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Directly heated negative temperature coefficient thermistors - Part 1: Generic specification (IEC 60539-1:2002)

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EUROPEAN STANDARD

**EN 60539-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2002

ICS 31.040.30

English version

**Directly heated negative temperature coefficient thermistors**  
**Part 1: Generic specification**  
(IEC 60539-1:2002)

Thermistors à coefficient de température  
négatif à chauffage direct  
Partie 1: Spécification générique  
(CEI 60539-1:2002)

Direkt beheizte temperaturabhängige  
Widerstände mit negativem  
Temperaturkoeffizienten  
Teil 1: Fachgrundspezifikation  
(IEC 60539-1:2002)

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This European Standard was approved by CENELEC on 2002-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

**CENELEC**

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

The text of document 40/1193/FDIS, future edition 1 of IEC 60539-1, prepared by IEC TC 40, Capacitors and resistors for electronic equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60539-1 on 2002-03-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-03-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A, B and ZA are normative and annex C is informative.

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 60539-1:2002 was approved by CENELEC as a European Standard without any modification.

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## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60027	Series	Letter symbols to be used in electrical technology	HD 245	Series
IEC 60050	Series	International electrotechnical vocabulary	-	-
IEC 60062	1992	Marking codes for resistors and capacitors	EN 60062 + A11	1993 2001
IEC 60068-1 + corr. October + A1	1988 1988 1992	Environmental testing Part 1: General and guidance	EN 60068-1	1994
IEC 60068-2-1 A1 A2	1990 1993 1994	Part 2: Tests - Tests A: Cold	EN 60068-2-1 A1 A2	1993 1993 1994
IEC 60068-2-2 A1 A2	1974 1993 1994	Part 2: Tests - Test B: Dry heat	EN 60068-2-2 <sup>1)</sup> A1 A2	1993 1993 1994
IEC 60068-2-3 + A1	1969 1984	Part 2: Tests - Test Ca: Damp heat, steady state	HD 323.2.3 S2	1987
IEC 60068-2-6 + corr. March	1995 1995	Part 2: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	1995
IEC 60068-2-11	1981	Part 2: Tests - Test Ka: Salt mist	EN 60068-2-11	1999
IEC 60068-2-13	1983	Part 2: Tests - Test M: Low air pressure	EN 60068-2-13	1999
IEC 60068-2-14 + A1	1984 1986	Part 2: Tests - Test N: Change of temperature	EN 60068-2-14	1999
IEC 60068-2-17	1994	Part 2: Tests - Test Q: Sealing	EN 60068-2-17	1994
IEC 60068-2-20 + A2	1979 1987	Part 2: Tests - Test T: Soldering	HD 323.2.20 S3	1988

<sup>1)</sup> EN 60068-2-2 includes supplement A:1976 to IEC 60068-2-2.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-21 + corr. November + A1 A2 A3	1983 1991 1995 1991 1992	Part 2: Tests - Test U: Robustness of terminations and integral mounting devices	EN 60068-2-21 A2 A3	1997 1997 1997
IEC 60068-2-27	1987	Part 2: Tests - Test Ea and guidance: Shock	EN 60068-2-27	1993
IEC 60068-2-29 + corr.	1987	Part 2: Tests - Test Eb and guidance: Bump	EN 60068-2-29	1993
IEC 60068-2-30 + A1	1980 1985	Part 2: Tests - Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle)	EN 60068-2-30	1999
IEC 60068-2-45 A1	1980 1993	Part 2: Tests - Test Xa and guidance: Immersion in cleaning solvents	EN 60068-2-45 A1	1992 1993
IEC 60068-2-52	1984	Part 2: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)	HD 323.2.52 S1 <sup>2)</sup>	1987
IEC 60068-2-58	1989	Part 2: Tests - Test Td: Solderability, resistance to dissolution of metallization and to soldering heat of Surface Mounting Devices (SMD)	HD 323.2.58 S1 <sup>3)</sup>	1991
IEC 60249-2-4 + A2 A3 A4 IEC 60294	1987 1992 1993 1994 1969	Base materials for printed circuits Part 2: Specifications - Specification No. 4: Epoxide woven glass fabric copper-clad laminated sheet, general purpose grade Measurement of the dimensions of a cylindrical component having two axial terminations	EN 60249-2-4 + corr. March A3 + corr. March A4 -	1994 1994 1994 1994 1995 -
IEC 60410	1973	Sampling plans and procedures for inspection by attributes	-	-
IEC 60617	Series	Graphical symbols for diagrams	-	-
IEC 60717	1981	Method for the determination of the space required by capacitors and resistors with unidirectional terminations	-	-
IEC 61760-1	1998	Surface mounting technology Part 1: Standard method for the specification of surface mounting components (SMDs)	EN 61760-1	1998

<sup>2)</sup> HD 323.2.52 S1 is superseded by EN 60068-2-52:1996, which is based on IEC 60068-2-52:1996.

<sup>3)</sup> HD 323.2.58 S1 is superseded by EN 60068-2-58:1999, which is based on IEC 60068-2-58:1999.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC QC 001002-3	1998	IEC Quality Assessment System for Electronic Components (IECQ) - Basic rules Part 3: Approval procedures	-	-
ISO 1000	1992	SI units and recommendations for the use of their multiples and of certain other units	-	-

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# INTERNATIONAL STANDARD

**IEC**  
**60539-1**

QC 430000

First edition  
2002-02

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## Directly heated negative temperature coefficient thermistors –

### Part 1: Generic specification

**iTeh STANDARD PREVIEW**  
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*Thermistors à coefficient de température négatif  
à chauffage direct –*

<https://standards.iteh.ai/catalog/standards/sist/97f8c62d-d46d-4c2f-a980-592ebd353a58/sist-en-60539-1-2003>

*Partie 1:  
Spécification générique*

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International Electrotechnical Commission  
Международная Электротехническая Комиссия

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# INTERNATIONAL ELECTROTECHNICAL COMMISSION

## DIRECTLY HEATED NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS –

### Part 1: Generic specification

#### FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60539-1 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This edition cancels and replaces the first edition of IEC 60539 published in 1976.

