

JIS

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS K 5600-4-5 : 1999
(ISO 7724-2 : 1984)

**Testing methods for paints—
Part 4 : Visual characteristics
of film—
Section 5 : Colorimetry
(Measurement)**

ICS 87.040

Descriptors : paints, painting, membranes, visual perception, colorimetry, colorimetric characteristics, colour tests

Reference number : JIS K 5600-4-5 : 1999 (E)



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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law.

JIS K 5400 corresponding to this Standard will be withdrawn and replaced with this Standard in April 2002, at the time of three years passed after establishment of this Standard.

Consequently it is recommended to comply with this Standard.

JIS K 5600 consists of the following parts.

JIS K 5600 Part 1 Section 1 to Section 8	<i>General rule</i>
JIS K 5600 Part 2 Section 1 to Section 7	<i>Characteristics and stability of paints</i>
JIS K 5600 Part 3 Section 1 to Section 6	<i>Film formability</i>
JIS K 5600 Part 4 Section 1 to Section 7	<i>Visual characteristics of film</i>
JIS K 5600 Part 5 Section 1 to Section 11	<i>Mechanical property of film</i>
JIS K 5600 Part 6 Section 1 to Section 3	<i>Chemical property of film</i>
JIS K 5600 Part 7 Section 1 to Section 8	<i>Long-period performance of film</i>
JIS K 5600 Part 8 Section 1 to Section 6	<i>Evaluation of degradation of paint coatings</i>

JIS K 5600-4 consists of the following sections under the title of "Testing methods for paints—Part 4 : Visual characteristics of film".

JIS K 5600 Part 4 Section 1	<i>Hiding power (for light-coloured paints)</i>
JIS K 5600 Part 4 Section 2	<i>Hiding power (for dark-coloured paints)</i>
JIS K 5600 Part 4 Section 3	<i>Visual comparison of the colour of paints</i>
JIS K 5600 Part 4 Section 4	<i>Colorimetry (Principles)</i>
JIS K 5600 Part 4 Section 5	<i>Colorimetry (Measurement)</i>
JIS K 5600 Part 4 Section 6	<i>Colorimetry (Calculation of colour differences)</i>
JIS K 5600 Part 4 Section 7	<i>Specular gloss</i>

Date of Establishment: 1999-04-20

Date of Public Notice in Official Gazette: 1999-04-20

Investigated by: Japanese Industrial Standards Committee
Divisional Council on Chemical

JIS K 5600-4-5:1999, First English edition published in 2000-09

Translated and published by: Japanese Standards Association
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Printed in Japan

Testing methods for paints— Part 4 : Visual characteristics of film— Section 5 : Colorimetry (Measurement)

Introduction This Japanese Industrial Standard has been prepared based on ISO 7724-2 : 1984 *Paints and varnishes—Colorimetry—Part 2: Measurement*, without changing the technical contents.

The portions underlined with dots in this Standard are not stated in the original International Standard.

The specifications for colorimetry consist of the following three sections.

JIS K 5600-4-4 Testing methods for paints—Part 4 : Visual characteristics of film—Section 4 : Colorimetry (Principles)

JIS K 5600-4-5 Testing methods for paints—Part 4 : Visual characteristics of film—Section 5 : Colorimetry (Measurement)

JIS K 5600-4-6 Testing methods for paints—Part 4 : Visual characteristics of film—Section 6 : Colorimetry (Calculation of colour differences)

JIS K 5600-4-4, JIS K 5600-4-5 and JIS K 5600-4-6 describe methods for the instrumental determination of the colour co-ordinates and colour differences of paint films, as required for such purposes as

- a) the objective description of colour differences between a test specimen (a test panel coated with a paint, or a specimen from a painted article) and a reference specimen;
- b) determining colour deviations in the production of painted articles so that the results may be used for the control or regulation of the process;
- c) the objective description of changes in colour caused by weathering and other chemical or physical influences;
- d) the objective supervision of colour reference standards.

Note : Colour reference standards are subject to ageing, which may lead in the course of time to pronounced changes in colour. High accuracy colorimetry is required for the timely detection of these changes. This is of particular importance when ordering against such reference standards.

1 Scope This Japanese Industrial Standard describes the method for determining the colour co-ordinates of paint films. The method is only applicable to paint films that appear to be uniformly of one colour, i.e. monochromatic, when examined with normal vision. Paint films that do not completely hide a non-transparent substrate represent an opaque system and may be measured by using the procedure described in this Standard.

