What's New in Weathering and Corrosion Test Standards
老化和腐蚀测试标准的更新与解读

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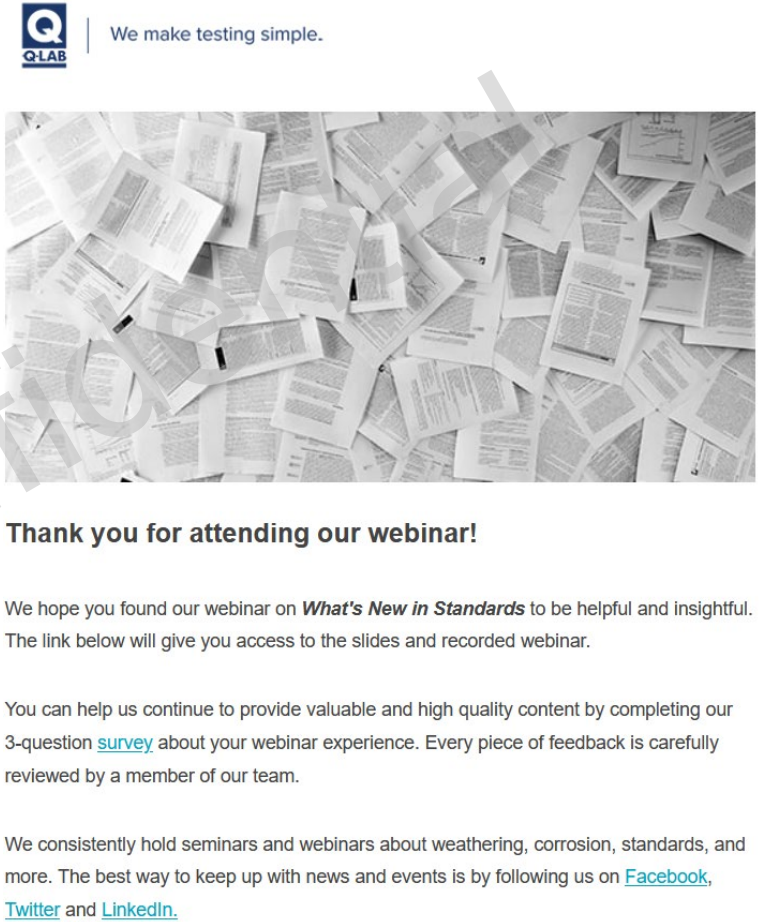

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Thank you for attending our webinar!

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
标准进展

Standards Development 标准进展

- Weathering and corrosion test standards have been in use for over **100 years** 老化与腐蚀测试标准已使用100多年
- The most popular ASTM, ISO, SAE, and OEM standards have **A LOT** of historical data 有大量历史数据
  - There may be reluctance to change 可能不愿意改变
  - Revisions must be done *very carefully* and often with international support and agreement among stakeholders

    修订工作必须非常谨慎，并得到国际支持及相关方同意
- *However… 然而…*

Standards Development 标准进展

Standards committees do actively review, revise, and create test protocols! 标委会积极审查，修订并制定测试方案

- Calibration and maintenance recommendations 校准与维护建议
- Performance verification techniques 性能验证技术
- Hardware neutrality 硬件中立
- Updates to cycles, accessories, and instrument parameters
  测试循环，附件和设备参数的更新
- Incorporation of new technologies 采用新技术
- Language and typographical updates 表述和排版更新

Revising Standards 修订标准

- Standards revised upon committee member request, if committee agrees to participate 根据标委会委员的要求修订标准
  - Procedure differs based on organization – see our other webinar! 程序各异
  - Called a *New Work Item Proposal*, *Work Item*, *Work In Progress*, etc. 工作项目
  - **Problem-based** (an issue requires a standardized solution) or 问题导向
    Supply-based (new equipment needs a repeatable procedure) 供给导向

