CSUN 晶体硅光伏组件产品安装手册（IEC）

地址：中国南京江宁开发区佛城西路 123 号

邮编：211100

电话：+86-25-52766666-6530/6728

传真：+86-25-52766767

EMAIL：info@chinasunergy.com

网址：www.chinasunergy.com

目录

CSUN 晶体硅光伏组件产品安装手册（IEC）

（版本:2017 年 1 月）

1 目的

本手册提供了中电光伏有限公司及其子公司（以下称为“CSUN”）生产的光伏组件（以下称为“组件”）在安装和安全使用方面的相关信息。

组件安装前，安装者必须阅读和理解本手册，如有任何疑问，请联系CSUN的销售或者客服人员做进一步的了解。安装组件时，安装者应遵守本手册的所有安全防范措施和安装地相关的法律规范；在安装太阳能光伏发电系统前，安装人员应熟悉此系统的机械和电气要求。若因施工或者发电系统设计缺陷而导致的产品损坏，CSUN有权拒绝赔偿。

本手册请妥善保管，以备将来在组件维护保养或出售、处理时做参考。

2 免责申明

客户在对CSUN的组件将进行安装时应严格遵守本手册的要求。如果客户的安装、操作、使用和维护的条件或方法超出了本手册所规定的范围而造成损失，CSUN不对任何由此所引起的损失、损坏或费用负责。

客户因使用CSUN的组件而导致侵犯第三方专利权或其它权利，不属于CSUN的责任范围。客户并不因使用CSUN的组件获得任何专利或者专利使用授权，无论明示的或隐含的。

本手册的信息基于CSUN的知识和可靠经验，但是包括产品规格的这些信息和建议并不构成任何保证，无论明示的或隐含的。CSUN保留修改该安装手册、PV产品、规格或产品信息的权利，无需提前通知客户。

3 安全须知

3.1 安全通则

- 组件安装时，应遵守安装地相关的法律法规，必要时应先获得建筑许可证等所需证件。
- 安装太阳能光伏发电系统要求专门的技能和知识，必须由获得专业资格的工程师来完成。安装人员应预先了解安装过程中可能会发生伤害的风险，包括电击等。

- 太阳能电池组件应用于地面、屋顶、车辆或船只等户外环境。合理设计支撑结构是系统设计者或安装者的责任。请使用本手册中推荐的安装孔或安装压块。
- 单个组件在阳光直射下可产生30V以上的直流电压，直接接触30V以上的电压非常危险。不要触碰或倚靠在工作的组件。
- 禁止在有负载的情况下断开连接线，禁止在组件表面刷油漆或其他粘合剂。
- 保持所有的电接触干燥、无污染，禁止改变旁路二极管的接线，禁止拆解组件或移动任何铭牌和粘附于组件上的部件。
- 禁止用镜子或透镜聚焦阳光照射到组件上，不要将组件背面长时间直接暴露在太阳光下。
- 组件应存放在通风干燥处，在存储和搬运过程中，如遇恶劣天气（雨、雪、风沙等），需在包装箱上覆盖塑料薄膜、防雨布等材料。
- 组件正常工作时，禁止在组件玻璃面覆盖塑料薄膜、防雨布等任何材料。

3.2 安全搬运

- 在运输和安装组件时，不要让儿童和未授权人员接近组件。不适当的搬运和放置，可能导致组件的玻璃的破碎和丧失电性能，组件失去使用的价值。
- 在搬运安装组件时应轻拿轻放，不要使组件掉落或让物体落在组件上，特别注意不能碰撞、划伤和挤压到组件；无框双玻组件在搬运时需加倍小心，需戴防滑手套。
- 禁止拉拽线缆和接线盒，禁止抓住接线盒或电缆线来抬起组件，必须有 2 个或 2 个以上的人用双手握住组件的边缘。
- 禁止把已开封的组件平面堆垛摆放和运输，不要把组件放置在坚硬物体的表面。
- 禁止在组件上放置重物、工具，禁止踩踏组件。
- 不正确的运输可能会损坏组件，道路状况较差时，需控制车辆行驶速度。

3.3 安全安装

- 遵守适用于所有安装部件的安全规则，如电线和电缆、连接器、充电控制器、逆变器、蓄电池等，只可使用与太阳能电力系统相匹配的设备、连接器、电线和支架。在同一系统中，要求组件规格相同，同时尽可能保证颜色等级一致。
- 在潮湿或风力较大的情况下，请不要安装或操作组件。
- 组件的表面为钢化玻璃，操作时需要小心，不合理的操作会造成组件表面的钢化玻璃破碎。如果正面的玻璃破碎或者背面的聚合物烧坏，任何与组件表面或者铝合金边框的接触都可能造成

电击，尤其在组件潮湿的情况下。破损的组件必须由专业人员妥善处理。

- 组件铭牌中标识了最大系统电压，在系统安装过程中，组件串联引起的最大开路电压不得超过最大系统电压。
- 在安装过程中，应使用不透明材料完全覆盖组件以防止电流产生，在高温高湿环境下，该材料不会对组件玻璃面造成污染，如橡胶胶质转印、油污、印染等；禁止裸手接触玻璃表面。
- 禁止将组件玻璃面向下或背板面向下直接放置在安装场地（泥土地、沙地、草地、戈壁等）。
- 未使用完的组件需参照出厂包装方式包装、存储、运输。
- 安装或维修光伏系统时，不要穿戴金属戒指、表带、耳环、鼻环、唇环及其它金属配饰。应使用电气安装允许的绝缘工具，及保持工具的干燥。
- 组件背面边框上开的三角形孔为排水孔，注意不要被堵塞。
- 在互连组件时，要保证将连接电缆固定在安装组件的支撑架上，限制电线松弛部分的摆动幅度。
- 遵守电缆线的允许最小弯曲半径。
- 在动物和儿童可以接触到的地方，必须用导管保护线缆。
- 请使用专门为光伏系统设计的连接器，装配连接器时使用生产商推荐或指定的工具。如需适用于太阳能光伏系统的连接器，请联系当地供应商。
- 组件与逆变器，或者蓄电池，或者汇流箱连接时，注意极性正确，避免极性错误对组件内部旁路二极管的损坏。

4 产品标识和电流分档

（A）产品标识

每块组件有如下标签，提供了以下信息：

- 铭牌：描述产品的型号、额定功率、额定电流、额定电压、开路电压、短路电流等所有在标准测试条件下的测试值，重量、尺寸、最大系统电压和保险丝容量等。
- 序列号条形码：每块组件有唯一的序列号，条形码中涵盖了组件相关生产信息。

（B）电流分档

每块组件都有一个特殊的标签位于组件长铝边框的侧面，如图 1 所示，它提供了以下重要信息：

- 每块组件按 Impp（组件最大功率点对应的电流）预先分类，不同颜色及对应的字母 I_1，I_2，I_3，I_4…代表不同 Impp 类别。
- 系统安装时，在同一组件阵列中，我们推荐使用相同 Impp 电流类别的组件进行安装，可降低

因电流失配效应引起的功率损失。

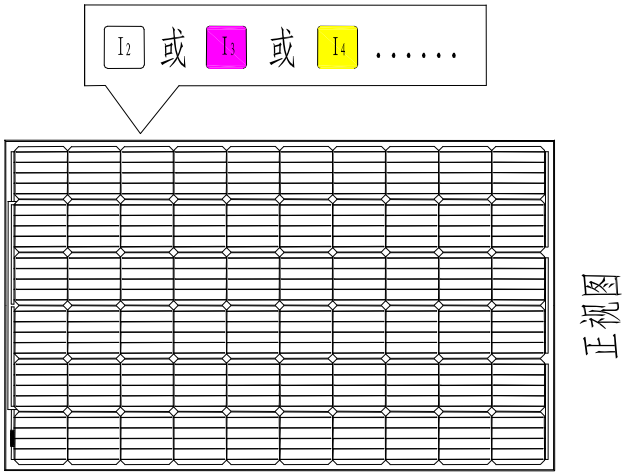


图 1 组件电流标签

5 组件电性能参数

- 在标准测试条件下(1000W/m^{2}的辐照度，AM 1.5光谱， 25°C (77°F)的环境温度)，组件的电性能参数如Isc，Voc和Pmax与标称值有±10%内的偏差。
- 在普通室外条件下，组件产生的电流和电压会与CSUN组件产品规格书中在标准测试条件下测得的数值会有所不同，所以在确定光伏发电系统中的额定电压、导线容量、保险丝容量、控制器容量等和组件功率输出有关联的参数时，请参照对应组件的短路电流和开路电压的值，并按125%的值进行设计和安装。
- 根据IEC标准，一般组件系统的最大额定电压有1000V和1500V两种规格，具体以组件铭牌标定的最大系统电压为准。

