



EEDC 5 (5039) P3

## DRAFT TANZANIA STANDARD

(Draft for Stakeholders' comments only)

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### Off-grid solar photovoltaic lighting kits — Requirements

*Draft for Stakeholders' comments only*

TANZANIA BUREAU OF STANDARDS

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## Foreword

This Tanzania Standard was prepared by the Solar Power Systems Technical Committee, under the supervision of the Electrical Engineering Divisional Standards Committee. It was approved by the Board of Directors of the Tanzania Bureau of Standards. The preparation was conducted as per establish procedure and in compliance with regional and international best practice of preparation of standards.

In the preparation of this draft Tanzania Standard assistance was derived from *EEDC 5 (4719) P3 /IEC/TS 62257-9-5 Recommendations for renewable energy and hybrid systems for rural electrification — Part 9-5: Integrated systems — Selection of stand-alone lighting kits for rural electrification* published by the International Electrotechnical commission.

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## Off-grid solar photovoltaic lighting kits —Requirements

### 1 Scope

This draft Tanzania Standard applies to off-grid lighting appliances or kits that can be installed by a typical user without employing a technician. The kits are generally comprised of a light source (LED, CFL, or other), a rechargeable energy storage device (usually a battery), an energy generation device or source (PV module, dynamo, AC grid, unregulated DC input, or other), and internal electronics. Lighting appliances or kits with PV modules larger than 10 W (peak power under standard test conditions) are excluded from the scope of this standard.

### 2 Normative references

The following referenced documents are indispensable for the application of this draft standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EEDC 5 (4719) P3 /IEC/TS 62257-9-5 *Recommendations for renewable energy and hybrid systems for rural electrification — Part 9-5: Integrated systems — Selection of stand-alone lighting kits for rural electrification*

### 3 Definitions

For the purposes of this draft standard the definitions given in EEDC 5 (4719) P3 /IEC/TS 62257-9-5 shall apply.

### 4 Requirements

#### 4.1 General

All testing specified in this standard shall be conducted using the test methods provided in IEC/TS 62257-9-5. Prior to conducting qualification and recurring testing, the sampling procedures in Annex E: Product sampling of EEDC 5 (4719) P2 /IEC/TS 62257-9-5 shall be followed. All applicable test methods provided in EEDC 5 (4719) P2 /IEC/TS 62257-9-5 are necessary for qualification and recurring testing (including the battery storage tests in Annex BB: Battery durability test).

#### 4.2 Initial and recurring testing requirements

Initial qualification under the quality, warranty, and performance reporting requirements outlined in sub-clauses 4.3 to 4.5 of this standard requires one of the following:

- a) Quality Test Method (QTM) results according to Clause 6 of EEDC 5 (4719) P3 /IEC/TS 62257-9-5 for all applicable aspects specified in sub-clause 4.2 of EEDC 5 (4719) P3 /IEC/TS 62257-9-5.<sup>1</sup>
- b) Accelerated Verification Method (AVM)<sup>2</sup> results that are drawn from two rounds of testing:

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<sup>1</sup> A product family (set of interchangeable components sold on a component-level basis or as a mix-and-match kit) can receive initial qualification as follows:

- a) At least one fully configured system (“kit”) must be tested according to the QTM.
- b) At least half (rounding down) of the models of each product component (PV module, battery / control unit, light point, etc.) must be tested. The smallest/dimmest and largest/brightest models of each component must be tested, at a minimum.

<sup>2</sup> Only products from companies that meet the following eligibility requirements may receive initial qualification via AVM testing:

1. Initial Screening Method (ISM) according to Clause 8 of EEDC 5 (4719) P3 /IEC/TS 62257-9-5 for all applicable aspects specified in sub-clause 4.2 of EEDC 5 (4719) P3 /IEC/TS 62257-9-5, with a sample size of two for all applicable tests. Results from this first round serve as the initial testing requirement for a period of up to nine months after the report date.
  2. Follow-up QTM testing according to Clause 6 of EEDC 5 (4719) P3 /IEC/TS 62257-9-5 for all applicable aspects specified in sub-clause 4.2 of EEDC 5 (4719) P3 /IEC/TS 62257-9-5. Follow-up QTM testing shall be conducted on commercially available products within six months of the preceding ISM testing.
- c) Targeted testing of fee-for-service or pay-as-you-go (PAYG) enabled versions of products that were previously qualified according to this standard using one of the processes described in 1 and 2, above. Targeted testing is comprised of:
1. Visual inspection, including internal assessment
  2. Durability testing on any aspects that may have been impacted by the addition of the PAYG option (e.g. new ports or changes to the existing casing).
  3. An estimate of the parasitic consumption or additional standby loss due to the addition of the PAYG option.
  4. Submission of manufacturer declaration indicating that the performance of the PAYG enabled version is equivalent to that of the previously tested non-PAYG product.

