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1. NOTES ON THIS MANUAL

1.1 Scope of Validation

The main purpose of this User's Manual is to provide instructions and detailed procedures for installing, operating, maintaining, and troubleshooting the following Mac solar Grid Tie Solar Inverter:

- Macsol – TL1.5K
- Macsol – TL2K

Please keep this manual all time available in case of emergency.

All the illustrated pictures in this Manual concerning Mac solar Grid Tie Solar Inverter derive from the simulated model of Macsol-TL2K.



1.2 Symbols Used



DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

WARNING indicates a hazardous situation which, if not avoided, can result in death or serious injury or moderate injury.



CAUTION

CAUTION indicates a hazardous condition which, if not avoided, can result in minor or moderate injury.



NOTICE

NOTICE indicates a situation that can result in property damage, if not avoided.



1.3 Target Group

Chapter 1, 2, 3, 4, 7, 8, 9, 10 and Chapter 11 are intended for anyone who is intended to use Macsolar Grid Tie Solar Inverter. Before any further action, the operators must first read all safety regulations and be aware of the potential danger to operate high-voltage devices. Operators must also have a complete understanding of this device's features and functions.



WARNING

Do not use this product unless it has been successfully installed by qualified personnel in accordance with the instructions in Chapter 5, "Installation".

Chapter 5, and Chapter 6 are only for qualified personnel who is intended to install or uninstall the Macsolar Grid Tie Solar Inverter.



NOTICE

Hereby qualified personnel means he/she has the professional training, knowledge, and experience in:

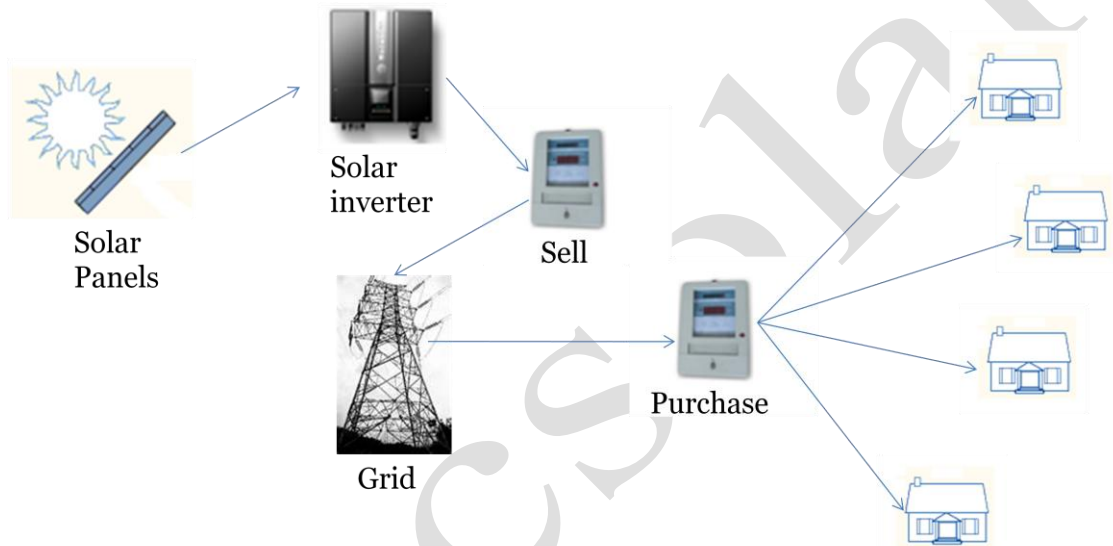
- Installing electrical equipment and PV power systems (up to 1000 V).
- Applying all applicable installation codes.
- Analyzing and reducing the hazards involved in performing electrical work.
- Selecting and using Personal Protective Equipment (PPE).

All installation, commissioning, maintenance, repair and recycling of Macsolar Inverter must be done only by qualified personnel.

2. PREPARATION

2.1 System Demonstration

Solar energy generation systems, based on photovoltaic modules, nowadays represent the most suitable solution, in particular for domestic power levels, to reduce the energy consumption produced by oil and gas. Moreover in different European countries, electricity companies are providing money incentives for the energy produced by renewable sources and injected into the utility grid.



The solar inverter is a critical component in a solar energy system. It performs the conversion of the variable DC output of the PV modules into a clean sinusoidal 50 or 60 Hz AC current that is then applied directly to the commercial electrical grid or to a local grid electrical network. Typically, communications capability is included so users can monitor the inverter and report on power and operating conditions, provide firmware updates and control the inverter grid connection. Depending on the grid infrastructure wired (RS-485, CAN, Power Line Communication, Ethernet) or wireless (Bluetooth, ZigBee/IEEE802.15.4, 6LoWPAN) networking options can be used.



2.2 Safety Instructions



DANGER

DANGER due to electrical shock and high voltage

DO NOT touch the operating component of the inverter, it might result in burning or death.

TO prevent risk of electric shock during installation and maintenance, please make sure that all AC and DC terminals are plugged out.

DO NOT touch the surface of the inverter while the housing is wet, it might lead to electrical shock.

DO NOT stay close to the instruments while there are severe weather conditions including storm, lighting, and etc.



WARNING

The installation, service, recycling and disposal of the inverters must be performed by qualified personnel only in compliance with national and local standards and regulations. Please contact your dealer to get the information of authorized repair facility for any maintenance or repairmen.

Any unauthorized actions including modification of product functionality of any form will affect the validation of warranty service, Macsolar may deny the obligation of warranty service accordingly.



CAUTION

The PV inverter will become hot during operation, please don't touch the heat sink or peripheral surface during or shortly after operation.

Risk of damage due to improper modifications.

Never modify or manipulate the inverter or other components of the system.







NOTICE

Public utility only

The PV inverter designed to feed AC power directly to the public utility power grid, do not connect AC output of the device to any private AC equipment.



2.3 Explanations of Symbols on Inverter

Symbol	Description
	Dangerous electrical voltage This device is directly connected to public grid, thus all work to the inverter shall only be carried out by qualified personnel.
	DANGER to life due to high electrical voltage! There might be residual currents in inverter because of large capacitors. Wait 10 MINUTES before you remove the front lid.
	NOTICE, danger! This device directly connected with electricity generators and public grid.
	Danger of hot surface The components inside the inverter will release a log of heat during operation, DO NOT touch aluminum housing during operating.
	An error has occurred Please go to Chapter 9 “Trouble Shooting” to remedy the error.
	This device SHALL NOT be disposed of in residential waste Please go to Chapter 8 “Recycling and Disposal” for proper treatments.
	Without Transformer This inverter does not use transformer for the isolation function.
	CE Mark Equipment with the CE mark fulfils the basic requirements of the Guideline Governing Low-Voltage and Electromagnetic Compatibility.
	No unauthorized perforations or modifications Any unauthorized perforations or modifications are strictly forbidden, if any defect or damage (device/person) is occurred, Mac solar shall not take any responsibility for it.

3.PRODUCT INFORMATION

3.1 Overview

Industrial Layout



Reduced Heat Sink





3.2 Major Characteristics

MacSolar inverter has following characteristics which make MacSolar inverter “High Efficiency, High Reliability, High Cost Effective Ratio”

- High DC input voltage, can be connected with more PV panels.
- Wide MPPT voltage range can fit in different locations or various weather conditions.
- High MPP tracking accuracy, catch most of electricity from panels and converts it into money in your pocket.
- Complete set of protection methods.

Also, following protection methods are integrated in MacSolar inverter:

- Internal overvoltage
- DC insulation monitoring
- Ground fault protection
- Grid monitoring
- Ground fault current monitoring
- DC current Injection monitoring

3.3 Datasheet

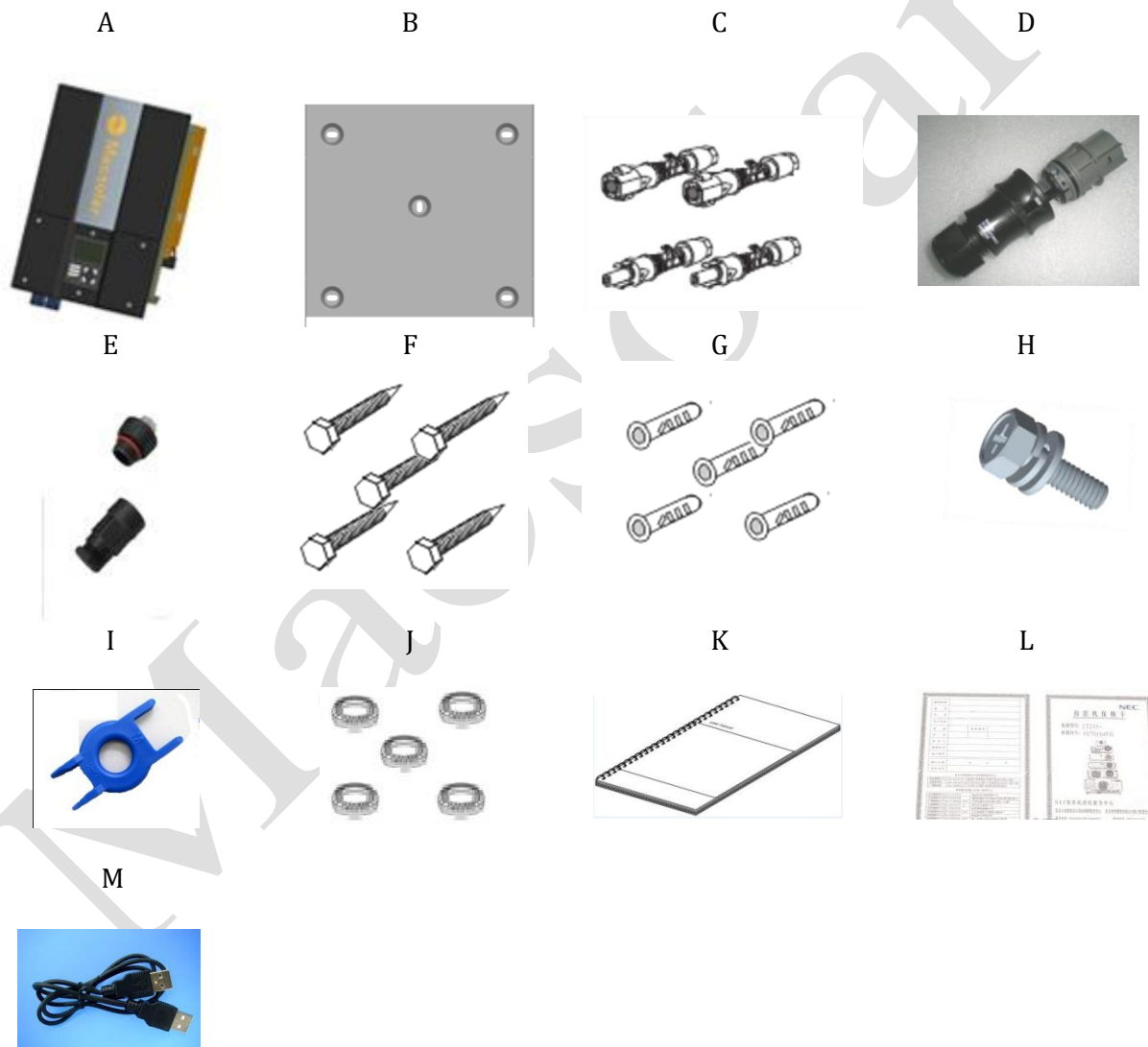
Type	Macsol-TL1.5K	Macsol-TL2K
Input (DC)		
Max. DC Power [W]	1800	2400
Max. DC Voltage [V]	480	
Rated DC Voltage [V]	360	
PV-Voltage Range, MPPT [V]	125-480	
Max. Input Current [A]	12	12
Number of DC Connection Sets	1	2
Number of MPP Trackers	1	1
Output (AC)		
Rated AC Power [W]	1500	2000
Max. AC Power [W]	1650	2200
Rated AC Current [A]	6.5	8.7
Max. AC Current [A]	8.5	11.0
Grid Voltage/Frequency Range	According to AS4777,VDE 0126-1-1, RD1663,ENEL Guide 2010, C10/C11 ,G83	
Power Factor(cos φ)	>0.99(full load)	
AC Current Distortion (THD)	<3%	
Consumption at Night [W]	0	
Efficiency		
Max. Efficiency	97.2%	97.2%
Euro Efficiency (at 360Vdc)	96.6%	96.6%
MPPT Accuracy	99.5%	99.5%
Protection		
Internal Overvoltage Protection	Integrated	
DC Insulation Monitoring	Integrated	
DC/AC Side Varistors	Integrated	
DC Current Injection Monitoring	Integrated	
Ground Fault Current Monitoring	Integrated	
Grid Monitoring	Integrated	
Short Current Protection	Integrated	
Thermal Protection	Integrated	
Interface		
DC Connection	Amphenol Helios 4	
LCD Display	3.5 Inches, 256x160 Pixels, Backlight	
Display Language	Multi Language	
Datalogger & Communication	USB, RS485-COM1, RS485-COM2(Optional), ETHERNET(Optional)	
Devide Data		
Isolation	Transformerless	
Operating Temperature Range	-20° C to +60° C	
Cooling Method	Natural Convection	
Ambient Humidity	0% to 98% Non-condensing	
Noise Emission (dBA)	<40	
IP Protection	IP65	
Dimensions (WxHxD) [mm]	495 × 346 × 163	
Weight [kg]	13.5	
Standard Warranty (Year)	5 / 10 (Optional)	
Safety Class Compliance	AS3100, IEC62109	
EMC Compliance	EN61000-6-2,EN61000-6-3, EN61000-3-2,EN61000-3-3,EN61000-3-11,EN61000-3-12	
Grid Protection Compliance	According to AS4777,VDE 0126-1-1, RD1663,ENEL Guide 2010, C10/C11 ,G83	



4. UNPACKING

4.1 Assembly parts

After you receive the Macsolar inverter, please check if there is any damage on the carton. Also, please check the inside completeness and for any visible external damage on the inverter or any accessories. Contact your dealer if anything is damaged or missing.



