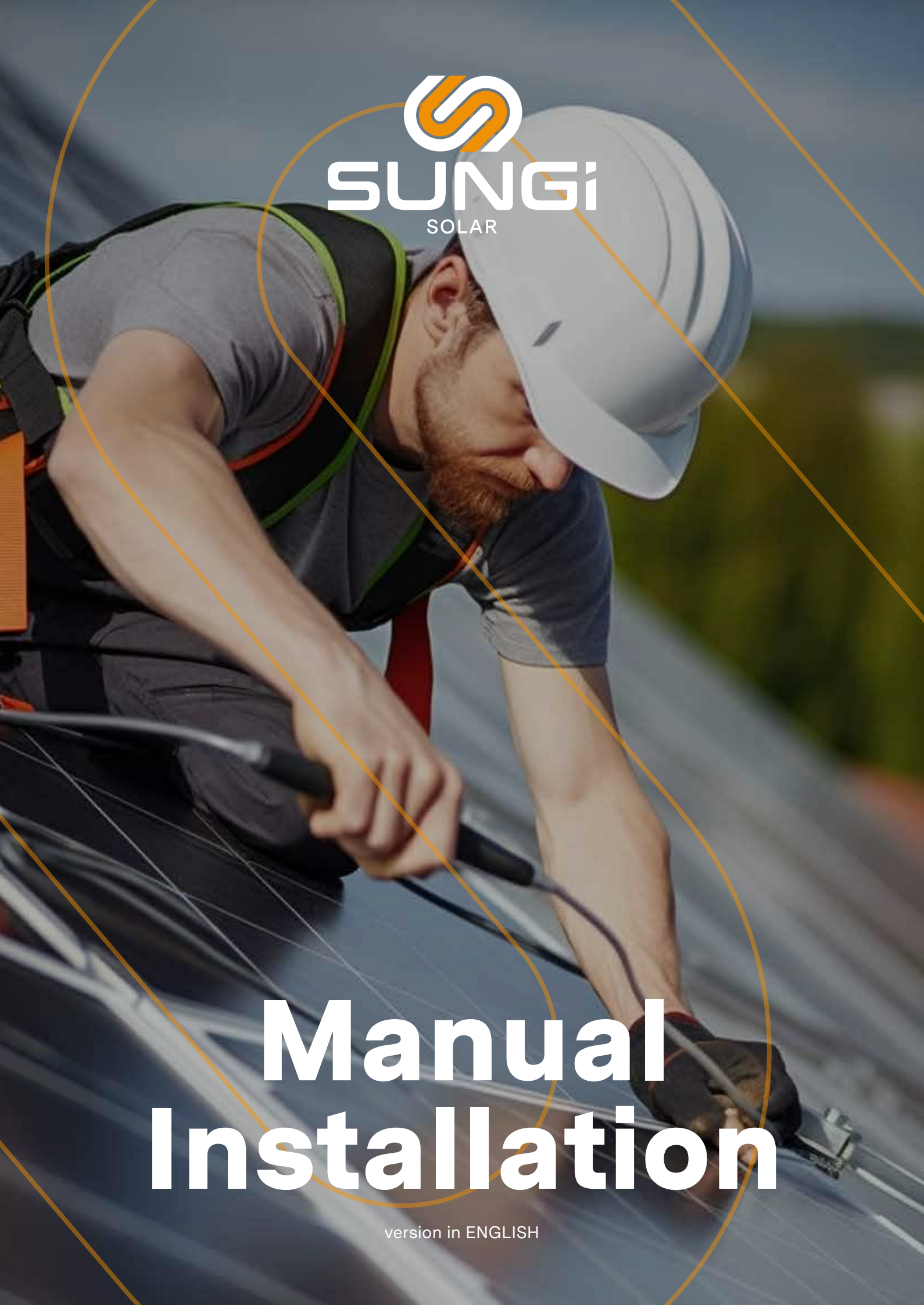


SUNGi
SOLAR

Manual Installation

version in ENGLISH

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1. DISCLAIMER

The installation, handling, and use of Sungi Solar crystalline modules are beyond the company's control. Sungi Solar assumes no responsibility for any losses, damages, injuries, or expenses resulting from improper installation, handling, use, or maintenance.

Sungi Solar does not assume any responsibility for potential patent infringements or other third-party rights violations that may arise from the use of the module. No license is granted by implication or under any patent or patent rights.

Specifications are subject to change without prior notice.

2. SAFETY MEASURES

Safety Measures: Precautions

Warning:

- Before installing, wiring, operating, or maintaining Sungi Solar modules, it is essential to read and understand all safety precautions. When the surface of the module's cells is exposed to direct sunlight or other light sources, direct current (DC) is generated, and direct contact with the active parts of the module, such as the terminals, can result in fatal injuries, regardless of whether the module is connected or not.

General Safety:

- All installation work must comply with local codes and relevant international electrical regulations.
- It is recommended that photovoltaic module installation be performed by personnel experienced in photovoltaic system installation. Operation by individuals unfamiliar with relevant safety procedures can be extremely dangerous.
- Unauthorized persons must not be allowed to access the installation or storage areas of the modules.
- Under no circumstances should you stand, walk, or lean directly on the modules.



- Avoid damaging or scratching the front or rear surfaces of the module under any circumstances.
- Do not scratch or forcibly bend the output cable. Damage to the output cable insulation could cause current leakage or electric shock.
- Do not install modules with damaged glass or torn backsheets.
- Do not disassemble or move any part of the module.
- It is essential to protect electrical contacts from corrosion and ensure they are clean before making any connections.
- Avoid installing or handling modules in wet or high-wind conditions under any circumstances.

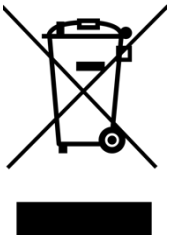
- Do not touch the junction box or the ends of the output cables (connectors) with bare hands under sunlight, regardless of whether the photovoltaic module is connected or disconnected from the system.
- Ensure that connections are securely made without gaps to prevent potential electrical arcing, which could cause fires or electric shocks.
- Verify that the polarity of the modules is correct and not reversed compared to other modules or strings.
- Avoid artificially concentrating sunlight on the modules under any circumstances.
- Sungi Solar modules are certified for Class A installations operating at voltages below 1500V DC; therefore, it is crucial not to exceed this maximum voltage and to account for voltage variations due to operating temperatures when designing the photovoltaic (PV) system.
- Never use water to extinguish electrical fires.
- Under normal conditions, solar photovoltaic modules may produce a higher current and/or voltage than standard values. Therefore, when determining conductor currents, fuse sizes, and controls connected to the SPV output, the Isc value marked on the modules must be multiplied by a factor of 1.25.

3. UNLOADING, TRANSPORTATION, STORAGE, UNPACKING, AND SAFETY: IMPORTANT PROCEDURES

- Upon delivery, carefully check that the product matches the order specifications. Detailed information, such as the product name, subtitle, and serial number, is clearly indicated on the outside of each packaging box.
- Keep the product in its original Sungi Solar packaging until installation, storing it in a clean and dry area with a relative humidity below 85% and ambient temperatures between -20°C and 40°C.
- Protect the packaging from damage. Unpack the modules following the recommended procedures meticulously. The entire process of unpacking, transportation, and storage must be carried out with utmost care.
- Under no circumstances should modules come into contact with sharp objects to prevent scratches that could compromise their safety.
- Before installation, ensure that all modules and their electrical contacts are perfectly clean and dry.
- It is strictly forbidden to stand, climb, walk, or jump on unopened module pallets.
- Avoid stacking multiple pallets on top of each other beyond the maximum allowed to prevent damage.
- If pallets are temporarily stored outdoors, cover them with protective material to shield them from direct weather exposure and do not stack more than one pallet in height.
- Unpacking must be performed simultaneously by two or more people. It is strictly forbidden to use module cables or junction boxes for transportation. Handling modules requires two or more people wearing anti-slip gloves. Additionally, avoid handling modules overhead or stacking them.
- Use wire cutters instead of knives to cut plastic ties.
- Avoid placing modules directly on top of one another to prevent damage during storage and handling.
- Do NOT place modules in unsupported or unstable locations.

