

Conformal Coating Description

Our 4224 *Optically Clear Conformal Coating Epoxy* offers a very strong and UV-resistant finish. This two part coating is easy to use: it does not require special or costly equipment to apply.

The 4224 epoxy coating protects electric circuits against corrosive chemicals, moisture, dirt, dust, thermal shocks, and scratches. This avoids corrosion and physical damages to electric components. It also insulates against high-voltage arcing, shorts, and static discharges.

Applications & Usages

The 4224 *Optically Clear Conformal Coating Epoxy* improves reliability, operational range, and lengthens the life of electronic and LED parts. You will find it mainly in corrosive environments such as farming, mining, smelting, oil exploration, and marine industries. As well, it applies to any other areas where corrosion must be avoided.

Common epoxy conformal coatings industrial uses are with electric generators, motors, transformers, relays, and equipment controllers. Commercial applications span fire alarms, sensors, automotive electronics, electrical connectors, and porcelains.

Features and Benefits

- **Excellent Chemical and Abrasion Resistance**
- **Optically Clear:** Transmission @25 µm [1 mil] <4.5% loss in optical range
- **UV light stable:** non yellowing
- **Protects electronics from** chemicals corrosion, oil, moisture, fungus, and static discharges

Curing, Work, and Storage Schedules

<i>Properties</i>	<i>Value</i>
Working Pot life @25 °C [77 °F]	3 h
Full Cure @80 °C [172 °F]	2 h
Storage Temperature	25 °C [77 °F]

Service Ranges

<i>Properties</i>	<i>Value</i>
Service Temperature	-40 to +100 °C [-40 to +212 °F]
Max Withstand Temperature	+115 °C [+239 °F]
Max coverage per gal for 50 µm [2 mil] ^{a)}	<840 000 cm ² [<910 ft ²]

a) Estimated based on ideal values. Actual value will be somewhat less than quoted.

Chemical Components

Name	CAS Number
Part A: Epoxy Resin	30583-72-3
Xylene	1330-20-7
Ethyl Benzene	100-41-4
Part B: Epoxy Hardener	2855-13-2

Properties of Cured 4224

<i>Physical Properties</i>	<i>Method</i>	<i>Value</i>
Color	Visual	Clear
Solderability	—	No
Abrasion Resistance	—	Superior
Fungus Resistance	—	Good
UV Resistant	—	Yes
Optical Transmission Loss @ 25 µm (1 mil)	UV-Vis Spectrophotometer	<4.5%
<i>Electric Properties</i>	<i>Method</i>	<i>Value</i>
Dielectric Strength (dry)	ASTM D149	600 volts/mil
<i>Thermal Properties</i>	<i>Method</i>	<i>Value</i>
Glass Transition Temperature	ASTM D 115	113 °C
Thermal Cycling Stability	-40 to 200 °C	Passed
Thermal Stability 24 h @ 80 °C on Cu/Al substrates		No yellowing
Thermal Stability 96 h @ 100 °C on Cu/Al substrates		Slight yellowing
<i>Chemical Resistance</i>	<i>Method</i>	<i>Value</i>
Water	—	Good
Acid (10% sulfuric acid)	—	Excellent
Alkali (1% sodium hydroxide)	—	Excellent
Salt water	—	Excellent
Copper corrosion	—	None expected

Properties of Uncured 4224

Physical Property	Mixture (4A:1B)	
Color	Colorless	
Viscosity	73 cP [0.073 Pa·s] ^{a)}	
Density	1.02 g/mL	
Typical Dry Film Thickness	50 µm [2 mil]	
Mix Ratio by weight (A:B)	4:1	
Mix Ratio by volume (A:B)	4:1	
Physical Property	Part A	Part B
Color	Colorless	Colorless
Viscosity ^{a)}	120 cP [0.12 Pa·s]	20 cP [0.020 Pa·s]
Density	1.06 g/mL	0.92 g/mL
Flash Point	150 °C [302 °F]	112 °C [234 °F]
% solids	~85%	100%
Odor	Aromatic, sweet	Ammonia like

Note: Unless indicated otherwise, densities and viscosities were taken at 25°C [77 °F].

a) Brookfield viscometer at 60 RPM with spindle LV1 for Part A and spindle LV2 for Part B.

Compatibility

Adhesion—The 4224 epoxy coating adheres well to printed circuit boards and their components; 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.

