

R-3 # Modules (9) Pitch: 30° Azimuth: 270°

Layout Subject to	Change Based of	n Site Conditions
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	Godwin Engineering and	
	Design, LLC	
	8378 Foxtail Loop	
ec	Pensacola, FL 32526	
	D. Chad Godwin, PE	
	Chad@godwineng.com	
	<b>Date:</b> 10/06/2023	Ν
	<b>Drawn by:</b> JM	
	<b>Revised by:</b> DMB	
	<b>Rev #:</b> 01	
	<b>Rev Date:</b> 10/31/2023	
	Page: 11"x17" S-1	V

Ironridge XR-100	PV MODULE (BY OTHERS) (BY OTHE	HE REAL PROPERTY AND A REA
	# DESCRIPTION	S- QuickMount Halo Ultra Grip (HUG) MATERIALS/NOTES
(R1-R3)	15 HALO ULTRAGRIP BASE, MILL OI 16 ULTRAGRIP FLASHING SYST	R BLACK 300 SERIES ALUMINUM EM PRESSURE SENSITIVE ADHESIVE
Roof Type: Composition Shingle	17 SCREW, #14 X 3" WITH EPDM BACK	ED WASHER 300 SERIES SS & EPDM
Roof Pitch-& Overhang: 7/12: 12" Overhang		
Mount Type: Halo UltraGrip		
Fastener: No Substitutions (2) #14 x 3" SS Self-drilling Screws into Roof Rafters		
Structure: 2"x4" Wood Trusses @ 24" O.C.		
Sealing/Flashing: All penetrations are sealed and flashed with Ultragrip Flashing System)		
Extra Notes: (HW-RD1430-01-M1 screw)		
Rafter Spans Zone 1 Zone 2e Zone 2r Zone 3		
Exposed 24" 24" 24" 24"		
Non-Exposed 48" 48" 24" 24"		
-Roof Height 15'		Customer Info:
-Per 2020 FRC the Roof Mounted PV System	Inverter Type: (46)Enphase IQ8PLUS-72-2-US	
will be subject to the following design criteria:	PV Panel: (46) TSM-390DE09C.07 Racking: Iron Pidge VP 100	
Design Wind Sneed(Vult) - 120mnh 3 see quet	Total Wattage: 17,940W DC	$\begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} $
Evnosura Catagory C	Roof Type: Composition Shingle	I AVE CITV EI
Designed as non ASCE7 16	Wind-Load: 27-to-45 Deg	LANE CIT I, FL 22055
-Designed as per ASCE/-10	Fastener Type:   Use (2) #14 x 3" SS Screws	52055





Disconnect	Labeling			
<ul> <li>NEC 225</li> <li>Disconnect means shall be provided for disconnecting all ungrounded conductors that supply or pass through the building or structure Per Code 2017 NEC Section 225.31 &amp; Section 225.32</li> <li>NEC 230</li> <li>If multiple service disconnects are present, grouping of disconnects will be done per NEC 230.72</li> <li>NEC 690</li> <li>Rapid Shutdown Built in Per Code NEC 690.12</li> <li>E04. Construction documents specify PV system circuits installed on or in buildings include a rapid shutdown function that controls specific conductors in accordance with NEC article 690.12.</li> <li>E05. These construction documents specify that a label is provided with the method to initiate rapid shut down per 690.12(4).</li> <li>E06. Construction drawings specify buildings or structures with both utility service and a PV system, complying with NEC article 690.12 shall have a permanent plaque or directory including the following wording: "PHOTO VOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN" as per NEC article 690.56 (C).</li> <li>E07. Construction documents specify all warning sign(s) or label(s) shall comply with NEC article 110.21 (B). Label warnings shall adequately warn of the hazard. Labels shall be permanently affixed to the equipment, and Labels required shall be suitable for the environment.</li> <li>NEC 705</li> </ul>	<ul> <li>Markings shall be placed on all DC Conduits, DC C Enclosures, Junction Boxes, and Cable Assemblies above and below penetrations in compliance with N</li> <li>All Interactive System(S) Points of interconnection be marked at an accesible location at the disconnect source and with the rated ac output current and the r voltage. Per NEC 690.54</li> <li>Labels will be placed in the correct location Per Cor 690.56(C), &amp; 690.53</li> <li>Include required label for metallic raceways and cor 690.31(G)(3).</li> <li>Add required label per NEC article 705.10.</li> <li>Markings Shall Be reflective, Weather Resistant and environment.</li> <li>Markings Shall be red with white lettering with min Letters</li> <li>NEC 705.10 A permanent plaque or directory, denor all electric power source disconnecting means on or be installed at each service equipment location and the system disconnect(s) for all electric power product of being interconnected. One sign required for each</li> </ul>	Combiners, Raceways, at every 10', turns, and IFPA with other sources shall ing means as a power nominal operating AC de NEC 690.56(B), induits per NEC article d suitable for the nimum 3/8" Capital of the premises, shall at the location of of the premises, shall at the location(s) of uction sources capable PV system.	Combiner box in compliance Per Code NEC 705.12 4* 20A < 125A *No other loads to be add C AC DISCONNECT	ce ded EMERGENCY RESPONDER THIS SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN
<ul> <li>Photovoltaic AC disconnect shall be capable of being locked in the open position per VAC disconnect shall be capable of being locked in the open position per NEC article 705.22(6).</li> <li>Photovoltaic AC Overcurrent protection shall be located within 10 feet of the point where conductors are connected to the service per NEC 705.31.</li> </ul>	3/5 IN MIN. TEXT WITH RAPID SHUTDOWN TURN RAPID SHUTDOWN SWITCH TO SHUTDOWN PV SHUTDOWN PV SHUTDOWN PV SHUTDOWN PV SHUTDOWN PV SHUTDOWN PV	RAPID SH	UTDOWN SWITCH	TURN RAPID SHUTDOWN SWITCH TO THE 'OFF' POSITION TO SHUT DOWN THE ENTIRE PV SYSTEM.
Grounding	SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY.	FOR SO	LAR PV SYSTEM	NEC690.56(C)(1) AND NFPA 111.122.1.1.1.1,11.122.1.4
<ul> <li>In compliance with NEC 250.58, NEC 690.8, NEC 250.24, NEC250.24(D)</li> <li>System meets the grounding requirements of NEC 690.43 Grounding Electrode:</li> <li>All grounding Electrodes will be at meter or MDP</li> <li>Ground Rods to be at least 8' long and 5/8" in diameter per NEC 250.52(A)(5)</li> <li>Add supplemental electrode as required</li> </ul>	<b>A WARNING</b> ELECTRICAL SHOCK HAZARD TERMINALS ON THE LINE AND	PHOTOVOLT	TAIC POWER SOURCI	ECT
Fire	IN THE OPEN POSITION	U	NDER LOAD	
<ul> <li>All Exterior equipment is a minimum of Nema-R3 Rated</li> <li>Smoke Alarms per F.S. 553.883</li> <li>All Electrical Service Equipment shall be located at or above BFE+1' or 8.00' NAVD</li> </ul>	NEC 690.13	M WARNING	DUAL POWER S	IING SUPPLY ITY GRID
Misc - Install will be done to Manufacturer Spec - Service Conductors are Parallel Notice Conductors are Parallel		OVERCURRENT DEVIC	AND PV SO ELECTRIC SY	LAR /STEM
<ul> <li>No interconnections to be performed on inside panels unless stated by the contractor.</li> <li>The Contractor shall Be responsible for verifying all existing conditions, and for conforming with these drawings in the event of any unforeseen circumstances.</li> <li>Plans Satisfy NEC 250.94 &amp; NEC250.53(A)(2)</li> </ul>		Apply to	Main Disconnect	Customer Info:
Note: - Subject PV Systems has been designed to meet the requirments of the NEC 2017, and those set forth by the Florida Solar Energy Center Certification, Including Maximum Number of Module Strings, Maximum number of modules per string, Maximum Output, Module Manufacturer and model number, inverter manufacturer and model number, as applicable.		In Case of Enli at 35	Emergency Call ght Energy 2-222-0795 cer added to disconnect	ANDREW BUERGO 241 NW POMPANO CT LAKE CITY, FL 32055
	Install will be done to Manufacturer Spec			