Per una procedura sicura, seguire attentamente queste indicazioni durante il disimballaggio, lo stoccaggio e la movimentazione dei moduli fotovoltaici.

SYMBOLS ON THE OUTER PACKAGING

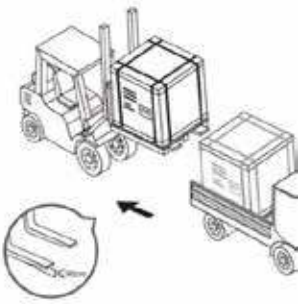
Do not dispose of modules indiscriminately; special recycling treatment is required. 	Modules must be kept dry and protected from rain or moisture.  KEEP DRY
The modules inside the box are fragile and must be handled with care.  FRAGILE	The packaging must be transported in an upright position.  HEADS UP
Do not step on the package or the module.  NO JUMP	The cardboard is recyclable.  RECYCLE
Modules must be stacked as instructed, not exceeding the maximum number of layers indicated on the outer packaging. (n = 2 means no more than two layers, and n = 3 means no more than three layers). 	The module must be handled by at least two people together.  TEAM LIFT

UNLOADING WARNING

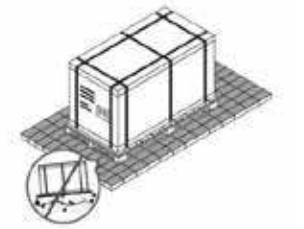
Use the appropriate lifting device (as shown in the image) to handle the load, with no more than 2 pallets per lift. Before lifting, ensure that the pallet and carton are NOT damaged and that the lifting cable is secure and sturdy. Before placing the carton on the ground, two people must gently support both sides of the carton to set it on a relatively flat surface.



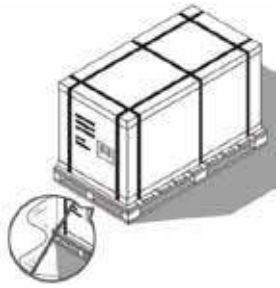
If conditions allow, use a forklift to remove the module pallets from the truck.



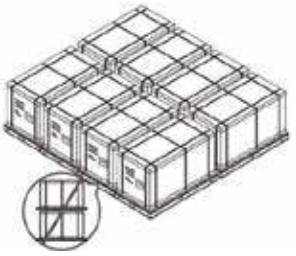
Place the load on a level surface, as shown in the figure:



Store the module in a dry and well-ventilated location.



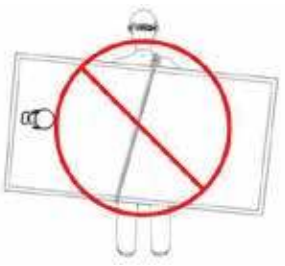
Do not stack the modules at the project site.



Cover the module with waterproof material to prevent moisture.



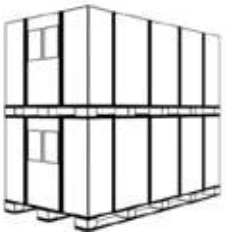
SECONDARY TRANSPORT AND WARNING

Do not remove the original packaging if the modules need to be transported over long distances or stored for an extended period. 	The packaged load can be transported by land, sea, or air. During transport, ensure that the packaged load is securely fastened to the shipping platform to prevent any movement. 
Transportation: Do not stack more than two layers on a truck. 	Only one stacking layer is allowed for transport at the project site. 
Transport or handling with pedicabs is prohibited, as shown below: 	Do not transport the module using ropes, as shown below: 
Do not carry the modules on a person's back, as shown below: 	

STORAGE

- Do not expose the modules to rain or moisture. Store the finished product in a well-ventilated, waterproof, and dry location.
- Do not remove the original packaging if the modules are to be transported over long distances or stored for an extended period.

Humidity and Temperature Conditions: Humidity below 85%, temperature between -20°C and +40°C. Modules of different sizes must be stacked separately. Do not stack modules of different sizes together; all modules in a stack must be of the same size.



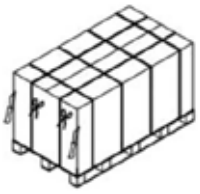
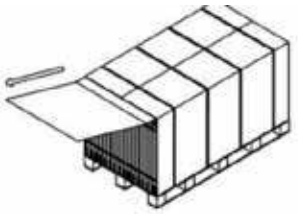
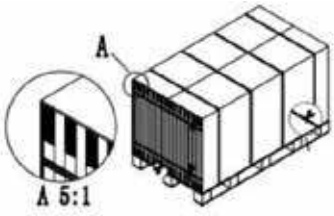
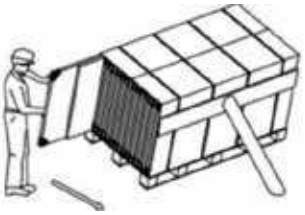
Modules must NOT be stacked more than two layers high to ensure proper weight support and prevent damage.

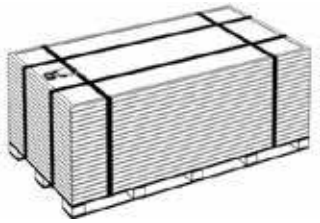


UNPACKING SAFETY

- Unpacking modules outdoors in rainy conditions is prohibited, as the cardboard will soften and become damaged when wet. Stacked photovoltaic modules (hereafter "modules") may tip over, causing damage or injury to personnel.
- In windy conditions, special attention must be paid to safety. Transporting modules in strong winds is not recommended. Unpacked modules must be secured to prevent unintended movement.
- The work surface must be level to ensure the package can be placed stably, avoiding slipping.
- Wear protective gloves during unpacking to prevent hand injuries and fingerprints on the glass surface.
- Module information and unpacking instructions can be found on the exterior of each package. Carefully read the instructions before unpacking.
- Each module must be handled by two people. Using module wires or junction boxes for transportation is prohibited. Do not remove the module from the carton by pulling on the long side frame.

UNPACKING PROCEDURE

<table>
<tr>
<td>Cut the two packing straps on the shorter sides of the pallet using a blade or scissors, and unpack the side surface of the carton along the vertical direction.
</td>
<td>Cut the tape on the short edge and lift it 90° from the bottom; then pull the carton away to expose the modules.
</td>
</tr>
<tr>
<td>Cut the two horizontal packing straps on the carton and the two straps near the bottom of the pallet, then remove the packing straps.

</td>
<td>When unpacking on a flat surface, remove the module from one side of the packaging to the other and transport it with the help of two people. When unpacking on an inclined surface, secure the modules to prevent tipping or sliding, as shown below:
</td>
</tr>
</table>

Do not rest the module on the mounting posts. 	If not all modules are removed after unpacking and some remain in the pallet, the remaining modules must be laid flat and repacked to prevent them from falling. They must be positioned horizontally. 

PACKING LIST

An A4 sheet with the packing list is attached to one of the short sides of the packaging carton. The packing list includes the product name, pallet number, and product serial numbers.



4. PRODUCT IDENTIFICATION

Each module is equipped with a unique serial number laminated behind the glass and another permanently affixed to the back sheet of the module. It is recommended to record all serial numbers for a given installation for future reference.

