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Polymeric thermistors – Directly heated positive step function temperature coefficient –

Part 1-1: Blank detail specification – Current limiting application

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

POLYMERIC THERMISTORS – DIRECTLY HEATED POSITIVE STEP FUNCTION TEMPERATURE COEFFICIENT –

Part 1-1: Blank detail specification – Current limiting application

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International Standard IEC 62319-1-1 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

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

FDIS	Report on voting
40/1506/FDIS	40/1535/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.

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- withdrawn;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.

POLYMERIC THERMISTORS – DIRECTLY HEATED POSITIVE STEP FUNCTION TEMPERATURE COEFFICIENT –

Part 1-1: Blank detail specification – Current limiting application

INTRODUCTION

Blank detail specification

A blank detail specification is a supplementary document to the generic specification and contains requirements for style and layout and minimum content of detail specifications. Detail specifications not complying with these requirements shall not be considered as being in accordance with IEC specifications nor shall they so be described.

In the preparation of detail specifications, the content of 4.1 of the generic specification shall be taken into account.

The numbers between brackets on the first page correspond to the following information which shall be inserted in the position indicated.

Identification of the detail specification

[1] The “International Electrotechnical Commission” or the National Organisation under whose authority the detail specification is drafted.

[2] The IEC or National Standards number of the detail specification, date of issue and any other information required by the national system.

[3] The number and issue number of the IEC or national generic specification.

[4] The IEC number of the blank detail specification.

Identification of the thermistor

[5] A short description of the type of thermistor.

[6] Information on typical construction (if applicable).

NOTE When the thermistor is not designed for use on printed boards, this should be stated in the detail specification in this position.

[7] Outline drawing with main dimensions which are important for the interchangeability and/or reference to the national or international documents for outlines. Alternatively, this drawing may be given in the annex to the detail specification.

[8] Application or group of applications covered and/or assessment level.

[9] Reference data on the most important properties, to allow comparison between the various thermistor types.

[1]	IEC 62319-1-1-XXX QC XXXXXX-XXX [2]
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH: [3]	IEC 62319-1-1 QC XXXXXX [4]
	POLYMERIC POSITIVE TEMPERATURE COEFFICIENT THERMISTORS FOR CURRENT LIMITING APPLICATION [5]
Outline drawing: (see Table 1) (... angle projection) [7]	[6]
(Other shapes are permitted within the dimensions given)	Assessment level(s): EZ [8]
NOTE For [1] to [9] see preceding page.	

Information on the availability of components qualified to this detail specification is given in IEC QC 001005. [9]

1 General data

1.1 Method(s) of mounting (to be inserted)

See 4.9 of IEC 62319-1.

1.2 Dimensions

All dimensions are in millimetres or inches and millimetres; it shall be stated which dimensions are suitable for gauging.

Dimensional drawing(s) shall be given in the detail specification. If necessary, the dimensions may be listed in tabular form with reference to styles or codes.

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 60068, *Environmental testing*

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

IEC 62319-1; *Polymeric thermistors – Driectly heated positive step function temperature coefficient – Part 1: Generic specification* [1]

[1] To be published.

1.4 Coating

The detail specification shall state (if applicable):

a) whether the coating is insulating or non-insulating;

b) the material;

c) the colour, if applicable.

1.5 Terminations

The detail specification shall state whether the terminations are suitable for soldering. If they are not, suitable methods of connection shall be stated for example: welding, clamping or crimping.

1.6 Flammability

The detail specification shall state whether the thermistor is actively or passively flammable, if applicable.

1.7 Resistance to solvents

The detail specification shall state whether the coating and the marking of the thermistor are solvent resistant, if applicable.

1.8 Packaging

The detail specification shall give the following information (if required):

a) whether bulk packed or taped and if taped, drawing or references;

b) the dimensions of the immediate packaging and the number of thermistors packed;

c) the dimensions of the outer package and the number of immediate packages;

d) methods of disposal of the packaging material.

