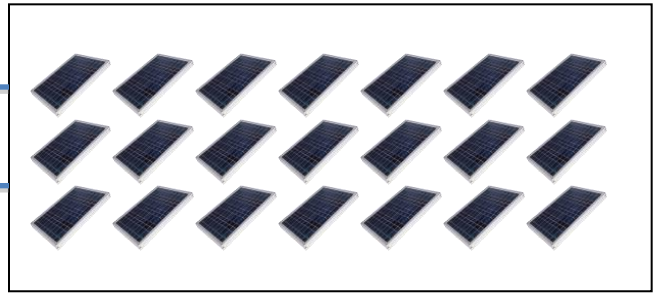


(21) roof mounted Heliene 480w modules mounted with Rescom Solar Matters Composition Shingle Rapid Kit mini-rail mounting system.. #6 solid copper conductor to ground racking system.
(3) strings of 7 modules
VOC: 438.2v
Max VOC: 525v DC per string
& (1) Soladeck flashed PV roof mount enclosure

Action Solar & Electric, LLC
Julian Nuñez, Electrical Contractor 31399-U
204 Deer Ridge Dr., Chapel Hill, NC 27516
12/10/2020

¾" EMT w/(3) #10 THHN, 1 black, 1 red, 1 green ground

¾" pvc pipe w/ (3) #6 THHN wire and (1) #8 THHN green

Line tap to Main Service Wire

125A AC SD Combiner Box w/ (2) 30A 2-pole breakers

5KW GroWatt inverter #1

5KW GroWatt inverter #2

¾" EMT with (5) #10 THHN wires (2) black, (2) red, (1) green for grounding
Inverter #1 to (1) string of 7 modules, Inverter #2 to (2) strings of 7 modules each

Utility Feed

200 AMP Main Electrical Panel

60A knife style AC Disconnect w/ (2) 60amp fuses

200A Utility Meter

2 ground rods, #4 grounding wire

¾" PVC w/1 #6 THHN red, 1 #6 THHN black, 1 #6 THHN white, 1 #8 THHN green

NOTICE TO CONTRACTOR
All construction must comply with current NC Building Codes and is subject to field inspection and verification.
APPROVED
Limited building only review
Permit holder responsible for full compliance with the code
03/24/2021
Harnett COUNTY NORTH CAROLINA

Project Description:
Victoria L. Olive
1876 NC 87N, Sanford, NC 27332-1752

10KW AC Roof Mount System Array
(21) 480watt Heliene PV Modules (model: 96M480)
(2) 5KW Growatt inverters (model: MTL P5000-US)
(6) NEP PVG Rapid Shut-offs

RJB, P.E., P.A.
C-0269

ROBERT J. BRACKEN
ENGINEER + SURVEYOR
3768 Carbonton Road • Sanford, North Carolina 27330

November 25, 2020 (Revised: 11/28/20)

Harnett County Building Inspections
P.O. Box 65
Lillington, NC 27546

REF: Structural Inspection of Roof
1876 NC 87 N
Vicky Olive, Don White Res.
Sanford, N C 27332

Dear Sir/Madam:

I made an onsite visit to the above referenced Residential site on November 24, 2020. The purpose of the visit was to examine the Roof structure to see if the roof will support the additional loading of 3.04 pounds per square foot for a solar panel array.

The roof materials and construction is as follows:

Materials: The roof rafters are a full 2x6 Southern Yellow Pine #1 Dense with a Bending stress of fb 2000. (The grading is based on the age of the SLP)
The roof sheathing is a full 2x6 boards.
The ridge beam is a full 2x10 SYP.

Construction: The rafters are placed 16 inches on center and spanning approximately 17'-6".
There is a structural supporting knee wall at approximately the center of the rafter span which increases the supporting factor of the rafters.
There is also a foam insulation applied to the roof which increases the supporting factor.

The roof will support the additional 3.04 pound per square foot load applied by the Heliene 96M480 Solar Panel and will meet or exceed the requirements set forth in the North Carolina Residential Building Code, 2018,ed. for roof loading.

If you have any questions, please feel free to contact me @ 919-774-6074.

Sincerely,

Robert J. Bracken, PE

NORTH CAROLINA PROFESSIONAL SEAL 7291 ENGINEER ROBERT J. BRACKEN

RJB:jeb

Installation and Operation Manual

PVG-4

Rapid Shutdown Device

USA
Address: 2570 N. First Street, Suite 200, San Jose, CA 95131
TEL: +1 888-598-9901

Japan
Address: 812-0011　福岡市博多区博多駅前 3-10-24　藤井ビル 1F
TEL: +81 092-433-3252
FAX: +81 092-433-3171

China
Address: No.1 Anhe Rd Tsingtao Export Processing Zone, Tsingtao, China 266113
TEL: +86 532 87963900
FAX: +86 532 81100917

Email: info@northernep.com
Web: http://www.northernep.com
http://www.nep-japan.com
http://www.micro-inverter.jp

COMPANY PROFILE

Northern Electric & Power Inc. (NEP) was founded in the United States and has manufacturing and R&D facilities in China. The mission of the company is to develop cutting-edge clean energy technologies and provide state-of-the-art solar inverter products to its customers. The first round of investment to the company was US$20 Million, with a planned total investment of US$50 Million. The company is headquartered in the city of Tsingtao, a major industrial center and trading port in the northeastern China. The company campus occupies more than 18 acres in the Tsingtao Export Processing Zone, and has more than 650,000 square feet building space. The campus is planned to be connected through a micro smart grid demo community and powered by electricity from solar, wind and micro turbines. Outside China, the company has operation offices in Chicago, U.S. and Vancouver, Canada.

The technology founders of the company are well-known experts in the fields of power electronics, automatic control, signal processing, and communications. Each of the founders has multiple U.S. and world patents in their specialty areas. They received Ph.D. degrees from top universities in North America, and each has more than 10 years engineering and management experiences in leading U.S. companies.

NEP has a complete product line of grid-tied solar inverters, including 180W~500W micro inverters, 1.5kW~5kW single phase solar inverters, and 10kW~500kW three-phase solar inverters. Field deployment results demonstrated high system efficiency and reliability of NEP solar inverters.

NEP is committed to develop *Clean, Reliable, Affordable and Efficient* (CARE) products for worldwide customers.

1. INTRODUCTION

1.1 Prefix

Dear customer, thank you for choosing the PVG rapid shutdown devices. We hope you will find our products meet your need for renewable energy. Meantime, we appreciate your feedback regarding our products.

1.2 Standards Compliance

PVG rapid shutdown devices comply with the NEC 2014 and NEC 2017 article 690.12, and CEC 2015 section 64-218.

1.3 How to Use This Manual

This manual provides detailed product information and installation instructions for the PVG rapid shutdown devices (RSD). Please read through this manual before installation and operation.

WARNING: This indicates a situation where failure to follow instructions may be a safety hazard or cause equipment malfunction. Use extreme caution and follow instructions carefully.

1.4 Label

The label is located on the side of the inverter. The information on the label includes technical data as well as type, firmware version and serial number of the device. Safety instructions on the label are listed and explained below:

	Danger! The term “danger” describes an issue which, if ignored can cause personal injury.
	Attention! With the term “attention” a circumstance is listed which may cause property damage if disregarded.
	Instructions for use! Under “Instructions for Use“, it is pointed out that installation and operating instructions are to be read and understood before installation or repair.
	Caution, hot surface! Under “Caution, hot surface”, it should be noted that surfaces of equipment may be hot and create a burn hazard.
	Special disposal instructions! With “Note Separate Disposal”, it is pointed out that this product may not be disposed of with normal garbage. An improperly conducted disposal can lead to damage to the environment.
CE	CE mark The product complies with essential requirements of relevant directives of EU

2. SAFETY INSTRUCTION

WARNING:

PLEASE READ THIS MANUAL BEFORE INSTALLATION. ANY DAMAGE TO THE PRODUCT DUE TO NOT FOLLOWING THIS MANUAL IS NOT COVERED BY THE WARRANTEE.

ALL THE INSTALLATION SHOULD BE DONE BY CERTIFIED ELECTRICIAN.

BESIDES THE CABLE CONNECTORS, NOTHING INSIDE THE PRODUCT SHOULD BE MODIFIED.

ALL INSTALLATION SHOULD FOLLOW THE LOCAL ELECTRIC CODES.

WARNING:

WHENTHEPHOTOVOLTAICARRAY IS EXPOSED TOLIGHT, IT SUPPLIES A DC VOLTAGETOTHE PVG RSD.

3. FCC COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

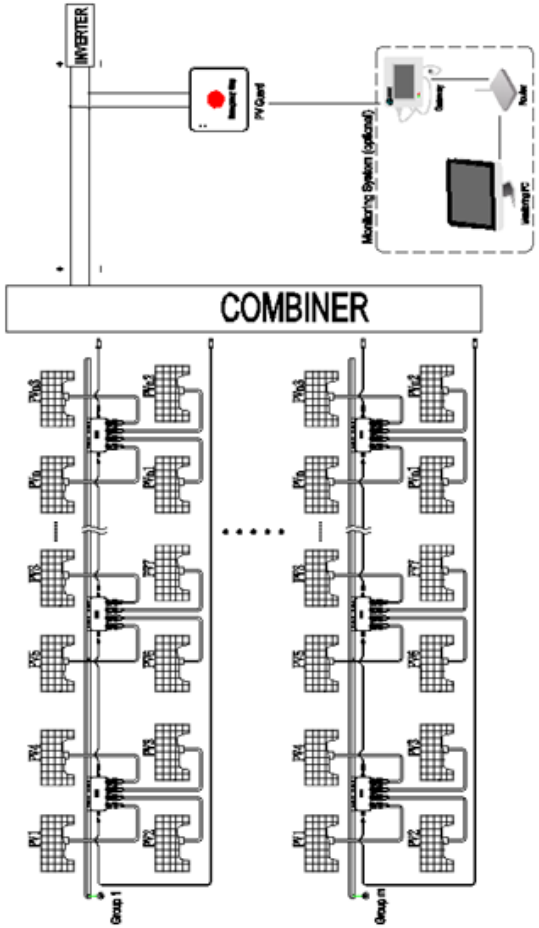
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance may void the user’s authority to operate the equipment.

4. INSTALLATION

WARNING: BE AWARE THAT INSTALLATION OF THIS EQUIPMENT INCLUDES RISK OF ELECTRIC SHOCK.

PVG-4 System Diagram



Connecting PVG-C controller to a BDG-256 gateway (Option)

A BDG-256 gateway can connect one or multiple PVG-C controllers, and upload the monitoring data from PVG to NEPVIEWER monitoring website. For details of BDG-256 gateway and NEPVIEWER, please refer to the user manual of BDG-256 gateway.

Connecting BDG-256 gateway to PVG-C is optional, and shall not affect the rapid shutdown function of PVG-C and PVG-4.

WARNING: ONE PVG-C CAN ONLY MONITOR ONE CHANNEL OF PV PANELS (ONE MPPT).

5. OPERATING INSTRUCTIONS

WARNING: PVG RAPID SHUTDOWN SYSTEM SHALL BE CHECKED REGULARLY TO MAKE SURE IT FUNCTIONS PROPERLY. TEST SHALL BE DONE AT DAYTIME, AND BY MANULLAY PUSH DOWN THE EMERGENCY BUTTON. SOLID GREEN LIGHT SHALL BE ON WITHIN 10 SECONDS AFTER THE EMERGENCY BUTTON IS PUSHED.

WARNING: IN ORDER TO MAKE THE RAPID SHUTDOWN FUNCTION PROPERLY, THE VOLTAGE ON THE DC BUS CAPACITOR OF THE STRING INVERTER SHALL BE REDUCED TO LESS THAN 30Vdc WITHIN 10 SECONDS, USING ONE OF THE FOLLOWING APPROACHES:

1) A DC SWITCH ON THE DC INPUT OF THE STRING INVERTER IS SWITCHED OFF WITHIN 10 SECONDS TO DISCONNECT THE DC BUS OF THE INVERTER

2) IF THE INVERTER DC BUS CANNOT BE DISCONNECTED, A “BLEEDING” RESISTOR SHALL BE CONNECTED ACROSS THE DC INPUTS OF THE STRING INVERTER AND DISSIPATE THE ENERGY ON THE DC BUS WITHIN 10 SECONDS

PVG is powered by the PV panel. Thus the rapid shutdown is operable during daytime when the PV panel is energized. Rapid shutdown can be activated by one of the following two operations:

Option-1 Press the E-STOP button on the PVG controller (PVG-C)
Option-2 Disconnect AC adapter to the PVG-C remote controller

Flashing LED on the PVG-1/2/3/4 indicates the status of the switch inside the PVG.

LED on PVG-4	Status
OFF for 5 seconds, ON for 1 second	PVG switch is connected
OFF for 1 second, ON for 1 second	PVG switch is disconnected
OFF for 2 second, ON for 1 second	PVG status error

There are two LEDs on the PVG-C. RED LED flashing indicates the

controller is powered, while the green LED on PVG-C indicates the DC voltage is safe.

Green LED on PVG-C	Status
OFF	PV array DC voltage is above 30Vdc
ON	PV array DC voltage is below 30Vdc

To re-connect the PV panels, a re-connection command can be send to each PVG by the following steps:

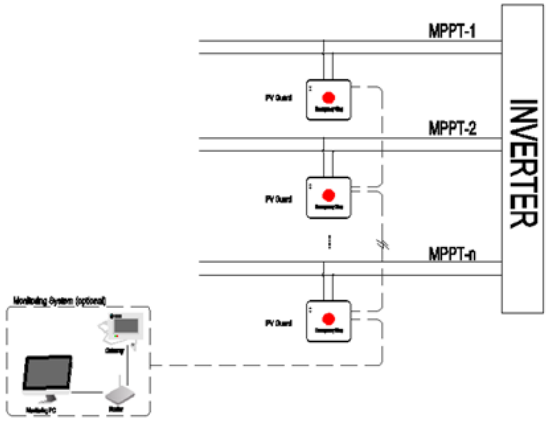
Step-1: Plug AC adapter into the PVG-C

Step-2: Release the E-Stop button on PVG-C

This operation can only be done at day time since the PVG is powered by PV panels. In most cases, all panels are re-connected immediately following the steps above.

6. PV PANEL MONITORING USING BDG-256

Using BDG-256 gateway, DC current, voltage, power, daily energy, and temperature of each PV panel can be monitored using MICROVIEWER locally, or NEPVIEWER remotely. BDG-256 usage should refer to the BDG-256 gateway manual. Connection of BDG-256 and PVG-C is as follows:

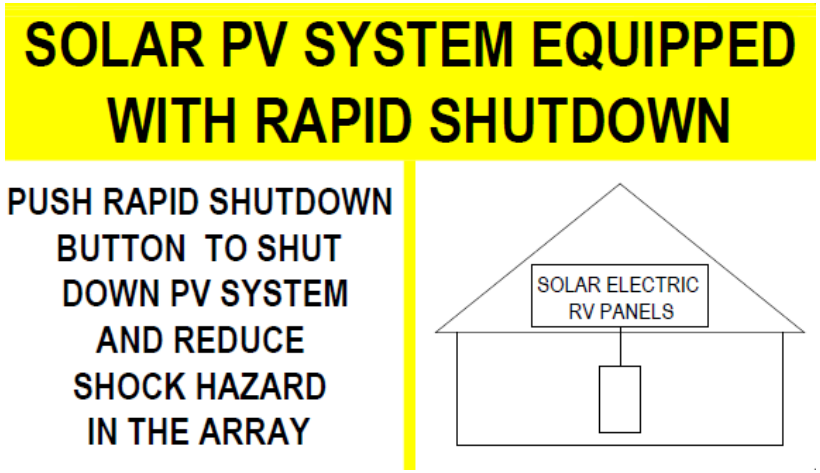


7. SPECIFICATION

MODEL		PVG-n
INPUT(DC)	Max Recommended PV Power	450(*n)
	Max DC Open Circuit Voltage	80 per input
	Max DC Input Current (Adc)	14
OUTPUT(DC)	Maximum Output Power (Wp)	0 ~ 450(*n)
	Maximum Output Current	14
	Maximum Output Voltage	0 ~ Voc(*n)
SYSTEM	Maximum System Voltage	600/1000/1500
	Maximum Series Fuse Rating	15
PROTECTION	Protection Degree	NEMA-6
	Ambient Temperature	-40C——+85C
	Display	LED LIGHT
	Communications	DC Power Line
	Product Safety Compliance	NEC 2014/2017 690.12

8. Mark

The following label shall be permanently placed close to the PVG-C remote controller.

