Change Log for Quality Standards

Last updated: September 2020

This document presents a list of all the changes made to the Quality Standards over time. Table 1 describes the changes made to the standards for pico-PV products (products with a peak PV power of 10 W or less). Table 2 describes the changes made to the standards for solar home system (SHS) kits (products with PV power up to 350 W).

The VeraSol program plans to reference *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 for products that begin testing after 1 January 2021. The document would thus replace both the Pico-PV Quality Standards (Version 8.0) and the Solar Home System Kit Quality Standards (Version 2.5). The tables below also include a list of differences between the latest versions of the Lighting Global Quality Standards and IEC TS 62257-9-8 to enable companies to prepare to meet the new requirements for both newly tested products and products undergoing renewal testing.

Note that all efforts have been made to record any substantive change to the standards, but the lists below may not be exhaustive. Those using the standards are encouraged to carefully review the most up-to-date version of the standards to ensure they are aware of the current requirements.

The most recent quality standards and a summary of the requirements in IEC TS 62257-9-8 are available for download here: https://verasol.org/solutions/quality-standards

IEC TS 62257-9-8:2020 is available for purchase here:
https://webstore.iec.ch/publication/62431

If you have questions regarding any of the changes listed below, please contact the VeraSol team at testing@verasol.org.

Table 1. Change Log for Pico-PV Quality Standards

The current pico-PV standards and several previous versions are available at:
https://verasol.org/publications/pico-pv-quality-standards-en-ch-fr

Standards Version	Date Issued	Change
IEC TS 62257-9-8	Published June 2020; will be required January 2021	In IEC TS 62257-9-8, the Quality Standards for both pico-PV and SHS kits are combined into a single document.
		Information that has historically be referenced from Lighting Global policies, such as procedures regarding renewal testing, market check testing, accelerated verification testing, and testing of similar products, families of products, pay-as-you-go (PAYG) products, and co-branded products is included in IEC TS 62257-9-8. Additionally, details regarding the performance reporting requirements, requirements for AC/DC chargers, water protection requirements,

		and requirements for outdoor cables that were maintained in separate policies are also now incorporated in IEC TS 62257-9-8. For reference, the current versions of these policies are available here: https://verasol.org/solutions/certification
		Additional clarity is included regarding the interpretation of results from the assessment of DC ports, appliance voltage range, and output overload protection tests. All aspects for ports are assessed for individual samples, rather than the average of tested samples. Additionally, guidance is provided for determining which products and components are subject to the drop test (dependent on their weight, expected use, and relevant advertisements).
		All PV modules not tested to IEC 61730 shall undergo additional safety testing, including: • Increased visual screening testing • Durability of markings (not required for integrated PV modules) • Sharp edge test (not required for integrated PV modules) • Screw connection test (for non-plug-and-play products only) • An impact test (not required for integrated PV modules already subject to drop test) • A bending and folding test (if the module is intended to be bent or folded during use)

		Lithium batteries shall meet the requirements of a standard for safety during use. Test reports shall cover both the individual cell and the fully assembled battery pack.
		• batteries used in portable applications (i.e. easily hand-carried devices), shall meet either IEC 62133-2, UL 62133, or the combination of UL 1642 and UL 2054
		• batteries used in stationary applications shall either:
		  ○ meet the requirements for portable batteries above, or
		  ○ meet the United Nations Recommendations on the transport of dangerous goods: manual of tests and criteria (UN 38.3) and either IEC 62619 or UL 1973.
		• Batteries used in a component with a mass greater than 18 kg shall meet the requirements of IEC 62619 or UL 1973.