5. ELECTRICAL ASSESSMENT

*Legend:

- *STC: Standard Testing Conditions*
- *NMOT: Normal Module Operating Temperature*
- *Pmax: Module power*
- *Vmp: Maximum power voltage*
- *Voc: Open circuit voltage*
- *Isc: Short circuit current*

SUNGI ECO LIVING SERIES (Watt Range: 370–500)

MODULE TYPE/S	SNG-370W-KY Eco Living	SNG-375W-KY Eco Living	SNG-380W-KY Eco Living	SNG-385W-KY Eco Living	SNG-390W-KY Eco Living
Testing Conditions	STC/NMOT	STC/NMOT	STC/NMOT	STC/NMOT	STC/NMOT
Pmax (with tolerance) [W]	370Wp/280Wp	375Wp/284Wp	380Wp/288Wp	385Wp/291Wp	390Wp/295Wp
Vmp [V]	34.46V/32.34V	34.64V/32.51V	34.82V/32.68V	35.00V/32.85V	35.18V/33.02V
Imp [A]	10.74A/8.67A	10.83A/8.74A	10.92A/8.81A	11.00A/8.88A	11.09A/8.95A
Voc (with tolerance) [V]	40.95V/39.12V	41.16V/39.31V	41.37V/39.51V	41.58V/39.71V	41.79V/39.92V
Isc (with tolerance) [A]	11.55A/9.32A	11.65A/9.40A	11.75A/9.48A	11.84A/9.56A	11.93A/9.63A

MODULE TYPE/S	SNG-380W-EV Eco Living	SNG-385W-EV Eco Living	SNG-390W-EV Eco Living	SNG-395W-EV Eco Living	SNG-400W-EV Eco Living
Testing Conditions	STC/NMOT	STC/NMOT	STC/NMOT	STC/NMOT	STC/NMOT
Pmax (with tolerance) [W]	380Wp/288Wp	385Wp/292Wp	390Wp/295Wp	395Wp/299Wp	400Wp/303Wp
Vmp [V]	28.69V/26.92V	28.88V/27.11V	29.07V/27.28V	29.26V/27.46V	29.44V/27.63V
Imp [A]	13.26A/10.69A	13.34A/10.76A	13.43A/13.51A	13.51A/10.89A	13.59A/10.95A
Voc (with tolerance) [V]	34.72V/33.17V	34.95V/33.39V	35.18V/33.61V	35.40V/33.82V	35.63V/34.04V
Isc (with tolerance) [A]	14.01A/11.31A	14.09A/11.37A	14.18A/11.45A	14.27A/11.52A	14.36A/11.59A

MODULE TYPE/S	SNG-400W-KY Eco Living
Pmax (with tolerance) [W]	400Wp/288Wp
Vmp [V]	34.7V/32.48V
Imp [A]	11.53A/9.71A
Voc (with tolerance) [V]	42.20V/39.60V
Isc (with tolerance) [A]	12.13A/10.15A

MODULE TYPE/S	SNG-400W-K2 Eco Living	SNG-405W-K2 Eco Living	SNG-410W-K2 Eco Living	SNG-415W-K2 Eco Living	SNG-420W-K2 Eco Living
Pmax (with tolerance) [W]	400Wp/303Wp	405Wp/306Wp	410Wp/310Wp	415Wp/314Wp	420Wp/318Wp
Vmp [V]	31.76V/29.81V	31.94V/29.98V	32.12V/30.15V	32.30V/30.32V	32.48V/30.49V
Imp [A]	12.60A/10.17A	12.69A/10.24A	12.77A/10.30A	12.85A/10.37A	12.94A/10.44A
Voc (with tolerance) [V]	38.43V/36.71V	38.65V/36.92V	38.87V/37.13V	39.09V/37.34V	39.31V/37.55V
Isc (with tolerance) [A]	13.31A/10.75A	13.40A/10.82A	13.49A/10.89A	13.58A/10.96A	13.66A/11.03A

MODULE TYPE/S	SNG-430W-K2 Eco Living	SNG-435W-K2 Eco Living	SNG-440W-K2 Eco Living	SNG-445W-K2 Eco Living	SNG-450W-K2 Eco Living
Pmax (with tolerance) [W]	430Wp/325Wp	435Wp/327Wp	440Wp/331Wp	445Wp/335Wp	450Wp/339Wp
Vmp [V]	32.86V/30.84	32.96V/30.34V	33.20V/30.57V	33.44V/30.79V	33.66V/31.02V
Imp [A]	13.09A/10.56A	13.21A/10.78A	13.27A/10.83A	13.33A/10.88A	13.39A/10.93A
Voc (with tolerance) [V]	39.77V/37.99V	38.86V/37.20V	39.00V/37.40V	39.14V/37.60V	39.28V/37.80V
Isc (with tolerance) [A]	13.83A/11.16A	13.96A/11.14A	14.02A/11.19A	14.08A/11.24A	14.14A/11.29A

MODULE TYPE/S	SNG-430W-K2 Eco Living	SNG-435W-K2 Eco Living	SNG-440W-K2 Eco Living	SNG-445W-K2 Eco Living	SNG-450W-K2 Eco Living
Pmax (with tolerance) [W]	430Wp/325Wp	435Wp/329Wp	440Wp/333Wp	445Wp/337Wp	450Wp/341Wp
Vmp [V]	32.86V/30.84	33.05V/31.02V	33.24V/31.20V	33.43V/31.38V	33.62V/31.55V
Imp [A]	13.09A/10.56A	13.17A/10.62A	13.24A/10.68A	13.32A/10.74A	13.39A/10.80A
Voc (with tolerance) [V]	39.77V/37.99V	40.00V/38.21V	40.43V/38.42V	40.46V/38.64V	40.69V/38.86V
Isc (with tolerance) [A]	13.83A/11.16A	13.91A/11.23A	13.99A/11.29A	14.06A/11.35A	14.14A/11.41A

MODULE TYPE/S	SNG-435W-K2 Eco Living	SNG-440W-K2 Eco Living	SNG-445W-K2 Eco Living	SNG-450W-K2 Eco Living	SNG-455W-K2 Eco Living
Pmax (with tolerance) [W]	435Wp/327Wp	440Wp/331Wp	445Wp/335Wp	450Wp/339Wp	455Wp/344Wp
Vmp [V]	32.96V/30.34V	33.20V/30.57V	33.44V/30.79V	33.66V/31.02V	33.90V/32.24V
Imp [A]	13.21A/10.78A	13.27A/10.83A	13.33A/10.88A	13.39A/10.93A	13.45A/10.98V
Voc (with tolerance) [V]	38.86V/37.20V	39.00V/37.40V	39.14V/37.60V	39.28V/37.80V	39.42V/38.00V
Isc (with tolerance) [A]	13.96A/11.14A	14.02A/11.19A	14.08A/11.24A	14.14A/11.29A	14.20A/11.34A

MODULE TYPE/S	SNG-450W-K2 Eco Living	SNG-455W-K2 Eco Living	SNG-460W-K2 Eco Living	SNG-465W-K2 Eco Living	SNG-470W-K2 Eco Living
Pmax (with tolerance) [W]	450Wp/337Wp	455Wp/345Wp	460Wp/349Wp	465Wp/352Wp	470Wp/356Wp
Vmp [V]	33.96V/30.99V	34.15V/32.05V	34.34V/32.23V	34.53V/32.41V	34.72V/35.59V
Imp [A]	13.26A/10.88A	13.33A/10.76A	13.40A/10.82A	13.47A/10.87A	13.54A/10.93A
Voc (with tolerance) [V]	40.23V/37.77V	40.45V/38.64V	40.68V/38.85V	40.90V/39.07V	41.13V/39.29V
Isc (with tolerance) [A]	14.31A/11.55A	14.38A/11.61A	14.46A/11.67A	14.54A/11.74A	14.61A/11.79A

MODULE TYPE/S	SNG-480W-FJ Eco Living	SNG-485W-FJ Eco Living	SNG-490W-FJ Eco Living	SNG-495W-FJ Eco Living	SNG-500W-FJ Eco Living
Pmax (with tolerance) [W]	480Wp/348Wp	485Wp/351Wp	490Wp/354Wp	495Wp/357Wp	500Wp/360Wp
Vmp [V]	42.90V/38.48V	43.10V/38.58V	43.30V/38.68V	43.50V/38.78V	43.70V/38.88V
Imp [A]	11.18A/9.05A	11.25A/9.10A	11.32A/9.16A	11.39A/9.21A	11.46A/9.26A
Voc (with tolerance) [V]	50.30V/45.74V	50.50V/45.77V	50.70V/45.80V	50.90A/45.83V	51.10V/45.86V
Isc (with tolerance) [A]	11.64A/9.65A	11.70A/9.71A	11.76A/9.77A	11.82A/9.83A	11.88A/9.89A

