

Description

The 4223F *Premium Polyurethane Conformal Coating* is an easy-to-use product that is UL recognized to the 746E standard for conformal coatings. This one-part product heat cures to form a protective coating that resists abrasion and chemical attacks. It is, therefore, ideal for chemically or mechanically aggressive environments. In addition, the 4223F is without isocyanates, xylenes, or other hazardous air pollutants. And lastly, the coating is easily repairable. All these characteristics make for a versatile conformal coating of premium quality.

The 4223F coating protects electronic circuits from physical, electrical, and corrosion damages. It resists dirt, dust, humidity, and chemically aggressive products. It also resists abrasion, scratches, and thermal shocks. It protects against short circuits, static discharges, and high-voltage arcing, which allows for the miniaturization of circuits by reducing the minimal spacing between traces. In summary, it efficiently protects your electronic components from several common failure modes.

Applications & Usages

The 4223F coating improves reliability, operational range, and lengthens the life of electronic components and electrical assemblies. This protection coating is especially useful in corrosive environments such as those found in the farming, mining, smelting, oil exploration, and marine industries. Other common uses of the urethane conformal coatings are with electric relays, motors, transformers, and generators. The coating also can be found in commercial products such as sensors, automotive electronics, fire alarms components, and air bag controllers.

Features and Benefits

- **UL certified as a conformal coating** according to **UL 746E** (Similar to file # [E203094](#))
- **Externally qualified** to the August 2002 **IPC-CC-830B**-class A, by Pacific Testing Laboratories
- **Excellent finish**—smooth, flexible, mar resistant
- **High chemical resistance**—resists water, solvents, and most household chemicals
- **Durable**—abrasion resistant
- **Protects electronics from** moisture, corrosion, fungus, and static discharges
- **Easy to inspect**—fluoresces under black light (UV light)
- **Easy rework and repairs**—can solder through coat • removable with MG 8312 Conformal Coating Stripper
- **Free of isocyanate, xylene, and other hazardous air pollutants**

ATTENTION! Heat curable product.
The 4223F is not suitable for room temperature cure.

Usage Parameters

<i>Properties</i>	<i>Value</i>
Tack Free	15 min
Recoat Time	3 min
Drying Time @80 °C [176 °F]	16 h
Shelf Life	3 y
Theoretical Coverage per 312G can	≤14 700 cm ² ≤2 280 in ²

a) Idealized estimate based on a coat thickness of 25 µm [1.0 mil] and 50% transfer efficiency.

Temperature Ranges

<i>Properties</i>	<i>Value</i>
Constant Service Temperature	-65 to 125 °C [-85 to 257 °F]
Storage Temperature Limits	-5 to 40 °C [23 to 104 °F]

Chemical Components

Name	CAS Number
N-heptane	142-82-5
Stoddard solvent	8052-41-3
Propane	74-98-6
Isobutane	75-28-5
Methyl Ethyl Ketone (MEK)	78-93-3

Properties of Cured 4223F

<i>Physical Properties</i>	<i>Method</i>	<i>Value</i>
Color	Visual	Clear, amber tint
Solderability	—	Good
Chemical Resistance	—	Excellent
Weather Resistance	—	Excellent
Fungus Resistance	IPC-TM-650 2.6.1.1	Passed
Flexibility	IPC-TM-650 2.4.5.1	Passed
Flammability	Similar to file # E203094	94V-0
Glass Transition Temperature (Tg)	Optical Dilatometer	57 °C
Coefficient of Thermal Expansion	" "	
Before Tg	" "	130 ppm/°C
After Tg	" "	190 ppm/°C
UV Inspection Absorption Max	Absorption spectrum	375 nm (near UV)
Fluorescence max	Emission spectrum	437 nm (blue)
<i>Electrical Properties</i>	<i>Method</i>	<i>Value</i>
Breakdown Voltage @1.2 mil	ASTM D 149	1 200 V 1.2 kV
Dielectric Strength @1.2 mil	"	1 000 V/mil 0.04 kV/mm
Dielectric Withstand Voltage	per IPC-TM-650	>1 500 V
Insulation Resistance (after 24 h)	IPC-TM-650 Test 2.6.3.4	9 × 10 ¹² Ω

Note: See Appendix A for UL 94V-0 and IPC-CC-830B standards test results.

Properties of Uncured 4223F

<i>Physical Properties</i>	<i>Method</i>	<i>Value</i>
Odor	—	Mild petroleum
Density	ASTM D 1475	0.72 g/ml
Percent Solids	Calculated	19% (weight)
Flash Point	Closed Cup	-104 °C [-155 °F]
Boiling Point		80 °C [176 °F]

Compatibility

The 4223F polyurethane coating is compatible with most materials found on printed circuit assemblies; however, in an uncured state it is not compatible with contaminants like water, oil, and greasy flux residues. Therefore, it is extremely important to clean the printed circuit assembly thoroughly with a suitable electronic cleaner before applying the coating.

