Operation Manual

iMarsBD-HS
Energy Storage Integrated Machine



INVT Solar Technology (Shenzhen) Co., Ltd.

Preface

The manual is intended to provide detailed information of product information, installation, application, trouble shooting, precautions and maintenance of the energy storage integrated machine. The manual does not contain all the information of the energy storage system. Please read this manual carefully and follow all safety precautions seriously before any moving, installation, operation and maintenance to ensure correct use and high performance of operation on the machine.

The use of the energy storage integrated machine must comply with local laws and regulations on grid-tied power generation.

The manual needs to be kept well and be available at all times.

All rights reserved. The contents in this document are subject to change without notice.

There may be data deviation because of product improving. Detailed information is in accordant with the final product.

Content

Preface i

Content ii

1 Safety precautions 1

1.1 Warning signs 1

1.2 Safety guide 1

1.2.1 Transportation and installation 2

1.2.2 Grid-tied operation 3

1.2.3 Maintenance and replacement 3

1.2.4 What to do after scrapping 4

2 Product overview 5

2.1 Energy storage system 5

2.2 Product appearance 6

2.2.1 Key component description 6

2.2.2 Nameplate 8

2.3 Products modules 9

2.4 Dimensions and weight 9

3 Storage of the energy storage integrated machine 11

4 Installation 12

4.1 Unpacking confirmation 12

4.2 Preparation before installation 14

4.2.1 Installation tools 14

4.3 Mechanical installation 16

4.3.1 Basic installation requirement 16

4.3.2 Installation procedures 16

4.4 Electrical connection 18

4.4.1 Battery electrical installation 18

4.4.2 Front panel interface of US2000B battery 19

4.4.3 Electrical characteristics of US2000B battery 21

4.4.4 Cascade installation of US2000B battery 21

4.4.5 PV connection 23

4.4.6 Grid and load connection 25

4.4.7 Definition of CAN interface pin in the battery 27

4.4.8 Definition of CAN2 interface pin in the energy storage inverter 27
4.4.9 RS-485 communication connection 27
5 LCD operation instructions 30
5.1 Instruction for main page 30
5.2 Display menu 31
5.3 Parameter setup of the energy storage integrated machine 32
5.3.1 Parameter classification page 32
5.3.2 Instruction for setup parameter 33
5.3.3 Inverter data display 35
6 Fault code 36
7 Technical parameter 38
8 Contact us 40

1 Safety precautions

Energy storage integrated machines are designed and tested strictly in accordance with relevant international safety standards. As an electrical and electronic device, all relevant safety regulations must be strictly complied during installation, operation, and maintenance. Incorrect use or misuse may result in:

- Injury to the life and personal safety of the operator or other people.
- Damage to the machine or other property belonging to the operator or other people.
- This chapter mainly various warning symbols in operation manual and provides safety instructions for the installation, operation, maintenance and use of energy storage integrated machines.

Statement

Our company shall not be liable for any consequence caused by any of the following events.

- Damage caused by transportation.
- The storage conditions do not meet the requirements specified in the manual, resulting in damage.
- Incorrect storage, installation, and use.
- Unqualified personnel install and operate the machine.
- Failure to comply with the operation instructions and safety precautions in this manual.
- Operate in extreme environments which are not covered in this manual.
- Exceed the operation range of parameters that specified in the technical specification.
- Unauthorized disassembly, modification, or modification of the software code.
- Device damage caused by abnormal natural environment (force majeure, such as lightning strikes, earthquakes, fires, storms, etc.)
- Warranty expiration without extension of the warranty service.
- Installation or use in environment which are not specified in related international standards

1.1 Warning signs

Warning signs are used to warn you about the conditions that may cause severe injury or damage to the device. They instruct you to exercise caution to prevent danger. The following table describes the warning signs used in this manual.

Sign	Name	Description	Abbreviation
 Danger	Danger	Serious physical injury or even death may occur if related requirements are not followed.	
 Warning	Warning	Physical injury or damage to the devices may occur if related requirements are not followed.	
 Electrostatic discharge	Electrostatic discharge	Damage may occur if related requirements are not followed.	
 Hot sides	Hot sides	Sides of the device may become hot. Do not touch.	
Note	Note	Steps to take for ensuring the proper running of the device.	**Note**

1.2 Safety guide

	• After receiving this product, first confirm the product package is intact. If any question, contact the logistic company or local distributor immediately. • The installation and operation of the machine must be carried out by professional technicians who have received professional trainings, and thoroughly familiar with all the contents in this manual and the safety requirements of the electrical system. • Do not carry out connection/disconnection, unpacking inspection and unit replacement operations on the machine when power source is applied. Before wiring and inspection, users must confirm the breakers on DC and AC side of inverter are disconnected and wait for at least 5 minutes.
	• Ensure there is no strong electromagnetic interference caused by other electronic or electrical devices around the installation site. • Do not refit the machine unless authorized. • All the electrical installation must conform to local and national electrical standards.

	• Do not touch the housing of the machine or the radiator to avoid scald as they may become hot during operation
	• Ground with proper technics before operation
	• Do not open the surface cover of the machine unless authorized. The electronic components inside the machine are electrostatic sensitive. Do take proper anti-electrostatic measures during authorized operation.
	• The machine needs to be reliably grounded.
	• Ensure that DC and AC side circuit breakers have been disconnected and wait at least 5 minutes before wiring and checking.

Note: Technical personnel who can perform installation, wiring, commissioning, maintenance, troubleshooting and replacement of the energy storage inverters must meet the following requirements:

- Operators need professional training.
- Operators must read this manual completely, and master the related safety precautions.
- Operators need to be familiar with the relevant safety regulations for electrical systems.
- Operators need to be fully familiar with the composition and operating principle of the entire energy storage system, and related standards of the countries/regions in which the project is located.
- Operators must wear personal protective equipment.

1.2.1 Transportation and installation

	• Keep the package and unit complete, dry and clean during storage and transportation. • This machine is heavy. Please remove and install it with at least two people. • To ensure the normal and safe operation of the energy storage integrated machine and avoid personal injury, please select proper handling and installation tools, and take mechanical protection measures to protect personal safety, such as wearing smashing shoes, coverall and so on. • Only qualified electricians are allowed to install the machine. • Do not put and install the machine on or close to flammable or explosive materials. • Do not install the machine in a place where children and other people can easily touch it. • To avoid a risk of electric shock, please remove rings, bracelets, and other metal jewelry on your hands before installation and electrical connection.

	• The solar cell modules exposed to the sunlight may generate dangerous voltage. Users must cover the cell modules with fully light shading materials before electrical connection. • The input voltage of the machine should not exceed the maximum input voltage, otherwise damage may occur. • The machine is not suitable for the positive or negative grounding systems of solar cell modules. • Ensure the proper grounding of the inverter. • Ensure reliable installation and electrical connection.

Note: iMarsBD-HS energy storage integrated machine are only for crystalline silicon solar modules.

1.2.2 Grid-tied operation

	• Only qualified electricians are allowed to operate the machine under the permission of local power departments. • All electrical connections must meet the electrical standards of the countries/regions in which the project is located. • Ensure reliable installation and electrical connection before operation. • Do not open the cover of the machine when the machine is working or any circuit is connecting to the machine.