		New performance reporting requirements including the following metrics:
		• Components included or packaged separately from the kit must present the following information on the packaging or user manual:
		  ○ Batteries: chemistry, battery capacity in mAh or Ah and nominal voltage (battery capacity and voltage must also be provided on the battery)
		  ○ Auxiliary lighting appliance with battery: light output (or brightness) in lumens and the full battery run time for the brightest setting
		  ○ Lighting appliance without battery: lumen output (or brightness) in lumens
		  ○ Appliances without batteries: power in watts and nominal voltage
		  ○ Appliances with batteries: power in watts and battery capacity in mAh or Ah and nominal voltage (battery capacity and voltage must also be provided on the battery)

		• PV modules not integrated into a product must have the following markings on the module: name, model number designation, serial number, date and place of manufacture (alternatively, serial number allowing traceability of the date and place of manufacture), maximum system voltage; voltage at open-circuit or Voc; current at short-circuit or Isc; module maximum power or Pmax.
		All products shall be labeled with the date of manufacture or a serial number assuring traceability of the date of manufacture.
		All ports on appliances shall be required to meet the requirements for charging ports unless they are explicitly advertised on the packaging, user manual, or at the port as "not for charging." Similar language may be accepted.
		The "Wiring and connector safety" requirement is extended to pico-products. Companies will need to sign a declaration stating the following: "All wires, cables and connectors are appropriately sized for the expected current and voltage, and all connectors and wire joints are robust."
		Remote controls that do not include built-in lights or radios and are associated with fixed-indoor components (i.e. TV remotes and remotes to turn on indoor lights) no longer need to meet water ingress requirements even if the remote is portable.
V8	December 2018	Allowed the use of non-plug-and-play connectors for connections made at the time of installation
		Increased lumen maintenance threshold from L85 to L90 at 2000 hours
		Added additional requirements for lithium batteries. Lithium batteries must carry UN 38.3 certification and have overcharge protection for individual cells or sets of parallel-connected cells. Note that this change will require that product manufacturers provide additional documentation to verify that their multi-cell lithium batteries have individual cell protection.
		Added requirements for circuit and overload protection for products with output ports. The system must pass an overcurrent and an overload protection test. Products must include a current limiting mechanism to prevent irreversible damage to the system. The mechanism must be easily resettable or replaceable by the user, or must automatically reset. If replaceable fuses are used for circuit protection, sizes must be labeled on the device and listed in the user manual, and, if fuses are replaceable by the user, at least one spare fuse must be included with the product. Included appliances are not required to meet this standard.
		Added requirement for protection from miswiring. The user interface should be designed to minimize the likelihood of making improper connections. If improper or reversed connections can easily be made, they should cause no damage to the system or harm to the user.
		Added requirement for PV overvoltage protection for products with output ports. If the battery is disconnected or isolated, the system must not be damaged and PV open-circuit voltage must not be present on load terminals.
		Added requirements for products that include output ports. Port voltage and current specifications, if provided, must be accurate. Included appliances must function when connected to output ports. Power output of ports must be sufficient to power appliances that

