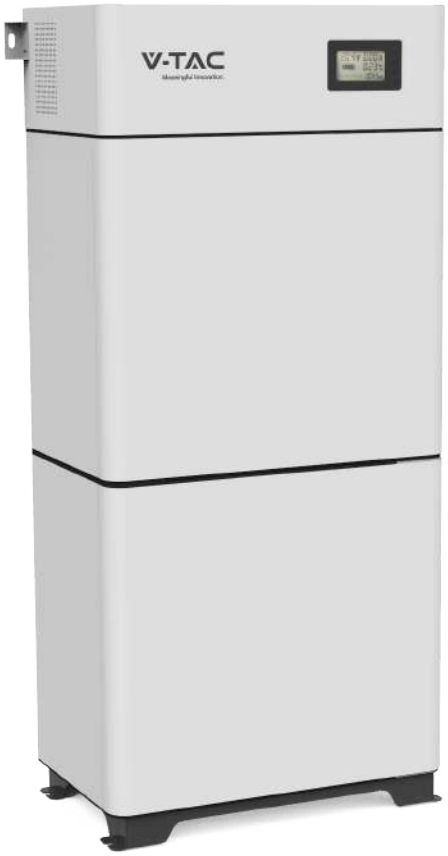
Meaningful Innovation.

WEEE Number: 80133970

INSTRUCTION MANUAL

ESS SERIES BATTERY PACK



05 YEAR WARRANTY*

MODEL	SKU
VT-204100	11527

INTRODUCTION

Thank you for selecting and buying V-TAC Product. V-TAC will serve you the best. Please read these instructions carefully & keep this user manual handy for future reference. If you have any another query, please contact our dealer or local vendor from whom you have purchased the product. They are trained and ready to serve you at the best.

Multi-Language Manual QR CODE
Please scan the QR code to access the manual in multiple languages.

About This Document

Intended Audience

This document is intended for:

- Hardware installation engineers
- Technical support engineers
- Maintenance engineers
- Users

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Definition	Remarks
DANGER	Danger	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Warning	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
ATTENTION	Attention	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTE	Note	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environmental deterioration.

2 Overview

2.1 Product Application

VT-204100 is a next-generation product developed by V-TAC, which is used in residential energy storage solut ions. This battery system has a capacity of 19.2 kWh or 20.48 kWh.

VT-204100 integrates the high-performance BMS. To extend battery life, it has multiple protection functions such as system over-charge, system over-discharge, cell over-voltage, cell under-voltage, charging over-current, discharging over-current, and insulation fault. It also has RS485, CAN, and dry contact communication, allowing for remote monitoring.

2.2 Product Composition

The VT-204100 consists of one battery cabinet (two battery boxes and one chassis base inside), one high-voltage box, and four battery modules.

The composition of the VT-204100 is shown as follows:

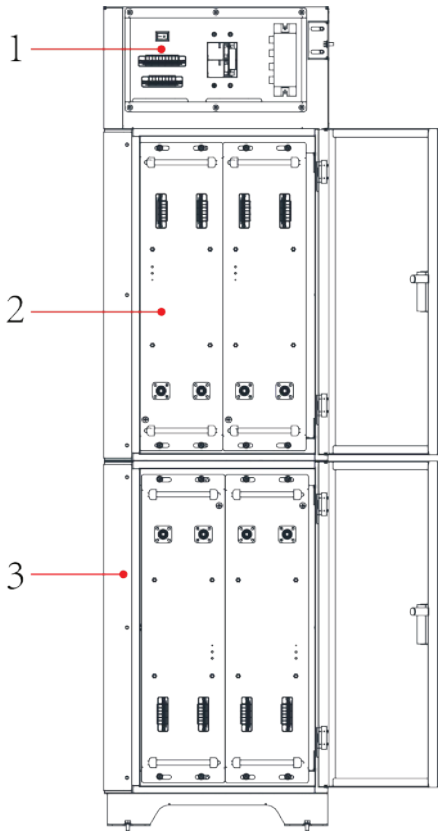


Figure 1. VT-204100 composition

(1) High-voltage box (2) Battery module (3) Battery cabinet

3 Components Introduction

3.1 Battery Cabinet

The appearance of the battery cabinet is shown as follows.

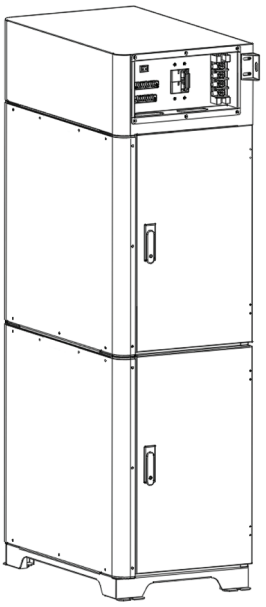


Figure 2. Battery cabinet appearance

The battery cabinet dimensions are shown as follows:

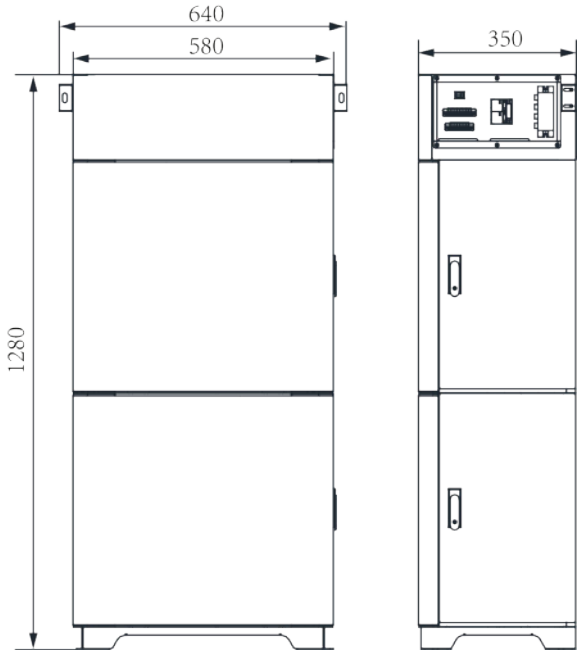


Figure 3. Battery cabinet dimensions (unit: mm)

3.2 Battery System

The battery system specifications are as follows.

Table 1. Battery system specifications

No.	Items	Parameter	Remark
1	Rated voltage	VEH192100C: 192 V VEH204100C: 204.8 V	
2	Rated capacity	100 Ah	
3	Rated energy	VEH192100C: 19.2 kWh VEH204100C: 20.48 kWh	
4	System efficiency	92%	Watt-hour efficiency
5	Communication type	CAN、RS485、DO/DI	
6	Equalization	Negative equalization	≤300 mA
7	Operation voltage range	VEH192100C: 168 V-204 V VEH204100C: 179.2 V-217.6 V	
8	Self-discharge	≤3% per month	
9	Max continuous charge current	100 A	
10	Max continuous discharge current	100 A	
11	Total voltage sampling	0 V-600 V	±(0.5%FS+0.1%RD)
12	Total current sampling	1 A-200 A	
13	Temperature sampling	NTC (-20℃～125℃)	±2℃
14	Insulation sampling	0～5MΩ	
15	SOC estimate accuracy	≤8%	
16	Charge ambient temperature	0℃-45℃	Optimum ambient temperature: 15℃-35℃
17	Discharge ambient temperature	-10℃-45℃	
18	Storage temperature	0℃-40℃	

No.	Items	Parameter	Remark
19	Humidity	5%-95% RH, no condense	
20	Protection	System over-voltage and system under-voltage, cell over-voltage and cell under voltage, charging over-current and discharging over-current, charging high temperature and charging low temperature, discharging high temperature and discharging low temperature, short circuit protection, insulation faulty protection	
21	Dimensions (W×H×D)	640 mm×1280 mm×350 mm	
22	Weight	VEH192100C: Approx. 230kg VEH204100C: Approx. 238kg	

3.2.1 Lithium-ion Cell

The lithium iron phosphate cell selected in the scheme is a special energy-type lithium battery product. This series of lithium iron phosphate cells have high specific energy, longer cycle life, low cost, capable of high current charge and discharge, high-temperature tolerance, high energy density, no battery memory effect, safety, and pollution-free features.

