



# Certificate of Compliance

**Certificate:** 1841082

**Master Contract:** 173688

**Project:** 2659115

**Date Issued:** September 5, 2013

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

3201 E Harbour Dr

Phoenix, AZ 85034

USA

Attention: Robert White

*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.*



*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, Models PVI-5000-OUTD-US, PVI-5000-OUTD-US-A, PVI-6000-OUTD-US, PVI-6000-OUTD-US-A, and PVI-6000-OUTD-US-W, permanently connected.

## **Notes:**

1. All above models in this series may include expansion board with wireless antennae option and will be identified with model designation including “-Z” suffix at the end.
2. Models PVI-5000-OUTD-US-A and PVI-6000-OUTD-US-A are provided with PV DC ARC-Fault Circuit Protection for series arcing faults.
3. For details related to rating, size, configuration, etc. reference should be made to the CSA Certification Record, Annex A of the Certificate of Compliance, or the Descriptive Report.



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### **APPLICABLE REQUIREMENTS**

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

\*UL Std No. 1741-Second Edition - Inverters, Converters, Controllers and Interconnection System Equipment For Use With Distributed Energy Sources (January 28, 2010)

UL 1699B - Outline of Investigation for Photovoltaic (PV) DC Arc-Fault Circuit Protection (Issue Number 2, January 14, 2013)

CSA TIL M-07 - Interim Certification Requirements for Photovoltaic (PV) DC Arc-Fault Protection (Issue Number 1, March 11, 2013)

\*Note: Conformity to UL 1741-Second Edition (January 28, 2010) includes compliance with applicable requirements of IEEE 1547 and IEEE 1547.1

<b>Annex A</b>
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**PART A: Models PVI-6000-OUTD-US, PVI-6000-OUTD-US-A, and PVI-6000-OUTD-US-W**

	Model PVI-6000-OUTD-US & PVI-6000-OUTD-US-A	Model PVI-6000-OUTD-US-W
Maximum Input Voltage (DC)	600 V dc	600 V dc
Range of Input Operating Voltage (DC)	90-580 V dc, 360 V dc nominal	50-580 V dc, 360 V dc nominal
Maximum Input Current (DC)	18 A (Each Input - 2 provided)	36 A
Maximum Input Short Circuit Current (DC)	22 A (Each Input - 2 provided)	44 A
Maximum Utility Backfeed Current (AC)	0 A	0 A
Output Power Factor Rating	1	1
Operating Voltage Range (AC) (See Note 2)	244-304 V ac for 277 V ac configuration 211-264 V ac for 240 V ac configuration 183-228 V ac for 208 V ac configuration	244-304 V ac for 277 V ac configuration 211-264 V ac for 240 V ac configuration 183-228 V ac for 208 V ac configuration
Operating Frequency Range (HZ)	59.3-60.5 Hz (Default)	59.3-60.5 Hz (Default)
Field Adjustable Operating Frequency Range (HZ)	57.0-59.8 Hz, 60.2-63.0 Hz	57.0-59.8 Hz, 60.2-63.0 Hz
Nominal Output Voltage (AC) (See Note 2)	277 V ac / 240 V ac / 208 V ac	277 V ac / 240 V ac / 208 V ac
Normal Output Frequency	60 Hz	60 Hz
Continuous Output Current (AC)	24 A / 28 A / 30 A	24 A / 28 A / 30 A
Maximum Continuous Output Power (AC) (See Note 4)	@ 50°C ambient: 6000 W	@ 50°C ambient: 6000 W
Maximum Output Fault Current and Duration	32 A (See Note 8)	32 A (See Note 8)
Maximum Output Overcurrent Protection	30 A / 35 A / 40 A	30 A / 35 A / 40 A
Utility Interconnection and Voltage and Frequency Trip Limits and Trip Times	See Note 9	See Note 9
Trip Limit and Trip Time Accuracy	Voltage: +/- 2% Frequency: +/- 0.10 Hz Time: 2 grid cycles (33 ms @ 60 Hz)	Voltage: +/- 2% Frequency: +/- 0.10 Hz Time: 2 grid cycles (33 ms @ 60 Hz)
Normal Operation Temperature Range	-25°C to 60°C (See Note 4)	-25°C to 60°C (See Note 4)
Output Power Temperature Derating and Maximum Full Power Operating Ambient	-25°C to 60°C (See Note 4)	-25°C to 60°C (See Note 4)
Enclosure Rating Type	4X	4X

