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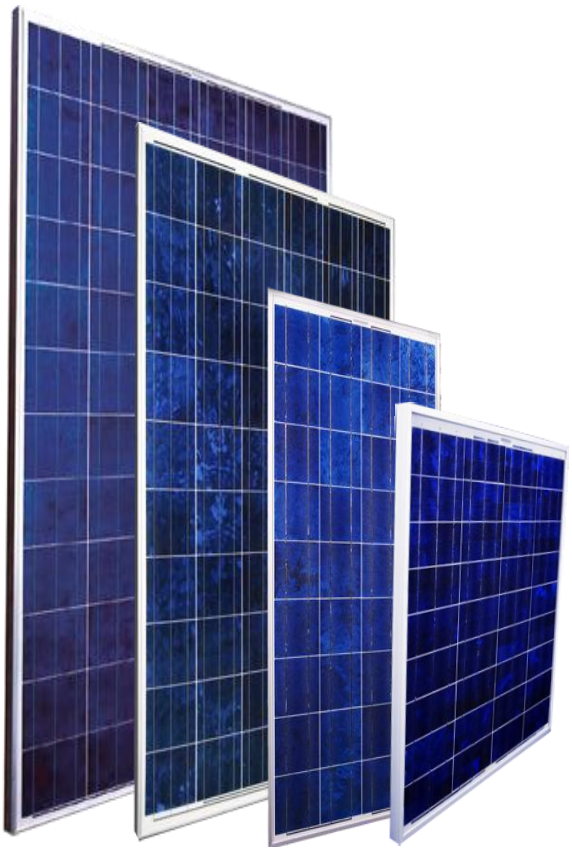
绿能电力
GREEN ENERGY POWER



Green Energy Power Module Installation Manual

Contents

1.General Information

1.1Overview

Thanks for choosing Green Energy Power modules. In order to ensure the PV modules are installed correctly, please read the following installation instructions carefully before modules are installed and used. Please remember that these products generate electricity and certain safety measures need to be taken to avoid danger. Make sure the module array is designed in such a way not to exceed the maximum system voltage of any system component such as connectors or inverters.Electrical installation shall comply with local regulations/electrical codes.

This module has a Class A Fire Rating (Canada) or Module Fire performance type 30 (United States of America) and must be installed over a roof which has appropriate fire resistance. Before mounting the module, please consult your local building department to determine approved roofing materials. The modules are qualified for application class A, and modules qualified for safety through UL 1703 within this application class are considered to meet the requirements of Safety Class II.

When used with a listed mounting system that has been rated as a Class A System when installed with type 30 modules,is suitable to maintain the System Class A Fire Rating in America.

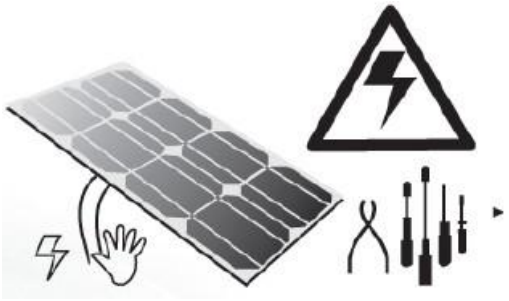
Module	Specific construction	Marking
GEP-JfMcxxxNH GEP-CfMcxxxNH GEP-GfMcxxxNH GEP-DfMcxxxNH GEP-HfMcxxxNH	Superstrate: 2.0 mm thick; EVA: 0.25 ~ 0.8 mm thick; Substrate: 2.0 mm thick; Frame: Types “35mm by 35mm” or “35mm by 30mm” or “30mm by 30mm”	Module Fire Performance: Type 30

1.2Warnings

- PV modules generate DC electrical energy when exposed to sunlight or other light sources. Active parts of modules such as terminals can result in burns, sparks and lethal shock.
- Artificially concentrated sunlight shall not be directed on the module or panel.
- Front protective glass is utilized on the module. Broken solar module glass is an electrical safety hazard (may cause electric shock or fire). These modules cannot be repaired and should

be replaced immediately.

- To reduce the risk of electrical shocks or burns, modules may be covered with an opaque material during installation to avoid injury.
- The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.
- The module is considered to be in compliance with UL1703 only when the module is mounted in the manner specified by the mounting instructions below.
- All installations must be performed in compliance with the National Electrical Code (NEC) and modules installed in Canada need to follow Canadian Electric Code (CEC).
- A module with exposed conductive parts is considered to be in compliance with UL1703 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 UL1703 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 UL1703.
- The installation work of the PV array can only be done under the protection of sun-sheltering covers or sunshades and only qualified person can install or perform maintenance work on this module.
- Follow the battery manufacture's recommendations, if batteries are used with modules.
- Do not use this module to replace or partly replace roofs and walls of living buildings.
- Do not install modules where flammable gas may be present.
- Do not touch live terminals with bare hands. Use insulated tools for electrical connections.



Use insulated tools for electrical connection

- Do not remove any part installed by Green Energy Power or disassemble the module.
- All instructions should be read and understood before attempting to install, wire, operate and maintain the module.
- Don't lift up PV modules using the attached cables or the junction box.
- All PV systems must be grounded to earth. If there is no special regulation, please follow the National Electrical Code or other national code.
- 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.

- 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 value of Isc and Voc marked on the 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.
- Once the PV module has been shipped to the installation site, all of the parts should be unpacked properly with care.
- Do not stand or step on the PV module like below pictures show. This is prohibited and there is a risk of damage to the module and cause injury for you.


- Only PV modules with the same cell size should be connected in series.
- During transporting modules, please attempt to minimize shock or vibration to the module, as this may damage the module or lead to cell micro cracks.
- During all transportation situations, never drop the module from a vehicle, house or hands. This will damage the module.
- Do not clean the glass with chemicals. Only use tap water. Make sure the module surface temperature is cool to the touch. Cleaning modules with cool water when module surface temp is high may result in glass breakage.
- Do not disconnect any of the modules when under load.
- The recommended standoff height is 6 inches (15cm). If other mounting means are employed this may affect the UL Listing.
- When looking at PV modules with anti-reflection (AR) coating technology, it will be normal to see some cells with a slight color difference at different angles. Modules with LRF (light reflective film) and without LRF should not be built in the same array.
- Do not use modules in an environment with aliphatic, aromatic, phenols, ketones, halogenated substance or mineral oil, which may corrode the junction box by chemical attack.
- PV modules are suitable for ground installation in areas below 2000 meters above sea level, which cannot be used in outer space.