1.2.3 Maintenance and replacement

	• Only qualified electricians are allowed to perform the maintenance, inspection, and component replacement of the machine. • Please contact the distributor or manufacturer for maintenance. • In order to avoid irrelevant personnel from entering the maintenance area during maintenance, temporary warning signs must be placed to warn non-professionals to enter or use fence for isolation. • Before carrying out any maintenance operations, all input power to the machine must be disconnected first, and wait for at least 5 minutes until the internal parts of the machine are fully discharged. • Please follow the electrostatic protection norms, and take correct protective measures because there are mostly electrostatic sensitive circuits and devices in the machine. • Do not use parts and components not provided by our company during maintenance. • Restart the machine after eliminating the faults and problems which may affect

	the safety and performance of the machine. • Do not get close to or touch any charged metal conductor parts of the grid or running system, otherwise electric shock or fire may occur. Please do not ignore the warning icons and instructions with “electric shock”.

1.2.4 What to do after scrapping

	• Do not dispose of the machine together with household waste. The user has the responsibility and obligation to send it to the designated organization for recycling and disposal.

2 Product overview

This chapter mainly describes the appearance, packaging accessories, nameplate, and other information of iMars series energy storage integrated machines.

2.1 Energy storage system

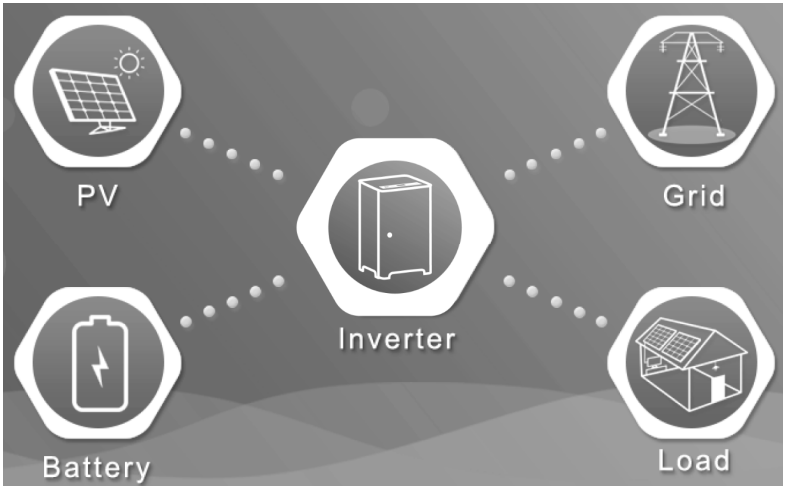


Figure 2.1 Energy storage system

Symbol	Description
A	PV module
B	Battery
C	Energy storage integrated machine
D	Public grid
E	Load

2.2 Product appearance

2.2.1 Key component description

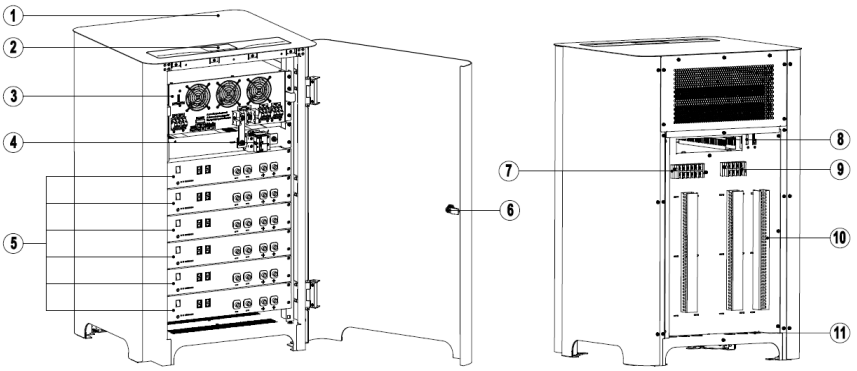


Figure 2.2 Appearance diagram of 3–5 kW energy storage integrated machine

No.	Name	Description
1	Energy storage integrated machine	
2	Touch screen	
3	Energy storage inverter	
4	Battery break	
5	Lithium battery	Purchased separately
6	lock	
7	External AC terminal block	
8	External communication port	
9	External PV connection terminal block	
10	Retaining groove	
11	Cable entry	

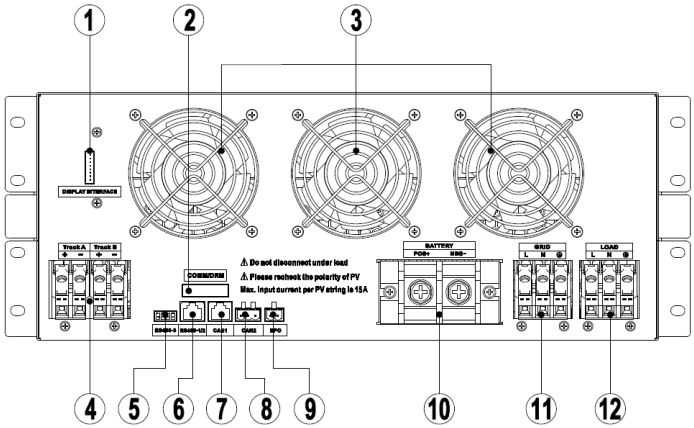


Figure 2.3 Appearance diagram of inverter module for 3–5 kW energy storage integrated machine

No.	Name	Description
1	LCD interface	LCD connection terminal
2	COMM/DRM	COMM/DRM communication port
3	Fan	Cooling fan
4	PV connection terminal block	PV DC input terminal of the inverter
5	RS485-3	RS485-3 communication port
6	RS485-1/2	RS485-1/2 communication port
7	Battery CAN1	Battery CAN communication interface (network interface)
8	Battery CAN2	Battery CAN communication interface (terminal)
9	EPO	E-stop switch port
10	Battery connection terminal block	Battery wiring port
.11	Mains connection terminal block	Mains wiring port
12	Load connection terminal block	Load wiring port

2.2.2 Nameplate

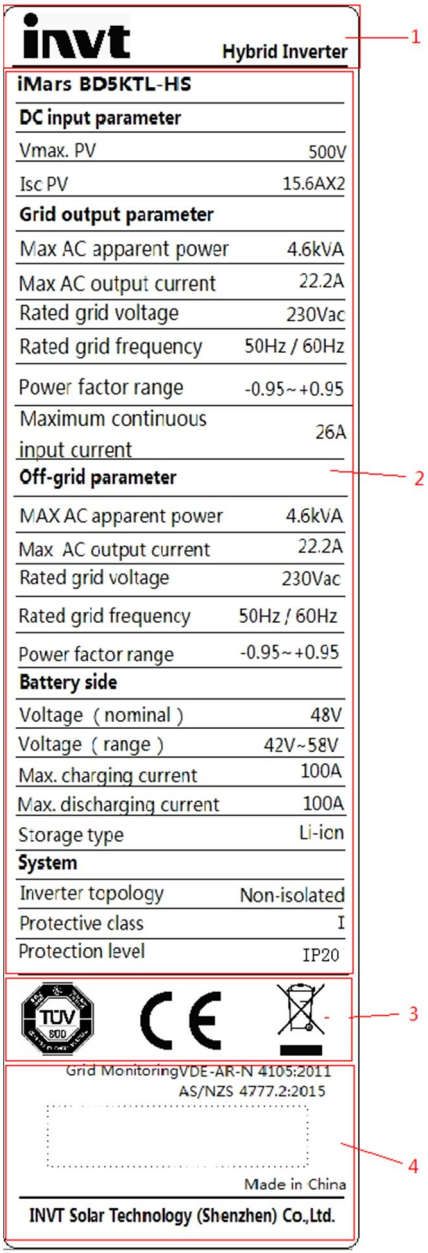


Figure 2.4 Nameplate for the machine

(1) Trademark and product type

(2) Model and important technical parameters

(3) Certification system of the inverter confirming

(4) Serial number, company name and country of origin

Icons	Instruction
	• TUV certification mark. The machine is certified by TUV.
	• CE certification mark. The machine complies with the CE directive.
	• EU WEEE mark. Cannot dispose of the machine as household waste.