6 机械安装

6.1 安装环境

- 在大多数应用中，光伏组件应安装在每年当地能接受太阳光辐照最多的位置。
- 组件应安装在阳光可以充分照射的位置，在组件工作的任何时间内不被遮挡。安装过程中，要避免在组件表面形成部分区域的遮挡（衣物、工具、包装材料等）。
- 组件应安装在通风良好的位置，确保组件背面、侧面有足够的自然空气散热通道，确保组件在

工作状态时产生的热量及时散发。

- 严禁将组件安装在有可燃性气体出现的地区。
- 建议组件安装在气候温和干燥地区，不能在冰雹、积雪、风沙、烟尘、空气污染、煤烟等过量的地区安装和使用组件。
- CSUN 组件通过了 IEC 61701 重量比为 5%的盐雾腐蚀测试，但腐蚀可能发生在组件边框和支架连接的部位，或者接地连接的部位。未经 CSUN 书面认可或双方合同约定，组件安装位置距离海边的直线距离不允许低于 500m；当组件安装在海边时，必须要采用不锈钢或铝的材料来与组件接触，且要对安装部位做好防腐蚀处理。组件不能安装在有强烈腐蚀性物质的地区，如盐、盐雾、盐水、活跃的化学气体、酸雨或者其它有任何会腐蚀组件，影响组件安全或性能的物质。
- 同一阵列串联的每块组件必须保证方向和角度一致。不同的角度和方向使得每一块组件受到不同的太阳辐照，可能会引起输出功率的不同，而组件最佳的倾斜角度和安装位置大致相同。
- 组件开箱后，需要立即进行安装连接，并将阵列接入汇流箱中，避免沙尘或水汽等进入导致连接器连接失效和安全问题。针对沙尘严重地区、盐雾较大地区以及污染严重地区，建议客户增加连接器防护套，作为配套防护措施。

6.2 安装支架的选择

- 必须遵守支架所附的说明书指导和安全守则。
- 由组件构成的整个方阵系统必须能承受住可以预见的机械压力，这些压力来自当地的风力和冰雪等。
- 严禁在组件玻璃表面钻孔，否则保修失效。
- 不要在组件的边框上钻附加的安装孔，否则保修失效。
- 支架结构必须由耐用、防锈蚀、抗紫外线的材料制成。
- 支架结构热胀冷缩时产生的力不应该影响组件的性能和使用。
- 安装支架的支撑面必须平整，无扭曲，变形，相连支架之间无上下高低错位。

6.3 三种安装方式

（A）屋顶安装

- 为屋顶安装提供一个特殊的支撑框架是必要的。组件安装在屋顶或建筑上时，要确保被安全固定，不会因为强风或大雪被破坏、掉落。屋顶安装时应检查使用的建筑规范，确保组件所安装的建筑及其结构具有足够的承重力。安装固定组件时所需穿透的屋顶应该密封，以防雨水渗漏。

- 平铺式安装时，为了适合于操作、减少水蒸气凝结、促进组件通风散热，组件尽量和建筑物墙壁或者屋顶的表面平行，且保证组件和墙壁或者屋顶的表面距离至少 115mm，以便组件背面的空气流通通风散热，防止线缆部分的损坏。堆叠式安装组件时，应确保组件被安装在防火屋顶，组件的防火等级为 C 级，适合安装在防火等级 A 级以上的屋顶。风力较大时不要在屋顶或建筑物上进行作业。
- 对安装区域有较大降雪或积雪记录的屋顶系统，客户应对整个系统的最下端组件边框进行支架加固处理，保证最下端边框免受自上而下的积雪推压破坏，以及白昼融雪结冰对组件的破坏。建议采用图 2 所示的加强支撑机构。

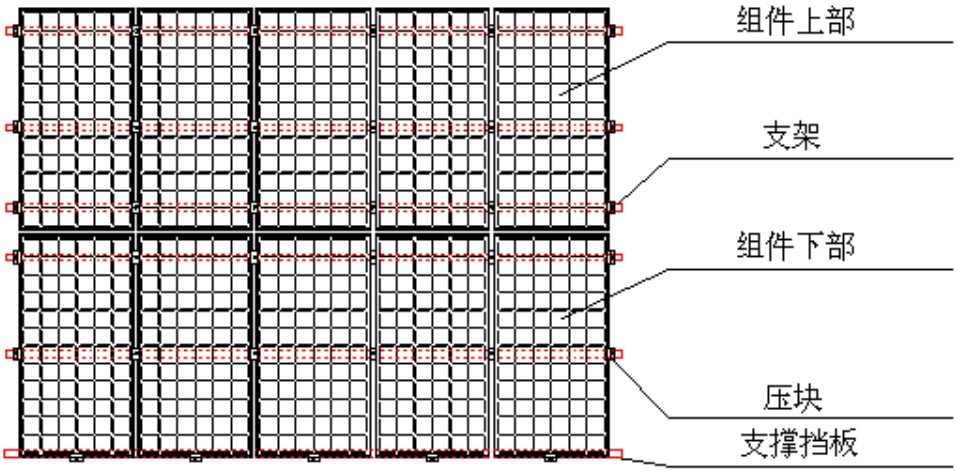


图 2 组件加固安装示意图

（B）支柱安装

- 当在支柱上安装组件时，选择能够承受当地预期风力的支柱和组件安装支架。支撑杆必须有坚实的地基。

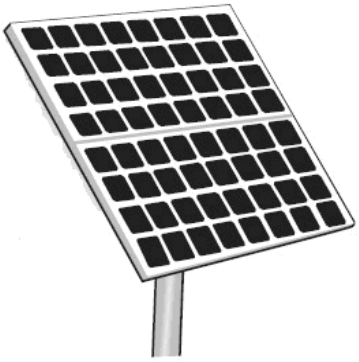


图3 支柱安装

图4 地面安装

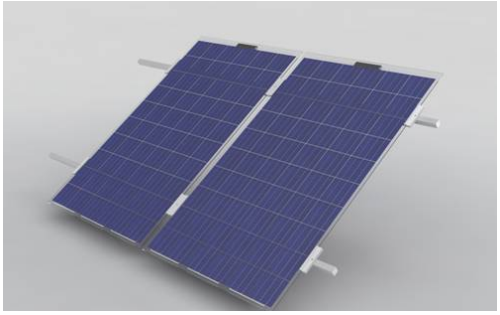


图 5 双玻无框组件安装

（C）地面安装

- 地面安装时选择适合的安装高度，防止冬天下雪时组件的下半部分长时间被积雪覆盖；应选取合适高度的支架进行安装，不可将组件直接斜铺在地面上；避免被植物或树遮挡，避免被吹来的沙石损坏组件或被雨水溅起的泥土遮挡组件表面。

6.4 两种安装方法

- 机械安装可以直接通过安装孔用螺栓固定或压力夹具夹紧固定的方式。组件安装必须按照以下方法进行作业，否则保修失效。
- CSUN 光伏组件已经达到 IEC61215 标准关于机械载荷的标准。标准安装时，使用边框上内侧的四个对称安装孔或压力夹具将组件固定在支架上，CSUN 组件可以抵御 2400Pa 的风压和 5400Pa 的静雪压，建议系统设计者或安装者进行载荷计算。
- 支架以及其他所需各类物资（如螺栓等）应该由耐用、防锈蚀、抗紫外线的材料制成。

6.4.1 螺栓固定:

- 使用防腐蚀 M8 螺栓通过组件铝合金边框背面的安装孔进行固定。
- 严禁在组件玻璃表面钻孔，不要在组件边框上钻附加的安装孔，否则质保失效。
- 每一块组件至少需要在 4 个安装孔上（边框内）安装固定。
- 用 M8 螺栓固定时，在 4 个对称的安装孔位，必须加上弹簧垫圈和平垫片。

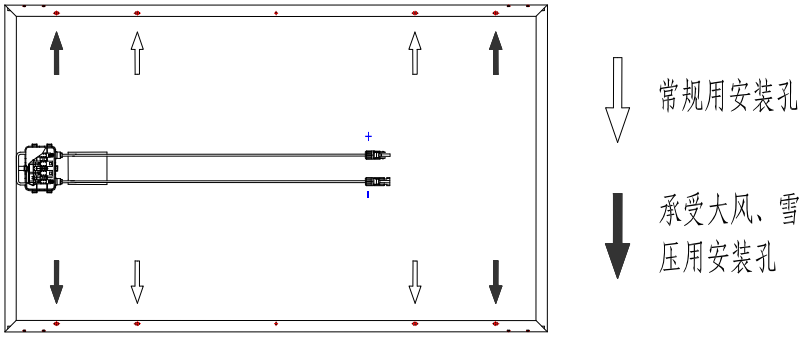


图6 安装孔示意图

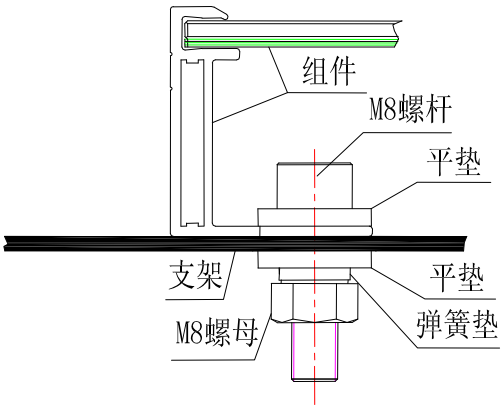


图 7 螺栓固定方法

6.4.2 夹紧方式：

（1）有框组件

- 使用合适的夹具在组件铝边框的边缘夹紧固定组件，我们建议固定在组件长边框上。 用固定夹夹持组件边框时，每个固定夹夹持组件边框 A 面的面积不小于 400mm^2。
- 用固定夹夹在边框的长边使用弹簧垫圈、平垫片和螺栓将组件固定在安装架上，固定夹必须夹在安装孔的位置。
- 注意两端都应该夹在中心对称的位置，推荐的扭矩为 8NM，参考图 8。
- 如客户有特殊的夹持和安装方案，未包含在本手册中，请咨询当地经销商获得专业支持。

