



VeraSol

Seeking Stakeholder Feedback: Proposed changes to test methods and standards for off-grid solar energy kits in IEC TS 62257-9-5 and IEC TS 62257-9-8

January 2023

The VeraSol team is preparing a list of proposed changes to the test methods and standards for off-grid solar energy kits, including pico-PV products and solar home system kits up to 350 Wp. We anticipate submitting the proposed changes to the International Electrotechnical Commission (IEC) for review in early 2023 and are reaching out to collect your feedback in advance of this submission.

The proposed changes are intended to:

- **Better delineate the purpose of each document** by moving all test methods into IEC TS 62257-9-5 while ensuring all requirements, standards, and passing thresholds are described in IEC TS 62257-9-8
- **Simplify the test methods and standards** to reduce testing time, lower testing costs, and make the certification process more straightforward
- **Update the documents to reflect recent changes in the market** and address issues identified in the past several years of testing

To provide feedback, please review the list of changes proposed in this document and then visit <https://www.surveymonkey.com/r/SolarKitStandards2023> to submit your comments. Please submit comments by **28 February 2023**. We value your feedback, and the insights we receive will help ensure that the updated documents identify quality products, protect the end user, and best meet the needs of all sector stakeholders. Please note that the IEC review process may result in further changes after the document has been submitted to the IEC.

To assist with reviewing changes, the existing documents can be viewed by purchasing from the IEC at the following links: [English version of IEC TS 62257-9-5](#) and [English/French version of IEC TS 62257-9-8](#). You can view a [summary of the requirements in IEC TS 62257-9-8](#) on the VeraSol website. These documents are also available in Chinese and can be purchased at the following links: [Chinese version of IEC TS 62257-9-5](#) and [Chinese version of IEC TS 62257-9-8](#). Free printed versions of the Chinese-translated standards may be available for qualifying companies in China. If interested, you may request a printed copy of the Chinese version of the test methods and standards via [this form](#).

PROPOSED CHANGES TO TEST METHODS AND STANDARDS

The changes we propose to the test methods and standards are detailed in the tables below. We are proposing two key structural changes:

1. Reduce the sample size from $n=6$ (pico-PV products) or $n=4$ (SHS kits) to $n=2$ for QTM testing of all products, retaining the existing sample size ($n=2$) for renewal and market check tests.
2. Reduce the truth-in-advertising tolerance from 15% to 10%.

These changes should reduce the cost of testing without compromising the accuracy of the results. The primary rationale for both changes is that upon review of test data from the past eight years, we have seen a substantial reduction in the variability of test results within sample sets of a given product. This change is likely the result of improvements in manufacturing tolerances for products, though advances in test methods and testing implementation may also play a role. Supporting data illustrating this trend are summarised in Appendix 1 of this document.

The reductions in sample size and allowable advertising tolerance are the main changes that we expect to impact most stakeholders significantly. However, there are approximately 20 additional changes on which we are requesting feedback. These changes are presented in three tables below:

- Table 1 lists the principal changes on which we are requesting feedback.
- Table 2 lists requests for additional information or data for proposed changes where we need more information to fully define the change or assess its impacts. We would welcome any additional data or suggestions.
- Table 3 lists additional changes for which we request feedback and expect to have more limited impacts than those listed in Table 1.

In addition, Table 4 lists changes we would like to inform stakeholders about but are not specifically seeking input. Comments on these additional changes are welcome.

As noted above, to provide feedback, please review the list of changes proposed in this document and then visit <https://www.surveymonkey.com/r/SolarKitStandards2023> to submit your comments. Thank you for your insights and time.

Table 1. Principal proposed changes to IEC TS 62257-9-5 and IEC TS 62257-9-8 on which we request feedback.

Note: in the Document column, the entries -9-5 and -9-8 refer to IEC TS 62257-9-5 and IEC TS 62257-9-8, respectively.

Document	Topic	Issue or reason for change	Proposed change	Feedback requested
-9-5	Sample size reduction and harmonization (Clauses 6-9)	The existing QTM (used for initial certification) and MCM (used for market check tests and renewals) have different sample sizes, which adds complexity to the certification process, especially when some aspects of a product are changed, resulting in a renewal test with multiple sample sizes. In addition, a reduced sample size would decrease the cost of testing.	We propose to change the sample size to 2 for all tests that currently have larger sample sizes (4 or 6). As a result, initial certification (QTM) testing, renewal testing, and market check testing would now have the same sample size. This change would eliminate one of the main differences between initial certification and renewal tests. A statistical analysis justifying this proposed change is given in Appendix 1.	We are interested to know if anyone is concerned about this change or foresees consequences we may not be considering. As described in Appendix 1, we believe this change is justified by the decreased variability in recent test result data.
-9-8	Reduction of truth-in-advertising tolerance (5.2.1, A.2.7)	The truth-in-advertising tolerance used to assess light output, run times and similar metrics is 15%, which is now wider than the expected variability in product performance due to improvements in manufacturing tolerances and testing accuracy.	Given the improvement in variability described in Appendix 1, we are proposing to tighten the tolerance for truth-in-advertising performance evaluation to 10% instead of 15%. This would also better align with other testing programs such as the US EPA's Energy Star program.	Please let us know if you have concerns about this change.
-9-8	Ports functionality and truth-in-advertising requirements (5.3.5, 5.3.6)	The truth-in-advertising tolerance of 5% for port current and power is different from the tolerance for other advertised parameters.	We plan to change the truth-in-advertising tolerance for port current and power to 10% to match the proposed revised tolerance for all other aspects.	Please let us know if you have concerns about this change.
-9-5	Minimum stock requirement for random sampling (Annex E)	Currently, the minimum stock requirement differs based on how many samples are being selected and what type of testing is being conducted. This can be confusing and adds unnecessary complexity.	Change minimum stock requirements to 150 units, regardless of the number of samples selected or the testing type. In other words, 150 units would be required to be available to select samples from for all tests, including QTM tests, renewal tests, and partial re-tests of pico-PV (<10 W) and SHS kits.	We are interested to understand if this requirement will be a burden to meet and/or if this change will still instill confidence that "golden samples" are not being selected for testing.

