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JIS K 5600-5-3 : 1999

**Testing methods for paints—  
Part 5 : Mechanical property  
of film—  
Section 3 : Falling-weight test**

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**ICS** 87.040

**Descriptors** : paints, film-forming capacity, cross-cut test, painting, membranes, drop tests, cracking, adhesion, mechanical testing

**Reference number** : JIS K 5600-5-3 : 1999 (E)

## 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**JIS K 5400** corresponding to this Standard will be withdrawn and replaced with this Standard in April 2002, at the time of three years passed after establishment of this Standard.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 *General rule*  
JIS K 5600 Part 2 Section 1 to Section 7 *Characteristics and stability of paints*  
JIS K 5600 Part 3 Section 1 to Section 6 *Film formability*  
JIS K 5600 Part 4 Section 1 to Section 7 *Visual characteristics of film*  
JIS K 5600 Part 5 Section 1 to Section 11 *Mechanical property of film*  
JIS K 5600 Part 6 Section 1 to Section 3 *Chemical property of film*  
JIS K 5600 Part 7 Section 1 to Section 8 *Long-period performance of film*  
JIS K 5600 Part 8 Section 1 to Section 6 *Evaluation of degradation of paint coatings*

**JIS K 5600-5** consists of the following sections under the title of “*Testing methods for paints—Part 5 : Mechanical property of film*”.

JIS K 5600 Part 5 Section 1 *Bend test (cylindrical mandrel)*  
JIS K 5600 Part 5 Section 2 *Cupping test*  
JIS K 5600 Part 5 Section 3 *Falling-weight test*  
JIS K 5600 Part 5 Section 4 *Scratch hardness (Pencil method)*  
JIS K 5600 Part 5 Section 5 *Scratch hardness (Stylus method)*  
JIS K 5600 Part 5 Section 6 *Adhesion test (Cross-cut test)*  
JIS K 5600 Part 5 Section 7 *Adhesion test (Pull-off methods)*  
JIS K 5600 Part 5 Section 8 *Abrasion resistance (Rotating abrasive-paper-covered wheel method)*  
JIS K 5600 Part 5 Section 9 *Abrasion resistance (Rotating abrasive rubber wheel method)*  
JIS K 5600 Part 5 Section 10 *Abrasion resistance (Reciprocating test panel method)*  
JIS K 5600 Part 5 Section 11 *Washability*

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the original JIS is to be the final authority.

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## Testing methods for paints— Part 5 : Mechanical property of film— Section 3 : Falling-weight test

**Introduction** This Japanese Industrial Standard has been prepared based on the first edition of **ISO 6272** *Paints and varnishes—Falling-weight test*, published in 1993, without any modification in technical content, except additionally included specification on testing methods which were not hitherto specified in the corresponding International Standard.

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

**1 Scope** This Japanese Industrial Standard is one of a series of standards dealing with the sampling and testing of paints and their related products. This Standard specifies the test method for evaluating the resistance of a dry film of coating to cracking or peeling from a substrate when it is subjected to a deformation caused by a falling-weight, dropped under the specified conditions.

**Remarks 1** The term “impact test” has been omitted intentionally from this Standard because a rapid deformation should be produced than a true impact in the falling-weight apparatus used in this Standard.

The following methods shall be applied:

- the test to judge of pass or fail with using of a specified weight from one drop height so as to test the compliance with a particular specification; or
- the classification test to determine the minimum mass and/or drop height for which the coating film crack or peel from its substrate by gradually increasing the drop height and/or the mass.

**Remarks :** The corresponding International Standard to this Standard is as follows:

ISO 6272 : 1993 *Paints and varnishes—Falling-weight test*

**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 B 1501 *Steel balls for ball bearings*

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 5600-1-6 Testing methods for paints—Part 1 : General rule—Section 6 : Temperatures and humidities for conditioning and testing

Remarks : **ISO 3270** : 1984 *Paints and varnishes and their raw material—Temperature and humidities for conditioning and 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/DIS 2808** : 1996 *Paints and varnishes—Determination of film thickness* is equivalent to the said standard.

