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**RACKING SPEC SHEET** 

#### Owner:

CS-R

JENNIFER EAD 67 SENTER FARM CT FUQUAY-VARINA, NC 27526 (401) 497-4214

#### **Solar Modules:**

18 JINKO JKM320M-60HL

#### (18) Enphase Energy Inc IQ7-60-2-US(240v)

( ) |

#### Nacking

QUICKMOUNT - ROOF MOUNT SYSTEM HARDWARE 06/09/2021

(9 MOUNTING RAILS) - ALUMINUM RAILS = 14' LENGTHS

(35 MOUNTING POINTS) - FOR "COMPS SHINGLE" ROOF

VSE Project Number: U2305.0958.211 Firm License Number: COA #P-0742

# **EAD RESIDENCE**

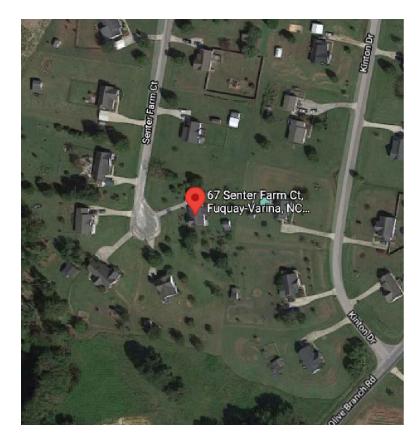
# PHOTOVOLTAIC SYSTEM PROJECT -

5.760 kW DC / 5.246 kW AC





#### **VICINITY MAP**



#### STREET VIEW



#### **GENERAL NOTES**

- 1. ROOF RAFTER 2x6" DF ON 16" ©
- 2. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE LATEST NC CODE OF REGULATIONS, NATIONAL
  ELECTRICAL CODE EDITION AND ALL APPLICABLE LOCAL CODES AND REGULATIONS. (Construction shall comply with 2018 International Building Codes, 2017 NEC, and 2018 International Fire Code)
- 3. ALL PANELS, SWITCHES, ETC. SHALL HAVE SUFFICIENT GUTTER SPACE AND LUGS IN COMPLIANCE TO UL REQUIREMENTS TO ACCOMMODATE CONDUCTORS SHOWN.
- 4. WHERE WIRE SIZES ARE INDICATED ON PLANS, FOR INDIVIDUAL CIRCUITS, THE WIRE SIZE INDICATED SHALL APPLY TO THE COMPLETE CIRCUIT, UNLESS OTHERWISE NOTED.
- 5. CONTRACTOR SHALL EXTEND WIRING FROM ALL JUNCTION BOXES, SWITCHES, ETC. AND MAKE FINAL CONNECTION AS REQUIRED TO ALL BUILDING EQUIPMENT REQUIRING ELECTRICAL CONNECTIONS.
- 6. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED. FOLLOW DRAWING IN LAYING OUT WORK AND CHECK DRAWINGS OR OTHER TRADES RELATING TO WORK TO VERIFY SPACE IN WHICH WORK WILL BE INSTALLED. MAINTAIN HEADROOM AND MINIMUM CODE REQUIRED WORKING CLEARANCES AT ALL TIMES.
- 7. ALL EXTERIOR ELECTRICAL DEVICES AND EQUIPMENT INCLUDING THOSE THAT ARE EXPOSED TO OUTSIDE ENVIRONMENT SHALL BE WEATHERPROOF TYPE, NEMA 3R.
- 8. DISCONNECT SWITCHES SHALL BE MOUNTED ON INDIVIDUAL SUPPORTS, OR OTHERWISE DIRECTLY ON EQUIPMENT, PROVIDED.

Vector Structural Engineering has reviewed the existing

is by others, unless stamped by Dean Levorsen

structure with loading from the solar array. The design of

the racking system, connections, and all other structural is by others. Mechanical, architectural, and all other

- 9. NO MODIFICATION TO EQUIPMENT IS NECESSARY. ALL ELECTRIC MATERIAL SHALL BE LISTED BY "UL" FOR THE TYPE OF APPLICATION AND "UL" LABEL SHALL APPEAR ON ALL ELECTRICAL FOLLOWING
- 10. WIRING METHOD SHALL BE EMT ABOVE GROUND AND MOUNTED IN CONCEALED SPACES (UNLESS APPROVED OTHERWISE) AND SCHEDULE 40 PVC FOR BELOW GROUND INSTALLATION UNLESS NOTED OTHERWISE.

EAD RESIDENCI
67 SENTER FARM C

SOLAR 108/5/02/1

Last Modified: 6/9/202

VEVIOLOGO.