3.2.1.1 Appearance

Lithium-ion cell's three views are shown as follows.

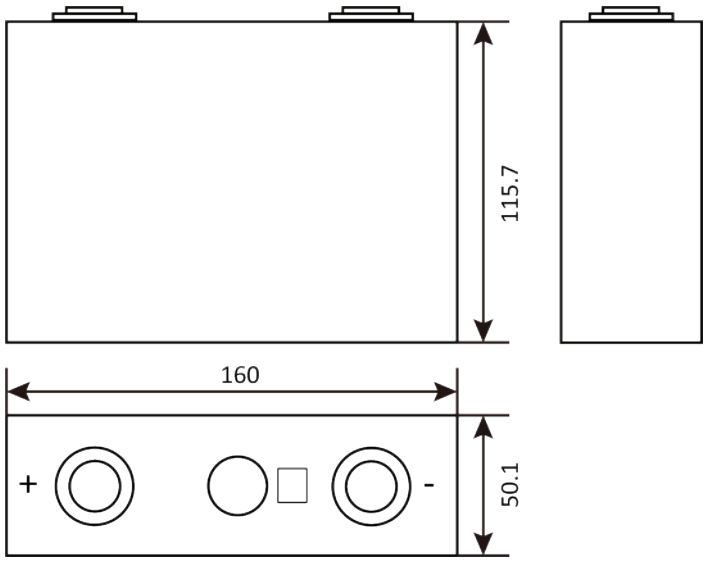


Figure 4. Lithium-ion cell three views (unit: mm)

3.2.1.2 Technical Specifications

Lithium-ion cell main technical specifications are shown as follows.

Table 2. Lithium-ion cell main technical specifications

No.	Items	Specification
1	Battery type	Lithium iron phosphate
2	Model	LF100MA
3	Rated voltage	3.2 V
4	Rated capacity	100 Ah
5	Rated energy	0.32 kWh
6	Max continuous charge current	100 A
7	Max continuous discharge current	100 A
8	Charging cut-off voltage	3.65 V
9	Discharging cut-off voltage	2.50 V
10	Operating charging temperature	0℃-55℃
11	Operating discharging temperature	-20℃-45℃
12	Storage temperature	-20-45℃（less than 1 month）; 0-35℃（less than 12 months）;
13	Operating humidity	5%-95% RH
14	Cycle life	≥3500 cycle@ 25℃ 80%DOD
15	Size (Width*High*Depth)	160 mm×115.7 mm×50.1 mm
16	Weight	About 1.92 kg

3.2.2 Battery Module

15 or 16 lithium cells are packed in the battery module, assembled in a combination of 1 parallel, 15, or 16 series.

The battery module is integrated with BMU to collect voltage and temperature and monitor the battery module's status at all times.

3.2.2.1 Appearance

The battery module appearance is shown as follows.

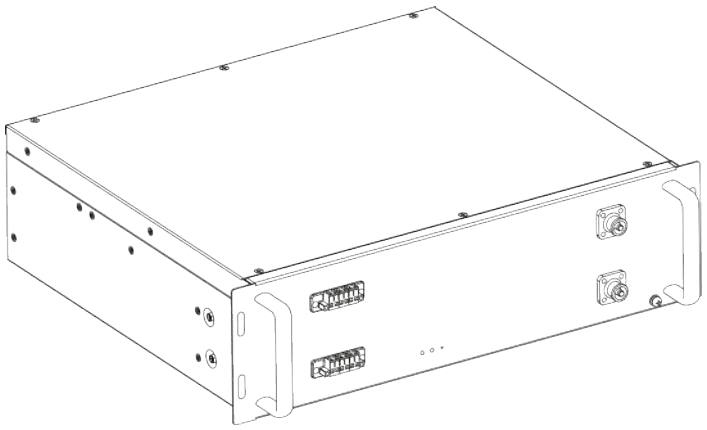


Figure 5. Battery module appearance

The battery module's three views are shown as follows.

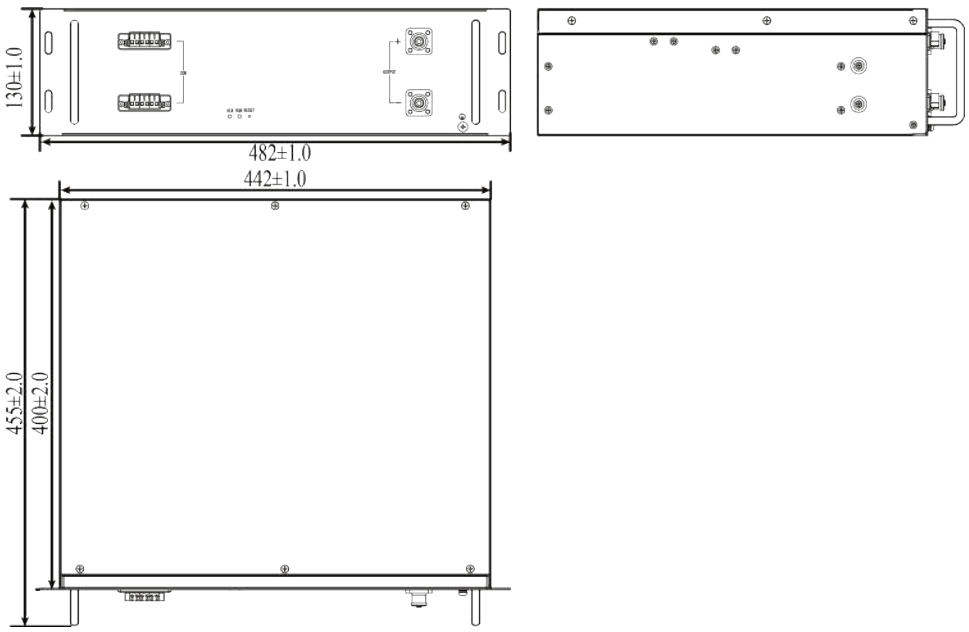


Figure 6. Battery module three views (unit: mm)

3.2.2.2 Operation Panel

The battery module operation panel is shown as follows.

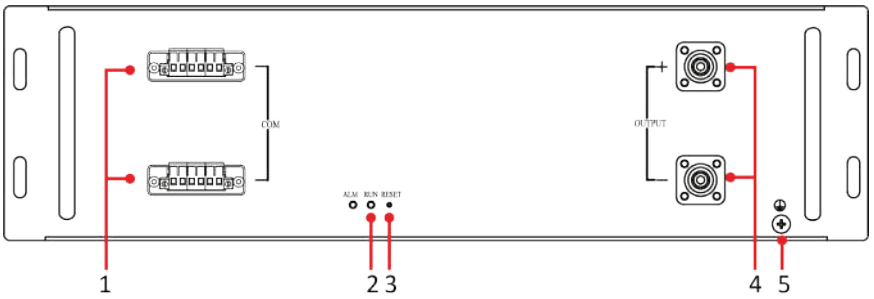


Figure 7. Battery module operation panel

The definition of the battery module operation panel is shown as follows.

