

Technical Specification of 48V100AH Energy Storage Battery

Model : TYL-48-100

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Contents

| | |
|--|---|
| Contents..... | 1 |
| 1. Scope..... | 2 |
| 2. Mechanical Design..... | 2 |
| 2.1 Battery specification: 51.2V,100AH..... | 2 |
| 2.2 Battery dimension: 442*525*133mm..... | 2 |
| 2.4 Combination Method: 16S..... | 2 |
| 3. Battery Pack Basic Performance..... | 3 |
| 4. Main Performance..... | 3 |
| 4.1 Battery pack main performance parameter..... | 3 |
| 4.2 Ambient Character..... | 4 |
| 4.3 Safe Performance..... | 5 |
| 5. BMS..... | 5 |
| 5.1 Protection Parameter..... | 5 |
| 5.2 Electrical Parameter..... | 6 |
| 6. Storage and Transportation Requirement..... | 7 |
| 7. Note for battery Usage..... | 8 |
| 7.1 Prohibition..... | 8 |
| 7.2 Attentions..... | 8 |

1. Scope

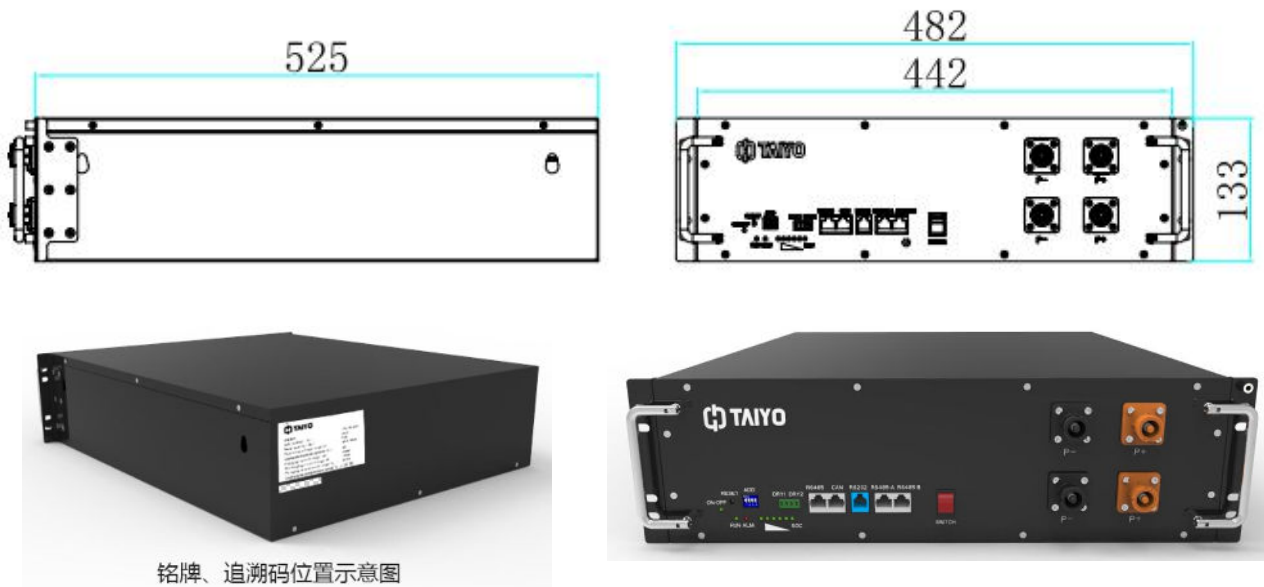
This specification describes the external dimensions, characteristics, technical requirements and matters needing attention of Energy Storage battery. This specification is applicable to TYL-48-100 lithium iron phosphate battery produced by Enertik.

