SCOPE OF WORK

SYSTEM SIZE: 6720W DC
MODULES: (24) GIGAWATT GW280MB
INVERTER(S): (1) SOLAREDGE SE7600A-US
RACKING: IRONRIDGE XR10
ATTACHMENT: QMSE

ESTIMATED SOLAR PRODUCTION: 854kWh/Month - 10249kWh/Year
AVERAGE ELECTRIC CONSUMPTION: 1134kWh/Month - 13608kWh/Year

ESTIMATED kWh OFFSET: 75.32%

GENERAL NOTES

- LOCAL UTILITY PROVIDER SHALL BE NOTIFIED PRIOR TO USE AND ACTIVATION OF ANY SOLAR PHOTOVOLTAIC INSTALLATION
- THIS PROJECT SHALL COMPLY WITH TITLE 24 AND 2013 CALIFORNIA BUILDING CODE (CBC), CALIFORNIA ELECTRICAL CODE (CEC) CALIFORNIA ENERGY CODE (CEC) AND LOCAL ORDINANCES
- PROPER ACCESS AND WORKING CLEARANCE WILL BE PROVIDED AS PER SECTION 110.26 CEC
- ALL ELECTRICAL WORK SHOWN ON THESE PLANS WILL BE COMPLETED BY THE Undersigned HOMEOWNER
- ALL APPLICABLE PV EQUIPMENT LISTED AND COMPLIANT WITH UL2703 AND UL1703
- ALL ROOF PENETRATIONS TO BE SEALED WITH A HIGH PERFORMANCE ROOF SEALANT SUCH AS GeoCel 2300 CLEAR SEALANT
- THE SYSTEM WILL NOT BE INTERCONNECTED UNTIL APPROVAL FROM THE LOCAL JURISDICTION AND THE UTILITY IS OBTAINED
- THE SOLAR PHOTOVOLTAIC INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS
- IF THE EXISTING MAIN PANEL DOES NOT HAVE VERIFIABLE GROUNDING ELECTRODE, IT IS THE HOME OWNERS (OWNER INSTALLED SYSTEM) RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE
- EACH MODULE WILL BE GROUNDED USING THE SUPPLIED CONNECTION POINTS IDENTIFIED ON THE MODULE AND THE MANUFACTURER'S INSTALLATION INSTRUCTIONS"
- A LADDER SHALL BE IN PLACE FOR THE INSPECTION IN COMPLIANCE WITH CAL-Osha REGULATIONS
- MAX HEIGHT OF MODULES OFF OF ROOF FACE : <6" - MAX RAIL SPAN IS 4' 0" BETWEEN ROOF ATTACHMENTS"
- ALL WORK SHALL COMPLY WITH 2011 NEC, 2012 IBC, MUNICIPAL COD, AND ALL
- MANUFACTURERS' LISTINGS AND INSTALLATION INSTRUCTION.
- PHOTOVOLTAIC SYSTEM WILL COMPLY WITH 2011 NEC.
- ELECTRICAL SYSTEM GROUNDING WILL COMPLY WITH 2011 NEC.
- PHOTOVOLTAIC SYSTEM IN UNGROUNDED. NO CONDUCTORS ARE SOLIDLY GROUNDED IN THE INVERTER. SYSTEM COMPLIES WITH 690.35.
- MODULES CONFORM TO AND ARE LISTED UNDER UL 1703.
- INVERTER CONFORMS TO AND IS LISTED UNDER UL 1741.
- CONSTRUCTION FOREMAN TO PLACE CONDUIT RUN PER 690.31 (E) AND 2012 IFC 605.11.2.
- ELECTRICAL EQUIPMENT AND MATERIAL TO BE LISTED, LABELED, AND INSTALLED PER THE CEC, THE INSTALLATION STANDARDS/MANUFACTURER'S RECOMMENDATIONS AND , IF REQUIRED'S A RECOGNIZED ELECTRICAL TESTING LABORATORY.
SITE PLAN: 1/16" = 1'-0"

<table>
<thead>
<tr>
<th>PROPERTY LINE</th>
<th>(E) GARAGE</th>
<th>(N) ARRAY AR-01</th>
<th>(E) RESIDENCE</th>
<th>(E) DRIVEWAY</th>
</tr>
</thead>
</table>

10588 NORTH AIRPORT RD

<table>
<thead>
<tr>
<th>PITCH</th>
<th>AZIMUTH</th>
<th>PV AREA (SQFT)</th>
<th>PV AREA (LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°</td>
<td>180°</td>
<td>420.29</td>
<td>978.96</td>
</tr>
</tbody>
</table>

PV 2.0

GO GREEN SOLAR.COM

OWNER INSTALLED

JOHN SOLAR
310 E. ORANGETHORPE
PLACENTIA, CA 92870

SITE PLAN

PV 2.0
**Micro Inverter Ratings**

**Make:** Solaredge

**Model:** SE7600A-US

**Max Input Current:** 23A

**Max Power (AC):** 7600W

**Nom. AC Voltage:** 350V

**Max AC Current:** 32A

**CEC Efficiency:** 97.5%

---

**Conductor Sizing Calculations**

<table>
<thead>
<tr>
<th>Circuit Description</th>
<th>Current</th>
<th>Imax</th>
<th>Specified Conductor</th>
<th>Ampacity @ 90oC</th>
<th>Ambient Temp Cond.</th>
<th>Current Carrying Cond.</th>
<th>Cond. of Use Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV Source Circuit String 1</td>
<td>12.83A</td>
<td>16.0A</td>
<td>#10 THHN 30A</td>
<td>35A</td>
<td>61-65</td>
<td>4-6</td>
<td>30A (at m. b. temp) x 0.8</td>
</tr>
<tr>
<td>PV Source Circuit String 2</td>
<td>12.83A</td>
<td>16.0A</td>
<td>#10 THHN 30A</td>
<td>35A</td>
<td>61-65</td>
<td>4-6</td>
<td>30A (at m. b. temp) x 0.8</td>
</tr>
<tr>
<td>Sub Panel</td>
<td>40A</td>
<td>40A</td>
<td>#8 THHN 55A</td>
<td>56-60</td>
<td></td>
<td>1-3</td>
<td>55A x 1.20 (at m. b. temp) x 1</td>
</tr>
</tbody>
</table>

**Terminal Temperature Rating Considerations**

<table>
<thead>
<tr>
<th>Circuit Description</th>
<th>Current</th>
<th>Imax</th>
<th>Specified Conductor</th>
<th>Terminal Temp Rating</th>
<th>Specified Conductor</th>
<th>Ampacity @ Terminal Temp Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV Source Circuit String 1</td>
<td>12.83A</td>
<td>16.0A</td>
<td>#10 THHN 30A</td>
<td>60C</td>
<td></td>
<td>30A</td>
</tr>
<tr>
<td>PV Source Circuit String 2</td>
<td>12.83A</td>
<td>16.0A</td>
<td>#10 THHN 30A</td>
<td>60C</td>
<td></td>
<td>30A</td>
</tr>
<tr>
<td>Sub Panel</td>
<td>40A</td>
<td>40A</td>
<td>#8 THHN 55A</td>
<td></td>
<td></td>
<td>55A</td>
</tr>
</tbody>
</table>

