INSTALLATION MANUAL

Structural and Electrical Installation Guidance

Modernité
By CarbonFutureX® Group

https://www.modernite.co.uk/

Important Safety Information

WARNING

Do not stand, step, sit or place concentrated loads on power glass during installation or cleaning. Installation and maintenance require professional photovoltaic and façade skills and must be carried out only by qualified personnel.

1. Read this manual and all project-specific drawings before installation. The installer is responsible for complying with applicable laws, standards, permits and site safety rules.
2. Wear suitable PPE, including a safety helmet, eye protection, electrically insulating gloves and footwear, and fall-arrest equipment where required.
3. Power glass generates DC electricity whenever exposed to light. Incorrect wiring can cause electric shock, arcing, fire, equipment damage or loss of warranty.
4. Keep this manual for commissioning, inspection, maintenance and future replacement work. Contact CarbonFutureX Group Ltd if project conditions differ from the examples in this manual.

Contents

1. Introduction

This manual provides typical installation methods and key precautions for Modernite® cadmium telluride (CdTe) power glass supplied by CarbonFutureX Group Ltd. Read the complete manual before work starts so that the product can achieve its intended structural, electrical and energy-generation performance.

This manual is guidance only and does not replace project engineering, statutory approvals, product datasheets, method statements, risk assessments or warranty terms. Failure to follow approved design documents or this manual may cause personal injury, property damage, reduced output, glass breakage or loss of warranty.

CarbonFutureX Group Ltd is not responsible for damage caused by improper handling, unsuitable supporting structures, incompatible materials, incorrect wiring, unauthorised modification, external impact or other causes unrelated to product quality.

The system designer and installer are responsible for verifying intellectual-property, planning, building-control and third-party rights applicable to the project. This manual may be revised without prior notice.

Project Engineering Requirement

The complete PV system must be designed and installed by appropriately qualified structural, façade and electrical professionals in accordance with local regulations, site conditions, wind and snow actions, fire strategy, drainage, corrosion exposure, electrical equipment limits and the approved construction documents.

2. Structural Installation

CdTe power glass can be used in many thin-film photovoltaic and building-integrated photovoltaic applications. The methods below are typical examples only. The supporting structure, fixings, gaskets, sealants and interfaces must be designed as a complete system for the specific project.

2.1 General Structural Requirements

1. Avoid permanent or repeated shading. Shading reduces energy yield and can cause electrical mismatch.
2. Provide effective rear ventilation wherever the application permits. Elevated module temperature reduces power output.
3. Recommended ambient operating range: -20 °C to +60 °C. Extreme operating range: -40 °C to +85 °C, subject to the applicable product datasheet.
4. Do not install near open flames, high-temperature equipment, flammable materials, explosive atmospheres or uncontrolled heat sources.
5. Avoid locations with foreseeable extreme hail, flying debris, rockfall, sand impact, mudflow or other hazards unless the project design specifically mitigates them.
6. Do not install during high winds, rain, snow, lightning or other unsafe weather conditions.
7. Avoid severe chemical vapours, acid deposition, heavy-metal particulate, soot or other aggressive pollution unless material compatibility has been verified.
8. Do not leave power glass continuously submerged or exposed to continuous concentrated cold-water jets.
9. Select tilt and orientation to suit the project objective, local solar resource, climate, drainage, self-cleaning and architectural requirements.
10. The allowable load depends on the complete mounting system. Use corrosion-resistant, durable supports, fasteners and structural sealants. The assembly must resist the project design actions, including local design wind and snow loads.

Reference Performance

Where confirmed by the relevant product and mounting-system test reports, a properly designed installation may be capable of resisting 2,400 Pa wind load, 5,400 Pa snow load and 25 mm hail at 82 km/h. These values are not a substitute for project-specific structural calculations or approval.

