

3M™ Matrix Resin 4833

Technical Data Sheet

Product Description

3M™ Matrix Resin 4833 is a two-part, low viscosity, nanoparticle modified Bis-F epoxy curable at low temperatures optimized for extreme toughness applications. 3M Matrix Resin 4833 can be used in filament winding, pultrusion and with typical heated bath processes and in RTM processes.

Features

	Composite Properties	Composite Tube or Shaft Properties
Design Flexibility	Improved Axial Stiffness Improved Compression Strength	Lightweighting Opportunities
Performance	Increased Stiffness	Increased Critical Buckling Torque Improved Vibrational Stability Part
Part Life	Increased Fracture Toughness Increased Hardness Improved Shrinkage Improved CTE	Reduced Micro-Cracking Abrasion Resistance Less Residual Stress

Typical Resin Properties (Not for specification purposes.)

Property	Test Method	3M™ Matrix Resin 4833*	Typical Epoxy**
Wt % Nanoparticles as mixed*	3M Internal Method	38 (34)	0
Density (g/cc)	ASTM D792	1.5	1.2
Viscosity, cP (Resin) @ 77 °F (25 °C)	3M Internal Method	10000	2500
Viscosity, cP (Mixed)* @ 77 °F (25 °C)	3M Internal Method	7500	1500
Epoxy Equivalent Weight (g/eq)	3M Internal Method	308 – 324	178 – 186

* Mixed with DICU/Urea at 100:1.3:1.3 mix ratio epoxy to DICU to Urea by weight or (cured with : 100 parts 4833 to 15.5 parts E100)

** Of similar Tg and cured with similar curing agent

Note: This technical information and data should be considered representative or typical only and should not be used for specification purposes.

Suggested Applications

- Pultruded or wound tubes and shafts exposed to extreme environmental impacts
- High energy flywheels where microcracking is a top concern
- RTM structural parts requiring extreme toughness and compressive strength

Benefits

- Longer part life due to improved performance after impact for exposed tubes or shafts, and lower residual stresses in manufactured parts
- Higher torque carrying capacity for rotating tubes and shafts enabling longer, stronger or lighter weight designs
- Enables single piece flywheel designs due to lower CTE and shrinkage during cure; longer part life by reduced microcracking via enhanced fracture toughness
- Enables new RTM part designs with improved performance and/or lighter weight
- 3.5 year shelf life at room temperature

Typical Laminate Properties (Not for specification purposes.)

Typical Carbon Fiber Composite Properties – Filament Wound Tubes			
Property	Test Method	3M™ Matrix Resin 4833	Typical Epoxy
Axial Modulus, GPa (Ksi)	ASTM D5449	31.0 (4497)	23.0 (3335)
Hoop Modulus, GPa (Ksi)	ASTM D2290-12	15 (2175)	10 (1450)
Coefficient of Thermal Expansion	ASTM E831	47	57

Sample Preparation: Epoxy carbon fiber tubes with dimensions of 8.63 cm inner diameter, 0.4 cm thickness and approximately 0.3m length, were wound utilizing a ca. 8 cm diameter aluminum mandrel. Winding was conducted with T700SC-24K-50C Torayca fiber at 7 lb of fiber tension. An industry standard winding pattern was used for both filament wound tube samples. A DICY cured epoxy formulation typical for use in filament winding applications was used for the control sample. Wound tubes were covered in Dunstone 212 HT Shrink Tape at 5 lbs of tension. The tubes were cured at 150°C for 2 hrs.

Typical Carbon Fiber Composite Properties – Unidirectional Laminates			
Property	Test Method	3M™ Matrix Resin 4833	Typical Epoxy
0° Compression Strength (ksi)	SACMA SRM1R-94	254	190

Sample Preparation: Pre-preg produced from uniaxial T700SC-24K-50C Torayca fiber wound on a drum winder. Laminates were autoclave cured at 150°C and 90 psi pressure.



Typical Cured Neat Resin Properties (Not for specification purposes)

Property	Test Method	3M™ Matrix Resin 4833*	Typical Epoxy**
Glass Transition Temperature (T_g) (°C)(Tan Delta Peak)	ASTM D3418-08	120 (145)	120
Tensile Modulus, GPa (ksi) Strain to failure, MPa (%) Strength (ksi)	ASTM D638	6.2 (899) 82.1 (11.9) 3.4	2.8 (406) 78.6 (11.4) 4.5
Fracture Toughness K_{IC} (MPa · m ^{0.5})	ASTM D5045 (Compact tension geometry)	2.2 (1.8)	1.0
Barcol Hardness (H_B)	ASTM D2583	65	33
Linear Shrinkage (%)	ASTM D2566	0.55	0.75
Exotherm During Cure ΔH @ 10°C/min (J/g)	ASTM D3418	246	442
Coefficient of Thermal Expansion (μm/m · °C) (5 th heat, 25-180°C)	Modified ASTM E831	38	55
Equilibrium Water Uptake (wt %)	EN2378	3.3	4.4

