Linde Material Handling

Linde connect:charger
Software operation

Linde connect

Edition 11/2023 - 01

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System description

connect:charger

The **connect:charger** system, which consists of a charger, connecting cables, Data Sync Point and Cloud (hereinafter referred to as the charging management system), is a technical solution for stationary Linde lithium-ion chargers.

The chargers can be equipped with a new CAN bus interface. This interface enables chargers to be monitored and controlled by an additional stationary control unit, the charging management system.

The chargers can be connected directly to the charging management system by cable.

Up to 50 chargers can be connected.

A local web server can be used to set power limits for a group of Linde lithium-ion chargers. Different charging algorithms can be set via the charging management system.

The charging power for each charger is calculated based on charger usage, charging state and priorities. This enables complete control of power consumption, avoidance of power peaks and improved truck availability and maintenance.

The charging management system is used for preparatory connection to the Cloud. Data visualisation and system configuration can be carried out later in the Cloud.

Variants of the Lademanagementsystem

Compact	Suitable for occasional use.
PRO	Suitable for frequent use.
TOUCH	For a high degree of transparency and flexibility as well as time-saving use on site.

Symbols used

The terms CAUTION, NOTE and ENVIRONMENTAL NOTE are used in these operating instructions for notes on particular hazards or for unusual information that needs to be highlighted:

⚠ DANGER

means that failure to comply involves risk to life and/or major damage to property can occur.

⚠ WARNING

means that failure to comply involves risk of serious injury and/or major damage to property can occur.

⚠ CAUTION

means that failure to comply can cause risk of material damage or destruction.

NOTE

means that particular attention is drawn to combinations of technical factors that may not be evident even to a specialist.

ENVIRONMENT NOTE

The instructions listed here must be observed to prevent environmental damage.

Representation of the number systems

Number system	Example	Comment
Decimal	100	Normal notation
Hexadecimal	0X64	C notation
Binary	'100' '0110.0100'	In inverted commas, nibbles separated by a decimal point

Font conventions

Font	Meaning
`Display text`	Names of paths and files are shown as display text, e.g.: `C:\Program Files\WAGO Software`
Menu	Menu items are highlighted, for example: **Save**
>	A "greater than" character between two words means selecting a menu item from a menu, for example: File **>** New
Input	The names of input or selection fields are highlighted, e.g. : **Start of measuring range**
"Value"	Input or selection values are shown in quotation marks, e.g.: Enter the value "4 mA" under the start of the measuring range.
[Button]	Button labels in dialogues are highlighted and enclosed in square brackets, for example: **[Enter]**
[Key]	Key labels on the keyboard are highlighted and enclosed in square brackets, for example: **[F5]**

List of abbreviations

NOTE

The list of abbreviations provides an overview of the abbreviations used in this document and their definitions. The explanations refer only to their use in this document.

Abbreviation	Meaning	Explanation
P_{grid}	Physical mains power	Physical power limit of the charging station
P_{Limit}	Power limit	Defined mains power (for distribution to the connected chargers)
P_{max}	Maximum power	Maximum power that a charger takes from the mains
P_{min}	Minimum power	Minimum power assigned to a charger by charging management
kW	Kilowatt	SI unit of power (energy transfer per time period)
SoC	State of Charge	Parameter for the state of charge of a battery (battery charge level)

Intended use

Installation

Applicable standards and laws must be observed when installing and commissioning the individual components.

In addition, the local conditions and customer-specific boundary conditions must be agreed and taken into account after consultation with the appropriate local contact persons:

- Responsible qualified electrician
- Electrical installers
- Truck fleet manager

The following points must be observed:

- The annual test and inspection intervals according to DGUV regulation 3 must be observed.
- If the Linde lithium-ion chargers are converted or modified, a safety inspection must be carried out (see operating instructions for the Linde lithium-ion chargers).
- For the CAN cable connection, the required spacing according to e.g. EN 50174-2 must be maintained.

When defining the set power limits, the following boundary conditions must also be considered:

- Design and dimensioning of the equipment present (transformers and cables).
- Design and dimensioning of the mains protection devices (fuses, RCD etc.).
- Mode of operation (simultaneity factor etc.).
- Charger-specific values (power factor, harmonic level etc.)
- Grid type (TN-C, TN-S etc.)

Area of application and use

⚠ CAUTION

The system is only suitable for indoor use.

Outdoor use is not possible due to insufficient IP protection classes and possible condensation formation due to considerable temperature changes.

The system, which consists of Linde lithium-ion chargers and a charging management system, is designed for indoor operation. This must be observed during installation, connection, operation, storage and transport. The operating instructions for the relevant Linde lithium-ion chargers must be observed.

Safety inspection

Linde Material Handling GmbH recommends that a safety inspection be carried out on the device at least every 12 months.

A safety inspection by a qualified electrician is recommended:

- After structural change
- After installation or conversions
- After repair, care and maintenance
- At least every 12 months

The measured leakage current to ground must be <3.5 mA.

NOTE

The relevant national and international standards and directives must be followed for the safety inspections.

Personnel qualification

The use of the product as described in this document is intended only by qualified electricians or persons instructed by qualified electricians who are familiar with the applicable standards.

The individuals in question must be familiar with all the products mentioned in this document and their instructions for use. They must also be able to correctly assess the risks that arise only when the products are combined.

Linde Material Handling GmbH accepts no liability for any human error or damage to the products resulting from disregard for the information contained in this document.

Limitation of liability

This documentation describes the use of various hardware and software components in specific example applications. The components may be products or parts of products from different manufacturers. With regard to the intended and safe use of the products, only the relevant instructions for use as provided by the manufacturers apply. The manufacturers of the products in question are solely responsible for the contents of the instructions.

The example applications described in this documentation represent concepts, i.e. technically possible applications. Whether these concepts can be implemented in a specific individual case depends on various boundary conditions. For example, other versions of the hardware or software components may require handling other than that described. The descriptions contained herein therefore do not imply any claim to a specific condition of the products.

Responsibility for the safe use of a specific software or hardware configuration lies with the person who creates or operates it. This also applies when one of the concepts described in this document has been implemented.

Linde Material Handling GmbH accepts no liability for the realisation of these concepts.

Safety

⚠ DANGER

Danger from electrical current!

Serious injury or death may result.

- Before starting work, switch off all devices and components involved and disconnect them from the mains.
- Secure all devices and components involved against being switched on again.
- If necessary, use only a type-B residual-current-operated circuit breaker to connect the equipment to the mains.

⚠ WARNING

Danger due to work carried out incorrectly!

Serious personal injury and property damage can result.

- The instructions in this document must be read and understood.
- The charger may only be installed by trained, qualified personnel.
- Observe the safety regulations for installation in the operating instructions of the charger.

Depending on the surface, different dowels and screws are required for fastening. Dowels and screws are therefore not included in the scope of delivery. The installer is responsible for the correct selection of the appropriate screws and dowels.

⚠ WARNING

Danger due to falling objects!

Serious personal injury and property damage can result.

- Use only fasteners recommended by the manufacturer.
- Check all screw connections for secure attachment.
- Mount the device horizontally.
- When mounting on a wall, ensure that the wall has sufficient load capacity.

Safety measures in normal operation

Only operate devices with a protective conductor on a mains supply that has a protective conductor and a socket that has a protective conductor contact. If a device is operated on a mains supply without a protective conductor or on a socket outlet without a protective conductor contact, this is considered to be grossly negligent. The manufacturer is not liable for any damage resulting from this.

Only operate the device according to the protection type specified on the rating plate.

Do not operate the device if it is damaged.

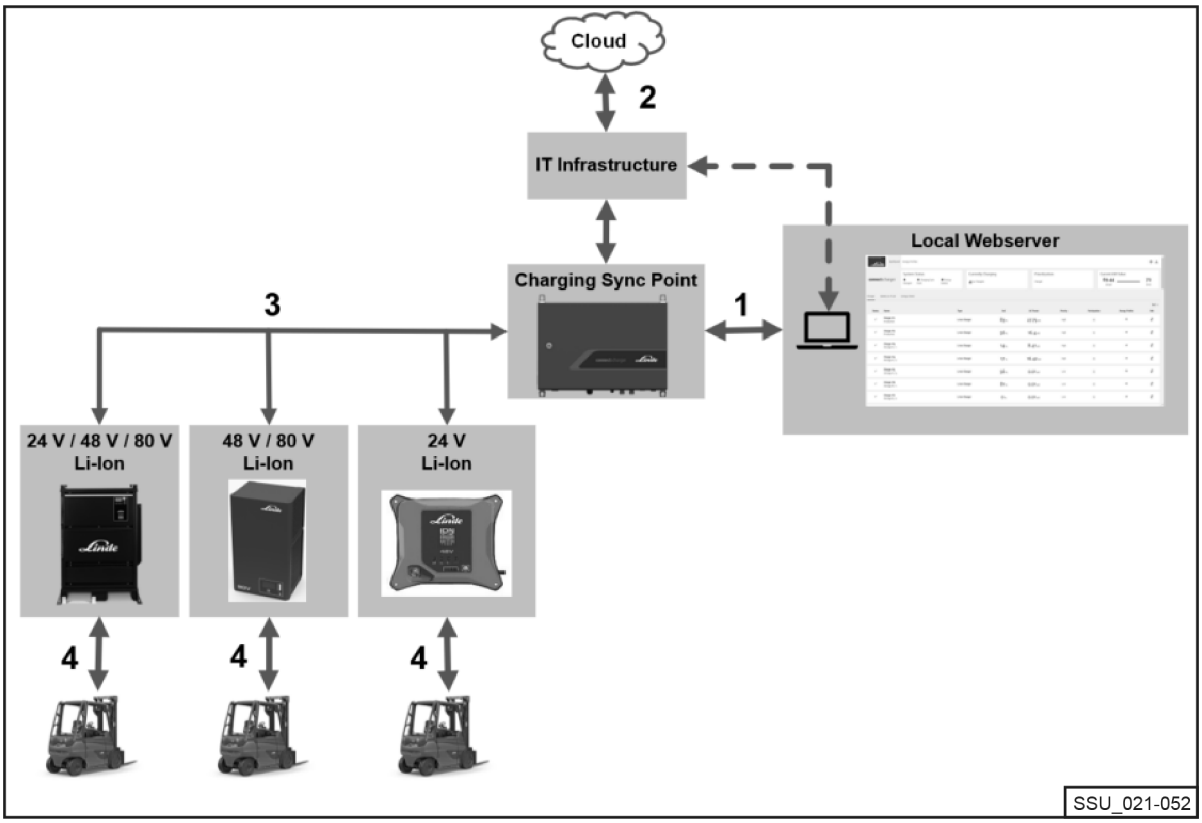
Have the mains feeder cable and device feeder cable checked regularly by a qualified electrician to ensure that the protective conductor is working properly (at least every twelve months).

Have safety systems that are not fully functional or components that are not in perfect condition repaired by an authorised specialist company before switching on the device.

Do not bypass or disable protective devices.

