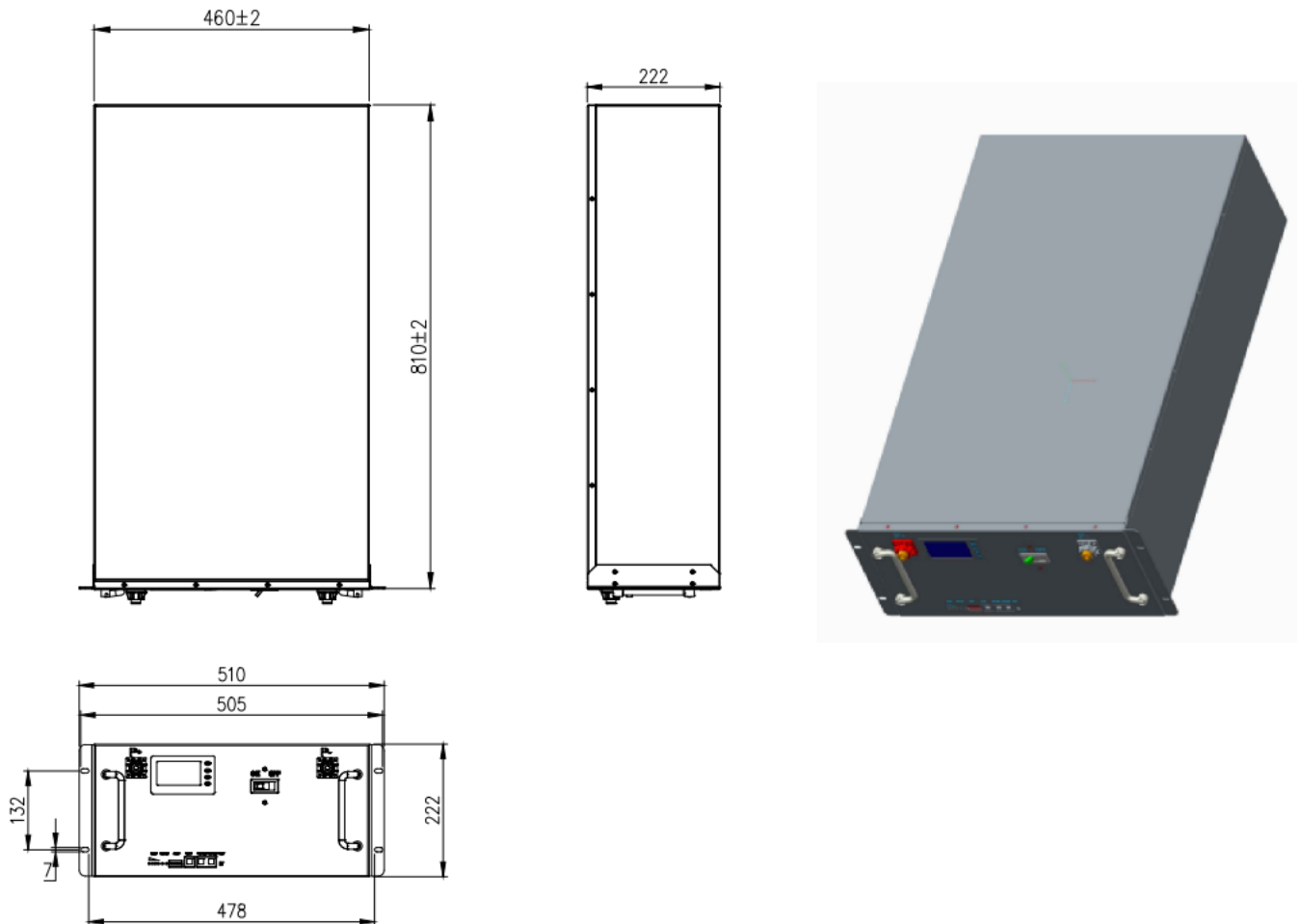


# Trophy Battery 48/51.2V 220 AH CATL Cell Product Specification Book

1. This specification book applies to Trophy Battery Model 48V220C-1 only.



Trophy Battery Model	Battery Dimension in millimeters	Battery weight (kg)	Wooden case dimension (cm)(L*W*H)	Wooden case weight (kg)	Total weight (kg)
48V220AH	810L, 510W, 222H	114	95*57*44	18	130.4
	Battery Dimension in Inches	Battery Weight (Pounds)	Wooden Case Dimensions (inches) (L*W*H)	Wooden Case Weight (Pounds)	Total Weight (Pounds)
48V220AH	31.89"L, 20.08" W, 8.74"H	250.8	37.40" * 22.44" * 17.32"	39.6	286.88

