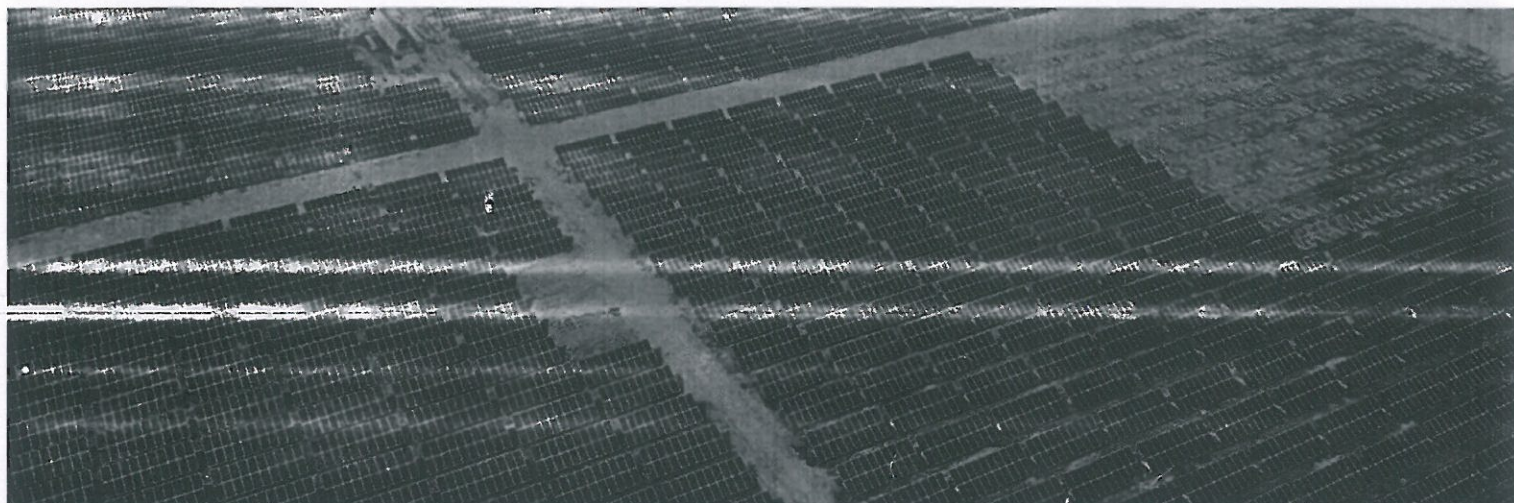




Specification For PV Module Unloading, unpacking and Secondary Transferring
光伏组件卸货、拆包、二次转运规范



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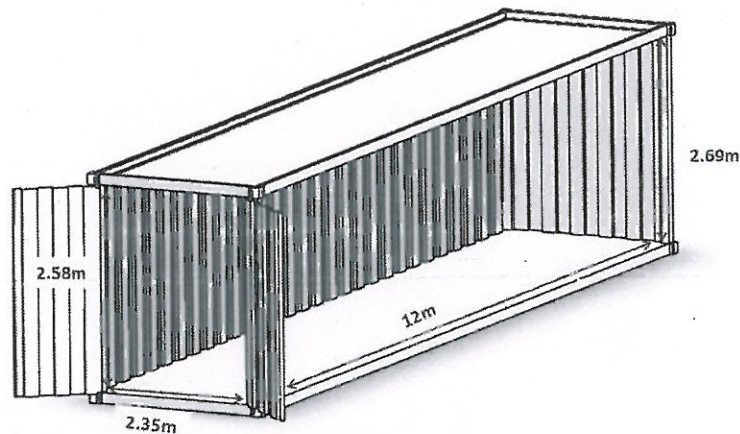
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1. Purpose 目的

ZNSHINE SOLAR sales regions distribute the PV modules all over the world, and relevant transportation modes can be mainly distinguished between Domestic and Overseas Market. Flat car has been mainly applied for China, while overseas transportation mostly adopts 40HQ container, the standardized height of the container is 2580mm. This specification rules the technical specifications for unloading, unpacking and secondary transfer of PV modules. 正信光电将光伏组件销往全球各地，其运输方式主要区分为国内市场和海外市场。国内主要应用的是平板车，国外运输多采用 40HQ 集装箱，标准集装箱高度为 2580mm。本标准规定了光伏组件卸货、拆包、二次转运的要求。



40HQ Container Size

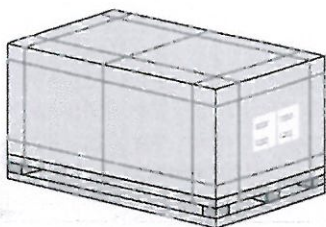
2. Range of application 适用范围

This specification applies to ZNSHINE PV-Tech Co., Ltd and its cooperated or affiliated companies. Each cooperated or affiliated companies includes but not limited to [ZNSHINE PV-TECH CHANGZHOU CO.,LTD] and [ZNSHINE PV-TECH DALI CO.,LTD]. ZNSHINE SOLAR is not responsible for any damages of any kind, including but not limited to any product damages, personal injury or any other property losses, as resulting from any improper operations or faults by the customers during the handling of the products as failure to follow the instructions in this specification. This specification cannot be applied to all geographic scenarios, especially if considering special unloading environment. If you have any questions, please contact customer service of ZNSHINE SOLAR (Tel: +86 519 6822 0233, Email: info@znshinesolar.com). In the event of any inconsistency among different language versions of this specification, the Chinese version shall prevail. ZNSHINE SOLAR reserves the right to modify or update this specification at any time, with or without notice. Please refer to our product lists and documents published on our website at: <https://www.znshinesolar.com> as these lists are updated on a regular basis. 本规范适用于正信光电科技股份有限公司及其合作或关联公司，各合作或关联公司包括但不限于【正信光电科技股份有限公司常州分公司】和【大理正信光电能源有限公司】。正信光电对于客户未按照本规范的任何不适当操作行为或者失误造成的任何损失不承担赔偿责任，包括但不限于由于组件操作过程中未遵循本规范中的说明而造成的任何产品毁损、人身伤害或其他财产损失。本规范不能适用于所有的地理场景，特别是考虑到特殊的卸载环境。如有疑问，请您与正信光电客服联系（Tel: +86 519 6822 0233, Email: info@znshinesolar.com）。如果本规范的不同语言版本有描述不一致的情况，以中文版为准。正信光电保留在没有预先通知的情况下变更本规范的权利。最新版请参阅正信光电网站（<https://www.znshinesolar.com>）上的产品和文件资料。

3. General safety 通用安全

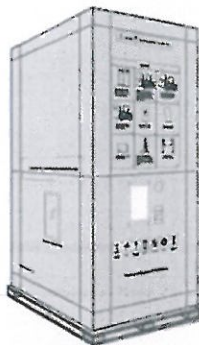


- 1) In any circumstances, for vertical landscape packages, it shall not be stacked more than two layers; for vertical portrait packages, stacking is not allowed. Example for vertical landscape package and vertical portrait package is shown as follows. 任何情况下，短边竖放包装请勿堆叠超过2层，长边竖放包装不允许堆叠。短边竖放包装（横式包装）和长边竖放包装（立式包装）样式如下。



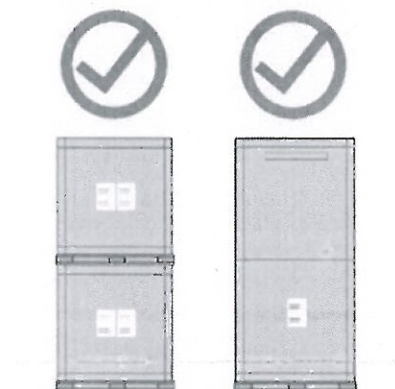
**Vertical landscape package
(short-side vertically placed)**

短边竖放包装（横式包装）



**Vertical portrait package
(long-side vertically placed)**

长边竖放包装（立式包装）



Right Examples

正确示例

- 2) The PV modules should be stored in the original package before installation. Protect the package from damage. Unpack the modules as per the unpacking procedures. The whole process of unpacking, transport and storing should be handled with care. 光伏组件在安装前应存储在原包装箱内，请保护好包装不要使其受损。按照拆包步骤打开组件包装。打开、运输和存储过程需小心操作。
- 3) The working ground needs to ensure that the packaging box can be placed horizontally and steadily to avoid tipping. 作业地面需要保证包装箱能够水平稳定的放置，避免倾倒。
- 4) If the modules need to be temporarily stored, the modules should be stored in a dry and ventilated conditions. 如果需要暂时存放组件，则应将组件存储在干燥通风的环境中。
- 5) Do not stand, climb, walk or jump on PV modules. 禁止在组件上站立、攀爬、行走或跳跃。
- 6) Before installation, ensure that all PV modules and electrical contacts are clean and dry. 安装前，确保所有组件和电气接触都是干净、干燥的。
- 7) Do not allow the PV modules to come in contact with sharp objects which will impact the safety of modules directly. 禁止组件与尖锐物接触，以免直接影响组件的安全性。
- 8) Do not leave modules unsupported or unsecured. 禁止将组件置于无可靠支撑或未固定的环境下。
- 9) We recommend to purchase relevant insurance for PV modules. 我们建议为光伏组件购买相关的保险。

