



Lithium Series 48V 5.1 kWh Battery

Read this manual before installing the battery and follow the instructions carefully during the installation process.

## Content

1. Scope .....	3
2. Specifications.....	3
3. Battery Dimensions .....	4
4. Features.....	4
5. Operation.....	5
5.1. Battery front .....	5
5.2. Battery back .....	5
5.3. Assembly and connection .....	5
5.3.1. Configuration without communications.....	7
5.3.2. Configuration with communications .....	8
5.4. On and Off .....	11
5.5. LED display .....	11
5.6. Protection codes.....	11
5.7. Error codes .....	12
6. Appendix.....	13
6.1. Security instructions .....	13
6.2. Safety warnings .....	13
6.3. Environmental Protection .....	14
6.4. Contact details .....	14

## 1. Scope

This document describes the basic operation of the Turbo Energy brand lithium-ion rechargeable battery (**Lithium Series 48V 5.1 kWh model**). This manual contains all the necessary details for understanding the operation of the equipment and for its correct application.

## 2. Specifications

### Electrical

Nominal Capacity	5.12 kWh
Usable Capacity	4.6 kWh
Depth of Discharge (DoD)	90%
Nominal Voltage	51.2V
Voltage operating range	48 – 57.6V
Cycle Life	>= 6000

### Physical

Weight	52 kg
Dimensions	475 x 446 x 200 mm
Protection class	IP20
Battery type	LiFePO <sub>4</sub>

### Operation

Maximum charge/discharge current	50A (0.5 C)
Temperature operating range	0°C...50°C
Humidity	15% - 85%
Maximum operating altitude	< 3000 m

### BMS

Energy consumption	<2 W running / <100mW at rest
Monitoring parameters	System voltage and current, Cell voltage and temperature
Communication	Compatible CAN and RS-485

### 3. Battery Dimensions



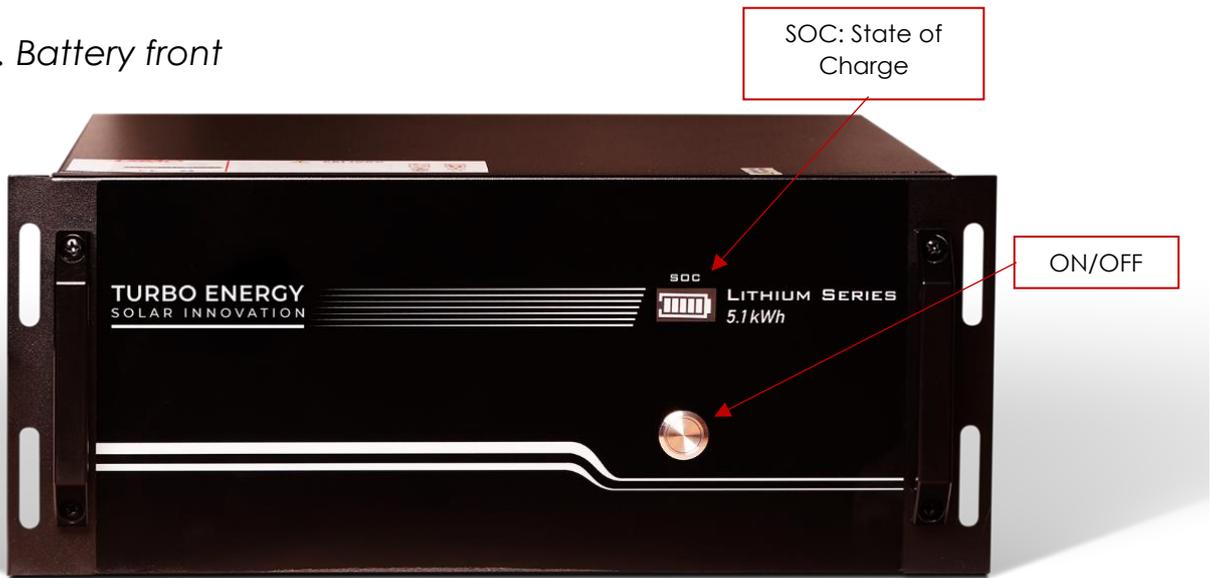
### 4. Features

The **Lithium Series 48V 5.1 kWh** battery has the following features:

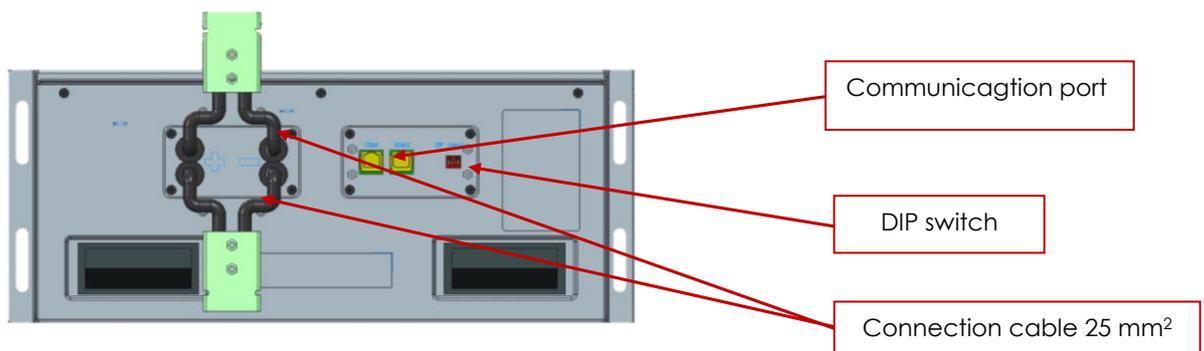
- Designed for use in photovoltaic applications.
- Battery Management System (BMS): The BMS system built into the battery that monitors its operation and does not allow it to work outside the bounds of the design regime (V, I).
- Expandability: The system's accumulation capacity can be expanded by incorporating more batteries.