# **Trophy Battery 48/51.2V 220 AH CATL Cell Product Specification Book**

## **2. Battery Management System (BMS) Functional Description**

### **2.1. Hibernation**

**The BMS has been installed inside the battery at our factory.**

**When no fault conditions are present, such as over-voltage, under-voltage, over-current, short-circuit, over-temperature, and under-voltage, you may press the On/Off/Reset button briefly to start the BMS and thus start the battery.**

**The Battery and BMS start on Standby, not charging or discharging. When the BMS is in Standby, the Run LED flashes, indicating the battery can be charged and discharged.**

**The following protection features are included in the battery**

**2.2. Over-charge protection and recovery**

**2.3. Over-discharge protection and restoration**

**2.4. Charge over-voltage protection and recovery**

**2.5. Discharge over-current protection and recovery**

**2.6. Over-Temperature protection and recovery**

**2.7. High-temperature protection and recovery during charging and discharging**

**2.8. While charging, activation of the internal heater as the temperature approaches freezing. The heaters will raise the battery's internal temperature; charging resumes when the battery reaches a safe temperature.**

**2.9. Automatic Cell Balancing**

**The BMS precisely monitors each battery cell carefully. If out of balance, then automatic cell balancing is performed.**

# Trophy Battery 48/51.2V 220 AH CATL Cell Product Specification Book

## 2.10. Power On and Off

Item Number	Features	Definition
1	<p style="text-align: center;">Start / Power Up</p> <p style="text-align: center;">Using the “Reset” Switch</p>	<p>If the BMS is in the Off/Sleep/Hibernation State, Press the On/Off/Reset Button (labeled “Reset”).</p> <p>The Reset switch is recessed for safety. Use a small object to <u>press the button gently</u>, but do not use knives or other sharp objects. (The warranty does not cover physical damage to the recessed Reset Button.)</p> <p>When the Reset button is pressed briefly, the BMS starts, the LED’s light in sequence, and the BMS and battery are fully operational.</p> <p>If the battery is not being charged or discharged, then the battery is in Hibernation, ready to be charged or discharged.</p>
2	<p style="text-align: center;">Turn Off / Hibernate</p>	<p>When BMS is in Standby or is discharging, gently hold down the Reset button for 3 seconds.</p> <p>The BMS will enter a Hibernation state to save power. The LEDs will flash in sequence, then go off to indicate that the battery is dormant and not wasting battery power.</p> <p>The BMS consumes almost no power during Hibernation.</p>

# Trophy Battery 48/51.2V 220 AH CATL Cell

## Product Specification Book

### 2.10. Short-circuit protection

The BMS detects and protects the battery from short circuits.

The Circuit Breaker also protects against short circuits.

Thus, there is double protection against excessive current draw.

### 2.11. LED Indicators

The battery has 6 LED indicators:

4 Green LED's, labeled SOC, for the battery state of charge,

1 Red LED, labeled ALM for "Alarm", indicates when a battery fault is detected, and the protection circuits are enabled,

1 Green LED, labeled Run, indicates the battery is in a normal operational condition, in Standby, Charging, or Discharging states.

### 2.12. Hibernation Function

The BMS features manual and automatic Hibernation. When 48 hours have occurred without charging or discharging, Hibernation Mode is activated. This mode helps preserve the battery's charge. Still, it is good practice to charge batteries every three months to a 50% state of charge.

When entering Hibernation Mode, or when the battery protection circuits are activated, the communication with the inverter(s) continues for 1 minute.

Hibernation Mode can be enabled by gently pressing and holding the Reset button for 6 seconds. When this mode is activated, the LEDs will flash in sequence, then turn off.

You may connect a computer to the battery. We call this computer the host computer. You may use the computer, with appropriate software, to enter Hibernation Mode.