2. Mechanical Design

2.1 Battery specification: 51.2V, 100AH

2.2 Battery dimension: 442*525*133mm

2.3 Combination Method: 16S



铭牌、追溯码位置示意图

Nameplate content:

| | |
|---------------------------------------|------------|
| Model : | TYL-48-100 |
| Rate voltage (V) : | 51.2 |
| Rate capacity (Ah) : | 100 |
| Energy: (Wh) : | 5120 |
| Operating voltage range (V) : | 43.2~58.4 |
| Standard charging current (A) : | 20 |
| Charging current range (A) : | ≤100 |
| Discharging current range (A) : | ≤100 |
| Charging temperature range (°C) : | 0~55 |
| Discharging temperature range (°C) : | -20~60 |

3. Battery Pack Basic Performance

| No. | Item | Parameter | Remark |
|-----|----------------------------------|------------|--|
| 1 | Rated Capacity | 100AH | 23°C ± 5°C, 0.2C Constant current discharging ,43.2V cut off |
| 2 | Rated Voltage | 51.2V | Battery module rate voltage |
| 3 | Standard Charge Current | 20A (0.2C) | 0°C~45°C, , 0.2C CC charge to 58.4V,then CV charge Cur off when charging current ≤ 0.05C. |
| 4 | Max. Charge Current | 100A (1C) | 0°C~45°C, less than 1C |
| 5 | Charge Cut Off Voltage | 58.4V | |
| 6 | Max Continuous discharge Current | 100A (1C) | 25°C ± 3°C, continuous 100A discharge |
| 7 | Discharge Cut Off Voltage | 43.2V | |
| 8 | Max Pulse Discharge Current | 110A | 25°C ± 3°C; ≤ 1S |
| 9 | Working Temperature(charge) | 0°C~55°C | During charge, battery and ambient temperature should not exceed 55°C |
| 10 | Working Temperature(discharge) | -20°C~60°C | Battery can work at specified temperature range with capacity loss in tolerance |
| 11 | Weight | 42 ± 2kg | |
| 12 | Impedence | ≤ 25m Ω | AC 1kHz impedence with half electricity |

4. Main Performance

4.1 Battery pack main performance parameter

| NO. | Item | Standard | Test Method |
|-----|--------------------------|----------|---|
| 1 | Discharge Rate Character | 0.2C | Test Temperature: 25°C ± 3°C; Charge: 0.2C CC charge to 58.4V, transfer to constant voltage ,Cut off when current ≤ 0.05C Discharge:0.2C/0.5C/1C constant current discharge cut off@43.2V. |
| 2 | | 0.5C | |

| | | | | |
|----|----------------------------------|----------------|-------|---|
| | | 1C | ≥97% | |
| 3 | Capacity & Temperature Character | 55℃ | ≥95% | Charge: 0.2C CC charge to 58.4V, transfer to CV, cut off when current ≤0.05c; Discharge:0.5C CC discharge cut off at 43.2V,2 hours interval for the temperature. |
| 4 | | 45℃ | ≥95% | |
| 5 | | 25℃ | 100% | |
| 6 | | 0℃ | ≥65% | |
| 7 | | -10℃ | ≥50% | |
| 8 | Life Cycle Character | | ≥6000 | After finish the standard charging , lay aside for 30 min, in 25℃ ± 5,0.3C CC discharge to 80% DOD, then go for next cycle. |
| 9 | Storage Character | 25℃ 6months | ≥95% | Charge battery with 60%~75% capacity for storage |
| 10 | | 45℃ 3months | ≥90% | |
| 11 | | 60℃ 1months | ≥90% | |

4.2 Ambient Character

| NO. | Item | Standard | Test Method |
|-----|-----------------------|--|---|
| 1 | Steady damp heat test | No fire, No explosion, No leakage. Discharge capacity cannot be lower than 60% of initial capacity | After standard charge, test as below: Temp:40℃ ± 5℃ , Relative Humidity:90%~95%; Standing time:48h; take out and place for 2h at room temperature, Then discharge with 1C till cut off voltage |
| 2 | Vibration | No fire, No explosion, No leakage. | After standard charge, fix to vibration machine and vibrate 30 minutes each at XYZ direction. Frequency Sweeping Rate:1oct/min; Vibration Frequency:10Hz~30Hz; Displacement amplitude(Single):0.28mm; Vibration Frequency:30Hz~55Hz; Displacement amplitude(Single):0.19mm. |
| 3 | Low Pressure | No fire, No explosion, No | Under 25 ± 3℃ ambient temperature, put |

