

Compatible Racking Makes and Models for Mounting Enphase Microinverters

Purpose

This document is not intended to be an exclusive list of racking manufacturers compatible with the Enphase Microinverter System. Instead, it lists racking products that Enphase has validated for compatibility through field installations or lab evaluations. Enphase has validated that the products in this document work with our current product lines, but future microinverter products may not be compatible.

NOTE: All recommendations included in the Enphase Microinverter Operations and Installation Manual must be maintained, including, but not limited to:

- Do not install the microinverter in a location where it is exposed to prolonged periods of direct sunlight.
- Install the microinverter under the PV module to avoid direct exposure to rain, UV, and other harmful weather events. Do not expose the AC or DC connectors to rain or condensation before the connectors are mated.
- Install the microinverter at a distance greater than ½" from the module backsheet.
- Install the microinverter at a distance greater than ¾" from the roof.

NOTE: All trademarks are the property of their respective owners.

Grounding Options for Enphase Microinverters

Grounding Options for the IQ 6 and IQ 6+ Micros

The Enphase IQ6 and IQ6+ Microinverters include a double-insulated outer enclosure and do not bond the DC conductors to ground internally. The Q Cable includes only two line (hot) conductors with no neutral and no ground. In an IQ Microinverter system, the racking, module frames, and IQ Microinverter mounting flange/lid are all bonded with mounting hardware, such as UL2703 grounding hardware and then grounded as required by the jurisdiction.

Grounding Options for the M-Series and S-Series Microinverters

The Enphase M215-IG, M250, C250, S230, and S280 Microinverters are grounded through the grounding conductor in the Engage Cable. These microinverters require no additional ground. It is not necessary, but an additional bond can be provided between the microinverters and the racking systems using UL2703 listed hardware or a listed grounding washer, such as the WEEB grounding washer from Burndy Electronics. If a grounding path is established between the microinverters, the racking, and the module frames, it may be acceptable to the jurisdiction to provide the racking and modules' equipment grounding through the Enphase Engage Cable. The code case for this grounding application can be found in an Enphase technical brief at:

http://enphase.com/global/files/Equipment_Grounding_in_an_Enphase_IG_System-v2703.pdf

Grounding Options for the M215 Original and Previous Generation Microinverters

The ground clamp provided on the mounting flange of the M215 Original Enphase Microinverters accepts #8 through #6 AWG grounding electrode conductors. This document also details alternative grounding clip solutions for each rail type, if available.

CSA has evaluated and approved the Burndy / Wiley Electronics WEEB grounding washers for use with the Enphase Microinverter. Where the compatible racking models have listed grounding washers available, we list the Burndy / Wiley Electronics part numbers in sections 2 and 3 of this document.

Installing Enphase Microinverters with UL2703 Racking Partners

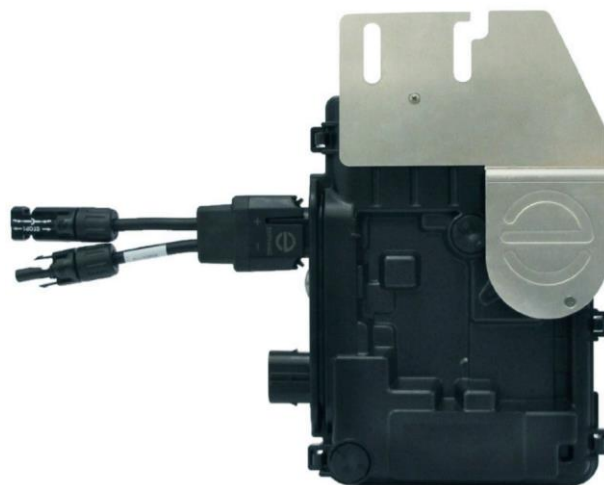
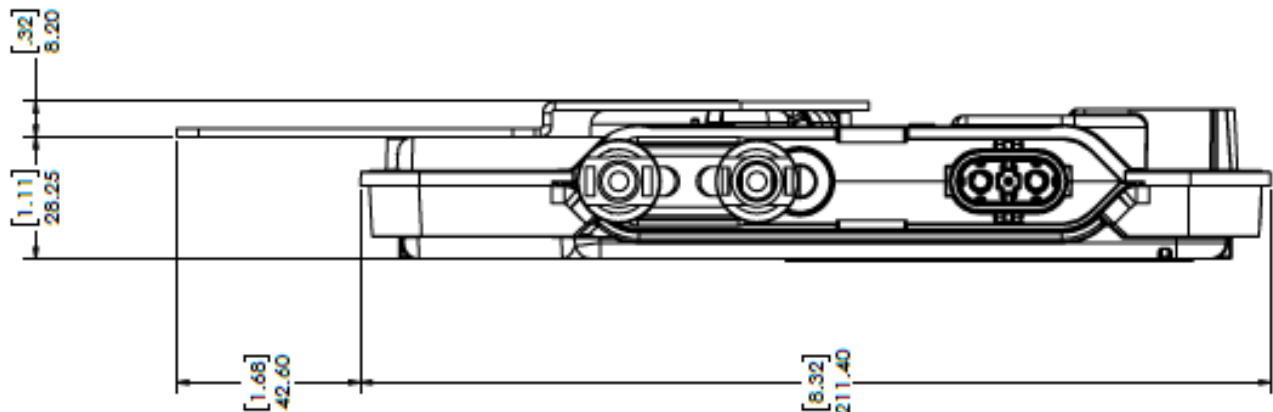
Enphase has partnered with Unirac, SnapNrack, Ironridge, and ProSolar to validate that the grounding and bonding of the modules, racking, and microinverters can be provided through the Enphase Engage Cabling system. The Enphase microinverters have been tested and listed to UL2703 with these racking company's products to provide the bonding and grounding through the Enphase Engage Cabling system. We have also worked with Ecofasten and Ecolibrium to list their microinverter frame attachment brackets to UL2703 for providing the grounding and bonding of the mounting system, modules, and microinverters through the Enphase Engage Cabling System. These certifications do not apply to the IQ Microinverter system, since the Q Cable does not include a ground conductor.

Enphase Microinverter Families

Enphase Microinverters have varying racking requirements as described below. See the product data sheets at <http://www.enphase.com/> for more information. Complete dimensions for all microinverter products are provided later in this document.

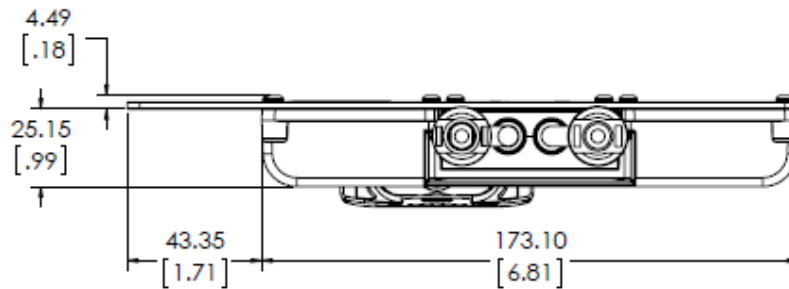
The IQ6 and IQ6+ Microinverter Products

In the first quarter of 2017, Enphase began shipping the IQ6 and IQ6+ Microinverters. These microinverters can be mounted to rails or module frames in the same way that previous microinverters were mounted.



