
Prevlečene kovine, ki se navijajo - Preskusne metode - 6. del: Oprijem po globljenju (preskus elastičnosti)

Coil coated metals - Test methods - Part 6: Adhesion after indentation (cupping test)

Bandbeschichtete Metalle - Prüfverfahren - Teil 6: Haftfestigkeit nach Eindrücken (Tiefungsprüfung)

Tôles prélaquées - Méthodes d'essai - Partie 6 : Adhérence après indentation (essai d'emboutissage)

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English Version

**Coil coated metals - Test methods - Part 6: Adhesion after
indentation (cupping test)**

Tôles prélaquées - Méthodes d'essai - Partie 6 :
Adhérence après indentation (essai d'emboutissage)

Bandbeschichtete Metalle - Prüfverfahren - Teil 6:
Haftfestigkeit nach Eindrücken (Tiefungsprüfung)

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 139.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (prEN 13523-6:2019) has been prepared by Technical Committee CEN/TC 139 “Paints and varnishes”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13523-6:2002.

The main changes are:

- a) the period of ageing has been changed from 1 h to agreement prior to the test (8.4);
- b) the time of ageing has been added to the test report;
- c) the text has been editorially revised and the normative references have been updated.

The EN 13523 series, *Coil coated metals — Test methods*, consists of the following parts:

- Part 0: General introduction
- Part 1: Film thickness
- Part 2: Gloss
- Part 3: Colour difference — Instrumental comparison
- Part 4: Pencil hardness
- Part 5: Resistance to rapid deformation (impact test)
- Part 6: Adhesion after indentation (cupping test)
- Part 7: Resistance to cracking on bending (T-bend test)
- Part 8: Resistance to salt spray (fog)
- Part 9: Resistance to water immersion
- Part 10: Resistance to fluorescent UV radiation and water condensation
- Part 11: Resistance to solvents (rubbing test)
- Part 12: Resistance to scratching
- Part 13: Resistance to accelerated ageing by the use of heat
- Part 14: Chalking (Helmen method)
- Part 15: Metamerism
- Part 16: Resistance to abrasion
- Part 17: Adhesion of strippable films

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- Part 18: Resistance to staining
- Part 19: Panel design and method of atmospheric exposure testing
- Part 20: Foam adhesion
- Part 21: Evaluation of outdoor exposed panels
- Part 22: Colour difference — Visual comparison
- Part 23: Resistance to humid atmospheres containing sulfur dioxide
- Part 24: Resistance to blocking and pressure marking
- Part 25: Resistance to humidity
- Part 26: Resistance to condensation of water
- Part 27: Resistance to humid poultice (Cataplasma test)
- Part 29: Resistance to environmental soiling (Dirt pick-up and striping)

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1 Scope

This document defines terms of the procedure for determining the adhesion of an organic coating to a metallic substrate after indentation produced by slow deformation.

The resistance to cracking can also be evaluated.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 13523-0, *Coil coated metals — Test methods — Part 0: General introduction*

EN 23270, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing (ISO 3270)*

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

EN ISO 1520, *Paints and varnishes — Cupping test (ISO 1520)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13523-0 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Principle

The test specimen is cross-hatched with a cutting tool and is then deformed by pressing under specified conditions. After pressing, the test specimen can be artificially aged by immersion in boiling water.

5 Apparatus and materials

5.1 Cross-hatching device

A single-bladed knife, very sharp to avoid any burrs. For coatings less than 60 µm in thickness, it is also possible to use a purpose-made cutting tool, capable of making a minimum of six parallel cuts.

5.2 Pressing device

Apparatus in accordance with EN ISO 1520, consisting essentially of:

- a steel die, of inside diameter $(27 \pm 0,05)$ mm, its contact surface with the test specimen being flat and polished;
- a retaining ring, having its flat and polished surface in contact with the test specimen;
- an indenter consisting of a polished steel sphere, of diameter $(20 \pm 0,05)$ mm with a maximum of 0,1 mm displacement from the axis of the die;
- a system, preferably hydraulic, allowing movement of the indenter at a speed of (12 ± 6) mm/min.

prEN 13523-6:2019 (E)**5.3 Ageing device**

The ageing device shall consist of:

- a) a vessel, to contain boiling water, whose dimensions allow the complete immersion of the test specimen;
- b) a heating system.

5.4 Pincers, the jaws of which shall be flat, blunt and having a width of at least 5 mm.

5.5 Magnifying glass × 10.

5.6 Transparent pressure-sensitive adhesive tape, 25 mm wide, with an adhesion strength of (10 ± 1) N per 25 mm width when tested in accordance with EN 60454-2.

6 Sampling

Sampling shall be in accordance with EN 13523-0.

7 Test panels

Preparation and conditioning of test panels shall be in accordance with EN 13523-0.