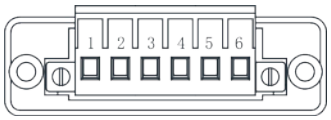
Table 3. Operation panel definition

No.	Items	Remark
1	Communication port	Communicate with other battery modules; Communicate with high-voltage box.
2	Running indicator	Indicate battery module running status.
3	Reset switch	Reset BMU.
4	Output connectors	Battery module output connectors.
5	Ground	Ground.

3.2.2.3 PIN Definition

The PIN definition of a communication port is shown as follows.

Table 4. Communication port PIN definition

Location schematic diagram	Location	Definition	Remark
	1	24 V+	BMU power supply
	2	24 V-	
	3	-	-
	4	CAN0H	Communication between BMU and BCU.
	5	CAN0L	
	6	CAN0S	

3.2.2.4 Technical Specifications

The battery module's main technical specifications are shown as follows.

Table 5. Battery module main technical specifications

No.	Items	VT48100E-H1	VT48100E-H2
1	Model	VT48100E-H1	VT48100E-H2
2	The number of cells	15	16
3	Cells in series and parallel	1P15S	1P16S
4	Model	48 V	51.2 V
5	Rated voltage	100 Ah	100 Ah
6	Rated capacity	4.80 kWh	5.12 kWh
7	Charging cut-off voltage	54.0 V	57.6 V
8	Discharging cut-off voltage	37.5 V	40.0 V
9	Max continuous charge current	100 A	100 A
10	Max continuous discharge current	100 A	100 A
11	Size (Width*High*Depth)	482 mm×130 mm×455 mm (With the handle)	482 mm×130 mm×455 mm (With the handle)
12	Weight	About 39 kg	About 41 kg

3.2.3 Battery Cluster

The battery cluster is composed of 4 battery modules. The schematic diagrams of battery clusters are shown as follows.

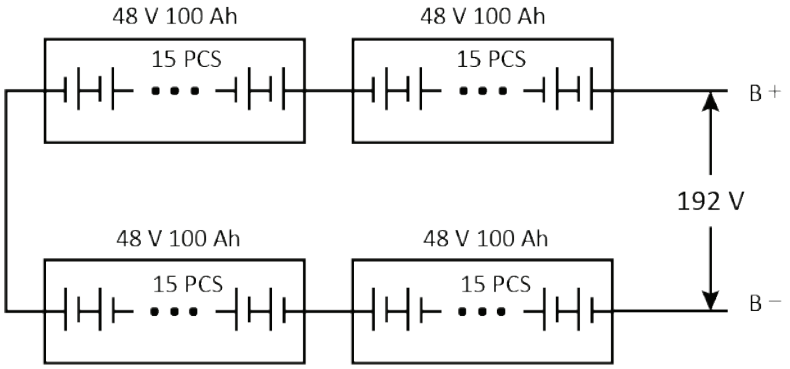


Figure 8. VEH192100C battery cluster composition diagram

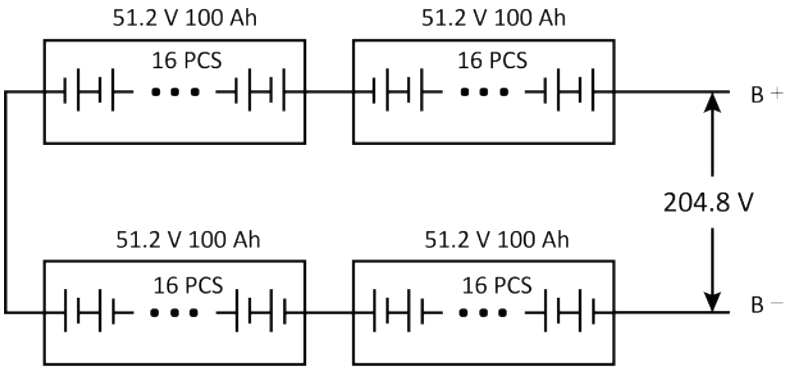


Figure 9. VEH204100C battery cluster composition diagram

3.2.4 High-Voltage Box

The high-voltage box is used to control and protect the DC connection or disconnection of the battery cluster and communicate with the inverter.

If there are multiple battery cabinets in parallel, the appearance of the master and slave high-voltage boxes is the same, but the functions are different. There is a PCU inside the master high-voltage box, and there is no PCU inside the slave high-voltage box.

3.2.4.1 Appearance

The appearance of the high-voltage box is shown as follows.

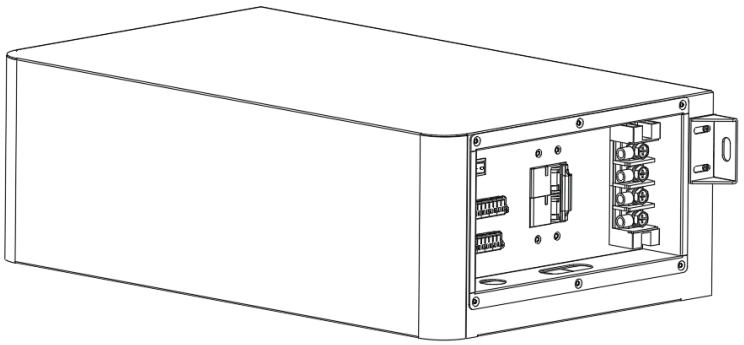


Figure 10. High-voltage box appearance

The high-voltage box's three views are shown as follows.

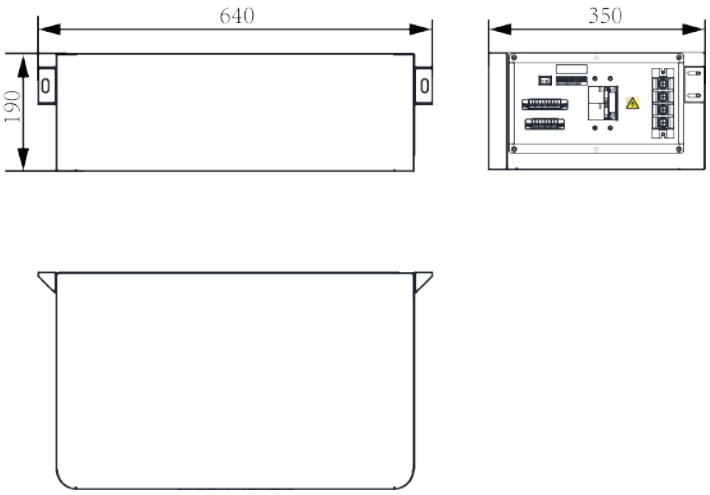


Figure 11. High-voltage box three views (unit: mm)

3.2.4.2 Operation Panel

The operation panel of the high-voltage box is shown as follows.

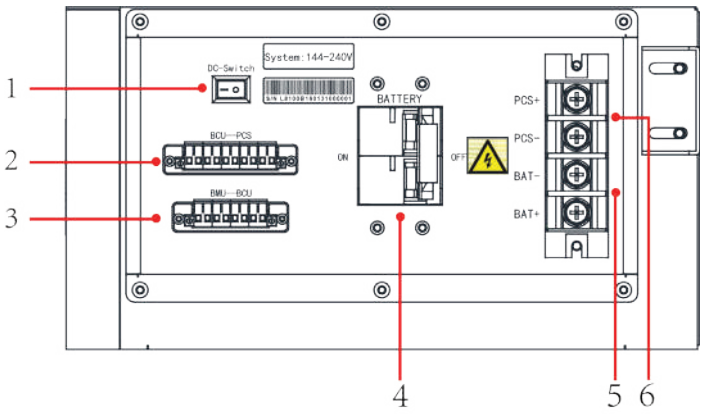


Figure 12. High-voltage box operation panel

The definition of the high-voltage box operation panel is shown as follows.