- Two scenarios for revision: 两种修订方式：
  - Systematic Review (every ~5 years depending on organization) 系统性审查
  - Any other time a need for an update is identified 更新需求一旦确定的任何时间

- Today we'll look at recent and upcoming revisions to key weathering and corrosion test standards 主要的老化和腐蚀测试标准最近和即将的修订

Recent Standards Updates
最近的标准更新

ASTM G155: Xenon arc weathering 氙灯老化测试

Designation: G155 – 21

Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials[1]

- Performance-based standard for operating a xenon-arc accelerated laboratory weathering apparatus 已性能为基础的标准，氙灯加速实验室老化设备
  - Information about xenon arc tester 关于氙灯试验箱的信息
  - Spectral irradiance 光谱辐照度
  - Temperature and water delivery 温度和水的施加
- 2013 edition revised in 2021 最新版2021

ASTM G155: Summary of changes 修订汇总

- Title now includes all materials, not just “Non-metallic” ones 适用于所有材料
- Clarifies updates to (non-mandatory!) test cycles 非强制性试验周期
  - Suggested chamber air temperatures 建议箱体空气温度
  - Addition of modern test cycle from ASTM D7869 增加ASTM D7869中的测试循环
  - Improved layout of table 改进了表格形式
- Notes added explaining differences in step transitions 添加说明步骤转换差异的注释
- Recommendation to always reposition specimens and suggestions as to how 轮换试样位置的建议及如何轮换的建议
- Improved definitions of optical filters 更精确定义过滤片

Optical Filter Classifications 过滤片分类

ASTM and ISO define classes of Optical Filters:

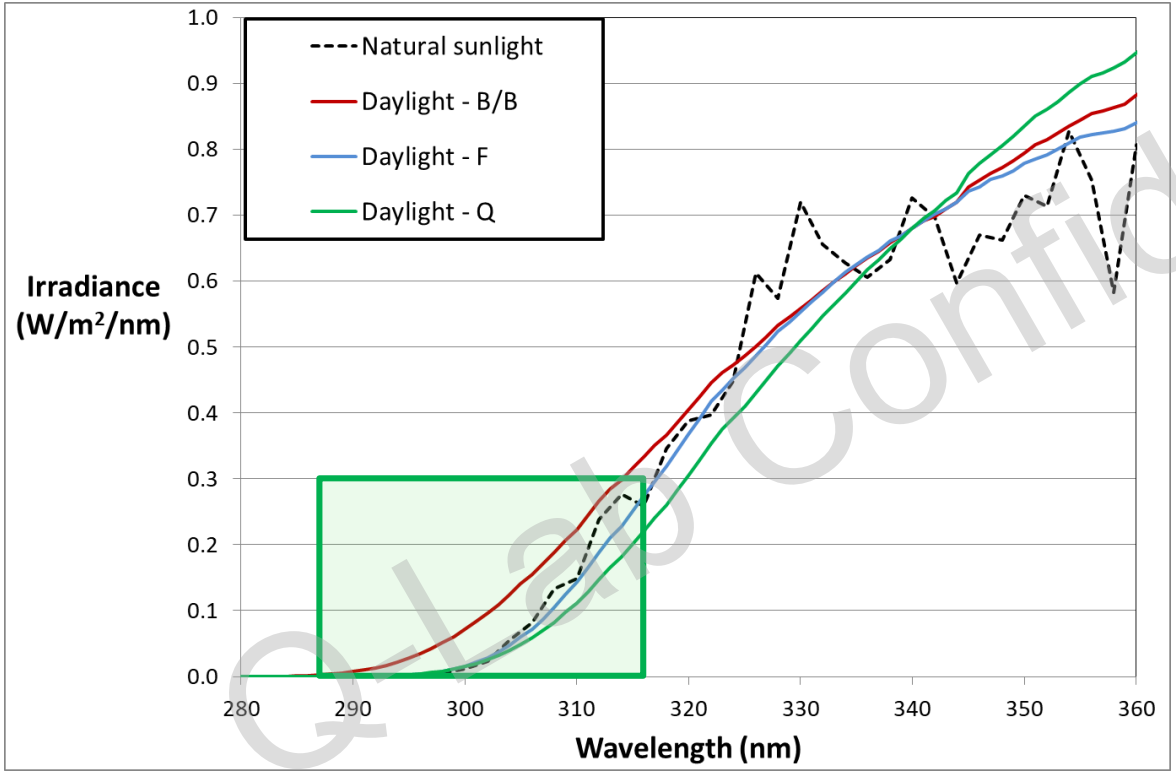
ASTM和ISO定义的过滤片类别：

- Daylight 日光过滤片
- Window 窗玻璃过滤片
- Extended UV (ASTM only) 紫外延展

The Daylight definition, however, is very broad

然而，日光过滤片的定义过于宽泛

Daylight Filters 日光过滤片



- 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]	
λ < 300[I]	2.6	8.1	0	0.2	0.2	1.1	5.8
300 ≤ λ ≤ 320			2.6	6	3.5	7.0	
320 < λ ≤ 340	28.3	40.0	10.0	17.0	10.0	17.0	40.0
340 < λ ≤ 360			18.3	23.2	18.3	23.2	
360 < λ ≤ 380	54.2	67.5	25.0	30.5	25.0	30.5	54.2
380 < λ ≤ 400			29.2	37.0	29.2	37.0	

- General: unchanged, still permitted, split into two mutually-exclusive classes:
- 总体：没改变，仍然允许，分为两类
- Type I
  - Close match to natural sunlight – generally recommended 与自然光更匹配，推荐
  - Includes Daylight-Q and Daylight-F (ASTM D7869 type) 包括Daylight-Q和Daylight-F
- Type II
  - Match to historical borosilicate filters – recommended only to match historical data
  - More shortwave UV than natural sunlight 比自然光多更短的UV

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 —

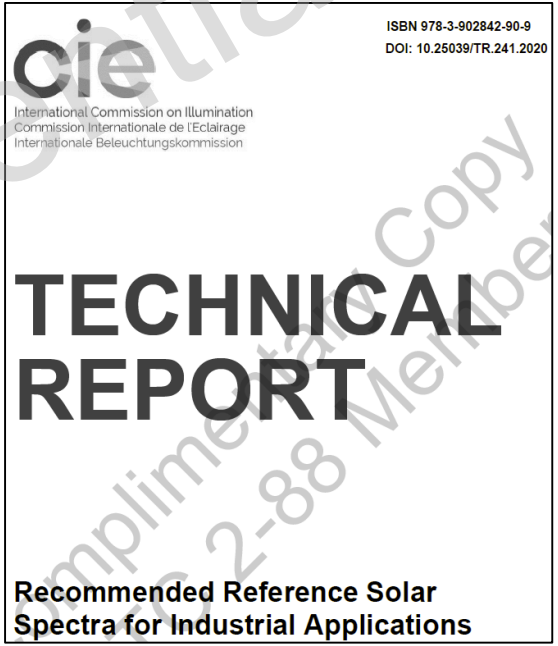
Part 2:
Xenon-arc lamps

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 太阳参考光谱

- Widely-referenced standard with reference solar irradiance tables 参考太阳辐照度表格的广泛参考标准
- Uses SMARTS2 (*Simple Model of the Atmospheric Radiative Transfer of Sunshine*) model 使用SMARTS2模型
- Similar to ASTM G173 and G177 与ASTM G173和G177类似
- CIE 241:2020 supersedes CIE85:1989 取代CIE85:1989
  - CIE issues a new document number instead of updating the publication date CIE发布新的文件编号，而不是更新日期
  - This reference is being updated in A LOT of standards!
  - 该参考标准正在大量标准中更新



