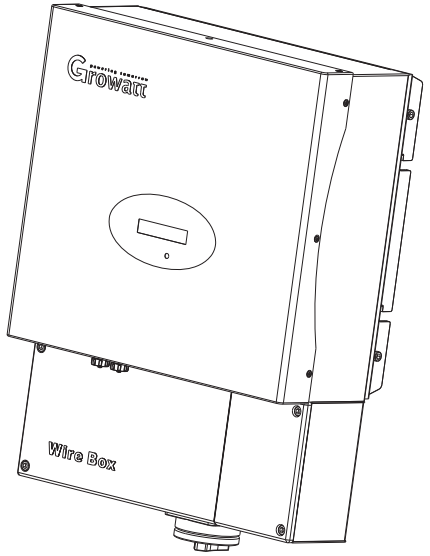
powering tomorrow

Growatt




Growatt 1500-US

Growatt 2000-US

Growatt 3000-US

# Installation & Operation Manual ▶

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AP - UM - 004 - 03

# Directory

# 1 Notes on this manual

## 1.1 Validity

This manual describes the assembly, installation, commissioning and maintenance of the following Growatt Inverters:

Growatt 1500-US
Growatt 2000-US
Growatt 3000-US

This manual does not cover any details concerning equipment connected to the Growatt inverter ( e.g. PV modules). Information concerning the connected equipment is available from the manufacturer of the equipment.

## 1.2 Target Group

| | |
|---|---|
| CAUTION | This manual is for qualified personnel. Qualified personnel have received training and have demonstrated skills and knowledge in the construction and operation of this device. Qualified personnel are trained to deal with the dangers and hazards involved in installing electric devices. |

## 1.3 Additional information

Find further information on special topics in the download area at

www.ginverter.com

## 1.4 Storage of the manuals

The manual and other documents must be stored in a convenient place and be available at all times. We assume no liability for any damage caused by failure to observe these instructions.

## 1.5 Symbols Used

The following types of safety instructions and general information appear in this document as described below:

| | |
|---|---|
| | Read the manual! |
| 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, could result in death or serious injury. |
| CAUTION | CAUTION indicates a hazardous situation which, if not avoided, could result in minor moderate injury. |
| NOTICE | Failure to observe a warning indicated in this manual may lead to damage to property |

## 1.6 Markings on this product

| Symbol | description |
|---|---|
|  | **Warning regarding dangerous voltage**<br>The product works with high voltage. All work on the product must only be performed as described in its documentation. |
|  | **Beware of hot surface**<br>The product can become hot during operation. Do not touch the product during operation. |
|  | **Observe the operating instructions**<br>Read the product's documentation before working on it. Follow all safety precautions and instructions as described in the documentation. |
|  | FCC certificate |
|  | **Intertek ETL mark**<br>it apply to the Growatt -US series certify that the inverter meet the safety standard UL1741. |
|  | Point of connection for grounding protection. |
|  | Direct Current (DC) |
|  | Alternating Current (AC) |





## 2.1 Safety Instructions



DANGER

**Danger to life due to lethal voltages!**
Lethal voltages are present within the unit and on the power supply lines. Therefore, only authorized electricians may install and open the unit.
Even when the unit is disconnected, high contact voltages may still be present within the unit.



DANGER

**Danger of burn injuries due to hot enclosure parts!**
During operation, the four sides of the enclosure lid and the heat sink may become hot.
Only touch the front enclosure lid during operation.



CAUTION

**Possible damage to health as a result of the effects of radiation!**
In special cases, there may still be interference for the specified application area despite maintaining standardized emission limit values (e.g. when sensitive equipment is located at the setup location or when the setup location is near radio or television receivers).In this case, the operator is obliged to take proper action to rectify the situation.
Do not stay closer than 20 cm to the inverter for any length of time.


NOTICE

**Grounding the PV generator**
Comply with the local requirements for grounding the PV modules and the PV generator. Growatt recommends connecting the generator frame and other electrically conductive surfaces in a manner which ensures continuous conduction with ground these in order to have optimal protection of the system and personnel.

NOTICE

The inverter may only be operated with a permanent connection to the public power grid. The inverter is not intended for mobile use. Any other or additional use is not considered the intended use. The manufacturer/supplier is not liable for damage caused by such unintended use. Damage caused by such unintended use is at the sole risk of the operator

NOTICE

**Capacitive Discharge Currents**

PV modules with large capacities relative to earth, such as thin-film PV modules with cells on a metallic substrate, may only be used if their coupling capacity does not exceed 470nF. During feed-in operation, a leakage current flows from the cells to earth, the size of which depends on the manner in which the PV modules are installed (e.g. foil on metal roof) and on the weather (rain, snow). This "normal" leakage current may not exceed 50mA due to the fact that the inverter would otherwise automatically disconnect from the electricity grid as a protective measure.

## ◆ Certified countries

With the appropriate settings, the unit will comply with the requirements specified in the following standards and directives

- UL 1741
- IEEE 1547
- CSA C22.2 No.107.1-1
- FCC Part15

Growatt can preset special grid parameters for other countries installation locations according to customer requests after evaluation by Growatt. You can make later modifications yourself by changing software parameters with respective communication products (e.g. shinebus or shineNet ect). To change the grid-relevant parameters, you need a personal access code, if you need it ,please contact with Growatt



## ◆ DC and AC Switch

Separate the Growatt -US securely from the grid and the PV generators using DC and AC Switch. DC and AC Switch shall be able to disconnect all unground conductors after installation.

## ◆ Grounding the PV modules

The Growatt-US is a transformerless inverter. That is why it has no galvanic separation. Do not ground the DC circuits of the PV modules connected to the Growatt -US. Only ground the mounting frame of the PV modules.
If you connect grounded PV modules to the Growatt -US, the error message "PV ISO Low".

## ◆ Approprite Usage

The Growatt Inverter converts DC Current from PV generator into AC current.
The inverter is suitable for mounting indoors and outdoors.
You can use the AC current gernerated as follows:

| | |
|---|---|
| House grid: | Energy flows into the house grid. The consumers connected, for example, household devices or lighting, consume the energy. The energy left over is fed into the public grid. When the Growatt is not gernerating any energy, e.g., at night, the consumers which are connected are supplied by the public grid.The Growatt does not have its own energy meter. When energy is fed into the public grid, the energy meter spins backwards. |
| Public grid: | Energy is fed directly into the public grid. The Growatt is connected to a separate energy meter. The energy produced is compensated at a rate depending on the electric power company. |

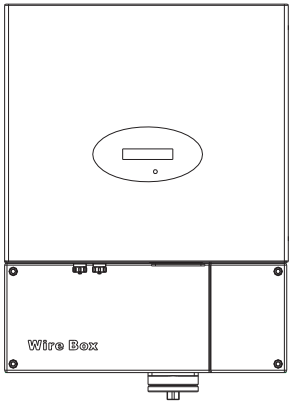
Persons with limited physical or mental abilities may only work with the Growatt inverter following proper instruction and under constant supervision. Children are forbidden to play with the Growatt inverter. Must keep the Growatt inverter away from children

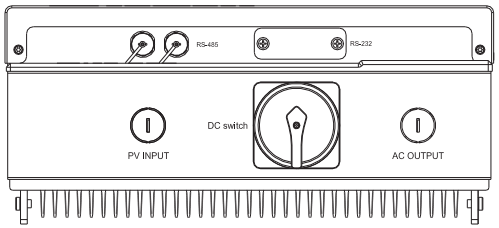
◆ **Qualification of Skilled Workers**

- Knowledge of how an inverter works and is operated
- Instruction in how to deal with the dangers and risks associated with installing and using electrical devices and plants
- Training in the installation and commissioning of electrical devices and plants
- Knowledge of all applicable standards and guidelines
- Knowledge and observance of this manual and all safety instructions

# 3 Product Description

## 3.1 Inverter Overview:

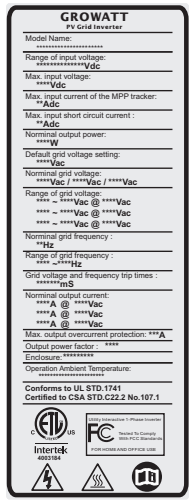



## 3.2 Information of Label

You can identify the pv inverter by the type label. It is on the left side of the enclosure.

- The type of product (Type/Model)
- Device-specific characteristics
- Specifications of the inverter
- Serial number




## 3.3 Dimensions and weight

| Model | Height (H) | Width (W) | Depth (D) | Weight |
|---|---|---|---|---|
| Growatt1500-US | 465 mm<br>18.3inch | 360 mm<br>14.2inch | 165 mm<br>6.5inch | 14.6 kg<br>32.2 lb |
| Growatt2000-US | 465 mm<br>18.3inch | 360 mm<br>14.2inch | 165 mm<br>6.5inch | 15.1 kg<br>33.3 lb |
| Growatt3000-US | 465 mm<br>18.3inch | 360 mm<br>14.2inch | 165 mm<br>6.5inch | 15.9 kg<br>35.1 lb |

## 3.4 Transportation

The inverter is thoroughly tested and inspected strictly before delivery. Our inverters leave our factory in proper electrical and mechanical condition. Special packaging ensures safe and careful transportation. However, transport damage may still occur. The shipping company is responsible in such cases. Thoroughly inspect the inverter upon delivery. Immediately notify the responsible shipping company if you discover any damage to the packaging which indicates that the inverter may have been damaged or if you discover any visible damage to the inverter. We will be glad to assist you, if required. When transporting the inverter, the original or equivalent packaging should to be used, and the maximum layers for original carton is four, as this ensures safe transport.

