

BLOCK 173.01

LOT 5

QUALIFICATION CODE

ADDRESS (SITE) 468 France Avenue

PERMIT NO.

15-0462



CONSTRUCTION PERMIT APPLICATION

Applicant Completes: Sections I, II, III (optional), IV, VI, and VII

I. IDENTIFICATION

1. Proposed Work Site at: 468 France Avenue

2. Name of Owner in Fee: Kenneth & Rose Marie Ferguson
Tel. [REDACTED] e-mail [REDACTED]
Address 468 France Avenue Brick Township 08723
street municipality zip code

3. Ownership in Fee: Public Private X

4. Principal Contractor: Astrum Solar, Inc Tel. (443) 758-0188
Address 705 General Washington Ave. Suite 650 e-mail blair.stiner@astrumsolar.com
Norristown, PA 19403
License No. OR, if new home, Builder Reg. No. 34EIO1175700 Exp. Date 03/31/2015
Home Improvement Contractor Registration No. or Exemption Reason 13VH05618900
Federal Emp. ID No. 27-1427044 FAX: (215) 392-3258

5. Architect or Engineer Astrum Solar, Inc. (same as above) Contact
Address e-mail
Tel. FAX:

6. Responsible Person in Charge once Work has Begun Blair Stiner
Tel. (443) 758-0188 FAX: (215) 392-3258

V. FEE SUMMARY (for office use only)

		Update	Update
1. Building	\$ 145 ✓		
2. Electrical	900 ✓		
3. Plumbing			
4. Fire Protection			
5. Elevator Devices			
6. Subtotal			
7. Less 20% for State Plan Review	\$		
8. Subtotal	\$		
9. State Permit Surcharge Fee	52		
10. Subtotal	\$		
11. Cert. of Occupancy			
12. Other			
13. TOTAL	\$ 1,097		

VI. BUILDING/SITE CHARACTERISTICS

	(office use only)
1. Number of Stories	
2. Height of Structure	ft.
3. Area — Largest Floor	sq. ft.
4. New Building Area	sq. ft.
5. Volume of New Structure	cu. ft.
6. Max. Live Load	
7. Max. Occupancy Load	
8. If Industrialized Building: State Approved HUD	
9. Total Land Area Disturbed	sq. ft.
10. Flood Hazard Zone	
11. Base Flood Elevation	ft.
12. Wetlands yes no	

IIa. PROPOSED WORK

- ☐ Minor Work
 ☐ New Building
 ☐ Addition
 ☐ Demolition
- ☐ Repair
 ☒ Alteration
 ☐ Renovation
 ☐ Reconstruction
- ☐ Asbestos Abat. -Subch. 8
 ☐ Lead Hazard Abatement
 ☐ Radon Remediation
 ☐ Annual Permit

IIb. SUBCODES

(Check all that apply)

- ☒ Building
☒ Electrical
☐ Plumbing
☐ Fire Protection
☐ Elevator

FOR OFFICE USE ONLY (Optional)

Est. Cost	Plans Rec'd by	Date Rec'd	Rejection Date	Approval Date	Re-viewer	Resubmission Dates Approval	Rejection	Re-viewer
3,225				2/2/15	W			
24,463				2/3/15	To			

TOTAL COST \$27,688

VII. DESCRIPTION OF BUILDING USE

A. RESIDENTIAL (primary use)

1. State Specific Use: R3
2. Use Group, Proposed: R3
3. Change in Use Group, Indicate Present:
4. No. of dwelling units: Total Units Income-restricted
- | | | |
|----------------|---|---|
| Gained, Sale | 0 | 0 |
| Gained, Rental | 0 | 0 |
| Lost, Sale | 0 | 0 |
| Lost, Rental | 0 | 0 |

B. NON-RESIDENTIAL (primary use)

1. State Specific Use:
2. Use Group, Proposed:
3. Change in Use Group, Indicate Present:

C. MIXED USE -List secondary use(s):

- D. Construct. Classification: Present Proposed

III. PLAN REVIEW (optional)

DO YOU WANT:

1. ☐ Partial Releases
2. ☐ Prototype Processing

IV. DOES OR WILL YOUR BUILDING CONTAIN ANY OF THE FOLLOWING?

1. ☐ Elevators/Escalators/Lifts/Dumbwaiters/Moving Walks
2. ☐ High Pressure Boilers
3. ☐ Refrigeration Systems
4. ☐ Cross-Connections/Backflow Preventers
5. ☐ Hazardous Uses/Places of Assembly
6. ☐ Smoke Control Systems in Open Wells
7. ☐ Underground Storage Tanks
8. ☐ Swimming Pools, Spas and Hot Tubs
9. ☐ Fire Alarm

CERTIFICATION IN LIEU OF OATH

I. OWNER SECTION (to be completed if the applicant is the owner in fee)

I hereby certify that I am the owner in fee of the property listed on Page 1.

Mark the following applicable boxes:

- A. ☐ I further certify that a new home (private residence) will be constructed on this property for my own use and occupancy. This dwelling is to be occupied by myself and is not to be used for any purpose other than single family residential use. I attest that all construction, plumbing, or electrical work will be done, in whole or in part, by me or by subcontractors under my supervision, in accordance with all applicable laws; and, I further acknowledge that said new home is not covered under the New Home Warranty and Builders Registration Act (N.J.S.A. 46:3B-1 et seq.) and that such fact shall be disclosed to any person purchasing this property within ten years of the date of issuance of a certificate of occupancy.

I UNDERSTAND THAT IN MARKING BOX A, I ACKNOWLEDGE THAT I AM ASSUMING RESPONSIBILITY FOR THE WORK DONE ON SAID PROPERTY, THE CONDITION OF THE PROPERTY PRIOR TO, DURING, AND AFTER ANY WORK PERFORMED, AND FOR THE PERFORMANCE OF THE SUBCONTRACTORS I HIRE, EMPLOY, OR OTHERWISE CONTRACT OR WITH WHOM I MAKE AGREEMENTS TO PERFORM WORK. I AM VOLUNTARILY AND KNOWINGLY ASSUMING THIS RESPONSIBILITY.

- B. ☒ I further certify the following as required by the New Jersey Uniform Construction Code, N.J.A.C. 5:23-2.15(f)1.ix:

I personally prepared the plans submitted for: 1) the new home referred to in A.; or, 2) an addition, alteration, renovation, or repair to an existing single family residence owned and occupied by myself and located on the property listed on Page 1; or, 3) a new structure that will be physically separate from, but that will be deemed part of, an existing single family residence that is owned and occupied by myself and located on the property listed on Page 1.

- C. ☐ I further certify that I will perform or supervise the following work:

C.1. ☒ Building C.2. ☐ Fire Protection

I further certify that I will perform the following work:

C.3. ☒ Electrical C.4. ☐ Plumbing

- D. ☒ I agree to advise all contractors on this project that they are required to be registered with the New Jersey Division of Taxation and to comply with all New Jersey tax laws.

I further certify the following as required by the Uniform Construction Code, N.J.A.C. 5:23-2.15(a)5: All required State, county, and local prior approvals have been given, including such certification as the construction official may require.

I understand that if any of the above statements are willfully false, I am subject to punishment.

Signature



Date

11/01/15

II. AGENT SECTION (to be completed if the applicant is not the owner in fee)

I hereby certify the following as required by the Uniform Construction Code, N.J.A.C. 5:23-2.15(d): the proposed work is authorized by the owner in fee; and I have been authorized by the owner in fee to make this application as his agent.

I further certify the following as required by the Uniform Construction Code, N.J.A.C. 5:23-2.15(a)5: All required State, county, and local prior approvals have been given, including such certification as the construction official may require.

I agree to advise all contractors on this project that they are required to be registered with the New Jersey Division of Taxation and to comply with all New Jersey tax laws.

I understand that if any of the above statements are willfully false, I am subject to punishment.

- ☒ Check if contractor.

Agent Name Blair Stiner

Address 705 General Washington Ave. Suite 650

Norristown, PA 19403

Telephone (443) 758-0188

Signature



III. ☐ LEAD HAZARD ABATEMENT: Include Homeowner or Building Owner Affidavit as per N.J.A.C. 5:17.



Brick Township
401 Chambersbridge Rd
Brick, NJ 08723

Date Issued 3/9/2015
Control Number C-15-000289
Permit Number 15-0462
Permit Issue Date 2/19/2015
Certificate Number 15-0462

Certificate

Construction Code Division

(Certificate of Approval)

Identification

Work Site Location: 468 FRANCE AVE Brick Township, NJ 08723 Block: 173.01 Lot: 5 Qual: _____
Owner in Fee: FERGUSON, KENNETH & ROSE MARIE
Owner Address: 468 FRANCE AVE BRICK NJ 08723
Telephone: _____
Contractor Astrum Solar Inc.
Address 705 General Washington Avenue Norristown PA 19403
Telephone: (610) 937-9411 Fax: (215) 392-3258
License Number or Builders Registration Number: 13VH05618900 Federal Emp. Number: _____
34E101175700

Home Warranty Number: _____

Type of Warranty Plan: ☐ State ☐ Private

Use Group: R-5

Construction Classification: _____

Maximum Live Load: 0

Maximum Occupancy Load: 0

Description of Work/Use: SOLAR PANELS ...INSTALL 6.45 kw ROOF MOUNT PHOTOVOLTAIC SOLAR SYSTEM

Certificate Comments:

☐ **Certificate of Occupancy**

This serves notice that said building or structure has been constructed in accordance with the New Jersey Uniform Construction Code and is approved for occupancy.

☒ **Certificate of Approval**

This serves notice that the work completed has been constructed or installed in accordance with the New Jersey Uniform Construction Code and is approved. If the permit was issued for minor work, this certificate was based upon what was visible at the time of inspection.

☐ **Certificate of Continued Occupancy**

This serves notice that based on a general inspection of the visible parts of the building there are no imminent hazards and the building is approved for continued occupancy.

☐ **Temporary Certificate of Compliance**

The following conditions must be met no later than or the owner will be subject to fine or order to vacate:

This certificate has an expiration date of:

Conditions to be met:

☐ **Certificate of Clearance - Lead Abatement 5:17**

This serves notice that based on written certification, lead abatement was performed as per NJAC5:17 to the following extent.

- ☐ Total removal of lead-based paint hazards in scope of work
☐ Partial or limited time period (years); see file

☐ **Certificate of Clearance - Asbestos Abatement**

This serves notice that based on written certification, asbestos abatement was performed to the following extent.

- ☐ Total removal of asbestos hazards in scope of work
☐ Partial or limited time period (years); see file

☐ **Certificate of Compliance**

This serves notice that said potentially hazardous equipment has been installed and/or maintained in accordance with the New Jersey Uniform Construction Code and is approved for use until

☐ **Temporary Certificate of Occupancy**

The following conditions must be met no later than: or the owner will be subject to fine or order to vacate:

This certificate has an expiration date of:

Conditions to be met:

Daniel Newman Jr

Construction Official

Date Printed: 3/9/2015

U.C.C. F260 (rev. 08/05)

Fee: \$0.00

Check Number: _____

Collected By: _____

Page 1



KD 200-60 F Series

KD245GX-LFB2

KD250GX-LFB2

CUTTING EDGE TECHNOLOGY

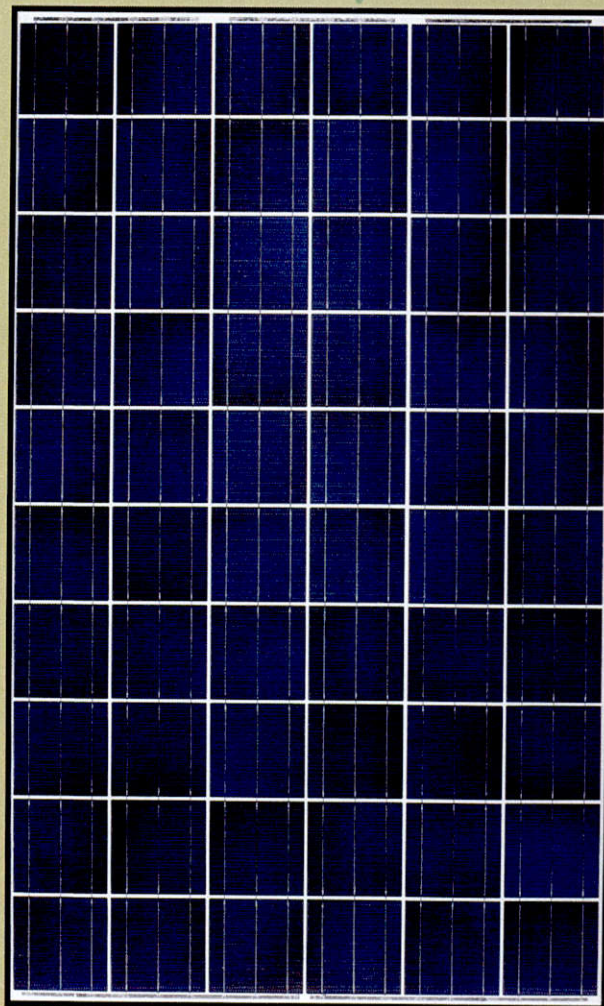
As a pioneer with over 39 years in the solar energy industry, Kyocera demonstrates leadership in the development of solar energy products. Kyocera's *Kaizen* Philosophy, commitment to continuous improvement, is shown by repeatedly achieving world record cell efficiencies.

