SLOVENSKI STANDARD
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Specification for vulcanized fibre for electrical purposes - Part 2: Methods of test (IEC 60667-2:1982 + IEC 60667-2:1982/A1:1986)

Specification for vulcanized fibre for electrical purposes -- Part 2: Methods of test

Bestimmung für Vulkanfiber für die Elektrotechnische Zwecke -- Teil 2: Prüfverfahren

Spécification pour les fibres vulcanisées à usages électriques -- Partie 2: Méthodes d'essai

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29.035.10	Papirni in kartonski izolacijski materiali	Paper and board insulating materials

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SPECIFICATION FOR VULCANIZED FIBRE FOR ELECTRICAL PURPOSES
PART 2: METHODS OF TEST

Spécification pour les fibres vulcanisées à usages électriques
Deuxième partie: Méthodes d'essai

Bestimmung für Vulkanfiber für elektrotechnische Zwecke
Teil 2: Prüfverfahren

BODY OF THE HD

The Harmonization Document consists of:

- IEC 667-2 (1982) ed 1 + Amdt 1 (1986); IEC/SC 15C, not appended

This Harmonization Document was approved by CENELEC on 22 September 1987.

The English and French versions of this Harmonization Document are provided by the text of the IEC publication and the German version is the official translation of the IEC text.

According to the CENELEC Internal Regulations the CENELEC member National Committees are bound:

to announce the existence of this Harmonization Document at national level by or before 1988-04-01

to publish their new harmonized national standard by or before 1988-10-01

to withdraw all conflicting national standards by or before 1988-10-01.

Harmonized national standards are listed on the HD information sheet, which is available from the CENELEC National Committees or from the CENELEC Central Secretariat.

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Spécification pour les fibres vulcanisées à usages électriques

Deuxième partie: Méthodes d'essai

Specification for vulcanized fibre for electrical purposes

Part 2: Methods of test

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SPECIFICATION FOR VULCANIZED FIBRE FOR ELECTRICAL PURPOSES

Part 2: Methods of test

FOREWORD

1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.

3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by Sub-Committee 15C: Specifications, of IEC Technical Committee No. 15: Insulating Materials.

A draft was discussed at the meeting held in Zurich in 1979. As a result of this meeting, a draft, Document 15C(Central Office)104, was submitted to the National Committees for approval under the Six Months' Rule in October 1979.

The National Committees of the following countries voted explicitly in favour of publication:

Austria	Finland	Switzerland
Belgium	France	Turkey
Brazil	Ireland	Union of Soviet Socialist Republics
Canada	Israel	United Kingdom
China	Italy	Yugoslavia
Czechoslovakia	New Zealand	
Denmark	Norway	

Other IEC publications quoted in this standard:

Publications Nos. 243: Recommended Methods of Test for Electrical Strength of Solid Insulating Materials at Power Frequencies.
296: Specification for New Insulating Oils for Transformers and Switchgear.
554-2: Specification for Cellulosic Papers for Electrical Purposes, Part 2: Methods of Test.
641-2: Specification for Pressboard and Presspaper for Electrical Purposes, Part 2: Methods of Test.

Other publications quoted:

ISO Standard 62:	Plastics — Determination of Water Absorption.
ISO Recommendation R 149:	Modified Erichsen Cupping Test for Steel Sheet and Strip.
ISO Standard 178:	Plastics — Determination of Flexural Properties of Rigid Plastics.
ISO Standard 287:	Paper and Board — Determination of Moisture Content — Oven-drying Method.
ISO Standard 604:	Plastics — Determination of Compressive Properties.
ISO Standard 1924:	Paper and Board — Determination of Tensile Strength.
ISO Standard 1974:	Paper — Determination of Tearing Strength.
ISO Standard 2144:	Paper and Board — Determination of Ash.
ISO Standard 2758:	Paper — Determination of Bursting Strength.

SPECIFICATION FOR VULCANIZED FIBRE FOR ELECTRICAL PURPOSES

Part 2: Methods of test

INTRODUCTION

This standard is one of a series which deals with vulcanized fibre for electrical purposes.

The series will have three parts:

Part 1: Definitions and general requirements.

Part 2: Methods of test.

Part 3: Specifications for individual materials.

Whenever appropriate the methods given or quoted here are identical to those given in IEC Publication 641: Specification for Pressboard and Presspaper for Electrical Purposes.

1. Scope

The standard covers vulcanized fibre sheets, flat or corrugated sheets, round rods and round tubes suitable for use as electrical insulation. Material made by combining with an adhesive several thicknesses of vulcanized fibre is not covered by this standard.

2. General notes on tests

Unless otherwise specified, the test specimens, after being cut, shall be conditioned in an atmosphere of 23 ± 2 °C, and 50 ± 5% r.h., and then tested in this atmosphere. The duration of the conditioning in relation to the nominal thickness for sheet and tubes shall be:

— nominal thickness or wall thickness (mm)

⩽0.5	>0.5 to 1.0	>1.0 to 2.0	>2.0 to 3.0	>3.0
48	72	96	120	240*

— time (h)

For rods the time shall be 240 h.

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* If approached from the wet side then the appropriate time values are: 48, 96, 120, 240, 480 h.

3. Dimensions

3.1 *Thickness of flat sheets*

The thickness shall be determined as in Clause 2 of IEC Publication 641-2: Specification for Pressboard and Presspaper for Electrical Purposes, Part 2: Methods of Test. The result is the central value of the eight measurements. The highest and lowest values shall be reported.

