AUSGEM ENERGY
Designed for Australians

OBSIDIAN SERIES

N-Type Monocrystalline Dual Glass Modules

Installation Manual

AUSTRALIA
Revision Date 27/01/2022

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1. Introduction

This manual contains relevant information about the installation methods and safe operation of photovoltaic modules (hereinafter referred to as "modules") of EEMU Pty Ltd T/A Ausgem Energy (hereinafter referred to as Ausgem). Now the standard modules AG-OS108N, AG-OS120N, AGOS144N series are included, the manual would be updated when new modules are introduced in the future. Failure to follow these safety guidelines may result in personal injury or death or property damage.

The Installers must read and understand this guide before installation. For any questions, please contact our customer service department or our local representative for more detailed information. The installer must follow all safety precautions in this guide, local requirements, regulations of laws or authorised agency requirements. Before installing a solar photovoltaic system, the installer should be familiar with its mechanical and electrical requirements. The installer requires relevant professional knowledge, and the system must be installed and maintained by qualified persons with professional knowledge.

Please store this guide in a safe place for future reference (maintenance), which would also be useful when selling or disposing of the modules.

The module of Ausgem have passed the tests of IEC standards in certification agencies. Please rest assured that you can use them under the premise of complying with the requirements of this installation manual.

The module installer must inform the end customer (or consumer) of the above matters accordingly.

1.1. Declaration

Ausgem reserves the right to change this installation manual without prior notice. Ausgem does not make any guarantee for any express or implied information contained in this manual. If the customer fails to follow the requirements listed in this manual during the installation of the modules, the limited product warranty provided would be invalidated.

1.2. Limitation of Liability

For any of the following injuries or losses, including but not limited to bodily injury and property damage caused by module operation, system installation errors, and failure to follow the instructions of this manual, Ausgem is not responsible for that.

2. Safety Instructions

2.1. Warning

Before installing, wiring, operating or maintaining modules, you should read and understand all safety rules. Modules will generate electricity when exposed under a light source environment. The generation of electricity from the array of multiple modules would cause fatal electric shock or burns. Person(s) without authorisation and relevant training should not touch modules and wiring terminals.

2.2. General Safety

2.2.1. It is strictly forbidden to use modules with broken glass. Damaged modules must not be repaired. Contact with the surface of the modules may cause electric shock. Do not disassemble the module or remove any part of the module. Do not artificially gather sunlight on these solar modules.

2.2.2. The operator of the system requires relevant professional knowledge, and the system must be installed and maintained by qualified person(s) with professional knowledge. Person(s) without authorisation and relevant training should not touch modules and approach the installation area or module storage area.

2.2.3. Do not connect the positive terminal of a single module to the positive terminal of another module. Please make sure that the polarity of each module or module string is not opposite to other modules or module strings. Please make sure that there are no gaps between the insulating washers of the joint. If there are gaps between the insulating washers, it may cause the risk of fire or electric shock.

2.2.4. According to the requirements of the National Electrical Code, the maximum system voltage should not exceed 1500V.

2.2.5. Do not install module when the module is wet or on a windy condition.

2.3. Operation Instruction

2.3.1. In order to avoid damaging the modules, please do not scratch or hit the module, and do not use paint or adhesive on the front or back side of the module. To ensure insulation performance of modules from being damaged, please avoid scratching, cutting the cables and connectors or expose under the sun for a long time. Do no drop the module or drop other things onto the module surface. Do not place any heavy or sharp objects on the module surface.

2.3.2. Please do not use water to extinguish fire when the power is on.

2.3.3. Only work in a dry environment, and only use dry tools. Do not work in a humid environment without wearing any protective measures. When exposed under the sun, no matter whether the module is connected or not, please do not directly touch the junction box connector, cable or other charged objects of the module without any protection.

2.3.4. It is forbidden to climb, step on stand, walk or jump directly on the package or module.

3. Unload, Transportation and Storage

Preventive measures and general safety rules:

Modules should be stored in the original box before installation. Please protect the package from being damaged. Transport or unpack modules with recommended shipping methods and unpacking procedures. To avoid damage, scratch or strike the module, do not apply pressure directly on the module during transportation. Improper transportation or installation also may damage the module, which is excluded from the warranty. Do not stand, climb, walk or jump on unpacked pallets of modules.