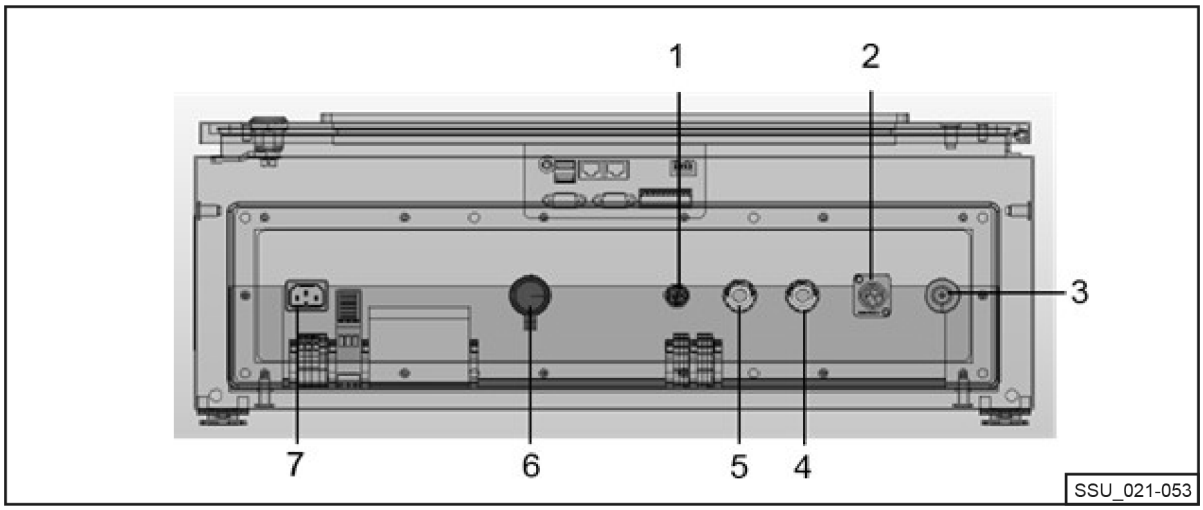
Safety

Design



1	Local web server via Ethernet	3	CAN bus (up to 50 chargers)
2	Preparatory Cloud connection	4	Linde lithium-ion battery charger

Connections

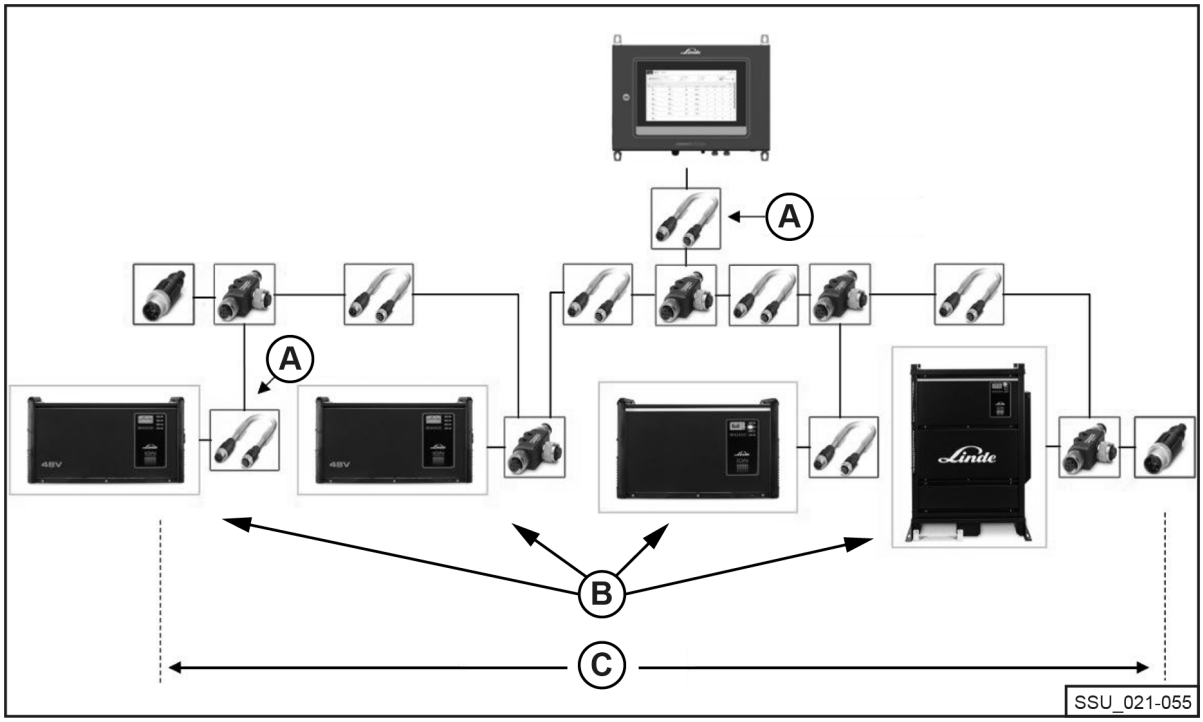


1	CAN connection (for connecting chargers)	5	Reserve (M16 screw joint)
2	Universal opening	6	Network socket
3	Vent plugs	7	Power supply
4	Reserve (M16 screw joint)		

Setup options

In a CAN network, two terminating resistors must be used at each end. There are two ways of achieving this.

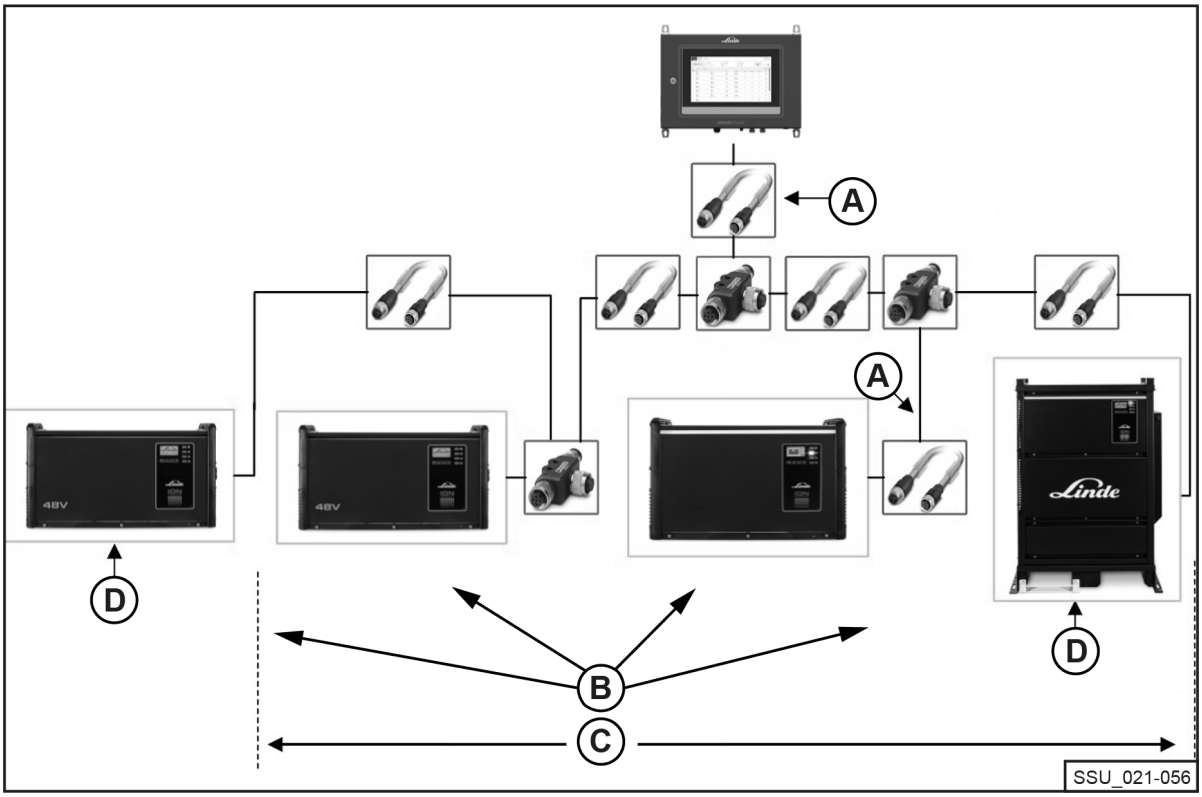
Variant 1: Charging management system with terminating resistors (screw design)



A	Cable length ≦ 1 m	C	CAN bus length ≦ 200 m.
B	Number of chargers ≦ 50		

An M12 terminating resistor must be connected to the first and last lithium-ion charger in the chain. All lithium-ion chargers must have the **Terminating Resistor and Power Supply** option configured to **OFF**.

Variant 2: Charging management system with integrated terminating resistors in lithium-ion chargers



A	Cable length ≦ 1 m	D	Terminating resistor: plugged in Supply voltage: switched on
B	Number of chargers ≦ 50		
C	CAN bus length ≦ 200 m.		

The interface of the lithium-ion chargers has a switchable terminating resistor, which can be switched together with the supply voltage. The **Terminating Resistor and Power Supply** option must be configured to **ON** on both the first and last charger in the chain. On the other lithium-ion chargers, the terminating resistors must not be activated!

System with integrated terminating resistors in lithium-ion chargers

Component	Connection design
Lithium-ion battery charger	Plug
Terminating resistor	Plug
T-distributor	Socket / plug and socket
CAN distributor	Plug < - > socket
Charging management system	Plug

Starting from the two CAN terminating resistors with the respective connection type "plug", the two strands are merged on the charging management system that has the connection type "bush". The lithium-ion chargers as well as the power supply are each integrated into the CAN bus via a T-distributor. The T-piece can be connected directly to the lithium-ion charger. Alternatively, a short connecting cable can be used.

Length of connecting cable (especially for networks with many participants): ≦ 1 m.

Requirements

The CAN bus interface of the lithium-ion chargers allows them to be connected to each other in a local CAN network and to be integrated at a single point into the charging management system.

Setup options

Technical constraints:

- Max. CAN bus cable length: 200 m.
- Max. section length (cable length): ≤ 1 m
- Max. number of connected lithium-ion chargers: 50
- Activation of the power supply and terminating resistor only on the lithium-ion chargers located at the ends of the chain. Alternatively, use a terminating resistor (see. the chapter "Setup options").

Cables and accessories

1	Bus system cable (1 m, 2 m, 3 m, 5 m, 10 m and 15 m) Other lengths are technically possible.	2	T-distributor
		3	Terminating resistor

Configuration of the CAN bus interface

A detailed configuration description of the CAN bus interface can be found in the operating instructions of the lithium-ion chargers and in the workshop manual of the charging management system.

The CAN bus interface of the lithium-ion charger is activated and configured in the **Additional Functions** menu in the **CAN Connection** submenu. After activation, the CAN bus interface must be configured as follows:

1 To connect multiple lithium-ion chargers, set the **CAN Bus Mode** to **Multiple Chargers**.

2 Assign the **Charger Node ID** consecutively, starting with 3 and going up. The **Charger Node ID** must be unique within a CAN bus network. The same assignment must not be issued twice (range: from 3 to 53).

3 Under **Terminating Resistor and Power Supply**, activate the output voltage and the CAN bus terminating resistor:

- "**OFF**": Variant 1: With separate terminating resistors; see the chapter "Setup options".
- "**ON**": Variant 2: With integrated terminating resistors in the lithium-ion chargers; see the chapter "Setup options".

⚠ CAUTION

Risk of communication errors!

Variant 2: If the bus is not terminated correctly, communication errors can occur.

➢ Activate terminating resistors only on the chargers located at the ends.

Network connectivity and configuration

All system variants (Compact, PRO and TOUCH) with their respective controllers have two network interfaces. The interface is accessible from the outside, under a lid (labelled "-XG2") at the bottom of the switch cabinet. The network interface X1 is referred to below as the "external network interface", as it is accessible from the outside of the switch cabinet.

The second network interface X2 is a service interface that provides additional services and functions. This interface is located in the switch cabinet and can only be accessed with a switch cabinet key. The X2 network interface is referred to below as the "internal network interface", as it is only accessible on the inside after opening the switch cabinet.

Access to local web server via external network interface X1

The external network interface X1 is configured to DHCP by default and can be used to integrate the system into the IT infrastructure. After the system is connected to the IT infrastructure or the nearest router with a network cable, the nearest DHCP server automatically assigns a separate IP address to the system and the network interface.

The local web server can be reached using an Internet-enabled browser with the following IP address:

- IP/Charger

In the case of the TOUCH variant, this local web server is called up directly on the display after startup.

NOTE

Observe the correct spelling (case sensitive).

For the configuration of the network interface (to a static IP address) via the system's local web server, see the chapter "Connection settings".

If integration into the IT infrastructure has still not been successful, the following options are available to reach the web server during initial commissioning via the external network interface X1:

a): Use of a mobile auxiliary router with DHCP functionality:

Network connectivity and configuration

1 The system, as well as a computer or laptop, must be connected to the mobile auxiliary router with network cables.
2 The computer/laptop must be configured with its appropriate network interface to an automatic IP address or manually configured within the same address range of the router (this may require admin rights on the computer/laptop).
3 The IP address assigned to the system by the router must be determined.