**3 Classification of test** The falling-weight methods shall be the following three classes.

**3.1 Falling-weight method** The method to evaluate the resistance of bending and elongation to coating film by dropping a cylindrical weight with round top along a guide tube (the difference from DuPont method exists in 3.5 mm gap between tup and die).

**3.2 Falling ball method** The method to be used in the case of very small deformation of substrate and to evaluate the existence of cracking and peeling by the impact resistance of coating film when a sphere has been crashed on the film surface.

**3.3 DuPont method** The method to evaluate the resistance to be subjected of both impact and deformation at edge part at the same time because of differing from the falling-weight method and having no gap between tup and die:

**4 Falling-weight method**

**4.1 Required supplement information** For any particular application, the test method specified in this Standard shall be completed by supplementary information. The items of supplementary information are given in Annex A.

**4.2 Apparatus** The laboratory apparatus equipped with the following and the viewing lens.

**4.2.1 Falling-weight apparatus** The apparatus composed of the elements described in a) to f).

- a) **Base stand** The base stand having sufficient mass to support the die in d).
- b) **Falling-weight** (refer to Fig. 1) The falling-weight with the head having the shape of a spherical sector of diameter  $20\text{ mm} \pm 3\text{ mm}$  and a total mass of  $1\,000\text{ g} \pm 1\text{ g}$ .  
Remarks 2 An additional weight of mass  $1\,000\text{ g} \pm 1\text{ g}$  can be mounted on top.
- c) **Vertical guide tube** (refer to Fig. 1 and Fig. 2) The vertical guide tube to direct the falling-weight perpendicularly on to the surface of test panel. The guide tube shall be graduated, in millimetres, over 1 m from the surface of the test panel upward. To avoid excessive friction and to ensure accurate guidance, the difference between the inner diameter of the guide tube and the outer diameter of the falling-weight shall be  $0.7\text{ mm} \pm 0.1\text{ mm}$  and the distance between the bottom end of the guide tube and the top of the test panel shall be not more than 45 mm.
- d) **Die** (refer to Fig. 1) The die shall be ring-shaped with an inner diameter of  $27\text{ mm} \pm 0.3\text{ mm}$ . The inner upper edge of the ring shall be rounded with a radius of curvature of  $0.9\text{ mm} \pm 0.2\text{ mm}$ . The minimum height of the ring shall be 20 mm.
- e) **Clamping sleeve** (refer to Fig. 1 and Fig. 2) The clamping sleeve shall be to hold the test panel in the specified position. The inner diameter at the bottom shall be the same as that of the die of  $27\text{ mm} \pm 0.3\text{ mm}$ .
- f) **Stops** (refer to Fig. 2) The stops have different thickness, to limit the indentation depth of the falling-weight.

**4.2.2 Viewing lens** The viewing lens of portable type, with a magnification of  $\times 10$ .

**4.3 Sampling method** Take a representative sample of the product to be tested (for of each product in the case of a multi-coat system) according to **JIS K 5600-1-2**. Examine and prepare each sample for testing according to **JIS K 5600-1-3**.

#### 4.4 Test panels

**4.4.1 Substrate** Unless otherwise agreed, the substrate shall be a steel plate, complying with the requirements of **JIS K 5600-1-4**. The test panels shall be planar, free from distortion and at least 0.25 mm thick. The dimensions of test panel shall be such as to allow the test to be carried out for at least five different positions not less than 40 mm from each other and not less than 20 mm from the edge of the panel. Measure the thickness to the place of 0.01 mm.

**4.4.2 Preparation and coating** Unless otherwise agreed, prepare each test panel according to **JIS K 5600-1-4** and then coat it by the specified method with the product or coating system under test.

**4.4.3 Drying** Dry (or stove) and age (if necessary) each coated test panel for the specified time and under the specified conditions.