SunSpec Modbus Documents Update

August 14, 2024

Antitrust and IP Admonition

- All SunSpec meetings are conducted in accordance with the SunSpec Antitrust Policy and Intellectual Property Provisions defined in the SunSpec Member Agreement. This agreement can be found at https://sunspec.org/sunspec-alliance-membership-agreement/
- SunSpec strictly prohibits market participants, and their employees who take part in these activities, from using their participation as a forum for engaging in practices or communications that violate antitrust laws.
- Confidential or proprietary information should not be discussed in open session. Please contact SunSpec management if you have any questions.

Agenda

- Documents Under Review
  - SunSpec Modbus Device Information Model Specifications
  - SunSpec Modbus Conformance Test Procedures
  - SunSpec Modbus Conformance for IEEE 1547 Test Procedures
  - SunSpec Modbus Model Reference Sheet
- Next Steps
  - 45 Day Review Period
  - Work Group Sprint
  - Joining the Work Group
- SunSpec Dashboard
- Complimentary DERSec Lab Test Plus License
- Q&A
- Annual Member Meeting

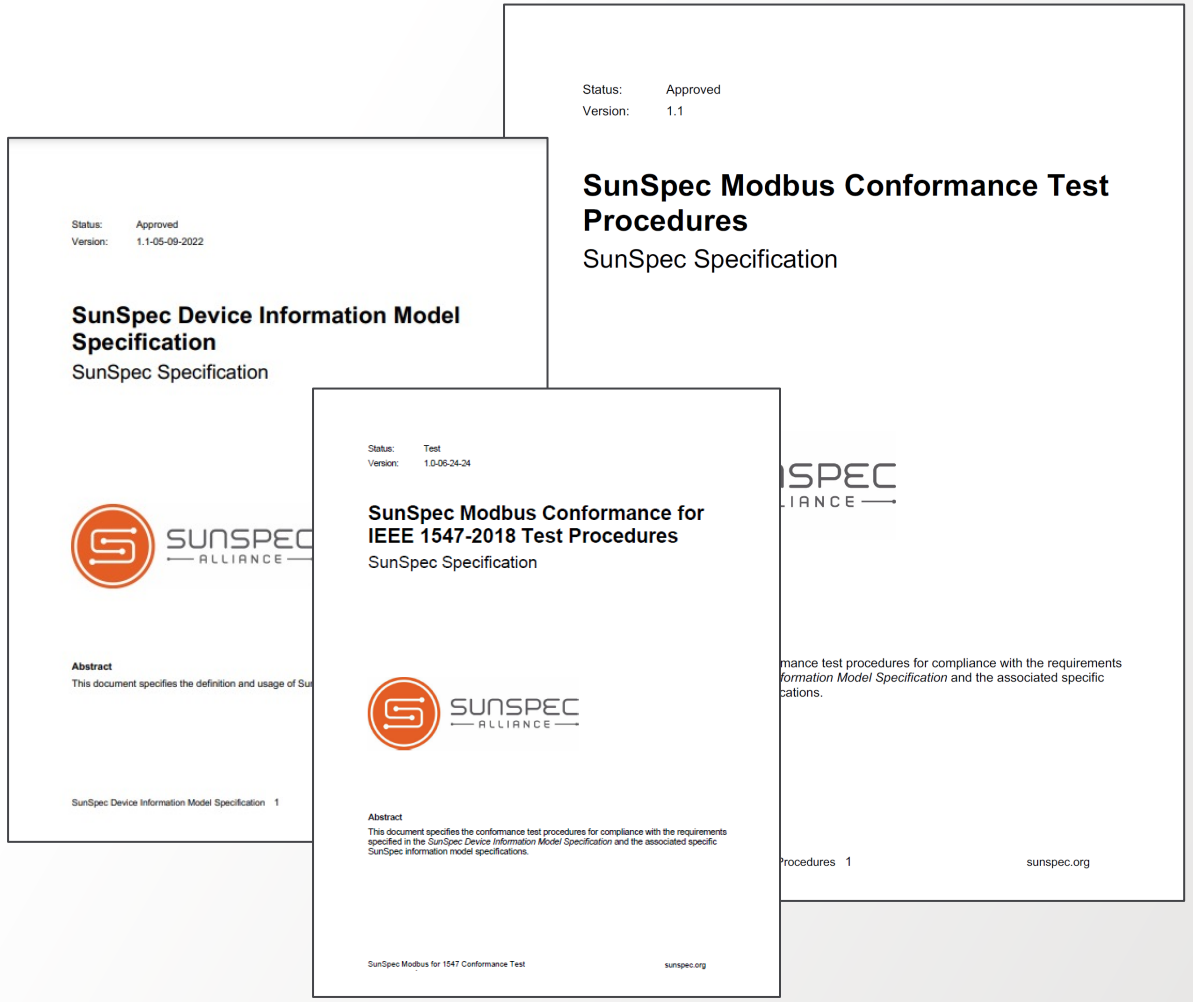
SunSpec Modbus Update Summary

SunSpec 700 Series Models

- Clarifying points with better descriptions using '**detailed description**' field.
- Included new field for **grid code standards** that require the point.
- Marked duplicative points as '**unused**' with reason.

SunSpec Modbus Server Conformance Test Procedures

- Expanded/improved default tests
- Clarified requirements (e.g., readback time)
- Added Exception Generation tests
- Added broadcast test for RTU devices
- Created IEEE 1547 conformance test procedures



SunSpec Modbus Schema

- Updates to add clarity to the points and identify mandatory points.
- Added information into the **Detailed Description** (“notes” or “comments”).
- Added new attribute **Standards** that is a list of standards requiring the element.

Element	Description
model	A logical grouping of data points that are assigned a model id.
group	A group of *points* or point *groups*. A *model* can have multiple point groups and point groups can be nested. A *model* always has a top-level point group that includes all points and point groups in the model. A *model* can only have one top-level point group.
point	A data point that has a value.
symbol	A name-value pair used to represent a constant value associated with an enumerated value or bit position in a *point*.