**Voltage Drop Calculations**

<table>
<thead>
<tr>
<th>Length</th>
<th>I</th>
<th>Ohms/kft</th>
<th>V</th>
<th>Calc</th>
<th>%V/ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>50ft</td>
<td>12.83A</td>
<td>0.9989</td>
<td>350V</td>
<td>0.5083A x 2 x 0.9989/1000/350V = 0.53%</td>
<td></td>
</tr>
<tr>
<td>50ft</td>
<td>12.83A</td>
<td>0.9989</td>
<td>350V</td>
<td>0.5083A x 2 x 0.9989/1000/350V = 0.53%</td>
<td></td>
</tr>
<tr>
<td>30ft</td>
<td>40A</td>
<td>0.3951</td>
<td>350V</td>
<td>0.3951A x 2 x 0.3951/1000/350V = 0.42%</td>
<td></td>
</tr>
</tbody>
</table>

---

**Module and Array Ratings:**

**Module Ratings (STC):**

**Make:** Gigawatt

**Model:** GW280MB

**Series:** 12 12

**Parallel:** 1 1

**Imp:** 8.80A

**Vmp:** 31.90V

**Isc:** 9.46A

**Voc:** 39.6V

**Pmax:** 287W

**%Voc/Isc:** 0.31%

**Array Ratings:**

**Make:** Gigawatt

**Model:** GW280MB

<table>
<thead>
<tr>
<th>String 1</th>
<th>String 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 12</td>
<td>12 12</td>
</tr>
<tr>
<td>Imp: 8.80A</td>
<td>Imp: 9.6A</td>
</tr>
<tr>
<td>Vmp: 350V</td>
<td>Vmp: 350V</td>
</tr>
<tr>
<td>Isc: 12.83A</td>
<td>Isc: 12.83A</td>
</tr>
<tr>
<td>Voc: 350V</td>
<td>Voc: 3360W</td>
</tr>
<tr>
<td>Pmax: 3360W</td>
<td>Pmax: 3360W</td>
</tr>
</tbody>
</table>

---

**Electrical**

**PV 4.0**

---

**Owner Installed**

**John Solar**

310 E. Orangeforke

Placentia, CA 92870
The Best Value PV for American Homes

Positive power tolerance
+5W
-0 / +5 Wp: guaranteed to produce up to an additional 5W of power.

PID-Free
PID stands for Potential Induced Degradation
Module power loss is less than 5% under IEC 62804

Hot-spot protection
Designed to withstand localized heating caused by cracked, mismatched cells, interconnection failures, or partial shadowing.

Maximum load
Designed to withstand heavy snow and wind pressure under IEC 61215 & IEC 61730.

In-House EL tests
Electroluminescence (EL) measurements rule out invisible defects such as microcracks, finger defects, and low-current output areas in modules.

We’re an all American company creating local jobs to support the adoption of renewable solar power. As the leader in home installation solar kits, we understand that pricing, reliability, and performance are important to homeowners. Join us in creating a cleaner, greener world and power your life with sunshine!

Warranty & Certificates
25-year limited warranty on power output
10-year limited warranty on workmanship
60 CELL 270W-280W MONO SOLAR PANEL

Performance at standard test condition (STC)*

<table>
<thead>
<tr>
<th></th>
<th>GW270MB</th>
<th>GW275MB</th>
<th>GW280MB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Power  $P_{max}$</td>
<td>270</td>
<td>275</td>
<td>280</td>
</tr>
<tr>
<td>Open Circuit Voltage $V_{oc}$</td>
<td>38.79</td>
<td>39.28</td>
<td>39.56</td>
</tr>
<tr>
<td>Maximum Power Voltage $V_{mp}$</td>
<td>31.19</td>
<td>31.57</td>
<td>31.90</td>
</tr>
<tr>
<td>Short Circuit Current $I_{sc}$</td>
<td>9.37</td>
<td>9.39</td>
<td>9.46</td>
</tr>
<tr>
<td>Maximum Power Current $I_{mp}$</td>
<td>8.69</td>
<td>8.73</td>
<td>8.80</td>
</tr>
<tr>
<td>Tolerance of Maximum Power</td>
<td>+5 / -0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module Efficiency</td>
<td>16.60</td>
<td>16.90</td>
<td>17.21</td>
</tr>
<tr>
<td>PTC Rating</td>
<td>245.5</td>
<td>250.2</td>
<td>254.8</td>
</tr>
</tbody>
</table>

*STC: Standard Test Condition, 1000 W/m², AM 1.5, 25°C
*PTC: PVUSA Test Condition

Thermal Characteristics

<table>
<thead>
<tr>
<th>NOCT*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>113.9 °F / 45.5°C</td>
</tr>
</tbody>
</table>

TC $I_{sc}$

$\text{TC}_{I_{sc}} = +0.069 \% / ^\circ \text{C}$

TC $V_{oc}$

$\text{TC}_{V_{oc}} = -0.312 \% / ^\circ \text{C}$

TC $P_{max}$

$\text{TC}_{P_{max}} = -0.432 \% / ^\circ \text{C}$

*NOCT: Nominal Operating Cell Temperature
800 W/m², AM 1.5, Ambient Temperature 20°C, Wind Speed 1 m/s

System Integration Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum DC system voltage</td>
<td>1000 V (IEC / UL)</td>
</tr>
<tr>
<td>Maximum series fuse</td>
<td>15 A</td>
</tr>
<tr>
<td>Number of bypass diodes</td>
<td>3</td>
</tr>
<tr>
<td>Snow load</td>
<td>112 psf / 5,400 Pascal</td>
</tr>
<tr>
<td>Wind load</td>
<td>50 psf / 2,400 Pascal</td>
</tr>
<tr>
<td>Operating range</td>
<td>-40 to 185°F / -40 to 85°C</td>
</tr>
<tr>
<td>Fire performance</td>
<td>Type 2 (UL 1703)</td>
</tr>
</tbody>
</table>

IV Curve

[Graph showing Current, Power vs. Voltage Characteristics]

Module Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell Type</td>
<td>6&quot; Monocrystalline Silicon</td>
</tr>
<tr>
<td>Length</td>
<td>64.57 in / 1640 mm</td>
</tr>
<tr>
<td>Width</td>
<td>39.06 in / 992 mm</td>
</tr>
<tr>
<td>Height</td>
<td>1.57 in / 40 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>40.79 lbs / 18.5 Kg</td>
</tr>
<tr>
<td>Glass</td>
<td>Low iron tempered with ARC</td>
</tr>
<tr>
<td>Frame</td>
<td>Black anodized aluminum</td>
</tr>
<tr>
<td>Junction Box</td>
<td>IP 67</td>
</tr>
<tr>
<td>Connectors</td>
<td>MC4 Compatible</td>
</tr>
</tbody>
</table>

310 E. Orangethorpe Ave Ste D · Placentia, CA 92870
www.GoGreenSolar.com · 866-798-4435
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# Listing Mark Verification

This Listing Mark Verification is not an Authorization to Mark. Verification of products currently authorized to bear the Mark(s) indicated can be found at [http://www.intertek.comdirectories](http://www.intertek.com/directories).

