Heraeus’ new HL2000 low temperature co-fireable tape is self-constraining, allowing near zero x-y shrinkage for the production of high performance LTCC devices with no additional processing or tooling.

HL2000 has properties appropriate for applications such as general-purpose packaging, automotive modules and RF applications requiring low-loss at high frequencies.

The main difference between HL2000 and all other LTCC tapes is its unique shrinkage properties during firing. Free-sintered HL2000 densifies by shrinking in the z-axis.

**Key Benefits**

- ROHS compliant
- Near zero (0.2 %) x-y shrinkage with no added processing steps
- Compatible with co-fired solderable conductors
- Resists conductor show-through and camber
- Cavity structures cut into the green HeraLock tape show no x-y shrinkage or distortion after firing
- Pb and Cd free
- High Q

**Typical Fired Electrical Properties of HL2000**

**Dielectric Constant at 2.5 GHz**

7.3 ± 0.3

**Dissipation Factor (loss tangent) at 2.5 GHz**

< 0.0026

**Thermal Coefficient of Expansion (25 to 300 °C)**

6.1 ppm/°C

**DC Breakdown Voltage**

450 – 600 V/mil

**Surface Roughness**

0.7 µm (Tencor surface measurement)

**Camber**

Conforms to setter

< 1 mil/inch up to 100 % conductor coverage on all layers (3” x 3” tested)

**Insulation Resistance at 25 °C**

> 10^13 Ωcm

**Recommended Processing Guidelines for HL2000**

**Printing:**

Blank tape, to the desired size tape, can be processed on the Mylar® carrier (for easy handling) or removed. The majority of the printing is done on the dull side with a 250 – 325 mesh screen. The shiny side can be printed on if printing is required on both sides.

**Print Drying:**

**BOX DRYING OVEN**

Temperature: 80 °C

Time: 15 minutes

**Preconditioning:**

**CONVECTION BOX OVEN**

10 minutes at 80 °C

**Lamination:**

**ISOSTATIC**

Stack each printed and dried layer on a metal registration plate. Place stack inside of a heat sealable bag, evacuate and seal. It is critical that the bag be fully evacuated.

**Lamination Conditions – 150 static hot water**

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Temperature</th>
<th>Dwell Time</th>
<th>Cycle Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500 psi</td>
<td>75 °C</td>
<td>90 seconds</td>
<td>10 minutes</td>
</tr>
</tbody>
</table>
Technical Data Sheet

HeraLock® Tape
Low Temperature Co-Fireable Tape

**Burnout and Firing Profile in a Box Oven**
Ramp at 3 °C/min to 100 °C for start of burnout
Burnout: ramp at 1 °C/min to 450°C (typically no holds are required during burnout)
Ramp at 8.0 to 10 °C/min to 865 °C
Firing peak: 865 °C for 20 to 30 minutes
Cool at 10 °C/min to room temp

**Typical Fired Properties of HL2000**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shrinkage (free sintered):</td>
<td>x, y 0.20 % ± 0.04 % (≤ 0.35 %)</td>
</tr>
<tr>
<td>Fired Layer Thickness:</td>
<td>3.6 mils ± 0.2 (5.25 mils) 2.16 mils ± 0.2 (3.6 mils) 1.45 mils ± 0.2 (2.6 mils)</td>
</tr>
<tr>
<td>Fired Density:</td>
<td>2.9 ± 0.5 g/cm³ (&gt; 2.8)</td>
</tr>
<tr>
<td>Fracture Strength:</td>
<td>&gt; 200 MPa (ASTM #F394-78)</td>
</tr>
</tbody>
</table>

**Ramp at 3 °C/min to 100 °C for start of burnout.**

**Recommended Setter:**
Porous or Honeycombed

**Typical Unfired Properties of HL2000**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Density:</td>
<td>2.3 g/cm³</td>
</tr>
<tr>
<td>Tensile Strength:</td>
<td>240 psi</td>
</tr>
<tr>
<td>Green Sheet Thickness:</td>
<td>5.25 mils ± 0.2 mils 3.6 mils ± 0.2 mils 2.6 mils ± 0.15 mils</td>
</tr>
</tbody>
</table>

**Legend:**

1) RoHS compliant according to the latest ** Directives (European Union) of Restriction of Hazardous Substances ("RoHS") and its subsequent amendments (including the exceptions related to Pb).

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