

INTERNATIONAL STANDARD

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2411

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Rubber- or plastics-coated fabrics — Determination of coating adhesion

*Supports textiles revêtus de caoutchouc ou de plastique —
Détermination de l'adhérence du revêtement*



Reference number
ISO 2411:1991(E)

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.

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.

International Standard ISO 2411 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.

This second edition cancels and replaces the first edition (ISO 2411:1973), of which it constitutes a technical revision.

Annex A forms an integral part of this International Standard.

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Rubber- or plastics-coated fabrics — Determination of coating adhesion

1 Scope

This International Standard specifies a method of test for the determination of the coating adhesion of fabrics coated with vulcanized rubber or plastics.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2231:1989, *Rubber- or plastics-coated fabrics — Standard atmospheres for conditioning and testing.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 coating-to-fabric peel: Separation with no coating polymer residue remaining on the substrate fabric.

3.2 coating or film delamination: The splitting of a multilayer coating, leaving one or more layers of coating film residue on the substrate fabric.

3.3 fabric delamination: The splitting or delamination of substrate fabric, leaving a partial layer or complete fabric laminate adhering to the coating.

NOTE 1 An example of this is in the case of coated nonwoven laminates, when the nonwoven textile element may fail due to the coating adhesion strength being greater than the between-fibre cohesion of the nonwoven textile fabric.

3.4 fabric failure: The breaking of substrate fabric during testing, indicating that the coating adhesion strength is greater than the substrate fabric strength.

3.5 inseparable: Used to describe a coating which is incapable of peeling because it breaks during preparation or testing, indicating that the coating adhesion strength is greater than the coating polymer strength.

3.6 partial film tear: Delamination, leaving patches of coating polymer still adhering to the substrate fabric.

3.7 fabric surface failure: The separation, from the surface layer of the substrate fabric, of portions of fabric pile or groups of fibres which adhere to the removed surface coating polymer.

4 Apparatus

4.1 Autographic strength-testing machine, having one jaw movable at a constant rate within the range 100 mm/min \pm 10 mm/min. The load range shall be such that the force required to cause separation is within 15 % to 85 % of the maximum scale reading.

5 Preparation of test specimens

5.1 General

For the determination of coating adhesion, prepare 10 test specimens, in the manner appropriate to the type of coating as given in 5.2 and 5.3, irrespective of the method of separation to be used, five with their length parallel to the longitudinal direction and five with their length parallel to the transverse direction of the coated fabric under test. Each specimen shall be not less than 75 mm wide and not less than 200 mm long. No specimen shall be taken within 50 mm of a selvage. In the case of coated fabrics with substrate fabrics having a pile, prepare 10 specimens, five in the direction of the pile and five against the direction of the pile.

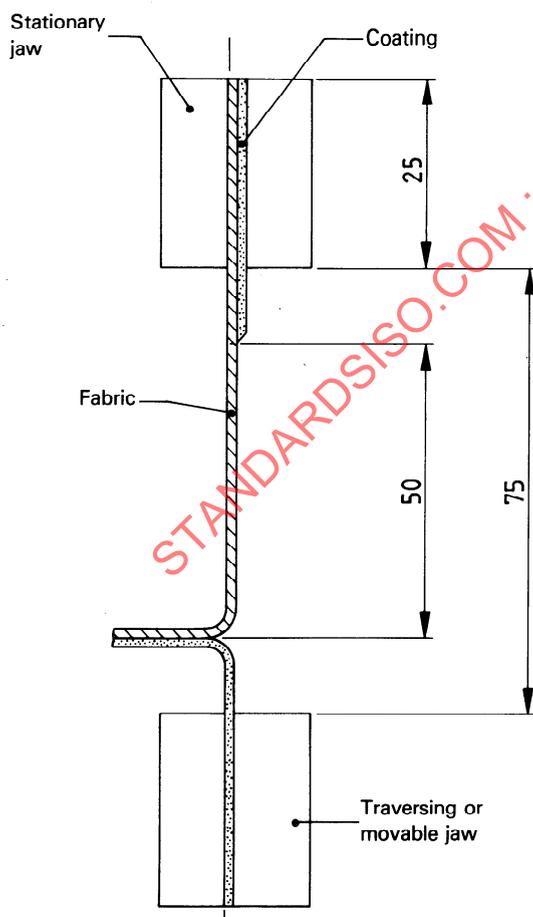


Figure 1 — Mounting of thick coatings

5.2 Thick coatings

Where the strength of the coating layer exceeds the force of the adhesive bond to the substrate fabric, prepare the test specimen by carefully cutting through the coating to the substrate fabric at right angles to the length of the specimen. From this cut, separate carefully the coating film from the substrate fabric for a distance sufficient to enable the test specimen to be mounted in the jaws of the apparatus. Trim the width of the specimen to $50 \text{ mm} \pm 0,5 \text{ mm}$, taking care to avoid damage to the longitudinal threads of the substrate fabric.

