Hysol® EA 9394

Epoxy Paste Adhesive

Loctite Aerospace

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Description

Hysol EA 9394 is a two-part structural paste adhesive, which cures at room temperature and possesses excellent strength to 350°F/177°C and higher. Its thixotropic nature and excellent high temperature compressive strength also make it ideal for potting, filling and liquid shim applications. Hysol EA 9394 is qualified to MMM-A-132 Rev A, Type I, Class 3.

The mechanical properties in this data sheet are also valid for Hysol EA 9394S. Hysol EA 9394S is only available in Semkits and differs from Hysol EA 9394 as it has 1 part less thixotrope in the Part B to aid packaging. All other mechanical and handling properties are the same.

Features

Room Temperature Cure
Good Gap Filling Capabilities
350°F/177°C Performance
Potting Material
Room Temperature Storage
Outstanding Mechanical Properties
Long Pot Life
Low Toxicity

Uncured Adhesive Properties

	Part A	Part B	Mixed
Color	Gray	Black	Gray
Viscosity, 77°F	4000-8000 Poise	200-700 Poise	1600 Poise
Brookfield, HBT	Spdl 7 @ 20 rpm	Spdl 4 @ 20 rpm	Spdl 5 @ 20 rpm
Viscosity, 25°C	400-800 Pa·S	20-70 Pa·S	160 Pa·S
Brookfield, HBT	Spdl 7 @ 2.09 rad/sec	Spdl 4 @ 2.09 rad/sec	Spdl 5 @ 2.09 rad/sec
Density (g/ml)	1.50	1.00	1.36
Shelf Life from date of shipment			
@ <40°F/4°C	1 year	1 year	
@ <77°F/25°C	1 year	1 year	

This material will normally be shipped at ambient conditions, which will not alter our standard warranty, provided that the material is placed into its intended storage upon receipt. Premium shipment is available upon request.

Handling

Mixing - This product requires mixing two components together just prior to application to the parts to be bonded. Complete mixing is necessary. The temperature of the separate components prior to mixing is not critical, but should be close to room temperature (77°F/25°C).

Mix Ratio	Part A	Part B
By Weight	100	17

Note: Volume measurement is not recommended for structural applications unless special precautions are taken to assure proper ratios.

Pot Life (450 gm mass) 90 minutes
Method - ASTM D 2471 in water bath**.**

Application

Mixing - Combine Part A and Part B in the correct ratio and mix thoroughly. THIS IS IMPORTANT! Heat buildup during or after mixing is normal. Do not mix quantities greater than 450 grams as dangerous heat buildup can occur causing uncontrolled decomposition of the mixed adhesive. TOXIC FUMES CAN OCCUR, RESULTING IN PERSONAL INJURY. Mixing smaller quantities will minimize the heat buildup.

Applying - Bonding surfaces should be clean, dry and properly prepared. For optimum surface preparation consult the Hysol Surface Preparation Guide. The bonded parts should be held in contact until the adhesive is set. Handling strength for this adhesive will occur in 8 hours @ 77°F/25°C, after which the support tooling or pressure used during cure may be removed. Since full bond strength has not yet been attained, load application should be small at this time.

Note: Special precautions are recommended to minimize carbonate formation in large assemblies subject to extended open times in humid environments. A special memo is available upon request from Loctite providing users with suggestions for minimizing carbonate formation.

Curing - Hysol EA 9394 may be cured for 3 to 5 days @ 77°F/25°C to achieve normal performance. Accelerated cures up to 200°F/93°C (for small masses only) may be used as an alternative. For example, 1 hour @ 150°F/66°C will give complete cure**.**

Cleanup - It is important to remove excess adhesive from the work area and application equipment before it hardens. Denatured alcohol and many common industrial solvents are suitable for removing uncured adhesive. Consult your supplier's information pertaining to the safe and proper use of solvents.

Bond Strength Performance

Tensile Lap Shear Strength - tested per ASTM D1002 after curing for 5 days @ 77°F/25°C. Adherends are 2024-T3 bare aluminum treated with phosphoric acid anodized per ASTM D3933.

