भारतीय मानक

Indian Standard

IS 7016 (Part 8) : 2023
ISO 1419 : 2019

रबड़ या प्लास्टिक लेपित कपड़े की परीक्षण पद्धतियाँ

भाग 8 त्वरित एजिंग

(पहला पुनरीक्षण)

Methods of Test for Rubber or Plastics Coated Fabrics

Part 8 Accelerated Ageing

(First Revision)

ICS 59.080.40

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

February 2023 **Price Group 6**

Methods of Test for Rubber and Rubber Products Sectional Committee, PCD 29

NATIONAL FOREWORD

This Indian Standard (Part 8) (First Revision) which is identical with ISO 1419 : 2019 'Rubber- or plastics-coated fabrics — Accelerated-ageing tests' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on recommendation (s) of the Methods of Test for Rubber and Rubber Products Sectional Committee and approval of the Petroleum, Coal and Related Products Division Council.

This standard was published in 1975 which was an indigenous standard formulated based on ISO/R 1419 : 1970 'Accelerated ageing and simulated service test of fabrics coated with rubber or plastics'.

The first revision of this standard has been undertaken to align it with ISO 1419 : 2019 Rubber- or plastics-coated fabrics — Accelerated-ageing tests', under dual numbering system.

The Committee also decided to modify the common title of all the Indian Standards under IS 7016 series as 'Methods of test for rubber or plastics coated fabrics' for the uniformity in the title in line with the ISO Standards. Accordingly, the title of the Indian Standard has also been modified.

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards, which are to be substituted in their respective places, are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 188 : 2007 Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests	IS 3400 (Part 4) : 2012/ISO 188 : 2011 Methods of test for vulcanized rubber: Part 4 Accelerated ageing and heat resistance (*third revision*)	Identical
ISO 2286-1 Rubber or plastics coated fabrics — Determination of roll characteristics — Part 1: Methods for determination of length, width and net mass	IS 7016 (Part 1/Sec 1) : 2016/ISO 2286-1 : 1998 Methods of test for coated and treated fabrics: Part 1 Determination of roll characteristics, Section 1 Methods for determination of length, width and net mass (*second revision*)	Identical with ISO 2286-1 : 1998
ISO 2286-2 Rubber or plastics coated fabrics — Determination of roll characteristics — Part 2: Methods for determination of total mass per unit area, mass per unit area of coating and mass per unit area of substrate	IS 7016 (Part 1/Sec 2) : 2019/ISO 2286-2 : 2016 Methods of test for coated and treated fabrics: Part 1 Determination of roll characteristics, Section 2 Methods for determination of total mass per unit area, mass per unit area of coating and mass per unit area of substrate (*second revision*)	Identical with ISO 2286-2 : 2016

(*Continued on third cover*)

Contents

Page

Introduction

The ageing of coated fabrics consists in subjecting test pieces, with previously determined properties, to a controlled deteriorating influence for a known period. The selection of the most appropriate test method(s), ageing time and temperature will depend on the purpose of the test and the type of coated fabric. The properties used to measure the deterioration of coated fabrics may be strength properties, flexing, blocking or any other desired physical or chemical property. By selection of appropriate methods of test, the properties can be investigated.

Indian Standard

METHODS OF TEST FOR RUBBER OR PLASTICS COATED FABRICS

PART 8 ACCELERATED AGEING

(First Revision)

WARNING — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

1 Scope

This document describes four methods of assessing the resistance of coated fabrics to deterioration by accelerated ageing.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

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

ISO 2286-1, *Rubber- or plastics-coated fabrics — Determination of roll characteristics — Part 1: Methods for determination of length, width and net mass*

ISO 2286-2, *Rubber- or plastics-coated fabrics — Determination of roll characteristics — Part 2: Methods for determination of total mass per unit area, mass per unit area of coating and mass per unit area of substrate*

3 Terms and definitions

No terms and definitions are listed in this document.

