

# ATLAS WEATHERING SERVICES GROUP PRODUCTS AND SERVICES



The Global Leader in  
Product Durability, Performance,  
Weathering Testing Instruments  
and Services



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# Outdoor Weathering Locations

## World's Largest Network of Natural Weathering Facilities

The climates of southern Florida and central Arizona are recognized as global benchmarks for natural weathering environments. The warm, humid, subtropical environment of our outdoor test sites in Miami and the intense sun and arid climate of our site in Phoenix are some of the harshest climates to which your products can be exposed. Often the best natural weathering test scenario requires testing in a variety of climates. For that reason, Atlas offers the world's largest network of outdoor weathering test facilities with more than 20 sites worldwide.

## South Florida, USA

Our South Florida Test Service continues to pioneer natural exposure testing. Located in a rural, unpolluted environment, SFTS provides clients with more than 70 years of experience in weathering. This subtropical location is used by companies worldwide for exposure testing of paints, coatings, textiles, plastics and other various products.

## Central Arizona, USA

Arizona, like Florida, possesses high levels of solar radiation and elevated temperatures. However, unlike Florida, Arizona has an arid climate that can have a distinct effect on material durability.

Atlas Weathering Services Group's Arizona desert site, DSET Laboratories, is in an unpolluted environment. Since 1948, DSET has offered desert exposure testing suitable for materials used in a wide range of industries, including automotive, construction and consumer products.

## Sanary-sur-Mer, France

The Bandol region of France is in a typical Mediterranean climate. With 3,000 hours of sunlight per year, an elevation of 110 m (361 ft), average wet time of 2,700 hours, and a proximity to the Mediterranean Sea of only 4 km (2.5 miles), the site is used by many European companies to test a wide range of materials.

## Chennai, India

Located near Chennai, it is the first official outdoor exposure site in India and is characterized by a tropical climate with high levels of sunlight, humidity and temperature. This site provides valuable test data for many industries, including: automotive exterior and interior; architectural and building products; consumer durable goods; and lightfastness of textiles.

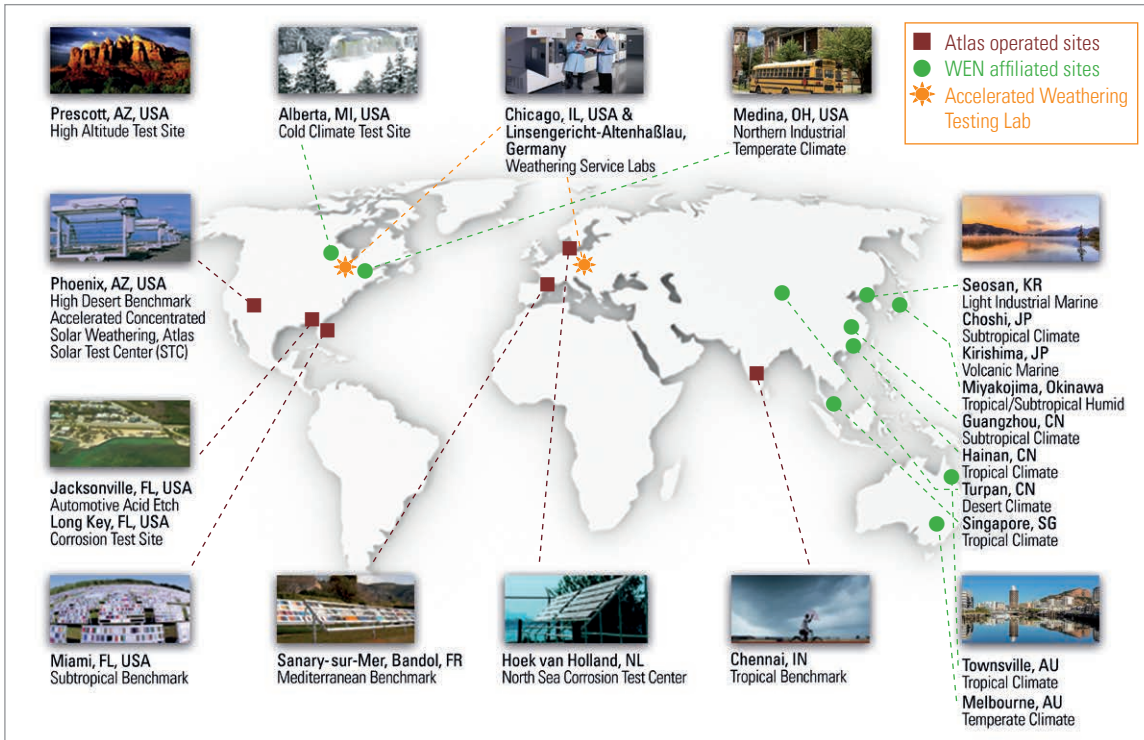


South Florida, USA



Central Arizona, USA

# Atlas' Worldwide Exposure Network (WEN)



Annual Climatological Data*	Latitude	Longitude	Elevation (m)	Avg. Ambient Temp. (°C)	Avg. Ambient RH (%)	Rainfall (mm)	Total Radiant Energy (MJ/m <sup>2</sup> )
Prescott, Arizona	34° 39' N	112° 26' W	1531	12	65	1093	7000
Phoenix, Arizona	33° 54' N	112° 8' W	610	22	37	225	8004
Chicago, Illinois	41° 47' N	87° 45' W	190	10	69	856	5100
Medina, Ohio	41° 7' N	81° 54' W	336	10	72	844	5100
Keys, Florida	24° 33' N	81° 45' W	1	25	73	989	N/A
Jacksonville, Florida	30° 29' N	81° 42' W	8	20	76	1303	5800
Miami, Florida	25° 52' N	80° 27' W	3	23	78	1685	6588
Alberta, Michigan	46° 65' N	88° 48' W	399	6	64	847	N/A
Hoek van Holland, The Netherlands	51° 57' N	4° 10' E	6	10	87	800	3800
Sanary-sur-Mer, France (Bandol)	43° 8' N	5° 49' E	110	13	64	1200	5500
Singapore, (Changi Airport)	1° 22' N	103° 59' E	15	27	84	2300	6030
Hainan, China	19° 15' N	110° 28' E	10	24	81	3013	4664
Guangzhou, China	23° 8' N	113° 17' E	6	22	79	1492	4590
Chennai, India	12° 35' N	79° 48' E	45	28	72	1252	6760
Seosan, Korea	36° 55' N	126° 21' W	7	12	75	1235	4700
Miyakojima, Okinawa	24° 44' N	125° 19' E	50	23	76	1741	4894
Choshi, Japan	35° 43' N	140° 45' E	53	14	78	1682	4659
Melbourne, Australia	37° 49' S	144° 58' E	35	16	62	650	5385
Townsville, Australia	19° 15' S	146° 46' E	15	25	70	937	7236

\* Extracted from published data or measured at test site. Other sites in Australia are also available, please contact your local Atlas representative for more information.

