EpoPro® 104F-A/B

2 PART MULTIPURPOSE EPOXY ADHESIVE SYSTEM

EpoPro® 104F-A/B is a two part epoxy system that cures at room temperature or with heat into a tough adhesive compound. The EpoPro® 104F is a mineral filled version of our standard EpoPro® 104A/B system. This system when cured produces a polymer composite that provides excellent mechanical and electrical properties, and is resistant to moisture and many chemicals. The EpoPro 104F-A/B is an excellent adhesive and demonstrates excellent bond strengths to most common materials including metals, wood, rubber, glass, and most rigid plastics.

A unique feature of this system is that the hardness of the cured polymer can be controlled by varying the mix ratio of the 104F-A & 104B. The cured polymer can be varied from a hard, rigid polymer to a softer, more semi-flexible state by varying the mix ratio.

The EpoPro 104F-A/B system is available in many standard colors including standard gray as well as black or a neutral tan. For your specific application, we can recommend custom variations of this product to fit your processing or cured property requirements. Please contact us to discuss your application if you'd like to receive samples of a custom color or to discuss the development of a custom variant that would be suitable for your application.

SUGGESTED APPLICATIONS

- Multipurpose adhesive and potting compound – excellent for many uses
- Excellent for semi-flexible, and impact resistant bonds and sealing applications
- Complies with FDA 21 CFR 175.105 &175.300 for use on food contact surfaces

HANDLING PROPERTIES

	VALUE	TEST METHOD
EpoPro 104F-A (resin)		
Visual Appearance	Tan Semi-Paste	Visual
Density, Part A	1.4 g/cm³	ASTM E-201
Viscosity, Part A, @ 25ºC	60,000 cps	ASTM D-2393
Flash Point	>93°C	ASTM D-92
EpoPro 104F-B (hardener)		
Visual Appearance	Gray Semi-Paste	Visual
Density,	1.4 g/cm³	ASTM E-201
Viscosity, Part B, @ 25ºC	60,000 cps	ASTM D-2393
Flash Point	>93°C	ASTM D-92

Mix Ratio (part by weight)	**100A:50B**	**100A:100B**	**100A:150B**	
Viscosity Mixed @ 25ºC	60,000 cps	60,500 cps	60,000 cps	ASTM D-2393
Viscosity Mixed @ 65ºC	5000 cps	5,200 cps	5,300 cps	ASTM D-2393
Pot life (100 grams) @ 25ºC	120 minutes	95 minutes	125 minutes	Gardner
Pot life (100 grams) @ 50ºC	22 minutes	18 minutes	25 minutes	Gardner

Cure Schedules: 24-48 hours at 25ºC **or** 3-4 hours at 60ºC **or** 1-2 hours at 80ºC **or** 10-30 minutes at 100ºC will provide good initial cure. At room temperature full curing may take 3-7 days. Heat cures will achieve full strength within the cure time listed or within 24 hours at room temperature after the heat cure is complete. In many applications, allowing the adhesive to set for 4 hours or longer prior to curing will reduce curing shrinkage and provide the optimum bond strength.

PHYSICAL PROPERTIES (Tested at 25ºC unless otherwise noted)

Mix Ratio (parts by weight)	**100:50**	**100:100**	**100:150**	**TEST METHOD**
Appearance	Translucent, yellow to amber			Visual
Hardness, Shore D	88	83	78	ASTM D-2240
Tensile Strength	10,300 psi	8,500 psi	3,800 psi	ASTM D-638
Tensile Elongation	2.9%	7.5%	25%	ASTM D-638
Tensile Modulus	420,000 psi	310,000 psi	-	ASTM D-638
Flexural Strength	14,000 psi	11,000 psi	-	ASTM D-790
Flexural Modulus	350,000 psi	340,000 psi	-	ASTM D-790
Compressive Yield Strength	11,500	10,400 psi	-	ASTM D-695
Izod Impact Strength notched (Ft-lb)	0.75	1.24	-	ASTM D-256
Thermal Shock Cycle from 100ºC to -55ºC	Passes 3 cycles	Passes 8 cycles	Pass >10 cycles	Olyphant Washer
Curing Shrinkage (linear)	0.001%	0.001%	<0.001%	ASTM D-2566
Glass Transition Temperature (Tg)	81ºC	72ºC	57ºC	ASTM D-648
Coefficient of Thermal Expansion (CTE)				ASTM E-831
below Tg / above Tg (ppm/ºC)	74/ 154	84 / 170	94 / 286	
Weight Loss after 48 hrs at 150ºC	0.01%	0.04%	-	ASTM D-495
Moisture absorption (24 hour immersion - % weight gain)	0.15%	0.18%	-	ASTM D-570
Thermal Conductivity	0.3 W/mK	0.3 W/mK	0.3 W/mK	ASTM D-2214
Thermal Rating	130ºC	105ºC	90ºC	EIC 216
Fungus Resistance	Non-Nutrient	Non-Nutrient	Non-Nutrient	ASTM G-21
Insulation Resistance (ohms)	$>5.0 \times 10^{15}$	3.0×10^{15}	$>1.0 \times 10^{13}$	ASTM D-150
Volume Resistivity (ohm-cm)				ASTM D-150
at 25ºC	1.2×10^{16}	3.0×10^{15}	1.0×10^{13}	
at 100ºC	2×10^{10}	-	-	
Dielectric Strength (V/mil)	450	4000	-	ASTM D-149
Dielectric Constant at 25ºC				ASTM D-150

