ALBRIGHT
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# WIND PRESSURE TESTING OF PHONO SOLAR PANEL MODELS: PSXXXL7GFH-18/VBH (SOLAR PHOTOVOLTAIC MODULES)

ACE REFERENCE: 25-073.02, REV: 01

Date of Issue: 17th October 2025

**SUMEC Australia Phono Solar**
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**RE: Phono Solar Panel Modules, PSXXXL7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg; Models: PS475L7GFH-18/VBH; PS480L7GFH-18/VBH; PS485L7GFH-18/VBH; PS490L7GFH-18/VBH & PS495L7GFH-18/VBH, with 2 Supports at 800 mm, 2 Supports at 1200 mm Centres & 3 Supports at 600 mm**

This Test Report certifies the Recommended Design Wind Pressure(s) for the above-mentioned Phono Solar Panels, Models: PSXXXL7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg. This Test Report is for the testing of the PV Module Frames only, and does not cover the supporting elements/ rails and or associated fixings of the tested panels to the supporting elements/ rails.

This Report verifies that the PV Modules are capable of withstanding the Design Wind Loads when installed to an approved railing system with the corresponding support points as listed in Table 1.

Albright Consulting Engineers (ACE) Pty Ltd were engaged by SUMEC Australia Phono Solar to carry out and witness 6 individual mechanical load tests (simulated static, wind load strength test). The testing was performed on new panels supplied by SUMEC Australia Phono Solar.

A total of 6 individual panels were tested. The following tests were carried out:

- Test Scope 1: 3 individual test samples with 2 supports/ clamps at 800 mm centres;
- Test Scope 2: 3 individual test samples with 2 supports/ clamps at 1200 mm centres;
- Test Scope 3: 3 individual test samples with 3 supports/ clamps at 600 mm centres;

The solar panel module(s) were mounted front side up using fixing clamps and brackets, which are then bolted to the test bed chassis. This is was to imitate a real-world situation; (this process was repeated for each test sample).

A constant pressure/ load was applied by an airbag located the back of the panel. A calibrated digital manometer was used to measure and track the design test pressures, while a calibrated digital deflection meter was used to measure and record the centre (vertical) deflection of the solar panel at 1kPa intervals. The electrical continuity or the cells themselves were not monitored during each of the tests.

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Note that a mechanical load testing and or simulated static, wind load strength testing was carried out for the above-mentioned solar panel module samples and the support fixing configuration(s). The testing procedure that was adopted is generally accordance to the methods outlined in AS4040 (series), Static Strength Test Regime.

The 9 individual simulated static, wind load strength tests were conducted and observed by Nicholas Kastellorizios a representative of Albright Consulting Engineers in Darwin Northern Territory, on the 17th October 2025. The behaviour of the modules was observed and recorded.

**Material Variability Factor AS/NZS 1170.0, Table B1 – kt:**

The applied factor for variability for 1 individual test sample (1 individual units tested per support centre) and adopting a coefficient of variation of structural characteristics of 10% in accordance with AS/NZS 1170.0, Table B1 (when determining the allowable design capacity) is 1.46.

The applied factor for variability for 2 individual test samples (2 individual units tested per support centre) and adopting a coefficient of variation of structural characteristics of 10% in accordance with AS/NZS 1170.0, Table B1 (when determining the allowable design capacity) is 1.38.

The applied factor for variability for 3 individual test samples (3 individual units tested per support centre) and adopting a coefficient of variation of structural characteristics of 10% in accordance with AS/NZS 1170.0, Table B1 (when determining the allowable design capacity) is 1.33.

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**Results & Observations:**

**Test No.1, x3 Samples, Phono Solar Panel Modules: PS475L7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg, with 2 Supports at 800 mm Centres. Serial Numbers: PSVHBMG21240310925; PSVHBMG21950310925 & PSVHBMG21090310925**

The above-mentioned solar panel samples were mounted to the test rig with 2 supports at **800 mm** centres apart on each side with a cantilever/ overhang of approximately **500 mm** at each end.

During all three individual tests, the solar panel modules were observed to be able to support an equivalent design test pressure of **5.0 kPa**, with a centre vertical deflection **67.8 mm** (approximately). While attempting to increase the design test pressure(s), the solar panels failed at approximately **5.5 kPa**.