comment	The text used to annotate the information model definition. Comments are associated with one of any definition element (*model*, *group*, *point*, or *symbol*) in the *model* definition.

Table 1: Model Definition Elements

Attribute	Description	M	G	P	S
ID	The element ID.	R	R	R	R
Points	An array of point definitions in a point group.		R		
Group	An array of point elements or other point group elements.	R			
Groups	An array of point group definitions in a point group.		O		
Value	If present, a constant value associated with the element.			O	R
Type	The element type.		R	R	
Count	The occurrence count of the element.		O	O	
Size	The element size. Mandatory when type is `string`.			O	
Scale Factor	If present, the scale factor point associated with the element.			O	
Units	If present, the units associated with the element.			O	
Access	Element access, read or read/write. If not present, defaults to read. (`R` or `RW`)			O	
Mandatory	Element is mandatory/optional. If not present, default to optional. (M or O)			O	
Label	Short label associated with the element.	R	R	O	O
Description	Description associated with the element.	O	O	O	O
Symbols	A name-value pair used to represent a constant value associated with an enumerated value or bit position in a point.	O	O	O	O
Detailed Description	A detailed note to describe the usage of the point. This attribute may include examples.	O	O	O	O
Standards	This list mentions all the standards/grid codes in which the point is mandatory for compliance.	O	O	O	O

Address Offset	Group Offset	Name	Value	Count	Type	Size	Scale Factor	Units	Detailed Description	Standards
14		VNomRtg			uint16		V_SF	V	Voltages are LN for single phase DER (e.g. 120 V nominal), LL for split phase DER (e.g. 240 V nominal), and LL for three phase DER (e.g., 480 V nominal).	IEEE 1547-2018

Duplicative PF Points

Parameter	Description	SunSpec **Rating** Point (Model 702)	SunSpec **Settings** Point (Model 702)
Active power rating at unity power factor (nameplate active power rating)	Active power rating in watts at unity power factor	WMaxRtg	Wmax
Active power rating at specified over-excited power factor	Active power rating in watts at specified over-excited power factor	WOvrExtRtg	WMaxOvrExt
Specified over-excited power factor	Over-excited power factor as described in 5.2	WOvrExtRtgPF	WOvrExtPF
Active power rating at specified under-excited power factor	Active power rating in watts at specified under-excited power factor	WUndExtRtg	WMaxUndExt
Specified under-excited power factor	Under-excited power factor as described in 5.2	WUndExtRtgPF	WUndExtPF
?	?	PFOvrExtRtg	PFOvrExt
?	?	PFUndExtRtg	PFUndExt