## 3.5 Storage of Inverter

If you want to storage the inverter in your warehouse, you should choose an appropriate location to store the inverter.

- The unit must be stored in original package and desiccant must be left in the package.
- The storage temperature should be always between -25℃and +60℃. And the storage relative humidity should be always between 0 and 95%.
- If there are a batch of inverters need to be stored, the maximum layers for original carton is four.
- After long term storage, local installer or service department of Growatt should perform a comprehensive test before installation

## 3.6 The advantage of the unit

- Maximum efficiency of 97%
- Growatt 1500-US CEC efficiency of 96%
- Growatt 2000-US&Growatt 3000-US CEC efficiency of 96.5%
- Integrated wire box
- Integrated DC switch
- High MPP efficiency of 99.5%
- Adapt to multi gird model(208Vac/240Vac/277Vac)
- Sound control
- Easy installation



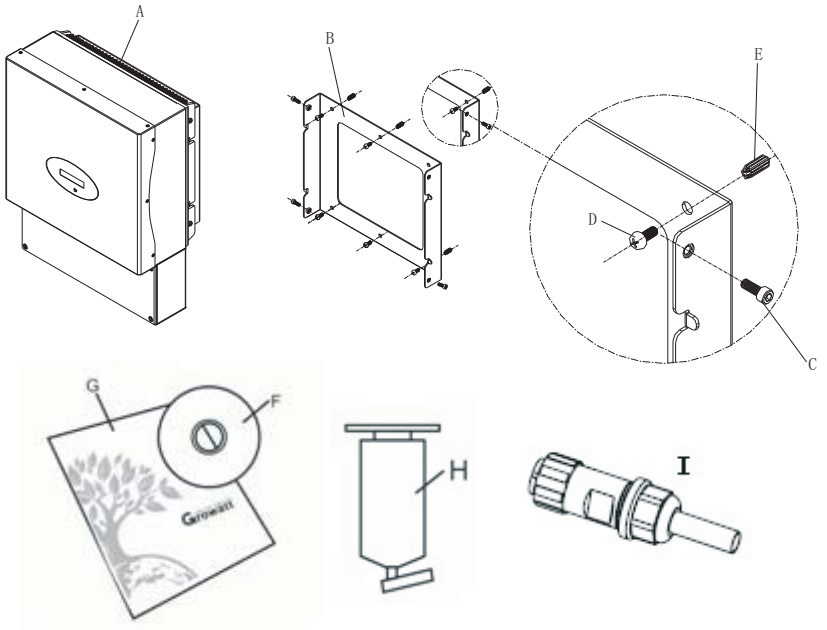


## 4.1 Unpacking and inspection

Thoroughly inspect the packaging upon received. If any damage to the carton is visible, or if you find that the inverter unit is damaged after unpacking, please notify the shipping company and GROWATT NEW ENERGY TECHNOLOGY CO.,LTD immediately.

Meanwhile please check the delivery for completeness and for visible external damages of the inverter. If there are anything damaged or missing, please contact your dealer. Don't dispose its original package. If you want to transport the inverter, it is better to store the inverter into the original package.

Complete delivery should contain as follows:



| Item | Name | Quantity |
|---|---|---|
| A | inverter | 1 |
| B | Mounting frame | 1 |
| C | Safety-lock screws | 4 |
| D | Mounting screws | 6 |
| E | Mounting frame screws sleeve | 6 |
| F | Monitor software(disk) | 1(Optional) |
| G | Manual | 1 |
| H | Bluetooth | 1(Optional) |
| I | RS485 connectors | 2 |

| | |
|---|---|
| NOTICE | Though the packaging box of Growatt is durable, please treat the packing box gently and avoid dispose the packing box. In this package, they are inverter ,cystosepiment and carton from inside to outside. |

# Installation and Electrical Connection 5

## 5.1 Safety

DANGER

**Danger to life due to fire or explosion**

Despite careful construction, electrical devices can cause fires.

Do not install the inverter on easily flammable materials and where flammable materials are stored.

DANGER

**Risk of burns due to hot enclosure parts**

Mount the inverter in such a way that it cannot be touched inadvertently.

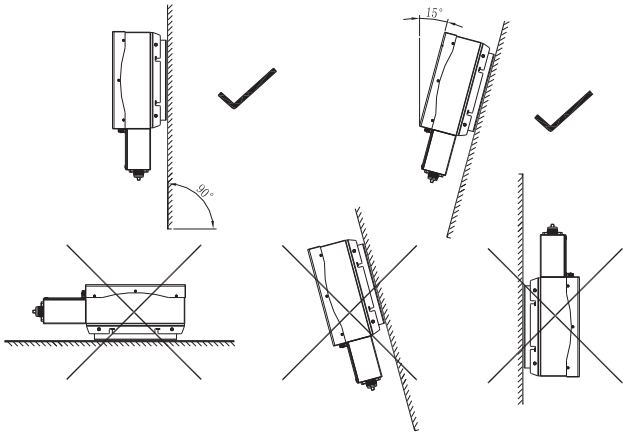
- All electrical installations shall be done in accordance with the local and national electrical codes. Do not remove the casing. Inverter contains no user serviceable parts. Refer servicing to qualified service personnel. all wiring and electrical installation should be conducted by a qualified service personnel .
- Carefully remove the unit from its packaging and inspect for external damage. If you find any imperfections, please contact your local dealer.
- Be sure that the inverters connect to the ground in order to protect property and personal safety.
- The inverter must only be operated with PV generator. Do not connect any other source of energy to it.
- Both AC and DC voltage sources are terminated inside the PV Inverter. Please disconnect these circuits before servicing.

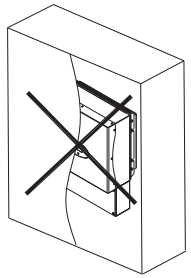
DANGER

- This unit is designed to feed power to the public power grid (utility) only. Do not connect this unit to an AC source or generator. Connecting Inverter to external devices could result in serious damage to your equipment.
- When a photovoltaic panel is exposed to light, it generates a DC voltage. When connected to this equipment, a photovoltaic panel will charge the DC link capacitors.
- Energy stored in this equipment's DC link capacitors presents a risk of electric shock. Even after the unit is disconnected from the grid and photovoltaic panels, high voltages may still exist inside the PV-Inverter. Do not remove the casing until at least 5 minutes after disconnecting all power sources.
- Although designed to meet all safety requirements, some parts and surfaces of Inverter are still hot during operation. To reduce the risk of injury, do not touch the heat sink at the back of the PV-Inverter or nearby surfaces while Inverter is operating.

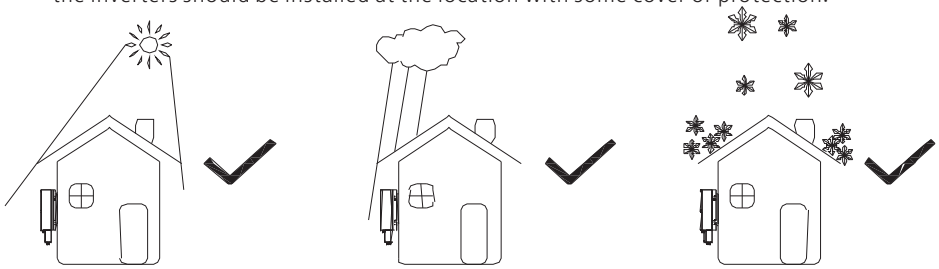
## 5.2 Selecting the installation location

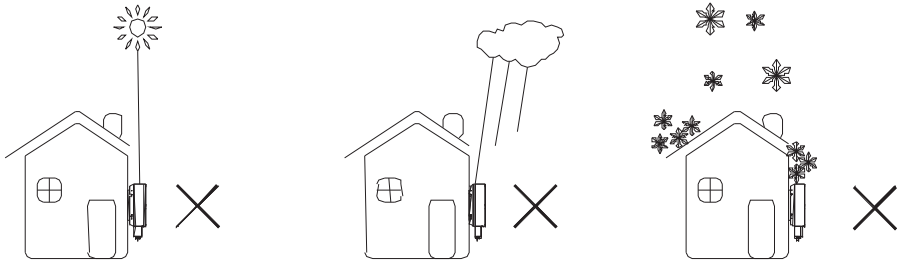
- This is guidance for installer to choose a suitable installation location, to avoid potential damages to device and operators.
- Raintight or wet location hubs that comply with the requirements in the Standard for Conduit, Tubing, and Cable Fittings, UL 514B, are to be used.
- The unit shall be mounted at least 914 mm (3 feet) above the ground.
- The installation location must be suitable for the inverter's weight and dimensions for a long period time.
- Select the installation location so that the status display can be easily viewed.
- Do not install the inverter on structures constructed of flammable or thermolabile materials.
- The humidity of the installation location should be 0~95% without condensation.
- The installation location must be freely and safely to get at all times.
- Vertically installation or tilted backwards by max. 15°. and make sure the connection of inverter must be downwards. Never install horizontal and avoids forward and sideways tilt.
- Be sure that the inverter is out of the children's reach.
- Don't put any things on the inverter. Do not cover the inverter.
- Do not install the inverter near television antenna or any other antennas, antenna cables.
- Inverter requires adequate cooling space. Providing better ventilation for the inverter to ensure the heat escape adequately. The ambient temperature should be below 40°C to ensure optimum operation. Please make sure the inverter is installed at the right place，The inverter can't install close to trunk。



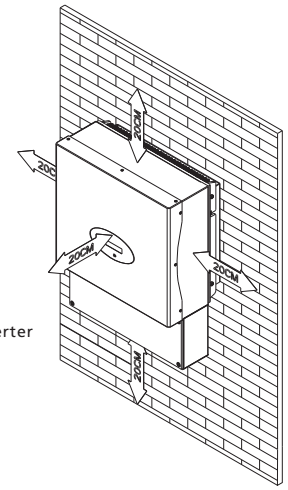
The inverter can't install to direct sunlight,drench,firn location. We suggest that the inverters should be installed at the location with some cover or protection.