## 5. Operation

### 5.1. Battery front



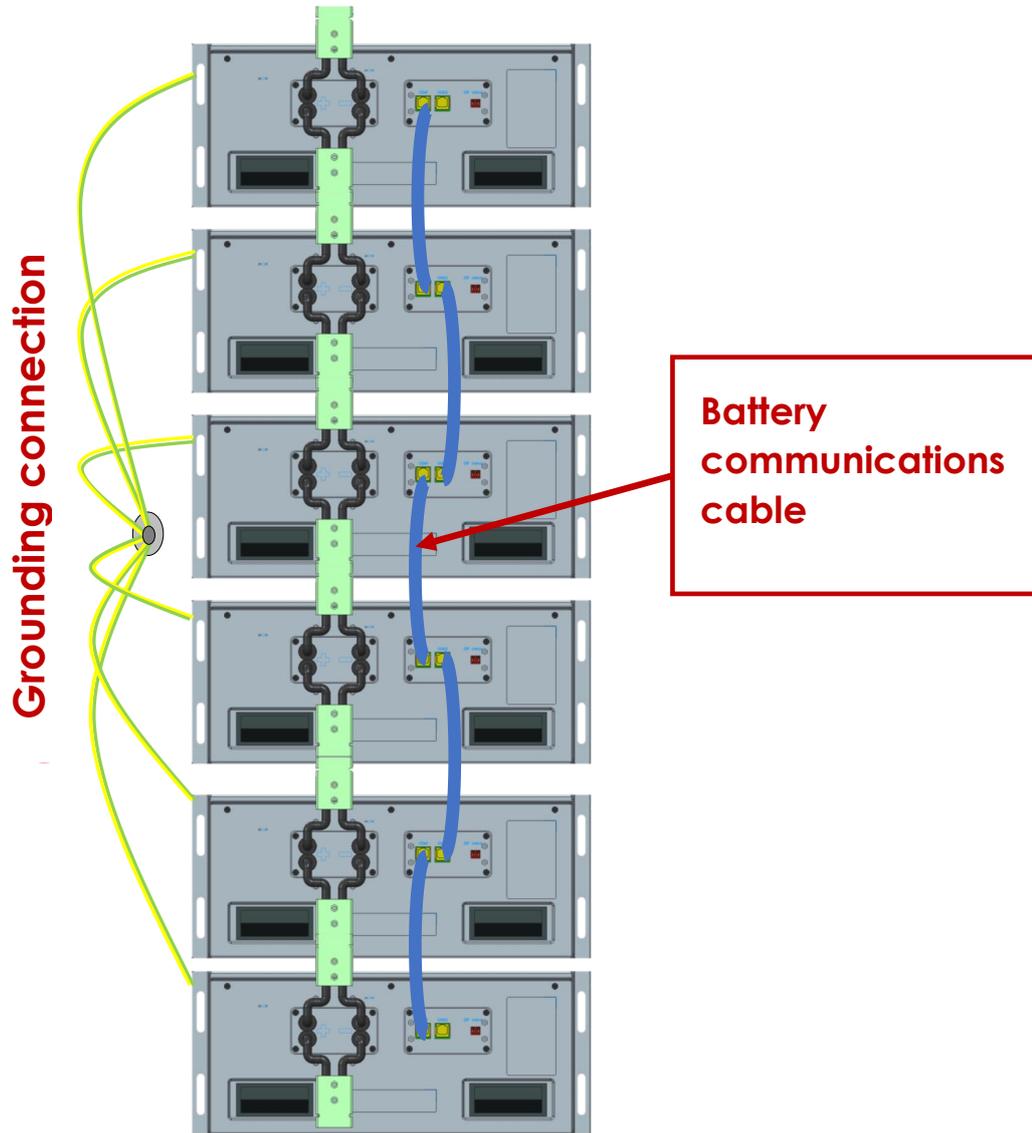
### 5.2. Battery back



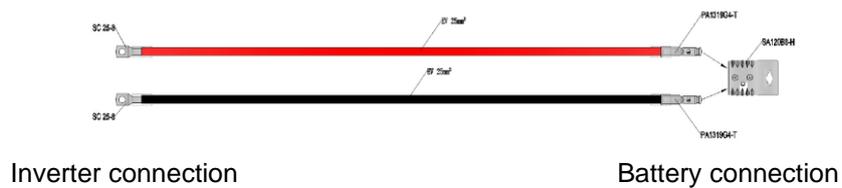
### 5.3. Assembly and connection

Batteries may be connected in parallel up to a maximum of 6. All batteries must be grounded. It is suggested to connect the installation ground to the rack at the same point as all battery lands.

- Connection between batteries:**  
 Connect the power cord by plugging the connector behind the battery module. Connect communication cable with the cable provided inside the battery pack.



- Connection between battery and inverter:



25 mm<sup>2</sup> power cable section.

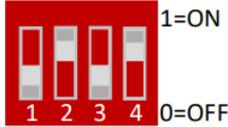
**NOTE:** Each power cord can carry a maximum of 100 A, so every two batteries would need to connect a new cable to the inverter. However, if the inverter is 5 kW only with one cable it would be sufficient to be at the limit of the maximum current recommended.

**Warning when doing a battery expansion:** It is very important that in the case of connecting batteries in parallel that are not new (for example, we add a new battery to an existing system), we previously perform a voltage balancing (without load) between them to avoid overcurrents that could damage the system. As an alternative to balancing voltages, balancing can be done by equalizing the SOC of the batteries. In addition, when connecting new batteries, we must take into account that the number of batteries at the time of connection must be similar to the number of batteries that are already connected in the system. For example, if we have five batteries installed and we want to connect a new one, we must first connect the new battery with two of the five that were already in place to balance them, and then connect these three with the other three remaining batteries in the system. Batteries should always be connected in groups of similar numbers so that a large group cannot damage a smaller group of batteries at the time of connection.