Re-testing is required two years after the date of completion for the QTM testing. If the product has remained unchanged since QTM testing, testing according to the Initial Screening Method (ISM) according to Clause 8 of IEC/TS 62257-9-5 with a sample size of two for all applicable tests shall be conducted. If the product has changed since QTM testing, testing according to the QTM of EEDC 5 (4719) P2 /IEC/TS 62257-9-5 shall be conducted. Furthermore, market check testing according to the ISM of EEDC 5 (4719) P3 /IEC/TS 62257-9-5 with a sample size of two for all applicable tests can be used to verify that a product, after passing the quality and warranty requirements through QTM or AVM testing, continues to do so.

### 4.3 Product category requirements

Every lighting appliance or kit can be categorized as “fixed separate (indoor)”, “portable separate”, “portable integrated”, or “fixed integrated (outdoor)” according to sub-clause 4.1.2 of EEDC 5 (4719) P2 /IEC/TS 62257-9-5. To qualify as a “separate” PV module, the PV module cable length shall be at least 3 m ± 0.3 m in length.

### 4.4 Quality requirements

The lighting appliance or kit shall meet each of the criteria listed in Table 1 and Table 2 to meet the quality requirements.

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- a) The company must have had at least three products that have met *EEDC 5 (5039)P3* via QTM testing according to IEC/TS 62257-9-5. At least one of these products must currently meet *EEDC 5 (5039)P3*
  - b) The company must have no products that have failed QTM, ISM, or market check testing in the past two years, according to tests that were carried out according to methods specified in EEDC 5 (4719) P2 /IEC/TS 62257-9-5

**Table 1 — Truth-in-advertising requirements**

Truth-in-advertising criterion	Qualification and market check testing requirement	EEDC 5 (4719) P3 /IEC/TS 62257-9-5 Required Test Method(s)
System performance tolerance – numeric ratings	≤ 15 % deviation from ratings (always ok if actual performance is better than advertised).	Various; based on consumer-facing advertisements for product. Commonly, Annex I: Light output test and Annex R: Solar charge test are required (at a minimum).
System components tolerance – numeric ratings	≤ 15 % deviation from ratings (always ok if actual performance is better than advertised).	Various; based on consumer-facing advertisements for product components. Commonly, Annex K: Battery test and Annex Q: Outdoor photovoltaic module I-V characteristics test are required (at a minimum).
Other numeric ratings tolerance	≤ 15 % deviation from ratings (always ok if actual performance is better than advertised).	Various; based on consumer-facing advertisements.
Fee-for-service or Pay-as-you-go (PAYG) metering	The metering system shall be capable of accurately quantifying energy services provided.	Annex F: Visual screening and Annex D: Manufacturer self-reported information
Overall truth-in-advertising statement	Any description of the lighting appliance or kit that appears on the packaging, inside the package, and in any other media shall be truthful and accurate. No statements shall mislead buyers or end users about the features or utility of the lighting appliance or kit.	Annex F: Visual screening

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**Table 2 — Safety and durability requirements<sup>1,2</sup>**

<b>Safety or durability criterion</b>	<b>Lighting appliance or kit category</b>	<b>QTM testing requirement (n=6)</b>	<b>Market check and renewal testing requirement (n=2)</b>	<b>EEDC 5 (4719) P3 /IEC/TS 62257-9-5 Required Test Method(s)</b>
Overall water exposure protection (for components containing electronics or electrical connections)	Fixed separate (indoor)	No protection required	No protection required	Annex U: Physical and water ingress protection test, Annex V: Level of water protection, and Annex D: Manufacturer self-reported information
	Portable separate	Protection from occasional exposure to rain: IPx1 OR technical equivalent OR with warning label	Protection from occasional exposure to rain: IPx1 OR technical equivalent OR with warning label	
	Portable integrated	Protection from frequent exposure to rain: IPx3 OR technical equivalent OR IPx1 / equivalent + warning label	Protection from frequent exposure to rain: IPx3 OR technical equivalent OR IPx1 / equivalent + warning label	
	Fixed integrated (outdoor)	Protection from permanent outdoor exposure: IPx5 OR IPx3 + circuit protection	Protection from permanent outdoor exposure: IPx5 OR IPx3 + circuit protection	
	All PV modules	Protection from permanent rooftop installation: Modified IPx4 OR circuit protection	Protection from permanent rooftop installation: Modified IPx4 OR circuit protection	
Physical ingress protection (for components containing electronics or electrical connections)	All except below	Minimum of IP 2x protection	Minimum of IP 2x protection	Annex U: Physical and water ingress protection test
	Fixed integrated (outdoor)	Minimum of IP 5x protection	Minimum of IP 5x protection	
	All PV modules	Minimum of IP 3x protection	Minimum of IP 3x protection	

<sup>1</sup> All safety and durability requirements are extended to PAYG components and appliances that are included with the product.

