

THORNOVA solar

Packaging Manual

Version 02212001



1、 PURPOSE

This manual provides information about photovoltaic modules in packaging operation, loading, unloading, storage and use. All safety measures and operating procedures outlined in this manual must be followed by operators. If you have any questions, please contact the technical support staff for more information.

2、 SCOPE

This document is applicable to the packaging of single glass and double glass modules with frames. Quality and Global Customer Service Center

3、 OBLIGATIONS

3.1 Technology R & D: responsible for preparing new product packaging manual documents and handing over to the technology integration department after mass production;

3.2 Technical Integration Department: responsible for updating, process adjustment and change modification, document control;

3.3 Storage Division: responsible for standard operation and safety precautions according to the packaging manual;

3.4 Quality Management Department: responsible for shipment inspection according to the standard provisions of the packaging manual;

Technology R & D

4、 REFERENCES

《[Standard Operating Procedures for the Packaging Process](#)》

5、 DEFINITIONS

NO.

6、 PROCEDURE

NO.

7、 RELEVANT RECORDS AND SHEETS

See the amendment's description.

8、 SUPPLEMENTARY PROVISIONS

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1 Packaging Manual Instruction

The following is the correct way of packing, storing and transporting Thornova Solar modules. The package consists of a double corrugated card carton, a single corrugated board and paper card, plywood corner protection, **anti-inverted tape** and a plywood tray that meets export requirements with strong and beautiful packaging as well as simple operation. Operators shall comply with all safety precautions and operation methods specified in this manual.

2 Module Type and Packaging Data

This packaging manual is applicable to single glass and double glass modules. The module type and packaging data are shown in the following table.

2.1 Bifacial Single Glass (Grid Backsheet) Module with Frame

Type (Typical)	Dimension			Dimensions of Pallet			Module Qty. Per Pallet(pcs)	GW (kg)	Module Qty. Per Container (pcs)		
	L	W	H	L	W	H			40ft HC	13m Car	17.5 m Car
TS-BB78(XXX-XXX)	2464	1134	35	2509	1135	1269	31	960	558	620	806
TS-BB72(XXX-XXX)	2279	1134	35	2324	1135	1269	31	915	620	682	930
TS-BB66(XXX-XXX)	2094	1134	35	2139	1135	1269	31	870	651	744	992
TS-BB72(XXX-XXX)	2279	1134	30	2324	1135	1269	36	1055	648	792	1080
TS-BB66(XXX-XXX)	2094	1134	30	2139	1135	1269	36	1005	648	864	1152
TS-BB60(XXX-XXX)	1903	1134	30	1948	1135	1269	36	915	720	936	1224
TS-BB54(XXX-XXX)	1722	1134	30	1767	1135	1269	36	825	828	1008	1368

2.2 Bifacial Dual Glass Module with Frame

Type (Typical)	Dimension			Dimensions of Pallet			Module Qty. Per Pallet(pcs)	GW (kg)	Module Qty. Per Container (pcs)		
	L	W	H	L	W	H			40ft HC	13m Car	17.5 m Car
TS-BG78(XXX-XXX)	2464	1134	35	2509	1135	1269	31	1084	527	620	806
TS-BG72(XXX-XXX)	2279	1134	35	2324	1135	1269	31	1060	558	682	930
TS-BG66(XXX-XXX)	2094	1134	35	2139	1135	1269	31	940	620	744	992
TS-BG72(XXX-XXX)	2279	1134	30	2324	1135	1269	36	1255	540	792	1080
TS-BG66(XXX-XXX)	2094	1134	30	2139	1135	1269	36	1090	612	864	1152
TS-BG60(XXX-XXX)	1903	1134	30	1948	1135	1269	36	930	720	936	1224
TS-BG54(XXX-XXX)	1722	1134	30	1767	1135	1269	36	815	828	1008	1368

3 Packaging Steps

Operators must wear labor protective equipment and get packing tools and materials (such as cartons, trays, balers, packing buckles, packing belts, etc.).

- Place the pallet on the ground, then combine it with the paper gasket packing material, with the four corners aligned with the pallet's edge, as shown in Figures 1 and 2.

