PV MATERIAL SUMMARY: DISTRIBUTOR

Q.TRON BLK M-G2+ 430	21
MCI-1	7
MI-BHW	7
Tesla PW3 1707000-xx-y	1
Tesla GW3 1841000-01-y	1
XR-10-168B	6
XR-10-204B	5
XR10-BOSS-01-M1	4
UFO-CL-01-B1	34
UFO-END-01-B1	16
XR-LUG-03-A1	5
4 IN QB1	42
GC66803 Geocel Sealant	3
SOLADECK 0799-5B	1

NC SOLAR NOW

CLIENT INFO

DAKOTA LEWIS
95 WINTERBERRY WAY
FUQUAY VARINA NC 27526

PROJECT INFO

DC INPUT:	9.030 kW
AC OUTPUT:	11.500 kW
DOI INSPT. METHOD:	OPTION 2

Model Energy
300 Fayetteville St.
#1430
Raleigh, NC 27602
919-274-9905
ModelEnergy.com
P-1194

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING
8/28/24

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	120 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

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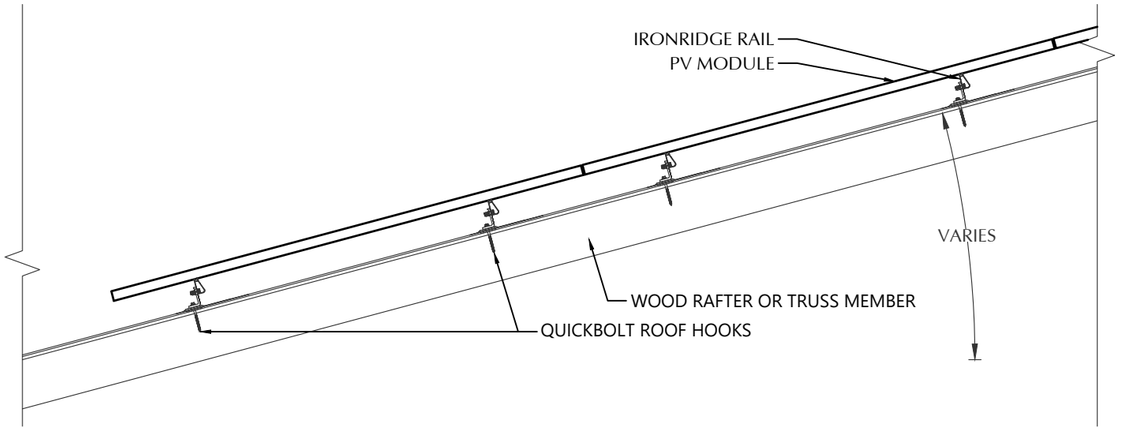
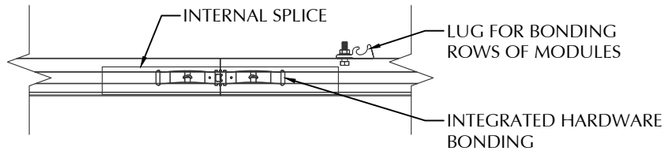
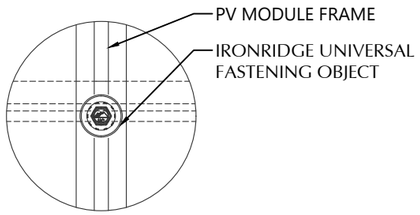
CONSTRUCTION	MCP	8/27/2024

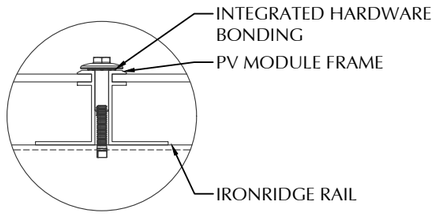
PV SYSTEM COVER PAGE

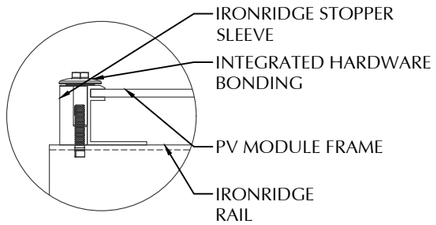
PV-1.1

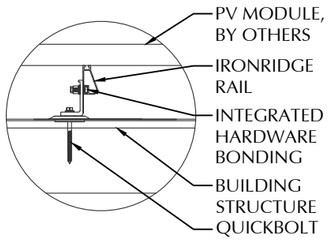




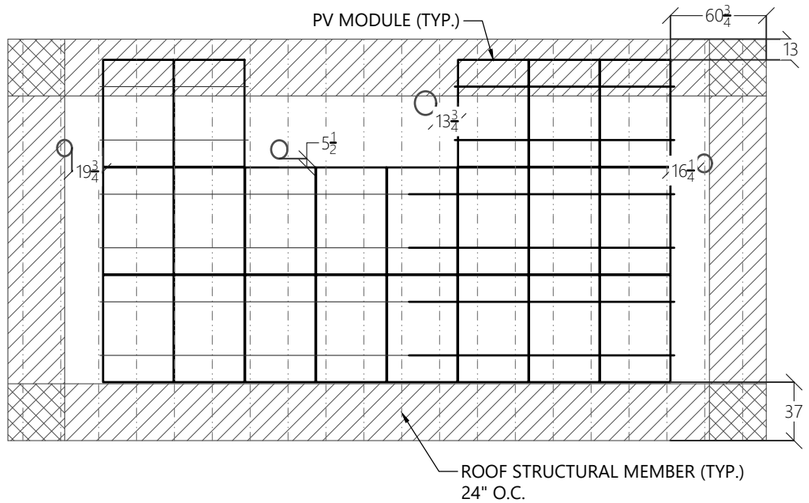








1 ROOF FASTENER DETAIL
NOT TO SCALE



2 ROOF A ARRAY LAYOUT
1/8" = 1'-0"

STATEMENT OF STRUCTURAL COMPLIANCE

THE EXISTING ROOF STRUCTURE HAS BEEN DESIGNED TO SUPPORT THE ADDITIONAL LOADS OF THE PROPOSED PV SYSTEM. IN ADDITION, THE RACKING AND FASTENING SYSTEM SHALL BE CAPABLE OF SECURING THE SYSTEM TO THE STRUCTURE UNDER DESIGN CONDITIONS WHEN INSTALLED PROPERLY AND IN ACCORDANCE WITH THE RACKING AND FASTENING ARRANGEMENT DETAILED WITHIN THESE DRAWINGS.

NAME: ANDREW W. KING, PE

SIGNED:

PV MODULES

MAKE	HANWHA
MODEL	Q.TRON BLK M-G2+ 430
WIDTH	44.60 IN
LENGTH	67.80 IN
THICKNESS	30 MM
WEIGHT	46.70 LBS.
ARRAY AREA	441 SQFT.
ARRAY WEIGHT	1102 LBS.

ROOF SUMMARY

STRUCTURE:	
TYPE	TRUSSES
MATERIAL	SOUTHERN PINE #2
SIZE	2 X 4
SPACING	24 IN O.C.
ALLOWABLE SPAN	88 IN
PITCH	6/12
DENSITY	30 LBS./CU.FT.
DECKING:	
TYPE	OSB
MATERIAL	COMPOSITE
THICKNESS	7/16 IN
WEIGHT	1.60 LBS/SQFT
ROOFING:	
TYPE	ASPHALT SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.30 LBS./SQFT.

ROOF MOUNT SUMMARY

MAXIMUM (IN)	MOUNT SPACING	RAIL OVERHANG
WIND ZONE 1	72 IN	24 IN
WIND ZONE 2	48 IN	24 IN
WIND ZONE 3	48 IN	22 IN

ROOF LOADING

GROUND SNOW LOAD:	15 LBS./SQFT.
LIVE LOAD	20 LBS./SQFT.
DEAD LOAD	
ROOFING	3.9 LBS/SQFT.
PV ARRAY	2.5 LBS./SQFT.
TOTAL	6.4 LBS./SQFT.
WIND LOAD:	
UPLIFT ZONE 1	-24.6 LBS./SQFT.
UPLIFT ZONE 2	-29.0 LBS./SQFT.
UPLIFT ZONE 3	-29.0 LBS./SQFT.
DOWNWARD	23.0 LBS./SQFT.
FASTENER LOAD:	
UPLIFT ZONE 1	-414 LBS.
UPLIFT ZONE 2	-325 LBS.
UPLIFT ZONE 3	-325 LBS.
DOWNWARD	387 LBS.

