

July 30, 2024

EnergyOne Renewables 1333 North-West Vivion Road, Suite 101 Kansas City, MO, 64118

> Re: Engineering Services Koschmann Residence 2417 SW River Trail Road, Lee's Summit, MO 6.150 kW System

To Whom It May Concern:

We have received information regarding solar panel installation on the roof of the above referenced structure. Our evaluation of the structure is to verify the existing capacity of the roof system and its ability to support the additional loads imposed by the proposed solar system.

A. Site Assessment Information

- 1. Site visit documentation identifying attic information including size and spacing of framing for the existing roof structure.
- 2. Design drawings of the proposed system including a site plan, roof plan and connection details for the solar panels. This information will be utilized for approval and construction of the proposed system.

B. Description of Structure:

Roof Framing: 2x6 dimensional lumber at 16" on center with a purlin support near midspan.
Roof Framing: 2x6 dimensional lumber at 16" on center.
Roof Material: Composite Asphalt Shingles
Roof Slope: 20 degrees
Attic Access: Accessible
Foundation: Permanent

C. Loading Criteria Used

- Dead Load
 - Existing Roofing and framing = 7 psf
 - New Solar Panels and Racking = 3 psf
 - TOTAL = 10 PSF
- Live Load = 20 psf (reducible) 0 psf at locations of solar panels
- Ground Snow Load = 20 psf
- Wind Load based on ASCE 7-16
 - Ultimate Wind Speed = 109 mph (based on Risk Category II)
 - Exposure Category C

Analysis performed of the existing roof structure utilizing the above loading criteria is in accordance with the 2018 International Residential Code, including provisions allowing existing structures to not require strengthening if the new loads do not exceed existing design loads by 105% for gravity elements and 110% for seismic elements. This analysis indicates that the existing framing will support the additional panel loading without damage, if installed correctly.

D. Solar Panel Anchorage

- 1. The solar panels shall be mounted in accordance with the most recent Sunmodo installation manual. If during solar panel installation, the roof framing members appear unstable or deflect non-uniformly, our office should be notified before proceeding with the installation.
- 2. The maximum allowable withdrawal force for an M8x115 hex lag bolt is 229 lbs per inch of penetration as identified in the National Design Standards (NDS) of timber construction specifications. Based on a minimum penetration depth of 2½", the allowable capacity per connection is greater than the design withdrawal force (demand). Considering the variable factors for the existing roof framing and installation tolerances, the connection using one M8x115 hex lag bolt with a minimum of 2½" embedment will be adequate and will include a sufficient factor of safety.
- Considering the wind speed, roof slopes, size and spacing of framing members, and condition of the roof, the panel supports shall be placed no greater than 48" on center.

Based on the above evaluation, this office certifies that with the racking and mounting specified, the existing roof system will adequately support the additional loading imposed by the solar system. This evaluation is in conformance with the 2018 IRC, current industry standards, and is based on information supplied to us at the time of this report.

Should you have any questions regarding the above or if you require further information do not hesitate to contact me.

trulv vours

Scott E. Wyssling, PE Missouri License No. 2010011786 Missouri COA No. 2020037943



Signed 7/30/2024



NEW PV SYSTEM DESIGN

15 MODULES - 6.150 kW DC, 5.120 kW AC SYSTEM SIZE

KOSCHMANN RESIDENCE - 2417 SOUTHWEST RIVER TRAIL ROAD, LEE'S SUMMIT, MO



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SCOPE OF WORK

SYSTEM SIZE: 6.150kW DC / 5.120kW AC SYSTEM SIZE PV MODULE: (15) MSOLAR 410 108BB INVERTER: (8) AP DS 3-S COMBINER: (1) 125A LOAD CENTER AC DISCONNECT: (1) 60A FUSED AC DISCONNECT PV PRODUCTION METER: (1) 200A PV PRODUCTION METER