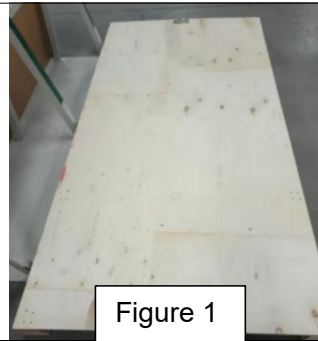


Figure 1



Figure 2

- The surface of the first module's front side with the paper-wrapped corner should face the outside of the packing box, and the barcode on the rear side faces the head of the packing box, as shown in Figures 3 and 4.

The second module, without the paper-wrapped corner, should face the first module and then be loaded; the rest can be done in the same way and placed on the pallet in order, as shown in Figure 5.



Figure 3



Figure 4

Corner guards are placed on the four corners of the first module and then on every other module after that.

When the box is full, the last module with the rear side should face outward; the border barcode will be pasted on side B of the module head frame, with the barcode number facing the front side and the one-letter code facing the back panel, as shown in Figure 6.



Figure 5



Figure 6

- Use plastic packing tape to wrap twice around the long side of the packing box after the modules are fully loaded, as shown in Figure 7.

The packing tape must be placed on the paper-wrapped corner and parallel to the bottom of the paper corner, as shown in Figures 8 and 9.

The automatically printed shipping marks should be put on the first packing belt at the head, as shown in Figure 10.



Figure 7



Figure 8

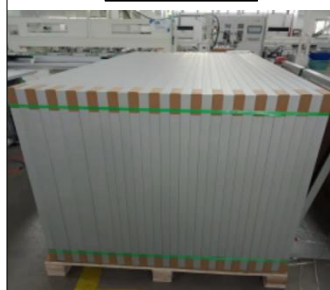


Figure 9



Figure 10

4. Fold the packing tape in half and pass it through the bottom of the pallet. Fix the packing tape with both hands to prevent it from turning over.

Grab the packing tape at the other end of the packing box with your hands. Keep the packing tape aligned with the positioning line on the packing box. While protecting the corners with paper protectors, use a baler to tighten and heat-melt the joints of the packing tape.

Repeat the above actions and use three packing tapes to wrap the long side and two tapes on the short side. After the packing is completed, check the packing effect. Re-adjust the packing if there is a flip in the packing tapes, as shown in Figures 11–14.

When the packing is finished, put the shipping mark of this pallet in a plastic ziplock bag and paste the shipping mark within the grid frame, which is on the head of the module.



Figure 11



Figure 12



Figure 13



Figure 14

5. Start wrapping the first layer of film around the packing tape at either end of the tail wooden tray, and the stretching film should be fixed to the packing tape so that it exceeds the pallet by more than 5 cm, as shown in Figure 15.

The upper cover needs to be filmed after the first layer of stretching film is finished; no gaps or gases are allowed to exist between the first layer of the film and the upper cover film, as shown in Figures 16 and 17.

After the upper cover film is wrapped, use the stretching film to wrap the upper cover of the packaging box again, as shown in Figure 18.



Figure 15



Figure 16



Figure 17



Figure 18

6. OBA conducts random checks of finished modules every two hours. The appearance, barcode, nameplate, and frame hole distance of the finished modules will be checked for confirmation; unqualified modules need additional sampling. The whole batch of unqualified modules needs to be reworked, as shown in Figures 19 and 20.

After the OBA sampling check has passed, the pallet number, cabinet number, package quantity, and shipping mark template should be confirmed; after this, the modules will be put into storage, as shown in Figure 21.

The shipping mark is pasted on the heads of the modules (the direction of the internal barcode of the modules) and should be in the grid wireframe, as shown in Figure 22.