### Annex A

Device	Device Version	Device Checksum
Rev. Number Microprocessor	C.0.1.6	97CA
Rev. Number DC-DC Converter	A.1.0.8	853E
Rev. Number Inverter	B.1.0.B	A421

**Alternate Device Version**

(Referred to Alternate Microcontroller, Atmel, Type ATMEGA 256-16-AU):

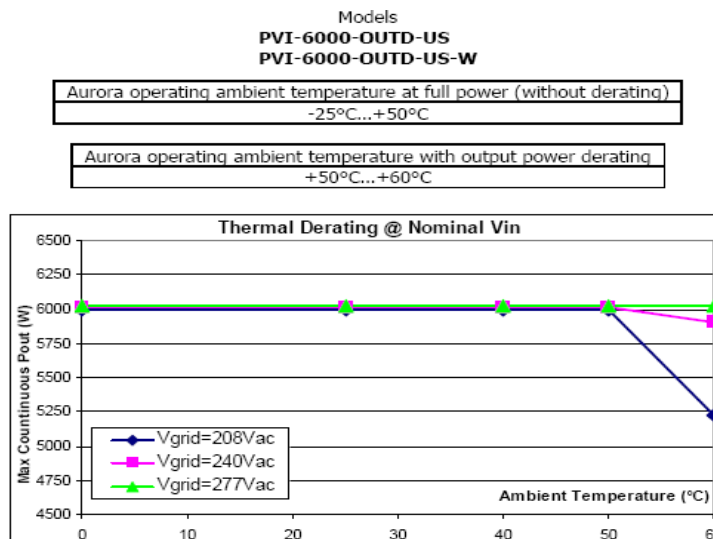
Device	Device Version	Device Checksum
Rev Number DC-DC Converter	A.1.0.8	853E
Rev. Number Inverter	B.1.0.B	A421
Rev. Number Microprocessor	C.1.4.0	3382

**For Model PVI-6000-OUTD-US-A**

Device	Device Version	Device Checksum
Rev. Number Microprocessor	A.1.0.8	853E
Rev Number DC-DC Converter	B.1.0.B	A421
Rev. Number Inverter	C.0.4.0	8914

