ATLAS
MATERIAL TESTING SOLUTIONS

AMETEK®
MEASUREMENT & CALIBRATION
TECHNOLOGIES

Have you put your vehicle to the test?

LEADERS IN WEATHERING TESTING FOR THE AUTOMOTIVE INDUSTRY

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To test real world performance, you need to replicate real world conditions.

When predicting how a car will stand up to the elements, it isn't enough to guess. You need to know. For over 75 years, Atlas has worked with nearly every major automotive manufacturer on the market today to develop comprehensive testing programs that deliver reliable results.

Atlas offers:

- Weathering and corrosion instruments
- Outdoor weathering testing
- Methodology and standards development
- Material performance tests for plastics, coatings, textiles, rubber and glass
- Consultation and client education services

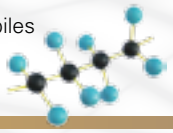
Let Atlas drive your testing program.

HISTORY OF ATLAS

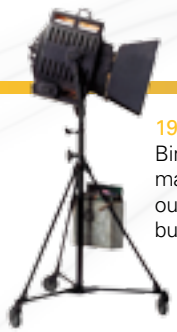
AUTOMOTIVE EVENTS RELATED TO MATERIALS AND DURABILITY

1908
Mass production helps popularize the automobile

1950's
Use of plastics in automobiles increases dramatically for a variety of applications



Late 1970's
Growth of Japanese automotive industry, largely fueled by improved quality and reliability



1915
Birth of Atlas as a provider of materials test equipment as an outgrowth of their stage lighting business

1930's
Outdoor testing of automotive materials begins in the benchmark subtropical climate at South Florida Test Service

1954
Heraeus develops the first xenon-arc weathering instrument, the Xenotest 150

1980's
Society of Automotive Engineers (SAE) develops test methods for automotive interior and exterior materials. These became the industry standards for 20+ years

2000's
Global OEM's complete significant work on materials analyses for better weathering simulation resulting in company-specific test methods

