

SYSTEM INFORMATION	
MODULE	HANWHA Q.PEAK DUO BLK ML-G10+ 405
INVERTER	ENPHASE IQ8PLUS-72-2-US
RACKING	ROOFTECH RT-MINI II W/ UNIRAC NXT HORIZON 2-RAIL RACKING SYSTEM
SYSTEM SIZE (DC)	7.29 KW
LOCATION	30.1963379,-82.6678166

**GENERAL NOTES:**

THIS PV SYSTEM HAS BEEN DESIGNED TO MEET THE MINIMUM DESIGN STANDARDS FOR BUILDING AND OTHER STRUCTURES OF THE ASCE 7-16, 7TH EDITION 2020 FLORIDA RESIDENTIAL CODE, 7TH EDITION 2020 FLORIDA BUILDING CODE, 7TH EDITION 2020 FLORIDA FIRE PREVENTION CODE, NEC 2017 AND ALL LOCAL CODES & ORDINANCES.

ROOF SHALL HAVE NO MORE THAN TWO LAYERS OF COVERING IN ADDITION TO THE SOLAR EQUIPMENT.

INSTALLATION OF SOLAR EQUIPMENT SHALL BE FLUSH MOUNTED, PARALLEL TO AND NO MORE THAN 6-INCHES ABOVE THE SURFACE OF THE ROOF.

ANY PLUMBING VENTS ARE NOT TO BE CUT OR COVERED FOR SOLAR EQUIPMENT INSTALLATION. ANY RELOCATION OR MODIFICATION OF THE VENT REQUIRES A PLUMBING PERMIT AND INSPECTION.

ALL DESIGN, CALCULATIONS ARE PERFORMED BY DANIEL DUNZIK REGISTERED ARCHITECT. FLORIDA STATE STATUTE 471.003(3) PROVIDES THAT LICENSED ARCHITECTS ARE EXEMPTED FROM THE PROVISIONS OF CHAPTER 471 ENGINEERING AND NOT PRECLUDED FROM PERFORMING ENGINEERING SERVICES FOR INTEGRATED SYSTEMS AND SERVICES THAT ARE INCIDENTAL TO BUILDINGS AND STRUCTURES.

**INVERTER PLACEMENT:**

SYSTEM UTILIZES "ENPHASE" MICRO-INVERTERS WITH RAPID SHUTDOWN CONTROL LOCATED ON THE BACK SIDE OF EACH MODULE.

**STRUCTURAL STATEMENT:**

THE EXISTING STRUCTURE IS ADEQUATE TO SUPPORT THE NEW LOADS IMPOSED BY THE PHOTOVOLTAIC MODULE SYSTEM INCLUDING UPLIFT & SHEAR. EXISTING RAFTER SIZES & DIMENSIONS CONFORM TO 7TH EDITION 2020 FLORIDA RESIDENTIAL CODE

MOUNTING BRACKETS AND HARDWARE MEET OR EXCEED FLORIDA CODE REQUIREMENTS FOR THE DESIGN CRITERIA OF THE TOWN.

**FSEC CERTIFICATION STATEMENT:**

PER FL. STATUE 377.705 , I, MINA A. MAKAR PE# 86753, CERTIFICATE OF AUTHORIZATION #33404, AN ENGINEER LICENSED PURSUANT TO CHAPTER 471, CERTIFY THAT THE PV ELECTRICAL SYSTEM AND ELECTRICAL COMPONENTS ARE DESIGNED AND APPROVED USING THE STANDARDS CONTAINED IN THE MOST RECENT VERSION OF THE FLORIDA BUILDING CODE. FBC 2020


CLIMATIC & GEOGRAPHIC DESIGN CRITERIA TABLE R301.2(1)	
SPEED (MPH)	120
TOPOGRAPHIC EFFECTS	B
SPECIAL WIND REGION	NO
WIND BORNE DEBRIS ZONE	2
SEISMIC DESIGN CATEGORY	C
CLIMATE ZONE	2A
WIND EXPOSURE CATETORY	B

FBC, RESIDENTIAL 2020

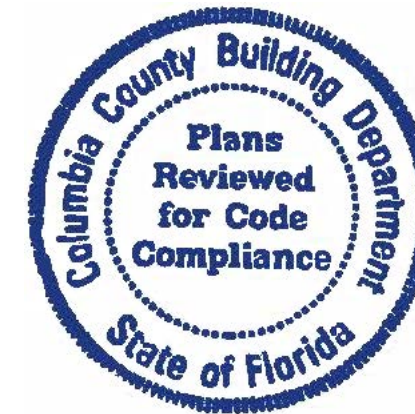
TABLE R301.2.1.3 WIND SPEED CONVERSIONS <sup>a</sup>											
V <sub>ult</sub>	110	115	120	130	140	150	160	170	180	190	200
V <sub>asd</sub>	85	89	93	101	108	116	124	132	139	147	155

For SI: 1 mile per hour = 0.447 m/s.

a. Linear interpolation is permitted.