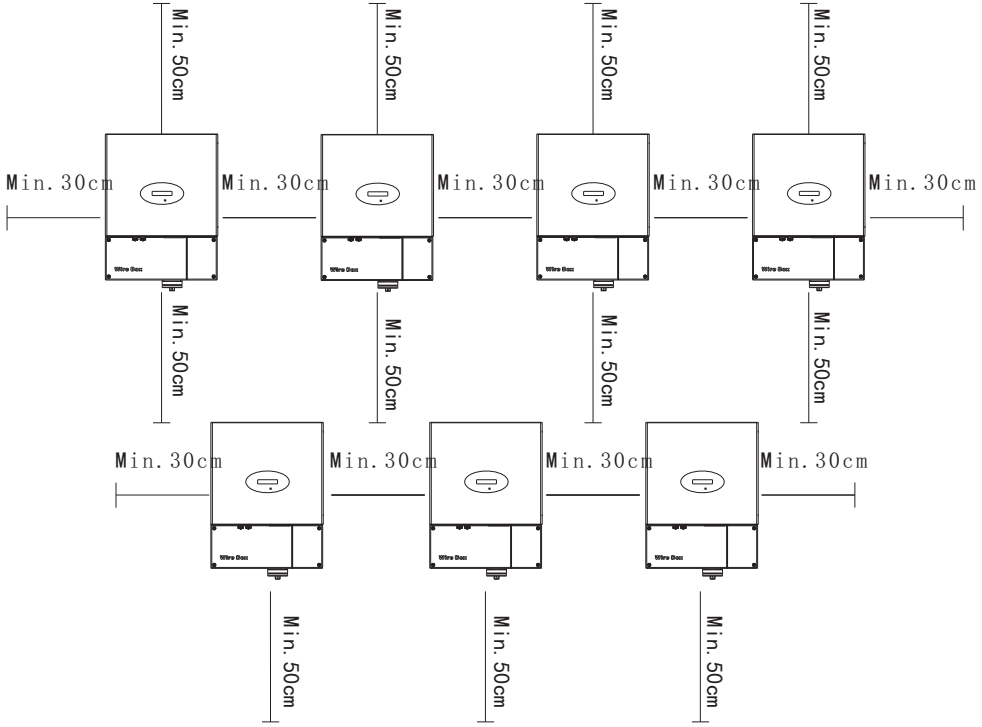


- Observe the minimum clearances to walls, other inverters or objects as shown in the diagram below in order to guarantee sufficient heat dissipation.

| Direction | Min.clearance(cm) |
|---|---|
| above | 30 |
| below | 50 |
| sides | 30 |
| front | 30 |




Ambient dimensions of one inverter




Ambient dimensions of a series inverters

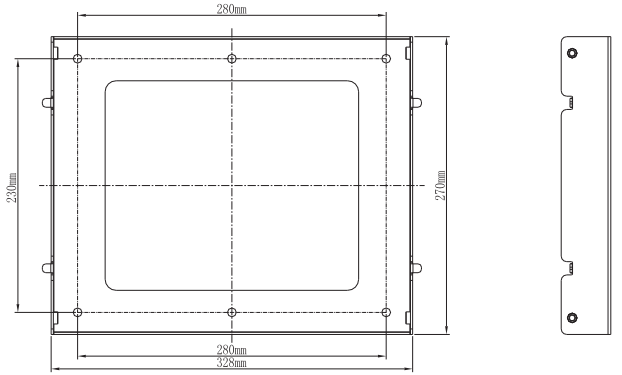
- There must be sufficient clearance between the individual inverters to ensure that the cooling air of the adjacent inverter is not taken in.
- If necessary, increase the clearance spaces and make sure there is enough fresh air supply to ensure sufficient cooling of the inverters.

## 5.3 Mounting the Inverter with bracket

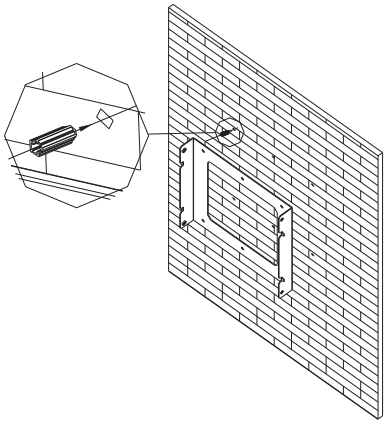
**WARNING**

In order to avoid electrical shock or other injury, inspect existing electronic or plumbing installations before drilling holes.

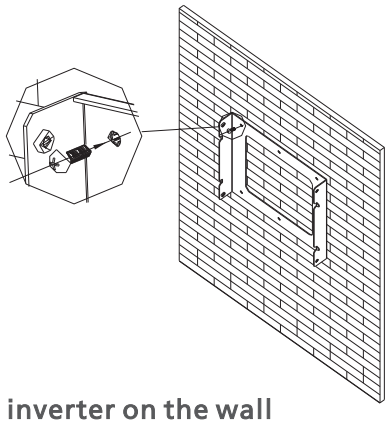
- The dimension of bracket as follow




- Using the mounting frame as a template, drill holes as illustrated in image.



- Fix the mounting frame as the figure shows. Do not make the screws to be flush to the wall. Instead, leave 2 to 4mm exposed.

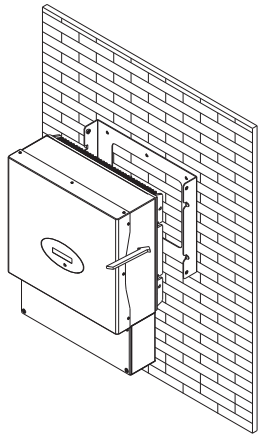


## 5.4 Fixed the inverter on the wall

**WARNING**

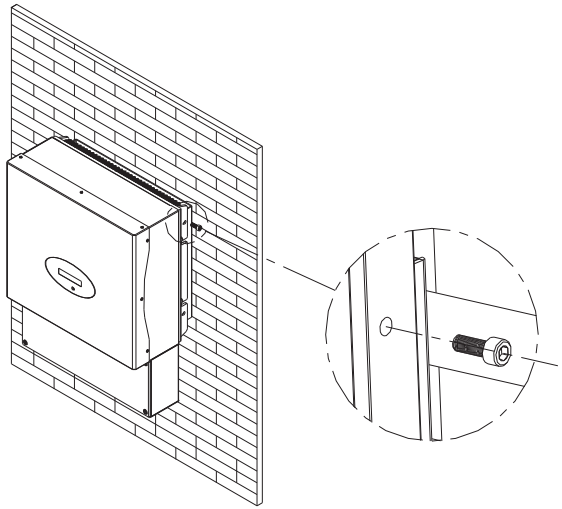
Falling equipment can cause serious or even fatal injury, never mount the inverter on the bracket unless you are sure that the mounting frame is really firmly mounted on the wall after carefully checking.

- Rise up the inverter a little higher than the bracket. Considered the weight of them. During the process please maintain the balance of the inverter.Hang the inverter on the bracket through the match hooks on bracket.





- After confirming the inverter is fixed reliably, fasten four M6 safety-lock sokets head cap screws on the left and right side firmly to prevent the inverter from being lifted off the bracket.



## 5.5 Check Inverter Installation Status

- Check the upper straps of inverter and ensure it fits on to the bracket.
- Check the secure mounting of the inverter by trying to raise it from the bottom. The inverter should remain firmly attached.
- Choose a strong mounting wall to prevent vibrations while inverter is operating.

## 5.6 Electrical Connection

### 5.6.1 Safety

**DANGER**

Danger to life due to lethal voltages!
High voltages which may cause electric shocks are present in the conductive parts of the inverter. Prior to performing any work on the inverter, disconnect the inverter on the AC and DC sides

WARNING

Danger of damage to electronic components due to electrostatic discharge.
Take appropriate ESD precautions when replacing and installing the inverter.

DANGER

Before connecting the power cables, you much connect both ground wire of DC and AC side in wire box first.

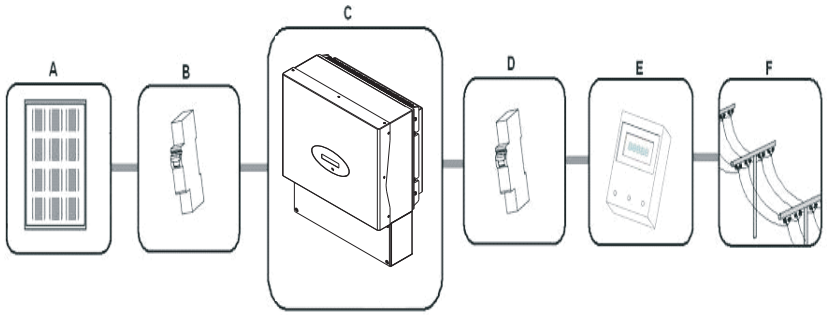
### 5.6.2 System Diagram with Inverter Electrical

### Intended Use

The unit converts the DC current generated by the photovoltaic (PV) modules to grid-compliant alternating current and feed-in into the electricity grid. Growatt inverters are built according to all required safety rules. Nevertheless, improper use may cause lethal hazards for the operator or third parties, or may result in damage to the units and other property.

