Installation Instructions

Monocrystalline Solar Module

Multicrystalline Solar Module
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1. Safety

The instructions relate to the safety indicated in the following are for preventing unexpected danger or damage in advance by safely and exactly using the product.

⚠️ **DANGER**

Non-compliance of the instructions may immediately cause serious injury or death.

⚠️ **WARNING**

Non-compliance of the instructions may cause death or serious injury to the user.

⚠️ **CAUTION**

Non-compliance of the instructions may cause injury or property damage to the user.
Safety

DANGER

Do not contact with electrically active parts of the panel, such as terminals, regardless of connection of the module. It may result in spark or lethal electric shock.

Please don’t use the module with the broken window or the torn back side. There is a danger of electric shock.
Safety

**WARNING**

- Please perform works in the dry condition and use only dry tools. Do not handle the wet panels without protection equipment. It may result in safety accident.
- Do not approach the damaged or broken module unless you are an expert. It may result in serious injury.
- Damaged module must be treated with safety protection equipment. It may result in injury.
Safety

**CAUTION**

Please use proper equipment, connector, wire and buttress for system configuration of the module. It may result in damage or failure of the product.

Do not use the glass surface or frame of the solar module after installation of the module. It may result in injury.

Do not perform installation in rainy, heavily windy or snowy days. It may result in safety accident.

Do not locate a heavy object onto the module. Do not stand on or step on the module. Do not drop or suddenly lay down the module. The cells organized in the module may be broken.

Do not make the holes in the frame or glass of the module. It may decrease the strength of the frame or glass.

Do not scratch the coating surface of the frame. It may decrease the strength due to corrosion of the frame.
Safety

CAUTION

Do not concentrate sunlight on the module surface.
It may result in damage of the product.

Do not apply a shock to the junction box of the module or pull the cable.
Do not remove the labels attached to the module.
It may result in damage of the product.

If the installing structure has a curved surface (ex. arch type) as shown in the below picture, do not forcefully modify the module in installation when connecting it with the structure.
Please install the module in the place where the structure has been completely set up because deformation of the structure may cause deformation of the product when performing exterior installation by using a crane, etc after assembling the module to the installing structure.
It may result in damage of the product.
* The installing structure must be in the bent type.
The straight type may cause deformation of the product as shown in the following picture or decrease the strength of structure due to a space between the frame and the structure.
Before Installation

2. Before Installation

Please carefully read this manual before installation.

- Solar module installation should be performed by an authorized installer for the safety and maintenance of the system.
- All installation instructions should be clearly understood before attempting installation.
- Do not twist, pull, or scratch the cable attached to the solar module.
- Do not touch the glass or rear surface of the solar module with bare hands.
- Do not stand on and put weight on the solar module.
- Do not drop the solar module and cause an excessive load on solar module.
- Do not disassemble the solar module.
- After installation or repair, check whether solar module operates properly or not.
- In case the currently used solar module or the parts applied to the solar module have been replaced, check whether the changed solar module is properly operated or not.

The newly replaced solar module and its parts must be the same solar module (model name) and parts with the current solar module.

- Please contact the local office to confirm the regulations and to obtain permission.
- Follow all safety precautions of all other used components.
- Do not let anyone approach the solar module who has little knowledge of solar modules or on the measures to take when solar modules are damaged in order to avoid the risk of injury or electrical shock.
- Do not locate the solar module horizontally, as this may cause dirt or white efflorescence (glass deformation)
- Panels produce voltage even when not connected to an electrical circuit or load. Panels produce nearly full voltage when exposed to as little as 5% of full sunlight, and both electrical current and power increase with light intensity.
Before Installation

- Panels are intended for outdoors, land-based applications only. Panels are not intended for use indoors or applications on moving vehicles of any kind.
- Reflection from snow, water or other surfaces can increase light and therefore increase both the current and power generated by the panel.
- Industry standard rated specifications are made at conditions of 1000W/m² irradiance and 25°C (77°F) solar cell temperature. Colder temperatures can substantially increase voltage and power.
- Keep the solar module and system away from children when installing.
- Keep the module packed in the carton until the time of installation.
- Make sure the flammable gases are not generated near the installation site.
- Do not work alone. Please work as part of a team of two or more people.
- Wear a safety belt if working high above the ground.
- When working with panels in light, follow all applicable regulation regarding working with live electrical equipment.
- Contact with electrically active parts of the panels, such as terminals, can result in burns, sparks and lethal shock whether the panel is connected or disconnected.
- Even partial shadowing can substantially reduce panel and system output.
- Care must be taken to avoid low tilt angles which may cause dirt to build-up on the glass against the frame edge.
- Dirt build-up on the surface of the panel can cause active solar cells to be shaded and electrical performance to be impaired.
- Always keep the back surface of the panel free from any foreign objects or structural elements which could come into contact with the panel, especially when the panel is under mechanical load.
- For permission to use mounting methods not described in the Mounting Guide. Please consult LG Solar. Failure to do so will void the warranty and panel certification.
3. After Installation

- Plug the connector in tightly and ensure that the wiring properly works. Failure of electricity generation may be caused by failure of inverter operation due to the non-connection of +/- connectors (ex. only 12 units out of 15 units connected)

- It is advisable to conduct periodic inspection of the panels for damage to front glass, back skin, frame, junction box, or external electrical connections.