2.Installation

2.1Installation Safety

- Always wear protective head gear, insulated gloves and safety shoes (with rubber soles).
- Keep the PV module packed in the carton until installation.
- Do not touch the PV module unnecessarily during installation. The glass surface and the frame may be hot. There is a risk of burns and electric shock.
- Do not work in rain, snow or windy conditions.
- Due to the risk of electrical shock, do not perform any work if the terminals of the PV module are wet.
- Use insulated tools and do not use wet tools.
- When installing PV modules, do not drop any objects (e.g., PV modules or tools).
- Make sure flammable gases are not generated or present near the installation site.
- The modules are equipped with PV wiring connectors that comply with UL 6703, Standard for Connectors for use in Photovoltaic Systems. Connectors from other manufactures should not be mated with each other connectors.
- Insert module connectors fully and correctly. An audible "click" sound should be heard. This sounds confirms the connectors are fully seated. Check all connections.
- The module leads should be securely fastened to the module frame. Wire Management should be done in a way to avoid the connector from scratching or impacting the back sheet of the module.
- Do not touch the junction box and the end of the interconnect cables (connectors) with bare hands during installation or under sunlight, regardless if the PV module is connected to or disconnected from the system.
- Do not expose the PV module to excessive loads on the surface of the PV module or twist the frame.
- Do not hit or put excessive load on the glass or back sheet, this may break the cells or cause micro cracks.
- During installation or operation, don’t use sharp tools to wipe the back sheet and glass. Scratches can appear on the module.
- Do not drill holes in the frame, it may cause corrosion of the frame and void the warranty.
- When installing modules on roof mounted structures, please try to follow the “from top to bottom” and/or “from left to right” principle, and don’t step on the module. This will damage the module and would be dangerous for personal safety. For roof mounted applications, the assembly is to be mounted over a fire resistant roof covering rated for the application.
- All PV systems must be grounded to earth (Refer to 3.“Wiring and connection” for specific grounded).

2.2Installation Condition

2.2.1 Climate Condition

Please install the modules in the following conditions:

a)Operating temperature: within –40°C(-40°F) to 85°C(T98max:70°C).

b)Humidity: < 85RH%.

＊Note:

The mechanical load bearing (including wind and snow loads) of the module is based on the approved mounting methods. The professional system installer must be responsible for mechanical load calculation according to the system design.

2.2.2 Site Selection

In most applications, Green Energy Power modules should be installed in a location where they will receive maximum sunlight throughout the year. In the Northern Hemisphere, the module should typically face south, and in the Southern Hemisphere, the modules should typically face north. Modules facing 30 degrees away from true South (or North) will lose approximately 10 to 15 percent of their power output. If the module faces 60 degrees away from true South (or North), the power loss will be 20 to 30 percent.

When choosing a site, avoid trees, buildings or obstructions, which could cast shadows on the solar photovoltaic modules especially during the winter months when the arc of the sun is lowest over the horizon. Shading causes loss of output, even though the factory fitted bypass diodes of the PV module will minimize any such loss.

Do not install the PV module near open flame or flammable materials.

When solar modules are used to charge batteries, the battery must be installed in a manner, which will protect the performance of the system and the safety of its users. Follow the battery manufacturer’s guidelines concerning installation, operation and maintenance recommendations. In general, the battery (or battery bank) should be away from the main flow of people and animal traffic. Select a battery site that is protected from sunlight, rain,snow, debris, and is well ventilated. Most batteries generate hydrogen gas when charging, which can be explosive. Do not light matches or create sparks near the battery bank. When a battery is installed outdoors, it should be placed in an insulated and ventilated battery case specifically designed for the purpose.

Do not install the PV module in a location where it would be immersed in water or continually exposed to water from a sprinkler or fountain etc.

2.2.3 Tilt Angle Selection

The tilt angle of the PV module is measured between the surface of the PV module and a horizontal ground surface (Figure 1). The PV module generates maximum output power when it faces the sun directly.

For standalone systems with batteries where the PV modules are attached to a permanent

structure, the tilt angle of the PV modules should be selected to optimize the performance based on seasonal load and sunlight. In general, if the PV output is adequate when irradiance is low (e.g., winter), then the angle chosen should be adequate during the rest of the year. For grid-connected installations where the PV modules are attached to a permanent structure, PV modules should be tilted so that the energy production from the PV modules will be maximized on an annual basis.

Only for UL listed products .The System Fire Class Rating of the module or panel in a mounting system in combination with a roof covering should complete the requirements to achieve the specified System Fire Class Rating for a non-BIPV module or panel.

Any module or panel mounting system have limitations on inclination required to maintain a specific System Fire Class Rating.

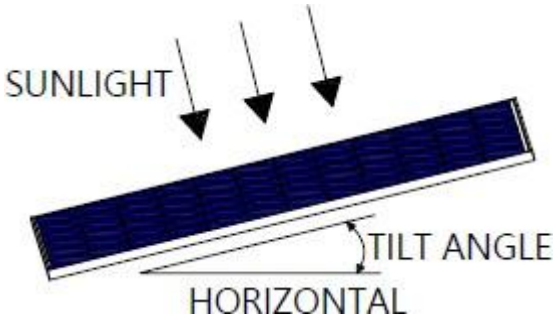


Figure1: PV module tilt angle

For bifacial modules, the suggested installation tilt angle and height is 30 degree and 1.2m, respectively. For different ground cover conditions, like snow, grass, desert, water surface, cement land and so on, the expectation generation energy gain varied from 4% to 24%, as shown in figure 2.The PV module should be installed at an Angle greater than 15 degrees to avoid water and dust accumulation on the surface.

i) The reflectivity of snow is 80-85%, generation energy will be increased by 17-24%.
ii) The reflectivity of sand is 22-25%, generation energy will be increased by 7-14%.
iii) The reflectivity of cement is 30-33 %, generation energy will be increased by 6-13%.
iv) The reflectivity of grass is 10-20 %, generation energy will be increased by 6-8 %.
v) The reflectivity of water is 2-5 %, generation energy will be increased by 4-7 %.