at 60 Hz / 10 KHz / 1 MHz	3.3 / 3.2 / 2.9	3.5 / 3.3 / 3.1	4.7 / 3.8 / 3.3	
Dissipation Factor at 25ºC				ASTM D-150
at 60 Hz / 10 KHz / 1 MHz	0.01 / 0.02 / 0.02	0.02 / 0.03 / 0.04	0.11 / 0.14 / 0.15	

Lap Shear Strength at 25ºC (psi) — ASTM D-1002

(Mix ratio 6A:5B by weight or 1A:1B by volume)

Various Substrates:

Concrete	1100*	Aluminum	2000
FR-4 laminate	3200*	Galvanized Steel	1800
Polyester laminate	2800*	Copper	1650
Wood (maple)	1800*		

*Indicates substrate failure

Effect of Temperature:

(Aluminum lap shear panels – mix ratio 6A:5B by weight or 1A:1B by volume)

-40°F (-40°C)	2800	105°F (40°C)	1825
67°F (20°C)	2500	150°F (65°C)	1300
77°F (25°C)	2000	180°F (82°C)	1000

NOTE: Values are based on laboratory or average production results – not for specification purposes.

FDA STATUS

Fully cured bond lines and castings made from this system comply with the requirements of the Food & Drug Administrations regulations 21 CFR 175.105 & 175.300 for the safe use on food contact surfaces under the conditions described in those sections.

NASA OUTGASSING

(After 24 hours at 125ºC and 10^{-6} torr per ASTM E-595)

Results will vary with cure schedule & mix ratio used. In general, lower levels of the 104F-B and heat cures will produce the best results.

Mix ratio	Cure Schedule	Total Mass Loss (TML) %	Collectible Condensable Volatile Materials (CCVM), %	Water Vapor Release (WVR) %
2 :1 by weight	7 days at 25°C	0.26%	0.00%	0.30%
2 :1 by weight	30 days at 25°C	0.25%	0.00%	0.1%
2 :1 by weight	2 hours at 65°C	0.64%	0.40%	0.20%
2 :1 by weight	1 hours at 93°C	0.20%	0.01%	0.19%
2 :1 by volume (100:40 by weight)	7 days at 25°C	0.20%	0.00%	0.20%
2 :1 by volume	1 hours at 93°C	0.22%	0.02%	0.25%
1 :1 by weight	7 days at 25°C	0.80%	0.02%	0.40%
1 :1 by volume (6 :5 by weight)	1 hours at 93°C	1.10%	0.05%	0.45%

100 :150 by weight	7 days at 25°C	1.48%	0.10%	0.80%

CHEMICAL RESISTANCE

(Samples cured for 7 days at room temperature then soaked 30 days in the fluids indicated at 23ºC (75ºF)

Ammonia	Excellent
Vinegar (5% Acetic Acid)	Fair
Hydrochloric Acid (10%)	Fair
Sodium Hydroxide (10%)	Good
Sodium Hydroxide (50%)	Fair
Sulfuric Acid (10%)	Poor
Boric Acid	Excellent
Kerosene	Excellent
Transmission Fluid (Type A & F)	Excellent
Power Steering Fluid	Excellent
Brake Fluid	Fair
Simple Green cleaner (undiluted)	Excellent

Rubbing Alcohol (70% Isopropyl Alcohol & 30% Water)	Fair
Ethanol	Fair
Toluene	Fair
Acetone	Fair
Paint Thinner/Mineral Spirits	Excellent
Turpentine	Good
Chlorinated solvent (carbon tetrachloride)	Fair
Water	Excellent
Mineral Oil	Excellent
Corn Oil	Excellent
Window Washer Fluid	Excellent

Excellent = Recommended for applications requiring long term immersion
Good = Recommended for applications with short term immersion or prolonged minor exposure (such as from spills, vapor, etc.)
Fair = Recommended only for short term spillage or other minor exposure applications
Poor = Not recommend (samples dissolved or dramatically weakened by exposure of more than a few minutes)

PROCESSING AND APPLICATION INSTRUCTIONS

To use, weigh (or proportion by volume) Part A and Part B in the ratio you have selected into a clean mixing container. Mixing containers should preferably be made of polypropylene, polyethylene, glass, or non-corroding metal. (Stainless steel, aluminum, etc.) Always use weighing equipment having accuracy that is ±1% or less of the smallest quantity that you will be weighing. Blend Part A & B thoroughly by using a spatula or stirring stick for at least 2-3 minutes using a kneading motion. Scrape the bottom and sides of the mixing container carefully and frequently to produce a uniform mixture. Vacuum de-gassing after mixing may be helpful for best electrical and physical properties.

