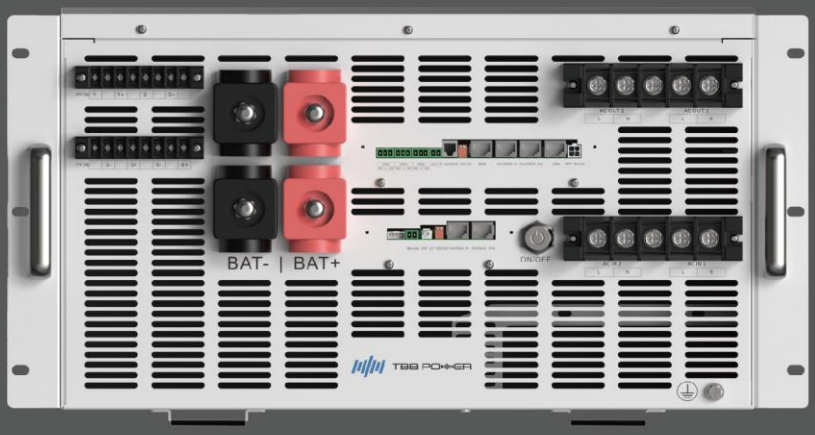
TBB POWER

Version: V1.0

USER MANUAL

Solar Hybrid Inverter

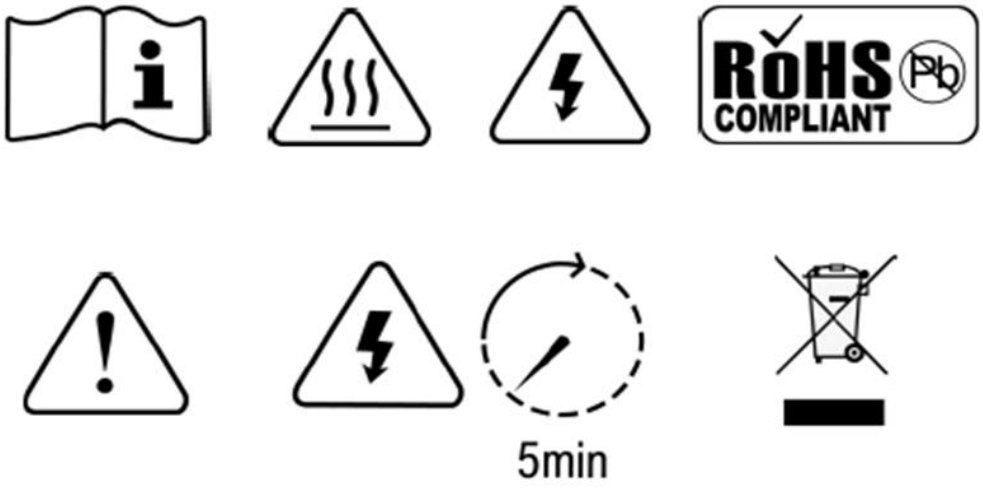
Matrix II Series



www.tbbpower.com

Revision History

Version	Description
V1.0	Initial Version Matrix II 10.0S Pro-R, Matrix II 15.0S Pro-R: Hardware Ver V1.0, Firmware Ver V2.01, Software Ver V1.03



WARNING: HIGH VOLTAGE INSIDE

CAUTION: THE DC FUSE MUST HAVE BEEN TURNED OFF BEFORE SERVICING

MADE IN CHINA

Disclaimer

Unless specially agreed in writing, TBB POWER (XIAMEN) CO., LTD.

- Takes no warranty as to the accuracy, sufficiency of suitability of any technical or other information provided in this manual or other documentation.
- Assumes no responsibility or liability for loss or damage, whether direct, indirect, consequential or incidental, which might arise out of the use of such information.
- Offers standard warranty with its products, taking no responsibility for direct or indirect loss due to equipment failure.

About This Manual

This manual describes our product features and provides procedure of installations. This manual is for anyone intending to install our equipment.

General Instruction

Thanks for choosing our products and this manual is suitable for Matrix II. This chapter contains important safety and operation instructions. Read and keep this User Guide well for later reference.

Matrix II needs to be installed by professionals and please pay attention to the following points prior to installation:

Please make sure the input voltage or voltage of battery is equal to the nominal input voltage of this inverter.

- Please connect the positive terminal "+" of the battery to the "+" input of the inverter.
- Please connect the negative terminal "-" of the battery to the "-" input of the inverter.
- Please use the shortest cable for connection and ensure a secure connection.
- While connecting, please secure the connection and avoid the short circuit between the positive terminal and the negative terminal of the battery, to protect the battery from damage.
- The inverter has high voltage inside. Only the authorized electrician can open the case.
- The inverter is NOT designed to be used in any life-sustaining equipment.

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1. General Safety Instruction

1.1 Safety Instruction

As dangerous voltage and high temperature exist within the Matrix II series solar hybrid inverter, only qualified and authorized maintenance personnel are permitted to open and repair it.

This manual contains information concerning the installation and operation of the Matrix II solar hybrid inverter. All relevant parts of the manual should be read prior to commencing the installation. Please follow the local regulations meantime.

Any operation against safety requirement or against design, manufacture, safety standard are out of the manufacturer warranty.

1.2 General Precaution

- Do not expose to rain, snow or liquids of any type. It is designed for indoor use.
- To avoid fire and electric shock, make sure all cables are selected with right gauge and connected well. Cables with smaller or broken cables are not allowed to use.
- Please do not put any inflammable goods next to the Matrix II series.
- Never place the Matrix II series directly above batteries. Gas from a battery will corrode and damage the Matrix II series solar hybrid inverter.
- Do not place battery over the Matrix II series.

1.3 Precaution regarding Battery Operation

- Use plenty of fresh water to clean in case battery acid contacts skin, clothing, or eyes and consult with a doctor as soon as possible.
- The battery may generate flammable gas during charging. Never smoke or allow a spark or flame in vicinity of a battery.
- Do not put the metal tool on the battery. Spark and short circuit might lead to explosion
- Remove all personal metal items such as rings, bracelets, necklaces, and watches while working with batteries. Batteries can cause short-circuit current high enough to melt metal, and could cause severe burns.

2. Instruction

2.1. Brief Instruction

2.1.1. General Description

Matrix II series solar hybrid inverter (**hereinafter referred to as Matrix II**) is a low-frequency transformer-based inverter integrated with multiple functions like battery inverter, AC charger, suitable for backup power and off-grid applications.

Matrix II series has the following features:

Strong surge capability to carry various inductive loads, such as air conditioners, refrigerators, water pumps, etc.

1. Flexible configuration on energy priority to charge the battery or power the loads with grid or solar energy, meeting the needs of different application scenarios.

2. Matrix II 10.0S, Matrix II 15.0S: Two AC inputs for grid and generator (or for two generators).

   Matrix II 5.0S, Matrix II 8.0S: Two AC outputs: one usual uninterruptible output, one programmable port for load management or generator.

3. Support system wake-up when AC source or PV is regained, to effectively prevent the system from becoming deadlock due to low battery voltage/SoC, to realize unattended function.

4. Equipped with Power Assist function to relieve power supply pressure of AC side under short-term overload condition.

5. Equipped with Bypass Assist function to relieve power supply pressure of battery side under short-term overload condition and limit the battery's discharge power, effectively limiting the discharge current of the lithium battery BMS, thus to avoid over current protection of the BMS.