2.3 Products modules

Product name	Model	Rated output power (W)
Single phase (L, N, and PE)		
Single-phase energy storage integrated machine	3kW	3000
Single-phase energy storage integrated machine	5kW	5000

Note: Technical parameters of the energy storage integrated machine refers to appendix.

2.4 Dimensions and weight

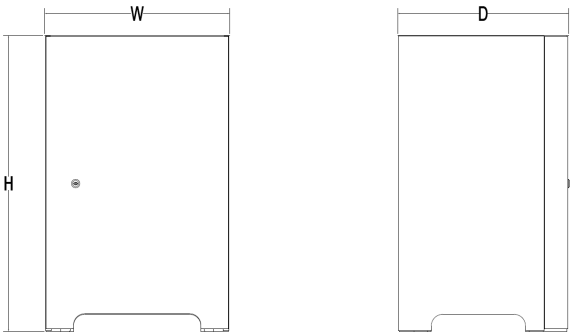


Figure 2.5 Dimensions of the energy storage integrated machine

Dimension and net weight of the energy storage integrated machine

Model	H(mm)	W(mm)	D(mm)	Net weight (kg)
3kW/5kW	1045	654	605	70

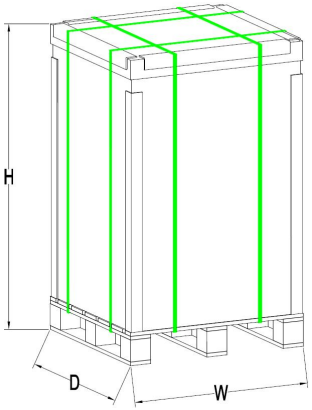


Figure 2.6 Paper package size

Package size and gross weight

Model	H(mm)	W(mm)	D(mm)	Net weight (kg)
3kW/5kW	1250	770	720	90

3 Storage of the energy storage integrated machine

If the machine is not put into use immediately, the storage of the machine should meet the following requirements:

- Do not remove the outer packing.
- The machine needs to be stored in a clean and dry place, and prevent the erosion of dust and water vapor.
- The storage temperature should be kept at -20°C–+60°C, and the relative humidity should be kept at 4% RH–100% RH.
- Keep away from chemically corrosive substances that may corrode the machine.
- Periodic inspections are required. If damages are found by worms and rats, or packages are found to be damaged, the packaging materials must be replaced in time.
- After long-term storage, machines need to be inspected and tested by qualified personnel before putting them into use.

4 Installation

4.1 Unpacking confirmation

Before unpacking, check carefully whether the product information in the order is consistent with that on the nameplate of the package box, and whether the product package is intact. If there is any question, please contact the supplier timely.

Store the idled machine in its original package, and take anti-moisture and anti-dust measures.

After taking the machine out of the box, check the following items:

- Confirm the main body of the machine is intact and free from any damage;
- Confirm there is operation manual, interface accessories and installation accessories inside the package box;
- Confirm the deliverables inside the package box are intact and complete;
- Check whether the product information in the order is consistent with that on the machine nameplate;
- The standard delivery list is shown below.

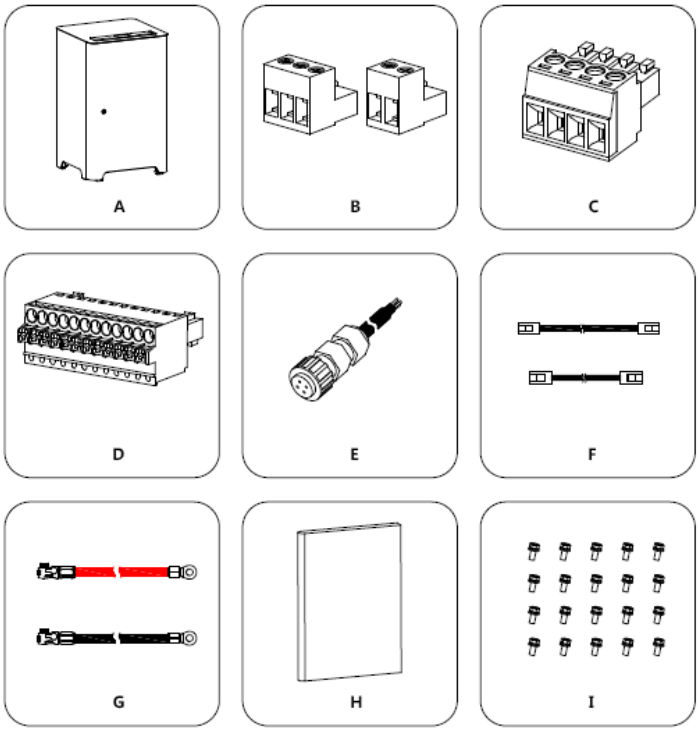


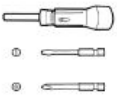
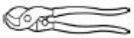
Figure 4.1 Standard delivery list

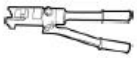
Delivery list of 3 KW/5 KW energy storage integrated machine

No	name	quantity	remarks
A	3 kW / 5 kW energy storage integrated machine cabinet	1	
B	communication connector	2	
C	RS485 communication connector	1	
D	DRM0 communication connector	1	
E	RS485 Communication link	1	
F	RJ45 reticle	2	
G	Power cable of the battery energy storage integrated machine	2	
H	User manual	1	
I	M5*14 hex assembling bolts	20	

4.2 Preparation before installation

4.2.1 Installation tools

Species	Tools and instruments		
Installation	 Impact drill (bit Φ 10mm)	 Torque socket wrench (sleeve opening: 13mm, suitable for M8 bolts, torque range: 0 N•m-15 N•m)	 Torque wrench (opening size: 13mm, 33mm, torque range: 0 N•m-15 N•m)
	 Diagonal pliers	 Wire stripper	 Torque screwdriver (cutting head: M4, M6, torque range: 0 N•m-5 N•m)
	 Rubber hammer	 Utility knife	 Wire cutters
	 Wire crimpers	 Open spanner	 Cable tie
	 Vacuum cleaner	 Multimeter (DC voltage range ≥ 600VDC)	 Marking pen

Species	Tools and instruments		
	 Steel tape	 Level ruler	 Hydraulic clamp
	 Heat-shrinkable tubing	 Hot air heating gun	-
Personal protective equipment	 Safety gloves	 Safety goggles	 Dust mask
	 Safety shoes	-	-

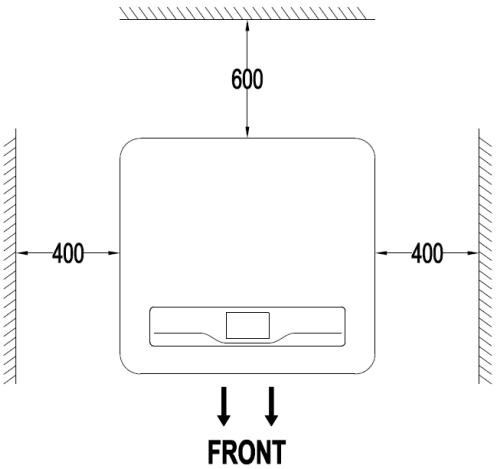


Figure 4.2 Installation spacing

In order to ensure good ventilation of the energy storage integrated machine, please reserve enough installation spacing around the machine during installation.