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

FDIS	Report on voting
40/1193/FDIS	40/1249/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.

Annexes A, B and C form an integral part of this standard.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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

# DIRECTLY HEATED NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS –

## Part 1: Generic specification

### 1 General

#### 1.1 Scope

This part of IEC 60539 is applicable to directly heated negative temperature coefficient thermistors, typically made from transition metal oxide materials with semiconducting properties.

It establishes standard terms, inspection procedures and methods of test for use in sectional and detail specifications of electronic components for quality assessment or any other purpose.

#### 1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60539. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60539 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

NOTE In the case of IEC 60068 standards, use the referenced edition.

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

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

IEC 60062:1992, *Marking codes for resistors and capacitors*

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*  
Amendment 1 (1992)

IEC 60068-2-1:1990, *Environmental testing – Part 2: Tests – Tests A: Cold*  
Amendment 1 (1993)  
Amendment 2 (1994)

IEC 60068-2-2:1974, *Environmental testing – Part 2: Tests – Tests B: Dry Heat*  
Amendment 1 (1993)  
Amendment 2 (1994)

IEC 60068-2-3:1969, *Environmental testing – Part 2: Tests – Test Ca: Damp heat, steady state* (incorporating Amendment 1 (1984))

IEC 60068-2-6:1995, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-11:1981, *Environmental testing – Part 2: Tests – Test Ka: Salt mist*

IEC 60068-2-13:1983, *Environmental testing – Part 2: Tests – Test M: Low air pressure*

- IEC 60068-2-14:1984, *Environmental testing – Part 2: Tests – Test N: Change of temperature*  
Amendment 1 (1986)
- IEC 60068-2-17:1994, *Environmental testing – Part 2: Tests – Test Q: Sealing*
- IEC 60068-2-20:1979, *Environmental testing – Part 2: Tests – Test T: Soldering*  
Amendment 2 (1987)
- IEC 60068-2-21:1983, *Environmental testing – Part 2: Tests – Test U: Robustness of terminations and integral mounting devices*  
Amendment 2 (1991)  
Amendment 3 (1992)
- IEC 60068-2-27:1987, *Environmental testing – Part 2: Tests – Test Ea and guidance: Shock*
- IEC 60068-2-29:1987, *Environmental testing – Part 2: Tests – Test Eb and guidance: Bump*
- IEC 60068-2-30:1980, *Environmental testing – Part 2: Tests – Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)*  
Amendment 1 (1985)
- IEC 60068-2-45:1980, *Environmental testing – Part 2: Tests – Test XA and guidance: Immersion in cleaning solvents*  
Amendment 1 (1993)
- IEC 60068-2-52:1984, *Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*
- IEC 60068-2-58:1989, *Environmental testing – Part 2: Tests – Test Td: Solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)*
- IEC 60249-2-4:1987, *Base materials for printed circuits – Part 2: Specifications – Specification No. 4: Epoxide woven glass fabric copper-clad laminated sheet, general purpose grade*  
Amendment 3 (1993)  
Amendment 4 (1994)
- 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 (all parts), *Graphical symbols for diagrams*
- IEC 60717:1981, *Method for determination of the space required by capacitors and resistors with unidirectional terminations*
- IEC 61760-1:1998, *Surface mounting technology – Part 1: Standard method for the specification of surface mounting components (SMDs)*
- IEC QC 001002-3:1998, *IEC Quality Assessment System for Electronic Components (IECQ) – Rules of procedure – Part 3: Approval procedures*
- ISO 1 000:1992, *SI units and recommendations for the use of their multiples and of certain other units*

## 2 Technical data

### 2.1 Units, symbols and terminology

Units, graphical symbols, letter symbols and terminology should, whenever possible, be taken from the following publications:

- IEC 60027
- IEC 60050
- IEC 60617
- ISO 1000

When further items are required they should be derived in accordance with the principles of the publications listed above.

### 2.2 Definitions

For the purpose of this part of IEC 60539, the following definitions apply:

#### 2.2.1

##### type

products having similar design features manufactured by the same techniques and falling within the manufacturer's usual range of ratings for these products

NOTE 1 Mounting accessories are ignored, provided they have no significant effect on the test results.

NOTE 2 Ratings cover the combination of:

- electrical ratings;
- sizes;
- climatic category.

NOTE 3 The limits of the range of ratings shall be given in the detail specification.

#### 2.2.2

##### style

variation within a type having specific nominal dimensions and characteristics

#### 2.2.3

##### thermistor

thermally sensitive semiconducting resistor whose primary function is to exhibit an important change in electrical resistance with a change in body temperature

#### 2.2.4

##### negative temperature coefficient thermistor (NTC)

thermistor in which the resistance decreases with increasing temperature

#### 2.2.5

##### directly heated negative temperature coefficient thermistor

it obtains its resistance variation by the changes of physical conditions such as current through the thermistor, ambient temperature, humidity, wind velocity, gas, etc.

#### 2.2.6

##### indirectly heated negative temperature coefficient thermistor

it obtains its resistance variation primarily by the change of temperature of the thermistor, due to the change of a current through a separate heater which is in close contact with, but electrically insulated from, the thermistor element

NOTE Temperature of the thermistor can also be changed by the changes of physical conditions such as current through the thermistor element itself, ambient temperature, humidity, wind velocity, gas, etc.