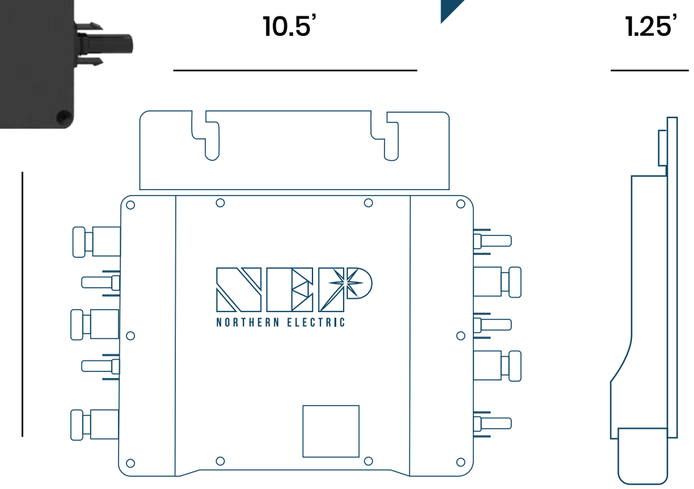


PV-Guard Module-Level Rapid Shutdown and Monitoring

northernep.com

NORTHERN ELECTRIC

PVG - 4



Features

- Shut-off the whole PV site BEFORE fire or smoke
- Compatible with SunSpec control signaling
- Commercial or residential use up to 90 Vdc
- Over temperature protection
- Module level shutdown and monitoring (option)

Important product information

- NEP is committed to developing Clean, Reliable, Convenient and Efficient (CARE) products for our customers worldwide.
- Our products have a 10-year warranty.
- NEC 2014/2017 690.12 (CEC 2015 64-218) Module-Level Rapid Shutdown

INPUT(DC)	Max DC Open Circuit Voltage per Input (Vdc)	90
	Max DC Current per input (Adc)	15
OUTPUT(DC)	Maximum Output Voltage (Vdc)	0 Voc * n (n=1/2/3/4)
SYSTEM	Maximum System Voltage (Vdc)	1500
MECHANICS	PV Cable	12AWG
	PV Connectors	MC4, MC4 compatible, Amphenol
	Size (not including PV cable)	10.5’ x 8.25’ x 1.25’ (PVG-4)
	Protection Degree	NEMA 6
	Operating Ambient Temperature	-40°C--+85°C
SIGNAL	Communications	DC Power Line Compatible with SunSpec signaling
CERTIFICATION	Product Safety Compliance	UL 1741 CSA C22.2 No. 107.1 NEC 2014/2017 690.12 Canada CEC 2015 64-218

UL LISTED

C ETL LISTED US
Intertek
4005622

NEMA
National Electrical Manufacturers Association

HELIENE

PHOTOVOLTAIC MODULES

INDEX

1. Introduction for this User Manual

This Manual contains information regarding the installation, maintenance and use of the series solar modules manufactured by Heliene Inc. All instructions should be read and understood before attempting installation. Failure to follow these safety instructions could result in personal injury or property damage.

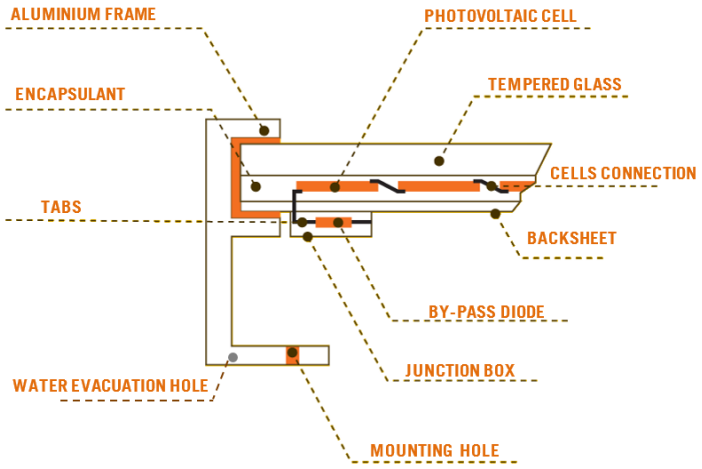
Installation and operation of solar modules require specialized skills, and only professional personnel can engage in the work. The term “Module” Or “PV module” in this Manual refers to one or more series solar modules.

Please keep this Manual in a safe place for future reference.

2. General

Heliene Solar Modules includes the latest technology of mono-crystalline and multi-crystalline solar cells designed and manufactured by industry leading suppliers. The absorption surface and innovative design provide a world class power output and an unmatched aesthetic presence.

- Ordinary Location Modules comes with a permanently attached junction box and #12 AWG (4 mm^2) wire terminated in PV Multi-Contact (MC4 type) connectors.
- Hazardous Location Modules (Class I Division 2) comes with a permanently attached junction box that requires field assembly according to local code since cables, glands or connectors are not included. Exercise caution when wiring or handling modules exposed to sunlight.
- Photovoltaic solar modules convert light energy to direct-current electrical energy, and are designed for outdoor use. Proper design of support structures is the responsibility of the system designer and installer.



CROSS-SECTION OF A MODULE IDENTIFYING BASIC COMPOSITION.

2.1 Applicable Products

This document is applicable to the series of solar modules as listed below:

36 Cell Mono (Max. Power Range: 165 – 185W)	60 Cell Mono (Max. Power Range: 285 – 305W)
36 Cell Poly (Max. Power Range: 145 – 160W)	60 Cell Poly (Max. Power Range: 250 – 270W)
72 Cell Mono (Max. Power Range: 340 – 370W)	96 Cell Mono (Max. Power Range: 460 – 490W)
72 Cell Poly (Max. Power Range: 310 – 340W)	96 Cell Poly (Max. Power Range: 415 – 430W)

Make sure the installation of modules is within the maximum permitted system voltage and rating current.

3. Module Specification

Electrical Values

The rated electrical values at Standard Test Conditions (STC) of Heliene Modules can be found in the table below. The Electrical characteristics are within +/- 10% of the indicated values of I_{SC}, V_{OC}, and P_{MAX} under STC (irradiance of 1000W/m2, AM 1.5 spectrum, and a cell temperature of 25°C (77°F)).

36M

Peak Rated Power	Pmpp(W)	185	180	175	170
Maximum Power Voltage	Vmpp(V)	20.2	19.62	19.2	18.93
Maximum Power Current	Impp(A)	9.43	9.3	9.22	9.11
Open Circuit Voltage	Voc(V)	23.87	23.79	23.4	23.29
Short Circuit Current	Isc (A)	9.77	9.74	9.63	9.5
Module Efficiency	Eff (%)	18.50	18	17.5	17
Maximum Fuse Rating	MF (A)	20	20	20	20
Power Output Tolerance	[-0, + 4.99] Wp				

36P

Peak Rated Power	P_{mpp} (W)	160	155	150	145
Maximum Power Voltage	V_{mpp} (V)	19.00	18.73	18.46	18.19
Maximum Power Current	I_{mpp} (A)	8.59	8.43	8.27	8.11
Open Circuit Voltage	V_{oc} (V)	22.77	22.49	22.21	21.93
Short Circuit Current	Isc (A)	9.26	9.10	8.94	8.78
Module Efficiency *	Eff (%)	16.0	15.5	15.0	14.5
Maximum Fuse Rating	MF (A)	15	15	15	15
Power Output Tolerance	[- 0 , + 4.99] Wp				

60M

Peak Rated Power	P_{mpp} (W)	305	300	295	290	285
Maximum Power Voltage	V_{mpp} (V)	33.44	33.14	32.84	32.537	32.236
Maximum Power Current	I_{mpp} (A)	9.196	9.127	9.06	8.989	8.92
Open Circuit Voltage	V_{oc} (V)	39.981	39.83	39.68	39.528	39.38
Short Circuit Current	Isc (A)	9.673	9.59	9.51	9.424	9.34
Module Efficiency *	Eff (%)	18.9	18.6	18.3	18.0	17.7
Maximum Series Fuse Rating	MF (A)	20	15	15	15	15
Power Output Tolerance	[- 0 , + 4.99] Wp					

60P

Peak Rated Power	P_{mpp} (W)	270	265	260	255	250
Maximum Power Voltage	V_{mpp} (V)	31.317	31.011	30.705	30.395	30.089
Maximum Power Current	I_{mpp} (A)	8.713	8.636	8.561	8.483	8.408
Open Circuit Voltage	V_{oc} (V)	38.399	38.199	37.999	37.799	37.599
Short Circuit Current	Isc (A)	9.162	9.077	8.996	8.914	8.830
Module Efficiency *	Eff (%)	16.8	16.5	16.2	15.9	15.6
Maximum Series Fuse Rating	MF (A)	15	15	15	15	15
Power Output Tolerance	[- 0 , + 4.99] Wp					

72M

Peak Rated Power	P_{mpp} (W)	370	360	350	345	340
Maximum Power Voltage	V_{mpp} (V)	40.233	39.713	39.133	38.843	38.503
Maximum Power Current	I_{mpp} (A)	9.26	9.13	9.01	8.95	8.90
Open Circuit Voltage	V_{oc} (V)	48.66	48.10	47.54	47.26	46.95
Short Circuit Current	Isc (A)	9.77	9.71	9.65	9.57	9.49
Module Efficiency *	Eff (%)	19.3	18.8	18.3	18.0	17.8
Maximum SeriesFuse Rating	MF (A)	20	20	20	15	15
Power Output Tolerance	[- 0 , + 4.99] Wp					

72P

Peak Rated Power	P_{mpp} (W)	330	325	320	315	310
Maximum Power Voltage	V_{mpp} (V)	37.54	37.42	37.40	37.33	37.20
Maximum Power Current	I_{mpp} (A)	8.85	8.745	8.64	8.50	8.40
Open Circuit Voltage	V_{oc} (V)	46.26	46.11	45.96	45.81	45.66
Short Circuit Current	Isc (A)	9.13	9.05	8.97	8.89	8.81
Module Efficiency *	Eff (%)	17.3	17.0	16.7	16.5	16.2
Maximum Series Fuse Rating	MF (A)	15	15	15	15	15
Power Output Tolerance	[- 0 , + 4.99] Wp					

96M

Peak Rated Power	P_{mpp} (W)	490	480	470	465	460
Maximum Power Voltage	V_{mpp} (V)	52.664	52.262	51.860	51.659	51.458
Maximum Power Current	I_{mpp} (A)	9.359	9.235	9.111	9.049	8.987
Open Circuit Voltage	V_{oc} (V)	62.985	62.587	62.189	61.990	61.791
Short Circuit Current	Isc (A)	10.056	9.91	9.764	9.691	9.618
Module Efficiency *	Eff (%)	19.3	18.9	18.5	18.3	18.1
Maximum Series Fuse Rating	MF (A)	20	20	20	20	20
Power Output Tolerance	[- 0 , + 4.99] Wp					

96P

Peak Rated Power	P_{mpp} (W)	430	425	420	415
Maximum Power Voltage	V_{mpp} (V)	50.320	50.140	49.960	49.800
Maximum Power Current	I_{mpp} (A)	8.594	8.529	8.464	8.389
Open Circuit Voltage	V_{oc} (V)	61.655	61.585	61.515	61.440
Short Circuit Current	Isc (A)	9.065	8.995	8.925	8.855
Module Efficiency *	Eff (%)	17.0	16.8	16.6	16.4
Maximum Series Fuse Rating	MF (A)	15	15	15	15
Power Output Tolerance	[- 0 , + 4.99] Wp				

4. Safety Precaution

4.1 Warnings:

Before unpacking, installing, wiring, operating or maintaining Heliene Modules, responsible personnel should read and understand all safety precautions. Each modules produces a continuous current (DC) when exposed to sunlight or other light source. Contact with any of the electrically active parts, such as terminals of the modules, can result in injury or death weather module is connected or not.

Warning – Explosion Hazard – Do not disconnect while circuit is alive unless area is known to be non-hazardous. Please refer to the all applicable electrical safety code for additional information.

4.2 General Safety

- All installation work must comply with the local codes and relevant international electrical standards.
- PV module installation should be conducted by certified personnel in electrical and PC system installation. Operation by personnel who are not familiar with the relevant safety will result in dangerous scenarios.
- Do Not attempt to connect or disconnect the modules when it is energized or in the presence of flammable substances.
- Do Not concentrate/focus light source on the module as this will result in damage of cells.
- Do Not disassemble a module or remove any of its parts.
- Do Not install modules with broken glasses or damaged backsheet.
- The module must not be immersed or continuously exposed to water.

4.3 Handling Safety

- Do Not walk or stand on the module as this will result in broken glasses.
- Do Not drop PV modules, or put heavy object on the PV module as this will result in broken glasses.
- Do Not damage or scratch the modules' glasses or backsheet.
- Do Not bend the output cable as this might result in damage of insulation, thus leading to electricity leakage or shock.
- Avoid installing/handling modules in wet/high wind environment. The modules should be stored in a dry and temperature controlled place prior to their installation, also in a well-balanced position always.
- It is recommended to install modules under low intensity of irradiance, because of the voltage being produced in the form of current always continues as long as the unit is illuminated.

5. Précautions de Sécurité

5.1 Avertissements:

Avant de déballer, installer, câbler, utiliser ou entretenir les modules Heliene, le personnel responsable doit lire et comprendre toutes les précautions de sécurité. Chaque module produit un courant continu (CC) lorsqu'il est exposé au soleil ou à une autre source de lumière. Le contact avec l'une des pièces électriquement actives, telles que les bornes des modules, peut entraîner des blessures ou la mort du module météorologique connecté ou non.

Avertissement – Risque d'explosion. Ne pas debrancher tant que le circuit est sous tension, a moins qu'il ne s'agisse d'un emplacement non dangereux.

Veuillez vous reporter au code de sécurité électrique applicable pour plus d'informations.

5.2 Sécurité générale

- Tous les installation doivent être conformes aux codes locaux et aux normes électriques internationales en vigueur.
- L'installation des modules PV doit être effectuée par le personnel certifié en installations électriques et systèmes PC. L'utilisation par le personnel qui n'est pas familiarisé avec la sécurité pertinente entraînera des scénarios dangereux.
- N'essayez pas de connecter ou de déconnecter les modules lorsqu'il est sous tension ou en présence de substances inflammables.
- Ne concentrez pas la source de lumière sur le module car cela endommagerait les cellules.
- Ne démontez pas un module et ne retirez aucune de ses pièces.
- N'installez pas de modules avec des lunettes cassées ou une feuille de fond endommagée.
- Le module ne doit pas être immergé ni exposé en permanence à l'eau.

5.3 Sécurité de manutention

- Ne marchez pas et ne vous tenez pas sur le module car cela pourrait briser la vitre.
- Ne laissez pas tomber les modules PV ou ne posez pas d'objet lourd sur le module PV car cela pourrait briser les vitres.
- Ne pas endommager ni rayer la vitre ou la feuille de fond des modules.
- Ne courbez pas le câble de sortie car cela pourrait endommager l'isolation et entraîner une fuite d'électricité ou un choc électrique.
- Évitez d'installer / de manipuler des modules dans un environnement humide / très venteux. Les modules doivent être stockés dans un endroit sec et à température contrôlée avant leur installation, également toujours dans une position bien équilibrée.
- Il est recommandé d'installer des modules sous un éclairement énergétique de faible intensité, car la tension produite sous la forme d'un courant continue toujours tant que l'unité est allumé.

6. Transport/Unpack/Storage of PV Modules

6.1 Transportation and General Rules

- Heliene recommend the modules be stored in its original packaging strapped to pallets until they reach the destination of installation site.
- Do not remove any strapping or packaging materials if the modules require secondary transportation/long-term storage.
- Do Not transport modules in an upright position, only transport them in box strapped to pallet as supplied by Heliene Inc. on a level surface.
- Load and Unload with a forklift avoiding hitting, banding, dropping or damage to the packaging.
- Always keep electrical contacts clean and dry.
- Do not Stand, Step on, Walk or Jump on the Modules.
- Always set the modules onto surfaces bigger than the module perimeter size, as module weight must sit on the aluminum frame ONLY. Please refer Dimensions of the module in Heliene Modules' Specification Sheet.

6.2 Unpacking

- Before unpacking, have module box in a level, dry area, free of excessive dust, debris. Read the unpacking instructions carefully and follow the steps accordingly. This process requires two people minimum.
- Cut the straps with blade or scissors, remove box top vertically and lift it over to the side.
- Be carefully when removing the packaging, do not scratch the frame or glass.
- Remove modules with two hands at each side, each person lifting on opposite ends. Never lift by Junction Box Cables or Box.
- Never leave a module unsupported or lean it on the mounting posts.
- If there are modules left in the box after unpacking, the remaining modules shall be repackaged to prevent from external damages. 26 modules maximum per pallet.

6.3 Storage

- Store pallets of modules on a levelled surface, in a dry and ventilated room.
- Pallet are not weatherproof and modules are not meant to be exposed to weather element until completely unpackaged.
- Store modules where there is not any potential of falling objects onto modules.
- Stack only 2 boxes/pallets high at maximum, and never put any other materials on top of them.

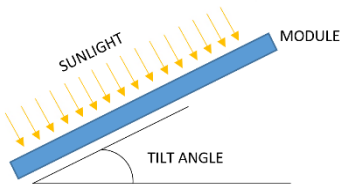
7. Installation Requirements

7.1 Site Selection and Preparation

- To maximize the power output, it is recommended to install PV modules at an optimized tilt angle. The module must be facing towards the equator for optimum performance. Refer to standard solar photovoltaic installation guides and incorporate other local requirements.
- The module should not be shaded at any time of the day. Try to install the modules in a site where there is rare shading throughout the year to minimize the chances of shading.
- Never install the modules near the location/equipment where flammable gasses are generated.