	Mini. spacing
Side spacing	400 mm
Back spacing	600 mm

Note: For detailed requirements about the narrowest maintenance channel, escape route, etc., refer to the applicable standards of the country/ region where the project is located.

4.3 Mechanical installation

4.3.1 Basic installation requirement

The energy storage integrated machine cabinet is IP20 and suitable for installation in dry, dusty environments. According to EMC standards, the energy storage integrated machine cabinet is designed to meet the installation requirements in a home environment. Select the installation site according to the following requirements:

- The installation site shall be well ventilated, free from rain and direct sunlight;
- The installation floor shall be dry and flat. It is strictly forbidden to have water on the ground; ensure that the ground level is not shaken and can fully carry the weight of the energy storage integrated machine cabinet.
- The temperature in the installation environment shall range from -10 °C to 40 °C; the relative temperature shall range from 4 to 100 %.
- Reserve enough installation spacing between the front, rear, left and right, top and wall of the energy storage integrated machine cabinet to ensure good ventilation, heat dissipation, installation and maintenance, and safe escape.
- There are no combustible gas and flammable materials in the installation space.
- The installation environment shall be clean.

4.3.2 Installation procedures

The mechanical installation steps are as follows:

Step 1 Use a forklift, pallet truck or crane to move the energy storage integrated machine cabinet to the designated installation site. Ensure smooth transportation and no tilting during the movement process.

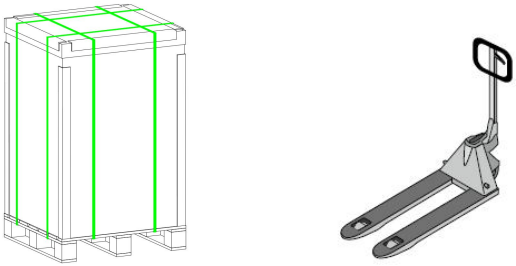


Figure 4.3

Step 2 Remove the outer packaging carton and cushioning material; remove the L-shaped iron piece for fixing the machine and pallet, and separate the energy storage integrated machine from the pallet.

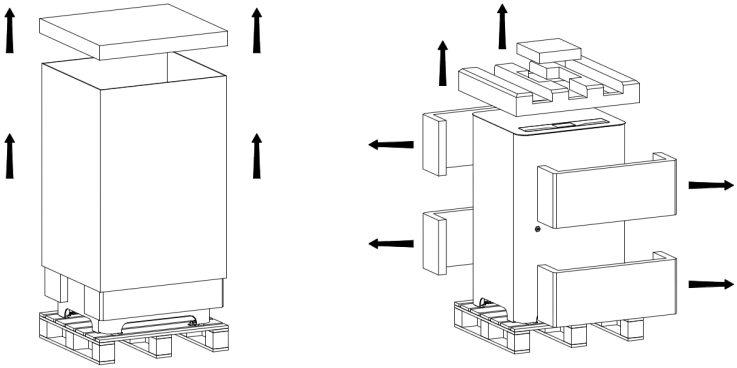


Figure 4.4

Step 3 Place the ramp into the pallet slot, slide the machine down the ramp, and slowly push it down to the ground.

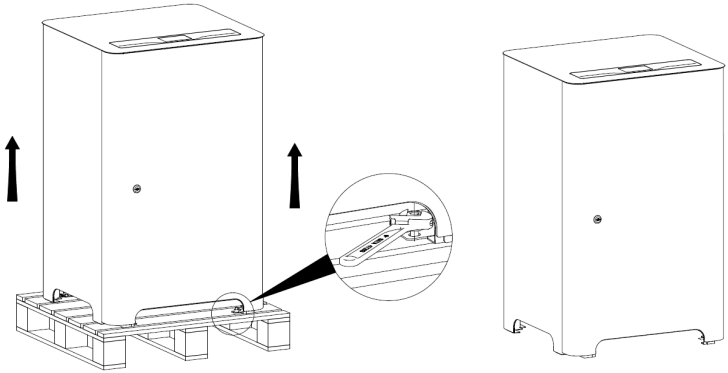


Figure 4.5

4.4 Electrical connection

This section introduces the detailed contents and safety precautions related to electrical connection.

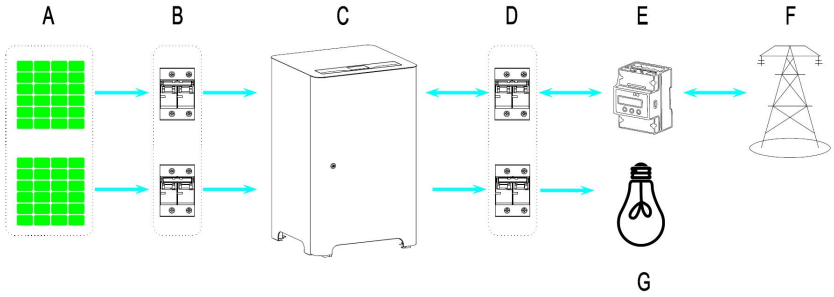


Figure 4.6 Connection diagram of the system

No.	Name
A	PV string
B	PV side DC switch（DC600V，C16A, 2P）
C	Energy storage inverter
D	AC switch（AC250V,C32A, 2P）
E	Digital meter
F	Public grid
G	Load

4.4.1 Battery electrical installation

The energy storage integrated machine does not contain a battery because it belongs to free choice of goods. Due to the system design, and machine structure and size, it is recommended to use the battery product US2000B recommended by our company.

⚠	• Electrical connection must be carried out by professional technicians as wrong operation may cause damage to the device, physical injuries or even death during system operation. • All the electrical installation must conform to the national regulations concerning electrical safety. • Ensure all the cables are installed firmly according to the specified safety requirements and free from any damage. • It is not allowed to close the AC and DC breakers before the machine is electrically connected.

Note	• Read this section carefully and operate strictly according to the requirements. • Note the rated voltage and current value specified in the manual as they cannot be exceeded.
	Only qualified cables under the local electrical safety laws and regulations and comply with the technical parameters of this manual are allowed to connect to the iMars series energy storage integrated machines.
	Reverse polarity of the battery will damage the energy storage integrated machines! Please ensure that the wiring is correct, otherwise, our company will not assume the relevant responsibilities and warranty.

Recommended wire specifications for safe system operation are as shown in the following table.

