

# Installation and Operation Manual

## Solarion M210T

### General Information

This document contains important information for the installation of Solarion M210T solar modules from OC3 AG.

### Please read this document before unpacking or installing the solar modules!

Prior to installation, it must be determined that the modules are applicable for the intended use. The interaction with other system components must be possible without damage to either the modules or said components. All local, national and international codes, installation and inspection regulations shall apply. Installation and connection of the modules must be performed by a qualified, authorized expert.

**Please be aware that registration of your Solarion modules will increase the product warranty time from 2 to 5 years.** By registering your solar modules, OC3 AG will be able to provide better customer support in case you encounter problems with or have questions about your modules and their installation, operation, use and maintenance. You should also familiarize yourself with regional, national or international feed-in-tariffs are tax allowances that may be appropriate for your solar system. Solarion recommends to talk with your installer such that the necessary forms and/or applications that are required by the local electric grid operator are filled out. Please retain this document for your records.

### Liability Exclusion

OC3 AG accepts no responsibility for any losses, damages, injuries or costs that arise when installing, operating, using, maintaining or otherwise interacting with the module if the cause was due to the non-adherence to the provisions of this installation and operating manual and the use of the conditions and procedures when installing, operating, using and maintaining the module.

### Electrical Danger

OC3 AG recommends that you familiarize yourself with local and national regulations for work safety and accident prevention.

A Solarion solar module generates a direct current (DC) when its front side is exposed to light. Improper handling or placement of the cables and connectors can lead to dangerous shocks, burns or death, or may lead to fire, particularly when several modules are connected together in series (higher voltages) or in parallel (higher currents). To prevent accidents, modules should be covered with a non-transparent, non-abrasive material and under no circumstances connected while under load (i.e. both string poles must be left unconnected).

Please be aware that arcing may occur when contacts in a live circuit are disconnected! Doing so can lead to fire or cause bodily injury! **Modules under load must never be disconnected from the system!** Ensure that no children or unqualified people are close to the system or the modules during installation.



### General Handling and Use

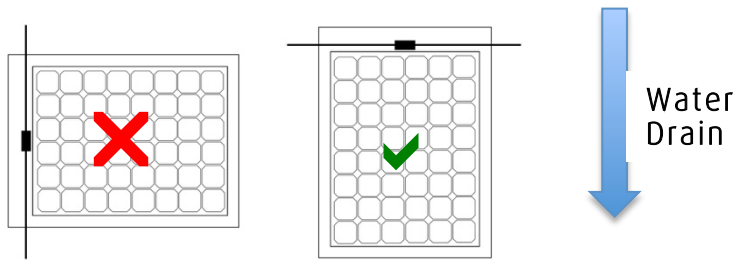
Solarion glass modules are robustly constructed. Nevertheless, please be aware of the following recommendations during handling and use. Failure to abide by these recommendations will void the warranties of the modules if such actions lead to module damage.

- Do not carry out installation work in rain, snow, ice or strong winds. Always work with solar modules during dry days.
- Ensure that the modules are exposed to ambient temperatures between -40°C and +45°C.
- Wear suitable protective clothing such as safety shoes and protective gloves in order to prevent injuries.
- Impact loads on the front side or edges of the module can lead to irreparable damage and should be avoided.
- The front and back sides of the modules are glass and must not be placed onto hard surfaces.
- Do not step on the module!
- Do not drop or place objects on the modules.
- Always hold the module flat (no bending, torsion, etc. allowed)
- Never carry a solar module by its connector cables or junction box
- Do not stack the modules, either vertically or horizontally, after they have been removed from the package
- Lenses or mirrors must not be used to concentrate light onto the module. The module can be damaged in such cases.
- Always use insulated tools.
- Modules must not be installed in areas where there are risks of explosions.
- Never install damaged modules or modules with damaged cables or junction boxes, as these pose a risk of fire, shock or injury.
- Modifying the module in any way will void the warranty.
- The following applications for Solarion modules are not allowed: indoor use, on moving vehicles, within 500 meter of the coast or where they are likely to become partially or fully immersed in fresh or salt water.

