# BYD Battery-Box Pro User Manual

## Battery-Box Pro 13.8

Version 6.0

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# 1 General Information

## 1.1 Validity

This user manual applies to the Battery-Box Pro 13.8.

## 1.2 Application

This user manual introduces the Battery-Box product information, using guidance, safety, common issues and actions.

The Battery-Box Pro 13.8 is an energy storage unit that can be used in ON-grid system or Off-grid system.

The product is suitable for indoor use only.

## 1.3 Intended use

The Battery-Box is not suitable for supplying life-sustaining medical devices. A power outage must not lead to personal injury.

Use this product only in accordance with the information provided in the enclosed documentation and with the locally applicable standards and directives. Any other application may cause personal injury or property damage.

The illustrations in this manual meant only to help explain system configuration concepts, includes using guidance, safety caution and normal failure and actions.

Alterations to the product, e.g. changes or modifications, are only permitted with the express written permission of BYD. Unauthorized alterations will void warranty claims. BYD shall not be held liable for any damage caused by such changes. Any use of the product other than that described in the Intended use section does not qualify as appropriate. The enclosed documentation is an integral part of this product. Keep the documentation in a convenient place for future reference and observe all instructions contained therein. The type label must be attached to the product.

Battery-Box Pro 13.8 must work with compatible inverters which are listed in the "Compatible inverter list" in this manual.

## 1.4 Battery-Box definition

BYD Battery-Box products Battery-Box Pro 13.8 is defined as below:
Battery-Box Pro 13.8: the name of Battery Box system with the usable energy of 13.8kWh.

## 1.5 Identifying the Product

The Type Label describes the product identification, which is attached on the product.
The Type Label includes following information:
Product Name:
Product Type:
Nominal Capacity:

Nominal Voltage:
Max Charging & Discharging Current:
Operating Temperature Range:

# 2 Safety

This section contains safety information that must be observed at all times when working on or with batteries by professionals. To prevent personal injury or property damage and to ensure long-term operation of the batteries, read this section carefully and observe all safety information at all times.

**WARNING**

Environmental requirement

- Do not expose the battery to temperature above 50℃.
- Do not install or use the battery near any heat sources.
- Do not install or use the battery in wet locations, such as bathroom.
- Do not expose them to moisture or liquids.
- Do not expose the battery to corrosive gases or liquids.
- Do not expose the battery to direct sunlight for extended periods of time.
- Place battery in secure location away from children and animals.
- Do not allow the battery power terminals to touch conductive objects such as wires.
- Do not dispose of batteries in a fire, which may explode.

Operation

- Do not touch the battery pack with wet hands.
- Do not crush, drop or puncture the battery.
- Always dispose of the batteries according to local safety regulations.
- Store and recharge battery in a manner in accordance with this user manual.
- Ensure reliable grounding.
- The charging circuit of inverter shall be DVC A, and the output circuit needs to be isolated from high voltage bus.
- The cabinet and battery modules shall be transported separately to reduce the risk of damage caused by drop, vibration, topple, etc.
- Do not short circuit the terminals, remove all metal objects including watches and rings that could product a short circuit before installation, replacement and maintenance.
- The battery shall be repaired, replaced or maintained by skilled personal recognized. (Skilled personnel recognized is a trained and qualified electrician or installer defined in installation guidance).
- Do not reverse the polarity.
- Do not stack up batteries without protective package, when store or handle batteries.

- Do not open, mutilate or disassemble the battery, the released electrolyte, which may be toxic, is harmful to the skin and eyes.
- Disconnect the charging source prior to connecting or disconnecting battery terminals, for instance, disconnect battery from power/load and then power off battery before installation and maintenance.
- Packaged batteries should not be stacked more than specified number stipulated on the package.
- Do not lay tools or metal parts on top of batteries.
- Do not use damaged, failed or deformed batteries, which may reach temperatures that exceed the burn thresholds for touchable surfaces. Continued operation of damaged battery may result in dangerous situation and cause severe injury due to electrical shock.