<p>HANWHA Q.PEAK DUO BLK ML-G10+ 405 405 WATT MODULE 74" X 41.1" X 1.26" (SEE DATASHEET)</p>

PLAN KEY	
PV-1	COVER PAGE
PV-1.1	ATTACHMENT DETAIL
PV-1.1(2)	ATTACHMENT DETAIL
PV-1.2	INVERTER SPECS
PV-1.3	COMBINER SPECS
PV-1.4	PANEL SPECS
PV-2	PANEL LAYOUT
PV-3	ELETRICAL
PV-3.1	ELECTRICAL CONT.
PV-3.2	EQUIPMENT LABELS



BILL OF MATERIALS	
MODULES	18
INVERTERS	18
L-FOOT ATTACHMENT W/ RT-MINI	37
171" RAILS	8
SKIRTS	
ENPHASE COMBINER BOX	1
EATON 60A FUSIBLE AC DISCONNECT	1
35A FUSES	2
125A LINE TAPS	2



PRO CUSTOM SOLAR LLC D.B.A. MOMENTUM SOLAR  
325 HIGH STREET, METUCHEN, NJ 08840  
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Date: 2023.09.08 01:09:58 -05:00

**SOLAR CONTRACTOR**

CAMERON CHRISTENSEN  
CERTIFIED SOLAR CONTRACTOR LICENSE NUMBER: CVC57036  
MOMENTUM SOLAR  
5728 MAJOR BLVD. SUITE 307, ORLANDO FL. 32819

**CUSTOMER INFORMATION**

COBY LAW - MS135162  
626 NW BRADY CIRCLE  
LAKE CITY, FL 32055  
3862340041

**PV SYSTEM INFORMATION**

SYSTEM SIZE (DC ): 7.29 KW  
18 MODULES: HANWHA Q.PEAK DUO BLK ML-G10+ 405  
18 INVERTERS: ENPHASE IQ8PLUS-72-2-US

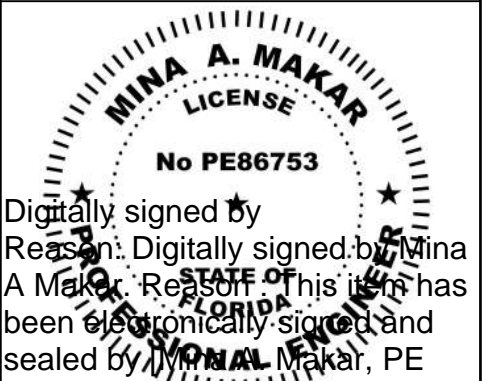
**PROJECT INFORMATION**

INITIAL	DATE: 9/8/2023	DESIGNER: SR
REV:	DATE:	DESIGNER:
REV:	DATE:	DESIGNER:

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**PV-1**

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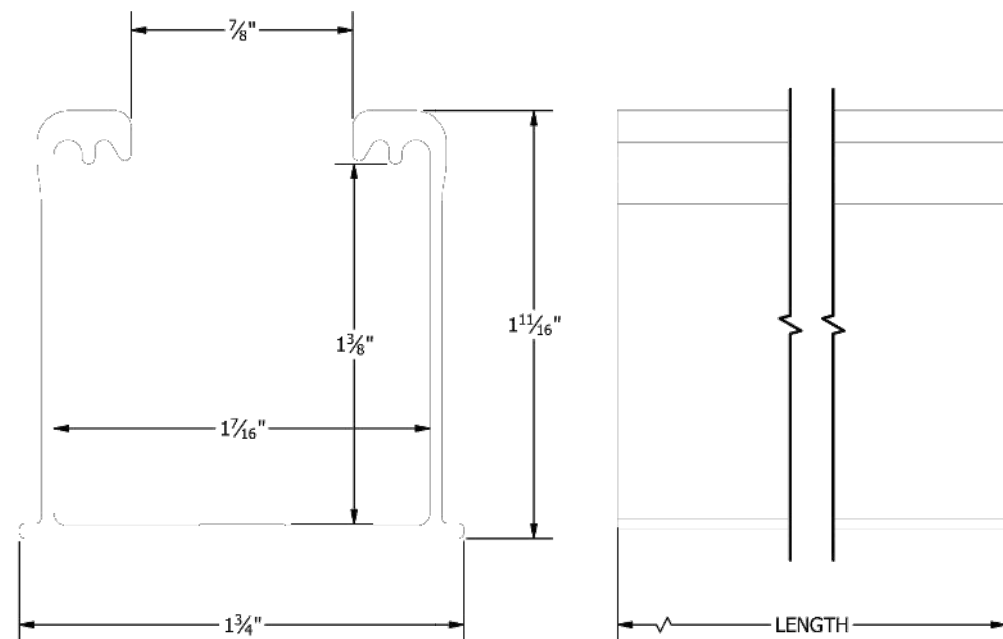
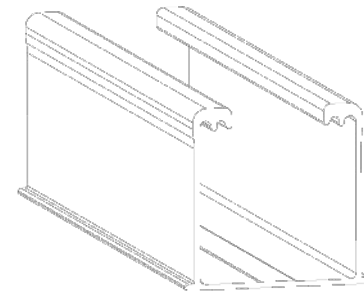
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**ATTACHMENT DETAIL**

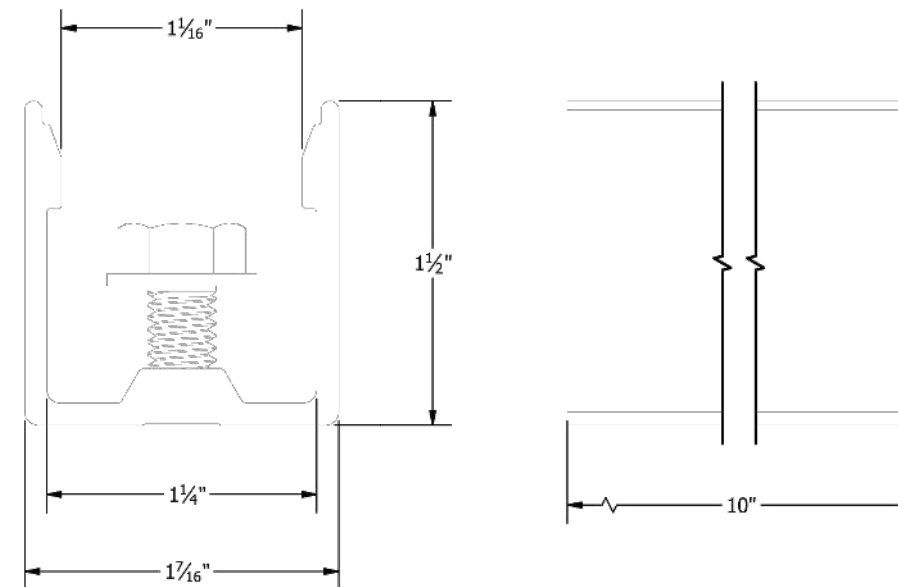
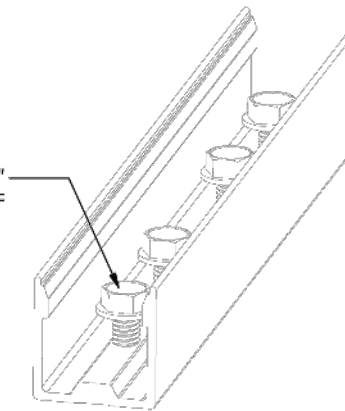
**PV-1.1**