QUALITY BUILT IN

- UV stabilized, aesthetically pleasing black anodized frame
- Supported by major mounting structure manufacturers
- Easily accessible grounding points on all four corners for fast installation
- Proven junction box technology with 12 AWG PV wire to work with transformerless inverters
- Quality locking plug-in connectors to provide safe and quick connections

RELIABLE

- Proven superior field performance
- Tight power tolerance
- First module manufacturer to pass rigorous long-term testing performed by TÜV Rheinland
- Pass Salt Mist Corrosion Test Severity 6, most severe test conditions, performed by TÜV Rheinland



QUALIFICATIONS AND CERTIFICATIONS

UL Listing
QIGU.E173074



NEC 2008 Compliant, UL 1703, ISO 9001, and ISO 14001
UL1703 Certified and Registered, UL Fire Safety Class C, CEC
IEC 61701 Ed. 2 Severity 6 (Salt Mist Corrosion Test)

ELECTRICAL SPECIFICATIONS

Standard Test Conditions (STC)

STC = 1000 W/M² irradiance, 25°C module temperature, AM 1.5 spectrum*

	KD245GX-LFB2	KD250GX-LFB2	
P _{max}	245	250	W
V _{mp}	29.8	29.8	V
I _{mp}	8.23	8.39	A
V _{oc}	36.9	36.9	V
I _{sc}	8.91	9.09	A
P _{tolerance}	+5/-0	+5/-0	%

Nominal Operating Cell Temperature Conditions (NOCT)

NOCT = 800 W/M² irradiance, 20°C ambient temperature, AM 1.5 spectrum*

T _{NOCT}	45	45	°C
P _{max}	176	180	W
V _{mp}	26.8	26.8	V
I _{mp}	6.58	6.72	A
V _{oc}	33.7	33.7	V
I _{sc}	7.21	7.36	A
PTC	219.1	223.7	W

Temperature Coefficients

P _{max}	-0.46	-0.46	%/°C
V _{mp}	-0.52	-0.52	%/°C
I _{mp}	0.0065	0.0065	%/°C
V _{oc}	-0.36	-0.36	%/°C
I _{sc}	0.060	0.060	%/°C
Operating Temp	-40 to +90	-40 to +90	°C

System Design

Series Fuse Rating	15 A
Maximum DC System Voltage (UL)	600 V
Hailstone Impact	in (25mm) @ 51mph (23m/s)

* Subject to simulator measurement uncertainty of +/- 3%.
KYOCERA reserves the right to modify these specifications without notice.

NEC 2008 COMPLIANT
UL 1703 LISTED



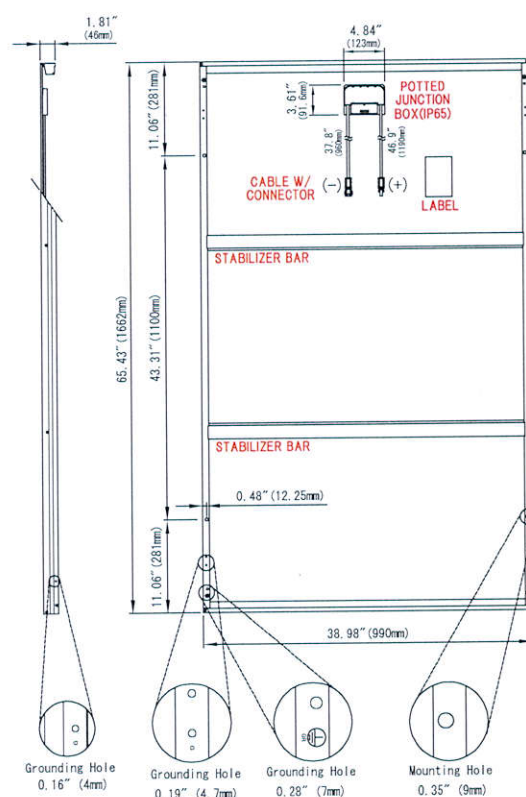
WARNING: Read the instruction manual in its entirety prior to handling, installing & operating Kyocera Solar modules.

MODULE CHARACTERISTICS

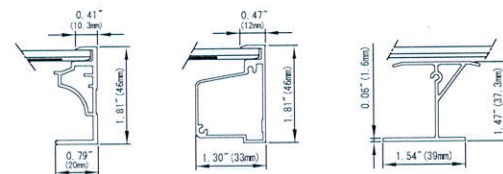
Dimensions:	65.43in/38.98in/1.81in (1662mm/990mm/46mm)
Weight:	44.1lbs (20.0kg)

PACKAGING SPECIFICATIONS

Modules per pallet:	20
Pallets per 53' container:	36
Pallet box dimensions:	66in/40in/47in (1675mm/1005mm/1175mm)
Pallet box weight:	990 lbs (450kg)



FRAME CROSS SECTION DIAGRAM



OUR VALUED PARTNER

032514

Grounding Washer Installation Procedure for Enphase Microinverters

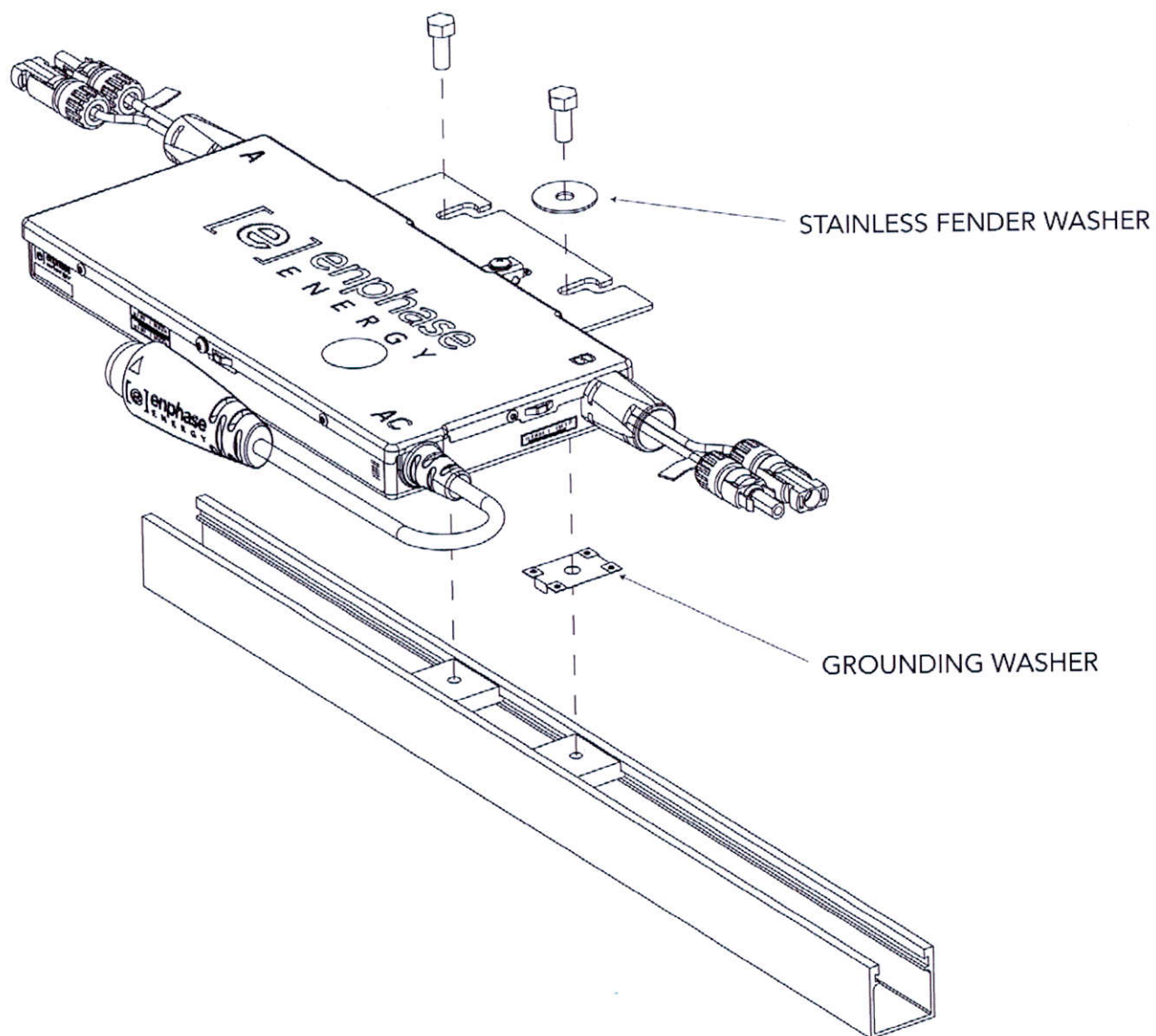
Purpose

As an alternative to installing a continuous grounding electrode conductor connected to each microinverter chassis, a grounding washer may be used to ground the microinverter to grounded racking. CSA recently completed the evaluation and approval of the Wiley Electronics "WEEB" grounding washers for use with the Enphase Microinverter. This document provides the installation procedure and torque specifications. The Enphase compatible racking models that have listed grounding washers available are included on the last page of this App Note.

Installation Procedure

- Install a minimum of one grounding washer per microinverter.
- Each microinverter requires a stainless steel fender washer on the topside of the Enphase Microinverter mounting bracket for the bolt that passes through the grounding washer.
- Torque the microinverter fasteners. The values listed below are minimum torque requirements. Wiley Electronics and the racking manufacturers will have specific torque specifications in their installation documents. We recommend using the highest of the recommended values.

1/4" mounting hardware – 45 in-lbs minimum
5/16" mounting hardware – 80 in-lbs minimum



The Enphase Microinverter model D380 is shown. The installation procedure and grounding washer model numbers also apply to the Enphase Microinverter models M190 and M210.

Compatible Racking/Washers

AEE

Module Rail	Fastener Information	Grounding Washer
SnapNRack	Slide nut with 5/16 hex head bolt	WEEB-PMC

Conergy

Module Rail	Fastener Information	Grounding Washer
Suntop	Quickstone slide nut with M8 socket head cap screw	WEEB-CMC

Direct Power and Water

Module Rail	Fastener Information	Grounding Washer
Power Rail	1/4" hex head bolt, washer, nut, for top rail mount	WEEB-DMC

IronRidge

Module Rail	Fastener Information	Grounding Washer
Light Rail XRL	1/4" hex head bolt, washer, nut, for top rail mount	WEEB-DMC

Krannich Solar

Module Rail	Fastener Information	Grounding Washer
K2 Systems	Slide nut with M8 socket head cap screw	WEEB-KMC

ProSolar

Module Rail	Fastener Information	Grounding Washer
Rooftrac	Slide nut with 5/16" hex head bolt	WEEB-PMC

Unirac

Module Rail	Fastener Information	Grounding Washer
Solarmount Light	1/4" hex head bolt, washer, nut, for top rail mount	WEEB-DMC
Solarmount Standard	1/4" hex head bolt, washer, nut, for top rail mount	WEEB-DMC
Solarmount HD	1/4" hex head bolt, washer, nut, for top rail mount	WEEB-DMC



Bright Thinking in Solar

SOLARMOUNT®

Top Mounting UniRac Grounding Clips and WEEBLugs Installation Sheet 225.5

Clips and lugs are sold separately.

