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THE MARKET LEADER – PROVEN RELIABILITY

Over 90% **of the World's** *HOS (Heaters on Steel)*™ **have been made** using ESL materials. ***Millions*** are being used successfully worldwide.

INSULATING COMPOSITION 4986

HOS (Heaters on Steel)™ • Designed for Co-Firing Applications

Cadmium, Lead, Nickel and Barium-Free

Dielectric composition **4986** is designed to insulate unabraded, unoxidized ferritic steels. The **4986** dielectric is non-porous and its TCE closely matches that of BS970/1449 Type 430-S17 or AISI Type 430 stainless steel. ESL **4986** may be co-fired in a standard 850°C furnace (one hour profile) providing that care is taken with leveling, drying and cooling times between prints. Three layers, having a total fired thickness of more than 80 micrometers, are recommended to provide excellent breakdown voltage between top conductive prints and the steel base. It is essential that the steel is only handled using protective gloves at all times in a clean room environment. ESL **9695** silver/palladium conductor and **29XXX** resistors are recommended for use as the heating elements. The **4986** is recommended as an 850°C overglaze**. ESL 4770-BCG** may be used as a low temperature overglaze. These materials may be used in TFOS (Thick Film on Steel)™ applications in which the dielectric layers are separately fired.

PASTE DATA

RHEOLOGY:	Thixotropic, screen printable paste
VISCOSITY: (Brookfield RVT, ABZ Spindle, 10 rpm, 25.5°C±0.5°C)	100±20 Pa•s
SOLIDS CONTENT:	76 ± 2%
COLOR:	Dark Blue
SHELF LIFE: (at 20°C)	6 months

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ESL Affiliates
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See Caution and Disclaimer on other side.

PROCESSING

SCREEN MESH/EMULSION: (Stainless Steel**)**		165/0 □m
LEVELING TIME: (25°C)		5-10 minutes
DRYING AT 125°C: (dependent on substrate volume**)**		>15 minutes
FIRING TEMPERATURE RANGE:		850°C - 930°C
	Optimum	850°C
	Time at peak:	10 minutes
RATE OF ASCENT/DESCENT:		50°C - 60°C /minute
SUBSTRATE OF CALIBRATION:		Unabraded, unoxidized 430 stainless steel
		122.5mm diameter x 1.2mm
THINNER:		ESL 401

TYPICAL PROPERTIES

FIRED THICKNESS: (at least three layers of dielectric between 9695 and 430 stainless steel measured using an Elcometer 345 thickness gauge)	> 80 □m
APPROXIMATE COVERAGE: (80□m thickness)	40 cm^2/g
BREAKDOWN VOLTAGE: (measured on an 88mm diameter 9695 print on a 120 mm diameter area of dielectric at 25°C in air using standard Clare Flash Tester)	≥ 1800 VAC
Insulation Resistance: (measured on an 88mm diameter 9695 print on a 120 mm diameter area of dielectric using 500 VDC at 25°C in air)	
After storage at 93% ± 2% RH, 25°C ± 2°C for 48 hrs.	> 10^9 □
At 300°C	> 10^9 □

A wide range of ESL materials is compatible with 4986 permitting the fabrication of other COS (Circuits on Steel)□.

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