

Flame Retardant Structural Epoxy Adhesive

Description

9200FR is a toughened, flame retardant, two-part epoxy adhesive, designed to create long-lasting load-bearing joints. It adheres strongly to materials that are difficult to bond to, including glass, ceramics, metals, engineered thermoplastics, and thermoset laminates, such as SMC (sheet molding compound) and GRP (glass-reinforced plastics). It creates tough vibration-resistant bonds, and is especially useful for joining dissimilar materials that will experience thermal cycling stresses.

This product also provides excellent electrical insulation, and protects against static discharges, thermal shocks, galvanic corrosion, environmental humidity, salt water, fungus, and many harsh chemicals.

It is smooth, non-sagging and thixotropic, so it is excellent for use on vertical surfaces and for gap-filling. It is also useful for potting electronics in enclosures with gaps where a non-thixotropic encapsulant would flow through.

If flame retardance is not required, use 9200, which has superior mechanical properties.

Features and Benefits

- *1:1 mix ratio*
- *Flame retardant—meets UL 94V-0*
- *Excellent bond strength to a wide variety of substrates*
- *Extreme resistance to vibration and temperature cycling*
- *High tensile, compressive and lap shear strength*
- *Excellent chemical resistance*
- *Excellent electrical insulating characteristics*
- *Non-sagging and gap-filling*
- *Ideal for bonding dissimilar materials*
- *Low shrinkage*
- *RoHS 3 compliant*

Usage Parameters

| Properties | Value |
|---|--------|
| Working life @22 °C [72 °F] | 30 min |
| Shelf life @22 °C [72 °F] ^{a)} | ≥3 y |
| Service cure @22 °C [72 °F] | TBD |
| 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 |

Temperature Ranges

| Properties | Value |
|------------------------------|-------------------------------|
| Constant service temperature | -40 to 150 °C [-40 to 302 °F] |
| Storage temperature | 16 to 27 °C [61 to 81 °F] |

Cured Properties

| Physical Properties | Method | Value ^{a)} |
|--------------------------------------|-------------------|--|
| Color | Visual | Light yellow |
| Density @25 °C [77 °F] | ASTM D 1475 | 1.29 g/mL |
| Hardness | Shore D Durometer | 78D |
| Tensile strength | ASTM D 638 | 13 N/mm ² [1 900 lb/in ²] |
| 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) | ASTM D 1002 | 10 N/mm ² [1 500 lb/in ²] |
| Lap shear strength (copper) | ASTM D 1002 | 12 N/mm ² [1 800 lb/in ²] |
| Lap shear strength (brass) | ASTM D 1002 | 13 N/mm ² [1 900 lb/in ²] |
| Lap shear strength (polycarbonate) | ASTM D 1002 | 2.3 N/mm ² [340 lb/in ²] |
| Lap shear strength (ABS) | ASTM D 1002 | 0.7 N/mm ² [100 lb/in ²] |

Note: Specifications are for epoxy samples cured at 40 °C for 16 h and conditioned at ambient temperature and humidity.

a) N/mm² = mPa; lb/in² = psi

Cured Properties

| Electrical Properties | Method | Value |
|--|-----------------------------|---|
| Breakdown voltage @2.1 mm | ASTM D 149 | 39 800 V [39.8 kV] |
| Dielectric strength @2.1 mm | ASTM D 149 | 497 V/mil [19.6 kV/mm] |
| Breakdown voltage @3.175 mm [1/8"] | Reference fit ^{a)} | 50 000 V [50 kV] |
| Dielectric strength @3.175 mm [1/8"] | Reference fit ^{a)} | 400 V/mil [15.7 kV/mm] |
| Volume resistivity | ASTM D 257 | $1.1 \times 10^{13} \Omega \cdot \text{cm}$ |
| Volume conductivity | ASTM D 257 | $9.1 \times 10^{-14} \text{ S/cm}$ |
| Thermal Properties | Method | Value |
| Glass transition temperature (T_g) | ASTM E 3418 | 59 °C [138 °F] |
| CTE ^{b)} prior T_g after T_g | ASTM E 831 ASTM E 831 | 79 ppm/°C [174 ppm/°F] 126 ppm/°C [259 ppm/°F] |
| Thermal conductivity @25 °C [77 °F] | ASTM E 1461 92 | 0.4 W/(m·K) |
| Thermal diffusivity @25 °C [77 °F] | ASTM E 1461 92 | 0.2 mm ² /s |
| Specific heat capacity @25 °C [77 °F] | ASTM E 1461 92 | 1.5 J/(g·K) |

Note: Specifications are for epoxy samples cured at 40 °C for 16 h and conditioned at ambient temperature and humidity.

a) To allow comparison between products, the dielectric strength was recalculated with the Tautscher equation fitted to 5 experimental values and extrapolated to a standard thickness of 1/8" (3.175 mm).

