

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS L 0843 : 2006

(SWTF/JSA)

**Test methods for colour fastness to
xenon arc lamp light**

ICS 59.080.01

Reference number : JIS L 0843 : 2006 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Suga Weathering Technology Foundation (SWTF) / Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS L 0843:1998** is replaced with this Standard.

This Standard has been made based on **ISO 105-B02 : 1994** *Textiles—Tests for colour fastness—Part B02: Colour fastness to artificial light: Xenon arc fading lamp test*, Amendment 1 (1998) and Amendment 2 (2000), and **ISO 105-B06 : 1998** *Textiles—Tests for colour fastness—Part B06: Colour fastness and ageing to artificial light at high temperatures: Xenon arc fading lamp test* and Amendment 1 (2002) for the purpose of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Date of Establishment: 1971-09-01

Date of Revision: 2006-05-20

Date of Public Notice in Official Gazette: 2006-05-22

Investigated by: Japanese Industrial Standards Committee
Standards Board

Technical Committee on Consumer Life Products

JIS L 0843 : 2006, First English edition published in 2007-05

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

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the original JIS is to be the final authority.

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Printed in Japan

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Test methods for colour fastness to xenon arc lamp light

Introduction This Japanese Industrial Standard has been prepared based on the fourth edition of **ISO 105-B02 Textiles—Tests for colour fastness—Part B02: Colour fastness to artificial light: Xenon arc fading lamp test** published in 1994, Amendment 1 published in 1998 and Amendment 2 published in 2000, and the second edition of **ISO 105-B06 Textiles—Tests for colour fastness—Part B06: Colour fastness and ageing to artificial light at high temperatures: Xenon arc fading lamp test** published in 1998 and Amendment 1 published in 2002 with some modifications of the technical contents.

The portions given sidelines or dotted underlines are the matters in which the contents of the original International Standards have been modified. A list of modifications with the explanations is given in Annex (informative).

1 Scope This Standard specifies the test methods for colour fastness of dyed textiles to xenon arc lamp light.

NOTE : The International Standards corresponding to this Standard are as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standards and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO 105-B02 : 1994 *Textiles—Tests for colour fastness—Part B02: Colour fastness to artificial light: Xenon arc fading lamp test*, Amendment 1: 1998, Amendment 2: 2000 (MOD)

ISO 105-B06 : 1998 *Textiles—Tests for colour fastness—Part B06: Colour fastness and ageing to artificial light at high temperatures: Xenon arc fading lamp test*, Amendment 1: 2002 (MOD)

2 Normative references The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. If the indication of the year of publication is given to these referred standards, only the edition of the indicated year constitutes the provision of this Standard but the revision and amendment made thereafter do not apply. The normative references without the indication of the year of coming into effect apply only to the most recent editions (including amendments).

JIS L 0801 *General principles of testing methods for colour fastness*

NOTE : **ISO 105-A01:1994 Textiles—Tests for colour fastness—Part A01: General principles of testing** is equivalent to the said standard.

JIS L 0804 *Grey scale for assessing change in colour*

NOTE : **ISO 105-A02** : 1993 *Textiles—Tests for colour fastness—Part A02: Grey scale for assessing change in colour* is equivalent to the said standard.

JIS L 0809 *Instrumental determination of colour fastness — Change in colour and staining*

JIS L 0841 *Test methods for colour fastness to daylight*

NOTE : **ISO 105-B01**:1994 *Textiles—Tests for colour fastness—Part B01: Colour fastness to light: Daylight* is equivalent to the said standard.

JIS L 0886 *Test methods for the detection and assessment of photochromism*

NOTE : **ISO 105-B05**:1993 *Textiles—Tests for colour fastness—Part B05: Detection and assessment of photochromism* is equivalent to the said standard.

ISO 5631 : 2000 *Paper and board—Determination of colour (C/2 degrees)—Diffuse reflectance method*

3 Summary A specimen is exposed to xenon arc lamp light along with blue scales in accordance with the specified method or it is exposed to the specified energy, and the colour fastness is assessed according to the change in colour of the specimen.

4 Classification of tests The test shall be classified into two types, method A (ordinary temperature method) and method B (high temperature method), and they shall be as shown in table 1. The test shall be performed by selecting the method suitable for the purpose. Other test conditions shall be in accordance with the agreement between the purchaser and the supplier.

Exposure shall be continuously performed, and for the temperature, the temperature within a chamber shall be adjusted so that the indication of a black panel thermometer becomes the specified value at the time of exposure. The irradiance shall be adjusted within 300 nm to 400 nm.