NOTE

See the documentation for the router under "DHCP leases". Alternatively, third-party software can be used to scan the network (e.g. "Advanced IP Scanner"). The installation may require admin rights on the computer/laptop.

b): Use of a special program or tool to set up a DHCP server with a computer or laptop:

1 The system must be connected to the computer/laptop using a network cable.
2 The special program/tool for setting up a DHCP server (e.g. "DHCP Server"; the installation may require admin rights on the computer/laptop) can set up a DHCP server within the desired address range.

NOTE

Do not use the address range of network interface X2.

3 The IP address assigned to the system by the DHCP server can be determined.

NOTE

See the documentation for the program under "DHCP leases" or in the "log-file".

Access to local web server via internal network interface X2

NOTE

The internal network interface X2 is located in the switch cabinet and can only be accessed with a switch cabinet key.

By default, the internal network interface X2 is configured to the following fixed static IP addresses:

- IP address: 169.254.195.170
- Subnet mask: 255.255.0.0

The local web server can be reached using an Internet-enabled browser with the following IP address:

- 169.254.195.170/Charger

NOTE

Observe the correct spelling (case sensitive).

Follow this procedure:

⚠ DANGER

Dangerous electrical voltage in the switch cabinet!

➢ Disconnect the switch cabinet from the mains voltage before opening it.
➢ Only qualified electricians may open the switch cabinet.

➢ Disconnect the system from the mains voltage.

To do this, pull out the AC mains plug from the connection point of the switch cabinet.

➢ Open the switch cabinet with the switch cabinet key.

➢ Switch the internal network cable on the controller from network port X1 to X2.

➢ Close the switch cabinet.

➢ Reconnect the system to the mains voltage.

To do this, plug the AC mains plug into the connection point of the switch cabinet.

The computer/laptop can access the system through the browser if the following prerequisites are fulfilled:

- The appropriate network adapter in Windows is configured to "Obtain an IP address automatically".
- The appropriate network adapter in Windows is configured to "Automatic Private IP Addressing".
- The static IP address above is entered.

NOTE

Alternatively, the computer/laptop can be manually configured with its appropriate network interface to a static IP address within the same address range (this may require admin rights on the computer/laptop).

After access has been established:

⚠ DANGER

Dangerous electrical voltage in the switch cabinet!

➢ Disconnect the switch cabinet from the mains voltage before opening it.

➢ Only qualified electricians may open the switch cabinet.

➢ Disconnect the system from the mains voltage.

To do this, pull out the AC mains plug from the connection point of the switch cabinet.

➢ Open the switch cabinet with the switch cabinet key.

➢ Switch the internal network cable on the controller from network port X2 to X1.

➢ Close the switch cabinet.

➢ Reconnect the system to the mains voltage.

To do this, plug the AC mains plug into the connection point of the switch cabinet.

Further details about this service interface as well as other services and functions are described in the workshop manual of the charging management system.

⚠ CAUTION

Integration of the system into IT infrastructure and connection to the cloud!

For security reasons, only the external network interface X1 is suitable for integration into the IT infrastructure and connection to the cloud.

Connecting the monitor, mouse and keyboard

The PRO variant has an HDMI connector that can be used to connect an external monitor. The monitor also displays the local web server of the system; see the chapter "User interface".

The use of the HDMI interface is **not** permitted in residential, business or commercial properties or by small enterprises. The use of the HDMI interface is permitted in the industrial sector.

The PRO and Touch variants each have 2 x USB 2.0 type-A connectors. These connections are only accessible directly on the controller after the switch cabinet has been opened. A mouse and/or a

Connecting the monitor, mouse and keyboard

keyboard can be connected here and can be routed outwards via the reserve openings in the switch cabinet.

Logging in

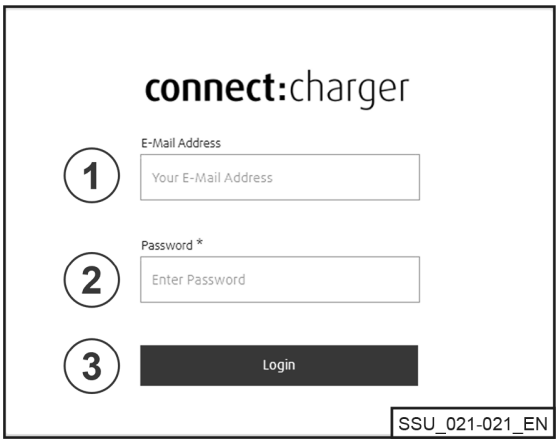
An initial password must be entered when logging into the software for the first time:

- Email address: admin
- Initial password: admin

After the first login, the initial password must be changed and a new, individual password created. The terms and conditions must be accepted.

The first user to log in is automatically set as administrator and must create the additional users accordingly.

▷

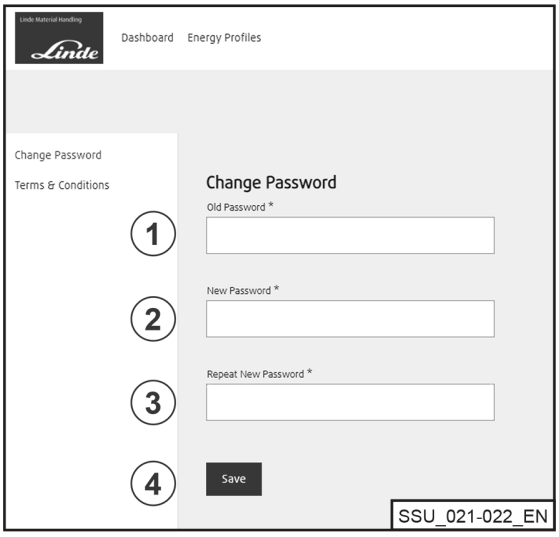


1 Enter your email address
2 Enter your password
3 Login via the [Login] button

Changing the password

In the Change Password menu, the user can change their password by entering the old and new passwords.

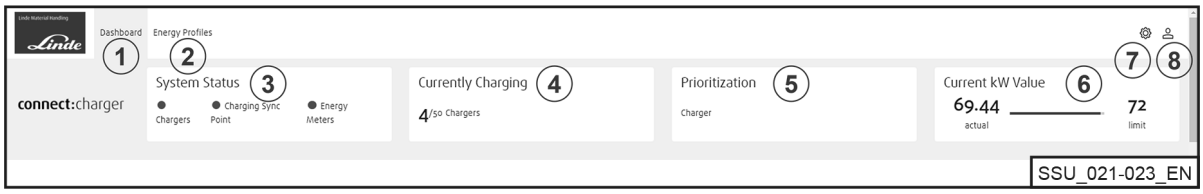
▷



1 Enter the old password
2 Enter a new password
3 Repeat the new password
4 Save using the [Save] button

Dashboard

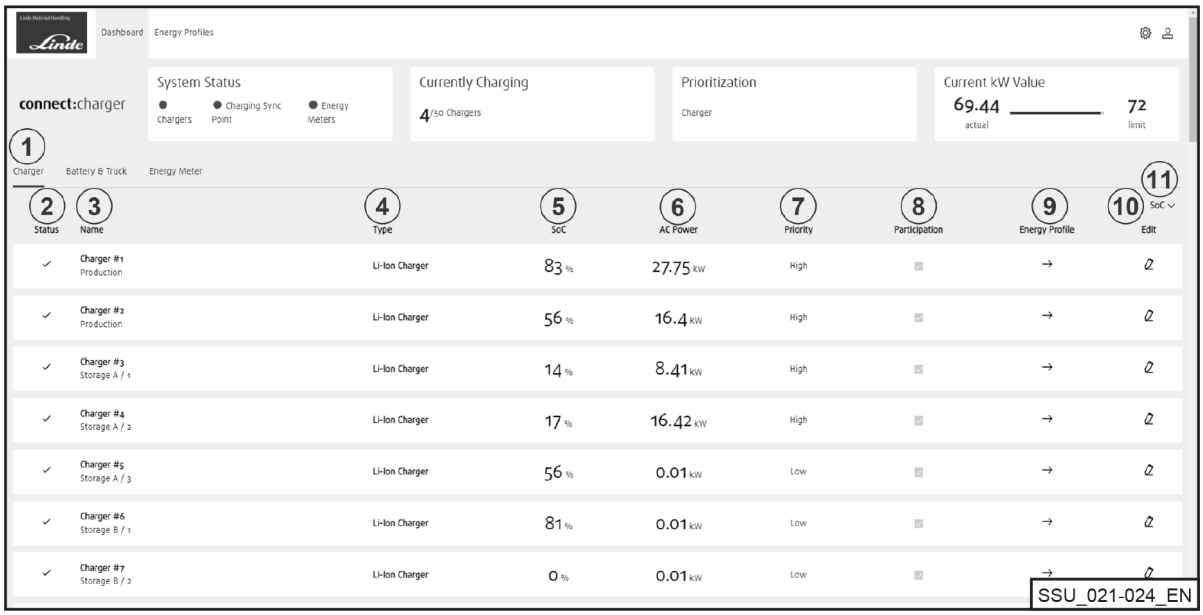
The Dashboard displays all important information at a glance. The menu bar of the Dashboards always remains the same, regardless of the selection made.



Item no.	Description
1	The currently displayed tab ("Dashboard") is shown in grey.
2	The "Energy Profiles" tab displays the charging profiles in detail in a graph.
3	System Status Indicates whether lithium-ion chargers are connected and whether the charge management system is connected and active. Status-LED green = connected, status LED red = not connected
4	Currently Charging Displays how many of the lithium-ion chargers you have set up are actively charging at this time.
5	Prioritisation Indicates which prioritisation is selected (Charger, Battery & Truck or SoC).
6	Current power in kW Displays how much power in kW is being consumed by the active lithium-ion chargers. The current value is shown on the left-hand side. The set limit is displayed on the right-hand side.
7	Settings and prioritisation can be made via the settings icon.
8	Settings for the user profile, e.g. changing the password, can be made via the profile icon.

Battery charger

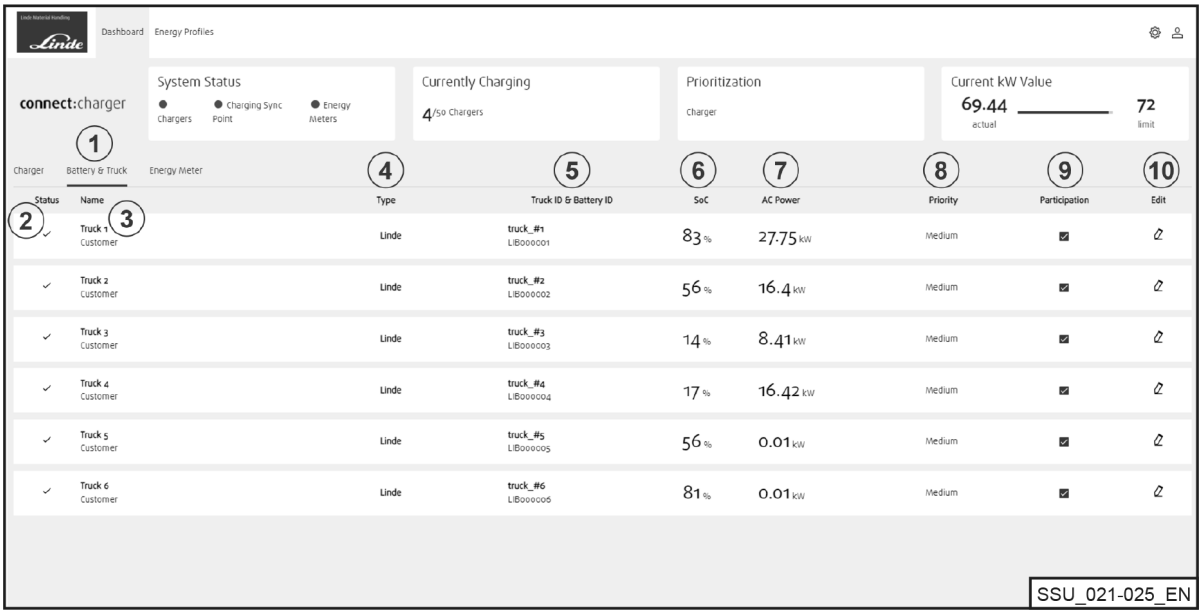
The "Charger" tab can be used to display all information about the lithium-ion chargers that have been set up.



