TBB POWER

Version: A1.0

ALL IN ONE INVERTER

USER MANUAL

CG Series

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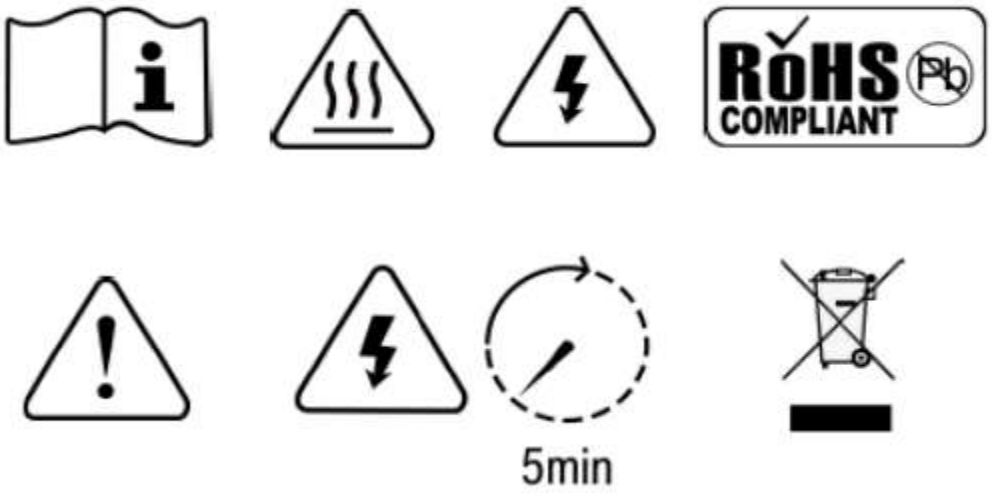


WARNING: HIGH VOLTAGE INSIDE

CAUTION: THE DC FUSE MUST HAVE BEENTURNED OFF BEFORE SERVICING

MADE IN CHINA

Disclaimer

Unless specially agreed in writing, TBB Power Co.,Ltd

- Take 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.
- TBB offer 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 were suitable for CG seriesAll in one inverter. This chapter contains important safety and operation instructions. Read and keep this User Guide well for later reference.

The CG seriesAll in one inverter needs to be installed by professionals and please pay attention to the following points prior to installation:

- Please check the input voltage or voltage of battery is same to the nominal input voltage of this inverter.
- Please connect positive terminal “+” of battery to “+” input of the inverter.
- Please connect negative terminal “-” of battery to “-” input of the inverter.
- Please use the shortest cable to connect and ensure the secure connection.
- While connecting, please secure the connection and avoid short cut between positive terminal and negative terminal of battery, which will cause damage of battery.
- Inverter will have high voltage inside. Only authorized electrician can open the case.
- The inverter WAS NOT designed to use in any life retaining equipment.

Car starter batteries can provide a short period of high current discharge when starting the engine, but are not suitable for continuous discharge or deep cycle discharge. If you need to use an electrical device for a long time, having an additional set of batteries suitable for deep discharge is recommended, such as AGM or GEL batteries.

Contents

1. General Safety Instruction

1.1 Safety instruction

As dangerous voltages and high temperature exist within the CG series All in one inverter, only qualified and authorized maintenance personnel are permitted to open and repair it. Please make sure CG series All in one inverter is turned off before opening and repairing it.

This manual contains information concerning the installation and operation of the CG series All in one inverter. All relevant parts of the manual should be read prior to commencing the installation. Please follow the local stipulation 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 dust, rain, snow or liquids of any type, it is designed for indoor use. DO NOT block off ventilation, otherwise the CG series All in one inverter would be overheating.
- To avoid fire and electric shock, make sure all cables selected with right gauge and being connected well. Smaller diameter and broken cable are not allowed to use.
- Please do not put any inflammable goods near to inverter.
- NEVER place unit directly above batteries, gases from a battery will corrode and damage CG series All in one inverter.
- DO NOT place battery over CG series All in one inverter.

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 doctor as soon as possible.
- The battery may generate flammable gas during charging. NEVER smoke or allow a spark or flame in vicinity of 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 make metal melt, and could cause severe burns.

2. Instruction

2.1 Brief Instruction

2.1.1 General Description

CG series is the new generation All in one inverter designed for various on-board power application such as for RV, Utility Vehicle, Marine etc.