GENERAL NOTES

- 1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND REVIEW ALL MANUFACTURER INSTALLATION DOCUMENTS PRIOR TO INITIATING CONSTRUCTION.
- 2. ALL COMPONENTS SHALL BE NEW AND LISTED BY A RECOGNIZED ELECTRICAL TESTING LABORATORY AND LISTED FOR THEIR SPECIFIC APPLICATION.
- 3. OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED OR BETTER.
- 4. ACCESS TO ELECTRICAL COMPONENTS OVER 150 VOLTS TO GROUND SHALL BE RESTRICTED TO QUALIFIED PERSONNEL.
- 5. CONTRACTOR SHALL OBTAIN ELECTRICAL PERMITS PRIOR TO INSTALLATION AND SHALL COORDINATE ALL INSPECTIONS, TESTING COMMISSIONING, AND ACCEPTANCE WITH THE HOMEOWNER, UTILITY CO. AND CITY INSPECTORS AS NEEDED.
- 6. EACH MODULE TO BE GROUNDED USING THE SUPPLIED CONNECTION POINT PER THE MANUFACTURER'S REQUIREMENTS. ALL PV MODULES, EQUIPMENT, AND METALLIC COMPONENTS ARE TO BE BONDED. IF THE EXISTING GROUNDING ELECTRODE SYSTEM CANNOT BE VERIFIED OR IS ONLY METALLIC WATER PIPING, IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE.
- 7. DC CONDUCTORS SHALL BE RUN IN EMT AND/OR MC (METAL CLAD CABLE) AND SHALL BE LABELED. ALL DC CONDUCTORS RUN INSIDE OF THE STRUCTURE SHALL BE INSTALLED A MINIMUM OF 18" BELOW THE ROOF DECK.
- 8. EXPOSED NON-CURRENT CARRYING METAL PARTS OF ELECTRICAL EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH APPLICABLE NEC.
- 9. CONFIRM LINE SIDE VOLTAGE AT THE ELECTRIC UTILITY SERVICE PRIOR TO CONNECTING INVERTER. VERIFY SERVICE VOLTAGE IS WITHIN INVERTER VOLTAGE OPERATIONAL RANGE.
- 10. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER CODE.
- 11. ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE, AND FOR ROOF-MOUNTED SYSTEMS, WIRING MUST BE PERMANENTLY AND COMPLETELY HELD OFF OF THE ROOF SURFACE.
- 12. ALL ROOF PENETRATIONS MUST BE SEALED OR FLASHED.
- 13. EQUIPMENT MAY BE SUBSTITUTED FOR SIMILAR EQUIPMENT BASED ON AVAILABILITY, SUBSTITUTED EQUIPMENT SHALL COMPLY WITH DESIGN CRITERIA.
- 14. REMOVAL OF AN INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BONDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR AND THE PHOTOVOLTAIC SOURCE AND/OR OUTPUT CIRCUIT GROUNDED CONDUCTORS.
- 15. WHENEVER A DISCREPANCY IN THE QUALITY OF EQUIPMENT ARISES ON THE DRAWING OR SPECIFICATIONS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL MATERIAL AND SERVICES REQUIRED BY THE STRICTEST CONDITIONS NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS TO ENSURE COMPLETE COMPLIANCE AND LONGEVITY OF THE OPERABLE SYSTEM REQUIRED BY THE ENGINEERS.

ROOF STORIES: 2 ROOF TYPE(S): COMP SHINGLE MOUNTING(S) & RACKING(S): (39) SUNMODO NANOMOUNTS (ROOF MOUNT) \

INTERCONNECTION: LINE SIDE TAP MAIN SERVICE PANEL RATING: (E) 200A MAIN BREAKER RATING: (E) 200A

GOVERNING CODES

2017 NATIONAL ELECTRIC CODE 2018 INTERNATIONAL BUILDING CODE 2018 INTERNATIONAL RESIDENTIAL CODE 2018 INTERNATIONAL FIRE CODE 2018 INTERNATIONAL FUEL GAS CODE 2018 INTERNATIONAL EXISTING BUILDING CODE 2018 INTERNATIONAL ENERGY CONSERVATION CODE 2018 INTERNATIONAL MECHANICAL CODE 2018 INTERNATIONAL PLUMBING CODE

AS ADOPTED BY LEE'S SUMMIT INCLUDING ANY AMENDMENTS OR ADDITIONAL LISTED REQUIREMENTS. DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF EVERGY UTILITY.

DESIGN CRITERIA

WIND SPEED: 109 MPH	
GROUND SNOW LOAD: 20 PSF	Γ
ASCE: 7-16	
EXPOSURE CATEGORY: C	
BUILDING OCCUPANCY: R-2	
CONSTRUCTION TYPE: TYPE I-B	
SPRINKLERS: NO	F

		DESIGN ENGINEER		
		CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE		
	11, IVIO 64082	76 N. MEADOWBROOK DRIVE ALPINE UT 84004 swyssling@wysslingconsulting.com (201) 874-3483 COA NO. 2020037943		
		SOLAR COMPANY/CLIENT		
		ENERGYONE 1333 NW VIVION RD STE 101 KANSAS CITY, MO		
1 SIZE		KOSCHMANN RESIDENCE 2417 SOUTHWEST RIVER TRAIL ROAD LEE'S SUMMIT, MO 64082		
CT ION METER		COVER PAGE		
NOMOUNTS (ROOF MOUNT) WITH SMR 100 RAIL	NUMBER PE-2019011786		
		Signed 7/30/2024		
AMENDMENTS OR D IN ACCORDANCE WITH THE		SCOTT E WYSSLING, PE MO LICENSE NO 2019011786		
		DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW		
DATE	REVISION			
		D\/_4		
		PV-1 AHJ: LEE'S SUMMIT		
		PV-1 AHJ: LEE'S SUMMIT UTILITY: EVERGY		