SHEET NAME:

TITLE SHEET

SHEET NUMBER

7





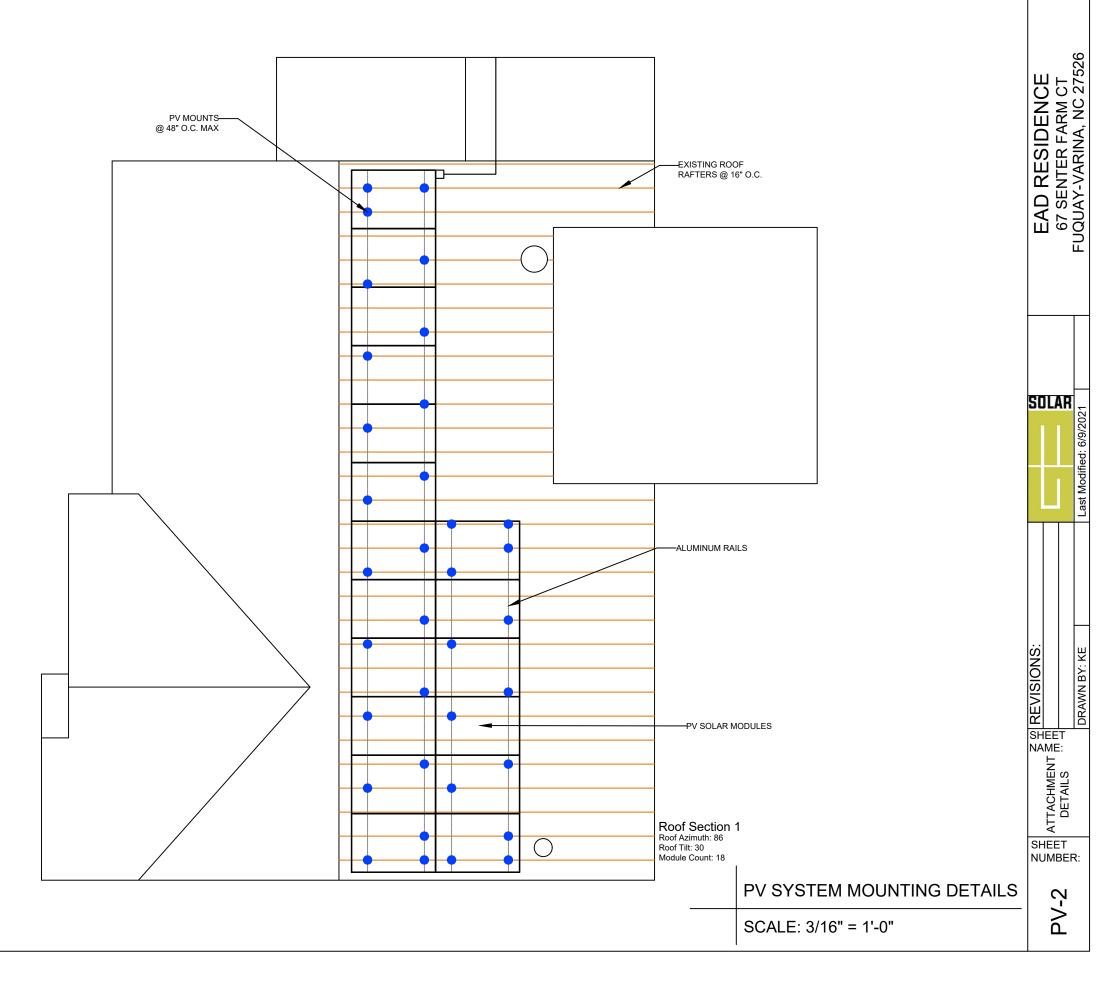
651 W. GALENA PARK BLVD. STE. 101 DRAPER, UTAH 84020 PHONE (801) 990-1775 WWW.VECTORSE.COM