The following results were recorded just as the solar panel module frames failed:

It was observed that during each test, as the test pressures were increased, the top flanges of the longer rail framing elements appeared to roll inwards. This rolling or torsional effect caused concentrated pressures/ stress to form along the top (glass) face of the panel. This was more evident at the clamping zones of the panel, as localised indentations to the top face of solar panel modules were observed in each case. The cracking to the top glass face appeared to be more concentrated at the clamping zones.

It was also observed during all three test procedures; while increasing the design test pressure, the shorter rail framing elements of the solar panel modules curved/ buckled upwards in an arch like manner.

The high deflections experienced by the shorter rail framing elements as well as the high localised pressures at the clamping zones appeared to be the likely cause of failure to the solar panel module.

The glass front face of the solar panel modules failed: (shattered/ cracked); with visually obvious signs of major structural fatigue that had occurred at the shorter framing elements of the solar panel module. The shorter rail elements had permanently buckled upwards in an arch/ curved like manner. This indicated that the frames had yielded (plastic phase of the material).

This is likely due to a thinner (30mm) frame as well as other changes to the section properties of the shorter framing elements, refer to notes below. In all three cases the front and back glass face failed/ cracked.

(Note there were very consistent results and observations during all three tests)

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**Results & Observations:**

**Test No.2, x3 Samples, Phono Solar Panel Modules: PS475L7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg, with 2 Supports at 1200 mm Centres. Serial Numbers: PSVHBMG2400310925; PSVHBMG2409031092 & PSVHBMG24150310925**

The above-mentioned solar panel samples were mounted to the test rig with 2 supports at **1200 mm** centres apart on each side with a cantilever/ overhang of approximately **300 mm** at each end.

During all three individual tests, the solar panel modules were observed to be able to support an equivalent design test pressure of **5.0 kPa**, with a centre vertical deflection **70.3 mm** (approximately). While attempting to increase the design test pressure(s), the solar panels failed at approximately **5.5 kPa**.

The following results were recorded just as the solar panel module frames failed:

It was observed that during each test, as the test pressures were increased, the top flanges of the longer rail framing elements appeared to roll inwards. This rolling or torsional effect caused concentrated pressures/ stress to form along the top (glass) face of the panel. This was more evident at the clamping zones of the panel, as localised indentations to the top face of solar panel modules were observed in each case. The cracking to the top glass face appeared to be more concentrated at the clamping zones.

It was also observed during all three test procedures; while increasing the design test pressure, the shorter rail framing elements of the solar panel modules curved/ buckled upwards in an arch like manner.

The high deflections experienced by the shorter rail framing elements as well as the high localised pressures at the clamping zones appeared to be the likely cause of failure to the solar panel module.

The glass front face of the solar panel modules failed: (shattered/ cracked); with visually obvious signs of major structural fatigue that had occurred at the shorter framing elements of the solar panel module. The shorter rail elements had permanently buckled upwards in an arch/ curved like manner. This indicated that the frames had yielded (plastic phase of the material).

This is likely due to a thinner (30mm) frame as well as other changes to the section properties of the shorter framing elements, refer to notes below. In all three cases the front and back glass face failed/ cracked.

(Note there were very consistent results and observations during all three tests)

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**Results & Observations:**

**Test No.3, x3 Samples, Phono Solar Panel Modules: PS475L7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg, with 3 Supports at 600 mm Centres. Serial Numbers: PSVHBMG21250310926; PSVHBMG21250310925 & PSVHBMG03050310925**

The above-mentioned solar panel samples were mounted to the test rig with 3 supports at **600 mm** centres apart on each side with a cantilever/ overhang of approximately **300 mm** at each end.

During all three individual tests, the solar panel modules were observed to be able to support an equivalent design test pressure of **4.0 kPa**, with a centre vertical deflection **47.7 mm** (approximately). While attempting to increase the design test pressure(s), the solar panels failed at approximately **4.8 kPa**.

The following results were recorded just as the solar panel module frames failed:

It was observed that during each test, as the test pressures were increased, the top flanges of the longer rail framing elements appeared to roll inwards. This rolling or torsional effect caused concentrated pressures/ stress to form along the top (glass) face of the panel. This was more evident at the clamping zones of the panel, as localised indentations to the top face of solar panel modules were observed in each case. The cracking to the top glass face appeared to be more concentrated at the clamping zones.

It was also observed during all three test procedures; while increasing the design test pressure, the shorter rail framing elements of the solar panel modules curved/ buckled upwards in an arch like manner.

