


**Please read the manual before installation*


Professional ON-Grid Brake Inverter Manual



TGWGI-1.5K/2.0K

Grid Tie Inverter for Small Wind



 Notes :

- Thank you very much for purchasing our brake inverter, please read the user manual carefully before installation and use the product and keep it with due care.
- The installation must be done by experienced technicians .The process must be strictly in accordance with the user manual to ensure that the product can work properly.
- Inverter should avoid long-term corrosive gas and moist environment. Do not put this product in wet, rain, exposure, severe dust, shock, corrosion and strong electromagnetic interference environment.
- Do not open the inverter to repair it by yourself.



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1 .About this manual



This chapter explains symbols, signal words and abbreviations possibly used in this manual.

1.1 Illustration of General Notices

Beside warnings general notices are used in this manual to emphasize information.

These notices are labeled by the following symbols.

Symbols for General Notices

Symbol	Description
	General hint
	Tip for background information

2 . General Information

Read this manual carefully and pay attention to the safety instructions embodied.

This manual describes the feed-in inverter TGWGI-1.5K/2K developed our company. This device is used for grid-connected operation of small wind turbines (WT), which means the energy generated by the WT is supplied to the connected grid. Therefore the TGWGI-1.5K/2K converts the speed dependent AC/DC voltage of the WT into a grid- compatible AC voltage. For this process grid voltage is necessary. In the event of a mains power failure or when the WT generates more energy than the TGWGI-1.5K/2K can feed to the grid, the integrated intelligent electronic break system will automatically trigger, inverter will auto rest after a while when gust wind passes, and system will start to generate electricity again.

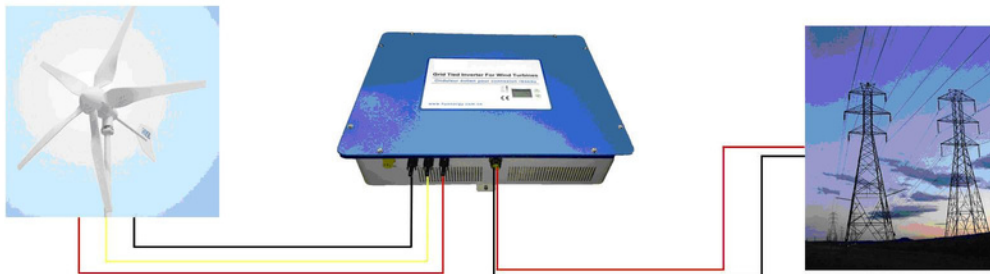


Fig. 1: Principle block diagram of TGWG between small wind turbine and grid

The TGWGI-1.5K/2K accommodates the components rectifier and inverter in a compact housing.

The TGWGI-1.5K/2K display integrated in the front panel of the device displays the different measured variables. Thus you can check the performance of the small wind turbine. The data logger stores the values for later use. The operating mode of the device is indicated by the LED status display.

The TGWGI-1.5K/2K meets the applying European regulations and standards.

Among others the device complies with the BDEW guideline for the connection and parallel operation of generators in the public low-voltage grid of the distribution network operators (DNO). This includes the regulations for mains monitoring according to DIN V VDE V 0126-1-1 (automatic disconnection device between a generator and the public low-voltage grid). You can look up other country configurations and standards in the Internet.

Country-specific and plant-specific settings are secured by password and must be set by the plant manufacturer of the WT.



2.1 Scope of Supply and Additional Equipment

The following articles are included in the scope of supply when you purchase the TGWGI:

- < Wall mount with suitable bolts and fixings
- < User Manual

3 . Safety Instructions

These safety instructions must be kept.

3.1 General Safety Instructions

- Before installation, please read all instructions in this manual.
- It is performed only by qualified personnel.
- All electrical installation shall be done in accordance with local and national electrical codes.
- Connecting to the grid must be done after receiving prior approval from the utility company.
- Before connecting, please shut down the generator output in order not to get electric shock, for the generator generate electricity in the wind.

All Information and advice attached to the device, such as safety instructions or danger warnings and technical data (type plate) are:

- not to be removed
- not to be damaged
- to be kept readably (no covers, no paint over or the like)

3.2 Appropriate Use

The appropriate use involves:

- completely reading and following the content of the documentation and attend to the safety instructions and danger warnings comprised therein
- mounting and connecting the device according to the installation instructions by trained staff

Moreover we refer to the following guidelines:
regulations of the utility concerning the grid feed-in
instructions of the small wind turbine manufacturer

3.3 Galvanic Isolation

The TGWGI-1.5K/2K is constructed and designed to assure maximum safety during the installation and operation. The maximum possible degree of safety is being assured by the galvanic isolation of the input and the output. In addition the galvanic isolation allows parallel connection of several feed-in converters of the type TGWGI-1.5K/2K on the generator end.


3.4 Mains Monitoring

The device interrupts operation in case of line interferences, e.g. in the event of an AC power failure. The grid feed-in is stopped according to the country-specific standard (e.g. DIN V VDE V 0126-1-1). This way dangerous voltage in the AC conductors is avoided, when a mains failure occurs.

3.5 Storage, Transport and Setup

	NOTICE
	Storage and transport without original packaging When the device is stored or transported without the original packaging, this is to be considered as extraordinary burden and may cause property damage. Store the device in a dry, well ventilated room! Store and transport the device only in original packaging in compliance with class 2M1, according to DIN EN 60721-3-x: 1998-03.

The TGWGI-1.5K/2K is tested for mechanical shock, mechanical oscillation and its fatigue strength under oscillation stresses according to DIN VDE 50178: 1997 class 3M1.

	NOTICE
	Property damage due to loose setup Oscillation beyond the limiting value or application onto non-stationary equipment is to be considered extraordinary burden and can cause property damage. Mount the device shock-proof and free of oscillation to a wall according to the regulations for stationary appliances.

Environmental Conditions

Pay attention to the following notes to provide for a long service life and trouble-free operation:

- < Protect the device against mechanical damage!
- < Protect the device against dirt and humidity!
- < Protect the device against direct sunlight! Excessive solar radiation will impair the service ability of the device! The optimum ambient temperature is in the range of 10 - 20°C.
- < Take care that a sufficient amount of space is provided around the device.

When the operation/mounting place is outside the denoted area, this is to be considered not intended.

Precise information on the permissible ambient conditions are given in the technical data.

3.6 Maintenance

The TGWGI-1.5K/2K is designed for a minimum amount of maintenance.

We recommend checking the following functions at regular intervals in order to ensure a proper operation of the device:

- < Check on a regular basis, preferably weekly, whether the device operates properly. This should be done at different wind conditions. You can recognize the proper operation by means of the displayed operating modes. Serious errors are displayed by the red LED.
- < Pollution of the heat sink can restrict the heat dissipation. Check the heat sink for dirt on a regular basis and clean it with a paintbrush, a soft brush or compressed air.
- < Clean the display and the LED display with a moist cloth when it is dirty. Do not use harsh cleaning agents (e.g. abrasive), solvent or acid substances!

3.7 Disposal

The TGWGI-1.5K/2K fulfills the requirements covered in the Directive 2002/95/EC on the restriction of the use of hazardous substances in electrical and electronic equipment (RoHS Directive).



The TGWGI-1.5K/2K must not be disposed as part of domestic waste. According to the European Directive 2002/96/EC about old electrical and electronic equipment and the implementation into national law, exhausted electric equipment must be collected separately and recycled in an environmentally acceptable

way. Make sure that you can return the used device to the merchant. It may have potential effect on the environment and on your health, if you disregard the EC Directive!

3.8 Guarantee and Liability

The guarantee period is two years from the date of delivery (implied warranty). Guarantee claims are excluded:

- < when the device has been employed beyond its intended use in terms of section 3.2 "Appropriate Use", P.9
- < when the device has been mounted non-standard or improperly, especially by electricians without license
- < when the device has been employed although the protection equipment was defective
- < when the maximum permissible input voltage has been exceeded
- < through improper operation
- < when the device or its equipment have been modified
- < when the device was affected by foreign material or force majeure

In addition to the implied warranty manufacturer offers a fee-based manufacturer's guarantee of five years from the date of purchase.



Exclusion of liability

The country-specific parameters of the grid must be set by the plant manufacturer of the WT according to the local grid parameters.

4 Description of the Device

4.1 Technical Data

Important technical data are also find on the type plate attached to the device.

Model	TGWGI-1.5K	TGWGI-2K
Matching wind turbine	1KW or 1.5KW	2KW
Brake		
Rated Current	32A	32A
Rated Voltage	Set according to user requirements.	
Power		
Rated output	1000W or 1500W	2000W
Peak output	1600W (adjusted)	2200W(adjusted)
DC voltage input		
Working voltage	40Vdc~450Vdc	
On-grid voltage	70Vdc~350Vdc	
Max. input current(dc)	8A	
AC output		
AC output voltage	220V/230V/240V(1 ψ 2W)	
Output frequency	50 Hz / 60Hz	
Output standard option	CE-EMC, CE-LVD, VDE0126-1-1	
Power factor	>0.99 @ full load	
Max. conversion efficiency	>95%	
Environment requirement		
Protection grade		
Ambient temperature	IP20	
Physical features	-20°C~60°C	
Packing dimension		
Gross weight	670*540*250 mm	
Humidity	33kg	
	≤90%	

Output of a TGWGI-1.5K/2K(V1.0/V1.5)

The following figure indicates the relation between the generated DC voltage and the maximum output power.