ROOF MOUNT & FASTENER

ROOF MOUNT:	
MAKE	QUICKBOLT
MODEL	4 IN QB1
MATERIAL	STAINLESS / EPDM
FASTENER:	
MAKE	QUICK SCREWS
MODEL	HANGER BOLT
MATERIAL	304 SS
SIZE	5/16-18 X 5-1/4"
GENERAL:	
WEIGHT	0.56 LBS.
FASTENERS PER MOUNT	1
MAX. PULL-OUT FORCE	960.0 LBS.
SAFETY FACTOR	2
DESIGN PULL-OUT FORCE	480.0 LBS.

MOUNTING RAILS

MAKE	IRONRIDGE
MODEL	XR10
MATERIAL	ALUMINUM
WEIGHT	0.425 LBS/IN
SPACING	34 IN

NC SOLAR NOW

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PV SYSTEM STRUCTURAL

PV-2.1

CONDUCTOR SCHEDULE

TAG	CURRENT CARRYING CONDUCTORS			GROUNDING CONDUCTORS			CONDUIT/RACEWAY			NOTES
	QTY.	SIZE	INSULATION	QTY.	SIZE	INSULATION	QTY.	SIZE	LOCATION	
C1	4	10 AWG	PV WIRE	1	6 AWG	BARE	-	-	FREE AIR	1
C2	4	10 AWG	THWN-2	1	10 AWG	THWN-2	1	3/4"	EXT/INT	2,4
C3	3	6 AWG	THWN-2	1	10 AWG	THWN-2	1	1"	EXTERIOR	2,4
C4	3	4/0 AWG ALUMINUM	XHHW	1	6 AWG	THWN-2	1	2"	EXT/INT	2,4
C5	3	4/0 AWG ALUMINUM	XHHW	-	-	-	1	2"	EXTERIOR	2,4
XC	-	-	-	-	-	-	-	-	-	3

NOTES:

1. MANUFACTURER PROVIDED, UL LISTED WIRING HARNESS FOR USE ON EXPOSED ROOFS
2. CONDUIT SIZE SHOWN IS CODE MINIMUM. LARGER SIZES ARE ALLOWED.
3. EXISTING CONDUCTORS, FIELD VERIFY
4. EQUIPMENT TERMINAL RATING SHALL BE A MINIMUM OF 75°C AT BOTH END OF CONDUCTOR

ENERGY MANAGEMENT

MAKE	TESLA
MODEL	BACKUP GATEWAY 3
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
DISCONNECT CURR.	200 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	YES
MAIN BREAKER RATING	200 AMPS

- TROUGH MAY BE USED IF NECESSARY
- INSTALL 200A MAIN BREAKER THAT WILL SERVE AS THE NEW SERVICE DISCONNECT SWITCH
- INSTALL BONDING JUMPER FROM NEUTRAL TO GROUND
- FEED BACKED-UP LOADS PANEL VIA BACKUP LUGS
- LAND POWERWALL 3 ON 60A BREAKER IN EXISTING GATEWAY INTERNAL PANELBOARD

PV MODULE

MAKE	HANWHA
MODEL	Q.TRON BLK M-G2+ 430
NOM. POWER (PNOM)	430 WATTS
NOM. VOLT. (VMPP)	32.9 VOLTS
O.C. VOLT (VOC)	39.3 VOLTS
MAX. SYS. VOLT.	1000 VOLTS
NOM. CURR. (IMPP)	13.1 AMPS
S.C. CURR. (ISC)	13.7 AMPS
TEMP. COEF. (PMPP)	-0.30 %/C
TEMP. COEF. (Voc)	-0.24 %/C
MAX SERIES FUSE	25 AMPS
UL COMPLIANT (Y/N)	YES

MAX. DC VOLTAGE CALCULATION

$V_{OC}MAX = V_{OC} * (1 + (TMIN - TSTC) * (VTC / 100))$

$V_{OC}MAX$	42.46
MAX STRING VOLTAGE	509.5

MAX. DC CURRENT CALCULATION

$I_{SC}MAX = I_{SC} * TCX$

$I_{SC}MAX$ (AMPS)	17.13

MID-CIRCUIT INTERRUPTER

MAKE	TESLA
MODEL	MCI-1
ENCL. RATING	NEMA 4X / IP65
DC INPUT:	
CONNECTOR TYPE	MC4
MAX IN-LINE PV MODULES	3
MAX MCI PER STRING	5
MAX. SYSTEM VOLTAGE	600 VOLTS
NOM. CURRENT (Imp)	13.00 AMPS
MAX. CURRENT (Isc)	19.00 AMPS
RSD COMPLIANT (Y/N)	YES
UL COMPLIANT (Y/N)	YES

JUNCTION BOX

MAKE	SOLADECK
PROTECT. RATING	NEMA TYPE 3R
UL LIST. (Y/N)	YES

EX. BACKED-UP LOADS PANEL

MAKE	SQUARE D
MODEL	HOMC30UC
ENCL. RATING	NEMA TYPE 1
VOLT. RATING	240
BUS RATING	200 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	YES
MAIN BREAKER RATING	200 AMPS