# Data Acquisition, Accreditation, Certification

## State-of-the-art Weather Data Tracking and Reporting

Our benchmark exposure sites offer the latest technology in weather reporting instrumentation, such as total solar (UV, Visible and IR), total UV and narrow-band UV radiometers and pyheliometers. Instruments for monitoring ambient temperature and humidity, rainfall, total wet-time and wind speed are also employed. All instruments are directly traceable to national and international standards, including the World Radiometric Reference (WRR) and the National Institute of Standards and Technology (NIST).

## Reporting

Reporting of testing results and test status are customized and delivered electronically in PDF and XLS formats.

## Quality Accreditation

Atlas` sites are accepted and accredited testing laboratories by the following:

- ISO/IEC 17025 (all Atlas weathering locations)**

Atlas has always focused on being the quality leader in the weathering industry. As a result, Atlas was the first weathering organization to receive accreditation to ISO/IEC 17025, General Requirements for the Competence of Testing and Calibration Laboratories. Atlas was also awarded the first ever A2LA ISO 17025 accreditation for technical competence in calibrating radiometers used for solar and various light source irradiance measurements.

- AMECA (Arizona, Florida)**

Atlas laboratory facilities and personnel are fully accredited by the Automotive Manufacturers Equipment Compliance Agency, Inc. (AMECA), for compliance with all AMECA laboratory requirements.

- FGIA (Arizona, Florida, Chicago)**

Atlas is an approved laboratory to perform American Architectural Manufacturers Association (AAMA) indoor and outdoor test methods.

- CRRC (Arizona, Florida, Ohio)**

The Cool Roof Rating Council (CRRC) has accredited Atlas Weathering Services Group as the first approved Test Farm facility for the CRRC's Product Rating Program. To earn the coveted CRRC rating, roofing manufacturers and sellers must perform weathering tests through Atlas for three years at locations in Florida (hot/humid), Arizona (hot/dry) and the Midwest (cold/temperate).

*For more detailed information about accreditation at any of our outdoor sites, contact your local Atlas representative.*



## Test Site Data

	Florida SFTS	Arizona DSET	Sanary, France
<b>Latitude</b>	25° 52' N	33° 54' N	43° 08' N
<b>Longitude</b>	80° 27' W	112° 8' W	5° 49' E
<b>Elevation</b>	3 m	610 m	110 m
<b>Avg. High Temperature</b>			
<b>Summer</b>	34° C (93° F)	39° C (102° F)	23° C (73° F)
<b>Winter</b>	26° C (79° F)	20° C (68° F)	9° C (48° F)
<b>Avg. Relative Humidity</b>	78%	37%	76%
<b>Total Rain</b>	1685 mm	255 mm	700 mm
<b>Total UV 295-385 nm</b>	280 MJ/m <sup>2</sup>	333.5 MJ/m <sup>2</sup>	382.4 MJ/m <sup>2</sup> *
<b>Total Radiant Energy 295-3000 nm</b>	6588 MJ/m <sup>2</sup>	8004 MJ/m <sup>2</sup>	5500 MJ/m <sup>2</sup>

\* Data measured from 300-400 nm

## Average Monthly UV and Total Radiant Energy (MJ/m<sup>2</sup>)

Month	26° South (Miami)		34° South (Phoenix)	
	UV	Total	UV	Total
January	20.0	505	20.1	490
February	22.5	545	19.8	546
March	26.5	618	24.7	633
April	28.0	612	33.3	755
May	28.0	609	38.6	786
June	25.7	543	36.8	770
July	24.7	532	35.1	745
August	24.0	543	32.5	756
September	22.3	540	29.3	711
October	21.7	555	25.8	705
November	18.0	490	19.2	582
December	18.6	496	18.3	525
<b>Annually</b>	<b>280.0</b>	<b>6588</b>	<b>333.5</b>	<b>8004</b>

# Outdoor Exposure Methods

## Direct Weathering

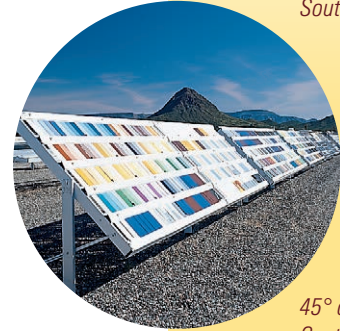
Direct weathering, also known as outdoor, natural, or static weathering, is defined as an exposure to direct sunlight and other elements of weather. Standard racks are made from anodized aluminum and face directly south (in the Northern Hemisphere) at a fixed angle. The typical sample size is 105 x 305 mm (6" x 12"). Common angles of exposure are near horizontal (usually 5°), 45°, vertical (90°), and equal to the site latitude (26° and 34° in south Florida and central Arizona, respectively). The angle of exposure used depends on the end-use application of the material or a specific test method requirement.

## Backed vs. Open-backed

Open-backed exposures are natural weathering tests conducted by either fastening or clamping the specimens at their extremities so that most of the material will be exposed to the circulation of ambient air on all sides of the sample. Glass, free-films, coil coatings, and plastic lenses such as taillight assemblies are commonly exposed in this open-backed condition. Backed exposures are conducted by mounting the specimens to a substrate (usually 12 mm [1/2"] plywood) to simulate the end-use thermal environment of the material. Polyvinyl chloride (PVC) siding, roofing membranes, and automotive molding would be typically exposed on a backed exposure rack.



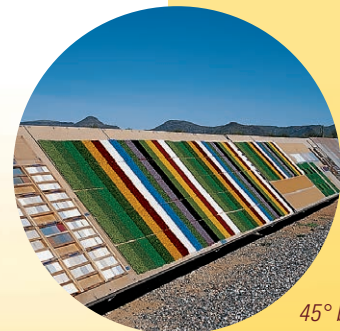
*Window assemblies mounted on a 90° open-backed rack - South Florida*



*45° open-backed rack - Central Arizona*



*90° backed rack - South Florida*



*45° backed rack - Central Arizona*



*45° backed rack - South Florida*



*Racks in the direct weathering test field - South Florida*

# Accelerated Laboratories

The Testing Laboratories of the Atlas Weathering Services Group



The Mount Prospect, Illinois, USA and Linsengericht-Altenhasslau, Germany laboratories complement each other to offer a global breadth of capabilities.

## State-of-the-art Weathering Testing Instruments

The AWSG Accelerated Laboratories have nearly 100 instruments to meet all of your testing needs, including:

- Xenon-arc, from small table top to large rotating rack instruments
- Fluorescent UV devices, commonly used for testing paints and coatings
- Sun simulation climatic chambers, for testing large 3-dimensional components
- UVC testing devices, to evaluate the effect on materials to Ultraviolet Germicidal Irradiation (UVGI)
- Carbon-arc test chambers, for tests based on older material specifications
- Salt Fog and Cyclic chambers for corrosion testing