7.2 Module Tilt-Angle

The tilt angle of the PV module is measured between the PV module and a Horizontal ground surface. For different location or projects there are different mounting angles, for maximum power output it is the best for PV modules to face the sun directly. Ensure to comply with local regulations or follow recommendations of experienced PV module installers.



7.3 Installation Method

7.3.1 General

- The module is considered to be in compliance with UL 1703 only when the module is mounted in the manner specified by the mounting instructions below.
- A module with exposed conductive parts is considered to be in compliance with UL 1703 only when it is electrically grounded in accordance with the instructions presented below and the requirements of the National Electrical Code.
- Any module without a frame (laminate) shall not be considered to comply with the requirements of UL 1703 unless the module is mounted with hardware that has been tested and evaluated with the module under this standard or by a field Inspection certifying that the installed module complies with the requirements of UL 1703.
- Installation must comply with All local building codes. The Mounting Design must be certified in the USA and Canada by a registered professional engineer. Also mounting design and procedure shall comply with local codes and all authorities having jurisdiction.
- Tools used to connect the modules must comply with all applicable electrical safety regulations. They must be dry and have the correct level of insulation.

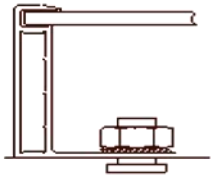
7.3.2 Mechanical Mounting Instructions

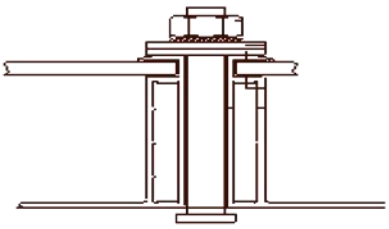
- Using a torque wrench for installation (Torque to amount specified by professional engineer). Please follow instructions below for methods of fastening a module to a support structure.
- Modules shall be bolted or clamped to support racking with spans and overhands less than the allowable in the table below. Any additional mounting outside of these limits without **Written Approval** from Heliene Inc. will void the Warranty by doing so.

	UL Design Rating 30 lbs/ft2		UL Design Rating 50 lbs/ft2			
	<=2400Pa (50.1 lbs/ft2)		<=3590Pa (75 lbs/ft2)		<=5400Pa (112.8 lbs/ft2)	
Module Size	overhang	span	overhang	span	overhang	span
36M/36P	<=402mm	<=1450mm	<=402mm	<=1380mm	<=402mm	<=1180mm
60M/60P	<=402mm	<=1600mm	<=402mm	<=1380mm	<=402mm	<=1180mm
72M/72P	<=402mm	<=1906mm	<=402mm	<=1380mm	<=402mm	<=1180mm
96M/96P	<=402mm	<=1906mm	<=402mm	<=1380mm	<=402mm	<=1250mm

For Clamping Racking System:

- Each clamp must have a minimum 5mm x 25mm surface clamping onto top surface from the side.
- If the clamps are being used to support two modules (at corner of each), it must have a minimum of 25mm on each module frame surface.





- Use at minimum 4 clamps to attached modules to the mounting rails.
- Frames must not be deformed by modules clamps, also clamps should not come into contact with the glass.

For Rooftop installation:

- Ensure to comply with all local building codes.
- Freestanding modules turn a Class B rooftop into a Class C rooftop.
- Use appropriate corrosion-proof fastening materials.
- Top or Bottom clamping methods will vary and are dependent on the mounting structures.
- Follow mounting guidelines recommended by the PV racking Suppliers.

7.3.3 Electrical Installation

- All wiring should be performed by registered installer and comply with local codes &regulations.
- The wiring must ensure that the loss of nominal voltage is less than 2%, it is recommended to maintain this loss around 1% of the nominal power.
- Heliene modules are provided with stranded copper cables – with exception of Class I Division 2 (CID2) products.
- The maximum voltage of the system must be less than the maximum certified voltage, the maximum input voltage of the inverter and the other electrical devices installed in the system. Heliene's modules are rated from 600V ~ 1500V, please check your specification sheet and ask your manufacturer for confirmation.
- Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. The requirements of the National Electrical Code (NEC) in Article 690 shall be followed to address these increased outputs. In installations not under the requirements of the NEC, the values of I_{SC} and V_{OC} marked on this module should be multiplied by a factor of **1.25** when determining component voltage ratings, conductor ampacities, overcurrent device ratings, and size of controls connected to the PV output.
- For CID2 rated modules, glands and cables are not provided with the product, wiring methods shall be per the CEC, NEC and/or applicable local codes. All cable fittings shall be suitable for hazardous locations and environmental applications.

Wiring

- PV modules that are connected in series should have similar current, and PV modules that are connected in parallel should have similar voltage. The number of modules in series and in parallel shall be designed reasonable according to the system configuration.
- All Heliene modules contains installed bypass diodes, if the modules are incorrectly connected to each other this will result in damage of bypass diodes, cables or junction boxes.

<u>Class I Division 2 Field Wiring:</u>

To connect the modules, remove the knockout plugs on the junction box and install ¾ inch cable glands fittings (torque to 33 in-lb) suitable for hazardous locations and environmental applications. Wires can then be connected to the positive and negative screw terminals. These terminals are identified by a positive and negative sticker. Make sure to use the screw terminals that are not holding bypass diodes.

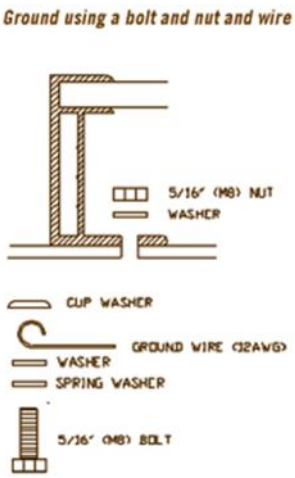
The recommended rating for wiring connections is 6 mm2 and never less than 4 mm2, 10 AWG recommended and never less than 12 AWG. Only use cable listed by UL4703 PV wire, 90°C thermal insulated in accordance with all the local fire, building and electrical codes.

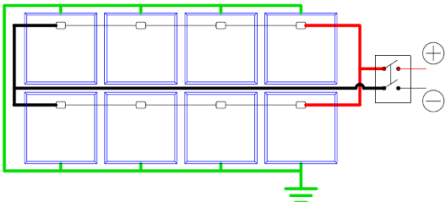
Module connectors

Brand	Model	Physical Appearance		Website
600V				
Multi-Contact	PV-KBT4/6LL (Male) PV-KST4/6LL (Female)			http://ec.staubli.com
Lumberg	LC4-CP30 (Female) LC4-CP31 (Male)			http://www.lumberg.com
1000V				
Zhejiang Jiaming Tianheyuan Photovoltaic Technology (JMTHY)	PV-JM601			http://en.jmthy.com
1500V				
Zhejiang Jiaming Tianheyuan Photovoltaic Technology (JMTHY)	PV-JM608			http://en.jmthy.com
Zhejiang Jiaming Tianheyuan Photovoltaic Technology (JMTHY)	PV-JM601A			http://en.jmthy.com
Taizhou Jinxiu	LJQ-1A-F/M			http://www.tzjinxiu.com
QC Solar (Suzhou) Corp.	QC 4.10			http://www.qc-solar.com/
Zhejiang ZhongHuan Sunter PV Technology Co LTD	PV-ZH202	 		http://www.pvzh.com
Zhejiang ZhongHuan Sunter PV Technology Co LTD	PV-ZH202B	 		http://www.pvzh.com

Grounding

- All module frames and mounting racks must be accordance with CEC, NEC and applicable local codes.
- It is recommended that modules be grounded. For grid connected modules in U.S and Canada: All PV modules must be grounded by electrical connection from the module frames to the ground. A UL-listed grounding lug or UL approved clamp is to be used.
- Connect modules frames to each other using cables with cable lugs. All connections on the conductive connection must be fixed. Metal containing iron in the conductive connection should be treated against corrosion and rusting.
- Another method is to ground the frame of the module to racking structure in accordance with NEC.
- Self-Tapping screw (10 x ¾ size) can be used to attach a wire terminal loop to one of the 4mm Grounding Holes. Also Grounding connections using spikes into the surface clamping point (IE. WEEB) which are UL approved permitted.
- A UL-Listed grounding lug may be used if the mounting holes are not used for mounting (ie. Clamps. 9mm (0.354") diameter mounting/grounding hole accept M8-5/16" bolts onto the module frame).
- Where common grounding hardware (nuts, bolts, star washers, spilt-ring lock washers, flat washers and the like) is used to attach a listed grounding/bonding device, the attachment must be made in conformance with the grounding device manufacturer's instructions.





Example of Connecting in parallel after connected in series & Grounding

- Common hardware items such as nuts, bolts, star washers, lock washers and the like have not been evaluated for electrical conductivity or for use as grounding devices and should be used only for maintaining mechanical connections and holding electrical grounding devices in the proper position for electrical conductivity. Such devices, where supplied with the module and evaluated through the requirements in UL 1703, may be used for grounding connections in accordance with the instructions provided with the module.

7.4 Fire Rating

- The Fire Rating of this module is valid only when mounted in the manner specified in the "6.2.2 Mechanical Mounting Instructions". Heliene Inc. Modules are certified to Class C Fire rating.
- When installing the modules, please ensure the assembly is mounted over a fire resistant roof covering rated for the application and required a slope less than 5 in/ft (127mm/305mm) to maintain fire class rating.
- The Fire rating of the module is valid only when mounted in the manner specified in the mechanical mounting instructions.

7.5 Maintenance

- Visual inspection should be done on the PV array regularly for damages on glass, cable and junction box. As this will result in operation/performance and safety problems.
- Clean PV modules will improve the optical performance. It is recommended this process being done when irradiance is below 200W/m2. Use clean water with low calcium concentration without any detergents or abrasives. Do not scratch the glass through the process, also it is recommended to use similar temperature liquid so thermal shock on the glass could be avoided.
- Test the wiring and connection at least once year, including the integrity and waterproof of all the parts that make up the wiring and connections. This process should be done by qualified personnel duly trained and equipped for the job.
- No serviceable parts within the PV module assembly. Consult Heliene Inc.

7.6 Warranty

- If your installation does not work properly, please inform your installer immediately. Qualified professionals should be advised to avoid any electrical shock or loss of life due to high voltage of the array.
- If you need necessary replacement in the event of accelerated deterioration of the module, please go to: https://www.heliene.com/contact to fill out your RMA Submission/Warranty Inquiry, a responsible personnel will reach out to you within 48 hrs.

8. Disclaimer

Heliene reserves the rights to change this User Manual without prior notice. Failure of the customer to follow the requirements outlined in this Manual during the installation of the module will result in the invalidity of product's limited warranty.

9. Limitation of Liability

Heliene Inc. disclaim any liability for (including but not limited to) breakage, deterioration, loss of performance, system installation error, and personnel injury or property loss resulted from failure to follow the instruction in this Manual.

Growatt 4000~7600 MTLP-US

- Maximum efficiency of 97.5%
- Multi MPP tracker
- Reactive power control
- Flexible Interfaces

POWER-ING TOMO-RROW

Growatt powering tomorrow

www.ginverter.com

Datasheet	4000MTLP-US	5000MTLP-US	6000MTLP-US	7000MTLP-US	7600MTLP-US
Input Data					
Max. power per MPPT	4000/4000W	5000/5000W	6000/6000W	7000/4800W	7600/4800W
Max. usable input current per MPPT	18A/18A	18A/18A	18A/18A	20A/10A	20A/10A
Max. short circuit input current per inverter	42A	47A	56A	47A	47A
Startup voltage	150V	150V	150V	150V	150V
Max. voltage	600V	600V	600V	600V	600V
DC nominal voltage MPPT tracker	360V	360V	360V	360V	360V
DC voltage range	100-600V	100-600V	100-600V	100-600V	100-600V
MPP operating voltage range	120-500V	120-500V	120-500V	120-500V	120-500V
Number of MPPT	2	2	2	2	2
Inputs per MPPT	2/2	2/2	2/2	2/1	2/1
Output (AC)					
Nominal output power	4000W	5000W	6000W	7000W	7600W
Max. Continuous output current	16.7A	21A	25A	29A	31.7A
Max. over current protection device	21A	26A	31A	36A	40A
Operating frequency/range	60/59.5~60.5	60/59.5~60.5	60/59.5~60.5	60/59.5~60.5	60/59.5~60.5
Ambient operating temperature range(full load)	-25℃~45℃(-13...+ 113℉)	-25℃~45℃(-13...+ 113℉)	-25℃~45℃(-13...+ 113℉)	-25℃~45℃(-13...+ 113℉)	-25℃~45℃(-13...+ 113℉)
AC nominal voltage; range	Default:240V split-phase, optional:208V & 240V & 277V single phase , 183-228@208V 211-264V@240V 244-305@277V				
Phase shift (cosφ)	Default: 0.99, opt Reactive power adjust / range:-0.85~+0.85				
THDI	<3%	<3%	<3%	<3%	<3%
Efficiency					
Max.efficiency	97.2%	97.5%	97.5%	97.4%	97.3%
CEC weighted efficiency	96%	96.5%	96.5%	97%	97%
MPPT efficiency	99.5%	99.5%	99.5%	99.5%	99.5%
Protection Devices					
Integrated DC disconnect	yes	yes	yes	yes	yes
DC reverse polarity protection	yes	yes	yes	yes	yes
Output overvoltage protection-varistor	yes	yes	yes	yes	yes
Output over current protection	yes	yes	yes	yes	yes
Ground fault monitoring					
Grid monitoring	yes	yes	yes	yes	yes
Integrated all - pole sensitive leakage current monitoring unit	yes	yes	yes	yes	yes
Compliant to UL 1699B	yes	yes	yes	yes	yes
General Data					
Dimensions(W* H*D)	28.74*15.75*8.46in	28.74*15.75*8.46in	28.74*15.75*8.46in	28.74*15.75*8.46in	28.74*15.75*8.46in
Weight	31.5kg/69.4Lb	31.5kg/69.4Lb	32kg/70.5Lb	32kg/70.5Lb	32kg/70.5Lb
Enclosure	NEMA 4X	NEMA 4X	NEMA 4X	NEMA 4X	NEMA 4X
Cooling concept	natural cooling	natural cooling	natural cooling	natural cooling	natural cooling
Topology	Transformer-less	Transformer-less	Transformer-less	Transformer-less	Transformer-less
Relative humidity	100%	100%	100%	100%	100%
Altitude	Up to 2000m(6560ft) without power de-rating	Up to 2000m(6560ft) without power de-rating	Up to 2000m(6560ft) without power de-rating	Up to 2000m(6560ft) without power de-rating	Up to 2000m(6560ft) without power de-rating
Noise emission (typical)	≤ 25 dB(A)	≤ 25 dB(A)	≤ 25 dB(A)	≤ 25 dB(A)	≤ 25 dB(A)
Consumption: standby	<5W	<5W	<5W	<5W	<5W
Revenue Grade Meter	opt	opt	opt	opt	opt
Features					
Display	LCD	LCD	LCD	LCD	LCD
RS485/ShineLink RF/Wifi/Ethernet/Zigbee/ Cellular	yes/opt/opt/opt/opt/ opt	yes/opt/opt/opt/opt/ opt	yes/opt/opt/opt/opt/ opt	yes/opt/opt/opt/opt/ opt	yes/opt/opt/opt/opt/ opt
Warranty: 5years/10years	yes/opt	yes/opt	yes/opt	yes/opt	yes/opt

UL1741,UL1741 SA, CA Rule21, UL1998, IEEE 1547, CSA C22.2 No.107.1-1, FCC Part15(Class A&B), UL1699B

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powering tomorrow

Growatt

Growatt 4000MTLP-US

Growatt 5000MTLP-US

Growatt 6000MTLP-US

Installation & Operation Manual

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Contents

Manual Introduce and Copyright

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Notes on this manual 1

1.1 Validity

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

Growatt 4000MTLP-US

Growatt 5000MTLP-US

Growatt 6000MTLP-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 Growatt 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 informatio

Find further information on special topics in the download area at WWW.growatt.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 Usedt

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.
 **NOTE**	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** The product works with high voltage. All work on the product must only be performed as described in its documentation.
	**Beware of hot surface** The product can become hot during operation. Do not touch the product during operation.
	**Observe the operating instructions** Read the product's documentation before working on it. Follow all safety precautions and instructions as described in the documentation.
	**FCC certificate**
	**Intertek ETL semko mark,** it apply to the Growatt MTLP-US series certify that the inverter meet the safety standard Ul1741.
	**Point of connection for grounding protection.**
	**Direct Current (DC)**
	**Alternating Current (AC)**

2 Safet and conformity

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.

NOTE

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.

NOTE

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

NOTE

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
- UL1699B

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. contact Growatt). 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 MTLP-US Inverter 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 MTLP-US series product is a transformer-less inverter. That is why it has no galvanic separation. Do not ground the DC circuits of the PV modules connected to the GROWATT MTLP-US Inverter. Only ground the mounting frame of the PV modules.
If you connect grounded PV modules to the GROWATT MTLP-US Inverter, the error message "PV ISO Low".

