



IEC standards for PV modules, current status and ongoing developments

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Joint
Research
Centre

Outline

IEC TC82 scope and structure

- Working groups and project teams

WG2 Modules, non-concentrating

- Current status, Ongoing activities
- Missing or needed?

TC82 Scope

To prepare international standards for systems of photovoltaic conversion of solar energy into electrical energy and for all the elements in the entire photovoltaic energy system. In this context, the concept "photovoltaic energy system" includes the entire field from light input to a photovoltaic cell to and including the interface with the electrical system(s) to which energy is supplied.

There are currently 186 documents published by the IEC from Technical committee 82 (established in 1981)

<https://www.iec.ch>

IEC TC82 structure

Working Groups

WG 1	Glossary
WG 2	Modules, non-concentrating
WG 3	Systems
WG 6	Balance-of-system components
WG 7	Concentrator modules
WG 8	Photovoltaic (PV) cells
WG 9	BOS Components – Support Structures

Project Teams

PT 600	Vehicle Integrated Photovoltaics
PT 63092	Building Integrated Photovoltaics (BIPV)

Joint Working Groups

JWG 1	Photovoltaic off grid systems, including decentralized rural electrification and hybrid systems
JWG 10	Distributed Energy Resources Interconnection with the Grid Managed by TC 8
JWG 11	Building-Integrated Photovoltaics (BIPV) linked to ISO/TC 160/SC 1
JWG 4	Grid code compliance assessment for grid connection of wind and PV power plants Managed by SC 8A
JWG 5	System issues regarding integration of wind and PV generation into bulk electrical grid Managed by SC 8A
JWG 82	TC21/TC82 - Secondary cells and batteries for Renewable Energy Storage Managed by TC 21
JWG 32	Electrical safety of PV system installations Managed by TC 64

WG2 Activity

Today WG2 has 62 published documents

27 ongoing projects (+ 1 TR)

20 as either revisions or amendments of existing standards

7 as new documents (+ 1TR)

WG2 Members ~ 290

Observers ~ 220

Technical Areas for WG2 Standards

Measurement Principles

Qualification and Safety Tests

Energy Rating

Specialized Stress Tests

Module Components

Module Materials

Increased Reliability

Measurement Principles

Published Standards

IEC 60891: Temperature and Irradiance Corrections to I-V Curves

IEC 60904- 1 to 14: Measurements Principles for PV Devices

IEC TS 63109 Measurement of diode ideality factor by quantitative analysis of electroluminescence images

IEC TR 63228: Measurement protocols for photovoltaic devices based on organic, dye-sensitized or perovskite materials

Activities

IEC TS 60904-1-2 ED2: Measurement of current-voltage characteristics of bifacial photovoltaic (PV) devices

Status: [CD circulating](#), [Closing date for comments [2022-07-22](#)]

Measurement Principles cont.

Activities

IEC 60904-2 ED3: Requirements for photovoltaic reference devices

Status: **CDV submitted**

IEC 60904-5/AMD1 ED3: Determination of the equivalent cell temperature (ECT)

Status: **FDIS submitted**

IEC 60904-8/AMD1 ED3 Measurement of spectral responsivity of a photovoltaic (PV) device

Status: **Working on CD for submission 2022-10**

Qualification and Safety Tests

Published Standards

IEC 61215 standard series: Design qualification and type approval

IEC 61730-1 and -2: Photovoltaic (PV) module safety qualification

IEC TS 62915: Type approval, design and safety qualification - Retesting

Activities

IEC 61215-1 Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1: Test requirements

IEC 61215-2 Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 2: Test procedures

Status: **Approved to start an amendment to clarify Bifacial gate 1 requirements**

Qualification and Safety Tests cont.

Activities

IEC 61730-1 and -2 ED3

Status: **FDIS ready for submission**

IEC 62788-2-1: Safety requirements for polymeric frontsheet and backsheet

Status: **Working on FDIS for submission**

IEC TS 62788-2: Polymeric materials used for frontsheets and backsheets

Status: **Working on DTS for submission**

IEC TS 62915 ED2: Type approval, design and safety qualification - Retesting

Status: **Working on DTS for submission**

Energy Rating

Published Standards

IEC 61853-1: Irradiance and temperature performance measurements and power rating

IEC 61853-2: Spectral responsivity, incidence angle and module operating temperature measurements

IEC 61853-3: Energy Rating of PV Modules

IEC 61853-4: Standard reference climatic profiles

Activities

All parts open for revision

Status: **Working on CD for submission**

Specialized Stress Tests

Published Standards

IEC 61701 ED3: – Salt mist corrosion testing

IEC 62716: Ammonia corrosion testing

IEC 62759-1: Transportation testing

IEC TS 62782: Cyclic (dynamic) mechanical load testing

IEC TS 62804-1: Test methods for the detection of PID - Crystalline silicon

IEC TS 62804-1-1: Part 1-1: Crystalline silicon – Delamination

IEC TS 62804-2: PID testing for thin-film

IEC 62938: Photovoltaic (PV) modules - Non-uniform snow load testing

IEC TS 63140: Photovoltaic (PV) modules - Partial shade endurance testing for monolithically integrated products

IEC TS 63163: Terrestrial photovoltaic (PV) modules for consumer products - Design qualification and type approval

Specialized Stress Tests cont.

