

# INTERNATIONAL STANDARD

**IEC**  
**61212-2**

Second edition  
2006-04

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**Insulating materials –  
Industrial rigid round laminated tubes  
and rods based on thermosetting resins  
for electrical purposes –**

**Part 2:  
Methods of test**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INSULATING MATERIALS –  
INDUSTRIAL RIGID ROUND LAMINATED TUBES  
AND RODS BASED ON THERMOSETTING RESINS  
FOR ELECTRICAL PURPOSES –****Part 2: Methods of test**

## FOREWORD

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International Standard IEC 61212-2 has been prepared by IEC technical committee 15: Standards on specifications for electrical insulating materials.

This second edition cancels and replaces the first edition published in 1995 and constitutes a technical revision.

The main changes from the previous edition are as follows: added application use and safety statements. Reformatted document to bring it up to current IEC document format. Test method references updated.

The text of this standard is based on the following documents:

FDIS	Report on voting
15/273/FDIS	15/306/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A bilingual version of this publication may be issued at a later date.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
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## INTRODUCTION

This part of IEC 61212 is one of a series which deals with industrial, rigid, round, laminated tubes and rods based on thermosetting resins for electrical purposes. The materials are similar to those described in IEC 62011-1 but of different cross-section.

This series, under the general heading *Insulating materials – Industrial rigid round laminated tubes and rods based on thermosetting resins for electrical purposes*, consists of three parts:

Part 1: Definitions, designations and general requirements (IEC 61212-1)

Part 2: Methods of test (IEC 61212-2)

Part 3: Specifications for individual materials (IEC 61212-3)

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# INSULATING MATERIALS – INDUSTRIAL RIGID ROUND LAMINATED TUBES AND RODS BASED ON THERMOSETTING RESINS FOR ELECTRICAL PURPOSES –

## Part 2: Methods of test

### 1 Scope

This part of IEC 61212 describes methods of test for the materials defined in IEC 61212-1.

Materials which conform to this specification meet established levels of performance. However, the selection of a material by a user for a specific application should be based on the actual requirements necessary for adequate performance in that application and not based on this specification alone.

Safety warning:

It is the responsibility of the user of the methods contained or referred to in this document to ensure that they are used in a safe manner.

### 2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 60167:1964, *Methods of test for the determination of the insulation resistance of solid insulating materials*

IEC 60212:1971, *Standard conditions for use prior to and during the testing of solid electrical insulating materials*

IEC 60216-1:2001, *Electrical insulating materials – Properties of thermal endurance – Part 1: Ageing procedures and evaluation of test results*

IEC 60216-2:2005, *Electrical insulating materials – Thermal endurance properties – Part 2: Determination of thermal endurance properties of electrical insulating materials – Choice of test criteria*

IEC 60243-1:1998, *Electrical strength of insulating materials – Test methods – Part 1: Tests at power frequencies*

IEC 60250:1969, *Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including metre wavelengths*

IEC 60296:2003, *Fluids for electrotechnical applications – Unused mineral oils for transformers and switchgear*



IEC 60695-11-10:1999, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*  
Amendment 1 (2003)<sup>1</sup>

IEC 61212-1, *Insulating materials – Industrial rigid round laminated tubes and rods based on thermosetting resins for electrical purposes – Part 1: General requirements*

IEC 61212-3 (all sheets), *Insulating materials – Industrial rigid round laminated tubes and rods based on thermosetting resins for electrical purposes – Part 3: Specifications for individual materials*

ISO 62:1999, *Plastics – Determination of water absorption*

ISO 178:2001, *Plastics – Determination of flexural properties*

ISO 604:2002, *Plastics – Determination of compressive properties*

ISO 1183-1:2004, *Plastics – Methods for determining the density and relative density of non-cellular plastics – Part 1: Immersion method, liquid pycnometer method and titration method*

ISO 3611:1978, *Micrometer callipers for external measurement*

ISO 3599:1976, *Vernier callipers reading to 0,1 and 0,05 mm*

ISO 6906:1984, *Vernier callipers reading to 0,02 mm*

### 3 Conditioning of specimens

Unless otherwise specified, test specimens shall be conditioned immediately prior to testing for at least 24 h in standard atmosphere B according to IEC 60212 at a temperature of 23 °C ± 2 K and a relative humidity of (50 ± 5) %.

Unless otherwise specified, each specimen shall be tested in the conditioning atmosphere or the tests shall commence within 3 min of removal of each specimen from the conditioning atmosphere.

Where testing at an elevated temperature is required in a specification sheet of IEC 61212-3, test specimens shall be conditioned for 1 h at the elevated temperature immediately before testing.

## 4 Dimensions

### 4.1 General

All dimensions shall be measured in the “as received” condition.

### 4.2 External diameter

#### 4.2.1 Test apparatus

The external diameter of the tubes and rods shall be determined using one of the apparatus listed below:

<sup>1</sup> There exists a consolidated version 1.1 (2003) that includes IEC 60695-11-10 (1999) and its Amendment 1 (2003).

a) Nominal external diameter  $\leq 100$  mm

An external screw type micrometer with an accuracy of  $\pm 0,02$  mm or better, according to ISO 3611, having faces with diameters between 6 mm and 8 mm.

b) Nominal external diameter  $> 100$  mm and  $\leq 500$  mm

A slide gauge (Vernier caliper) in accordance with ISO 3599.

c) Nominal external diameter  $> 500$  mm

A steel tape, graduated in divisions of 0,5 mm with an accuracy of  $\pm 0,1$  mm or better.

Any other means of measurement with the same or better accuracy may be used. In case of dispute, the specified apparatus shall be used.

#### 4.2.2 Procedure

For tubes or rods with nominal external diameter  $\leq 500$  mm, measure the external diameter at three points along the length, but not less than 20 mm from the ends, generally at both ends and the middle. At each of these points, a minimum of three readings equally distributed around the circumference shall be taken.

For tubes or rods with nominal external diameter  $> 500$  mm, measure the circumference at three places along the length, distributed as above, and calculate the diameter.

#### 4.2.3 Results

For nominal external diameters  $\leq 100$  mm, the measured values shall be recorded to the nearest 0,02 mm.

For nominal external diameters  $> 100$  mm and  $\leq 500$  mm, the measured values shall be recorded to the nearest 0,1 mm.

For nominal external diameters  $> 500$  mm, the diameters shall be calculated from the measured circumferences and recorded to the nearest millimetre.

#### 4.2.4 Report

The arithmetic mean of the recorded values shall be reported as the diameter of the tube or rod.

### 4.3 Internal diameter

#### 4.3.1 Test apparatus

The internal diameter of tubes shall be determined using one of the instruments listed below.

a) For tubes with nominal internal diameter  $\leq 10$  mm

A tapered plug gauge or pin type micrometer with an accuracy of  $\pm 0,02$  mm or better.

b) For tubes with nominal internal diameter  $> 10$  mm and  $\leq 500$  mm

A slide gauge (Vernier caliper) in accordance with ISO 3599.