

Application examples for networking,
connection and load management
for charging stations with ECU



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1 General information

About this document

This document is a supplement to the operating and installation manual of the respective charging station. It contains useful information and application examples for networking, connection and load management for charging stations with an ECU (ECU-Firmware 4.53 or 4.61).

The document is applicable to the following charging stations:

- AMEDIO Professional+, AMEDIO Professional, AMEDIO Professional+*, AMEDIO Professional*: hereinafter referred to as "AMEDIO"
- AMTRON® Professional+ , AMTRON® Professional: hereinafter referred to as "AMTRON®"

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About the ECUs

AMEDIO and AMTRON® have one installed ECU (Electronic Control Unit) per charging point (CP). The ECU is used to control the individual charging point as well as for communication between the charging stations and with a Backend-System.

Differences:

	AMTRON®	AMEDIO
ECU design	Top-hat rail device	Board
Number of ECUs in the charging station	1	2 (These are pre-configured in the AMEDIO as a Master-Satellite connection)

The charging stations can be configured via the Micro-USB port on the ECU.

➔ "2 Configure charging station"

To configure an AMEDIO, the Micro-USB port on the ECU on the **right-hand side** must be used.

2 Configure charging station

2.1 Configure AMEDIO via USB

CONNECTIONS

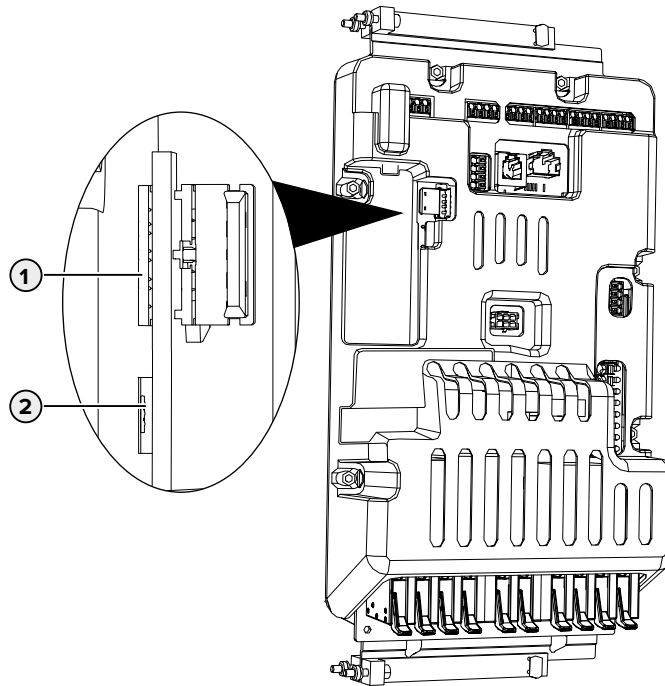


Fig. 1: Connections for the configuration on the ECU (AMEDIO)

Item	Usage	Connection
1	Slot for a SIM card. ▶ Use the connection point on the ECU on the left-hand side.	Micro-SIM
2	Configuration of the device. ▶ Use the connection point on the ECU on the right-hand-side.	Micro-USB

- ▶ Connect terminal device (e. g. PC, laptop, mobile phone) und ECU with the provided USB cable. To do this, use the micro USB connection (2) of the ECU on the right-hand-side.

➔ "Fig. 1: Connections for the configuration on the ECU (AMEDIO)"

If the driver is not installed automatically under the Windows operating system it must be installed manually. Example:



- ▶ Navigate to "Control Panel" > "Device Manager" > "Other devices".
- ▶ Right-click "RNDIS/Ethernet Gadget" > "Update Drive Software" > "Search for driver software on the computer" > "Select from a list of device drivers on the computer" > "Network Adapter" > "Microsoft Corporation" > "NDIS-compatible remote device".
- ✓ The driver is being installed.

Configuring via the web interface

Configuration occurs via the web interface in a web browser. The web interface is password-protected.

Both charge points in the device are pre-configured as a master/slave connection (for OCPP).



- Perform configuration tasks only via the master web interface. Most of the settings are automatically adopted for the satellite charge point or they are not relevant to the satellite charge point.
- The settings that need to be made separately via the satellite web interface are shown in this document.

▶ To do this, open the web interface of the satellite ECU.

→ "Fig. 2: Selection page: Master - Satellite"

▶ Open the web browser.

The web interface can be reached via **http://192.168.123.123/operator**

✓ A selection page opens where you can choose whether to configure the master ECU or the satellite (slave) ECU.

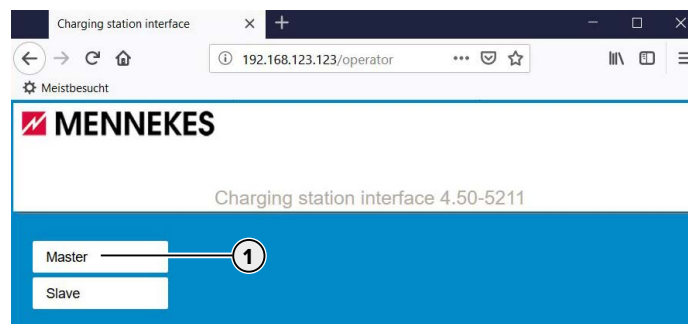


Fig. 2: Selection page: Master - Satellite

▶ Open the web interface of the master ECU (1).

► Enter password.

📄 Password: See Commissioning Data Sheet.

Commissioning Data Sheet Einrichtungsdatenblatt



**Serial Number:
140802412.00015**

Credentials

User Name Master:	operator
Password Master:	6eBb1vDc
Password Slave:	TqJkkLZe

Device Data

Application Version Master:	4.52-5412-d6a2288f6
Application Version Slave:	4.52-5412-d6a2288f6
Controller Serial Number Master:	1903523062/B94060045
Controller Serial Number Slave:	1903527652/B94060046
Meter Serial Number Master:	093609
Meter Serial Number Slave:	093633

Fig. 3: Commissioning Data Sheet for AMEDIO (example)

✓ The web interface for the configuration opens.

➔ "2.4 Structure of the web interface"

2.2 Configure AMTRON® via USB

CONNECTIONS



Fig. 4: Connections for the configuration on the ECU (AMTRON®)

Item	Use	Connection
1	Slot for a SIM card	Micro-SIM
2	Configuration of the device	Micro-USB

- ▶ Connect terminal device (e. g. PC, laptop, mobile phone) und ECU with the provided USB cable. To do this use the Micro-USB port (2) of the ECU.

➔ "Fig. 4: Connections for the configuration on the ECU (AMTRON®)"

If the driver is not installed automatically under the Windows operating system it must be installed manually. Example:



- ▶ Navigate to "Control Panel > "Device Manager" > "Other devices".
- ▶ Right-click "RNDIS/Ethernet Gadget" > "Update Drive Software" > "Search for driver software on the computer" > "Select from a list of device drivers on the computer > "Network Adapter" > "Microsoft Corporation" > "NDIS-compatible remote device".
- ✓ The driver is being installed.

Configuring via the web interface

Configuration occurs via the web interface in a web browser. The web interface is password-protected.

- ▶ Open the web browser.

The web interface can be reached via <http://192.168.123.123/operator>

▶ Enter password.

📄 Password: See Commissioning Data Sheet.

Commissioning Data Sheet Einrichtungsdatenblatt



**Serial Number:
1376204.00010**

Credentials

User Name: operator
Password: **LmaIWux1**

Device Data

Application Version: 4.50-5332-f2190336c
Controller Serial Number: 1812519916/B94060015
Meter Serial Number: 094984

Fig. 5: Commissioning Data Sheet for AMTRON® (example)

✓ The web interface for the configuration opens.

➔ "2.4 Structure of the web interface"

2.3 Configure the charging station via the Ethernet network

Once the charging station is integrated into an Ethernet network (referred to as "network" in the following), the web interface can also be reached via a terminal device that is located in the same network.

Requirement:

■ The charging station must be integrated into a network.

➔ "4 Set up network"

■ A terminal device (e.g. PC, laptop, mobile phone) must also be included in the network.

■ The IP address of the charging point must be known.

With dynamic IP address assignment, you can view the IP address of the charging point via the web interface of the switch to which the charging points are connected (see "4 Set up network").

Configuring via the web interface

- ▶ Open the web browser of the terminal device.

The web interface can be reached via " **http://IP address of the charging point**".

Example:

IP address of the charging point: 192.168.0.70

The web interface can be reached via: http://192.168.0.70

QUERYING THE ASSIGNED IP ADDRESSES IN THE WEB INTERFACE

The assigned IP address can be retrieved via the web interface.

- ▶ In the web interface, navigate to the menu "State".

List of interfaces	eth0: [3C:49:37:17:B7:A1] IP: 192.168.0.70 ppp0: IP: 10.0.3.69 (occp)	List of interfaces and their IPs
--------------------	--	----------------------------------

Fig. 6: Web interface for displaying the assigned IP addresses

The assigned IP address is displayed under "List of interfaces".

The IP address of the SIM card can be queried in the master web interface.

SPECIAL FEATURE OF THE AMEDIO

Although there are two charging points, the AMEDIO is always visible in the network with a single IP address. This is achieved by running the two charging points of the AMEDIO charging station on different ports. The master charging point always runs on port 81 and the satellite charging point on port 82.

Example:

- Master charging point: 192.168.0.70:81
- Satellite charging point: 192.168.0.70:82

2.4 Structure of the web interface

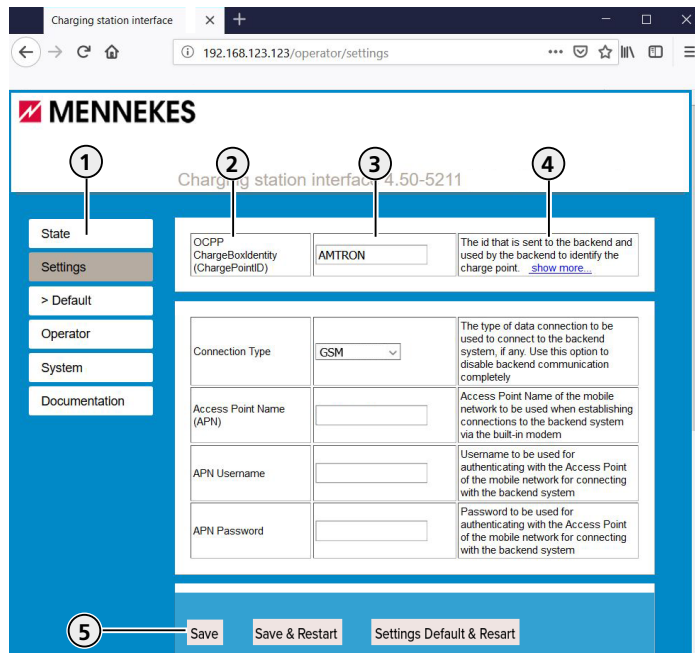


Fig. 7: Structure of the web interface

1. Menu
2. Parameter
3. Setting / Status
4. Comment / information
5. Buttons for saving, restarting and loading presets

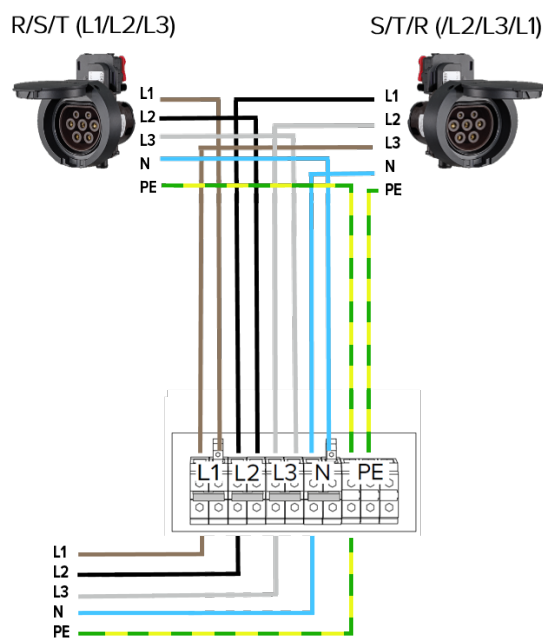
The following menus are displayed in the web interface:

- "State"
- "Settings"
- "> Default"
- "Operator"
- "System"
- "Documentation"

3 Power supply connection diagram for AMEDIO

3.1 Three-phase operation (delivery state)

To ensure that the network load is distributed as evenly as possible, the connection of the right-hand charging socket is phase-shifted by 120° (see illustration). This favours the network load for single-phase vehicle charging because charging takes place on two different phases.



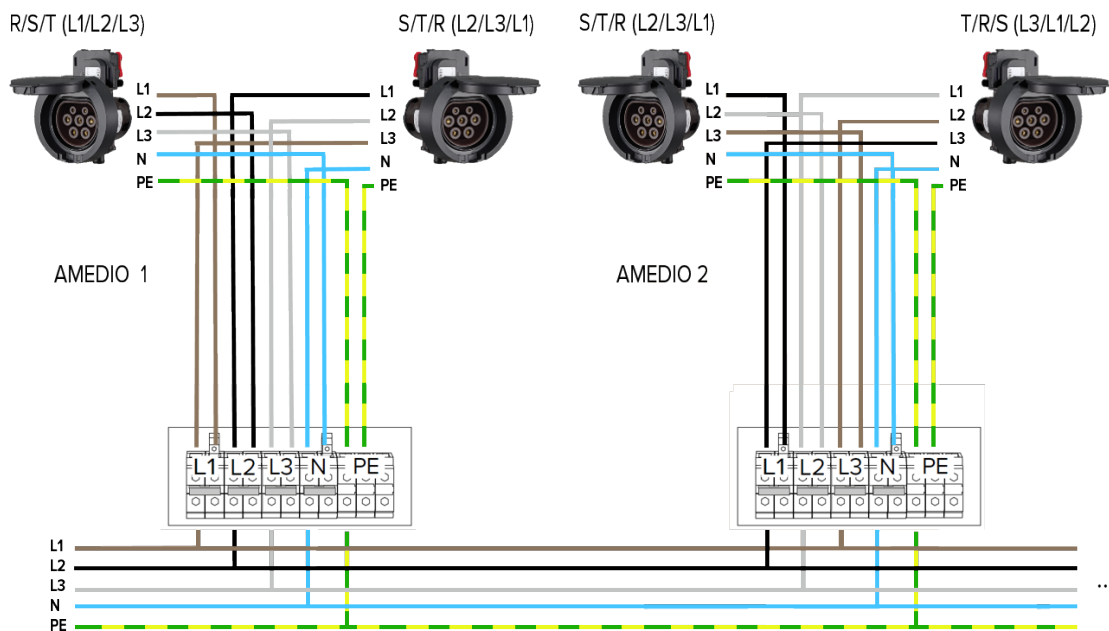
SETTINGS IN THE WEB INTERFACE

In the delivery state, in the menu "Operator" of the web interface, the following settings are selected for each charging point (CP):

Parameter	Setting	
	CP 1 / left-hand ECU	CP 2 / right-hand ECU
Phase connected to the Charge Point	Three-phase system	
Phase rotation of the Charge Point	R/S/T (L1/L2/L3)	S/T/R (L2/L3/L1)

3.2 Three-phase operation of several charging stations

To ensure that the network load is distributed as evenly as possible, we recommend connecting the supply lines to the terminals of the AMEDIO with phase reversal (see illustration).