| | | | |
|---|-----------|------------------------------------|--|
| | | leakage. | call into vacuum cabinet, and reduce internal pressure gradually to not high than 11.6kPa(Simulated altitude 15240m), keep 6 Hours |
| 4 | Drop Test | No fire, No explosion, No leakage. | Under the condition of shipment, the battery is free fall from a height of 1 m to a concrete floor of 5 cm thick repeat 3 times from X,Y,Z axis direction. |

4.3 Safe Performance

| NO. | Item | Standard | Test Method |
|-----|-----------------------|-----------------------------------|---|
| 1 | Over Charge Test | No fire, No explosion, No leakage | After standard charge, Under 25°C ± 3°C ambient temperature for 1h. Then under the same temperature, 0.5C constant current charge to 5V(the simple cell) |
| 2 | Over Discharge Test | No fire, No explosion, No leakage | After standard charge, Under 25°C ± 3°C ambient temperature for 1h. Then under the same temperature, 0.2C constant current discharge to 0V(the simple cell) |
| 3 | Heat shock | No fire, No explosion, No leakage | Put battery in hot cabinet, temperature is up with 5°C |
| 4 | High Temperature Test | No fire, No explosion, No leakage | After standard charge, place battery in 85°C for 4h. |
| 5 | Short Circuit | No fire, No explosion, No leakage | After standard charge, ambient temperature for 1h. Then put the battery by external short circuit for 10min, the outside line resistance should be less than 100mΩ. |

5. BMS

5.1 Protection Parameter

| NO. | Item | Description | Value | Unit |
|-----|-----------------------|--|-------|------|
| 1 | Over Charge Parameter | Unit Overcharge Warning Voltage | 3600 | mV |
| | | Unit Overcharge Protection | 3650 | mV |
| | | Battery pack over charge warning voltage | 57.6 | V |

| | | | | | |
|---|----------------------------------|--|-----------------------------|-------|----|
| | | Battery pack over charge Protection voltage | 58.4 | V | |
| 2 | Over Discharge Parameter | Unit Over discharge Warning Voltage | 3000 | mV | |
| | | Unit Over discharge Protection voltage | 2700 | mV | |
| | | Battery pack over discharge warning voltage | 48 | V | |
| | | Battery pack over discharge Protection voltage | 43.2 | V | |
| 3 | Charge Over Current Parameter | Charge Over Current Warning | 105 | A | |
| | | Charge 1st over current | 110 | A | |
| | | Short circuit at charging port | YES | | |
| 4 | Discharge Over Current Parameter | Discharge Over Current Warning | 105 | A | |
| | | Discharge 1st over current | 110 | A | |
| | | Discharge 2st over current | 130 | A | |
| | | Short circuit at discharging port | YES | | |
| 5 | Temperature Protection | Charge | High temperature warning | 50.0 | °C |
| | | | Low temperature warning | 5.0 | °C |
| | | | High temperature protection | 55.0 | °C |
| | | | Low temperature protection | 0.0 | °C |
| | | Discharge | High temperature warning | 55.0 | °C |
| | | | Low temperature warning | -15.0 | °C |
| | | | High temperature protection | 60.0 | °C |
| | | | Low temperature protection | -20.0 | °C |