1.9 Electrical data/ratings and characteristics

The detail specification shall give the units and tolerances or limiting values for the following parameters, if applicable. If necessary, electrical data may be listed in tabular form, with reference to style and codes.

Operating temperature range

Maximum voltage (U_{max})

Zero power resistance (R_t)

Isolation voltage (insulated thermistors only)

Insulation resistance (insulated thermistors only)

Trip current (I_t)

Hold current (I_h)

Residual current at U_{max} (I_{res})

Maximum current (I_{max})

Time-to-trip (t_{trip})

Fault current (I_{fault})

Power dissipation (P_d)

1.10 Marking

The marking of the thermistors and package containing the thermistors shall be in accordance with the requirements of 2.4 of the generic specification IEC 62319-1.

The details of the marking of the thermistors and package containing the thermistors shall be given in full in the detail specification.

1.11 Ordering information

Orders for thermistors covered by this specification shall contain the number and issue reference of the detail specification.

1.12 **Additional information** (not for inspection purposes)

1.13 Additional or increased severities or requirements to those specified in the generic specification

NOTE Additions or increased requirements should be specified only when essential.

2 Inspection requirements

2.1 Procedures

2.1.1 For qualification approval, the procedures shall be in accordance with the generic specification IEC 62319-1.

2.1.2 For quality conformance inspection, the test schedules (Tables 1 and 2) include sampling, periodicity, severities and requirements. The formation of inspection lots is covered by 3.5.7 of the generic specification.

The following list applies to the test schedules developed in Tables 1 and 2:

1) Subclause numbers of tests and performance requirements refer to the generic specification IEC 62319-1 and Clause 1 of this specification.
2) Number to be tested: sample size as directly allotted to the code letter for *IL* in Table IIA of IEC 60410 (single sampling plan for normal inspection).
3) In these tables: *p* is the periodicity (in months);
   n is the sample size;
   c is the acceptance criteria (permitted number of non-conforming items);
   D indicates a destructive test;
   ND indicates a non-destructive test;
   IL is the inspection level.
4) The temperature at which the zero power resistance shall be measured is the temperature specified in the detail specification. This temperature shall be stated, where required, in the test schedule.
5) The specimens used for this group may, at the discretion of the manufacturer, be used for any subsequent group which is identified as being “destructive”.
6) The soldering tests (solderability and resistance to solder heat) shall only be applied where the thermistor has terminations which are appropriate for soldering.
7) Where the terminations are stated to be suitable for printed wiring applications, the appropriate test conditions in IEC 60068 shall apply.
8) The thermistors shall be mounted by their normal means.
9) Vibration, bump, and shock tests are only conducted if required in the detail specification. The bump test and the shock test are alternatives.

10) 100 % production testing shall be followed by re-inspection by sampling in order to monitor outgoing quality level by non-conforming items per million (10^{-6}). The sampling level shall be established by the manufacturer. For the calculation of x 10^{-6} values, any parametric failure shall be counted as a non-conforming item. If one or more non-conforming items occur in a sample, this lot shall be rejected.

11) The number of cycles for a high breaking current device (I_{max} >100 A) in the cycle life test shall be specified in the detail specification.

12) The duration for a high breaking current device (I_{max} >100 A) in the trip endurance test shall be specified in the detail specification.

13) The subgroup B2 tests are only conducted if required in the detail specification.

