

**ANNEX A - Ratings for Certificate of Compliance**

**PRODUCTS**

CLASS 5311 09 - POWER SUPPLIES - Distributed Generation Power Systems Equipment

CLASS 5311 89 - POWER SUPPLIES - Distributed Generation - Power Systems Equipment - Certified to U.S. Standards

Combined Inverter/Battery Charger, permanently connected:

Special Purpose Grid Support Utility Interactive Inverter/Charger/ Stand-alone, Model XW Pro 6848 NA with Conduit Box supplied, is permanently connected, fixed equipment. System ratings as follows:

	Grid-interactive Mode	Charge Mode	Inverter Stand-alone Mode
Maximum System Voltage	57 V dc (Input) 264 V ac (Output)	60 V dc (Output) 280 V ac (Input)	60 V dc (Input) 240 V ac (Output)
Range of Operating DC Voltage	47 - 58 V dc	40 - 60 V dc	42 - 60 V dc
Max. Operating Current (DC)	160 A	140 A	180 A
Maximum Input Short Circuit Current (DC)	3000 A	N/A	3000 A
Max. Utility Backfeed Current (AC)	0 A	N/A	N/A
Output Power Factor Rating	>0.98	>0.98	0 - 1.00
Operating Voltage Range (AC)	211 - 264 V ac	156 - 280 V ac	120/240 V ac
Operating Frequency Range	59.4 - 60.4 Hz	52 - 68 Hz	60 Hz
Nominal Output Voltage (AC)	240 V ac	50.4 V dc	120/240 V ac
Nominal Output Frequency	60 Hz	N/A	60 Hz
Maximum Continuous Output Current (AC or DC)	27 Arms	140 Adc	28 Arms
Maximum Continuous Output Power (AC)	6000 W	6500 W	6800 W
Maximum Output Fault Current and Duration	425A pk ~0.4 milliseconds	5150A pk ~1 milliseconds	925A pk ~0.5milliseconds
Maximum Output Overcurrent Protection	60 A	250 A	30 A
Utility Interconnection Voltage and Frequency Trip Limits and Trip Times	See Note 2 below	N/A	N/A
Synchronization In-rush Current	0 A	N/A	N/A
Trip Limit and Trip Time Accuracy	+/-3V L-L +/-1.5V L-N +/-0.05 Hz +/-15% trip time	N/A	N/A
Normal Operation Temperature Range	See Note 1 below.	See Note 1 below.	See Note 1 below.
Output Power Temperature Derating and Maximum Full Power Operating Ambient	See Note 1 below.	See Note 1 below.	See Note 1 below.

Utility interconnection voltage and frequency trip limits and trip times.		
Trip limit and trip time	Voltage:	+/- 1.0 % Nominal
	Frequency:	+/- 0.05 Hz

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accuracy	Trip Time Accuracy:	+/- 0.5 Sec +/- 1Sec (For Ride through duration $\geq 12$ sec)
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Notes:

- Derated operation for elevated ambient temperatures: rated 6800 W continuous from -25°C to 25°C Operates at reduced power at temperatures above these ratings to 70°C max; refer to operations manual for derating curves.
- Utility Interconnection Voltage and Frequency Trip Limits and Trip Times:  
Voltage and frequency limits for utility Interaction

Condition	Simulated utility source		Maximum time (sec) (cycles) at 60 Hz <sup>a</sup> before cessation of current to the simulated utility
	Voltage (V)	Frequency (Hz)	
A	$< 0.50 V_{nor}^b$	Rated	0.16
B	$0.50 V_{nor}^b \leq V < 0.88 V_{nor}$	Rated	2
C	$1.10 V_{nor}^b < V < 1.20 V_{nor}$	Rated	1
D	$1.20 V_{nor} \leq V$	Rated	0.16
E	Rated	$f > 60.5$	0.16
F	Rated	$f < (59.8 - 57.0)$ (Adjustable Set Point)	0.16 - 300 (Adjustable)
G	Rated	$f < 57.0$	0.16

- All models meet the surge requirements of IEEE C62.41.2-2002, Location Category B (6kV). Tests were done using ringwave and combination waveforms, both polarities, for common mode and differential mode coupling, 20 pulses each test. After surge testing the unit was operational with control functionally verified by frequency and voltage disconnect tests.