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, O_3: 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 电**子格式的表格数据**
- New extraterrestrial and terrestrial spectra **新的光**谱
- Harmonization with ASTM spectra **与**ASTM**光**谱协调
- Modern radiative transfer and UV data 现**代辐射**传输
- Smaller sampling intervals **更频繁采**样

- Table **CIE-H1** is the most commonly referenced table in **CIE 241** 表**CIE-H1**是**CIE 241**中最常用的参考表格
- Irradiance of "noon summer sunlight" at 340 nm historically 0.68 W/m^2/nm ; now 0.756 W/m^2/nm.
- "夏天正午太阳光"的辐照度，之前是0.68 W/m^2/nm；现在是0.756 W/m^2/nm
- This value is probably *too high* due to albedo (reflected), but committee agreed to leave atmospheric inputs consistent with CIE 85 由于反射该值可能太高，但委员会同意将大气输入与CIE 85保持一致

ISO 23741: Water Delivery for Xenon Arc

INTERNATIONAL STANDARD

ISO 23741

First edition
2021-03

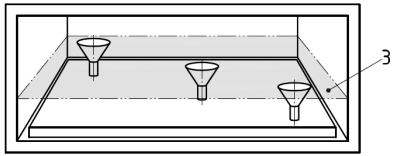
Plastics — Determination of spray water delivery during spray cycles when using a xenon arc weathering test apparatus

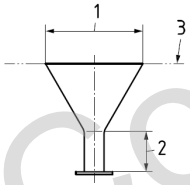
- Standard method introduced to quantify water delivery in xenon arc testers 水的施加的定量
- Includes rotating rack and flat array geometries 包括旋转和平板设备
- Simple, 5-minute test with ±10% criterion for recommending specimen repositioning
- 简单，5分钟测试，采用±10%的准则来建议试样轮换位置

New in ISO 23741

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

Suggested collection device configurations 建议的收集装置





Flat array

Rotating rack

Standards Updates Expected Soon
即将更新的标准

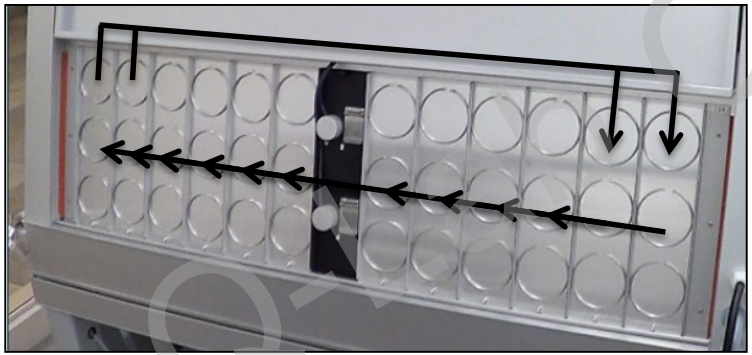
SAE J2020: UV Fluorescent Weathering

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 汽车行业以性能为基础的标准，荧光紫外加速老化试验机
  - Information about UV fluorescent tester 紫外试验机相关信息
  - Specification of UVA and UVB lamps UVA和UVB灯管规格
  - Temperature control and condensation 温度控制和冷凝
- 2016 edition revised, to be published in 2022 2022版即将发布

Proposed Updates to SAE J2020

- Improved description of black panel thermometers
- 黑板温度计的改进说明
- Better-defined calibration practices
- 更明确的校准操作



- Clearly allows use of end positions (if other positions full) **明确允许使用两端位置**
- Specifies recommended repositioning guidelines and frequency (like ASTM G151)
- **指定建议的试样轮换准则及频率**

