SLOVENSKI STANDARD
SIST EN 13523-7:2002

01-september-2002

Kovine, zaġļ itene po postopku coil-coating - Metode preskuġanja - 7. del: Odpornost proti pokanju pri upogibu (T-upogibni preskus)

Coil coated metals - Test methods - Part 7: Resistance to cracking on bending (T-bend test)

Bandbeschichtete Metalle - Prüfverfahren - Teil 7: Widerstandsfähigkeit gegen Rissbildung beim Biegen (T-Biegeprüfung)

Tôles prélaquées - Méthodes d'essai - Partie 7: Résistance a la fissuration par pliage (essai de pliage en T)

Ta slovenski standard je istoveten z: **EN 13523-7:2001**

ICS:

17.040.20	Lastnosti površin	Properties of surfaces
25.220.60	Organske prevleke	Organic coatings

SIST EN 13523-7:2002 **en**

EUROPEAN STANDARD

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English version

Coil coated metals - Test methods - Part 7: Resistance to cracking on bending (T-bend test)

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 13523-7:2001 E

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 139 "Paints and varnishes", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2001, and conflicting national standards shall be withdrawn at the latest by July 2001.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This part of EN 13523 describes the procedure for determining the resistance to cracking of an organic coating on a metallic substrate when bent through 135° to 180°. The degree of adhesion may also be evaluated.

Both folding and mandrel methods are considered. The folding method is more often used for practical purposes but where more precise determinations are required, the mandrel method is recommended.

The cylindrical bend method can also be used for a pass/fail decision by using an agreed mandrel.

The choice of the appropriate test method is limited by the thickness and/or the hardness of the substrate.

NOTE: The feasibility of the test depends on the type and thickness of the substrate. During the procedure the mandrel should not deform.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 13523-0:2001
Coil coated metals – Test methods – Part 0: General introduction and list of test methods

prEN 13523-13:1999
Coil coated metals – Test methods – Part 13: Resistance to accelerated ageing by the use of heat

EN 23270:1991
Paints and varnishes and their raw materials – Temperatures and humidities for conditioning and testing (ISO 3270:1984)

IEC 60454-2:1994
Specifications for pressure-sensitive adhesive tapes for electrical purposes – Part 2: Methods of test

3 Terms and definitions

For the purposes of this part of EN 13523, the terms and definitions given in EN 13523-0:2001 apply, together with the following.

3.1
metal thickness
total thickness of the substrate including any metallic coating and excluding any organic coating.

4 Principle

The coated test specimen is bent parallel to the direction of rolling through 135° to 180° over a period of 1 s to 2 s around various radii with the coating on the outside of the bend.

Close contact is maintained between the test specimen and either the wedge or mandrel to ensure a uniform bend.

Any bending device allowing the required smooth and uniform bending may be used.

The minimum bending radius to which the specimen can be bent without cracking of the organic coating determines the resistance to cracking on bending through 135° to 180°.

The minimum bending radius to which the specimen can be bent without loss of adhesion determines the resistance to loss of adhesion on bending through 135° to 180°.

5 Apparatus

5.1 Bending device

5.1.1 for the folding method

Vice or **suitable bend forming apparatus** as shown in figure 1.

5.1.2 for the mandrel method

Bending device, appropriate to the metal thickness, hardness, and panel size:

– cylindrical mandrel: see figure 2;

– conical mandrel: see figure 3;

– conical wedge mandrel: see figure 4; the conical wedge mandrel can be driven manually (see figure 5) or pneumatically (see figure 6).

5.2 Magnifying glass × 10.

5.3 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 IEC 60454-2:1994.

6 Sampling

See EN 13523-0:2001.

Use only flat strip of such a size that the required procedure can be executed and the results obtained are representative of the end use of the material.

7 Test panels

See EN 13523-0:2001.

Because of possible burrs, up to 5 mm on extreme edges shall be ignored during evaluation.

The coating surface shall be free of oil and other foreign matter that might influence the flexibility of the coating or interfere with the observation for cracking or loss of adhesion.

