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# SunSpec IEEE 2030.5/CSIP Conformance Test Procedures Results Reporting

## SunSpec Specification



## Abstract

This document specifies the contents and format of SunSpec IEEE 2030.5/CSIP Test Procedures test results report format. SunSpec IEEE 2030.5/CSIP certification testing partners are required to deliver test results to SunSpec in this format.

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## Revision History

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0.9	01-15-2019	Candidate final release
1.0	02-05-2019	Final
1.1	11-10-2019	Added COMM-004 connection TLS packet trace requirement.

## About the SunSpec Alliance

The SunSpec Alliance is a trade alliance of developers, manufacturers, operators, and service providers together pursuing open information standards for the distributed energy industry. SunSpec standards address most operational aspects of PV, storage, and other distributed energy power plants on the smart grid, including residential, commercial, and utility-scale systems, thus reducing cost, promoting innovation, and accelerating industry growth. Over 100 organizations are members of the SunSpec Alliance, including global leaders from Asia, Europe, and North America. Membership is open to corporations, non-profits, and individuals. For more information about the SunSpec Alliance, or to download SunSpec specifications at no charge, visit [sunspec.org](http://sunspec.org).

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# 1 Introduction

This document specifies the content and format of the SunSpec IEEE 2030.5/CSIP Test Results Report (“Test Results Report”) generated by testing tools that implement the SunSpec IEEE 2030.5/CSIP Conformance Test Procedures. The Test Results Report is the document that SunSpec uses to determine the compliance of a DER devices to the IEEE 2030.5/CSIP standard and to grant a SunSpec Certified mark to the device manufacturer.

This document is subdivided into three main sections:

- General Testing Considerations: information you need to set up and run a valid test
- Test Results Report (TRR) Format Specification: the specific data needed by SunSpec to make a certification evaluation of the device that was tested. These reports are posted on the SunSpec web site and made available to the general public.
- Chapter 4, Detailed Test Logs: the data used by SunSpec to verify successful execution of each test procedure . This data is archived by SunSpec and used only for confirming test results. It is not shared with the public.

SunSpec may update this document on a periodic basis. To make sure you have the most current version, go to <https://sunspec.org/download/>.

## **2 General Testing Considerations**

The following general testing considerations must be observed when performing testing and generating a Test Results Report (TRR).

### **2.1 Equipment Version**

All tests must be completed without altering the software or hardware during the testing process. If any changes are made to the software or hardware, the testing process must be restarted.

### **2.2 Configuration**

The complete equipment configuration must be documented such that the configuration can be applied to an unconfigured production unit for test replication.

#### **2.2.1 Client**

A client must be configured before the test procedures are started and the configuration may not be changed during the testing process. If any changes are made to the client configuration, the testing process must be restarted.

#### **2.2.2 Aggregator Client**

An aggregator client must be configured before the test procedures are started and the configuration may only be changed as specified by tests during the testing process. If any other changes are made to the aggregator client configuration, the testing process must be restarted.

#### **2.2.3 Server**

A server must be configured before the test procedures are started and the configuration may only be changed as specified by tests during the testing process. If any other changes are made to the server configuration, the testing process must be restarted.

### 3 Test Results Report (TRR) Format Specification

TRR's submitted to SunSpec for the SunSpec IEEE 2030/5/CSIP Conformance Test Procedures are comprised of two elements: Summary Test Results, and a Detailed Test Log for all tests.

#### 3.1 Summary Test Results

The Summary Test Results are contained in a single document containing comma separated values (CSV) where each row consists of an information key and a value. The ordering of the key/value pairs is unimportant although the example below lays out the report in a manner that can be easily read.

- The values for many of the keys are enumerated. Enumerated values are defined in the Description column as shown in the example.
- For values that are not enumerated, the following rules apply:
  - All values must be strings
  - Keys must match the documented key values
  - Values that include characters that have a specific meaning in the CSV format must be placed in quotes.