Figure 19



Figure 20

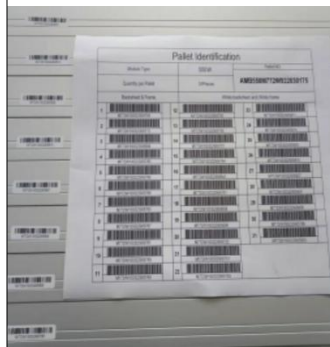


Figure 21



Figure 22

7. Drive the palletizing forklift to insert the prong perpendicular to the long side of the packing box into the inner side of the tray. Use the forklift to lift the entire modules 20 cm away from the bottom tray for stacking. The forklift can also be adjusted to move the modules forward and backward, and the prong can be adjusted to move the modules left and right, as shown in Figure 23.

After this, bind the upper tray strip and the lower tray strip on the long side of the tray with packing bags twice, as shown in Figure 24.

At the same time, on the short side of the tray, use packaging tape to wrap around the entire packed box twice, as shown in Figure 25.

The finished packaging boxes are waiting for storage, as shown in Figure 26.



Figure 23



Figure 24



Figure 25









Figure 26

4 Storage

- Place the packaged modules horizontally in the warehouse or designated packaging area.
- Do not expose modules to a wet or damp environment. Store them in a ventilated, rainproof, and dry environment.
- Do not remove the original packed box if long-distance transportation or long-term storage is required.
- When the modules are stored in the warehouse at the project site, please ensure that the humidity of the storage environment is <85% and the temperature ranges from - 40 °C to + 50°C.
- Do not stack the modules beyond the maximum number limit printed on the packaging boxes. Please place the packaging boxes in a ventilated, dry and rainproof place before unpacking the modules.
- Do not stand, climb, walk, or jump on unpacked boxes or modules.
- Keep modules in a safe place to avoid damage.

- Pallets shall be handled carefully to minimize any damage to the carton or its contents.
- All operations carried out by machines in or out of the warehouse shall be properly operated by personnel.
- Pallets should be moved in the loading area by forklifts, and they can only be moved with the correct mechanical equipment (forklifts).
- For safety reasons, pallets shall not be stacked beyond the specified number of layers shown on the outer box.
- The trays should be stacked on top of one another so that the corners are flush and there are no overhangs. The warehouse shall be properly arranged, and the storage area shall be clearly marked.
- Do not unpack unused modules. Unpacked modules, if not used in time, should be covered with plastic film to prevent water and dust.
- It is forbidden to put the modules near corrosive chemicals or gases, and the location needs to be fireproof.

4.1 Markers on Outer Packaging

<p>Do not discard the modules at will; special recycling is required.</p> 	<p>Modules must be kept dry and NOT exposed to rain or damp conditions.</p> 	<p>Modules in cartons are fragile and should be handled with care.</p> 
<p>The packaging must be transported upright.</p> 	<p>Do not exceed the maximum number of layers printed on the outer box when stacking modules.</p> 	<p>The packaging material can be recycled.</p> 