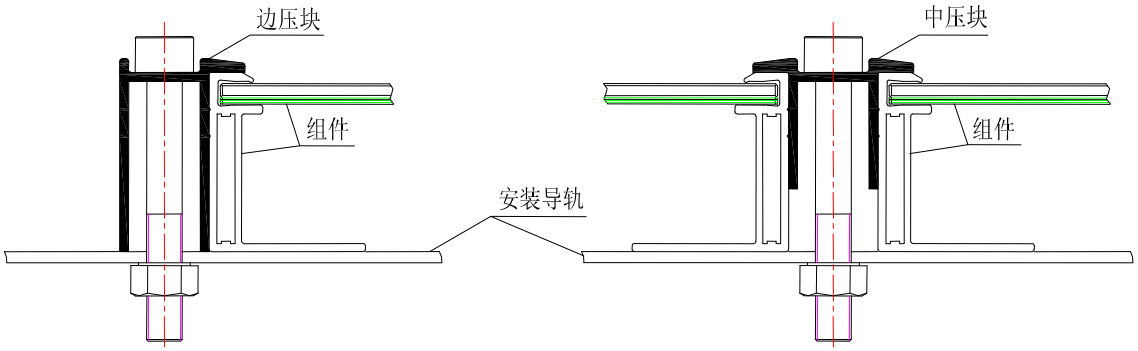


图 8 夹具安装方法

- 如组件安装区域存在较大的降雪或雪压，以及较大的风压，建议客户采用 5400Pa 加强安装的方案来夹持固定组件（如图 9 建议所示），以提高组件的正面耐静态雪压及背面的动态风压，提高系统的能力。

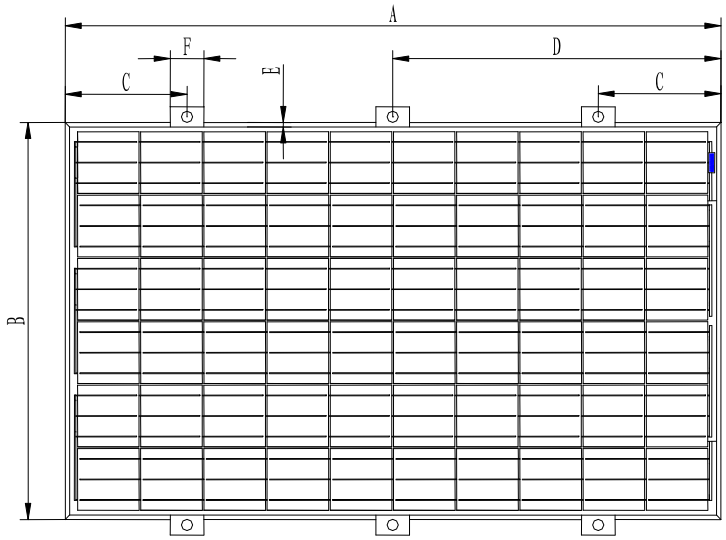


图 9 压块示意图

组件型号	机械强度/Pa	A/mm	B/mm	C/mm	D/mm	E/mm	F/mm
CSUNXXX-72M（125）	5400	1580	808	350±50	/	10	≥40
	5400（加强）	1580	808	200±50	790±50	10	≥40
CSUNXXX-60M/P	5400	1640	990	350±50	/	10	≥40
	5400（加强）	1640	990	200±50	820±50	10	≥40
CSUNXXX-72M/P	5400	1956	990	400±50	/	10	≥40
	5400（加强）	1956	990	250±50	978±50	10	≥40
CSUNXXX-54M/P	5400	1480	990	300±50	/	10	≥40
	5400（加强）	1480	990	200±50	740±50	10	≥40
CSUNXXX-48M/P	5400	1320	990	300±50	/	10	≥40
	5400（加强）	1320	990	200±50	660±50	10	≥40
CSUNXXX-24M/P	5400	1956	350	400±50	/	10	≥40
	5400（加强）	1956	350	250±50	978±50	10	≥40

注：

A：代表该类型组件长度； B：代表该类型组件宽度； C：代表该类型组件安装夹具 1 中心距端边距离；

D：代表该类型组件安装夹具 2 中心距端边距离； E：代表该类型组件安装夹具夹持组件型材宽度；

F：代表该类型组件安装夹具夹持组件型材长度；

（2）无框双玻组件

a) 压块安装

- CSUN推荐含有EDPM或者相似绝缘垫圈的夹具，固定螺栓的直径至少M8，夹具边缘到玻璃边缘的距离需在14mm~16mm之间。
- 组件加紧后需确保夹具对组件无遮挡效应。
- 采用这种夹具安装的方式，每块组件至少使用4个夹块，每个长边至少使用2个，如下图10-a、10-b所示。

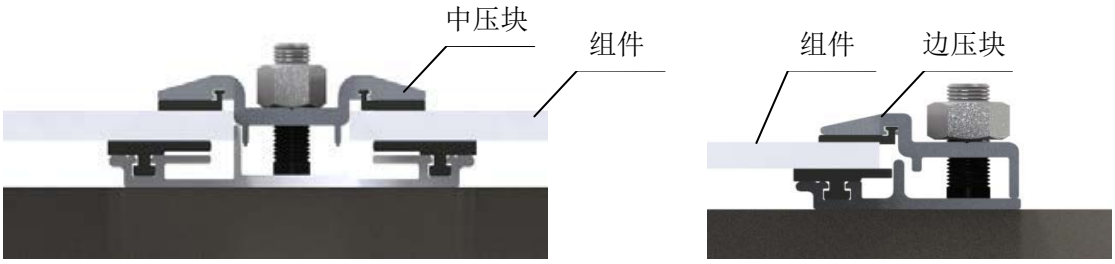


图 10-a 夹具安装方式

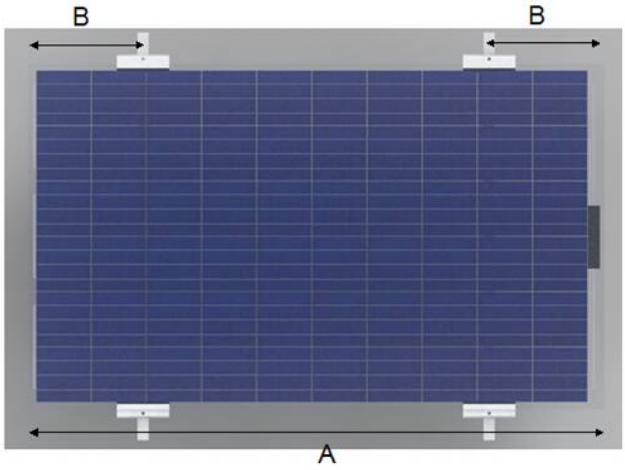
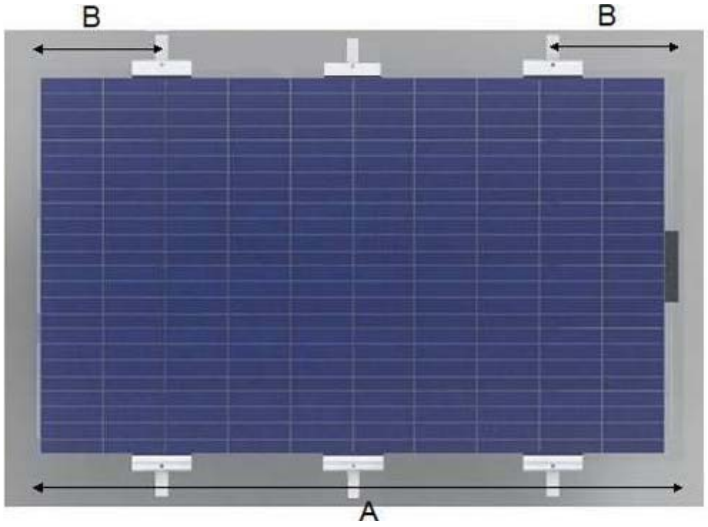


