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# INTERNATIONAL STANDARD



# 2815

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## Paints and varnishes — Buchholz indentation test

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## FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 2815 was drawn up by Technical Committee ISO/TC 35, *Paints and varnishes*, and circulated to the Member Bodies in May 1972.

It has been approved by the Member Bodies of the following countries :

Austria	India	South Africa, Rep. of
Canada	Iran	Sweden
Chile	Israel	Switzerland
Czechoslovakia	Netherlands	Turkey
Egypt, Arab Rep. of	Poland	United Kingdom
France	Portugal	U.S.S.R.
Germany	Romania	

No Member Body expressed disapproval of the document.

# Paints and varnishes – Buchholz indentation test

## 0 INTRODUCTION

This International Standard is one of a series dealing with the sampling and testing of paints, varnishes and related products. It should be read in conjunction with ISO 1512, *Paints and varnishes – Sampling*, ISO 1513, *Paints and varnishes – Examination and preparation of samples for testing*, ISO 1514, *Paints and varnishes – Standard panels for testing*, and ISO 2808, *Paints and varnishes – Determination of film thickness*.

The method of test specified requires to be completed, for any particular application, by the following supplementary information. This information shall be derived from the national standard or other document for the product under test or, where appropriate, shall be the subject of agreement between the interested parties.

- 1) Material and surface preparation of substrate.
- 2) Method of application of test coating to substrate.
- 3) Thickness, in micrometres, of the dry coating, including method of measurement, and whether it is a single coating or a multicoat system.
- 4) Duration and conditions of drying of the coated panel before testing (or conditions of stoving and ageing, if applicable).
- 5) Recovery time before measuring the indentation, if other than  $35 \pm 5$  s.

## 1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for carrying out an indentation test on a single coating or multicoat system of paint, varnish or related product, using a specified instrument (Buchholz).

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The length of the indentation produced when an indenter of specified size and shape is applied to the coating under defined conditions is indicative of the residual deformation of the coating. The result is expressed as a function of the reciprocal of the indentation length and this increases as the desired property (resistance to indentation) increases.

## NOTES

- 1 Since the indentation test, like other physical tests on paints, gives results which may be dependent upon time, temperature and humidity, comparable results will only be obtained if the test is carried out within well-defined conditions.
- 2 Since the indentation depth depends upon the film thickness, the result obtained for indentation resistance is only valid if the coating thickness exceeds a minimum value (see 5.3.2).

## 2 APPARATUS

### 2.1 Indentation apparatus

This is shown in figure 1. It consists essentially of a rectangular block of metal, which forms the body of the instrument, an indenter and two pointed feet.

The indenter is a sharp-edged metal wheel of hardened tool steel. The cross-section through its axis of rotation and its dimensions shall be as shown in figure 2, which also shows the shape of the indentation produced.

The complete apparatus weighs  $1\,000 \pm 5$  g. The indenter and the two feet are so positioned in the body that when the instrument is placed on a level surface it is stable, its upper surface is horizontal and the effective load upon the indenter is  $500 \pm 5$  g.

**2.2 Measuring device**

A suitable device for measuring the length of the indentation consists of a microscope with 20 X magnification and an eyepiece fitted with a graduated scale capable of reading to 0,1 mm. The area of indentation shall be illuminated by means of a light source located so that its angle of incidence exceeds 60° as shown in figure 3. The microscope shall be positioned vertically over the illuminated area and focused to bring the shadow produced by the indentation (see figure 4) and the graduated scale together.

NOTE – The position of the indentation mark can be located by means of a suitable template prepared from a triangular sheet of transparent plastics film (see figure 5).

**3 SAMPLING**

A representative sample of the product to be tested (or of each product in the case of a multicoat system) shall be taken as specified in ISO 1512. The sample shall then be examined and prepared for testing as specified in ISO 1513.

**4 TEST PANELS**

**4.1 Materials and dimensions**

Unless otherwise specified or agreed the test panels shall be of metal or glass complying with ISO 1514.

The test panels shall be flat and free from distortion and the surface shall be free from any visible ridges or cracks.

