

What's New in Weathering and Corrosion Test Standards

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Q-Lab's Standards and Calibration Series

Today is the 2nd of a three-part webinar series on standards, calibration, and documentation

All upcoming and archived webinars can be accessed at:
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Date	Topic
01 Sep	Calibration and Documentation
08 Sep	What's New in Standards
15 Sep	How to Run ISO 105-B02

Administrative Notes

You'll receive a follow-up email from info@email.q-lab.com with links to a survey, registration for future webinars, and to download the slides

Use the Q&A feature in Zoom to ask us questions today!



Thank you for attending our webinar!

We hope you found our webinar on *What's New in Standards* to be helpful and insightful. The link below will give you access to the slides and recorded webinar.

You can help us continue to provide valuable and high quality content by completing our 3-question [survey](#) about your webinar experience. Every piece of feedback is carefully reviewed by a member of our team.

We consistently hold seminars and webinars about weathering, corrosion, standards, and more. The best way to keep up with news and events is by following us on [Facebook](#), [Twitter](#) and [LinkedIn](#).

Standards Development

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Standards Development

- Weathering and corrosion test standards have been in use for over **100 years**
- The most popular ASTM, ISO, SAE, and OEM standards have **A LOT** of historical data
 - There may be reluctance to change
 - Revisions must be done *very carefully* and often with international support and agreement among stakeholders
- *However...*



Standards Development

Standards committees do actively review, revise, and create test protocols!

- Calibration and maintenance recommendations
- Performance verification techniques
- Hardware neutrality
- Updates to cycles, accessories, and instrument parameters
- Incorporation of new technologies
- Language and typographical updates

Revising Standards

- Standards revised upon committee member request, if committee agrees to participate
 - Procedure differs based on organization – see our other webinar!
 - Called a *New Work Item Proposal*, *Work Item*, *Work In Progress*, etc.
 - **Problem-based** (an issue requires a standardized solution) or **Supply-based** (new equipment needs a repeatable procedure)
- Two scenarios for revision:
 - Systematic Review (every ~5 years depending on organization)
 - Any other time a need for an update is identified
- Today we'll look at recent and upcoming revisions to key weathering and corrosion test standards

Recent Standards Updates

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ASTM G155: Xenon arc weathering



Designation: G155 – 21

Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials¹

- Performance-based standard for operating a xenon-arc accelerated laboratory weathering apparatus
 - Information about xenon arc tester
 - Spectral irradiance
 - Temperature and water delivery
- 2013 edition revised in 2021



ASTM G155: Summary of changes

- Title now includes all materials, not just “Non-metallic” ones
- Clarifies updates to (non-mandatory!) test cycles
 - Suggested chamber air temperatures
 - Addition of modern test cycle from ASTM D7869
 - Improved layout of table
- Notes added explaining differences in step transitions
- Recommendation to always reposition specimens and suggestions as to how
- Improved definitions of optical filters

Optical Filter Classifications

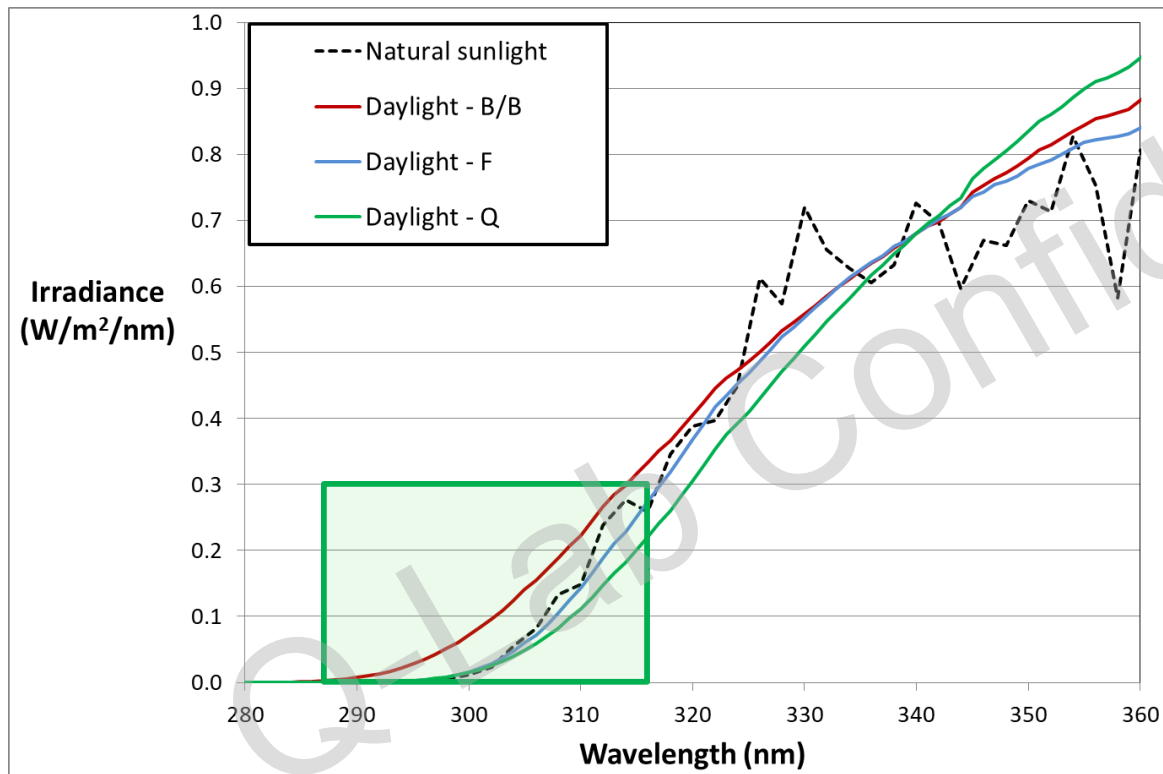
ASTM and ISO define classes of Optical Filters:

- Daylight
- Window
- Extended UV (ASTM only)



The Daylight definition, however, is very broad

Daylight Filters



- Each filter meets the ASTM / ISO definition of Daylight
- Solar cut-on different for borosilicate (B/B) filters
- Daylight filters can produce different test results!

Type I and Type II Daylight Optical Filters

Spectral Bandpass Wavelength λ in nm	General ^B		Type I ^C		Type II ^D		Benchmark Solar Radiation Percent ^{F,G,H}
	Min. % ^E	Max % ^E	Min. % ^E	Max % ^E	Min. % ^E	Max % ^E	
$\lambda < 300'$			0	0.2	0.2	1.1	
$300 \leq \lambda \leq 320$	2.6	8.1	2.6	6	3.5	7.0	5.8
$320 < \lambda \leq 340$			10.0	17.0	10.0	17.0	
$340 < \lambda \leq 360$	28.3	40.0	18.3	23.2	18.3	23.2	40.0
$360 < \lambda \leq 380$			25.0	30.5	25.0	30.5	
$380 < \lambda \leq 400$	54.2	67.5	29.2	37.0	29.2	37.0	54.2

- **General:** unchanged, still permitted, split into two mutually-exclusive classes:
- **Type I**
 - Close match to natural sunlight – generally recommended
 - Includes Daylight-Q and Daylight-F (ASTM D7869 type)
- **Type II**
 - Match to historical borosilicate filters – recommended only to match historical data
 - More shortwave UV than natural sunlight

Type I and Type II Daylight Filters: The Invasion

ISO 4892-2
TC 61 - **Plastics**

Plastics — Methods of exposure to laboratory light sources —

Part 2:
Xenon-arc lamps

AMENDMENT 1: Classification of daylight filters

Type I and Type II was added in 2021 to ISO 4892-2, probably the world's most popular xenon weathering test standard

ISO 16474-2
TC 35 – **Paints and Varnishes**

Paints and varnishes — Methods of exposure to laboratory light sources —

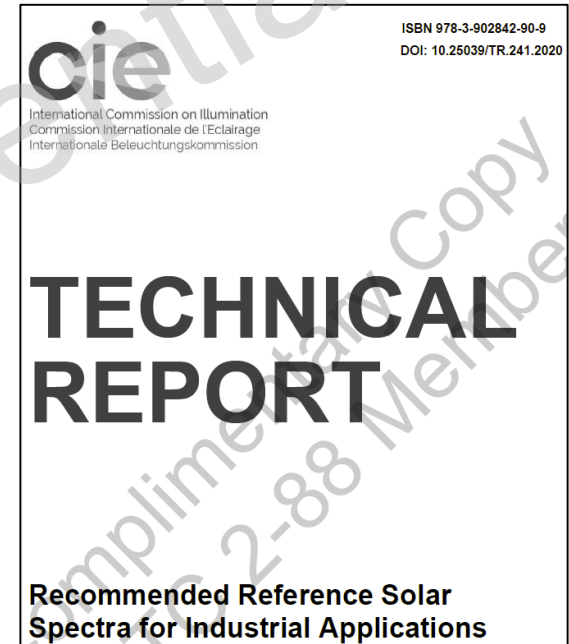
Part 2:
Xenon-arc lamps

AMENDMENT 1: Classification of daylight filters

Type I and Type II added in 2022 to ISO 16474-2, a xenon weathering test standard just like ISO 4892-2 but used for coatings

