



QUV

QUV[®] Accelerated Weathering Testers

www.q-lab.com

The Most Trusted Name in Weathering



Why Test?

Meet Specifications

- * Meet customer requirements
- * Stay ahead of government regulations

Prevent Field Failures

- * Improve quality and durability
- * Enhance reputation
- * Assure product performance

Gain a Competitive Edge

- * Save on material costs
- * Expand product lines
- * Enter new markets
- * Outrun the competition

About Q-Lab

Established in 1956, Q-Lab Corporation is a global provider of products and services to help manufacturers test the weatherability, light stability, or corrosion resistance of their products for industrial, commercial, government, and consumer markets. Our headquarters and manufacturing facility is in Cleveland, Ohio (USA). Q-Lab offices and technology centers are located in Saarbrücken, Germany; Bolton, England; and Shanghai, China. Q-Lab also is supported by a worldwide network of highly technical sales representatives.

The quality, economy and reliability of Q-Lab's products and services have established the company's reputation as "The Most Trusted Name in Weathering."

The World's Most Widely Used Weathering Tester



Will Your Product Last Outdoors?

Find Out Fast With the QUV Weathering Tester

Sunlight and moisture cause millions of dollars of material damage every year. The QUV Accelerated Weathering Tester reproduces the damage caused by sunlight, rain and dew. In a few days or weeks, the QUV can reproduce the damage that occurs over months or years outdoors.

Don't Guess When You Can Test

The QUV tests materials by exposing them to alternating cycles of UV light and moisture at controlled, elevated temperatures. The QUV simulates the effects of sunlight with fluorescent ultraviolet (UV) lamps, and it simulates dew and rain using condensing humidity and/or water spray. Types of damage include color change, gloss loss, chalking, cracking, crazing, hazing, blistering, embrittlement, strength loss and oxidation.

Realistic

The QUV with the UVA-340 lamp produces the most realistic simulation of sunlight in the short wavelength portion of the spectrum. The result is a tester that provides excellent correlation with outdoor tests.

Affordable

The QUV is surprisingly economical, both to purchase and to operate. This is a result of the QUV's efficient design, which incorporates low cost fluorescent UV lamps for sunlight simulation and ordinary tap water for condensation.

Easy to Operate

The QUV's simple, yet sophisticated design makes it easy to install, easy to use, and almost maintenance-free. The QUV operates completely automatically, 24 hours a day, 7 days a week.

- * Simple user interface for easy programming
- * Exposure conditions are displayed continuously
- * Self-diagnostic warnings and service reminders
- * Quick calibration with patented AUTOCAL™ system



The QUV is engineered to be completely user serviceable, with easy access to all parts. This virtually eliminates the need for service calls and helps keep operating costs low.

Simplicity Is the Ultimate Sophistication

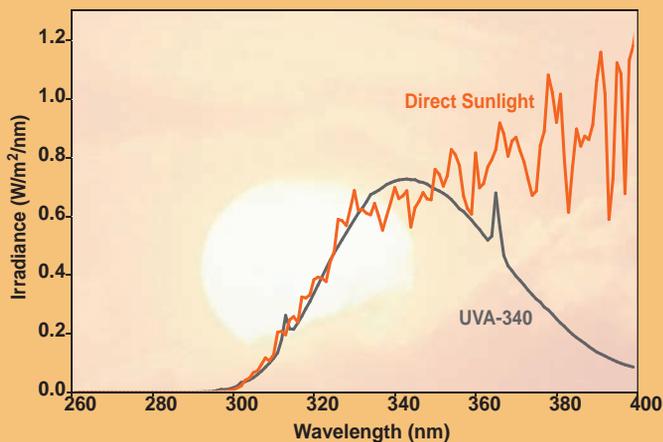
The QUV is legendary for its ease of use and reliability. The QUV is designed to eliminate the perennial complaints against complicated weathering testers: confusing to operate, too many subsystems to break down, too much downtime, difficult maintenance and troubleshooting, expensive parts and service calls.