6. Intelligent fan control to minimize noise.

7. Flexible in system expansion, two or more units can be connected in parallel to compose a single-phase parallel system or a three-phase parallel system.

8. Support feeding energy back into the grid.

9. Support ESS functionality via E4 LCD Monitor.

10. Remote monitoring and control via NOVA APP or Web.

11. Support AC Coupled PV system, DC Coupled PV system or the combination of both.

12. Higher PV open circuit voltage and multiple MPPT trackers.

13. Compatible with SP600-120 to achieve a higher efficiency DC Coupled PV system.

14. Minimize the impact of loads on batteries when the grid is available.

15. Built-in three programmable relays, supporting automatic generator start and stop (AGS).

2.1.2 Naming Rules

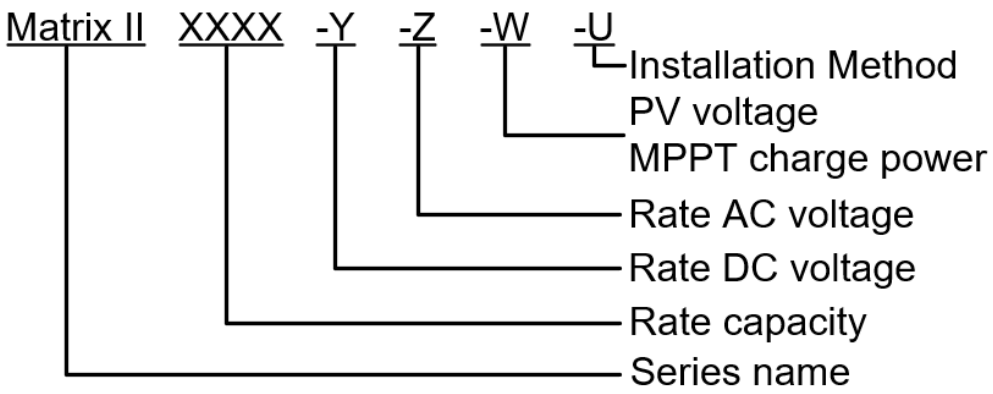
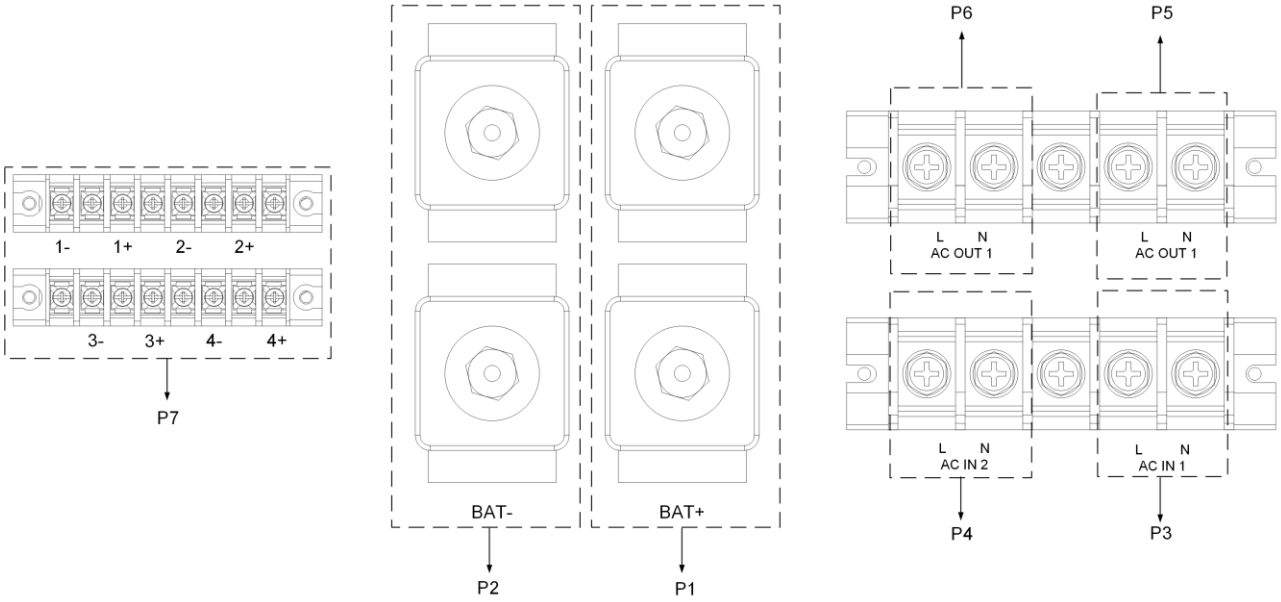


Figure	Explanation	
Matrix II	Series name	
15.0	Indication of rated power	15000W
10.0		10000W
-S	Indication of rated DC voltage	48VDC
--	Indication of rated AC voltage	230VAC
Pro	Indication of PV voltage Indication of MPPT charge power	600VDC or 900VDC Enhanced MPPT charge power
--	Installation Method	Wall Mounted
-R		Rack Mounted

2.2. Structure

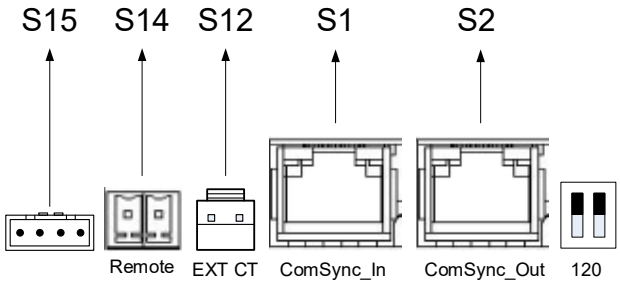
2.2.1 Connection Terminal

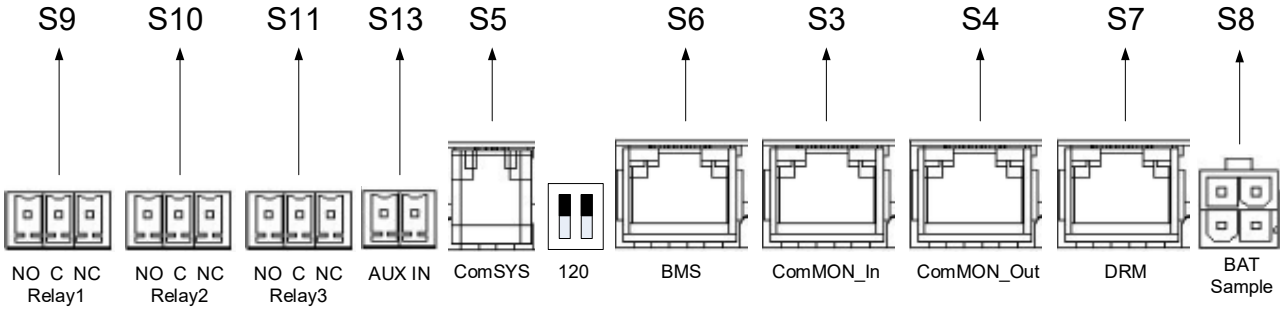
Matrix II 15.0S-R, Matrix II 10.0S-R



2.2.2 Power Port

No.	Name	Description	Note
P1	BAT+	Battery Positive Input	M8 bolt
P2	BAT-	Battery Negative Input	
P3	AC IN 1	AC Input 1 Can be connected to the grid or generator	M6 bolt
P4	AC IN 2	AC Input 2 CAN only be connected to the generator	
P5	AC OUT1	AC Output 1	
P6	AC OUT2	AC Output 2	
P7	PV 1/2/3/4	PV Input	M3 bolt