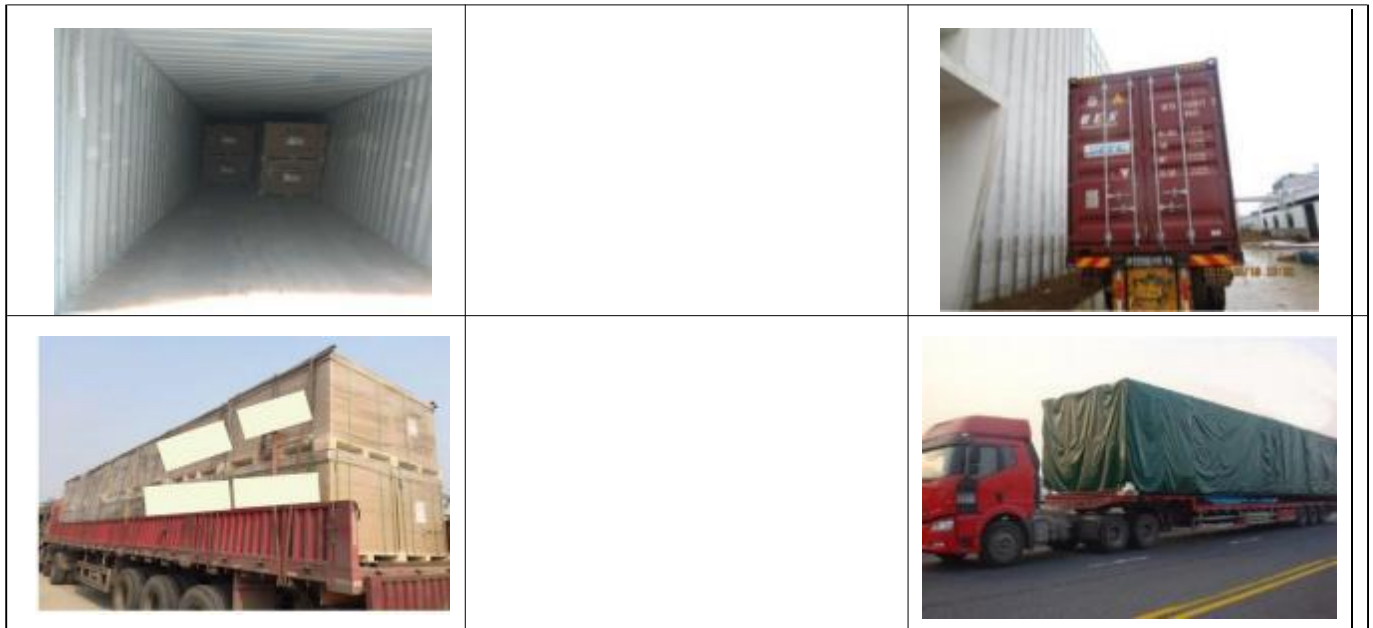
5 Container Transportation

5.1 Container Loading & Handling Guide Lines

- The boxes should always be handled using mechanical equipment, such as mechanical forklifts and hydraulic forklifts.
- It is recommended to lift the pallets from the short side. The forklifts should not be too small because they need to avoid pallets tilting back during transportation. The forklifts need to slowly move up and down to grasp the center of gravity of the modules.
- Driving a forklift with others or while intoxicated is strictly prohibited. No eating, no chatting, and no talking on cell phones while driving forklifts.
- It is recommended that loading be done lengthwise, both in trucks and containers, which also applies to storage in warehouses.
- For lengthwise handling, it is necessary to attach extensions to the forklifts to reach at least 1.9 m in length for **RSM72/144/132/156** modules & 1.6 m for **RSM60/120 or** smaller modules.
- Once loaded, the goods should be attached to the storage area of the truck or container to avoid any dangerous movement. All trucks or unfilled containers must be secured with straps, and container doors should be locked to avoid any movement.
- The truck used for transportation must be equipped with rainproof cloth that covers the goods when loading to protect the packaging from dampness and rain. Loading and unloading of modules outdoors is prohibited on rainy days.
- The modules sent to the project site or stored for a long time (more than 1 month) are not allowed to be stacked and must be placed horizontally in a single box.