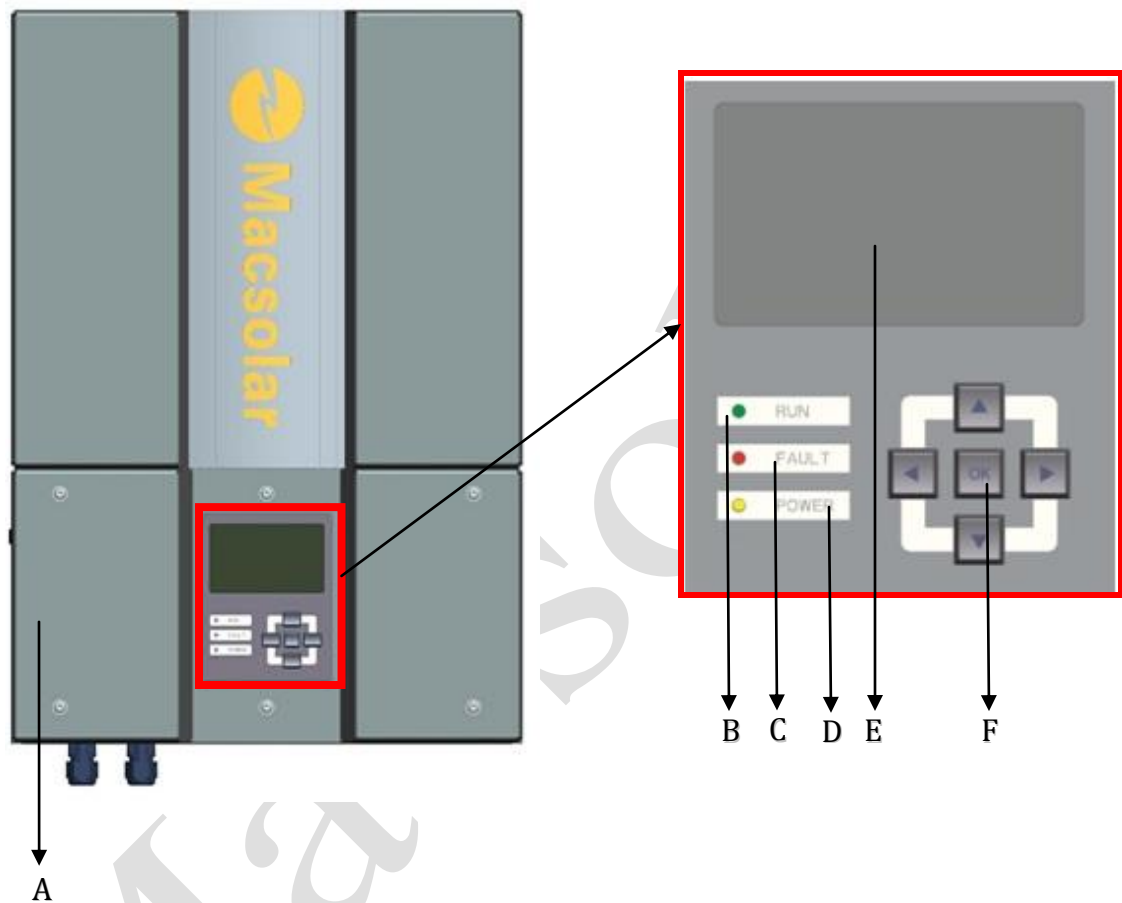


Object	Part No.	Quantity	Description
A(customized)	40005000020	1	Inverter Macsol-TL1.5K
A1(customized)	40005000010	1	Inverter Macsol-TL2K
B	212000015	1	Rear panel
C	20605000030	2 sets for 2k or 1 set for 1.5k	DC connector
D	206020002	1	AC connector
E	206030004	1	RJ45 connector
F	20400000030	5	ST6×50 Expansion screw
G	21000000010	5	Expansion tube
H	20410000030	1	M6×12 cross recessed pan head screw and washer connecting the rear panel with inverter
I	206000001	1	Ring tool to disconnect DC connector
J	204090001	5	Washer Φ 6
K	22000000052	1	Installation guide, including user manual
L	21901000050	1	Quality certificate card
M	20603000020	1	USB connection cable (Male-Male)



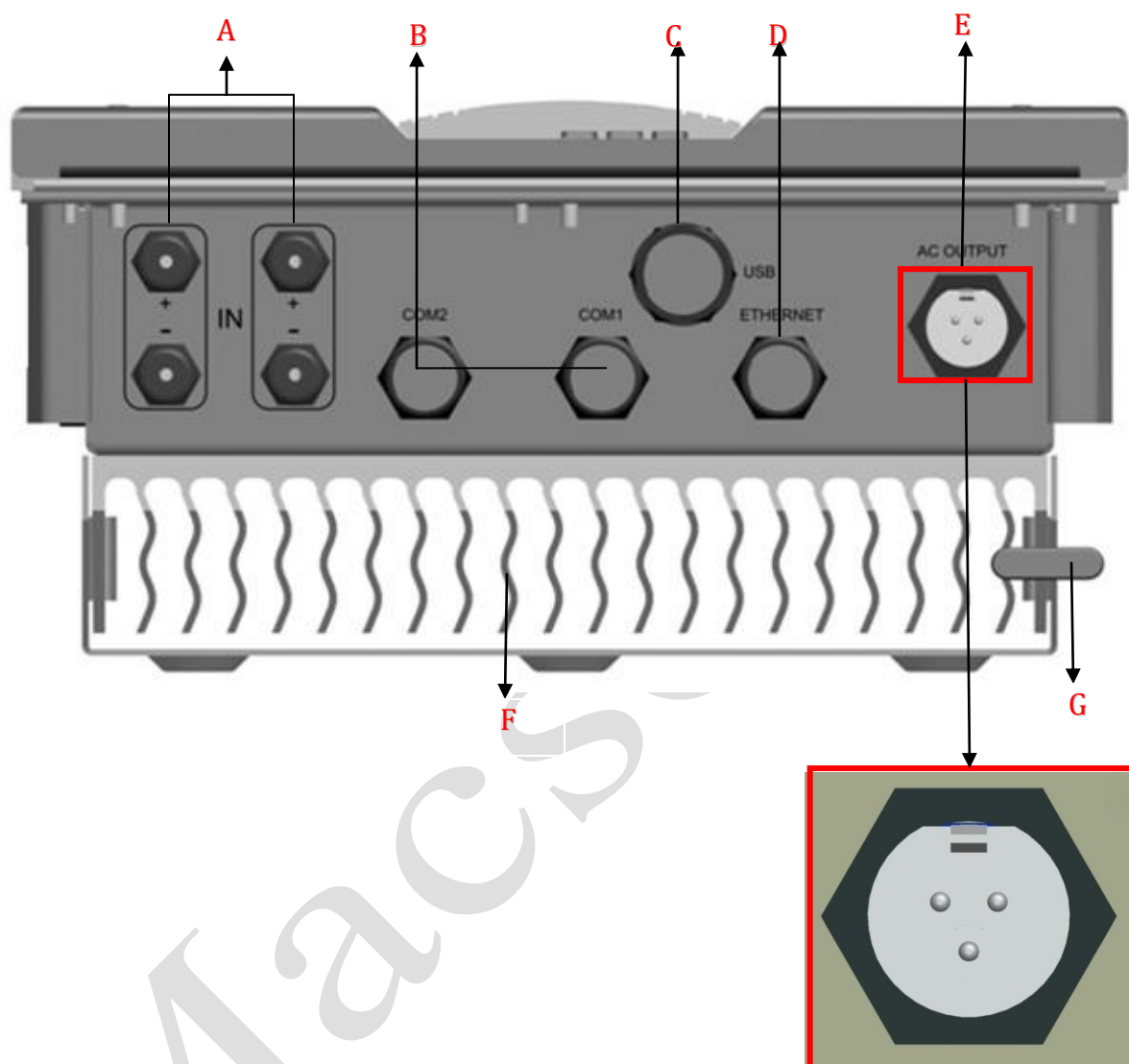
4.2 Product Appearance

Front:



Object	Description
A	Removable front lid for potential maintenance and repair
B	LED light – RUN
C	LED light – FAULT
D	LED light – POWER
E	LCD screen for checking the operating status and configuration
F	Control keyboard for displays and configuration of parameters

Bottom:




Object	Description
A	DC input (1 set for Macsol-TL1.5K and 2 sets for Macsol-TL2K)
B	Plugs for connecting the RS485 communication module. Among them COM1 must be equipped, but COM2 is optional equipped (Customized)
C	USB plug for connecting the inverter to a PC directly via USB connection
D	Plug for connecting the Ethernet , communication module (Optional, not Must)
E	AC output
F	Heat sink
G	Extra lock













4.3 Product Identification

You can identify the inverter by the side type label. Information such as serial number (SN.), type of the inverter, as well as inverter specifications are specified on the side type label. The type label is on the middle part of the right side of the inverter housing.

(Side type label example as on Macsol-TL2K)

**Mac solar**Made in China
www.macsolar-power.com

Type:Macsol-TL2K

	DC :	
	V _{DC max} :	480V
	V _{DC nom} :	360V
	V _{DC MPP} :	125-480V
	P _{DC max} :	2400W
	I _{DC max} :	12A
	AC :	
	V _{AC nom} :	230V
	f _{AC nom} :	50Hz
	P _{AC nom} :	2000W
	P _{AC max} :	2200W
	I _{AC nom} :	8.7A
	cos φ :	0.99
IP 65 -20°C to +60°C Protection Class I Overvoltage Cat.III VDE0126-1-1, IEC62109-1; C10/11 AS4777.2/1.3, AS3100; G83/1 ENEL Guide; RD1663		
<div></div> <div></div>		
TEL: +86 21 68689998 E-mail: service@macsolar-power.com ADD: Building 9, No.590 Ruiqing Road, 201201, Shanghai P.R. China.		
S/N		



4.4 Quality Certificate Card

When the single product passes a series of performance tests as well as visual inspection of all surfaces, a quality certificate card, which represents the outcome of internal inspection, will be issued by Macsolar's Quality assurance department rather than by the third party (authoritative laboratory or testing institute). With this card we want to convince our clients that Macsolar puts a new premium on the quality of products.

 MacSolar Quality Certificate Product Name: <u>PV Inverter</u> Type: <input type="checkbox"/> 1.5K <input type="checkbox"/> 2K <input type="checkbox"/> 3K <input type="checkbox"/> 4K <input type="checkbox"/> 5K Inspector: _____ Date: _____	 MacSolar Shanghai Macsolar Power Co.,Ltd ADD: Building 9, No.590 Ruiqing Road, Shanghai, P. R. China TEL: +86 21 68689998 FAX: +86 21 50720639 WEB: www.macsolar-power.com
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4.5 Further Information

If you have any further questions concerning the type of accessories or installation, please check our website www.macsolar-power.com or contact our service hotline.