Table 1 Classification of tests and test conditions

Classification	Test conditions			
	Black-panel temperature °C	Temperature within chamber (informative) °C	Relative humidity %	Irradiance ⁽¹⁾ W/m ² (300 nm to 400 nm)
Method A	63±2	38±3	50±5	50
Method B	89±3	45±4	50±5	162

Note ⁽¹⁾ The irradiance is normally measured on the energy (irradiance) of a range of wavelength 300 nm to 400 nm. If measured on the energy of a range of wavelength 300 nm to 700 nm or a specific wavelength (420 nm, 340 nm, etc.), the irradiance shall be measured and displayed after the calibration. Furthermore, the irradiance may be selected from a range of 30 W/m² to 180 W/m². In this case, the temperature within the chamber and relative humidity shall be selected as appropriate.

5 Apparatus and materials The apparatus and materials shall be as follows.

- a) **Blue scale** As specified in **JIS L 0841**.
- b) **Grey scale for assessing change in colour** As specified in **JIS L 0804**.
- c) **Opaque cover** This shall be a white cardboard perfectly opaque to light. When other thin opaque material such as a paperboard laminated with aluminium foil is used, it shall be stated in record.

NOTE : Normally, a frame of the specimen holder should not be expected to serve the function of an opaque covering.

- d) **White cardboard** This shall be a white cardboard which is 0.5 mm to 1.0 mm in thickness and not less than 70 % in Y-value, and which normally contains no fluorescence.
- e) **Surrounding field and mask** As specified in **JIS L 0801**.
- f) **Standard light source for assessment** As specified in **10 a) 1)** of **JIS L 0801**.
- g) **Light-exposure apparatus** The light exposure apparatus shall be as follows. An example is as shown in attached figure 1.

- 1) The light source shall be the water-cooled type or the air-cooled type xenon lamp and the long arc system of 5 000 K to 6 000 K in correlated colour temperature. An example of spectral distribution is as shown in attached figure 2.
- 2) Although the water-cooled or the air-cooled type xenon lamp includes various types of which the capacity differs, any of them shall be selected to use.
- 3) The optical filter shall be of quartz, borosilicate glass, soda lime glass, etc. and for any purpose, any of them shall be used by combining them as the inner filter and the outer filter. Normally, they should be used by combining quartz and soda lime glass (or borosilicate glass). The types of the used optical filters shall be recorded.

An example of the transmittance of each optical filter and the combination of filters is as shown in attached figure 3.

- 4) The temperature controller shall adjust the chamber temperature at a fixed temperature during lighting of a light source and record the temperature of a black panel thermometer (may be abbreviated as BPT).
- 5) The black panel thermometer which consists of a metal plate and stem finished by baking spray-coat of light resistant black enamel twice and is of the reflectance of not more than 5 % (see informative attached figure 1) shall be used. An example is as shown in attached figure 4. Since the black panel thermometer deteriorates due to light and temperature with the use and due to high humidity, calibration shall be performed at an appropriate time. Normally, two black panel thermometers shall be prepared, one of them is used for measuring and the other is for calibrating the black panel thermometer for measuring ⁽²⁾. Both black panel thermometers shall be mounted on the same place as the specimen and the calibration shall be performed under the light-exposure condition.

A black standard thermometer (is occasionally abbreviated as BST) may be used instead of the black panel thermometer. The black standard thermometer shall be so structured that the thermal sensor part of which is fixed to the centre of the back side of the metal plate finished by baking spray-coat of light resistant black enamel twice, and further the heat insulating material (polyvinylidene fluoride) is stuck to it, and the temperature is normally displayed digitally. When the black standard thermometer is used, the relation with the temperature when the black panel thermometer is used shall be obtained beforehand, and it shall be used at the corresponding temperature. An example is as shown in attached figure 5.

Note (2) The black panel thermometer for measuring should be taken out and kept after it is confirmed that the temperature meets the specified value when the light source and temperature are stabilized.

- 6) The light energy measuring instrument for the measurement of irradiance or radiant exposure (also called the irradiance meter) or the light energy measuring instrument equipped with an adjustment function shall be calibrated by the energy standard light source which has been calibrated officially.
- 7) The specimen holder to be used shall be made of aluminium to which a suitable anti-corrosion treatment is applied, or stainless steel. An example is as shown in attached figure 6.

When the backing of the specimen is used, the suitable backing shall be used according the purpose.

- h) **Backing** The backing is a material which is stuck to the back side of the specimen according to the use condition of material.

6 Preparation of specimen

6.1 Specimen of fabric The dimensions of specimen shall be at least approximately 10 mm × 40 mm capable of assessing the fastness and should be preferably approximately 67 mm × 150 mm ⁽³⁾, approximately 65 mm × 55 mm or the like.

Note (3) It is used in common for the test of textile other than the fastness test, for example, a tensile test, etc.

6.2 Specimen of yarns Yarns shall be wound closely on a white cardboard equivalent to the dimensions of the specimen in **6.1** parallel to the long side direction.

6.3 Specimen of loose fibre The loose fibres shall be combed and compressed, and mount them on a white cardboard in a layer as thin as unable to see the white cardboard equivalent to the dimensions of the specimen in **6.1**.