图 10-b 夹具安装位置

- 如组件安装区域存在较大的降雪或雪压，以及较大的风压，建议客户采用 5400Pa 加强安装的方案来夹持固定组件（如图 10（c）所示），以提高组件的正面耐静态雪压及背面的动态风压，提高系统的能力。



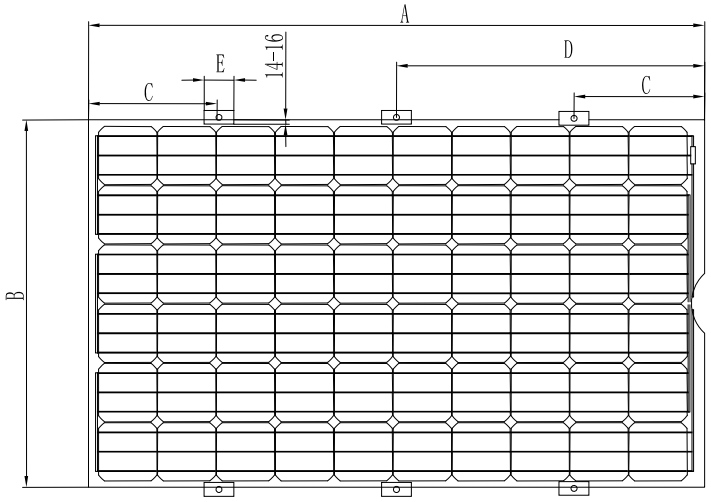


图 11

组件型号	机械强度/Pa	A/mm	B/mm	C/mm	D/mm	E/mm
CSUNXXX-60M/P	5400	1658	992	360±50	/	≥200
	5400(加强)	1658	992	360±50	829±50	≥150
CSUNXXX-24M/P	5400	1950	354	390±50	/	≥200
	5400(加强)	1950	354	390±50	975±50	≥150

注：

A：代表该类型组件长度；

B：代表该类型组件宽度；

C：代表该类型组件安装夹具 1 中心距端边距离；

D：代表该类型组件安装夹具 2 中心距端边距离；

E：代表该类型组件安装夹具夹持组件型材长度；

b) 挂钩安装

CSUN 推荐一种更简单、快捷的横梁安装方式。1658mm*992mm*5/6mm 的双玻组件挂钩在组件上的位置如图 12 所示：

- 组件出厂前，每块组件上安装两个规格 600mm*41mm*23mm 的铝合金横梁
- 挂钩的设计与专用结构的铝合金支架相匹配。

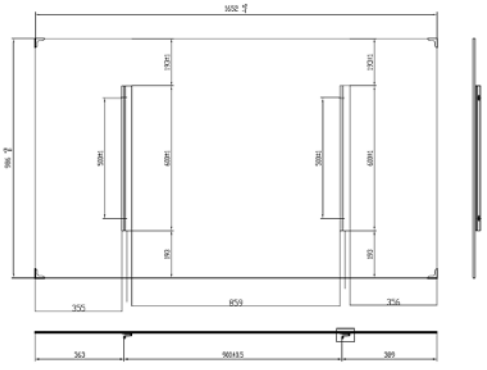


图 12 挂钩安装位置

*** 提示:**

没有遵守本安装手册而采取不正确的安装方法所导致的后果，CSUN 不予质保。当您采取夹具安装时，请注意以下几点：

A. 保护好组件的铝边框，防止铝边框变形。

B. 夹具在组件玻璃面勿产生遮挡阴影。

C. 不要破坏铝边框表面。

D. 安装时确保组件的排水孔没有被堵塞。

本节中对于安装的未尽事宜，请联系当地经销商获得专业支持。

7 电气安装

7.1 电气安装通则

- 在同一个光伏发电系统上尽量使用相同配置的组件。如果组件串联，总电压等于各个组件电压的总和，可串联的组件最大数量 (N) = Vmax（系统）/ [Voc(at STC)]。
- 在需要安装高电流的系统，可以将几个光伏组件串并联，总电流等于各串组件电流的总和，可并联组件串的最大数量 (N)= Imax (fuse rating) / Isc。
- 连接组件时应保证同一串组件的连接器是同一厂家的或者完全兼容，组件端与系统端的连接端子也需如此，不同厂家的连接件可能存在不兼容状况，易产生失配风险。
- 安装过程中禁止使用润滑油或烷烃类物质的清洗剂对连接器、接线盒、电缆等组件进行预处理。
- 所选电缆的横截面积和连接器容量必须满足最大系统短路电流(用于单个组件的电缆线横截面积推荐为 4mm^2，连接器的额定电流不小于 30A ；请注意电缆温度上限是 85℃，连接器温度上限是 105℃)。
- 安装组件时带有接线盒的一端朝上，并且尽量避免被雨水淋到。
- 不要在阴雨天气里安装，潮湿将导致绝缘保护失效，易发生安全事故。

7.2 接地

- 组件长边框上设有接地孔，如图 13-a 所示，组件和安装支架必须接地。
- 使用经过电镀处理的支撑框架，以保证导电良好。
- 用合适的接地导体，将该组件框架和支撑构件连接，以达到良好的接地效果。
- 地导体必须通过一个合适的地面电极连接到地面。如图 13-b 所示，推荐使用接地线配件（接线

鼻）连接接地电缆。将接地电缆焊接在接线鼻的插口内，然后用 M4 螺钉插入接线鼻的圆环和组件边框接地孔，用螺母紧固。应该使用星型弹簧垫圈，以防止螺钉松脱导致接地不良。

- 组件边框的接地电阻必须小于 10 欧姆。
- 如果组件使用条件处于高温高湿的环境中，要求客户配置负极接地的逆变器（如图 14 所示）。必要情况下，CSUN 推荐采用 Offset Box 或 PID Box 在夜间对组件阵列施加正电压以避免发生 PID 效应。

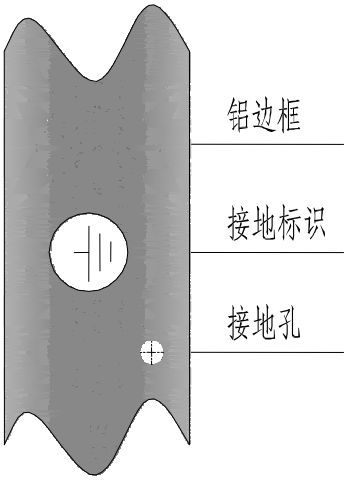


图 13-a 接地孔

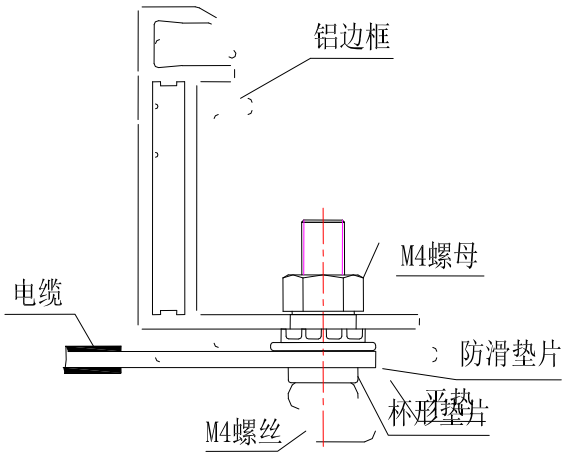


图 13-b 接地方法

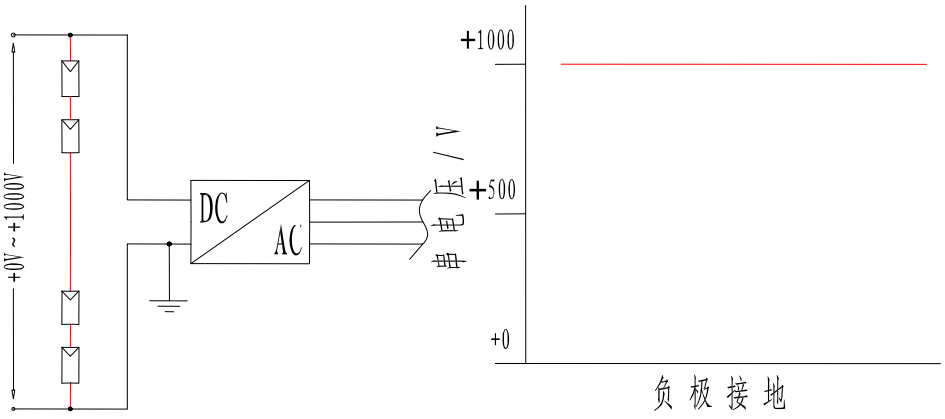


图 14 逆变器接地电势示意图

8 保养维护

- 需对玻璃表面进行定期清洁，避免因鸟粪、树叶、昆虫尸体等覆盖在组件玻璃面引发热斑风险。
- 一般情况下用软海绵或者是抹布沾水清洁。必要时，可使用中性的、不加研磨剂的清洗剂去除