2.2 Metal Roof Installation

Metal-roof installations are commonly used on industrial buildings and warehouses. Before installation, verify the existing roof structure, purlins, deck profile, fasteners, corrosion condition and remaining load capacity. A typical additional module load is approximately 0.2 kN/m², but the actual project load must be calculated. Strengthen the building where required.

2.2.1 Profile-Clamp Installation (framed or sub-framed glass)

Set out**:** Mark module positions from the approved array layout.

Install clamps: Fit profile-compatible aluminium adapters and clamps. Confirm pull-out resistance by test or calculation; a typical minimum single-point pull-out resistance is greater than 500 N unless the design requires more.

Install rails: Install and align rails in accordance with the mounting-system manufacturer's instructions. Tighten all fasteners to the specified torque.

Install glass: Secure the power-glass frame or sub-frame with approved aluminium clamps. Typical bolt torque: 16 N·m, unless otherwise stated by the fixing supplier or project drawings.

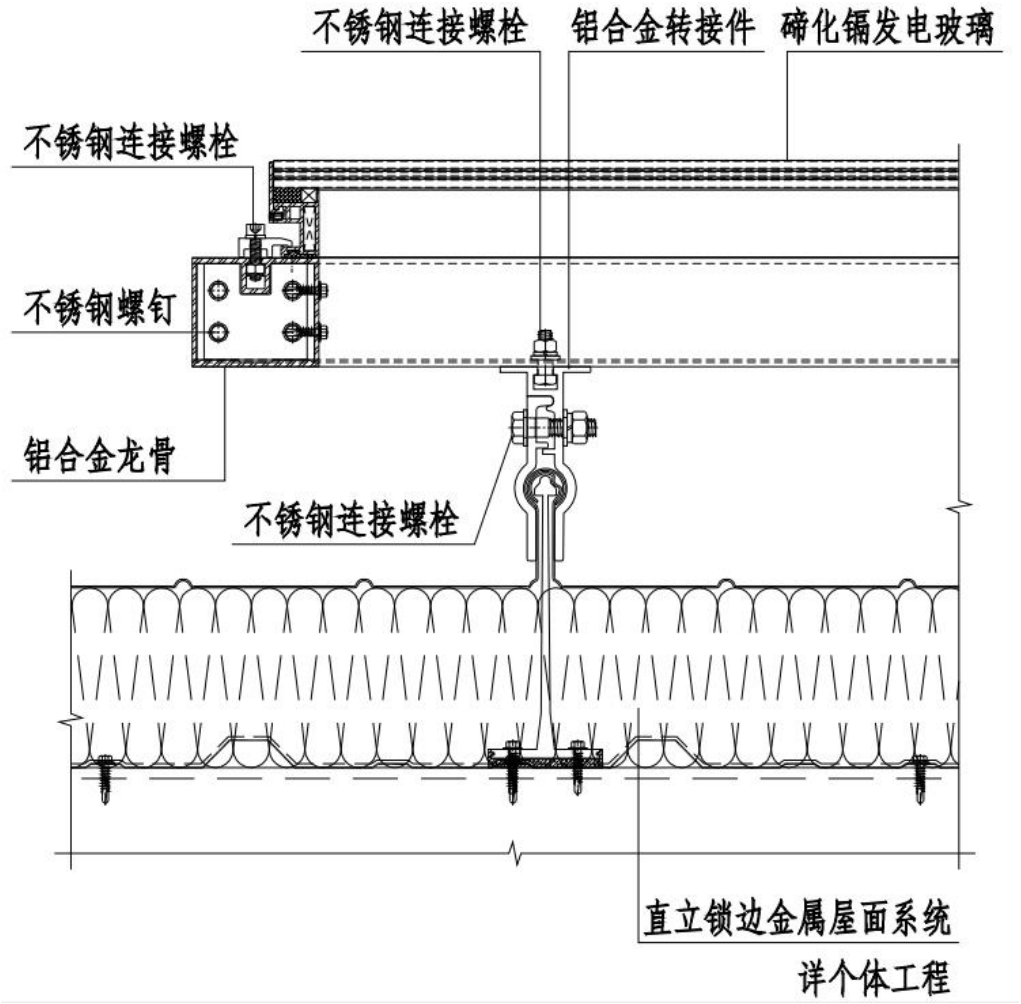

Figure 1. Typical standing-seam metal-roof clamp installation

English label key: stainless-steel connection bolt; aluminium adapter; CdTe power glass; stainless-steel fixing bolt; aluminium rail; standing-seam metal roof system.

