晶澳太阳能科技股份有限公司

Module Storage Guide

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Module Storage Guide

Important Instructions

This manual provides main safety information related to the storage operation of JA Solar modules. All requirements of this manual should be followed during the module storage operation.

Storage operation requires specialized skills and knowledge and can only be performed by qualified personnel. It is recommended to read carefully this guide before storage operation. Operators should be familiar with the requirements of general storage operations. Please keep this guide in a safe place as reference.

If you have any questions, please contact the Global Quality and Customer Service Department of JA Solar.

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Introduction

Thank you for choosing JA Solar PV modules!

In order to ensure the good performance of our products, to prevent potential damage caused by non-standard storage operations, JA Solar created a module storage guide. This manual contains important information on warehouse operations. Please be familiar with this manual information before proceeding with JA Solar module storage operations. Besides, this manual includes additional safety information and the operators should be aware of these procedures. All the content of this manual belongs to the intellectual property of JA Solar, which comes from long-term research and experience.

These instructions do not constitute a warranty, neither expressed nor implied. JA Solar does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with the module storage operations. No responsibility is assumed by JA Solar for any loss caused by irregular operations. JA Solar reserves the right to make changes to this instruction without prior notice.

The requirements in this manual are to ensure the good performance of the modules in the storage process, which has been proved and tested in the field. Please provide these instructions to the relevant personnel of the storage operations for their reference and inform them of all relevant safety and operational requirements and recommendations.

1Module storage requirement in general warehouse

1.1Module stacking operation requirement

1.1.1 Stability

Forklift driver must act in accordance with the safety operation procedures. During the forklift

operation, the pallets must be stable and steady, they are not supposed to be tilted. To ensure the safety and stability, the forklift must be kept at a certain distance from the roof, pillars or walls. The maximum height for a module stack is two layers. The left and right trays should be arranged properly so the deviation must be less than 5cm, as shown on the picture.

1.1.2 Neatness

The modules should be stacked together depending on various sizes and model types, the pallets should be arranged properly. The packaging label should face outward for an easy sorting.

1.1.3 Quantification

The storage capacity shall not exceed the storage limitation, meaning that the maximum height of a module stack is two layers, the pallets should be stored within the effective area of the warehouse and according to the bearing capacity of the floor and the available height.

1.2 Module positioning requirements

The “five distances” should meet the safety requirement. The “five distances” refers to the distance to the wall, to the pillars, to the ceiling, to the lights and distance between the module stack. While stacking module, it is forbidden to hit the wall, pillars, ceiling or lights. Do not place the modules too close from these parts, a clearance distance should be maintained. Walkways

should be arranged to facilitate module transportation and to ensure fire protection regardless the stacking type.

1.2.1 Distance between the module stack and the pillars

To prevent the warehouse pillars moisture from affecting the products and to protect the safety of the warehouse building itself, a distance of 0.1 to 0.3m should be kept between the module stack and the pillars.

1.2.2 Distance between the module stack and the ceiling

The distance between the maximum height of the module stack and the ceiling of the warehouse is called “top distance”. The top distance contributes to facilitate loading and unloading operations, ventilation and heat dissipation which helps for fire protection, distribution and consolidation. The top distance is generally from 0.5 to 0.9m, depending on circumstances.

1.2.3Distance between the module stack and the lights

The distance between the module stack and the lights is called the light distance. In order to ensure the safety of the modules stored and to prevent fire safety issues due to the heat generated by the lights, a sufficient safety distance of more than 0.5m should be kept.

1.2.4 Distance between the module stacks

The distance between the module stacks should not be less than 80cm.

1.2.5Distance between the module stack and the wall

The distance between the module stacks and the wall should not be less than 50cm.

2 Module storage requirement in high rack warehouse

2.1 Introduction of pallet racking

The pallet racking is the shelf for storing goods in the form of pallet unit goods. It is the main component of the mechanized and automated storage system, and it is also the most widely used rack for external warehouses. The structure is shown on the pictures below, several rows are arranged along the width direction of the warehouse and there is a roadway between each two rows to facilitate the stacking crane and forklift operation.

2.2 Shelves management

2.2.1 Load capacity

The load capacity of the shelves is determined by the size of the crossbeams, the thickness of the shelves layers and the number of reinforcing columns. According to the weight requirements of standard shelves, the minimum load capacity per layer is above 1600kgs and the maximum stacking height per layer is not more than two pallets.

2.2.2 Shelf height and structure requirement

The maximum height of the shelf is 12m. According to the height of the components, 4 to 6 layers can be installed. The spacing between layers is from 2 to 4m, depending on the real module height. Each layer can be adjusted up and down by 75mm step. The load bearing section should withstand even pressure and stress to avoid the accumulation of gravity.

2.2.3 Safety

The shelf top distance should be more than 1m and the width of walkways should be at least

3m.

3 Safety requirement in warehouse

3.1 Safety of Module Storage in Warehouse

The module storage should be waterproof, explosion-proof, fireproof, dust-proof, rust-proof, anti-theft, anti-deterioration, anti-extrusion and well ventilated.

3.2 Entry and exit in warehouse

The entry of module warehouse is forbidden for unauthorized persons or irrelevant persons.

3.3 Storage environment

Storage environment should waterproof and moisture-proof, carton aging and pallet nail rust will affect the quality of package.

3.4 Storage validity of package

Storage of package is valid for 1 year. It is recommended to do regular product check and inspection, especially if cartons and pallets are moldy after one year.

