

PV Module Certification Standards: What You Need to Know

A factual, structured overview for manufacturers and industry professionals

Content Partner: J. v. G. technology GmbH

Turnkey solar module production lines — since 1997

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A Technical Overview of PV Module Certification Standards



Created as part of the PVKnowHow Knowledge Network



Prepared by J.v.G. Technology GmbH



European specialists in turnkey solar module production lines

Why Certifications Matter in PV Manufacturing

Market Access

- Certifications are a legal requirement in most major markets
- Uncertified modules are effectively excluded from commercial projects

Bankability

- Financial institutions require third-party certified modules
- Certification signals reliability and projected long-term yield

Quality & Safety

- Standards minimize fire, electrical, and mechanical hazards
- Protects manufacturers from liability and product recalls

The Role of Standards: Quality, Safety, Market Access

Quality Assurance

- Standards define minimum performance thresholds
- Accelerated aging tests simulate 25+ year product lifetime
- Metrics include power output, temperature coefficient, efficiency retention

Safety Assurance

- Covers electrical shock, fire hazard, and mechanical failure risks
- Construction requirements for insulation, grounding, and enclosures
- Mandatory in most markets for legal installation

Regulatory Compliance

- Certifications unlock grid connection, subsidies, and insurance
- Regional frameworks (EU, US, global) each define their own requirements
- Non-compliance blocks permitting and project financing

Major Certification Bodies Overview



IEC – International Electrotechnical Commission

- Publishes globally recognized PV module standards
- Foundation for most national and regional frameworks
- Key body: IEC TC-82 (Solar Photovoltaic Energy Systems)



UL – Underwriters Laboratories

- Primary certification body for the North American market
- Issues UL 1703 and the harmonized UL 61730 standard
- Products must be tested by a UL-recognized NRTL



IECEE CB Scheme

- International mutual recognition system for safety test results
- One test report accepted across 50+ member countries
- Reduces duplication and cost for multi-market manufacturers

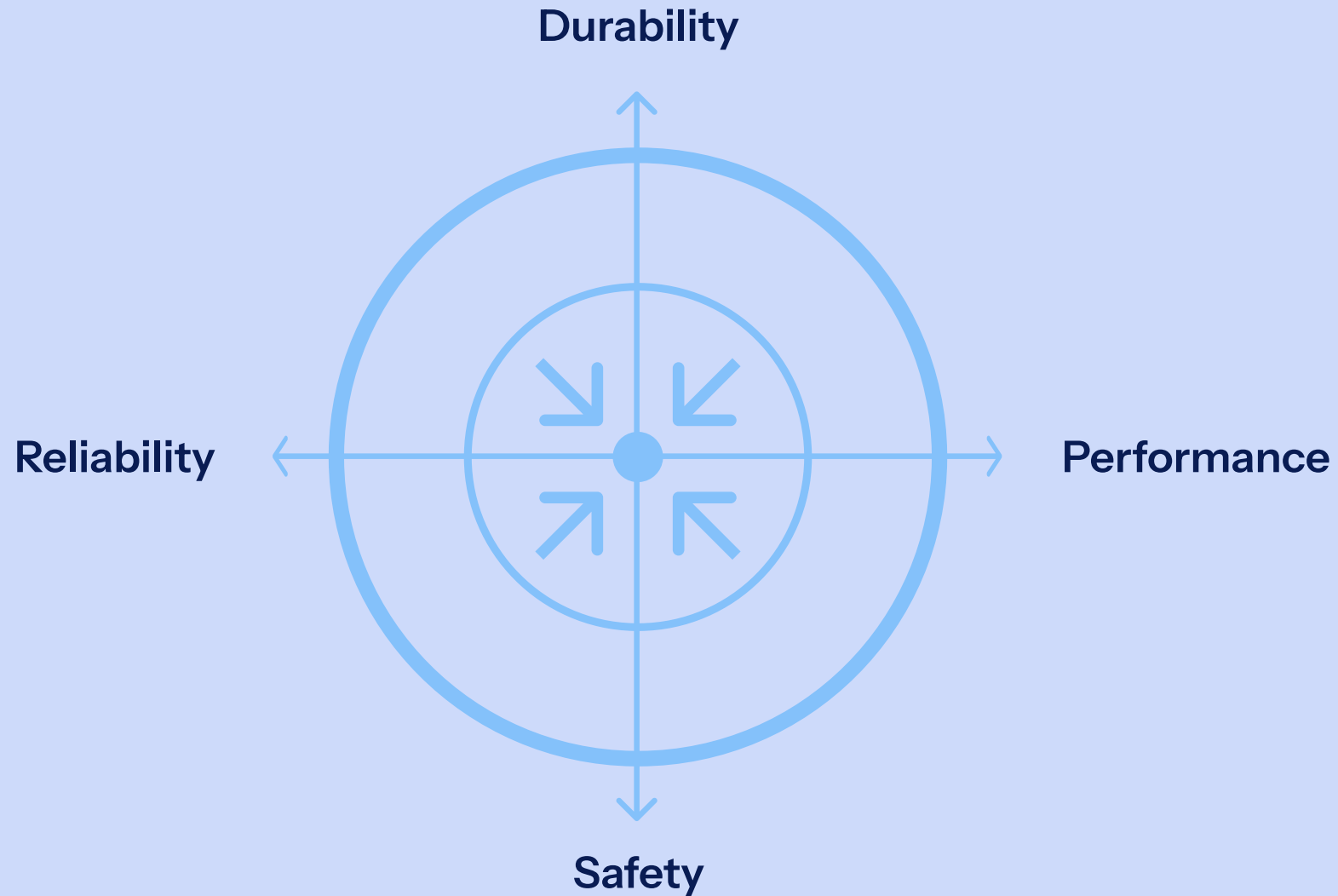
Core IEC Standards: IEC 61215 & IEC 61730