2.2.2 Direct Structural-Silicone Bonding (frameless glass)

Assess suitability: Confirm that the roof profile provides sufficient bonding width, is flat enough, and has a stable coating. Carry out adhesion, peel and ageing tests where necessary.

Set out: Mark the approved glass positions.

Clean: Clean bonding surfaces with the sealant manufacturer's approved cleaner and lint-free cloths. Allow surfaces to dry.

Apply spacer tape: Apply compatible double-sided façade spacer tape in the specified pattern.

Apply structural sealant: Apply approved structural silicone between the spacer-tape sections. The wet sealant bead must stand proud of the tape before the glass is placed.

Place the glass: Clean the glass bonding surface, complete placement within the sealant open time, route junction-box leads without trapping them, and maintain support until full cure. A typical full cure period is about 20 days, but the sealant manufacturer's written requirements govern.

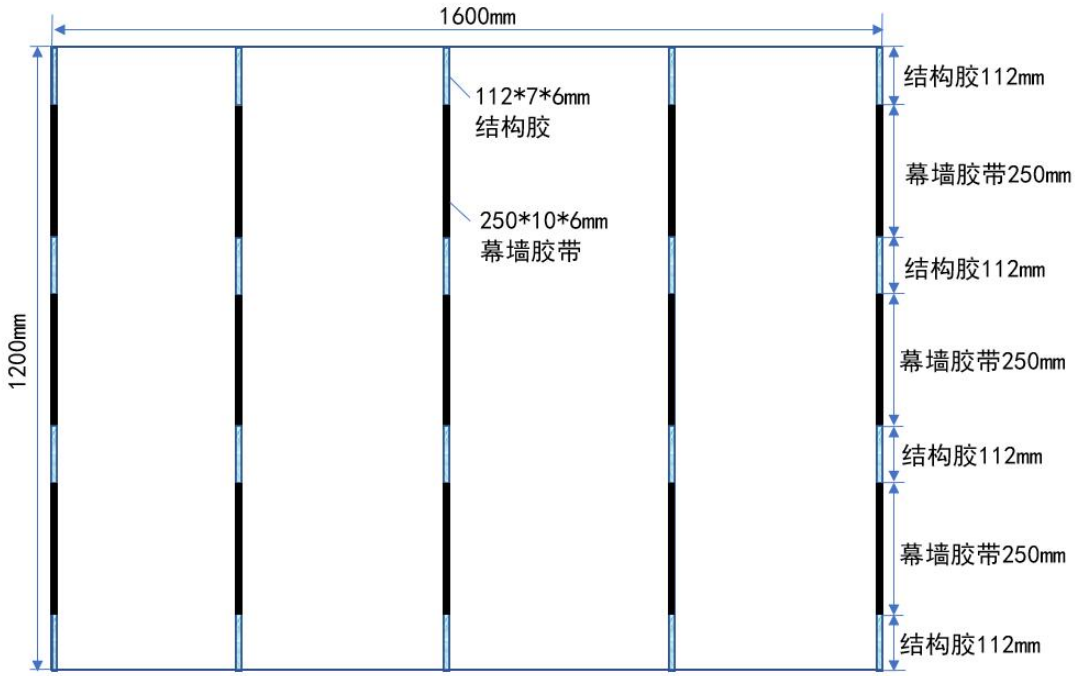

Figure 2. Typical structural-sealant and spacer-tape pattern

English label key: Example panel size 1,600 mm × 1,200 mm; structural sealant sections approximately 112 mm; façade spacer-tape sections approximately 250 mm. Final dimensions must be engineered for the actual project.