*Mixed with DICY/Urea at 100:1.3:1.3 mix ratio epoxy to DICY to Urea by weight
or (cured with : 100 parts 4833 to 15.5 parts E100)

**Of similar T_g and cured with similar curing agent

Handling/Cure Information

Note: This processing information is general or summary in nature and not intended to replace user's careful consideration of the unique circumstances involved in its use of 3M products.

To improve the ease of mixing with the curative, 3M™ Matrix Resin 4833 can be heated to 40°C before being combined with the curative. It is recommended to minimize the heat exposure of the resin in order to maximize the shelf life of the product.

When 3M™ Matrix Resin 4833 is used in filament winding applications with curatives (i.e. DICY), it will normally require approximately 10°C higher heating of the resin coating bath to achieve an equal viscosity to a typical epoxy system and to achieve good fiber wet-out.

The use of 3M™ Matrix Resins does not require any changes to the curing conditions recommended for typical curatives – follow cure cycle as recommended by curative supplier. In some cases, the cure cycle can be shortened due to the significant reductions of exotherm and shrinkage experienced with 3M™ Matrix Resins. This is an especially important consideration in thick composite parts. 3M™ Matrix Resin 4833 may have undesirable interactions with surface-active additives such as mold releases, air releasers, de-foamers, pigments, fillers, tougheners, and additives.

These undesirable interactions can adversely affect the performance of the 3M™ Matrix Resin, even at low concentrations. It is recommended initially to evaluate only the 3M™ Matrix Resin and curative components, eliminating all fillers and additives. Information on curatives suitable for use with 3M™ Matrix Resin 4833 is available by calling 3M Customer Service at 1-800-235-2376.

Shipping and Storage

Shelf life is one year under proper storage conditions. The product should be stored indoors at 70-80°F (21-27°C). Higher temperatures shorten normal shelf life. The product should not be placed near any heating equipment. Refrigeration or freezer storage can extend shelf life. The product should be used as soon as possible after the package is opened and any unused product should be properly sealed with original or similar package.

Precautionary Information

Refer to product label and Safety Data Sheet (SDS) for health and safety information before using this product. For SDS visit our website https://www.3m.com/3M/en_US/company-us/SDS-search/.

Additional Information

In the U.S. call toll free 1-800-235-2376, or fax 1-800-435-3082 or 651-737-2171. For U.S. Military, call 1-866-556-5714. If you are outside of the U.S., please contact your nearest 3M representative.

These products were manufactured under a 3M Quality Management System registered to the AS9100 standard

Technical Information: The technical information, guidance, and other statements contained in this document or otherwise provided by 3M are based upon records, tests, or experience that 3M believes to be reliable, but the accuracy, completeness, and representative nature of such information is not guaranteed. Such information is intended for people with knowledge and technical skills sufficient to assess and apply their own informed judgment to the information. No license under any 3M or third party intellectual property rights is granted or implied with this information. **Product Selection and Use:** Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. As a result, customer is solely responsible for evaluating the product and determining whether it is appropriate and suitable for customer's application, including conducting a workplace hazard assessment and reviewing all applicable regulations and standards (e.g., OSHA, ANSI, etc.). Failure to properly evaluate, select, and use a 3M product and appropriate safety products, or to meet all applicable safety regulations, may result in injury, sickness, death, and/or harm to property. **Warranty, Limited Remedy, and Disclaimer:** Unless a different warranty is specifically stated on the applicable 3M product packaging or product literature (in which case such warranty governs), 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ARISING OUT OF A COURSE OF DEALING, CUSTOM, OR USAGE OF TRADE. If a 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price. **Limitation of Liability:** Except for the limited remedy stated above, and except to the extent prohibited by law, 3M will not be liable for any loss or damage arising from or related to the 3M product, whether direct, indirect, special, incidental, or consequential (including, but not limited to, lost profits or business opportunity), regardless of the legal or equitable theory asserted, including, but not limited to, warranty, contract, negligence, or strict liability.

4833
Issue date: 8/2019



Automotive & Aerospace Solutions Division
3M Center
St. Paul, MN 55144-1000
Phone 1-800-328-1684
Web www.3M.com/aerospace

3M is a trademark of 3M Company.
All other trademarks are the property
of their respective owners.
© 3M 2019. All rights reserved.