Kepler Series

Hybrid solar inverter with charger

User Manual

User Manual_Kepler series_PC
CE, RoHS, ISO9001:2015
Subject to change without notice!

Contents

Dear Clients,

Thank you for purchasing our Epoch Series inverter. Your support and trust in us are much appreciated. Please take time to read this manual, this will help you make full use of the many advantages this inverter. This manual presents important recommendations for installing and operating. Read it with special care in your own interest and please pay attention to the safety recommendations herein indicated.

1, Safety instructions and waiver of liability

1.1Safety Instructions

Please reserve this manual for future review.

The following symbols are used throughout this manual to indicate potentially dangerous conditions or mark important safety instructions. Please take care when meeting these symbols.

WARNING: Indicates a potentially dangerous condition. Use extreme caution when performing this task.

CAUTION: Indicates a critical procedure for safe and proper operation of the inverter.

CAUTION:

1) There are no user serviceable parts inside the inverter. Do not disassemble or attempt to repair the inverter.

2) Keep children away from batteries and the charge inverter.

1.2 Liability Exclusion

The manufacturer shall not be liable for damages, especially on the battery, caused by use other than as intended or as mentioned in this manual or if the recommendations of the battery manufacturer are neglected. The manufacturer shall not be liable if there has been service or repair carried out by any unauthorized person, unusual use, wrong installation, or bad system design.

1.3 Safety precautions

After receiving the inverter, please check the product condition first, if there is any damage occurred during shipping, please contact the transportation company or us in time.。

CAUTION: The installation of the system must be done by professional technicians.

CAUTION: When the machine is working, the shell will produce a lot of heat, the temperature is very high,do not touch, and stay away from the high temperature affects materials or equipment.

CAUTION: Make sure there isn't any electrical arcing danger around the operation area before installation.

CAUTION: Connect the inverter to the battery is highly recommended; the minimum capacity (Ah) of the battery should be 5 times of the inverter rated output power (P), which means Ah=5×(P/V).

WARNING: Advised to install a proper safety or circuit breaker outside the appliance.

CAUTION: Before installing and adjusting cables to the fusioncube, disconnect the safety or circuit breakers near the photovoltaic array, mains, and battery terminals.

CAUTION: After installation, check that all line connections are tight to avoid the danger of heat accumulation due to virtual connection.

CAUTION: If the appliance is an off-grid device, ensure that the input power of the load device is the only input device. Do not use it in parallel with other input AC power supplies to avoid damage.

WARNING: The machine is off-grid type, it is strictly prohibited to connect to the grid, which will damage the inverter.

WARNING: Only a single machine is allowed to work, prohibit multiple outputs in parallel or in series, otherwise it will cause damage to the inverter!

WARNING: When the machine is working, the AC output is high voltage. Do not touch the wiring to prevent electric shock.

WARNING: Do not open the chassis when the fusioncube is working.

WARNING: The following operations may cause hazards such as arcing, fire, and explosion.In the event of an accident, it must be handled by professionals!

- Touch an uninsulated end of a potentially live cable;
- Touch the wiring terminals or internal components of the inverter that may be live;
- Power cables are improperly connected;
- Screws and other parts accidentally fall into the interior of the machine;
- Improper operation by untrained non-professional technicians.

WARNING: Do not touch or open the case for maintenance, in case of danger!

- Restart the inverter only after troubleshooting faults that affect the safety performance of the machine;
- The machine does not contain repair parts, if you need any repair service, please contact product after-sales service.

2.Overview

Kepler series is a new hybrid solar energy storage inverter control machine integrating solar energy storage, mains charging energy storage and AC sine wave output. It adopts DSP control and advanced control algorithm, and has the characteristics of high response speed, high reliability and high industrial standards. There are four charging modes: solar only, mains priority, solar priority and mains & solar power. Inverter and mains output modes are available to meet different application requirements.

The solar charging module adopts the latest optimized MPPT tracking technology, which can quickly track the maximum power point of the photovoltaic array in any environment, obtain the maximum energy of the solar panel in real time, and the MPPT voltage range is wide.

AC-DC charging module adopts advanced control algorithm to realize full digital voltage and current double closed-loop control, which has high control precision and small size. Ac voltage input range is wide, input/output protection function is complete, stable and reliable to achieve battery charging and protection.

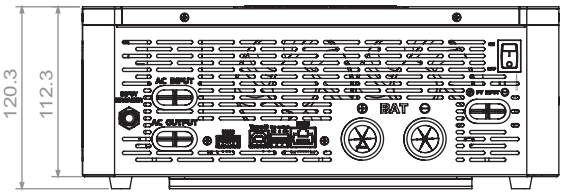
DC-AC inverter module based on full digital intelligent design, the use of advanced SPWM technology, output pure sine wave, direct current into alternating current, suitable for household appliances, power tools, industrial equipment, electronic audio and video and other AC load. The product uses segment LCD display design, real-time display system operating data and operating status. The comprehensive electronic protection function ensures the whole system is safer and more stable.

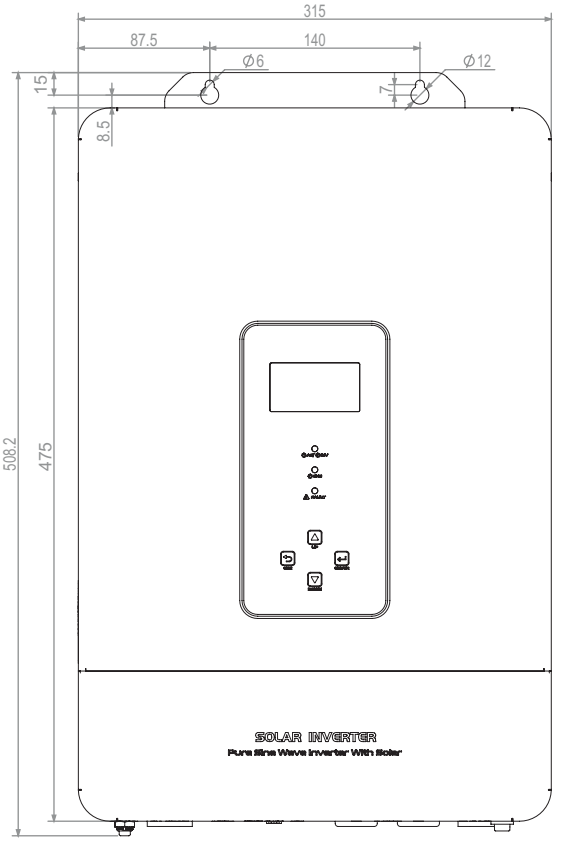
Characteristic:

- Adopt full digital voltage and current double closed loop control, advanced SPWM technology, output pure sine wave.
- It has two output modes of mains bypass and inverter output, with uninterrupted power supply function.
- There are 4 charging modes to choose from: solar only, mains priority, solar priority, hybrid charging.
- Advanced MPPT technology, efficiency up to 99.9%.
- Wider MPPT voltage range.
- With solar and AC power activated lithium battery function, support lead-acid battery, lithium battery access.
- LCD screen design, 3 LED indicators, dynamic display of system data and operating status.
- With power saving mode function, reduce no-load loss.
- Intelligent adjustable fan, efficient heat dissipation, prolong system life.