4. Unloading precautions 卸货注意事项



Due to the fragile nature of the PV modules, the modules should be unloaded by a forklift after they arrive at the project site, or a crane can be used if conditions are insufficient. Other vehicles such as loaders are not allowed to unload, and all operators must have operation certificates. 因光伏组件的易碎特性，组件运抵项目地后，应该使用叉车卸货，条件不足也可使用吊车。不得使用装载机及其它车辆卸载，所有操作人员必须具备操作资格证。



4.1 Inspection of outer packaging 检验外包装

To ensure the products inside are not damaged, it is necessary to make a visual checking firstly: 为了确保里面的产品没有损坏，首先需要进行目视检查：

- The pallet should be in good condition: that is the status without broken or badly fastened slats or other elements. 托盘应处于良好状态：即板条或其他元件无破损或紧固不良。
- Ensure that the box and lid are in perfect condition; i.e.: no evidence of it 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 more than 3cm. 确保盒子和盖子完好无损；没有被撞击或凹陷的迹象，没有破损或其他视觉缺陷。确保箱子与托盘尺寸正确对齐，且上下箱子的错位不超过 3cm。
- Check the outer package of PV modules to see if there is a shipping mark (pallet number, module technology, current binning, etc.). Check the below picture. 检查组件外箱看是否有唛头（托盘编号、组件技术、电流分档等）。请看下图。

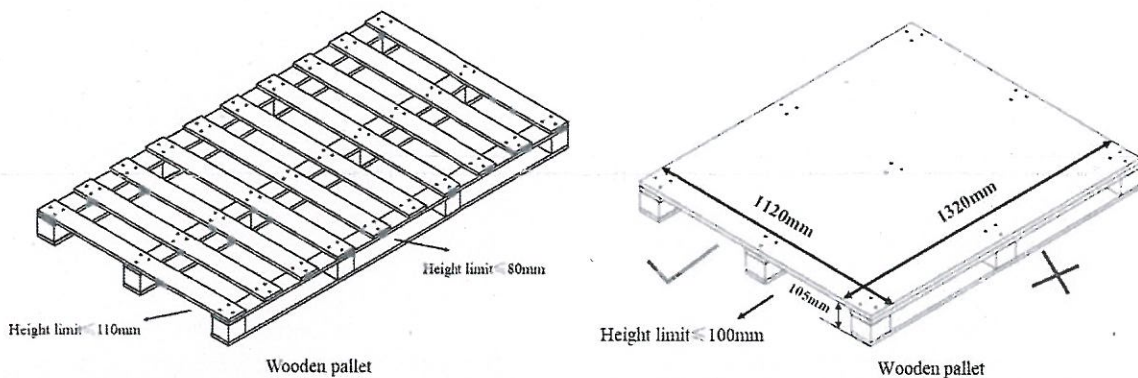


- If any abnormality elements are detected, please take a photo or video at first time, contact the person who is in charge of PV modules in the site or contact our customer service directly. 如果检查出异常，请在第一时间拍摄照片或视频，联系现场负责人员，并和我司客服或相关销售人员联系。

4.2 Unloading with forklift 叉车卸货



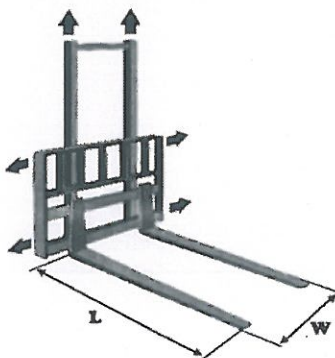
When a forklift is selected for unloading, the forklift load shall be no less than 3.5 tons. For landscape package, it is recommended to lift the pallets from the short side. The minimum height from the top of the fork to the ground shall not exceed 105mm. If the fork's thickness is 80~105mm, the forklift can only lift the pallets on the short side of the cargo. If fork's thickness is < 80mm, the forklift can lift the cargo on both short and long side. For portrait package, it can only lift the pallets from the short side. And the fork thickness shall be less than 100mm. 当选用叉车卸货时，叉车载重应不小于 3.5 吨。横式包装建议将托盘从短侧抬起。货叉顶部距地面的最小高度不应超过 105mm。如果货叉的厚度在 80~100mm 之间，叉车只能举起货物短侧的托盘。如果货叉的厚度小于 80mm，叉车可举起货物的短侧和长侧。竖式包装只能将托盘从短侧抬起，货叉厚度应该小于 100mm。

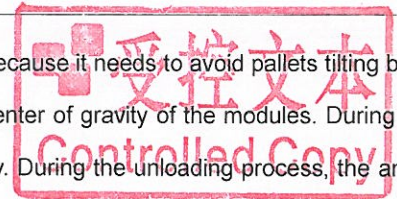


When using a forklift to unload the modules, please choose a forklift with suitable tonnage according to module weight. The forks should go into the pallet at least 3/4 of the depth of pallet during unloading operation (the forks length $L \geq 3/4$ of pallet length). It is recommended to extend the height or width of the forklift backrest to prevent directing touch with the module glass. 请根据叉运组件的重量选择合适吨位的叉车。货叉插入托盘的深度不得小于托盘的四分之三（货叉的长度 $L \geq 3/4$ 托盘长度）。建议延长叉车挡货架的高度或宽度，防止叉车直接触碰组件玻璃。

In order to ensure better stability during forklift transportation, the forks distance (W) should be adjusted to the maximum position without any interference. 为保证叉运时更好的稳定性，避免进出托盘刚蹭角墩的情况下货叉间距 W 尽量调节到最大。

For vertical portrait package, it is ought to secure the module package to the forklift with 2 safety ropes. Please drive slowly and do not allow forks to hit the cartons or pallets. Please place buffer protection material (preferably silicone, rubber, EPE) in advance to prevent the inside modules being damaged due to the external force. 针对立式包装的组件，需要用 2 条安全绳将组件固定在叉车上。请缓慢操作严禁货叉顶撞纸箱或托盘。请提前放置缓冲防护材料（材料建议选择硅胶、橡胶、EPE），防止因外力作用导致包装箱内组件破损。

