

INCH-POUND
MIL-PRF-23648/9C
w/ Amendment 4
8 February 2018
SUPERSEDING
MIL-PRF-23648/9C
w/ Amendment 3
5 September 2014

PERFORMANCE SPECIFICATION SHEET

RESISTOR, THERMAL (THERMISTOR), INSULATED
POSITIVE TEMPERATURE COEFFICIENT
STYLE RTH22

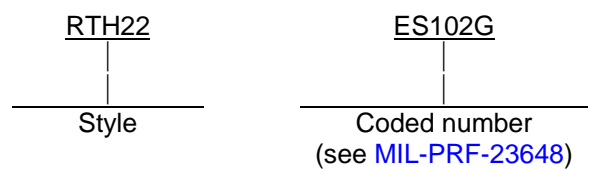
This specification is approved for use by all Departments
and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall
consist of this specification sheet and [MIL-PRF-23648](#).

1. SCOPE

1.1 Scope. This specification covers the detail requirements for style RTH22 thermistors. This style is available in resistance ratio E only. Terminal leads type S and W are available. Resistance tolerance versus temperature characteristics G, J, and K are applicable through the maximum temperature of 125°C.

1.2 Part or Identifying Number (PIN). Thermistors covered by this specification are identified by a PIN which consists of a basis style and a coded number. The PIN is in the following form:



2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990, or emailed to Resistor@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.



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2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATION

[MIL-PRF-23648](#) - Resistor, Thermal (Thermistor), Insulated, General Specification For

(Copies of these documents are available online at <http://quicksearch.dla.mil>.)

2.3 Order of precedence. Unless otherwise noted herein or in the contract or in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Requirements. Requirements shall be in accordance with [MIL-PRF-23648](#), and as specified herein.

3.2 Interface and physical dimensions. The thermistors shall meet the interface and physical dimensions as specified on [figure 1](#) and herein.

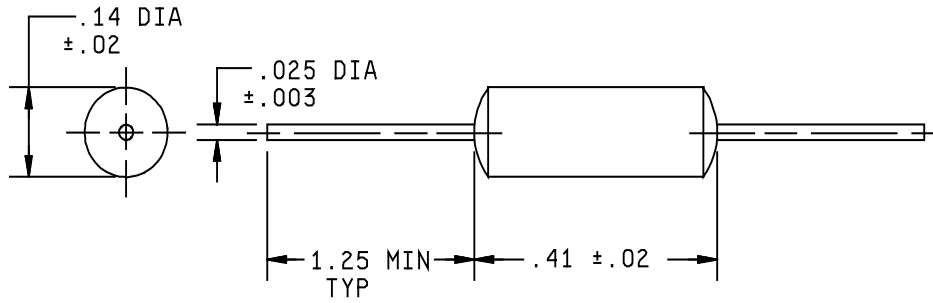
3.2.1 Pure tin. The use of pure tin, as an underplate or final finish is prohibited both internally and externally. Tin content of resistor components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see [6.3](#)).

3.3 Thermal time constant. The thermal time constant shall be 60 seconds maximum.

3.4 Dissipation constant. The dissipation constant shall be 5 milliwatts per degrees Celsius minimum.

3.5 Power rating. The thermistor shall be capable of dissipating a maximum power of 0.5 watts at 25°C. Thermistors shall be derated in accordance with [figure 2](#).

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| Inch | mm |
|-------|-------|
| 0.003 | 0.08 |
| 0.02 | 0.51 |
| 0.025 | 0.64 |
| 0.14 | 3.56 |
| 0.41 | 10.41 |
| 1.25 | 31.75 |

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.

FIGURE 1. Style RTH22 thermistors.

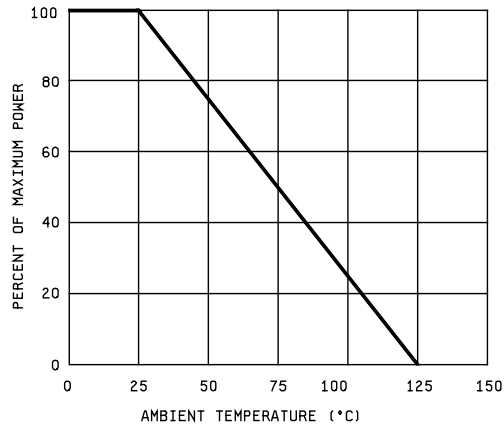


FIGURE 2. Derating curve for high ambient temperatures.

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3.6 Resistance.

3.6.1 Resistance at 25°C. Standard values shall be as specified in MIL-PRF-23648 except that the 5 percent decade values shall also be used for resistance tolerance G. Minimum and maximum resistance values shall be in accordance with table I.