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-9-5	Lumen maintenance (Annex J)	<p>The lumen maintenance test is time-consuming, and the different variations of the test (500 h, 500 h + IES LM-80, and 2000 h) add complexity to the certification process. While the IES LM-80 procedure was developed to reduce the time and cost of testing, it is not clear that it actually results in a meaningful improvement.</p> <p>Nearly all products now pass the lumen maintenance test; however, we believe it is still important to have a lumen maintenance requirement to detect poorly performing products. Occasional lumen maintenance failures still occur at both the entry and renewal testing stage.</p> <p>Analysis of prior test data showed that the 500 h test alone did not reliably predict whether a product would pass or fail at 2000 h. However, products that maintained greater than 95% of the light output at 1000 h nearly always maintained at least 90% at 2000 h.</p>	<p>We propose to simplify the lumen maintenance test by establishing a single requirement for all tests by changing the requirement to ≥95% of initial light output at 1000 h for all types of tests, eliminating the IES LM-80 option. While this change can increase the test duration for products that would otherwise undergo 500 h tests, we do not expect the overall testing duration to increase significantly. In addition, the change of sample size to 2 should partly offset any decrease in laboratory throughput as a result of the increased duration.</p> <p>For reference, the existing requirements are:</p> <ul style="list-style-type: none"> • For QTM tests (initial certification): <ul style="list-style-type: none"> ○ Average ≥90% of initial light output at 2000 h with no more than one sample less than 85%, or ○ All samples ≥95% of initial light output measured at 500 h <i>and</i> ≥90% estimated at 2000 h based on IES LM-80 data • For renewal tests, MCM primary check tests, and AVM tests: <ul style="list-style-type: none"> ○ Both samples ≥95% of initial light output measured at 500 h ○ If fail, test can be repeated with additional samples for 2000 h 	Please let us know if you have concerns about this change.

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-9-5	Energy service calculations (Annex GG)	<p>The worldwide smartphone penetration rate has increased since the previous revision of IEC TS 62257-9-5, consequently, it is more likely that consumers will expect products that advertise mobile phone charging to be capable of charging a smartphone. For example, according to a report from International Data Corporation (IDC), smartphones accounted for 72% of new mobile phone shipments in Kenya in Q1 2022, while feature phone shipments declined by 31.6% relative to the previous year. A 2021 GSMA report stated that smartphones accounted for about 48% of mobile connections in Sub-Saharan Africa in 2020.</p> <p>In addition, typical smartphone battery capacity has increased since the original publication of IEC TS 62257-9-5; analysis of a representative range of current devices indicates that battery capacities of 15 Wh for smartphones and 30 Wh for tablets are typical.</p>	<p>We will revise the example use profile in the energy service calculations (ESC) to use a smartphone instead of a basic mobile phone. (Manufacturers can still advertise a number of charges for a basic phone, and this will continue to be evaluated as it is now.) The value shown on a product's Spec Sheet will be for a smart phone.</p> <p>In addition, in Table HH.2, we plan to change the values for mobile device battery capacity to reflect current typical values:</p> <ul style="list-style-type: none"> • Smartphone: change 5.7 Wh to 15 Wh • Tablet: change 15 Wh to 30 Wh <p>This change will significantly decrease the number of full charges for a smartphone or tablet reported in the energy service calculations (ESC). The assumed capacity for a basic mobile phone or feature phone would remain 3.7 Wh.</p>	<p>Please let us know if you have concerns about this change. In addition, we would be interested in any data you may have regarding the prevalence of smartphones among off-grid users or typical battery capacities of mobile phones charged by off-grid solar products.</p>

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-9-8	Information and Performance Reporting Requirements (5.2.3)	Some consumer information requirements are inflexible, limiting manufacturers' choices in representing product characteristics.	<p>We propose the following changes to consumer information requirements:</p> <ul style="list-style-type: none"> For pico products (<10 W), allow the light output and solar run time on the packaging to be presented for either the main lighting or the combination of the main lighting and auxiliary lights. The light output could be presented for each light individually, the main lighting as a unit, or all lights in combination, but would need to align with the presented solar run time. For SHS kits, change the solar run time profile requirement to allow any combination of appliances to be advertised, rather than requiring that all appliances in a kit be included in the run time profile. 	We are not fully satisfied with our proposal to change the solar run time profile requirement for solar home system kits, but we have found this requirement very difficult for companies to meet for all products across their product lines, and difficult for us to verify and enforce (especially for product families). We are interested in any suggestions on how to ensure consumers have accurate information about product performance, while also ensuring that the requirement is reasonable to require and enforce.
-9-8	Functionality requirements for 12 V ports (5.3.6.3)	The 12 V port functionality requirements are complicated and can be confusing for manufacturers and for the certification team. The lack of standardization and diversity of 12 V appliances make it difficult to determine a universally applicable functionality requirement for 12 V ports. In addition, it is difficult to communicate port capabilities effectively to end users—for example, general statements that “some appliances may not work correctly” provide little meaningful information to users.	<p>We are considering making one or more of the following changes to the port requirements:</p> <ul style="list-style-type: none"> Add a requirement to state maximum current and nominal voltage or voltage range in the user manual, on the packaging, or on the product. This would give end users more consistent information about port capabilities and simplify the pathways for compliance. Add a requirement that all 12 V ports can provide at least 10.5 V at a nonzero load (e.g., 10% of maximum sustained current) at the typical battery discharge voltage. This would ensure that 12 V ports can power at least some 12 V appliances. (The existing exception for low battery state of charge would remain.) Remove the voltage range requirement (5.3.6.3) for 12 V ports, but retain the truth-in-advertising requirements. If a port is advertised as being able to power an appliance, the voltage will be required to be within the range of 10.5 V to 15 V at the power required for the appliance. (We would need to determine an appropriate requirement if an ability to power appliances is advertised, but the specific appliances are not listed.) 	We welcome any comments on the proposed changes, or any alternative or additional proposals to simplify the port standards and/or improve the way that port performance is communicated to end users.