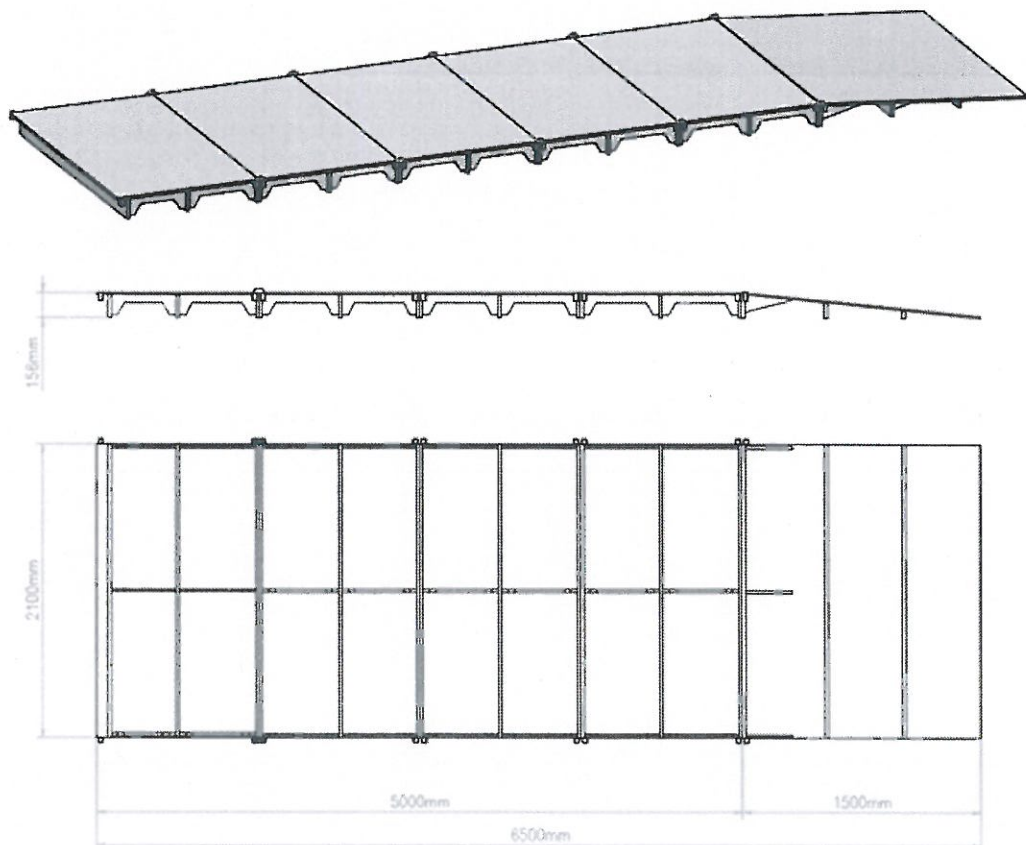




Forklift with side shift function is preferred. The forklift should not be too small because it needs to avoid pallets tilting back during transportation. The forklift need to slowly move up and down to grasp the center of gravity of the modules. During the unloading process, the wooden pallet should be kept in balance and handled lightly. During the unloading process, the angle between the fork and the wooden pallet should be less than 90° . It is strictly forbidden for the fork to collide with the wooden pallet and the packing box, until the module is placed on a flat surface. 优先选用具备侧移功能的叉车。叉车不宜过小，因为需要避免托盘在运输过程中向后倾斜。叉车需要缓慢上下移动，以抓住组件的重心。在卸货过程中应保持木托盘的整体平衡，轻拿轻放，在卸货过程中货叉与木托盘的角度应 $\leq 90^\circ$ 缓缓前行，严禁货叉碰撞组件木托盘及包装箱，直至组件放置到平整的地面上。

If unloading process is on the ground, please use a platform. The height of the platform is required to be kept on the same level with the bottom of the container, and the deviation should be around $\pm 30\text{mm}$. 如果卸货过程在地面进行，请使用月台。月台高度要求与集装箱底部保持同一水平，偏差应在 $\pm 30\text{mm}$ 左右。

If the cargo is being unloaded on the flat ground base, please use the steel ramp during the unloading operation. The horizontal section of the steel ramp shall be longer than 5m, and the slope of the inclined section shall not exceed 5 degrees to avoid the forklift hitting the top of the container due to excessive inclination when it comes out of the container port. The steel ramp height should be leveled with container base (If it is standard container, the height of steel ramp should be $156\pm 4\text{mm}$). The loading weight of the steel ramp should be larger than 5 tons. 如果在平地上卸货，请在卸货过程中使用钢制坡道。钢坡道的水平段应大于 5m，倾斜段的坡度应不超过 5 度，避免叉车出集装箱口时因倾斜过大碰撞到箱顶。钢坡道高度应与集装箱底座平齐（如果是标准集装箱，钢坡道高度应为 $156\pm 4\text{mm}$ ）。钢坡道的装载重量应大于 5 吨。



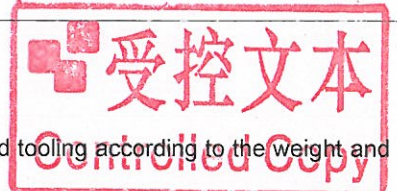


Please make sure to have sufficient safe distance during forklift operation to prevent people from standing or passing on both sides. When operator use a forklift during unloading process, needs to control the running speed and prevent tilting particularly. The forklift should be driven at a controlled speed of ≤ 5 km/h in straight, and ≤ 3 km/h for turning, so as to avoid sudden stop and rapid start. Special person shall be assigned to direct the unloading of the modules with vertical landscape packages to ensure that the fork will not exceed the modules and prevent the adjacent modules from being damaged due to the long forklift arm during forking or placement. Since the packing box will block the sight of the forklift driver, it is recommended to drive backwards during the forklifting, and arrange for special supervision and command to prevent bumping into people or items causing personal injury or damage to the modules. 请在叉车作业过程中需要预留足够的安全距离，禁止两侧有人员站立或经过。叉车卸货时注意控制行驶速度，防止转弯时组件倾倒对人员造成伤害。叉车运输直线行驶速度控制 ≤ 5 km/h，拐弯速度 ≤ 3 km/h，避免急停和急速启动。横装组件卸货时需要专人指挥，确保货叉不会超出组件，防止在叉起或放置时因叉车臂过长损坏相邻组件产品。若包装箱遮挡叉车驾驶员视线，建议叉运过程中倒车行驶，并安排专人监护指挥，防止撞到人员或物品导致发生人员伤害事故或包装箱摔落组件破损。

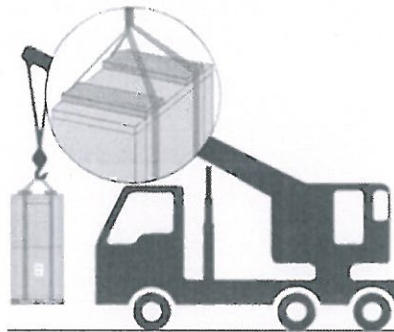
Operation Process 操作流程

- a) The operator needs to put forks at the lowest height to the ground; Drive forward until the forks are completely inserted into the pallet, and then lift the cargo of modules slowly by raising the forks slowly. 操作者需将货叉放置在离地面最低位置，向前推进，直至货叉完全插入托盘中，然后通过慢慢举起货叉来轻举组件。
- b) Ensure that the height of the pallet, from the ground, is less than 50mm, and maintain the distance (>40 mm) between the top of the module's packages and the container ceiling. 确保托盘离地面的高度小于 50mm，并保持组件包装顶部与集装箱吊顶之间的距离大于 40mm。
- c) The forklift drives backward to move the whole pallet of modules slowly out of the container after lifting. 叉车在抬起后，将整托组件缓慢地移出集装箱。
- d) Once the forklift reaches the entry of the container, slow down to avoid the cargo touching the container ceiling. In case of any risk, adjust the height of the fork immediately. 当叉车到达集装箱入口时，减速以避免货物接触集装箱顶棚。如有危险，请立即调整货叉的高度。
- e) This step may occur in the situations when there is a slope at the end of the steel ramp, in this situation the electric forklift cannot transport on the slope. Then the LPG forklift must be used from the other end to unload the modules. When stack up pallet is completely away from the container, pull out the forks from the pallet, replace the electric forklift by the LPG forklift and insert the long side of the pallet to carry the cargo to the target location. 这一步可能发生在钢质坡道末端有斜坡的情况下，这种情况下电动叉车无法在斜坡上运输。必须使用液化石油气叉车从另一端来卸载组件。当堆垛托盘完全离开集装箱时，将货叉从托盘上拔出，用液化石油气叉车代替电动叉车，插入托盘的长边，将货物运送到目标位置。

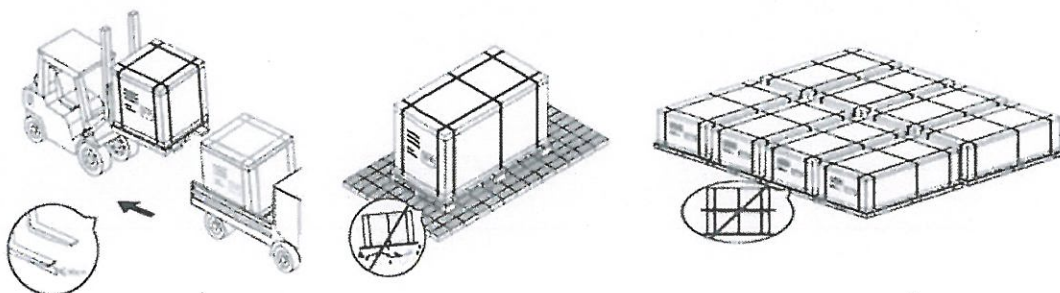
4.3 Unloading with crane 吊车卸货



When crane is used to unload the modules, please choose and use specialized tooling according to the weight and size of the module. Before lifting, check whether the pallet and the carton are damaged and whether the hoisting ropes are strong and firm. Please adjust the position of the sling to keep the modules steady. To ensure the safety of the module, wooden sticks, boards or other fixtures of the same width as the outer packing cases should be used on the upper part of the box to prevent the sling from squeezing the pallet and damaging the modules. When placing the modules, do not lower the packing box too quickly. Two people shall support at the two sides of the righting carton gently to place it on a flat ground. In addition to equipment operators, on-site should be equipped with operational command staff to coordinate many matters in the unloading process. For vertical landscape packages, do not lift up more than FOUR pallets of modules at once; for vertical portrait packages, do not lift up more than TWO pallets of modules at once. Do not unload modules under the weather conditions of wind more than 6 class (in Beaufort scale), heavy rain or heavy snow. 采用吊车卸货时，请使用专用工装，吊装前请根据组件重量和尺寸选用足够拉力的吊装工具。吊装前应确认托盘和纸箱是否有破损及吊装的绳索是否结实、牢固。吊装时请调整吊带位置保持组件重心平稳，应在包装箱的顶部使用与其相同宽度的木板或其他固定装置，防止吊带挤压包装箱，导致组件破损。请匀速操作吊具，吊装接近地面时，两人一人一边扶正纸箱轻轻放在平坦位置上。除设备操作人员外，现场应配备操作指挥人员，协调卸货过程中诸多事宜。横式包装一次性最多允许吊装 4 托组件，立式包装一次性最多吊装 2 托组件。严禁在风力大于 6 级（蒲福风级）、大雨或大雪的气象条件下吊装光伏组件。