2013
Atlas instruments meet the new ASTM D7869 coatings testing standard

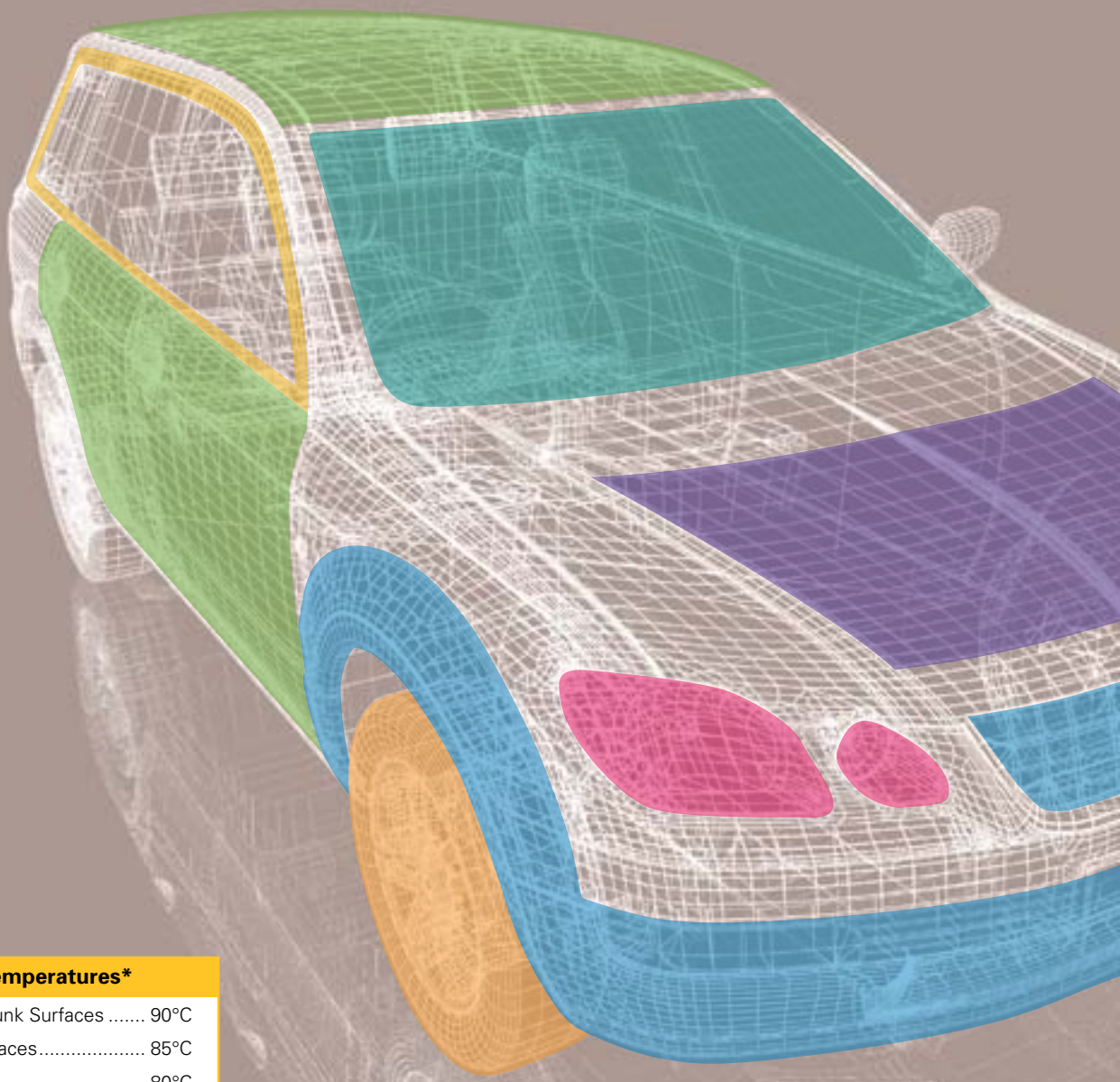
1977
Atlas patents the first xenon-arc instruments with controlled irradiance, the Atlas Ci65 Weather-Ometer

1980's
Full-car testing is popularized by Atlas using metal halide lamps

2010's
Atlas introduces the Right Light™ filter to further increase testing consistency and accuracy

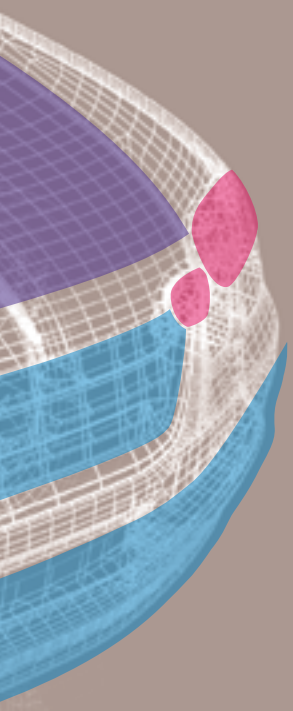
Weathering testing for exterior materials and components

Atlas' rigorous automotive test method development process is designed to replicate real world conditions. The result is an in-depth understanding of the long-term performance of materials commonly used in the automotive industry.



Automotive Maximum Temperatures*	
Coating System Roof/Hood/Trunk Surfaces	90°C
Bumper Fascia Horizontal Surfaces	85°C
Upper Exterior Door Panel	80°C
Lower Door Panel	75°C

* based upon outside ambient temp. of 52°C



Exterior Weathering

Paint

- Gloss loss and color change
- Cracking and peeling
- Corrosion of substrate
- Scratch and mar