Table 2. Requests for additional information or data. *This table lists changes we are proposing where we need more information to fully define the change or assess its impacts and would welcome any additional data or suggestions.*

Document	Topic	Issue or reason for change	Proposed change	Feedback requested
-9-5	Level of water protection from technical aspects (V.5.3)	The requirements for water protection from technical aspects such as conformal coatings are very broad and difficult for labs to implement consistently.	We plan to add a detailed step-by-step procedure for assessment of conformal coatings, equivalent to the procedure that VeraSol laboratories currently follow. In addition, we are considering adding a procedure to assess enclosure drainage.	We welcome any feedback regarding this topic, especially suggestions related to standardized procedures for assessing adequate enclosure drainage or other types of water protection not currently described in IEC TS 62257-9-5.
-9-5	Mechanical durability test (Annex W)	Plug strain/bend relief is a common point of failure that is not tested in IEC TS 62257-9-5.	We are not planning to add a cable flexing test to IEC TS 62257-9-5 at this time; however, we are considering adding such a test to a future version, possibly referenced from an existing test procedure such as IEC 60320 or UL 817.	We are interested in feedback on the proposed test procedures. As IEC 60320 and UL 817 are both standards for AC power cords, we are also interested in any suggestions for test procedures specifically suited to the types of cables typically found in off-grid renewable energy products.
-9-5	Switch and connector test (W.4.2)	We have found that switches are a common point of failure in the field despite rarely failing the switch test in IEC TS 62257-9-5.	No changes planned in this revision.	We are interested in suggestions for making the switch and connector tests more rigorous and/or more reflective of real-world operating conditions, for example, by performing the switch test in a dust chamber. These changes would be implemented in a future revision.
-9-8	Battery documentation (5.6.1, 5.6.3)	Since the publication of IEC TS 62257-9-8:2020, we have identified cases in which the authenticity of battery documents provided to VeraSol has been unclear. IEC TS 62257-9-8 does not provide guidance on how to verify that documents are genuine.	We will include additional guidance on validation of battery documents (specification sheets and safety test reports or certificates), including a requirement to confirm the validity of the document with the issuer in cases where there is reason to doubt its validity. This requirement may be met by the test laboratory or by the entity using the document (e.g. VeraSol).	We are interested in any other suggestions for ways to confirm the validity of battery spec sheets, test reports, and certificates.
-9-8	Outdoor cable durability (5.7.7)	We are aware that the outdoor cable requirements are complex and it can be difficult for manufacturers to obtain the required documentation and difficult for VeraSol to assess it.	We are considering changes to simplify the outdoor cable requirements while still ensuring that cables intended for outdoor use are suitable for the application.	We welcome any feedback regarding what aspects of the outdoor cable requirements are difficult to comply with or any suggestions for improvement.

Table 3. Additional requests for comments on proposed changes to IEC TS 62257-9-5 and IEC TS 62257-9-8. *We expect these changes to have more limited or less significant impacts than those listed in Table 1.*

Document	Topic	Issue or reason for change	Proposed change	Feedback requested
-9-5	Visual screening (Annex F)	The visual screening procedure of IEC TS 62257-9-5 is time-consuming for test laboratories and includes items that are not used by VeraSol or other stakeholders.	We plan to simplify the visual screening procedure by removing requirements to measure or record information that is not useful for stakeholders and is not needed for tests, and by allowing laboratories to include photos instead of textual descriptions when the information is apparent from the photos. A full list of proposed visual screening changes is given as Appendix 2 to this document.	We are interested to understand if your use of test reports or specification sheets will be affected by the proposed changes. In addition, though our goal is to simplify the visual screening, we welcome any suggestions of items that should be added.
Both	Light distribution test (IEC TS 62257-9-5, Annex T; IEC TS 62257-9-8, 4.5.1)	The light distribution test is time-consuming for laboratories and appears to provide limited value for most stakeholders.	We are considering removing the light distribution test or making it an optional procedure to be performed only at customer request. If this change is made, the full-width half-maximum (FWHM) angles and polar plots of light distribution would no longer be included in test reports and the distribution type (narrow, wide, omnidirectional) would no longer be included in spec sheets (unless the customer specifically requests the test).	We are interested in feedback regarding the effects of this change. Are these metrics useful to stakeholders?
-9-5	PV overvoltage test (DD.4.3)	Products rarely fail this test, and an analysis of the failures that have occurred determined that most failures are unlikely to damage appliances or result in a hazard to the user.	We propose removing procedure A of the PV overvoltage test (DD.4.3.4). We will retain procedure B, which is only used for products in which the battery can be easily disconnected in normal use, shipping, or installation. Procedure B determines whether appliances plugged into the ports might be damaged by excessive voltage if the battery is disconnected while the PV module is connected. Because most products have batteries that cannot be easily disconnected (procedure A), most products would no longer need to undergo this test.	Please let us know if you have concerns about this change.