IEC 61215 — Design Qualification & Type Approval

- Tests long-term performance and durability of PV modules
- Covers UV, thermal cycling, humidity, mechanical load, and hail
- Determines power output metrics at Standard Test Conditions (STC)
- Applies to all flat-plate technologies: crystalline silicon and thin-film
- Typical test duration: 60–90 days; ~10 module samples required

IEC 61730 — Safety Qualification

- Defines construction requirements to ensure safe electrical operation
- Tests for electrical shock, fire hazard, and mechanical integrity
- Two parts: Part 1 (construction requirements) / Part 2 (testing sequences)
- Coordinated with IEC 61215 — single sample set can be used for both
- Updated 2023 edition: improved fire testing ($\geq 815^{\circ}\text{C}$), new material requirements



Additional IEC Tests: Specialized Conditions

IEC 61701 — Salt Mist Corrosion

- Tests module resistance to salt-laden coastal environments
- Required for offshore, coastal, and marine installations
- Evaluates corrosion of frames, connectors, and encapsulants

IEC 62716 — Ammonia Resistance

- Tests resistance to ammonia exposure (agricultural environments)
- Relevant for agri-PV and farm-adjacent installations
- TÜV certification may require ammonia testing as standard

IEC 62804 — PID Testing

- Tests for Potential Induced Degradation (PID) resistance
- Critical for high-voltage system configurations
- Increasing importance as utility-scale voltages rise

Regional Regulatory Frameworks

Region	Key Requirements	Notes
European Union	CE Marking + IEC 61215 / IEC 61730 (EN versions)	Mandatory for free movement of goods within EU/EEA
United States	UL 1703 or harmonized UL/IEC 61730	Required for NEC compliance; UL 61730 increasingly standard since 2020
Canada	UL 1703 / CSA C61215 / UL 61730	Cross-certification with US possible under harmonized standard
Global (Multi-market)	CB Scheme (IECEE)	Single test report recognized in 50+ countries; reduces cost
General Compliance	CE, FCC, RoHS	Electromagnetic compatibility (FCC) required for US; RoHS for hazardous materials (EU)