7 Operation The operation shall be as follows.

7.1 Operation of testing machine The operation of a testing machine shall be as follows.

- a) Fix a specimen and a blue scale to a white cardboard respectively, and mount them on a specimen holder.

Tightly hold the portions of the specimen holder other than the window-opening with the holding metal from back and front in order to make definite boundary between the light-exposed area and the unexposed area covered by the opaque cover. When there is unevenness on the specimen surface of window parts, convex parts may give a strong change in colour and concave parts a weak change in colour, therefore eliminate wave or unevenness as far as possible.

- b) Mount the specimen holder to which a specimen has been attached on the specimen revolving rack leaving no clearance. If there are specimen holders without specimen attached, mount white cardboards to all of them.
- c) Operate the testing machine. Take this time as the test starting time. Adjust to the specified irradiance.
- d) Adjust the chamber-temperature using the temperature controller, and record the temperature when the indication of the black panel thermometer becomes stable. After confirming the temperature, take out the black panel thermometer and keep it.
- e) Perform the procedure after starting the operation according to **7.2**.

7.2 Exposure method The exposure methods include exposure method 1 to exposure method 4 using the blue scale and exposure method 5 of the energy method, and each of them shall be as follows.

- a) **Exposure method 1** Exposure method 1 is the most basic method for assessing the fastness of a specimen, and a specimen is exposed to light along with a set of blue scales as follows.

- 1) Arrange and fix the specimen and the blue scale on a white cardboard as shown in figure 1, and cover by using the covers AA' and BB', respectively ⁽⁴⁾.

Note ⁽⁴⁾ To facilitate operation, it is recommended that the respective covers are made so as to bend at the part of XX'.

- 2) After starting the exposure, raise the cover of the specimen AA' periodically and inspect the exposed part of the specimen by using the grey scale for assessing change in colour.
- 3) When the specimen has reached the standard fading (which means that the difference in colour between the exposed part and the unexposed part has become equal to the difference in colour of No.4 of grey scale for assessing change in colour), raise the cover of the blue scale BB', inspect the blue scale, and take the grade of blue scale of standard fading as the fastness of the specimen.
- 4) When the specimen has not reached the standard fading even if Grade 8 blue scale has reached the standard fading, assess the fastness of the specimen as "Grade 8 or superior", and finish the exposure.

NOTE : The photochromism of the specimen shall be in accordance with **JIS L 0886**.

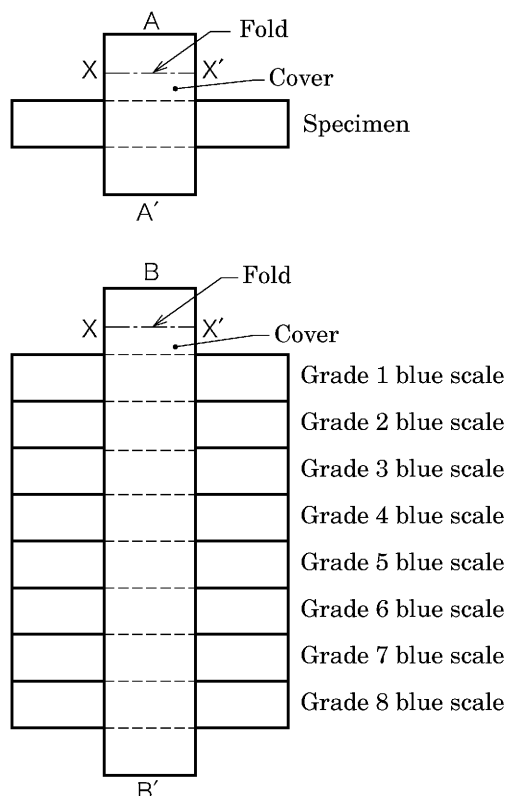


Figure 1 Exposure method 1

b) **Exposure method 2** Exposure method 2 is the method for exposing more than one specimen simultaneously and assessing the fastness of the specimen respectively, and more than one specimen is exposed to light along with a set of blue scale as follows.

- 1) Arrange and fix the specimens and the blue scale on a white cardboard as shown in figure 2, and cover approximately one-fourth of the whole length of them by using the covers AA', BB', CC' and DD', respectively ⁽⁴⁾.
- 2) After starting the exposure, raise the cover of the blue scale BB' periodically and inspect the exposed part of Grade 2 of the blue scale. When the exposed part has reached the standard fading, raise the cover of the specimen AA', and if any specimen has reached the standard fading, (for example, it is No.1 specimen and No.3 specimen) assess the fastness of No.1 specimen and No.3 specimen as Grade 2, remove these specimens and Grade 2 of the blue scale and store them.

And, when the specimen has faded equally to or more than the standard fading, assess it as "Grade 1 or inferior".

- 3) Put the covers back on, continue the exposure and repeat the operation in 2) successively from Grade 3 to Grade 8 of the blue scale. When the assessment of the fastness of all specimens has finished, finish the exposure.
- 4) If the specimen has not reached the standard fading even when Grade 8 of