

# INTERNATIONAL STANDARD

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

Second edition  
2006-04

---

---

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

### **Part 2: Methods of test**

© IEC 2006 — Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland  
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: [inmail@iec.ch](mailto:inmail@iec.ch) Web: [www.iec.ch](http://www.iec.ch)



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

PRICE CODE

**S**

*For price, see current catalogue*

## CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references .....	6
3 Conditioning of specimens.....	7
4 Dimensions .....	7
4.1 General.....	7
4.2 External diameter .....	7
4.3 Internal diameter .....	8
4.4 Wall thickness .....	9
4.5 Departure from straightness – Applicable to all tubes up to 300 mm diameter .....	10
5 Mechanical tests.....	10
5.1 Flexural strength perpendicular to laminations.....	10
5.2 Axial compressive strength.....	12
5.3 Cohesion between layers .....	14
6 Electrical tests.....	15
6.1 Electric strength and breakdown voltage .....	15
6.2 Insulation resistance after immersion in water .....	17
6.3 Dissipation factor and permittivity (tube only).....	18
7 Other tests .....	18
7.1 Thermal endurance .....	18
7.2 Water absorption.....	19
7.3 Density.....	19
7.4 Flammability.....	19
BIBLIOGRAPHY .....	22
Figure 1 – Preparation of test specimen from a large tube for testing flexural strength.....	11
Figure 2 – Position of tube in testing machine for testing cohesion between layers .....	14
Figure 3 – Test specimens and electrodes for testing electric strength of tubes .....	17
Figure 4 – Test specimens for flammability testing.....	20

## 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

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization, comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible in any way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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
- amended.

## 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)

# 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 60213-1:1998, *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*

---

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