



## ESL ELECTROSCIENCE

CERAMIC TAPES &  
THICK-FILM MATERIALS

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## DIELECTRIC COMPOSITION

# 4911

ESL 4911 is a developmental low dielectric constant (K) multilayer dielectric whose coefficient of thermal expansion (T.C.E) is closely matched to 96% alumina. This dielectric is dense firing and yields a transparent blue layer.

### PASTE DATA

<b>Rheology:</b>	Thixotropic, screen-printable paste
<b>Viscosity:</b> (Brookfield RVT, 10 rpm, ABZ spindle, 25.5 ± 0.5 °C)	300 ± 50 Pa.s
<b>Colour:</b>	Blue
<b>Shelf Life (20 - 25 °C):</b>	6 months

### PROCESSING

<b>Screen Mesh, Emulsion:</b>	200 S/S, 25 µm
<b>Levelling Time (at 20°C):</b>	5 - 10 min
<b>Drying Time (at 125°C):</b>	10 - 15 min
<b>Firing Temperature Range:</b>	850 - 930°C in air
	Optimum: 930°C
	Time at peak: 10 min
<b>Rate of Ascent/Descent:</b>	50 - 60°C / min
<b>Substrate for Calibration:</b>	96% alumina
<b>Thinner:</b>	ESL 401

ESL Europe 4911 9306-B

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See Caution and Disclaimer on other side.

## TYPICAL PROPERTIES

<b>Fired Thickness:</b> (at least 2 layers between Au conductors on 96% alumina)	40 - 50 $\mu\text{m}$
<b>Approximate Coverage:</b> (40 $\mu\text{m}$ thickness)	60 - 70 $\text{cm}^2/\text{g}$
<b>Dielectric Constant (K) at 1 kHz:</b> (at 25°C)	4.3 $\pm$ 5%
<b>Dielectric Constant (K) at 1 MHz:</b> (at 25°C)	4.2 $\pm$ 5 %
<b>Dissipation Factor at 1 kHz:</b> (at 25°C)	0.05 %
<b>Dissipation Factor at 1 MHz:</b> (at 25°C)	0.26 %
<b>Insulation Resistance:</b> (at 100V DC)	> 10 <sup>11</sup> $\Omega$
<b>Pressure Cooker Test:</b> (IR after 15 min at 2 atmospheres steam pressure)	> 10 <sup>12</sup> $\Omega$
<b>Breakdown Voltage:</b> (at 25°C in air, total thickness > 45 $\mu\text{m}$ )	> 1000 V DC / 40 $\mu\text{m}$
<b>Via Definition:</b>	300 $\mu\text{m}$ x 300 $\mu\text{m}$
<b>Leakage Current:</b> (1M NaCl solution / 10V DC Bias / 5 min)	<1 $\mu\text{A}$ / $\text{cm}^2$
<b>Warpage:</b> (400 $\mu\text{m}$ thick layer on 12.7 mm x 12.7 mm x 0.625 mm 96% alumina substrate)	< 10 $\mu\text{m}$ / cm
<b>Conductor Compatibility:</b>	ESL 8836-D, 8884

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**CAUTION:** Proper industrial safety precautions should be exercised in using these products. Use with adequate ventilation. Avoid prolonged contact with skin or inhalation of any vapours emitted during use or heating of these compositions. The use of safety eye goggles, gloves or hand protection creams is recommended. Wash hands or skin thoroughly with soap and water after using these products. Do not eat or smoke in areas where these materials are used. Refer to appropriate MSDS sheet.

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