Solar Equipment & Space Requirement: 500kW System

MITREX™

Introduction

Photovoltaic systems offer a promising solution to combat global warming while providing sustainable energy for the future. In utility scales, solar farms are prevalent and interconnected with the grid. For enhanced efficiency and reduced loss, it is beneficial to have load and generation sources situated close to each other. Solar projects implemented in or on buildings are particularly advantageous as they harness most of the solar energy for immediate use within the building. This approach not only minimizes losses but also alleviates congestion in transmission and distribution lines.

For Building Owners

A crucial concern for building owners is the electrical equipment required for solar projects. Beyond cost considerations, they worry about the space these equipment installations demand. This document addresses the necessary equipment for various PV project sizes and scenarios.

Logistics Considerations

BIPV (Building Integrated Photovoltaics) and regular rooftop solar installations as BAPV (Building applied photovoltaics) differ in terms of installation locations, solar panel types, and mounting equipment. However, both BIPV and BAPV systems share similar components apart from the solar panels. In rooftop projects, a designated area on the flat or tilted roof is necessary. In contrast, BIPV panels replace specific building elements such as facades, windows, railings, and so on, eliminating the need for additional space.

Additional equipment, such as AC equipment, requires some space on the roof, wall, or inside the building (like electrical or mechanical room). The specific requirements for AC equipment depend on factors such as the system size, number of electricity phases (single phase or three phases), maximum DC voltages allowed in the building, and local distribution company (LDC) regulations. When inverters are placed inside the building, DC cables need to be carefully routed through conduits, necessitating penetration points in the structure. The number and size of conduits vary according to each scenario, as detailed in the accompanying table.

Required AC Equipment For Different Scenarios

Mitrex Panels, both BIPV and BAPV, are suitable for a 1000V system voltage. However, certain buildings may be restricted to a maximum of 600V DC based on local codes. Electricity services typically operate at 240V single phase or 208V, 480V, and 600V three phases. The table below outlines the required AC equipment for all the aforementioned scenarios, considering different system sizes.

600V DC MAX SYSTEM

NO. OF PHASES		SINGLE PHASE	THREE PHASE		
VOLTAGE		• 240V	• 208V	• 480V	• 600V
5kW	Inverter	Solaredge SE5000H-US	---	---	---
	Disconnect	240V 30A Disconnect	---	---	---
	Panelboard	---	---	---	---
	Transformer	---	---	---	---
	Conduit	1" Conduit	---	---	---
	SCADA	---	---	---	---
10kW	Inverter	Solaredge SE10000H-US	Solaredge SE10KUS	Fronius Symo 15.0-3	Solaredge SE10KUS
	Disconnect	240V 60A Disconnect	240V 60A Disconnect	600V 30A Disconnect x 2	600V 30A Disconnect x 3
	Panelboard	---	---	---	---
	Transformer	---	---	---	600V/208V 15kVA TX
	Conduit	1 1/4" Conduit	1 1/4" Conduit	1 1/2 " Conduit	1 1/4 " Conduit
	SCADA	---	---	---	---
20kW	Inverter	Solaredge SE10000H-US x 2	Solaredge SE10KUS x 2	Fronius Symo 20.0-3	Solaredge SE10KUS x 2
	Disconnect	240V 200A Disconnect	240V 100A Disconnect	600V 30A Disconnect x 2	600V 30A Disconnect x 2
	Panelboard	240V 200A Panel	240V 100A Panel	---	600V 100A Panel
	Transformer	---	---	---	600V/208V 30kVA TX
	Conduit	1 1/2" Conduit	2" Conduit	1 1/2 " Conduit	2" Conduit
	SCADA	---	---	---	---
50kW	Inverter	---	Solaredge SE17.3KUS x 3	SMA Core1 33.3kW x 2	SMA Core1 33.3kW x 2
	Disconnect	---	240V 200A Disconnect	600V 60A Disconnect x 2	600V 60A Disconnect x 2
	Panelboard	---	240V 200A Panel	600V 100A Panel	600V 100A Panel
	Transformer	---	---	---	600V/480V 75kVA TX
	Conduit	---	2" Conduit	3" or 2 x 2" Conduit	3" or 2 x 2" Conduit
	SCADA	---	Depends on the Hydro	Depends on the Hydro	Depends on the Hydro
100kW	Inverter	---	Solaredge SE17.3KUS x 6	SMA Core1 33.3kW x 3	SMA Core1 33.3kW x 3
	Disconnect	---	240V 400A Disconnect	600V 200A Disconnect x 2	600V 200A Disconnect x 2
	Panelboard	---	240V 400A Panel	600V 200A Panel	600V 200A Panel
	Transformer	---	---	---	600V/480V 150kVA TX
	Conduit		3" or 2 x 2" Conduit	4" or 2 x 3" or 3 x 2" Conduit	4" or 2 x 3" or 3 x 2" Conduit
	SCADA	---	Depends on the Hydro	Depends on the Hydro	Depends on the Hydro
500kW	Inverter	---	---	SMA Core1 33.3kW x 15	SMA Core1 33.3kW x 15
	Disconnect	---	---	600V 600A Disconnect x 2	600V 600A Disconnect x 2
	Panelboard	---	---	600V 800A Panel	600V 800A Panel
	Transformer	---	---	---	600V/480V 500kVA TX
	Conduit	---	---	5 x 4" Conduit	5 x 4" Conduit
	SCADA	---	---	Depends on the Hydro	Depends on the Hydro

1000V DC MAX SYSTEM

NO. OF PHASES		SINGLE PHASE	THREE PHASE		
VOLTAGE		**• 240V**	**• 208V**	**• 480V**	**• 600V**
5kW	Inverter	Fronius Primo 5.0-1	---	---	---
	Disconnect	240V 30A Disconnect	---	---	---
	Panelboard	---	---	---	---
	Transformer	---	---	---	---
	Conduit	1 1/4" Conduit	---	---	---
	SCADA	---	---	---	---
10kW	Inverter	Fronius Primo 10.0-1	Fronius Symo 10.0-3 (208V)	Fronius Symo 10.0-3	Fronius Symo 10.0-3
	Disconnect	240V 60A Disconnect	240V 60A Disconnect	600V 30A Disconnect x 2	600V 30A Disconnect x 3
	Panelboard	---	---	---	---
	Transformer	---	---	---	600V/480V 15kVA TX
	Conduit	1 1/2" Conduit	1 1/2" Conduit	1 1/2" Conduit	1 1/2" Conduit
	SCADA	---	---	---	---
20kW	Inverter	Fronius Primo 10.0-1 x 2	Fronius Symo 10.0-3 (208V) x 2	Fronius Symo 20.0-3	Fronius Symo 20.0-3
	Disconnect	240V 200A Disconnect	240V 100A Disconnect	600V 30A Disconnect x 2	600V 30A Disconnect x 3
	Panelboard	240V 200A Panel	240V 100A Panel	---	---
	Transformer	---	---	---	600V/480V 30kVA TX
	Conduit	2" Conduit	2" Conduit	1 1/2" Conduit	1 1/2" Conduit
	SCADA	---	---	---	---
50kW	Inverter	---	Fronius Symo 15.0-3 (208V) x 3	SMA Core1 50kW	SMA Core1 50kW
	Disconnect	---	240V 200A Disconnect	600V 60A Disconnect x 2	600V 60A Disconnect x 3
	Panelboard	---	240V 200A Panel	---	---
	Transformer	---	---	---	600V/480V 75kVA TX
	Conduit	---	3" or 2 x 2" Conduit	1 1/2" Conduit	1 1/2" Conduit
	SCADA	---	Depends on the Hydro	Depends on the Hydro	Depends on the Hydro
100kW	Inverter	---	Fronius Symo 15.0-3 (208V) x 7	Solaredge SE100KUS	Solaredge SE100KUS
	Disconnect	---	240V 400A Disconnect	600V 200A Disconnect x 2	600V 200A Disconnect x 3
	Panelboard	---	240V 400A Panel	---	---
	Transformer	---	---	---	600V/480V 150kVA TX
	Conduit	---	4" or 2 x 3" or 4 x 2" Conduit	2 1/2" or 2 x 1 1/2" PVC Conduit	2 1/2" or 2 x 1 1/2" PVC Conduit
	SCADA	---	Depends on the Hydro	Depends on the Hydro	Depends on the Hydro
500kW	Inverter	---	---	Solaredge SE100KUS x 5	Solaredge SE100KUS x 5
	Disconnect	---	---	600V 600A Disconnect x 2	600V 600A Disconnect x 2
	Panelboard	---	---	600V 800A Panel	600V 800A Panel
	Transformer	---	---	600V/480V 500kVA TX	600V/480V 500kVA TX
	Conduit	---	---	2 x 4" or 5 x 2 1/2" Conduit	2 x 4" or 5 x 2 1/2" Conduit
	SCADA	---	---	Depends on the Hydro	Depends on the Hydro

Case Study

500kW System On Midrise Industrial Building

Building Type:
Industrial building with 1920 panels of 320W (total 614.4 kW DC)

System Size:
5 × 100kW Solaredge inverter SE100KUS

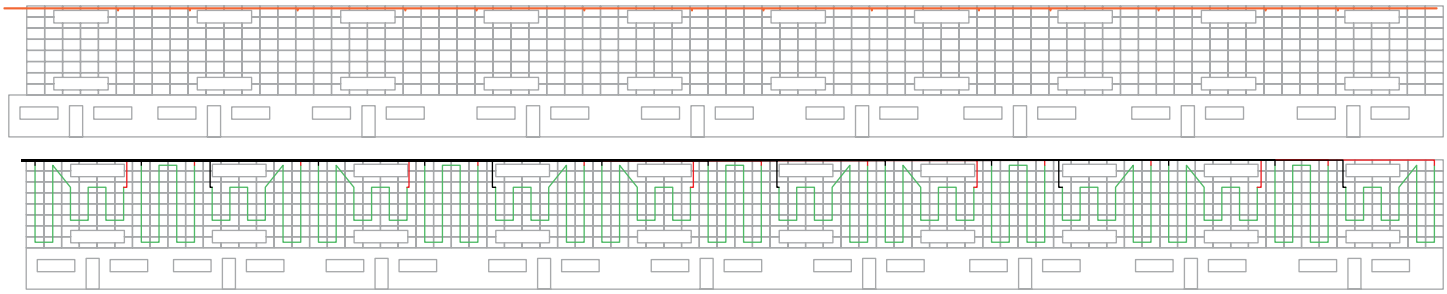
System Layout:
60 strings of 32 panels with two building penetration holes (Conduit size 4")

Project Solar Equipment:
One AC Panelboard 800A 600V, One 500kVA transformer 480V/600V, two 600A 600V disconnect switches (One could be replaced with breaker inside the main building switchboard if available).