Note: During the unloading process, the modules are prevented from extruding each other, resulting in the deformation of the profiles and the glass breaking. The surface of the modules should be flat without obvious concavity and convexity, so as to avoid the collapse of the packaging box after the overloading, which will result in the extrusion damage of the modules. After unloading, the module should be placed in a single layer. Do not stack the modules at the project site. 卸载过程中防止组件之间的相互挤压，造成型材变形和玻璃破碎；组件所存放的地表应平整无明显凹凸，防止包装箱过度受力后垮箱倒塌，造成组件挤压损坏；卸载后的组件应单层摆放，禁止在项目地将组件堆码。



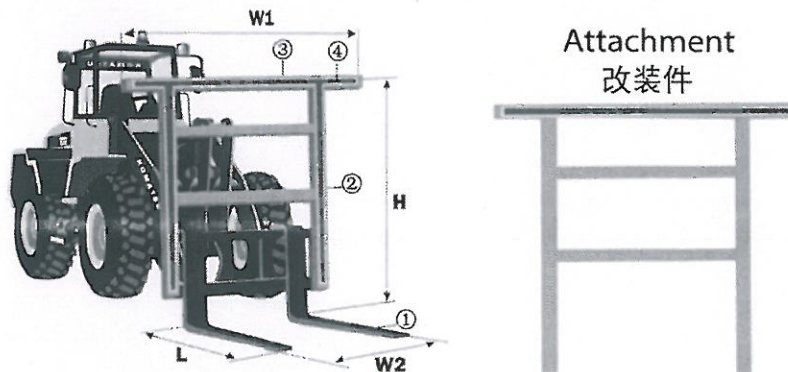
5. Secondary handling and transportation 二次搬运及运输

Client shall inform ZNSHINE SOLAR that if they have the demand of "Secondary handling or transportation" when they perform the previous business discussion. Generally, most of the modules need to be transported at the construction site from the storage area to the installation site. During the transport process, the integrity of the modules should be ensured. Trucks shall not carry more than 30 tons of goods, and containers shall not carry more than 25 tons of goods. 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., forklift). 客户在订单商务谈判期间应考虑或明示后期组件存在“二次搬运或运输”的需求。一般来说，组件在施工现场由仓储区运至安装现场大多都需要进行二次搬运，搬运过程中应确保组件的完整无损。卡车载运货物不得超过 30 吨，集装箱载运货物不得超过 25 吨。运输货物时，应提前检查路线，确保道路上没有障碍物。任何可能因超重而造成人身伤害的物品都应采用机械搬运（例如叉车）。

Appropriate transportation equipment should be selected for secondary transportation according to the terrain. Before transportation, ensure that the modules are packaged intact, and the bottom of the carton package is equipped with a wooden pallet. 应根据地形选择合适的运输器械进行二次搬运，运输前应确保组件包装完好，纸箱包装底部配以木托盘。

A. Forklift operation at project site 项目地叉车转运

Attachment is required for forklift transportation between storage and construction site (as shown in the figure below). Forklift specifications and operating practices include, but are not limited to, the below-mentioned matters. 叉车在存储地及施工现场之间运输需要使用改装件（如下图所示）。叉车规格及操作规范包括但不限于以下所述内容。



① Forks 货叉

The fork length (L) should ≥ 1.0 m. 长度(L) ≥ 1.0 m

The forks distance (W2) should be adjusted to the maximum position without any interference to the pallet. 间距(W2)调整到尽量靠近托盘两边角墩。

② Backrest 门架

Vertical landscape package: The backrest length (H) should ≥ 1.5 m; the backrest width (W1) should ≥ 2.5 m.

横式包装：高度(H) ≥ 1.5 m，宽度(W1) ≥ 2.5 m；

Vertical portrait package: The backrest length (H) should ≥ 1.7 m; the backrest width (W1) should ≥ 1.5 m.

立式包装：高度(H) ≥ 1.7 m，宽度(W1) ≥ 1.5 m。

The backrest shall perpendicular to the fork, and the structure must be firm (withstand pressure ≥ 15 tons). When the entire module package leans on the backrest, the backrest shall not be deformed due to pressure.

门架需与货叉垂直，门架结构要坚固(可承受压力 ≥ 1.5 吨)，当整托组件斜靠在门架上时，门架不会因受压而变形。

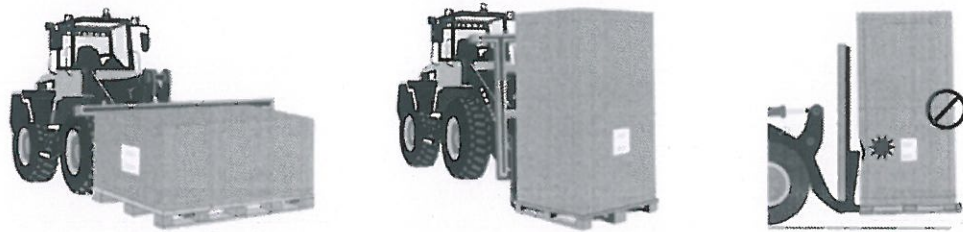
③ Beam 横梁

④ Buffer material 缓冲材料

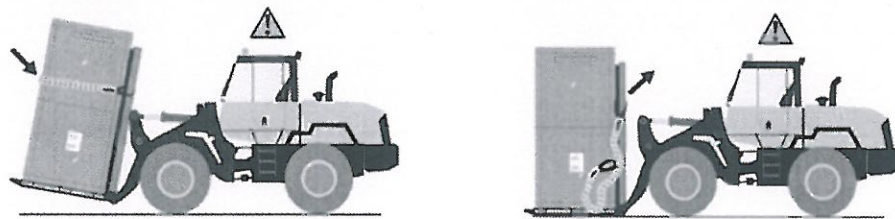
The contact position between the top beam and the module package should be fixed with a buffer material (preferably silicone, rubber, EPE) to prevent the forklift from damaging the modules.

门架顶端横梁与组件包装接触位置使用缓冲材料固定（建议缓冲材料选择硅胶、橡胶、EPE），避免叉车撞破组件和型材。

Do not allow the convex part of the fork to directly contact with the carton or modules to prevent damage to the modules. 请勿使货叉的凸起部分直接与纸箱或组件接触，防止顶撞组件导致组件破损。



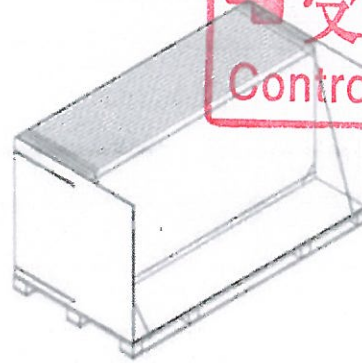
The module package shall lean on the backrest, the package must be fixed using a safety rope with a tensile strength of $\geq 20\text{kN}$, and control the speed to prevent tip-off. Place the module package smoothly on the ground, untie the safety rope after the confirmation of no risk of tilting. 叉车运输时将包装箱倾斜抵靠在叉车门架上，必须用抗拉强度 $\geq 20\text{kN}$ 的安全绳将组件固定在叉车上，并控制速度，以防止倾倒。将包装箱平稳的放在地面上，（无倾倒风险）再解开安全绳。



B. Transport the unpacked modules 已拆包组件运输

If the unpacked modules need to be transported to other places, it is recommended to pack the single module together in a package to the maximum number allowed, and fixed with inner packing belts (2100N force recommended). Finally, cover it with the packaging carton box and fix it with the same number of packing belts as before. 如已拆包的组件需要转运至其它项目地，建议按照拆箱前单托组件数量将零散组件合并，打内部打包带(拉力建议 2100N)。最后套上外包装纸箱再用打包带把组件和托盘打包固定，打包带数量参考拆箱前。

If the number of modules need to be packed is less than the maximum number allowed in a package, the modules need to be fixed and secured to the center of the pallet for utility packaging (the following figure to the left) or on the side for distribution packaging (the following figure to the right), and fixed with inner packing belts (2100N force recommended). Finally, cover it with the packaging carton box and fix it with the same number of packing belts as before. Do not put the unfulfilled package on the lower layer when transported. 如组件不满一个托盘，参考以下图左将组件居中摆放（分销包装参照下图右靠侧边摆放），打内部打包带（拉力建议 2100N）。最后套上外包装纸箱再用打包带把组件和托盘打包固定，打包带数量参考拆箱前。不满托组件运输时禁止放在下层。