2.2.3 Signal Port

No.	Name	Description	Note
S1	ComSync In	For multiple inverters running in parallel system or three-phase system.	
S2	ComSync Out		
S3	ComMON In	Monitoring communication port for connecting to the upper computer (via TBB Interface), Kinergy II, E4, Ether-Link, etc.	⚠ Connecting to undefined port is prohibited for it could lead to inverter damage.
S4	ComMON Out		
S5	ComSYS	System communication port for connecting to the Solar Mate, Meter, etc.	
S6	BMS	For connecting lithium battery BMS communication.	⚠ Connecting to undefined port is prohibited for it could lead to inverter damage.
S7	DRM	Can be configured as DRM0-DRM8 for AS 4777.2 (Australia/New Zealand).	
S8	BAT Sample	Battery temperature sampling.	
S9	Relay1	Dry output contact. Its control logic can be selected through the upper computer.	Built-in 30Vdc/3A or 250Vac/3A relay.
S10	Relay2	Dry output contact. Its control logic can be selected through the upper computer.	Built-in 30Vdc/3A or 250Vac/3A relay.
S11	Relay3	Dry output contact. Its control logic can be selected through the upper computer.	Built-in 30Vdc/3A or 250Vac/3A relay.
S12	EXT CT	External current sensor interface for external grid current sampling.	
S13	AUX IN	Programmable input dry contact.	

S14	Remote	Remote on/off control.	⚠Only for connecting to a touch switch. It is forbidden to connect to voltage signals. When the setting item 'Main_Switch_SEL' is set to 'Mobile', the touch switch needs to be changed to a rocker switch.

ComSync In Port Pin Definition

Pin No.	Definition
1	--
2	--
3	--
4	CAN_H_1
5	CAN_L_1
6	--
7	--
8	--

ComSync Out Port Pin Definition

Pin No.	Definition
1	--
2	--
3	--
4	CAN_H_1
5	CAN_L_1
6	--
7	--
8	--

ComMON In Port Pin Definition

Pin No.	Definition
1	--
2	--
3	RS485_A_2
4	CAN_H_2
5	CAN_L_2
6	RS485_B_2
7	+12V（10-14V/500mA）
8	0V

ComMON Out Port Pin Definition

Pin No.	Definition
1	--
2	--
3	RS485_A_2
4	CAN_H_2
5	CAN_L_2
6	RS485_B_2
7	+12V（10-14V/500mA）
8	0V

BMS Port Pin Definition

Pin No.	Definition
1	--
2	--
3	--
4	CAN_H_2
5	CAN_L_2
6	--
7	--
8	--

ComSYS Port Pin Definition

Pin No.	Definition
1	NC
2	RS485_A_1
3	RS485_B_1
4	NC

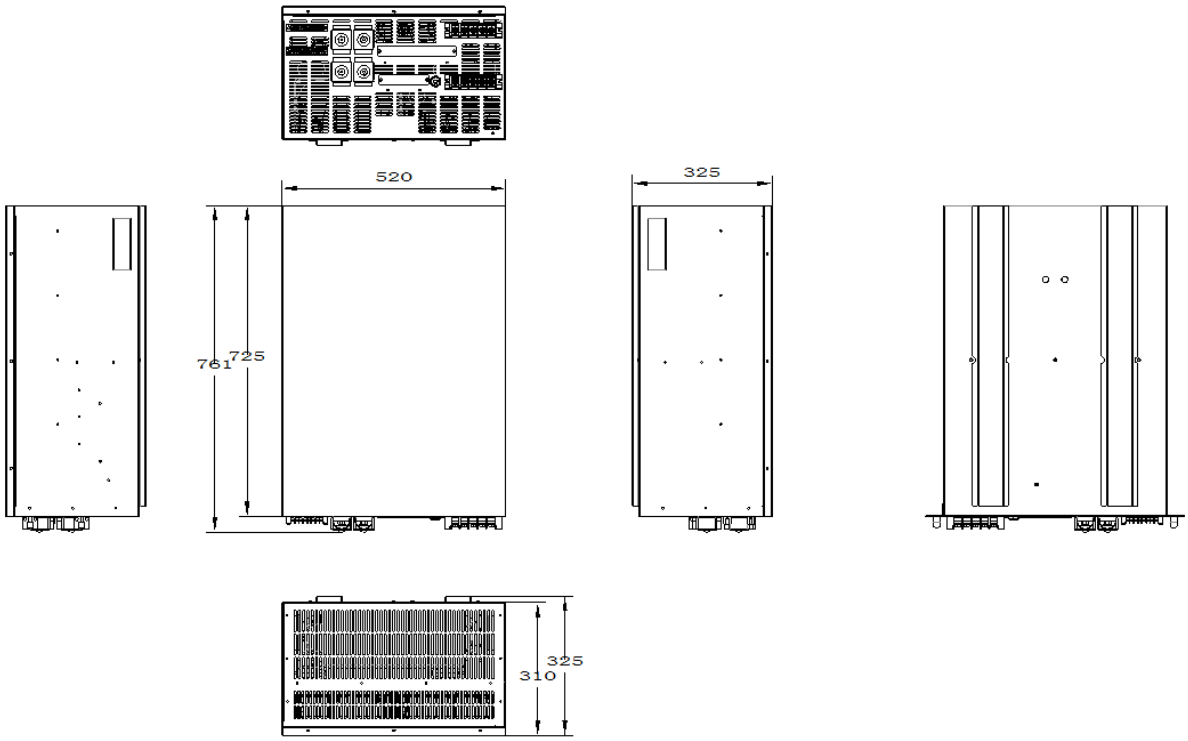
DRM Port Pin Definition

Pin No.	Definition
1	DRM_1/5
2	DRM_2/6
3	DRM_3/7
4	DRM_4/8
5	REF_GEN/0
6	COM LOAD/0
7	+12V（10-14V）
8	0V

BAT Sample Port Pin Definition

Pin No.	Definition
1	For internal use. The pin must be kept unconnected.
2	For internal use. The pin must be kept unconnected.
3	Battery temperature sampling+
4	Battery temperature sampling-

2.2.4 Dimension



Matrix II 10.0S Pro-R, Matrix II 15.0S Pro-R

2.3. Function

2.3.1 DC Coupled and AC Coupled System

Using Matrix II together with a Solar Mate MPPT and a PV inverter from TBB Renewable, the user can compose both the DC Coupled system and AC Coupled system. Featuring greater flexibility, the AC Coupled system can achieve a higher system power and is much more suitable for a commercial project.

2.3.2 Parallel and Three-phase

Two or more units can be connected in parallel to compose a single-phase parallel system or a

three-phase parallel system, which is convenient for system expansion or to construct a micro-grid system. For a single-phase system, maximum 3 units can be connected in parallel. For a three-phase system, maximum 9 units can be connected together.