2.3 Flat-Roof and Ground Installation

Flat-roof and ground-mounted systems normally use piles, anchors or concrete ballast supporting steel or aluminium frames. This method is intended for framed or sub-framed power glass.

Assess load capacity: Verify that the roof can carry permanent, wind, snow, maintenance and ballast loads. A typical concrete flat roof may require a capacity of at least 1 kN/m², but the actual structure must be assessed.

Set out foundations: Position foundations or ballast blocks from the approved array plan.

Cast foundations: Form and cast C25 concrete or the specified grade, install embedded parts, compact and cure. A typical upstand height is greater than 300 mm where drainage and detailing require it.

Install supports: Install, align and brace the mounting frame in accordance with the engineered drawings.

Install glass: Clamp the power-glass frame or sub-frame with approved pressure blocks. Typical bolt torque: 16 N·m unless otherwise specified.

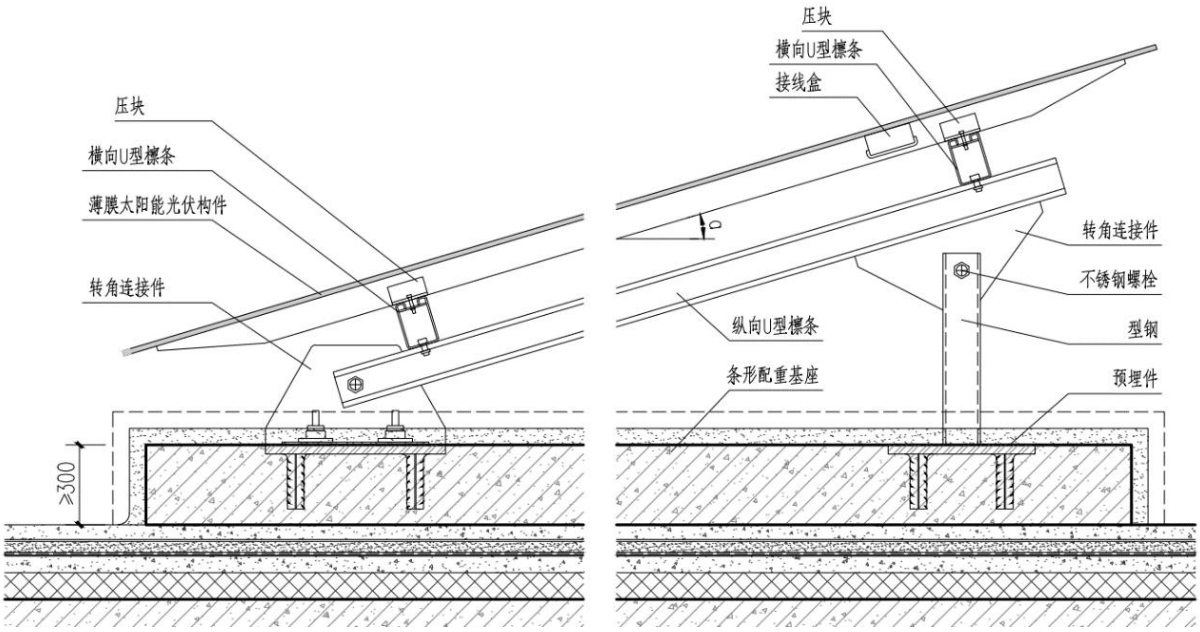

Figure 3. Typical flat-roof support arrangements

English label key: pressure block; transverse U-section; thin-film photovoltaic element; angle connector; anchor or embedded fixing; waterproofing build-up. The two sketches show typical fixed and post-supported variants.

2.4 Framed Building-Integrated Installation

Framed installation is commonly used for façades, canopies, rooflights and sunrooms. Sub-framed power glass is secured to the primary steel structure with pressure blocks, and the joints are weather-sealed with compatible silicone sealant.

