

VOOL

VOOL Load Management Controller Installation Manual

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Safety Instructions

WARNING

- Please read these instructions before installing, or maintaining the VOOl Load Management Controller (LMC).
- For safety reasons, avoid installing or using the VOOl LMC near flammable, explosive, harsh, combustible materials, chemicals, or vapors.
- To ensure proper installation, an authorized installer must carry out all installations. Incorrect installation can damage the electrical cabinet.
- The VOOl LMC should not be used by Individuals with a lack of experience or knowledge without the supervision of a responsible party.
- Turn off the power from the main switch before installing VOOl LMC.
- Use the VOOl LMC only within the specified operating parameters.
- Avoid inserting any foreign items into the VOOl LMC to prevent damage.
- For safety reasons, avoid direct liquid showers to the VOOl LMC.
- Modifying the equipment or any part of the product is strictly prohibited.
- For safety reasons, do not use the equipment if it appears to be damaged.
- The installations must comply with local regulations. Do not exceed current limitations.

Preface

Thank you for choosing the Vool Load Management Controller (LMC). The Vool LMC is a state-of-the-art solution for optimizing the charging power for your electric vehicle (EV). The LMC measures the amount of power available on the grid and the power demand of the EV and provides maximum power supply to your EV while avoiding system overloads.


About this document

Before you start using your LMC, we encourage you to read through this manual carefully. This manual is written to provide you with clear and concise instructions for the safe and efficient use and maintenance of your Vool LMC.

If you have any questions or require assistance, please refer to this manual or contact our customer support team at support@vool.com.

Symbols used in this manual

This manual contains safety warnings that may result in injury when ignored. Each safety warning is indicated with a signal word. The signal word corresponds with the level of risk of the described hazardous situation.

Signal sign	Results when ignored
WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates that damage to the machine can occur if the instruction is not properly observed.
	Indicates information considered important, but is not directly hazard related.

Original instructions

This manual has been translated into multiple languages. The original manual is written in UK English. All other language versions are translations of the original manual.

Copyright

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In the Box

- Load Management Controller (LMC)
- Current transformers with socket
- Socket for power connection

Tools for Installation

- Wire cutters
- Voltmeter or digital multimeter
- Flathead screwdriver
- Ferrules (size varies according to power wiring diameter and construction)

Product Overview

1.1 Intended use

The VOOl Load Management Controller (LMC) is designed to measure the available power grid capacity and safely and efficiently control the single or three-phase power supply to connected VOOl Chargers.

This LMC is intended for indoor installation in distribution units.

Please note that the VOOl LMC is intended solely for the purpose of measuring the grid usage and controlling the supplied charging power to VOOl Chargers and should not be used for any other applications.

Always adhere to safety guidelines and instructions provided in the user manual to ensure safe and effective operation.

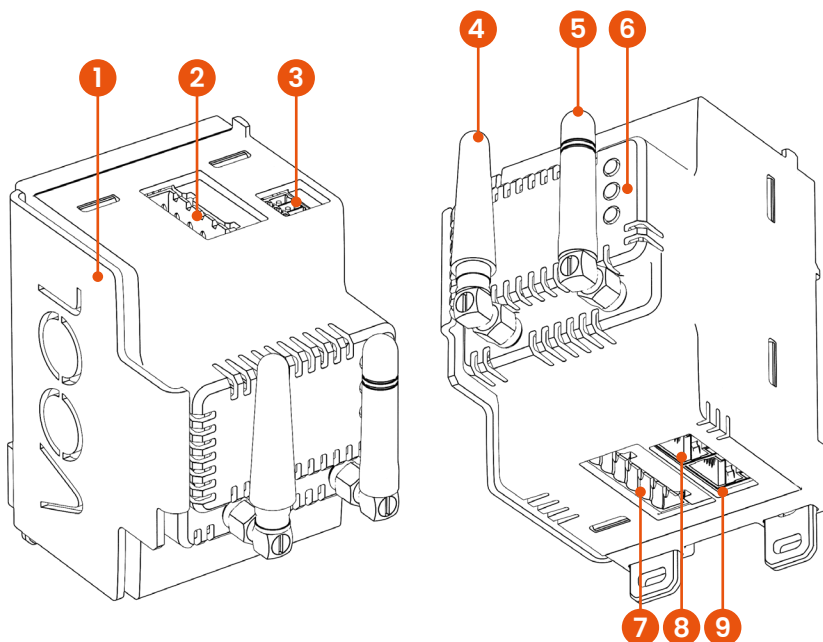
1.2. Description and operation

The VOOl LMC is mounted in the electrical switchboard and is connected to your home grid. The LMC continuously measures the grid usage of each phase, using current transformers (CT) mounted around the main phase wire(s) of the power grid.

