

### Description

Our 4228 *Red Insulating Varnish* is a highly insulating coating with excellent arc and corona resistance. This low viscosity, one-part varnish coating is easy to use and adheres well to many substrates.

### Applications & Usages

The 4228 insulates transformers, coils, armature, motor windings, and various electric generator parts against arc and corona. As well, it protects these parts from corrosion and moisture.

### Features & Benefits

- **High dielectric strength**—3 000 V/mil (dry); 1 500 V/mil (wet)
- **Insulation Class H**—Suitable for service up to 180 °C
- **Excellent oil and moisture resistance**
- **Excellent finish**—tough, flexible, glossy, and durable red coat
- **Good water and salt water resistance**
- **Good adhesion**
- **High gloss**

### Usage Parameters

<i>Properties</i>	<i>Value</i>
Tack Free	15–30 min
Recoat Time	4 h
Dry to Handle	30 min
Drying Time @25 °C [77 °F]	24 h
Drying Time @80 °C [176 °F]	1 h
Theoretical coverage <sup>a)</sup> per gal for 25 µm [1.0 mil]	<800 000 cm <sup>2</sup> <850 ft <sup>2</sup>
Recommended Thickness	25 to 38 µm [1 to 1.5 mil]
Shelf Life	5 y

a) Estimated based on dip method and assuming a 90% transfer efficiency. Spray methods typically have transfer efficiency less than 65%. Actual coverage will be somewhat less than the theoretical values.

### Temperature Ranges

<i>Properties</i>	<i>Value</i>
Constant Service Temperature <sup>b)</sup>	-40 to 180 °C [-40 to 356 °F]
Storage Temperature Limit <sup>c)</sup>	<25 °C [<77 °F]

b) The upper limit is the addition of maximum ambient temperature of 40 °C, temperature rise of 125 °C, and a hot-spot allowance of 15 °C.

c) The product should not be exposed to direct sunlight.

### Principal Components

Name	CAS Number
Modified Alkyd Resin	proprietary
Xylene	1330-20-7
Ethyl benzene	100-41-4
Iron Oxide	1309-37-1

### Properties of Cured 4228

<i>Physical Properties</i>	<i>Method</i>	<i>Value</i>
Color	Visual	Red
Gloss @60°	—	80 minimum
Moisture Resistance	—	Excellent
Oil Resistance	—	Excellent
Salt Water Resistance	—	Good
Acid Resistance	—	Good
Alkali Resistance	—	Fair for low concentrations
<i>Electrical Properties</i>	<i>Method</i>	<i>Value</i>
Dielectric strength @1.5 mil (dry) <sup>a)</sup>	ASTM D149	3 000 V/mil
@1.5 mil (wet) <sup>b)</sup>	ASTM D149	1 500 V/mil

a) After conditioning in air at 25 °C for 24 h; coat thickness 33 µm

b) After conditioning in water at 25 °C for 24 h; coat thickness 33 µm

### Properties of Uncured 4228

<i>Physical Properties</i>	<i>Method</i>	<i>Value</i>
Viscosity @25 °C [77 °F]	ASTM D2196	370 cP [0.37 Pa·s]
Solids Content (w/w)	—	52%
Density	—	1.06 g/ml
Flash Point	ASTM D93	15 °C [59 °F]
Odor	—	Aromatic

a) Brookfield viscometer with spindle LV1

## Compatibility

**Adhesion**—The 4228 insulation coating adheres well to copper and steel; however, it is not compatible with contaminants like water, oil, and greasy flux residues that may affect adhesion. If contamination is present on the substrate, clean the surface first.

### 4228 Adherence Compatibility

Substrate	Note
Copper	Excellent
Steel and Iron	Excellent

## Health and Safety

Please see the 4228-Liquid **Safety Data Sheet** (SDS) for further details on transportation, storage, handling, safety guidelines, and regulatory compliance.

## Application Instructions

The 4228 can be easily applied by dip or spray gun. Follow the procedure below for best results. The product may be diluted with xylene or other similar low cost solvents.

### Prerequisites

- Ensure that the substrate is free of scratches, gouges, and raised metal burrs
- Ensure surface to be coated is clean: oil free, dust free, and rust free

### To coat by dipping method

1. Hang PCB on a dipping arm
2. Lower board in dip tank
3. Immerse at least 12" below the top to minimize entrapments
4. Let dwell for 2 minutes to allow for penetration
5. Withdraw slowly at about 10 cm/min [5 in/min]
6. Let air dry 1 h before recoat to avoid solvent entrapment.
7. Apply additional coats until desired thickness are achieved. (Go to Step 1)

**NOTE:** Dipping in undiluted 4228 typically yields 1 to 1.5 mil dry film thickness per coat.

### To coat by spray gun method

1. Mix thoroughly, and spray a test pattern.  
This step ensures good flow quality and helps establish appropriate distance to avoid runs.
2. At a distance of 20 to 25 cm (8 to 10 inches), spray a thin and even coat onto the part. For best results, use spray-and-release strokes with an even motion to avoid excess paint in one spot.
3. If additional coats are required, rotate the part 90° to ensure good coverage.
4. Wait at least 1 hour at room temperature before recoat. The delay avoids trapping solvent between coats.
5. Apply additional coats until desired thickness are achieved. (Go to Step 1)

**NOTE:** Dilution with a thinner may be required.

**ATTENTION:** Using excessive coat thickness can cause defects. Do not heat cure between coats because this causes wrinkling.

**Air dry the electric insulation coating:**

- Let air dry 24 hours

While this product can be air dried, it is highly recommended that you bake the product for optimal dielectric properties.

**Heat cure:**

- Wait 1 h or more at room temperature for the coating to dry
- Put in an oven 110 °C [230 °F] for 30 min.  
OR
- Put in an oven at 80 °C [176 °F] for 60 min.

**Packaging and Supporting Products**

<i>Cat. No.</i>	<i>Packaging</i>	<i>Net Volume</i>		<i>Net Weight</i>		<i>Packaged Weight</i>	
<b>4228-55ML</b>	Bottle	55 mL	1.8 fl oz	58.3 g	2.05 oz	1 kg <sup>a)</sup>	2.2 lb <sup>a)</sup>
<b>4228-225ML</b>	Can	225 mL	7.6 fl oz	238 g	8.41 oz	0.3 kg	0.7 lb
<b>4228-1L</b>	Can	945 mL	1.99 pint	1 kg	8.83 lb	6 kg <sup>a)</sup>	13.2 lb <sup>a)</sup>
<b>4228-4L</b>	Can	3.78 L	1 gal	4 kg	8.83 lb	4.7 kg	10 lb

a) Case pack of 5 bottles/cans

**Supporting Products**

- *Thinner 4:* Cat No. 4354-1L, 4354-4L



## 4228 Technical Data Sheet Red Insulating Varnish

ISO 9001:2008 Registered Quality System. Burlington, Ontario, CANADA SAI Global File: 004008

4228-Liquid

### Technical Support

Please contact us regarding any questions, suggestions for improvements, or problems with this product. Application notes, instructions and FAQs are located at [www.mgchemicals.com](http://www.mgchemicals.com).

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