• Appropriated 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 generated 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 generating 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 inverter following proper instruction and under constant supervision. Children are forbidden to play with the inverter. Must keep the inverter away from children.

• Qualification of Skilled Workers

1）Knowledge of how an inverter works and is operated

2）Instruction in how to deal with the dangers and risks associated with installing and using electrical devices and plants

3）Training in the installation and commissioning of electrical devices and plants

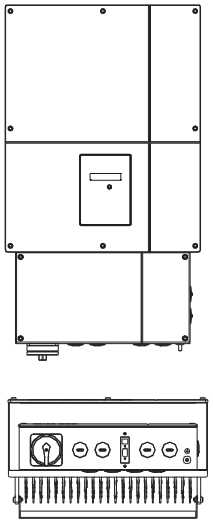
4）Knowledge of all applicable standards and guidelines

5）Knowledge and observance of this manual and all safety instructions

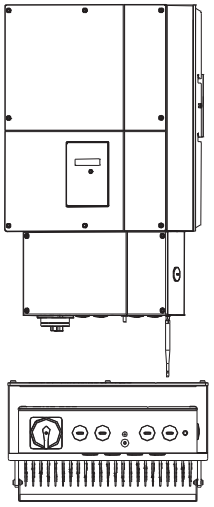
3 Product Description

3.1. Inverter Overview:

3.1.1 Type1 Inverter model



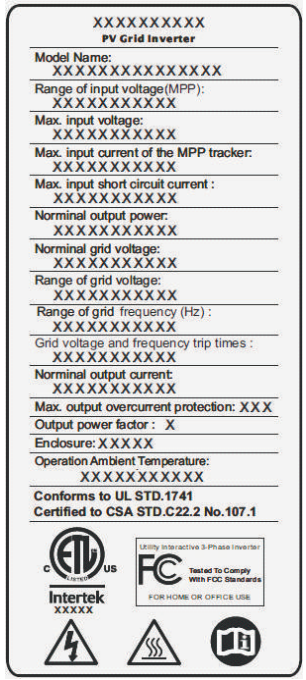
3.1.2 Type2 Inverter model

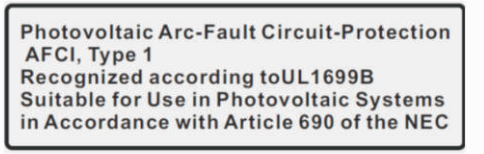


3.2. Information of Label

You can consult the 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

Type 1				
Model	Height (H)	Width (W)	Depth (D)	Weight
4000 MTLP-US	685 mm 26.97inch	400 mm 15.75 inch	215mm 8.46inch	31Kg 68.3b
5000 MTLP-US	685 mm 26.97inch	400 mm 15.75 inch	215mm 8.46inch	31Kg 68.3b
6000 MTLP-US	685 mm 26.97inch	400 mm 15.75 inch	215mm 8.46inch	31.5Kg 69.4b

Type 2				
Model	Height (H)	Width (W)	Depth (D)	Weight
4000 MTLP-US	735 mm 28.94inch	400 mm 15.75 inch	215mm 8.46inch	31.5Kg 69.4b
5000 MTLP-US	735 mm 28.94inch	400 mm 15.75 inch	215mm 8.46inch	31.5Kg 69.4b
6000 MTLP-US	735 mm 28.94inch	400 mm 15.75 inch	215mm 8.46inch	32Kg 70.5b

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 storage temperature should be always between -25℃and +60℃. And the storage relative humidity should be always between 0 and 100% (without condensation).
- If there are a batch of inverters need to be stored, the max layers for original carton is six.
- 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

- DSP controller
- Multi MPP controller
- Sound control
- Easy installation
- Integrated wire box
- Integrated DC switch
- CEC efficiency of 97.0%
- Maximum efficiency of 97.5%
- Wide input voltage range from 100-600V
- Adapt to multi gird model(208Vac/240Vac/277Vac)
- Multi communication pattern optional
- Reactive power regulate function optional(Default PF>0.99)
- Integrated smart meter optional

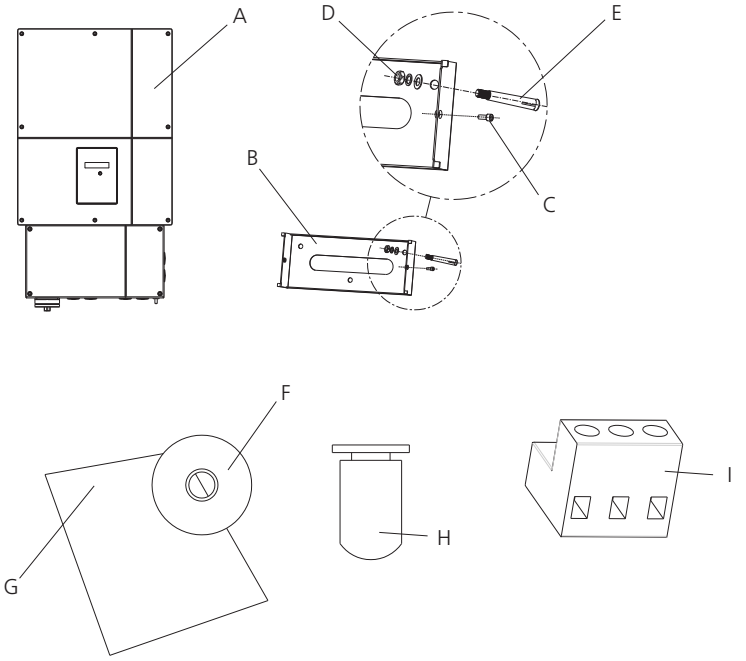
4 Unpacking

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 Inverter supplier 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:



A	inverter	1
B	Mounting frame	1
C	Safety-lock screws	2
D	Mounting screws	3
E	Mounting frame screws sleeve	3
F	Monitor software(disk)	1(Optional)
G	Manual	1
H	Wi-fi or shinelan	1(Optional)
I	Rs485 connectors	3

NOTE

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.

5 Installation and Electrical Connection

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.

DANGER

1. 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 .
2. Carefully remove the unit from its packaging and inspect for external damage. If you find any imperfections, please contact your local dealer.
3. .Be sure that the inverters connect to the ground in order to protect property and personal safety.
4. The inverter must only be operated with PV generator. Do not connect any other source of energy to it.
5. Both AC and DC voltage sources are terminated inside the PV Inverter. Please disconnect these circuits before servicing.
6. 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.
7. 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.
8. 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.
9. 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 0~100% without condensation.

➢ The installation location must be freely and safely to get at all times.

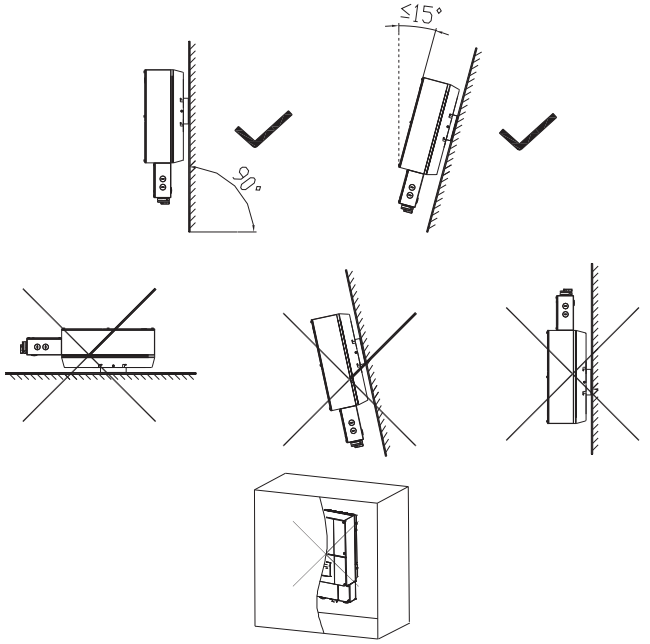
➢ Vertically installation or tilted backwards by max. 15°. and make sure the connection of inverter must be downwards. Never install horizontal and avoids forward and sideways tilt.

➢ Be sure that the inverter is out of the children's reach.

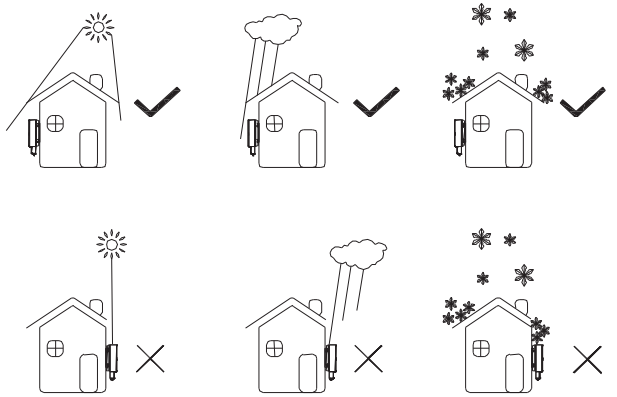
➢ Don't put any things on the inverter. Do not cover the inverter.

➢ Don't 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。

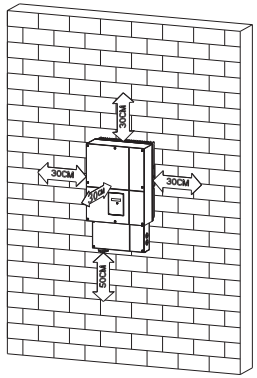


➢ The inverter can't install to direct sunlight，drench，firn location. We suggest that the inverters should be installed at the location with some cover or protection。

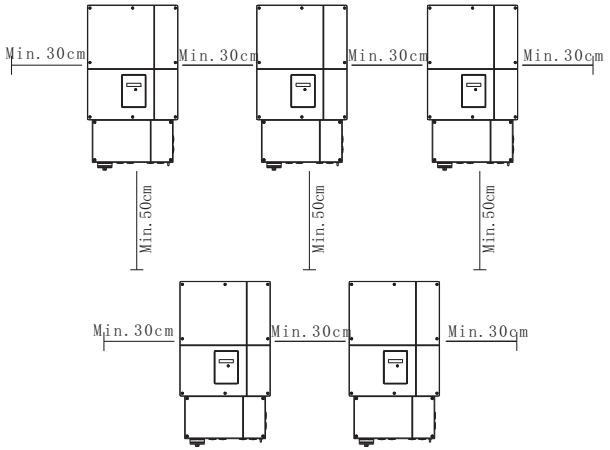


➢ Observe the minimum clearances to walls, other inverters or objects as shown in the diagram below in order to guarantee sufficient heat dissipation.

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



Ambient dimensions of one inverter



Ambient dimensions of a series inverters

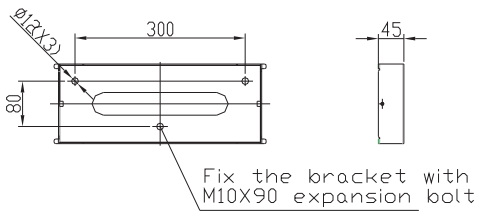
- There must be sufficient clearance between the individual inverters to ensure that the cooling air of the adjacent inverter is not taken in.
- If necessary, increase the clearance spaces and make sure there is enough fresh air supply to ensure sufficient cooling of the inverters.

5.3. Mounting the Inverter with bracket

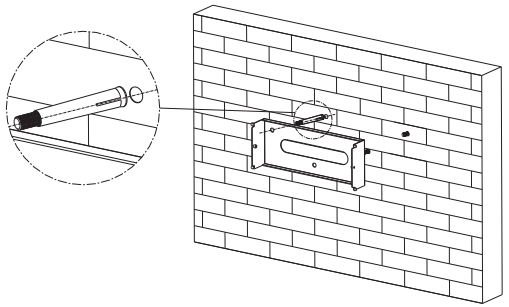
WARNING

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

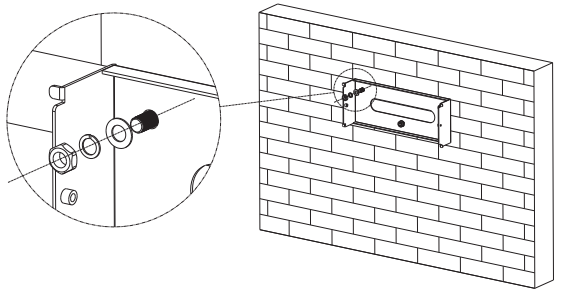
- The dimension of bracket as follow:



- 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.

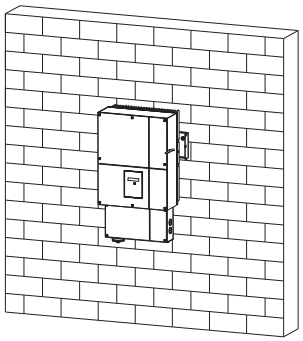


5.4. Fixed the inverter on the wall

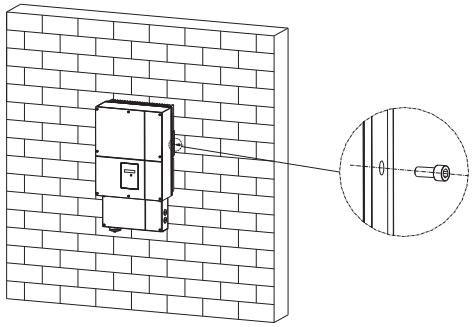
WARNING

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.

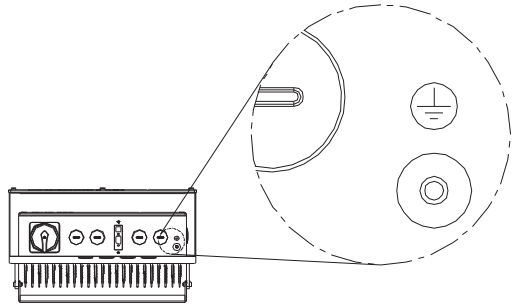


- After confirming the inverter is fixed reliably, fasten four M6 safety-lock sokets head cap screws on the left and right side firmly to prevent the inverter from being lifted off the bracket.

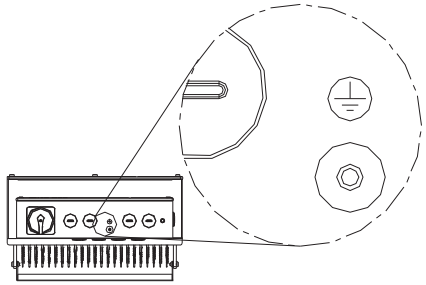


- Connecting the Second Protective Conductor

- If the installation requires, the earth terminal can be used to connect a second protective conductor or as equipotential bonding. This prevents touch current if the original protective conductor fails.



Type1 model second protective Ground



Type2 model second protective Ground

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

Grounding

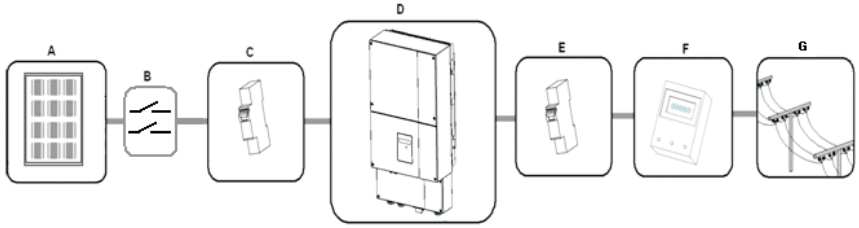
Before connecting the power cables, you much connect both ground wire of DC and AC side in wire box first.

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.

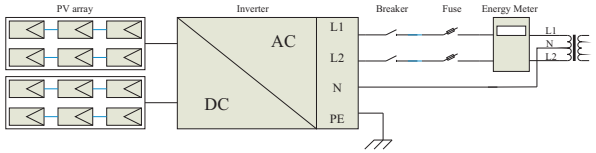
- This unit or system is provided with fixed trip limits and shall not be aggregated above 30 kW on a single Point of Common Connection.
- PV Panel: Provide DC power to inverter. IF MTL series PV inverter With Arc fault current detection function, recommend consumer connect the Tracker A and Tracker B to differ PV panel string.
- 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.



