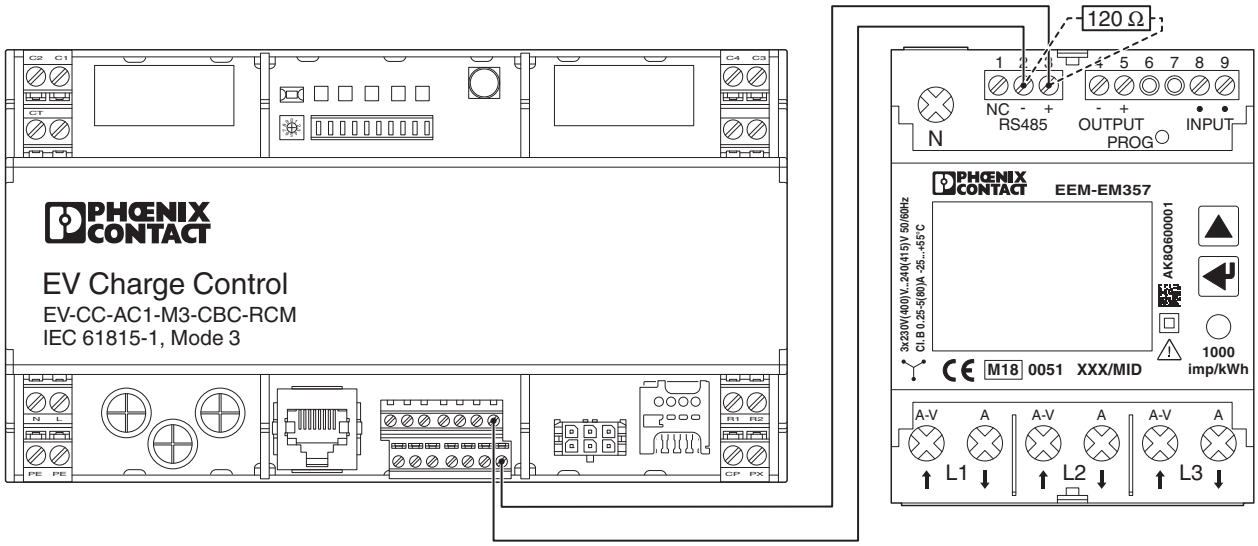
Up to firmware 1.11: EEM-350-D-MCB

Figure 4-14 Connection of the EEM-350-D-MCB energy measuring device via RS-485



Firmware 1.12 or later: EEM-EM357

Figure 4-15 Connection of the EEM-EM357 energy measuring device via RS-485



The connection is configured via the web server, see “Energy Meter” tab. Set the communication parameters. Configure the register addresses, data length, and conversion factors for the measured data of the energy measuring device. The energy measuring devices must provide integer data with a maximum of two data words in Little Endian or Big Endian format in Holding or Input registers. The data read from the energy measuring device is then available via Modbus/TCP and the web server. The OCPP protocol can be used to forward the data to the central management system.

Overcurrent monitoring can also be activated.

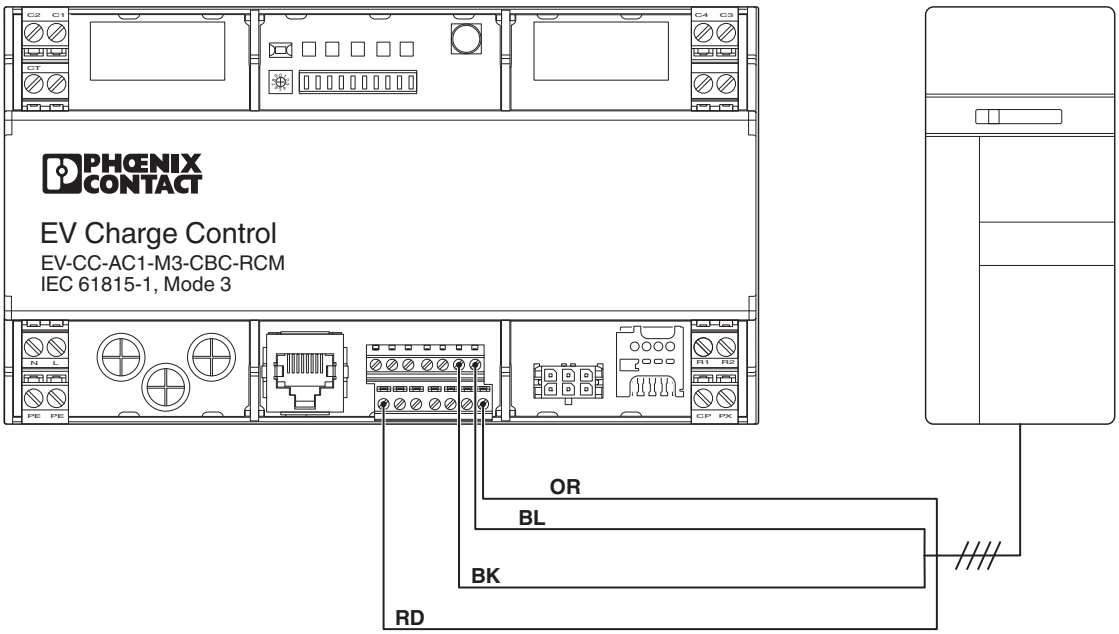
In the event of an overcurrent of I/Imax > 1.25, shutdown occurs after 10 s.

– In the range of 1.25 > I/Imax > 1.1, shutdown occurs after 100 s.
– Currents of I/Imax < 1.1 are tolerated.

The energy measuring device interface is activated and configured via the web server (see “Energy Meter” tab) or Modbus (see “Modbus register types” on page 70).

4.8.2 Connecting an RFID card reader

Figure 4-16 Connection of a Quio QDE 950-4 RFID card reader via RS-485



To identify users and enable charging processes, you can connect an RFID card reader to the Modbus/RTU interface.

You can configure the RFID card reader as follows:

– Web server (""Status" tab" on page 47)
– Modbus/TCP ("Register assignment" on page 71)

In the factory default settings, the charging controller is configured for the QDE 950-4 RFID card reader from Quio.

To enable the RFID card reader, set DIP switch #10 = 1.

The charging process can be enabled after comparing the locally stored whitelist or by means of a higher-level management system.

Checking against a local whitelist

Up to 20 RFID unique identifiers (UIDs) can be stored on the charging controller. The whitelist is edited via the web server (see ""Card Reader" tab" on page 65). If a read-in card is recognized in the list, the charging process is enabled. If a vehicle is not connected to the charging station within 30 s, this enable expires. A new identification process must be performed to refresh enabling. Enabling also expires when the vehicle is disconnected from the charging station after the charging process.

If the RFID UID is not recognized in the whitelist and the charging process is not started, this is indicated by a buzzer signal.

Checking against a higher-level management system

To check the UID by means of a higher-level management system, suppress the buzzer via Modbus/TCP (register address 425, see "Register assignment" on page 71). The buzzer signal is suppressed for 60 s and must be suppressed again on a continuous basis.

The UID is read via Modbus/TCP and can be processed accordingly by the higher-level system. Enabling is also performed via Modbus/TCP. If charging cannot be enabled, the buzzer can be activated via Modbus/TCP, register address 421. Charging remains enabled until it is reset again by the higher-level system via Modbus.

5 Cellular interface

The charging controllers are available in versions with a cellular interface.

Table 5-1 Communication interfaces

Charging controller	Communication	
	Ethernet	**Cellular**
EV-CC-AC1-M3-CBC-RCM-ETH	x	–
EV-CC-AC1-M3-CBC-RCM-ETH-3G	x	**x**
EV-CC-AC1-M3-RCM-ETH-XP	x	–
EV-CC-AC1-M3-RCM-ETH-3G-XP	x	**x**

Antenna

Only use the supplied antenna to connect to the cellular network. Connect it to the SMA female antenna connector (see Figure 3-1 “Connections on the charging controller”).

SIM card

Insert a SIM card in micro SIM format into the SIM card reader (Figure 3-1 “Connections on the charging controller”).

Before starting the charging controller with the SIM card, enter the PIN number for the SIM card via the web server (see Section 8.4, ““Network” tab for cellular”).

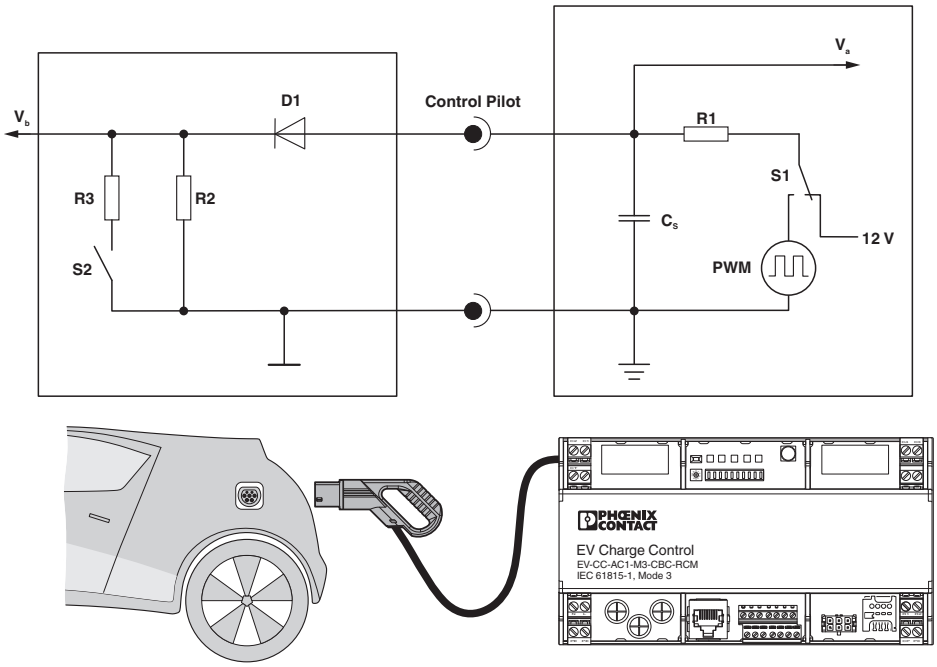
The SIM card is not supplied as standard. It is usually provided by the operator of the backend system to which the charging station is connected.

The connection data for the backend is set via the controller web server, see Section 8.4, ““Network” tab for cellular”.

6 Basics of signal contacts and charging sequences

6.1 Control Pilot signal

Figure 6-1 Control Pilot signal



The charging controller indicates that it is ready for charging via the CP (Control Pilot) signal. The CP signal specifies the permissible charging current value to the vehicle as a coded PWM signal.

The vehicle indicates the current vehicle status via the voltage value V_a.

The assignment of the permissible charging current value to the pulse width of the PWM signal and the assignment of the voltage value to the vehicle states are defined in IEC 61851-1 (see Table 6-2 on page 38).

Table 6-1 Vehicle states in accordance with IEC 61851-1

System status	Vehicle connected	S2*	V_a †	Description
A	No	Open	12 V	V_b ‡ = 0 V A1 (12 V DC): no vehicle connected A2 (12 V PWM): only temporary transition state, enters the A1 state
B	Yes	Open	9 V	R2 detected B1 (9 V DC): EVSE** not ready yet B2 (9 V PWM): EVSE ready ††
C	Yes	Closed	6 V	R3 = 1.3 kΩ ±3% ventilation not required C1 (6 V DC): EVSE not ready, charging process aborted. Transition state; permanent state only possible in the event of a simplified Control Pilot. C2 (6 V PWM): charging process active
D‡‡	Yes	Closed	3 V	R3 = 270 Ω ±3% ventilation of the charging area required D1 (6 V DC): EVSE not ready, charging process aborted. Transition state; permanent state only possible in the event of a simplified Control Pilot. D2 (6 V PWM): charging process active
E	–	–	0 V	b = 0: EVSE mains problem or mains not available; short circuit at Control Pilot
F	–	–	-12 V	EVSE not available

* Switch S2 (see Figure 6-1 on page 36)

† V_a = measured voltage at the charging controller

‡ V_b = measured voltage in the vehicle

** EVSE = Electric Vehicle Supply Equipment (charging station)

†† The charging station can be set to an operational state, e.g., by a signal at the Enable input or using the relevant Modbus command.

