

## Product documentation

### MSR solar Standard Photovoltaic Modules (type designation “MSR Standard”)

Please read carefully the following product documentation and safety instructions. Non-compliance with these instructions may void the module warranty.

#### 1. Purpose of this documentation

This guide contains basic information regarding Malaysian Solar Resources Sdn. Bhd. standard photovoltaic modules, their installation and safe handling. All instructions should be read and understood before attempting installation. If there are any questions, please contact your dealer or MSR for further information.

This documentation refers to the PV-modules themselves and is not the complete installation. It serves as a general reference.


Generally, the installer must understand to all safety precautions in this documentation, as well as the applicable national codes and standards when installing MSR PV-modules. Before installing a solar photovoltaic system, the installer should become familiar with the mechanical and electrical requirements for photovoltaic systems. Keep this documentation in a safe place for future reference.

#### 2. System components (modules and mounting system; standard scope of delivery)

- MSR solar standard photovoltaic modules ((MYS-zzM/By/ww-xxx, MYS-zzP/By/ww-xxx type designation MSR Standard module which is where (M = monocrystalline cells; P = polycrystalline cells), “y” = busbar number either it is a 2 busbar or 3 busbar, “ww” = is either CF = glass-foil-module (framed) or CL= glass-foil-module (frameless) and the “xxx” stands for nominal power values up to 420 W<sub>p</sub>), IEC 61215ed. 2, IEC 61701 and IEC61730 certified framed glass/foil laminates with crystalline solar cells, permanently attached junction box, and double insulated 4mm<sup>2</sup> wires terminated in touch safe specific PV DC-connectors.
- The mounting system does not form part of Malaysian Solar Resources supply.

#### 3. General safety relevant aspects

**Do not attempt to disassemble the module, and do not remove any attached nameplates or components. Doing so will void the warranty.**

-  The modules are qualified for application class A: Hazardous voltage (IEC 61730: higher than 50V DC; EN 61730: higher than 120V), hazardous power applications (higher than 240W) where general contact access is anticipated.
- Installing solar photovoltaic systems requires specialized skills and knowledge. It should be performed only by

qualified and specially instructed personnel. The installer assumes all risk of injury, including risk of electric shock.

- Use only equipment, connectors, wiring and mounting hardware specifically designed for use in a photovoltaic system.

#### 3.1. Precautions for mechanical installation

- MSR Standard modules are designed for installation with specific photovoltaic mounting systems. Otherwise it will be fully responsible by the installer.
- The mounting system must be capable of securely fixing MSR Standard modules exposed to uplift or load pressures of more than 2'400 N/m<sup>2</sup>.
- The mounting structure and hardware must be made of durable, corrosion- and UV-resistant material.
- Observe all instructions and safety precautions included with the mounting system (e.g. “Alutec”) to be used with the module.
- If modules are installed on roofs (non-integral modules or panels), a fireproof underlay is needed. If modules are installed in roofs, all applicable local, regional and national codes and regulations have to be observed.
- The correct order to orient the module is vertical with the junction box on the higher side of it. The reason is the breather port in the junction box, that must be mounted facing downward and not be exposed to the rain.

#### 3.2. Precautions for electrical installation

- When disconnecting wires connected to a photovoltaic module that is exposed to light, an electric arc may occur. Arcs can cause burns, start fires or otherwise create safety (up to lethal electric shock) problems.
- Before any manipulation at an installed PV plant, switch it of first on AC-side after on DC-side of the inverter or the charge controller.
- Check for remaining voltage before starting, and observe the local safety relevant regulations for such working conditions.
- Under normal conditions, a photovoltaic module can produce more current and/or voltage (here: 30V DC) than reported at standard test conditions.
- Accordingly, the values of ISC and VOC marked on this module should be multiplied by a factor of 1,25 when determining component voltage ratings, conductor current ratings, fuse sizes, and size of controls connected to the PV output. In the USA, refer to Section 690-8 of the National Electrical Code (NEC) for an additional multiplying factor of 125 percent (80 percent de-rating) which may be applicable.
- Contact with a DC voltage of 30 V or more is potentially hazardous. Exercise caution when wiring or handling modules exposed to sunlight.
- Only connect modules with the same rated output current in series. If modules are connected in series, the total voltage is equal to the sum of the individual module voltages.
- Only connect modules or series combinations of modules with the same voltage in parallel. If modules are connected in parallel, the total current is equal to the sum of individual module or series combination currents.
- Always use the same type of module within a particular photovoltaic system.
- With a serial interconnection of the modules, the sum of the open circuit voltage at Standard Test Conditions (V<sub>oc</sub>

@ STC) must not pass over the maximal system voltage indicated, both indicated in the modules datasheet.