Luminescent paint films, transparent paint films and translucent paint films (for example for displays or lamp glass), retroreflecting paint films (for example for traffic signs), and metallic paint films are outside the scope of this Standard.

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

JIS K 5600-1-2 Testing methods for paints—Part 1 : General rule—Section 2 : Sampling of products

Remarks : ISO 1512 : 1991 *Paints and varnishes—Sampling of products in liquid or paste form* is identical with the said standard.

JIS K 5600-1-3 Testing methods for paints—Part 1 : General rule—Section 3 : Examination and preparation of samples for testing

Remarks : ISO 1513 : 1992 *Paints and varnishes—Examination and preparation of samples for testing* is identical with the said standard.

JIS K 5600-1-4 Testing methods for paints—Part 1 : General rule—Section 4 : Standard panels for testing

Remarks : ISO 1514 : 1993 *Paints and varnishes—Standard panels for testing* is identical with the said standard.

JIS K 5600-1-7 Testing methods for paints—Part 1 : General rule—Section 7 : Determination of film thickness

Remarks : ISO 2808 : 1997 *Paints and varnishes—Determination of film thickness* is identical with the said standard.

ISO 3534 *Statistics—Vocabulary and symbols*

ISO 5725 *Precision of test method—Determination of repeatability and reproducibility by inter-laboratory tests*

JIS K 5600-4-4 Testing methods for paints—Part 4 : Visual characteristics of film—Section 4 : Colorimetry (Principles)

Remarks : ISO 7724-1 : 1984 *Paints and varnishes—Colorimetry—Part 1 : Principles* is identical with the said standard.

JIS K 5600-4-6 Testing methods for paints—Part 4 : Visual characteristics of film—Section 6 : Colorimetry (Calculation of colour differences)

Remarks : ISO 7724-3 : 1984 *Paints and varnishes—Colorimetry—Part 3 : Calculation of colour differences* is identical with the said standard.

CIE Publication No. 15, Supplement No. 1 *Special metamerism index : Change in illuminant*

3 Principle Measurement of the tristimulus values X_{10} , Y_{10} , Z_{10} by one of the following methods.

- measurement of the spectral photometric characteristics (spectral reflectances or spectral reflectance factors) of the paint film with a spectrophotometer and calculation of the tristimulus values;

— measurement of the tristimulus values with a tristimulus colorimeter.

Calculation of the chromaticity co-ordinates x_{10} , y_{10} or the colour co-ordinates in the approximately uniform CIE 1976 ($L^*a^*b^*$) colour space from the tristimulus values, as described in **JIS K 5600-4-4**.

4 Choice of illumination and viewing conditions One of the measuring conditions for illumination and viewing specified in **JIS K 5600-4-4** should be chosen taking into account the surface texture, the reflection properties of the paint film tested and the information that is to be obtained by the measurement.

4.1 Smooth non-textured paint films All the measuring conditions specified in **JIS K 5600-4-4** are suitable for determining the colour co-ordinates of smooth non-textured paint films.

Informative reference : Texture is typically a surface structure of cloth but it means here a surface structure of the size and composition in the fine parts of material, which can be seen with the eye.

With high gloss specimens, results obtained under all measuring conditions are comparable if the tristimulus values determined with an integrating sphere without gloss trap are corrected for the surface reflection.

Note : The surface reflection is the part of the light falling on a specimen that is reflected (diffusely and specularly) at the surface; another part is back-scattered by the pigments (volume reflection). The surface reflectance (Fresnel reflectance) for illumination at incidence between 0° and 8° on paint films is approximately 0.04.

For all other specimens the choice of measuring conditions depends on whether the specular reflection is to be included in or excluded from the measurement (see **JIS K 5600-4-6**).

4.1.1 Measurement including the specular reflection Use the measuring condition $8/d$ or $d/8$ (without gloss trap for both).

Note : If the gloss changes without a visually perceptible change in colour, for example after weathering, the tristimulus values measured including the specular reflection will generally not be influenced.

4.1.2 Measurement excluding the specular reflection Use the measuring condition $8/d$ or $d/8$ (with gloss trap for both) or $45/0$ or $0/45$.

Note : If the gloss changes, the diffuse part of the surface reflection will change and consequently the tristimulus values measured excluding the specular reflection change too.

4.2 Paint films with surface texture

4.2.1 Measurement including the specular reflection For the spectral characterization of paint films with surface texture (for example textured finishes) use the measuring condition $8/d$ or $d/8$ (without gloss trap for both).