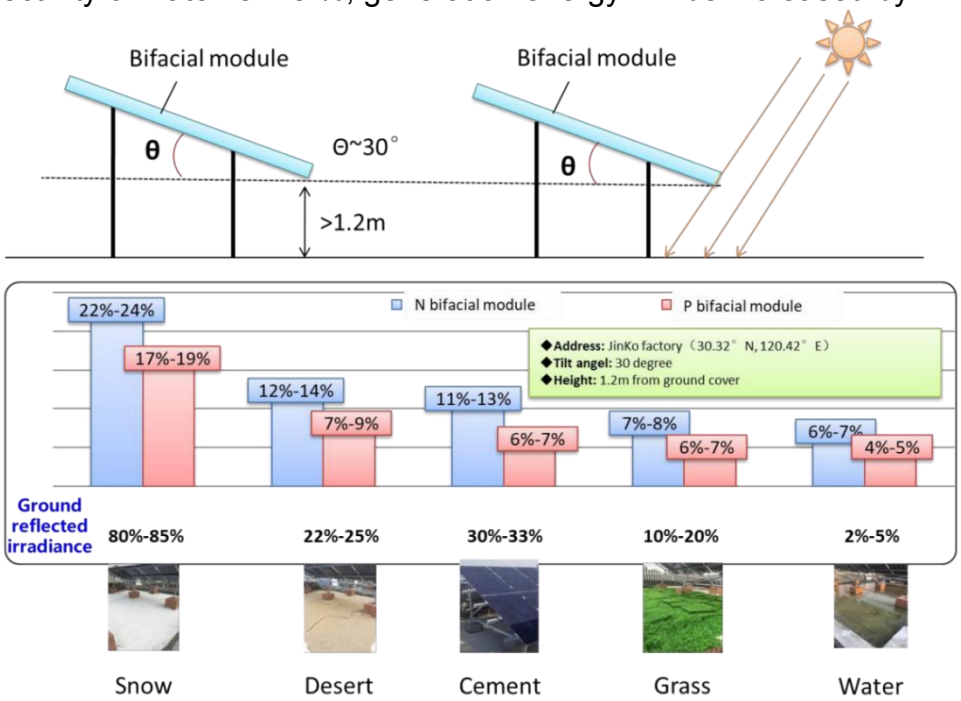


Figure2: PV module installed on different ground covers

2.3 Mechanical Installation Introduction

2.3.1 General Instructions

The installation instructions described in this manual need to be followed, make sure that all local applicable standards and construction regulations are complied with as well.

In most applications, the PV modules should be installed in a location where they will receive maximum sunlight throughout the year.

MODULES should not be shaded, since this can lead to “hot spot”, power loss even failure of the MODULE.

In the Northern Hemisphere, orient the MODULE to the south, and in the Southern Hemisphere, MODULE shall face the north. Determine the optimum setting angle according to the latitude of the installation site. Consult this information from a reputable installer or system integrator.

For stand-alone PV systems with batteries where MODULES are attached to a permanent structure, the tilt angle of the MODULE should be selected to optimize the performance based on seasonal load and sunlight. For grid-tired installations where the MODULES are attached to a permanent structure, MODULES should be tilted to maximize the energy generation on an annual basis.

MODULES can be clamped in place depending on the design of PV mounting structure. The mounting structure must be made from anti-corrosion material and able to withstand the required loads.

We recommend using our PV mounting structure for the ground or roof installations. Welcome to contact us at Jiangsu Green Energy Power Technology Co., Ltd; Fax No: +86 511 8853 2992;Service Line: +86 511 8812 9618 for details.

2.3.2 Mechanical Installation

The MODULES may be installed in various applications utilizing a variety of mounting structures and attachment methods, and the structure should have enough strength to achieve mounting span. The photovoltaic module has mounting holes and can be fixed by bolts at the installation holes,At least four fastening bolts must be installed.Modules can be mounted in landscape or portrait orientation however the impact of dirt shading the solar cells can be minimized by orienting the product in landscape.

The connection of the module to the racking system can be created with clamps, with frame, or an embedded system on the frame. The modules must be installed according to the following examples and recommendations.

Panels must not be subjected to wind or snow loads exceeding the maximum permissible

loads, and must not be subjected to excessive forces due to the thermal expansion of the support structures.

The module frame drain holes cannot be blocked in any situation during installation or use.

To maximize mounting longevity, We strongly recommends the use of corrosion proof (stainless steel) attachment hardware.

a) Mounting with Bolts 4-φ9*14mm mounting holes

Modules can be attached using the mounting holes 4-φ9*14mm on the back of the module frame, by fixing the module to the support rails with bolts. The mounting details are shown in the following figures.

The frame of each module has 4-φ9*14mm mounting holes, ideally placed to optimize the load handling capability, to secure the modules to the supporting structure. Installation holes of 4-φ9*14 mm are used for installation, as shown in Figure 4.

To maximize mounting longevity,we strongly recommends the use of corrosion proof (stainless steel) attachment fixings.

Secure the module in each mounting location with an M8 bolt and a flat washer, spring washer and nut and tighten to a torque of 16~20 N.m (140-180lbf.in.).

All parts in contact with the modules should use flat stainless-steel washers of minimum 1.5mm thickness with an outer diameter of 20-24mm (0.79-0.94in).

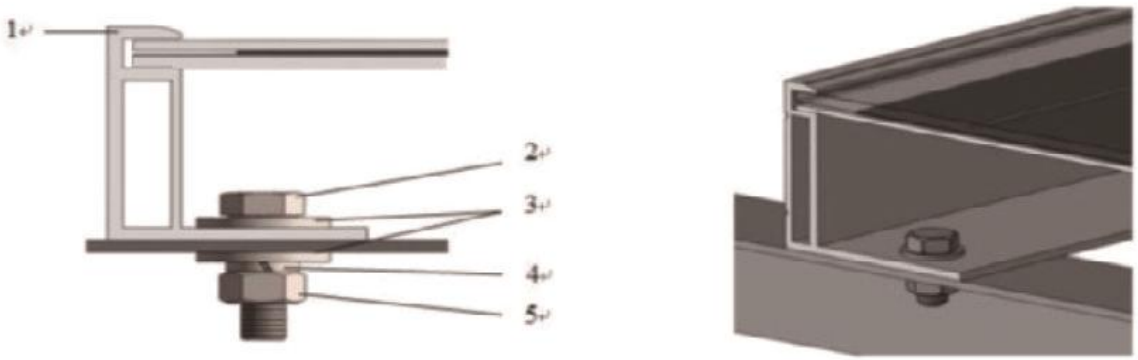
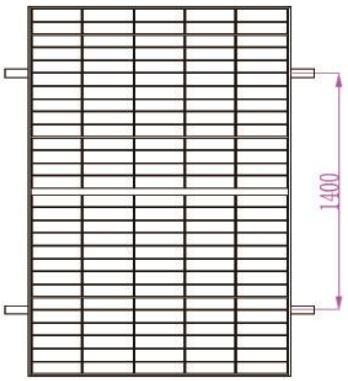
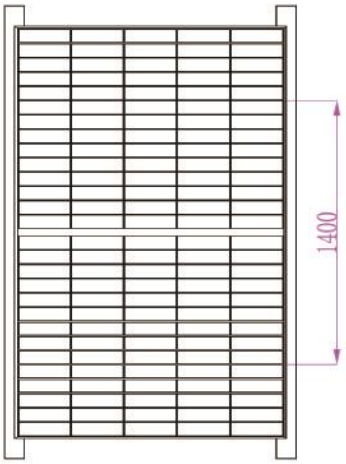


