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BSI Standards Publication

Guidelines for principal component reliability testing for LED light sources and LED luminaires

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National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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GUIDELINES FOR PRINCIPAL COMPONENT RELIABILITY TESTING FOR LED LIGHT SOURCES AND LED LUMINAIRES

FOREWORD

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62861, which is a Technical Specification, has been prepared by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

The text of this Technical Specification is based on the following documents:

Enquiry draft	Report on voting
34A/1884/DTS	34A/1966/RVDTS

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

LED products depend generally on how balanced its principal components are in terms of their reliability. It is not only the LED components that determine product performance, but also other parts of the LED product play an equally important role. For instance, electronic subassemblies, optics, mechanics and the involved cooling method play such a role.

This Technical Specification envisions a methodology, which addresses separate subcomponent reliability data, to provide a basis for statistical system reliability design. Standardized reporting formats and flowcharts are presented.

Next, protocols based on accelerated methods are given to estimate system reliability of the final product using subcomponent data.

Verification of LED product lifetime is based on a ‘test to pass’ principle, which means the components of the product under test are evaluated to give equivalent reliability confidence to that which would be achieved by real-time life testing of the complete LED product. The tests described in this Technical Specification are divided into: initial qualification tests (IQT) giving confidence of basic component robustness, but not linked to any specific lifetime projection, and accelerated stress tests (AST) giving confidence of reliability to a specific lifetime (within the specified constraints of the test).

Since the approach foreseen in this Technical Specification covers a generic methodology, it can be seen as guidance related to relevant product performance standards, such as the LED lamp performance standard IEC 62612, the LED module performance standard IEC 62717 and LED luminaire performance standard IEC 62722-2-1. This Technical Specification is not recommended for use as a normative reference to the LED product performance standards.

This Technical Specification addresses the need for a document giving guidance that is developed according to consensus procedures and in itself is normative in nature, while at the same time recognizing that LED technology for lighting products is still in an emerging phase. This Technical Specification approaches an International standard in terms of detail and completeness.

GUIDELINES FOR PRINCIPAL COMPONENT RELIABILITY TESTING FOR LED LIGHT SOURCES AND LED LUMINAIRES

1 Scope

This Technical Specification provides guidelines for establishing confidence in product reliability using principal component testing for LED light sources and LED luminaires for general lighting. It includes methods and criteria using initial qualification tests and accelerated stress tests of the principal components. The performance of any principal component will influence the performance of the final product.

Techniques to validate full lifetime claims and lumen maintenance projection are outside the scope of this Technical Specification.

The following principal components are included in the testing if they are used as an integral part for the LED light source or LED luminaire:

- LED package and interconnects;
- optical materials;
- electronic subassemblies;
- cooling systems, both active (e.g. fans) and passive (e.g. thermal interface material);
- construction materials.

This Technical Specification is not recommended for use as a normative reference to the LED product performance standards.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-20:2008, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60068-2-27:2008, *Basic environmental testing procedures – Part 2: Tests – Test Ea and guidance: Shock*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-42:2003, *Environmental testing – Part 2-42: Tests – Test Kc: Sulphur dioxide test for contacts and connections*

IEC 60068-2-43:2003, *Environmental testing – Part 2-43: Tests – Test Kd: Hydrogen sulphide test for contacts and connections*

IEC 60068-2-58:2015, *Environmental testing – Part 2-58: Tests – Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)*