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-9-5	Generic appliances (Table HH.1, Table HH.2)	<p>Since the publication of IEC TS 62257-9-5:2018, we have tested several products that advertise the ability to power appliances not listed in these tables describing default values for generic appliances. Default power and battery capacity values are needed so that the run time or number of battery charges for these appliances can be calculated in cases where no power value is advertised, and the appliance has not been tested.</p>	<p>Revise Table HH.1 (default power consumption for advertised appliances) as follows:</p> <ul style="list-style-type: none"> • Change the entry for “television” to 18 W or $(0,0216 \text{ W/in}^2) \times D^2 + 7,51 \text{ W}$, whichever is greater (where D is the screen diagonal in inches) , or 18 W if screen size is unspecified. • Add the following entries: <ul style="list-style-type: none"> ○ Body/facial hair trimmer: 1,4 W ○ Hair clipper: 5 W <p>In Table HH.2 (default battery capacity for advertised appliances), add the following entries:</p> <ul style="list-style-type: none"> • Personal audio player: 3,4 Wh • Digital camera: 4,5 Wh • Body/facial hair trimmer: 3 Wh • Hair clipper: 10 Wh <p>Note: the revised value for televisions is based on data from VeraSol and the US Energy Star program. The other values are based on analysis of a representative range of products available on the market. We considered adding the following appliances, but were unable to find sufficient data, or the range of values identified was too wide to identify a “typical” value:</p> <ul style="list-style-type: none"> • Sewing machines • Bug zappers • Water filtration systems 	<p>Do you have any comments on the proposed values?</p> <p>Are there other appliance categories that should be added to these tables?</p> <p>Are you aware of any source of power consumption or battery capacity data to inform these typical values?</p> <p>Please note: these values are used for advertised appliances in the energy service calculations (ESC). If a specific model of appliance is included with a product or in a product family, the measured value for the specific appliance will continue to be used.</p>

Document	Topic	Issue or reason for change	Proposed change	Feedback requested
-9-8	Information and Performance Reporting Requirements (5.2.3)	The list of required specifications that must be present on consumer-facing materials for products is long and may be burdensome for companies. In some cases, required information does not provide clear benefits to customers.	<p>We propose to remove the requirement for the following to be presented on the packaging or user manual:</p> <ul style="list-style-type: none"> • PV V_{oc} and PV I_{sc} (these would still be required on the PV module label) • Power rating of each light or appliance (measured values would still be presented in the test report and on the VeraSol Spec Sheet) • Nominal operating voltage of each light or appliance • For SHS kits, no longer require PV power to be displayed on the packaging, but instead allow it to be on either the packaging or user manual (or both) <p>We propose to remove the requirement for the following to be presented on the PV label (except for modules larger than 240 W, as these items are required by IEC 61730):</p> <ul style="list-style-type: none"> • Serial number • Date and place of manufacture • Maximum system voltage 	The majority of these changes are relaxing or removing requirements, so we want to hear if the removal of these specifications from the product packaging, user manual, or PV module label will negatively impact any stakeholders.
-9-8	Requirements for systems with large PV modules or arrays (5.5.6)	For products with PV modules greater than 240 W, 8 A, or 35 V, we currently require the main unit to be tested to IEC 62109-1. This requirement is more restrictive than other comparable requirements for charge controllers, such as the requirements for CE Marking in the EU.	<p>We plan to revise the requirements to allow any of the following additional standards, in line with the European Commission Low Voltage Directive and other national requirements:</p> <ul style="list-style-type: none"> • IEC 62109-1, • IEC 60335-1 and IEC 60335-2-29, or • UL 1741 	Are you aware of additional safety standards that would be appropriate for these larger systems?

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-9-8	Battery safety (5.6.3)	We have found that some of the battery safety requirements of IEC TS 62257-9-8 have caused confusion or unintended expenses and delays for manufacturers.	<p>We will make the following clarifications and modifications to the battery safety requirements and charge controller test:</p> <ul style="list-style-type: none"> • Allow single-cell batteries to be tested to IEC 62133-2, IEC 62619, or UL 1642; clarify that cell-level documentation is sufficient and pack-level documentation is not required for single-cell batteries. These single-cell batteries will still undergo the overcharge protection test in IEC TS 62257-9-5. • For products with individual discrete cells installed directly in a battery holder or compartment that is integrated into the product, we will continue to require pack-level testing, which would require the entire component containing the battery compartment to undergo the pack-level safety tests. • Add clarifying language that specifies that "no damage or safety hazard" is a passing requirement for the overcharge protection test in IEC TS 62257-9-5 (to align with other battery test procedures such as IEC 62133-2). • Clarify that multiple batteries that have been tested as batteries (i.e., at the pack level) can be incorporated into a product without further testing if the battery, including any integrated protection circuit, has not been modified from the tested version. • Clarify that UL 1642 is not required for batteries that have been tested to UL 2054, because UL 1642 for cells is already a requirement of UL 2054. 	We welcome any additional suggestions for streamlining the battery safety testing and documentation requirements while still protecting the safety of the end user.
-9-8	Date of manufacture (5.8.2)	Printing date of manufacture on the product or packaging can increase manufacturing costs.	We are considering allowing the date of manufacture to be in the user manual or on a separate document included in the package.	We understand that this change would increase flexibility and could decrease costs for manufacturers, but we are concerned that it could make relabeling of old stock and printing of inaccurate dates easier. We would appreciate any feedback regarding benefits or risks of this decision.

Document	Topic	Issue or reason for change	Proposed change	Feedback requested
-9-8	PV module partial shading (Annex B) and visual screening and durability tests (Annex C)	The PV durability and safety tests specified in -9-8 represent a significant expense and in our experience have rarely or never resulted in failures. Additionally, the durability of markings test is not difficult or expensive, but does require chemicals that can be difficult to obtain in some countries that have active test laboratories.	<p>We propose the following changes to the PV durability and safety tests:</p> <ul style="list-style-type: none"> • Durability of markings: we are interested in stakeholder feedback regarding this test. We are aware that illegible labels are common on PV systems, but uncertain as to whether this failure mode represents a significant problem for end users of pico-solar and SHS kits. • Screw connections: we will clarify that this test applies only to connections made at the time of installation. • Breakage/impact: we propose eliminating this requirement. We have not observed any failures and we feel that the condition detected by the test—large fragments of glass that could cause injury—is not a significant hazard in our application. • Partial shading: we propose requiring this test for PV modules of greater than 100 W. <p>In addition, we will move these test procedures to IEC TS 62257-9-5.</p>	Please let us know if you have concerns about these changes or any suggestions for additional changes to these requirements.