Always work under a dry environment, ensure that all modules and electrical contacts are clean and dry before installation. If it is necessary to store the modules outdoors for a certain period of time, always cover modules and ensure that the glass surface is facing down on a soft surface, preventing water from entering inside of the module, preventing connectors from being damaged. Unpacking must be operated by two or more people at the same time. Do not lift module by grasping the module terminal box or lead wires. Use both hands to carry the module and do not stack modules. Do not place modules in

an environment without reliable support or unfixed. Do not place any heavy objects or sharp objects on modules.

3.1. Marks on outer packaging

3.1.1. Prohibit discarding modules randomly, special recycling is needed

3.1.2. Protect modules from rain or moisture

3.1.3. Modules in carton are fragile, shall be handled with care

3.1.4. The package should be vertically up during transportation

3.1.5. Do not step on or stand above package or module

3.1.6. Stack no more than 2 layers

3.2. Unloading Instructions

3.2.1. When unloading modules from vehicle, less than 2 lots of the package could be lifted each time with a reasonable fixture. Before lifting, ensure that the trays and cartons are undamaged and the hoisting ropes are durable. When the hoisting is near the ground, two people should put the carton gently on a relative flat position. Using a forklift to remove modules from the truck, unloaded modules should be placed on a level surface.

3.2.2. When modules are temporarily stored in a project site, modules should be placed in a dry and ventilated place. Do not stack modules at a project site. Cover modules with a tarpaulin, the tarpaulin should be fixed by a curtain or mesh belt to protect modules from moisture and rain.

3.3. Secondary Transportation and Precautions

3.3.1. If the module would be transported for long distance or stored for a long period, it is forbidden to remove the original package. Modules packed with original package could be transported by land, sea, or air. During transportation, fix the package to the transport flatform to ensure it would not be tumbled. Taking

land transportation as an example, when transported with a truck, stacking up should be less than two layers, it is forbidden to cut the packaging belts of packages.

3.3.2. If is forbidden to remove the original package when modules transported at a project site. One pallet should be transported each tie. During transportation, fix the package to the transport platform to ensure that the package would not be tumbled. Do not use tricycle to transport modules. Do not handle modules with rope during transportation, and it is forbidden to carry or drag modules through the wires or the junction box of the modules.

3.4.Storage

3.4.1. It is forbidden to let modules be exposed to the rain or get wet. If it is necessary to store modules outdoors for a certain period of time, modules should always be covered.

3.4.2. Warehouse requirements: Humidity <70%; Temperature -20°C ~+50°C. Modules should be stacked less than 2 layers.

4. Unpacking Instruction

4.1. Unpacking safety instruction

4.1.1. When modules are unpacked outdoors, it is forbidden to work under rain, as carton would become soft and be broken. Modules inside of it would come out, damaging or bruising may be caused to the module. During windy days, special attention should be paid for safety, it is recommended not to transport modules, and the unpacked modules should be properly fixed.

4.1.2. The ground needs to be flat enough to ensure the package could be placed horizontally and stably. Supportive tools should be used when disassembling the carton to prevent the modules from falling down.

4.1.3. Wear protective gloves during unpacking to avoid injury and fingerprints on the glass surface.

4.1.4. Module information could be queried from the outer packaging, please read it carefully before unpacking.

4.1.5. Each module should be lifted by 2 people. Do not lift modules by grasping the module terminal box or lead wires. Use both hands to carry module, do not stack modules during lifting.

4.1.6. The unpacked modules must all be installed, should not be stored at the project site.

4.2. Unpacking Steps

4.2.1. Before unpacking, please check the product name and serial number on an A4 paper on the surface of the package, unpacking method should not be randomly changed.

4.2.2. When unpacking, cut all vertical packing belts with a blade or scissors, first cut the long side packing belt, secondly cut the short side packing belt. Remove the upper cover of the carton and take out two or three upper lifting brackets.

4.2.3. When removing modules from the package, two people must stand on each side of the box while lifting the module, one hand grasping the corner of the module, the other hand grasping the short side of the module. When unpacking on a horizontal floor, remove modules from one side to the other of the package, and then carry them. If unpacking on a non-horizontal floor, use a supportive tool to ensure the package is placed vertically.