### 5.3.1. Configuration without communications

For those cases where the battery is intended to operate connected to an inverter without communications, the recommended configuration parameters are set in the following table:

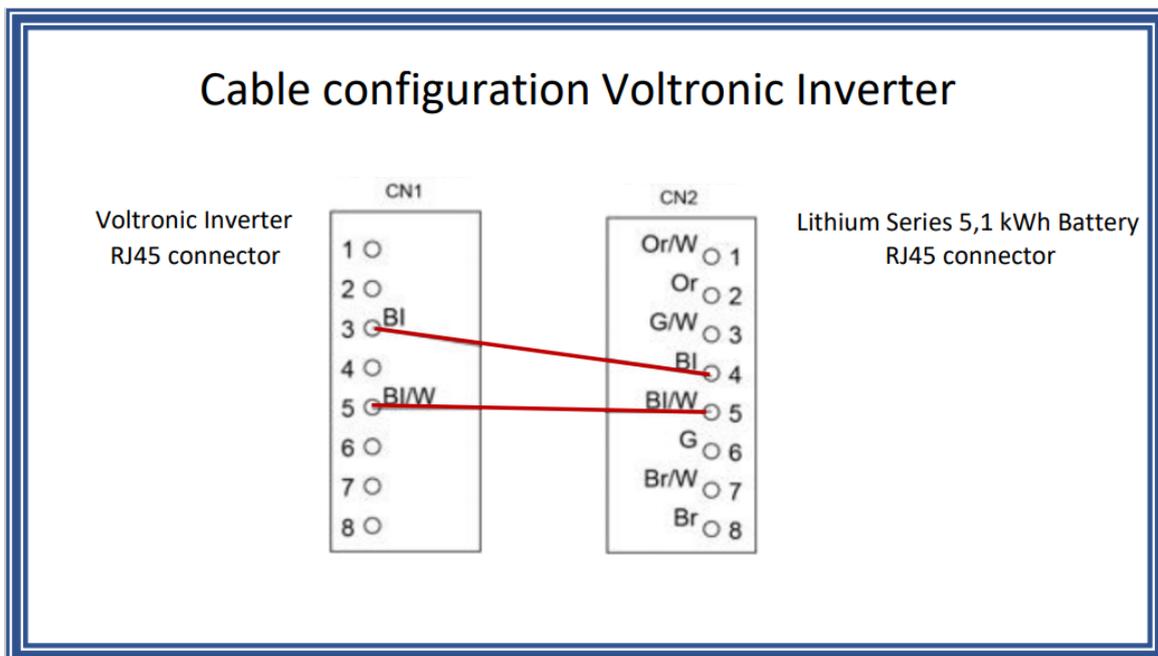
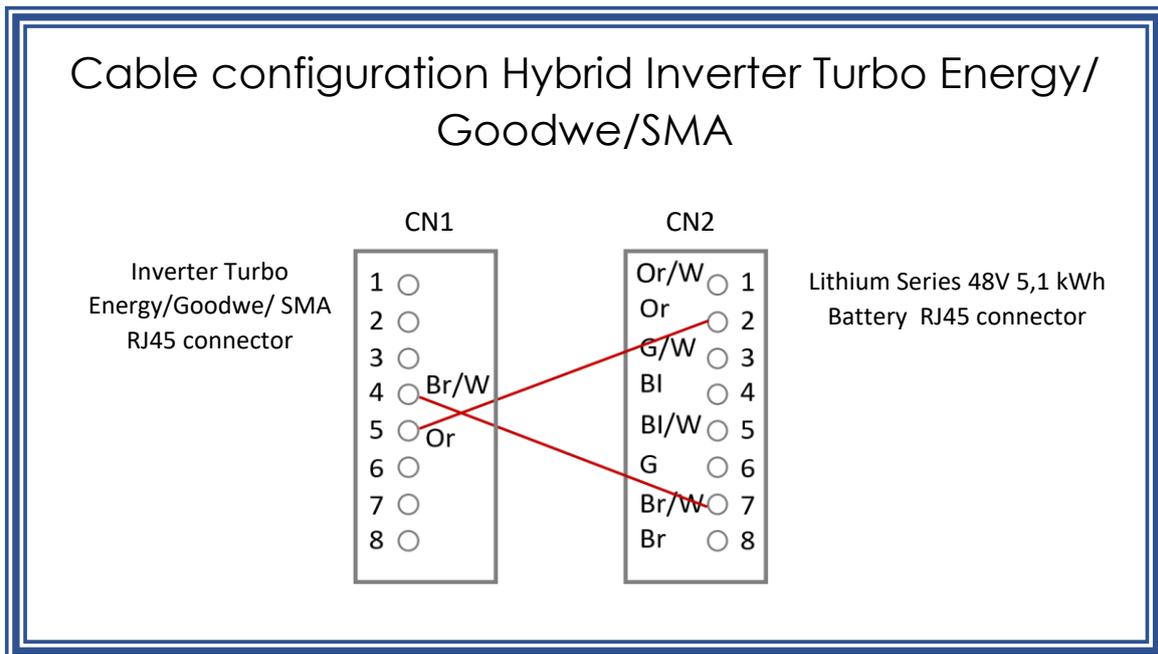
**Configuration without communications between  
Battery and PV Inverter**