Figure 3: Bifacial module with frame

1.aluminum frame
2.M8 stainless bolt
3.flat stainless washer
4.spring stainless washer
5.hex stainless nut

Module	Mechanical Load Pressure	Safety factor	Mounting Direction
Bifacial Module	+3600 Pa / -1600Pa	1.5	 * NOTE: 1. This installation may cause the cell covered, so GREEN ENERY POWER does not recommend this installation for Bifacial Dual Glass Module. 2. The above-described distance is from the middle of the bolts to the middle of the bolts. 3. The crossbeam is perpendicular to the long side. 4. Need two support rails below the PV module to make sure the Mechanical load. 5. The actual load is + 5400Pa/-2400Pa;
Bifacial Module	+3600 Pa / -1600Pa	1.5	 * NOTE: 1. The above-described distance is from the middle of the bolts to the middle of the bolts. 2. The beam is parallel to the long side. 3. Need two support rails below the PV module to make sure the Mechanical load. 4. The actual load is + 5400Pa/-2400Pa.

b).Mounting with Clamps

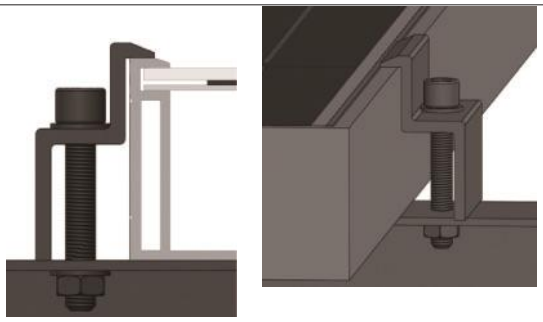
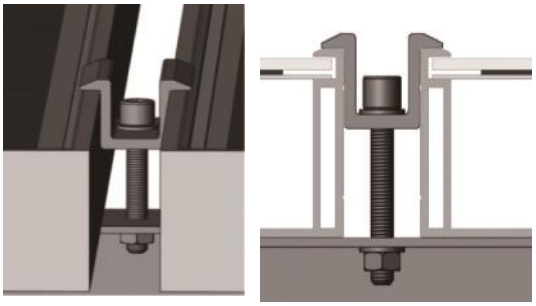
GEP has tested its modules with a number of clamps from different manufacturers, with a mounting bolt of at least M8. The length of clamp ≥60mm (2.36in), thickness≥3mm (0.12in), Material: 6005 T5 / T6 (Rm≥255 MPa, Rp0.2 ≥230 MPa).

The clamp must overlap the module frame by at least 7mm (0.28in) but no more than 10mm (0.39in). Use at minimum 4 clamps to attach modules to the mounting rails.

Modules clamps should not come into contact with the front glass and must not deform the frame. Be sure to avoid shadowing effects on the solar cells from the module clamps.

The module frame is not to be modified under any circumstances.

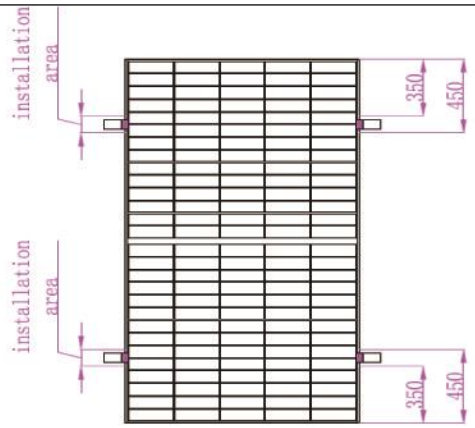
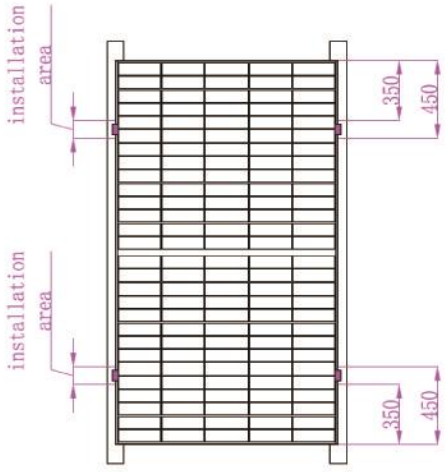
When choosing this type of clamp-mounting method, use at least four clamps on each module, two clamps should be attached on each long sides of the module (for portrait orientation) Depending on local wind and snow loads, additional clamps may be required to ensure that modules can bear the load.

End Clamp installation	Middle Clamp installation
	

4: Referenced mounting method

Install the components on the bracket guide rail using anti-corrosion bolts, elastic washers and flat washers. The torque used should be large enough to ensure the components are safely fixed. The torque reference values for M8 bolts are 16 to 20 Nm, and for M6 bolts, they are 9 to 12 Nm. If a special bracket system or special installation method is required, please reconfirm the torque value with the bracket supplier. The following table lists the bolt dimensions corresponding to the installation holes of different sizes.