**Limits for Grid Support utility Interaction for Model: XW Pro 6848 NA**

Region	SA 9.1 High and Low Voltage ride Through		Maximum time (sec) at 60 Hz before cessation of current to the simulated utility
	Voltage (V)	Voltage (V)	
LV3	$< 0.50 V_{nor}$ Non-Adjustable	Rated	1.5s (Default) Adjustable (0 s to 10s)
LV2	$0.50 V_{nom} \leq V < 0.70 V_{nom}$ Non-Adjustable	Rated	11s (Default) Adjustable (1s to 1000s)
LV1	$0.70 V_{nom} \leq V < 0.88 V_{nom}$ Non-Adjustable	Rated	21s (Default) Adjustable (1s to 1000s)
NN	$0.88 V_{nom} \leq V < 1.10 V_{nom}$	Rated	Continuous operation (indefinite)
HV1	$1.10 V_{nom} \leq V < 1.20 V_{nom}$ Non-Adjustable	Rated	13s (Default) Adjustable (1s to 1000s)
HV2	$V \geq 1.20 V_{nom}$	Rated	0.16s (default) Adjustable from (0s to 1s)

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Region	SA 10.1 High and Low Frequency Ride through		Maximum time (sec) at 60 Hz before cessation of current to the simulated utility
	Voltage (V)	Frequency (Hz)	
LF1, LF2, NN-HF1 and HF2	Rated	Refer to Simulated Utility Source's Table item E to G above in Note 2	Refer to Simulated Utility Source's Table item E to G above in Note 2

SA11 Ramp Rates		
		CAL-Setup
Output current Rating [A]	I <sub>rated</sub>	According to rating plate
Minimum normal ramp up rate [% I <sub>rated</sub> /sec]	RR <sub>norm_up_min</sub>	1%
Maximum normal ramp up rate [% I <sub>rated</sub> /sec]	RR <sub>norm_up_max</sub>	100
Minimum output current [A]	I <sub>low</sub>	10% I <sub>rated</sub>
Ramp Rate Accuracy MSARR [% I <sub>rated</sub> /sec]		2%
Minimum soft start ramp up rate [% I <sub>rated</sub> /sec]	RR <sub>SS_min</sub>	1%
Maximum soft start ramp up rate [% I <sub>rated</sub> /sec]	RR <sub>SS_max</sub>	100

A12 SPF (Specified Power Factor)		
		CAL-Setup
Apparent Power Rating [VA]	S <sub>rated</sub>	According to rating plate
Output Power Rating [W]	P <sub>rated</sub>	According to rating plate
DC input voltage range with function enabled [V]		According to rating plate
Nominal AC voltage [V]	V <sub>nom</sub>	According to rating plate
AC voltage range with function enabled [V <sub>min</sub> , V <sub>max</sub> ]		According to rating plate
AC voltage measurement accuracy [V]	MSA <sub>Vac</sub>	≤1% V <sub>n</sub>
DC voltage measurement accuracy [V]	MSA <sub>Vdc</sub>	≤2% V <sub>n</sub>
Active power range of function [W]	P <sub>low</sub> , P <sub>rated</sub>	20% - 100%

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A12 SPF (Specified Power Factor)		
Power Factor Accuracy	MSAPF	0.05; >50% of Prated) 0.07; <50% of Prated)
Power Factor settling time [sec]		1%/sec
Minimum Inductive (Under excited) Power Factor	PF min.ind	0.80
Minimum Capacitive (Over excited) Power Factor	PF min.cap	0.80
Power factor default	PF	1
PF mid.cap		0.925
PF mid. ind		0.925

SA13 Volt-Var Mode		
		CAL-Setup
Apparent Power Rating [VA]	Srated	According to rating plate
Output Power Rating [W]	Prated	According to rating plate
EUT Input voltage range with function enabled [V]		According to rating plate
Nominal AC EPS voltage [V]	Vnom	According to rating plate
AC EPS voltage range with function enabled [V]	Vmin - Vmax	0.9Vnom – 1.1Vnom
Reactive Power Accuracy [% or Var]	>60% Rated Load <60% Rated Load	±5% Sn ±7% Sn
Maximum Ramp Rate[Var/s]		900Var/sec
Maximum Rated Reactive Power Production (Capacitive. Overexcited) [Var]	Qmax.over cap	30% of Sn
Maximum Rated Reactive Power Production (Inductive.Underexcited) [Var]	Qmax.under ind	30% of Sn