The high deflections experienced by the shorter rail framing elements as well as the high localised pressures at the clamping zones appeared to be the likely cause of failure to the solar panel module.

The glass front face of the solar panel modules failed: (shattered/ cracked); with visually obvious signs of major structural fatigue that had occurred at the shorter framing elements of the solar panel module. The shorter rail elements had permanently buckled upwards in an arch/ curved like manner. This indicated that the frames had yielded (plastic phase of the material).

This is likely due to a thinner (30mm) frame as well as other changes to the section properties of the shorter framing elements, refer to notes below. In all three cases the front and back glass face failed/ cracked.

(Note there were very consistent results and observations during all three tests)

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**Other Observations:**

In our opinion the changes to the physical geometry of the solar panel modules is a major contributing factor to the overall failure and performance of the panel, i.e., the grade of aluminium; the depth of the frame being 30 mm, as well as the length of the shorter rails being wider at 1134 mm.

The reductions in capacities when compared to other models tested previously are likely due to the overall system not being as stiff or robust as previous models. Previous models had deeper framing elements with 40mm to 45mm thicker framing and glass elements, with wider flanges to all framing elements, and were also narrower (approx. 990mm), which provided an overall stiffer system, giving them the ability to resist these concentrated localised pressures at the clamping zones, as well as at the corners of the frame.

Other likely factors that may have contributed to the failure or affected performance of these panels include:

1. Thickness & Grade of Glass Face;
2. Thickness of Backing Material;
3. Material used for Backing Material, dual layer glass solar panels appear to be less flexible than solar panels with PET (polyester) or fluoropolymers (PVF, PVDF, PTFE) backing materials;
4. Grade of Aluminium used in the manufacturer of the Frame;
5. Alternative framing elements, some rails do not have flanges, only a thin narrow box section;
6. Inner Frame Connections/ Junctions;
7. Glass Supports within Frame;
8. Lack of and or quality of Adhesive of between the rails & Sheeting Layers;
9. Packing. Transport and Handling of Samples;
10. Smoothness of top flange at clamping locations; causing lack of friction with clamping.

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## Table 1: Test Summary: Recommended Ultimate Design Strength, Limit Design Capacity

| Test | Panel Manufacturer, Model & Size (mm) | Support Centres (mm) | Maximum Applied Load (kPa) | Material Variability Factor AS/NZS 1170.0 Table B1 – kt | Recommended Ultimate Design Strength<br><br>Limit State Design Capacity (kPa) |
|---|---|---|---|---|---|
| No.1 | X3 Samples: Phono Solar Panel Modules: PSXXXL7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg | 2 Supports at 800mm | 5.0 | 1.33 | **3.76** |
| No.2 | X3 Samples: Phono Solar Panel Modules: PSXXXL7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg | 2 Supports at 1200mm | 5.0 | 1.33 | **3.76** |
| No.3 | X3 Samples: Phono Solar Panel Modules: PSXXXL7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg | 3 Supports at 600mm | 4.0 | 1.33 | **3.01** |

**Note that the above mentioned Recommended Ultimate Design Strength, Limit Design Capacities are only applicable to the models & power series stated within this certificate, as well as listed on the attached data sheet.**

**Note that the Project Engineer/ Design Engineer should consider the panel deflection as a design criteria. These deflections could cause the panels to pop/ slip out of the fixing clamps.**

## Phono Solar Panel Modules, PSXXXL7GFH-18/VBH, Mechanical Properties:

| | |
|---|---|
| Cell Type: | N-Type |
| Cells: | No Data Provided |
| Dimensions: | 1800 mm x 1134 mm x 30 mm |
| Weight: | 23.5 kg |
| Backing Material/ Substrate: | 1.6 mm Heat Strengthened Glass |
| Front Material/ Superstrate: | 2.0 mm Heat Strengthened Glass |
| Frame: | 30 mm Black Anodized Aluminium Frame |

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**Summary:**

We recommended and verify that the **PSXXXL7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg; Models: PS475L7GFH-18/VBH; PS480L7GFH-18/VBH; PS485L7GFH-18/VBH; PS490L7GFH-18/VBH & PS495L7GFH-18/VBH,** Solar Panel Modules can resist the following vertical design loads, with a Recommended Ultimate Design Strength (Limit State Design Capacity), as listed for the following support conditions:

- **Supported on purlins/ battens, 2 supports/ rails at 800 mm centres: 3.76 kPa;**
- **Supported on purlins/ battens, 2 supports/ rails at 1200 mm centres: 3.76 kPa;**
- **Supported on purlins/ battens, 3 supports/ rails at 600 mm centres: 3.01 kPa;**

This Report has been prepared on behalf of and for the exclusive use of SUMEC Australia Phono Solar and is for the testing of the PV Module Frame only; and **not** the supporting elements, clamps, rails and or associated fixings of the PV Modules to the rails.