Table 6. Operation panel definition

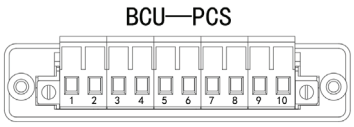
No.	Items	Remark
1	DC input switch	BMS 24V power supply control
2	External communication port (Master high voltage box)	SCADA communication / Inverter communication
3	BMU communication port	BMU power supply and communication
4	Output switch	Battery output control
5	Battery input connectors	Battery input connectors
6	Output connectors	Battery output connectors

3.2.4.3 PIN Definition

External communication port

The PIN definition of an external communication port is shown as follows.

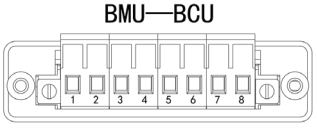
Table 7. External communication port PIN definition

Location schematic diagram	Location	Definition	Remark
	1	CAN1H	BCU communication, connect the last high voltage box（***Optional***）
	2	CAN1L	
	3	CAN1H	BCU communication, connect the next high voltage box（***Optional***）
	4	CAN1L	
	5	CAN2H	Inverter communication
	6	CAN2L	
	7	DI+	Low voltage wake up
	8	DI-	
	9	AC/L	AC input
	10	AC/N	

BMU communication port

The PIN definition of the BMU communication port is shown as follows.

Table 8. BMU communication port PIN definition

Location schematic diagram	Location	Definition	Remark
	1	V+	Battery module 24V power supply
	2	V-	
	3	CAN0H	BMU communication, connect the last battery module
	4	CAN0L	
	5	V+	Battery module 24V power supply
	6	V-	
	7	CAN0H	BMU communication, connect the next battery module
	8	CAN0L	

3.2.4.4 Technical Specifications

High-voltage box main technical specifications are shown as follows.

Table 9. High-voltage box main technical specifications

No.	Items	Specification	Remark
1	Rated voltage	300 VDC	
2	Rated current	100 A	
3	Power supply	Dual power redundant power supply: battery module power supply, inverter power supply	
4	Power consumption	＜40 W	
5	Communication type	CAN*3	
6	Cooling type	Natural cooling	
7	Total voltage sampling	0 V~600 V	±(0.5%FS+0.1%RD)
8	Total current sampling	1 A~200 A	
9	Temperature sampling	NTC (-20℃～125℃)	±2℃
10	Insulation	0～5MΩ	
11	Short circuit protect	Yes, fuse	
12	Isolation rate	500 VDC, the 60s, isolation resistance of more than 10 MΩ	
13	Dielectric strength	1500 VAC, the 60s, No flashover, and breakthrough	
14	Ambient temperature	0℃-45℃	Recommended temperature: 25℃-35℃
15	Operation humidity	5%-95%RH and no condense	
16	Size (Width*High*Depth)	640 mm×190 mm×350 mm	
17	Weight	14.5 kg	

3.3 Battery Management System

VT-204100 adopts the battery management system (BMS) developed by Vestwoods, including the following three-layer structural units:

- Battery module management module: BMU, integrated with the battery module.
- Battery cluster management module: BCU, integrated with the high voltage box.
- Battery system management module: PCU, integrated with the high voltage box.

BMS can monitor the current, voltage, and temperature of cells in the battery module in real-time, calculate the SOC of the battery system, communicate with the host computer software, and send fault and alarm information.

The schematic diagram of the communication structure of the BMS is shown as follows.

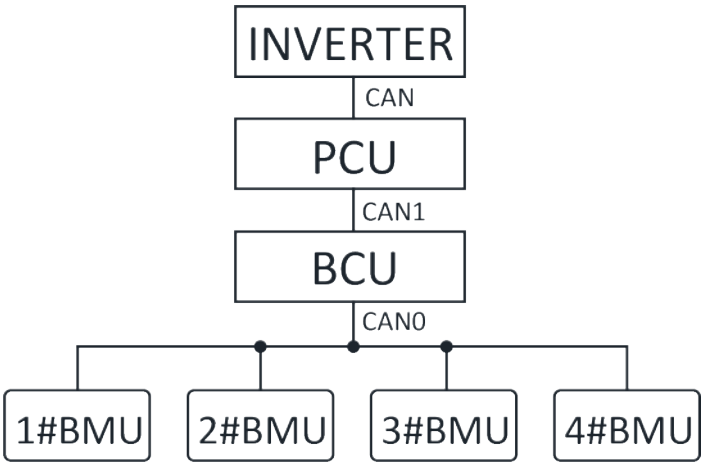


Figure 13. Communication topology

3.3.1 BMU

The BMU integrated with the battery module is the initiating unit of the BMS. It monitors battery voltage and temperature and transmits cell information to the BCU through the communication port.

BMU's main technical specifications are shown as follows.

Table 10. BMU main technical specifications

No.	Item	Specification	Remark
1	Power supply	24 VDC	
2	Power consumption	＜1 W	Without equalization
3	Voltage sampling channels	15 strings	Compatible with 16 strings
4	Voltage sampling range	0 V～5 V	Accuracy ±10 mV
5	Temperature sampling channel	4 cell sampling and 1 PCB sampling	
6	Temperature sampling range	-20℃～125℃	Accuracy ±2℃

No.	Item	Specification	Remark
7	Equalization	Negative equalization	≤ 300 mA
8	Operation temperature	-20℃～75℃	
9	Operation humidity	5%-95%RH	

3.3.2 BCU

The BCU integrated with the high-voltage box is the intermediate level of the BMS. It collects information from the BMU and transmits it to the PCU.

BCU can effectively manage the safety of charge and discharge of battery clusters, provide real-time monitoring of battery parameters, fault diagnosis, SOC/SOH estimation, insulation detection, remote monitoring, and other functions, and trigger protection when alarm and emergency battery module possible failures appear, to ensure the safety, reliable and stable operation of battery modules.

BCU's main technical specifications are shown as follows.

Table 11. BCU main technical specifications

No.	Item	Specification	Remark
1	Power supply	24 VDC	
2	Power consumption	＜2 W	
3	Total voltage sampling	0 V~600 V	±(0.5%FS+0.1%RD)
4	Current sampling	0 A~1000 A	±(0.5%FS+0.5%RD)
5	Temperature sampling	2 Channels, -20℃-125℃	Accuracy ±2℃
6	DO	8 channels	
7	DI	8 channels	
8	Insulation	0~5 MΩ	Total voltage≥400 V, accuracy ±20%； Total voltage＜400 V, accuracy ±30%； Insulation resistance≤5kΩ, accuracy ±10kΩ
9	SOC estimate accuracy	≤8%	
10	Communication type	CAN-3 channels, RS485-2 channels	

3.3.3 PCU

The PCU integrated with the high-voltage box can monitor and manage battery clusters internally and complete information exchange externally.

The main functions of the PCU are as follows:

- Battery information management: PCU can monitor cell voltage, cell temperature, cluster voltage, cluster charging current, and cluster discharging current in real-time.
- SOC estimation: Estimated the battery cluster SOC.
- DI/ DO communication: PCU provides multiple DI and DO interfaces.
- CAN and RS485 communication: PCU provides 3 CAN communication interfaces and 2 RS485 communication interfaces.
- Self-fault diagnosis: PCU has a self-test function.
- Charge and discharge management: PCU can coordinate the charge and discharge between battery clusters and improve the circulating current in clusters.