CG series delivers high reliability, performance and industry leading efficiency for mission critical application. Its distinguishing surge capability makes it capable to power most demanding appliances, such as air conditioner, water pump, washing machine, freezer, compressor, power tool etc.

With the function of power assist & power control, it can be used to work with a limited AC source such as generator or limited grid. CG series can automatically adjust its charging current avoiding grid or generator to be overloaded. In case of temporary peak power appear, it can work as the supplement source to generator or grid.

2.1.2 Naming Rules

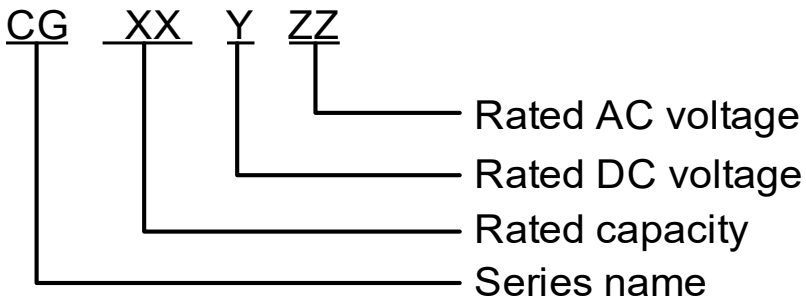


Figure	Explanation	
CG	series name	
3.0	Represent rated capacity	3000W
5.0		5000W
M	Represent rated DC voltage	24VDC
S		48VDC
--	Represent rated AC voltage	230VAC

Naming example: CG3.0S

CG series All in one inverter

Rated capacity: 3000W

Rated DC voltage: 48V

2.2 Structure

2.2.1 Front

Figure 2-1 All in one inverter structure in front view

2.2.2 Control panel

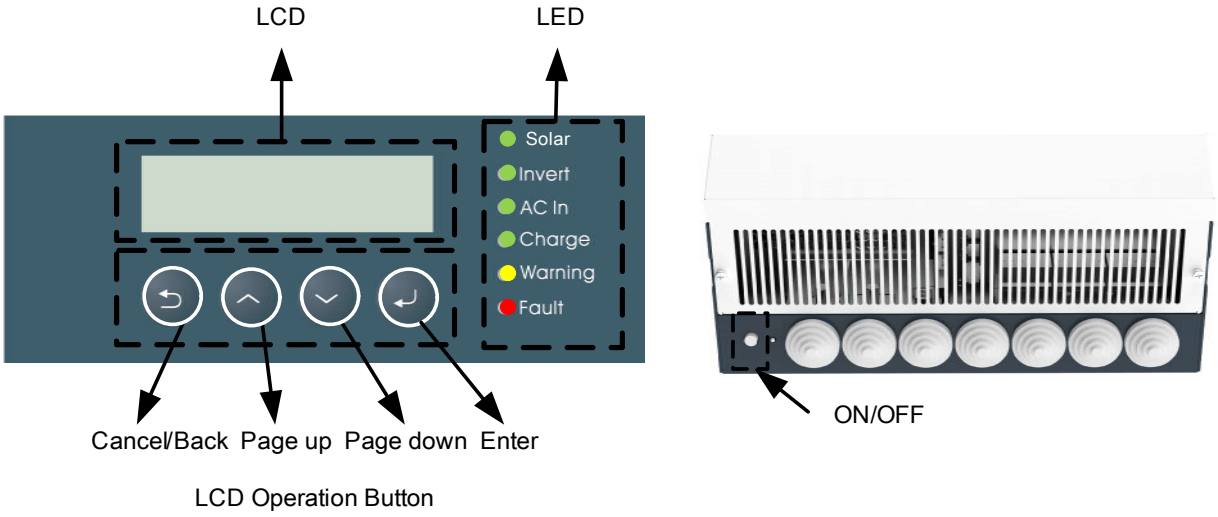


Figure 2-2 All in one inverter Control buttons

Table 2-1 Control Buttons

Button	Function
	➢ Cancel the selection ➢ Display the previous level of menu
	➢ Display the previous page ➢ Increase the value of the selected item ➢ Press the button for more than 2 seconds to scroll the page up
	➢ Display the next page ➢ Decrease the value of the selected item ➢ Press the button for more than 2 seconds to scroll the page down
	➢ Enter into this menu, displaying the next level ➢ Select and confirm the selection of a menu item

Table 2-2 LED directive function

LED	Function
Solar	➢ It will illuminate when CG is in solar charging mode.
Invert	➢ It will illuminate when CG is inverting.
AC In	➢ It will flash when CG detect any input, mains or generator.
Charge	➢ It will flash when CG is in float charging. ➢ It will illuminate when CG is in bulk or absorption charging.
Warning	➢ It will flash when CG have warning.
Fault	➢ It will flash when CG have error.