TABLE I. Minimum and maximum resistance values (at 25°C).

| |
|--|
| Ratio 0.53 (E) |
| <u>Ohms</u> 10 ohms min 10 kilohms max (see table II) |

3.6.2 Resistance at temperatures other than 25°C. Factors for determining resistance at temperatures other than 25°C are in accordance with table II. The appropriate factor is selected from the column headed by the resistance range which includes the zero-power 25°C resistance of the thermistor in question. The 25°C resistance of the thermistor is multiplied by the factor selected to obtain the resistance at any given temperature.

Example: Given a thermistor with a 25°C resistance of 220 ohms, find the resistance at 75°C. Select the factor opposite 75°C from the column headed by the resistance range containing 220 ohms. The factor 1.400 is thus selected from the column headed 180-620. Multiply 220 ohms by the factor 1.400 to obtain the resistance at 75°C of 308 ohms.

TABLE II. Factors for determining resistance at various temperatures.

| Temperature (°C) | 10-75 | 82-160 | 180-620 | 680-108k | 2.0k-10k | 15k-39k 1/ |
|------------------|-------|--------|---------|----------|----------|------------|
| -55 | 0.615 | 0.582 | 0.560 | 0.550 | 0.493 | 0.481 |
| -15 | 0.790 | 0.770 | 0.755 | 0.740 | 0.717 | 0.712 |
| 0 | 0.863 | 0.847 | 0.838 | 0.835 | 0.816 | 0.814 |
| 25 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 50 | 1.160 | 1.170 | 1.180 | 1.20 | 1.205 | 1.210 |
| 75 | 1.350 | 1.370 | 1.400 | 1.420 | 1.430 | 1.430 |
| 100 | 1.545 | 1.584 | 1.623 | 1.656 | 1.660 | 1.670 |
| 125 | 1.750 | 1.80 | 1.860 | 1.920 | 1.862 | 1.90 |

1/ Inactive for new design.

3.7 Short time overload. The maximum allowable change in zero-power resistance as the result of the short time load test shall be ± 2 percent.

3.8 Low temperature storage. The maximum allowable change in zero-power resistance as the result of the low temperature storage test shall be ± 2 percent.

3.9 High temperature storage. The maximum allowable change in zero-power resistance as the result of the high temperature storage test shall be ± 1 percent.

3.10 Terminal strength. When tested in accordance with 4.2, the maximum allowable change in zero-power resistance shall be ± 1 percent.

3.11 Thermal shock. The maximum allowable change in zero-power resistance as the result of the thermal shock test shall be ± 2 percent.

3.12 Resistance to soldering heat, type S. The maximum allowable change in zero-power resistance as the result of the resistance to soldering heat test shall be ± 1 percent.

3.13 Moisture resistance. The maximum allowable change in zero-power resistance as the result of the moisture resistance test shall be ± 5 percent.

3.14 Life. The maximum allowable change in zero-power resistance as the result of the life test shall be ± 5 percent.

3.15 High temperature exposure. The maximum allowable change in zero-power resistance as the result of the high temperature exposure test shall be ± 1 percent after 100 hours and ± 2 percent after 1,000 hours.

3.16 Vibration, high frequency. The maximum allowable change in zero-power resistance as the result of the vibration test shall be ± 2 percent.

3.17 Shock, specified pulse. The maximum allowable change in zero-power resistance as the result of the shock test shall be ± 2 percent.

3.18 Immersion. The maximum allowable change in zero-power resistance as the result of the immersion test shall be ± 3 percent.

3.19 Resistance to solvents. There shall be no evidence of mechanical damage to the body and the marking shall remain clear and legible.

3.20 Marking. The thermistors shall be marked in accordance with [MIL-PRF-23648](#).

4. VERIFICATION

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with [MIL-PRF-23648](#).

4.2 Terminal strength.

4.2.1 Direct load. Direct load shall be applied gradually until the load reaches 4.5 pounds.

4.3 Solderability (type S leads). The solderability test is applicable to this specification for the type S leads.

4.4 Resistance to soldering heat (type S leads). The resistance to soldering heat test is applicable to this specification.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Service or Defense Agency, or within the military services system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The notes specified in [MIL-PRF-23648](#) are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Unless otherwise specified (see 2.1), the versions of the individual documents referenced will be those in effect on the date of release of the solicitation.
- c. Packaging requirements (see 5.1).

6.3 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to [ASTM-B545](#) (Standard Specification for Electrodeposited Coatings of Tin).

6.4 Amendment notations. The margins of this specification are marked with asterisks to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

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Custodians:

Army - CR
Navy - EC
Air Force - 85
DLA - CC
NASA - NA

Preparing activity:
DLA - CC

(Project 5905-2018-005)

Review activities:

Army - AT
Navy - AS, CG, MC, OS
Air Force - 19

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil>.