The LMC uses this live information to calculate the remaining available power on the grid and distributes this power over connected VOOl Chargers in use. This ensures the maximum possible charging speeds without overloading the power grid.

The lights on the front of the LMC indicate the connection status of the LMC.

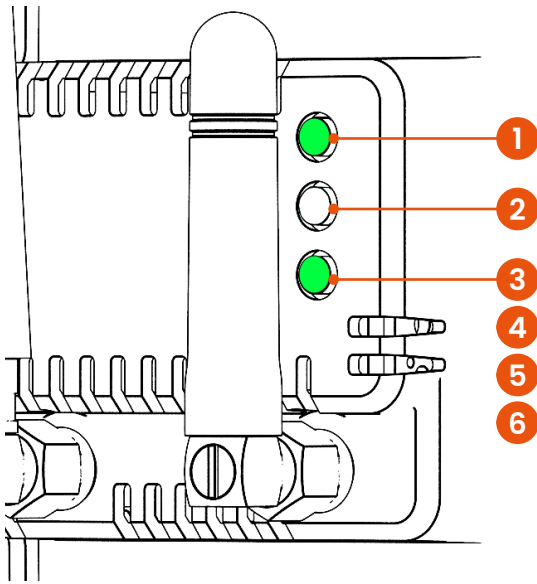
The LMC can be controlled and monitored with the VOOl Admin portal. The LMC ensures continuous operation even if the network is disconnected, managing loads using locally set parameters in the Admin portal.



1.3 Main Parts

1. Heat sink
2. AC Power supply
3. RS485 interface
4. Wi-Fi antenna
5. 4G LTE antenna
6. Status LEDs
7. Current transformer input
8. Ethernet port for Internet connection
9. CAN Bus for communication with VOOl Charger

1. Product



1.4 Status LEDs

1. Power ON
2. (non-functional)
3. 2 short blinks every 2 seconds - LMC has no chargers configured.
4. Slow blinking - No chargers are in charging state. LMC is not doing load management.
5. Fast blinking - At least one of chargers is in charging state. LMC is actively managing chargers' load.
6. Green, not blinking (for longer than 1 minute) - Error, powercycle to restart LMC if LED stays green and does not blink contact Vool customer support

2. Safety

2. Safety

While the LMC is designed and constructed with safety in mind, residual risks may still exist. This manual contains safety messages that highlight these potential risks. In this chapter, you will find important usage and maintenance safety instructions. Please read and follow them carefully.

Adhere to the strictest requirements, whether from laws, regulations, or this manual. Failure to follow these instructions may lead to dangerous situations or damage to the charger.

2.1. Safety symbols and labels on the product

Always adhere to the warning labels and information signs affixed to the product. Ensure that these labels and signs remain readable, and if they become illegible or require replacement, please contact us at support@vool.com for replacement labels.

2.2. Safety warnings and regulations

WARNING

- Risk of shock - Do not insert any foreign objects into the Vool LMC.
- Risk of shock - Do not cut, pierce or otherwise damage the power supply wires. Switch off and do not use the LMC if one or more wires are in any way damaged or exposed.
- Risk of shock - Do not immerse the LMC in water or other liquids.
- Risk of shock - Ensure that no water or other liquids enter the LMC.
- Risk of shock - Do not use the LMC if the housing, AC power supply terminal or any other component of the LMC is visibly damaged or removed.
- Risk of shock - Do not open the LMC, there are no user-serviceable parts inside. Only qualified technicians should open the LMC for maintenance or repairs.

- Risk of shock – The removal of this product from the electrical grid must be done by a certified electrician. The main circuit breaker of the LMC from the must be shut off completely before starting any removal work.
- The VOOL LMC should not be used by individuals with a lack of experience or knowledge without the supervision of a responsible party.
- Modifying the equipment or any part of the product is strictly prohibited.

CAUTION

- Risk of fire or short circuit – Do not use adaptors, extension cables, splitters or other accessories with the LMC.

NOTICE

- Only use the VOOL LMC within the operating conditions as stated in Chapter 10: Technical Specifications.
- Risk of overheating – Do not cover the LMC.
- Risk of damage to the LMC – Do not use aggressive or abrasive cleaning agents when cleaning the outside of the LMC.

2.3. In case of an emergency

Always put your own safety and the safety of those around you first.
Only when it is safe, switch off the main circuit breaker of the LMC to cut off all power to the LMC.