The World Standard in Weathering

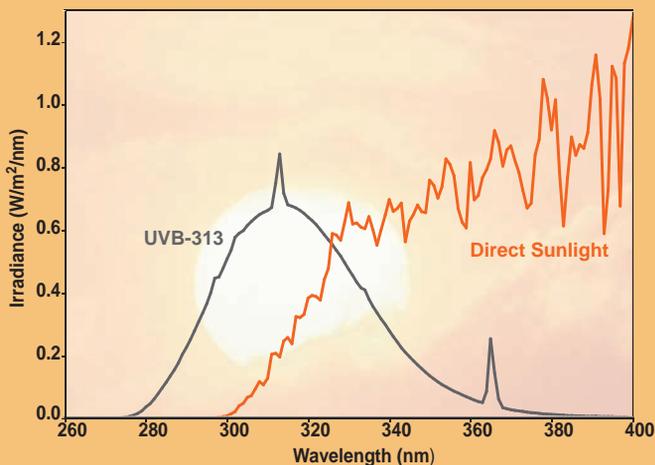
With thousands of testers in service worldwide, the QUV is the world standard for accelerated laboratory weathering.

The QUV complies with a wide range of international, national, and industry specifications, ensuring the reliability and reproducibility of your test program.

Lamp Spectra



The UVA-340 spectrum is the best available simulation of sunlight in the UV region, where most of the damage to durable materials occurs.



UVB-313 exposures may be useful for testing very durable materials, such as automotive coatings or roofing materials.

UV & Sunlight Simulation

UV light is responsible for almost all photodegradation of durable materials exposed outdoors. The QUV's fluorescent lamps simulate the critical short-wave UV and reproduce the physical property damage caused by sunlight. Several different types of UV lamps are available for different applications. See *Q-Lab Bulletin LU-8160, Choice of Lamps* for application guidelines.

QUV Lamps

Q-Lab supplies the highest quality UV fluorescent lamps available. The technology behind the lamps produces a spectrum that is inherently stable throughout their use. Each manufacturing lot is required to pass a stringent series of tests before it is approved for sale. The result is that the QUV provides a consistent, stable spectrum, year after year.

UVA-340 Lamps

The UVA-340 lamps give an excellent simulation of sunlight in the critical short wavelength region from 365 nm down to the solar cut-off of 295 nm.

UVB-313 Lamps

The UVB-313 lamps maximize acceleration utilizing short-wave UV that is more severe than the UV normally found at the earth's surface. Consequently, these lamps may produce unrealistically severe results for some materials. UVB-313 lamps are most useful for QC and R&D applications, or for testing very durable materials.

Fluorescent Lamp Advantages

- * Fast results
- * Stable light spectrum
- * Simplified irradiance control
- * Minimal maintenance
- * Long lamp life
- * Low price and operating cost



The QUV's fluorescent lamps simulate the short-wave UV energy from sunlight to reproduce the polymer degradation your product experiences outdoors.

SOLAR EYE® Irradiance Control

Changes in light intensity may affect the speed of material degradation. Changes in spectrum may affect both speed and type of degradation. Therefore, a weathering tester must control irradiance to achieve reproducible test results.

The SOLAR EYE System

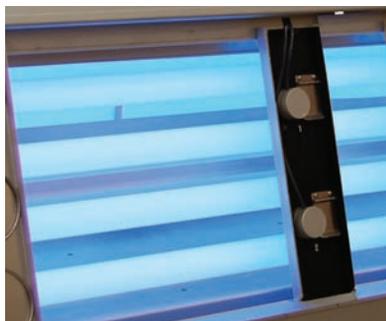
Most QUV models are equipped with SOLAR EYE Irradiance Control. The SOLAR EYE is a precision control system that automatically maintains light intensity through a feedback loop. The controller monitors UV intensity and compensates for lamp aging or any other variability by adjusting power to the lamps. The SOLAR EYE system allows better reproducibility and repeatability than manual irradiance control systems.



The operator selects the desired irradiance level. The level selected is the “set point.”

Irradiance W/m ² @ Control Wavelength				
Actual:	0.68	0.68	0.68	0.68
Set:	0.68	0.68	0.68	0.68
	1	2	3	4

Both the set point and the actual irradiance are continuously displayed for each pair of lamps.



The SOLAR EYE's UV sensors are located in the specimen mounting plane.

