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# VOOL

## **VOOL Load Management Controller LMC**



## 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, or 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](mailto: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 to the level of risk of the described hazardous situation.

Signal sign	Results when ignored
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	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**

- The content of this manual is protected by copyright and other intellectual property laws. The content of this manual may only be copied, modified, reproduced and/or translated with express written permission from VOOL.
- This manual may only be published, transmitted, displayed or made available to a third party with express written permission from the manufacturer.

## **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**

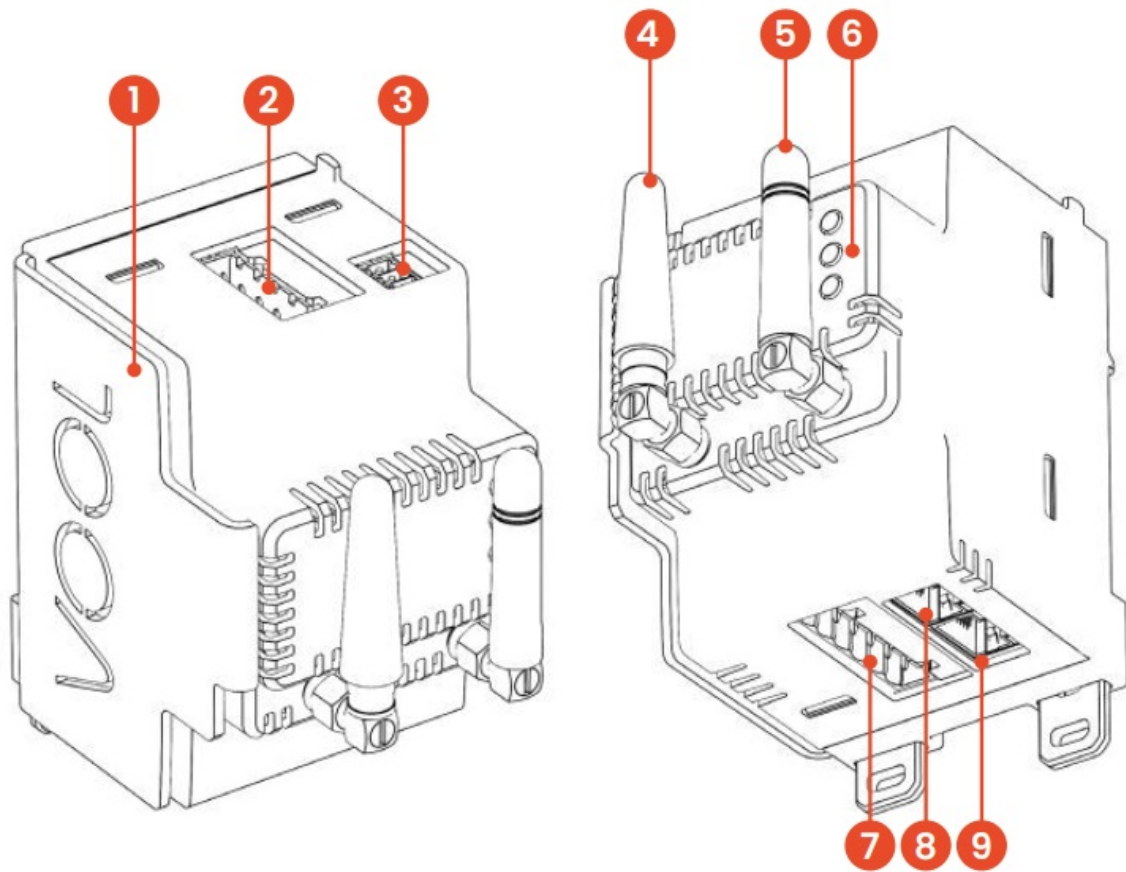
## **Intended use**

- 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.

