

## Dielectrics

### IP 211

#### High Temperature Glaze for Platinum and Steel Insulation

#### Description

IP 211 is a high temperature overglaze for protection of platinum structures, e.g. sensor applications. The standard color is blue. A clear version, IP 211 clear, is available on demand.

It also can be used to cover Cr-steel with an insulating layer.

#### Key Benefits

- It fires to an extremely dense, hermetic film, allowing excellent electrical performance at fired thicknesses of  $\geq 50 \mu\text{m}$ .
- A continuous operation temperature at up to  $500^\circ\text{C}$  is possible.
- The following steel types may be used:

DIN-Standard No.	Steel Type
1.4016	X 6 Cr 17
1.4742	X 10 CrAl 18
1.4762	X 10 CrAl 24

- Free of cadmium and nickel
- Free of phthalate
- REACH<sup>3</sup> and RoHS<sup>4</sup> compliant

#### Processing

1. Spatulate well prior to processing.  
When stored in a fridge, the paste should have acquired room temperature before being opened to avoid condensation.
2. Print through a 165 – 325 mesh screen. A print-dry-fire sequence is advised for each layer.
3. Level at room temperature for 10 minutes.
4. Dry at  $150^\circ\text{C}$  for 10 – 20 minutes.
5. Fire at  $950 - 1350^\circ\text{C}$  (peak) for 8 – 12 minutes, and with a total firing cycle time  $> 30$  minutes.

**Thinner**                      HVS 100

#### Typical Properties (Paste)

Form: Thixotropic paste

Viscosity: IP 211 (blue): 15 – 30 Pas  
IP 211 clear: 25 – 45 Pas  
( $25^\circ\text{C}$ ,  $D = 100 \text{ s}^{-1}$ )

Coverage: c.  $40 \text{ cm}^2/\text{g}$  (FFT<sup>5</sup>:  $50 \mu\text{m}$ )

Shelf Life: 3 months from date of shipment with correct storage (in a dry, cool ( $5 - 25^\circ\text{C}$ ) and dark place with container tightly shut)

#### Typical Properties (Fired)<sup>1</sup>

Dielectric Constant<sup>2</sup>: 7 – 10 ( $25^\circ\text{C}$ , 1 kHz)

Dissipation Factor<sup>2</sup>:  $< 0.5 \%$  ( $25^\circ\text{C}$ , 1 kHz)

Insulation Resistance<sup>2</sup>:  $> 10^{11} \text{ Ohms} \times \text{cm}$  ( $25^\circ\text{C}$ )

Breakdown Voltage:  $> 500 \text{ V DC}$   
(3 separately fired layers with a total FFT<sup>5</sup> of  $50 \mu\text{m}$ )

Color: IP 211: blue  
IP 211 clear: colorless transparent

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- 1 Typical property based on laboratory test methods. For optimum results all materials should be fired in a profiled furnace supplied with dried, hydrocarbon and other contaminant free air (PP-1).
- 2 Depending on conductor material, processing conditions and measurement methods
- 3 REACH compliant according to the Annex XIV (Feb. 17, 2011) of Commission Regulation (EU) No 143/2011 to Regulation (EC) No 1907/2006 of the European Parliament and of the council on the Registration, Evaluation, Authorisation and Restriction of Chemicals ("REACH") by European Chemicals Agency; we define a material as REACH compliant, as long as substances used are not recorded in the Annex XIV.
- 4 RoHS compliant according to Directives (European Union) No 2011/65/EC of Restriction of Hazardous Substances ("RoHS") and its subsequent amendments (including the exceptions No. 7. c. I. of the EU Directive e.g. related to Pb)
- 5 FFT: Fired Film Thickness

The descriptions and engineering data shown here have been compiled by Heraeus using commonly-accepted procedures, in conjunction with modern testing equipment, and have been compiled as according to the latest factual knowledge in our possession. The information was up-to date on the date this document was printed (latest versions can always be supplied upon request). Although the data is considered accurate, we cannot guarantee accuracy, the results obtained from its use, or any patent infringement resulting from its use (unless this is contractually and explicitly agreed in writing, in advance). The data is supplied on the condition that the user shall conduct tests to determine materials suitability for a particular application.

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