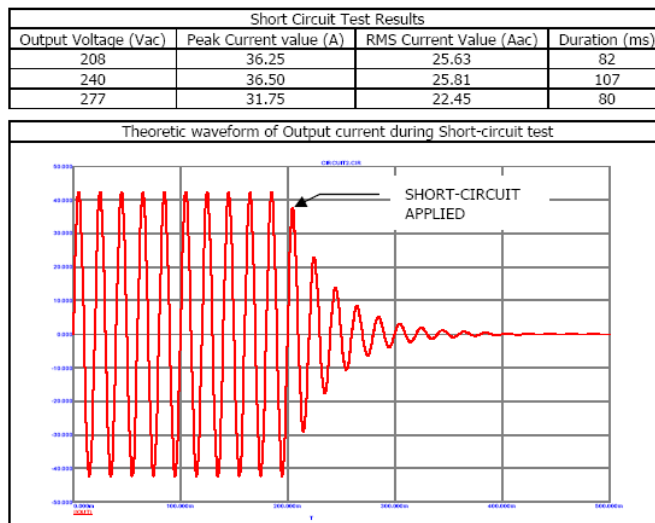
**Notes:**

- Inverter, Models PVI-6000-OUTD-US, PVI-6000-OUTD-US-A, and PVI-6000-OUTD-US-W have been evaluated for use in utility-interactive applications.
- The output of Inverter, Models PVI-6000-OUTD-US, PVI-6000-OUTD-US-A, and PVI-6000-OUTD-US-W may be 277 V ac, 240 V ac or 208 V ac which is user settable based on the utility system.
- Inverter Models PVI-6000-OUTD-US, PVI-6000-OUTD-US-A, and PVI-6000-OUTD-US-W have been evaluated for outdoor use.
- Maximum output power can be delivered only with an input voltage range of:
  - 200-530 V dc for 208 V ac configuration
  - 200-530 V dc for 240 V ac configuration
  - 200-530 V dc for 277 V ac configuration



### Annex A

5. Inverter, Models PVI-6000-OUTD-US, PVI-6000-OUTD-US-A and PVI-6000-OUTD-US-W are intended to be used in an ungrounded power system in conjunction with the requirements specified in the National Electrical Code, ANSI/NFPA 70, 2005 Ed, section 690.35.
6. Inverter Model PVI-6000-OUTD-US-W is intended for operation with an AC Generated supply (i.e. wind or hydro); this inverter is intended to receive an input supply from a certified interface module (rectifier-controller which converts AC voltage from an AC generator into a regulated DC voltage).
7. 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 model coupling, 20 pulses each test. After surge testing the units were optional with control functionally verified by frequency and voltage disconnect tests.
8. Maximum Output Fault Current and Duration:



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

Condition	Simulated utility source		Maximum time (sec) 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 (60 Hz)	0.16 (Fixed)
B	$0.50 V_{nor}^b \leq V < 0.88 V_{nor}$ (Adj. See Notes Below)	Rated (60 Hz)	2 (Fixed)
C	$1.10 V_{nor}^b < V < 1.20 V_{nor}$ (*) (Adj. See Notes Below)	Rated (60 Hz)	1 (Fixed)
D	$1.20 V_{nor} \leq V$ (*)	Rated (60 Hz)	0.16 (Fixed)
E	Rated	$f > 60.5$ Hz (Default) (Adj. 60.2 to 63.0 Hz)	0.16 (Default) (Adj. 0.16 to 300 sec)
F	Rated	$f < 59.3$ Hz (Default) (Adj. 59.8 to 57.0 Hz)	0.16 (Default) (Adj. 0.16 to 300 sec)
G	Rated	$f < 57.0$ Hz	0.16
H	Rated	$f > 63.0$ Hz	0.16

<b>Annex A</b>
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- <sup>a</sup> When a utility frequency other than 60 Hz is used for the test, the maximum number of cycles it takes to cease to export power to the simulated utility shall not exceed the number of cycles a utility frequency of 60 Hz takes regardless of the time the inverter takes to cease to export power to the simulated utility.
- <sup>b</sup> V is the nominal output voltage rating.
- (\*) Note: For model at 277V High Voltage is fixed at 110%  $V_{nor}$  and Very High Voltage is fixed at 111%  $V_{nor}$ .
- (\*\*) Note: For model at 208V Very Low Voltage is fixed at 55%  $V_{nor}$  and Minimum Adjustable Low Voltage is 55%  $V_{nor}$ .

10. All above models in this series may include expansion board with wireless antennae option and will be identified with model designation including "-Z" suffix.
11. Model PVI-6000-OUTD-US-A is provided with PV DC ARC-Fault Circuit Protection for series arcing faults.