- Check electrical connections for loose connections and corrosion.

- PV panels can operate effectively without ever being washed, although removal of dirt from the front glass can increase output.

- Water can be used for regular washing or rinsing of the treated front glass to remove dust, dirt or other deposits.

- To remove ingrained dirt, the treated glass can be washed with a micro-fiber cloth and ethanol or a conventional glass cleanser.

- No aggressive and abrasive cleansers or chemicals should ever be used on the treated front glass. No alkali based chemicals should be used, including ammonia based solutions.

- Always wear rubber gloves for electrical insulation whilst maintaining, washing or cleaning panels.

- Deposits of foreign material on the frame surface can be cleaned using a wet sponge or cloth and dried in air or by using a clean chamois.

- Alternatively, a mild detergent or glass cleaner may be used. Never use aggressive alkaline or acid cleaners to clean any part of the panel.

- Foreign material on the frame may in some instances look like small scratches, but in most cases can be removed by cleaning.

- Perform the wiring work by connecting the connector and wires to the stand away from the roof or ground.
4. Component

Front

LGxxxM1W(C)-G2 / LGxxxS1W(C)-G2

Glass  Solar Cell (Mono)

LGxxxP1W(C)-G2 / LGxxxR1W(C)-G2

Glass  Solar Cell (Multi)

Back

Junction Box

Backsheet

Frame

(Figure 1)
5. Electrical Installation

- Avoid all electrical hazards when installing, wiring, operating and maintaining a panel.

- Do not use panels of different electrical or physical configurations in the same system.

- Match the polarities of cables and terminals when making the connections; failure to do so may result in damage to the panel.

- When reverse currents can exceed the value of the maximum protective fuse marked on the back of the panel, a properly rated and certified over-current device (fuse or circuit breaker) must be connected in series with each panel or string of panels.

- The rating of the over-current device shall not exceed the value of the maximum protective fuse marked on the back of the panel.

- The panel contains factory installed bypass diodes located inside the junction box.

- When installing the system, it is recommended to install the lightning rod to protect the system.

- The junction box is not designed or certified to be field accessible or maintainable and should under no circumstances be opened. Opening the junction box may void the warranty.

- Panels with a suspected electrical problem should be returned to LG Solar for inspection and possible repair or replacement as per the warranty conditions provided by LG Solar.
Electrical Connections

Modules may be connected in series and/or parallel to achieve the desired electrical output as long as certain requirements are met. Please use only the same type of modules in a combined source circuit.

Never direct artificially concentrated light on to the module.
Do not disconnect the module under load.
Shock hazard shall be applied near the means of connection to the modules.

General Wiring

LG Electronics recommends that all wiring be double insulated with a minimum rating of 90°C (194°F). All wiring should use a flexible copper (Cu) conductor.
The minimum size should be determined by the applicable codes.
We recommend a size not smaller than 4mm².

Earth Ground Wiring

To prevent electric shock and fire, an earth ground must be done on the frames of Photovoltaic(solar modules) modules and arrays. There is an earth hole in the center of the module frame. Using this hole, an earth conductor and the solar module frame must be connected and earthed.

1. The installation instructions shall include:
   1. Details for wiring in accordance with the NEC, Article 690 and that the grounding method of the frame of arrays shall comply with the NEC, Article 250.
   2. CNL model instruction manuals shall also include a statement that installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.
Series Connection

The solar modules may be wired in series to produce the desired voltage output. The current of each module connected in series should be same. Do not exceed the 80% of maximum system voltage.

* Maximum Module configuration (recommend) : refer to the ‘8. Product Specification’ in this manual. (this value is calculated under the condition of Voc at -40°C)
Parallel Connection

The solar modules may be combined in parallel to produce the desired current output. The voltage of each module connected in parallel should be the same. Every series string or solar module must be fused prior to combining with other strings. By-pass diodes are factory installed in the solar modules. Please refer to the applicable regional and local codes for additional fusing requirements and limitations on the maximum number of solar modules in parallel.

* Maximum parallel strings without proper measures [e.g. fuse 20A and/or blocking diode]: 1 string
[Parallel configuration is not limited if proper measures are taken to block the reverse current flow, e.g. fuses for the protection of the module and cables from over-current and/or blocking diodes for prevention of unbalanced string voltage].

