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# INSULATING COMPOSITION 4987

## HOS Heaters on Steel® • COS Circuits on Steel® • TFOS Thick Film on Steel®

### Cadmium, Lead and Nickel-Free*

Dielectric composition ESL 4987 is designed to insulate unabraded, unoxidised, ferritic steels. 4987 is non-porous and its TCE closely matches that of 430 S17 grade stainless steel. Three separately fired layers of 4987, having a minimum total thickness of 80 µm, 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 clean room conditions. ESL 9695 and 9501-CH terminations and ESL 29XXX resistors are recommended for use as the heating elements. 4987 is recommended as an 850°C overglaze. These materials are also useful in other TFOS (Thick Film on Steel)® applications.

## 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:** | | 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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See Caution and Disclaimer on other side.

## 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) > $10^9$ Ω

A wide range of ESL materials are compatible with 4987 permitting the fabrication of other COS (Circuits on Steel)®.



***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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