	Typical Results	
Test Temperature, °F/°C	psi	MPa
-67/-55	3,300	22.8
77/ 25	4,200	29.0
180/82	3,000	20.7
200/93	2,900	20.0
250/121	2,300	15.9
300/149	1,600	11.0
350/177	1,200	8.3
400/204	600	4.1

After Exposure to/Test Temperature	Typical Results psi	MPa
Room Temperature Control (no exposure)	4,300	29.7
77°F/25°C Water - 7 days @77°F/25°C	4,100	28.3
Isopropyl Alcohol - 7 days @77°F/25°C	4,000	27.6
Hydraulic Oil - 7 days @77°F/25°C	4,100	28.3
JP-4 Fuel - 7 days @ 77°F/25°C	4,200	29.0

Peel Strength

T-Peel strength tested per ASTM D1876 after curing for 5 days @ 77°F/25°C.
Adherends are 2024-T3 clad aluminum treated with phosphoric acid anodized per ASTM D3933.

Test Temperature, °F/°C	Typical Results pli	nlm
77/25	5	875

Bell Peel strength tested per ASTM D3167 after curing for 7 days @ 77°F/25°C.
Adherends are 2024-T3 clad aluminum treated with phosphoric acid anodized per ASTM D3933.

Test Temperature, °F/°C	Typical Results pli	nlm
77/25	20	3,500

Service Temperature

Service temperature is defined as that temperature at which this adhesive still retains 1000 psi/6.9 MPa) using test method ASTM D1002 and is 350°F/177°C.

Loctite QC Acceptance Testing

This data sheet provides users with typical properties obtained from this adhesive. These values are not meant to be used to develop aerospace QC acceptance testing. Users interested in establishing values and tests for routine QC acceptance should request the Loctite Aerospace Specification (LAS) which provides detail test methods and values used to certify this adhesive.

Bulk Resin Properties

Tensile Properties - tested using 0.125 inch/ 3.18 mm castings per ASTM D638.

	psi	MPa
Tensile Strength, @ 77°F/25°C	6,675	46.04
Tensile Modulus, @ 77°F/25°C	.615 x 10^6	4,242
Shear Modulus, dry @ 77°F/25°C	212,000	1,462
Shear Modulus, wet, @ 77°F/25°C	148,500	1,204
Elongation at Break, % @77°F/25°C	1.66	
Shore D Hardness, @ 77°F/25°C	88	
T_g dry	172°F	78°C
T_g wet	154°F	68°C

Compressive Properties - tested with rectangular specimens 0.5 in/12.7 mm width by 1.0 in/25.4 mm length by 0.5 in/12.7 mm height.

Compressive Strength, °F/°C	psi	MPa
77/25	10,000	69

Electrical Properties - tested per ASTM D149, D150.

	0.1 KHz	1.0 KHz	10.0 KHz
Dielectric Constant	7.72	7.51	7.20
Dissipation Factor	.017	.022	.033
Thermal Conductivity	7.92×10^{-4} cal/sec-cm-°C		[0.331 W/(m•K)]
Volume Resistivity	4.05×10^{13} ohm-cm		[4.05×10^{11} ohm]
Surface Resistivity	4.60×10^{13} ohm		
Coefficient of Thermal Expansion	55.6µm/m°C @ 40°C		
	80.6µm/m°C @ 100°C		

Handling Precautions

Do not handle or use until the Material Safety Data Sheet has been read and understood.
For industrial use only.

General:

As with most epoxy based systems, use this product with adequate ventilation. Do not get in eyes or on skin. Avoid breathing the vapors. Wash thoroughly with soap and water after handling. Empty containers retain product residue and vapors, so obey all precautions when handling empty containers.

PART A

WARNING! As with most epoxy based systems, the uncured adhesive may cause eye and skin irritation or allergic dermatitis. Contains epoxy resins.

PART B

DANGER! Causes severe skin and eye burns. Contains tetraethylenepentamine. Vapors may be irritating to the respiratory tract.

Hysol® is a registered trademark of Loctite Corporation.

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