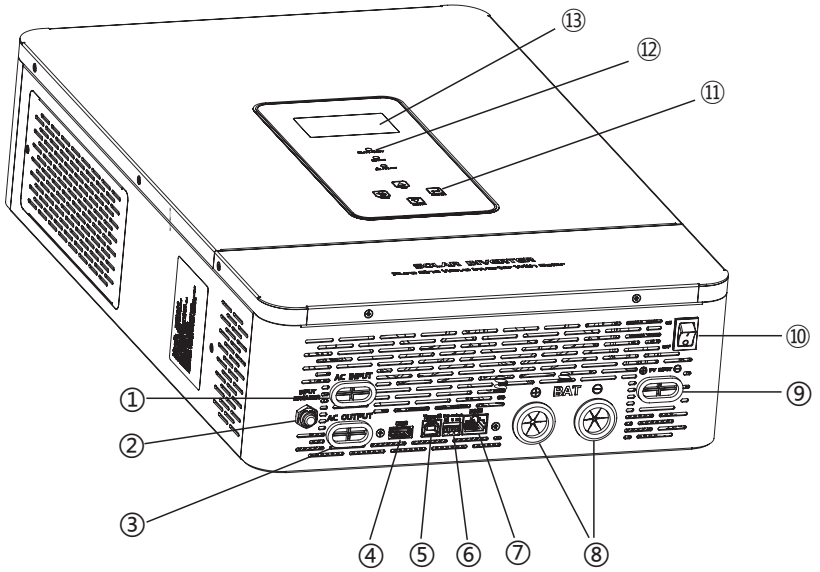
3.Dimensions（单位：mm）

■ KH5000-42



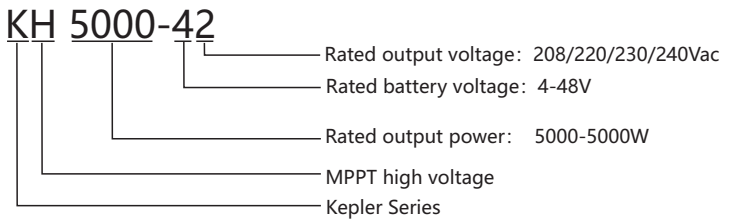


4.Appearance introduction



①	AC Input	⑧	Battery Terminal (Positive/Negative)
②	Overcurrent protector	⑨	Solar Panel Input
③	AC Output	⑩	Power ON/OFF Switch
④	USB Communication port	⑪	Key
⑤	Type-C port	⑫	indicator light
⑥	Dry connect Communication port	⑬	LCD panel
⑦	BMS communication port		

5.Desinations of Models



6.Installation

CAUTION: Please read the manual carefully to get familiar with the installation steps before installation!

6.1 Installation Notes

- Be very careful when installing the batteries, especially flooded lead-acid batteries. Please wear eye protection, and have fresh water available to rinse if any contact with battery acid.
- Keep the battery away from any metal objects, which may cause a short circuit of the battery.
- Acidic gas may be generated when the battery is charged. Ensure that the environment is well ventilated.
- When installing a cabinet, leave enough space around the appliance for heat dissipation. Do not install the fusioncube and lead-acid liquid batteries in the same cabinet to prevent acid gas generated by batteries from corroding the fusioncube.
- Charge only the battery type that meets the requirements of the device.
- Loose connections and corroded wires may result in high heat that can melt wire insulation, burn surrounding materials, or even cause a fire. Ensure tight connections and use cable clamps to secure cables and prevent them from swaying in motion.
- Select the system connection cables according to the current density no higher than 5A/mm².
- For outdoor installation, keep out of the direct sunshine and rain infiltration.
- After the power switch is turned off, there is still a high voltage inside the appliance. Do not open or touch the internal components until the capacitor is powered off.
- Please do not install the inverter in humid, greasy, flammable, explosive, dust accumulative, or other severe environments.
- Do not reverse polarity of the battery input; otherwise, the device may be damaged or unpredictable risks may occur.
- AC output is a high voltage, and please do not touch the wiring connection.
- When the fan is working, and please do not touch it to avoid injury.
- Load device Input power supply Ensure that the appliance is the only input device. Do not use it in parallel with other input AC power supplies to avoid damage.

WARNING: Make sure the inverter is clean and no electrical connection before installation.

CAUTION: To avoid the danger of heat accumulation caused by the loose connection, please ensure all the cable connections are tight.

CAUTION: Please connect the inverter case to the ground and ensure the sectional area of the connection cable is not less than 4mm².

CAUTION: Follow the parameter setting requirements to set the DC input voltage , higher or lower may cause the inverter down or even broken.

CAUTION: The cable between battery and inverter should be less than 3meters, otherwise, please reduce the current density.

CAUTION: A fuse or breaker is recommended between battery and inverter, also the rated current of the fuse or breaker should be 1.25*Rated current of battery.

CAUTION: Keep the inverter away from the flooded lead-acid battery because the sparkle of the terminals may ignite the hydrogen released by the battery.

WARNING: Only the load is allowed to connect to the AC output terminal, do not connect it to power supply or utility, which may cause the inverter damaged, also please shut off the inverter before wiring.

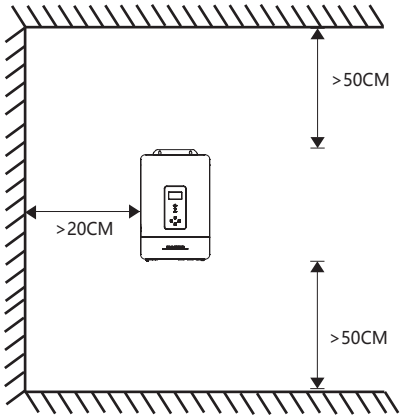
WARNING: It is recommended that the DC input terminal of the inverter be directly connected to the battery terminal instead of the terminal of the charging power supply. Otherwise, the charging voltage spike of the charging power supply may lead to overvoltage or damage to the machine.

6.2 Installation procedure and cable connection requirements

Installation procedure:

The first step: Do not subject the inverter to direct sunlight or any other heat sources. Protect the inverter from any dust, dirt and moisture. Mount it flat to a vertical wall. Must be a non-flammable material. Maintain a minimum clearance of 20 cm below and around the inverter to ensure unhindered air circulation.

Warning: Do not install the all-in-one machine and lead-acid liquid battery in the same confined space! Do not install in a closed place where battery gas may accumulate. Otherwise there's a risk of explosion!



The second step: Remove the terminal protection cover**.**

The third step: Wiring.

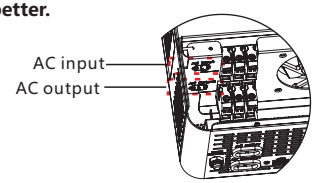
■ AC input/output connection method:

①Before connecting AC input/output cables, disconnect the external circuit breaker and check whether the cables are thick enough;

②Connect the AC input cable correctly according to the cable sequence and terminal position shown in the following figure. Ground the cable first, and then connect the live wire (L) and the neutral wire (N);

③Connect the AC output cable according to the sequence and terminal positions shown in the following figure. Ground the AC output cable first, and then connect the live wire (L) and neutral wire (N). Connect the ground cable to the ground screw hole of the chassis through the O-terminal.

Note: The ground cable should be as thick as possible (with a cross-sectional area of no less than 4mm2), and the ground point should be as close to the fusioncube as possible. The shorter the ground cable, the better.