## **Description and operation**

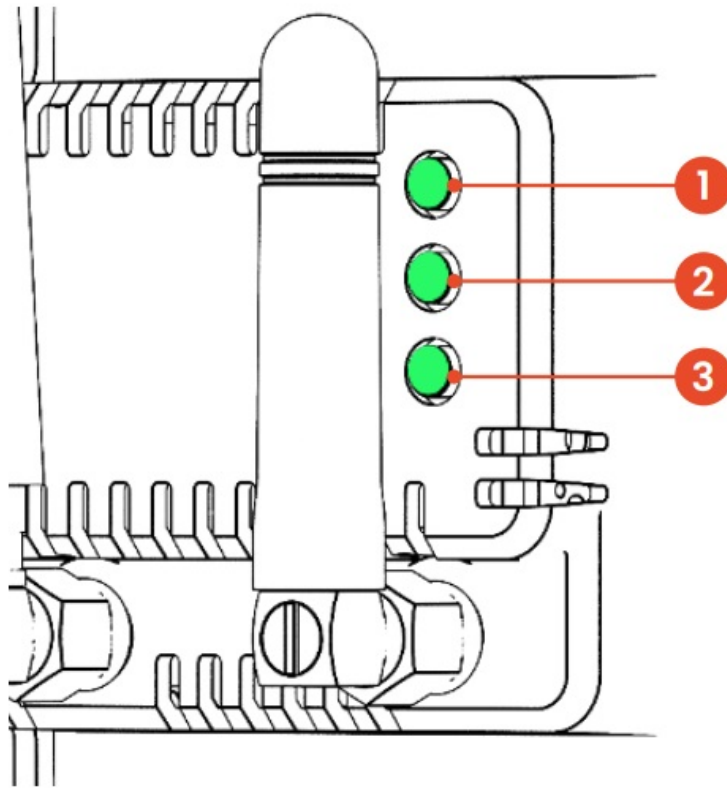
- The VOOL LMC is mounted in the electrical switchboard and is connected to your home grid. The LMC continuously measures the grid usage of each phase, using current transformers (CT) mounted around the main phase wire(s) of the power grid.
- The LMC uses this live information to calculate the remaining 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.