‡‡ In the delivery configuration, status D is not supported

Figure 6-2 Typical curve of the Control Pilot signal

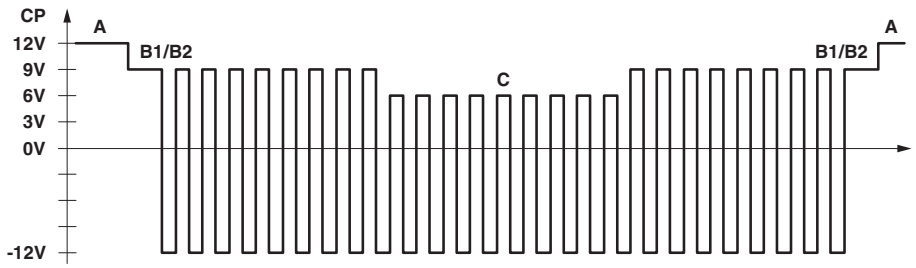


Table 6-2 Typical sequence of a charging process

System status	State	Description	CP signal
A	No vehicle connected	–	12 V
B	Vehicle connected	Voltage at the CP signal drops to 9 V. Resistor R2 in the vehicle is detected. The voltage value at the CP signal is the result of the series connection of resistor R1 in the charging controller, diode D in the vehicle, and resistor R2 in the vehicle at 12 V. When the charging station is ready to supply energy, the PWM signal is switched on. The ready-to-charge state can be set automatically via input EN, RFID, Ethernet or cellular interface. The pulse width codes the permissible charging current that the vehicle may take from the charging infrastructure. The coding is shown in Table 6-3 on page 39. B1 (9 V DC): EVSE not ready yet B2 (9 V PWM): EVSE ready	9 V
C	Charging process started	When the vehicle detects the PWM signal, the vehicle connects another resistor (R3) parallel to R2 via S2. This results in a voltage value of 6 V The charging controller connects the mains voltage to the vehicle via a charging contactor and charging cable. The charging process begins.	6 V
B	Charging process stopped	The charging process can be aborted via the charging station or via the vehicle. Switch-off via the charging station: the charging station switches off the PWM signal and indicates the end of the charging process. The vehicle opens S2. The charging controller disconnects the charging contactor again and with it the voltage from the charging cable. If S2 is not opened within 5 s after switching off the PWM signal, the charging process is stopped irrespective of the vehicle status. Switch-off via the vehicle: the vehicle disconnects resistor R3 again via S2. The vehicle stops the charging process and opens S2. The charging controller disconnects the charging contactor again and with it the voltage from the charging cable.	9 V
A	Vehicle disconnected from the charging station	–	12 V

Assignment of charging currents to the pulse duty factor of the Control Pilot signal

Table 6-3 Controlling the maximum charging current that may be taken in accordance with IEC 61851-1

Evaluation of the pulse duty factor by the vehicle	Maximum current in accordance with IEC 61851-1 that the vehicle may take
Pulse duty factor < 3%	Charging process is not permitted.
3% ≤ pulse duty factor ≤ 7%	Indicates that digital communication between the vehicle and charging station is being used to determine the charging parameters. The charging process is only permitted with digital communication. 5% pulse duty factor is suitable if the Control Pilot is used for digital communication.*
7% ≤ pulse duty factor ≤ 8%	Charging process is not permitted.
8% ≤ pulse duty factor < 10%	6 A
10% ≤ pulse duty factor ≤ 85%	Available current = (pulse duty factor %) x 0.6 A
85% < pulse duty factor ≤ 96%	Available current = (pulse duty factor % - 64) x 2.5 A
96% < pulse duty factor ≤ 97%	80 A
Pulse duty factor > 97%	Available current = (pulse duty factor % - 64) x 2.5 A

* Function not supported by this controller

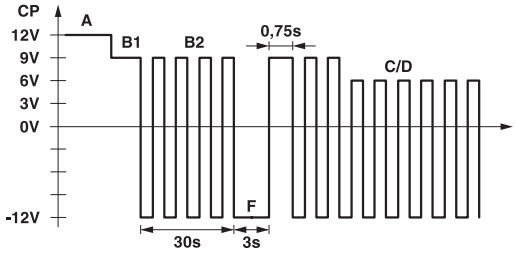
Activation mode

If the connected vehicle switches from status B1 (9 V DC) to status B2 (9 V PWM) and the vehicle does not enter status C or D within 30 seconds, the charging controller simulates the disconnection of the vehicle from the charging station.

To do this, the CP signal is set to -12 V DC for 3 seconds. It then switches back to the PWM signal.

After the transition from status A1 or B1 to status B2, this process is performed only once.

Figure 6-3 Activation mode



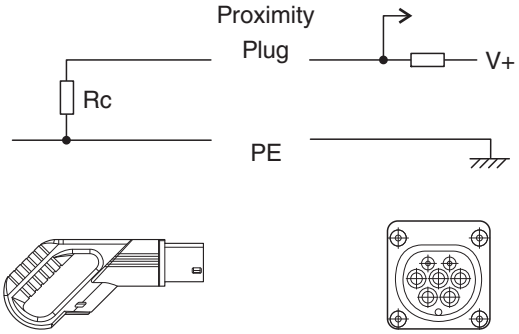
Activation mode is activated again under these conditions:

– The vehicle is disconnected from the charging controller and connected again.
– The charging process is interrupted by the charging station (e.g., for reasons of load management).

6.2 Proximity signal (Proximity Plug)

The Proximity Plug is used to detect a charging connector in the charging station, and to determine its current carrying capacity.

Figure 6-4 Proximity signal (Proximity Plug)



The current carrying capacity is identified in accordance with IEC 61851-1 by means of resistor Rc.

The device measures the resistance value via signal PP (Proximity Plug). The device then determines the current carrying capacity of the connected charging cable.

The coding of the permissible current for the resistance value is defined in IEC 61851-1.

Table 6-4 Coding of the permissible current for the resistance value in accordance with IEC 61851-1

Rc resistance value in accordance with standard	Tolerance range	Resulting current carrying capacity
–	< 75 Ω	Error
100 Ω	75 Ω ... 150 Ω	63 (70) A
220 Ω	150 Ω ... 330 Ω	32 A
680 Ω	330 Ω ... 1000 Ω	20 A
680 Ω	1000 Ω ... 2200 Ω	13 A
–	> 2200 Ω	0 A

7 OCPP backend connection

OCPP communication

Depending on the version, you can connect the charging controller to a central management system via Ethernet or cellular. The charging controller communicates with a central management system via the Open Charge Point Protocol OCPP 1.6J (JSON) and the WebSockets protocol.

Table 7-1 Interfaces

Charging controller	OCPP 1.6J communication	
	Ethernet	Cellular
EV-CC-AC1-M3-CBC-RCM-ETH	–	–
EV-CC-AC1-M3-CBC-RCM-ETH-3G	–	**x**
EV-CC-AC1-M3-RCM-ETH-XP	**x**	–
EV-CC-AC1-M3-RCM-ETH-3G-XP	**x**	**x**

The following table provides an overview of the supported operations from the OCPP protocol:

Table 7-2 Overview of supported OCPP operations

OCPP operations	Notes
Authorize	Without “Local Authorization List” and “Authorization Cache”
Boot Notification	Full implementation
Heartbeat	Full implementation
Meter Values	Cannot be configured, all measured values are transmitted
Start Transaction	Full implementation
Status Notification	Full implementation
Stop Transaction	Full implementation
Cancel Reservation	Full implementation
Change Availability	Full implementation
Clear Charging Profile	Full implementation
Remote Start Transaction	Start of charging processes only with authorization by the backend
Remote Stop Transaction	Full implementation
Reserve Now	Full implementation, reservations only on specific connector ID, not on ID 0 in general
Reset	HardReset only (A HardReset will also be performed if a SoftReset is requested)

Table 7-2 Overview of supported OCPP operations [...]

OCPP operations	Notes
Set Charging Profile	No recurring profiles, no stacked profiles Maximum number of linked elements in a profile: **EV-CC-...-3G charging controller** – Master: TxDefaultProfile, TxProfile: 10 elements MaxProfile: 5 – Slave: TxDefaultProfile, TxProfile: 10 elements MaxProfile: none **EV-CC-...-XP charging controller** – Master: TxDefaultProfile, TxProfile: 40 elements MaxProfile: 5 – Slave: TxDefaultProfile, TxProfile: 10 elements MaxProfile: none Please also refer to “OCPP charging profiles and load management” on page 69.
Trigger Message	Only for the implemented messages
Unlock Connector	Limited
Change Configuration	Parameters – ConnectorTimeOut – HeartbeatInterval – MeterValueSampleInterval – StopTransactionOnInvalidId – PricePerkWh – WebSocketPingInterval
Get Diagnostics	Upload to an FTP server
Firmware-Update	FW update downloaded from an FTP server

Configuration

The charging controller can be configured to a limited extent. The table provides an overview of the implemented configuration for the charging controller. ConfigurationKeys with the ReadOnly value “false” can be overwritten by the backend.

Table 7-3 ConfigurationKeys of the charging controller

ConfigurationKey	ReadOnly	Value
AuthorizeRemoteTxRequests	true	true
ChargeProfileMaxStackLevel	true	1
ChargingScheduleAllowedChargingRateUnit	true	Current
ChargingScheduleMaxPeriods	true	1
ClockAlignedDataInterval	true	0
ConnectionTimeOut	false	60
ConnectorPhaseRotation	true	unknown
GetConfigurationMaxKeys	true	0
HeartbeatInterval	false	1800
LocalAuthorizeOffline	true	false
LocalPreAuthorize	true	false
MaxChargingProfilesInstalled	true	1
MeterValuesAlignedData	true	0
MeterValueSampleInterval	false	300
MeterValuesSampledData	true	0
NumberOfConnectors	true	According to the connected charging controllers
PricePerkWh	false	0
ResetRetries	false	0
StopTransactionOnEVSideDisconnect	true	true
StopTransactionOnInvalidId	true	true
StopTxnAlignedData	true	true
StopTxnSampledData	true	true
SupportedFeatureProfiles	true	Core, Reservation, SmartCharging, RemoteTrigger
TransactionMessageAttempts	false	3
TransactionMessageRetryInterval	false	10
UnlockConnectorOnEVSideDisconnect	true	true
WebsocketPingInterval	false	600

8 Status indicator and configuration via web server

8.1 Connecting the charging controller to the PC

Using an Ethernet cable, connect the charging controller to a computer on which a browser is installed.

In the delivery state, the static IP address of the system is 192.168.0.8.

The system can be reached using the preset IP address if the following settings have been made on your computer (example procedure for Windows 10):

- In your system, select “Network and Sharing Center” under “Start, Windows System, Control Panel, Network and Internet”.
- From the connections available, select the one that is connected to the charging controller, e.g., Ethernet.
- Click on the “Properties” button.
- Select “Internet Protocol Version 4 (TCP/IPv4)”. Click on the “Properties” button.
- Here you can assign a suitable IP address and subnet mask to your computer, enabling you to use it to establish a direct connection to the charging controller, e.g., IP address 192.168.0.1 and subnet mask 255.255.255.0
- You can now access the system via your browser and configure it. To do this, enter http://192.168.0.8 in the address line of your browser.
- Depending on the setup and network, in the address line of your browser you can also enter the device name or another IP address you have set via the browser.

When the web server is launched, you are prompted to enter a password. The factory default setting is “**phoenix**”. We recommend that you change this on the “Config” tab.

Configurations on the individual pages are transferred to the device using the “**Submit**” button. Individual configuration parameters only take effect after the device has been restarted. Once all of the parameters have been set, a single reset via the corresponding button is necessary.