4.2.4. Modules removed out of package are prohibited from leaning against a unreliable support or an unfixed object.

5. Installation

Double glass modules produced by Ausgem could work for more than 30 years under proper conditions. Modules with an expired life should be reasonably disposed in accordance with local laws and regulations.

5.1. Installation Safety

5.1.1. The modules produced by Ausgem could be installed landscape or portrait, the influence of shading effect caused by dust could be minimised when installed landscape.

5.1.2. Do not remove module package before installation.

5.1.3. When installing modules, only work in a dry environment with dry tools. Do not work in a humid environment without wearing any protective measures. Do not install modules under any rainy, snowy or windy conditions. Keep the connectors dry and clean when installing modules to avoid the risk of electric shock. If the terminal of the module is wet, no work could be done,

otherwise electric shock may be caused. Modules should be installed immediately after it is unpacked.

5.1.4. Do not wear metal rings, wristwatches, earrings, nose rings, lip rings, or other metal materials when installing or repairing PV systems.

5.1.5. Use opaque materials to cover the module completely during installation. Do not open the electrical connection or pull out the connector while the circuit is under load. Do not touch the modules during installation unless necessary. Glass surfaces and brackets may have high temperature, which might lead to the risk of hazardous burns and electric shock.

5.1.6. Do not damage the back glass of the module when modules are mounted on the bracket. If modules need to be replaced, do not damage the surrounding modules or mounting structure.

5.1.7. When installing modules do not work alone and keep working with a team of two or more people.

5.1.8. After modules are installed, the cables should be fixed or tied to avoid exposure under direct sunlight after installation, which would prevent cable from aging. Low-hanging cables can cause various problems, such as electrical leakage and fire.

5.1.9. The application level of module produced by Ausgem is Class A. modules with different colour should be avoided from installation in the same array or roof.

5.2. Installation Method

5.2.1. Mechanical Installation and Precautions

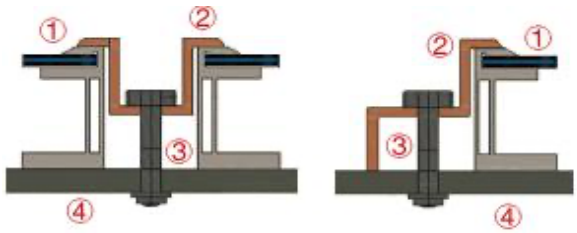
Modules could be mounted with clamps or bezels. Module installation must be carried out according to the following examples and recommendations. If the installation method is different from the methods below, please consult Ausgem's local technical support or aftersales to obtain the consent of Ausgem, otherwise when the modules are damaged, the limited warranty would be invalid.

The mechanical load of the module (including snow and wind loads) depends on the way of module installed. The mechanical load should be calculated by the professional system designer based on actual conditions and environment. Moreover, it does not withstand the excessive force generated by the thermal

expansion of the support structure. The drain hole should not be blacked under any conditions during installation or use.

5.2.2. Framed Bifacial Double-Glass Modules (Installation with Clamps)

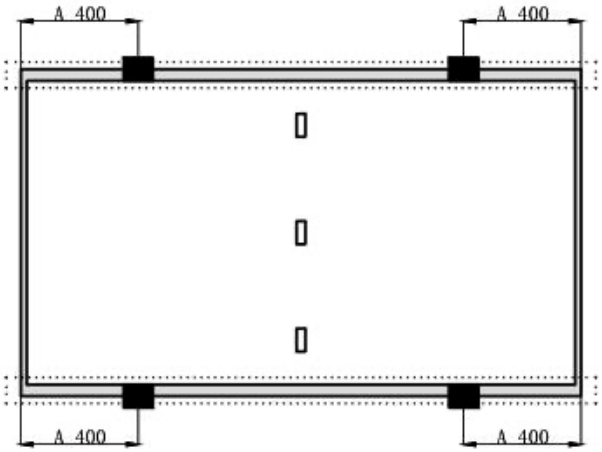
Edge Clamp & Middle Clamp:



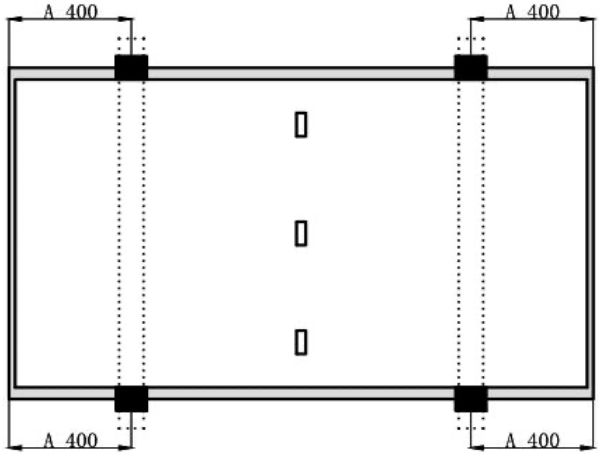
1: Frame 2: Clip 3: M8 Bolt. 4: Mounting System

Fixture Installation Method

AG-OS120N

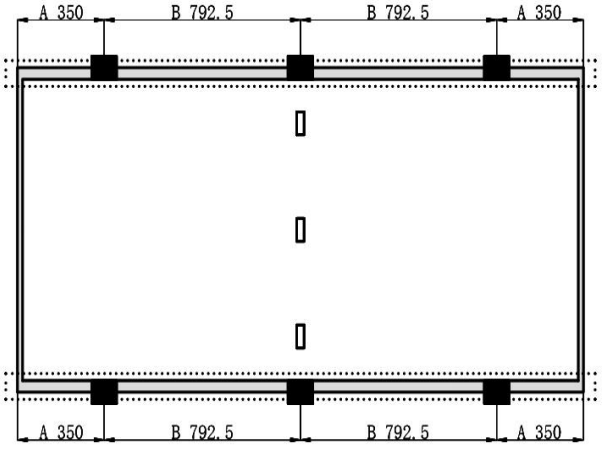


Mounted with 4 clamps along long frame.
Mounting bracket/C-shaped steel parallel to the long frame.
Edge Clamp: width=40-50mm, height=30mm.
A=400±20mm
Maximum load: front ≤2400pa back ≤2400pa



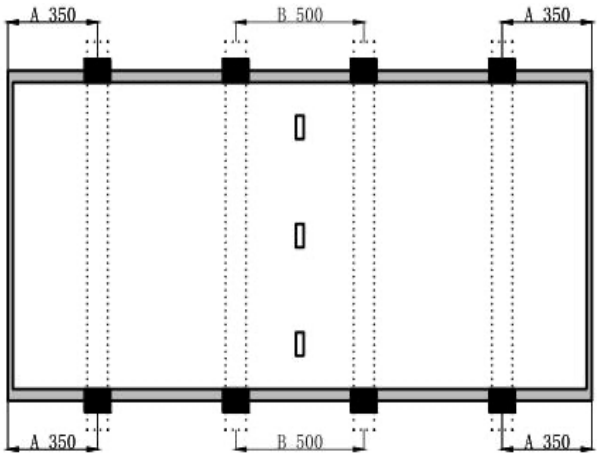
Mounted with 4 clamps along long frame.
Mounting bracket/C-shaped steel perpendicular to the long frame.
Edge Clamp: width=40-50mm, height=30mm.
A=400±20mm
Maximum load: front ≤5400pa back ≤2400pa

AG-OS144N



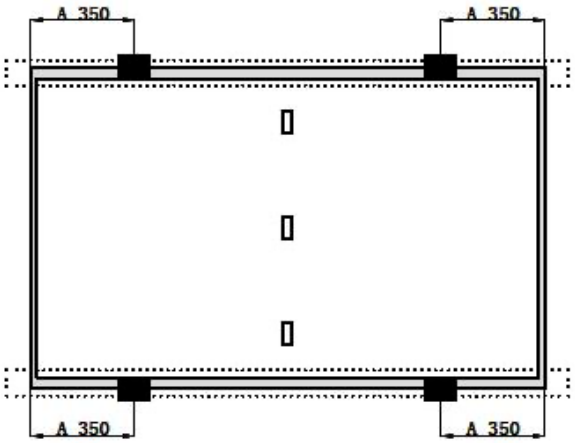
Mounted with 6 clamps along long frame.
Mounting bracket/C-shaped steel parallel to the long frame.
Edge Clamp: width=40-50mm, height=30mm.