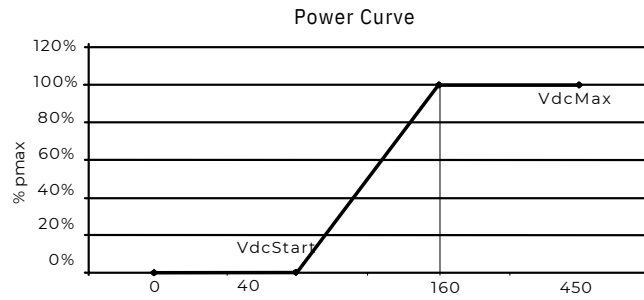


Fig. 2: Output curve

4.2 Device View and Type Plate

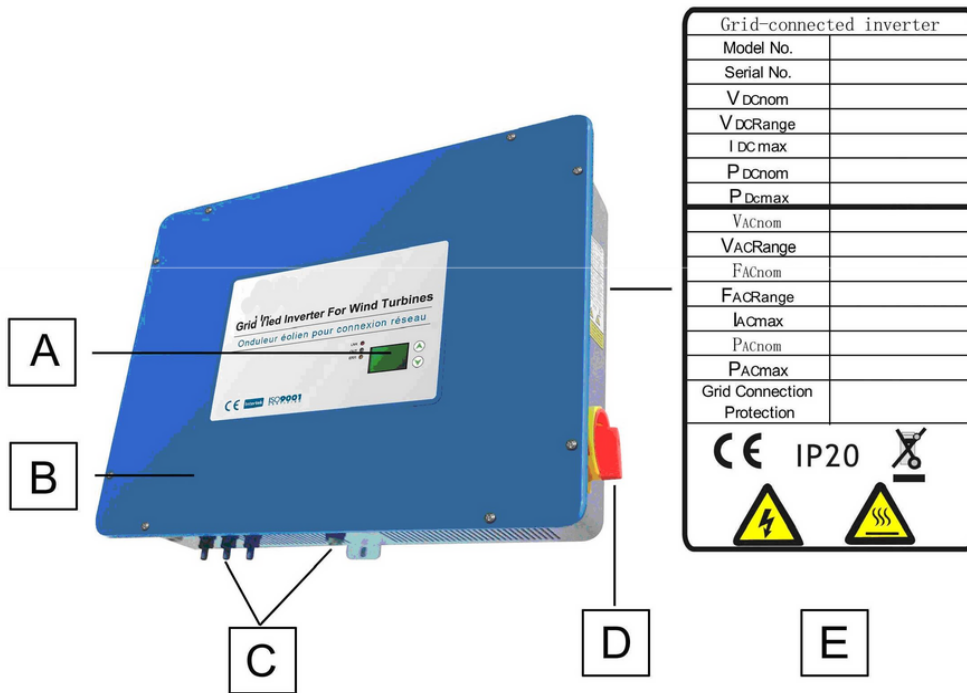


Fig. 3: TGWGI-1.5K./2K (V1.0/V1.5) (steel sheet housing) with type plate

- [A] Operating unit with graphic display, LEDs and push buttons
- [B] Steel sheet housing (IP Code: IP20)
- [C] Screwed cable glands
- [D] Manual brake
- [E] Type plate

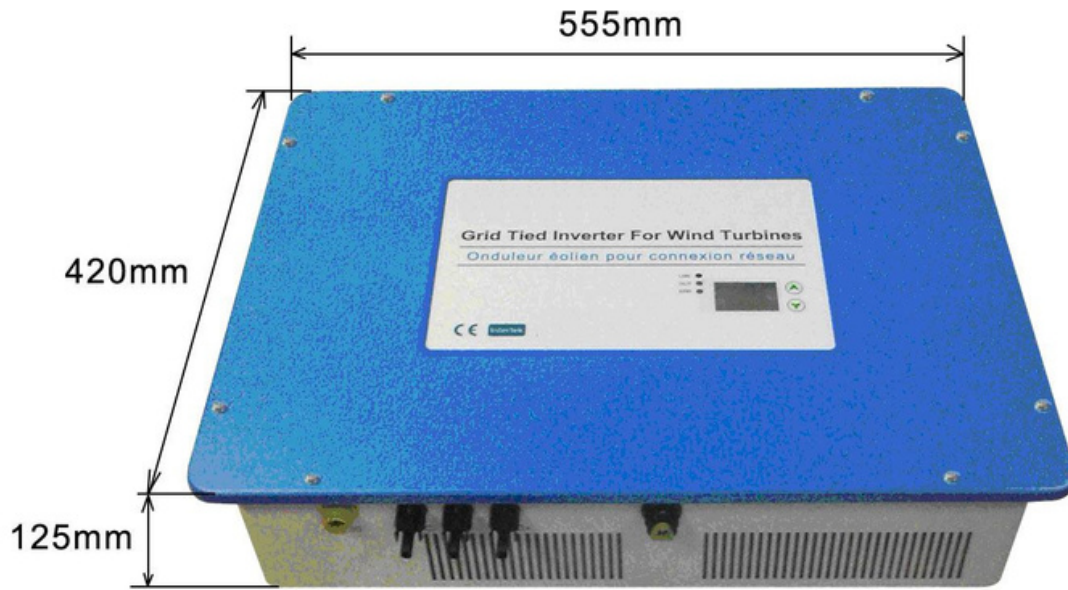


Fig. 4: Dimensions TGWGI-1.5K./2K (V1.0/V1.5) (steel sheet housing) in mm

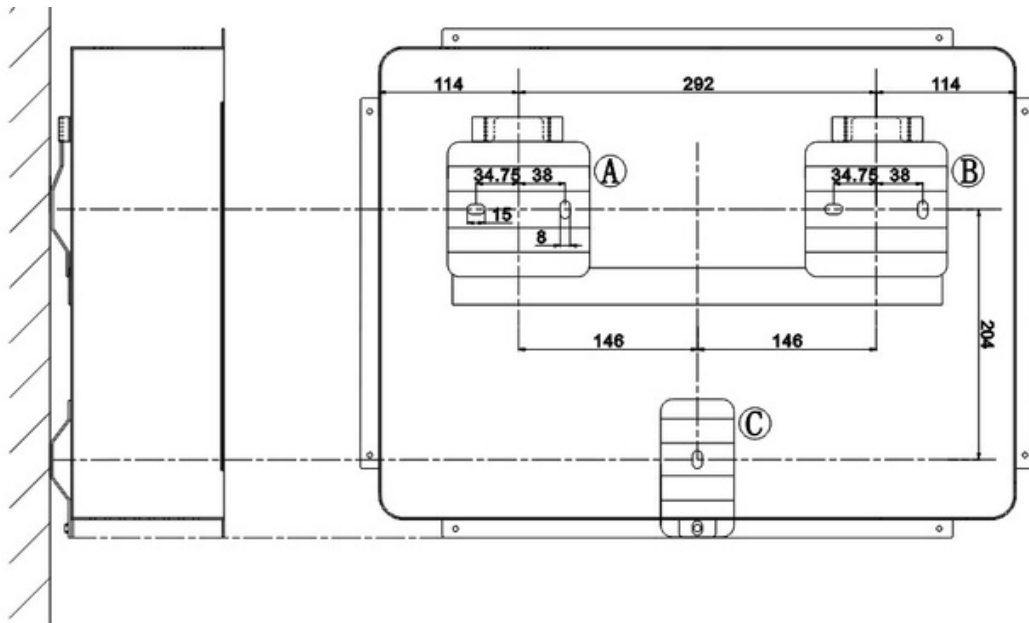


Fig. 5: Dimensions wall mount in mm


5 Installation

This chapter first describes the mounting of *TGWGI-1.5K/2K (V1.0/V1.5)* to the wall, followed by the electrical the connection.

5.1 Mounting the TGWGI-1.5K/2K (V1.0/V1.5)

The *TGWGI-1.5K/2K (V1.0/V1.5)* is mounted vertically to a weight-bearing wall using the wall mount provided. Please, consider the safety instructions and application advice and the technical data, when mounting the device.

A dry, dust-free room provides for ideal environmental conditions.

 Risk of fire due to hot surfaces

During operation individual device parts can reach a temperature of 60°C and may cause a fire. A fire can cause serious personal injury and property damage.

Make sure that there are no combustible materials near by the device.

5.1.1 Ventilation and Free Space

The *TGWGI-1.5K/2K (V1.0/V1.5)* isn't convection ventilated, an internal fan is necessary. A greater amount of space must be provided above the device, so it can be moved into the wall mount. Keep the spacing to other devices.