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/

4 Method A: Loss of volatiles on heating of plasticized-PVC-coated fabrics

4.1 General

As a result of natural ageing, PVC-coated fabrics may lose plasticizer by volatilization, and in time this will have an adverse effect on the performance of the coating. The extent to which a particular material will be so affected will depend on the formulation of the coating, so it is desirable to assess this property. The method described is designed to accelerate the loss of volatiles by exposing test pieces to an elevated temperature, followed by determination of the loss in mass of the coating. The procedure shall be in accordance with ISO 188.

4.2 Apparatus

4.2.1 Air oven

It shall have slow circulation of air, providing not less than three and not more than ten air changes per hour. It shall have provisions for controlling and measuring the rate of airflow and for maintaining and measuring the desired temperature and relative humidity, if necessary.

There shall be provisions for suspending the test pieces vertically within the oven. During the ageing process, in order to prevent individual test pieces touching each other or the inner walls of the oven and being exposed to higher temperature, the test pieces shall not be within 10 mm of each other or within 50 mm of the inner surfaces of the oven, The incoming air shall be at the temperature specified before coming into contact with the test pieces. Any electric elements used for heating the incoming air shall be shielded to avoid direct radiation on to the test pieces. No copper or copper alloy shall be within the ageing chamber of the oven. The oven shall be of such a size that the total volume of the test pieces does not exceed 10 % of the free air space in the oven. Means shall be provided for suspending the test pieces vertically within the oven so that they are not within 10 mm of each other or within 50 mm of the inner surfaces of the oven.

The temperature of the oven shall be maintained at 100 °C with an accuracy of ±1 °C.

4.2.2 Thermometer, or other temperature-indicating device, for monitoring the oven temperature with an accuracy of ±1 °C.

4.2.3 Balance, capable of weighing to an accuracy of 1 mg.

4.2.4 Ruler or other length-measuring device, of accuracy ±0,5 mm.

4.2.5 Desiccator for cooling the specimens after removal from the oven.

4.3 Preparation of test pieces

Cut out six test pieces, each measuring 100 cm^2 ± 1 cm^2, selected so that, as far as possible, they are evenly spaced across the Sample, but not within 50 mm of a selvedge.

4.4 Conditioning and determination of mass

Condition the test pieces in atmosphere A, B or C as defined in ISO 2231. Determine and record the mass m_1 of each test piece to an accuracy of 1 mg in accordance with ISO 2286-1. Determine the mass per unit area Q_{AC} of the coating of three test pieces in accordance with ISO 2286-2.

4.5 Procedure

Select three of the conditioned test pieces, making a note of the conditioned mass of each. Pre-heat the oven to the test temperature of 100 °C ± 1 °C. Place the test pieces in the oven so that they are free from strain and exposed to the free passage of air on both sides. Remove the test pieces from the oven after 16 h and allow to cool.

Re-condition the test pieces in accordance with 4.4 and determine and record the mass m_2 of each to an accuracy of 1 mg in accordance with ISO 2286-2.

If test pieces conditioned as specified in 4.4 after preparation approach equilibrium from the wet side of the hysteresis curve, this may result in an apparent inaccuracy due to the hysteresis loss caused by re-conditioning from the dry side of the hysteresis curve after ageing. This effect will be more marked with highly hygroscopic substrates, and in such cases, it is advisable to pre-condition the test pieces in a dry atmosphere, i.e. one having a relative humidity less than 10 %, prior to conditioning as specified in 4.4.

4.6 Expression of results

Calculate the loss in mass of each test piece, expressed as a percentage of the coating mass, using the formula

$$\frac{m_1 - m_2}{m_1} \times \frac{Q_{AT} \times 100}{Q_{AC}}$$

where

m_1 is the mass, in grams, of the test piece before ageing;

m_2 is the mass, in grams, of the test piece after ageing;

Q_{AT} is the mass per unit area, in grams per square metre, of the material under test;

Q_{AC} is the coating mass per unit area, in grams per square metre.