- RE-FEED BACKED-UP LOADS PANEL VIA GATEWAY OUTPUTS
- REMOVE N/G BOND IN BACKED-UP LOADS PANEL ONLY

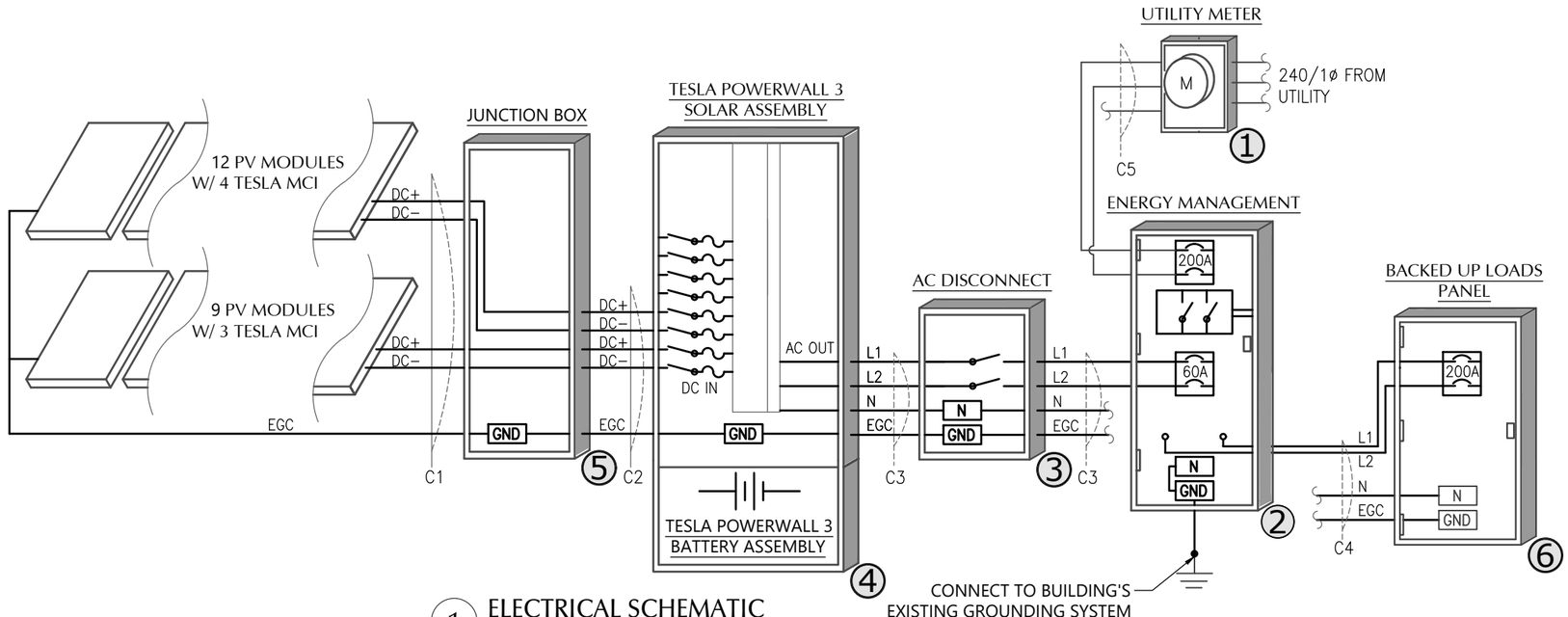
DC/AC INVERTER & BATTERY

MAKE	TESLA POWERWALL 3
MODEL	1707000-XX-Y
INVERTER INFO:	
DC INPUT:	
MAX POWER	20000 WATTS
INPUT VOLT. RANGE	60-550 VOLTS
MPPT VOLT. RANGE	60-480 VOLTS
MAX. MPPT CUR.	13 AMPS
STRING INPUTS	6 MPPTs
AC OUTPUT:	
MAX. CONT. POWER	11500 WATTS
NOM. VOLT.	240 VOLTS
MAX. CONT. CURRENT	48.00 AMPS
RAPID SHUTDOWN (Y/N)	YES
PROTECT. RATING	NEMA TYPE 3R
BATTERY INFO:	
USABLE ENERGY	13.5 kWh
NOM. VOLT.	240 VOLTS
MAX. CONT. CHARGE	5000 WATTS
UL LIST. (Y/N)	YES

AC DISCONNECT

MAKE	GENERIC
MODEL	NA
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
AMP RATING	60 AMPS
UL LIST. (Y/N)	YES
FUSED (Y/N)	NO
FUSE RATING	N/A

- LOAD-BREAK RATED
- VISIBLE OPEN
- LOCKABLE IN OPEN POSITION
- INSTALL ADJACENT TO METER
- DISCONNECT TO BE READILY ACCESSIBLE TO UTILITY COMPANY PERSONNEL AT ALL TIMES
- DISCONNECT MARKED AND RATED PER NEC SECTION 690.13 AND 705.10



1 ELECTRICAL SCHEMATIC
NTS

NC SOLAR NOW

CLIENT INFO
DAKOTA LEWIS
95 WINTERBERRY WAY
FUQUAY VARINA NC 27526

PROJECT INFO

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SITE CONDITIONS

WIND SPEED:	120 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

SHEET INDEX

VERSIONS

FOR:	DESIGNER	DATE
CONSTRUCTION	MCP	8/27/2024

PV SYSTEM ELECTRICAL

PV-3.1

WARNING: PHOTOVOLTAIC POWER SOURCE

(5) NEC 690.31 (G)(3)&(4)
PLACE ON ALL JUNCTION BOXES, EXPOSED RACEWAYS, AND OTHER WIRING METHODS EVERY 10' AND ON EVERY SECTION SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.

⚠WARNING

THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE SHALL NOT EXCEED AMPACITY OF BUSBAR.

(2) NEC 705.12 (B)(2)(3)(c)

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

(3) NEC 690.56 (C)(3)
PLACE ON RAPID SHUTDOWN SWITCH OR EQUIPMENT WITH INTEGRATED RAPID SHUTDOWN *REFLECTIVE*

PV SYSTEM DISCONNECT

(3) NEC 690.13 (B)
PLACE ON PV SYSTEM DISCONNECTING MEANS.

⚠WARNING

ELECTRIC SHOCK HAZARD

TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

(2) NEC 690.13 (B)
PLACE ON PV SYSTEM DISCONNECTING MEANS.

⚠WARNING⚠

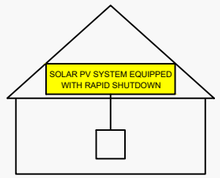
THREE POWER SOURCES

SOURCES: UTILITY GRID, BATTERY AND PV SOLAR ELECTRIC SYSTEM

(1) (2) (6) NEC 705.12(B)(3)
PLACE ON ALL EQUIPMENT THAT IS SUPPLIED BY THREE POWER SOURCES

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY



(2) NEC 690.56 (C)(1)(a)
PLACE WITHIN 3FT OF SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATIONS OF RAPID SHUTDOWN SWITCHES

PHOTOVOLTAIC SYSTEM ⚠ AC DISCONNECT ⚠

OPERATING VOLTAGE	240	VOLTS
OPERATING CURRENT	48.0	AMPS

(3) NEC 690.54
PLACE ON INTERCONNECTION DISCONNECTING MEANS

DIRECT CURRENT PHOTOVOLTAIC POWER SOURCE

MAXIMUM VOLTAGE 600 VDC

MAX CIRCUIT CURRENT 34.26 AMPS

(4) NEC 690.53
PLACE ON ALL DC DISCONNECTING MEANS

WARNING:

IN THE EVENT OF A UTILITY OUTAGE, THIS PANEL IS FED FROM ENERGY STORAGE SYSTEM.

(2) (6) PLACE ON BACKED UP LOAD PANEL(S).

SERVICE DISCONNECT LOCATED: NORTH WALL OF RESIDENCE

BATTERY DISCONNECT LOCATED: NORTH WALL OF RESIDENCE

PV DISCONNECT LOCATED: NORTH WALL OF RESIDENCE

(2) (3) NEC 705.10
PLACE AT SERVICE EQUIPMENT AND PV SYSTEM DISCONNECTING MEANS.

LABEL NOTES

1. LABELS SHOWN ARE HALF THEIR ACTUAL REQUIRED SIZE.
2. LABEL MATERIAL SHALL BE SUITABLE FOR THE EQUIPMENT ENVIRONMENT.
3. DC CONDUIT SHALL BE MARKED WITH REQUIRED LABEL EVERY 10 FEET.
4. LABELS WILL BE APPLIED IN ACCORDANCE WITH THE NEC. SOME LABELS MAY NOT BE NECESSARY.

DC WIRING NOTES

1. CONDUCTORS SHALL BE COPPER, RATED AT NOT LESS THAN 600 VOLTS FOR RESIDENTIAL CONSTRUCTION AND NOT LESS THAN 1000 VOLTS FOR COMMERCIAL CONSTRUCTION.
2. MINIMUM SIZE SHALL BE #10 AWG UNLESS OTHERWISE NOTED ON THE DRAWINGS.
3. EXPOSED WIRING CONDUCTOR INSULATION SHALL BE TYPE PV WIRE, USE-2, OR RHW-2 WHERE THE OUTER LAYER OF THE INSULATION IS UV, SUNLIGHT, AND MOISTURE RESISTANT.
6. EXTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THWN-2 AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT) OR RIGID POLYVINYL CHLORIDE CONDUIT(PVC). ALTERNATIVELY, METAL CLAD CABLE(MC) CAN BE USED AS WELL WHEN RATED FOR USE IN WET LOCATIONS.
7. INTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THHN-2 AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), FLEXIBLE METAL CONDUIT(FMC), OR METAL CLAD CABLE(MC).
6. USE SCHEDULE 40 PVC OUTDOORS WHERE NOT SUBJECT TO PHYSICAL DAMAGE OR BELOW FLOOR SLAB. USE SCHEDULE 80 PVC OUTDOORS WHERE SUBJECT TO PHYSICAL DAMMAGE
7. MINIMUM CONDUIT SIZE TO BE 1/2".
8. WIRING METHODS TO CONFORM TO ARTICLES 330, 334, 348, 350, 352, 356, AND 358 OF THE 2017 NEC.