		-		ROOF DESCRIPTIO	N				
ROOF #	ROOF TYPE	TILT	AZIMUTH	ROOF FRAMING	MODULE COUNT	ARRAY SQ. FT.	ATTACHMENT	MIN EMBEDMENT	
1	COMP SHINGLE	20°	165°	2X6@16" O.C. RAFTERS	12	252.23	(1) M8X115 LAG SCREW	2.5"	
2	COMP SHINGLE	20°	255°	2X6@16" O.C. RAFTERS	3	63.06	(1) M8X115 LAG SCREW	2.5"	٠
		_							
TOTAL RO	OOF AREA SQ. FT.	2	334.31	TOTAL ARRAY SQ. F	Т.	315.29	ROOF COVER %	13.51	

2417 SOUTHWEST RIVER TRAIL ROAD



REQUIRED ELECTRICAL CLEARANCE TO BE MAINTAINED 5.

Λ

MODULE

TYPE

MODULE

WEIGHT

MODULE

DIMENSIONS

UNIT WEIGHT

OF ARRAY

SYSTEM INFORMATION

LEGEND

MSolar 410 108BB

46.3 LBS

67.80" x 44.65"

2.20 PSF

4.

5.

DESIGN ENGINEER



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(201) 874-3483 COA NO. 2020037943

SOLAR COMPANY/CLIENT



ENERGYONE 1333 NW VIVION RD STE 101 KANSAS CITY, MO

KOSCHMANN RESIDENCE

2417 SOUTHWEST RIVER TRAIL ROAD LEE'S SUMMIT, MO 64082

SITE PLAN



Signed 7/30/2024

SCOTT E WYSSLING, PE MO LICENSE NO 2019011786

DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW

PV-2

AHJ: UTILITY: DRAWN BY: MAS

LEE'S SUMMIT EVERGY

DATE: 07/30/2024

ATTACHMENT DIAGRAM MAX ATTACHMENT SPACING SHALL ATTACHMENTS SHALL BE STAGGERED



NTS

DESIGN ENGINEER



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SOLAR COMPANY/CLIENT



ENERGYONE 1333 NW VIVION RD STE 101 KANSAS CITY, MO

KOSCHMANN RESIDENCE 2417 SOUTHWEST RIVER TRAIL ROAD LEE'S SUMMIT, MO 64082

MOUNTING DETAILS



Signed 7/30/2024

SCOTT E WYSSLING, PE MO LICENSE NO 2019011786

DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW

PV-3

AHJ: UTILITY:

LEE'S SUMMIT EVERGY

DRAWN BY: MAS DATE: 07/30/2024

NTS





		DESIGN ENGINEER
NG TABLE	MINIMUM	
15(B)(16)	OCPD	VECTING
30	20	VYISSLING
30	20	V V CONSULTING A
65	30	CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE
65	30	CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE 76 N. MEADOWBROOK DRIVE ALPINE UT 84004 Swyssling@wysslingconsulting.com (201) 874-3483 COA NO. 2020037943 SOLAR COMPANY/CLIENT ENERGYONE 1333 NW VIVION RD STE 101 KANSAS CITY, MO KOSCHMANN RESIDENCE 2417 SOUTHWEST RIVER TRAIL ROAD LEE'S SUMMIT, MO 64082
		THREE LINE DIAGRAM
EVER 120/24 PHAS 3-WIF	GY METER 40V SINGLE SE RE	
		DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW
D ec		DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW PV-4
		DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW PV-4 AHJ: LEF'S SUMMIT
		DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW PV-4 AHJ: LEE'S SUMMIT UTILITY: EVERGY
GROUND DROD +		DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW PV-4 AHJ: LEE'S SUMMIT UTILITY: EVERGY DRAWN BY: MAS

DATE:

07/30/2024

PV MC	DULE	INVERTER		
MODEL	MSOLAR 410 108BB	MODEL	AP DS 3-S	
PMAX	410W	MAX INPUT DC VOLTAGE	60V	
VOC	35.23V	MAX DC CURRENT	16A	
VMP	31.45V	MAX OUTPUT POWER	640W	
IMP	13.04A	MAXIMUM CONT. OUTPUT CURRENT	2.66A	
ISC	13.95A	CEC EFFICIENCY	0.97	