A=350±20mm B is 792.5mm from the center
Maximum load: front ≤2400pa back ≤2400pa

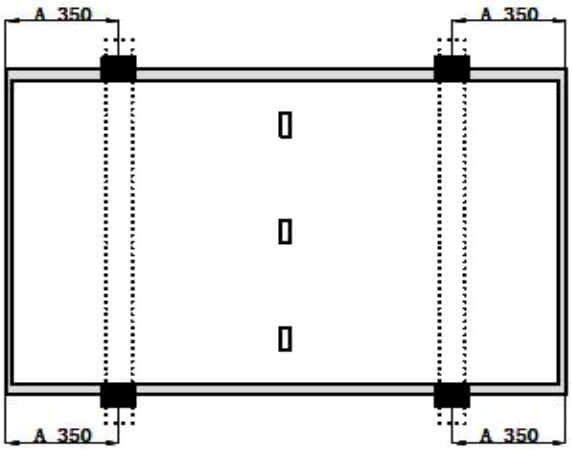


Mounted with 8 clamps along long frame.
Mounting bracket/C-shaped steel perpendicular to the long frame.
Edge Clamp: width=40-50mm, height=30mm.
A=350±20mm B is 500mm between the two sides of the center
Maximum load: front ≤5400pa back ≤2400pa

AG-OS108N



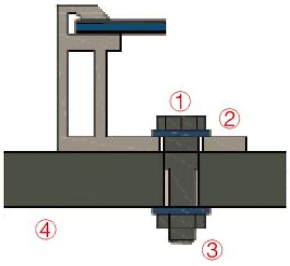
Mounted with 4 clamps along long frame.
Mounting bracket/C-shaped steel parallel to the long frame.
Edge Clamp: width=40-50mm, height=30mm.
A=350±20mm
Maximum load: front ≤2400pa back ≤2400pa



Mounted with 4 clamps along long frame.
Mounting bracket/C-shaped steel perpendicular to the long frame.
Edge Clamp: width=40-50mm, height=30mm.
A=350±20mm

Maximum load: front ≤5400pa back ≤2400pa

5.2.3. Framed Bifacial Double-Glass Modules (Installation with Bolt)



1: M8 Screw. 2: Washer. 3: Nut 4: Mounting Rail

5.2.3.1. The mounting holes on the back of the module frame are installed on the support structure with stainless steel bolts (the screw faces the frame mounting holes)

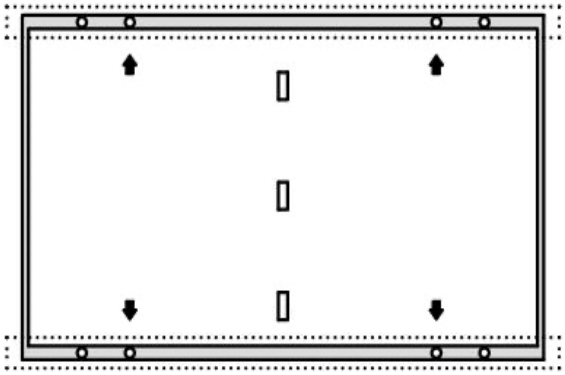
5.2.3.2. The modules are fastened at 8 points according to load requirements or installation requirements (four points on the long side).

5.2.3.3. The tensile strength of M8*16 stainless steel outer hexagonal bolts, nuts, bolts and nuts should not be less than 700MPa, and the recommended torque is 16Nm.

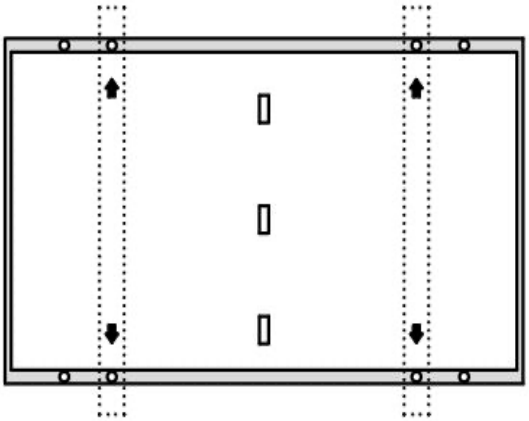
5.2.3.4. The outer flat washer needs to use M8 (A2-70), a stainless steel (SUS304) flat washer with an outer diameter of 20±2mm and a thickness of 1.1-1.2mm; the corresponding stainless steel spring washer thickness is 2.0±0.2mm.