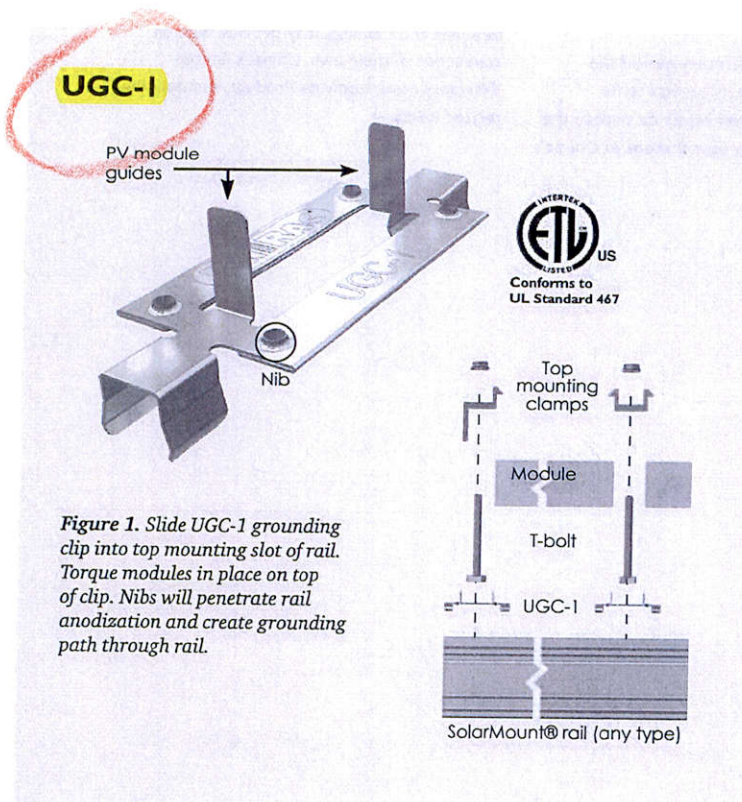


Figure 1. Slide UGC-1 grounding clip into top mounting slot of rail. Torque modules in place on top of clip. Nibs will penetrate rail anodization and create grounding path through rail.

WEEBLug

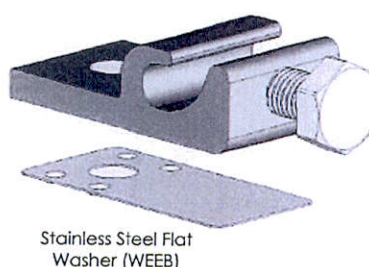


Figure 2. Insert a bolt in the aluminum rail or through the clearance hole in the stainless steel flat washer. Place the stainless steel flat washer on the bolt, oriented so the dimples will contact the aluminum rail. Place the lug portion on the bolt and stainless steel flat washer. Install stainless steel flat washer, lock washer and nut. Tighten the nut until the dimples are completely embedded into the rail and lug. The embedded dimples make a gas-tight mechanical connection and ensure good electrical connection between the aluminum rail and the lug through the WEEB.

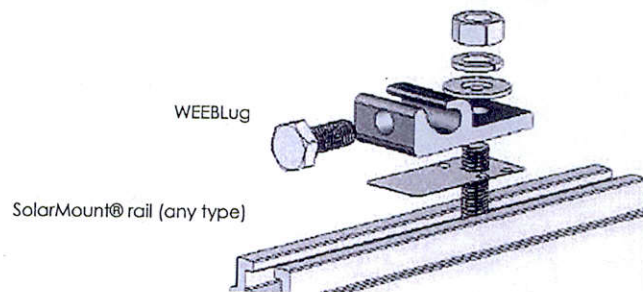
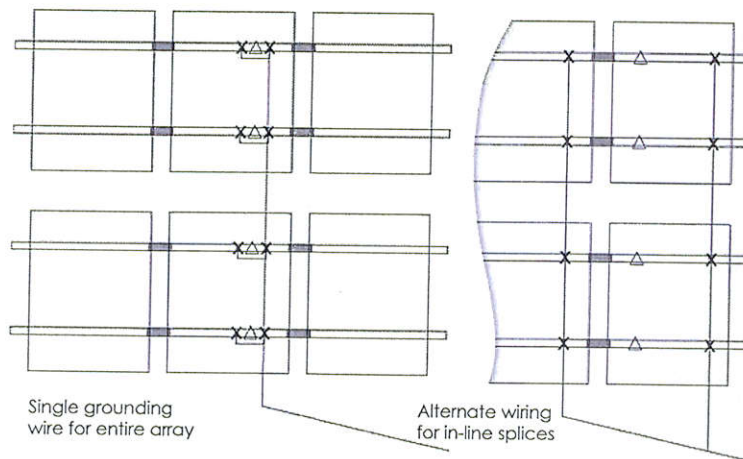


Figure 3. Place grounding clips, WEEBLugs, and copper wire (6–10 AWG) as shown. Place a loop in the wire around splices to prevent tension. Be sure wiring between rails is not taut.

KEY	
	PV module
	SolarMount rail (any type)
	Rail splice
	Grounding lug
	Grounding clip
	Copper wire



10 year limited Product Warranty

Unirac, Inc., warrants to the original purchaser ("Purchaser") of product(s) that it manufactures ("Product") at the original installation site that the Product shall be free from defects in material and workmanship for a period of ten (10) years, from the earlier of 1) the date the installation of the Product is completed, or 2) 30 days after the purchase of the Product by the original Purchaser. This Warranty does not cover damage to the Product that occurs during its shipment, storage, or installation.

This Warranty shall be VOID if installation of the Product is not performed in accordance

with Unirac's written installation instructions, or if the Product has been modified, repaired, or reworked in a manner not previously authorized by Unirac IN WRITING, or if the Product is installed in an environment for which it was not designed. Unirac shall not be liable for consequential, contingent or incidental damages arising out of the use of the Product by the Purchaser under any circumstances.

If within the specified Warranty period the Product shall be reasonably proven to be defective, then Unirac shall repair or replace the defective Product, or any part thereof, in Unirac's

sole discretion. Such repair or replacement shall completely satisfy and discharge all of Unirac's liability with respect to this limited Warranty. Under no circumstances shall Unirac be liable for special, indirect or consequential damages arising out of or related to use by Purchaser of the Product.

Manufacturers of related items, such as PV modules and flashings, may provide written warranties of their own. Unirac's limited Warranty covers only its Product, and not any related items.



1411 Broadway Boulevard NE
Albuquerque NM 87102-1545 USA

EVALUATION REPORT



Report Number: 0216
Originally Issued: 04/2011
Revised: 05/16/2012
Valid Through: 04/2013

DIVISION: 06—WOOD AND PLASTICS
Section: 06060—Connections and Fasteners

REPORT HOLDER:

EcoFasten Solar®
289 Harrel Street
Morrisville, Vermont 05661
Phone: 888-766-4273
brian@alpinesnowguards.com

EVALUATION SUBJECT:

EcoFasten Solar, GreenFasten-1-812 Roof Mount Assembly

1.0 EVALUATION SCOPE

1.1 Compliance with the following codes

- 2009 International Building Code® (IBC)
- 2009 International Residential Code (IRC)
- 2006 International Building Code® (IBC)
- 2006 International Residential Code (IRC)

1.2 Evaluated in accordance with

- IAPMO ES Evaluation Criteria for the Testing and Analysis of Joist Hangers and Miscellaneous Connectors, (EC002-2011).

1.3 Property Evaluated

- Structural
- Water Penetration

2.0 USES

The EcoFasten Solar, GreenFasten-1-812 Roof Mount is a mounting assembly used to attach solar panels and other types of equipment to the rafters of roofs with asphalt shingle roof coverings.

3.0 DESCRIPTION

3.1 Product Information

3.1.1 EcoFasten Solar, GreenFasten-1-812: The GreenFasten-1-812 Roof Mount has four basic components: an aluminum flashing with pre-installed

EPDM grommet (GF-1), one-hole bracket (L-101-3), slotted bracket (SCL-101-3) or two-hole brackets (L-102-3), 5/16" Lag bolt, and EPDM bonded 18.8 washers. See published installation instructions for more detailed dimensional information.

3.2 Materials

The GreenFasten-1-812 Roof Mount component material standards are specified in Table 2.

Fasteners used to secure the flashing to the roof rafter must be 5/16-inch-diameter (7.9 mm) lag bolts complying With ANSI/AMSE B18.2.1-B1. The lag bolt must be long enough to penetrate the rafter a minimum of 2.5 inches (64 mm). The lag bolts must be corrosion-resistant, see table 12 QSM for pull out capacities for typical roof lumber (ADS).

4.0 DESIGN AND INSTALLATION

4.1 Design

Compliance to the following will be provided by the Designer/Engineer if requested by the jurisdiction having authority: The tabulated allowable loads 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 NDS.

Where the roof mounts are exposed to temperatures exceeding 100°F (37.8°C), uplift allowable loads must be adjusted by the temperature factor, C_t , in accordance with Section 10.3.4 of the NDS temperature factor, C_t , which applies to the roof mount connected to supporting wood members where sustained temperatures are greater than 100°F (37.8°C). When products are attached to wood framing having a 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 EcoFasten Solar, GreenFasten-1-812 Roof Mount must be installed to the rafter using one lag screw at each bracket location as described in the published

EVALUATION REPORT



Report Number: 0216
Originally Issued: 04/2011
Revised: 05/16/2012
Valid Through: 04/2013

installation instructions. The minimum specific gravity of the wood member 0.42. The flashing must be placed underneath the shingle far enough up slope to prevent water infiltration. Installation of the EcoFasten, GreenFasten-1-812 Roof Mount is limited to roofs having minimum and maximum slopes of 3:12 (14 percent) and 12:12 (45 percent), respectively.

5.0 CONDITIONS OF USE

The EcoFasten Solar, GreenFasten-1-812 Roof Mount described in this report complies with the codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The EcoFasten Solar, GreenFasten-1-812 Roof Mount must be installed in accordance with this report the manufacturer's published installation instructions, codes listed in Section 1.1 and the supplement.

5.2 Calculations (If requested) 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.

5.3 Fasteners used in contact with fire-retardant-treated or preservative-treated lumber must comply with IBC Section 2304.9.5 or the 2009 IRC Section R317.3 (2006 IRC Section R319.3), as applicable. The report holder or lumber treater should be contacted for recommendations on minimum corrosion resistance and connection capacities of fasteners used with the specific proprietary preservative-treated or fire-retardant treated lumber.

5.4 When required by the jurisdiction having authority a licensed design professional shall provide calculations to verify that imposed loads on the assembly do not exceed the allowable loads contained in Table 1 of this report.

5.5 When required by the jurisdiction having authority a licensed design professional shall provide calculations for the assembly support framing.

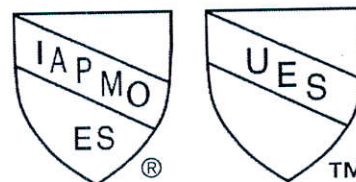
6.0 EVIDENCE SUBMITTED

Testing and analysis data submitted is in conformance with IAPMO ES Evaluation Criteria for the Testing and

Analysis of Joist Hangers and Miscellaneous Connectors, (EC002-2011). Rain test data is in conformance with the Underwriters Laboratory Standard for Gas Vents, (UL 441-96 Section 25). Test results are from laboratories in compliance with ISO/IEC 17025.

7.0 IDENTIFICATION

The EcoFasten Solar, GreenFasten-1-812 Roof Mount is identified with a label bearing the Manufacturers name and address, product designation, IAPMO Uniform ES Marks of Conformity, this evaluation report number (Evaluation Report 0216), compliance code, and inspection agency.