*Ci-Series Weather-Ometers®*



*Xenotest Family*



*SUNTEST Family*



*SC2000*



*SC600*



*UVTest and UVCTest*





## A selection of international standards in the Atlas testing laboratories

AATCC	TM 16E		TM 16.3		TM 169			
ASTM	C1442 D4303 D7869	D750 D4355 F1164	D904 D4459 F1515	D1670 D4798 G151	D2565 D5010 G152	D3424 D5071 G153	D3451 D6551 G154	D4101 D6695 G155
Ford	FLTM BO 116-01							
GB/T	1865 16422	3511 16991	6151 32088	8427	8430	10485	14522	16259
GM	GM 9125P	GME 60292	GMW 14162	GMW 14170	GMW 14650	GMW 3414		
Hyundai Motor Co.	MS 210-05	MS 300-32						
IEC	61345							
ISO	105-B02 4892-3 18930	105-B04 11341 18937	105-B06 11507	105-B07 12040	105-B10 16474-1	3917 16474-2	4892-1 16474-3	4892-2 18909
JASO	M346	M351						
JIS	B7754	D0205						
MIL STD	810F	810G						
Peugeot/Citroën (PSA)	D27 1389	D47 1431						
Renault	D27 1911	D47 1431						
SAE	J1885	J1960	J2020	J2412	J2413	J2527		
VDA	621-429	621-430	75202					
VW	PV 1303	PV 1306	PV 3929	PV 3930				





# EMMAQUA<sup>®</sup>

## Equatorial Mount with Mirrors for Acceleration, with Water (Aqua)

### Weathering with Sunlight In a Fraction of Time

EMMAQUA employs 10 highly reflective mirrors and a sun-tracking system to concentrate sunlight onto test specimens. The result is natural weathering testing in a fraction of the time. In addition, you get the closest correlation to end-use conditions because samples are exposed to the full spectrum of natural sunlight.

### Test Apparatus

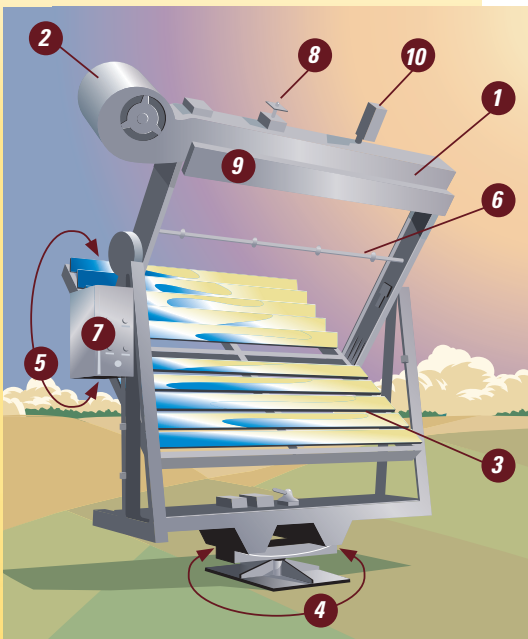
Our DSET Laboratories pioneered the development of the EMMAQUA outdoor accelerated test methods in the early sixties. The method employs Fresnel reflecting solar concentrators that use ten flat mirrors to uniformly focus natural sunlight onto specimens mounted in the target plane. High-quality, first surface mirrors provide an intensity of approximately eight "total suns" with the spectral balance of natural sunlight in terms of ultraviolet integrity.

The target board, located at the focal line of the mirrors, lies along a wind tunnel along which a deflector directs cooling air across the specimens. A nozzle assembly sprays the specimens with deionized water in accordance with established schedules to simulate subtropical, semi-humid and temperate regions. Nighttime spray cycles can be used to keep samples moist during the non tracking portion of the test to provide the total time of wetness typically encountered in subtropical regions.

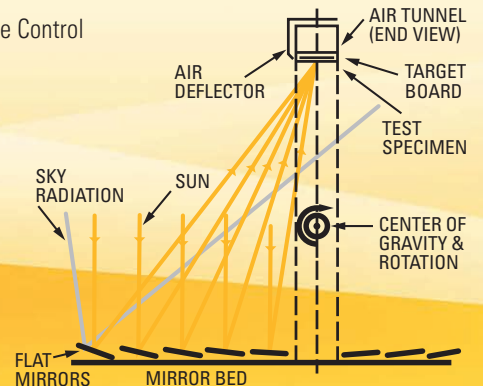
### Features

- Microprocessor Control
- Dual Axis Tracking
- Thermal Shocks
- Nighttime Wetting
- Patented Temperature Control

### Schematic of EMMAQUA



1. Air Tunnel
2. Air Blower
3. Mirror
4. Rotation (Azimuth Direction)
5. Rotation (Elevation Direction)
6. Water Spray Nozzles
7. Microprocessor Control Box
8. Solar Cells/Shadow Hat
9. Specimen Protection Door
10. Door Release Mechanism



# Temperature and Moisture Controlled

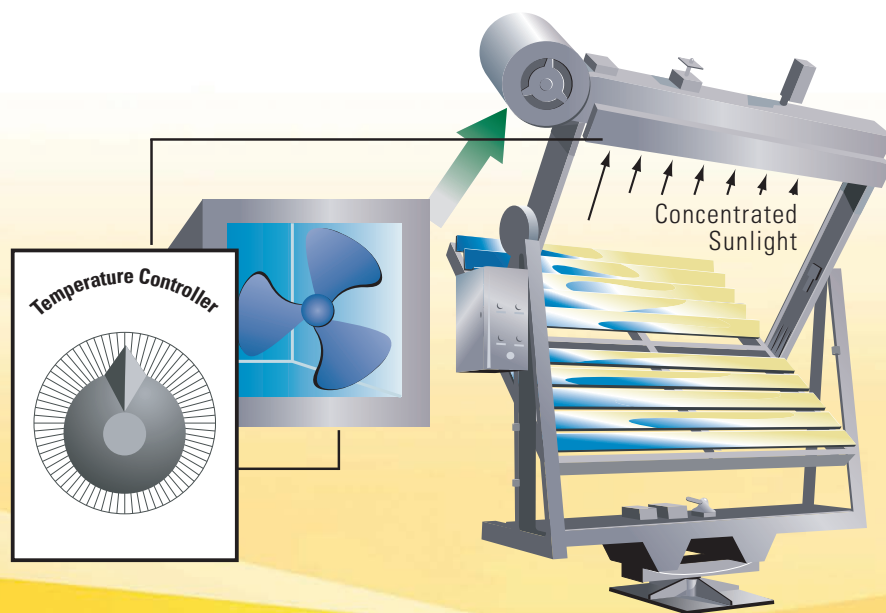
## Our Patented Temperature Control System Ushers in a New Era for Accelerated Outdoor Testing

Accelerated outdoor testing has often been thought of as the ultimate in solar weathering testing. Your samples are subject to actual fluctuations that products see in their end-use environment and harnessing actual sunlight, rather than a simulated light source. This gives researchers the best correlation to solar degradation. The drawback to traditional accelerated outdoor testing has been the extreme temperatures and irregular water uptake levels that are a natural side effect of solar multiplication in an EMMA® or EMMAQUA device.

Atlas now offers a solution to control temperature in accelerated outdoor testing. Our patented temperature and moisture control systems allow customers to manage thermal buildup during an accelerated outdoor test. These patented systems can be used independently or in various combinations to create the most accurate accelerated outdoor testing results available in the industry today.

### Static Control

A temperature sensor mounted in the exposure target area interfaces with a controller that powers the variable speed blower motor that maintains specimen temperature to a user-defined set-point.