### 2.13. On/Off/Reset Switch

The On/Off/Reset Switch is labeled "Reset".

When the Battery and BMS are being operated from the host computer, the On/Off/Reset

# **Trophy Battery 48/51.2V 220 AH CATL Cell Product Specification Book**

switch on the battery is inoperative. The host computer has complete control.

Note that the host computer must specify one battery out of multiple batteries connected in parallel, or even if just one battery is connected.

# Trophy Battery 48/51.2V 220 AH CATL Cell Product Specification Book

## 4.14. CAN Port and Two RS-485 Ports

The battery and BMS support communications with inverters and identical model batteries connected in parallel with appropriate cables.

The CAN port can communicate with inverters that use the CAN interface. Various protocols are supported. If an inverter supports CAN communications, typically, one of the following protocols is used.

<b>Trophy Battery - Inverter Communications</b>		
<b>Inverter Brand</b>	<b>Protocol Name</b>	<b>Communication Method</b>
Goodwe	V1.5	CAN
PYLONTECH	CAN-Bus-protocol PYLON-v1.3	CAN
Growatt	Growatt BMS CAN-Bus-Protocol low-voltage-V1.05 English version	CAN
	Growatt Protocol (RS-485)	RS-485
Victron	Canbus BMS Protocol	CAN
	Voltronic Inverter and BMS RA-485 Communication Protocol	RS-485
LXP	Luxpowertek Battery CAN Protocol	RS-485
Sofar	CAN Rev 5	CAN
Deye	Use PYLONTECH Protocol	CAN
Others	Use PYLONTECH Protocol	CAN or RS-485
If you have other needs, please get in touch with us		







# Trophy Battery 48/51.2V 220 AH CATL Cell

## Product Specification Book

Third Battery	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourth Battery	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fifth Battery	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Sixth Battery	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)

Seven Batteries								
Master	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Up (On)	Up (On)	Down (Off)
Second Battery	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Third Battery	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourth Battery	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fifth Battery	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Sixth Battery	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Seventh Batteries	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)

Eight Batteries								
Master	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Up (On)	Up (On)	Up (On)	Down (Off)
Second Battery	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Third Battery	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourth Battery	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fifth Battery	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)



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Fifth Battery	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Sixth Battery	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Seventh Battery	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eighth Battery	Up (On)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Ninth Battery	Down (Off)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Tenth Battery	Up (On)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)

Eleven Batteries								
Master	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Up (On)
Second Battery	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Third Battery	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourth Battery	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fifth Battery	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Sixth Battery	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Seventh Battery	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eighth Battery	Up (On)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Ninth Battery	Down (Off)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Tenth Battery	Up (On)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eleventh Battery	Down (Off)	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)

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Twelve Batteries								
Master	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Up (On)	Up (On)	Down (Off)	Up (On)
Second Battery	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Third Battery	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourth Battery	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fifth Battery	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Sixth Battery	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Seventh Battery	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eighth Battery	Up (On)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Ninth Battery	Down (Off)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Tenth Battery	Up (On)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eleventh Battery	Down (Off)	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Twelfth Batteries	Up (On)	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)

Thirteen Batteries								
Master	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Up (On)	Up (On)
Second Battery	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Third Battery	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourth Battery	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fifth Battery	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)

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Sixth Battery	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Seventh Battery	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eighth Battery	Up (On)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Ninth Battery	Down (Off)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Tenth Battery	Up (On)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eleventh Battery	Down (Off)	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Twelfth Battery	Up (On)	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Thirteenth Battery	Down (Off)	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)

Fourteen Batteries								
Master	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Up (On)	Up (On)
Second Battery	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Third Battery	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourth Battery	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fifth Battery	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Sixth Battery	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Seventh Battery	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eighth Battery	Up (On)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Ninth Battery	Down (Off)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Tenth Battery	Up (On)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)

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Eleventh Battery	Down (Off)	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Twelfth Battery	Up (On)	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Thirteenth Battery	Down (Off)	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourteenth Battery	Up (On)	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)