The test panels shall be rectangular and, unless otherwise specified, 150 mm X 100 mm in size and not less than 1 mm in thickness. The test panels may be cut to size after coating or drying, provided no distortion occurs.

**4.2 Preparation and coating of panels**

The test panels shall be prepared in accordance with ISO 1514, unless otherwise specified, and shall then be coated by the specified method with the product or system under test to the specified film thickness limits.

**4.3 Drying and conditioning of the test panels**

The coated test panels shall be dried (or stoved and aged) for the specified time and under the specified conditions and, unless otherwise specified, shall be conditioned at a temperature of 23 ± 2 °C and a relative humidity of 50 ± 5 % for a minimum of 16 h. The test procedure shall then be carried out as soon as possible.

**4.4 Thickness of coating**

The average thickness, in micrometres, of the dry coating in the region to be tested shall be determined by the method specified, using one of the procedures specified in ISO 2808.

**5 PROCEDURE**

**5.1 Ambient conditions**

The test shall be carried out at a temperature of 23 ± 2 °C and relative humidity of 50 ± 5 %, unless otherwise specified.

**5.2 Determination of indentation length**

**5.2.1** Place the test panel, paint film uppermost, on a firm horizontal surface.

**5.2.2** Take the apparatus specified in 2.1 and place it gently and without any tilting or lateral movement on to the test panel, leave the indenter in position for 30 ± 1 s and remove it carefully.

NOTE – The feet of the apparatus shall first of all be allowed to make contact with the test panel and then the indenter shall be lowered carefully until it touches the panel. The apparatus shall be lifted off the test panel indenter first and feet last.

**5.2.3** Place the light source and microscope in position as specified in 2.2 and measure the length, in millimetres, of the shadow produced by the indentation 35 ± 5 s after removal of the indenter, unless otherwise specified. Record the results in millimetres, to the nearest 0,1 mm, as the indentation length.

**5.2.4** Carry out five tests on different parts of the same test panel and calculate the mean value.

**5.3 Calculation of indentation resistance**

**5.3.1** Round off the mean value to the nearest value in the first column of the table and use this rounded off value of the indentation length to calculate the indentation resistance.

**5.3.2** Calculate the indentation resistance from the table or by the formula

$$\frac{100}{L}$$

where *L* is the nominal value of the indentation length, in millimetres.

The following table shows the relationship between indentation length and indentation resistance. It also gives the associated indentation depth, in micrometres (rounded off to the nearest integer), and the minimum coating thickness, in micrometres, for which the measurement is valid.

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Indentation length	Indentation resistance	Indentation depth	Minimum coating thickness for which a measurement is valid
mm		$\mu\text{m}$	
0,8	125	5	15
0,85	118	6	20
0,9	111	7	20
0,95	105	7	20
1,0	100	8	20
1,05	95	9	20
1,1	91	10	20
1,15	87	11	25
1,2	83	12	25
1,3	77	14	25
1,4	71	16	30
1,5	67	18	30
1,6	63	21	35
1,7	59	24	35

## 6 TEST REPORT

The test report shall include the following particulars :

- a) a reference to this International Standard or to a corresponding national standard;
- b) type and identification of the product under test;
- c) the items of supplementary information referred to in the Introduction to this International Standard;
- d) the national standard or other document supplying the information referred to in c) above;
- e) any deviation, by agreement or otherwise, from the test procedure specified;
- f) the result of the test, expressed as the Buchholz indentation resistance, as calculated in 5.3.2;
- g) date of the test.

