

September 2, 2015

Comparison of the Draft Lighting Global Solar Home System Kit Test Methods and IEC/TS 62257-9-5

The Lighting Global Solar Home System Kit Test Methods are intended to assess solar home system (SHS) kits with peak power ratings greater than 10 W and up to 100 W. The methods are similar to the existing test methods used to assess pico-products that are described in IEC/TS 62257-9-5, but include some modifications and new test procedures. This document provides a brief introduction to the Lighting Global SHS Kit Test Methods and lists the key differences between these methods and those used for pico-products. The intention of this document is to enable stakeholders to more easily provide informed feedback.¹

The SHS Kit Test Methods are structured in the following sections:

- An Introduction – describing the purpose of the test methods.
- 9 clauses (i.e. chapters) – providing information on the scope, referenced documents, terms and definitions used, details on system limits, a product specification for communicating test results, and descriptions of the QTM, ISM, and MCM test methods.
- 30 Annexes – Providing procedures for all of the individual tests involved in QTM, ISM and MCM testing and additional information to assist with the understanding and use of the Test Methods. Some of these Annexes are "normative," while others are "informative." Normative annexes contain requirements that must be followed when conducting the full series of tests. Informative annexes provide additional information and recommendations that assist in the understanding or use of the document.

The changes made from IEC/TS 62257-9-5 in drafting the Lighting Global SHS Kit Test Methods are as follows:

- **5 new annexes have been added:**

Annex	Description of new procedures
Annex P: Protection Tests	These include a test to assess the potential for damage and safety concerns due to PV overvoltage, output overloads, and user miswiring.
Annex Q: DC Ports Test	These include an assessment of the functionality of USB, 5 V, 12 V and other DC ports.
Annex R: Appliance Power Consumption	These are tests to measure the power consumption of various included appliances, such as lights, TVs, radios and fans.
Annex S: Energy Service Calculation	These are a series of calculations used to assess the available daily energy of a system in Wh/day and the daily runtime of appliances based on different use scenarios.
Annex DD: Generic Appliances	These are a list of standard values used in the energy service calculation and full battery runtime test in cases where the product advertises the use of appliances, but does not include them with the kit being tested.

¹ See this "Call for Comments" on the Lighting Global website to provide feedback:

<https://www.lightingglobal.org/call-for-comments-on-draft-test-methods-and-quality-standards-for-solar-home-system-kits/>. For questions, please contact shs@lightingglobal.org.

We have extended the deadline for feedback to September 25th. Comments received after this point may not be included in our first submission to the IEC, but may be included in subsequent comment periods/revisions.

- Annexes from IEC/TS 62257-9-5 have been edited as follows²:

Annex	Description of change
Clauses 1-9 and Annexes A-E	<ul style="list-style-type: none"> • Included eligibility criteria for SHS kits. • Changed sample size to 4 for QTM tests with notes on how many of each component needs to be sampled. • Added aspects, tests, and definitions to match the new annexes. • Updated example Quality Standards and Spec Sheet to match the current version of each.
Annex F: Visual Screening	<ul style="list-style-type: none"> • Adjusted to inspect appliances, cables, ports, and to report IP categories on a component basis rather than for the full system.
Annex G: Sample Prep	<ul style="list-style-type: none"> • Included appliances and recommended wire sizes to be used for testing based on maximum current.
Annex H: Power Supply Set-up	<ul style="list-style-type: none"> • Supplied "standard operating voltages" for different battery chemistries for use during system tests. • Defined "typical port voltage" for use if testing a single appliance at a time.
Annex I: PV module IV characteristics	<ul style="list-style-type: none"> • Allowed the use of data from IEC 61215. Included methods to measure IV curves using indoor equipment.
Annexes J and K: Battery test and Battery Testing Recommended Practices	<ul style="list-style-type: none"> • Included instructions for testing flooded lead-acid batteries.
Annex L: Charge Controller Behaviour	<ul style="list-style-type: none"> • Required that PV modules be plugged in during the standby loss test.
Annex M: Full Battery Run Time Test	<ul style="list-style-type: none"> • Rather than testing two lighting settings, the test is now designed to conduct one test of the FBRT with only the lights plugged in and a second test with a higher-power drawing set of appliances.

