

STRUCTURAL ADHESIVE RECOMMENDATION

PRODUCT ALL PRODUCTS

This Technical Bulletin is applicable for deck mount installations (Seakeeper 1 / 2 / 3) or Seakeeper Bond-In saddles (Seakeeper 5 / 6 / 9 / 16 / 18 / 26 / 35). For bond-in installations, Seakeeper recommends using a structural adhesive with a lap shear strength of 2000 psi (13.8 MPa) or greater. Careful consideration should be exercised by the installer when selecting the appropriate adhesive, such as working time, material compatibility (deck mount plate, deck mount grids, cast aluminum saddles, and hull structure), and surface preparation are three important factors to consider. Proper surface preparation in accordance with the adhesive manufacturer's recommendations prior to installation is critically important. Information regarding pot-life, structural properties and material compatibility can be found on the adhesive product's technical data sheet (TDS). An etching/cleaning primer compatible with the adhesive should be used on all aluminum surfaces if recommended by the manufacturer. Review the relevant Seakeeper installation manual and/or relevant part drawings for additional guidance.

Below are examples of acceptable structural adhesives which meet the requirements for a bond-in Seakeeper installation:

- Plexus MA590 Structural Adhesive manufactured by ITW
- SCI-GRIP SG300-40 Structural Adhesive
- PRO-SET ADV-176/276 Super-Toughened Adhesive Epoxy

All TDS's and application instructions should be reviewed prior to the selection of any adhesive. There may be variables unique to your installation (such as gap filling properties or working time) that may require adhesives not listed above.

The TDS for Plexus MA590, Sci-Grip SG300, and Pro-Set ADV 176/276 are attached to this Bulletin as appendices. The adhesive manufacturer or supplier should be contacted for additional information specific to each adhesive.

Seakeeper recommends the following sources for structural adhesives in the US:

- Plexus: Efrain Grillo, Technical Sales Representative | Composites One – Phone: 305-342-8277 / Email: efrain.grillo@compositesone.com
- Sci-Grip: John Canada, President | Torx Marine – Email: john@torxmarine.com

Description Plexus® MA590 is a two-part methacrylate adhesive designed for structural bonding of thermoplastic, metal, and composite assemblies¹. Combined at a 1:1 ratio, MA590 has a working time of 90 to 105 minutes and achieves approximately 500 and 1000 psi in 5 and 6.5 hours, respectively, at 74°F (23°C). This product has been designed for use on large marine structures where a very long open time product is needed. Plexus MA590 is commonly used for bonding stringers and liners into large fiberglass boats with bond lines up to one inch thick. In addition, this product provides a unique combination of excellent fatigue endurance, outstanding impact resistance, and superior toughness. Plexus MA590 is gray when mixed and is available in ready-to-use 400-mL cartridges, 5-gallon (20-liter) pails, and 50-gallon (200-liter) drums to be dispensed as a non-sagging gel.

Characteristics	Room Temperature Cure	
	▪ Working Time ²	90 – 105 minutes
	▪ Fixture Time ³	250 – 380 minutes
	▪ Operating Temperature ⁶	-40°F – 180°F (-40°C – 82°C)
	▪ Gap Filling	0.03 in. – 1.50 in. (0.75 mm – 38 mm)
	▪ Mixed Density	7.83 lbs/gal (0.94g/cc)
	▪ Flash Point	51°F (11°C)

Chemical Resistance⁴	Excellent resistance to:	Susceptible to:
	▪ Hydrocarbons	▪ Polar Solvents
	▪ Acids and Bases (pH 3-10)	▪ Strong Acids and Bases
	▪ Salt Solutions	

Typical Physical Properties (uncured) – Room Temperature	Adhesive	Activator
Viscosity, cP	140,000 – 230,000	165,000 – 230,000
Color	White	Black / White
Density, lbs/gal (g/cc)	7.79 (0.93)	7.86 (0.94) / 8.62 (1.03)
Mix Ratio by Volume	1.0	1.0
Mix Ratio by Weight	1.0	1.0
Mixed Color – Grey		
Mixer Recommendation:	Cartridge (400-mL):	Stock # 30095 (MC 13-18) mix nozzle
	Bulk:	See back & refer to ITW PP

