

非金属材料 干热气候下的光照试验

1 范围

本标准规定了评定塑料、橡胶以及可折叠车顶织物等在经历日光照射后的老化行为（如颜色、光泽的改变）的试验流程。

该试验通过在人为的干热气候(如,卡拉哈里,南非和亚利桑那州)下进行光照来完成。

该试验用于对试样与标准产品的监控。

注：在一些特定的应用上，老化标准可能还包括力学性能或被裂的变化。因为这个原因，除目视评定，颜色与光泽度测试之外，还需要额外的试验来对此进行评定。这些试验可能包括拉伸试验，冲击阻力试验，硬度测试以及金相微观等试验。

2 规范性引用文件

下列文件中的条款通过本标准的引用而成为本标准的条款。凡是注日期的引用文件，其随后所有的修改单（不包括勘误的内容）或修订版均不适用于本标准，然而，鼓励根据本标准达成协议的各方研究是否可使用这些文件的最新版本。凡是不注日期的引用文件，其最新版本适用于本标准。

DIN 6167 纯白色或无色材料黄色的描述

DIN 6174 彩色坐标的色度评定和色彩差异的评定依照近似的 CIELAB 均匀色度空间

DIN 53236 材料颜色的测试;测量条件和涂装的色彩差异测量评定, 类似的塑料件和涂层

DIN 67530 反射计作为塑料件和涂装的平面光泽评定的一种方法

Non-Metallic Materials Weathering in Dry, Hot Climate

1 Scope

This standard describes the procedure for testing the aging behavior (e.g., change in color and gloss) of plastics, elastomers and folding-top cloths that are subjected to weather and daylight.

Testing is carried out by means of artificial weathering in a dry, hot climate (e.g., Kalahari, South Africa and Arizona).

The test is used for sample and standard production monitoring.

NOTE: For certain applications, the aging criteria may consist of changes in the mechanical properties or cracking. For this reason, additional tests may be required along with the visual evaluation and color and glossiness measurements. These tests may include tensile tests, determination of impact resistance, determination of hardness and microscopic examinations, for example.

2 Normative references

The following normative documents contain provision which, through reference in this text, constitute provisions of this standard. For dated reference, subsequent amendments to, or revisions of, any of these publications do not apply (exclude the correction), but parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards. For undated references, the latest edition of the normative document referred to applies.

DIN 6167 Description of Yellowness of Near-White or Near-Colourless Materials.

DIN 6174 Colorimetric Evaluation of Colour Coordinates and Colour Differences according to the Approximately Uniform CIELAB Colour Space.

DIN 53236 Testing of Colouring Materials; Conditions of Measurement and Evaluation for the Determination of Colour Differences for Paint Coatings, Similar Coatings and Plastics.

DIN 67530 Reflectometer as a Means for Gloss Assessment of Plane Surfaces of Paint Coatings and Plastics.

DIN EN 20105-A02 纺织品-颜色牢固性的测试-A02 部分: 变色灰度级的评定

DIN EN ISO 105-A01 纺织品-颜色牢固性的测试-A01 部分: 常规原理测定

DIN EN ISO 4628-1 涂料和清漆-涂层退化的评定-缺陷数量和尺寸的名称, 以及在外表面上的光亮度的统一变化-第 1 部分: 常规介绍和系统的名称

DIN EN ISO 4892-2 塑料体-对实验室光源的曝光方法-第 2 部分: 氙弧光灯

DIN EN ISO 11341 涂料和清漆-人造大气曝露试验和人造辐射的曝光-对氙弧光灯的辐射过滤后的曝光

3 要求

试验所需要的年周期以及与本试验标准之间的偏差, 视零部件所处的位置或材料将在供货技术要求, 本公司的标准和图样上予以陈述。

4 试验方法

4.1 原理

采用氙弧光灯对试样进行照射。滤光器应使氙弧光灯发射的紫外线和可见光光谱可对试样进行球面辐射。

试验设备参照 DIN EN ISO 4892-2 和 DIN EN ISO 11341。

试验条件为紫外线平均波长在(300 至 385) nm 的干热气候地带, 如卡拉哈里, 南非和亚利桑那州。试验周期为一年。

4.2 试验设备

光照试验设备的辐射强度应能逐步增强且易于控制。为了确保供应商和客户的试验结果具有可比性, 用于试验的设备必须经本公司职能实验室同意并认可。

4.3 光照试验条件

DIN EN 20105-A02 Textiles – Tests for Colour Fastness – Part A02: Grey Scale for Assessing Change in Colour.

