INTERNATIONAL STANDARD

ISO 29862

Second edition
2018-05

Self adhesive tapes — Determination of peel adhesion properties

Rubans auto-adhésifs — Détermination des caractéristiques du pouvoir adhésif linéaire

Reference number
ISO 29862:2018(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

This second edition cancels and replaces the first edition (ISO 29862:2007) of which it constitutes a minor revision.

The changes compared to the previous edition are as follows:

— the normative references in Clause 2 have been updated;

— definitions have been added in Clause 3 for “self adhesive tape”, “liner” and “double sided adhesive tape”;

— a Bibliography has been added;

— the text has been editorially revised to comply with the most recent editing rules.

Self adhesive tapes — Determination of peel adhesion properties

1 Scope

This document specifies a series of methods for the determination of peel adhesion properties of self adhesives tapes.

This document contains:

— Method 1: Self adhesive tapes – Measurement of peel adhesion from stainless steel at an angle of 180°;

— Method 2: Self adhesive tapes – Measurement of peel adhesion from its own backing at an angle of 180°;

— Method 3: Self adhesive tapes – Measurement of peel adhesion of double sided and transfer tapes at an angle 180°;

— Method 4: Self adhesive tapes – Measurement of adhesion of the liner to an adhesive tape at an angle of 180°.

Annexes A and B specify further variations in the testing protocol according to specific conditions.

A guide to the use of these methods is given in Table 1.

Table 1 — Methods and annexes

Method	Angle of peel	Temperature of test	
		23 °C	Low temperature
Method 1	180°	—	Annex A
Adhesion to steel	90°	Annex B	-
Method 2	180°	—	Annex A
Adhesion to backing	90°	Annex B	—
Method 3	180°	—	Annex A
Adhesion of double sided and transfer tape	90°	Annex B	—
Method 4	180°	—	Annex A
Adhesion of liner	90°	Annex B	-

NOTE 1 These methods provide a means of assessing the uniformity of the adhesion of a given type of self adhesive tape. The assessment may be within a roll of tape, between rolls or between production lots.

NOTE 2 Variations in the tape backing and adhesive affect the response. Therefore these methods cannot be used to pinpoint the specific cause(s) of non uniformity.

NOTE 3 These test methods may not be appropriate to test tapes having either relatively stiff backings, stiff liners or backing showing high stretch at low forces. These characteristics will result in a high variability for the test response which is not a true indication of the real nature of the adhesive bond.

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 12481, *Self adhesive tapes — Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12481 and the following 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 https://www.iso.org/obp

3.1
peel adhesion
force required to peel a strip of adhesive tape from a specified substrate at a specified angle and speed

3.2
open side
<adhesive> surface of the adhesive on a double sided tape which is exposed on normal unwinding or separation of the first liner

3.3
closed side
<adhesive> surface of the adhesive on a double sided tape which normally remains in contact with the release liner on normal unwinding or separation of the first liner

3.4
transfer tape
adhesive tape having two available pressure sensitive surfaces without the need for a carrier and with a release liner separating the adhesive surfaces. The adhesive may contain reinforcing material

3.5
self adhesive tape
pressure sensitive adhesive
adhesive which in a dry state is permanently tacky at room temperature and adheres readily to surfaces under brief and light pressure

3.6
liner
treated sheet to cover the adhesive temporarily to facilitate handling or unrolling

3.7
double sided adhesive tape
tape where adhesive is applied to both sides of the carrier

4 Significance and use

These test methods are tools for quality control use. Given specific self adhesive tape and a requirement in terms of the minimum or maximum value expected for this tape, the data from the test can be used in conjunction with acceptance criteria.

Test methods 1, 2, 3, and Annexes A and B can show the relative bond strength of a given tape to one or more surfaces (material and texture) as compared to the standard stainless steel panel. Substitution of representative samples of materials in question for the standard steel panel would suffice to do this.

Test methods 1, 2, 3, and Annexes A and B cannot be used to compare two self adhesive tapes of the same type but of different manufacture for their ability to adhere to a surface. This is because the measured peel force is not normalised for a fixed area of stress. The area under stress varies with backing stiffness and adhesive rheology (firmness). Two different tapes seldom agree in these properties.