		are advertised but not included. 12 V and 5 V ports must meet additional specific requirements.
		Clarified that products and all advertised features must be functional
		Added an exception to the PAYG battery protection requirement to allow products with lithium batteries and adequate protective measures to cut off solar charging during periods of non-payment.
		Removed the pathway for a product to meet "permanent outdoor exposure" for water protection by having IPx3 + circuit protection. The only option to meet "permanent outdoor exposure" is to meet IPx5.
V7.1	September 2017	Clarified water ingress options
		Removed eligibility requirements based on past product performance for using the LM80 test method for lumen maintenance and clarified information about the lumen maintenance options.
V7.0	May 2017	Assigned an IP level to common advertising terms for physical and water ingress protection. This helped to ensure that claims related to physical and water ingress protection are evaluated consistently.
		Clarified that when evaluating truth in advertising, if a range is provided, the best rating must be within the 15% tolerance.
		Clarified that when evaluating truth in advertising, if a run time is advertised, it is assumed to be for solar run time and for the highest setting, e.g., brightest, unless otherwise stated.
		Required 6 out of 6 samples to pass durability tests (previously 5 out of 6)
		Clarified passing threshold for visual screening
		Clarified that the passing threshold for MCM/AR 500 hour lumen maintenance test is 95%
		Added that passing threshold for 500 hour LM-80 test is 85%
V6	May 2016	Included a statement that durability standards could be waived for appliances if provided with IEC 60065 or IEC 60335 report
		Included statement that standards are extended to PAYG elements
		Added additional certifications that could be used for AC-DC chargers
		Presented a new option based on LM-80 data for meeting the lumen maintenance standard: If the most recent product submitted by a company met the lumen maintenance standard because all 6 samples maintained ≥ 95% of initial light output at 1,000 hours, the company is eligible to use a new expedited method. The expedited method includes a 500-hour lumen maintenance test and single point temperature measurements of the LED array. The temperature measurements are compared to IESNA LM80-08 data from the LED manufacturer to determine the lumen maintenance at 2000 hours.
		Added modified drop test for appliances where they are dropped 2 times instead of 6
		Clarified that which elements must be reported as part of the performance reporting requirements
		Clarified that IP requirements are only for components that included electrical/electronic connections
		Clarified that only included appliances with light output greater than 15 lm were required to meet battery durability (or be tested for light output, lumen maintenance, and light distribution)
		Provided information regarding which standards apply to auxiliary

		appliances, such as radios, torches and fans that are included with the main product.
		Added that for PAYG systems, appropriate battery protection must remain active regardless of whether the system is in an enabled or disabled state. To avoid damage to a battery during long-term periods of non-payment disabled system status, the solar module must be able to charge the battery even if the product is in a disabled state.
V5	March 2015	Required performance reporting of light output, run time and mobile charging
V4.4	January 2015	Clarified that lumen maintenance thresholds were evaluated as: "Average relative light output ≥ 85% of initial light output at 2,000 hours, with only one sample allowed to fall below 75% OR All 6 samples maintain ≥ 95% of initial light output at 1,000 hours"
V4.3	September 2014	Increased OVP limit for NiMH batteries from 1.4 to 1.45 V/cell
		Changed the battery durability passing threshold from "all samples must be lower than 20%" to "the average must be lower than 25% with only 1 sample below 35%"
V4.2	June 2014	Clarified OVP and LVD thresholds
		Added statement that if a product fails for any aspect at any point during testing, it can count as a failure for that aspect
		Removed drop test requirement for fixed indoor products
		Included statement that PV cables must be at least 3 m to be considered "portable separate"
V4.1	February 2014	Added IP requirements for PV modules
		Extended time period for requiring the performance reporting requirements
V4	January 2014	No longer allowed Cadmium batteries
		Introduced battery durability test (Not fully implemented in testing until April 2014)
		Announced performance reporting requirements, but did not require them until March 2015
		Increased warranty requirement from 6 months to 1 year and clarified requirements for how it was presented and what it covered
		Increased lumen maintenance threshold from L70 to L85 at 2000 hours
V3.2	July 2013	Transferred standards from Lighting Africa to Lighting Global. Removed performance targets (this did not affect pass/fail status, just whether products could get access to certain programs). Also, changed the name of performance targets to "eligibility criteria for accessing consumer awareness campaigns" and simultaneously increased performance targets for light output and light distribution.
V3.1	August 2012	No substantive changes - changed "autonomous run time" to "full-battery run time"
V3	March 2012	Added requirements for batteries to be protected by a charge controller
		Reduced water and physical ingress protection requirements for "fixed indoor" products (IP41->IP20)
		Allowed labeling and conformal coating options for water protection
		Added gooseneck and strain relief tests
		Changed solar run time (SRT) calculation
		Introduced 1000-hour short cut for lumen maintenance

		Separated Quality Standards and Performance Targets. To be listed on the website, products no longer had to meet minimum light output and run time requirements; however, products would need to meet these requirements to access consumer information campaigns and other targeted services.
V1	2010	These included performance targets (minimum run times and light output) as part of the standards.