## **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

## Product



## Status LEDs

1. Power
2. Ethernet connection
3. Charger connection

## Safety

### 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.

### 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](mailto:support@vool.com) for replacement labels.

## **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 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.



## 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.

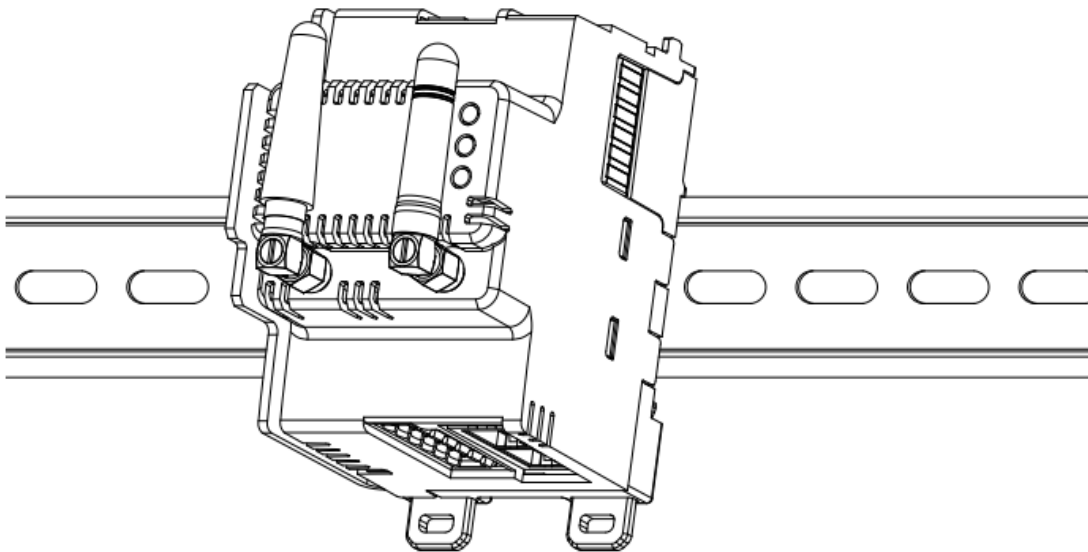
## WARNING

- 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

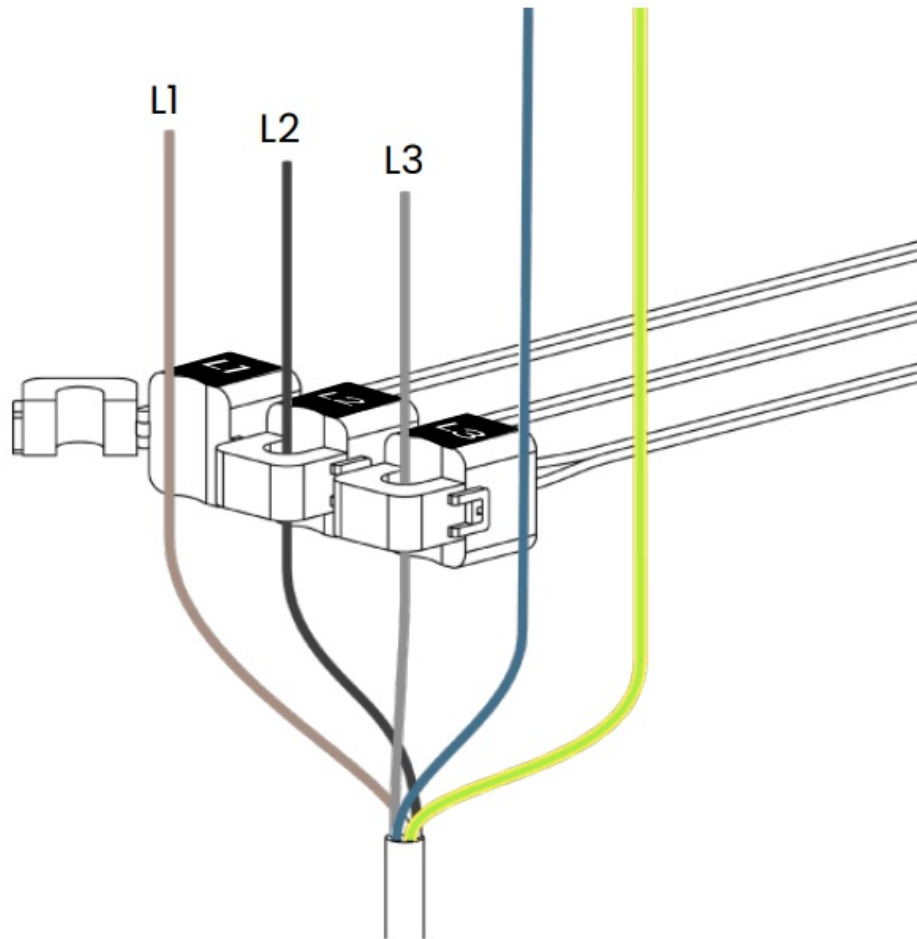
### Mount the LMC on a DIN rail

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



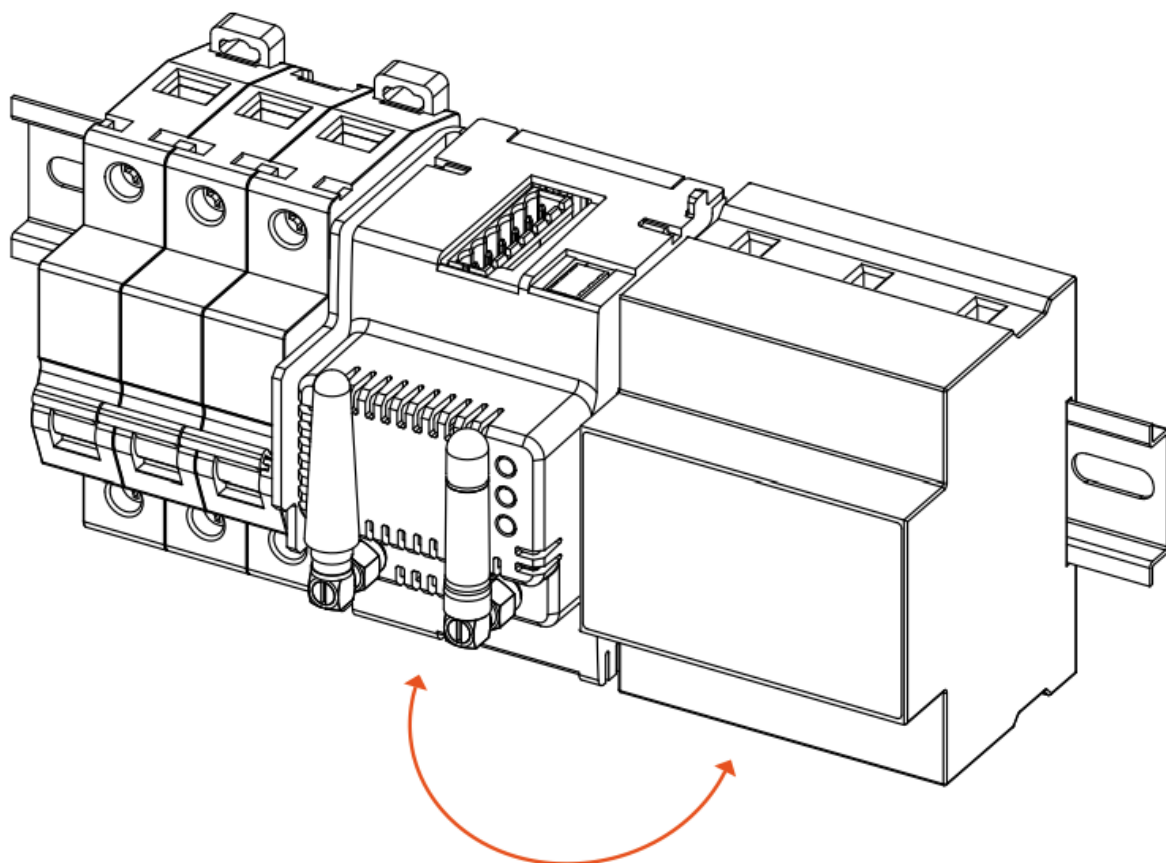
### Connect Current Transformers

- 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.



