INTERNATIONAL STANDARD

IEC 61051-1

QC 420000

Second edition 2007-04

Varistors for use in electronic equipment –

Part 1:
Generic specification
# CONTENTS

**FOREWORD**....................................................................................................................... 5

1 General .......................................................................................................................................... 7
   1.1 Scope ................................................................................................................................. 7
   1.2 Object ............................................................................................................................... 7
   1.3 Normative references ......................................................................................................... 7
2 Technical data .......................................................................................................................... 8
   2.1 Units, symbols and terminology ......................................................................................... 8
   2.2 Terms and definitions .......................................................................................................... 9
   2.3 Preferred values and characteristics .................................................................................. 9
   2.4 Marking ................................................................................................................................ 13
       2.4.1 General .................................................................................................................... 13
       2.4.2 Coding .................................................................................................................... 14
3 Quality assessment procedures ............................................................................................... 14
   3.1 Qualification approval/quality assessment systems ............................................................ 14
   3.2 Primary stage of manufacture ............................................................................................ 14
   3.3 Structurally similar components ......................................................................................... 14
   3.4 Qualification approval procedures ..................................................................................... 15
       3.5 Quality conformance inspection .................................................................................... 15
       3.5.1 Certified records of released lots .............................................................................. 15
       3.5.2 Delayed delivery ........................................................................................................ 15
       3.5.3 Release for delivery before the completion of Group B tests ...................................... 16
3.6 Alternative test methods ........................................................................................................ 16
3.7 Unchecked parameters .......................................................................................................... 16
4 Test and measurement procedures ......................................................................................... 16
   4.1 General ................................................................................................................................ 16
   4.2 Standard atmospheric conditions ....................................................................................... 16
       4.2.1 Standard atmospheric conditions for testing .............................................................. 16
       4.2.2 Recovery conditions .................................................................................................... 17
       4.2.3 Referee conditions ...................................................................................................... 17
       4.2.4 Reference conditions .................................................................................................. 17
   4.3 Drying and recovery ............................................................................................................ 17
   4.4 Visual examination and check of dimensions ...................................................................... 18
       4.4.1 Visual examination ...................................................................................................... 18
       4.4.2 Marking ...................................................................................................................... 18
       4.4.3 Dimensions (gauging) ............................................................................................... 18
       4.4.4 Dimensions (detail) ................................................................................................... 18
   4.5 Nominal varistor voltage or leakage current (not applicable to pulse measurements) ............. 18
       4.5.1 Test procedure ........................................................................................................... 18
       4.5.2 Measurement and requirements .................................................................................. 18
   4.6 Pulse current ....................................................................................................................... 18
       4.6.1 Standard pulse currents ............................................................................................. 19
       4.6.2 Tolerances ................................................................................................................ 19
       4.6.3 Measurement of the pulse current .............................................................................. 19
   4.7 Voltage under pulse condition ............................................................................................ 19
   4.8 Capacitance ........................................................................................................................ 20
4.9 Voltage proof (for insulated varistors only) .................................................. 20
  4.9.1 V-block method ..................................................................................... 20
  4.9.2 Metal ball method ................................................................................ 20
  4.9.3 Foil method ......................................................................................... 21
4.10 Insulation resistance (for insulated varistors only) ..................................... 21
  4.10.1 Test procedure ................................................................................... 21
  4.10.2 Measurement and requirements .......................................................... 21
4.11 Robustness of terminations ....................................................................... 22
  4.11.1 General .............................................................................................. 22
  4.11.2 Test Ua1 – Tensile ............................................................................. 22
  4.11.3 Test Ub – Bending (half of the number of terminations) ....................... 22
  4.11.4 Test Uc – Torsion (other half of the number of terminations) .......... 22
  4.11.5 Test Ud – Torque (for terminations with threaded studs or screws and for integral mounting devices) .............................................. 22
  4.11.6 Visual examination ............................................................................ 22
  4.11.7 Final measurement ............................................................................ 22
4.12 Resistance to soldering heat ...................................................................... 23
  4.12.1 Preconditioning ................................................................................ 23
  4.12.2 Test procedure .................................................................................. 23
  4.12.3 Recovery ........................................................................................... 23
  4.12.4 Final inspection, measurement and requirements ................................ 23
4.13 Solderability .............................................................................................. 23
  4.13.1 Test procedure .................................................................................. 23
  4.13.2 Final inspection, measurements and requirements ............................. 24
4.14 Rapid change of temperature ................................................................... 24
  4.14.1 Initial measurement .......................................................................... 24
  4.14.2 Test procedure .................................................................................. 24
  4.14.3 Final inspection, measurement and requirements ................................ 24
4.15 Bump ........................................................................................................ 25
  4.15.1 Initial measurement .......................................................................... 25
  4.15.2 Test procedure .................................................................................. 25
  4.15.3 Final inspection, measurement and requirements ................................ 25
4.16 Shock ........................................................................................................ 25
  4.16.1 Initial measurement .......................................................................... 25
  4.16.2 Test procedure .................................................................................. 25
  4.16.3 Final inspection, measurement and requirements ................................ 25
4.17 Vibration ................................................................................................... 25
  4.17.1 Initial measurement .......................................................................... 25
  4.17.2 Test procedure .................................................................................. 26
  4.17.3 Final inspection, measurement and requirements ................................ 26
4.18 Climatic sequence .................................................................................... 26
  4.18.1 Initial measurement .......................................................................... 26
  4.18.2 Dry heat ............................................................................................ 26
  4.18.3 Damp heat, cyclic, Test Db, first cycle .............................................. 26
  4.18.4 Cold .................................................................................................. 26
  4.18.5 Low air pressure ............................................................................... 26
  4.18.6 Damp heat, cyclic, Test Db, remaining cycles .................................... 26
  4.18.7 Final inspection, measurement and requirements ............................ 27
4.19 Damp heat, steady state .......................................................................... 27
4.19.1 Initial measurement ................................................................. 27
4.19.2 Test procedure ......................................................................... 27
4.19.3 Final inspection, measurement and requirements .................. 27