The Recommended Ultimate Design Strength, Limit State Design Capacities, (kPa) are only applicable for the panel model; size, weight and support/ rail spacing's as the above-mentioned tested model(s). Any additional power output models referenced may also be covered under this certificate provided that they are referenced in the same technical datasheet (attached); are mechanically & physically identical to the (tested): **Phono Solar Panel Modules: PS475L7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg**; and that they are manufactured in the exact same way with the exact same materials as the (tested): **Phono Solar Panel Modules: PS475L7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg**. Refer to Appendix A for datasheet.

**This certificate and certification is no longer valid if:**

1. If any of the Engineering & Mechanical Properties used in the manufacture of the solar panel modules/ models is altered or changed in any way to the above mentioned tested solar panel modules/ models.
2. If any of the manufacturing processes or techniques used in the manufacture of the solar panel modules/ models is altered or changed in any way to the above mentioned tested solar panel modules/ models.
3. It is the responsibility of the manufacturer to confirm if there has been any alterations, changes or revisions to the physical makeup of the frame, i.e. aluminium grade, front glass face or backing sheet, etc.; or if the manufacturing process has altered or changed in any way, re-testing may be required.
4. This certificate is rendered invalid if any changes have occurred to the tested modules/ models as noted above.

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**Important Notes:**

1. Note that the deflection criteria of the panels themselves may govern or limit the structural design and should be considered in high design wind pressure zones; as excessive deflections may cause the panel's to slip and or pop out from the fixing clamps.
2. The panel fixing clamps; the support rails; their associated fixings or the fixings of the L Feet to the immediate supporting structure, were not tested as part of the test procedure/ scope, and therefore no comment can be made as to their role as a potential failure mode. Note that these elements must be individually evaluated and confirmed by the Project Engineer and or the Design Engineer, as they may limit the structural design or capacity of the total structural system.
3. The railing system is excluded from this certification and is designed & certified by others.
4. The immediate supporting elements for the PV Roof Mounted Solar Panel System is also excluded from this certification and is designed & certified by others.
5. This Report verifies the Design Wind Pressures for the above referenced Solar Panel Modules/ Modes. However, they are subject to the analysis and approval by the Project Engineer; Design Engineer and or Approved Competent Person on a project by project basis. Note that the Design Engineer must confirm that the Design Wind Pressures are less than the Recommend Capacities referenced within this report, for each specific project.

<table>
<tr><td colspan="2">Company Name if certification issued on behalf of a corporation<br>Albright Services Group Pty Ltd, Trading as Albright Consulting Engineers</td><td colspan="2">Company NT Registration Number<br>215037ES</td></tr>
<tr><td colspan="4">I certify that reasonable care has been taken to ensure that the structural engineering aspects of the works as described above have been designed in accordance with the requirements of the Building Code of Australia and the Northern Territory Building Regulations</td></tr>
<tr><td>Name<br>Nicholas Kastellorizios<br>Nominee for Albright Services Group Pty Ltd, Trading as Albright Consulting Engineers</td><td>Nominee/Individual<br>NT Registration Number<br>215037ES</td><td>Signature<br> </td><td>Date<br>17/10/2025</td></tr>
</table>

Please contact our office if you require any further information in relation to this report.

Nicholas Kastellorizios
Director/ Structural Engineer
**Albright Consulting Engineers**

