



Lithium-ion Battery

MLI-E 12/1200



CE

USER AND INSTALLATION MANUAL

10000013074_03

DELIVERY CONTENTS

The MLI-E 12/1200 is part of the Mastervolt MLI series of Lithium Ion batteries. These batteries are equipped with an integrated cell management system which features:

- Cell balancing
- Battery voltage monitoring
- Battery current monitoring
- Pre warning when battery is almost empty
- Battery temperature monitoring (integrated temperature sensor)
- Communication with other devices like chargers and alternators

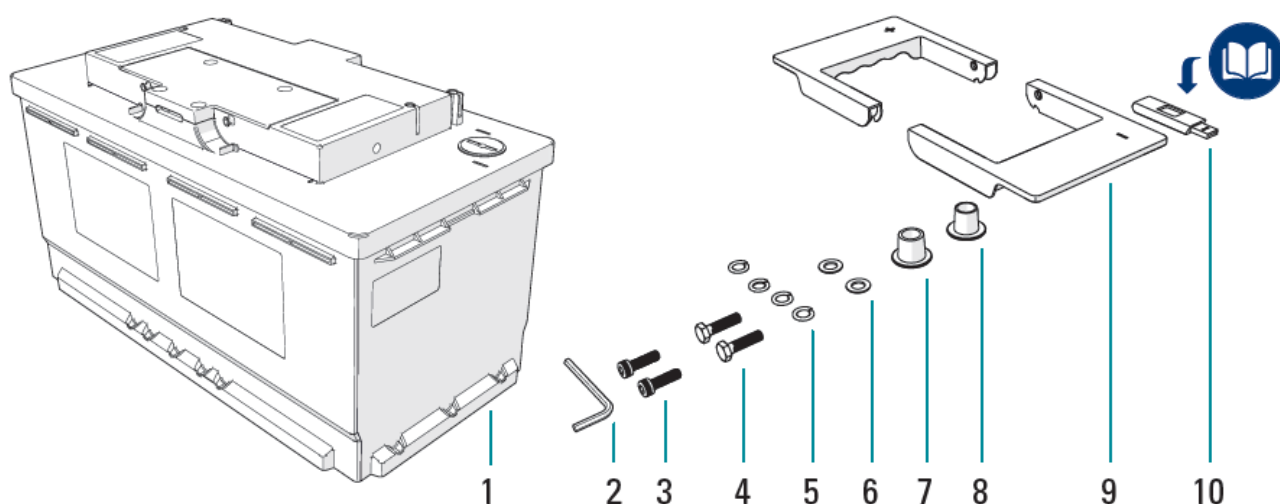


Figure 1: Delivery contents

1. (1x) MLI-E 12/1200 Battery
2. (1x) Tool (combined 2.5mm/6mm Allen hex key)
3. (2x) Hex bolt M8 x 16mm
4. (2x) Bolt M8 x 20mm
5. (4x) Spring washer M8
6. (2x) Plain washer M8
7. (1x) Removable automotive battery pole positive
8. (1x) Removable automotive battery pole negative
9. (2x) Removable handles
10. (1x) USB drive with manual

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1 SAFETY GUIDELINES AND MEASURES

1.1 General rules



Observe these instructions and keep them located near the MLI-E for future reference. Work on the Li-ion Battery should be carried out by qualified personnel only.



While working on the Li-ion Battery wear protective eye-glasses and clothing.



Any uncovered battery material such as electrolyte or powder on the skin or in the eyes must be flushed with plenty of clean water immediately. Then seek medical assistance. Spillages on clothing should be rinsed out with water.



Explosion and fire hazard. Terminals of the Li-ion Battery are always alive; therefore do not place items or tools on the Li-ion Battery. Avoid short circuits, too deep discharges and too high charge currents. Use insulated tools. Do not wear any metallic items such as watches, bracelets, et cetera. In case of fire, you must use a type D, foam or CO2 fire extinguisher.



Never try to open or dismantle the Li-ion Battery. Electrolyte is very corrosive. In normal working conditions contact with the electrolyte is impossible. If the battery casing is damaged do not touch the exposed electrolyte or powder because it is corrosive.



Li-ion Batteries are heavy. If involved in an accident they can become a projectile! Ensure adequate and secure mounting and always use suitable handling equipment for transportation. Handle with care because Li-ion Batteries are sensitive to mechanical shock.



Li-ion batteries can be charged with a voltage up to 14.6 V. On the other hand, Li-ion batteries can be discharged down to 11.0 V. Note that this voltage range (11.0-14.6V) is larger than you may expect from other battery types such as lead-acid batteries. Be aware that these voltages may exceed the permitted voltages of the connected load(s). Therefore appropriate measures must be taken to avoid damage to the connected load(s).



If charged after the Li-ion battery was discharged below the Discharge cut-off voltage, or when the Li-ion battery is damaged or overcharged, the Li-ion battery can release a harmful mixture of gasses such as phosphate.

Non-compliance with operating instructions, repairs made with other than original parts, or repairs made without authorization render the warranty void.

1.2 Transportation warnings



The Li-ion battery must be transported in its original or equivalent package and in an upright position.

If the battery is in its package, use soft slings to avoid damage.

Do not stand below a Li-ion battery when it is hoisted.

Never lift the battery at the terminals, only lift the battery at the handles.

Batteries are tested according to UN Handbook of Tests and Criteria, part III, sub section 38.3 (ST/SG/AC.10/11/Rev.5).

For transport the batteries belong to the category UN3480, Class 9, Packaging Group II and have to be transported according to this regulation. This means that for land and sea transport (ADR, RID & IMDG) they have to be packed according to packaging instruction P903 and for air transport (IATA) according to packaging instruction P965. The original packaging satisfies these instructions.

1.3 Correct disposal of this product

This product is designed and manufactured with high quality materials and components, which can be recycled and reused. Batteries marked with the recycling symbol must be processed via a recognized recycling agency. By agreement, they may be returned to the manufacturer. Batteries must not be mixed with domestic or industrial waste.

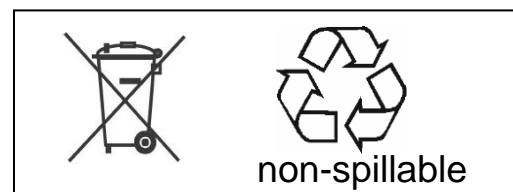


Figure 2: Disposal and recycling symbols

Please be informed about the local separate collection system for electrical and electronic products. Please act according to your local rules and do not dispose of your old products with your normal household waste. The correct disposal of your old product will help prevent potential negative consequences to the environment and human health.