- This unit or system is provided with fixed trip limits and shall not be aggregated above 30 kW on a single Point of Common Connection.
- PV Panel: Provide DC power to inverter.
- Converts DC (Direct Current) power from PV panel to AC (Alternating Current) power. Because Inverter is grid-connected, it controls the current amplitude according to the PV Panel power supply. Inverter always tries to convert the maximum power from your PV panel.
- Connection system: This "interface" between Utility and PV-Inverter may consist of electrical breaker, fuse and connecting terminals. To comply with local safety standards and codes, the connection system should be designed and implemented by a qualified technician.
- Utility: Referred to as "grid" in this manual, is the way your electric power company provides power to your place.

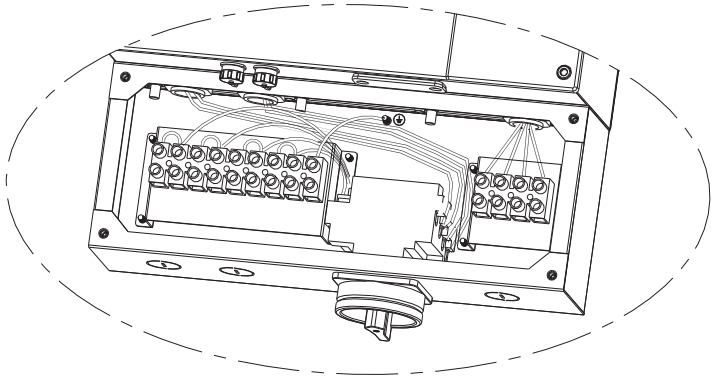





Principle of PV plant system

| Position | Description |
|---|---|
| A | PV modules |
| B | DC load circuit fuse or breaker |
| C | Growatt Inverter |
| D | AC load circuit fuse or breaker |
| E | Energy meter |
| F | Utility grid |

### Wire box



In the wire box, the right side is AC output wire connection terminal, and the left side is PV input wire connection terminal, the middle is DC switch.

NOTICE

Use only solid or stranded wire but not fine stranded wire.

- Use cables with high ambient temperatures.
- Use cables with a large cross-section .


| Code | Name | Detail |
|---|---|---|
| A | Conductor cross-section | Conductor cross-section |
| B | Stripping insulation | 12mm |

## 5.6.3 Connecting to the grid (AC utility)

### Grid standard

Before wiring the inverter, the installer needs to determine the grid configuration that the inverter will be connected to. The Growatt inverter is default set for utility interconnection with 240Vac from factory. However, you can choose the Net MODEL through the LCD to set the inverter to be fitted the commonly used utility configuration types shown in the figure 5.6.3.
Based on the local grid standards, it is possible to select different connection types. The available configurations are shown in the following table:

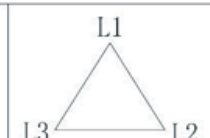
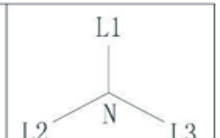
| GRID STANDARD |   208Vac 3phase-△ | | |   240Vac 3phase-△ | | |   277 3phase-Y | | |
|---|---|---|---|---|---|---|---|---|---|
| **AC terminal pin (from left to right)** | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| **wiring to terminal pin** | L1 | L2 | PE | L1 | L2 | PE | L1 | N | PE |
| NET MODEL | NET MODEL:2 (Option) | | | NET MODEL:3 (Default) | | | NET MODEL:4 (Option) | | |

figure 5.6.3



NOTE: in the inverter wire box,AC terminal pin is written as L1,L2 and PE,not the pin number,that just for the default net model.
if you connect to other net model,you much connect the wire to the terminal pin number exactiude as above.

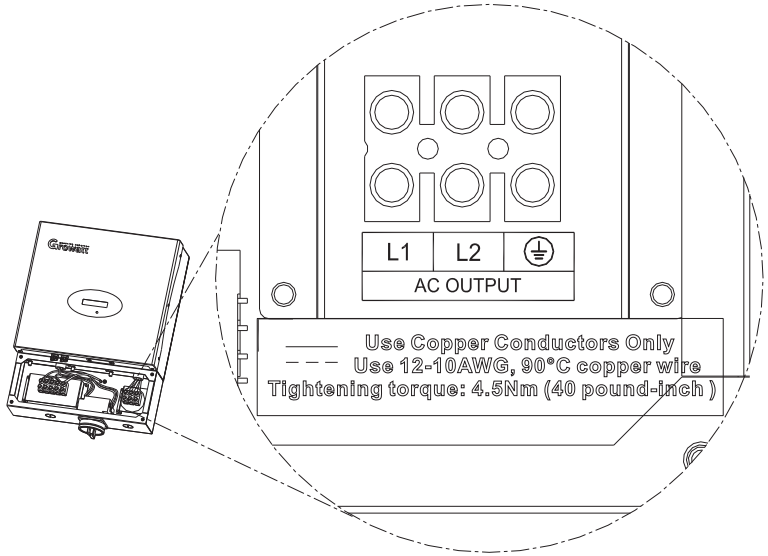
WARNING

If several Growatt inverter are installed in a three-phase AC grid. it is recommended to distribute the inverters between the phases in order to reduce the power unbalances between the phases. Always refer to the local standards.

WARNING

si plusieurs Growatt inverter sont installés sur un réseau électrique à courant alternatif à trois phases. Il est recommandé de distribuer les onduleurs entre les phases pour réduire les déséquilibres de puissance entre les phases. Toujours vous référer aux normes locales.

### Connection of the AC cable



## Output connection terminal

➢ Make sure the grid (AC utility) configuration types .If you grid standard is not the factory default type, don't worried, you just need to wire the local AC grid according with the figure 5.6.3, after wiring both DC input and AC output, you can use the LCD to choose the NET model to make the inverter suit the local grid type in the chapter 6.2 "Setting the LCD display".

➢ You must install a AC separate circuit-breaker or other load disconnection unit between the inverter and utility, in order to ensure that the inverter can be safely disconnected under load.

**The separate disconnection unit spec require as follow:**

WARNING

**Voltage:** the voltage much not less than the AC grid voltage which you connection.

**Current:** the current much not less than 1.2 times of the inverter max output current which defined in the inverter spec.

## We suggest the AC separate unit spec as follow:

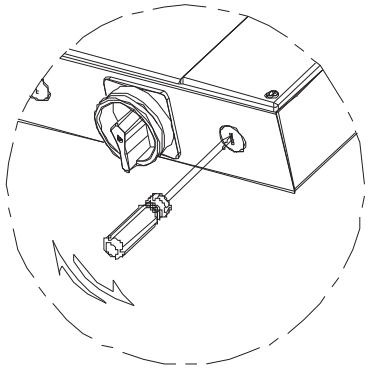
| Model / Grid type | Growatt 1500-US | Growatt 2000-US | Growatt 3000-US |
|---|---|---|---|
| @208Vac | 10A/400Vac | 15A/400Vac | 20A/400Vac |
| @240Vac | 10A/400Vac | 15A/400Vac | 20A/400Vac |
| @277Vac | 10A/400Vac | 10A/400Vac | 15A/400Vac |



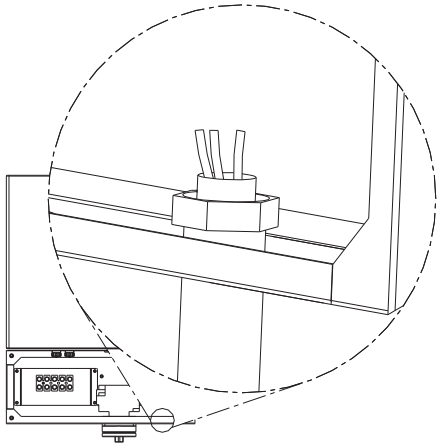
## ➢ Wiring Step :

1.Open the AC separate unit between the inverter and utility and the DC switch on the inverter.

2.Open the wire box cover and the knock-out hole.



3. installation rubber pipe into the knock-out hole and pull the pipe nut slightly, feed the cables through the pipe into the wire box till the terminal



4. The AC side terminal is clear, Connect cables into relevant terminals as the figure 5.6.3

- Cable requirements

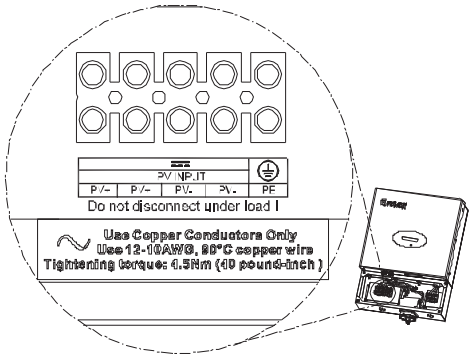
| Product Model | Area(mm²) | AWG No. |
|---|---|---|
| Growatt1500-US | 3.33~5.26 | 10~12 |
| Growatt2000-US | 3.33~5.26 | 10~12 |
| Growatt3000-US | 3.33~5.26 | 10~12 |

NOTICE

The cables length should not exceed 50 m, the resister of the cable will consume inverter output power , finally reduce the inverter efficiency .

