Certificate of Compliance

Certificate: 2585060 **Master Contract:** 173688

Project: 70033503 **Date Issued:** August 4, 2015

Issued to: **Power-One, Inc**

3201 E Harbour Dr
Phoenix, AZ 85034
USA

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

C US

Rob Hempstock

Issued by: Rob Hempstock, AScT.

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

Utility Interactive Inverter, ULTRA Series, 3 phase output, permanently connected.

Notes:

For details related to model ratings, size, configuration, etc., reference should be made to the CSA Certification Record, Annex 1 Ratings for Certificate of Compliance, or the Descriptive Report.

APPLICABLE REQUIREMENTS

CSA C22.2 No. 107.1-01 - General Use Power Supplies

*UL Std. No. 1741-2nd Edition - Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources (Rev. January 7, 2015)

** UL CRD - Special Purpose Utility Interactive Product Requirements dated January 28, 2010

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*Note: Conformity to UL 1741-Second Edition (Rev. January 7, 2015) includes compliance with applicable requirements of IEEE 1547 and IEEE 1547.1.

**Note: When the SPECIAL PURPOSE UTILITY INTERACTIVE INVERTER settings are enabled, some IEEE 1547 settings are disabled. IEEE 1547 Unintentional-Islanding function is still functional.

ANNEX 1 - Ratings for Certificate of Compliance

Utility Interactive Inverter, ULTRA-Series, 3 phase output, permanently connected.

The ULTRA Series uses a model numbering scheme as shown below:

ULTRA-XXXX-TL-OUTD-Y-US-690-ABCDE-FGHJKL-**ZZZZZ**

Where:
XXXX denotes Base Model size; 750, 1100, 1500
Y denotes power configuration and efficiency;
1 = active power same as apparent power
2 = reduced active power compared to apparent power
3 = Active power same as apparent power, but provided with more efficient cooling system and inverter modules are power optimized.
4 = Reduced active power compared to apparent power, but provided with more efficient cooling system and inverter modules are power optimized.

A-L denotes configuration and options; see Option Table below.
ZZZZZ is a unique number for customized products. Having a "0" here means no further customization has been done.

ULTRA-XXXX-TL-OUTD-Y Base Model Number Table:

Orderable PN	Inverter configuration	Max. Active Power (kW)	Max. Reactive + Active Power (kVA)
ULTRA-750-TL-OUTD-1 (3)	2 x 390kW	780	780
ULTRA-750-TL-OUTD-2 (4)	2 x 375kW*	750	780
ULTRA-1100-TL-OUTD-1 (3)	3 x 390kW	1170	1170
ULTRA-1100-TL-OUTD-2 (4)	3 x 333kW*	1000	1115
ULTRA-1500-TL-OUTD-1 (3)	4 x 390kW	1560	1560
ULTRA-1500-TL-OUTD-2 (4)	4 x 375kW*	1500	1560

Note: *Special power-limited 390kW inverter modules

ULTRA Part Number Options Table

Option Letter	Item	Available options		
A	MPPT	S = Single MPPT	D=Dual MPPT	M = Multiple (>2) MPPTs*
B	Grounding	S = Solid	R = Resistive	
C	Array Configuration	N = Negative gnd	P = Positive gnd	
D	**DC input protection type**	2 = 200 Amps	4 = 400 Amps	**D = DC Breaker Option****
E	Communication	R = Modbus RTU	T = Modbus TCP	I = Ethernet IP
F	Zone Level Monitoring	1 = Yes	0 = No	
G	Programmable MPPT Sweep	1 = Yes	0 = No	
H	IR Window	1 = Yes	0 = No	
J	Leakage Current Monitor	1 = Yes	0 = No	
K	Array Ground Isolation Monitor	1 = Yes	0 = No	
L	Roxtec Blocks	1 = Yes	0 = No	

Note: *1100 and 1500 models only, resistive grounding only. For option letter E the option I may be paired with option T or R.
**** DC Breaker Option is available only with Single MPPT option.**

ANNEX 1 - Ratings for Certificate of Compliance

Models and system ratings as follows:

Base Model		ULTRA-1500-TL-OUTD-1-US-690	ULTRA-1100-TL-OUTD-1-US-690	ULTRA-750-TL-OUTD-1-US-690
INPUT RATINGS:				
Maximum input voltage		1000 V dc	1000 V dc	1000 V dc
Range of input operating voltage		470 to 1000 V dc	470 to 1000 V dc	470 to 1000 V dc
MPPT input range		470 to 900 V dc	470 to 900 V dc	470 to 900 V dc
Maximum input current (dc)		700 A for each inverter module(4 modules total)	700 A for each inverter module (3 modules total)	700 A for each inverter module (2 modules total)
Maximum input S/C current		3920 A	2940 A	1960 A
Maximum input source back feed current to input source		0 A	0 A	0 A
OUTPUT RATINGS:				
Output power factor rating		> 0.99	> 0.99	> 0.99
Operating voltage range (ac) (L-L)		607-759V~	607-759V~	607-759V~
Operating frequency range or single frequency		59.3-60.5 Hz	59.3-60.5 Hz	59.3-60.5 Hz
Number of phases		3	3	3
Nominal output voltage (ac)		690V ac	690V ac	690V ac
Normal output frequency		60 Hz	60 Hz	60 Hz
Maximum continuous output current (ac) per line		1310 A	983 A	655 A
Maximum continuous output power (ac)		1.56MVA (1.56MW) @ +50C ambient	1.17MVA (1.17MW) @ +50C ambient	780kVA (780kW) @ +50C ambient
Maximum Output Fault Current and Duration		(See Note 3)	(See Note 3)	(See Note 3)
Utility interconnection voltage and frequency trip limits and trip time accuracy:				
Trip limit and trip time accuracy	Voltage:	+/-2%	+/-2%	+/-2%
	Frequency:	+/-0.1 Hz	+/-0.1 Hz	+/-0.1 Hz
	Time	0.150 secs	0.150 secs	0.150 secs
Normal operation temperature range		-40C to +60°C	-40C to +60°C	-40C to +60°C
Maximum full power operating ambient (refer to Derating Tables below)		+50°C	+50°C	+50°C
Enclosure Rating Type		4X	4X	4X

ANNEX 1 - Ratings for Certificate of Compliance

Base Model		ULTRA-1500-TL-OUTD-2-US-690	ULTRA-1100-TL-OUTD-2-US-690	ULTRA-750-TL-OUTD-2-US-690
INPUT RATINGS:				
Maximum input voltage		1000 V dc	1000 V dc	1000 V dc
Range of input operating voltage		470 to 1000 V dc	470 to 1000 V dc	470 to 1000 V dc
MPPT input range		470 to 900 V dc	470 to 900 V dc	470 to 900 V dc
Maximum input current (dc)		700 A for each inverter module(4 modules total)	700 A for each inverter module (3 modules total)	700 A for each inverter module (2 modules total)
Maximum input S/C current		3920 A	2940 A	1960 A
Maximum input source back feed current to input source		0 A	0 A	0 A
OUTPUT RATINGS:				
Output power factor rating		> 0.99	> 0.99	> 0.99
		Adjustable to 0.96 at full output power	Adjustable to 0.90 at full output power	Adjustable to 0.96 at full output power
Operating voltage range (ac) (L-L)		607-759V~	607-759V~	607-759V~
Operating frequency range or single frequency		59.3-60.5 Hz	59.3-60.5 Hz	59.3-60.5 Hz
Number of phases		3	3	3
Nominal output voltage (ac)		690V ac	690V ac	690V ac
Normal output frequency		60 Hz	60 Hz	60 Hz
Maximum continuous output current (ac) per line		1310 A	932 A	655 A
Maximum continuous output power (ac)		1.56MVA (1.5MW) @ +50C ambient	1115kVA (1MW) @ +50C ambient	780kVA (750kW) @ +50C ambient
Maximum Output Fault Current and Duration		(See Note 3)	(See Note 3)	(See Note 3)
Utility interconnection voltage and frequency trip limits and trip time accuracy:				
Trip limit and trip time accuracy	Voltage:	+/-2%	+/-2%	+/-2%
	Frequency:	+/-0.1 Hz	+/-0.1 Hz	+/-0.1 Hz
	Time	0.150 secs	0.150 secs	0.150 secs
Normal operation temperature range		-40C to +60°C	-40C to +60°C	-40C to +60°C
Maximum full power operating ambient (refer to Derating Tables below)		+50°C	+50°C	+50°C
Enclosure Rating Type		4X	4X	4X

Note: -2 model is the same as -1 (standard power) model, except for power derating and adjustable power factor.