Install the supporting structure: Fabricate and install the steelwork to the approved structural drawings. A typical grid centre spacing for a 1,600 mm × 1,200 mm module is

approximately 1,620 mm × 1,220 mm, but the actual dimensions must match the supplied glass and joint design. Keep bearing surfaces flat and free of weld spatter, screw heads and other projections.

Position the glass: Set modules accurately and maintain a typical joint width of 16–20 mm, or the project-specified dimension.

Tighten pressure blocks: Secure the pressure blocks with approved fasteners and the specified torque. Do not create point loads on glass edges.

Seal the joints: Mask edges, install compatible closed-cell backing rod, apply approved silicone sealant and tool the joint to provide continuous weather protection.

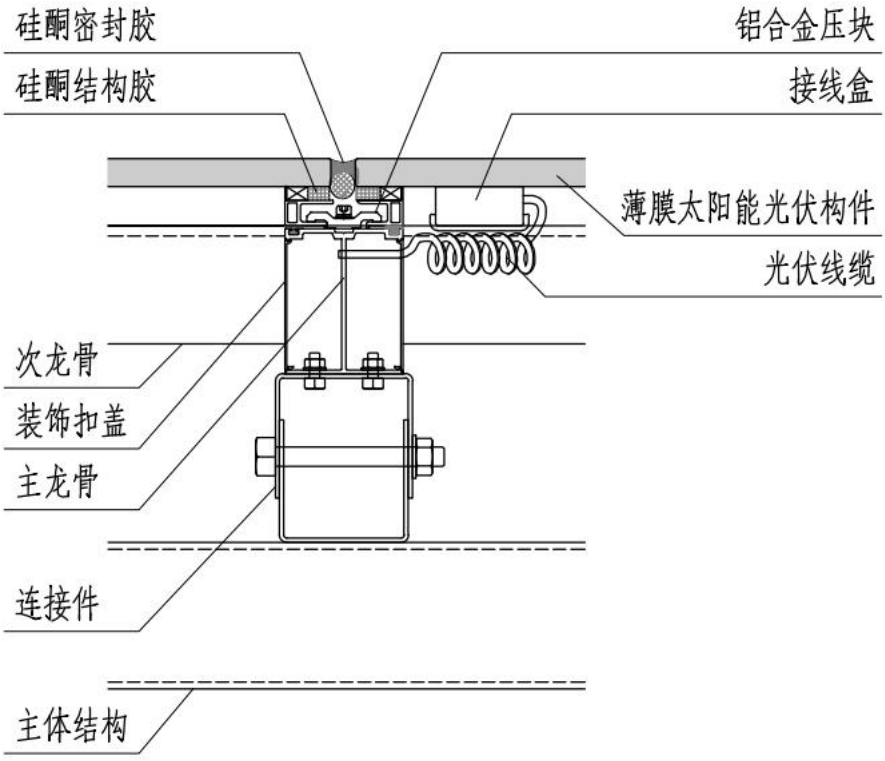

Figure 4. Typical framed BIPV joint detail

English label key: weather sealant; structural silicone; aluminium pressure block; junction box; thin-film PV element; PV cable; secondary rail; decorative cover; main rail; connector; primary structure.

3. Electrical Installation

Power glass is an electrical generating component. Incorrect connection can damage the product, invalidate warranty and cause electric shock, arcing or fire. The DC and AC system must be designed by a competent PV electrical designer and installed by qualified personnel in accordance with applicable regulations, inverter and combiner limits, cable ratings, local irradiation, temperature and the approved single-line diagram.