4.7 Test report

The test report shall include the following information:

a) a reference to this document including its year of publication, and to the method used (method A);

b) all details necessary for the identification of the coated fabric tested;

c) the conditioning atmosphere used;

d) the loss in mass of each test piece, expressed as a percentage of the coating mass, and the mean value;

e) details of any deviation from the test procedure specified.

5 Method B: General method

5.1 General

This ageing test consists of subjecting test pieces to air at an elevated temperature and atmospheric pressure, after which the condition of the coated fabric is assessed. In this test, the oxygen concentration is comparatively low and, if oxidation is rapid, oxygen may not diffuse into the coating quickly enough to maintain uniform oxidation. The test is therefore liable to give misleading results with poor-ageing coatings unless the coatings are very thin.

If desired, selected samples may be aged for periods considerably in excess of those specified, in order to ensure that decomposition will occur; such samples are then used to illustrate the effects of ageing.

The procedure shall be in accordance with ISO 188.

5.2 Apparatus

5.2.1 Air oven, as described in 4.2.1, except that it be maintained at a temperature of 70 °C ± 1 °C unless otherwise specified.

5.2.2 Thermometer, or other temperature-indicating device, for monitoring the oven temperature.

5.3 Test pieces

The number of test pieces, and their dimensions, shall be as required by the particular post-exposure physical test(s) selected. The test pieces shall not be selected from within 50 mm of a selvedge.

It is recommended that in any event the number of test pieces chosen for post-ageing comparisons should be not less than five.

5.4 Procedure

Pre-heat the oven to the operating temperature and place the test pieces in the oven so that they are free from strain, exposed to the free passage of air on both sides and not exposed to light. Ensure that the pressure inside the oven does not exceed atmospheric pressure. Simultaneous ageing of different types of compound shall be avoided in order to ensure that migration of sulfur or antioxidant does not occur.

After 168 h (7 days) or 336 h (14 days), or multiples thereof, remove the test pieces from the oven and condition in atmosphere A, B or C as defined in ISO 2231.

5.5 Assessment

Compare the properties of the aged material with those of the unaged material using appropriate methods of test.

5.6 Test report

The test report shall include the following information:

a) reference to this document including its year of publication, and to the method used (method B);

b) all details necessary for the identification of the coated fabric tested;

c) the conditioning atmosphere used;

d) the results of the assessment conducted in accordance with 5.5;

e) the period and conditions of exposure in the air oven;

f) details of any deviation from the test procedure specified.

6 Method C: Tropical test

6.1 General

Some polymeric materials are markedly affected by moisture as well as by elevated temperatures, and in certain applications very high humidities are experienced in combination with relatively high temperatures. When such service conditions are probable, it is preferable, because of the interaction of effects, to test by exposing the material to both conditions simultaneously. In the ageing test given here, test pieces of coated fabric are exposed for a given period to an atmosphere of air having a relative humidity of not less than 95 % and a temperature of 70 °C. For particular applications, it may be appropriate to use alternative relative humidities, temperatures and exposure times. It should be noted that this test is not intended for use in cases where the material will be continuously immersed in water during use.

6.2 Apparatus

6.2.1 Air oven, as described in 4.2.1, except that it shall be maintained at a temperature of 70 °C ± 1 °C and a relative humidity of not less than 95 %.

The injection of live steam at a temperature above 71 °C as a means of achieving the requisite relative humidity shall not be used.

6.2.2 Thermometer, or other temperature-indicating device, for monitoring the oven temperature.

6.2.3 Humidity-measuring instrument, for monitoring the actual relative humidity.

6.3 Test pieces

The number of test pieces, and their dimensions, shall be as required by the particular post exposure physical test(s) selected. The test pieces shall not be selected from within 50 mm of a selvedge.

It is recommended that in any event the number of test pieces chosen for post-ageing comparisons should be at least five.