■ PV input connection method:

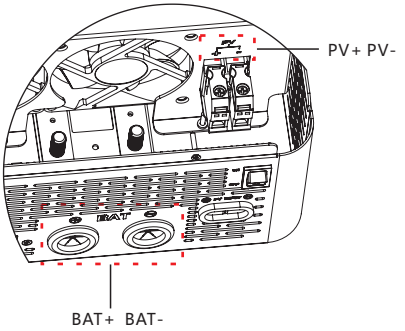
①Before connecting cables, disconnect the external circuit breaker and check whether the cables are thick enough;

②Connect the PV input cable correctly based on the cable sequence and terminal positions shown in the following figure.

■ BAT connection method:

①Before connecting AC input/output cables, disconnect the external circuit breaker and check whether the cables are thick enough. The BAT cable needs to be connected to the machine through an O-type terminal. The O-type terminal with an inner diameter of 5MM is recommended. The O-type terminal must firmly press the BAT cable to prevent excessive heat caused by excessive contact impedance.

②Connect the BAT cable according to the cable sequence and terminal positions shown in the following figure.



Warning:

1.AC input, AC output and photovoltaic array will produce high voltage, make sure to disconnect the circuit breaker or safety before wiring.

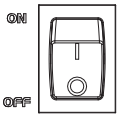
2.Be sure to pay attention to safety during wiring; Do not close the circuit breaker or safety during the wiring process, and ensure that the "+" and "-" leads of each component are correctly connected. A circuit breaker must be installed at the battery terminal.

3.Before wiring, disconnect the circuit breaker to prevent strong spark and battery short circuit during wiring. If the appliance is used in an area with frequent lightning strikes, you are advised to install an external lightning arrester at the PV input.

The fourth step: Check whether the wiring is connected correctly and firmly, especially to check whether the battery input positive or negative connection, PV input positive or negative connection, AC input is incorrectly connected to the AC output.

The five step: Install the terminal protection cover.

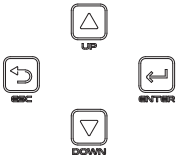
The six step: Start the fusioncube. First, close the circuit breaker at the battery end, then turn the ship switch under the left side of the machine to the "ON" state, the "AC/INV" indicator light blinking means that the inverter works normally, close the circuit breaker of the photovoltaic array and the mains again, and finally turn on the AC load one by one after the AC output is normal. In order to avoid the protection action caused by a large transient impact caused by the simultaneous opening of the load, the fusioncube works normally in the set mode. Note: If you supply power to different AC loads, it is recommended to turn on the load with high impulse current first, and then turn on the load with low impulse current after the load is stable.



Note: If the fusioncube does not work properly or the LCD or indicator display is abnormal, refer to section 7.2 Troubleshooting.

7.Operation and display

7.1 keys operation

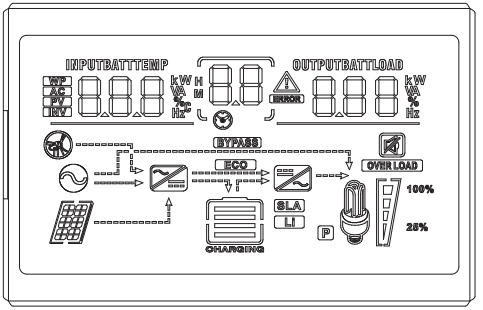


Buttons	Descriptions
Function settings/ ENTER	Function settings:Press the ENTER button on the display page for more than 2 seconds to enter the function setting page.After entering,press the ENTER button to turn the page and select the interface to be set. ENTER: On the function Settings page, press ENTER button for 0.1 to 2 seconds to determine the options set.
Page turning/inquiry button UP/DOWN	Page turning: Press UP/DOWN on any page to turn the pages.
ESC	After setting up a single item,press ESC and press UP/DOWN to select other settings. Confirm and save settings:On the function settings page,press ESC for 2 seconds, then go back to the main interface and set to save.

7.2 LED indicator introduction

LED Indicator			Descriptions
AC/ INV	Green	Solid on	Output is powered by utility in Line mode
		Flashing	Output is powered by battery or PV in battery mode
CHG	Yellow	Solid on	The battery is undergoing float charging
		Flashing	Battery charging at constant voltage
		Off	Other states
FAULT	Red	Solid on	Fault occurs in the inverter
		Flashing	Warning condition occurs in the inverter

7.3 operation interface



7.3.1 Interface introduction

Icon	Function	Icon	Function
	Battery capacity display (each cell represents 25% capacity)	ERROR	Indicates that the machine is in a faulty state
	Load capacity display (each cell represents 25% capacity)		Indicates to the machine that a warning has occurred
	Indicates that the PV input is connected to a solar panel		Indicates that the AC/PV charging circuit is working
	Indicates that the AC input is connected to the power grid		Indicates AC voltage output at AC output
	This icon indicates Wide voltage AC Input mode (APL mode)	CHARGING	Indicates that the battery is being charged
LI	Indicates that the current battery type of the machine is lithium battery	OVER LOAD	Indicates that the AC output is in overload state
SLA	Indicates that the current battery type of the machine is lead-acid battery	WP	The icon is not displayed
	Indicates that the inverter circuit is working	AC	Indicating AC input
	Indicates that the machine is in setup mode	PV	Indicating PV input
	The indicating buzzer is not enabled	INV	Indicating inverter circuit
BYPASS	Indicates that the machine is in AC bypass mode		
	The parameters in the middle of the screen are displayed. 1. In non-setting mode, the alarm or fault code is displayed. 2. In setting mode, the current parameter code is displayed		
	Displays battery voltage, total battery charge current, AC charge power, AC input voltage, AC input frequency, PV input voltage, internal radiator temperature, software version		
	Indicates output voltage, output current, output active power, output apparent power, battery discharge current, software version; In setting mode, the setting parameters are displayed		

7.3.2 Inverter operating status table corresponding to the buzzer

Warning buzzer	Descriptions
Long beeping, continuous for 10 seconds then stop	Failure Mode
Stop after beeping for 1 seconds	Loss or recovery of PV/input voltage
	The main switch is on or off
Beep per second,comtinuous for 1 min then stop	All other alarms(battery low voltage alarm will only beep in battery mode.)

7.4 Daily on, off switch operation

1.Startup Procedure You can start a battery when it meets the requirements (the battery voltage must be greater than 11.5V) or the AC power supply (the AC power supply needs to determine the proper input range based on the output mode).

①AC power on:

Switch ON the AC. Press the switch and turn on the ON state. The system will start. If the AC output priority is set, wait for a period of time until the AC mode is displayed on the Screen.

②Battery power on:

Power on the battery Connect the normal battery, press the switch, and the inverter establishes the working power supply. The system will start automatically. Wait for a period of time for the battery mode to be displayed on the Screen, indicating that the startup is complete and the system enters battery mode.

2.Shutdown Procedure When the system outputs in battery mode or AC mode, press the switch again and switch to OFF to shut down the system.

3.MUTE Operation When the inverter is in any mode, you can mute or unmute the inverter by setting MUTE ON or OFF.

4. Perform operations in the alarm state When the inverter has an alarm tone and the LED fault indicator blinks, it indicates that the inverter works in the alarm state. You can locate the cause of the alarm or contact the supplier based on the alarm information.

5. Operation in Fault mode When the inverter buzzer sounds and the LED fault indicator is on for a long time, the inverter works in fault mode. You can contact suppliers or maintenance personnel to provide fault alarm information for troubleshooting.

