

<p>Specification available from:</p> <p>Österreichischer Verband für Elektrotechnik (OVE) Eschenbachgasse 9 A-1010 VIENNA</p>	<p>IEC 60738-1-4 – AT0002 Issue 1 / 2020-06</p> <p>QC 440004</p>
<p>Electronic Components of assessed quality in accordance with:</p> <p>IEC 60738-1: 2009-07</p>	<p>IEC 60738-1-4: 2008-02</p> <p>QC 440004</p> <p>Directly heated positive step-function temperature coefficient thermistors for sensing application (Limit temperature sensors)</p>
	<p>Modified ferro-electric ceramic material parts for over-temperature protection</p> <p>Assessment level: EZ</p>

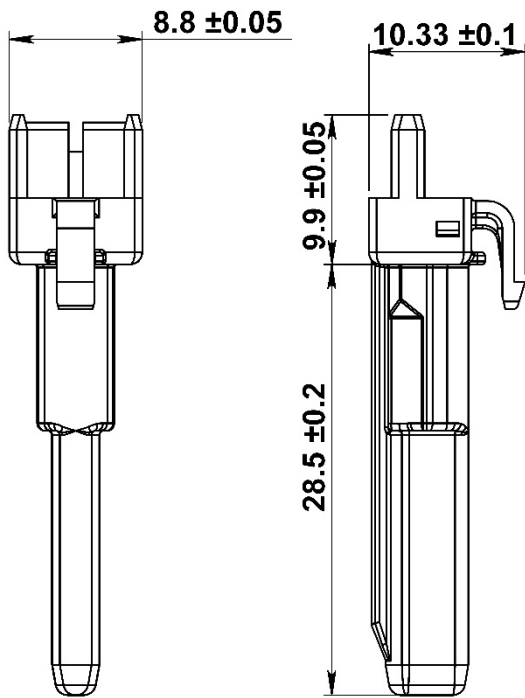
Information on the availability of components  
qualified to this detail specification is given in  
the Register of Approvals

## 1 GENERAL DATA

### 1.1 Method of mounting

PTCs are equipped with flat contacts for clamp contacting. They are placed between winding coil of electro-motors

### 1.2 Dimensions



All dimensions in mm

### 1.3 Coating

Thermistor is insulated by injection-moulded plastic housing

### 1.4 Terminations

The terminations are suitable for clamp contacting

### 1.5 Flammability

Not defined

### 1.6 Resistance to solvents

Not applicable.

### 1.7 Packaging

Bulk

### 1.8 Electrical data / ratings and characteristics

Parameter	Symbol	min.	nom.	max.	Unit
Operating voltage ( $I_{inrush} < 100mA$ )	$V_{op}$			15	VDC
Resistance @ 25°C *) ( $T_T$ )	$R_T$	30	65	100	$\Omega$
Resistance @ 150°C *) ( $T_{NF}-5K$ )	$R_{150}$			550	$\Omega$
Resistance @ 160°C *) ( $T_{NF}+5K$ )	$R_{160}$	1330			$\Omega$
Resistance @ 170°C *) ( $T_{NF}+15K$ )	$R_{170}$	4000			$\Omega$
Thermal response time **)	$t_a$			30	s
Insulation resistance	$R_{ins}$	500			M $\Omega$
Insulation voltage (AC)	$V_{ins}$	4.0			kV
Lower / upper category temperature	LCT/UCT	0		150	°C
Operating temperature ( $V \leq V_{opmax}$ ) ***)	$T_{op}$	0		170	°C

\*) In order to limit self heating effects, the electrical power during measurement should be less than 1mW

\*\*) Customer specific method: Device under test is changed from air with  $T_1=25\pm 2^\circ C$  to an oil bath (immersion depth 12 $\pm$ 2mm) which is at  $T_3= 205^\circ C\pm 2^\circ C$ . Time  $t_a$  is measured until PTC resistance increases to 1kOhm.

\*\*\*) Only short time operation (<1h) in case of malfunction of the circuit

**1.9 Normative references**

IEC 60738-1, thermistors – directly heated positive step-function temperature coefficient – Part 1: Generic specification.