PART # TABLE		
P/N	DESCRIPTION	LENGTH
084RLM1	NXT HORIZON RAIL 84" MILL	84"
084RLD1	NXT HORIZON RAIL 84" DARK	84"
168RLM1	NXT HORIZON RAIL 168" MILL	168"
168RLD1	NXT HORIZON RAIL 168" DARK	168"
208RLM1	NXT HORIZON RAIL 208" MILL	208"
208RLD1	NXT HORIZON RAIL 208" DARK	208"
246RLM1	NXT HORIZON RAIL 246" MILL	246"
246RLD1	NXT HORIZON RAIL 246" DARK	246"



PART # TABLE		
P/N	DESCRIPTION	LENGTH
RLSPLCM1	NXT HORIZON RAIL SPLICE	10"

4X - 5/16"-18 x 5/8"  
HEX FLANGE SCREW - TYPE F



1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	NXT HORIZON
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	RAIL
REVISION DATE:	9/13/2021

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS  
LEGAL NOTICE

NH-P01

SHEET



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ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	NXT HORIZON
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	RAIL SPLICE
REVISION DATE:	9/22/2021

DRAWING NOT TO SCALE  
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LEGAL NOTICE

NH-P02

SHEET





## IQ Combiner 4/4C



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, 3<sup>rd</sup> Ed.)

## IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 X-IQ-AM1-240-4 X2-IQ-AM1-240-4 (IEEE 1547:2018)	IQ Combiner 4 with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) and consumption monitoring (± 2.5%). Includes a silver solar shield to match the IQ Battery and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C X-IQ-AM1-240-4C X2-IQ-AM1-240-4C (IEEE 1547:2018)	IQ Combiner 4C with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) and consumption monitoring (± 2.5%). Includes Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.
ACCESSORIES AND REPLACEMENT PARTS (not included, order separately)	
Supported microinverters	IQ6, IQ7, and IQ8. (Do not mix IQ6/7 Microinverters with IQ8)
Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
X-IQ-NA-HD-125A	Hold-down kit for Eaton circuit breaker with screws
Consumption monitoring CT (CT-200-SPLIT/CT-200-CLAMP)	A pair of 200A split core current transformers
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 Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation/95A with IQ Gateway breaker included
IQ Gateway breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200A solid core pre-installed and wired to IQ Gateway
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 cm x 49.5 cm x 16.8 cm [14.75 in x 19.5 in x 6.63 in]. Height is 53.5 cm (21.06 in) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40°C to +46°C (-40°F to 115°F)
Cooling	Natural convection, plus heatshield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20A to 50A breaker inputs: 14 to 4 AWG copper conductors • 60A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors • Always follow local code requirements for conductor sizing.
Altitude	Up to 3,000 meters (9,842 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	IEEE 802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Mobile Connect cellular modem is required for all Enphase Energy System installations.
Ethernet	Optional, IEEE 802.3, Cat5E (or Cat6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	CA Rule 21 (UL 1741-SA) IEEE 1547:2018 - UL 1741-SB 3 <sup>rd</sup> Ed. (X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C) CAN/CSA C22.2 No. 107.1, Title 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

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IQ-C-4-4C-DS-0103-EN-US-12-29-2022



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No PE86753

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18 MODULES: HANWHA Q.PEAK DUO BLK ML-G10+ 405  
18 INVERTERS: ENPHASE IQ8PLUS-72-2-US

## PROJECT INFORMATION

INITIAL	DATE:	DESIGNER:
	9/8/2023	SR
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## COMBINER SPECS

# PV-1.3



To learn more about Enphase offerings, visit [enphase.com](https://enphase.com)  
IQ-C-4-4C-DS-0103-EN-US-12-29-2022



# Q.PEAK DUO BLK ML-G10+ SERIES



385-410 Wp | 132 Cells  
20.9% Maximum Module Efficiency

MODEL Q.PEAK DUO BLK ML-G10+



### Breaking the 20% efficiency barrier

Q. ANTIM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.9%.



### A reliable investment

Inclusive 25-year product warranty and 25-year linear performance warranty<sup>1</sup>.



### Enduring high performance

Long-term yield security with Anti LeTID Technology, Anti PID Technology<sup>2</sup> and Hot-Spot Protect.



### Extreme weather rating

High-tech aluminium alloy frame, certified for high snow (5400 Pa) and wind loads (4000 Pa).



### Innovative all-weather technology

Optimal yields, whatever the weather with excellent low-light and temperature behaviour.



### The most thorough testing programme in the industry

Qcells is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.

<sup>1</sup> See data sheet on rear for further information.

