3M Science. Applied to Life.™

3M™ Structural Adhesive SA9844

Technical Data Sheet

Description

3M™ Structural Adhesive SA9844 is a two-part epoxy adhesive which is impact resistant and provides excellent mechanical properties when cured at lower temperatures. Time for Geo fixing can be accelerated by the application of locally applied heat. 3M™ structural adhesive SA9844 has good adhesion to prepared surfaces along with high impact peel performance and is intended for structural bonding applications when specified by Automotive OEM's. It is particularly suited to injection joints, allowing clean and quick assemblies to be created.

Product Features and Benefits

- Designed for OEM build
- Controlled flow rheology (ideal for injection joints)
- Optimized shear, peel, and impact performance
- Develops high level of wedge impact peel performance at lower cure temperatures
- Room temperature curing
- Can be spot cured for geo fixing

In addition to the product features and benefits, 3M offers a global presence and numerous services including testing, process consulting, and prototyping.

This product is intended to augment, or in cases specifically identified by the OEM, replace welds/rivets used in the attachment of body panels, reinforcements, frame members, floor pans, etc., where strength is required to increase vehicle durability or stiffness. If this product is intended to be used for structural procedures that are "bond-only" then it is recommended that the vehicle manufacturer should verify suitability through testing etc.

Physical Properties

Packaging	400 mL, 50L and 182 L	
Base	Epoxy	Amine
Density (approx.) g/mL	1,12	1,16
Colour	Black	Silver
Solids in %	100	100
Consistency	Viscous Liquid	Soft paste
Mix Ratio by Volume	200	100
Complex viscosity in Pa.s (according DIN 54458, A1, 1Hz, 0,05 % deformation, at 23°C)	50	180
Complex viscosity in Pa.s (according DIN 54458, A4, 10Hz, 10 % deformation at 23°C)	40	35
Complex viscosity in Pa.s (according DIN 54458, A4, 10Hz, 10 % deformation at 23°C)	40	
Elastic Modulus (ASTM D638) in GPa	2.2	
Elongation (ASTM D638) in %	3-5	
Ultimate Tensile Strength (ASTM D638) in MPa	46	
Density cured g/cm^3	1,19	

Typical Performance Properties

Typical performance of 3M™ Structural Adhesive SA9844 is shown below. These values are for reference only. The following technical information and data is based upon limited 3M testing conditions and should not be used for specification purposes.

The test specimens used to generate the data below were cured at 80°C for 15 minutes, followed by 24 hours at room temperature. Bond gap used was 1mm; abrasion was conducted using grit blasting.

*Failure mode EN ISO 10365

Tensile Lap-Shear Strength (SAEJ1523) – Overlap Shear (OLS)

Test	Substrate and Pre-treatment	Shear Strength	Failure mode *
OLS strength @ 23°C	2024T3 aluminium abraded	26.41 MPa	CF
OLS strength @ 80°C	2024T3 aluminium abraded	13.8 MPa	CF+AF
OLS strength @ 90°C	2024T3 aluminium abraded	8.76 MPa	CF+AF
OLS strength @ -40°C	2024T3 aluminium abraded	30.91MPa	CF
OLS strength @ 23°C	6063 aluminium abraded	22.8 MPa	CF
OLS strength @ 80°C	6063 aluminium abraded	12.5 MPa	CF+AF
OLS strength @ 23°C	2024T3 aluminium primed with 3M™ Primer EW5000AS	26.39 MPa	CF
OLS strength @ 80°C	2024T3 aluminium primed with 3M EW5000AS	15.85 MPa	CF
OLS strength @ 90°C	2024T3 aluminium primed with 3M EW5000AS	11.44 MPa	CF
OLS strength @ -40°C	2024T3 aluminium primed with 3M EW5000AS	33.91 MPa	CF
OLS strength @ 23°C	6063 aluminium primed with 3M EW5000AS	24.67 MPa	CF
OLS strength @ 80°C	6063 aluminium primed with 3M EW5000AS	16.5 MPa	CF
OLS strength @ 80°C	LM5 Cast aluminium Anodized	11.67 MPa	AF >50%
OLS strength @ 80°C	LM5 Cast aluminium Anodized primed with 3M EW5000AS	15.49 MPa	CF >50%
OLS strength @ 23°C	CFRP Composite abraded	23.2 MPa	SF
OLS strength @ 80°C	CFRP Composite abraded	15.5 MPa	CF