WARNING

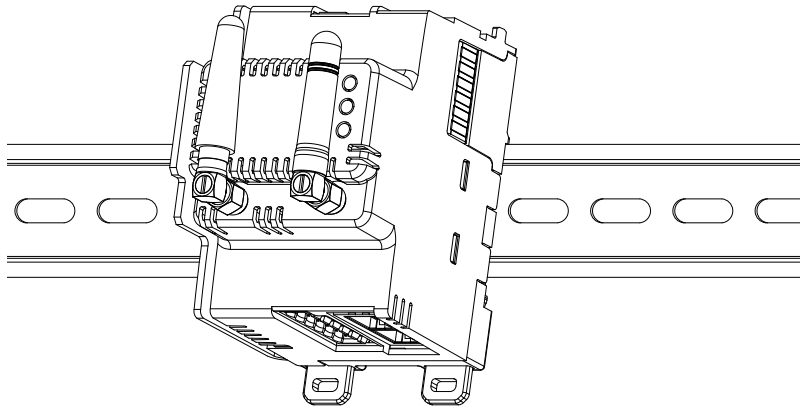
Be careful when touching electrical parts of the LMC, since there might be residual current present even after the main circuit breaker is switched off.

Installation

3. Installation

3.1 Mount the LMC on a DIN rail

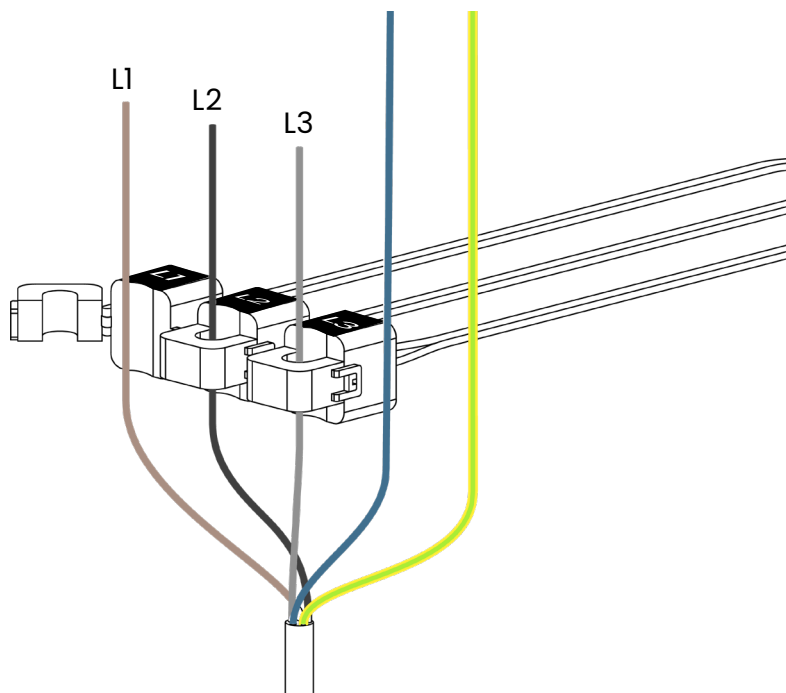
Before installation, disconnect the power supply to prevent electrical hazards. Secure the LMC on the chosen location on the DIN rail.



3.2 Connect Current Transformers

The LMC comes with three current transformers available in 50A, 100A, and 200A configurations. They are split-core type, meaning they don't require disconnection of power cables for installation.

Before installing the current transformers on wires, ensure their socket is connected to the LMC.

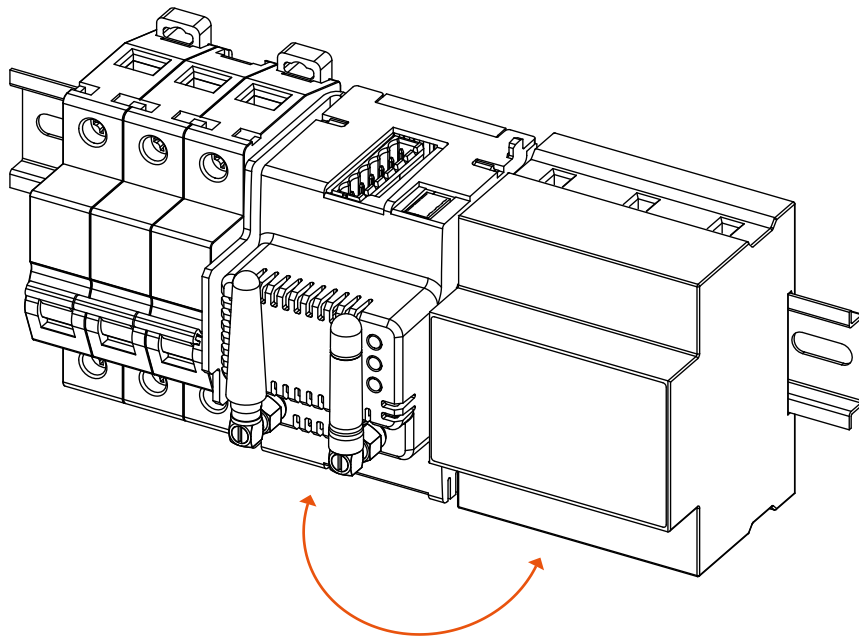


3. Installation

3.3 Install with Previously Installed Current Transformers or Multimeter

If current transformers are installed in the distribution box, ensure compatibility before connecting to the LMC.

