
**Paints and varnishes — Bend test
(conical mandrel)**

Peintures et vernis — Essai de pliage (mandrin conique)

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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 6860 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

This second edition cancels and replaces the first edition (ISO 6860:1984), which has been technically revised. The main changes are:

- an indication of the rolling direction of aluminium panels has been added to Subclause 5.1;
- the diameter of the small end of the cone has been changed to $(3,1 \pm 0,1)$ mm so that the apparatus standardized in ASTM fits into the International Standard;
- the text has been editorially revised.

Introduction

This International Standard is one of five documents (see also ISO 1519, ISO 1520, ISO 6272-1 and ISO 6272-2) which specify empirical test procedures for assessing the resistance of coatings of paints, varnishes and related products to cracking and/or detachment from the substrate under different conditions of deformation.

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Paints and varnishes — Bend test (conical mandrel)

1 Scope

This International Standard describes an empirical test procedure for assessing the resistance of a coating of paint, varnish or related product to cracking and/or detachment from a metal substrate when subjected to bending around a conical mandrel under standard conditions.

For a multi-coat system, each coat may be tested separately or the complete system may be tested.

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

3 Apparatus

A suitable apparatus is shown in Figure 1.

The mandrel of the test assembly shall be in the form of a truncated cone, such that its small diameter (d_0) is $(3,1 \pm 0,1)$ mm and its large diameter (d_1) is $(38 \pm 0,1)$ mm, over a length (l) of (203 ± 3) mm (see Figure 2).

The mandrel is mounted horizontally on a base plate. An operating lever with a draw bar is provided for bending the test panel around the mandrel. The assembly is also fitted with a device for clamping the test panel.

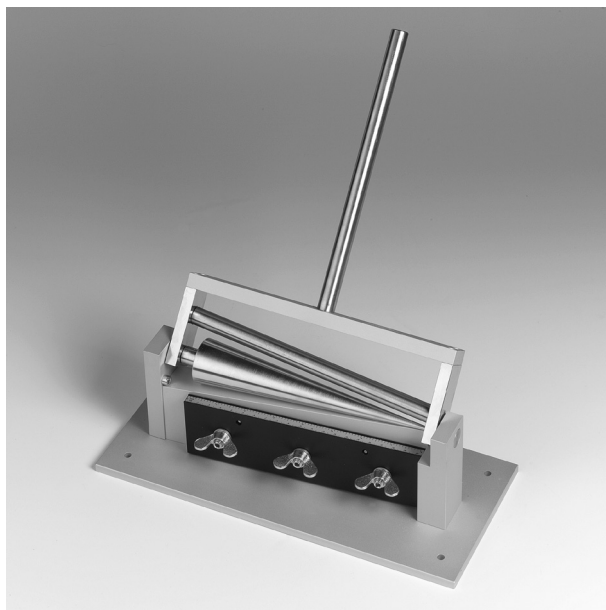
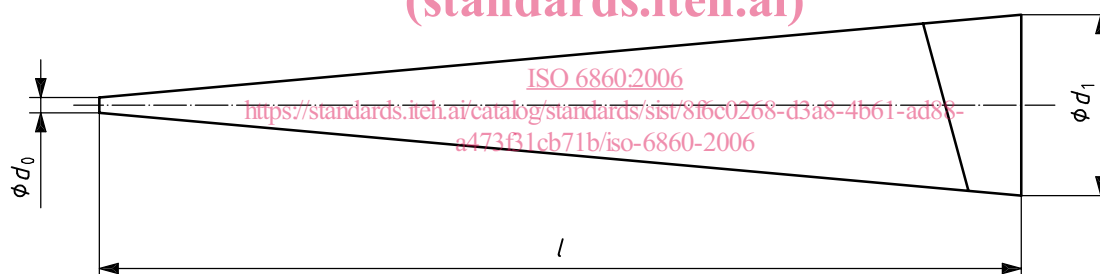


Figure 1 — Conical mandrel test apparatus

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Key

- $d_0 = (3,1 \pm 0,1) \text{ mm}$
- $d_1 = (38 \pm 0,1) \text{ mm}$
- $l = (203 \pm 3) \text{ mm}$

Figure 2 — Cone with bent test panel

4 Sampling

Take a representative sample of the coating material to be tested (or of each coating material in the case of a multi-coat system), 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, the test panels shall conform to the requirements of ISO 1514 and shall be made of burnished steel, burnished tinplate or soft aluminium.

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

The test panels shall be rectangular with sides measuring approximately 75 mm × 150 mm and shall have a maximum thickness of 0,8 mm, unless otherwise agreed or specified between the interested parties. The test panels may be cut to size after coating and drying, provided no distortion occurs. In the case of aluminium panels, the longitudinal direction of metallurgical rolling shall be at an angle of 90° to the axis of the cone.

5.2 Preparation and coating

Unless otherwise agreed, prepare each test panel in accordance with ISO 1514. Coat the panels by a method agreed between the interested parties with the coating material or system under test. If the coating under test is applied by brushing, any brush marks shall be at an angle of 90° to the axis of the cone.

5.3 Drying and conditioning

Dry (or stove and age) each coated test panel for the specified time. Then condition the coated panels at $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \%$ relative humidity (see also ISO 3270) for a minimum period of 16 h. Carry out the test procedure as soon as possible after conditioning.

5.4 Thickness of the coating

Determine the thickness, in micrometres, of the dry coating using one of the procedures described in ISO 2808.

6 Procedure

6.1 Number of determinations

Carry out the determination in triplicate.

6.2 Test conditions

Carry out the test at $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \%$ relative humidity, unless otherwise specified or otherwise agreed between the interested parties. If conditions other than $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \%$ relative humidity are used, they shall be recorded in the test report.

Avoid warming or undue handling of the test panel.

6.3 Bending of the panel

If agreed between interested parties, make incisions in the coating through to the substrate, parallel to the short edges of the panel at distances of 20 mm.

NOTE 1 Without incisions, cracks starting at the small diameter can propagate over the whole length of the cone.