Test method 4 can show the amount of force required to remove a liner that covers the adhesive side of a tape at a specified peel rate. The force will be different at other peel rates.

These test methods may not provide design information as there is usually no direct relationship between peel adhesion and any functional requirement.

5 Method 1 — Self adhesive tapes — Measurement of peel adhesion from stainless steel at an angle of 180°

5.1 Principle

The method 1 gives a measure of the force required to remove at an angle of 180° an adhesive tape which has been applied to a stainless steel panel.

A length of adhesive tape is applied to a standard plate which is then fixed vertically in one clamp of a tensile testing machine. The other clamp of the machine pulls the free end of the adhesive tape at an angle of 180° to the plate.

The adhesive strength is measured by the force required to peel the adhesive tape continuously from the plate, the line of separation being perpendicular to the direction of the applied force.

5.2 Materials

5.2.1 Absorbent cleaning material, surgical gauze, cotton wool or tissue. To be suitable, materials shall be lint free during use, absorbent, contain no additives that are soluble in the solvents listed in 5.2.2 and made exclusively from virgin materials.

5.2.2 One or more of the following solvents:

— diacetone alcohol non-residual grade (4-hydroxy-4-methyl-2-pentanone);

— methanol;

— methyl ethyl ketone;

— acetone;

— *n*-heptane;

— a mixture of *n*-heptane and a fluorinated hydrocarbon such as refrigerant (suitable when toxicity or flammability restrictions apply).

Solvents shall be of general purpose chemical grade and held in a suitable dispensing system.

5.3 Apparatus

5.3.1 Test piece cutter

An appropriate test piece cutter shall hold two single edge razor blades in parallel planes a precise distance apart, to form a cutter of exact specimen width; two cutters, 12 mm and 24 mm cutting width, shall be available or appropriate alternatives which will not cause edge damage. The precision of the razor blade separation shall be the nominal width ±0,1 mm.

5.3.2 Tensile testing machine

A constant rate of extension (CRE) tension tester shall be used. It is proposed to use an electronic machine taking at least one reading per mm of tape peeled. The tester shall have two clamps with centres in the same plane, parallel with the direction of the motion on the same plane, parallel with the direction of the motion on the stressing clamp and so aligned that they will hold the specimen wholly in the same plane; a means of moving the stressing clamp at a uniform rate of (5 ± 0,2) mm/s and a device for recording load. The instrument shall be calibrated such that a maximum error of 2 % is allowed on the reading.

5.3.3 Stainless steel panels

These shall be perfectly flat, at least 125 mm long and 50 mm wide and at least 1,1 mm thick, stainless steel type 1.4301 in accordance with the 2 R quality defined in EN 10088-2, having a bright annealed finish with a surface roughness of 50 nm ± 25 nm. Panels showing stains, discoloration or many scratches are not acceptable. New panels shall be cleaned prior to use as described in 5.5.2 except with ten washes of the final solvent. Between uses the panel test surface shall be protected from scratches and contamination and the panels shall be stored in the conditions described in 5.4.1.

5.3.4 Roller mechanically or hand operated

5.3.4.1 A steel roller (85 ± 2,5) mm in diameter and (45 ± 1,5) mm in width, covered with rubber approximately 6 mm in thickness, having a hardness of (80 ± 5) Shore A. The surface shall be a true cylinder, void of any convex or concave deviations. The mass of the roller shall be (2 ± 0,1) kg.

5.3.4.2 No part of the apparatus shall increase the mass of the roller during use. The roller shall move either mechanically or by hand at the rate of (10 ± 0,5) mm/s.

5.4 Test samples and test pieces

5.4.1 Condition the sample rolls of tape in the standard conditions of (23 ± 1) °C and (50 ± 5) % relative humidity (RH). Test at these conditions unless otherwise specified [see 5.7 i)]. If these tolerances cannot be maintained, the closest possible tolerances shall be used and these revised tolerances quoted in the report.

5.4.2 The test piece shall be 24 mm wide. A limit deviation of ±0,5 mm shall be allowed. The length shall be approximately 300 mm.