Fifteen Batteries								
Master	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Up (On)	Up (On)	Up (On)
Second Battery	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Third Battery	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourth Battery	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fifth Battery	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Sixth Battery	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Seventh Battery	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eighth Battery	Up (On)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Ninth Battery	Down (Off)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Tenth Battery	Up (On)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eleventh Battery	Down (Off)	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Twelfth Battery	Up (On)	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Thirteenth Battery	Down (Off)	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourteenth Battery	Up (On)	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)

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Fifteenth Battery	Down (Off)	Up (On)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
-------------------	---------------	------------	------------	------------	---------------	---------------	---------------	---------------

Sixteen Batteries								
Master	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Up (On)	Up (On)	Up (On)	Up (On)
Second Battery	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Third Battery	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourth Battery	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fifth Battery	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Sixth Battery	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Seventh Battery	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eighth Battery	Up (On)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Ninth Battery	Down (Off)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Tenth Battery	Up (On)	Down (Off)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Eleventh Battery	Down (Off)	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Twelfth Battery	Up (On)	Up (On)	Down (Off)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Thirteenth Battery	Down (Off)	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fourteenth Battery	Up (On)	Down (Off)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Fifteenth Battery	Down (Off)	Up (On)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)
Sixteenth Battery	Up (On)	Up (On)	Up (On)	Up (On)	Down (Off)	Down (Off)	Down (Off)	Down (Off)

Front Panel Address Switch - Binary Address Scheme
--

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	Battery Address (0 to 15) Master or Only Battery = 0				Number of Additional Batteries (0 to 15)			
Binary Battery Address (0 to 15)	1	2	4	8				
Binary Number of Additional Batteries					1	2	4	8

## 2.16. Connecting Multiple Batteries in Parallel

Up to 16 identical models of Trophy Batteries may be connected to create a very powerful battery system.

When connecting batteries in parallel, it is necessary to establish communications among the batteries. You also need to connect the battery outputs, which we cover in another section.

The first battery is considered the Master. It will communicate with the other batteries via RS-485 communications.

You need an 8P8C network cable which must be a straight-thru cable and not a typical network cable where the signals cross within the cable.

8P8C and RJ45 are typically interchangeable.

A straight-thru cable is such that the connections are to the same Pin at both ends of the cable. (Pin 1 to 1, Pin 2 to 2, etc.)

Here is an appropriate cable to use.

The following is a Monoprice cable, part number 5899. You may select 1 foot or longer cables. We recommend 3 foot long cables if you place multiple batteries side by side.



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[Monoprice Cat6A Ethernet Patch Cable - Snagless RJ45, Stranded, 550MHz, STP, Pure Bare Copper Wire, 10G, 26AWG, 3ft, Blue - Monoprice.com](https://www.monoprice.com/products/product.asp?c1=114&c2=115&c3=116&id=11146&from=serp)

Each battery has two RS-485 Ports. You may plug the cable into either of the RS-485 ports. Do not use the CAN Port for connecting multiple batteries.

There are two RS-485 ports on each battery.

## 2.17. Communicating with Inverters.

Trophy Batteries can communicate with many types of inverters.

The inverter may use RS-485 or CAN communications. Using the same type of cable listed above, but possibly in a longer length, connect the cable to the RS-485 or the CAN port, as appropriate, and plug the other end to the port on your inverter.

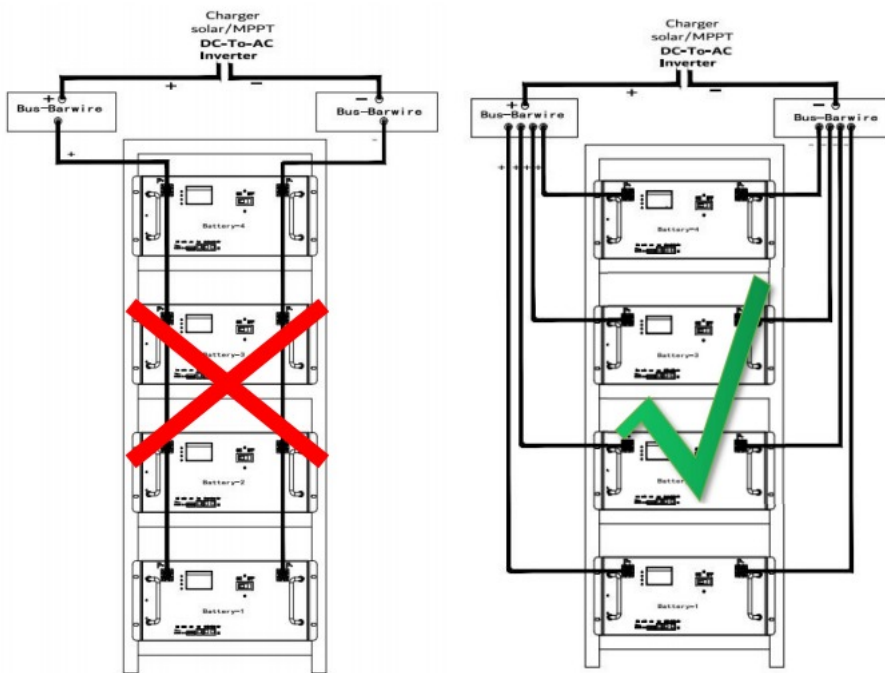
When ordering cables, be sure to obtain one for your inverter if it supports communications with your batteries.