3.1 General Wiring Requirements

1. Use clearly arranged DC combiners or junction boxes where appropriate, and apply durable outdoor circuit labels for future inspection and maintenance.
2. Use the connector manufacturer's approved stripping and crimping tools. Do not nick or cut conductor strands.
3. Maintain a minimum cable bend radius of at least four times the cable diameter, or the cable manufacturer's larger requirement.
4. Secure loose cables with UV-resistant ties or clips. Prevent movement in wind, abrasion, sharp bends, trapped cables and mechanical contact with glass edges. Avoid unnecessary direct sunlight and standing water.
5. Keep the enclosed area of each DC circuit loop as small as practicable to reduce lightning-induced voltage. Provide correctly rated surge protection where required by the electrical design.
6. Do not expose polymer junction boxes or connector housings to incompatible organic solvents.
7. Select AC cables to suit the connected equipment. Use PV-rated DC cable carrying an appropriate recognised certification and sized for current, voltage drop, installation method, ambient temperature and grouping.

Figure 5. Cable bend and connector strain relief

Typical application	String cable	Combiner cable
Typical operating current	< 2.5 A	< 15 A
Example cable	PV1-F 1 × 2.5 mm²	PV1-F 1 × 4 mm²

Cable sizes above are examples only. The electrical designer must confirm final conductor size and protective-device coordination.

3.2 Connector Installation

1. Do not mate connectors from different manufacturers or product families unless the connector manufacturers explicitly approve the combination. Match the manufacturer and model at the module, combiner and inverter interfaces.
2. Prevent open live connectors from contacting rainwater or conductive contamination.
3. Protect unmated connectors outdoors from water, dust and insects with the manufacturer's protective caps or another approved temporary method.
4. Before mating, check that seals, locking tabs and housings are complete, clean and undamaged.
5. Fully engage positive and negative connectors until the locking mechanism is secure. A loose connection can overheat, leak current or cause fire.
6. Crimp only with the specified dies and tools. Carry out pull testing or inspection as required by the connector manufacturer and project quality plan.
7. Do not connect or disconnect under load. DC arcing can destroy the connector and cause burns or electric shock.

3.3 Series and Parallel Connection

1. The total series open-circuit voltage, corrected for the lowest design temperature, must remain below the maximum system voltage: typically 600 V, 1,000 V or 1,100 V depending on the approved product and system.
2. The total short-circuit current of parallel circuits must remain below the rating of all cables, connectors, combiners, switches and inverters.
3. Protect modules from reverse current. Where parallel strings can feed reverse current above the maximum series-fuse rating, install correctly rated overcurrent protection.

For two or more parallel strings, string fuses and reverse-current blocking devices may be required by the design.

4. Do not place modules with materially different current ratings, orientations, tilt angles or shading conditions in the same series string.

5. After completing each string, measure open-circuit voltage with a DC instrument rated above the system maximum voltage. Confirm polarity and compare the result with the design value before parallel connection.

6. Do not exceed the approved maximum number of modules per string or strings in parallel. Optimise the final configuration for climate, inverter MPPT range, layout, cable routing and maintainability.

