Technical Process Bulletin

LOCTITE EA 9321 AERO
Epoxy Paste Adhesive
(KNOWN AS Hysol EA 9321)

INTRODUCTION
LOCTITE EA 9321 AERO is a two-component thixotropic paste adhesive, which exhibits toughness and retains strength at elevated temperatures. This product cures at room temperature and yields durable bonds over a wide temperature range.

FEATURES
- Two Component System
- Tough Durable Bonds
- Room Temperature Cure
- Good Elevated Temperature Strength

Uncured Properties

	Part A	Part B	Mixed
Color	Gray	Off White	Gray
Viscosity @ 77°F	2,900 - 7,100 Poise	200 - 800 Poise	
Brookfield, HBT	Spdl 7 @ 20 rpm	Spdl 5 @ 20 rpm	
Viscosity @ 25°C	290 - 710 Pa·S	20 - 80 Pa·S	
Brookfield, HBT	Spdl 7 @ 2.1 rad/s	Spdl 5 @ 2.1 rad/s	
Density (g/ml)	1.24	1.22	1.23
Shelf Life			
@ <40°F/4°C	1 year	1 year	
@ <77°F/25°C	3 months	1 year	
@ <90°F/32°C	1 month	1 year	

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	50

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

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Pot Life (450 gram mass) 40 minutes @ 77°F/25°C
Method - ASTM D2471 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 LOCTITE Surface Preparation Guide. The bonded parts should be held in contact until the adhesive is set. Handling strength for this adhesive will occur in 24 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.

Curing - This adhesive may be cured for 5 to 7 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 @ 180°F/82°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
Tensile lap shear strength tested per ASTM D1002 after curing as shown below. Adherends are 2024-T3 AlClad aluminum treated with sodium dichromate - sulfuric acid etch (FPL) per ASTM D2651-90.

Typical Results

Test Temperature (F/°C)	Cured 7 days @ 77°F/25°C psi	Cured 7 days @ 77°F/25°C MPa	Cured 1 hr @ 180°F/82°C psi	Cured 1 hr @ 180°F/82°C MPa
-67/-55	3,000	20.7	3,800	26.2
77/25	4,000	27.6	4,000	27.6
180/82	2,900	20.0	3,500	24.1
250/121	1,000	6.9	1,500	10.3
300/149	750	5.2	900	6.2
350/177	600	4.1	600	4.1
400/204	500	3.4	500	3.4

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Test Temperature @ 77°F/25°C	Typical Results	
Specimen Conditioning	**psi**	**MPa**
Control	4,200	29.0
120°F/49°C - 100% RH - 30 days @ 77°F/25°C	3,700	25.5
Salt Spray - 105°F/40°C - 30 days @ 77°F/25°C	3,400	23.4

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 approximately 250°F/121°C.

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

Tensile Strength @ 77°F/25°C	7,100 psi	49.0 MPa
Tensile Modulus @ 77°F/25°C	420 ksi	2.90 GPa
Elongation at Break @ 77°F/25°C	6%	
Shore D Hardness @ 77°F/25°C	84	
Tg Dry	230°F	110°C
Tg Wet	190°F	88°C
Shear Modulus	225 ksi	1.55 GPa
Poisson's Ratio	0.36	

Tensile Properties tested using 0.5 inch/12.7 mm castings per ASTM D695.

Compressive Strength @ 77°F/25°C - Yield	9,280 psi	64.00 MPa
Compressive Strength @ 77°F/25°C - Ultimate	16,880 psi	116.42 MPa

Electrical Properties - tested per ASTM D149, D150.

Dielectric Constant, 1 KHz, 77°F/25°C	4.81
Dissipation Factor, 1 KHz, 77°F/25°C	0.018

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

DISPOSAL INFORMATION
Dispose of spent remover and paint residue per local, state and regional regulations. Refer to HENKEL TECHNOLOGIES MATERIAL SAFETY DATA SHEET for additional disposal information.

PRECAUTIONARY INFORMATION
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.

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PART A
CAUTION! This material may cause eye and skin irritation or allergic dermatitis. It contains epoxy resins.

PART B
WARNING! This material causes eye and skin irritation or allergic dermatitis. It contains amines.

Before using this product refer to container label and HENKEL TECHNOLOGIES MATERIAL SAFETY DATA SHEET for additional precautionary, handling and first aid information.

Note
The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, **Henkel Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Henkel Corporation's products. Henkel Corporation specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits.** The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any Henkel Corporation patents that may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.

Rev. 11/2019

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