2.3.3 Power Control and Power Assist

Matrix II offers a unique feature of power control & power assist, which is very useful when you have a limited grid supply or work with a generator. Matrix II will take control of energy flow automatically, using extra power to charge the battery or discharge the battery to compensate the insufficient part of the grid or generator. With this feature, the user can avoid air switch trip and does not have to use oversized generators.

2.3.4 Auto Restart While AC is Recovering

Matrix II can automatically restart when the AC input (AC IN port only) is recovering. Full explanations are as follows:

While the lead-acid battery is under low-voltage protection, and once the AC input is recovering, Matrix II can be woken up to recharge the battery (preconditions for wake-up: after the grid is regained, the battery voltage must be higher than the working voltage of Matrix II's auxiliary source. For 48V model, the working voltage of its auxiliary source is 40V, and for 24V model the value is 20V).

While the lithium battery is under low-voltage protection, and once the AC input is recovering, Matrix II can be woken up to recharge the lithium battery, and meantime the lithium battery can also be woken up to return to the normal state of charge and discharge.

2.3.5 Auto Restart While PV is Recovering

Matrix II can automatically restart when the PV input is recovering. Full explanations are as follows:

While the lead-acid battery is under low-voltage protection, and once the PV input is recovering, the lead-acid battery can be charged by the MPPT module, and Matrix II can be woken up at the same time.

While the lithium battery is under low-voltage protection, and once the PV input is recovering, the lithium battery can be charged by the MPPT module, so the lithium battery can be woken up to return to the normal state of charge and discharge, and meantime Matrix II can also be woken up.

2.3.6 Powerful and Reliable Inverter

High Performance Pure Sine Wave

Matrix II is a pure sine wave inverter generating a near perfect sine AC wave power output that is very similar to or even better than what the user can get from the utility grid. Pure sine wave can guarantee the normal function of the sensitive equipment (computer, laser printer, TV, etc.). Also, your home appliances such as fridge, microwave and power tools will work more efficiently.

High Surge Power Capability

Provided with outstanding surge power capability and low frequency transformer, Matrix II is suitable for heavy inductive loads like fridge, coffee maker, microwave, power tools, air conditioner, etc.

Battery Low Voltage/SOC Protection

Matrix II provides configurable battery low voltage/SOC protection.

2.3.7 Professional Battery Charger

Battery Type Settings

Matrix II supports working with lithium and lead-acid batteries. The current battery type and charging parameters can be displayed and set on the TBBLinking software.

No	Battery Type	Absorption charging voltage (Default)	Float charging voltage (Default)	Battery Default Charge Rate	Battery Maximum Charge Rate	EQ charging voltage
0	GEL/OPzV (Default)	14.1V (13.5~14.5V Configurable)	13.7V (13.0~14.0V Configurable)	0.15C	0.25C	-
1	AGM	14.4V (13.5~14.5V Configurable)	13.5V (13.0~14.0V Configurable)	0.15C	0.25C	-
2	Lead-Carbon	14.1V (13.5~14.5V Configurable)	13.5V (13.0~14.0V Configurable)	0.2C	0.5C	-
3	Flooded	14.7V	13.5V	0.15C	0.25C	Enable (15.5V)
4	Traction	15.2V	13.5V	0.15C	0.25C	Enable (16.2V)
5	Customized User-defined / Lithium Battery without Communication	13.3V (48V system Configurable)	13.1V (48V system Configurable)	0.3C	1.0C	-
6	TBB SUPER-L (TBB Lithium)	BMS Communication Set (General Can Communication Protocol for Residential Energy Storage Industry) (The initial equalization voltage is 13.3V, and the float voltage is 13.0V; when the communication is established, it will follow the instructions from the BMS)				

Note: The above voltage is based on 12V battery voltage as a reference. For the 48V battery system, please multiply the given values by 4.

Multi Stage Sophisticated Charging Algorithm for Lead Acid Battery

Fitted with multistage charging algorithm (bulk-absorption-float-recycle), the built-in charger of Matrix II is designed to charge battery quickly and fully. A microprocessor-controlled charging algorithm with variable absorption charging timer could guarantee the optimal charging for the batteries of different discharged states.

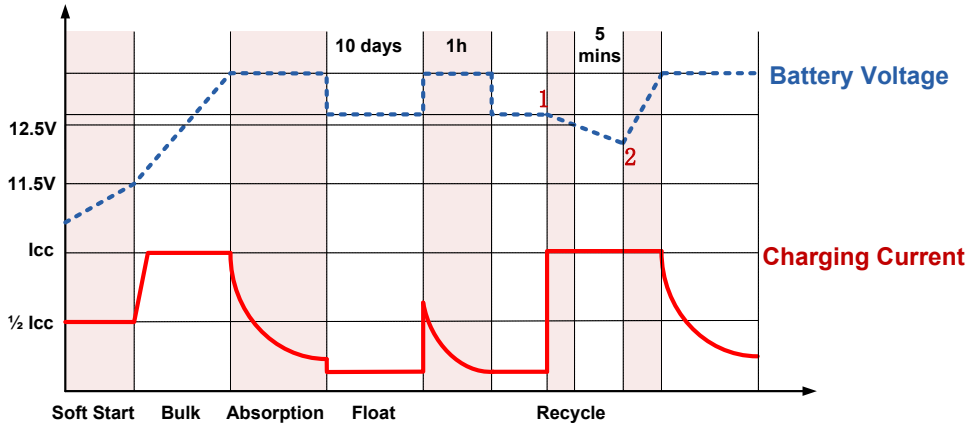


Figure 2-6 Multi Stage Sophisticated Charging Algorithm for Lead Acid Battery

Float and cycle charging program ensure that your battery is properly maintained over extended periods of connection to the inverter, reducing aging over extended periods of inactivity.

Multi Chemical Batteries Available

Matrix II offers premium charging algorithm for the common chemical acid batteries, including AGM, GEL, Flooded, lead-carbon and Lithium battery. User can set the battery parameters through the TBBLinking software.

Compatible with Lithium Battery

Matrix II supports working with general lithium battery for residential energy storage. Connect the 'BMS' port of Matrix II to the CAN port of the lithium battery to set up the communication between the lithium battery and Matrix II.

When the connection with the lithium battery is set up, Matrix II can automatically respond to the charging request of the lithium battery BMS, and meantime read the information sent by the lithium battery BMS for monitoring. When a communication error occurs after working with the lithium battery for a period of time, Matrix II can automatically detect the error and raise an alarm.

Manual Equalization

It is strongly recommended to read this section carefully before you start the EQ charging and don't leave the battery unattended while performing desulfuration.

Always check if your battery supplier recommends the EQ charging. Only start when it is suitable.

If the battery type is set to AGM, GEL or Lead-Carbon, this charging profile can't be triggered on.

Over a period of time, the cells in a flooded battery will develop uneven chemical states. This will result in a weak cell which in turn can reduce the overall capacity of the battery. To improve the life span and performance of the flooded battery, Matrix II provides a manual equalization program that can be used. If it is recommended by the battery manufacturer, user can initiate the desulfuration program manually. Once you trigger the equalization program, Matrix II will perform equalization charging.

After 30 minutes, it will quit EQ charging and enter into float charging.

- Check the electrolyte level and refill the battery with the distilled water if necessary.
- If you want to return to normal charging, you need to stop equalization charging and switch off Matrix II.
- Switch on Matrix II again, then you will have your equipment back to normal charging.



