

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Varistors for use in electronic equipment –
Part 2: Sectional specification for surge suppression varistors**

**Varistances utilisées dans les équipements électroniques –
Partie 2: Spécification intermédiaire pour varistances pour limitations de
surtensions transitoires**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2021 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 l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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

Tel.: +41 22 919 02 11
info@iec.ch
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables 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 It also gives information on projects, replaced and withdrawn publications.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

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

IEC Customer Service Centre - 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: sales@iec.ch.

IEC online collection - oc.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) 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 IEC

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

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC 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.

IEC Just Published - webstore.iec.ch/justpublished

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

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC online collection - oc.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Varistors for use in electronic equipment –
Part 2: Sectional specification for surge suppression varistors**

**Varistances utilisées dans les équipements électroniques –
Partie 2: Spécification intermédiaire pour varistances pour limitations de
surtensions transitoires**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 31.040.20

ISBN 978-2-8322-1045-7

**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.....	4
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	7
4 Preferred characteristics.....	7
4.1 Climatic categories	7
4.2 Voltage ratings.....	7
4.3 Derating for metal oxide varistors.....	9
4.3.1 General	9
4.3.2 Derating at increased operating temperatures	9
4.3.3 Maximum peak current derating characteristic	10
5 Test procedures, test severities and performance requirements	11
5.1 General.....	11
5.2 Visual examination and check of dimensions	11
5.3 Electrical tests	11
5.3.1 Varistor voltage	11
5.3.2 Leakage current.....	11
5.3.3 Capacitance	11
5.3.4 Voltage proof.....	11
5.3.5 Clamping voltage.....	11
5.3.6 Maximum peak current	11
5.3.7 Rated energy	11
5.4 Soldering test.....	12
5.4.1 Resistance to soldering heat.....	12
5.4.2 Solderability.....	12
5.5 Temperature and climate test.....	12
5.5.1 Damp heat, steady state	12
5.5.2 Endurance at upper category temperature	12
5.5.3 Rapid change of temperature.....	12
5.5.4 Climatic sequence	12
5.6 Robustness test.....	12
5.6.1 Robustness of terminations	12
5.6.2 Shock testing.....	12
5.6.3 Vibration.....	13
5.6.4 Solvent resistance of marking.....	13
5.7 Fire hazard (Needle flame test).....	13
6 Marking, packaging and ordering information.....	13
7 Detail specifications.....	13
7.1 General.....	13
7.2 Outline drawing and dimensions.....	13
7.3 Mounting.....	14
7.4 Ratings and characteristics	14
7.5 Marking.....	14
7.6 Ordering information	14
8 Quality assessment procedure.....	14
8.1 General.....	14

8.2	Primary stage of manufacturer	14
8.3	Structurally similar components	14
8.4	Qualification approval (QA)	15
8.4.1	Qualification approval (QA) procedures	15
8.4.2	Fixed sample size procedure	15
8.4.3	Test schedule	15
8.5	Quality conformance inspection	19
8.5.1	General	19
8.5.2	Formation of inspection lots	19
8.5.3	Test schedule	19
8.5.4	Assessment level	19
Annex X (informative) Cross-references to the previous edition of this document		21
Figure 1 – Typical temperature derating curve for maximum continuous voltage, surge current, energy absorption and average power dissipation		10
Figure 2 – Typical maximum peak current derating curve		10
Table 1 – Upper and lower category temperature and duration of the damp heat, steady state test		7
Table 2 – Preferred voltage ratings for disk type varistors		8
Table 3 – Preferred voltage ratings for SMD types		9
Table 4 – Test schedule for the qualification approval		16
Table 5 – Test schedule for the qualification approval		20
Table 6 – Periodic inspection		20
Table X.1 – Cross-references		21

INTERNATIONAL ELECTROTECHNICAL COMMISSION

VARISTORS FOR USE IN ELECTRONIC EQUIPMENT –**Part 2: Sectional specification for surge suppression varistors**

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.

IEC 61051-2 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment. It is an International Standard.

This second edition cancels and replaces the first edition published in 1991 and Amendment 1:2009. This edition constitutes a technical revision.

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

- a) revision for the structure in accordance with ISO/IEC Directives, Part 2) to the extent practicable, and for harmonizing with IEC 61051-1:2018;
- b) Annex X has been added for comparison with the previous edition;
- c) two lists of preferred voltage ratings for disk type and SMD type varistors have been added;
- d) permissible numbers of non-conforming items have been set to zero (zero fault) in the test schedule in 8.4.3.

The text of this International Standard is based on the following documents:

Draft	Report on voting
40/2877/FDIS	40/2895/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 61051 series, published under the general title *Varistors for use in electronic equipment*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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

VARISTORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 2: Sectional specification for surge suppression varistors

1 Scope

This part of IEC 61051 is a sectional specification and is applicable to metal oxide varistors with symmetrical voltage-current characteristics for use in electronic equipment connected to any AC or DC supply system.

These varistors are designed to protect electronic and other sensitive equipment from high transient surges. Varistors under the scope of this sectional specification are not intended to give primary protection against lightning surges.

These varistors have metallic connections and are intended to be mounted as through hole component or directly on to printed boards.

The object of this document is to prescribe preferred ratings and characteristics and to select from IEC 61051-1 the appropriate quality assessment procedures, tests and measuring methods, and to give general performance requirements for this type of varistors.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60062, *Marking codes for resistors and capacitors*

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-20, *Environmental testing – Part 2-20: Tests – Test Ta and Tb: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-45, *Basic environmental testing procedures – Part 2-45: Tests – Test XA and guidance: Immersion in cleaning solvents*

IEC 60695-11-5, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

IEC 61051-1:2018, *Varistors for use in electronic equipment – Part 1: Generic specification*

IEC 61051-2-2, *Varistors for use in electronic equipment – Part 2: Blank detail specification for zinc oxide surge suppression varistors. Assessment level E*

IEC 61193-2:2007, *Quality assessment systems – Part 2: Selection and use of sampling plans for inspection of electronic components and packages*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61051-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Preferred characteristics

4.1 Climatic categories

The varistors covered by this specification are classified into climatic categories according to the general rules given in IEC 60068-1.

The upper and lower category temperatures and the duration of the damp-heat steady-state test shall be selected from Table 1.

Table 1 – Upper and lower category temperature and duration of the damp heat, steady state test

Lower category temperature [°C]	–55, –40, –25, –10
Upper category temperature [°C]	+70, +85, +100, +105, +125, +155
Duration of damp heat, steady state test [days] ^a	4, 10, 21, 56
^a Not applicable to unprotected types which have a -/-/00 category.	

4.2 Voltage ratings

Table 2 and Table 3 provide preferred voltage ratings for disk type varistors and SMD type varistors.