## Issue Date: August 18, 2015

<table>
<thead>
<tr>
<th>Applicant:</th>
<th>Gigawatt Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Description:</td>
<td>PV Module</td>
</tr>
<tr>
<td>Trade Name:</td>
<td>Gigawatt</td>
</tr>
</tbody>
</table>

### Models Covered:
- GW280PB
- GW275PB
- GW270PB
- GW265PB
- GW260PB
- GW255PB
- GW250PB
- GW300MB
- GW295MB
- GW290MB
- GW285MB
- GW280MB
- GW275MB
- GW270MB

### Standards:
Standard for Safety Flat-Plate Photovoltaic Modules and Panels – UL 1703 and ULC/ORD-C1703

### Directory Link(s):
[http://www.intertek.comdirectories](http://www.intertek.com/directories)

Pearly Yu
Directory Coordinator
Signature

# Relevant Listing Mark(s):

![Intertek Certification Mark](image)

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SolarEdge Power Optimizer
Module Add-On For North America
P300 / P320 / P400 / P405

PV power optimization at the module-level
- Up to 25% more energy
- Superior efficiency (99.5%)
- Mitigates all types of module mismatch losses, from manufacturing tolerance to partial shading
- Flexible system design for maximum space utilization
- Fast installation with a single bolt
- Next generation maintenance with module-level monitoring
- Module-level voltage shutdown for installer and firefighter safety
## SolarEdge Power Optimizer
Module Add-On for North America

**P300 / P320 / P400 / P405**

### INPUT

<table>
<thead>
<tr>
<th></th>
<th>P300 (for 60-cell modules)</th>
<th>P320 (for high-power 60-cell modules)</th>
<th>P400 (for 72 &amp; 96-cell modules)</th>
<th>P405 (for thin film modules)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated Input DC Power</strong></td>
<td>300 W</td>
<td>320 W</td>
<td>400 W</td>
<td>405 W</td>
</tr>
<tr>
<td><strong>Absolute Maximum Input Voltage</strong> (Voc at lowest temperature)</td>
<td>48 Vdc</td>
<td>80 Vdc</td>
<td>125 Vdc</td>
<td>12.5 - 105 Vdc</td>
</tr>
<tr>
<td><strong>MPPT Operating Range</strong></td>
<td>8 - 48 Vdc</td>
<td>8 - 80 Vdc</td>
<td>10.1 Vdc</td>
<td>12.63 Vdc</td>
</tr>
<tr>
<td><strong>Maximum Short Circuit Current (Isc)</strong></td>
<td>10 Adc</td>
<td>11 Adc</td>
<td>10.1 Adc</td>
<td>12.63 Adc</td>
</tr>
<tr>
<td><strong>Maximum DC Input Current</strong></td>
<td>12.5 Adc</td>
<td>13.75 Adc</td>
<td>12.63 Adc</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum Efficiency</strong></td>
<td>99.5%</td>
<td>98.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weighted Efficiency</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overvoltage Category</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)

<table>
<thead>
<tr>
<th></th>
<th>Maximum Output Current</th>
<th>Maximum Output Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15 Adc</td>
<td>60 Vdc</td>
</tr>
</tbody>
</table>

### OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF)

| Safety Output Voltage per Power Optimizer | 1 Vdc |

### STANDARD COMPLIANCE

<table>
<thead>
<tr>
<th>EMC</th>
<th>FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>IEC62109-1 (class II safety), UL1741</td>
</tr>
<tr>
<td>RoHS</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### INSTALLATION SPECIFICATIONS

| Maximum Allowed System Voltage | 1000 Vdc |
| Compatible inverters | All SolarEdge Single Phase and Three Phase inverters |
| Dimensions (W x L x H) | 128 x 152 x 27.5 / 5 x 5.97 x 1.08 |
| Weight (including cables) | 760 / 1.7 gr |
| Input Connector | MC4 Compatible |
| Output Wire Type / Connector | Double Insulated; MC4 Compatible |
| Output Wire Length | 0.95 / 3.0 m |
| Operating Temperature Range | -40 - 4085 / -40 - +185 °C / °F |
| Protection Rating | IP68 / NEMA6P |
| Relative Humidity | 0 - 100 % |

### PV SYSTEM DESIGN USING A SOLAREDGE INVERTER

<table>
<thead>
<tr>
<th>SINGLE PHASE</th>
<th>THREE PHASE 208V</th>
<th>THREE PHASE 480V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum String Length (Power Optimizers)</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Maximum String Length (Power Optimizers)</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Maximum Power per String</td>
<td>5250 W</td>
<td>6000 W</td>
</tr>
<tr>
<td>Parallel Strings of Different Lengths or Orientations</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

---

(1) Rated STC power of the module. Module of up to +5% power tolerance allowed.

(2) It is not allowed to mix P405 with P300/P400/P600/P700 in one string.
SolarEdge Single Phase Inverters
For North America

The best choice for SolarEdge enabled systems
- Integrated arc fault protection for NEC 2011 690.11 compliance
- Rapid shutdown for NEC 2014 690.12
- Superior efficiency (98%)
- Small, lightweight and easy to install on provided bracket
- Built-in module-level monitoring
- Internet connection through Ethernet or Wireless
- Outdoor and indoor installation
- Fixed voltage inverter, DC/AC conversion only
- Pre-assembled Safety Switch for faster installation
- Optional – revenue grade data, ANSI C12.1
<table>
<thead>
<tr>
<th>Single Phase Inverters for North America</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OUTPUT</strong></td>
</tr>
<tr>
<td>Nominal AC Power Output</td>
</tr>
<tr>
<td>Max. AC Power Output</td>
</tr>
<tr>
<td>AC Output Voltage Min.-Nom.-Max.</td>
</tr>
<tr>
<td>AC Output Voltage Min.-Nom.-Max.</td>
</tr>
<tr>
<td>AC Frequency Min.-Nom.-Max.</td>
</tr>
<tr>
<td>Max. Continuous Output Current</td>
</tr>
<tr>
<td>GFDI Threshold</td>
</tr>
<tr>
<td>Utility Monitoring, Islanding Protection, Country Configurable Thresholds</td>
</tr>
<tr>
<td><strong>INPUT</strong></td>
</tr>
<tr>
<td>Maximum DC Power (STC)</td>
</tr>
<tr>
<td>Transformer-less, Ungrounded</td>
</tr>
<tr>
<td>Max. Input Voltage</td>
</tr>
<tr>
<td>Nom. DC Input Voltage</td>
</tr>
<tr>
<td>Max. Input Current</td>
</tr>
<tr>
<td>Max. Input Short Circuit Current</td>
</tr>
<tr>
<td>Reverse-Polarity Protection</td>
</tr>
<tr>
<td>Ground-Fault Isolation Detection</td>
</tr>
<tr>
<td>Maximum Inverter Efficiency</td>
</tr>
<tr>
<td>CEC Weighted Efficiency</td>
</tr>
<tr>
<td>Nighttime Power Consumption</td>
</tr>
<tr>
<td><strong>ADDITIONAL FEATURES</strong></td>
</tr>
<tr>
<td>Supported Communication Interfaces</td>
</tr>
<tr>
<td>Revenue Grade Data, ANSI C12.1</td>
</tr>
<tr>
<td>Rapid Shutdown – NEC 2014 690.12</td>
</tr>
<tr>
<td><strong>STANDARD COMPLIANCE</strong></td>
</tr>
<tr>
<td>Safety</td>
</tr>
<tr>
<td>Grid Connection Standards</td>
</tr>
<tr>
<td>Emissions</td>
</tr>
<tr>
<td><strong>INSTALLATION SPECIFICATIONS</strong></td>
</tr>
<tr>
<td>AC output conduit size / AWG range</td>
</tr>
<tr>
<td>DC input conduit size / # of strings / AWG range</td>
</tr>
<tr>
<td>Dimensions with Safety Switch (HxWxD)</td>
</tr>
<tr>
<td>Weight with Safety Switch</td>
</tr>
<tr>
<td>Cooling</td>
</tr>
<tr>
<td>Noise</td>
</tr>
<tr>
<td>Min.-Max. Operating Temperature Range</td>
</tr>
<tr>
<td>Protection Rating</td>
</tr>
</tbody>
</table>