Energy storage integrated machine model	**Battery cable**
	Recommended min. cross-sectional area mm² (length ≤ 5 m)
3 kW/5 kW	16-25

4.4.2 Front panel interface of US2000B battery

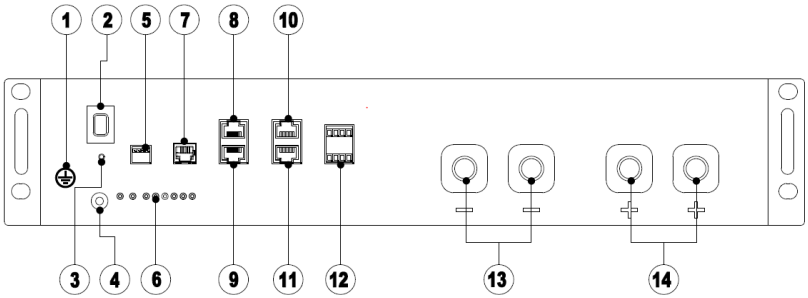


Figure 4.7 Front panel interface of US2000B battery

No.	Name	Silkscreen sign	Function description
1	Grounding terminal		Used for battery grounding
2	Power key	POWER	When the power turns ON, the system can be started by the “standby” button or the external power supply; when it turns OFF, the system cannot be booted.
3	Power indicator		When the switch is set to “ON”, the power indicator lights up.
4	Soft boot switch		When the switch key is in the "ON" state, long press this button to enter the power on or sleep mode.
5	DIP switch	ADD	(Reserved)
6	Indicator		Running indicator, warning indicator, and capacity indicator
7	RS232 communication port	RS232	Used to communicate with the host computer
8	External CAN communication port	CAN	Used to communicate with external devices (power storage inverter)
9	External RS485 communication port	RS485	Used to communicate with external devices
10-11	Cascade terminals	Link Port	Used for the cascade communication between the master and slaves. Connected by the standard cross-over cable and the master is connected to PORT1 while the slave is connected to PORT0.
12	Dry contact alarm terminals		1 input and 3 outputs of dry contact alarm signals. Passive signals or active signals that are not higher than 5 V are inputted. The output port specification is 30 V/300 mA.
13	I/O interface: negative	"-"	Negative poles of two battery inputs and outputs
14	I/O interface: positive	"+"	Positive poles of two battery inputs and outputs

4.4.3 Electrical characteristics of US2000B battery

Project	Specification	Remark
Nominal voltage	48 V	
Nominal capacity	50 Ah	
Nominal charging method	Charge: CC-CV, 0.2C, 0.01C cutoff	
Rated discharge current	25 A	Used to communicate with external devices
Discharge protection current	100 A	Delay 15 s protection, 1 min recovery after protection or immediate recovery upon the occurrence of charge current
Rated charge current	25 A	Delay 15 s protection, 1 min recovery after protection or immediate recovery upon the occurrence of discharge current
Internal resistance in battery pack (excluding BMS)	Internal resistance <20 mΩ	
Charge upper limit voltage	54±0.1 V	Recommended charging voltage: 53.50.5 V
Recharge lower limit voltage	44.5±0.1 V	
Working temperature	0–50℃	
Working temperature	5%–95%	No condensation, the battery system works properly
Storage temperature	-25–65℃	

4.4.4 Cascade installation of US2000B battery

Step 1 Use the accessory cabinet-specific key to open the right side door of the energy storage integrated machine. Install the battery inside the cabinet and fix it with M5X12 screws.

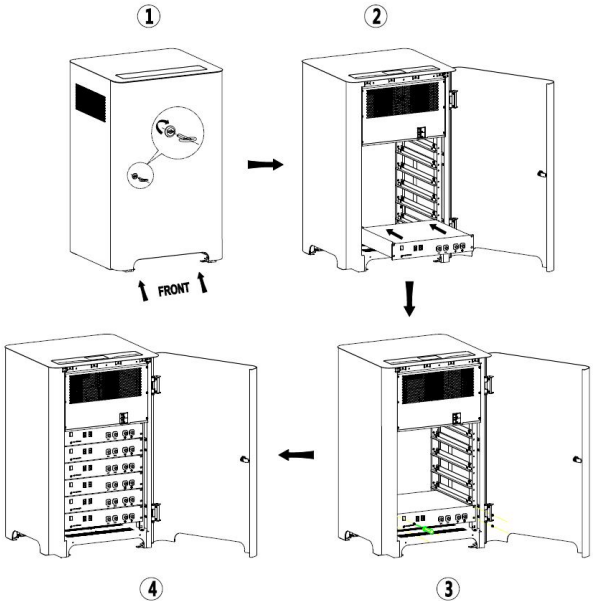


Figure 4.8 Battery Installation

Step 2 According to the number of batteries, open the front cover, as shown in Figure 1 below, and connect the batteries in parallel with the battery power cables according to the positive and negative poles (red for the positive and black for the negative).

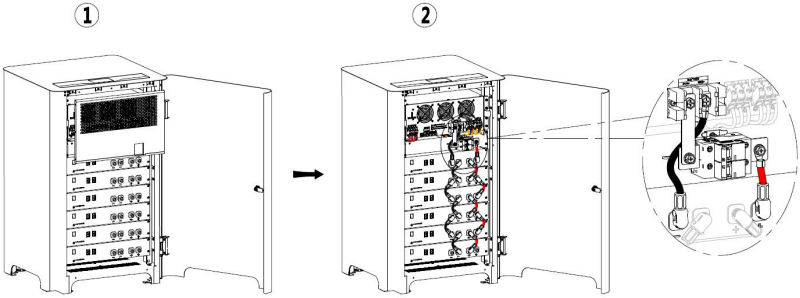


Figure 4.9 Battery parallel power cable connection, using M8 screw connection and 6–8 N•m torque.

Step 3 According to the number of batteries, connect the battery parallel communication cables with the RJ45 cables. Connected from top to bottom, Link port 0 of the the first battery is not connected (the first battery defaults to the master, and others default to the slave), the Link port 1 of the first battery is connected to Link port 0 of the next battery, connected in this order until the Link port 0 of the last slave is connected, the Link port 1 of the last slave is not connected (it defaults to the last slave), and the address is automatically assigned.

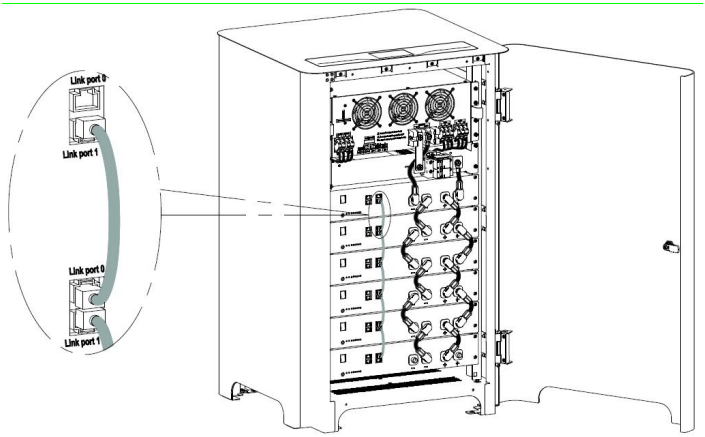


Figure 4.10 Battery parallel communication cable connection

Step 4 Battery CAN communication connection, plug one end of the RJ45 network cable into the CAN port of the battery host, and plug the other end into the CAN1 port of the inverter.

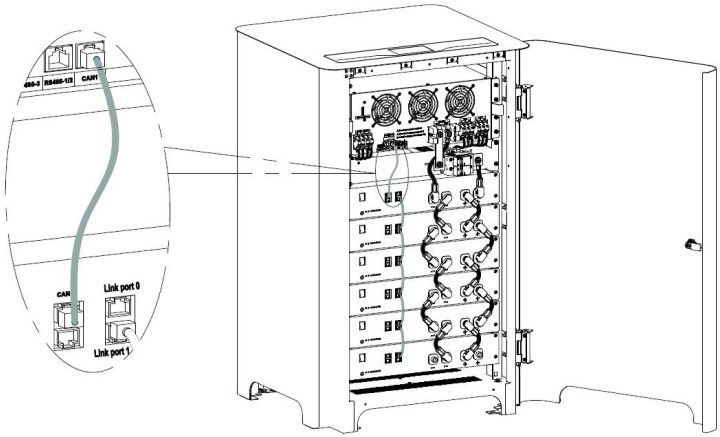


Figure 4.11 CAN communication cable connection

4.4.5 PV connection

⚠	Only qualified PV strings under the local electrical safety laws and regulations and comply with the technical parameters of this manual are allowed to connect to the iMars series energy storage integrated machines.
⚠	The PV string connected to the energy storage integrated machine must adopt the DC connector configured especially for the energy storage integrated machine, do not use other connection devices without authorization from our company, otherwise damage to the device, unstable operation or fire may

	occur, and our company will not undertake quality assurance or assume any direct or joint liability thereof.