SOLAR EYE

Controls Irradiance

- * Monitors light intensity
- * Maintains preprogrammed intensity
- * Maximizes repeatability & reproducibility

Extends Lamp Life

- * Operates lamps until set point cannot be maintained
- * Reduces maintenance

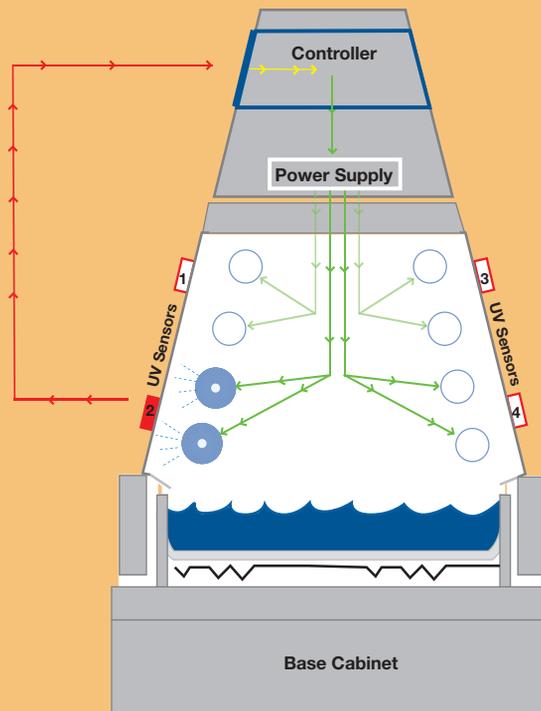
Accelerates Results

- * Maximizes effects with high irradiance
- * Operates at 75% higher irradiance than noon, summer sunlight

How It Works: SOLAR EYE Irradiance Control

With the SOLAR EYE's automatic feedback loop system, the irradiance is continuously monitored and precisely maintained.

During the UV cycle, built-in sensors measure the light from each pair of lamps and transmit this data to the controller.



The controller compares the measured irradiance to the set point.

Then the controller instructs the power supply to adjust the current to the lamps to maintain the set point.

Irradiance Calibration

CR-10 Calibration Radiometer

The CR-10 is an essential accessory to the QUV's SOLAR EYE system because it ensures the accuracy of the SOLAR EYE and, ultimately, the QUV test results. One CR-10 radiometer can calibrate any number of QUVs.

AUTOCAL™ Calibration

Calibrating the SOLAR EYE system takes only seconds and is so easy to perform that there is little chance for operator error. A warning light shows when it is time to calibrate. The patented AUTOCAL system automatically transfers the calibration information from the radiometer to the QUV's SOLAR EYE controller.

CR-10 Recalibration

The CR-10 should be sent back to Q-Lab for recalibration annually to ensure NIST traceability and ISO compliance.

Temperature Control

The QUV precisely controls temperature to enhance accuracy and accelerate test results.

UV Cycle

Although temperature does not normally affect the primary photochemical reaction, it does affect the rate of any subsequent reactions. Therefore, the QUV's ability to control temperature is essential during UV exposure.

Moisture Cycle

Because materials can stay wet outdoors for an average of 8-12 hours per day, it is difficult to accelerate moisture attack in a laboratory tester. The QUV's moisture cycles are conducted at elevated temperatures to increase the severity and accelerate the damaging effects of moisture.

Ease of Use

Easy to Operate

- * Fully automatic operation 24/7
- * User-friendly programming
- * Built-in microprocessor
- * Continual irradiance monitoring and control

Easy to Maintain

- * Fast, error-free AUTOCAL calibrations
- * CR-10 recalibration ensures accuracy

Easy to Service

- * User-serviceable, no need for expensive service calls
- * Self-diagnostic error checking
- * Continuous system monitoring
- * Easy-to-read status messages



The patented AUTOCAL system electronically transfers the calibration information from the CR-10 to the SOLAR EYE Irradiance Controller, ensuring accuracy.



Calibrations with the CR-10 Radiometer are quick, easy and reliable. In just a few seconds, you can calibrate for ISO compliance.

Moisture Simulation

The QUV allows two approaches to moisture simulation. For most applications, condensing humidity is the best way to simulate outdoor moisture attack. All QUV models allow a programmed condensation cycle. Because certain applications also require water spray to achieve realistic results, some QUV models can produce both condensation and water spray.

Condensation

In many outdoor environments, materials are wet more than 12 hours each day. Research indicates that the main cause of this outdoor wetness is dew, not rain. The QUV simulates this using a unique condensation mechanism. During the condensation cycle, a water reservoir in the bottom of the test chamber is heated to produce vapor. The hot vapor maintains the chamber at 100% relative humidity, at an elevated temperature.

The QUV is designed so that test specimens form the external walls of the chamber. Thus, the reverse side of the specimens is exposed to ambient room air. This room-air cooling causes the test surface to drop a few degrees below the interior vapor temperature, ensuring that water continually condenses on the specimen surface. The evaporation process naturally distills the water, resulting in only pure water collection on specimens even when ordinary tap water is used.

