SLOVENSKI STANDARD
oSIST prEN ISO 22970:2020

01-september-2020

Barve in laki - Preskusna metoda za vrednotenje oprijema elastičnih lepil na premazih s preskušanjem luščenja, trdnosti luščenja ter natezne in strižne trdnosti z dodatnimi obremenitvami s kondenzacijsko vodo ali shranjevanjem v kataplazmi (ISO 22970:2019)

Paints and varnishes - Test method for evaluation of adhesion of elastic adhesives on coatings by peel test, peel strength test and tensile lap-shear strength test with additional stress by condensation test or cataplasm storage (ISO 22970:2019)

Beschichtungsstoffe - Prüfverfahren zur Beurteilung der Haftfestigkeit von elastischen Klebstoffen auf Beschichtungen durch Prüfen der Schälhaftung, Schälfestigkeit und Zugscherfestigkeit mit zusätzlicher Beanspruchung durch Kondenswasserprüfung oder Kataplasmalagerung (ISO 22970:2019)

Peintures et vernis - Évaluation de l'adhérence des adhésifs élastiques sur les produits de peinture en examinant l'adhérence, la résistance au pelage et la résistance à la traction et le cisaillement en combinaison avec l'exposition à l'eau de condensation ou au cataplasme (ISO 22970:2019)

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87.040	Barve in laki	Paints and varnishes

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INTERNATIONAL STANDARD

ISO 22970

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Paints and varnishes — Test method for evaluation of adhesion of elastic adhesives on coatings by peel test, peel strength test and tensile lap-shear strength test with additional stress by condensation test or cataplasm storage

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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.

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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Paints and varnishes — Test method for evaluation of adhesion of elastic adhesives on coatings by peel test, peel strength test and tensile lap-shear strength test with additional stress by condensation test or cataplasm storage

1 Scope

This document specifies three methods for testing the peel adhesion, peel strength and tensile lap-shear strength in order to evaluate the adhesive bond as well as the type, location and structure of failures of elastic adhesives on coatings. These methods are used, for example, for testing the assembly with respect to the bond of panes or built-on parts, such as plastic covers, spoilers, instrument panel covers, headlights, with coatings for automobile construction. The two methods of climatic exposure of specimens described herein are the condensation test and cataplasm storage.

This document does not specify requirements for adhesives and coatings.

NOTE The peel strength test (method B) for rigid car body construction adhesives is described in ISO 8510-2. The tensile lap-shear strength test (method C) for rigid car body construction adhesives is described in EN 1465. Testing of rigid car body construction adhesives is generally conducted on small joint thicknesses, i.e. <1 mm.

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.

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

ISO 4618, *Paints and varnishes — Terms and definitions*

ISO 6270-2, *Paints and varnishes — Determination of resistance to humidity — Part 2: Condensation (in-cabinet exposure with heated water reservoir)*

ISO 10365, *Adhesives — Designation of main failure patterns*

ISO 17872, *Paints and varnishes — Guidelines for the introduction of scribe marks through coatings on metallic panels for corrosion testing*

DIN 55997, *Solvents for paints and varnishes — Deionized water — Requirements and methods of test*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4618 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
adhesive
non-metallic substance capable of joining materials by surface bonding (adhesion), where the bond possessing adequate internal strength for force transmission

3.2
adherend
body that is, or is intended to be, held to another body

Note 1 to entry: "Adherend" is a narrower term than "substrate".

[SOURCE: ISO 472:2013, 2.13]

3.3
tensile lap-shear strength
stressing in shear of an overlap specimen between rigid *adherends* (3.2) by applying to the adherends a tensile force which is parallel to the bond area and to the major axis of the specimen

3.4
cohesion failure
cohesive failure
failure of an adhesive bond within the body of the *adhesive* (3.1), i.e. not at the interface

[SOURCE: ISO 472:2013, 2.159]

3.5
adhesion failure
adhesive failure
failure of an adhesive bond in such a way that the separation appears to be at the adhesive/adherend interface

[SOURCE: ISO 472:2013, 2.30]

4 Principle

4.1 Adhesive strength test method A — Peel adhesion

It describes the peel adhesion test of adhesives on coatings. This method is suitable where a qualitative, i.e. visual, evaluation of an adhesive's behaviour is sufficient or when testing large and voluminous parts.

