



Performance standards for photovoltaic (PV) systems

UL provides both safety and performance certification for PV equipment

While safety standards are important in the equipment purchase decision-making process, buyers and project developers are also concerned with performance. To address such concerns, UL has published a new set of performance standards specifically suited for PV modules, accompanied by a unique three-tiered certification program.

New performance standards: UL 61215 (crystalline modules) and UL 61646 (thin-film modules)

In today's PV market, consistency of power output performance is vital. Factors that affect reliability are material selection, production processes and installation environments at various global locations, all of which can alter and potentially affect the intended power output performance. This can impact both the quantity of modules needed based upon nameplate power ratings and the actual power output when installed.

UL performance certification provides a reliable indicator of power output as well as other parameters, such as electrical and thermal characteristics of modules or the capability to withstand prolonged exposure to temperature change. With the addition of on-going verification, UL is able to verify a high measure of reliability that can be useful in addressing bankability concerns.

Project developers, financiers and owner-operators will identify the UL performance certification as an indication of a high integrity module fit for use. The certificate-based testing service shows compliance to UL 61215 (crystalline modules) and UL 61646 (thin-film modules) for power output performance, and may be supplemented with additional stressor tests beyond the standard definition. Regarding safety requirements, ANSI/UL 1703 remains the UL standard for PV module safety, with requirements to address electric shock, fire, and mechanical hazards.

Benefits of PV performance certification by UL

- **PV equipment manufacturers can look to UL as their single source for both safety and performance**
- **Performance certification provides a basis to support the reliability and bankability concerns of stakeholders**
- **Third-party verification of performance of PV modules provides integrity and independence of product performance claims**
- **UL 61215 and UL 61646 are equivalent to the IEC standards, allowing manufacturers to demonstrate their product's performance for international and U.S. solar markets**
- **On-going verification services can be bundled with traditional product safety follow-up services**

Three-tiered certification service

Evaluation and testing is conducted at one of UL's five global PV laboratories and/or at the PV module manufacturing facility as identified in UL 61215 or UL 61646. After attaining certification and successful completion of the required inspections, the manufacturer is issued a certificate and is authorized to market the product as "UL performance certified". Additionally, UL may accept a CB report for the equivalent IEC standard, and, after its review and any additional testing, can issue the UL performance certification, possibly at a reduced cost.

On-going performance verification

The on-going performance verification service provides confidence that the performance of a PV module is as stated by the manufacturer, even after the initial performance certification has been issued. While the Bronze level product construction inspection and examination of the manufacturing process roughly corresponds with a traditional product safety follow up-service, the Silver and Gold levels include more in-depth and on-going product testing.

Bronze Level	Silver Level	Gold Level
Performance certification testing as identified in UL 61215 / UL 61646	Performance certification testing as identified in UL 61215 / UL 61646	Performance certification testing as identified in UL 61215 / UL 61646
	Additional initial testing conducted: <ul style="list-style-type: none"> – Potential Induced Degradation (PID) testing sequence – Electro-Luminescence photo pre-/post-testing sequences – Gel Content test 	Additional initial testing conducted: <ul style="list-style-type: none"> – Extended Temperature Cycling and Damp Heat testing sequences – Potential Induced Degradation (PID) testing sequence – Electro-Luminescence photo pre-/post-testing sequences – Gel Content test
Product inspection on a quarterly basis following initial certification	Product inspection on a quarterly basis following initial certification	Product inspection on a quarterly basis following initial certification
	Product testing on an annual basis following initial certification <ul style="list-style-type: none"> – Limited Temperature Cycling, as applicable to the technology, and Damp Heat testing sequences – Potential Induced Degradation (PID) testing sequence – Electro-Luminescence photo pre-/post-testing sequences – Gel Content test 	Product testing on a bi-annual (twice yearly) basis following initial certification <ul style="list-style-type: none"> – Limited Temperature Cycling, as applicable to the technology, and Damp Heat testing sequences – Potential Induced Degradation (PID) testing sequence – Electro-Luminescence photo pre-/post-testing sequences – Gel Content test
On-going verification includes: <ul style="list-style-type: none"> – Auditing the manufacturer's relevant test equipment calibration – Reviewing the production power output logs – Physically reviewing the product – Quality program audit 	On-going verification includes: <ul style="list-style-type: none"> – Auditing the manufacturer's relevant test equipment calibration – Reviewing the production power output logs – Physically reviewing the product – Quality program audit – Plus annual test program 	On-going verification includes: <ul style="list-style-type: none"> – Auditing the manufacturer's relevant test equipment calibration – Reviewing the production power output logs – Physically reviewing the product – Quality program audit – Plus bi-annual test program

NOTE: Tests, sequences and program details vary for thin-film based technology.

For more information, please contact your local sales team or visit ul.com