##### 3.1.1 Key/Value Pair Descriptions for Summary Test Results

The following table describes the key/value pair definitions for test results:

Key	Description	Value Field Type
Certificate Type	The name of the SunSpec certificate type.	Enumerated list (IEEE1815/AN2018, IEEE 2030.5/CSIP, SunSpec Modbus, SunSpec RSD)
Certificate Number	Number of the SunSpec Certificate. This number is assigned by SunSpec.	String
Company Name	Official name of the company that the SunSpec Certificate is issued to.	String
Company Address	Address of the company that the SunSpec Certificate is issued to.	String
Company City	Name of the company that the SunSpec Certificate is issued to.	String
Company State	The U.S. State of the company that the SunSpec Certificate is issued to.	Enumerated list (see Appendix A). Mark "Not Applicable" if company is not located in U.S.
Company Province	The Province of the company that the SunSpec Certificate is issued to. Only applicable to companies not located in the U.S.	String. Mark "Not Applicable" if company is located in the U.S.

Company Country	Country of the company that the SunSpec Certificate is issued to.	Enumerated list. See Appendix A for details.
Company Postal Code	Postal code of the company that the SunSpec Certificate is issued to.	String
Date Issued	Date the SunSpec Certificate was issued.	Date: MM/DD/YYYY
Test Laboratory	The SunSpec Authorized Test Laboratory that performed the Test.	Enumerated list. See Appendix A for details.
Supervising Test Engineer	The name(s) of the employee of the SunSpec Authorized Test Laboratory who performed the Tests.	String
Certificate Signer Name	The name of the person at SunSpec Alliance who approved the SunSpec Certificate.	String
Software Name <n (Software)>	The file name of the SunSpec Certified Software including file type suffix. Multiple fields of this type may be present. Individual fields are distinguished by adding a number at the end of the key label.	String
Software Version <n (Software)>	The version number of the SunSpec Certified software. Multiple fields of this type may be present. Individual fields are distinguished by adding a number at the end of the key label.	String
Software Checksum <n (Software)>	Checksum of the SunSpec Certified software. Multiple fields of this type may be present. Individual fields are distinguished by adding a number at the end of the key label.	String
Operating System <n (OS)>	The operating system of the SunSpec Certified software	String
Operating System Version <n (OS)>	Major version number plus first digit of minor version number of the Operating System that supports SunSpec Certified software, expressed as "X.X". Multiple fields of this type may be present. Individual fields are distinguished by adding a number at the end of the key label.	String
Software Operating Environment	The operating environment where the Certified Software operates.	Enumerated list. Choices are "Cloud" or "Hardware Device"
Protocol Implementation Conformance Statement	The Protocol Implementation Conformance Statement of the Certified Software.	String (properly formed URL)

Cloud Provider	The name of cloud platform provider where the Certified Software operates.	String. Mark "Not Applicable" if software is hosted in a device.
Cloud Provider Version	The version of cloud platform where the Certified Software operates.	String. Mark "Not Applicable" if software is hosted in a device.
Product Manufacturer <n (Prod Mfr)>	The manufacturer name of the Product that incorporates the SunSpec Certified software and the Hardware. Multiple fields of this type may be present. Individual fields are distinguished by adding a number at the end of the key label.	String. Mark "Not Applicable" is software is hosted in cloud.
Hardware Model <n (Prod Model)>	The model name of the Product that incorporates the SunSpec Certified software and the Hardware. Multiple fields of this type may be present. Individual fields are distinguished by adding a number at the end of the key label.	String. Mark "Not Applicable" is software is hosted in cloud.
Hardware Manufacturer <n (HW Mfr)>	The manufacturer name of the Hardware device that supports the SunSpec Certified software. Multiple fields of this type may be present. Individual fields are distinguished by adding a number at the end of the key label.	String. Mark "Not Applicable" is software is hosted in cloud.
Hardware Model <n (HW Model)>	The model name of the Hardware device that supports the SunSpec Certified software. Multiple fields of this type may be present. Individual fields are distinguished by adding a number at the end of the key label.	String. Mark "Not Applicable" is software is hosted in cloud.
Test Completion Date	The date when the test was performed.	Date: MM/DD/YYYY
Test Description	The description of the test performed.	Enumerated list. See Appendix A for details.
Additional Test Comments	Comments associated with most recent Test as indicated by Test Date.	String
Test <Test ID>	The result of the test performed. Multiple fields of this type may be present. Individual fields are distinguished by adding a Test ID at the end of the key label.	Enumerated list. Choices are "PASS" or "FAIL" or "NOT SUPPORTED"