#### Install with Previously Installed Current Transformers or Multimeter

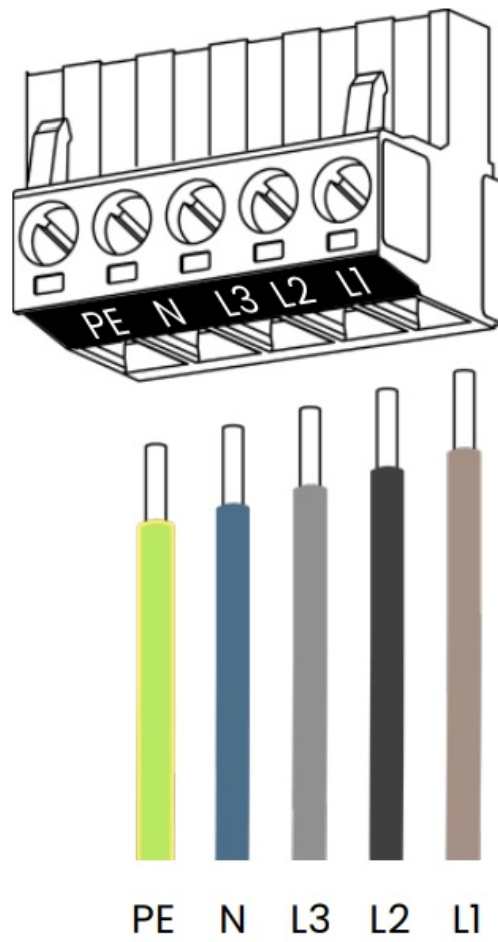
- If current transformers are installed in the distribution box, ensure compatibility before connecting to the LMC.
- If a multimeter that supports the Modbus protocol is available on-site, it can be directly connected to the LMC. Both devices need to be in the same LAN. The cable is to be connected to the LMC Ethernet port.



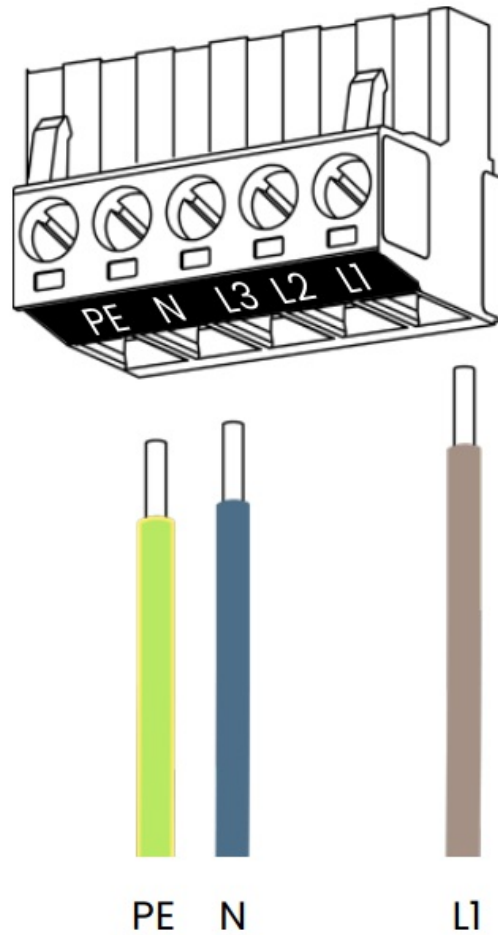
## Connect AC Power Supply

(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.