IAPMO #0216

Amir Zamanian, PE
Technical Director of Evaluation Service

GP Russ Chaney
CEO, The IAPMO Group

EVALUATION REPORT



Report Number: 0216
Originally Issued: 04/2011
Revised: 05/16/2012
Valid Through: 04/2013

Table 1: Allowable Load Tables based on Specific Gravity

Load Direction	Part	Specific Gravity of Lumber	Allowable Load (lb.)
Uplift	L-101-3	0.52	741
Uplift	L-102-3	0.42	653
Uplift	SCL-101-3	0.47	642
Lateral	L-101-3	0.52	298
Lateral	L-102-3	0.42	293
Lateral	SCL-101-3	0.47	294

Table 2: Material Properties

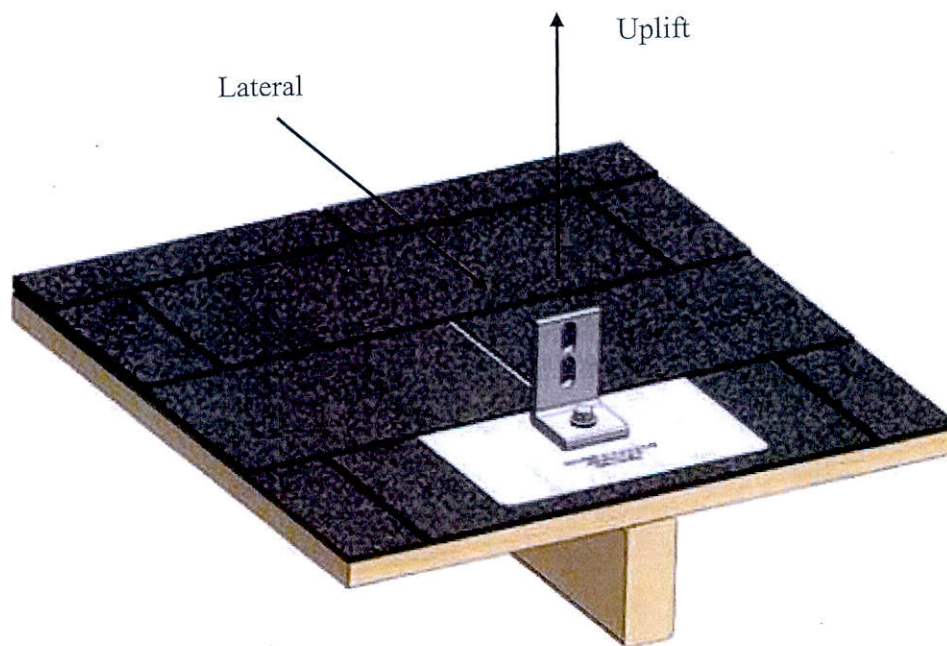
Hex Lag screw	ANSI/AMSE B18.2.1-B1 see table 12 QSM for pull out capacities for typical roof lumber (ADS)	Figure 1
Aluminum Bracket	AAS-6061	Figure 2 , 5 & 6
EPDM Metal roof bushing (washer)	Type 304 stainless steel complying with ASTM A 240	Figure 3
EPDM Grommet	ASTM D412, D297, D2240, and ASTM D624, with a durometer rating of 60	Figure 4
Flashing	ASTM B-209, ASTM E-1251, and ASTM B-557	Figure 4

EVALUATION REPORT



Report Number: 0216
Originally Issued: 04/2011
Revised: 05/16/2012
Valid Through: 04/2013

Load Orientation/Direction Detail



Building Green with EcoFasten Solar®

EVALUATION REPORT



Report Number: 0216
Originally Issued: 04/2011
Revised: 05/16/2012
Valid Through: 04/2013

EcoFasten Solar Components



Figure 1:
Lag Screw

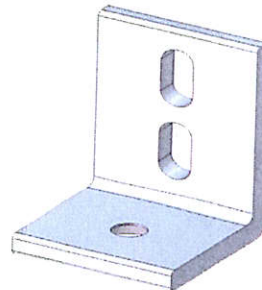


Figure 2: L-102-3



Figure 3:
EPDM
Metal roof
bushing



Figure 4:
EPDM
Grommet

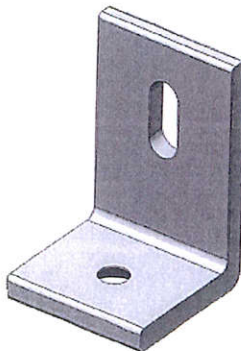


Figure 5: L-101-3

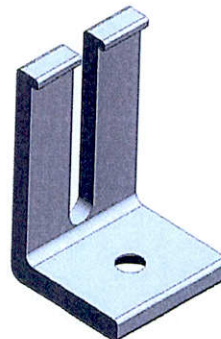


Figure 6: SC L-101-3



Building Green with EcoFasten Solar®

EVALUATION REPORT



Report Number: 0216
Originally Issued: 04/2011
Revised: 05/16/2012
Valid Through: 04/2013

SUPPLEMENT

DIVISION: 06—WOOD AND PLASTICS
Section: 06060—Connections and Fasteners

REPORT HOLDER:

EcoFasten Solar®
289 Harrel Street
Morrisville, Vermont 05661
Phone: 888-766-4273
brian@alpinesnowguards.com

EVALUATION SUBJECT:

EcoFasten Solar, GreenFasten 1-812 Roof Mount Assembly

1.0 EVALUATION SCOPE

1.1 Compliance with the following codes

- 1997 Uniform Building Code (UBC)

2.0 SUBSTANTIATING DATA

Testing and analysis data submitted is in conformance with IAPMO ES Evaluation Criteria for the Testing and Analysis of Joist Hangers and Miscellaneous Connectors, (EC002-2011). Rain test data is in conformance with the Underwriters Laboratory Standard for Gas Vents, (UL 441-96 Section 15). Test results are from laboratories in compliance with ISO/IEC 17025.



Listing Constructional Data Report (CDR)

1.0 Reference and Address			
Report Number	3171411PRT-002	Original Issued: 30-Jan-2009	Revised: 16-Mar-2009
Standard(s)	UL 1741 Standard for Safety for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources. First Edition, 05/07/1999, revisions including 11/07/2005		
Applicant	RSTC Enterprises, Inc.	Manufacturer	RSTC Enterprises, Inc.
Address	2219 Heimstead Road Eau Claire, WI 54703	Address	2219 Heimstead Road Eau Claire, WI 54703
Country	USA	Country	USA
Contact	Mr. Steve Capozzi	Contact	Mr. Steve Capozzi
Phone	(715) 830-9997	Phone	(715) 830-9997
FAX	(715) 830-9976	FAX	(715) 830-9976
Email	scapozzi@rstcenterprises.com	Email	scapozzi@rstcenterprises.com

2.0 Product Description	
Product	DC Combiner Box
Brand name	RSTC Enterprises
Description	The product covered by this report is a DC combiner box for use with a up to four photovoltaic array inputs, and an output of a single DC source.
Models	Soladeck 0783-41 and Soladeck 0786-41
Model Similarity	Similar except for the use of the negative terminal block in unit. The 0783-41 model has its negative terminal block mounted to the enclosure in a stand-alone fashion with up to four inputs and one lug output, while the 0786-41 model has its negative terminals mounted to the DIN rail.
Ratings	600 VDC, 30 amps/fuse, 120 A total
Other Ratings	Maximum Fuse Short Circuit Current = 10kA