This illustration is incomplete. More AMEDIOs can be connected to the same power supply using the above principle of phase reversal. From a fourth connected AMEDIO, the recommended phase position and the necessary settings in the web interface are repeated.

Connected AMEDIOs	Charging points	Input terminal		
		L1	L2	L3
AMEDIO 1	CP 1 / left-hand ECU	L1	L2	L3
	CP 2 / right-hand ECU	L2	L3	L1
AMEDIO 2	CP 1 / left-hand ECU	L2	L3	L1
	CP 2 / right-hand ECU	L3	L1	L2
AMEDIO 3	CP 1 / left-hand ECU	L3	L1	L2
	CP 2 / right-hand ECU	L1	L2	L3
AMEDIO 4 (cf. AMEDIO 1)	CP 1 / left-hand ECU	L1	L2	L3
	CP 2 / right-hand ECU	L2	L3	L1
...

SETTINGS IN THE WEB INTERFACE

To allow the correct assignment between each charging point and the applied phase position, the correct phase position for each charging point must be set in the web interface. As a result, an overload can be prevented when operating load management, for example.

- ▶ In the web interface, navigate to the menu "Operator" and select the following settings:

AMEDIO 1	
Setting	
Parameter	CP 1 / left-hand ECU CP 2 / right-hand ECU
Phase connected to the Charge Point	Three-phase system
Phase rotation of the Charge Point	R/S/T (L1/L2/L3) S/T/R (L2/L3/L1)

AMEDIO 2	
Setting	
Parameter	CP 1 / left-hand ECU CP 2 / right-hand ECU
Phase connected to the Charge Point	Three-phase system
Phase rotation of the Charge Point	S/T/R (L2/L3/L1) T/R/S (L3/L1/L2)

AMEDIO 3 (not shown in the illustration)	
Setting	
Parameter	CP 1 / left-hand ECU CP 2 / right-hand ECU
Phase connected to the Charge Point	Three-phase system
Phase rotation of the Charge Point	T/R/S (L3/L1/L2) R/S/T (L1/L2/L3)

- ▶ Click the "Save & Restart" button.

3.3 Single-phase operation of AMEDIO

For single-phase operation of AMEDIO, a number of settings must be changed.

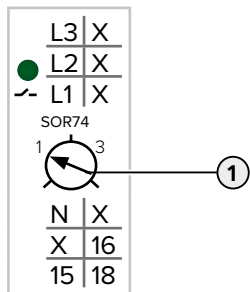
SETTING THE PHASE SEQUENCE RELAY

1. Setting the phase sequence relay

The potentiometer at both phase sequence relays must be changed over to operate the device in single-phase.

The phase sequence measuring relay is located on the second top-hat rail from the top.

 Operating and installation manual: "3.3 Device setup"



- ▶ Adjust potentiometer (1) to position 1 using a slotted screwdriver.

Setting	Description
1	Single-phase operation
3	Three-phase operation

RECONNECT JUMPERS

2. Reconnect the jumpers at the terminals of the power supply

The jumpers at the terminals of the power supply have to be reconnected for single-phase operation.

⚠ ATTENTION

Material damage as a result of incorrectly reconnected jumpers

A short-circuit will occur whenever the jumpers are configured for single-phase operation and the device is connected for three-phase operation. This can result in damage to the circuit breakers in the indoor breaker box.

- ▶ Set up jumpers according to the device connection.
- ▶ Use a slotted screwdriver for removing jumpers (except for the jumper at terminals N).
- ▶ Connect a jumper between the L1 and L2 terminals.
- ▶ Check that the jumper is tightly fitted and can only be removed by using a tool.

Position of jumpers for single-phase operation:

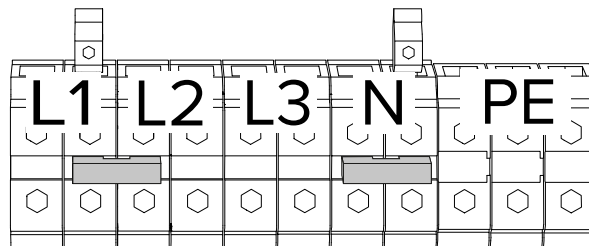


Fig. 8: Position of jumpers for single-phase operation

i Only two jumpers are required for single-phase operation.

Position of jumpers for three-phase operation (condition at the time of delivery):

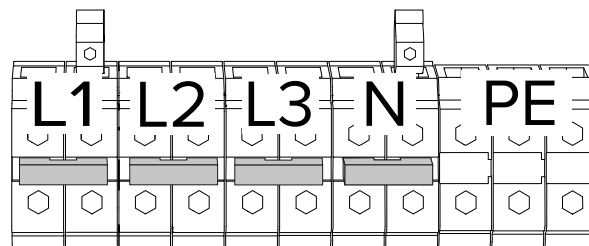


Fig. 9: Position of jumpers for three-phase operation (condition at the time of delivery)

CONNECT THE DEVICE TO THE SINGLE-PHASE POWER SUPPLY

3. Connect the device to the single-phase power supply

The device can be connected in a TN / TT network. The device can only be connected in an IT network under the following conditions:

- Connection to a 230 / 400 V IT network is not permitted.
- Connection to an IT network with 230 V external line voltage over a residual current circuit breaker is permissible, provided that the maximum contact voltage does not exceed 50 V AC when the first error occurs.

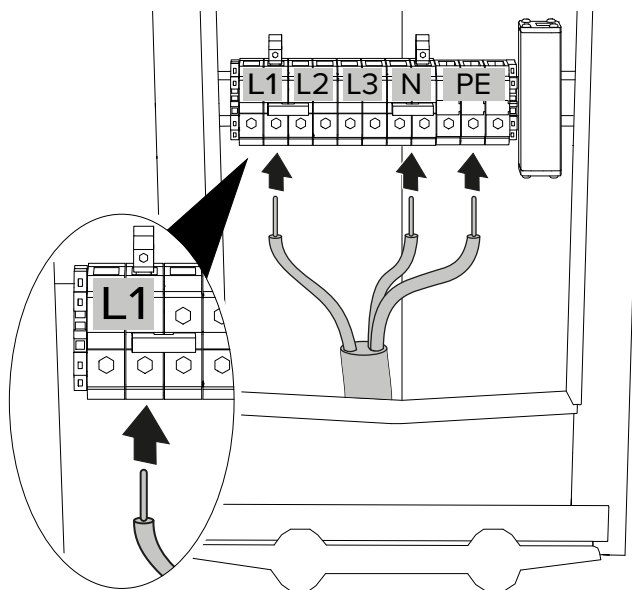


Fig. 10: Power supply connection (single-phase operation)

- ▶ Strip the supply line.
- ▶ Strip conductors 12 to 18 mm.
- ▶ Connect the supply cable to the terminals as per the terminal labelling.

i Several devices can be connected in series (loop through supply cable).

- ▶ Comply with the connection data for the terminals and the maximum back-up fuse.

📄 Operating and installation manual: "4 Technical data"

i When routing the supply line, comply with the permissible bending radius.

- ▶ Use terminals L1, N and PE.



The terminal on the **right-hand side** of the two L1 terminals has to be used for single-phase operation.

→ "Fig. 10: Power supply connection (single-phase operation)"

- ▶ Check whether the individual cores are connected correctly and that the screws are tightened.

SETTINGS IN THE WEB INTERFACE

4. Web interface

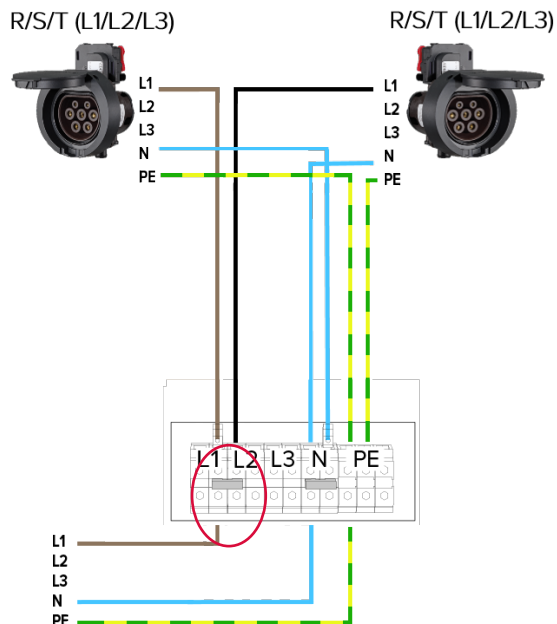
To operate the device on a single phase, it is necessary to change two parameters in the master web interface and in the satellite web interface.

- ▶ In the web interface, navigate to the menu "Operator" and select the following settings:

Parameter	Setting	
	CP 1 / left-hand ECU	CP 2 / right-hand ECU
Phase connected to the Charge Point	Single-phase system	
Phase rotation of the Charge Point	R/S/T (L1/L2/L3)	R/S/T (L1/L2/L3)

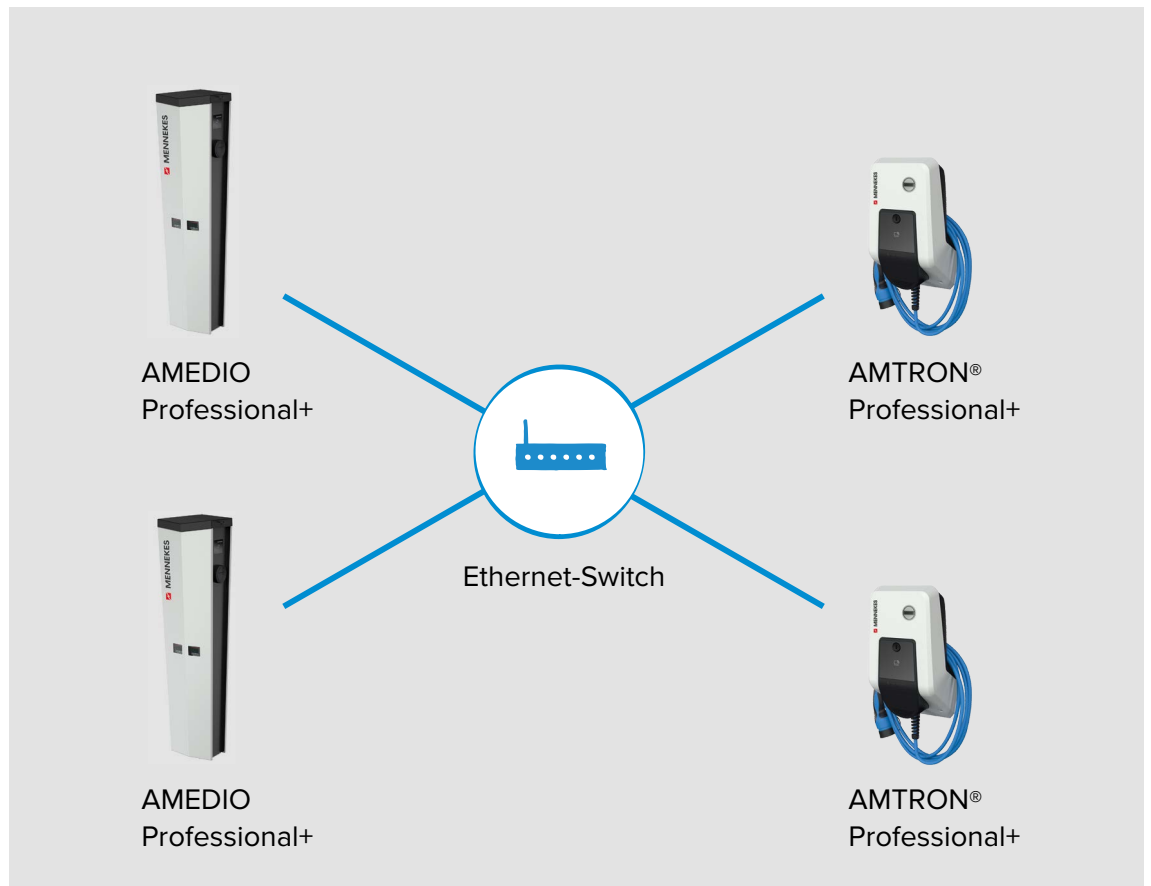
POWER SUPPLY CONNECTION DIAGRAM

After the changes, the power supply connection diagram looks as follows:



4 Set up network

In order to network several charging stations, all charging stations must be networked to a switch using a network cable (not included in the scope of delivery). The wiring must be carried out in star topology. The Ethernet cables may not exceed 100 m in length.



Local networking can be used for the following functions:

- Connection of several charging points to a Backend-System via a SIM card (wireless communication).
- Connection of several charging points to a Backend-System over local internet.
- Operation of local and dynamic load management (DLM).

4.1 Set up network with dynamic IP addresses (DHCP)



From ECU-Firmware 4.61, the IP addresses of all charging points in the network can be assigned dynamically. Should an older ECU-Firmware have been installed, the IP addresses must be assigned manually (statically).