AC WIRING NOTES

1. CONDUCTORS SHALL BE COPPER RATED AT NOT LESS THAN 600 VOLTS.
2. MINIMUM SIZE SHALL BE #14 AWG UNLESS OTHERWISE NOTED ON THE DRAWINGS.
3. EXTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THWN AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), RIGID POLYVINYL CHLORIDE CONDUIT(PVC), LIQUID-TIGHT FLEXIBLE METAL CONDUIT(LFMC), OR LIQUID-TIGHT FLEXIBLE NON-METALLIC CONDUIT(LFNC) . ALTERNATIVELY, METAL CLAD CABLE(MC) CAN BE USED AS WELL WHEN RATED FOR USE IN WET LOCATIONS.
4. INTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THHN AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), FLEXIBLE METAL CONDUIT(FMC), METAL CLAD CABLE(MC), OR ROMEX.
5. USE SCHEDULE 40 PVC OUTDOORS WHERE NOT SUBJECT TO PHYSICAL DAMAGE OR BELOW FLOOR SLAB. USE SCHEDULE 80 PVC OUTDOORS WHERE SUBJECT TO PHYSICAL DAMMAGE
6. MINIMUM CONDUIT SIZE TO BE 1/2".
7. WIRING METHODS TO CONFORM TO ARTICLES 330, 334, 348, 350, 352, 356, AND 358 OF THE 2017 NEC.

CONSTRUCTION NOTES

1. ALL WORK IS TO BE PERFORMED IN ACCORDANCE WITH THE NEC, STATE, AND LOCAL APPLICABLE CODES.
2. FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS, BEST PRACTICES, AND SPECIFICATIONS.
3. ENSURE REQUIRED MAINTENANCE ACCESS AND CLEARANCES ARE MAINTAINED.
4. WIRES SHALL BE RATED AND LABELED "SUNLIGHT RESISTANT" WHERE EXPOSED TO AMBIENT CONDITIONS.
5. FUSES 0 - 600 AMPS SHALL BE UL CLASS "RK-1" LOW PEAK DUAL ELEMENT TIME DELAY WITH 200,000 AMPERE INTERRUPTING RATING AS MANUFACTURED BY BUSSMANN, UNLESS NOTED OTHERWISE.
6. ALL TERMINALS/LUGS SHALL BE 75° RATED. ALL TERMINALS, SPLICING CONNECTORS, LUGS, ETC SHALL BE IDENTIFIED FOR USE WITH THE MATERIAL (CU/AL) OF THE CONDUCTOR AND SHALL BE PROPERLY INSTALLED.
7. PROVIDE A PULLWIRE IN ALL EMPTY CONDUITS.
8. ALL PENETRATIONS THROUGH EXTERIOR ROOFS SHALL BE FLASHED IN A WATERPROOF MANNER.
9. ALL PENETRATIONS THROUGH ATTIC FIRE BARRIERS SHALL BE SEALED WITH FIRE-BARRIER SEALANT CAULK.
10. SUPPORT ALL CONDUIT AND EQUIPMENT IN ACCORDANCE W/ NEC. ANY SUSPENDED MATERIALS SHALL BE DIRECTLY SUPPORTED BY THE BUILDING STRUCTURE.
11. METAL CONDUIT COUPLINGS CAN BE COMPRESSION TYPE, THREADED, OR BE SET-SCREW TYPE. PLASTIC CONDUIT COUPLINGS TO BE SOCKET GLUED TYPE.
12. A COMPLETE GROUNDING SYSTEM SHALL BE PRESENT OR PROVIDED AND INSTALLED IN ACCORDANCE WITH ARTICLE 250 OF THE NEC, AND AS SHOWN ON THE DRAWINGS.
13. EACH ELECTRICAL APPLIANCE SHALL BE PROVIDED WITH A NAMEPLATE GIVING THE IDENTIFYING NAME AND THE RATING IN VOLTS AND AMPERES, OR VOLTS AND WATTS. IF THE APPLIANCE IS TO BE USED ON A SPECIFIC FREQUENCY OR FREQUENCIES, IT SHALL BE SO MARKED. WHERE MOTOR OVERLOAD PROTECTION EXTERNAL TO THE APPLIANCES IS REQUIRED, THE APPLIANCE SHALL BE SO MARKED.
14. WHERE APPLICABLE, GROUNDING ELECTRODE CONDUCTOR TO BE CONTINUOUS. GROUNDING CRIMPS TO BE IRREVERSIBLE.
15. PHOTOVOLTAIC SYSTEMS SHALL BE PERMANENTLY MARKED AT VARIOUS EQUIPMENT LOCATIONS TO IDENTIFY THAT A PHOTOVOLTAIC SYSTEM IS INSTALLED AND THAT VARIOUS DANGERS ARE PRESENT.
16. EACH PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS SHALL BE PERMANENTLY MARKED TO IDENTIFY IT AS A PHOTOVOLTAIC SYSTEM DISCONNECT.
17. WHERE ALL TERMINALS OF A DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION, A WARNING SIGN SHALL BE MOUNTED ON OR ADJACENT TO THE DISCONNECT.
18. A PERMANENT LABEL FOR THE DIRECT-CURRENT PHOTOVOLTAIC POWER SOURCE SHALL BE PROVIDED AT THE DC DISCONNECT MEANS.
19. A PERMANENT PLAQUE OR DIRECTORY, DENOTING ALL ELECTRIC POWER SOURCES SERVING THE PREMISES, SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT LOCATIONS OF ALL POWER PRODUCTION SOURCES.
20. ALL MODULE GROUND CONNECTIONS SHALL BE MADE IN ACCORDANCE WITH NEC SECTION 690.4 (C)
21. A NORTH CAROLINA REGISTERED DESIGN PROFESSIONAL WILL BE REQUIRED TO SEAL THE STRUCTURAL DESIGN AT THE TIME OF PERMIT APPLICATION IF ANY OF THE FOLLOWING EXIST AND ARE ATTESTED TO BY THE APPLICANT:
    I. THE WEIGHT OF THE PV SYSTEM EXCEEDS THREE (3) POUNDS PER SQUARE FOOT(PSF)
    II. THE ROOF POSSESSES MORE THAN ONE (1) LAYER OF ASPHALT SHINGLES
    III. THE ROOFING MATERIAL CONSISTS OF A TYPE OTHER THAN ASPHALT SHINGLES OR METAL
    IV. THE ROOF IS LOCATED IN A 140 MPH OR GREATER WIND ZONE

NC SOLAR NOW

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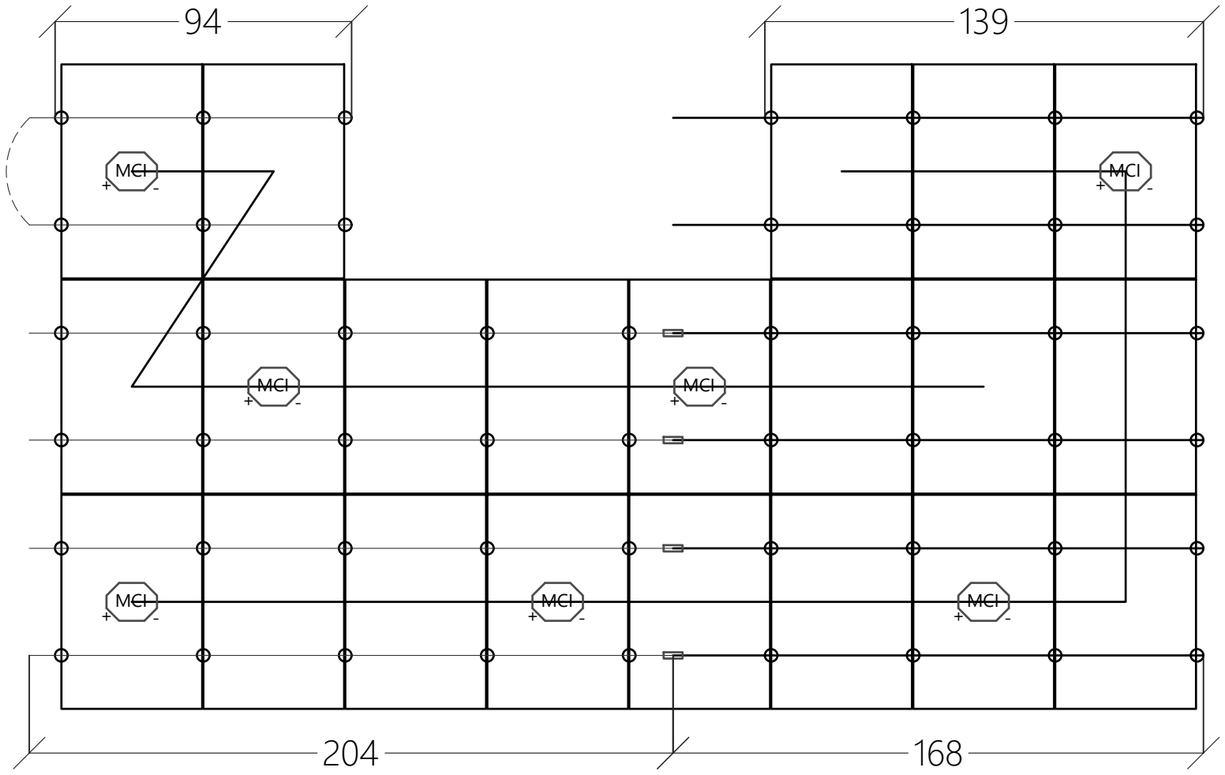
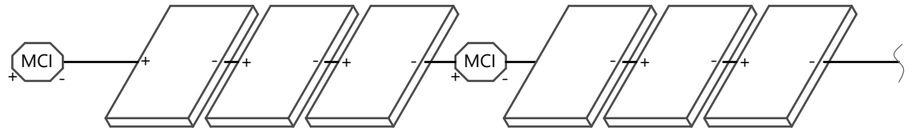
PV SYSTEM EQUIPMENT LABELS

