

Harvest the Sunshine

Premium Cells, Premium Modules

CLEANING METHOD OF JA SOLAR PHOTOVOLTAIC MODULES' GLASS

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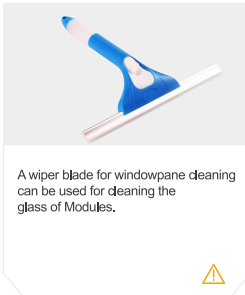
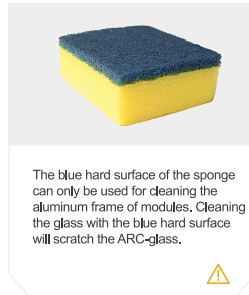
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This manual is a detailed description for cleaning the anti-reflection coated glass (referred to as ARC-glass) and the normal tempered glass (referred to as Tempered glass) of JA's photovoltaic solar modules (referred to as module).

With the passage of time, dirt and dust may accumulate on the glass surface of the module, reducing the power output of the module. JA recommends regular cleaning of modules to ensure maximum power output, especially in low rainfall areas.

01.DETAILED DESCRIPTION

- Do not use bare fingers or hands without gloves to touch or handle the glass surface of modules. Wear clean gloves to prevent fingerprints and other dirt from staying on the glass.
- It is not allowed to use metal tools such as blades, knives, steel wool and other abrasive materials.
- All types of soft foam materials, non-woven fabrics, whisks, soft sponges, soft brushes and hair brushes may be used.
- Cleaning brush specifications:
Material of cleaning brushes bristles: nylon wire 1010; Required diameter of cleaning Required diameter of cleaning brushe bristles for cleaning ARC-glass: 0.06-0.1 mm.
- All types of commercial glass cleaners, alcohol / ethanol / methanol may also be used.
- Do not use abrasive powders, abrasive cleaners, scrubber cleaners, polishers, sodium hydroxide, benzene, nitro-thin-ners, acid or alkali and other chemical substances.
- The pressure of the cleaning water should be less than 690KPa. It is not recommended to use water with high mineral content as it may deposit on the glass surface when the water left to dry on the panels. Most municipal water can meet the above two requirements.
The recommended quality of cleaning water is:
Water PH Value between 6.5-8.5;
Total dissolved solids of cleaning water (TDS) ≤ 1500 mg/L;
Hardness ≤ 450 mg/L;
- Do not use steam or corrosive chemicals to speed up the cleaning.
- Do not try to clean broken glass or modules with broken lines or exposed wires, as it may cause electric shock.
- Do not step, stand or sit on the modules to cleaning.



- It is recommended to use robots that have passed the compatibility test of JA Solar components as the first choice. Passing the compatibility test means that after conducting no less than 10000 accelerated cleaning tests (equivalent to 30 years of application) in a simulated local environment, the power attenuation of the component does not exceed 1%, and the component has no new battery cell hidden cracks, glass film damage, or appearance damage.
- If the cleaning robot has not undergone compatibility testing with JA Solar components, it is recommended to meet the main performance indicators suggested by JA Solar below, but its effectiveness is unknown due to the lack of compatibility testing.
If users wish to conduct compatibility testing with JA Solar products, JA Solar can assist in providing support.
- Please note that regardless of whether the selected robot has undergone compatibility testing, JA Solar is not responsible for components damaged by the cleaning robot, as components damaged by the cleaning robot will not be covered by the warranty.

Cleaning robots can be categorized into resident robots and mobile robots. Resident robots walk along PV module borders and fixed tracks, usually without the aid of liquids or solutions, and carry dry cleaning devices such as rollers and brushes for module cleaning, which are mainly used in utility scale PV plants and industrial and commercial rooftop PV plants. Mobile robots are robots that can travel directly on PV module surface, plan routes autonomously, and clean by moving.



resident robots



mobile robots

The main performance and parameters of the cleaning robot specified by JA Solar: The cleaning robot should have strong weather resistance, and all non-metallic parts should be tested under the irradiance of 340nm for 1008 hours according to ISO 4892. After the test, the surface has no chalking, cracking phenomenon and obvious discoloration and embrittlement phenomenon (judged as Grade 4~ Grade 5 according to ISO 4892), and at the same time, it is required to provide a third-party test report. The resident robots should also meet the parameters in the table below. The key indicators of mobile robots (brush hardness, cleaning speed) need to refer to the parameters of resident cleaning robots.

THE MAIN PARAMETERS OF THE PERFORMANCE OF THE RESIDENT CLEANING ROBOT							
Brush hardness	Roller brush performance	Climbing angle	High overruns	face-to-face crossing	Cleaning speed	Cleaning efficiency	Robot availability
≤1H	It is recommended that the roller brush speed be independently adjustable, ranging from 55 to 150rpm	Recommend ≥25°	Recommend ≥50mm	Recommend ≥50mm	Recommend 10-20m/min	Recommend ≥99.5%	Recommend ≥98.5%

02. SELECTION OF CLEANING TIME

The module glass cleaning should be done in the early morning, in the evening, at night or on cloudy days. At the same time, when cleaning in the morning or evening, select the period when sunshine is not strong.

03. PLANNING OF CLEANING CYCLE AND REGION

For a large-scale photovoltaic station with large floor area and a large number of modules, the time appropriate for the cleaning operations is short each day; it is necessary to plan the cleaning cycle and divide regions according to the specific circumstances of the electric field so as to complete the cleaning work of the photovoltaic station with less manpower.

The subregion division in the cleaning work should be carried out according to the electrical structure of the photovoltaic station, and should ensure that each of the cleaning work can cover all components connected to a number of combiner boxes or inverters.

If the cleaning robot is used, the cleaning cycle needs to be discussed and determined by the owner and the robot manufacturer according to the specific situation of the project.

04. ROUTINE STEPS OF CLEANING

STEP 1: WHISKING

Deposits such as dry floating dust and leaves on the module surface should be whisked off with a dry whisk or cloth. If there are no other deposits on the module surface, and the module has been cleaned in this step, the following steps may be dispensed with. If the Modules were installed in the desert, due to less water and more dust Recommend to use air to blow the sand from the surface of the modules.

STEP 2: SCRAPING

If there is hard foreign matter such as dirt, bird droppings, plant branches, leaves, etc., stuck to the module ,the module should be scrubbed with non-woven fabric or cleaning brush and must not be scratched with high-hardness objects; if the foreign matter is removed, do not scratch regions without hard deposits.

STEP 3: WASHING

If there are colored substances such as bird droppings, plant juices, etc., on the module surface, or dust that cannot be whisked off due to high indoor humidity, the colored substances need to be removed by cleaning. The colored substances are generally removed with clean water by spraying the clean water onto the region with pollutants and scrubbing with a cleaning brush. Oily substances, if any, may be removed by coating water blended with alcohol onto the colored region and scrubbing with a cleaning brush after the solution penetrates through the pollutants. For ARC-glass, if necessary, the module may be cleaned with commercial glass cleaner, together with non-woven fabric. For normal tempered glass, if necessary, the module may be cleaned with commercial glass cleaner and wiper blade at the end.

05. CLEANING OF SNOW

JA modules are designed to be able to withstand high snow pressure. However, if you need to clear snow to improve output power, use a cleaning brush to gently remove the snow, and use of air to blow the snow too. But do not try to remove frozen snow or ice on the modules.