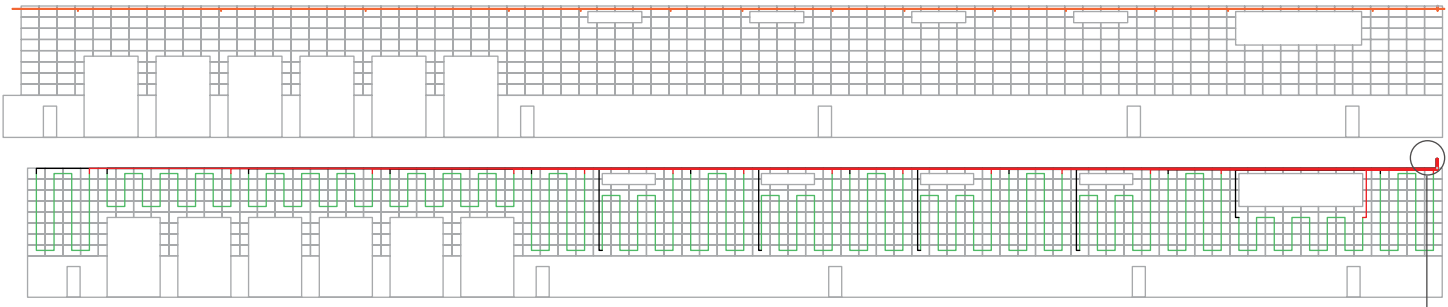
500kW System Wiring Layout:

Home Run To The Building Rooftop

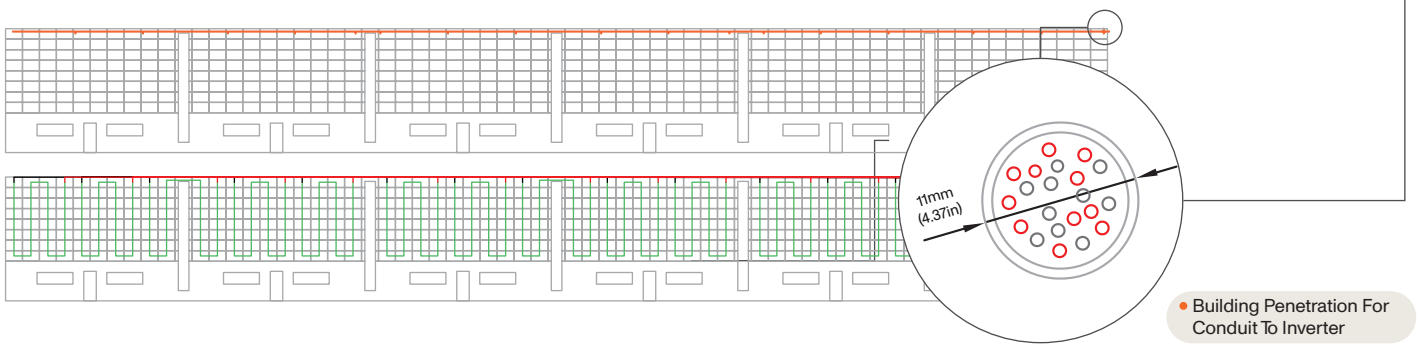
- East Elevation



- West Elevation

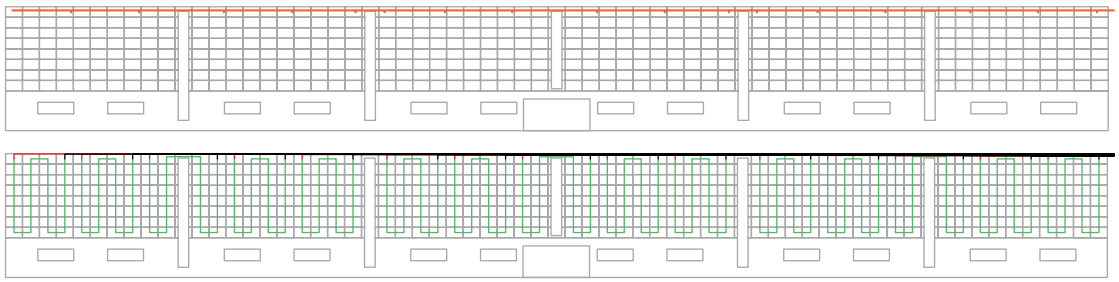


- South Elevation



- Building Penetration For Conduit To Inverter

- North Elevation



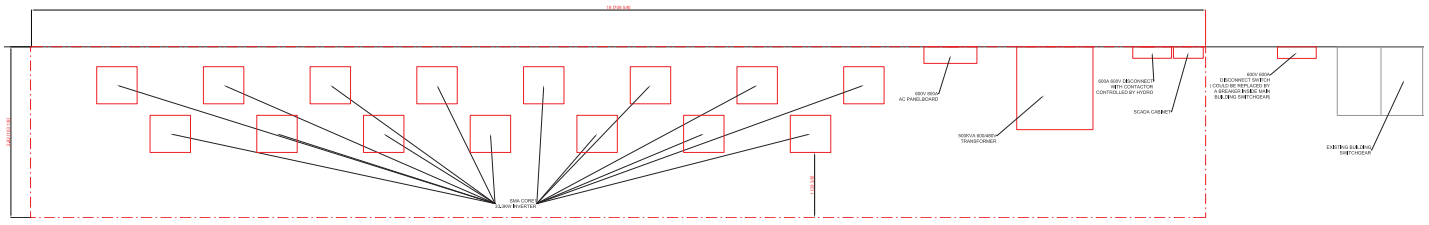
Line Colour Reference

- Building & solar panels layout
- Conduit layout
- Electrical strings
- Home run wiring

Required Space For Solar Equipment:

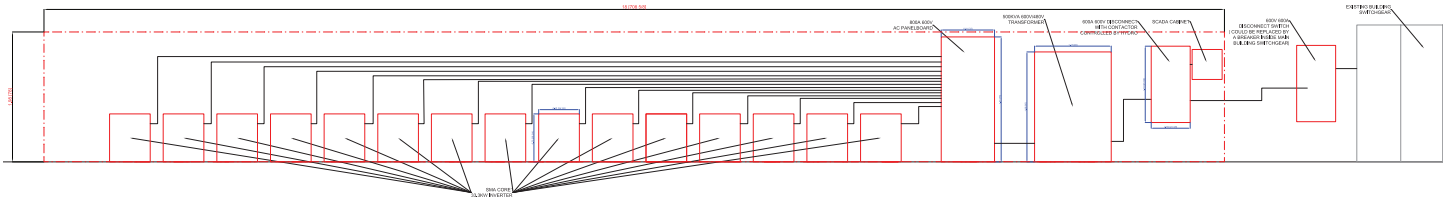
Placed On The Rooftop

- Top View



Note: Working area is 1m (39.37in) in front of solar equipments as per electrical code.

- Front View



Three Phase Inverter with Synergy Technology

For the 277/480V Grid for North America

SE80KUS / SE100KUS / SE110KUS / SE120KUS

INVERTER

Powered by unique pre-commissioning process for rapid system installation

- Pre-commissioning feature for automated validation of system components and wiring during the site installation process and prior to grid connection
- Easy 2-person installation with lightweight, modular design (each inverter consists of 2 or 3 Synergy units and 1 Synergy Manager)
- Independent operation of each Synergy unit enables higher uptime and easy serviceability
- Built-in thermal sensors detect faulty wiring, ensuring enhanced protection and safety
- Built-in arc fault protection and rapid shutdown
- Built-in PID mitigation for maximized system performance
- Monitored* and field-replaceable surge protection devices, to better withstand surges caused by lightning or other events
- Built-in module-level monitoring with Ethernet or cellular communication for full system visibility

*Applicable only for DC and AC SPDs

solaredge

/ Three Phase Inverter with Synergy Technology

For the 277/480V Grid for North America

SE80KUS / SE100KUS / SE110KUS / SE120KUS

MODEL NUMBER	SE80KUS	SE100KUS	SE110KUS	SE120KUS	
APPLICABLE TO INVERTERS WITH PART NUMBER	SExxK-USx8Ixxxx				UNITS
OUTPUT					
Rated AC Active Output Power	80000	100000	110000	120000	W
Maximum AC Apparent Output Power	80000	100000	120000	120000	VA
AC Output Line Connections	3W + PE, 4W + PE				
Supported Grids	WYE: TN-C, TN-S, TN-C-S, TT, IT; Delta: IT				
AC Output Voltage Minimum-Nominal-Maximum[1] (L-N)	244 – 277 – 305				Vac
AC Output Voltage Minimum-Nominal-Maximum[1] (L-L)	422.5 – 480 – 529				Vac
AC Frequency Min-Nom-Max[1]	59.5 – 60 – 60.5				Hz
Maximum Continuous Output Current (per Phase, PF=1)	96.5	120	144.3		Aac
GFDI Threshold	1				A
Utility Monitoring, Islanding Protection, Configurable Power Factor, Country Configurable Thresholds	Yes				
Total Harmonic Distortion	≤ 3				%
Power Factor Range	+/-0.2 to 1				
INPUT					
Maximum DC Power (Module STC) Inverter / Synergy Unit	140000 / 70000	175000 / 58300	210000 / 70000		W
Transformer-less, Ungrounded	Yes				
Maximum Input Voltage DC+ to DC-	1000				Vdc
Operating Voltage Range	850 – 1000				Vdc
Maximum Input Current	2 x 48.25	3 x 40	3 x 48.25		Adc
Reverse-Polarity Protection	Yes				
Ground-Fault Isolation Detection	167kΩ sensitivity per Synergy Unit[2]				
CEC Weighted Efficiency	98.5				%
Nighttime Power Consumption	< 8	< 12			W
ADDITIONAL FEATURES					
Supported Communication Interfaces[3]	2 x RS485, Ethernet, Wi-Fi (optional), Cellular (optional)				
Smart Energy Management	Export Limitation				
Inverter Commissioning	With the SetApp mobile application using built-in Wi-Fi access point for local connection				
Arc Fault Protection	Built-in, User Configurable (According to UL1699B)				
Photovoltaic Rapid Shutdown System	EC 2014, 2017 and 2020, Built-in				
PID Rectifier	Nighttime, built-in				
RS485 Surge Protection (ports 1+2)	Type II, field replaceable, integrated				
AC, DC Surge Protection	Type II, field replaceable, integrated				
DC Fuses (Single Pole)	25A, integrated				
DC SAFETY SWITCH					
DC Disconnect	Built-in				
STANDARD COMPLIANCE					
Safety	UL1699B, UL1741, UL1741 SA, UL1741 SB, UL1998, CSA C22.2#107.1, Canadian AFCI according to T.I.L. M-07				
Grid Connection Standards	IEEE 1547-2018, Rule 21, Rule 14 (HI)				
Emissions	FCC part 15 class A				

(1) For other regional settings please contact SolarEdge support.
(2) Where permitted by local regulations.
(3) For specifications of the optional communication options, visit the Communication product page or the Resource Library to download the relevant product datasheet.

/ Three Phase Inverter with Synergy Technology

For the 277/480V Grid for North America

SE80KUS / SE100KUS / SE110KUS / SE120KUS

MODEL NUMBER	SE80KUS	SE100KUS	SE110KUS	SE120KUS	
APPLICABLE TO INVERTERS WITH PART NUMBER	SExxK-USx8Ixxxx				UNITS
INSTALLATION SPECIFICATIONS					
Number of Synergy Units per Inverter	2	3			
Ac Max Conduit Size	2 ½"				in
Max AWG Line / PE	4/0 / 1/0				
DC Max Conduit Size	1 x 3"; 2 x 2"				in
DC Input Inverter/ Synergy Unit	8 / 4 pairs; 6-12 AWG	12 / 4 pairs; 6-12 AWG			
	2 pairs / 1 pair, Max 2 AWG; copper or aluminum	3 pairs / 1 pair, Max 2 AWG; copper or aluminum			
Dimensions (H x W x D)	Synergy Unit: 22 x 12.9 x 10.75 / 558 x 328 x 273 Synergy Manager: 14.17 x 22.4 x 11.6 / 360 x 560 x 295				in / mm
Weight	Synergy Unit: 70.4 / 32 Synergy Manager: 39.6 / 18				lb / kg
Operating Temperature Range	-40 to +140 / -40 to +60(4)				°F / °C
Cooling	Fan (user replaceable)				
Noise	< 67				dBA
Protection Rating	NEMA 3R				
Mounting	Brackets provided				

(4) For power de-rating information refer to the Temperature De-rating - Technical Note (North America).