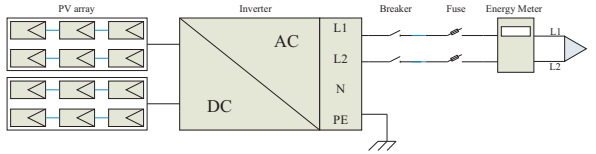
Principle of PV plant system

Position	Description
A	PV modules
B	rapid shutdown system
C	DC load circuit fuse or breaker
D	Growatt Inverter
E	AC load circuit fuse or breaker
F	Energy meter
G	Utility grid

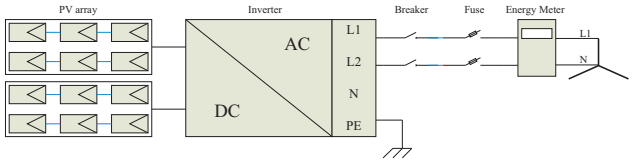
Single inverter System Installation



For 240 split phase

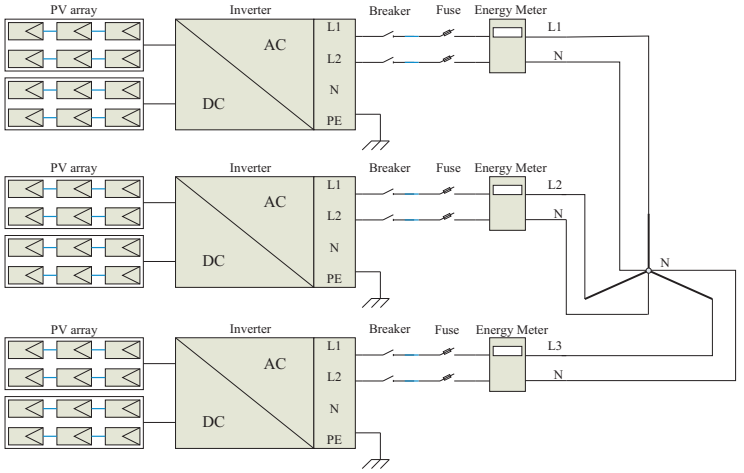


For 208/240V delta 3-phase

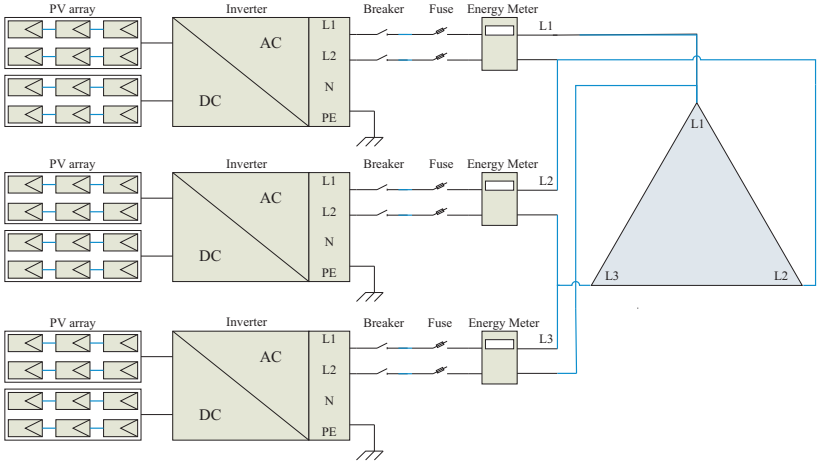


For Y 277V 3-phase

Multi inverters System Installation

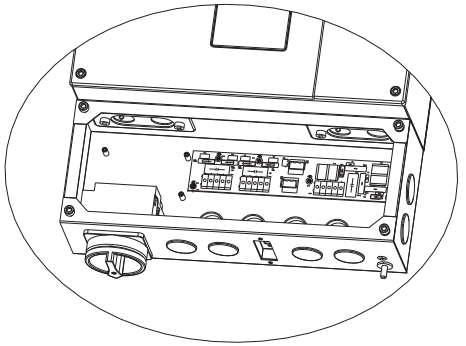


For Y 277V 3-phase



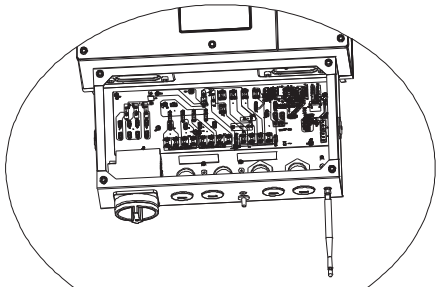
For 208/240V delta 3-phase

wire box



Type1

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

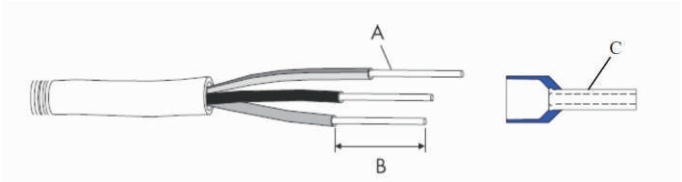


Type2

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

NOTE

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	See the Conductor cross section in the flowing chart
B	Stripping insulation	10mm or 12mm
C	bushing	KST E4010 or E6012

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 inverter is default set for utility interconnection with 3Phase-Δ Grid type 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:

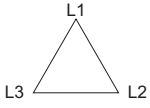
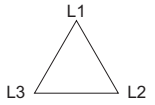
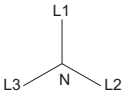
GRID STANDARD	 240Vac Split-phase	 208Vac 3phase-Δ	 240Vac 3phase-Δ	 277Vac 3phase-Y
wiring to terminal pin	L1 L2 N PE	L1 L2 - PE	L1 L2 - PE	L1 N - PE
NET MODEL	NET MODEL:1 (Option)	NET MODEL:2 (Option)	NET MODEL:3 (Default)	NET MODEL:4 (Option)

figure 5.6.3

WARNING

If several 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.

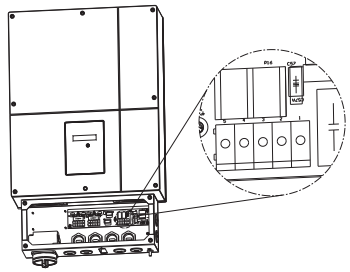
WARNING

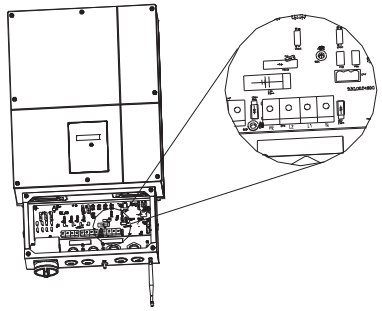
Si plusieurs inverter sont installés sur un réseau électrique à courant alternatif à trois phases. Il est recommandé de distribuer les onduleurs entre les phases pour réduire les déséquilibres de puissance entre les phases. Toujours vous référer aux normes locales.

Connection of the AC cable

Output connection terminal

Type1





Type2

- 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 figure5.6.3, 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.

WARNING

The separate disconnection unit spec require as follow:

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.

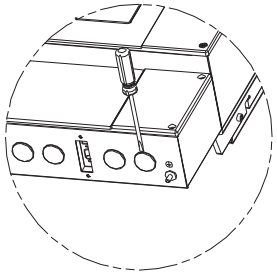
We suggest the AC separate unit spec as follow:

Model / Grid type	4000 MTLP-US	5000 MTLP-US	6000 MTLP-US
@208Vac	30A/400Vac	35A/400Vac	40A/400Vac
@240Vac	30A/400Vac	35A/400Vac	40A/400Vac
@277Vac	25A/400Vac	30A/400Vac	35A/400Vac

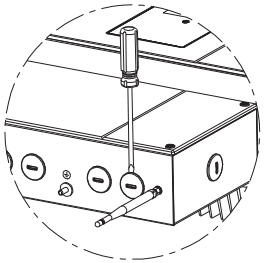
- **Wiring Step :**

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.

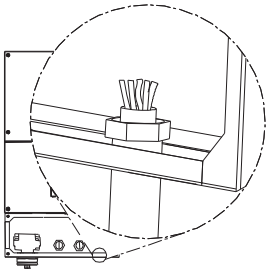


Type1



Type2

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.
GROWATT MTLP-US	3.30~6.63	9~12

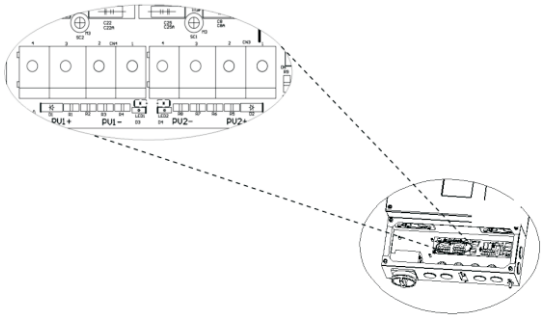
NOTE

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

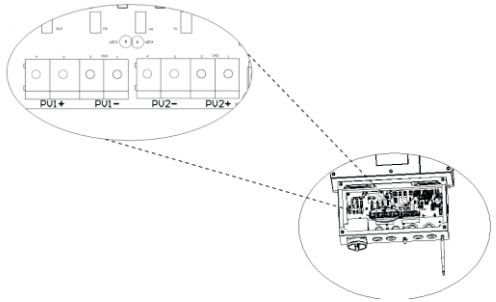
5.6.4 Connect to PV Panel (DC input)

DANGER	Risk of electric shock and fire, use only with PV modules, and with a maximum system voltage of 600Vdc.
	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. 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

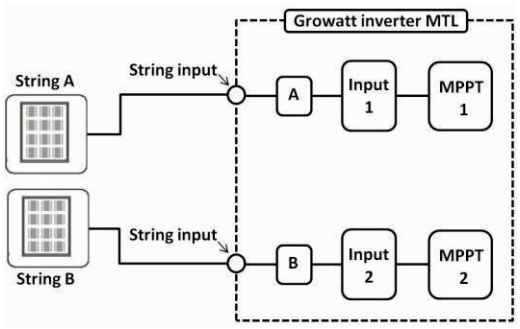


Type1



Type2

There are two MPP trackers of Growatt MTLP-US series , so you can connect two independent MPP channels.



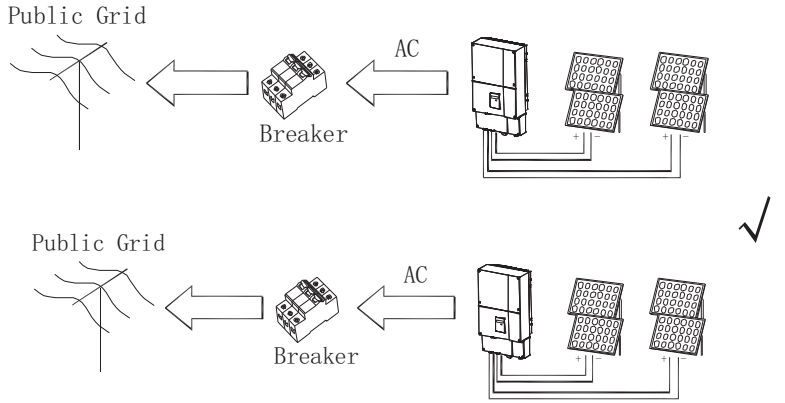
➢ Suggestions for the PV modules of the connected strings:

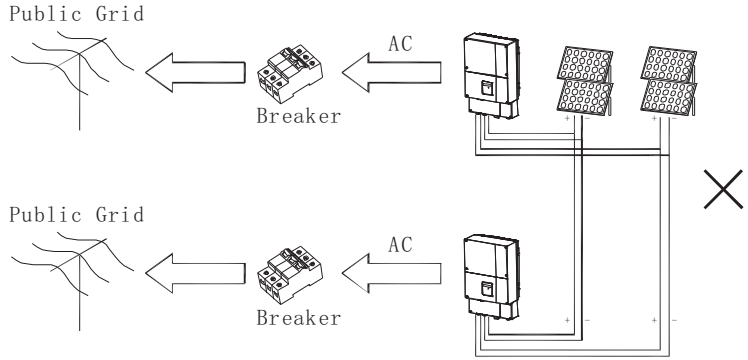
- Same type
- Same quantity of PV modules connected in series

➢ 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.

NOTE: The inverter with AFCI function, if tracker A and tracker B connect to same string PV model, it mand be possibility misinformation AFCI fault.





- Under any condition! Make sure the maximum open circuit voltage (Voc) of each PV string is less than 600Vdc.

  • 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 PV-Inverter. Each DC terminal on Inverter can withstand 18Adc.

- For instance, if the positive pole of a string is connected at MPP tracker A and the string's negative pole at MPP tracker B, this is called a mixed connection, the inverter no longer fulfils the requirements of the EMC Directive.

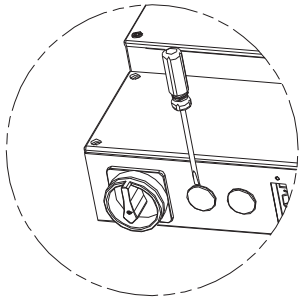
- Only connect strings at one input zone and never mix the input zones A and B!

- 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

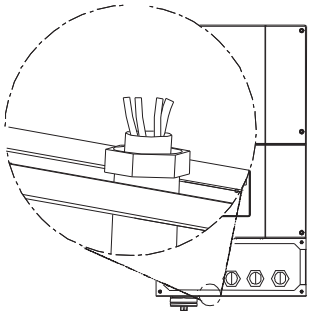
- **Wiring step:**

1.Open the independent DC separate unit ,the DC switch on the GROWATT MTLP-US inverter and the AC separate unit.

2.Open the left hand side knock-out hole.

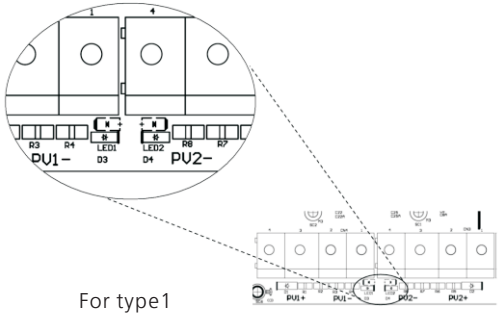


3. installation rubber pipe into the knock-out hole and pull the pipe nut slightly, feed the cables through the pipe into the wire box till the terminal.

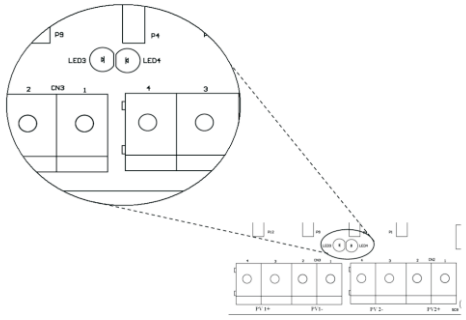


4. Connect the PV cables to the terminal correct.
5. Checking the wiring of PV positive and cathode connect is right then turn on DC switch.

NOTE:
When DC switch turn off, PV wiring mistake (polarity reverse) the wire Box board LED light brighten.



For type1



For type2

➢ **Cable requirements**:

Product Model	Area(mm²)	AWG No.
6K MTLP-US	3.30~5.26	10~12
5K MTLP-US	3.30~5.26	10~12
4K MTLP-US	3.30~5.26	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: “PV 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 xxxx.xVar ”. 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 4,000 W for half an hour and then at a constant power of 1,000 W for another half an hour, it has fed 2,500Wh 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 photovoltaic.

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

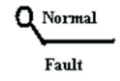
Connect in: xxxS

Connect : OK

Power: xxxx.xW xxxx.xVar

6.1.2 LCD display

- 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 4 status listed in below table.

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

➢ The Second line can change by knock on .

The Second Line Of LCD		
Cycle display	Display time/S	Remark
2279.5W 12.4Var Model:PVIA00F163	2	The inverter model
1872.0W 25.4Var FW Version:IA1.0	2	The software version
2270.0W 14.3Var SerNo:xxxxxxxxxx	2	The Serial Number
4240.1W 75.4Var Etoday: 12.7KWh	4	The energy today
1270.0W 75.4Var Eall: 102.1KWh	4	The energy all
743.7W 20.3Var Ppv: 421/ 389 W	4	PV input watt
427.3W 15.7Var PV:387/389 B:389	4	The PV and Bus Voltage
3724.3W 10.1Var AC:217V F:60.1Hz	4	Grid information
3143.7W 20.3Var L1:119V L2:120V	4	The grid system

The Second Line Of LCD		
Cycle display	Display time/S	Remark
2635.1W 10.3Var Setting	4	Setting
2521.7W 11.3Var 2014/12/05 11:20	4	Time system
2324.5W 16.7Var AC Error Record	4	The last 5dated failure report
2635.1W 10.3Var Input 123: xxx	4	Set input page
2635.1W 10.3Var Language:English	4	Set language
2635.1W 10.3Var COM Address: xxx	4	Set Communications Address
2635.1W 10.3Var Net model: x	4	Set Net Model

6.2. Setting the LCD display

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

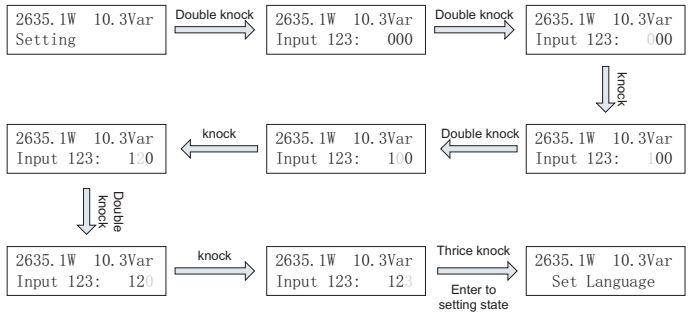
Knock type	Definition
Single knock	Key Down
Double knock	Key SET
Thrice knock	Key Enter or ESC

Before light the background, the types of knock functions are the same: just light the background.

NOTE: That the background light will automatically off if there is no knock detected in 10 seconds.
Sound control can define the display language, communication address and utility model choice.

➢ **Enter to set**

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 state. Display show as follows:



➢ **Setting language**

On the set situation page →knock to "Set language"→double knock to enter "language：English"→ knock to select the language you need and thrice knock enter or wait until the display become dark.

