
Paints and varnishes — Cross-cut test

Peintures et vernis — Essai de quadrillage

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Published in Switzerland

Contents

Page

Foreword.....	iv
1 Scope	1
2 Normative references	1
3 Apparatus	2
4 Sampling.....	5
5 Test panels	5
6 Procedure	5
7 Supplementary test conditions	8
8 Evaluation and expression of results	8
9 Precision.....	9
10 Test report.....	10
Bibliography	11

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 2409 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

This third edition cancels and replaces the second edition (ISO 2409:1992), which has been technically revised. The main changes are:

- the requirements for the adhesive tape have been changed;
- precision data have been added.

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Paints and varnishes — Cross-cut test

1 Scope

This International Standard describes a test method for assessing the resistance of paint coatings to separation from substrates when a right-angle lattice pattern is cut into the coating, penetrating through to the substrate. The property measured by this empirical test procedure depends, among other factors, on the adhesion of the coating to either the preceding coat or the substrate. This procedure is not to be regarded, however, as a means of measuring adhesion.

Where a measurement of adhesion is required, attention is drawn to the method described in ISO 4624.

NOTE 1 Although the test is primarily intended for use in the laboratory, the test is also suitable for field testing.

The method described may be used either as a pass/fail test or, where circumstances are appropriate, as a six-step classification test. When applied to a multi-coat system, assessment of the resistance to separation of individual layers of the coating from each other may be made.

The test can be carried out on finished objects and/or on specially prepared test specimens.

Although the method is applicable to paint on hard (e.g. metal) and soft (e.g. wood and plaster) substrates, these different substrates need a different test procedure (see Clause 6).

The method is not suitable for coatings of total thickness greater than 250 µm or for textured coatings.

NOTE 2 The method, when applied to coatings designed to give a rough patterned surface, will give results which will show too much variation (see also ISO 16276-2).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1513, *Paints and varnishes — Examination and preparation of samples for testing*

ISO 1514, *Paints and varnishes — Standard panels for testing*

ISO 2808, *Paints and varnishes — Determination of film thickness*

ISO 3270, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

IEC 60454-2, *Specification for pressure-sensitive adhesive tapes for electrical purposes — Part 2: Methods of test*

3 Apparatus

3.1 General

Use ordinary laboratory apparatus, together with the apparatus specified in 3.2 to 3.6.

3.2 Cutting tool

3.2.1 General requirements

It is particularly important to ensure that the cutting tool has a defined shape and that the cutting edges are in good condition. Suitable tools are described in 3.2.2 and 3.2.3 and shown in Figures 1a) and 1b).

A single-blade cutting tool (3.2.2) is the preferred tool in all cases, i.e. with all kinds of coating on both hard and soft substrates. The multi-blade cutting tool (3.2.3) is not suitable for thick ($> 120 \mu\text{m}$) or hard coatings or where the coating is applied over soft substrates.

The tools described in 3.2.2 and 3.2.3 are suitable for manual use and, although this is the more usual method of use, the tool may be mounted on a motor-driven apparatus which gives more uniform cutting. The application of the latter procedure shall be subject to agreement between the interested parties.

3.2.2 Single-blade cutting tool

A single-blade cutting tool shall have a 20° to 30° edge and a blade thickness of $(0,43^{+0,03}_{-0,03})$ mm as shown in Figure 1a).

When the cutting edge has worn to 0,1 mm it shall be reground.

3.2.3 Multi-blade cutting tool

A multi-blade cutting tool shall have six cutting edges spaced 1 mm, 2 mm or 3 mm apart [see Figure 1b)].

The width across the six cutting edges, a , shall be 5 mm for a tool which has a cutting-edge spacing of 1 mm, and 10 mm for a tool which has a cutting-edge spacing of 2 mm.