8 Procedure

8.1 General

Measure the resistance of the organic coating to cracking at ambient temperature. For more accurate measurements, as required for instance in the case of dispute, the temperature shall be (23 ± 2)°C and the relative humidity (50 ± 5) %, in accordance with EN 23270:1991.

The coating under test shall always be at the outside of the bend.

The bending shall be carried out over a period of 1 s to 2 s.

The bends shall be examined with the magnifying glass (5.2) immediately after bending.

NOTE: If necessary, a second inspection may be agreed after a specified ageing (see, for example, prEN 13523-13:1999) of either the flat material before bending or the bend itself.

The adhesion can also be evaluated as follows: Remove two complete laps from a reel of the adhesive tape (5.3) and discard. Remove an additional length at a steady rate and cut a piece, approximately 75 mm long.

Place the centre of the tape along the length of the bend and smooth the tape into place over for a distance of at least 20 mm either side with a finger.

To ensure good contact with the coating, rub the tape firmly with a fingertip. The colour of the coating seen through the tape is a useful indication of overall contact.

Within 5 min of applying the tape, remove the tape by holding the free end and pulling it off steadily in 0,5 s to 1 s at an angle that is as close as possible to 60° to the panel.

In cases of dispute, one of the following test methods shall be agreed between the interested parties.

8.2 Methods for practical (industrial) use

8.2.1 Folding method

The apparatus (5.1.1) shall be firmly secured near the edge of a bench, so that the handle can be operated freely.

The test specimen shall be firmly clamped between the jaws of the device or vice, with the painted surface to be evaluated facing downwards, or, in the case of the vice, facing the operator. The handle operating the bending plate shall be lifted smoothly over a period of 1 s to 2 s. This operation shall be repeated with the test specimen being examined immediately after each bend, with the magnifying glass (5.2). In the instance of a vice being used where no bending plate is available, even pressure shall be applied with both thumbs, to ensure a smooth and uniform bending operation (see figure 7).

NOTE: This method can result in peaking of the bend. Therefore, for more precise results one of the other methods should be used.

8.2.2 Mandrel method

The test specimen shall be placed on an appropriate thick and flexible rubber mat, the painted surface facing towards the rubber. Either by hand or pneumatically, either the cylindrical mandrels in decreasing radius-order or the conical wedge mandrel (see figures 4, 5 and 6) shall be pressed deep enough into the rubber to ensure the proper deformation of the test specimen, with the bending parallel to the direction of rolling.

For cylindrical bends mandrels having radii from 0,5 mm to 5 mm, with steps of 0,5 mm, shall be used.

For a 0T-bend a mandrel of radius 0,5 mm shall be used, and the resulting bend totally bent flat.

8.3 Method for laboratory purposes

The coated panel shall be inserted in the apparatus in such a way that a smooth cylindrical or conical bending through 135° to 180° can be achieved.

Any device that allows such a smooth and uniform bending within a period of 1 s to 2 s may be used. A few examples are given in figures 1, 2 and 3.

For cylindrical bends mandrels having radii from 0,5 mm to 5 mm, with steps of 0,5 mm, shall be used.

For a 0T-bend a mandrel of radius 0,5 mm shall be used, and the resulting bend totally bent flat.

The cylindrical bend method can also be used for a pass/fail decision by using an agreed mandrel.

NOTE: The feasibility of the test depends on the type and thickness of the substrate. During the procedure the mandrel should not deform.

9 Expression of results

The result shall be the minimum bending radius to which the test specimen can be bent without cracking or without loss of adhesion, expressed in T, rounded upwards to the nearest half T, for example "½T no loss of adhesion" or "1T no cracking". See figure 7.

For cylindrical bendings:

$$T_{cyl} = \frac{\text{Minimum mandrel radius}}{\text{Metal thickness}}$$

For conical bendings:

$$T_{con} = \frac{\text{Minimum mandrel radius}}{\text{Metal thickness}}$$

NOTE: The T-expression as defined in this part of EN 13523 differs from that explained in ASTM A 4145-83 where values are twice as high.

10 Precision

Precision data are curently not available.