### 5.6.4 Connect to PV Panel (DC input)

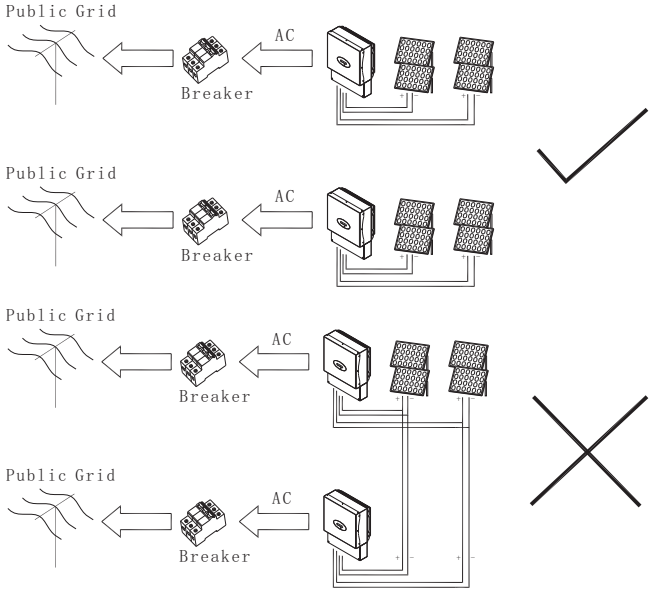
| | |
|---|---|
| DANGER | Risk of electric shock and fire, use only with PV modules, and with a maximum system voltage of 450Vdc for Growatt1500-US,500V for Growatt2000-US &Growatt3000-US. |
| | Electric shock hazard , the DC conductors of this photovoltaic system are normally ungrounded but will become intermittently grounded without indication when the inverter measures the PV array isolation.<br>Because of the transformer less design, the DC positive pole and DC negative pole of PV arrays are not permitted to be grounded. |
| | Do not disconnect the DC connectors under load! |




Input connection terminal

- Suggestions for the PV modules of the connected strings:
  - Same type
  - Same quantity of PV modules connected in series
- Wiring inverter in parallel

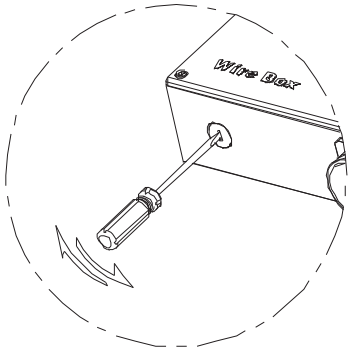
  The inverter can be connected in parallel in order to obtain more power, each inverter shall connect to its own PV array, cannot connect a single PV array to more than one inverter. That will cause the inverter to work abnormally, the worst condition inverter will be damaged.



- **Under any condition! Make sure the maximum open circuit voltage (Voc) of each PV string is less than 450Vdc for Growatt1500-US,500Vdc for Growatt2000-US&Growatt3000-US.**
  - Do not connect strings with an open circuit voltage greater than the Max. input voltage of the inverter. If the strings voltage exceeds the Max. input voltage of the inverter, it can be destroyed due to overvoltage. All warranty claims become void.
  - Check the design of the PV plant. The Max. open circuit voltage, which can occur at solar panels ambient temperature of -10℃, must not exceed the Max. input voltage of the inverter.
- Before connecting PV panels to DC terminals, please make sure the polarity is correct. Incorrect polarity connection could permanently damage the unit. Check short-circuit current of the PV string. The total short-circuit current of the PV string should be less than the inverter's maximum DC current.
- Connect the positive and negative terminals from the PV panel to positive (+) terminals and negative (-) terminals on the Inverter. Each DC terminal on Inverter can withstand 12Adc for 1500-US,14Adc for 2000-US, 17Adc for 3000-US.
  High voltages exist when the PV panel is exposed to the sun. To reduce risk of electric shock, avoid touching live components and treat connection terminals carefully

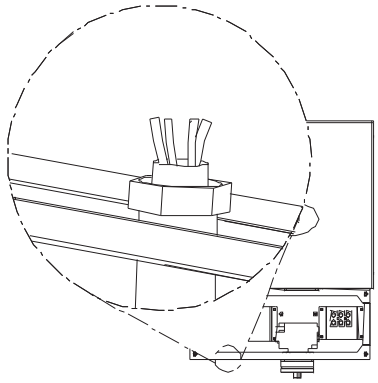
- **Wiring step:**

1.Open the independent DC separate unit ,the DC switch on the Growatt -US inverter and the AC separate unit.
2.Open the left hand side knock-out hole.






3.installation rubber pipe into the knock-out hole and pull the pipe nut slightly, feed the cables through the pipe into the wire box till the terminal.



4.connect the PV cables to the terminal correct.

- **Cable requirements**

| Product Model | Area(mm²) | AWG No. |
|---|---|---|
| Growatt1500-US | 3.33~5.26 | 10~12 |
| Growatt2000-US | 3.33~5.26 | 10~12 |
| Growatt3000-US | 3.33~5.26 | 10~12 |

## 5.7 Commissioning Checking

- Cover the wire box.
- Close the DC separate unit and the DC switch on the inverter.
- When the PV panels are connected and PV voltage is greater than 100 Vdc but the AC grid is not yet connected, the message on the LCD display produce the following messages in order: "Growatt Inverter"-> "Waiting" -> "No AC connection". The display repeats "No AC connection" and the LED will be red.
- Setting grid model choice. See the chapter 6.2 "Setting the LCD display".
- Close the AC separate unit between inverter and grid. The normal operating sequence begins.
- Under normal operating conditions the LCD displays "Power: xxxx.xW". That is the power fed to the grid. The LED turns green.
  This completes the check.

# 6 LCD display

## Glossary

| | |
|---|---|
| **AC** | Abbreviation for "Alternating Current". |
| **DC** | Abbreviation for "Direct Current". |
| **Energy** | Energy is measured in Wh (watt hours), kWh (kilowatt hours) or MWh (megawatt hours). The energy is the power calculated over time. If, for example, your inverter operates at a constant power of 20,000 W for half an hour and then at a constant power of 10,000 W for another half an hour, it has fed 15，000Wh of energy into the power distribution grid within that hour. |
| **Power** | Power is measured in W (watts), kW (kilowatts) or MW (megawatts). Power is an instantaneous value. It displays the power your inverter is currently feeding into the power distribution grid. |
| **Power rate** | Power rate is the radio of current power feeding into the power distribution grid and the maximum power of the inverter that can feed into the power distribution grid. |
| **Power Factor** | Power factor is the ratio of true power or watts to apparent power or volt amps. They are identical only when current and voltage are in phase than the power factor is 1.0. The power in an ac circuit is very seldom equal to the direct product of the volts and amperes. In order to find the power of a single phase ac circuit the product of volts and amperes must be multiplied by the power factor. |
| **PV** | Abbreviation for photovoltaics. |



## 6.1 Display and messages

### 6.1.1 LCD display

Starting-up display sequence, Once the PV power is sufficient, Inverter displays information as shown in the flow chart as follow:

Module: xxxxxx
Ser No: xxxxxxxxxx
FW Version: x.x.x
Connect in: xxS
Connect : OK
Power: xxxx.xW

### 6.1.2 LCD control

- The LCD display's backlight automatically turns off after 30 seconds to save the power. The display on the inverter can be control by Knock on the front of it.

| Symbol | Description | Explanation |
|---|---|---|
|  | Tap symbol | Indicates display operation |
|  | Inverter status symbol | Indicates inverter operation status |

- The first line will show some status of the inverter, there are 5 status listed in below table.

| The First Line Of LCD | | |
|---|---|---|
| STATE | DISPLAY CONTENT | REMARK |
| Wait State | Standby<br>Waiting<br>Connect in xx S<br>Reconnect in xx S | PV voltage low<br>Initial waiting<br>System checking<br>System checking |
| Inverter State | Connect OK<br>Power: xxxx.x W | Connect to Grid<br>Inverter watt at working |
| Fault State | Error: xxx | System Fault |
| Program State | Programming | Update Software |

While Growatt inverter is working, the first line will normally show Power status:

Power : 2016.4w
AC:241V F:60HZ

- The Second line can change by knock on .

| The Second Line Of LCD | | |
|---|---|---|
| Cycle display | Display time/S | Remark |
| Power : 2013.4w<br>model: P7U1M2S4 | 2 | The inverter model |
| Power : 2016.8w<br>FW Version: U.1.2 | 2 | The software version |
| Power : 2012.8w<br>SerNO:DK00000000 | 2 | The Serial Number |



| | | |
|---|---|---|
| Power : 2019.6w<br>Etoday: 7.1kwh | 4 | The energy today |
| Power : 2017.0w<br>Eall: 90kwh | 4 | The energy all |
| Power : 2123.4w<br>Ppv: 2123.4w | 4 | PV input watt |
| Power : 2013.4w<br>PV: 313 B: 370V | 4 | The PV and Bus Votage |
| Power : 2016.2w<br>AC: 241V F: 60.0Hz | 4 | The grid system |
| Power : 2019.5w<br>Set Language | 4 | Set Language |
| Power : 2008.2w<br>Set LCD Contrast | 4 | Set LCD Contrast |
| Power : 2019.5w<br>COM Address: Move | 4 | Set Communications Address |
| Power : 2016.2w<br>Net Model: 2 | 4 | Set Net Model |

When inverter started to connect to grid, the following message will appear on LCD screen.

