

Polymer Composites Incorporated

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Technical Data Sheet MAX FRE A/B FLAME RETARDANT EPOXY

Description

MAX FRE A/B is a two-component, epoxy-based resin specially formulated as a self extinguishing resin system. It can be utilized as a casting resin, encapsulating resin or as an adhesive that requires resistance to open flame ignition and will self extinguish upon removal of the flames source. MAX FRE A/B does not contain Chlorine, Bromine, Antimony or other highly toxic compounds during combustion and smoke release.



MAX FRE A/B demonstrates excellent electrical insulative properties, low odor and excellent thermal dissipation values as well as dimensional stability. Upon full cure, its self extinguishing performance conforms to

UL 94 V0 Rating
(Federal Aviations Regulation)
FAR 25.855
FAR 25.853

MAX FRE A/B is room temperature cured, low in viscosity and offers ease of use. It can be demolded and handled after 24 hours room temperature cure. For a faster demold time, allow the applied MAX FRE A/B to gel at room temperature for 2 to 3 hours and then post cured at 30 minutes at 200°F.

MAX FRE A/B cures to a tough and thermal shock resistant compound suitable for electrical potting or encapsulation applications for both low and high voltage circuitry. It and can also be used as casting resin to fabricate enclosures, protective shielding.

MAX FRE A/B is an excellent fiberglass impregnating resin for fabricating composite structures that requires fire ignition resistant properties.

MAX FRE A/B demonstrates dimensional stability, reduced shrinkage and color opacity. MAX FRE A/B is available in white, black, red and yellow for circuitry masking and color coding). MAX FRE A/B is easily mixed and poured into place and it is self-leveling. A 200 gram mass can be mixed without overheating due to exothermic heat generation and will provide up to a 30 minutes working time.

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Application and Usage

MAX FRE A/B is filled with flame-retardant fillers that may settle during storage. Re-dispersing the fillers is required prior to use to insure proper cured performance. In its original container, gently mix by hand using a stiff spatula or by mechanical mixer until all the filler is uniformly dispersed.

Avoid aggressive mixing to reduce excessive air entrapment. Allow the mixed Part A to sit for about 30 minutes to permit any entrapped air bubbles to rise to the surface and evacuate. To remove stubborn air bubbles from the surface, use a hot air gun or a hair dryer or a propane torch and pass it very quickly over the surface. If available, use vacuum to degas the resin to accelerated air bubble removal

MAX FRE A/B for Electrical Potting And Encapsulation Compound

For hand mix or manual applications, measure out the proper amounts Part A and Part B based on a 33 parts Curing agent to 100 parts Resin by weight mix ratio in a clean container (the resin is heavier in density than the curing agent). Gently mix until a uniform consistency is achieved (2 minutes). Do not mix aggressively to avoid excessive air entrapment. Transfer the mixture into another clean container and continue mixing for another minute. This will guarantee a thorough mixture and homogenous mixture which critical for its self extinguishing performance.

Secure the PCB and lead wires to the desire position and then pour the mixed MAX FRE A/B in to the cavity or housing. Do not exceed 400 cubic centimeters of casted volume to be confined to a concentrated mass as the exothermic may activate the fire-retardant filler. Specialty wire jackets such as PVC, Plastisol Military Grade, Geon® and Plenum wire and cable jackets bond very well to

MAX FRE A/B. Secure the wire into a bundle and secure the position of the wire bundle.

For under water potting application, use a Silane adhesion promoter and apply it unto the to prevent loss of adhesion from hydrolysis. Loss of adhesion (Hydrolysis Reaction) between plastic and polymer resins typically occurs when submerged for long periods or salt water immersion.

For large castings, allow the first pour to reach its peak exotherm (60 minutes) and then pour the remainder to the desired volume.

Allow to cure undisturbed for 24 hours. For a faster cure time allow to gel at room temperature and then post cured at 30 minutes at 175°F (If a plastic housing is used, post cure the encapsulated part 25% below the softening point of the plastic housing). Allow to cool slowly to room temperature.

Adhesion of the MAX FRE A/B to the various types of plastic has been tested and demonstrates excellent bond performance. High surface tension plastics such as HDPE, UHMW and PET will require CORANA or FLAME TREATING to facilitate and improve adhesion prior to application of the MAX FRE A/B.

Mix Meter Dispensing

MAX FRE can be adapted to use with mix meter and dispense equipments with low abrasion performance to the dispensing pimp cylinders. Use a 28-turn mix meter nozzle to yield a uniform and homogenous mixture.

Curing

Allow the potting to cure at room temperature; depending on the ambient temperature cures times can vary from 24 to 36 hours. If available, use a Durometer to determine the cured hardness, a reading of 65 D will be sufficient for handling Longer cure times may be required when curing below 70°F.

For a faster cure times, allow the casting to set-up for 1 hour at room temperature then post cure in an oven for 30 minutes at 200°F.