→ "4.2 Set up network with static IP addresses"

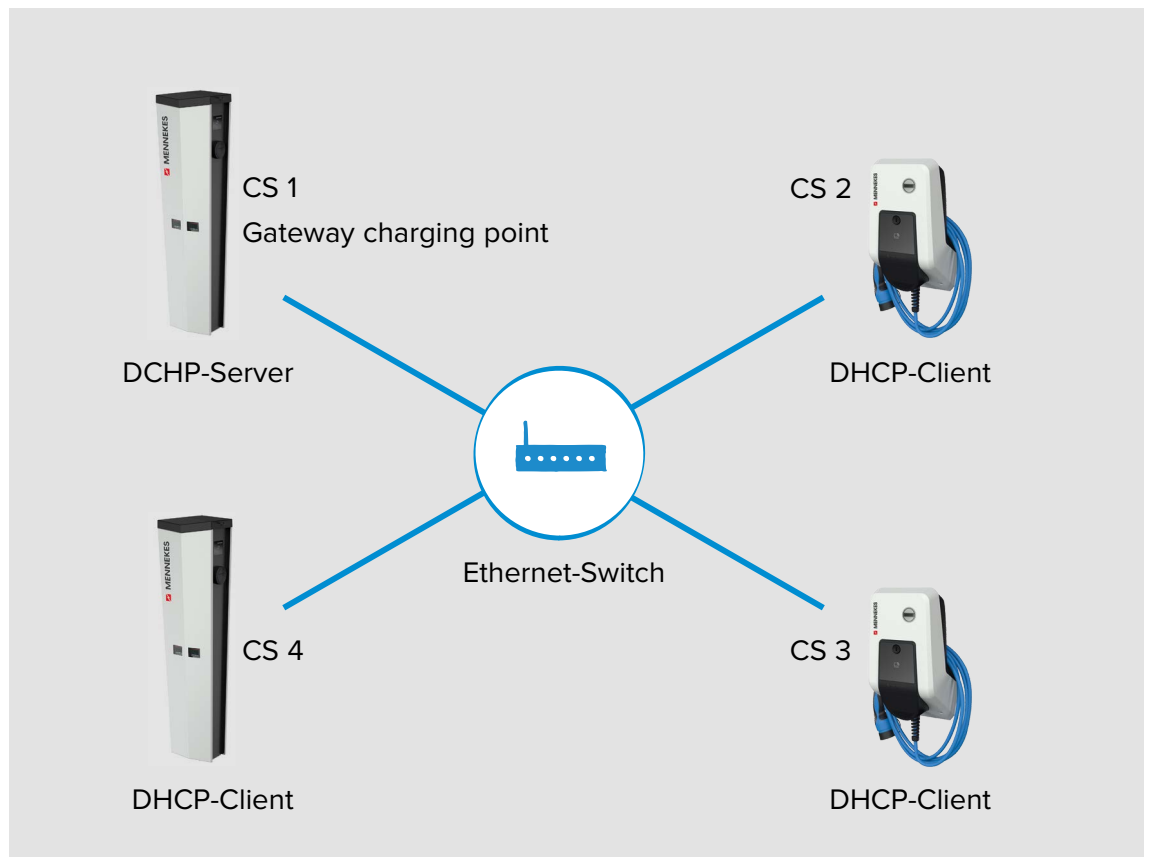
4.1.1 ECU as a DHCP-Server



For a connection to the Backend-System via a SIM card (wireless communication) it is necessary to use the ECU as a DHCP-Server.

→ "5 Connection of several charging points to a Backend-System via a SIM card"

If the charging points are connected via a switch, the charging points can be configured for the network communication. The dynamic IP address assignment for the ECUs in the network is made by any desired ECU in the same network, which is configured as a DHCP-Server. One ECU in the network must therefore be configured as a DHCP-Server and all other ECUs as a DHCP-Client:



The ECU that is configured as a DHCP-Server must be the same ECU that will subsequently be configured as the Gateway for communication with the Backend-System.

→ "5 Connection of several charging points to a Backend-System via a SIM card"

SETTINGS IN THE WEB INTERFACE

- ▶ In the web interface, navigate to the menu "Operator" .

Mode for ethernet configuration	DHCP server ▾	Mode for ethernet configuration to be used for the ChargePoint. 'Auto' uses DHCP to configure the ChargePoint's ethernet connection; 'Static' uses the addresses as filled in static network configuration IP; 'DHCP server' assigns a predefined DHCP configuration to other DHCP clients in the same network (range 172.42.23.100-172.42.23.254); netmask 255.255.255.0; gateway 172.42.23.1; DNS 172.42.23.1). The DHCP server's own IP is 172.42.23.1. Any static network configuration is ignored in case of DHCP server mode. Please consider to switch the 'WAN router' on in case of DHCP server enabled.
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Fig. 11: Web interface of the DHCP-Server for configuring dynamic IP addresses

- ▶ Set the following parameter in the web interface:

	Web interface setting			
Parameter	CS 1 / DHCP-Server (Gateway charging point)	CS 2 / DHCP-Client	CS 3 / DHCP-Client	...
Mode for network configuration	DHCP Server	Auto (DHCP Client)	Auto (DHCP Client)	Auto (DHCP Client)



- From ECU-Firmware 4.61, the parameter is called "Mode for ethernet configuration".
- Present: "Auto (DHCP Client)".

- ▶ Click the "Save & Restart" button.

4.1.2 Router as a DHCP-Server



For a connection to the Backend-System over local internet it is necessary to use the router with the internet connection as a DHCP-Server.

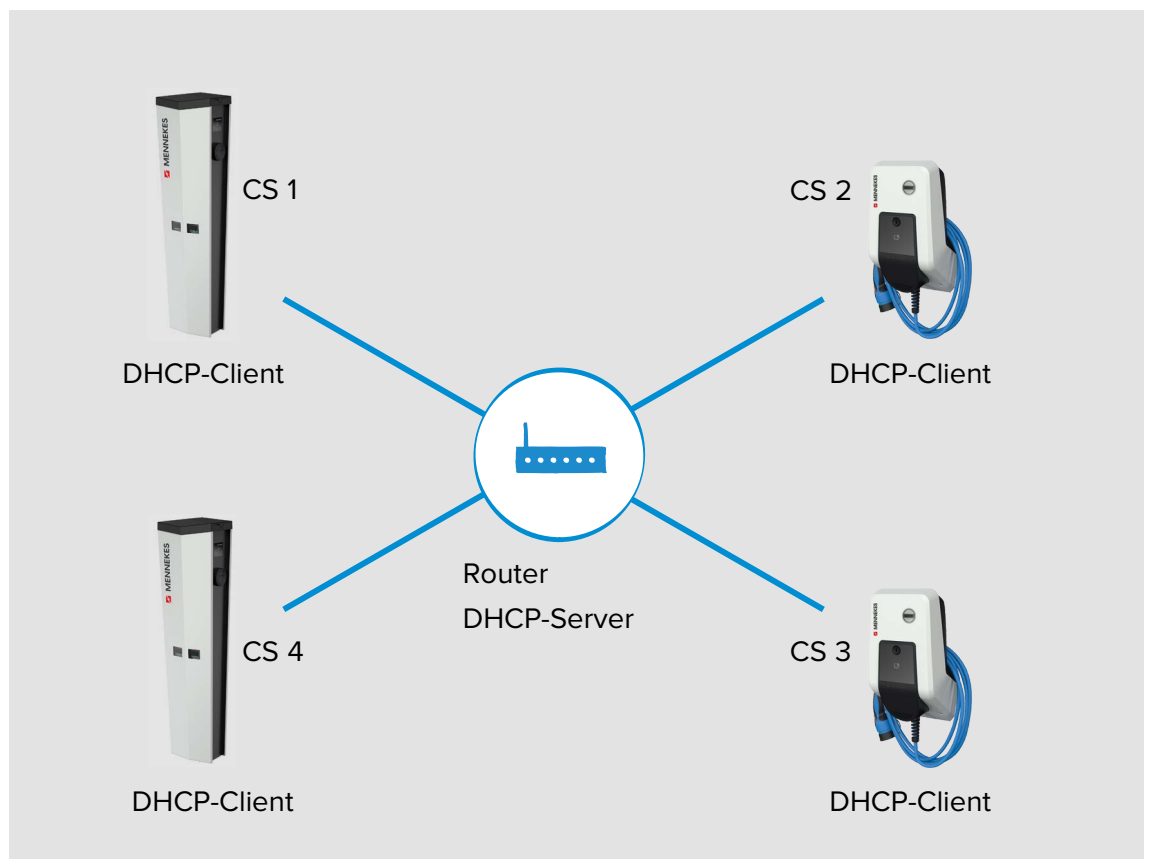
→ "6 Connection of several charging points to a Backend-System over local internet"



As an alternative, the IP addresses can also be assigned manually (statically).

→ "4.2 Set up network with static IP addresses"

If the charging points are connected via a router / switch, the charging points can be configured for the network communication. The dynamic IP address assignment for the ECUs in the network is made by a router in the same network, which is configured as a DHCP-Server. All ECUs must be configured as a DHCP-Client.



SETTINGS IN THE WEB INTERFACE

- ▶ In the web interface, navigate to the menu "Operator" .

Mode for network configuration	Auto (DHCP) ▼	Mode for network configuration to be used for the ChargePoint. 'Auto' uses DHCP to configure the ChargePoint's network connection; 'Manual config' uses the addresses as filled in above.
--------------------------------	---------------	---

Fig. 12: Web interface of all ECUs for configuring dynamic IP addresses

- ▶ Set the following parameter in the web interface:

Parameter	Web interface setting			
	CS 1 / DHCP-Client	CS 2 / DHCP-Client	CS 3 / DHCP-Client	...
Mode for network configuration	Auto (DHCP Client)	Auto (DHCP Client)	Auto (DHCP Client)	Auto (DHCP Client)

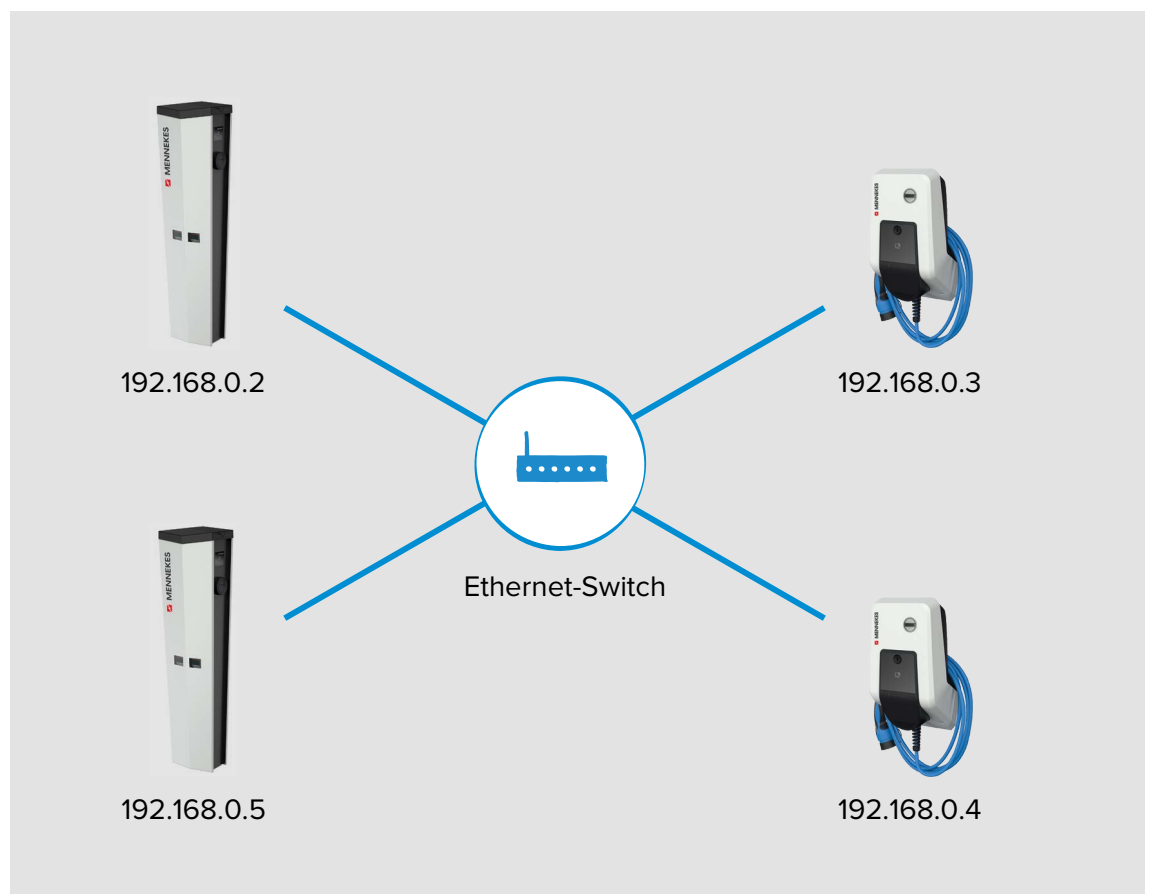


- From ECU-Firmware 4.61, the parameter is called "Mode for ethernet configuration".
- Present: "Auto (DHCP Client)".

- ▶ Click the "Save & Restart" button.

4.2 Set up network with static IP addresses

As an alternative to the dynamically assigned IP addresses, the ECUs can also be assigned static IP addresses.



SETTINGS IN THE WEB INTERFACE

- ▶ In the web interface, navigate to the menu "Operator".

Mode for network configuration	Manual config ▼	Mode for network configuration to be used for the ChargePoint. 'Auto' uses DHCP to configure the ChargePoint's network connection; 'Manual config' uses the addresses as filled in above.
DHCP client hostname		Hostname string sent to DHCP server along with a DHCP request.
DHCP client request retries	10	DHCP request number of retries before giving up.
DHCP client request timeout	10	DHCP request timeout in seconds.
DHCP client request delay	10	DHCP request delay between multiple requests in seconds.
Static network configuration IP	192.168.0.100	Static IP of the ChargePoint. Only applies to the backend connection device. In case the backend connection device is not Ethernet nor WLAN, the configuration applies to Ethernet.
Static network configuration NETMASK	255.255.255.0	Netmask to use for the ChargePoint.

