

INTERNATIONAL STANDARD

IEC
61212-1

Second edition
2006-03

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

**Part 1:
Definitions, designations and general
requirements**



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Part 1: Definitions, designations and general requirements

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INSULATING MATERIALS –
INDUSTRIAL RIGID ROUND LAMINATED TUBES
AND RODS BASED ON THERMOSETTING RESINS
FOR ELECTRICAL PURPOSES –****Part 1: Definitions, designations and general requirements****FOREWORD**

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International Standard IEC 61212-1 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. Method for designation of tubes changed in line with common practice. New types EP GC 23 and PF CC 24 added. Type PF CP 24 removed.

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

FDIS	Report on voting
15/271/FDIS	15/304/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- withdrawn,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 International Standard is one of a series which deals with industrial rigid round laminated tubes and rods based on thermosetting resins for electrical purposes.

This series 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 1: Definitions, designations and general requirements

1 Scope

This part of IEC 61212 gives the definitions related to the designations to be used for, and the general requirements to be fulfilled by, industrial rigid round laminated tubes and rods for electrical purposes made with any of the following resins as the binder: phenolic, epoxy (epoxide), melamine and silicone. The following reinforcements may be used either singly or in combination: cellulosic paper, woven cotton cloth, woven glass cloth, mica paper.

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 61212-2:2006, *Insulating materials – Industrial rigid round laminated tubes and rods based on thermosetting resins for electrical purposes – Part 2: Methods of test*

IEC 61212-3 (all parts):—, *Insulating materials – Industrial rigid round laminated tubes and rods based on thermosetting resins for electrical purposes – Part 3: Specifications for individual materials*²

ISO 472, *Plastics – Vocabulary*

3 Terms and definitions

For the purposes of this document, the following definitions, which are taken from ISO 472, apply.

3.1

round laminated rolled tube (as applied to thermosets)

tube formed by rolling impregnated layers of material on a mandrel between heated pressure rolls, curing in an oven, and then removing the mandrel

[ISO 472, MOD]

3.2**round laminated moulded tube (as applied to thermosets)**

tube formed by rolling impregnated layers of material on a mandrel, curing the assembly in a cylindrical mould under heat and pressure, and then removing the mandrel

[ISO 472 MOD]

3.3**round laminated moulded rod (as applied to thermosets)**

rod formed by rolling impregnated layers of material on a mandrel, removing the mandrel, curing in a cylindrical mould under heat and pressure, and grinding to size

[ISO 472, MOD]

4 Designations and abbreviations**4.1 General**

The tubes and rods covered by this standard, and tested according to the methods defined in IEC 61212-2 are classified into types which differ in the resin and reinforcement which is used in the manufacture of the products, the method of manufacture and their distinguishing properties.

4.2 Designation

Individual types are designated by

- a two-letter abbreviation denoting the resin;
- a second two-letter abbreviation, denoting the reinforcement;
- a serial number of two digits, the first digit denoting the form of the material,
 - a “2” indicates rolled tubes,
 - a “3” indicates moulded tubes,
 - a “4” indicates moulded rods,
- and, a second digit denoting sub-grades of the same type.

The abbreviations are given in 4.3.

The complete designation of the tube or rod is denoted by

- description: rolled tube, moulded tube or moulded rod;
- number of the IEC standard: IEC 61212 – 3 – Sheet No.;
- designation of the individual type;
- dimensions (in millimetres):
 - of the tube: internal diameter x external diameter x length;
 - of the rod: diameter x length.
- a letter designating the finish on the external surface of the tube or rod:
 - “A” designating tubes or rods in the “as produced” condition;
 - “B” designating tubes or rods in ground or turned condition.

Examples:

- Rolled tube IEC 61212 – 3 – 1 – EP GC 21 – 25 × 37 × 1 000 – A
- Moulded tube IEC 61212 – 3 – 2 – EP CC 31 – 25 × 37 × 1 000 – A
- Moulded rod IEC 61212 – 3 – 3 – EP CC 41 – 25 × 1 000 – A

4.3 Abbreviations

Types of resin		Types of reinforcement	
EP	Epoxy (epoxide)	CC	Woven cotton cloth
MF	Melamine	CP	Cellulosic paper
PF	Phenolic	GC	Woven glass cloth
SI	Silicone	MP	Mica Paper

4.4 Characteristics of types

Tables 1, 2 and 3 are intended as a guide to aid in the selection of materials. Detailed requirements are given in IEC 61212-3.

Table 1 – Types of industrial laminated round rolled tubes

Resin	Reinforce- ment	Serial number	Applications and distinguishing characteristics ^a
EP	GC	21	Mechanical, electrical and electronic applications. Extremely high mechanical strength at moderate temperatures. Very good stability of electrical properties when exposed to high relative humidity.
		22	Similar to EP GC 21, but with high mechanical strength at elevated temperature.
		23	Similar to EP GC 21, but with improved flame resistance.
	MP	21	Mechanical, electrical and electronic applications. Good stability of electrical properties when exposed to high relative humidity. Good heat resistance.
MF	GC	21	Mechanical and electrical applications. High mechanical strength. Good arc and tracking resistance.
PF	CC	21	Mechanical and electrical applications. Fine weave ^b .
		22	Mechanical and electrical applications. Coarse weave ^b .
		23	Mechanical applications. Very coarse weave ^b .
		24	Similar to PF CC 21. For close tolerance machining applications (very fine weave) ^b .
	CP	21	Mechanical and low voltage electrical applications. Good electrical properties when exposed to normal relative humidity.
		22	High voltage electrical applications at power frequencies. High electric strength in oil.
		23	Similar to type PF CP 21, but with improved electrical properties when exposed to high relative humidity.
	GC	21	Mechanical and electrical applications. Very high mechanical strength at moderate temperatures.
SI	GC	21	Mechanical, electrical and electronic applications when exposed to high relative humidity.
	MP	21	Mechanical, electrical and electronic applications. Good stability of electrical properties at elevated temperatures.