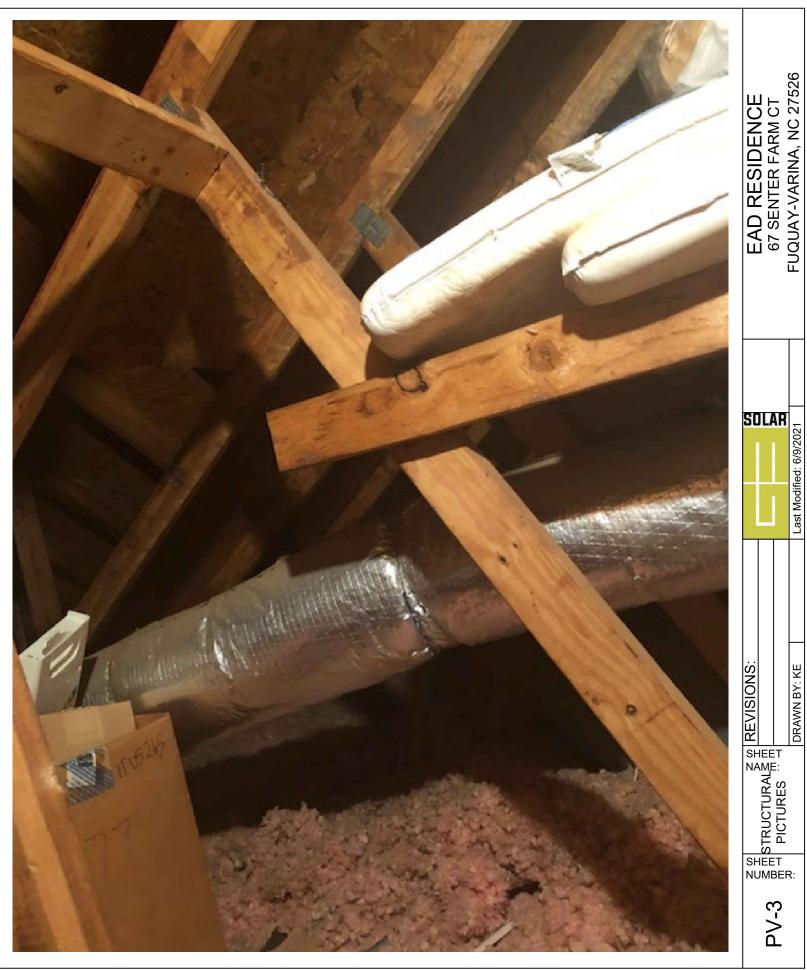
Firm License Number: COA #P-0742 VSE Project Number: U2305.0958.211

Vector Structural Engineering has reviewed the existing structure with loading from the solar array. The design of the racking system, connections, and all other structural is by others. Mechanical, architectural, and all other nonstructural aspects of the design are by others. Electrical is by others, unless stamped by Dean Levorsen.







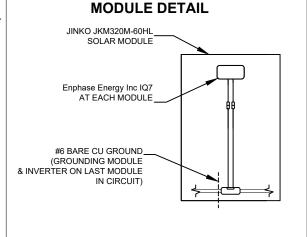


PV-3

PV MODULE SPECIFICATIONS						
MANUFACTURER	JIN	IKO				
MODEL	18	JKM320M-60HL				
Pmax	32	0				
Imp	9.5	i9				
Vmp	33	.4				
Vdc	100	00V(DC)/1500V(DC)				
OCPD	20					
PANEL WATTAGE	32	320				
INVERTER SPECIFICATIONS						
MANUFACTURER		ENPHASE				
MODEL		18 IQ7-60-2-US(240v				
MAX DC INPUT VOLTAGE		48				
MAX OUTPUT POWER		240				
MAX FUSE (OCPD)		30				
INVERTER WATTAGE		240				
DESIGN INFO						
CUSTOMER NAME	JEN	JENNIFER EAD				
SYSTEM SIZE	5.76	60 kW DC / 5.246 kW AC				