5. INSTALLATION

5.1 Safety



DANGER

DANGER to life due to potential fire or electricity shock.

DO NOT install the inverter near any inflammable or explosive items.

This inverter will be directly connected with HIGH VOLTAGE power generation device, the installation must be performed by qualified personnel only in compliance with national and local standards and regulations.



NOTICE

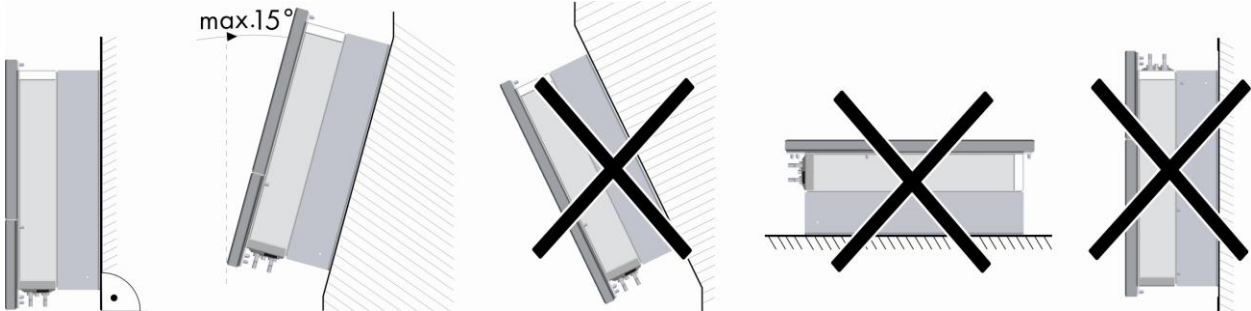
NOTICE due to the inappropriate or the harmonized installation environment may jeopardize the life span of the inverter.

Installation directly expose under intensive sunshine is not recommended.

The installation site **MUST** have good ventilation condition.



5.2 Mounting Instructions



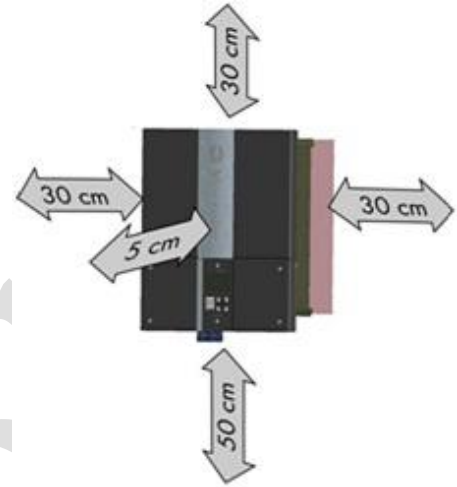
- Mac solar inverter is designed for installation both indoors and outdoors
- Please only mount the inverter in the direction as illustrated above
- Installation of the inverter in the vertical direction is recommended
- Tilted backwards by max.15 degree is allowed
- Never install the device with a forward tilt, horizontally or even upside down
- For the convenience of checking the LCD display and possible maintenance activities, please install the inverter at eye level
- Make sure the wall you selected is strong enough to handle the screws and the weight of the inverter
- Ensure the device is properly fixed to the rear panel
- It is not recommended to install the inverter directly exposed in strong sunshine, the excess heating might lead to power reduction
- The ambient temperature of installation site should be between -20 ℃ and +40 ℃ (between -4 ℉ and 104 ℉)
- Make sure the ventilation of the installation spot, not sufficient ventilation may affect the operating performance of the electronic components inside the inverter and the life span of the inverter might be jeopardized



5.3 Safety Clearance

To make sure the ventilation of the installation spot, if there are multiple Mac solar inverters installed in the same area, the following safety clearance shall be followed for proper ventilation conditions.

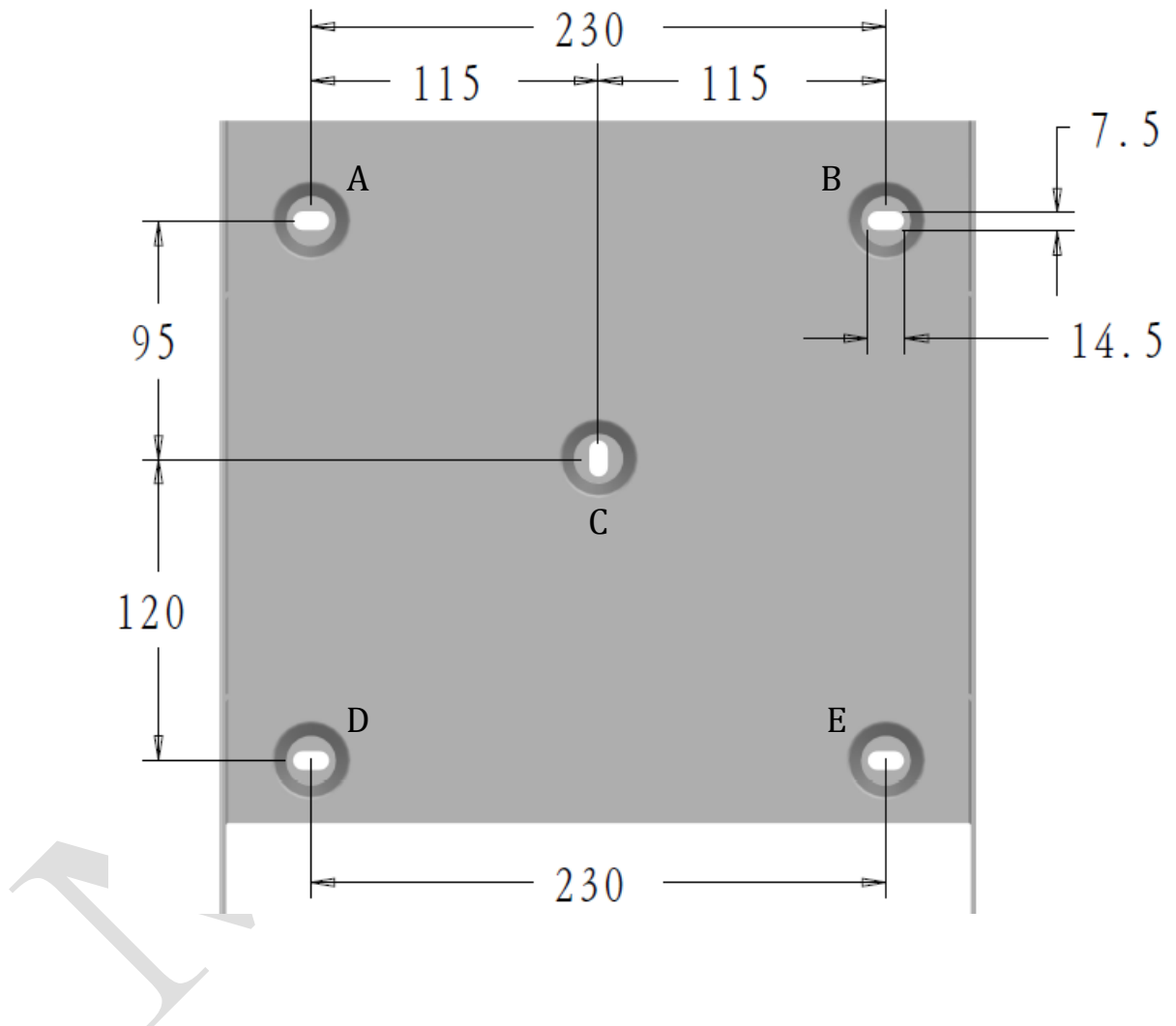
Direction	Minimum Clearance
Above	30 cm
Below	50 cm
Side	30 cm
Front	5 cm





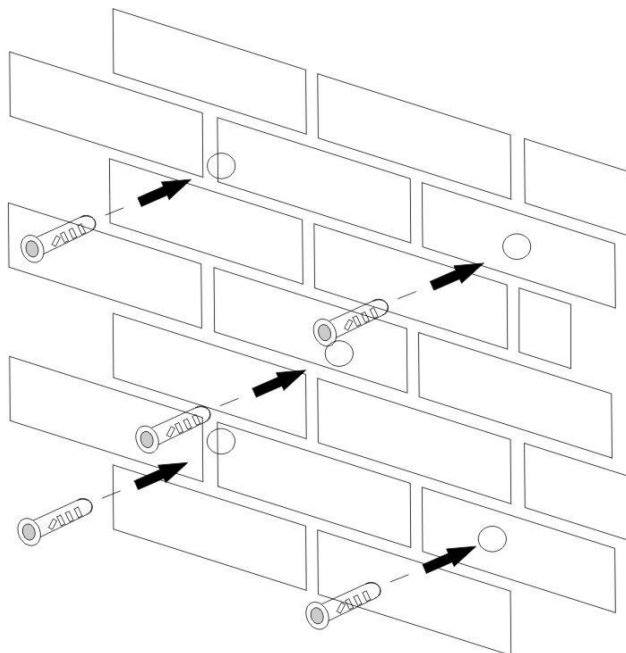
5.4 Mounting Procedure

1. Use the rear panel in the package as a drilling template and mark the positions of the drill holes, as illustrated below with symbols A/B/C/D/E.

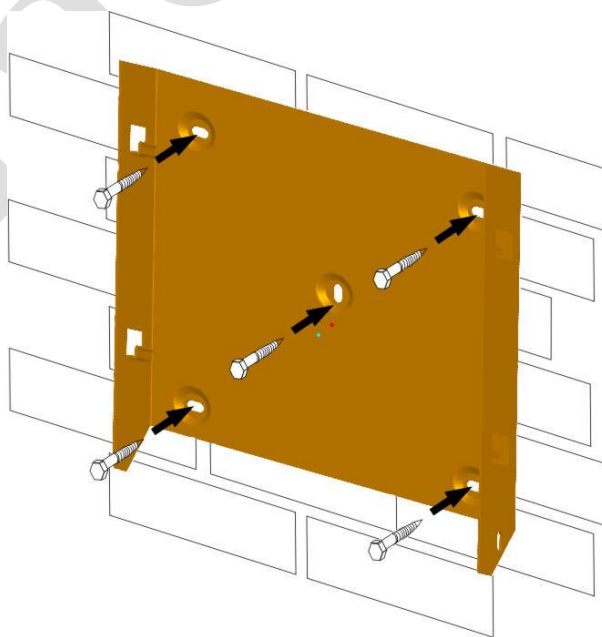




2. According to the marks, drill 5 holes in the wall (in conformity with position A/B/C/D/E marked in above picture), and then place five expansion tubes in the holes using a rubber hammer.