3.2 *Thickness of corrugated sheets*

Under consideration.

3.3 *Dimensions of tubes*

3.3.1 *Outside diameter of tubes of outside diameter up to and including 300 mm*

Using a machinist's micrometer or vernier calipers capable of reading to 0.02 mm make three measurements 60° apart around the circumference near each end and the middle of the tube.

The result is the central value of the nine measurements. The highest and lowest values shall be reported (see Sub-clause 3.3.3).

3.3.2 *Outside diameter of tubes of outside diameter above 300 mm*

Using a flat steel tape, measure the circumference to the nearest 0.5 mm near each end and the middle of the tube.

Calculate the outside diameter remembering to subtract twice the thickness of the tape. Alternatively a tape calibrated to read the diameter directly may be used.

The result is the central value of the three determinations. The highest and lowest values shall be reported (see Sub-clause 3.3.3).

3.3.3 *Variation in outside diameter of tubes*

From the measurements of outside diameter determined as above, report the difference between the maximum and minimum readings as the variation in outside diameter.

3.3.4 *Inside diameter of tubes of inside diameter up to and including 300 mm*

At each end of the tube using any device capable of measuring the inside diameter to 0.02 mm, make three measurements at points 60° apart around the circumference.

The result is the central value of the six determinations. The highest and lowest values shall be reported.

3.3.5 *Inside diameter of tubes of inside diameter above 300 mm*

Calculate the inside diameter by subtracting twice the central value of the measurements of wall thickness determined as in Sub-clause 3.3.6 below from the central value of the measurements of outside diameter determined as in Sub-clause 3.3.2 above.

3.3.6 *Wall thickness*

Using any device capable of measuring wall thickness to within 0.02 mm, measure the wall thickness at three points spaced approximately equally around the circumference of the tube. Make the determinations at or near to each end of the tube.

The result is the central value of the six determinations. The highest and lowest values shall be reported.

3.4 *Dimensions of rods*

3.4.1 *Diameter of rods*

Using a machinist's micrometer or vernier calipers capable of reading to 0.02 mm, make three measurement 60° apart around the circumference near each end and the middle of the rod.

The result is the central value of the nine measurements. The highest and lowest values shall be reported.

4. Tensile strength of flat sheets

Tensile strength shall be measured according to the method described in ISO Standard 1924, the load being applied at a rate of 100 mm/min and continued until the test piece breaks.

Deviations from ISO Standard 1924:

— five measurements are made on the test pieces cut from one direction and five measurements on test pieces cut from the direction at right angles to this;

— the result in each direction is the central value of the five tests in that direction. The highest and lowest values in each direction shall be reported. The test results shall be expressed in newtons per square millimetre.

Note. — The machine direction of the sheet will be that corresponding to the length direction of the test piece having the greater tensile strength.

5. Tensile strength of rods

Test piece

The central portion of a 230 mm length of the rod is machined down for a length of 90 mm. For rods up to 20 mm diameter the diameter of the central portion is reduced by 1.6 mm. For rods of diameter greater than 20 mm and up to 25 mm the diameter of the central portion is reduced by 3 mm. The radius at the transition between rod and reduced portion is 6 mm.

Three test pieces are tested.

Apparatus

Any apparatus may be used which will measure the load applied to an accuracy of 1 %.

Procedure

Measure the diameter at the centre by taking two measurements at right angles.

Insert the test piece in the jaws of the machine in axial alignment with the direction of pull.

Apply the load at such a rate that the stress stipulated in Part 3 is reached in approximately 2 min and continue until the test piece breaks.

Result

The tensile strength is the central value of the three test results expressed in newtons per square millimetre. The two other values shall be reported.

6. **Tensile strength of tubes of internal diameter up to and including 50 mm**

Test pieces

Three test pieces shall be tested each consisting of a tube not less than 150 mm long with the central portion cut away as shown in Figure 1, page 24.

Apparatus

Any apparatus may be used which will measure the load applied to an accuracy of 1%.

Procedure

A steel plug of the same diameter as the internal diameter of the tube shall be inserted into each end of the tube to avoid crushing the test piece during testing. The test piece may then be held in ordinary wedge shape clamps.

The load shall be calculated from the stress stipulated in Part 3 and applied in such a way that it is reached in approximately 2 min and continued until the test piece breaks.

The tensile strength shall be calculated from the original cross-sectional area of the wall of the tube at the point of fracture and expressed in newtons per square millimetre.

Result

The result is the central value of the three determinations, in newtons per square millimetre. The two other values shall be reported.

7. **Flexural stress at rupture of flat sheets**

Flexural stress at rupture shall be determined as specified in ISO Standard 178.

The test pieces shall be cut from the sheet to be tested with their major axes in the directions indicated at A and B in Figure 1 of ISO Standard 178; five test pieces in each direction. If the sheet to be tested is more than 20 mm thick, the thickness of the test pieces shall be reduced to 20 mm by machining both faces symmetrically.

The result in each direction is the central value of the five tests in that direction. The highest and lowest values in each direction are reported.

8. **Flexural stress at rupture of rods**

The flexural stress at rupture shall be determined as specified in ISO Standard 178 and in the following.

Test pieces

Three test pieces shall be tested.

If the diameter of a rod exceeds 20 mm it shall be reduced concentrically to 20 mm by machining.

The length of the test piece shall be not less than 20 times its diameter.

Procedure

The distance between the supports shall be 15 to 17 times the measured diameter and shall be measured to within 0.5%.