GENERAL ELECTRICAL NOTES

- CONDUIT A AND B AMPS EQUAL TO LARGEST STRING ON TAG. 1
- CONDUIT A SHALL BE RUN THROUGH ATTIC IF POSSIBLE. 2
- EQUIPMENT MAY BE SUBSTITUTED FOR SIMILAR EQUIPMENT BASED ON AVAILABILITY, SUBSTITUTED EQUIPMENT SHALL COMPLY WITH DESIGN CRITERIA. WIRE SIZES ARE BASED ON MINIMUMS AND ARE NOT 3 MEANT TO LIMIT UPSIZING AS REQUIRED BY FIELD CONDITIONS/AVAILABILITY.
- WIRING SHALL COMPLY WITH MAXIMUM CONTINUOUS CURRENT OUTPUT AT 25°C AND MAXIMUM VOLTAGE AT 600V: WIRE SHALL BE WET RATED AT 90°C.
- EXPOSED PHOTOVOLTAIC SYSTEM CONDUCTORS ON THE ROOF WILL BE TYPE 2 OR PV-TYPE WIRE. 5
- PHOTOVOLTAIC SYSTEM CONDUCTORS SHALL BE IDENTIFIED AND GROUPED. THE MEANS OF IDENTIFICATION SHALL BE PERMITTED BY SEPARATE COLOR-CODING, MARKING TAPE, TAGGING OR OTHER APPROVED. 6. MEANS.
- ALL CONDUCTORS AND TERMINATIONS SHALL BE RATED FOR INSTALL LOCATION 7
- ALL EXTERIOR CONDUIT, FITTINGS, AND BOXES SHALL BE RAIN-TIGHT AND APPROVED FOR USE IN WET LOCATIONS. 8
- ALL METALLIC RACEWAYS AND EQUIPMENT SHALL BE BONDED AND ELECTRICALLY CONTINUOUS. 9
- 10. WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, CONTRACTOR SHALL SIZE THEM ACCORDING TO APPLICABLE CODES.
- 11. REMOVAL OF A UTILITY-INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BUILDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR AND THE PV SOURCE AND/OR OUTPUT CIRCUIT GROUNDED CONDUCTOR.
- FOR GROUNDED SYSTEMS, THE PHOTOVOLTAIC SOURCE AND OUTPUT CIRCUITS SHALL BE PROVIDED WITH A GROUND-FAULT PROTECTION DEVICE OR SYSTEM THAT DETECTS A GROUND FAULT, INDICATES THAT 12. FAULT HAS OCCURRED, AND AUTOMATICALLY DISCONNECTS ALL CONDUCTORS OR CAUSES THE INVERTER TO AUTOMATICALLY CEASE SUPPLYING POWER TO OUTPUT CIRCUITS.
- FOR UNGROUNDED SYSTEMS, THE INVERTER IS EQUIPPED WITH GROUND FAULT PROTECTION AND A GFI FUSE PORT FOR GROUND FAULT INDICATION. 13
- 14. PV MODULE FRAMES SHALL BE BONDED TO RACKING RAIL OR BARE COPPER GEC/GEC PER THE MODULE MANUFACTURER'S LISTED INSTRUCTION SHEET.
- 15. PV MODULE RACKING RAIL SHALL BE BONDED TO BARE COPPER GEC VIA WEEB LUG, IL SCO GBL-4DBT LAY IN LUG, OR EQUIVALENT LISTED LUG.
- 16 THE PHOTOVOLTAIC INVERTER WILL BE LISTED AS AUL 1741 COMPLIANT.
- 17. RACKING AND BONDING SYSTEM TO BE UL2703 RATED.
- 18. ANY REQUIRED GROUNDING ELECTRODE CONDUCTOR WILL BE CONTINUOUS, EXCEPT FOR SPLICES OR JOINTS AS BUSBARS WITHIN LISTED EQUIPMENT
- 19. WHEN BACKFEED BREAKER IS THE METHOD OF UTILITY INTERCONNECTION, THE BREAKERS SHALL NOT READ "LINE AND LOAD."
- 20. WHEN APPLYING THE 120% RULE, THE SOLAR BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUSBAR FROM THE MAIN BREAKER.
- 21. THE WORKING CLEARANCE AROUND THE EXISTING ELECTRICAL EQUIPMENT AS WELL AS THE NEW ELECTRICAL EQUIPMENT WILL BE MAINTAINED.
- 22. LISTED CONDUIT AND CONDUCTOR SIZES ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UPSIZING AS REQUIRED BY FIELD CONDITIONS/AVAILABILITY.
- 23. AP DS 3-S INVERTERS HAVE INTEGRATED GROUND AND DOUBLE INSULATION. NO GEG OR EGC IS REQUIRED. THE DC CIRCUIT IS ISOLATED AND INSULATED FROM GROUND AND MEETS THE REQUIREMENTS OF NEC.
- 24. CALCULATIONS ARE BASED ON A) ASHRAE 2# AVERAGE HIGH = 32°C B)NEC TABLE 310.15(B)2(a) 75° DERATE FACTOR = .96 C) NEC TABLE NEC 310.15(B)(16) 75°C.
- 25. SUPPLEMENTAL GROUNDING ELECTRODE TO BE INSTALLED NO CLOSER THAN 6' FROM EXISTING WHEN REQUIRED. NEC 250.53(A)(2) DOES NOT REQUIRE IT IF CONTRACTOR CAN PROVE THAT A SINGLE ROD HAS A RESISTANCE TO EARTH OF 25 OHMS OR LESS.

