

Description

The 9200FR *Flame Retardant Structural Epoxy Adhesive* is a two-part, flame retardant, thixotropic, toughened adhesive that is designed to create load bearing joints. It offers excellent adhesion to a wide range of difficult to bond to materials, including glass, ceramics, metals, engineered thermoplastics, and thermoset laminates such as SMC (sheet molding compound) and GRP (glass-reinforced plastics).

The toughened adhesive protects against vibration damage when fully cured, but remains sufficiently flexible to accommodate thermal cycling stresses when bonding materials with different coefficients of thermal expansion.

The 9200FR is electrically insulating and chemically resistant, which helps prevent corrosion damage. It has an excellent resistance to moisture, salt water, detergents, gasoline, hydraulic fluids, antifreeze, automotive fluids, acids, and bases. In addition, dissimilar metals can be bonded together without fear of causing galvanic corrosion because the adhesive prevents current flow through the bond.

Applications & Usages

This adhesive is primarily used to create long-lasting, load-bearing joints, especially in situations where vibration resistance is key or where dissimilar materials are being joined. It is especially suitable for sheet molding compound (SMC) and glass-reinforced plastics (GRP) bonding. It is thixotropic, which makes it a great gap filler and is sag resistant—perfect for use on vertical surfaces.

It is also excellent for encapsulating electronics enclosures with holes or seams where a non-thixotropic potting compound would flow through. It provides superior environmental protection and performs very well under temperature cycling.

Benefits and Features

- **Toughened, smooth, thixotropic paste**
- **1:1 mix ratio**
- **Flame Retardant**—Meets UL 94V-O Vertical Burn Test
- **Working life: 30 minutes**
- **Cure time: 24 hours at room temperature**
- **Non-sagging and gap filling**
- **Very strong adhesion**
- **Bonds dissimilar materials**
- **Highly resistant to vibration and temperature cycling**
- **Extreme chemical resistance**
- **Low shrinkage**
- **Easy to dispense**

ENVIRONMENT

- ✓ RoHS
- ✓ REACH compliant

Usage Parameters

<i>Properties</i>	<i>Value</i>
Working Life @22 °C [72 °F] ^{a)}	30 min
Shelf Life	3 y
Full Cure @22 °C [72 °F]	24 h
Full Cure @40 °C [104 °F]	16 h
Full Cure @65 °C [149 °F]	3 h
Full Cure @80 °C [176 °F]	1.5 h

a) Working life and full cure assumes room temperature and 100 g. A 10 °C increase can decrease the pot life by half.

Temperature Ranges

<i>Properties</i>	<i>Value</i>
Constant Service Temperature	-40 to 150 °C [-40 to 302 °F]
Intermittent Temperature Limits ^{b)}	-50 to 175 °C [-58 to 347 °F]
Storage Temperature of Unmixed Parts	16 to 27 °C [61 to 81 °F]

b) Short-term exposure temperature toleration limit—not recommended as a sustained or repeated operation condition.

ATTENTION! Do NOT store above stated temperature range. Resin and hardener will separate above 30 °C [86 °F].

Properties of Cured 9200FR

<i>Physical Properties</i>	<i>Method</i>	<i>Value</i> ^{a)}
Color	Visual	Light yellow
Density @25 °C [77 °F]	ASTM D 1475	1.29 g/mL
Hardness	Shore D	78D
Tensile Strength	ASTM D 638	13 N/mm ² [1 900 lb/in ²]
Young's Modulus	"	2 000 ± 520
Compressive Strength	ASTM D 695	46 N/mm ² [6 700 lb/in ²]
Lap Shear Strength (Stainless Steel)	ASTM D 1002	14 N/mm ² [1 900 lb/in ²]
Lap Shear Strength (Aluminum)	"	10 N/mm ² [1 500 lb/in ²]
Lap Shear Strength (Copper)	"	12 N/mm ² [1 800 lb/in ²]
Lap Shear Strength (Brass)	"	13 N/mm ² [1 900 lb/in ²]
Lap Shear Strength (ABS)	"	0.7 N/mm ² [98 lb/in ²]
Lap Shear Strength (Polycarbonate)	"	2.3 N/mm ² [340 lb/in ²]

Note: Specifications are for epoxy samples cured at 40 °C for 16 hours, with additional curing time at room temperature for optimal results. For most tests, samples were conditioned at 23 °C and 50% RH.

a) N/mm² = mPa; lb/in² = psi



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<i>Electrical Properties</i>	<i>Method</i>	<i>Value</i>
Breakdown Voltage @2.1 mm	ASTM D 149	39 800 V [39.8 kV]
Dielectric Strength	"	497 V/mil [19.6 kV/mm]
Breakdown Voltage @3.175 mm [1/8"]	Reference fit ^{b)}	50 000 V [50 kV]
Dielectric Strength	"	400 V/mil [15.7 kV/mm]
Volume Resistivity	ASTM D 257	1.1 x 10 ¹³ Ω·cm

b) To allow comparison between products, the Tautscher equation was fitted to 3 experimental dielectric strengths and extrapolated to a standard reference thickness of 1/8" (3.175 mm).