DRY TYPE TRANSFORMER SPECIFICATION

TRANSFORMER SPECIFICATION

RATING	500kVA
COOLING	ANN
TEMPERATURE RISE	115°C
PHASES	3
FREQUENCY	60Hz
K-FACTOR	4

	PRIMARY	SECONDARY
VOLTAGE	600V	480Y/277V
TAPS - FCAN	2 x 2.5%	-
TAPS - FCBN	2 x 2.5%	-
BIL	10kV	10kV

CONDUCTOR	ALUMINUM
WINDINGS	POLYESTER RESIN DIPPED
INSULATION CLASS	220°C
IMPEDANCE (@ 135°C)	4.0% - 6.0%
MIN EFFICIENCY	99.14% @ 35% LOAD, 75°C
AVG. SOUND LEVEL	60dBA
ELECTROSTATIC SHIELD	NONE
EST. WEIGHT	3860 lbs [1755kg]

TERMINALS AND CABLE LUGS

	PRIMARY	SECONDARY
LOCATION	FRONT	REAR
LINE LUGS (/PH)	PADS	PADS
NEUTRAL LUGS	N/A	PADS
GROUND LUG	300 MCM-6 AWG LUG ON ENCLOSURE BASE	

WIRING / CONNECTIONS

PRIMARY: H1-H2-H3

VOLTAGE	% TAP	LINKS:
630	105.0%	1-2
615	102.5%	2-3
600	100.0%	3-4
585	97.5%	4-5
570	95.0%	5-6

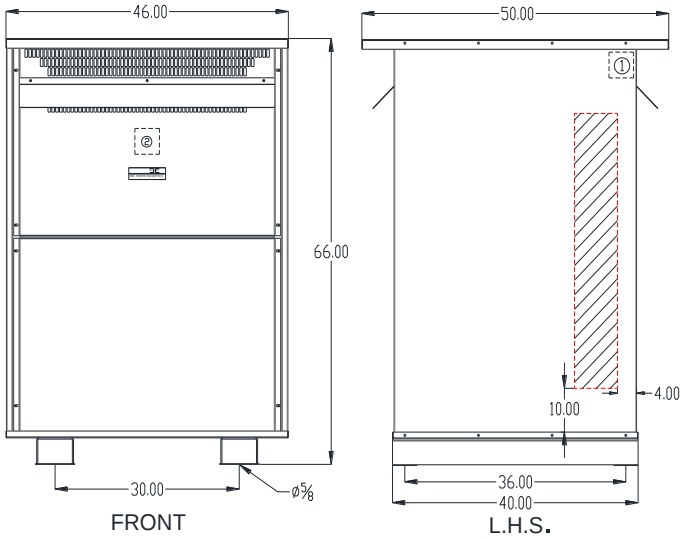
SECONDARY: X0-X1-X2-X3

VOLTAGE	PHASE	CONNECT LOAD TO
480	3	X1-X2-X3
277	1	X0-X1, X0-X2, AND/OR X0-X3

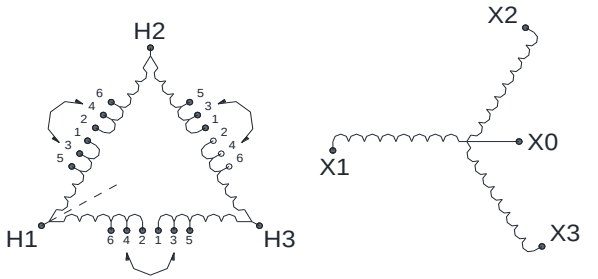
FEATURES

- NEOPRENE ANTI-VIBRATION PADS INSTALLED BETWEEN CORE & COIL AND ENCLOSURE BASE
- LUG FOR EARTH GROUNDING PROVIDED
- SUITABLE FOR NON-SINUSOIDAL CURRENT LOAD WITH K-FACTOR NOT TO EXCEED 4
- NEUTRAL SIZED FOR 200% OF LINE CURRENT
- SEISMIC RATED FOR USA ZONE 4 AND CANADA ZONE 6
- CSA CERTIFIED (FILE # LR34493)
- UL LISTED (FILE # E108255)
- ISO 9001 QUALITY MANAGEMENT SYSTEM
- EFFICIENCY MEETS OR EXCEEDS:
  - CANADA: SOR/DORS/2018-201 (NRCan 2019)
  - CSA: CSA C802.2-18
  - USA: DOE 10 CFR PART 431:2016-01 (DOE 2016)

1)Location of nameplate and labels for Canada
2)Location of nameplate and labels for USA
*Recommended area for side cable entry(7"x50") on either side



FRONT L.H.S.



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ENCLOSURE

ENCLOSURE PART #	E3R-10
ENCLOSURE RATING	TYPE 3R (INDOOR)*
CONSTRUCTION	VENTILATED
MATERIAL	STEEL
FINISH	POLYESTER POWDER COAT
COLOR	ANSI/ASA 61 (GREY)
MOUNTING	FLOOR

*SPRINKLERPROOF WHEN THE ANGLE BETWEEN SPRINKLER HEADS AND OPENING IN THE ENCLOSURE DOES NOT EXCEED 45 DEGREE FROM THE VERTICAL.

*FOR PROPER VENTILATION FOR FLOOR INSTALLATION KEEP AT LEAST 6 INCHES FROM ADJACENT WALLS

REV	REMARKS	BY	DATE

PRELIMINARY DRAWING

THIS DRAWING MAY NOT TRULY REFLECT OUR FINAL DESIGN. ANY ORDER(S) MUST BE ACCOMPANIED BY OR REFER TO THIS DRAWING. REX POWER MAGNETICS RESERVES THE RIGHT TO CHANGE OR REVISE THESE SPECIFICATIONS WITHOUT NOTICE

PRODUCT		**K-FACTOR RATED ISOLATION TRANSFORMER**	
MODEL / CAT No.		**BA500J-P/K4/T115/Z3**	
CUSTOMER	-		
PO #	-		
SWO #	-	**QTY**	-
Prepared By	C.G.	**Date**	9/21/2020
Approved By		**Date**	-

REX POWER MAGNETICS

System	Ampere Rating	Indoor — Type 1 Catalog Number	Indoor — Type 1 Ship Wt. (lbs.) Std. Pkg	Outdoor — Type 3R Catalog Number	Outdoor — Type 3R Ship Wt. (lbs.) Std. Pkg	Horsepower Rating④ 480V AC 1-Phase, 2-Wire Std.	480V AC 1-Phase, 2-Wire Max.	480V AC 3-Phase, 3-Wire Std.	480V AC 3-Phase, 3-Wire Max.	600V AC 1-Phase, 2-Wire Std.	600V AC 1-Phase, 2-Wire Max.	600V AC 3-Phase, 3-Wire Std.	600V AC 3-Phase, 3-Wire Max.	250 Volt DC	600 Volt DC
600 Volt Fusible⑤															
2-Pole, 2-Fuse③														**480 Volt AC/600 Volt AC/600 Volt DC**	
	30	HF261	15	HF261R	15	3	7½	—	—	3	10	—	—	5	15
	60	HF262	20	HF262R	20	5	20	—	—	10	25	—	—	10	30
	100	HF263	26	HF263R	27	10	30	—	—	15	40	—	—	20	50
3-Pole, 3-Fuse														**480 Volt AC/600 Volt AC/250 Volt DC①**	
	30	HF361	14	HF361R	15	3	7½	5	15	3	10	7½	20	5	—
	30	HF361L⑦	19	HF361RL⑦	20	3	7½	5	15	3	10	7½	20	5	—
	60	HF362	19	HF362R	20	5	20	15	30	10	25	15	50	10	30⑧
	60	—	—	HF362RL⑦	25	5	20	15	30	10	25	15	50	10	30⑧
	100	HF363	24	HF363R	25	5	20	25	60	15	40	30	75	20	50⑧
	200	HF364	48	HF364R	49	25	50	50	125	30	50	60	150	40	50
	400	HF365A①	93	HF365RA①	157	—	—	100	250	—	—	125	350	50	—
	600	HF366A①	98	HF366RA①	161	—	—	150	400	—	—	200	500	50	—
	800	HF367	365	HF367R	365	—	—	200	500	—	—	250	500	50	—
	1200	HF368	383	HF368R	385	—	—	200	500	—	—	250	500	50	—
3-Pole, 3-Fuse and Solid Neutral														**480 Volt AC/600 Volt AC/250 Volt DC①**	
	30	HF361N	14	HF361NR	15	3	7½	5	15	3	10	7½	20	5	—
	60	HF362N	19	HF362NR	20	5	20	15	30	10	25	15	50	10	30⑧
	100	HF363N	25	HF363NR	26	10	30	25	60	15	40	30	75	20	50⑧
	200	HF364N	49	HF364NR	50	25	50	50	125	30	50	60	150	40	50
	400	HF365NA	94.6	HF365NRA	94.6	—	—	100	250	—	—	125	350	50	—
	600	HF366NA	99.6	HF366NRA	99.6	—	—	150	400	—	—	200	500	50	—
	800	HF367N	375	HF367NR	375	—	—	250	500	—	—	250	500	50	—
	1200	HF368N	395	HF368NR	388	—	—	250	500	—	—	250	500	50	—
600 Volt Fusible⑤ (For 2-Pole Applications use outside poles of 3-Pole Switches)															
2-Pole, 2-Fuse③														**480 Volt AC/600 Volt AC/600 Volt DC**	
		Type 4/4X Stainless⑨		Type 12 Industrial⑥											
	30	HF261S	15	HF261J■	15	3	7½	—	—	3	10	—	—	5	15
	60	HF262S	20	HF262J■	20	5	20	—	—	10	25	—	—	10	30
	100	HF263S■	27	HF263J■	27	10	30	—	—	15	40	—	—	20	50
3-Pole, 3-Fuse														**480 Volt AC/600 Volt AC/250 Volt DC①**	
	30	HF361S	13	HF361J	14	—	—	5	15	—	—	7½	20	5	—
	60	HF362S	20	HF362J	20	—	—	15	30	—	—	15	50	10	30⑧
	100	HF363S	25	HF363J	25	—	—	25	60	—	—	30	75	20	50⑧
	200	HF364S	49	HF364J	49	—	—	50	125	—	—	60	150	40	50
	400	HF365SA①	93	HF365JA①	93	—	—	100	250	—	—	125	350	50	—
	400	HF365SSA	93	—	—	—	—	100	250	—	—	125	350	50	—
	600	HF366SA①	98	HF366JA①	98	—	—	150	400	—	—	200	500	50	—
	600	HF366SSA	98	—	—	—	—	150	400	—	—	200	500	50	—
	800	HF367S	370	HF367J■	365	—	—	200	500	—	—	250	500	50	—
	1200	HF368S■	388	HF368J■	388	—	—	250	500	—	—	250	500	50	—

■ Built to order. Allow 3-5 weeks for delivery.
① 60-600A 3-Pole switches are also rated 600V DC.
② Height reduced switch (45.25 rather than 56 inches in height) for use with 500MCM or smaller conductors.
③ Use 3-Pole switch for 200A applications.
④ Dual horsepower ratings: Std.- applies when non-time delay fuses are installed. Max.- applies when time-delay fuses are installed.
⑤ Suitable for use as service entrance equipment except on 1200 Amp solidly grounded wye systems per NEC 230.95.
⑥ Also rated Type 3S/3R.
⑦ Indicates oversized enclosure (30A switch with 60A lugs in a 60A enclosure or 60A switch with 100A lugs in a 100A enclosure).
⑧ 600V DC & 600V DC horsepower rating shown requires (2) poles to be connected in series.
⑨ 304 grade stainless steel. For switches with enclosures constructed from 316 grade stainless steel, see page 4-18.

