



## ESL ELECTROSCIENCE

CERAMIC TAPES &  
THICK-FILM MATERIALS

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## CERMET RESISTOR

## 29XXX-C 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-C Series are low value resistors designed for use as heating elements on ferritic stainless steel substrates insulated with ESL 4987 insulating dielectric. 29XXX-C is 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>Rate of Ascent/Descent:</b>	50 - 60 °C / min
<b>Substrate for Calibration:</b>	4987 on 96% alumina
<b>Thinner:</b>	ESL 401

ESL Europe 29XXX-C Series 0306-D

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See Caution and Disclaimer on other side.

## TYPICAL PROPERTIES

**Dried Thickness:**  
 (427.2 mm x 2.4 mm resistor track with 9695 terminations over 4987 Glaze) 21 ± 1 μm

**Approximate Coverage:** 80 cm<sup>2</sup>/g

**Resistivity & TCR:**

<b>Table 1: Resistor Properties</b>										
<b>Product Number</b>	29103-C	29106-C	29206-C	29109-C	29209-C	29115-C	29215-C	29130-C	29230-C	29515-C
<b>Resistivity (mΩ/sq) ± 10%</b>	100	100	200	100	200	100	200	100	200	500
<b>TCR (ppm/°C)</b>	350	600	600	900	900	1500	1500	3250	3250	1500
<b>TCR Tolerance (ppm/°C)</b>	50	50	50	50	50	50	50	250	250	50

ESL Europe 29XXX-C Series 0306-D

**\*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.

**DISCLAIMER:** The product information and recommendations contained herein are based on data obtained by tests we believe to be accurate, but the accuracy and completeness thereof is not guaranteed. No warranty is expressed or implied regarding the accuracy of these data, the results obtained from the use hereof, or that any such use will not infringe any patent. ElectroScience assumes no liability for any injury, loss, or damage, direct or consequential, arising out of its use by others. This information is furnished upon the condition that the person receiving it shall make his own tests to determine the suitability thereof for his particular use, before using it. User assumes all risk and liability whatsoever in connection with his intended use. ElectroScience's only obligation shall be to replace such quantity of the product proved defective.