IEC 60893-3-4

Edition 2.1 2012-10
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Insulating materials – Industrial rigid laminated sheets based on thermosetting resins for electrical purposes – Part 3-4: Specifications for individual materials – Requirements for rigid laminated sheets based on phenolic resins

Matériaux isolants – Stratifiés industriels rigides en planches à base de résines thermodurcissables à usages électriques – Partie 3-4: Spécifications pour matériaux particuliers – Prescriptions pour stratifiés rigides en planches à base de résine phénolique

IEC 60893-3-4:2003+AMD1:2012 CSV(en-fr)

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FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 60893-3-4 edition 2.1 contains the second edition (2003) [documents 15C/1524/FDIS and 15C/1538/RVD] and its amendment 1 (2012) [documents 15/682/FDIS and 15/688/RVD].

A vertical line in the margin shows where the base publication has been modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through.

International Standard IEC 60893-3-4 has been prepared by subcommittee 15C: Specifications, of IEC technical committee 15: Insulating materials.

In this revision of the IEC 60893 series of specifications, new material types have been included, changes have been made to the property requirements of some existing types, a new method for testing permittivity and dissipation factor has been added, and all non-specification data for each type has been moved to a new Part 4 document – IEC 60893-4 – Typical values.

The amendment introduces revised limits for CHARPY and IZOD impact strengths for the requirements of all types of rigid laminated sheets based on phenolic resins. These revised limits are based on the results of round-robin testing.

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

The committee has decided that the contents of the base publication and its amendments 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- withdrawn,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.

The contents of the corrigendum of March 2014 have been included in this copy.

IMPORTANT – The "colour inside" logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

INTRODUCTION

This part of IEC 60893 is one of a series, which deals with industrial rigid laminated sheets based on thermosetting resins for electrical purposes.

This series consists of four parts:

Part 1: Definitions, designations and general requirements (IEC 60893-1)

Part 2: Methods of test (IEC 60893-2)

Part 3: Specifications for individual materials (IEC 60893-3)

Part 4: Typical values (IEC 60893-4)

IEC 60893-3-4 contains one of the specification sheets comprising Part 3, as follows:

Sheet 4: Requirements for rigid laminated sheets based on phenolic resins

INSULATING MATERIALS – INDUSTRIAL RIGID LAMINATED SHEETS BASED ON THERMOSETTING RESINS FOR ELECTRICAL PURPOSES –

Part 3-4: Specifications for individual materials – Requirements for rigid laminated sheets based on phenolic resins

1 Scope

This part of IEC 60893 gives the requirements for industrial rigid laminated sheets for electrical purposes based on phenolic resin 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.

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 60893-1:—, *Insulating materials – Industrial rigid laminated sheets based on thermosetting resins for electrical purposes – Part 1: Definitions, designations and general requirements* [1]

IEC 60893-2:2003, *Industrial rigid laminated sheets based on thermosetting resins for electrical purposes – Part 2: Methods of test*

3 Designation

The sheets covered by this specification are classified into types, which differ in the reinforcement employed and in their distinguishing properties. The sheets are designated by

– the IEC standard number;
– a two-letter abbreviation denoting the resin;
– a second two-letter abbreviation, denoting the reinforcement;
– a serial number;
– nominal thickness x width x length in millimetres.

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[1] To be published

Example of designation: Industrial rigid laminated sheet of type PF CP 201 with a nominal thickness of 10 mm, 500 mm wide, 1 000 mm long.

Sheet IEC 60893-3-4 – PF CP 201 – 10 x 500 x 1 000.

The following abbreviations are used in this Part 3 sheet:

Type of resin:		*Types of reinforcement:*	
PF	Phenolic	CC	Woven cotton cloth
		CP	Cellulosic paper
		GC	Woven glass cloth
		WV	Wood veneers

4 Requirements

In addition to the general requirements given in IEC 60893-1, the laminated sheets shall also comply with the dimensional requirements given in Tables 2, 3 and 4 as well as with the other requirements given in Tables 5, 6 and 7.