**1.10 Marking**

No marking

**1.11 Ordering information**

Ordering code:

B59007-J1155-B040+
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1 <sup>st</sup> block:	type designation	B59xxx	B59... PTC Thermistor xxx... type number
2 <sup>nd</sup> block	sensing temperature	J1yyy	yyy ... T <sub>sense</sub> [°C]
3 <sup>rd</sup> block:	Packing, processing, customer specific information	A(B)zzz+	zzz ... . + ... can be followed by additional numbers and letters (3 digits) not effecting IEC specifications.

## 2. INSPECTION REQUIREMENTS

### 2.1 Procedures

**2.1.1** For qualification approval, the procedures shall be in accordance with the generic specification IEC 60738-1, 6.5.4.

**2.2.2** For quality conformance inspection has been used the test schedules (tables 1 and 2) include sampling, periodicity severity's and requirements. The formation of inspection lots is covered by 6.5.7 of the generic specification.

The following list applies to the test schedules developed in tables 1 and 2.

- 1) The Subclause numbers of tests and performance requirements refer to the generic specification IEC 60738-1 and to the data 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 /alternatively IEC 61193-2 (Single sampling plan for normal inspection).
- 3) In these tables:
  - p = periodicity in months
  - n = number of devices in the samples
  - c = the acceptance criterion (permitted number of non-confor. 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 – solderability and soldering – resistance to heat tests shall only be applied where the thermister 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 60068-2-58 shall apply.
- 8) The thermistors shall be mounted by their normal means.
- 9) The bump test and the shock test are alternatives. The test selected in the detail specification shall be used.
- 10) The detail specification shall specify which of the endurance tests in groups C4, C5 and D1 respectively are appropriate to the construction and application of the termistor.
- 11) Any deviation from annex B of the generic specification shall be given in the detail specification.
- 12) 100% testing shall be followed by re-inspection by sampling in order to monitor outgoing quality level by non-conforming items per million ( $\times 10^{-6}$ ). The sampling level shall be established by the manufacturer. For the calculation of  $\times 10^{-6}$  values any parametric failure shall be counted as non-conforming item. In case one or more non-conforming items occur in a sample, this lot shall be rejected.

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

Subclause number and test (see list item 1)	D or ND	Conditions of test (see list item 1)	IL	n	c	Performance requirements (see list item 1)
			(see list item 3)			
<b>GROUP A INSPECTION</b>	ND	Temperature: 25±2°C Measurement power:<1mW	100 %			According par. 1.8
<b>Subgroup A0</b>						
7.5 Zero-power resistance $R_T$						
<b>Subgroup A1</b>	ND		S-4	2)	0	As in 7.4.1
7.4.1 Visual examination						
<b>Subgroup A2</b>	ND	Not applicable	S-3	2)	0	
7.4.2 Marking						
7.4.3 Dimensions (gauging)						
<b>GROUP B INSPECTION</b>	ND	R(25°C±2°C) Measurement power:<1mW  T=150°C±0.1°C, T=160°C±0.1°C, T=170°C±0.1°C Measurement power:<1mW  Not specified	S-2	2)	0	According par. 1.8  According to par. 1.8
<b>Subgroup B1</b>						
7.5 Zero-power rated resistance $R_T$						
7.9 Functioning resistances $R_{NF}$ at $T_{NF}±5K$ , $T_{NF}+15K$						
7.27 Residual current	ND		S-2	2)	0	No breakdown or flashover
<b>Subgroup B2</b>						
7.8 Voltage proof						
7.16 Soldering - Solderability		Not applicable				

**Table 2- Test schedule for quality conformance inspection: periodic**

Subclause number and test (see list item 1)	D or ND	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	
<b>GROUP C INSPECTION</b>						
<b>Subgroup C1A</b>						
<b>Part of sample</b>						
7.17 Resistance to soldering heat	D	Not applicable	6	5	0	ΔR <sub>T</sub> /R <sub>T</sub> : ±10% No visible damage
7.15 Robustness of termination		Acc. to 7.15.1 Test Ua1 - Tensile test, F = 20 N  Zero-power resistance R <sub>T</sub> Visual examination				
<b>Subgroup C1B</b>						
<b>Other part of sample</b>						
7.18 Rapid change of temperature	D	IEC 60068-2-14; Na T1 = 0°C T2 = 150±2°C 5 cycles; t=30min  Zero-power resistance R <sub>T</sub> Visual examination	6	5	0	ΔR <sub>T</sub> /R <sub>T</sub> : ±20% No visible damage