7.5 Checking Parameter Operation

Under normal circumstances, press the query button UP/DOWN to turn a page for the display, and display information such as input-output voltage, input-output rate,battery, PV voltage and current, load and software, etc.If there is an alarm, a page of alarm information will be displayed, and if the inverter fails, a page of trouble code will be displayed.By default, the screen panel displays the fault information. When the inverter has no fault or warning, the main page displays the voltage and rate information by default.

On the LCD home page, press UP/DOWN to turn pages and view real-time data.

Screen left parameters	Page number	Screen right parameters
Input voltage	P1	Output voltage
input frequency	P2	Output frequency
battery voltage	P3	Battery charging current
PV voltage	P4	PV charging current
PV voltage	P5	PV power
Input voltage	P6	Output active power
Output voltage	P7	Output compound power
Output display voltage	P8	load percentage
Inverter system	P9	Inverter system software version
Photovoltaic power generation	P10	Photovoltaic power generation

Parallel state	P11	*The current model does not support the parallel function.
Lithium battery networking status	P12	When the SIG constant is displayed on the upper right, the battery pack runs in one group. When displayed as PAR constant, the battery pack runs in parallel in multiple series. When the display flashes PAR, the battery pack is establishing a multiple series parallel state. When the BMS communication fails, the ERR blinking is displayed on the upper right.
Lithium battery voltage and current information; The BMS battery voltage information is displayed on the upper left. When the BMS communication fails, the ERR blinking is displayed on the upper left.	P13	Lithium battery voltage current information; The BMS battery current information is displayed on the upper right. When the BMS communication fails, the ERR blinking is displayed on the upper right.
Lithium battery temperature, SOC; The BMS temperature information is displayed on the upper left. When the BMS communication fails, the ERR blinking is displayed on the upper left.	P14	Lithium battery temperature, SOC; BMS SOC information is displayed on the upper right. When the BMS communication fails, the ERR blinking is displayed on the upper right.
Lithium battery capacity; The rated capacity is shown on the upper left; When the BMS communication fails, the ERR blinks.	P15	Lithium battery capacity; The current capacity is displayed on the upper right. When the BMS communication fails, the ERR blinks.
Lithium battery constant voltage point; The upper left shows the fixed letter CV; When the BMS communication fails, the ERR blinks.	P16	Lithium battery constant voltage point; The BMS constant voltage charging point is displayed on the upper right; When the BMS communication fails, the ERR blinks.
Lithium battery fault alarm; The BMS alarm information is displayed on the upper left. When the BMS communication. fails, the ERR blinks.	P17	Lithium battery fault alarm; The BMS fault information is displayed on the upper right. When the BMS communication fails, the ERR blinks.

***P12-P17 is not displayed by default. You need to enable the BMS function to connect to battery pack communication.**

7.6 Function setting operation

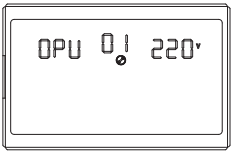
Function setting operation:
The page for setting the exit function and setting as bellow:

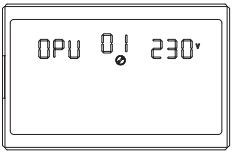
(1) Press "ENTER" button for more than 2 seconds, enter into function setting mode.Press "UP/DOWN" button for 0.1 seconds or 2 seconds to choose function. After turning to the desired function setting page, the corresponding indicator will flash;

(2) Press "ENTER" button for 0.1 seconds or 2 seconds, enter the function setting, you will see the word of function you choose lighting, on the left of word will occur numerical flashing, then you can press"UP/DOWN"button for 0.1 seconds or 2 seconds to use.

(3) After finish setting, press the "ENTER" button again, the data will be on instead of flashing.Long press "ESC"button for more than 2 seconds, the function will complete setting. Return to function setting, then back to main page. (If you don't exit manually, after 30 seconds, it will be back to main page automatically).

Example: Output Voltage (OPU)





- The default output voltage is 208V, 220V, 230V, 240V can be set, all working conditions can be set, and it takes effect immediately.
- Press the function setting key "ENTER" for more than 2 seconds to enter the function setting page.
- Press the query key No. 2 or No. 3 for 0.1 to 2 seconds to select the function. After turning to the output voltage OPU setting page, the word OPU flashes.
- Press the "ENTER" key 0.1 to 2 seconds to enter the setting page of the output voltage OPU.At this time, the word OPU is long on, and the value flashes to the right of the word OPU. Press the query key "UP/DOWN" key for 0.1 to 2 seconds to select different output voltage values, the available voltage values are 208V, 220V, 230V, 240V. By default, the output voltage is 230V, and the settings are saved in real time.
- After turning the page to the desired output voltage value, press the "ENTER" key for 0.1-2 seconds, the output voltage PU setting is completed, and the value on the right side of the OPU will be on and no longer flashing.
  Press the "ESC" key for more than 0,1 to 2 seconds, the function will be set successfully, exit the function setting page, and return to the main display page (or do not operate, and automatically jump back to the main display page after waiting for up to 30S).

Note: When the output voltage is set to 208V, the output needs to be derated to 90%.

No.	Parameter Name	Settings	Description
01	Output Voltage (OPU)	[01]208 [01]220 [01]230 [01]240	The default output voltage is 208V, 220V, 230V, 240V can be set, all working conditions can be set, and it will takes effect immediately. **Note: When the output voltage is set to 208V, the output needs to be derated to 90%.**
02	Output frequency (OPF)	[02]50Hz [02]60Hz	All states can be set.This parameter cannot be set in battery mode.The AC mode takes effect immediately. After the setting is complete, the frequency changes at a slower rate when the battery mode is switched back.
03	Output priority settings (OPP)	[03]GRD (default) [03]PU [03]PBG	There are three options for output priority, the default is GRD: AC output priority; the second is PU(PV): photovoltaic output priority; the third is PBG:Photovoltaic battery AC
04	Output Mode Settings (MOD)	[04]APP [04]UPS	There are two options for AC output mode, the default is APP: Appliance which is used for home appliances: the second is UPS mode, which is used for computers and other equipment. The switching time is typically 10ms.(Input voltage range in APP mode :90~2802Vac. Input voltage range in UPS mode :170~246Vac) .
05	Charging priority settings (CHP)	[05]PNG (default) [05]OPV [05]GRD [05]PV	There are four options for charging priority, the default is PNG (PV and Grid): PV and Grid are charged at the same time; the second is OPV (Only PV): only photovoltaic charging: the third is GRD (Grid):mains charging priority The fourth is PV: PV priority charging.