<sup>2</sup> APT test conditions according to IEC/TS 62804-1:2015, method A (-1500V, 96h)

The ideal solution for:



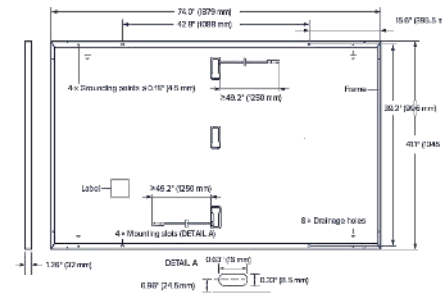
Rooftop arrays on residential buildings



## Q.PEAK DUO BLK ML-G10+ SERIES

### Mechanical Specification

Format	74.0 in × 411 in × 126 in (including frame) (1879 mm × 1045 mm × 32 mm)
Weight	48.5 lbs (22.0 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodised aluminium
Cell	6 × 22 monocrystalline Q. ANTIM solar half cells
Junction box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm <sup>2</sup> Solar cable; (+) ≥ 49.2 in (1250 mm), (-) ≥ 49.2 in (1250 mm)
Connector	Standard MC4; IP68



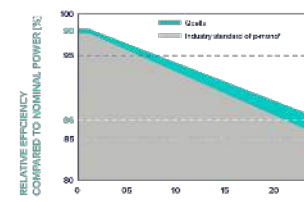
### Electrical Characteristics

POWER CLASS	385	390	395	400	405	410	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC <sup>1</sup> (POWER TOLERANCE +5W/-0W)							
Power at MPP <sup>2</sup>	P <sub>MPP</sub> [W]	385	390	395	400	405	410
Short Circuit Current <sup>1</sup>	I <sub>SC</sub> [A]	11.04	11.07	11.10	11.14	11.17	11.20
Open Circuit Voltage <sup>1</sup>	V <sub>OC</sub> [V]	45.19	45.23	45.27	45.30	45.34	45.37
Current at MPP	I <sub>MPP</sub> [A]	10.59	10.65	10.71	10.77	10.83	10.89
Voltage at MPP	V <sub>MPP</sub> [V]	36.36	36.62	36.88	37.13	37.39	37.64
Efficiency <sup>1</sup>	η [%]	≥ 19.6	≥ 19.9	≥ 20.1	≥ 20.4	≥ 20.6	≥ 20.9

MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT <sup>2</sup>							
Power at MPP	P <sub>MPP</sub> [W]	288.8	292.6	296.3	300.1	303.8	307.6
Short Circuit Current	I <sub>SC</sub> [A]	8.90	8.92	8.95	8.97	9.00	9.03
Open Circuit Voltage	V <sub>OC</sub> [V]	42.62	42.65	42.69	42.72	42.76	42.79
Current at MPP	I <sub>MPP</sub> [A]	8.35	8.41	8.46	8.51	8.57	8.62
Voltage at MPP	V <sub>MPP</sub> [V]	34.59	34.81	35.03	35.25	35.46	35.68

<sup>1</sup> Measurement tolerances P<sub>MPP</sub> ± 3%; I<sub>SC</sub>, V<sub>OC</sub> ± 5% at STC: 1000 W/m<sup>2</sup>, 25 ± 2 °C, AM 1.5 according to IEC 60904-3 - <sup>2</sup> 800 W/m<sup>2</sup>, NMOT, spectrum AM 1.5

### Qcells PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Qcells sales organisation of your respective country.

### TEMPERATURE COEFFICIENTS

Temperature Coefficient of I <sub>SC</sub>	α [%/K]	+0.04	Temperature Coefficient of V <sub>OC</sub>	β [%/K]	-0.27
Temperature Coefficient of P <sub>MPP</sub>	γ [%/K]	-0.34	Nominal Module Operating Temperature	NMOT [°F]	109 ± 5.4 (43 ± 3 °C)

### Properties for System Design

Maximum System Voltage	V <sub>SYST</sub> [V]	1000 (IEC)/1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI/UL 61730	TYPE 2
Max. Design Load, Push/Pull <sup>3</sup>	[lbs./ft <sup>2</sup> ]	75 (3600 Pa)/55 (2660 Pa)	Permitted Module Temperature on Continuous Duty	-40 °F up to +185 °F (-40 °C up to +85 °C)
Max. Test Load, Push/Pull <sup>3</sup>	[lbs./ft <sup>2</sup> ]	113 (5400 Pa)/84 (4000 Pa)		

<sup>3</sup> See Installation Manual

### Qualifications and Certificates

UL 61730, CE compliant, Quality Controlled PV - TÜV Rheinland, IEC 61215:2016, IEC 61730:2016, U.S. Patent No. 9,893,215 (solar cells).



Qcells pursues minimizing paper output in consideration of the global environment.

Note: Installation instructions must be followed. Contact our technical service for further information or approved installation of this product. Hanwha Q CELLS America Inc. 400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | TEL +1 949 748 59 961 | EMAIL: tqc.inquiry@qcells.com | WEB: www.qcells.com



Specifications subject to technical changes © Qcells Q.PEAK DUO BLK ML-G10+ series\_385-410\_2023-08\_Rev0.LNA



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COBY LAW - MS135162  
626 NW BRADY CIRCLE  
LAKE CITY, FL 32055  
3862340041

### PV SYSTEM INFORMATION

SYSTEM SIZE (DC) : 7.29 KW  
18 MODULES: HANWHA Q.PEAK DUO BLK ML-G10+ 405  
18 INVERTERS: ENPHASE IQ8PLUS-72-2-US

### PROJECT INFORMATION

INITIAL	DATE: 9/8/2023	DESIGNER: SR
REV:	DATE:	DESIGNER:
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## PANEL SPECS

# PV-1.4

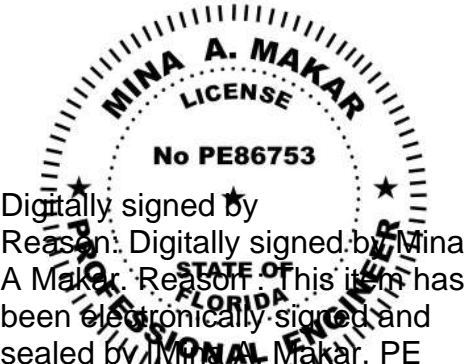
SCALE: 1/8" = 1'-0"