INTERCON

BACK FE REQUIR MINIMUM I RATIN

INECTIC 705.12 (I	DN PER NEC B)
ED ED	26.6A
FUSE G	30A

DESIGN ENGINEER



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KOSCHMANN RESIDENCE 2417 SOUTHWEST RIVER TRAIL ROAD LEE'S SUMMIT, MO 64082

ELECTRICAL NOTES

DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW

PV-5

AHJ: UTILITY:

LEE'S SUMMIT EVERGY

DATE: 07/30/2024

DRAWN BY: MAS

PHOTOVOLTAIC AC DISCONNECTMAXIMUM AC OPERATING CURRENT:21.28NOMINAL OPERATING AC VOLTAGE:240	AT POINT OF INTERCONNECTION, MARKED AT DISCONNECTING MEANS [NEC 690.54]	EXPARTING THE EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUISBAR	PERMANENT WARNING LABELS SHALL BE APPLIED TO DISTRIBUTION EQUIPMENT	
MAIN PHOTOVOLTAIC SYSTEM DISCONNECT	AT POINT OF INTERCONNECTION [NEC 705.12(C),690.59] EACH PV SYSTEM DISCONNECTING MEANS SHALL PLAINLY INDICATE WHETHER IN THE OPEN (OFF) OR CLOSED	EXPARTING INVERTER OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE	A PERMANENT WARNING LABEL SHALL BE APPLIED TO THE DISTRIBUTION EQUIPMENT ADJACENT TO THE BACK-FED BREAKER FROM THE INVERTER [NEC 705.12(B)(3)(2)]	
	(ON) POSITION AND BE PERMANENTLY MARKED [NEC 690.13(B)] AT EACH DC DISCONNECTING	SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN	FOR PV SYSTEMS THAT SHUT DOWN THE ARRAY AND CONDUCTORS LEAVING THE ARRAY: THE TITLE "SOLAR PV SYSTEM IS FOUIPPED WITH	
DC DISCONNECT	MEANS [NEC 690.13(B)]	OFF POSITION TO SHUTDOWN PV SYSTEM AND REDUCE SHOCK HAZRRD IN ARRAY	RAPID SHUTDOWN" SHALL UTILIZED CAPITALIZED CHARACTERS WITH A MINIMUM HEIGHT OF 3/8 IN. IN BLACK ON YEI I OW BACKGROUND, AND	
PHOTOVOLTAIC AC DISCONNECT	AT EACH AC DISCONNECTING MEANS [NEC 690.13(B)]		THE REMAINING CHARACTERS SHALL BE CAPITALIZED WITH A MINIMUM HEIGHT OF 3/16 IN. IN BLACK ON WHITE BACKGROUND [NEC 690.56(C)(1)(A)]	
WARNING: PHOTOVOLTAIC POWER SOURCE	AT EXPOSED RACEWAYS, CABLE TRAYS, AND OTHER WIRING METHODS; SPACED AT MAXIMUM 10 FT SECTION OR WHERE SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS [NEC 690.31(D)(2)]	RAPID SHUTDOWN SWITCH FOR SOLAR PV	A RAPID SHUTDOWN SWITCH SHALL HAVE A LABELED LOCATED ON OR NO MORE THAN 8 FT FROM THE SWITCH THAT INCLUDES THIS WORDING. THE LABEL SHALL BE REFLECTIVE, WITH ALL LETTERS CAPITALIZED AND HAVING A MINIMUM HEIGHT OF	
AWARNING ELECTRICAL SHOCK HAZARD	AT BUILDING OR STRUCTURE MAIN DISCONNECTING MEANS [NEC 690.12(E), NEC 690.13(B)]		3/8 IN., IN WHITE ON RED BACKGROUND [NEC 690.58(C)(2)]	
DO NO TOUCH TERMINALS TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION		CAUTION: DO NOT INSTALL ADDITIONAL LOADS IN THIS PANEL	PLACE LABEL AT MAIN SERVICE PANEL	
A WARNING	AT AC COMBINER PANEL [NEC 690.13(B)]	▲ WARNING	PLACE LABEL AT MAIN SERVICE PANEL	LADELING NOTES.
PHOTOVOLTAIC SYSTEM COMBINER PANEL DO NOT ADD LOADS		THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUSBAR.		1. LABELS CALLED OUT ACCORDING TO AL CONFIGURATIONS. ELECTRICIAN TO DET REQUIREMENTS IN THE FIELD PER CURF CODES AND MAKE APPROPRIATE ADJUST
				2. LABELING REQUIREMENTS BASED ON TH CODE, OSHA STANDARD 19010.145, ANS
				3. MATERIAL BASED ON THE REQUIREMENT HAVING JURISDICTION.

