

## Technical Data Sheet

### THICK FILM MATERIALS

**Product Type:** LTCC Materials

**Product Name:** HL2000



### HeraLock® Tape Low Temperature Co-Fireable Tape

#### Description

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<sup>1</sup> 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<sup>13</sup> 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

Pressure 1500 psi

Temperature 75 °C

Dwell Time 90 seconds

Cycle Time 10 minutes

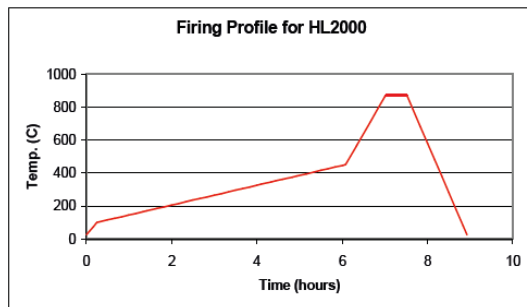
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### HeraLock® Tape Low Temperature Co-Fireable Tape

#### 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



**Recommended Setter:**  
 Porous or Honeycombed

#### Typical Unfired Properties of HL2000

**Green Density:**  
 2.3 g/cm<sup>3</sup>

**Tensile Strength:**  
 240 psi

**Green Sheet Thickness:**  
 5.25 mils ± 0.2 mils  
 3.6 mils ± 0.2 mils  
 2.6 mils ± 0.15 mils

#### Typical Fired Properties of HL2000

**Shrinkage (free sintered):**  
 x, y 0.20 % ± 0.04 % (≤ 0.35 %)  
 z 32 % (5.25 mils)  
 40 % (3.6 mils)  
 44% (2.6 mils)

**Fired Layer Thickness:**  
 3.6 mils ± 0.2 (5.25 mils)  
 2.16 mils ± 0.2 (3.6 mils)  
 1.45 mils ± 0.2 (2.6 mils)

**Fired Density:**  
 2.9 ± 0.5 g/cm<sup>3</sup> (> 2.8)

**Fracture Strength:**  
 > 200 MPa (ASTM #F394-78)

#### Co-Fire Conductor System for HL2000

	Product #
Ag Routing & Ground Plane	TC0307
Inner Layer Ag Via Fill	TC0308
Co-fire Solderable Ag	TC0306
Transition Ag/Pd Via Fill	TC0401
Top Co-fire Gold	TC8101
Co-fire solder dam	TO2002

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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