Tensile Lap-Shear Strength (SAE1523) after Ageing

Test	Substrate and Pre-treatment	Shear Strength	Failure mode
OLS strength @ 23°C after 14 Day Cataplasma	2024T3 aluminium abraded	23.1 MPa	CF
	2024T3 aluminium primed with 3M EW5000AS	23.48 MPa	CF
	LM5 Cas aluminium anodized	23.62 MPa	CF+AF
	LM5 Cast aluminium anodized primed with 3M EW5000AS	26.75 MPa	CF >50%
	6063 aluminium abraded	19.8 MPa	CF+AF
	6063 aluminium primed with 3M EW5000AS	23.9 MPa	CF
	CFRP Composite abraded	22.7 MPa	SF
OLS strength @ 23°C after 30 Day APGE	2024T3 aluminium abraded	26.1 MPa	CF >50%
	2024T3 aluminium primed with 3M EW5000AS	26.4 MPa	CF
	6063 aluminium abraded	22.5 MPa	CF+AF
	6063 aluminium primed with 3M EW5000AS	24.56 MPa	CF

Floating Roller Strength (ASTM D1876)

Test	Substrate and Pre-treatment	Peel Strength	Failure mode
Floating Roller Peel Strength @23°C	2024T3 aluminium abraded	6.8 N/mm	CF >50%
	2024T3 aluminium primed with 3M EW5000AS	8.7 N/mm	CF

Wedge Impact Peel Strength (EN 11343)

Curing Conditions	Substrate and Pre-treatment / Test temperature	Impact Strength	Failure mode
72 hours @ 23°C	Steel primed with 3M EW5000AS tested @23°C	26 KN/m	CF
	Steel primed with 3M EW5000AS tested @-20°C	18 KN/m	CF
30 minutes @ 80°C	Steel primed with 3M EW5000AS tested @23°C	33 KN/m	CF
	Steel primed with 3M EW5000AS tested @-20°C	32 KN/m	CF

Fatigue Testing (ASTM D3166)

Cyclic loading of 1KN (R=0.1) was used on overlap shear test joints that were exposed to 50°C/95%RH during the whole of the test. Fatigue testing in hot/wet conditions is a key discriminator of both adhesive and mechanical performance. All the test joints survived to 10 million cycles (testing stopped) and were then tested to destruction in an Instron. Several OEMs have put a spec limit of 6 million cycles fir hot/wet fatigue run under these conditions.

Surface	No of Cycles (testing stopped)	Shear stress MPa (after Fatigue)	Failure mode after lap shear testing
2024T3 aluminium abraded	10,119,023	25.38	CF
	10,119,066	26.18	CF
	10,119,139	26.16	CF
2024T3 aluminium primed with 3M EW5000AS	10,119,034	26.57	CF
	10,119,080	26.38	CF
	10,119,070	26.93	CF

Handing / Process Properties

Storage (Standard Container Sizes)	Part A	Part B
Drums	182 L in 200 L	182 L in 200 L
Pails	50 L in 50 L	50 L in 50 L
Dual-Pack Cartridges	400 ml	

Shelf Life

	Part A	Part B
When stored at room temperature [1]	12 months[2]	12 months[2]

[1] Expiry from date of manufacture, stored at average adhesive temperatures between 10°C and 30°C. Adhesive temperatures are preferably controlled to 20°C or above to ensure good application and mixing. For short term transportation conditions contact 3M.

[2] Shelf-life under review for extension to 12 months.

Dispensing	Mixed Adhesive	
Mix Ratio (B:A) by Weight	2.0 B	1.0 A
Mix Ratio (B:A) by Volume	2.0 B	1.0 A
Off-Ratio Tolerance	1.8 – 2.2 B	1.0 A (±10%)
Open Time	Approximately 60 minutes at room temperature. Open time varies based on temperature.	

Curing Kinetics:

Cure temperature[1]	10 °C	21 °C	30 °C	40 °C	50 °C	60 °C	80 °C
Open time [2]	2,5 h	1h	30 min	12 min	5 min	3-4 min	2 min
Handling time [2,3]	17 h	6 h	3 h 30	2 h	50 min	35 min	12 min
Curing time [2]	> 2 days	> 1 day	12 h	6 h	4 h	2 h 30	1h 20

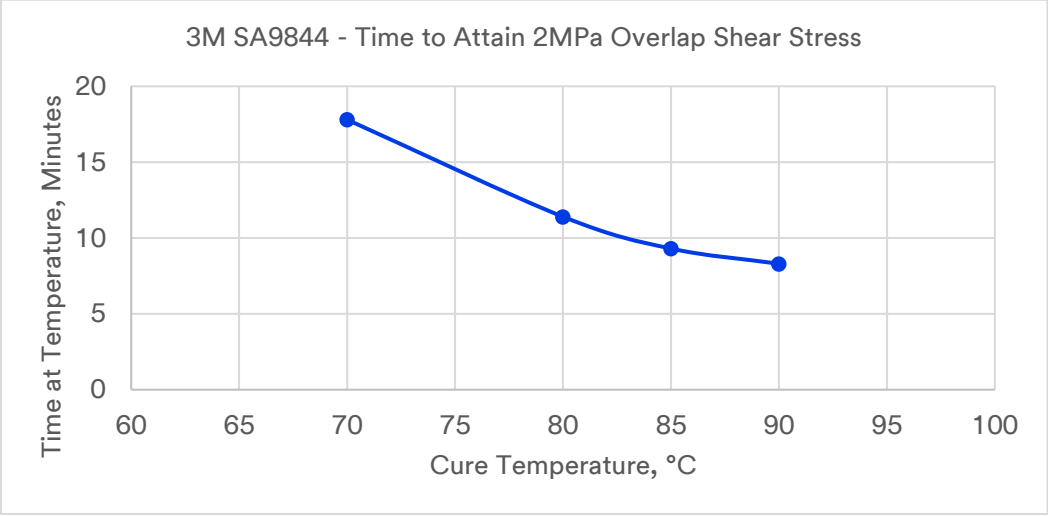
Curing after 1 minute induction process at 120°C [1,4]	
Open time [2]	n.a.
Handling time [2,3]	3 min
Curing time [2]	40 min