Safety Switch Dimensions (Inches)* & Shipping Weights

Catalog Number	Height			Width		Depth		Knockout Diagram①	Shipping Weight (lbs.)
	Box A	With Door B	With Rain Shed C	Box D	With Handle E	Box F	With Handle G		
HF362J, JW	16.27	19.31	—	9.17	11.47	5.33	10.46	—	20
HF362N	16.26	17.46	—	9.15	11.53	5.05	10.17	S16	19
HF362NR	16.26	—	17.77	9.16	11.53	5.05	10.17	S17	20
HF362R, RPV, RPVPG, RW	16.26	—	17.77	9.16	11.53	5.05	10.17	S17	20
HF362RL	21.95	—	23.46	9.64	11.97	5.05	10.17	S11	25
HF362S, SS, SSW, SW	16.27	19.31	—	9.17	11.47	5.33	10.46	—	20
HF363, PV, PVPG	21.95	23.15	—	9.64	12.01	5.05	10.17	S10	24
HF363J, JW	21.96	23.16	—	9.65	12.02	5.34	10.46	—	25
HF363N	21.95	23.15	—	9.64	12.01	5.05	10.17	S10	25
HF363NR	21.95	—	23.46	9.64	11.97	5.05	10.17	S11	26
HF363R, RPV, RPVPG	21.95	—	23.46	9.64	11.97	5.05	10.17	S11	25
HF363S, SS, SSW, SW	21.96	23.16	—	9.65	12.02	5.34	10.46	—	25
HF364, PV, PVPG	29.9	31.07	—	14.62	16.98	6.36	12.33	S12	48
HF364J, JW	29.96	31.07	—	14.62	16.95	6.63	12.58	—	49
HF364N	29.9	31.07	—	14.62	16.98	6.36	12.33	S12	49
HF364NR	29.9	—	31.42	14.61	16.99	6.36	12.33	S13	48
HF364R, RPV, RPVPG	29.9	—	31.42	14.61	16.99	6.36	12.33	S13	49
HF364S, SS, SSW, SW	29.96	31.07	—	14.62	16.95	6.63	12.58	—	49
HF365A	45.32	45.81	—	22.4	23.404	6.94	9.93	S18	93
HF365JA, HF365JWA	45.32	45.81	—	22.4	23.404	6.97	10.05	—	93
HF365NA	45.32	45.81	—	22.4	23.404	6.94	9.93	S18	94.6
HF365NRA	45.32	45.81	—	22.4	23.404	6.94	9.93	S19	94.6
HF365RA	45.32	45.81	—	22.4	23.404	6.94	9.93	S19	93
HF365SA, HF365SWA	45.32	45.81	—	22.4	23.404	7.34	10.347	—	93
HF365SSA, HF365SSWA	45.32	45.81	—	22.4	23.404	7.34	10.347	—	93
HF366A	45.32	45.81	—	22.4	23.404	6.94	9.93	S18	98
HF366JA, HF366JWA	45.32	45.81	—	22.4	23.404	6.97	10.05	—	98
HF366NA	45.32	45.81	—	22.4	23.404	6.94	9.93	S18	99.6
HF366NRA	45.32	45.81	—	22.4	23.404	6.94	9.93	S19	99.6
HF366RA	45.32	45.81	—	22.4	23.404	6.94	9.93	S19	98
HF366SA	45.32	45.81	—	22.4	23.404	7.34	10.347	—	98
HF366SSA	45.32	45.81	—	22.4	23.404	7.34	10.347	—	98
HF367	66.67	67.16	—	38.4	39.96	9.24	14.68	—	380
HF367J	66.67	67.16	—	38.4	39.96	9.24	14.68	—	380
HF367N	66.67	67.16	—	38.4	39.96	9.24	14.68	—	382
HF367NR	66.67	—	67.74	38.4	40.25	9.24	14.68	—	386
HF367R	66.67	—	67.74	38.4	40.25	9.24	14.68	—	382
HF367S	66.67	67.16	—	38.4	39.96	9.24	14.68	—	380
HF368, J, S	66.67	67.16	—	38.4	39.96	9.24	14.68	—	383
HF368N	66.67	67.16	—	38.4	39.96	9.24	14.68	—	385
HF368NR	66.67	—	67.74	38.4	40.25	9.24	14.68	—	388
HF368R	66.67	—	67.74	38.4	40.25	9.24	14.68	—	385
HNF365JA	45.32	45.81	—	22.4	23.404	6.97	10.05	—	75
HNF365RA	33.47	33.96	—	22.4	23.404	6.94	9.93	S19	75
HNF365SA	33.47	33.96	—	22.4	23.404	7.34	10.347	—	75
HNF365SSA	33.47	33.96	—	22.4	23.404	7.34	10.347	—	75
HNF366SA	33.47	33.96	—	22.4	23.404	7.34	10.347	—	77
HNF366SSA	33.47	33.96	—	22.4	23.404	7.34	10.347	—	77
HNF366JA	45.32	45.81	—	22.4	23.404	6.97	10.05	—	77
HNF366RA	33.47	33.96	—	22.4	23.404	6.94	9.93	S19	77
HNF361, PV, PVPG also **HNF261 & HNF362H**	11.11	12.31	—	6.64	9.01	5.05	10.17	S7	12
HNF361J, JW also **HNF261J & HNF362JH**	11.12	14.14	—	6.65	9.02	5.56	10.46	—	13
HNF361R, RPV, RPVPG also **HNF261R & HNF362RH**	11.11	—	12.63	6.64	9.01	5.05	10.17	S9	13
HNF361RL	16.26	—	17.77	9.16	11.53	5.05	10.17	S17	20
HNF361S, SS, SSW, SW also **HNF261S & HNF362SH**	11.12	14.14	—	6.65	9.02	5.56	10.46	—	13
HNF362, PV, PVPG also **HNF262**	16.26	17.46	—	9.15	11.53	5.05	10.17	S16	18
HNF362J, JW also **HNF262J**	16.27	17.46	—	9.17	11.47	5.33	10.46	—	19
HNF362R, RPV, RPVPG also HNF262R	16.26	—	17.77	9.16	11.53	5.05	10.17	S17	19
HNF362RL	21.95	—	23.46	9.64	11.97	5.05	10.17	S11	24
HNF362S, SS, SSW, SW also **HNF262S**	16.27	17.46	—	9.17	11.47	5.33	10.46	—	19
HNF363, PV, PVPG also **HNF263**	21.95	23.15	—	9.64	12.01	5.05	10.17	S10	23
HNF363J, JW also **HNF263J**	21.96	23.16	—	9.65	12.02	5.34	10.46	—	24
HNF363R, RPV, RPVPG also **HNF263R**	21.95	—	23.46	9.64	11.97	5.05	10.17	S11	24
HNF363S, SS, SSW, SW also **HNF263S**	21.96	23.16	—	9.65	12.02	5.34	10.46	—	24

***For inches / millimeters conversion, multiply inches by 25.4.**

① Knocks not provided on Type 4 / 4X and 12 or in 800 & 1200A switches.

Application
Type P4 Panelboards

Table P4-3 – Main Breaker Selection

Ampere rating	Breaker type: Trip type [1]	Frame type	Breaker family	Maximum IC (KA) Symmetrical Amperes: 240V	480V	600V	Main Breaker Unit Space in inches (mm)	Continuous Current Rating
400A	TMTU	JXD6, JD6	Sentron	65	35	22	8.75 (222)	200, 225, 250, 300, 350, 400
		HJXD6, HJD6	Sentron	100	65	35	8.75 (222)	200, 225, 250, 300, 350, 400
		HHJXD6, HHJD6	Sentron	200	100	50	8.75 (222)	200, 225, 250, 300, 350, 400
		CJD6	Sentron	200	150	100	8.75 (222)	200, 225, 250, 300, 350, 400
	ETU	NJ	VL	65	35	25	6.25 (159)	250, 400
		SJD6	Sentron	65	35	25	8.75 (222)	200, 300, 400
		HJ	VL	100	65	25	6.25 (159)	250, 400
		SHJD6	Sentron	100	65	35	8.75 (222)	200, 300, 400
		LJ	VL	200	100	25	6.25 (159)	250, 400
		SCJD6	Sentron	200	150	100	8.75 (222)	200, 300, 400
600A	TMTU	LXD6	Sentron	65	35	25	8.75 (222)	450, 500, 600
		LD6	Sentron	65	35	25	8.75 (222)	250, 300, 350, 400, 450, 500, 600
		HLXD6, HLD6	Sentron	100	65	35	8.75 (222)	250, 300, 350, 400, 450, 500, 600
		HHLXD6, HHLD6	Sentron	200	100	50	8.75 (222)	250, 300, 350, 400, 450, 500, 600
		CLD6	Sentron	200	150	100	8.75 (222)	250, 300, 350, 400, 450, 500, 600
	ETU	NL [2]	VL	65	35	18	6.25 (159)	400, 600
		SLD6	Sentron	65	35	25	8.75 (222)	300, 400, 500, 600
		HL [2]	VL	100	65	18	6.25 (159)	400, 600
		SHLD6	Sentron	100	65	35	8.75 (222)	300, 400, 500, 600
		LL [2]	VL	200	100	18	6.25 (159)	400, 600
		SCLD6	Sentron	200	150	100	8.75 (222)	300, 400, 500, 600
800A	TMTU	NM [3]	VL	65	35	25	8.75 (222)	600, 700, 800
		HM [3]	VL	100	65	35	8.75 (222)	600, 700, 800
		LM [3]	VL	200	100	50	8.75 (222)	600, 700, 800
	ETU	NM [3]	VL	65	35	25	8.75 (222)	600, 800
		HM [3]	VL	100	65	35	8.75 (222)	600, 800
		LM [3]	VL	200	100	50	8.75 (222)	600, 800

[1] TMTU = Thermal Magnetic Trip Unit and ETU = Electronic Trip Unit.
[2] 100% ratings are not available for the VL LG frame, replace with VL MG frame @ 600A rated 100%.
[3] 100% ratings are not available for the VL MG. Use a P5 panel for this application with the VL NG frame @ 800A rated 100%.

Table P4-4 – Enclosure Selection [1]

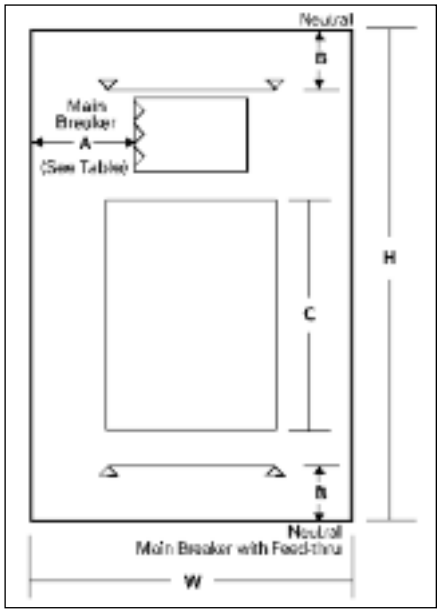
Enclosure Dimension in Inches (mm)			Available Unit Space in Inches (mm) Dimension "C" in Fig. 4-1		
H	W	D	Main Lug Only 400 / 800A	Main Breaker 400A/600A	800A
60 (1524)	32 (813)	10 (254)	30 (762)	23.75 (603)	21.25 (540)
75 (1905)	32 (813)	10 (254)	45 (1143)	38.75 (984)	26.25 (921)
90 (2286)	32 (813)	10 (254)	60 (1524)	53.75 (1365)	51.25 (1302)

[1] Standard trim is four piece without door. Surface or flush one piece trim is available for 32 in. (813 mm) wide circuit breaker panels.

Table P4-5 – Main Breaker Lug Location Reference (Fig. P4-1)

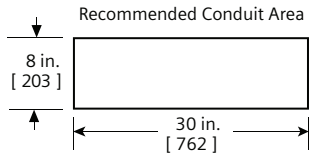
Ampere Rating	Breaker Type	Dimensions in Inches (mm) A	B
400	JXD6, JD6, HJXD6, HJD6	10.425 (265)	13.125 (333)
400	HHJXD6, HHJD6		
400	NJ, HJ, LJ	12.500 (318)	
400	SJD6, SHJD6	10.425 (265)	
400	CJD6, SCJD6	8.250 (210)	
600	LXD6, LD6, HLXD6, HLD6, HHLXD6, HHLD6	10.425 (265)	
600	NL, HL, LL	11.250 (286)	
600	SLD6, SHLD6	10.425 (265)	
600	CLD6, SCLD6	8.250 (210)	
800	NM, HM, LM,	10.425 (265)	