IEEE 1547-2018 Table 28

Duplicative PF Points (Model 702)

- Ratings
  - Specified Over/Under-Excited PF (WOvrExtRtgPF/WUndExtRtgPF) - Mandatory in the "SunSpec Modbus IEEE 1547-2018 Profile Specification and Implementation Guide". Change description to say it's a rating.
  - PF Over/Under-Excited Rating (PFOvrExtRtg/PFUndExtRtg) - Marked “unused"
- Settings:
  - Specified Over/Under-Excited PF (WOvrExtPF /WUndExtRtgPF) - Specified in the "SunSpec Modbus IEEE 1547-2018 Profile Specification and Implementation Guide“ as corresponding configuration points. Change description to say it's a setting.
  - PF Over/Under-Excited Setting (PFOvrExt/PFUndExt) - Marked “unused"

Name	Type	Scale Factor	Static (S)	Label	Description
PFOvrExtRtg	uint16	PF_SF	S	PF Over-Excited Rating	Unused. Please use WOvrExtRtgPF.
PFUndExtRtg	uint16	PF_SF	S	PF Under-Excited Rating	Unused. Please use WUndExtRtgPF.

Modbus Functions

- Implementation of basic Modbus functions for interoperability.
- Mandated the support for **Function Code 6** – Write Single Register.
- Mandated the support for **broadcast** in RTU devices.

		Function Codes		
		code	*Sub code*	*(hex)*
Physical Input Registers	Read Input Register	**04**		**04**
Internal Registers Or Physical Output Registers	Read Holding Registers	**03**		**03**
	Write Single Register	**06**		**06**
	Write Multiple Registers	**16**		**10**
	Read/Write Multiple Registers	**23**		**17**
	Mask Write Register	**22**		**16**
	Read FIFO queue	**24**		**18**

Function codes support required

*

In **broadcast** mode, the master can send a request to all slaves. No response is returned to broadcast requests sent by the master. The broadcast requests are necessarily writing commands. All devices must accept the broadcast for writing function. The address 0 is reserved to identify a broadcast exchange.

- Defined the read time (after a write) to have a maximum delay of 1000 ms.

6.5 Verifying Written Values

It is common practice with Modbus devices to perform a read operation after a write operation to verify that the values were successfully written. The written values should be read with a maximum delay of 1000 ms for a successful write operation.

*MODBUS over serial line specification and implementation guide V1.02: https://modbus.org/docs/Modbus_over_serial_line_V1_02.pdf

SunSpec Conformance Test Procedures – Additional Tests

- Added the read time with a maximum delay of 1000 ms to the Point Write Verification test.
- Added **Broadcast** and **Device Address Write** tests for RTU devices.
- Added the **single** and **multiple register write** test to the Modbus Tests.
- Added the following Exception Generation Tests:
  - **Invalid Value:** Example – setting a value of '2' to an Enable point or adopting a non-existing curve.
  - **Writing a Read-Only Register:** Example – writing to the read-only Curve-1 in Model 705
  - **Illegal Function Code:** Example – sending a request with a non-defined function code like 50.