06	AC charging current (RCC)	[06]30A(KH 5000-42 default)	Maximum charging current of the AC. The default value of KH5000-42 is 30A and the setting range is [2,80A].
07	Maximum charging current (MCC)	[07]80A(K H5000-42 default)	Maximum charging current.The default value of KH5000-42 is 80A and the setting range is [2,100A].
08	Menu Front (MDF)	[08]ON (default) [08]OFF	The default setting is ON. In the function setting operation, when it is set to ON, if the page is not in the first interface (P1) at this time, it will return to the first interface after 1 minute; if it is set to OFF,if the page is not in the first interface (P1) at this time, the LCD will Always stay on this interface.
09	Overload restart setting (LrS)	[09]ON (default) [09]OFF	All states can be set.Overload restart is set to ON by default.
10	Over temperature restart setting (TrS)	[10]ON (default) [10]OFF	All states can be set. Overtemperature restart is set to ON by default.
11	AC input power failure alarm setting (MIP)	[11]ON [11]OFF (default)	The default value is ON. After the primary input detection is lost, the buzzer will ring for 3s. When set to OFF, the buzzer will not sound after the primary input is lost.
12	Power Saving Mode (PWS)	[12]ON [12]OFF (default)	The default setting is OFF, and the function is not enabled. When the value is set to ON, in battery mode, if the load is less than 25W, the system will output abnormally. If the load is higher than 35W, the system will resume continuous normal output.
13	Overload convert to bypass setting (OLG)	[13]ON [13]OFF (default)	The default setting is OFF, and the function is not enabled. When set to ON, in the case of PV priority output with load, if overloaded, the system will immediately switch to bypass (AC output, that is, the so-called bypass mode).
14	Silent mode setting (MUE)	[14]ON [14]OFF (default)	The default setting is OFF, and the function is not enabled. When the value is set to ON, the buzzer does not sound in any state such as alarm or fault.
15	Battery mode to AC mode voltage point (BTG)	[15]46V(K H5000-42 default	When the battery and AC exists at the same time, the battery discharge to a certain voltage will be transferred to the AC to ensure that the battery will not empty. Setting conditions: All states can be set, and the output priority should be set in PV or PBG mode. The KH5000-42 is set to 46V by default. The range varies according to battery type. See the battery type parameter table for details.

16	Voltage point back to battery mode (BTB)	[16]52V(KH5000-42 default)	After the battery is powered off at low voltage, the battery voltage must restore to a certain value before restarting the battery mode. Setting condition: All states can be set. The The default value of KH5000-42 is 52V. The range varies according to battery type. For details, see Battery type Parameter table.
17	Barttery mode setting (BAT)	[17]AGM (default) [17]FLD [17]LIB [17]CUS	Four battery type Settings: The default setting is AGM; The second is FLD(Liquid battery); The third is LIB(lithium battery); The fourth type is CUS(manual setting).
18	Barttery low voltage point (bAL)	[18]55V(KH5000-42 default)	Low voltage alarm point set. Setting condition: All states can be set. For KH5000-42, the default value is 55V. This parameter cannot be set if the battery type is AGM or FLD(Liquid battery type). For details about the setting range, see Battery Type Parameter table.
19	Barttery low voltage cut off point (bAU)	[19]42V(KH5000-42 default)	Battery low voltage shutdown point Settings, all states can be set. The default value of KH5000-42 is 42V. Battery type: AGM, FLD(Liquid battery) cannot be set. For details about the setting range, see Battery Type Parameter table.
20	Constant voltage mode voltage point setting (bCV)	[20]56.4V(KH5000-42 default)	Constant voltage point setting, all states can be set. The default value is 56.4V for KH5000-42. Battery type: AGM, FLD(Liquid battery type) cannot be set. For details about the setting range, see Battery Type Parameter table.
21	Floating charge mode voltage point setting (bFL)	[21]54V(KH5000-42 default)	Floating charging voltage point Settings, all states can be set. The default value of KH5000-42 is 54V. Battery type: AGM, FLD(Liquid battery type) cannot be set. For details about the setting range, see Battery Type Parameter table.
22	Mains low voltage point setting (LLV)	[22]154V(APP mode default) [22]185V(UPS mode default)	This section describes how to set the low-voltage protection point for the utility power. The default setting is 154V.When the output mode is APP mode, the default setting is 154V, and the range can be set [90,154].If the output mode is UPS, the default value is 185V. The value range is [170,200].
23	Mains high voltage protecting point setting (LHV)	[23]264V (default)	Set the utility power high voltage protection point, which can be set when the output mode is APP. The default setting is 264V and the setting range is [264,280].

24	Low power discharging time setting (LWD)	[24]8(8 hours) default	Low power discharge protection function, in battery mode, when the load has a low power consumption, unlimited discharge will make the battery empty, affecting the battery life. After the low-load discharge to the set time, the low-voltage shutdown point of the KH5000-42 battery will be increased to 44V. When the low-load discharge reaches the low-voltage shutdown point of the battery, the system will alarm and shut down after 1 minute. KH5000-42 When the battery voltage exceeds 52.8V, the battery discharge time is reset. Setting conditions: Can be set when the output mode is APP.
25	Inverter soft start Settings (SRE)	[25]OFF (default) [25]ON	The default setting is OFF. When the interface is in ON state, the inverter is turned on, and the inverter output gradually increases from 0V to the target voltage value. When the interface is OFF, the inverter is turned on, and the output of the inverter is directly increased from 0V to the target voltage value. Setting condition: This parameter can be set in any state.
26	Default setting (STD)	[26]OFF (default) [26]ON	Before the setting, the interface is displayed as OFF. When it is set to ON, the system will restore the default setting. After the Settings are complete, the screen will display OFF again. The mains and standby modes can be set and take effect immediately. The battery mode cannot be set.
27	Parallel mode Settings (PAM)	[27]SIG (default)	The default setting is SIG single-machine mode. The current model does not support parallel mode.
28	Missing battery alarm (SBA)	[28]OFF (default) [28]ON	The default setting is OFF. If this parameter is set to OFF, no battery miss, battery low, or battery undervoltage alarm is generated when the battery is not connected. Setting condition: All states can be set.
29	Equalization mode (EQM)	[29]OFF (default) [29]ON	The default setting is OFF, and the function is not enabled. Set to On, the controller will begin to enter the equalization phase when the floating charge phase reaches the set equalization interval (battery equalization cycle), or when the equalization is activated immediately.
30	Equalization voltage point setting (EQV)	[30]58.4V(KH5000-42 default)	Equalization voltage point Settings, all states can be set. The default value of KH5000-42 is 58.4V. For details about the setting range, see Battery Type Parameter table.
31	Equalization charging time setting (EQT)	[31]60 (default)	During the equalization phase, the controller will charge the battery as much as possible until the battery voltage rises to the battery equalization voltage. Then constant voltage regulation is used to maintain the battery voltage to maintain the battery balance voltage. The battery will remain in the equalization phase until the setted battery equalization time is reached. The default value is 60 minutes, and the value range is [5,900]. The increments of each setting are 5 minutes.

32	Equalization Delay Time setting (EQO)	[32]120 (default)	In the equalization stage, when the battery equalization time expires and the battery voltage does not rise to the battery equalization voltage point, the charge controller will extend the battery equalization time until the battery voltage reaches the battery equalization voltage. When the battery equalization delay setting ends, the battery voltage is still lower than the battery equalization voltage, and the charge controller will stop the equalization and return to the floating charge stage. The default setting is 120 minutes, and the range can be set [5,900]. Each setting is incremented by 5 minutes.
33	Equalization interval setting (EQI)	[33]30(30 days) default	Function Description: Equalization charging interval Settings. Setting condition: All states can be set. When the battery is detected during the float charge phase with the equalization mode on, the controller will begin to enter the equalization phase when the set equalization interval (battery equalization period) is reached. The default value is 30 days, and the value range is [1,90]. Each increment is 1 day.
34	Turn on equalization change immediately (EQN)	[34]OFF (default) [34]ON	The default setting is OFF, and the function is not enabled. When set to On, when the floating charge phase is enabled in the equalization mode and the battery is detected, the equalization charge is activated immediately, and the controller begins to enter the equalization phase.
35	Grid-connected inverter function (GTI)	[35]OFF (default) [35]ON	The default setting is OFF, and the function is not enabled. When set to ON, the inverter carries out the maximum power point tracking and the excess energy is fed into the utility power. If the communication is abnormal after the function is enabled, alarm 56 is generated, and the inverter does not determine the running logic based on the BMS information.
36	Battery dual output low voltage shutdown point (DBV)	[36]48V(KH5000-42 default)	If this function is enabled, the inverter suboutput is enabled by default. After entering battery mode, when the battery voltage is lower than the set point, the secondary output is turned off. When the battery voltage again exceeds the set value + 1V/ knot, the secondary output is turned on. All states can be set. The KH5000-42 is set to 48V by default and can be set in the range [44,60]. *** The current model does not support dual output.**
37	Battery dual output duration (DBT)	[37]OFF (default) [37]FUL	Function Description: When this function is enabled, the inverter sub-output is enabled by default. After entering battery mode, when the battery discharge time reaches the set point, the secondary output is turned off.Setting condition: All states can be set.The default value is OFF and the function is disabled. The value range is [5,890] (unit: minute). When the value is set to FUL, the output time of the secondary route is not limited. *** The current model does not support dual output**