8.2 “Status” tab

Figure 8-1 “Status” tab

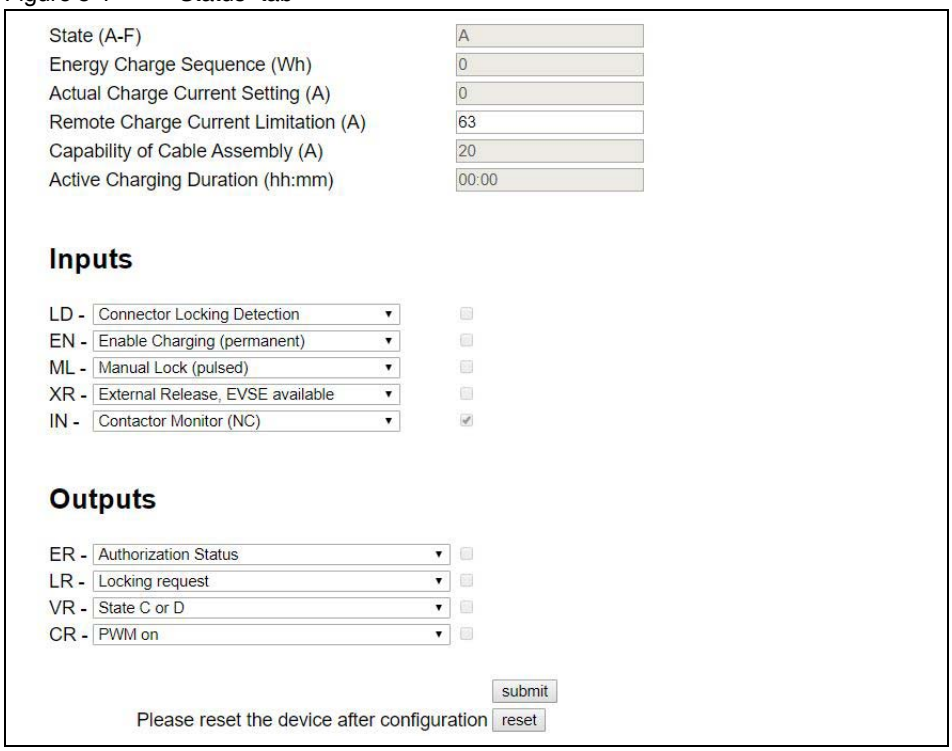


Table 8-1 “Status” tab

Display value	Description
State (A-F)	Status of the charging process (A - F) in accordance with IEC 61851-1, Annex A
Energy Charge Sequence (Wh)	Amount of energy that has already been charged in the current charging process. Reset via status A.
Actual Charge Current Setting (A)	Corresponds to the maximum permissible charging current that is transferred to the vehicle via the PWM pulse duty factor. The displayed value is determined as the smallest value from the following factors: – The configuration via the rotary coding switch – The current carrying capacity of the charging cable – The value entered via “Remote Charge Current Limitation”
Remote Charge Current Limitation (A)	Input field that can be used to adjust the maximum charging current for the electric vehicle.
Capability of Cable Assembly (A)	Corresponds to the current carrying capacity of the connected charging cable, determined by evaluating the proximity contact.
Active Charging Duration (hh:mm)	Time in hh:mm that the vehicle has been charging. Reset via status A.

Table 8-1 “Status” tab [...]

Display value	Description
Inputs	
LD	Displays the status of digital input LD via the checkbox. A ticked checkbox stands for logic 1 or 12 V at the input. The assignment of the functions to the input signals can be configured via the pull-down menu. The default value is “Connector Locking Detection”, see Table 8-2.
EN	Displays the status of digital input EN via the checkbox. A ticked checkbox stands for logic 1 or 12 V at the input. The assignment of the functions to the input signals can be configured via the pull-down menu. The default value is “Enable Charging (permanent)”, see Table 8-2.
ML	Displays the status of digital input ML via the checkbox. A ticked checkbox stands for logic 1 or 12 V at the input. The assignment of the functions to the input signals can be configured via the pull-down menu. The default value is “Manual Lock (pulsed)”, see Table 8-2.
XR	Displays the status of digital input XR via the checkbox. A ticked checkbox stands for logic 1 or 12 V at the input. The assignment of the functions to the input signals can be configured via the pull-down menu. The default value is “External Release, EVSE available”, see Table 8-2.
IN	Displays the status of digital input IN via the checkbox. A ticked checkbox stands for logic 1 or 12 V at the input. The assignment of the functions to the input signals can be configured via the pull-down menu. The default value is “Maximum Current 16 A”, see Table 8-2.
Outputs	
ER	Displays the status of digital output ER via the checkbox. A ticked checkbox stands for logic 1 or 12 V at the output. The outputs can be configured for different states/events via the pull-down menu. The default value is “State E or State F (Error)”, see Table 8-3.
LR	Displays the status of digital output LR via the checkbox. A ticked checkbox stands for logic 1 or 12 V at the output. The outputs can be configured for different states/events via the pull-down menu. The default value is “Locking Request”, see Table 8-3.
VR	Displays the status of digital output VR via the checkbox. A ticked checkbox stands for logic 1 or 12 V at the output. The outputs can be configured for different states/events via the pull-down menu. The default value is “State C or D”, see Table 8-3.
CR	Displays the status of digital output CR via the checkbox. A ticked checkbox stands for logic 1 or 12 V at the output. The outputs can be configured for different states/events via the pull-down menu. The default value is “PWM on”, see Table 8-3.
Buttons	
Submit	Transfers selected configurations to the charging controller.
Reset	Restarts the charging controller. A restart is required to apply any changes to the configuration.

Table 8-2 Configuration options for digital inputs

Option	Meaning
(Empty)	No function assigned to the input.
Enable Charging (permanent)	The charging process is enabled by a permanent High signal at the input (default for input EN). Requirement: DIP #7 = 1
Enable Charging (pulsed)	The charging process is enabled by a pulsed High signal at the input. The enable is withdrawn with the next pulse. Requirement: DIP #7 = 1
External Release, EVSE available	Availability of the charging station through permanent High signal at the input. Status F for Low signal (default for input XR). Requirement: DIP #8 = 1
Connector Locking Detection	Evaluation of locking feedback, High signal corresponds to locked charging connector in the infrastructure charging socket (default for input LD). Requirement: DIP #6 = 1
Manuel Lock (permanent)	Charging connector locked on a High signal at the input, unlocked on a Low signal. Requirement: DIP #9 = 1
Manuel Lock (pulsed)	Charging connector locked when a pulse is detected at the input; unlocked with the next pulse (default for input ML). Requirement: DIP #9 = 1
Contactor Monitor (NO)	Feedback for contactor monitoring via a N/O (normally open) auxiliary contact at the load contactor. The “Contactor Monitoring” function must be enabled on the CONFIG tab.
Contactor Monitor (NC)	Feedback for contactor monitoring via a N/C (normally closed) auxiliary contact at the load contactor. The “Contactor Monitoring” function must be enabled on the CONFIG tab.
Maximal Current “digital communication”	PWM pulse duty factor of the Control Pilot signal is set to: 5% – digital communication with the vehicle. High-level communication with the vehicle is not part of the charging controller.
Maximal Current 6 A	On a High signal, the maximum charging current is limited to the relevant current value. (Default for input IN: 16 A)
Maximal Current 10 A	
Maximal Current 13 A	
Maximal Current 16 A	
Maximal Current 20 A	
Maximal Current 32 A	
Maximal Current 63 A	
Maximal Current 70 A	
Maximal Current	The charging current is increased to the maximum permissible value. Restrictions via Modbus/TCP are ignored.
Suspended EVSE	The charging process is interrupted. During operation on an OCPP backend, a “Suspended_EVSE” message is generated. The active transaction is not terminated.
Error Input	The charging controller can be set to a specific error state via a digital input. Bit 2 is set in register 155 (see Table 9-2).

Table 8-3 Configuration options for digital outputs

Option	Meaning
(Empty)	No status or event assigned to this output.
State A	Device is in status A, no vehicle connected.
State B	Device is in status B, vehicle connected, no charging process.
State B and PWM on	Device is in status B2, vehicle connected, PWM enabled (charging station ready for charging).
State B and PWM off	Device is in status B1, vehicle connected, PWM disabled (charging station not ready for charging).
State C	Device is in status C, charging process can take place.
State D	Device is in status D, charging process can take place.
State E	Device is in status E, error or charging station not ready.
State F	Device is in status F, charging station not available for charging processes.
State A or State B	Device is in status A or B, no charging process active.
State A or State B and PWM on	Device is in status A or B – with enabled PWM signal.
State A or State B and PWM off	Device is in status A or B – with disabled PWM signal.
State A or State B or State C	Device is in status A, B or C.
State A or State B or State D	Device is in status A, B or D.
State A or State B or State C or State D	Device is in status A, B, C or D, no errors, charging station available.
State E or State F (Error)	Status E or Status F, error or charging station not available. Default for output ER.
State C or D	Status C or D, charging process can take place. Default for output VR.
PWM on	PWM signal on, charging process enabled on the charging controller side. Default for output CR.
Valid ProximityPlug	Charging connector with valid Proximity detected.
Invalid ProximityPlug	Charging connector with invalid Proximity detected.
13A at ProximityPlug	13 A charging cable detected.
20A at ProximityPlug	20 A charging cable detected.
32A at ProximityPlug	32 A charging cable detected.
63A at ProximityPlug	63 A charging cable detected.
13A or 20A at ProximityPlug	13 or 20 A charging cable detected.
13A or 20A or 32A at ProximityPlug	13, 20 or 32 A charging cable detected.
Rejected plug with low current carrying capacity	Device rejects vehicle charging because current carrying capacity of charging cable is too low.
Contactor on	Charging contactor connected.
Ventilation on	Ventilation (status D) connected.
Locking request	Locking is active. Default for output LR.
Register Output1	The “Output1” register has been set via Modbus (logic 1).
Register Output2	The “Output2” register has been set via Modbus (logic 1).
Register Output3	The “Output3” register has been set via Modbus (logic 1).
Register Output4	The “Output4” register has been set via Modbus (logic 1).

Table 8-3 Configuration options for digital outputs [...]

Option	Meaning
Overcurrent Detected	A vehicle has been charged with a higher current than specified by the PWM signal.
Contactor Failure	Contactor monitoring has detected a state. This state can lead to voltage being present at the charging station even when it is in the off state.
State D Vehicle Rejected	A vehicle that charges in status D has been detected and rejected.
State B or State C or State D	A vehicle is connected to the charging station.
Authorization Status	A flashing signal is present at the output when the request for authorization is sent to a central management system via OCPP. The output is switched on permanently if the enable is issued and status B2 or C2/D2 is present. The output is reset if one of these states occurs: – Charging process stopped – Charging not enabled – Charging revoked

8.3 “Network” tab for Ethernet

Table 8-4 Interfaces

Charging controller	Communication		OCPP 1.6J communication	
	Ethernet	Cellular	**Ethernet**	Cellular
EV-CC-AC1-M3-CBC-RCM-ETH	**x**	–	–	–
EV-CC-AC1-M3-CBC-RCM-ETH-3G	**x**	x	–	x
EV-CC-AC1-M3-RCM-ETH-XP	**x**	–	**x**	–
EV-CC-AC1-M3-RCM-ETH-3G-XP	**x**	x	**x**	x

Figure 8-2 “Network” tab for Ethernet communication

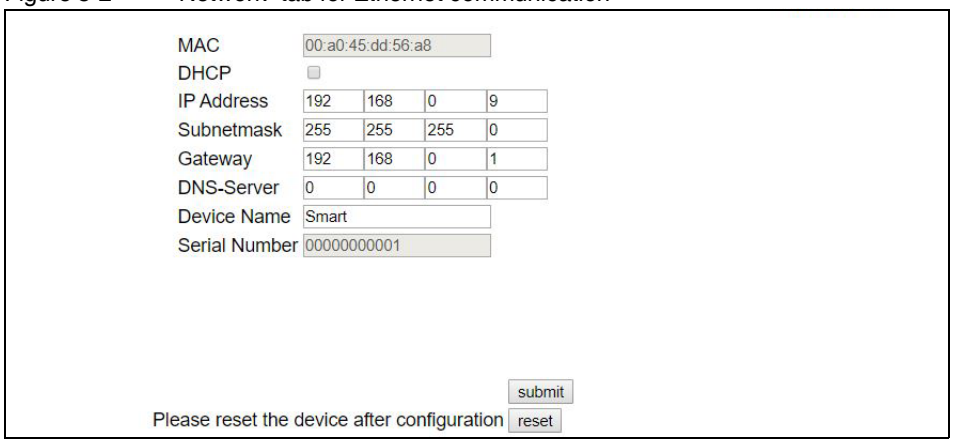


Table 8-5 “Network” tab for Ethernet

Option	Meaning
MAC	MAC address of the device. The MAC address is fixed, unique, and cannot be changed.
DHCP	This field allows you to choose between a fixed IP address and a DHCP request. – “disabled”: a fixed IP address including subnet mask and default gateway is set (default). – “enabled”: a DHCP request is executed. If there is a DHCP server in the network, an IP address is assigned to the device. If there is also a DNS server in the network, the device can be accessed via the device name.
IP Address	Here you can set the IP address of the device. This IP address is used if there is no active DHCP service. (Default: 192.168.0.8)
Subnetmask	Here you can set the subnet mask of the device. This subnet mask is used if there is no active DHCP service. (Default: 255.255.255.0)
Gateway	Here you can set the IP address of the standard gateway. This IP address is used if there is no active DHCP service. (Default: 192.168.0.1)
Device Name	You can access the system via the device name if a DNS server in the network can resolve the name. The default value is “Smart”.
Serial Number	The device serial number is fixed and unique.