ISO 9227: Continuous Corrosion 连续腐蚀

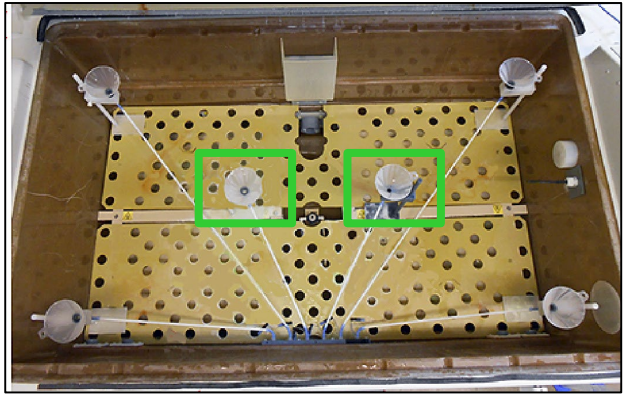
Corrosion tests in artificial atmospheres - Salt spray tests (ISO 9227:2017)

- Performance-based continuous corrosion standard with three tests:
- 以性能为基础的连续腐蚀标准，包含3个测试：
  - Neutral salt spray (NSS) 中性盐雾
  - Acetic Acid Salt Spray (AASS) 乙酸盐雾
  - Copper-accelerated Acetic acid Salt Spray (CASS) 铜加速乙酸盐雾
- 2017 edition under revision 2017版正在修订中

Proposed Updates to ISO 9227

- Multiple steel grades allowed for corrosion (mass-loss) coupons
- 腐蚀coupon板（失重）允许使用多种钢板
  - 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)

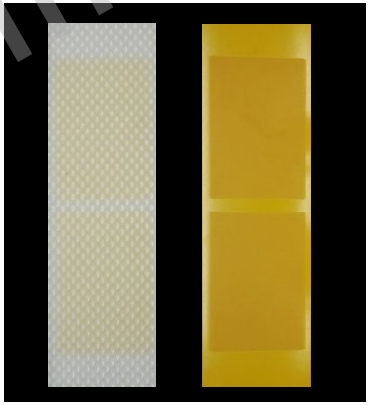
- Routine fog verification can be performed with only two collection devices
- 可以只用2个收集装置进行常规盐雾验证
  - The standard of six funnels is still required to be performed periodically



UVC Testing: New Development

UVC测试：新开发的标准

- UVC testing is very new! UVC测试非常新！
- UVC lacks historical basis of other weathering and corrosion tests 缺少历史基础
- *This is challenge and an opportunity*
- *既是挑战也是机遇*
- Work item in progress in ASTM G03 (Weathering and Durability) ASTM G03正在进行的工作项目



UVC Testing: Parameters Under Consideration

Irradiance: 1-6 mW/cm^2 (10-60 W/m^2)

*Will reciprocity be valid for UVC testing? **互易**对UVC测试有效吗？*
Should low-irradiance values established previously be included?
***是否**应包括先前确定的低辐照度值？*

Temperature: 30-63 °C BPT (Black Panel Temperature)

Are room temp values more practical? Does high temp accelerate?

Cycle: Continuous or Light/Dark cycling

Will dark periods affect results?

Duration: 200-1000 hours

Usually not specified in standard operating practice

Short exposures acceptable, or longer tests required?

Summary 总结

- 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 更清晰，更包容，更实用
- 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)