ROOF	PANEL COUNT	TILT	AZIMUTH	SHADING	LANDSCAPE MAX SPAN (ROOF AREA 1/2/3)	PORTRAIT MAX SPAN (ROOF AREA 1/2/3)	LANDSCAPE MAX CANTILEVER	PORTRAIT MAX CANTILEVER
R1	18	25°	159°	75%	48 /48 /48	48 /48 /48	16 /10 /10	16 /10 /10



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**SOLAR CONTRACTOR**

CAMERON CHRISTENSEN  
CERTIFIED SOLAR CONTRACTOR LICENSE NUMBER: CVC57036  
MOMENTUM SOLAR  
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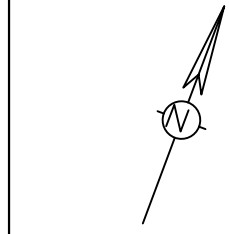
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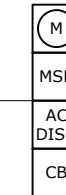
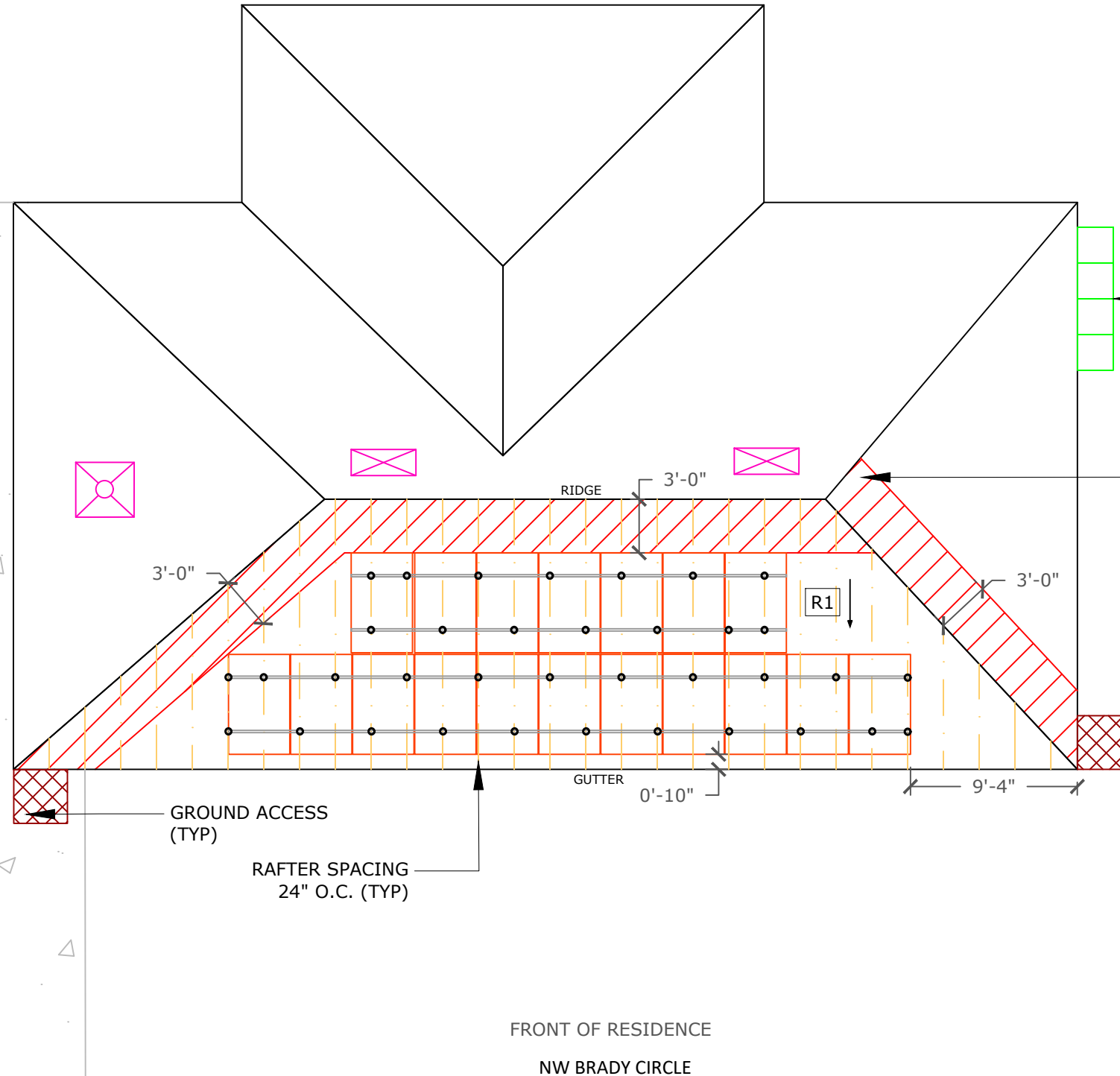
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**ROOF LAYOUT**

**PV-2**



DRIVEWAY



ELECTRICAL EQUIPMENT

FIRE SETBACK  
(36" VENTILATION,  
36" ROOF ACCESS)  
(TYP)

CLAMPING MAX SPACING IN ZONE 1 48" O.C  
AND IN ZONE 2 AND ZONE 3 48" O.C

TOTAL SQUARE FOOTAGE OF ROOF: 2410 SQFT

SQUARE FOOTAGE OF SOLAR ARRAY: 380.18 SQFT

PERCENTAGE OF SOLAR ROOF COVERAGE: 15.78%

18" RIDGE SETBACK SHALL BE REQUIRED

**SYMBOL LEGEND**

MSP	MAIN SERVICE PANEL	Chimney symbol	CHIMNEY
SP	SUB-PANEL	Skylight symbol	SKYLIGHT
M	UTILITY METER	Vent symbol	VENT
AC DISC	AC DISCONNECT	Pipe vent symbol	PIPE VENT
UDC	UTILITY DISCONNECT	Fan symbol	FAN
LC	LOAD CENTER	Satellite dish symbol	SATELLITE DISH
N3R	NEMA 3R BOX W/ ENVOY-S	Fire setbacks symbol	FIRE SETBACKS
CB	COMBINER BOX	Min 3'x3' ground access point symbol	MIN 3'x3' GROUND ACCESS POINT
Module symbol	MODULE	Pitch direction arrow	PITCH DIRECTION