Where the width of the specimen is less than 24 mm, apply one or more additional strips of the tape to give an equivalent width of 24 mm for rolling purposes. Alternatively acceptable rolling pressure may be obtained with a 1 kg roller on samples with width 8,5 mm to 17 mm or with 2 kg roller on samples with widths greater than 17 mm to a maximum of 34 mm.

5.4.3 Discard at least three but no more than six outer wraps of tape from the sample roll before taking the test pieces for testing.

5.4.4 Remove one test piece for each test to be performed. Remove the test piece from a freely rotating roll at the rate of 500 mm/s to 750 mm/s. Where high unwind force makes it impossible to remove the test piece at the prescribed rate, remove it at a rate as close to 500 mm/s as possible.

5.4.5 When the tape is wider than 24 mm, test pieces of the widest specified width are to be cut with an apparatus as described in 5.3.1 from the centre of a strip removed from the roll in accordance with 5.4.4.

5.4.6 Apply the test pieces within 5 min after unwinding.

5.5 Procedure

5.5.1 Standard test conditions

Standard test conditions shall be the same as 5.4.1 for test pieces and test samples conditioning.

5.5.2 Preparation of the panel

Dispense one of the solvents listed in 5.2.2 on to the panel, wiping it to dryness with fresh absorbent cleaning material. Repeat for a total of three washes with this solvent.

Final wipe shall be with methyl ethyl ketone or acetone. The panel should be allowed to dry for at least 10 min. Panels not used within 10 h should be recleaned.

In order to obtain consistent results a new panel shall be wiped at least 10 times with final solvent before use.

Discard plates showing stains, discoloration, or many scratches. Avoid contacting panel surface with fingers. During storage panel should, be protected from damage or contamination.

5.5.3 Peel adhesion

5.5.3.1 Remove a 300 mm test piece of the tape to be tested, as described in 5.4.4. Fold 12 mm at one end, adhesive to adhesive to form a tab. Touch the other end of the test piece to an end of the test panel. Holding the tab end of the test piece so that it does not make contact with the panel but is positioned loosely above it, roll mechanically or by hand twice in each lengthwise direction, causing the roller to apply the tape to the panel. This prevents entrapment of air between the adhesive and the panel. Should this occur, discard the test piece.

Individually prepare each test piece and test within 1 min.

NOTE Longer dwell time will give different results. Peel adhesion increases with dwell time at different rates for various tapes. A longer dwell time can be chosen purposely.

5.5.3.2 Stripping the test piece. Double back the folded end of the tape at an angle of 180° and peel 25 mm of the tape from the panel. Clamp that end of the panel into one of the jaws of the tensile testing machine and the tape into the other jaw. Operate the tester at (5,0 ± 0,2) mm/s.

After the movable jaw is started in motion disregard the values obtained while the first 25 mm of tape is mechanically peeled. Use the average force obtained during peeling of the next 50 mm of adhesive tape from the panel as the adhesion value.

The tester should know that by prolonged handling, heat is transmitted to the stainless steel test panel. Therefore during and after application of the adhesive tape to the test panel, the panel should be handled as little as possible.

5.6 Expression of results

Express the peel adhesion in newtons per 10 mm, if necessary first converting the observed force in newtons.

5.7 Test report

The test report shall include the following information:

a) a reference to this document;

b) statement that this test method was used and indicating any deviations from the method as written;

c) identification of each roll of tape tested;

d) anomalous behaviour during testing (such as adhesive transfer or splitting);

e) peel adhesion value in newtons per 10 mm to the nearest 0,1 N/10 mm;

f) the test method used;

g) dwell time, if less or greater than the standard 1 min;

h) test piece width is other than 24 mm;

i) conditions of test if other than (23 ± 1) °C and (50 ± 5) % relative humidity.

6 Method 2 — Self adhesive tapes — Measurement of peel adhesion from its own backing at an angle of 180°

6.1 Principle

The method 2 gives a measure of the force required to remove an adhesive tape at an angle of 180° which has been applied to the backing of a second piece of the same tape.

A length of adhesive tape is superimposed on a second length of the same adhesive tape which has already been applied to a suitable panel (as described in 5.5.3.1). The panel is then fixed vertically in one clamp of a tensile testing machine. The other clamp of the machine pulls the free end of the adhesive tape at an angle of 180° from the backing of the underlying tape.

