



VeraSolSM

VeraSol Solar Home System Kit Testing Policy: Outdoor-rated cables

Version 2.1

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Background

The applicable standards¹ for Solar Home System Kits include a requirement that “Any outdoor cables must be outdoor-rated and UV-resistant.” This requirement goes beyond the applicable standards¹ for pico-products (off-grid products with peak power ratings of 10 W or less) and is based on the assumption that larger solar home system kits are expected to last for a longer period (10-20 years). Outdoor cables are defined as any cables intended to be used outdoors, such as the cable to the PV module or cables connecting components that are installed outdoors.

Note: This policy does not apply to products with power ratings of 10 W or less.

Policy

VeraSol assesses whether a cable is suited for outdoor use based on manufacturer declarations and documentation provided by the manufacturer. VeraSol also reserves the right to use the Market Check Method Test to verify compliance with this policy.

As part of the testing process, manufacturers are required to sign a declaration form that includes the following statement:

- All cables intended to be used outdoors, such as cables connecting the PV module, are appropriately protected against UV radiation and water ingress.

Manufacturers are also required to provide supporting documentation. Approved documentation includes one or more of the following:

- Certifications indicating that the cable meets relevant PV cable standards, such as UL 4703, UL 854, IEC 62930, EN 50618 or similar standards
- Certifications indicating that cables have been evaluated for outdoor use and are resistant to damage from sunlight and water exposure, such as UL746C (f1).
 - The cable is UL listed, and the listing indicates that the cable is suitable for use outdoors.

¹ VeraSol began referencing *IEC TS 62257-9-8: Integrated systems – Requirements for stand-alone renewable energy products with power ratings less than or equal to 350 W* in place of the Lighting Global Quality Standards in 2020.

See <https://verasol.org/updates/transition-to-iec-ts-62257-9-8> for detailed transition information. See the [Change Log for Quality Standards](#) for details on new requirements and the differences between the Standards.

- Other listings that indicate the cable is suitable for use outdoors.
- Laboratory test results indicating that the cable jacket material is resistant to damage from sunlight and water exposure
 - For sunlight resistance: UL 44:2018, 5.15.2; ISO 4892; ASTM G154-06; the sunlight resistance test of UL 1581; the weather (sunlight) resistance test of UL 2556; HD 605/A1; or an equivalent test method.
 - For water resistance: some form of wet/damp heat testing, such as that described in IEC 60068-2-78, UL 493, ISO 4892, ASTM G154-06 or similar
- Cable specification sheets confirming that the cable jacket material is one of the pre-approved cable jacket material formulations described below.

VeraSol will determine if the documentation provided by the manufacturer is sufficient to establish approval for a specific cable jacket. Market check testing of cable compliance may be used to verify manufacturer claims at the discretion of VeraSol.

Pre-approved cable jacket materials

The cable jacket is the outermost layer of material of an insulated wire or multi-conductor cable. The jacket may be separate from individual wire insulations, or it may serve as both the insulation and the outer jacket. The jacket is exposed to sunlight and water when the cable is used outdoors.

Some outdoor cable jacket materials are pre-approved by VeraSol for use in renewable energy products. When properly manufactured, these cable jacket materials are expected to resist damage from UV and water exposure for an acceptable period of service. The product manufacturer is still responsible, however, for ensuring that the cable will have the necessary performance characteristics for their product.

The renewable energy product manufacturer is responsible for providing VeraSol with documentation showing the material composition of the cable jacket. This documentation can include material specification sheets from the cable manufacturer, polymer masterbatch information, and/or information detailing the manufacture of the cable jacket. VeraSol will work with the product manufacturer to determine what materials are necessary to establish that a cable jacket is made from a pre-approved material. VeraSol will hold all submitted documentation confidential.

VeraSol recognizes that many jacket materials may be appropriate for use with outdoor renewable energy products. Product manufacturers may submit a jacket material that is not on the pre-approved list for consideration of inclusion. If the jacket material is determined to be acceptable, that material will be added to the list.

List of pre-approved cable jacket materials and polymer additives. For purposes of this designation, "cable jacket" refers to the outermost layer of material that covers a cable.

Thermoplastic materials

1. PVC with >2.5% by weight carbon black additive.
2. Polyethylene with >2.5% by weight carbon black additive.
3. PVC or Polyethylene with an approved UV-resistant polymer additive.
4. PVC or Polyethylene with laboratory test results indicating that the cable jacket material is resistant to damage from sunlight

Thermoset (cross-linked) materials

1. Styrene-butadiene rubber (SBR)
2. Silicone rubber
3. Ethylene propylene diene monomer (EPDM) rubber

Thermoplastic elastomers (TPE)

1. Thermoplastic elastomers (also called thermoplastic rubbers (TPR))
[contact Lighting Global for additional information on determining if a specific thermoplastic elastomer qualifies as pre-approved.]

Approved UV-resistant polymer additives

1. Additives for polymers, such as octabenzene, are formulated to protect the jacket material from damage due to sunlight exposure. These additives should be used according to the manufacturer's directions. These additives meet the requirement for sunlight exposure, but resistance to damage from water exposure shall be addressed using another measure.
 - a. CYASORB UV-531 is an approved UV Light Absorber additive.
 - b. PVC1018 (f1)
 - c. UV-234

Product manufacturers may submit a jacket material that is not on the preapproved list for consideration of inclusion. If the jacket material is determined to be acceptable, that material will be added to the list. Manufacturer submission of an additional jacket material must supply the following information:

- A detailed description of the material, including master batch material compositions and additives. Percentage compositions should be listed.
- Information supporting a listing as UV resistant and/or outdoor rated. This information can include technical test data, academic research, industry white papers, or other specific technical information describing the outdoor durability of a polymer jacket material. A manufacturer statement of UV resistance/outdoor durability will not be sufficient to list a material as pre-approved.
- VeraSol will assess a manufacturer's submission and may require additional detail before a decision to grant pre-approval is made. VeraSol may or may not approve a submission at its sole discretion.

Market Check Method (MCM) Testing

VeraSol reserves the right to perform MCM testing on outdoor cables that have previously met this standard. This testing may include any procedure, or an equivalent procedure mentioned above.

About VeraSol

An evolution of Lighting Global Quality Assurance, the VeraSol program supports high-performing, durable off-grid products that expand access to modern energy services. VeraSol builds upon the strong foundation for quality assurance laid by the World Bank Group and expands its services to encompass off-grid appliances, productive use equipment, and component-based solar home systems. Like Lighting Global Quality Assurance, the VeraSol program is managed by CLASP in collaboration with the Schatz Energy Research Center at Humboldt State University. Foundational support is provided by the World Bank Group's Lighting Global program, UK aid, IKEA Foundation, Good Energies Foundation, and others.

Please visit VeraSol.org for more information.