5.2 Electrical Parameter

| NO. | Item | Min | Typical | Max | Unit |
|-----|---------------------------------|-----|---------|------|------|
| 1 | Manage cell qty | - | 16 | - | ↑ |
| 2 | Normal Working Voltage | - | 51.2 | 58.4 | V |
| 3 | Working temperature range | -20 | 25 | 60 | °C |
| 4 | Continuous charge current | - | 20 | 100 | A |
| 5 | Continuous discharge current | - | 50 | 100 | A |
| 6 | Total Operate Power Consumption | - | | 45 | mA |
| 7 | Total dormant Power Consumption | | | 200 | uA |

| NO. | Function | Description |
|-----|-----------------------|----------------|
| 1 | Setup address devices | By dial switch |

| | | |
|----|---|---|
| 2 | System Rest | Using reset button |
| 3 | Communicate Interface | RS485 connector allows several devices connecting in parallel to enlarge battery capacity. RS232 interface communicates with computer. CAN communication and inverter communication |
| 4 | SOC Evaluate and Display | Can dynamic evaluate SOC for each battery pack, and display the remaining power by 4green LED. |
| 5 | Operation Status Display | Can display system operation status by 1 green LED. |
| 6 | Failure Warning Display | Cn display system failure by 1 red LED |
| 7 | Data Storage | Can record battery array's voltage , temperature, each charge and discharge power |
| 8 | Low Consumption | Very slight static consumption deviation, and low operation & standby consumption |
| 9 | SOH Evaluation | Per sampling information, can do SOH evaluation for whole battery |
| 10 | Balance Management | The balanced opening voltage is 3380mv and the opening voltage difference is 30mV to improve the battery consistency |
| 11 | Unit Voltage Inspection | Test cell unit's voltage, 16S Max can be inspected |
| 12 | Temperature Inspection | Battery temperature protection function , battery high& low temperature protection and component high temperature protection. |
| 13 | Charge & Discharge control | Disconnect failed module when at abnormal charge, over discharge, over-hot, over current, short circuit, separate each defective module timely and reduce defective scope. |
| 14 | Short Circuit Protection | When battery has short circuit, system will be automatically protective within 300Us, Disconnect load and recover. |
| 15 | Communication | Through connection between upper computer and BMS, can remote signaling. Remote control, remote adjust, |
| 16 | Battery in Parallel Connection Management | Support multiple-unit battery connection in parallel, and set up address. Charge limiting current is 20A(0.2C). |
| 17 | Switch | The power switch is on the front panel |

6. Storage and Transportation Requirement

| Item | Requirement |
|---------------------|-------------------|
| Storage Temperature | Less than 1month |
| | Less than 6months |
| Humidity | <70%RH |
| Storage SOC | 60%~75%SOC |

7. Accessories list

| NO. | Product | Discription | Quantity | Unit |
|-----|---------|-------------|----------|------|
|-----|---------|-------------|----------|------|

| | | | | |
|---|--------------------------------|---|-----|---------------|
| 1 | Positive pole of power line | L500mm 25mm ² Quick connector at one end and 25mm ² terminal at one end | 1 | PCS/module |
| 2 | Negative pole of power line | L500mm 25mm ² Quick connector at one end and 25mm ² terminal at one end | 1 | PCS/module |
| 3 | Battery positive parallel line | L200mm 25mm ² Red quick connectors at both ends | 1 | PCS/module |
| 4 | Battery negative parallel line | L200mm 25mm ² Black quick connector at both ends | 1 | PCS/module |
| 5 | RS485 communication line | Length:500mm,RJ45 port *2 | 1 | PCS/module |
| 6 | RS485-USB Converter Cable | Length:1500mm, | 1/8 | PCS/8 modules |
| 7 | RS232-USB Converter Cable | Length:1500mm, | 1/8 | PCS/8 modules |
| 8 | CAN communication line | Super class 5 8-core 3000mm long RJ45 terminals with two ends pressed | 1 | PCS/module |

8. Note for battery Usage

8.1 Prohibition

For avoiding battery leakage, heat radiating, explosion, below prevent tips should be taken care of: :

- A) Prohibition of disassembly or re-assembly;
- B) Prohibition of short circuited battery;
- C) Prohibition to use near hot source;
- D) Prohibition of dumping of battery into water ,ocean or getting battery wet;
- E) Prohibition of charging near fire or under sunlight;
- F) Charge with specified charge according to charging requirement;
- G) Prohibition of inserting nail into battery, hammering or stepping on foot;
- H) Prohibition of throwing;
- I) Prohibition to use with damaged or deformed battery

8.2 Attentions

- A) Prohibit of using battery in sunlight, otherwise will cause over hot, firing, or function failure , life reducing;
- B) Prohibit use near static place which over 64V;
- C) Prohibit charge at temperature below 0°C or above 60°C ;
- D) When use at first time, if has corrosion, or bad smell, or any other abnormal, please do not use;



Handle

Made of galvanized steel for lifting.

