



# Electro-Science Laboratories, Inc.

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## HIGH K CAPACITOR DIELECTRICS

## 4160 Series

### Lead Free Low Temperature Capacitor Dielectric Pastes for Burying in LTCC Tape With Dielectric Constants Between 50 And 250

ESL 4160 Series low firing temperature capacitor pastes are designed to be used for capacitors buried in LTCC tape. The range of dielectric constant achievable depends on the firing schedule and host tape but is approximately 50-250. The dissipation factors are about 1-3% and exhibit X7R temperature characteristics.

#### PASTE DATA

<b>RHEOLOGY:</b>	Thixotropic, screen printable pastes	
<b>VISCOSITY:</b> (Brookfield RVT, ABZ spindle, 10 rpm, 25.5±0.5°C)	<b>4162</b>	250±50 Pa·s
	<b>4163</b>	250±50 Pa·s
	<b>4164</b>	250±50 Pa·s
<b>COLOR:</b>	yellow-tan	
<b>SHELF LIFE:</b> (at 4°C)	6 months	

#### PROCESSING

<b>SCREEN MESH/EMULSION:</b>	200 mesh/37.5 µm
<b>LEVELING TIME:</b>	10-15 minutes
<b>DRYING AT 125°C:</b>	10-15 minutes
<b>FIRING TEMPERATURE RANGE:</b>	875°C-900°C
<b>FIRING SCHEDULE</b>	determined by LTCC tape

4160 Series 0205-New

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See Caution and Disclaimer on other side.

<b>SUBSTRATE OF CALIBRATION:</b>	ESL 41050-70C
<b>THINNER:</b>	ESL 401
<b>SCREEN CLEANER:</b>	acetone, isopropanol, polar organic solvents

**TYPICAL PROPERTIES**

(Properties based on capacitors of 1 mm x 1 mm electrode area.)

	<u><b>4162</b></u>	<u><b>4163</b></u>	<u><b>4164</b></u>
<b>FIRED THICKNESS:</b>	40-55 μm	40-55 μm	40-55 μm
<b>DIELECTRIC CONSTANT (K) at 1 kHz:</b> (Fired at 875°C, 903-CT1 conductor, measured at 25°C)	50±50%	100±50%	250±50%
<b>EIA DESIGNATION:</b>	X7R	X7R	X7R
<b>DISSIPATION FACTOR at 1 kHz:</b> (at 25°C)	≤1.0%	≤ 2.0%	≤ 3.0%
<b>BREAKDOWN VOLTAGE:</b> (VDC/25 μm, 25°C in air)	≥ 200	≥ 200	≥ 200
<b>RECOMMENDED CONDUCTORS:</b>	ESL 903-CT1		

**Note:** X7R: T.C.C. Range = ±15%, -55°C to +125°C

4160 Series 0205-New

**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 vapors 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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