Fascias and Body Panels

- Gloss loss and color change
- Delamination
- Scratch and mar

Headlamps

- Yellowing
- Micro-cracking
- Delamination

Wheels and Wheel Covers

- Filiform corrosion
- Cracking
- Delamination

Glazing

- Loss of laminate adhesion
- Hazing
- Yellowing of laminates

Weather Seals and Gaskets

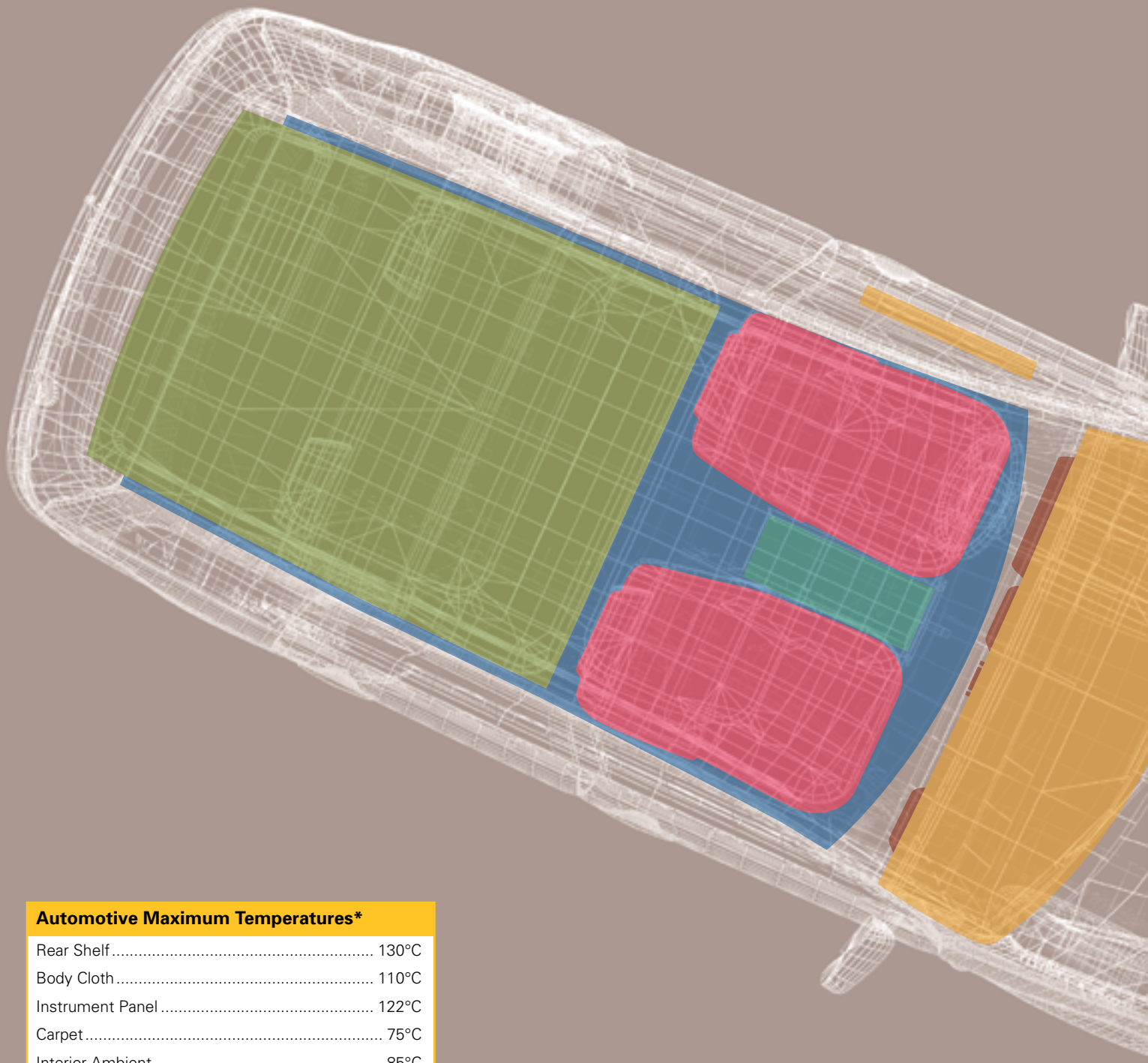
- Cracking
- Seal failure
- Embrittlement