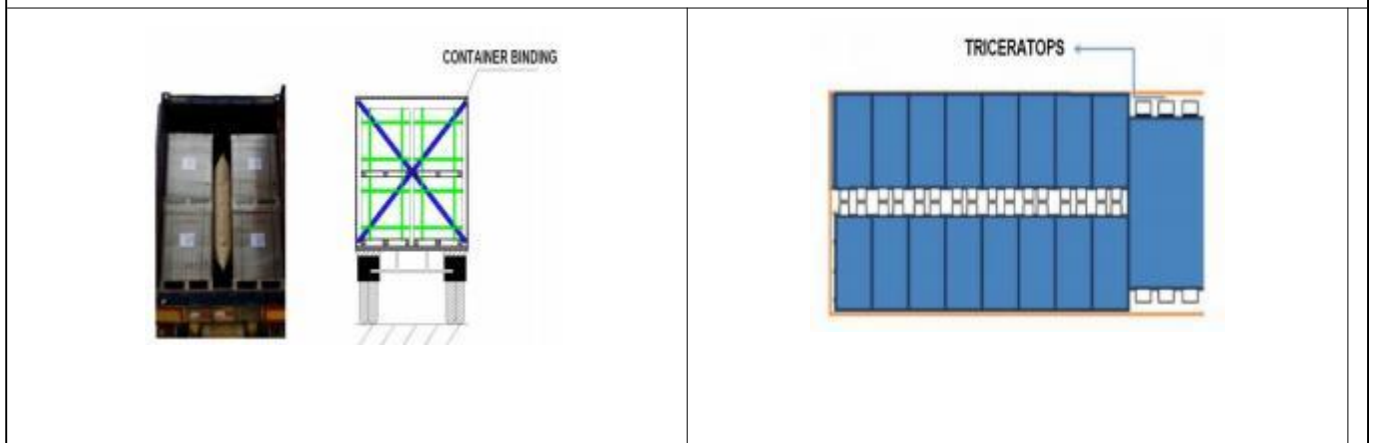
5.2 Container Pictures





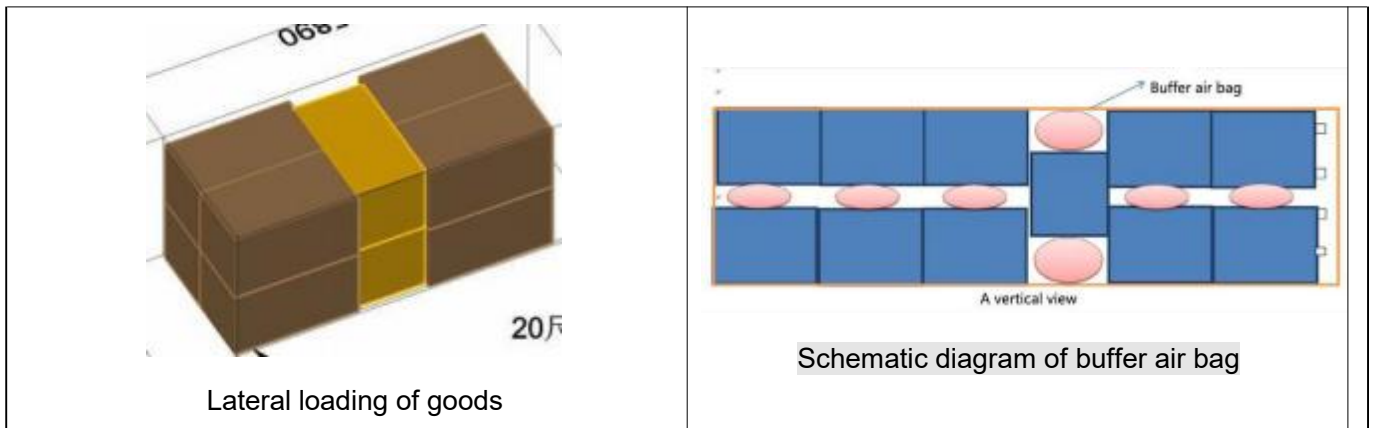
5.3 Cargo Fixing Specification

- All trucks or unfilled containers must be secured with straps, and the unfilled containers are filled with **triangular wood** or buffer material. After loading, doors and guardrails should be locked to avoid any movement.
- Trucks shall not carry more than 30 tons of goods, and containers shall not carry more than 25 tons of goods.
- When placing goods horizontally on a single pallet in a container, it should be placed between the front and rear of the goods to prevent displacement during transportation. Triangle wood or buffer air bags are needed for cargo clearances ≥ 20 cm. After loading, the goods need to be secured with a container binding, as shown in the following figure 5.3-1:



Buffer air bag and container binding

Use triangle wood to fix the goods

**Figure 5.3-1**

6 Unloading Cautions

6.1 Inspection of External Packaging

To ensure that the products inside are not damaged, it is first necessary to make a visual check.