<sup>2</sup> Safety and durability requirements for physical ingress protection, strain relief, switch, gooseneck, moving part and connector durability, drop test and battery durability (charge control) may be waived for non-lighting appliances included with the product/system that also meet relevant *country name* standards such as IEC 60065 and IEC 60335.

**Table 2 — Safety and durability requirements (continued)**

Safety or durability criterion	Lighting appliance or kit category	QTM testing requirement (n=6)	Market check and renewal testing requirement (n=2)	EEDC 5 (4719) P3 /IEC/TS 62257-9-5 Required Test Method(s)
Mechanical durability – drop test	Fixed separate (indoor) and fixed integrated (outdoor)	No protection required	No protection required	Annex W: Mechanical durability test
	Portable separate	Maximum failure rate for functionality is 1/6; none result in safety hazards	None fail for functionality; none result in safety hazards	
	Portable integrated	Maximum failure rate for functionality is 1/6; none result in safety hazards	None fail for functionality; none result in safety hazards	
	Non-lighting portable appliances; Lighting appliances providing less than 15 lumens of light output that are included with the main product	Maximum failure rate for functionality is 1/6; none result in safety hazards	None fail for functionality; none result in safety hazards	Annex W: Mechanical durability test, yet only 2 drops per sample. The sides on which the product is dropped will be alternated between samples to ensure that all 6 sides receive impact at least once.

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**Table 2 — Safety and durability requirements (continued)**

<b>Safety or durability criterion</b>	<b>Lighting appliance or kit category</b>	<b>QTM testing requirement (n=6)</b>	<b>Market check and renewal testing requirement (n=2)</b>	<b>EEDC 5 (4719) P3 /IEC/TS 62257-9-5 Required Test Method(s)</b>
Mechanical durability – goosenecks	Any with gooseneck	Maximum failure rate for functionality is 1/6; none result in safety hazards	None fail for functionality; none result in safety hazards	Annex W: Mechanical durability test
Mechanical durability – connectors	All products	Maximum failure rate for functionality is 1/6; none result in safety hazards	None fail for functionality; none result in safety hazards	
Mechanical durability – switches	All products	Maximum failure rate for functionality is 1/6; none result in safety hazards	None fail for functionality; none result in safety hazards	
Mechanical durability – strain relief	All products	Maximum failure rate for functionality is 1/6; none result in safety hazards	None fail for functionality; none result in safety hazards	
Workmanship	All products	Maximum prevalence of bad solder joints is 1/6 samples; maximum prevalence of poor wiring is 1/6 samples; maximum prevalence of overall workmanship failure is 1/6	None have bad solder joints or poor wiring; no overall workmanship failures	

**Table 2 — Safety and durability requirements (continued)**

Safety or durability criterion	Lighting appliance or kit category	QTM testing requirement (n=6)	Market check and renewal testing requirement (n=2)	EEDC 5 (4719) P2 /IEC/TS 62257-9-5 Required Test Method(s)
Battery durability	All products	An appropriate battery protection strategy is used that will protect batteries from early failure and end-users from harm; no more than 1/6 samples fails	An appropriate battery protection strategy is used that will protect batteries from early failure and end-users from harm; no samples fail	Annex S: Charge controller behavior test and Annex D: Manufacturer self-reported information
	Products that are fee-for-service or Pay-as-you-go (PAYG) enabled	An appropriate battery protection must remain active regardless of whether the system is in an enabled or disabled state. The battery must be able to receive a charge even if the product is in a disabled state.	An appropriate battery protection must remain active regardless of whether the system is in an enabled or disabled state. The battery must be able to receive a charge even if the product is in a disabled state.	Annex D: Manufacturer self-reported information

**Table 2 — Safety and durability requirements (continued)**

Safety or durability criterion	Lighting appliance or kit category	QTM testing requirement (n=6)	Market check and renewal testing requirement (n=2)	EEDC 5 (4719) P3 /IEC/TS 62257-9-5 Required Test Method(s)
Lumen maintenance	All products; Does not apply to appliances providing less than 15 lumens of light output that are included with the main product	One of the following criteria must be met: 1. $L_{85}$ time is greater than 2 000 h for the average sample; no more than 1/6 samples fails (defined as being more than 10 % below $L_{85}$ at 2 000 h) 2. All samples maintain $\geq 95\%$ of initial light output at 1 000 h 3. $L_{85}$ time is greater than 500 h for the average sample; No samples fail (defined as being more than 10 % below $L_{85}$ at 500 h); AND the estimated lumen depreciation at 2000 h is less than 15%, as estimated using single point temperature measurements of the LED array in comparison to IESNA LM80-08 data from the LED manufacturer.	$L_{95}$ time is greater than 500 h for the average sample; No samples fail (defined as being more than 10 % below $L_{85}$ at 500 h). If the average sample decrease in initial light output at 500 hours is greater than 5%, then the $L_{85}$ time must be greater than 2 000 h for the average sample.	Annex J: Lumen maintenance test
AC-DC charger safety	Products that include an AC-DC grid charger	Any included AC-DC charger carries approval from a recognized consumer electronics safety regulator, such as UL or similar.	Any included AC-DC charger carries approval from a recognized consumer electronics safety regulator, such as UL or similar.	Annex F: Visual screening and Annex D: Manufacturer self-reported information