During equalization, the battery generates potentially flammable gas. Follow all the battery safety precautions listed in this guide. Ventilate the area around the battery thoroughly and ensure that there are no sources of flame or sparks in the vicinity.



Turn off or disconnect all loads on the battery during equalization. The voltage applied to the battery during equalization may be above the safe levels for some loads.

Frequency:

For heavily used battery, you may need to equalize your battery once a month. For light-duty batteries, equalization is only required every 2-3 months.

Important:

- Equalization may damage your batteries if it is not performed properly. Always check battery fluid before and after equalization. Fill the batteries only with the distilled water.
- Always check the equalization switch is set back to OFF after each equalization.
- Follow the battery manufacturer's recommendations on equalization. Always follow the battery manufacturer’s instructions to properly equalize the batteries. According to the guide, a heavily used battery may require equalization once a month while a battery with light duty service only needs equalizing once every 2 to 4 months.
- Battery type: as a protection, equalization charging can be performed if and only if you set the battery to Traction, Flooded or OPzS battery. If you choose the AGM, GEL or Lead-Carbon, EQ charging can’t be performed.

2.3.8 Transfer

Uninterrupted AC Power Supply

In case of voltage/frequency/waveform of AC input match the minimum quality, the voltage will be switched directly to the AC output. Matrix II will work as a battery charger and the loads will be powered by AC input. The voltage of the AC output and the AC input will be the same.

In case of the AC input failure or excessive AC input current, Matrix II will initiate a fast take-over of power supply, which will guarantee an uninterrupted power supply. Once the AC input resumes or matches the quality, the power supply will be switched back to AC input again. Due to its ultra fast transfer design, as fast as 0ms, Matrix II could be used as an UPS.

2.3.9 Protection Function

Matrix II is equipped with a series of complete hardware and software protection functions to ensure its stable and reliable operation.

Overload Protection

When overload protection is triggered, it will restart automatically after 60s. And after three consecutive overload shutdown protections, Matrix II will not restart automatically. In this case, the user needs to manually restart it.

Over Temperature Protection

When the internal temperature is too high, Matrix II will enter the over-temperature protection. After the internal temperature returns to normal, it can automatically resume normal operation.

Short Circuit Protection

Matrix II will automatically shut down when the AC output is short-circuited and needs to be manually activated.

Battery Low Voltage/SoC Protection

To prevent the permanent battery damage caused by the over discharge of battery, Matrix II will automatically cut off the output according to the low voltage/SoC protection threshold set by the user.

3. Configuration

3.1 Check Before Operation

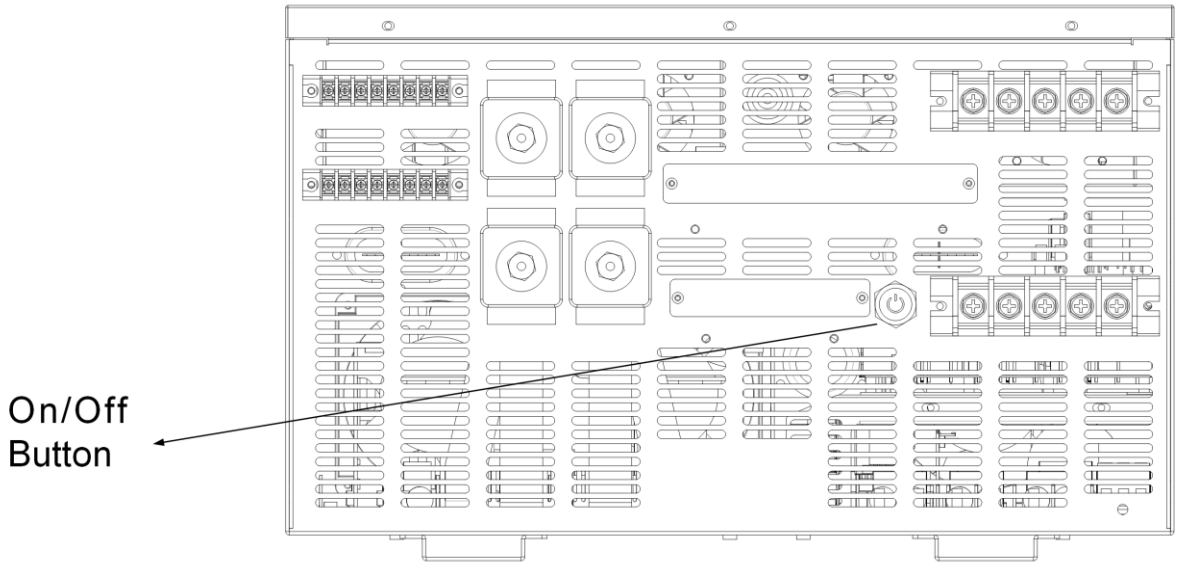
Please check before operation according to the following.

- Matrix II is installed correctly and firmly.
- Reasonable cable layout to meet customer requirements.
- Make sure the grounding is reliable.
- Make sure the ground wire is properly, firmly and reliably connected.
- Double check to make sure the battery breaker, AC breaker, PV breaker is OFF.
- Make sure the cables are properly, firmly and reliably connected.
- Reasonable installation space, clean and tidy environment, no construction residue.

3.2 Power ON Test



Make sure the battery voltage is within the permissible range before the breaker is turned ON.



Matrix II 10.0S Pro-R, Matrix II 15.0S Pro-R

Please follow the instructions step by step.

- Step 1: Turn on the battery breaker.
- Step 2: Press the On/Off button for 2 seconds to turn on the inverter into the standby mode.
- Step 3: Press the On/Off button again for 1 second to set the inverter to the inverting mode and observe the LED indicator to make sure the inverter is running normally.

3.3 Power OFF



After Matrix II is powered OFF, there is still residual power and heat on the case, which may lead to electric shock or burns. Therefore, 5 minutes after Matrix II is powered off, you should wear protective gloves before removing Matrix II.

Please follow the instructions step by step.

- Step 1: When the inverter is in the inverting mode or charging mode, press the On/Off button for 2 seconds to turn the inverter into the standby mode.
- Step 2: When the inverter is in the standby mode, press the On/Off button for 5 seconds to turn the inverter into the complete off mode.
- Step 3: Turn off the battery breaker.

4. Operation

4.1 Configure Matrix II Through TBBLinking

Connect Matrix II to a computer via the TBB Interface module, and configure Matrix II's parameters on the TBBLinking.

The configure items described in the following sections are for reference only. Please refer to the configure items on the TBBLinking software for actual settings.

4.1.1 System

Item	Setting range	Description
Rated AC Voltage	200~240V	Inverter output voltage RMS. **Default**: 230V
Rated AC Freq.	50/60Hz	Rated AC frequency. **Default**: 50Hz
Parallel Mode	0- Stand Alone 1- Parallel 2- Three-phase	Set the unit in the stand alone or parallel or three-phase system. **Defaul**:0- Stand-alone
Parallel_UVW	1- U(L1) 2- V(L2) 3- W(L3)	Only can be set if the 'Parallel Mode' is '2-Three-phase'. **Default**:1- U(L1)
Parallel ADDR	Parallel system:1~3 Three phase system:1~3	Only can be set if the 'Parallel Mode' is '1- Parallel' or '2- Three-phase'. **Default**:1
Detect Neutral and GND Voltage	0- Disable 1- Enable	Voltage detection between Neutral and Ground. Disable: Disable the voltage detection Enable: Enable the voltage detection **Default**:1- Enable
Ground Relay	0- Disable 1- Enable	The neutral output of inverter is automatically connected to earth when no external AC source is available. Disable: Neutral grounding is disable Enable: Neutral grounding is enable **Default**: 1- Enable
UPS Mode	0-Disable 1-Enable	 **Default**: 1- Enable
Solar Mode	0- N/A 1- DC Coupled 2- AC Coupled 3- DC+AC Coupled	Select Solar system you are intending to compose. 1- DC Coupled: Communication with Solar Mate series MPPT charger. 2- AC Coupled: Connect to the PV inverter without communication.