ANNEX 1 - Ratings for Certificate of Compliance

Base Model		ULTRA-1500-TL-OUTD-3-US-690	ULTRA-1100-TL-OUTD-3-US-690	ULTRA-750-TL-OUTD-3-US-690
INPUT RATINGS:				
Maximum input voltage		1000 V dc	1000 V dc	1000 V dc
Range of input operating voltage		470 to 1000 V dc	470 to 1000 V dc	470 to 1000 V dc
MPPT input range		470 to 900 V dc	470 to 900 V dc	470 to 900 V dc
Maximum input current (dc)		700 A for each inverter module(4 modules total)	700 A for each inverter module (3 modules total)	700 A for each inverter module (2 modules total)
Maximum input S/C current		3920 A	2940 A	1960 A
Maximum input source back feed current to input source		0 A	0 A	0 A
OUTPUT RATINGS:				
Output power factor rating		> 0.99	> 0.99	> 0.99
Operating voltage range (ac) (L-L)		607-759V~	607-759V~	607-759V~
Operating frequency range or single frequency		59.3-60.5 Hz	59.3-60.5 Hz	59.3-60.5 Hz
Number of phases		3	3	3
Nominal output voltage (ac)		690V ac	690V ac	690V ac
Normal output frequency		60 Hz	60 Hz	60 Hz
Maximum continuous output current (ac) per line		1310 A	983 A	655 A
Maximum continuous output power (ac)		1.56MVA (1.56MW) @ +50C ambient	1.17MVA (1.17MW) @ +50C ambient	780kVA (780kW) @ +50C ambient
Utility interconnection voltage and frequency trip limits and trip time accuracy:				
Trip limit and trip time accuracy	Voltage:	+/-2%	+/-2%	+/-2%
	Frequency:	+/-0.1 Hz	+/-0.1 Hz	+/-0.1 Hz
	Time	0.150 secs	0.150 secs	0.150 secs
Normal operation temperature range		-40C to +60°C	-40C to +60°C	-40C to +60°C
Maximum full power operating ambient		+50°C	+50°C	+50°C
Enclosure Rating Type		4X	4X	4X

Note: -3 model is same as -1 (standard power), except with more efficient cooling and power optimization.

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Base Model		ULTRA-1500-TL-OUTD-4-US-690	ULTRA-1100-TL-OUTD-4-US-690	ULTRA-750-TL-OUTD-4-US-690
INPUT RATINGS:				
Maximum input voltage		1000 V dc	1000 V dc	1000 V dc
Range of input operating voltage		470 to 1000 V dc	470 to 1000 V dc	470 to 1000 V dc
MPPT input range		470 to 900 V dc	470 to 900 V dc	470 to 900 V dc
Maximum input current (dc)		700 A for each inverter module(4 modules total)	700 A for each inverter module (3 modules total)	700 A for each inverter module (2 modules total)
Maximum input S/C current		3920 A	2940 A	1960 A
Maximum input source back feed current to input source		0 A	0 A	0 A
OUTPUT RATINGS:				
Output power factor rating		> 0.99	> 0.99	> 0.99
		Adjustable to 0.96 at full output power	Adjustable to 0.90 at full output power	Adjustable to 0.96 at full output power
Operating voltage range (ac) (L-L)		607-759V~	607-759V~	607-759V~
Operating frequency range or single frequency		59.3-60.5 Hz	59.3-60.5 Hz	59.3-60.5 Hz
Number of phases		3	3	3
Nominal output voltage (ac)		690V ac	690V ac	690V ac
Normal output frequency		60 Hz	60 Hz	60 Hz
Maximum continuous output current (ac) per line		1310 A	932 A	655 A
Maximum continuous output power (ac)		1.56MVA (1.5MW) @ +50C ambient	1115kVA (1MW) @ +50C ambient	780kVA (750kW) @ +50C ambient
Utility interconnection voltage and frequency trip limits and trip time accuracy:				
Trip limit and trip time accuracy	Voltage:	+/-2%	+/-2%	+/-2%
	Frequency:	+/-0.1 Hz	+/-0.1 Hz	+/-0.1 Hz
	Time	0.150 secs	0.150 secs	0.150 secs
Normal operation temperature range		-40C to +60°C	-40C to +60°C	-40C to +60°C
Maximum full power operating ambient		+50°C	+50°C	+50°C
Enclosure Rating Type		4X	4X	4X

Note: -4 model is the same as -1 (standard power) model, except for power derating, adjustable power factor, and more efficient cooling and power optimization.

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Notes:

1. Models ULTRA-XXXX-TL-OUTD-Y-US-690-ABCDE-FGHJKL-**ZZZZZ**, are permanently connected, 3-phase, utility-interactive inverters intended for operation with Photovoltaic supplies only.

2. Operating power is a function of ambient temperature and input PV voltage.

Model ULTRA-1500-TL-OUTD-1-US-690

Input Voltage (V)	Ambient Temperature				
	-40C	+30C	+40C	+50C	+60C
470Vdc	1314210 W	1272655 W	1222201 W	1170384 W	703943 W
585Vdc	1561375 W	1562864 W	**1470690 W**	**1341990 W**	759783 W
660Vdc	No Data	No Data	1566249 W	1561952 W	787011 W
746Vdc	1569484 W	1562876 W	1562756 W	1568445 W	872379 W
850Vdc	1565044 W	1569003 W	1567156 W	1561138 W	926339 W
875Vdc	No Data	774373 W	No Data	No Data	No Data
1000Vdc	24585 W	25063 W	24309 W	24412 W	24604 W