PV-4.1



1 ARRAY LAYOUT DETAIL
NOT TO SCALE



1 STRING WIRING + MCI DETAIL
NOT TO SCALE

NC SOLAR NOW

CLIENT INFO

DAKOTA LEWIS
95 WINTERBERRY WAY
FUQUAY VARINA NC 27526

PROJECT INFO

DC INPUT:	9.030 kW
AC OUTPUT:	11.500 kW
DOI INSPT. METHOD:	OPTION 2

Model Energy
300 Fayetteville St.
#1430
Raleigh, NC 27602
919-274-9905
ModelEnergy.com
P-1194

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING
8/28/24

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	120 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF

SHEET INDEX

VERSIONS

FOR:	DESIGNER	DATE
CONSTRUCTION	MCP	8/27/2024

PV SYSTEM INSTALL GUIDE

PV-5.1

Q.TRON BLK M-G2+ SERIES

PRELIMINARY

410 - 430 Wp | 108 Cells
22.4 % Maximum Module Efficiency

MODEL Q.TRON BLK M-G2+

High performance Qcells N-type solar cells

Q.ANTUM NEO Technology with optimized module layout boosts module efficiency up to 22.4 %.

A reliable investment

Inclusive 25-year product warranty and 25-year linear performance warranty[1].

Enduring high performance

Long-term yield security with Anti LeTID Technology, Anti PID Technology[2], Hot-Spot Protect.

Extreme weather rating

High-tech aluminium alloy frame, certified for high snow (5400 Pa) and wind loads (3600 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.

[1] See data sheet on rear for further information.
[2] APT test conditions according to IEC/TS 62804-1:2015, method A (–1500 V, 96 h)

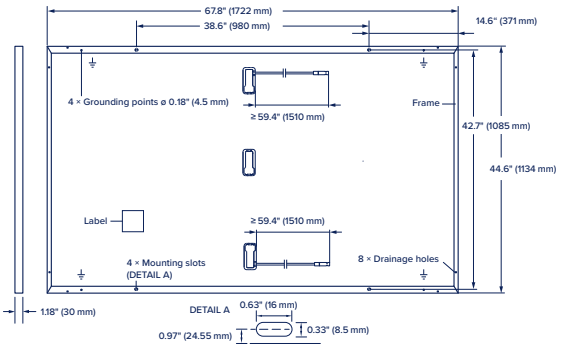
The ideal solution for:

Rooftop arrays on residential buildings

Q.TRON BLK M-G2+ SERIES

Mechanical Specification

Format	67.8 in × 44.6 in × 1.18 in (including frame) (1722 mm × 1134 mm × 30 mm)
Weight	47.2 lbs (21.4 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 × 18 monocrystalline Q.ANTUM NEO 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), Protection class IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥ 59.4 in (1510 mm), (−) ≥ 59.4 in (1510 mm)
Connector	Stäubli MC4; IP68

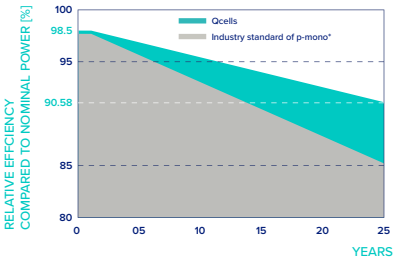


Electrical Characteristics

POWER CLASS				410	415	420	425	430
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / −0 W)								
Minimum	Power at MPP[1]	P_{MPP}	[W]	410	415	420	425	430
	Short Circuit Current[1]	I_{SC}	[A]	13.39	13.42	13.46	13.49	13.53
	Open Circuit Voltage[1]	V_{OC}	[V]	38.58	38.61	38.64	38.67	38.70
	Current at MPP	I_{MPP}	[A]	12.68	12.75	12.82	12.88	12.95
	Voltage at MPP	V_{MPP}	[V]	32.32	32.55	32.77	32.98	33.20
	Efficiency[1]	η	[%]	≥ 21.4	≥ 21.6	≥ 21.9	≥ 22.2	≥ 22.4
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]								
Minimum	Power at MPP	P_{MPP}	[W]	310.0	313.8	317.6	321.4	325.2
	Short Circuit Current	I_{SC}	[A]	10.79	10.82	10.84	10.87	10.90
	Open Circuit Voltage	V_{OC}	[V]	36.61	36.63	36.66	36.69	36.71
	Current at MPP	I_{MPP}	[A]	9.97	10.03	10.09	10.15	10.21
	Voltage at MPP	V_{MPP}	[V]	31.09	31.29	31.48	31.66	31.85

[1]Measurement tolerances P_{MPP} ±3%; I_{SC}; V_{OC} ±5% at STC: 1000 W/m², 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • [2]800 W/m², NMOT, spectrum AM 1.5

Qcells PERFORMANCE WARRANTY

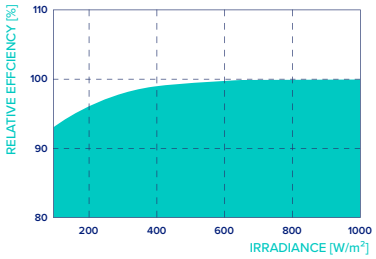


At least 98.5 % of nominal power during first year. Thereafter max. 0.33 % degradation per year. At least 95.53 % of nominal power up to 10 years. At least 90.58 % of nominal power up to 25 years.

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

*Standard terms of guarantee for the 5 PV companies with the highest production capacity in 2021 (February 2021)

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²).

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	−0.24
Temperature Coefficient of P_{MPP}	γ	[%/K]	−0.30	Nominal Module Operating Temperature	NMOT	[°F]	109 ± 5.4 (43 ± 3 °C)

Properties for System Design

Maximum System Voltage	V_{SYS}	[V]	1000 (IEC) / 1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating		[A DC]	20	Fire Rating based on ANSI / UL 61730	C / TYPE 2
Max. Design Load, Push / Pull[3]		[lbs / ft²]	75 (3600 Pa) / 50 (2400 Pa)	Permitted Module Temperature on Continuous Duty	−40 °F up to +185 °F (−40 °C up to +85 °C)
Max. Test Load, Push / Pull[3]		[lbs / ft²]	113 (5400 Pa) / 75 (3600 Pa)		

[3] See Installation Manual

Qualifications and Certificates

Quality Controlled PV -
TÜV Rheinland;
IEC 61215:2016;
IEC 61730:2016.
This data sheet complies with DIN EN 50380.

C Certified US
UL 61730

TÜVRheinland CERTIFIED
www.tuv.com
ID 1111220277

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

Note: Installation instructions must be followed. Contact our technical service for further information on 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 96 | EMAIL hqc-inquiry@qcells.com | WEB www.qcells.com

Powerwall 3

Power Everything

—

Powerwall 3 is a fully integrated solar and battery system, designed to accelerate the transition to sustainable energy. Customers can receive whole home backup, cost savings, and energy independence by producing and consuming their own energy while participating in grid services. Once installed, customers can manage their system using the Tesla App to customize system behavior to meet their energy goals.

