



SLOVENSKI STANDARD
SIST EN 12023:1997

01-avgust-1997

Samolepilni trakovi - Merjenje prenosa vodne pare v topli vlažni atmosferi

Self-adhesive tapes - Measurement of water transmission in a warm humid atmosphere

Klebebänder - Messung der Wasserdampfdurchlässigkeit in feuchtwarmer Atmosphäre

Rubans auto-adhésifs - Mesure de la transmission de vapeur d'eau en atmosphère chaude et humide

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83.180 Lepila Adhesives

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Self adhesive tapes - Measurement of water vapour transmission in a warm humid atmosphere

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 253 "Self adhesive tapes", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by February 1997, and conflicting national standards shall be withdrawn at the latest by February 1997.

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

This European standard gives :

- Annex A (normative) Measurement of water vapour transmission in a warm humid atmosphere for adhesive tape less than 50 mm width ;
- Annex B (informative) Bibliography

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1 Scope

This standard specifies the method to determine the mass of the water vapour transmitted through the adhesive tape under specific test conditions. Details of the test method depend upon the width of the adhesive tape under test. For adhesive tapes less than 50 mm width it is necessary to use Annex A (normative).

When test pieces below 50 mm wide are used (as will be common) together with the smaller dry box the precision of this test may be reduced due to undesired moisture transmission at the adhesive seal. This part of the method should therefore be considered to give only approximate values.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from others 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.

ISO 483 Plastics - Small enclosures for conditioning and testing using aqueous solutions to maintain relative humidity at constant value

ISO 3310-1 Test sieves - Technical requirements and testing - Part 1 : Test sieves of metal wire cloth

3 Definition

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For the purposes of this standard the following definition applies :

water vapour transmission rate : The mass of water vapour passing through a unit area of adhesive tape in unit time under prescribed conditions of humidity and temperature.

4 Principle

The adhesive tape is used to separate the humid atmosphere of relative humidity of $93 \% \pm 2 \%$ contained in an outer vessel from the "dry" atmosphere contained in a metal box, the adhesive side of the adhesive tape facing the "dry" atmosphere.

The increase in mass of the contents of the metal box due to the passage of the water vapour through the adhesive tape is measured. The water vapour transmission of the adhesive tape is expressed as an increase in mass of the box assembly per unit of time per unit area of the opening in the box for a given period of exposure of the test piece to water vapour.

5 Materials

5.1 External humid atmosphere

The relative humidity of 93 % \pm 2 % shall be produced :

- either in the outer container by means of a saturated aqueous solution of ammonium dihydrogen phosphate ($\text{NH}_4\text{H}_2\text{PO}_4$) as ISO 483 ;
- or by means of a humidity cabinet.

5.2 "Dry" boxes

The dry atmosphere within the box shall be produced by means of pure anhydrous calcium chloride (CaCl_2) of a fineness in accordance with the following specifications in accordance with ISO 3310-1 the particles shall be able to pass through a 2 mm sieve but not pass through a 600 μm sieve.

5.3 Test solution for "dry" box

2 % solution of methylene blue in ethanol.

5.4 Cleaning solvent

Toluene - general purpose chemical grade

6 Apparatus

6.1 "Dry" box : (see figure 1) shall conform to the following requirements :

It shall be constructed from a non-ageing, non-corrodible material which does not absorb moisture. It shall consist of an open box of rectangular section topped by a perfectly flat, rigid stainless steel plate, having a central rectangular opening of 100 mm x 25 mm.

The overall dimensions of the plate shall be 140 mm x 65 mm.

The internal dimensions of the box shall be 100 mm x 25 mm x 20 mm.

The assembly shall be rigid. The plate shall be roughened with abrasive grit ¹⁾ the direction of the abrasion lines being parallel to the long dimension of the opening.

The total mass of the box shall not exceed 150 g. The box must be air-tight except for the 100 mm x 25 mm opening.

This should be checked frequently, for example by one of the methods given below :

- apply compressed air at a pressure of the order of 300 kPa to the opening in such a manner that leakage of air does not occur. Immerse the assembly in water and locate any leaks by the escape of air bubbles ;
- fill the box with a 2 % solution of methylene blue in ethanol. After standing for 24 h, examine the outside of the box for the presence of blue streaks indicating the position of leaks.

6.2 Container for outer humid atmosphere

¹⁾ It is recommended to roughen the testing surface with Nr 240 Type FEPA abrasive grit (see annex B). This information is given for the convenience of users of this standard and does not constitute an endorsement by CEN of this product type.