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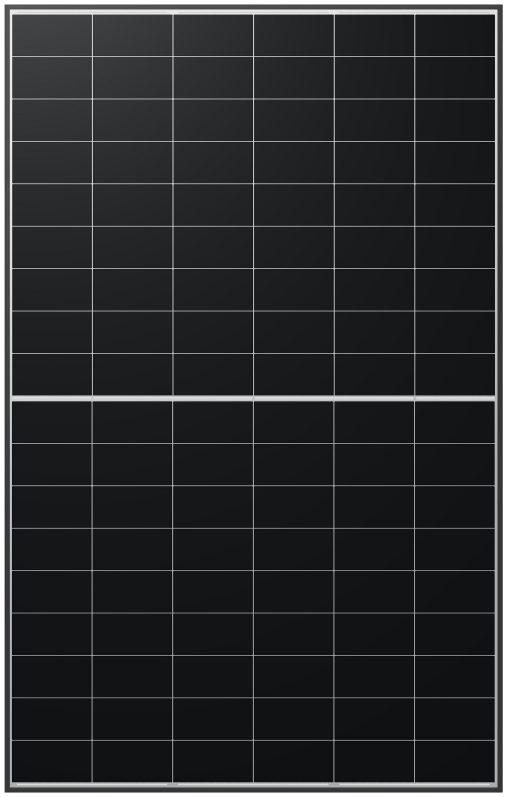
## Appendix:

**PSXXXL7GFH-18/VBH, 1800 mm x 1134 mm x 30 mm, 23.5 kg; Models: PS475L7GFH-18/VBH; PS480L7GFH-18/VBH; PS485L7GFH-18/VBH; PS490L7GFH-18/VBH & PS495L7GFH-18/VBH**



# 475-495W

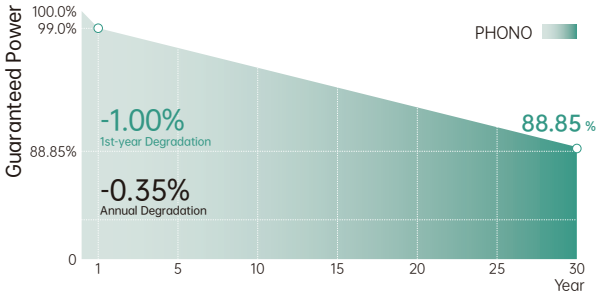
## Quasar Module Series

N-BC HIGH EFFICIENCY 108-0BB-B-BG

Bloomberg NEW ENERGY FINANCE Tier 1 TOP PERFORMER 2025 kiwa PV MODULE RELIABILITY SCORECARD

## Product Characteristics

- All back contact design enhances light absorption
- Aesthetic design in true black
- Optimized cell size brings higher power and lower transportation costs




**15-year** Product Warranty

**30-year** Linear Performance Warranty

## Higher Quality Reliability

- Competitive high-temperature performance with ameliorated temperature coefficient
- Optimize power generation performance under partial shading conditions

## Wider Application Conditions

- Universal solution for residential and C&I
- Easy for integration, designed for compatibility with existing mainstream inverters and diverse mounting systems

## MANAGEMENT SYSTEM CERTIFICATES

IEC 61215, IEC 61730,

ISO 9001
2015 / Quality management system

ISO 14001
2015 / Standards for environmental management system

ISO 45001
2018 / International standards for occupational health & safety

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www.phonosolar.com / info@phonosolar.com

## Electrical Typical Values

| Model | PS475L7GFH-18/VBH | | PS480L7GFH-18/VBH | | PS485L7GFH-18/VBH | | PS490L7GFH-18/VBH | | PS495L7GFH-18/VBH | |
|---|---|---|---|---|---|---|---|---|---|---|
| Testing Condition | STC | NOCT | STC | NOCT | STC | NOCT | STC | NOCT | STC | NOCT |
| Rated Power (Pmpp) | 475 | 361 | 480 | 365 | 485 | 369 | 490 | 373 | 495 | 377 |
| Rated Current (Impp) | 14.31 | 11.47 | 14.41 | 11.55 | 14.51 | 11.63 | 14.61 | 11.71 | 14.71 | 11.79 |
| Rated Voltage (Vmpp) | 33.20 | 31.47 | 33.32 | 31.60 | 33.43 | 31.73 | 33.54 | 31.85 | 33.66 | 31.98 |
| Short Circuit Current (Isc) | 15.01 | 12.06 | 15.11 | 12.14 | 15.21 | 12.22 | 15.31 | 12.30 | 15.41 | 12.38 |
| Open Circuit Voltage (Voc) | 40.11 | 37.93 | 40.27 | 38.10 | 40.42 | 38.27 | 40.56 | 38.34 | 40.72 | 38.60 |
| Module Efficiency (%) | 23.27 | | 23.52 | | 23.76 | | 24.01 | | 24.25 | |

STC (Standard Testing Conditions): Irradiance 1000W/m2 AM 1.5, Cell Temperature 25°c