## 2.18. Connecting Power Cables

It is essential to use appropriately sized battery cables to connect one battery to your inverter or multiple batteries to one or more inverters. The power cables must be an appropriate size to carry the current your inverters will draw.

When using multiple batteries in parallel, you must use equal-length cables running to two busbars, one for negative voltages and one for positive. Then connect your inverter(s) to the busbars. All negatives must be connected together; all positives must be connected together. Never put the batteries in series by connecting negative to positive.

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## Product Specification Book

### 2.19. Soft Start - Pre-charge function

The Soft Start/Pre-charge function protects your inverter(s)'s capacitors.

Without this function, the high current capabilities of the battery would destroy capacitors or circuits in inverters. The inrush current would burn out the capacitors or the wires or circuit traces leading to the capacitors.

The Soft Start/Pre-charge function limits the amount of in-rush current to your inverter. This function is automatically enabled every time the battery starts supplying current. Soft-Start/Pre-charge sends limited power to the inverters for a few seconds to charge your capacitors slowly.

Pre-charging is very important, as the capacitors may be discharged any time the inverter is idle for a while.

The Soft Start/Pre-Charging time can be set from 1 millisecond to 5,000 milliseconds (5 seconds) to deal with various capacity load scenarios and avoid short-circuit protection of BMS output. The BMS comes factory set to 2,000 milliseconds (2 Seconds) which should be adequate for most situations.

### 2.17. Charging Current Protections

The charging flow limit is divided into two modes: Active Flow Restriction and Passive Flow Restriction. This is an automatic function that protects your battery from excessive current during charging.

1. **Passive Flow Limit:** This is the normal condition. When the battery is being charged, the BMS allows up to the maximum charging current to flow into the battery. If the maximum charging current value is exceeded, set at the factory to 200 Amps, then the charging current is limited to the Active Flow Limit, typically ten amps.
2. **Active Flow Limit:** When the battery is being charged, and the Active Flow Limit is enabled due to an excessive charging current, the BMS limits the charging current to 10 Amps to protect the battery. This occurs when the charging current exceeds the maximum current

# **Trophy Battery 48/51.2V 220 AH CATL Cell Product Specification Book**

limit.

If the Active Flow Limit is enabled, then after 5 minutes, the current is again checked, and if it does not exceed the maximum charging current, then the Active Flow Limit is disabled, and regular charging resumes.

# Trophy Battery 48/51.2V 220 AH CATL Cell

## Product Specification Book

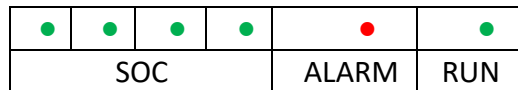
### 3. LED Indicators

#### 3.1. Six LED Indicators

The Green Run LED indicates that the battery is in the normal operational mode.

The Red ALM (Alarm) indicates that a fault has occurred.

The Four Green SOC (State of Charge) LED's indicate the current state of charge of the battery.