Table 1 – Test schedule for quality conformance inspection: lot-by-lot

Subclause number and test (see list item 1)	**D or ND** 3)	**Conditions of test** (see list item 1)	***IL*** (see list item 3)	***n*** (see list item 3)	***c*** (see list item 3)	**Performance requirements** (see list item 1)
GROUP A INSPECTION (lot-by-lot)						
Subgroup A0	ND	100 % of production followed by sampling re-inspection (see list item 10)	S-4	2)	0	
4.4 Zero power resistance		Temperature: ... °C				$R_{min} < R < R_{max}$
Subgroup A1	ND		S-4	2)	0	
4.3.1 Visual examination						As in 4.3.1
Subgroup A2	ND		S-3	2)	0	
4.3.2 Marking						As in 4.3.2
4.3.3 Dimensions (detail)						As in 4.3.3
GROUP B INSPECTION (lot-by-lot)						
Subgroup B1	D		S-2	2)	0	
4.15 Hold Current		Current: ... A Time ≥ ... min Temperature: ... °C				Voltage across PTC ≤ ... V
4.17 Time-to-trip		Applied voltage: ... V Fault current: ... A Temperature: ... °C				Time: ≤ ... s
Subgroup B2 (see list item 13)	D		S-2	2)	0	
4.8.1 Solderability (see list item 6)		Method: ...				The terminations shall be uniformly tinned.
4.6 Voltage proof (insulated types only)		Method: ... Applied voltage: ... V				As in 4.6.4

Table 2 – Test schedule for quality conformance inspection: periodic

Subclause number and test (see list item 1)	D or ND 3)	Conditions of test (see list item 1)	Sample size and acceptance criterion (see list item 3)			Performance requirements (see list item 1)
			p	*n*	*c*	
GROUP C INSPECTION (periodic)						
Subgroup C1A	D		24	5	0	
Part of sample (5 with lowest resistance)						
4.14 Trip current		Current: ... A Time:≤ ... min Temperature: ... °C				Voltage across PTC ≥ ... V
4.16 Residual current and power dissipa-tion		Voltage: ... V Time ≥ ... min Temperature:... °C				Residual current ≤ ... mA Power dissipation ≤ ... W
Subgroup C1B	D		24	5	0	
Other part of sample (5 with highest resistance)						
4.15 Hold current		Current: ... A Time: ≥ ... min Temperature: ... °C				Voltage across PTC ≤ ... V
Power dissipation and hold current (for >100 A types only)		Time: ≥ ... min Temperature: ... °C				Power dissipation ≤ ... W
Subgroups C1A and C1B	D		24	5	0	
Combined sample of specimens of Sub-groups C1A and C1B						
4.6 Voltage proof (insulated types only)		Method: ... Applied voltage: ... V				As in 4.6.4
Subgroup C2A	D		24	5	0	
Part of sample						
4.8.2 Resistance to soldering heat (see list item 6)		Solder temperature: 260 °C Time: ... s				
		Zero power resistance				See 4.4, with $\Delta R/R$: from .. % to .. %
		Visual examination				As in 4.3.1
4.7 Robustness of terminations		As appropriate				
		Final measurements:				
		Visual examination				As in 4.3.1
		Hold current (4.15):				
		Current : ... A Time: ≥ ... min Temperature ... °C				Voltage across PTC ≤ ... V
		Time-to-trip (4.17):				Time ≤ ... s
		Applied voltage: ... V Fault current: ... A Temperature: ... °C				

Table 2 – Test schedule for quality conformance inspection: periodic *(continued)*

Clause/subclause number and test (see list item 1)	D or ND 3)	Conditions of test (see list item 1)	Sample size and acceptance criterion (see list item 3)			Performance requirements (see list item 1)
			p	*n*	*c*	
Subgroup C2B **Other part of sample** (see list item 9)	D		24	5	0	
B.1 Vibration		Frequency range = ... Hz to ...Hz Amplitude: ... mm, or acceleration: ... m/s^2 Sweep endurance: .. h Number of sweep cycles: ...				
		Visual examination				As in 4.3.1
B.2 Bump (or shock)		Acceleration: ... m/s^2 Number of bumps: ...				
		Visual examination				As in 4.3.1
B.3 Shock (or bump)		Pulse shape: halfsine Acceleration: ... m/s^2 Pulse duration: ... ms				
		Final measurements:				
		Visual examination				As in 4.3.1
		Hold current (4.15):				
		Current: ... A Time ≥ ... min Temperature: ... °C				Voltage across PTC ≤ ... V
		Time-to-trip (4.17):				
		Applied voltage: ... V Fault current: ... A Temperature: ... °C				Time ≤ ... s
Subgroup C3	D		24	10	0	
4.10 Rapid change of temperature		T_A = LCT T_B = UCT				
		Final measurements:				
		Visual examination				As in 4.3.1
		Hold current (4.15):				
		Current: ... A Time ≥ ... min Temperature: ... °C				Voltage across PTC ≤ ... V
		Time-to-trip (4.17):				
		Applied voltage: ... V Fault current: ... A Temperature: ... °C				Time ≤ ... s
Subgroup C4	ND		24	10	0	
4.3.3 Dimensions (detail) (see list item 5)		The detail specification shall define dimensions to be measured				As specified in the detail specification