Fig. 13: Web interface for configuring static IP addresses

- ▶ Set the following parameters in the web interface(s):

Parameter	Web interface settings	Special feature
Mode for network configuration	Mode for network configuration of charging point. ▶ Set "Manual config".	Only for ECU-Firmware 4.53.
Mode for ethernet configuration	Mode for network configuration of charging point. ▶ Set "Static".	Only for ECU-Firmware 4.61.
Static network configuration IP	IP address for static IP address configuration. ▶ Enter static IP address.	
Static network configuration NETMASK	Network screen for static IP address configuration. ▶ Enter network screen.	

The static IP address is selected depending on the switch. Requirement:

- The IP addresses of the ECUs should be numbered consecutively.
- An IP address must not be assigned twice within a network.

- ▶ Click the "Save & Restart" button.

SPECIAL FEATURE OF THE AMEDIO

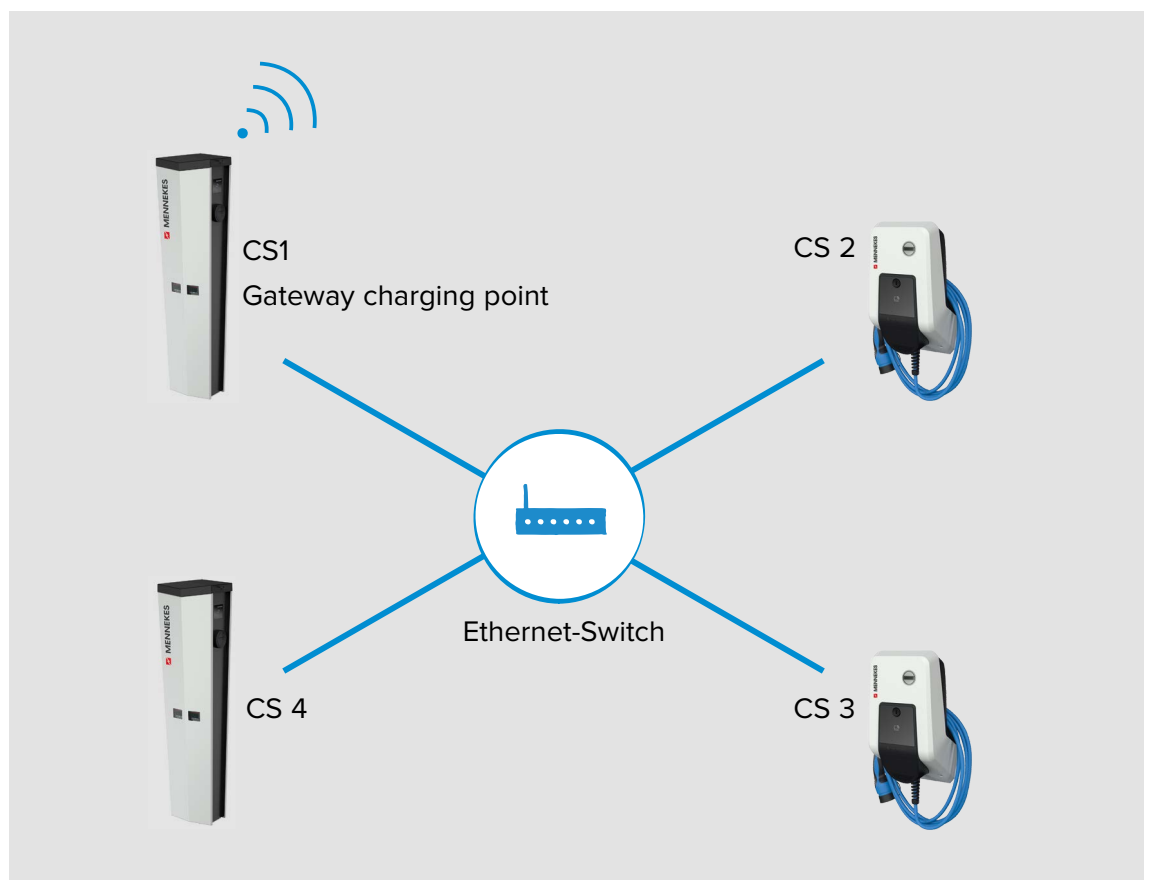
Although there are two charging points, the AMEDIO is always visible in the network with a single IP address. This is achieved by running the two charging points of the AMEDIO charging station on different ports. The master charging point always runs on port 81 and the satellite charging point on port 82.

Example:

- Master charging point: 192.168.0.70:81
- Satellite charging point: 192.168.0.70:82

5 Connection of several charging points to a Backend-System via a SIM card

If several charging points are to be connected to a Backend-System via a SIM card, one charging point in the network must be configured as a Gateway. The Gateway charging point acts as an interface between the locally networked charging points on one side and the Backend-System on the other.



Requirements for the network:

- The IP address assignment is made either statically or dynamically. For a dynamic IP address assignment it is necessary to use the ECU as a DHCP-Server.
- ➔ "4.2 Set up network with static IP addresses"
- ➔ "4.1.1 ECU as a DHCP-Server"

Requirements for the Gateway charging point:

- Each charging point with an integrated wireless communication modem can be configured as a Gateway (all device variants with a "+" in the name have an integrated wireless communication modem).
- The Gateway charging point must have a Micro-SIM card for wireless communication.
- The following applies for AMEDIO: A master charging point must be configured as a Gateway, as only the master charging point contains a wireless communication modem.

**SPECIAL FEATURE OF
THE AMEDIO**

Further requirements:

- The charging stations must be on the same network.
- ➔ "4 Set up network"
- The network must have only one Gateway charging point.
- For the Gateway functionality, communication with the Backend-System must be via OCPP-J 1.6.
- The maximum number of charging points that are connected to a Backend-System via wireless communication must be selected depending on the network quality at the location and the available data volume. MENNEKES recommends connecting a maximum of 50 charging points to a Backend System via a SIM card.
- The following applies to the ECU-Firmware 4.53:
The connection of multiple charging points to a Backend-System via a Gateway can only be done with the assignment of a static IP address.
- ➔ "4.2 Set up network with static IP addresses"

**SPECIAL FEATURE OF
THE ECU-FIRMWARE
4.53**

5.1 Define Gateway charging point

The charging point with the integrated SIM card ("Connection type" = "GSM") could define as a Gateway over the "WAN router" = "On" parameter.

- ▶ In the web interface of the Gateway charging point, navigate to the menu "Operator".

WAN router	On ▼	Enables access from LAN interfaces (Ethernet/WLAN/USB) to WAN (GSM) interface
------------	------	---

Fig. 14: Web interface for configuring the Gateway charging point

- ▶ Set the following parameters in the web interfaces:

	Settings			
Parameter	CS1 / Gateway charging point	CS2	CS3	...
Connection type	▶ Select "GSM".	▶ Select "Ethernet".	▶ Select "Ethernet".	▶ Select "Ethernet".
WAN router	▶ Select "On".	▶ Select "Off".	▶ Select "Off".	▶ Select "Off".

- ▶ Click the "Save & Restart" button.

5.2 Select OCPP communication protocol

- ▶ In the web interface, navigate to the menu "Settings".

OCPP Mode	OCPP-J 1.6 ▼	This parameter determines whether backend communication is done using the standard OCPP SOAP/JSON variant or the proprietary Binary OCPP variant of Ebee Smart Technologies. The Binary OCPP variant is working across NAT networks and therefore does not require a private APN for remote messages to arrive at the charge point. Also Binary OCPP uses much less data (factor 20 to 50) than standard OCPP. Binary OCPP however requires a Binary OCPP proxy on the backend side.
WebSockets JSON OCPP URL of the Backend	ws://192.168.22.183	The WS/WSS URL of the OCPP backend system. This URL must be the WS/JSON endpoint and begin with either "ws://" or "wss://". This parameter is only used if OCPP-J 1.6 mode is used. The Chargepoint's ID gets automatically appended when connecting to the backend.

Fig. 15: Web interface of the Gateway charging point for configuring the OCPP communication protocol

- ▶ Set the following parameters in the web interfaces:

Parameter	Settings			
	CS1 / Gateway charging point	CS2	CS3	...
OCPP mode	▶ Select "OCPP-J 1.6".	▶ Select "OCPP-J 1.6".	▶ Select "OCPP-J 1.6".	▶ Select "OCPP-J 1.6".
WebSocket JSON OCPP URL of Backend	Enter the WS / WSS-URL of the OCPP Backend-System.	Enter the WS / WSS-URL of the OCPP Backend-System.	Enter the WS / WSS-URL of the OCPP Backend-System.	Enter the WS / WSS-URL of the OCPP Backend-System.

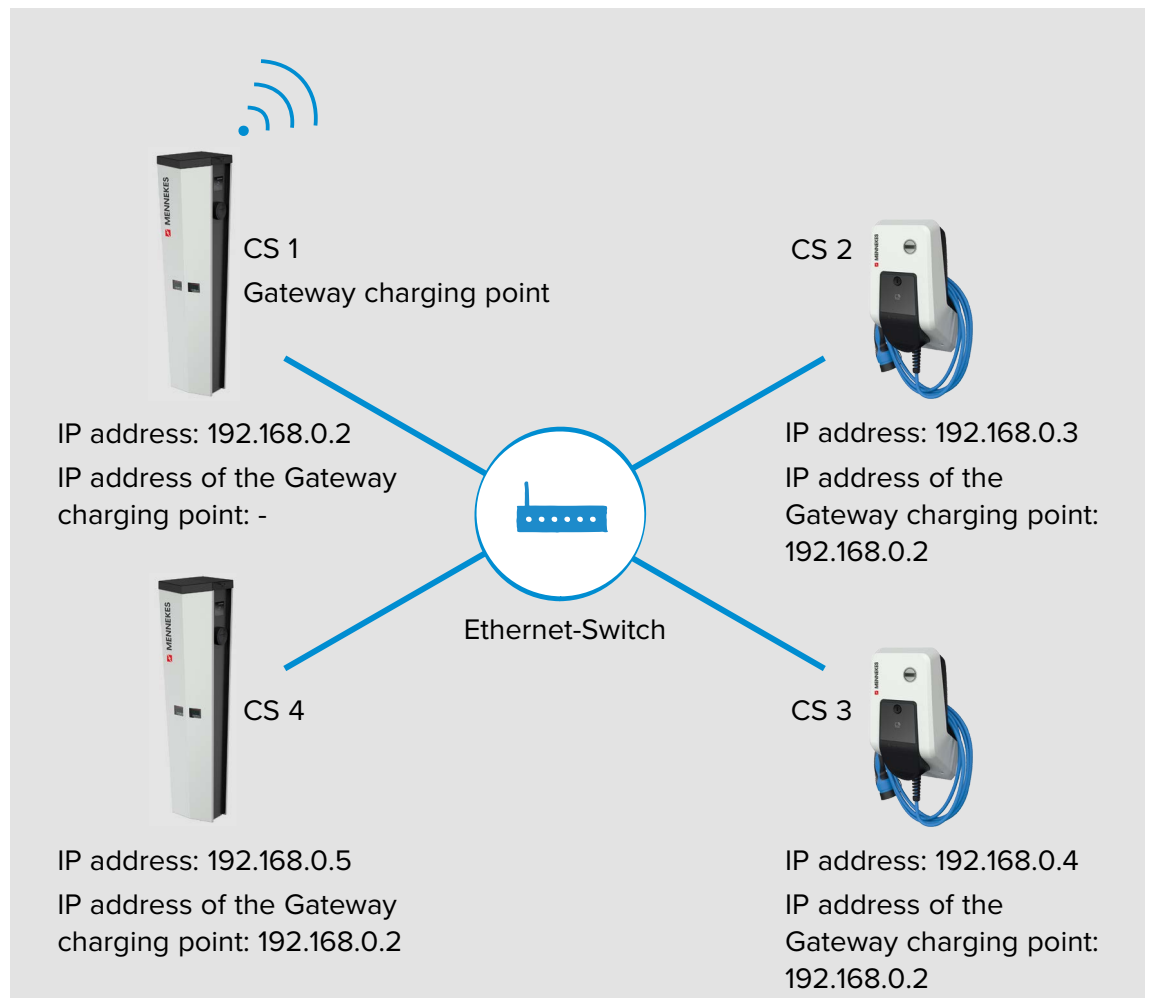
- ▶ Click the "Save & Restart" button.

5.3 Additional settings for local networking with statically assigned IP addresses

The following configurations only need to be implemented if the IP addresses were assigned manually (statically).

➔ "4.2 Set up network with static IP addresses"

If the IP addresses of all charging points in the network were assigned manually (statically), in addition to the manually entered IP address of the charging point, the IP address of the Gateway charging point in each charging point (except for the actual Gateway charging point) must also be specified.



SETTINGS IN THE WEB INTERFACE

► In the web interface of the Gateway charging point, navigate to the menu "Operator".

WAN router	On ▼	Enables access from LAN interfaces (Ethernet/WLAN/USB) to WAN (GSM) interface
Mode for network configuration	Manual config ▼	Mode for network configuration to be used for the ChargePoint. 'Auto' uses DHCP to configure the ChargePoint's network connection; 'Manual config' uses the addresses as filled in above.
DHCP client hostname		Hostname string sent to DHCP server along with a DHCP request.
DHCP client request retries	10	DHCP request number of retries before giving up.
DHCP client request timeout	10	DHCP request timeout in seconds.
DHCP client request delay	10	DHCP request delay between multiple requests in seconds.
Static network configuration IP	192.168.0.2	Static IP of the ChargePoint. Only applies to the backend connection device. In case the backend connection device is not Ethernet nor WLAN, the configuration applies to Ethernet.
Static network configuration NETMASK	255.255.255.0	Netmask to use for the ChargePoint.
Static network configuration GATEWAY		Gateway to use for the ChargePoint.