If a multimeter that supports the Modbus protocol is available on-site, it can be directly connected to the LMC. Both devices need to be in the same LAN. Cable to be connected to LMC Ethernet port.



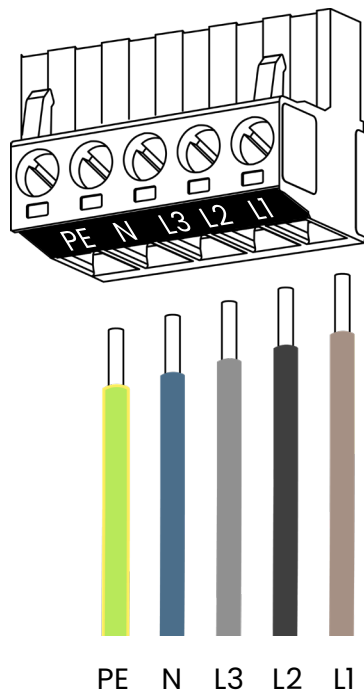
3. Installation

3.4 Connect AC Power Supply

3.4.1 (Three-Phase) Connect Cables to the Designated Connector and Connector to LMC

Switch on the LMC and ensure that top and bottom LED light up

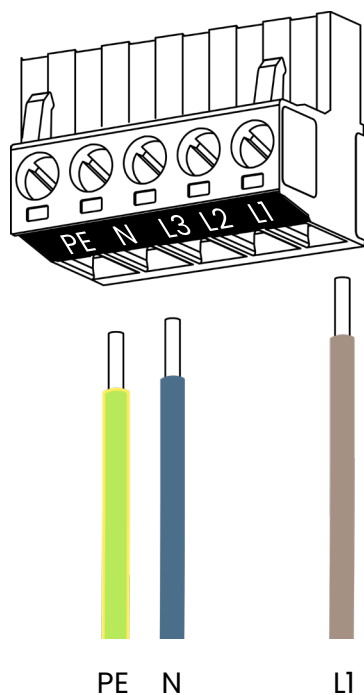
If any LEDs are unlit or red, refer to the troubleshooting section.



3.4.2 (Single-Phase) Connect Cables to the Designated Connector and Connector to LMC

Switch on the LMC and ensure that top and bottom LED light up

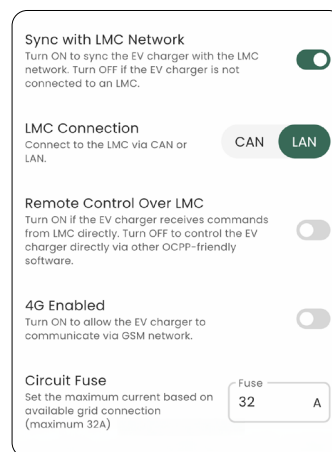
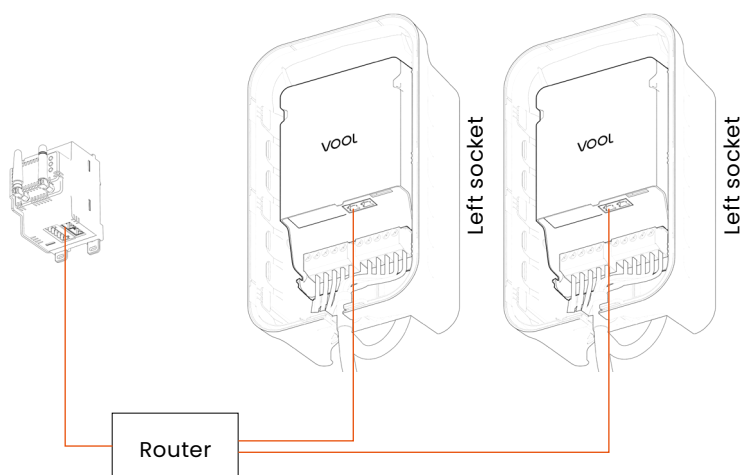
If any LEDs are unlit or red, refer to the troubleshooting section.



3.5 Connecting LMC to Chargers

Chargers can be connected to the LMC if they are in the same LAN (local area network) or connected via a CAN connection.

