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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 1518

PAINTS AND VARNISHES

SCRATCH TEST

1st EDITION
July 1970

For each individual country the only valid standard is the national standard of that country.

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BRIEF HISTORY

The ISO Recommendation R 1518, *Paints and varnishes – Scratch test,* was drawn up by Technical Committee ISO/TC 35, *Paints and varnishes,* the Secretariat of which is held by the Nederlands Normalisatie-instituut (NNI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1518 which was circulated to all the ISO Member Bodies for enquiry in November 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Israel	Sweden
Austria	Italy	Switzerland
Denmark	Netherlands	Turkey
Germany	Peru	U.A.R.
Greece	Poland	United Kingdom
India	Portugal	U.S.S.R.
Iran	South Africa, Rep. of	
Ireland	Spain	

The following Member Body opposed the approval of the Draft :

France

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

ISO Recommendation R 1518 July 1970

PAINTS AND VARNISHES

SCRATCH TEST

INTRODUCTION

This ISO Recommendation 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 Recommendations R 1512, *Paints and varnishes – Sampling*, R 1513, *Paints and varnishes – Examination and preparation of samples for testing*, and R 1514, *Paints and varnishes – Standard panels for testing.*

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

(1) Nature 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) The specified load to be applied to the needle during the test, if applicable.

1. SCOPE

1.1 This ISO Recommendation describes a test procedure for determining under standard conditions the resistance of a single coating or a multicoat system of paint, varnish or related product to penetration by scratching with a needle.

1.2 The method described may be carried out

either as a "go/no go" test, by testing with a single specified load applied to the needle to assess compliance with a particular requirement;

or by applying increasing loads to the needle to determine the minimum load at which the coating is fully penetrated to the substrate.

2. APPARATUS

2.1 Mechanized apparatus

Figure 1 illustrates the principle of the apparatus. Figure 2 shows a suitable type of apparatus, but other arrangements can be used which give a similar performance. This apparatus consists essentially of a horizontal sliding panel (A) driven by a constant-speed motor (B) at a rate of 3 to 4 cm/s beneath the point of a scratching needle (C), which is perpendicular to the film. The needle is fixed in a chuck, directly above which is a holder for weights, which should be able to take weights up to at least 2000 g (see Note). The apparatus is adjusted so that the needle comes smoothly into contact with the film, i.e. before the stop (D) reaches the bottom of the sloping ramp (E). The scratch should be straight and not less than 60 mm in length. A ramp with an angle of 10 to 15° to the horizontal has been found to be satisfactory. An electrical indicating device based on conductivity may be used as a guide to penetration of the film where appropriate.

NOTE. – The maximum load for which the apparatus is designed should be marked on the apparatus.

2.2 Needle

The scratching needle has a hardened steel hemispherical tip of 1 mm diameter, and may conveniently be made by soldering a 1 mm diameter steel ball of the type used in ball bearings (1 % C, 1 % Cr type steel) to a steel shank of the type illustrated in Figure 3. In view of the ease with which these needles can be made, it is recommended that they should be used once only and then discarded for recovery. (See Appendix).

2.3 Hand-operated apparatus

A hand-operated apparatus may be used, except for referee tests, provided it is operated so as to give a similar performance to the mechanized apparatus described in clause 2.1, i.e. regular movement, smooth lowering of the needle, etc.

NOTE. – Smooth lowering may conveniently be accomplished by lowering the needle onto a safety razor blade and then allowing it to slide off the sharp edge of the blade onto the film.