Key Certification Overview

Category	Standard / Scheme	Scope & Purpose
Core Standards	IEC 61215	Design qualification — long-term performance and durability testing
Core Standards	IEC 61730	Safety qualification — electrical, fire, and mechanical safety
Additional Tests	IEC 61701	Salt mist resistance — required for coastal/marine environments
Additional Tests	IEC 62716 / IEC 62804	Ammonia resistance / PID testing for specialized installations
US Market	UL 1703 / UL 61730	Safety standard for North American market; UL 61730 is harmonized successor
Global Access	CB Scheme (IECEE)	Mutual recognition of test reports across 50+ countries
Compliance Marks	CE / FCC / RoHS	EU market entry (CE), US EMC compliance (FCC), hazardous materials (RoHS)

 Source: PVKnowHow / J.v.G. Technology GmbH

Strategic Importance for PV Manufacturers

1

Bankability

Financial institutions treat IEC certification as minimum due-diligence requirement for project financing

2

Brand Credibility

Certification demonstrates third-party validated quality — critical for new market entrants

3

Export Eligibility

EU, US, and other key markets legally require certification before modules can be sold or installed

Challenges in the Certification Process

Time & Cost

- Full IEC 61215 program: typically 60–90 days per test cycle
- Multiple standards require separate submissions and sample sets
- Multi-market manufacturers may face duplicated testing costs

BOM Sensitivity

- Certification applies to a specific module design and bill of materials
- Any change to components may trigger full or partial re-testing
- Supply chain flexibility is constrained by certified BOM requirements

Regulatory Divergence

- Regional differences between IEC, UL, and national standards persist
- Evolving standards (e.g. IEC 61730 2023 update) require re-evaluation
- Location-specific requirements add complexity for export-oriented manufacturers

Market Access & Competitive Advantage

EU Market

- CE Marking + IEC 61215/61730 required
- EN (European Norm) versions apply within EU/EEA
- Binding renewable energy targets sustain demand

US Market

- UL 1703 or UL 61730 required for NEC compliance
- Installation permits not issued without UL listing
- Grid connection and government rebates contingent on certification

Global Markets

- CB Scheme enables single-test multi-country market access
- Reduces time-to-market in new geographies
- Harmonized UL/IEC 61730 streamlines US + international approval

Certification Planning: Key Considerations

01

Define Target Markets Early

Identify required certifications before production line design is finalized

EU, US, or global scope determines which standards apply

02

Design for Certifiability

Select components and materials that comply with certified BOM requirements

Production methodology must support repeatable, auditable quality

03

Engage Accredited Test Labs

Work with IECEE-accredited or NRTL-approved laboratories

Factor 60–90 day testing cycles into product launch timelines

04

Plan for Ongoing Compliance

Standards evolve — monitor IEC and UL updates regularly

BOM changes require re-evaluation; maintain robust change control processes

Summary: Certification as a Strategic Asset

Not Optional – Foundational

- IEC 61215 + IEC 61730 are the global baseline for market-ready modules
- Absence of certification excludes manufacturers from all serious projects

Plan from Day One

- Certification requirements must inform factory design and BOM selection
- Mistakes in the planning phase are costly to correct post-production

Multi-Market Strategy

- CB Scheme and harmonized UL/IEC 61730 reduce multi-market complexity
- Strategic certification portfolio directly expands addressable market

📄 This presentation is based on publicly available industry standards data. Source: PVKnowHow / J.v.G. Technology GmbH – composite scenario based on real consulting experience.

About the Content Partner

J. v. G. technology GmbH – The DESERT Company

Founded in 1997 in Bavaria, Germany. Family-owned engineering company specializing in turnkey solar module production lines.

More than 90 factory projects delivered worldwide.

On-site team training included – no prior manufacturing experience required.

Key areas:

Turnkey PV manufacturing lines | DESERT Technology® |
TÜV-certified module designs | Factory planning to production

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