Bolt Installation method:

AG-OS120N & AG-OS108N

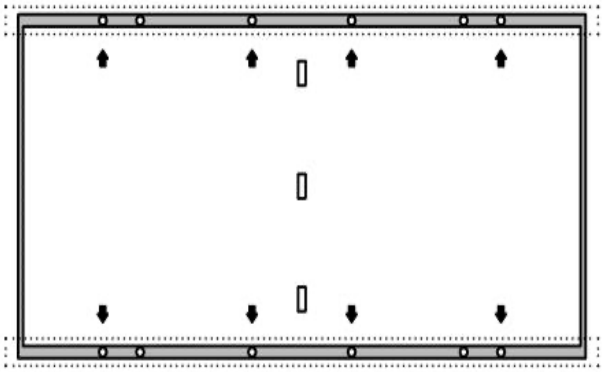


The long frame uses the inner four holes (990mm) for bolt installation
Mounting rail/C-shaped steel parallel to the long side
Maximum load: front ≤2400pa back ≤2400pa

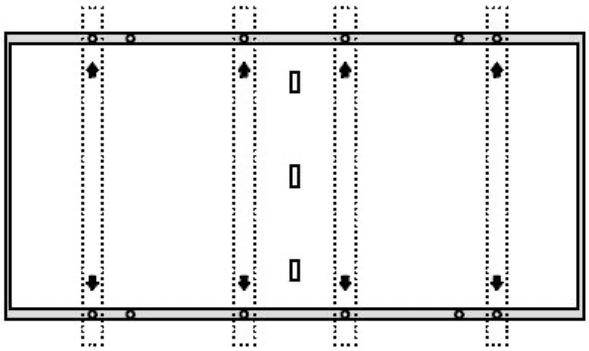


The long frame uses the inner four holes (990mm) for bolt installation
Mounting rail/C-shaped steel perpendicular to the long side
Maximum load: front ≤4400pa back ≤2400pa

AG-OS144N



The long frame uses four outer holes (1600mm) and four holes in the center (400mm) for bolt installation
Mounting rail/C-shaped steel parallel to the long side
Maximum load: front ≤2400pa back ≤2400pa



The long frame uses four outer holes (1600mm) and four holes in the center (400mm) for bolt installation
Mounting rail/C-shaped steel perpendicular to the long side
Maximum load: front ≤5400pa back ≤2400pa

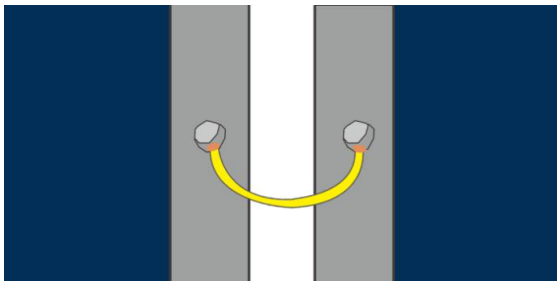
5.2.4. Grounding

5.2.4.1. All module frames and brackets must be grounded in accordance with the appropriate National Electrical Code. The grounding conductor or grounding wire could be made with copper, copper alloy or other material, which should also be in accordance with the requirements of the corresponding National Electrical Code. The grounding

conductor must be connected to the ground through a suitable grounding method.

5.2.4.2. Module could be grounded with a grounding equipment listed by a third party. The equipment must be installed in accordance with the instructions given by the grounding equipment manufacturer.

5.2.4.3. The electrical contact is formed by penetrating the anodised coting of the aluminium frame and tightening the ground screw (together with the star washer) to an appropriate torque of 25 lbf.in. A properly sized ground wire (solid bare copper wire according to American wire Gauge 6 to 12) should be selected and mounted under the connecting bolt.



Place the toothed washers, washers, and grounding wires in turn, and screw the screws into the grounding holes to connect the two adjacent modules.