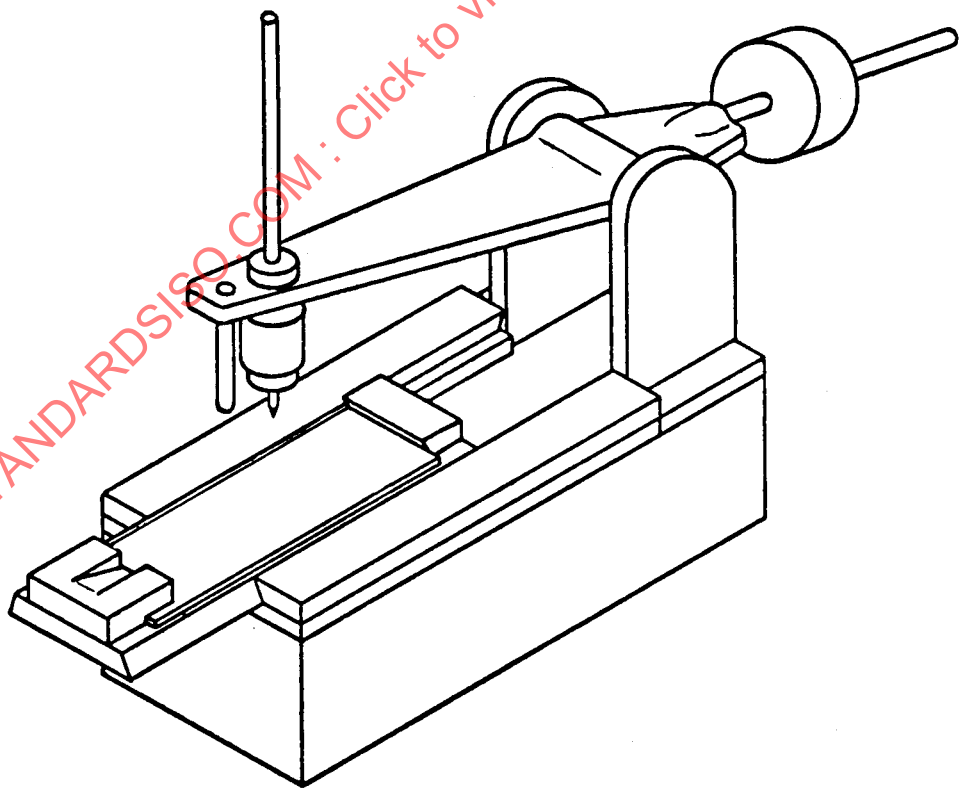

FIG. 1 – **Diagram of scratch test apparatus**

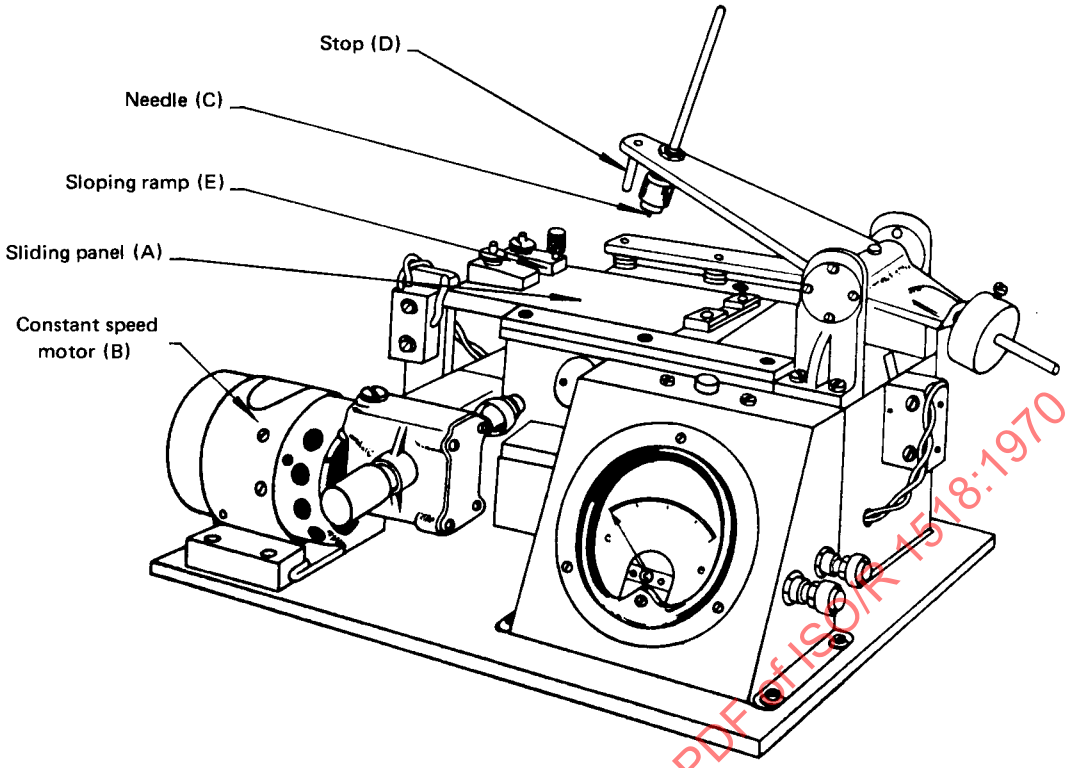

FIG. 2 – **Suitable type of mechanized scratch test apparatus**

Dimensions in millimetres

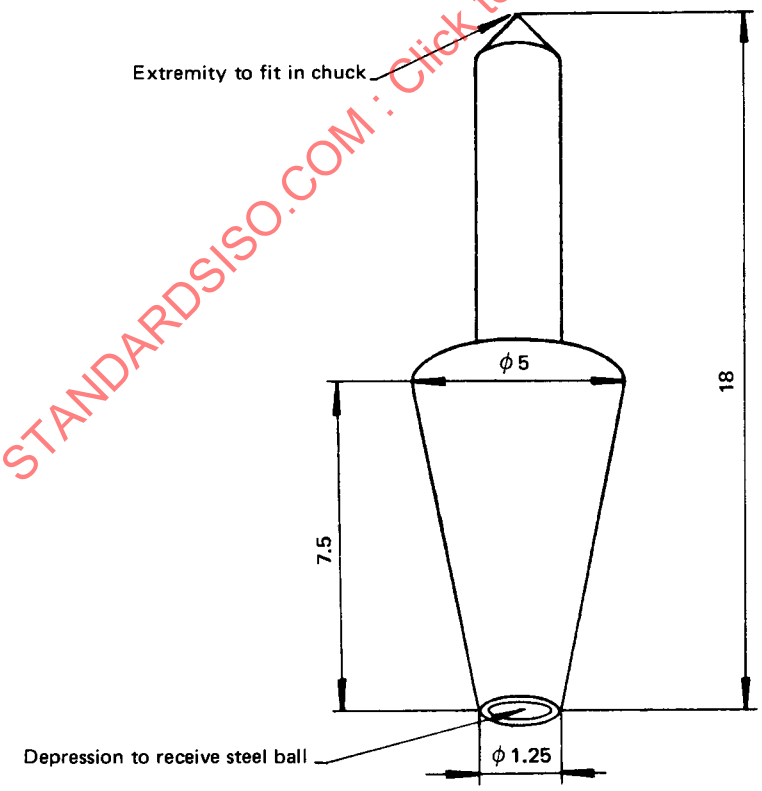

FIG. 3 – **Suitable shank for scratch test needle**

3. SAMPLING

A representative sample of the product to be tested (or of each product in the case of a multicoat system) should be taken as described in ISO Recommendation R 1512, *Paints and varnishes – Sampling*. The sample should then be examined and prepared for testing as described in ISO Recommendation R 1513, *Paints and varnishes – Examination and preparation of samples for testing.*

4. TEST PANELS

4.1 Material

Unless otherwise specified or agreed, the test panels should be of burnished tinplate, burnished steel or acid chromate treated hard aluminium complying with the requirements of ISO Recommendation R 1514, *Paints and varnishes – Standard panels for testing.*

4.2 Dimensions

The test panels should be rectangular and approximately 125 mm × 50 mm in size. If the product under test is to be applied by brushing, the material used should be of such size that, after coating and drying, a panel of the above dimensions can be cut from it with the brush marks parallel to the shorter side.

4.3 Preparation and coating of panels

The test panels should be prepared in accordance with ISO Recommendation R 1514, *Paints and varnishes – Standard panels for testing,* unless otherwise specified, and should then be coated by the specified method with the product or system under test.

4.4 Thickness of coating