Fig. 16: Web interface of the Gateway charging point for configuring the static IP addresses

The parameter "Static network configuration GATEWAY" must remain empty for the Gateway charging point.

► In the web interfaces of the networked charging points, navigate to the menu "Operator".

WAN router	Off ▼	Enables access from LAN interfaces (Ethernet/WLAN/USB) to WAN (GSM) interface
Mode for network configuration	Manual config ▼	Mode for network configuration to be used for the ChargePoint. 'Auto' uses DHCP to configure the ChargePoint's network connection; 'Manual config' uses the addresses as filled in above.
DHCP client hostname		Hostname string sent to DHCP server along with a DHCP request.
DHCP client request retries	10	DHCP request number of retries before giving up.
DHCP client request timeout	10	DHCP request timeout in seconds.
DHCP client request delay	10	DHCP request delay between multiple requests in seconds.
Static network configuration IP	192.168.0.3	Static IP of the ChargePoint. Only applies to the backend connection device. In case the backend connection device is not Ethernet nor WLAN, the configuration applies to Ethernet.
Static network configuration NETMASK	255.255.255.0	Netmask to use for the ChargePoint.
Static network configuration GATEWAY	192.168.0.2	Gateway to use for the ChargePoint.

Fig. 17: Web interface of the networked charging points for configuring static IP addresses

In the parameter "Static network configuration GATEWAY", the IP address of the Gateway charging point (parameter "Static network configuration IP") must be entered for each networked charging point.

Example:

	Settings				Special feature
Parameter	CS 1 / Gateway charging point	CS 2	CS 3	...	
Mode for network configuration	Manual config	Manual config	Manual config	Manual config	Only for ECU-Firmware 4.53.
Mode for ethernet configuration	Static	Static	Static	Static	Only for ECU-Firmware 4.61.
Static network configuration IP	192.168.0.2	192.168.0.3	192.168.0.4	192.168.0. ...	
Static network configuration NETMASK	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0	
Static network configuration GATEWAY		192.168.0.2	192.168.0.2	192.168.0.2	

6 Connection of several charging points to a Backend-System over local internet

Requirements for the network:

- The IP address assignment is made either statically or dynamically. For a dynamic IP address assignment it is necessary to use the ECU as a DHCP-Server.
 - ➔ "4.2 Set up network with static IP addresses"
 - ➔ "4.1.1 ECU as a DHCP-Server"
- The network must have a connection to the internet.

SETTINGS IN THE WEB INTERFACE

- In the web interfaces of the networked charging points, navigate to the menu "Settings".

Connection Type	Ethernet ▼	The type of data connection to be used to connect to the backend system, if any. Use this option to disable backend communication completely
OCPP Mode	OCPP-J 1.6 ▼	This parameter determines whether backend communication is done using the standard OCPP SOAP/JSON variant or the proprietary Binary OCPP variant of Ebee Smart Technologies. The Binary OCPP variant is working across NAT networks and therefore does not require a private APN for remote messages to arrive at the charge point. Also Binary OCPP uses much less data (factor 20 to 50) than standard OCPP. Binary OCPP however requires a Binary OCPP proxy on the backend side.
WebSockets JSON OCPP URL of the Backend	ws://192.168.22.183	The WS/WSS URL of the OCPP backend system. This URL must be the WS/JSON endpoint and begin with either "ws://" or "wss://". This parameter is only used if OCPP-J 1.6 mode is used. The Chargepoint's ID gets automatically appended when connecting to the backend.
HTTP Basic Authentication password	NuLRhQdeM6jttw51Myh4 x	The password to be used for HTTP Basic Authorization. If left empty, HTTP Basic Authorization is not used.

Fig. 18: Web interface for configuring a connection to a Backend-System via local internet

- ▶ Set the following parameters in the web interfaces:

Parameter	Web interface settings
Connection type	▶ Select "Ethernet".
OCPP Mode	▶ Select "OCPP-J 1.6".
WebSocket JSON OCPP URL of Backend	▶ Enter the WS / WSS-URL of the OCPP Backend-System.
HTTP Basic Authentication Password	Only available from ECU-Firmware 4.61. ▶ Enter the password for HTTP Basic Authentication. An empty field prevents the HTTP Basic Authentication.



Information concerning OCPP and the password for HTTP Basic Authentication are provided by your Backend-System operator.

- ▶ Click the "Save & Restart" button.

7 Operation of local and dynamic load management (DLM)

The main purpose of load management is to ensure that as many vehicles as possible can be charged simultaneously, without overloading the power supply. The available energy must be distributed to the connected vehicles as evenly as possible. In the process, the vehicles must be charged with the highest possible charging current.

There are two principles concerning the supply of the entire charging infrastructure at the location:

- The value of the maximum upper current limit is static and corresponds, for example, to the value of the building connection or the back-up fuse of the charging infrastructure.
- The value of the maximum upper current limit is dynamic and is regulated, for example, as a function of the other consumers at the location.

Load management in this form offers the following advantages:

- Cost reduction / cost avoidance
 - Peak load avoidance
 - Reduced expansion of the grid connection
 - Energy consumption during favourable tariff periods
 - Optimal use of renewable energy
- Flexibility and convenience
 - Increase availability of charging points
 - Intelligent, dynamic controls for fastest possible , cost-optimised charging

The various options (use cases) for load management and the necessary configurations are described below.

Requirement:

- The charging stations must be on a network.
→ "4 Set up network"

GENERAL

In load management, one of the charging points in the network always assumes the coordination function. This charging point, which is also referred to as the DLM-Master, distributes the maximum available energy proportionately to the remaining charging points in the network. Any charging point in the network can be configured as the DLM-Master in the web interface (regardless of whether it is already configured as a Gateway charging point). All other charging points must be configured as DLM-Satellites.



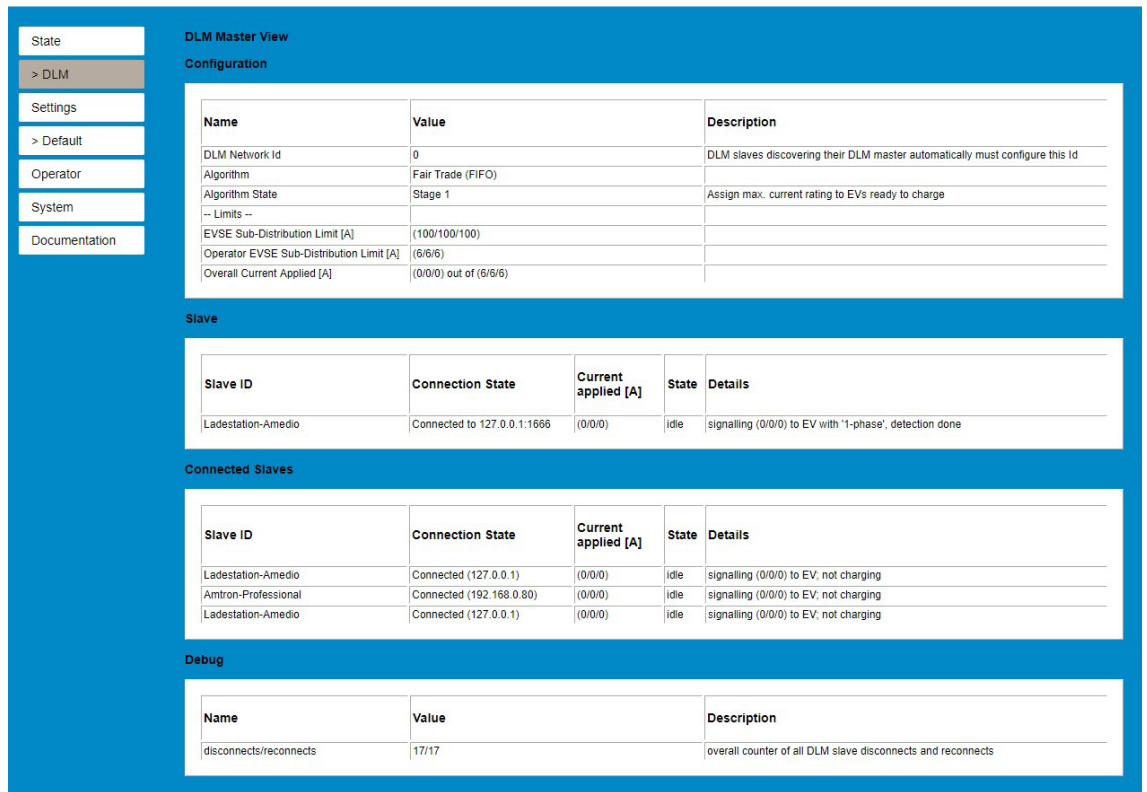
Operating principle:

- Load management distributes the maximum available power to the connected vehicles.
- Load management responds as a function of all internal phase-accurate measurements.
- All current charging currents are considered in "real time".
- Load management regulates the connected vehicles in the entire charging point network on an equal basis. Regulation takes place in 1 A steps.
- If the charging current on the vehicle side is reduced at the end of the charging process or to pause the charge, the released power reserve is distributed to the other connected vehicles.

- If an external meter is connected to the DLM-Master, the maximum available power depends on the remaining power consumption at the location and is automatically reduced or increased according to the load. If an external meter is connected, therefore, additional power consumers (outside the charging infrastructure) can be considered.

VIEW NETWORKED CHARGING STATIONS

Once a DLM-Master has been defined in the web interface, the new menu "> DLM" is displayed.



The screenshot shows the web interface menu "> DLM" with the following sections:

State

- > DLM
- Settings
- > Default
- Operator
- System
- Documentation

DLM Master View

Configuration

Name	Value	Description
DLM Network Id	0	DLM slaves discovering their DLM master automatically must configure this Id
Algorithm	Fair Trade (FIFO)	
Algorithm State	Stage 1	Assign max. current rating to EVs ready to charge
-- Limits --		
EVSE Sub-Distribution Limit [A]	(100/100/100)	
Operator EVSE Sub-Distribution Limit [A]	(6/6/6)	
Overall Current Applied [A]	(0/0/0) out of (6/6/6)	

Slave

Slave ID	Connection State	Current applied [A]	State	Details
Ladestation-Amedio	Connected to 127.0.0.1:1666	(0/0/0)	idle	signalling (0/0/0) to EV with '1-phase', detection done

Connected Slaves

Slave ID	Connection State	Current applied [A]	State	Details
Ladestation-Amedio	Connected (127.0.0.1)	(0/0/0)	idle	signalling (0/0/0) to EV; not charging
Amtron-Professional	Connected (192.168.0.80)	(0/0/0)	idle	signalling (0/0/0) to EV; not charging
Ladestation-Amedio	Connected (127.0.0.1)	(0/0/0)	idle	signalling (0/0/0) to EV; not charging

Debug

Name	Value	Description
disconnects/reconnects	17/17	overall counter of all DLM slave disconnects and reconnects

Fig. 19: Web interface menu > DLM

You cannot make any settings here. Information is provided about the network connection of the respective charging station. The web interface of the DLM-Master (see Fig. 19) also provides information on the network settings and the status of the networked charging stations.



In load management, the DLM-Master takes account of each ECU in the network individually. Therefore, the energy is always distributed to the number of ECUs in the network and not to the number of charging stations.

7.1 Use case 1: Car park with two charging points

Load management is not configured in the delivery state, hence Use case 1 must be considered here.

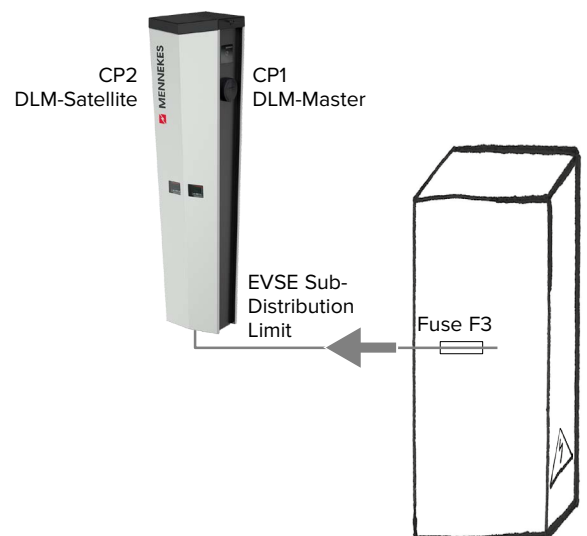
Application field:

For cost reasons, it may be appropriate during the installation not to lay the supply line for the full capacity of the charging station (e.g. for AMEDIO 64 A (2×22 kW)), but limit it to 32 A, for example. Load management allows a connected vehicle to charge with 32 A. As soon as another vehicle is connected, the charging power is limited to 16 A per charging point. This means that the fuse F3 does not trip.

Objective of load management:

The total charging current of both charging points must not exceed the rated current of fuse F3, so that the power supply and the operational reliability of the charging station are always ensured.

CONNECTION



SETTINGS IN THE WEB INTERFACE

- In the web interface, navigate to the menu "Operator".

Dynamic Load Management	DLM Master (With internal DLM-Slave) ▼	Specifies the ChargePoint's role in a DLM network. There MUST be exactly one DLM Master in a DLM network managing multiple DLM-Slaves. Typically, a ChargePoint configured as DLM Master will also host an internal DLM-Slave. Note: A ChargePoint configured as standalone DLM Master will not host an internal DLM-Slave. If used for charging anyway, its power consumption will be not controlled by DLM!
DLM Network Id	0	Several DLM groupings might coexist in one physical LAN. In case of DLM Master-Auto-Discovery, they are distinguished by Master-Auto-Discovery Network Id
DLM Algorithm Sample Rate	30 sec ▼	The DLM algorithm will not calculate and re-assign current to it's DLM slaves any faster than at this configured rate. As an exception, EVs getting ready to charge will be considered and assigned current immediately. Between algorithm calculation times external meter values will be averaged.
EVSE Sub-Distribution Limit (L1/L2/L3) [A]	32 32 32	Overall current limit for DLM available for distribution to EVs
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	32 32 32	Operator current limit for DLM available for distribution to EVs. The 'Operator EVSE Sub-Distribution Limit' is equal or smaller than the 'EVSE Sub-Distribution Limit'. It can be changed without rebooting the chargepoint. Thus, a backend could use this parameter to alter the energy available for charging EVs dynamically. The backend will not be able to set a value higher than the 'EVSE Sub-Distribution Limit'

Fig. 20: Web interface of the DLM-Master for configuring load management

In the web interface of the DLM-Master under the parameters "EVSE Sub-Distribution Limit" and "Operator EVSE Sub-Distribution Limit", the maximum connection current of the charging station must be configured with 32 A for all three phases.

