

Polymeric thermistors — Directly heated positive step function temperature coefficient —

Part 1: Generic specification

ICS 31.040.30

National foreword

This British Standard is the UK implementation of EN 62319-1:2005. It is identical with IEC 62319-1:2005, incorporating corrigendum March 2009.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum March 2009 is indicated in the text by **AC1** ~~AC1~~.

The UK participation in its preparation was entrusted by Technical Committee EPL/40X, Capacitors and resistors for electronic equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

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**Polymeric thermistors -
Directly heated positive step function temperature coefficient
Part 1: Generic specification
(IEC 62319-1:2005)**

Thermistances polymères -
Coefficient de température positif
de fonction échelon à chauffage direct
Partie 1: Spécification générique
(CEI 62319-1:2005)

Temperaturabhängige Widerstände
aus Polymerwerkstoffen -
Direkt geheizte temperaturabhängige
Widerstände mit positivem
Temperaturkoeffizienten
Teil 1: Fachgrundspezifikation
(IEC 62319-1:2005)

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CENELEC

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

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Foreword

The text of document 40/1505/FDIS, future edition 1 of IEC 62319-1, 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 62319-1 on 2005-02-01.

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) | 2005-12-01 |
| – latest date by which the national standards conflicting
with the EN have to be withdrawn | (dow) | 2008-02-01 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62319-1:2005 was approved by CENELEC as a European Standard without any modification.

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POLYMERIC THERMISTORS – DIRECTLY HEATED POSITIVE STEP FUNCTION TEMPERATURE COEFFICIENT –

Part 1: Generic specification

1 General

1.1 Scope

This part of IEC 62319 prescribes terms and methods of test for polymeric positive temperature coefficient thermistors, insulated and non-insulated types, typically intended for use in current limiting and overcurrent protection applications.

It establishes standard terms, inspection procedures and methods of test for use in detail specifications for Qualification Approval and for Quality Assessment Systems for electronic components.

1.2 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 60027-1: *Letter symbols to be used in electrical technology – Part 1: General*

IEC 60050: *International Electrotechnical Vocabulary*

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

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

IEC 60068-2-14: *Environmental testing – Part 2: Tests – Test N: Change of temperature*

IEC 60068-2-20: *Environmental testing – Part 2: Tests – Test T: Soldering*

IEC 60068-2-21: *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

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

IEC 60068-2-29: *Environmental testing – Part 2: Tests – Test Eb and guidance: Bump*

IEC 60068-2-45: *Environmental testing – Part 2: Tests – Test XA and guidance: Immersion in cleaning solvents*

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

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

IEC 60617-DB: 2001¹ *Graphical symbols for diagrams*

IECQ 001003: *IEC Quality Assessment System for Electronic Components – Guidance documents*

IECQ 001002-3: *IEC Quality Assessment System for Electronic Components – Rules of Procedure – Part 3: Approval procedures*

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

2 Technical data

2.1 Units and symbols

Units, graphical symbols, letter symbols and terminology shall, whenever possible, be taken from the following documents:

IEC 60027

IEC 60050

IEC 60617

ISO 1000

The following subclauses contain additional terminology applicable to thermistors.

Where further items are required they shall be derived in accordance with the principles of the documents listed above.

2.2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.2.1

thermistor

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

2.2.2

positive temperature coefficient thermistor

thermistor in which the resistance increases with increasing temperature throughout the useful part of its characteristic. The PTC thermistors covered in this specification typically exhibit a very sharp increase in resistance over a narrow temperature range

2.2.3

directly heated positive temperature coefficient thermistor

thermistor in which the change in temperature is obtained either by the flow of current through the thermo-sensitive element, or by a change in ambient temperature, or by a combination of both of these means

¹ "DB" refers to the IEC on-line database.

2.2.4

zero power resistance

R_T

value of the resistance of a PTC thermistor, at a given temperature, under such conditions that the change in resistance due to the internal generation of heat is negligible with respect to the total error of measurement

NOTE Any resistance value of a PTC thermistor is dependent on the value and the mode of the applied voltage (AC or DC).

2.2.5

nominal zero power resistance

R_n

zero power resistance used as a reference value for which the following conditions should be given in the detail specification:

- a) reference temperature, preferably 25 °C
- b) applied voltage (DC or AC)

2.2.6

resistance/temperature characteristics

relationship between the zero power resistance of a thermistor and the temperature of the thermosensitive element when measured under specified reference conditions

2.2.7

upper category temperature

UCT

maximum ambient operating temperature of the thermistor

2.2.8

lower category temperature

LCT

minimum ambient operating temperature of the thermistor

2.2.9

trip event

event of rapid increasing resistance of the thermistor in response to an overcurrent surge