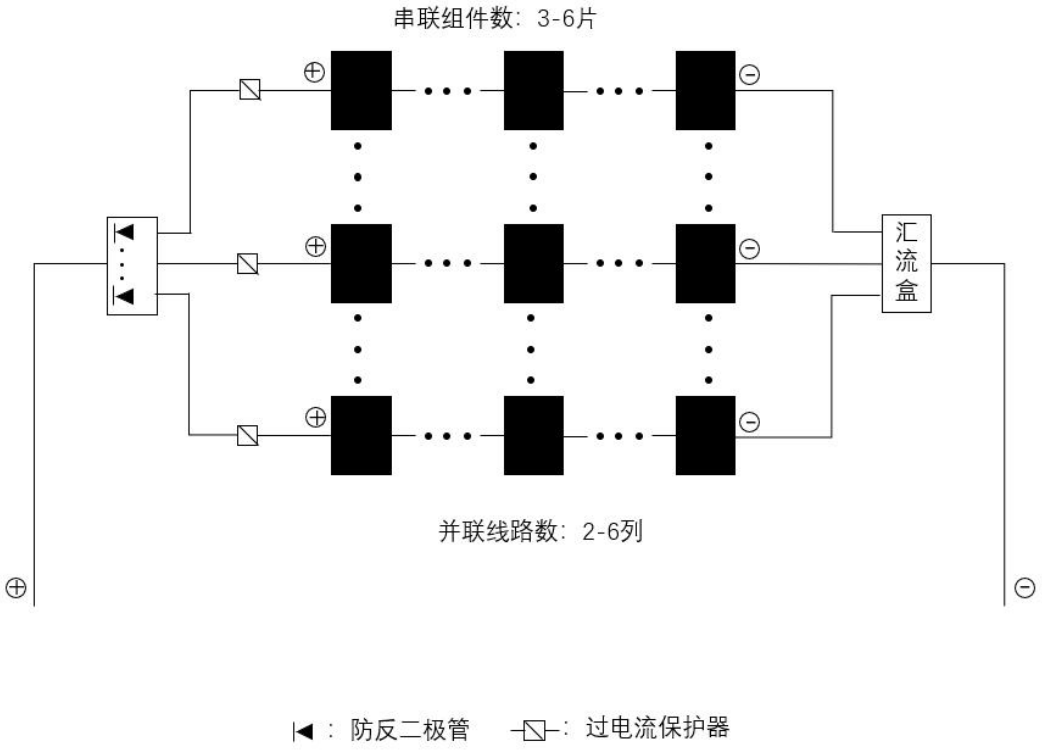

Figure 6. Typical series/parallel arrangement with reverse-current protection

English label key: Typical series count shown: 3–6 modules. Typical parallel count shown: 2–6 strings. Symbols indicate blocking diodes and overcurrent protection. The approved electrical design governs.

Parameter	600 V system	1,000 V system	1,100 V system (-40 to -30 °C)	1,100 V system (-30 to +85 °C)
Maximum modules in series	3	5	5	6
Typical modules in series	3	5	5	5–6

Downstream input rating	10 A	12.5 A	15 A
Maximum parallel strings	4	5	6
Typical parallel strings	2–4	2–5	2–6

These configuration values are carried over from the source manual and must be checked against the exact product datasheet, temperature coefficients, fuse rating and inverter limits before use.

3.4 Inverter Installation

1. Use a reputable, certified inverter compatible with the module technology and system earthing arrangement. Poor-quality or incompatible equipment may introduce leakage current or abnormal voltages that damage bypass diodes, thin-film layers or other internal circuits.
2. Follow the inverter manufacturer's installation, insulation-monitoring, earthing, shutdown and commissioning instructions.
3. The DC-array power to inverter AC-rated-power ratio (DC/AC ratio) should be optimised for local irradiance, temperature, orientation, clipping losses, cable losses, inverter life and project economics. Confirm that all equipment and conductors remain within their ratings.

Maximum irradiance	700 W/m²	800 W/m²	900 W/m²	General reference
Typical DC/AC ratio	1.5:1	1.3:1	1.1:1	1:1

The above ratios are indicative only and require project-specific energy modelling and equipment checks.

4. Inspection, Commissioning and Handover

1. Inspect every glass unit for cracks, edge damage, delamination, abnormal marks, frame distortion and junction-box damage before and after installation.
2. Confirm support positions, joint widths, clearances, drainage paths, fixing type and torque against the approved drawings.
3. Confirm sealant batch, shelf life, primer, adhesion tests, application conditions, joint dimensions and cure records where structural or weather sealants are used.
4. Check cable routing, bend radius, support, polarity, connector locking, string voltage, insulation resistance and protective-device ratings using approved procedures.
5. Label strings, isolators, combiners, inverters and shutdown points. Record serial numbers and as-built string allocation.
6. Provide the owner with as-built drawings, test results, warranties, product datasheets, maintenance instructions and this manual.

Maintenance

Clean and inspect the installation at intervals determined by the site environment and applicable O&M plan. Do not use abrasive tools, incompatible chemicals, high-pressure concentrated jets or methods that create thermal shock or point loading.

End of Manual