Powerwall 3 achieves this by supporting up to 20 kW DC of solar and providing 11.5 kW AC of continuous power per unit. It has the ability to start heavy loads up to 150 A LRA, meaning a single unit can support the power needs of most homes. Powerwall 3 is designed for mass production, fast and efficient installations, easy system expansion, and simple connection to any electrical service.

2023

Powerwall 3 Technical Specifications

System Technical Specifications

Model Number	1707000-xx-y
Nominal Grid Voltage (Input & Output)	120/240 VAC
Grid Type	Split phase
Frequency	60 Hz
Overcurrent Protection Device	Configurable up to 60 A
Solar to Battery to Grid Round Trip Efficiency	89% [1,2]
Solar to Grid Efficiency	97% [3]
Supported Islanding Devices	Backup Gateway 2, Backup Switch
Connectivity	Wi-Fi (2.4 and 5 GHz), Dual-port switched Ethernet, Cellular (LTE/4G [4])
Hardware Interface	Dry contact relay, Rapid Shutdown (RSD) certified switch and 2-pin connector, RS-485 for meters
AC Metering	Revenue Grade (+/- 0.5%)
Protections	Integrated arc fault circuit interrupter (AFCI), Isolation Monitor Interrupter (IMI), PV Rapid Shutdown (RSD) using Tesla Mid-Circuit Interrupters
Customer Interface	Tesla Mobile App
Warranty	10 years

Solar Technical Specifications

Maximum Solar STC Input	20 kW
Withstand Voltage	600 V DC
PV DC Input Voltage Range	60 — 550 V DC
PV DC MPPT Voltage Range	150 — 480 V DC
MPPTs	6
Maximum Current per MPPT (I_{mp})	13 A [5]
Maximum Short Circuit Current per MPPT (I_{sc})	15 A [5]

Battery Technical Specifications

Nominal Battery Energy	13.5 kWh AC [2]
Maximum Continuous Discharge Power	11.5 kW AC
Maximum Continuous Charge Power	5 kW AC
Output Power Factor Rating	0 - 1 (Grid Code configurable)
Maximum Continuous Current	48 A
Maximum Output Fault Current	10 kA
Load Start Capability (1 s)	150 A LRA
Power Scalability	Up to 4 Powerwall 3 units supported

[1] Typical solar shifting use case.

[2] Values provided for 25°C (77°F), at beginning of life. 3.3 kW charge/discharge power.

[3] Tested using CEC weighted efficiency methodology.

[4] Cellular connectivity subject to network service coverage and signal strength.

[5] Where the DC input current exceeds the MPPT rating, a jumper can be used to combine two MPPTs into a single input to intake DC current up to 26 A I_{MP} / 30 A I_{SC}.

Powerwall 3 Technical Specifications

Environmental Specifications

Operating Temperature	–20°C to 50°C (–4°F to 122°F) [6]
Operating Humidity (RH)	Up to 100%, condensing
Storage Temperature	–20°C to 30°C (–4°F to 86°F), up to 95% RH, non-condensing, State of Energy (SOE): 25% initial
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Rating	NEMA 3R
Ingress Rating	IPX7 (Battery & Power Electronics) IPX5 (Wiring Compartment)
Pollution Rating	PD3
Operating Noise @ 1 m	< 50 db(A) typical <62 db(A) maximum

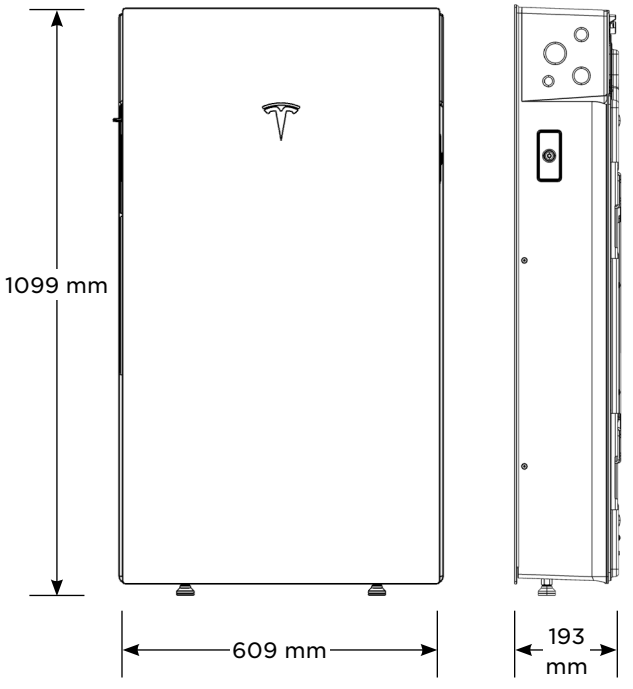
[6] Performance may be de-rated at operating temperatures above 40°C (104°F).

Compliance Information

Certifications	UL 1642, UL 1699B, UL 1741, UL 1741 SA, UL 1741 SB, UL 3741, UL 1973, UL 1998, UL 9540, IEEE 1547-2018, IEEE 1547.1, UN 38.3
Grid Connection	United States
Emissions	FCC Part 15 Class B
Environmental	RoHS Directive 2011/65/EU
Seismic	AC156, IEEE 693-2005 (high)
Fire Testing	Meets the unit level performance criteria of UL 9540A

Mechanical Specifications

Dimensions	1099 x 609 x 193 mm (43.25 x 24 x 7.6 in)
Weight	130 kg (287 lb)
Mounting Options	Floor or wall mount



Solar Shutdown Device Technical Specifications

—

The Solar Shutdown Device is a Mid-Circuit Interrupter (MCI) and is part of the PV system rapid shutdown (RSD) function in accordance with Article 690 of the applicable NEC. When paired with Powerwall 3, solar array shutdown is initiated by any loss of AC power.

Electrical Specifications

Model	MCI-1	MCI-2
Nominal Input DC Current Rating (I_{MP})	12 A	13 A
Maximum Input Short Circuit Current (I_{SC})	19 A	17 A
Maximum System Voltage (PVHCS)	600 V DC	1000 V DC [7]

[7] Maximum System Voltage is limited by Powerwall to 600 V DC.

RSD Module Performance

Maximum Number of Devices per String	5	5
Control	Power Line Excitation	Power Line Excitation
Passive State	Normally Open	Normally Open
Maximum Power Consumption	7 W	7 W
Warranty	25 years	25 years

Environmental Specifications

Operating Temperature	-40°C to 50°C (-40°F to 122°F)	-45°C to 70°C (-49°F to 158°F)
Storage Temperature	–30°C to 70°C (–22°F to 158°F)	–30°C to 70°C (–22°F to 158°F)
Enclosure Rating	NEMA 4X / IP65	NEMA 4X / IP65

Mechanical Specifications

Electrical Connections	MC4 Connector	MC4 Connector
Housing	Plastic	Plastic
Dimensions	125 x 150 x 22 mm (5 x 6 x 1 in)	173 x 45 x 22 mm (6.8 x 1.8 x 1 in)
Weight	350 g (0.77 lb)	120 g (0.26 lb)
Mounting Options	ZEP Home Run Clip M4 Screw (#10) M8 Bolt (5/16") Nail / Wood screw	Wire Clip

Compliance Information

Certifications	UL 1741 PVRSE, UL 3741, PVRSA (Photovoltaic Rapid Shutdown Array)
RSD Initiation Method	External System Shutdown Switch or Powerwall 3 Enable Switch

UL 3741 PV Hazard Control (and PVRSA) Compatibility

The following categories of solar module meet the UL 3741 PVHCS listing when installed with Powerwall 3 and Solar Shutdown Devices.

Tesla Solar Roof	PV Hazard Control System: BIPV compliance document
Tesla or Hanwha (Q.Peak Duo BLK or BLK-G6+) Modules certified for use with ZEP racking	PV Hazard Control System: ZS PVHCS compliance document
Other module and racking combinations	PV Hazard Control System: Generic PV Array compliance document

Gateway 3

—

Tesla Gateway 3 controls connection to the grid in a Powerwall system, automatically detecting outages and providing seamless transition to backup power. It provides energy monitoring that is used by Powerwall for solar self-consumption, time-based control, and backup operation.