#### **EQUIPMENT SIZING CALCULATIONS**

18 AMP (MAX INVERTER OUTPUT)\*1.25 (OCP) =22.5A (USE 30A BREAKER) (SOLAR BREAKER IN MAIN PANEL)



#### Notes:

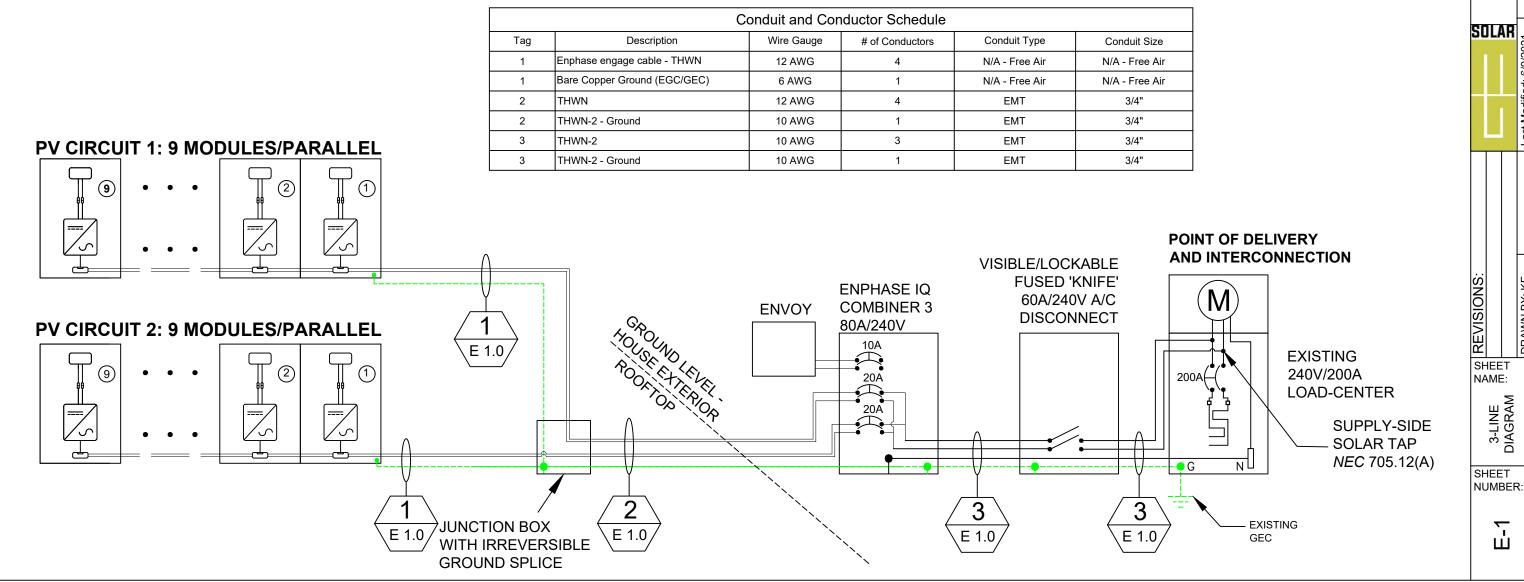
- 1. This system meets the requirements of NEC 690.35 and is exempt from the system grounding requirements of NEC 690.41 System Grounding.
- The DC conductors are not bonded to ground and the optimizers do not require a GEC.
- NEC 690.43(C) Structure as Equipment Grounding Conductor allows for equipment to be used as the EGC in a photovoltaic system.
- The devices listed and identified for grounding the equipment may be stand-alone grounding components or UL-2703 listed mounting hardware. Optimizers and modules are bonded to the racking with listed and appoved grounding components.
- Equipment operating 150 volts or greater shall only be serviced or replaced by qualified personnel. Field protection may be in the form of conduit, closed cabinet or an enclosure which require use of tools to open.

EAD RESIDENCE 67 SENTER FARM CT FUQUAY-VARINA, NC 27526

3-LINE DIAGRAM

ш

- Solar Photovoltaic System equipment will be installed in accordance with the requirements of Art. 690 of the 2017 NEC.
- Local utility provider shall be notified prior to use and activation of any solar photovoltaic installation.
- No sheet metal or tech screws shall be used to ground disconnect enclosure with tin-plated aluminum lugs; proper grounding/bar kits must be
- All solar modules, equipment, and metallic components are to be grounded in accordance with code and the manufacturer's installation instructions.
- 10. PV modules Cannot be installed over or block any attic vents, plumbing vents, furnace or water heater vents etc.
- 11. Wiring must be permanently and completely held off of the roof surface per NEC 110.2, 110.3(A), 110.3(B) & 300.4
- 12. Conductors with higher temperature ratings if the equipment is listed and identified for use with such conductors per NEC 110.14 (C)(1)(3)







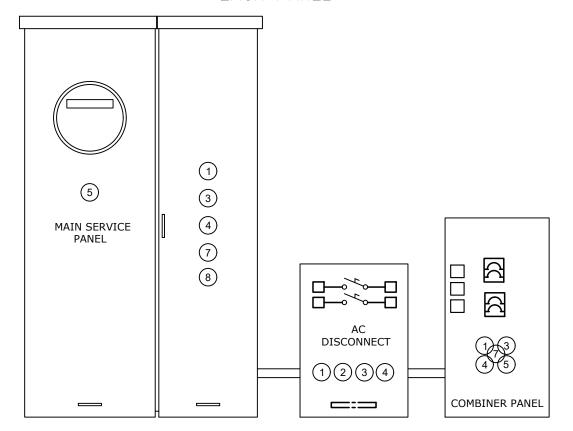
EAD RESIDENCE 67 SENTER FARM CT FUQUAY-VARINA, NC 27526 SOLAR . REVISIONS: METER PICTURES

E-2

SHEET NUMBER:

### DETAIL - 1:

MAIN SERVICE PANEL, AC DISCONNECT AND COMBINER PANEL MOUNTED ON EXTERIOR WALL OF SINGLE FAMILY RESIDENCE. WITH Enphase Energy Inc IQ7-60-2-US(240v) MICROINVERTER MOUNTED UNDER EACH PANEL



ABFI -8:

# PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

LABEL 8 IS REFLECTIVE WEATHER RESISTANT PLAQUE WITH LETTERING A MINIMUM HEIGHT OF 3/8" IN WHITE ON RED BACKGROUND.