Electrical Ca	lculations
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Inve	rter Outpu	t Ckt
To Overcurrent Pr	otection De	evice with Copper
Design Temperature(F)	94°F	
Max Amb Temp Range(F)	87-95	310.15(B)(2)(a)
Temp Rating of Conductors (C)	75°C	
Current Carrying	<4	310.15(B)(3)(a)
AC Max Output Current	56A	690.8(A)(3)
AC Max Output Current * 1.25%	70A	690.8(B)
Overcurrent Protection(A)	70A	
Amp Temp Correction Factor	0.94	310.15(B)(2)(a)
Raceway Fill adjustment Factor	100%	310.15(B)(3)(a)
Wire Size(Awg)	4	310.15(B)(16)
Cond. Allowable Ampacity(A)	85A	
Cond Adjusted Ampacity(A)	80A	85A*1*0.94=79.9A
Ampacity Check 1 Per 690.8(B)(1)	Pass	55.66A*1.25=70A<85A Pass
Ampacity Check 2 Per 690.8(B)(2)	Pass	85A*0.94A*1=79.9A>55.66A Pas







405W MAXIMUM POWER OUTPUT

# 0~+5W

POSITIVE POWER TOLERANCE

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#### **High value**

- More productivity from same roof size.
- Outstanding visual appearance.
- Leading 210mm cell technology.

#### Small in size, big on power

• Small format module allow greater energy generation in limited space. • Up to 405W, 21.1% module efficiency with high density interconnect

Multi

PRODUCT: TSM-DE09C.07

PRODUCT RANGE: 380-405W

21.1%

MAXIMUM EFFICIENCY

Mono

Solutions

- technology.
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current.
- Reduce installation cost with higher power bin and efficiency.
- Boost performance in warm weather with lower temperature coefficient (-0.34%) and operating temperature.

#### Universal solution for residential and C&I rooftops

- Designed for compatibility with existing mainstream optimizers, inverters and mounting systems.
- Perfect size and low weight makes handling and transportation easier and more cost-effective.
- Diverse installation solutions for flexibility in system deployment

#### **High Reliability**

- 25 year product warranty.
- 25 year performance warranty with lowest degradation.
- Minimized micro-cracks with innovative non-destructive cutting technology.
- Ensured PID resistance through cell process and module material control.
- Mechanical performance up to +6000 Pa and 4000 Pa negative load

#### Trina Solar's Backsheet Performance Warranty



#### Comprehensive Products and System Certificates



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IEC61215/IEC61730/IEC61701/IEC62716/UL61730 IEC61215/IEC61730/IEC61701/IEC62710 ISO 14001: Environmental Management System CE 🔹 🚊 More ISO14064: Greenhouse Gases Emissions Verification ISO45001: Occupational Health and Safety Management System



## Vertex S BACKSHEET MONOCRYSTALLINE MODULE

#### DIMENSIONS OF PV MODULE(mm)







#### ELECTRICAL DATA (STC)

Peak Power Watts-PMAX (Wp)*	380	385	390	395	400	405
Power Tolerance-PMAX (W)			0~-	+5		
Maximum Power Voltage-VMPP (V)	33.4	33.6	33.8	34.0	34.2	34.4
Maximum Power Current-Impp (A)	11.38	11.46	11.54	11.62	11.70	11.77
Open Circuit Voltage-Voc (V)	40.4	40.6	40.8	41.0	41.2	41.4
Short Circuit Current-Isc (A)	12.00	12.07	12.14	12.21	12.28	12.34
Module Efficiency n m (%)	19.8	20.0	20.3	20.5	20.8	21.1
STC: Irrdiance 1000W/m2, Cell Temperature 25°C, A	ir Mass AM1.5.	*Measuring tol	erance: ±3%.			
lectrical characteristics with diff	erent pow	ver bin (re	ference to	010% Irra	adiance ra	itio)
Total Equivalent power -Рмах (Wp)	407	412	417	423	428	433
Maximum Power Voltage-VMPP (V)	33.4	33.6	33.8	34.0	34.2	34.4
Maximum Power Current-Impp (A)	12.19	12.26	12.34	12.44	12.51	12.59
Open Circuit Voltage-Voc (V)	40.4	40.6	40.8	41.0	41.2	41.4
Short Circuit Current-Isc (A)	12.92	13.00	13.08	13.20	13.25	13.36
Irradiance ratio (rear/front)			10	)%		
Power Bifaciality:70±5%.						
ELECTRICAL DATA (NOCT)						
Maximum Power-PMAX (Wp)	286	290	294	298	302	305
Maximum Power Voltage-VMPP (V)	31.4	31.6	31.8	31.9	32.1	32.4
Maximum Power Current-Impp (A)	9.12	9.18	9.24	9.32	9.38	9.42
Open Circuit Voltage-Voc (V)	38.0	38.2	38.4	38.6	38.8	38.9
Short Circuit Current-Isc (A)	9.67	9.73	9.78	9.84	9.90	9.94