MODULE TYPE/S	SNG-480W-KY Eco Living	SNG-485W-KY Eco Living	SNG-490W-KY Eco Living	SNG-495W-KY Eco Living	SNG-500W-KY Eco Living
Pmax (with tolerance) [W]	480Wp/361Wp	485Wp/365Wp	490Wp/368Wp	495Wp/372Wp	500Wp/376Wp
Vmp [V]	35.38V/33.27V	35.55V/33.44V	35.72V/33.59V	35.89V/33.75V	36.06V/33.91V
Imp [A]	13.57A/10.85A	13.65A/10.92A	13.72A/10.97A	13.79A/11.03A	13.87A/11.09A
Voc (with tolerance) [V]	42.71V/40.57V	42.88V/40.73V	43.12V/40.96V	43.32A/41.15V	43.53V/41.35V
Isc (with tolerance) [A]	14.31A/11.55A	14.39A/11.61A	14.46A/11.67A	14.55A/11.74A	14.62A/11.80A

MODULE TYPE/S	SNG-500W-KY Eco Living
Pmax (with tolerance) [W]	500Wp/376Wp
Vmp [V]	36.06V/33.91V
Imp [A]	13.87A/11.09A
Voc (with tolerance) [V]	43.53V/41.35V
Isc (with tolerance) [A]	14.62A/11.80A

SUNGI SUN ELITE SERIES (Watt Range: 540-780)

MODULE TYPE/S	SNG-540W-FJ Sun Elite	SNG-545W-FJ Sun Elite	SNG-550W-FJ Sun Elite	SNG-555W-FJ Sun Elite
Pmax (with tolerance) [W]	540Wp/409Wp	545Wp/413Wp	550Wp/417Wp	555Wp/421Wp
Vmp [V]	41.20V/39.44V	41.40V/39.67V	41.60V/39.90V	41.80V/40.14V
Imp [A]	13.11A/10.37A	13.17A710.41A	13.23A/10.54A	13.30A/10.49A
Voc (with tolerance) [V]	49.40V/47.63V	49.60V/47.87V	49.80V/48.10V	50.00V/48.24V
Isc (with tolerance) [A]	13.187A/10.99A	13.93A/11.03A	13.99A/11.07A	14.05A/11.10A

MODULE TYPE/S	SNG-580W-FJ Sun Elite	SNG-585W-FJ Sun Elite	SNG-590W-FJ Sun Elite	SNG-595W-FJ Sun Elite
Pmax (with tolerance) [W]	580Wp/436Wp	585Wp/440Wp	590Wp/444Wp	595Wp/448Wp
Vmp [V]	42.80V/39.69V	43.00V/39.81V	43.20V/39.90V	43.40V/39.99V
Imp [A]	13.56A/10.99A	13.61A/11.05A	13.66A/11.13A	13.71A/11.21A
Voc (with tolerance) [V]	50.93V/48.46V	51.17V/48.60V	51.41V/48.74V	51.65V/48.88V
Isc (with tolerance) [A]	14.36A/11.68A	14.42A/11.75A	14.48A/11.82A	14.53A/11.89A

MODULE TYPE/S	SNG-580W-FJ Sun Elite	SNG-585W-FJ Sun Elite	SNG-590W-FJ Sun Elite	SNG-595W-FJ Sun Elite	SNG-600W-FJ Sun Elite
Pmax (with tolerance) [W]	580Wp/436Wp	585Wp/440Wp	590Wp/444Wp	595Wp/448Wp	600Wp/452Wp
Vmp [V]	42.80V/39.86V	43.00V/40.00V	43.20V/40.15V	43.40V/40.29V	43.60V/40.43V
Imp [A]	13.56A/10.94A	13.61A/11.00A	13.66A/11.06A	13.71A/11.12A	13.77A/11.18A
Voc (with tolerance) [V]	50.93V/48.89V	51.17V/49.08V	51.41V/49.27V	51.65V/49.46V	51.88V/49.65V
Isc (with tolerance) [A]	14.36A/11.60A	14.42A/11.65A	14.48A/11.70A	14.53A/11.75A	14.59A/11.80A

MODULE TYPE/S	SNG-580W-FJ Sun Elite	SNG-585W-FJ Sun Elite	SNG-590W-FJ Sun Elite	SNG-595W-FJ Sun Elite	SNG-600W-FJ Sun Elite
Pmax (with tolerance) [W]	580Wp/439Wp	584Wp/443Wp	590Wp/447Wp	595Wp/451Wp	600Wp/455Wp
Vmp [V]	43.22V/40.57V	43.41V/40.75V	43.60V/40.92V	43.79V/41.10V	43.98V/41.28V
Imp [A]	13.42A/10.83A	13.48A/10.88A	13.54A/10.93A	13.59A/10.97A	13.65A/11.02A
Voc (with tolerance) [V]	52.30V/49.96V	52.54V/50.19V	52.77V/50.41V	53.00V/50.63V	53.23V/50.85V
Isc (with tolerance) [A]	14.18A/11.45A	14.24A/11.50A	14.30A/11.55A	14.36A/11.59A	14.42A/11.64A

MODULE TYPE/S	SNG-585W-KY Sun Elite	SNG-590W-KY Sun Elite	SNG-595W-KY Sun Elite	SNG-600W-KY Sun Elite	SNG-605W-KY Sun Elite
Pmax (with tolerance) [W]	585Wp/444Wp	590Wp/448Wp	595Wp/452Wp	600Wp/456Wp	605Wp/460Wp
Vmp [V]	33.8V/31.65V	34.00V/31.80V	34.20V/31.94V	34.40V/32.09V	34.60V/32.24V
Imp [A]	17.31A/14.03A	17.35A/14.09A	17.40A/14.15A	17.45A/14.21A	17.49A/14.27A
Voc (with tolerance) [V]	40.90V/38.52V	41.10V/38.72V	41.30V/38.92V	41.50V/39.11V	47.70V/39.31V
Isc (with tolerance) [A]	18.37A/14.90A	18.42A/14.94A	18.47A/14.98A	18.52A/15.94A	18.57A/15.98A

MODULE TYPE/S	SNG-645W-BL Sun Elite	SNG-650W-BL Sun Elite	SNG-655W-BL Sun Elite	SNG-660W-BL Sun Elite	SNG-665W-BL Sun Elite
Pmax (with tolerance) [W]	645Wp/489Wp	650Wp/492Wp	655Wp/496Wp	660Wp/500Wp	665Wp/504Wp
Vmp [V]	37.69V/34.98V	37.87V/35.14V	38.05V/35.31V	38.23V/35.48V	38.41V/35.64V
Imp [A]	17.12A/13.97A	17.17A/14.01A	17.22A/14.05A	17.27A/14.09A	17.32A/14.13A
Voc (with tolerance) [V]	45.29V/42.12V	45.49V/42.31V	45.69V/42.49V	45.89V/42.68V	46.09V/42.86V
Isc (with tolerance) [A]	18.13A/14.87A	18.18A/14.01A	18.23A/14.95A	18.28A/14.99A	18.33A/15.03A

MODULE TYPE/S	SNG-670W-BL Sun Elite	SNG-675W-BL Sun Elite	SNG-680W-BL Sun Elite	SNG-685W-BL Sun Elite	SNG-690W-BL Sun Elite
Pmax (with tolerance) [W]	670Wp/510Wp	675Wp/514Wp	680Wp/518Wp	685Wp/522Wp	690Wp/526Wp
Vmp [V]	38.20V/34.79V	38.40V/34.97V	38.60V/35.15V	38.80V/35.32V	39.00V/35.50V
Imp [A]	17.55A/14.66A	17.59A/14.70A	17.63A/14.74A	17.67A/14.78A	17.71A/14.82A
Voc (with tolerance) [V]	46.10V/41.92V	46.30V/42.10V	46.50V/42.28V	46.70V/42.46V	46.90V/42.64V
Isc (with tolerance) [A]	18.62A/15.66A	18.66A/15.70A	18.71A/15.74A	18.80A/15.82A	18.80A/15.82A