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SA13 Volt-Var Mode		
Maximum Slope [Var/V]	KVARmax	300Var/V
Deadband Range [V]	Deadband min Deadband max	0% Vnom 20% Vnom
Settling Time [s]		1
V1=the voltage at Q1		0.92 Vn
Q1=the maximum reactive power production setting		30% of Sn
V2=the voltage at Q2		0.967 Vn
Q2=the reactive power setting at the lower voltage deadband limit		0
V3=the voltage at Q3		1.033 Vn
Q3=the reactive power setting at the upper voltage deadband limit		0
V4=the voltage at Q4		1.07 Vn
Q4=the maximum reactive power absorption setting		(30% of Sn)

SA14 Frequency Watt		
Output Power Rating [W]	Prated	According to rating plate
AC frequency range with function enabled [Hz]	fmin. fmax	57Hz, 63Hz
Manufacturer's stated AC frequency measurement accuracy [Hz or %Hz]	MSAHz	0.1Hz
Manufacturer's stated P(f) accuracy [W or %W]	MSAP(f)	±5% Prated
Settling time [sec]	ts	1
Adjustment range of the start of frequency droop [Hz]	fstart_min. fstart_max	60.1 Hz - 61 Hz
Maximum slope of frequency droop (%Prated/Hz)	Kpower-Freq_Max	75%Prated/Hz
Minimum slope of frequency droop (%Prate/Hz)		50%Prated/Hz
Slope of frequency droop [%Prated/Hz]	KPower-Freq_Max	50 %Prated/Hz

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SA15 Voltage Watt		
Output Power Rating [W]	Prated	According to rating plate
AC voltage range with function enabled [Hz]	Vmin. Vmax	According to rating plate
Manufacturer's stated AC voltage measurement accuracy [V or %V]	MSAVolt	1% of Vn
Manufacturer's stated P(V) accuracy [W or %W]	MSAP(W)	±5% Prated
Settling time [sec]	ts	2.5 sec
Adjustment range of the start of the start of active power reduction [V]	Vstart_min. Vstart_max	244.8V - 264V
Adjustment range of the stop of the curtailment function (V)	Vstop_min Vstop_max	244.8V – 252V
Maximum slope of active power reduction at 240V (%Prated/V)	Kpower-volt_max	20%/V
Minimum Slope of active power reduction at 240V [%Prated/V]	KPower-vol_Min	5%/V
Range of adjustment of delays before return normal operation (second)	Treturn_min Treturn_max	1sec 300sec
Adjustment range of the rate of return to normal operation (%Prated/sec)	KPower_Rate_min KPower_Rate_max	300W/sec 1200W/sec
Use of hysteresis in the Volt-Watt function		With hysteresis

4. Utility interactive evaluations were conducted with the following firmware:

Models: XW Pro 6848 NA

Device	Device Manufacturer/Type	Software Version (release date)	Device Checksum
MCU 32 bit, single-core w/bootloader, U27 on control PCBA	Texas Instruments TMS320F2837	V1.01 (BN0233) Date: Feb-11-2019	16f4a17719c2682e748723c4eb1103a0

5. All models meet the surge requirements of IEEE C62.41.2-2002, Location Category B (6kV). Tests were performed using ring wave and combination waveforms, both polarities, for common mode and differential mode coupling, 20 pulses each test. After surge testing the units were operational with control functionally verified by frequency and voltage disconnect tests.

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Maximum output power with derating for:

Models XW Pro 6848 NA:

Maximum output power can be delivered with an input voltage range of 48-60Vdc'

240Vac

Volts	-40C	+40C	+45C	+50C	+60C
48 Vdc	6000 W	6000 W	5200W	4300W	2600W
54Vdc	6000 W	6000 W	5200W	4300W	2600W
60 Vdc	6000 W	6000 W	5200W	4300W	2600W