2.2.3 Remote control and monitor MCK

Apart from above control panel, the user is also allowed to monitor, control and configure CG by a remote controller MCK. The MCK could be installed at a location with convenient access to user to monitor and operate CG.

Figure 2-3 Remote control and monitor MCK

More details of MCK about operation, installation and connection, please refers to the a dedicated user manual which is attached in the box of MCK.

2.2.4 Connection compartment

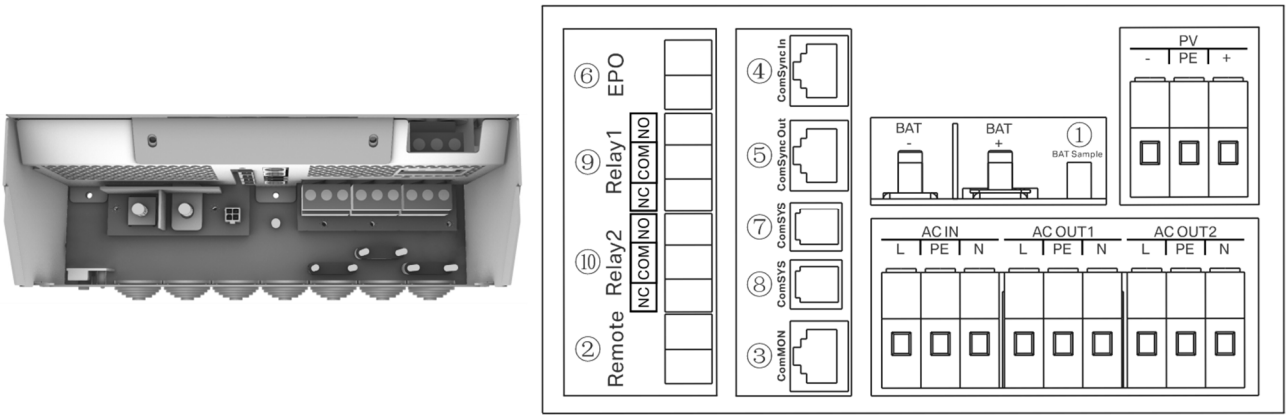
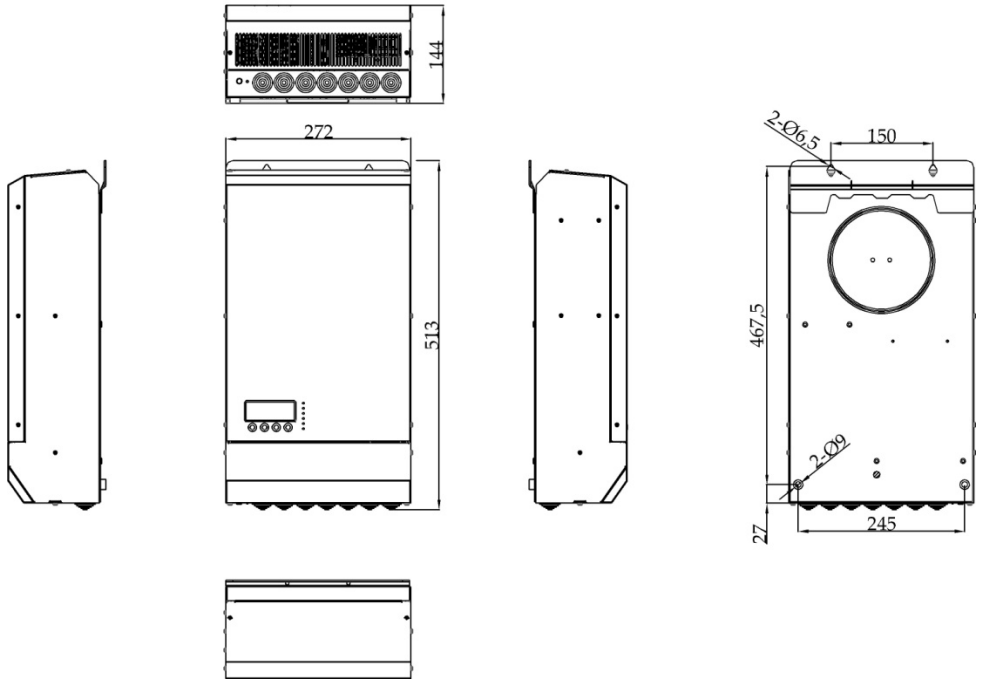