MODULE TYPE/S	SNG-710W-BL Sun Elite	SNG-715W-BL Sun Elite	SNG-720W-BL Sun Elite	SNG-725W-BL Sun Elite	SNG-730W-BL Sun Elite
Pmax (with tolerance) [W]	710Wp/537.8Wp	715Wp/541.5Wp	720Wp/545.3Wp	725Wp/549.0Wp	730Wp/552.8Wp
Vmp [V]	39.71V/40.44V	39.90V/40.58V	40.08V/37.63V	40.28V/37.81V	40.47V/37.99V
Imp [A]	17.88A/14.43A	17.92A/14.46A	17.96A/14.49A	18.00A/14.52A	18.04A/14.55A
Voc (with tolerance) [V]	48.03V/45.91V	48.29V/46.13V	48.52V/46.35V	48.76V/46.57V	48.98V/46.79V
Isc (with tolerance) [A]	18.90A/15.26A	18.94A/15.30A	18.99A/15.34A	19.03A/15.36A	19.07A/15.39A

MODULE TYPE/S	SNG-760W-FJ Sun Elite	SNG-765W-FJ Sun Elite	SNG-770W-FJ Sun Elite	SNG-775W-FJ Sun Elite	SNG-780W-FJ Sun Elite
Pmax (with tolerance) [W]	760Wp/575.8Wp	765Wp/579.6Wp	770Wp/583.4Wp	775Wp/587.2Wp	780Wp/590.5Wp
Vmp [V]	42.82V/40.21V	43.03V/40.39V	43.22V/40.57V	43.41V/40.75V	43.60V/40.92V
Imp [A]	17.75A/14.32A	17.78A/14.35A	17.82A/14.38A	17.86A/14.41A	17.89A/14.43A
Voc (with tolerance) [V]	51.85V/49.53V	52.08V/49.75V	52.31V/49.97V	52.54V/50.20V	52.7V/50.35V
Isc (with tolerance) [A]	18.75A/15.14A	18.79A/15.18A	18.83A/15.20A	18.87A/15.23A	18.93A/15.30A

SUNGI SOLAR ENTERPRISE SERIES (Only Bifacials; Watt Range: 580+)

MODULE TYPE/S	SNG-580W-FJ Solar Enterprise	SNG-585W-FJ Solar Enterprise	SNG-590W-FJ Solar Enterprise	SNG-595W-FJ Solar Enterprise	SNG-600W-FJ Solar Enterprise
Pmax (with tolerance) [W]	580Wp/436Wp	585Wp/440Wp	590Wp/444Wp	595Wp/448Wp	600Wp/452Wp
Vmp [V]	42.80V/39.86V	43.00V/40.00V	43.20V/40.15V	43.40V/40.29V	43.60V/40.43V
Imp [A]	13.56A/10.94A	13.61A/11.00A	13.66A/11.06A	13.71A/11.12A	13.77A/11.18A
Voc (with tolerance) [V]	50.93V/48.89V	51.17V/49.08V	51.41V/49.27V	51.65V/49.46V	51.88V/49.65V
Isc (with tolerance) [A]	14.36A/11.60A	14.42A/11.65A	14.48A/11.70A	14.53A/11.75A	14.59A/11.80A
Enhanced Power Output for Bifacials [W]	609Wp 667Wp 725Wp	614Wp 672Wp 731Wp	619Wp 678Wp 737Wp	624Wp 684Wp 743Wp	630Wp 690Wp 750Wp

MODULE TYPE/S	SNG-580W-FJ Solar Enterprise	SNG-585W-FJ Solar Enterprise	SNG-590W-FJ Solar Enterprise	SNG-595W-FJ Solar Enterprise	SNG-600W-FJ Solar Enterprise
Pmax (with tolerance) [W]	580Wp/439Wp	584Wp/443Wp	590Wp/447Wp	595Wp/451Wp	600Wp/455Wp
Vmp [V]	43.22V/40.57V	43.41V/40.75V	43.60V/40.92V	43.79V/41.10V	43.98V/41.28V
Imp [A]	13.42A/10.83A	13.48A/10.88A	13.54A/10.93A	13.59A/10.97A	13.65A/11.02A
Voc (with tolerance) [V]	52.30V/49.96V	52.54V/50.19V	52.77V/50.41V	53.00V/50.63V	53.23V/50.85V
Isc (with tolerance) [A]	14.18A/11.45A	14.24A/11.50A	14.30A/11.55A	14.36A/11.59A	14.42A/11.64A
Enhanced Power Output for Bifacials [W]	609Wp 667Wp 725Wp	614Wp 672Wp 731Wp	619Wp 678Wp 737Wp	624Wp 684Wp 743Wp	630Wp 690Wp 750Wp

MODULE TYPE/S	SNG-585W-KY Solar Enterprise	SNG-590W-KY Solar Enterprise	SNG-595W-KY Solar Enterprise	SNG-600W-KY Solar Enterprise	SNG-605W-KY Solar Enterprise
Pmax (with tolerance) [W]	585Wp/444Wp	590Wp/448Wp	595Wp/452Wp	600Wp/456Wp	605Wp/460Wp
Vmp [V]	33.8V/31.65V	34.00V/31.80V	34.20V/31.94V	34.40V/32.09V	34.60V/32.24V

Imp [A]	17.31A/14.03A	17.35A/14.09A	17.40A/14.15A	17.45A/14.21A	17.49A/14.27A
Voc (with tolerance) [V]	40.90V/38.52V	41.10V/38.72V	41.30V/38.92V	41.50V/39.11V	47.70V/39.31V
Isc (with tolerance) [A]	18.37A/14.90A	18.42A/14.94A	18.47A/14.98A	18.52A/15.94A	18.57A/15.98A
Enhanced Power Output for Bifacials [W]	614Wp 672Wp 731Wp	619Wp 678Wp 737Wp	624Wp 684Wp 743Wp	630Wp 690Wp 750Wp	635Wp 695Wp 756Wp

MODULE TYPE/S	SNG-640W-BL Solar Enterprise	SNG-645W-BL Solar Enterprise	SNG-650W-BL Solar Enterprise
Pmax (with tolerance) [W]	640Wp/486Wp	645Wp/490Wp	650Wp/494Wp
Vmp [V]	37.30V/33.71	37.50V/33.89V	37.70V/34.07V
Imp [A]	17.19A/14.42A	17.23A/14.46A	17.27A/14.5A
Voc (with tolerance) [V]	45.10V/40.54V	45.30V/40.82V	45.50V/41.10V
Isc (with tolerance) [A]	18.26A/15.42A	18.31A/15.46A	18.35A/15.50A
Enhanced Power Output for Bifacials [W]	672Wp 736Wp 672Wp	677Wp 741Wp 806Wp	682Wp 747Wp 812Wp

MODULE TYPE/S	SNG-670W-BL Solar Enterprise	SNG-675W-BL Solar Enterprise	SNG-680W-BL Solar Enterprise	SNG-685W-BL Solar Enterprise	SNG-690W-BL Solar Enterprise
Pmax (with tolerance) [W]	670Wp/510Wp	675Wp/514Wp	680Wp/518Wp	685Wp/522Wp	690Wp/526Wp
Vmp [V]	38.20V/34.79V	38.40V/34.97V	38.60V/35.15V	38.80V/35.32V	39.00V/35.50V
Imp [A]	17.55A/14.66A	17.59A/14.70A	17.63A/14.74A	17.67A/14.78A	17.71A/14.82A
Voc (with tolerance) [V]	46.10V/41.92V	46.30V/42.10V	46.50V/42.28V	46.70V/42.46V	46.90V/42.64V
Isc (with tolerance) [A]	18.62A/15.66A	18.66A/15.70A	18.71A/15.74A	18.80A/15.82A	18.80A/15.82A
Enhanced Power Output for Bifacials [W]	703Wp 770Wp 837Wp	708Wp 776Wp 843Wp	714Wp 782Wp 850Wp	719Wp 787Wp 856Wp	724Wp 793Wp 862Wp