Mounting hole (mm)	Bolt size	Reference torque (Nm)
14 x 9	M8	16-20
10 x 7	M6	9-12

Module	Mechanical Load Pressure	Safety factor	Mounting Direction
Bifacial Module	+3600 Pa / -1600Pa	1.5	 *NOTE: 1. This installation may cause the cell covered, so GREEN ENERY POWER does not recommend this installation for Bifacial Dual Glass Module. 2. The above described distance is from the module edge to the middle of the clamp. 3. The crossbeam is perpendicular to the long side. 4. Need two support rails below the PV module to make sure the Mechanical load. 5.The actual load is + 5400Pa/-2400Pa;
Bifacial Module	+3600 Pa / -1600Pa	1.5	 *NOTE: 1. The above described distance is from the module edge to the middle of the clamp. 2. The beam is parallel to the long side. 3. Need two support rails below the PV module to make sure the mechanical load. 5.The actual load is + 5400Pa/-2400Pa;

*Note:The above-described distances are from the module edge to the middle of the clamp.

*Note2: Need two or more support rails below the PV module to ensure the mechanical load.

2.3.3 MODULE Grounding

This guide is for MODULE frame grounding. If grounding is required, ensure that MODULE frames (metal exposed to touch) are always grounded. Installation for wiring and grounding method shall be in accordance with national, regional and local codes, standards and laws as well.

Each MODULE has a predrilled grounding hole in the frame for use. Proper grounding is achieved by connecting MODULE frames and all metallic structural parts continuously to one another using a suitable grounding conductor. This grounding conductor shall be made by copper, copper alloy or other appropriate materials. The grounding conductor must connect to earth using a proper earth grounding electrode. Ensure positive electrical contact through the anodizing layer on MODULE frame to be scored by using the following method.The torque of M4 bolt is 2.3N·m.

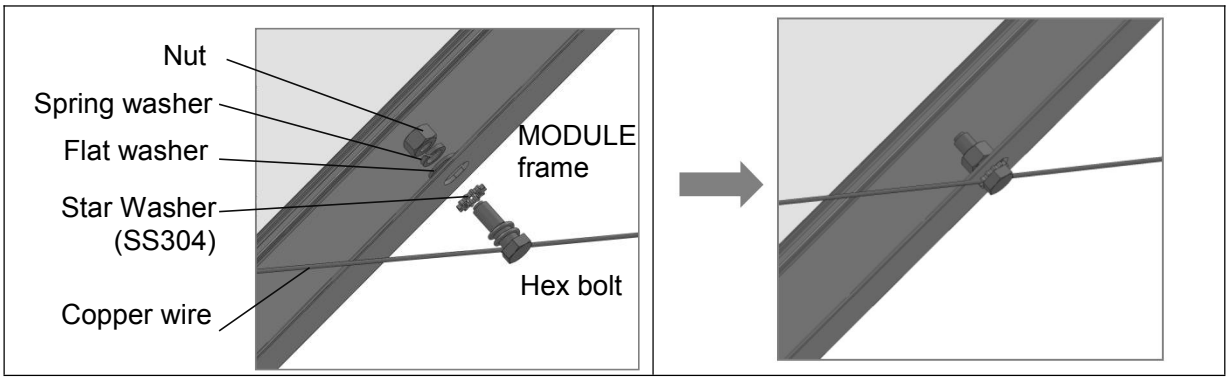


Figure 5: Grounding method

3.Wiring and Connection

h)Before this procedure, please read the operation instructions of the PV system carefully. Connect the PV module connections in series or parallel, which is determined by the user‟s configuration requirement for system power, current and voltage.

i)PV modules connected in series should have similar current, and modules must not be connected together to create a voltage higher than the permitted system voltage. The maximum number of modules in series depends on system design, the type of inverter and environmental conditions.

j)The maximum fuse rating value in an array string can be found on the product label or in the product data sheet. The fuse rating value is also corresponding to the maximum reverse current that a module can withstand, i.e. when one string shaded then the other parallel strings of modules will be loaded by the shaded string and the current will pass through to create a current circuit. Based on the maximum series fuse rating of the module and local electrical codes and standards, make sure the modules strings in parallel are protected with the appropriate in-line string fusing.

k)Connect the conductors from the PV array to the combiner box in accordance with the design and local codes and standards. The cross-sectional area and cable connector capacity must satisfy the maximum short-circuit of the PV system (for a single component, it is recommended the cross-sectional area of cables be 4mm^2 and the rated current of connectors be more than 10A, otherwise cables and connectors will become overheated from high current. Please note the temperature limit of the cables is 85℃.

l) modules can be grounded using bolts. Attach the equipment grounding conductor to the module frame using the hole and hardware provided. Note that a stainless steel bolt is used between the ground wire and module frame as illustrated in following figure. A washer is used to avoid corrosion due to dissimilar metals. Tighten the screw securely. It is recommended that the applied torque is 1.7~2.0 ft-lbs (2.3 to 2.8 N*m)

Module	Mounting hardware configuration			
	Hardware	**Material**	**Size**	**Number provided**
	Bolt	Stainless steel	M4	2
	Spring washer	Stainless steel	M4	2
All	Nut	Stainless steel	M4	2
Module	Star washer	Stainless steel	M4	2
	Plain washer	Stainless steel	M4	4

Table 6：The mounting part of the ground mounting hole

Figure 7: Ground installation of PV modules

The use of bolt grounding device is not allowed unless the grounding device is UL1703 or UL2703 certified with Green Energy Power modules. Alternate grounding options built into the racking system are acceptable as long as they have been UL approved.

Model series	Grounding Clip	
	Manufacturer	Type
Group 1 ～ 16	Tyco Electronics Corp	1954381-1

Table 8：The ground mounting Clip of PV modules

m)The following UL Listed Ground Clamp in combination with the following model number PV modules can be used. Other third party grounding method can't be used unless the grounding device is UL2703 certified with Green Energy Power modules.

n)Follow the requirements of applicable local and national electrical codes.

o)These modules contain factory installed bypass diode. If these modules are incorrectly connected to each other, the bypass diodes, cable or junction box may be damaged.

p)The module shall be wired in accordance with the NEC, the grounding method of the frame of arrays shall comply with the NEC, article 250