		3- DC+AC Coupled: Communication with Solar Mate series MPPT charger and connect to the PV inverter without communication. **Default**: 0- N/A
PV Charger Num	1~6	Only can be set if the 'Solar Mode' is '1- DC Coupled' or '3- DC+AC Coupled'. Set the Solar mate MPPT charger number **Default:** 1
SP Model Set	1- SP100/150/250 2- SP600	Only can be set if the 'Solar Mode' is '1- DC Coupled' or '3- DC+AC Coupled'. Set the Solar mate MPPT charger model **Default:** 1- SP100/150/250
PV Inverter Num	1~2	Only can be set if the 'Solar Mode' is '2- AC Coupled' or '3- DC+AC Coupled'. Set the PV inverter number **Default:** 1

4.1.2 Battery

Item	Setting range	Description
Battery Type	Please refer to 0 for detail explanation. 0- GEL/OPzV 1- AGM 2- Lead-Carbon 3- Flooded 4- Traction 5- Customized LFP 6- TBB SUPER-L (TBB Lithium)	Set the following Battery Type chart. **Default**: 0- GEL/ OPzV
Battery AH	50~5000Ah	Set the battery capacity (not applicable if Battery_Type is TBB SUPER-L) **Default**: 200Ah
Max Charge Current		Battery bank allows maximum charging current. Note: there is a default current according to the battery type and size you choose, and it can be adjusted as well.
Absorption Voltage	54.9~58.0V	The absorption charging value

		Default: 56.4V
Float Voltage	52.0-56.0V	The float charging value **Default**: 54.5V
Undervoltage Warning	40.4~52.0V	Undervoltage warning value **Default**: 44V
Undervoltage Protect	38.4~43.6V	Undervoltage protection value **Default**: 40V
Undervoltage Protect Recover	44.0~58.0V	Undervoltage protection recovery value. **Default**: 52.0V
Deep Undervoltage Protect	36.0~39.6V	Ultimate undervoltage protection for value. Note: the status consumption power will be 0mA once trigger this protection. With Solar Mate MPPT charger, the inverter can be triggered automatically as soon as the sun comes up next day. **Default**: 38V
Min Bulk Time	10~600min	Minimum Bulk time. **Default**: 30min
Max Absorption Time	1~120h	Maximum absorption time. Note: the allowed max time varies according to the selected battery type. **Default**: 30h
Auto Charge Cycle Time	8~960h	Absorption cycle time. **Default**: 240h
Temperature Compensation	0- OFF 1- ON	Enable the charging temperature compensation. **Default**: 1- OFF
Temperature Compensation Coef	-144~0mV/℃	Only can be set if 'Temperature Compensation' is '1- ON'. Charging temperature compensation coefficient. **Default**: -72mV/℃
Max DisCHG Current at Bypass	50~600A	Only can be set if the 'AC IN Bypass Connect' is '1- Bypass Assist'. **Default**: 550A
SoC Low Warning	11~80%	Only can be set if the 'Battery Type' is '6- TBB SUPER-L'. **Default**: 15%
SoC Low Protect	3~14%	Only can be set if the 'Battery Type' is '6- TBB SUPER-L'. **Default**: 10%
SoC Charge Enough	30~99%	Only can be set if the 'Battery Type' is

		'6- TBB SUPER-L'. **Default**: 85%
BMS OV Warn		Only can be set if the 'Battery Type' is '6- TBB SUPER-L'. **Default**: Shield
Low charge Voltage	0~2V	Only can be set if the 'Battery Type' is '6- TBB SUPER-L'. The charging voltage can be reduced. **Default**: 0V
Float Charge Enable	0- Disable 1- Enable	Only can be set if the 'Battery Type' is '6- TBB SUPER-L'. When the BMS issues a 0A charging current command, the floating charging current remains 2A. **Default**: 0- Disable

4.1.3 AC Input

Item	Setting range	Description
AC IN 1 Source Selection	0- Grid 1- Generator	Select the AC source. **Default**: 0- Grid
Max Voltage	240~265V for 230V model 120~140V for 120V model	Maximum AC in input voltage. **Default**: 265V for 230V model 140V for 120V model
Min Voltage	145~200V for 230V model 80~110V for 120V model	Minimum AC in input voltage. **Default**: 175V for 230V model 85V for 120V model
Max Freq.	51~59Hz @50Hz 61~69Hz @60Hz	Maximum AC in input frequency. **Default**: 55Hz
Min Freq.	41~49Hz @50Hz 51~59Hz @60Hz	Minimum AC in input frequency. **Default**: 45Hz
AC Wave Harmonic Adaption	0- Normal 1- Weak AC Source	AC input harmonic adaptation mode. Note: When the AC input harmonic is too large and the inverter cannot track its phase, select 1 to enable the inverter a greater chance to track the phase of the AC input. Please refer to the specification for the transfer time after this setting. **Default**: 0- Normal

AC IN 1 Power Assist Current	10A~Rated AC input Current	The maximum current allowed for AC in input. Note: Once it is set up, the inverter will use only extra power to charge the battery. And when the input current of ACin reaches the set value, the insufficient part of the energy required by the load will be taken from the battery. **Default**: Rated AC input Current
AC IN 2 Power Assist Current		
AC In Connect Delay	20~990s	Time delay upon detecting qualified grid. **Default**: 20s
External CT	0- N/A 1- 100A/100mA 2- 200A/100mA 3- 400A/100mA	Set the Rate of CT. **Default**: 0- N/A
External CT Control Mode	0- Display Only 1- Zero Export to CT 2- AC Current Limit 3- Feedback Control	Only can be set if the 'External CT' is '1- 100A/100mA', '2- 200A/100mA' or '3- 400A/100mA'. **Default**: 0- Display Only
Feedback Power	0~12000W	Only can be set if the 'External CT Control Mode' is '3- Feedback Control'. **Default**: 100W

4.1.4 User Control

	Item	Setting range	Description
AC In Logic	AC IN1 Charge Max Current	0~200A	This setting is designed for user to configure the charging current for this inverter or even switch off the charger. **Default**: 140A
	AC IN 2 Charge Max Current		
	AC IN Logic	0- AC In First mode 1- Battery First mode 2- Time Ctrl 3- Ubat / SOC Ctrl	0- AC In First mode: Under this mode, the grid will supply power to the load preferentially and meantime charging the battery. Matrix II will switch the power supply to the battery only upon the grid fails. 1- Battery First mode: Under this mode, the load will be powered by the PV and the battery. Only upon battery reaches

			discharged warn level, Matrix II will bring AC in (grid or generator) to charge the battery. Once the battery reaches the absorption stage or lithium battery BMS sends signal, Matrix II will stop charging and use battery to power the load. 2- Time Ctrl: Matrix II offers Time Ctrl mode which is an advanced control mode, offering three timers for user to configure. Within the set time zone, Matrix II will work in the AC In First Mode. Beyond the time zone, Matrix II will work in the BATT First mode. Meantime, when the battery discharges under Batt First Time zone, you can configure whether to let Matrix II enter the AC in First mode. This mode can be used in area where there is peak/off peak tariff policy. 3- Ubat Ctrl: This is the advanced mode base on BATT First. Under this mode, part of the energy can be reserved for powering on purpose when the grid fails. Users can set the battery voltage threshold for transferring to the mains supply (charging the battery at the same time after transferring) and the battery voltage threshold for disconnecting the mains. 4- SOC Ctrl: This is the mode with the same function to that of Ubat_Ctrl mode, but designed for TBB SUPER-L lithium battery only. Under this mode, user can program the SOC percentage for entering charging or existing charging mode.