**PART B:** Utility Interactive Inverter, Model PVI-5000-OUTD-US and PVI-5000-OUTD-US-A

Model	Model PVI-5000-OUTD-US and PVI-5000-OUTD-US-A
Maximum Input Voltage (DC)	600 V dc
Range of Input Operating Voltage (DC)	90-580 V dc, 360 V dc nominal
Maximum Input Current (DC)	18 A (Each Input - 2 provided)
Maximum Input Short Circuit Current (DC)	22 A (Each Input - 2 provided)
Maximum Utility Backfeed Current (AC)	0 A
Output Power Factor Rating	1
Operating Voltage Range (AC) (See Note 2)	244-304 V ac for 277 V ac configuration 211-264 V ac for 240 V ac configuration 183-228 V ac for 208 V ac configuration
Operating Frequency Range (HZ)	59.3-60.5 Hz (Default)
Field Adjustable Operating Frequency Range (HZ)	57.0-59.8 Hz, 60.2-63.0 Hz
Nominal Output Voltage (AC) (See Note 2)	277 V ac / 240 V ac / 208 V ac
Normal Output Frequency	60 Hz
Continuous Output Current (AC)	20 A / 23 A / 27 A
Maximum Continuous Output Power (AC) (See Note 4)	@ 60°C ambient: 5000 W
Maximum Output Fault Current and Duration	32 A (See Note 7)
Maximum Output Overcurrent Protection	25 A / 30 A / 35 A
Utility Interconnection and Voltage and Frequency Trip Limits and Trip Times	(See Note 8)
Trip Limit and Trip Time Accuracy	Voltage: +/- 2% Frequency: +/- 0.10 Hz Time: 2 grid cycles (33 ms @ 60 Hz)
Normal Operation Temperature Range	-25°C to 60°C (See Note 4)
Output Power Temperature Derating and Maximum Full Power Operating Ambient	-25°C to 60°C (See Note 4)
Enclosure Rating Type	4X

<b>Annex A</b>
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Device	Device Version	Device Checksum
Rev. Number Microprocessor	C.0.1.6	97CA
Rev. Number DC-DC Converter	A.1.0.8	853E
Rev. Number Inverter	B.1.0.B	A421

## Alternate Device Version

(Referred to Alternate Microcontroller, Atmel, Type ATMEGA 256-16-AU):

Device	Device Version	Device Checksum
Rev Number DC-DC Converter	A.1.0.8	853E
Rev. Number Inverter	B.1.0.B	A421
Rev. Number Microprocessor	C.1.4.0	3382

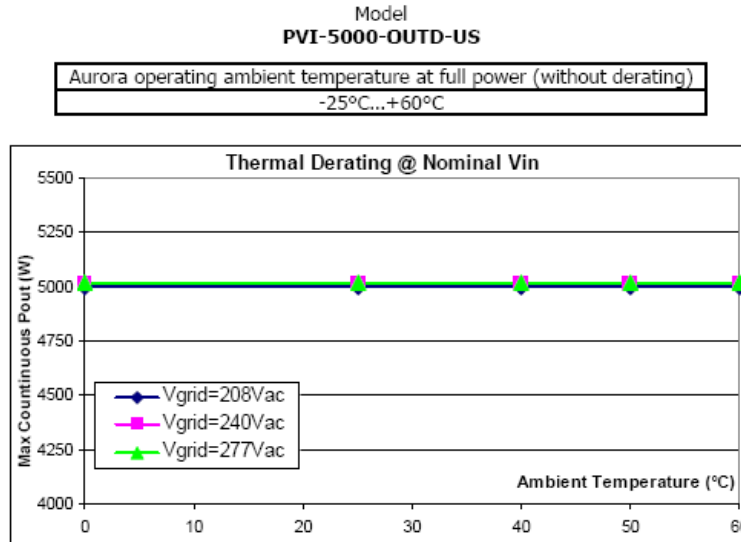
## For Model PVI-5000-OUTD-US-A

Device	Device Version	Device Checksum
Rev. Number Microprocessor	A.1.0.8	853E
Rev Number DC-DC Converter	B.1.0.B	A421
Rev. Number Inverter	C.0.4.0	8914

Notes:

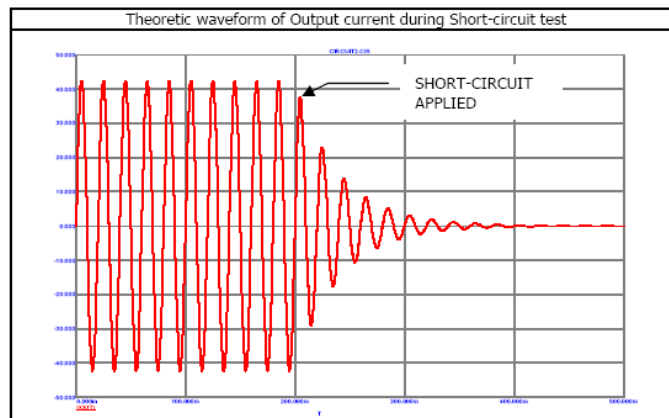
1. Inverter, Model PVI-5000-OUTD-US and PVI-5000-OUTD-US-A has been evaluated for use in utility-interactive applications.
2. The output of Inverter, Model PVI-5000-OUTD-US and PVI-5000-OUTD-US-A may be 277 V ac, 240 V ac or 208 V ac which is user settable based on the utility system.
3. Inverter, Model PVI-5000-OUTD-US and PVI-5000-OUTD-US-A have been evaluated for outdoor use.
4. Maximum output power can be delivered only with an input voltage range of:
  - 200-530 V dc for 208 V ac configuration
  - 200-530 V dc for 240 V ac configuration
  - 200-530 V dc for 277 V ac configuration

**Annex A**



5. Inverter, Model PVI-5000-OUTD-US and PVI-5000-OUTD-US-A are intended to be used in an ungrounded power system in conjunction with the requirements specified in the National Electrical Code, ANSI/NFPA 70, 2005 Ed, section 690.35.
6. 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 model coupling, 20 pulses each test. After surge testing the units were optional with control functionally verified by frequency and voltage disconnect tests.
7. Maximum Output Fault Current and Duration:

Short Circuit Test Results			
Output Voltage (Vac)	Peak Current value (A)	RMS Current Value (Aac)	Duration (ms)
208	36.25	25.63	82
240	36.50	25.81	107
277	31.75	22.45	80



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



<b>Annex A</b>
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Condition	Simulated utility source		Maximum time (sec) 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 (60 Hz)	0.16 (Fixed)
B	$0.50 V_{nor}^b \leq V < 0.88 V_{nor}$ (Adj. See Notes Below)	Rated (60 Hz)	2 (Fixed)
C	$1.10 V_{nor}^b < V < 1.20 V_{nor}^{(*)}$ (Adj. See Notes Below)	Rated (60 Hz)	1 (Fixed)
D	$1.20 V_{nor} \leq V^{(*)}$	Rated (60 Hz)	0.16 (Fixed)
E	Rated	$f > 60.5$ Hz (Default) (Adj. 60.2 to 63.0 Hz)	0.16 (Default) (Adj. 0.16 to 300 sec)
F	Rated	$f < 59.3$ Hz (Default) (Adj. 59.8 to 57.0 Hz)	0.16 (Default) (Adj. 0.16 to 300 sec)
G	Rated	$f < 57.0$ Hz	0.16
H	Rated	$f > 63.0$ Hz	0.16
<sup>a</sup> When a utility frequency other than 60 Hz is used for the test, the maximum number of cycles it takes to cease to export power to the simulated utility shall not exceed the number of cycles a utility frequency of 60 Hz takes regardless of the time the inverter takes to cease to export power to the simulated utility. <sup>b</sup> V is the nominal output voltage rating. (*) Note: For model at 277V High Voltage is fixed at 110% $V_{nor}$ and Very High Voltage is fixed at 111% $V_{nor}$ . (***) Note: For model at 208V Very Low Voltage is fixed at 55% $V_{nor}$ and Minimum Adjustable Low Voltage is 55% $V_{nor}$ .			

9. All above models in this series may include expansion board with wireless antennae option and will be identified with model designation including "-Z" suffix.
10. Model PVI-5000-OUTD-US-A is provided with PV DC ARC-Fault Circuit Protection for series arcing faults.