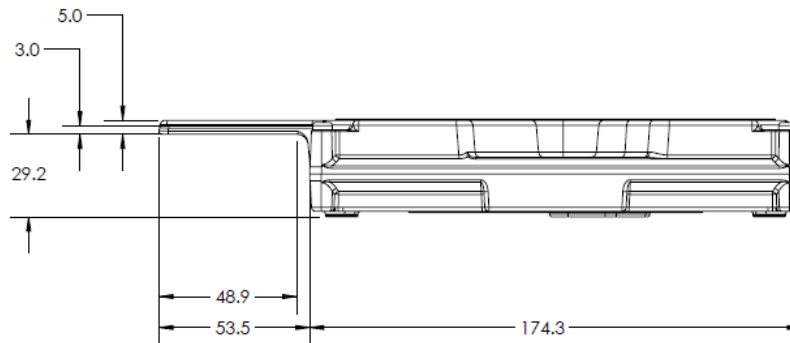
Modifications to the M215-IG and M250 Lid

In the first quarter of 2014, Enphase began manufacturing M215-IG and M250 Microinverters with a new lid. These microinverters no longer have a grounding channel, grounding hole, and grounding clip, and the lids have been shortened by about an inch.



The S230 and S280 Microinverter Products

In 2015, Enphase began shipping the S230 and S280 Microinverters with a cast lid. This enclosure is very different from our M-series and C-series products, and may have some impact on the mounting hardware required. The S-series product is not compatible with the Enphase Frame Mount bracket or other module frame brackets.

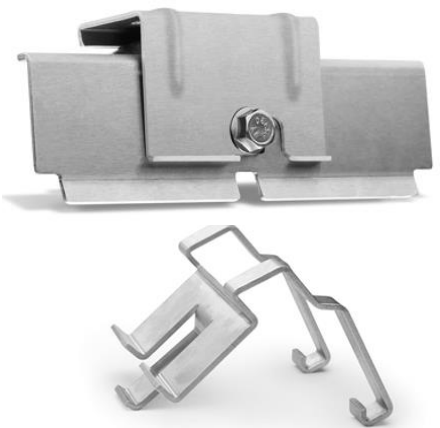


Frame Mount and Connector Clip

You can use the Enphase Frame Mount and Connector Clip to attach Enphase Microinverters directly to most module frames. The Frame Mount bracket is a convenient solution for mounting microinverters when conventional, rail based mounting solutions aren't available. It may be the ideal solution for railless mounting systems and ballasted, flat-roof commercial racking systems.

When using the Enphase Frame Mount bracket, use the Enphase Connector Clip to keep Engage cabling off the roof and connected to the module frames. The Connector Clip securely holds the Enphase Engage Cable connectors to module frames. You may need additional AC wire clips to support the cable between the cable connectors.

The Enphase Frame Mount bracket works with M-Series, C-250s, and IQ Series Microinverters, but does not work with S-Series Microinverters. For frame mounting the S-230 and S-280 Microinverter, you may use a Unirac MLPE mount bracket.



Enphase Frame Mount	Enphase Connector Clip
EFM-35MM - For 35mm module frames	EFM-CC - Holds Enphase Engage Cable Connector Clip securely to module frames
EFM-40MM - For 40mm module frames	

Wire Management

Wire management is critical to ensuring the long-term reliability of an Enphase system. This section contains a list of wire clips that can support and manage the AC and DC conductors in an Enphase system.

You can find more comprehensive wire management information at www.enphase.com. One wire management document that is focused on Engage Cable applications for M-Series, C-250s, and S-Series products recommends best practices for managing the AC and DC conductors, wiring the junction boxes for long term reliability, and using the Engage Coupler to reduce the numbers of conduits, conductors, and junction boxes on the roof:


<http://enphase.com/global/files/Enphase-Engage-Cable-Management.pdf>

When planning an IQ Microinverter system, wire management options are listed in the Technical Brief: Planning for an IQ Microinverter System:

<https://enphase.com/sites/default/files/downloads/support/TechBrief-Planning-for-IQ-System.pdf>

DC Wire Management Products

There are a variety of products available to support the DC module leads off the roof. The following clips let you attach the DC module lead to the module frame using a clip rated for PV Cable. Just a few of the many options include:

Manufacturer	Model	Image
Nine Fasteners	DCS-1307 PV cable clip	
Burndy / Wiley Electronics	ACME ACC-PV PV cable clip	
Heyco Products	SunRunner PV cable clip	

Wire Management Clips for Attaching Q Cable to Solar Mounting Rails

The Enphase Q Clip (Q-CLIP-100) allows for managing one or two Q Cables or Raw Q Cables to a solar mounting rail. We have evaluated a large selection of racking systems and have determined that this clip works with approximately 90% of the racking systems available today. These clips work great for supporting the cable along the rail and are likely adequate for supporting the cabling during row to row transitions, but additional support may be provided from module frame clips.



Wire Management Clips for Attaching Q Cable to Module Frames for Railless and AC Module Applications

There are a variety of products available for supporting DC module leads off the roof. Most of the wire clips available today for PV cable and for USE-2 cable can also be used to attach Q Cable to module frames. Being able to attach Q Cable to module frames can be useful for railless racking systems since there is no rail to support the cabling on. Also, for AC Module installations, it is often more convenient to clip the Q Cable to the module frame than to clip the Q Cable to the racking system (if available.)









The Q Cable and Raw Q Cable must be supported at intervals not to exceed 6 ft. It must be supported securely so that the cable does not touch the roof surface.

The Q Cable may be supported to a module frame with a PV Cable Clip or a USE-2 rated cable clip, such as the Nine Fasteners DCS-1306 or DCS-1307 cable clips.

Wire Management Products for the Enphase Engage Cable

The following products work with the Enphase Engage Cable.

- The Enphase Engage 240V, single-phase cable has an outside diameter of 10.75mm (0.425”).
- The Enphase Engage 208V, three-phase cable has an outside diameter of 11.75mm (0.463”).

Manufacturer	Model	Rail or Module Frame	Parallel or Perpendicular	Image
Enphase Energy	ET-CLIP	Rail	When cable runs parallel to rail	
Nine Fasteners	NFI-1463	Module frame – 1 cable only	When cable runs parallel to module frame	
Nine Fasteners	NFI-1461	Module frame	When cable runs parallel to module frame	
Nine Fasteners	NFI-1462	Module frame	When cable runs perpendicular to module frame	
Burndy/Wiley	ACC-F2-90	Module frame	When cable runs parallel or perpendicular to module frame	
Burndy/Wiley	UNIRAP	Rail	When cable runs parallel to rail or mounting system	
Heyco	SunRunner 2 Series	Rail or module frame	When cable runs parallel to rail or module frame	
Heyco	SunBundler	Rail	When cable runs parallel to rail or mounting system	

Racking Products

- Section 1 lists rail-based racking systems that work without modification, using the racking manufacturer's standard microinverter attachment hardware.
- Section 2 lists railless racking systems. These systems may require a custom bracket or attachment method and often require that the cable be supported with a clip to the module frames.
- Section 3 lists racking systems where the Enphase Microinverter is part of a factory-assembled proprietary racking or module solution.