2 GENERAL INFORMATION

2.1 Use of this manual

This manual serves as a guideline for the safe and effective installation, operation and maintenance of the Mastervolt MLI-E series of lithium ion batteries further mentioned as “Li-ion Battery” or “Li-ion Batteries”. It is therefore obligatory that every person who works on or with the Li-ion Battery is completely familiar with the contents of this manual, and that he/she carefully follows the instructions contained herein.

Installation of, and work on the Li-ion Battery, may only be carried out by qualified, authorized and trained personnel, consistent with the locally applicable standards and taking into consideration the safety guidelines and measures (chapter 1 of this manual). Keep this manual at a secure place!

All of the specifications, provisions and instructions contained in this manual apply solely to the following products:

Part number	Description
66011200	Li-ion Battery MLI-E 12/1200

2.2 Disclaimer

Our products are subject to continual development and improvement. Therefore, additions or modifications to the products may cause changes to the technical data and functional specifications. No rights can be derived from this document. Please consult our most current Terms & Conditions of Sale.

2.3 Warranty specifications

Mastervolt guarantees that the Li-ion Battery has been built according to the legally applicable standards and specifications. Acting not conform instructions and specifications contained in this manual, may damage the battery or it may not fulfill its specifications. All of these matters mean that the warranty becomes invalid.

The warranty is limited to the costs of repair and/or replacement of the product. Costs for installation labor or shipping of the defective parts are not covered by this warranty. Battery damage as a result of over and undercharging is not compensated. You must take measures to disconnect the Li-ion battery based on (MasterBus) generated alarms by this battery, otherwise warranty becomes invalid. Use of a battery controlled external safety relay is obligatory (refer to chapter 4). The correct functioning of this product is subject to warranty. The period and conditions of this warranty are laid down in Mastervolt Warranty Terms and Conditions which can be downloaded from www.mastervolt.com/support.

2.4 Liability

Mastervolt accepts no liability for:

- Consequential damage due to use of the Li-ion Battery;
- Possible errors in the manuals and their results.
- Use that is inconsistent with the purpose of the product.

2.5 Identification label

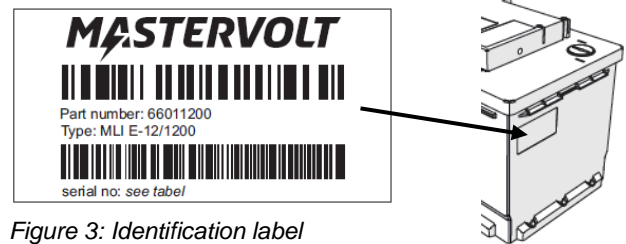


Figure 3: Identification label

The identification label is located at the top side of the Li-ion Battery, next to the grip handle (see Figure 3). Important information required for service or maintenance can be derived from the identification label.



CAUTION!

Never remove the identification label.

2.6 Use for intended purpose

The Li-ion Battery is constructed as per the applicable safety-technical guidelines.

Use the Li-ion Battery only:

- in a technical correct condition;
- in a closed, well-ventilated area, protected against rain, moist, dust and condensation;
- observing the instructions and specifications in this manual.



WARNING

Never use the Li-ion Battery at locations where there is danger of gas or dust explosion or potentially flammable products!

Use of the Li-ion Battery other than mentioned in point 2 is not considered to be consistent with the intended purpose. Mastervolt is not liable for any damage resulting from the above.

2.7 Organizational measures

The user must always:

- have access to the user manual;
- be familiar with the contents of this manual. This applies in particular to chapter Safety Guidelines and Measures.

2.8 Maintenance and repair

If the electrical installation is switched off during maintenance and/or repair activities, it should be secured against unexpected and unintentional switching on:

- switch off all charging systems;
- switch off the connection with the batteries;
- be sure that third parties cannot reverse the measures taken.

If maintenance and repairs are required, only use original spare parts.

2.9 General safety and installation precautions

- Do not expose the Li-ion Battery to rain, snow, spray, moisture, excessive pollution and condensing circumstances. Do not install the Li-ion Battery in a non-ventilated area, overheating may result.
- Short circuiting or reversing polarity will lead to serious damage to the Li-ion Battery, equipment connected to the Li-ion Battery and the wiring. Fuses between batteries and equipment cannot prevent damage caused by reversed polarity and the warranty will be void.

- Protect the wiring with fuses, according to the local standards.
- Connection and protection must be done in accordance with local standards.
- Do not work on the Li-ion Battery or system if it is still connected to a power source. Only allow changes in your electrical system to be carried out by qualified electricians.
- Check the wiring at least once a year. Defects such as loose connections, burned cables etc. must be corrected immediately.

2.10 Warning regarding life support applications

Mastervolt products are not designed to be used as component of medical equipment, unless negotiated in the form of a written agreement between customer and/or manufacturer and Mastervolt. Such agreement will require the equipment manufacturer either to contract additional reliability testing of the Mastervolt parts and/or to commit to undertake such testing as a part of the manufacturing process. In addition the manufacturer must agree to indemnify and not hold Mastervolt responsible for any claims arising from the use of the Mastervolt parts in the life support equipment.

3 OPERATION

3.1 Charging and discharging

Use the MLI-E within the specifications as stated in section 8.1.

3.2 Cell management system

The MLI-E consists of a pack of battery cells. As with all kind of batteries, there is always some kind of unbalance present between the individual cells. During charging of an unbalanced battery pack, one or more cells will reach the maximum state of charge before the other cells. During discharge the cells that are not fully charged will be depleted prior to the other cells, causing early undervoltage shutdown of the pack. Normally spoken, these early charge and discharge limits reduce the usable capacity of the battery and will shorten the expected lifetime of the pack. To avoid this kind of premature failure, the MLI-E is provided with a Cell Management System (BMS). With this system, each cell is conditioned individually.

Features of the Cell Management System:

- Balancing between the different cells. Normally, cells in a series string receive identical currents. With the Cell Management System current from stronger cells will be transferred to the weaker cells during the charging/ discharging process and idle mode;
- Protection of each separate cell from under- and over-charging by voltage monitoring of each individual cell;
- Prevention of too deep battery discharges;
- Monitoring of temperature. Each separate cell as well as the external temperature of the battery pack is being monitored;
- Communication with Mastervolt charge devices to maximize safety and performance;
- Pre warnings when the state of charge is becoming low.



WARNING

Before using the MLI-E, it must be installed and commissioned in accordance with the instructions stated in chapter 4 of this manual!

3.3 Safety features

Under- and over-charging and excessive temperatures may lead to permanent damage to the MLI-E and even to dangerous situations. Therefore the Li-ion battery is provided with several advanced safety features.



WARNING

Alarms and warnings generated by the MLI-E should not be neglected. It is the user's responsibility to take adequate measures.