			Default: 0-ACin First
	AC IN Bypass Connect	0- Total Bypass 1- Bypass Assist	Set the bypass logic: 0- Total Bypass: When the battery power is sufficient and no error occurs, power the loads with the battery only. 1- Bypass Assist If the ACin is normal, the load is powered by the DC power first. When the battery power is insufficient to supply power to the load or an overload occurs, the bypass is used as an assist power to supply the loads. **Default**: 1- Bypass Assist
AC Out2 Control	AC Out2 Control	0- Default 1- SoC Ctrl 2- Time Ctrl 3- Load Ctrl	**Default**: 0- Default
Relay Definition	Relay Control	0- Default 1- User Define	**Default**: 1- User Define
	Relay1 Function	0- Ubat_LV_Warn 1- OL/OT Warn 2- Inverter Fault 3- AC In Error 4- AC In Charging 5- AC In Ready 6- AC In Voltage 7- Fan Running 8- AC In/MPPT Charging 9- PV Voltage 10- BMS Alarm 11- AGS Driver (Relay1)	**Default**: 0- Ubat_LV Warn
	Relay2 Function		**Default**: 7- Fan Running
	Relay3 Function		**Default**: 7- Fan Running
Time Setting		Set Current Time	
Error Shield	AC IN Undervoltage Warn	0- Display 1- Shield	Whether shield the ACin_LV Warning. For UPS application, it is recommended to enable this alarm. **Default**: 1- Shield
	AC IN 2 LV Warn	0- Display 1- Shield	Whether shield the ACin_LV Warning. For UPS application, it is recommended to enable this alarm.

			Default: 1- Shield
	MPPT Offline Warn	0- Display 1- Shield	Whether shield the PV inverter offline Warning. **Default**: 0- Display

4.2 Configure Matrix II Through TBB Nova Web or APP

Connect Matrix II to the Kinergy II or E4, and configure Matrix II parameters on NOVA Web or APP.

5. FAQ

Error codes and warning codes can be queried via the TBBLinking, NOVA Web or APP.

5.1 Error Code

5.1.1 Inverter Error

Error Code		Description	Solution
101	U_Bus_OV	DC bus is over voltage.	Check the battery voltage.
102	U_Bus_LV	DC bus is under voltage.	Check the battery connection and voltage.
103	U_Bus_HW_Pro	Hardware protection to prevent DC bus over voltage.	Check the battery voltage and charger output voltage.
104	PSU_Fault	Auxiliary power supply is abnormal.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
105	T_HS_OT	Heat sink's temperature is too high.	Check the installation place of the charger and its ventilation conditions and ambient temperature.
106	T_TX_OT	Transformer's temperature is too high.	
107	Sam_HD_Fault	Sampling is abnormal.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
108	EEPROM_Fail	ROM is abnormal.	
109	Output_ShortCut	Output short circuit.	Check if there is short circuit at loads.
110	Output_OverLoad	Output over load.	Reduce the load.
111	CoolSys_Err	Cooling system is abnormal.	Check if the fan is working properly.
112	U_BAT_Low_Deep	Battery is severely under voltage.	Connect to a valid grid or generator. Restart the inverter and charge the battery.
114	Instant_OC_Soft	Instantaneous over current.	Check if there is a short circuit at loads.
115	EPO	Emergency stop.	Check the EPO Dry Input.
116	Rly_Err	Relay is abnormal.	Restart the inverter. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
117	Comm Err Timeout		Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.

5.1.2 MPPT Error

Error Code		Description	Solution
801	U_PV1_OV	PV1 input is over voltage.	Check the connection of PV tracker 1 and make sure the open circuit voltage does not exceed the limit.
802	U_PV2_OV	PV2 input is over voltage.	Check the connection of PV tracker 2 and make sure the open circuit voltage does not exceed the limit.
803	I_PV1_OC	PV1 input is over current.	Check the connection of PV tracker 1 and make sure the configured power does not exceed the limit.
804	I_PV2_OC	PV2 input is over current.	Check the connection of PV tracker 2 and make sure the configured power does not exceed the limit.
805	HD_HVBus_OV	DC BUS is over voltage.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
806	HD_OutBat_OV	Battery is over voltage.	Check whether the bafttery pack at the output has a high voltage and make sure whether there is a abnormal high voltage from other charging source to the battery at the output.
807	HD_LLC_OC	Internal module is over current.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
808	HD_U_PSU_LV	Auxiliary power supply is abnormal.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
809	T_HS_OT	Heat sink's temperature is too high.	Check the installation place of the charger and its ventilation conditions and ambient temperature.
810	T_HS_LT	Heat sink's temperature is too high.	
811	T_Mcu_OT	Control Board's temperature is too high.	
812	U_Bat_LV_SD	Battery is under voltage.	Check the validity of the PV input to avoid the situation where the battery is uncharged as the PV has not been connected for a long time.
813	Sam_HD_Fault	Sampling is abnormal.	Check whether the PV input is reversedly connected. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.

5.1.3 BMS Error

Error Code		Description
040	Module_OV	Lithium module is under the over voltage protection.
041	Module_UV	Lithium module is under voltage protection.
042	Module_OT	Lithium module's temperature is too high.
043	Module_UT	Lithium module's temperature is too low.
044	Discharge_OC	Lithium module's discharge current is over normal value.
045	Charge_OC	Lithium module's charge current is over normal value.
046	Module_INT_Err	Lithium battery module fails.