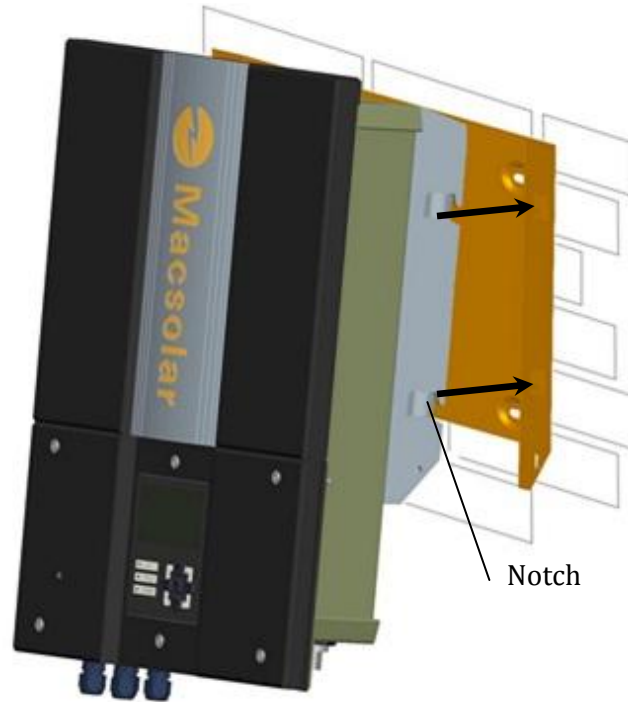


3. Mount the rear panel.
Wring five screws into the expansion tubes and tightly mount the rear panel on the wall.

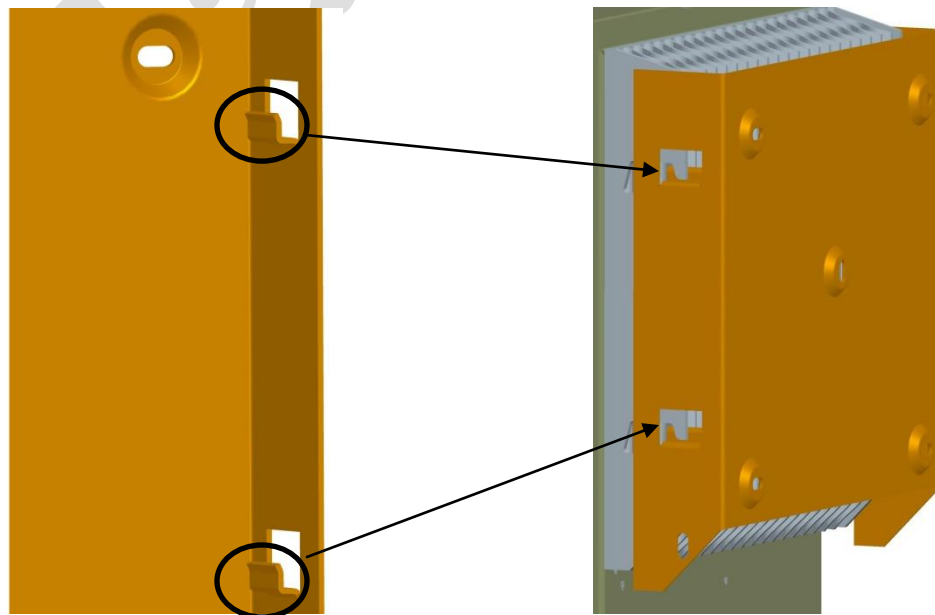




4. Carefully attach the inverter to the rear panel according to the position of the screws. Make sure the backside of the inverter is closely against the rear panel.
 - When two people transport the inverter, make sure each one use the hand grip in right position.



5. Pay attention to the four notches cut in both flanks of heat sink (as illustrated in above picture), which should be placed in corresponding hooks from the rear panel. Make sure that the heat sink and the rear panel are buckled together and the inverter is tightly attached to the rear panel.

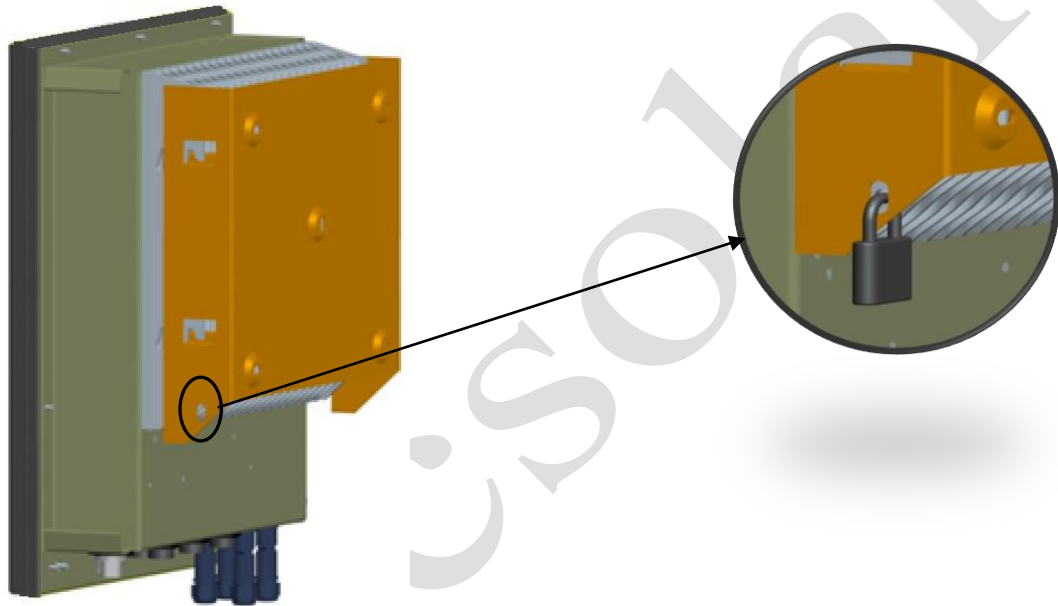




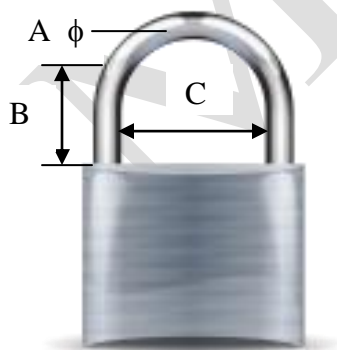
- Please carefully check the accessories and original carton to make sure during the installation every necessary part is used and nothing is missing.

5.5 Safety Lock

To prevent possible theft activity, Mac solar gives you an extra guard for your property. It is possible to lock the inverter to the rear panel with a padlock. The diameter of this hole drilled at the padlock location is 7mm.



Recommended padlock dimension:



A. Shackle Diameter	5 mm
B. Vertical Clearance	8~15 mm
C. Horizontal Clearance	12~20 mm
Stainless, solid hanger and secured lock cylinder	



NOTICE

For further maintenance and possible repair, please keep the key of the padlock in a safe place.

MacSolar



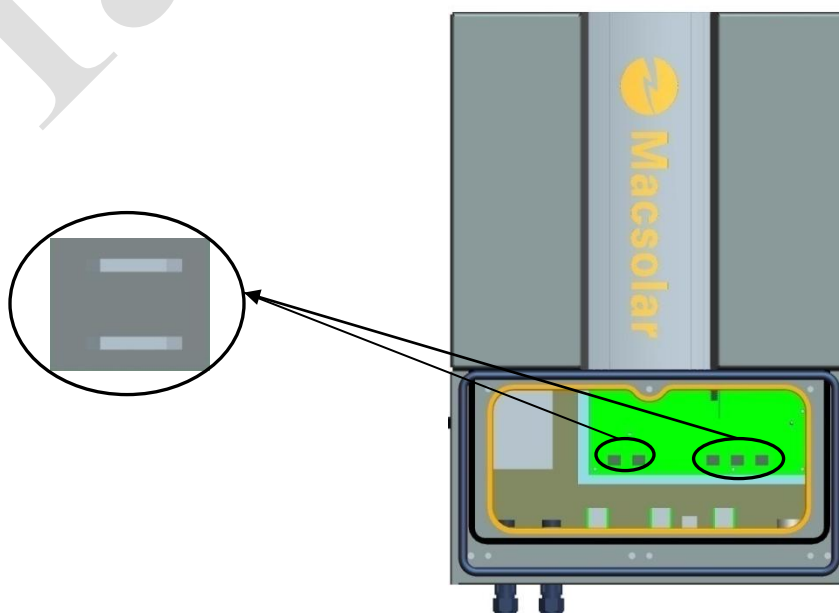
5.6 Check Varistors

If the one or more of the varistors might be out of function, please check or replace the varistors according to following steps:

1. Loosen all 6 captive screws of the removable front lid. Right after the 6 captive screws are removed, please keep them at a distance. Lift the lid upwards and remove it.



2. Then you will see the 5 varistors in 2 groups: 2 in left side and 3 in right side.



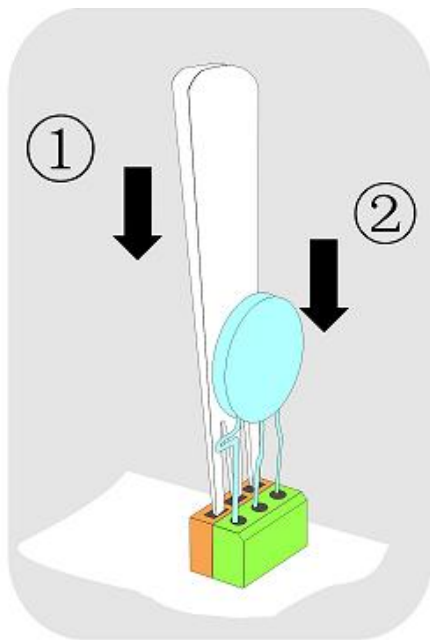
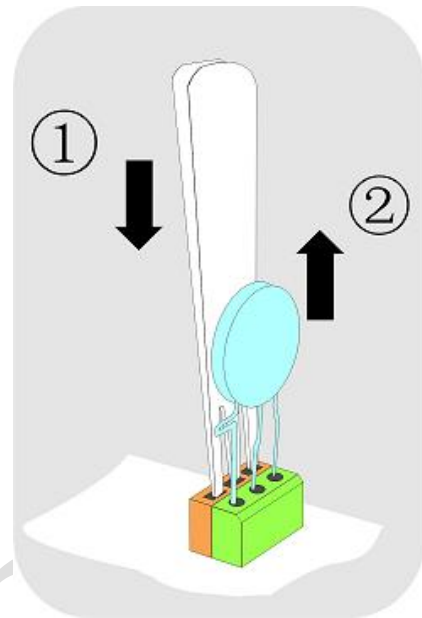


3. Remove and install the varistors

Remove:

First use specified tool and insert it to three holes in the left side of the varistor, then press it to the end.

Pull the varistor out.



Install:

Use specified tool and insert it to three holes in the left side of the varistor, then press it to the end.

Press the varistor in.

4. Put the lid back and re-screw all 6 screws, make sure the lid is tightened to the inverter.



6. ELECTRICAL CONNECTION

6.1 Safety



DANGER

DANGER to life due to potential fire or electricity shock.

With the inverter powered, comply with all prevailing national regulations on accidents prevention.

This inverter will be directly connected with HIGH VOLTAGE power generation device, the installation must be performed by qualified personnel only in compliance with national and local standards and regulations.



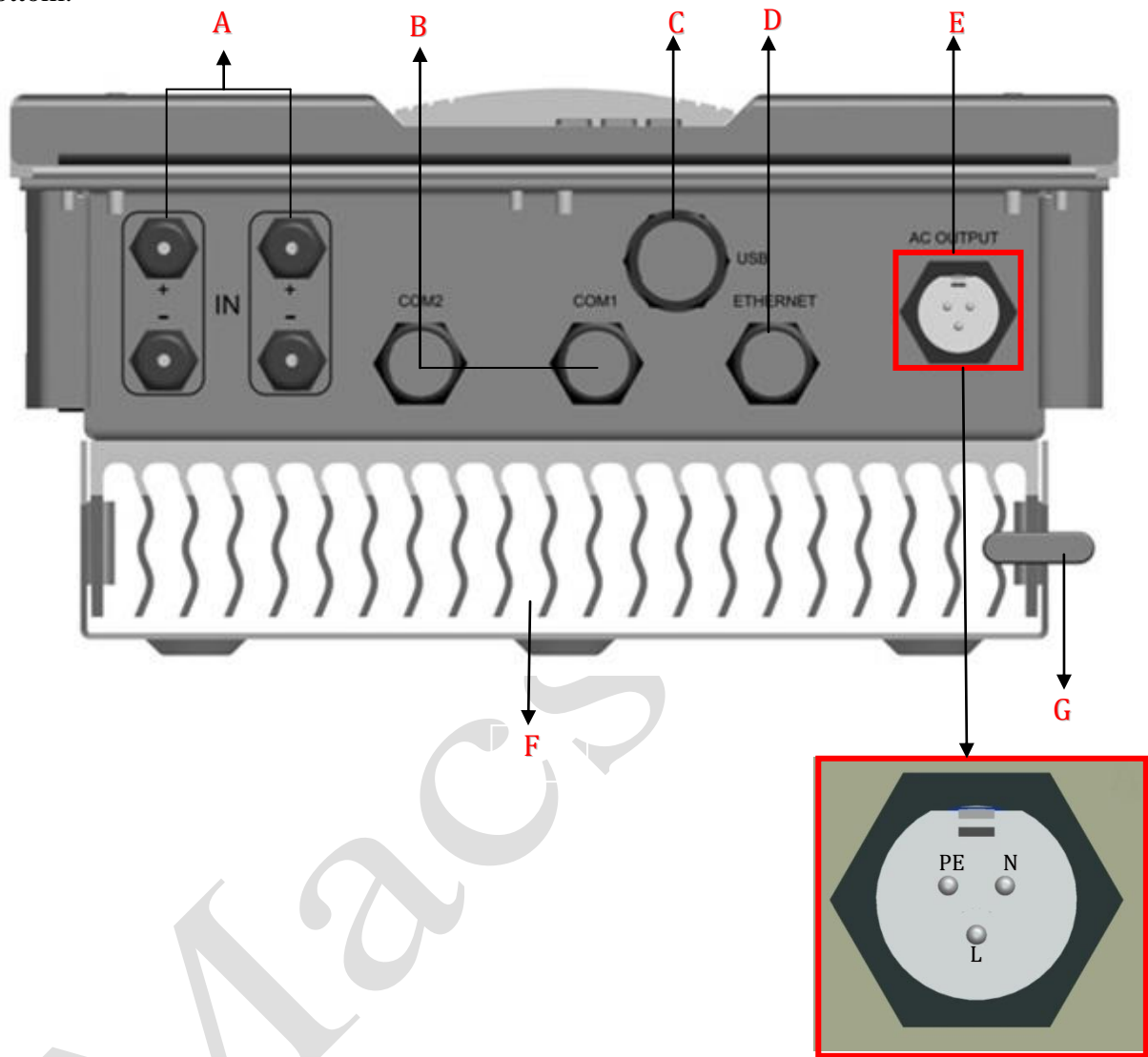
NOTICE

Electrical connections shall be carried out in accordance with the applicable regulations, such as conductor sections, fuses, PE connection.