# 3 Technical Data

| Model | Battery-Box Pro 13.8 |
|---|---|
| Battery type | Lithium Ion Battery |
| Battery module [1] [kWh] | 13.8 |
| Usable Energy [1] [kWh] | 13.8 |
| Max Output Power [kW] | 12.8 |
| Peak Output Power [kW] | 13.3, 60s |
| Round-Trip Efficiency | ≥95.3% ( Under test condition [1] ) |
| Nominal Voltage [Vd.c] | 51.2 |
| Operating Voltage Range [Vd.c] | 43.2~56.4 |
| Communication | RS485 / CAN |
| Dimension [ W × H × D, mm ] | 650 × 800 × 550 |
| Net Weight [kg] | 181 |
| Enclosure Protection Rating | IP20 |
| Ambient Temperature Range [2] [℃] | -10 ~ +50 |
| Certification & Safety Standard | TUV(IEC62619) / CE / RCM / UN38.3 |
| Scalability | Max. 32 systems in parallel |
| Compatible Inverters | Please refer to the Battery-Box Compatible inverter list |

[1].Test conditions: 100% DOD, 0.2C charge & discharge @+25℃

[2]. -10℃~12℃ will be derating

* System Usable Energy may be variant with different inverter brands

Note: The maximum operating voltage of the rechargeable lithium-ion battery system is less than 60Vd.c

When Battery-Box works in different temperatures, the current of charge and discharge will be adjusted automatically, battery will permit lower current when operating temperature gets lower. Please refer to below table for the detail parameters setting:

| Parameter setting of charging current in various temperatures | |
|---|---|
| Operating temp. (℃) | Normal current(Ad.c) |
| -10~2 | 15*N |
| 2~12 | 42.5*N |
| 12~50 | 175*N |
| Remark:<br>1. Effective time is 2mins when changing from one temperature range to another.<br>2. N= battery quantity | |

| Parameter setting of discharging current in various temperatures | |
|---|---|
| Operating temp. (℃) | Normal current(Ad.c) |
| -10~50 | 125~250*N |
| Remark: N= battery quantity | |

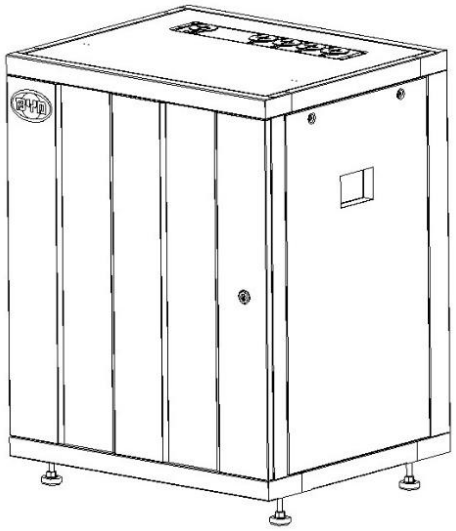
# 4 Technical Terms

| No. | Term | Comment |
|---|---|---|
| 1 | Discharge | Battery output power for load |
| 2 | Charge | To put electricity into battery by charger |
| 3 | Full charged | Battery had been full charged, SOC is 100%. |
| 4 | Idle | Battery is on status of neither charge nor discharge and has not been fully charged. |
| 5 | Shutdown mode | Power off |
| 6 | SOC | State of Charge |
| 7 | SW | Software |
| 8 | HW | Hardware |
| 9 | Battery voltage | The voltage between B+/B- |
| 10 | Pack voltage | The voltage between P+/P- |
| 11 | Cell voltage | Single cell voltage |
| 12 | Failure | Battery or BMS are broken, and unit needs to be replaced |
| 13 | Alarm | Battery will stop charging or discharging immediately |
| 14 | Protect | Battery stops charging or discharging (e.g. cell is overvoltage). Operation can resume at a later stage. |
| 15 | Over discharged | Battery module or batteries overvoltage, need to be recharged timely |