#### 3.2. LED State of Charge Indicators

LED		Charging				Discharge			
State of Charge LED's		L4●	L3●	L2●	L1●	L4●	L3●	L2●	L1●
	0~25%	Off	Off	Off	Varies	Off	Off	Off	On
	25~50%	Off	Off	Varies	On	Off	Off	On	On
	50~75%	Off	Varies	On	On	Off	On	On	On
	≥75%	Varies	On	On	On	On	On	On	On
Run LED ●		On				Varies			

#### 3.3. LED Flash Modes

Flash mode	LED On Time In Seconds	LED Off Time In Seconds
Flash 1	1/4	3 3/4
Flash 2	1/2	1/2
Flash 3	1/2	1 1/2

# Trophy Battery 48/51.2V 220 AH CATL Cell

## Product Specification Book

### 3.4. System Mode Indicators

System Status	Run Status	RUN	ALM	SOC				Description
		●	●	●	●	●	●	
Off	Power Save	Off	Off	Off	Off	Off	Off	Battery is in Hibernation Mode
Standby	Normal	Varies	Off	Off	Off	Off	Off	Standby Mode
Charging	Normal	On	Off	According to the current state of charge				Maximum LED Flash 2
	Over-Current	On	Flash 2	According to the current state of charge				Maximum LED Flash 2
	Over-voltage protection	Flash 1	Off	Off	Off	Off	Off	
	Over-Temperature protection	Flash 1	Off	Off	Off	Off	Off	
Discharging	Normal	Flash 3	Off	According to the current state of charge				Normal Discharge
	Over-Current Discharge	Flash 3	Flash 3					Excessive Current Draw
	Over-Temperature	Off	On	Off	Off	Off	Off	Battery Discharge Stops

#### 4. Trophy Battery 48/51.2V 220 Amp-Hour system parameters

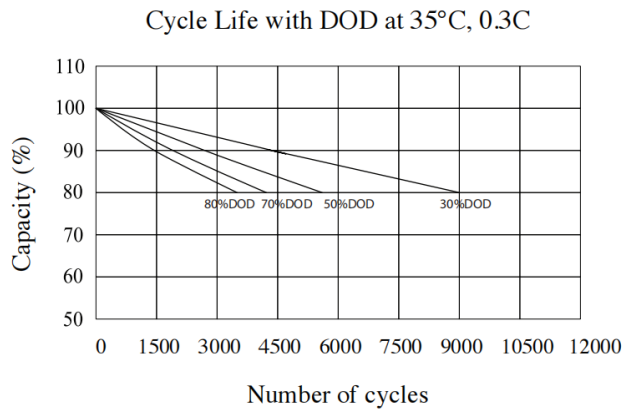
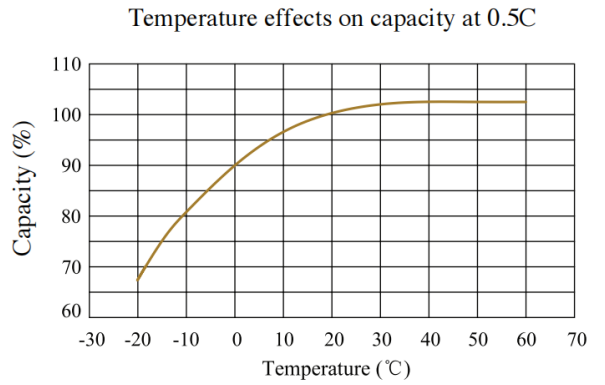
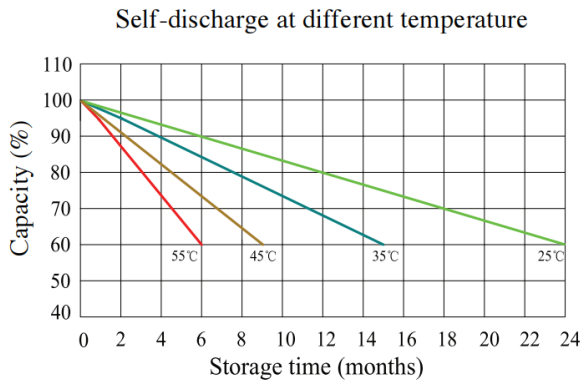
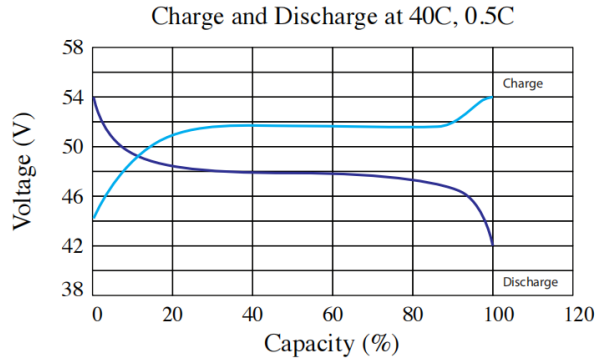
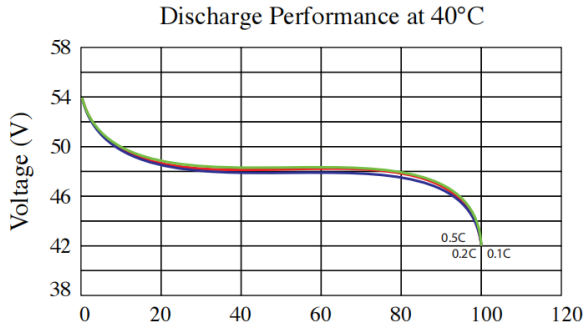
Item		Parameters	
Single Cell	1	Battery Cell model	CATL 3.2V, 120AH
	2	Product material system	Lithium iron phosphate and graphite
	3	Rated voltage (V)	3.2
	4	Rated capacity AH)(Amp-Hours)	120
	5	Size (mm)	47*173*170mm
	6	Weight (kg)	2.7
Battery system	1	Product model	48V220C-1
	2	Product applications	Numerous
	3	Battery Cell Configuration	16s2p
	4	Cooling mode	Natural cooling
	5	Rated voltage (V)	51.2
	6	Rated Capacity (AH) $\pm$ 5%	220
	7	Rated Energy (WH) $\pm$ 5% The BMS disconnects the output when a 5% state of charge is reached to prolong the battery's life. For this reason, the Rated Energy in Watt-Hours has been reduced by 5%, and the conservative value is shown here.  This protective feature may be disabled, but repeated full charge and discharge cycles will diminish the battery life.	11,264
	8	Charge and discharge port (standard port or split port)	Common port
	9	Communication ports	Three ports: CAN, RS-485, RS-485
	10	Display	LCD
	11	Maximum Batteries in Parallel	16
	12	System charging termination	57.6