➢ **Setting communication address**

On the set situation page →knock to "COM Address: xx" → double knock to change the Address model → knock to set address, thrice knock enter or wait until the display become dark.

➢ **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.
On the set situation page →knock to "Net Model: x" →double knock to enter "Net Model: x"→knock to select the grid model .need to wait for 10S till the LCD background light gone out then the Inverter restart.

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.

Features:

- Monitor and record current data and of inverters
.
- Record historical data.
- Monitor and record event information of inverter
- Connect computer and inverter via RS232 or RS485 port
- Remote access available for local area network.

Information

Users are able to monitor the inverter after the setting of software. Detailed information about setting and functions refer to the ShineNET Manual.
You can download the ShineNet YN2.0 from: ftp://113.106.58.169, the user name is ftpguest and Password is ftpguest.
ShineNet may be upgraded for better function or user experience, please refer to the actual software version.

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 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

7.1.4 Wi-Fi module

Wi-Fi module is a wireless device used to monitor inverter. It transmit the data collected from the inverter to the server via router. User could get access to the inverter data by inquiring the server.

WiFi module

7.1.5 Shinelan module

Shinelan module include wi-fi and Ethernet function, user can choose wireless communication or Cable communication.

Shinelan module

7.1.6 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 Multi communication mode optional:

➢ Cable communication mode

There are three kinds of cable communication mode: RS232, RS485 and Ethernet. RS232 as the Type1 inverter model standard, RS485 as the Type1 and Type2 inverter model standard, Ethernet as the Type1 and Type2 inverter model optional function.

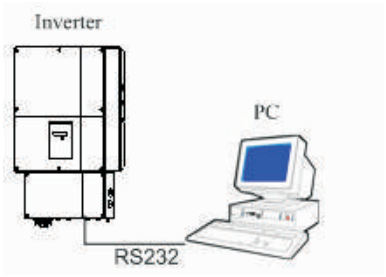
➢ Wireless communication mode

There are three kinds of Wireless communication mode: Wi-Fi, Zigbee and GPRS . Wireless communication as the user matching function.

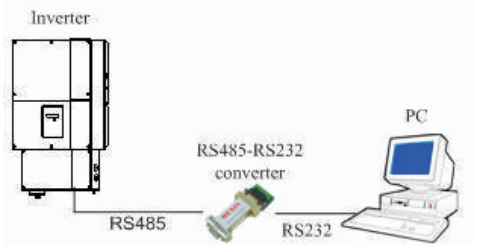
7.2.1. RS232 and RS485 monitoring system

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

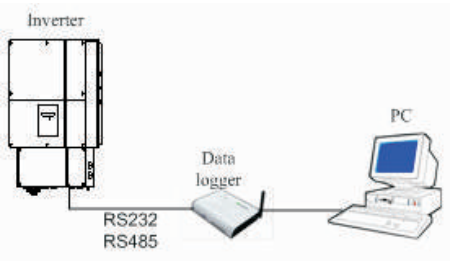
➢ Through RS232 interface +PC monitor single inverter



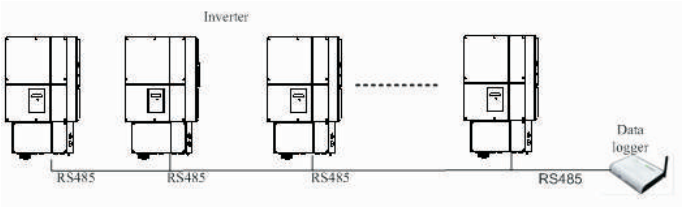
➢ Through RS485 interface- RS485-232 converter +PC monitor single inverter



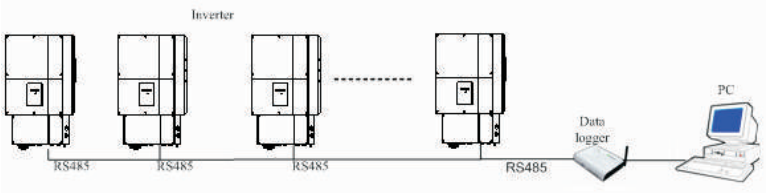
➢ Through RS232 or RS485 interface-data logger +PC monitor single inverter



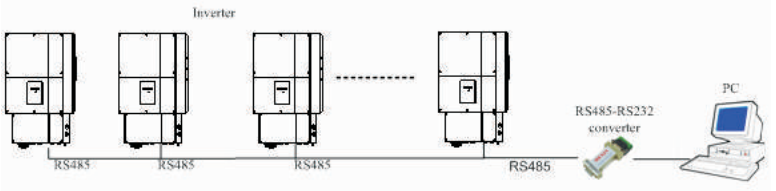
➢ Through RS485 interface-Data logger monitor Multi inverter



➢ Through RS485 interface-Data logger+ PC monitor Multi inverter

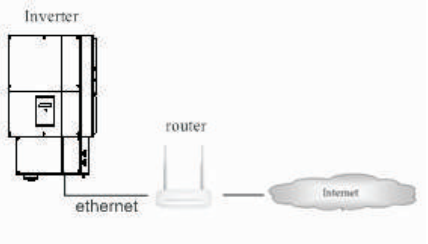


➢ Through RS485 interface-RS485-232 converter+ PC monitor Multi inverter

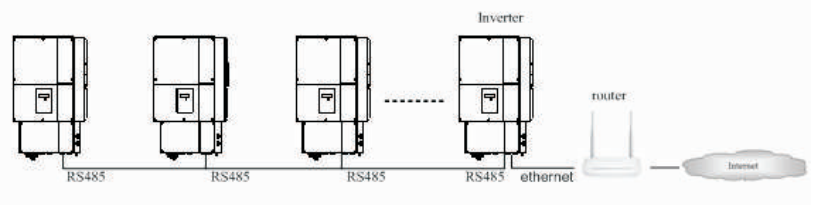


7.2.2. RS485 and Ethernet monitoring system

➢ Through RS485 interface +Ethernet monitor single inverter

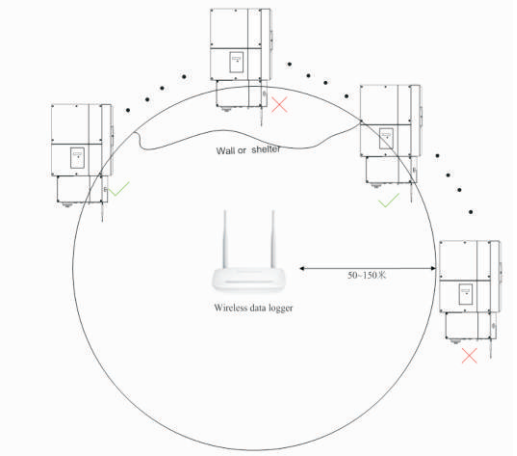


➢ Through RS485 interface +Ethernet monitor Multi inverter

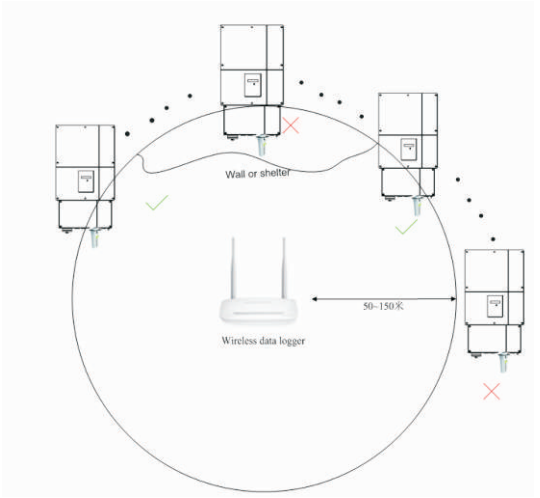


7.2.3. Wireless communication monitoring system

Wireless communication mode limit as follows



For Integrated wireless module inverter type



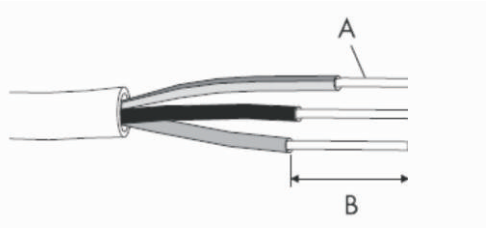
For exterior wireless module inverter type

7.3. Inverter communication setup

User different communication mode monitor inverter system, must setup inverter and insure inverter monitor stabilization.

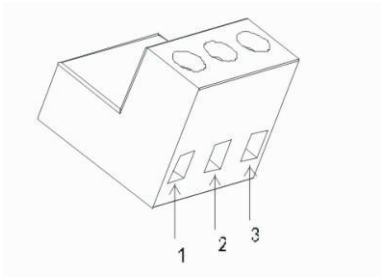
7.3.1. RS485 cable connection

1. Installation rubber pipe into the knock-out hole and pull the pipe nut slightly, feed the RS485 cables through the pipe into the wire box.
2. Rs485 communication wiring request and machining.

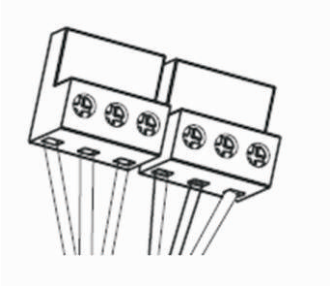


Code	Name	Detail
A	Conductor cross-section	0.2~0.5mm²
B	Stripping insulation	5~8mm

3. Take out the RS485 connection terminal from accessory packing bag.



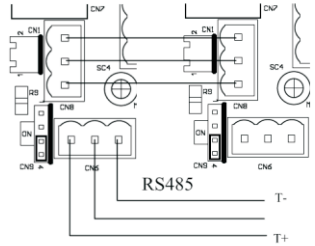
4. Connect the cable to the RS485 terminal ('1' to 'T/R-', '3' to 'T/R+', and '2' to the shielding net)



5. Plug RS485 terminals into the inverter

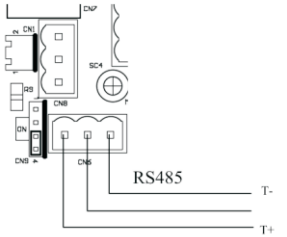
Information

As to the connection between inverters, please refer to the following figure.



Information

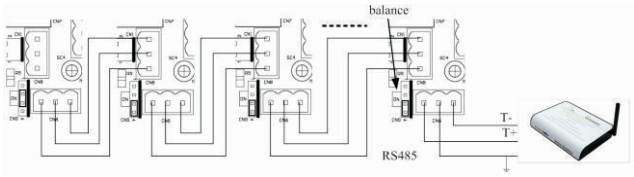
As to the connection between inverter and data logger, please refer to the following figure.



Information

RS485 BUS balance jumper:

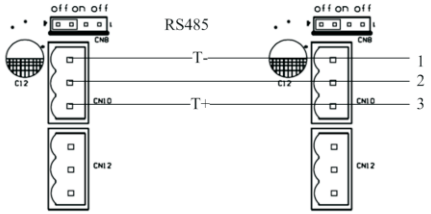
In RS485 communication circuit, when the T/R+ and T/R- lines reach a certain length, the line itself has impedance, in order to balance the impedance of the RS485 bus line, you'd better get the jumper to the state "ON" in RS485 BUS balance jumper of the remote inverter that the last one connects to the RS485 bus line while others keep "OFF" state.



Type1 inverter

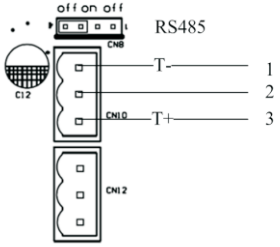
Information

As to the connection between inverters, please refer to the following figure.



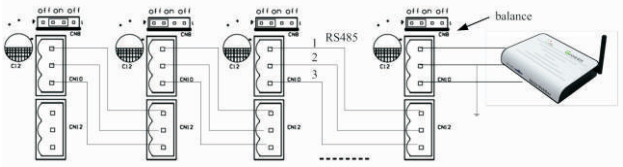
Information

As to the connection between inverter and data logger, please refer to the following figure.



Information

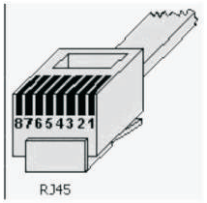
RS485 BUS balance jumper:
In RS485 communication circuit, when the T/R+ and T/R- lines reach a certain length, the line itself has impedance, in order to balance the impedance of the RS485 bus line, you'd better get the jumper to the state "ON" in RS485 BUS balance jumper of the remote inverter that the last one connects to the RS485 bus line while others keep "OFF" state.



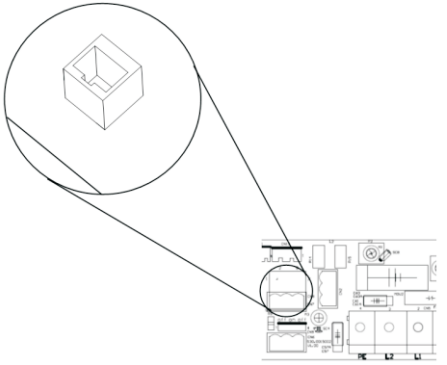
Type2 inverter

7.3.2. Ethernet cable connection

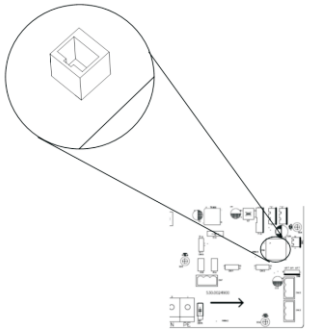
1. Installation rubber pipe into the knock-out hole and pull the pipe nut slightly, feed the Ethernet cables through the pipe into the wire box.
2. Ethernet communication wiring request and machining.
3. Using CAT5 cable for monitoring connections, connect RJ45 plug to the end of the cable as shown in the flowing table and plug into RJ45 jack.



PIN	Signal name	Description
1	TX+	Transmit Data
2	TX-	Transmit Data
3	RX+	Receive Data
6	RX-	Receive Data
4,5,7,8	N/U	NA



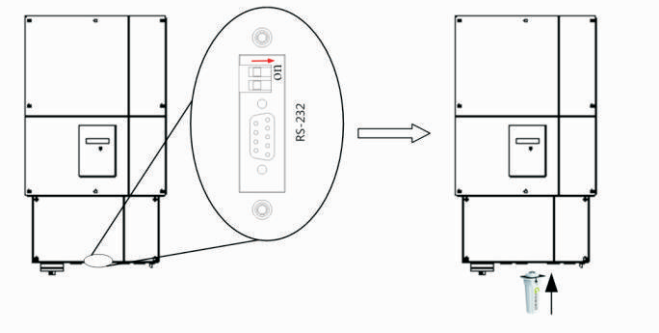
Type1 inverter



Type2 inverter

7.3.3. exterior wireless module user setup

Type1 inverter model user exterior wireless module，setup port as follows



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. Shut down 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.

9 Maintenance and Cleaning

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

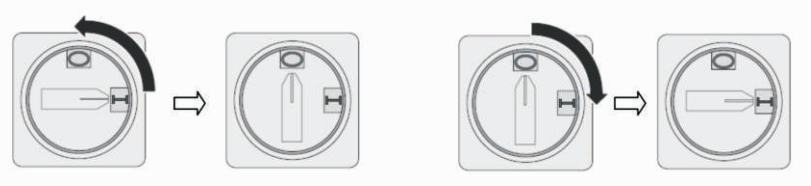
If the inverter is dirty, shut down the inverter, then clean the enclosure lid, the display, and the LEDs using only a wet cloth. Do not use any cleaning agents (e.g. solvents or abrasives).

9.3. Checking the DC switch

Checking 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.

WARNING

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.



Decommissioning 10

10.1. Dismantling the Inverter

1. Disconnect the inverter as described in chapter 10.
2. Remove all connection cables from the inverter.
3. Screw off all projecting cable glands.
4. Lift the inverter off the bracket and unscrew the bracket screws.

DANGER

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

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.

11.1 Warnings(W)

Warnings(W) identify the current status of the GROWATT MTLP-US inverter. Warnings do not relate to a fault. When a (W) with a number after it appears in the display, it indicates a Warning Code and is usually cleared through an orderly shutdown/re-set or a self corrective action performed by the inverter. See the (W) codes in the following table.

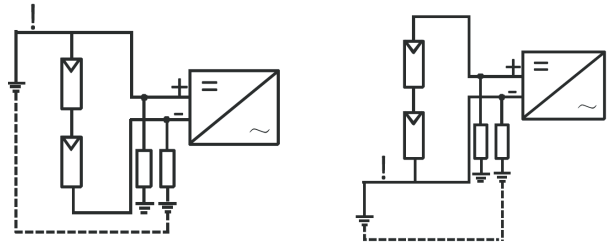
Error message	Description	Suggestion
No AC Connection	No utility grid connected or utility grid power failure.	1. Check AC wiring and switch state, especially the ground wire. 2. Clear malfunction, Restart inverter.
AC V Outrange	Utility grid voltage is out of permissible range.	1. Shunt down the inverter, check grid type and voltage. 2. Insure NET model and voltage is right, Restart inverter.
AC F Outrange	Utility grid frequency out of permissible range.	1. Check grid frequency range. 2. Restart inverter
Over Temperature	Temperature outrange	1. Check the inverter operation state 2. Play down ambient temperature, Restart inverter.
PV Isolation Low	Insulation problem	1. Check if panel enclosure ground properly. 2. Check if inverter ground properly. 3. Check if the DC breaker gets wet. 4. Clear malfunction, Restart inverter. 5. Clear the PV array firn and desiccate.
Output High DCI	Output current DC offset too high	Restart inverter.
Residual I High	Leakage current too high	Restart inverter.
PV Voltage High	The DC input voltage is exceeding the maximum value.	Disconnect the DC switch immediately.
Information	If the error message is displayed despite the above checking suggestions passed, contact dealer or Growatt.	