LABEL-9:

#### DC POWER SUPPLY

DC OPERATING CURRENT 16.46 AMPS
OPERATING VOLTAGE 350 Vdc
MAXIMUM DC SYSTEM VOLTAGE 500 Vdc
MAXIMUM CIRCUIT CURRENT 30.0
SHORT CIRCUIT CURRENT 30 Adc

LABEL-10:

#### RAPID SHUTDOWN DISCONNECT

LABEL 10 IS REFLECTIVE WEATHER RESISTANT PLAQUE WITH LETTERING A MINIMUM HEIGHT OF 3/8" IN WHITE ON RED BACKGROUND.

## REQUIRED SIGNAGE:

2017 NEC CODES, ARTICLE 690

LABEL-1:

# PHOTOVOLTAIC SYSTEM AC DISCONNECT

LABEL-2:

#### **AC POWER SUPPLY**

PHOTOVOLTAIC AC DISCONNECT AC OPERATING VOLTAGE 240 VOLTS MAXIMUM CIRCUIT CURRENT 22.5

LABEL-3:

#### WARNING-ELECTRIC SHOCK HAZARD

DO NOT TOUCH TERMINALS

TERMINALS ON BOTH LINE AND LOAD SIDE

MAY BE ENERGIZED IN THE OPEN POSITION

LABEL-4:

#### WARNING - ELECTRIC SHOCK HAZARD

IF A GROUND FAULT IS INDICATED
THEN THE NORMALLY GROUNDED CONDUCTORS
MAY BE ENERGIZED IN THE OPEN POSITION

LABEL-5:

#### **CAUTION:**

PANEL MAY BE ENERGIZED BY UTILITY OR CUSTOMER
SOLAR PV SYSTEM

LABEL-6:

#### **CAUTION:**

BOTH TOP AND LOWER SOCKET JAWS MAY BE ENERGIZED
BY SOURCE AND CUSTOMER SOLAR PV SYSTEM

LABEL-7:

#### WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL 7 IS REFLECTIVE WEATHER RESISTANT STICKER TO BE PLACED ON ALL INTERIOR AND EXTERIOR CONDUIT, RACEWAYS, ENCLOSURES, AND CABLE ASSEMBLIES EVERY 10', WITHIN 1' OF TURNS OR BENDS, AND 1' ABOVE AND BELOW ALL PENETRATIONS ON DC CONDUIT

EAD RESIDENCE 67 SENTER FARM CT FUQUAY-VARINA, NC 27526

SOLAR

SHEET NAME:

> LABELS DIAGRAM

SHEET NUMBER:

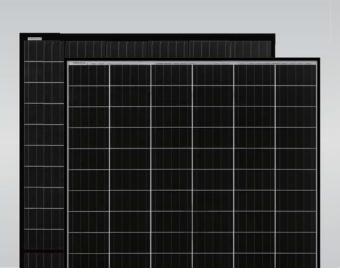
E-3

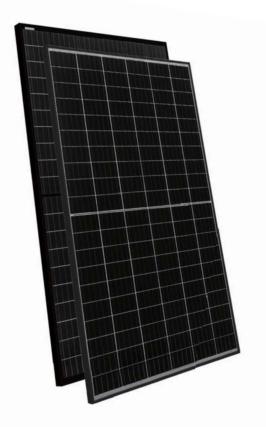


# Eagle HC 60M G2 315-335 Watt

MONO PERC HALF CELL MODULE

Positive power tolerance of 0~+3%





- ISO9001:2008 Quality Standards
- ISO14001:2004 Environmental Standards
- OHSAS18001 Occupational Health & Safety Standards
- IEC61215, IEC61730 certified products
- UL1703 certified products

#### Nomenclature:

#### JKM335M-60HBL

Code	Cell	Code	Backsheet	Code	Cell
null	Full	null	White	null	Normal
Н	Half	В	Black	L	Diamond









#### **KEY FEATURES**



#### **Diamond Cell Technology**

Uniquely designed high performance 5 busbar mono PERC half cell



#### **Higher Module Power**

Decrease in current loss yields higher module efficiency



#### Shade Tolerance

More shade tolerance due to twin arrays



#### PID FREE

Reinforced cell prevents potential induced degradation

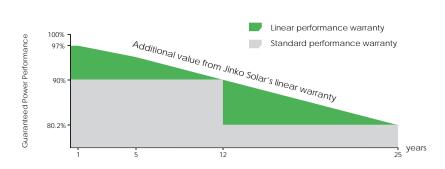


#### Strength and Durability

Certified for high snow (5400 Pa) and wind (2400 Pa) loads

#### LINEAR PERFORMANCE WARRANTY

10 Year Product Warranty • 25 Year Linear Power Warranty



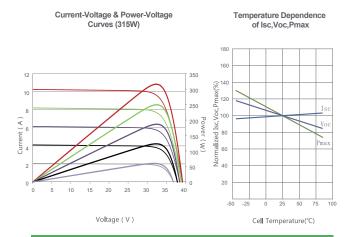
# **Engineering Drawings** Front Back

#### **Packaging Configuration**

(Two pallets = One stack)