Typical Mechanical Properties⁸ (Cured) – Room Temperature	Tensile (ASTM D638)	
	▪ Strength, psi (MPa)	2,000 – 2,500 (13.8 – 17.2)
	▪ Modulus, psi (MPa)	70,000 – 120,000 (482 – 827)
	▪ Strain to Failure (%)	>130
	Lap Shear (ASTM D1002)	
	▪ Cohesive Strength, psi (MPa)	1,500 – 2,500 (10.3 – 17.2)

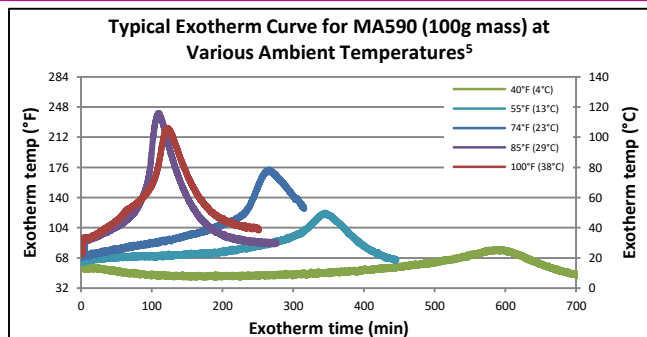
Recommended for:	▪ ABS	▪ PVC	▪ Styrenics
	▪ Acrylics	▪ Polyesters	▪ Urethanes (general)
	▪ FRP	(including DCPD modified)	▪ Vinyl Esters
	▪ Gelcoats	▪ Stainless Steel*	
		▪ Aluminum*	

* Plexus Primer Suggested⁷

VOC's	% (g/L)
During Cure (see back page)	<1 (<10)

Shelf Life*	Months
Adhesive (A Side)	7
Activator Black / White (B Side)	7 / 3
Cartridges: Mixed Gray / White	7 / 3

* See back for effect of temperature on Storage and Use



SAFETY & HANDLING: Plexus® adhesive (Part A) and activator (Part B) are flammable. Contents include methacrylate esters. Keep containers closed after use. Wear gloves and safety glasses to avoid skin and eye contact. Wash with soap and water after skin contact. In case of eye contact, flush with water for 15 minutes and get medical attention. Harmful if swallowed. Keep out of reach of children. Keep away from heat, sparks, and open flames. For more complete health and safety information, contact ITW PP for a Material Safety Data Sheet (MSDS).

NOTE: Because of the rapid curing features of this product, a large amount of heat may be generated when large masses of material are mixed at one time. Further, the heat generated by the exotherm resulting from the mixing of large masses of this system can result in the release of entrapped air, steam, and volatile gases. To prevent this, dispense only enough material as needed for the application and for use within the working time of the product and confine gap thickness to no more than its maximum gap fill capability. Questions relative to handling and applications should be directed to ITW PP at 855-489-7262.

DISPENSING ADHESIVE AND APPLICATION: Plexus Adhesives may be applied manually or with all stainless steel bulk dispensing equipment. Automated applications may be accomplished with a variety of 1-to-1 meter mix equipment delivering both components to a static mixer. Avoid contact with copper or copper-containing alloys in all fittings, pumps, etc. Seals and gaskets should be made of Teflon, Teflon-coated PVC foam, ethylene/propylene, or polyethylene. Avoid the use of Viton, BUNA-N, Neoprene, or other elastomers for seals and gaskets. For more information, contact ITW PP. To assure maximum bond strength, surfaces must be mated within the specified working time. Use sufficient material to ensure the joint is completely filled when parts are mated and clamped. All adhesive application, part positioning, and fixturing should occur *before* the working time of the mix has expired. After indicated working time, parts must remain undisturbed until the fixture time is reached. Clean up is easiest *before* the adhesive has cured. Citrus terpene or N-methyl pyrrolidone (NMP) containing cleaners, degreasers, and soap and water can be used for best results. If the adhesive is already cured, careful scraping, followed by a wiping with a cleaning agent, may be the most effective method of clean up.