6.2 Overview of Connection Area

Bottom:



Object	Description
A	DC input (1 set for Macsol-TL1.5K and 2 sets for Macsol-TL2K)
B	Plugs for connecting the RS485 communication module. Among them COM1 must be equipped, but COM2 is optional equipped (Customized)
C	USB plug for connecting the inverter to a PC directly via USB connection
D	Plug for connecting the Ethernet , communication module (Optional, not Must)
E	AC output (left-PE, right-N, down-L)
F	Heat sink
G	Extra lock



6.3 AC Side Connection



DANGER

DANGER to life due to potential fire or electricity shock.

NEVER connect or disconnect the connectors under load.

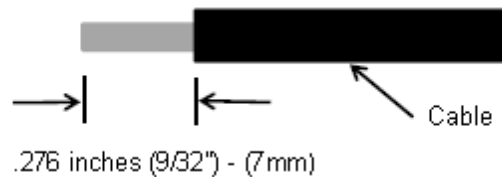
Integrated RCD and RCM

The Mac solar inverter is equipped with integrated RCD (Residual Current Protective Device) and RCM (Residual Current Operated Monitor). The current sensor will detect the volume of the leakage current and compare it with the pre-set value. If the leakage current is above the permitted range, the RCD will disconnect the inverter from the AC load.

The Mac solar inverter will probably cause a d.c. current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product. Provided an a.c. current or pulse current is caused in the external protective earthing conductor, an RCD or RCM of Type AC or Type A as alternative can be permitted putting into use.

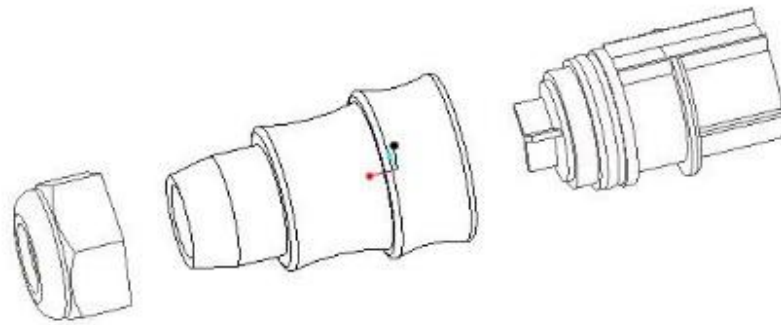
Assembly Instructions:

1. Strip the cable with the length 0.276 inches (9/32") - (7mm) and please be careful NOT to nick conductors.

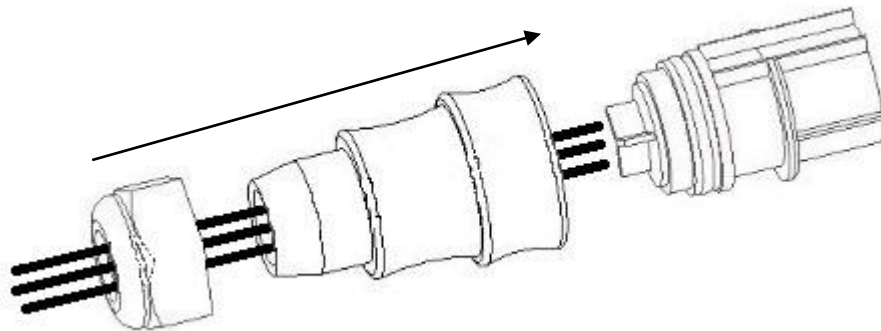




2. Screw off and separate each component of AC connector as follows.



3. Pass the cable through each component from left to the right as follows.

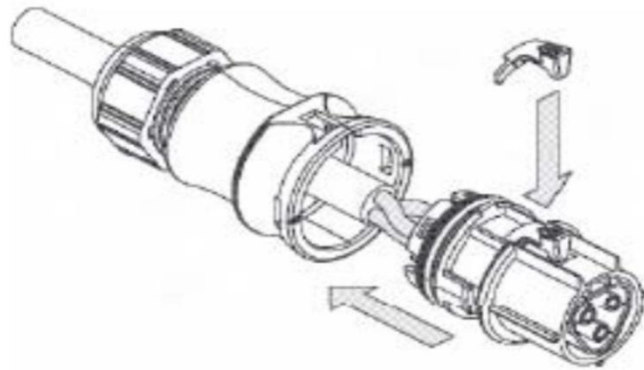


4. Use a screw driver and loose the three screws at the side of the straight plug. Then insert the stripped **N, L and PE cable accordingly** to the corresponding position and fully tighten the screws.

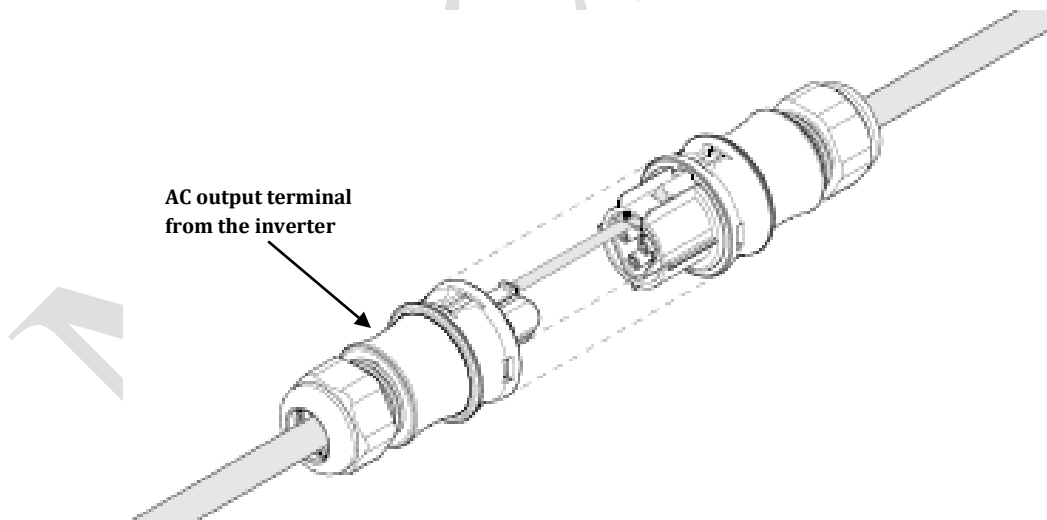




5. Aim the terminals on the straight plug to the holes of the grommet, and then compress them together.



6. Finally, connect the straight plug to the AC terminal on inverter. **Pay attention to the polarity of the terminals to avoid wrong connecting.**





6.4 DC Side Connection

For Macsol – TL2K, there is only one MPP Tracker, for the two string inputs, the connected PV modules must meet following requirements:

- Same type
- Same quantity
- Identical alignment
- Identical tilt

Inverter Type	MPP Tracker	Max. DC Power	Max. DC Voltage	Max. DC Current
Macsol-TL1.5K	1	1800W	480V	12A
Macsol-TL2K	1	2400W		12A



DANGER

DANGER to life due to potential fire or electricity shock.

NEVER connect or disconnect the connectors under load.



NOTICE

If only one string input is used for DC connection, please use the sealing plug to seal the left DC input set to ensure the inverter IP 65 protection.



The DC connectors come pre-assembled and the caps are loose. The whole connector will include the male side and female side as showed below:



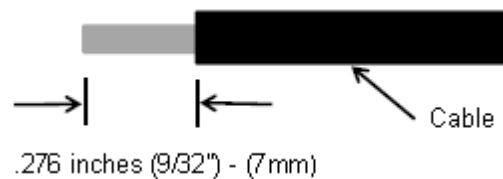
Female side connector (F)



Male side connector (M)

Assembly Instructions:

1. Strip the cable with the length 0.276 inches (9/32") - (7mm) and please be careful NOT to nick conductors.



Use specified strip tool in this step. Adjust the stripper stopper and put the cable in corresponding notch to strip the length of 7mm. Please see below figures.





2. Insert striped cable into contact barrel and insure all conductor strands are captured in the contact barrel and the conductors are visible in the contact barrel observation hole. Please see below figures.

Pin contact

Barrel observation hole
Conductor should be visible

Socket contact

Barrel observation hole
Conductor should be visible

3. Crimp contact barrel by using the hex crimping die. Please see below figures.

Crimped pin contact**Crimped socket contact**

Cable requirements:

Cable Size	Cable pull – out force requirement
2.5 mm ²	Min. 310 N (70 Lbs)
4 mm ²	Min. 400 N (90 Lbs)
6 mm ²	Min. 450 N (100 Lbs)



4. Insert contact cable assembly into back of male and female connector. A “click” should be heard or felt when the contact cable assembly is seated correctly. Please see below figures.



Female side connector (F)



Male side connector (F)

5. Wrest the cap by using the torque of 2.6~2.9NM.



6. After wrest the cap tightly, align the 2 half connectors and mate them together by hand until a “click” is heard or felt.

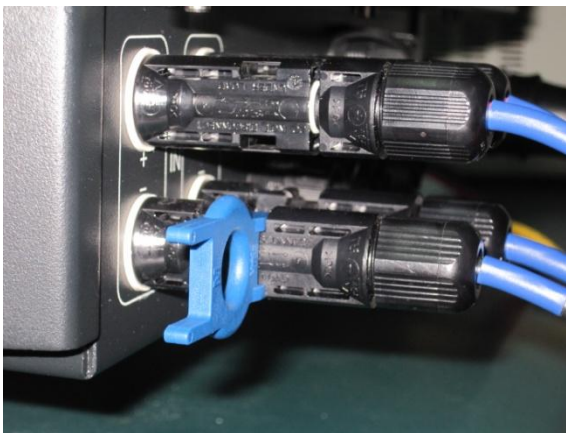




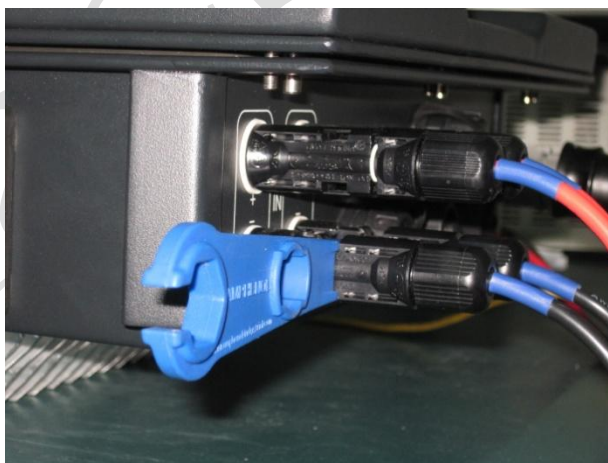
6.5 DC Side Disconnection

When the separation of DC connectors is necessary, please use the specified tool (Ring tool or wrench tool) to separate them.