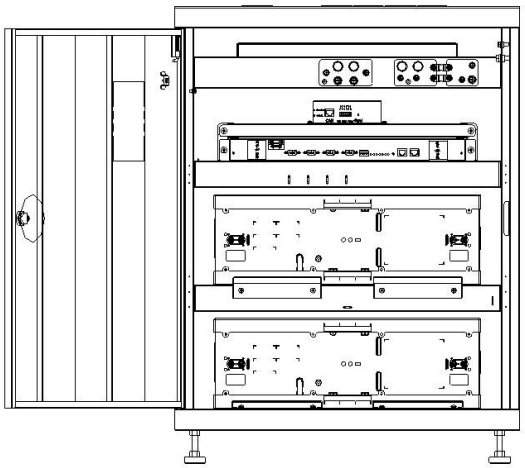
# 5 Product Overview

## 5.1 Battery-Box System brief introduction

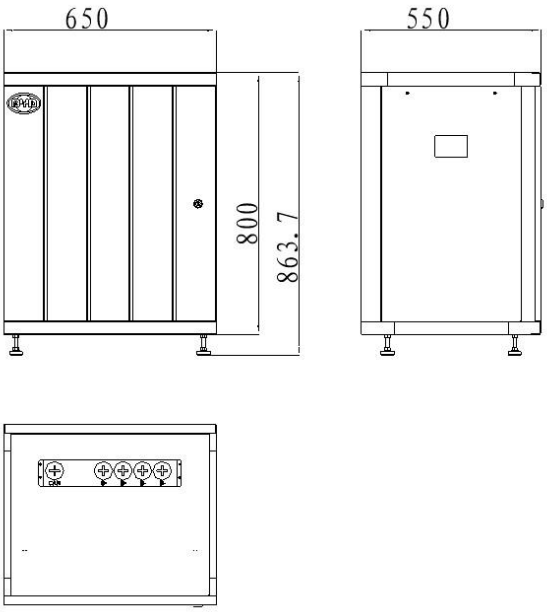
The Battery-Box energy storage system combined with high-performance BYD lithium battery, consists of cabinet, battery, BMS and BMU. Each set of the storage system includes 2 battery modules connected in series, and up to 32 Battery-Box 13.8 energy storage system can be connected in parallel.



Internal drawing



External drawing




Structure dimension drawing

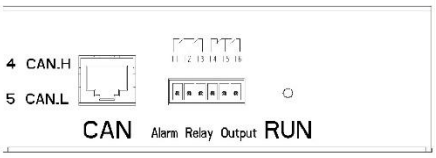
## 5.2 Battery-Box configuration table

| No. | Component | Name | Description |
|---|---|---|---|
| 1 | Cabinet | Battery Box Cabinet | The cabinet is used to accommodate these 2 modules and provide DC input and output. |
| 2 | Battery | Battery module | Battery module with 51.2V 270Ah, BYD’ s P/N is: GBSSB |
| 3 | BMU | BMU | Battery management unit. Provides communication with external equipment. |
| 4 | BMS | BMS | Battery module management unit and communicate with BMU |

## 5.3 General introduction of BMU

BMU is the battery management unit installed in the cabinet; its function is to manage the battery’ s charging and discharging, collect information from the battery and report to the inverter.

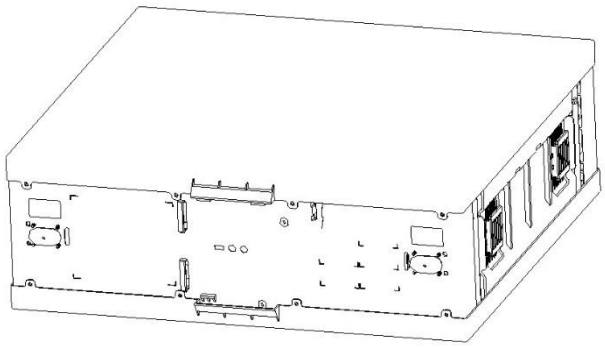
Main functions:




- ✓ CAN / RS485 communication with inverter
- ✓ RS485 communicate with battery/BMS
- ✓ Other Communication interface for maintenance
- ✓ Charge and discharge management