This container shall entirely surround the "dry" box. Its freedom from leakages shall be such that the humidity can be maintained constant for the duration of the test.

It shall consist of a closed container within which a relative humidity of $93 \% \pm 2 \%$ (see 5.1) shall be maintained at the temperature of test.

The interior volume of the container shall be 3 to 5 times greater than that of the total volume of the "dry" boxes within it.

Care shall be taken to prevent condensation of water vapour on or near the "dry" boxes.

6.3 Analytical balance

Sensitivity 0,1 mg.

6.4 Oven

The external container containing the "dry" boxes shall be placed in an oven at $38 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$.

6.5 Polished cylindrical metal roller

This shall have a diameter of at least 50 mm and a mass corresponding to 2 kg per centimetre width of the adhesive tape under test.

7 Test sample and test pieces

Condition the sample roll for 24 hours at $23 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$ and $50 \% \pm 5 \%$ relative humidity.

Discard the three outer turns of adhesive tape from the roll before taking test pieces.

Perform the test on 3 test pieces from each roll. Each test piece shall be at least 50 mm wide and more than 150 mm long.

Narrower widths to a minimum of 15 mm may be used following the procedure in annex A.

Note that further test pieces may be required (see 8.4).

8 Procedure

8.1 Standard test conditions

The test shall be carried out at $23 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$ and $50 \% \pm 5 \%$ relative humidity, and at $38 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$ and $93 \% \pm 2 \%$ relative humidity.

8.2 Preparation of apparatus

8.2.1 Keep the empty "dry" box in the standard atmosphere until it is required.

Clean the top plate with cotton wool soaked in toluene, and dry the plate. Fill the box evenly up to about 3 mm from the top with calcium chloride (5.2). Take care that the box is not inverted or tilted in subsequent operations.

8.2.2 Condition the box for 30 min at $38 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$, then remove.

8.2.3 Immediately place the box on a rigid supporting jig so that the overhanging ends of the top plate rest on the jig. The construction of this jig shall be such that it is capable of supporting,

firmly, the overhanging ends of the top plate without being distorted by the pressure exerted during the subsequent application of the test piece to the top plate.

The object of this is to ensure that the plate does not bend during application of the test piece and that the closure of the box, effected by means of the test piece, is complete.

Carefully apply the test piece along the major axis of the box in such a way that there is at least 12,5 mm of the test piece beyond each edge of the opening. To ensure good contact between test piece and plate, smooth down with the finger, then pass the roller 5 times to and fro along the test piece. Cut off the surplus length of test piece flush with the edges of the plate, taking care not to disturb or lift the edges.

8.3 Preliminary conditioning

Place the prepared box assembly in the outer container at $93 \% \pm 2 \%$ relative humidity and place the outer container in the oven at $38\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for 24 h, taking care to close the outer container completely.

Alternatively place the prepared box assembly in the humidity cabinet under the same conditions.

At the end of this period, remove the box, wipe carefully and place for 30 min in the standard atmosphere of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and $50 \% \pm 5 \%$ relative humidity.

Measure tare (T) of the box by means of an analytical balance in the standard atmosphere, to the nearest 0,1 mg.

8.4 Exposure to humid atmosphere

The actual exposure test shall be carried out as follows :

Immediately after the above tare mass determination, return the box to the humid atmosphere. Close the outer container completely and place this in the oven for the appropriate period as follows :

For adhesive tapes with water vapour transmission of 50 g/m^2 or more in 24 hours, the exposure shall be for 48 h.

For adhesive tapes with water vapour transmission less than 50 g/m^2 in 24 hours, the exposure shall be for 72 h.

Alternatively, if using a humidity cabinet use the same exposure times.

At the end of the exposure period, remove the box from the outer container or humidity cabinet, wipe carefully and place in the standard atmosphere for a cooling period of 30 minutes. Measure the mass (N) of the box to the nearest 0,1 mg.

Let the mass increase in grammes be : $N - T = M$.

When determining the result, use as the value of M the arithmetic mean (i.e. average) of the values found for the 3 test pieces.

If the ratio of the range of the 3 values to their average, when expressed as a percentage, exceeds 20 %, carry out the test on a further 5 test pieces at least, and use for M the average of all the results obtained.

NOTE : Attention should be drawn to the fact that as the implementation of this test method is a little delicate, it is desirable to closely observe the following precautions:

The tightness of the boxes should be carefully checked prior to each series of tests.