The adhesive is applied to the test panel in form of a (round or triangular) bead, dried and peeled off the coating using a cutter knife and, if required, pliers. This is followed by a visual evaluation of the failure pattern.

4.2 Adhesive strength test method B — Peel strength

It describes the adhesive strength testing of adhesives by determination of the peel force. This method enhances the range of results obtained using method A by additional quantitative measurement values and enables a statement as to which forces are transmitted to the adherend.

The adhesive is applied to the test panel to be bonded in form of a (round or triangular) bead, pressed to the required thickness using a suitable thin plate and cured. A tensile force is applied to the plate thereby peeling it off the bond in a defined angle. The reported result is the maximum force measured for each bond width (see Figure 20).

4.3 Adhesive strength test method C — Tensile lap-shear strength

It describes the adhesive strength testing of adhesives on coatings by determination of the tensile lap-shear strength. This method yields both qualitative and quantitative results. It is suitable for testing complete bonded assemblies as later used in practice. This also includes the use of original adherends.

The tensile lap-shear strength of overlap specimens is determined by stressing in shear of an overlap joint between rigid adherends by applying to the adherends a tensile force which is parallel to the bond area and to the major axis of the specimen. The reported result is the maximum force or maximum tensile shear stress measured for each bond width.

4.4 Conduction of the test

After complete curing of the adhesive, testing is conducted according to adhesive strength test method A, B or C, either immediately or following subsequent climatic exposure (exposure method 1 or 2).

5 Apparatus and test media

Normal laboratory equipment together with the following.

5.1 Adhesive strength test method A — Peel adhesion

5.1.1 Test panel, e.g. coated plates having dimensions of approximately 200 mm × 100 mm and a thickness of 0,7 mm to 1,2 mm or coated plastic or coated glass (float glass) having a thickness of approximately 4 mm. The thickness shall be sufficient to prevent deformation or fracture of the test panel in combination with the specimen grip under the expected tensile load when peeling off the bead.

Specimen preparation, coating and drying/curing shall be indicated in the test report.

5.1.2 Adhesive, as agreed between the interested parties, supplied in a commercially available can.

5.1.3 Application gun, for applying the adhesive.

5.1.4 Doctor blade, for forming the adhesive beads (see Figure 1).

Dimensions in millimetres

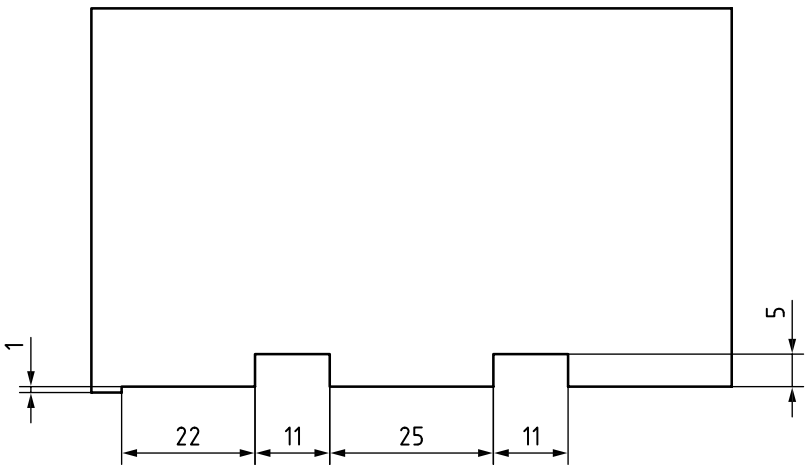

Figure 1 — Example for doctor blade design

5.1.5 Vapour barrier, e.g. strips of PE film or siliconized paper, e.g. baking paper, having dimensions of approximately 200 mm × 25 mm and a thickness of about 0,1 mm.

5.1.6 Spacer, according to the agreed bond thickness.

5.1.7 Cutter knife, which shall be in accordance with ISO 17872, designed as agreed between the interested parties.

5.1.8 Commercially available adhesive tape, approximately 20 mm wide.

5.1.9 Pliers, designed as agreed between the interested parties, e.g. needle-nose pliers.

5.2 Adhesive strength test method B — Peel strength

5.2.1 Test panel, e.g. coated plates having dimensions of at least 250 mm × 70 mm and a thickness of 0,7 mm to 1,2 mm. The thickness shall be sufficient to prevent deformation of the test panel in combination with the specimen holder under the expected tensile load when peeling off the bead.