➢ PV isolation detection

The ISO function a protection mechanism. The inverter measures the resistances between both the positive pole and negative pole of PV panel and earth.

Either of the measured value is lower than the limit, the PV inverter will not connect to grid, the output relay will stay open, and show 'PV isolation low'. The limited value is determined by the standards.

The simplified principle of the isolation resistance measurement is described as below:



Note:

In the rain and snow weather or humid environment (humidity >90%),PV panel array equivalent resistance less than the dry environment , the inverter may appear ISO error.

UL1741 require show as:

Inverter Maximum Power Rating	Minimum DC insulation resistance allowed between the PV array input(s) with respect to ground
≤ 5 kVA	The larger resistance of 100kΩ or (1 kΩ *Vmax)
>5 kVA	The larger resistance of 100kΩ or (5000 * Vmax) / (Smax)
Vmax = manufacturer rated maximum PV input voltage Smax = maximum rated inverter output apparent power in kVA	

➢ GFCI function

GFCI is short for Ground-Fault Circuit Interrupter which is used for preventing from being electric shock. The 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.

11.2 Errors(E)

Errors(E) codes identify a possible equipment failure, fault or incorrect inverter setting or configuration. Any and all attempts to correct or clear a fault must be performed by qualified personnel. Typically, the(E) code can be cleared once the cause or fault is removed. Some of the(E) codes, Error as indicated in the table below, may indicate a fatal error and require you to contact the supplier to replace a new one.

Error code	Description	Suggestion
Error: 100	2.5V reference voltage fault	1. Restart inverter 2. If error message still exists, contact Growatt
Error: 101	Communication fault Slave processor can't receive data from Master processor.	1. Restart inverter 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. 2. If error message appears frequently or error message still exists after replacement, check utility grid. if you require help, contact Growatt 3. If error message still exists, contact Growatt
Error: 112	AFCI fault. System PV circuitry exist arc.	1.Check the system circuitry remove fault, restart inverter. 2.If error message still exists, contact Growatt.
Error: 114	AFCI Device Danage	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 2.If error message still exists, contact Growatt..
Error: 122	Bus voltage fault	Contact Growatt.

Operation Modes 12

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;

NOTE

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.

NOTE

Detailed fault information refers to 11. Trouble shooting.

12.3 Shutdown 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.

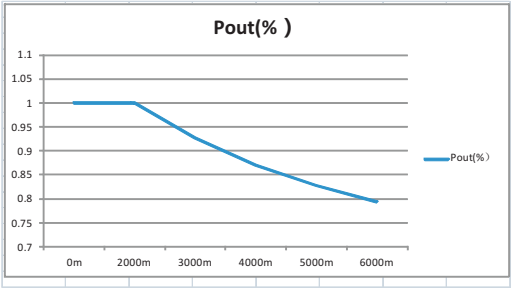
NOTE

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

13 Protection

13.1 Altitude protect

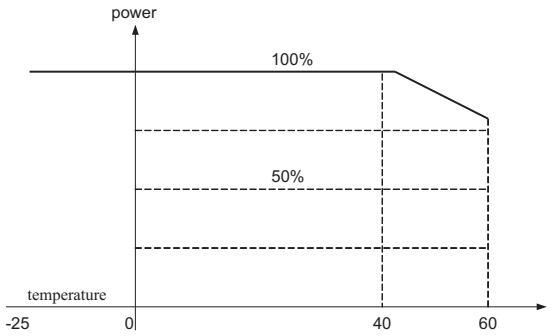
The inverter uses natural convection cooling mode, if the installation site altitude of more than 2000m, the inverter may happen de-rating protection. Altitude and output Power curves reference as follows:



13.2 Temperature protect

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.

High temperature output Power de-rating curves reference as follows:



13.3 Arc detection protect and Operation

Arc-Fault Circuit Interrupter (AFCI)

In accordance with the National Electrical Code®, Article 690.11, the inverter has a system for the recognition of electric arc detection and interruption. An electric arc with a power of 300 W or greater must be interrupted by the AFCI within the time specified by UL 1699B. A tripped AFCI can only be reset manually. You can deactivate the automatic arc fault detection and interruption (AFCI) via a communication product in "Installer" mode if you do not require this function. The 2011 edition of the National Electrical Code®, Section 690.11 stipulates that newly installed PV systems attached to a building must be fitted with a means of detecting and disconnecting serial electric arcs (AFCI) on the PV side.

Fault message

Error NO.	Eerror description
Error 112	AFCI fault. System PV circuitry exist arc
Error 114	AFCI device damage.

Danger information

Then "Error 112" Message is displayed and red LED is permanently lit and the buzzer alarms. An electric arc occurred in the PV system. The AFCI has tripped and the inverter is in permanent shutdown.

The product has large electrical potential differences between its conductors. Arc flashes can occur through air when high-voltage current flows. Do not work on the product during operation.

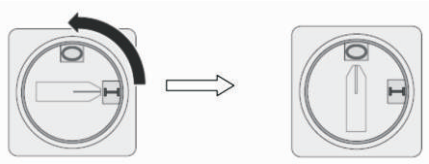
Danger of fire from electric arc

- Only test the AFCI for false tripping in the order described below.
- Do not deactivate the AFCI permanently.

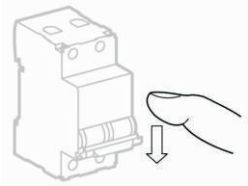
Operation step

When the inverter error 112, please according to the following steps.

a) Turn the DC Disconnect to position "0".



b) Turn the PV system AC Disconnect to position "0".

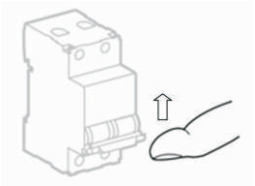


☑ Wait for the display to go out.

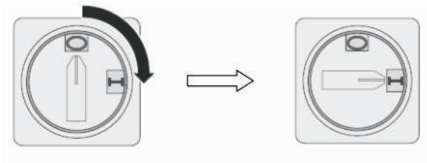
c) Perform troubleshooting in the PV system :
Check all PV strings for the correct open-circuit voltage.

d) After the fault is rectified, restart the PV inverter :

e) Turn the AC Disconnect to position "1".



Turn the DC Disconnect to position "1".

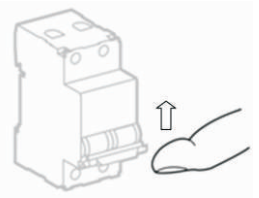


☑ The PV inverter starts and performs another AFCI self-test.

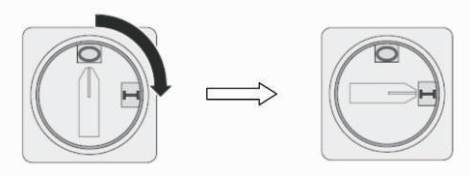
c) Perform troubleshooting in the PV system :
Check all PV strings for the correct open-circuit voltage.

d) After the fault is rectified, restart the PV inverter :

e) Turn the AC Disconnect to position "1".



Turn the DC Disconnect to position "1".



☑ The PV inverter starts and performs another AFCI self-test.

f) If the AFCI self-test is successful:
The PV inverter switches into the "nominal" mode and the green LED is permanently lit.

g) If the AFCI self-test fails:
The following message appears on the display : "Error 114."
Please restart the system, repeat step 1 to step 4.

h) If the AFCI self-test continues to fail:
Turn the DC Disconnect to position "0" and switch off the AC disconnect switch to the inverter.

Contact

If the AFCI self-test fails permanently, Please shutdown mode and contact the Service Line. dealer information you can refer to the warranty card.

14 Growatt Warranty

Please refer to the warranty card.

15 Technical Data

15.1 Specification

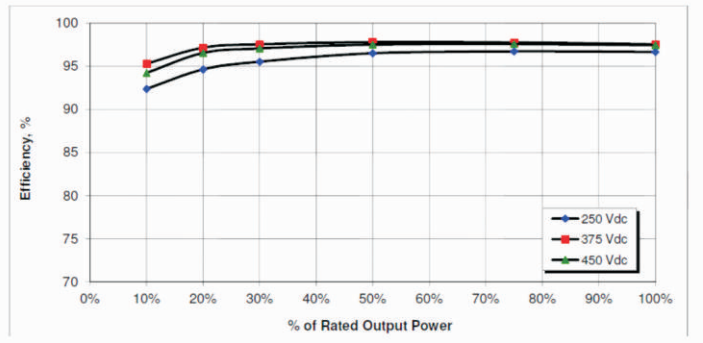
Model / Specifications	4000 MTLP-US	5000 MTLP-US	6000MTLP-US
Input data			
Max. recommend PV power	4800W	6000W	7200W
Max. DC power	4300W	5300W	6300W
Max. DC voltage	600±15V	600±15V	600±15V
Start voltage	150±15V	150±15V	150±15V
DC nominal voltage	360±15V	360±15V	360±15V
PV voltage range	100-600±15V	100-600±15V	100-600±15V
MPP operating voltage range	120-500±15V	120-500±15V	120-500±15V
Rated MPPT voltage range	180-480±15V	180-480±15V	100-600±15V
Number of independent MPP trackers/strings per MPP tracker	2/2	2/2	2/2
Max. input current /per MPP tracker	24A/18A	30A/18A	36A/18A
Grid Output data			
Nominal AC output power (@ cosΦ=1)	4000W	5000W	6000W
Max. output current	16.7A	21A	25A
AC nominal voltage; range	Default:240V single phase, optional:208 or 277 single phase , optional: 240Vsplit phase 183-228@208V 211-264V@240V 244-305@277V		

Specifications \ Model	4000 MTLP-US	5000 MTLP-US	6000MTLP-US
Grid Output data			
abnormal voltage Clearing time adjust range	V<0.45Un; ⩽0.16S±0.08S 0.45Un<V<0.6Un; ⩽11S±0.2S 0.6Un<V<0.88Un;⩽21S±0.2S 1.1Un<V<1.2Un; ⩽13S±0.2S V>1.2Un; ⩽0.16S±0.08S		
AC grid frequency; range	60Hz; 59.5-60.5Hz		
abnormal frequency Clearing time adjust range	1# Under:56~60Hz/⩽10S±0.08S 2# Under:56-60Hz/⩽300S±0.8S 1# Over:60~64Hz/⩽10S±0.08S 2# Over:60~64Hz/⩽300S±8S		
Phase shift (cosΦ)	Default: >0.99, opt Reactive power adjust / range:-0.85~+0.85		
THDI	⟨3%		
AC connection	Single phase		
Off-line Output (opt)			
Max. output power	1800VA		
Max. output current	15A		
AC nominal voltage	120V+/-10%		
AC grid frequency	60Hz+/-0.5		
Phase shift	0.9+/-0.1		
THDV	⟨5%		
Efficiency (Grid)			
Max. efficiency	97.2%	97.5%	97.5%

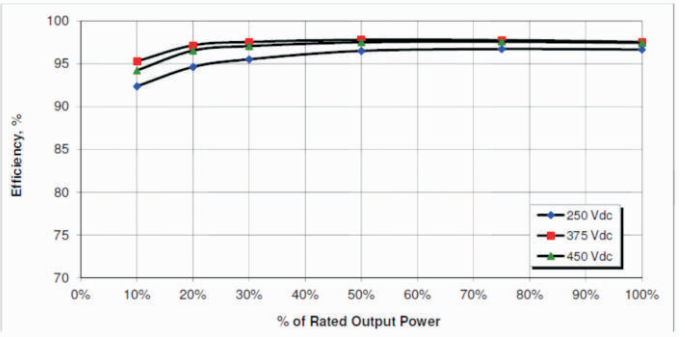
Specifications \ Model		4000 MTLP-US	5000 MTLP-US	6000MTLP-US
Efficiency (Grid)				
CEC efficiency		96.5%	97%	97%
MPPT efficiency		99.50%	99.50%	99.50%
Protection devices				
DC reverse polarity protection		yes		
DC switch rating for each MPPT		yes		
Output over current protection		yes		
Output overvoltage protection-varistor		yes		
Ground fault monitoring for Split phase		yes		
Grid monitoring		yes		
Integrated all - pole sensitive leakage current monitoring unit		yes		
AFCI compliant to UL 1699B		yes		
General Data				
Dimensions (W / H / D) in mm	Type1	660*400*215	660*400*215	660*400*215
	Type2	735*400*215	735*400*215	735*400*215
Weight	Type1	31Kg	31Kg	31.5Kg
	Type2	31.5Kg	31.5Kg	32Kg

Specifications \ Model	4000 MTP-US	5000 MTLP-US	6000MTLP-US
Protection devices			
Operating temperature range	-25..+60℃/(-13...+ 140℉) with de-rating above 45℃(113℉)		
Noise emission (typical)	⩽ 25 dB(A)		
Altitude	Up to 2000m(6560ft) without power de-rating		
Relative humidity	100%		
Consumption: standby/ night	<5W / < 0.5 W		
Topology	Transformer-less		
Cooling concept	Natural		
Enclosure	Type 3R		
Features			
DC connection:	Screw terminal		
Smart meter for Type2	opt	opt	opt
AC connection:	Screw terminal		
display	LCD		
Interfaces:			
Type1:RS485/RS232/RF/ WIFI /Ethernet	yes/yes/opt/opt/opt		
Type2:RS485/WIFI/Zigbee /Ethernet/GPRS	yes/opt/opt/opt/opt		
Warranty: 10 years / 15 years	yes /opt		
Certificates and approvals	UL1741,UL1998 ,IEEE 1547, CSA C22.2 No.107.1-1,FCC Part15(Class A&B),UL1699B		

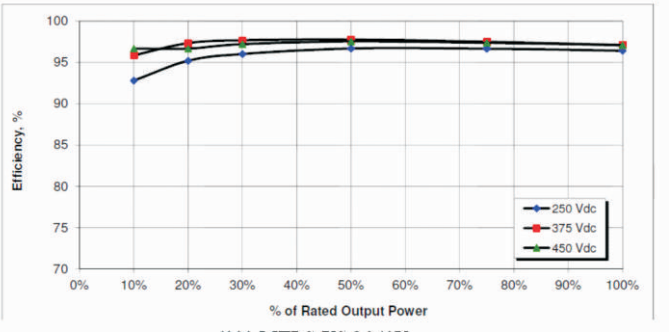
15.2 Efficiency curve



GROWATT 4000 MTLP-US @240Vac



GROWATT 5000 MTLP-US @240Vac



GROWATT 6000 MTLP-US@240Vac

15.3 Torque

Shell and RS232 screws	12kg.cm
DC/AC terminal	12kg.cm
M6 soket head cap screws for securing the enclosure at the bracket	20kg.cm
Additional ground screws	20kg.cm

15.4 Optional accessories

In the following table you will find the optional accessories or optional integrated function module for your product. If required, you can order these from SHENZHEN GROWATT NEW ENERGY TECHNOLOGY CO.,LTD or your dealer.

