



## ESL ELECTROSCIENCE

CERAMIC TAPES &  
THICK-FILM MATERIALS

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## CERMET RESISTOR

## 29XXX Series

**HOS Heaters on Steel<sup>®</sup> • COS Circuits on Steel<sup>®</sup> • TFOS Thick Film on Steel<sup>®</sup>**

**Cadmium, Lead and Nickel-free\***

ESL 29XXX Series are low value resistors designed for use as heating elements on stainless steel substrates in combination with ESL's insulating dielectrics. They are available in a range of resistivities and temperature coefficients of resistance (TCR) - see Table 1. Intermediate resistivities may be obtained by blending the two members of a TCR group.

### PASTE DATA

<b>Rheology:</b>	Thixotropic, screen-printable paste
<b>Viscosity:</b> (Brookfield RVT, 10 rpm, ABZ spindle, 25.5 ± 0.5 °C)	225 ± 25 Pa.s
<b>Shelf Life (20 - 25 °C):</b>	6 months

### PROCESSING

<b>Screen Mesh, Emulsion:</b>	250 S/S, 5 µm
<b>Levelling Time (at 20°C):</b>	10 - 15 min
<b>Drying Time (at 125°C):</b>	15 min
<b>Firing Temperature Range:</b>	850°C in air
	Optimum: 850°C
	Time at peak: 10 min
<b>Total Firing Cycle:</b>	1 hour
<b>Substrate for Calibration:</b>	ESL 4924 on 96% alumina
<b>Thinner:</b>	ESL 401

ESL Europe 29XXX Series 1303-P

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See Caution and Disclaimer on other side.

## TYPICAL PROPERTIES

**Dried Thickness:**  
(427 mm x 2.4 mm resistor track with 9695 terminations over 4924 dielectric)  $21 \pm 1 \mu\text{m}$

**Approximate Coverage:**  $80 \text{ cm}^2 / \text{g}$

**Resistivity & TCR:**

**Table 1: Resistor Properties**

Product Number	29106	29206	29109	29115	29215	29130	29230	29515	291003
Resistivity ( $\text{m}\Omega/\text{sq}$ ) $\pm 10\%$	100	200	100	100	200	100	200	500	1000
Average TCR ( $\text{ppm}/^\circ\text{C}$ ) $\pm 50$	600	600	900	1500	1500	3320	3320	1500	350

ESL Europe 29XXX Series 1303-P

**\*None of the six substances referred to in the RoHS Directive (2002/95/EC) are used in the formulation of this product.**

**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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