ULTRA-HIGH STRENGTH ALLOYS FOR VOICE COIL MOTORS AND OPTICAL IMAGE STABILIZATION SYSTEMS

www.materion.com/EtchMet
EtchMet™ alloy is a material that is tailor made for the springs in voice coil motors and optical image stabilization systems common in smart phone cameras. These devices have a relatively large mass (lenses) suspended by extremely small, thin springs. The small size of the springs requires very high strength material to withstand shock loads when the phone is dropped or deliberately tapped against an NFC reader. Therefore, the springs must be made from a very robust material. Furthermore, the lack of a damping mechanism makes high spring stiffness important to combat vibration and shorten autofocus time. EtchMet alloy provides a number of advantages that make it the ideal material for this application.

**ETCHMET ALLOY™ TM10 & TM20 STRIP**

**ADVANTAGES**

- It has a uniform elastic modulus across all thicknesses/ diameters and from product form to product form. This provides consistently high stiffness for greater damping, allowing faster autofocus and easier spring calculations.
- It has a very high resilience allowing it to withstand impact loads without fracturing or permanently deforming.
- It has high fatigue strength to withstand many drops and actuation cycles.
- It has a uniform, primarily single-phase microstructure, which photochemically machines easily and cleanly for uniform edges free of stress risers.
- It is supplied fully precipitation hardened so no further heat treatment is required.
- It solders and welds readily (above 0.0015” / 0.038mm).
- EtchMet alloy strip is inherently flat with minimal coil set, which helps with alignment during photochemical machining.

**ETCHMET ALLOY WIRE**

**ADVANTAGES**

- It has a uniform elastic modulus across all thicknesses/ diameters and from product form to product form. This provides consistent stiffness and damping behavior which makes spring calculations easy.
- It solders and welds readily (above 0.0015” / 0.038mm).
- It has high fatigue strength to withstand many drops and actuation cycles.
- It has a very high resilience allowing it to withstand impact loads without fracturing or permanently deforming.
### Physical Properties*

<table>
<thead>
<tr>
<th></th>
<th>ELASTIC MODULUS</th>
<th>ELECTRICAL CONDUCTIVITY/RESISTIVITY</th>
<th>DENSITY**</th>
<th>THERMAL EXPANSION COEFFICIENT</th>
<th>THERMAL CONDUCTIVITY (25°C)</th>
<th>RELATIVE MAGNETIC PERMEABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>EtchMet™ TM10 Strip</td>
<td>19,000 ksi 131 GPa</td>
<td>17-28% IACS 6.2-10.1 μΩ - cm</td>
<td>0.302 lb/in³ 8.36 g/cm³</td>
<td>9.7x10⁻⁶ in/in°F 17.5x10⁻⁶ m/m°C</td>
<td>60 BTU/ft hr°F 105 W/m k</td>
<td>&lt;1.001</td>
</tr>
<tr>
<td>EtchMet™ TM20 Strip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EtchMet™ Wire</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Properties specified for the precipitation age hardened (heat treated) condition
**Value listed is the density after heat treatment. The density before heat treatment is 0.300 lbs/in³ (8.30 g/cm³)

### Mechanical and Electrical Properties*

<table>
<thead>
<tr>
<th>TEMPER</th>
<th>HEAT TREATMENT</th>
<th>0.2% OFFSET YIELD STRENGTH**</th>
<th>ULTIMATE TENSILE STRENGTH</th>
<th>ELONGATION***</th>
<th>HARDNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REQUIRED</td>
<td>ksi</td>
<td>ksi</td>
<td>MPa</td>
<td>Percent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600-625 °F 315-330 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EtchMet™ TM10 Strip</td>
<td>EtchMet TM10</td>
<td>-</td>
<td>160 min.</td>
<td>1103 min</td>
<td>175 min.</td>
</tr>
<tr>
<td>EtchMet™ TM20 Strip</td>
<td>EtchMet TM20</td>
<td>-</td>
<td>195 min.</td>
<td>1344 min.</td>
<td>200 min.</td>
</tr>
<tr>
<td>EtchMet™ Wire</td>
<td>Before Heat Treatment</td>
<td>20-30</td>
<td>130-210</td>
<td>58-85</td>
<td>410-585</td>
</tr>
<tr>
<td></td>
<td>After 1 Hour</td>
<td>145-180</td>
<td>990-1250</td>
<td>160-200</td>
<td>1100-1380</td>
</tr>
<tr>
<td></td>
<td>HT</td>
<td>180-220</td>
<td>1240-1520</td>
<td>195-230</td>
<td>1340-1590</td>
</tr>
</tbody>
</table>

*Properties may vary by diameter.
**These are the target properties for EtchMet TM20.
***Elongation numbers valid only for wire greater than 0.004” (0.10 mm) diameter.
****Wire is typically provided in a cold drawn temper and heat treated after forming. Wire may also be provided pretempered (heat treated).
†Post heat treatment properties are provided for reference only. Thin diameter wire would likely be redrawn by outside vendors, so properties may vary from Materion’s certification lab.
Tolerances

<table>
<thead>
<tr>
<th>STRIP THICKNESS (INCHES)</th>
<th>STANDARD THICKNESS TOLERANCE INCHES</th>
<th>STRIP THICKNESS (MM)</th>
<th>STANDARD THICKNESS TOLERANCE (MM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over</td>
<td>Including</td>
<td>Plus or Minus</td>
<td>Over</td>
</tr>
<tr>
<td>EtchMet™ TM10 Strip</td>
<td>-</td>
<td>0.0020</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0.0020</td>
<td>0.0040</td>
<td>0.00015</td>
</tr>
<tr>
<td>EtchMet™ TM20 Strip</td>
<td>-</td>
<td>0.0020</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0.0020</td>
<td>0.0040</td>
<td>0.00015</td>
</tr>
</tbody>
</table>

Please specify the exact tolerances that you require when you place your order. Tighter tolerances may be available at additional cost. Please contact your local sales engineer to confirm the requested capability.

<table>
<thead>
<tr>
<th>WIRE DIAMETER (INCHES)</th>
<th>STANDARD DIAMETER TOLERANCE INCHES</th>
<th>WIRE THICKNESS (MM)</th>
<th>STANDARD DIAMETER TOLERANCE (MM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over</td>
<td>Including</td>
<td>Cold Drawn Tempers</td>
<td>Over</td>
</tr>
<tr>
<td>EtchMet™ Wire</td>
<td>0.0300</td>
<td>±0.0003</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>0.0800</td>
<td>±0.004</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Additional tolerances are per ASTM B 250. Please specify the exact tolerances that you require when you place your order. Tighter tolerances may be available at additional cost. Please contact your local sales engineer to confirm the requested capability.

EtchMet alloy provides higher fatigue strength and longer life than other alloys used in applications. EtchMet alloy provides higher dynamic modulus and longer fatigue life than other alloys used in consumer electronics applications.
HEALTH & SAFETY
Handling copper beryllium in solid form poses no special health risk. Like many industrial materials, beryllium-containing materials may pose a health risk if recommended safe handling practices are not followed. Inhalation of airborne beryllium may cause a serious lung disorder in susceptible individuals. The Occupational Safety and Health Administration (OSHA) has set mandatory limits on occupational respiratory exposures. Read and follow the guidance in the Material Safety Data Sheet (MSDS) before working with this material.

For additional information on safe handling practices or technical data on copper beryllium, contact Materion Brush Performance Alloys, Technical Service Department at 800.375.4205.

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