MODULE TYPE/S	SNG-710W-BL Solar Enterprise	SNG-715W-BL Solar Enterprise	SNG-720W-BL Solar Enterprise	SNG-725W-BL Solar Enterprise	SNG-730W-BL Solar Enterprise
Pmax (with tolerance) [W]	710Wp/537.81Wp	715Wp/541.53Wp	720Wp/545.26Wp	725Wp/549.00Wp	730Wp/552.75Wp
Vmp [V]	39.71V/40.44V	39.90V/40.58V	40.08V/37.63V	40.28V/37.81V	40.47V/37.99V
Imp [A]	17.88A/14.43A	17.92A/14.46A	17.96A/14.49A	18.00A/14.52A	18.04A/14.55A
Voc (with tolerance) [V]	48.03V/45.91V	48.29V/46.13V	48.52V/46.35V	48.76V/46.57V	48.98V/46.79V
Isc (with tolerance) [A]	18.90A/15.26A	18.94A/15.30A	18.99A/15.34A	19.03A/15.36A	19.07A/15.39A
Enhanced Power Output for Bifacials [W]	745Wp 816Wp 887Wp	750Wp 822Wp 893Wp	756Wp 828Wp 900Wp	761Wp 833Wp 906Wp	766Wp 839Wp 912Wp

MODULE TYPE/S	SNG-760W-FJ Solar Enterprise	SNG-765W-FJ Solar Enterprise	SNG-770W-FJ Solar Enterprise	SNG-775W-FJ Solar Enterprise	SNG-780W-FJ Solar Enterprise
Pmax (with tolerance) [W]	760Wp/575.8Wp	765Wp/579.6Wp	770Wp/583.4Wp	775Wp/587.2Wp	780Wp/590.5Wp
Vmp [V]	42.84V/40.21V	43.03V/40.39V	43.22V/40.57V	43.41V/40.75V	43.60V/40.92V
Imp [A]	17.75A/14.32A	17.78A/14.35A	17.82A/14.38A	17.86A/14.41A	17.89A/14.43A
Voc (with tolerance) [V]	51.85V/49.53V	52.08V/49.75V	52.31V/49.97V	52.54V/50.20V	52.70V/50.35V
Isc (with tolerance) [A]	18.75A/15.14A	18.79A/15.18A	18.83A/15.20A	18.87A/15.23A	18.93A/15.30A
Enhanced Power Output for Bifacials [W]	798Wp 873Wp 949Wp	803Wp 879Wp 955Wp	808Wp 885Wp 961Wp	813Wp 891Wp 967Wp	818Wp 897Wp 973Wp

6. ENVIRONMENTAL CONDITIONS

Sungi Solar's crystalline series modules are designed to withstand the following environmental conditions for over 25 years. In addition to the IEC certification required to comply with European standards, Sungi Solar products have also been tested to ensure resistance to ammonia fumes, which may be present in areas near livestock facilities, as well as their suitability for installation in humid areas such as coastal regions and areas prone to severe sandstorms.

Environmental Conditions:

- Ambient Temperature: -40°C to +40°C
- Operating Temperature: -40°C to +85°C
- Storage Temperature: -20°C to +50°C
- Humidity: <85% Relative Humidity
- Mechanical Load: Design pressure is 3600 Pa (front) / 1600 Pa (rear), with a safety factor of 1.5.

*Note:
The mechanical load capacity depends on the mounting methods employed, and failure to follow the instructions in this manual may result in a different resistance to snow and wind loads. The system installer is responsible for ensuring that the installation methods used meet these requirements and comply with applicable local regulations.

7. INSTALLATION SITE SELECTION

- Sungi Solar modules can be installed both horizontally and vertically; however, a vertical orientation is recommended to reduce shading caused by dirt on the solar cells (the distance between the mounting structure and the long side is 150–250 mm).
- It is advised to install solar modules at an optimized tilt angle to maximize energy output. Generally, the tilt angle should approximately match the latitude of the project site, with the modules facing the equator. In the Northern Hemisphere, photovoltaic modules should generally face south, while in the Southern Hemisphere, they should face north. However, the optimal system design should also consider other local requirements.
- Sungi Solar recommends a mounting tilt angle of no less than 10° to ensure that dust on the module surface can be easily washed off by rain, reducing the cleaning frequency, and to allow water to drain properly, preventing water stains on the glass caused by prolonged water stagnation, which could affect the module's appearance and performance.
- When installing solar modules on a roof, the roof must be covered with a layer of fire-resistant material suitable for its class, and proper ventilation must be ensured between the module's rear and the installation surface. Additionally, a safe working area must be left between the roof's edge and the solar panel's outer edge.
- For ground-mounted residential installations, modules must be installed according to local regulations, such as using a fence.
- Position the modules to minimize shading during the day, maintaining a distance from obstacles at least three times greater than the height of the obstacle itself.
- Sungi Solar recommends installing the modules in an environment with a working temperature between -20°C and 40°C. The working ambient temperature limit for the modules is between -40°C and 85°C. The maximum altitude is 2000 m or lower. The maximum mechanical load is 5400 Pa on the front and 2400 Pa on the back.
- If the photovoltaic modules are to be used in areas where water damage is possible (humidity > 85% RH), consult Sungi Solar's local technical support beforehand to determine an appropriate installation method or to confirm whether installation is feasible.
- If the modules are installed in an area with frequent lightning and thunderstorms, they must be protected from lightning strikes. For information on lightning protection, contact Sungi Solar's local technical support.
- Ensure there are no flammable gases near the installation site.
- To comply with fire safety regulations, ensure the installation angle does not exceed 5 inches per foot.
- Avoid obstructing the drainage holes in the module frame during mounting.

- If all solar modules are mounted on the same surface and have the same orientation, they are expected to perform similarly throughout the day and can be connected to the same inverter channel.
- If modules are oriented differently, it is recommended to connect them to separate inverters to optimize energy output. Consult inverter suppliers for further guidance.
- According to salt mist corrosion tests conducted by Intertek in compliance with IEC 61701 for photovoltaics (PV), Sungi Solar modules can be installed in corrosive salt areas near the ocean or in sulfurous areas. Modules must not be immersed in water or placed in environments (e.g., fountains, water sprays) where they may come into prolonged contact with water (fresh or saltwater). If modules are installed in a salt mist environment (e.g., marine environment) or sulfurous environment (e.g., sulfur springs, volcanoes), there is a risk of corrosion.
- For installations between 50 m and 500 mm from the sea, stainless steel or aluminum materials must be used for contact with photovoltaic modules, and the installation site must be treated with an anti-corrosion coating.
- According to ammonia corrosion tests for photovoltaic (PV) modules IEC 62716:2013 and ammonia resistance tests by DLG Fokus, Sungi Solar modules can be safely installed in environments with high ammonia concentrations, such as barns and farms.

8. GENERAL ASSEMBLY INSTRUCTIONS

- Always wear dry insulating protective clothing and accessories: insulated tools, headgear, insulated gloves, safety harness, and safety shoes (with rubber soles).
- DO NOT wear metallic jewelry that could cause electric shocks during installation.
- DO NOT install modules in rain, snow, or strong wind conditions.
- Keep connectors dry and clean during installation to avoid the risk of electric shocks. It is recommended to install them immediately after unpacking the modules.
- If the photovoltaic module terminals are wet, DO NOT perform any work to avoid electric shocks. Install immediately after unpacking.
- The application level of Sungi Solar modules is Class A, suitable for systems operating at voltages above 50 V DC or 240 W, where general public access is expected.
- Keep the photovoltaic module packed in the Trina carton until installation.
- Use an opaque material to completely cover the photovoltaic module surface during installation and wiring.
- DO NOT disconnect the connector if the system circuit is connected to a load.
- DO NOT stand on the module glass during installation. There is a risk of injury or electric shock if the glass breaks.
- DO NOT work alone (always work in teams of 2 or more people).
- DO NOT damage the back sheet of photovoltaic modules when securing them to a mount with bolts.
- DO NOT damage surrounding photovoltaic modules or the mounting structure when replacing a module.
- Cables must be positioned and secured so that they are not exposed to direct sunlight after installation to prevent cable degradation.
- Avoid having cables hang low from the junction box. Low-hanging cables can lead to issues such as animal bites, electrical leaks in water, and fires.
- Installing modules with different color codes in the same block or on the same roof is not recommended.