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

Uncured Properties

| Physical Properties | Mixture (A:B) |
|---------------------|---------------|
| Color | Light yellow |
| Density | 1.25 g/mL |
| Mix ratio by volume | 1:1 |
| Mix ratio by weight | 1:0.92 |

| Physical Properties | Part A | Part B |
|--------------------------|-------------------------------------|-------------------------------------|
| Color | Off-white | Light yellow |
| Viscosity @25 °C [77 °F] | 380 000 cP [380 Pa·s] ^{a)} | 370 000 cP [370 Pa·s] ^{a)} |
| Density | 1.30 g/mL | 1.27 g/mL |
| Odor | Mild | Ammonia-like |

a) Brookfield viscometer at 20 rpm with spindle RV S96

Compatibility

Adhesion—9200FR epoxy adheres to most plastics and metals used to house printed circuit assemblies; however, it is not compatible with contaminants like water, oil, or greasy flux residues, which may affect adhesion. In case of contamination, first clean the surface to be coated with MG Chemicals 824 Isopropyl Alcohol.

For substrate substances with weak adhesion strengths, surface preparation such as sanding or pre-coating with a suitable primer may improve adhesion.


Chemical resistance—Once cured, the epoxy adhesive is inert under normal conditions. It will resist water and salt exposure.

It is expected to resist short term exposures to fuels or similar non-polar organic solvents, but it is not suitable for prolonged exposures. Avoid use with strong acids, strong bases, or strong oxidizers.

Storage

Store between 16 to 27 °C [61 to 81 °F] in a dry area, away from sunlight. Some of the components are sensitive to air, always recap firmly when not in use to maximize shelf life.

Substrate Adhesion (In Decreasing Order)

| Physical Properties | Adhesion | |
|---------------------|--|---------------|
| Steel | Stronger | |
| Copper/brass |  | |
| Aluminum | | |
| Fiberglass | | |
| Wood | | |
| Paper, Fiber | | |
| Glass | | |
| Rubber | | |
| Polycarbonate | | |
| Acrylic | | Weaker |
| Polypropylene | | Does not bond |

Health and Safety

Please see the 9200FR Safety Data Sheet (SDS) parts A and B for further details on transportation, storage, handling, safety guidelines, and regulatory compliance.

Application Instructions

For best results, follow the procedure below. Heat cure to achieve optimal conductivity.

Syringe or cartridge:

To insert the cartridge in the gun, see the Application Guide section for dispensing accessories.

1. Twist and remove the cap from the cartridge or syringe. Do not discard cap.
2. Dispense a small amount to ensure even flow of both parts.
3. (Optional) Attach a static mixer to the 9200FR-50ML.
 - a. Dispense and discard 3 to 5 mL of the product to ensure a homogeneous mixture.
 - b. After use, dispose of static mixer.
4. Without a static mixer, dispense material on a mixing surface or container, and thoroughly mix parts A and B together.
5. To stop the flow, pull back on the plunger.
6. Clean nozzle to prevent contamination and material buildup.
7. Replace the cap on the cartridge or syringe.

Cure Instructions

Room temperature cure:

- Let cure at room temperature for 24 h.

Heat cure:

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

Dispensing Accessories

Consult the table below for appropriate accessory selection. See the [Application Guide](#) for instructions on using the dispensing accessories.

| Cat. No. | Dispensing Gun | Static Mixer |
|-------------|----------------|------------------|
| 9200FR-25ML | N/A | N/A |
| 9200FR-50ML | 8DG-50-1-1 | 8MT-50, 8MT-50FT |

Packaging and Supporting Products

| Cat. No. | Packaging | Net Volume | Packaged Weight |
|-------------|----------------|--------------------|-----------------|
| 9200FR-25ML | Dual syringe | 25 mL [0.84 fl oz] | 88 g [0.19 lb] |
| 9200FR-50ML | Dual cartridge | 45 mL [1.52 fl oz] | 112 g [0.25 lb] |

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.

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Disclaimer

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