5.2 Warning Code

5.2.1 Inverter Warning

Warning Code		Description	Solution
001	U_BAT_OV	Battery is over voltage.	Check the battery voltage.
002	U_BAT_LV	Battery is under voltage.	Check the battery voltage.
003	U_BAT_LV_Fault	Battery is under voltage protection.	Check the battery voltage.
004	Overload	Overload warning.	Reduce the load.
005	NTC_HS_Fault	Heat sink NTC fails.	Power off the inverter and check the internal NTC connection. Contact the installer if the fault still exists.
006	NTC_TX_Fault	Transformer NTC fails.	
007	T_BAT_OT	Battery temperature is too high.	Check battery sensor connection; check battery temperature; check battery connection.
008	Fan_Fault	Fan is abnormal.	1.Check whether the fan is blocked. 2.Open the case, and check the fan connection. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
009	ParConnect_Err	Parallel connect is abnormal.	Check the connection of the parallel communication cable.
010	ParComm_Err	CAN communication is abnormal.	Check the parallel parameter setting.
011	Par_ID_Conflict	Parallel address conflicts.	Check the parallel parameter setting (ID address).
012	Para_Conflict	Parameters do not match.	Check the parameter setting or trigger the Parameter Sync.
013	Par_SyncTimeOut	synchronization overtime.	
014	ModeSet_Mismatch	The system mode and parameter setting do not	Check the parameter setting (Lithium battery, AC Couple).

		match.	
015	Out_Circuit_Err	Parallel system or three-phase system's AC output is abnormal.	Check the output wire connection.
016	Comm_HMI_Err	Internal communication of LCD is abnormal.	Open the case, and check the LCD wire connection. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
020	ACin_OV	AC input is over voltage.	Check the AC input voltage and the connection.
021	ACin_LV	AC input is under voltage.	
022	ACin_OF	AC input is over frequency.	
023	ACin_LF	AC input is under frequency.	
024	ACin_PhaseErr	AC input phase sequence is abnormal.	
025	U_NEU_2_GND_Err	The voltage between N and GND is abnormal.	1.Check the ACin L-N connection. 2.Check the GND connection.
030	Comm_Inner_Err	Communication between the inverter and the LCD is abnormal.	Open the case, and check the LCD wire connection. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
031	Model_Detect_Err	Software and hardware matching error.	Restart the inverter. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.

5.2.2 MPPT Warning

Warning Code		Description	Solution
701	U_PV1_High	PV1 input is over voltage.	Check the connection of PV tracker 1 and make sure the open circuit voltage does not exceed the limit.
702	U_PV2_High	PV2 input is over voltage.	Check the connection of PV tracker 2 and make sure the open circuit voltage does not exceed the limit.
703	U_HVBus_High	DC BUS is over voltage.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
704	U_OutBat_High	Battery is over voltage.	Check whether the battery pack at the output has a high voltage and make sure whether there is an abnormal high voltage from other charging source to the output battery.

705	I_PV1_CurLimit	PV1 input is over current.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
706	I_PV2_CurLimit	PV2 input is over current.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
707	OutBat_Connect_Abanormal	The SP is not connected to battery.	Check whether the length and cross-sectional area of the cable for the connection of the battery pack at the output meets the requirements, and whether the battery connection circuit is disconnected.
708	OutBat_ShortCut	SP output or battery is short circuit.	Check whether there is a short circuit in the battery circuit at the output.
709	EEPROM_Err	ROM is abnormal.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
710	ComHMI_Offline	Internal communication is off line.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
711	T_BatExt_OT	Battery temperature is too high.	Check the actual temperature of the external battery.
712	DSP_IO_Err		Restart the inverter. Contact installer if fault still exists.
713	Impedance Low	Insulation resistance value is lower than the set threshold.	Check the impedance between the PV Array and Earth.
714	INSCheck_Offline	Display screen is disconnected from the detection board during insulation resistance detection.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.
715	SP600_Offline	Internal communication error.	Internal failure. If it occurs repeatedly, please contact the after-sales service for replacement or maintenance.

5.2.3 BMS Warning

Warning Code		Description
050	Module_HV	Lithium module is over voltage.
051	Module_LV	Lithium module is under voltage.
052	Module_HT	Lithium module's temperature is too high.
053	Module_LT	Lithium module's temperature is too low.
054	Discharge_HC	Lithium module's discharge current is over normal value.
055	Charge_HC	Lithium module's charge current is over normal value.
056	INT_Comm Fail	Communication between lithium modules is abnormal.
057	EXT_Comm Fail	Communication with the inverter is abnormal.
058	SOC_Low	Lithium module's SoC is too low.

5.2.4 Smart GEN Warning

Warning Code		Description	Solution
060	GEN_OV	Generator is over voltage.	Check the generator's voltage and frequency.
061	GEN_LV	Generator is under voltage.	
062	GEN_OF	Generator frequency is too high.	
063	GEN_LF	Generator frequency is too low.	
064	GEN_Phase_Err	Generator phase is abnormal.	

6. Specification

Model	Matrix II 10.0S Pro-R	Matrix II 15.0S Pro-R
Product topology	Transformer based	
Power Assist	Yes	
Feedback into Grid	Yes	
AC input voltage range (VAC)	175~265	
AC input Frequency range (Hz)	45Hz~55Hz@50Hz(normal), 55Hz~65Hz@60Hz(normal)	
AC input Current (transfer switch) (A)	2x100	2x100
Inverter		
Nominal battery voltage (V)	48	
Input voltage range (V)	42~68	
AC output voltage (VAC)	220/230/240 ± 2%	
AC output Frequency (Hz)	50/60 ± 0.1%	
Harmonic distortion	<2%	
Cont. output power at 25°C (VA)	10000	15000
Max output power (30min) at 25°C (W)	10000	15000
Cont. output power at 25°C (W)	8000	13000
Cont. output power at 40°C (W)	7000	10000
Cont. output power at 65°C (W)	6000	7500
Peak power (W)	30000	45000
Maximum efficiency	96%	96%
Zero load power (W)	40	60
Charger		
Charge voltage 'absorption' (V)	57.6	
Charge voltage 'float' (V)	55.2	
Battery types	AGM / GEL / OPzV / Lead-Carbon / Flooded / Traction / Lithium	
Max AC charge current (A)	140	200
Temperature compensation	Yes	
Solar Charge Controller		
Max output current(A)	300	400
Maximum PV open circuit voltage (V)	600	900
Start-up voltage (V)	120	160
Maximum charge Power	17500W @ 57.6V total 5000W @ 57.6V per tracker	23000W @ 57.6V total 8000W @ 57.6V per tracker
PV operating voltage range (V)	120-600	160-900
MPPT voltage range (V)	80-525	80-720
Number of MPPT trackers	4	4
Maximum PV input current per tracker (A)	20+20+20+20	
Maximum PV short circuit current per tracker (A)	25+25+25+25	
MPPT efficiency	99.9%	
PV array insulation resistance detection (Earth fault detection)	Integrated	
General data		
Main Output (AC Out1) Current (A)	100	
Auxiliary Output (AC Out2) Current (A)	50	
Smart Port Current (A)	N/A	
Transfer time	0ms (<15ms in Weak AC source Mode)	
Protection	a) output short circuit, b) overload, c) battery voltage too high, d) battery voltage too low, e) temperature too high, f) input voltage out of range, g) input voltage ripple too high, h) Fan block, i) PV reverse polarity,	
ComSync communication port	For parallel and three phase operation	
ComMON communication port	For remote monitoring and system integration	
Configurable relay	3x (30Vdc/3A or 250Vac/3A)	
Operating temperature range	-40˚C to 65˚C	
Relative humidity in operation	95% without condensation	
Altitude (m)	3500	
Mechanical Data		
Battery connection	Bolts M8(2+2)	
AC connection	Bolts M6	
PV connection	Bolts M3	
Dimension (mm) (max)	725*520*320 (Excluding connectors and brackets)	
Net Weight (kg)	90	108
Cooling	Forced fan	
Protection index	IP21	
Standards		
Safety	EN-IEC 62477-1, EN-IEC 62109-1, EN-IEC 62109-2	
EMC	EN-IEC 61000-6-1, EN-IEC 61000-6-2, EN 61000-6-3, EN 61000-6-4	

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