Standard Specification for Thermostat Component Alloys

This specification describes requirements for alloys to be used as components in the manufacture of bonded multi-component thermostat metal strip. More specifically it describes alloys having composition, and thermal expansion suitable for application in thermostat metal sheet and strip.

1. Scope

1.1 This specification describes requirements for alloys to be used as components in the manufacture of bonded multi-component thermostat metal strip. More specifically it describes alloys having composition, and thermal expansion suitable for application in thermostat metal sheet and strip.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to become familiar with all hazards including those identified in the appropriate Material Safety Data Sheet (MSDS) for this product/material as provided by the manufacturer, to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:

A480/A480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
B63 Test Method for Resistivity of Metallically Conducting Resistance and Contact Materials
B152/B152M Specification for Copper Sheet, Strip, Plate, and Rolled Bar
B162 Specification for Nickel Plate, Sheet, and Strip
B388 Specification for Thermostat Metal Sheet and Strip
E18 Test Methods for Rockwell Hardness of Metallic Materials
E228 Test Method for Linear Thermal Expansion of Solid Materials With a Push-Rod Dilatometer

3. Ordering Information

3.1 Orders for this material under this specification shall include the following information:

3.1.1 Alloy type,
3.1.2 Size,
3.1.3 Surface finish,
3.1.4 Marking and packaging, and
3.1.5 Certification, if required.

4. General Requirements

4.1 The material shall be free of scale, slivers, cracks, seams, corrosion and other defects as best commercial practice will permit. Surfaces shall be uniform and sufficiently clean so that commonly used methods of surface preparation, or pre-bond cleaning will allow bonding of the entire mating surfaces. Since surface condition can vary for different alloys and because bonding practices vary, product surface condition can be agreed upon between supplier and purchaser.

5. Chemical Composition

5.1 The material shall be manufactured to the chemical compositions shown in Table 1.

5.2 The manufacturer will insure uniformity of composition throughout a heat lot to provide uniform thermal expansion and electrical resistivity properties. See Specifications B152/B152M and B162.

6. Thermal Expansion Requirements

6.1 Samples tested in accordance with 6.2 shall exhibit thermal expansion properties described in Table 2.

6.2 One test sample representing each heat lot shall be machined to a suitable specimen configuration, heat treated in accordance with instructions in Table 2 and Test Method E228.

7. Electrical Resistivity

7.1 The electrical resistivity measured at room temperature as in Test Method B63 on suitably prepared and annealed specimens shall conform to Table 3.

8. Temper

8.1 This product will be supplied in the condition agreed upon by purchaser and seller.
8.2 Hardness shall be measured on representative samples from each heat treat lot and reported as Rockwell B hardness.

8.3 Hardness values in the annealed condition shall conform to the requirements in Table 4 tested as in Test Methods E18.
9. Dimensions and Permissible Variations

9.1 Permissible variations in thickness and width shall adhere to those described in Specification A480/A480M. These are shown in Table 5.

9.2 Edge camber shall conform to Specification A480/A480M. (Edge camber for widths >1½-in. shall be a maximum 1⁄4 in. on any 8-ft length.)

9.3 Maximum deviation across the width of the strip at a given location shall not exceed 3 % of the nominal thickness.

9.4 Slitting burr shall be no greater than 10 % of the thickness.

10. Certification

10.1 The manufacturer shall provide the purchaser with a certification containing the following information:

10.1.1 Alloy type,
10.1.2 Specification number,
10.1.3 Dimensions,
10.1.4 Chemical composition by heat number,
10.1.5 Coefficient thermal expansion,
10.1.6 Hardness,
10.1.7 Quantity shipped,
10.1.8 Purchase order number,
10.1.9 Resistivity (optional), and

### Table 3 Nominal Electrical Resistivity of Thermostat Alloys Values Shown Are Ohm Circular Mil/Ft. (Microhm-CM)

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<td>460</td>
<td>570</td>
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<td></td>
<td>(170)</td>
<td>(78.5)</td>
<td>(77)</td>
<td>(79)</td>
<td>(78)</td>
<td>(110)</td>
<td>(86.6)</td>
<td>(40.7)</td>
<td>(54.8)</td>
<td>(61.5)</td>
<td>(63.2)</td>
<td>(70.6)</td>
<td>(80.6)</td>
<td>(8.5)</td>
<td>(76.5)</td>
<td>(94.8)</td>
<td>(1.8)</td>
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### Table 4 Maximum Rockwell B Hardness Required For Thermostat Alloys – Annealed Condition

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### Table 5 Permissible Variations In Dimensions For Thermostat Alloy Strip

<table>
<thead>
<tr>
<th>Specified Thickness</th>
<th>Widths</th>
<th>3/16 (4.76) to 6 (152.4)</th>
<th>6 (152.4) to 13 (330.2)</th>
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<tbody>
<tr>
<td>0.035 (0.89) to 0.050 (1.27) incl</td>
<td>0.0025 (0.064)</td>
<td>0.0035 (0.089)</td>
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<tr>
<td>0.050 (1.27) to 0.069 (1.75) incl</td>
<td>0.003 (0.08)</td>
<td>0.0035 (0.089)</td>
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<tr>
<td>0.069 (1.75) to 0.100 (2.54) incl</td>
<td>0.003 (0.08)</td>
<td>0.004 (0.10)</td>
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<tr>
<td>0.100 (2.54) to 0.125 (3.18) incl</td>
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<td>0.125 (3.18) to 0.161 (4.09) incl</td>
<td>0.0045 (0.114)</td>
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<tr>
<td>0.161 (4.09) to 0.187 (4.76) incl</td>
<td>0.005 (0.13)</td>
<td>0.005 (0.13)</td>
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</table>

<table>
<thead>
<tr>
<th>Specified Thickness</th>
<th>Widths</th>
<th>0.5 (12.7) to 6 (152.4)</th>
<th>6 (152.4) to 9 (228.6)</th>
<th>9 (228.6) to 13 (330.2)</th>
</tr>
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<td>0.068 (1.73) and under</td>
<td>0.005 (0.13)</td>
<td>0.005 (0.13)</td>
<td>0.010 (0.25)</td>
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<td>0.099 (2.51) to 0.069 (1.75) incl</td>
<td>0.008 (0.20)</td>
<td>0.010 (0.25)</td>
<td>0.016 (0.41)</td>
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<tr>
<td>0.160 (4.06) to 0.100 (2.54) incl</td>
<td>0.010 (0.25)</td>
<td>0.016 (0.41)</td>
<td>0.016 (0.41)</td>
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<tr>
<td>0.1875 (4.76) to 0.161 (4.09) incl</td>
<td>0.016 (0.41)</td>
<td>0.020 (0.51)</td>
<td>0.020 (0.51)</td>
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</table>

\* This table is from Specification A480/A480M. For sizes not listed in the table above, refer to appropriate table in Specification A480/A480M.

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10.1.10 Manufacturer’s name.

11. Packaging and Marking

11.1 Packaging and unit size shipped shall be subject to agreement between purchaser and supplier. Packaging will be sufficient to prevent damage or spoilage in transit.

11.2 Marking shall contain the following information:
11.2.1 Manufacturer’s name,
11.2.2 Alloy type,
11.2.3 Heat number,
11.2.4 Size,
11.2.5 Shipped weight, and
11.2.6 Purchaser’s order number.

12. Investigation of Claims

12.1 Where any material fails to meet the requirements of the specification, the material so designated shall be handled in accordance with a mutual agreement between purchaser and seller.

13. Keywords

13.1 alloys; chemical composition; components; controlled thermal expansion; electrical resistivity; hardness; temper; thermostat metal strip

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