[1] Temperature of the adhesive
[2] Timing is given approximately: based on kinetics data (Function of time and temperature is predicted based on the activation energy value that is experimentally determined by thermal analysis at different heating rates, the prediction of the reaction conversion is utilizing a Netsch Kinetics Neo software)
[3] Handling time corresponds to Geo-fixing: strength of about 2 Mpa measured on OLS (aluminum substrates 2 mm thick).
[4] Induction process: heating from 20 °C to 120°C within 1 minute by induction treatment. Follow by a period at room temperature. Handling and curing time are given for the full period.

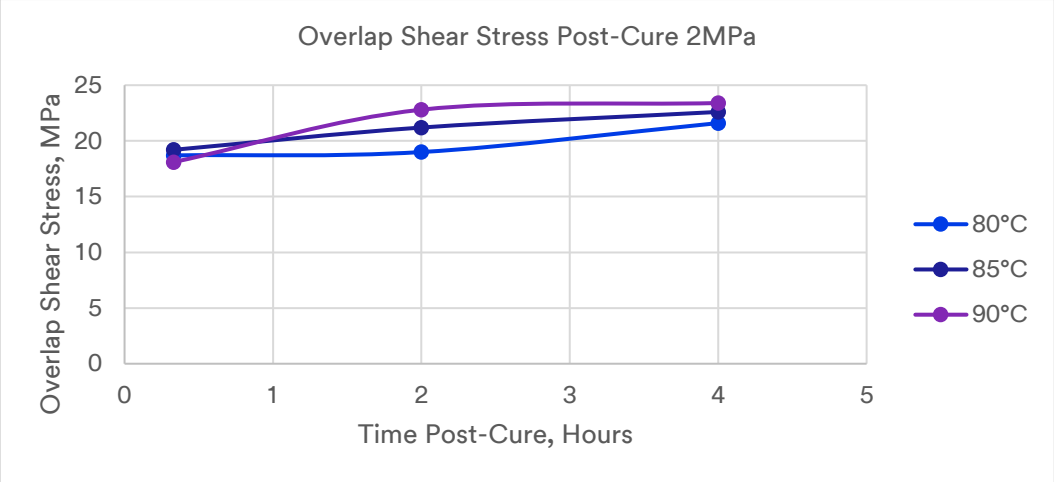
Rate of Strength Build up

1. Accelerated Heat Cure – Time to Achieve 2 MPa (Geo Fixing)

- Overlap shear: 25mm overlap, 13mm/min test speed, (based on ASTMD1002. Substrate: 2024-T3 Aluminium
- Surface preparation: P2 Etch (ASTM D2651) Bond gap: 1.0 mm; Cure temperatures: tested at 70°C, 80°C, 85°C and 90°C achieved in an oven (please note that induction cure would be much more efficient)



2. Evaluation of the strength build-up after reaching 2MPa with heat acceleration and then the heat being immediately removed. Strength build-up was then measured at room temperature.



Nozzle life

Approximately 30 minutes depending on temperature. Typical mixer nozzle is available from companies such as Sulzer Mixpac - MFQ 08-24T or alternatively MFH 08-24T.

Induction Cure

Heat acceleration profiles obtained by induction treatment are available from 3M application engineering on request.

Regulatory Information

Please refer to the product label and Safety Data Sheet (SDS) for health and safety information before using.

Additional Information

This data sheet contains specific information about the product. General characteristics and application rules of structural adhesives are available separately.

Contact Information

The information provided in this technical document is intended as a guide for these products. For more information or help in selecting a 3M product for an application, please contact your local 3M application engineering representative.

Notice and Disclaimer

3M™ Structural Adhesive SA9844 is designed FOR OCCUPATIONAL INDUSTRIAL USE ONLY. Read full instructions and Safety Data Sheet before use.

All statements, technical information and recommendations are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed. Please ensure before using our product that it is suitable for your intended use. All questions of reliability relating to this product are governed by the Terms of Sale subject, where applicable, to the prevailing law.

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.

Automotive and Aerospace Solutions Division
3M Centre
Cain Road, Bracknell, RG12 8HT United Kingdom
Phone
Web www.3M.co.uk/oem-and-tier