- Ensure that the maximum open circuit voltage of each PV string is not higher than the maximum input voltage of the energy storage integrated machine under any circumstances.
- It is forbidden to connect the PE wire (ground wire) to the positive and negative poles of the PV strings, otherwise it will cause damage to the energy storage integrated machine.
- Ensure that the PV string polarity matches the PV connector, otherwise the energy storage integrated machine will be damaged.
- The insulation resistance of the PV panel to the ground should be greater than the safety regulation, otherwise there will be electrical hazards.

Energy storage integrated machine model	**PV DC side**
	Recommended min. cross-sectional area mm² (length ≤ 50 m)
3 kW/5 kW	4

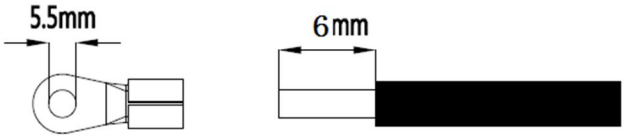


Figure 4.12 PV wire stripping length and crimping

PV+ and PV- terminal crimping

Terminal crimping torque 3.6–4.6 N•m

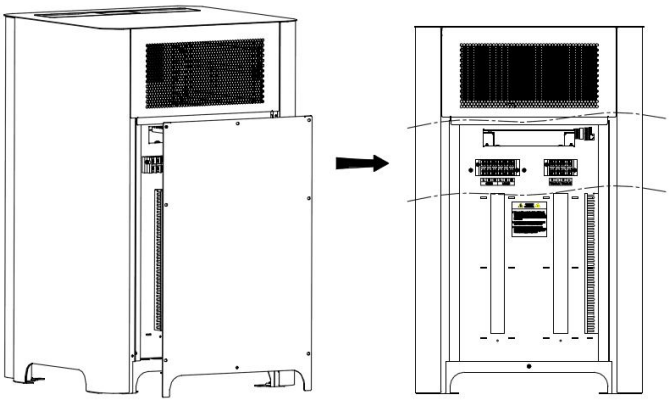


Figure 4.13 PV wire connection

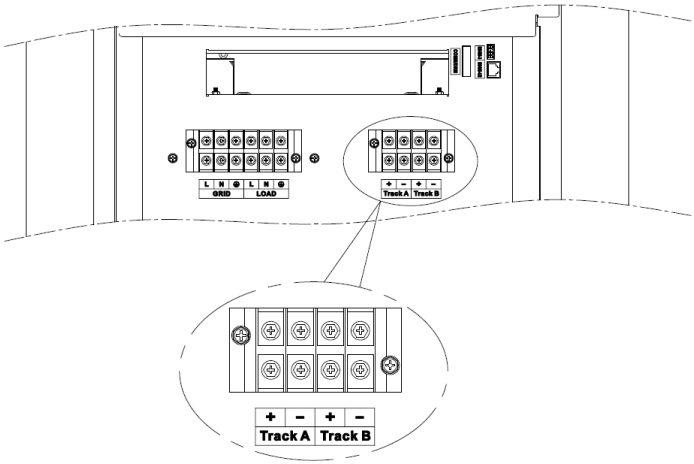


Figure 4.14 PV wire connection

- Ensure the wires of the cable correspond to the connector terminals, and tighten the screws. The crimping torque of the screws is 1.5–2.5 N•m.
- Use a multimeter to measure the voltage of the DC input string, verify the polarity of the DC input cable, and ensure that the voltage of each string is within the allowable range of the machine



Figure 4.15 Measuring PV voltage

4.4.6 Grid and load connection

⚠	Only qualified AC transmission cables under the local electrical safety laws and regulations and comply with the technical parameters of this manual are allowed to connect to the iMars series energy storage integrated machines.

Please install an AC breaker between the battery and the energy storage integrated machine (250 A–30 A recommend).

Recommended wire specifications for safe system operation are as shown in the following table.

Energy storage integrated machine model	Grid AC	Load AC
	Recommended min. cross-sectional area mm² (length ⩽ 50 m)	Recommended min. cross-sectional area mm² (length ⩽ 50 m)
3 kW/5 kW	6	4

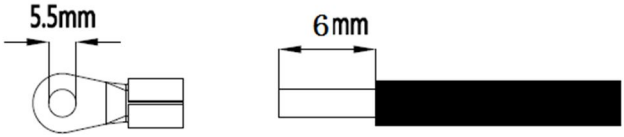


Figure 4.16 Stripping length and crimping of wires L, N, and PE of the mains and load cables

Terminal crimping of wires L, N, and PE of the mains and load cables

Terminal crimping torque 3.6–4.6 N•m

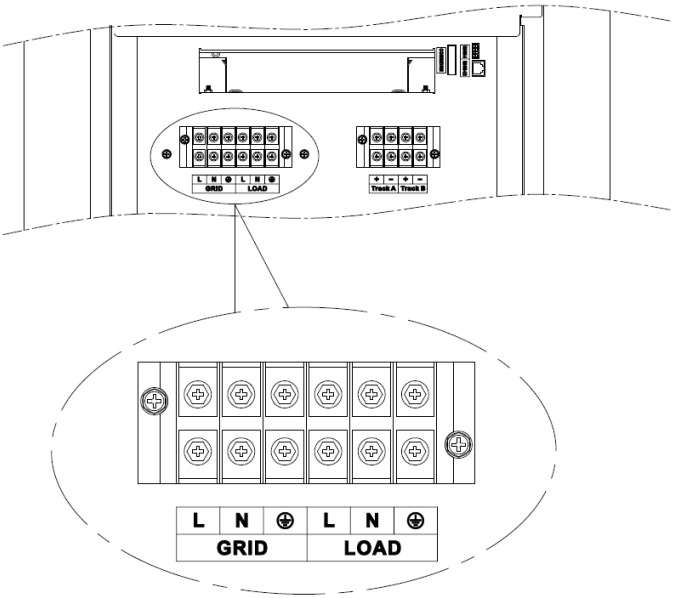


Figure 4.17 Grid and load wiring

- Before connecting the AC power grid cable to the energy storage integrated machine, the lightning protection and short circuit protection measures must be taken in accordance with the local electrical safety regulations. The PE cable (grounding cable) of the machine must be reliably grounded.

- Connect the three wires L, N, and PE of the single-phase public power grid to the corresponding AC terminals, fasten them, and tighten the screws. The crimping torque is 1.5–2.5 N•m.
- Connect the three wires L, N, and PE of the load to the corresponding load terminals, fasten them, and tighten the screws. The crimping torque is 1.5–2.5 N•m.