DIN EN ISO 105-A01 Textiles – Tests for Colour Fastness – Part A01: General Principles of Testing.

DIN EN ISO 4628-1 Paints and Varnishes – Evaluation of Degradation of Coatings – Designation of Quantity and Size of Defects, and of Intensity of Uniform Changes in Appearance – Part 1: General Introduction and Designation System.

DIN EN ISO 4892-2 Plastics – Methods of Exposure to Laboratory Light Sources – Part 2: Xenon-Arc Lamps.

DIN EN ISO 11341 Paints and Varnishes – Artificial Weathering and Exposure to Artificial Radiation– Exposure to Filtered Xenon-Arc Radiation.

3 Requirements

The number of required year cycles, as well as deviations from this test standard, are set out in the Technical Supply Specifications, SAIC Motor standards and drawings depending on the component position or material.

4 Test method

4.1 Principle

Specimens are irradiated using Xenon arc light. Filters shall be used to adapt the Xenon arc light to the global irradiation with its spectral distribution of ultraviolet and visible radiation.

Testing is performed in equipment according to DIN EN ISO 4892-2 and DIN EN ISO 11341.

The test conditions each describe a year cycle, referred to the average dose of UV radiation of (300 to 385) nm in dry heat climate zones, e.g., Kalahari, South Africa and Arizona.

4.2 Test equipment

Weathering equipment with which the increased intensity of irradiation can be achieved and controlled shall be used. To ensure that the test results of the suppliers and purchaser are comparable, the make to be used for the test must be agreed with the responsible laboratory of the SAIC Motor.

4.3 Weathering conditions

为保持试验温度一致,推荐将试验设备安装在可保持恒温的试验室内。具体试验条件见表1。

See Table 1. In order to comply with the test temperatures, it is recommended to set up the test equipment in a test room that is kept at a constant temperature.

表 1/Table 1

| 试验设备 make | Weather O-meter Ci 3000 | Xenotest 1200 CPS | Xenotest alpha | Beta LM | Ci 4000 | Suntest XXL+ | Q-Panel |
|---|---|--|--|------------|---|--|-------------------------------------|
| 滤光器 Filter | Pyrex S/ Pyrex S 可根据生 产商的技 术规范替 换 Replace according to manuf acturer's specificati ons | 3UV-Spezi al Suprax 可根据生 产商的技 术规范替 换 Replace according to manuf acturer's specificati ons | Xenochrom 300 可根据生产商的技 术规范替换 Replace according to manufacturer's specifications | | Pyrex S / PyrexS可 根据生产 商技术 规范的 Replace according to manuf acturer's specificati ons | 涂上一层 石英的滤 光 器 和 300 nm 日光滤光 器Coated quartz filter and 300 nm daylight filter | 日光滤光 器 Daylight filter |
| 试样的旋转 specimen rotation | 只允许非 交变模式 Only non- turning mode is possible | 非交变模式Non-turning mode | | | 非交变模式 Non-turning mode | 交变模式 Flatbed equipme nt | 交 变 模 式 Flatbed equipmen t |
| 布莱克标准温度 Black standard temperature(°C) | 90±2 | | | | | | |
| 干的状态下的试样 室温度 Specimen chamber temperature in the dry phase (°C) | 50±2 | | | | | | |
| 相对湿度 Relative humidity (%) | 20±10 | | | | | | |
| 辐射强度 Intensity of irradiation (W/m²)(nm) | 0.6 340 | 75 300~400 | | | | | |
| 试验时间(近似值) Test duration (approximate value) (h) | 1 500 | | | | 大约 Approx.1 500 | | |
| 辐射量(一年为周 期) Irradiation dose(1 year cycle) (MJ/m²) | 3.2 | 400 | | | | | |