While using the ring tool or wrench tool, please make sure the wedge side of the fingers faces the female connector and push the tool down. Then separate the connector by hand. See below figures.



Separation by ring tool

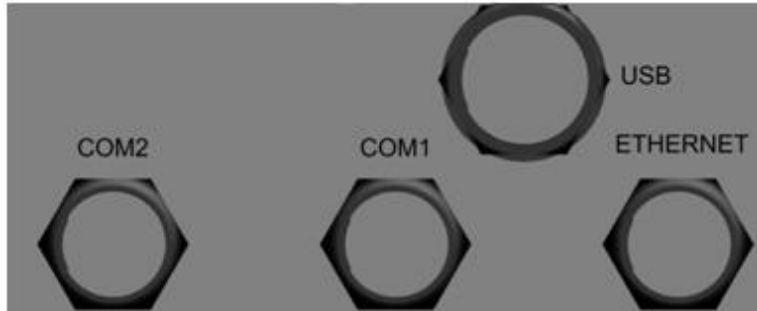


Separation by wrench tool



6.6 Communication and Monitoring Device

There are 4 plugs in the bottom side of the Mac solar inverter:



1 × USB

2 × RS485---COM1, COM2 (Optional)

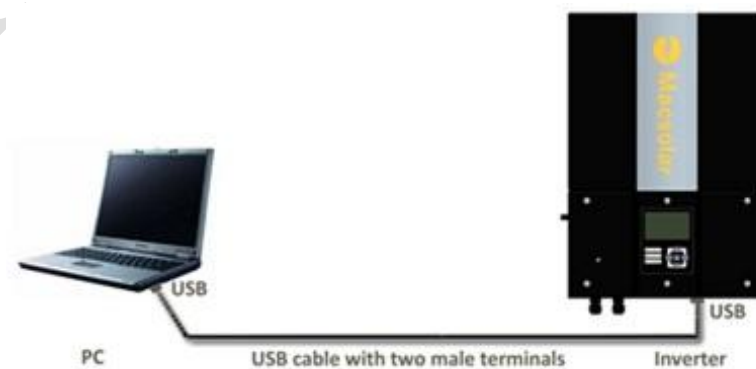
1 × Ethernet ---Ethernet (Optional)

All communication and monitoring plugs in inverter are simply “plug and use”. Please select the appropriate one according to the desired functionality and usage.

6.7 Software updating

Please pay attention to the USB plug mentioned in last section, which is prepared for software updating. By this means we can supplement new developed functions or just modify and remove the non-used function to inverters with ease on the basis of previous software version.

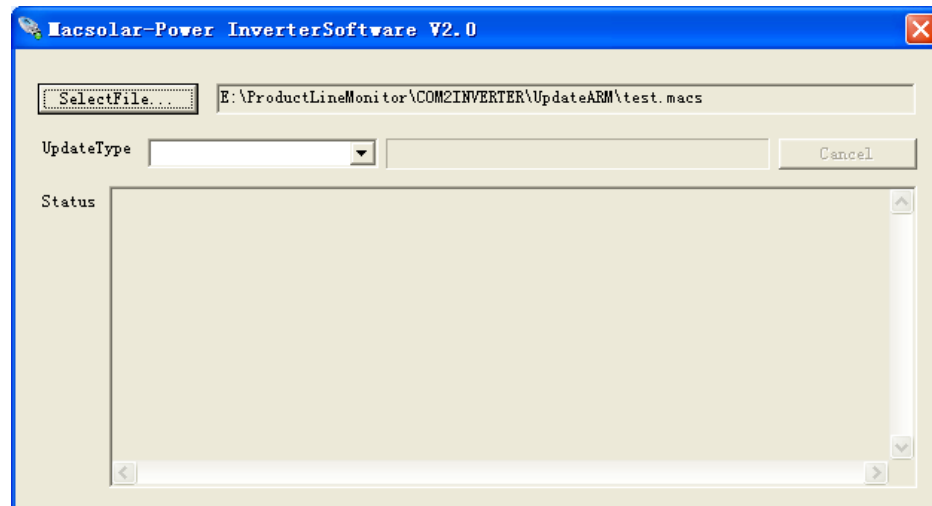
Connection of relevant parts via USB cable as follows, whose terminals are both male.



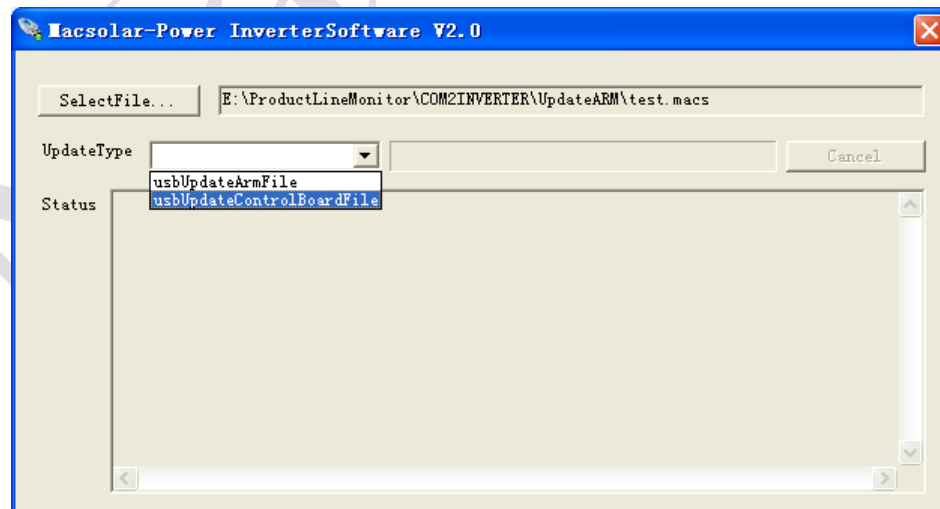


After building the hardware circuit for inverter's software updating, we should carry out the following procedures:

1. Install the application program **MacSolar-Power InverterSoftware V2.0** on your PC
2. Open the software **MacSolar-Power InverterSoftware V2.0**. You will see the interface as below. Select the file which needs to be updated or enter the route of this file.

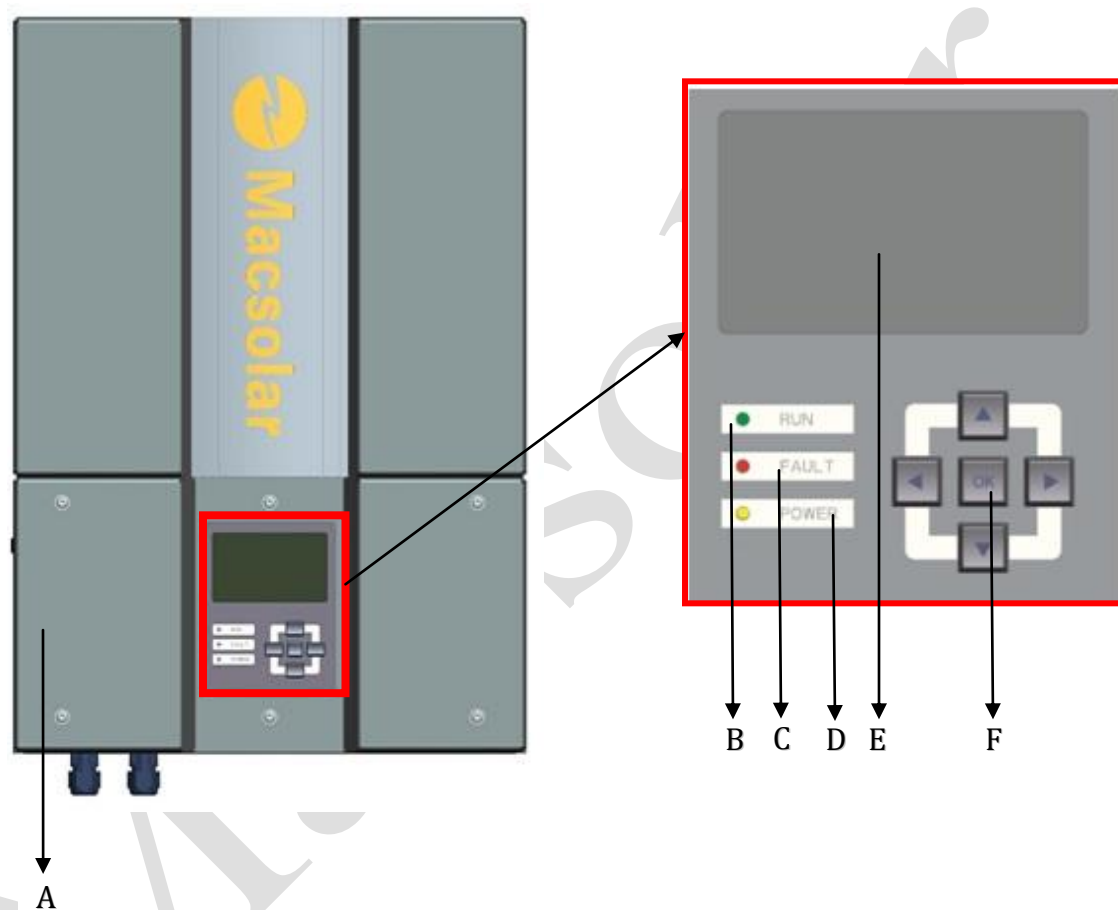


3. Select the proper **Update Type**. Then you can start the software updating. Through the "Status" text box you can monitor the whole updating process.



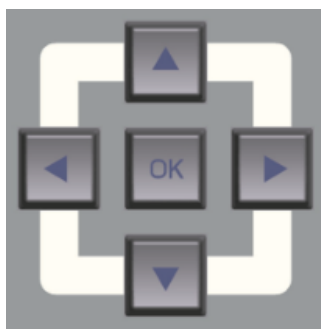
7. CONFIGURATION






7.1 LCD Display



Object	Description
A	Removable front lid for potential maintenance and repair
B	LED light – RUN
C	LED light – FAULT
D	LED light – POWER
E	LCD screen for checking the operating status and configuration
F	Control keyboard for displays and configuration of parameters

Press any key from the control keyboard to illuminate the LCD screen.



Item	Function
	“Right” key Depending on the selection: To navigate right To navigate to the next level menu
	“Down” key Depending on the selection: To navigate down Change to the next number
	“Left” key Depending on the selection: To navigate left To navigate to the previous level menu
	“Up” key Depending on the selection: To navigate up Change to the previous number
	“OK” key Depending on the selection: To confirm a selection To enter the main menu



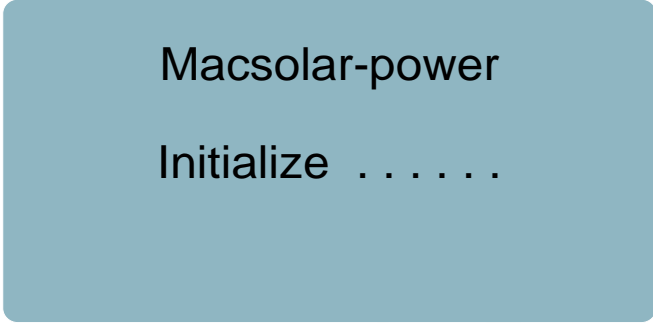
NOTICE

Macsolar inverter is not an aligned measuring instrument for current, voltage or power consumption. A slight deviation of a few percent points is intrinsic to the system, the results from the inverter cannot be used for grid balance calculations. An aligned meter will be required to make calculations for the utility company.

7.2 Setup

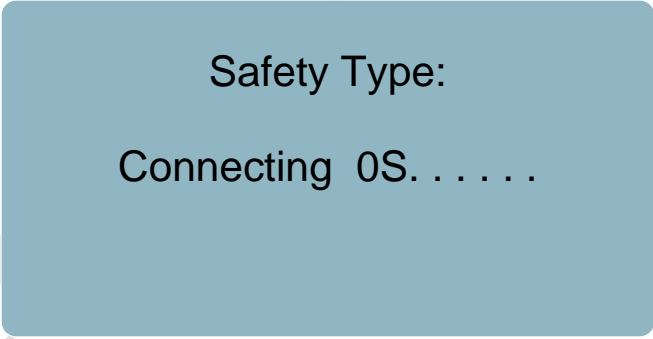
DISPLAY

After the inverter has started, programs will be initialized with the screen showing as follows;



Macsolar-power
Initialize

Subsequently a connection interface will appear for short time to indicate the duration of ARM board power-on;



Safety Type:
Connecting 0S.