SOC

The meaning of SOC indication light shown in table 2-1.

Table 2-1 The relationship between the capacity of the battery and the SOC light

| ● | ● | ● | ● | Capacity |
|---|---|---|---|----------|
| ☒ | ☒ | ☒ | ☒ | 75%-100% |
| ☒ | ☒ | ☒ | ○ | 50%-75% |
| ☒ | ☒ | ○ | ○ | 25%-50% |
| ☒ | ○ | ○ | ○ | 0%-25% |

 **INTRO** ☒ Indicates ON, ○ Indicates OFF.

ALM

When the battery has a fault condition, the "ALM" light is red.

RUN

During charging, the "RUN" light will be green.

During discharging, the "RUN" light will be flashing.

"RUN" and "ALM" can display the battery status, as shown in table 2-2.

Table 2-2 The explanation of "RUN" and "ALM"

| Function | Mark | Color | Flashing frequency | Indication |
|----------|------|-------|---------------------------|---------------|
| Running | RUN | Green | No light | Not working |
| | | | Slow Flash (about 3 secs) | Standby state |
| | | | Fast flash | Working state |
| Alarm | ALM | Red | No light | Normal |
| | | | Stable light | Alarm |

ON/OFF

The on / off light is the on / off light. The on light is on and the off light is off

ADD

When batteries are used in parallel, the four dip switches are used to set the batteries' addresses in the system. The address settings are shown in table 2-3.

Table 2-3 Dip switches address code

| Address Code | | | | ADD | PACK Definition | Explanation |
|--------------|-----|-----|-----|-----|-----------------|--|
| 1 | 2 | 3 | 4 | | | |
| OFF | OFF | OFF | OFF | 0 | PACK0 | Use as Single Pack |
| ON | OFF | OFF | OFF | 1 | PACK1 | Use as MasterPack (When more than one used in parallel) |
| OFF | ON | OFF | OFF | 2 | PACK2 | Use as SlavePack2 |
| ON | ON | OFF | OFF | 3 | PACK3 | Use as SlavePack3 |
| OFF | OFF | ON | OFF | 4 | PACK4 | Use as SlavePack4 |
| ON | OFF | ON | OFF | 5 | PACK5 | Use as SlavePack5 |

| | | | | | | |
|-----|-----|-----|-----|----|--------|--------------------|
| OFF | ON | ON | OFF | 6 | PACK6 | Use as SlavePack6 |
| ON | ON | ON | OFF | 7 | PACK7 | Use as SlavePack7 |
| OFF | OFF | OFF | ON | 8 | PACK8 | Use as SlavePack8 |
| ON | OFF | OFF | ON | 9 | PACK9 | Use as SlavePack9 |
| OFF | ON | OFF | ON | 10 | PACK10 | Use as SlavePack10 |
| ON | ON | OFF | ON | 11 | PACK11 | Use as SlavePack11 |
| OFF | OFF | ON | ON | 12 | PACK12 | Use as SlavePack12 |
| ON | OFF | ON | ON | 13 | PACK13 | Use as SlavePack13 |
| OFF | ON | ON | ON | 14 | PACK14 | Use as SlavePack14 |
| ON | ON | ON | ON | 15 | PACK15 | Use as SlavePack15 |

RS232

The system uses RS-232 series communications to load data and transfer data including: system parameters, system status and alarm information.

RS-232 generally uses 9600bps. The RS-232 port on the battery is only active when the dip switch is set to Single Pack mode (ON,OFF,OFF,OFF). Connection is as shown in figure 2-3.