Power : 2009.6w
Etoday: 7.1kwh

## 6.2 Setting the LCD display

The inverter can support three kinds of knock: single knock, double knock. Each kind of knock has different function. Refer to specified definition in Table below：

| Knock type | Definition |
|---|---|
| Single knock | Key Down |
| Double knock | Key SET |

Before light the background, the types of knock functions are the same: just light the background.
That the background light will automatically off if there is no knock detected in 10 seconds.

Sound control can define the display language, luminance of the display, and utility model choice. When the LCD is dark, Knock and double knock make it becomes bright. Knock to make it display next information or change the set situation. Double knock make the display stand for 30 second, enter to setting the menu.

- Setting language

Knock to make the display bright→ knock to "set language"→double knock to enter "language: English"→knock to select the language you need and wait until the display become dark.

- Setting luminance of the display

Knock to make the display bright →knock to "set LCD contrast"→double knock to enter "LCD contrast 2"→knock to select the luminance you need and wait until the display become dark.

- Setting communication address

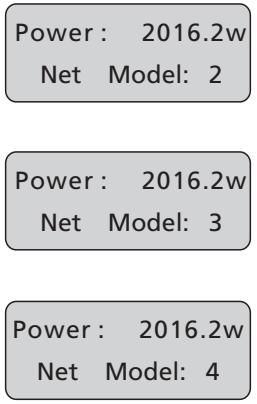
Knock to make the display bright-->knock to "COM Address: xx" -->double knock to change the Address model-->clock to set address.

- Setting grid model choice

This function is disable when the inverter work in the normal state, you much turn off the AC separate unit, and the inverter LCD will display a error "NO AC Connection" , LED turn red ,then this model choice function is enable.
Knock to make the display bright →knock to "Net Model: xx" →double knock to enter "Net Model: xx"→knock to select the grid model .need to wait for 10S till the CPU restart.
Then check the "NET Model" in LCD display again.
Turn on the AC separate unit, inverter begin to work.








## 7.1 Monitoring Products

### 7.1.1 Shine Net

Shine NET is a PC software that communicate with inverter to analyze the inverter working state. It is convenient for you to know the inverter's real-time working state and the history work information.

- Specification:

Communicate with inverter by RS232 and Bluetooth.
Construct net with inverter, GRO monitor and Shine NET by RS232, Bluetooth and Internet.
Two Interfaces: Multi Inverter Interface and Wave Data Interface.
In Multi Inverter Interface: See at most 4 inverters working data at the same time, you can select your own compare inverters and parameters.
In Wave Data Interface: Query the inverter real time and history power wave,work data and error information.
Multi languages: English, French, German, Spanish and etc.
Support OS: WinXP/ Vista/win7/2000/2003.

### 7.1.2 Shine Vision

Shine Vision, which consists of a power monitor and a number of transmitters, can achieve 1 to 6 monitoring modes. The transmitters transmit the power data collected from a photovoltaic inverter to the monitor and display the data onto the monitor screen, as along as data of generated energy, the gross generated energy and the generation income obtained from the above-mentioned data through some simple calculations. We can also see AC voltage, two-way PV voltage, indoor temperature, date and time, as well as CO2 emissions.

**Shine Vision**

### 7.1.3 Shine Pano

Shine Pano have a large touch screen, customers can browse data or set communication parameters, inverter parameters by touching easily. It is designed for solar power plant remote monitoring. While supporting both wired and wireless communication, ShineWebbox can simultaneously monitor, record and analyze inverter operating parameters real time with a maximum quantity of 50. Monitored data also can be sent to Shine Server.


**Shine Pano**



### 7.1.4 Shine Webbox

Shine WebBox is specially designed for solar power plant remote monitoring. While supporting both wired and wireless communication, Shine WebBox can simultaneously monitor, record and analyze inverter operating parameters real time with a maximum quantity of 50. Monitored data can be sent to ShineServer.


**Shine WebBox**

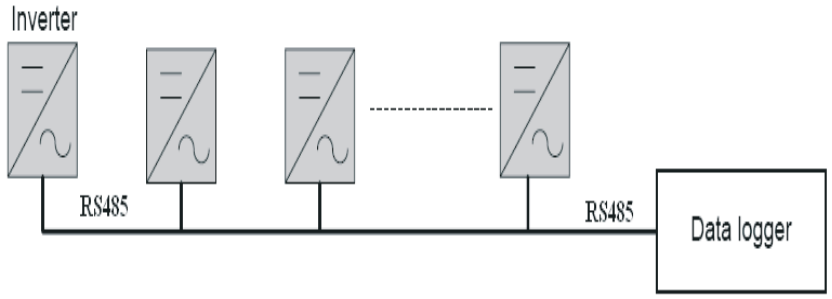
### 7.1.5 Shine Server

Shine Server is a remote data server, it is based on B/S structure. It can receive monitoring data from Shine Webbox or Shine Pano, and publish monitored data to LAN or WAN. User can easily access data browse interface via an Internet Explorer.

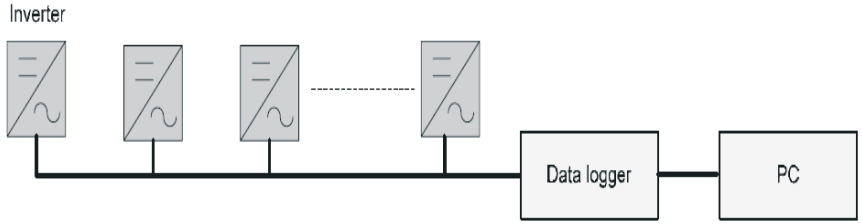
## 7.2 Monitoring System

The inverter provides RS485 interface and RS232 interface to communicate with remote PC or logger. User can monitor the inverter's state via the following types of communication systems.

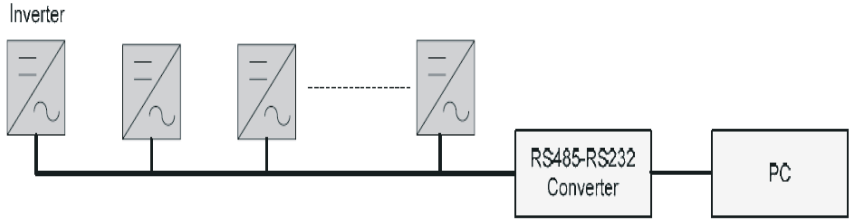
- Through RS485 interface-Data logger




- Through RS485 interface-Data logger+ PC



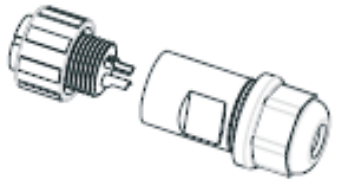

- Through RS485 interface-RS485-232 converter+ PC



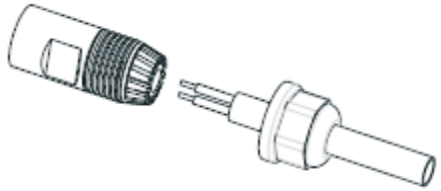



## 7.3 RS485 cable connection

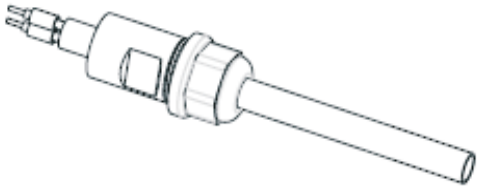
1. Unscrew the plastic connector.



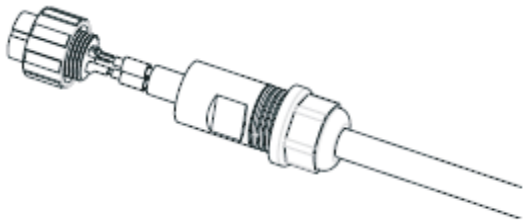
2. Make the RS485 cable go through the connector.



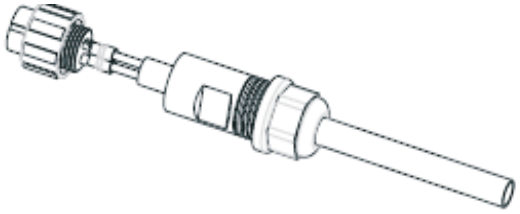
3. Put two heat shrink tubes onto the front head of RS485 cable.



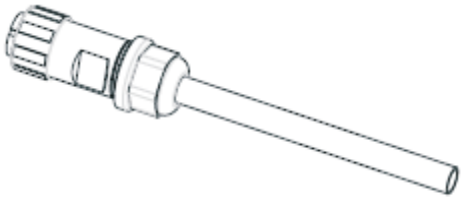
4. Insert the two metal head into relevant small cupreous hole, and fasten the connection by soldering.



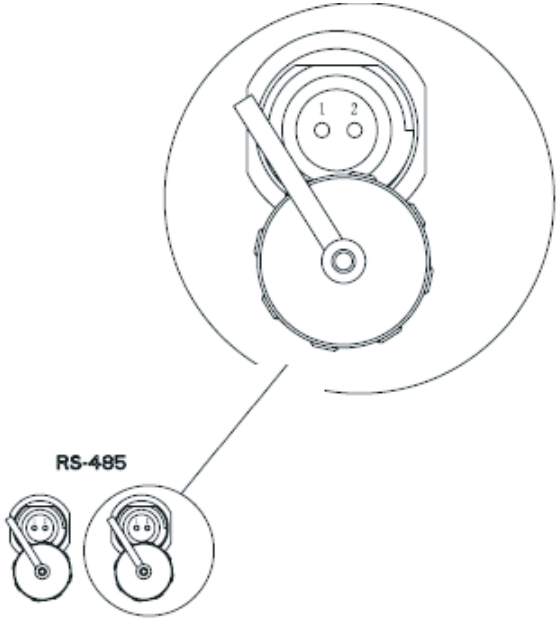
5. Make the heat shrink tubes wrap the joint.