There are two levels of protection:

- **Warning:** The yellow LED of the MLI-E will be lit.
- **Alarm:** The red LED of the MLI-E will be lit. This is an "emergency stop" of the battery. The battery will disconnect itself from the system.

3.4 MasterBus functionality

Refer to chapter 1 for advanced MasterBus functionality.

The Li-ion battery is **not** able to power the MasterBus network. A proper amount of powering devices should be placed in the MasterBus network.



CAUTION!

Make sure to place the MLI-E batteries on the end of a MasterBus network.

3.5 Connections and battery controls

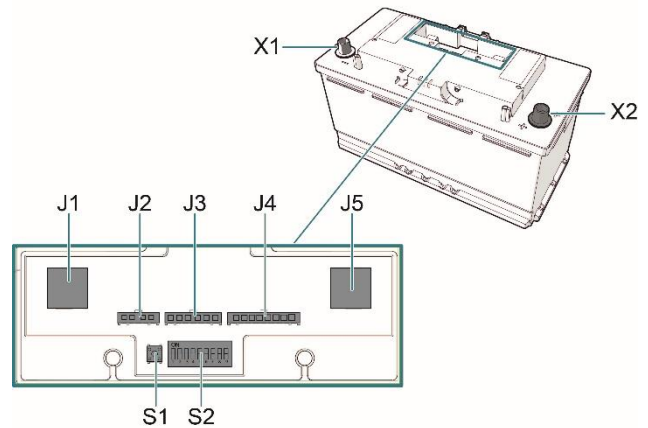


Figure 4: Connections and battery controls

Port/connection	Description
J1	RJ45 (CAN1)
J2	Inputs 4-pins
J3	Monitor 6-pins
J4	Outputs 8-pins
J5	RJ45 (CAN2)
S1	Red push button
S2	Configuration switches
X1	Battery negative (–) terminal
X2	Battery positive (+) terminal

3.6 LED indicators

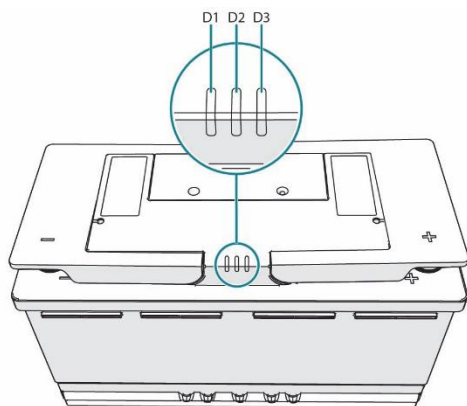


Figure 5: LED positions

3.7 Operation modes

- **Empty mode;** battery voltage is below 10V.
- **Deep discharge mode;** battery voltage is below 6V. The MLI-E is not usable anymore.
- **Storage mode;** the MLI-E was set to storage mode manually. In storage mode it uses no power. This prevents the MLI-E from draining its charge during winter for example.
- **Alarm mode;** the BMS detects either an internal or external failure. If a critical alarm occurs during operation mode, the mode management function goes to alarm mode.
- **Operation mode;** the MLI-E is fully operational. No error is detected.
- **Warning mode;** the MLI-E parameters are out of specified limit(s).

D1 (Green)	D2 (Yellow)	D3 (Red)	Operating mode	Protective disconnect device	Communication	BMS
Off	Off	Off	Empty/Deep discharge/ Storage mode	Open	No	Inactive
Off	Off	On	Alarm mode	Open	Yes	Active
On	Off	Off	Operation mode	Closed	Yes	Active
Off	On	Off	Warning mode	Closed	Yes	Active

When the battery is not charging or discharging, the green LED will blink.

Before the battery goes to Empty/Deep discharge/Storage mode, the green and the red LEDs will blink 3 times.

4 INSTALLATION



During installation and commissioning of the Li-ion battery, the Safety Guidelines & Measures are applicable at all times. See chapter 1 of this manual.

4.1 Unpacking

After unpacking, check the contents for possible damage. Check the open clamp voltage with a suitable voltage meter. It should be in the range 11.0 to 14.5V. Do not use the product if it is damaged or if the open clamp voltage is out of range. If in doubt, contact your supplier.

4.2 Required tools

- Hexagon socket wrench 13mm (M8 bolt) to connect the battery cables to the Li-ion battery (torque: see section 4.4)
- Tools to install the wiring.

4.3 Location to install

- Place the battery in a sufficiently ventilated room
- Keep the Li-ion battery away from heat sources. See specifications for allowed operating temperatures.
- Keep the Li-ion battery away from moist.
- Keep at least 1 cm between two Li-ion batteries for air flow.
- The Li-ion battery must be secured to its foundation, use appropriate LN5 fastening brackets.

4.4 General installation guidelines

- Switch off all loads and chargers before starting installation.
- Use properly sized and reliable, cables, cable lugs and battery terminals. Tighten all connections. For the

main DC connections use 13 Nm torque. Do not over torque as this will damage the Li-ion Battery beyond repair.

- Unused wiring should be insulated properly to avoid accidental contact.
- Connect the battery with the correct polarity to the charger and load(s) (positive pole to positive terminal). Note that the position of the battery poles may differ from previously installed batteries! In installations with a negative earth, connect the negative cable last of all to prevent short circuiting.
- After connecting the battery cable, close the protection lids (grip handles of the Li-ion battery) to prevent incidental touching of the terminals.



WARNING

Use properly sized fuses and wiring to prevent hazardous situations.

4.5 Connecting power cables with automotive type terminals

1. Connect the positive wire of the load or charger to the positive (+) terminal of the battery, see Figure 6.



CAUTION

Do not connect the negative (–) terminal first as this may lead to short circuits.

2. Connect the negative wire of the load or charger to the negative (–) terminal of the battery, see Figure 6.
3. Ensure both contacts are firmly tightened.
4. Place the handle covers over the terminals.