Now in this interface you can check all necessary information about the system;

Pac	xx W	Temp	xx C
Fgrid	x.xx Hz	T-run	xx h
Vgrid	x.x V	E-day	x.xx kWh
Igrid	x.xx A	E-all	x.xx kWh
Vpv1	x.x V	Ipv1	x.xx A
Fault Code:			
Time:			

YIELD POWER

Press “OK” key to enter the main menu, the default screen is the “Yield Power”, it will show the cumulated power consumption by Day;

Yield Power	
Yield Power	Day
Actual Value	x.xx kWh
Fault Info.	Total
History data	
Configure	
Device Info.	x.xx kWh
Time:	

ACTUAL VALUE

Press “Down” key to enter “Actual Value”, then “Actual Value” is highlighted, please press “Right” key or “OK” key to enter the submenu, and select the actual information that you’d like to check;

Actual Value	
Yield Power	
Actual Value	
Fault Info.	PV string1
History data	
Configure	AC
Device Info.	
Time:	

PV string1	
	PV string1 Power xxxx W
PV string1	PV string1 Voltage xxxx V
AC	PV string1 Current xxxx A
Time:	

AC	
	AC Power xxxx W
PV string1	AC Voltage xxxx V
AC	AC frequency xxxx Hz
Time:	

FAULT INFORMATION

Press “Left” key to back to main menu, and then enter “Fault Information”, here you can check all fault information including real-time fault and fault history;

Fault info.	
Yield Power	
Actual Value	
Fault Info.	Latest Fault
History data	Fault List
Configure	
Device Info.	
Time:	

Latest Fault	
	Error Number: xxxx
Latest Fault	Time: xx-xx-xx xx:xx:xx
Fault List	Error Code: xx xx xx
Time:	

In the “Fault List”, you can check up to 21 failures at five different moments.

Latest Fault	
	Error Number: xxxx
Latest Fault	Time: xx-xx-xx xx:xx:xx
Fault List	Error Code: xx xx xx
Time:	

```

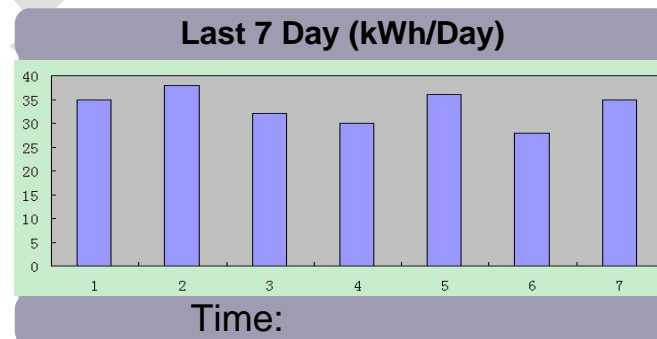
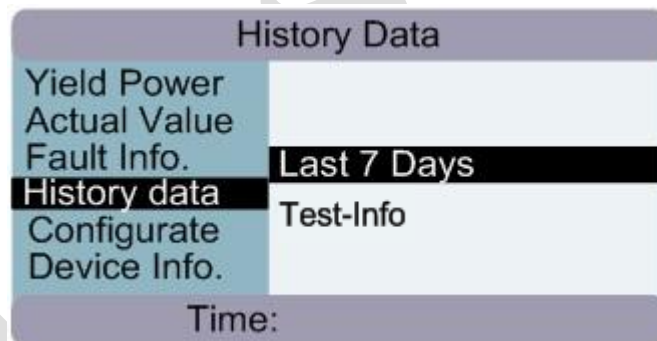
XX-XX-XX XX:XX:XX
00 00 00
XX-XX-XX XX:XX:XX
00 00 00
XX-XX-XX XX:XX:XX
00 00 00

```

HISTORY DATA

Click the “Left” key to back to main menu and enter the “History Data” screen, here you can check the information for “Last 7 Days” as well as “Test Info”

Select “Last 7 Days”, press “Right” or “OK” key to show the corresponding power consumption curves;



Select “Test-Info”, press “Right” or “OK” key to show the standard as well as measured value related to H-Uac, L-Uac, H-Fac, L-Fac complying with requirements



of ENEL Guide 2010. Each record from Uac or Fac contains the following items: testing parameter, self-test Runtime (Stop time), and testing results.

Test-Info					
Time:					
	ST-V	ACT-V	ST-T	ACT-T	
H-Volt	276V	274V	100ms	10ms	PASS
L- Volt	184V	185V	200ms	9ms	PASS
H-Freq	50.30Hz	50.29Hz	100ms	17ms	PASS
L-Freq	49.70Hz	49.71Hz	100ms	39ms	PASS
Time:					

For the system’s safety type other than ENEL Guide 2010, the following interface will display when you select the “Test-Info” option.

Test-Info	
Sorry, this function is reserved!!!	
Time:	

CONFIGURATE

Back to the main menu, and then enter the “Configure”, here you can setup your “Language”, “Date/Time”, “Address” , “Safety Type” as well as”Self Test”;

“Language” Setup:

Configure	
Yield Power	Language
Actual Value	Date/Time
Fault Info.	Address
History data	Safety Type
Configure	Self Test
Device Info.	
Time:	

Configure	
Language	English
Date/Time	
Address	Chinese
Safety Type	
Self Test	Deutsch
Time:	

“Date/Time” Setup:

Use “Left/Right” key to choose object, and then use “Up/Down” key to set the number;

Configure	
Language	
Date/Time	Date/Time
Address	2011-01-01
Safety Type	00:00:00
Self Test	
Time:	

“Address” Setup:

Use “Left/Right” key to choose object, and then use “Up/Down” key to set the number;



NOTICE

Possible communication failure due to wrong configuration

IP Address will directly affect the performance of the data logger.



Configure	
Language	Address <input type="text" value="XXX"/>
Date/Time	
Address	
Safety Type	
Self Test	
Time:	

“Safety Type” Setup:

Use “Left/Right” key to choose object, and then use “Up/Down” key to select the authorized certificate from the options such as “None”, “VDE0126”, “RD1663” “AS4777”, “C10/11” applying to the product in conformity with the regulations for safety class compliance or suitability for grid connection of the inverter.

Configure	
Language	Safety Type VDE0126
Date/Time	
Address	
Safety Type	
Self Test	
Time:	

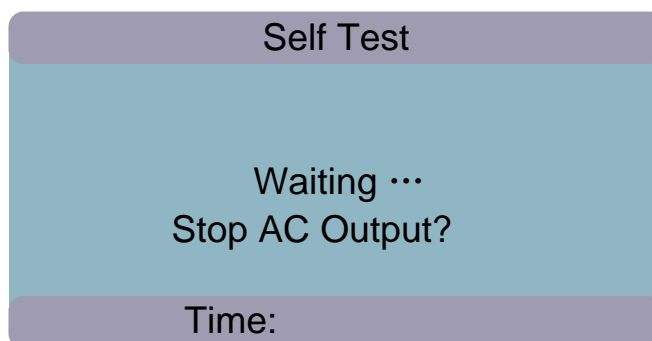
“Self Test” Setup---Applying for the safety type ENEL Guide 2010:

Press OK button to enter the Self-test interface. Selecting the “Self Test” option to get into Self-test mode.

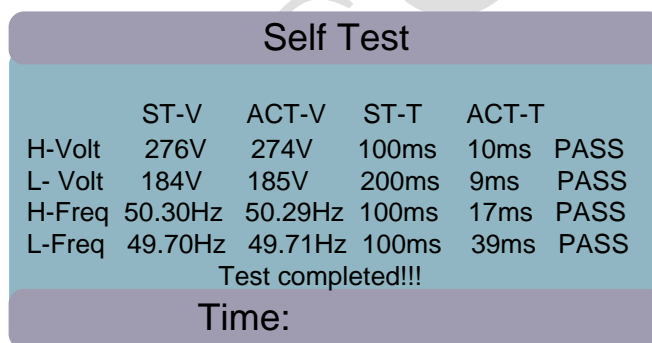
Configure	
Language	Self Test
Date/Time	
Address	
Safety Type	
Self Test	
Time:	



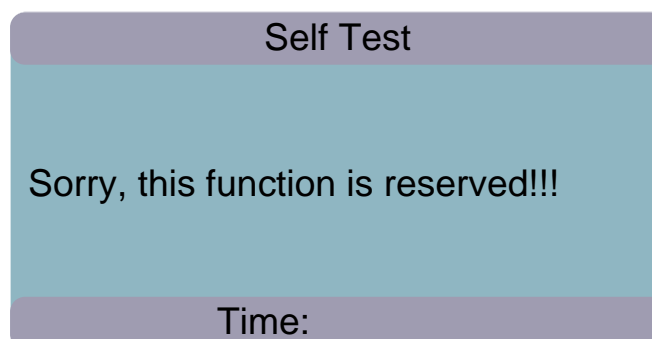
Please note that LCD will indicate the text “Stop AC Output?” provided the inverter still connects with AC Source or grid in the mode of “Normal”. In this case, if you press “OK”, output will then be suspended. If you press any navigation key, automatic self-test will be terminated.



Waiting for a short while and you will see testing results of the self test, which lasts for several seconds.



For the system’s safety type other than ENEL Guide 2010, the following interface will display when you select the “Self Test” option.



DEVICE INFORMATION

Back to main menu, and then enter “Device Information”, you can check “Control Version”, “Update Time”, “ARM Version”, “Update Time”, “Serial Number”, “Machine Type”, “Safety Type”.

Device Info.	
Yield Power	Control Version :
Actual Value	V01.00
Fault Info.	xxxx-xx-xx xx:xx:xx
History data	ARM Version:
Configure	V01.00
Device Info.	xxxx-xx-xx xx:xx:xx
Time:	

Device Info.	
Yield Power	Serial Number:
Actual Value	
Fault Info.	Machine Type:
History data	xxxx
Configure	Safety Type:
Device Info.	xxxx
Time:	



7.3 Error Message

If any of the following messages occurs in LCD Screen, or the status LED Light “Fault” is on, there is one or more error that has been detected by Mac solar Inverter.

Please go to Chapter “9. TROUBLESHOOTING” for further information

Error No.	Information
0	Grid Vtg. Fault
1	Grid Vtg.10min Fault
2	Fac Fault
3	Utility Loss
4	High DC Bus
5	GFCI Fault
6	Over-temperature
7	Varistor Fault
8	PV-Overvoltage
9	Consistence Fault
10	Isolation Fault
11	DC INJ Fault
12	Device Fault
13	GFCI Device Fault
14	Comm. disturbed
15	Current Sensor Fault
16	CPU Ref 2.5V Fault
17	EEPROM R/W Fail
18	DC INJ Device Fault
19	Relay Fault
20	AC-Overcurrent



8. RECYCLING AND DISPOSAL



WARNING



This device **SHALL NOT** be disposed of in residential waste.

To comply with European Directive 2002/96/EC on waste Electrical and Electronic Equipment and its implementation as national law, electrical equipment that has reached the end of its life must be collected separately and returned to an approved recycling facility. Any device that you no longer required must be returned to your dealer or you must find an approved collection and recycling facility in your area.

Ignoring this EU Directive may have severe effects on the environment and your health.