## 5.4 General introduction of Battery-Box 13.8 module

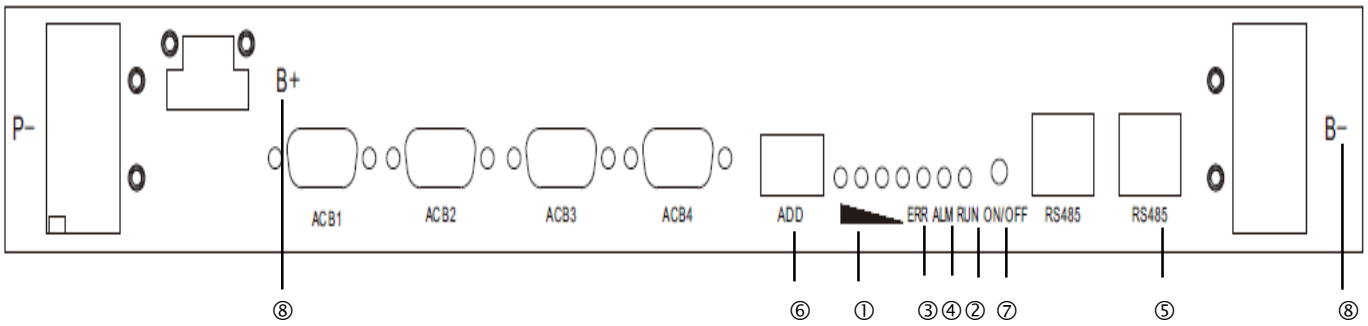
Battery-Box Pro 13.8 includes two battery modules, one battery modules is 25.6V/270Ah, and the batteries are in series connection.



Module overview

## 5.5 General introduction of BMS

BMS, the battery management system, manages battery' s charging and discharging, and communicates with BMU. It reports warning and alarm information to external equipment to make sure that the system run normally.




Display and communication interface

| No. | Interface | Mark | |
|---|---|---|---|
| ① | SOC LED | SOC | Indicate current SOC of battery |
| ② | RUN LED | RUN | Indicate that the Battery is in running status |
| ③ | ERR LED | ERR ADDR | Indicate error status |
| ④ | ALM LED | Alarm | Indicate alarm status |
| ⑤ | RJ45 terminal | RS485 | Communication ports |
| ⑥ | Address | ADDR | Address needs to be set, if they are connected in parallel. |
| ⑦ | ON/OFF | ON/OFF | Power on/power off manually |
| ⑧ | Test terminal | B- B+ | Measure battery voltage when testing. |

## 5.6 Operating environment

Operating environment parameters

| No. | Item | Min. | Typical | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| 1 | Discharging temperature | -10 | 25 | 50 | ℃ | |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Charging temperature | -10 | 25 | 50 | ℃ |
| 3 | Relative humidity | 5 | | 95 | % |
| 4 | Absolute humidity | 0.26 | | 25 | g/m3 |
| 5 | Elevation | - | 2000 | - | m |
| 6 | Enclosure | | | IP20 | |
| 7 | Pollution | | | PD2 | |
| 8 | Voltage category | | | II | |
| 9 | Recommended external breaker | | | 300A | |

# 6 Cleaning and Maintenance

## 6.1 Cleaning

**CAUTION:**

**Please power off the system before cleaning the Battery-Box Pro 13.8**

The Battery-Box system is recommended to be cleaned periodically. If the enclosure is dirty, please use a soft , dry brush or a soot blower to remove the dust. Liquids such as solvents, abrasives or corrosive liquids are not allowed to clean the enclosure.

## 6.2 Maintenance

### 6.2.1 Recharge requirement for normal storage

Batteries should be stored in position with the temperature range of -20℃ ~ +45℃, and maintained regularly according to the following table with 0.5C (125A) current for 1 hour after a long time of storage.

Recharge conditions when in storage

| Storage environment temperature | Relative humidity of storage environment | Storage time | SOC |
|---|---|---|---|
| Below -20℃ | / | Avoid | / |
| -20~25℃ | 5%~70% | ≤12 months | 30%≤SOC≤60% |
| 25~35℃ | 5%~70% | ≤6months | 30%≤SOC≤60% |
| 35~45℃ | 5%~70% | ≤3months | 30%≤SOC≤60% |
| Above 45℃ | / | Avoid | / |

### 6.2.2 Recharge requirement when battery is over discharged

Please recharge the over discharged batteries in time as per the following table, otherwise the over discharged ones will be damaged.

Recharge condition when battery is over discharged

| Storage environment temperature | Storage time |
|---|---|
| -20~25℃ | ≤15 days |
| 25~45℃ | ≤7 days |

# 7 Compatible Inverter List

To make sure that the system can be operated normally, please use BYD compatible inverters and select battery quantity correctly, according to the "Battery-Box configuration list with different inverter" in Appendix 1 in this user manual.