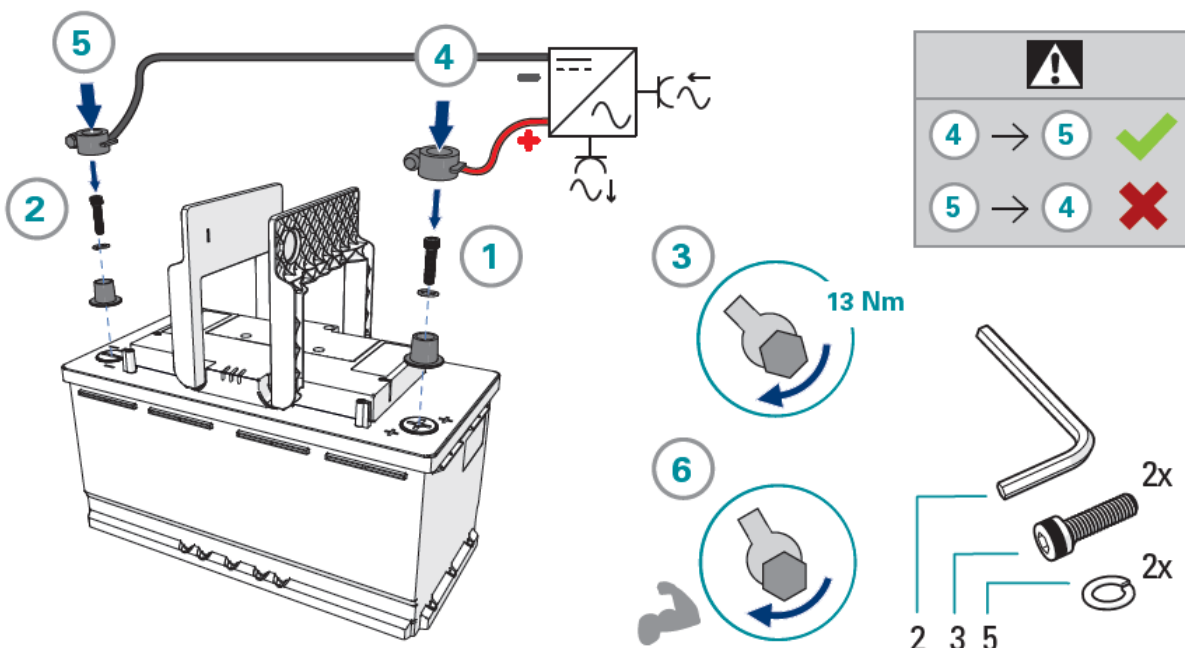


Figure 6: Connect the X1 (–) and X2 (+) terminal of the battery (automotive terminals)

4.6 Connecting shrink fit type of power cables

1. Remove the automotive power terminals, see Figure 7.
2. Connect the positive wire of the load or charger to the positive (+) terminal of the battery, see Figure 8. Use the included M8 bolt, spring washer and plain washer to connect the battery cable.



CAUTION

Do not connect the negative (–) terminal first as this may lead to short circuits.

3. Connect the negative wire to the negative (–) terminal of the battery, see Figure 8. **Error! Reference source not found..** Use the included M8 bolt, spring washer and plain washer to connect the battery cable.
4. Ensure both contacts are tightened to 13Nm.
5. Place the handle covers over the terminals.

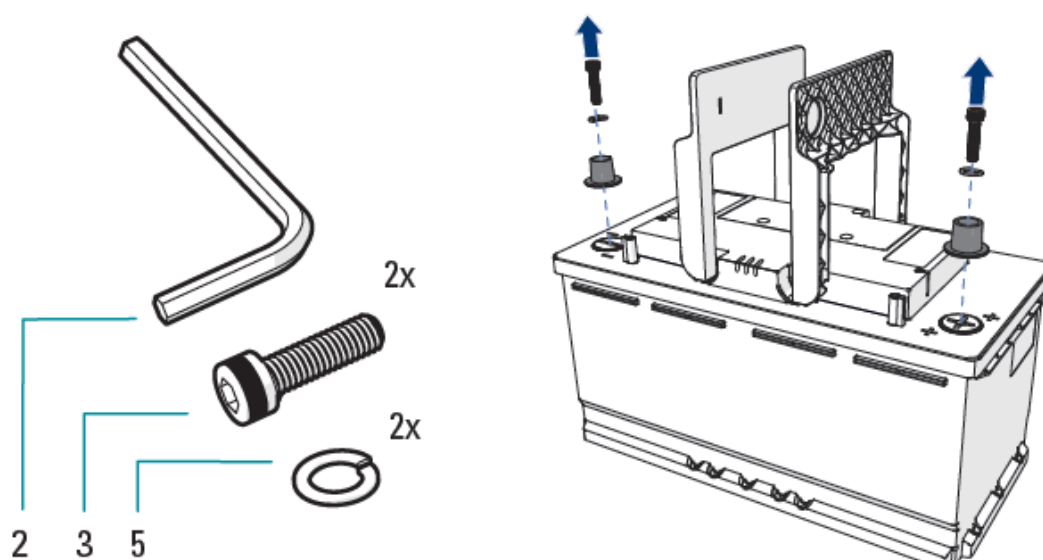


Figure 7: Remove automotive power terminals

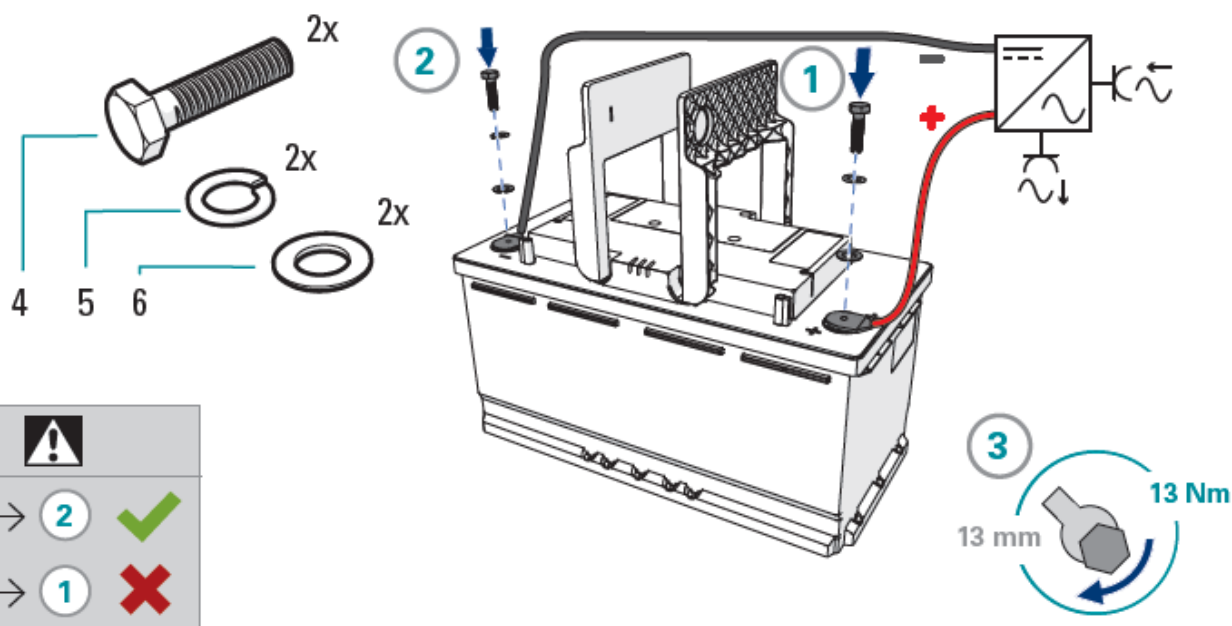


Figure 8: Connect the X1 (–) and X2 (+) terminal of the battery (shrink fit)

4.7 Connecting power cables with automotive type terminals and placing protective caps

1. Remove the handle covers, see Figure 9.
 - a. Lift the handles 30°.
 - b. Remove the handles by pulling them outwards.
2. Connect the positive wire of the load or charger to the positive (+) terminal of the battery, see Figure 10.