5. Make the heat shrink tubes wrap the joint.



7. Connect the RS485 connector onto the inverter. Make sure the connection matched ('1' to '1', '2' to '2').






### 7.4 Using shine tool to set the information of the inverter

About the software of shine tool and the usage of it please download from the web: www.ginverter.com/Download.aspx

# Start-Up and shut down the inverter 8

### 8.1 Start-Up the inverter

1. Connect the AC circuit breaker
2. Turn on the DC switch, and the inverter will start automatically when the input voltage is higher than 150V.

### 8.2 Disconnecting the Inverter

1. Disconnect the AC circuit breaker and prevent it from being reactivated.
2. Turn off the dc switch.
3. Check the inverter operating status.
4. Waiting until LED,LCD display have gone out, the inverter is shut down.

# Maintenance and Cleaning 9

### 9.1 Checking Heat Dissipation

If the inverter regularly reduces its output power due to high temperature, please improve the heat dissipation condition. Maybe you need to clean the heat sink.

### 9.2 Cleaning the Inverter

If the inverter is dirty, shut down the inverter, then clean the enclosure lid, the display, and the LEDs using only a wet cloth. Do not use any cleaning agents (e.g. solvents or abrasives).

### 9.3 Checking the DC switch

Check for externally visible damage and discoloration of the DC disconnect and the cables at regular intervals. If there is any visible damage to the DC disconnect, or visible discoloration or damage to the cables, contact the installer.


Once a year, turn the rotary switch of the DC switch from the On position to the Off position 5 times in succession. This cleans the contacts of the rotary switch and prolongs the electrical endurance of the DC Disconnect.

# 10 Decommissioning

### 10.1 Dismantling the Inverter

1. Disconnect the inverter as described in chapter 10.
2. Remove all connection cables from the inverter.


**Danger of burn injuries due to hot enclosure parts!**
Wait 20 minutes before disassembling until the housing has cooled down.

3. Screw off all projecting cable glands.
4. Lift the inverter off the bracket and unscrew the bracket screws.

### 10.2 Packing the Inverter

If possible, always pack the inverter in its original carton and secure it with tension belts. If it is no longer available, you can also use an equivalent carton. The box must be capable of being closed completely and made to support both the weight and the size of the inverter.

### 10.3 Storing the Inverter

Store the inverter in a dry place where ambient temperatures are always between -25°C and +60°C.

### 10.4 Disposing of the Inverter

Do not dispose of faulty inverters or accessories together with household waste. Please accordance with the disposal regulations for electronic waste which apply at the installation site at that time. Ensure that the old unit and, where applicable, any accessories are disposed of in a proper manner

# 11 Trouble shooting

Sometimes, the PV inverter does not work normally, we recommend the following solutions for common troubleshooting. The following table can help the technician to understand the problem and take action.

| Error message | Description | Suggestion |
|---|---|---|
| No AC Connection | No utility grid connected or utility grid power failure. | 1.Check AC wiring, especially the ground wire<br>2.ContactGrowatt. |
| AC V Outrange | Utility grid voltage is out of permissible range. | 1.Check grid typ and voltage.<br>2.If the error message still exists despite the grid voltage being within the tolerable range, contact Growatt. |
| AC F Outrange | Utility grid frequency out of permissible range. | 1.Check grid frequency.<br>2.If the error message is displayed despite the grid frequency being within the tolerable range, contact Growatt. |
| Over Temperature | Temperature outrange | 1.check the inverter operation state<br>2.If the error message is displayed still,please contact Growatt. |
| PV Isolation Low | Insulation problem | 1.Check if panel enclosure ground properly.<br>2.Check if inverter ground properly.<br>3.Check if the DC breaker gets wet.<br>4.If the error message is displayed despite the above checking passed, contact Growatt. |
| Output High DCI | Output current DC offset too high | 1.Restart inverter.<br>2.If error message still exists, contact Growatt. |
| Residual I High | Leakage current too high | 1.Restart inverter.<br>2.If error message still exists, contact Growatt. |
| PV Voltage High | The DC input voltage is exceeding the maximum tolerable value. | Disconnect the DC switch immediately. |
| Error: 100 | 2.5V reference voltage fault | 1.Restart inverter<br>2.If error message still exists, contact Growatt. |
| Error: 101 | Communication fault Slave processor can't receive data from Master processor. | 1.Restart inverter<br>2.If error message still exists, contact Growatt. |
| Error: 102 | Consistent fault. Data received by Master and Slave processor are different. The reason can be utility grid voltage or frequency change frequently. | 1.Restart inverter.<br>2.If error message appears frequently or error message still exists after replacement, check utility grid. if you require help, contact Growatt.<br>3.If error message still exists, contact Growatt. |
| Error: 116 | EEPROM fault | Contact Growatt. |
| Error: 117 | Relay fault | Contact Growatt. |
| Error: 118 | Init model fault | Contact Growatt. |
| Error: 119 | GFCI Device Damage | Contact Growatt. |
| Error: 120 | HCT fault | Contact Growatt. |
| Error: 121 | Communication fault. Master processor can't receive data from Slave processor. | 1.Restart the inverter<br>2.If error message still exists, contact Growatt. |
| Error: 122 | Bus voltage fault | Contact Growatt. |

# 12 Operation Modes

## 12.1 Normal Mode

In this mode, the inverter works normally and LED turns green.

1. Whenever the DC voltage is higher than 150Vdc, inverter converts power to grid as generated by the PV panels;
2. Whenever the DC voltage is lower than 150Vdc, the inverter will work in waiting state and attempt to connect the grid. In waiting state the inverter consumes just enough power generated by the PV panel to monitor the internal system status;


The inverter starts up automatically when the DC power from the PV panel is sufficient.

## 12.2 Fault Mode

The internal intelligent controller can continuously monitor and adjust the system status. If inverter finds any unexpected conditions such as system fault and inverter fault, the fault information will be displayed on the LCD. In fault mode the LED turns red.


Detailed fault information refers to 13. Trouble shooting.

## 12.3Shutdown Mode

Inverters automatically stop running during periods of little or no sunlight. In shutdown mode the inverters take no power from the grid and panel, and the LCD and LED turns off.


If the PV string DC voltage is too low, the inverter will also turn to Shutdown Mode.



# De-rating Operation 13

Temperature

The inverter will monitor the temperature of the heat-sink. Once the temperature exceeds 75°C (167°F) ,the system will reduce the output power until the temperature drops under the critical value. The inverter will shut down the power output to the grid if the temperature reaches 85°C (185°F). If this occasion happens often, it is necessary to check whether the inverter is mounted at an appropriate place with good ventilation and not directly exposure to the sunshine.

# Manufacturer Warranty 14

This certificate represents a 10 year warranty for the Growatt inverter products listed below. Possession of this certificate validates a standard factory warranty of 5 years from the date of purchase.

## 14.1 Warranted products

This warranty is applicable solely to the following products:
Growatt1500-US;Growatt2000-US;Growatt3000-US
Growatt3600MTL-US;Growatt4200MTL-US;Growatt5000MTL-US

## 14.2 Limited Product Warranty

(Applicable under normal application, installation, use and service conditions)
Growatt warrants the above listed products to be free from defects and/or failure specified for a period not exceeding ten (10) years from the date of sale as shown in the Proof of Purchase to the Original purchaser.

The warranties described in these "Limited Warranties" are exclusive and are expressly in lieu of and exclude all other warranties, whether written, oral, express or implied, including but not limited to, warranties of merchantability and of fitness for a particular purpose, use，or application, and all other obligations or liabilities on the part of Growatt，unless such other obligations or liabilities are expressly agreed to it in writing signed and approved by Growatt， Growatt shall have no responsibility or liability whatsoever for damage or injury to persons or property, or for other loss or injury resulting from any cause whatsoever arising out of or related to the modules, including, without limitation, any defects in the modules or from use or installation. Under no circumstances shall Growatt be liable for incidental , consequential or special damages howsoever caused; loss of use, loss of production, loss of revenues are therefore specifically and without limitation excluded to the extent legally permissible, Growatt's aggregate liability, if any, in damages or otherwise, shall not exceed the invoice as paid by the customer.

The "**Limited Product Warranties**" described above shall not apply to, and Growatt shall have no obligation of any kind whatsoever with respect to, any inverter which has been subjected to:

— Misuse, abuse, neglect or accident;
— Alteration, improper installation or application;
— Unauthorized modification or attempted repairs;
— Insufficient ventilation of the product;
— Transport damage;
— Breaking of the original manufacturers seal;
— Non-observance of Growatt installation and maintenance instruction;
— Failure to observe the applicable safety regulations
— Power failure surges, lighting, flood, fire, exposure to incorrect use, negligence, accident, force majeure, explosion, terrorist act, vandalism or damage caused by incorrect installation, modification or extreme weather conditions or other circumstances not reasonably attributable to Growatt.

The warranty shall also cease to apply if the product cannot be correctly identified as the product of Growatt. Warranty claims will not be honored if the type of serial number on the inverters have been altered, removed or rendered illegible.