6.4 Procedure

Pre-heat the oven to 70 °C ± 1 °C and not less than 95 % relative humidity. Place the test pieces in the oven so that they are free from strain, exposed to the free passage of air on both sides and not exposed to light. Ensure that the pressure inside the oven does not exceed atmospheric pressure. Simultaneous ageing of different types of compound shall be avoided in order to ensure that migration of sulfur or antioxidant does not occur.

After 168 h (7 days) or 336 h (14 days), or multiples thereof, remove the test pieces from the oven and condition in atmosphere A, B or C as defined in ISO 2231.

6.5 Assessment

Compare the properties of the aged material with that of the unaged material using appropriate methods of test.

6.6 Test report

The test report shall include the following information:

a) a reference to this document including its year of publication, and to the method used (method C);

b) all details necessary for the identification of the coated fabric tested;

c) the conditioning atmosphere used;

d) the results of the assessment conducted in accordance with 6.5;

e) the period and conditions of exposure in the air oven;

f) details of any deviation from the test procedure specified.

7 Method D: Ageing test for nitrocellulose-type coatings

7.1 General

In a similar way to PVC-coated fabrics, nitrocellulose coated fabrics may lose plasticizer by volatilization, and in time this will have an adverse effect on the flexibility of the coating. This is particularly relevant in bookbinding, which is the main end-use for this type of product, where long-term flexibility at the hinge is required. This test attempts to simulate and accelerate this situation, and hence the end-point is based on visual inspection rather than mass loss.

7.2 Apparatus

7.2.1 Three test-tubes, measuring 150 mm × Ø25 mm.

7.2.2 Three clean corks, to fit the tubes.

7.2.3 **Air oven**, as described in 4.2.1, except that it shall be maintained at a temperature of 70 °C ± 1 °C.

7.3 Preparation test pieces

Cut three test pieces, each measuring 150 mm × 75 mm, selected so that, as far as possible, they are evenly spaced across the sample, but not within 50 mm of a selvedge, and with their length in the longitudinal or transverse direction.

7.4 Procedure

Roll up each test piece along its length with the coating outermost and insert into a 150 mm × 25 mm test-tube. Place a clean fresh cork lightly into the mouth of each test-tube and place the assembly in the oven, maintained at 70 °C ± 1 °C.

After 168 h (7 days) at this temperature, remove the test-tubes from the oven, take-out the test pieces and condition them in atmosphere A, B or C as defined in ISO 2231. While still in the standard atmosphere, fold each test piece sharply along its length between the fingers, with the coating outermost. Examine the test piece and record any cracks in the coating.

7.5 Test report

The test report shall include the following information:

a) a reference to this document including its year of publication, and to the method used (method D);

b) all details necessary for the identification of the coated fabric tested;

c) the conditioning atmosphere used;

d) whether any cracks were observed in the coating;

e) details of any deviation from the test procedure specified.

(*Contineud from second cover*)

The technical committee has reviewed the provisions of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

International Standard	*Title*
ISO 2231	Rubber or plastics coated fabrics — Standard atmospheres for conditioning and testing

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.

This Indian Standard has been developed from Doc No.: PCD 29 (19917).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	2323 7617
Eastern	: 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	2367 0012 2320 9474
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019	265 9930
Southern	: C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	2254 1442 2254 1216
Western	: Plot No. E-9, Road No.-8, MIDC, Andheri (East), Mumbai 400093	2821 8093

Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. CHANDIGARH. CHENNAI. COIMBATORE. DEHRADUN. DELHI. FARIDABAD. GHAZIABAD. GUWAHATI. HIMACHAL PRADESH. HUBLI. HYDERABAD. JAIPUR. JAMMU & KASHMIR. JAMSHEDPUR. KOCHI. KOLKATA. LUCKNOW. MADURAI. MUMBAI. NAGPUR. NOIDA. PANIPAT. PATNA. PUNE. RAIPUR. RAJKOT. SURAT. VISAKHAPATNAM.

Published by BIS, New Delhi