- Helps overcome effects of starting tests at different times of year (winter vs. summer)
- Greatly reduces temperature intermittency effects
- Manages maximum temperatures throughout the test to a user-defined set-point
- Increases exposure temperature if desired
- Increases morning and afternoon exposure temperatures

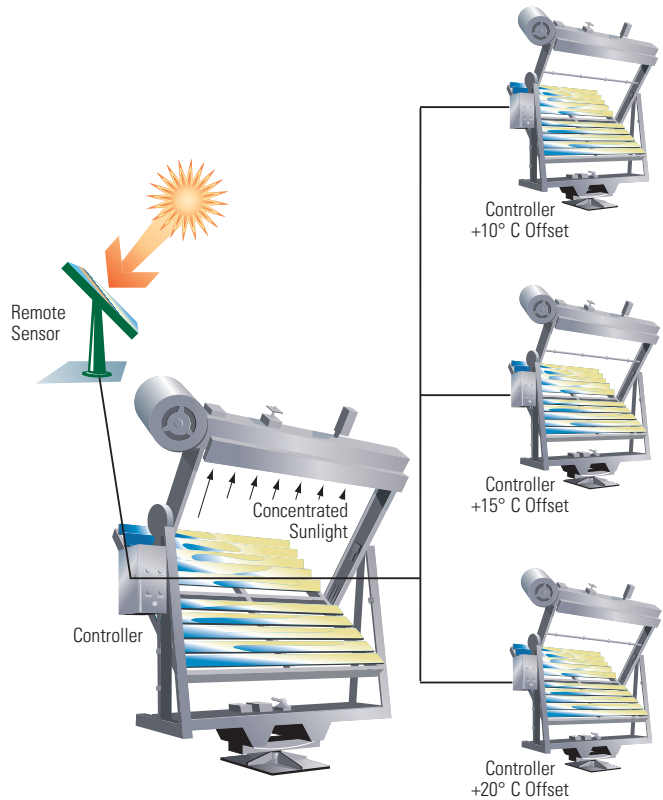


# EMMAQUA<sup>®</sup> continued

## Temperature and Moisture Controlled

### Dynamic Control

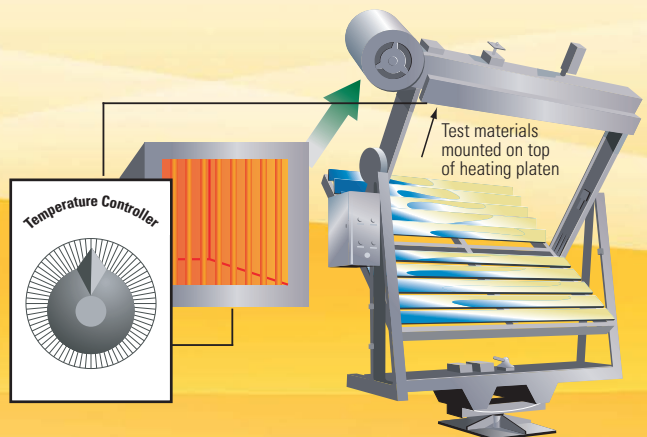
Two temperature sensors are used, one in the exposure target area and a remotely located temperature sensor. The controller compares the two sensors and adjusts the cooling blower speed to match the remote sensor temperature.



- Approximates intermittent temperature patterns found in natural exposures on an accelerated test
- The remote sensor may be black panels, end-use materials on exposure racks and even full-scale installations
- Target area temperature sensors can be mounted as standard black panels or even some customer specified materials
- The system can incorporate a variety of temperature offsets while maintaining natural environmental temperature patterns

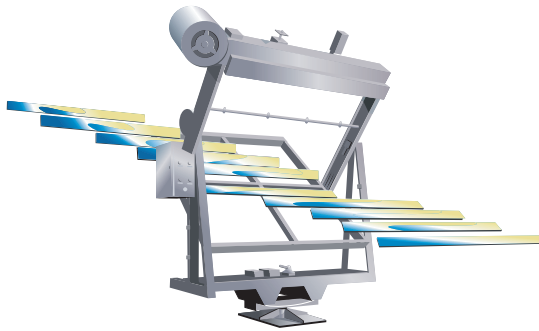
### Night Temperature Control

Special heater platens are mounted behind specimens on the target area to offset cooler seasonal nighttime temperatures. Specimens receive radiative, convective and conductive heating through the unexposed side.



## Variable Irradiance Control

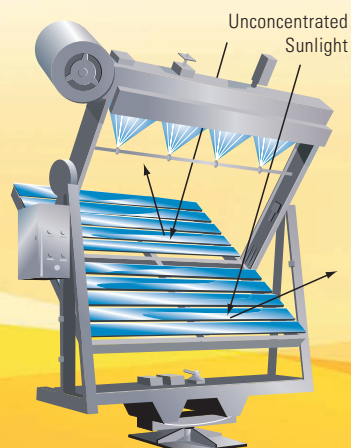
The number of mirrors in the EMMA® device is varied between two and ten depending on the exposure requirements of the material. A temperature control system is typically used in conjunction with this system for finer control.



2 Mirrors	4 Mirrors	6 Mirrors	8 Mirrors	10 Mirrors
1/5 Standard Irradiance	2/5 Standard Irradiance	3/5 Standard Irradiance	4/5 Standard Irradiance	5/5 Standard Irradiance

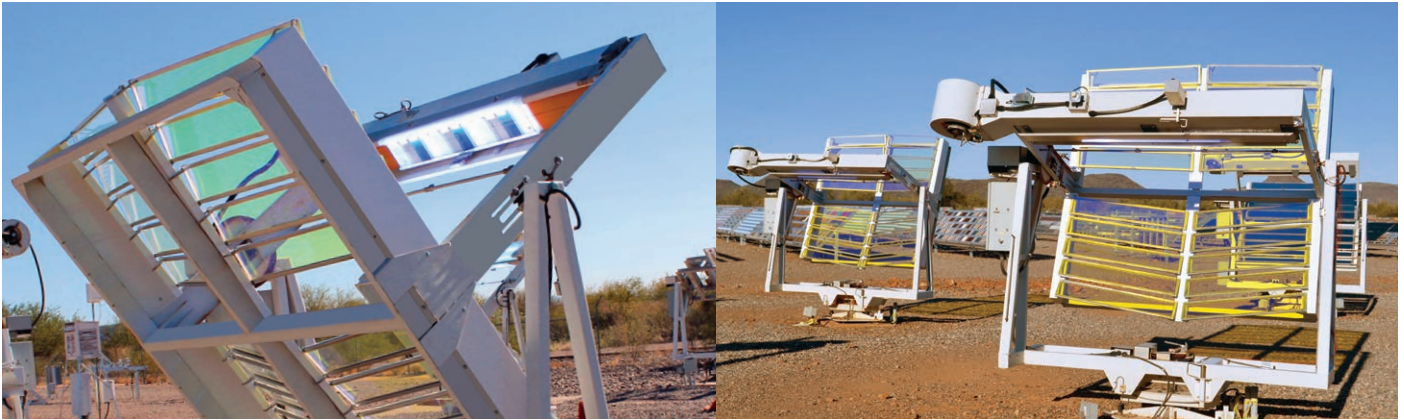
## Moisture Control

The target area rotates out of the concentrated sunlight prior to spraying the specimens. Blown air cools test specimens to ambient temperatures. Specimens are sprayed with ultra pure water for the customized length of time. The programmable logic controller then rotates the test samples back into focus at the end of the water spray cycle.



