



ESL ELECTROSCIENCE

CERAMIC TAPES &
THICK-FILM MATERIALS

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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

| | | |
|--|-------------------------------------|---------------|
| Rheology: | Thixotropic, screen-printable paste | |
| Viscosity: (Brookfield RVT, 10 rpm, ABZ spindle, 25.5 ± 0.5 °C) | 4162 | 250 ± 50 Pa.s |
| | 4163 | 250 ± 50 Pa.s |
| | 4164 | 250 ± 50 Pa.s |
| Colour: | Yellow - Tan | |
| Shelf Life (4 °C): | 6 months | |

PROCESSING

| | |
|-----------------------------------|--|
| Screen Mesh, Emulsion: | 200 mesh, 37.5 µm |
| Levelling Time (at 20°C): | 10 - 15 min |
| Drying Time (at 125°C): | 10 - 15 min |
| Firing Temperature Range: | 850 - 900°C (in air) |
| | Optimum: 875°C |
| | (Determined by LTCC tape) |
| | Time at peak: 10 min |
| Substrate for Calibration: | 96% alumina |
| Thinner: | ESL 401 |
| Screen Cleaner: | acetone, isopropanol, polar organic solvents |

ESL Europe (KOP) 4160 Series 0304-B

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See Caution and Disclaimer on other side.

TYPICAL PROPERTIES

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

| | <u>4162</u> | <u>4163</u> | <u>4164</u> |
|---|--------------|---------------|---------------|
| Fired Thickness: (μm) | 35 - 50 | 40 - 55 | 40 - 55 |
| Dielectric Constant (K) at 1 kHz: (Fired at 875°C, 9916 conductor, at 25°C) | 50 \pm 50% | 100 \pm 50% | 250 \pm 50% |
| EIA Designation: | X7R | X7R | X7R |
| Dissipation Factor: (1 kHz, 25°C), % | \leq 1.0 | \leq 2.0 | \leq 3.0 |
| Breakdown Voltage: (25°C in air), V/25 μm | \geq 200 | \geq 200 | \geq 200 |
| Recommend Conductors: | | ESL 9916 | |

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

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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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