		voltage (V)a	
	13	System discharge termination Voltage (V)	43.2
	14	Single Cell charging protection voltage (V)	3.65
	15	Single Cell discharge protection voltage (V)	2.5
	16	Charging operating temperature range (°C) Built-in heaters help ensure that the battery cells stay above freezing	-0~45
	17	Discharge Operating Temperature Range (°C)	-10~50
	18	Maximum Continuous Charging current (A)	200
	20	Maximum Continuous discharge current (A)	200
	21	Discharge protection overcurrent (A)	210
	22	Charge and Discharge Cycles to 20% State of Charge (SOC) (80% Depth of Discharge) at 0.2 C at 25°C ambient temperature, Refer to Battery Charts, below.	Approximately Cycle 3500 times to 20% SOC, Cycle 4200 times to 30% SOC, Cycle 4500 times to 50% SOC, Cycle 9000 times to 70% SOC With capacity retention ≥ 80%
	23	Battery Case Size (width * height * depth) (mm)	(460±2)×(222±2)×(810±2)
	24	Battery Case weight tolerances are ± 3kg	110 KG
Comment			



# Battery Charts

## PERFORMANCE CURVES



Performance may vary depending on, but not limited to cell usage and application. If cell is used outside specifications, performance will diminish. All specifications are subject to change without notice. All information provided herein is believed, but not guaranteed, to be current and accurate.

## 5. Storage and Transportation

5.1 To maintain battery safety and optimum battery life, keep the battery in desirable environmental conditions; 10C to 45C is best.

5.2 During the battery storage, maintain the SOC level to around 50% to 70%, recharging as necessary every three months.

Before transporting the battery, establish a state of charge near 50%.

Ensure against short circuits and any liquid flowing into the battery.

5.3 If not used temporarily, store battery in 10°C to 10°C conditions; keep dry, in a clean and well-ventilated space.

5.4 During the loading and unloading process, the battery should be handled carefully, avoiding drops, falls, rolling, and exposure to fluids.

