

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

[IEC 60893-3-3:2003+AMD1:2011 CSV](https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-IEC-60893-3-3:2003+AMD1:2011/IEC-60893-3-3:2003+AMD1:2011)

<https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-IEC-60893-3-3:2003+AMD1:2011/IEC-60893-3-3:2003+AMD1:2011>

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



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2012 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, 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 either IEC or IEC's member National Committee in the country of the requester.  
If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.  
Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

#### Useful links:

IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

---

### A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Liens utiles:

Recherche de publications CEI - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

<https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-330163101631/iec-60893-3-3-2005-amd1-2011-csv>

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 29.035.01

ISBN 978-2-88912-879-2

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
<b>INTRODUCTION (to amendment 1).....</b>	<b>5</b>
1 Scope.....	6
2 Normative references.....	6
3 Designation .....	6
4 Requirements .....	7
Bibliography.....	13

## **iTeh STANDARD PREVIEW** **(standards.iteh.ai)**

[IEC 60893-3-3:2003+AMD1:2011 CSV](https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-3b04e04c81d5/iec-60893-3-3-2003amd1-2011-csv)  
<https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-3b04e04c81d5/iec-60893-3-3-2003amd1-2011-csv>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INSULATING MATERIALS –  
INDUSTRIAL RIGID LAMINATED SHEETS  
BASED ON THERMOSETTING RESINS FOR ELECTRICAL PURPOSES –****Part 3-3: Specifications for individual materials –  
Requirements for rigid laminated sheets based on melamine resins**

## 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 for the 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 itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 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.

**This consolidated version of IEC 60893-3-3 consists of the second edition (2003) [documents 15C/1523/FDIS and 15C/1537/RVD] and its amendment 1 (2011) [documents 15/489/CDV and 15/616/RVC]. It bears the edition number 2.1.**

**The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience. 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 60893-3-3 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.

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.

**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.**

[IEC 60893-3-3:2003+AMD1:2011 CSV](https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-3b04e04c81d5/iec-60893-3-3-2003amd1-2011-csv)

<https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-3b04e04c81d5/iec-60893-3-3-2003amd1-2011-csv>

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

Sheet 3: Requirements for rigid laminated sheets based on melamine resins

## INTRODUCTION (to amendment 1)

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

**(standards.iteh.ai)**

[IEC 60893-3-3:2003+AMD1:2011 CSV](https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-3b04e04c81d5/iec-60893-3-3-2003amd1-2011-csv)

<https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-3b04e04c81d5/iec-60893-3-3-2003amd1-2011-csv>

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

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

### 1 Scope

This part of IEC 60693 gives the requirements for industrial rigid laminated sheets for electrical purposes based on melamine 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.

### 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 60893-3-3:2003+AMD1:2011 CSV](https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-3b04e04c8145/sc/60893-3-3-2003amd1-2011-csv)

IEC 60893-1:—, *Insulating materials – Industrial rigid laminated sheets based on thermosetting resins for electrical purposes – Part 1: Definitions, designations and general requirements*<sup>1</sup>

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 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.

---

<sup>1</sup> To be published



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

Sheet IEC 60893-3-3 – MF CC 201 – 10 x 500 x 1 000.

The following abbreviations are used in this Part 3 sheet:

<i>Type of resin</i>		<i>Types of reinforcement</i>	
MF	Melamine	CC	Woven cotton cloth
		GC	Woven glass cloth

## 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 melamine resins**

Laminate type			Applications and distinguishing characteristics <sup>a</sup>						
Resin	Reinforcement	Serial number							
MF	CC	201	Mechanical and electrical applications. Arc and tracking resistant (coarse weave) <sup>b</sup>						
	GC	201	Mechanical and electrical applications. High mechanical strength. Arc and tracking resistant. Low flammability						
<p><sup>a</sup> 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.</p> <p><sup>b</sup> Fabric weaves of type PC and CC reinforcements.</p> <table> <thead> <tr> <th></th> <th><i>Mass per unit area</i> g/m<sup>2</sup></th> <th><i>Thread count</i> cm<sup>-1</sup></th> </tr> </thead> <tbody> <tr> <td>Coarse weave</td> <td>&gt;130</td> <td>≤30</td> </tr> </tbody> </table> <p>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.</p>					<i>Mass per unit area</i> g/m <sup>2</sup>	<i>Thread count</i> cm <sup>-1</sup>	Coarse weave	>130	≤30
	<i>Mass per unit area</i> g/m <sup>2</sup>	<i>Thread count</i> cm <sup>-1</sup>							
Coarse weave	>130	≤30							