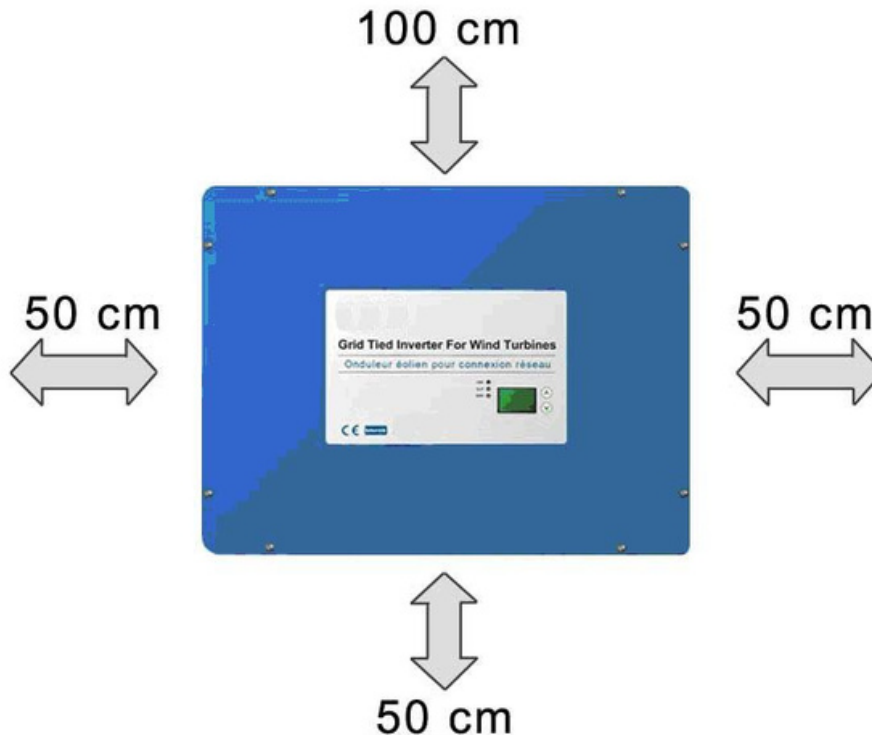


Fig. 6: Required space to other devices



When the circulation of air is restricted, the *TGWGI-1.5K/2K (V1.0/V1.5)* may overheat and switches off. Do not put anything onto the device and clean the fan.

5.1.2 Mounting Instructions

We recommend mounting the device to the wall vertically.

Pay attention that the device is not tilted to the front. The mounting angle should be 90°.

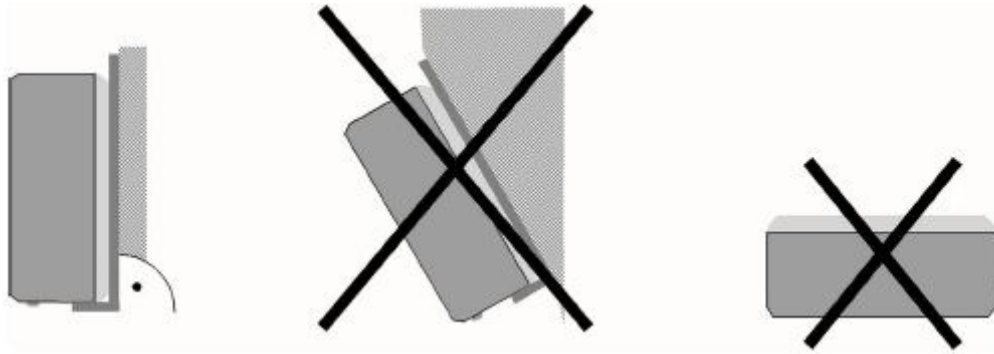


Fig. 7: Type of mounting and tilt angle

Use the wall mount provided with the devices to mount the TGWGI-1.5K/2K (V1.0/V1.5) simply and safely. Mount the device as follows:

- ◆ Select a mounting location for simple operation. The display should be at eye level of the operator.
- ◆ Fasten the wall mount to a vertical wall using the fixings and the hexagon head bolts supplied with the device.
- ◆ Make sure that the wall mount is tightened firmly.
- ◆ Place the TGWGI-1.5K/2K (V1.0/V1.5) on the edges of the angular mounting rails so that it is tilted to the front. Position the device so that the slide-in rails of the wall mount fit into the grooves of the TGWGI-1.5K/2K (V1.0/V1.5) on both sides.
- ◆ Tilt the TGWGI-1.5K/2K (V1.0/V1.5) to the rear then and move it vertically into the wall mount. The angular mounting rails interlock with the bent outer fins of the device to ensure secure hold.

5.2 Electrical Connection

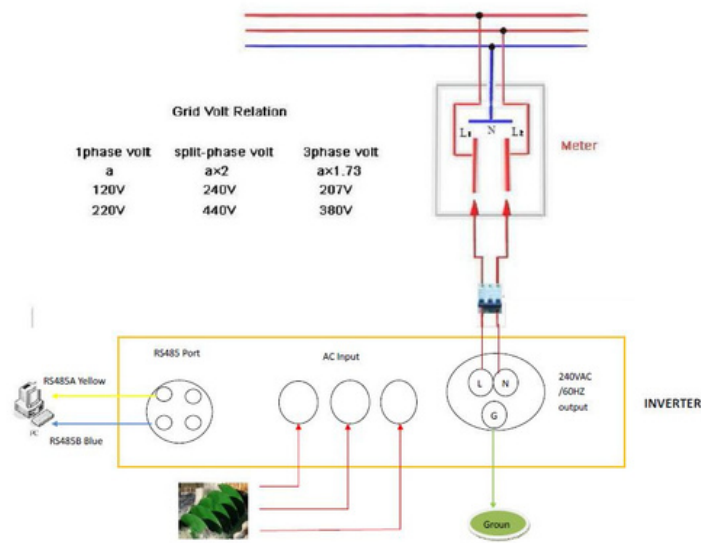


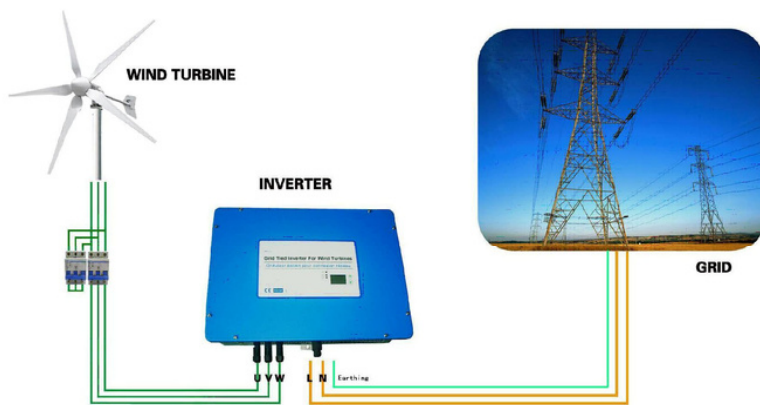
Fig. 8: Connection of TGWGI-1.5K/2K (V1.0/V1.5) to small wind turbine and public grid

□ Connection to The Grid

- TGWGI-1.5K/2K (V1.0/V1.5) is designed for the 230V single phase utility grid, whose voltage is between 196V~264V and frequency is between 47.5Hz~51.5Hz (Rerating according to VDE 0126-1-1/A1 :2011above 50.2Hz).
- Make sure that connecting wires can support over current.
- For safe installation and operation, the breaker is necessary, which should support over current and over voltage.
- Technical specification and standard should be in accordance with local power company code.

🚧 Input three phase AC connection

A Please make sure the wind turbine is stop during installation. To ensure the safety while installing the system, please switch the manual brake to ON status. Since the manual brake switch is ON, wind turbine can keep stop during your installation. During the operation in the future, when storm is coming, you can stop the turbine by turning on manual brake located right side down of the inverter. Please refer to following cable connection:



- B Three phase AC output wires from turbines connect to three phase input
- C ports. Please ensure connecting wires to be stable.

🚧 Output AC connection

- A Disconnect the breaker so as to ensure output AC ports without electricity.
- B AC output “L” connects to “L” of the single phase grid.
- C AC output “N” connects to “N” of the single phase grid.

- D The earthing wire connects to the earth.
- E Please ensure connecting wires to be stable.

Communication connection

When a PC is used to monitor one inverter or several inverters, RS485 bus is applied as communication method. There is a RS485/RS232 converter (optional) between PC and RS485 bus. Communication system diagrams are as below.