- In the web interface, set the following parameters for each charging point:

Parameter	Description
Dynamic Load Management	Used to set the charging point function for load management in a DLM-Network. The charging point that is assigned the setting "DLM Master (With internal DLM-Slave)" or "DLM Master (Standalone)" is the DLM-Master. The charging point that is assigned the setting "DLM Slave (Master-Auto-Discovery)" is the DLM-Satellite.
DLM Network Id	The charging points must be assigned to the same DLM-Network.
EVSE Sub-Distribution Limit (L1/L2/L3) [A]	Maximum mains current available for load management. This parameter must be set for the DLM-Master only.
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	Upper current limit for load management. This value is smaller than or equal to the value for "EVSE Sub-Distribution Limit (L1/L2/L3) [A]". This parameter must be set for the DLM-Master only.

- Click the "Save & Restart" button.
- ✓ Load management now ensures that the outer conductor currents in the supply line are limited to the respective current value.

Example:

Parameter	Settings					
	CP 1 / DLM-Master			CP 2 / DLM-Satellite		
Dynamic Load Management	DLM Master (with internal DLM-Slave)			DLM Slave (Master-Auto-Discovery)		
DLM Network Id	0			0		
EVSE Sub-Distribution Limit (L1/L2/L3) [A]	32	32	32	-	-	-
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	32	32	32	-	-	-

7.2 Use case 2: Car park with several charging points

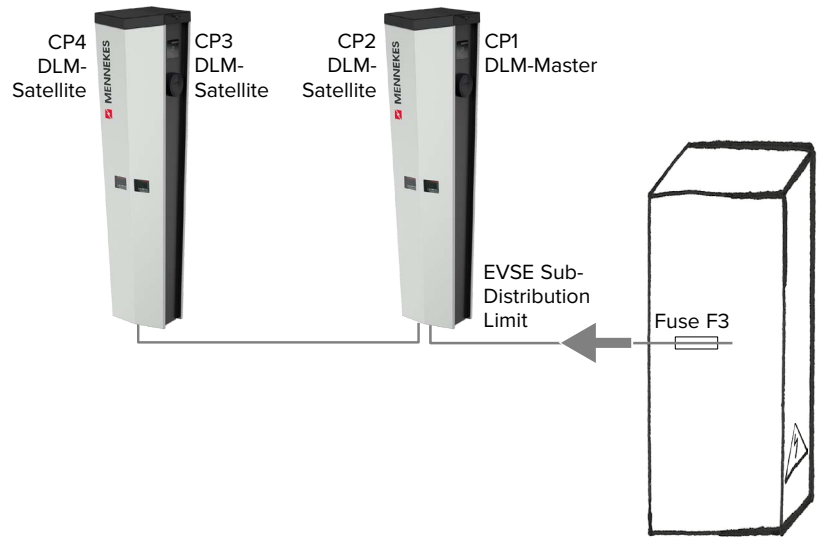
Application field:

For cost reasons, it may be appropriate during the installation not to lay the supply line for the full capacity of the charging point network (all charging stations on one supply line), but to limit the capacity. All connected vehicles charge with full charging power until the maximum current for the supply line has been reached. If another vehicle is plugged into a charging point, load management distributes the charging currents intelligently to all vehicles.

Objective of load management:

The total charging current of all charging points must not exceed the rated current of fuse F3, so that the power supply and the operational reliability of the AMEDIOs are always ensured.

CONNECTION



SETTINGS IN THE WEB INTERFACE

► In the web interface, navigate to the menu "Operator".

Dynamic Load Management	<input type="text" value="DLM Master (With internal DLM-Slave)"/>	Specifies the ChargePoint's role in a DLM network. There MUST be exactly one DLM Master in a DLM network managing multiple DLM-Slaves. Typically, a ChargePoint configured as DLM Master will also host an internal DLM-Slave. Note: A ChargePoint configured as standalone DLM Master will not host an internal DLM-Slave. If used for charging anyway, its power consumption will be not controlled by DLM!
DLM Network Id	<input type="text" value="0"/>	Several DLM groupings might coexist in one physical LAN. In case of DLM Master-Auto-Discovery, they are distinguished by Master-Auto-Discovery Network Id
DLM Algorithm Sample Rate	<input type="text" value="30 sec"/>	The DLM algorithm will not calculate and re-assign current to it's DLM slaves any faster than at this configured rate. As an exception, EVs getting ready to charge will be considered and assigned current immediately. Between algorithm calculation times external meter values will be averaged.
EVSE Sub-Distribution Limit (L1/L2/L3) [A]	<input type="text" value="100"/> <input type="text" value="100"/> <input type="text" value="100"/>	Overall current limit for DLM available for distribution to EVs
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	<input type="text" value="100"/> <input type="text" value="100"/> <input type="text" value="100"/>	Operator current limit for DLM available for distribution to EVs. The 'Operator EVSE Sub-Distribution Limit' is equal or smaller than the 'EVSE Sub-Distribution Limit'. It can be changed without rebooting the chargepoint. Thus, a backend could use this parameter to alter the energy available for charging EVs dynamically. The backend will not be able to set a value higher than the 'EVSE Sub-Distribution Limit'

Fig. 21: Web interface of the DLM-Master for configuring load management

- In the web interface, set the following parameters for each charging point:

Parameter	Description
Dynamic Load Management	Used to set the charging point function for load management in a DLM-Network. The charging point that is assigned the setting "DLM Master (With internal DLM-Slave)" is the DLM-Master. The charging point that is assigned the setting "DLM Slave (Master-Auto-Discovery)" is the DLM-Satellite.
DLM Network Id	The charging points must be assigned to the same DLM-Network.
EVSE Sub-Distribution Limit (L1/L2/L3) [A]	Maximum mains current available for load management. This parameter must be set for the DLM-Master only.
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	Upper current limit for load management. This value is smaller than or equal to the value for "EVSE Sub-Distribution Limit (L1/L2/L3) [A]". This parameter must be set for the DLM-Master only.

- Click the "Save & Restart" button.

- ✓ Load management now ensures that the outer conductor currents in the supply line are limited to the respective current value.

Example:

Parameter	Settings					
	CP 1 / DLM-Master			CP2 / CP3 / CP4 / DLM-Satellite		
Dynamic Load Management	DLM Master (with internal DLM-Slave)			DLM Slave (Master-Auto-Discovery)		
DLM Network Id	0			0		
EVSE Sub-Distribution Limit (L1/L2/L3) [A]	100	100	100	-	-	-
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	100	100	100	-	-	-

7.3 Use case 3: Car park with several charging stations and common power connection

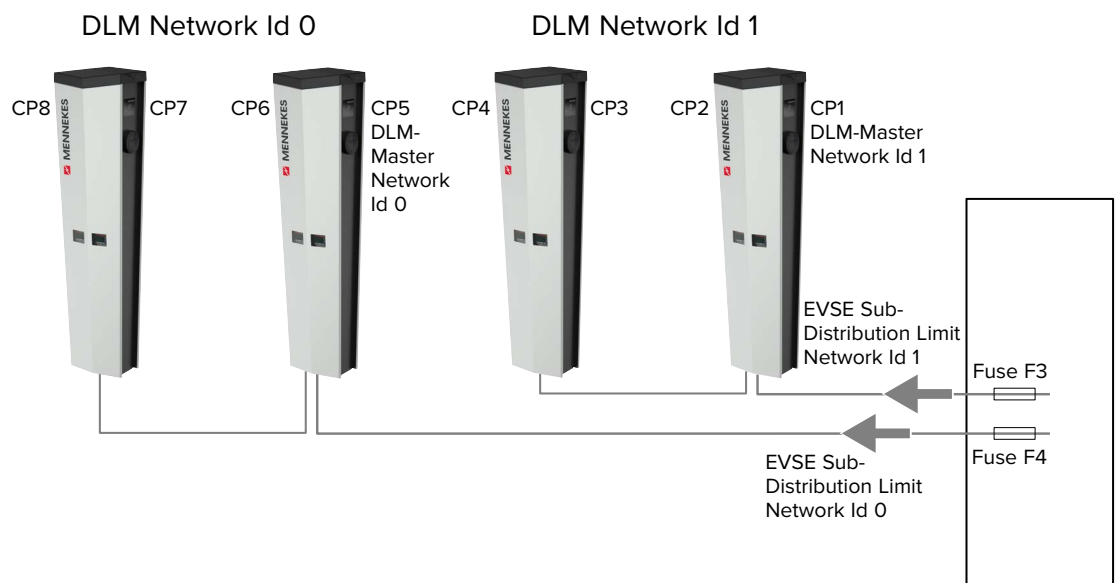
Application fields:

- For cost reasons, it may be appropriate during the installation not to lay the supply line for the full capacity of all charging stations on each respective supply line, but to limit the capacity. All connected vehicles charge with full charging power until the maximum current for the supply line has been reached. If another vehicle is plugged into a charging point, load management distributes the charging currents intelligently to all vehicles.
- The charging points can be connected to different supply lines and still be in the same network (e.g. for common communication with a Backend-System). By assigning a load management network ID ("DLM Network Id"), load management can be operated separately for each supply line.

Objective of load management:

To ensure the power supply and operational reliability of a network of defined charging points.

CONNECTION



SETTINGS IN THE WEB INTERFACE

- In the web interface, navigate to the menu "Operator".

Dynamic Load Management	<input type="text" value="DLM Master (With internal DLM-Slave)"/>	Specifies the ChargePoint's role in a DLM network. There MUST be exactly one DLM Master in a DLM network managing multiple DLM-Slaves. Typically, a ChargePoint configured as DLM Master will also host an internal DLM-Slave. Note: A ChargePoint configured as standalone DLM Master will not host an internal DLM-Slave. If used for charging anyway, its power consumption will be not controlled by DLM!
DLM Network Id	<input type="text" value="0"/>	Several DLM groupings might coexist in one physical LAN. In case of DLM Master-Auto-Discovery, they are distinguished by Master-Auto-Discovery Network Id
DLM Algorithm Sample Rate	<input type="text" value="30 sec"/>	The DLM algorithm will not calculate and re-assign current to it's DLM slaves any faster than at this configured rate. As an exception, EVs getting ready to charge will be considered and assigned current immediately. Between algorithm calculation times external meter values will be averaged.
EVSE Sub-Distribution Limit (L1/L2/L3) [A]	<input type="text" value="100"/> <input type="text" value="100"/> <input type="text" value="100"/>	Overall current limit for DLM available for distribution to EVs
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	<input type="text" value="100"/> <input type="text" value="100"/> <input type="text" value="100"/>	Operator current limit for DLM available for distribution to EVs. The 'Operator EVSE Sub-Distribution Limit ' is equal or smaller than the 'EVSE Sub-Distribution Limit'. It can be changed without rebooting the chargepoint. Thus, a backend could use this parameter to alter the energy available for charging EVs dynamically. The backend will not be able to set a value higher than the 'EVSE Sub-Distribution Limit'

Fig. 22: Web interface of the DLM-Master for configuring load management

- In the web interface, set the following parameters for each charging point:

Parameter	Description
Dynamic Load Management	Used to set the charging point function for load management in a DLM-Network. The charging point that is assigned the setting "DLM Master (With internal DLM-Slave)" is the DLM-Master. The charging point that is assigned the setting "DLM Slave (Master-Auto-Discovery)" is the DLM-Satellite.
DLM Network Id	The charging points that are supplied by the same supply line must be assigned to the same DLM-Network.
EVSE Sub-Distribution Limit (L1/L2/L3) [A]	Maximum mains current available for load management. This parameter must be set for the DLM-Master only.
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	Upper current limit for load management. This value is smaller than or equal to the value for "EVSE Sub-Distribution Limit (L1/L2/L3) [A]". This parameter must be set for the DLM-Master only.

- Click the "Save & Restart" button.
- ✓ Load management now ensures that the outer conductor currents in the supply line are limited to the respective current value.

Example:

Parameter	Setting for DLM Network Id 0					
	CP 5 / DLM-Master			CP6 / CP7 / CP8 / DLM-Satellite		
Dynamic Load Management	DLM Master (with internal DLM-Slave)			DLM Slave (Master-Auto-Discovery)		
DLM Network Id	0			0		
EVSE Sub-Distribution Limit (L1/ L2/L3) [A]	100	100	100	-	-	-
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	100	100	100	-	-	-

Parameter	Setting for DLM Network Id 1					
	CP 1 / DLM-Master			CP2 / CP3 / CP4 / DLM-Satellite		
Dynamic Load Management	DLM Master (with internal DLM-Slave)			DLM Slave (Master-Auto-Discovery)		
DLM Network Id	1			1		
EVSE Sub-Distribution Limit (L1/ L2/L3) [A]	100	100	100	-	-	-
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	100	100	100	-	-	-

7.4 Use case 4: Consideration of dynamic measured values of an external meter (Standalone application with one charging point and Master-Satellite application with several charging stations and common power connection)

Requirement:

- The load management system can not distribute the power supply dynamically to the individual charging points. Therefore, the connection lines of the charging stations must be designed for the full capacity of all connected charging stations. Alternatively, a maximum charging current can be assigned to the charging points. To do this, the parameter "Operator Current Limit (A)" must be set in the master web interface and in the Satellite web interface in such a way that the sum of all charging currents in a DLM-Network does not exceed the capacity of the connecting cables.
- All charging stations must have been assigned the same DLM Network Id.
- A network-compatible Modbus meter with Ethernet interface and TCP/IP protocol (e.g. Siemens PAC 2200) must be installed in the power distribution and integrated via the switch into the same network as the charging stations.