NOCT (Nominal Operation Cell Temperature): Irradiance 800W/m2, Ambient Temperature 20°C , Spectra at AM1.5, Wind at 1m/s

## Mechanical Characteristics

| | |
|---|---|
| Cell Type | N Type BC |
| Dimension (L × W × H) | Length: 1800mm (70.87 inch)<br>Width: 1134mm (44.65 inch)<br>Height: 30mm (1.18 inch) |
| Weight | 23.5kg (51.80 lbs) |
| Front Glass | 2.0mm Heat Strengthened Glass |
| Back Glass | 1.6mm Heat Strengthened Glass |
| Frame | Anodized Aluminium Alloy |
| Cable<br>(Including Connector) | 4mm² (IEC),<br>(+): 400mm,(-): 200mm or Customized Length |
| Junction Box | IP 68 Rated |

## Temperature Ratings

| | |
|---|---|
| Voltage Temperature Coefficient | -0.20%/°C |
| Current Temperature Coefficient | +0.05%/°C |
| Power Temperature Coefficient | -0.26%/°C |
| Power Tolerance | 0~+3% |
| NOCT | 45±2°C |
| Bifaciality | 70±5% |

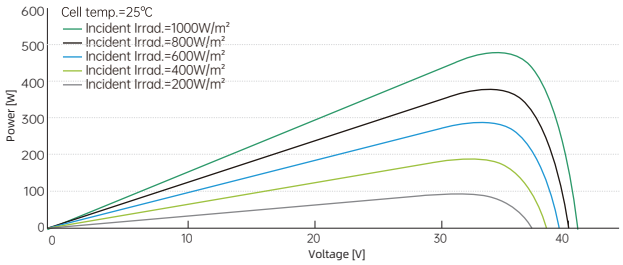
## Absolute Maximum Rating

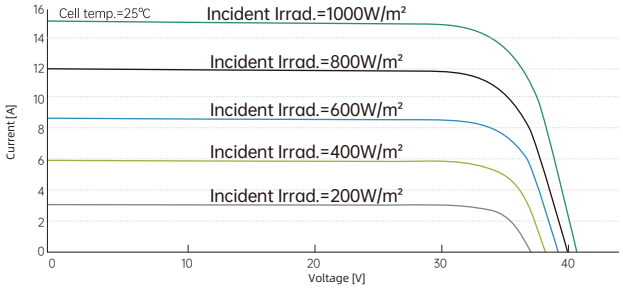
| | |
|---|---|
| Operating Temperature | From -40 to + 85°C |
| Hail Diameter @ 80km/h | Up to 25mm |
| Front Side Maximum Static Loading | 5400Pa |
| Rear Side Maximum Static Loading | 2400Pa |
| Maximum Series Fuse Rating | 30A |
| PV Module Classification | II |
| Fire Rating (IEC61730) | C |
| Maximum System Voltage | DC 1500V |

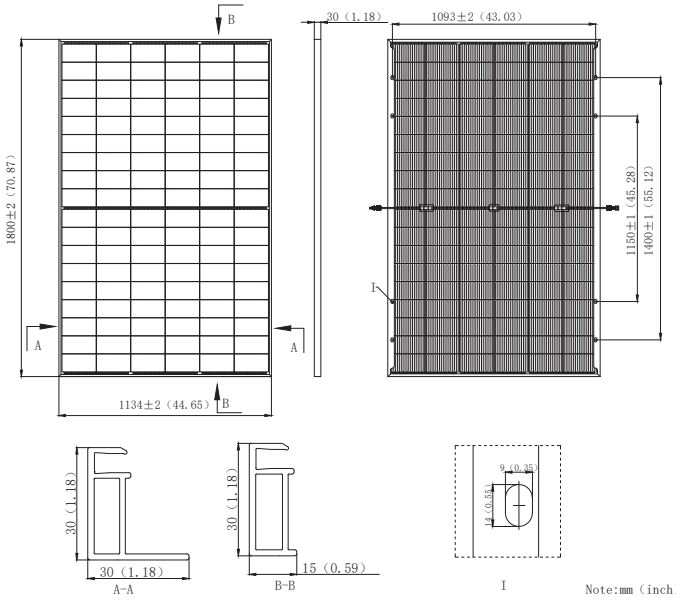
## Packing Configuration

| | |
|---|---|
| Container | 40' HQ |
| Pcs/Container | 864 |
| Pcs/Pallet | 36 |
| Pallets/Container | 24 |

## Electrical Characteristics

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