Table 4. Additional proposed changes. *These primarily involve minor adjustments and clarifications. Comments are welcome.*

Document	Topic	Issue or reason for change	Proposed change
-9-5	Reporting requirements for several tests (Clauses J.7, M.9, R.5, S.5, T.6)	The data that test labs are required to report in the test report include several items that do not appear to be useful to stakeholders.	To simplify the test report, we plan to remove the following reporting requirements: <ul style="list-style-type: none"> Lumen maintenance: Full data set for lumen maintenance. The data will still be available upon request. Overall results and graphs will continue to be included in reports. Full-battery run time test and deep discharge protection test: Average deep discharge protection and overcharge protection voltage values and deviation from rating. Since the passing requirements are based on the minimum and maximum values respectively, the average values are not relevant. Solar charge test: Average charging voltage - this voltage is not used for any further calculations or tests. Light distribution test: table of illuminance measurements on grid. The values will still be available on request, if the test is performed.
-9-5	Solar charge test and energy service calculations (Annex R, Annex GG)	The solar charge test underestimates the daytime run time of appliances when the PV module is sized to be able to power appliances in addition to fully charging the battery.	We plan to improve the solar charge test to correctly calculate the available solar energy in products where the PV module can provide more energy than is needed to charge the battery fully. The changes to the procedure are still under development.
-9-5	Battery storage test (Annex BB)	The battery storage test does not include an explicit requirement that batteries are not damaged or unsafe.	We plan to add clarifying language noting that during the battery storage test no swelling, leaking, venting, fire, explosion, or damage can occur. In addition, we will clarify that batteries that cannot be tested after storage due to unsafe conditions will be excluded from the average capacity loss and that such conditions will result in a failure.
-9-5	Assessment of DC ports (Annex EE), full-battery run time test (Annex M)	In some products, the battery continues to discharge after the product has stopped functioning. This results in an incorrect voltage being used to calculate the low-battery voltage in the assessment of DC ports (EE.4.2.6 i)), resulting in an incorrect conclusion that the ports cannot function with a low battery.	We plan to change the definition of the low-battery voltage in the assessment of DC ports (EE.4.2.6 i)) to replace the deep discharge protection voltage (V_{DDP}) with the voltage at which the product is no longer functional, typically the voltage at which the lighting appliances turn off. This ensures that the product is still functional at the low-battery voltage. In addition, we will revise the definition of E_{LVD} in the full-battery run time test to use the same endpoint. This may slightly reduce the daily energy estimate (Wh/day) for some products to better reflect actual usable energy.

Document	Topic	Issue or reason for change	Proposed change
-9-5	Assessment of DC ports – truth-in-advertising assessment (EE.4.5.2 c))	Currently, if it is advertised that a port can power an appliance, it is only required that the port can supply the power required for that appliance; there is no voltage requirement. This could result in a product that meets the truth-in-advertising requirements but cannot actually supply a voltage sufficient to power an advertised appliance.	When a port is advertised as being capable of powering an appliance that is not included, we will require the port to meet the functionality requirements of IEC TS 62257-9-8, 5.3.6, at the power required by the advertised appliance (per IEC TS 62257-9-5, Table HH.1). For example, if it is advertised that a 12 V port can power a 16" television (10 W per Table HH.1), the port shall supply 10.5 V to 15.0 V at an output power of at least 10 W. (Currently, it is required that the port can supply 10 W, but there is no voltage requirement at that output power.) <i>Note: this change applies only to advertised appliances that are not included in a kit. Functionality of included appliances is confirmed during testing.</i>
-9-5	Energy service calculations (Annex GG)	In the definition of the example use profile, it is not clear whether appliances that are advertised but not included with a kit should be used in the example use profile when other appliances of the same type are included. For example, if a product includes a 10 W fan but a 20 W fan is advertised and sold separately, should the 10 W fan and the 20 W fan be included in the example use profile, or just the 10 W fan?	Specify that if there are both included and advertised appliances of a given type, only the included appliances are used in the example use profile. Otherwise, the advertised appliances are used. (In the given example, only the 10 W fan will be used.) <i>Note: the solar run times for the example use profile are shown in the VeraSol Standardized Specification Sheet as "Run time after a typical day of solar charging: Used in combination." The proposed change to the language in the test method is consistent with VeraSol's practice for choosing which appliances to include in the example use profile on the Spec Sheet.</i>
-9-5	Energy service calculations (Annex GG)	The method for calculating the total energy available for a particular run time profile can give inconsistent results for products in which there is a significant time between 70% light output and low-voltage disconnect. The individual run time for the lights on high can be lower than the run time for these same lights when used in combination with a small load (like a mobile phone).	We plan to revise the energy service calculations to address this issue; the specific changes to the procedure have not been developed yet.
-9-8	Reference to other standards (4.2.8)	IEC 60598 defines requirements for luminaires, but IEC TS 62257-9-5 and IEC TS 62257-9-8 do not reference it.	We will revise IEC TS 62257-9-8 to permit the requirements for strain relief and truth in advertising regarding IP code to be met through IEC 60598 testing. We will continue to require random sampling for testing to meet the IP Code requirements of IEC TS 62257-9-8, 5.7.2.