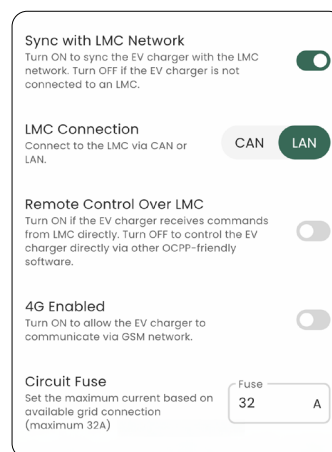
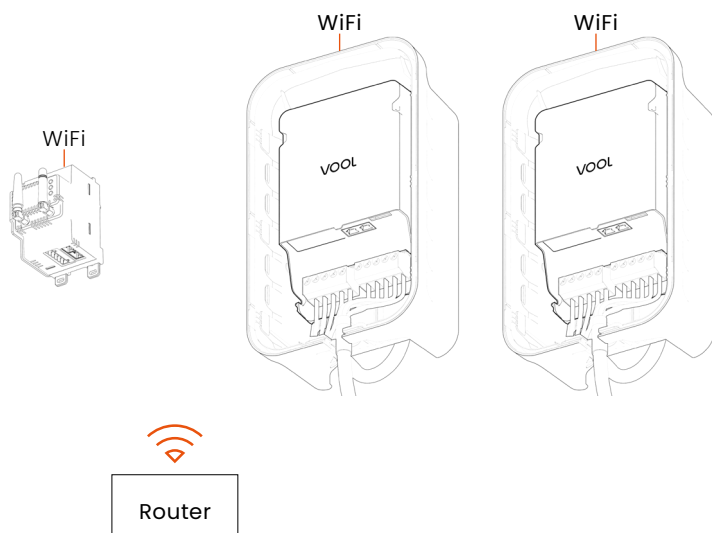
3.5.1



VOOL App Basic setup

Scenario 1: The Charger(s) and the LMC are in the same LAN connected via Ethernet cables.

