

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)
- **Excellent oil and moisture resistance**
- **Excellent finish**—tough, flexible, glossy, and durable transparent coat
- **Good water and salt water resistance**
- **Good Adhesion**
- **High gloss**

Curing & Work Schedule

| <i>Properties</i> | <i>Value</i> |
|-----------------------------|---------------|
| Tack Free | 10 min |
| Recoat Time | 4 h |
| Dry to Handle | 30 min |
| Full Cure (@25 °C [77 °F]) | 1 d |
| Full Cure (@80 °C [176 °F]) | 1 h |
| Storage Temp. ^{b)} | 25 °C [104°F] |
| Shelf life ^{c)} | 1 y |

- a) Cure times assume a thickness of 1 mil to 1.5 mil and standard conditions.
 b) The product should not be exposed to direct sunlight.
 c) After date of shipment

Service Ranges

| <i>Properties</i> | <i>Value</i> |
|--|---|
| Service Temperature | -40 to +135 °C [-40 to +275 °F] |
| Max coverage ^{d)} per gal for 25 µm [1.0 mil] | <800,000 cm ² [<850 ft ²] |
| Recommended thickness | 25 to 38 µm [1 to 1.5 mil] |

- d) 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.

Chemical Components

| Name | CAS Number |
|----------------------|--------------------|
| Modified Alkyd Resin | <i>proprietary</i> |
| 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 Gloss @ 60° Moisture resistance Oil resistance Salt water resistance Acid resistance Alkali resistance | Visual | Red 80 minimum Excellent Excellent Good Good Fair for low concentrations |
| <i>Electric Properties</i> | <i>Method</i> | <i>Value</i> |
| Dielectric strength @1.5 mil (dry) ^{a)} @1.5 mil (wet) ^{b)} | ASTM D149 ASTM D149 | 3 000 V/mil 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 Property</i> | <i>Method</i> | <i>Value</i> |
|----------------------------|---------------|--------------------|
| Viscosity at 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.

838 Adherence Compatibility

| Substrate | Note |
|----------------|-----------|
| Copper | Excellent |
| Steel and Iron | Excellent |

Health, Safety, and Environmental Awareness

Please see the 4228-Liquid **Safety Data Sheet** (SDS) for more details on transportation, storage, handling and other security guidelines.

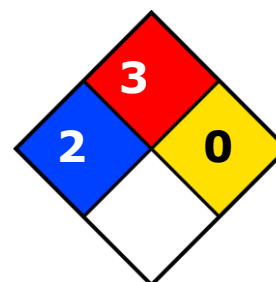
Environmental Impact: The 4228 formulation has a volatile organic content of 52% (w/w) [or 556 g/L]. The coating is RoHS compliant.

Health and Safety: The liquid is flammable and should be kept away from flames and other ignition sources. As with most paint materials, avoid breathing in fumes or direct contact with the material. Solvents therein can cause irritation and other symptoms like headaches, pain, as well as having long term exposure effects.

HMIS® RATING

| | |
|-----------------------------|------------|
| HEALTH: | * 2 |
| FLAMMABILITY: | 3 |
| PHYSICAL HAZARD: | 0 |
| PERSONAL PROTECTION: | |

NFPA® 704 CODES



Approximate HMIS and NFPA Risk Ratings Legend:

0 (Low or none); 1 (Slight); 2 (Moderate); 3 (Serious); 4 (Severe)

Use in the open air, in fume hoods, or in well ventilated area. For short or long term (8 hours) at levels of exposures exceeding 100 ppm of xylene, use NIOSH approved respirator with organic vapor cartridges rated for this order of concentrations.

Wear safety glasses or goggles and disposable gloves to avoid exposures. Wash hands thoroughly after use.

The cured coating presents no known hazard.

Application Instructions

Dip or spray application are possible. 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.

To 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.

To 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>Form</i> | <i>Net Volume</i> | | <i>Net Weight</i> | | <i>Shipping Weight</i> | |
|-------------------|-------------|-------------------|-----------|-------------------|----------|------------------------|----------------------|
| 4228-55ML | Liquid | 55 mL | 2 fl oz | 53 g | 0.12 lb | 0.3 kg ^{a)} | 0.6 lb ^{a)} |
| 4228-250ML | Liquid | 250 mL | 8.6 fl oz | 300 g | 0.66 lb | 1.9 kg ^{a)} | 4.1 lb ^{a)} |
| 4228-1L | Liquid | 950 mL | 1 quart | 1.1 kg | 2.50 lb | 1.4 kg | 2.5 lb |
| 4228-4L | Liquid | 3.8 L | 1 gal | 4.5 kg | 10.10 lb | 5.5 kg | 12.0 lb |

a) 4228-55ML and 4228-250ML shipping weight are for a pack of 5 bottles

Supporting Products

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



ISO 9001 Registered Quality System.
Burlington, Ontario, Canada QMI File # 004008

Red Insulating Varnish 4228 Technical Data Sheet

4228-Liquid

Technical Support

Contact us regarding any questions, improvement suggestions, or problems with this product. Application notes, instructions, and FAQs are located at www.mgchemicals.com.

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Warranty

M.G. Chemicals Ltd. warrants this product for 12 months from the date of purchase by the end user. *M.G. Chemicals Ltd.* makes no claims as to shelf life of this product for the warranty. The liability of *M.G. Chemicals Ltd.* whether based on its warranty, contracts, or otherwise shall in no case include incidental or consequential damage.

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