The thickness, in micrometres, of the dry coating, should be determined by the method specified, using one of the procedures described in ISO Recommendation R ...*

5. PROCEDURE

5.1 General

5.1.1 *Drying the test panel.* The coated test panels should be dried (or stoved and aged) for the specified time and, unless otherwise specified, should be conditioned at a temperature of 20 ± 2 °C and 65 ± 5 % relative humidity for a minimum time of 16 hours. The appropriate test procedure should then be carried out as soon as possible.

5.1.2 *Ambient conditions.* The test should be carried out at a temperature of 20 ± 2 °C and 65 ± 5 % relative humidity, unless otherwise specified.

5.2 Procedure for a single specified load

The following sequence of operations should be carried out three times on each of two test panels.

5.2.1 Take an unused needle and examine it under a × 30 magnification to ensure that the hardened steel point is smooth, hemispherical and free from contamination.

5.2.2 Fix the needle in the chuck so that the position of operation is perpendicular to the coating.

5.2.3 Clamp the test panel, with the coating uppermost, to the sliding panel of the apparatus with the longer side of the panel parallel to the direction in which the scratch will be made.

5.2.4 Place weights on the holder above the needle to obtain the specified load.

5.2.5 Start the motor of the apparatus or pull the sliding panel of the hand-operated apparatus and allow the scratch to be made on the coating.

5.2.6 Remove the panel and examine the scratch to see if the coating has been penetrated to the substrate. By agreement between the parties a suitable magnification may be used, in which case the degree of magnification should be mentioned in the test report.

* In preparation.