Section 1 — Rail Based Systems That Require No Modification

A.E.T (Applied Energy Technologies)

Module Rail	Fastener Information	Grounding Washer
Rayport P (pitched roofs)	Microinverter hardware kit 80677	
Rayport B (ballasted)	Microinverter hardware kit 80672 / 80612	WEEB-11.5
Rayport T6 (ground)	Microinverter hardware kit 80235	
Rayport G-Eco (ground)	Microinverter hardware kit 81068	

<http://www.aetenergy.com>

Baja Carports

Module Rail	Fastener Information	Grounding Washer
Solar Support Systems	5/16" bolt and hardware to purlin	

<http://www.bajacarports.com/>

Cooper B-Line

Module Rail	Fastener Information	Grounding Washer
ARISTA™ (ballasted)	1/4" or 5/16" strut nuts or spring nuts	
B-Line Ground Mount	1/4" or 5/16" strut nuts or spring nuts	

<http://www.cooperindustries.com/content/public/en/b-line/markets/solar.html>

DPW Solar (Direct Power and Water)

Module Rail	Fastener Information	Grounding Washer
Power Rail (pitched roofs)	0.25 inch hex head bolt, washer, nut, for top rail mount	WEEB-DMC
Ballasted Power Rail (ballasted)	0.25 inch hex head bolt, washer, nut, for top rail mount	WEEB-DMC

<http://www.dpwsolar.com/>

Ecolibrium Solar

Module Rail	Fastener Information	Grounding Washer
Ecorail (pitched roofs)	Slider and bolt	WEEB-DSK516
Eco-X Rail-less	Power Accessory Bracket PN ES10072 (previously ECO-001-104)	

<http://www.ecolibriumsolar.com/>

Everest Solar Systems

Module Rail	Fastener Information	Grounding Washer
CrossRail (pitched roofs)	Microinverter mounting kit (200315)	WEEB-KMC
XpressRail (pitched roofs)	Microinverter mounting kit (200315)	WEEB-KMC
Dome System S/D (ballasted)	Microinverter mounting kit (200315)	WEEB-KMC

<http://www.everest-solarsystems.com/home.html>

Haticon

Module Rail	Fastener Information	Grounding Washer
Haticon Rail (pitched roofs)	Slider and bolt	WEEB-DMC
Haticon Rail (ballasted)	Slider and bolt	WEEB-DMC
Haticon Rail (ground)	Slider and bolt	WEEB-DMC

<http://www.haticonsolar.com/home/>

IronRidge

Module Rail	Fastener Information	Grounding Washer
Light Rail XRL	0.25 inch hex head bolt, washer, nut, for top rail mount (#29-5003-005)	WEEB-DMC
Standard Rail XRS	0.25 inch hex head bolt, washer, nut, for top rail mount	WEEB-DMC

<http://www.ironridge.com/>

Kinetic Solar

Module Rail	Fastener Information	Grounding Washer
K-Rack	Slider and hardware	WEEB-KSR

<http://www.K-rackinfo.com>

K2 Systems

Module Rail	Fastener Information	Grounding Washer
K2 Systems	Slide nut with M8 socket head cap screw	WEEB-KMC
K2 MultiRail	K2 slot nut (#1001643) and M8 bolt	

<http://www.k2-systems.uk.com/home.html>

Mage

Module Rail	Fastener Information	Grounding Washer
Systemtec	T-bolt and hardware	WEEB-CCR

http://www.magesolar.com/us/products/mounting_system.html

MBarC Carports

Module Rail	Fastener Information	Grounding Washer
Solar F.I.T. Structures	5/16" bolt and hardware to purlin	

<http://www.mbarconline.com/>

mounts4solar

Module Rail	Fastener Information	Grounding Washer
Rail 6.0	M8 SS hammer head bolt	

<http://mounts4solar.com/>

MSI (Mounting Systems, Inc.)

Module Rail	Fastener Information	Grounding Washer
Alpha (Flush Mount)	T-bolt 806-0021	WEEB-CMC
Alpha+ (Flush Mount)	T-bolt 806-0021	
Tau (Flush Mount)	T-bolt 806-0021	WEEB-CMC
Tau+ (Flush Mount)	T-bolt 806-0021	
Lambda (Ballasted Flat Roof)	T-bolt 806-0021	WEEB-CMC
Sigma (Ground Mount)	T-bolt 806-0021	WEEB-CMC

<http://ww3.mounting-systems.info/en/>

PanelClaw, Inc.

Racking System	Fastener Information	Grounding Washer
Polar Bear – 5 deg	Microinverter Mounting Kit #5000203	Proprietary UL-2703
Polar Bear III – 10 deg	Microinverter mounting kit #5000204	Proprietary UL-2703

<http://www.panelclaw.com/>

Polar Racking

Module Rail	Fastener Information	Grounding Washer
PRR	Rotite nut and hardware	Proprietary ground washer
PRP Solar Carport	5/16" bolt and hardware to purlin	

<http://www.polarracking.com/>

ProSolar

Module Rail	Fastener Information	Grounding Washer
Rooftrac Rail	Channel nut with 5/16" hardware	WEEB-PMC
Groundtrac Rail	Channel nut with 5/16" hardware	WEEB-PMC

<http://www.prosolar.com>

PVaccessories

Module Rail	Fastener Information	Grounding Washer
Series 42 Rail	PV-Tbolt-42	PV-GC-42
Series 42 Rail	PV-DC-42	PV-GCV-42

<http://www.exelsolar.com>

PV Racking

Module Rail	Fastener Information	Grounding Washer
PV Racking Pitched Roof	3/8" hardware	SGB4 Lug

<http://www.pvracking.us/>

RBI Solar

Module Rail	Fastener Information	Grounding Washer
RBI Solar GM-I (Portrait)	Enphase compatibility kit	
RBI Solar RM-I	Bolt to support bar (under module)	

<http://www.rbisolar.com/>

Renusol

Module Rail	Fastener Information	Grounding Washer
Renusol VS	T-bolt and hardware	WEEB-SMC

<http://www.renusolamerica.com/>

S:Flex

Module Rail	Fastener Information	Grounding Washer
S:Flex Rail	M8x20mm T-bolt with M8 serrated nut	WEEB-CCR

<http://www.sflex.com/>

Schletter, Inc.