- Allows temperature-sensitive materials to utilize EMMA exposures at different levels of acceleration
- Allows investigation of effects from different solar and UV irradiance levels
- Allows investigation of a material's reciprocity characteristics
- Maintains natural intermittent patterns of light and temperature while varying light and temperature levels
- Can be used to design sophisticated and controlled weathering experiments
- May allow better correlation between accelerated and end-use weathering exposures
- Reduces material exposure temperature below other Atlas Temperature Controlled EMMA products
- Customization of spray cycles at varying frequency and duration to meet specific material needs
- Ability to overcome "lensing" and thermal shock effects of wetting specimens in concentrated sunlight
- Fine tuning of ratios of light dose to wet time to more closely simulate end-use conditions and/or accelerated degradation rates
- Design of custom wetting cycles to accommodate different water absorption rates for different materials

# The Benefits of Ultra-Accelerated Testing



## What is the Ultra-Accelerated EMMA®?

The Ultra-Accelerated EMMA (UA-EMMA) is Atlas' latest advancement in natural exposure testing. The system achieves this accelerated exposure through a patented "cool mirror" technology that has very high reflectance in the UV and near visible wavelength ranges while attenuating reflectance in the longer wavelength visible and IR portions of the solar spectrum.

This reduction of visible and IR radiation allows for up to 20 mirrors to be focused onto a single specimen target area. By doubling the number of mirrors over a standard EMMAQUA, approximately 10-12 years of equivalent radiant exposure for a standard outdoor test in south Florida can be delivered in a single year.

## Ideal Materials for UA-EMMA/EMMAQUA Testing

- Materials that require a long service life
- Dense materials
- Temperature-sensitive materials such as vinyl siding and composite decking
- Coatings applied to metal panels
- Materials that perform well in EMMA or EMMAQUA testing but would benefit from lower temperatures or can withstand even higher irradiance levels

## Applications

- Adhesives
- Automotive Exteriors
- Elastomers
- Packaging
- Plastics
- Sealants
- Agricultural Films
- Building Materials
- Glass (Architectural & Automotive)
- Paints & Coatings
- Roofing

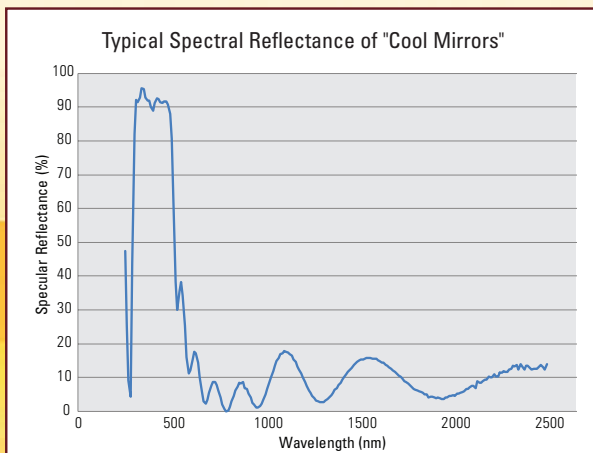


Figure 1

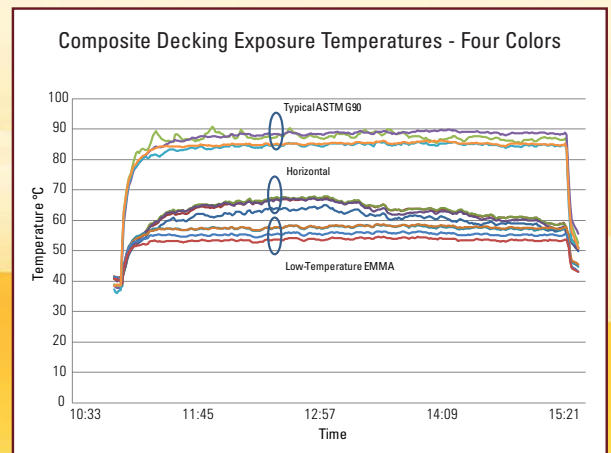
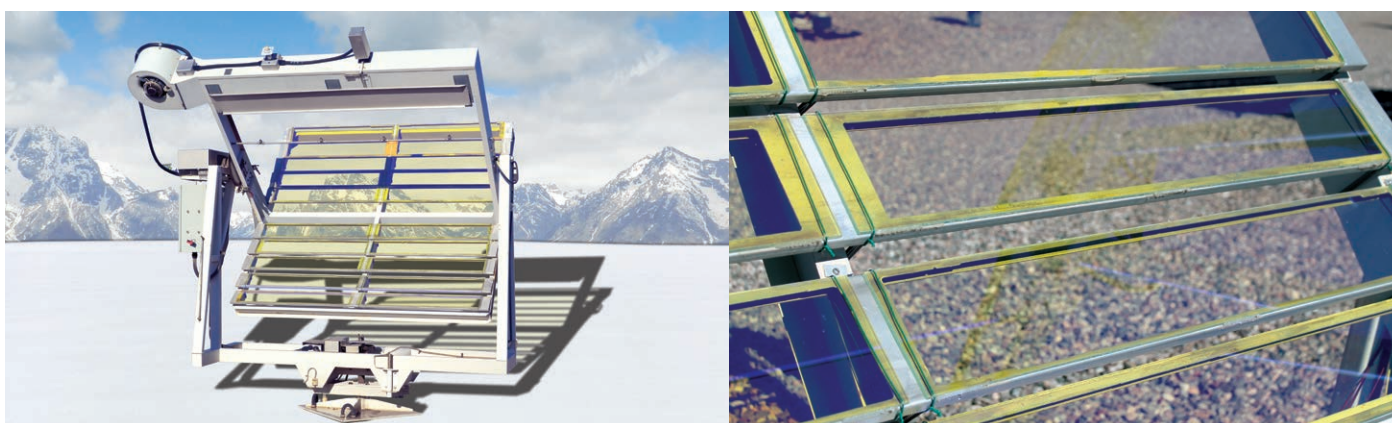


Figure 2



## Temperature's Effects

ASTM G90 devices can effectively cool many test materials. However, there are several situations where this cooling methodology does not adequately maintain sample temperatures within acceptable limits. Elevated temperatures can adversely affect samples and potentially compromise test results by causing unnatural weathering degradation.

Oftentimes, even moderate temperature increases in accelerated testing may cause significant adverse appearance effects on test materials. The result may cause these materials to show signs of thermal degradation.

Frequently, high exposure temperatures can cause even greater damage to mechanical properties on temperature-sensitive materials and may cause them to warp and develop other structural damage.

## LT-EMMA®/EMMAQUA®

The Low-Temperature EMMA/EMMAQUA (LT-EMMA/EMMAQUA) is Atlas' latest innovation that utilizes "cool mirror" technology in natural exposure testing. This new outdoor testing device delivers more than five years of equivalent radiation exposure as would be received in a standard outdoor testing rack in South Florida in a single year, but with much cooler sample temperatures when compared to traditional EMMA/EMMAQUA testing.