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

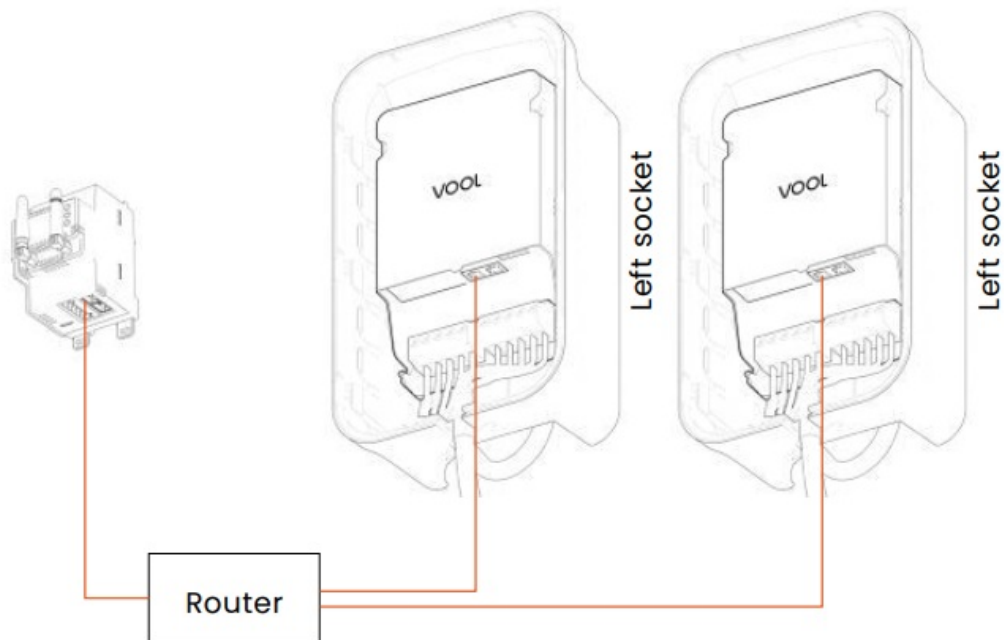


- Switch on the LMC and ensure that the top and bottom LED lights up.
- If any LEDs are unlit or red, refer to the troubleshooting section.