Module Rail	Fastener Information	Grounding Washer
05 Series Rail	Mounting hardware - microinverter kit	Schletter clip Incl. w/ kit
Fix Z Series Rail	Mounting hardware - microinverter kit	Schletter clip Incl. w/ kit
S Series Rail	Microinverter mounting kit for S series	

<http://www.schletter.us/>

Schuco

Module Rail	Fastener Information	Grounding Washer
SolarEZ	ezUniversal screws (M8x14) ezAnchor blocks	WEEB-SMC

<http://www.schueco.com/>

SnapNrack

Module Rail	Fastener Information	Grounding Washer
SnapNrack Series 100	Channel nut with 5/16" hex head bolt	WEEB-PMC
SnapNrack Series 100UL	UL listed channel nut with 5/16" hex head bolt	Proprietary UL-2703

<http://www.snapnrack.com/>

Solar SpeedRack

Module Rail	Fastener Information	Grounding Washer
HRS160	Direct Mount or Bracket Mount	Integrated

<http://www.solarspeedrack.com>

SolarWorld

Module Rail	Fastener Information	Grounding Washer
Sunfix Plus	SK0145- T40 truss head screw, M8x16mm, SA0295- M8 channel nut	WEEB-PMC

<http://www.solarworld-usa.com/>

Sollega

Module Rail	Fastener Information	Grounding Washer
InstaRack	Top spring nut with 5/16" hex head bolt	

<http://www.sollega.com/>

Spider-Rax

Module Rail	Fastener Information	Grounding Washer
Red Widow Rail-less	2 – 3/8" bolts and washers to post	
Black Widow Rail-less	3/8" bolt and hardware to short rail	
Wolf Spider	5/16" bolt and hardware to purlin	

<http://spiderrax.com/>

Sunlink

Sunlink Mounting Solution	Fastener Information	Grounding Washer
Core-RMS 490-000000	5/16" hardware: 09-00010-01 screw, 09-0002-01 nut, 09-00154-01 washer	WEEB-11.5
Precision-RMS 690-000010	5/16" hardware: 09-00002-01 flange nut, 09-00139-01 T-stud	WEEB-11.5
Sunlink-RMS	Specify Enphase compatible	

When ordering a Sunlink Tilt Access system, specify that it be for an Enphase Microinverter installation. Sunlink will add microinverter-mounting holes to the "Spar" extrusion. The mounting holes are located at per-module spacing for the microinverters.

<http://www.sunlink.com/products/ground-mount-systems/>

<http://www.sunlink.com/>

SunModo Corp.

Module Rail	Fastener Information	Grounding Washer
Ez Helio Rail	0.25 inch hex head bolt, nut, and washers	WEEB-UMC

<http://www.sunmodo.com/>

Unirac

Module Rail	Fastener Information	Grounding Washer
SolarMount: Light, Standard, and HD Rails	¼" t-bolt, Kep nut, for top rail mount (UL2703 listed) – Unirac p/n: 008011S	Kep nut attached lock star washer, SST (UL2703)
SunFrame MicroRail	MLPE Mount Assembly: Module frame mounting bracket, drilled and tapped with 5/16" serrated flange hex bolt (UL2703 Listed) – Unirac p/n 008014M	Serrated flange on hex bolt, SST and bonding pin, SST
RoofMount 1.0 and 2.0	MLPE Mount Assembly: Module frame mounting bracket, drilled and tapped with 5/16" serrated flange hex bolt (UL2703 Listed) – Unirac p/n: 008014M	Serrated flange on hex bolt, SST and bonding pin, SST
SunFrame	Enphase Module Frame Mount	Module frame mounting bracket/hardware

<http://www.unirac.com/>

Unistrut

Module Rail	Fastener Information	Grounding Washer
1-5/8", 1-1/4", 13/16", metal framing system	¼" or 5/16" strut nuts or spring nuts	

<http://www.unistrut.us/>

Zilla

Module Rail	Fastener Information	Grounding Washer
Rail Mounting System	Microinverter hanger	

<http://www.zillarc.com/>

Section 2 — Railless Mounting Systems for Residential

Enphase Microinverters have been evaluated for compatibility with a variety of railless mounting systems. These microinverter mounting components meet our minimum requirements for mechanical mounting with respect to the microinverter. You must follow all instructions provided by the mounting system and module manufacturers when mounting microinverters in these systems. It is critical that the mounting hardware is compatible with your module manufacturer's frame. Follow all instructions in the Enphase Microinverter Installation and Operation manual.

Andalay Solar

Mounting System	Fastener Information	Grounding Washer
Instant Connect AC-250	Mounted at factory	Proprietary

<http://www.andalaysolar.com/ac-system/>

Ecofasten Solar

Mounting System	Fastener Information	Grounding Washer
Rock-It System	Rock-It Clip SS (UL2703 Listed)	Rock-It Clip SS

<http://www.ecofastensolar.com/index.aspx>

Ecolibrium Solar

Module Rail	Fastener Information	Grounding Washer
Eco-X Rail-less	Microinverter attachment bracket ECO-001-104 (UL2703 Listed)	ECO-001-104

<http://www.ecolibriumsolar.com/>

Nissei Metals

Mounting System	Fastener Information	Grounding Washer
Solar Angle	Microinverter attachment bracket	

<http://www.nissei-metals.com/solarangle/>

Pegasus Solar

Mounting System	Fastener Information	Grounding Washer
LightSpeed Mount	Enphase Frame Mount bracket	

<http://pegasussolar.com/>

Quick Mount Solar

Mounting System	Fastener Information	Grounding Washer
Quick Rack Mounting	Enphase Frame Mount bracket	Proprietary

<http://www.quickmountpv.com/>

Roof Tech, Inc.

Mounting System	Fastener Information	Grounding Washer
RT-[E] Mount Air	RT-[E] Mount Air microinverter attachment bracket	Proprietary

<http://www.roof-tech.us/>

Solar Clam-P

Mounting System	Fastener Information	Grounding Washer
Solar Clam-P	MI-Clam-P	

<http://www.solarclam-p.com/>

Spider-Rax

Module Rail	Fastener Information	Grounding Washer
Black Widow	3/8" bolt and hardware to short rail	
Red Widow	2 – 3/8" bolts and washers to post	

<http://spiderrax.com/>

Spice Solar

Mounting System	Fastener Information	Grounding Washer
Spice Splice	Enphase L-bracket	Proprietary

<http://www.spicesolar.com/>

Unirac

Mounting System	Fastener Information	Grounding Washer
SunFrame MicroRail	MLPE Mount Assembly: Module frame mounting bracket, drilled and tapped with 5/16" serrated flange hex bolt (UL2703 Listed) – Unirac p/n 008014M	Serrated flange on hex bolt, SST and bonding pin, SST

<http://unirac.com/>

Zep Solar

Mounting System	Fastener Information	Grounding Washer
Zep Solar	Zep Groove adapter bracket	Integrated into Bracket

<http://www.zepsolar.com/>

Section 3 — Factory Installed Assemblies

Andalay Solar (formerly Westinghouse Solar)

The Westinghouse system makes use of a proprietary PV module frame that allows the PV modules to be assembled to each other without the use of standard module racking. The Enphase Microinverter is factory mounted directly to the underside of the PV module frame and shipped as a one PV module, one microinverter assembly.