(1) For other regional settings please contact SolarEdge support.
(2) A higher current source may be used; the inverter will limit its input current to the values stated.
AUTHORIZATION TO MARK

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Applicant: SolarEdge Technologies Ltd
Address: 6 Ha’Harash Street 45240 Hod Hasharon
Country: Israel
Contact: Mr. Oren Bachar or Mr. Meir Adest
Phone: +972 9 957 6620 #293 or +972 9 957 6620 #131
FAX: +972 9 957 6591
Email: OREN.B@SOLAREEDGE.COM
Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Cortland, NY 13045
Control Number: 4004590
Authorized by: for Thomas J. Patterson, Certification Manager

Intertek Testing Services NA Inc.
545 East Algonquin Road, Arlington Heights, IL 60005
Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672


CSA C22.2 107.1 Issue:2001/09/01 Ed:3 General Use Power Supplies - (R2011)

Standard(s): UL SUBJECT 1699B, Outline of Investigation for Photovoltaic (PV) DC Arc-Fault Circuit Protection - Issue No.2, 2013/01/14

CSA TIL M-07, Interim Certification Requirements for Photovoltaic (PV) DC Arc-Fault Protection - Issue No. 1, 2013/03/11

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| **Applicant:** | SolarEdge Technologies Ltd |
| **Manufacturer:** | Bigtech CLI Inc. |
| **Address:** | 6 Ha'Harash Street 45240  
Hod Hasharon |
| **Country:** | Israel |
| **Contact:** | Mr. Oren Bachar or  
Mr. Meir Adest |
| **Phone:** | +972 9 957 6620 #293 or  
+972 9 957 6620 #131 |
| **FAX:** | +972 9 957 6591 |
| **Email:** | OREN.B@SOLAREEDGE.COM |
| **Party Authorized To Apply Mark:** | Same as Manufacturer |
| **Report Issuing Office:** | Cortland, NY 13045 |
| **Control Number:** | 5000139 |
| **Authorized by:** | _____________________________ for Thomas J. Patterson, Certification Manager |

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545 East Algonquin Road, Arlington Heights, IL 60005  
Telephone 800-345-3851 or 847-439-5667  
Fax 312-283-1672

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Applicant: SolarEdge Technologies Ltd
Manufacturer: Flextronics ZALA
Address: 6 Ha’Harash Street 45240
Address: Zrínyi Miklós u. 38
Hod Hasharon
8900
Country: Israel
Country: Hungary
Contact: Mr. Oren Bachar or Mr. Meir Adest
Contact: Balázs Banics
Phone: +972 9 957 6620 #293 or +972 9 957 6591
Phone: +36 92 507134
FAX: +972 9 957 6620 #131
FAX: +36 92 552033
Email: OREN.B@SOLAREEDGE.COM
Email: balazs.banics@flextronics.com

Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Cortland, NY 13045
Control Number: 4008271
Authorized by: 
for Thomas J. Patterson, Certification Manager

Intertek Testing Services NA Inc.
545 East Algonquin Road, Arlington Heights, IL 60005
Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672


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Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.

Force-Stabilizing Curve
Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs
XR Rails are compatible with FlashFoot and other pitched roof attachments.

Corrosion-Resistant Materials
IronRidge offers a range of tilt leg options for flat roof mounting applications.

All XR Rails are made of marine-grade aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.
XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.

XR10
XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves 6 foot spans, while remaining light and economical.

- 6’ spanning capability
- Moderate load capability
- Clear & black anodized finish
- Internal splices available

XR100
XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

- 8’ spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available

XR1000
XR1000 is a heavyweight among solar mounting rails. It’s built to handle extreme climates and spans 12 feet or more for commercial applications.

- 12’ spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

<table>
<thead>
<tr>
<th>Load</th>
<th>Rail Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snow (PSF)</td>
<td>Wind (MPH)</td>
</tr>
<tr>
<td>None</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>160</td>
</tr>
<tr>
<td>10-20</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>160</td>
</tr>
<tr>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>160</td>
</tr>
<tr>
<td>40</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>160</td>
</tr>
<tr>
<td>50-70</td>
<td>160</td>
</tr>
<tr>
<td>80-90</td>
<td>160</td>
</tr>
</tbody>
</table>

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Background

All roofing products are tested and classified for their ability to resist fire.

Recently, these fire resistance standards were expanded to include solar equipment as part of the roof system. Specifically, this requires the modules, mounting hardware and roof covering to be tested together as a system to ensure they achieve the same fire rating as the original roof covering.

Adoption of these new requirements will begin in California in 2015 and extend to the rest of the country in 2016.

IronRidge Certification

In August 2014, IronRidge was the first company to receive a Class A Fire Rating—the highest possible rating—from Intertek Group plc., a Nationally Recognized Testing Laboratory.

IronRidge Roof Mount products were tested on flat and sloped roofs in accordance with the new UL 1703 & UL 2703 test standards. The testing evaluated the system’s ability to resist flame spread, burning material and structural damage to the roof.

Refer to the table below to determine the requirements for achieving a Class A Fire Rating on your next project.

<table>
<thead>
<tr>
<th>Roof Slope</th>
<th>Mount</th>
<th>Module</th>
<th>Fire Rating*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steep Slope (&gt; 9.5 deg.)</td>
<td>Flush</td>
<td>Type 1 &amp; 2</td>
<td>Class A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Slope (&lt; 9.5 deg.)</td>
<td>Flush</td>
<td>Type 1</td>
<td>Class A</td>
</tr>
<tr>
<td></td>
<td>Tilt</td>
<td>Type 1</td>
<td>Class A</td>
</tr>
</tbody>
</table>

*Can be installed on Class A, B, & C roofs.
Frequently Asked Questions

What is a “module type”?
The new UL1703 standard introduces the concept of a PV module type, based on 4 construction parameters and 2 fire performance parameters. The purpose of this classification is to certify mounting systems without needing to test it with every module.