A multiplying factor is required for increased output of the PV modules. Under normal conditions, a PV module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions.

Accordingly, the values of Isc and Voc marked on this PV module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacities, fuse sizes, and size of controls to the PV output. Refer to Section 690.8 of the National Electrical Code for an additional multiplying factor of 125 percent (80 percent derating) which may be applicable.
6. Mechanical Installation

Module Mounting

The LG Electronics (LGE) Limited Warranty for solar modules is contingent upon modules being mounted in accordance with the requirements described in this section.

* Application class A
  (Panels rated for use in Application Class A may be used in systems operating at greater than 50 V DC or 240 W, where general contact access is anticipated)

Site Consideration

LGE solar modules should be mounted in a location that meets the following requirements.

Operating Temperature

All LGE solar modules must be mounted in an environment that ensures that the LGE solar module will operate within the following maximum and minimum operating temperatures.

| Maximum Operating Temperature | +90°C (194°F) |
| Minimum Operating Temperature  | -40°C (-40°F) |

Care should be taken to provide adequate ventilation behind the solar modules, especially in hot environments.

Design Strength

LGE solar modules are certified to basic loads 30lb/ft² (about 1440 Pa). When mounting solar modules in snow prone or high wind environments, special care should be taken to mount the solar modules in a manner that provides sufficient design strength while meeting the local code requirements.

Excluded Operating Environments

Certain operating environments are not recommended for specific LGE solar modules and are excluded from the LGE Limited Warranty for these modules. No LGE solar module should be mounted at a site where it may be subject to direct contact with salt water.
Mounting Configurations

Mounting using frame bolt holes

Solar modules may be mounted at any angle from horizontal to vertical. Select the appropriate orientation to maximize sunlight exposure. Specific information on the solar module dimensions and location of mounting and grounding holes is provided below.

In order to prevent water from entering the junction box, which could present a safety hazard, module should not be mounted such that the front/top glass faces downward.

Clearance between the solar module frames and structure or ground is required to prevent wiring damage and to allow air to circulate behind the solar module.

When installed on a roof, the solar module must be mounted over a fire-resistant roof covering rated for the application. (Fire rating of LG PV module is C)

The solar module is only IEC listed for use when its factory frame is fully intact.

Do not remove or alter the solar module frame. Creating additional mounting holes may damage the solar module and reduce the strength of the frame.

The solar module may be mounted using only the following methods: (*Torque: 2.5kgf-m *)

![Figure 4](image-url)
Mechanical Installation

Frame Holes
Secure the solar module to the structure using the factory mounting holes. Four M6 stainless steel bolts, four nuts, four spring washers, and eight plain washers are recommended per solar module. Refer to Figure 6 for the solar module dimensions and mounting hole locations. The module may be fastened to a support using the bolt holes in the bottom of the frame at location ‘A’ (refer to Figure 5). The module should be fastened with M6 bolts, plain washers, spring washers, and nuts for support.

* Roof mount: A gap between the solar module and mounting surface is necessary for cooling air circulation. Do not seal this gap. The recommended standoff height is a minimum of 4 inches.
## Mechanical Installation

### Mechanical characteristics

<table>
<thead>
<tr>
<th>Description</th>
<th>LGxxxM1W(C)-G2 &amp; LGxxxS1W(C)-G2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>1632mm</td>
</tr>
<tr>
<td>Width</td>
<td>986mm</td>
</tr>
<tr>
<td>Depth</td>
<td>42mm</td>
</tr>
<tr>
<td>Weight</td>
<td>18.5kg</td>
</tr>
</tbody>
</table>

![Diagram](image_url)

<Figure 6>
Mechanical Installation

Mechanical characteristics

<table>
<thead>
<tr>
<th>Description</th>
<th>LGxxxP1W(C)-G2 &amp; LGxxxR1W(C)-G2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>1632mm</td>
</tr>
<tr>
<td>Width</td>
<td>986mm</td>
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<tr>
<td>Depth</td>
<td>42mm</td>
</tr>
<tr>
<td>Weight</td>
<td>18.5kg</td>
</tr>
</tbody>
</table>

<Figure 6>
7. Disclaimer of Liability

Since the use of this Safety, Installation and Operation Manual and the conditions or methods of installation, operation, use and maintenance of the panel are beyond LG Solar control, LG Solar does not assume responsibility and expressly disclaims liability for loss, damage, injury or expense arising out of or in any connected with such installation, operation, use or maintenance of the panel.

LG Solar assumes no responsibility for any infringement of patents or other rights of third parties that may result from use of the panel. No license is granted by implication or otherwise under any patent or patent rights.