Type1 inverter optional accessories and function

Name	Brief description
WI-FI	Wireless monitor device
WebBox	Data logger
Vision	Wireless monitor device
Ethernet	Integrated function
Shinelan	Monitor device

Type2 inverter optional accessories and function

Name	Brief description
WebBox	Data logger
Ethernet	Integrated function
Zigbee	Integrated Wireless communication module
GPRS	Integrated Wireless communication module
Meter	Integrated function

Download address 16

www.ginverter.com/Download.aspx

Download address 17

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

Manufacturer:
GROWATT NEW ENERGY TECHNOLOGY CO.,LTD

Address:
No. 28 Guangming Road, Longteng Community,Shiyan, Baoan District, Shenzhen, P.R. China

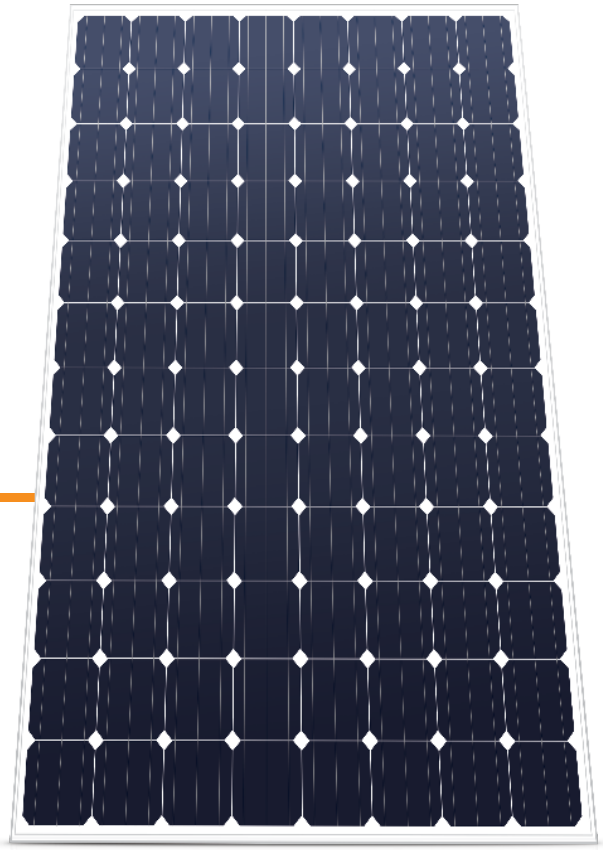
Serviceline
T: +86 755 2747 1942
F: +86 755 2747 2131
E: service@ginverter.com

MONO POLY

HELIENE

96M

96-CELL MONOCRYSTALLINE MODULE



490 Wp
MAX POWER OUTPUT

19.1%
MAX EFFICIENCY

10 YEAR
PRODUCT WARRANTY

25 YEAR
LINEAR PERFORMANCE GUARANTEE

- GUARANTEED POSITIVE POWER SORTING: [-0 : +4.99 WP]
- AVAILABLE IN 1000V OR 1500V SYSTEM VOLTAGE RATING
- MANUFACTURED ACCORDING TO INTERNATIONAL QUALITY SYSTEM STANDARDS: ISO9001
- REDUCES SYSTEM TOTAL INSTALLED COST (TIC)

HELIENE INC. IS A PREMIER SOLAR MODULE MANUFACTURER, SERVICING THE GROWING SOLAR ENERGY MARKETS OF NORTH AMERICA.

COMBINING PROVEN EUROPEAN TECHNOLOGY WITH NORTH AMERICAN INGENUITY ALLOWS HELIENE TO MAKE A REAL COMMITMENT IN PROVIDING SMARTER ENERGY CHOICES FOR THE FUTURE.

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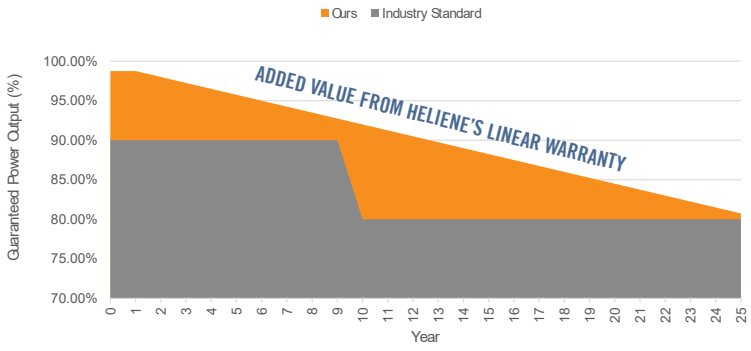
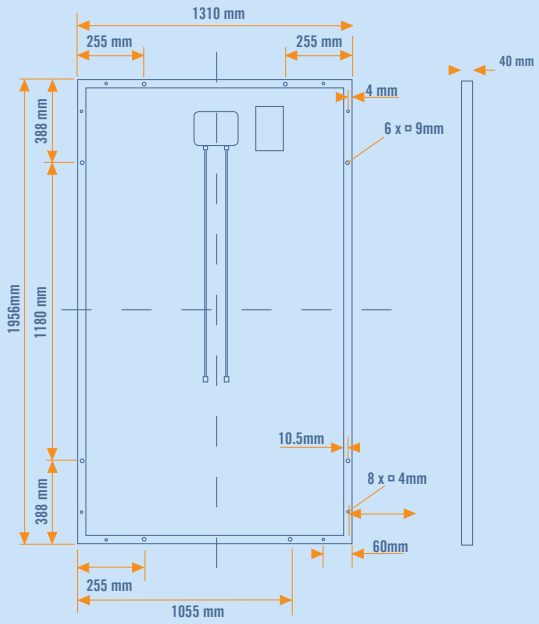
LINEAR PERFORMANCE GUARANTEE

10 YEAR WORKMANSHIP WARRANTY • 25 YEAR LINEAR PERFORMANCE GUARANTEE

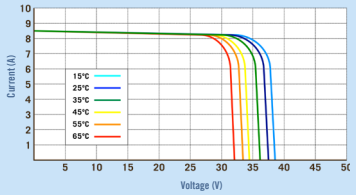


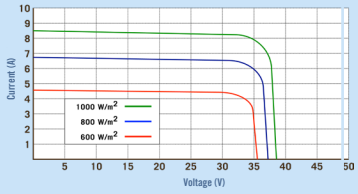
96M

DIMENSIONS FOR HELIENE 96M SERIES MODULES



I-V CURVE FOR HELIENE 96M SERIES





CERTIFICATIONS

ELECTRICAL DATA (STC)

Peak Rated Power	P_{mpp} (W)	490	480	470	465	460
Maximum Power Voltage	V_{mpp} (V)	52.66	52.26	51.86	51.66	51.46
Maximum Power Current	I_{mpp} (A)	9.36	9.24	9.11	9.05	8.99
Open Circuit Voltage	V_{oc} (V)	62.99	62.59	62.19	61.99	61.79
Short Circuit Current	Isc (A)	10.06	9.91	9.76	9.69	9.62
Module Efficiency *	Eff (%)	19.1	18.7	18.3	18.1	18.0
Maximum Series Fuse Rating	MF (A)	20	20	20	20	20
Power Output Tolerance	[- 0 , + 4.99] Wp					

STC - Standard Test Conditions: Irradiation 1000 W/m2 - Air mass AM 1.5 - Cell temperature 25 ºC
* Calculated using maximum power based on full positive output tolerance [-0 , +4.99] Wp

MECHANICAL DATA

Dimensions (L x W x D)	1956 x 1310 x 40 mm (77 x 51.6 x 1.6 inch)
Weight	38 kg (83.7 lbs)
Output Cables	1.5 m (47.2 inch) symmetrical cables with MC4 type connectors
Junction Box	IP-67 rated with bypass diodes
Frame	Double webbed 5 micron anodized aluminum alloy
Front Glass	Low-iron content, high-transmission PV solar glass
Solar Cells	96 Monocrystalline cells (156 x 156 mm)

CERTIFICATIONS

UL Certification	ULC/ORD-C1703-1, UL1703
IEC Certification	Optional

TEMPERATURE RATINGS

Nominal Operating Cell Temperature (NOCT)	+45°C (±2°C)
Temperature Coefficient of P_{max}	-0.39%/°C
Temperature Coefficient of V_{oc}	-0.31%/°C
Temperature Coefficient of I_{sc}	0.045%/°C

PACKAGING CONFIGURATION

Modules per box:	25 pieces
Modules per 53' trailer:	550 pieces

MAXIMUM RATINGS

Operational Temperature	-40°C - +85°C
Max System Voltage	1000V (*1500V) *Optional

WARRANTY

10 Year Manufacturer's Workmanship Warranty
25 Year Linear Power Guarantee

(Refer to product warranty page for details)

HELIENE96M_IFD_1701-Rev.03

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.
Specifications included in this datasheet are subject to change without notice.

HELIENE

Equipment	Manual/instructions	Specifications	equipment certifications	Documentation that the equipment is listed by a qualified evaluation
Heliene 96M480 (21 panels)	EXD 8.5-001 PV Module Installation Manual_Rev.02.pdf	Heliene96M_Silver_NA-Rev.03 spec sheet.pdf	ULC/ORD-C1703-1, UL1703	Heliene96M_Silver_NA-Rev.03 spec sheet.pdf
Growatt 5000 MTLP-US (2 inverters)	Growatt 5 - 7.6 kw manual.pdf	Growatt 5000 spec sheet w compliances.pdf	UL1741,UL1998 ,IEEE 1547, CSA C22.2 No.107.1-1,FCC Part15(Class A&B),UL1699B	Growatt Solar Inverter 4000-7600 MTLP-US spec sheet.pdf
NEP RAPID SHUTDOWN	NEP-Rapid-Shutdown-Manual.pdf	NEP RAPID SHUTDOWN Specification sheet.pdf	UL 1741 CSA C22.2 No. 107.1 NEC 2014/2017 690.12 Canada CEC 2015 64-218	NEP RSD-PVG-4 certifications.pdf
Iorn Ridge mounting		IronRidge_RoofMount_ DataSheet.pdf	UL 2703	IronRidge_RoofMount_ DataSheet.pdf
Emergency shotdown Switch next to inverters				
Inverter location	North side of house at 1876 NC 87-N			

Statewide Uniform Requirement of Inspection Procedures for Solar Photovoltaic Systems Installed on Reside ntial Rooftops Option No. 2

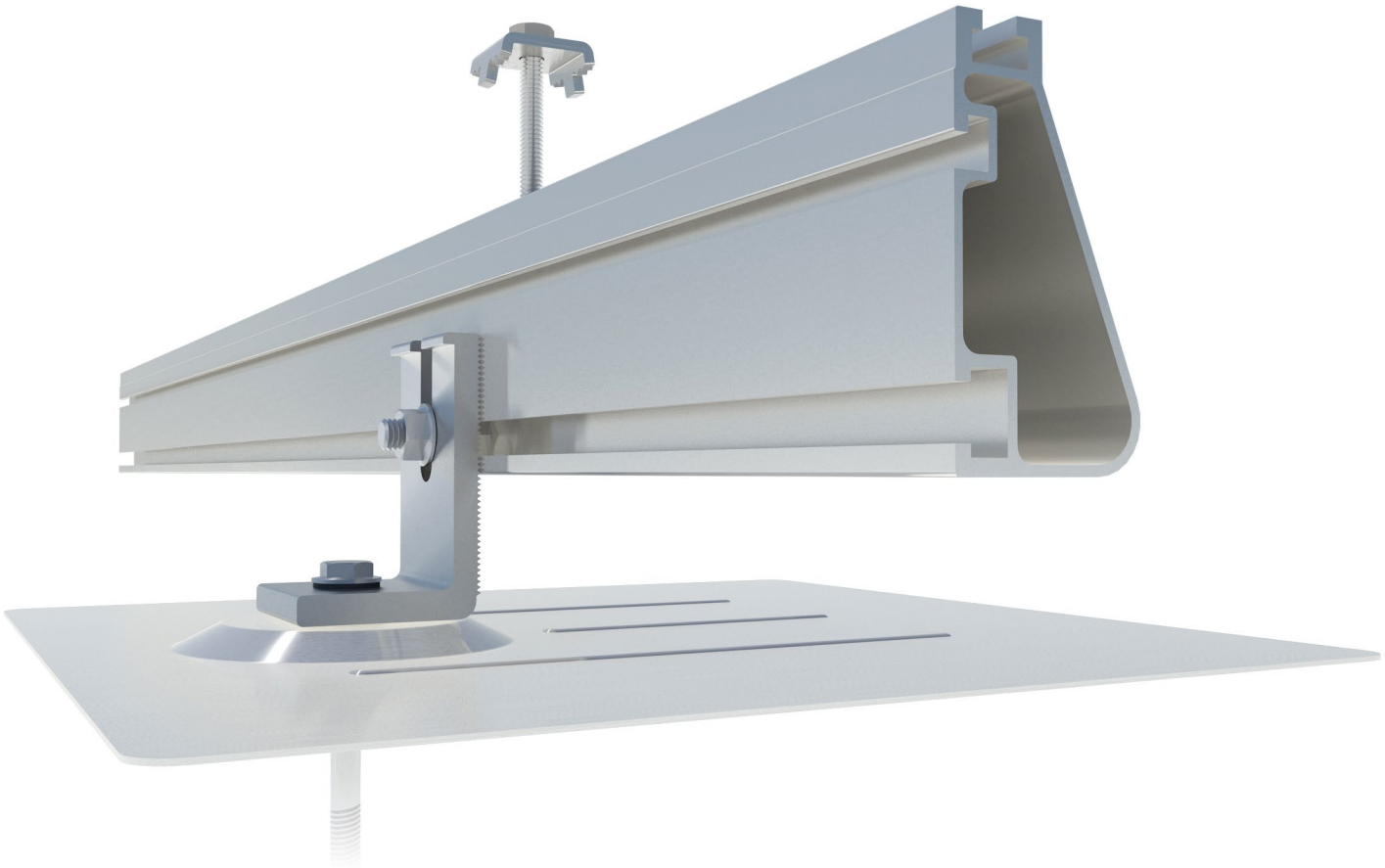
1. Application for Electrical and Building Permit must include:

a. Sketch of the electrical design that complies with the NEC	see attached line drawing
b. Electrical details of the equipment including:	
i. Manufacturer' s instructions	see attachments
ii. Documentation that the equipment is listed by a qualified evaluation laboratory	see attachments
iii. Instructions for the rapid shutdown of the system at the roof	see attachments
iv. Inverter location	North side of house at 1876 NC 87-N
v. Type and size of conductors to be used	see attached line drawing
vi. How the metal frame(s) and the PV electrical system is to be grounded	see attached line drawing
c. Sketch of the equipment's structural mounting design. A North Carolina registered design professional will be required to seal the structural design at the time of application if any of the following exist and are attested to by the applicant:	
i. The weight of the PV system exceeds three (3) pounds per square foot (psf)	Structural Inspection of roof load (2.60 lb per sqft) 3-9-21
ii. The roof possesses more than one (l) layer of asphalt shingles	no
iii. The roofing material consists of a type other than asphalt shingles or metal, or	no
iv. The roof is located in a 140 mph or greater wind zone	no

Datasheet

IRONRIDGE

Roof Mount System



Built for solar's toughest roofs.

IronRidge builds the strongest roof mounting system in solar. Every component has been tested to the limit and proven in extreme environments.

Our rigorous approach has led to unique structural features, such as curved rails and reinforced flashings, and is also why our products are fully certified, code compliant and backed by a 20-year warranty.

Strength Tested

All components evaluated for superior structural performance.

PE Certified

Pre-stamped engineering letters available in most states.

Class A Fire Rating

Certified to maintain the fire resistance rating of the existing roof.

Design Software

Online tool generates a complete bill of materials in minutes.

Integrated Grounding

UL 2703 system eliminates separate module grounding components.

20 Year Warranty

Twice the protection offered by competitors.

XR Rails

XR10 Rail

A low-profile mounting rail for regions with light snow.

- 6’ spanning capability
- Moderate load capability
- Clear & black anod. finish

XR100 Rail

The ultimate residential solar mounting rail.

- 8’ spanning capability
- Heavy load capability
- Clear & black anod. finish

XR1000 Rail

A heavyweight mounting rail for commercial projects.

- 12’ spanning capability
- Extreme load capability
- Clear anodized finish

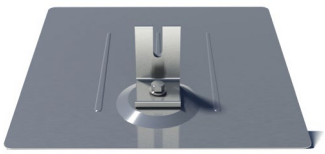
Internal Splices

All rails use internal splices for seamless connections.

- Self-tapping screws
- Varying versions for rails
- Grounding Straps offered

Attachments

FlashFoot



Anchor, flash, and mount with all-in-one attachments.

- Ships with all hardware
- IBC & IRC compliant
- Certified with XR Rails

Slotted L-Feet

Drop-in design for rapid rail attachment.

- High-friction serrated face
- Heavy-duty profile shape
- Clear & black anod. finish

Standoffs

Raise flush or tilted systems to various heights.

- Works with vent flashing
- Ships pre-assembled
- 4” and 7” Lengths

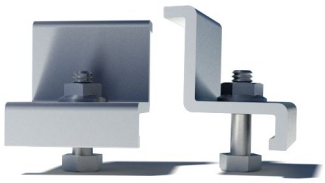
Tilt Legs

Tilt assembly to desired angle, up to 45 degrees.

- Attaches directly to rail
- Ships with all hardware
- Fixed and adjustable

Clamps & Grounding

End Clamps



Slide in clamps and secure modules at ends of rails.

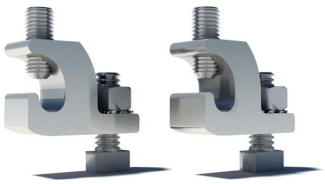
- Mill finish & black anod.
- Sizes from 1.22” to 2.3”
- Optional Under Clamps

Grounding Mid Clamps

Attach and ground modules in the middle of the rail.

- Parallel bonding T-bolt
- Reusable up to 10 times
- Mill & black stainless

T-Bolt Grounding Lugs



Ground system using the rail’s top slot.

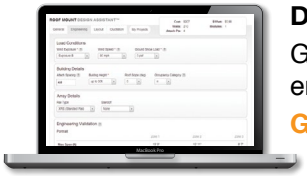
- Easy top-slot mounting
- Eliminates pre-drilling
- Swivels in any direction

Accessories

Provide a finished and organized look for rails.

- Snap-in Wire Clips
- Perfected End Caps
- UV-protected polymer

Free Resources



Design Assistant

Go from rough layout to fully engineered system. For free.

Go to IronRidge.com/rm

NABCEP Certified Training

Earn free continuing education credits, while learning more about our systems.

Go to IronRidge.com/training