Document	Topic	Issue or reason for change	Proposed change
-9-8	Information and Performance Reporting Requirements (5.2.3)	Some consumer information requirements are inflexible, limiting manufacturers' choices in representing product characteristics.	In addition to the changes listed in Table 1 and Table 3, we propose the following changes to consumer information requirements: <ul style="list-style-type: none"> Allow lithium iron phosphate batteries to be referred to as lithium, lithium-ion, or lithium iron phosphate Allow battery capacity to be expressed as Wh or the combination of Ah and nominal voltage (but no longer require battery nominal voltage to be stated on the packaging or user manual)
-9-8	Ports requirements (5.3)	Ports requirements are complex and often result in conditional passes.	To simplify the assessment of DC ports and follow-up compliance actions, we plan to make several changes: <ul style="list-style-type: none"> Organize the requirements and exceptions in a more logical way Remove the limitation that cigarette lighter sockets are not eligible for the exception to the lower voltage limit for 12 V ports. (This change is intended to simplify the requirements.) Remove the procedure to measure port steady-state performance at the average charging voltage. We are not aware of any manufacturer requesting this optional measurement. Remove the dynamic measurement (EE.4.3). This test is not required by IEC TS 62257-9-8 and we are not aware of any requests to perform it.
-9-8	Requirements for ports not intended for charging or powering appliances (5.3.1, 5.5.3)	The requirements regarding ports not intended for charging or powering appliances have been a source of confusion in the certification process.	We will clarify the requirements for ports to be exempt from the overload protection test and assessment of DC ports: <ul style="list-style-type: none"> Revise the wording of the suggested phrase from "not for charging" to "not for charging or powering appliances." Equivalent phrases would also be accepted at VeraSol's discretion. Clarify that ports other than barrel jacks or USB ports that are not typically used to supply power and are clearly labeled with their intended function do not need to be labeled as "not for charging or powering appliances." Clarify that the requirement does not apply to PV input sockets that are not used to supply power (as these do not meet the definition of "port" in IEC TS 62257-9-5).
-9-8	Health and safety requirements (5.5)	There is no requirement to avoid the use of connectors intended for AC mains power. This could result in someone connecting an input intended for a low voltage (e.g., 12 V DC) to a 120 V/240 V AC supply.	We will add a requirement that no connector typically used for AC mains power (e.g., IEC 60320 appliance couplers) shall be used, with the exception of AC/DC power supplies that comply with the requirements of IEC TS 62257-9-8, 5.5.1. This is to prevent potential damage or hazards if a user connects a low-voltage DC input to the mains power supply.

Document	Topic	Issue or reason for change	Proposed change
-9-8	Physical and water ingress protection (5.7.2)	No requirements are given for connectors intended for outdoor use.	<p>We will revise the requirements for outdoor connectors to match existing VeraSol policy. Any connectors intended for permanent outdoor installation shall be rated at least IP55 (the same as other fixed outdoor components). For connectors, this requirement may be met by a test report from an ISO 17025 accredited test laboratory even if random sampling requirements are not met. Alternatively, the cable may be randomly sampled along with the rest of the product and tested to IP55 by a laboratory in the VeraSol network that is accredited for this testing.</p> <p>(In the past, VeraSol has accepted cable specification sheets as evidence of IP55; spec sheets will no longer be accepted.)</p>
-9-8	Bending or folding test for PV modules (C.6)	This test is based on a committee draft of IEC TS 63163 and needs to be updated to match the published version of IEC TS 63163.	<p>We will make the following changes to align with IEC TS 63163:2021:</p> <ul style="list-style-type: none"> • For bendable modules, require the radius of curvature to be marked on the module label. • Adopt the definition of “foldable module” from IEC TS 63163:2021. This will clarify that two PV modules connected by a hinge are not subject to the bending or folding test, but instead are subject to the gooseneck and moving part test of IEC TS 62257-9-5, W.4.3.

Appendix 1: Supporting data for changes to sample size and truth-in-advertising tolerance

Figure 1 shows how the variability in test results has decreased over time; the width of the yellow bar indicates the amount of variability between test samples. In the top row, representing tests conducted from 2014–2016, most of the bars are much wider (indicating more variability) than those in the bottom row with more recent tests from 2020 onward. Potential explanations for the reduction in variability include:

- Improvements in product quality control are resulting in more consistent performance.
- A transition from lead-acid to lithium-ion and lithium iron phosphate batteries, which typically have more consistent performance in the battery storage test.
- To a lesser extent, improvements in test procedures and test laboratory performance as laboratories get more experience with the test methods.