What roofing materials are covered?
All fire rated roofing materials are covered within this certification including composition shingle, clay and cement tile, metal, and membrane roofs.

What if I have a Class C roof, but the jurisdiction now requires Class A or B?
Generally, older roofs will be “grandfathered in”, and will not require re-roofing. However, if 50% or more of the roofing material is replaced for the solar installation the code requirement will be enforced.

Where is the new fire rating requirement code listed?
2012 IBC: 1509.7.2 Fire classification. Rooftop mounted photovoltaic systems shall have the same fire classification as the roof assembly required by Section 1505.

Where is a Class A Fire Rating required?
The general requirement for roofing systems in the IBC refers to a Class C fire rating. Class A or B is required for areas such as Wildland Urban Interface areas (WUI) and for very high fire severity areas. Many of these areas are found throughout the western United States. California has the most Class A and B roof fire rating requirements, due to wild fire concerns.

Are standard mid clamps covered?
Mid clamps and end clamps are considered part of the PV “system”, and are covered in the certification.

What attachments and flashings are deemed compatible with Class A?
Attachments and their respective flashings are not constituents of the rating at this time. All code-compliant flashing methods are acceptable from a fire rating standpoint.

What mounting height is acceptable?
The UL testing was performed at a height of 5". The code does not specify minimum or maximum height. The IronRidge Class A rating covers all heights as long as they fit within the “flush mounted” category.

Am I required to install skirting to meet the fire code?
No, IronRidge achieved a Class A fire rating without any additional racking components.

What determines Fire Classification?
Fire Classification refers to a fire-resistance rating system for roof covering materials based on their ability to withstand fire exposure.

Class A - effective against severe fire exposure
Class B - effective against moderate fire exposure
Class C - effective against light fire exposure

What if the roof covering is not Class A rated?
The IronRidge Class A rating will not diminish the fire rating of the roof, whether Class A, B, or C.

What tilts is the tilt mount system fire rated for?
The tilt mount system is rated for 10 degrees and up and any roof to module gap, or mounting height.

More Resources

Fire Rating Certificate
Visit our website to download the official UL 2703 certification document.
Go to IronRidge.com

Engineering Certification Letters
We offer complete engineering resources and pre-stamped certification letters.
Go to IronRidge.com
Installation

Once the end module is set into position, place second module into position, leaving a 1/2" gap between it and the previous module. While holding module in place, drop Grounding Mid Clamps into rail slots and rotate nuts to engage T-bolts.

Slide second module flush against clamp tabs. Once clamp teeth are in contact with both module frames and the bolts are properly aligned in slots, torque to 84 in-lbs (55 in-lbs for SunPower modules). Repeat procedure for each following module.

- Make sure indent at top of T-bolt is perpendicular to rail slot to ensure T-bolts are properly seated.
- If grounding mid clamps need to be reinstalled, slightly move the modules so that clamp teeth are in contact with a new section of the module frame.

Markings

Markings are located on the top surface of the Grounding Mid Clamp and being with the manufacturing and model number followed by the revision and manufacturing date.

Manufacturer and model number: IR

Revision and manufacturing date:
First digit (revision code): A = Rev A, B = Rev B, etc.
Second digit (month produced): A = Jan, B = Feb, etc.
Third & fourth digits (year produced): 15 = 2015, etc.

Ratings

Max Overcurrent Protective Device (OCPD) Rating: 25A

Installer is responsible for and shall provide an appropriate method of direct-to-earth grounding according to the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems.

If loose components, loose fasteners or corrosion are found during periodic inspection, replace affected components immediately.
Module Compatibility

The Grounding Mid Clamp may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions. Unless otherwise noted, "xxx" refers to the module power rating and both black and silver frames are included in the certification.