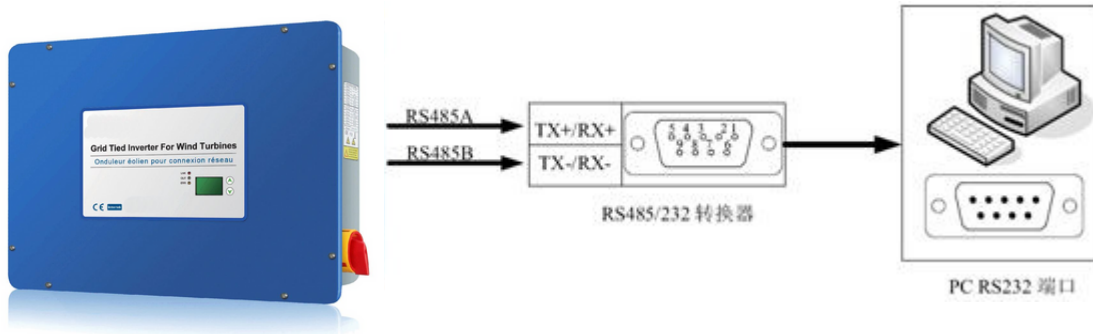


Fig. 9: Communication Connection of TGWGI-1.5K/2K (V1.0/V1.5) and RS485/RS232 converter (optional)



The TGWGI-1.5K/2K (V1.0/V1.5) is to be connected according to the figure. By means of the disconnecting points (2 breakers) the device is de-energized to ensure that you can work safely at the device and personal injuries are avoided in the event of an error.

5.2.1 Opening the Device



Opening the device will result in the loss of guarantee. .

6 Initial Operation

Take the following steps to put the TGWGI-1.5K/2K (V1.0/V1.5) into operation:

A According to installing process, connect the turbine, controller, inverter and grid.

B Before starting, ensure AC voltage to meet the start conditions.

C Switch-on the circuit breaker to connect the grid.

D Switch-off the manual brake.

E When all start conditions are met, the inverter will automatically start to generate power to the grid.

F In normal operation of inverter, it needs no people to control, as well as it will automatically restart after an error stop.

7 Operation at the Device



This chapter describes the different displays and settings you can attain via the operating unit of the device. You find a clearly arranged operating structure attached.

7.1 Operating Elements

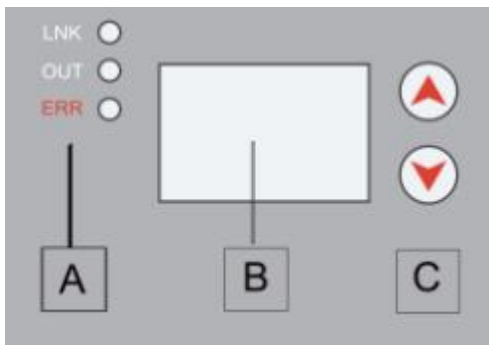





Fig. 11: Operating unit of the CTW-2KS

[A] LEDs
[B] Display
[C] Buttons

7.1.1 LED Status Display

			State
On	On	On	Processing of Initialization
Off	Off	Off	Standby state
Flash	Off	Off	Connecting to The Grid
On	Off	Off	Connected to The Grid
On	On	Off	Generating Power to The Grid
Off	Off	On	An Error Occurred
Off	Flash	On	Manual Stop State

7.1.2 Description of Buttons

Buttons	Using method	Function
▲	UP	①Up to another screen ②To increase the value
▼	Down	①Down to another screen ②Shift to the next edit position
▲▼	Both press for 0.5~1s Enter	Applying the current input or switch to the next screen Cancel the current input; screen is
▲▼	Both press for 1~2s Esc	set back to the previous one
▲▼	Both long press Esc	Switch to the main menu


7.2 Data Logger

The TGWGI-1.5K/2k features a data logger with real time clock that records the power of the wind turbine continuously. The following values are saved in the data logger: P_grid, P_heater, n_WT. The memory is equipped with a battery which makes sure that no data become lost during windless times.

Since the saved values are approximate values, the data logger must not be used as substitute for a kilowatt-hour meter.

7.3 Device Screens

In the following the different screens of the device are described.

You find a clear  arranged operating structure attached.

After initializing, it shows Offline (standby status).

System Status
Offline
10/06/06 12:18

When all connecting conditions are fulfilled, it shows Connecting.

System Status
Connecting?
10/06/06 12:18

When the turbine output power is low, it shows Low Wind.

System Status
Low Wind
10/06/06 12:18

After the inverter connected to the grid, it shows Online (connected status).

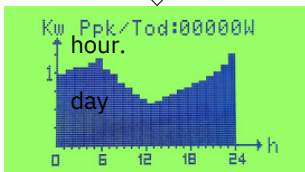
System Status
Online
10/06/06 12:30

7.3.1 Device Status

In any interface, click both more than 2s to enter value interface

POWER
0000
W

Click "⏪" to next page



Graph: peak power of every

Ppk/day : peak power of the

Click "⏪" to next page

U_AC: 230.2V

U_AC : AC output voltage

I_AC: 0.32AI_AC : AC output current

FREQ : Grid frequency

FREQ: 50.01HZ

Click "⏪" to next page

U_DC: 123.2V

U_DC : DC input voltage

I_DC: 0.71AI_DC : DC input current

E_TOL: Total energy

E_TOL: 1kwh

Click "⏪" to next page

E_MON: Energy of the

E_MON: 1kwhmonth

E_DAY: Energy of the

E_DAY: 1kwhday

System version:

Ver: 1.0.0/50Hzversion code and standard of the grid

7.3.2 Settings

The user can enter into the setting screens at any above screen by pressing both buttons “▲” “▼” quickly (for 0.5 ~ 1s) . There are two types of setting, user and system. The system setting is only operated by the qualified personnel and needs the password which can be reset.

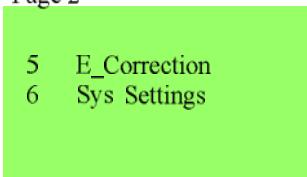
The user settings as follows:

Page 1

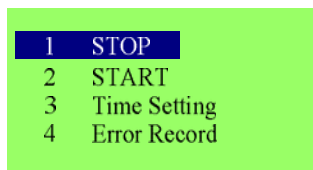


- 1 STOP: manual stop
- 2 START: manual start
- 3 Time Setting: set time
- 4 Error Record: inquiry error record
- 5 E_Correction: generated power value correct
- 6 Sys Settings: system advanced setting

Page 2

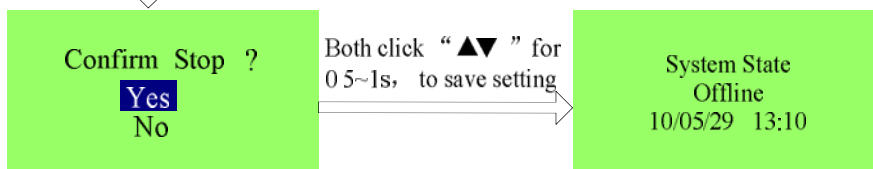


Manual stop:

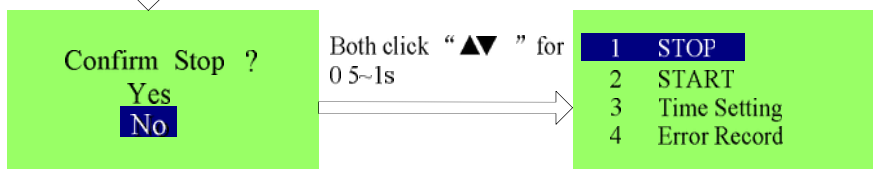


- 1 STOP: manual stop In a special situation, this function can disconnect the inverter from turbines and the grid

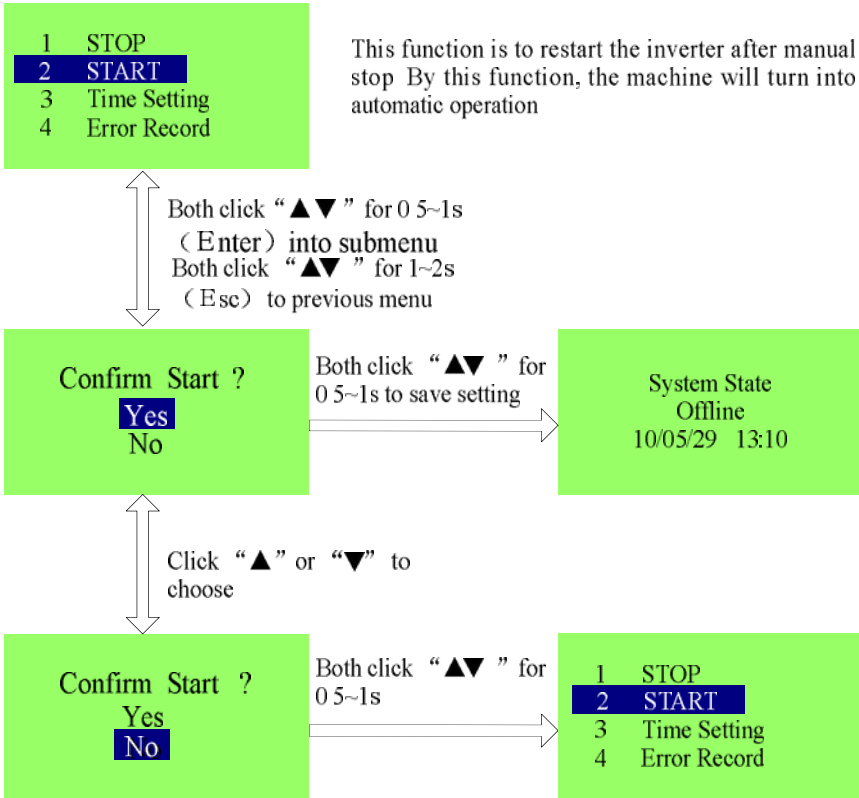
Both click “▲▼” for 0.5~1s
(Enter) into submenu
Both click “▲▼” for 1~2s
(Esc) to previous menu



