



# Letter of Attestation

**Document:** 80193124

**Master Contract:** N/A

**Project:** 80193124

**Date Issued:** January 8, 2024

**Issued to:** Fortress Power LLC  
2010 Cabot Blvd. W. Suite L  
Langhorne, Pennsylvania  
United States  
Attention: Limin Huang

*CSA Group hereby confirms that it has completed an evaluation of:*

*Bi-directional Transformerless Grid Support Utility Interactive Power Conversion Equipment,  
Models Avalon HV PC38, Avalon HV PC50, Avalon HV PC60, Avalon HV PC76, Avalon HV PC80,  
Avalon HV PC100 and Avalon HV PC114, permanently connected.*

*CSA Group hereby attests that the products identified above and described  
in test report 80150494 dated January 28, 2023, and*

*Reference to CSA's Listing Project 80182239 (Appendix A), Attestation Letter project 80150494  
(Appendix B) and Vendor Evidence E5000 - E5036 Letters in Appendix C  
complies with the following standards/tests, to the extent applicable:*

*Common Smart Inverter Profile V2.1 with reference to SunSpec IEEE2030.5 Common Smart  
Inverter Profile  
(CSIP) Conformance Test Procedure VI.2*

*Issued by: Peter Lim*

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*CSA Group*

**THIS LETTER OF ATTESTATION DOES NOT AUTHORIZE THE USE OF THE CSA MARK ON THE SUBJECT PRODUCTS.**

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# Descriptive Report

**MASTER CONTRACT:** Not Applicable

**REPORT:** 80193124

**PROJECT:** 80193124

**Edition 1:** January 8, 2024; Project 80193124 - Richmond

Prepared By: Peter Lim

Authorized By: Peter Lim

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Fortress's Vendor Evidence Letter for E5000 and E 5036  
Appendix A - CSA's CofC Listing Project 80182239  
Appendix B - CSA's Attestation Letter Project 80150494  
Appendix C - Vendor Evidence Letter for E5000 and E 5036

## PRODUCTS

Bi-directional Transformerless Grid Support Utility Interactive Power Conversion Equipment

Models Avalon HV PC38, Avalon HV PC50, Avalon HV PC60, Avalon HV PC76, Avalon HV PC80, Avalon HV PC100 and Avalon HV PC114, permanently connected, system ratings as follows. Model Avalon HV PC76 from the series is selected for testing.

Note: The Fortress models listing project 80182239 – see Appendix A.

Model	Avalon HV PC38	Avalon HV PC50	Avalon HV PC60
INPUT RATINGS (PV Port)			
Maximum input voltage	600Vdc		
Nominal DC voltage(Volts)	380V		
Range of input operating voltage	80~520Vdc		
Range of full power input operating voltage	140~450V	140~450V	155~450V
MPPT number	2	3	
Maximum input string	2	3	
Maximum input current	16Adc per MPPT		
Maximum input short circuit current (dc)	25.6Adc per MPPT		

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Model	Avalon HV PC38	Avalon HV PC50	Avalon HV PC60
Maximum input source backfeed current to input source	0		
INPUT RATINGS (Battery Port)			
Maximum input voltage	500Vdc		
Range of input operating voltage	120~500Vdc		
Maximum input current	25A		
Maximum input short circuit current (dc)	25A		
INPUT RATINGS (AC Grid side)			
Maximum input voltage	264Vac		
Range of input operating voltage	211- 264Vac		
Range of full power input operating voltage	211- 264Vac		
Maximum input current	23.8Arms	31.2Arms	37.5Arms
Frequency range	58.8-61.2Hz		
OUTPUT RATINGS (Battery Port)			
Maximum continuous output power	3800W	5000W	6000W
Charging output voltage operating range	120~500Vdc		
Maximum continuous output current	25A		
Maximum output overcurrent protection	30A		
Maximum output fault current (ac) and duration	70A, 200ms		
OUTPUT RATINGS (Back-up power)			
Maximum continuous output power	3800VA	5000VA	6000VA
Number of Phases	split phase with neutral or without neutral		
Nominal output voltage	240Vac		
Operating voltage range	211-264Vac(L-L) 105-132Vac(L-N)		
Operating frequency range or single frequency	55~65Hz		
Normal output frequency	60Hz		
Maximum continuous output current	15.8Arms	20.8Arms	25.0Arms
Maximum output overcurrent protection	25.4A	33.3A	40A