Table 8-5 “Network” tab for Ethernet [...]

Option	Meaning
Buttons	
Submit	Transfers selected configurations to the charging controller.
Reset	Restarts the charging controller after transferring the selected configuration.

8.4 “Network” tab for cellular

Table 8-6 Interfaces

Charging controller	Communication		OCPP 1.6J communication	
	Ethernet	**Cellular**	Ethernet	**Cellular**
EV-CC-AC1-M3-CBC-RCM-ETH	x	–	–	–
EV-CC-AC1-M3-CBC-RCM-ETH-3G	x	**x**	–	**x**
EV-CC-AC1-M3-RCM-ETH-XP	x	–	x	–
EV-CC-AC1-M3-RCM-ETH-3G-XP	x	**x**	x	**x**

Figure 8-3 “Network” tab for cellular

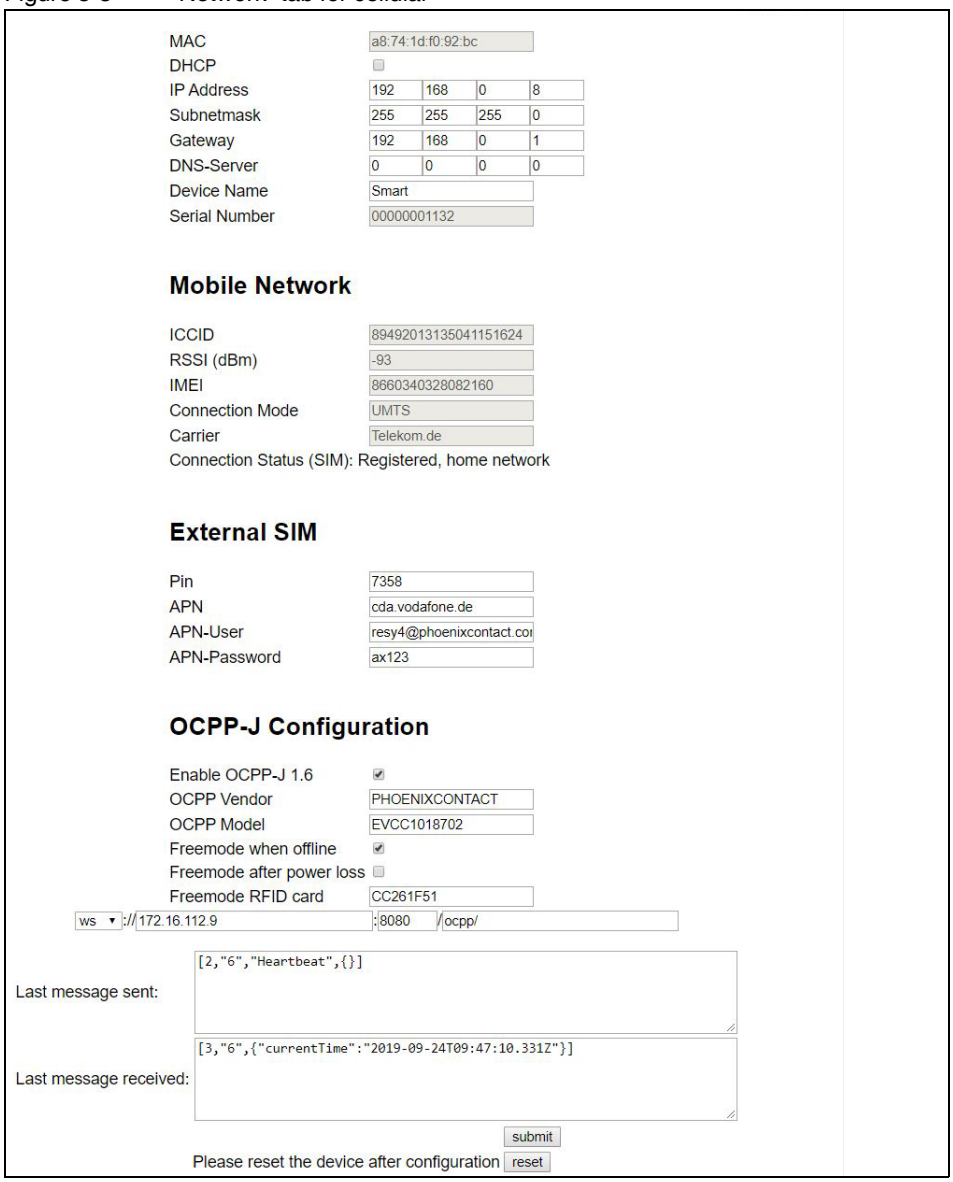


Table 8-7 “Network” tab (3G version)

Mobile Network (EV-CC-AC1-M3-CBC-RCM-ETH-3G only)	
ICCID	Integrated Circuit Card Identifier: unique SIM card serial number.
RSSI (dBm)	Received Signal Strength Indication: signal strength of the incoming wireless signal. Ideally in the range from -70 to -80 dBm for a stable wireless connection. -120 dBm means that a connection could not be established.
IMEI	International Mobile Equipment Identity: serial number of the integrated cellular modem.
Connection Mode	Available cellular standard (UMTS/GSM)
Carrier	Operator of the network the charging controller is registered with.
Connection Status (SIM)	
“Not registered, MS is currently searching for a new operator to register with”	Charging controller not yet registered in the cellular network.
“Registered, home network”	The device is registered in the cellular network.
“Registration denied”	SIM card blocked by provider.
“Registered, roaming”	Mobile station is not registered in the home network. Roaming is active.
“Wrong PIN”	Incorrect PIN. Enter again and restart the device.
“PUK required”	SIM card blocked after multiple attempts to enter PIN. PUK must be entered via external device (e.g., cellphone).
“Unknown Error”	Miscellaneous modem error.
External SIM	
PIN	Personal Identification Number for the SIM card. Enter this number before inserting the SIM card in the charging controller and starting the device. This avoids your SIM card being blocked.
APN	Access Point Name: name of the gateway between the cellular and public network.
APN user	User name for access to the APN.
APN password	Password for access to the APN.
OCPP-J Configuration	
Enable OCPP-J 1.6	Field to activate communication with a central management system via standard OCPP 1.6J.
OCPP Interface (EV-CC-...-XP charging controller only)	Select whether OCPP communication should be performed via modem or Ethernet.
OCPP Vendor	Field for entering the manufacturer of the charging station.
OCPP Model	Field for entering the model designation of the charging station.
Freemode when offline	If the connection to the central management system is interrupted, charging processes will be started without requesting authorization.
Freemode after power loss	If the charging controller is in status B when starting up (e.g., after a power failure), an authorization request will be started with the “Freemode RFID card”.
Freemode RFID card	User identifier for the RFID card (RFID UID) that is used to start the authorization after a power failure. Store the RFID UID in the management system as a valid user.

Table 8-7 “Network” tab (3G version) [...]

Mobile Network (EV-CC-AC1-M3-CBC-RCM-ETH-3G only)	
OCPP End Point Address	Backend connection data. The connection data is typically provided by the backend operator. Protocol: WebSocket (WS) or WebSocketSecure (WSS): – End point address – Port number – OCPP ID
Last Message Sent	Displays the last message that was sent to the backend.*
Last Message Received	Displays the last message that was received from the backend.*
Buttons	
Submit	Transfers selected configurations to the charging controller.
Reset	Restarts the charging controller after transferring the selected configuration.

* Additional log data can be viewed via “IP address/loggedmessages”, e.g., “192.168.0.8/loggedmessages”.

8.5 “Configuration” tab

Figure 8-4 “Configuration” tab

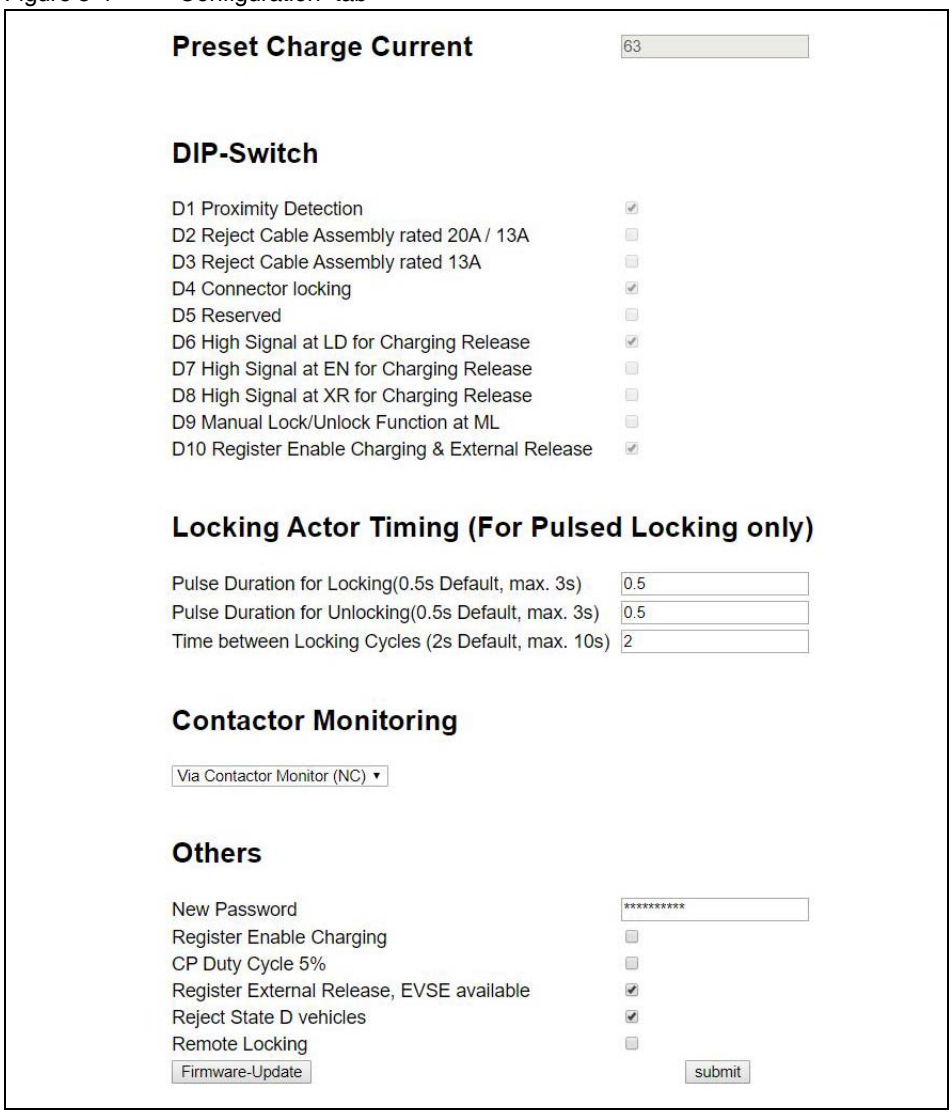


Table 8-8 Display values for the “Configuration” tab

Display value		Description
Configuration		
Preset Charge Current		The maximum permissible charging current is displayed here, which is set via the rotary coding switch on the device.
DIP-Switch		The device settings are displayed here, as set on the front of the device using the DIP switches, see Table 3-2 on page 15.
D1	Proximity Detection	The Proximity resistor is evaluated. The current carrying capacity of the charging connector is determined.
D2	Reject Cable Assembly rated 20 A / 13 A	Rejection of charging connectors with a current carrying capacity ≤ 20 A or ≤ 13 A (only when DIP 1 is set to ON)
D3	Reject Cable Assembly rated 13 A	Rejection of charging connectors with a current carrying capacity ≤ 13 A (only when DIP 1 and 2 are set to ON)
D4	Connector Locking	Locking function activated
D5	Reserved	Reserved for future applications
D6	High Signal at LD for Charging Release	Locking feedback (only when DIP 4 is set to ON)
D7	High Signal at EN for Charging Release	Activate enabling function for charging process
D8	High Signal at XR for Charging Release	Select charging station availability
D9	Manual Lock/Unlock Function at ML	Select manual locking option (only when DIP 4 is set to ON)
D10	Register Enable Charging & External Release	Enabling is performed via Modbus, web server, local RFID whitelist or from the OCPP backend.
Locking Actor Timing		
Pulse Duration for Locking (0.5 s Default, max. 3 s)		Duration of the locking pulse
Pulse Duration for Unlocking (0.5 s Default, max. 3 s)		Duration of the unlocking pulse
Time between Locking Cycles (2 s Default, max. 10 s)		Waiting time between the locking and unlocking pulses if errors occur while the automatic locking option is running

Table 8-8 Display values for the “Configuration” tab [...]