Table 2 – Test schedule for quality conformance inspection: periodic *(continued)*

Subclause number and test (see list item 1)	D or ND 3)	Conditions of test (see list item 1)	Sample size and acceptance criterion (see list item 3)			Performance requirements (see list item 1)
			p	*n*	*c*	
GROUP D INSPECTION (periodic)						
Subgroup D1	D		24	10	0	
4.12 Cycle life		The detail specification shall describe the method of mounting "Time on": ... s "Time off": ... s Test a) for > 100 A types: Applied voltage: ... V Applied current: ... A Temperature ... °C Number of cycles: ... (see list item 11) Test b) for ≤ 100 A types: Applied voltage: ... V Applied current: ... A Temperature ... °C Number of cycles: 10 Followed by, Applied voltage: ... V Applied current: ... A Temperature ... °C Number of cycles: 6 000 Final measurements: Time-to-trip (4.17): Applied voltage: ... V Fault current: ... A Temperature ... °C Power dissipation (4.16): Voltage: ... V Time ≥ ... min Temperature: ... °C Insulation resistance (4.5): (insulated types only) Method: ... Applied voltage: ... V				Zero power resistance (4.4): $\Delta R/R$: from .. % to .. % (after 10 cycles) Time ≤ ... s Power dissipation ≤ ... W Insulation resistance: ≥ ... MΩ
Subgroup D2	D		24	10	0	
4.13 Trip endurance		The detail specification shall describe the method of mounting Test a) for > 100 A types: Applied voltage:... V Temperature ... °C Duration: ... h (see list item 12) Test b) for ≤ 100 A types: Applied voltage:... V Temperature ... °C Duration: 1 000 h				

Table 2 – Test schedule for quality conformance inspection: periodic *(continued)*

Subclause number and test (see list item 1)	D or ND 3)	Conditions of test (see list item 1)	Sample size and acceptance criterion (see list item 3)			Performance requirements (see list item 1)
			p	*n*	*c*	
		Final measurements: Time-to-trip (4.17): Applied voltage: ... V Fault current: ... A Temperature ... °C Power dissipation (4.16): Voltage: ... V Time ≥ ... min Temperature: ... °C Insulation resistance (4.5): (insulated types only) Method: ... Applied voltage: ... V				Time ≤ ... s Power dissipation ≤ ... W Insulation resistance: ≥ ... MΩ
Subgroup D3 4.11 Climatic sequence: Dry heat Damp heat (cyclic – first 24 h cycle) Cold Damp heat (cyclic – second 24 h cycle)	D	Temperature: ... °C Time: 16 h Upper temperature: ... °C Relative humidity: ... % Temperature: ... °C Time: 2 h Upper temperature: ... °C Relative humidity: ... % Final measurements: Time-to-trip (4.17): Applied voltage: ... V Fault current: ... A Temperature: ... °C Power dissipation (4.16): Voltage: ... V Time ≥ ... min Temperature: ... °C Insulation resistance (4.5): (insulated types only) Method: ... Applied voltage: ... V Voltage proof (4.6): (insulated types only) Method: ... Applied voltage: ... V	24	10	0	No visible damage and marking shall be legible Time ≤ ... s Power dissipation ≤ ... W Insulation resistance: ≥ ... MΩ No breakdown or flashover

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