Model	Avalon HV PC38	Avalon HV PC50	Avalon HV PC60
Maximum output fault current (ac) and duration	130.6A <sub>pk</sub> , 33ms; 66.9Arms@ 3 cycles; 49.6Arms@ 5 cycles		
OUTPUT RATINGS (AC Grid Port)			
Maximum continuous output power	3800W	5000W	6000W
Nominal output voltage	240Vac		
Operating voltage range (ac)	211-264Vac(L-L) 105-132Vac(L-N)		
Number of Phases	split phase with neutral or without neutral		
Normal output frequency	60 Hz		
Operating frequency range or single frequency	58.8-61.2Hz		
Output power factor rating	> 0.99 (+/- 0.8 adj.)		
Maximum continuous output current@240V <sub>nom</sub>	15.8Arms	20.8Arms	25.0Arms
Maximum output overcurrent protection@240V <sub>nom</sub>	25.4A	33.3A	40A
Maximum output fault current (ac) and duration	130.6A <sub>pk</sub> , 33ms; 66.9Arms@ 3 cycles; 49.6Arms@ 5 cycles		
Utility interconnection voltage and frequency trip limits and trip times	See note 1		
Trip limit and trip time accuracy	Voltage:	± 1% V <sub>nom</sub>	
	Frequency:	± 0.01 Hz	
	Time:	1%, but not less than 34ms	
Normal operation temperature range	-25°C to 60°C		
Output power temperature derating and maximum full power operating ambient	See note 2		
Storage temperature	-30°C to 60°C		
Enclosure Rating Type	Type 4X		

Model	Avalon HV PC76	Avalon HV PC80	Avalon HV PC100	Avalon HV
<b>INPUT RATINGS (PV Port)</b>				
Maximum input voltage	600Vdc			
Nominal DC voltage(Volts)	380V			
Range of input operating voltage	80~520Vdc			

Model	Avalon HV PC76	Avalon HV PC80	Avalon HV PC100	Avalon HV
Range of full power input operating voltage	175~450V	185~450V	230~450V	245-450 V
MPPT number	4			
Maximum input string	4			
Maximum input current	16Adc per MPPT			
Maximum input short circuit current (dc)	25.6Adc per MPPT			
Maximum input source backfeed current to input source	0			
INPUT RATINGS (Battery Port)				
Maximum input voltage	500Vdc			
Range of input operating voltage	120~500Vdc			
Maximum input current	50A			
Maximum input short circuit current (dc)	50A			
INPUT RATINGS (AC Grid side)				
Maximum input voltage	264Vac			
Range of input operating voltage	211- 264Vac			
Range of full power input operating voltage	211- 264Vac			
Maximum input current	47.6Arms	49.9Arms	62.6Arms	71.3Arms
Frequency range	58.8-61.2Hz			
OUTPUT RATINGS (Battery Port)				
Maximum continuous output power	7600W	8000W	10000W	11400W
Charging output voltage operating range	120~500Vdc			
Maximum continuous output current	50A			
Maximum output overcurrent protection	63A			
Maximum output fault current (ac) and duration	120A, 200ms			
OUTPUT RATINGS (Back-up power)				
Maximum continuous output power	7600VA	8000VA	10000VA	11400VA
Number of Phases	split phase with neutral or without neutral			
Nominal output voltage	240Vac			
Operating voltage range	211-264Vac(L-L) 105-132Vac(L-N)			
Operating frequency range or single frequency	55~65Hz			