- 4. LABELS TO BE OF SUFFICIENT DURABILIT ENVIRONMENT INVOLVED [NEC 110.21] TI PERMANENTLY ATTACHED, WEATHER/SL AND SHALL NOT BE HAND WRITTEN PER
- APPLICABLE LABELS TO BE A MINIMUM L WHITE ON RED BACKGROUND; REFLECT AFFIXED [IFC 605.11.1.1]

	DESIGN ENGINEER
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	ENERGYONE 1333 NW VIVION RD STE 101 KANSAS CITY, MO
	KOSCHMANN RESIDENCE 2417 SOUTHWEST RIVER TRAIL ROAD LEE'S SUMMIT, MO 64082
	LABELS
LL COMMON TERMINE EXACT RENT NEC AND LOCAL STMENTS.	
HE NATIONAL ELECTRIC 81 Z535.	
ITS OF THE AUTHORITY	
ITY TO WITHSTAND THE THEY SHALL BE SUNLIGHT RESISTANT, R NEC 110.21(B)	DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW
LETTER HEIGHT OF 3/8".	PV-6
TIVE, AND PERMANENTLY	AHJ: LEE'S SUMMIT UTILITY: EVERGY
	DRAWN BY: MAS DATE: 07/30/2024



LOCATION: MSP NEC 705.10

DESIGN ENGINEER
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SOLAR COMPANY/CLIENT Energy Energy En
KOSCHMANN RESIDENCE 2417 SOUTHWEST RIVER TRAIL ROAD LEE'S SUMMIT, MO 64082
PLACARD
DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW
PV-6.1
AHJ: LEE'S SUMMIT UTILITY: EVERGY
DRAWN BY: MAS











CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE
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KOSCHMANN RESIDENCE 2417 SOUTHWEST RIVER TRAIL ROAD LEE'S SUMMIT, MO 64082
SITE PHOTOS
DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW
DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW PV-7
DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW PV-7 AHJ: LEE'S SUMMIT UTILITY: EVERGY

2 STRINGS OF MODULES

MODULE: (15) MSOLAR 410 108BB INVERTER: (8) AP DS 3-S COMBINER: (1) 125A LOAD CENTER

STRING 1: (8) MODULES STRING 2: (7) MODULES



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ALPINE UT 84004 swyssling@wysslingconsulting.com (201) 874-3483 COA NO. 2020037943
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KOSCHMANN RESIDENCE 2417 SOUTHWEST RIVER TRAIL ROAD LEE'S SUMMIT, MO 64082
STRING PLAN
DC SYSTEM SIZE: 6.150kW AC SYSTEM SIZE: 5.120kW
PV-8
AHJ: LEE'S SUMMIT UTILITY: EVERGY
DRAWN BY: MAS DATE: 07/30/2024

msolar



108BB 410W **HC** Series

mSolar 10BB Half-Cell Black Monocrystalline PERC PV Module



108BB 410W HC Series | msolar 10BB Half-Cell, All-Black Monocrystalline PERC PV Module

Dimensions (MM)