4.4 试验样品

4.4.1 试样制备

试样应选取零件具有代表性的区域或标准生产条件下制造的样片。试样应尽量保持平整。只要整个零部件尺寸不超过试验设备试样台的尺寸均可进行测试。但必须保证试样台上面向辐射光照射方向的试样表面凸出不能超过10 mm

4.4 Specimen

4.4.1 Specimen preparation

The specimens shall be taken from a representative portion of the finished part to be tested or of specimen sheets manufactured under standard production conditions. They shall be as flat as possible. As long as the apparatus-dependent specimen carrier size is not exceeded, complete components may be tested.

(对于Xenotest alpha设备不能超过5mm)。试样应在试样台上受到保护,一半以上的试样表面应被金属膜片覆盖。

为测试力学性能的变化。如,通过拉伸试样和冲击阻力试验。试样应按照各自的试验程序或标准上的定义制备。

4.4.2 试样尺寸

样品尺寸应与原始样品台夹具的最大测试面积一致。因此,可用以下尺寸:

| | |
|----------------------------------|-------------|
| Xenotest 1200 CPS | (175×60) mm |
| Xenotest alpha | (140×40) mm |
| Weather-O-meter Ci 3 000, Ci4000 | (145×45) mm |
| Beta LM | (350×80) mm |
| Suntest XXL+ | (135×45) mm |
| Q-Panel | (135×45) mm |

选择的样品的尺寸应足够大,以确保能使用指定的程序来完成正确的评定。

4.4.3 试样台

仅适用于 Xenotest 1200 CPS: 为使试样台三个平面均获得均匀的辐射强度,倾向于采用不能旋转的试样台。

对Suntest XXL+ 和 Q-Panel Xenotest 设备,应采用能每200小时按顺时针旋转的试样架,以确保试验获得均匀的光照。

4.5 光照试验

4.5.1 滤光器的清洗

过滤系统应定期的检查与清洗。

4.5.2 辐照器的替换

对于不可调整型设备,辐照器的最长操作时间为1 500h。但是,可调整型设备的操作时间可

complete components may be tested. However, it is important to ensure that the surface to be tested does not project more than 10 mm (or 5 mm in the case of the Xenotest alpha) over the specimen carrier plane toward the source of the irradiation. The specimen shall be secured on the specimen carrier. One half of the specimen's surface shall be covered with a sheet metal mask.

In order to test the change in mechanical properties, e.g., by means of tensile tests and determination of the impact resistance, the specimens shall be made in a size that is required for the respective test procedure or that is prescribed in standards.

4.4.2 Specimen size

The specimen size is in accordance with the maximum clampable test surfaces in the original specimen carriers. Thus, the following would apply:

| | |
|---------------------------------|---------------|
| Xenotest 1200 CPS | (175 x 60) mm |
| Xenotest alpha | (140 x 40) mm |
| Weather-O-meter Ci 3000, Ci4000 | (145 x 45) mm |
| Beta LM | (350 x 80) mm |
| Suntest XXL+ | (135 x 45) mm |
| Q-Panel | (135 x 45) mm |

The selected specimen size shall be sufficiently large to ensure that proper evaluation can be performed with the designated procedures.

4.4.3 Specimen carriers

Only for Xenotest 1200 CPS: Bent non-turning carriers shall be used in order to achieve an even intensity of irradiation over all three specimen carrier planes.

For the Suntest XXL+ and Q-Panel Xenotest equipment types, it shall be ensured that the specimen frames are rotated clockwise every 200 h in order to achieve uniform weathering of the specimens.

4.5 Weathering test

4.5.1 Cleaning the filters

The filter systems shall be checked and cleaned at regular intervals.