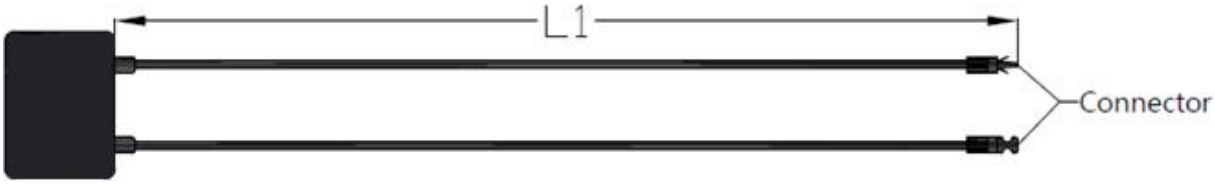
q)CNL models shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.

r)It is recommended that the M8 bolt be tightened to a torque of about 16 ~ 20 N*m .

s)The cable of the junction box is defined as L1, as showed below. For Green Energy Power standard module, L1 is 900/1200mm; and for customized module, L1 can be based on your condition, take the cable length into consideration before designing the wiring layout.

t)Green Energy Power Solar requires the negative grounding of the inverter when a system is installed with standard (non-Eagle line) PV solar modules. Alternatively, a "charge-equalizing" device may be used to mitigate the effects of the Potential Induced Degradation (PID) phenomenon that can occur in specific environments that the array is installed in.

Figure 10: Junction box



u) The Suppliers and types of connectors should be in accordance with the Standard IEC 62852.For more details, please see below:

	Manufacturer	Type / model
Junction box combination 1:		
Junction box	Jiangsu Jingke New Energy Technology Co., Ltd.	Type: JK-BOX040 Rated voltage= DC 1500V Rated current=25/30A Reverse current=30A
Connector 1	Jiangsu Jingke New Energy Technology Co., Ltd.	JK-CABLE02 Rated voltage= DC 1500V Rated current=30A
Junction box combination 2:		
Junction box	Jiangsu Haitian Microelectronics Corp.	Type:PV-HT021x (x=2, 3, 4 or 5) Rated voltage =1500VDC Ratedcurrent=20/25/30/35A Reverse current=50A
Connector 1	Jiangsu Haitian Microelectronics Corp.	PV-HT03x (x=1 or 2) Max. voltage [V]: 1500 Max. current [A]:45
Connector 2	Amphenol Technology (Shenzhen) Co., Ltd.	UTXCFabcde; (a=A;b=4;C=A; d=lor Cor M; e=Blank or Ato Z) Max. voltage [V]: 1500 Max. current [A]:35
Connector 3	Stäubli Electrical Connectors AG	PV-KST4-EVO2/xy_ UR (male);PV-KBT4-EVO 2/xy_UR (female) Max. voltage [V]: 1500 Max. current [A]:45
Connector 4	Zerun Co., LTD	Z4S-abcde Max. voltage [V]: 1500 Max. current [A]:40
Connector 5	Zhejiang Renhe Photovoltaic Technology Co., Ltd.	RHC2xyzu Max. voltage [V]: 1500 Max. current [A]:35
Junction box combination 3:		
Junction box	Hellermanntyton (Wuxi) Elect. Acc.	Type: PV-HT20xy (x=1; y=1 or 2) Rated voltage=1500VDC Rated current= 25/30A Reverse current=41A
Connector 1	Hellermanntyton (Wuxi) Elect. Acc.	PVP-HT20 Max. Voltage=1500VDC Max. Current=41A
Junction box combination 4:		
Junction box	The 40th Institute of China Electronic Technology Group Corporation.	Type: PV-ZPB090x (x=blank or 1) Rated voltage=1500VDC Rated current=25/30A Reverse current=35A
Connector 1	The 40th Institute of China Electronic Technology Group Corporation.	PV-ZPJ030A Max. Voltage=1500VDC Max. Current=30A
Connector 2	QC Solar (Suzhou) Corporation	QC4.10-cds (c=3 or 4; d=4 or 5 or 6 or 7 or 8; s=blank or 1) Max. Voltage=1500VDC Max. Current=30A

Connector 3	Stäubli Electrical Connectors AG	PV-KST4-EVO2/xy_ UR (male);PV-KBT4-EVO 2/xy_UR (female) Max. voltage [V]: 1500 Max. current [A]:45

4.Maintenance and Care

a) A build up of dust or dirt on the module(s) front glass will result in decreased energy output. Clean the module(s) preferably once annually if possible (depending on site conditions) using a soft dry or damp cloth, as necessary.
b) Never use abrasive material under any circumstances.
c) Examine the PV module(s) for signs of deterioration. Check all wiring for possible rodent damage, weathering and that all connections are tight and corrosion free. Check electrical leakage to ground.
d) Check screws/bolts and mounting brackets are tight, adjust and tighten as necessary.
e) Check the junction box and diodes as well. If you have any diodes problem, please contact Green Energy Power Solar.
f) When cleaning the modules, it is not allowed to stand on the module.
g) Never use chemicals when cleaning modules as this may affect the module warranty and energy output.

5.Electrical Specification

The module electrical ratings are measured under Standard Test Conditions, which are 1000W/m^2, irradiance with AM 1.5 spectrum and 25 deg C (77° F) ambient temperature. The module might produce more or less voltage or current than rated value in uncertainty condition. Tables below are electrical characteristics of PV products at STC and the tolerance of Isc, Voc, Vmp and Imp is ±10%.

Electrical Connect Methods:
a) Several PV modules are connected in series and then connected in parallel to form a PV array, which is especially for application with a high operation voltage.
b) If modules are connected in series, the total voltage is equal to the sum of individual voltages.
c) For applications requirement of high current, several modules can be connected in parallel, and the total current of the array is equal to the sum of the currents of each module.
d) The maximum quantity of modules in series and in parallel must be calculated based on the related regulations.installation system.The maximum number of modules in series is (N) < system Vmax / fVoc (at STC) x [1+(t- 25)* Kv]}, where:System Vmax: The smaller of the maximum certified voltage, the maximum output voltage of the system inverteror other

electrical equipment.(Voc: Open circuit voltage of PV module (v);t: The lowest ambient temperature (°C);Kv: Temperature coefficient of open circuit voltage for PV module (/°C) -- refer to product technical data sheet).

e) The maximum number of modules in parallel depends on the inverter selection.

f) The open-circuit voltage (VOC) under the expected lowest local temperature and the highest irradiation should not exceed DC 1500 V, the regulated maximum system voltage.

g) Reference formula for protection devices per string(1.25×ISC).

h) modules are provided with standard cables with a cross sectional area of 4mm2and the temperature in the range from -40 °C to 85 °C.

i) The plug connector is divided into positive and negative polarity, which need to be of the same type.