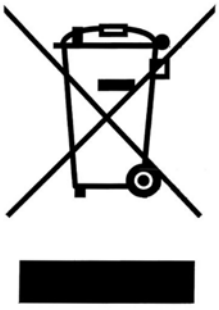
污垢。

- 清洗组件时避免局部重压组件（例如高压水枪冲刷组件），使用的力度要小于690kPa，以防损电池片，降低组件的使用寿命。及时清除组件上的积雪，避免积雪长期堆积、结冰对组件造成破坏；及时清除组件周围的植物及杂物，避免遮挡电池片，影响组件性能。
- 定期对机械和电气进行检查，确保组件接头清洁及连接可靠；检查组件是否有破损，如：玻璃，背板，铝合金边框；检查电器接口是否松动或者被腐蚀老化。
- 清洗电缆、接线盒、连接器等电气连接件时严禁使用含有烷烃类等有机物的清洗剂。
- 如有任何问题，需具有资质的人员进行检查。

*如使用未包含在本手册中的保养维护措施，请咨询当地经销商获得专业支持。

9 环境保护

- 产品符合电子电器废弃物WEEE指令和欧盟标准EN50419，不将报废组件作为未分类市政废弃物处置。
- 分离的收集及回收有助于节省自然资源，保护人类健康和环境。



CSUN Crystalline Silicon PV Module Products Installation Manual (IEC Version)

ADD.: No.123, Focheng West Road, Jiangning Development Zone, Nanjing, China

Code: 211100

TEL.: +86-25-52766666-6530/6728

FAX: +86-25-52766767

EMAIL: info@chinasunergy.com

WEB: www.chinasunergy.com

Table of Contents

Crystalline Silicon PV Module Products

Installation Manual (IEC Version)

(Version: Jan. 2017)

1 General Information

This manual contains information regarding the installation and safe handling of the photovoltaic module (hereafter is referred to as “module”) which are produced by China Sunergy Co., Ltd., or its subsidiaries (hereinafter is referred to as “CSUN”).

Installers must read and understand the manual before installation. Any questions, please contact the sales or customer service personnel of CSUN for further explanations. The installer should conform to all safety precautions in the manual and local laws & regulations when installing module; before installing a solar photovoltaic system, installers should become familiar with the mechanical and electrical requirement for such a system. CSUN has the right to refuse to compensate for the product damage due to construction or design defects of the solar photovoltaic system.

Keep this manual in a safe place for future reference (care and maintenance) and in case of sale or disposal of the modules.

2 Disclaimer of Liability

Customers shall strictly abide by the requirements of this manual when installing the modules of CSUN. If the conditions or methods of the installation, handling, use and maintenance of the customer are beyond the range specified in this manual and cause damage, CSUN does not assume responsibility for any loss, damage or expense thus caused.

No responsibility is assumed by CSUN for any infringement of patent right or other rights of third parties, which may result from the customer’s use of the CSUN’s modules. No patent license or patent rights is granted to customer, express or implied, due to its use of CSUN’s modules.

The information in this manual is based on CSUN’s best knowledge and experience and is believed to be reliable; but such information including product specification (without limitations) and suggestions do not specifications, or product information without prior notice.

3 Safety Precaution

3.1 General Safety

- When installing the modules, it should be abided by the relevant local laws and regulations. It is need to obtain the required certificates in advance when necessary, such as the building permit.
- Installing solar photovoltaic systems require specialized skills and knowledge. Installation should be performed only by qualified persons. Installers should assume the risk of all injuries that might occur during installation, such as electric shock.
- Photovoltaic modules are designed for outdoor use. Modules may be mounted on ground, rooftops, vehicles or boats. Proper design of support structures is the responsibility of the system designers or installers. Mounting holes or clamp range and numbers suggested in this manual shall be used.
- A single module may produce the direct current (hereafter is referred to as DC) voltage of above 30V in direct sunlight and it is extremely dangerous to contact it.. Do not touch or lean on an operating module.
- Do not disconnect under load or apply paint or adhesive to module surface.
- Keep all electrical contacts clean and dry. Do not change the wiring of the bypass diodes. Do not disassemble the modules or remove any attached nameplates or components from the modules.
- Do not use mirrors or other magnifiers to artificially concentrate sunlight on the modules. Do not expose the backside of modules directly to sunlight for a long time.
- Modules should store in a dry and ventilated environment. In the storage and handling process,in case of inclement weather (rain, snow, wind, etc.) , materials such as plastic film and waterproof cloth need to be covered on the packing boxes.
- During normal work, materials such as plastic film and waterproof cloth are forbidden to be covered on the glass surfaces of modules.

3.2 Handling Safety

- Keep children and unauthorized persons away from the modules while transporting and installing them. Improper transportation and placing may lead to glass breakage or power loss of the modules, resulting in the loss of the use value of modules.
- Handle modules with care. Lift and put down modules gently. Do not drop modules or drop objects

on the modules. Pay special attention not to collide, scratch or press the module backside when transporting and installing the modules. The double glass module should be handled more carefully. Non-slip gloves are required when handling and during installation.

- It is forbidden to pull the junction box or cables when carry or lift the modules. Carry a module by its edges with two or more persons. Increasing one or two persons lift up the middle of the panel is necessary for Non-frame module.
- Do not stack the modules for transportation. Do not set the modules down on any hard surface, which maybe cause the cells broken.
- To avoid module damage, do not place heavy objects or tools on the modules, and do not stand or step on the modules.
- Inappropriate transport and installation may damage the module. Control the vehicle speed when the road condition is relatively poor.

3.3 Installation Safety

- Abide by the safety regulations for all other components used in the system, including wiring and cables, connectors, solar charge controller, inverters, storage batteries, etc. Use suitable equipment, connectors, wiring and mounting system for a PV system. Use the same type modules and ensure color grade consistent as far as possible in one system.
- Do not install or handle the modules when they are wet or during strong wind.
- Modules are constructed with tempered glass, which shall be handled with care. Improper operations may cause the tempered glass breakage. If the front glass is broken or if the backsheet is burned-out, contact with any module surface or the aluminum frame can produce electrical shock, particularly when the module is wet. Broken or damaged modules must be disposed properly.
- The maximum system voltage is indicated in the nameplate. During the system installation, the maximum open circuit voltage in series cannot exceed the maximum system voltage.
- Completely cover the module with an opaque material during installation to keep electricity from being generated. Under high temperature and high humidity environment, the material component of glass surface will not cause pollution, such as rubber glue splotch, oil, printing and dyeing, etc. Contact the glass surface with bare hand is prohibited.

- Do not place the glass surface or the backsheet surface of the modules down directly on the ground in the installation site (mud, sandy land, grassland, Gobi, etc.).
- Modules not used up should be stored and transported after packaging in accordance with the manufacturer's packaging.
- Do not wear metallic rings, watchbands, ear, nose, lip rings or other metallic devices while installing or troubleshooting photovoltaic systems. Use insulated tools that are approved for working on electrical installations and always keep them dry.
- The triangle hole punched on the backside frame of the module is the drain hole which cannot be blocked.
- During modules interconnection, guarantee to fix the connecting cables to the mounting system, so as to restrict the swing amplitude of the slack part of the wire.
- Conform to the allowable minimum bending radius of the wire.
- Always protect the wire with conduit where animals or children can touch it.
- Please use the connector which is specially designed for photovoltaic system and assemble it with the tools recommended or specified by the manufacturer. In case that the connector applicable to the solar photovoltaic system is required, please contact the local supplier.
- Make sure that the polarity is correct when connecting the module with inverter, storage battery or combiner box to avoid the damage of bypass diodes in the modules due to incorrect polarity.

4 Product Identification and Current Sorting

(A) Product Identification

Each module has labels providing the following information:

- Nameplate：Describes the product type, rated power, rated current, rated voltage, open circuit voltage, short circuit current, all are measured at STC; weight, dimension, maximum system voltage and the fuse rating are all shown on the nameplate.
- Barcode：Each module has a unique serial number. It contains the relevant production information of the module.

(B) Current Sorting

Each module has a specific label on either side of long aluminum frame (as shown in FIG 1) with the

following information:

- Modules are sorted by Impp (current at maximum power point). Different color labels with distinct alphabetical letters (I_1, I_2, I_3, I_4……) are used to represent the Impp class.
- CSUN recommends connecting the same Impp class modules in series in order to avoid or minimize power loss due to mismatch effects in arrays.