The Low-Temperature EMMA®/EMMAQUA® provides a solution to long-standing concerns over outdoor accelerated weathering of temperature-sensitive materials (Figure 2). Analyzing black standard temperature (BST) and black panel temperature (BPT) measurements on the Atlas LT-EMMA/EMMAQUA has shown that temperatures remain significantly lower than that of standard ASTM G90 devices (Figure 3) while successfully achieving high irradiance levels (Figure 4).

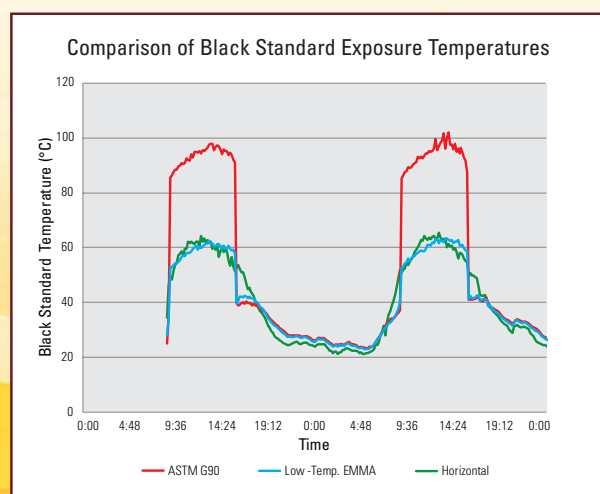


Figure 3

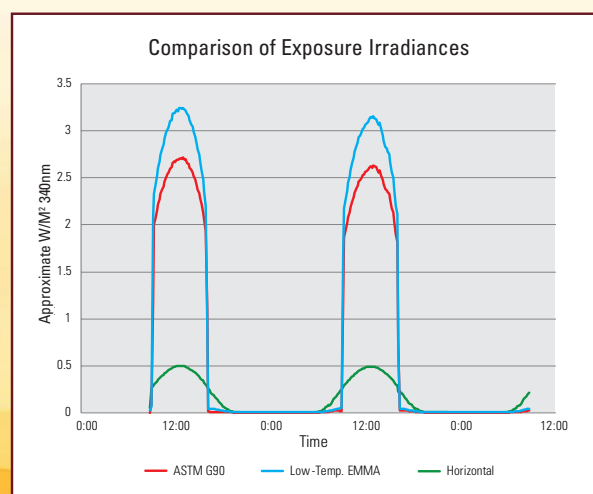


Figure 4

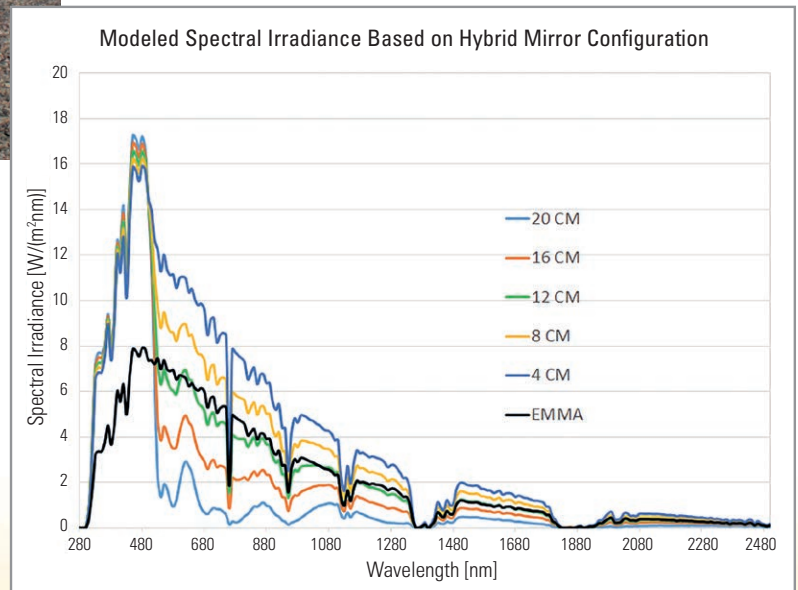
# UA-EMMA / EMMAQUA – Hybrid



UA-EMMA – Hybrid

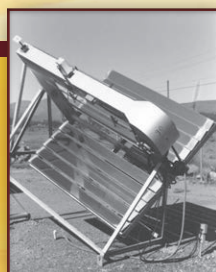
Through investigative work in partnership with many of our clients, Atlas recognized that even with 20 mirrors as used on the UA-EMMA system, the specimen temperature was sometimes too low, especially during the winter months. To resolve that issue, Atlas has developed the UA-EMMA/EMMAQUA – Hybrid, combining cool mirrors with standard mirrors to provide a better simulation of the longer visible and IR wavelengths to match temperature profiles of different colors.

This version still offers twice the acceleration of traditional EMMA/EMMAQUA while allowing for higher specimen temperatures than is possible with the UA-EMMA/EMMAQUA. Sample surface temperature can have a significant impact on the acceleration factor and correlation of results of an accelerated test. UA-EMMA/EMMAQUA – Hybrid offers clients more flexibility of target surface temperatures.



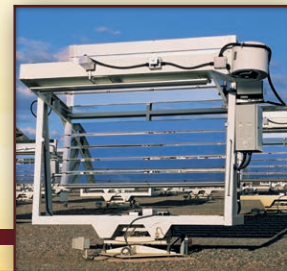
1958

The first EMMAQUA® device, constructed with a wooden frame and sheet metal skin, is patented, manufactured and placed into service.



1969

Atlas' DSET Laboratories relocates from Phoenix to New River, Arizona. The EMMAQUA device is redesigned with a steel framework and more efficient spray delivery system.



1991

EMMAQUA+®, the next generation of accelerated weathering devices, is introduced. Advancements include individual cycle programming, black panel temperature control, and altazimuth solar tracking for more efficient delivery of full-spectrum solar energy.

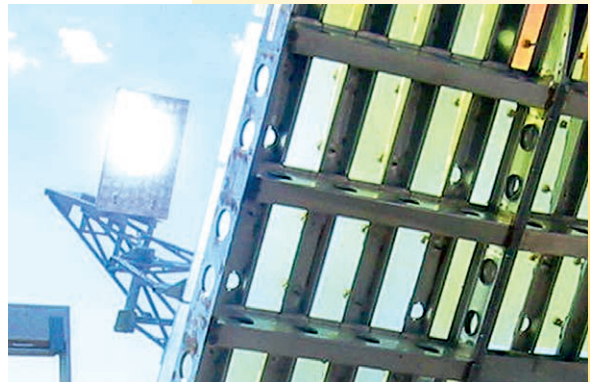


# Ultra-Accelerated Weathering System: UAWS

- Developed in partnership with the National Renewable Energy Laboratory (NREL)
- 29 "Cool Mirror" facets
- Up to 63x direct normal UV irradiance on target area
- Very little IR radiation
- Surface Area: approx. 150 mm x 150 mm

## Ideal Materials for UA-EMMA® Testing

- Materials that require a long service life
- Transparent and glazing materials
- Small solar PV cells or material used in these cells
- Coatings applied to metal panels
- Materials that perform well in EMMA® or EMMAQUA® exposure testing



The MQ3K is launched, utilizing state-of-the-art technology in computer-controlled cycle programming, more accurate altazimuth solar tracking, one-touch start/stop, error sensing feedback and the most specular mirrors available.