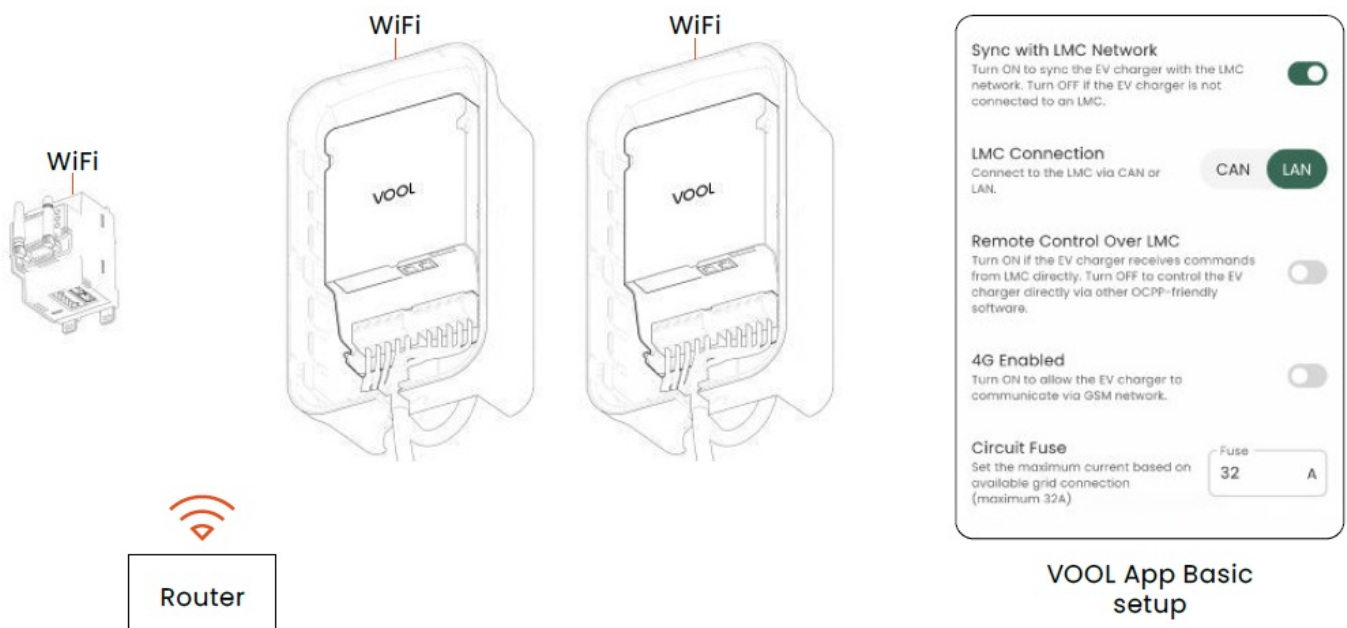
### Connecting LMC to Chargers

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

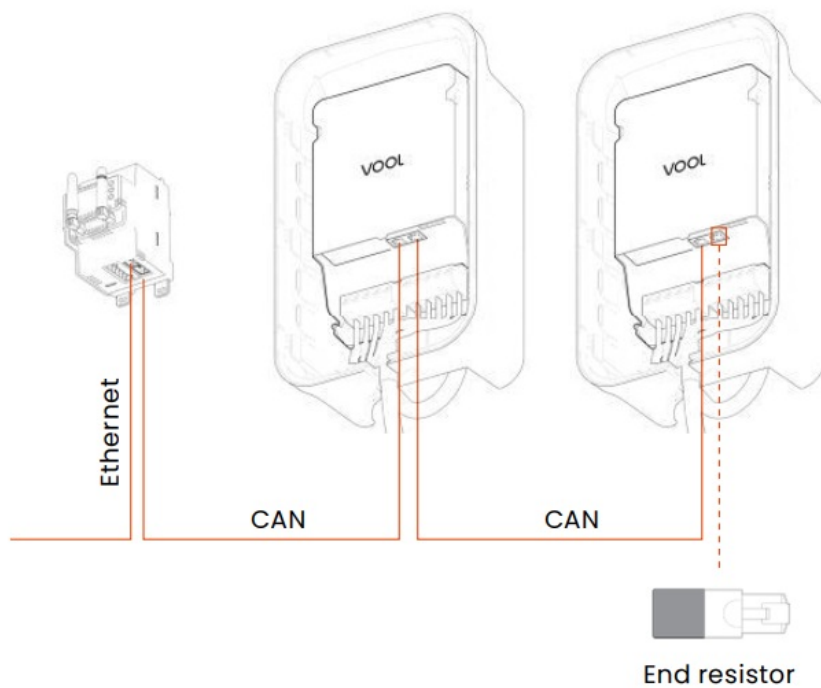
#### 3.5.1



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



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



Sync with LMC Network  
Turn ON to sync the EV charger with the LMC network. Turn OFF if the EV charger is not connected to an LMC.

LMC Connection

Connect to the LMC via CAN or LAN.

CAN

LAN

Remote Control Over LMC

Turn ON if the EV charger receives commands from LMC directly. Turn OFF to control the EV charger directly via other OCPP-friendly software.

4G Enabled

Turn ON to allow the EV charger to communicate via GSM network.

Circuit Fuse

Set the maximum current based on available grid connection (maximum 32A).