Table 2. Change Log for SHS Kit Quality Standards

The current SHS kit standards and several previous versions are available at: https://verasol.org/publications/shs-kits-quality-standards

Standards Version	Date Issued	Change
IEC TS 62257-9-8	Published June 2020; will be required January 2021	In IEC TS 62257-9-8, the Quality Standards for both pico-PV and SHS kits are combined into a single document.
		Information that has historically be referenced from Lighting Global policies, such as procedures regarding renewal testing, market check testing, accelerated verification testing, and testing of similar products, families of products, pay-as-you-go (PAYG) products, and co-branded products is included in IEC TS 62257-9-8. Additionally, details regarding the performance reporting requirements, requirements for AC/DC chargers, water protection requirements, and requirements for outdoor cables that were maintained in separate policies are also now incorporated in IEC TS 62257-9-8. For reference, the current versions of these policies are available here: https://verasol.org/solutions/certification
		Additional clarity is included regarding the interpretation of results from the assessment of DC ports, appliance voltage range, and output overload protection tests. All aspects for ports are assessed for individual samples, rather than the average of tested samples. Additionally, guidance is provided for determining which products and components are subject to the drop test (dependent on their weight, expected use, and relevant advertisements).
		Additional requirements are included for systems with large PV modules (modules with any of the following characteristics: maximum power greater than 240 W, open-circuit voltage greater than 35 V, or short-circuit current greater than 8 A). These large PV modules shall meet IEC 61730 and charge controllers associated with these modules shall meet IEC 62109.
		All PV modules greater than 10 W_p, but not tested to IEC 61730 shall pass a modified version of the hot-spot endurance test from IEC 61730.
		All PV modules not tested to IEC 61730 shall undergo additional safety testing, including: • Increased visual screening testing • Durability of markings (not required for integrated PV modules) • Sharp edge test (not required for integrated PV modules) • Screw connection test (for non-plug-and-play products only) • An impact test (not required for integrated PV modules already subject to drop test) • A bending and folding test (if the module is intended to be bent or folded during use)

		Lithium batteries shall meet the requirements of a standard for safety during use. Test reports shall cover both the individual cell and the fully assembled battery pack.
		• batteries used in portable applications (i.e. easily hand-carried devices), shall meet either IEC 62133-2, UL 62133, or the combination of UL 1642 and UL 2054
		• batteries used in stationary applications shall either:
		  ○ meet the requirements for portable batteries above, or
		  ○ meet the United Nations Recommendations on the transport of dangerous goods: manual of tests and criteria (UN 38.3) and either IEC 62619 or UL 1973.
		• Batteries used in a component with a mass greater than 18 kg shall meet the requirements of IEC 62619 or UL 1973.

		New performance reporting requirements including the following metrics:
		• SHS kits must report at least one solar run time profile for all the light points on high and any other included appliances.
		• Components included or packaged separately from the kit must present the following information on the packaging or user manual:
		  ○ Batteries: chemistry, battery capacity in mAh or Ah and nominal voltage (battery capacity and voltage must also be provided on the battery)
		  ○ Auxiliary lighting appliance with battery: light output (or brightness) in lumens and the full battery run time for the brightest setting
		  ○ Lighting appliance without battery: lumen output (or brightness) in lumens
		  ○ Appliances without batteries: power in watts and nominal voltage
		  ○ Appliances with batteries: power in watts and battery capacity in mAh or Ah and nominal voltage (battery capacity and voltage must also be provided on the battery)
		PV modules not integrated into a product must have the following markings on the module: name, model number designation, serial number, date and place of manufacture (alternatively, serial number allowing traceability of the date and place of manufacture), maximum system voltage; voltage at open-circuit or Voc; current at short-circuit or Isc; module maximum power or Pmax.