WIND PRESSURE ZONE LINES. REFER TO PV-2.2 FOR ADDITIONAL INFO

**NOTE:**  
1. ROOF COVERING MATERIAL IS COMPOSED OF SINGLE LAYER ASPHALT COMPOSITE SHINGLE.  
2. EXACT ATTACHMENT LOCATION AND QUANTITY OF ATTACHMENTS ARE BASED ON EXISTING RAFTER LOCATIONS OBTAINED FROM FIELD MEASUREMENTS. THE LOCATION AND QUANTITY OF ATTACHMENTS MAY VARY BASED ON RAFTER LAYOUT START POINT, SPACING VARIATIONS AND ROOFING TYPE. VERIFY IN THE FIELD ALL RAFTER LOCATIONS AND ADJUST LAYOUT AS REQUIRED. A TILE ROOF WILL PRODUCE A STAGGERED ATTACHMENT LAYOUT BECAUSE OF EXISTING STAGGERED TILE JOINT LOCATIONS.

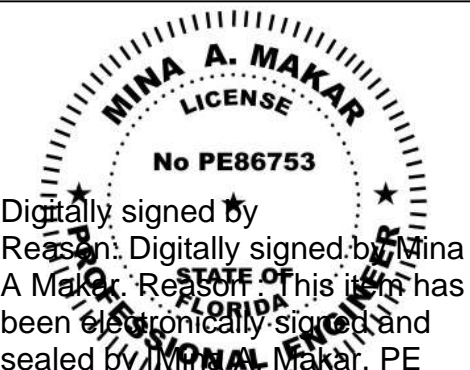
PV MODULE RATINGS		INVERTER RATINGS	
MODULE MAKE	HANWHA	INVERTER MAKE	ENPHASE
MODEL	Q.PEAK DUO BLK ML-G10+ 405	MODEL	IQ8PLUS-72-2-US
MAX POWER	405W	MAX OUTPUT POWER	290W
OPEN CIRCUIT VOLTAGE	45.34V	OPEN DC VOLTAGE	60V
MPP VOLTAGE	37.39V	NOMINAL AC VOLTAGE	240V
SHORT CIRCUIT CURRENT	11.17A	MAX AC CURRENT	1.21A
MPP CURRENT	10.83A	CEC INVERTER EFFICIENCY	97%
NUMBER OF MODULES	18	NUMBER OF INVERTERS	18
UL1703 COMPLIANT	YES	UL1703 COMPLIANT	YES

VOLTAGE DROP CALCULATIONS							
FORMULA USED PER NEC HANDBOOK 215.2(A)(4) WHERE APPLICABLE							
WIRE RUN	V <sub>mp</sub>	I <sub>mp</sub>	R	L (FT)	V <sub>o</sub>	% V <sub>o</sub>	WIRE SIZE
BRANCH TO J-BOX	240.00	10.89	1.98	59.25	2.555	1.06%	12 AWG
J-BOX TO LOAD CENTER	240.00	21.78	1.24	50.00	2.701	1.13%	10 AWG
LOAD CENTER TO AC DISCONNECT	240.00	27.225	0.778	3.00	0.127	0.05%	08 AWG
AC DISCONNECT TO INTERCONNECTION	240.00	27.225	0.778	10.00	0.424	0.18%	08 AWG



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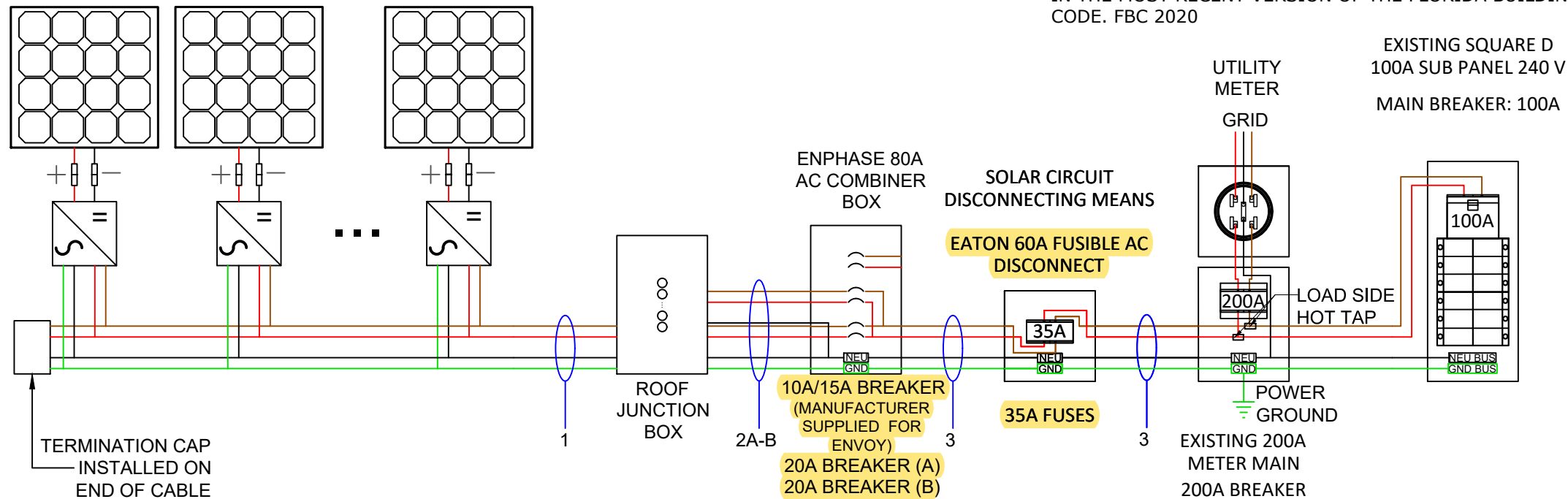
**NEC 705.12(B)(2)(3)(b) 120% RULE**  
 $(1.25 \times \text{INVERTER OUTPUT}) + \text{MAIN OCPD} \leq \text{BUS RATING} \times 1.20$   
 $(1.25 \times 21.78) + 200 \leq 200 \times 1.20$