- If the sum of short circuit currents of the parallel connected modules passes over the reverse current (indicated in the table of chapter 8), string diodes or fuses have to be used in each string of modules connected in parallel. These string diodes or fuses have to be qualified for the maximum expected current and voltage.
- Observe the instructions and safety precautions for all other components used in the system, including wiring and cables, connectors, DC-breakers, inverters, etc.
- Use appropriate safety equipment (insulated tools, insulating gloves, etc) approved for use on electrical installations.

### 3.3. General prescriptions for installation

- Do not install the modules near equipment or in locations where flammable gases can be generated or collected.
- Do not use mirrors or other hardware to artificially concentrate sunlight on the module.
- When installing modules, observe all applicable local, regional and national codes and regulations. Obtain a building and/or electrical permit where required.
- Keep children well away from the system while transporting and installing mechanical and electrical components.
- Do not wear metallic rings, watchbands, ear, nose, or lip rings or other metallic devices while installing or troubleshooting photovoltaic systems.
- Do not drill holes in the glass surface of the module. Doing so will destroy the module and void the warranty.
- Do not drill additional mounting holes in the module frame. Doing so will void the warranty.
- Do not lift the module by grasping the module's junction box or electrical leads.
- Do not apply paint or adhesive to the module.
- ❖ **Do not stand or step on module. Danger of breaking the glass or slipping off with possibility of severe injury or death!**
- Do not drop the module or allow objects to fall on the module.
- Do not place any heavy objects on the module.
- Inappropriate transport and installation may damage the module glass or the solar cells inside the module.

## 4. Mechanical Installation

### 4.1. Robustness of modules and mounting system

Malaysian Solar Resources Sdn. Bhd. standard photovoltaic modules have been tested to withstand snow loads of up to 2'400 N/m<sup>2</sup> and a wind pull of up to 2'400 N/m<sup>2</sup>. The tests were conducted with a static load for one hour. The modules must not be mounted in regions, where higher wind- and snow loads are expected than 2'400 N/m<sup>2</sup>. The whole support structure needs to be strong enough to cope with above loads. Load calculations to check for the applicability for the actual installation are within the responsibility of the system planner or installer.

### 4.2. Selecting the location

- Select only suitable locations for installation of the modules.
- In most cases, optimum performance is achieved if the modules face true south in northern latitudes and true north in southern latitudes.
- For detailed information on optimal module orientation, refer to standard solar photovoltaic installation guides or a reputable solar installer or systems integrator.
- The module should not be shaded at any time of the day.
- Do not install the module near equipment or in locations where flammable gases can be generated or collected.

### 4.3. Mounting methods

#### 4.3.1. Mounting with bolts

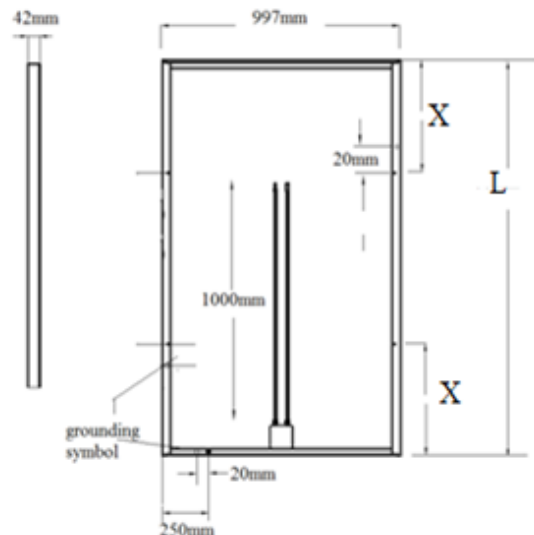
- The module must be attached and supported by at least four bolts M6 or M8 (depending on the situation) through the indicated mounting holes.
- Most installations will use the four inner mounting holes on the module frame.
- Depending on the local wind and snow loads, additional mounting points may be required.

#### 4.3.2. Mounting with clamping hardware

- If module clamps are used to secure the module, the torque on the clamp bolt should be around 8–10 Nm.
- A minimum of four module clamps should be used, two on each long frame side, in the general clamping areas denoted by the wide arrows on the drawing.
- Depending on the local wind and snow loads, additional module clamps may be required.

#### 4.3.3. Other

- Other specific photovoltaic mounting methods are acceptable as long as the minimum requirements as described in chapter 4.1 are met. Electrical Installation



Type	Cell Number	L Length	X Length
MYS-72M/BY/CF-XXX	72	1984mm	281mm
MYS-60M/BY/CF-XXX	60	1666mm	281mm
MYS-54M/BY/CF-XXX	54	1507mm	281mm
MYS-48M/BY/CF-XXX	48	1348mm	281mm
MYS-36M/BY/CF-XXX	36	1130mm	281mm

Type	Cell Number	L Length	X length
MYS-72P/BY/CF-XXX	72	1984mm	281mm
MYS-60P/BY/CF-XXX	60	1666mm	281mm
MYS-54P/BY/CF-XXX	54	1507mm	281mm
MYS-48P/BY/CF-XXX	48	1348mm	281mm
MYS-36P/BY/CF-XXX	36	1130mm	281mm