8 Procedure**8.1 Ambient conditions**

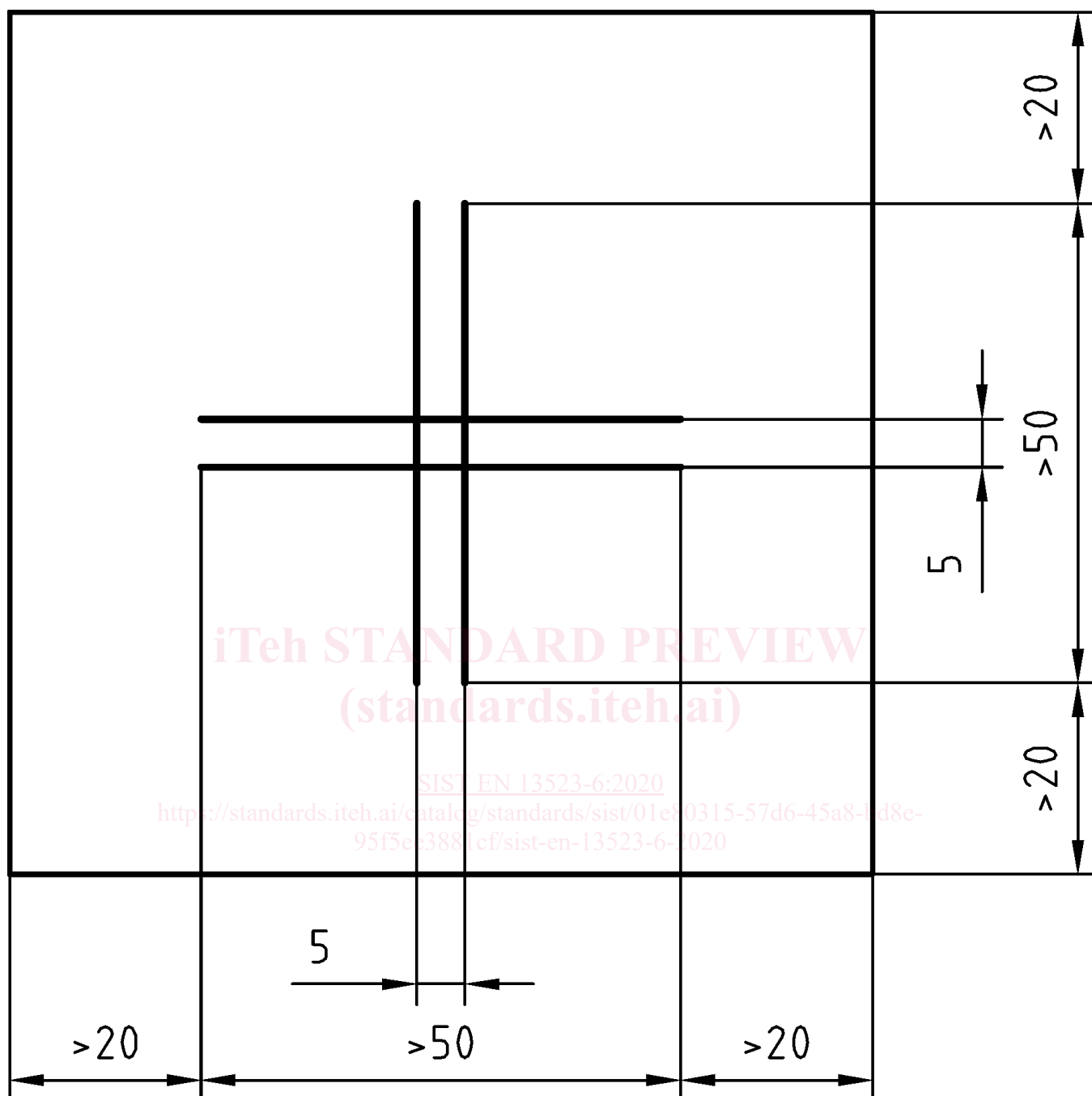
Measure the coating adhesion at ambient temperature. For more accurate measurements, as required for instance in case of dispute, the temperature shall be (23 ± 2) °C and the relative humidity (50 ± 5) %, in accordance with EN 23270.

8.2 Cross-hatching (not used for evaluation of resistance to cracking)**8.2.1 For coatings greater than or equal to 60 µm thickness (see Figure 1)**

Make two parallel cuts 5 mm apart, together with two additional similar cuts at right angles to form a central 5 mm × 5 mm square.

Each cut shall just reach the metallic substrate, and each cut shall measure at least 50 mm in length.

Each cut shall be at a distance of not less than 20 mm from the edge of the test panel.