Display value	Description
Contactor Monitoring	
Contactor Monitoring	Selection options for load contactor monitoring Disabled: load contactor is not monitored Via Sense: load contactor is monitored by evaluating the output voltage of the load relay via input CT Via Contactor Monitor NO: monitoring via a N/O (normally open) auxiliary contact of the load contactor. A digital input must be assigned to this function. Via Contactor Monitor NC: monitoring via a N/C (normally closed) auxiliary contact of the load contactor. A digital input must be assigned to this function. Via Energy Meter: evaluation through voltage measurement using a connected energy measuring device
Others	
New Password	Input option for changing the password
Register Enable Charging	This field corresponds to digital input EN. When activated, the charging process is enabled if this option was selected via DIP 10. If digital input EN is also activated for the charging process via DIP 7, these two input variables are ORed.
CP Duty Cycle 5%	The “Digital Communication” function is selected in this field. This selection corresponds to the “Dig” setting at the rotary coding switch. The Powerline communication applied in this case is not supported directly by this charging controller.
Register External Release, EVSE available	This field corresponds to digital input XR. When activated (default on controller start), the charging station is activated, otherwise status F is set. DIP 10 = 1 must be set to use this function.
Reject State D vehicles	If this function is set to “enabled”, vehicles that charge in status D are rejected. (Status D = positive value of PWM signal at Control Pilot = 3 V.) In this case, the device enters an error state and can only be reset via status A.
Remote Locking	Checkbox for locking and unlocking the charging connector in the infrastructure charging socket. Set DIP 4 and DIP 9 to 1 for this.
Buttons	
Firmware-Update	Opens a dialog window to update the firmware
Submit	Transfers the selected configuration to the charging controller

8.6 “Energy Meter” tab

Various energy measuring devices which support the Modbus/RTU protocol can be connected to the charging controller via the RS-485 interface. The energy measuring devices must provide integer data with a maximum of two data words in Little Endian or Big Endian format in Holding or Input registers.

The measured values that are relevant for the charging process are cyclically read by the charging controller and displayed at the web server. In addition, the measured values are provided in the Modbus/TCP registers for reading via the Ethernet interface.

With the 3G and 3G-XP versions, you can transfer the relevant measured values from the charging controller to the relevant backend via OCPP. Note the following differences.

When connecting to a central management system, the measured values are provided in the form of OCPP MeterValues.

Factory-configured energy measuring devices

Charging controllers **up to firmware 1.11** are set to this energy measuring device by default: EEM-350-D-MCB, 2905849.

Charging controllers with **firmware 1.12** or later are set to this energy measuring device by default: EEM-EM357, 2908588.

See also: Connecting the energy measuring device

NOTE: Display change from KWh to Wh

For **firmware** 1.12 or later, the **energy measuring device** values of the charging controllers are displayed in Wh and transferred to the OCPP backend. Following an update to firmware 1.12 or later, you need to manually adjust the configuration of the **energy measuring devices**.

Figure 8-5 “Energy Meter” tab for EEM-350-D-MCB

	Modbus Address	# Register	Conversion unit	Value
Voltage V1 (V)	0	2	0.1	227
Voltage V2 (V)	2	2	0.1	155
Voltage V3 (V)	4	2	0.1	156
Current I1 (A)	12	2	0.001	0
Current I2 (A)	14	2	0.001	0
Current I3 (A)	16	2	0.001	0
Active Power (W)	40	2	0.1	0
Reactive Power (W)	44	2	0.1	0
Apparent Power (W)	42	2	0.1	0
Power Factor	53	1	1	1000
Energy Total (Wh)	62	2	100	2100
Max. Power Charge Sequence (W)	0	0	0	0
Mains Frequency (Hz)	55	1	0.1	50
Max. Current I1 (A)	0	0	0.001	0
Max. Current I2 (A)	0	0	0.001	0
Max. Current I3 (A)	0	0	0.001	0
Reset 1 Address/Value	0	0		0
Reset 2 Address/Value	0	0		0

Communication

Metering Device	EEM-350
Baud Rate	9600
Register type	holding (0x03)
Stop Bits	1 Bit
Energy Meter Address	1
Polling cycle (ms)	1000
High Register First	☑
Overcurrent Detection Enabled	☐

submit

Please reset the device after configuration reset

Figure 8-6 “Energy Meter” tab for EEM-EM357

	Modbus Address	# Register	Conversion unit	Value
Voltage V1 (V)	50520	2	0.01	230
Voltage V2 (V)	50522	2	0.01	0
Voltage V3 (V)	50524	2	0.01	0
Current I1 (A)	50528	2	0.001	0
Current I2 (A)	50530	2	0.001	0
Current I3 (A)	50532	2	0.001	0
Active Power (W)	50536	2	10	0
Reactive Power (W)	50538	2	10	0
Apparent Power (W)	50540	2	10	0
Power Factor	50542	2	1	0
Energy Total (Wh)	270	2	0.1	3014
Max. Power Charge Sequence (W)	0	0	0	0
Mains Frequency (Hz)	50526	2	0.01	50
Max. Current I1 (A)	51070	2	0.001	7
Max. Current I2 (A)	51072	2	0.001	0
Max. Current I3 (A)	51074	2	0.001	0
Reset 1 Address/Value	0	0		0
Reset 2 Address/Value	0	0		0

Communication

Metering Device	EEM-EM357
Baud Rate	9600
Register type	holding (0x03)
Stop Bits	1 Bit
Energy Meter Address	5
Polling cycle (ms)	1000
High Register First	☐
Overcurrent Detection Enabled	☐

submit

Please reset the device after configuration reset

Configuration parameters for the energy measuring device

The configuration of the energy measuring devices allows measured values to be assigned to the display fields in various ways.

Deviations from the table are possible and may be necessary for some measuring devices. This depends on the data that is provided by the measuring device. Please also refer to the documentation for the energy measuring device used.

You can connect different energy measuring devices to the charging controller, which can be configured via the web server or Modbus/TCP. Configuration is performed via the parameters listed in the table below.

Table 8-9 Configuration parameters for the energy measuring device

Parameter	Meaning
Modbus Address	Address of the corresponding measured value in the device in decimal notation.
# Register	Number of data words used to provide the measured value in the energy measuring device. If “0” is entered here, the corresponding value is not read. This is necessary if the energy measuring device does not provide the corresponding values. Energy measuring devices that code measured values in more than two data words cannot be read with the charging controller.
Conversion Unit	Conversion factor for read measured values for display at the web server. Depending on the manufacturer, the measured values on the energy measuring devices are provided with different bit values. This factor is used to adapt to the specified units (V, A, W, Wh, Hz) for display at the web server. On initial startup of a new energy measuring device with the charging controller, we recommend carrying out a plausibility check for the displayed measured values and adapting the conversion factors as necessary.
Value	Displayed value (see “Energy Meter” tab – display values)
Communication	
Metering Device	The designation identifying the energy measuring device used can be freely selected.
Baud Rate	Transmission speed between the charging controller and energy measuring device (2.4 kbps … 115,200 kbps). The value set here must match the value set on the energy measuring device.
Register Type	Select whether the data in the measuring device is available as a Holding or Input register.
Stop Bits	Number of stop bits for data transmission (1 or 2).
Energy Meter Modbus Address	Address of the energy measuring device (0 ... 254). The value set here must match the value set on the energy measuring device.
Polling cycle (ms)	Time between two polling cycles. Please note that if the selected cycle time is too short, this may adversely affect system performance, such as Ethernet communication.
High Register First	Select this field if the data in the energy measuring device is represented in Big Endian byte sequence. The most significant bit is stored at the smallest memory address.
Overcurrent Detection Enabled	Select this field if overcurrent monitoring is to be activated. In the event of an overcurrent of I/Imax > 1.25, shutdown occurs after 10 s. In the event of an overcurrent of I/Imax > 1.1, shutdown occurs after 100 s. Currents of I/Imax < 1.1 are tolerated.

Table 8-10 “Energy Meter” tab – display values

Display value	Meaning
Energy Meter	
Voltage V1 - V3 (V)	Voltage at the three phases. Either as phase-to-phase voltage or voltage to neutral conductor, depends on the configuration and the data provided by the energy measuring device.
Current I1 - I3 (A)	Current of the three phases
Active Power (W)	Active power
Reactive Power (W)	Reactive power
Apparent Power (W)	Apparent power
Power Factor	Power factor/cos phi
Energy Total (Wh)	Reading on a meter that cannot be reset
Max. Power Charge Sequence (W)	Maximum power of the current charging process
Mains Frequency (Hz)	Current mains frequency
Max. Current I1 - I3 (A)	Maximum measured currents on conductors L1 - L3 during the current charging process
Reset 1 Address/Value Reset 2 Address/Value	Certain measured values can be reset in the energy measuring device by writing defined values (max. two data words long) to the specified address area. The charging controller automatically writes these values after the charging process has been completed (status A). If the value 0 is entered for “# Register (0...2)”, no values are reset.

8.7 “Card Reader” tab

RFID card readers that support the Modbus/RTU protocol with Input registers can be connected to the charging controller via the RS-485 interface. The UIDs of the cards are read and can be processed further via Modbus/TCP. Up to 20 UIDs can also be edited and stored on a local whitelist via the web server.

Figure 8-7 “Card Reader” tab for QUIO QDE 950-4 RFID reader

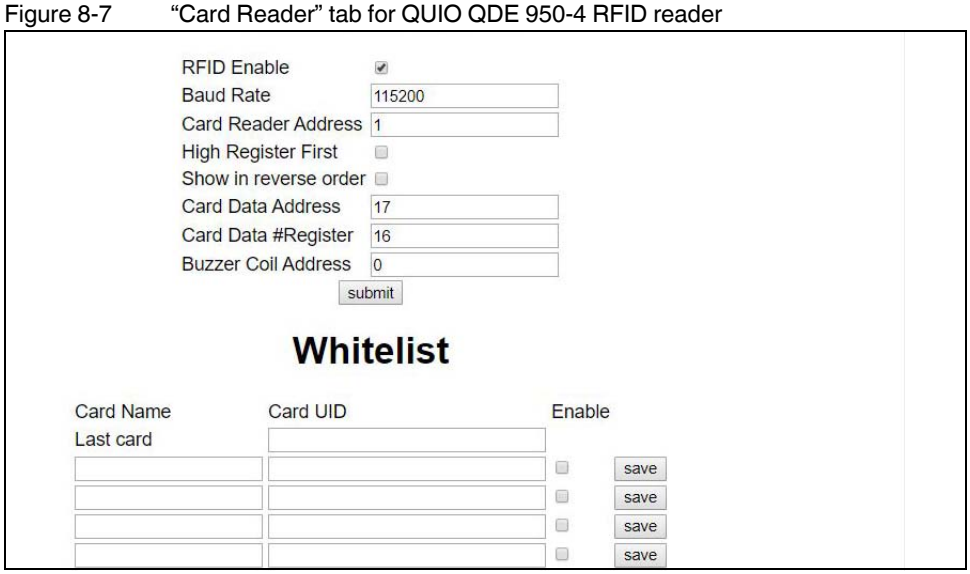


Table 8-11 Display values for the “Card Reader” tab

Option	Meaning
Card Reader	
RFID Enable	Activates the RFID reader, data is read. In addition, set DIP #10 = 1 in order to control enabling via the RFID card reader.
Baud Rate	Transmission speed between the charging controller and card reader (2.4 kbps … 115,200 kbps). The value set here must match the value set on the card reader.
Card Reader Address	Address of the RFID card reader (0 … 254) in the network. The value set here must match the value set on the card reader.
High Register First	This field must be selected if the data in the card reader is represented in Big Endian byte sequence.
Card Data Address	Address under which the UID of the RFID card is stored in the card reader.
Card Data #Register	Number of data registers which must be read for a complete UID.
Buzzer Coil Address	Address under which an integrated buzzer for the card reader can be activated.
Whitelist	
Last Card	Unique identifier (UID) of the last RFID card read.
Card Name	Freely selectable name that can be assigned to an RFID card.

Table 8-11 Display values for the “Card Reader” tab [...]

Option	Meaning
Card UID	Unique identifier (UID) of the RFID card.
Enable	Enabling of the RFID chip for the charging process.
Save	Storing of “Card Name”, “Card UID”, and enable in the whitelist on the charging controller.

You can copy the read UID to the whitelist. There you can name the UID and enable it for charging processes.