11 Test report

The test report shall contain at least the following information:

a)all details necessary to identify the product tested, including substrate used, type of paint used, coating thickness;

b)a reference to this part of EN 13523 (EN 13523-7);

c)the method used: cylindrical (cyl.) or conical (con.), practical (P) or laboratory (L) test;

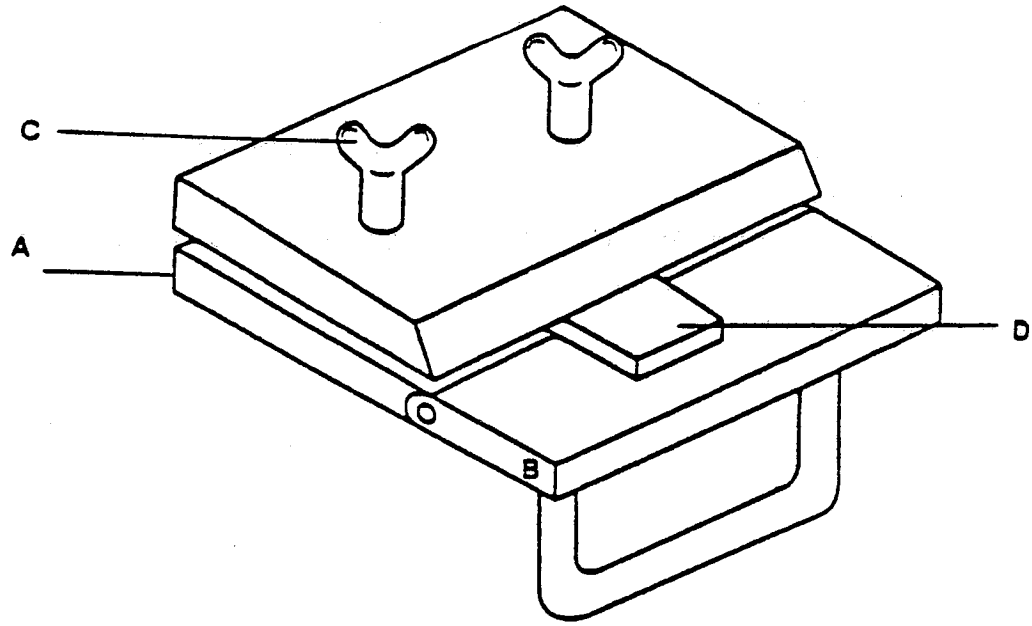
d)the bending device used;

e)the results of the test, as indicated in clause 9, specifying cracking or loss of adhesion as appropriate;

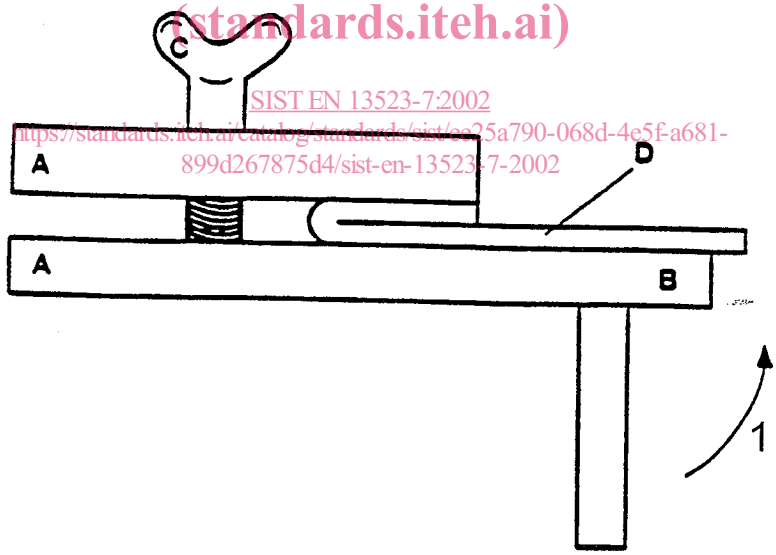
f)any deviation from the test method specified;

g)the date of the test.