## 6. Important Warning and Precautions for battery use

To prevent possible battery leakage, heat and explosion, pay attention to the following precautions:

### Warnings!

- The battery stores a dangerous amount of current, which, if improperly used, can cause damage, severe harm, or death to people and pets and may cause fires.
- The battery must not be short-circuited.
- The battery must be used only with other electrical equipment designed for 48V Class batteries. The battery will produce a varying output voltage, with a nominal DC voltage of 51.2 Volts. The voltage will vary from 43.2 to 57.6 volts but can be slightly higher or lower.
- Use a licensed electrician or a competent person familiar with high current batteries.
- Improper installation or use can harm you and others or can be fatal.
- While installing or working on batteries, ensure that the circuit breaker is in the off position and manually measure the output terminals to ensure no voltage is present.
- Do not underestimate the power in the batteries.
- Keep children, pets, and others away from the batteries. The battery is not a toy.
- Do not allow any liquids to enter the battery case or the battery.
- Keep batteries while in storage or in operation at cool temperatures, ideally at room temperatures, to extend the life of the batteries

- **When connecting to other equipment and other batteries, never reverse the positive and negative poles.**
- **Never connect the batteries in series.**
- **Never short the positive and negative terminals of the battery with any object**
- **Never drop anything on the battery or damage the outer case.**
- **Never transport or store batteries together with any metal.**
- **Do not physically abuse the battery in any way.**
- **Do not weld anything to the batteries or puncture them in any way.**
- **Do not use a battery that has been damaged, has an unusual order, or emits fumes or leaks liquids out of the battery.**
- **Do not connect different models or types of batteries in parallel or series.**  
This practice is unsafe.
- **Do not make any connections to the battery or BMS not mentioned in this document.**
- **You may connect up to 16 batteries of the same model together.**
- **It is necessary to use appropriately sized electrical cables that safely carry the high current that our batteries can deliver.**

## **Notes!**

- **Please do not use or allow the battery to be exposed to high temperatures (hot sun, hot car, or hot environment); otherwise, it may cause overheating, fire or functional failure, and reduced life. The recommended long-term storage temperature is 10-45°C.**
- **It is forbidden to dispose of batteries in fire or high temperatures to prevent fire, explosion, and environmental pollution; scrapped batteries must be returned to a battery recovery point for disposal.**
- **It is forbidden to place the battery in strong static electrical fields or strong magnetic fields. Otherwise, the battery may be damaged.**
- **If the battery leaks do not get the battery electrolyte into one's eyes and keep pets away. Do not rub your eyes. Wash eyes immediately and thoroughly with water, and immediately send them to the hospital for treatment. Otherwise, your eyes will be damaged. Call for help.**
- **If the battery emits odors, heat, or if you see discoloration, deformation, or any abnormality during use, storage, charging, the battery shall be immediately removed from use and disabled.**

- It is forbidden to directly connect positive and negative battery terminals to AC, including household AC. A purpose-built inverter or charger for 48V LiFePO4 batteries must be used. Vehicle alternators must not be used for charging. Lead-acid and other types of battery chargers must not be used.
- Only after performing all standard safety measures and checks, including checking the battery voltage and connections, should the battery be turned on and used.
- If the battery is not used for three months, the battery should be recharged to a 50% state of charge.
- If the electrodes are dirty, apply a dry cloth before use. Otherwise, it may cause poor contact and functional failure.

## **General Information and Legal Disclaimers**

We plan to offer additional models of our batteries over time. We cannot guarantee that current models will be available in the future. Trophy Battery reserves the right to revise its product specifications without incurring the obligation to retrofit previous models. If you find errors in the specifications, please notify Trophy Battery. No Warranty of Merchantability and no Warranty of Fitness for a Particular Purpose” are supplied.

Trophy Battery believes these specifications are accurate but cannot be held liable for errors. It is the responsibility of the purchaser to ensure that the battery is suitable for its intended purposes. The purchaser’s responsibility is to install and use the battery properly, following all instructions, cautions, and warnings provided in this document and on the [www.TrophyBattery.com](http://www.TrophyBattery.com) website.

Trophy Battery will be happy to advise and consult with those interested in our batteries but offers no guarantees that our advice is accurate. We cannot be held liable for our good-faith communications.