1999



2004

Atlas introduces four patented suites of Temperature-Controlled EMMAQUA. (Static, Night, Dynamic Temperature and Variable Irradiance Control). This breakthrough allows for the testing of materials that are sensitive to thermal buildup.

Atlas introduces the UA-EMMA, the latest advancement in outdoor accelerated testing. This device couples the EMMA platform with a new patented mirror system, optimizing real-world correlation.



2014



# Evaluation Services

## Analytical Services to Complete any Testing Program

Atlas offers a wide range of evaluation and measurement services for our client's specimens during and after the weathering process. These services are available at all of our primary weathering sites. Atlas uses the most advanced instrumentation from leading manufacturers for measuring appearance properties such as color change, gloss, distinctness-of-image, transmittance and reflectance. All of our services meet the latest measurement test standards from organizations such as ASTM, ISO, DIN and others. A full range of visual assessment services is also available, including coating adhesion, blistering, chalking, cracking, mildew growth, and gray scale evaluation in accordance with respective standards' organizations.

Temperature monitoring programs are provided for single and multiple specimens under any type of exposure, as well as for large assemblies such as complete vehicles. Strict quality control guidelines have enabled Atlas' Evaluations Laboratory to achieve industry-accepted accreditation from world renowned standards' organizations. Atlas is accredited to ISO/IEC 17025 by the American Association for Laboratory Accreditation (A2LA) and accredited or approved by Ford, GM and AMECA.



### Services available include:

- Color Measurements
- Gloss Measurements
- Visual Assessment
- Chalking
- Digital Photography
- Spectrophotometry
- Emittance
- Transmission Haze and Clarity
- Temperature Studies

### Evaluation Services Standards

<b>Adhesion</b>	ASTM D3359	GM 9071P
<b>Blistering</b>	ASTM D714	ISO 4628-2
<b>Chalking</b>	ASTM D4214	ISO 4628-6
<b>Checking</b>	ASTM D660	ISO 4628-5
<b>Cracking</b>	ASTM D661	ISO 4628-4
<b>Erosion</b>	ASTM D662	
<b>Mildew</b>	ASTM D3274	
<b>Grey Scale Evaluation</b>	AATCC Evaluation Procedure 1	
	ASTM D2616	
	DIN EN 20105-A02	
	ISO 105 A02	
<b>Instrumental Color</b>	ASTM D2244; ASTM E308	
<b>Gloss</b>	ASTM D523	
<b>Transmittance/ Reflectance</b>	ASTM E903	

## Color Measurements

Spectrophotometric color is offered at all of our primary test sites using the latest technology in instrumental measuring devices. The color transmittance or reflectance data can be recorded in several different color coordinate systems and configurations. Portable spectrophotometers are available to perform field measurements. All tests are performed in accordance with industry standards. In addition, each of our laboratories participates in collaborative test service programs, available to the entire industry.

## Gloss Measurements

Atlas uses portable and benchtop gloss meters for both laboratory and field measurements at 20°, 60°, 75°, and 85° to evaluate changes in specular reflectance of a surface. Atlas also offers distinctness-of-reflective-image (DOI) testing to evaluate the sharpness with which an object's outlines are reflected by a surface.

## Visual Assessment

A variety of visual evaluations are available for rating degradation phenomena on specimens associated with the weathering process. All of our global evaluations labs utilize ASTM or ISO pictorial standards to rate failure modes such as: checking, cracking and blistering. Assessment techniques like tape chalk, velvet chalk, adhesion, AATCC or ISO grey scale, edge penetration of glass laminates are also available.

## Spectrophotometry

Atlas has the capability for absolute or relative spectral measurements as a function of incident angle that meet the requirements of ASTM E308 and E903. Data for UV-VIS-NIR measurements include a report and one normalization (e.g., solar transmittance or reflectance, color, chromaticity, etc.).

## Transmission Haze and Clarity

Atlas measures haze, total transmittance, and clarity in accordance with ASTM D1003 and is used in conjunction with SAE J576 exposure programs. The specimen surface is illuminated perpendicularly with the transmitted light, measured with an integrating sphere (0°/diffuse geometry). The spectral sensitivity conforms to CIE standard spectral value function "Y" under illuminant C with a 2° observer.





## Special Project Testing

Atlas takes our motto “We Test Everything Under the Sun” quite literally. We have tested everything from golf balls to swimming pools. The images below are just a few of the more unique types of testing that we have employed. Our consultants can discuss appropriate testing methodology for any end-use application.



*Window profiles tested in their end-use condition*



*Large roofing decks*



*Mold/mildew studies*



*Chemicals in swimming pool water*



*Sun-tracking carousel for automotive temperature measurement programs*



*Photovoltaic panels*



*Bicycle tires*

# Radiometer Calibration Services



Atlas is proud to offer a solar radiometer calibration service that has been accredited to ISO/IEC 17025 requirements. These radiometers include pyranometers and pyrhemometers, which need calibration directly traceable to the World Radiometric Reference (WRR), as well as radiometers that are used to measure total or narrow-band ultraviolet radiation which need traceability to the National Institute of Standards and Technology (NIST).

These calibrations are performed according to ASTM and ISO standard methods and a Certificate of Calibration is issued that complies with ISO/IEC 17025 requirements.

- Calibrations are traceable to the World Radiometric Reference (WRR) and to the National Institute of Standard's Technology (NIST)
- Radiometer calibrations comply with ISO 17025
- Calibrations are performed according to ASTM Standard Methods and are accredited by A2LA as part of DSET's overall laboratory accreditation

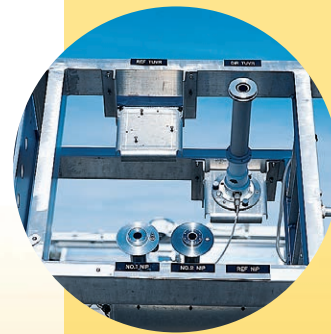
## Standards

Radiometer Measurement and Calibration are performed to meet or exceed the following industry standards:

Measurement & Calibration Standards			
ASTM	E816	E824	G130
ISO/IEC	9059	9847	



*Full-spectrum pyranometer*



*Pyrhemometers measuring direct (beam) solar radiation*



# Weather Stations and Exposure Racks

## Mobile Weather Measurement Station

For over 80 years, Atlas has been performing outdoor testing and collecting weather data. As a materials testing laboratory, we consider the data that our weather station provides to be a core component of our business. Atlas is now offering this advanced weathering technology directly to you.