4.5.2 Replacing the irradiator

The maximum operating time of the irradiator for non-adjustable equipment types is 1 500 h. However, the operating time for

延长至设备的可控极限。

4.5.3 光照周期

按照表1中规定,当达到某一试验周期(时间)/辐射量后,光照周期结束。为确保获得均匀的辐射强度,应使用Atlas生产的Xenocal设备每周检查一次。Q-Panel设备,应采用合适的传感器进行检查。

4.6 试样的评定

4.6.1 目视评定

颜色与光泽上的变化,通过与先前覆盖的表面或一个未经光照的参考试样进行对比,根据DIN EN 20105-A02采用灰度级评定“颜色上的变化”。在照明条件下根据DIN EN ISO 105-A01评定或间接的照明下,通过几位具有经验但普通视力的专家进行评定(至少2位)。

并不需要根据DIN EN ISO 4628-1中所描述的测试方法来评定发生的变化。

4.6.2 色度的评定

除了目视评定之外,应根据DIN 53236定义的流程,根据CIELAB (DIN 6174)定义的分光光度计进行除光泽度值外其他色度的评定。

在必要时,应根据DIN EN 20105-A02将试验结果转换为灰度级。根据DIN 6167进行泛黄至黄的评定。

对于单一颜色和同质表面,至少使用三种测量法以取平均值。对于多种颜色,结构或非均质的试样,应增加测量的方法来获得平均值。

4.6.3 光泽的评定

光泽可根据DIN 67530通过反射计值进行评定。光照后的光泽改变采用%表示。

4.7 试验报告

若是相应的技术供货条件/本公司标准/图样所必须的,与本试验标准有关的以下信息应在试验报告中指定出来:

- 试验设备。
- 总的试验周期。
- 颜色变化:灰度级/dE/dL/da/db。
- 任何颜色的改变。

adjustable equipment types may be extended up to the control limit.

4.5.3 Weathering cycle

The end point of a weathering cycle is achieved after a certain test duration (time)/irradiation dose, as specified in Table 1. To ensure even intensity of irradiation, this shall be checked weekly with the Xenocal made by Atlas. In the Q-Panel equipment, this is checked with appropriate sensors.

4.6 Evaluating the specimens

4.6.1 Visual evaluation

Changes in color and gloss shall be compared against the previously covered surface or an unexposed reference specimen with the gray scale to evaluate the "change in color" according to DIN EN 20105-A02 under lighting according to DIN EN ISO 105-A01 or indirect daylight by several proficient normal-sighted people (at least two).

Changes that need not be evaluated by means of measurements are described according to DIN EN ISO 4628-1.

4.6.2 Colorimetric evaluation

In addition to the visual evaluation, a colorimetric evaluation using a spectrophotometer according to CIELAB (DIN 6174), excluding the gloss value, shall be conducted according to a procedure specified in DIN 53236.

If required, the result shall be converted to gray-scale levels according to DIN EN 20105-A02, and for yellowing to yellow values according to DIN 6167.

For single-color and homogenous surfaces, at least three measurements shall be averaged. For multicolored, structured or anisotropically scattering specimens, the number of measurements to be averaged shall be increased.

4.6.3 Evaluation of gloss

Gloss shall be measured as a reflectometer value according to DIN 67530, and the change after weathering shall be expressed in %.

4.7 Test report

If required in the corresponding Technical Supply Specification/SAIC Motor standard/drawing, the following information shall be specified in the test report with reference to this test standard:

- Test equipment
- Total test duration
- Color change: gray-scale



e) 根据 DIN 6167 评定的黄色值。

f) 光泽的变化。

g) 额外的观测报告和变化，比如裂纹，污点，渗出物，粉化等。

h) 任何与本试验规范有偏差，但取得一致意见的条件。

level/dE/dL/da/db

d) Any color shift

e) Yellow value according to DIN 6167

f) Change in gloss

g) Additional observations and changes such as cracks, spotting, exudations, chalking, etc.

h) Any agreed upon conditions that deviate from this Test Specification.