3.0 Product Photographs

Photo 1 - External view of model 0783, also represents model 0786

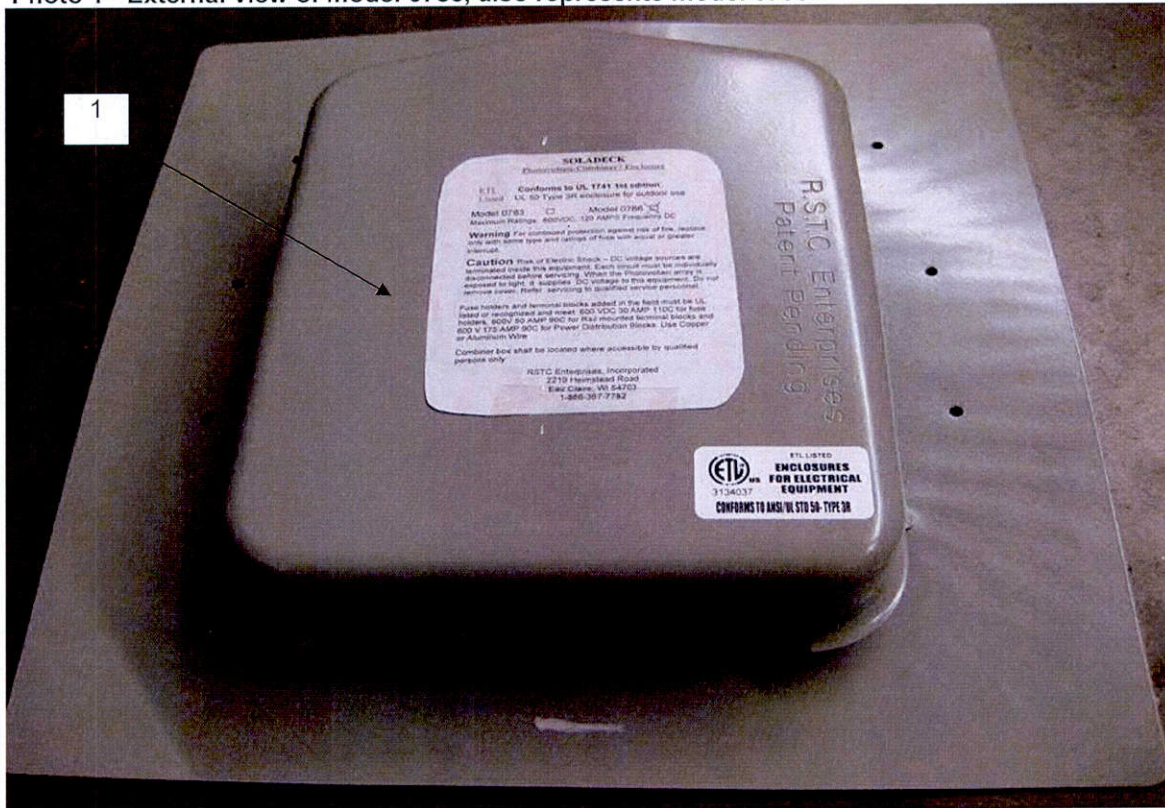
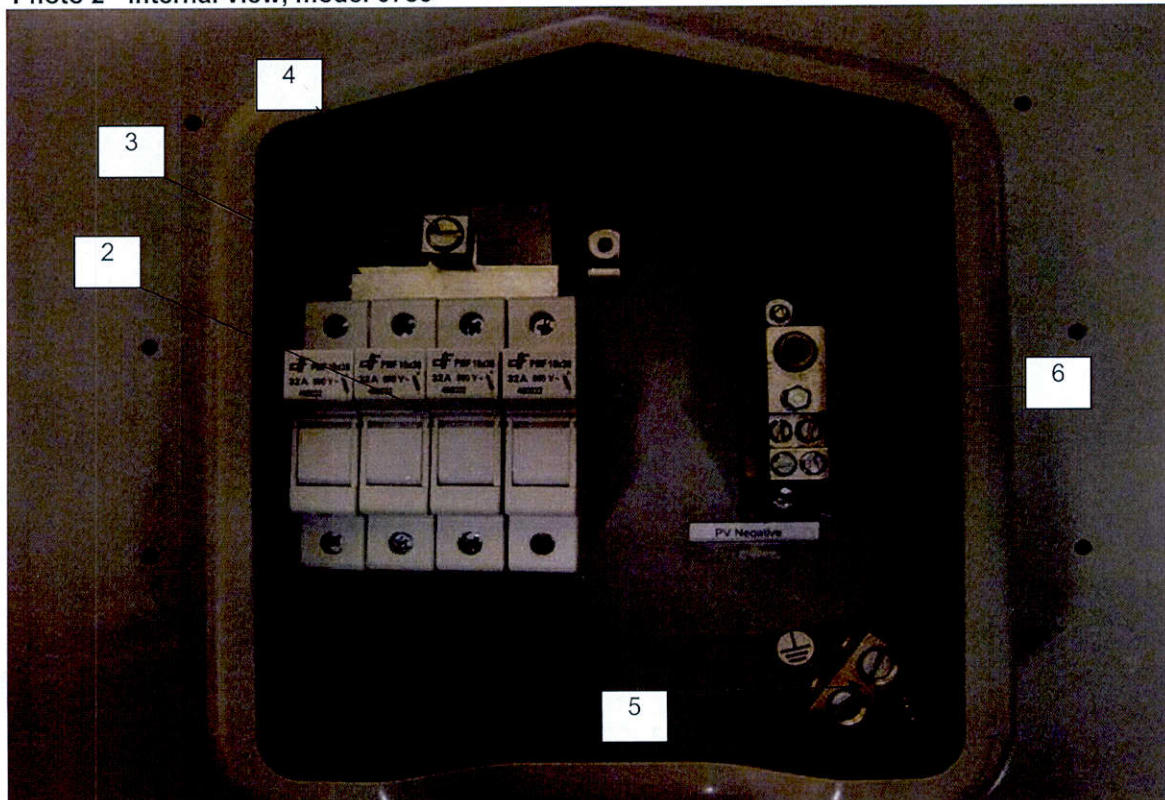
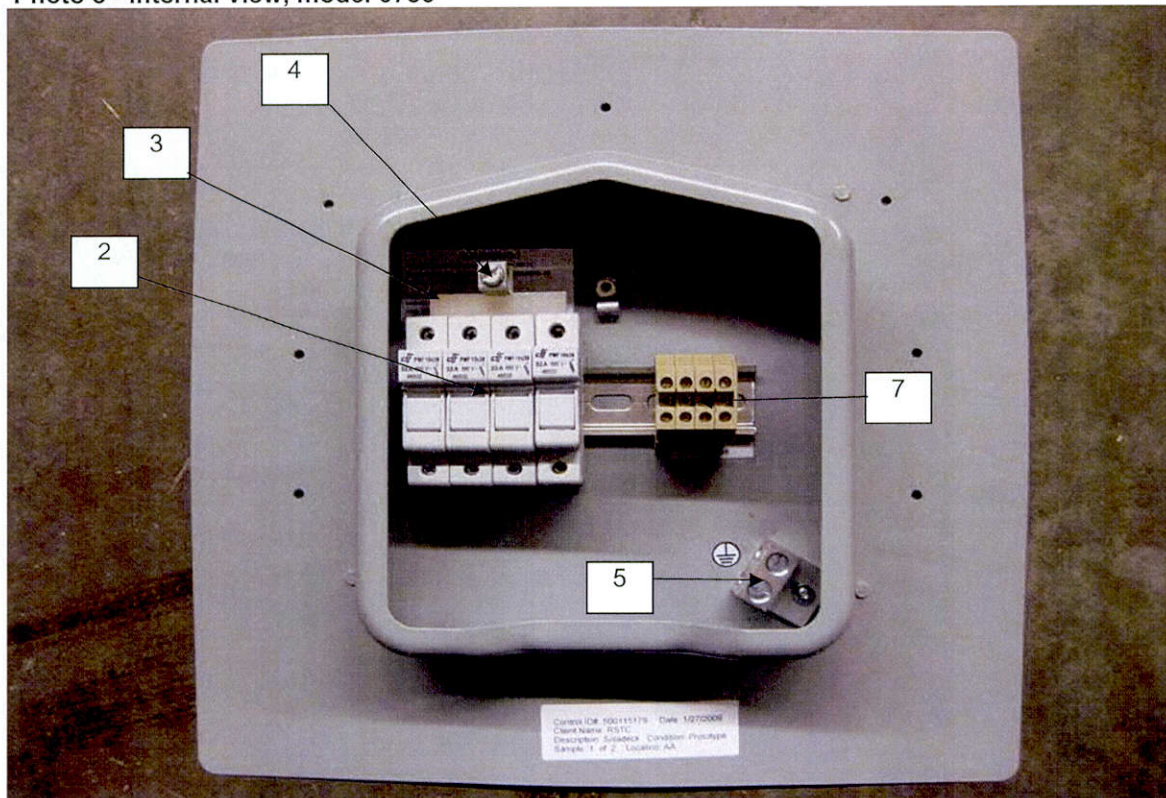


Photo 2 - internal view, model 0783



3.0 Product Photographs

Photo 3 - internal view, model 0786



4.0 Critical Components						
Photo #	Item no. ¹	Name	Manufacturer/ trademark ²	Type / model ²	Technical data and securement means	Mark(s) of conformity ³
1	1	Enclosure	RSTC		ETL listed, 18 gauge galvanized steel, 0.055 inches thick, 15 inches square at base, 8.75 inches wide by 10.75 inches long on cover. Labels adhered to enclosure to comply with UL 969	ETL
2,3	2	Fuse Holders	DF	Part No. 480032	10x38 PMF Fuse Holder (1 Pole), rated 30A, 600V, 110°C, up to 10 AWG, Secured to DIN Rail.	UR/CSA
2,3	3	Positive Bus Bar	Storm Copper	B110C	Made of tin plated copper approximately .08 inches thick. Each positive input to terminal .25 inches wide by .49 inches long. Common Bus .51 inches wide by 2.35 inches long. Provision for terminal lug approximately .53 inches square.	NR
2,3	4	Terminal Lug	IlSCO	CA4SP	Wire Rated 2-14 CU, Recognized for 75°C, 600V	UR/CSA
2,3	5	Grounding Terminal	Electric Motion	2-2/0T	Wire range two 2/0-14, Secured to enclosure by stud	UL/CSA
2	6	Negative Terminal Block	IlSCO	PDC-14-2/0-1	Wire range primary: 2/0-14, Wire range secondary: 4-14. Rated 90°C, 600V, 175 A/pole.	UR/CSA
3	7	Negative Terminal Block	IMO Precision Controls	ER6	Wire range 8-26 AWG Cu, Rated 600V, 50A	UR/CSA
	8	Alternate Negative Terminal Block	IMO Precision Controls	ER10	Wire range 6-16 AWG Cu, Rated 600V, 65A. Used in alternate construction with bus bar attached for single lug output.	UR/CSA
	9	Negative Bus Bar	Storm Copper	C110	Made of tin plated copper approximately .08" thick. Each tang to negative terminal .187" wide by .875" long.	NR

NOTES:

- 1) Not all item numbers are indicated (called out) in the photos, as their location is obvious.
- 2) "Various" means any type, from any manufacturer that complies with the "Technical data and securement means" and meets the "Mark(s) of conformity" can be used.
- 3) Indicates specific marks to be verified, which assures the agreed level of surveillance for the component. "NR" - indicates Unlisted and only visual examination is necessary. "See 5.0" indicates Unlisted components or assemblies to be evaluated periodically refer to section 5.0 for details.

M215 Microinverter Installation Planning

The M215 Microinverter

The M215 Microinverter™ is a powerful and efficient grid-tied microinverter. It is compatible with PV modules (up to 270 Watts or higher) and installs quickly and easily. It works with both three-phase 208 VAC or single-phase 240 VAC services in North America. A separate model is available for 230 VAC service in other regions.

For detailed installation information, refer to the **M215 Installation and Operations Manual** and the **M215 Quick Install Guide** at <http://www.enphase.com/support>.



Compatibility and Capacity

The M215 can be paired with most 60-cell PV modules. The M215 can also be paired with a 72-cell module if the voltage and current from the module stays within allowable ranges for the microinverter to perform safely, notably in warm climates. Refer to the Enphase Compatibility Calculator at: <http://enphase.com/module-compatibility-calculator-m250-update/> to ensure PV module **electrical compatibility**. To ensure **mechanical compatibility**, be sure to order the correct connector type for both microinverter and PV module from your distributor.

Mechanical Compatibility

Model Number	PV Module Connector Type
M215-60-2LL-S22-IG ¹	MC-4 locking connector
M215-60-2LL-S23-IG ¹	Tyco locking connector
M215-60-2LL-S24-IG ¹	SMK locking connector
M215-60-2LL-S22 ² M215-60-2LL-S22-NA ²	MC-4 locking connector
M215-60-2LL-S23 ² M215-60-2LL-S23-NA ²	Tyco locking connector
M215-60-2LL-S24 ² M215-60-2LL-S24-NA ²	SMK locking connector



WARNING: For the M215-60-2LL-(XXX)-IG, the paired PV module DC conductors must be labeled "PV Wire" or "PV Cable" to be compliant with NEC 690.35(D) for Ungrounded PV Power Systems.

¹ Microinverter does not require a GEC. Paired modules **must** use PV (photovoltaic) Wire.

² Requires use of a Grounding Electrode Conductor (GEC).

Grounding Considerations

With the M215-60-2LL-IG, the DC circuit within the M215 is isolated and insulated from ground. Ground fault protection (GFP) is integrated into the microinverter. Because of this, the M215-60-2LL-IG does not require a GEC. As a result, it takes less time to install than other microinverters, saves money, and increases safety.

If you are installing the M215-60-2LL, this microinverter requires a GEC or other compliant grounding method.



TIP: If installing a mix of IG (Integrated Ground) and non-IG microinverters, install the non-IG microinverters closer (electrically) to the junction box to minimize GEC use.

Utility Service Requirements

The M215 Microinverter works with split phase 240 VAC service or with three phase 208 VAC service. Measure AC line voltage at the electrical utility connection to confirm that it is within the ranges shown:

240 Volt AC, Split Phase		208 Volt AC, Three Phase	
L1 to L2	211 to 264 VAC	L1 to L2 to L3	183 to 229 VAC
L1, L2 to neutral	106 to 132 VAC	L1, L2, L3 to neutral	106 to 132 VAC

Branch Circuit Capacity

Plan your AC branch circuits to meet the following limits for maximum number of M215s per branch when protected with a 20-amp over-current protection device (OCPD).

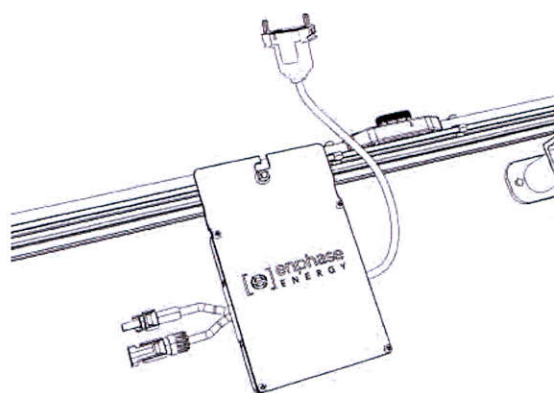
Maximum number of M215s when protected with a 20 A OCPD	
Service type	Max M215s per AC branch circuit
Split phase 240 VAC	17
Three phase 208 VAC	25

The Enphase Engage Cable

The Engage Cable is a continuous length of 2.5 mm² (12 AWG), outdoor-rated cable with integrated connectors for microinverters. These connectors are preinstalled along the Engage Cable at intervals to accommodate PV module widths. The microinverters plug directly into the cable connectors.

Selecting Cable Type

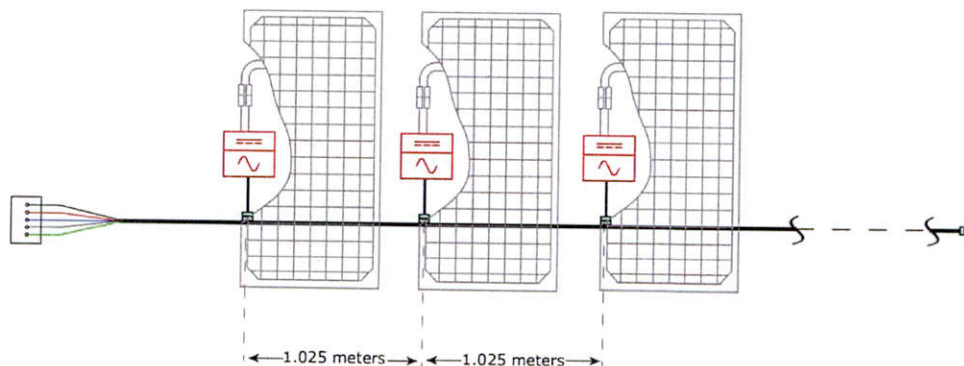
Enphase Engage Cable is available in two different voltage types and two connector spacing options. Depending upon installer needs, the cable is also available in different lengths.