### Mounting Instructions

**It is recommended that the customer confirm with the installer that the load of the solar system is compatible with the static requirements of the intended area of installation (i.e. roof).**

The customer accepts the responsibility to use a safe, load-bearing roof for the Solarion modules. All load-bearing substructures must be inspected and confirmed for use at appropriate mechanical loads (wind, snow, etc.) by a specialist at the job site. It is recommended to mount the module with portrait orientation; landscape orientations should be avoided (see Figure 1).



### Figure 1: Correct module orientation

A qualified installer should provide to you a plan of your solar system, including module layout, string plan and electrical plan.

Shading of the solar system at times of high irradiation, particularly between the hours of 9:00 and 15:00, should be avoided. It is recommended that a professional installer investigate possible shading instances at all times of the year (e.g. with the aid of a SunEye) prior to module installation.

**The Solarion M210 module is appropriate for flat-roof and low-slope systems with a tilt angle between 3° and 10°.** The likelihood for ponded water is higher on rooftops below 3°, and the possibility for heavy snow loads to place significant stress on the module junction boxes and cables is high on rooftops above 10°. Where installation sites receive no snowfall or ice build-up, mechanical fastening of the module must be used on rooftop pitches greater than 40°. Please consult with your roofing specialist or installer.

All mounting components used with the Solarion M210 modules must be UL-listed and/or IEC certified and must meet the applicable Code requirements.

It must be ensured that the intended installation site has adequate drainage and experiences no standing water, even after heavy rainfall.

**If the modules are not mounted onto a verifiable positive drainage surface according to the presiding roofing codes at the site of installation, the warranty of the product will be voided.** It is also vital to ensure that the upper edges of the module be suitably protected against snow and ice run-off when installed on pitched rooftops.

Solarion solar modules are guaranteed to support a maximum snow load of 2.4 kPa (2400 N/m<sup>2</sup>) only when the module is installed on to roofing membrane or other membrane surface with membrane welding on all 4 edges of solar panel considering backsheets type of solar module and designated installation surface made from same material. For example if you are going to install this solar panel on to TPO based membrane, then you should install Solarion M210T TPO modules. **If you wish to use a special mounting system that is not approved for use by Solarion, you must first obtain written permission by OC3 AG, otherwise the guarantee will be voided.**