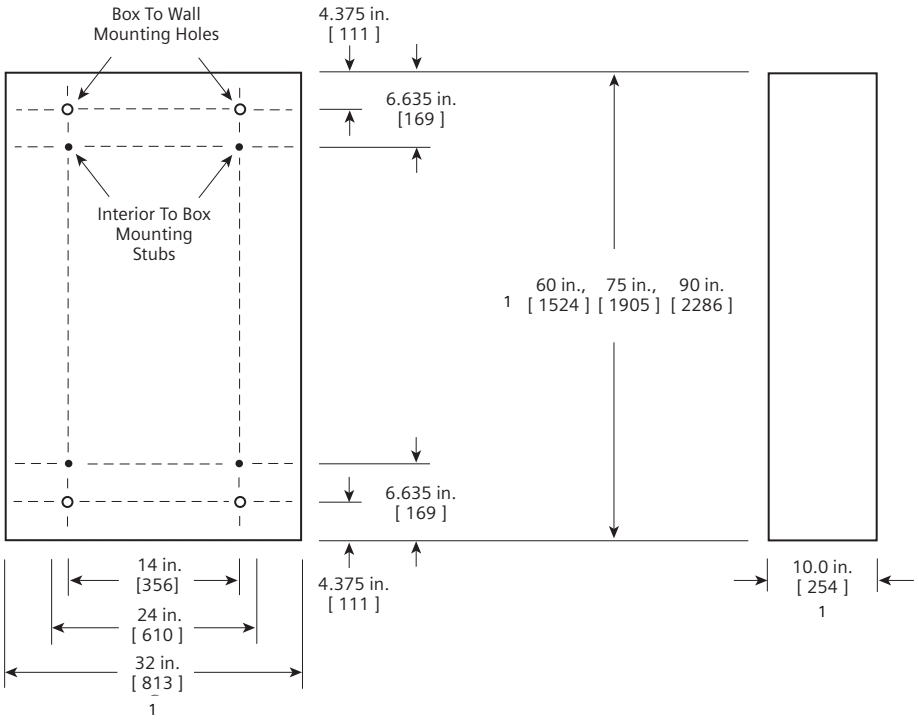
Fig. P4-1



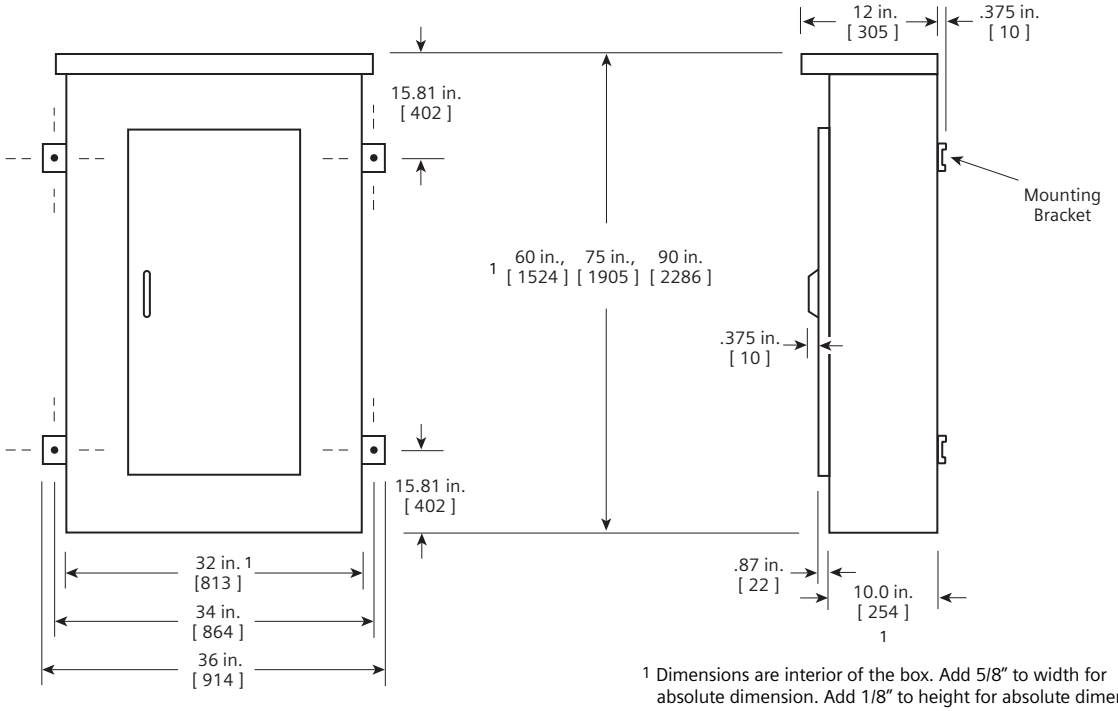
Dimensions
Type P4 Panelboards

Type 1 Box
Box is symmetrical





Type 3R and 3R/12 Box



1 Dimensions are interior of the box. Add 5/8" to width for absolute dimension. Add 1/8" to height for absolute dimension.

Dimensions shown in inches and millimeters [ ].

Case Study

500kW System On Midrise Residential Building

Building Type:
Residential building with 1800 panels of 360W (total 648 kW DC).

System Size:
5 × 33.3kW SMA Core1.

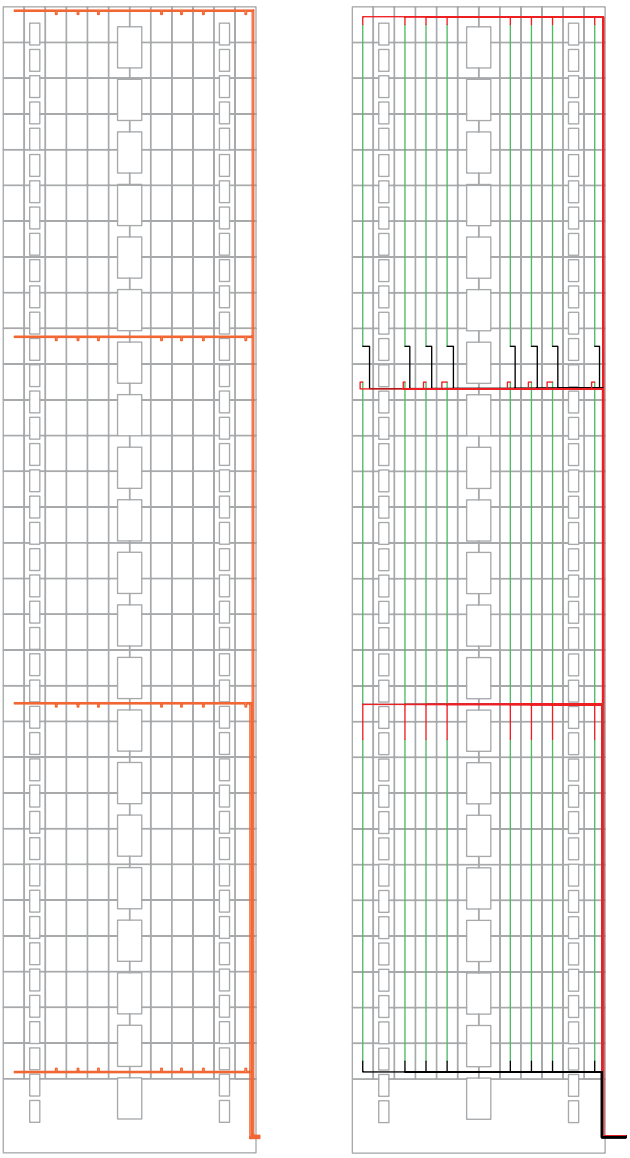
System Layout:
180 strings of 10 panels with five building penetration holes (Conduit size 4”).

Project Solar Equipment:
One AC Panelboard 800A 600V, One 500kVA transformer 480V/600V, two 600A 600V disconnect switches (0ne could be replaced with breaker inside the main building switchboard if available).

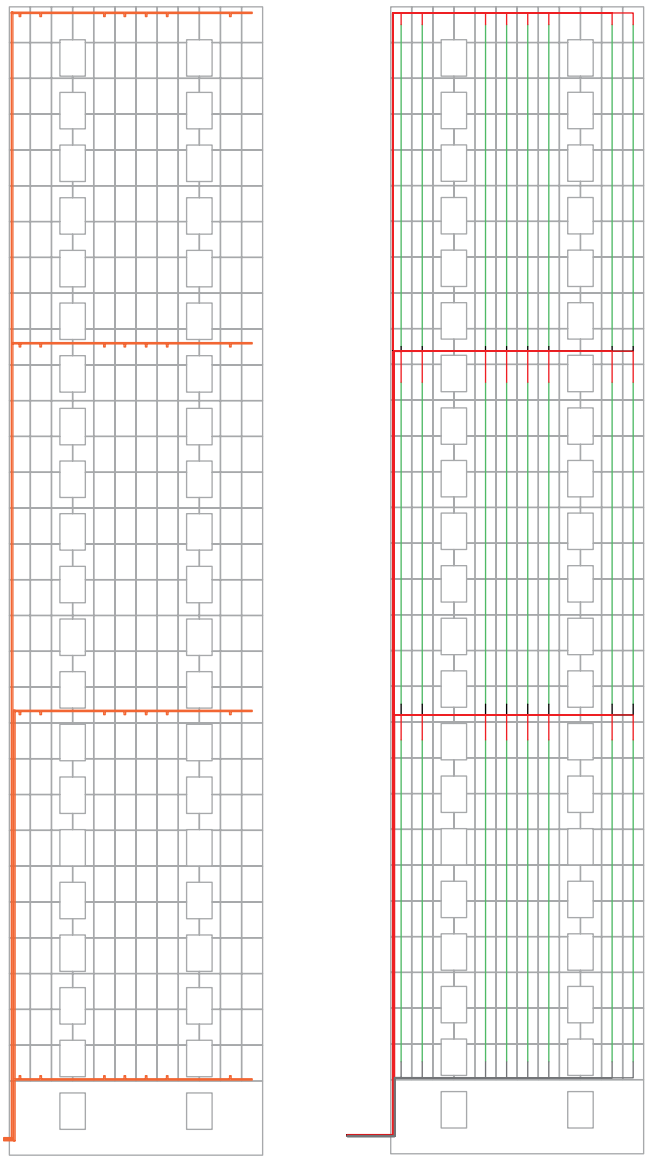
500kW System Wiring Layout:

Home Run To The Building Basement

- East Elevation



- West Elevation



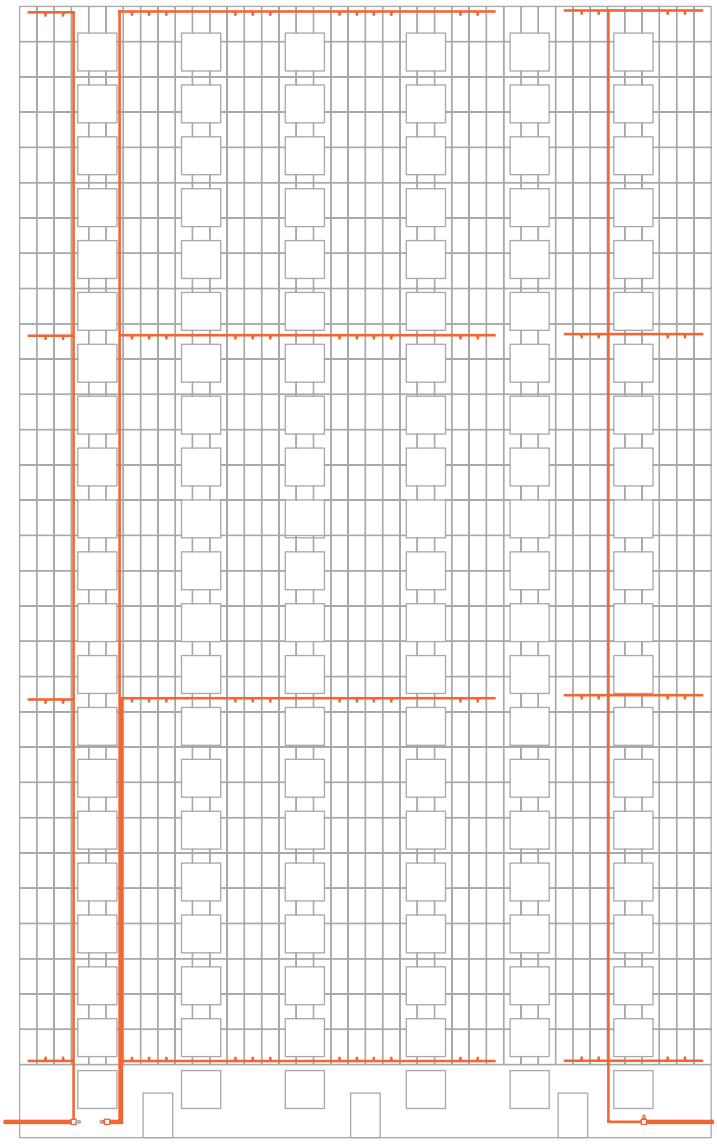
Line Colour Reference

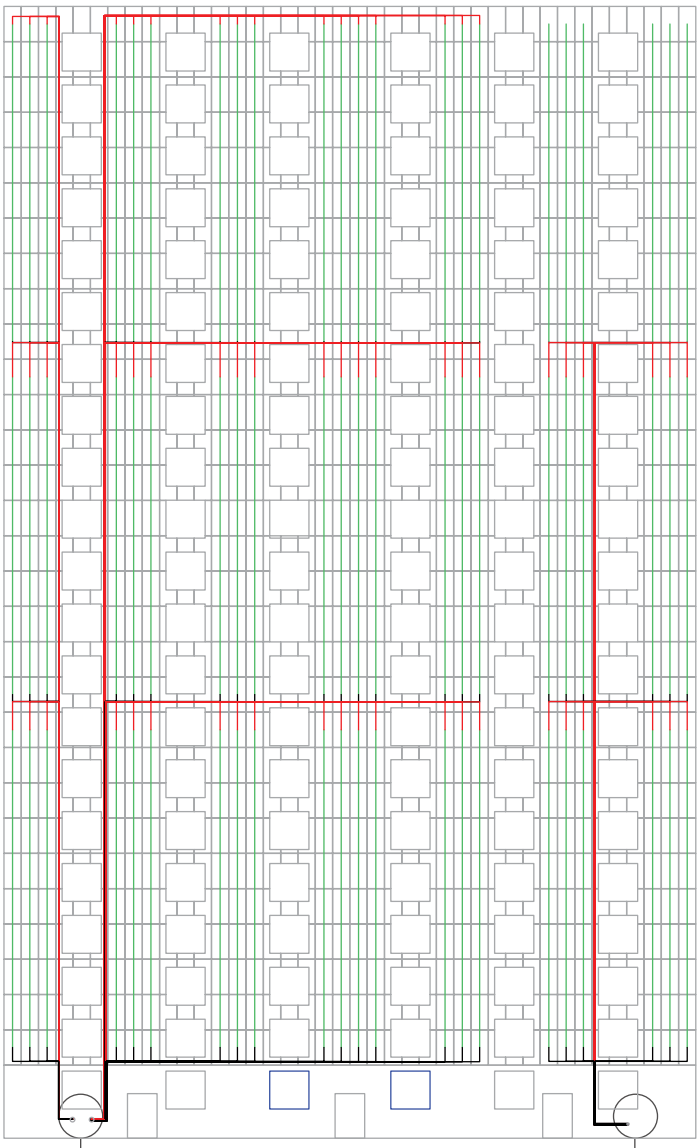
- Building & solar panels layout
- Conduit layout
- Electrical strings
- Home run wiring