Bend forming apparatus



Test procedure – Bend forming apparatus



Key

A Apparatus jaws
B Bending plate
C Clamping screws
D Test specimen
1 Direction of movement

Figure 1 - Practical test (P) – folding method

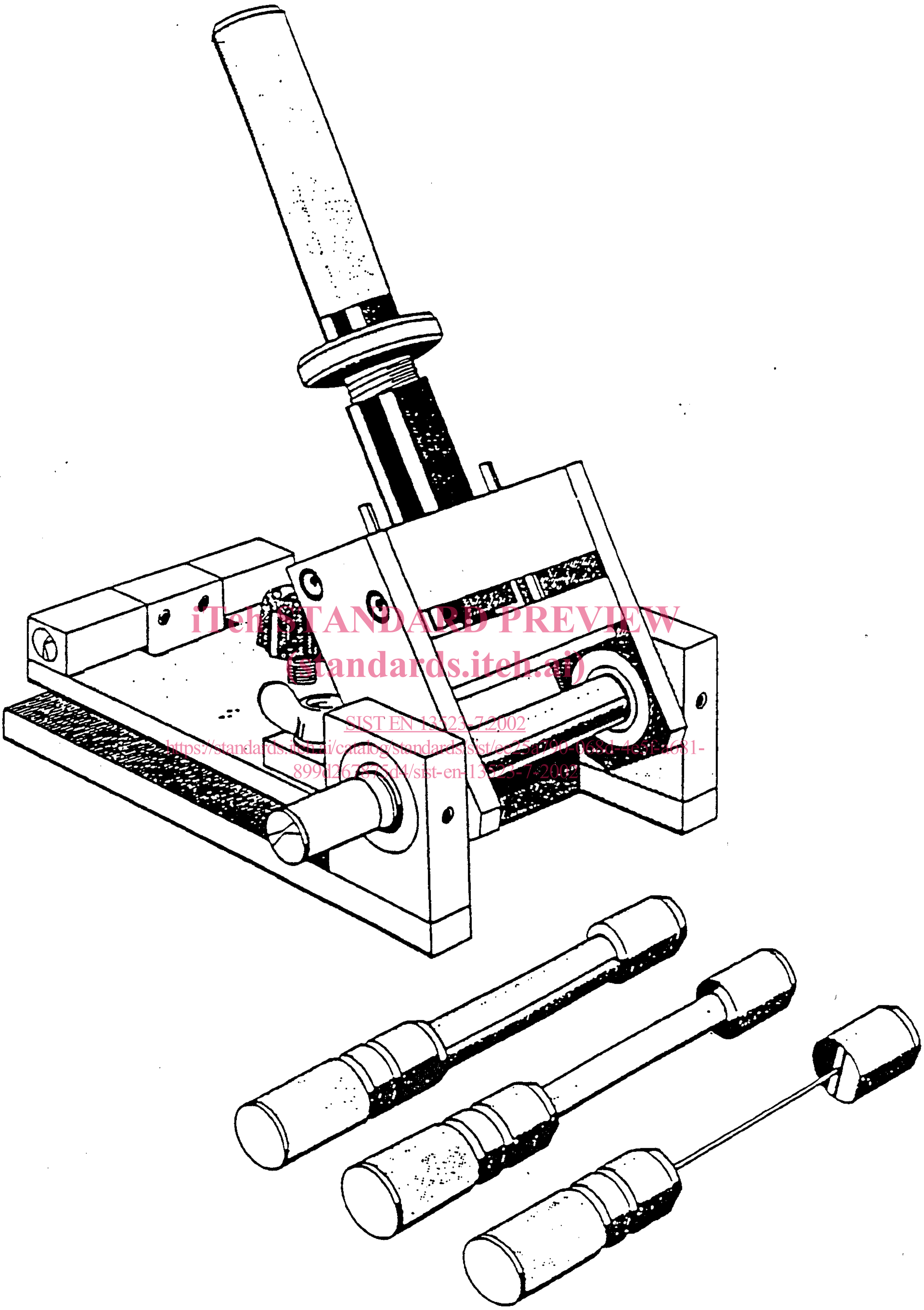


Figure 2 - Laboratory test (L) – cylindrical bend