Item no.	Description
1	If a coloured bar is displayed under the "Charger" tab, the information about the connected lithium-ion chargers is displayed in the area below.
2	Status Indicates whether the lithium-ion charger is connected. Tick = connected, exclamation mark = not connected
3	Name Displays the name of the charger that has been set up, see the chapter "Configuration".
4	Type Displays the most important data for the device type set up, see the chapter "Configuration".
5	SoC Indicates the battery's current charge level in %.
6	AC Power Displays the power in kW currently being used to charge the battery.
7	Priority Displays the preset prioritisation of the lithium-ion chargers; see the chapter "Defining prioritisation".
8	Participation Indicates whether the lithium-ion charger is participating in charging management. This can be switched off or on manually by the administrator; see the chapter "Defining prioritisation".
9	Clicking on the arrow in the "Energy Profiles" column displays the charging profile in the form of a detailed graph for the lithium-ion charger in question.
10	By clicking the **[pen icon]** in the "Edit" column, you can quickly change the participation and prioritisation of the charger.
11	The **[filter button]** can be used to select the sorting order of the lithium-ion charging devices.

Batteries and trucks

The "Battery & Truck" tab displays the data pertaining to the existing batteries.

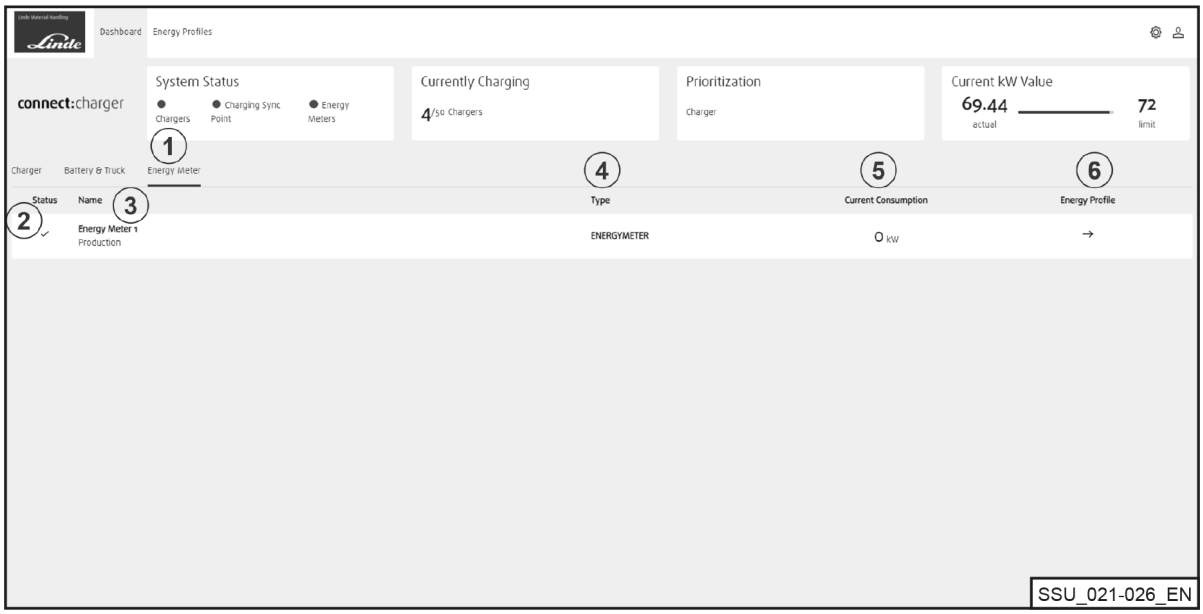


Dashboard

Item no.	Description
1	If a coloured bar is displayed under the "Battery & Truck" tab, the information about the connected batteries and trucks is displayed in the area below.
2	Status Indicates whether the battery or truck is connected. Tick = connected, exclamation mark = not connected
3	Name Displays the name set up for batteries and trucks; see the chapter "Battery and truck configuration".
4	Type Displays the most important data for the device type set up, see the chapter "Battery and truck configuration".
5	Truck ID & Battery ID Displays the name and the truck ID; see the chapter "Battery and truck configuration".
6	SoC Indicates the battery's current charge level in %.
7	AC Power Displays the power in kW currently being used to charge the battery.
8	Priority Displays the preset prioritisation of the lithium-ion chargers; see the chapter "Defining prioritisation".
9	Participation Indicates whether the battery is participating in charging management. This can be switched off or on manually by the administrator, see the chapter "Defining prioritisation".
10	By clicking the **[pen icon]** in the "Edit" column, batteries and trucks can be quickly edited. For example, the name or type can be changed.

Energy meter

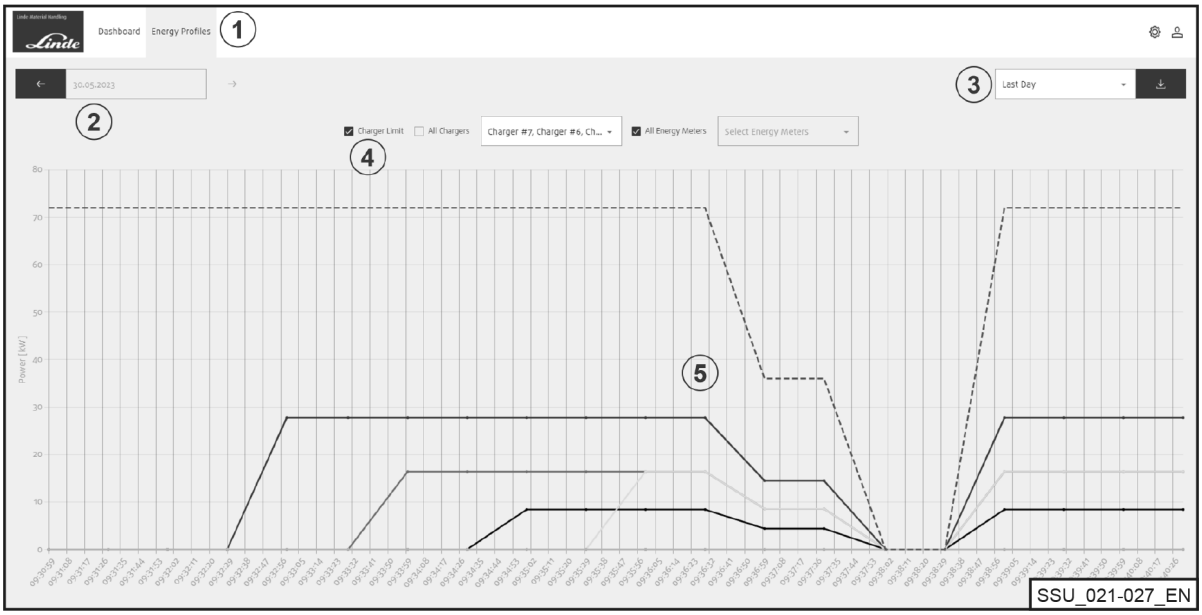
The "Energy Meter" tab allows you to view the data of the existing energy meters.



Item no.	Description
1	If a coloured bar is displayed under the "Energy Meter" tab, the information about the energy meters is displayed in the area below.
2	Status Indicates whether an energy meter is connected. Tick = connected, exclamation mark = not connected
3	Name Displays the set name for the energy meter, see the chapter "Energy meter configuration".
4	Type Displays the most important data for the device type set up; see the chapter "Energy meter configuration".
5	Current Consumption Displays the currently measured power in kW.
6	Clicking on the **[arrow symbol]** in the "Energy Profiles" column displays the charging profile in the form of a detailed graph for the energy meter in question.

Energy profiles

The charging capacities of the connected lithium-ion chargers and the data of the energy meters can be accessed and downloaded via the "Energy Profiles" tab. The data can be used to draw conclusions for charging optimisation. By selecting prudent charging limits, charging peaks can be avoided; see the chapter "Defining prioritisation". They can also be avoided by means of a filter that is only intended for certain lithium-ion chargers.



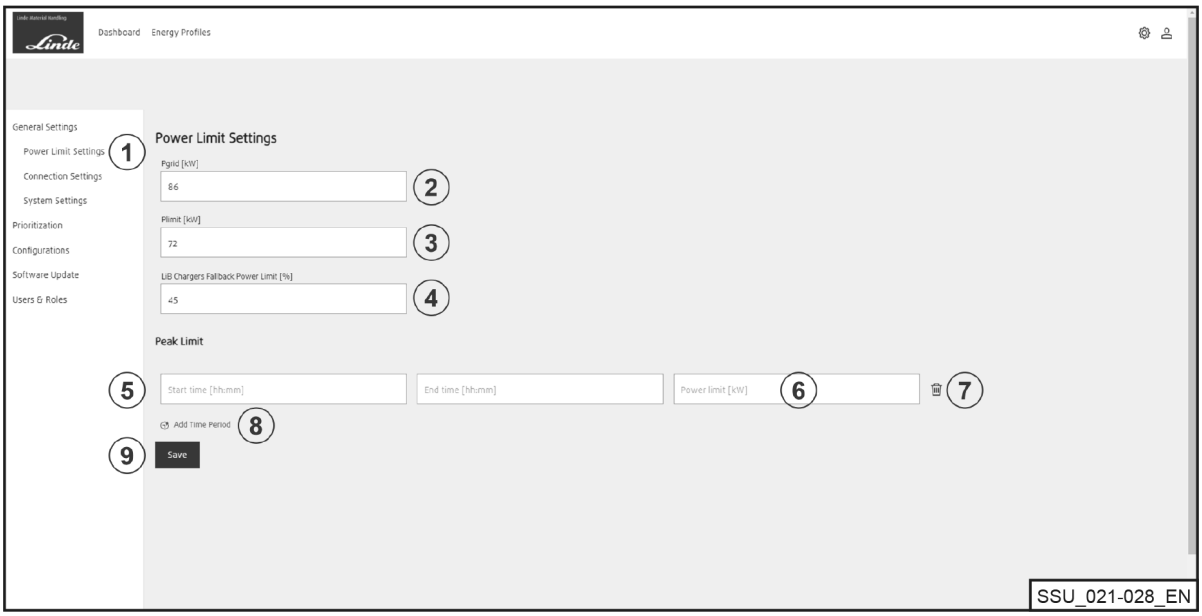
Dashboard

Item no.	Description
1	If a coloured bar is displayed under the "Energy Profiles" tab, the appropriate information is displayed in the area below.
2	A date can be selected here to display the charging data for that date. The profiles for the selected day are displayed. Other time windows are not available.
3	Here you can set the time period for which the charging data is to be downloaded. The data can be downloaded by clicking on the **[arrow icon]**.
4	This row allows you to select the devices to be displayed. The selection is made either according to the set limits or according to the different devices. You can select one device, multiple devices or all devices.
5	The previously selected data is visualised in the diagram.

General settings

The "General Settings" menu allows you to set the system, connection and power limits. These settings can be selected using the tool icon in the upper right corner.