Condition the test specimens in accordance with ISO 2231.

Clamp the coated end of the specimen in the stationary jaw and the coating film in the traversing or movable jaw of the testing apparatus as shown in figure 1.

5.3 Thin coatings and coatings of low cohesive strength

Where the coating layer is not sufficiently strong to be stripped continuously from the substrate fabric, but where the coating layer can be distinctly identified from the substrate fabric and can be cut through separately, bond two specimens of the same material face to face, avoiding the first 50 mm, using an adhesive system suitable for the type of coating being evaluated. It is important that the adhesive chosen does not cause the coating to swell irreversibly or otherwise affect the coating/fabric strength.

NOTE 2 In contractual situations, it may be advisable for the interested parties mutually to agree upon the type of adhesive to be used.

Roll the composite specimen lengthwise at least twice with a roller 75 mm wide and of mass 2 kg in order to ensure a good bond.

Where thermal-welding techniques are used in the production process, the interested parties may prefer to use such techniques in conducting the test, but care shall be taken to ensure that spurious results are not obtained.

Apply the adhesive strictly in accordance with the recommendations of the supplier of the adhesive. Allow sufficient time for the bond to attain its optimum strength, turn back the undoped length of one of the plies of the specimen and carefully cut through the coating down to the substrate fabric at the adhesion line. Carefully separate the substrate from its coating for a distance sufficient to enable the test specimen to be mounted in the jaws of the apparatus. Trim the specimen at each edge to give a width of $50 \text{ mm} \pm 0,5 \text{ mm}$, taking care to avoid damage to any longitudinal threads.

If necessary, it is permissible to use a plain weave cotton fabric, desized and bleached, in place of one of the coated specimens.

Condition the test specimens in accordance with ISO 2231.

Clamp the end of the specimen under test in the stationary jaw and the undoped end of the composite specimen in the traversing jaw of the test apparatus as shown in figure 2.

NOTE 3 Where the coating surface is to be treated in any way which may inhibit the coating-to-coating bond, for example siliconized, it is recommended that the test be conducted before any such treatment is applied.

If, in conducting the test, the adhesion between the coating surfaces fails, so that no separation of the coating from the fabric takes place, the load at which this occurs shall not be taken as a measure of the coating adhesion strength but merely as a measure of the cohesive strength of the adhesive.

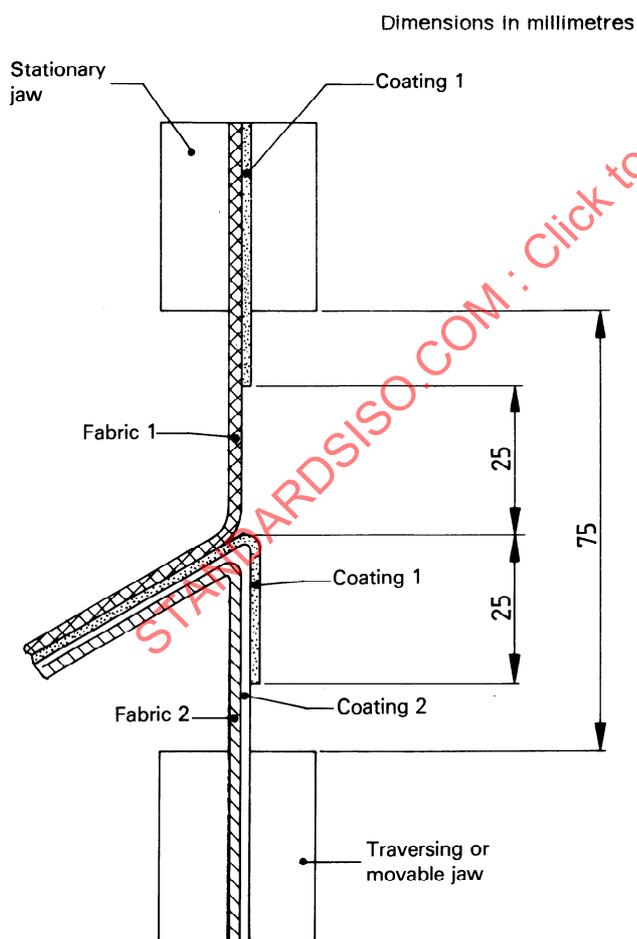


Figure 2 — Mounting of thin coatings and coatings of low adhesive strength

6 Test atmosphere

Carry out the test in one of the atmospheres specified in ISO 2231.