CIE 241: Solar Reference Spectra

- Widely-referenced standard with reference solar irradiance tables
- Uses **SMARTS2** (*Simple Model of the Atmospheric Radiative Transfer of Sunshine*) model
- Similar to ASTM G173 and G177
- CIE 241:2020 supersedes CIE85:1989
 - CIE issues a new document number instead of updating the publication date
 - This reference is being updated in A LOT of standards!



Updates to CIE 241

Table A.2 – CIE-H1: Global solar spectral irradiance on a horizontal plane at sea level
AM: 1,0, Water Vapour: 1,42 atm-cm, O₃: 0,340 atm-cm, AOD: 0,10, Albedo: 0,2

Wavelength nm	$E_{\lambda,H1}$ W·m ⁻² ·nm ⁻¹	Wavelength nm	$E_{\lambda,H1}$ W·m ⁻² ·nm ⁻¹	Wavelength nm	$E_{\lambda,H1}$ W·m ⁻² ·nm ⁻¹	Wavelength nm	$E_{\lambda,H1}$ W·m ⁻² ·nm ⁻¹
290	1,956E-05	570	1,653E+00	850	9,548E-01	1 130	1,941E-01
295	1,025E-03	575	1,658E+00	855	9,206E-01	1 135	1,765E-01
300	1,478E-02	580	1,656E+00	860	9,766E-01	1 140	2,776E-01
305	7,653E-02	585	1,657E+00	865	9,422E-01	1 145	2,163E-01
310	1,894E-01	590	1,572E+00	870	9,555E-01	1 150	2,346E-01
315	3,113E-01	595	1,594E+00	875	9,463E-01	1 155	2,941E-01
320	4,238E-01	600	1,587E+00	880	9,333E-01	1 160	3,588E-01
325	5,700E-01	605	1,598E+00	885	9,205E-01	1 165	4,140E-01
330	7,221E-01	610	1,587E+00	890	9,085E-01	1 170	4,415E-01
335	7,102E-01	615	1,551E+00	895	8,090E-01	1 175	4,379E-01
340	7,562E-01	620	1,549E+00	900	6,973E-01	1 180	4,323E-01

Update includes:

- Tabulated data in electronic format
 - New extraterrestrial and terrestrial spectra
 - Harmonization with ASTM spectra
 - Modern radiative transfer and UV data
 - Smaller sampling intervals
- Table CIE-H1 is the most commonly referenced table in CIE 241
 - Irradiance of “noon summer sunlight” at 340 nm historically 0.68 W/m²/nm ; now 0.756 W/m²/nm.
 - This value is probably *too high* due to albedo (reflected), but committee agreed to leave atmospheric inputs consistent with CIE 85

ISO 23741: Water Delivery for Xenon Arc

INTERNATIONAL
STANDARD

ISO
23741

First edition
2021-03

**Plastics — Determination of spray
water delivery during spray cycles
when using a xenon arc weathering
test apparatus**

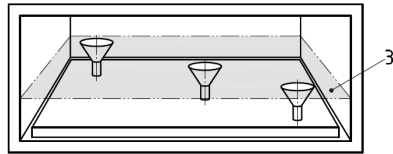


- Standard method introduced to quantify water delivery in xenon arc testers
- Includes rotating rack and flat array geometries
- Simple, 5-minute test with $\pm 10\%$ criterion for recommending specimen repositioning

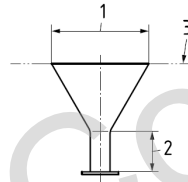
New in ISO 23741

Suggested collection device configurations

$$R_{H2O} = m_{H2O} / A_{cd} \times t_e$$



Flat array



Rotating rack



Standards Updates Expected Soon

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SAE J2020: UV Fluorescent Weathering