2.2.10

minimum initial resistance

R_{min}

minimum resistance of the thermistor

2.2.11

maximum initial resistance

R_{max}

maximum resistance of the thermistor before it's initial trip event

2.2.12

maximum resistance 1 h after tripping

R_{1max}

for leaded thermistors the maximum resistance of the thermistor 1 h after it's first trip event;
for surface mount thermistors, the maximum resistance of the thermistor 1 h after reflow

2.2.13

maximum voltage

U_{max}

maximum AC or DC voltage which may be applied to the thermistor

2.2.14**operating temperature range at maximum voltage**

range of ambient temperatures at which the thermistor can operate at the maximum voltage

2.2.15**isolation voltage (applicable only to insulated thermistors)**

maximum peak voltage which may be applied under continuous operating conditions between any of the thermistor terminations and any conducting surface

2.2.16**maximum current** $I_{\max}$

value of current for the operating temperature range, which should not be exceeded

2.2.17**residual current** I_{res}

value of current in the tripped thermistor at a specified ambient temperature (preferably 25 °C) under steady state conditions; the applied voltage is the maximum voltage unless otherwise specified

2.2.18**trip current** I_t

lowest current which will cause the thermistor to trip to its high resistance state at a specified temperature (preferably 25 °C) and within a time specified in the detail specification

2.2.19**hold current** I_h

the maximum current at specified ambient temperature, preferably 25 °C, which will not cause the trip event

2.2.20**fault current** I_{fault}

current used when measuring time to trip

2.2.21**power dissipation** P_d

product of the current flowing through a device and the voltage across it, under steady state conditions; the applied voltage is the maximum voltage unless otherwise specified

2.2.22**time-to-trip** t_{trip}

under specified ambient conditions, starting from the time the fault current (I_{fault}) is applied, the time-to-trip is the time required for a device to switch into the tripped state

2.2.23**insulated thermistors**

thermistors capable of meeting the requirements of the insulation resistance and voltage proof tests when specified in the test schedule

2.3 Preferred values

2.3.1 Climatic categories

The thermistors covered by this specification are classified into climatic categories according to the general rules given in the annex to IEC 60068-1. The detail specification prescribes the appropriate category.

AC1 2.3.2

Void AC1

2.3.3 Shock test severities

Test severities given in detail specifications shall preferably be the following:

Test Ea (IEC 60068-2-27)

Pulse shape: Half sine

Acceleration: 500 m/s²

Pulse duration: 11 ms.

Severity: 3 successive shocks in each axis direction per specimen. Separate specimens to be used for each axis (6 shocks total per specimen).

NOTE The shock and bump tests are normally specified as alternatives.

2.3.4 Vibration severities

Test severities given in the detail specifications shall preferably be selected from the following:

Test Fc (IEC 60068-2-6)

Frequency range: 10 Hz to 55 Hz or 10 Hz to 500 Hz

Amplitude: 0,75 mm or AC1100 m/s² AC1 (whichever is the less severe)

Sweep endurance: Total duration 6 h.

Thermistors shall be mounted by their normal means, in such a manner that there shall be no parasitic vibration. During vibration testing there shall be no interruption in electrical continuity greater than 0,5 ms.

2.4 Marking

2.4.1 General

The following shall be clearly marked on the thermistor in the following order of precedence as space permits:

- a) values of the primary characteristics appropriate to the application of the thermistor to be specified in the detail specification. When these values are coded (including colour coding), details shall be given in the detail specification or type designation;
- b) manufacturer's name and/or trade mark;
- c) date of manufacture or date code;
- d) the number of the detail specification and style.

The package containing the thermistors shall be clearly marked with all the information listed above.

Any additional marking shall be so applied that no confusion can arise.

3 Quality assessment procedures

3.1 General

When these documents are being used for the purposes of a full quality assessment system such as the IEC Quality Assessment System for Electronic Components (IECQ), compliance with 3.5 is required.

When these documents are used outside such quality assessment systems for purposes such as design proving or type testing, the procedures and requirements of 3.5.1 and 3.5.3 b) may be used, but if used, the test and parts of tests shall be applied in the order given in the test schedule.

Before thermistors can be qualified according to the procedures of this clause, the manufacturer shall obtain the approval of his organisation in accordance with the provisions of IECQ 001002-3.

The method for the approval of thermistors of assessed quality given in 3.5 is qualification approval according to the provisions of Clause 3 of IECQ 001002-3.

3.1.1 Applicability of qualification approval

Qualification approval is appropriate for a standard range of thermistors manufactured to similar design and production processes and conforming to a published detail specification.

The programme of tests defined in the detail specification for the appropriate assessment and performance levels applies directly to the subfamily of thermistors to be qualified, as prescribed in 3.5 and the relevant blank detail specification.

3.2 Primary stage of manufacture

The primary stage of manufacture is defined as the initial compounding process of the ingredients.