The adhesive strength is measured by the force required to peel the adhesive tape continuously from the backing of a second piece of the same tape. The line of separation being perpendicular to the direction of the applied force.

6.2 Apparatus

6.2.1 Test piece cutter

As 5.3.1.

6.2.2 Tensile testing machine

As 5.3.2.

6.2.3 Suitable panels

Any suitable clean rigid panel with dimension 50 mm by not less than 125 mm and not less than 1,1 mm thick.

6.2.4 Roller mechanically or hand operated

As 5.3.4.

6.3 Test samples and test pieces

As 5.4 but with the following modifications.

In 5.4.4 "two test pieces shall be taken, to be used as described in 5.5.2".

6.4 Procedure

6.4.1 Standard test conditions

Standard test conditions shall be the same as 5.4.1 for test pieces and test samples conditioning.

6.4.2 Preparation of the panel

6.4.2.1 Remove a 300 mm test piece of adhesive tape to be tested as described in 5.4.4. Apply this to the rigid panel and roll firmly. Remove a second 300 mm test piece and apply to the backing of the test piece on the panel by touching one end of the second test piece to one end of the test panel and rolling mechanically or by hand twice in each lengthwise direction causing the roller to apply the second test piece directly aligned with the first test piece. This prevents entrapment of air between the two test pieces. Should this occur discard the test piece. Individually prepare each test piece and test within 1 min.

6.4.2.2 Strip the test piece, as 5.5.3.2.

6.5 Expression of results

As 5.6.

6.6 Test report

As 5.7.

7 Method 3 — Self adhesive tapes — Measurement of peel adhesion of double sided and transfer tapes at an angle of 180°

7.1 Principle

The method 3 gives a measure of the force required to remove either side of a double sided tape or an adhesive transfer tape which has been applied to a standard metal with the non tested adhesive surface being covered by a 25 µm polyester film.

A length of double sided or adhesive transfer tape is applied to a standard plate with the non tested surface covered by a 25 µm polyester film. The plate is then fixed vertically in one clamp of a tensile testing machine. The other clamp of the machine pulls the free end of the adhesive tape at an angle of 180° to the plate. The adhesive strength is measured by the force required to peel either face of the double sided or transfer tape continuously from the plate, the line of separation being perpendicular to the direction of the applied force.

7.2 Materials

As 5.2.

— polyester film 25 µm thick, approximately 3 mm wider than the test piece (typically 27 mm).

7.3 Apparatus

As 5.3.

7.4 Test samples and test pieces

As 5.4.

7.5 Procedure

7.5.1 Standard test conditions

As 5.4.1.

7.5.2 Preparation of the panel

As 5.5.2.

7.5.3 Procedure for open side of double sided or adhesive transfer tape

7.5.3.1 Remove a 300 mm test piece of the tape to be tested as described in 5.4.4. Fold 12 mm at one end, adhesive to adhesive to form a tab. Touch the other end of the specimen to an end of the test panel. Hold the tabbed end of the specimen so that it does not make contact with the panel, but is positioned loosely above it, roll mechanically or by hand once in each lengthwise direction, causing the roller to apply the tape to the panel. This prevents entrapment of air between the adhesive and the panel. Should this occur, discard the test piece.

Remove the liner and superimpose onto the test piece a strip of 25 µm polyester film. Apply this film in the manner of applying the double coated test strip to the panel so that the roller makes the actual application of the film to the double coated adhesive tape.

NOTE The two passes of the roller in applying polyester film can be made using the hand roller. The rolling rate can be increased to 50 mm/s.

7.5.3.2 Strip the test piece from the panel, as 5.5.3.2.

7.5.4 Procedure for closed side of double sided or adhesive transfer tape

7.5.4.1 Remove a 300 mm test piece of the tape to be tested as described in 5.4.4. Apply this tape to a 25 µm polyester film and roll mechanically or by hand causing the roller to apply the tape to the film. This prevents entrapment of air between the tape and the film. Remove the liner, fold 12 mm at one end adhesive to adhesive to form a tab. Touch the other end of the test piece to an end of the test panel. Hold the tabbed end of the test piece so that it does not make contact with the panel but is positioned loosely above it, roll mechanically or by hand twice in each lengthwise direction, causing the roller to apply the tape to the panel. This prevents entrapment of air between the adhesive and the panel. Should this occur, discard the test piece.