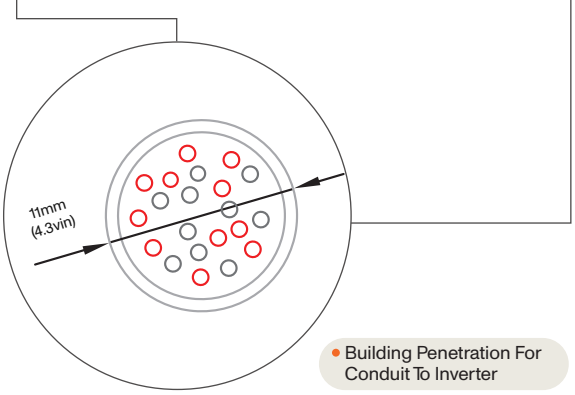
500kW System Wiring Layout:

Home Run To The Building Basement

- South Elevation







- Building Penetration For Conduit To Inverter

Line Colour Reference

- Building & solar panels layout
- Conduit layout
- Electrical strings
- Home run wiring

500kW System Wiring Layout:

Home Run To The Building Basement

- North Elevation

Line Colour Reference

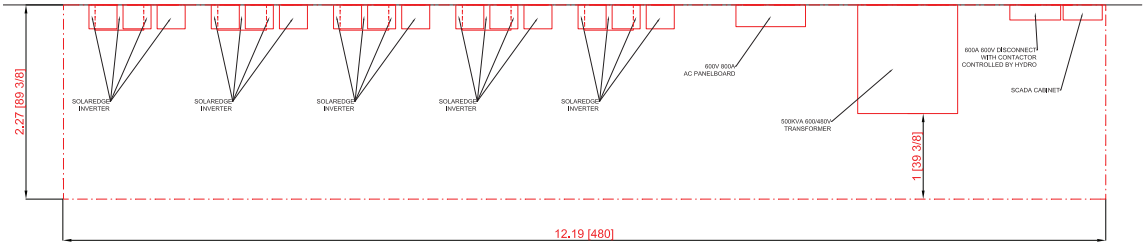
- Building & solar panels layout
- Conduit layout
- Electrical strings
- Home run wiring

- Building Penetration For Conduit To Inverter

Required Space For Solar Equipment:

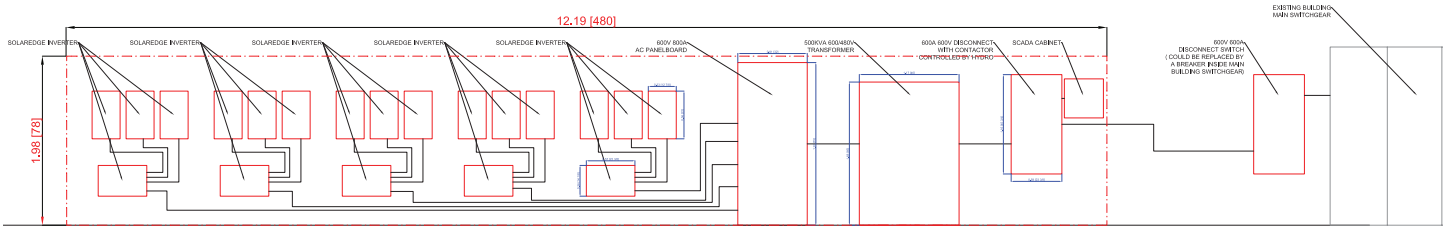
Placed In The Basement

- Top View



Note: Working area is 1m (39.37in) in front of solar equipments as per electrical code.

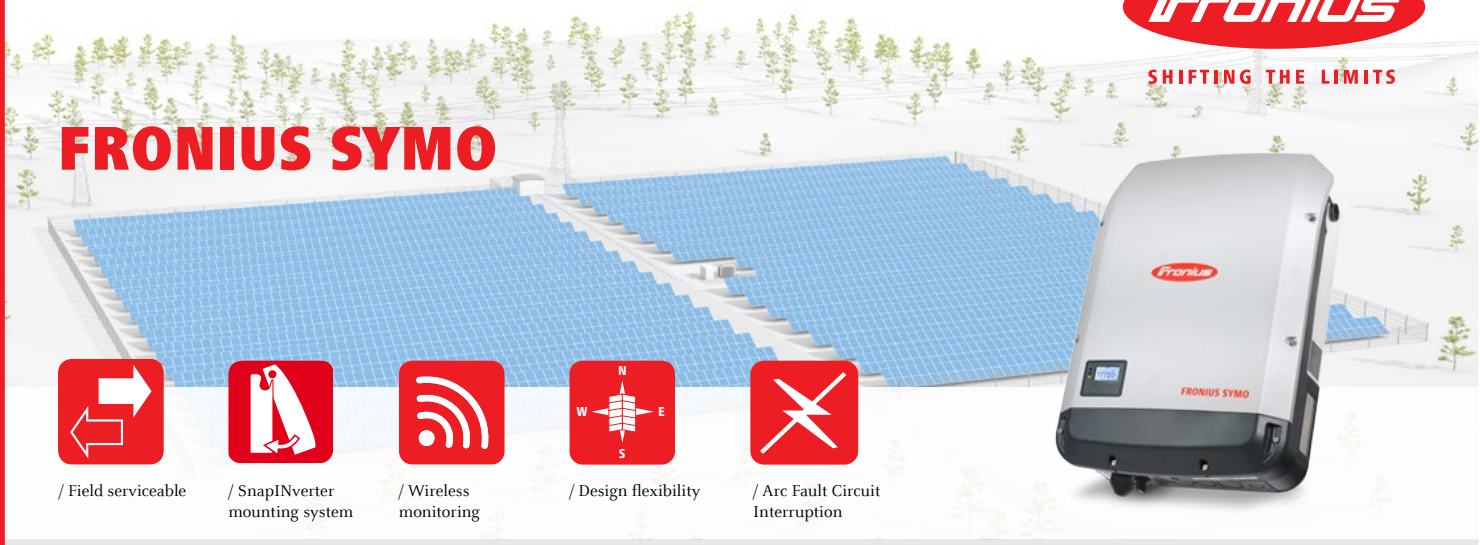
- Front View



/ Perfect Welding / Solar Energy / Perfect Charging

SHIFTING THE LIMITS

FRONIUS SYMO



/ Field serviceable

/ SnapINverter mounting system

/ Wireless monitoring

/ Design flexibility

/ Arc Fault Circuit Interruption

Boasting power categories from 10 to 24 kW, the transformerless Fronius Symo is the ideal compact three-phase inverter for commercial applications. Its dual maximum power point tracking, high maximum system voltage, wide input voltage range and unrestricted use indoors and out, ensures maximum flexibility in PV system design. As a member of the new SnapINverter family, the Fronius Symo features the SnapINverter mounting system, allowing for secure and convenient installation and field servicing.

Industry-leading features now come standard with the Fronius Symo, including: arc fault protection, integrated wireless monitoring, and SunSpec Modbus interfaces for seamless monitoring and datalogging via Fronius' online and mobile platform, Fronius Solar.web. This makes the Fronius Symo one of the most communicative, efficient and streamlined inverters on the market.

TECHNICAL DATA FRONIUS SYMO, ALL SIZES

GENERAL DATA	STANDARD WITH ALL FRONIUS SYMO MODELS
Dimensions (width x height x depth)	20.1 x 28.5 x 8.9 in. / 51.1 x 72.4 x 22.6 cm
Degree of protection	NEMA 4X
Night time consumption	< 1 W
Inverter topology	Transformerless
Cooling	Variable speed fan
Installation	Indoor and outdoor installation
Ambient operating temperature range	-40 F to 140 F (-40 to 60 C)
Permitted humidity	0 - 100 % (non-condensing)
DC connection terminals	6 x DC+ and 6 x DC- screw terminals for copper (solid / stranded / fine stranded) or aluminum (solid / stranded)
AC connection terminals	Screw terminals 14-6 AWG
Certificates and compliance with standards *(Except Symo 15.0 208 V)*	UL 1741-2010, UL1998 (for functions: AFCI and isolation monitoring), IEEE 1547-2003, IEEE 1547.1-2008, ANSI/IEEE C62.41, FCC Part 15 A & B, NEC Article 690, C22. 2 No. 107.1-01 (September 2001), UL1699B Issue 2 -2013, CSA TIL M-07 Issue 1 -2013
Certificates and compliance with standards *(Symo 15.0 208 V)*	UL 1741-2015, UL1998 (for functions: AFCI, RCMU and isolation monitoring), IEEE 1547-2003, IEEE 1547.1-2003, ANSI/IEEE C62.41, FCC Part 15 A & B, NEC 2014 Article 690, C22. 2 No. 107.1-01 (September 2001) , UL1699B Issue 2 -2013, CSA TIL M-07 Issue 1 -2013

PROTECTIVE DEVICES	STANDARD WITH ALL FRONIUS SYMO MODELS
AFCI & 2014 NEC Compliant	Yes
DC disconnect	Yes
DC reverse polarity protection	Yes
Ground Fault Protection with Isolation Monitor Interrupter	Yes

INTERFACES	AVAILABILITY	AVAILABLE WITH ALL FRONIUS SYMO MODELS
USB (A socket)	Standard	Datalogging and inverter update via USB
2 x RS422 (RJ45 socket)	Standard	Fronius Solar Net, interface protocol
Wi-Fi/Ethernet/Serial/ Datalogger and webserver	Optional	Wireless standard 802.11 b/g/n / Fronius Solar.web, SunSpec Modbus TCP, JSON / SunSpec Modbus RTU
6 inputs and 4 digital I/Os	Optional	Load management; signaling, multipurpose I/O

TECHNICAL DATA FRONIUS SYMO (10.0-3 208/240, 12.0-3 208/240, 10.0-3 480, 12.5-3 480, 15.0-3 208)

GENERAL DATA	10.0-3 208/240	12.0-3 208/240	10.0-3 480	12.5-3 480	15.0-3 208
Weight	91.9 lbs. / 41.7 kg		76.7 lbs. / 34.8 kg		78.3 lbs. / 35.5 kg

INPUT DATA		10.0-3 208/240	12.0-3 208/240	10.0-3 480	12.5-3 480	15.0-3 208
Max. permitted PV power		15.00 kW	18.00 kW	15.00 kW	18.75 kW	19.5 kW
Max. usable input current (MPPT 1/MPPT 2)		25.0 A / 16.5 A				50.0 A
Max. usable input current total (MPPT 1 + MPPT 2)		41.5 A				50.0 A
Max. admissible input current (MPPT 1/MPPT 2)		37.5 A / 24.8 A				75.0 A
Max. admissible input current total (MPPT 1 + MPPT 2)		62.2 A	62.2 A	62.2 A	62.2 A	75.0 A (1 MPPT)
Integrated DC string fuse holders *Must be specified when ordering*		None	None	None	None	Integrated: 6- and 6+
MPP voltage range		300 - 500 V		300 - 800 V	350 - 800 V	325 - 850 V
Operating voltage range		200 - 600 V		200 - 1,000 V		325 – 1,000 V
Max. input voltage		600 V		1,000 V		
Nominal input voltage	208 V	350 V	350 V	N/A	N/A	325 V
	240 V	370 V	370 V	N/A	N/A	N/A
	480 V	N/A	N/A	675 V	685 V	N/A
Admissible conductor size DC		AWG 14 - AWG 6 copper direct, AWG 6 aluminium direct, AWG 4 copper or aluminium with input combiner				
Number of MPPT		2				1

OUTPUT DATA		10.0-3 208/240	12.0-3 208/240	10.0-3 480	12.5-3 480	15.0-3 208
Max. output power	208 V	9,995 VA	11,995 VA	N/A	N/A	15,000 VA
	240 V	9,995 VA	11,995 VA	N/A	N/A	N/A
	480 V	N/A	N/A	9,995 VA	12,495 VA	N/A
Max. output fault current / Duration		43.1 A RMS / 158.4 ms	43.1 A RMS / 158.4 ms	43.1 A RMS / 158.4 ms	43.1 A RMS / 158.4 ms	67.7 A RMS / 153.0 ms
Max. continuous output current	208 V	27.7 A	33.3 A	N/A	N/A	41.6 A
	240 V	24.0 A	28.9 A	N/A	N/A	N/A
	480 V	N/A	N/A	12.0 A	15.0 A	N/A
Recommended OCPD/AC breaker size	208 V	35 A	45 A	N/A	N/A	60 A
	240 V	30 A	40 A	N/A	N/A	N/A
	480 V	N/A	N/A	15 A	20 A	N/A
Max. efficiency		97.0 %	97.0 %	98.1 %	98.1 %	97.3 %
CEC efficiency	208 V	96.5 %	96.5 %	N/A	N/A	96.5 %
	240 V	96.5 %	96.5 %	N/A	N/A	N/A
	480 V	N/A	N/A	96.5 %	97.0 %	N/A
Admissible conductor size AC		AWG 14 - AWG 6				
Grid connection		208 / 240 V	208 / 240 V	480 V Delta +N**		208 V
Frequency		60 Hz				
Total harmonic distortion		< 1.75 %				< 3.5%
Power factor		0 - 1 ind./cap.				