- The pallet should be in good condition, that is, without broken or badly fastened slats or other elements.
- Ensure that the box and lid are in perfect condition, i.e., there is no evidence of them having been hit or dented, no breakage, or other visual defects. Ensure that the boxes are correctly aligned to the pallet dimensions and that the upper and lower boxes are not misaligned by more than 3 cm.
- Each module has the following labels: nameplate (product type, nominal power, rated Current rated voltage, open circuit voltage, short circuit current, certification mark, maximum system voltage, current binning, product name, etc.), B5 paper, container number, pallet number, module technology, and current binning. See figure 6.1-1 below:

Figure 6.1-1

6.2 Basic Operating Safety Rules

- The forklift enters from the short side and moves the entire pallet of goods. When removing the carton, use the removal tool and the supporter to prevent the modules from leaning or falling off. Do not place modules in an unsupported or unsecured environment.
- Proper safety equipment must be used when handling goods, e.g., gloves and safety shoes.
- One should not attempt to lift the modules from the long side of the frame, as this may cause the integrity of the frame to be compromised. It can also cause back strain. Do not lift the modules with one hand or carry the modules on your back.
- When transporting goods, check the route in advance to ensure that there are no obstacles on the road. Anything that may cause physical injury due to excess weight should be carried mechanically (e.g., by forklift).
- Never handle or move the module via the cable or the J-Box at any time. One module must be handled at a time by at least two personnel wearing non-slip gloves. Do NOT carry the module via overhead, and do NOT handle the stacked modules for moving.
- Please store the modules in a ventilated, dry, and rainproof place when temporary storage is needed. Ensure all the modules and electrical contact parts are clean and dry during installation.

6.3 Unpacking Cautions

- For unpacking outside, it is prohibited to operate in rainy conditions. The rain will soften the box, damage the modules, and hurt the staff.
- Please pay special attention to safety when it is windy. When the wind is strong, it is not recommended to handle the PV modules.
- Please ensure that the box is placed stably and horizontally to avoid tilting. Please wear gloves when opening a packed box to avoid hurting your hands and leaving fingermarks on the glass.
- Move the packed box and pallet by forklift to the operation area. The long side of the unopened PV modules needs to be near a solid wall, stand, or other unopened PV modules with the same specifications, parallel with the long side of the pallet. The recommended distance is 15-20 cm. The following figure 6.3-1 is shown below.
- There are module information and unpacking instructions on the outer packing case; please read them carefully before unpacking.
- When moving modules, two people are needed to work together. It is forbidden to move modules by lifting wires or junction boxes.