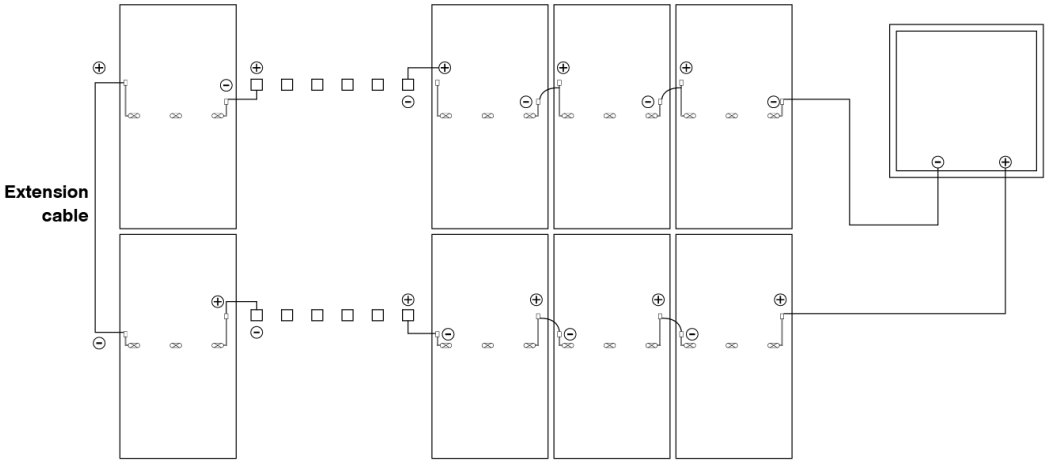
j) Make sure that connection is clean, dry, safe and tight.

k) Wrong connection or loose connection may cause electric arc or electric shock.

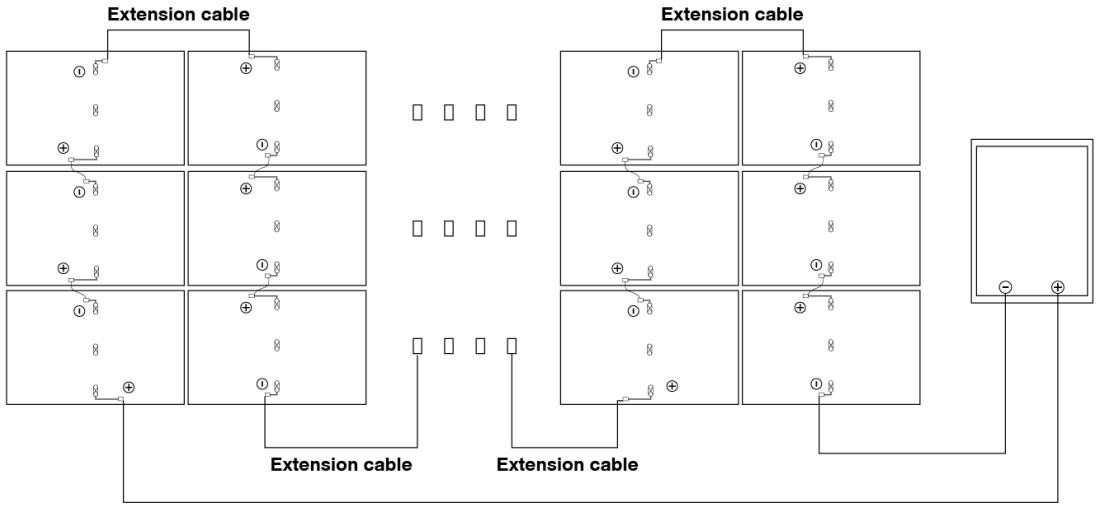
l) Plug connector should not receive external stress.

m) Unqualified personnel should not open locked nut.

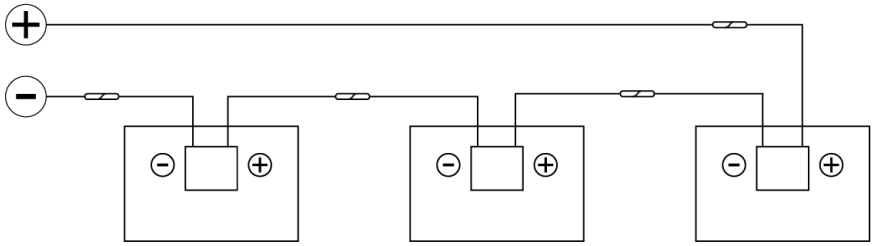
n) Connectors should only be used to connect circuit, but never be used to turn circuit on or off.



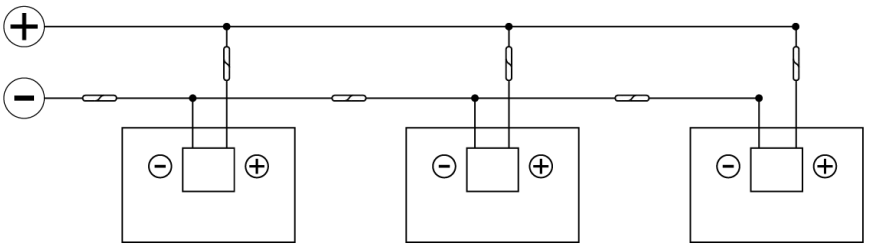
(a) Series Connection (Vertical installation of short cable modules)



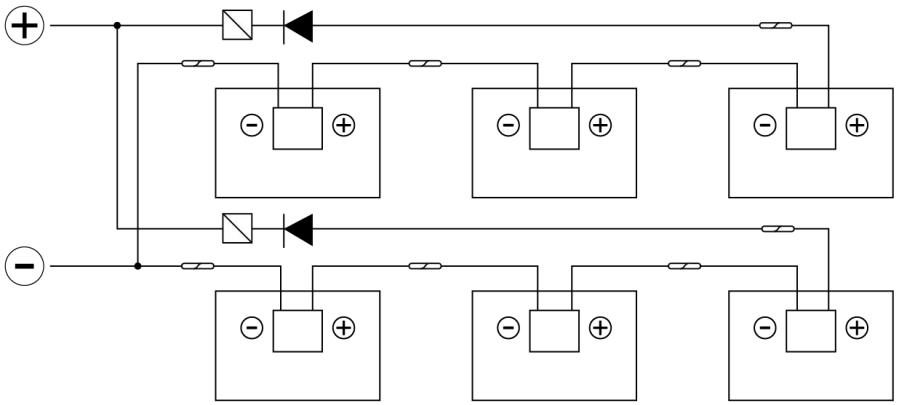
(b) Typical modules mechanical drawing of bifacial modules (with frame)



(c) Series connection



(d) Parallel connection



(e) Parallel-series connection

Figure 9 - Connecting in series and in parallel

Note: The extra extended cable is required for connection at the turn-back corner of wiring as shown below.The number of modules is related to the selected PV inverter.