Engine Components

- Corrosion
- Seal failure
- Fastener integrity

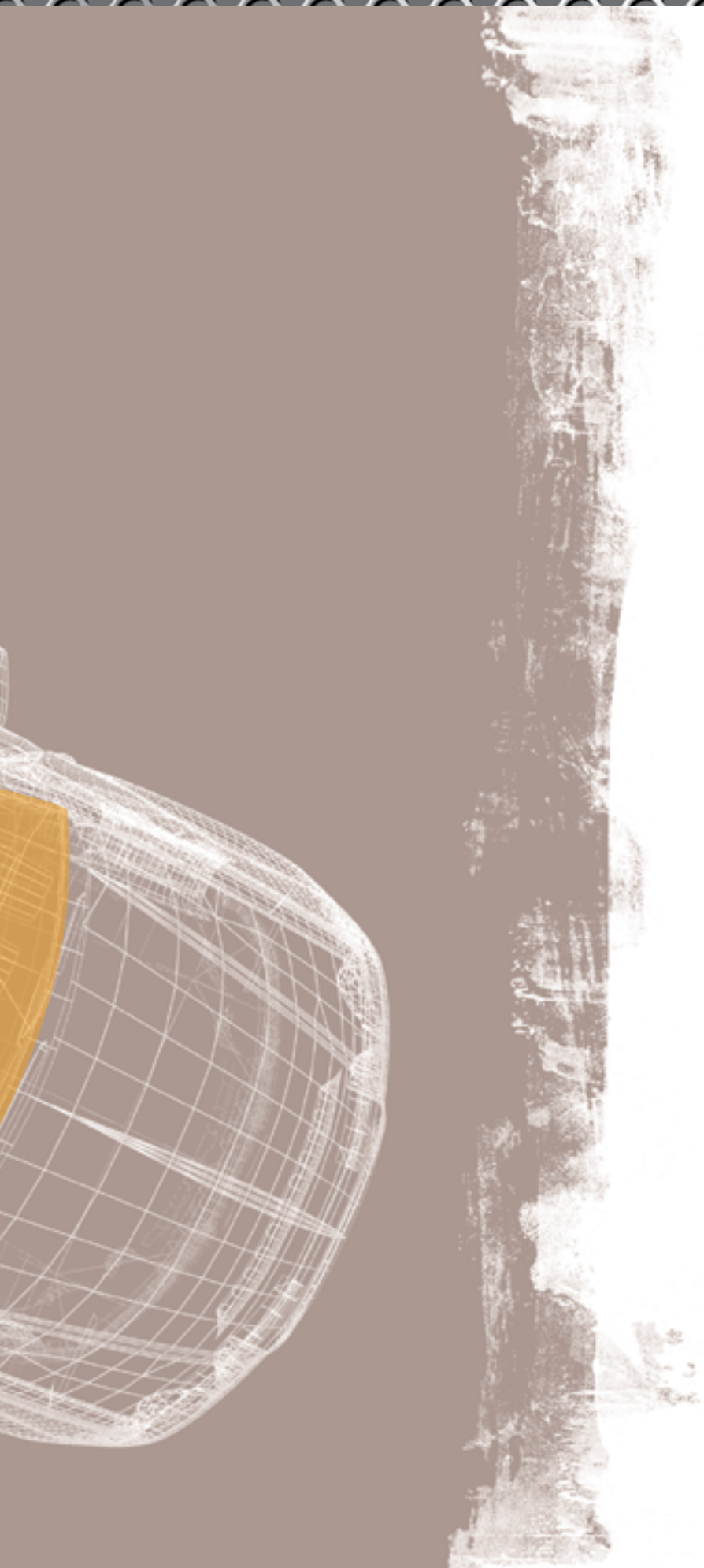
Atlas testing will determine how long vehicle interior components will last

As thorough as we are with the car's exterior, we put just as much care and attention to detail in testing the interior. Ensuring a long lifespan of these materials and components is critical for implementing a cost-efficient design and maintaining high user satisfaction.