Fuse

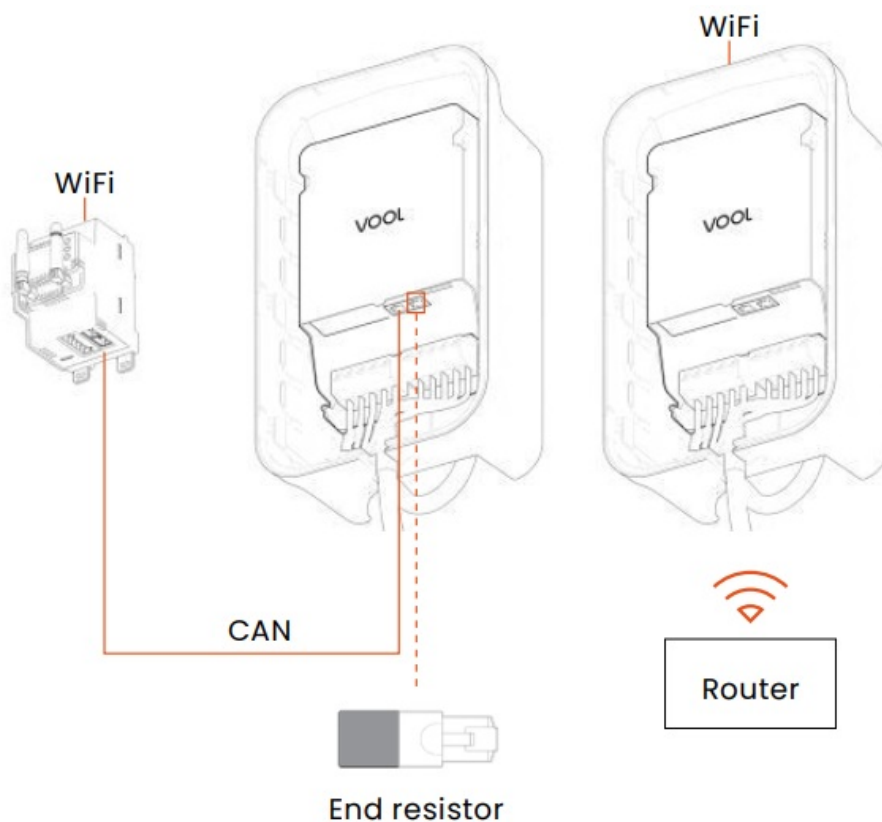
32

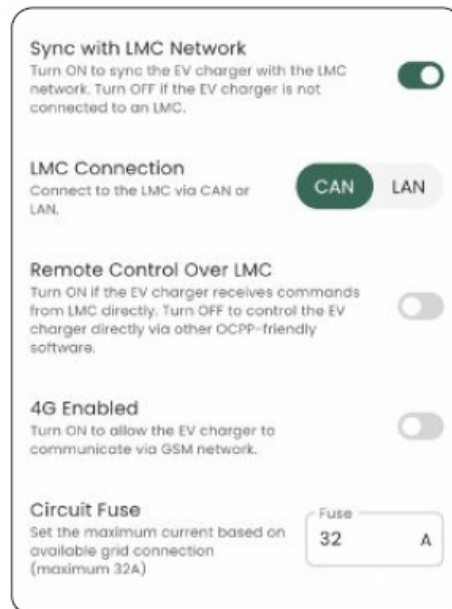
A

VOOL App Basic setup

**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.

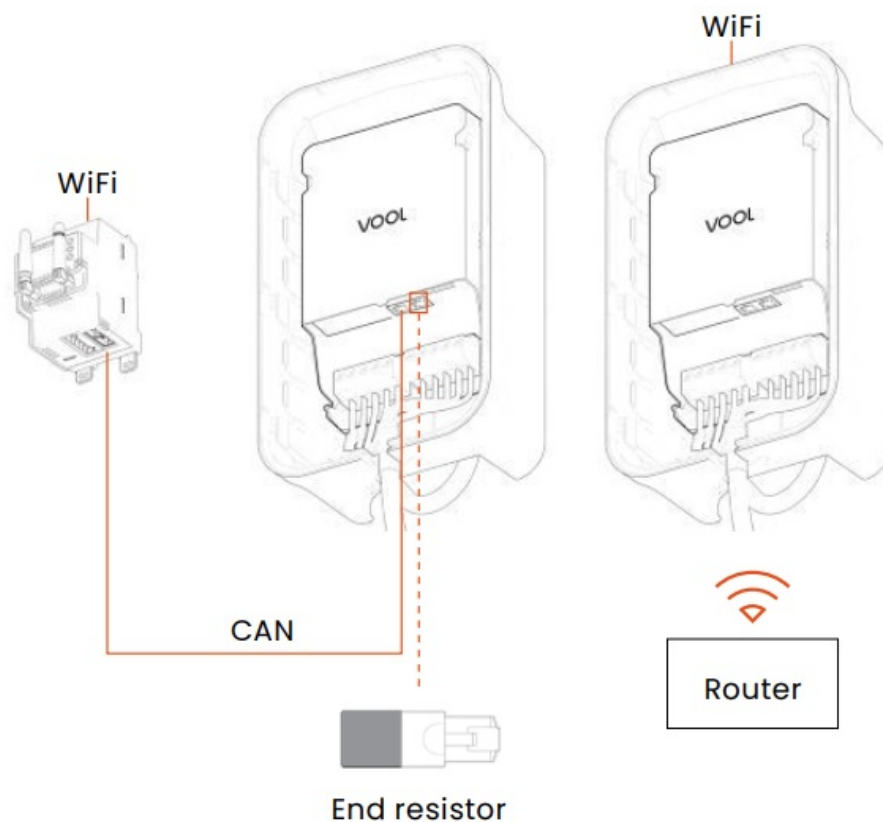
### 3.5.4





### VOOL App Basic setup

- **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.



- **Scenario 5:** The Charger(s) and the LMC are connected via CAN and LAN. The LMC is connected to the Internet via an Ethernet cable or WiFi and the charger needs to be connected in the same LAN. The last Charger on the CAN 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 VOOL 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..

## **Connect to the VOOL 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.
  1. 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](mailto:support@vool.com).

## **Add the LMC in the VOOL Portal**

1. To add the LMC to the VOOL 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 one
- Add device
- Select manufacturer – VOOL
- Scan or enter the serial number and PIN located on the packaging and the LMC casing.
- If the 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 VOOL Portal. Then, select which chargers are connected to LMC on the site setup.

The screenshot shows the VOOL Portal interface for a site named 'Teatri Maja'. The 'Overview' section displays details for the site, including its address (Teatri v 1, 10143 Tallinn), charging rules (Auto start, 24h, every day), and availability (Public, Market + €0.30/kWh). The 'Devices' section lists two devices: 'Primary LMC' (VOOL • LMC) and 'Charger 1' (VOOL • Charger). The 'Primary LMC' device is highlighted with a red box, and its 'Controller/Group' dropdown menu is also highlighted, showing 'Primary LMC' as the selected option.