4 Installation Guide

4.1 Precautions for Installation

- Light intensity is required near the installation location.
- Comply with the safety operation technical regulations when lifting and handling heavy objects.
- Equipment and tools must be complete, intact, and reliable. It is strictly prohibited to use tools with cracks, burrs, loose handles, etc., that do not meet the safety Standards.
- Installation operations must be guided by qualified engineers.
- During installation, two people must work together, one operating and the other inspecting.
- The original cable connection and operation process shall not change without the authorization of the company's consent.

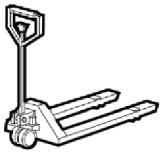
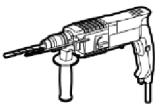
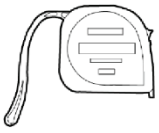
4.2 Preparing for Installation

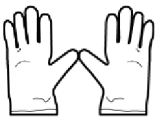
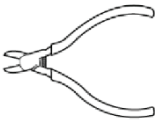
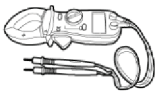
4.2.1 Tools

Must be insulate installation tools to prevent electric shocks. If tools without insulation protection are used, may the exposed metal parts need to be wrapped and insulated with insulating tape.

The following table shows the tools that need to be prepared before installation.

Table 12. Tools

Electric screwdriver	Manual forklift	Impact drill	Socket wrench
			
Tape measure	Adjustable wrench	Torque wrench	Claw hammer
			

Goggle	Helmet	Insulation shoes	Anti-static gloves
			
Phillips screwdriver	Diagonal pliers	Clamp meter	Multimeter
			

4.2.2 Packing List

Open the package and take out the product, please check the accessories first. The packing list is shown below.

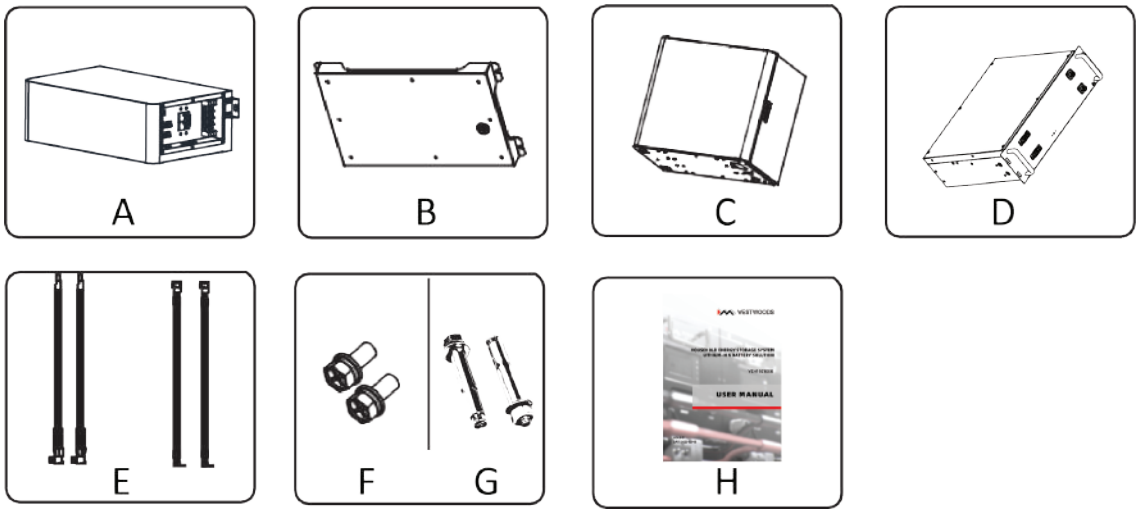


Figure 14. Accessories of VT-204100

A	High-voltage box	B	Base	C	Battery box*2 (optional)
D	Battery*4 (optional)	E	Wire rod	F/G	Expansion screws and hexagonal screw
H	User manual				

4.2.3 Unpacking Acceptance

After receiving the goods on-site, please check whether the packing box is intact and inspect the goods in time. If the packing box is slightly damaged, please sign and confirm the goods list and indicate the extent of the damage. If the damage is severe, please refuse to sign.

Please carry out an unpacking inspection after receiving all the goods. If users find that the received goods do not match the packing list, please contact Vestwoods as soon as possible.

4.3 Installing Battery Cabinet

Context

Before installing the battery cabinet, users need to plan the installation site. The installation site should comply with the following conditions:

- The installation site should be able to place one battery cabinet, and there should be a wall to mount the inverter.
- A 500 mm ventilation and operation space should be reserved at the right of the battery cabinet.
- If possible, the installation site should be as spacious and ventilated as possible. If the site is small and confined, please configure auxiliary heat dissipation equipment.

Procedure

⚠ATTENTION

The battery cabinet is heavy. If possible, please use tools to assist in handling and installation.

1 Plan the installation position of the battery cabinet according to the actual situation of the site.

2 Fixing the chassis base with the battery box 1, using 8 pcs M5*12 screws. (***It has been pre-installed before delivery***）

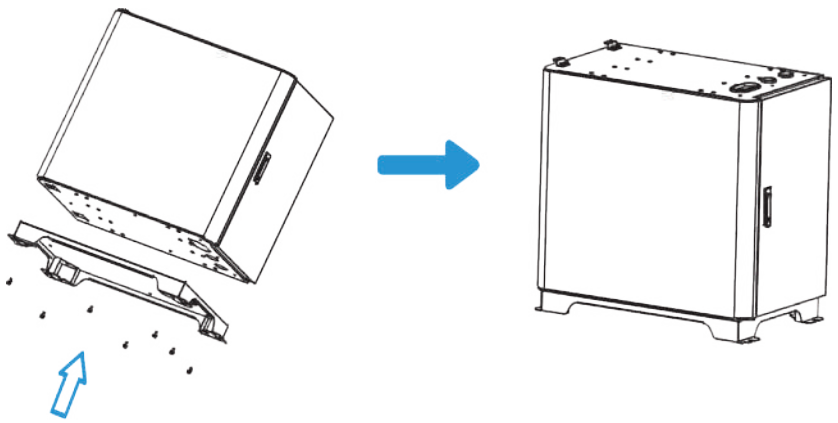


Figure 15. Fixing the chassis base of the battery box

3 The battery box 2 fixing. Install 2 pcs guide rails of battery box 1 first, then align the lower notch of battery box 2 with the upper guide of battery box 1, lower it and push it to the right. Facilitate pushing to the right, the coil can be removed before assembly.

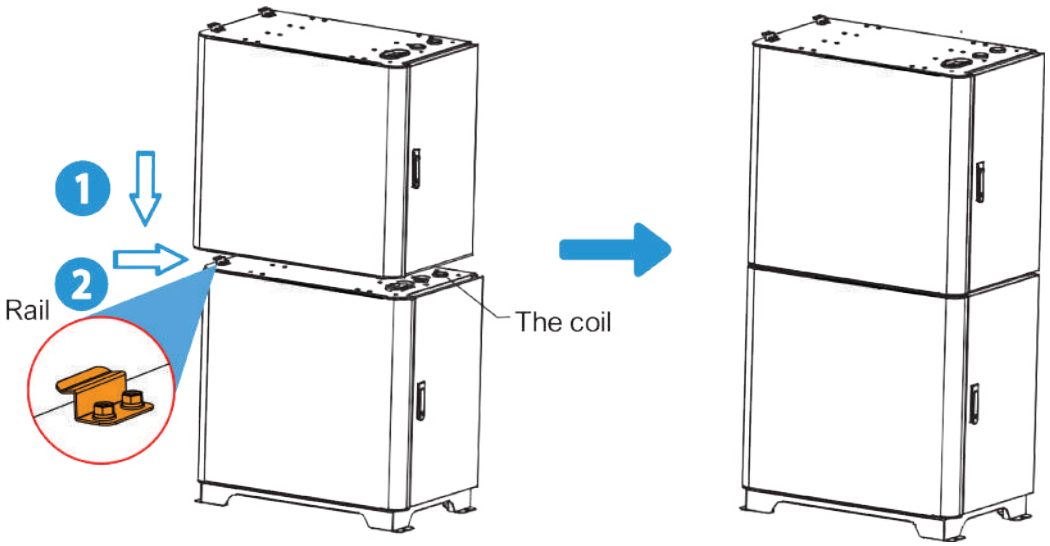


Figure 16. Fixing the battery box 2

4 Two sets of battery cabinets are fixed, install 2 pcs guide rails of battery box 2, then open the battery cabinet doors, and use 2 pcs M5*12 screws to fix it upward.