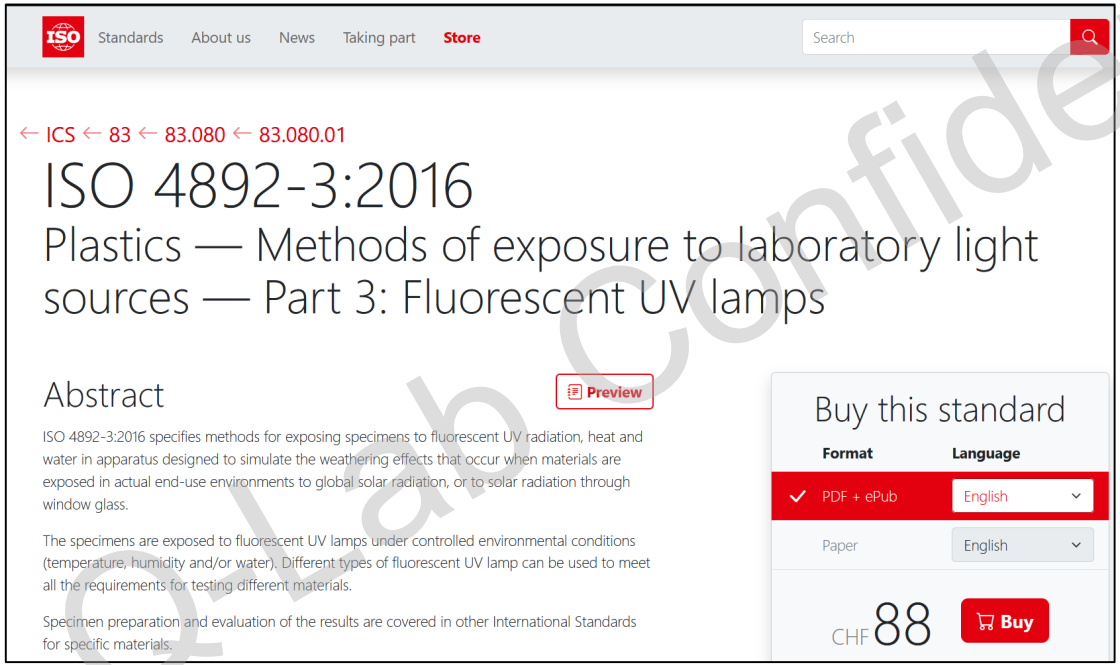
Summary 总结

- 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 更清晰，更包容，更实用
- 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?
备注：我能做什么？

Research Your Standard

It's easy to find the status of most standards online! 很容易在网上找到大多数标准的状态!

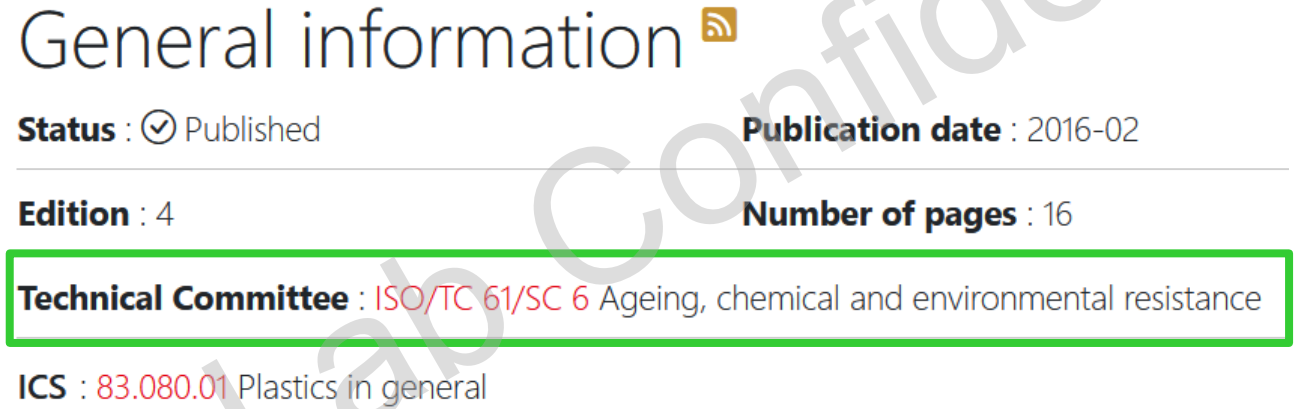


If you want more details, Q-Lab can help with that

Buy it if you like it!

Research Your Standard

Find out what committee is responsible 了解委员会的职责



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ICS : 83.080.01 Plastics in general

See if work is in progress 查看工作是否正在进行

Active revisions may be indicated - not all organizations do this

Join a committee 加入一个标委会

- 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!

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