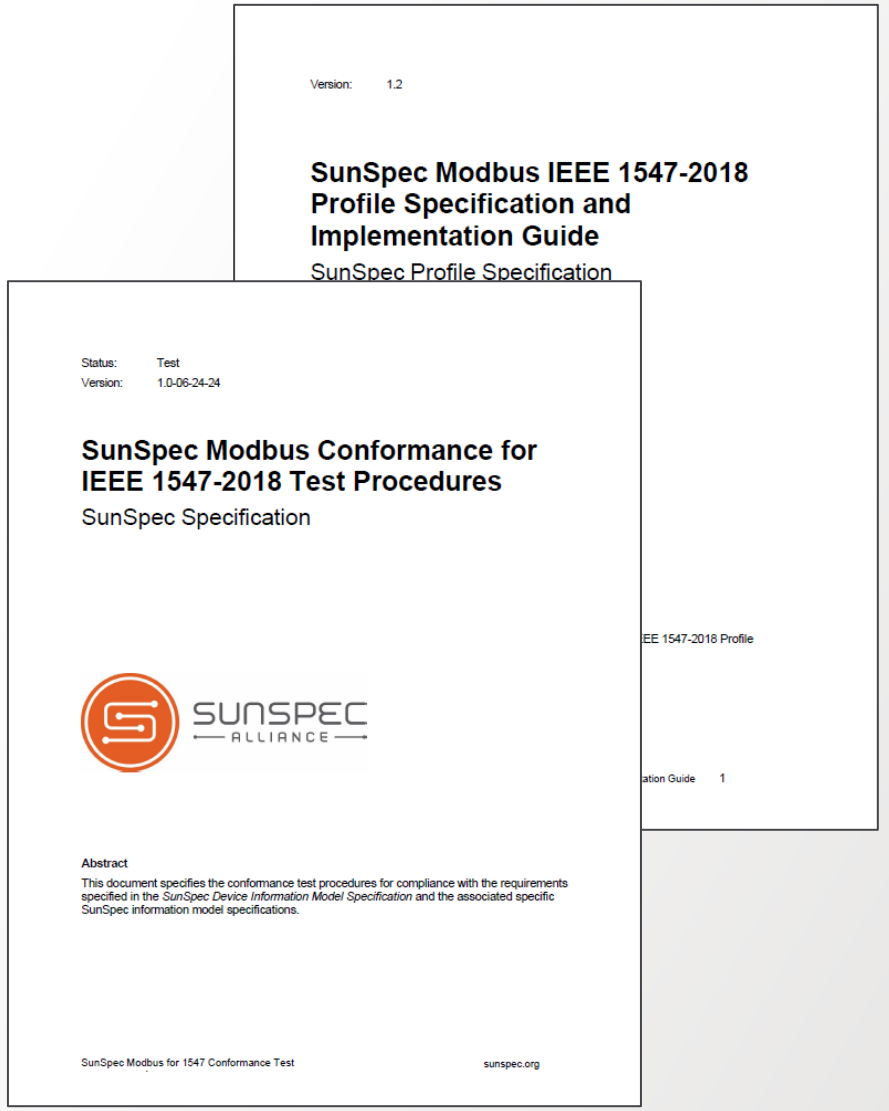
Test	Description
RTU-4	Broadcast Test
RTU-5	Device Address Write
EXC-1	Invalid Value
EXC-2	Writing a Read-Only Register
EXC-3	Illegal Function Code

SunSpec Conformance for 1547 Test Procedures

- New specification for IEEE 1547 protocol compliance testing.
- Additional tests to implement SunSpec Modbus IEEE 1547-2018 Profile.
- New tests added are as follows:
  - Mandatory Points (and models)
  - Scale Factor Check: Validating SFs are in the correct range. For e.g., the highest value for Voltage can be 65535. A voltage SF of -3 will not allow values higher than 65V. So, V_Sf_{min} must be -2.

ID
L
Mn
Md
SN
Vr

Table 16 - Common Model (1) Required Points



45 Day Review Period

- DRAFT phase is complete
- TEST phase has begun
  - Download the specs and test yourselves: https://sunspec.org/specifications/
  - DERSec LabTest Plus is first implementation
- Submit written comment here: https://sunspec.org/specification-comment-form/
- Comment period ends September 30, 2024

TEST Phase Work Group Sprint

- Meetings to review comments:
  - **August 21, 2024 @ 10 AM PT**
  - August 28, 2024 @ 10 AM PT
  - September 4, 2024 @ 10 AM PT
  - **September 11, 2024 @ 10 AM PT**
  - September 18, 2024 @10 AM PT
  - **September 25, 2024 @ 10 AM PT**
- Sign up in Member Portal:
  - https://sunspec.org/register/contributing-member/sunspec-device-interface-work-group/

Sign Up for the Work Group

Overview | Courses | Specifications | Work Groups | SunSpec TV | Account Settings