<p>Absorption voltage: 55V          Floating voltage: 55V          Low battery cutting voltage: 48,5 V          Charge/discharge current: 50A//Ud          Starting voltage: 49V</p> <p><b>Important:</b>  <b>Conect the communication cable between Batteries.</b></p>	 <p><b>DIP CONFIGURATION</b> (For every battery)</p>
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Even if the system does not have Inverter-Battery communication, the batteries need to be connected to each other via the communications cable.

### 5.3.2. Configuration with communications

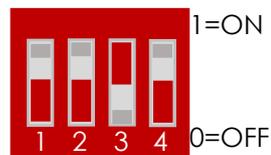
**Communication cable:** It will be configured one way or another depending on the inverter used.



### DIP switch

- Each module has 4 DIP switches (Dual Inline Package) that will be configured differently according to the system requirements, depending basically on the brand of the inverter with which it is communicating.

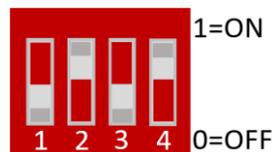
## Configuration Inverter Turbo Energy/Voltronic VMIII (One battery)



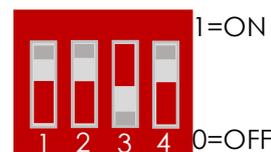
**Important:**

**Connect the specific communication cable supplied by the provider.**

## Configuration Inverter Turbo Energy/Voltronic VMIII (Two batteries)



DIP CONFIGURATION  
(Master battery)



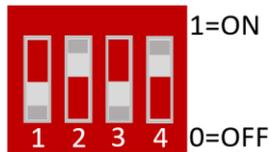
CONFIGURACIÓN DIP  
(Bottom battery)

**Important:**

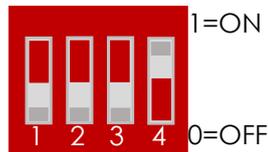
**Connect the specific communication cable supplied by the provider.**

**Connect the communication cable between Batteries.**

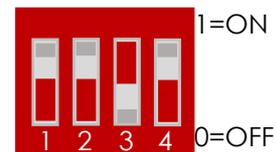
## Configuration Inverter Turbo Energy/Voltronic VMIII (Three or more batteries)



DIP CONFIGURATION  
(Master battery)



DIP CONFIGURATION  
(Middle batteries).



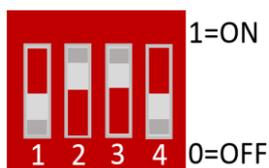
CONFIGURACIÓN DIP  
(Bottom battery)

**Important:**

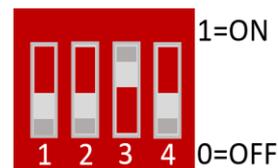
**Connect the specific communication cable supplied by the provider.**

**Connect the communication cable between Batteries.**

## Configuration Inverter Goodwe



DIP CONFIGURATION  
(Master battery)



DIP CONFIGURATION  
(Rest of the batteries)

**Important:**

**Connect the specific communication cable supplied by the provider.**

**Connect the communication cable between Batteries.**

### 5.4. On and Off

To turn on, press the power button for 2-4 seconds. The BMS will start and the LCD screen and the power button will also light up.

To turn off the batteries, press the power button for more than 5 seconds.