7.5.4.2 Strip the test piece from the test panel, as 5.5.3.2.

7.6 Expression of results

As 5.6.

7.7 Test report

As 5.7.

— whether open or closed side tested.

8 Method 4 — Self adhesive tapes — Measurement of adhesion of the liner to an adhesive tape at an angle of 180°

8.1 Principle

The method 4 gives a measure of the force required to remove at 180° a liner from an adhesive tape.

8.1.1 Double sided adhesive tapes

A length of double sided adhesive tapes is adhered to a suitable panel. This panel is fixed vertically into one jaw of the tensile testing machine. The other jaw of the machine pulls the free end of the liner away from the adhesive tape at an angle of 180°. The adhesive strength is measured by the force required to peel the liner continuously from the adhesive surface, the line of separation being perpendicular to the direction of the applied force.

8.1.2 Single sided adhesive tapes

As 8.1.1 except that a double sided adhesive tape is used to adhere the single sided adhesive tape to the test panel.

8.2 Materials

As 5.2.

8.3 Apparatus

As 5.3 except that a suitable panel as in 6.2.3 is acceptable.

8.4 Test samples and test pieces

As 5.4.

8.5 Procedure

8.5.1 Double sided tapes

8.5.1.1 Follow 5.5.2.

8.5.1.2 Apply 125 mm of one end of the test piece with the adhesive side (face side) down to the panel. Make two passes with the roller in each direction at a rate of (10 ± 0,5) mm/s. Separate the liner from the tape at the free end and cut away the free tape. Do not disturb the liner adhered to the tape on the panel.

Double back the liner at an angle of 180° and peel 25 mm of the liner from the tape surface. Clamp that end of the panel into one jaw of the tensile testing machine and the free end of the liner into the other jaw. Operate the tensile testing machine at (5,0 ± 0,2) mm/s.

After the movable jaw is started in motion, disregard the values obtained while the first 25 mm of tape is mechanically peeled. Use the average force obtained during peeling of the next 50 mm of adhesive tape from the panel.

8.5.2 Single sided tape

8.5.2.1 Follow 5.5.2.

8.5.2.2 Apply a strip of double sided tape at least as wide as the test piece, to the full length of the panel. Remove the liner from the double sided tape. Superimpose 125 mm of one end of the test piece, backing side down onto the double sided tape on the panel. Make two passes with the roller in each direction at a rate of (10 ± 0,5) mm/s. Separate the liner from the tape at the free end and cut away the free tape. Do not disturb the liner adhered to the test piece on the panel. Double back the liner at an angle of 180 ° and peel 25 mm of the tape from the panel. Clamp that end of the panel into one jaw of the tensile testing machine and the free end of the liner into the other jaw. Operate the tensile testing machine at (5,0 ± 0,2) mm/s.

After the movable jaw is started in motion disregard the values obtained while the first 25 mm of tape is mechanically peeled. Use the average force obtained during peeling of the next 50 mm of adhesive tape from the panel.

8.6 Expression of results

As 5.6.

8.7 Test report

As 5.7.

Annex A
(normative)

Self adhesive tapes — Measurement of peel adhesion from a surface at low temperature

A.1 Principle

This annex specifies the method to measure at low temperature the force required to remove an adhesive tape which has been applied to a surface in the manner described in any of the methods in this document at the chosen low temperature, and kept at this low temperature for 16 h to 24 h before measuring the adhesion value.

A.2 Apparatus

— as in the appropriate test method; and

— an environment or environmental chamber appropriate to the chosen temperature.

A.3 Test samples and test pieces

A.3.1 Test samples, test pieces, and panels (after cleaning) shall be conditioned at the chosen low temperature for 2 h.

A.3.2 Follow the appropriate test method.

A.4 Procedure

A.4.1 The entire test shall be carried at the chosen low temperature.

A.4.2 Apply the test piece in the low temperature environment as described in the appropriate test method.

Allow to condition for 16 h to 24 h before stripping the test piece from the panel as required by the appropriate test method.