² Some of the annexes have been rearranged, added or deleted, so annex letters do not necessarily correspond between the two documents. The Annex letters listed correspond to the annexes in the Lighting Global SHS Kit Test Methods.

Annex	Description of change
Annex U: Lumen Maintenance	<ul style="list-style-type: none"> • Changed to allow the use of LM80 data as a substitute for the full 2000 hour test. • Changed to only require the testing of one of each identical light point (i.e. four samples of each non-identical light point would be measured).
Annex V: Light Output Test	<ul style="list-style-type: none"> • Changed to only require the testing of one of each identical light point (i.e. four samples of each non-identical light point would be measured). • Changed to use the "standard operating voltage" or "typical port voltage" rather than the average voltage from the FBRT.
Annex W: Light Distribution	<ul style="list-style-type: none"> • Changed to only require measurement of the full-width half max angle, and only require measurement of one sample of each non-identical light point.
Annex X: Mechanical Durability	<ul style="list-style-type: none"> • Changed requirements based on component type. • Changed to only require testing 100 cycles for switches and connectors that are meant to be used only during initial installation.
Annexes Y and Z: Ingress Protection Tests	<ul style="list-style-type: none"> • Changed requirements to be based on component type.

- **Removed 6 Annexes:** The Grid Charge Test, Electromechanical Charge Test, Example Test Report Templates, Photometer Box for Relative Luminous Flux, Photometer Tube for Relative Luminous Flux, and Field Testing Methods Annexes were removed (Annexes O, P, S, Y, Z and AA of IEC/TS 62257-9-5).
- Additionally, in June 2014, we proposed a number of changes to IEC/TS 62257-9-5 which are still under review by the IEC committee, but will likely be included in an upcoming revision. We have included all of the relevant changes from this list in the draft Lighting Global SHS Kits Test Methods. The three most significant revisions are listed below, while the full list of revisions submitted to the IEC are presented in the [Call for comments on IEC Technical Specification 62257-9-5 ed2.0 Stakeholder Outreach Memo on the Lighting Global Stakeholder page](#).
 - The Market Check Method (MCM) was updated to match the current Lighting Global Market Check Policy.
 - The battery test method for nickel-based batteries was changed to more accurately calculate the battery efficiency.
 - Procedures were added for testing PV modules for physical and water ingress.

- **Updated Annex CC: Equipment Requirements:** Added equipment to address the needs of larger systems and new procedures. See Table 1 for a list of additional equipment required, which totals approximately US\$15,000.

Test	New equipment	Qty	Example make/model
All-Appliance Full Battery Run Time Test	Power resistors for generic loads	--	--
Solar Charge Test	High power variable and/or fixed resistors for series resistance	--	power resistors with a current capacity of 10 A, adjustable from 0 to 6 ohms. A combination of fixed and variable resistors may be more economical than a single large variable resistor.
Output overload protection	High current power supply	1	Mastech HY3020D
	Electronic load	1	BK Precision 8601
Assessment of Charging Ports - Steady-state characteristics	Current shunt, 20A max (power resistor, metal backing) or Two multimeters with a 20A range	2	TE Connectivity 7-1625971-5 plus scrap sheet metal, screws, thermal compound
Assessment of Charging Ports - Dynamic measurement	Digital oscilloscope with memory	1	Tektronix DPO2002B
Measurement of battery capacity	Large battery analyzer	1	Cadex C8000
Battery storage durability	Oven (may need to fit up to four 100Ah lead-acid batteries)	1	local materials
Proposed changes to OVP for lithium batteries with external cell protection circuit	Custom voltage dividers, etc.	--	misc. electronic components