

3M™ Matrix Resin 4891

Developmental Product
Preliminary Technical Data Sheet

General Description

Note: The data presented in this preliminary data sheet are 3M's best estimates for the current product construction being evaluated. While this product is being developed for general commercialization, this product is still considered developmental at this time and changes in product construction or process conditions may occur that can cause subsequent changes in product characteristics or performance. User should consult with 3M before making any business plans in reliance upon the future availability or the current properties of this product.

3M™ Matrix Resin 4891 (AMD-841) is a one part, high-performance, epoxy matrix resin featuring uniformly dispersed inorganic nanoparticles for use in the fabrication of carbon fiber composites by resin transfer molding (RTM). Unlike typical resins used for RTM, 3M™ Matrix Resin 4891 (AMD-841) has a high glass transition temperature with high modulus and fracture toughness.

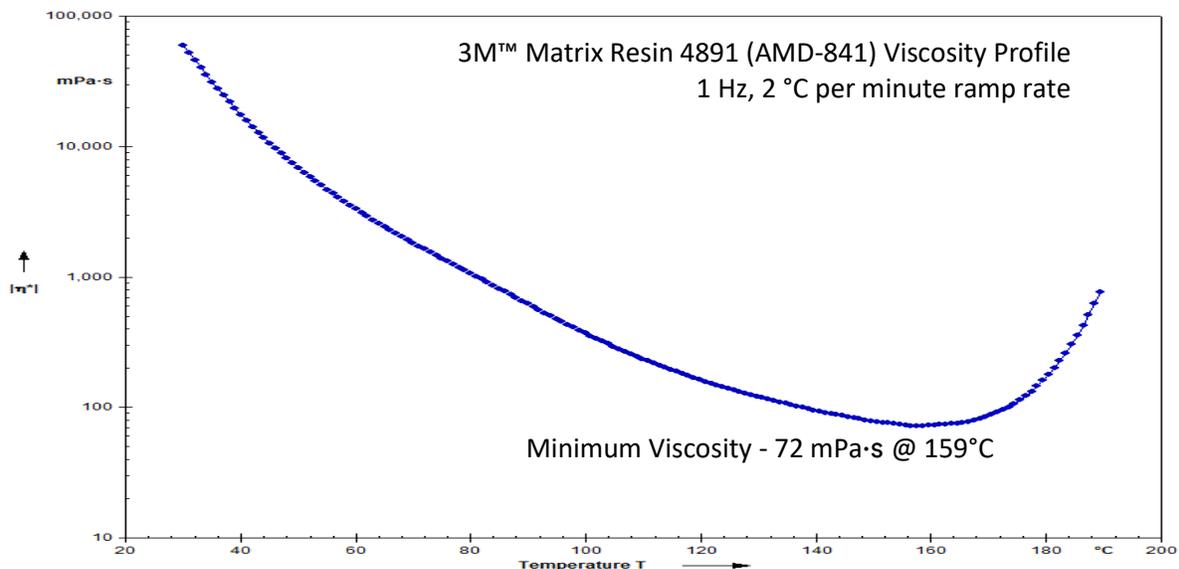
3M™ Matrix Resin 4891 (AMD-841) contains a curative and is ready to use.