Table 1 – Types of industrial rigid laminated sheets based on phenolic resins

Laminate type			Applications and distinguishing characteristics[b]
Resin	Reinforcement	Serial[a] number	
PF	CC	201	Mechanical applications. Better mechanical properties and poorer electrical properties than type PF CC 202. (coarse weave)[c]
		202	Mechanical and electrical applications. (coarse weave)[c]
		203	Mechanical applications. Recommended for small parts. Better mechanical properties and poorer electrical properties than type PF CC 204. (fine weave)[c]
		204	Mechanical and electrical applications. Recommended for small parts. (fine weave)[c]
		305	Mechanical and electrical applications. For close tolerance machining applications. (very fine weave)[c]
	CP	201	Mechanical applications. Mechanical properties better than other PF CP types. Poor electrical properties under normal humidity. Also available in hot-punching versions.
		202	High-voltage applications at power frequencies. High electric strength in oil. Good electric strength in air under normal humidity.
		203	Mechanical and electrical applications. Good electrical properties under normal humidity. Also available in hot-punching versions.
		204	Electrical and electronic applications. Good stability of electrical properties in high humidity. Also available in cold or hot-punching versions.
		205	Similar to type PF CP 204, but low flammability.
		206	Mechanical and electrical applications. Good electrical properties in high humidity. Also available in hot-punching versions.
		207	Similar to type PF CP 201, but with improved punching characteristics at lower temperature.
		308	Similar to type PF CP 206, but low flammability.
	GC	201	Mechanical and electrical applications. High mechanical strength and good electrical properties under normal humidity. Heat resistant.
	WV	201	Mechanical applications. Cross-plied. Good mechanical properties.
		202	Mechanical and electrical applications. Cross-plied. Good electrical properties in normal humidity.
		303	Mechanical applications. Parallel plied. Good mechanical properties.
		304	Mechanical and electrical applications. Parallel plied.

[a] This specification was originally based on ISO 1642 [1][2], which is now obsolete. Consequently, the type designations of the 200 series types come from ISO 1642 and those of the 300 series were added later.

[b] It should not be inferred from the contents of Table 1 that laminates of any particular type are necessarily unsuitable for applications other than those listed for them, or that specific laminates will be suitable for all applications within the wide description given.

[c] Fabric weaves of type PC and CC reinforcements:

	Mass per unit area g/m^2	*Thread count* cm^{-1}
Coarse weave	>130	≤30
Fine weave	≤130	>30
Very fine weave	≤125	>38

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.

[2] The figure in square brackets refers to the bibliography.

Table 2 – Tolerances on thickness
(test method: see 4.1 of IEC 60893-2)

Nominal thickness mm	Tolerance (all types) ± mm				
	PF CP all types	PF CC 202 PF CC 201	PF CC 204 PF CC 203 PF CC 305	PF GC 201	PF WV all types
0,4	0,07	–	–	0,10	–
0,5	0,08	–	0,13	0,12	–
0,6	0,09	–	0,14	0,13	–
0,8	0,10	0,19	0,15	0,16	–
1,0	0,12	0,20	0,16	0,18	–
1,2	0,14	0,22	0,17	0,21	–
1,5	0,15	0,24	0,19	0,24	–
2,0	0,19	0,26	0,21	0,28	–
2,5	0,22	0,29	0,24	0,33	–
3,0	0,25	0,31	0,26	0,37	–
4,0	0,30	0,36	0,32	0,45	–
5,0	0,34	0,42	0,36	0,52	–
6,0	0,37	0,46	0,40	0,60	–
8,0	0,47	0,55	0,49	0,72	–
10,0	0,55	0,63	0,56	0,82	–
12,0	0,62	0,70	0,64	0,94	1,25
14,0	0,69	0,78	0,70	1,02	1,35
16,0	0,75	0,85	0,76	1,12	1,45
20,0	0,86	0,95	0,87	1,30	1,60
25,0	1,00	1,10	1,02	1,50	1,80
30,0	1,15	1,22	1,12	1,70	2,00
35,0	1,25	1,34	1,24	1,95	2,10
40,0	1,35	1,45	1,35	2,10	2,25
45,0	1,45	1,55	1,45	2,30	2,40
50,0	1,55	1,65	1,55	2,45	2,50
60,0	–	–	–	–	2,80
70,0	–	–	–	–	3,00
80,0	–	–	–	–	3,25
90,0	–	–	–	–	3,60
100,0	–	–	–	–	3,75

Where the nominal thickness is not one of the preferred thicknesses listed, then the tolerance for the next higher preferred nominal thickness shall apply.

NOTE Other tolerances may be agreed between the supplier and the purchaser.