When the power button is pressed for <5 seconds while the battery is running, the LCD will turn on for 30 seconds. When two or more batteries are used, the power button should be pressed for 30 seconds to synchronize them. When the power button is pressed for about 2 seconds, make sure that all batteries in a group are turned on within the next 25 seconds.

### 5.5. LED display

The LED light on the front of the battery will indicate the State Of Charge (SOC) as shown in the following table:

SOC LED	Estado de carga
	SOC < 5%
	5% ≤ SOC ≤ 25%
	25% ≤ SOC ≤ 50%
	50% ≤ SOC ≤ 75%
	75% ≤ SOC ≤ 95%
	SOC ≥ 95%

### 5.6. Protection codes

#### LED Alarm

Red light: 1 flicker

Green light:

N. ° flickers = protection code

Protection Code	Display LED	Description
1		Temperature difference
3		High temperature
4		Low discharge temperature

5		Charge over-current
6		Discharge over-current
8		Cell overvoltage
9		Cell under voltage
11		Low charge temperature

### 5.7. Error codes

#### LED Alarm

Red light: 2 flickers

Green light: N. ° flickers = error code

Error Code	Display LED	Description	Solution
Error 01		Hardware Error	Wait for automated recovery. If the problem is not resolved, call for repair.
Error 03		Hardware Error	
Error 05		Hardware Error	
Error 06		Open breaker	Close the circuit breaker after turning off the battery system.
Error 07		DIP difference	Maintain consistency of DIP switches, reboot system.
Error 08		LMU disconnected (slave)	Reconnect the communication cable.
Error 09		SN missing	Enter the serial number, restart the system or call for repair.
Error 10		LMU disconnected (master)	Reconnect the communication cable.
Error 11		Software version inconsistent	Call for repair.

If the battery constantly runs for 30 days and its **SOC has not been corrected**, the discharge function will not be available until the battery is fully charged at least once and the SOC is corrected.

In case of parallel mode or work mode, if Protection 09 appears and the power button is pressed 5 times within 10 seconds, the BMS will be forced to turn on MOS of discharge so that the inverter can detect the battery voltage and the battery can be charged.

## 6. Appendix

### 6.1. *Security instructions*

1. Please read the battery instructions before use.
2. Keep the battery away from high voltage and out of reach of children.
3. In operation, the battery should be kept in the set temperature ranges (between -10°C and 50°C) and a humidity less than 80%.
4. During handling, be very careful to avoid bumps/falls of the battery.
5. Be careful not to touch the contacts at the same time.
6. The battery, at the end of its useful life, requires a recovery process, not disassemble it.
7. Avoid locating batteries in damp places to avoid danger.
8. When not in use for a long time, store the battery intact and let the battery be half charged. Wrap the battery with non-conductive material to avoid direct contact of the metal. Store the battery in a cool, dry place.
9. Never expose the battery to fire or water.

### 6.2. *Safety warnings*

1. Do not disassemble the batteries. The inside of the battery has a protective mechanism and a protective circuit to avoid danger. Improper disassembly will damage the protection function permanently, leaving the battery without safety conditions.
2. Never short-circuit the poles of the Battery. Avoid contact of positive and negative poles with metals.
3. Keep the batteries away from fire and extreme temperatures. Monitor the distance to thermal bulbs, stoves, etc.

4. Keep the battery away from the water. Always be careful that the battery is not located in damp places where the dew point can be reached.
5. Do not use batteries that have physical damage that may be due to falls or bumps.
6. Do not weld near the battery.
7. Overheating will result in the loss of the protective function of its life cycle, even, it could render the battery useless and in extreme cases self-ignition of the battery occurs.
8. Never connect this battery in series and connect it in parallel only with identical batteries up to a maximum number of 6.
9. If the battery has liquid leakage, avoid contact with it completely. It can be harmful to the skin, and if you touch the eyes, wash, and go to the hospital immediately for treatment.

### 6.3. *Environmental Protection*

Turbo Energy's batteries comply with EU ROHS regulations.

### 6.4. *Contact details*

For any incident with the battery write, indicating your contact details, an email to the address: [info@turbo-e.com](mailto:info@turbo-e.com) and we will contact you as soon as possible.