<http://www.andalaysolar.com/>

Phono Solar AC Module- PS-250P-AC

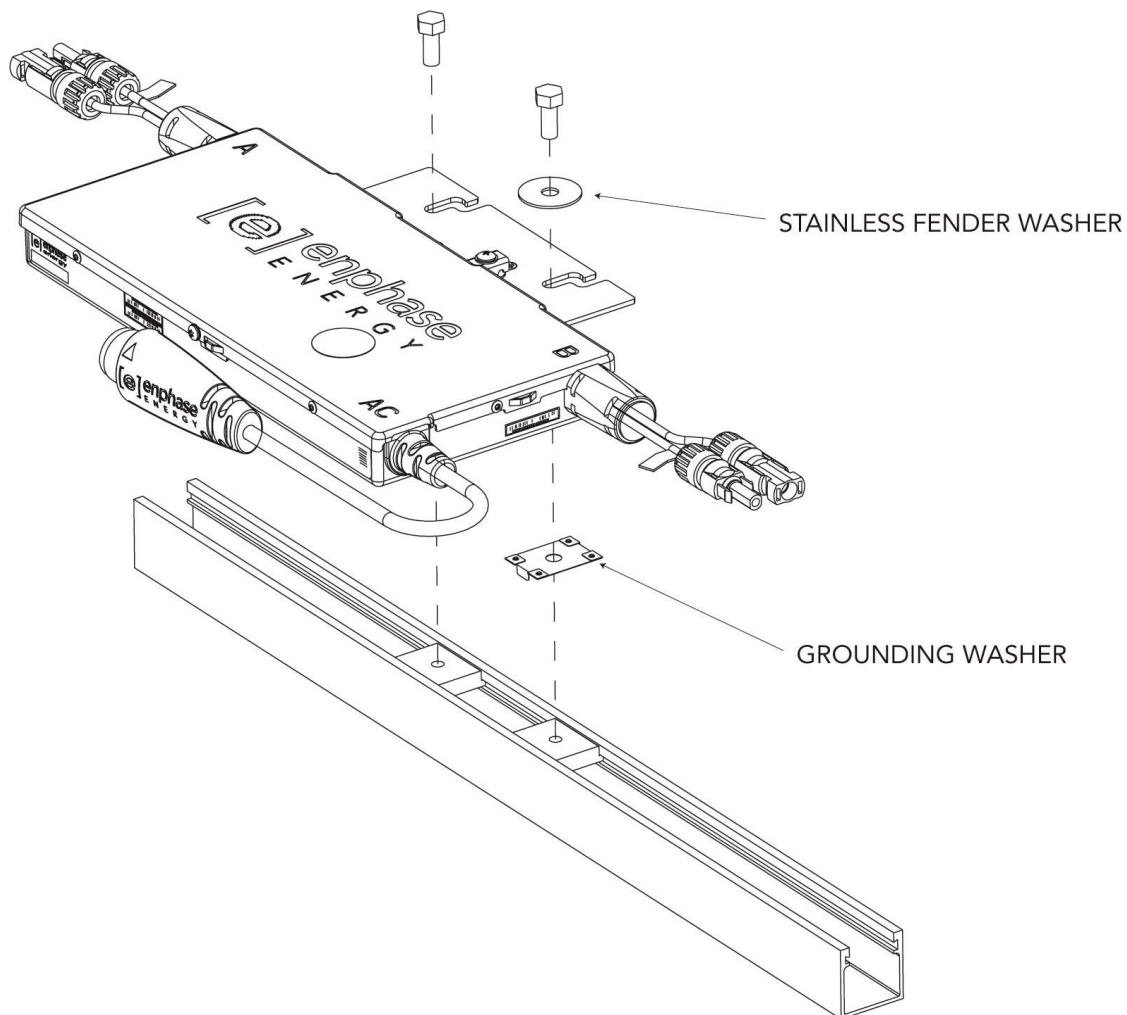
The Phono Solar AC Module provides a manufactured assembly that does not require the mounting of any microinverter, as the microinverter is assembled onto the module.

<http://www.phonosolarusa.com/products-a-solutions/250w-ac-module>

WEEB Installation Procedure

If using WEEBs or star washers in your installation, follow these steps:

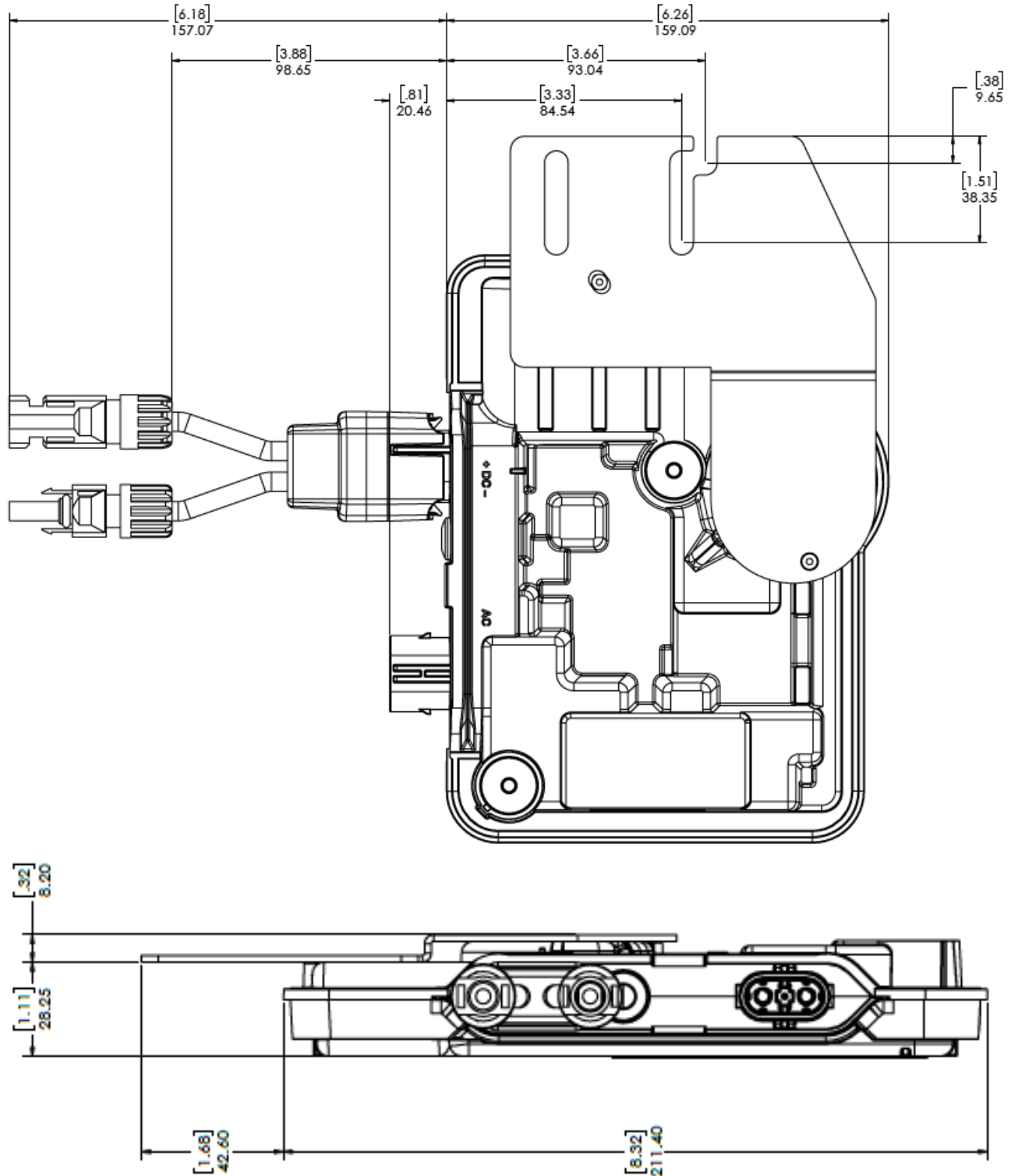
1. Install a minimum of one grounding washer per microinverter.
2. For each microinverter, install stainless steel 1-1/2" fender washers on the topside of the mounting bracket for the bolt that passes through the grounding washer.
3. Torque the microinverter fasteners to the values listed (minimum torque requirements). Wiley Electronics and the racking manufacturers will have specific torque specifications in their installation documents. We recommend using the highest of these values.
 - 0.25 inch mounting hardware – 45 in-lbs minimum
 - 5/16" mounting hardware – 80 in-lbs minimum