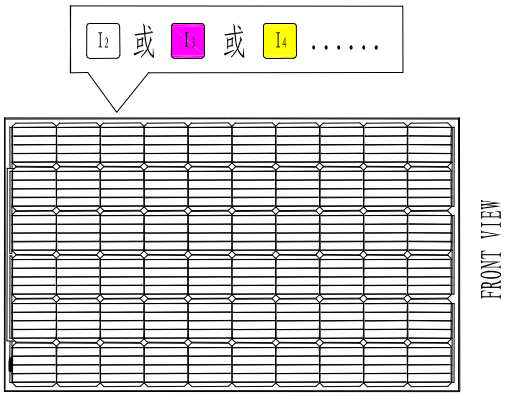


FIG 1 Label of module current

5 Electrical Property Parameters of Modules

- Under Standard Test Conditions (1000W/m², AM1.5 and 25ºC (77°F)) the electric characteristics, including Isc, Voc and Pmax,the deviation between the measured value and nominal value is within ±10%.
- Under normal outdoor conditions, a module is likely to produce different current and voltage than the values measured under STC in the specification of CSUN module products. Therefore, when determining the parameters related to the power output of the module, for example, nominal voltage, conductor capacity, fuse capacity and controller capacity, etc., refer to the values of short-circuit current and open circuit voltage of the modules, and take 125% of those values during design and installation.
- The maximum nominal voltage for all module series is 1000V or 1500V according to IEC standards.Please check it according to the nameplate.

6 Installation Instructions

6.1 Installation Environment

- In most applications, PV modules should be installed in a location where they will receive maximum sunlight throughout the year.
- The module shall be installed in the place where the sunshine is adequate. The module should not be shaded at any time during its operation. During installation, the module surface shall not be partly shaded by clothes, tools, packaging materials, etc.
- Install the module in well ventilated place and guarantee that adequate natural air heat dissipation channels are provided at the back and sides of the module to ensure that the heat generated during operation is radiated in time.
- Never place the module in locations where flammable gases may be easily generated or collected.
- CSUN suggests installing the module in dry areas where the climate is moderate. The modules shall not be allowed to be mounted in the site with excessive hail, snow, sand, smoke dust and so on.
- CSUN's modules have passed the certification of IEC 61701 with 5% NaCl. But corrosion probably occurs in the contact place between modules and mounting brackets. Without the approval of CSUN, modules should not be installed in the site which is within 500m away from the sea.
- Modules connected in series should be at the same tilt and azimuth. Differing orientations or angles may cause a loss of power output due to differing amount of sunlight exposure for each module. Typically, the optimal tilt for a module is roughly the same as the installation location.
- When unpacking the modules should be installed as soon as possible and connected to the combiner box to avoid connection failure. Protecting covers are advised to be used if modules are installed in the site with heavy sand or salt mist.

6.2 Selection of Mounting Structure

- Always conform to the instruction manual and safety rules attached to the mounting system.
- The entire PV system consisting of modules must be able to withstand anticipated mechanical pressure which comes from local wind force, snow, etc.
- Drilling holes on the surface of module glass may void the warranty.
- Drilling additional mounting holes on module frames may void the warranty.

- The mounting system structure must be made of durable, corrosion-resistant and UV-resistant materials.
- Forces generated during thermal expansion and contraction of the mounting system structure shall not influence the performance and use of the module.
- The bearing surface of the mounting structure must be smooth without any twist or deformation, and the connected support frames shall be at the same height.

6.3 Three kinds of Mounting

(A) Roof Mounting

- It is necessary to provide a special support frame for the roof mounting. When installing a module on a roof or building, ensure that it is securely fastened and cannot fall or be damaged as a result of strong winds or heavy snows. During roof mounting, check the building codes being used to ensure that the building and its structure where the module is installed have adequate bearing capacity. The roof needs to be penetrated during module installation and fixing shall be sealed to avoid rainwater seepage.
- To be suitable for operation, reduce steam condensation and facilitate the ventilation & heat dissipation of the module during tile installation, the module shall be parallel to the wall or roof surface of the building, and the clearance between module and surface of the wall or roof shall be at least 115mm to prevent wiring damage and to allow air circulation, ventilation and heat dissipation behind the module. During stacking type installation, the module shall be installed on the fire-resistant roof. The modules Fire Resistance Rated Class of the modules is Class C, and the modules are suitable for mounting on an above Class A roof. Do not install modules on a roof or building during strong winds.
- For the roof system installed in the area that ever experienced relatively heavy snowfall or snow cover, the customer shall reinforce the mounting system at the lower frame of the module, in order to prevent the lower frame from being pressed and damaged by the falling snow, and avoid the module damage due to melt snow freezing in daytime. CSUN suggests to selecting the support reinforcing mechanism shown in Figure 2.

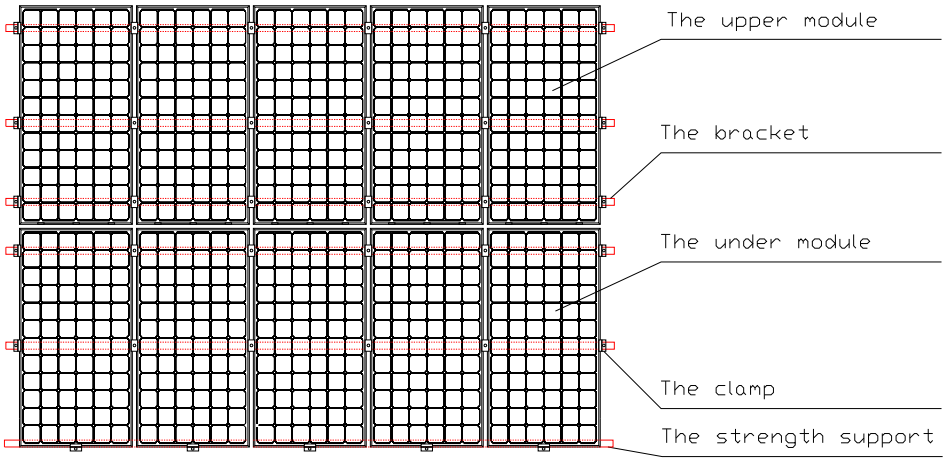


FIG 2 Schematic diagram of reinforcement mounting of module

(B) Pole Mounting

- When installing a module on a pole, choose a pole and module mounting structure that will withstand the anticipated wind power of the local area. The support rod must be constructed on a solid foundation.

FIG 3 Pole mounting

FIG 4 Ground mounting

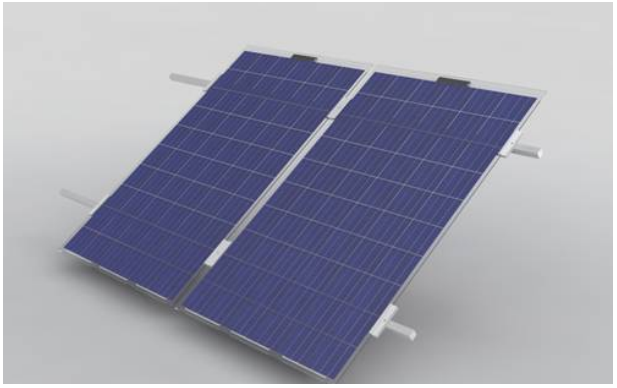


FIG 5 Non –frame double glass clamp mounting

(C) Ground Mounting

- Select the height of the mounting system to prevent the lowest edge of the module from being covered

by snow for a long time in winter in areas that experience heavy snowfalls. The module shall be installed on the mounting system with appropriate height instead of being directly laid on the ground. In addition, assure the lowest portion of the module is placed high enough, so that it is not shaded by plants or trees, and the module is not damaged by sand and stone driven by wind, or the module surface is not shaded by the mud splashed by rain water.

6.4 Two Installation Methods

- Modules can be installed on the frame using mounting holes or clamps. Modules must be installed according to the following examples. Not mounting the modules according to these instructions may void the warranty.
- The modules have been evaluated by IEC61215 standard for mechanical losd design. CSUN modules can sustain 2400Pa wind pressure and 5400 Pa snow load. System designer and installer are responsible for load calculations.
- The mounting system and other various goods & materials required (such as screw) shall be made of durable, corrosion-resistant and UV-resistant materials.

6.4.1 Screw fitting:

- Using corrosion-proof screws (M8) in the existing installing holes in the module frame.
- Do not attempt to drill holes in the glass surface or additional mounting.
- The frame of each module has 4 mounting holes used to secure.
- The module frame must be attached to the mounting system using M8 stainless steel hardware together with spring washers and flat washers in four places symmetrical on the module.