Specimen preparation, coating and drying/curing shall be indicated in the test report.

5.2.2 Adhesive, as agreed between the interested parties, supplied in a commercially available can.

5.2.3 Application gun, for applying the adhesive.

5.2.4 Strips of PE film or siliconized paper, e.g. baking paper, having dimensions of approximately 70 mm × 100 mm and a thickness of about 0,1 mm.

5.2.5 Peeling plate, just thick enough to enable transmission of the expected tensile forces to the adhesive while allowing bending without using excessive force, e.g. aluminium A1050P, 25 mm × 250 mm × 0,5 mm.

5.2.6 Spacer, according to the agreed bond thickness.

5.2.7 Tensile testing machine, having a nominal load suitable for the respective adhesive bond, e.g. 10 kN.

The response time of the testing machine shall be sufficiently short to prevent influences on the accuracy when measuring the force at failure. The recorded force shall not deviate from the actually required force by more than 1 %. The testing machine shall be capable of applying the required tensile force increasing at a steady rate. It shall be provided with a pair of suitable self-aligning grips to hold the specimen. The grips and attachments shall be constructed such as to move into alignment with the specimen as soon as the force is applied, so that the longitudinal axis of the specimen will coincide with the direction of the required force through the centre line of the grip assembly to avoid bending moment. Grips that operate by bolting through the adherends shall not be used since tearing of the bolting holes is to be expected.

5.3 Adhesive strength test method C — Tensile lap-shear strength

5.3.1 Test panel, e.g. coated plates having dimensions of at least 75 mm × 25 mm and a thickness of 0,7 mm to 1,2 mm or coated plastic or coated glass (float glass) having a thickness of approximately 6 mm. The test panel strength shall be sufficient to enable transmission of the occurring tensile forces to the bond.

Specimen preparation, coating and drying/curing shall be indicated in the test report.

5.3.2 Adhesive, as agreed between the interested parties, supplied in a commercially available can.

5.3.3 Application gun, for applying the adhesive.

5.3.4 Jig, for accurately locating adherends during bonding.

5.3.5 Spacer, according to the agreed bond thickness or **bonding frame with non-adhesive film or coating.**

5.3.6 Tensile testing machine, having a nominal load suitable for the respective adhesive bond, e.g. 10 kN.

The response time of the testing machine shall be sufficiently short to prevent influences on the accuracy when measuring the force at failure. The recorded force shall not deviate from the actually required force by more than 1 %. The testing machine shall be capable of applying the required tensile force increasing at a steady rate. It shall be provided with a pair of suitable self-aligning grips to hold the specimen. The grips and attachments shall be constructed such as to move into alignment with the specimen as soon as the force is applied, so that the longitudinal axis of the specimen will coincide with the direction of the required force through the centre line of the grip assembly to avoid bending moment. Grips that operate by bolting through the adherends shall not be used since tearing of the bolting holes is to be expected.

5.4 Exposure method 1 — Condensation atmosphere with constant humidity

5.4.1 Apparatus for testing in a condensation atmosphere with constant humidity shall be in accordance with ISO 6270-2.

5.5 Exposure method 2 — Cataplasm storage

5.5.1 Laboratory drying chamber, capable of maintaining the test temperature within ±2 °C (for temperatures up to 150 °C). A laboratory drying chamber with technical ventilation shall be used.

5.5.2 Freezer, adjustable to (−20 ± 2) °C.

5.5.3 Aluminium foil, commercial quality.

5.5.4 Plastic bag made of polyethylene, at least 0,22 mm thick, heat resistant and sealable or thermally sealable with an appropriate sealing device.

5.5.5 Deionized water, which shall be in accordance with DIN 55997, but with a maximum conductivity of 20 µS/cm.

5.5.6 Purified absorbent cotton, single layer, rectangular, pH neutral.

6 Sequence of adhesive strength tests A, B and C

Table 1 gives an overview over the sequence of adhesive strength tests A, B and C.