Apply to clean, dry surfaces. For best adhesion, abrade the surface with a wire brush, scouring pad, steel wool or coarse sand paper. After abrasion, clean the surface of any loose material and degrease with solvent or detergent to remove any contaminants. The material may then be applied with any suitable application method include brushes, spatulas, trowels, etc.

PACKAGING AVAILABLE

This product is available in a wide range of kits including 1/2-pints, pints, quarts, ½-gallons, 1-gallons, 2.5 gallons, 5-gallons, and drums.

It can be supplied in 4oz, 8oz, or 16oz squeeze bottles for easy dispensing of small volumes of material or in dual syringe cartridges in 2:1 or 1:1 by volume mix ratios to eliminate the need for hand mixing.

In addition, pre-mixed and frozen syringes and cartridges are available in a wide variety of sizes (1ml, 3ml, 5ml, 10ml, 20ml, 30ml, 50ml and 55ml syringes, as well as 2.5 oz, 6 oz, and 12 oz cartridges) and styles (manual or air operated, EFD, Techcon, Semco, Iwashita, etc.)

Please call use with any special packaging requests, or for information on custom kitting.

STORAGE GUIDELINES

Store these materials in a clean, cool and dry environment in their tightly closed original containers. Protect from extended exposure to temperatures below 15ºC (59ºF). Crystallization may occur if the material is exposed to cold for extend periods. If this occurs, heat the entire container for 4 hours at 60ºC to re-liquefy the material. Allow to cool to ambient temperature prior to using. Also protect the EpoPro® 104A&B from exposure to moisture or high humidity. Tightly re-seal containers after use. If the recommended storage conditions are observed the products will have a minimum shelf-life of 12 months from the date of shipment.

HANDLING PRECAUTIONS

Mandatory and recommended industrial hygiene procedures should be followed whenever these products are being handled and processed. For additional information please consult the corresponding material safety data sheets.

PERSONAL HYGIENE

EpoPro® 104F-A
WARNING! May cause eye & skin irritation. Prolonged or repeated skin contact or inhalation of vapors may cause allergic skin or respiratory reactions. Harmful if inhaled or swallowed. Avoid contact with eyes, skin, or clothing. Wear eye protection and impervious gloves when handling. Wash thoroughly after handling. Avoid breathing vapor or mist. Keep containers closed when not in use. Use only with adequate ventilation. Do not take internally.

EpoPro® 104F-B
WARNING! May cause eye & skin irritation. Prolonged or repeated skin contact or inhalation of vapors may cause allergic skin or respiratory reactions. Harmful if inhaled or swallowed. Avoid contact with eyes, skin, or clothing. Wear eye protection and impervious gloves when handling. Wash thoroughly after handling. Avoid breathing vapor or mist. Keep containers closed when not in use. Use only with adequate ventilation. Do not take internally.

FIRST AID

In case of contact:
Skin – Immediately wash skin thoroughly with mild soap and water. Remove contaminated clothing and wash before reuse. Destroy contaminated shoes and other articles made of leather.
Eyes – Immediately flush eyes with plenty of water for 15 minutes and get prompt medical attention.
Inhalation - Remove person to fresh air. Administer oxygen or artificial respiration if necessary. Call a physician.
Ingestion - Do not induce vomiting. Dilute with plenty of water and contact physician immediately. Never give anything by mouth to an unconscious person.

DISCLAIMER

IMPORTANT: The following supercedes Buyer's documents. **SELLER / MANUFACTURER MAKES NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, INCLUDING OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE**. No statements herein are to be construed as inducements to infringe any relevant patent. Under no circumstances shall Seller / Manufacturer be liable for incidental, consequential or indirect damages for alleged negligence, breach of warranty, strict liability, tort or contract arising in connection with the product(s). Buyer's sole remedy and Seller's sole liability for any claims shall be Buyer's purchase price. Data and results presented are based on controlled or laboratory work and must be confirmed by Buyer by testing for its intended conditions of use. The product(s) has not been tested for, and is therefore not recommended for, uses for which prolonged contact with mucous membranes, abraded skin, or blood is intended; or for uses for which implantation within the human body is intended.

Specialty Polymers & Services, Inc. (SP&S)
27822 Fremont Court
Valencia, CA 91355
www.spolymers.com

Tel: 661-294-1790
Fax: 661-294-0640
info@spolymers.com