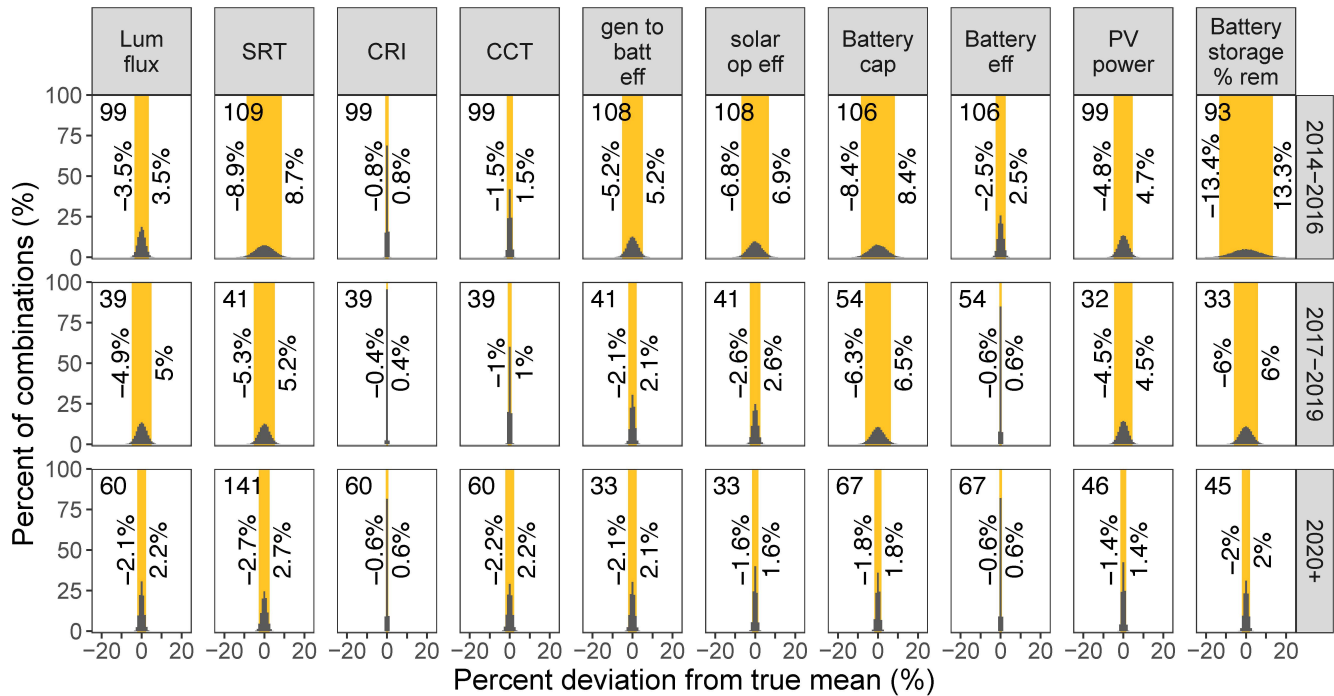


FIGURE 1. REDUCTION OF VARIABILITY IN TEST RESULTS OVER TIME. The histograms represent the expected distribution of the difference between the average value of each metric with a sample size of 6 and the true mean for the entire product population, assuming that the variability in each metric is the same across different products. The yellow shaded area includes 95% of the values; the number of tests included in the data set is indicated in the top left corner of each plot. The data indicate a reduction in variability in test results for products evaluated since 2020 compared to products evaluated previously.

Note: the number of tests for solar run time in the 2020+ period is greater than for other tests because of a change to the test methods. Previously, only a single solar run time result was reported for most products; however, since 2020, separate values have been reported for each advertised or included appliance. Each of these results is treated as an individual test in this analysis.

With this improvement in test result variability, we believe that a reduction in sample size will not substantially decrease the rigour or accuracy of testing. Using a sample size of two for all test types (quality test method (QTM), renewal, and market check method (MCM)) will help simplify the testing process and may reduce the time and cost of testing while enabling more throughput at test labs. To better understand the potential impact of reducing the sample size, we also analysed test data from the past two years (i.e., the 2020+ period). For

each test conducted with a full QTM sample size (of either n=4 for SHS kits or n=6 for pico-products), we looked at all possible combinations for hypothetical cases where only a subset of those same samples had been tested. The percentage of products that would have had a different outcome if a smaller sample size had been used is presented in Figure 2. The results show that the percentage of cases where a product's outcome (i.e., meeting or not meeting the relevant requirements) would have changed if the sample size were reduced to two is very small (less than 2%). There are cases where this reduction in sample size would allow products that would have failed with a larger sample size to now pass, but this risk now seems small enough to warrant the reduction, given the benefits gained from both reducing the sample size and ensuring the same sample size is used for all test types. We are further proposing to tighten the allowable tolerance for truth-in-advertising (TIA) metrics, such as luminous flux and PV power, from 15% to 10%, which will help mitigate the small risk presented by reducing the sample size. Further, this change to a 10% tolerance better aligns with similar certification schemes and is merited given the improvement in variability evidenced in Figure 1.