Water Spray

In some service environments, material temperatures can suddenly decrease when heat builds up over the course of a sunny day and a sudden rain shower rapidly dissipates the heat. The resulting thermal shock is a challenge for many materials. Some materials are susceptible to mechanical erosion from rainfall. The QUV with water spray is useful for simulating both environments.

Unlike the condensation system that works effectively with ordinary tap water, the water spray system requires laboratory grade pure water. See page 10 for information on a water re-purification system for the QUV/spray.

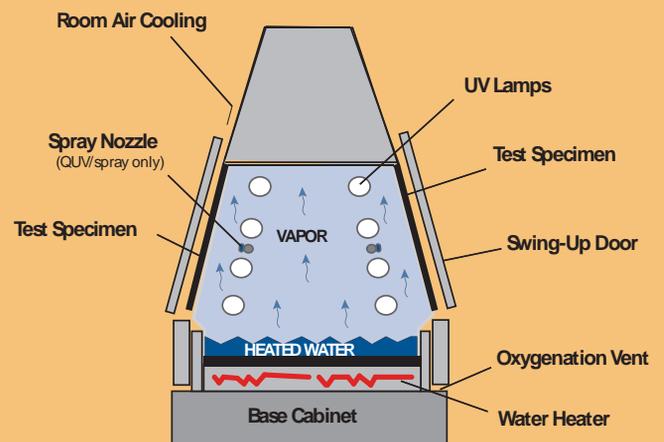


Using a unique condensation mechanism, the QUV reproduces dew, the main cause of outdoor wetness.

Condensation Advantages:

- * Identical to natural wetness
- * Elevated temperatures for acceleration
- * Ordinary tap water input
- * Condensation is pure water – no spotting or contamination of sample
- * Minimal maintenance

QUV Cross-Section During Condensation Period



The QUV reproduces the effects of outdoor moisture with pure, warm condensation.

The QUV Controller

Designed to be both functional and easy to use, the QUV controller includes complete self-diagnostic error checking.

The controller constantly monitors the status and performance of all systems. It also displays simple warning messages, routine service reminders or performs safety shutdown, as needed.

Now every QUV allows the convenient storage of 10 preprogrammed test cycles, including ISO and ASTM exposure cycles. Built-in computerized data logging ensures a quick and easy connection between your QUV and PC or LAN. New automatic lab temperature sensing records the temperature when any fault occurs, and displays the information to aid in troubleshooting.

Automatic Data Logging

For quality systems that require documented proof of test conditions or for independent test labs whose customers require extensive test documentation, every QUV is equipped with an Ethernet connection. Optional PC software allows the user to:

- * Automatically record exposure conditions
- * Directly transfer data from the QUV to a Windows-based computer
- * Easily connect to a PC directly or through a LAN
- * Examine data in either graphical or tabular format



With built-in computerized data logging, compiling and reviewing your QUV data has never been easier.

QUV Space Saver Frames

The QUV requires little floor space in crowded labs. Doors swing up and out of the way for easy access to the chamber. Where space is at a premium, QUVs can be stacked two-high with Space Saver Frames.



Common QUV Test Cycles

The QUV conforms to a large number of national, international and industry specifications, including but not limited to:

- * ASTM D4799
- * ASTM D6662
- * ASTM G154
- * ASTM D4587
- * EN 927-6
- * ISO 11507
- * ISO 4892-3
- * SAE J2020
- * J15 K 5600-7-8
- * AATCC TM186



Test specimens are mounted on both the front and back side of the QUV, providing a large sample capacity.

Versatile Specimen Mounting

Easy-to-use specimen holders adjust for any thickness up to 3/4" (20 mm) and allow fast, snap-action specimen mounting. Retaining rings provide positive hold-down and do not require that test specimens be cut to close tolerance. In addition, custom holders are available for mounting various products, such as lenses and 3-D components.