### 3.1.2 Example Test Results Report

The following table is an example of a Test Results Report generated by a SunSpec Authorized Test lab following the evaluation of an IEEE 2030.5/CSIP compliant product:

IEEE 2030.5/CSIP Client Test Example Report

Key	Value
Certificate Type	IEEE 2030.5/CSIP
Certificate Type Version	2019
Certificate Number	ICS183884882
Company Name	ACME Incorporated
Company Address	569 Regents Park Avenue
Company City	Boston
Company State/Province	MA
Company Country	USA
Company Postal Code	02123
Date Issued	01/12/2019
Test Laboratory	Official Lab LLC
Supervising Test Engineer	Peter A Smith
Certificate Signer Name	Daniela T Jones
Software Name 1	ABC2030client.exe
Software Version 1	11.01
Software Checksum 1	423EC0E4
Operating System 1	Ubuntu
Operating System Version 1	18.04
Software Operating Environment	Device
Protocol Implementation Conformance Statement	<a href="https://pics.sunspec.org/abccopics12.xlsx">https://pics.sunspec.org/abccopics12.xlsx</a>
Cloud Provider	Not Applicable
Cloud Provider Version	Not Applicable
Hardware Manufacturer 1	Maxima
Hardware Model 1	DERGate MB31-M-SC
Test Completion Date	01/03/2019
Test Description	Test performed in compliance with California Rule 21 Phase 2 and Phase 3 requirements.

Additional Test Comments	This test was performed using the QL testing software version 3.8.
Test BASIC-001	PASS
Test BASIC-002	PASS
Test BASIC-003	PASS
Test BASIC-004	PASS
Test BASIC-005	PASS
Test BASIC-006	PASS
Test BASIC-007	PASS
Test BASIC-008	PASS
Test BASIC-009	PASS
Test BASIC-010	PASS
Test BASIC-011	PASS
Test BASIC-012	PASS
Test BASIC-013	PASS
Test BASIC-014	PASS
Test BASIC-015	PASS
Test BASIC-016	PASS
Test BASIC-017	PASS
Test BASIC-018	PASS
Test BASIC-019	PASS
Test BASIC-020	PASS
Test BASIC-021	PASS
Test BASIC-022	PASS
Test BASIC-023	PASS
Test BASIC-024	PASS
Test BASIC-025	PASS
Test BASIC-026	PASS
Test BASIC-027	PASS
Test BASIC-028	PASS
Test BASIC-029	PASS
Test COMM-002	PASS
Test COMM-003	PASS

Test COMM-004	PASS
Test COMM-005	PASS
Test COMM-006	PASS
Test CORE-003	PASS
Test CORE-004	PASS
Test CORE-005	PASS
Test CORE-006	PASS
Test CORE-007	PASS
Test CORE-008	PASS
Test CORE-009	PASS
Test CORE-010	PASS
Test CORE-011	PASS
Test CORE-012	PASS
Test CORE-013	PASS
Test CORE-014	PASS
Test CORE-015	PASS
Test CORE-016	PASS
Test CORE-017	PASS
Test CORE-020	PASS
Test CORE-021	PASS
Test CORE-022	PASS

## 4 Detailed Test Logs

The detailed test logs consist of HTTP message logs for all the tests performed. The detailed test logs may be supplied in a single document or multiple documents in the format outlined below. The detailed test logs must contain all HTTP(S) messages in unencrypted form that were transferred as part of the test. The detailed test logs are encoded in JSON format in three different JSON objects: Test Log, Message, and Test Logs. The contents of each JSON object is described below.

### 4.1.1 Test Log Object

Each test log is represented as a test log object that contains an array of test names the log applies to, an optional context id and the log consisting of an array of HTTP messages.

The tests array is an array of strings that corresponds to the name specified in the test procedure such as “CORE-001” that the test log applies to. There may be one or more test procedures specified in the array.

The context id is a string used as an id to provide an association for multiple tests if they are archived as separate items. The context id is optional.

The messages array contains the HTTP messages associated with the test. The format of a message is specified in the Message Object section below.