NOCT: Irradiance at 800W/m<sup>2</sup>, Ambient Temperature 20°C, Wind Speed 1m/s



Version number: TSM\_NA\_2022\_A

# 30 Voltage(V)

#### MECHANICAL DATA

5	Solar Cells	Monocrystalline
	No. of cells	120 cells
	Module Dimensions	1754×1096×30 mm (69.06×43.15×1.18 inches)
.4	Weight	21.0 kg (46.3 lb)
77	Glass	3.2 mm (0.13 inches), High Transmission, AR Coated Heat Strengthened Glass
.4	Encapsulant material	EVA/POE
34	Backsheet	Transparent backsheet
.1	Frame	30mm(1.18 inches) Anodized Aluminium Alloy
	J-Box	IP 68 rated
	Cables	Photovoltaic Technology Cable 4.0mm <sup>2</sup> (0.006 inches <sup>2</sup> ),
З		Landscape: N 1100 mm /P 1100 mm (43.31/43.31 inches)
.4	Connector	MC4 EVO2 / TS4*
59	*Please refer to regional datasheet for sp	ecified connector.
.4	TEMPERATURE RATINGS	MAXIMUMBATINGS
	TELL ERATORE RATINGS	

5	NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)	Operati
	Temperature Coefficient of PMAX	- 0.34%/°C	Maxim
	Temperature Coefficient of Voc	- 0.25%/°C	
	Temperature Coefficient of Isc	0.04%/°C	Max Se

#### 305 WARRANTY 32.4 25 year Product Workmanship Warranty 9.42

	(Please refer to product warranty for details)
94	0.55% Annual Power Attenuation
3.9	2% first year degradation
	25 year Power Warranty

Coefficient of Isc	0.04%/°C	Max Series Fuse Rating	25A
Coefficient of Voc	- 0.25%/°C		1500V DC (UL)
Coefficient of PMAX	- 0.34%/°C	Maximum System Voltage	1500V DC (IEC)
perating Cell Temperature)	43°C (±2°C)	Operational Temperature	-40~+85°C

#### PACKAGING CONFIGUREATION

Modules per box: 36 pieces Modules per 40' container: 828 pieces

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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#### DATA SHEET