Power limit settings

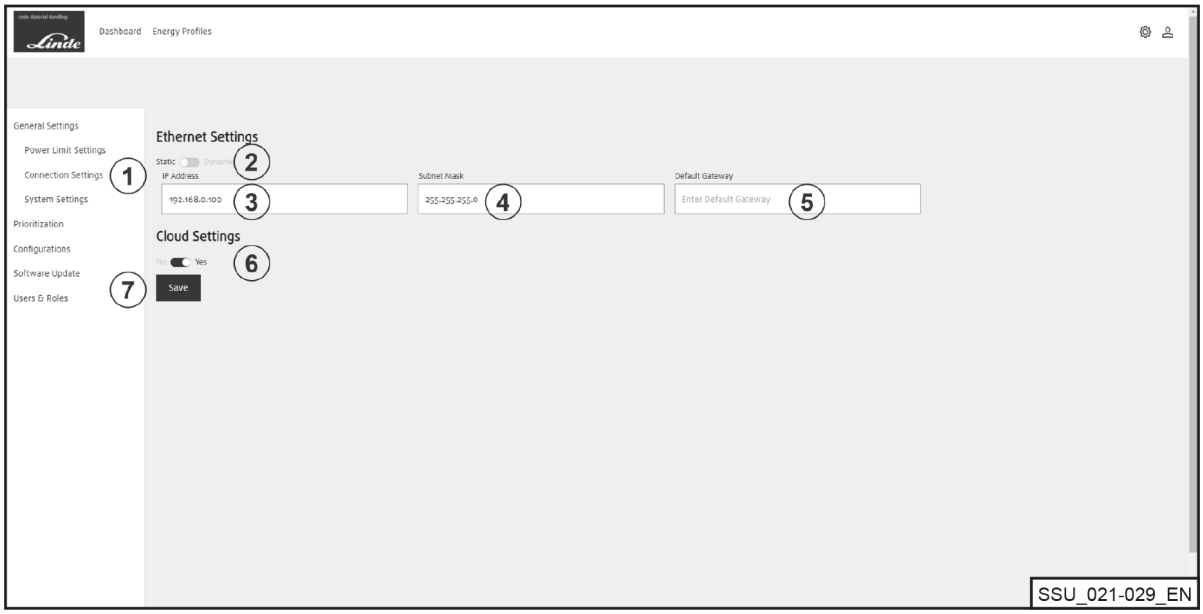


Item no.	Description
1	The "Power Limit Settings" menu is highlighted in colour.
2	Enter the power limit of the mains connection (must be defined by the responsible qualified electrician).
3	Enter the fallback power limit In the event of a failure of the charging management system, this value is implemented by the lithium-ion chargers. Value between 25% and 100%; see the chapter "Fallback power value".
4	Enter the general power limit in kW; this will be distributed to the participating lithium-ion chargers via the charging management system.
5	Enter an additional time limit that overrides the general limit. The start time of the charging limit can be set here. The end time can be set in the following selection field.
6	Enter the charging limit in kW.
7	The **[recycle bin icon]** deletes the set time limit.
8	The **[Add Time Period]** button can be used to set a new time period for a new charging limit.
9	The **[Save]** button can be used to save all the settings you have made.

General settings

Connection settings

Settings for the IP address, subnet mask, Gateway and Cloud connection can be made in the Connection Settings menu.



Item no.	Description
1	The "Connection Settings" menu is highlighted in colour.
2	The **[slider]** can be used to set the network connection and IP address assignment to "Static" or "Dynamic".
3	Enter the IP address here if the network connection is configured to "Static".
4	Enter the subnet mask here if the network connection is configured to "Static".
5	Enter the default gateway here if the network connection is configured to "Static".
6	Select the Cloud settings here (No or Yes).
7	The **[recycle bin icon]** deletes the set time limit.
8	The **[Save]** button can be used to save all the settings you have made.

NOTE

Integration into the IT infrastructure of a company must be coordinated internally with the appropriate IT department.

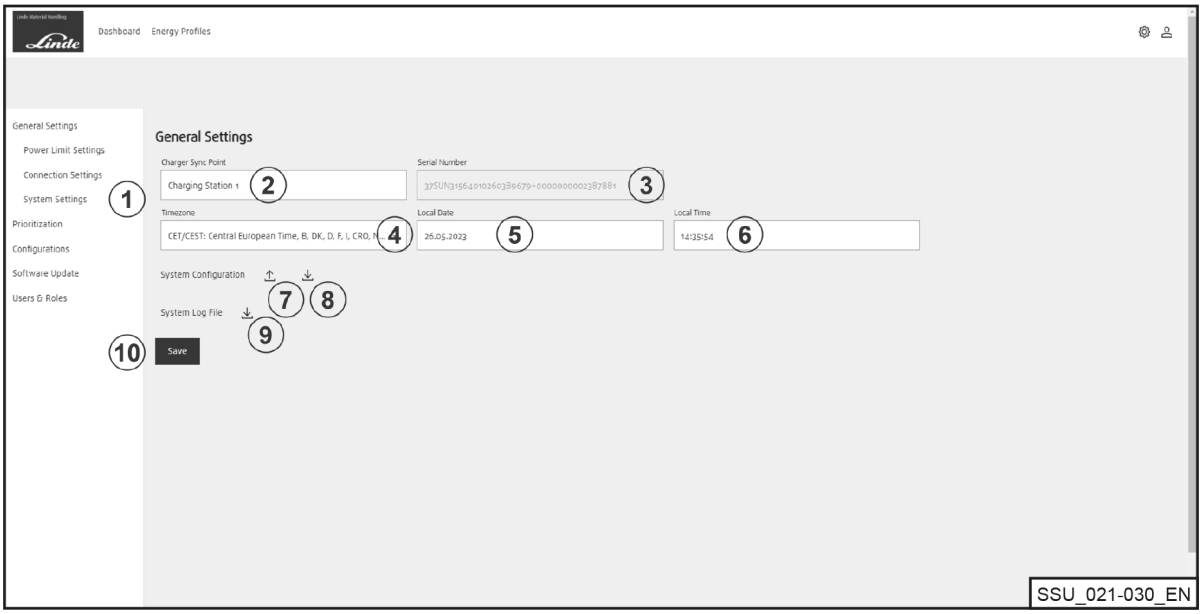
The controller and the required ports must be enabled. Activation of a specific network socket and integration into the IT infrastructure (assigning the IP address etc.) can be configured in part remotely.

The following ports are required:

- 80 - HTTP access to the web server
- 123 - Time synchronisation via an NTP server
- 443 - HTTPS access the web server
- 8883 - Cloud communication

System settings

General data pertaining to the charging management system is entered in the System Settings menu (e.g. name or serial number).



Item no.	Description
1	The "System Settings" menu is highlighted in colour.
2	Specify the name of the charging management system here.
3	The serial number is displayed here.
4	Select the local time zone.
5	Set the local date.
6	Set the local time.
7	System configuration upload Here, system configurations can be uploaded from a previously set-up charging management system.
8	System configuration backup The set system data for the charging management system currently being set up can be downloaded here.
9	System Log File The System Log File can be downloaded here (to view which user logged in at what time).
10	The **[Save]** button can be used to save all the settings you have made.

Defining prioritisation

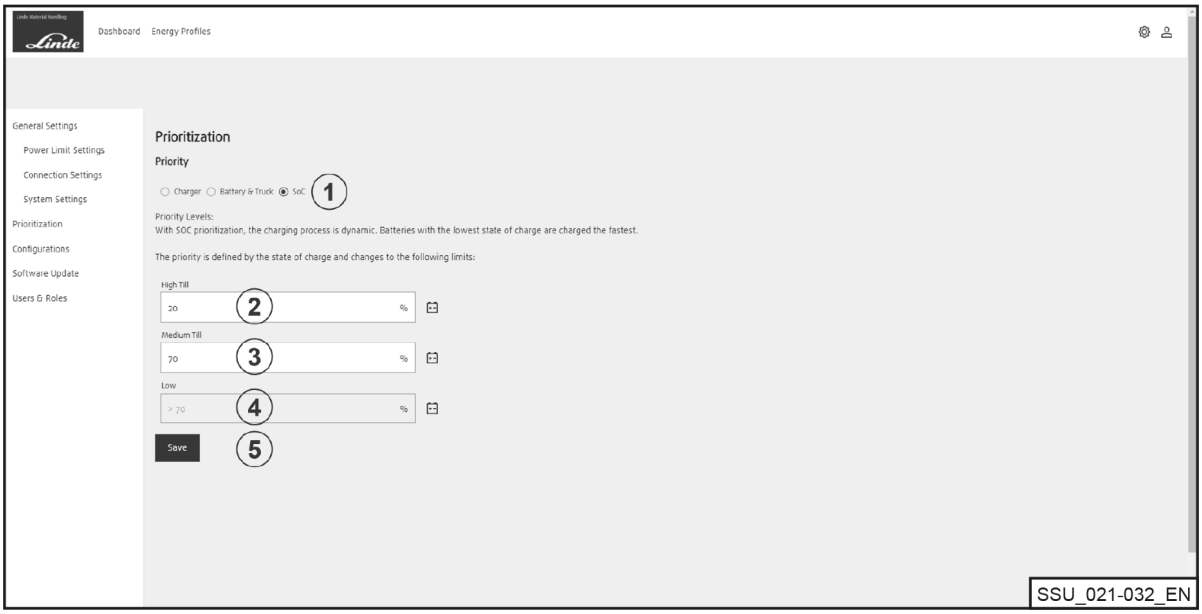
Chargers - Batteries - Trucks

Chargers, batteries and trucks can be selected to prioritise the charging of lithium-ion chargers or the batteries of the trucks. Different lithium-ion chargers or batteries can be selected and prioritised.

Item no.	Description
1	The "Prioritization" menu is highlighted in colour.
2	Select the appropriate radio button: - Charger - Battery & Truck
3	Displays the connected lithium-ion chargers/batteries for which the prioritisation settings can be made.
4	To allow the device to participate in charging prioritization, you must select "Yes" in the "Participation" selection field. If "No" is selected, the device is not taken into account for the set charging limit.
5	Prioritisation: **Priority "High"**: Devices are charged first and at the highest available capacity. **Priority "Medium"**: Devices are not charger until after the high-priority devices. **Priority "Low"**: Any available remainder of the maximum set power is used to charge these devices. If no power is available, they will only be charged at the end.
6	The **[Save]** button can be used to save all the settings you have made.

SoC

Selecting "SoC" automatically sets the prioritisation of the lithium-ion chargers and the batteries according to the current "SoC". Batteries with a low charge level are thus charged first. Here you can specify when a device is assigned which priority. This makes the charging process dynamic.



Item no.	Description
1	Select the radio button "SoC"
2	Determines when a device is prioritised "High Till". This applies to devices that have a low charging state and are therefore charged with a high priority. In this case, all devices with a charge up to 20% will be classified with this prioritisation.
3	Determines the percentage charge according to which a device is classified as "Medium Till". In this case, all devices with a charge between 20% and 70% are classified here.
4	A charge can be specified here for the prioritisation "Low". In the case shown, all devices with a charge of more than 70% will be classified here.
5	The **[Save]** button can be used to save all the settings you have made.

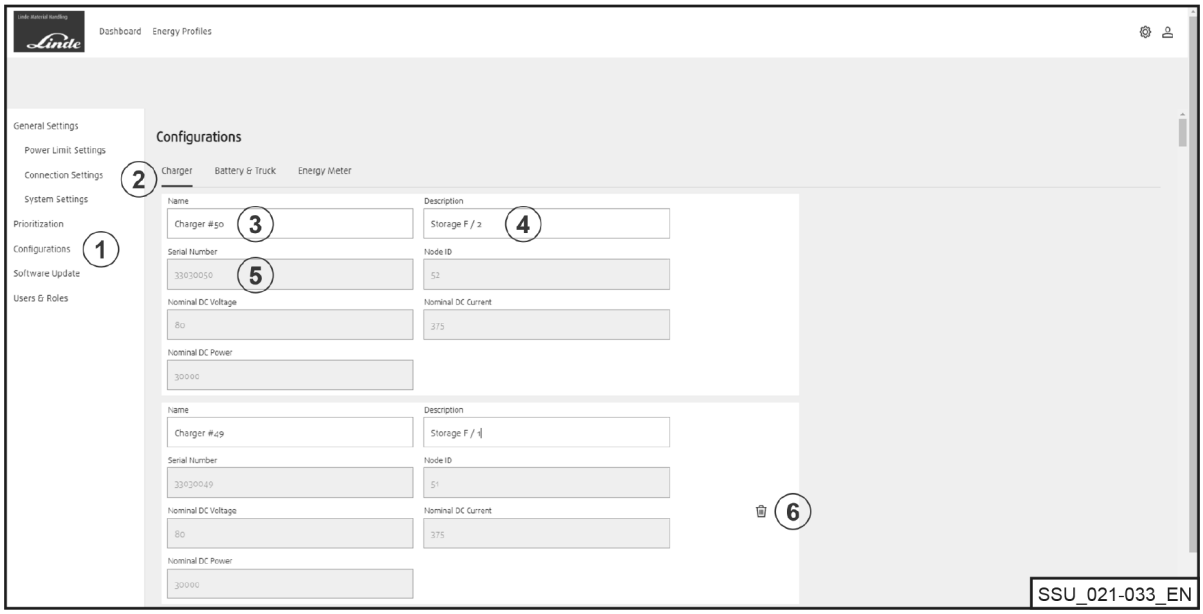
Configuration

The "Configurations" menu allows different configurations to be set up for lithium-ion chargers, batteries and trucks, as well as for energy meters.