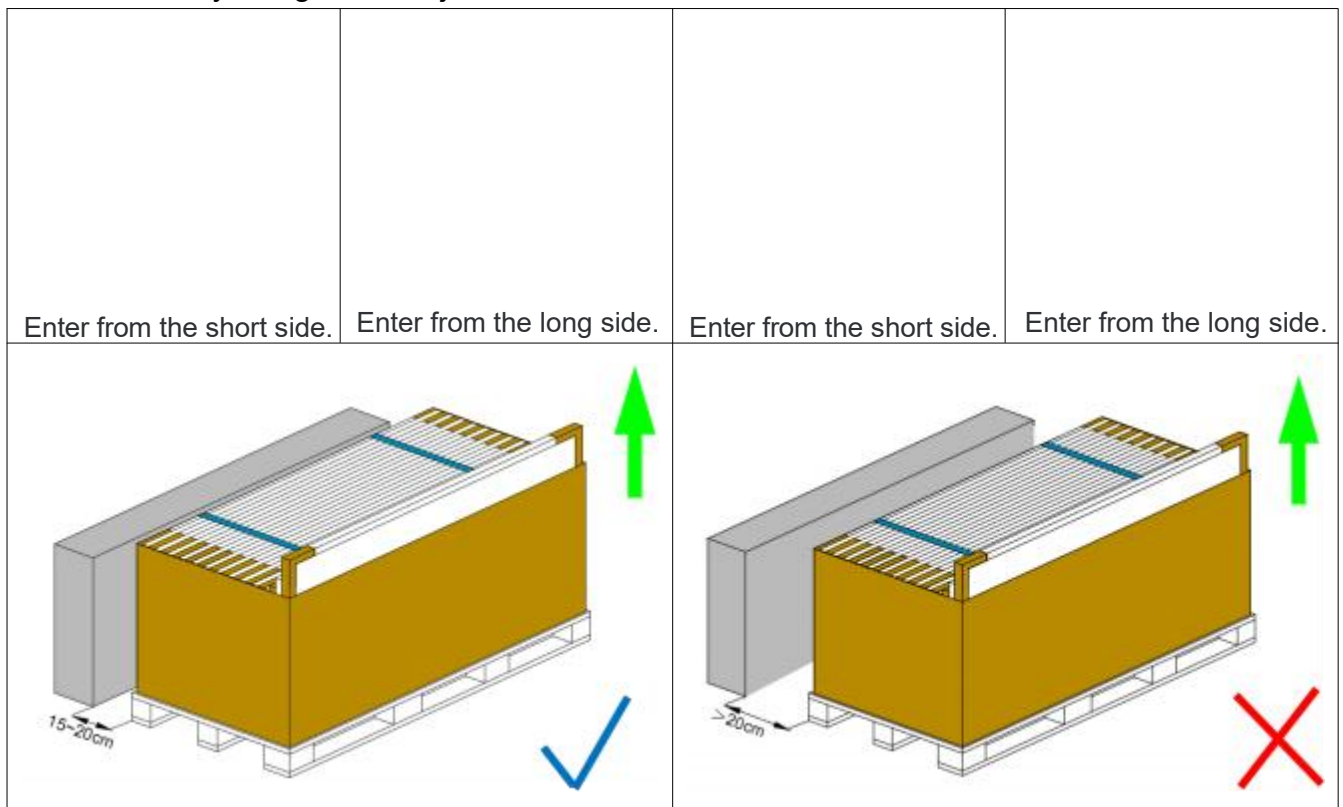


Figure 6.3-1

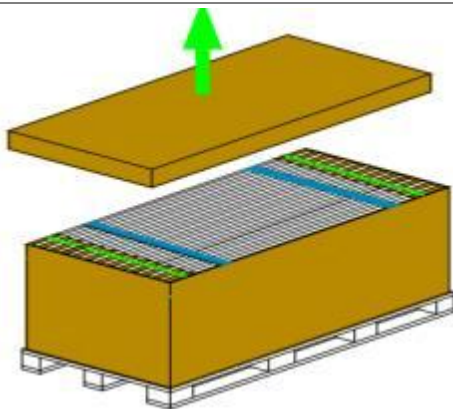
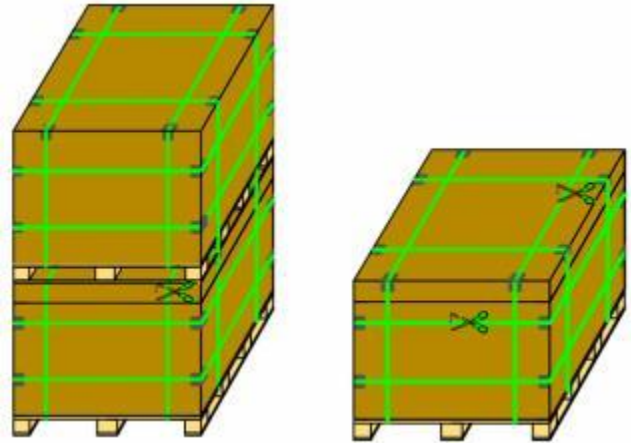
6.4 Unpacking Steps

Equipment and tools: cutters or scissors, gloves, and forklifts;

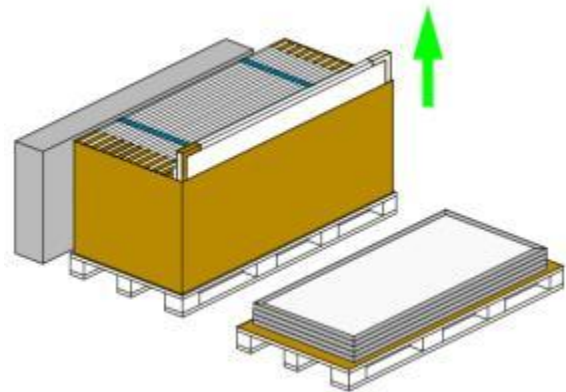
Staff: at least three people.

Get information about the modules in the packaging box to determine if they are consistent with the order.

Cut the upper and lower straps and use a forklift to separate the goods into single boxes and place them horizontally. Then cut the outer packing belt.



After opening the lid, cut the inner packing belt, tear off the **anti-inverted tape** one by one, and extract the modules from the outermost part.