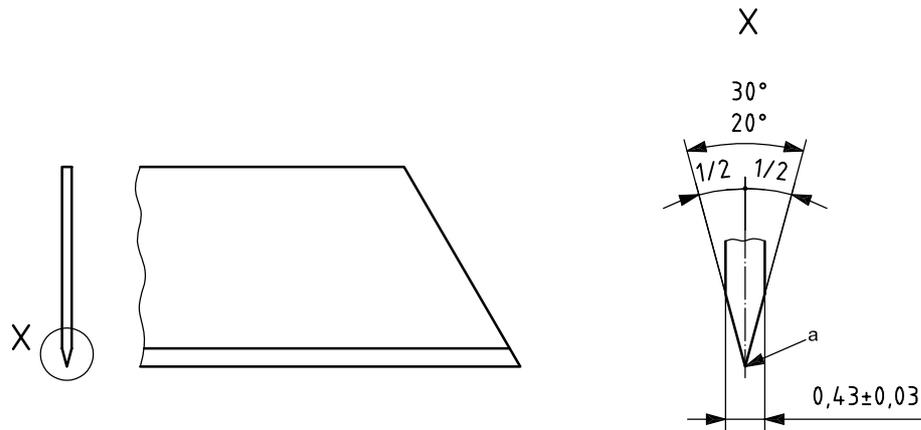
When the cutting edge has worn to 0,1 mm it shall be reground.

The guide edges and the cutting edges shall lie on the same diameter.

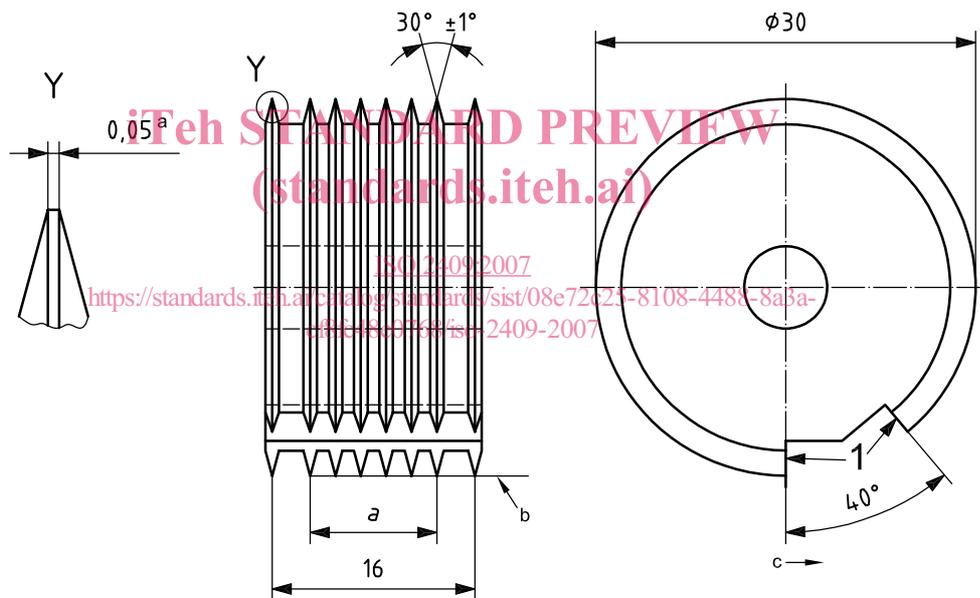
3.3 Guiding and spacing edges

In order to space the cuts correctly, a series of guiding and spacing edges is necessary when using a single-blade cutting tool. A suitable apparatus is shown in Figure 2.