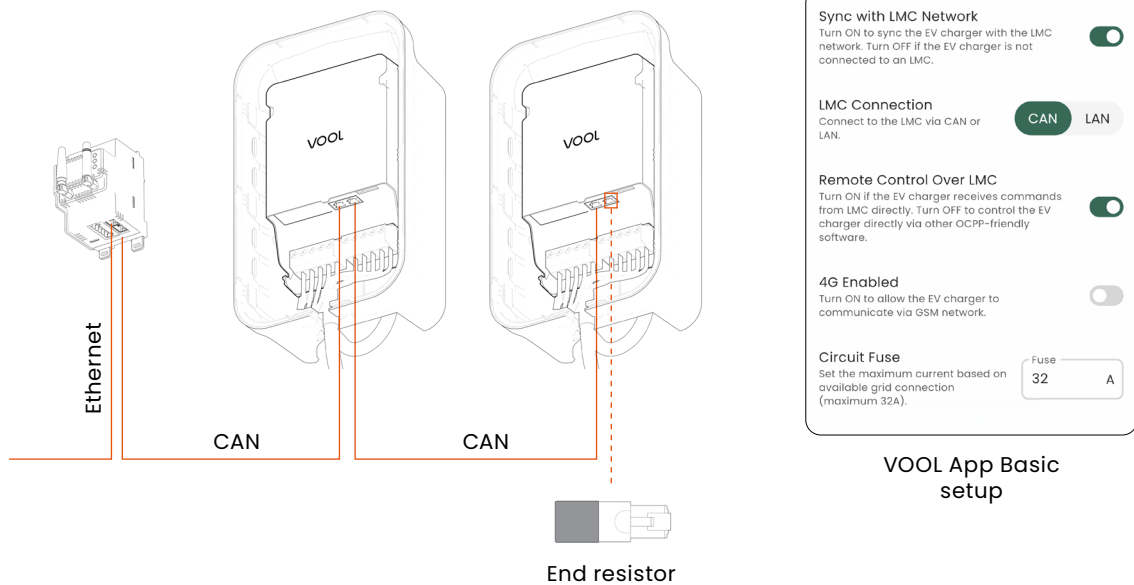
3.5.2



VOOL App Basic setup

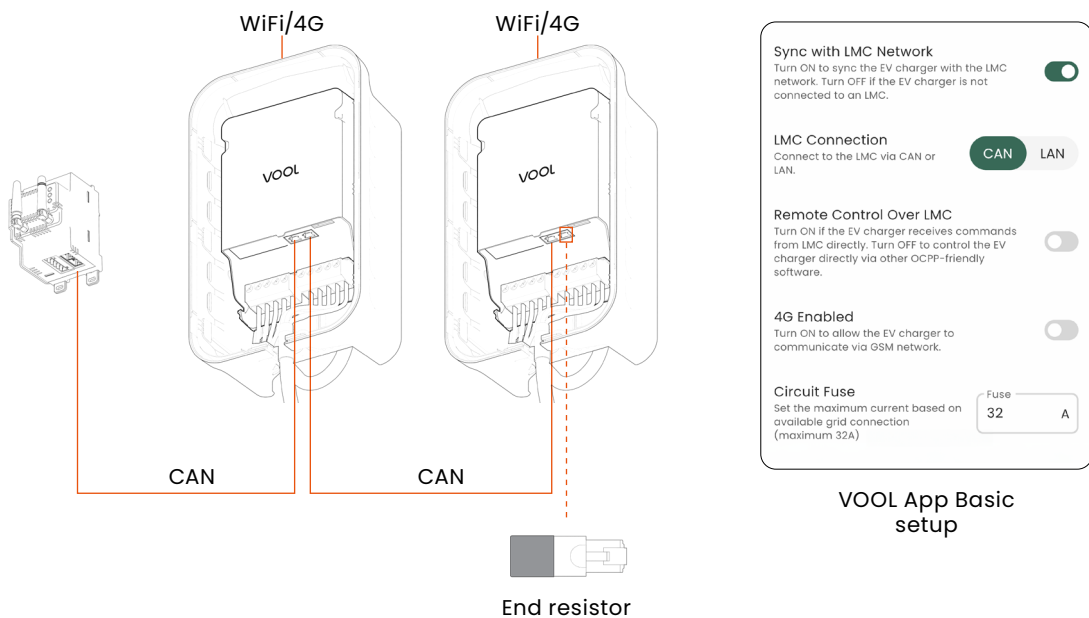
Scenario 2: The Charger(s) and the LMC are in the same LAN connected via Wifi.

3.5.3



Scenario 3: The Charger(s) and the LMC are connected via CAN. The LMC is connected to the Internet via an Ethernet cable. The last Charger on the line should be equipped with an end resistor to provide reliable communication between the devices.

3.5.4



Scenario 4: The Charger(s) and the LMC are connected via CAN. All the devices are connected to the Internet via Wifi or 4G. The last Charger on the line should be equipped with an end resistor to provide reliable communication between the devices.

LAN connection: It is possible to combine Wifi and Ethernet connections, allowing devices within the same site to be connected to the same LAN via either cable or Wifi. In the event that the LAN loses connection to the Internet but remains active locally, the devices may not be visible from the VOOOL Portal, but the load management function will continue to work as expected.

CAN connection: if only the LMC is connected to the Internet as shown in step 7.2.1, after disconnection none of the devices will be visible online. The LMC however remains operational and manages the load management function offline.

CAN connection: if all devices are connected to the Internet as shown in step 7.2.2, only the disconnected devices will lose online visibility. The LMC remains operational and manages the load management function offline..

3.6 Connect to the VOOOL Network

The LMC can be connected online either via Ethernet cable, Wifi or 4G.

1. **Ethernet:** Connect an Ethernet cable with Internet connectivity to the Ethernet port on the LMC.
2. **Wifi:** After powering up, wait for up to 2 minutes until the LMC creates a Wifi hotspot named 'LMC ID123456789'. If the Wifi has already been configured, the hotspot will not appear. To connect to the hotspot, enter the password 'Vool1234' and configure the hotspot name and password. In case the window does not appear automatically, open your browser, enter a random domain address, and the LMC Wifi setup window will open.
3. **4G:** Your LMC comes with the hardware required for 4G connectivity. For more details, contact support@vool.com.

3.7 Add the LMC in the VOO Portal

To add the LMC to the VOO Portal, navigate to <https://app.vool.com/> and log in using your email and password.

After logging in, follow the steps:

- Add a new site or select existing
- Add device
- Select manufacturer – VOO
- Scan or enter the serial number and PIN located on the packaging and the LMC casing.
- If device is connected online it will appear in the list of devices.

Make sure to connect the device(s) online and add them to the same site in the VOO Portal. Then, select which chargers are connected to LMC on the site setup.

Sites > Teatri Maja

Overview

Details

Teatri v 1, 10143 Tallinn
100A • Market price

Charging rules

Auto start
24h, every day

Availability

Public
Market + €0.30/kWh

Devices

Add a device

Name	Status	Grid connection	Sessions	Consumption
<div><div>VOOL</div><div>Primary LMC</div><div>VOOL • LMC</div></div>	<div>Online</div>	-	-	-

Device	Status	Connectors	Controller/Group	Sessions	Consumption
<div><div>VOOL</div><div>Charger 1</div><div>VOOL • Charger</div></div>	<div>Available</div>	<div></div>	<div>Primary LMC</div>	-	-

3.8 Adjust the LMC Settings in the VOOOL Portal

- Find the LMC device in your account.
- Set the fuse rating in amperes and adjust other settings from here.
- During the installation of the LMC, you must match the current setting with the main fuses' size and capacity to ensure proper calibration of the DLM system and avoid potential damage.