## IQ8 and IQ8+ Microinverters

Non-Link lab         Link dots         Link dots           Commonly used module paringly         V         800-cell / 20 half-cell and 235 - 440           MdPA         800-cell / 20 half-cell and 27-cell / 44 half-cell         800-cell / 20 half-cell and 27-cell / 44 half-cell           MdPA         0         300 / 48         900-cell / 20 half-cell and 30 / 68           Min/max start wholog         V         0         300 / 68           Max ingo D0 vintige         V         0         300 / 68           Max D0 vintige         V         0         0           Variary collignaming         V         0         0           Naminal file L1 voltage/magn <sup>1</sup> V					
Canthenio use minute pairedNNModele compatibility900-edl/201400-edl/2014Modele compatibility4020-43020-43Marrana satt voltage4020-43020-43Marrana satt voltage4020-43020-43Marrana satt voltage4020-60000Marrana satt voltage4020-000000Marrana satt voltage5020-000<			108-60-2-08	1082005-72-2-05	
Module compatibility0000000000000000000000000000000000	Commonly used module pairings'	W	235 - 350	235 - 440	
MMP1 votage rangeV22232333Max ingo DC votageV30 / 4830 / 5860 <t< td=""><td>Module compatibility</td><td></td><td>60-cell/120 halt-cell</td><td>60-cell/120 half-cell and /2-cell/144 half-cell</td></t<>	Module compatibility		60-cell/120 halt-cell	60-cell/120 half-cell and /2-cell/144 half-cell	
Openating anageV000Mixrow satur VoltageV30/4960Max DC voltageV6060Max DC voltageV060Overvoltage class OpenM	MPP1 voltage range	v	27 - 37	29 - 45	
Marings of value930 / 4830 / 58Maxingst DC surfet (nodel lsc)45060Max DC surfet (nodel lsc)4	Operating range	V	25 - 48	25 - 58	
Max input CC voltagev5060Max DC current (module loto)Max DC current (module loto)Overvoltage class DC portatPA area collaguationatPA area collaguationatUtilugrounded arrays No additional DC side proteiner may: ACA delip prot	Min/max start voltage	V	30 / 48	30 / 58	
Max BC querrent (module lac)         i           Overvoltage class DC port         N           PV array configuration         is Ut/Ungrounded array: No additional DC side protection requises max 20A per branch circuit           PV array configuration         is Ut/Ungrounded array: No additional DC side protection requises max 20A per branch circuit           PSets Outpa Deport         V         164-60-243         169000000000000000000000000000000000000	Max input DC voltage	v	50	60	
Overvitige class DC port         in         Image: Control of Contro	Max DC current <sup>2</sup> [module lsc]	Α	1	5	
DC portbackfield currentnIPV array configurationVIU ground actional DC side protector requires an 20A per branch clocutPV array configurationVIV 100 conductional DC side protector requires an 20A per branch clocutPeak output powerVA200Peak output powerVA200New configurational output powerVA30New configurational output powerVA30New configurational output powerVA30New configurational output powerVA30New configurational output powerVA30Overvoltage class AC poertVA97.6New configurational output powerVA97.6New configurational output powerVAVA </td <td>Overvoltage class DC port</td> <td></td> <td>1</td> <td>I</td>	Overvoltage class DC port		1	I	
PY arroy configuration         Villagrounded array; be additional DC side protection requires max 20A per branch circuit           CHPU DXA IXA         Villagrounded array; be additional DC side protection requires max 20A per branch circuit           Clippe Daries         Villagrounded array; be additional DC side protection requires max 20A per branch circuit           Clippe Daries         Villagrounded array; be additional DC side protection requires max 20A per branch circuit           Pask cutpt power         Villagrounded array; be additional DC side protection requires max 20A per branch circuit           Max continuous output power         Villagrounded array; be additional DC side protection requires max 20A per branch circuit           Max continuous output power         Villagrounded array; be additional DC side protection requires max 20A per branch circuit           Max continuous output power         Villagrounded array; be additional DC side protection requires max 20A per tranch circuit           Max continuous output power         Villagrounded array; be additional DC side protection requires max 20A per tranch circuit           Max continuous output power         Villagrounded array; be additional DC side protection requires max 20A per tranch circuit           Max continuous output power         Villagrounde array; be additional DC side protection reguires max 20A per tranch circuit           Control toppe tranch circuit         Villaground array; be additional DC side protection reginam 20A per tranch circuit	DC port backfeed current	mA	(	)	
OUTER DATA (AC)         (D26-02-UG         OD27-22-UG           Pask output power         %         245         3500           Nax continuous output power         %         240         2900           Nominal (L-1) outga/range <sup>3</sup> %         2400         2900           Nominal (L-1) outga/range <sup>3</sup> %         2100         121           Nominal (L-1) outga/range <sup>3</sup> %         2000         121           Nominal frequency range         %         0         100         100           Max unts par 20.4 L-1b hanch circuit          13         13           Total harmonic distortion          10         13           Total harmonic distortion          5         5           Overoblage class AC port         #         0.055 feating-1         10           AC port backfred current ast         97.5         97.6         97.6           Order teoror daylistability ange         \$         97.5         97.6         97.6           CEC weighted difficiency         \$         97.7         97.6         97.6         97.6           CEC weighted difficiency         \$         97.7         97.7         97.6         97.6         97.6         97.6         97	PV array configuration		1x1 Ungrounded array; No additional DC side protection requ	ired; AC side protection requires max 20A per branch circuit	
Peak output powerViQ40Q50Max continuous output powerViQ40Q30Max continuous output currentViQ40Q40Max continuous output currentViQ40Q50Max continuous output currentViQ40Q50Max continuous output currentViQ40Q50Max units per 20A (L-L) branchecuredQ40Q50Q50Total harmonic distorionViQ40Q50AG port backfeed currentViQ40Q50Q50Power factor settingQ40Q50Q50Q50Pickel distorionViQ40Q50Q50Pickel distorionQ40Q50Q50Q50Pickel distorionQ40Q50Q50Q50Pickel distorionQ40Q50Q50Q50Pickel distorionQ40Q50Q50Q50Pickel distorionQ50Q50Q50Q50 <td>OUTPUT DATA (AC)</td> <td></td> <td>108-60-2-US</td> <td>108PLUS-72-2-US</td>	OUTPUT DATA (AC)		108-60-2-US	108PLUS-72-2-US	
<table-container>Nax continuous output purpowViiQ200Q200Nax continuous output quartantA10.000012.100000000000000000000000000000000000</table-container>	Peak output power	VA	245	300	
Nemial (L-L) voltage/range*vGenerational control contro control control control control control co	Max continuous output power	VA	240	290	
Max continuous output currentA10121Nominal frequency rangeNaKax units per 20A (L-1) branch circuit65Total harmonic distortion3Total harmonic distortionAC port backfeed currentnaAC port backfeed currentnaGrid-factor settingna </td <td>Nominal (L-L) voltage/range<sup>3</sup></td> <td>v</td> <td>240 / 2</td> <td>11 - 264</td>	Nominal (L-L) voltage/range <sup>3</sup>	v	240 / 2	11 - 264	
Noninal frequencyisImage: Second Seco	Max continuous output current	Α	1.0	1.21	
Extended frequency rangerke613Max units per 20 A (L-L) branch circuit*1613Total harmonic distortion613Ovarvoltage class AC port0	Nominal frequency	Hz	6	0	
Max units per 20 A (L-L) branch circuit*1613Total harmonic distortionOvervoltage class AC portAC port backfed currentmAAC port backfed currentmAOvervoltage class AC portmAOvervoltage class AC portmAAC port backfed currentmAOvervoltage class AC portmAOver factor (adjustable)00.85 leading-OssB leading leading leading leading leading le	Extended frequency range	Hz	50 -	- 68	
Total harmonic distortion       Image: Second	Max units per 20 A (L-L) branch circuit <sup>4</sup>		16	13	
Overrelage class AC port         IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Total harmonic distortion		<5%		
AC port backfeed current         nn         Generator setting           Power factor setting         Image: Comparison of the power factor (adjustable)         Staging           Grid-tied power factor (adjustable)         Image: Comparison of the power factor (adjustable)         97.5           Peak efficiency         %         97.5         97.6           Night-time power consumption         mode: Comparison of the power consumption         97.6           Night-time power consumption         Mode: Comparison of the power consumption         97.6           KetANLGAL DATA         Comparison of the power consumption         Mode: Comparison of the power consumption           KetANLGAL DATA         Comparison of the power consumption         Mode: Comparison of the power consumption           Relative humidity range         Geneticar type         Sont comparison of the time power consum (adjust the power consust the power consum (adjust the power consust the	Overvoltage class AC port		I	l	