WORK GROUPS

Manage Work Group Subscriptions

Sign Up Here

SUNSPEC CONFORMANCE PROFILE FOR IEEE 2030.5

Learn More

Sign Up To Join

IEEE 2030.5 / SAE J3072 EV CHARGING PROFILE

Learn More

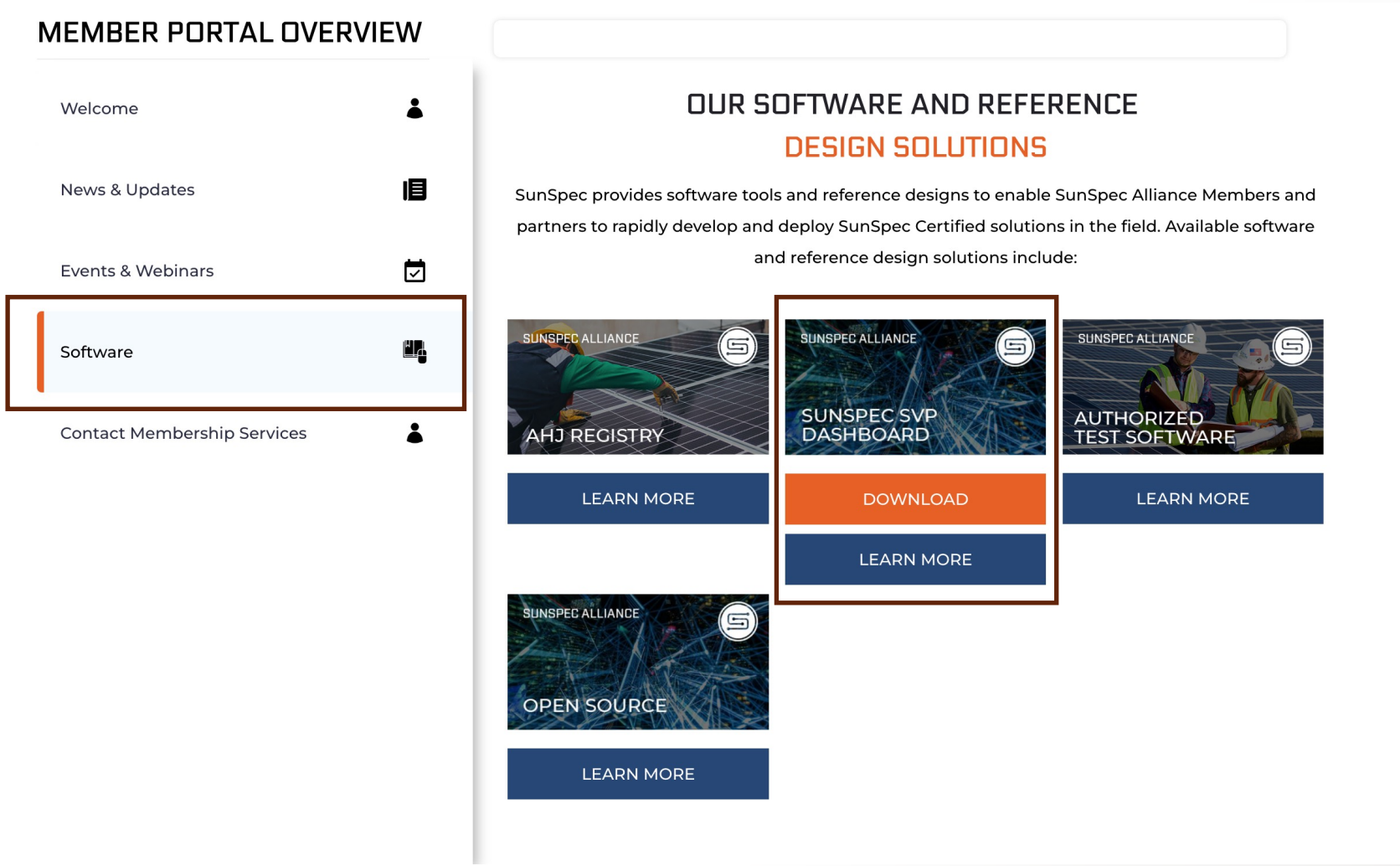
Sign Up To Join

SUNSPEC MODBUS (DEVICE INTERFACE)

