



Colorfastness to Artificial Weathering

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This test method shall be used to determine the effects of weathering using a xenon-arc lamp source (artificial sunlight) to simulate extreme environmental conditions encountered inside a vehicle due to sunlight, heat and humidity. This method shall be used to evaluate the colorfastness, as well as being the artificial weathering method to evaluate degradation. This method describes four (4) possible exposure cycles.

- **Method A.** Light and Dark Exposure Cycle (100 °C, 420 nm). The cycle alternates between light and dark periods. This cycle is based on ISO 105-B06 exposure condition Number Three (3).
- **Method B.** Light Only Exposure Cycle (100 °C, 300 nm to 400 nm). This cycle is based on ISO 105-B06 exposure condition Number Three (3).
- **Method C.** Light Only Exposure Cycle (115 °C, 300 nm to 400 nm). This cycle is based on ISO 105-B06 exposure condition Number One (1).
- **Method D.** Light and Dark Exposure (89 °C, 340 nm). The cycle alternates between light and dark periods. This cycle is based on ISO 105-B06 exposure condition Number Five (5) (SAE J1885/SAE J2412 equivalent with SAE J2413 as the companion document).

1.2 Applicability. Testing of the textile materials to simulate extreme environmental conditions of interior of vehicle.

1.3 Remarks. This test procedure was developed by the Global Textile Team to create a common method for evaluating colorfastness to artificial weathering.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ISO 105-A02	ISO 4892-1	SAE J2412	SAE J2413
ISO 105-B06	SAE J1885		

2.2 GM Standards/Specifications.

GMW3221	GMW6992
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3 Resources

3.1 Facilities. Testing facilities shall be equipped with the required equipment for specific test.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Method A. Test equipment, according to ISO 105-B06, with the following machine setup shall be used:

3.2.1.1 Filters.

- Inner filter: Type S Borosilicate
- Outer filter: Soda Lime

Appendix A, Figure A1 defines the Spectral Power distribution for Type "S" Borosilicate/Soda Lime filter combination for Method A.

3.2.1.2 Temperature Sensor. Black Standard Temperature (BST).

3.2.1.3 Chamber (Dry Bulb) Temperature. Active.

3.2.1.4 Rack Panel Temperature. Active.

3.2.1.5 Radiation. Controlled at 420 nm.

3.2.2 Method B. Test equipment according to ISO 105-B06 with exposure apparatus B or C shall be used.

3.2.3 Method C. Test equipment according to ISO 105-B06 with exposure apparatus B with 4IR+3WG or 10 WG filter system shall be used.

3.2.4 Method D. Test equipment according to ISO 105-B06 for exposure condition Number Five (5) or SAE J2412/SAE J2413.

3.2.5 White Standard Thermometer. The White Standard thermometer is in accordance with the Black Standard thermometer of ISO 105-B06. However, the metal plate is provided with a white cover according to ISO 4892-1.

3.3 Test Vehicle/Test Piece. Test material according to ISO 105-B06 shall be used.

3.4 Test Time. The timing will be set based on the material specification requirement.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Personnel trained in accordance with the laboratory accreditation and Standard Operating Procedure requirements

4 Procedure

Test specimens are exposed in a xenon-arc weathering device to artificial weathering conditions which simulate extreme environmental conditions encountered inside a vehicle due to sunlight, heat, and/or humidity. Test specimens are then evaluated for colorfastness (fade) or other modes of degradation.

4.1 Preparation. Test samples shall be prepared according to ISO 105-B06. A conditioning to GMW3221 is not required.

4.2 Conditions.

4.2.1 Environmental Conditions. See 4.3.1.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Exposure Conditions.

4.3.1.1 Method A. Exposure conditions according to ISO 105-B06 Condition Three (3), but with parameters according to Table 1. Exposure begins in the Dark Period. The Dark and Light Periods are alternated until the required exposure level of kilojoules per square meter (kJ/m²) is met. The timing for the Light Period only is calculated from the required radiant exposure as:

$$t = \frac{Q}{E \times 3.6}$$

Where:

- **T** is the time expressed in hours.
- **Q** is the radiant exposure expressed in kilojoules per square meter
- **E** is the irradiance expressed in watts per square meter (or joules per square meter second).
- **3.6** is the conversion factor expressed in kiloseconds per hour.

Appendix B, Tables B1, B2, and B3, identify timing for typical required irradiation values.

Table 1: Exposure Conditions for Method A

	Dark Period (Light Off Period) Note 1	Light Period (Light on Period) Note 1
Duration = (Time/Irradiation)	1 h	3.8 h at 1.2 W/m ² at 420 nm
Test Chamber Temperature, °C	38 °C ± 2 °C	65 °C ± 3 °C
Black Standard Temperature, °C	38 °C ± 2 °C	100 °C ± 3 °C
Relative Humidity in Test Chamber, percent (%)	95% ± 2%	20% ± 10%
Specimen Spray	Off	Off
Rack Spray	Off	Off
Conditioning water temperature, °C. (This will be for some models or weatherometer only)	40 °C ± 4 °C	66 °C ± 4 °C

Note 1: Method A consists of five (5) alternating Dark Periods (1 h per each period) and five (5) Light Periods (3.8 h per each period) in a 24 h duration with the test beginning in the Dark Period.

4.3.1.2 Method B. Exposure conditions shall be according to ISO 105-B06 Condition Three (3), but with humidity of 0% to 20% relative humidity (RH).

In addition to the BST of +100 °C, a White Standard Temperature of +76 °C ± 1 °C is observed for information only. The timing (number of cycles) for the wide band exposure is calculated per the equation in 4.3.1.1. Appendix B, Table B1 displays timing for typical required radiant exposure values.

4.3.1.3 Method C. Exposure conditions shall be according to ISO 105-B06 Condition One (1) but with humidity of 0% to 20% RH. In addition to the BST of +115 °C, a White Standard Temperature of 75 °C ± 1 °C is observed for information only. The timing (number of cycles) for the wide band exposure is calculated per the equation in 4.3.1.1. Appendix B, Table B1 displays timing for typical required radiant exposure values.

4.3.1.4 Method D. Exposure conditions shall be according to ISO 105-B06 Condition Five (5) or SAE J2412/SAE J2413.

4.3.2 Exposure. Exposure shall be according to ISO 105-B06. The exposure shall be continued until the required radiant exposure value as specified in the relevant material specification has been reached. The time until the required radiant exposure value has been reached is noted.