4224 Adherence Compatibility

Substrate	Adhesion Test Rating ASTM D339
ABS Plastic	5B = Excellent
Aluminum	5B = Excellent
Copper	5B = Excellent
FR4 Fiber Board	5B = Excellent
Glass	5B = Excellent

Compatibility—The 4224 coating doesn't have any known incompatibilities with materials commonly found on printed circuit assemblies. If in doubt, always test for possible incompatibilities on test coupons prior to doing a full scale application.

Storage

Store around 25 °C [77 °F] in dry area away from sunlight. Keep the containers tightly sealed.

Health, Safety, and Environmental Awareness

Please see the 4224 **Safety Data Sheet** (SDS) for more details on transportation, storage, handling and other security guidelines.

Environmental Impact: The 4224 formulation is designed for industrial use. The solvent contribution to the VOC is 12% (123 g/L). Part A and Part B liquids are toxic to aquatic life; avoid runoff into storm and sewer drains. Once cures, this coating is not considered to be an environmental hazardous.

Health and Safety

Please see the 4224 **Safety Data Sheet** (SDS) parts A and B for more details on transportation, storage, handling and other security guidelines.

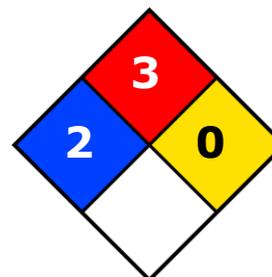
Wear safety glasses or goggles and disposable polyvinyl chloride, neoprene, or nitrile gloves while handling liquids. Part B in particular causes skin burns and may cause sensitization if exposed over a long period of time. Part A is highly flammable.

Part A

HMIS® RATING

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

NFPA® 704 CODES

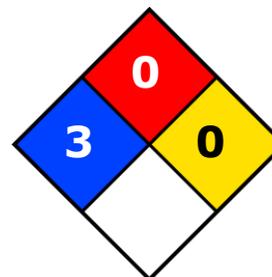


Part B

HMIS® RATING

HEALTH:	* 3
FLAMMABILITY:	0
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)

Spray Gun Application Instructions

Read the procedure below fully and make necessary adjustments to get the required coat thickness for your needs. Typically, one coat results in a dry film thickness of roughly 50 μm [2 mil]. For automated spray booths and spray guns alike, follow the equipment manufacturer guidelines.

Spray Equipment

MG recommends the use of multi-components, HVLP (high-volume low pressure) spray guns using the initial settings described in the following table. Adjust these settings and recommendations as required.

Initial Setting Recommendations

Air Cap	#3 HVLP		
Pressure	<i>Inlet</i> 23 psi	<i>Air flow</i> 13.5	<i>Air cap</i> 10 psi
Fluid Tip	1.3 mm (1.5 mm) ^b		

Note: These recommendations are based may differ depending on the equipment brands. Please consult your spray gun manufacturer's guide.

To hand mix a 4:1 (A:B) epoxy mixture (for one-component spray equipment)

1. Stir **Part A** and **Part B** containers separately.
2. Measure **four** parts by volume (or weight) of pre-stirred **A**, and pour in the mixing container.
3. Measure **one** part by volume (or weight) of pre-stirred **B**, and slowly pour in the mixing container while stirring.
4. Let sit for 2 to 3 minutes.
5. Transfer the mixture to an HVLP spray gun cup for immediate use.
6. After spraying application is finished, clean gun with MG 8328 or other suitable solvents. This step is to prevent the epoxy coating from curing inside the spray equipment.

TIP! The mixture starts curing as soon as the material is mixed, so plan to apply this material without delay. The equipment must be cleaned within 3 hours after use.

To apply the required thickness by weight

1. 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 horizontal board. For best results, use spray-and-release strokes with an even motion to avoid excess paint in one spot.
3. Immediately move the sample to an oven for curing.

ATTENTION! To avoid surface wrinkles, the coated assembly should be transferred to a curing oven within 7 minutes after spraying.

To cure the conformal coating

Full cure can be achieved in 2 hours in an oven at 80 °C [176 °F]. Let stand at room temperature for an additional 30 minutes.

Packaging and Supporting Products

Product Availability

Cat. No.	Form	Net Volume	Net Weight	Shipping Weight
4224-1	Liquid	1.125 L 38 fl oz	1.16 kg 2.6 lb	1.3 kg 2.9 lb
4224-2	Liquid	4.5 L 1.2 gal	4.63 kg 10.2 lb	5.0 kg 11 lb
4224-3	Liquid	18.9 L 10.7 gal	19.44 kg 42.9 lb	22.0 kg 48 lb

Supporting Products

- Epoxy and Adhesive Cleaner—Cat No. 8328-500 mL

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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