4.4.7 Definition of CAN interface pin in the battery

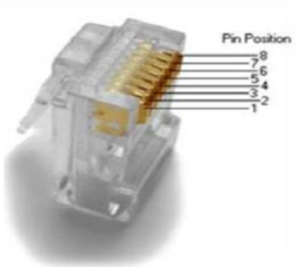


Figure 4.18 CAN communication

1	2	3	4	5	6	7	8
——	GND	——	CANH	CANL	——	——	——

4.4.8 Definition of CAN2 interface pin in the energy storage inverter

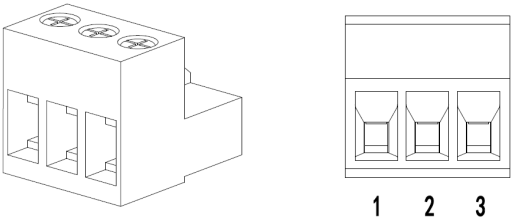


Figure 4.19 CAN2 communication wiring diagram

1	2	3
CANH1	CANL1	GND

4.4.9 RS-485 communication connection

The RS-485 communication of the energy storage integrated machine is used for upper PC monitoring, and monitoring of our company's WIFI and GPRS communication. It can realize local monitoring, remote monitoring as well as mobile APP monitoring. The RS-485 communication interface of our energy storage integrated machine carries three-channel communications. The interface diagram is shown as Figure4.20 and Figure 4.21while the interface definition is shown as

Table 3-4 and 3-5.

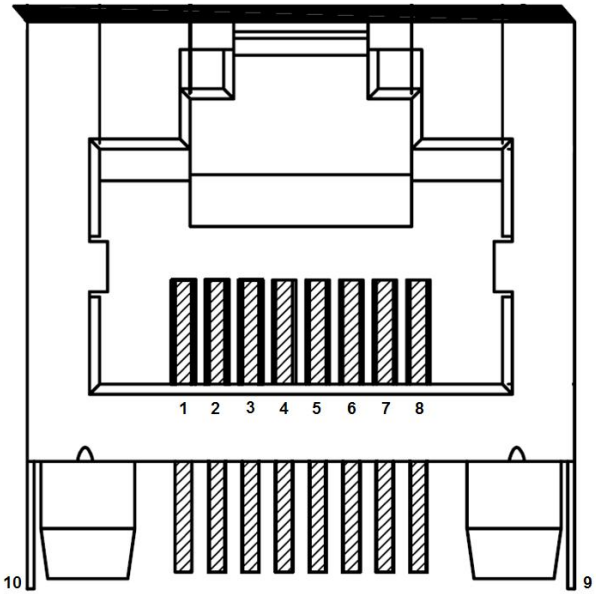


Figure 4.20 Diagram of RS-485 1/2 interface

Table 3-4 RS-485 1/2 communication interface definition

Port no.	Port definition
1	RS1-485+
2	RS1-485-
3	RS2-485+
4	+5VDC
5	
6	RS2-485-
7	GND
8	
9	PE
10	



Figure 4.21 RS485 3 standard connector

Table 3-5 RS-485 3 communication interface definition

Connector pin of the energy storage integrated machine communication	Pin definition
1	+5VDC
2	A（RS3485+）
3	B（RS3485-）
4	GND

Users can select RS-485 1/2/3 to communicate during RS-485 communication. If selecting our company's WIFI and GPRS for monitoring, users only need to connect WIFI and GPRS to RS-485 3 to communicate.

5 LCD operation instructions

5.1 Instruction for main page

After the machine enters the working state, the main page displays the energy flow diagram according to machine state as shown in figure 5.1.

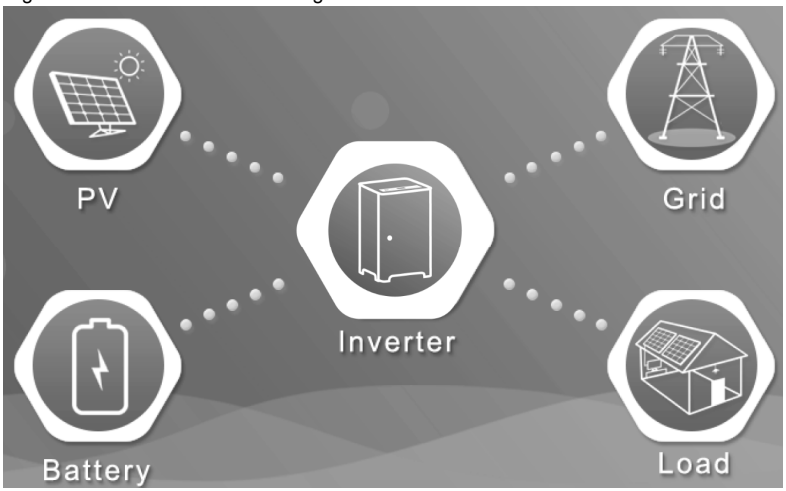


Figure 5.1

Icon instruction

Icon	Instruction
	PV information, displaying parameters related to PV panel, such as PV voltage, current, power, etc.
	Inverter data display and parameter setting
	Grid information, displaying parameters related to the grid, such as grid voltage, current, power, etc.
	Battery information, displaying parameters related to the battery, such as battery voltage, current, power, etc.
	Load information, displaying parameters related to the load, such as load voltage, current, power, etc.

5.2 Display menu

Icon name	No.	Parameter name
PV information	1	PV1 voltage
	2	PV2 voltage
	3	PV1 current
	4	PV2 current
	5	PV1 power
	6	PV2 power
	7	Daily generation
	8	Monthly generation
	9	Annual generation
	10	Total generation
Energy storage integrated machine information	1	operation
	2	Alarm
	3	Power curve
	4	Configuration
Grid information	1	Grid voltage
	2	Grid current
	3	Grid frequency
	4	Active power
	5	Apparent power
	6	Daily on-grid generation
	7	Monthly on-grid generation
	8	Annual on-grid generation
	9	Total on-grid generation
Battery information	1	Battery type
	2	Battery voltage

Icon name	No.	Parameter name
	3	Battery current
	4	Battery power
	5	Battery temperature
	6	Battery SOC
Load information	1	Load voltage
	2	Load current
	3	Active power
	4	Apparent power
	5	Daily consumption
	6	Monthly consumption
	7	Annual consumption
	8	Total consumption

5.3 Parameter setup of the energy storage integrated machine

5.3.1 Parameter classification page

The parameter classification page has five menus, corresponding to five groups of setup parameters. Instruction for each group of menu is shown as below:

Menu
PV parameter
Grid parameter
Battery parameter
Other parameter
Inverter Information

5.3.2 Instruction for setup parameter

Name of parameter group	No.	Menu	Name of setup parameter	Instruction/Range of the set value
PV parameter	1	Connection mode	PV connection mode:	PV connection mode: (0: Independent; 1: Parallel)
Grid parameter	1	PF setup	PF:	PF setup, range: -1.000–1.000
	2	Output power control	Output power (%):	Range: 0–100%
Battery parameter	1	Battery type	Battery type:	Battery type: 0: Lithium iron phosphate battery 1: Lead acid battery 3: Ternary lithium battery
	2	Battery protocol	Battery protocol:	Battery protocol: 1: Pylon 2: Sunwoda 3: Yinlong 4: Xstellar 5: FES 6: Olipower 7: DLG 8: GCL
	3	Charge voltage	Charge voltage:	Charge voltage range: 0–60 V
	4	Charge current	Charge current:	Charge voltage range: 0–100 A
	5	Discharge critical voltage	Discharge critical voltage:	Discharge critical voltage range: 40–55V
			Critical recovery voltage:	Critical recovery voltage range: 40–55V (Recovery voltage must be greater than the critical voltage)
	6	Forced charge voltage		Range: 40–55V
	7	Charge time period 1 setup	Charge time period 1 starts:	Start time of charge time period 1, range: 0–23:59
			Charge time period 1 ends:	End time of charge time period 1, range: 0–23:59
	8	Discharge time	Discharge time	Start time of discharge time period