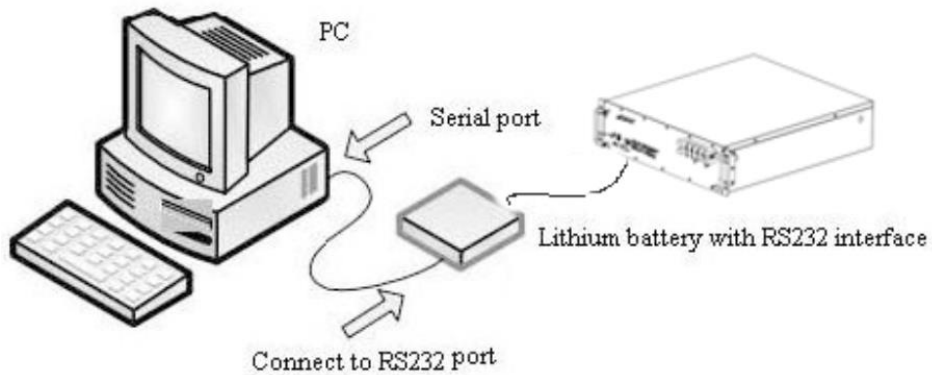


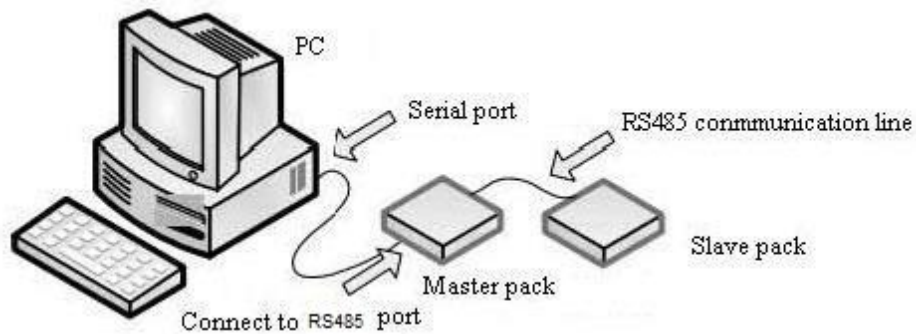
Figure 2-3 RS-232 connection schematic diagram

RS485

When the system is in parallel mode, it uses the RS-485 serial port for data transfer. The main system (Charger/Inverter controller or PC) connects through the Master Pack to get the data for each Slave Pack. Connection as shown in figure 2-4.

The RS485 RJ45 pin-out on the battery is: Pin 7 RS485A, pin 8 RS485B, (pin 6 GND).

Figure 2-4 RS-485 connection schematic diagram

**CAN**

The CAN bus communication interface to the inverter

The CAN RJ45 pin-out on the battery is: Pin 4 CANH, pin 5 CANL; Change the pin-out on the inverter side to match the inverter's pin-out definition.

RESET

Press RST key for 3 seconds to start the device, or press the RST key for 3 seconds again to shut down the device. When the system is running, should there be an exception (alarm), press this button for 6 seconds to reset the system (press / release) to ensure the stability of the system.

