



Microinverters and the technology behind durable performance

Photovoltaic (PV) inverters convert DC power from solar panels into AC power, crucial for solar setups. Their efficiency significantly impacts overall system performance. By converting power from each solar panel individually, they ensure optimal performance without being affected by others. As the microinverter market grows, establishing standards for evaluation is essential. This article outlines key tests and criteria for assessing durable microinverters.



An extended warranty to get your solar covered

While the performance warranty for PV modules using string inverters can be as long as 30 years, string inverters themselves are generally designed with a 15 year service life in mind. Depending on the inverter design, the materials used, and the installation environment, their actual typical life ranges from 8 to 15 years. That's a two to four times lifespan difference between the two. In a real life scenario, this means that string inverters are likely to need replacing halfway through the service life of the PV system.

So the warranty period is the first thing you should consider. Normally, a standard 12 years is reasonable, and leading microinverter manufacturers may have extensions to 25 years.

This ensures that the life span of the microinverters matches that of your PV modules, making the subsequent operation and maintenance of the PV system more convenient and cost effective.

The IP67 Hi-level Protection test

Since PV setups are placed outdoors, a high IP rating is needed to ensure the absolute protection of microinverters against dust and water. Normally, an IP67 rating represents

a good level of protection. This means that the microinverter can resist the force of water hoses and jet sprays, and tolerate submersion in water of a depth between 150 mm to 1000 mm for up to half an hour.

Microinverters with an IP67-rated enclosure are assured to operate effectively in indoor and outdoor environments, as well as in challenging industrial and commercial situations.

Mechanical environment testing of microinverters and components

Microinverter components must also meet critical performance and reliability requirements.

High standard microinverters are put through a series of rigorous vibration, shock, and drop tests to simulate the mechanical environment that microinverters may experience during transportation and installation. Make sure that the microinverter you are looking for is compliant with IEC 62093:2022.

Enhanced lightning and surge testing

A signal generator is used to produce a 6000 V surge voltage: after multiple tests, the microinverter unit must not show any abnormalities to pass.

The threshold requirement stipulates that any microinverter withstanding a 2000 V surge test (Category III) receives a green light. Some manufacturers would choose a much stricter 6000 V surge test (Category IV).

The strength of this testing means our microinverters can make a real difference to your solar setup. In addition to a sudden voltage surge from the grid, PV systems may also experience lightning during bad weather. A lightning strike can pose high voltage and electric shock risks, so your system components must be strong enough to deal with these rare situations.

This standard makes sure your whole system will not malfunction even if the lightning protection measures of your property/building fail and a voltage surge strikes the microinverter directly.

Salt spray test: competence against corrosion

An Industrial Grade Salt Spray Test is a method commonly used to evaluate the corrosion resistance of industrial products. By simulating salt spray corrosion in marine environments, the test examines the durability of the product in harsh environmental conditions.

During the test, the product is usually exposed to a salt spray or salt water mist for a designated period of time while being observed for rust, corrosion or other damage on the surface.

The successful passing of the test means that the products have excellent corrosion resistance and are able to operate stably for long periods of time in marine environments. Generally, products that pass this test are safe to use in offshore engineering, marine equipment, seaside wind power and other scenarios that are prone to salt spray erosion.

Temperature and humidity test

The temperature and humidity test is an essential evaluation procedure designed to assess the resilience and endurance of products under extreme environmental conditions. Important test items include:

- Constant humidity and heat operation test. This is to test the maximum temperature and humidity the product can work in, without affecting the performance of the equipment
- 85°C temperature and 85% humidity test: This is to simulate harsh environmental conditions to make sure the internal components of the microinverter are still reliable for a long time under these conditions

These tests can ensure the durable performance of PV systems in high temperatures and the humid conditions that are typical in coastal areas.

Ultraviolet exposure testing

Ultraviolet (UV) Exposure Testing is a method that evaluates the durability performance of materials and products. By simulating the UV exposure of sunlight, the test examines the product's durability in outdoor environments.

During the test, microinverters are exposed to UV light for a certain period of time and are then observed for color changes, cracks, fading or other aging signs. The successful passing of the UV exposure test means that the product has good anti-aging performance and can resist UV radiation in sunlight, and other natural environmental factors. Qualified products can be safely used in outdoor applications such as building facades, outdoor decoration, solar photovoltaics, and other scenarios that are usually under direct sunlight.

Ammonia testing

Ammonia testing evaluates the durability and reliability of electrical and electronic equipment in environments containing ammonia. In ammonia testing, equipment is placed in an environment containing ammonia gas to simulate real life contamination conditions. This is to see if the equipment

can maintain its performance and longevity in harsh environmental conditions.

Some countries and regions have regulations or standards that require equipment to be tested in specific scenarios to ensure that it can operate safely and reliably. These regulations and standards typically apply to sites such as industrial production sites, chemical plants, farms, and breeding grounds, where leaks of corrosive gases such as ammonia may occur.

Mixed gas testing

Mixed gas testing evaluates the durability and reliability of electrical and electronic equipment in specific environments contaminated with multiple gases. It typically exposes equipment to conditions that simulate the complex atmospheric conditions found in locations such as industrial production sites, chemical plants, and wastewater treatment plants, among others.

Regulations and standards in certain countries and regions require mixed gas testing to ensure the safe and reliable operation of equipment in these environments.

These tests involve a combination of gases, such as hydrogen sulfide, ammonia, and methane, depending on specific industries and environments.

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