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<th>MODELS</th>
</tr>
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<tbody>
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<td>AstroEnergy Solar</td>
<td>Modules with 35, 40, and 45mm frames and model identifier aaSM66yyPzz-xxx; where &quot;aa&quot; can be CH or A; &quot;yy&quot; can be either 10 or 12; &quot;zz&quot; can be blank or (BL).</td>
</tr>
<tr>
<td>Canadian Solar</td>
<td>Modules with 40mm frames and model identifier CS6Y-xxxZ; where &quot;Y&quot; can be K, P, V, or X; and &quot;Z&quot; can be M, P, PX, or P-SD.</td>
</tr>
<tr>
<td>ET Solar</td>
<td>Modules with 35, 40, and 50mm frames and model identifier ET-Y6ZZxxxxAA; where &quot;YY&quot; can be P, L, or M; &quot;ZZ&quot; can be 60 or 72; and &quot;AA&quot; can be WB, WW, BB, WBG, WWG, WBAC, WBCO, WWCO, WWBCO or BBAC.</td>
</tr>
<tr>
<td>GigaWatt Solar</td>
<td>Modules with 40mm frames and model identifier GWxxxxYY; where &quot;YY&quot; can be either PB or MB.</td>
</tr>
<tr>
<td>Hanwha Solar</td>
<td>Modules with 40, 45, and 50mm frames and model identifier HSLaap6-YY-1-xxxZ; where &quot;aa&quot; can be either 60 or 72; &quot;YY&quot; can be PA or PB; and &quot;Z&quot; can be blank or B.</td>
</tr>
<tr>
<td>Hanwha Q CELLS</td>
<td>Modules with 32, 35, 40, and 42mm frames and model identifier Q.YY-xxx-Z; where &quot;YY&quot; can be PLUS, PRO, or PEAK; and &quot;ZZ&quot; can be G3, G4, L-G2, L-G3y, L-G4y, BFR-G3, BLK-G3, BFR-G4, BFR-G4.1, or G4.1/SC.</td>
</tr>
<tr>
<td>Hyundai</td>
<td>Modules with 35 and 50mm frames and model identifier HiS-YxxxZ; where &quot;Y&quot; can be M or S; and &quot;ZZ&quot; can be MI, MF, MG, SG, RI, RG, TI, or TG.</td>
</tr>
<tr>
<td>JA Solar</td>
<td>Modules with 40 and 45mm frames and model identifier JAYyzz-zz-xxx; where &quot;yy&quot; can be M6 or P6; &quot;zz&quot; can be blank, (K), (L), (R), (V), (BK), (FA), (TG), (FA)(R), (L)(BK), (L)(TG), (R)(BK), (R)(TG), (V)(BK), (BK)(TG), or (L)(BK)(TG); &quot;bb&quot; can be 48, 60, or 72; and &quot;aa&quot; can be MP, SI, PR, 3BB, 4BB, 4BB/RE.</td>
</tr>
<tr>
<td>Jinko</td>
<td>Modules with 35 and 40mm frames and model identifier JKMYxxxZ; where &quot;Y&quot; can be either blank or S; and &quot;ZZ&quot; can be M, P, PP, P-B, or P-V.</td>
</tr>
<tr>
<td>Kyocera</td>
<td>Modules with 46mm frames and model identifier KYxxxZ-AA; where &quot;Y&quot; can be D or U; &quot;ZZ&quot; can be blank, GX, or SX; and &quot;AA&quot; can be LPU, LFU, UPU, LPS, LPB, LFB, LFO, LFB2, LPB2, 3AC, 3BC, 4AC, 4BC, 4FC, 4UC, 5AC, 5BC, 5FC, 5UC, 6BC, 6FC, or 6BC.</td>
</tr>
<tr>
<td>LG</td>
<td>Modules with 35, 40, and 46mm frames and model identifier LGxxxY1Z-bb; where &quot;y&quot; can be A, N, or S; &quot;z&quot; can be C or K; and &quot;bb&quot; can be A3, B3, G3, C4 or K4.</td>
</tr>
<tr>
<td>Mistubishi</td>
<td>Modules with 46mm frames and model identifier PV-MYYxxxZ; where &quot;YY&quot; can be LE or JE; and &quot;ZZ&quot; can be either HD, H2D, or FB.</td>
</tr>
<tr>
<td>Motech</td>
<td>IM and XS series modules with 40, 45, and 50mm frames.</td>
</tr>
<tr>
<td>Panasonic</td>
<td>Modules with 35mm frames and model identifier VBHNxxxSAyy; where &quot;yy&quot; can be either 06, 06B, 11, 11B, 15, 15B, 16 or 16B.</td>
</tr>
<tr>
<td>Phono Solar</td>
<td>Modules with 35, 40, and 45mm frames and model identifier PSxxxY-ZZ/A; where &quot;Y&quot; can be M or P; &quot;ZZ&quot; can be 20 or 24; and &quot;A&quot; can be F, T or U.</td>
</tr>
<tr>
<td>REC Solar</td>
<td>Modules with 38 and 45mm frames and model identifier RECxxxYYZZ; where &quot;YY&quot; can be M, PE or TP; and &quot;ZZ&quot; can be blank, BLK, SLV, or 72.</td>
</tr>
<tr>
<td>Renesola</td>
<td>Modules with 35, 40, and 50mm frames and model identifier JCxxxY-ZZ; where &quot;Y&quot; can be F, M or S; and &quot;ZZ&quot; can be Ab, Ab-b, Abh, Abh-b, Abv, Abv-b, Bb, Bbh, Bbh-b, Bbv, Bbv-b, Bbv-b, D, or Db-b.</td>
</tr>
<tr>
<td>SolarWorld</td>
<td>Sunmodule Plus, Protect or XL mono or poly modules with 31, 33 or 46mm frames and model identifier SW-xxx.</td>
</tr>
<tr>
<td>Stion</td>
<td>Thin film modules with 35mm frames and model identifier STO-xxx.</td>
</tr>
<tr>
<td>SunEdison</td>
<td>Modules with 35, 40, and 50mm frames and model identifier SE-YxxxZABCDE; where &quot;Y&quot; can be B, F, H, P, R, or Z; &quot;Z&quot; can be 0 or 4; &quot;A&quot; can be B, C, D, E, H, I, J, K, L, M, or N; &quot;B&quot; can be B or W; &quot;C&quot; can be A or C; &quot;D&quot; can be 3, 7, 8, or 9; and &quot;E&quot; can be 0, 1 or 2.</td>
</tr>
<tr>
<td>Suniva</td>
<td>Modules with 35, 38, 40, 46, and 50mm frames and model identifiers OPTxxx-AAA-B-BYY-Z or MVxxx-AAA-B-BYY-Z; where &quot;AA&quot; is either 60 or 72; &quot;B&quot; is either 4 or 5; &quot;YY&quot; is either 100,101,700,1B0, or 1B1; and &quot;Z&quot; is blank or B.</td>
</tr>
<tr>
<td>Sunpower</td>
<td>SPR-A-xx series with standard (G3) or InvisiMount (G5) 46mm frames; where &quot;A&quot; is either E or X; and &quot;xx&quot; is the series number.</td>
</tr>
<tr>
<td>Suntech</td>
<td>Vd, Vern, Wdb, Wde, and Wd series modules with 35, 40, and 50mm frames.</td>
</tr>
<tr>
<td>Trina</td>
<td>Modules with 35, 40 and 46mm frames and model identifier TSM-xxxYYZZ; where &quot;YY&quot; can be PA05, PC05, PD05, PA14, PC14, or PD14; and &quot;ZZ&quot; can be blank or A or A.05 or A.08.</td>
</tr>
<tr>
<td>Winaico</td>
<td>Modules with 35 and 40mm frames and model identifier Wsy-xxxZ6; where &quot;yy&quot; can be either P or T; and &quot;zz&quot; can be either M or P.</td>
</tr>
<tr>
<td>Yingli</td>
<td>Panda, YGE, and YGE-U series modules with 35, 40, and 50 mm frames.</td>
</tr>
</tbody>
</table>
Built for solar’s toughest roofs.

IronRidge builds the strongest roof mounting system in solar. Every component has been tested to the limit and proven in extreme environments.

Our rigorous approach has led to unique structural features, such as curved rails and reinforced flashings, and is also why our products are fully certified, code compliant and backed by a 20-year warranty.

**Strength Tested**
All components evaluated for superior structural performance.

**Complete Assembly**
End-to-end solution provides attachment, mounting, and grounding.

**Integrated Grounding**
UL 2703 system eliminates separate module grounding components.

**PE Certified**
Pre-stamped engineering letters available in most states.

**Design Software**
Online tool generates a complete bill of materials in minutes.

**20 Year Warranty**
Twice the protection offered by competitors.
XR Rails

XR10 Rail
A low-profile mounting rail for regions without snow.
- 6’ spanning capability
- Moderate load capability
- Clear anodized finish

XR100 Rail
The ultimate residential solar mounting rail.
- 8’ spanning capability
- Heavy load capability
- Clear & black anod. finish

XR1000 Rail
A heavyweight mounting rail for commercial projects.
- 12’ spanning capability
- Extreme load capability
- Clear anodized finish

Internal Splices
All rails use internal splices for seamless connections.
- Self-tapping screws
- Varying versions for rails
- Grounding Straps offered

Attachments

FlashFoot
Anchor, flash, and mount with all-in-one attachments.
- Ships with all hardware
- IBC & IRC compliant
- Certified with XR Rails

Slotted L-Feet
Drop-in design for rapid rail attachment.
- High-friction serrated face
- Heavy-duty profile shape
- Clear & black anod. finish

Standoffs
Raise flush or tilted systems to various heights.
- Works with vent flashing
- Ships pre-assembled
- Lengths from 3” to 9”

Tilt Legs
Tilt assembly to desired angle, up to 45 degrees.
- Attaches directly to rail
- Ships with all hardware
- Fixed and adjustable

Clamps & Grounding

End Clamps
Slide in clamps and secure modules at ends of rails.
- Mill finish & black anod.
- Sizes from 1.22” to 2.3”
- Optional Under Clamps

Grounding Mid Clamps
Attach and ground modules in the middle of the rail.
- Parallel bonding T-bolt
- Reusable up to 10 times
- Mill & black stainless

T-Bolt Grounding Lugs
Ground system using the rail’s top slot.
- No clips or washers
- Eliminates pre-drilling
- Easy top-slot mounting

Accessories
Provide a finished and organized look for rails.
- Snap-in Wire Clips
- Perfected End Caps
- UV-protected polymer