8.8 “Remote Control” tab

You can connect the charging controllers together over an Ethernet network to create a master/slave group. The master handles communication to the OCPP backend for all connected charging points. The 3G versions can be used as masters.

Table 8-12 Master/slave group

Charging controller	OCPP 1.6J communication		Number of slaves
	Ethernet	Cellular	
EV-CC-AC1-M3-CBC-RCM-ETH	–	–	–
EV-CC-AC1-M3-CBC-RCM-ETH-3G	–	x	5
EV-CC-AC1-M3-RCM-ETH-XP	x	–	–
EV-CC-AC1-M3-RCM-ETH-3G-XP	x	x	10

NOTE: Same firmware version

For master/slave operation, the same firmware version must be installed on all devices. If necessary, update the devices. You can download the latest version at phoenixcontact.net/product/1018702.

Figure 8-8 “Remote Control” tab (EV-CC-…-3G / …-3G-XP)

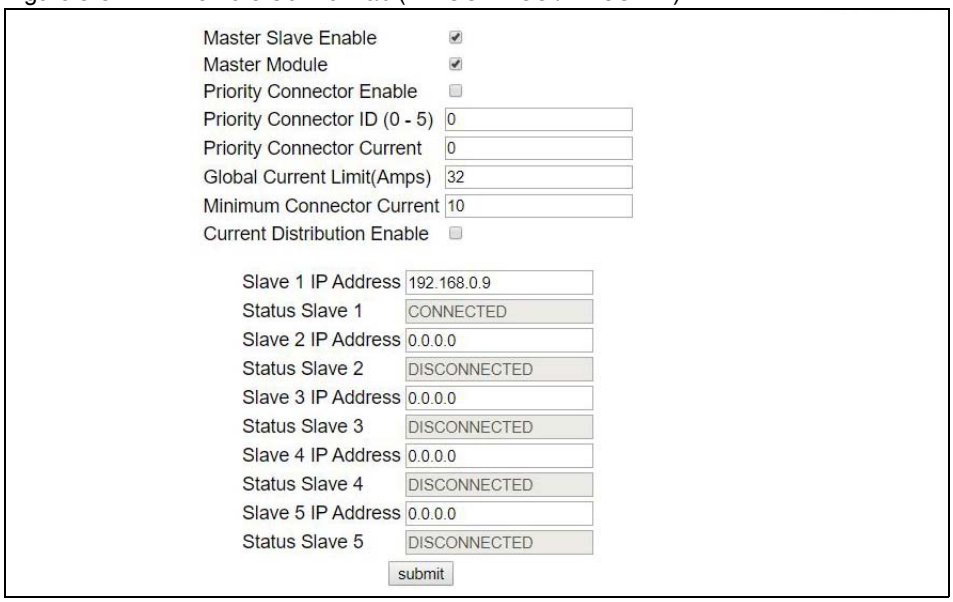


Figure 8-9 “Remote Control” tab (EV-CC-…-ETH / …-ETH-XP)

Table 8-13 “Remote Control” tab

Option	Meaning
Master Slave Enable	Activates the master/slave function.
Master Module	Specifies that the device is the master.
Priority Connector Enable	One charging point is provided with charging current as a priority. In this case, OCPP charging profiles for the Priority Connector are rejected.
Priority Connector ID (0 - 5)	Assignment of the “Priority Connector” status to a charging point.
Priority Connector Current	Maximum charging current that should be allocated to the Priority Connector.
Global Current Limit (Amps)	Maximum charging current that is available to the master/slave group from the grid connection point.
Minimum Connector Current (A)	Minimum charging current that a charging point can accept.
Current Distribution Enable	Activates load management. You must set these parameters if the master/slave function is active and charging profiles are to be implemented by the backend.
Slave IP 1 ... 5 Address (EV-CC-…-3G / …-3G-XP only)	IP address of the relevant slave.
Status Slave 1 ... 5 (EV-CC-…-3G / …-3G-XP only)	Connection status to the slave (Connected / Disconnected)
Master Status (EV-CC-…-ETH / …-ETH-XP only)	Connection status to the master (Connected / Disconnected)

Notes on load management

Load management ensures that the total charging current of the master/slave group does not exceed the maximum current. The maximum current is defined by the grid connection point via the “Global Current Limit” value.

Load management ensures that all connected vehicles can be charged simultaneously with at least the minimum current (“Minimum Connector Current”). To do this, the total minimum current across all charging points plus the minimum current at the Priority Connector must not exceed the maximum current (“Global Current Limit”).

Load management takes into consideration the actual charging currents at the individual charging points when it allocates the charging currents to the individual charging points.

The Priority Connector can always be charged with its “Priority Connector Current”.

Load management does not taken into consideration whether vehicles use single- or three-phase charging or whether the charging points are connected to the grid with phase shift. In the calculation, the largest current measured at a charging point is applied for all phases.

At the start of the charging process, the maximum charging current that can be used to charge a vehicle is determined. Charging begins with the minimum charging current. The charging current is continuously increased until the vehicle has reached its maximum charging current. To do this, charging currents at other connections may have to be reduced temporarily.

There may be occasions when the charging current available through the grid connection is insufficient. If it is not possible to charge all vehicles with the respective maximum current, the charging current is reduced proportionally at all charging points. All vehicles are charged with the same relative charging power. The relative charging power is based on the maximum charging power of the vehicle.

Load management ensures that the Priority Connector is always charged with the “Priority Connector Current”. If less current is required at the Priority Connector, this charging current is made available to the other charging points.

If a vehicle reduces its charging current or terminates the charging process, the available charging currents are proportionally allocated to the other charging points.

Since it may not be possible to charge some vehicles in the lower range, a “Minimum Connector Current” of 10 A is recommended.

OCPP charging profiles and load management

To also use charging profiles via OCPP in a master/slave group, you need to activate the “Current Distribution Enable” function. If this field is not enabled, the charging profiles sent by the charging controller will be rejected.

OCPP MaxProfile

A “MaxProfile” limits the charging current that is taken at the grid connection point (Connector 0). The master distributes the charging current to all the charging points according to the specified criteria. If the current value of “MaxProfile” is greater than the “Global Current Limitation” value, the “MaxProfile” is ignored.

OCPP TxDefaultProfile and TxProfile

“TxDefaultProfile” and “TxProfile” are specific to a charging point or transaction. The “TxDefaultProfiles” of Connector 0 are applied to all connected connectors. If current default values are specified by load management or the OCPP backend for a connector or transaction, the lower value is applied.

9 Modbus description

You can access the device registers via Modbus. The device operates as a Modbus slave using address 255. It waits for incoming Modbus/TCP requests at port 502.

9.1 Modbus register types

Modbus/RTU supports three register types which are used as follows:

Table 9-1 Modbus register types

Modbus register type	Value	Access
Input	16-bit	Read
Discrete	1-bit	Read
Holding	16-bit	Read/write
Coil	1-bit	Read/write

You can combine several Input and Holding registers to transmit 32-bit data. This data is coded in Little Endian format. The word with the least significant element is listed first.

9.2 Register assignment

The following table shows how the device information is assigned registers that can be accessed via Modbus.

Unless otherwise specified, the numerical values are decimal values.

Table 9-2 Register assignment, Input type

Type	Address	Value	Access	Function	Coding
Input	100	16-bit	Read	System status in accordance with IEC 61851-1, Annex A	ASCII (8-bit), A … F
Input	101	16-bit	Read	Current carrying capacity of charging cable (Proximity)	Integer, amperes
Input	102	32-bit	Read	Charging time	Integer, seconds
Input	103				
Input	104	16-bit	Read	DIP switch configuration	Binary, DIP 1 = LSB Each switch corresponds to one bit.
Input	105	32-bit	Read	Firmware version	ASCII, e.g., 1.21 = 0x2E31 0x3132
Input	106				

Table 9-2 Register assignment, Input type [...]

Type	Address	Value	Access	Function	Coding
Input	107	16-bit	Read	Error codes	Hexadecimal Bit error 1. Cable rejection 13 A and 20 A 2. Cable rejection 13 A 3. Invalid PP value 4. Invalid CP value 5. Status F due to no charging station availability 6. Locking 7. Unlocking 8. LD unavailable during locking 9. Overcurrent shutdown 10. Communication problem between charging controller and energy measuring device when overcurrent shutdown is activated 11. Status D, vehicle rejected 12. Contactor error detected 13. No diode in the Control Pilot circuit on the vehicle side 14. Reserved 15. Residual current detected 16. Master/slave communication error (Further error codes in register 155)
Input	108	32-bit	Read	Display energy measuring device voltage V1	Integer [V]
Input	109				
Input	110	32-bit	Read	Display energy measuring device voltage V2	
Input	111				
Input	112	32-bit	Read	Display energy measuring device voltage V3	
Input	113				
Input	114	32-bit	Read	Display energy measuring device current I1	Integer [A]
Input	115				
Input	116	32-bit	Read	Display energy measuring device current I2	
Input	117				
Input	118	32-bit	Read	Display energy measuring device current I3	
Input	119				

Table 9-2 Register assignment, Input type [...]

Type	Address	Value	Access	Function	Coding
Input	120	32-bit	Read	Display energy measuring device active power	Integer [W, (VA, var)]
Input	121				
Input	122	32-bit	Read	Display energy measuring device reactive power	
Input	123				
Input	124	32-bit	Read	Display energy measuring device apparent power	
Input	125				
Input	126	32-bit	Read	Display energy measuring device power factor	Integer [Cos Phi/1000]
Input	127				
Input	128	32-bit	Read	Display energy measuring device energy (total)	Integer [kWh] Display in [Wh]: see register 904 (Holding)
Input	129				
Input	130	32-bit	Read	Display energy measuring device maximum power	Integer [W]
Input	131				
Input	132	32-bit	Read	Display energy of current charging process	Integer [kWh] Display in [Wh]: see register 3376 (Holding)
Input	133				
Input	134	32-bit	Read	Display energy measuring device mains frequency	Integer [Hz]
Input	135				
Input	136	32-bit	Read	Display energy measuring device maximum current I1	Integer [A]
Input	137				
Input	138	32-bit	Read	Display energy measuring device maximum current I2	
Input	149				
Input	140	32-bit	Read	Display energy measuring device maximum current I3	
Input	141				
Input	142	16-bit	Read	OCPP configuration “PricePerkWh”	Integer [cent]
Input	143	16-bit	Read	OCPP configuration “HeartbeatInterval”	Integer [s]
Input	144	16-bit	Read	OCPP configuration “ConnectionTimeOut”	Integer [s]
Input	145	16-bit	Read	OCPP configuration “MeterValueSampleInterval”	Integer [s]
Input	146	16-bit	Read	OCPP configuration “ResetRetries”	Integer

Table 9-2 Register assignment, Input type [...]

Type	Address	Value	Access	Function	Coding
Input	147	16-bit	Read	OCPP configuration “TransactionMessageAttempts”	Integer
Input	148	16-bit	Read	OCPP configuration “Transaction MessageRetryInterval”	Integer [s]
Input	155	16-bit	Read	Error codes continued	Hexadecimal Bit error 1. Charging station offline (if activated via register 432) 2. Error status via digital input (Error Input) 3. Reserved 4. DC residual current sensor self-test failed 5. DC residual current sensor error 6. Residual current > 6 mA DC 7. Residual current > 30 mA AC

Table 9-3 Register assignment, Discrete type

Type	Address	Value	Access	Function	Coding
Discrete	200	1-bit	Read	Status of digital input LD	1-bit
Discrete	201	1-bit	Read	Status of digital input EN	1-bit
Discrete	202	1-bit	Read	Status of digital input ML	1-bit
Discrete	203	1-bit	Read	Status of digital input XR	1-bit
Discrete	204	1-bit	Read	Status of digital output ER	1-bit
Discrete	205	1-bit	Read	Status of digital output LR	1-bit
Discrete	206	1-bit	Read	Status of digital output VR	1-bit
Discrete	207	1-bit	Read	Status of digital output CR	1-bit
Discrete	208	1-bit	Read	Status of digital input IN	1-bit

Table 9-4 Register assignment, Holding type

Type	Address	Value	Access	Function	Coding
Holding	300	16-bit	Read	Set charging current (PWM signal)	Integer [A]
Holding	301	3 x 16-bit	Read	MAC address	Hexadecimal E.g., 00:A00:45:66:4F:40: 0xA000 0x6645 0x404F
Holding	302				
Holding	303				

Table 9-4 Register assignment, Holding type [...]