Model ULTRA-1100-TL-OUTD-1-US-690

Input Voltage (V)	Ambient Temperature				
	-40C	+30C	+40C	+50C	+60C
470Vdc	1064338 W	1011144 W	946240 W	889372 W	617211 W
585Vdc	1171526 W	1171365 W	1106367 W	1079336 W	661145 W
660Vdc	No Data	No Data	1179160 W	1178139 W	667938 W
746Vdc	1175991 W	1173489 W	1173184 W	1173113 W	730393 W
850Vdc	1176234 W	1175879 W	1173604 W	1178111 W	758500 W
875Vdc	21442 W	497773 W	No Data	No Data	No Data
1000Vdc	No Data	18764 W	18193 W	18248 W	18344 W

Model ULTRA-750-TL-OUTD-1-US-690

Input Voltage (V)	Ambient Temperature				
	-40C	+30C	+40C	+50C	+60C
470Vdc	677130 W	688825 W	647198 W	602245 W	397204 W
585Vdc	781315 W	781313 W	738724 W	712201 W	442780 W
660Vdc	No Data	No Data	781482 W	781786 W	453385 W
746Vdc	784898 W	781396 W	782802 W	786172 W	480782 W
850Vdc	784033 W	787626 W	783930 W	785914 W	513415 W
875Vdc	12285 W	34522 W	No Data	No Data	No Data
1000Vdc	No Data	12514 W	12113 W	12241 W	12256 W

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3. Maximum Output Fault Current and Duration:

Models	Output Voltage (V)	Fault Current RMS (A) @ 1 cycle	Fault Current RMS (A) @ 3 cycles	Fault Current PK (A)	Total Overall Duration (mSec)
ULTRA-1500-TL-OUTD-Y-US-690	690	601 A	512 A	6320 A	107ms
ULTRA-1100-TL-OUTD-Y-US-690	690	432 A	266 A	6480 A	73ms
ULTRA-750-TL-OUTD-Y-US-690	690	284 A	178 A	4800 A	73ms

4. Utility Interconnection Voltage and Frequency Trip Limits and Trip Times:

Condition	Simulated utility source		Maximum time (sec) at 60 Hz before cessation of current to the simulated utility
	Voltage (V)	Frequency (Hz)	
A	V< 50% V_{nor} (Fixed)	Rated	0.16 sec (Fixed)
B	50%V_{nor}≤ V< 88% V_{nor} (Adj.Set Points)	Rated	2 sec (Default) (Adj. Set Points 0.16s to 3s)
C	110%V_{nor}≤ V< 120% V_{nor} (*) (Fixed)	Rated	1 sec (Default) (Adj. Set Points 0.16s to 3s)
D	V≥120% V_{nor} (**) (Fixed)	Rated	0.16 sec (Fixed)
E	Rated	f > 60.5 (Default) (Adj. Set Points 60.2 to 63.0Hz)	0.16 sec (Default) (Adj. Set Points 0.16s to 300s)
F	Rated	f < 59.3 (Default) (Adj. Set Points 59.8 Hz to 57 Hz)	0.16 sec (Default) (Adj. Set Points 0.16s to 300s)
G	Rated	f < 57.0 (Default, Fixed)	0.16 sec (Fixed)
H	Rated	f > 63.0 (Default, Fixed)	0.16 sec (Fixed)

(*) Note: Max High Voltage level is 110% V_{nor}
(**) Note: Max Very High Voltage level is 115% V_{nor}.

5. Utility interactive evaluations for models ULTRA-1500/1100/750-TL-OUTD-1(-2, -3, -4)-US-690 were conducted with the following firmware:

Device	Device Version	Device Checksum
DSP Inverter	BF92	06D4
Micro Processor	CF2D	9605
DSP DC/DC	AF10	C4AC

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6. Surge Testing for Combination Wave (1.2/50us) was done at 6 kV/3 kA, 2 ohms effective impedance, and Ringwave (0.5us-100kHz) was done at 6 kV/0.5 kA, 12 ohms effective impedance. Tests were performed using 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 variation disconnect tests.

7. The above inverter models are intended to be used in conjunction with an external rated TP1 medium voltage isolation transformer (1.56MVA min for model ULTRA-1500-TL-OUTD-Y-US-690, 1.17MVA min for model ULTRA-1100-TL-OUTD-Y-US-690, and 780KVA min for model ULTRA-750-TL-OUTD-Y-US-690, where suitability is to be determined in the end application.

8. **Inverter models provided with AC Close Coupling Option (AC connection directly through Bus Bars) are to be used in conjunction with a Bus Bar shroud and an external MV transformer. The suitability of the combination of inverter, Bus Bar shroud, and external MV transformer is to be determined in the end installation.**

9. The ULTRA series inverter models have also been evaluated for additional requirements to voltage and frequency settings as Special Purpose Utility Interactive Inverters, refer to Appendix H for details.