# 8 Common Issues and Solutions

8.1 Alarm indicated on the BMU and solution

| LED of the BMU | Possible cause | Solution |
|---|---|---|
| Flash 1 time | Inverter and BMU communication failure | Step1. Check whether the CAN communication cable has been connected correctly and tightly；<br>Step2. If the connection is incorrect, please reconnect the cable correctly; if the connection is correct and reliable, then replace the BMU； |
| Flash 2 times | Battery not found | Check the connection between BMU and first battery. |
| Flash 3 times | One or some batteries are disconnected | 1. Check RS485 cable and battery address<br>2. If the connection and the address are correct, please contact the after service provider |
| Flash 4 times | Any battery failure | Check battery led status. If the red led is on and buzzer alarms, please contact the after service provider to replace the battery. |

8.2 Alarm display on BMS and solution

Alarm indicated by flashing LED

| Info Battery displayed | Flash | Possible cause | Solution |
|---|---|---|---|
| Only yellow led is ON<br> | 0.5Hz | Battery was powered off abnormally; | Press ON/OFF button for 2-3 seconds to restart the battery, If the battery cannot be recovered, contact the after service provider immediately; |
| Flow led flashes and alternates with capacity led | 10s per cycle | Communication connection timeout | Step1.Check the communication wire/cable<br>Step2.Check battery address |
| NO.1/3 led and No.2/4 led flashing alternately | / | Update status | If the firmware is not updated, then reset the battery. |

Alarm indicated by flashing yellow Led

| Fault phenomenon | Flashing Times | Possible causes | Solution |
|---|---|---|---|
| 1.Yellow led (Alarm) is always on<br>2 Press on/off button for 1S and release, then hear short buzzer<br>3. The green Led (RUN) is always on, and yellow led (ALM) flash at different times, which indicates that battery is in alarm status. | 1time | Under voltage (BAT or CELL) | Contact the after service provider |
| | 2times | Over charge | Contact the after service provider |
| | 3times | Low temperature charge over-current | Contact the after service provider |
| | 4times | Charge short circuit | Contact the after service provider |
| | 5times | Discharge short circuit | Contact the after service provider |
| | 6times | Parallel short circuit | Contact the after service provider |
| | 7times | Discharge over-current protection | Contact the after service provider |
| | 8times | High temperature protection | Contact the after service provider |
| | 9times | Low temperature protection | Contact the after service provider |
| | 10times | PACK over voltage protection | Contact the after service provider |

Alarm status indicated by flashing red led

| Fault phenomenon | Times | Possible cause | Solution |
|---|---|---|---|
| 1.Red led (Err) is always on<br>2. Press the on/off button press the for1S and released, then buzzer sounds shortly<br>3. Green led (RUN) is always on, and red led (ERR) is flashing, which shows the alarm status. | 1time | Voltage sensor failure | Replace the battery |
| | 2times | Temperature sensor failure | Replace the battery |
| | 3times | Charging circuit failure | Replace the battery |
| | 4times | Discharge circuit failure | Replace the battery |
| | 5times | Batteries failure | Replace the battery |
| | 6times | Communication failure | Replace the battery |

Failures indicated by buzzer

| Fault phenomenon | Times | Possible cause | Solution |
|---|---|---|---|
| The buzzer sounds with different times at a 15 seconds interval. | 4times | Reverse 、 short circuit | 1.Power off;<br>2.Inspect short/reverse connection of cable between P+&P-;<br>3.If short/reverse connection is confirmed, please reconnect cable correctly;<br>4.Restart battery; |
| | 3times | Batteries failure | Replace the battery |
| | 2times | Voltage sensor failure、Temperature sensor failure | Replace the battery |

| | | | |
|---|---|---|---|
| | 1time | Charging/Discharge circuit failure | Replace the battery |

### 8.3 Common issues displayed on inverter and solution

User also can check the battery' s running, warning and alarm information from App or LED display of inverter, detail information please refer to Appendix 2 in this user manual.

### 8.4 Emergency

Please cut off the power supply and turn off the battery in emergency.

# 9 Warranty

BYD provides warranty when the product is installed and used according to the description of user manual / installation manual / warranty letter.

1. Please contact our local service provider for technical support & after service.
2. Please download the Warranty Letter via following website:

   Australia customer: www.alpspower.com.au

   European customer: www.eft-systems.de

# Contact Information

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