7 Procedure

Fix the separated ends of the test specimen in the grips of the testing machine and adjust it so that the tension is distributed uniformly, no twisting of the test piece occurs during the test and the angle of separation is approximately 180° . It is important to ensure that the strips of test specimen held in the grips and the line of separation of the plies lie in the same specimen plane as shown in figures 1 and 2 (i.e. that one strip does not lie substantially out of the plane of the other).

Set the force-measuring system at zero. Continue the ply separation and record the force over a length of 100 mm.

8 Calculation and expression of results

If the trace obtained consists of a series of peaks, each representing the load at which the plies have separated, and troughs corresponding to the fall-back of the load, determine the median value of the peaks in accordance with normative annex A. Calculate the mean of the median values for the five test specimens in each of the directions tested (see 5.1) and express this, in newtons per 50 mm width, to the nearest newton, as the coating adhesion strength. Give also the mean of the maximum values obtained, if required. In the case where the substrate fabric has a pile, calculate the two means of each of the five values obtained (see 5.1).

9 Test report

The test report shall include the following particulars:

- a reference to this International Standard;
- the details of the coated fabric from which the test pieces have been taken;
- the number of test specimens and the direction of cutting with relation to the coated fabric, the coating face submitted to the test, if necessary, and the adhesion strength values for each of the test specimens;
- the arithmetic-mean adhesion strength values in each direction and, if necessary, for each of the two faces;
- the conditioning and testing atmosphere used (see ISO 2231);

- f) the rate of separation of the grips if other than 100 mm/min \pm 10 mm/min;
- g) the type of test specimen, i.e. whether cemented or non-cemented or thermal-welded (and, in the last case, the method of welding used);
- h) the type of separation (see clause 3);
- i) details of any operation not specified in this International Standard or in the International Standard to which reference is made, and any other factors which may have influenced the results.

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Annex A (normative)

Determination of median values from autographic recordings

Figure A.1 shows typical autographic traces. A "peak" is a point on the trace where the gradient changes from positive to negative. Points marked A are peaks; points marked B are not peaks. The importance of the peaks in the trace is that they give the force on the specimen at the instant of adhesion failure.

NOTE 4 The troughs, marked "e", merely represent a point on the stripping trace to which the pen has been allowed to fall and are a function of the inertia in the system and the linear speed of the autographic trace.

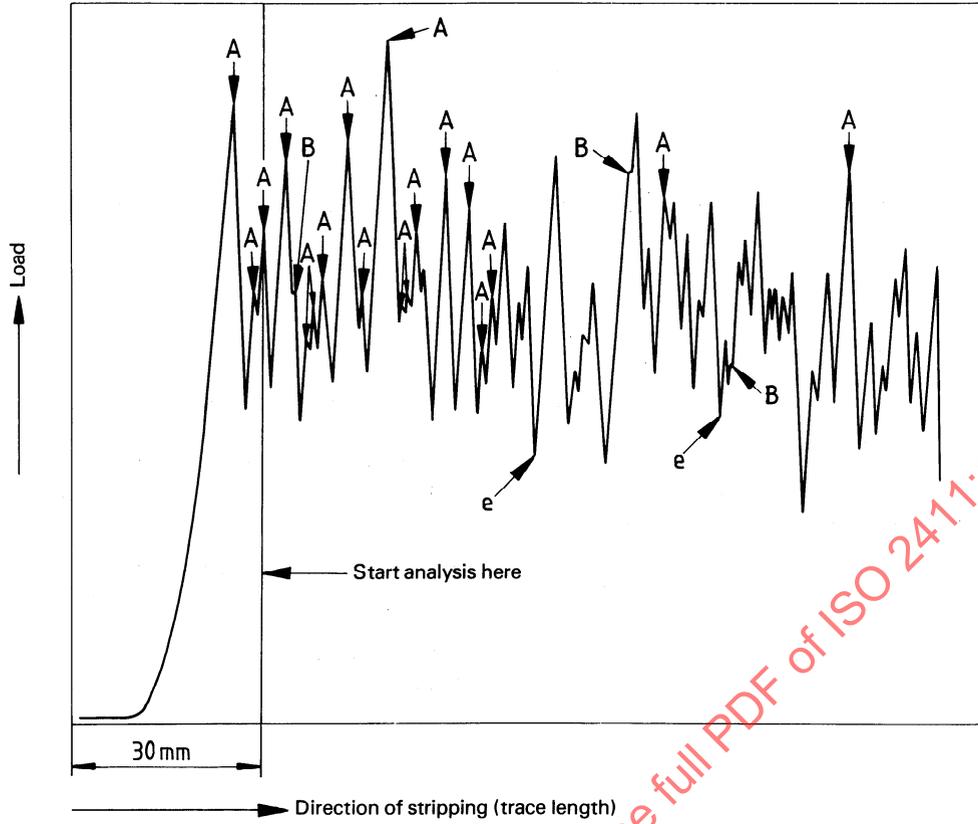
The median value of the adhesion strength is the value such that half the number of peaks have higher values and half have lower values.