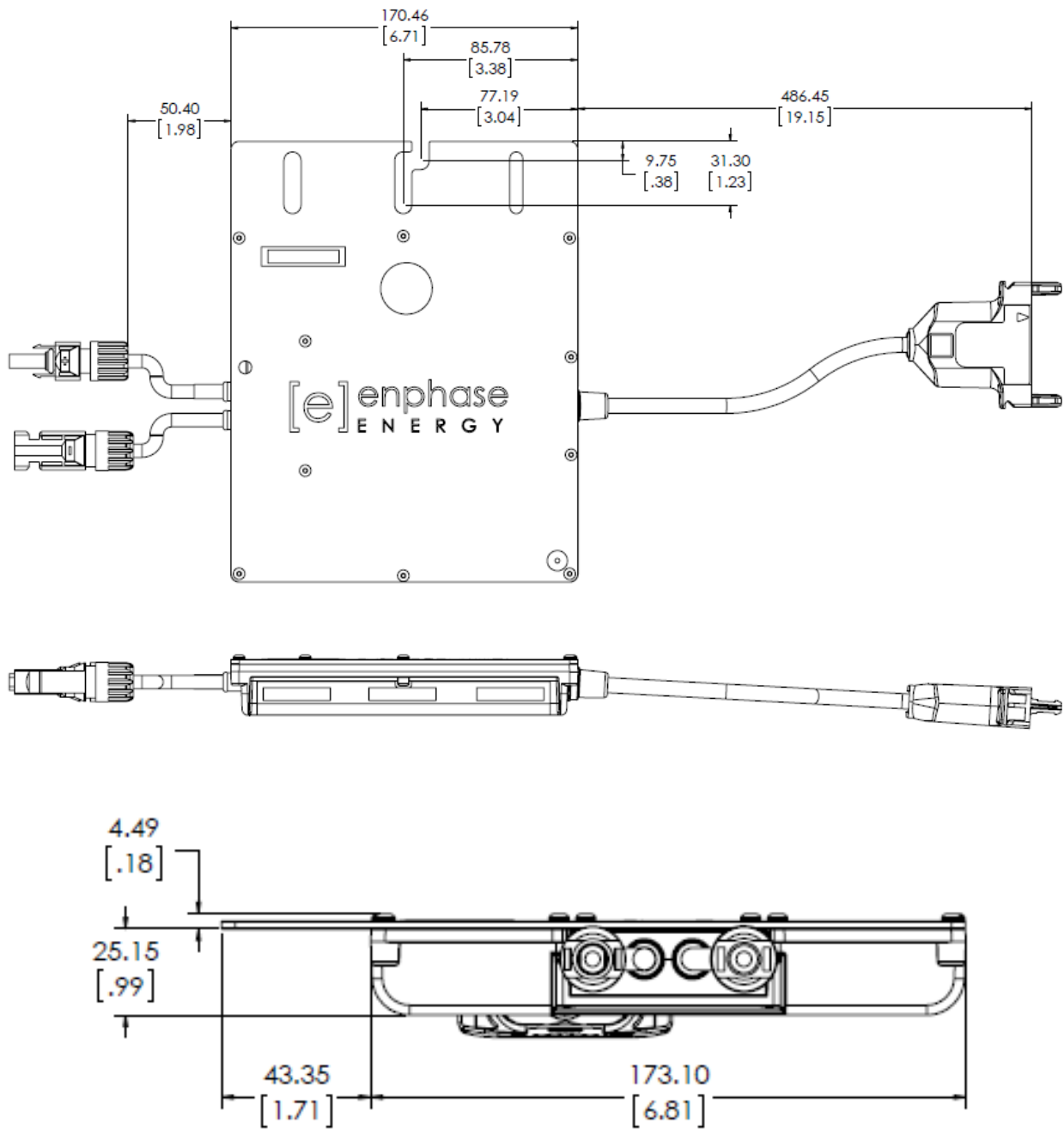
Enphase Microinverter Dimensions

If a specific racking model is not listed in this document, use the following microinverter dimensional diagrams to verify compatibility.