**FSEC CERTIFICATION STATEMENT:**  
PER FL. STATUE 377.705 , I, MINA A. MAKAR PE# 86753, CERTIFICATE OF AUTHORIZATION #33404, AN ENGINEER LICENSED PURSUANT TO CHAPTER 471, CERTIFY THAT THE PV ELECTRICAL SYSTEM AND ELECTRICAL COMPONENTS ARE DESIGNED AND APPROVED USING THE STANDARDS CONTAINED IN THE MOST RECENT VERSION OF THE FLORIDA BUILDING CODE. FBC 2020

THIS SOLAR PHOTOVOLTAIC SYSTEM COMPLIES WITH THE 2020 FLORIDA BUILDING CODE AND THE 2017 NATIONAL ELECTRICAL CODE

18 HANWHA Q.PEAK DUO BLK ML-G10+ 405 405W MODULES PAIRED WITH  
18 ENPHASE IQ8PLUS-72-2-US MICRO-INVERTERS

BRANCH CIRCUIT A  
9 MICRO-INVERTERS  
BRANCH CIRCUIT B  
9 MICRO-INVERTERS



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Wire Tag	Conduit	Wire Qty	Wire Gauge	Wire Type	Temp. Rating	Wire Ampacity (A)	Temp. Derate	Conduit Fill Derate	Derated Ampacity (A)	Inverter Qty	NOC (A)	NEC Correction	Design Current (A)	Ground Size	Ground Wire Type
1	OPEN AIR	2	12 AWG	Trunk Cable	90°C	30	0.96	1	28.80	9	1.21	1.25	13.61	12 AWG	Trunk Cable
2A	3/4" PVC	4	10 AWG	THWN-2	75°C	35	0.96	0.8	26.88	9	1.21	1.25	13.61	08 AWG	THWN-2
2B			10 AWG	THWN-2	75°C	35	0.96								
3	3/4" PVC	3 + G	08 AWG	THWN-2	75°C	50	0.96	1	48.00	18	1.21	1.25	27.23	08 AWG	THWN-2

NOTE: LETTER "G" IN WIRE QTY TAB STANDS FOR GROUNDING CONDUCTOR.

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**THREE LINE DIAGRAM**

**PV-3**

**ELECTRICAL NOTES:**

- ALL CALCULATIONS FOR VOC, VMAX, IMP AND ISC HAVE BEEN CALCULATED USING THE MANUFACTURED STRING CALCULATOR BASED ON ASHRAE 2% HIGH AND EXTREME MINIMUM TEMPERATURE COEFFICIENTS.
- THE ENTIRE ARRAY IS BONDED ACCORDING TO (NEC 690.46 - 250.120 PARAGRAPH C). THE GROUND IS CARRIED AWAY FROM THE GROUNDING LUG USING #6 BARE COPPER WIRE OR #8 THWN-2 COPPER WIRE.
- THIS SYSTEM COMPLIES WITH NEC 2017
- BRANCH CIRCUIT CALCULATION FOR WIRE TAG 1 DISPLAYS THE LARGEST BRANCH CIRCUIT IN SYSTEM. OTHER BRANCH CIRCUITS SHALL HAVE LOWER DESIGN CURRENT THAN THE ONE SHOWN. IN ADDITION, VOLTAGE DROP CALCULATIONS FROM PANELS TO THE COMBINER BOX SHALL BE SHOWN IN A SIMILAR FASHION
- ALL CONDUCTORS ARE SIZED BASED ON NEC 2017 ARTICLE 310
- ALL EQUIPMENT INSTALLED IS RATED AT 75°C
- INVERTER NOC (NOMINAL OPEN CURRENT) OBTAINED FROM EQUIPMENT DATASHEET
- CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLYING WITH ALL LOCAL AND NATIONAL CODE REQUIREMENTS.
- EACH MODULE MUST BE GROUNDED ACCORDING TO USER INSTRUCTIONS
- ALL EQUIPMENT SHALL BE LISTED PER NEC 690.4(B)
- PER NEC 690.13, 690.15, PROVIDE A WARNING SIGN AT ALL LOCATIONS WHERE TERMINALS OF THE DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION> SIGN SHALL READ \*WARNING - ELECTRIC SHOCK HAZARD - DO NOT TOUCH TERMINALS - OR EQUIVALENT.
- PER NEC 705.10, PROVIDE A PERMANENT PLAQUE OR DIRECTORY SHOWING ALL ELECTRIC POWER SOURCES ON THE PREMISES AT SERVICE ENTRANCE.
- INTERCONNECTION METHOD SHALL COMPLY WITH NEC 705.12
- AND OPTION FOR A SINGLE CIRCUIT BRANCH TO BE SPLIT INTO TWO SUB-CIRCUIT BRANCHES IS ACCEPTABLE.
- ALL CONDUCTORS MUST BE COPPER.
- NEUTRAL AND EQUIPMENT GROUNDING CONDUCTOR BONDED AS PER NEC 250.24(C).
- EQUIPMENT GROUNDING CONDUCTOR IS CONNECTED TO A GROUNDING ELECTRODE SYSTEM PER 250.54(D).
- FUSES FOR PV DISCONNECT HAVE AIC RATINGS OF 200KA AC AND 20KA DC.
- SUPPLY SIDE CONNECTION SHALL BE MADE USING ILSKO INSULATION PIERCING CONNECTORS (IPC). MAKE, MODEL, AND RATING OF INTERCONNECTION CAN BE SEEN ON TABLE 1 BELOW.
- METHOD OF INTERCONNECTION CAN BE SEEN IN FIGURE 1.
- UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.

