ATLAS 25+

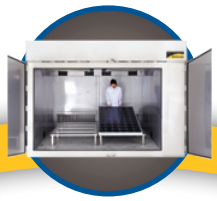
Comprehensive PV Durability Testing

ATLAS
MATERIAL TESTING SOLUTIONS

AMETEK®
MEASUREMENT & CALIBRATION TECHNOLOGIES

The Atlas 25+® Standard Testing Program

3 Condensing Humidity



4 Solar/Thermal Humidity Cycle

5 Solar/Thermal/ Humidity/Freeze Cycle

2 Salt Spray Corrosion

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6 Arizona Solar Tracking
Including peak summer

1 UV-A/UV-B Exposure

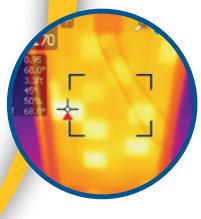
8 Results and Data

Completion of the Atlas 25+ Program provides test data that would otherwise be unattainable with current test methods.

Reporting of results after each measurement set and a final report details all data, images and analyses at the end of the one year sequence.

7 Initial, Final and Multiple Interval Measurements

Consists of visual inspections, IV curves, infrared thermographs, electroluminescence, wet leakage and digital photography



Outdoor solar tracking in subtropical South Florida and Arizona Sonoran desert

The Atlas 25+ standard testing program exposes one module to the series of combined stresses outlined in the diagram above, while simultaneously two replicate modules are subjected to outdoor exposure for a full year at the South Florida and Arizona Sonoran Desert test facilities for reference data points.

To learn more about the Atlas 25+ Program,
contact your local Atlas sales representative
or visit us online at **www.solardurability.com**

Testing Tiers

The three different testing tiers allow you to select the appropriate stresses and test durations for your module based upon your needs.

Basic

Outdoor Exposure	6 months
Testing Locations	Desert Sub-Tropical
Modules Tested	4*
Interim Evaluations	1
Additional Tests	None

Standard

Outdoor Exposure	12 months
Testing Locations	Desert Sub-Tropical
Modules Tested	4*
Interim Evaluations	5
Additional Tests	None

Premium

Outdoor Exposure	12 months
Testing Locations	Desert Sub-Tropical High Altitude Tropical Corrosion
Modules Tested	6*
Interim Evaluations	6
Additional Tests	Elevated Temperature Exposure

* All tiers include a laboratory and a control module and comprise of two of the modules tested

Atlas has been pioneering weathering testing for over 85 years. Our industry-leading accelerated weathering equipment along with our consulting services provide our customers with superior, easy-to-use technology and advanced testing solutions.

Durability Testing Designed for PV

To address the unique needs of the photovoltaic industry, Atlas has developed a comprehensive durability testing program specifically for photovoltaic modules – Atlas 25+®. The program now offers basic, standard and premium testing tiers.

Long-term Environmental Exposure

Atlas 25+ provides a crucial missing component to the IEC type design qualification tests, that of predicting the effects of long-term environmental exposure during the product lifetime. Instead of comprising isolated, individual stresses targeted at infant mortality, Atlas 25+ consists of a series of combined stresses applied to photovoltaic modules, providing a true analog of the effects of long-term ageing resulting from exposure to the elements.

To put it simply, Atlas 25+ is a proprietary, multi-dimensional durability testing program designed to subject photovoltaic modules to the environmental degradation stresses which can be expected over long-term service.

Certification, Data, Support and Independent Validation

Atlas' partnership with SGS provides customers with certified test results by an internationally recognized certification body. Atlas 25+ provides manufacturers with the data they need to demonstrate long-term durability and to support warranty and performance claims while reducing the costs associated with aftermarket product failure.

The Atlas 25+ mark serves as a key product differentiator and provides photovoltaic module manufacturers and financial stakeholders with the proof of independent third-party environmental durability testing by the recognized industry leader.

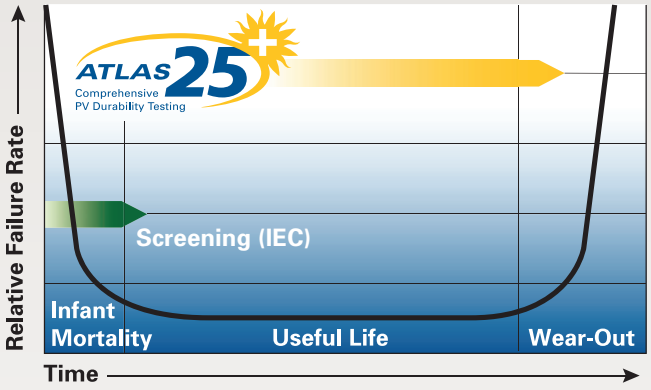
SGS

ATLAS 25+ TESTED

Atlas 25+® and IEC Design Qualification Testing

IEC Tests for Terrestrial PV Modules

- Qualification, safety and infant mortality
- Isolated, individual stress tests
- Premature, catastrophic failure over short time frames



Atlas 25+ Comprehensive PV Durability Testing

- Simulates long-term environmental exposure effects
- Subjects modules to combined stresses
- Natural simultaneous exposure to solar radiation load with temperature/humidity and freeze/thaw cycles; additional corrosion and condensing humidity
- Short-term diurnal and long-term seasonal cycles closely simulate nature
- True analog of the synergistic effects of weathering in end-use conditions
- Complements short-term IEC qualification tests with long-term durability and reliability assessment to support warranty and performance claims

	DESIGN QUALIFICATION ENVIRONMENTAL TESTS	ATLAS 25+ ENVIRONMENTAL LIFE TESTS
INTENT	• Accelerated tests to screen for major material, design and manufacturing flaws resulting in premature, "infant mortality" failures	• Accelerated environmental durability testing for accumulated damage of long-term exposure
CLIMATE STRESSES	• Delivered to separate modules • Temperature-only cycling • UV preconditioning • Humidity/Freeze cycling, damp heat test	• Alternating temperature/humidity cycling and temperature/humidity/freeze cycling with full spectrum solar load and forward bias • UV, salt spray and condensing humidity
STRESS LEVELS & DELIVERY	• No module goes through all tests • Limited to one or two stresses	• Select module goes through full test sequence • Climate derived conditions • Multiple, simultaneous stresses • Short- and long-term cycles • Global composite climate conditions • Alternate hot arid desert, tropical/subtropical or northern temperate climate conditions available • Optional modifiers: coastal/marine; alpine/snow load; urban/industrial; dust/dirt/mildew effects
CORROSION TESTING	• Damp heat test	• Salt spray and condensing humidity tests
OUTDOOR EXPOSURES	• No long-term outdoor exposure	• Combination of laboratory and accelerated outdoor exposures for one year
CYCLES & CONDITIONS	• Few cycles • Harsher conditions	• More cycles • Climate derived conditions
OPERATIONAL	• No forward bias • No electrically related corrosion, migration or arcing	• Forward bias, resistive load • Realistic electrical operation at Max Power Point (MPP)

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Atlas Material Testing Technology LLC. +1.773.327.4520
Atlas Material Testing Technology GmbH +49.6051.707.140
www.solardurability.com or
www.atlas-mts.com

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