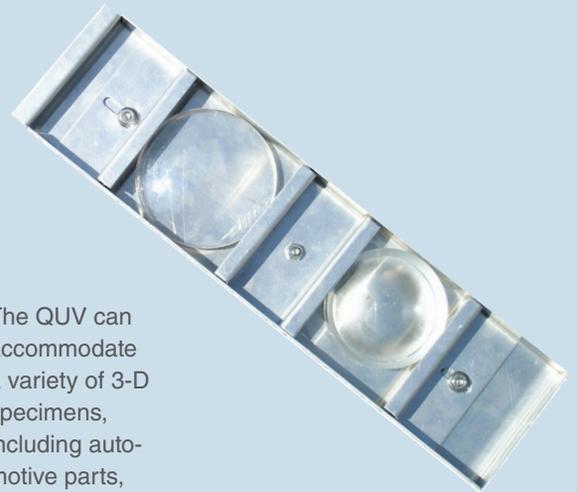
Specimen Mounting

Specimen Holders

- * 2 flat panels per holder
- * Standard size 3" x 6" (75 mm x 150 mm)
- * Mount 3-D parts with special holders
- * 4" x 6" (100 mm x 150 mm) also available

Specimen Capacity

- * 48 standard size specimens for QUV/se, QUV/spray and QUV/cw
- * 50 standard size specimens for QUV/basic



The QUV can accommodate a variety of 3-D specimens, including automotive parts, lenses, bottles and CDs.



QUV Models

The QUV comes in several models. See the *LU-0819 specification sheet* for comparative capabilities.

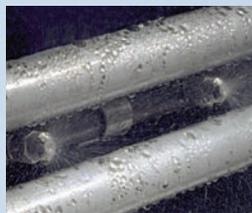
Model QUV/se

The most popular QUV model features the SOLAR EYE Irradiance Control for precise maintenance of UV light intensity. The QUV/se uses a proven condensation mechanism to simulate outdoor moisture attack. It allows faster, more reproducible testing, longer lamp life, and ISO calibration. With the QUV/se, state-of-the-art accelerated weathering is available in an affordable tester that is easy to use.

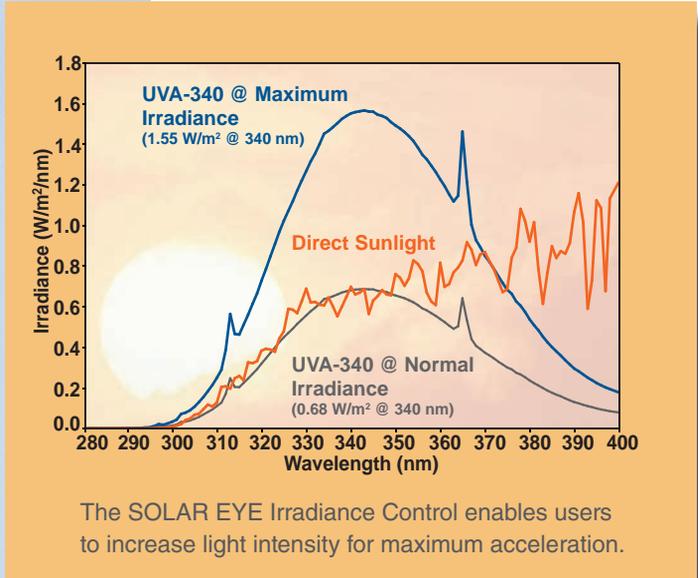
Model QUV/spray

The QUV/spray is the same as a standard QUV/se, but also includes a water spray system consisting of spray nozzles, piping, controls and drain.

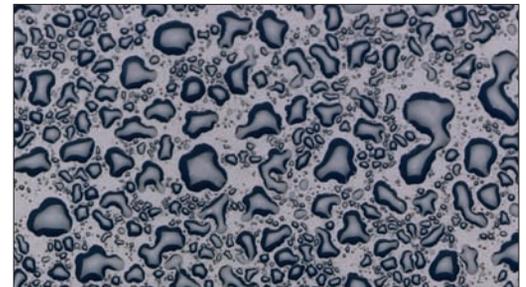
Short periods of spray can be used to create a thermal shock. Longer periods can be used to achieve mechanical erosion. The QUV/spray can be set to produce the following conditions: UV alone, spray alone, or condensation. Deionized water is recommended for most spray applications.



In addition to condensation, the QUV/spray can be programmed to produce water spray for thermal shock and/or surface erosion.



The SOLAR EYE Irradiance Control enables users to increase light intensity for maximum acceleration.



Research indicates that dew, not rain, is the main cause of outdoor wetness. All QUV models use condensation to simulate outdoor moisture.

Optional Water Repurification System

Some tests using the QUV water spray system consume large amounts of purified water. The costs of water purification for these tests can add up quickly. Q-Lab offers an optional system that repurifies spray water that has already been purified with an external system. This system can reduce the cost of purifying the QUV's water supply by 80% or more.