**+N for sensing purposes - no current carrying conductor.

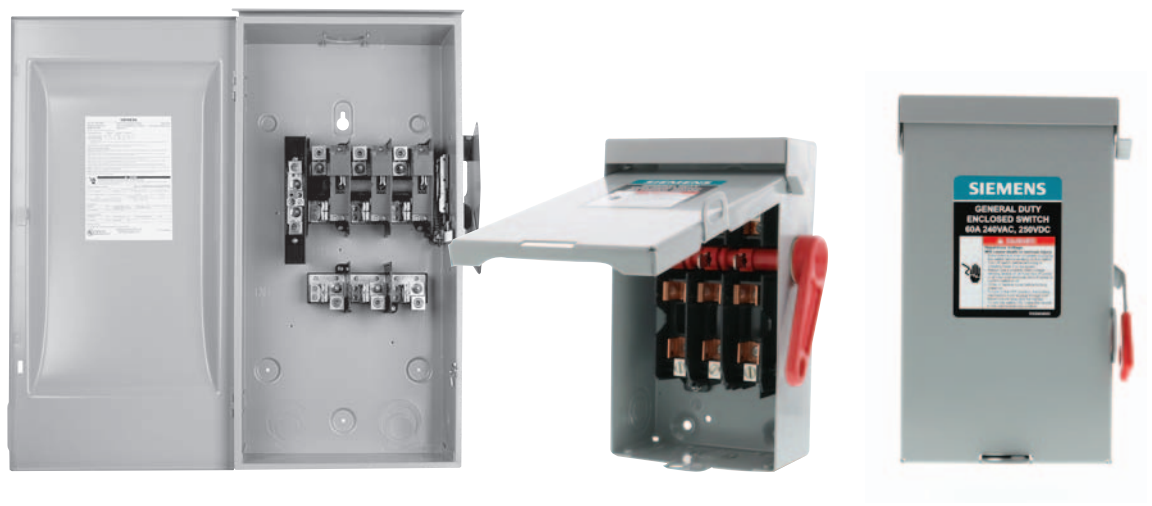
TECHNICAL DATA FRONIUS SYMO (15.0-3 480, 17.5-3 480, 20.0-3 480, 22.7-3 480, 24.0-3 480)

GENERAL DATA	15.0-3 480	17.5-3 480	20.0-3 480	22.7-3 480	24.0-3 480
Weight	95.7 lbs. / 43.4 kg				

INPUT DATA		15.0-3 480	17.5-3 480	20.0-3 480	22.7-3 480	24.0-3 480
Max. permitted PV power		22.50 kW	26.25 kW	30.00 kW	34.09 kW	36.00 kW
Max. usable input current (MPPT 1/MPPT 2)		33.0 A / 25.0 A				
Max. usable input current total (MPPT 1 + MPPT 2)		51 A				
Max. admissible input current (MPPT 1/MPPT 2)		49.5 A / 37.5 A				
Max. admissible input current total (MPPT 1 + MPPT 2)		76.5 A	76.5 A	76.5 A	76.5 A	76.5 A
Integrated DC string fuse holders *Must be specified when ordering*		Optional: 6- and 6+	Optional: 6- and 6+	Optional: 6- and 6+	Optional: 6- and 6+	Optional: 6- and 6+
MPP voltage range		350 - 800 V	400 - 800 V	450 - 800 V	500 - 800 V	500 - 800 V
Operating voltage range		200 - 1,000 V				
Max. input voltage		1,000 V				
Nominal input voltage	208 V	N/A	N/A	N/A	N/A	N/A
	240 V	N/A	N/A	N/A	N/A	N/A
	480 V	685 V	695 V	710 V	720 V	720 V
Admissible conductor size DC		AWG 14 - AWG 6 copper direct, AWG 6 aluminium direct, AWG 4 copper or aluminium with input combiner				
Number of MPPT		2				

OUTPUT DATA		15.0-3 480	17.5-3 480	20.0-3 480	22.7-3 480	24.0-3 480
Max. output power	208 V	N/A	N/A	N/A	N/A	N/A
	240 V	N/A	N/A	N/A	N/A	N/A
	480 V	14,995 VA	17,495 VA	19,995 VA	22,727 VA	23,995 VA
Max. output fault current / Duration		30.9 A RMS / 150.4 ms	30.9 A RMS / 150.4 ms	30.9 A RMS / 150.4 ms	30.9 A RMS / 150.4 ms	30.9 A RMS / 150.4 ms
Max. continuous output current	208 V	N/A	N/A	N/A	N/A	N/A
	240 V	N/A	N/A	N/A	N/A	N/A
	480 V	18.0 A	21.0 A	24.0 A	27.3 A	28.9 A
Recommended OCPD/AC breaker size	208 V	N/A	N/A	N/A	N/A	N/A
	240 V	N/A	N/A	N/A	N/A	N/A
	480 V	25 A	30 A	30 A	35 A	40 A
Max. efficiency		98.0 %	98.0 %			
CEC efficiency	208 V	N/A	N/A	N/A	N/A	N/A
	240 V	N/A	N/A	N/A	N/A	N/A
	480 V	97.0 %	97.5 %	97.5 %	97.5 %	97.5 %
Admissible conductor size AC		AWG 14 - AWG 6				
Grid connection		480 V Delta +N**				
Frequency		60 Hz				
Total harmonic distortion		< 1.75 %				
Power factor		0 - 1 ind./cap.				

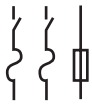
**+N for sensing purposes - no current carrying conductor.



System	Ampere Rating	Indoor — Type 1 Catalog Number	Indoor — Type 1 Ship Wt. (lbs.) Std. Pkg	Outdoor — Type 3R Catalog Number	Outdoor — Type 3R Ship Wt. (lbs.) Std. Pkg	Horsepower Rating① 240V AC 1-Phase, 2-Wire Std.	1-Phase, 2-Wire Max.	2-Phase, 4-Wire Std.	2-Phase, 4-Wire Max.	3-Phase, 3-Wire Std.	3-Phase, 3-Wire Max.	250 Volt DC Std.

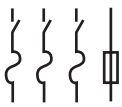
240 Volt Fusible⑪

2-Pole, 2-Fuse, and Solid Neutral②③④ — 240 Volt AC/250 Volt DC



	30	GF221NA	30⑦	GF221NRA⑤	30⑦	1½	3	—	—	3	7½	5
	60	GF222NA	20⑥	GF222NRA⑤	20⑥	3	10	—	—	7½	15	10
	100	GF223N	23	GF223NR	23	7½	15	—	—	15	30	20
	200	GF224N	47	GF224NR	48	15	—	—	—	25	60	40

3-Pole, 3-Fuse, and Solid Neutral④ — 240 Volt AC/250 Volt DC



	30	GF321NA	30⑦	GF321NRA⑤	30⑦	1½	3	—	—	3	7½	5
	60	GF322NA	20⑥	GF322NRA⑤	20⑥	3	10	—	—	7½	15	10
	100	GF323N	25	GF323NR	25	7½	15	—	—	15	30	20
	200	GF324N	49	GF324NR	50	15	—	—	—	25	60	40
	400	GF325NA	94.6	GF325NRA	94.6	15	—	—	—	50	125	50
	600	GF326NA	95.6	GF326NRA	95.6	15	—	—	—	75	200	—

240 Volt Non-Fusible③④⑪

2-Pole or 3-Pole — 240 Volt AC/250 Volt DC

	30	GNF221A	20⑦	GNF221RA⑤	20⑦	—	3	—	—	—	—	5
	30	GNF321A⑨	20⑦	GNF321RA⑤⑨	20⑦	—	3	—	—	7½	—	5
	30	GNF321LA⑩	30⑦	GNF321RLA⑤⑩	30⑦	—	3	—	—	7½	—	5
	60	GNF222A	30⑦	GNF222RA⑤	30⑦	—	10	—	—	15	—	10
	60	GNF322A	30⑦	GNF322RA⑤	30⑦	—	10	—	—	15	—	10
	100	GNF323	23	GNF323R	24	—	15	—	—	30	—	20
	200	GNF324	46	GNF324R	47	—	15	—	—	60	—	40
	400	GNF325A	114	Use 600V Switch — HNF365RA		—	15	—	—	125	—	50
	600	GNF326A	116	Use 600V Switch — HNF366RA		—	15	—	—	200	—	—

① Dual horsepower ratings: Std.- applies when non-time delay fuses are installed. Max.- applies when time-delay fuses are installed.
② These switches are UL-listed for application on grounded B-phase systems.
③ Suitable for use on 3-phase motor loads.
④ Service entrance labeled.
⑤ Has provision for ECHA type hub.
⑥ 5 switches per standard package.
⑦ 10 switches per standard package.
⑧ Height reduced switch (45.25 rather than 56 inches in height) for use with 500MCM or smaller conductors.
⑨ Not suitable for service entrance.
⑩ Indicates oversized enclosure.
⑪ Internal shields for 30A to 200A switches to meet 2020 NEC 230.62 touch safe requirements for service entrance equipment can be purchased separately. See accessory section for catalog numbers.