9. TROUBLESHOOTING

Error No.	Message	Corresponding Action
0	<p>“Grid Vtg. Fault”</p> <p>The grid voltage has exceeded the permitted range according to local grid regulations.</p> <p>Following causes might lead to this error:</p> <ul style="list-style-type: none">• Grid voltage is too high or too low at the point of common coupling to the inverter.• Grid impedance at the terminal of the inverter is too high. <p>For safety consideration, the inverter will disconnect itself from the grid for a short period of time, and it will reconnect to the grid automatically after a short period of time if the grid voltage is back to the permitted range.</p>	<ul style="list-style-type: none">• Check the grid voltage.• Check the grid connection of the inverter. <p>If the grid voltage exceeds the permitted range because of local grid conditions, please ask the utility operator if the voltage can be adjusted at the feed-in point or if changes in the values of the monitored operational limits are possible.</p> <p>If the grid voltage that checked is within the permitted range, yet this error is still showing in the LCD screen, please contact Mac solar Serviceline.</p>
1	<p>“Grid Vtg. 10min Fault”</p> <p>The average grid voltage over 10 minutes has been outside the permitted range according to local grid regulations.</p> <p>Following causes might lead to this error:</p> <ul style="list-style-type: none">• Grid voltage is too high at the point of common coupling to the inverter.• Grid impedance at the terminal of the inverter is too high. <p>For safety consideration, the inverter will disconnect itself from the grid for a short period of time, and it will reconnect to the grid automatically after a short period of time if the grid voltage is back to the permitted range.</p>	<ul style="list-style-type: none">• Check the grid voltage.• Check the grid connection of the inverter. <p>If the grid voltage exceeds the permitted range because of local grid conditions, please ask the utility operator if the voltage can be adjusted at the feed-in point or if changes in the values of the monitored operational limits are possible.</p> <p>If the grid voltage that checked is within the permitted range, yet this error is still showing in the LCD screen, please contact Mac solar Serviceline.</p>



Error No.	Message	Corresponding Action
2	<p>“Fac Fault”</p> <p>The grid frequency has left the permitted range.</p> <p>For safety consideration, the inverter will disconnect itself from the grid for a short period of time, and it will reconnect to the grid automatically after a short period of time if the grid frequency is back to the permitted range.</p>	<ul style="list-style-type: none"> Within safety scope, check the grid frequency and observe how often major deviations occur. <p>If there are repeated frequency turbulences which lead to this error, please ask the utility operator if modification of the operating parameter is possible.</p> <p>If this error is not solvable, please contact Mac solar Serviceline.</p>
3	<p>“Utility Loss”</p> <p>The inverter has detected an error in the cabling and cannot connect to the grid.</p> <p>Following causes might lead to this error:</p> <ul style="list-style-type: none"> Grid connection installation failure. Cabling failure. Incorrect country setting. 	<ul style="list-style-type: none"> Check AC installation. Check grid connection. Check if the country setting is correct: <ul style="list-style-type: none"> Via LCD screen (please refer to chapter 7.2 “Configuration”). Via the remote communication: setting Parameter “Country”. <p>If this error is not solvable, please contact Mac solar Serviceline.</p>
4	<p>“High DC Bus”</p> <p>The voltage of the Bus which paralleling connected with the string is too high.</p> <p>Following causes might lead to this error:</p> <ul style="list-style-type: none"> The DC input voltage connected to the inverter is too high. Sudden DC surge. <p>For safety consideration, the inverter will shutdown itself.</p>	<ul style="list-style-type: none"> Please immediately disconnect the inverter from the PV strings (see chapter 6.5 “DC side Disconnection”) or else the inverter might be damaged. Check the DC voltage of the strings for adherence to the maximum input voltage of the inverter, before you reconnect the inverter to the PV strings.
5	<p>“GFCI Fault”</p> <p>The inverter has detected a ground fault in the PV generator.</p>	<ul style="list-style-type: none"> The installer of the PV generator must solve the ground faults before you re-connect the strings. <p>If this error is not solvable, please contact Mac solar Serviceline.</p>



Error No.	Message	Corresponding Action
6	<p>“Over-temperature”</p> <p>The delivered power of the inverter was reduced below rated power because of abnormal temperature within 0.5s.</p> <p>Following causes might lead to this error:</p> <ul style="list-style-type: none"> • At least one or more of the thermally monitored varistors are defective. • Overheating inside. • Not sufficient ventilation. 	<p>If this event occurs often:</p> <ul style="list-style-type: none"> • Please ensure sufficient ventilation. • Check the varistors. <p>If this error is not solvable, please contact Macsolar Serviceline.</p>
7	<p>“Varistor Fault”</p> <p>At least one of the varistors from the DC or AC side is defected.</p> <p>Following causes might lead to this error:</p> <ul style="list-style-type: none"> • Varistor is bust due to over-voltage protection. 	<p>If this event occurs:</p> <ul style="list-style-type: none"> – Please check the varistors as chapter 5.6 “Check Varistors”. <p>If this error is not solvable, please contact Macsolar Serviceline.</p>
8	<p>“PV-Overvoltage”</p> <p>The DC input voltage which connects to the inverter is too high.</p> <p>Following causes might lead to this error:</p> <ul style="list-style-type: none"> • The open-circuit voltage of the PV generator is higher than the maximum DC input voltage of the inverter. • Sudden DC surge. • Junction temperature of solar panel too low. 	<ul style="list-style-type: none"> • Please immediately disconnect the inverter from the PV strings (see chapter 6.5 “DC side Disconnection”) or else the inverter might be damaged. • Check the DC voltage of the strings for adherence to the maximum input voltage of the inverter, before you reconnect the inverter to the PV strings.
9	<p>“Consistence Fault”</p> <p>Following causes might lead to this error:</p> <ul style="list-style-type: none"> • Interference device 	<p>If this event occurs often:</p> <ul style="list-style-type: none"> – Please contact Macsolar Serviceline.
10	<p>“Isolation Fault”</p> <p>There is a sudden isolation fault which is detected by the inverter. Normally this fault will only exist for a very short period of time and shall not have any bad influence to the inverter.</p>	<p>If this event occurs often:</p> <ul style="list-style-type: none"> – Please contact Macsolar Serviceline.



Error No.	Message	Corresponding Action
11	“DC INJ Fault” The direct component of the AC current is out of the permitted range.	If this event occurs often: – Please contact Macsolar Serviceline.
12	“Device Fault” A fault has occurred in one or more major components of the inverter. For safety consideration, the inverter will shutdown itself.	If this event occurs: – Please contact Macsolar Serviceline.
13	“GFCI Device Fault” The internal sensor has detected that the GFCI Device is out of function. For safety consideration, the inverter will shutdown itself.	If this event occurs: – Please contact Macsolar Serviceline.
14	“Comm. Disturbed” A fault has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid.	If this event occurs often: – Please contact Macsolar Serviceline.
15	“Current Sensor Fault” A fault has occurred in one or more current sensor of the inverter. For safety consideration, the inverter will shutdown itself.	If this event occurs: – Please contact Macsolar Serviceline.
16	“CPU Ref 2.5V Fault” The CPU voltage that detected by internal sensor is deviating the pre-set 2.5V reference line.	If this event occurs: – Please contact Macsolar Serviceline.
17	“EEPROM R/W Fail” Internal device fault. For safety consideration, the inverter will shutdown itself.	If this event occurs: – Please contact Macsolar Serviceline.
18	“DC INJ Device Fault” A fault has occurred in the sensor which detects the direct component of the AC current. For safety consideration, the inverter will shutdown itself.	If this event occurs: – Please contact Macsolar Serviceline.



Error No.	Message	Corresponding Action
19	<p>“Relay Fault”</p> <p>A fault has occurred in the relay which will automatically disconnect the inverter from the grid.</p> <p>For safety consideration, the inverter will shutdown itself.</p>	<p>If this event occurs:</p> <ul style="list-style-type: none">– Please contact Macsolar Serviceline.
20	<p>“AC-Overcurrent”</p> <p>The detected AC current has exceeded the pre-set Max. AC Current.</p> <p>Following causes might lead to this error:</p> <ul style="list-style-type: none">• Short circuit happens in the output circuit.	<p>If this event occurs often:</p> <p>Please contact Macsolar Serviceline.</p>



10. GUARANTY SCOPE AND GUARANTY SERVICE

10.1 Macsolar Factory Guaranty Scope

This guaranty declaration is solely applied to the following Macsolar Grid Tie Solar Inverter:

- Macsol – TL1.5K
- Macsol – TL2K

For the above named products, you will receive a Macsolar factory warranty card which will valid for 5 years from the date of purchase. The Macsolar factory warranty covers any costs which you incur for repair or replacement parts during the agreed period beginning at the date of purchase of the device, subject to the conditions listed below. This is not associated with a durability warranty.

You have the possibility of purchasing an extension of this Macsolar factory warranty within the 5 year term of the Macsolar factory warranty. The prices are based on the respective Macsolar price list valid at the time the warranty extension was signed.

10.2 Guaranty Conditions

This guaranty declaration is solely applied when any defect of Macsolar inverter is detected.

If a device becomes defective during the Macsolar guaranty period, and it is proved that further functional performance is impossible, the device will be, as selected by Macsolar:

- Repair the defect at the factory free of charge within the guaranty period.
- Exchange for a replacement device of equivalent value according to model and age.

If it is the latter case, the remainder of the warranty entitlement will be automatically transferred to the replacement device. In this case, you will not receive a new certificate since your entitlement is already documented at Macsolar if the rest warranty period is more than 1 year. If a replacement occurs when rest warranty period is less than 1 year, it will automatically extend the rest warranty period to exactly 1 year.



NOTICE

If exchange for a replacement device of equivalent value according to model and age is needed. The defected unit must, where possible, be returned in its original or equivalent packaging.

MacSolar will only perform guaranty service only if the user provides a copy of invoice which was issued to the user by the dealer and a completed warranty card. If any one of these two is missing, MacSolar has the rights to deny the guaranty service or only provide paid service.

10.3 Guaranty Exclusion

Guaranty declaration is excluded in the following cases:

- Transport damage
- Improper installation and installation that does not comply with standards
- Use of the devices in ways not intended
- Improper operations without following the user manual
- Operation of units with defective protective equipment which might lead to damage
- Unauthorized modifications to the units or repair attempts
- Influence of foreign objects and force majeure (lightning, grid overvoltage, severe weather, fire)
- Insufficient ventilation of the unit
- Failure to observe the relevant safety regulations

If the device becomes defective when in any of the above cases, MacSolar will not perform guaranty service and the user shall take whole responsibility for the defects.



11. CONTACT

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Serviceline

Tel: (+86)-21-50720833 / (+86)-21-68689998

Fax: (+86)-21-50720639

Email: service@macsolar-power.com

www.macsolar-power.com

ABBREVIATION

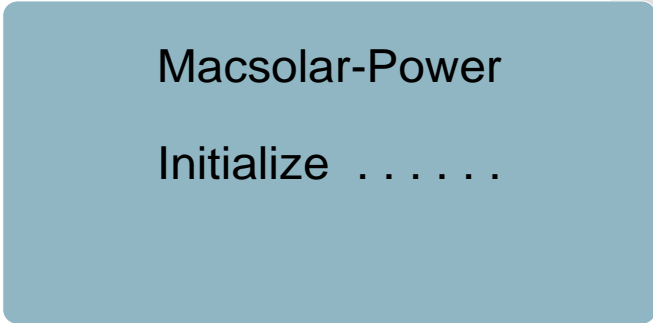
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MPPT	Maximum Power Point Tracking
PV	Photovoltaic
GFCI	Ground Fault Circuit Interrupter
V _{dc}	Voltage at the DC side
V _{ac}	Voltage at the AC side
V _{mpp}	Voltage at the Maximum Power Point
I _{mpp}	Amperage at Maximum Power Point
V _{oc}	Open Circuit Voltage
I _{sc}	Short Circuit Current
AC	Alternating Current (Form of electricity supplied by Utility Company)
DC	Direct Current (Form of electricity generated by PV modules)
VDE 0126-1-1	German standards for establishing suitability for Grid Connection of the Inverter.
UL 1741	US standards for establishing suitability for Grid Connection of the Inverter.

The user manual revise as follows(P43 and P44):

7.2 Setup

DISPLAY

After the inverter has started, programs will be initialized with the screen showing as follows;



Macsolar-Power
Initialize

Now in this interface you can check all necessary information about the system;

MacSolar-Power			
Pac	xx W	Temp	xx C
Fgrid	x.xx Hz	T-run	xx h
Vgrid	x.x V	E-day	x.xx kWh
Igrid	x.xx A	E-all	x.xx kWh
Vpv1	x.x V	Ipv1	x.xx A
Time:			

YIELD POWER

Press “OK” key to enter the main menu, the default screen is the “Yield Power”, it will show the cumulated power consumption by Day;

Yield Power		
Yield Power	Day	
Actual Value		x.xx kWh
Fault Info.	Total	
History data		x.xx kWh
Configure		
Device Info.		
Time:		

ACTUAL VALUE

Press “Down” key to enter “Actual Value”, then “Actual Value” is highlighted, please press “Right” key or “OK” key to enter the submenu, and select the actual information that you’d like to check;