Test Log Object contents:

JSON Element	Description
tests	Array of test names
cid	Context id
messages	Array of HTTP messages in specified format

Test Log Object JSON format:

```
{"tests": [<array of test names>],  
 "cid": <context id>,  
 "messages": [<array of HTTP messages>]  
}
```

### 4.1.2 Message Object

A message object contains the contents of a single HTTP message along with a time stamp and the message type.

The time stamp is a number containing a value in seconds that represents the timing of the message. The time may represent sub-second timing using a decimal notation. The time must have second accuracy and ideally sub-second accuracy.

The type is a string (“req” or “resp”) that indicates whether the message is an HTTP request or response.

The URI is a string that is the URI from the HTTP message.

The version element contains the HTTP version string as it appears in the HTTP message.

The headers object contains all the HTTP message headers as key/value string entries.

The body is a string containing the body of the HTTP message.

Message Object contents:

JSON Element	Description
time	Time stamp
type	Message type (“req” or “resp”)
method	HTTP method
uri	Message URI
vers	HTTP version string
headers	Object con header key/value pairs
body	Message body (empty string if no message body)

Message Object JSON format:

```
{"time": <time stamp>,
"type": <message type ("req" or "resp")>,
"method": <HTTP method>,
"uri": <message URI>,
"vers": <HTTP version string>
"headers": {< object containing header key/value pairs>},
"body": <message body (empty string if no message body)>
}
```

Example request message:

```
{"time": 1539663163.6476057, "type": "req", "method": "GET",
"uri": "/sep2/dcap", "vers": "HTTP/1.1", "headers": {"Accept": "application/sep+xml", "Host": "192.168.0.6:8080"}, "body": ""}
```



Example response message:

```
{"time": 1539663163.9776247, "type": "resp", "headers": {"Server": "BaseHTTP/0.6 Python/3.6.4", "Date": "Tue, 16 Oct 2018 04", "Access-Control-Allow-Origin": "*", "Access-Control-Allow-Methods": "GET,PUT,POST,DELETE, OPTIONS", "Access-Control-Allow-Headers": "Content-Type, Authorization", "Access-Control-Expose-Headers": "Location", "Content-Type": "application/sep+xml; charset=utf-8", "Content-Length": "566", "Connection": "keep-alive"}, "body": "<DeviceCapability href=\"/sep2/dcap\" xmlns=\"urn:ieee:std:2030.5:ns\" xmlns:xsi=\"http://www.w3.org/2001/XMLSchema-instance\">\n\t<EndDeviceListLink href=\"/sep2/edev\" all=\"3\"/>\n\t<MirrorUsagePointListLink href=\"/sep2/mup\" all=\"1\"/>\n\t<DemandResponseProgramListLink href=\"/sep2/grp/39/dr\" all=\"0\"/>\n\t<DERProgramListLink href=\"/sep2/grp/39/derp\" all=\"0\"/>\n\t<MessagingProgramListLink href=\"/sep2/grp/39/msg\" all=\"0\"/>\n\t<ResponseSetListLink href=\"/sep2/grp/39/rsps\" all=\"0\"/>\n\t<TimeLink href=\"/sep2/tm\"/>\n\t<UsagePointListLink href=\"/sep2/grp/39/upt\" all=\"0\"/>\n</DeviceCapability>", "vers": "HTTP/1.1", "code": "200", "reason": "OK\r\n"}}
```

#### 4.1.3 Test Logs Object

Multiple test logs can be placed in a test logs object along with an optional context id.

The test log array contains test log objects.

The context id is a string used as an id to provide an association for multiple tests if they are archived as separate items. The context id is optional.

Tests Logs Object contents:

JSON Element	Description
logs	Array of test log objects
cid	Context id

Tests Logs Object JSON format:

```
{"logs": [<array of test log objects>], "cid": <context id>}
```

## **5 COMM-004 Connection TLS Packet Traces**

The COMM-004 test specifies a series of connection tests involving different certificate scenarios being presented to the device under test. The test specifies that the TLS packets be inspected to verify the correct test behavior. A packet trace in either Libpcap or PcapNg format that includes all the TLS packets associated with connection establishment should be submitted for each connection scenario specified in COMM-004.