## 5. Electrical Installation

### 5.1. Grounding

- All module frames must be properly grounded in countries, where grounding of modules is mandatory. Observe all local electric codes and regulations.
- A bolted or screwed connection is required, it incorporates
  - a screw size of M4 at least
  - a star washer under the screw head or a serrated screw must penetrate nonconductive coatings like anodized frame
  - screw and star washer in stainless steel
  - 2 or more screws or 2 full threads of a single screw shall engage the metal
- Devices listed and identified for grounding metallic frames of PV modules are permitted to ground the exposed metallic frames of the module to grounded mounting structures.
- When using lay-in lugs, the grounding conductor should be inserted into the opening, and secured using the set screw.
- Functional grounding is not foreseen for the Malaysian Solar Resources Sdn. Bhd. standard photovoltaic modules. If it is performed, local electric codes and regulations have to be observed, and used grounding means have to be isolated from live parts by reinforced insulation.
- In any case the grounding screws, bolts or other parts have to be used separately from mounting parts of the module.

The ground point on the frame must be screw only at this symbol below



### 5.2. General electrical installation

**WARNING!** Electrical shock hazard! Do not touch bare conductors or other potentially energized parts.

- Photovoltaic modules convert light energy to direct-current electrical energy. They are designed for outdoor use.
- Do not use modules of different configurations in the same system.
- MSR-Standard modules are supplied with IEC certified cables and connectors for serial electrical connections.
- Use only additional cables which are qualified for the expected maximum current, maximum voltage and environmental conditions. Minimum cross section 4mm<sup>2</sup> (#12 AWG).
- For additional extension cables use only suitable cables.
- The PV-DC-connectors must never be disconnected under load! Stick to the first rule of chapter 3.2.
- Refer to the relevant standards in your country to determine overcurrent, conductor ampacity and size requirements.
- For best performance, ensure that positive and negative DC wires run closely together avoiding loops, which will also reduce the strength of inductive impacts of nearby lightning strikes.
- Following the installation of a module string, its performance is checked to ensure proper functioning. At least, I<sub>sc</sub> and V<sub>oc</sub> need to be checked with appropriate equipment and circuit breakers.

## 6. Maintenance

MSR recommends the following maintenance items to ensure optimum performance of the module:

- Clean the glass surface of the module as necessary. Use water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent can be used if necessary. Do not use dishwasher detergent.
- Electrical and mechanical connections and the general condition of an installed PV-system should be checked periodically by qualified personnel to verify that they are clean, secure and undamaged.
- Eventually occurring problems must only be investigated by qualified personnel.
- Observe also the maintenance instructions for all other components used in the system.

## 7. Shutting down the system

- Disconnect system from all power sources in accordance with instructions for all other components used in the system.
- The PV-DC-connectors must never be disconnected under load! Use switches designed for being disconnected under the prevailing DC-load or stick to the first rule of chapter 3.2.



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- The system should now be out of operation and can be dismantled. In doing so, observe all safety instructions as applicable to installation.

## 8. Typical electrical ratings after preconditioning >20kWh/m<sup>2</sup> of the concerned modules:

Model (MYS-60M/B3/CF-XXX)	250	245
Maximum Power ( $P_{MPP}$ )	250 W	245 W
Rated Voltage ( $V_{MPP}$ )	31.26 V	31.14 V
Rated Current ( $I_{MPP}$ )	8.0 A	7.87 A
Open Circuit Voltage ( $V_{OC}$ )	36.96 V	36.85 V
Short Circuit Current ( $I_{SC}$ )	8.8 A	8.75 A
Maximum System Voltage	1'000 V	1'000 V
Fire Class (UL 790)	C	C
NOCT	45 °C	45 °C
Maximum reverse current	12 A	12 A

The electrical characteristics are within  $\pm 3$  % of the indicated values of  $I_{sc}$ ,  $V_{oc}$ , and  $P_{mpp}$  under Standard Test Conditions (irradiance of 1000 W/m<sup>2</sup>, AM 1.5 spectrum, and a cell temperature of 25°C/77°F)

## 9. Disclaimer of liability

Because the use of this documentation and the conditions or methods of installation, operation, use and maintenance of photovoltaic products are beyond MSR 's control, MSR 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 MSR 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.

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Information about manufacturer:

Please consult your dealer or the manufacturer concerning the warranty of your modules. If you have any further questions, your dealer will gladly assist you.

Malaysian Solar Resources Sdn. Bhd.  
Lot74369,Lebuhraya Tun Razak,  
26300 Gambang, Kuantan,  
Pahang, Malaysia.  
[www.malaysiansolar.com](http://www.malaysiansolar.com)  
[info@malaysiansolar.com](mailto:info@malaysiansolar.com)

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