Automotive Maximum Temperatures*	
Rear Shelf	130°C
Body Cloth	110°C
Instrument Panel	122°C
Carpet	75°C
Interior Ambient	85°C

* based upon outside ambient temp. of 52°C



Interior Weathering

Instrument and Door Panels/Airbag Covers

- Color change (fade, shift, chalking)
- Cracking
- Scratch and mar
- Delamination of skin to substrate
- Embrittlement

Hard Trim

- Color change (fade and shift)
- Embrittlement
- Delamination
- Thermal failure of control knobs

Seats

- Color change (fade and shift)
- Cracking
- Fiber deterioration

Carpets and Fabrics

- Color change (fade and shift)
- Fiber deterioration
- Adhesion loss/delamination

Center Consoles/ Overhead Console

- Color change (fade and shift)
- Coating delamination
- Scratch and mar

Headliners

- Color change (fade and shift)
- Adhesive failure

Your needs determine the direction of your testing program

Atlas offers design and implementation of complete testing and durability solutions to help you meet your quality goals, validate warranty statements, avoid premature failures, save time and money, and strengthen your market position.

Our four-step approach will help you develop the right weathering testing solution for your products:

1. Needs assessment
2. Development of test methods and strategies
3. Failure Mode and Effects Analysis
4. Management of test programs

Our complete offering of services include:

Test Method Development

- Test Method Review and Design
- Test Method Implementation
- Weathering Experiments
- Measurement Analysis and Degradation Modeling

Weathering Technology Consulting

- Process Assessment and Management
- Service Life Solutions
- Test Facility Design