Safety Switch Dimensions (Inches)* & Shipping Weights

Catalog Number	Height			Width		Depth		Knockout Diagram①	Shipping Weight (lbs.)
	Box A	With Door B	With Rain Shed C	Box D	With Handle E	Box F	With Handle G		
GF221NA	8.4	8.56	—	5.08	5.44	2.93	3.96	S4	30(10)
GF221NRA	8.4	8.56	8.56	5.08	5.44	2.93	3.96	S5	30(10)
GF222NA	9.91	10.07	—	6.06	6.42	3.21	4.24	S21	20(5)
GF222NRA	9.91	10.07	10.07	6.06	6.42	3.21	4.24	S22	20(5)
GF223N	21.95	23.15	—	9.64	11.7	5.05	8.63	S10	23
GF223NR	21.95	—	23.46	9.64	11.67	5.05	8.7	S11	24
GF224N	29.9	31.07	—	14.62	16.68	6.36	10.92	S12	47
GF224NR	29.9	—	31.42	14.61	16.68	6.36	10.92	S13	48
GF225NA	45.32	45.81	—	22.4	23.404	6.94	9.93	S18	91.1
GF225NRA	45.32	45.81	—	22.4	23.404	6.94	9.93	S19	91.1
GF226NA	45.32	45.81	—	22.4	23.404	6.94	9.93	S18	95.6
GF226NRA	45.32	45.81	—	22.4	23.404	6.94	9.93	S19	95.6
GF321NA	8.4	8.56	—	5.08	5.44	2.93	3.96	S4	30(10)
GF321NRA	8.4	8.56	8.56	5.08	5.44	2.93	3.96	S5	30(10)
GF322NA	9.91	10.07	—	6.06	6.42	3.21	4.24	S21	20(5)
GF322NRA	9.91	10.07	10.07	6.06	6.42	3.21	4.24	S22	20(5)
GF323N	21.95	23.15	—	9.64	11.7	5.05	8.63	S10	25
GF323NR	21.95	—	23.46	9.64	11.67	5.05	8.7	S11	25
GF324N	29.9	31.07	—	14.62	16.68	6.36	10.92	S12	49
GF324NR	29.9	—	31.42	14.61	16.68	6.36	10.92	S13	50
GF325NA	45.32	45.81	—	22.4	23.404	6.94	9.93	S18	94.6
GF325NRA	45.32	45.81	—	22.4	23.404	6.94	9.93	S19	94.6
GF326NRA	45.32	45.81	—	22.4	23.404	6.94	9.93	S19	99.6
GF326NA	45.32	45.81	—	22.4	23.404	6.94	9.93	S18	99.6
GF326NRA	45.32	45.81	—	22.4	23.404	6.94	9.93	S19	99.6
GNF221A	6.18	6.35	—	4.2	4.56	2.88	3.93	S4	20(10)
GNF221RA	6.18	6.35	6.35	4.2	4.56	2.88	3.93	S5	20(10)
GNF321LA	8.4	8.56	—	5.08	5.43	2.93	3.95	S4	30(10)
GNF321RLA	8.4	8.56	8.56	5.08	5.43	2.93	3.95	S5	30(10)
GNF222A	8.4	8.56	—	5.08	5.43	2.93	3.95	S4	30(10)
LNF222RA	8.4	8.56	8.56	5.08	5.43	2.93	3.95	S20	30(10)
GNF222RA	8.4	8.56	8.56	5.08	5.43	2.93	3.95	S5	30(10)
GNF321A	6.18	6.35	—	4.2	4.56	2.88	3.93	S4	20(10)
GNF321RA	6.18	6.35	6.35	4.2	4.56	2.88	3.93	S5	20(10)
GNF322A	8.4	8.56	—	5.08	5.43	2.93	3.95	S4	30(10)
GNF322RA	8.4	8.56	8.56	5.08	5.43	2.93	3.95	S5	30(10)
GNF323	21.95	23.15	—	9.64	11.7	5.05	8.63	S10	23
GNF323R	21.95	—	23.46	9.64	11.67	5.05	8.7	S11	24
GNF324	29.9	31.07	—	14.62	16.68	6.36	10.92	S12	46
GNF324R	29.9	—	31.42	14.61	16.68	6.36	10.92	S13	47
GNF325A	33.47	33.96	—	22.4	23.404	6.94	9.93	S18	75
GNF326A	33.47	33.96	—	22.4	23.404	6.94	9.93	S18	77
HF221J also **HF261J**	14.27	17.33	—	6.65	9.02	5.32	10.46	—	13
HF221N also **HF261**	14.26	15.45	—	6.64	9.01	5.05	10.17	S6	12
HF221NR also **HF261R**	14.39	—	15.77	6.64	9.01	5.05	10.17	S8	13
HF221S also **HF261S**	14.27	17.33	—	6.65	9.02	5.32	10.46	—	13
HF222J also **HF262J**	16.22	19.31	—	9.17	11.47	5.33	10.46	—	19
HF222N also **HF262**	16.26	17.46	—	9.15	11.53	5.05	10.17	S16	18
HF222NR also **HF262R**	16.26	—	17.77	9.16	11.53	5.05	10.17	S17	19
HF222S also **HF262S**	16.22	19.31	—	9.17	11.47	5.33	10.46	—	19
HF223J also **HF263J**	21.96	23.16	—	9.65	12.02	5.34	10.46	—	24
HF223N also **HF263**	21.95	23.15	—	9.64	12.01	5.05	10.17	S10	23
HF223NR also **HF263R**	21.95	—	23.46	9.64	11.97	5.05	10.17	S11	24

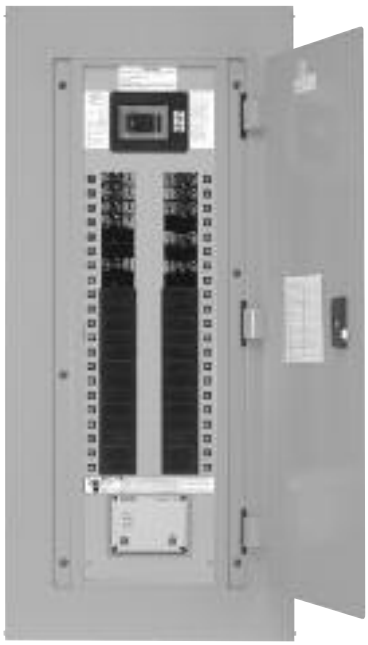
***For inches / millimeters conversion, multiply inches by 25.4.**

① Knocks not provided on Type 4 / 4X and 12 or in 800 & 1200A switches.

Application
Type P1 Panelboards

Table P1-3 – Main Breaker Panel Size Selector

Maximum Ampere Rating	Main Breaker Types	Max. No. of Poles	Dimensions in Inches (mm)		
			Unit Space A	Box Height B	Weight In lbs. (kg)
100	BL, BLH	18 30 42	9 (229)	32 (813)	105 (48)
	HBL		15 (381)	38 (965)	120 (55)
	BQD		21 (533)	44 (1118)	135 (61)
125	NGB		9 (229)	32 (813)	110 (50)
			15 (381)	38 (965)	125 (57)
			21 (533)	44 (1118)	140 (64)
	ED2, ED4,		9 (229)	32 (813)	110 (50)
	ED6, HED4,		15 (381)	38 (965)	125 (57)
	HED6		21 (533)	44 (1118)	140 (64)
225	QJ2		9 (229)	32 (813)	110 (50)
	QJH2		15 (381)	38 (365)	125 (57)
	QJ2-H		21 (533)	44 (1118)	140 (64)
250	FXD6		9 (229)	32 (813)	115 (52)
	FD6		15 (381)	38 (965)	130 (59)
	HFD6, HFXD6		21 (533)	44 (1118)	145 (66)
≤ 250			9 (229)	32 (813)	115 (52)
	MLO		15 (381)	38 (365)	125 (57)
			21 (533)	44 (1118)	135 (61)
400	JD6, JXD6	18 30 42	9 (229)	56 (1422)	172 (78)
	HJD6		15 (381)	62 (1575)	190 (86)
	HJXD6		21 (533)	68 (1727)	208 (95)
			9 (229)	56 (1422)	115 (52)
	MLO		15 (381)	62 (1575)	130 (59)
			21 (533)	68 (1722)	145 (66)



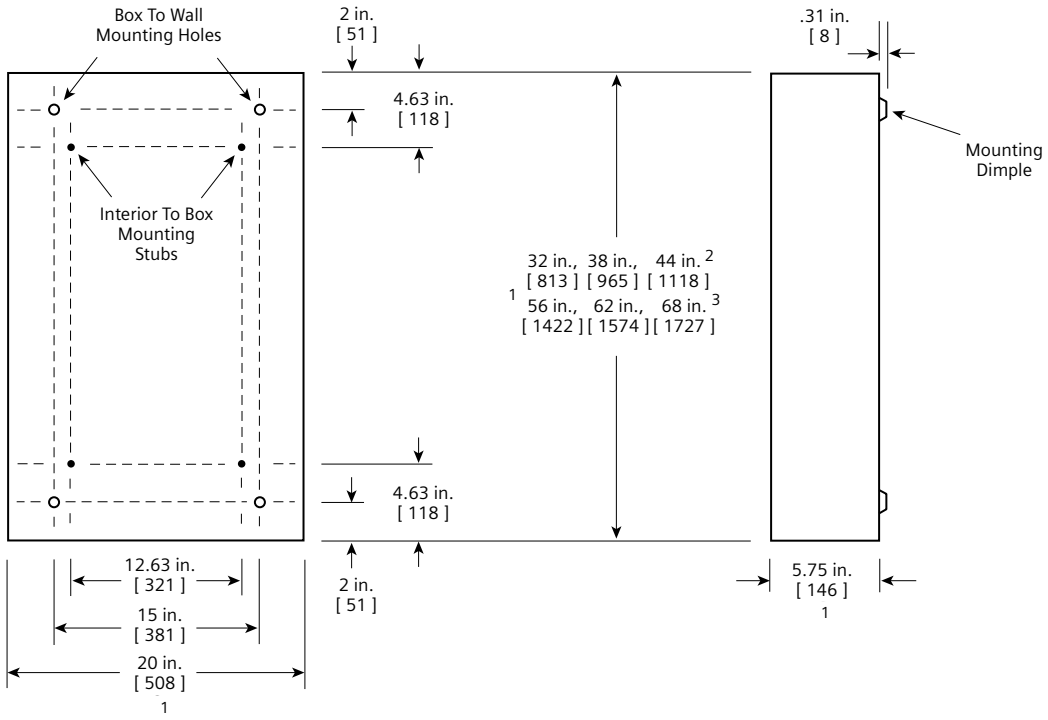
Note: Main breakers use breaker connectors. For sizes, see breaker connector chart. 400 amp main breaker panel has wire bending space for 600 kcmil cables as standard. Use 750 Kcmil lug if 600 Kcmil cable is to be used.

Table P1-4 – Main Breaker Selection

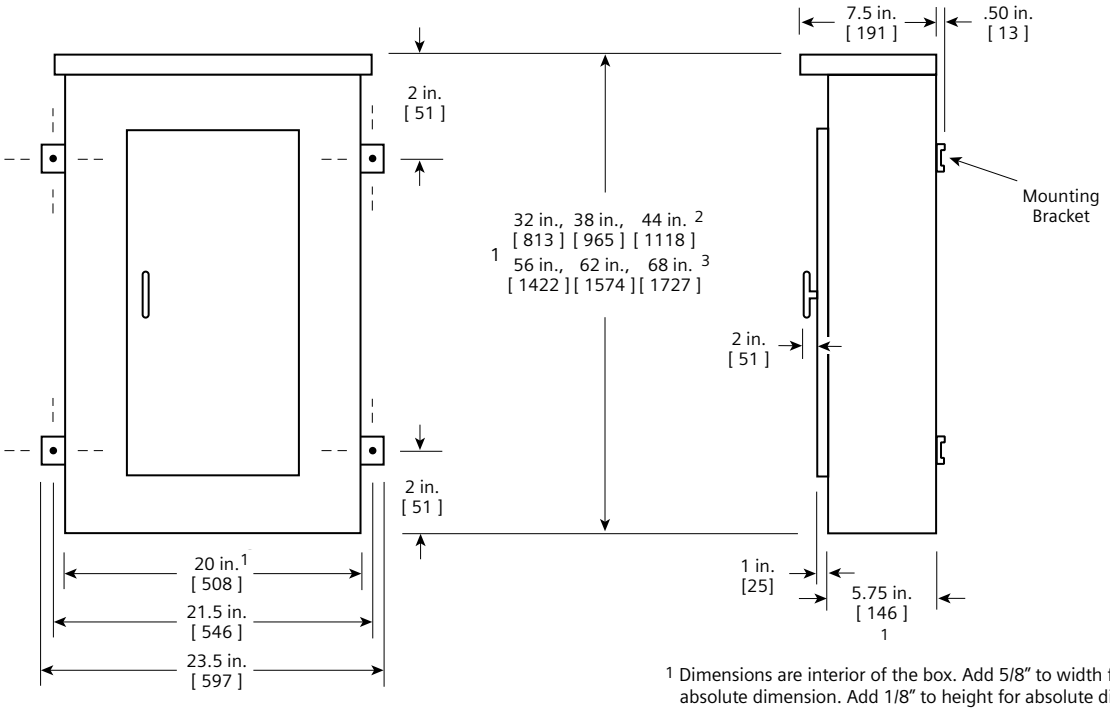
Ampere Rating	Breaker Type	Max. IR (kA) at		Additional Trip Values
		240V AC	480/277V AC	
100	BL (STD)	10	—	15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
	BLH	22	—	15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
	HBL	65	—	15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
	BQD	65	14	15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
125	NGB (STD)	100	25	50, 60, 70, 80, 90, 100, 110, 125
	ED4 (STD)	65	25	50, 60, 70, 80, 90, 100, 110, 125
	HED4	100	42	50, 60, 70, 80, 90, 100, 110, 125
225	QJ2 (STD)	10	—	60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225
	QJH2	22	—	60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225
	QJ2-H	42	—	60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225
	HQJ2H	100	—	60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225
250	FXD6 (STD)	65	35	70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250
	FD6	65	35	70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250
	HFD6	100	65	70, 80, 90, 100, 150, 175, 200, 225, 250
	HFXD6	100	65	70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250
400	JXD6 (STD)	65	35	200, 225, 250, 300, 350, 400
	JD6	65	35	200, 225, 250, 300, 350, 400
	HJD6	100	65	200, 225, 250, 300, 350, 400
	HJXD6	100	65	200, 225, 250, 300, 350, 400

Dimensions
Type P1 Panelboards

Type 1 Box
Box is symmetrical



Type 3R and 3R/12 Box



1 Dimensions are interior of the box. Add 5/8" to width for absolute dimension. Add 1/8" to height for absolute dimension.
2 250 Amp panel.
3 400 Amp panel.

Dimensions shown in inches and millimeters [ ].

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