Performance Specifications

Model Number	1841000-x1-y
Nominal Grid Voltage	120/240 V AC
Grid Configuration	Split phase
Grid Frequency	60 Hz
Continuous Current Rating	200 A
Maximum Supply Short Circuit Current	22 kA with Square D or Eaton main breaker 25 kA with Eaton main breaker [11]
IEC Protective Class	Class I
Overvoltage Category	Category IV

[11] Only Eaton CSR or BWH main breakers are 25 kA rated.

AC Meter	+/- 0.5%
Communication	CAN
User Interface	Tesla App
Backup Transition	Automatic disconnect for seamless backup
Overcurrent Protection Device	100–200 A Service entrance rated Eaton CSR, BWH, or BW, or Square D QOM breakers
Internal Panelboard	200 A 8-space/16 circuit breakers Eaton BR, Siemens QP, or Square D HOM breakers rated to 10–125A
Warranty	10 years

Environmental Specifications

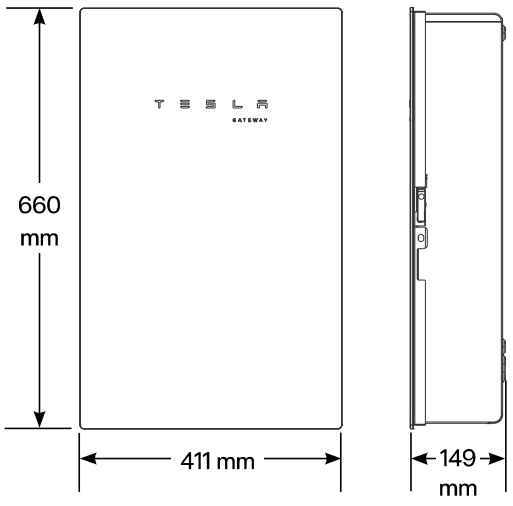
Operating Temperature	–20°C to 50°C (–4°F to 122°F)
Operating Humidity (RH)	Up to 100%, condensing
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R

Compliance Information

Certifications	UL 67, UL 869A, UL 916, UL 1741 PCS, CSA 22.2 107.1, CSA 22.2 29
Emissions	FCC Part 15, Class B, ICES 003

Mechanical Specifications

Dimensions	660 x 411 x 149 mm (26 x 16 x 6 in)
Weight	16.3 kg (36 lb)
Mounting options	Wall mount



Backup Switch

—

The Tesla Backup Switch controls connection to the grid in a Powerwall system, and can be easily installed behind the utility meter or in a standalone meter panel downstream of the utility meter.

The Backup Switch automatically detects grid outages, providing a seamless transition to backup power. It communicates directly with Powerwall, allowing home energy usage monitoring from any mobile device with the Tesla app.

Performance Specifications

Model Number	1624171-xx-y
Continuous Load Rating	200 A, 120/240 V split phase
Maximum Supply Short Circuit Current	22 kA with breaker [10]
Communication	CAN
AC Meter	Revenue accurate (+/- 0.5%)
Expected Service Life	21 years
Warranty	10 years

[10] Breaker maximum supply short circuit current rating must be equal to or greater than the available fault current.

Environmental Specifications

Operating Temperature	–40°C to 50°C (–40°F to 122°F)
Storage Temperature	–40°C to 85°C (–40°F to 185°F)
Enclosure Rating	NEMA 3R
Pollution Rating	PD3

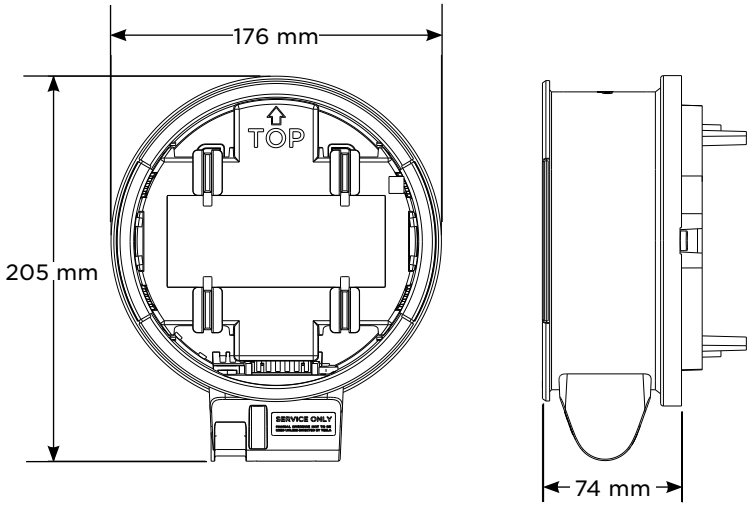
Compliance Information

Safety Standards	USA: UL 414, UL 2735, UL 916, CA Prop 65
Emmissions	FCC, ICES

Mechanical Specifications

Dimensions	176 x 205 x 74 mm (6.9 x 8.1 x 2.9 in)
Weight	2.8 lb
Meter and Socket Compatibility	ANSI Type 2S, ringless or ring type
External Service Interface	Contactor manual override [11]
	Reset button
Conduit Compatibility	1/2-inch NPT

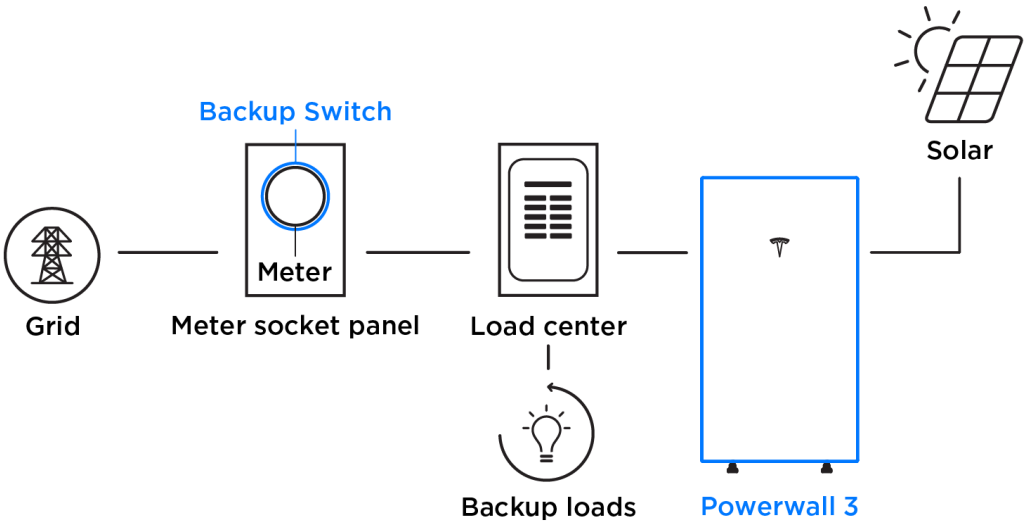
[11] Manually overrides the contactor position during a service event.