Front

1134

Barcod

1134±2

Flectrical Characteristics STC	*	r	
Module Type	TXI10-40010888	TX110-405108BB	TXI10-410108PB
Nominal Power Watt Pmax (W/)*	400	405	410
Power Output Telerance Pmax (W)	400	405	410
Power Output Tolerance Pmax (W)	0~+5	0~+5	0~+5
Maximum Power Voltage Vmp (V)	31.01	31.21	31.45
Maximum Power Current Imp (A)	12.90	12.98	13.04
Open Circuit Voltage (V)	37.07	37.23	37.32
Short Circuit Current Isc (A)	13.97	13.87	13.95
Module Efficiency (%)	20.48	20.74	21.00
*STC (Standard Test Condition): Irradiance 1000 *Measuring tolerance: ±	W/m², Module Temperature	≘ 25°C, AM 1.5	
Electrical Characteristics NM	IOT*		
Maximum Power Watt Pmax (Wp)	270	274	278
Maximum Power Voltage Vmpp (V)	29.26	29.47	29.72
Maximum Power Current Impp (A)	10.32	10.38	10.43
Open Circuit Voltage Voc (V)	34.88	35.12	35.23
Short Circuit Current Isc (A)	11.03	11.10	11.16
*NMOT(Nominal module operating temperature): Irradiance 800W/m². Aml	pient Temperature 20°C, AM 1.5,	Vind Speed 1m/s
Mechanical Data			
Solar Cells		Mono PERC, 182mm half o	cells
Cells orientation	108 (6x9+6x9)		
Module dimension	67.80x44.65x1.38 in. (1,722x1,134x35 mm)		
Weight		46.30 lb (21.00 kg)	
Glass	3.2mm, High Transmission, Low Iron & Semi-Tempered Glass		
Junction Box	IP 68, 3 Diodes		
Cables	1,200mm		
Connectors		MC4 EVO2	
Temperature Ratings	1	Working Conditions	
NOCT	42°C±2°C I	Maximum System Voltage	1500VDC
Temperature coefficient of Pmax	-0.350%/°C	Operating Temperature	-40°C ~+85°C
Temperature coefficient of Voc	-0.275%/°C	Maximum Series Fuse	25A
Temperature coefficient of Isc	+0.045%/°C	Maximum Load (Snow/Wind)	5,400Pa / 2,400Pa
		Fire Rating	UL Type 1**
*Do not connect Fuse in Combiner Box with two or more strings in parallel connection *Remark: Electrical data in this catalog do not refer to a single module and they are not part	of the offer. They only ser among different module t **Please note, the 'Fire Cl designated for the full ins	ve for comparison which incl ypes. module, ti ass' Rating is roof comp talled PV system,	udes, but is not limited to, the he type of mounting used, pitch and position.
I-V Curves of PV Module (405	W)		
14 10°C 12 25°C 10 40°C 6 6 4 2	Current(A)	14 1000W/m ² 800W/m ³ 6 600W/m ³ 4 400W/m ² 200W/m ²	
	40	0 10 20	30 40

Note: please read safety and installation instructions before using this product. Subject to change without prior notice.

Voltage(V)

Voltage(V)

Packaging Details 31 Panels per pallet 26 Pallets per truck

Tolerance: Length: ±2mm Width: ±2mm Height: ±1mm Pitch-row: ±1mm

Back





76 N. MEADOWBROOK DRIVE ALPINE UT 84004

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MODULE



Leading the Industry in Solar Microinverter Technology



DS3 Series The most powerful Dual Microinverter

PRODUCT FEATURES

APsystems' 3rd generation of dual-module microinverters, the DS3 product family represents the culmination of years of power conversion expertise and innovation in high-efficiency, high-density power conversion to maximize the peak performance of today's high-capacity PV modules.

The DS3 series reaches unprecedented levels of power output. It features 2 input channels, each with independent MPPT, and encrypted wireless ZigBee communication. An innovative and compact design makes the product lighter while maximizing power production, and silicone-encapsulated components reduce stress on electronics, facilitate thermal dissipation, and enhance weatherproofing. Reliability is significantly increased thanks to 20% fewer components than previous generations. A 24/7 energy access through apps or web based portal facilitate remote diagnosis and maintenance.

The DS3 series is grid-interactive and fully compliant with CA Rule 21 requirements. With an excellent performance and high converstion efficiency, a unique integration with less components, the APsystems DS3 series is a gamechanger for residential and commercial solar.

WIRING SCHEMATIC



Datasheet | DS3 Microinverter Series Model DS3-S DS3-L Region USA / Canada Input Data (DC) Recommended PV Module Power (STC) Range 250Wp-480Wp+ Peak Power Tracking Voltage 28V-45V Operating Voltage Range 26V-60V Maximum Input Voltage 60V Maximum Input Current 16A x 2 18A x 2 Maximum input short circuit current 20A per input **Output Data (AC)** Maximum Continuous Output Power 640VA 768VA Nominal Output Voltage/Range 2.66A 3.2A Nominal Output Current Maximum Output Fault Current (ac) And Duration Nominal Output Frequency/ Range⁽¹⁾ Power Factor (Default/Adjustable) Maximum Units per 12AWG Branch⁽²⁾ Maximum Units per 10AWG Branch⁽²⁾ 9 (30A breaker) Efficiency Peak Efficiency 97.3% **CEC Efficiency** 97% Nominal MPPT Efficiency 99.5% Night Power Consumption 20mW **Mechanical Data** Operating Ambient Temperature Range Storage Temperature Range Dimensions (W x H x D) 10.3" × 8.6" × 1.6" (263mm x 218mm x 41.2mm) 5.7lbs(2.7kg) Weight DC Connector Type Cooling Type 6 Enclosure Environmental Rating **Features**