### 14.3 Liability

The liability of Growatt in respect of any defects in its PV inverters shall be limited to compliance with the obligations as stated in these terms and conditions of warranty. Maximum liability shall be limited to the sale price of the product. Growatt shall accept no liability for loss of profit, resultant of indirect damage, any loss of electrical power and/or compensation of energy suppliers within the express meaning of that term.

The warranty rights as meant herein are not transferable or assignable to any third party excepting the named warranty holder.

### 14.4 Warranty conditions

If a device becomes defective during the agreed Growatt factory warranty period and provided that it will not be impossible or unreasonable, the device will be, as selected by Growatt.

- Shipped to a Growatt service centre for repair, or repaired on-site, or exchanged for a replacement device of equivalent value according to model and age.

The warranty shall not cover transportation costs in connection with the return of defective modules. The cost of the installation or reinstallation of the modules shall also be expressly excluded as are all other related logistical and process costs incurred by all parties in relation to this warranty claim.

# Technical Data 15

### 15.1 Specification

| Model / Specifications | Growatt 1500-US | Growatt 2000-US | Growatt 3000-US |
|---|---|---|---|
| **Input data** | | | |
| Max. DC power | 1800W | 2300W | 3200W |
| Max. DC voltage | 450V | 500V | 500V |
| Start voltage | 150V | 150V | 150V |
| DC nominal voltage | 360V | 360V | 360V |
| PV voltage range | 100V-450V | 100V-500V | 100V-500V |
| MPP voltage range | 120V-400V | 120V-450V | 120V-450V |
| Number of independent MPP trackers/strings per MPP tracker | 1/1 | 1/ 2 | 1/ 2 |
| Max. input current of the MPP tracker | 12A | 14A | 17A |
| **Output data** | | | |
| Nominal AC output power | 1500W@208V ac 1650W@240&277V ac | 1800W@208V ac 2000W@240&277V ac | 2500W@208V ac 2800W@240&277V ac |
| Max. output current | 8A/7.8A/6.8A | 9.7A/9.4A/8.2A | 15A/14.2A/12.3A |
| AC nominal voltage; range | Default:240V single phase optional:208,240or277 single phase 183-228@208V 211-264V@240V 244-305@277V | | |
| AC grid frequency; range | 60Hz;59.3-60.5Hz | 60Hz;59.3-60.5Hz | 60Hz;59.3-60.5Hz |
| Phase shift (cos$\varphi$) | 1 | 1 | 1 |
| THDI | <3% | <3% | <3% |
| AC connection | Single phase | Single phase | Single phase |



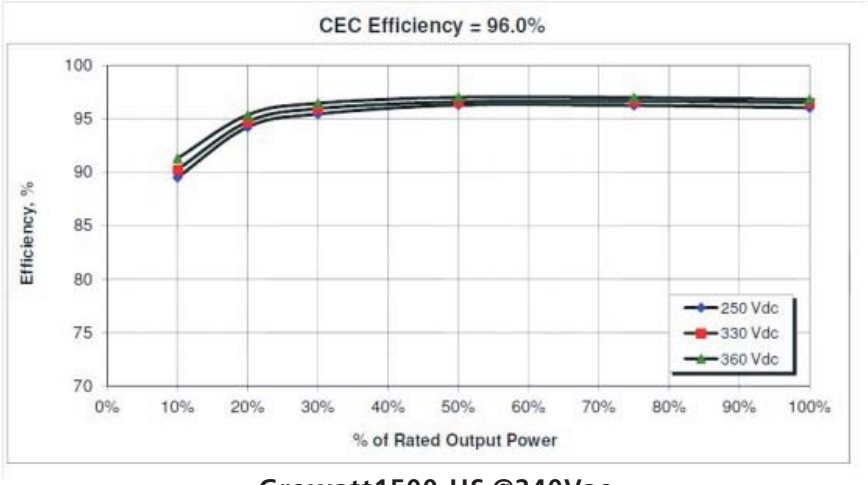
| | | | |
|---|---|---|---|
| **Efficiency** | | | |
| Max. efficiency | 97% | 97% | 97% |
| CEC efficiency | 96% | 96.5% | 96.5% |
| MPPT efficieny | 99.5% | 99.5% | 99.5% |
| **Protection devices** | | | |
| DC reverse polarity protection | yes | yes | yes |
| DC switch ratiing for each MPPT | yes | yes | yes |
| Output Over current protection | yes | yes | yes |
| Output Overvoltage Protection-varistor | yes | yes | yes |
| Ground fault monitoring | yes | yes | yes |
| Grid monitoring | yes | yes | yes |
| Integrated all - pole sensitive leakage current monitoring unit | yes | yes | yes |
| **General Data** | | | |
| Dimensions (W / H / D) in mm | 360/465/165 | 360/465/165 | 360/465/165 |
| Weight | 14.6KG | 15.1KG | 15.9KG |
| Operating temperature range | -25…+60℃ (-13…+ 140°F) with derating above 45°C (113°F) | -25…+60℃ (-13…+ 140°F) with derating above 45°C (113°F) | -25…+60℃ (-13…+ 140°F) with derating above 45°C (113°F) |
| Noise emission (typical) | ⩽ 25 dB(A) | ⩽ 25 dB(A) | ⩽ 25 dB(A) |
| Altitude | Up to 2000m(6560ft) without power derating | | |

| | | | |
|---|---|---|---|
| Relative humidity | 95% | 95% | 95% |
| Consumption: night | < 0.5 W | < 0.5 W | < 0.5 W |
| Topology | transformerless | transformerless | transformerless |
| Cooling concept | Natural | Natural | Natural |
| Enclosure | Type 3R | Type 3R | Type 3R |

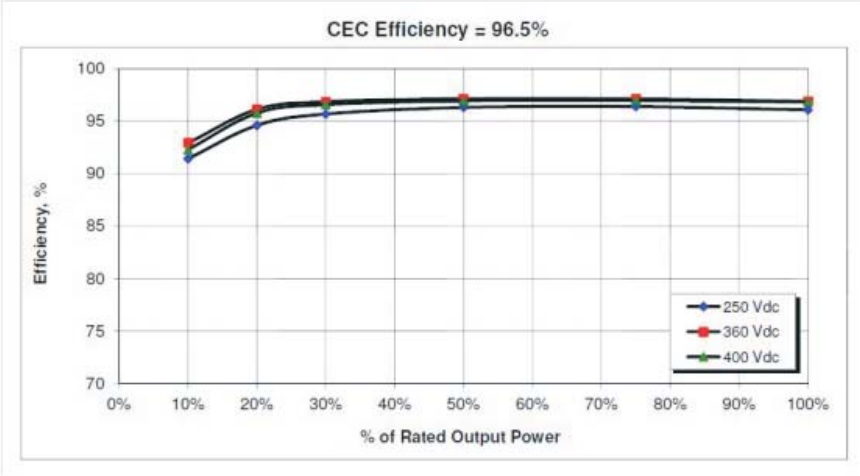
## Features

| | | | |
|---|---|---|---|
| DC connection: | Screw terminal | Screw terminal | Screw terminal |
| AC connection | Screw terminal | Screw terminal | Screw terminal |
| display | LCD | LCD | LCD |
| Interfaces: RS485/RS232/ Bluetooth/RF/Zigbee | yes/yes/opt/ opt/opt | yes/yes/opt/ opt/opt | yes/yes/opt/ opt/opt |
| Warranty: 10 years / 15 years | yes /opt | yes /opt | yes /opt |
| Certificates and approvals | UL1741,UL1998 IEEE 1547, CSA C22.2 No.107.1-1,FCC Part15(Class A&B) | | |

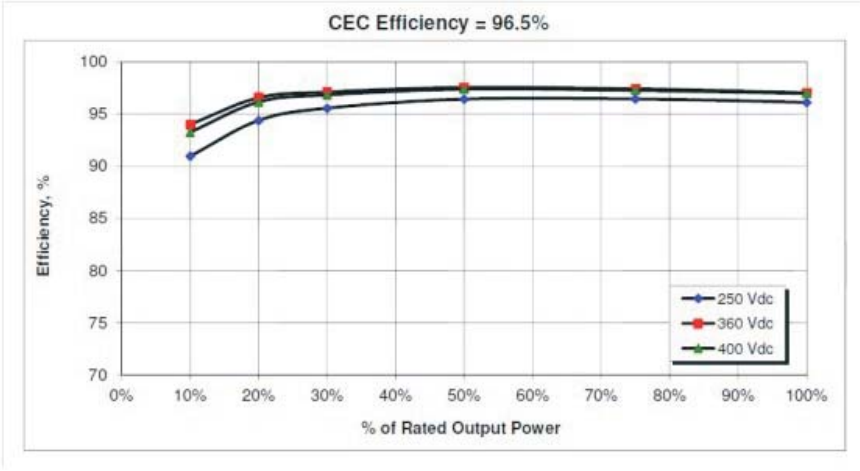
## 15.2 Efficiency curve




**Growatt1500-US @240Vac**




**Growatt2000-US @240Vac**




**Growatt3000-US @240Vac**

# 16 Download Address

www.ginverter.com/Download.aspx

# 17 Contact

**If you have technical problems about our products, contact the Growatt Service line. We need the following information in order to provide you with the necessary assistance:**

- Inverter type
- Serial number of the inverter
- Event number or display message of the inverter
- Type and number of PV modules connected
- Optional equipment