The modules rest on the support and are placed vertically. Recommend “pick out one, install one” during site installation.

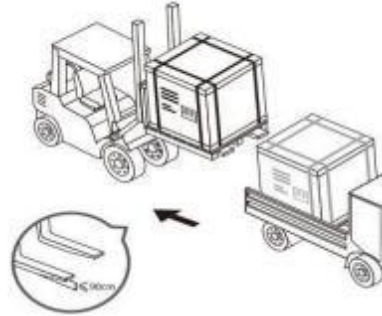
If horizontal stacking is inevitable, please place the unpacked cover on the tray and stack modules in their original order with perfect alignment to avoid scratching. The stacking quantity shall not exceed the maximum number of pieces per box.

6.5 Unloading Transportation Standard

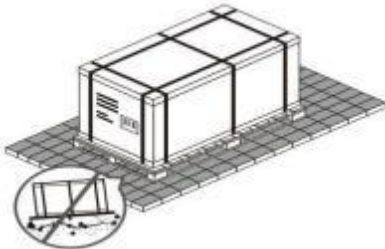
Use a suitable lifting fixture to handle no more than two pallets of modules per lift. Before lifting, please check that the tray and the carton are NOT damaged and that the hoisting ropes are solid and firm. Before lowering the carton back onto the ground, two people must support the two sides of the carton gently and place it on a relatively flat surface of the project site.



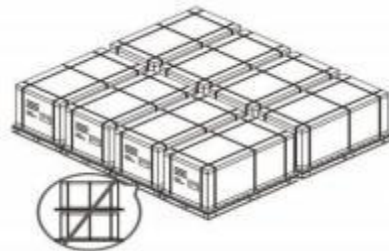
Use a forklift to remove the units from the truck.



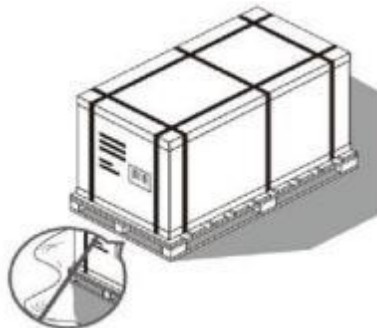
The stacking of modules at the project site is prohibited.



Place the modules on a level surface.



Place the units in a dry and ventilated place.



~~Cover the modules with a tarpaulin to prevent the package from getting wet.~~ Cover all the parts of the package with waterproof material to prevent the panel package and plate from getting wet.



6.6 Secondary Transportation and Warning

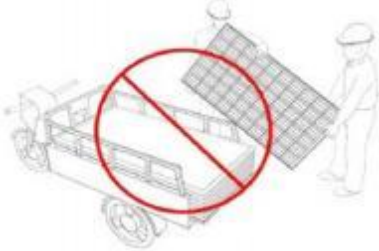
Do NOT remove the original packages if the modules require long-distance transportation or long-term storage.



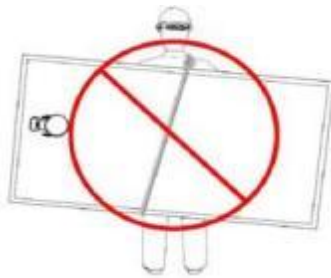
Packaged products can be shipped by land, sea, or air. During transportation, please fix the packed box on the transport platform to ensure that it will not roll over. Normally, no more than two layers are transported by truck.



No pedi-cab transport or handling as shown below.



Do Not handle the module with rope as shown below.



No carrying the module on one's back.



7 Disclaimer

*If the packaging, transportation, and use of **xxxx solar** PV modules are beyond the control of our company, **xxxx** shall not be responsible for the power loss, damage to solar PV modules, casualties, or additional costs caused by improper operation and transportation.*

***xxxx** reserves the rights to update the product, packaging method, product specifications, and packaging manual contents without prior notice.*

*This manual is available in electronic form only. Please call our customer service hotline **(400-8291-000)** if you require a hard copy. In case of any discrepancy between the Chinese and English versions of this Manual, the Chinese version shall prevail.*

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