The information in this Manual is based on LG Solar knowledge and experience and is believed to be reliable; but such information including product specifications (without limitations) and suggestions do not constitute a warranty, expressed or implied. LG Solar reserves the right to make changes to the product, specifications or this Manual without prior notice.
# Product Specification

## 8. Product Specification

### Mono-crystalline

**Standard Test Condition (STC): Irradiation**

1,000W/m², Cell temp. 25°C, 1.5AM

<table>
<thead>
<tr>
<th>Model</th>
<th>LGxxxSTW(C)-G2 (xxx : Pmax)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pmax(W)</td>
<td>230</td>
</tr>
<tr>
<td>Voc(V)</td>
<td>36.6</td>
</tr>
<tr>
<td>Vmp(V)</td>
<td>29.5</td>
</tr>
<tr>
<td>Imp(A)</td>
<td>7.81</td>
</tr>
<tr>
<td>Isc(A)</td>
<td>8.37</td>
</tr>
</tbody>
</table>

**Output Tolerance**

+3% / -0%

**Maximum System Voltage**

600V

**Maximum Series Fuse**

20A

**Total Number of Cells**

60 each

**Total Number of Strings Diodes / Rating**

3 / 3 20A/each

**Temperature coefficient of power (TkPmax)**

0.434%/K

**Temperature coefficient of current (TkImp)**

0.052%/K

**Temperature coefficient of voltage (TkVmp)**

-0.335%/K

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### Multi-crystalline

#### Standard Test Condition (STC): Irradiation 1,000W/m², Cell temp. 25°C, 1.5AM

<table>
<thead>
<tr>
<th>Model</th>
<th>LGxxxPW(C)-G2 (xxx : Pmax)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pmax(W)</td>
</tr>
<tr>
<td></td>
<td>Voc(V)</td>
</tr>
<tr>
<td></td>
<td>Vmp(V)</td>
</tr>
<tr>
<td></td>
<td>Imp(A)</td>
</tr>
<tr>
<td></td>
<td>Isc(A)</td>
</tr>
<tr>
<td></td>
<td>Output Tolerance</td>
</tr>
<tr>
<td></td>
<td>Maximum System Voltage</td>
</tr>
<tr>
<td></td>
<td>Maximum Series Fuse</td>
</tr>
<tr>
<td></td>
<td>Total Number of Cells</td>
</tr>
<tr>
<td></td>
<td>Total Number of Strings Diodes / Rating</td>
</tr>
<tr>
<td></td>
<td>Temperature coefficient of power (TkPmax)</td>
</tr>
<tr>
<td></td>
<td>Temperature coefficient of current (TkImp)</td>
</tr>
<tr>
<td></td>
<td>Temperature coefficient of voltage (TkVmp)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>LGxxxRTWC(C)-G2 (xxx : Pmax)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pmax(W)</td>
</tr>
<tr>
<td></td>
<td>Voc(V)</td>
</tr>
<tr>
<td></td>
<td>Vmp(V)</td>
</tr>
<tr>
<td></td>
<td>Imp(A)</td>
</tr>
<tr>
<td></td>
<td>Isc(A)</td>
</tr>
<tr>
<td></td>
<td>Output Tolerance</td>
</tr>
<tr>
<td></td>
<td>Maximum System Voltage</td>
</tr>
<tr>
<td></td>
<td>Maximum Series Fuse</td>
</tr>
<tr>
<td></td>
<td>Total Number of Cells</td>
</tr>
<tr>
<td></td>
<td>Total Number of Strings Diodes / Rating</td>
</tr>
<tr>
<td></td>
<td>Temperature coefficient of power (TkPmax)</td>
</tr>
<tr>
<td></td>
<td>Temperature coefficient of current (TkImp)</td>
</tr>
<tr>
<td></td>
<td>Temperature coefficient of voltage (TkVmp)</td>
</tr>
</tbody>
</table>
9. Ground method

To prevent electric shock or fire, an earth must be done on the frames of solar modules.

(Torque: 2.5kgf-m)

![Grounding components](image)

<table>
<thead>
<tr>
<th>Grounding hardware</th>
<th>Dimension &amp; material</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexagon nut &amp; bolt</td>
<td>M4 stainless</td>
<td>The length of the bolt: 15 mm</td>
</tr>
<tr>
<td>Plain washer</td>
<td>M4 stainless</td>
<td></td>
</tr>
<tr>
<td>Toothed lock washer</td>
<td>M4 stainless</td>
<td></td>
</tr>
<tr>
<td>Screw washer</td>
<td>M4 stainless</td>
<td></td>
</tr>
<tr>
<td>Ground wire</td>
<td>12 AWG copper</td>
<td></td>
</tr>
</tbody>
</table>
10. Maintenance and Inspection

Disposal

Please contact us at the address given overleaf if you have any queries related to the disposal or recycling of solar modules from LG Electronics.