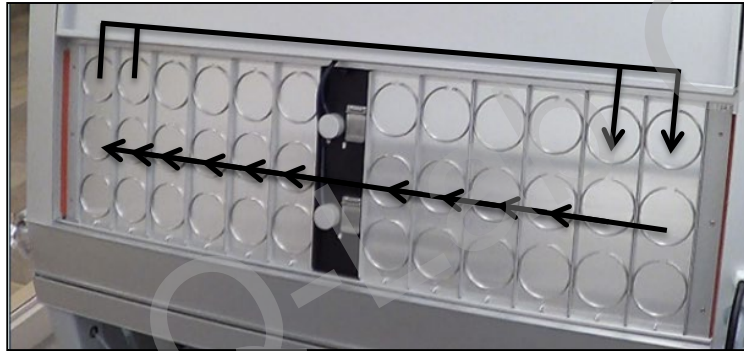
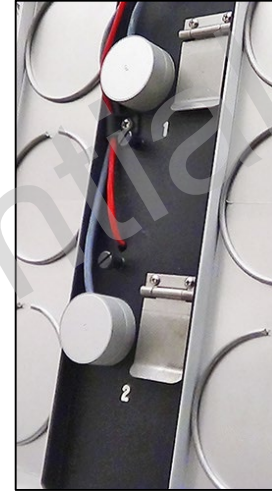
SURFACE VEHICLE STANDARD	J2020™	APR2016
	Issued	1989-06
	Revised	2016-04
Superseding J2020 FEB2003		
Accelerated Exposure of Automotive Exterior Materials Using a Fluorescent UV and Condensation Apparatus		

- Automotive performance-based standard for UV fluorescent weathering apparatus
 - Information about UV fluorescent tester
 - Specification of UVA and UVB lamps
 - Temperature control and condensation
- 2016 edition revised, to be published in 2022



Proposed Updates to SAE J2020

- Improved description of black panel thermometers
- Better-defined calibration practices



- Clearly allows use of end positions (if other positions full)
- Specifies recommended repositioning guidelines and frequency (like ASTM G151)

ISO 9227: Continuous Corrosion

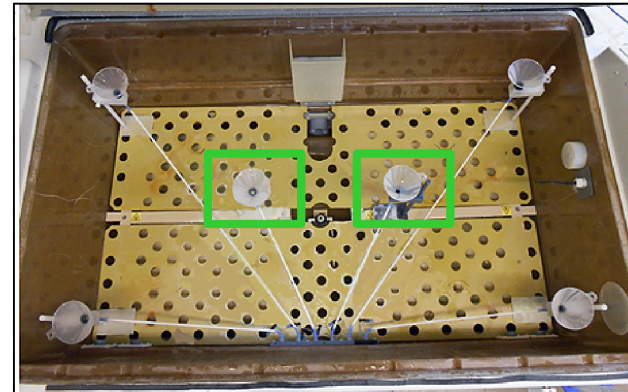
Corrosion tests in artificial atmospheres - Salt spray tests (ISO 9227:2017)

- Performance-based continuous corrosion standard with three tests:
 - Neutral salt spray (NSS)
 - Acetic Acid Salt Spray (AASS)
 - Copper-accelerated Acetic acid Salt Spray (CASS)
- 2017 edition under revision



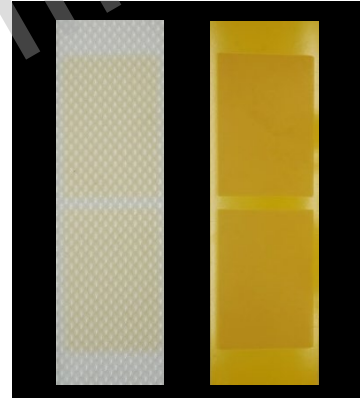
Proposed Updates to ISO 9227

- Multiple steel grades allowed for corrosion (mass-loss) coupons
 - Formerly only CR4 (Japanese grade) cold rolled steel
 - Ring study delivered same results from equivalent USA and European grades (SAE 1006, ASTM 1008, ISO 3574)
- Routine fog verification can be performed with only two collection devices
 - The standard of six funnels is still required to be performed periodically



UVC Testing: New Development

- UVC testing is very new!
- UVC lacks historical basis of other weathering and corrosion tests
- *This is challenge and an opportunity*
- Work item in progress in ASTM G03 (Weathering and Durability)