Name of parameter group	No.	Menu	Name of setup parameter	Instruction/Range of the set value
		period 1 setup	period 1 starts:	1, range: 0–23:59
			Discharge time period 1 ends:	End time of discharge time period 1, range: 0–23:59
	9	Charge time period 2 setup	Charge time period 2 starts:	Start time of charge time period 2, range: 0–23:59
			Charge time period 2 ends:	End time of charge time period 2, range: 0–23:59
	10	Discharge time period 2 setup	Discharge time period 2 starts:	Start time of charge time period 2, range: 0–23:59
			Discharge time period 2 ends:	End time of charge time period 2, range: 0–23:59
	11	Charge time period 3 setup	Charge time period 3 starts:	Start time of charge time period 3, range: 0–23:59
			Charge time period 3 ends:	End time of charge time period 3, range: 0–23:59
	12	Discharge time period 3 setup	Discharge time period 3 starts:	Start time of charge time period 3, range: 0–23:59
			Discharge time period 3 ends:	End time of charge time period 3, range: 0–23:59
	13	Load power priority		1: Battery first; 2: Grid first
	14	Charge supply selection		1: PV 2:PV+grid
	15	Battery grid-tied switch		0: Disable 1: Enable
Other parameter	1	Data/time setup	Data/time setup	Date and time setups for the real-time clock in the device
	2	LCD setup	LCD backlight setup:	LCD backlight, range: 0–100%
	3	Currency setup	Currency name:	Currency: A–Z, A: US dollar, R: RMB
			Exchange rate:	Exchange rate: 0–655.35
	4	Language setup	Language setup	Switch between Chinese and English
	5	RS485 address setup	RS485 address setup	Device address range of RS485 communication and Modbus protocol: 1–254

5.3.3 Inverter data display

No.	Data name	Instruction/Range of the set value
1	Working mode	Working mode of the inverter
2	Temperature	Temperature in the inverter
3	Device type	
4	Production data	
5	Auxiliary DSP software version no.	
6	Product SN	
7	Grid-tied standard	
8	Hardware version	
9	CPU1 software version	
10	CPU2 software version	
11	LCD software version	
12	Modbus protocol version	
13	CPU1 driver version	
14	CPU2 driver version	

6 Fault code

This chapter mainly introduces faults alarms and fault codes for users to quickly identify the machine fault.

Table 6-1 Fault code for the energy storage integrated machine

Fault code	Description	Analysis
01	Ac voltage high1	
02	Ac voltage high2	
03	Ac voltage low1	
04	Ac voltage low2	
05	Ac freq. high1	
06	Ac freq. high2	
07	Ac freq. low1	
08	Ac freq. low2	
09	Ac over currhw	
10	Ac over currsw	
11	Bus over volt hw	
12	Bus over volt sw	
13	Gfci over	
14	Gfci sensor fault	
15	Relay fault	
16	Iso low	
17	Ac dc over	
18	DSP communication error	
19	PV soft fault	
20	Ac zero error	
21	Temperature high1	
22	LLC soft fault	
23	LLC over voltage	
24	LLC over current	
25	PV1 voltage high	
26	PV1 voltage low	
27	PV2 voltage high	
28	PV2 voltage low	
29	PV1 over current	
30	PV2 over current	

Fault code	Description	Analysis
31	RTC error	
32	Eeprom error	
33	Inv soft fault	
34	Fan fault	
35	Cmd shut down	
36	Grid loss	
37	Load over current	
38	Battery over current	
39	Battery volt high	
40	Battery open	
41	Quik stop	
42	Pv1 over current hw	
43	Pv2 over current hw	
44	Bat over current hw	
45	LLC over current hw	
46	LLC over voltage hw	
47	CAN comm error	
48	Load over power	
49	Extern Battery Alarm	
50	Load error hw	
51	Battery volt low	
52	PEFault	
53	DRM0Fault	
54	Dis/Chrg time conflict	
55	Grid Abnormity	

7 Technical parameter

Model	BD3KTL-HS	BD5KTL-HS
PV DC input parameter (PV side)		
Max. input power	3300 W	6600 W
Max. input voltage	500 VDC	
Start voltage/min. working voltage	100 V/80 V	
MPPT voltage range	120–450 V	
Number of MPPT/Strings per MPPT	1/1	2/1
Max. input current	13 A	13 A×2
Max. short circuit current	15.6 A	15.6 A×2
PV reverse current	0 A	
Grid output parameter (AC side)		
Rated AC output power	3000 W	4600 W
Max. AC output current	13 A	20 A
Max. output short circuit current	20 A	30 A
Max. output overcurrent protection	20 A	30 A
Rated grid voltage/grid voltage range	230 Vac/180-270 Vac	
Rated grid frequency/frequency range	50 Hz(45–54 Hz) / 60 Hz(55–65 Hz).	
AC output type	Single phase (L, N, and PE)	
Power factor	≥0.99 (±0.95 adjustable)	
THDI	≤3%(rated power)	
Off-grid parameter		
Rated output voltage	220 Vac/230 Vac/240 Vac	
Frequency	50 Hz/60 Hz	
Rated current	13 A	20 A
Max. output power	3000 VA/3000 W	4600 VA/4600 W
Time of switching between grid-connected and off-grid	20 ms	
THDV	≤3% (rated power)	
Max. output short circuit	20 A	30 A

current		
Max. peak power/duration	150%/10 S;	
Allowable reverse current	0 A	
Battery side		
Battery type	Lithium battery/lead acid battery	
Rated battery voltage	48 V	
Battery voltage range	42-58 V	
Battery capacity	2.4–12 KW/h (optional)	
Max. charge current	60 A	100 A
Max. discharge current	60 A	100 A
Charging curve	Three-stage	
System		
Max. efficiency	97.3%	97.6%
PV-AC Euro efficiency	96.5%	96.8%
MPPT efficiency	99.9%	
Isolation mode (PV side)	No isolation	
Isolation mode (PV side)	High frequency isolation	
Protection level	IP20	
Dimension (H*W*D)	1043.5*770*605 mm	
Protection function	DC insulation monitoring, DC monitoring, grid monitoring, islanding protection, short-circuit protection, overheat protection, PV anti-reverse connection protection, battery anti-reverse connection protection	
Working temperature	-10℃ to +50℃/(derating above 40°C）	
Cooling mode	Fan	
RH	4–100%, no condensation	
Display	LCD	
Communication	RS485 (standard configuration), WIFI, (optional), CAN-BUS (internal communication)	
Certification	VDE-AR-N4105，AS4777/3100	
Warranty	5 years (10 years optional)	
Note: As our products are under continuous improvement and update, the final product and data information are subject to the physical product.		

8 Contact us

China•Shenzhen

INVT Solar Technology (Shenzhen) Co., Ltd.

Address: 6th Floor, Block A, INVT Guangming Technology Building, Songbai Road, Matian, Guangming District, Shenzhen, China

Service hotline: +86 755 86312953

E-mail: invtsolarcn@invt.com.cn

INVT group website: www.invt.com

INVT solar website: www.invt-solar.com