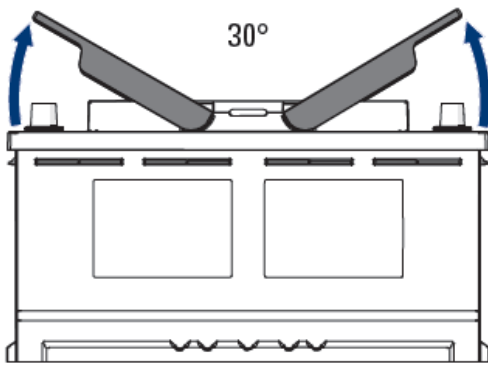


Figure 9: Remove the handle covers



CAUTION

Do not connect the negative (–) terminal first as this may lead to short circuits.

3. Connect the negative wire of the load or charger to the negative (–) terminal of the battery, see Figure 10.
4. Ensure both contacts are firmly tightened.
5. Place the accessory caps over the terminals, see Figure 11.

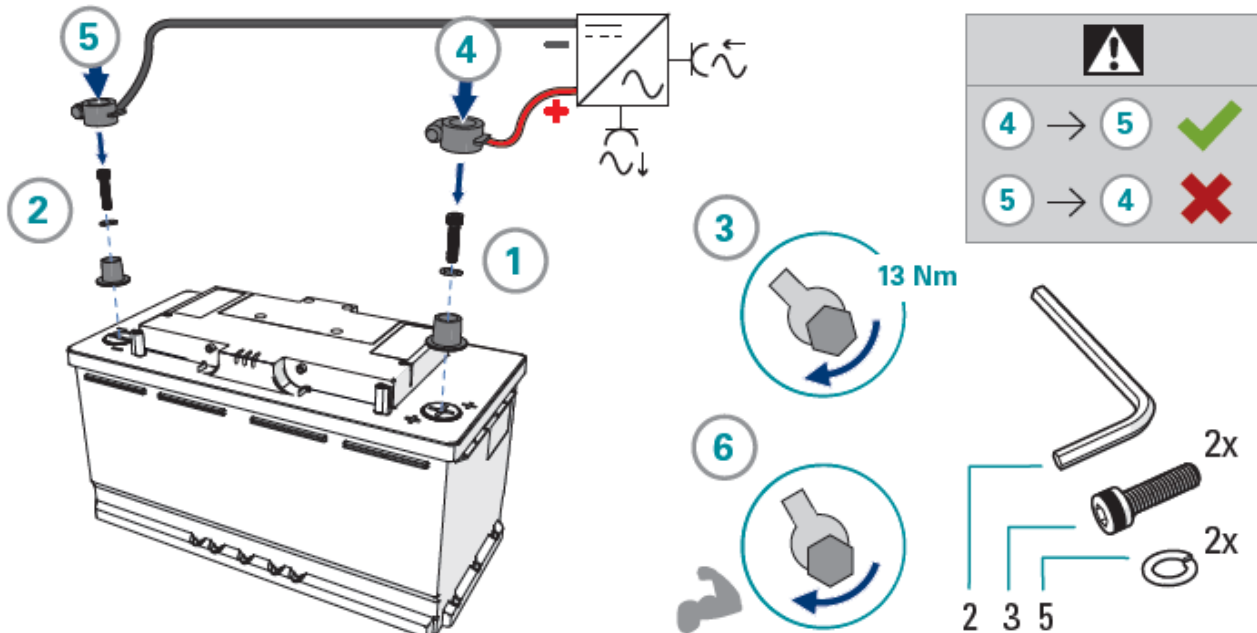
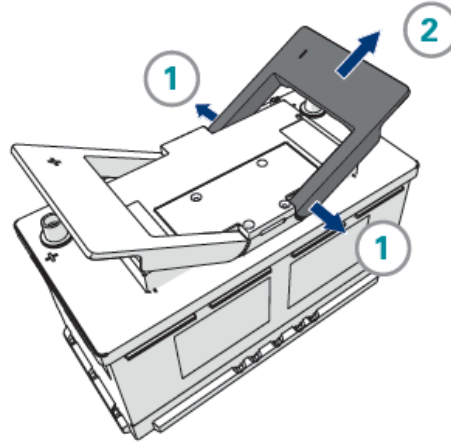


Figure 10: Connect the X1 (–) and X2 (+) terminal of the battery (automotive terminals and caps)

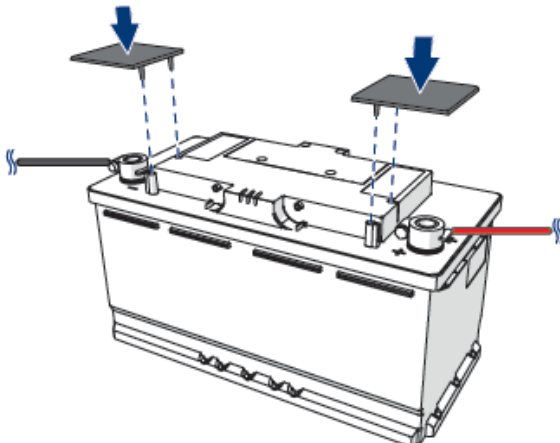


Figure 11: Place the accessory caps over the terminals

4.8 Set battery in normal operation mode

The Li-Ion battery is pre-programmed in storage mode. Before it is used, the Li-Ion battery must be set up in normal operation mode.

The Li-Ion battery can be set to normal operation mode by one of the following procedures:

- Press the red button (S1 in Figure 4) for 2 seconds.
- Connect the battery to the charger and charge the battery.

4.9 Charger settings

A single Mastervolt Li-ion battery can be charged with any standard Mastervolt battery charger. These chargers feature the MLI charging option. Without this option, IUoUo charge settings must be as follows:

Li-ion battery model	Bulk / absorption voltage setting	Float voltage setting
MLI-E 12/1200	14.25 V	13.5 V

Refer to the manual of the battery charger for adjustment.

The temperature of each cell pack as well as the temperature of the entire Li-ion battery is monitored by the cell management system.