Free Resources

Design Assistant
Go from rough layout to fully engineered system. For free.
Go to IronRidge.com/rm

NABCEP Certified Training
Earn free continuing education credits, while learning more about our systems.
Go to IronRidge.com/training
### **E-Mount Lag | QMSE - LAG**

**Lag pull-out (withdrawal) capacities (lbs) in typical lumber:**

<table>
<thead>
<tr>
<th>Material</th>
<th>Specific Gravity</th>
<th>5/16&quot; shaft per 3&quot; thread depth</th>
<th>5/16&quot; shaft per 1&quot; thread depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Douglas Fir, Larch</td>
<td>.50</td>
<td>798</td>
<td>266</td>
</tr>
<tr>
<td>Douglas Fir, South</td>
<td>.46</td>
<td>705</td>
<td>235</td>
</tr>
<tr>
<td>Engelmann Spruce, Lodgepole Pine (MSR 1650 f &amp; higher)</td>
<td>.46</td>
<td>705</td>
<td>235</td>
</tr>
<tr>
<td>Hem, Fir</td>
<td>.43</td>
<td>636</td>
<td>212</td>
</tr>
<tr>
<td>Hem, Fir (North)</td>
<td>.46</td>
<td>705</td>
<td>235</td>
</tr>
<tr>
<td>Southern Pine</td>
<td>.55</td>
<td>921</td>
<td>307</td>
</tr>
<tr>
<td>Spruce, Pine, Fir</td>
<td>.42</td>
<td>615</td>
<td>205</td>
</tr>
<tr>
<td>Spruce, Pine, Fir (E of 2 million psi and higher grades of MSR and MEL)</td>
<td>.50</td>
<td>798</td>
<td>266</td>
</tr>
</tbody>
</table>

**Sources:** American Wood Council, NDS 2005, Table 11.2 A, 11.3.2 A

**Notes:**
1) Thread must be embedded in a rafter or other structural roof member.
2) See NDS Table 11.5.1C for required edge distances.
**E-Mount Lag Installation Instructions**

**Installation Tools Required:** tape measure, roofing bar, chalk line, stud finder, caulking gun, sealant compatible with roofing materials, drill with 7/32" long-style bit, drill or impact gun with 1/2" socket.

**WARNING:** Quick Mount PV products are NOT designed for and should NOT be used to anchor fall protection equipment.

1. Locate, choose, and mark centers of rafters to be mounted. Select the courses of shingles where mounts will be placed.

2. Carefully lift composition roof shingle with roofing bar, just above placement of mount. Remove nails as required. See “Proper Flashing Placement” on next page.

3. Insert flashing between 1st and 2nd course. Slide up so top edge of flashing is at least 3/4" higher than the drip edge of the 3rd course and lower flashing edge is above the drip edge of 1st course. Mark center for drilling.

4. Using drill with 7/32" bit, drill pilot hole into roof and rafter, taking care to drill square to the roof. Do not use mount as a drill guide. Drill should be ‘long style bit’, aka ‘aircraft extension bit’ to drill a 1⅜" deep hole into rafter.

5. Clean off any sawdust, and fill hole with sealant compatible with roofing materials.

6. Slide the flashing into position. Insert the rubber plug into the QBlock cavity.

7. Slide the washer and the L-foot (not included) onto the lag screw.

8. Using a 1/2 inch socket on an impact gun drive the lag screw until the QBlock stops rotating easily. **DO NOT over-torque.**

You are now ready for the rack of your choice. Follow all the directions of the rack manufacturer as well as the module manufacturer.

All roofing manufacturers’ written instructions must also be followed by anyone modifying a roof system. Consult the roof manufacturer’s specs and instructions prior to touching the roof.
**Reference and Tips**

**Proper Flashing Placement**

- Moisture/debris accumulation can cause early shingle degradation.
- Remove nails.
- Incorrect Position
  - No shingle cutting required
- Correct Position
  - Acceptable Position
  - If shingle cutting is required, a 1/2” gap between block and shingle is recommended.

**Additional tips and information for installing mounts:**

- See Quick Tips videos on nail removal, and more at: http://www.quickmountpv.com/support/videos.html
- It is not necessary or advisable to use nails or other fasteners to secure the perimeter of the flashing.
- The E-Mount is made to work with standard and high-definition composition/asphalt and wood shingle roofs with 5” to 5-5/8” courses. If the exposed surface of the course exceeds this measurement you may need to use our Classic Shake Mount instead.
- Depending on the season and climate, size and location of seal tabs, and quality of the shingles, the seal tabs that adhere the shingle courses together may not effectively seal the shingles to the flashings. If this is the case, simply add several quarter-sized dabs of manufacturer accepted sealant or asphalt roofing cement, meeting ASTM D 4586 Type II, between the flashing and the shingle above.
- Mounts should not be installed in areas of the roof susceptible to ice damming. Water ponding under the shingles can reach the bolt penetration.
- Take care not to damage the roofing material while working on the roof. Removing stone granules and deforming the shingles in any way can shorten the lifespan of the roofing. The value of the solar array is directly affected by the condition of the roof it is attached to.
DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
SECTION: 06 05 23—WOOD, PLASTIC, AND COMPOSITE FASTENINGS

REPORT HOLDER:
QUICK MOUNT PV
2700 MITCHELL DRIVE, BUILDING 2
WALNUT CREEK, CALIFORNIA 94598

EVALUATION SUBJECT:
QUICK MOUNT PV ROOF MOUNTS

"2014 Recipient of Prestigious Western States Seismic Policy Council (WSSPC) Award in Excellence"
DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES  
Section: 06 05 23—Wood, Plastic, and Composite Fastenings  

REPORT HOLDER:  
QUICK MOUNT PV  
2700 MITCHELL DRIVE, BUILDING 2  
WALNUT CREEK, CALIFORNIA 94598  
(925) 478-8269  
www.quickmountpv.com  

EVALUATION SUBJECT:  
QUICK MOUNT PV ROOF MOUNTS  

1.0 EVALUATION SCOPE  
Compliance with the following code:  
■ 2012, 2009 and 2006 International Residential Code® (IRC)  

Properties evaluated:  
■ Structural  
■ Water penetration  

2.0 USES  
The Quick Mount PV Roof Mounts (QMSE, QMSE-LAG, QMSC-LAG and QMLC-LAG) are mounting brackets used to attach solar panel mounting systems to the wood framing of roofs with asphalt shingle or wood shake roof coverings.  