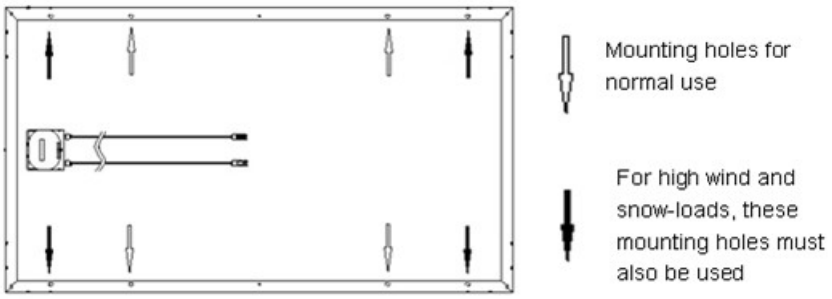


FIG 6 Mounting holes

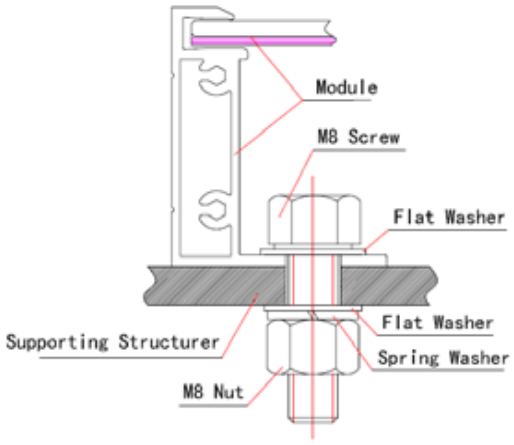


FIG 7 Screw fitting method

6.4.2 Clamp fitting:

(1) Frame module

- Using suitable module clamps on the side of the module frame to mount the modules we suggest installer use the long side of the module frame. When using clamps to clamp the module frame, the area of side A of module frame clamped by each clamp shall be no less than 400 mm^2.
- The modules should be fixed to the structure using M8 stainless steel hardware together with corrosion-proof clamps on the long side. The clamps must be mounted at the position of the mounting hole or CSUN suggested clamp range and numbers.
- Note that long sides should always be mounted in a symmetric position respect to the center. Recommended torque should be 8 Newton-meters. Please see details in FIG 8.
- If the customer has special clamping and installation schemes which are not included in this manual, please contact the local dealer for professional support.

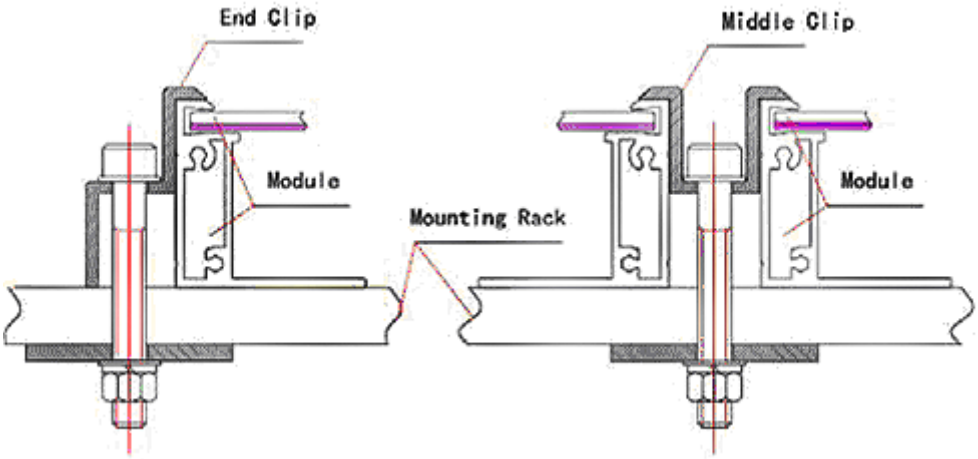


FIG 8 Clamping mounting method

- If heavy snowfall, relatively large snow load or large wind pressure exist in the module installation area, CSUN suggests the customer to selecting the 5400Pa strengthening installation scheme to clamp and fix the module (as shown in FIG 9) to improve the bearing capacity of the module for static snow load at front side and dynamic wind pressure at back side, and enhance the system capacity.

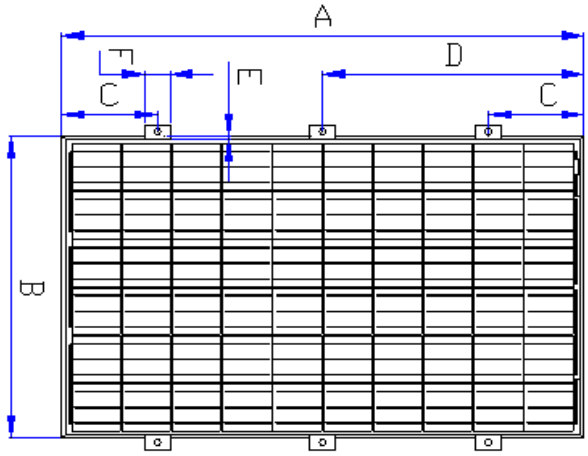


FIG 9

Module type	Mechanical Loading/Pa	A/mm	B/mm	C/mm	D/mm	E/mm	F/mm
CSUNXXX-72M(S125)	5400	1580	808	350±50	/	10	≥40
	5400(strengthening)	1580	808	200±50	790±50	10	≥40
CSUNXXX-60M/P	5400	1640	990	350±50	/	10	≥40
	5400(strengthening)	1640	990	200±50	820±50	10	≥40
CSUNXXX-72M/P	5400	1956	990	400±50	/	10	≥40
	5400(strengthening)	1956	990	250±50	978±50	10	≥40
CSUNXXX-54M/P	5400	1480	990	300±50	/	10	≥40
	5400(strengthening)	1480	990	200±50	740±50	10	≥40
CSUNXXX-48M/P	5400	1320	990	300±50	/	10	≥40
	5400(strengthening)	1320	990	200±50	660±50	10	≥40
CSUNXXX—24MP	5400	1956	350	400±50	/	10	≥40
	5400(strengthening)	1956	350	250±50	978±50	10	≥40

Note:

A: Length of this type of module; B: Width of this type of module;

C: The distance of clamp center1 from the edge of this type of module;

D: The distance of clamp center 2 from the edge of this type of module;

E: Clamped width of the module frame by the clamp of this type of module;

F: Clamped length of the module frame by the clamp of this type of module;

（2）Non-frame double glass module

- CSUN Solar recommends the use of clamps which have an EPDM or similar insulating washer, and a

fixing bolt thread diameter of at least M8. The clamp must overlap the module edge by at least 14 mm but no more than 16mm.

- Be sure to avoid shadowing effects from the module clamps.
- When using this type of clamp-mounting method, use at least four clamps on each module. Two clamps should be attached on each long side of the module (as shown in FIG 10).

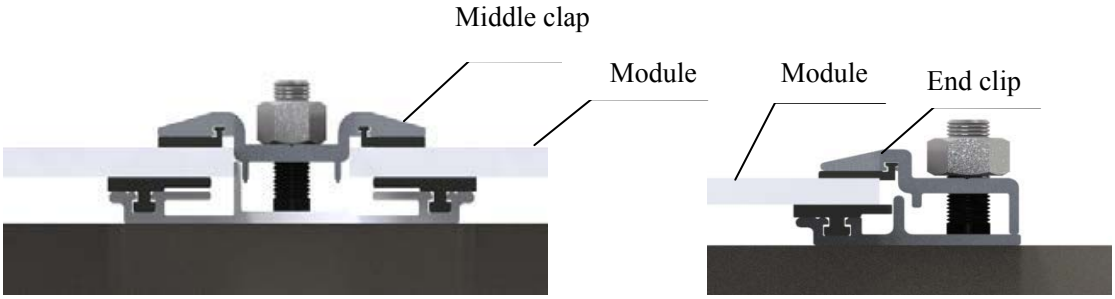


FIG 10-a Clamping mounting method

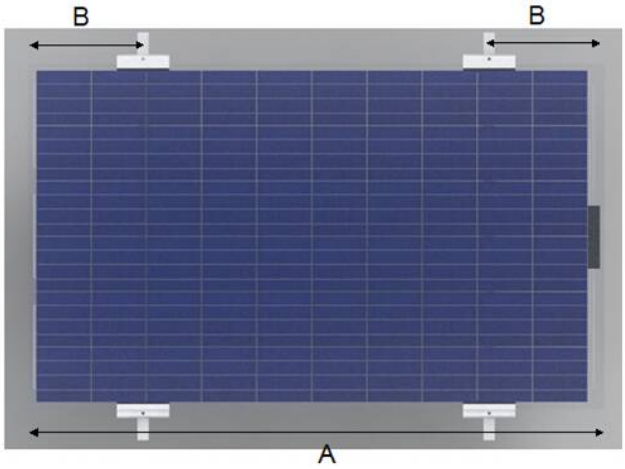


FIG 10-b The position of clip mounting

- If heavy snowfall, relatively large snow load or large wind pressure exist in the module installation area, CSUN suggests the customer to selecting the 5400Pa strengthening installation scheme to clamp and fix the module (as shown in FIG 11) to improve the bearing capacity of the module for static snow load at front side and dynamic wind pressure at back side, and enhance the system capacity.