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Physical and Mechanical Data

Mixed Viscosity	3000 to 4000 cPs @ 77°F
Color	Available in Black, White & Opposing Colors to show mix quality
Mix Ratio By Weight	100 Parts A to 33 Parts B
Mixed Density	1.35 g/cc
Working Time:	45 minutes (200 gram mass)
Peak Exotherm:	260°F max 200 gram mass in a 8 cubic centimeter @ 55 minutes

Cured Properties (4 inch by 4 inch by 1/2 inch-Specimen 3 day cure plus 30 minutes at 175°F)

Shore Hardness	80 to 83 Shore D (10 seconds)
Cure Shrinkage	<0.20 % (200 grams casted 1" diameter cylinder)
Compressive Strength	12,800 psi @ 77°F
Tensile Strength	6,900 psi @ 77°F
Tensile Elongation	3% to 5% @ 77°F
Thermal Conductivity	2.87 BTU/in/hr/square feet
Heat Distortion Temperature	200°F
Thermal Shock Resistance	-250°C to 200°C
Test Method	30 minute conditioning time- temp. transfer 10 seconds

Electrical Properties

Volume resistivity	9.3 x10 ¹⁶ Ohms/ cm
Dielectric Constant	3.54 @ 77°F 60 Hz 3.61 @ 77°F 1.0 kHz 3.67 @ 77°F 1.0 MHz
Dissipation Factor	0.0159 @ 77°F 1.0 kHz
Dielectric Strength	550 to 635 Volts per 0.001 @ 77°F

PACKAGING AND STORAGE

MAX FRE A/B is available in Gallon Kits, 5- Gallon Pails and 55-Gallon kits pen top containers; special use size packaging requests are also available. Stir MAX FRE A/B in their respective shipping container to insure uniform dispersion of filler before dispensing.

Replace lid and seal tightly and store in between 65°F to 90°F.

DO NOT store above 100°F for prolonged period as this will accelerate phase separation and will require remixing to re-disperse the fire retardant filler

MAX FRE A/B has a 12 month shelf life from the date of shipment.

Recertification may be required to determine and validate materials beyond the stated shelf life.

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MAX FRE A/B Fire Rating Qualifications

UL 94 V-0	The test samples are extinguished within 5 seconds average time (mean of 10 successive tests). None of the test sample burns longer than 10 seconds. None of the test sample emits burning particles.
FAR 25.855 FAR 25.853	This test method is intended for use in determining the resistance of materials to flame when tested according to the 60-second and 12-second Vertical Bunsen Burner. Smoke Density Cabin Chamber Test Method
UL 94 V-2	Same Test as UL 94 V-1, but the test samples emits burning particles during the test. The test samples mentioned above are extinguished in all cases.
UL 94 HB	If the test samples keep burning after 30 seconds, a horizontal test can be carried out to reach the classification.

Types of plastic used with MAX FRE A/B

Other types of plastic housing can be also be used; some plastics will require surface treating such as CORANA discharge or Surface Flame Treating to improve adhesion. Silane-based adhesion promoter is also highly recommended if the part will be submerged in water.

PLASTIC	PROPERTIES	TYPICAL APPLICATION
Noryl	Extremely good mechanical, thermal and electrical properties. Good ageing stability and weathering resistance. High stability against chemicals	Dimensionally stable, heat-resistant, self-extinguishing parts, mainly when exchanged with metal. Component parts and cases for entertainment industry and data processing units.
Polyimide	Thermoplastic with high temperature stability, extremely solid and tenacious. Good sliding properties and high capacity of resistance to wear.	Contact with humidity may result in a change of properties. Ideally suited for technical application, especially for machine elements with complicated geometry.
Polycarbonate	Thermoplastic with high temperature stability with excellent resistance to all kinds of temperature. On the whole, good resistance against chemicals and UV-light.	Recommended for cases housing instruments and general indoor and outdoor application. Not recommended for use with strong alkalis or for direct exposure to sunlight.
PC-ABS Blend	Good stability in case of high temperature combined with enormous impact strength as well as toughness at subzero temperature. On the whole, good resistance against chemicals. UV-light may have a negative effect. Ideally suited for indoor use with moderate corrosive conditions. Limited outdoor suitability.	Special materials comply with ball-thrust hardness test according to VDE 700 at 125°C
ABS	Good resistance against medium temperature combined with good impact strength (only certain types) and antistatic adjustment. On the whole, good resistance against chemicals. Marginal UV stability.	Cases and operating elements of all kinds. Indoor use, also suitable for low temperature. Limited outdoor application. Suitable for galvanic coating.
Polystyrene	Normally brittle and resistant to fairly low temperature. SB-types are impact resistant and less sensitive to tearing under pressure. Glossy surface. Metal-cutting is possible. Exposure to UV-light should be avoided	For cases and operating elements with working temperature of less than 65°C. Suitable for indoor use.
PMMA(Plexiglas ®)	Good mechanical properties, slightly brittle. Superior from optical point of view. Permeable to light up to 92% for certain types. Cases and front panels for infrared transmitters and receivers as well as transparent parts.	COMBUSTIBILITY TEST FOR PLASTICS ACCORDING TO UL SUBJECT 94

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SAFETY NOTE

This product is for industrial use only. Please review all precautions before using this product. As with all products of the same nature, avoid prolonged inhalation and repeated skin contact. Always wear safety goggles and impervious rubber gloves when handling this material. Large mass curing of this product is not recommended for it may produce noxious fumes.

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The user should thoroughly test any proposed use of this product and independently conclude satisfactory performance in the application. Likewise, if the manner in which this product is used requires government approval or clearance, the user must obtain said approval from an independent accredited laboratory for certification. Determination of the suitability of any kind of information or product for the use contemplated by the user, the manner of use and whether there is any infringement of patent is the sole liability of the user.