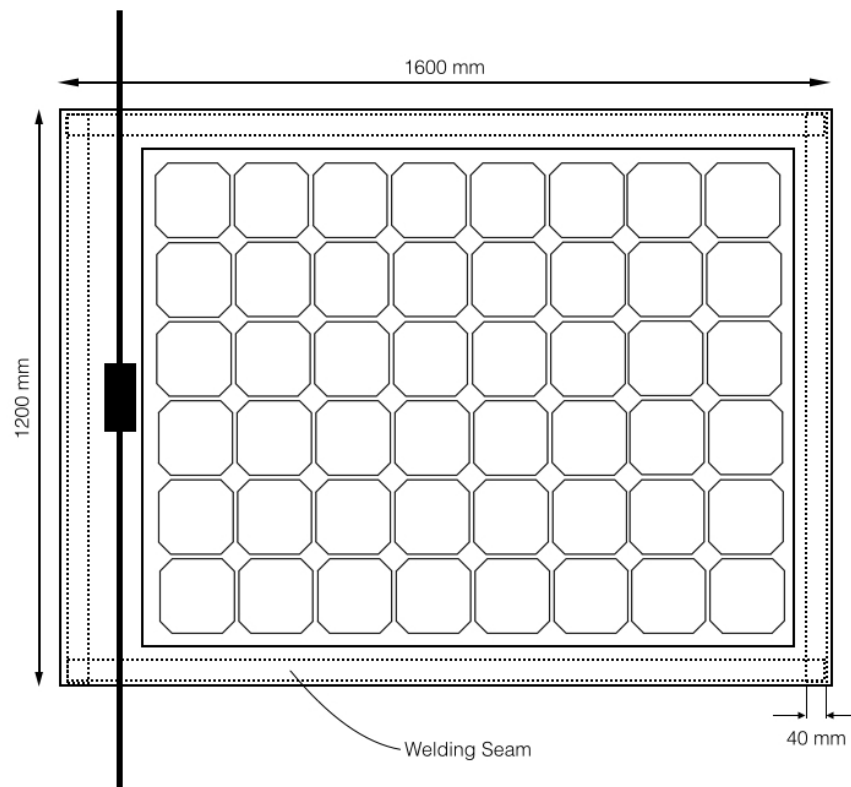


Figure 2: Allowable welding areas for mechanical fastening, valid for loads up to 2.4 kPa

The module weldings must be done by hot air welding along the long and short sides of the module. Welding seams should be done inside of the dotted rectangles.

The edges of the membranes to be welded must be clean and dry. Minimum air temperature at the building site should be 10 °C.

The welding with a 40 mm nozzle has to be done stepwise.

- Step 1. Spot welding: Weld the overlapping seam welding about every 40 cm at a distance of 6 cm from the edge.
- Step 2. Pre-welding: Weld the rear overlap area so that a 4 cm wide area remains for the finishing weld.
- Step 3. Welding: Weld the remaining stripe of 4 cm.

Welding temperature for TPO 450 °C with a speed of approximately 2 meters per minute. **As accepted**

good practice, the following installation recommendations should be abided by:

- The bending radius of the cables should be kept to a minimum of 60 mm
- The junction boxes should be positioned on top at all times.
- Bend or twist of the modules (without snow or wind loads) shall be kept < 3 mm/m
- The minimum distance between glass edges of the solar modules should be 150 mm
- Welding seam width between solar module backsheet membrane and membrane surface should be at least 40 mm
- Welding must be done on all 4 edges of the solar module

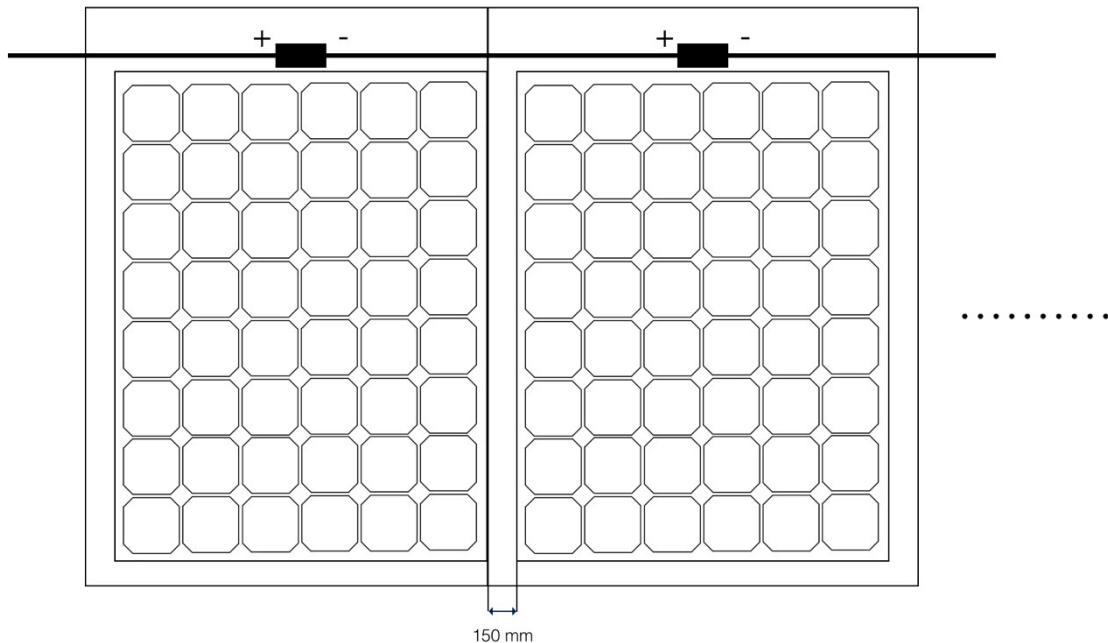


Figure 3: Welding multiple solar panels on to roofing membrane or other membrane surface

Multiple solar panels can be connected in series and parallel to reach desired power generation.