CAUTION

Do not use a temperature sensor for temperature compensated charging!

4.10 Fuse to cable size

For fuses that comply with your cabling cross sections, we refer to ISO 10133.

4.11 Battery balancing

During the batteries lifespan, the cells within the battery may become unbalanced due to high discharge currents and short float charge periods. This may result in a loss of capacity and overcharged cells.

The MLI-E 12/1200 automatically balances the cells if necessary. Balancing can take place during charging and idle mode.

4.12 Commissioning

1. Check all wiring and connections; see also the figures in chapter 4 for wiring details.
2. Install all fuses.
3. Switch on some loads.
4. Verify that a current is flowing out of the battery (negative current).
5. Switch off the load, switch on the charger and verify that a current is flowing into the battery (positive value).
6. Charge the Li-ion battery fully until the charger switches to the float stage (maintenance charge) of the charging algorithm.

Now the MLI-E is ready for operation.

5 COMMUNICATION

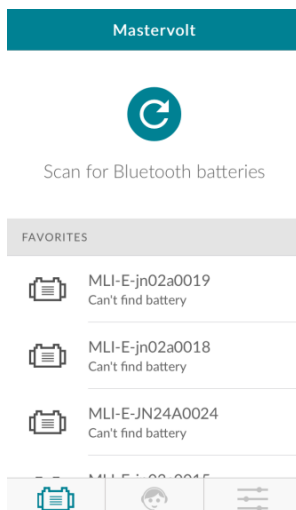
The MLI-E can be connected to an NMEA 2000 or MasterBus network. For both networks select communication type NMEA 2000 by setting the Configuration switches (S2 Figure 4 on page 7).

Switch 1	Switch 2	Switch 3	Protocol
Off	On	Off	CANOpen
On	On	Off	NMEA 2000

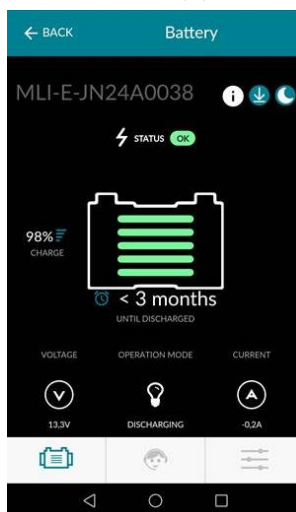
5.1 Bluetooth app

Hands-on monitoring is available using Bluetooth and a mobile app. To pair the battery with the app:

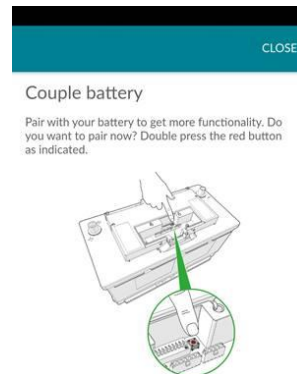
1. Download the battery monitoring app by going to the Apple App Store or the Google Play Store and searching for "Mastervolt". The app can be installed on an iPhone running iOS 9 or later, or on any Android device that runs version 5.0 or higher.
2. Open the app and tap the **Scan for Bluetooth devices** icon. Make sure Bluetooth is turned on.



3. Select the battery you want to connect.



4. After about two seconds, you need to pair the battery.



On the MLI-E, double press the red button (S1 in Figure 4).

5. On the phone, confirm to connect to the device.
6. When connected, close the previous window. The app is now ready for use.



- a) Put MLI-E in storage mode
- b) New MLI-E firmware available
- c) About the MLI-E
- d) Return to the list
- e) About support
- f) App settings

5.2 Basic NMEA Components and how to use them

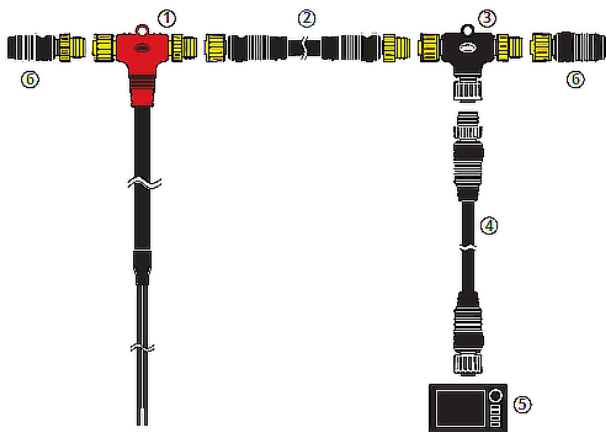


Figure 12: Basic NMEA Network Example

- ① **Power Tee** – Connects the network to a power source.
- ② **Backbone Cable** – Connects tee connectors to one another or to a power tee.
- ③ **Tee Connector** – Create a point within the network backbone to add a drop cable and device.
- ④ **Drop Cable** – Connects the network backbone to NMEA 2000 devices.
- ⑤ **NMEA 2000 device** – Any electronic device with an NMEA 2000 connection and an NMEA 2000 communication protocol;
- ⑥ **Terminating Resistors** – Terminators are required on each end of the network backbone to ensure signal integrity.

5.2.1 Adding additional NMEA 2000 devices

1. Start by determining where you will need to place a drop cable for the device.
2. Once you have determined this location, disconnect the backbone at the closest backbone connection and add in a tee connector. When connecting several drop cables in a similar location use an Ancor 2-way or 4-way tee connector.
3. Reconnect the backbone connection(s) with the new tee connector in place.
4. Connect the drop cable to the black coupler on the tee and then connect to the new NMEA 2000 device.



CAUTION!

Always make sure the NMEA 2000 network has TWO terminating resistors (one at each end of the backbone) and is connected to a power source with a power tee in **ONLY ONE** location.

5.2.2 NMEA 2000 Network limits

- Total length of the NMEA 2000 network cannot exceed 100 meters (328 feet)
- Each drop cable cannot exceed 6 meters (19.7 feet)

- Total length of all drop cables within the network cannot exceed 78 meters (256 feet)
- Maximum number of connected devices cannot exceed 30.
- There is no limit to the number of MLI-E batteries that can be monitored by an NMEA display.

5.3 What is MasterBus?



All devices that are suitable for MasterBus are marked by the MasterBus symbol.

MasterBus is a CAN based, fully decentralized data network for communication between Mastervolt devices. MasterBus is used as power management system for all connected equipment, such as the inverter, battery charger, generator and many more. Every device that is compatible with MasterBus is equipped with two data ports. The devices are simply daisy chained together, forming a local data network. This facilitates communication between the connected devices, for instance to start a generator when the batteries are low.



CAUTION!

Never connect a non-MasterBus device to the MasterBus network directly! This will void warranty of all MasterBus devices connected.