		All products shall be labeled with the date of manufacture or a serial number assuring traceability of the date of manufacture.
		All ports on appliances shall be required to meet the requirements for charging ports unless they are explicitly advertised on the packaging, user manual, or at the port as "not for charging." Similar language may be accepted.
		Remote controls that do not include built-in lights or radios and are associated with fixed-indoor components (i.e. TV remotes and remotes to turn on indoor lights) no longer need to meet water ingress requirements even if the remote is portable.
V2.5	December 2018	Added clarification that the voltage of 12 V ports cannot exceed 15 V under any circumstances
		Adjusted the requirement for overcurrent protection for solar modules of non-plug-and-play systems to better align with existing practice in solar installations

		Changed the requirement regarding the battery warranty to say, "The battery warranty is assumed to include a capacity retention figure of at least 80% at two years, benchmarked to the rated battery capacity."
		Required ports of included appliances to meet the ports standard, but clarified that ports which are intended for a function other than providing power (e.g., data ports) are not required to meet the ports standard.
		Added an exception to the PAYG battery protection requirement to allow products with lithium batteries and adequate protective measures to cut off solar charging during periods of non-payment.
		Removed the pathway for a product to meet "permanent outdoor exposure" for water protection by having IPx3 + circuit protection. The only option to meet "permanent outdoor exposure" is to meet IPx5.
V2.4	September 2018	Clarified that if a product offers pay-as-you-go (PAYG) functionality, the company must provide the user with written instructions on operating the PAYG system.
		Revised the wording of the ports requirements for added clarity. Added a description of how to determine if a port should be considered a 12 V port, removed the requirement to label ports if they drop below 10.5 V, and added an option for a second USB port to provide a higher voltage, up to 6 V. These are all changes designed to address issues we have identified during testing.
		Changed the statement about capacity retention for the battery warranty to: "The battery warranty is assumed to include a capacity retention figure of at least 80% at two years, benchmarked to the advertised battery capacity and/or the battery capacity presented in the Lighting Global test report, whichever is higher."
		Clarified that some reporting requirements may be included on a user agreement in cases where companies exclusively install products and do not have consumer-facing packaging.
		Increased the voltage threshold for the PV Overvoltage Protection test for USB ports to 6 V based on additional research and manufacturer feedback.
		Added options for meeting the safety requirement for lithium-based batteries. Companies must provide proof that batteries meet any one of the following standards: IEC 62281, IEC 62133-2, UL 1642 or UN 38.3.
		Stated that the test methods for SHS kits are now included in IEC/TS 62257-9-5
		Changed the suggested threshold between pico-PV and SHS kits to 10 W to match our current practices. Now that all products are tested to IEC/TS 62257-9-5, we have decided to phase out the 11-15 W window in which a product could be tested as either a pico-PV or SHS kit. If products between 11-15 W need to be evaluated as pico-PV products to meet an outside requirement, an additional two samples may be evaluated during testing.
		Allowed the use of non-plug-and-play connectors for connections made at the time of installation
V2.3	February 2018	Removed the dynamic port requirements (undershoot and overshoot voltages) for USB ports
V2.2	September 2017	Added detail to ports requirements based on experiences from product testing