30pcs/pallet, 60pcs/stack, 780pcs/40'HQ Container

#### **Electrical Performance & Temperature Dependence**



Mechanical	Characteristics					
Cell Type	Mono PERC Diamond Cell (158.75 x 158.75 mm)					
No.of Half-cells	120 (6×20)					
Dimensions	1684×1002×35mm (66.30×39.45×1.38 inch)					
Weight	19.0 kg (41.9 lbs)					
Front Glass	3.2mm, Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass					
Frame	Anodized Aluminum Alloy					
Junction Box	IP67 Rated					
Output Cables	12AWG, Anode 1525mm (60.04 in), Cathode 1525mm (60.04 in) or Customized Length					
Fire Type	Type 1					

SPECIFICATIONS										
Module Type	JKM31	JKM315M-60HL JKM32		0M-60HL JKM325M-60HL		5M-60HL	JKM330M-60HL		JKM335M-60HL	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	315Wp	235Wp	320Wp	239Wp	325Wp	242Wp	330Wp	246Wp	335Wp	250Wp
Maximum Power Voltage (Vmp)	33.2V	31.2V	33.4V	31.4V	33.6V	31.6V	33.8V	31.8V	34.0V	32.0V
Maximum Power Current (Imp)	9.49A	7.56A	9.59A	7.62A	9.68A	7.66A	9.77A	7.74A	9.87A	7.82A
Open-circuit Voltage (Voc)	40.7V	37.6V	40.9V	37.8V	41.1V	38.0V	41.3V	38.2V	41.5V	38.4V
Short-circuit Current (Isc)	10.04A	8.33A	10.15A	8.44A	10.20A	8.54A	10.31A	8.65A	10.36A	8.74A
Module Efficiency STC (%)	18.6	18.67% 18.96%		19.26%		19.	19.56%		19.85%	
Operating Temperature (°C)	-40°C~+85°C									
Maximum System Voltage		1000VDC(UL)/1000VDC(IEC)								
Maximum Series Fuse Rating	20A									
Power Tolerance	0~+3%									
Temperature Coefficients of Pmax	-0.36%°C									
Temperature Coefficients of Voc	-0.28%/℃									
Temperature Coefficients of Isc	0.048%/℃									
Nominal Operating Cell Temperature	(NOCT)				45±	:2°C				













<sup>\*</sup> Power measurement tolerance: ± 3%

# Enphase IQ 7 and IQ 7+ Microinverters

The high-powered smart grid-ready

Enphase IQ 7 Micro™ and Enphase IQ 7+ Micro™

dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.



#### Easy to Install

- · Lightweight and simple
- · Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

#### Productive and Reliable

- · Optimized for high powered 60-cell and 72-cell\* modules
- · More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

#### Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- · Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)
- \* The IQ 7+ Micro is required to support 72-cell modules.