EFFECT OF TEMPERATURE: Application of adhesive at temperatures between 65°F (18°C) and 85°F (30°C) will ensure proper cure. Temperatures below 65°F (18°C) or above 85°F (30°C) will slow down or increase cure rate significantly. Temperature affects viscosities of Parts A and B of this adhesive. To ensure consistent dispensing in meter-mix equipment, adhesive and activator temperatures should be held reasonably constant throughout the year. Adhesive in cured state behaves differently at elevated and low temperatures. See ITW PP for specific values.

STORAGE AND SHELF LIFE: Shelf Life is based on steady state storage between 55°F and 77°F (13°C and 25°C). Exposure, intermittent or prolonged, above 80°F (27°C) will result in a reduction of the stated shelf life. Exposure above 100°F (38°C) can quickly degrade shelf life and should be avoided. Shelf life may be extended by cool storage between 45°F and 65°F (7°C and 18°C). If stored cold, allow product to return to room temperature before using.

PRODUCT USE: Many factors beyond ITW PP control and uniquely within user's knowledge and control can affect the use and performance of an ITW PP product in a particular application. Given the variety of factors that can affect the use and performance of an ITW PP product, the end user is solely responsible for evaluating any ITW PP product and determining whether it is fit for a particular purpose and suitable for user's design, production, and final application.

EXCLUSION OF WARRANTIES: AS TO THE HEREIN DESCRIBED MATERIALS AND TEST RESULTS, THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. ITW PP MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SINCE THE USE OF THE HEREIN DESCRIBED INVOLVES MANY VARIABLES IN METHODS OF APPLICATION, DESIGN, HANDLING, AND/OR USE, THE USER, IN ACCEPTING AND USING THESE MATERIALS, ASSUMES ALL RESPONSIBILITY FOR THE END RESULT. ITW PP SHALL NOT OTHERWISE BE LIABLE FOR LOSS OF DAMAGES, WHETHER DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL, REGARDLESS OF THE LEGAL THEORY ASSERTED, INCLUDING NEGLIGENCE, WARRANTY, OR STRICT LIABILITY.

Notes

1. ITW PP strongly recommends that all substrates be tested with the selected adhesive in the anticipated service conditions to determine suitability.
2. Working Time: The time elapsed between the moment Parts A and B of the adhesive system are combined and thoroughly mixed and the time when the adhesive is no longer useable. Times presented were tested at 74°F (23°C).
3. Fixture Time: Varies with bond gap and ambient temperature. Present values were measured at 74°F (23°C).
4. Resistance to chemical exposure varies greatly based on several parameters including temperature, concentration, bond line thickness, and duration of exposure. The chemical resistance guidelines listed assume long-term exposures at ambient conditions.
5. In a typical bond line, exotherm temperatures will be lower than the temperatures shown.
6. All adhesives soften with temperature and should be evaluated at expected conditions. Consult with ITW PP for values at a specific temperature.
7. Exterior applications require the use of coatings or primers that inhibit oxidation of the metals.
8. Attained test values will vary with test method, approach, speed, etc.

NOTE: The technical information, recommendations, and other statements contained in this document are based upon tests or experience that ITW PP believes are reliable, but the accuracy or completeness of such information is not guaranteed. The information provided is not intended to substitute for the customers own testing.

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Plexus MA590 Rev 11, 05/2018





SG300 Series

Methacrylate Adhesives

DESCRIPTION

SCIGRIP™ SG300 Series Methacrylate Adhesives are two-component, 10:1 mix ratio products for bonding metals, composites and other plastic parts¹. Most metals can be bonded without priming². These advanced products are designed to meet specific requirements of the transportation industry, including reduced read through on show surfaces. The combination of minimum surface preparation^{1,2}, primerless metal bonding and low read through makes the SG300 series products ideal for a variety of assembly operations. Packaging options include 50 and 490 ml cartridges and 5 and 50 gallon (19 and 189 liters) bulk containers for application with meter-mix dispense equipment.