4.20 Fire hazard .................................................................................. 28

4.21 Endurance at upper category temperature .................................. 28

4.22 Solvent resistance of marking ...................................................... 29
  4.22.1 Test procedure .................................................................... 29
  4.22.2 Requirements .................................................................... 29

4.23 Component solvent resistance ..................................................... 29
  4.23.1 Initial measurements .......................................................... 29
  4.23.2 Test procedure .................................................................. 29
  4.23.3 Measurement and requirements ......................................... 30

4.24 Mounting (for surface mount varistors only) .............................. 30

Annex A (normative) Mounting for measurements of varistors .......... 32
Annex B (normative) Interpretation of sampling plans and procedures as described in IEC 60410 for use within the IEC quality assessment system for electronic components .... 34
Annex C (normative) Rules for the preparation of detail specifications for capacitors and resistors for electronic equipment ................. 35

Figure 1 – Shape of pulse current type 1 ........................................ 11
Figure 2 – Shape of pulse current type 2 .......................................... 12
Figure A.1 – Mounting methods for measurements ......................... 32
Figure A.2 – Mounting method for measurements of surface mount varistors ............................................................ 33

Table 1 – Standard atmospheric conditions .................................... 17
Table 2 – Accepted differences between specified and recorded pulse current values 19
Table 3 – Force for wire terminations .............................................. 22
Table 4 – Torque ............................................................................. 22
Table 5 – Number of cycles .............................................................. 27
INTERNATIONAL ELECTROTECHNICAL COMMISSION

VARISTORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 1: Generic specification

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.

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.

International Standard IEC 61051-1 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This second edition cancels and replaces the first edition published in 1991 and constitutes a minor revision related to tables, figures and references.

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

<table>
<thead>
<tr>
<th>CDV</th>
<th>Report on voting</th>
</tr>
</thead>
<tbody>
<tr>
<td>40/1775/CDV</td>
<td>40/1841/RVC</td>
</tr>
</tbody>
</table>

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

The QC number that appears on the front cover of this publication is the specification number in the IEC Quality Assessment System for Electronic Components (IECQ).
This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The list of all the parts of the IEC 61051 series, 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 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.

A bilingual version of this publication may be issued at a later date.
1 General

1.1 Scope

This part of IEC 61051 is applicable to varistors with symmetrical voltage-current characteristics for use in electronic equipment.

1.2 Object

The object of this standard is to establish standard terms, inspection procedures and methods of test for use in sectional and detail specifications for Qualification Approval and for Quality Assessment Systems for electronic components.

1.3 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 60027 (all parts), Letter symbols to be used in electrical technology

IEC 60050 (all parts), International Electrotechnical Vocabulary (IEV)


IEC 60062:2004, Marking codes for resistors and capacitors.


IEC 60294:1969, *Measurement of the dimensions of a cylindrical component having two axial terminations*

IEC 60410:1973, *Sampling plans and procedures for inspection by attributes*

IEC 60617:2007, *Graphical symbols for diagrams*


IEC 60717:1981, *Method for the determination of the space required by capacitors and resistors with unidirectional terminations*


IEC QC 001002-3, see http://www.iecq.org

ISO 1000:1992, *SI units and recommendations for the use of their multiples and of certain other units*

Amendment 1 (1998)