5.3.1 How to set up a MasterBus network

Keep the following rules in mind:

- Connections between the devices are made by standard straight UTP patch cables. Mastervolt can supply these cables.
- MasterBus needs a terminating device on both ends of the network.
- The electric power for the network comes from the connected devices according to the rule: 1 powering / 3 non-powering. At least one device in the network should have powering capabilities. As all powering devices are galvanically isolated, multiple powering devices are allowed. Spread the powering devices over the network. The MLI-E has no MasterBus powering capabilities.
- Do not make ring networks.
- Do not make T-connections in the network.

5.3.2 Monitor and configure the MLI-E with MasterBus

Monitoring and controlling the MLI-E in a MasterBus network requires a Mastervolt EasyView 5 remote control.

Note: One EasyView 5 panel can monitor two MLI-E batteries (always as separate units).

To configure the MLI-E in a MasterBus network, a MasterBus-USB interface connected to a PC with MasterAdjust software is also needed.

MONITORING TAB (read only)	
Menu	Description
General	
State	OK; the MLI-E is fully operational Discharge fail; fault condition, the MLI-E cannot be discharged Charge fail; fault condition, the MLI-E cannot be charged
State of charge (%)	Battery state of charge
Time remaining	Time remaining at current discharge in days:hours
Battery (V)	Battery voltage measured by the cell management system
Battery (A)	Current measured by the cell management system. Positive value: charging, Negative value: discharging
Battery (°C)	Internal temperature of the battery
ALARM TAB	
Menu	Description
Critical	
UBat too high	Battery voltage > 15.4V*
UBat too low	Battery voltage < 11.0V*
Temperature	The internal temperature is 80°C or -25°C*
Important	
UBat very high	The battery voltage is 15.0V*
UBat very low	The battery voltage is 11.5V*
Over current	The charge current is > 90A for more than 30 seconds. Reduce current. The battery current is >200A for more than 30 seconds. Reduce load immediately.
EVENTS TAB	
Menu	Description
Event source	
UBat very low	Battery voltage < 11.5V
UBat very high	Battery voltage > 15.0V
Battery pre low	State of Charge < Battery pre low level**, 30% by default
Battery low	State of Charge < Battery low level**, 20% by default
Battery full	State of Charge > Battery full level**, 95% by default
Overvoltage	Battery voltage > Overvoltage for Delay seconds**

* An alarm popup is provided in MasterBus.

** See Configuration tab – Event levels – for adjustment of the threshold levels

6 TROUBLE SHOOTING

Failure	Possible cause	What to do
No DC power available	A fuse has blown	Check all fuses and replace if necessary.
	A cable or cable connection is defective	Check all cables and their connections. Replace if necessary.
	The MLI-E is in Alarm Mode Red LED is lit. (Section 3.6)	Verify that the charging voltage is within the specifications (section 8.1). Discharge the MLI-E or press the red button (S1 in Figure 4) for 1 second.
The battery cannot be discharged.	Battery is in normal mode Green LED is blinking/lit. (Section 3.6)	Check the installation of the battery.
	Battery is in shutdown mode. No LED is lit (Section 3.6)	Charge the battery or press the red button (S1 in Figure 4) for 2 seconds.
	Battery is in degrade mode Red LED is blinking/lit. (Section 3.6)	Charge the battery.
The battery cannot be charged.	Battery is in normal mode Green LED is Blinking/lit. (Section 3.6)	Check the installation of the battery.
	Battery is in degrade mode Red LED is lit. (Section 3.6)	Discharge the battery.
Green and Yellow LED is blinking or lit	Battery in Warning mode (Section 3.6)	State of charge is low, fully charge the battery
Alarm on the MasterBus display	An alarm is activated.	The EasyView 5 will display an alarm. Correct the source of the alarm.
MasterBus display shows no Li-ion battery	The firmware of the EasyView 5 is too old.	Check if the firmware version is at least V2.10
	Error in the wiring.	Check the MasterBus cables.
	No terminating device placed at the ends of the network.	MasterBus needs a terminating device on both ends of the network (see section 6.3). Check if available.
	MasterBus network is configured as a ring network.	Ring networks are not allowed. Check the connections of the network (section 6.3).
	Battery is in storage mode	Charge the battery or press the red button (S1 in Figure 4) for 2 seconds.

7 MAINTENANCE, DECOMMISSIONING AND STORAGE

7.1 Maintenance

No specific maintenance of the Li-ion battery is required. Examine your electrical installation on a regular base, at least once a year. Defects such as loose connections, burnt wiring etc. must be corrected immediately.

Keep the battery clean and dry to avoid leakage currents. If necessary, use a soft clean cloth to clean the casing of the Li-ion battery. Never use any liquids, acids or scourers. Place the enclosed protective caps over the terminals before cleaning and other maintenance activities to avoid the risk of contacting the terminals.

7.2 Taking out of operation

If it is necessary to take the Li-ion battery out of operation, follow the instructions in order of succession as described below:

1. Disconnect all loads and charging devices.
2. Move the optional maintenance switch in the off position.
3. Disconnect all wiring
4. Place the enclosed protective caps over the terminals to avoid the risk of contacting the terminals.

Now the Li-ion battery can be demounted in a safe way.

7.3 Battery replacement



CAUTION

If Li-ion batteries need to be replaced individually, make sure that:
Before reconnection: the open circuit voltage of these batteries equals the voltage of the replaced or paralleled batteries.

7.4 Storage

The MLI-E should be stored in a dry and well ventilated environment. Follow the storage instructions in this section to optimize the lifespan of the battery during storage. If these instructions are not followed and the MLI-E has no charge remaining when it is checked, consider it to be damaged. Do not attempt to recharge or use it. Replace it with a new battery.

1. Charge the Li-ion battery to > 80% of its capacity.
2. Disconnect the MLI-E from all loads and the charging device.
3. To put the MLI-E in storage mode, 12V should be applied to pins 3/4 of connector J2. Where Pin 3 is +12V and pin 4 is GND, as shown in Figure 13.



WARNING

Avoid short-circuiting the battery terminals.

4. Place the terminal covers over the battery's terminals during storage.
5. Store the battery in a cool and well ventilated space.
6. Avoid exposure of the battery to sunlight and/or UV radiation.
7. Charge the battery to > 80% of its capacity every 100 days.

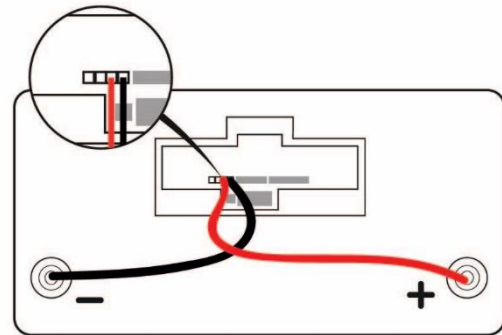


Figure 13: Storage

Tip: you can also do this with the Bluetooth App. See section 5.1.