UVC Testing: Parameters Under Consideration

Irradiance:	1-6 mW/cm ² (10-60 W/m ²) <i>Will reciprocity be valid for UVC testing?</i> <i>Should low-irradiance values established previously be included?</i>
Temperature:	30-63 °C BPT (Black Panel Temperature) <i>Are room temp values more practical? Does high temp accelerate?</i>
Cycle:	Continuous or Light/Dark cycling <i>Will dark periods affect results?</i>
Duration:	200-1000 hours <i>Usually not specified in standard operating practice</i> <i>Short exposures acceptable, or longer tests required?</i>

Summary

- Although many weathering and corrosion test standards have been in use for decades, international committees are continuously improving upon them
 - Most changes add clarity, openness, and usability
- Recent updates and new documents include:
 - ASTM G155 (xenon)
 - CIE 241 (solar reference)
 - ISO 23741 (water delivery)
 - ISO 4892-2 and ISO 16474-2 (xenon arc daylight filters)

Summary

- Although many weathering and corrosion test standards have been in use for decades, international committees are continuously improving upon them
 - Most changes add clarity, openness, and usability
- Upcoming updates expected for:
 - SAE J2020 (UV fluorescent)
 - ISO 9227 (continuous corrosion)
 - UVC testing (new!)
- *Future updates (work in progress)*
 - ISO 4892-1 (weathering instruments)
 - ASTM G154 and ISO 4892-3 (UV fluorescent)

Postscript: What Can I Do?

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Research Your Standard

It's easy to find the status of most standards online!

ISO Standards | About us | News | Taking part | **Store** | Search

← ICS ← 83 ← 83.080 ← 83.080.01

ISO 4892-3:2016

Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps

Abstract [Preview](#)

ISO 4892-3:2016 specifies methods for exposing specimens to fluorescent UV radiation, heat and water in apparatus designed to simulate the weathering effects that occur when materials are exposed in actual end-use environments to global solar radiation, or to solar radiation through window glass.

The specimens are exposed to fluorescent UV lamps under controlled environmental conditions (temperature, humidity and/or water). Different types of fluorescent UV lamp can be used to meet all the requirements for testing different materials.

Specimen preparation and evaluation of the results are covered in other International Standards for specific materials.

Buy this standard

Format	Language
<input checked="" type="checkbox"/> PDF + ePub	English
<input type="checkbox"/> Paper	English

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If you want more details, Q-Lab can help with that

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Research Your Standard

Find out what committee is responsible

General information

Status :  Published

Publication date : 2016-02

Edition : 4

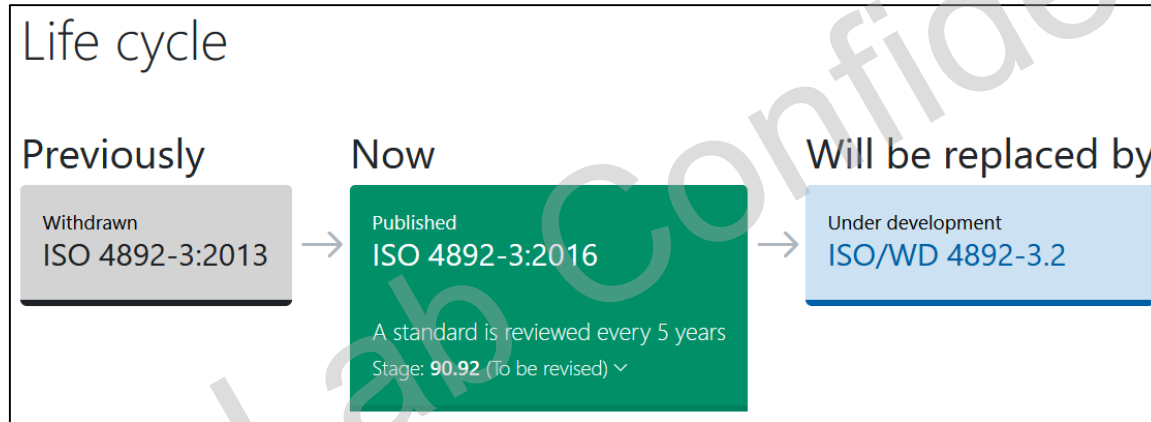
Number of pages : 16

Technical Committee : ISO/TC 61/SC 6 Ageing, chemical and environmental resistance

ICS : 83.080.01 Plastics in general

See if work is in progress

Active revisions may be indicated - not all organizations do this



Join a committee

- Best way to influence standards that matter to you
- Relatively inexpensive and open to join
- Some allow you to join any committees you want with a membership; with others, you may need to be more selective



Thank you for your attention!

Questions?

Send your inquiry to:
info@q-lab.com