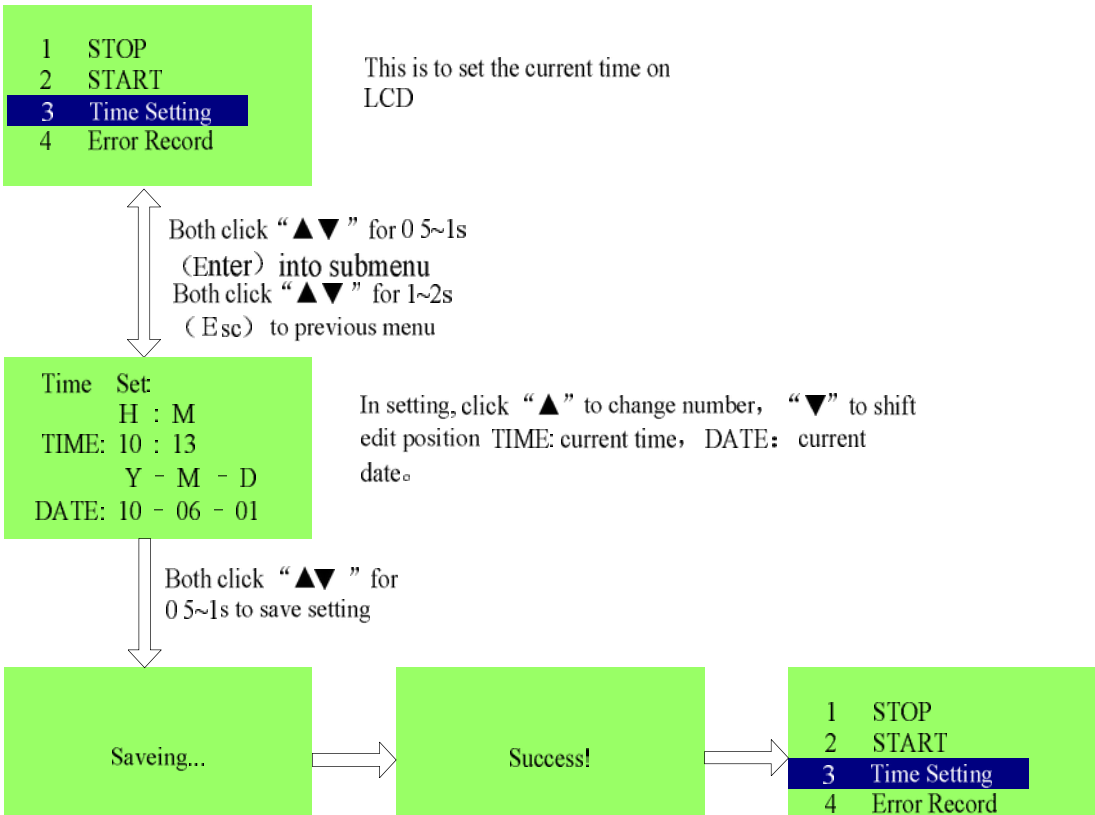
Click “▲” or “▼”, to choose



Manual start:



Time setting:



Error record:

1.STOP
 2. START
 3.Time Setting
 4. Error Record

To look over error records at most of 10 pics.

Click both "▲▼" for 0.5~1s (Enter) into submenu.
 Click both "▲▼" for 1~2s (Esc) to previous menu.

Err. Record 01
 Code : 07
 10/05/27 20:42

The first line is error No.
 The second line is error code. The third line is error time.

Balance values:

5 E_Correction
 6 Sys Settings

To balance values between display and actually generated

Both click "▲▼" for 0.5~1s (Enter) into submenu
 Both click "▲▼" for 1~2s (Esc) to previous menu

E Correction
 +010Kwh

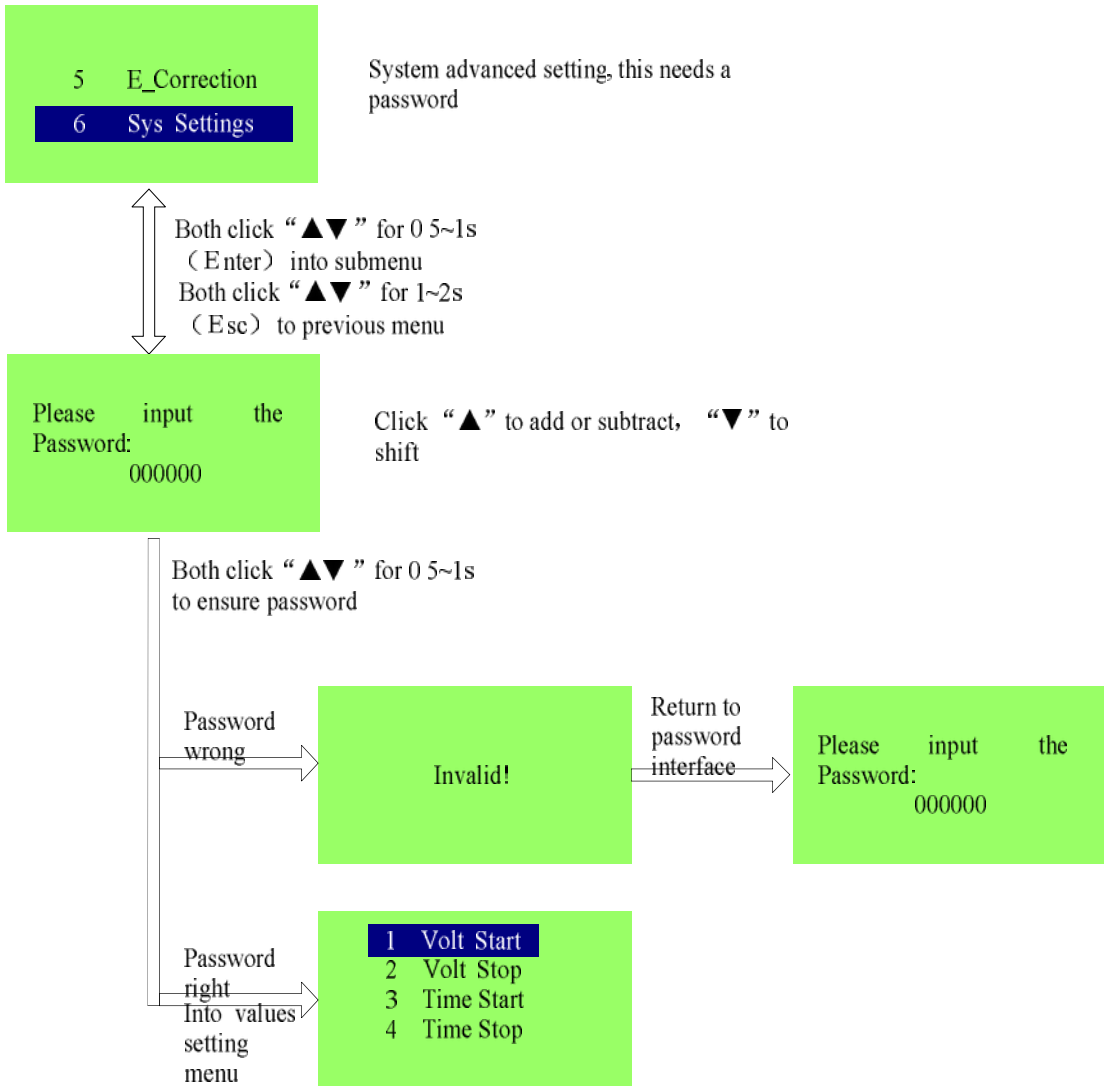
click "▲" to add or subtract number, "▼" to shift edit position

Both click "▲▼" for 0.5~1s (Enter) into submenu

U_DC: 1232V
 I_DC: 0.71A
 E_TOL: 102Kwh

U_DC : input DC voltage
 I_DC : input DC current
 E_TOL: total power generated

System advanced setting:



The system advanced settings as follows:

Page 1

- 1. Volt. Start
- 2. Volt. Stop
- 3. Time Start
- 4. Time Stop

- 1. Volt. Start: start voltage
- 2. Volt. Stop: stop voltage
- 3. Time Start: start time
- 4. Time Stop: stop time
- 5. SeNo. Setting: serial No
- 6. Comm. Setting: set communication
- 7. Curve Select: choose the curve NO
- 8. Curve. Setting: set Curve point
- 9. Power Factor: Set power factor
- 10. Grid STDS: choose the standards of the Grid