PERFORMANCE BENEFITS

• Primerless metal bonding	➔	No surface treatment or primers required for most metals ²
• Reduced bond line read through	➔	Reduced post finishing requirements
• Choice of 5, 15 and 40 minute working times	➔	Selection to fit application and process requirements
• Non-sag application characteristics	➔	Facilitates application on non-level surfaces
• Excellent environmental resistance	➔	Permanent bonds in harsh operating environments
• Permanent toughness	➔	Excellent fatigue, impact and shock load resistance

TYPICAL ADHESIVE CHARACTERISTICS @ 75°F (24°C)

Characteristics	Part A (Adhesive)	Part B (Activator)	Mix (Part A + B)
Color	Off White	Black or Off White	Black or Off White
Mix ratio by volume	10	1	—
Mix ratio by weight	8.75	1	—
Density, g/cc	1.01	1.15	1.02
Density, lb/gallon	8.40	9.60	8.51
Viscosity, cps	190,000 – 250,000	50,000 – 150,000	—

TYPICAL PHYSICAL PROPERTIES @ 75°F (24°C)

Tensile Strength psi (MPa)	2,000 – 2,200 (14 – 15)	Lap Shear Strength ⁴ psi (MPa)	2,500 – 2,800 (17 – 19)
Maximum Tensile Elongation (%)	100 – 125	Service Temperatures °F (°C)	-40 to 180 (-40 to 82)
Tensile Modulus ³ psi (MPa)	30,000 – 40,000 (207 – 276)		

RECOMMENDED SUBSTRATES

Composites	Metals ²	Thermoplastics ¹
✓ Epoxy	✓ Aluminum	✓ ABS
✓ Polyester & DCPD Modified	✓ Carbon Steel	✓ Acrylics
✓ Vinyl Ester	✓ Stainless Steel	✓ PVC/CPVC
✓ Gelcoats	✓ Coated Metals	✓ Styrenics

PRODUCT PROPERTIES @ 75°F (24°C) – Fixture Time (time to achieve 200 psi or 1.4 MPa strength in lap shear)⁴

Cartridge	Adhesive / Activator	Working Time (minutes)	Fixture Time (minutes)
SG300-05	SG305 A / SG605 B	4 – 6	>15
SG300-15	SG315 A / SG605 B	13 – 17	>30
SG300-40	SG340 A / SG605 B	35 – 45	>80

NOTES:

- Polyolefins, thermoplastic polyesters, fluorocarbon plastics and other low surface energy plastics are generally not bondable.
- Prepare metal by removing dust, loose scale, rust and other surface residue including oil and grease. For maximum bond strength on steel, abrade surface prior to bonding. See important notes a, b and c on reverse side.
- Tensile modulus as measured in the linear portion of the stress strain curve.
- Lap shear strength of unprimed aluminum to aluminum bond based on ASTM D 1002 method.



SAFETY AND HANDLING

Read Material Safety Data Sheet before handling or using this product. Adhesive components contain methyl methacrylate monomer and are flammable. Always use in a well-ventilated area. Floor-level extraction and large quantities of moving air greatly facilitate ventilation. Both materials must be stored in a cool place away from sources of heat and open flames or sparks. Keep containers closed when not in use. Prevent contact with skin and eyes. In case of skin contact, wash with soap and water. In case of eye contact, flush with water for 15 minutes and seek immediate medical attention. Harmful if swallowed. Keep out of reach of children.

MIXING AND APPLICATION

EXOTHERM: The chemical curing reaction that occurs when components A and B are mixed generates heat. The amount of heat generated is dependent on the mass and thickness of the mixed product. Large masses over 1.5 inch (39 mm) thick can develop heat in excess of 250°F (121°C) and can generate vapors that should be avoided from direct personal contact.

CURING

Open working time is the approximate time after mixing components A and B, depending on bonding conditions, that the adhesive remains fluid and bondable. Fixture time is the approximate time after mixing components A and B required for the adhesive to react the partial state of cure necessary to allow careful movement, unclamping or de-molding of assembled parts. Parts can generally be put in service when 80 percent of full strength is developed. The time to achieve 80% cure is approximately 2-3 times that required for fixturing. The working and fixture times presented in this bulletin are based on laboratory tests performed at 75°F (24°C). Higher temperatures speed the curing reaction and reduce open working time. The reverse is true for lower temperatures. If significant variation in temperatures or application at very high or low temperatures is anticipated, contact your SCIGRIP representative for technical assistance.