Communication (Inverter To ECU) Encrypted ZigBee Isolation Design High Frequency Transformers, Galvanically Isolated Energy Management Energy Management Analysis (EMA) system Warranty⁽⁵⁾ 10 Years Standard ; 25 Years Optional

Compliance

Safety and EMC Compliance

UL1741; CSA C22.2 No. 107.1-16; UL1741SA; UL1741SB; IEEE1547; Rule 21; SRD-V2.0; FCC Part15; ICES-003; NEC2014&NEC2017&NEC2020 Section 690.11 DC Arc-Fault circuit Protection; NEC2014&NEC2017&NEC2020 Section 690.12 Rapid Shutdown of PV systems on Buildings © All Rights Reserved using the most recent update found at web ; usa, APsyste

(1) Nominal voltage/frequency range can be extended beyond nominal if required by the utility. (2) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area. (3) The inverter may enter to power de-grade mode under poor ventilation and heat dissipation tallation environment.

Installation environment. (4) Recommend no more than 80 inverters register to one ECU for stable communication. (5) To be eligible for the warranty, APsystems microinverters need to be monitored via the EMA portal. Please refer to our warranty T8Cs available on us<u>a APsystemscom</u>.

APsystems



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INVERTER



DESIGN ENGINEER



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ATTACHMENT



DESIGN ENGINEER



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RAIL





Cut Sheet

6mm HEX DRIVE

Material: Aluminum

-0.75 -[19.1]

E





Shared Rail End Clamp



Material: Aluminum

D10225-V001 Dimensions shown are inches (and millimeters)



DESIGN ENGINEER



Material: Aluminum







Material: Aluminum



Details are subject to change without notice

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RAIL

SMR Pitched Roof System



SunModo Racking Self-Bonding System

SunModo's SMR system meets the stringent requirements of UL 2703 and CSA C22.2 No. 61730-2 which covers rack mounting systems, mounting grounding/bonding components, and clamping/retention devices for photovoltaic (PV) modules. The SMR system is intended for, but not limited to, PV module installations on residential roof tops, commercial buildings, and freestanding ground mount structures.

The SMR system components are designed in accordance with the National Electrical Code, ANSI/NFPA 70 and Model Building Codes. These code requirements cover rack mounting systems and clamping devices intended for use with PV module systems with a maximum system voltage of 1500V.

The SMR self-bonding system is for use with PV modules that have a maximum series fuse rating of 30A. This means the maximum number of PV modules in the SMR system is limited by the system voltage, so if a system has multiple inverters, the SunModo racking system can theoretically go on forever.



Mid Clamp with Bonding Pins

7 of 42

DESIGN ENGINEER



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MILBANK

4 Terminal Ringless Large Hub Open Adapt To Small Closing Plate Lever Bypass External

U4216-RXL



Hex

Appears In:

Kentucky, South Indiana Area

Brand Name	Milbank	
Туре	Ringless Meter Socket	
Application	Meter Socket	
Standard	UL Listed; Type 3R	
Voltage Rating	600 Volts Alternating Current	
Amperage Rating	200 Continuous Ampere	
Phase	1 Phase	
Frequency Rating	60 Hertz	
Size	4.844L x 13W x 19H	
Number of Main Breakers	0	
Main Breaker Size	No Main Breaker	
Cable Entry	Overhead or Underground	
Terminal	Lay in	
Insulation	Glass Polyester	
Mounting	Surface Mount	
Material	G90 Galvanized Steel with Powder Coat Finish	
Number of Jaws	4 Terminal	
Bypass Provision	Lever Bypass	
Number of Meter Positions	1 Position	
Equipment Ground	Triplex Ground	
Hub/Closing Plate	Large Hub Opening Adapted to Small Closing Plate	
Line Side Wire Range	6 AWG - 350 kcmil	
Load Side Wire Range	6 AWG - 350 kcmil	
Number Of Receptacles	0	
Height	19 IN	
Length	4.844 IN	
Width	13 IN	

Please consult serving utility for their requirements prior to ordering or installing, as specifications and approvals vary by utility and may require local electrical inspector approval. All installations must be installed by a licensed electrician and must comply with all national and local codes, laws and regulations. Milbank reserves the right to make changes in specifications and features shown without notice or obligation.

DESIGN ENGINEER



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PRODUCTION METER