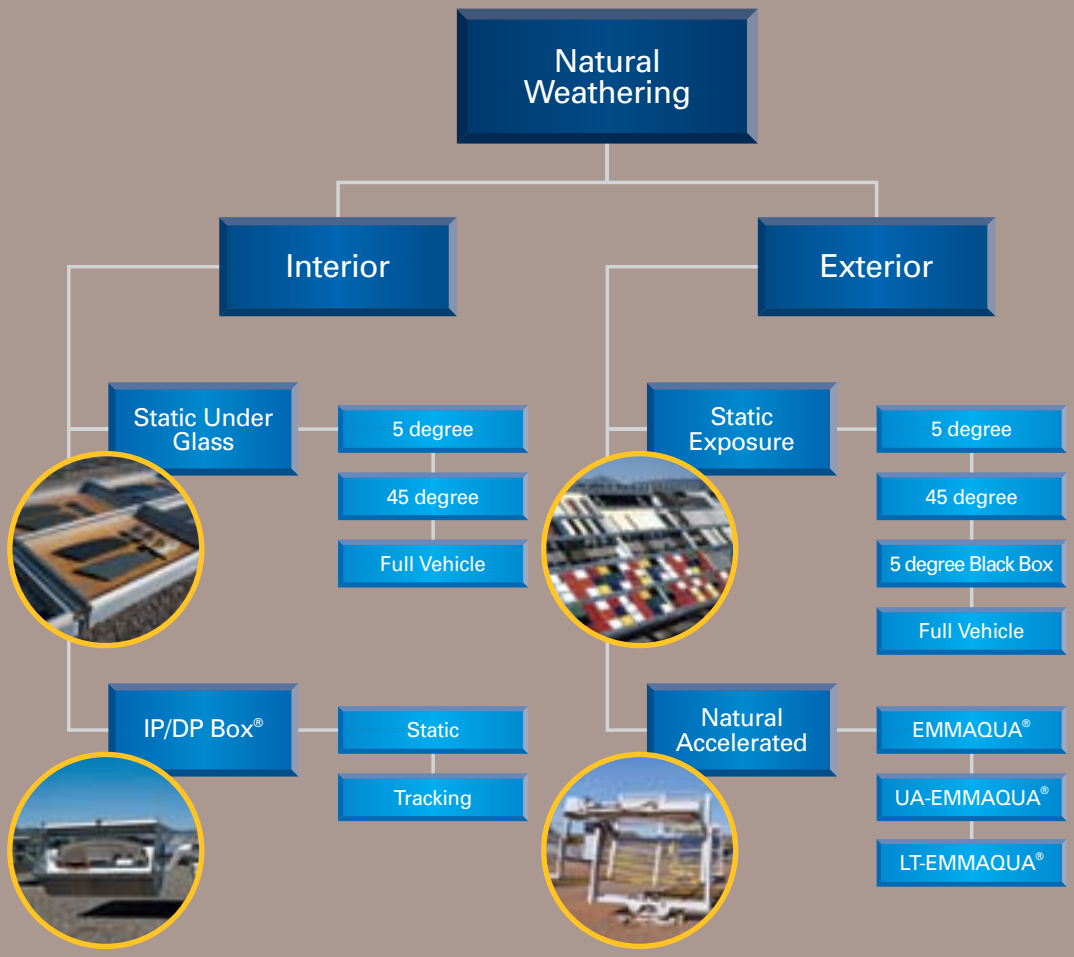
Education and Training

- Seminars
- Workshops
- In-House Programs
- Technical Conferences

Turn Key Outdoor Test Facility Development

- Design of indoor/outdoor testing facility
- Installation of indoor/outdoor testing facility
- Training program for facility operators

Hierarchy of Automotive Weathering Testing



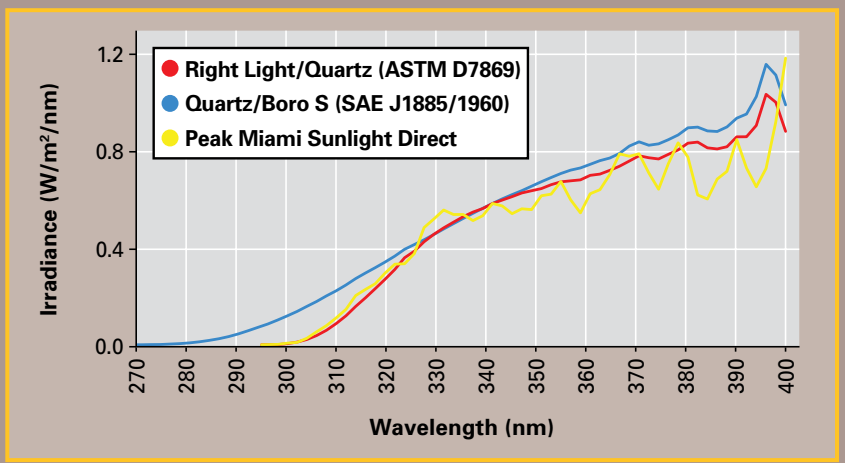
Indoor accelerated testing using xenon arc technology

Higher irradiance, better filters for maximum acceleration and correlation

"Water Cooled" Xenon Arc Lamp

- Best simulation of natural sunlight available
- 340nm up to 1.7 W/m²
- 420nm up to 3.0 W/m²
- 300-400nm up to 170 W/m²
- More than 10 filter combinations available

Sunlight vs. Xenon (Right Light™) vs. Xenon Arc



Automotive Standard Test Methods*

✔ = equipment meets requirements of test method ✘ = equipment not applicable for test method

