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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Concentrator photovoltaic (CPV) solar cells and cell on carrier (CoC) assemblies – qualification

Cellules solaires photovoltaïques à concentration (PVC) et ensembles de cellules sur support (CoC) – Qualification

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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FOREWORD

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The text of this International Standard is based on the following documents:

FDIS	Report on voting
82/1818/FDIS	82/1834/RVD

Full information on the voting for the approval of this International Standard 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.

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CONCENTRATOR PHOTOVOLTAIC (CPV) SOLAR CELLS AND CELL ON CARRIER (CoC) ASSEMBLIES – QUALIFICATION

1 Scope

This document specifies the minimum requirements for the qualification of concentrator photovoltaic (CPV) cells and Cell on Carrier (CoC) assemblies for incorporation into CPV receivers, modules and systems.

The object of this qualification standard is to determine the optoelectronic, mechanical, thermal, and processing characteristics of CPV cells and CoCs to show that they are capable of withstanding assembly processes and CPV application environments. The qualification tests of this document are designed to demonstrate that cells or CoCs are suitable for typical assembly processes, and when properly assembled, are capable of passing IEC 62108.

This document defines qualification testing for two levels of concentrator photovoltaic device assembly:

a) cell, or bare cell; and

b) cell on carrier (CoC).

NOTE Note that a variety of alternate names are used within the industry, such as solar cell assembly, receiver, etc.

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 60721-2-1:2013, *Classification of environmental conditions – Part 2-1: Environmental conditions appearing in nature – Temperature and humidity*

IEC 60749-3:2017, *Semiconductor devices – Mechanical and climatic test methods – Part 3: External visual examination*

IEC 60749-6:2017, *Semiconductor devices – Mechanical and climatic test methods – Part 6: Storage at high temperature*

IEC 60749-14:2003, *Semiconductor devices – Mechanical and climatic test methods – Part 14: Robustness of terminations (lead integrity)*

IEC 60749-21:2011, *Semiconductor devices – Mechanical and climatic test methods – Part 21: Solderability*

IEC 60749-22:2002, *Semiconductor devices – Mechanical and climatic test methods – Part 22: Bond strength*

IEC 60904-1-1:2017, *Photovoltaic devices – Part 1-1: Measurement of current-voltage characteristics of multi-junction photovoltaic (PV) devices*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61193-2:2007, *Quality assessment systems – Part 2 selection and use of sampling plans for inspection of electronic components and packages*

IEC TS 61836:2016, *Solar photovoltaic energy systems – Terms, definitions and symbols*

IEC 62108:2016, *Concentrator photovoltaic (CPV) modules and assemblies – Design qualification and type approval*

IEC 62137-1-2:2007, *Surface mounting technology – Environmental and endurance test methods for surface mount solder joint – Part 1-2: Shear strength test*

IEC 62670-1:2013, *Photovoltaic concentrators (CPV) – Performance testing – Part 1: Standard conditions*

IEC TS 62789:2014, *Photovoltaic concentrator cell documentation*

IEC 63202-2, *Photovoltaic cells – Part 2: Electroluminescence image for crystalline silicon solar cells*

ECSS-E-ST-20-08C Rev 1, 18 July 2012, *Space engineering – Photovoltaic assemblies and components – Part 7.5.8: Coating adherence (CA)*

MIL.ST-883-K, *Test Method Standard – Microcircuits Method 2019.9 Die shear strength*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TS 61836 and IEC 62108 apply, as well as the following.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
bare cell
refers to a semiconductor die level. The physical form during a commercial transaction may be a separated solar cell, a diced wafer on tape, or even a processed wafer. The one common denominator is that the qualified configuration is completely unprotected and not ready for interconnection with the rest of a CPV module

Note 1 to entry: For this qualified configuration, the customer is responsible for all integration and assembly.

Note 2 to entry: For some qualification tests, bare cells are mounted on a substrate, heatsink, or other type of carrier (see Figure 1c). This provides mechanical stability, robust electrical contacts, and appropriate thermal management, but it is not considered in the bare solar cell qualification.

3.2
Cell on Carrier
CoC
cell bonded and interconnected with a cell carrier, at a minimum (see Figure 1b). This is a relatively small, assembled unit in a relatively complete and rugged package