ESL ELECTROSCIENCE
CERAMIC TAPES & THICK-FILM MATERIALS
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INSULATING COMPOSITION 4986

HOS Heaters on Steel® • Designed for Co-firing Applications

RoHS Compliant*

Dielectric composition ESL 4986 is designed to insulate unabraded, unoxidised ferritic steels. The product 4986 is non-porous and its TCE closely matches that of 430 S17 grade stainless steels. It may be co-fired using a regular 850°C furnace/1 hour profile providing that care is taken with settling, drying and cooling times between prints. It is essential that the steel is only handled using protective gloves at all times in a Clean Room environment. Excellent breakdown voltage between top conductive prints and the steel base can be achieved with a minimum thickness of 80µm in three layers. ESL 29XXX-B resistors with 9695 terminations are recommended for use as the heating elements. ESL 4986 is recommended as an 850°C overglaze whilst 4771-P1 may be used as a low-temperature overglaze. These materials are also useful in other TFOS (Thick Film on Steel)® applications. In addition a wide range of ESL materials are compatible with 4986 permitting the fabrication of other COS (Circuits on Steel)®

PASTE DATA

Rheology:	Thixotropic, screen-printable paste
Viscosity: (Brookfield RVT, 10 rpm, ABZ spindle, 25.5 ± 0.5 °C)	120 ± 20 Pa.s
Colour:	Dark blue
Shelf Life (20 - 25 °C):	6 months

PROCESSING

Screen Mesh, Emulsion:	165 S/S, 0 µm
Levelling Time (at 25°C):	5 - 10 min
Drying Time (at 125°C): (dependent on substrate volume)	> 15 min
Firing Temperature Range:	850°C - 930°C in air
Optimum:	850°C
Time at peak:	10 min
Total Firing Cycle:	1 hour
Substrate For Calibration:	Unabraded, unoxidised 430 S17 122.5 mm diameter x 1.2 mm
Thinner:	ESL 401

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TYPICAL PROPERTIES

Fired Thickness:
(of at least 3 layers between 9695 and 430 S17 stainless steel measured using an Elcometer 345 thickness gauge) > 80 µm

Approximate Coverage:
(80 µm thickness) 40 cm^2/g

Breakdown Voltage:
(measured on a 88 mm diameter 9695 print on a 108 mm diameter area of dielectric at 25 °C in air using a standard Clare Flash Tester) 5/5 ≥ 1800 V AC

Insulation Resistance:
(measured on a 88 mm diameter 9695 print on a 108 mm diameter area of dielectric using 500 VDC at 25 °C in air)

After storage at 93 ± 2 % RH, 25 ± 2 °C for 48 hrs.	$> 10^9 \Omega$
At 300°C	$> 10^9 \Omega$

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