Configuration

Battery chargers

On the "Charger" tab, you can configure the lithium-ion charger data or remove chargers from the system configuration.



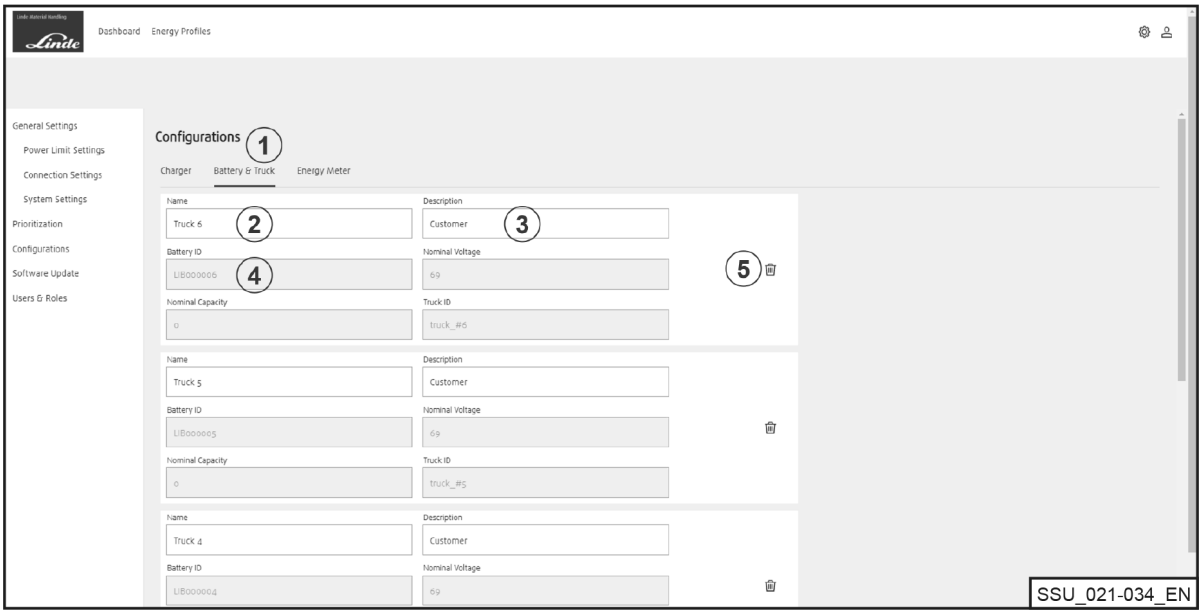
Item no.	Description
1	The "Configurations" menu is highlighted in colour.
2	To configure the lithium-ion chargers, select the tab "Charger".
3	A freely selectable name for the lithium-ion charger can be entered here.
4	An additional description for the lithium-ion charger can be entered here.
5	The non-editable data of the lithium-ion chargers is displayed here: Serial Number, Node ID, Nominal DC Voltage, Nominal DC Current, and Nominal DC Power.
6	A lithium-ion charger can be deleted from the system by clicking on the **[recycle bin icon]**.

NOTE

Make sure that you disconnect the communication connection before deleting a charger. Deleting a lithium-ion charger is only possible if the physical communication link has been interrupted and the charger is displayed as "offline" in the Dashboard. You can disconnect the CAN connection directly from the network interface on the charger.

Batteries and trucks

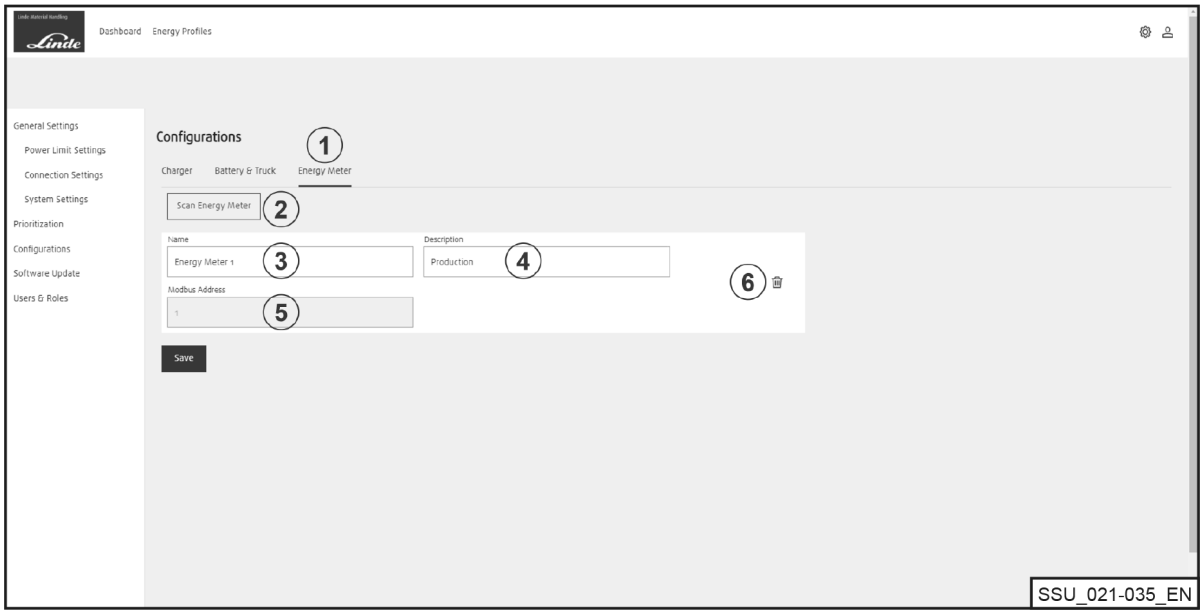
In the "Battery & Truck" tab, the truck battery data can be configured, a new device can be added or a device can be deleted.



Item no.	Description
1	To configure the lithium-ion chargers, select the tab "Charger".
2	A freely selectable name for the lithium-ion charger can be entered here.
3	An additional description for the lithium-ion charger can be entered here.
4	The non-editable data of the lithium-ion chargers is displayed here: Serial Number, Node ID, Nominal DC Voltage, Nominal DC Current, and Nominal DC Power.
5	A lithium-ion charger can be deleted from the system by clicking on the **[recycle bin icon]**.

Configuration

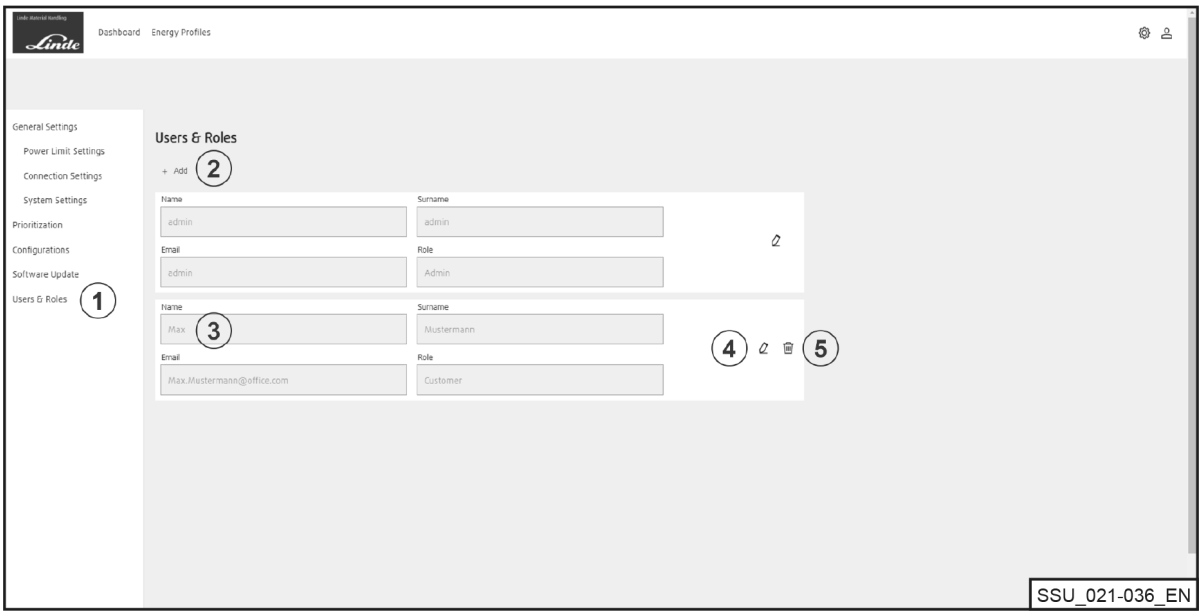
Energy meters



Item no.	Description
1	To configure the energy meters, select the "Energy Meter" tab.
2	By clicking on the **[Scan Energy Meter]** button, a connected energy meter can be automatically detected by the system.
3	A freely selectable name for the energy meter can be entered here.
3	An additional description for the energy meter can be entered here.
4	The non-editable data of the lithium-ion chargers is displayed here (e.g. the address).
5	An energy meter can be deleted from the system by clicking on the **[recycle bin icon]**.

Users and roles

The "Users & Roles" menu can be used to set rights and roles for users. In addition, new users can be added and old users can be deleted or changed.



Item no.	Description
1	The "Users & Roles" menu is highlighted in colour.
2	A new user can be created and added to the system by clicking on the **[Add User]** button.
3	All data pertaining to the created users is displayed here: first name, surname, email address and role.
4	The **[pen icon]** can be used to edit the user. Both the data and the role can be changed here.
5	Clicking on the **[recycle bin icon]** deletes a user from the system.

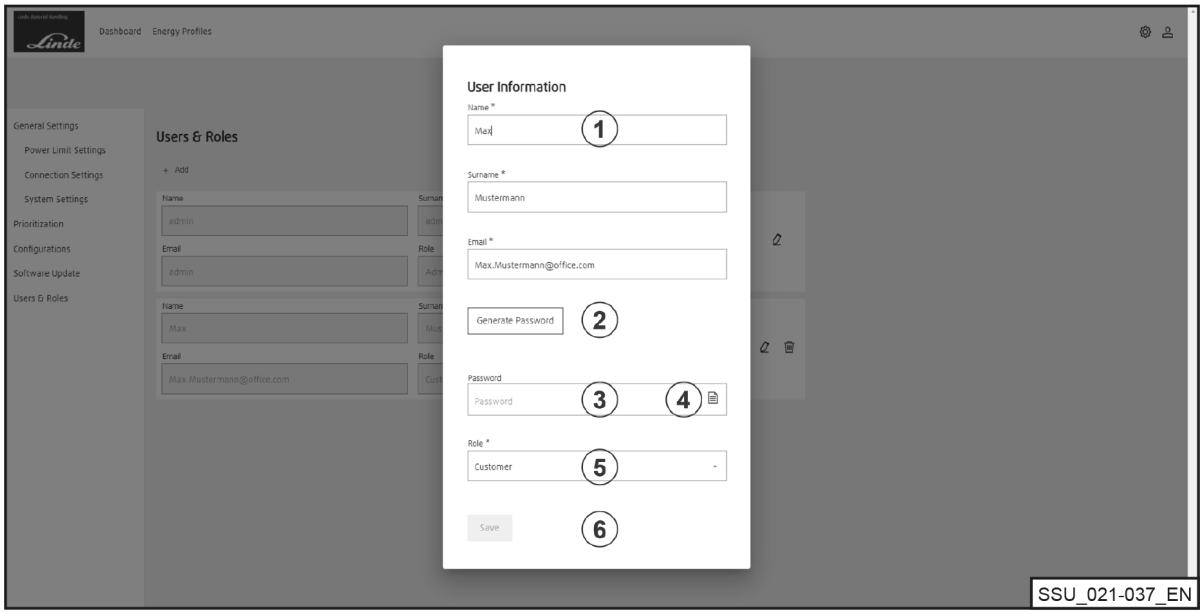
The following roles can be assigned:

Role	Description
Admin	An Admin can make new additions, changes, or deletions in all areas of the dashboard. The admin can also issue initial passwords for new users and reset user passwords. The Admin password can be reset via a reset button on the hardware.
Customer	A Customer can only view the menus and tabs of the dashboard and retrieve the data, but cannot make any changes.
Service Technician	A service technician must be created by the Admin as a Service-Technician.
Energy Expert	An energy expert must be created by the Admin as an Energy Expert.