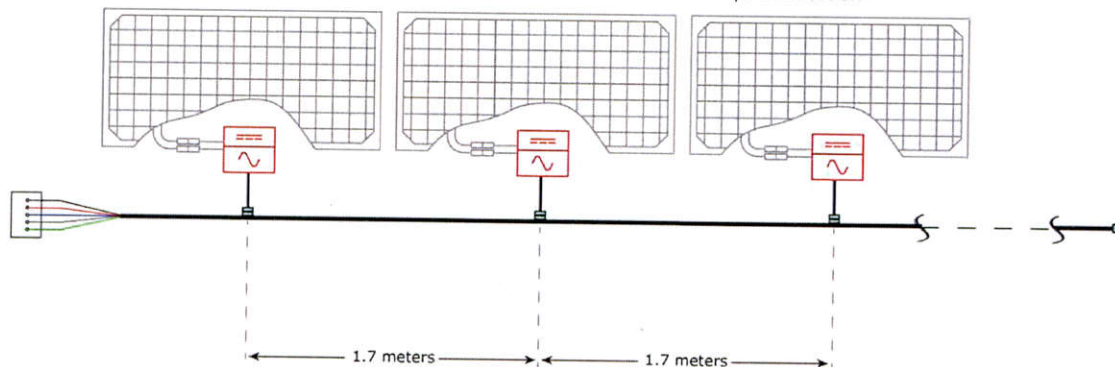
Connector Spacing Options

The gap between connectors on the cable can be either 1.025 meters (40") or 1.7 meters (67"). The 1.025-meter spacing is best suited for connecting PV modules installed in portrait orientation, while the 1.7-meter gap is best suited to PV modules installed in landscape orientation.

Cabling with connectors spaced at 1.025 meter (40") for PV modules in portrait orientation



Cabling with connectors spaced at 1.7 meters (67") for PV modules in landscape orientation



Voltage Type and Conductor Count Options

The voltage types are either 240 VAC split phase or 208 VAC three phase. **All cable connectors bear labels indicating the cable voltage designation.** Typically used for residential applications, 240VAC includes four conductors. Three-phase 208 VAC cabling includes five conductors, and is used for most commercial installations. Because Enphase microinverters output onto two phases, three phase cabling balances the phases by rotating conductor use from one microinverter to the next.

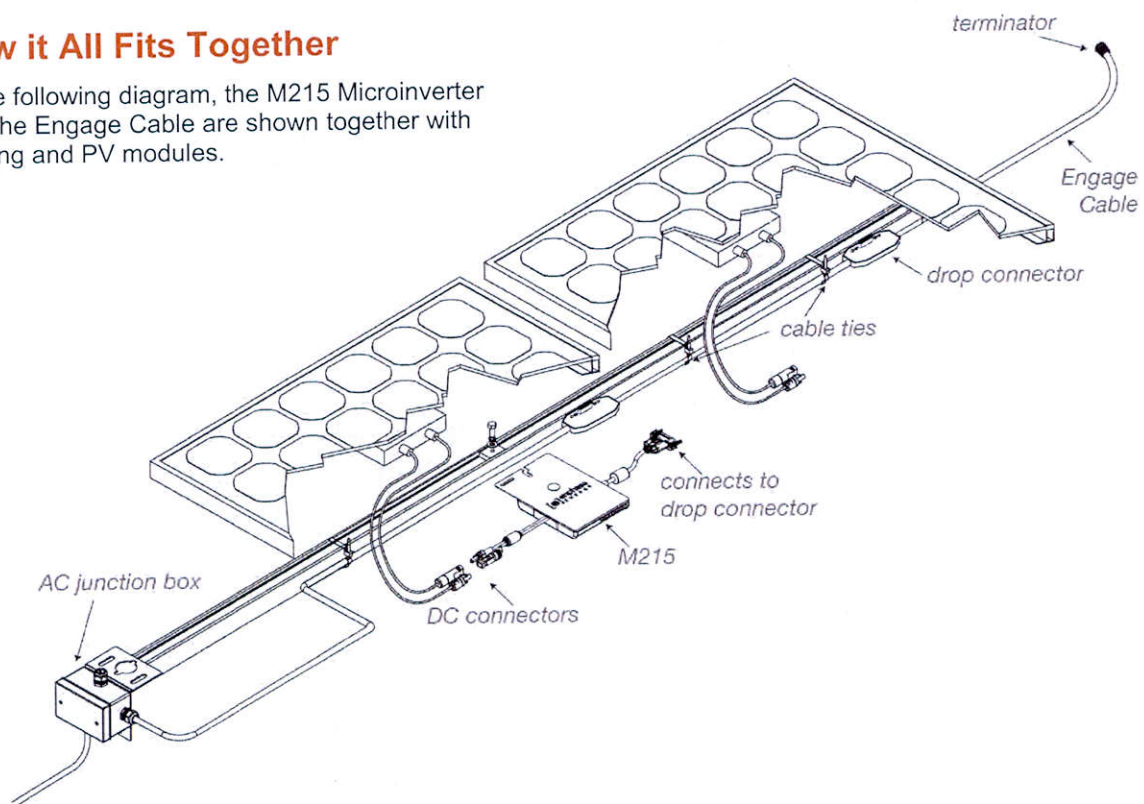
Cabling Length Options

Engage Cabling is available in shorter lengths with 30-40 connectors, depending upon voltage type. Longer lengths can be ordered and cut to suit per order. Ordering options include:

Model Number	Voltage type/ conductor #	Connector count	Connector spacing	PV module orientation	Approx. weight
ET10-240-40	240 VAC, 4 conductor	40	1.025 m (40")	Portrait	18.1 kg (40 lbs)
ET17-240-40	240 VAC, 4 conductor	40	1.7 m (67")	Landscape	20.4 kg (45 lbs)
ET10-208-30	208 VAC, 5 conductor	30	1.025 m (40")	Portrait	13.6 kg (30 lbs)
ET17-208-30	208 VAC, 5 conductor	30	1.7 m (67")	Landscape	15.9 kg (35 lbs)
ET10-240-BULK	240 VAC, 4 conductor	240	1.025 m (40")	Portrait	over 90 kg (200 lbs)
ET17-240-BULK	240 VAC, 4 conductor	240	1.7 m (67")	Landscape	over 90 kg (200 lbs)
ET10-208-BULK	208 VAC, 5 conductor	240	1.025 m (40")	Portrait	over 90 kg (200 lbs)
ET17-208-BULK	208 VAC, 5 conductor	240	1.7 m (67")	Landscape	over 90 kg (200 lbs)

How it All Fits Together

In the following diagram, the M215 Microinverter and the Engage Cable are shown together with racking and PV modules.



Microinverter Installation Requirements

- Allow a minimum of 1.9 cm (0.75 inches) between the roof and the bottom of the microinverter.
- Allow 1.3 cm (0.50 inches) between the back of the PV module and the top of the microinverter.
- You must install the M215 under the module, out of rain and sun. Do not mount the microinverter in a position that allows long-term exposure to direct sunlight or in a vertical orientation that allows water to collect in the DC connector recess. Do not install the microinverter black-side up or vertically, with the DC connectors facing up.
- Do not install the microinverter black-side up or vertically, with the DC connectors facing up.

Racking Compatibility

The M215 Microinverter and Engage Cabling are compatible with a variety of racking systems. For a list of approved PV racking types, refer to the Racking Compatibility document at <http://www.enphase.com/support>.

Planning for Cable Lengths and Type

The Cabling System is flexible enough to adapt to almost any solar design. To determine the length and cable type that you need, apply the following considerations:

- **Account for the number of Enphase Microinverters to be installed on the AC branch circuit.** Make sure to allocate the correct number of connectors, including extra connectors for gaps and turns.
- **Plan for additional cable length to reach from the AC branch circuit junction box to the first microinverter.** If greater than half a connector interval is needed, you may need to allow for one (or more) unused connectors in order to span this distance. You must cover unused connectors with Enphase watertight sealing caps.
- **Minimize the number of unused Engage Cable connectors** with three-phase systems. When cable connectors are left unused on a three-phase system, it creates a phase imbalance on the branch circuit. If multiple cable connectors are skipped over multiple branch circuits, the imbalance can multiply.

You can sometimes avoid skipping Engage Cable connectors with the use of Engage Couplers. Use the Engage Coupler to connect two Engage Cables or to connect Engage Cable to field cable. There are many possible scenarios for each type of connection, but they generally fall into four categories:

- Engage Cable to Engage Cable:
 1. Make use of leftover lengths of Engage Cable
 2. Transition between portrait and landscape Engage Cable
- Engage Cable to Field Cable (#12 TC-ER):
 3. Transition between sub-arrays on the same circuit
 4. Create wiring extensions for Engage Cable



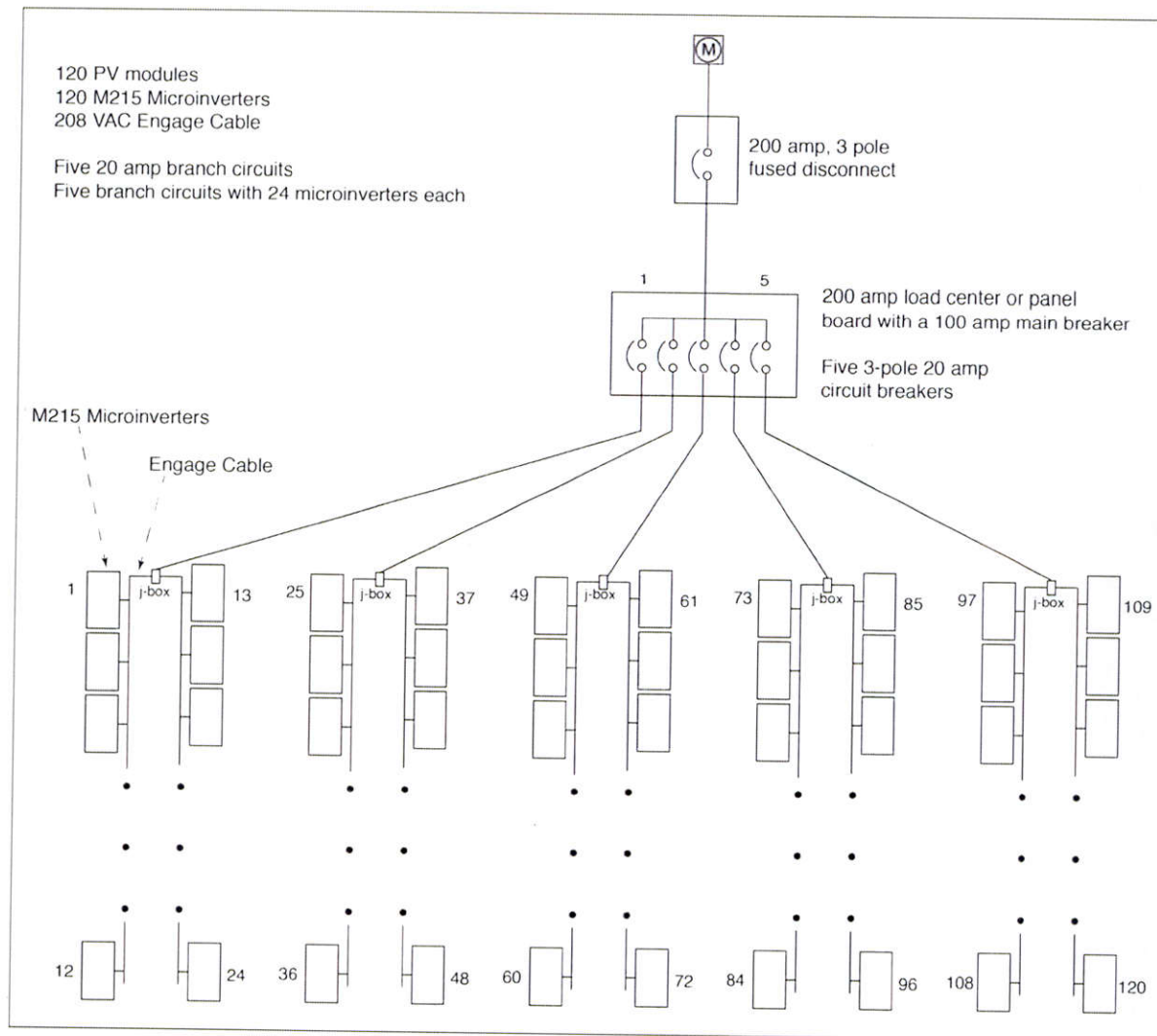
NOTE: The Engage Coupler supports only #12 TC-ER, which may not be sufficient for homerun wiring. Enphase Energy recommends maintaining less than 2% voltage drop across all wiring.