The chosen electronic cleaner should remove moisture, wax, greases, oils, and all other contaminants that are known to cause defects in this type of conformal coating (see recommended cleaners on page 5).

Health, Safety, and Environmental Awareness

Please see the 4223F-Aerosol **Safety Data Sheet** (SDS) for more details on transportation, storage, handling and other security guidelines.

Environmental Impact: The volatile organic content is 80% (575 g/L) by EPA and WHMIS standards.

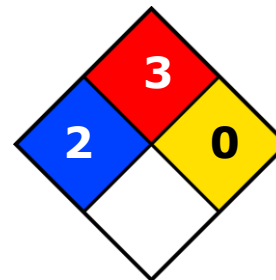


This product meets the European Directive 2011/65/EU Annex II (ROHS); recasting 2002/95/EC.

Health and Safety: The liquid and spray 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)

Wear safety glasses and disposable gloves. Wash hands thoroughly after use. 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 recommendations, use NIOSH approved respirator with organic vapor cartridges rated for this order of concentrations.

The cured coating presents no known hazard.

Aerosol Application Instructions

Follow the procedure below for best results. Each coat results in a dry film thickness of roughly 0.5 mil [13 µm].

To apply the required thickness by weight

1. Shake the can vigorously, 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 horizontal board.
For best results, start your movement off-surface, press the trigger, and only release off-surface at the end of the stroke. Use a uniform movement of the spray gun parallel to the surface.
3. Wait at least 5 minutes, and spray another coat. This delay avoids trapping solvent between coats.
4. Before the next coat, rotate the board 90° to ensure good coverage.
5. Apply other coats until desired thickness is achieved. (Go to Step 3.)
6. Let dry for 15 minutes (flash off time) at room temperature.

To clear nozzle of aerosol between use or for storage

1. Invert the aerosol can upside down.
2. Press button until clear propellant comes out. The propellant should become clear in a few seconds.

To cure the conformal coating

Full cure can be achieved in 16 hours by using an infrared lamp or in convection oven at 80 °C [176 °F]. At room temperature, the coat dries to the touch in 15 minutes.

The procedure above is based on a minimum thickness of 25 µm (1 mil) conformal coating. After full cure, measure the actual conformal coating thickness to ensure it meets the applications requirements.

ATTENTION! Heat curable product. The 4223F is not suitable for room temperature cure.

Packaging and Supporting Products

<i>Cat. No.</i>	<i>Packaging</i>	<i>Net Volume</i>		<i>Net Weight</i>	
4223F-312G	Aerosol	430 mL	14.6 fl oz	310 g	10 oz
4223F-1L	Can	945 mL	31.9 fl oz	840 g	1.8 lb
4223F-4L	Can	3.78 L	1 gal	3.36 kg	7.4 lb
4223F-20L	Pail	18.9 L	5 gal	16.8 kg	37 lb

Thinners & Conformal Coating Removers

- *Thinner 2*: Cat. No. 4352-945ML, 4352-4L (1 gal), 4352-20L, 4352-200L
- *Conformal Coating Stripper—Liquid*: Cat. No. 8312-580ML, 8312-3.78L

Technical Support

Contact us regarding any questions, suggestions for improvements, 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.

Disclaimer

This information is believed to be accurate. It is intended for professional end users who have the skills required to evaluate and use the data properly. *M.G. Chemicals Ltd.* does not guarantee the accuracy of the data and assumes no liability in connection with damages incurred while using it.

Appendix A

Standards Qualification

Meets UL 94V-0 and IPC-CC-830B (August 2002).

<i>Qualification Criteria</i>	<i>Test Method</i>	<i>Results</i>
UL 94V-0		
Coating flammability	UL 94V (File # E203094)	94V-0
IPC-CC-830B*		
Appearance	IPC-CC-830B 3.5.2	pass
Fluorescence	IPC-CC-830B 3.5.3	pass
Flammability	IPC-CC-830B 3.5.6	pass
Fungus Resistance	IPC-TM-650 2.6.1.1	pass
Flexibility	IPC-TM-650 2.4.5.1	pass
Dielectric Withstand Voltage	IPC-TM-650 2.5.7.1	pass
Moisture and Insulation Resistance	IPC-TM-650 2.6.3.4	pass
Thermal Shock	IPC-TM-650 2.6.7.1	pass
Temperature Humidity Aging	IPC-TM-650 2.6.11.1	fail

Note: The optional humidity ageing test failed due to a late stage loss of clarity that prevented color codes and identification marking to be viewed; this product thus meets the older 2002 IPC-CC-830B Class A requirements, but not the current ones.

*Qualified independently by Pacific Testing Laboratories, Inc.