Performance Characteristics

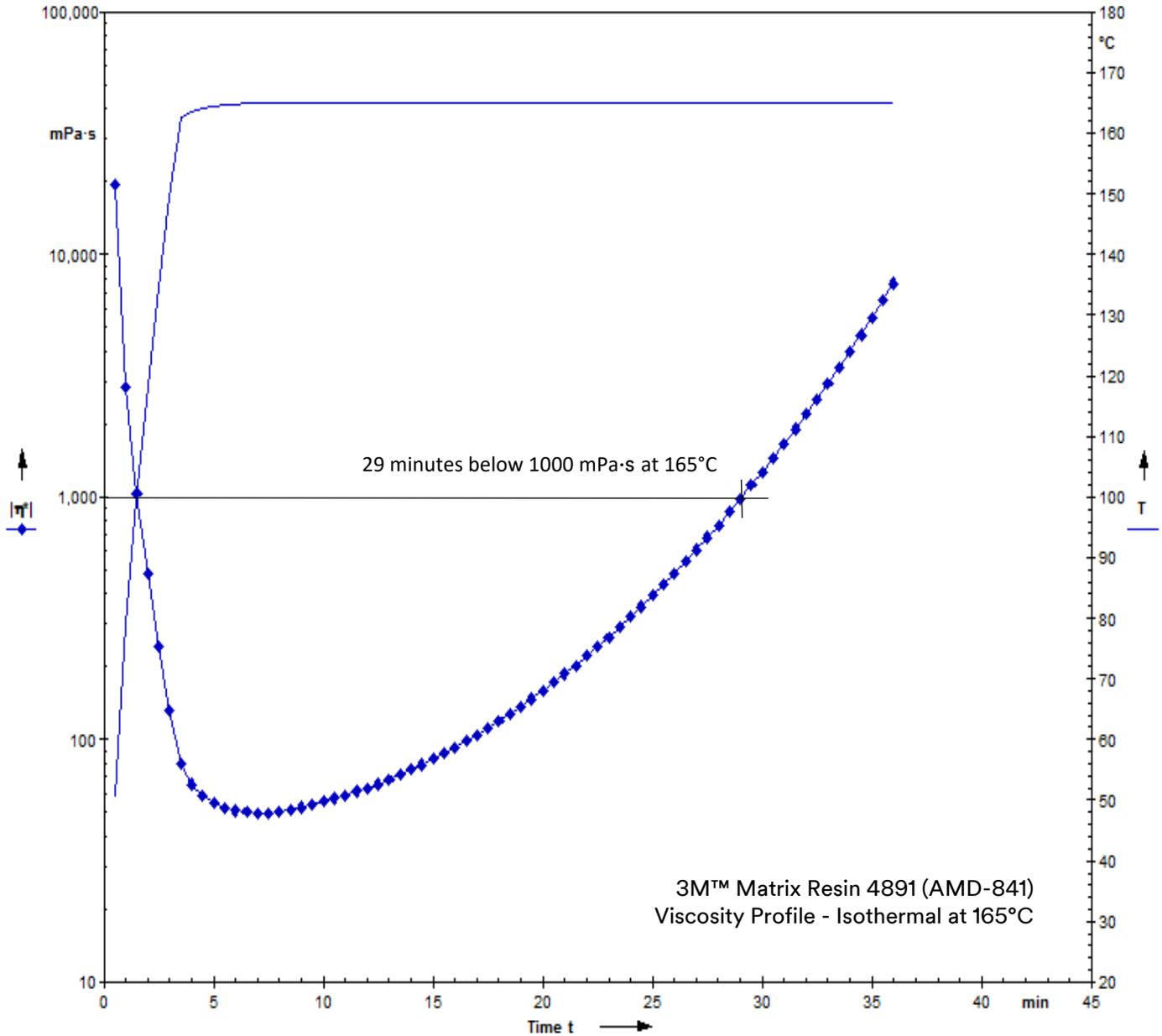
Resin	Toughness	Service Temp	Compression Strength	Applications
2894	+	-	+	Low cost aerospace grade RTM resin
2895	++	+	+	Improved service temperature and toughness
2896	+	++	+	Balanced service temperature/toughness
2897	++	++	+	Highest toughness / service temperature
4891	+	++	++	Structural parts requiring high compression strength

Typical Resin Flow Properties

The complex viscosity was measured at 1 Hz with a temperature ramp of 2°C/min. Under these conditions, the minimum viscosity is 72 mPa·s @ 159°C.



A resin viscosity below 1000 mPa·s is sufficient to allow for flow through typical fiber pre-form in an RTM mold. A processing temperature of 163°C (± 5°C) is recommended. In this range, the resin viscosity remains below 1000 mPa·s for approximately 29 minutes. This can be considered a guideline for ensuring complete filling of the fiber pre-form.