Type	Address	Value	Access	Function	Coding
Holding	304	6 x 16-bit	Read	Serial number	ASCII, e.g., 00000041 = 0x3030 0x3030 0x3030 0x3134
Holding	305				
Holding	306				
Holding	307				
Holding	308				
Holding	309				
Holding	310	5 x 16-bit	Read/write	Device name	ASCII, hexadecimal coded characters, e.g., “Smart” 0x6D53 0x72610 0x0074 x0000 0x0000
Holding	311				
Holding	312				
Holding	313				
Holding	314				
Holding	315	4 x 16-bit	Read/write	IP address	Decimal E.g., 192.168.0.8 (Default)
Holding	316				
Holding	317				
Holding	318				
Holding	319	4 x 16-bit	Read/write	Subnet mask	Decimal E.g., 255.255.255.0 (Default)
Holding	320				
Holding	321				
Holding	322				
Holding	323	4 x 16-bit	Read/write	Gateway	Decimal E.g., 192.168.0.1 (Default)
Holding	324				
Holding	325				
Holding	326				
Holding	327	16-bit	Read/write	Definition of output ER	Decimal, see Table 9-6 “Function assignment of digital outputs”
Holding	328	16-bit	Read/write	Definition of output LR	
Holding	329	16-bit	Read/write	Definition of output VR	
Holding	330	16-bit	Read/write	Definition of output CR	

Table 9-4 Register assignment, Holding type [...]

Type	Address	Value	Access	Function	Coding
Register addresses for connecting an energy measuring device up to firmware 1.11					
Holding	331	16-bit	Read/write	Voltage V1	Integer, in accordance with the documentation for the connected energy measuring device (Default: EEM-350-D-MCB energy measuring device from Phoenix Contact)
Holding	332	16-bit	Read/write	Voltage V2	
Holding	333	16-bit	Read/write	Voltage V3	
Holding	334	16-bit	Read/write	Current I1	
Holding	335	16-bit	Read/write	Current I2	
Holding	336	16-bit	Read/write	Current I3	
Holding	337	16-bit	Read/write	Active power	
Holding	338	16-bit	Read/write	Reactive power	
Holding	339	16-bit	Read/write	Apparent power	
Holding	340	16-bit	Read/write	Power factor	
Holding	341	16-bit	Read/write	Energy measuring device, total	
Holding	342	16-bit	Read/write	Maximum power (current charging process)	
Holding	343	16-bit	Read/write	Energy measuring device, can be reset	
Holding	344	16-bit	Read/write	Mains frequency	
Holding	345	16-bit	Read/write	Maximum current I1	
Holding	346	16-bit	Read/write	Maximum current I2	
Holding	347	16-bit	Read/write	Maximum current I3	
Holding	348	16-bit	Read/write	Reset register 1	
Holding	349	16-bit	Read/write	Reset value 1	
Holding	350	16-bit	Read/write	Reset register 2	
Holding	351	16-bit	Read/write	Reset value 2	

Table 9-4 Register assignment, Holding type [...]

Type	Address	Value	Access	Function	Coding
Register addresses for connecting an energy measuring device with firmware 1.12 or later					
Holding	331	16-bit	Read/write	Voltage V1	Integer, in accordance with the documentation for the connected energy measuring device (Default: EEM-EM357 energy measuring device from Phoenix Contact)
Holding	332	16-bit	Read/write	Voltage V2	
Holding	333	16-bit	Read/write	Voltage V3	
Holding	334	16-bit	Read/write	Current I1	
Holding	335	16-bit	Read/write	Current I2	
Holding	336	16-bit	Read/write	Current I3	
Holding	337	16-bit	Read/write	Active power	
Holding	338	16-bit	Read/write	Reactive power	
Holding	339	16-bit	Read/write	Apparent power	
Holding	340	16-bit	Read/write	Power factor	
Holding	344	16-bit	Read/write	Mains frequency	
Holding	345	16-bit	Read/write	Maximum current I1	
Holding	346	16-bit	Read/write	Maximum current I2	
Holding	347	16-bit	Read/write	Maximum current I3	
Holding	348	16-bit	Read/write	Reset register 1	
Holding	349	16-bit	Read/write	Reset value 1	
Holding	350	16-bit	Read/write	Reset register 2	
Holding	351	16-bit	Read/write	Reset value 2	
Holding	900	16-bit	Read/write	Energy measuring device, total	

Table 9-4 Register assignment, Holding type [...]

Type	Address	Value	Access	Function	Coding
Conversion factors for values from the energy measuring device up to firmware 1.11					
Holding	352	32-bit	Read/write	Voltage V1	Decimal EEM-350-D-MCB energy measuring device from Phoenix Contact
Holding	353				
Holding	354	32-bit	Read/write	Voltage V2	
Holding	355				
Holding	356	32-bit	Read/write	Voltage V3	
Holding	357				
Holding	358	32-bit	Read/write	Current I1	
Holding	359				
Holding	360	32-bit	Read/write	Current I2	
Holding	361				
Holding	362	32-bit	Read/write	Current I3	
Holding	363				
Holding	364	32-bit	Read/write	Active power	
Holding	365				
Holding	366	32-bit	Read/write	Reactive power	
Holding	367				
Holding	368	32-bit	Read/write	Apparent power	
Holding	369				
Holding	370	32-bit	Read/write	Power factor	
Holding	371				
Holding	372	32-bit	Read/write	Energy measuring device, total	
Holding	373				
Holding	374	32-bit	Read/write	Maximum power (current charging process)	
Holding	375				
Holding	376	32-bit	Read/write	Energy measuring device, can be reset	
Holding	377				
Holding	378	32-bit	Read/write	Mains frequency	
Holding	379				
Holding	380	32-bit	Read/write	Maximum current I1	
Holding	381				
Holding	382	32-bit	Read/write	Maximum current I2	
Holding	383				
Holding	384	32-bit	Read/write	Maximum current I3	
Holding	385				

Table 9-4 Register assignment, Holding type [...]

Type	Address	Value	Access	Function	Coding
Conversion factors for values from the energy measuring device with firmware 1.12 or later					
Holding	352	32-bit	Read/write	Voltage V1	Decimal EEM-EM357 energy measuring device from Phoenix Contact
Holding	353				
Holding	354	32-bit	Read/write	Voltage V2	
Holding	355				
Holding	356	32-bit	Read/write	Voltage V3	
Holding	357				
Holding	358	32-bit	Read/write	Current I1	
Holding	359				
Holding	360	32-bit	Read/write	Current I2	
Holding	361				
Holding	362	32-bit	Read/write	Current I3	
Holding	363				
Holding	364	32-bit	Read/write	Active power	
Holding	365				
Holding	366	32-bit	Read/write	Reactive power	
Holding	367				
Holding	368	32-bit	Read/write	Apparent power	
Holding	369				
Holding	370	32-bit	Read/write	Power factor	
Holding	371				
Holding	902	32-bit	Read/write	Energy measuring device, total	
Holding					
Holding	378	32-bit	Read/write	Mains frequency	
Holding	379				
Holding	380	32-bit	Read/write	Maximum current I1	
Holding	381				
Holding	382	32-bit	Read/write	Maximum current I2	
Holding	383				
Holding	384	32-bit	Read/write	Maximum current I3	
Holding	385				
Holding	902	32-bit	Read/write	Energy measuring device, total	
Holding					

Table 9-4 Register assignment, Holding type [...]

Type	Address	Value	Access	Function	Coding
Communication parameters					
Holding	386	32-bit	Read/write	Baud rate for communication with the energy measuring device	Integer, default = 9600 Max. 115,200
Holding	387				
Holding	388	16-bit	Read/write	Modbus address of energy measuring device	Integer, default = 5 (up to firmware < 1.21: default = “1”)
Holding	389	16-bit	Read/write	Polling cycle of energy measuring device	Integer (ms), default = 1000
Holding	390	16-bit	Read/write	Activation of charging contactor monitoring	Integer 1. Inactive 2. Voltage detection via input CT 3. Evaluation of N/O auxiliary contact 4. Evaluation of N/C auxiliary contact 5. Evaluation of voltage measurement from energy measuring device
Holding	391	8 x 16-bit	Read/write	Name of energy measuring device	ASCII hex.-coded, 15 characters + F68
Holding	392				
Holding	393				
Holding	394				
Holding	395				
Holding	396				
Holding	397				
Holding	398				

Table 9-4 Register assignment, Holding type [...]

Type	Address	Value	Access	Function	Coding
Number of data words for the measured values up to firmware 1.11					
Holding	500	16-bit	Read/write	Voltage V1	Integer (0 - 2) (According to Phoenix Contact EEM-350-D-MCB energy measuring device)
Holding	501	16-bit	Read/write	Voltage V2	
Holding	502	16-bit	Read/write	Voltage V3	
Holding	503	16-bit	Read/write	Current I1	
Holding	504	16-bit	Read/write	Current I2	
Holding	505	16-bit	Read/write	Current I3	
Holding	506	16-bit	Read/write	Active power	
Holding	507	16-bit	Read/write	Reactive power	
Holding	508	16-bit	Read/write	Apparent power	
Holding	509	16-bit	Read/write	Power factor	
Holding	510	16-bit	Read/write	Energy measuring device total	
Holding	511	16-bit	Read/write	Maximum power (current charging process)	
Holding	512	16-bit	Read/write	Energy measuring device can be reset	
Holding	513	16-bit	Read/write	Mains frequency	
Holding	514	16-bit	Read/write	Maximum current I1	
Holding	515	16-bit	Read/write	Maximum current I2	
Holding	516	16-bit	Read/write	Maximum current I3	
Holding	517	16-bit	Read/write	Reset energy measuring device 1	
Holding	518	16-bit	Read/write	Reset energy measuring device 2	

Table 9-4 Register assignment, Holding type [...]

Type	Address	Value	Access	Function	Coding
Number of data words for the measured values with firmware 1.12 or later					
Holding	500	16-bit	Read/write	Voltage V1	Integer (0 - 2) (According to Phoenix Contact EEM-EM357 energy measuring device)
Holding	501	16-bit	Read/write	Voltage V2	
Holding	502	16-bit	Read/write	Voltage V3	
Holding	503	16-bit	Read/write	Current I1	
Holding	504	16-bit	Read/write	Current I2	
Holding	505	16-bit	Read/write	Current I3	
Holding	506	16-bit	Read/write	Active power	
Holding	507	16-bit	Read/write	Reactive power	
Holding	508	16-bit	Read/write	Apparent power	
Holding	509	16-bit	Read/write	Power factor	
Holding	513	16-bit	Read/write	Mains frequency	
Holding	514	16-bit	Read/write	Maximum current I1	
Holding	515	16-bit	Read/write	Maximum current I2	
Holding	516	16-bit	Read/write	Maximum current I3	
Holding	517	16-bit	Read/write	Reset energy measuring device 1	
Holding	518	16-bit	Read/write	Reset energy measuring device 2	
Holding	901	16-bit	Read/write	Energy measuring device total	
Number of data words for the measured values					
Holding	519	16-bit	Read/write	Waiting time for evaluation of contactor monitoring	Integer (ms), default: 500 ms
Holding	520	16-bit	Read/write	Definition of input LD	Decimal See Table 9-7 “Function assignment of digital inputs”
Holding	521	16-bit	Read/write	Definition of input EN	
Holding	522	16-bit	Read/write	Definition of input ML	
Holding	523	16-bit	Read/write	Definition of input XR	
Holding	524	16-bit	Read/write	Definition of input IN	
Holding	525	16-bit	Read/write	Activation time of locking in ms	Integer (ms), default = 500 ms
Holding	526	16-bit	Read/write	Activation time of unlocking in ms	Integer (ms), default = 500 ms
Holding	527	16-bit	Read/write	Time between repeated attempts of locking control	Integer (ms), default = 2000 ms
Holding	528	1 x 16-bit	Read/write	Default charging current	Default charging current

Table 9-4 Register assignment, Holding type [...]