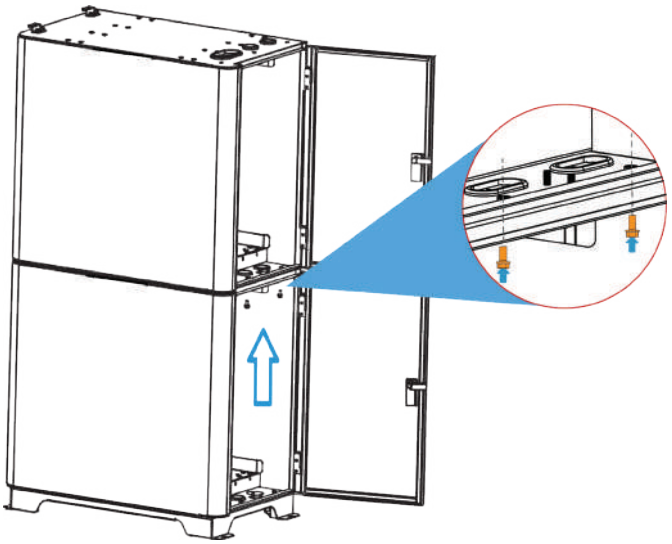


Figure 17. Fixing the battery cabinet

5 Fixing of high-voltage box. The method is the same as step 3 & step 4. To facilitate pushing to the right, the coil can be removed before assembly.

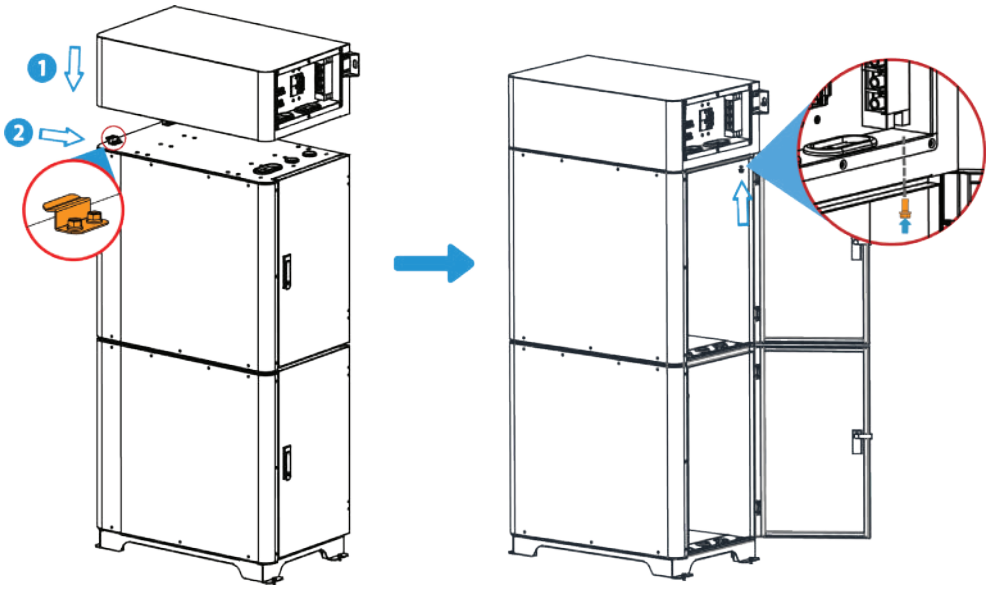


Figure 18. Fixing the high-voltage box

6 Whole machine fixing, drill holes according to the position of the battery cabinet installation holes. The top is fixed to the wall, and the bottom is fixed to the ground, using M6 Expansion screws.

NOTE

If the battery cabinet is installed against the wall, it can be fixed on the wall.

7 Use a hammer drill to drill holes for installing the expansion bolts and then install the expansion sleeves in the holes.

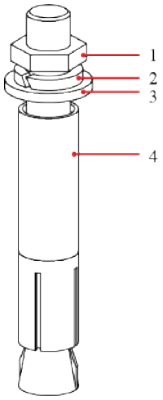


Figure 19. Expansion bolt composition

(2) M10 bolt (2) Spring washer (3) Flat washer (4) Expansion sleeve

NOTE

Ensure the expansion tube of the expansion bolts fits completely into the hole. The expansion sleeves must be completely buried under the ground to properly facilitate subsequent installation.

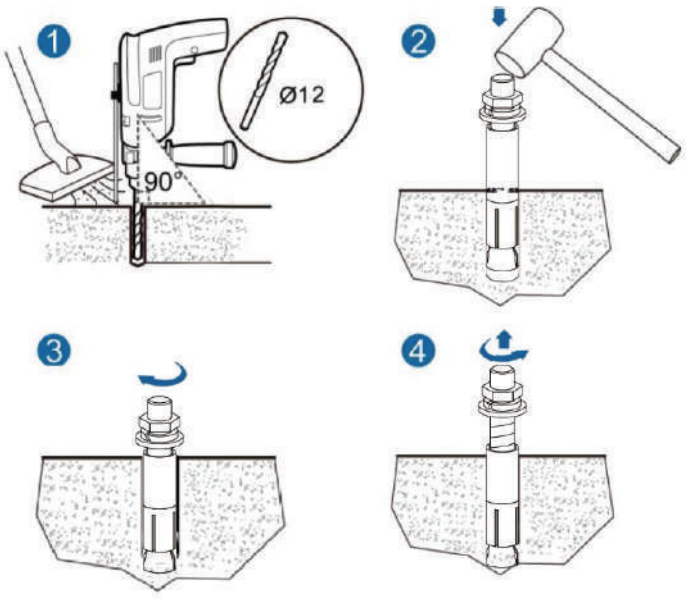


Figure 20. Installing expansion bolts (unit: mm)

A Drill holes in the ground by using a hammer drill.

B Partially tighten the expansion bolt and vertically insert it into the hole. Hit the expansion bolt using a hammer until the expansion sleeve is fully inserted into the hole.

C Partially tighten the expansion bolt.

D Remove the bolt, spring washer, and flat washer.

8 Place the cabinet in the installation location. Use M10×90 expansion bolts to fix the expansion holes of the master cabinet and slave cabinets to the ground.