Users and roles

Creating new users

A new user can be created and added to the system by clicking on the **[Add User]** button. To do this, all the necessary data must be entered and a new password created.



Item no.	Description
1	All relevant data for the new user to be created must be entered here: first name, surname, email address.
2	The **[Generate Password]** button can be used to set a password for one-time use.
3	The password for newly created users is displayed here.
4	The **[copy button]** can be used to copy the password to the clipboard.
5	The user's role is selected here.
6	The **[Save]** button allows the new user to be added to the system and saved.

Software

Software updates appear in the "Software Update" menu.

Item no.	Description
1	The "Software Update" menu is highlighted in colour once it is selected. It displays information about the currently installed software.
2	The **[Factory Reset]** button resets the system to factory settings.
3	The current software version is displayed below the **[Factory Reset]** button.

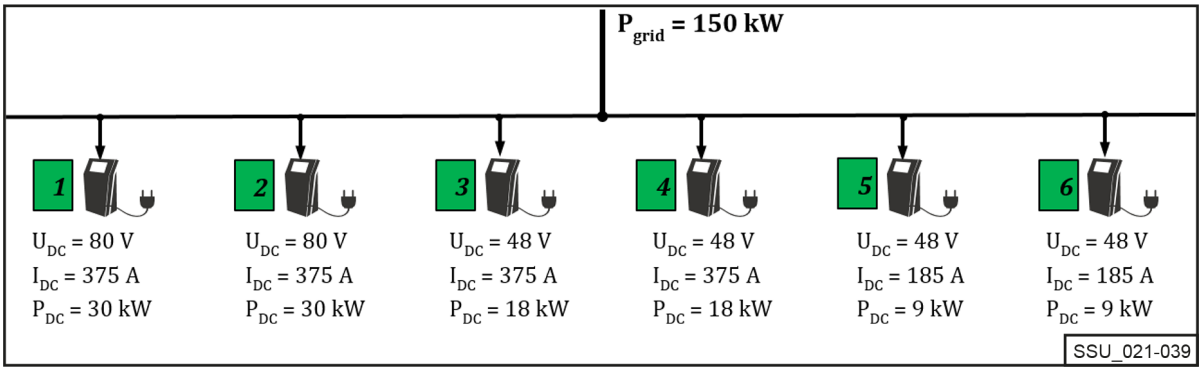
Charging management configuration

This chapter shows different configurations of the charging management system and the resulting charging capacities using example scenarios.

In these example scenarios, six lithium-ion chargers are connected to the system:

- Lithium-ion chargers 1 and 2 with 80 V / 375 A and 30 kW DC nominal capacity
- Lithium-ion chargers 3 and 4 with 48 V / 375 A and 18 kW DC nominal capacity
- Lithium-ion chargers 5 and 6 with 48 V / 185 A and 9 kW DC nominal capacity

Charger key data



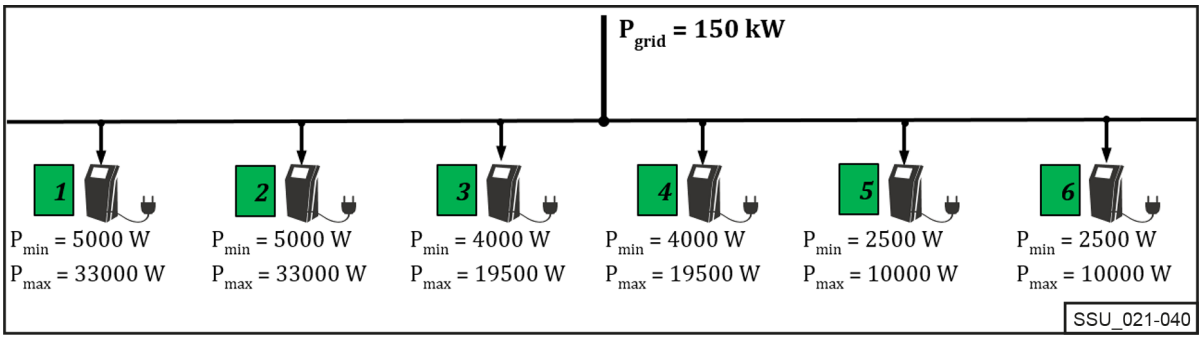
The charging management system is designed for the mains-side AC power as well as the limitation of the connected lithium-ion chargers within a charging station with the intention of maintaining a certain overall AC power.

Each lithium-ion charger can be limited within a minimum and maximum power value. The device-specific power range results from the design and efficiency profile of the lithium-ion chargers, meaning that reasonable operation with regard to efficiency can be guaranteed within the power limits.

The performance limits are taken into account by the charging management system.

In the example above, the limits have the following values:

Charger power range



Prioritisation of chargers

Power distribution with the same priority

The power limit (P_{Limit}) is set to 60 kW. The adjustable limit must always be less than the physical power limit of the charging station (P_{grid}).

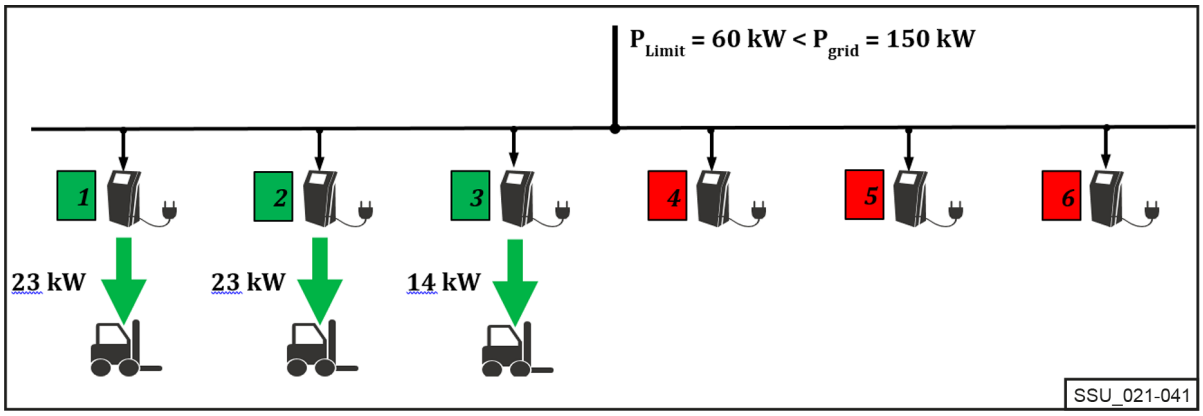
The power limit (P_{Limit}) is distributed equally among the active lithium-ion chargers (with a battery not fully charged) within the same priority class (high, medium, low) as a percentage of the maximum AC power.

(In the example 60 kW / (33 kW + 33 kW + 19.5 kW) = 70.175%)

Prioritisation of chargers

When three trucks are connected to the lithium-ion chargers 1 to 3, the limit is distributed as follows:

Power distribution with the same priority



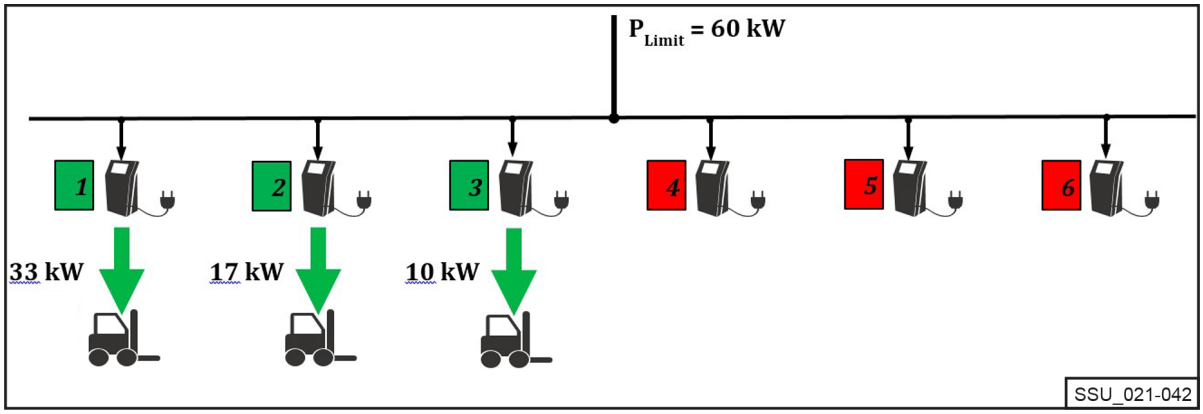
Power distribution with a different priority

In the same charging scenario, the lithium-ion chargers are prioritised differently. The charger with the "high" priority receives the maximum power (in this case P_{max} = 33 kW).

For chargers 2 and 3, the priority is set to "medium". The remaining 27 kW is again divided up as a percentage of the maximum AC power of the two chargers.

(In the example 27 kW / (33 kW + 19.5 kW) = 51.429%)

Power distribution with a different priority

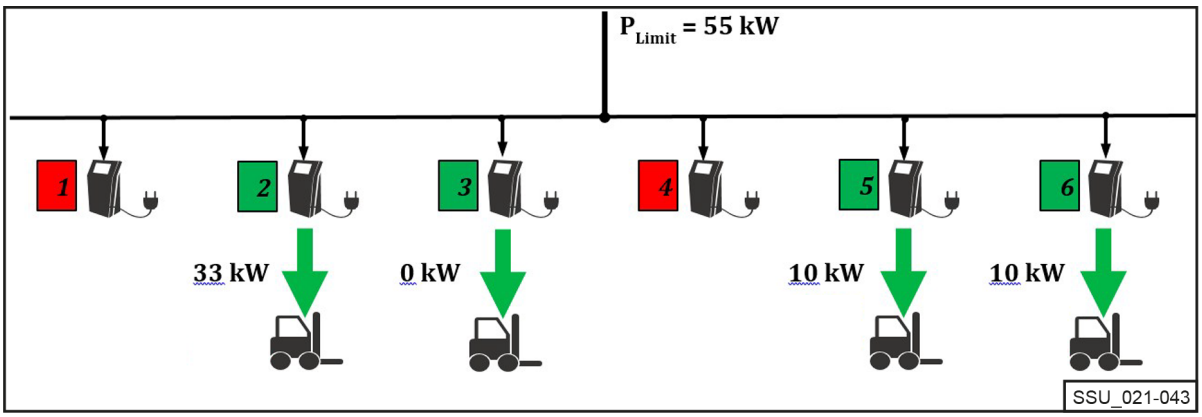


1	Priority "high"	4	Not in operation
2	Priority "medium"	5	Not in operation
3	Priority "medium"	6	Not in operation

In the following example, with the different priorities "high", "medium" and "low", the lithium-ion chargers 2, 3, 5 and 6 are in operation. With a power limit P_{Limit} of only 55 kW and the selected priorities, charger 5 is first fully operated at "high" priority and charges at 10 kW.