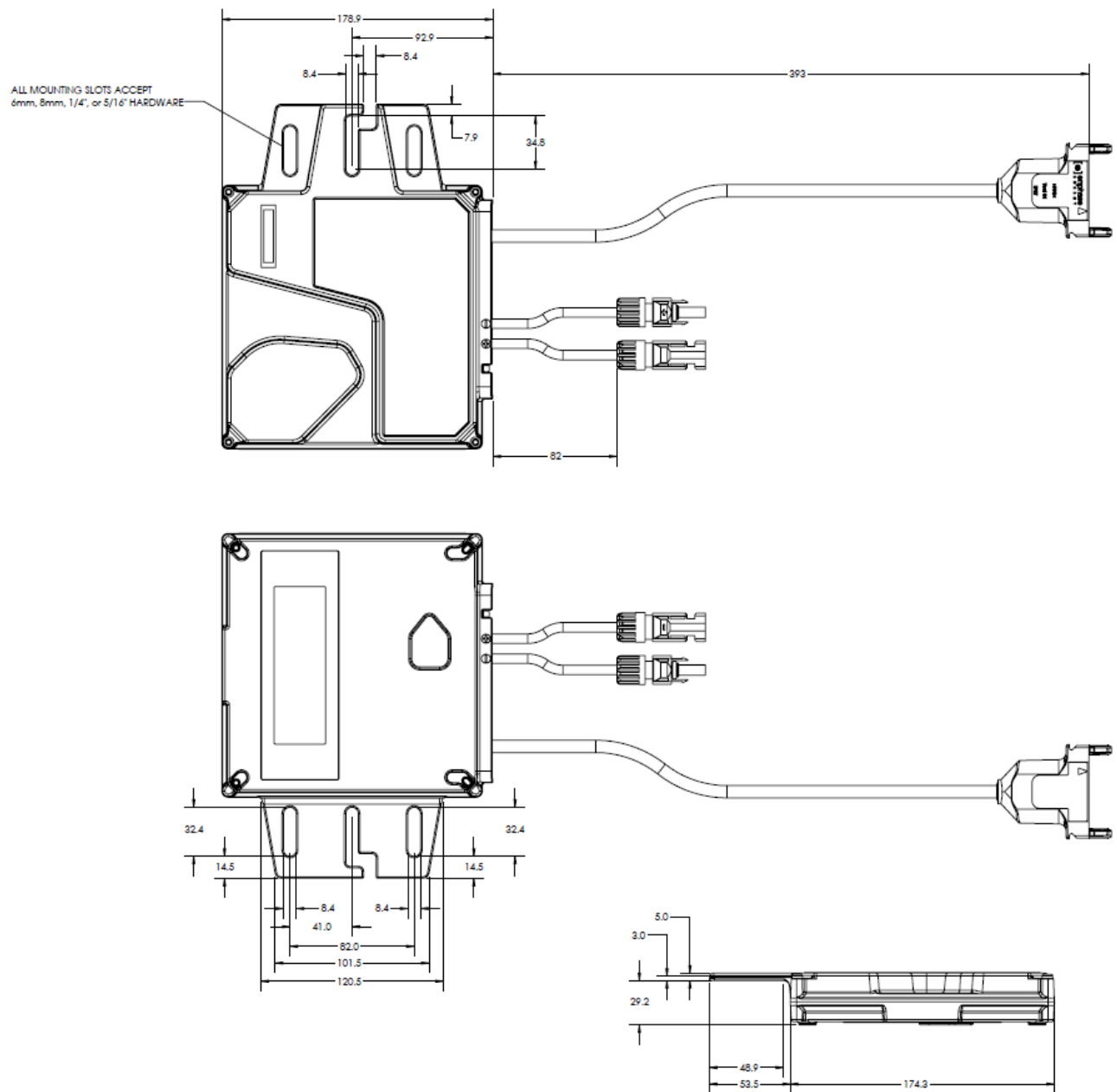
IQ 6 and IQ6+ Microinverters (beginning first quarter, 2017)



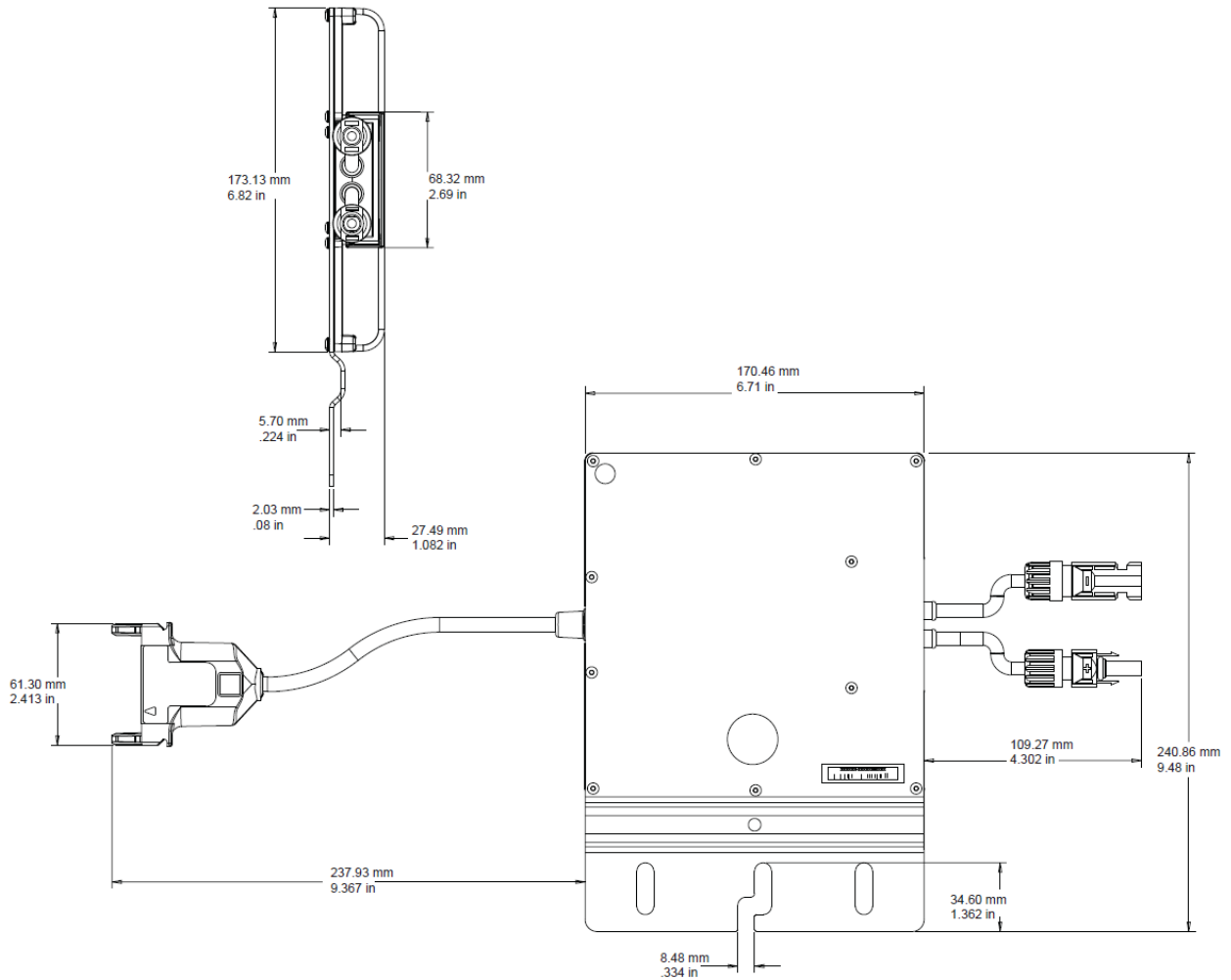
M215-IG and M250 Microinverters (beginning first quarter, 2014)