When handling the module, pay attention to inspect the module glass and back sheet if has damage, scratches, and cracks: check the junction box for degumming, loosening, and falling off: check the cable and connector of J-box for squeeze deformation or broken. If the above phenomenon occurs, the modules should be properly placed aside, to avoid secondary damage to the modules during placement, it is strictly prohibited to carry the damaged modules to the construction site. 组件搬运时, 要注意检查组件玻璃、背板是否有损坏、划伤及裂纹; 检查接线盒有无脱胶、松动、脱落; 检查光伏接线盒线缆及连接插头有无挤压变形或破损。如果出现以上现象应先将组件妥善放置一旁, 放置时要避免对组件造成二次损坏, 严禁将有损坏的组件搬运至施工现场。

C. Truck transport modules 货车运输组件

When using box trucker and flatbed trucker transport the modules, the module packages should be placed close to each other without any gap. The empty space needs to be filled to prevent the package moving backwards to the rear of the truck. Additionally, every package needs to be fixed using e.g. ropes to the vehicle when transporting with the flatbed trucker. 厢式及非厢式货车运输组件时, 托盘与托盘之间要紧密摆放不留空隙, 车厢尾部空位需进行填充加固, 预防运输中组件向车尾移动。当使用非厢式货车运输时, 每托组件都需要用绳索与运输车辆进行固定。

Before the secondary transportation vehicle is started, it should be bundled with net ropes. The rope should be fastened to prevent damage to the modules during the transportation. If the safety rope is used, the contact part between the safety rope and the carton shall be separated by paper corrugated or other cushioning materials. The speed of the vehicle carrying the modules shall be $\leq 5\text{km/h}$. 在二次搬运车辆启动前, 应采用网绳捆绑, 绳索应系牢, 严防组件在运输过程左右晃动造成损坏。如果采用安全绳, 则安全绳与纸箱接触部分用纸护楞或其他材质的缓冲材料隔开。搬运组件车辆行驶速度应 ≤ 5 公里/小时。



D. Manual transportation of modules 人工搬运组件

For vehicles that cannot travel to the installation site, each module shall be manually moved to the installed site. The principle is to carry the module by two peoples. When carrying the module, the transporter should work hard at the same time, with the module backsheet upward, and grasp the inside of the long side frame of the module to carry it. During the

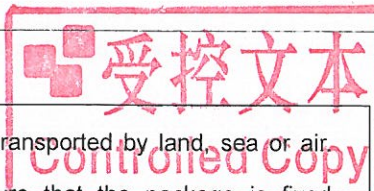


transportation process, it is strictly forbidden to touch the glass surface by hand, and at the same time to prevent sharp objects from bumping modules. It is forbidden for porters to carry out the assembly of the module junction box by hand. In some mountain projects and when it is not suitable for two persons to transport the module, special tools are required to carry it, and the module glass and back sheet are not stressed. 对于车辆无法行进至安装地点的，应由人工将每块组件搬运至安装地点。原

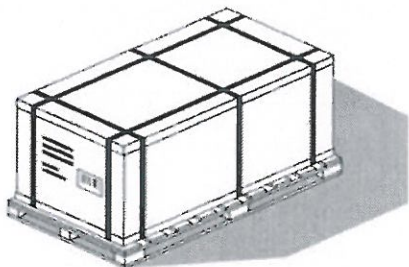
则按照每两人一块组件进行搬运，搬运时搬运人员应同时用力，组件背朝上，抓住组件长边的边框内侧进行搬运，在搬运过程中严禁手接触玻璃面，同时防止尖锐物品磕碰组件。禁止搬运人员手提组件接线盒出线进行搬运，在一些山地项目及不适合两人搬运组件的情况下，需要使用特制工具搬运，并确保组件玻璃及背板不受力。

The onsite modules should not be placed on the stand or placed on sharp stones. The modules should be placed neatly and no skewing is allowed. When lying flat, the terminal and cable of the module should not be pressed between the frame and exposed, so as not to damage the cable and terminal. 组件现场摆放不能倚靠在支架上或放置在尖锐石头上，组件要放置整齐，不允许有歪斜现象。平放时组件的接线头和电缆不可压在边框之间和外露，以免压伤电缆和接线头。

When it is left for a long time (such as overnight) or when there is rain or snow, the module should be covered with waterproof material, and the connector placed on the top module should be short-circuited (male and female connectors are connected to each other). Water may cause electrical leakage and corrodes joints. 长时间放置时（如过夜）或有雨雪时，组件需使用防水材料盖住，并将放置在最上方的组件的连接器短路（公母头互接），避免因有水导致漏电和连接头腐蚀。

NOTE:


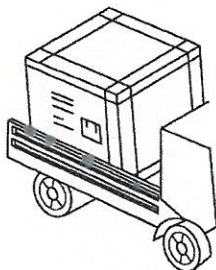
1) Do not remove the original packages if the modules require long-distance transport or long-term storage. 如果组件需长途运输或长期存储，请不要拆除原包装。



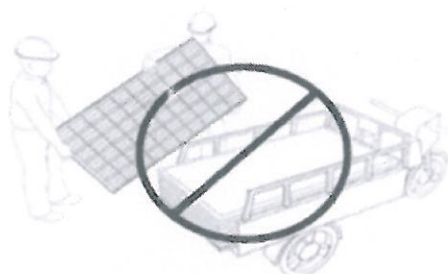
2) Packaged products can be transported by land, sea or air. During transportation, make sure that the package is fixed securely to the shipping platform without movement. Do not Stack more than two layers on truck. 包装完的成品可以通过陆运、海运、或空运进行运输。在运输过程中：请将包装箱固定在运输平台上，确保包装箱不会倾倒、移位。正常卡车运输时，最多2层叠加后运输。（以陆运为例）



3) Only one layer stacking is only allowed for transport at the project site. 项目现场托运，只允许1层运输。



4) No transport or handling by pedicab or improper vehicle as shown below. 禁止三轮车，马车或其他不合理车辆转运。



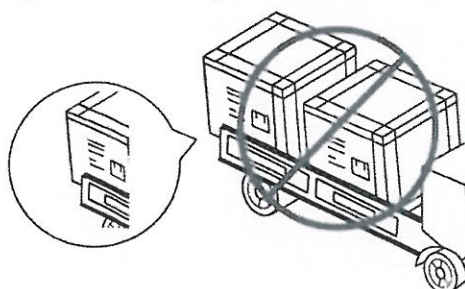
5) Do not transport the module with rope as shown below. 禁止用绳子背组件。



6) Do not carry the modules on the back of one person as shown below. 禁止单人背组件。

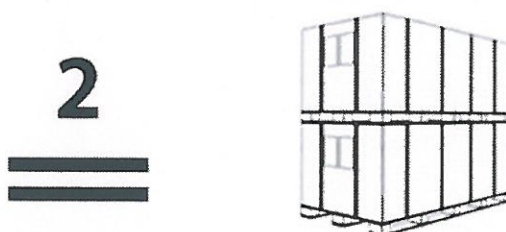


7) Do not allow pallets to exceed the loading area of the transport vehicle. 禁止托盘超出运输车辆的装载区。



6. Storage 存储

- 1) If the modules require long-distance transport or long-term storage, do not remove the original package and keep the wrapping film and carton box in a good condition. 如果组件需要长途运输或长期存储, 请不要拆除原包装, 保持缠绕膜和包装纸箱完好
- 2) For long-term storage, it is recommended to store the modules in a standard warehouse with regular inspection, and under confirming of your personal safety, reinforce the package in a timely manner if any anomalies are found. 组件长期存储建议存储在标准仓库中, 定期巡检, 一旦发现倾斜异常请在保证人身安全情况下及时加固处理。
- 3) Storage in project site warehouse or normal warehouse (moisture < 85%RH, temperature in the range from -40°C to +50°C): Do not stack different types of PV modules together. Modules shall be stacked as required, not exceeding the maximum number of layers printed on the outer packaging. (no more than two layers). In any circumstances, for vertical portrait packages, stacking is not allowed. 项目现场及常规仓库存储 (湿度 < 85%RH; 温度: -40°C ~ +50°C): 不同类型组件不允许堆叠在一起。堆叠组件时请勿超过外包装箱上印刷标志的最高层数限制 (最多堆码 2 层)。任何情况下, 长边竖放 (立式) 包装不允许堆叠。