Name	Status	Grid connection	Sessions	Consumption
VOOL Primary LMC VOOL • LMC	Online	-	-	-

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

## Adjust the LMC Settings in the VOOL 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.

## Multipoint or Multilevel Load Management

- If you are installing multiple LMCs for multi-residential or commercial properties, contact directly [support@vool.com](mailto:support@vool.com) for detailed instructions

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

## 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](mailto:support@vool.com).

Error code	Explanation	Possible solution
01	No LEDs light up	<ol style="list-style-type: none"> <li>1. Switch off the LMC using the main circuit breaker in the distribution unit.</li> <li>2. Switch the circuit breaker back on.</li> <li>3. Check if the AC power supply wires are correctly connected.</li> <li>4. Make sure the main power in the switchboard is on.</li> </ol>

02	No network connection	<p>1. Check if the Ethernet cable is connected and has internet.</p> <p>2. Make sure that Wi-Fi is configured and working.</p> <p>3. Check if 4G connection has internet access.</p>
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.	<p>1. Make sure that the serial no. and PIN are entered correctly.</p> <p>2. Make sure that the LMC has an internet connection.</p>
05	The LEDs light up continuously red	Check if the power cables are connected correctly.

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06	The LEDs blink red	<p>LMC is overheating.</p> <ol style="list-style-type: none"> <li>1. Try to reduce the ambient temperature.</li> <li>2. Switch off the LMC using the main circuit breaker in the distribution unit and allow the LMC to cool down.</li> </ol>
07	There is a malfunction in the charger.	<ol style="list-style-type: none"> <li>1. Switch off the LMC using the main circuit breaker in the distribution unit.</li> <li>2. Switch the circuit breaker back on.</li> </ol>

## 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, 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.

## 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](mailto:support@vool.com) for repairs.
- Regularly check if the LMC is properly functioning using the VOOL Admin portal.

## 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.

## **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**

### **FEATURES**

- Remote connectivity: OCPP 1.6, OCPP 2.0
- Integration: Solar<sup>1</sup>, batteries<sup>1</sup>
- Market price monitoring: EU markets
- Supported no. of chargers: 64 chargers
- Load management: Dynamic Load Management (DLM), Dynamic Phase Management (DPM), Multipoint Load Management, Multilevel Load Management
- DLM response time: Below 50ms
- Firmware updates: Automatic, OTA

### **EXTERNAL INTERFACES**

- Internet connectivity: 4G, Wi-Fi (IEEE 802.11 b/g/n), Ethernet 10/100
- External meter: Modbus RTU(RS485), Modbus TCP/UDP
- Local device network: CAN
- Current input: 3x external current transformer
- Voltage input: phase 230/400 VAC

## **SAFETY**

- Compliance: LVD
- Electrical protection: Protection CLASS I, overvoltage category III

## **GENERAL SPECIFICATIONS**

- Supply voltage: 90-265 VAC
- AC frequency: 50 or 60Hz
- Dimensions (W x H x D): 61 x 87 x 77 mm
- Weight: 0.3 kg
- Mounting options: DIN-rail, custom
- Operating temperature: -20...+55 C
- Enclosure environmental rating: Indoor / IP22
- Standards: LVD 2014/35/EU, EMCD 2014/30/EU
- Standard warranty: 5 years

Coming Soon

## **Warranty Information**

### **General Terms**

- The VOOL LMC Limited Warranty provides coverage for a period of 5 years (5 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 to, 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 VOOL 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 VOOL charger 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 VOOL 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 VOOL LMC exceed its fair market value at the time when the defect was discovered, VOOL will not be responsible for covering such costs. Furthermore, the total benefits you receive under this VOOL LMC Limited Warranty cannot exceed the price you paid for the VOOL LMC.
- VOOL does not allow the creation of any additional responsibilities or liabilities on behalf of the company. VOOL 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, VOOL declares that it takes no responsibility for any indirect, incidental, special, or consequential damages arising from or relating to the VOOL 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, VOOL requests that you notify them in written form of any manufacturing defects within a reasonable timeframe and during the coverage period specified in the VOOL 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](mailto: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 VOOL about the VOOL LMC Limited Warranty, Vool will try all possibilities to reach for agreeable resolution.

### More Info

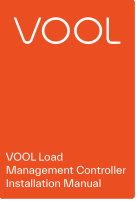
- For more information, support, or inquiries, please reach out to us at
- [info@vool.com](mailto:info@vool.com)

### FAQ

Q: What should I do if the status LEDs indicate an issue?

A: If the status LEDs show an issue, refer to the user manual for troubleshooting steps. If the issue persists, contact customer support for assistance.

## Documents / Resources

	<a href="#">VOOL Load Management Controller LMC [pdf]</a> Installation Guide Load Management Controller LMC, Management Controller LMC, Controller LMC
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### References

- [User Manual](#)

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