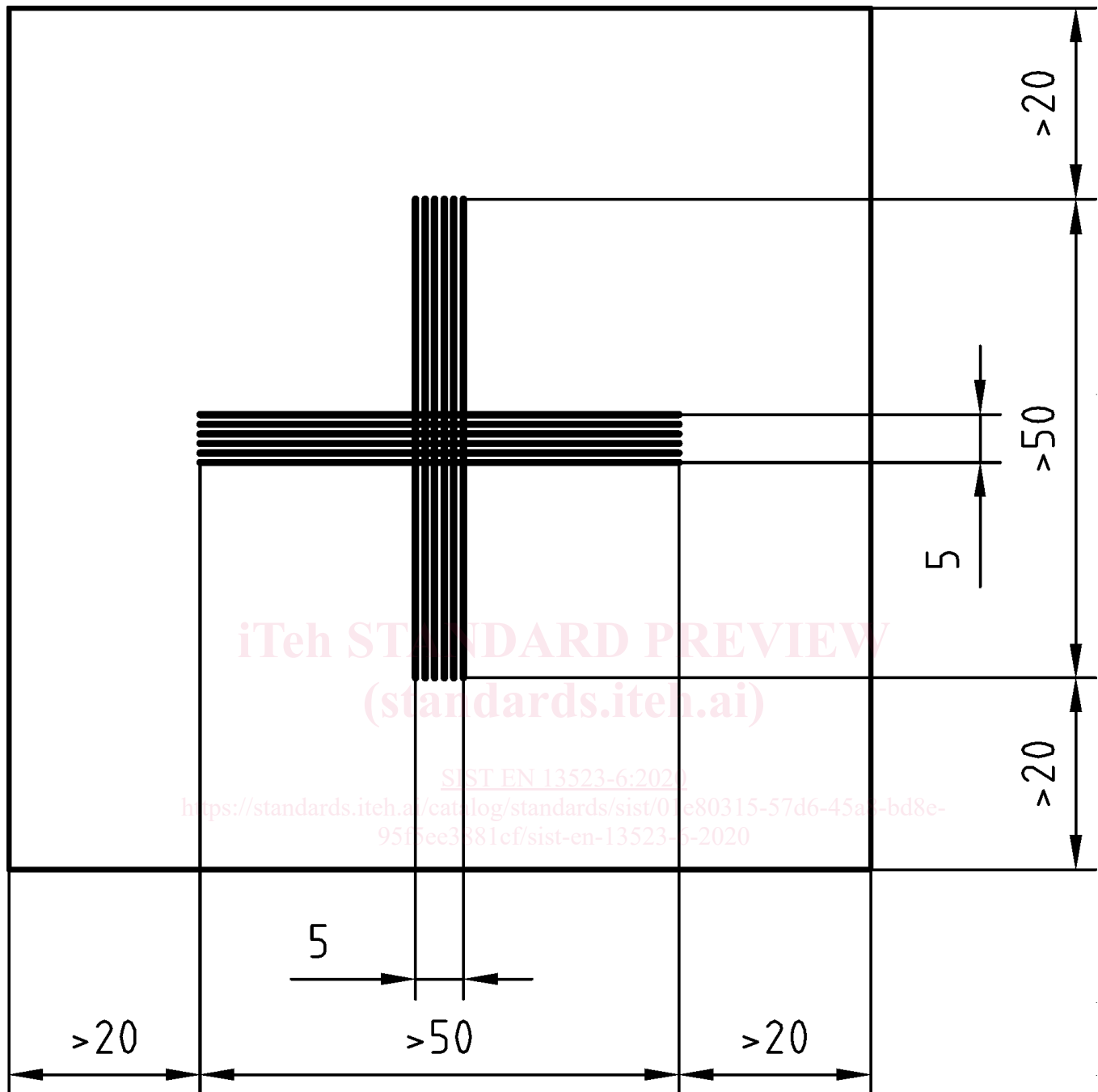


**Figure 1 — Cutting of coatings $\geq 60 \mu\text{m}$ thickness
(2 cuts in each direction, 5 mm apart)**

8.2.2 For coatings less than $60 \mu\text{m}$ thickness (see Figure 2)

Make at least six parallel cuts 1 mm apart, together with at least six additional similar cuts at right angles. Each cut shall just reach the metallic substrate, and each cut shall measure at least 50 mm in length. Each cut shall be at a distance of not less than 20 mm from the edge of the test panel.

NOTE At this stage, none of the squares formed exhibit adhesion failure from the metallic substrate.



**Figure 2 — Cutting of coatings < 60 μm thickness
(minimum of 6 cuts in each direction, 1 mm apart)**

8.3 Pressing

Choose an indentation depth in millimetres, for example 80 % of the depth which ruptures the metallic substrate.

Clamp the test panel between the retaining ring and the die, the coating facing the die and the end of the indenter being in contact with the test panel. The measuring device shall be in position 0. Ensure that the cross-hatching shall be centred on the dome.

Move the spherical end of the indenter at constant speed of (12 ± 6) mm/min to reach the chosen depth of indentation.