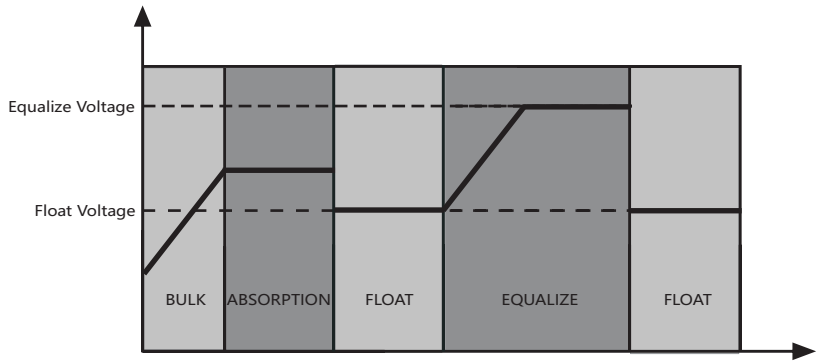
38	BMS communication function (BMS)	[38]OFF (default) [38]ON	Function Description: Set whether the inverter communicates with the lithium battery BMS. Setting condition: All states can be set. The default setting is OFF, and the function is not enabled. When set to ON, the inverter communicates with the lithium battery BMS through the central centralized control board and obtains battery information. If the communication is abnormal after the function is enabled, alarm 56 is generated, and the inverter does not determine the running logic based on the BMS information. *** This function needs to be used with the central control board.** *** This option page is blocked when the central controller is not connected.**
39	Low SOC shutdown function (SBU)	[39]20 (default)	Function Description: Set the inverter to shut down when SOC is low. Setting condition: All states can be set.The default value is 20, and the range is [5,50]. In battery mode, when the lithium battery SOC reaches the set value, the battery shuts down and generates an alarm 68. When the battery SOC returns to the set value + 5%, the alarm 68 is cleared. In standby mode, the battery mode is entered only when the value reaches + 10%. If the value does not reach 69, the alarm is generated. After this function is enabled, alarm 69 is generated when the SOC of the lithium battery reaches the set value + 5%. Alarm 69 is cleared when the SOC of the lithium battery returns to the set value + 10%. You can set this parameter to OFF. In this case, the inverter does not shut down, start, or generate alarms based on the SOC. After the function is enabled, if a communication exception occurs, the inverter does not run logic based on SOC information, and the related alarm is cleared. *** This function needs to be used with the central control board.** *** This option page is blocked when the central controller is not connected.**
40	High SOC to battery function (STB)	[40]90 (default)	Function Description: Set the SOC value of the inverter to battery mode. Setting condition: All states can be set.The default value is 90, and the range is [10,100]. PBG priority Mains In normal mains mode, the lithium battery SOC is switched to battery mode when it reaches the set value. When turned on, the inverter switches to battery mode only when the SOC is higher than the set point and the battery voltage is higher than the switch back to battery mode voltage point (see Settings page 16). You can set this parameter to OFF. In this case, the inverter does not switch from the mains mode to the battery mode based on the SOC. After the function is enabled, if a communication exception occurs, the inverter does not run logic based on SOC information, and the related alarm is cleared. *** This function needs to be used with the central control board.** *** This option page is blocked when the central controller**

41	Low SOC transfer function (STG)	[41]50 (default)	Function Description: Sets the SOC value of the inverter in mains mode. Setting condition: All states can be set.The default value is 50, and the range is [10,90]. PBG priority In normal battery mode, when the lithium battery SOC reaches the set value, it switches to the mains mode. When turned on, the inverter switches to mains mode when the SOC is below the set point or the battery voltage is below the switch back to mains voltage point (see Settings page 15).You can set this parameter to OFF. In this case, the inverter does not switch from battery mode to mains mode based on the SOC. After the function is enabled, if a communication exception occurs, the inverter does not run logic based on SOC information, and the related alarm is cleared. If the setting is higher than the STB point, STB and STG do not take effect after the next setting. *** This function needs to be used with the central control board.** *** This option page is blocked when the central controller is not connected.**

8.Battery equalization instructions

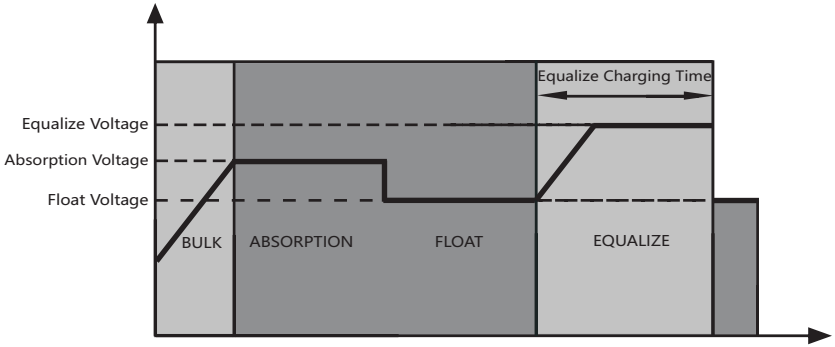
8.1 Equalization time

When the set equalization interval(battery equalization cycle) is arrived, or equalization is activited immediately, the controller will start to enter Equalize stage.

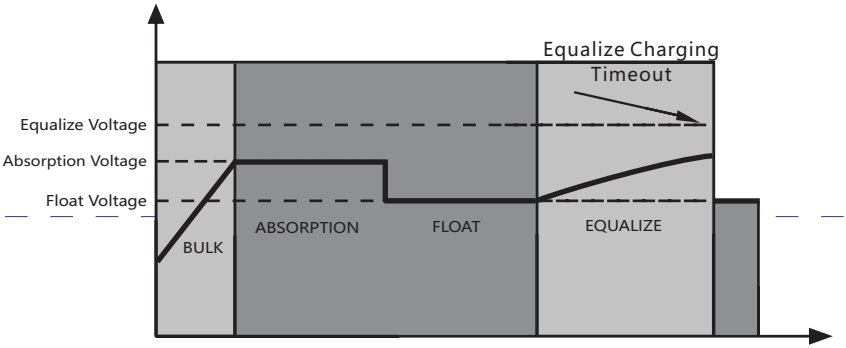


8.2 Equalize charging time and timeout

In Equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raises to battery equalization voltage.Then,constant-voltage regulation is applied to maintain battery voltage at the battery equalization voltage. The battery will remain in the Equalize stage until the set battery equalized time is arrived.



However, in Equalize stage, when battery equalized time is expired but battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery equalization voltage when battery equalized timeout setting is over, the charge controller will stop equalization and return to float stage.