#### Enphase IQ 7 and IQ 7+ Microinverters

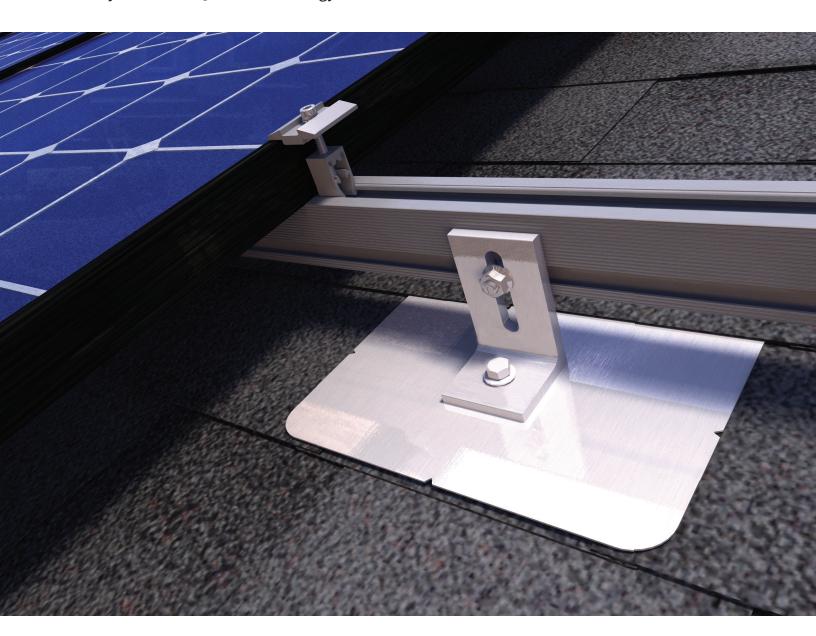
INPUT DATA (DC)	IQ7-60-2-US		IQ7PLUS-72-2-US				
Commonly used module pairings <sup>1</sup>	235 W - 350 W +		235 W - 440 W +				
Module compatibility	60-cell PV modules only		60-cell and 72-cell PV modules				
Maximum input DC voltage	48 V		60 V				
Peak power tracking voltage	27 V - 37 V		27 V - 45 V				
Operating range	16 V - 48 V		16 V - 60 V				
Min/Max start voltage	22 V / 48 V		22 V / 60 V				
Max DC short circuit current (module lsc)	15 A		15 A				
Overvoltage class DC port	II		II				
DC port backfeed current	0 A		0 A				
PV array configuration		l array; No addition n requires max 20.					
OUTPUT DATA (AC)	IQ 7 Microinver	ter	IQ 7+ Microin	verter			
Peak output power	250 VA		295 VA				
Maximum continuous output power	240 VA		290 VA				
Nominal (L-L) voltage/range <sup>2</sup>	240 V / 211-264 V	208 V / 183-229 V	240 V / 211-264 V	208 V / 183-229 V			
Maximum continuous output current	1.0 A (240 V)	1.15 A (208 V)	1.21 A (240 V)	1.39 A (208 V)			
Nominal frequency	60 Hz		60 Hz				
Extended frequency range	47 - 68 Hz		47 - 68 Hz				
AC short circuit fault current over 3 cycles	5.8 Arms		5.8 Arms				
Maximum units per 20 A (L-L) branch circuit <sup>3</sup>	16 (240 VAC)	13 (208 VAC)	13 (240 VAC)	11 (208 VAC)			
Overvoltage class AC port	III	,	III	, ,			
AC port backfeed current	0 A		0 A				
Power factor setting	1.0		1.0				
Power factor (adjustable)	0.85 leading 0.	85 lagging	0.85 leading (	0.85 lagging			
EFFICIENCY	@240 V	@208 V	@240 V	@208 V			
Peak efficiency	97.6 %	97.6 %	97.5 %	97.3 %			
CEC weighted efficiency	97.0 %	97.0 %	97.0 %	97.0 %			
MECHANICAL DATA							
Ambient temperature range	-40°C to +65°C						
Relative humidity range	4% to 100% (condensing)						
Connector type (IQ7-60-2-US & IQ7PLUS-72-2-US)	MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter)						
Dimensions (WxHxD)		n x 30.2 mm (with					
Weight	1.08 kg (2.38 lbs)						
Cooling	Natural convection - No fans						
Approved for wet locations	Yes						
Pollution degree	PD3						
Enclosure		sulated, corrosion	resistant nolymer	ric enclosure			
Environmental category / UV exposure rating	Class II double-insulated, corrosion resistant polymeric enclosure  NEMA Type 6 / outdoor						
FEATURES	TTENIA Type 0 / 01						
Communication	Power Line Comr	munication (PLC)					
	Power Line Communication (PLC)						
Monitoring	Enlighten Manager and MyEnlighten monitoring options. Both options require installation of an Enphase IQ Envoy.						
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.						
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.						

- No enforced DC/AC ratio. See the compatibility calculator at <a href="https://enphase.com/en-us/support/module-compatibility">https://enphase.com/en-us/support/module-compatibility</a>.
   Nominal voltage range can be extended beyond nominal if required by the utility.
   Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.



# QRail™ Series

Rail System with QClick Technology<sup>™</sup>



Cost-Effective Mounting and Racking For All Roofs





# QRail<sup>™</sup>— Fully Integrated Mounting and Racking System

The QRail Series is a strong and versatile solar array mounting system that provides unrivaled benefits to solar designers and installers. Combined with Quick Mount PV's industry-leading waterproof mounts, QRail offers a

complete racking solution for mounting solar modules on any roof.

Easily design array configurations with the QDesign software application. Generate complete engineering reports and calculate a precise bill of materials for all the mounting, racking and accessories needed for a complete solar array.

## Comprehensive, One-Source Solution

QRail, together with Quick Mount PV's waterproof mounting products, provides the benefit of a single-sourced, seamlessly integrated rooftop installation that works with all roof types — composition/asphalt shingles, flat or curved tile, metal shingle, shake, slate and low slope roofs. The QRail system also works with any roof attachment system for maximum flexibility.