Figure 2-4 Signal terminal

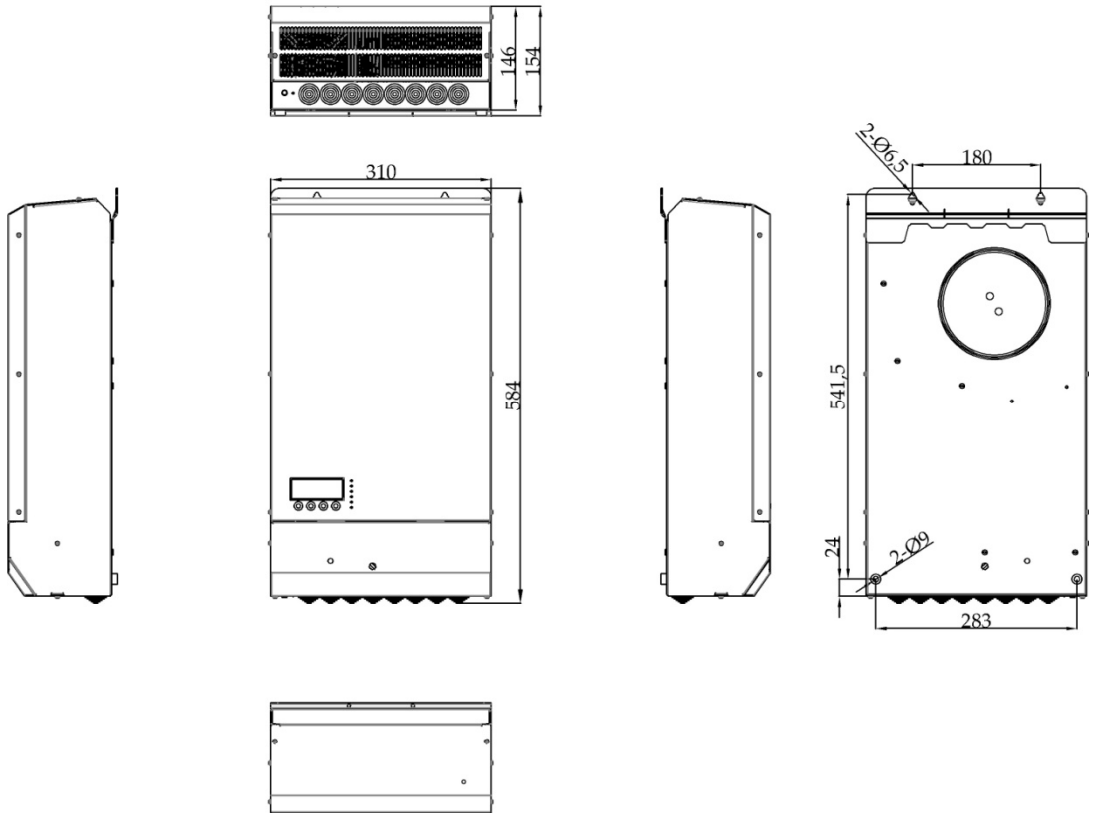
Table 2-3 Signal terminal introduction

No.	Silk-screen	Definition
①	BAT Sample	Battery temperature and voltage sample.
②	Remote	Dry contact input control, remote ON/OFF control.
③	ComMON	RS485 port for external monitor such as MCK, SNMP etc.
④	ComSync In	Parallel synchronous communication input(CAN) .
⑤	ComSync Out	Parallel synchronous communication output(CAN) .
⑥	EPO	Dry contact input control, emergency power off.
⑦	ComSYS	System communication(RS485), connected to SP or BGK.
⑧	ComSYS	System communication(RS485), connected to SP or BGK.
⑨	Relay1 (NO,C,NC)	Dry contact output control 1(NO,C,NC) .
⑩	Relay2 (NO,C,NC)	Dry contact output control 2(NO,C,NC) .