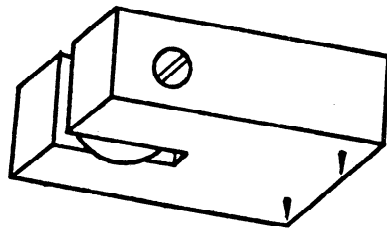


FIGURE 1 – Indentation apparatus (oblique underside view)

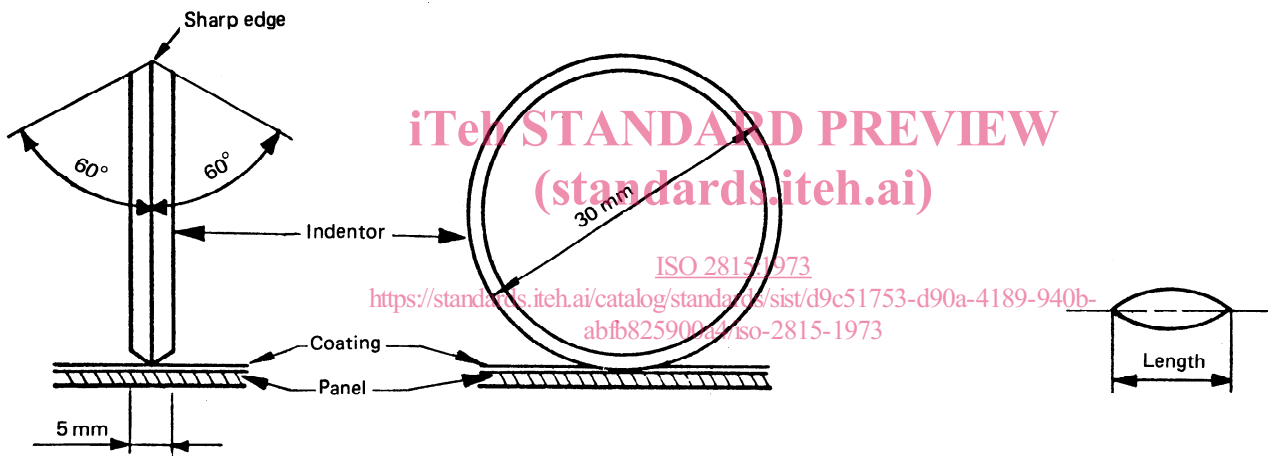


FIGURE 2 a) – Indenter

FIGURE 2 b) – Shape of indentation (enlarged)

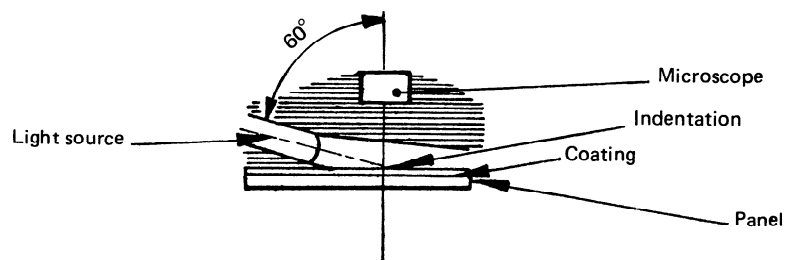


FIGURE 3 – Position of the light source and the microscope

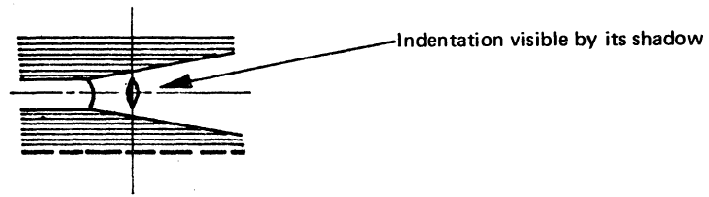
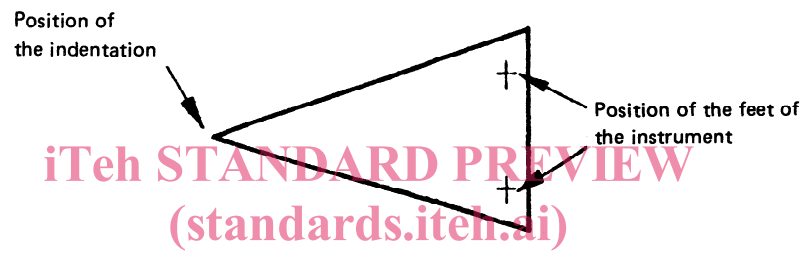


FIGURE 4 – Shadow produced by the indentation



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FIGURE 5 – Template to locate the position of the indentation

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