As accepted good practice, the following installation recommendations should be abided by:

- The solar modules should be welded to each other by their neighbouring edges as shown in Figure 3.
- There must be 150 mm of distance between glass edges of solar panels
- In a group of solar modules there space between horizontal groups must be at least 150 mm
- Use Solarion M210T TPO series modules for TPO based polymeric installation surface. This is crucial for proper welding of the solar module on to installation membrane.

### Electrical Installation

Modules of the same type (i.e. Solarion M230 KEE) and power class (i.e. 235 Watt) must be used within a serially-connected module string. A Multicontact junction box is glued to the front side of the module on to membrane backing. **Removing the junction box from the membrane, or opening the junction box will void the module guarantee.** The male and female connectors are labeled with "+" and "-", respectively. Same-type connectors must be used in the interconnection of Solarion solar modules. All cables used in the solar system must be appropriate for long-term outdoor use (i.e. UV-resistant). The insulation rating of the cable must be equal to or greater than the highest expected open circuit voltage (Voc). Please observe all local regulations, such as building and electrical codes, in your region. In order to avoid damage to the cables, do not lay the cables on sharp edges, and it is strongly recommended to use cable ties on the cables such that they are not able to sit in standing or run-off water. The cable cross sections for module interconnections must abide by standard practice with professional standards.

Under certain circumstances, Solarion modules may generate more current or higher voltage as the current and voltage measured at standard test conditions (STC is defined as an irradiance of 1000 W/m<sup>2</sup> at 25°C). It is therefore important to use a minimum safety factor of 1.25 when specifying string fuses, string diodes, cables and inverters. The maximum system voltage found on the module labels must not be exceeded.

The use of additional system components such as fault detectors (e.g. RCD, GFDI, etc.), fuses, diodes or circuit breakers may be required due to local electrical or safety ordinances. Thus safety regulations of these components must likewise be met. Since the glass-membrane solar panels do not have any accessible conductive parts (i.e. frame), they need not be electrically grounded. **Please be aware that local regulations and codes for functional grounding or substructure bonding of solar systems shall prevail.**

**Each module string requires the use of serially-connected string diodes in order to avoid the flow of reverse current from parallel strings or from defective inverters.** It is recommended to use rectifier diodes with blocking voltages in accordance with the appropriate system voltage. The use of string fuses is not mandatory.

**For a system voltage of 1000 Volt, a maximum 32 modules are allowed to be serially connected in a single module string.** Based on the aforementioned requirements for the use of string diodes, there is no limit to the number of strings wired in parallel.

### Operation and Maintenance

OC3 AG recommends that a specialist perform any possible required maintenance of your solar system. Routine maintenance is not necessary; however, it is recommended that the solar system be checked at least once per year for damage, soiling, etc. Defective modules must be taken out of operation and immediately replaced. Soiling (i.e. pollen, vegetation, bird lime, etc.) on the front side of the module can be removed with a damp sponge or cotton cloth at ambient temperatures between 10°C and 30°C. De-mineralized water (i.e. soft water) should be used to avoid water stains. Under no circumstances should abrasive detergents or soaps (i.e. surfactants) be used!

### Module Disposal

Module disposal must be done in agreement with local ordinances. The end customer is therefore responsible to correctly dispose of the modules. If you have any questions on this matter, please contact OC3 AG, and we will consult on proper methods of disposal.



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