- 4) Do not expose the modules to rain or moisture. Store the finished product in a well ventilated, waterproof, dry and smooth place (for vertically portrait package, the inclination of ground needs to be less than 4°), to avoid damage or dumping of the modules due to ground deformation or collapse. The modules should be centrally stored with pallet spacing within 10cm. And the modules should be covered with waterproof material. 禁止淋雨或者受潮, 请将包装的成品置于通风、防雨、干燥及平整的地方 (立式包装存储区域若存在倾角, 要求倾角 ≤ 4°), 避免因地面变形或塌陷导致包装破损或倾倒。组件尽量集中存放, 建议保持托盘间距在 10cm 之内。组件需使用防水材料盖住。
- 5) If you need to store the modules in the project site, do not choose soft ground and the ground that is easy to collapse, should choose a hard ground or a higher ground with flat surface to ensure the module packages not collapsing and tilting for long-term storage. 仓库的货架要有足够的承载能力和存放空间, 定期巡检确保货物存放安全。如果需要在项目地存储组件, 禁止选择松软、容易塌陷的地面, 应选择硬质地面或地势较高的地面并对地面进行整平, 保证组件长期存放不会塌陷、倾斜。
- 6) The module must be installed as soon as possible in the project site and must not be exposed to rain or damp. ZNSHINE SOLAR shall not be responsible for any damage or collapse of the modules caused by moisture in the packaging. 到项目地组件应尽快安装, 禁止暴露在雨水和潮湿环境中, 如因为包装受潮导致组件破损、倒塌等问题, 正信光电不承担责任。
- 7) Do not allow unauthorized persons to access the module storage area. 禁止未经授权的人员接近组件存储区域。

7. Unpacking of PV modules 光伏组件拆包

7.1 Unpacking precautions 拆包注意事项

- 1) Operators shall wear labor protection articles and prepare cutters. During the process of opening the box, pay attention to safety and avoid cutting finger by knives and scissors. 操作人员应穿戴劳保用品, 并准备好刀具。拆包过程中注意安全, 防止刀片、剪刀等利器划伤手指。



safety helmet
安全帽



safety helmet
劳保手套



Safety shoes
安全鞋

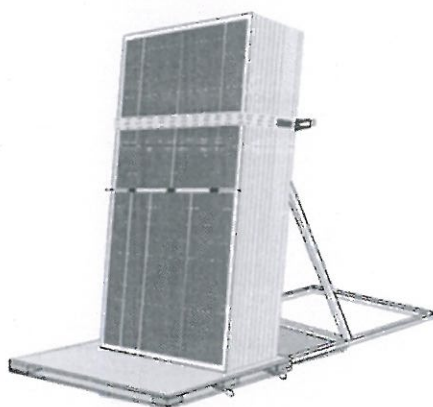


Scissors or knives
剪刀或刀具

- 2) It is forbidden to open the packing box outdoors when it is raining. Because after the rain, the carton will be soft and the PV modules will be broken or hurt the staff. 在户外拆箱时, 禁止在下雨的条件下作业。因为纸箱淋雨后会变软散开, 里面的光伏组件会脱出造成损坏或者砸伤人员。
- 3) Please pay more attention to the safety when it is windy. When the wind is strong, it is suggested not to move the PV modules and need to fix the unpacking modules. 如果现场有风, 需要特别注意安全, 尤其大风情况下, 建议不要搬运组件, 并且妥善固定好已拆开包装的组件。
- 4) Unpacking must be carried out by two or more people at the same time. It is forbidden to pull the wires or junction boxes of the modules to carry the modules. Handling the modules requires two or more people with slip-proof gloves to avoid hurting the hands and leaving finger marks on the glass; It is forbidden to carry PV modules on your head. 拆包时, 必须由 2 个或 2 个以上人员同时操作, 禁止拉扯组件的线缆或接线盒来搬运组件, 搬运组件时应由 2 个人以上带防滑手套同时手持组件搬运, 避免划伤手和在玻璃正面留下指印; 禁止头顶组件搬运。
- 5) You need someone to hold the module or take other protective measures to avoid tipping and falling. When unpacking, the builder must check the appearance of the module, and if any problem found, it must be kept on site and inform our staff to confirm it timely. Any appearance quality problems were caused by the installation process shall be bore by the construction side. 去掉围卡时需要有人扶住组件或采取其他保护措施避免组件倾斜、倾倒。拆箱时, 施工方必须对组件外观进行确认, 如若发现问题必须保留现场, 第一时间通知我司人员进行确认, 安装过程中造成的任何外观质量问题, 由施工方负责。
- 6) When carrying the remaining PV modules from the pallet, the other side of the pallet needs to be held by someone or take effective protective measures to prevent the module from tilting and falling. 从托盘上搬运剩余组件时, 托盘的另一端需有人扶住组件或采取有效的保护措施避免组件倾斜、倾倒。
- 7) No object is allowed to fall on the module when moving the module. 搬运组件时严禁有物体落在组件上。
- 8) After the module is removed from the pallet, it should be placed on another pallet and placed in a designated flat position. 组件从托盘上搬运后, 应放置在另一块托盘上搬运到指定的平整的地方放置。
- 9) The modules rest on the support and place vertically. Recommend "pick out one, install one" during site installation. If horizontal stack is inevitable, please place the unpacked cover on the pallet, and stack module as original sequence with perfect alignment to avoid scratch. 组件垂直放置在支架上。现场安装时建议“取一块, 装一块”。如果不可避免要水平

堆叠，请将拆包后的盖子放在托盘上，堆叠组件按原顺序对齐，避免划伤。

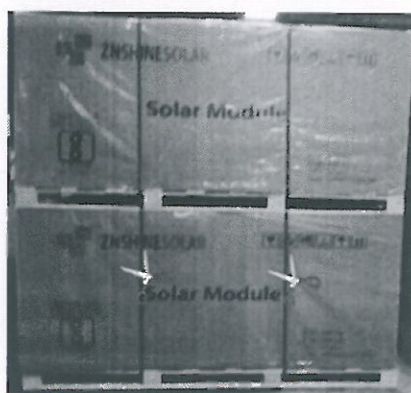
- 10) If all the modules are not taken out after unpacking, the remaining modules shall be placed horizontally and repackaged to prevent them from tipping. When packaging, please note that the glass side of the bottom module should face up, the glass side of the middle modules should face down, and the glass side of the top module should face up. Stacks of modules should contain no more than 16 modules, and the frames should be aligned. 如果拆包后没有将组件全部取出，则将剩余的组件水平放置后重新打包，防止倾倒。（打包时，最下层组件玻璃面朝上，其他组件的玻璃面朝下，最上层的组件需玻璃面朝上放置）。组件的最大堆叠数量不超过 16 片。
- 11) If the unpacked modules are not installed immediately, they should be fixed to the stand supporter with a safety rope under weather of 6 class wind (the modules should be less than 12 pieces). 如果组件拆包后短时间内不进行安装，6 级以内的大风天气（组件少于 12 片），则需要使用安全绳将立放的组件与靠架进行固定。（如图所示）



7.2 Unpacking process 拆包流程

➤ A. Unpacking process for regular modules with vertical landscape package 常规组件横式包装拆包流程

Disassembly method for the upper and lower pallets of PV modules: 组件上下两托拆卸方法:



Caution: Cut the packing belt which binding the two pallets if the forklift can only unload one pallet firstly, please refer to the picture above. Unload the top pallet of the products and pay attention that don't cut the packing belt of the top pallet in advance to avoid modules falling. **注意事项:** 如叉车只能一小托卸货时先将上下两托捆绑的打包带剪开，如上图所示。剪开后将上托组件用叉车卸下，注意不能将上托组件的打包带提前剪开，避免组件倒塌。

Step 1: Confirm whether the module packing case is damaged or not. If there is any damage, please inform the on-site service person to take photos and open the case together.



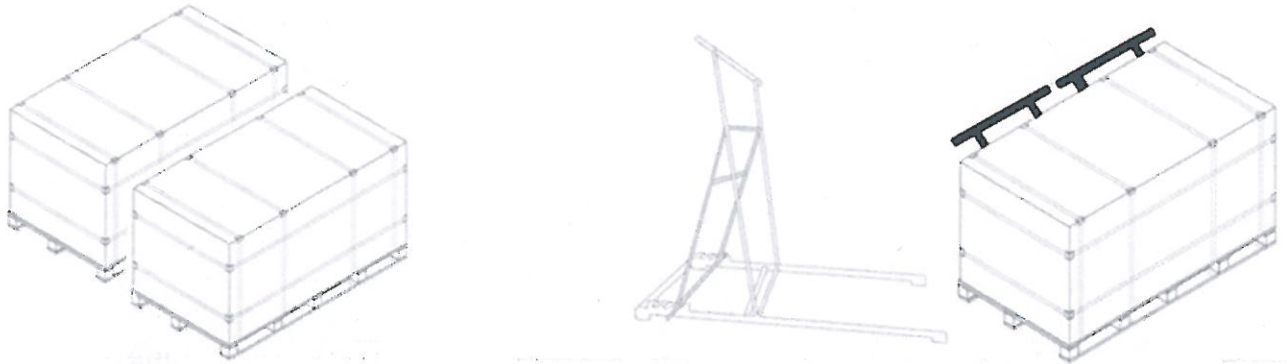
第一步：确认组件包装箱有无破损。如有破损通知现场服务人员拍照记录并一起开箱。

Step 2: Get information about the modules in the packaging box to determine if they are consistent with the order.