- WORKING CLEARANCES AROUND THE EXISTING AND NEW ELECTRICAL EQUIPMENT WILL BE MAINTAINED IN ACCORDANCE WITH NEC ARTICLE 110.26.
- CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C)(1) AND ARTICLE 310.8 (D).
- CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C).
- TOTAL AREA OF ALL CONDUCTORS, SPLICES, AND TAPS INSTALLED AT ANY CROSS SECTION OF THE WIRING DOES NOT EXCEED 75% OF THE CROSS SECTIONAL AREA OF THE SPACE. NEC 312.8(A)(2).
- SYSTEM IS CONSIDERED AN AC MODULE SYSTEM. NO DC CONDUCTORS ARE PRESENT IN CONDUIT, COMBINER, JUNCTION BOX, DISCONNECT. AND COMPLIES WITH 690.6 - NO DC DISCONNECT AND ASSOCIATED DC LABELING ARE REQUIRED.
- SYSTEM COMPLIES WITH 690.12 RAPID SHUTDOWN AND ASSOCIATED LABELING AS PER 690.56(C). AC VOLTAGE AND SYSTEM OPERATING CURRENT SHALL BE PROVIDED 690.52.
- CONDUCTORS IN CONDUIT ARE AC CONDUCTORS BRANCH CIRCUITS AND NOT PV SOURCE CIRCUITS. 690.6.
- ALL GROUNDING SHALL COMPLY WITH 690.47(A) IN THAT THE AC MODULES WILL COMPLY WITH 250.64.
- NO TERMINALS SHALL BE ENERGIZED IN THE OPEN POSITION IN THIS AC MODULE SYSTEM 690.13, 690.15, 690.6.
- WHERE APPLICABLE: INTERCONNECTION SHALL COMPLY WITH 705.12(A) OR 705.12(B)
- ALL WARNING SIGN(S) OR LABEL(S) SHALL COMPLY WITH 2017 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.
- PV POWER CIRCUIT LABELS SHALL APPEAR ON EVERY SECTION OF THE WIRING SYSTEM THAT IS SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.

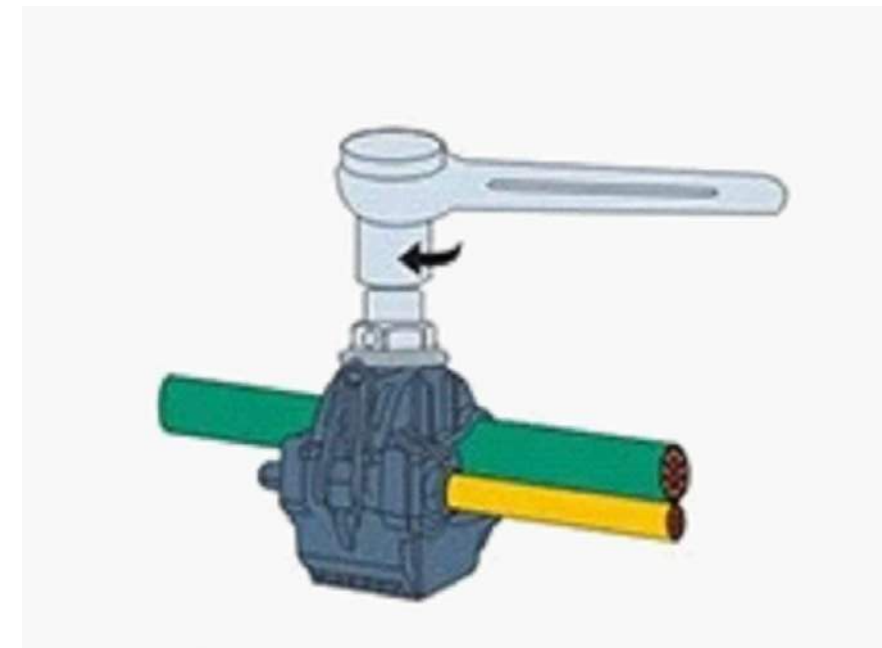
**TABLE 1:**

MAKE	MODEL	VOLTAGE RATING	CONDUCTOR RANGE MAIN	CONDUCTOR RANGE TAP
ILSCO	IPC 4006	600 V	4/0-4 AWG	6-14 AWG
ILSCO	IPC 4020	600 V	4/0-2 AWG	2/0-6 AWG

**INSTRUCTIONS FOR LINE TAPS**

**FIGURE 1:**

- ADJUST THE CONNECTOR NUT TO SUITABLE LOCATION
- PUT THE BRANCH WIRE INTO THE CAP SHEATH FULLY
- INSERT THE MAIN WIRE, IF THERE ARE TWO LAYS OF INSULATED LAY IN THE MAIN CABLE, SHOULD STRIP A CERTAIN LENGTH OF THE FIRST INSULATED LAY FROM INSERTED END
- TURN THE NUT BY HAND, AND FIX THE CONNECTOR IN SUITABLE LOCATION.
- SCREW THE NUT WITH THE SLEEVE SPANNER.
- SCREW THE NUT CONTINUALLY UNTIL THE TOP PART IS CRACKED AND DROPPED DOWN



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**MINA A. MAKAR**  
LICENSE  
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**ELECTRICAL CONT.**

**PV-3.1**