Power factor setting         I           Grid-tied power factor (adjustable)         GR         0.85 leading - U.85 leading           Peak efficiency         %         97.5         97.6           CEC weighted efficiency         %         97.6         97.6           Night-time power consumption         w         97.6         97.6           Night-time power consumption         w         97.6         97.6           Multicat DATA         Consector consumption         w         97.6         97.6           Relative humidity range         GR         -40°C to 60°C - 40°F to 140°F T	AC port backfeed current	mA	3	0	
Grid-tied power factor (adjustable)         0.85 legalmy - 0.85 legalmy           Peak efficiency         %         97.5         97.6           CEC weighted efficiency         %         97         97           Night-time power consumption         mV         97         97           Notest	Power factor setting		1.	0	
Peak efficiency         %         97.5         97.6           CEC weighted efficiency         %         97         97           Nght-time power consumption         ww         97         97           Netword Notations         97         97         97           Relative humidity range         0         212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")           Dimensions (HxWxD)         212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")         97           Weight         1.08 kg (2.38 lbs)         97         97           Cooling         Natural convection - no fans         97           Approved for wet locations         Yes         97         97           Pollution degree         PD         Yes         97         97           Enclosure         CA Ruile 21	Grid-tied power factor (adjustable)		0.85 leading -	- 0.85 lagging	
CEC weighted efficiency         %         97         97           Night-time power consumption         mW         G	Peak efficiency	%	97.5	97.6	
Night-time power consumption         mW         60           MeterANICAL DATA         Ambient temperature range         -40°C to +60°C (-40°F to +140°F)           Relative humidity range         Good Condensing)         Condensing)           DC Connector type         MC4         MC4           Dimensions (HxWxD)         212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")         Weight           Cooling         MC4         1.08 kg (2.38 lbs)         MC4           Cooling         Natural convection - no fans         MC4           Acoustic noise at 1 m         <60 dBA	CEC weighted efficiency	%	97	97	
MECHANICAL DATA           Ambient temperature range         -40°C to +60°C (-40°F to +140°F)           Relative humidity range         4% to 100% (condensing)           DC Connector type         MC4           Dimensions (HxWxD)         212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")           Weight         1.08 kg (2.38 lbs)           Cooling         Natural convection – no fans           Approved for wet locations         Yes           Acoustic noise at 1 m         <60 dBA	Night-time power consumption	mW	6	0	
Ambient temperature range         -40°C to +60°C (-40°F to +140°F)           Relative humidity range         4% to 100% (condensing)           DC Connector type         MC4           Dimensions (HxWxD)         212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")           Weight         1.08 kg (2.38 lbs)           Cooling         Natural convection – no fans           Approved for wet locations         Yes           Acoustic noise at 1 m         <60 dBA	MECHANICAL DATA				
Relative humidity range       4% to 100% (condensing)         DC Connector type       MC4         Dimensions (HxWxD)       212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")         Weight       1.08 kg (2.38 lbs)         Cooling       Natural convection - no fans         Approved for wet locations       Yes         Acoustic noise at 1m       <60 dBA	Ambient temperature range		-40°C to +60°C (	(-40°F to +140°F)	
DC Connector typeMC4Dimensions (HxWxD)C122 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")Weight1.08 kg (2.38 lbs)CoolingI.08 kg (2.38 lbs)CoolingCoolingApproved for wet locationsYesAcoustic noise at 1 mYesPollution degreePD3EnclosureClass II double-insulated, corrosion resistant polymeric enclosureEnclosureNEMA Type 6 / outdoorCOMPLIANCECA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 69012 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	Relative humidity range		4% to 100% (	(condensing)	
Dimensions (HxWxD)212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")Weight1.08 kg (2.38 lbs)Cooling0Approved for wet locations0Approved for wet locationsYesAcoustic noise at 1 m60 dBAPollution degree9D3EnclosureClass II double-insulated, corrosion resistant polymeric enclosureEnclosureNEMA Type 6 / outdoorCOMPLIANCECa Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section of 900.12 and C22.1-2018 Rule 64-218 Rapid Shut down of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	DC Connector type		Μ	24	
Weight1.08 kg (2.38 lbs)CoolingNatural convection - no fansApproved for wet locationsApproved for wet locationsAcoustic noise at 1 mPollution degreePollution degreePD3EnclosureClass II double-insulated, corrosion resistant polymeric enclosureEnviron. category / UV exposure ratingNEMA Type 6 / outdoorCMMPLIANCEContingClass II double-insulated, corrosion resistant polymeric enclosureContingNEMA Type 6 / outdoorTotal double-insulated, corrosion resistant polymeric enclosureInterpretNEMA Type 6 / outdoorContent is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rupid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rupid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rupid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section manufacturer's instructions.	Dimensions (HxWxD)		212 mm (8.3") x 175 mm	ı (6.9") x 30.2 mm (1.2")	
CoolingNatural convection - no fansApproved for wet locationsApproved for wet locationsAcoustic noise at 1 mPollution degreePollution degreePD3EnclosureClass II double-insulated, corrosion resistant polymeric enclosureEnviron. category / UV exposure ratingCOMPLIANCECertificationsCA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section manufacturer's instructions.	Weight		1.08 kg ( <sup>°</sup>	2.38 lbs)	
Approved for wet locationsYesApproved for wet locationsGenetationsAcoustic noise at 1 mGenetationsPollution degreePD3Pollution degreeClass II double-insulated, corrosion resistant polymeric enclosureEnclosureClass II double-insulated, corrosion resistant polymeric enclosureEnviron. category / UV exposure ratingNEMA Type 6 / outdoorCOMPLIANCECertificationsCA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	Cooling		Natural conve	ction – no fans	
Acoustic noise at 1 m       <60 dBA	Approved for wet locations		Ye	25	
Pollution degree       PD3         Pcllution degree       PD3         Enclosure       Class II double-insulated, corrosion resistant polymeric enclosure         Environ. category / UV exposure rating       NEMA Type 6 / outdoor         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         Certifications       Ch 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, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	Acoustic noise at 1 m		<60	dBA	
Enclosure       Class II double-insulated, corrosion resistant polymeric enclosure         Environ. category / UV exposure rating       NEMA Type 6 / outdoor         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         Certifications       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, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	Pollution degree				
Environ. category / UV exposure rating       NEMA Type 6 / outdoor         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         Certifications       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, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	Enclosure		Class II double-insulated corrosion resistant polymeric enclosure		
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         Certifications       This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	Environ. category / UV exposure rating		NEMA Type	6 / outdoor	
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 Certifications This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	COMPLIANCE				
Certifications This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.			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	
	Certifications		This product is UL Listed as PV Rapid Shut Down Equipment and 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Syste manufacturer's instructions.	conforms with NEC 2014, NEC 2017, and NEC 2020 section ms, for AC and DC conductors, when installed according to	