Objective of load management:

To ensure the power supply and operational reliability of a network of charging points.

Application field:

If an additional meter is used, further consumers can be considered.

The external meter can be placed in such a way that only the external consumers are measured (see "7.4.1 Option 1: Meter measures external consumers only") or that the external consumers and the charging stations are measured (see "7.4.2 Option 2: Meter measures external consumers and charging stations (total consumption)").

COMPATIBLE METERS

The ECU is compatible with the following meters:

Siemens PAC 2200:

- Indirect measurement via a transducer (5 A):
 - 7KM2200-2EA30-1JA1 (with MID approval)
 - 7KM2200-2EA30-1EA1 (without MID approval)

- Direkt measurement (bis 65 A)
 - 7KM2200-2EA40-1JA1 (with MID approval)
 - 7KM2200-2EA40-1EA1 (without MID approval)

Phoenix EEM-MB371-EIP 2907976:

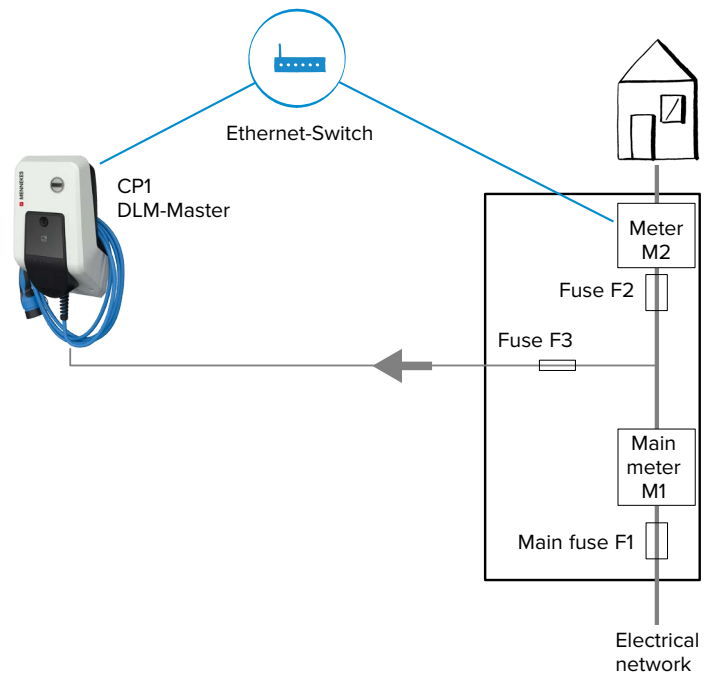
This meter additionally enables a direct connection of Rogowski coils.

7.4.1 Option 1: Meter measures external consumers only

The DLM-Master queries at regular intervals the current consumption measured by the meter M2. The DLM-Master subtracts the current consumption at meter M2 from the set value in the parameter "Main Distribution Limit (L1/L2/L3) [A]" and makes the remaining power available to the charging stations. The charging current is distributed evenly to all connected vehicles.

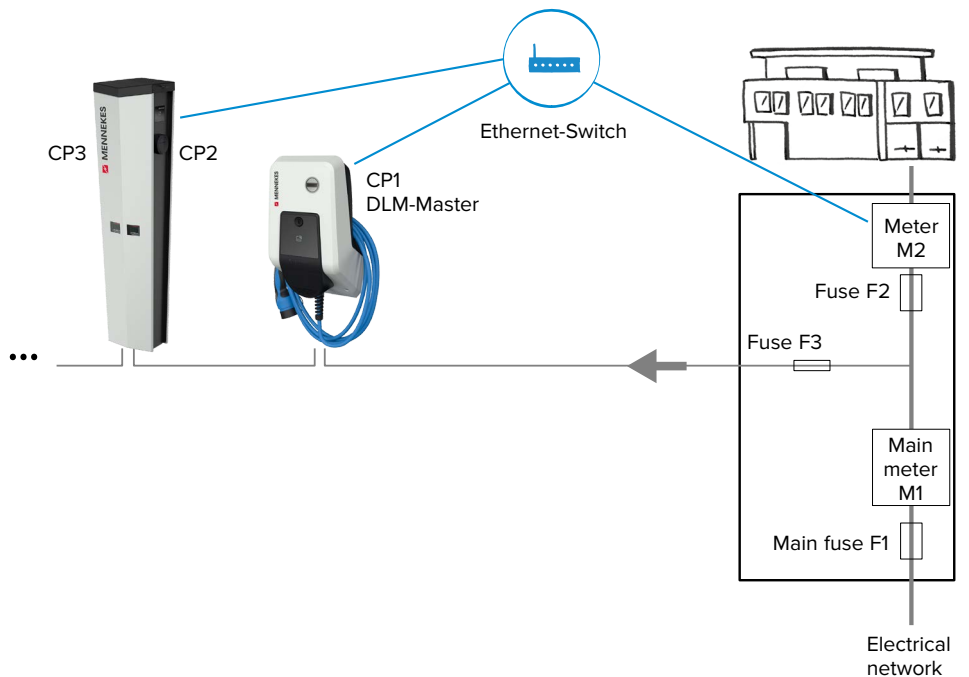
**CONNECTION
EXAMPLE: SINGLE-
FAMILY HOUSE
(STANDALONE)**

**EXTERNAL METER FOR
EXTERNAL USE ONLY**



**CONNECTION
EXAMPLE: APARTMENT
BUILDING (MASTER-
SATELLITE)**

**EXTERNAL METER FOR
EXTERNAL USE ONLY**



SETTINGS IN THE WEB INTERFACE

► In the web interface of the DLM-Master, navigate to the menu "Operator".

External Meter Support	<input type="checkbox"/> On ▼	If enabled, an external, secondary meter allows to also consider the power consumption of additional load. The power available for charging EVs will be adjusted accordingly. Please make sure, 'Meter configuration (Second)' is configured, preferably to a 3-phase, phase aware meter
Main Distribution Limit (L1/L2/L3) [A]	<input type="text" value="100"/> <input type="text" value="100"/> <input type="text" value="100"/>	Current limit for DLM available for distribution to EVs and additional energy loads. This value is typically higher than the 'EVSE Sub-Distribution Limit' above. An external meter is required to detect the energy consumption of the additional load
External Meter Disconnected Fallback (L1/L2/L3) [A]	<input type="text" value="9999"/> <input type="text" value="9999"/> <input type="text" value="9999"/>	In the error case, where the external meter is disconnected or fails, 'External Meter Disconnected Fallback' is assumed as external meter value. Set to a high value (like the 'Main Distribution Limit' or higher) will result in no current available for the EVSE sub-distribution in that particular situation. Thus, charging would stop
External Meter Location	<input type="text" value="Excluding EVSE Sub-Distribution"/> ▼	Specifies, how the external meter is connected: in case the external meter measures the energy of chargepoints and additional consumer altogether, the value shall be set to 'Including EVSE Sub-Distribution', otherwise to 'Excluding EVSE Sub-Distribution'

Fig. 23: Web interface of the DLM-Master for configuring load management

► In the web interface of the DLM-Master, set the following parameters:

Parameter	Description
External Meter Support	This setting specifies whether an external energy meter is connected for additional consumers.
Main Distribution Limit (L1/L2/L3) [A]	Upper current limit for load management and for additional consumers. Rated current of the main fuse.
External Meter Disconnected Fallback (L1/L2/L3) [A]	Upper current limit if no external energy meter is connected. <ul style="list-style-type: none"> ■ External Meter Disconnected Fallback = 0: No charging current is provided to the charging stations. ■ External Meter Disconnected Fallback = 9999: The charging stations are provided with the entire power supply.
External Meter Location	This setting specifies how the external energy meter is connected. <ul style="list-style-type: none"> ■ "Including EVSE Sub-Distribution": Used to detect charging points and additional consumers. ■ "Excluding EVSE Sub-Distribution": Used to detect external consumers only.



- From ECU-Firmware 4.61 there is an additionally parameter "External Load Headroom (L1/L2/L3) [A]". In this parameter a safety distance to the parameter "Main Distribution Limit (L1/L2/L3) [A]" can be set.
- From ECU-Firmware 4.61 the parameter "External Meter Disconnected Fallback (L1/L2/L3) [A]" is called "External Load Fallback (L1/L2/L3) [A]".

Example:

Parameter	Settings		
	CP1 / DLM-Master		
External Meter Support	On		
Main Distribution Limit (L1/L2/L3) [A]	100	100	100
External Load Headroom (L1/L2/L3) [A]	0	0	0
External Meter Disconnected Fallback (L1/L2/L3) [A]	50	50	50
External Meter Location	Excluding EVSE-Sub Distribution		

Select meter

Additionally the used meter has to be selected.

- ▶ In the web interface of the DLM-Master, navigate to the menu "Operator".

Meter configuration (Second)	Modbus Siemens 7KM2200 (TCP) ▼	Energy Management: the type of second meter, used only for input to manage the current on the grid.
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Fig. 24: Web interface of the DLM-Master for selecting the meter

- ▶ In the web interface of the DLM-Master, set the following parameter:

Parameter	Description
Meter configuration (second)	Setting which meter was used.

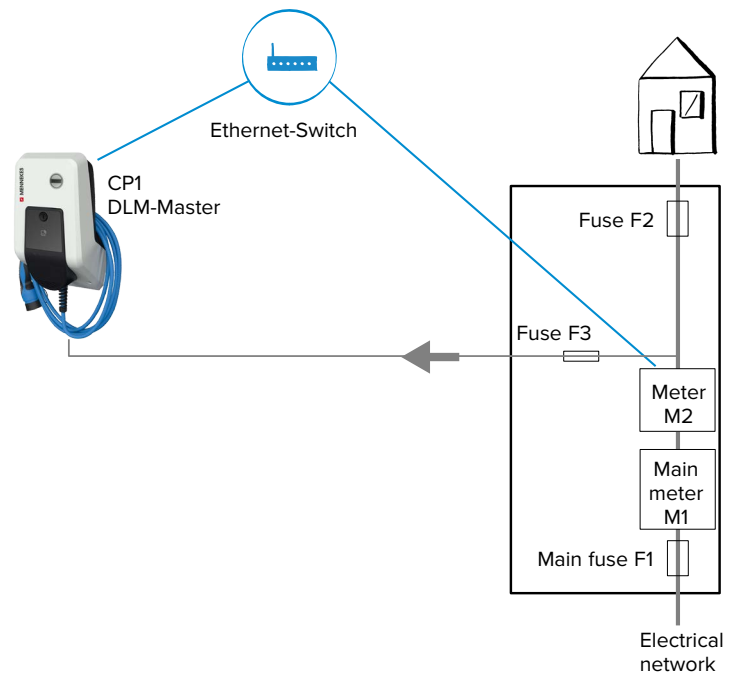
- ▶ Click the "Save & Restart" button.

7.4.2 Option 2: Meter measures external consumers and charging stations (total consumption)

The DLM-Master queries at regular intervals the current consumption measured by the meter M2. The DLM-Master regulates the individual charging currents of the charging points so that the measured value of the meter M2 does not exceed the set value "Main Distribution Limit (L1/L2/L3) [A]". The charging current is distributed evenly to all connected vehicles.

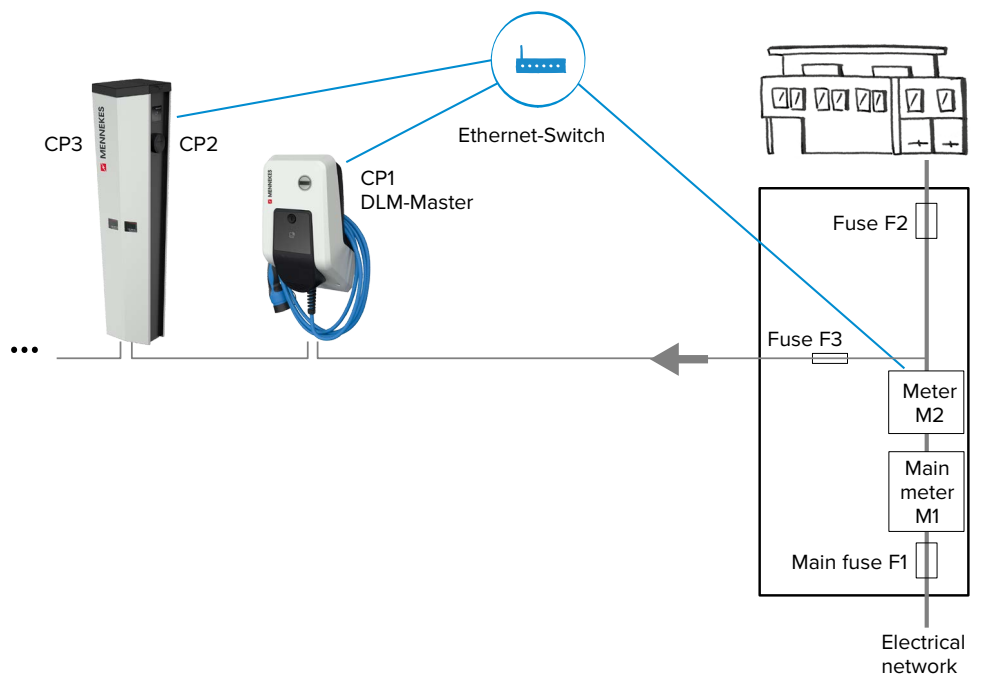
**CONNECTION
EXAMPLE: SINGLE-
FAMILY HOUSE
(STANDALONE)**

**EXTERNAL METER FOR
TOTAL CONSUMPTION**



**CONNECTION
EXAMPLE: APARTMENT
BUILDING (MASTER-
SATELLITE)**

**EXTERNAL METER FOR
TOTAL CONSUMPTION**



SETTINGS IN THE WEB INTERFACE

- In the web interface of the DLM-Master, navigate to the menu "Operator".