To return to normal operation, perform one of the following actions:

- Press the red button (S1 in Figure 4) for 2 seconds.
- Connect the MLI-E to the charger and charge before use.

8 TECHNICAL INFORMATION

8.1 Specifications

Model	MLI-E 12/1200
Article number	66011200
Nominal voltage	12V
No load voltage, fully charged	13.2V
Nominal capacity (C _n)	90Ah
Nominal energy	1.2 kWh
Approximate weight	12.5 kg (27.6 lb)
Terminal type	Bolts M8 or Automotive
Chemistry	Lithium iron phosphate
Charge/discharge parameters	
Charge voltage, Bulk/absorption phase****	Minimum 13.75V Recommended 14.25V Maximum 14.6V
Charge voltage, Float phase	13.5V
Undervoltage cut off voltage***	10V
Overvoltage cut off voltage***	15V
Recommended charge / discharge current	30A / 45A
Maximum charge / discharge current	90A / 200A
Discharge pulse current (30sec)	350A
Discharge current pulse (1sec)	600A
Short circuit protection	700A
Rated capacity and cycle life	
Rated capacity	90Ah (1.2 kWh)
Cycle life	~ 5000 @ 80% DOD and 23°C
General	
Parallel configuration*	Yes, unlimited
Series configuration*	No
Operating temperature**	–40 to 65°C / –40 to 149°F
Nominal operating temperature:	25°C / 77°F
Storage temperature**	–40 to 65°C / –40 to 149°F
Self-discharge	< 4% per month @ 23°C
Warranty	2 years
Protection degree	IP51
Standards, approvals & listings	CE, E-mark
Dimensions in mm [inches]	
Length (L)	353 [13.90]
Width (W)	175 [6.89]
Height (H)	190 [7.48]
Installation angle	Mountable in multiple orientations, suitable for LN5 fastening brackets
Interfacing	
MasterBus connectivity	Yes (see chapter 1)
Powering capabilities for MasterBus	No, cuts power to the bus (see section 3.4)
Internal disconnect switch	Yes
NMEA 2000 connectivity	Yes
Bluetooth	Yes, 10m (class 2)

* For systems with more than one single battery, please refer to www.mastervolt.com/batteries.

** Temperatures below 5°C/41°F and above 25°C/77°F may affect life time and cycle life.

Charging: derating <0°C and >45°C / <32°F and >113°F

*** Trigger point for safety switch

**** Bulk/absorption phase should be terminated before current accepted by the battery < 0,015xC_n

8.2 Dimensions

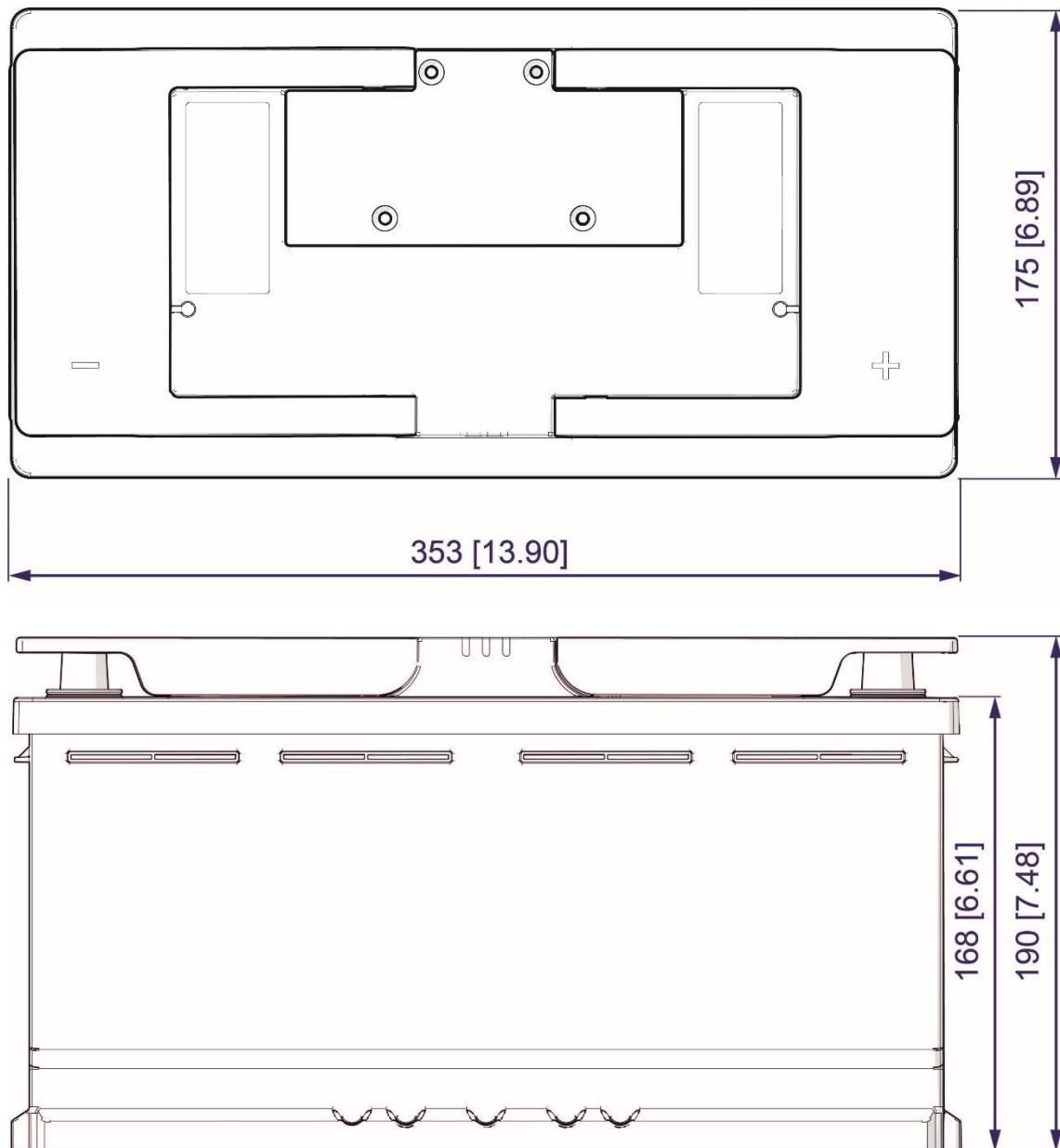


Figure 14: Li-ion battery MLI-E 12/1200 dimensions in mm [inches]



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