6.Disclaimer of Liability

Because the use of the manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic (PV) product are beyond Green Energy Power's control, Green Energy Power does not accept responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with such installation, operation, use or maintenance.

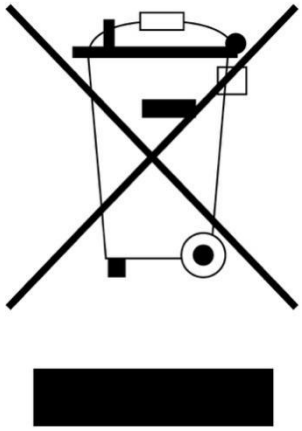
No responsibility is assumed by Green Energy Power for any infringement of patents or other rights of third parties, which may result from use of the PV product. NO license is granted by implication or otherwise under any patent or patent rights.

7.Others

Meaning of crossed – out wheeled dustbin:

Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being.

When replacing old appliances with new ones, the retailer is legally obligated to take back your old appliance for disposals at least free of charge.



8.MODULE SPECIFICATIONS

The information in this manual is based on Green Energy Power's knowledge and experience and is believed to be reliable, but such information including product specification (without limitations) and suggestions do not constitute a warranty, expresses or implied. Green Energy Power reserves the right to change the installation manual, the PV product, the electrical specifications, or product information sheets without prior notice.All electrical data should be measured under below test conditions:
STC: AM= 1.5, E= 1000 W/m², Tc=25 °C;
The additional test conditions for Bifacial PV modules:
BNPI: E= 1000 W/m² + φ•135 W/m²
BSI: E= 1000 W/m² + φ•300 W/m²
Pmax of any individual module will be within ±3% tolerance of these specified values.
Voc of any individual module will be within ±3% tolerance of these specified values.
Isc of any individual module will be within ±3% tolerance of these specified values.
Specifications and electric characteristics in Table 1 and 2 is subject to technical and product innovations.
Information in this document is subject to change without notice.

Model	Maximum power output (Pmax)	Optimum operation voltage (Vmp)	Optimum operation current (Imp)	Open circuit voltage (Voc)	Short circuit current (Isc)	Maximum system voltage (IEC)	Maximum series fuse rating (A)
GEP-JfMc XXXNH	420	32.54	12.91	39.14±3%	14.00 ±3%	1500	30
	425	32.80	12.97	39.25±3%	14.08±3%	1500	30
	430	33.06	13.03	39.36±3%	14.16±3%	1500	30
	435	33.28	13.09	39.47±3%	14.22±3%	1500	30
	440	33.50	13.15	39.59±3%	14.28±3%	1500	30
	445	33.72	13.21	39.70±3%	14.34±3%	1500	30
	450	33.92	13.27	39.81±3%	14.40±3%	1500	30
GEP-CfMc XXXNH	465	36.65	12.70	43.36±3%	13.87±3%	1500	30
	470	36.84	12.78	43.48±3%	13.95±3%	1500	30
	475	36.98	12.85	43.61±3%	14.03±3%	1500	30
	480	37.12	12.95	43.73±3%	14.11±3%	1500	30
	485	37.26	13.02	43.86±3%	14.19±3%	1500	30
	490	37.40	13.12	43.98±3%	14.27±3%	1500	30
	495	37.56	13.20	44.11±3%	14.35±3%	1500	30
	500	37.68	13.27	44.23±3%	14.40±3%	1500	30
GEP-GfMc XXXNH	510	40.32	12.65	47.56±3%	14.00±3%	1500	30

	515	40.49	12.72	47.69±3%	14.05±3%	1500	30
	520	40.62	12.81	47.83±3%	14.10±3%	1500	30
	525	40.75	12.90	47.97±3%	14.15±3%	1500	30
	530	40.90	12.99	48.11±3%	14.20±3%	1500	30
	535	41.04	13.06	48.24±3%	14.25±3%	1500	30
	540	41.18	13.13	48.38±3%	14.30±3%	1500	30
	545	41.31	13.20	48.52±3%	14.35±3%	1500	30
	550	41.45	13.27	48.65±3%	14.40±3%	1500	30
GEP-DfMc XXXNH	555	43.95	12.64	51.73±3%	13.86±3%	1500	30
	560	44.09	12.72	51.88±3%	13.92±3%	1500	30
	565	44.23	12.79	52.03±3%	13.98±3%	1500	30
	570	44.37	12.86	52.18±3%	14.04±3%	1500	30
	575	44.51	12.92	52.33±3%	14.10±3%	1500	30
GEP-DfMc XXXNH	580	44.65	13.01	52.48±3%	14.16±3%	1500	30
	585	44.79	13.08	52.63±3%	14.22±3%	1500	30
	590	44.93	13.15	52.78±3%	14.28±3%	1500	30
	595	45.07	13.21	52.93±3%	14.34±3%	1500	30
	600	45.22	13.27	53.08±3%	14.40±3%	1500	30
GEP-HfMc XXXNH	600	47.39	12.67	55.90±3%	13.80±3%	1500	30
	605	47.55	12.73	56.06±3%	13.86±3%	1500	30
	610	47.71	12.79	56.22±3%	13.92±3%	1500	30
	615	47.87	12.85	56.38±3%	13.98±3%	1500	30
	620	48.03	12.91	56.54±3%	14.04±3%	1500	30
	625	48.19	12.97	56.70±3%	14.10±3%	1500	30
	630	48.35	13.03	56.86±3%	14.16±3%	1500	30
	635	48.51	13.09	57.02±3%	14.22±3%	1500	30
	640	48.67	13.15	57.18±3%	14.28±3%	1500	30
	645	48.83	13.21	57.34±3%	14.34±3%	1500	30
	650	48.99	13.27	57.50±3%	14.40±3%	1500	30

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