Table 1 (continued)

^a It should not be inferred from the contents of Table 1 that round laminated rolled tubes of any particular type are necessarily unsuitable for applications other than those listed for them, or that specific round laminated rolled tubes will be suitable for all applications within the wide description given.

^b Fabric weaves of type CC reinforcements:

	<i>Mass per unit area</i> g/m ²	<i>Thread count</i> cm ⁻¹
Very coarse weave	> 200	< 18
Coarse weave	> 130	18 to 29
Fine weave	≤ 130	30 to 37
Very fine weave	≤ 125	> 37

These values are only for information. They are not to be considered as specification values. In general, the finer weave materials have better machining characteristics.

Table 2 – Types of industrial laminated round moulded tubes

Resin	Reinforce- ment	Serial number	Applications and distinguishing characteristics ^a
EP	CC	31	Mechanical, electrical and electronic applications. Good resistance to tracking.
PF	CC	31	Mechanical and electrical applications. Fine weave ^b .
		32	Similar to type PF CC 31, but of coarse weave ^b .
		33	Similar to type PF CC 31, but of very coarse weave ^b .
	CP	31	Electrical and mechanical applications. Good electrical properties when exposed to normal relative humidity.
		32	Similar to type PF CP 31, but with improved mechanical and electrical properties.

These values are only for information. They are not to be considered as specification values. In general, the finer weave materials have better machining characteristics.

^a It should not be inferred from the contents of Table 2 that round laminated rolled tubes of any particular type are necessarily unsuitable for applications other than those listed for them, or that specific round laminated rolled tubes will be suitable for all applications within the wide description given.

^b Fabric weaves of type CC reinforcements:

	<i>Mass per unit area</i> g/m ²	<i>Thread count</i> cm ⁻¹
Very coarse weave	> 200	< 18
Coarse weave	> 130	18 to 29
Fine weave	≤ 130	≥ 30

Table 3 – Types of industrial laminated round moulded rods

Resin	Reinforce-ment	Serial number	Applications and distinguishing characteristics ^a
EP	CC	41	Mechanical, electrical and electronic applications. Good resistance to tracking. Fine weave ^b
	GC	41	Mechanical and electrical applications. High mechanical strength at moderate temperatures. Good stability of electrical properties when exposed to high relative humidity.
		42	Similar to EP GC 41, but with high mechanical strength at elevated temperature.
		43	Similar to EP GC 41, but with improved flame resistance.
PF	CC	41	Mechanical and electrical applications. Fine weave ^b .
		42	Mechanical and electrical applications. Coarse weave ^b .
		43	Mechanical and electrical applications. Very coarse weave ^b .
	CP	41	Mechanical and electrical applications. Good stability of electrical properties when exposed to high relative humidity.
		42	Similar to PF CP 41, but with lower mechanical and electrical properties.
		43	Mechanical applications and low voltage electrical applications.
SI	GC	41	Mechanical, electrical and electronic applications. Good stability of electrical properties at elevated temperatures.

^a It should not be inferred from the contents of Table 3 that round laminated rolled moulded rods of any particular type are necessarily unsuitable for applications other than those listed for them, or that specific round laminated rolled moulded rods will be suitable for all applications within the wide description given.

^b Fabric weaves of type CC reinforcements:

	Mass per unit area g/m ²	Thread count cm ⁻¹
Very coarse weave	> 200	< 18
Coarse weave	> 130	18 to 29
Fine weave	≤ 130	≥ 30

5 General requirements – Appearance

Tubes and rods shall be supplied either in the as-produced condition or with machined finish on the external surface. In the latter case, the ground surface shall be uniform and free from obvious signs of splitting, cracking and delamination.

All tubes and rods shall be supplied substantially free from holes, voids or open cracks and shall be supplied with their ends trimmed smooth and square.

NOTE 1 Fine stress cracks are an inherent feature of certain types and sizes of tubes and rods, particularly paper base. Such cracks are more likely to occur in rods of a diameter greater than 25 mm, in tubes of wall thickness greater than 12 mm and in tubes in which the ratio of wall thickness to internal diameter is greater than 0,4. Glass based tubes with a ratio of wall thickness to internal diameter of 0,25 and below are also subject to stress cracks.

NOTE 2 In the case of moulded tubes and rods, some resin concentration will occur in the region of the mould lines, and at the centre of rods, and therefore is permissible.

NOTE 3 Tubes and rods may be supplied with a varnished or other finish depending upon agreement between the purchaser and the supplier.

6 Conditions of supply

The material shall be supplied in a packing material that ensures adequate protection during transport, handling and storage.

The IEC designation of the material and the number of and type of the product or the mass shall be clearly marked on the outside of each package.

Where different types of products are contained in the same package, the required information may be on a note accompanying the package.

Any marking on individual products shall be as specified in the purchase contract.

Where marking is carried out with a stamp, the stamping ink used shall not impair the electrical properties of the material.



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