2.2.5 Dimension



CG3.0M, CG3.0S



CG5.0S

Figure 2-5 Dimension of All in one inverter

2.3 Function

2.3.1 Power control and Power assist

The CG Series All in one inverter offers a unique feature of power control & power assist, which is very useful upon you have a limited grid supply or working with generator. CG Series will take control of energy flow automatically, using extra power to charge the battery or inverting as the supplement to the grid or generator. With this feature, you can avoid tripping of shore power MCB or using a generator with too large a power capacity.

2.3.2 Automatic energy distribution function

The CG Series All in one inverter has a built-in automatic energy distribution module, which can automatically adjust the charging power according to the load size when connected to the campsite grid power of 16A, avoiding causing the campsite vacant to trip. As long as the total load of the appliances in the caravan does not exceed 16A, users can use it with no worries.

2.3.3 Powerful and Reliable Inverter

High performance pure sine wave

CG series is a pure sine wave inverter generating a near perfect sinusoidal AC wave power output that is very similar or even better to what you can get from your utility grid. Pure sine wave can guarantee the correct function of sensitive equipment (computer, laser printer, TV etc.). Also, your home appliances will work smoother, cooler and more efficient, such as fridge, microwave and power tools.

High surge power capability

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

High efficiency

Industry-leading 95% efficiency and 14W static power consumption to ensure maximum use of energy from expensive battery investments.

Battery low voltage protect

CG series provides configurable battery low voltage protection.

2.3.4 Built in BMS pre-defined LFP charging and communication

According to cell temperature and real time SOC, BMS will send command to battery charger asking for optimum charging voltage and current. This synchronization will prevent overheating or overcharging especially at the end of charging, to ensure the lithium battery reaches its target cycle life.

In the meantime, instead of using voltage as protection, SOC value is used with more accuracy thus to avoid permanently dead of lithium battery due to left discharged for long time.

2.3.5 Professional Battery Charger for lead acid battery

Multi stage sophisticated charging algorithm

Microprocessor controlled charging algorithm with temperature compensation is designed to charge battery quickly and fully and extend battery life.

Battery temperature compensation

Battery temperature is a key factor in correct charging. The BTS (Battery Temperature Sensor) supplied with CG measures the temperature of battery and automatically makes adjustments at real time to properly charge your batteries at the default compensation rate of – 4mv/°C/cell.

Battery capacity selection

You can set the corresponding battery capacity (Ah) according to the battery capacity configured in the equipment through the TBB Link or MCK control panel. The charger will automatically adjust the charging current (I=0.15C) to charge the battery pack.

Cycle charging

When the battery is left floating for a long period of time, a cycle charging procedure is initiated every 10 days.

2.3.6 Protect function

The CG seriesAll in one inverter 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 trigger on, it will restart automatically after 60s. And after three consecutive overload shutdown protections, the equipment will not restart automatically. At this time, the user needs to manually restart.

Over temperature protection

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

Short circuit protection

The equipment will automatically shut down when the AC output is shorted and needs to be manually activated.

Battery over temperature protection

During the charging, the equipment will continuously monitor the battery temperature. When the battery temperature is too high, the equipment will automatically reduce the charging current. When the battery is severely heated, the charger will automatically turn off to protect the battery.

Battery low voltage protection

To prevent the permanent damage caused by the over discharge of battery, the equipment will automatically cut off the output according to the low voltage protection point set by the user.

2.3.7 Communication

Dry contact input

CG series is equipped with a dry contact input for remote on/off.

Dry contact output

CG Series All in one inverter is equipped with two NO/NC relay type dry contact output, the user can set specific functions through the LCD.

RS485

Equipped with a RS485 interface.

3. Installation and Wiring

Please refer to "Quick Installation Guide".

Keep away from fire, avoid direct sunlight and rain; do not store flammable, explosive or corrosive gases or liquids in the working environment. Don't install in a working environment with metal conductive dust

- Please install the equipment in a location of dry, clean, cool with good ventilation.
- Operating temperature: -20～65℃
- Storage temperature: -40～70℃
- Cooling: Force fan
- Relative humidity in operation: 95% without condensation.