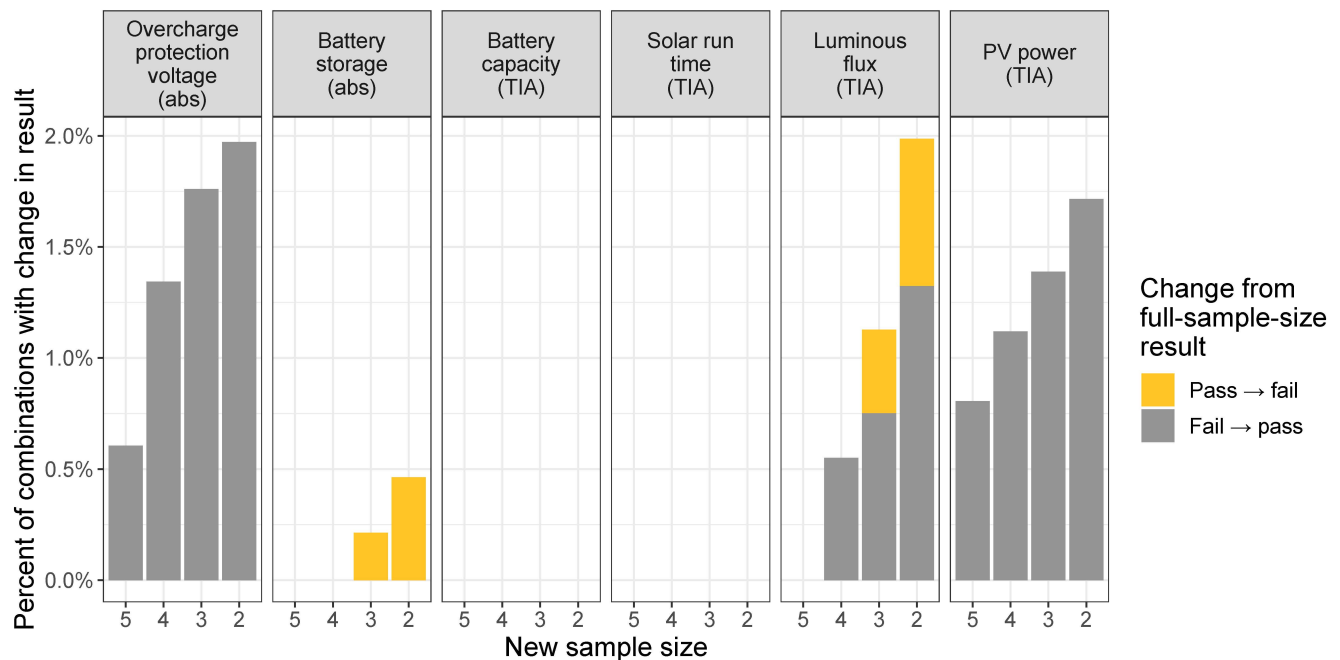


FIGURE 2. PERCENTAGE OF PRODUCTS WHERE THE PASS/FAIL OUTCOME WOULD HAVE CHANGED IF THE SAMPLE SIZE HAD BEEN REDUCED

Appendix 2: Proposed changes to visual screening

We plan to revise the visual screening (IEC TS 62257-9-5, Annex F) with the following general goals:

- Remove requirements to measure or record information that is not useful for stakeholders and is not needed for tests.
- Remove requirements to record textual descriptions when the information is apparent from photographs.

To accomplish these goals, we plan to make the following changes to the visual screening:

F.4.1.5 a):

- Remove item 5) (designer contact information). We do not define the term "designer"; the definition of "manufacturer" in IEC TS 62257-9-8 often applies to the entity that designed the product rather than the factory that manufactures it, so there is no need to list a "designer" in addition to the manufacturer, and this information is usually left blank in test reports.
- Remove the requirement to describe the labelling of hazards. If future versions of the document require specific hazard labelling, e.g., for refrigerators with flammable refrigerants, we will add those items to evaluate.
- Remove the items that are recommended, but not required, to be included in a user manual in 14)-36), except for 12) "instructions for replacement of the battery." Item 12) will be moved to the user manual requirements in IEC TS 62257-9-8, with language to clarify that these instructions are required only if the user can replace the battery. VeraSol plans to publish a technical note with more detailed recommendations for user manual content, but the presence of these recommended items will no longer be assessed in IEC TS 62257-9-5. This should simplify the visual screening.
- Instead of evaluating the user manual requirements in IEC TS 62257-9-5, we will require the laboratory to provide legible photographs or scans of all user documentation. VeraSol and other users of IEC TS 62257-9-8 can then evaluate the documentation and determine whether it meets the requirements. This will reduce laboratory workload and ensure consistent evaluation of the requirements.

F.4.1.5 b): revise the requirements for mass and dimensional measurements:

- Remove overall dimensional measurements of components and require only mass and cable length measurements for all components, including the entire product in its packaging (if all components are packaged together).
- Additionally, require the mass (but not dimensions) of the entire product in its packaging. VeraSol already requests this information from test laboratories and includes it in spec sheets.
- Add a requirement to include a scale reference in photographs of components in place of dimensional measurements.

F.4.1.5 c):

- Remove the requirement to note whether outdoor cable certification is provided; this is specified in IEC TS 62257-9-8.
- Remove item 6) (number of arrays)
- For item 7) require a photo that shows the number of individual light sources (i.e., the number of LED chips) but do not require the lab to record this information.
- In item 11) ("Describe and photograph the arrangement of lamp units, included appliances, battery(ies), and energy source(s) in terms of housing/cases"), delete "describe and" (i.e. only require a photo)
- In item 12) (materials) only require a description of the materials if not evident from the photos
- In item 13) (indicators) only require a description of the battery indicator, not other indicators

- Remove item 14) (other features); laboratories can still comment on notable or unusual features or characteristics.
- In item 15), remove "radio or" (redundant as radio functions are described later)
- In item 17) clarify what is meant by "central" and "independent" charging
- Remove item 20) (expected uses)

F.4.1.5 d)

- Remove item 1) (PV module mass) since there is already an instruction to record the mass of all components
- Remove item 5) (PV module cable length), as it is redundant after changes to F.4.1.5 c,) 1).
- Remove item 7) to (PV encasing material). The lab can still comment on unusual PV module constructions.
- Combine item 8) and the PV module visual screening in IEC TS 62257-9-8, removing redundant items
- Remove 11) (note whether any appliances can turn on while the main unit is charging)
- F.4.1.5 e): add instruction to note if any ports are powered directly from the PV module.

F.4.2.5 a):

- Remove item 6) (lamp driver specifications) – these values are rarely advertised, and in practice, we generally do not use these advertised values to evaluate the product. We would still collect information about the lamp driver from manufacturers to facilitate testing.
- Remove items 8)–9) (charge controller ratings) –these values are rarely advertised, and in practice, we do not use the advertised values to assess the charge controller. We would still collect charge controller information from manufacturers to facilitate testing.
- Remove item 16) (included appliances) – this is redundant since all included components have already been listed
- In 21) remove all television specifications except the screen size
- In 22) remove all fan specifications except the number of settings and rotor diameter
- Remove 23) (radio specifications – note the listed battery specifications are redundant)
- Remove 24) (portable video player specifications – note the listed battery specifications are redundant)

F.4.3.5 c)


- Remove items 3)–5) (cable strain relief types, fixture methods, and methods for securing connections). These items are only needed if there are deficiencies, in which case the deficiencies will be noted in the quality assessment.

General


- Add more detailed instructions about what needs to be shown in photos. In general, replace textual descriptions with photographs to reduce the time required for visual screening.
- In addition to the changes listed above to F.4.2.5 a) and b) (appliance specifications), combine the content into a single step applicable to all components to clarify the wording and remove duplication.




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