IEC 61212-3-2

Edition 3.0 2013-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Insulating materials – Industrial rigid round laminated tubes and rods based on thermosetting resins for electrical purposes –
Part 3: Specifications for individual materials – Sheet 2: Round laminated moulded tubes

Matériaux isolants – Tubes et barres industriels rigides, ronds, stratifiés, à base de résines thermodurcissables, à usages électriques –
Partie 3: Spécifications pour matériaux particuliers – Feuille 2: Tubes ronds stratifiés moulés

IEC 61212-3-2:2013

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Part 3: Specifications for individual materials – Sheet 2: Round laminated moulded tubes

FOREWORD

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International Standard IEC 61212-3-2 has been prepared by IEC technical committee 15: Solid electrical insulating material.

This third edition cancels and replaces the second edition published in 2006. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

Details of test for insulation resistance after immersion in water are changed.

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

FDIS	Report on voting
15/700/FDIS	15/710/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 list of all parts in the IEC 61212 series, published under the general title *Insulating materials – Industrial rigid round laminated tubes and rods based on thermosetting resins for electrical purposes*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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- withdrawn,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.

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)

IEC 61212-3-2 contains one of the specification sheets comprising Part 3, as follows:

Sheet 2: Round laminated moulded tubes.

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

Part 3: Specifications for individual materials – Sheet 2: Round laminated moulded tubes

1 Scope

This part of IEC 61212 gives requirements for industrial rigid round laminated moulded tubes for electrical purposes, based on different resins and different reinforcements.

Applications and distinguishing properties are given in Table 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 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.

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

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*

3 Terms and definitions

For the purposes of this document, the following term and definition apply.

3.1
moulded tube
<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

[SOURCE: ISO 472:1999, modified – In the ISO definition, the term “laminated moulded tube” is used instead of “moulded tube” and an indication “or other suitable” is provided between the words “cylindrical” and “mould”.]

4 Designations and abbreviations

4.1 General

The moulded tubes covered by this Part 3 sheet are classified into types which differ in the resin and reinforcement used, 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 “3” indicates moulded tubes,
  and, a second digit denoting sub-grades of the same type.

The abbreviations are given in 4.3.

The complete designation of the moulded tube is denoted by:

– description: moulded tube;
– number of the IEC standard: IEC 61212-3-2;
– designation of the individual type;
– dimensions (in millimetres) of the moulded tube:
  internal diameter × external diameter × length;
– a letter designating the finish on the external diameter of the moulded tube:
  "A" designating moulded tubes in the "as produced" condition;
  "B" designating moulded tubes in ground or turned condition.

EXAMPLE Moulded tube, IEC 61212-3-2 – EP CC 31 – 25 × 35 × 1 000-A.

4.3 Abbreviations

Types of resin		Types of reinforcement	
EP	Epoxy (epoxide)	CC	Woven cotton cloth
PF	Phenolic	CP	Cellulosic paper

5 Requirements

In addition to the general requirements given in IEC 61212-1, the moulded tubes shall comply with the additional requirements given in Tables 2, 3, 4, 5, 6, 7, and 8, with the exception of the length of tube supplied, which shall be subject to agreement between buyer and seller.

Table 1 – Types of industrial 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. fine weave[b].
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.

[a] It should not be inferred from the contents of Table 1 that round laminated moulded tubes of any particular type are necessarily unsuitable for applications other than those listed for them, or that specific round laminated moulded tubes 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 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 – Permissible deviation from nominal external diameter of round moulded tubes in the "as moulded" condition

Nominal external diameter *D* mm	Maximum deviation, ± mm	
	Type	
	PF CP	EP CC PF CC
≤ 3	0,08	--
3 < *D* ≤ 6	0,1	--
6 < *D* ≤ 10	0,15	--
10 < *D* ≤ 20	0,2	0,3
20 < *D* ≤ 30	0,3	0,4
30 < *D* ≤ 50	0,3	0,4
50 < *D* ≤ 75	0,4	0,4
75 < *D* ≤ 100	0,5	0,5
100 < *D* ≤ 150	0,6	0,6
150 < *D* ≤ 200	0,7	0,7
200 < *D* ≤ 300	0,75	0,75
300 < *D* ≤ 500	0,8	0,8
> 500	1,0	1,0

Test method: see 4.1 of IEC 61212-2:2006.

NOTE A double dash "--" signifies that there is no requirement.

Table 3 – Permissible deviation from nominal external diameter of moulded tubes in ground or turned condition, all types

Nominal external diameter *D* mm	Maximum deviation[a] ± mm
≤ 25	0,15
25 < *D* ≤ 50	0,25
50 < *D* ≤ 75	0,30
75 < *D* ≤ 100	0,35
100 < *D* ≤ 125	0,45
> 125	0,50
Test method: see 4.2 of IEC 61212-2:2006.	
[a] If a unilateral tolerance is agreed between purchaser and supplier, the tolerance may not be greater than twice the value given in the table.	

Table 4 – Permissible deviation from nominal internal diameter of moulded tubes

Nominal internal diameter *d* mm	Maximum deviation[a] ± mm
≤ 3	0,10[b]
3 < *d* ≤ 30	0,15
30 < *d* ≤ 50	0,20
50 < *d* ≤ 75	0,25
75 < *d* ≤ 100	0,30
100 < *d* ≤ 150	0,50
150 < *d* ≤ 200	0,70
200 < *d* ≤ 300	1,00
300 < *d* ≤ 500	1,50
> 500	2,00
Test method: see 4.3 of IEC 61212-2:2006.	
[a] If a unilateral tolerance is agreed between purchaser and supplier, the tolerance may not be greater than twice the value given in the table.	
[b] Applicable to PF CP types only.	

Table 5 – Tolerance on wall thickness for round moulded tubes

Nominal wall thickness *t* mm	Maximum deviation ± mm		
	Types		
	PF CP PF CP 32	EP CC PF CC 31	PF CC PF CC 33 PF CC 34
≤ 1,5	0,25	0,28	0,40
1,5 < *t* ≤ 3,0	0,40	0,45	0,60
3,0 < *t* ≤ 6,0	0,55	0,60	0,85
6,0 < *t* ≤ 12,0	0,90	1,00	1,35
12,0 < *t* ≤ 25,0	1,30	1,40	1,90
> 25,0	2,00	2,00	2,70
Test method: see 4.4 of IEC 61212-2:2006.			

Table 6 – Departure from straightness for round moulded tubes

Nominal external diameter *D* mm	**Maximum deviation** mm
$D < 8$	$8\ L^2$
$D \geq 8$	$6\ L^2$
Test method: see 4.5 of IEC 61212-2:2006. The departure from straightness of any tube shall not exceed the appropriate limiting value given above, where *L* is the length of the tube in metres.	