Activities

IEC 62759-1 ED2: Transportation testing

Status: **Being published**

IEC TS 62804-1 ED2: Test methods for the detection of PID - Crystalline silicon

Status: **Working on CD for submission**

IEC TS 63342: Light and elevated temperature induced degradation (LETID) test for c-Si Photovoltaic (PV) modules: Detection

Status: **DTS submitted**

IEC TS 63397: Guidelines for qualifying PV modules for increased hail resistance

Status: **DTS circulating [Closing date for vote 2022-08-19]**

Module Components

Published Standards

IEC 62790: Junction boxes for PV modules

IEC 62852:2014/AMD1:2020 Connectors for DC applications in PV systems

IEC TS 62916: Bypass diode electrostatic discharge

IEC 62979: Photovoltaic module bypass diode thermal runaway test

Activities

IEC 62852/AMD2: Connectors for DC-application in photovoltaic systems - Safety requirements and tests

Status: **Working on CD for submission**

Module Materials

Published Standards

IEC 67288-1-2: Measurement of volume resistivity of photovoltaic encapsulants and other polymeric materials

IEC 67288-1-4: Measurement of encapsulant optical transmission

IEC 67288-1-5: Measurement of change in linear dimensions of sheet encapsulation material resulting from applied thermal conditions

IEC 62788-1-6: Test methods for determining the degree of cure in Ethylene-Vinyl Acetate

IEC 62788-1-7: Test procedure for the optical durability of transparent polymeric PV packaging materials

IEC TS 62788-2: Polymeric materials used for frontsheets and backsheets

IEC 62788-5-12020/AMD1:2022: Suggested test methods for use with edge seal materials

IEC TS 62788-5-2: Edge seals - Durability evaluation guideline

Module Materials cont.

Published Standards

IEC 62788-6-2: Moisture permeation testing with polymeric films

IEC 62788-7-2: Environmental exposures - Accelerated weathering tests of polymeric materials

IEC 62788-7-3: Environmental exposures - Accelerated abrasion tests of PV module external surfaces

IEC 62805-1: PV Glass - Measurement of total haze and spectral distribution of haze

IEC 62805-2: PV Glass - Measurement of transmittance and reflectance

Activities

IEC 62788-1-1: Polymeric materials used for encapsulants

Status: **Working on FDIS**

IEC TS 62788-2 ED2: Polymeric materials - Frontsheets and backsheets

Status: **Working on DTS for submission**

Module Materials cont.

IEC TS 62788-6-3: Adhesion testing of interfaces within PV modules

Status: **Being Published**

IEC 62788-7-2/AMD1 ED1: Environmental exposures - Accelerated weathering tests of polymeric materials

Status: **Working on CD for submission**

IEC 62788-8-1: Electrically conductive adhesive (ECA): Measurement of material properties

Status: **Working on CD for submission**

Increased Reliability

Published Standards

IEC 62892: Extended thermal cycling of PV modules

IEC 62941: Quality system for PV module manufacturing

IEC TS 63126: Guidelines for qualifying PV modules, components and materials for operation at higher temperatures

IEC TS 63209-1: Photovoltaic modules - Extended-stress testing - Part 1: Modules

IEC TR 63279: Sequential and combined accelerated stress testing for de-risking photovoltaic modules

Activities

IEC TS 63126 ED2: Guidelines for qualifying PV modules, components and materials for operation at high temperatures

Status: **Approved to start work**

Increased Reliability cont.

Activities

IEC TS 63209-2: Extended-stress testing of photovoltaic modules – Part 2: Component materials and packaging

Status: **Being published**

Re-use of PV modules

Development of a Technical Report for the "Re-use of PV modules and circular economy"

Status: **Ongoing**

Missing or needed items

How to measure Perovskite devices.

Impacts the 60904-x series

Perovskite specific requirements for type approval and safety testing

Impacts the 61215 series and 61730

- Measurement issues, Gate 1 and Gate 2
- Stabilization of the metastability
- Any technology specific requirements for the climatic testing?

Sustainability issues

- All technologies

How to get involved in standardization

National

- Contact your national committee to be included in the distribution and discussion of documents

International

- Via your national committee, volunteer to be a member of TC82 working groups

If interested in experimental work and development of material standards, comparative testing or manufacturing QA then join

- International Photovoltaic Quality Assurance Task Force (PVQAT)

<http://www.pvqat.org>

Thank you



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