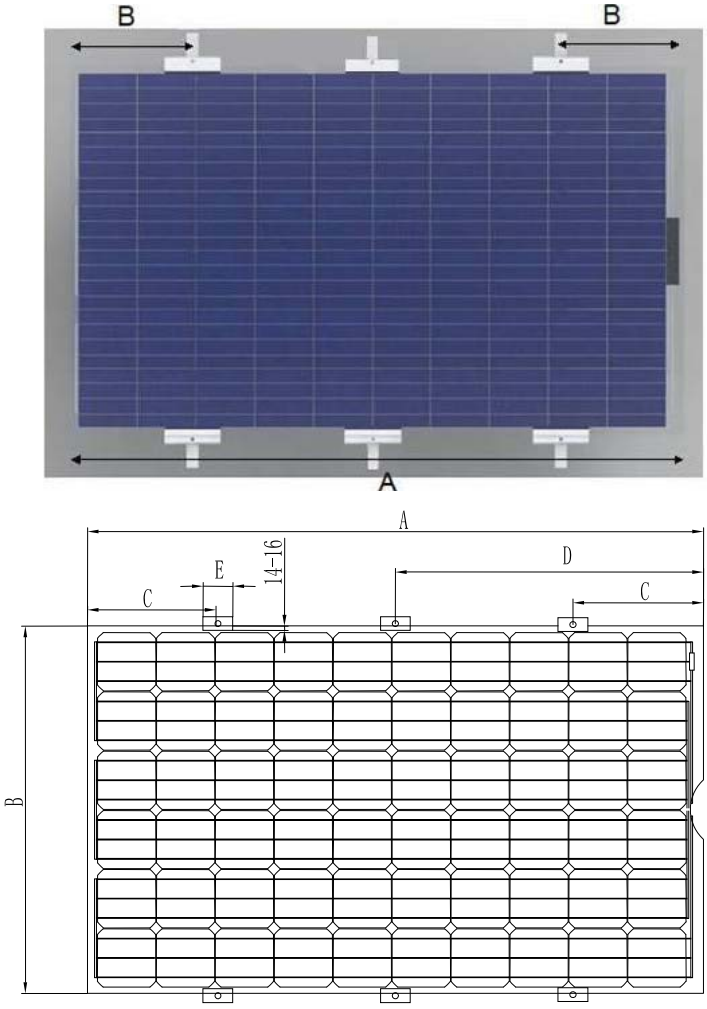


FIG 11

Module type	Mechanical Loading）/Pa	A/mm	B/mm	C/mm	D/mm	E/mm
CSUNXXX-60M/P	5400	1658	992	360±50	/	≥200
	5400(strengthening)	1658	992	360±50	829±50	≥150
CSUNXXX-24M/P	5400	1950	354	390±50	/	≥200
	5400(strengthening)	1950	354	390±50	975±50	≥150

Note:

A: Length of this type of module;

B: Width of this type of module;

C: The distance of clamp center1 from the edge of this type of module;

D: The distance of clamp center 2 from the edge of this type of module;

E: Clamped length of the module frame by the clamp of this type of module;

*** NOTES:**

CSUN's limited warranty will be void in cases where improper clamps or installation methods deviating from this manual are used. When installing inter-modules or end type clamps, take measures so as:

A. Not to bend the module frame.

B. The clips must only fix the modules by the contact with the frame. Do not allow contact between clip and glass.

C. Not to damage the surface of the frame.

D. When mounting, be sure that the module's drain holes are not blocked.

For matters concerning installation not mentioned in this section, contact the local dealer for professional support.

7 Electrical Installation

7.1 General With Regard to Electrical Installation

- Try to use the modules with the same configuration in the same photovoltaic system. If the modules are connected in series, the total voltage is the sum of voltages of all the modules, and the maximum number of the series modules (N)=Vmax (System)/[Voc(at STC)].
- If the system requires the installation of high current, several photovoltaic modules can be connected in parallel, and total current is the sum of current of all the modules. The maximum number of the parallel module strings(N)=Imax (fuse rating) / Isc.
- When connecting modules, make sure that the connectors of the same series module shall come from the same manufacturer or totally be compatible with each others, and the same requirements shall go to the connection terminals of module end and system end, for the connectors of the different manufacturers may not be compatible with each others, which easily leads to mismatch risk.
- The cross section area and connector capacity of the cable selected must satisfy the maximum short-circuit current of the system (It is recommended that the cross section area of the cable used for the single module is 4mm^2, and the rated current of the connector is not less than 30A. Please note that the upper temperature limit of the cable and connector is 85℃ and 105℃ respectively).
- When installing the module, place the end with the junction box up and try to avoid the rain.
- Do not carry out installation in rainy weather for humidity will void the insulation protection, thus causing safety accidents.

7.2 Grounding

- All module frames and mounting racks must be properly grounded. The grounding wire must be properly fastened to the module frame to assure good electrical contact. Use the recommended type,

or an equivalent, connector for this wire.

- If the mount system is made of metal, the surface of the structure must be electroplated and have excellent conductivity.
- Proper grounding is achieved by connecting the module frame(s) and structural members contiguously using a suitable grounding conductor.
- The grounding conductor must then make a connection to earth using a suitable earth ground electrode. Recommend to use the ground wire accessories (lugs) connected to ground Cable. Welding ground cable to the jack of lugs, and then with the M4 screws inserted into the wiring nose ring and t the grounding hole of the module frame, fastening with nuts. Star spring washers should be used to prevent the screws from loosening and lead to poor grounding (as shown in FIG12).
- The module frame to EARTH resistance must be less than 10 ohm.
- If the modules are used in high-temperature and high-humidity environment, CSUN requires the customer to ground the negative end of the inverter (as shown in FIG13). Offset Box or PID Box can also be used instead to apply a positive voltage to the module arrays at night to avoid PID.

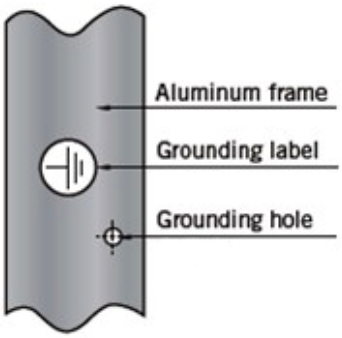


FIG 12-a Grounding hole

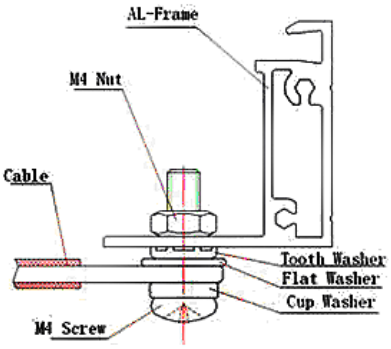
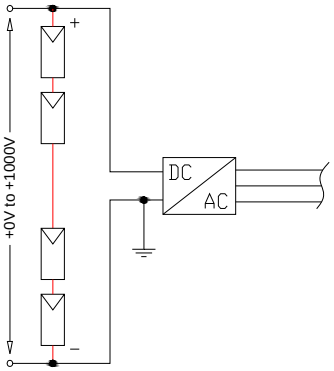


FIG 12-b Grounding method



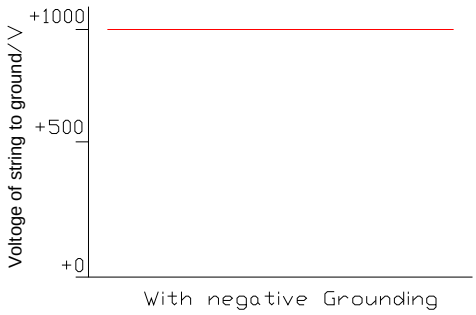


FIG 13 Schematic diagram for grounding potential of the inverter

8 Maintenance and Care

- Clean the glass surface on a regular basis. Avoid the hotspot risk caused by ornithocopros, leaves and dead insects covering the glass surface.
- In general, use water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent can be used to remove stubborn dirt.
- Avoid pressing part of the module hard during cleaning, such as washing modules by water torch. The strength on the module is less than 690kPa, because pressing hard may cause glass deformation, cell damage and service life reduction. Remove the snow covered on the module in time to avoid the module damage caused by long-term accumulation of snow cover and freezing of melted snow. Remove plants and sundries surrounding the modules in time to stop them from shading modules and influencing the property.
- Examine the PV module(s) for signs of deterioration. Check all wiring for possible rodent damage, weathering and that all connections are tight and corrosion free. Check electrical leakage to ground. Check fixing screws and mounting brackets, adjust and tighten as necessary.
- Never clean the electrical connectors including cable, junction box and connector with the cleaning agents that contain organic matters such as alkane.
- If any problem arises, have it investigated by a competent specialist.

* If the maintenance measures are not included in this manual, please contact the local dealer for professional support.

9 PV recycling

Do not dispose the PV module as unsorted municipal waste in accordance with WEEE Directive (Waste from Electrical and Electronic Equipment Directive), EN50419and all the other applicable laws.

-END