

Module Cleaning Guidelines

Applicable for all products covered under Warranty

This manual applies to photovoltaic modules (“PV modules”, also commonly known as solar panels) manufactured by Insolation Energy Pvt. Ltd. (“INA brand”), and is explicitly written for qualified professionals (“Installer” or “Installers”), including without limitation licensed electricians Certified PV Installers.

INTRODUCTION

Thank you for choosing INA as your PV module provider. We appreciate your business! This manual contains important information pertaining to the electrical and mechanical installation and maintenance of PV modules, and contains safety information that you must read carefully and be familiar with before handling, installing, and/or maintaining Insolation Energy PV modules.

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Insolation Energy and its subsidiaries are not liable for any damages caused by inappropriate installation, use, or maintenance of Insolation Energy PV modules, including without limitation damages, losses, and expenses caused by non-observance of the instructions of this manual or caused by or in connection with products of other manufacturers.

Insolation Energy PV modules are designed to meet the requirements for the standards IEC 61215, IEC 61701, IEC 61853, IEC 61730, application class A. Modules rated for use in this application class may be used in systems operating at greater than 50 V DC or 240 W, where general contact access is anticipated. Modules qualified for safety through IEC 61730-1 and IEC 61730-2 and within this application class are considered to meet the requirements for safety class II. In the course of the PV module certification process, the compliance of this manual with the certification requirements has been verified by an independent certification laboratory.

This Cleaning Guideline is available in different languages. In cases of discrepancy between versions, the English language version shall control.

Failure to comply with the requirements listed in this manual will invalidate the Limited Warranty for PV Modules as provided by Insolation Energy at the time of sale to the direct customer. Additional

recommendations are provided to enhance safety practices and performance results. Please provide a copy of this manual to the PV system owner for their reference, and inform them of all relevant aspects of safety, operation, and maintenance.

SAFETY WARNING



- Cleaning activities create risk of damaging the modules and array components, as well as increasing the potential electric shock hazard.
- Cracked or broken modules represent an electric shock hazard due to leakage currents, and the risk of shock is increased when modules are wet. Before cleaning, thoroughly inspect modules for cracks, damage, and loose connections.
- The voltage and current present in an array during daylight hours are sufficient to cause a lethal electrical shock.
- Ensure that the circuit is disconnected before starting the cleaning procedure as contact with leakage of electrically active parts can result in injury.
- Ensure that the array has been disconnected to other active components (such as inverter or combiner boxes) before starting with the cleaning.
- Wear suitable protection (Clothes, insulated gloves, etc.).
- Do not immerse the module, partially or totally, in water or any other cleaning solution.

HANDLING NOTICE

- Use a proper cleaning solution and suitable cleaning equipment.
- Do not use abrasive or electric cleaners on the module.
- Particular attention should be taken to avoid the module backsheet or frame to come in contact with sharp objects, as scratches may directly affect product safety.
- Do not use de-greasers on the module.
- Do not use cleaning corrosive solutions containing acid, alkali, acetone, or industrial alcohol.

OPERATION PREPARATION

- Noticeable dirt must be rubbed away by gentle cleaning implement (soft cloth, sponge or brush with soft bristles).
- Ensure brushes or agitating tools are not abrasive to glass, EPDM, silicone, aluminum, or steel.
- Conduct the cleaning activities avoiding the hottest hours of the day, in order to avoid thermal stress on the module.

Recommended Water To Be Used:

- ✓ Soft Water with Total Hardness < 60mg/L
- ✓ Near neutral PH water i.e. $6.5 < PH < 7.5$
- ✓ The maximum water pressure recommended is 4MPa (40 bar)
- ✓ TDS of water should be less than 400mg/L

CLEANING METHOD

Method A: Wet Cleaning

When cleaning the module use a soft cloth together with a mild detergent and clean water. Take care to avoid severe thermal shocks which might damage the module by cleaning modules with water which has a similar temperature to the modules being cleaned.

Method B: Compressed Air

Insolation Energy recommends cleaning the soft dirt (like dust) on modules just with air pressure. This technique can be applied as long as the method is efficient enough considering the existing conditions.

Method C: Dry or Brush Cleaning

If excessive soiling is present on module surface, a non-conductive brush, sponge, or other mild agitating method may be used with caution. An agitating method may be used with caution.

Please note that any damage caused to the Anti-reflective coating of the glass due to this method voids the performance warranty clause.

- If grease is present, an environmental friendly cleaning agent may be used with caution.
- Ensure that any brushes or agitating tools are constructed with non-conductive materials to minimize risk of electric shock and that they are not abrasive to the glass or the aluminum frame.
- Dirt must never be scraped or rubbed away when dry, as this will cause micro-scratches on the glass surface.

Method D: Rotating Brush

Insolation Energy Solar recommends to avoid this kind of cleaning methods, as it could create micro-cracks in PV modules as well as damage the Anti-reflective coating.

ADDITIONAL POINTS

- The back surface of the module normally does not need to be cleaned but, in the event this is deemed necessary, avoid the use of any sharp projects that might damage the substrate material.
- The benefit of cleaning dirt and debris from the array is a trade-off between the cost of the cleaning, increased energy production as a result of this cleaning, and the inevitable re-soiling of the laminates over time once they have been cleaned.
- When cleaning the back surface of the module, take care to avoid penetrating the substrate material. Modules that are mounted flat (0° tilt angle) should be cleaned more often, as

they will not "self-clean" as effectively as modules mounted at a 15° tilt or greater.

- If you are unsure whether the array or section thereof needs to be cleaned then first select an array string that is particularly soiled then
 - Measure & record the inverter feed in current from that string,
 - Clean all modules in the string
 - Measure the inverter feed in current again and calculate the % improvement from cleaning
 - If the improvement is less than 5% then it is normally not worth spending the expense on cleaning

The above verification should only be carried out when the insolation is effectively constant (clear sky, strong sunshine, no clouds)

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