TESTING FOR INTERIOR MATERIALS						
OEM	Test Method	Weather-Ometer®			Xenotest®	
		Ci3000+	Ci4000	Ci5000	Beta+	440+
General Motors	GMW 3414	✔	✔	✔	✔	✘
	GMW 14162	✔	✔	✔	✔	✔
	SAE J1885	✘	✔	✔	✘	✘
GM Opel	GME 60292	✔	✔	✔	✔	✔
Ford	FLTM BO 116-01	✘	✔	✔	✘	✘
	SAE J1885	✘	✔	✔	✘	✘
Chrysler	PF-11365	✘	✔	✔	✘	✘
Volkswagen	PV1303	✘	✘	✘	✔	✔
	PV1306	✘	✔	✘	✔	✘
Hyundai	MS-210-05	✔	✔	✔	✘	✘
PSA (Peugeot, Renault)	D47 1431	✔	✘	✘	✘	✘
BMW	VDA 75202	✔	✔	✔	✔	✔
Porsche	ISO 105-B06 (DIN 75202)	✔	✔	✔	✔	✔
Daimler	DBL 5555	✔	✔	✔	✔	✔
	DIN 75202	✔	✔	✔	✔	✔
Volvo	STD 423-0047	✔	✔	✔	✘	✘
	STD 1026, 82439	✔	✔	✔	✔	✔
	STD 1027, 359	✔	✔	✔	✘	✘
International	ISO 105-B06	✔	✔	✔	✔	✔
	ISO 4892-2	✔	✔	✔	✔	✔
	JASO M346	✔	✔	✔	✔	✔
	JIS D0205	✔	✔	✔	✔	✔
	SAE J1885/J2412	✔	✔	✔	✘	✘

TESTING FOR EXTERIOR MATERIALS						
OEM	Test Method	Weather-Ometer			Xenotest	
		Ci3000+	Ci4000	Ci5000	Beta+	440+
Ford	ASTM D7869	✔	✔	✔	✘	✘
	SAE J1960-Daylight Filters	✘	✔	✔	✘	✘
	SAE J2527	✔	✔	✔	✘	✘
General Motors	GMW 14650	✔	✔	✔	✔	✔
	SAE J2527	✔	✔	✔	✘	✘
	ISO 4892-2	✔	✔	✔	✔	✔
	GMW 14170	✔	✔	✔	✔	✔
	SAE J1960	✘	✔	✔	✘	✘
Volkswagen	PV3929	✔	✔	✘	✔	✔
	PV3930	✔	✔	✔	✔	✔
Hyundai	MS-300-31	✔	✔	✔	✘	✘
PSA (Peugeot, Renault)	D27 1389	✘	✔	✘	✘	✘
	D27 1911 / --D (2007)	✘	✔	✘	✘	✘
Porsche	ISO 4892-2	✔	✔	✔	✔	✔
Daimler	DBL 7399	✔	✔	✔	✔	✔
	DBL 5555	✔	✔	✔	✔	✔
Volvo	STD 1027, 337	✔	✔	✔	✘	✘
International	ASTM D7869	✔	✔	✔	✘	✘
	ISO 16474-2	✔	✔	✔	✔	✔
	ISO 4892-2	✔	✔	✔	✔	✔
	JASO M351	✔	✔	✔	✔	✔
	JIS D0205	✔	✔	✔	✔	✔
	SAE J1960/J2527	✔	✔	✔	✘	✘

*standards and instrument approvals subject to change

Ci Series Xenon Arc Weather-Ometer®

The #1 selling xenon weathering instrument for the automotive industry

A family of Weather-Ometers delivering the most uniform irradiance and precise temperature and humidity control. They offer the best price/sample capacity ratio in the industry.

Rotating Sample Rack

- Maximum uniformity for irradiance, temperature, relative humidity and spray

High Irradiance Xenon Arc Technology

- Up to 3 sun irradiance levels for acceleration
- More than 10 filter combinations to meet a variety of interior and exterior conditions

Multiple Wavelength and Light Monitoring System

- 340nm, 420nm, 300-400nm
- Full Spectrum Light Monitor (FSM) option allows user to verify compliance to standards and ensure consistent light output

ASTM Black Panel or ISO Black Standard Temperature

- BPT and BST can be installed simultaneously
- Independent control of BPT/BST and chamber temperature

Sample Temperature Measurement

- Specific Specimen Surface Temperature (S^3T) takes real-time temperature data of actual exposed samples

Easy-to-Use Touch Screen Controller

- Multiple language capabilities – Chinese, Japanese, Korean, Spanish, English and others
- 14 pre-programmed test methods and space for 10 custom test methods
- DAQ through USB, Ethernet or RS-232

Xenotest® Series Air Cooled Xenon Weathering

The Xenotest Series incorporates a variety of optional features to meet many global weathering test standards.