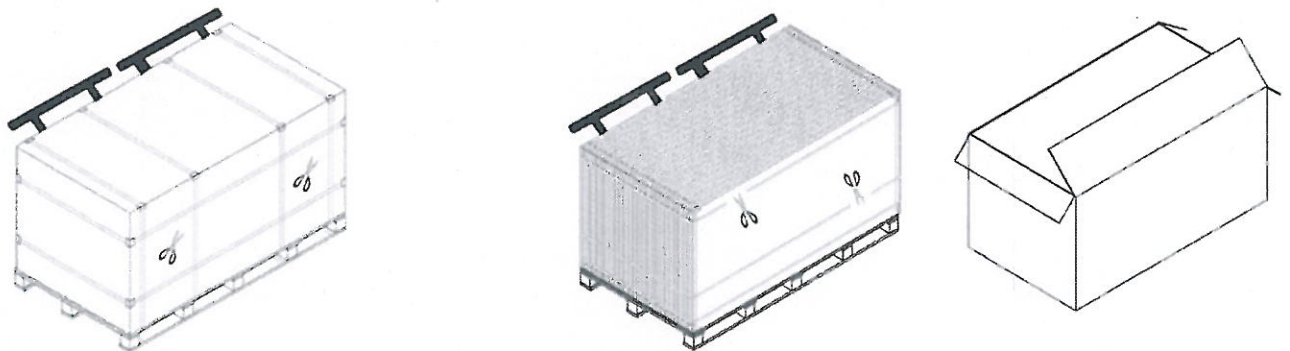
第二步：获取包装箱中组件的信息，以确定它们是否与订单一致。

Step 3: Open the box to carry the module, the module unpacking step is as follows.

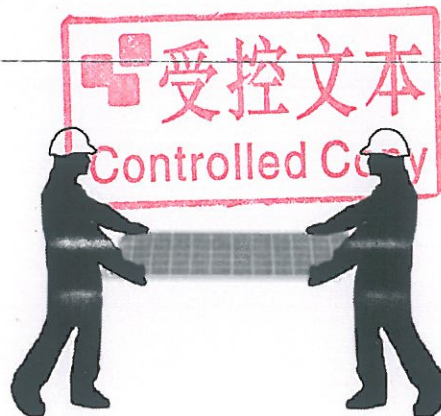
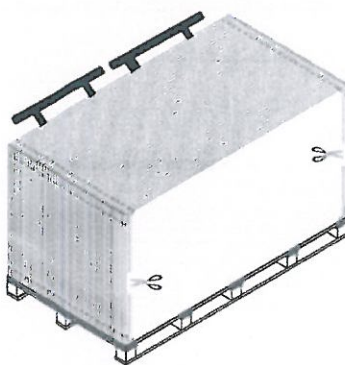
第三步：开箱搬运组件，组件拆箱步骤如下：



- a) The long side of the PV modules which are not open needs to be near the solid walls, stand or other unopened PV modules with the same specifications, which is need to be parallel with the long side of pallet and the distance is 15~20cm. Please refer to vertical portrait package unpacking for the use of auxiliary support in the figure above.待拆包的组件需要长边靠近坚实的墙壁、支架或者另外一拖同样规格的未拆封组件（下文简称支撑物）。支撑物与托盘长边平行，距离为 15~20cm。上图中辅助支架的使用方法请参考下方立式包装拆包。

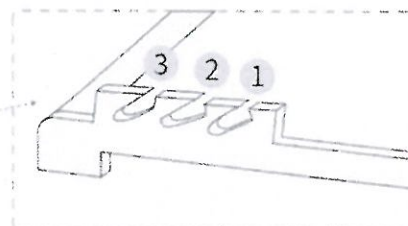
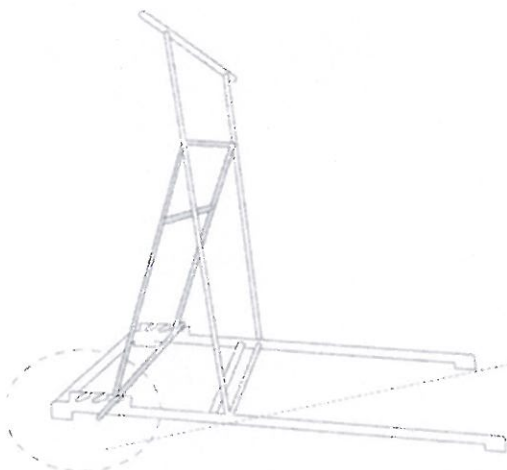


- b) Remove the wrapping film and packing belts. Remove the box after opening the upper cover. Cut off all the horizontal packing belts.剪掉并去除外箱四周的打包带、缠绕膜。拆开纸箱上盖后移除纸箱，剪断所有横向打包带。



- c) When there are 1~2 vertical packing belts remaining, push the module gently to tilt toward the stand supporter. Cut off the remaining packing belts. Take out the modules in order. The PV modules are pasted with anti-overturning tape. Before removing each module, remove the anti-overturning tape from the module. 剩余 1~2 根竖向打包带时，缓慢推动组件靠向稳固支撑物。剪断剩余打包带后，按顺序搬运组件。组件上粘贴有防倒胶带，每移除一块组件前去除该组件上的防倒胶带。

➤ B. Unpacking process for regular modules with vertical portrait package 常规组件立式包装拆包流程

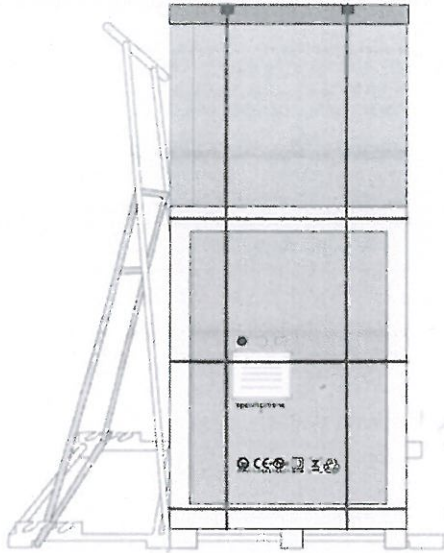


Confirm that the auxiliary support is intact and can adapt to the pallet. Open the unpacking auxiliary support. Erect the bracket support surface. Insert the lower end of the inclined support frame into the base slot.

确认辅助支架完好，可适配托盘。打开拆包辅助支架，竖起立架支撑面，将斜支撑架下端插入底座卡槽中。

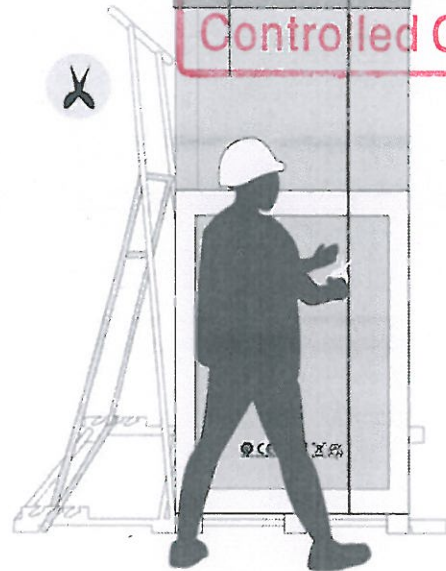
Adjust the tilt angle of the support and place the inclined support at gear 1, 2 and 3 (the corresponding inclination of the support is about 4°, 6° and 8° respectively).

调节支架倾角，斜支撑放置1、2、3档位置（支架对应倾角分别约为4°、6°、8°）



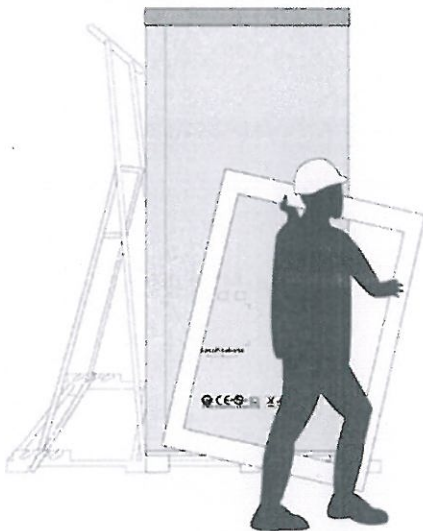
Put the cross bar of the installed unpacking auxiliary support into the bottom of the pallet, the support is close to the packaging, and one end of the support needs to extend from the bottom of the pallet.