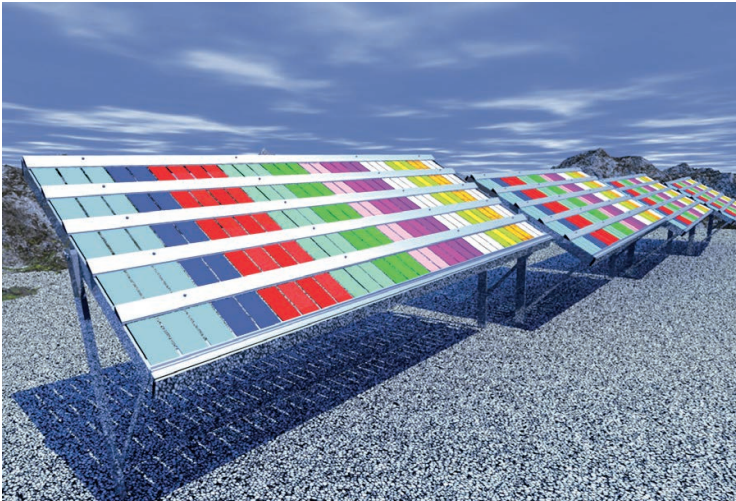
Whether you are designing a product or an experiment, environmental factors must be accounted for to ensure reliability and accuracy. The Atlas Weather Station will assist in your product development by providing the information you need about your local environment or diverse global climates.

With various options available to meet your individual needs, the Atlas Weather Station is a self-sustaining, semi-portable weather data measurement and collection instrument that utilizes the most dependable and precise research grade sensors available on the market today.

## Atlas Weather Station Features and Options\*

Features	Available Configuration Options		
	Basic	Custom Static	Custom Tracking
Ultraviolet UVA Radiometer	✓		
Ultraviolet UVA and UVB Radiometer		✓	✓
Total Solar Pyranometer First Class Sensor	✓		
Total Solar Pyranometer Secondary Standard Sensor		✓	✓
Temperature and Humidity Probe	✓	✓	✓
Wind Speed and Direction Sensor		✓	✓
Rain Gauge		✓	✓
Barometric Pressure Gauge		✓	✓
Thermocouples for Measuring Sample Temperatures		✓	✓
Black and White Temperature Panels		✓	✓
Wireless Communication for Data Collection		✓	✓
Base Station for Remote Site Monitoring		✓	✓
Solar Power	✓	✓	✓
Instruction Manual	✓	✓	✓
Shipping Container	✓	✓	✓
Pyrheliometer for Direct Normal Irradiance (DNI) Measurements			✓
Data Acquisition System - capable of storing 30+ days of data	✓	✓	✓

\* Additional options may be available to meet your specific needs.



## Do you have a need for Outdoor Testing?

### Atlas Outdoor Exposure Rack System

Atlas now produces outdoor exposure racks (components, full racks or custom designed exposure systems). Our design takes into account the best features of the historical exposure racks used at weathering sites around the world and incorporates ideas from our in-house weathering technicians and experts. The exposure rack comes in assembled or unassembled forms. We asked the question, "How can we make the exposure rack better?" The answer is improved ease of use and increased functionality!

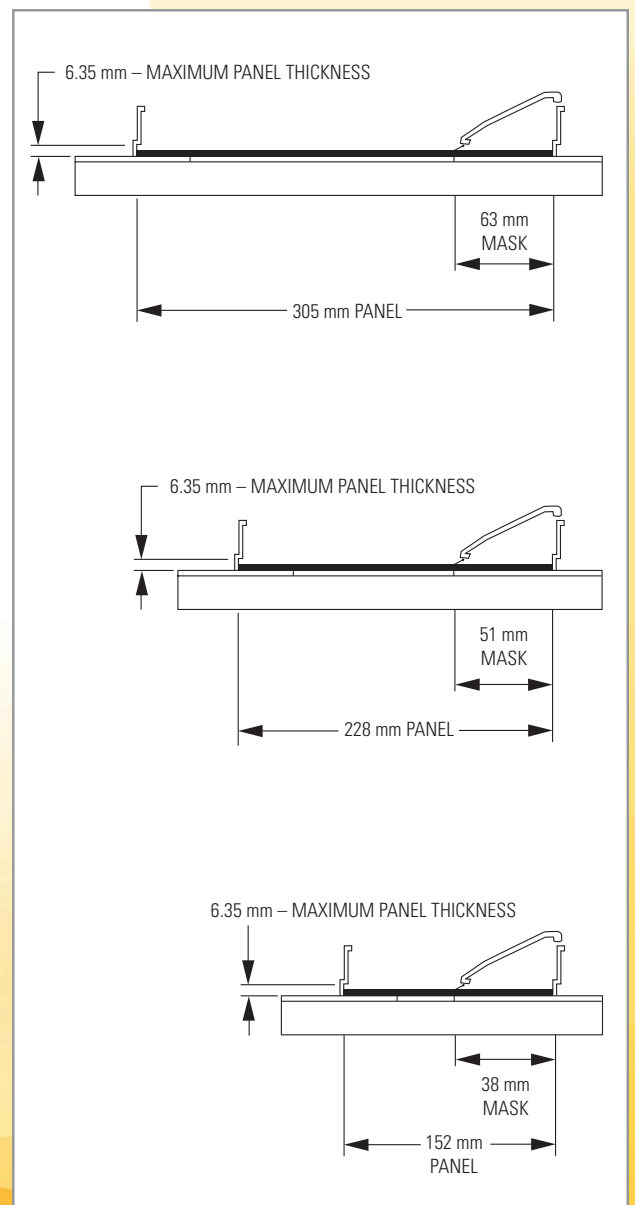
How is the Atlas rack an improvement over existing racks?

- The Atlas rack replaces the flap assembly's traditional wing nut fasteners with an ergonomically friendly cam lock design
- Atlas racks utilize "quick release" hardware for panel and sample mounting allowing in-place removal as opposed to the cumbersome, slide functionality of traditional model racks

This newly enhanced test rack continues to meet all applicable outdoor weathering standards, but with improved construction and increased ease of use.

Also ask about our specialty portable racks:

- Rolling exposure rack



Atlas offers more than testing instruments. From technical advice to final test method implementation, Atlas provides the support that you need when determining the right weathering testing solution for your products. For more information, please contact your local Atlas sales office or visit us at [www.atlas-mts.com](http://www.atlas-mts.com).

## ■ Corporate Offices

Chicago, Illinois USA ■ Linsengericht, Germany ■ Shanghai, China ■ São Paulo, Brazil  
Élancourt, France ■ Bangalore, India ■ Leicester, United Kingdom

## ● Outdoor Exposure Sites & Laboratories

Miami, Florida USA • Phoenix, Arizona USA • Sanary, France • Chicago, Illinois USA  
Linsengericht, Germany • Hoek van Holland, The Netherlands • Chennai, India • Prescott, Arizona USA  
Medina, Ohio USA • Keys, Florida USA • Jacksonville, Florida USA • Alberta, Michigan USA  
Hainan, China • Guangzhou, China • Turpan, China • Seosan, Korea • Miyakojima, Okinawa, Japan  
Choshi, Japan • Kirishima, Japan • Singapore • Melbourne, Australia • Townsville, Australia

For more detailed information about the Atlas Weathering Services Group, please visit  
<https://www.atlas-mts.com/products/weathering-test-services>

## ▲ Local Sales & Service Support

To contact your local Atlas Sales representative please visit <http://atlas-mts.com/contact/local-representatives/>

For general inquiries please contact us at [www.atlas-mts.com](http://www.atlas-mts.com)