The lithium-ion chargers 2 and 6 with the priority "medium" are also operated at their maximum power. The remaining 2 kW is available to charger 3 with priority "low".

Power distribution with different priority 2



1	Not in operation	4	Not in operation
2	Priority "medium"	5	Priority "high"
3	Priority "low"	6	Priority "medium"

Prioritisation according to battery charge level (also known as state of charge, SoC)

The connected batteries are charged according to the priority of the battery charge level (SoC).

This charging process is dynamic. During the charging process, both the SoC and the categorisation in the priority class increase.

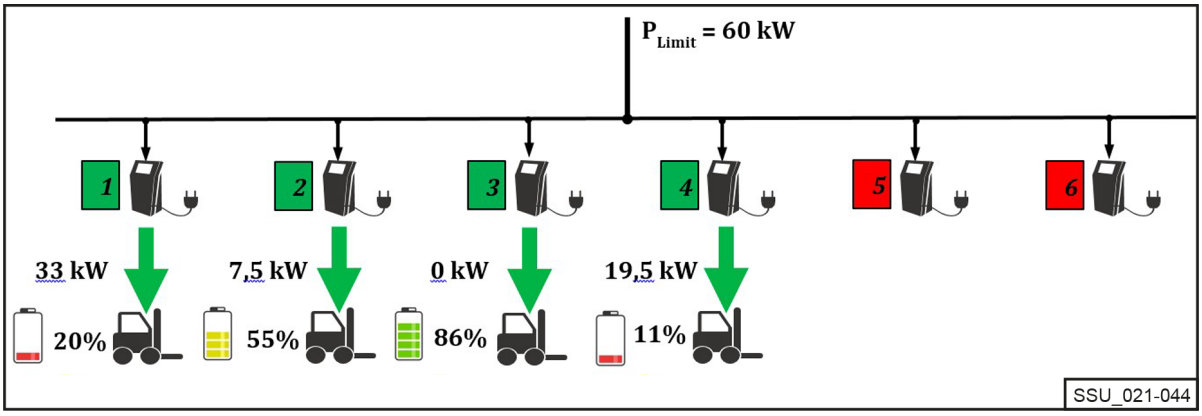
The batteries with the lowest SoC are charged with the highest priority and at the highest charging power. The thresholds can be configured via the local web server.

In the following example, the priorities for the are SoC as follows:

- Priority "high" = 0–35%
- Priority "medium" = 36–75%
- Priority "low" = 76–100%

The SoC of the batteries connected to lithium-ion chargers 1 and 4 will result in the charging priority "high". They are charged at maximum power. The remaining 7.5 kW will be allocated to lithium-ion charger 2. The SoC of the connected battery falls within the priority group "medium". Lithium-ion charger 3 pauses.

Power distribution when prioritised according to SoC



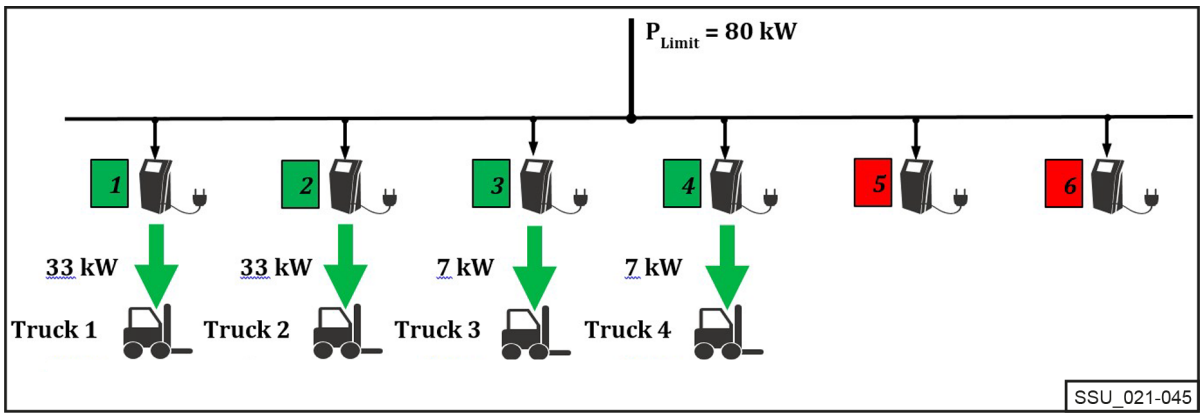
1	Priority "high"	4	Priority "high"
2	Priority "medium"	5	Not in operation
3	Priority "low"	6	Not in operation

Prioritisation by truck ID and battery ID

The priorities for this charging algorithm are based on the truck ID and battery ID. The identification number is read out when the truck/lithium-ion charger is plugged in. The priority defined by the local web server is used to assign the charging power.

In the following example, four trucks are connected to which different priorities have been assigned. Trucks 1 and 2 are charged with the maximum power of the chargers. Trucks 3 and 4 are "low" in the priority group and are charged with the remaining 14 kW.

Power distribution when prioritised according to truck ID / battery ID



Truck 1 Priority "high"
Truck 2 Priority "medium"
Truck 3 Priority "low"
Truck 4 Priority "low"

Fallback power value

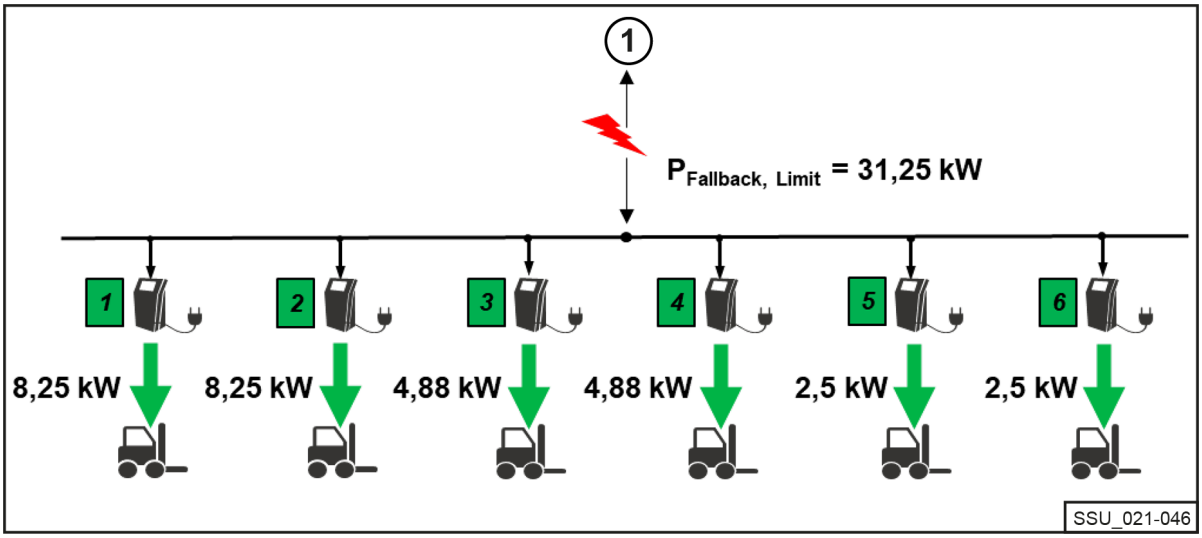
The "fallback power value" is used to configure the charging fallback power in the event of a failure of the charging management system. The fallback power value is the same percentage for all lithium-ion chargers. The adjustable value is between 25 and 100%.

The fallback power value is based on the maximum AC power of the connected lithium-ion chargers. In this case, it must be ensured that in the event of a failure of the charging management system, the remaining charging capacity is sufficient for the trucks to be deployed without problems. The total power defined by the fallback power value must not be greater than the desired power limit.

Failure of the charging management system

In the example, the fallback power value is set to 25%. In the event of a failure of the charging management system, the charging fallback powers shown apply. They appear as "AC-Limit" in the display of the lithium-ion charger. The total power in case of a system failure in the example is 31.25 kW.

Fallback power in the event of failure of the charging management system

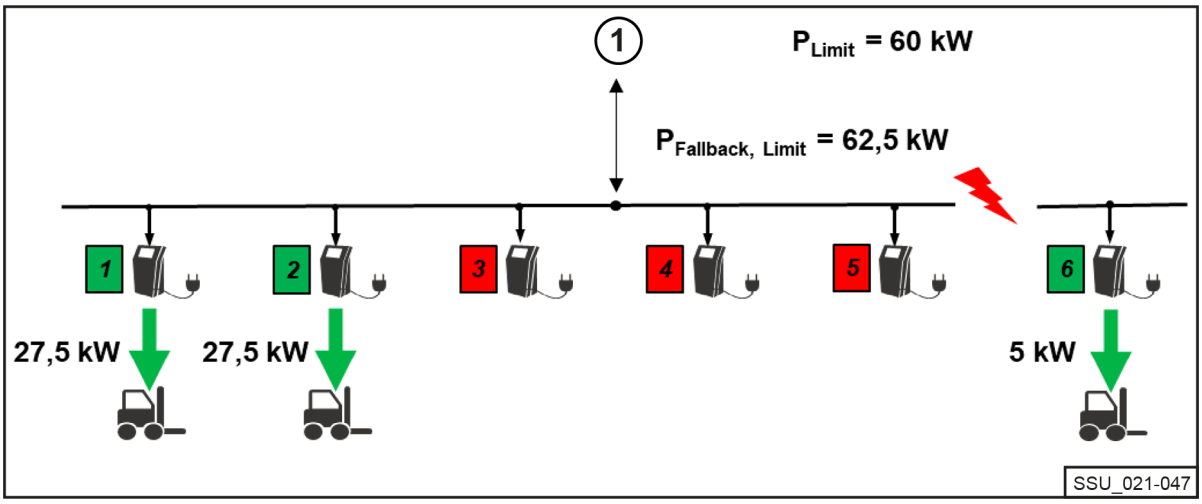


1 Charging management system

Failure or interruption of communication of a charger

The example shows the effect of the fallback power value when one of the connected lithium-ion chargers cannot communicate with the charging management system or the connection is interrupted. The fallback power value is set to 50% in the example. There are two chargers available, both of which are online and in operation (power limit 60 kW). Since charger 6 has a communication error with the charging management system, it is assumed that it is charging at the charging fallback power (50% of the maximum AC power of the lithium-ion charger (10 kW * 50% = 5 kW)). Chargers 1 and 2 share the remaining 55 kW (here in what are assumed to be equal shares).

Power distribution in case of charger failure



1 Charging management system

Fallback power value

Variants

connect:charger	Compact	PRO	TOUCH
Dimensions (mm, W x H x D)	600 x 400 x 210	600 x 400 x 210	600 x 400 x 210
Weight (kg)	16	16	18.5
Controller	Compact Controller 100: 8DI 4DO 2AI 2AO 2NI| 1K/PT1K 1RS485,2x Ethernet, SD	Edge Controller: 2x Ethernet, 2x USB, 1x USB C, HDMI, CAN, DI/DO, RS-232/485, Audio, Control	Touch Panel 600: 27.7 cm (10.1"), 1280 x 800 pixels, 2x Ethernet, 2x USB, CAN, DI/DO, RS-232/485, audio, control panel
Display	X	X	O
Computing power	→	↑	↑
Network connection	O	O	O
HDMI port	X	O	X
Use	Suitable for occasional use	Suitable for frequent use	For a high degree of transparency and flexibility as well as time-saving use directly on site.
Legend: X = not included, O = included, → = good, ↑ = very good			

Supported Linde Li-ion chargers

The following table lists the currently compatible Linde lithium-ion chargers.

Manufacturer	Battery voltage	Charging current max.	Device type	Mains voltage	Required software version
Fronius	24 V	225 A	3 kW	3 ~ 400 V	1.7.7 or later
	48 V	185 A	9 kW		
	48 V	375 A	18 kW		
	80 V	110 A	9 kW		
	80 V	210 A	17 kW		
	80 V	375 A	30 kW		

Supported energy meters

- WAGO (MID / 65 A).

Variants

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