将安装好的拆包辅助支架的横杆放入托盘底部，支架紧靠包装，支架一头需从托盘底部伸出。



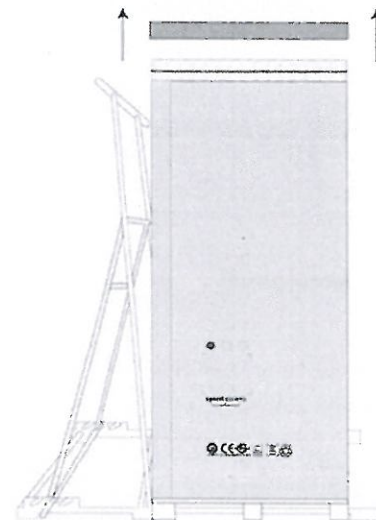
Cut off and remove the packing belt and winding film around the outer box.

剪掉并去除外箱四周的打包带、缠绕膜。



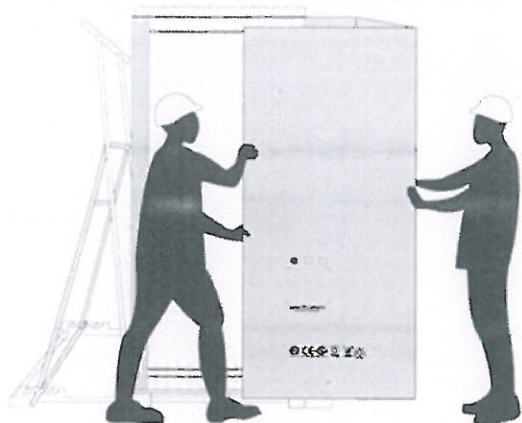
Remove the wood guard.

取掉木护楞



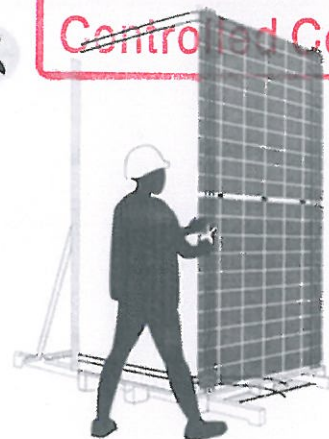
Remove the box cover (with the aid of tools).

取下箱盖（可借助工具）



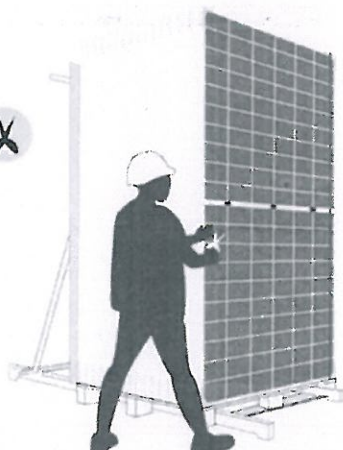
Remove the box and the box on the side of the support can be retained so that it is padded between the modules and the support.

取掉纸箱，靠支架一侧的纸箱可保留，使其垫在组件和支架之间。



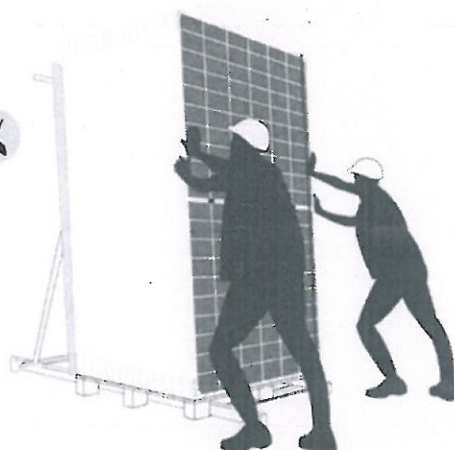
Cut all transverse packing belts.

剪断所有横向打包带。



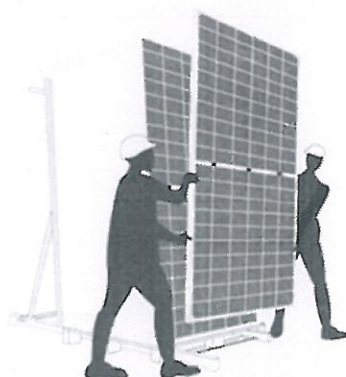
Cut the vertical packing belt, and the remaining 1~2 vertical packing belt not connected with the pallet will not be cut.

剪断竖向打包带，剩余1~2根不与托盘连接的竖向打包带不剪。



Gently push the PV modules so that the modules rest against the support, and then cut the remaining packing belt.

轻推组件，使组件依靠在支架上，然后将剩余的打包带剪断。



Two people lift the modules from the long side and carry them in sequence.

两人从长边抬起组件按照顺序搬运组件。



When placed horizontally, the glass of the lowest PV module faces upward and the glass of other modules face downward. The maximum number of modules stacked shall not exceed 16.

水平放置时最下层组件玻璃面朝上，其他组件玻璃面朝下，组件最大堆叠数量不超过16件。

➤ C.Unpacking process for lightweight and flexible modules 轻质柔性组件包装拆包流程

(1) Remove the packaging tape and check if the box is intact.

拆除打包带，同时检查箱体是否完整。

(2) Remove the top cover screws and flip the top cover over to the front of the box for later use.

取下顶盖螺丝，并将顶盖翻转至箱体前备用。

(3) Check the quantity of modules according to the markings and inspect the condition of the modules inside the box.

根据唛头核对组件数量，并检查箱内组件情况。

(4) Remove the screws from the front panel and remove the front panel.

取下前板螺丝，移除前板。

(5) Take out the top card strip and place it under the top cover for buffering.

取出顶卡条，并置于顶盖下方起缓冲作用。

(6) Two people use foam clamps at the same time to take out the modules vertically, and do not bend the modules.

两人同时使用泡沫夹具垂直取出组件，切勿弯折组件。

(7) The first module is placed on the top cover with the back facing downwards.

第一块组件背面向下，放置在顶盖上。

(8) The second module is attached to the front panel of the first module to prevent scratches on the front panel.

第二块组件与第一块组件前板相贴，防止划伤前板。

(9) When taking out the modules from the box and placing them on the top cover for transportation, the number of modules transported each time should not exceed four, as excessive quantity can easily lead to module damage.

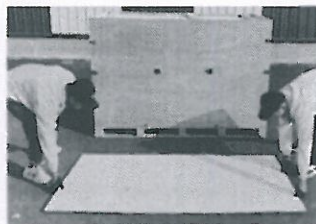
将组件从箱中取出放在顶盖上转运时，每次转运的组件不得超过四块，过多数量容易导致组件损伤。

(10) During the transportation of modules, two people are required to transport one module. Anti slip gloves and foam tooling must be worn during transportation.

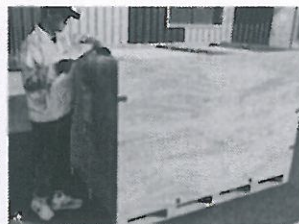
转运组件过程中，需要两人转运一块组件。转运时必须佩戴防滑手套并使用泡沫工装。



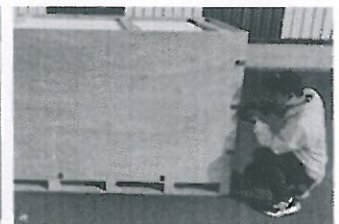
(1)



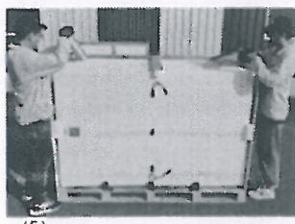
(2)



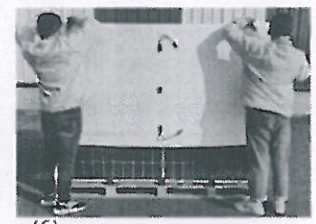
(3)



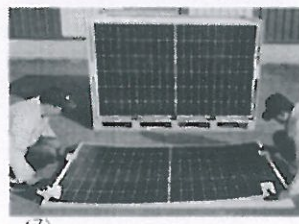
(4)



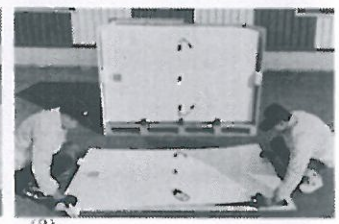
(5)



(6)



(7)



(8)



(9)



(10)



8. Revision record修订记录

Revise 修订	Date 日期	Version No. 版本号	Reviser 修订者	Remarks (Modifications, chapters, etc.) 备注（修改内容、章节等）
Revision 修订	2024.6.7	A	杨江辉 Mack Yang	修订子公司名字，增加轻质柔性组件的拆包。 Revise the name of the subsidiary and add unpacking of lightweight flexible photovoltaic modules.