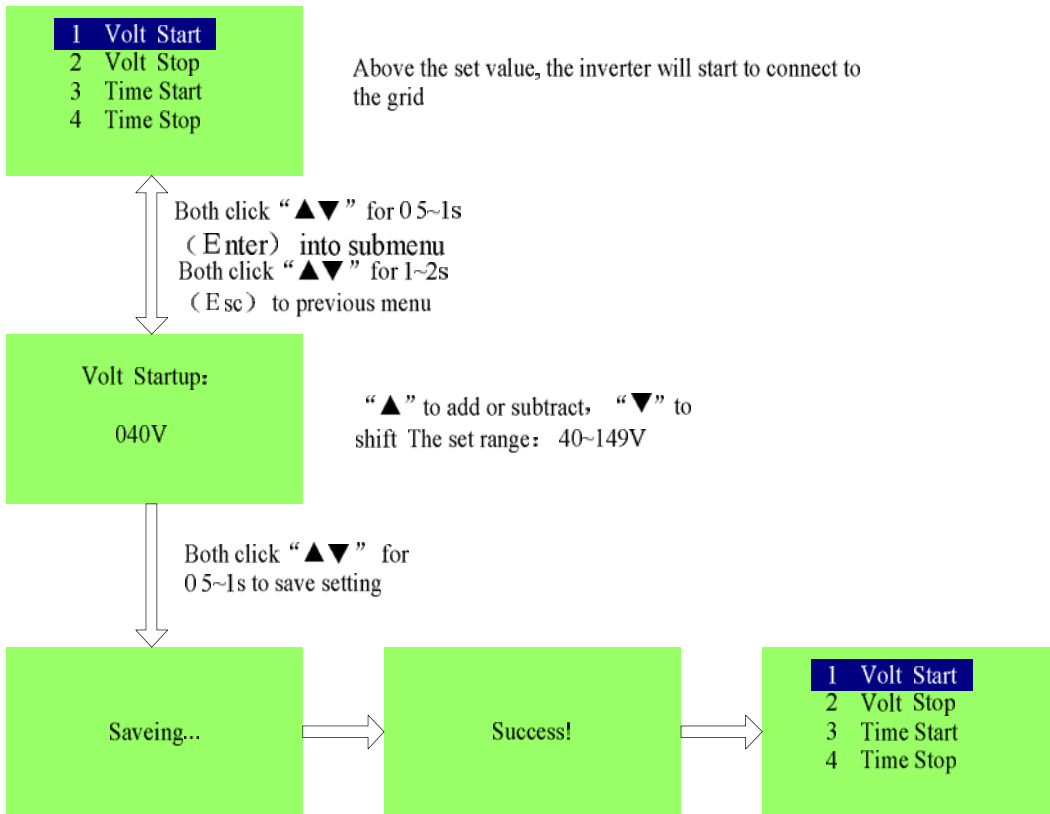
Page 2

- 5. SeNo. Setting
- 6. Comm. Setting
- 7. Curve. Select
- 8. Curve. Setting

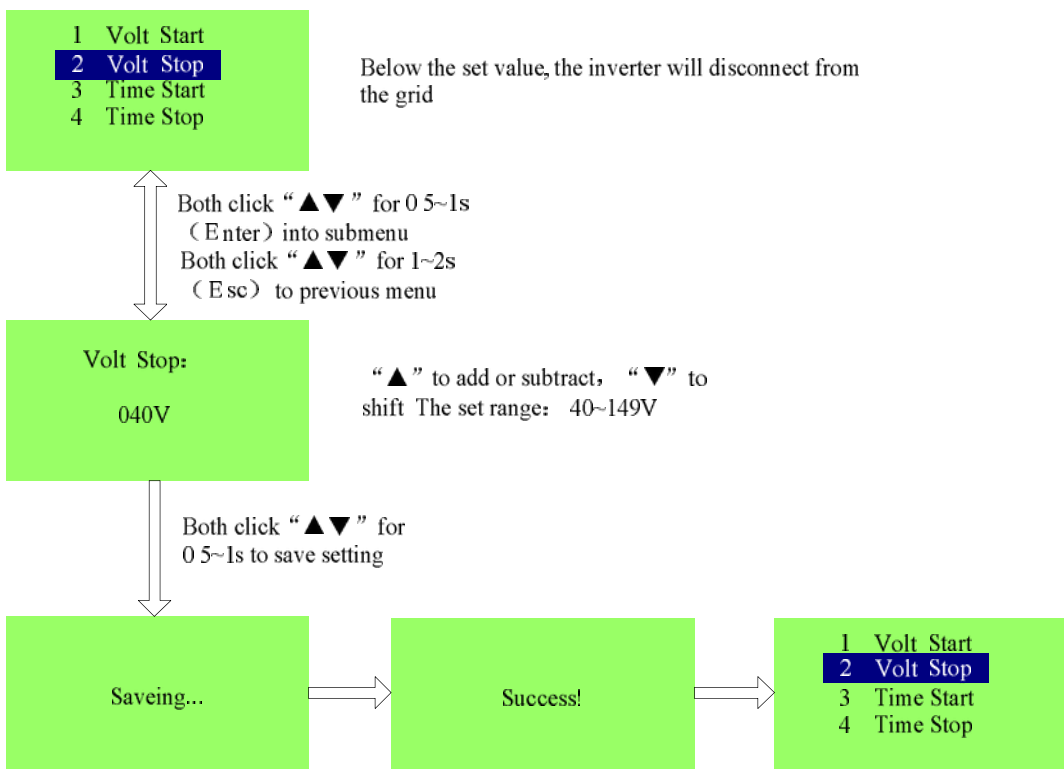
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- 9. Power Factor
- 10. Grid STDS

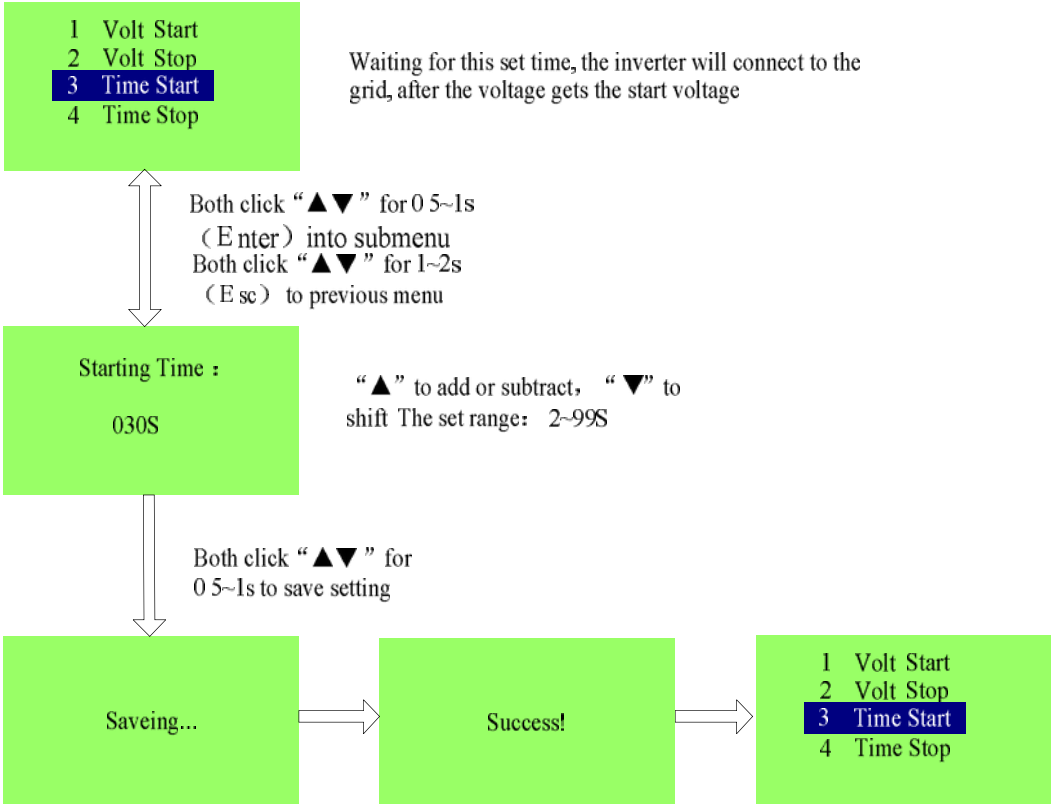
Start Voltage:



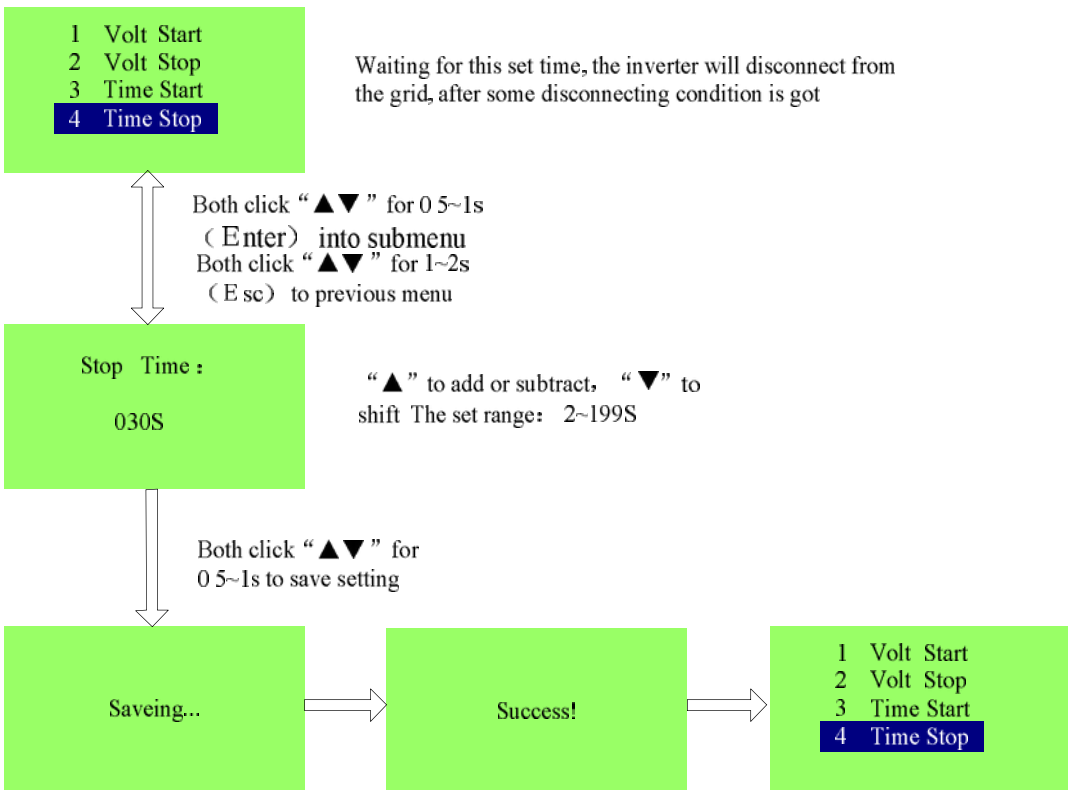
Stop Voltage:



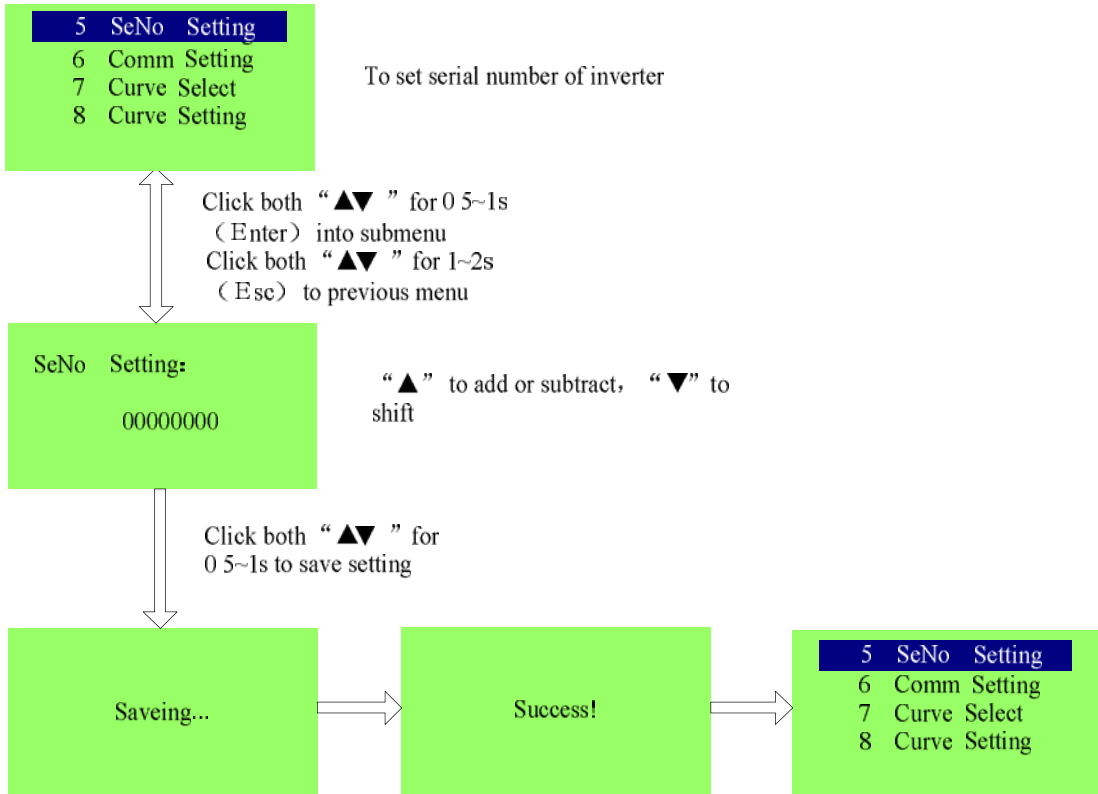
Start Time:



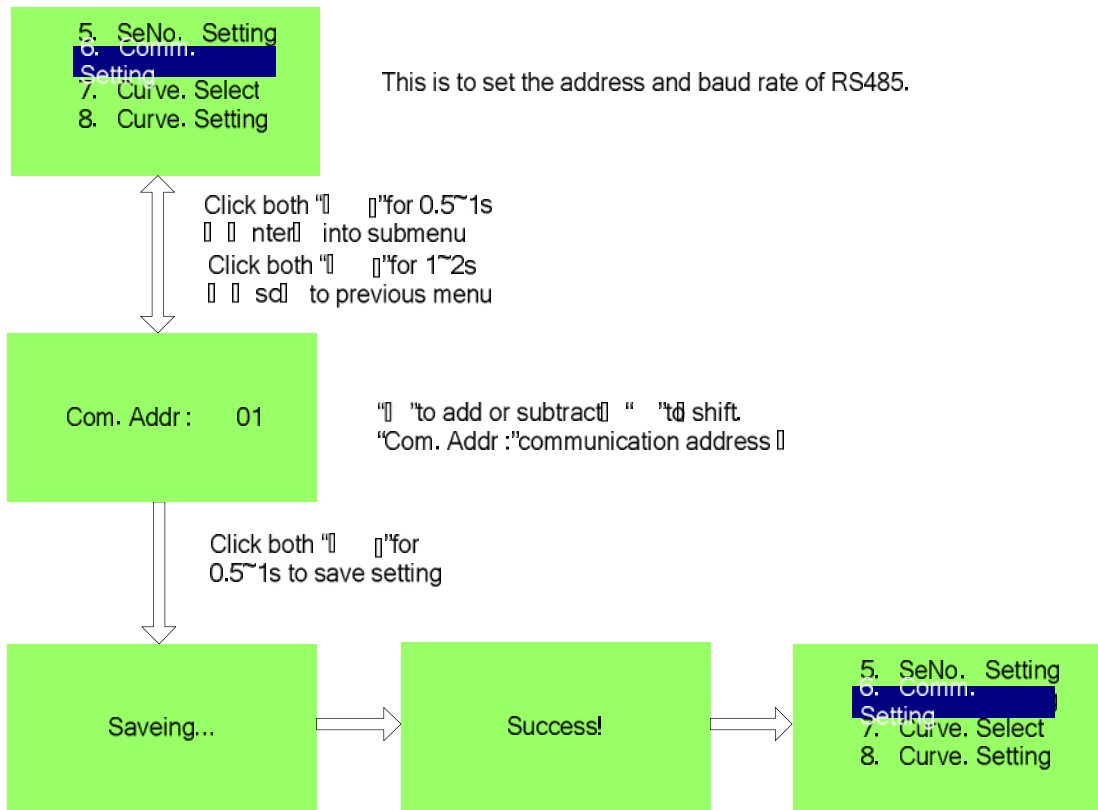
Stop Time:



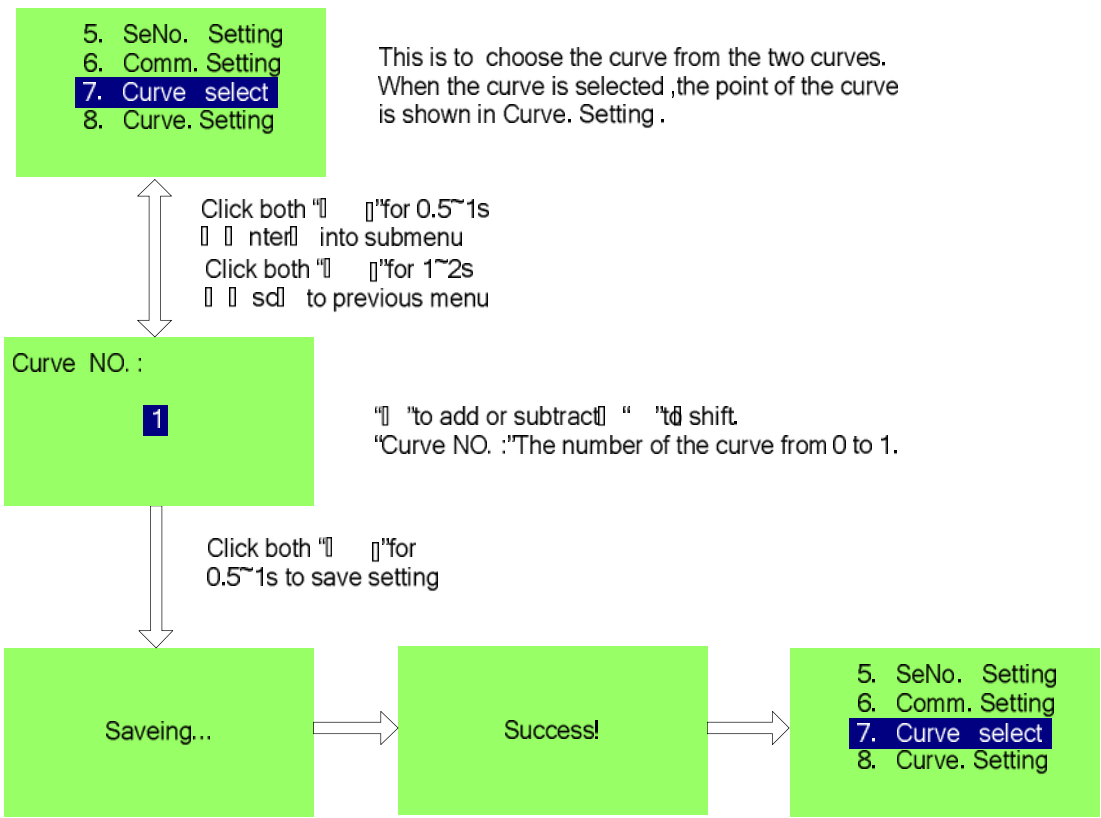
Serial No.:



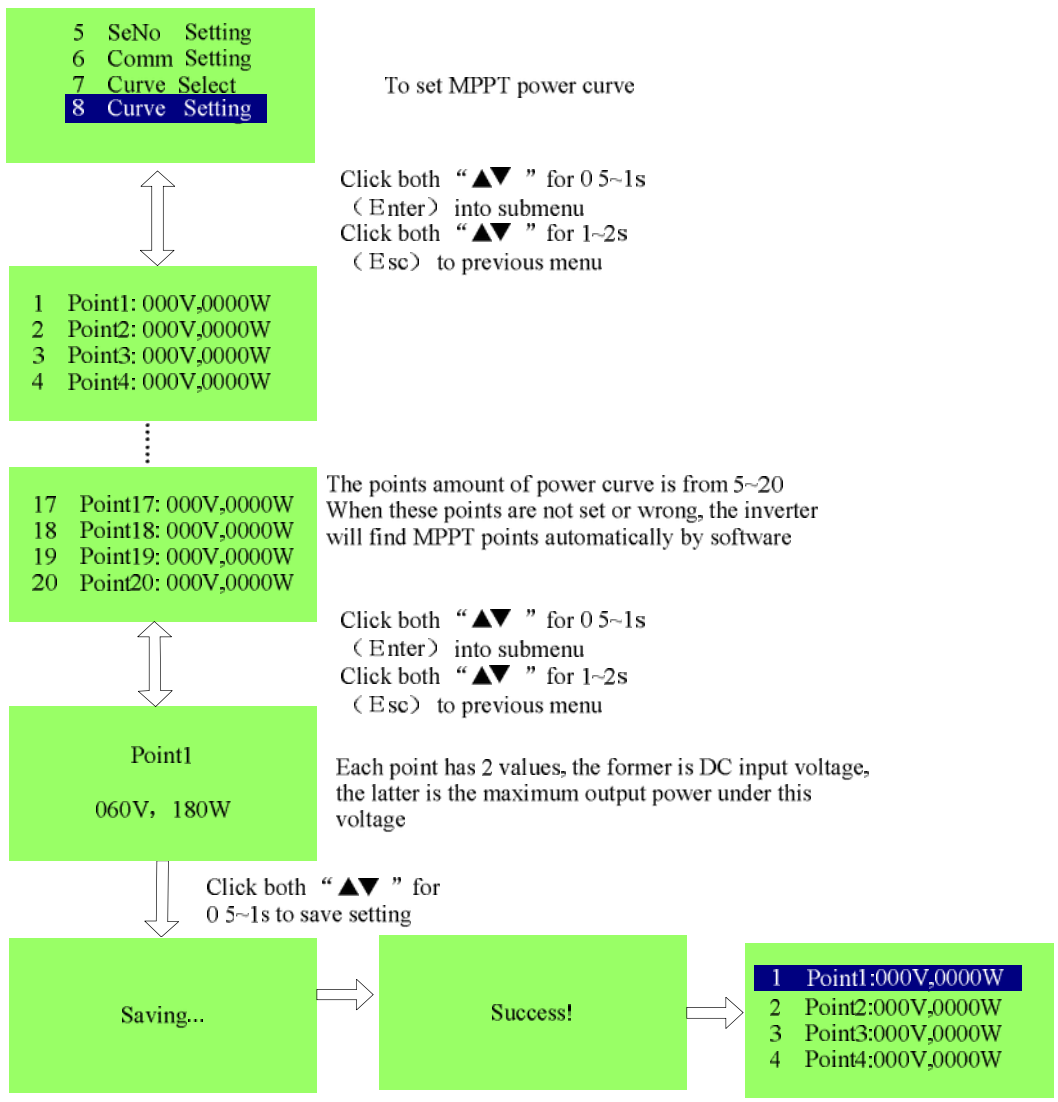
Communication Setting:



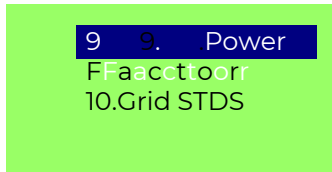
Curve select:



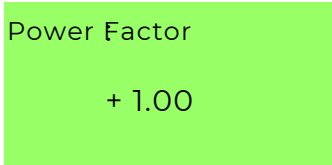
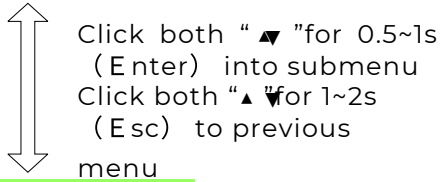
Curve Setting:



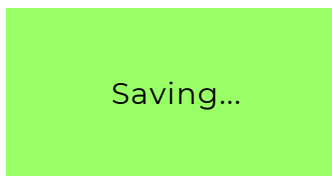
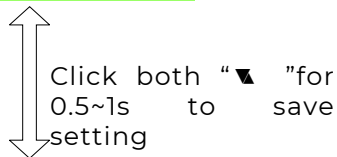
Power Factor



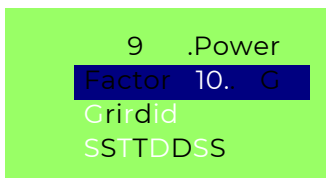
This is to set the power factor of the grid from -0.95 to +0.95.



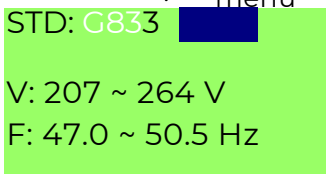
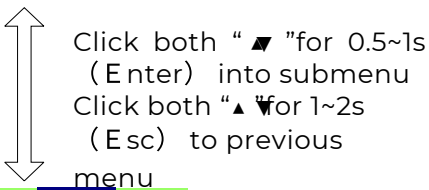
Click "▲" or "▼" to set power factor : -0.95 ~ +0.95



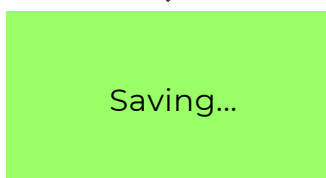
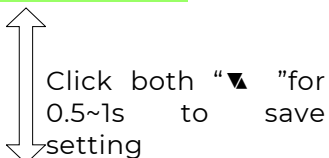
Grid STDS



This is to choose the standard of the grid .



Click "▲" or "▼" to choose the standards : VDE4105 , G83, VDE0126 , AS4777 , IEEE1547



7.3.3 Error Messages

When an error occurs, LCD will be into the error screen instantly:



In this interface, the time data indicates when an error happened, and the code number tells us which type the error is.

The code numbers indicate messages as the chart below:

Code Number	Messages
1	Over Input Voltage (>450VDC)
2	Over Bus Voltage (>450VDC)
3	Over Input Momentary DC (>40A)
4	Over Input Mean DC (>30A)
5	Over Output Momentary Current (>30A)
6	Over Output Mean Current (>22A)
7	Over Grid Frequency (>50.2HZ)
8	Under Grid Frequency (<47.5HZ)
9	Under Output Voltage (<196V)
10	Over Output Voltage (>253V)
11	IPM Error
12	Over Temperature
13	DSP Error
14	Communication Error

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