DISPENSING EQUIPMENT

Dispensing from disposable cartridges or meter-mix dispense equipment is highly recommended. Both methods employ convenient static motionless mixer technology. Product supplied in pre-measured cartridges is dispensed from approved manual or pneumatic powered guns. While using pneumatic dispensing guns, it is mandatory to use the gun's regulator to regulate the air pressure. Manufacturers recommended maximum operating pressure and maximum compressed air supply pressure are 85 and 120 psi respectively. Removal of the regulator from the dispensing unit can lead to over pressurizing and rupture of the cartridge cylinder. Contact your SCIGRIP representative for information and availability.

When meter-mix dispense systems are used, care must be taken to assure compatibility between the adhesive components and the materials in the equipment that they contact. All wetted metal components should be constructed of stainless steel, aluminum or a sufficient thickness of chemically resistant material that prevents contact between the adhesive components and the base metal. Contact with copper, brass, zinc or alloys containing these materials must be strictly avoided. All non-metallic seals and gaskets should be fabricated from Teflon®, or polyethylene based materials. Natural rubber, nitrile rubber (BUNA), neoprene and Viton® are not acceptable.

APPLICATION

Follow instructions provided or contact your SCIGRIP representative for proper preparation of dispensing equipment and substrates prior to starting the bonding process. Always dispense a quantity of adhesive at start-up to assure that the adhesive exiting the tip of the mixer is the proper color and is uniform, without streaks. If aged material is being used, allow the purged material to cure to assure quality before proceeding. Carefully dispense a sufficient quantity of

adhesive on the substrate to assure that the bond gap will be completely filled when the parts are mated. Allow for squeeze-out at the edges of the bond to assure filling. Carefully secure or clamp parts to prevent joint movement while the adhesive sets. Do not apply excessive pressure that can cause excessively thin gaps and starve the bond line. If in doubt, use shims or spacers to set the gap. A minimum gap of 0.02 inch (0.50 mm) is recommended for all other adhesives. Test the curing adhesive at the edges for fingernail hardness before removing clamps or fixtures. If clean up of the adhesive from the bonded area is required, we recommend that it is carefully performed using alcohol or other preferred industrial solvent while the adhesive is still wet or soft. Partially cured adhesive can be carefully removed with a sharp knife. Cured adhesive must be sanded or scraped, using a suitable solvent to remove remaining traces.

CLEAN UP

Adhesive components and mixed adhesive should be removed from mixing and application equipment with a suitable industrial solvent or cleaner before the mixed adhesive cures. Once the adhesive cures, soaking in a strong solvent or paint remover will be required to soften the adhesive for removal. If the bonds are exposed to UV rays then use of plasticizers such as Benzoflex 2088 is recommended, or contact your SCIGRIP representative for additional information. Any clean-up of the bonded assembly using industrial solvents is not recommended as it could affect the cure.

STORAGE AND SHELF LIFE

The shelf life of components A and B in unopened containers is approximately six months from the date the product is shipped from SCIGRIP facilities. Shelf life is based on steady state storage between 55°F and 80°F (13°C and 27°C). Exposure, intermittent or prolonged, above 80°F (27°C) will result in a reduction of the stated shelf life. Exposures above 100°F (38°C) during shipping or storage can quickly degrade component B in cartridges or bulk containers, and must be prevented. Shelf life of both components can be extended by air-conditioned or refrigerated storage between 50°F and 65°F (10°C and 18°C). **KEEP FROM FREEZING.**

IMPORTANT NOTES

- SUBSTRATE AND APPLICATION COMPATIBILITY:** The user must determine the suitability of a selected adhesive for a given substrate and application. SCIGRIP strongly recommends laboratory, shop and end-use testing that simulates the actual manufacturing and end-use environment.
- SURFACE PREPARATION:** The need for surface preparation must be determined by comparative testing of prepared and unprepared substrates to assure that unprepared bonding is equivalent to or acceptable for the application relative to prepared bonding. Initial bonding tests must be followed up with simulated or actual durability tests to assure that surface conditions do not lead to degradation of the bond over time under service conditions. Subsequent changes in substrates or bonding conditions will require re-testing.
- TECHNICAL ASSISTANCE:** Contact your SCIGRIP representative for questions or assistance with the selection of adhesives and methods for evaluating adhesives for your intended application.