In situations where you cannot use an Engage Coupler, you can use an electrical junction box to transition between cable types.

- **Account for additional lengths of cable** when calculating total voltage rise. Refer to the following documents to maintain AC voltage rise at less than 2%:
 - *Applications of the Engage Coupler*
 - *Circuit Calculations for the M215 Microinverter*
 - *Calculating AC Line Voltage Drop for M215 Microinverters with Engage Cables*
- **Plan for additional length to reach from one row of PV modules to the next.** If the PV modules are laid out in multiple rows, the distance from one row to the next often requires additional cabling length.
- **Account for bend radius.** When planning cabling turns or loops, you must account for a minimum bend radius of 4.75 inches (12 cm).
- **Consider additional cabling when installing multiple sub-arrays.** Often, an AC branch circuit may be composed of several smaller sub-arrays across more than one roof plane. In this case, cut the cable to service each smaller array, and connect the sub-arrays together using appropriately rated lengths of conduit. Accomplish the transition from cable to conduit using an outdoor rated AC junction box, as required by the NEC and local code. Cover unused connectors with Enphase sealing caps.
- **Account for any mixture of PV modules in both portrait and landscape orientation.** When PV modules are installed in mixed orientation (both portrait and landscape orientation), there are three choices for cabling:
 1. Cabling with 1.025 meter spacing between connectors results in cleanest install for the PV modules in portrait orientation. For PV modules placed in landscape orientation, plan for an unused connector between each PV module to accommodate the required additional distance. Cover unused connectors with Enphase watertight sealing caps.
 2. Cabling with 1.7 meter spacing between connectors results in cleanest install for PV modules in landscape orientation, but requires that any additional cable length between PV modules in portrait orientation be coiled and dressed so that cabling does not contact the roof. Cover unused connectors with Enphase watertight sealing caps.
 3. Transition between 1.025 and 1.7-meter spacing cable options using an outdoor-rated junction box. Install this junction box to the PV racking.

Example Installation: Layout & Parts Needed, 208 VAC Commercial

The following installation diagram shows an example with five branches. The 208VAC layout shows five center-fed branches with 24 microinverters each. The PV modules are in landscape orientation. The tables following the diagram list required and optional equipment.



Enphase Items Required

Quantity	Description	Order Number
120	M215 Microinverter	See page 1 for order numbers
3 packs	Cable clips (each pack contains 100 clips)	ET-CLIP-100
1 pack	Disconnect tool (each pack contains five tools)	ET-DISC-05
1 pack	Branch terminator (each pack contains 10 terminators)	ET-TERM-10
1	Engage Cable divided into ten lengths: Each length should be about 20.4 meters (67 feet) with 12 connectors.	ET17-208-BULK
1 pack	Watertight Sealing caps (each pack contains 10). Required only if there are any unused connectors; Unused connectors must be covered with this cap.	ET-SEAL-10
1	Envoy Communications Gateway For installations of more than 600 microinverters, refer to the Enphase Technical Brief: Commercial System Design with M215 at http://www.enphase.com/support .	ENV-120
as needed	Engage Coupler (each pack contains five Couplers). Used for splicing two AC power cables within an array.	ET-SPLK-05

Non-Enphase Items Required

Quantity	Description
120	PV module
5	Weather-proof (NEMA) junction box
5	Three-pole 20 amp circuit breaker
1	Three-pole 200 amp circuit breaker
1	200 amp load center
1	Lightning protection device (3-phase AC surge protector)
as needed	Homerun conductors
as needed	Continuous grounding conductor (if required)
as needed	Torque wrench, sockets, wrenches for mounting hardware
as needed	Adjustable wrench or open-ended wrench (for terminator caps)
as needed	Inspection mirror (for viewing indicator lights on the undersides of the microinverters)



CERTIFICATE OF LIABILITY INSURANCE

Page 1 of 1

DATE (MM/DD/YYYY)
01/20/2015

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Willis of Texas, Inc. c/o 26 Century Blvd. P.O. Box 305191 Nashville, TN 37230-5191	CONTACT NAME: PHONE (A/C, NO, EXT): 877-945-7378 FAX (A/C, NO): 888-467-2378 E-MAIL ADDRESS: certificates@willis.com	
	INSURER(S) AFFORDING COVERAGE	
INSURED Direct Energy and its majority owned subsidiaries and affiliates including Astrum Solar, Inc. 705 General Washington Ave Suite 650 Norristown, PA 19403	INSURER A: ACE American Insurance Company	NAIC# 22667-302
	INSURER B: Zurich American Insurance Company	16535-305
	INSURER C: American Zurich Insurance Company	16535-306
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES

CERTIFICATE NUMBER: 22704662

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN. THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	☒ COMMERCIAL GENERAL LIABILITY ☐ CLAIMS-MADE ☒ OCCUR ☒ SIR: \$100,000 GEN'L AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☒ PROJECT ☐ LOC OTHER:			XSLG27341226	1/1/2015	1/1/2016	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 100,000 MED EXP (Any one person) \$ 5,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 1,000,000 PRODUCTS - COMP/OP AGG \$ 1,000,000
B	☒ AUTOMOBILE LIABILITY ☒ ANY AUTO ☐ ALL OWNED AUTOS ☐ HIRED AUTOS ☐ SCHEDULED AUTOS ☐ NON-OWNED AUTOS			BAP595396601	1/1/2015	1/1/2016	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ EACH OCCURRENCE \$ AGGREGATE \$
	☐ UMBRELLA LIAB ☐ OCCUR ☐ EXCESS LIAB ☐ CLAIMS-MADE ☐ DED ☐ RETENTION \$						EACH OCCURRENCE \$ AGGREGATE \$
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N	N/A	WC595396901 WC595397301	1/1/2015 1/1/2015	1/1/2016 1/1/2016	☒ PER STATUTE ☐ OTHER E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 1,000,000

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
Re: Ken Lum system relocation.

CERTIFICATE HOLDER**CANCELLATION**

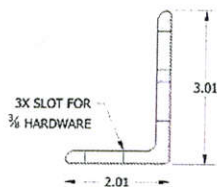
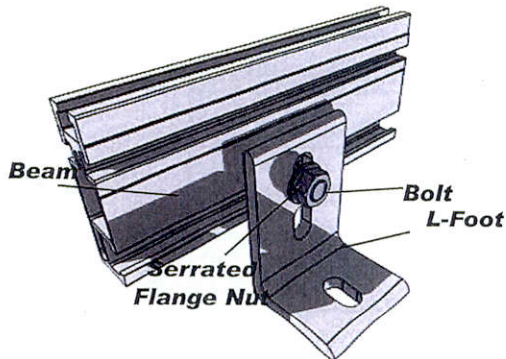
SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

SOLARMOUNT Beam Connection Hardware

SOLARMOUNT L-Foot

Part No. 304000C, 304000D



Dimensions specified in inches unless noted

- **L-Foot material:** One of the following extruded aluminum alloys: 6005-T5, 6105-T5, 6061-T6
- **Ultimate tensile:** 38ksi, Yield: 35 ksi
- **Finish:** Clear or Dark Anodized
- **L-Foot weight:** 0.215 lbs (98g)
- Allowable and design loads are valid when components are assembled with SOLARMOUNT series beams according to authorized UNIRAC documents
- **For the beam to L-Foot connection:**
 - Assemble with one ASTM F593 3/8"-16 hex head screw and one ASTM F594 3/8" serrated flange nut
 - Use anti-seize and tighten to 30 ft-lbs of torque
- Resistance factors and safety factors are determined according to part 1 section 9 of the 2005 Aluminum Design Manual and third-party test results from an IAS accredited laboratory

NOTE: Loads are given for the L-Foot to beam connection only; be sure to check load limits for standoff, lag screw, or other attachment method

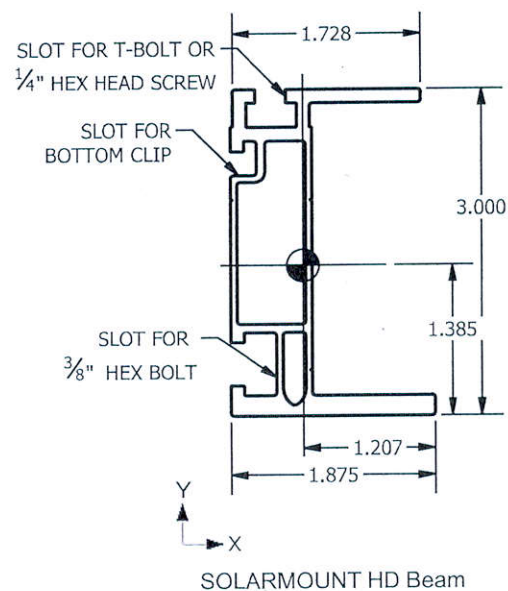
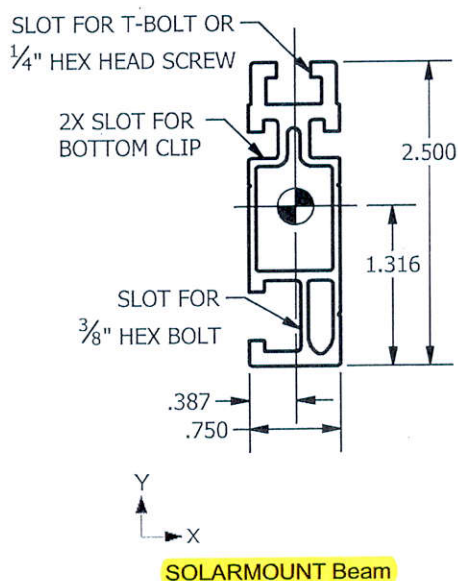
Applied Load Direction	Average Ultimate lbs (N)	Allowable Load lbs (N)	Safety Factor, FS	Design Load lbs (N)	Resistance Factor, Φ
Sliding, Z $\pm$	1766 (7856)	755 (3356)	2.34	1141 (5077)	0.646
Tension, Y+	1859 (8269)	707 (3144)	2.63	1069 (4755)	0.575
Compression, Y-	3258 (14492)	1325 (5893)	2.46	2004 (8913)	0.615
Traverse, X $\pm$	486 (2162)	213 (949)	2.28	323 (1436)	0.664

SOLARMOUNT Beams

Part No. 310132C, 310132C-B, 310168C, 310168C-B, 310168D
310208C, 310208C-B, 310240C, 310240C-B, 310240D,
410144M, 410168M, 410204M, 410240M

Properties	Units	SOLARMOUNT	SOLARMOUNT HD
Beam Height	in	2.5	3.0
Approximate Weight (per linear ft)	plf	0.811	1.271
Total Cross Sectional Area	in ²	0.676	1.059
Section Modulus (X-Axis)	in ³	0.353	0.898
Section Modulus (Y-Axis)	in ³	0.113	0.221
Moment of Inertia (X-Axis)	in ⁴	0.464	1.450
Moment of Inertia (Y-Axis)	in ⁴	0.044	0.267
Radius of Gyration (X-Axis)	in	0.289	1.170
Radius of Gyration (Y-Axis)	in	0.254	0.502