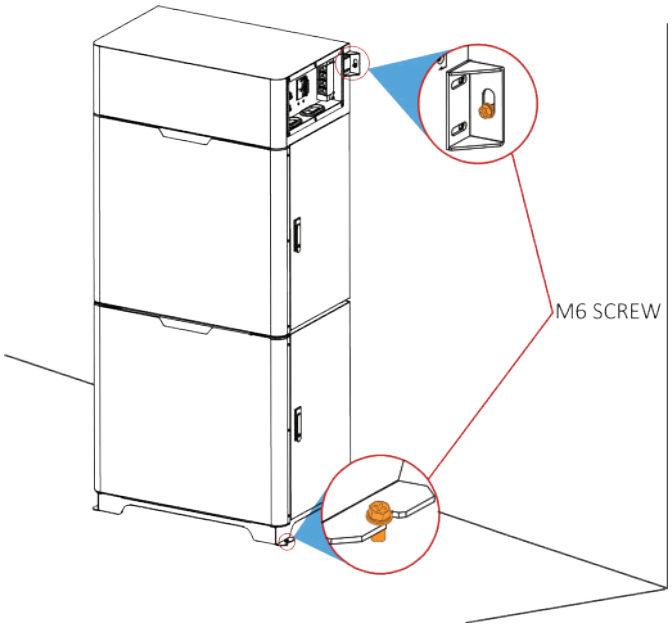


Figure 21. Location of the mounting holes (unit: mm)

4.4 Installing Battery Module

Procedure

1 Take out the battery module and put it in the installation place.

ATTENTION

- **The battery module is heavy. If possible, please use tools to assist in handling and installation.**
- **The address of the battery module can be automatically assigned after the battery module is powered on.**

2 Fixing the battery modules to the cabinet with the cross-recessed pan head combination screws. A total of 16 pcs M5*12 screws are used.

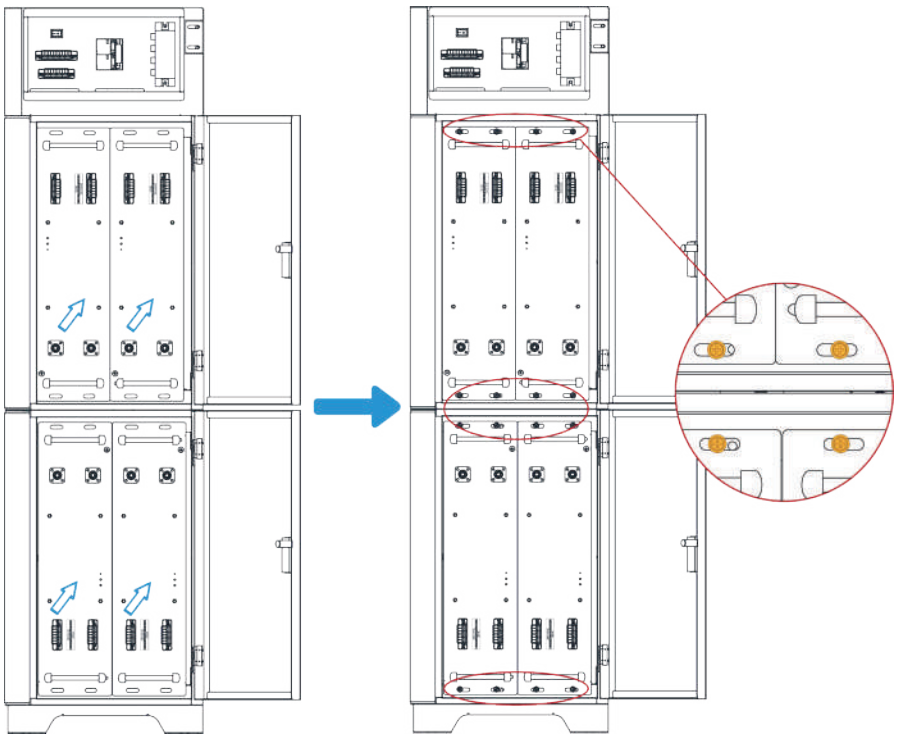


Figure 22. Installing battery module

3 Use ground cables to connect the battery module's ground point to the cabinet's ground point.

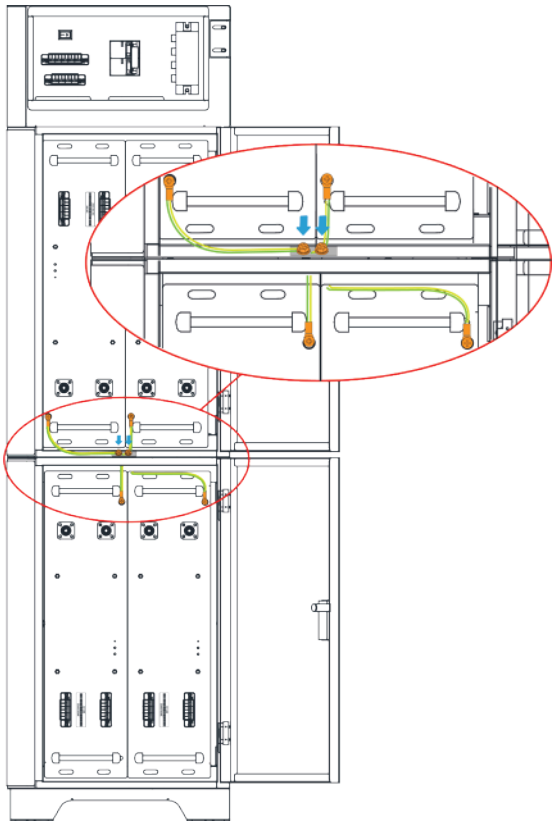


Figure 23. Battery module grounding

4.5 Connecting Power Cable

Context

ATTENTION

Insulate installation tools to prevent electric shocks.

The battery module power cable connection method adopts the self-locking connector method. The description of the self-locking connector is shown as follows:

- The steps for connecting the self-locking connector are as follows:
  - A Adjust the direction of the self-locking connector to align with the battery module terminal.
  - B Rotate the self-locking connector slightly, and it will be sucked in automatically.
  - C After the self-locking connector is automatically sucked in, push it in slightly, and after hearing a sound, the self-locking connector and the battery module terminal are connected.
- Users need to press the buttons on the self-locking connector simultaneously when users need to pull out the self-locking connector.

Figure 24. Self-locking connector button

Procedure

1 Connect the power cable between the high-voltage box and the battery module.

NOTE

- **The self-locking connector's color should correspond to the battery module terminal's color: orange corresponds to the positive pole, and black corresponds to the negative pole.**
- **The internal wiring of the battery cabinet is the same. This chapter takes a battery cabinet as an example to introduce.**
- **Please take care of the removed battery module protective cover in case of backup.**

2 Connect the power cable between the RESS battery modules.

The wiring diagram of the battery inside of the battery cabinet is as follows:

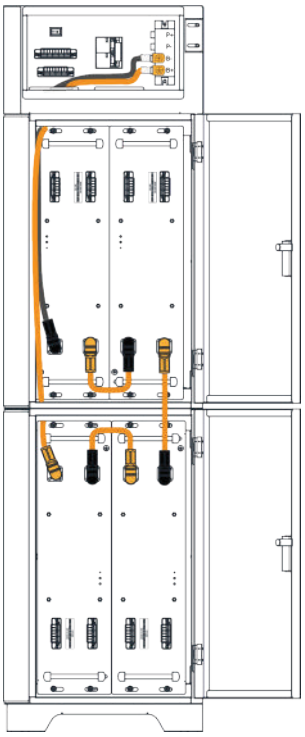


Figure 25. The wiring diagram of the inside of the battery cabinet

ATTENTION

- **The wiring sequence is: first connect the OT terminal to the high-voltage box terminal, and then connect to the battery modules. Please strictly follow the wiring sequence. Otherwise, it will be easy to short-circuit.**
- **The self-locking connector's color should correspond to the battery module terminal's color: orange corresponds to the positive pole, and black corresponds to the negative pole.**
- **The bolt type on the high-voltage box terminal is M8, and the recommended tightening torque is 7 N.m.**

4.6 Connecting Signal Cable

Context

ATTENTION

- **Please pay attention to the direction when plugging the signal cable connector, do not operate violently.**
- **Signal cables and power cables must be routed separately.**

If there are multiple battery cabinets in parallel, there is a ***Host machine*** label on the master high-voltage box and a ***Slave machine*** on the slave high-voltage box. Only the master high-voltage box needs to connect the signal cable to the inverter. Please pay attention to the distinction.