To determine the median value, count the total number of peaks (N). If N is an odd number, count downwards, starting at the uppermost peak, a number of peaks to $(N + 1)/2$. The number on the last peak counted is the median peak.

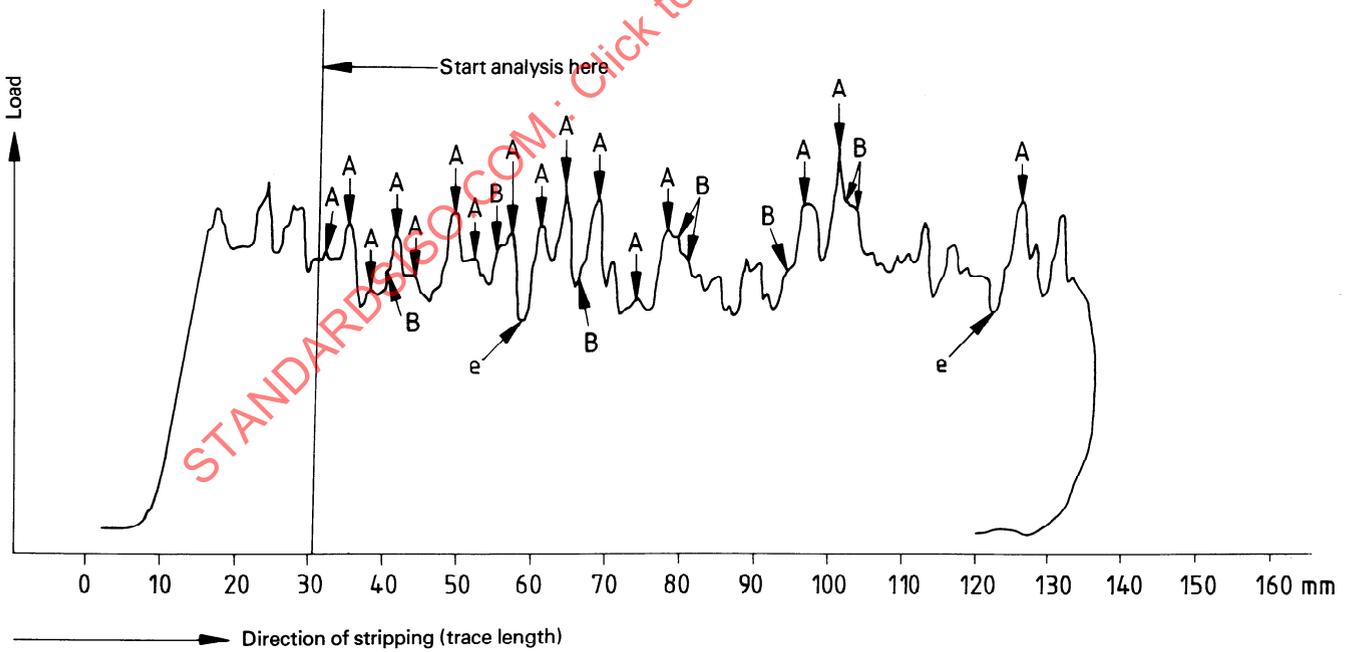
If N is an even number, the median value is taken as midway between peaks $N/2$ and $(N/2) + 1$.

Figure A.2 represents an autographic trace without definite peaks.

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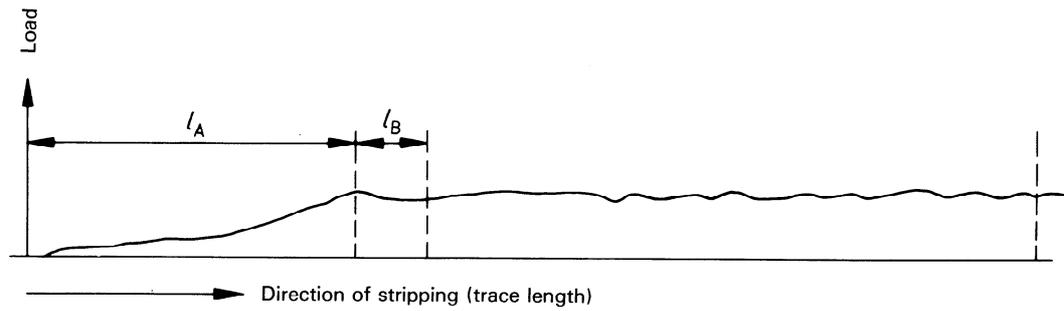


a) Electronic response time



b) Mechanical response at low inertia

Figure A.1 — Typical autographic traces



NOTE — This type of trace can be used only where maximum values are required.

Figure A.2 — Autographic trace without definite peaks

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