Dry contact

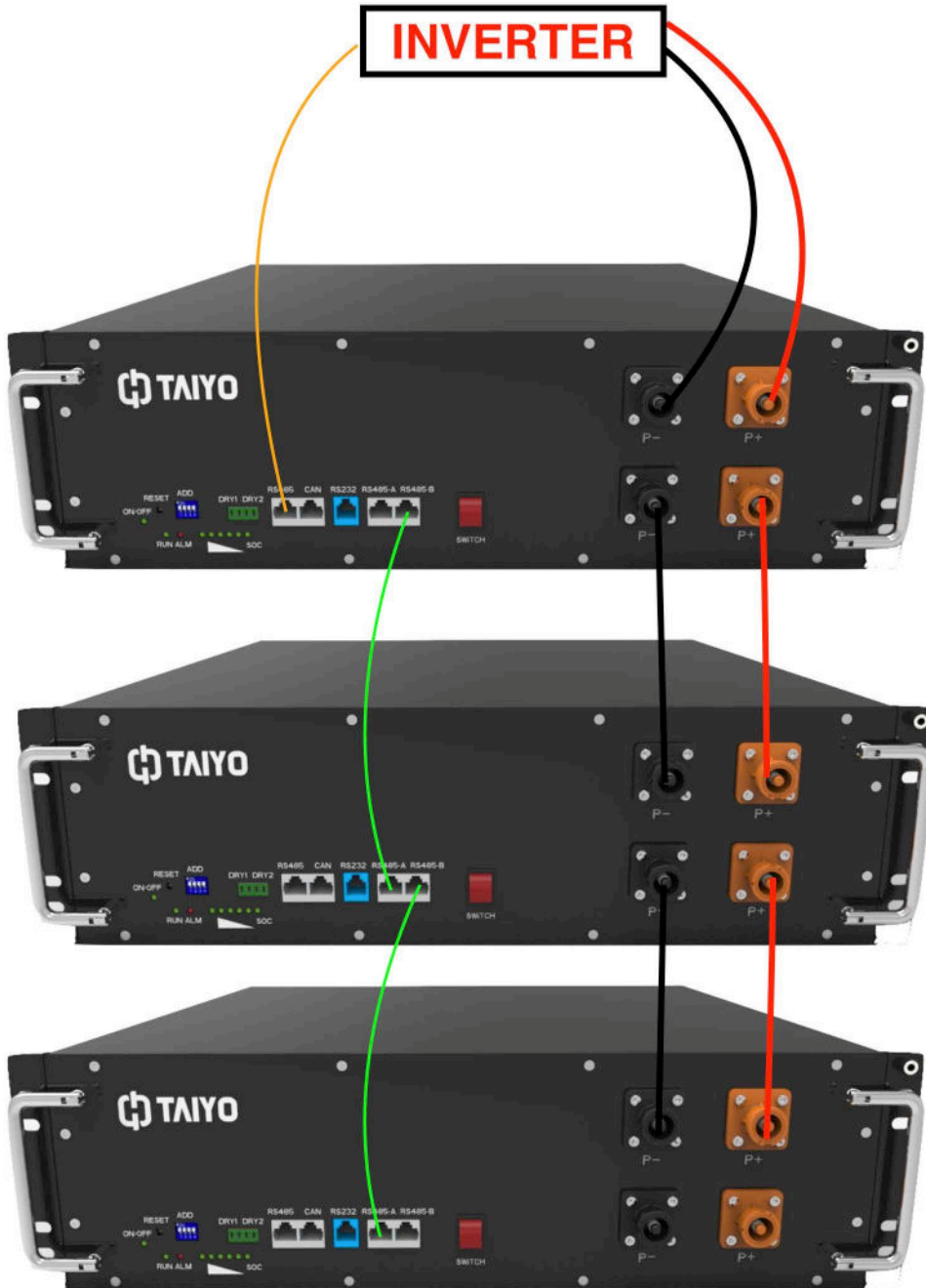
The two dry contacts can be used as control inputs to an inverter/charger to stop charging when the battery is at 100% SOC, stop discharging at 5% SOC or stop when there is an alarm or fault condition.

| | | |
|-------|----------------|------------------------|
| Dry 1 | Closed: Normal | Open: Stop charging |
| Dry 2 | Closed: Normal | Open: Stop discharging |

Output

A terminal of 4 connections, 2 for positive, 2 for negative, each connection is for a M6 ring-lug.

Parallel Connection Example



* The port on the front panel from which the battery connects to the inverter may be different from the example. It depends on the type or brand of inverter we use, and it could be RS485, CAN or RS232.

*Please refer to Page. 2-3, Section "ADD" and make sure that the dip switch on each battery module is set correctly.

Comply with local laws and regulations

When operating the equipment, make certain to comply with local laws and regulations.

Personnel requirements

Technicians who are responsible for installation and maintenance are required to have competent certificates and be allowed to carry out such procedures by local government's regulations/ authorities. Master the correct methods for operation and safety. Only when the installation is confirmed finished by the professional technicians, operation and maintenance can be carried out.