8.1. FIXING METHODS

Photovoltaic modules can be installed on the support structure using specific clamps designed for this purpose. Regardless of the fixing method used, the final installation of the modules must ensure the following:

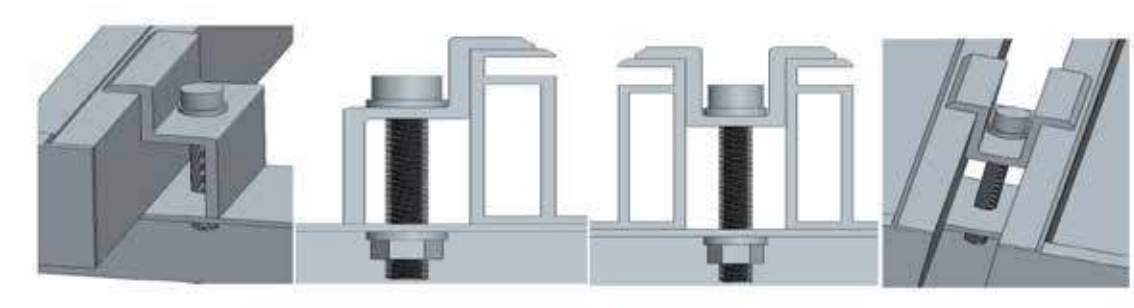
- A clearance of at least 115 mm must be maintained between the module frame and the wall or roof surface. The minimum distance between two modules must be at least 10 mm.
- The fixing method must not block the module's drainage holes.

- The panels must not be subjected to wind or snow loads exceeding the maximum allowable limits, nor exposed to excessive forces caused by thermal expansion of the support structures.

A. **Mounting with Clamps:**

- Sungi Solar has tested its modules with various clamps from different manufacturers and recommends using clamps with insulating gaskets made of EPDM or similar material and fastening bolts of at least M6. The clamp must overlap the module frame by at least 7 mm but no more than 10 mm.
- It is advisable to use at least 4 clamps to secure the modules to the mounting rails.
- Module clamps must never come into contact with the front glass and must not cause deformation of the frame.
- Ensure that shading effects caused by the module clamps are avoided.
- The module frame must NOT be modified under any circumstances.
- When using this mounting method with clamps, at least four clamps per module are recommended: two on each long side of the module (if oriented vertically) and two on each short side of the module (if oriented horizontally). Depending on local wind and snow conditions, additional clamps may be required to ensure the modules' load resistance.
- It is essential that the applied torque complies with mechanical design standards for the type of bolt used by the customer. For example, a torque of 8 Nm is recommended for an M6 bolt, and 16 Nm is recommended for an M8 bolt.

End Clamp Installation *Middle Clamp Installation*



Module Installed Using Clamp Mounting Method

	Load of 2,400Pa	Load of 5,400Pa
Clamp System Fixing to the Long Frame Side		

Other mounting configurations may be adopted; however, if the above recommendations are not followed, the load-handling capacity (snow/wind load) may decrease below the product specifications of 5400/2400 Pa, and product failure due to overloading will NOT be covered under warranty.

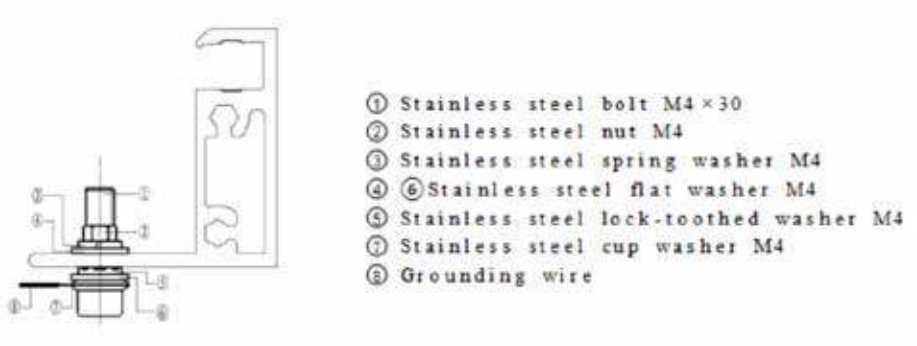
8.2. GROUNDING

- It is essential that all module frames and mounting structures are properly grounded in full compliance with the provisions of the appropriate National Electrical Code.
- To achieve proper grounding, the module frames and all metallic structural elements must be continuously connected using an appropriate grounding conductor. This conductor, which can be made of copper, copper alloy, or any other material suitable for electrical conduction as per the respective National Electrical Codes, must then be connected to the ground using a suitable grounding electrode.
- Sungi Solar modules can be installed using third-party grounding devices approved for grounding the metal frames of photovoltaic modules. These devices must be installed strictly according to the manufacturer's instructions for the grounding device.
- Sungi Solar recommends adopting the following grounding methods:

a. Use Schleter clamps for grounding. Connect the modules to the support structure as shown in the image below. (Grounding accessories must pass the compliance test for the UL467 standard).

- The recommended tightening torque is 20.5 Nm.
- For more information, please contact the Schletter supplier (http://www.solar.schletter.de).

b. The traditional grounding method (Grounding accessories must pass compliance tests for UL467 and UL E34440/E6207 standards).



- For complete grounding, the grounding hardware should penetrate the anodized oxidation layer of the frame.
- It is recommended to use a bare copper grounding wire of 10-12 AWG gauge.

8.3. MODULE WIRING

- All connections must be made by qualified installers in compliance with local codes and regulations.
- Modules can be connected in series to increase operating voltage by inserting the positive plug of one module into the negative socket of the next. Always ensure that contacts are clean, dry, and free of corrosion before making connections.
- If one module string is connected with reversed polarity relative to another, it could irreparably damage the product. Before making a parallel connection, always verify the voltage and polarity of each individual string. If reversed polarity or a voltage difference greater than 10 V between strings is detected, check the string configuration before connecting.
- Sungi Solar modules are equipped with multi-strand copper cables with a 4 mm^2 cross-section, certified for 1500V DC, 90°C, and UV resistance. All other cables used to connect the DC system should have similar or higher specifications.
- It is recommended to run all cables through dedicated conduits and keep them away from areas prone to water collection.

- The maximum system voltage must be below the certified maximum voltage (typically 1500V) and the maximum input voltage of the inverter and other electrical devices installed in the system. To ensure this, calculate the open-circuit voltage of the module string at the lowest ambient temperature expected for the location. This can be done using the following formula:

  System Voltage = N × Voc × {1 + TCvoc × (25 – Tmin)}

***Note:**

- N: Number of modules in series
- Voc: Open-circuit voltage of each module (refer to the product label or datasheet).
- TCvoc: Thermal coefficient of the open-circuit voltage for the module.
- Tmin: Minimum ambient temperature.
- The minimum and maximum outer cable diameters are 5 to 7 mm².
- For field connections, use at least 4 mm² copper cables insulated for a minimum of 90°C and sunlight resistance, designated as Photovoltaic Cable.
- The minimum cable bending radius should be 43 mm.



9. ELECTRICAL CONFIGURATION

Photovoltaic (PV) systems operate automatically and require very limited daily monitoring. The solar array generates direct current (DC) electricity whenever it is exposed to light, while the inverter automatically activates as soon as the energy from the solar array is sufficient to be converted into high-quality alternating current (AC) for the grid.

***Attention:**

- The module is designed to operate at potentially lethal DC voltages, which can pose significant risks of electric shock, arcing, and fire. Even though some solar modules produced by Sungi Solar are certified to operate up to 1500V, it is always advisable to check the module label to confirm the actual product rating before making connections.
- Before disconnecting the connectors, always ensure that an appropriate switch (DC switch) is used to interrupt the current flow.