3.9 Multipoint or Multilevel Load management

*If you are installing multiple LMCs for multi-residential, or commercial properties, contact directly support@vool.com for detailed instructions

Once you have set up the LMC, you are ready to add chargers or link LMC with existing chargers on the site.

4. Troubleshooting

If the LMC encounters an issue, the status light ring turns red. In the VOOl App or Portal the error is identified with a code that indicates what issue has occurred. Below you can find an overview of the possible causes and solutions for each error code.

If you need to de-energize the charger, turn off the power supply and wait at least 30 seconds before proceeding.

If the solutions in this chapter do not solve your issue, please contact us at support@vool.com

Error code	Explanation	Possible solution
01	No LEDs light up	<ol style="list-style-type: none"> 1. Switch off the LMC using the main circuit breaker in the distribution unit. 2. Switch the circuit breaker back on. 3. Check if the AC power supply wires are correctly connected. 4. Make sure the main power in the switchboard is on.
02	No network connection	<ol style="list-style-type: none"> 1. Check if the Ethernet cable is connected and has internet. 2. Make sure that Wi-Fi is configured and working. 3. Check if 4G connection has access to internet.
03	No connection with VOOl charger(s)	Make sure the ethernet cables between chargers and LMC are wired correctly.
04	The LMC does not appear in the VOOl admin portal.	<ol style="list-style-type: none"> 1. Make sure that the serial no. and PIN are entered correctly. 2. Make sure that the LMC has internet connection.
05	The LEDs light up continuously red	Check if the power cables are connected correctly.

4. Troubleshooting

06	The LEDs blink red	LMC is overheating. 1. Try to reduce the ambient temperature. 2. Switch off the LMC using the main circuit breaker in the distribution unit and allow the LMC to cool down.
07	There is a malfunction in the charger.	1. Switch off the LMC using the main circuit breaker in the distribution unit. 2. Switch the circuit breaker back on.

5. Maintenance

Performing routine maintenance on your VOOL LMC is essential for safe and dependable operation and extends the lifespan.

If you encounter any issues with the LMC, see chapter 5: Troubleshooting for possible solutions.

WARNING

- Risk of shock – Do not open the LMC, there are no user-serviceable parts inside. Only qualified technicians should open the LMC for maintenance or repairs.
- Risk of shock – Ensure that no water or other liquids enter the LMC.

5.1. Inspection

Regularly visually inspect the LMC and wires for any signs of damage or wear, such as cracks or loose connections. If you observe any problems, do not use the LMC and contact us at support@vool.com for repairs.

Regularly check if the LMC is properly functioning using the VOOL Admin portal.

5.2. Cleaning

Clean the outside of the LMC using a soft cloth and mild cleaning solutions. It is important to discard the VOOL LMC in an environmentally responsible and safe manner. The LMC contains potentially hazardous materials that require proper disposal methods.

6. Discard

With correct disposal, you contribute to the recycling and reusing of most of the LMC materials.

Discard the LMC at your local recycling and collection point for small electrical household equipment. This ensures that batteries and other potentially hazardous materials are separately collected in accordance with local guidelines and regulations.

Ensure that electrical and electronic equipment is discarded separately, adhering to the WEEE – 2012/19/EU Directive concerning the disposal of waste electrical and electronic equipment.

If you are unsure about where to dispose of the equipment, please reach out to the government waste-disposal department in your country.

Do not dispose of the LMC or any of its components with your regular household waste.

Technical Specifications

7. Technical Specifications

FEATURES

Gateway functionality	OCPP 1.6, OCPP 2.0
Energy metering	On-line and off-line energy metering and tracking
Integration	PV panels, batteries
Smart price monitoring	EU markets
Station master	64 chargers + other smart appliances
Dynamic load management	DLM (1) and DPM (1)

(1) In combination with Charger and/or Multiphaser, LMC enables dynamic load management and dynamic phase management for 100% grid utilization.