5.2.5. Electrical Installation

All wiring should be performed by a qualified and trained person in accordance with local regulations and procedures. Modules could be connected in series to increase the operating voltage by inserting the positive plug of one module into the negative plug of another module. Always ensure that the contact points are corrosion-resistant, clean, and dry before wiring modules. If the polarities of modules connected are wrong, it may lead to irreparable damage. Before modules connected in parallel, please check the voltage and polarity of each module array. If the polarity of products is opposite or the voltage difference is greater than 10V after measurement, please check the

configuration of the module array before its access to the power grid.

All cables and connectors used to connect the DC system must have similar (or higher) level. It is suggested that all cables should run in proper cable ducts and should be located away from water-prone areas.

Each module has two standard 90°C shading output cables with a plug-and-play connector on each terminal. Ausgem modules are equipped with a DC copper cable with a cross sectional area of 4mm^2, system voltage 1500V DC, insulation layer maximum work temperature up to 90°C, also UV-resistance. All cables used to connect the DC system must have similar or higher levels. It is required that all wiring and electrical connections should be compliant with the appropriate National Electrical Code.

5.2.6. Wiring

To ensure the PV system could operate smoothly, when connecting modules or connecting loads (such as inverters, batteries, etc.), ensure that the polarity of the cables are properly connected (Figure 1 and Figure 2). If modules are not connected properly, the bypass diode may be damaged. Modules could be connected in series to increase voltage. Connecting modules in series by inserting the positive terminal of one module into the negative terminal of the next module. Figure 1 shows the serial connecting of modules. Modules could be connected in parallel to increase current (shown in Figure 2). Connecting modules in series in parallel by inserting the positive terminal of one module into the negative terminal of the next module. The number of modules connected in series or in parallel needs to be reasonably designed according to the system configuration. All instructions above must be followed to meet Ausgem's warranty conditions.

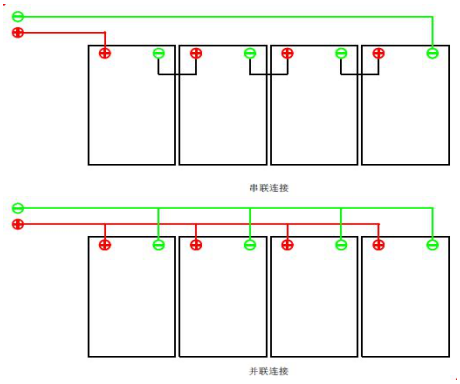


Figure 1

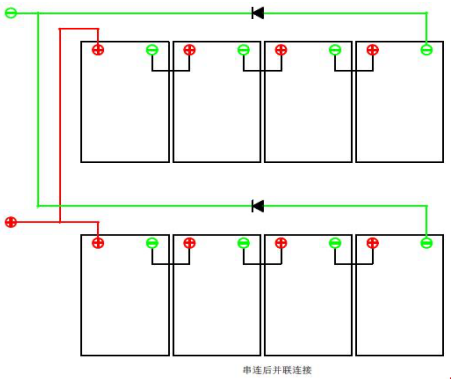


Figure 2

5.2.7. Fuse

The fuse should be connected to each non-grounded pole of the array (in other words, if the system is not grounded, the fuse should be connected to both positive and negative terminals).

a) The maximum rating of the fuse connected in series is 30A (Only applicable for AS-OS144N-xxx (525-570) and AG-OS108N-xxx (395-425) other maximum fuse ratings varies pending the series and power classes). The module-specific ratings are available on the product label and product datasheet.

b) The fuse rating also corresponds to the maximum reverse current that the module could withstand (when an array is shaded, the array is loaded into another parallel module array to generate power), thus the number of parallel connected arrays is affected.

c) It is forbidden to connect two or more strings in parallel and then share the fuses.

6. Maintenance of PV Modules

6.1. Module Visual Inspection and Replacement

Modules in array should be regularly inspected to check for damage. If damage on the module is found, it must be replaced with the same type. Damage such as broken glass, broken cables, damaged junction box, etc., would lead to functional and safety failure of the modules.

Well-designed solar systems require minimal maintenance, and some simple steps could be taken to improve system performance and reliability.