A.5 Test report

As test report for the appropriate test method indicating additionally that this annex has been used, and the testing temperature.

Annex B
(normative)

Self adhesive tapes — Measurement of peel adhesion from a surface at an angle of 90°

B.1 Principle

This annex specifies the method to measure the force required to remove an adhesive tape at 90° which has been applied to a surface in the manner described in any of the methods in this document.

The panel prepared with the sample to be tested is fitted into an apparatus which is attached to the fixed jaw of the tensile testing machine such, that the free end of the tape can be fixed in the moveable jaw and peels perpendicularly from the panel's surface maintaining an angle of 90° by horizontal movement of the panel.

B.2 Apparatus

B.2.1 As in the appropriate method.

B.2.2 90° peel test apparatus.

A suitable apparatus is shown in Figure B.1. The panel is slotted horizontally into the device and can move horizontally as the jaw moves vertically such that an angle of peel of 90° is maintained.

The panel should move either by normal pressure or by direct linkage to the moveable jaw.

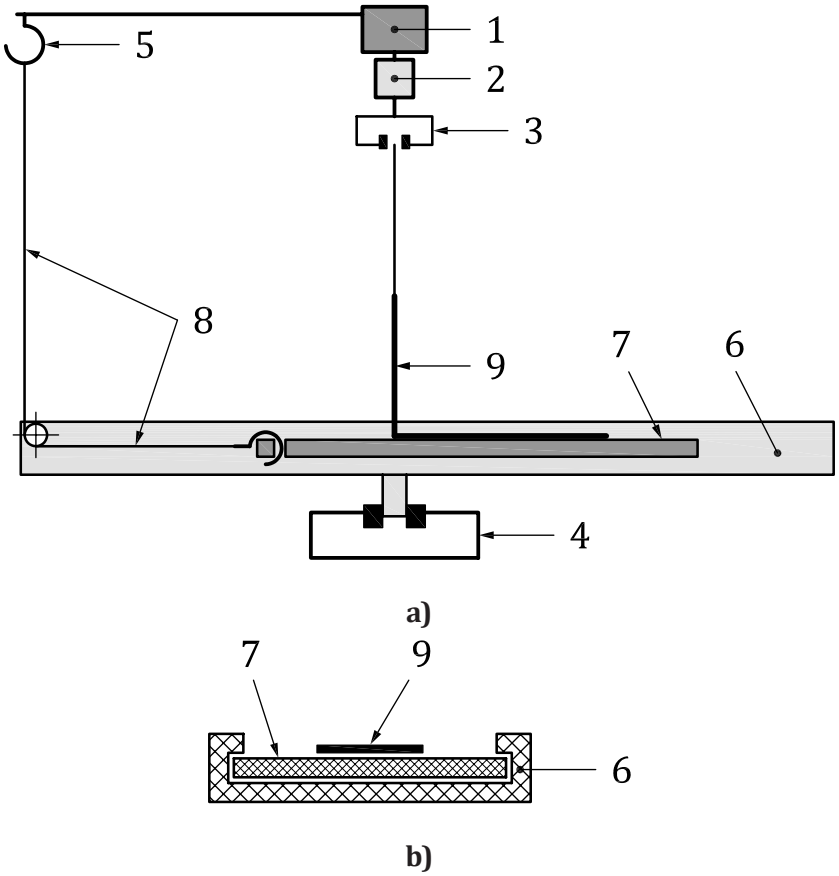
B.3 Procedure

The appropriate method shall be followed exactly except that the 90° peel apparatus is used.

The free end of the test piece is fastened in the moveable jaw and the test carried out as in the basic test method.

B.4 Test report

As test report for the appropriate test method indicating additionally that this annex has been used.



Key

1 upper movable part of tensile tester
2 load cell
3 upper clamp
4 lower clamp
5 hook mounted at upper movable part of tensile tester
6 plate holding device
7 testing plate
8 string
9 tape

Figure B.1 — Peel adhesion 90° apparatus

Bibliography

[1] EN 1939:2003, *Self adhesive tapes — Determination of peel adhesion properties*

[2] EN 10088-2, *Stainless steels — Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes*

ICS 83.180

Price based on 14 pages