Typical Cured Neat Resin Properties

	Test Method	3M™ Matrix Resin 4891 (AMD-841)
Minimum Viscosity (mPa·s)	3M internal method (Eta Viscosity, η^*)	72
Fracture Toughness K_{1C} (MPa- \sqrt{m})	ASTM D5045 (Compact tension)	1.41
Tensile Modulus GPa (ksi)	ASTM D638	4.1 (595)
Tensile Strength MPa (ksi)		101 (15)
Tensile Strain to failure (%)		4.4
Glass Transition Temperature (°C)	ASTM D3418-08	197

Typical Composite Properties

Composite test panels made with 5HS Fabric IM7 fiber with appropriate lay-up.

Typical fiber volume in the range of 57-60%

	Test Method	Test Temp (°C)	3M™ Matrix Resin 4891 (AMD-841)	
			Dry	Hot/Wet*
Combined Load Compression Strength MPa (ksi)	ASTM D6641-14	23	775 (112)	665 (96)
		120	526 (76)	416 (60)
		150	414 (60)	276 (40)
Interlaminar Shear Strength MPa (ksi)	ASTM D2344-13	23	84.6 (12.3)	72.7 (10.6)
		120	56 (8.1)	41.5 (6)
		150	39.5 (5.7)	22.6 (3.3)
Open Hole Compression Strength MPa (ksi)	ASTM D6434-14	23	327 (47)	260 (38)
		135		206 (30)
Fracture Toughness by GIIC (J/m ²)	3M Internal Method	23	998	

*conditioned at 85°C/85% RH

General Process Conditions

3M™ Matrix Resin 4891 is a one part resin system with a dispersed curative that melts upon heating. Proper processing of the resin is critical to ensure that the curative is fully dissolved and mixed prior to being injected into the part.

- The product is a white thick paste at room temperature. Upon heating the resin viscosity is reduced and is easily pumped and infused into the fiber preform
- The resin can be heated to 60-65°C to facilitate transferring the resin from the container.
- The resin should be degassed at a temperature of 100°C under vacuum with agitation for typically 15-30 min.
- The resin has a pot-life of 5 hours at 100°C
- Resin injector reservoir and inlet tubing should be maintained at least 100°C during the injection process. Alternatively, the inlet tubing can be held at a higher temperature no greater than 163°C (± 5°C)
- It is important that the resin reaches a minimum temperature of 163°C before entering the fiber preform. This can be ensured through the use of a heat exchanger or a tool with channels that provide sufficient area for heating the resin prior to entering the fiber preform. Contact 3M for details on tooling design.
- Successful RTM processing usually involves the maintenance of high vacuum in the tool prior to resin infusion. The tool should be maintained at 163°C (± 5°C) during resin infusion. Contact 3M for additional processing details.
- After the fiber preform is fully infused with resin and at full pressure (typically 5 -7 bar), resin cure is initiated by heating the tool to 190°C (± 5°C). Full pressure should be maintained for at least 30 minutes at this temperature.
- Full resin cure is complete after 120 minutes at 190°C.

Shelf Life and Storage

Shelf life is two years from date of manufacture under proper storage conditions. The product should be stored frozen below -18°C. It is acceptable to allow the resin to be stored at room temperature (23-25°C) for an out-time of approximately 30 days. As the storage temperature increases, this out-time will decrease.

Developmental Status Notice

This 3M product is a developmental product. It is currently available on a limited basis and is only provided for technical evaluation. The future availability, formulation, performance properties, and pricing of the material are not guaranteed and are subject to change. To discuss your evaluation, please contact your local 3M Application Engineer.

Additional Information

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

Experimental Product: This 3M product is an experimental or developmental product that has not been introduced or commercialized for general sale, and its formulation, performance characteristics and other properties, specifications (if any), availability, and pricing are not guaranteed and are subject to change or withdrawal without notice. **Technical Information:** The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed. **Product 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. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application. **Warranty, Limited Remedy, and Disclaimer:** This 3M product is sold or made available "AS IS." 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE. **Limitation of Liability:** Except where prohibited by law, 3M will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.



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

4891
Issue date: 12/2017

3M is a trademark of 3M Company
© 3M 2017. All rights reserved.