4 Humidity requirement in warehouse

4.1 Control of temperature and humidity

(Devices may include, but not limited to, air conditioners, dehumidifier, fans, heaters, etc.) In order to guarantee the quality of JA Solar finished products, it is essential to create a suitable

storage environment. When the temperature and humidity of the warehouse is appropriate, it is necessary to prevent the outside climate from affecting negatively the warehouse environment. When the temperature and humidity of the warehouse is inappropriate, effective measures should be taken over time to adjust the temperature and humidity in the warehouse. Practice demonstrates that the control of the ventilation and moisture absorption together is an effective way to control and regulate the temperature and humidity in the warehouse.

4.2 Sealing

In order to achieve a safe storage and reduce the negative impact of the outside weather, the modules should be sealed tight as much as possible.

Before sealing, check whether the outer box of the modules is normal. If there is any phenomenon appearing like mold or presence of insects, water, etc. it cannot be sealed. If the packaging material is too moist, it cannot be sealed neither.

4.3 Ventilation

The air flows from a place with higher pressure to a place with lower pressure. The higher the air pressure difference, the faster the air flow. Ventilation takes advantage of the pressure difference caused by the air temperature difference between the inside and the outside; ventilation is used to adjust the temperature and humidity in the warehouse. The larger the temperature difference between the inside and the outside, the faster the air flow. The pressure from the wind outside can accelerate the convection of the air between the inside and the outside of the warehouse. However, the wind cannot be too strong: if the wind force exceeds five, there will be a large amount of dust. A proper ventilation can improve the temperature and humidity control in the warehouse but also evaporate the excess of moisture in the products and packaging material over time. Ventilation can be classified into two processes: the cooling down process and the process of releasing the moisture.

4.4 Moisture absorption and dehumidification

During the rainy season or during rainy days, when the humidity in the warehouse is too high, it is not suitable for storage. When the humidity outside of the warehouse is too high, it is not suitable neither for releasing the moisture by ventilation. The moisture in the warehouse can be reduced by moisture absorption in the sealed warehouse. The moisture absorption agents commonly used in warehouses are calcium chloride, silica gel etc. The method of mechanical moisture absorption is commonly used in warehouses. Dehumidifier (or machine with similar function) takes the humid air from the exhaust fan, condenses it into water through a dehumidification unit into the cooler and discharges the water afterwards.

5 Entry and delivery requirement

5.1Reception

When the container truck enters and stops at the receiving area, it is necessary to ensure that the bottom is at the same level as the platform or slightly higher than the platform by 15-20cm, so that the forklift can enter and exit the container directly or can use the mobile auxiliary platform.

5.2Inspection

After opening and unloading the container, it is required to check whether the package of the module tray is complete, whether the pallets are neatly placed, whether there is risk of slipping. During the unloading process, the speed of the forklift needs to be controlled to observe the number and appearance of the module. When the unloading is finished, check the pallet number, quantity and shipping marks on the packing list label. If you find any abnormality, keep pictures and a record of the time and related handover processes.

5.3 Storage

After the initial inspection and acceptance of the modules, the pallets must be stored in a fixed

receiving area. Using a scan code system, the pallet codes should be imported into the warehouse system. According to the warehouse operation plan, the modules are stored in the allocated area and are marked with numbers.

5.4 Removal

The traditional technique is to pick the goods following the release order, which requires that the warehouse has a good time control, generally limited to half a day. The removal of the goods is planned by locking the storage location in the warehouse system. After picking the goods in order, the pallets should be stacked at the receiving area and the tray number should be scanned before the goods are picked up.

5.5 Delivery

The customer should inform the warehouse to arrange the delivery according to the instructions one day in advance. When the customer picks up the goods, they should cooperate with the warehouse operators together to supervise the loading of the modules in the receiving area. Before loading, check the following: the container is clean, not damaged or abnormal, the truck number is consistent with the packing list, the quality of the module packaging is good. When loading the truck, it is necessary to ensure a good weight balance between the front and back, the left side and right side, place the filler parts in the larger gaps.



Before loading Loading After loading

6 Module Storage requirement in external warehouse

The ground where the boxes are placed in the open air, should be levelled; trays or other ground barrier should be used to prevent the modules from getting wet in rainy days.

1) Choose a flat surface with a high ground to avoid rain flooding.

2) Choose spacers like undamaged trays.

3) Place the modules according the module design.

6.1 Placement of Module

1) The long sides of the modules should be close to each other and the shipping marks should be placed outward.

2) It is recommended that 28 pallets are placed in a same location.

Modules should be covered with a waterproof tarpaulin (to prevent rain and snow from soaking the modules).

3) Check the good waterproofness of the tarpaulin.

4) Cover uniformly the module according to the size of the tarpaulin.

6.2 Packing: fasten the waterproof tarpaulin on the modules

Pack the modules with a strap at 1 meter from the tarpaulin interface.

When packing, the tarpaulin interface should be tightly wrapped. If there is a strong wind, the modules should be packed with a tray on both sides and a tray or another heavy object should be placed on the top.

Make sure the tarpaulin completely covers the modules.

The modules should be placed temporally in the open air, the outside storage time should not be

longer than 10 days, to prevent the modules from damaging. Then modules should be placed inside the warehouse.

6.3 Precautions for external storage

Priority must be given to indoor storage when the modules arrives in storage area. If there is no space or location inside, the next step is to select carefully the external storage location.

Pay attention to the weather changes. At the end of rainy days, when there is no rain for two consecutive days, the tarpaulin should be ventilated, and the outer module box should be checked in case the box gets wet, damp, mildew etc.

After the tarpaulin is ventilated or dried, it should be folded and stored to prevent from corrosion or damage.