QUV Models (continued)

Model QUV/basic

This is a simplified version of the QUV for the lab where economy is critical. Irradiance is controlled by periodic lamp replacement and repositioning. The QUV/basic has a condensation system for moisture simulation. It does not have water spray.

The QUV/basic does not have the SOLAR EYE Irradiance Control system. Consequently, the light intensity cannot be adjusted or calibrated. This means the QUV/basic cannot be used for high irradiance testing.

We recommend the QUV/basic for comparative exposures where the test specimens and the control specimens are exposed at the same time in the same tester.



The QUV/basic is recommended for labs where economy is critical. Irradiance is controlled by periodic replacement of lamps.

Model QUV/cw

Some industries have test methods that specify the use of cool white lamps for indoor photostability testing. To reproduce indoor light conditions, the QUV/cw has a SOLAR EYE Irradiance Control system which has been modified to monitor and control the light output of cool white fluorescent lamps. See *Q-Lab Bulletin LU-0823, QUV/cw Cool White Photostability Tester* for more information.

QUV Models

QUV/se

- * SOLAR EYE Irradiance Control
- * Condensation
- * ISO calibration

QUV/spray

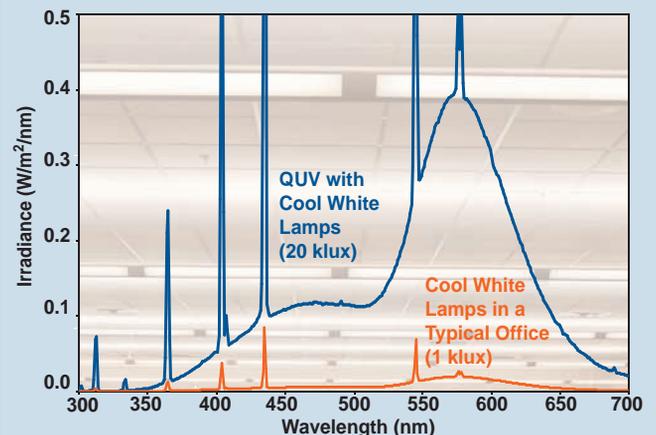
- * SOLAR EYE Irradiance Control
- * Condensation
- * Water spray system
- * ISO calibration

QUV/basic

- * Economical
- * Best used for comparative testing
- * Manual irradiance control
- * No calibration

QUV/cw

- * SOLAR EYE Irradiance Control
- * Cool white fluorescent lamps
- * Indoor photostability testing
- * ISO calibration



The QUV/cw uses cool white lamps to simulate indoor environments, such as the overhead fluorescent lighting typically found in offices. It also meets ISO, ANSI and ASTM test methods for indoor photostability testing.

Q-Lab Corporation – The Most Trusted Name in Weathering

Q-Lab Corporation is a global provider of material durability testing equipment and services. For more than 50 years, our goal has been to produce practical, economical, and reliable products and services for our customers.

Florida Subtropical Weathering is the world standard for natural sunlight and moisture exposures.

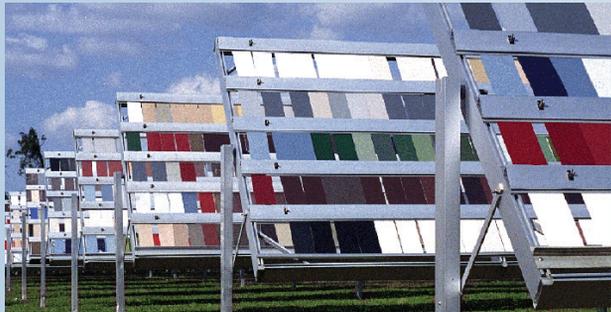
Arizona Desert Weathering has intense sunlight, high temperatures, and large daily temperature fluctuations.

Q-TRAC® Natural Sunlight Concentrator is an accelerated outdoor exposure test which uses natural sunlight as its source.

Q-SUN® Xenon Test Chamber reproduces the full spectrum of sunlight, including UV, visible and infrared. It is especially useful for testing dyes, pigments, textiles, inks and indoor materials.

Accelerated Laboratory Testing at Q-Lab Florida offers xenon, QUV, humidity, corrosion and chip resistance testing.

QUV Accelerated Weathering Tester provides fast and economical results. Fluorescent UV lamps provide the best simulation of solar UV. The QUV is especially useful for testing physical properties of polymers and appearance properties of coatings.



Exposure Racks at Q-Lab Florida



Q-TRAC at Q-Lab Arizona



Q-SUN Xenon Test Chamber

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