		Provided more clarity regarding the user manual and component specifications requirements
		Changed the upper voltage limit to 35 V
V2.1	May 2017	Added clarification regarding the user manual requirements and the consumer information requirements
		Removed eligibility requirements based on past product performance for using the LM80 test method for lumen maintenance and clarified information about the lumen maintenance options.
		Clarified the ports requirements
		Assigned an IP level to common advertising terms for physical and water ingress protection. This helped to ensure that claims related to physical and water ingress protection are evaluated consistently.
		Added clause to allow results from Global LEAP testing to be used in place of performance measurements for appliances
		Only required the light distribution to be measured for 2 samples to assess the full-width-half-max (FWHM) angle
		Clarified that when evaluating truth in advertising, if a run time is advertised, it is assumed to be for solar run time and for the highest setting, e.g., brightest, unless otherwise stated.
		Added clause to allow for certain standards to be altered for products designed for productive uses
		Clarified the soldering and electronics quality requirement
		Allowed PV modules to meet the physical IP requirement by meeting IP3x or IP2X+circuit protection
V2.0	February 2017	Clarified that when evaluating truth in advertising, if a range is provided, the best rating must be within the 15% tolerance.
		Reduced the system warranty to two years for the main system, including the PV module, control box, cables, lights, and battery. Lighting appliances with their own battery and non-lighting appliances are only required to carry a one-year warranty. USB charging cables and similar accessories are only required to carry a one-year warranty as well.
		Changed the upper eligibility limit to 350 W
V1.1	May 2016	Clarified voltage requirements for 12 V ports
		Presented a new option for meeting the lumen maintenance standard: If the most recent product submitted by a company met the lumen maintenance standard because all 6 samples maintained ≥ 95% of initial light output at 1,000 hours, the company is eligible to use a new expedited method. The expedited method includes a 500-hour lumen maintenance test and single point temperature measurements of the LED array. The temperature measurements are compared to IESNA LM80-08 data from the LED manufacturer to determine the lumen maintenance at 2000 hours. The test is described in T.6 of the Lighting Global Solar Home System Kit Quality Assurance Protocols and will be outlined in Annex J of an upcoming revision to IEC/TS 62257-9-5.
		Clarified that most appliances are not subject to a battery durability test, but lighting appliances are subject to the test.
		Clarified which appliance tests may be waived if a product has an IEC 60065 or 60335 certificate
		Added details to the requirement for appropriately sizing wires
		Increased threshold for appliances to be subject to the lighting tests from 10 lumens to 15 lumens

V1	December 2015	Announced requirements for outdoor cables (but requirements were not enforced until March 2017)
		Added a clause to say that "At the discretion of Lighting Global, some quality and durability requirements may be waived for non-lighting appliances that can be proven to meet other relevant standards."
Draft 4	November 2015	Clarified ports requirements
		Added a capacity retention figure to the minimum warranty requirements
		Added modified drop test for appliances where they are dropped 2 times instead of
		Removed the requirement that batteries be field replaceable and replaced it with consumer information requirements
		Provided information regarding which standards apply to auxiliary appliances, such as radios, torches and fans that are included with the main product. Set a limit of 10 lumens for an appliance to qualify as a lighting appliance and be subject to lighting tests.
		Added that for PAYG systems, appropriate battery protection must remain active regardless of whether the system is in an enabled or disabled state. To avoid damage to a battery during long-term periods of non-payment disabled system status, the solar module must be able to charge the battery even if the product is in a disabled state.
		Added that PV power must be reported on the packaging as a performance reporting requirement
		Extended standards to cover PAYG products
		Reduced the allowable voltage limit to 24 V nominal
		Clarified that products must be sold or installed as a kit, but did not necessarily need to be packaged in a single box
Draft 3	August 2015	Clarified passing thresholds of battery durability test
		Added requirement that lithium-based batteries carry a UN38.3 certificate
		Allowed for tamper-evident enclosures, but continued to prohibit tamper-proof enclosures
		Added requirement that user interfaces must be accurate
		Added requirements for output ports
Draft 2 used for pilot testing	September 2014	Increased minimum allowable overcharge protection voltage for sealed lead acid batteries from 2.25 V to 2.35 V
		Added requirement that batteries be field replaceable
		Added clarification regarding the hazardous substances ban
		Added requirement that wires be appropriately sized
		Removed allowance for products with voltage outputs higher than 50 V and allowance for products larger than 100 W
		Clarified requirements for overcurrent protection
Draft 1 for initial comment	July 2014	This version was not applied to any products, but had been circulated for initial stakeholder review