Procedure

1 Connect the internal signal cable of the VT-204100 battery cabinet.

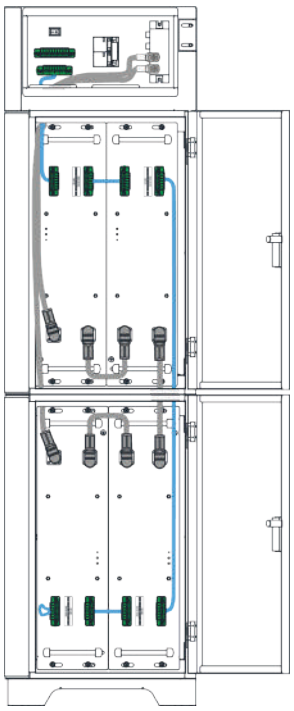


Figure 26. Connect the internal signal cable of the battery cabinet

2 Connect the remaining power cables and signal cables between the battery cabinet and inverter.

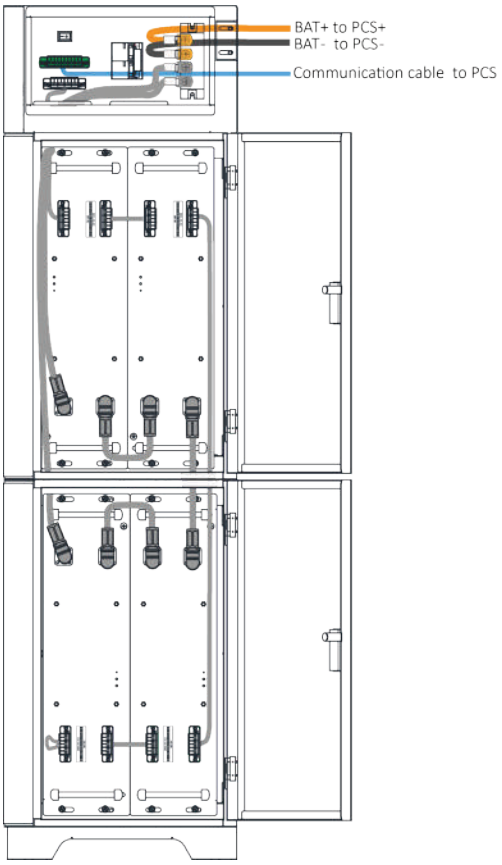


Figure 27. Connect the external cables

3 For the wiring diagram of the inverter to the user side, please refer to the inverter user manual.

NOTE

1. **Please confirm the usage scenarios of the inverter according to the actual situation. For details, please refer to the inverter user manual.**
2. **The communication cable to the inverter contains L&N cable（220V power supply for BMS）. Please connect this cable to the output port of the inverter. (Optional)**

5 Operation Guide

5.1 Check before Power-on

Context

After installing the VT-204100 , users need to perform a pre-power check to ensure that the device installation and cable connection are correct before performing the power-on operation.

Procedure

1. Check whether the battery module sequence is consistent with the layout diagram.
2. Check the cable connection on site.
   - Check whether the cables are connected correctly, whether the connectors are firm, and whether the self-locking connector is tightly connected.
   - Check whether the bolt torque on the terminal of the high-voltage box is 7 N.m.
   - Check whether the signal cable and the power cable are separated.
3. Check whether the battery module and high-voltage box are grounded.
4. Check the switch status.
   - The DC input switch and output switch of the high-voltage box are open.
   - The DC switch of the inverter is open.
   - The circuit breaker from the inverter to the grid is open.

5.2 Power-on

Context

⚠ATTENTION

Before performing the power-on commissioning on the RESS, users must strictly perform the pre-power-on check.

Procedure

1. Close the DC switch of the inverter.
2. Close the output switch of the high-voltage box.
3. Close the circuit breaker between the inverter and the grid.

5.3 Operation Guide

The battery system has completed the system parameter settings at the factory, and the system will run automatically after power is on.

The inverter needs to be set according to actual needs. For detailed operations, please refer to the ***User Manual***.

6 Routing Maintenance

ATTENTION

- **The engineering personnel who perform the following operations must have received professional training. Before operating and maintaining the VT-204100,wear anti-static work clothes, anti-static gloves, and wrist straps, and remove conductive objects such as jewelry and watches to avoid electric shock or burns.**
- **All RESS internal maintenance work requires insulated tools and should be performed by personnel who have received relevant training.**
- **When operations such as installation and maintenance only involve the battery system, the output switch of the high-voltage box should be kept open. When the inverter is involved, the DC input switch of the high-voltage box, the output switch of the high-voltage box, the DC switch of the inverter, and the circuit breaker from the inverter to the grid should be kept open.**

6.1 Battery Storage

- The recommended storage temperature is 15℃~35℃.
- Battery performance degradation after long-term storage, please shorten shelf time as possible as you can.
- Recharge charge before using to recover capacity loss of self-discharge during storage and transport.
- Storage battery should be at 40%-50%SOC when the battery is not used for a long time.
- Storage batteries over 40°C or under 0°C will reduce battery life. A storage battery in a dry and low-temperature, well-ventilated place.

If the battery is not used for a long time, the battery must be charged at regular intervals. The charging requirements are as follows：

Table 13. Battery Charge Requirement in Storage Status

Storage Temp.	Charge Period	Charge Process
20℃~30℃	Each 6 months	1. Charge by 0.2C to 100% SOC 2. Discharge by 0.2C to 0% SOC 3. Charge by 0.2C to 40%~50% SOC
0℃~20℃ or 30℃~40℃	Each 3 months	

6.2 Monthly Maintenance

Users should conduct a visual inspection of the RESS monthly. Please refer to the following table for monthly maintenance.

Table 14. Monthly maintenance

Item	Refer Standard	Abnormal Handling Suggestion
Battery appearance	● The appearance is neat and clean without stains. ● The battery terminals are intact. ● The battery shell is intact, and there are no bumps, breaks, or cracks around it. ● The appearance of battery has no leakage. ● There is no deformation or bulging of the shell.	● If there is dirt on the surface, clean the battery module's appearance with a cotton cloth. ● If the appearance is damaged, leaking, or deformed, take a photo and replace the problem battery module. ● Please contact Vestwoods in time for other abnormal situations.
Operation environment	The operation environment is between 0℃-45℃. Operation humidity range: ≤95% RH.	If temperature and humidity are abnormal, check the indoor air conditioner status.

6.3 Quarterly Maintenance

Please refer to the following table for the quarterly maintenance of RESS.

Table 15. Quarterly maintenance

Item	Refer Standard	Abnormal Handling Suggestion
Cable	● There is no aging of the connecting wire and no cracking of the insulation layer. ● The bolts at the cable connection are not loose.	● Replace the faulty cable. ● Fasten the screws.

6.4 Yearly Maintenance

It is recommended to perform trend analysis on recorded data (battery and environment).

Acronyms and Abbreviations

AC	Alternating Current
BMU	Battery Management unit
BMS	Battery Management System
BCU	Battery Control Unit
DC	Direct Current
PCU	Protocol Converter Unit
SOC	State of Charge
SOH	State of Health