In order to maximize the efficiency of the equipment, to obtain best possible operating results, and ensure maximum lifespan, please pay careful attention to the correct installation and usage requirements.

Personal safety

- Insulated tools and gloves should be used and worn at all times – During the installation process, watches, bracelets, rings and other metal products should be removed.
- Avoid any fall or collision during the installation process.
- Do not remove the battery components. The maintenance of the battery should be carried out by a professional engineer.
- Should be operated and supervised by engineer who have experience and can take preventive measures for potential hazards of battery.

Field and environment

- Site requirements
 - 1) Cleanliness

Lithium battery packs cannot be placed in or near garbage disposals, or accidentally dropped or placed in smaller disposal units, as their interaction with metals is likely to cause short circuits and endanger the system and personal safety.

- 2) Fire protection

The battery storage or installation room must not contain flammable, explosive and other dangerous goods, and it should be equipped with effective fire equipment (such as CO2 fire extinguishers).

3) Ventilation and heat dissipation

For optimum operation and maintenance access the equipment should be installed with 30cm – 50cm clearance all round, with preferably 50cm clearance above it. If installed in a cabinet or cramped area, an exhaust fan should be installed to maintain good indoor ventilation.

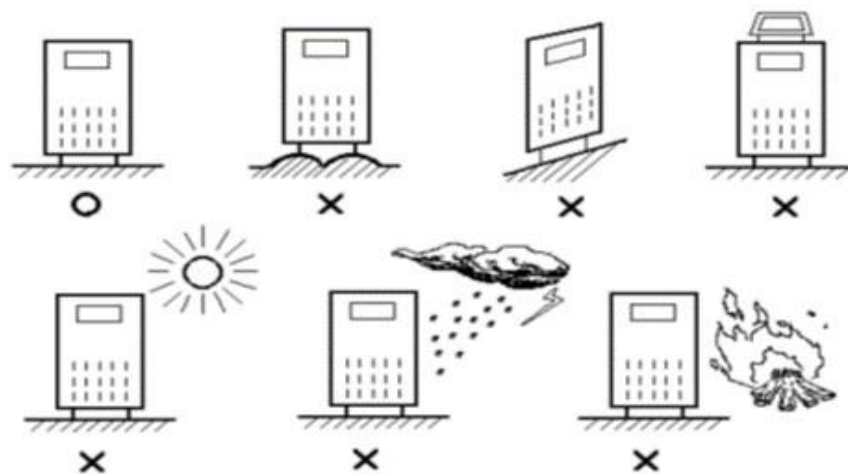
4) Installation requirements

Installation should be carried out as shown in figure 3-1 in order to avoid possible risks.

Put the lithium battery on the ground (to avoid tilt, uneven ground).

Avoid placing in the sunlight, rain or wet surfaces.

Figure 3-1 Requirements for installation scenarios



- Environmental requirements

Ambient temperature: (-10~+40) °C.

Relative humidity level: 0%RH~95%RH, no condensation.

Cooling method: convection; use external fans/air cooler when required.

Height above sea level: match to the standard requirement of GB3859.2-93.

Verticality: no vibration and the vertical inclination does not exceed 5°.

Pollution level: Level ii .

Recommended operating temperature : (20~25) °C , humidity level control within 50%.



caution

- Do not install in a working environment with metal conduction type dust.
 - Do not install in an area containing corrosive gases.
 - Do not install in high dust concentrated areas.
 - Do not place any items on the top of lithium-ion battery pack. People must not sit on the battery.
-
-



caution

- When installing the lithium-ion battery pack, the user should check the lithium-ion battery pack in advance to make sure that the contacts and connectors are safely in place to avoid an open circuit or short circuit fault.
 - During installation, do not connect the lithium batteries polarity in reverse or in any way incorrectly, to avoid causing a short circuit.
 - Please do not connect the terminals with no security or insulation protection, so as to avoid the risk of electric shock.
-
-