- Xenotest Alpha+, Beta+, 220+, and 440+
- Rotating rack maximizes exposure uniformity
- Up to 3 sun irradiance levels for acceleration
- Easy programming and monitoring using online features

Corrosion and Solar Testing Instruments

Salt Fog and Cyclic Corrosion Chambers

- Most sophisticated and versatile lab corrosion testing cabinet available
- Replicate up to 15 environmental conditions such as:
  - + Salt Fog
    (or complex electrolytes)
  - + Immersion
  - + Ambient
  - + -30°C to 90°C temperatures
  - + Solution Spray
  - + Controlled RH
  - + Other customized solutions

Solar Simulation Chambers

- Test individual components' ability to withstand solar radiation
- Metal Halide sunlight simulation
- Evaluation of both heat load and long-term aging
- Ensure long-term component durability

Full Vehicle Systems and Crash Test Lighting

Full Vehicle Testing

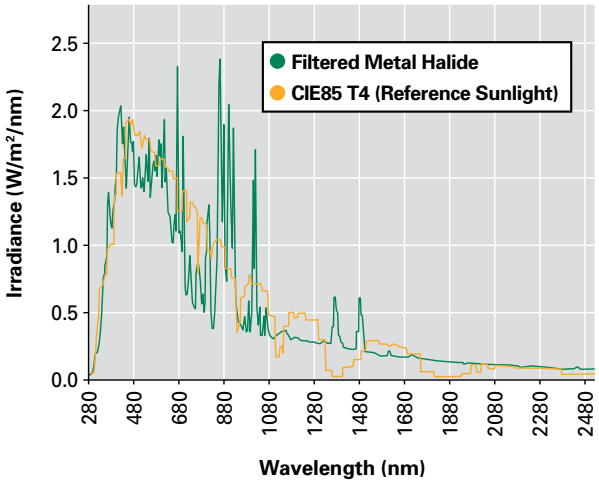
Applications

- Solar simulation systems for material exposure testing
- High speed lighting systems for crash test photography
- Fit and finish, occupant comfort, heating/AC analysis

Features

- Excellent full-spectrum match to sunlight, especially in IR region
- Efficient light source for large-scale testing
- Custom-designed for specific applications

Filtered Metal Halide vs. Daylight



Global Support & Weathering Exposure Sites

Phoenix, Arizona

- Recognized benchmark desert weathering site with high levels of UV radiation and temperature.
- EMMAQUA®/UA-EMMAQUA®/LT-EMMAQUA®, IP/DP Box®, car carousel and static testing.

Miami, Florida

- Recognized benchmark subtropical weathering site with high levels of UV radiation, temperature and humidity.
- Testing of full size automobiles, exterior coatings and interior components.

Main Climate	Precipitation	Temperature
A: equatorial	W: desert	h: hot arid
B: arid	S: steppe	k: cold arid
C: warm temperature	f: fully humid	a: hot summer
D: snow	s: summer dry	b: warm summer
E: polar	w: winter dry	c: cool summer
	m: monsoonal	d: extremely continental
		F: polar frost
		T: polar tundra

Source: Köppen-Geiger Climate Classification Map, koeppen-geiger.vu-wien.ac.at

Af	Am	As	Aw	BWk	BWh	BSk	BSh	Cfa	Cfb	Cfc	Csa	Csb	Csc	Cwa

Sanary sur Mer, France

- Benchmark Mediterranean site for European made products.
- Warm temperate climate providing the most severe weathering conditions on the European continent.

Hainan, China

- Popular Chinese test site for automotive testing with high levels of UV radiation, temperature and humidity.
- Testing of full size automobiles, IP/DP and exterior coatings.

Chennai, India

- Becoming a recognized benchmark subtropical weathering site in India with high levels of UV radiation, temperature and humidity.
- Testing of full size automobiles, exterior components and coatings.

Cwb Cwc Dfa Dfb Dfc Dfd Dsa Dsb Dsc Dsd Dwa Dwb Dwc Dwd EF ET

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