**Table 2 — Safety and durability requirements (concluded)**

Safety or durability criterion	Lighting appliance or kit category	QTM testing requirement (n=6)	Market check and renewal testing requirement (n=2)	EEDC 5 (4719) P3 /IEC/TS 62257-9-5 Required Test Method(s)
Battery longevity	All products; Does not apply to appliances providing less than 15 lumens of light output that are included with the main product	Measured capacity after storage is at least 75% of the measured capacity before storage for the average sample; no more than 1/6 samples fails (defined as a measured capacity after storage less than 65% of the measured capacity before storage)	Measured capacity after storage is at least 75% of the measured capacity before storage; no samples fail	Annex BB: Battery durability test (only storage tests apply, not cycling tests)
Battery Composition	All products	No battery may contain cadmium or mercury at levels greater than trace amounts.	No battery may contain cadmium or mercury at levels greater than trace amounts.	Annex F: Visual screening and Annex D: Manufacturer self-reported information

If a lighting appliance or kit fails one of the truth-in-advertising, safety, or durability requirements during market check or renewal testing in such a way that it could still pass through QTM testing with a sample size of six (6)—for example, if one sample failed to meet the battery durability requirement but the other sample passed—QTM testing should be conducted to verify only those requirements that the lighting appliance or kit failed to meet. At least six (6) samples shall be obtained for market check testing; therefore, if the four (4) spare samples are still in good condition, they may be used for the verification QTM testing to obtain the required sample size of six (6). If verification QTM testing is conducted, the lighting appliance or kit is then required to meet the requirements for QTM testing in Table 1 and Table 2.

#### 4.5 Warranty requirement

The lighting appliance or kit shall meet each of the following criteria to meet the warranty requirement:

- a) To be consumer-facing, the warranty shall be included on the lighting appliance's or kit's packaging or on a warranty card or user agreement that is easily accessed prior to purchase.
- b) End-users are provided at least twelve months of warranty coverage from the point of purchase.
- c) The warranty shall cover manufacturing defects that impede operation under normal use and protection from early component failure, including coverage on the battery.
- d) The warranty shall explain how the consumer can access the warranty (return to point of purchase/distributor/service centre, call or SMS a number, etc.), how the warranty will be executed (repair, replacement, etc.), and shall advise the customer to inquire about the warranty terms prior to purchase.
- e) The full terms of the warranty shall be available to the consumer in writing in a way that enables the end-user to verify and understand the terms of the warranty prior to purchase. The written information shall be in **English or Swahili**.

The information obtained from the procedures in Annex F: Visual screening and Annex D: Manufacturer self-reported information from EEDC 5 (4719) P3 /IEC/TS 62257-9-5 shall be used to determine if the lighting appliance's or kit's warranty meets the warranty requirement.

#### 4.6 Performance reporting requirement

The lighting appliance or kit shall meet each of the following criteria to meet the performance-reporting requirement:

- a) The lighting appliance's or kit's light output (luminous flux in lumens) and the corresponding solar run time in hours (at a minimum) shall be reported on the product packaging for at least the brightest setting. Other performance metrics such as full-battery run time, grid-charge run time (if applicable), or electromechanical run time (if applicable) may be reported additionally, provided that the information is presented so that these metrics are clearly distinguished from the solar run time.
- b) The information shall be available to the consumer in writing and/or pictorially in a way that enables the end-user to understand the performance metrics that are reported.
- c) Products that offer and advertise mobile phone charging or other auxiliary services must include consumer-facing text or graphic that describes the qualitative effect of phone charging or auxiliary services on product performance.

Annex I: Light output test, Annex T: Light distribution test, Annex R: Solar charge test, Annex M: Full-battery run time, Annex O: Grid charge test (if applicable), and Annex P: Electromechanical charge test (if applicable) from EEDC 5 (4719) P3 /IEC/TS 62257-9-5 shall be used to determine the lighting appliance's or kit's luminous flux, illuminance from a specified distance, full-battery run time, grid-charge run time, and electromechanical run time, respectively.