Type	Address	Value	Access	Function	Coding
Holding	529	11 x 16-bit	Read	ICCID SIM card number (Integrated Circuit Card Identifier)	ASCII (only relevant for EV-CC-AC1-M3-CBC-RCM-ETH-3G)
Holding	530				
Holding	531				
Holding	532				
Holding	533				
Holding	534				
Holding	535				
Holding	536				
Holding	537				
Holding	538				
Holding	539				
Holding	575	16-bit	Read/write	Pin number of the SIM card	Decimal 0000 - 9999 (only relevant for EV-CC-AC1-M3-CBC-RCM-ETH-3G...)
Holding	576	16-bit	Read	RSSI (Received Signal Strength Indicator)	Decimal, RSSI = 120 dB - “Value” (only relevant for EV-CC-AC1-M3-CBC-RCM-ETH-3G)
Holding	577	4 x 16-bit	Read	IMEI (International Mobile Equipment Identity)	Decimal (only relevant for EV-CC-AC1-M3-CBC-RCM-ETH-3G)
Holding	578				
Holding	579				
Holding	580				
Holding	600	16-bit	Read/write	Modbus address card reader	Decimal, default: 1
Holding	601	2 x 16-bit	Read/write	Modbus baud rate card reader	Decimal, default: 115,200
Holding	602				
Holding	603	16-bit	Read/write	RFID card reader Buzzer coil address	Decimal, default: 0
Holding	604	16-bit	Read/write	RFID cards: number of data words	Decimal, default: 16
Holding	605	16-bit	Read/write	RFID cards: Modbus address data	Decimal, default: 17

Table 9-4 Register assignment, Holding type [...]

Type	Address	Value	Access	Function	Coding
Holding	606	16 x 16-bit	Read	RFID card UID	32 characters, hexadecimal 0 - F Example: 450ECA25 [606]: 0x3235 [607]: 0x4341 [608]: 0x3045 [609]: 0x3435 [610]: 0x0000 ...
Holding	607				
Holding	608				
Holding	609				
Holding	610				
Holding	611				
Holding	612				
Holding	613				
Holding	614				
Holding	615				
Holding	616				
Holding	617				
Holding	618				
Holding	619				
Holding	620				
Holding	621				
Holding	622	16-bit	Read/write	Port for OCPP communication	Integer
Holding	623	32 x 16-bit	Read/write	OCPP host	ASCII
Holding	655	32 x 16-bit		OCPP path	(No longer used, moved to register 3403)
Holding	3403	64 x 16-bit	Read/write	OCPP path	ASCII
Holding	687	20 x 16-bit	Read/write	APN access point in cellular network	ASCII
Holding	707	20 x 16-bit		APN user	ASCII
Holding	727	20 x 16-bit	Read/write	APN password	ASCII
Holding	747	20 x 16-bit	Read/write	OCPP parameter “Vendor”	ASCII
Holding	767	20 x 16-bit	Read/write	OCPP parameter “Model”	ASCII
Holding	800	8-bit		“Reset to Factory”	“1” = reset to factory default settings
Holding	860	8-bit	Read	Modem available	“1” = modem present
Holding	904	32-bit	Read	Energy meter total	Integer [Wh]
Holding	992	16-bit	Read/write	Priority Connector ID	Integer [0 … 5]
Holding	994	16-bit	Read/write	Priority Connector Current	Integer [A]
Holding	996	16-bit		Minimum Connector Current	Integer [A]
Holding	3000	16 x 16-bit	Read	Current cellular network operator	ASCII
Holding	3376	8 x 16-bit	Read	Energy of current charging process	Integer [Wh]
Holding	3386	16-bit	Read/write	Pulse length of RFID buzzer	Integer [ms]

Table 9-4 Register assignment, Holding type [...]

Type	Address	Value	Access	Function	Coding
Holding	3387	6 x 16-bit	Read/write	Freemode RFID UID	ASCII
Holding	3396	3 x 16-bit	Read	Active cellular standard	ASCII
Holding	3403	64 x 16-bit	Read/write	OCPP path (extended)	ASCII

Table 9-5 Register assignment, COIL type

Type	Address	Value	Access	Function	Coding
COIL	400	1-bit	Read/write	Enable charging process (Only if DIP 10 = 1)	1-bit
COIL	401	1-bit	Read/write	Switch to digital communication (5%)	1-bit
COIL	402	1-bit	Read/write	Charging station availability	1-bit
COIL	403	1-bit	Read/write	Locking via Modbus (Only if DIP 9 = 1)	1-bit
COIL	404	1-bit	Read/write	Switch DHCP on/off	1-bit
COIL	405	1-bit	Read/write	Control output register 1	1-bit For function assignment to outputs, see Table 9-5 on page 86
COIL	406	1-bit	Read/write	Control output register 2	
COIL	407	1-bit	Read/write	Control output register 3	
COIL	408	1-bit	Read/write	Control output register 4	
COIL	409	1-bit	Read/write	Activate overcurrent shutdown	1-bit 0: monitoring inactive 1: monitoring activated Tripping characteristics: I/Imax > 1.25: approx. 10 s I/Imax > 1.1: approx. 100 s
COIL	410	1-bit	Read/write	Byte sequence for communication with energy measuring device	1-bit, 0 = Little Endian, 1 = Big Endian
COIL	411				Reserved
COIL	412	1-bit	Read/write	“Status D, reject vehicle” function activated	1-bit
COIL	413	1-bit	Read/write	Reset charging controller	1-bit
COIL	414				Reserved
COIL	415				Reserved
COIL	416				Reserved
COIL	417	1-bit	Read/write	Start firmware update	Web server starts with dialog window for firmware update
COIL	418				Reserved
COIL	419	1-bit	Read/write	Activate RFID card reader	1-bit
COIL	420	1-bit	Read/write	Buzzer on RFID card reader activated (permanent)	1-bit
COIL	421	1-bit	Read/write	Buzzer on RFID card reader activated (single-pulse)	1-bit
COIL	422	1-bit	Read/write	Byte sequence for communication with RFID card reader (Modbus/RTU)	1-bit, 0 = Little Endian 1 = Big Endian

Table 9-5 Register assignment, COIL type [...]

Type	Address	Value	Access	Function	Coding
COIL	423	1-bit	Read	Enable via RFID whitelist active	1-bit
COIL	424	1-bit	Read	RFID card reader: card detected	Signal service life (depends on RFID card reader used)
COIL	425	1-bit	Read/write	Suppress RFID buzzer	Suppression of the buzzer pulse for 60 s, then active again or needs to be suppressed again
COIL	426	1-bit	Read/write	Activate master/slave function	1-bit 1: master/slave activated
COIL	427	1-bit	Read/write	Activate OCPP communication	1-bit 1: OCPP communication active
COIL	428	1-bit	Read/write	WebSocket connection	1-bit 0: unencrypted (WS) 1: encrypted (WSS)
COIL	431	1-bit	Read/write	Suppression of the buzzer signal if RFID card is rejected	1-bit 0: automatic buzzer signal in the event of invalid RFID card 1: no buzzer signal in the event of invalid RFID card
COIL	432	1-bit	Read/write	Error state if offline status is detected	1-bit 1: charging station enters an error state in offline status
COIL	435	1-bit	Read/write	Priority Connector Enable	1-bit 1: “Priority Connector” function activated
COIL	436	1-bit	Read	Enable charging process	1-bit 1: enable charging process (by means of OCPP backend, Ethernet, RFID or digital input) 0: charging process not enabled
COIL	437	1-bit	Read	Connection to the master	1-bit 1: charging controller has detected master
COIL	438	1-bit	Read/write	Charging controller is the master module	1-bit 1: charging controller is the master in the master/slave group
COIL	439	1-bit	Read/write	OCPP interface	1-bit 0: OCPP via cellular 1: OCPP via Ethernet (…-XP version only)
COIL	440	1-bit	Read/write	Unlocking (regardless of the position of DIP 9)	1-bit 1: charging point is unlocked
COIL	441	1-bit	Read	Connection status slave 1	1-bit 1: slave 1 connected to master

Table 9-5 Register assignment, COIL type [...]

Type	Address	Value	Access	Function	Coding
COIL	442	1-bit	Read	Connection status slave 2	1-bit 1: slave 2 connected to master
COIL	443	1-bit	Read	Connection status slave 3	1-bit 1: slave 3 connected to master
COIL	444	1-bit	Read	Connection status slave 4	1-bit 1: slave 4 connected to master
COIL	445	1-bit	Read	Connection status slave 5	1-bit 1: slave 5 connected to master
COIL	446	1-bit	Read	Connection status slave 6	1-bit 1: slave 6 connected to master (...-XP version only)
COIL	447	1-bit	Read	Connection status slave 7	1-bit 1: slave 7 connected to master (...-XP version only)
COIL	448	1-bit	Read	Connection status slave 8	1-bit 1: slave 8 connected to master (...-XP version only)
COIL	449	1-bit	Read	Connection status slave 9	1-bit 1: slave 9 connected to master (...-XP version only)
COIL	450	1-bit	Read	Connection status slave 10	1-bit 1: slave 10 connected to master (...-XP version only)
COIL	462	1-bit	Read/write	OCPP enable	1-bit 1 (read): enable issued via OCPP 0 (write): charging process terminated, OCPP StopTransaction with “Reason=Local” (only on the master charging controller)
COIL	463	1-bit	Read/write	Activation of “Freemode when Offline”	1-bit 1: “FreemodeWhenOffline” activated
COIL	464	1-bit	Read/write	Activation of “Current Distribution Enable”	1-bit 1: “CurrentDistributionEnable” function activated
COIL	465	1-bit	Read	Locking status	1-bit 1: charging connector locked
COIL	466	1-bit	Read/write	Activation of “Freemode after Power Loss”	1-bit 1: “FreemodeAfterPowerLoss” activated
COIL	467	1-bit	Read	Status “Suspended EVSE” (charging process paused)	1-bit: 1: OCPP status “Suspended-EVSE” active

Table 9-5 Register assignment, COIL type [...]

Type	Address	Value	Access	Function	Coding
COIL	468	1-bit	Read/write	Pause charging process	1-bit: 1: charging process interrupted, OCPP status message “SuspendedEVSE” will be sent
COIL	469	1-bit	Read/write	Modbus register type of the energy meter	1-bit 0: Holding (0x03) 1: Input (0x04)
COIL	470	1-bit	Read/write	Modbus stop bits of the energy meter	1-bit 0: 1 bit 1: 2 bits

9.3 Function assignment of input and output registers

You can assign different functions to the digital inputs and outputs by using the corresponding values in the registers:

– Registers 327 to 330 for the digital outputs (Function assignment of digital outputs)
– Registers 520 to 524 for the digital inputs (Function assignment of digital inputs)

Table 9-6 Function assignment of digital outputs

Value	Function
0	Inactive
1	Charging controller in status A
2	Charging controller in status B
3	Charging controller in status B and PWM ON
4	Charging controller in status B and PWM OFF
5	Charging controller in status C
6	Charging controller in status D
7	Charging controller in status E
8	Charging controller in status F
9	Charging controller in status A or B
10	Charging controller in status A or B and PWM ON
11	Charging controller in status A or B and PWM OFF
12	Charging controller in status A, B or C
13	Charging controller in status A, B or D
14	Charging controller in status A to D
15	Charging controller in status E or F (default for output ER)
16	Charging controller in status C or D (default for output VR)
17	PWM ON (default for output CR)
18	Valid Proximity detected
19	Invalid Proximity detected
20	13 A charging connector detected
21	20 A charging connector detected
22	32 A charging connector detected
23	63 A charging connector detected
24	13 A or 20 A charging connector detected
25	13 A, 20 A or 32 A charging connector detected
26	Charging connector with low current carrying capacity rejected
27	Charging controller switches charging contactor ON
28	Status D ventilation on
29	Locking active (default for output LR)
30	Output 1 register
31	Output 2 register

Table 9-6 Function assignment of digital outputs [...]

Value	Function
32	Output 3 register
33	Output 4 register
34	Overcurrent detected
35	Charging contactor monitoring triggered
36	Status D, vehicle rejected
37	Vehicle connected in status B or C or D
38	Reserved for future function
39	Authorization status (flashing: authorization in progress, permanent: enable issued)

Table 9-7 Function assignment of digital inputs

Value	Function
0	Inactive
1	Enable charging process by permanent High signal (default for input EN)
2	Charging station availability (default for input XR)
3	Charging connector locking feedback (default for input LD)
4	Locking (permanent High signal)
5	Contactor monitoring via N/O auxiliary contact
6	Contactor monitoring via N/C auxiliary contact
7	PWM signal at 5%
8	Charging current at 6 A
9	Charging current at 10 A
10	Charging current at 13 A
11	Charging current at 16 A (default for input IN)
12	Charging current at 20 A
13	Charging current at 32 A
14	Charging current at 63 A
15	Charging current at 70 A
16	Enable charging process by pulsed signal
17	Locking (pulsed signal) (default for input ML)
18	Reserved for future function
19	Charging current at maximum permissible value
20	Pause charging process (OCPP: Suspend EVSE)
21	Generate error state

A Appendix for document lists

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