* Rails are extruded using these aluminum alloys: 6005-T5, 6105-T5, 6061-T6



Dimensions specified in inches unless noted

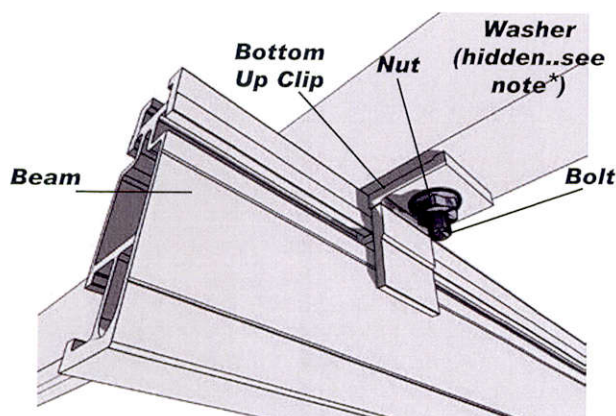
SOLARMOUNT Technical Datasheet

Pub 130817

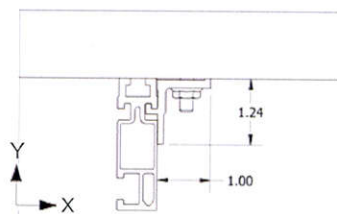
SOLARMOUNT Module Connection Hardware	1
Bottom Up Module Clip.....	1
Mid Clamp	2
End Clamp.....	2
SOLARMOUNT Beam Connection Hardware	3
L-Foot	3
SOLARMOUNT Beams	4

SOLARMOUNT Module Connection Hardware

SOLARMOUNT Bottom Up Module Clip Part No. 302000C



- **Bottom Up Clip material:** One of the following extruded aluminum alloys: 6005-T5, 6105-T5, 6061-T6
 - **Ultimate tensile:** 38ksi, Yield: 35 ksi
 - **Finish:** Clear Anodized
 - **Bottom Up Clip weight:** ~0.031 lbs (14g)
 - Allowable and design loads are valid when components are assembled with SOLARMOUNT series beams according to authorized UNIRAC documents
 - Assemble with one ¼"-20 ASTM F593 bolt, one ¼"-20 ASTM F594 serrated flange nut, and one ¼" flat washer
 - Use anti-seize and tighten to 10 ft-lbs of torque
 - Resistance factors and safety factors are determined according to part 1 section 9 of the 2005 Aluminum Design Manual and third-party test results from an IAS accredited laboratory
 - Module edge must be fully supported by the beam
- * **NOTE ON WASHER:** Install washer on bolt head side of assembly. **DO NOT** install washer under serrated flange nut

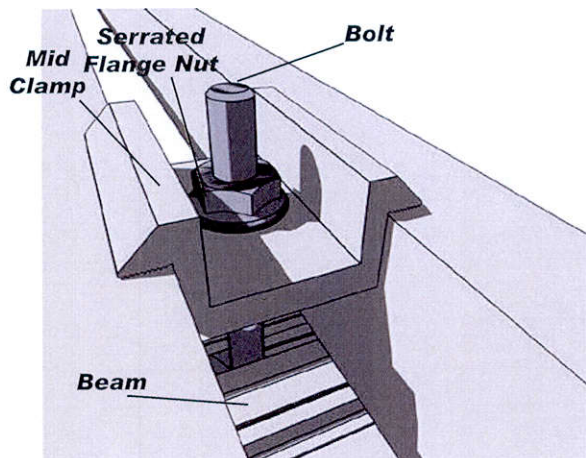


Applied Load Direction	Average Ultimate lbs (N)	Allowable Load lbs (N)	Safety Factor, FS	Design Load lbs (N)	Resistance Factor, Φ
Tension, Y+	1566 (6967)	686 (3052)	2.28	1038 (4615)	0.662
Transverse, X±	1128 (5019)	329 (1463)	3.43	497 (2213)	0.441
Sliding, Z±	66 (292)	27 (119)	2.44	41 (181)	0.619

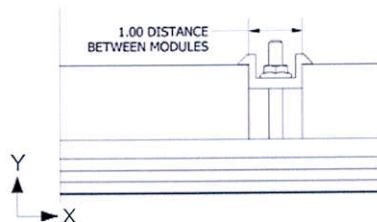
Dimensions specified in inches unless noted

SOLARMOUNT Mid Clamp

Part No. 302101C, 302101D, 302103C, 302104D,
302105D, 302106D



- **Mid clamp material:** One of the following extruded aluminum alloys: 6005-T5, 6105-T5, 6061-T6
- **Ultimate tensile:** 38ksi, Yield: 35 ksi
- **Finish:** Clear or Dark Anodized
- **Mid clamp weight:** 0.050 lbs (23g)
- Allowable and design loads are valid when components are assembled according to authorized UNIRAC documents
- Values represent the allowable and design load capacity of a single mid clamp assembly when used with a SOLARMOUNT series beam to retain a module in the direction indicated
- Assemble mid clamp with one Unirac 1/4"-20 T-bolt and one 1/4"-20 ASTM F594 serrated flange nut
- Use anti-seize and tighten to 10 ft-lbs of torque
- Resistance factors and safety factors are determined according to part 1 section 9 of the 2005 Aluminum Design Manual and third-party test results from an IAS accredited laboratory

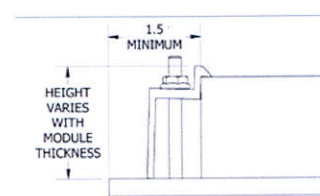
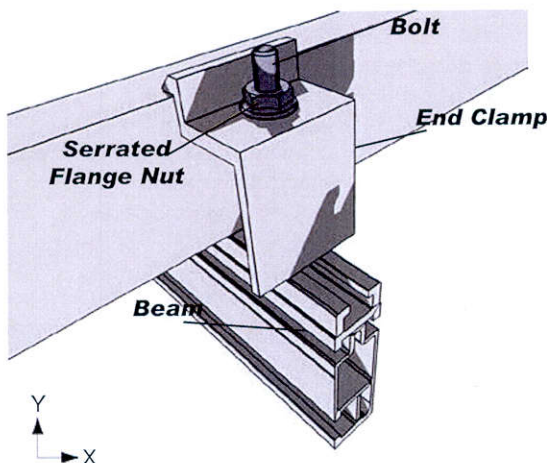


Dimensions specified in inches unless noted

Applied Load Direction	Average Ultimate lbs (N)	Allowable Load lbs (N)	Safety Factor, FS	Design Load lbs (N)	Resistance Factor, Φ
Tension, Y+	2020 (8987)	891 (3963)	2.27	1348 (5994)	0.667
Transverse, Z±	520 (2313)	229 (1017)	2.27	346 (1539)	0.665
Sliding, X±	1194 (5312)	490 (2179)	2.44	741 (3295)	0.620

SOLARMOUNT End Clamp

Part No. 302001C, 302002C, 302002D, 302003C,
302003D, 302004C, 302004D, 302005C, 302005D,
302006C, 302006D, 302007D, 302008C, 302008D,
302009C, 302009D, 302010C, 302011C, 302012C



Dimensions specified in inches unless noted

- **End clamp material:** One of the following extruded aluminum alloys: 6005-T5, 6105-T5, 6061-T6
- **Ultimate tensile:** 38ksi, Yield: 35 ksi
- **Finish:** Clear or Dark Anodized
- **End clamp weight:** varies based on height: ~0.058 lbs (26g)
- Allowable and design loads are valid when components are assembled according to authorized UNIRAC documents
- Values represent the allowable and design load capacity of a single end clamp assembly when used with a SOLARMOUNT series beam to retain a module in the direction indicated
- Assemble with one Unirac 1/4"-20 T-bolt and one 1/4"-20 ASTM F594 serrated flange nut
- Use anti-seize and tighten to 10 ft-lbs of torque
- Resistance factors and safety factors are determined according to part 1 section 9 of the 2005 Aluminum Design Manual and third-party test results from an IAS accredited laboratory
- Modules must be installed at least 1.5 in from either end of a beam

Applied Load Direction	Average Ultimate lbs (N)	Allowable Load lbs (N)	Safety Factor, FS	Design Loads lbs (N)	Resistance Factor, Φ
Tension, Y+	1321 (5876)	529 (2352)	2.50	800 (3557)	0.605
Transverse, Z±	63 (279)	14 (61)	4.58	21 (92)	0.330
Sliding, X±	142 (630)	52 (231)	2.72	79 (349)	0.555

CA-20

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Annapolis Junction, MD 20701

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Enphase® Microinverters

Enphase® M215



The **Enphase® M215 Microinverter** with integrated ground delivers increased energy harvest and reduces design and installation complexity with its all-AC approach. With the advanced M215, the DC circuit is isolated and insulated from ground, so **no Ground Electrode Conductor (GEC) is required for the microinverter**. This further simplifies installation, enhances safety, and saves on labor and materials costs.

The Enphase M215 integrates seamlessly with the Engage® Cable, the Envoy® Communications Gateway™, and Enlighten®, Enphase's monitoring and analysis software.

PRODUCTIVE

- Maximizes energy production
- Minimizes impact of shading, dust, and debris
- No single point of system failure

SIMPLE

- No GEC needed for microinverter
- No DC design or string calculation required
- Easy installation with Engage Cable

RELIABLE

- More than 1 million hours of testing and millions of units shipped
- Industry-leading warranty, up to 25 years

Enphase® M215 Microinverter // DATA

INPUT DATA (DC)		M215-60-2LL-S22-IG / S23-IG / S24-IG	
Recommended input power (STC)	190 - 270 W		
Maximum input DC voltage	48 V		
Peak power tracking voltage	27 V - 39 V		
Operating range	16 V - 48 V		
Min/Max start voltage	22 V / 48 V		
Max DC short circuit current	15 A		
Max input current	10 A		
OUTPUT DATA (AC)		@208 VAC	@240 VAC
Peak output power	225 W	225 W	
Rated (continuous) output power	215 W	215 W	
Nominal output current	1.1 A (A rms at nominal duration)	0.9 A (A rms at nominal duration)	
Nominal voltage/range	208 V / 183-229 V	240 V / 211-264 V	
Nominal frequency/range	60.0 / 57-61 Hz	60.0 / 57-61 Hz	
Extended frequency range*	57-62.5 Hz	57-62.5 Hz	
Power factor	>0.95	>0.95	
Maximum units per 20 A branch circuit	25 (three phase)	17 (single phase)	
Maximum output fault current	850 mA rms for 6 cycles	850 mA rms for 6 cycles	
EFFICIENCY			
CEC weighted efficiency, 240 VAC	96.5%		
CEC weighted efficiency, 208 VAC	96.5%		
Peak inverter efficiency	96.5%		
Static MPPT efficiency (weighted, reference EN50530)	99.4 %		
Night time power consumption	65 mW max		
MECHANICAL DATA			
Ambient temperature range	-40°C to +65°C		
Dimensions (WxHxD)	163 mm x 173 mm x 25 mm (without mounting bracket)		
Weight	1.6 kg (3.4 lbs)		
Cooling	Natural convection - No fans		
Enclosure environmental rating	Outdoor - NEMA 6		
FEATURES			
Compatibility	Compatible with 60-cell PV modules.		
Communication	Power line		
Integrated ground	The DC circuit meets the requirements for ungrounded PV arrays in NEC 690.35. Equipment ground is provided in the Engage Cable. No additional GEC or ground is required. Ground fault protection (GFP) is integrated into the microinverter.		
Monitoring	Enlighten Manager and MyEnlighten monitoring options		
Compliance	UL1741/IEEE1547, FCC Part 15 Class B, CAN/CSA-C22.2 NO. 0-M91, 0.4-04, and 107.1-01		

* Frequency ranges can be extended beyond nominal if required by the utility

To learn more about Enphase Microinverter technology,
visit enphase.com