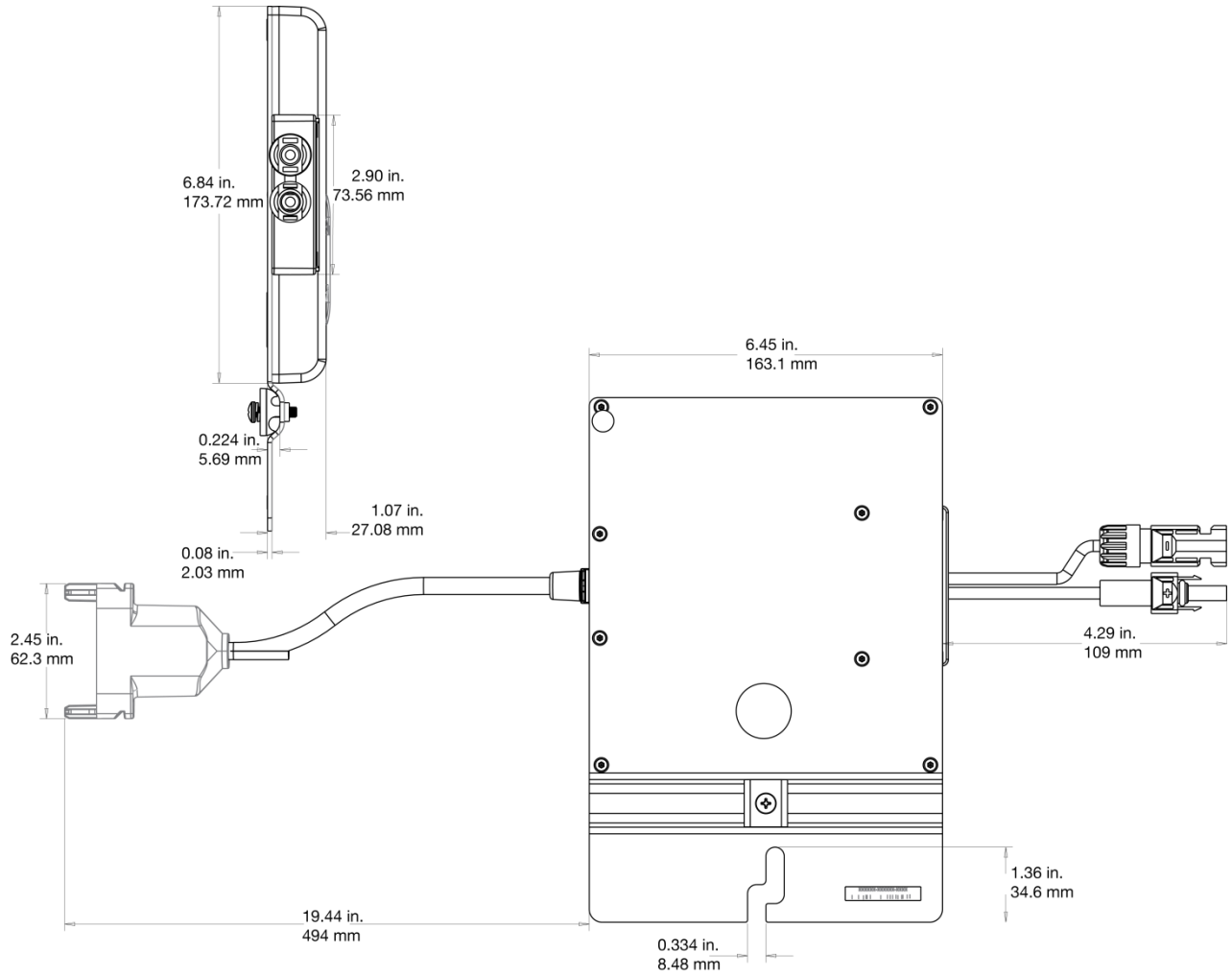
S230 and S280 Microinverters



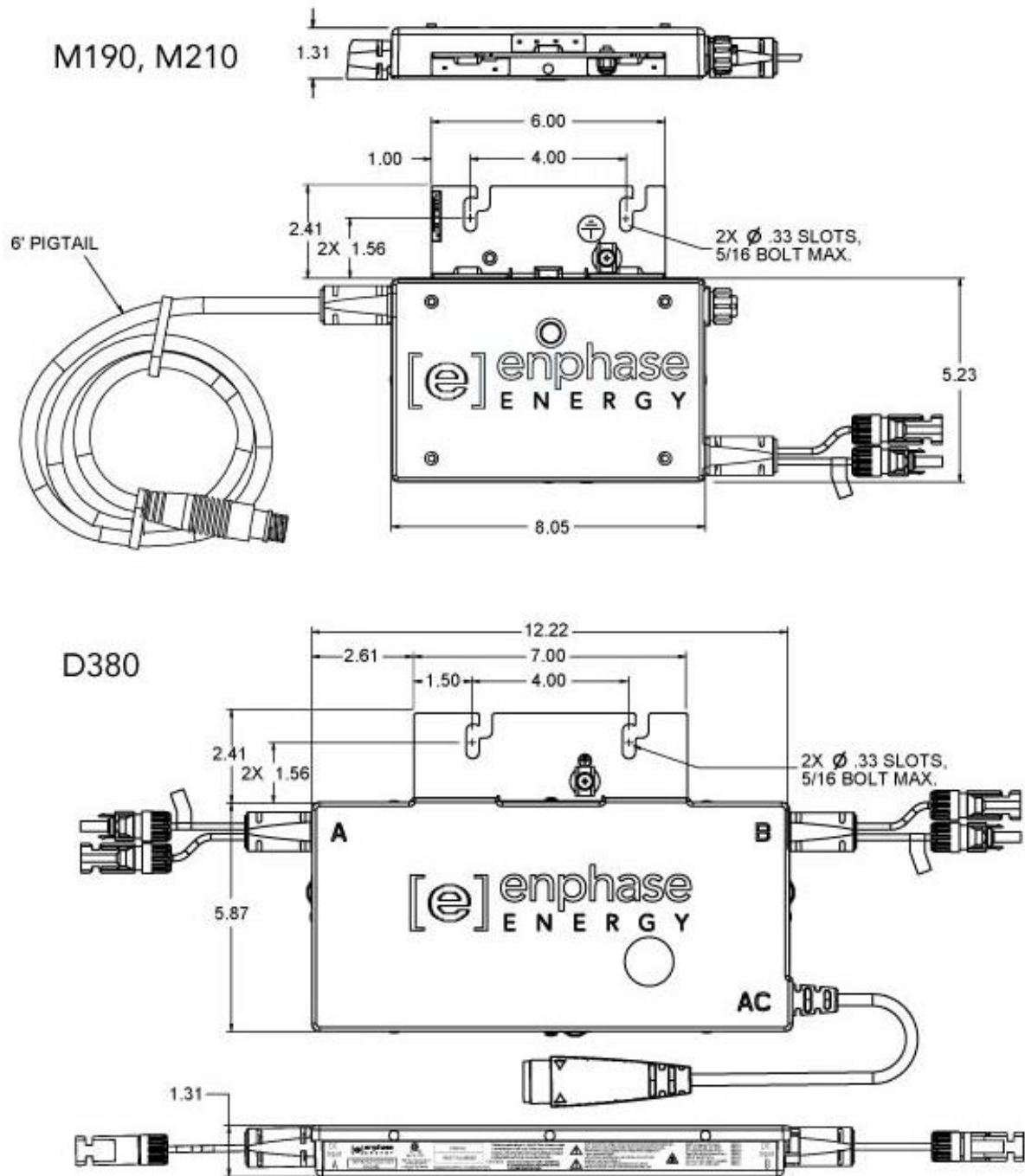
M250 Microinverters (prior to second quarter, 2014)



M215 Microinverters (prior to second quarter, 2014)



M190 and D380 Microinverters



We continue to evaluate racking models for compatibility. Please check the Enphase Energy website for product updates and announcements or contact Customer Support regarding a specific racking compatibility.

Enphase Energy website: <http://www.enphase.com>

Enphase Customer Support: <http://www.enphase.com/en-us/support/contact>