Dimensions in millimetres,
except where indicated otherwise



a) Single-blade cutting tool

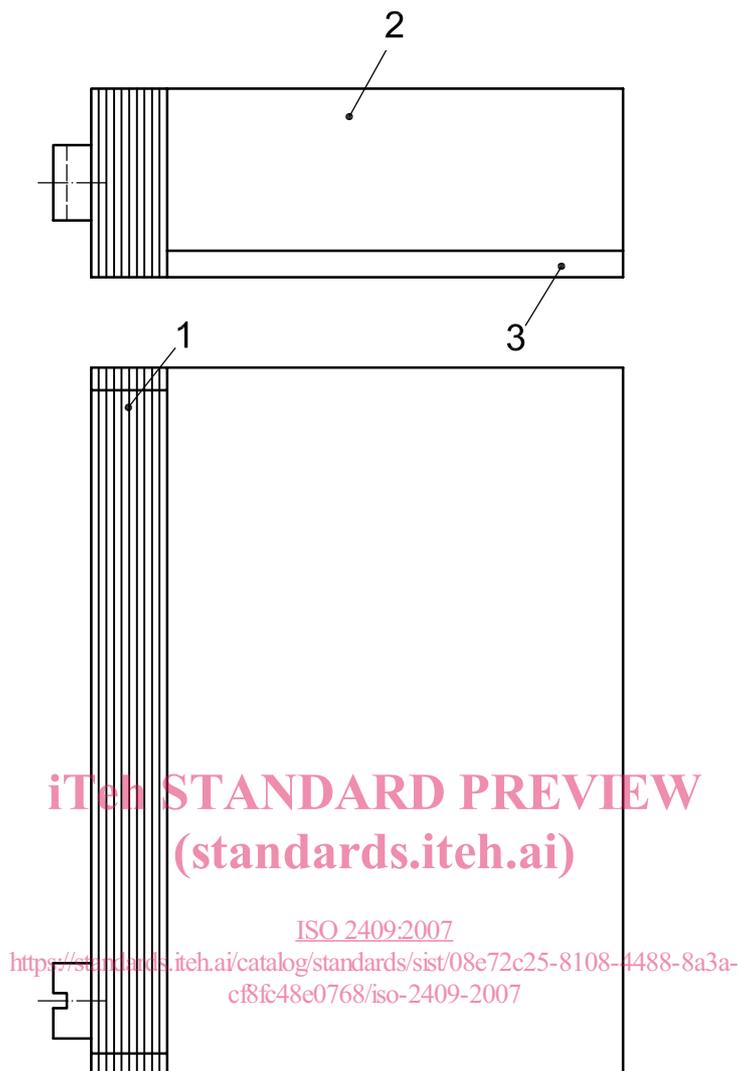


b) Multi-blade cutting tool

Key

- 1 cutting edges
- a width across all six cutting edges
- a Regrind when cutting edge has worn to 0,1 mm.
- b Guide edges and cutting edges lie on same diameter.
- c Direction of cut.

Figure 1 — Cutting tools



Key

- 1 ten spacing edges 1 mm thick
- 2 laminated moulding plastic or steel
- 3 rubber

Figure 2 — Series of spacing edges

3.4 Soft brush

3.5 Pressure-sensitive adhesive tape

Unless otherwise agreed, adhesive tape with an adhesive strength between 6 N per 25 mm width and 10 N per 25 mm width (determined in accordance with IEC 60454-2) shall be used. The tape shall be at least 50 mm wide.

NOTE Transparent tape is recommended.

3.6 Viewing lens

Use a hand-held lens with a magnification of $\times 2$ or $\times 3$.

4 Sampling

Take a representative sample of the product to be tested, as described in ISO 15528.

Examine and prepare each sample for testing, as described in ISO 1513.

5 Test panels

5.1 Substrate

Unless otherwise agreed, select the substrate from one of those described in ISO 1514.

The panels shall be plane and free from distortion. The dimensions shall be such as to allow the test to be carried out at three different positions not less than 5 mm from each other or from an edge of the panel.

Where panels consist of a relatively soft material such as wood, the minimum thickness shall be 10 mm. Where panels consist of a hard material, the minimum thickness shall be 0,25 mm.

NOTE 1 Rectangular panels, measuring approximately 150 mm × 100 mm, have been found to be convenient.

NOTE 2 In cases where the panel is made of wood, the direction and the structure of the grain can influence the test, and a pronounced grain will render the evaluation impossible.

5.2 Preparation and coating

Unless otherwise agreed, prepare each test panel in accordance with ISO 1514 and then coat it by the specified method with the product or system under test.

5.3 Drying

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Dry (or stove) and age (if applicable) each coated test panel for the specified time and under the specified conditions.

5.4 Thickness of coating

Determine the thickness, in micrometres, of the dried coating by one of the procedures specified in ISO 2808. Make the measurement at, or as near as possible to, the positions at which the cross-cut is to be made. The number of thickness determinations is dependent on the method used.

6 Procedure

6.1 General

6.1.1 Test conditions and number of tests

Carry out the test at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) %, unless otherwise agreed (see ISO 3270).

In field tests, the ambient conditions will have to be accepted.

6.1.2 Conditioning of the test panels

Unless otherwise specified, condition the test panels immediately prior to the test at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) % for a minimum of 16 h.