DLM response time	Below 50ms
Firmware updates	OTA

EXTERNAL INTERFACES

Internet connectivity	4G, Wi-Fi (IEEE 802.11 b/g/n), Ethernet 10/100
External modbus meter	RS485
Local device network	CAN
Current input	3x external current transformer

SAFETY

Overvoltage category	CAT III
Compliance	LVD, RoHS
Protection against electric shock	CLASS I

GENERAL SPECIFICATIONS

Operating voltage	90–265 VAC
AC frequency	50 or 60Hz
Dimensions (WxHxD)	85 x 85 x 59 mm
Weight	0.3 kg
Mounting options	DIN-rail, bolt mounted
Operating temperature	–25...+65 °C
Ambient temperature range	–40...+55 °C
Cooling	Natural convection
Enclosure environmental rating	Indoor / IP22
Standards	LVD 2014/35/EU, EMC 2014/30/EU
Standard warranty	36 months

Warranty Information

General Terms

The VOOL LMC Limited Warranty provides coverage for a period of 3 years (3 years for EU member states) from the date of purchase.

The Limited Warranty covers the refund, repair, or necessary replacement of adapters that have manufacturing defects occurring during normal use.

The VOOL LMC Limited Warranty does not provide coverage for any damage or malfunction caused directly or indirectly by normal wear and tear, abuse, misuse, carelessness, accidents, or using the LMC in a manner unsuitable for its intended purpose. The Limited Warranty does not provide coverage for improper maintenance, storage, or transport. This includes but is not limited to, situations where

- Maintenance and warnings specified in the documentation are not followed;
- External factors, including but not limited, such as faulty electrical wiring, damaged junction boxes, circuit breakers, power outlets, environmental factors, or natural disasters such as fire, earthquake, water, lightning, etc.
- Paint damage or any general appearance minor damages that may occur on the surface such as scratches, scrapes, small marks or notches, bumps, or fractures.
- VOOL is not contacted immediately after discovering a defect that is covered by the warranty.
- Non-certified parts or accessories or any other modification is made by an unauthorized person or facility.
- There is improper repair or maintenance, without non-genuine accessories or parts.

While it is not mandatory for you to have all maintenance, service, or repairs done at the VOOL service center, the Limited Warranty may not provide coverage when there are inadequate maintenance, service, or repairs.

For this reason, it is advised you have all maintenance services and repairs performed in an authorized repair facility.

Apart from the rights provided under the VOOL LMC Limited Warranty, you may be entitled to additional legal rights based on the laws in your local region or country.

Limits of Liability

This limited warranty is only for the VOO LMC. Any other warranties or conditions that may arise under relevant local laws, federal statutes, or otherwise, in law, including but not limited to implied warranties and conditions of merchantability or merchantable quality, durability, or those arising by a course of dealing or usage trade, are either disclaimed to the maximum extent permitted by your local law or limited in duration to the term of this VOO LMC Limited Warranty. To the maximum extent permitted by your local law, necessary repairs and/or replacements will be carried out using new remanufactured components. By your local law, the liability of the VOO LMC Limited warranty is limited to a reasonable cost of repair or replacement. This cost will not exceed the manufacturer's suggested retail price. If the replacement is necessary, it may be fulfilled with non-original manufacturer's parts of similar quality.

If the costs of repairing or replacing the VOO LMC exceed its fair market value at the time when the defect was discovered, VOO will not be responsible for covering such costs. Furthermore, the total benefits you receive under this VOO LMC Limited Warranty cannot exceed the price you paid for the VOO LMC.

VOO does not allow the creation of any additional responsibilities or liabilities on behalf of the company. VOO company reserves the right to decide whether to repair or replace a component and whether to use new, reconditioned, or remanufactured parts.

To the extent allowed by local law, VOO declares that it takes no responsibility for any indirect, incidental, special, or consequential damages arising from or relating to the VOO LMC. Including, but not limited to transportation, loss of the LMC, reduction of the vehicle value, loss of time, income, personal or commercial property, inconvenience or annoyance or emotional stress or harm, expenses that are made for towing, bus fares, vehicle rental, service call charges, gasoline expenses, lodging expenses and incidental expenses such as telephone calls, emails, etc.

Regardless of the nature of your claim, whether it is based on contract, tort, breach of warranty or conditions, misrepresentation, or any other law, these limitations and exclusions will still apply. This includes the situations where damages were reasonably foreseeable.

Laws and Dispute Resolution

In compliance with local laws, VOOOL requests that you notify them in written form of any manufacturing defects within a reasonable timeframe and during the coverage period specified in the VOOOL LMC Limited Warranty. This will allow us to perform any necessary repairs. If you have any disputes that require resolution, please send a written notification to:

support@vool.com

or

Telliskivi 51b
10611, Tallinn
Estonia

The following information must be provided:

- The date of purchase
- Your name and contact information
- Detailed information about the problem you are experiencing
- Details about the attempts you have made to resolve the issue

If any disputes or arguments arise between you and VOOOL about the VOOOL LMC Limited Warranty, Vool will try all possibilities to reach for agreeable resolution.

For more information, support,
or inquiries, please reach out to us at

info@vool.com

VOOL