3.0 DESCRIPTION  
The Quick Mount PV Roof Mounts (QMSE, QMSE-LAG, QMSC-LAG and QMLC-LAG) have three main components: a hanger bolt or lag screw, an aluminum spacer block and a flashing plate. The hanger bolt is a 5/16-inch-diameter-by-6-inch-long (7.9 by 152 mm) fastener with lag-screw threads on one end and UNC threads on the opposite end. The lag screw is a 5/16-inch-diameter-by-5½-inch-long (7.9 by 140 mm) fastener with lag-screw threads on one end. The hanger bolts and lag screws are fabricated from stainless steel as described in the approved quality documentation. The flashing plate can be 12 inches (305 mm) square or 18 inches (457 mm) square, formed 0.05-inch-thick (1.3 mm) aluminum conforming to ASTM B209, or 9 inches by 12 inches (229 mm by 305 mm), formed from 0.04-inch-thick (1.0 mm) aluminum conforming to ASTM B209. The 12-inch square or 9-inch-by-12-inch flashing plate are used for installation with asphalt shingles roofs and the 18-inch square flashing plate is used for installation with wood shake roofs. The aluminum spacer block measures 2.25 inches (57 mm) deep by 1.25 inches (32 mm) long. See Figure 2 for an illustration of QMSE Quick Mount Roof Mount, and Figure 4 for an illustration of QMSE-LAG, QMSC-LAG and QMLC-LAG Quick Mount Roof Mounts.  

4.0 DESIGN AND INSTALLATION  
4.1 Design:  
The tabulated allowable strengths shown in this report are based on allowable stress design (ASD) and include the load duration factor, \(C_D\), corresponding with the applicable loads in accordance with the National Design Specification for Wood Construction (NDS).  

Where the roof mounts are exposed to in-service temperatures exceeding 100°F (37.8°C), uplift allowable loads shown in Table 1 must be adjusted by the temperature factor, \(C_t\), in accordance with Section 10.3.4 of the NDS. When products are attached to wood framing having an in-service moisture content greater than 19 percent (16 percent for engineered wood products), or where wet service is expected, the allowable loads must be adjusted by the wet service factor, \(C_M\), specified in Section 10.3.3 of the NDS. Connected wood members must be analyzed for load-carrying capacity at the connection in accordance with the NDS.  

4.2 Installation:  
The flashing plate must be placed underneath the shingle or shake in a weather-lap fashion. Prior to the hanger bolt or lag screw being placed through the spacer block hole, the hole must be filled with a sealant approved for roofing applications. The lag-screw end of the hanger bolt is screwed into the rafter through the spacer block and flashing plate. The sealing washer and nut are fastened through the threaded rod portion of the hanger bolt. The black gasket is then placed over the nut and through the threaded rod to seal the hole of the spacer block. Then a 5/16-inch (7.9 mm) stainless steel nut is placed to secure the connection of a mounting bracket, which is supplied by others, onto the UNC threaded end of the hanger bolt. If a lag screw is used, a sealing plug is placed into the spacer block cavity before the lag screw is screwed into the rafter through the spacer block and flashing plate, securing the mounting bracket, which is supplied by others. Installation of the Quick Mount Roof Mounts described in this report is
limited to roofs having minimum slopes of 2:12 (18 percent) and maximum slopes of 24:12 (200 percent). The minimum specific gravity of the wood member is as noted in Tables 1 and 2.

5.0 CONDITIONS OF USE

The Quick Mount Roof Mounts described in this report comply with, or are suitable alternatives to what is specified in, the code indicated in Section 1.0 of this report, subject to the following conditions:

5.1 The Quick Mount PV Roof Mounts must be installed in accordance with this report and the manufacturer's published installation instructions. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

5.2 Calculations showing compliance with this report must be submitted to the code official. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

6.0 EVIDENCE SUBMITTED

6.1 Load test data in accordance with the ICC-ES Acceptance Criteria for Joist Hangers and Similar Devices (AC13), dated October 2010 (editorially revised December 2011).

6.2 Rain test data in accordance with the ICC-ES Acceptance Criteria for Roof Flashing for Pipe Penetrations (AC286), dated October 2012 (editorially revised August 2013).

6.3 Quality documentation and installation instructions.

7.0 IDENTIFICATION

The Quick Mount PV Roof Mounts are identified with a label bearing the report holder's name (Quick Mount PV), the product name or designation, and the evaluation report number (ESR-3744).
### TABLE 1—QUICK MOUNT ROOF MOUNT QMSE ALLOWABLE UPLIFT AND LATERAL LOADS

<table>
<thead>
<tr>
<th>LOAD DIRECTION</th>
<th>SPECIFIC GRAVITY OF LUMBER RAFTER</th>
<th>ALLOWABLE LOAD (lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uplift</td>
<td>0.50 (Douglas fir–larch)</td>
<td>811</td>
</tr>
<tr>
<td></td>
<td>0.36 (Western cedars)</td>
<td>436</td>
</tr>
<tr>
<td>Lateral</td>
<td>0.50 (Douglas fir–larch)</td>
<td>671</td>
</tr>
<tr>
<td></td>
<td>0.36 (Western cedars)</td>
<td>634</td>
</tr>
</tbody>
</table>

For SI: 1 lbf = 4.48 N.

1The lag screw portion of the 5/16-inch-diameter (7.9 mm) hanger bolt must be installed into the rafter with a minimum penetration of 2.875 inches (73 mm) and must satisfy edge distance specified by NDS.

2Design forces must be determined in accordance with the applicable code and must not exceed the tabulated values. No increases for load duration are permitted.

3Where the temperatures in the vicinity of the roof framing exceed 100°F (37.8°C), the tabulated uplift allowable loads must be multiplied by the temperature factor, C_t, set forth in Section 10.3.4 of the NDS.

4Uplift load direction is perpendicular to the plane of the roof. Lateral load direction is parallel to the rafter. Lateral load perpendicular to the framing member is outside the scope of this report. See figure 1 below for a description of the load direction.

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**FIGURE 1**

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**FIGURE 2—QMSE Quick Mount Roof Mount**
TABLE 2—QUICK MOUNT ROOF MOUNTS QMSE-LAG, QMSC-LAG and QMLC-LAG ALLOWABLE UPLIFT AND LATERAL LOADS

<table>
<thead>
<tr>
<th>LOAD DIRECTION</th>
<th>SPECIFIC GRAVITY OF LUMBER RAFTER</th>
<th>ALLOWABLE LOAD (lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uplift</td>
<td>0.50 (Douglas fir–larch)</td>
<td>732</td>
</tr>
<tr>
<td></td>
<td>0.36 (Western cedars)</td>
<td>--</td>
</tr>
<tr>
<td>Lateral</td>
<td>0.50 (Douglas fir–larch)</td>
<td>526</td>
</tr>
<tr>
<td></td>
<td>0.36 (Western cedars)</td>
<td>--</td>
</tr>
</tbody>
</table>

For SI: 1 lbf = 4.48 N.

1 The 5/16-inch-diameter (7.9 mm) lag screw must be installed into the rafter with a minimum penetration of 2.875 inches (73 mm) and must satisfy edge distance specified by NDS.

2 Design forces must be determined in accordance with the applicable code and must not exceed the tabulated values. No increases for load duration are permitted.

3 Where the temperatures in the vicinity of the roof framing exceed 100°F (37.8°C), the tabulated uplift allowable loads must be multiplied by the temperature factor, Ct, set forth in Section 10.3.4 of the NDS.

4 Uplift load direction is perpendicular to the plane of the roof. Lateral load direction is parallel to the rafter. Lateral load perpendicular to the framing member is outside the scope of this report. See figure 3 below for a description of the load direction.

---

FIGURE 3

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FIGURE 4—QMSE-LAG QUICK MOUNT ROOF MOUNT