3.1 Preparation for installation

After unpacking, please make sure that the equipment has not been damaged during the transportation and that all accessories are available.

This series contains the following components: main unit of CG series All in one inverter, user manual and certificate of conformity.

When installing the equipment, it should be transported to the installation site before removing the outer packaging. At this time, you should check that the various equipment and materials are correct according to the list in this manual, and keep the various spare parts and accessories for subsequent installation and upgrade of the equipment or for maintenance purposes.

Please select the AC cable and DC cable by yourself and make the connection terminal. To ensure electrical safety, please refer to the following table for cable selection:

Table 3-1 Reference table for cable selection

Model	AC Cable	Battery-side DC Cable	PV-side DC Cable
CG3.0S	6-10mm² Max. current 32A	25-50mm²（OT terminal usingø8） Max. current 75A	4-10mm² Max. current 15A
CG5.0S	10mm² Max. current 32A	35-50mm²（OT terminal usingø8） Max. current 125A	6-10mm² Max. current 30A

3.2 Installation tools

Multimeter, Tool kit, User manual, Cable, Pneumatic drill.

3.3 Inverter installation

Please determine the installation space and mounting holes for the main unit according to Figure 2-4, leaving enough space of 300mm or more around the equipment upon installation to guarantee a good ventilation.

3.4 Power cable connection

Before installation, please reconfirm that the voltage of the battery pack matches the DC input voltage of the installed inverter. If the DC input voltage does not match, no warranty will be given for damage to the inverter.

Please reconfirm that the polarity of the DC input is correct, reversing the polarity will damage the inverter. No warranty will be given for this kind of damage.

Please reconfirm that the AC input and output cables are connected correctly, otherwise the inverter may be damaged. No warranty will be given for this kind of damage.

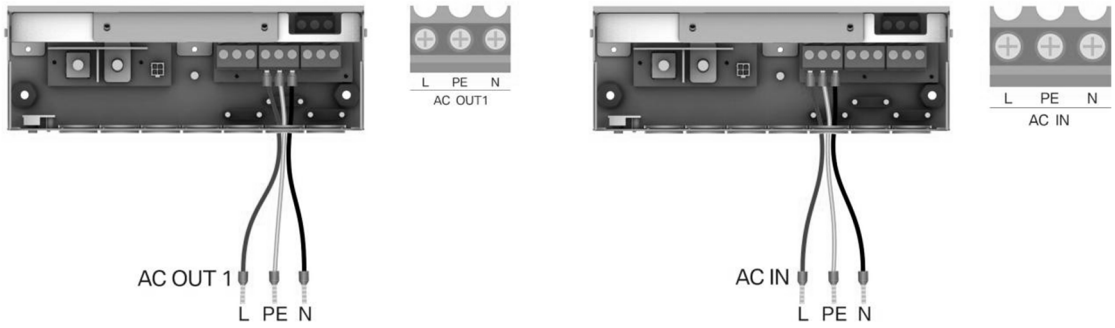


Figure 3-1 CG series AC terminal wiring diagram

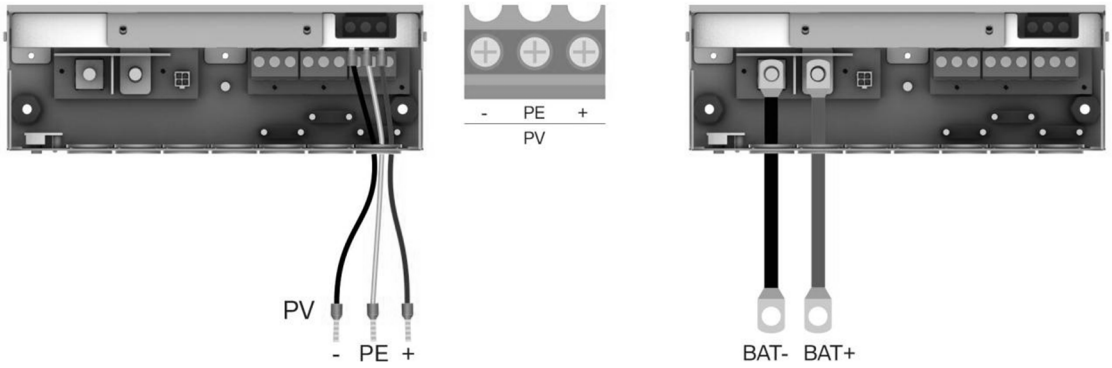


Figure 3-2 CG series DC terminal wiring diagram

4. Operation

4.1 Check before Operation

Please check before Operation according to the following.