Learn More

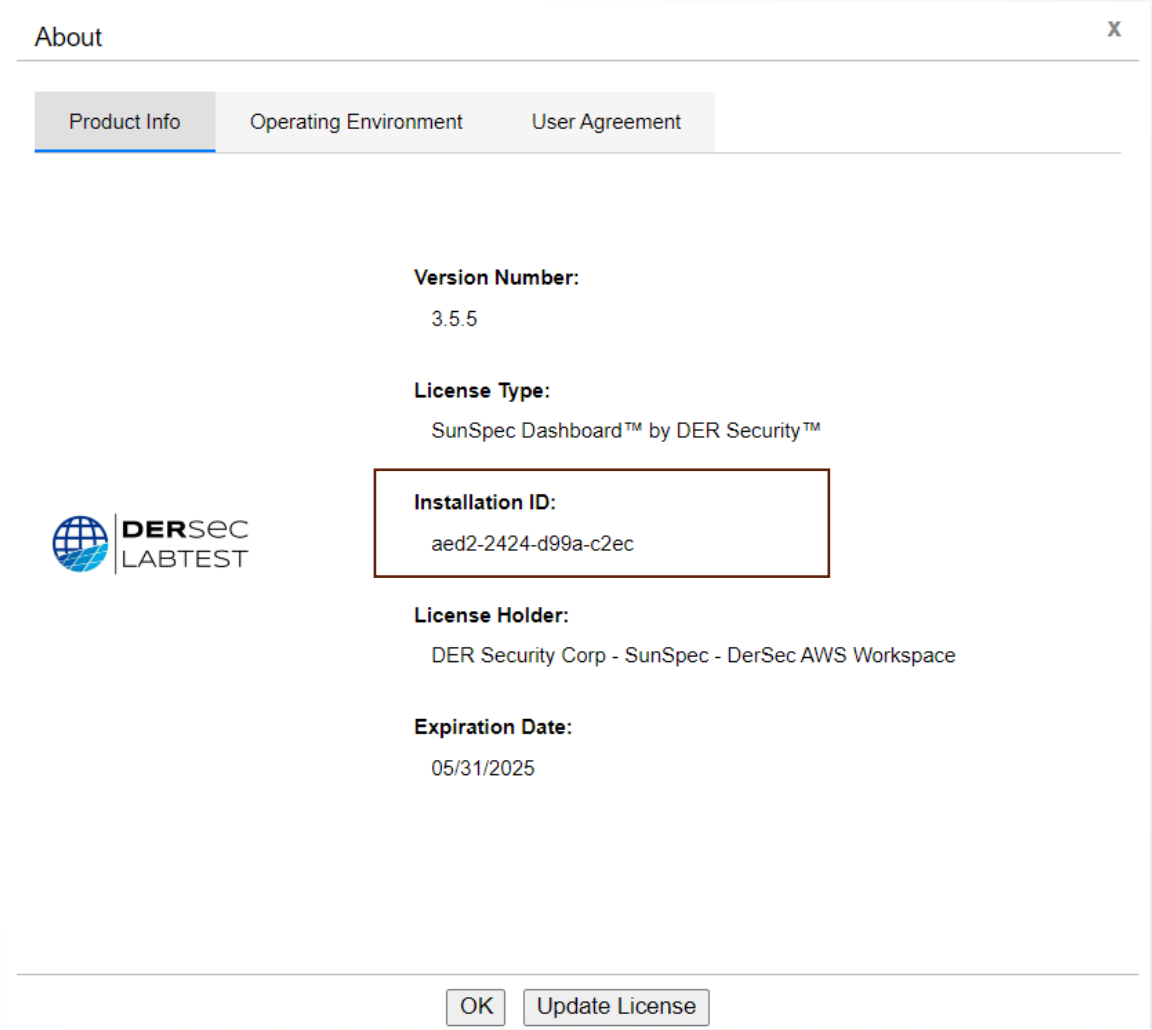
Sign Up To Join

SunSpec Dashboard



Complimentary DERSec Lab Test Plus License

- **Free 45-day trial** license to assist in testing process
- Download Labtest
- Acquire license from DERSec at support@dersec.io
- Learn more: DERSec Lab Test



Q & A

Kudrat Kaur
Software Engineer

Dylan Tansy
Executive Director

Make Plans For The SunSpec Annual Meeting

- December 3-5 at the Grande Colonial Hotel in La Jolla, CA
- Unique opportunity to network with other industry leaders!
- Early bird pricing ($695) until August 31

[Click here to register now!]