Model	Avalon HV PC76	Avalon HV PC80	Avalon HV PC100	Avalon HV
Normal output frequency	60Hz			
Maximum continuous output current	31.7Arms	33.3Arms	41.7Arms	47.5Arms
Maximum output overcurrent protection	50.7A	53.3A	66.7A	76A
Maximum output fault current (ac) and duration	130.6Apk, 33ms; 66.9Arms@ 3 cycles; 49.6Arms@ 5 cycles			
OUTPUT RATINGS (AC Grid Port)				
Maximum continuous output power	7600W	8000W	10000W	11400W
Nominal output voltage	240Vac			
Operating voltage range (ac)	211-264Vac(L-L) 105-132Vac(L-N)			
Number of Phases	split phase with neutral or without neutral			
Normal output frequency	60 Hz			
Operating frequency range or single frequency	58.8-61.2Hz			
Output power factor rating	> 0.99 (+/- 0.8 adj.)			
Maximum continuous output current@240Vnom	31.7Arms	33.3Arms	41.7Arms	47.5Arms
Maximum output overcurrent protection@240Vnom	50.7A	53.3A	66.7A	76A
Maximum output fault current (ac) and duration	130.6Apk, 33ms; 66.9Arms@ 3 cycles; 49.6Arms@ 5 cycles			
Utility interconnection voltage and frequency trip limits and trip times	See note 1			
Trip limit and trip time accuracy	Voltage:	± 1% Vnom		
	Frequency:	± 0.01 Hz		
	Time:	1%, but not less than 34ms		
Normal operation temperature range	-25°C to 60°C			
Output power temperature derating and maximum full power operating ambient	See note 2			
Storage temperature	-30°C to 60°C			
Enclosure Rating Type	Type 4X			

Notes:

1. While the Grid Support Utility interactive function evaluated according to IEEE 1547-2018, IEEE 1547a-2020 and IEEE 1547.1-2020, for Avalon HV PC(38-114) series inverter, Utility Interconnection Voltage and Frequency Trip Limits and Trip Times setting as well as the enter service setting as following:

Shall trip function	Abnormal Voltage Shall trip—Category III			
	Default settings		Ranges of allowable settings	
	Voltage (p.u. of nominal voltage)	Clearing time (s)	Voltage (p.u. of nominal voltage)	Clearing time (s)
OV2	1.20	0.16	fixed at 1.20	fixed at 0.16
OV1	1.10	13	1.10 – 1.20	1.0 – 13.0
UV1	0.88	21	0.0 – 0.88	2.0 – 50.0
UV2	0.50	2	0.0 – 0.50	0.16 – 21.0

Shall trip function	Abnormal Frequency Shall trip—Category III			
	Default settings		Ranges of allowable settings	
	Frequency (Hz)	Clearing time (s)	Frequency (Hz)	Clearing time (s)
OF2	62	0.16	61.8–66.0	0.16–1 000.0
OF1	61.2	300	60.1–66.0	180.0–1 000.0
UF1	58.5	300	50.0–59.9	180.0–1 000
UF2	56.5	0.16	50.0–57.0	0.16–1 000

Enter service criteria		Default settings	Ranges of allowable settings
Permit service		Enabled	Enabled/Disabled
Applicable voltage within range	Minimum value	$\geq 0.917$ p.u.	0.88 p.u. to 0.95 p.u.
	Maximum value	$\leq 1.05$ p.u.	1.05 p.u. to 1.06 p.u.
Frequency within range	Minimum value	$\geq 59.5$ Hz	59.0 Hz to 59.9 Hz
	Maximum value	$\leq 60.1$ Hz	60.1 Hz to 61.0 Hz

2. a): Operating power envelope as a function of ambient temperature:

PV DC Input, Rated AC output

Temp	-25°C	25°C	45°C	60°C
245Vdc	100% Prated	100% Prated	100% Prated	80% Prated
450Vdc	100% Prated	100% Prated	100% Prated	80% Prated

Battery DC Input, Rated AC output

Temp	-25	25°C	45°C	60°C
230	100% Prated	100% Prated	100% Prated	60% Prated
500	100% Prated	100% Prated	100% Prated	100% Prated