6.1.1. Maintenance should be carried out at least once a year by a trained person. As system voltage is so high, the maintenance person should always wear rubber gloves and insulated boots. Removing all possible shading of the solar array, which would affect power generation of the module array.

6.1.2. Check if the installed hardware is securely in place.

6.1.3. Check if all array fuses in each of the non-grounded poles are working properly.

6.1.4. If module is damaged (glass breakage or scratches on the back glass), it is needed to be replaced. Module must be replaced with the same type. Do not touch the live parts of the cables or connectors when replacing modules. Use appropriate safety guards (insulation tools, insulated gloves, insulated boots, etc.) when handling modules.

6.1.5. Cover the front surface of modules with an opaque material. Modules exposed under the sun could be extremely dangerous as high voltages could be generated.

6.1.6. Module junction boxes are equipped with bypass diodes to minimise module heating and current loss.

6.2. Connector and Cable Inspection

6.2.1. Check if all cables are securely connected. It is suggested that all cables should run in proper cable ducts and should be located away from the water-prone area.

6.2.2. Check the electrical, grounding, and mechanical connections every 6 months to ensure that they are clean, safe, free from damage, and rust-free; ensure that the mountings are properly tightened; check all cables to make sure they are tight.

6.2.3. It is forbidden to use WD-40 or various organic solvents to wipe all parts of the junction boxes, wires, and connectors.

6.2.4. The dustproof plug should not be removed in advance, it can only be removed during installation

6.3.Cleaning

The amount of electricity produced by a solar module is proportional to the amount of light reach on the surface of it. A dust covered module produces relatively lower power, so it is important to keep the module clean.

a) The PV module should be cleaned under the irradiance of less than 200w/m^2. Avoid cleaning water with great air temperature differences to avoid cracking. Hard water needs to be softened. The water residues should be removed from glass surface after cleaning.
b) It is strictly forbidden to clean PV modules under special weather conditions: wind levels greater than four, heaving rain or heavy snow.
c) During cleaning, the water pressure on the surface of the module glass shall not exceed 700kPa (14619.80 lb/ft2), and the module is not allowed to withstand additional external force.
d) During cleaning, it is strictly forbidden to step on the modules, splashing water to the back of the modules or cables. Ensure that all connectors are clean and dry to prevent electric shock and fire hazard. Steam clean machines are strictly prohibited; soft parts, cloth and mild detergent and water should be used. Do not put modules directly into the water. Serials thermal shocks also could damage modules.
e) For difficult-to-clean substances such as oil on the surface of modules, use a non-friction neutral liquid cleaner. Do not use any organic solvent containing alkali or acid. Do not use corrosive solvents or wipe the PV modules with a hard object.
f) If you are not sure whether the array need to be cleaned, first select a column of a particularly dirty array to begin cleaning. If the power generated increases less than 5%, cleaning is usually not required. The above verification should be carried out only under a stable sunshine rate (sunny, strong sunshine no cloud).
g) Regularly trim the vegetation to prevent shading created on to the module's surface, which would decrease power generation.

6.3.1. Water Quality Requirements

PH: 5~7;
Chloride or salt content: 0-3,000 mg/L;
Turbidity: 0-30 NTU;
Conductivity: 1500~3000 μs/cm;
Total dissolved solids: ≤1000 mg/L;
Water hardness: 0-40 mg/L;
Non-alkaline water must be used, use demineralised water when conditions are available.

6.3.2. Module Inspection After Cleaning

6.3.2.1. The overall appearance of modules is clean, bright and free of stains. The surface of module should have no ash accumulation; there is no obvious scratch on the surface of the module. No cracking occurs on the surface of the module.

6.3.2.2. The module brackets are not tilted or bent after cleaning, the module terminals are not disconnected.

6.3.2.3. After modules are cleaned, complete the PV module cleaning record.

6.3.3. Troubleshooting

If modules do not work after installation, please notify the installer immediately.

7. Technical issues or Claims

If you have any questions about technology or claims, please contact the installer. Please visit http://www.ausgemenergy.com.au to contact Ausgem's aftersales service team. If you wish to submit customer feedback, please also visit out website to do so. Our technical service representatives will contact you within 5 working days. Please download the specifications or datasheets for our modules from our website.