9.1. FUSES

When installing fuses, it is crucial that they are rated for the maximum DC voltage and placed on each ungrounded pole of the array (i.e., if the system is not grounded, fuses must be connected on both the positive and negative poles).
The maximum rating of a fuse connected in series with an array string is usually 20A, but the specific module rating can be found on the product label and in the product datasheet.
This fuse rating also corresponds to the maximum reverse current that a module can withstand (when one string is shaded, other parallel module strings will be charged by the shaded string, causing current to flow), thus influencing the number of parallel strings. The configuration of modules in parallel is based on the fuse rating divided by Isc.

9.2. INVERTER SELECTION AND COMPATIBILITY

When installed in systems subject to IEC standards, modules produced by Sungi Solar generally do not require an electronic grounding connection and can be used with both galvanically isolated inverters (with a transformer) and transformerless inverters.
Potential Induced Degradation (PID) is sometimes observed in photovoltaic modules due to a combination of factors such as high humidity, high temperature, and high voltage. PID is more likely to cause deterioration under certain conditions, including:
a) Installations in Areas with Hot and Humid Climates
b) Proximity to sources of continuous moisture, such as bodies of water.

To reduce the risk of PID, it is strongly recommended that the modules are equipped with Sungi Solar's Anti-PID technology, which can be applied to any product from the same company. Alternatively, it is recommended to use an inverter with a transformer, along with proper grounding of the negative DC side of the photovoltaic array.
In areas characterized by hot and humid climates, such as coastal and wetland regions, it is advised to opt for inverters with isolation transformers to ensure the proper functioning of the modules under positive voltage.

9.3. BLOCKING DIODE

In systems that incorporate a battery, blocking diodes are commonly placed between the battery and the module output to prevent battery discharge during the night and in rainy conditions. Diodes intended for this purpose must meet the following requirements:

a. The Nominal Average Direct Current [IF(AV)] must be higher than the maximum current of the system at the module's highest operating temperature.
b. The Nominal Repetitive Peak Inverse Voltage [VRRM] must be higher than the maximum system voltage [Vmax] at the module's lowest operating temperature (in accordance with IEC standards: Vmax = 1500V).

9.4. BYPASS DIODE

When a single module is partially shaded, reverse voltage may occur across the shaded module. This forces the current to pass through the shaded area from the other modules. By connecting a bypass diode in parallel with the series string, the forced current will pass through the diode, bypassing the shaded module. This process minimizes module overheating and array current losses.

The recommended bypass diode model is PV3045.

10. MAINTENANCE AND CARE OF PHOTOVOLTAIC SYSTEMS

A well-designed photovoltaic system requires minimal maintenance; however, the system's performance and reliability can be enhanced by following a few simple steps. It is essential to perform maintenance at least once a year by trained and competent personnel. The main maintenance activities include:

- Trim or remove any vegetation that could shade the solar array, as this could affect the overall performance of the system.
- Check that the mounting hardware is properly tightened.
- Inspect all cables to ensure that the connections are secure; cables should be protected from direct sunlight and placed away from water collection areas.
- Ensure that all fuses on the strings at each ungrounded pole are functioning properly.

If it is necessary to clean the solar modules:

- Use a soft cloth with a mild detergent and clean water, being careful to avoid severe thermal shock that could damage the module.
- In large systems, carefully assess the cost of cleaning relative to the increase in energy production and the time required for the modules to become dirty again.
- Check if the entire array or just a section needs cleaning by measuring the current before and after cleaning; if the current increase is less than 5%, cleaning may not be necessary.
- Ensure that this check is only performed under consistently high sunlight conditions without clouds.

Generally, the rear surface of the module does not require cleaning, but if necessary, avoid using sharp objects that could damage the substrate material.

10.1. VISUAL INSPECTION AND PANEL REPLACEMENT

Modules in a photovoltaic system should be regularly inspected for any damage. Factors such as glass breakage, cable breakage, and damage to the junction box can cause operational and safety issues. In the case of a damaged module, it must be replaced with one of the same type, following the instructions in the Product Installation Manual. It is recommended to perform a preventive inspection every six months without changing the module components.
If electrical or mechanical equipment is used for inspection or maintenance, it must be operated by qualified professionals to avoid electric shocks or fatal accidents.

During the replacement of damaged modules:

- Follow the safety precautions outlined in the manual.
- Wear cut-resistant gloves and other personal protective equipment.
- Isolate the affected array string to prevent current flow.
- Disconnect the damaged module connectors using the disconnection tool provided by the suppliers.
- Replace the damaged module with a new, fully functioning module of the same type.
- Check the open-circuit voltage of the array string and ensure it is within 10V of the other strings connected in parallel.
- Turn the switch back on.

10.2. INSPECTION OF CONNECTORS AND CABLES

- Inspect all cables to ensure that the connections are secure.
- Protect the cables from direct sunlight and place them away from water collection areas.
- Check the torque of the terminal bolts and the overall condition of the wiring at least once a year.
- Ensure that the mounting hardware is properly tightened, as loose connections can cause damage to the array.

Following these maintenance and care steps will help keep the photovoltaic system in optimal condition, ensuring high performance and reliability over time.

11. CLEANING

The amount of electricity generated by a solar module is proportional to the amount of light that falls on it. A module with shaded cells will produce less energy, so it is important to keep all photovoltaic modules clean.

Clean the photovoltaic modules when irradiance is below 200 W/m²; do not use liquids with a large temperature difference compared to the modules for cleaning.

Cleaning photovoltaic modules is prohibited in weather conditions with wind speeds exceeding 4 on the Beaufort scale, heavy rain, or heavy snow.

When cleaning modules with pressurized water, the water pressure on the module's glass surface should not exceed 700 KPa (14619.80 psf); the module should not endure excessive forces.

When cleaning photovoltaic modules: do not step on the modules; do not spray water on the back of the module or on the cables; keep the connectors clean and dry; prevent the risk of fires and electric shocks; do not use steam cleaners.

The rear surface of the module usually does not require cleaning; if necessary, avoid using sharp objects that could damage or penetrate the substrate material.

Periodically trim vegetation that could shade the solar array, compromising its performance.

For module cleaning, use a soft cloth with a mild detergent and clean water. Take care to avoid severe thermal shocks that could damage the module by cleaning the modules with water at a temperature similar to that of the modules themselves.

Use a clean, soft cloth, either dry or damp, to clean the photovoltaic modules; corrosive solvents or hard objects are strictly prohibited.

If there are grease stains or other difficult-to-remove substances on the module surface, conventional household glass cleaners can be used; do not use alkaline or strong acid solvents.

When cleaning the rear surface of the module, be careful not to let liquid penetrate the substrate material. Horizontally mounted modules (0° tilt angle) should be cleaned more often as they do not self-clean as effectively as modules mounted at a 10° tilt or greater.

If you are unsure whether the array or a section of it needs cleaning, first select a particularly dirty string from the array, then:

- Measure and record the inverter's input current from that string;
- Clean all the modules in the string;
- Measure the inverter's input current again and calculate the percentage improvement achieved from the cleaning.

11.1.1. WATER QUALITY REQUIREMENTS

- pH: 5 ~ 7;
- Chlorides or salt content: 0 – 3,000 mg/L;
- Turbidity: 0–30 NTU;
- Conductivity: 1500~3000 μs/cm
- Total dissolved solids (TDS): ≤1000 mg/L
- Water hardness—calcium and magnesium ions: 0–40 mg/L
- Non-alkaline water must be used; if possible, use demineralized water.

11.1.2. INSPECTION OF MODULES AFTER CLEANING

- Ensure that the visually inspected module is clean, shiny, and free from stains;
- Perform a spot check to verify if there are any soot deposits on the module surface;
- Check for any visible scratches on the module surface;
- Verify that there are no cracks caused by handling on the module surface;
- Ensure that the module support structure is not tilted or bent after cleaning;
- Check that the module connection terminals are not detached;
- After cleaning the photovoltaic modules, complete the photovoltaic module cleaning log.

12. WARNINGS

Solar modules do not include user-repairable components.

WARNING:
Before performing any electrical maintenance, it is essential to turn off the photovoltaic system to prevent potential risks of electric shock or burns.

13. CONTACT INFORMATION

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