<i>Thermal Properties</i>	<i>Method</i>	<i>Value</i>
Glass Transition Temperature (T _g)	ASTM D 3481	59 °C
CTE ^{c)} prior T _g	ASTM E 831	79 ppm/°C
after T _g	"	126 ppm/°C
Thermal Conductivity @25 °C [77 °F]	ASTM E 1461 92	0.40 W/(m·K)
@50 °C [122 °F]	"	0.43 W/(m·K)
@100 °C [212 °F]	"	0.41 W/(m·K)
Specific Heat Capacity @25 °C [77 °F]	"	1.5 J/(g·K)
@50 °C [122 °F]	"	1.7 J/(g·K)
@100 °C [212 °F]	"	1.9 J/(g·K)
Thermal Diffusivity @25 °C [77 °F]	"	0.21 mm ² /s
@50 °C [122 °F]	"	0.19 mm ² /s
@100 °C [212 °F]	"	0.17 mm ² /s

Note: Specifications are for epoxy samples cured at 40 °C for 16 hours, with additional curing time at room temperature for optimal results. For most tests, samples were conditioned at 23 °C and 50% RH.

c) Coefficient of Thermal Expansion (CTE) units are in ppm/°C = in/in/°C × 10⁻⁶ = unit/unit/°C × 10⁻⁶

Properties of Uncured 9200FR

<i>Physical Property</i>	<i>Mixture (1A:1B)</i>	
Color	Light yellow	
Viscosity @25 °C [77 °F]	Thixotropic paste	
Density	1.25 g/mL	
Mix Ratio by weight (A:B)	100:92	
Mix Ratio by volume (A:B)	1:1	
<i>Physical Property</i>	<i>Part A</i>	<i>Part B</i>
Color	Off-white	Light yellow
Viscosity @25 °C [77 °F]	Thixotropic paste	Thixotropic paste
Density	1.30 g/mL	1.27 g/mL
Odor	Mild	Ammonia-like

Compatibility

Adhesion—The 9200FR epoxy adhesive adheres to most materials found on printed circuit assemblies; however, it is not compatible with contaminants like water, oil, and greasy flux residues that may affect adhesion. If contamination is present, clean the printed circuit assembly with electronic cleaner such as MG Chemicals 4050 Safety Wash, 406B Superwash, or 824 Isopropyl Alcohol.

Storage

Store between 16 and 27 °C [60 and 80 °F] in dry area away from sunlight. Because some of the components are sensitive to air, always recap firmly when not in use to maximize shelf life.

ATTENTION! Do NOT store above stated temperature range. Resin and hardener will separate above 30 °C [86 °F].

Health and Safety

Please see the 9200FR **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. The epoxy is black and will not wash off once cured: wear protective work clothing. Wash hands thoroughly after use or if skin contact occurs. Do not ingest.

Use in well-ventilated area since vapors may cause irritation of the respiratory tract and cause respiratory sensitization in susceptible individuals.

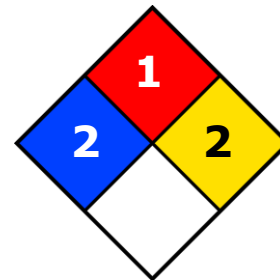
The cured epoxy resin presents no known hazard.

Part A

HMIS® RATING

HEALTH:	* 2
FLAMMABILITY:	1
PHYSICAL HAZARD:	2
PERSONAL PROTECTION:	

NFPA® 704 CODES

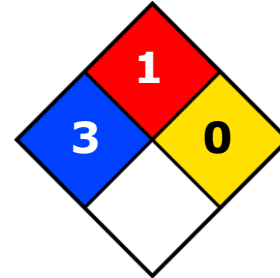


Part B

HMIS® RATING

HEALTH:	* 3
FLAMMABILITY:	1
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)

Application Instructions

Follow the procedure below for best results. For mixing quantities that are less than 1 mL in size or for stricter stoichiometry control, mix by weight ratio instead (requires a high precision balance). Heat cure is recommended to get the best possible conductivity.

To prepare 1:1 (A:B) epoxy mixture

1. Remove cap or cover.
2. Measure **one** part by volume of **A**.
3. Measure **one** part by volume of **B**.
4. Thoroughly mix the parts together with a stir stick until homogeneous.
5. Apply to with an appropriate sized stick for the application area.

NOTE: Remember to recap the syringe or container promptly after use.

TIP! You may preheat part A and part B to increase the flow and improve air release, but this will decrease pot life. Note that the viscosities of the parts also decrease with mixing, so they will be most liquid-like and easily dispensed with constant mixing.

To heat cure the 9200FR epoxy adhesive

Put in oven at 40 °C [104 °F] for 16 hours.
OR
Put in oven at 65 °C [149 °F] for 3 hours.
OR
Put in oven at 80 °C [176 °F] for 1.5 hours.

TIP! Hair dryers are normally rated not to exceed 60 °C, so they can generally be used to accelerate the cure.



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ATTENTION! Keep the curing temperature well below temperature limit of heat sensitive components that may be present. As a guideline, remember that commercial grade devices normally can be safely operated up to 70 °C, industrial grade up to 85 °C, and military grade up to 175 °C.

ATTENTION! Heat guns can easily exceed the temperature limits for your assembly: they should not be used.

To room temperature cure the 9200FR epoxy adhesive

Let stand for 24 hours.

TIP! While the product can be cured at room temperature, the better conductive performance is achieved with heat curing.

Packaging and Supporting Products

<i>Cat. No.</i>	<i>Packaging</i>	<i>Net Volume</i>		<i>Net Weight</i>		<i>Packaging Weights</i>
9200FR-25ML	Dual syringe	25 mL	0.8 fl oz	32 g	1.1 oz	TBD
9200FR-50ML	Dual cartridge	50 mL	1.6 fl oz	64.1 g	2.26 oz	TBD

TBD=To be determined

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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