### APPLICABLE REQUIREMENTS:

1. Common Smart Inverter Profile V2.1
2. SunSpec IEEE 2030.5 Common Smart Inverter Profile (CSIP) Conformance Test Procedures V1.2
3. Resolution E-5000 & E-5036

### **MARKINGS**

Not Applicable. Attestation Project

### **ALTERATIONS**

Not Applicable

### **FACTORY TESTS**

Not Applicable

### **DESCRIPTION**

CSA Group hereby attests that the products identified above and described in test report 80150494 dated January 28, 2023, and reference to Listing Project 80182239 complies with the following standards/tests, to the extent applicable: Common Smart Inverter Profile V2.1 with reference to SunSpec IEEE2030.5 Common Smart Inverter Profile (CSIP) Conformance Test Procedure V1.2.

### **DEVICE(S) UNDER TEST IDENTIFICATION.**

#### **Gateway Information:**

Product Type	CA Rule 21/CSIP DER Client
Product Name (Aggregator)	IEEE2030.5 Client Aggregator
Product Model	Client Aggregator
Product Object ID	1.3.6.1.4.1.54651.1.1
Software Operation Environment Type	Cloud
Software Name	SER_IeeeTest.jar
Software Version	1
Software Checksum	29c13eb5646601bbc62239c4baf636ef3b6f6178
Operating System	Centos
Operating System Version	7.6.64bit

#### **Test Tool information:**

Tool Company	QualityLogic
Tool Name	IEEE2030.5 Client Tester - FTS
Tool Version	V4.1.3

### **TEST SUMMARY**

As the gateway used by customer is certified by SunSpec, the compatibility testing is as part of IEEE2030.5 conformance testing of the gateway. According to the Resolution E-5000 & E-5036, the following SunSpec CSIP test procedures on the gateway while it is connected to the inverter. The test was conducted using the QualityLogic IEEE 2030.5 Test Harness which implements the test cases that are described in the CSIP Test



Procedures document. Note: No further testing is deemed necessary since the original model (see attestation letter and report in Appendix B and C) meets the test requirements mentioned above.

**TEST CONFIGURATION**

**Test Scope:**

The following tests were performed on inverter. For detailed test cases, refer to section 3.

- Inverter Status (BASIC-028)
- Inverter Meter Reading (BASIC-029)
- Basic Inverter Control – Volt/Var (BASIC-006)
- Basic Inverter Control – Fixed Power Factor (BASIC-008)
- Basic Inverter Control – Volt-Watt (BASIC -011)

**Test Environment**

Temperature in the range 15°Cto 35°C	Yes
Relative humidity in the range 20% to 75%	Yes

**Test Procedures**

The test has been run on January 12, 2023, with QualityLogic Inc. IEEE2030.5 Conformance Test Program. The SunSpec approved QualityLogic Test tools used was the Version 4.1.3 release of Functional Test Suit Client Tester.

**TEST RESULT**

**Summary Convention**

The following “Result” convention is used in this summary.

Result Items	Description
PASS	All test cases that have been executed have passed.
FAIL	At least one test case has failed.
NOT APPLICATION	The test case was not applicable to device under test

**Summary of Test Results**

Test Name	Test Description	Test Result
BASIC-006	Basic Inverter Control (Volt/Var) [C, A, S]	PASS
BASIC-008	Basic Inverter Control (Fixed Power Factor) [C, A, S]	PASS
BASIC-011	Basic Inverter Control (Volt-Watt) [C, A, S]	PASS
BASIC-028	Inverter Status [C, A, S]	PASS
BASIC-029	Inverter Meter Reading [C, A, S]	PASS

**MASTER CONTRACT:** N/A

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## **TEST HISTORY**

Edition: 1 (Project 80193124)

This is an attestation report pertaining to listing models to Fortress for meeting Common Smart Inverter Profile V2.1 with reference to SunSpec IEEE2030.5 Common Smart Inverter Profile (CSIP) Conformance Test Procedure V1.2 and providing E-5000 & E-5036 Vendor Evidence Letter. No further testing is deemed necessary since the original model (see attestation letter and report in Appendix B and C) meets the test requirements mentioned above.

---End of Report---