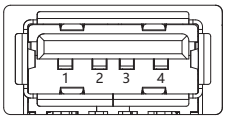


9.Communication interface and description

9.1 USB interface

Support WIFI/GPRS function, need to connect an external data collector (need to apply) for using. The inverter can be controlled through the mobile APP.

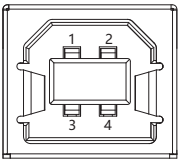
NO	Symbol	Description
1	+5V	5V Power
2	RS.232.RX	Serial Wire Debug
3	RS.232.TX	Serial Wire Clock
4	GND	Ground



9.2 Type-B interface

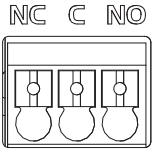
This port is a USB communication port and is mainly used for debugging by technician. You can communicate with our host computer (need to apply) software through this port.

NO	Symbol	Description
1	+5V	5V Power
2	DM	Serial Wire Debug
3	DF	Serial Wire Clock
4	GND	Ground



9.3 Dry connect interface

Unit Status	Condition			NC&C	NO&C
Power Off	Unit is off and no output is powered			Close	Open
Power On	Output is powered from Utility.			Close	Open
	Output is powered from Battery or PV	Output priority is set to utility power	Battery voltage < Low DC warning voltage(settable)	Open	Close
			Battery voltage > Setting value in BTB or Battery charging reaches	Close	Open
		Output priority is set to PBG or PV first	Battery voltage < Setting value in BTG	Open	Close
			Battery voltage > Setting value in BTB or Battery charging reaches floating stage	Close	Open

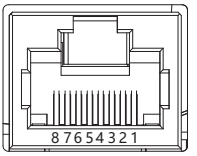


*BTB is the voltage point for switching back to battery mode.
*BTG is the point at which the battery returns to the utility power voltage.
*PBG is the output mode according to the priority of photovoltaic current mains sequence.

9.4 RJ45 interface

This interface can communicate with the lithium battery BMS for RS485. Interface definition:

NO	Symbol	Description
1	RS485B	485 communication interface
2	RS485A	485 communication interface
3	NC	/
4	CAN-BUS+	CAN communication interface
5	CAN-BUS-	CAN communication interface
6	NC	/
7	NC	/
8	NC	/



10.Troubleshooting instructions

10.1 Fault code and meaning

The inverter enters the fault mode, the red LED light is always on and the LCD displays.

Fault code	English meaning	Inverter action	Triggering condition	Recovering conditions	Alarm warning
1	Bus soft start fail	Fault mode	When the bus is soft, the set voltage cannot be reached	Unrecoverable	Fault
2	Bus high	Fault mode	The bus bar is higher than the set value	Unrecoverable	Fault
3	Bus low	Fault mode	The bus is below the set value	Unrecoverable	Fault
4	Battery Over Current	Fault mode	Instantaneous battery current value exceeds 580A, immediately protect	Unrecoverable	Fault
5	Over temperature	Fault mode	The PFC or INV temperature sensor is higher than the overtemperature setting	After the restart function is enabled, the fault cannot be recovered after six failed restarts	Fault
6	Battery high	Fault mode	The battery voltage is higher than the set value	Recoverable	Fault
7	Bus soft Fault	Fault mode	The DC soft starting voltage of the busbar does not reach the set value	Unrecoverable	Fault
8	Bus short Fault	Fault mode	In normal operation, the bus bar is immediately lower than the set value	Unrecoverable	Fault
9	INV soft Fault	Fault mode	After a period of soft start of the inverter, the rated output voltage still cannot be reached	Unrecoverable	Fault
10	INV over voltage	Fault mode	In battery mode, the inverter voltage is higher than the set value	Unrecoverable	Fault
11	INV under voltage	Fault mode	In battery mode, the inverter voltage is lower than the set value	Unrecoverable	Fault
12	INV short	Fault mode	The inverter voltage is immediately less than the set value, and the current is immediately greater than the set value	The fault cannot be recovered after six failed restarts	Fault
13	Negative power	Fault mode	The inverter power is less than the set value for a period of time	Unrecoverable	Fault
14	Over load fault	Fault mode	The load exceeds the specification	After this function is enabled, the restart cannot be recovered after six failed attempts	Fault
15	Model Fault	Fault mode	The software identification machine model does not match the hardware detection	Unrecoverable	Fault

16	No boot loader	Fault mode	No bootstrap	Unrecoverable	Fault
17	Panel Flash Fault	Fault mode	Model is writing PV control program	Restore after writing	Fault
19	Same Serial	Fault mode	In parallel mode, multiple machines with the same serial number are detected	Unrecoverable	Fault
20	CAN Fault	Fault mode	In parallel mode, CAN bus communication is abnormal	Unrecoverable	Fault
21	BAT Volt Different	Fault mode	In parallel mode, the battery pressure difference of different machines is too large	Unrecoverable	Fault
22	Line Volt Different	Fault mode	In parallel mode, the input pressure difference between different machines is too large	Unrecoverable	Fault
23	Line Freq Different	Fault mode	In parallel mode, the input voltage frequency difference of different machines is too large	Unrecoverable	Fault
24	Output Config Different	Fault mode	In the three-phase parallel mode, there is a lack of phase in the parallel mode Settings of different machines, or there is a three-phase parallel and a single phase parallel, or there is a single machine mode	Recover when set to stand-alone operation or meet the three-phase operation setting conditions	Fault
25	Output Syn Loss	Fault mode	In parallel mode, the output voltage detection is out of sync	Unrecoverable	Fault
26	BMS Fault	Fault mode	The battery BMS has fault information. Procedure	Close the BMS communication function,or BMS failure recovery	Fault

10.2 Alarm code and meaning

The red LED flashes, and the LCD displays the alarm code,the inverter does not enter the fault mode.

Alarm code	English meaning	Inverter action	Triggering condition	Recovering conditions	Alarm warning
50	Battery not connected	Alarm, no charging	Battery voltage <8V/piece	Battery voltage ≥ 10V/piece	Alarm
51	Low battery shutdown	Alarm, battery low voltage shutdown or unable to boot	Battery voltage < 10.5V/piece(default)	Auto-restart when battery voltage more then (10V+0.2V)"N, N for numbers of battery serial group	Alarm
52	Battery low	Warning	Based on bAL Settings	Recoverable(action point+ 0.2v/piece)	Alarm
53	Battery charge short	Alarm, no charging	Battery voltage < 5V and Charging current < 4A	Unrecoverable	Alarm