(1) No enforced DC/AC ratio. See the compatibility calculator at https://link.enphase.com/ module-compatibility (2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.



## IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, softwaredefined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.



Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed

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IQ8SP-DS-0002-01-EN-US-2021-10-19



according to manufacturer's instructions.

• Configurable to support a wide range of grid profiles

Complies with the latest

advanced grid support

Remote automatic updates for

the latest grid requirements

Easy to install

Lightweight and compact with

plug-n-play connectors

Power Line Communication

(PLC) between components

Faster installation with simple

High productivity and reliability • Produce power even when the

More than one million cumulative

two-wire cabling

grid is down

enclosure

hours of testing

**Microgrid-forming** 

Class II double-insulated

 Optimized for the latest highpowered PV modules

 Meets CA Rule 21 (UL 1741-SA) requirements

## IQ Combiner 4/4C



X2-IQ-AM1-240-4 (IEEE 1547:2018)

The IQ Combiner 4/4C with IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure. It streamlines IQ Microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

#### Smart

- Includes IQ Gateway for communication and control
- Includes Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Supports Wi-Fi, Ethernet, or cellular connectivity
- · Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

#### Simple

- Mounts on single stud with centered brackets
- Supports bottom, back and side conduit entry
- Allows up to four 2-pole branch circuits for 240VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

#### Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed
- X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C comply with IEEE 1547:2018 (UL 1741-SB, 3rd Ed.)

## IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 X-IQ-AM1-240-4	IQ Combiner 4 with IQ Gateway printed ci and consumption monitoring (± 2.5%). Ind
X2-IQ-AM1-240-4 (IEEE 1547:2018)	IO Combiner 4C with IO Gateway printed
X-IQ-AM1-240-4C	and consumption monitoring (± 2.5%). In
X2-IQ-AM1-240-4C (IEEE 1547:2018)	US Virgin Islands, where there is adequate IQ Battery and IQ System Controller and
ACCESSORIES AND REPLACEMENT PARTS	(not included, order separately)
Supported microinverters	IQ6, IQ7, and IQ8. (Do not mix IQ6/7 Mi
Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	<ul> <li>Includes COMMS-KIT-01 and CELLMC</li> <li>4G based LTE-M1 cellular modem with</li> <li>4G based LTE-M1 cellular modem with</li> </ul>
BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Circuit breaker, 2 pole, 10A, Eaton BR2 Circuit breaker, 2 pole, 15A, Eaton BR2 Circuit breaker, 2 pole, 20A, Eaton BR2 Circuit breaker, 2 pole, 20A, Eaton BR2 Circuit breaker, 2 pole, 20A, Eaton BR2
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combi
XA-PLUG-120-3	Accessory receptacle for Power Line Ca
X-IQ-NA-HD-125A	Hold-down kit for Eaton circuit breaker
Consumption monitoring CT (CT-200-SPLIT/CT-200-CLAMP)	A pair of 200A split core current transfo
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240VAC, 60 Hz
Eaton BR series busbar rating	125A
Max. continuous current rating	65A
Max. continuous current rating (input from PV/storage)	64A
Max. fuse/circuit rating (output)	90A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distri
Max. total branch circuit breaker rating (input)	80A of distributed generation/95A with
Draduation matering CT	2004 colid core pro installed and wired
	200A solid core pre-installed and wired
	07 E and y 40 E and y 16 0 and (14 7E in y
Dimensions (WXHXD)	37.5 cm x 49.5 cm x 16.8 cm (14.75 m x
weight	7.5 Kg (10.5 IDS)
Ambient temperature range	-40°C to +46°C (-40°F to 115°F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R
Wire sizes	<ul> <li>20A to 50A breaker inputs: 14 to 4 AW</li> <li>60A breaker branch input: 4 to 1/0 AV</li> <li>Main lug combined output: 10 to 2/0</li> <li>Neutral and ground: 14 to 1/0 copper</li> <li>Always follow local code requirement</li> <li>Up to 3,000 meters (9,842 feet)</li> </ul>
INTERNET CONNECTION OPTIONS	,
Integrated Wi-Fi	IEEE 802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODE cellular modem is required for all Enphase
Ethernet	Optional, IEEE 802.3, Cat5E (or Cat6) U
COMPLIANCE	
Compliance, IQ Combiner	CA Rule 21 (UL 1741-SA) IEEE 1547:2018 - UL 1741-SB, 3 <sup>rd</sup> Ed. (X: CAN/CSA C22.2 No. 107.1, Title 47 CFR Production metering: ANSI C12.20 acc Consumption metering: accuracy class
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1



To learn more about Enphase offerings, visit enphase.com IQ-C-4-4C-DS-0103-EN-US-12-29-2022

## 

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printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) 2.5%). Includes a silver solar shield to match the IQ Battery and IQ System Controller 2 and to

ay printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) 2.5%). Includes Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play r systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the s adequate cellular service in the installation area.) Includes a silver solar shield to match the oller and to deflect heat.

#### ately)

IQ6/7 Microinverters with IQ8)

CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan odem with 5-year Sprint data plan odem with 5-year AT&T data plan , BR220, BR230, BR240, BR250, and BR260 circuit breakers. aton BR210 aton BR215 Eaton BR220 aton BR215B with hold down kit support aton BR220B with hold down kit support

IQ Combiner 4/4C

er Line Carrier in IQ Combiner 4/4C (required for EPLC-01)

breaker with screws

nt transformers

es Distributed Generation (DG) breakers only (not included)

/95A with IQ Gateway breaker included

/Eaton included

and wired to IQ Gateway

4.75 in x 19.5 in x 6.63 in). Height is 53.5 cm (21.06 in) with mounting brackets.

A type 3R, polycarbonate construction

14 to 4 AWG copper conductors to 1/0 AWG copper conductors 10 to 2/0 AWG copper conductors 0 copper conductors uirements for conductor sizing.

ELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Mobile Connect Il Enphase Energy System installations

r Cat6) UTP Ethernet cable (not included)

3rd Ed. (X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C) le 47 CFR, Part 15, Class B, ICES 003 2.20 accuracy class 0.5 (PV production) acy class 2.5



**XR Rail Family** 



#### Solar Is Not Always Sunny

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

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



#### **Force-Stabilizing Curve**

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

#### **Compatible with Flat & Pitched Roofs**





#### **Corrosion-Resistant Materials**

All XR Rails are made of 6000-series aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.



#### **XR Rail Family**

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





XR100

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

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

## **Rail Selection**

The table below was prepared in compliance with applicable engineering codes and standards.\* Values are based on the following criteria: ASCE 7-16, Gable Roof Flush Mount, Roof Zones 1 & 2e, Exposure B, Roof Slope of 8 to 20 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed certification letters.

Load		Rail Span						
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'	
None	90							
	120							
	140	XR10		XR100		XR1000		
	160							
20	90							
	120							
	140							
	160							
30	90							
	160							
40	90							
	160							
80	160							
120	160							

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 10 feet.

• 10' spanning capability Heavy load capability Clear & black anodized finish • Internal splices available



#### XR1000

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

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

\*Table is meant to be a simplified span chart for conveying general rail capabilities. Use approved certification letters for actual design guidance.

### GODWIN ENGINEERING AND DESIGN, LLC

8378 Foxtail Loop, Pensacola, FL 32526 | (850)712-4219 | chad@godwineng.com

#### November 9, 2023

- To: Columbia County Building Department 135 NE Hernando Ave Lake City, FL 32055
- Subject: Buergo Residential PV Roof Mount Installation 241 NW Pompano Ct Lake City, FL 32055

#### To whom it may concern,

This letter is regarding the proposed installation of a rooftop-mounted Solar PV system on the existing residential structure at the subject address. I have reviewed the attachment plan and have determined that the rooftop-mounted PV system is in compliance with the applicable sections of the following Codes as amended and adopted by the jurisdiction when installed in accordance with the manufacturer's installation instructions:

2020 Florida Building Code 7<sup>th</sup> Edition, FBC ASCE 7 Min. Design Loads for Buildings & Other Structures Design Criteria: Design Wind Speed(Vult) - 120 mph 3sec gust, Exposure Category – C, Risk Category II

The rooftop-mounted photovoltaic panel system has been designed in accordance with FRC R324.4. When roof penetrations are necessary, they shall be flashed and sealed in accordance with the manufacture's installation instructions, R905.17.3. The PV system consist of the modules, railing, and connection hardware. Refer to the specific roof type calculation pages for PV dead loads. The portions of the existing structure covered with solar panels will be adequate for supporting the roof loads per R324.4.1.1.

The securement method of the the PV system is to be mounted parallel to the structure with the site specific railing and attachments according to the designed plans. The site specific wind load calculations for the module and their supports are attached with this document. Fasteners shall be installed to the designated roof member with the proper torque from the manufactures installation instructions.

The design wind pressures for rooftop solar panels located on enclosed or partially enclosed buildings of all heights, with panels parallel to the roof surface with a tolerance of  $2^{\circ}$  and with a max height above the roof surface,  $h_2$ , not exceeding 10 in. A min gap of 0.25 in shall be provided between all panels with the spacing of gaps between panels not exceeding 6.7 ft. in addition the array shall be located at least  $2h_2$  from the roof edge, a gable ridge, or a hip ridge.

It is the contractors responsibility to review all drawings for accuracy and notify the EOR of any discrepancies prior to beginning construction. To the best of my knowledge, the plans and specifications comply with the minimum requirements of the latest Florida Building code.

Please see attached documents and contact me should you have any questions.