- Inverter is installed correctly and steady.
- Reasonable cable layout to meet customer requirements.
- Make sure the grounding is reliable.
- Make sure the ground wire is properly connected and firm and reliable.
- Double check the battery breaker is OFF.
- Make sure the cables are properly connected and firm and reliable.
- Reasonable installation space, clean and tidy environment, no construction residue.

4.2 Power ON Test

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

Please follow the following instruction step by step.

- Step 1: Turn on the circuit breaker between the battery and the inverter.
- Step 2: Turn on the external control switch of the inverter (the external control switch should be connected to Remote interface and set to Mobile mode). Then the inverter enters the inverter state. You can confirm the inverter is in normal inverter state by the indicator light.
- Step 3: Set the parameters through the TBB Interface communication module and the TBB Link upper computer.

4.3 Power OFF

After the inverter is power OFF, there is still residual power and heat in the chassis, which may lead to electric shock or burn.

- Turn off the inverter external control switch (the external control switch should be connected to Remote interface and set to Mobile mode). Then the inverter is in standby mode. After 3 minutes the inverter is switched off automatically. You can confirm the inverter is switched off by the power indicator.
- Turn off the circuit breaker between the battery and the inverter.

5. Configuration

5.1 Default Setting

Table 5-1 CG series factory settings

System	Rate AC Voltage	230VAC
	Rate AC Frequency	50Hz
Battery	Battery Type	M4850 (TBB SUPER-L)
	SOC low warning	20%
AC Input	Power Assist Cur	Maximum AC input current corresponding to the model

5.2 Configuration

5.2.1 TBB Interface

The TBB Interface is a RS485 to USB communication module developed by TBB.

Connect the inverter to the computer requires a TBB Interface, which goes between the ComMON port on the inverter, and a USB port on the computer. Equipped with TBB Link, users can read the operating information and set the parameters of the CG series.

Figure 5-1 TBB Interface

5.2.2 TBB Link

The TBBLink is a powerful tool or CG series inverter configuration. The TBBLink can be installed on the computer, open the TBBLink and turn on the inverter, the inverter can be configured.