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

Nominal thickness mm	Tolerance (all types) ± mm	
	MF CC 201	MF GC 201
0,4	–	0,10
0,5	–	0,12
0,6	–	0,13
0,8	0,19	0,16
1,0	0,20	0,18
1,2	0,22	0,21
1,5	0,24	0,24
2,0	0,26	0,28
2,5	0,29	0,33
3,0	0,31	0,37
4,0	0,36	0,45
5,0	0,42	0,52
6,0	0,46	0,60
8,0	0,55	0,72
10,0	0,63	0,82
12,0	0,70	0,94
14,0	0,78	1,02
16,0	0,85	1,12
20,0	0,95	1,30
25,0	1,10	1,50
30,0	1,22	1,70
35,0	1,34	1,95
40,0	1,45	2,10
45,0	1,55	2,30
50,0	1,65	2,45

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

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

**Table 3 – Flatness**  
(test method: see 4.2 of IEC 60893-2)

Thickness <i>d</i> mm	Length of straight edge mm	
	1 000	500
3 < <i>d</i> ≤ 6	10	2,5
6 < <i>d</i> ≤ 8	8	2,0
8 < <i>d</i>	6	1,5

**Table 4 – Tolerances on width of cut strips  
(minus tolerances only)**

Nominal thickness <i>d</i> mm	Nominal width, all types mm					
	$3 < b \leq 50$	$50 < b \leq 100$	$100 < b \leq 160$	$160 < b \leq 300$	$300 < b \leq 500$	$500 < b \leq 600$
0,4	0,5	0,5	0,5	0,6	1,0	1,5
0,5	0,5	0,5	0,5	0,6	1,0	1,5
0,6	0,5	0,5	0,5	0,6	1,0	1,5
0,8	0,5	0,5	0,5	0,6	1,0	1,0
1,0	0,5	0,5	0,5	0,6	1,0	1,0
1,2	0,5	0,5	0,5	1,0	1,2	1,2
1,5	0,5	0,5	0,5	1,0	1,2	1,2
2,0	0,5	0,5	0,5	1,0	1,2	1,5
2,5	0,5	1,0	1,0	1,5	2,0	2,5
3,0	0,5	1,0	1,0	1,5	2,0	2,5
4,0	0,5	2,0	2,0	3,0	4,0	5,0
5,0	0,5	2,0	2,0	3,0	4,0	5,0

NOTE Unilateral, all-negative tolerances are normally applied to the width of the cut strips, and are given in the above table. Other tolerances may be agreed upon between purchaser and supplier.

(standards.iteh.ai)

[IEC 60893-3-3:2003+AMD1:2011 CSV](https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-3b04e04c81d5/iec-60893-3-3-2003amd1-2011-csv)

<https://standards.iteh.ai/catalog/standards/sist/6674a937-7253-4354-ae7e-3b04e04c81d5/iec-60893-3-3-2003amd1-2011-csv>

Table 5 – Property requirements

Property	Test method in IEC-60893-2 Subclause	Unit	Minimum or maximum	Nominal thickness of sheet to which test is applicable	Type		Remarks
					MF-CC-201	MF-GC-201	
Flexural strength	6-1	MPa	Minimum	≥1,5	70	240	
Charpy impact strength parallel to laminations	6-4-2	kJ/m <sup>2</sup>	Minimum	≥5	3-0	30	Conformance with the requirements for either the Charpy or Izod test constitutes, in this respect, conformance with this specification.
Izod impact strength parallel to laminations	5-4-3	kJ/m <sup>2</sup>	Minimum	≥5	2,5	34	
Electric strength at 90 °C in oil perpendicular to laminations	6-1	kV/mm	Minimum	≥3	See Table 6		
Breakdown voltage at 90 °C in oil parallel to laminations	6-1	kV	Minimum	>3	15	15	
Insulation resistance after immersion in water	6-3	MΩ	Minimum	All	1 x 10 <sup>4</sup>	1 x 10 <sup>2</sup>	
Proof tracking index	6-4	-	Minimum	≥3	500	500	
Flammability	7-2	Category		3	V-0	V-0	The small-scale laboratory test used in this standard for assigning a flammability category is primarily for monitoring consistency of production of laminates. The results so obtained should not in any circumstances be considered as an overall indication of the potential fire hazards presented by these laminates under actual conditions of use.
Water absorption	8-2	mg	Maximum	All	See Table 7		