Powerwall 3 Example System Configurations

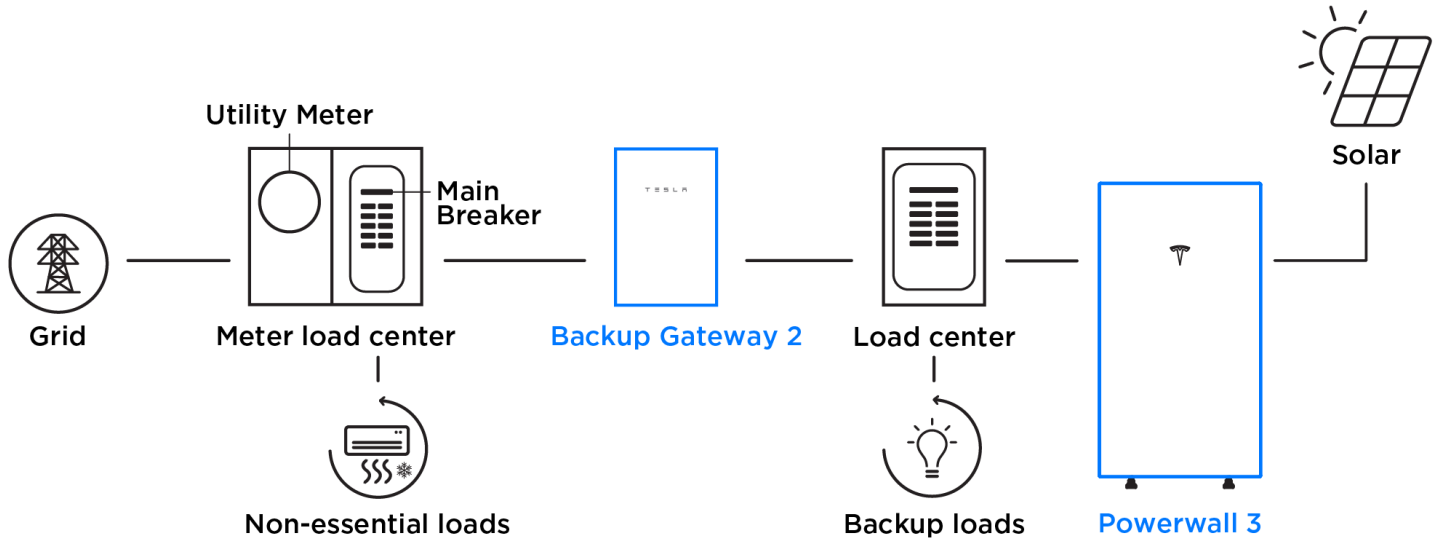
Powerwall 3 with Backup Switch

Whole Home Backup



Powerwall 3 with Backup Gateway 2

Partial Home Backup



RSTC Enterprises, Inc.
2214 Heimstead Road
Eau Claire, WI 54703
715-830-9997

SOLADECK
FLASHED PV ROOF-MOUNT COMBINER/ENCLOSURES

Outdoor Photovoltaic Enclosures

0799 Series

Composition/Cedar Roof System

ETL listed and labeled

Report # 3171411PRT-002 Revised May, 2018

- UL50 Type 3R, 11 Edition Electrical equipment enclosures
- CSA C22.2 No. 290 Nema Type 3R
- Conforms to UL 1741 Standard

0799 Series Includes:

0799 - 2	Wire size 2/0-14
0799 - 5	Wire size 14-6
0799 - D	Wire size 14-8

Models available in Grey, Black or Stainless Steel


SolaDeck 0799-2S


SolaDeck 0799-5G


SolaDeck 0799-DG

Basic Specifications

Material options:
- Powder coated, 18 gauge galvanized 90 steel (1,100 hours salt spray)
- Stainless steel

Process - Seamless draw (stamped)
Flashing - 15.25” x 17.25”
Height - 3”
Cavity - 255 Cubic inches

Base Plate:

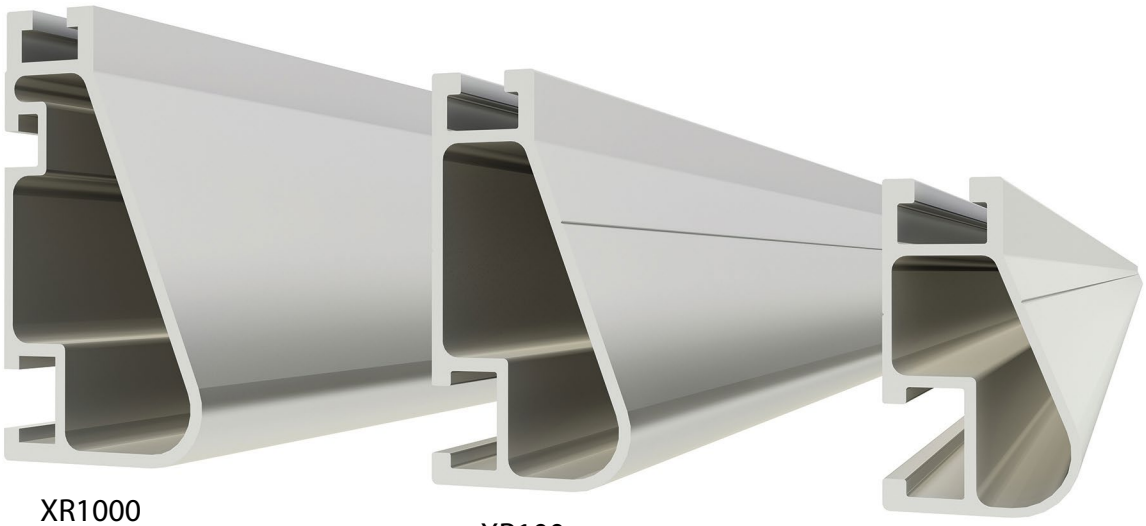
- Fastened to base using toggle fastening system
- 5 roof deck knockouts
- Knockout sizes: (3) .5”, (1) .75” and (1) 1”
- 8”, 35mm slotted din rail
- Ground Block

Passthrough and combiner kits are available for either AC or DC applications.

XR Rail® Assembly Overview

Our product development team strives to keep things simple and intuitive for installers while accommodating a wide range of mounting scenarios. As a result, we offer three complementary types of rail within the XR Rail® Family. Please refer to our website or contact our customer service team so that we can best assist in determining which rail assembly is best for you and your specific project.

XR Rail®



Item Number	Description	Item Number	Description
XR-1000-168A	XR1000, Rail 168" (14 Feet) Clear	XR-10-168A	XR10, Rail 168" (14 Feet) Clear
XR-1000-204A	XR1000, Rail 204" (17 Feet) Clear	XR-10-168B	XR10, Rail 168" (14 Feet) Black
XR-100-168A	XR100, Rail 168" (14 Feet) Clear	XR-10-204A	XR10, Rail 204" (17 Feet) Clear
XR-100-168B	XR100, Rail 168" (14 Feet) Black	XR-10-204B	XR10, Rail 204" (17 Feet) Black
XR-100-204A	XR100, Rail 204" (17 Feet) Clear		
XR-100-204B	XR100, Rail 204" (17 Feet) Black		

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. XR1000® is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans 12 feet or more for commercial applications. XR100® is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans. XR10® is a sleek, low-profile mounting rail, perfectly matched to regions with light or no snow. It achieves 6 foot spans, while also staying light and economical.

BOSS® Bonded Structural Splices

Item Number	Description
XR10-BOSS-01-M1	Bonded Strucutral Splice, XR10
XR100-BOSS-01-M1	Bonded Strucutral Splice, XR100
XR1000-BOSS-01-M1	Bonded Strucutral Splice, XR1000

The BOSS® (Bonded Structural Splice) provides a truly seamless, hidden connection for XR Rails®. Built-in, one-piece springs feature bonding teeth that bite inside the rail, creating a bonded rail connection and meeting all UL standards without any extra tools or hardware. In addition, BOSS® eliminates installation restrictions. Place it anywhere except the outside cantilever.

Universal Fastening Objects (UFO®)

Item Number	Description
UFO-CL-01-A1	Universal Module Clamp, Clear
UFO-CL-01-B1	Universal Module Clamp, Black

The IronRidge UFO® (Universal Fastening Object) is a single-size, single-piece fastener, built to quickly and securely bond any solar modules to XR Rails. It comes fully-lubricated and fully-assembled, and it looks just as good as it performs. When combined with a Stopper Sleeve, the UFO® functions as an end clamp. It comes in two finishes: Clear and Black.

Calculating Rail Length

Calculate the row lengths as follows:

1. Add module widths.
2. Add width of UFO® between modules.
3. Add allowances for UFO® and Stopper Sleeves on ends of rail.

Depending on the location of the UFO®, the clearance values will differ.

Location	UFO®
Mid Clamp	0.375″
End Clamp	1.0″

For example, to mount five modules that are each 40″ wide (in portrait), the row length is calculated as follows:

Step	UFO®
1. Add module widths	5 x 40″ = 200″
2. Add width of mid clamps between modules	4 x 0.375″ = 1.5″
3. Add allowances for end clamps	2 x 1″ = 2
Total length of row	203.5″ = 16.96′

Two 17′ rails will be required to mount this row of five modules.

IronRidge stock rail lengths: 11′, 14′, 17′. Custom lengths available via special order. Contact IronRidge Customer Service for additional details at 800-227-9523, or support@ironridge.com.