Sincerely, D. Chad Godwin, PE 81360 Exp. 02/28/2025

## GODWIN ENGINEERING AND DESIGN, LLC

#### 8378 Foxtail Loop, Pensacola, FL 32526 | (850)712-4219 | <u>chad@godwineng.com</u>

Roof Structure Details		Buergo - Residential Calculations Sheet - R1-R3								
Boof Angle 28° to 45°		<u>המבוקט - הכשומכוונומו כמוכמומנוטווג שוופער - הד-הס</u>								
Roof Type Hin		The securement method of the PV system is to be mounted parallel to the Asphalt Shingle						halt Shingle		
Roof Covering Asphalt Shi	nglo	roof with t	he IR-100 r	ailing and H	alo Ultragri	p - HUG flas	hings/atta	chments. Th	e mounts	
Noon Doof Usight 15 ft	ligie	should be s	staggered,	where possi	ble, to allow	v distributio	n of the de	esign loads e	evenly to	
		the structu	re. The mo	unts shall b	e installed v	vith (2) #14	Self-Dr, QN	A RD Structi	ural, to	
Rafter Spacing 24 In O.C.		Rafter								
Katter/Truss Size 2 x 4										
Wind Load Paramaters										
Wind Speed (asd)		93	mpn	FRC R301.2	2.1.3	Basic Wind :	speed (Uit	120	mph	
Effective Wind Area		20.69	ft-	26.20		Exp	posure Cat	. C	B,C, or D	
Wind Directionality	K <sub>d</sub>	0.85		Table 26.6	-1		Elevatior	n <1000	ft	
Topographic factor	K <sub>zt</sub>	1.00		26.8 or 26.8.2 bld		g. least hori	. dim (typ.	360	in	
Ground Elevation Factor	K <sub>e</sub>	1.00		Table 26.9-1		F	loof Height	15.00	ft	
Velocity Exposure Coefficient	Kz	0.85		Table 26.10-1		Ex	posed Mo	dule Definit	ule Definition	
Array Edge Factor	γε	1.50	Exposed	29.4.4		Exposed factor = 1.5 for uplift loads on panels t			anels that are	
Array Edge Factor	$\gamma_{\rm E}$	1.00	Non. Exp	29.4.4		exposed and within a distance 1.5(L <sub>p</sub> ) from the end			om the end of	
Solar Panel Equalization Factor	$\gamma_{a}$	0.67		Fig. 29.4-8		a row at an exposed edge of the array. Modules are			lodules are	
Velocity Pressure	q <sub>h</sub>	15.98	psf	q <sub>h</sub> =0.00256 K <sub>2</sub> K <sub>2</sub> K <sub>4</sub> K <sub>4</sub> K <sub>2</sub> V <sup>2</sup>		condidered Exposed if $d_1$ to the root edge > 0.5h and one of the following applies:			e > 0.511 aliu	
Added Safety Factor		1.2				one of the for	io ting uppin			
Allowable Pullout per mount		1004.0	lbs			1. d₁ to adja	cent array >	4ft.		
0	4h or 0 6h	6.00	ft	Flat - 0.6h. Gab	/Hip - 0.4h	2. $d_2$ to the	next adiacei	nt mod > 4ft.		
10% of least horizontal dim		3.00	ft	10% of least b	or Dim Or 0.4h	whichever is sp	aller but not	less than either	1% of Least hor	
Poof Zong Set Pack	2	2.00	ft	10% Of least II	01. DIIII. OI 0.411	Or 3ft. (flat	roof - 0.6h)	less than either -	476 UI LEAST HUI.	
Noor Zone Set Back	h	5.00	in	Not > 10in/non	ol hoight showo	raafi				
	11 <sub>2</sub>	5	111	NOL > 10In(pan	ei neight above		Colds Biller	and the states		
	202	10	in	"min distance	array shall be tro	om the root edge	e, Gable Kloge,	or nip ridge		
		0.25	in c	min gap betwe	en all panels bu	t not > 6.7ft				
	d1	1.00	ft	Horizontal dist	ance orthogona	l to panel edge				
	d2	0.25	ft	Horizontal dist	ance from edge	of one panel to	the nearest ed	lge in the next ro	w	
	0.5h	7.50	ft							
		F	V Attachm	ent - Result	S					
		R1-R	3 Roof Zone	es - Hip 28° 1	to 45°					
	1	2e	2r	3						
GC <sub>p</sub> - Uplift	-1.4	-1.5	-2.1	-2.1						
GC <sub>p</sub> - Down	0.7	0.7	0.7	0.7						
$p = q_{h}(GC_{p})(g_{E})(\gamma_{a})Up$	-19.8	-21.4	-31.1	-31.1			psf	29.4-7	Exposed	
$p = q_b(GC_o)(g_F)(\gamma_a)UP$	-16.0	-16.0	-19.8	-19.8			, psf	29.4-7	Non-Exp.	
$p = q_{b}(GC_{b})(g_{b})(v_{b})Down$	16.0	16.0	16.0	16.0			nsf	29 4-7	Exposed	
$p = q_{h}(GC_{n})(g_{n})(v_{n})Down$	16.0	16.0	16.0	16.0			nsf	29 4-7	Non-Exp	
Point load (Portrait Bails)	-3/12	-370	-537	-537			lb.	n*∆ "	Exposed	
Point load (Portrait Rails)	276.2	-276.2	-242.2	-242.2			lb	p * A	Non-Evn	
Point load (Portial Kais)	-270.2	-270.2	-342.2	-342.2			10	P reff	NUTELAP.	
Point Load (landscape Rails)	-213.8	-231.3	-335.8	-335.8			ai u	P A <sub>eff</sub>	Exposed	
Point Load (landscape Rails)	-1/2.6	-1/2.6	-213.8	-213.8			di	p · A <sub>eff</sub>	NON-EXP.	
Max Span (Portrait)	72	72	72	72			in		Exposed	
Max Span (Portrait)	72	72	72	72			in	***	Non-Exp.	
Max Span (landscape)	72	72	72	72			in		Exposed	
Max Span (landscape)	72	72	72	72			in		Non-Exp.	
Cantilever (Portrait)	29	29	29	29			in		Exposed	
Cantilever (Portrait)	29	29	29	29			in	Snan * 40%	Non-Exp.	
Cantilever (landscape)	29	29	29	29			in	5pun 40%	Exposed	
Cantilever (landscape)	29	29	29	29			in		Non-Exp.	
*** Spans v	vith <del>Mark t</del>	<del>hrough</del> der	ote allowa	ble Module	pressure ra	ating is exce	eded.			
PV Dead L	oad				TSM-DE09C	.07 380-405	Module S	pecification	S	
QTY of Modules (46 in Po	rtrait, )		46		ALLOWAE	ILE		K.F.K.		
Module Area		20.69	ft <sup>2</sup>		CLAMPING AR	EA		FE		
Rail, Clamps, Mounts		1	lb/ft	1	PORTRAIT R	AJL				
Total Rail Length		336	ft	0005		-	-			
Module	w.	46	lhs	ROOP	ATTACHMENT					
Array	W/ .	2120	lbs		PVMODUL					
Micro/ontimizor	w mods	104	lbc		TY MODUCI	~			<	
DV Doil	w mic	220	IDS Ibc							
PV Kdii	VV PV rail	330	105		END OF RO	W		100	×	
	vv <sub>total</sub>	2650								
Iotal Area	AT	951.85	tt <sup>-</sup>		SHIPSON'S N	+ common	1		0	
Dead Load	D <sub>PV</sub>	2.78	pst			1	в —	1	**	
Weight/attachment		25.0	lbs	ļ					1 A.	
Fastener Allow	vable Pullo	ut		A (ft)	B (ft)	C (in)	D (in)	E (in)	F (in)	
(2) #14 Self-Dr, QM	RD Structu	ral		5.75	3.60	9.84	13.78	0.00	7.87	
	Diameter	#14		Modul	e load ratin	gs (psf)	Ultimate	Allowabl	e( Ult /1.5)	
	S.G.	0.42		Loa	d Rating - S	now	126.0	84.0	Portrait	
Thread Embe	dment per	3	in	Loa	d Rating - V	Vind	-84.0	-56.0	- ortrait	
# 0	of Fastener	2		Loa	d Rating - S	now	50.4	33.6	Landsson	
Pullout Value (Source - FL Product Approval)		1004.0	lb <sub>f</sub>	Loa	Load Rating - Wind -37.8		-25.2	Lanuscape		