# Superior Strength and Versatility

QRail is engineered for optimal structural performance. The system is certified to UL 2703, fully code compliant and backed by a 25-year warranty. QRail is available in Light, Standard and Heavy versions to match all geographic locations. QRail is compatible with virtually all modules and works on a wide range of pitched roof surfaces. Modules can be mounted in portrait or landscape orientation in standard or shared-rail configurations.



QRails come in two lengths — 168 inches (14 ft) and 208 inches (17.3 ft) Mill and Black Finish

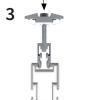
## Fast, Simple Installation: It Just Clicks

# **QClick Technology**™

The universal mid and end clamps use QClick technology to simply "click" into the rail channel and remain upright, ready to accept the module. The pre-assembled clamps fit virtually all module frames and require no extra hardware, eliminating pre-loading and reducing installation time.



*Installing is as easy as 1-2-3* 





2 clamps for modules from 30-45mm or 38-50mm thick



2 clamps for modules from 30-45mm or 38-50mm thick

Universal Bonded Mid Clamp

# **QSplice™ Technology**

QRail's innovative internal QSplice installs in seconds, requiring no tools or screws. Simply insert QSplice into the rail and slide the other rail on to create a fully structural, bonded splice. An external splice is also available.









Installs in seconds — no tools or hardware required

# Fully Integrated Electrical Bonding

The QRail system provides an integrated electrical bonding path, ensuring that all exposed metal parts and the solar module frames are electrically connected. All electrical bonds are created when the components are installed and tightened down.





2700 Mitchell Drive Walnut Creek, CA 94598 www.quickmountpv.com 925-478-8269





#### FlashFoot2

#### **The Strongest Attachment in Solar**

IronRidge FlashFoot2 raises the bar in solar roof protection. The unique water seal design is both elevated and encapsulated, delivering redundant layers of protection against water intrusion. In addition, the twist-on Cap perfectly aligns the rail attachment with the lag bolt to maximize mechanical strength.

# Three-Tier Water Seal

#### **Twist-On Cap**

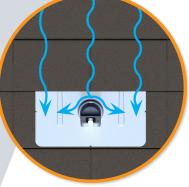
FlashFoot2's unique Cap design encapsulates the lag bolt and locks into place with a simple twist. The Cap helps FlashFoot2 deliver superior structural strength, by aligning the rail and lag bolt in a concentric load path.

#### Three-Tier Water Sea FlashFoot2's seal architectur

FlashFoot2's seal architecture utilizes three layers of protection. An elevated platform diverts water away, while a stack of rugged components raises the seal an entire inch. The seal is then fully-encapuslated by the Cap. FlashFoot2 is the first solar attachment to pass the TAS-100 Wind-Driven Rain Test.

#### Single Socket Size

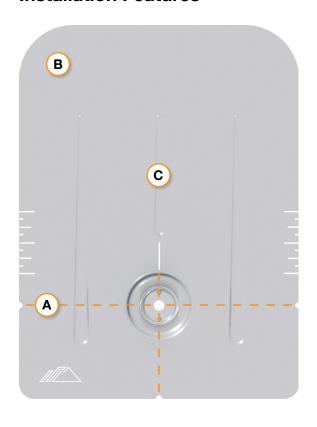
A custom-design lag bolt allows you to install FlashFoot2 with the same 7/16" socket size used on other Flush Mount System components.



#### Water-Shedding Design

An elevated platform diverts water away from the water seal.

#### **Installation Features**



#### (A) Alignment Markers

Quickly align the flashing with chalk lines to find pilot holes.

#### (B) Rounded Corners

Makes it easier to handle and insert under the roof shingles.

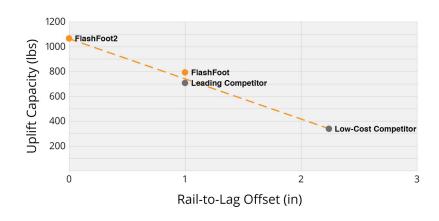
#### C Reinforcement Ribs

Help to stiffen the flashing and prevent any bending or crinkling during installation.

#### **Benefits of Concentric Loading**

Traditional solar attachments have a horizontal offset between the rail and lag bolt, which introduces leverage on the lag bolt and decreases uplift capacity.

FlashFoot2 is the only product to align the rail and lag bolt. This concentric loading design results in a stronger attachment for the system.



#### **Testing & Certification**

#### **Structural Certification**

Designed and Certified for Compliance with the International Building Code & ASCE/SEI-7.

#### **Water Seal Ratings**

Water Sealing Tested to UL 441 Section 27 "Rain Test" and TAS 100-95 "Wind Driven Rain Test" by Intertek. Ratings applicable for composition shingle roofs having slopes between 2:12 and 12:12.

#### **UL 2703**

Conforms to UL 2703 Mechanical and Bonding Requirements. See Flush Mount Install Manual for full ratings.