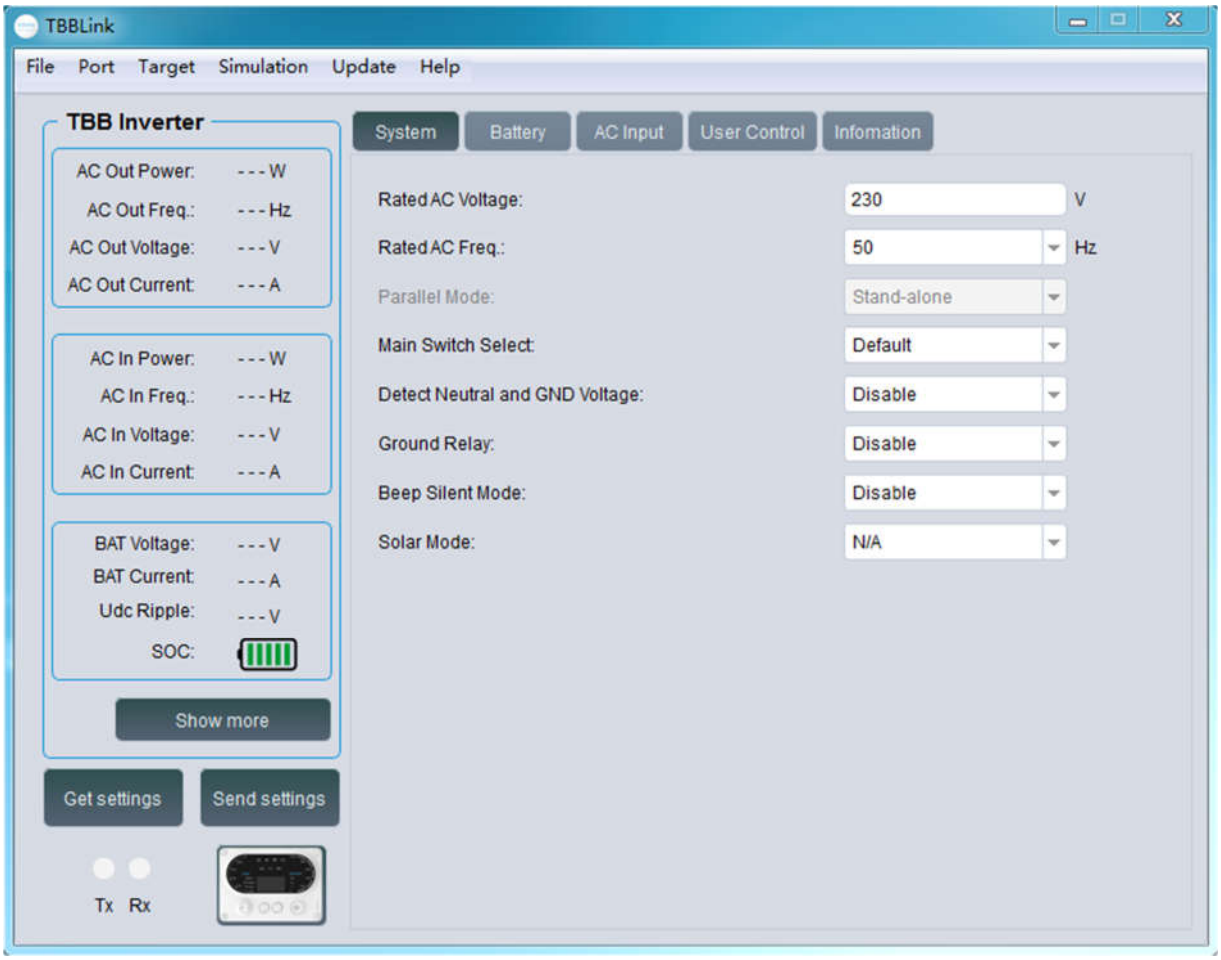


Figure 5-2 TBBLink

6. Specification

Model	CG3.0S	CG5.0S
Power Assist	Yes	
AC inputs	Input voltage range:175~265 VAC, Input frequency:45~65Hz	
AC input Current	32A (transfer switch)	50A (transfer switch)
Inverter		
Nominal battery voltage	48VDC	
Input voltage range	42~68VDC	
Output	Voltage: 220/230/240 VAC ± 2%, Frequency: 50/60 Hz ± 0.1%	
Harmonic distortion	<2%	
Power factor	1.0	
Cont. output power at 25°C	3000W	5000W
Peak power	6000W	10000W
Cont. output power at 40°C	2200W	3700W
Maximum efficiency	95%	96%
Zero load power	14W	20W
Charger		
Charge voltage 'absorption'	57.6VDC	
Charge voltage 'float'	55.2VDC	
Battery types	AGM / GEL / OPzV / Lead-Carbon / Li-ion / Flooded / Traction TBB SUPER-L(48V series)	
Battery Charge current	40A	70A
Temperature compensation	Yes	
Solar Charger Controller		
Max output current	30A	60A
Maximum PV power	2000W	4000W
PV open circuit voltage	150V	
MPPT voltage range	65V~145V	
General data		
AC Out1 Current	32A	50A
AC Out2 Current	32A	
Transfer time	<2ms(<15ms when Weak Grid Mode)	
Remote on-off	Yes	
Programmable relay	2x	
Protection	a) output short circuit, b) overload, c) battery voltage over voltage d) battery voltage under voltage, e)over temperature, f) Fan block g) input voltage out of range, h) input voltage ripple too high	
CAN Bus communication port	For parallel and three phase operation, remote monitoring and system integration	
General purpose com. Port	RS485 (GPRS,WLAN optional)	
Operating temperature range	-20 to +65˚C	
Storage temperature range	-40 to +70˚C	
Relative humidity in operation	95% without condensation	
Altitude	2000m	
Mechanical Data		
Dimension	513*272*144mm	584*310*154mm
Net Weight	20kg	31kg
Cooling	Forced fan	
Protection index	IP21	
Standards		
Safety	EN-IEC 62477-1, EN-IEC 62109-1, EN-IEC 62109-2	
EMC	EN61000-6-1,EN61000-6-2,EN61000-6-3,EN61000-3-11,EN61000-3-12 ECE R10.05	

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