**Table 2- continued**

Subclause number and test (see list item 1)	D or ND	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	
7.19 Vibration		IEC 60068-2-6, Fc Frequency range: 10 to 55 Hz Amplitude: 0.75 mm Acceleration: 98 m/s <sup>2</sup> Sweep endurance: Total duration 6h (3x2h in x,y,z)  Zero-power resistance R <sub>25</sub> Visual examination				ΔR <sub>T</sub> /R <sub>T</sub> : ±10% No visible damage
7.20 Bump		Not specified				
7.21 Shock		IEC 60068-2-27 Acceleration: 500 m/s <sup>2</sup> ; t=11ms Number of shocks: 6 x 3 pulses  Zero-power resistance R <sub>T</sub> Visual examination				
<b>Subgroup C1</b> <b>Combined sample of specimens of subgroups C1A and C1B</b>  7.22 Climatic sequence	D	IEC 60068-2-30 Db, IEC60068-2-1 A, IEC 60068-2-2 B Category: 0 / 150 / 21 - Dry heat: T = 150±2°C, t = 16h - Damp heat, cyclic, first cycle - Cold: T = 0°C, t = 2h - Damp heat, cyclic, remaining cycle  Zero-power resistance R <sub>T</sub> Visual examination Insulation resistance Voltage proof	6	10	0	ΔR <sub>T</sub> /R <sub>T</sub> : ±20% No visible damage R <sub>ins</sub> > 500 MΩ V <sub>ins</sub> > 4 kV



Table 2- continued

Subclause number and test (see list item 1)	D or ND	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	
<b>Subgroup C2</b> 7.11 Response time by ambient temp. $t_a$ 7.12 Response time by power change $t_b$	ND	$T_3 = 205 \pm 2^\circ\text{C}$ ; $T_1 = 25 \pm 2^\circ\text{C}$ ; sensor PTC put in Al-block according to par. 1.2; time until $R=1\text{k}\Omega$ Not specified	6	10	0	$t_a < 30 \text{ s}$
<b>Subgroup C3</b> 7.6 Temperature coefficient of resistance 7.4.4 Dimensions (detail) 7.10 Dissipation factor at $V_{opmax}$	ND	Not specified  According par. 1.2  Not specified	6	10	0	According par. 1.2
<b>Subgroup C4</b> 7.24.2 Endurance at upper category temperature	ND	IEC 60068-2-2 Test B: $T = 150^\circ\text{C} \pm 2^\circ\text{C}$ $t = 1000\text{h}$  Examination at 168h, 500h, 1000h Zero-power resistance $R_T$ Visual examination Insulation resistance	6	10	0	$\Delta R_T/R_T: \pm 25\%$ No visible damage $R_{ins} > 500 \text{ M}\Omega$
<b>GROUP D INSPECTION</b> <b>Subgroup D1</b> 7.24.1 Endurance at room temperature cyclic	D	100 cycles Applied voltage: $V_{max}$ (current limited to $I_{inrushmax}$ )  Zero-power resistance $R_T$ Visual examination Insulation resistance	12	10	0	$\Delta R_T/R_T: \pm 25\%$ No visible damage $R_{ins} > 500 \text{ M}\Omega$

Table 2- continued

Subclause number and test (see list item 1)	D or ND	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	
<b>Subgroup D2</b>  7.24.3 Endurance at max. operating temperature and maximum voltage	D	$T = 170^{\circ}\text{C} \pm 2^{\circ}\text{C}; V_{\text{max}} = 15\text{VDC},$ $t = 1 \text{ h}; \text{IEC } 60068-2-2, \text{ B}$  Zero-power resistance $R_T$ Visual examination Insulation resistance	12	10	0	$\Delta R_T/R_T: \pm 25\%$ No visible damage $R_{\text{ins}} > 500 \text{ M}\Omega$
<b>Subgroup D4</b>  7.23 Damp heat, steady state	D	$T = 40 \pm 2^{\circ}\text{C}, \text{ r.H.} = 93 \pm 2/-3\%$ $t = 21 \text{ d}; \text{IEC } 60068-2-78, \text{ Ca}$  Zero-power resistance $R_T$ Visual examination Insulation resistance Voltage proof; 4kV	12	10	0	$\Delta R_{25}/R_{25}: \pm 20\%$ No visible damage $R_{\text{ins}} > 500 \text{ M}\Omega$ No breakdown or flashover