54	Low watt discharge	Warning	The battery discharge exceeds the set low power discharge time	Recoverable (battery voltagehigher than 13.2V/cell)	Alarm
55	Over charge	Alarm, no charging	The battery voltage is higher than the set value	Recoverable	Alarm
56	BMS Loss	Alarm, lock stanby mode	Description After the BMS communication function is enabled, the communication fails	Recoverable	Alarm
57	Over Temperature	Alarm, no charging	The PFC or INV temperature sensor is higher than the set value	The PFC or INV temperature sensor is lower than the set value	Alarm
58	Fan lock	Alarm, If one fan is faulty, the other fan turns full speed	No fan speed signal is detected	Recoverable	Alarm
59	EEPROM fail	Warning	EEPROM read and write failed	Unrecoverable	Alarm
60	overload warning	Alarm, no charging	Load>102%	Recoverable (Load<97%)	Alarm
61	Abnormal generator waveform	Alarm, keep working in battery mode	Abnormal generator waveform detection	Recoverable	Alarm
62	PV Energy Weak	Turn off PV output and charging	When the battery is not connected, the bus voltage is lower than the set value	Recover after 10 mins	Alarm
63	Synchroni zat ion signal fail	Alarm, swich to failure mode	The parallel board is disconnected	Switch to stand-alone mode recovery Disconnect Troubleshooting Recovery	Alarm
64	Parallel configuration incompatible	Alarm, swich to standby mode	There is a phase missing setting when the three phase is combined	Restore when the three-phase Settings are correct	Alarm
65	Parallel version incompatible	Alarm, swich to standby mode	The parallel system has incompatible version	Restore when all machine versions in the parallel system are compatible with each other	Alarm
66	Parallel Communication Fault	Alarm, swich to standby mode	The slave cannot be detected in the parallel system	In the parallel system, recovery is detected after the slave is connected, and the recovery mode is set to single-node recovery	Alarm
67	Parallel Line Differ	Warning	The mains voltage or frequency error of the parallel machine is too large	When the mains voltage and frequency error of each machine is detected, it will be restored	Alarm

68	SOC Undere	Alarm，swich to standby mode	The SOC of the lithium battery is lower than the set value	Turn off the low SOC shutdownfunction, or turn off the BMScommunication function, orto the set value+5%	Alarm
69	SOC Low	Alarm,f it is in standby mode,it will remain in standby mode and not turn on	Lithium battery SOC below the set value +5% (mains mode or battery mode), below the set value + 10% (standby mode)	Turn off the low SOC shutdown function, or turn off the BMScommunication function, orrecover when the SOC returnsto the set value+10%	Alarm

10.3 Troubleshooting

Fault	Troubleshooting
No screen display	Check whether the battery circuit breaker or PV circuit breaker is closed. Whether the switch is in the "ON" state; Press any button on the screen to exit the screen sleep mode.
Rechargeable battery overvoltage protection	Measure whether the battery voltage is too high, and turn off the photovoltaic array circuit breaker and the mains circuit breaker.
Battery undervoltage protection	After the battery is charged and restored to the low voltage, the recovery voltage is above.
Fan error	Check whether the fan is not running or is blocked by something else.
Heat sink over temperature protection	When the temperature of the device cools down below the overtemperature recovery temperature, normal charge and discharge control is restored.
Bypass overload protection, inverter overload protection	①Reducing the use of electrical equipment; ②Restart the fusioncube and restore the load output.
Inverter short-circuit protection	①Carefully check the load connection and remove short-circuit fault points; ②Power on the device again, and the load recovers.
PV overvoltage	Use a multimeter to check whether the PV input voltage exceeds the maximum allowable input voltage.
The battery is not connected	Check whether the battery is disconnected or the battery side circuit breaker is not closed.

11.Maintenance

In order to maintain the best long-term performance, it is recommended to check the following items twice a year.

- Make sure the airflow around the unit is not blocked and remove any dirt or debris from the radiator.
- Check all exposed wires for insulation damage caused by sun exposure, friction with other objects around, dry rot, insects or rodents, etc. Repair or replace wires if necessary.
- Verify that the instructions and display are consistent with the operation of the equipment, note any faults or incorrect displays and take corrective action if necessary.
- Check all terminals for signs of corrosion, insulation damage, high temperature, or burning/discoloration, and tighten the terminal screws.
- Check for dirt, nesting insects and corrosion and clean as required.
- If the arrester fails, replace it in time to prevent lightning damage to the fusioncube or other devices.

Warning: Electric shock danger! When performing the preceding operations, ensure that all the power supplies of the fusioncube are disconnected and all the power in the capacitor is discharged before performing corresponding checks or operations.

The company shall not be liable for any damage caused by:
①Damage caused by improper use or use in an unsuitable place.
②The open circuit voltage of the PV module exceeds the maximum allowable voltage.
③Damage caused by the working environment temperature exceeding the limit working temperature range.
④Disassemble and repair the all-in-one machine.
⑤Damage caused by force majeure: damage occurred during transportation or loading and unloading.

12.Technical Data

Model		KH5000-42
Input	Input Sources	L+N+PE
	Rated Input Voltage	208/220/230/240Vac
	Rated Voltage (adjustable)	154~264Vac(APP mode)；185~264Vac(UPS mode)
	Freqency	50Hz/60Hz(Auto Adaptive)
Output	Rated Capacity	5000W
	Output Voltage	230Vac(208/220/230/240Vac adjustable)
	Output Frequency	Mains mode: Follows the mains frequency, Battery mode: 50/60Hz±0.3
	Waveform	Pure Sine Wave
	Transter Time (adjustable)	10ms(UPS mode)；20ms(APP mode)
	Peak Power	10000VA
	Over Load Ability (battery mode)	1min@102%~110% Load;10s@110%~130% Load;3s@130%~150%Load;0.2s@>150% Load
	Peak Efficiency	> 94%(Battery mode Rated input voltage)
Battery	Battery Votage	48Vdc
	Constant charging (adjustable)	56.4Vdc
	Float charging (adjustable)	54Vdc
Charges	PV Charging Mode	MPPT
	MAX.PV Input Power	6000W
	MPPT Tracking Range	120V~500Vdc
	Best Voltage	300V~400Vdc
	MAX.PV Input Voltage	500Vdc
	MAX.PV Charging Current	100A
	MAX.AC Charging Current	80A
	MAX.Charging Current	100A
Display	LCD Diaplay	Display Running Mode/Loads/Input/Output, etc.
Interface	USB Interface	Support WIFI/GPRS function
	Ty-B Interface	Technical personnel debugging use
	Dry connect Interface	This dry contact can control the diesel generator switch to charge the battery
	RJ45 Interface	RS485 communication with lithium battery BMS
Appearance	Net weight	9.4kg
	Dimensions	475*315*120.3mm
Environments	Operating Temperature	0℃~50℃
	Humidity	20℃~95℃ (Non-condensing)
	Storage Temperature	-15℃~60℃
	Altitude	Altiude not over 1000m,Derating over 1000m,Max 4000m,Refer to IEC62040
	Noise	≤50db

13.Battery type Data

KH5000-42	(AGM)	(FLD)	(LIB)	(CUS)
Battery mode to mains mode voltage point (BTG)	46V(44-52V adjustable)	46V(44-52V adjustable)	47.6V(40-50V adjustable)	(44-52V adjustable)
Switch back to battery mode voltage point (BTB)	52V(48-58V adjustable)	52V(48-58V adjustable)	54.4V(46-58V adjustable)	(48-58V adjustable)
Barttery low voltage point (bAL)	44V (unchangeable)	44V (unchangeable)	default 47.6V (41.2-50V adjustable)	(42-54V adjustable)
Barttery low voltage cut off point (bAU)	42V (unchangeable)	42V (unchangeable)	46V(40-48V adjustable)	(40-48V adjustable)
Constant voltage mode voltage point setting (bCV)	56.4V (unchangeable)	58V (unchangeable)	56.4V(48-60V adjustable)	(48-60V adjustable)
Floating charge mode voltage point setting (bFL)	54V (unchangeable)	54V (unchangeable)	55.2V(50-58V adjustable)	(48-60V adjustable)
Equalization voltage point setting (EQV)	58.4V(48-60V adjustable)	58.4V(48-60V adjustable)	58.4V(48-60V adjustable)	58.4V(48-60V adjustable)

*The constant pressure point must be greater than the floating charge point.