External Meter Support	On ▼	If enabled, an external, secondary meter allows to also consider the power consumption of additional load. The power available for charging EVs will be adjusted accordingly. Please make sure, 'Meter configuration (Second)' is configured, preferably to a 3-phase, phase aware meter
Main Distribution Limit (L1/L2/L3) [A]	100 100 100	Current limit for DLM available for distribution to EVs and additional energy loads. This value is typically higher than the 'EVSE Sub-Distribution Limit' above. An external meter is required to detect the energy consumption of the additional load
External Meter Disconnected Fallback (L1/L2/L3) [A]	9999 9999 9999	In the error case, where the external meter is disconnected or fails, 'External Meter Disconnected Fallback' is assumed as external meter value. Set to a high value (like the 'Main Distribution Limit' or higher) will result in no current available for the EVSE sub-distribution in that particular situation. Thus, charging would stop
External Meter Location	Including EVSE Sub-Distribution ▼	Specifies, how the external meter is connected: in case the external meter measures the energy of chargepoints and additional consumer altogether, the value shall be set to 'Including EVSE Sub-Distribution', otherwise to 'Excluding EVSE Sub-Distribution'

Fig. 25: Web interface of the DLM-Master for configuring load management

- In the web interface of the DLM-Master, set the following parameters:

Parameter	Description
External Meter Support	This setting specifies whether an external energy meter is connected for additional consumers.
Main Distribution Limit (L1/L2/L3) [A]	Upper current limit for load management and for additional consumers. Rated current of the main fuse.
External Meter Disconnected Fallback (L1/L2/L3) [A]	Upper current limit if no external energy meter is connected. <ul style="list-style-type: none"> ■ External Meter Disconnected Fallback = 0: No charging current is provided to the charging stations. ■ External Meter Disconnected Fallback = 9999: The charging stations are provided with the entire power supply.
External Meter Location	This setting specifies how the external energy meter is connected. <ul style="list-style-type: none"> ■ "Including EVSE Sub-Distribution": Used to detect charging points and additional consumers. ■ "Excluding EVSE Sub-Distribution": Used to detect external consumers only.



- From ECU-Firmware 4.61 there is an additionally parameter "External Load Headroom (L1/L2/L3) [A]". In this parameter a safety distance to the parameter "Main Distribution Limit (L1/L2/L3) [A]" can be set.
- From ECU-Firmware 4.61 the parameter "External Meter Disconnected Fallback (L1/L2/L3) [A]" is called "External Load Fallback (L1/L2/L3) [A]".

Example:

Parameter	Settings		
	CP1 / DLM-Master		
External Meter Support	On		
Main Distribution Limit (L1/L2/L3) [A]	100	100	100
External Load Headroom (L1/L2/L3) [A]	0	0	0
External Meter Disconnected Fallback (L1/L2/L3) [A]	50	50	50
External Meter Location	Including EVSE Sub-Distribution		

Select meter

Additionally the used meter has to be selected.

- ▶ In the web interface of the DLM-Master, navigate to the menu "Operator".

Meter configuration (Second)	Modbus Siemens 7KM2200 (TCP) ▼	Energy Management: the type of second meter, used only for input to manage the current on the grid.
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Fig. 26: Web interface of the DLM-Master for selecting the meter

- ▶ In the web interface of the DLM-Master, set the following parameter:

Parameter	Description
Meter configuration (second)	Setting which meter was used.

- ▶ Click the "Save & Restart" button.

8 Unbalanced load prevention

Unbalanced load refers to the uneven loading of the outer conductors of a three-phase alternating current network. To avoid unbalanced load, the load must be distributed evenly to the three outer conductors. In Germany, according to the technical connection conditions (TAB), the grid operator is limited to an asymmetry of up to 20 A at the grid connection point. An unbalanced load of the charging station can be prevented via the web interface.

POSSIBLE APPLICATIONS

An unbalanced load can be prevented in the following situations:

- Standalone charging point (e.g. AMTRON® Professional+ ; operating mode "Standalone Autostart"):
 - For a charging point, this setting prevents a single-phase load of more than 20 A from being applied, as otherwise an unbalanced load would arise.
 - For charging points with a connected external meter, the charging point is always controlled in such a way that an overload does not occur at the point where the external meter is connected. In this way, other consumers are also considered. Thus the maximum difference between two phases will never be more than 20 A.
- Two charging points in one charging station (e.g. AMEDIO Professional+ ; operating mode "Standalone Autostart"):
 - With two charging points in a network, the setting always refers to the combination of the two charging points. Here, too, this ensures that an unbalanced load never occurs on the supply line to the charging station.
 - With two charging points and one external meter in a network, an unbalanced load is prevented at the point of the external meter. In this way, other consumers are also considered.
- Several charging points (e.g. AMEDIO Professional+ ; operating mode "networked"):
 - With several charging points in a network, the setting always refers to the combination of all charging points. Here, too, this ensures that an unbalanced load never occurs on the supply line to the charging stations.
 - With several charging points and one external meter in a network, an unbalanced load is prevented at the point of the external meter. In this way, other consumers are also considered.

SETTINGS IN THE WEB INTERFACE

In the web interface, navigate to the menu "Operator".

Dynamic Load Management	<input type="text" value="DLM Master (With internal DLM-Slave)"/>	Specifies the ChargePoint's role in a DLM network. There MUST be exactly one DLM Master in a DLM network managing multiple DLM-Slaves. Typically, a ChargePoint configured as DLM Master will also host an internal DLM-Slave. Note: A ChargePoint configured as standalone DLM Master will not host an internal DLM-Slave. If used for charging anyway, its power consumption will be not controlled by DLM!
DLM Network Id	<input type="text" value="0"/>	Several DLM groupings might coexist in one physical LAN. In case of DLM Master-Auto-Discovery, they are distinguished by Master-Auto-Discovery Network Id
DLM Algorithm Sample Rate	<input type="text" value="30 sec"/>	The DLM algorithm will not calculate and re-assign current to it's DLM slaves any faster than at this configured rate. As an exception, EVs getting ready to charge will be considered and assigned current immediately. Between algorithm calculation times external meter values will be averaged.
EVSE Sub-Distribution Limit (L1/L2/L3) [A]	<input type="text" value="100"/> <input type="text" value="100"/> <input type="text" value="100"/>	Overall current limit for DLM available for distribution to EVs
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	<input type="text" value="80"/> <input type="text" value="80"/> <input type="text" value="80"/>	Operator current limit for DLM available for distribution to EVs. The 'Operator EVSE Sub-Distribution Limit' is equal or smaller than the 'EVSE Sub-Distribution Limit'. It can be changed without rebooting the chargepoint. Thus, a backend could use this parameter to alter the energy available for charging EVs dynamically. The backend will not be able to set a value higher than the 'EVSE Sub-Distribution Limit'
External Input 1 Config	<input type="text" value="DISABLE"/>	Adds a configurable offset to 'EVSE Sub-Distribution Limit' based on GPI External Input 1
External Input 2 Config	<input type="text" value="DISABLE"/>	Adds a configurable offset to 'EVSE Sub-Distribution Limit' based on GPI External Input 2
External Meter Support	<input type="text" value="Off"/>	If enabled, an external, secondary meter allows to also consider the power consumption of additional load. The power available for charging EVs will be adjusted accordingly. Please make sure, 'Meter configuration (Second)' is configured, preferably to a 3-phase, phase aware meter
Current Imbalance Prevention	<input type="text" value="On"/>	If enabled, DLM will not exceed the 'Current Imbalance Limit' configured
Current Imbalance Limit	<input type="text" value="20"/>	

Fig. 27: Web interface of the DLM-Master for configuring the prevention of an unbalanced load

The following settings are necessary to set the unbalanced load prevention:

Parameter	Description
Dynamic Load Management	Used to set the charging point function for load management in a DLM-Network. The charging point that is assigned the setting "DLM Master (With internal DLM-Slave)" or "DLM Master (Standalone)" is the DLM-Master. The charging point that is assigned the setting "DLM Slave (Master-Auto-Discovery)" is the DLM-Satellite.
Current Imbalance Prevention	This setting specifies whether current imbalances should be limited. The individual phase currents are limited so that the value difference between the individual phase currents does not exceed the value for "Current Imbalance Limit". This parameter must be set for the DLM-Master only.
Current Imbalance Limit	Maximum value difference between individual phase currents (in A). This parameter must be set for the DLM-Master only.

Example:

Parameter	Settings	
	CP 1 / DLM-Master	CP 2 / DLM-Satellite
Dynamic Load Management	DLM Master (with internal DLM-Slave)	DLM Slave (Master-Auto-Discovery)
Current Imbalance Prevention	On	-
Current Imbalance Limit	20	-

9 Downgrade



The relay for the downgrade input is only included in the AMEDIO Professional+* 22 and AMEDIO Professional+* 22 PnC.

The maximum power that is distributed to all connected charging points can be reduced via the downgrade input. You can control the downgrade input, for example, by means of the following criteria or systems:

- Electricity rate
- Time
- Load shedding
- Manual control
- External load management

To reduce the power via the downgrade input, an external 230 V control signal is required per charging point. The control signal can be generated, for example, by an external load shedding relay or an external timer. As soon as the 230 V control signal is applied to the relay, the charging current is reduced according to the set configuration of the parameter "Internal Input 1 Current Offset (L1/L2/L3) [A]".




ATTENTION


Damage to the device due to improper installation

Improper installation can damage the device or lead to malfunctions. Observe the following requirements during the installation:

- ▶ The control signal voltage must not exceed 230 V.
- ▶ Select suitable cable routing to avoid interference.
- ▶ Provide for secure separation of the remaining installation from the highest occurring voltage.

 Observe the circuit diagram.

Requirement:

- ✓ The control system is installed externally.
-  Observe the operating and installation manual.

SETTINGS IN THE WEB INTERFACE

► In the web interface, navigate to the menu "Operator".

Dynamic Load Management	DLM Master (With internal DLM-Slave) ▼			Specifies the ChargePoint's role in a DLM network. There MUST be exactly one DLM Master in a DLM network managing multiple DLM-Slaves. Typically, a ChargePoint configured as DLM Master will also host an internal DLM-Slave. Note: A ChargePoint configured as standalone DLM Master will not host an internal DLM-Slave. If used for charging anyway, its power consumption will be not controlled by DLM!
DLM Network Id	0			Several DLM groupings might coexist in one physical LAN. In case of DLM Master-Auto-Discovery, they are distinguished by Master-Auto-Discovery Network Id
DLM Algorithm Sample Rate	30 sec ▼			The DLM algorithm will not calculate and re-assign current to it's DLM slaves any faster than at this configured rate. As an exception, EVs getting ready to charge will be considered and assigned current immediately. Between algorithm calculation times external meter values will be averaged.
EVSE Sub-Distribution Limit (L1/L2/L3) [A]	100	100	100	Overall current limit for DLM available for distribution to EVs
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	80	80	80	Operator current limit for DLM available for distribution to EVs. The 'Operator EVSE Sub-Distribution Limit' is equal or smaller than the 'EVSE Sub-Distribution Limit'. It can be changed without rebooting the chargepoint. Thus, a backend could use this parameter to alter the energy available for charging EVs dynamically. The backend will not be able to set a value higher than the 'EVSE Sub-Distribution Limit'
External Input 1 Config	ENABLE OPTO 2 ▼			Adds a configurable offset to 'EVSE Sub-Distribution Limit' based on GPI External Input 1
Ext. Input 1 Current Offset (L1/L2/L3) [A]	16	16	16	Offset added to 'EVSE Sub-Distribution Limit' case external input 1 is high. Note: currently only negative values are supported
External Input 2 Config	DISABLE ▼			Adds a configurable offset to 'EVSE Sub-Distribution Limit' based on GPI External Input 2

Fig. 28: Web interface of the DLM-Master for configuring Downgrade

► In the web interface, set the following parameters of the DLM-Master:

Parameter	Description
External Input 1 Config	Activation of the relay for controlling via the downgrade input. This parameter must be set for the DLM-Master only.
External Input 1 Current Offset (L1/L2/L3) [A]	Current value by which the charging current is reduced when the downgrade is active. This parameter must be set for the DLM-Master only.

► Click the "Save & Restart" button.

Example:

Parameter	Settings		
Internal Input 1 Config	ENABLE OPTO 2		
Internal Input 1 Current Offset (L1/L2/L3) [A]	16	16	16



Set ENABLE OPTO 2". The input "OPTO 1" is not assigned.

10 Glossary

Term	Explanation
DLM-Network / DLM-Master / DLM-Satellite or DLM-Slave (designa- tion in the web inter- face menu)	<p>DLM = Dynamic Load Management</p> <p>Load management reduces the charging currents of all charging points in a DLM-Network as soon as the sum of all charging currents exceeds the adjustable current limit for load management.</p> <p>Load management can operate in a DLM-Network or at stand-alone charging points.</p>
ECU	<p>ECU = Electronic Control Unit</p> <p>Unit for control and communication</p>
Gateway charging point	<p>The Gateway charging point acts in the network as a portal through which the entire network is connected to a Backend-System. The Gateway charging point can be any charging point (for AMEDIO: Master charging point) that has a wireless communication modem and a Micro-SIM card for wireless communication.</p>
CP	CP = Charging Point
CS	CS = Charging Station
Master / Satellite (AMEDIO only)	<p>Both charging points in the AMEDIO are pre-configured as a master/slave connection (for OCPP). Both charging points can be configured via the Satellite-ECU.</p> <ul style="list-style-type: none"> ■ Master-ECU = ECU on the left-hand side = AF1 ■ Satellite-ECU = ECU on the right-hand side = AF2
Network	<p>An Ethernet network (referred to here as "network") consists of a number of charging stations that are networked via Ethernet. Local networking can be used for the following functions:</p> <ul style="list-style-type: none"> ■ Operation of load management ■ Connection of several charging points to a Backend-System via a SIM card (wireless communication) <p>It is possible to build a DLM-Network and a network for connection to a Backend-System together in a network.</p>



MY POWER CONNECTION

AN_Networking, Connection, Load Management_AMEDIO-AMTRON Professional_v01_16-03-2020_en

MENNEKES

Elektrotechnik GmbH & Co. KG

Aloys-Mennekes-Straße 1

57399 KIRCHHUNDEM

GERMANY

Phone: +49 2723 41-1

Fax: +49 2723 41-214

info@MENNEKES.de

www.MENNEKES.com