NOTE: This product is intended for use by skilled individuals at their own risk. Recommendations contained herein are based on information we believe to be reliable. The properties and strength values presented above are typical properties obtained under controlled conditions at the SCIGRIP laboratory. They are intended to be used only as a guide for selection for end-use evaluation. The ultimate suitability for any intended application must be verified by the end user under anticipated test conditions. Since specific use, materials and product handling are not controlled by SCIGRIP, our warranty is limited to the replacement of defective SCIGRIP products.

PRO-SET®

Technical Data

ADV-176

ADV-276

SUPER-TOUGHENED ADHESIVE EPOXY

The New
Standard

EPOXIES for
Laminating
Infusion
Tooling
Assembly

Gougeon Brothers, Inc.
P.O. Box 908
Bay City, MI 48707
prosetepoxy.com
888-377-6738

ISO9001:2015 Certified

Rev 4 / Dec 2015

COMBINED FEATURES

Shear thinning resins and hardeners are thixotropic gels. The mixture fills gaps and will not sag on vertical surfaces. The material wets out the substrate, making priming or pre-wetting unnecessary on most surfaces, while ensuring a good bond.

Slow cure speed hardener provides approximately 90 minutes of working time at 72°F (22°C).

Room temperature cure properties suitable for many composite components and structures.

High performance pre-thickened, two-part epoxy adhesive delivers toughness and superior peel strength for heavily loaded applications and difficult to bond substrates including pre-preg, SMC, metals and most plastics. Also for secondary bonding of laminated composites, steel, aluminum, cast iron, concrete, stone, and most wood species. PRO-SET Adhesive bonds these material in any combination.

Coverage one cartridge set dispenses approximately 47' of 1/4" bead, or 17' of 1/2" bead and will cover approximately 7 sq ft when spread with a 1/8" x 1/8" notched spreader, or 12 sq ft with a 1/16" x 1/16" notched spreader.

Shelf life is 18 months for resin and 18 months for hardener when properly stored¹.

HANDLING PROPERTIES

Property	Standard	Units	72°F (22°C)
100g Pot Life	ASTM D2471	minutes	27-33
Working Time (1/2" bead)	ASTM D2471	minutes	81-99
Minimum Cure Temp	ASTM D2196	°F (°C)	60 (16)

MIX RATIO

Method	Resin:Hardener	Resin:Hardener
Weight	2.24:1	100:44.6
Volume	2.00:1	100:50.0

DENSITY

State	Units	72°F (22°C)
Resin	lb/gal (g/cc)	9.76 (1.17)
Hardener	lb/gal (g/cc)	8.76 (1.05)

MECHANICAL PROPERTIES

Property	Standard	Units	72°F (22°C) x 2 wk
Hardness	ASTM D2240	Type D	80
Compression Yield	ASTM D695	psi (MPa)	7,770 (54)
Tensile Strength	ASTM D638	psi (MPa)	5,330 (37)
Tensile Modulus	ASTM D638	psi (GPa)	2.80E+05 (1.93)
Tensile Elongation	ASTM D638	%	10.1
Flexural Strength	ASTM D790	psi (MPa)	9,540 (66)
Flexural Modulus	ASTM D790	psi (GPa)	2.97E+05 (2.05)
Lap Shear on 1018 Steel	ASTM D1002	psi (MPa)	2,880 (20)
Lap Shear on 2024T Aluminum	ASTM D1002	psi (MPa)	2,860 (20)
Tensile Adhesion to 1018 Steel	ASTM D4541	psi (MPa)	4,300 (30)
Tensile Adhesion to 2024T Aluminum	ASTM D4541	psi (MPa)	3,410 (24)

THERMAL PROPERTIES

Property	Standard	Units	72°F (22°C) x 2 wk
Tg DSC Onset-1st Heat	ASTM E1356	°F (°C)	129 (54)
Heat Deflection Temperature	ASTM D648	°F (°C)	118 (48)

¹Store PRO-SET® Epoxy resins and hardeners at room temperature in sealed containers until shortly before use. As with many high-performance epoxy resins, repeated exposure to low temperatures during storage may cause the resin to crystallize. If this occurs, warm the resin to 125° F and stir to dissolve crystals. Hardeners may form carbamation when exposed to CO₂ and moisture in the atmosphere for extended periods of time. Prevent carbamation by protecting hardeners from exposure until immediately prior to processing.

Test specimens were neat epoxy (without fiber reinforcement).
Typical values, not to be construed as specification.