Technical Process Bulletin

LOCTITE EA 9330 AERO
Epoxy Paste Adhesive
(KNOWN AS Hysol EA 9330)

INTRODUCTION
LOCTITE EA 9330 AERO is a two-component paste adhesive, which is easily mixed and has high peel strength. This room temperature cure system has good environmental resistance and bonds to a variety of substrates.

FEATURES
- Two Component System
- Tolerant of Bondline Thickness Variations
- Room Temperature Cure
- High Peel Strength
- Excellent Environmental Resistance

Uncured Adhesive Properties

	Part A	Part B	Mixed
Color	Cream	Amber	Cream
Viscosity, 77°F	740 Poise	11 Poise	
Brookfield, HBT	Spdl 5 @ 5 rpm	Spdl 1 @ 20 rpm	
Viscosity, 25°C	74 Pa·S	1.1 Pa·S	
Brookfield, HBT	Spdl 5 @ 0.5 rad/sec	Spdl 1 @ 2.09 rad/sec	
Density (g/ml)	1.16	1.03	1.14
Shelf Life			
@ <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	33

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

Pot Life (100 gram mass) 60 minutes @ 77°F/25°C
Method - ASTM D 2471 in water bath**.**

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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 - LOCTITE EA 9330 AERO 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 chromic acid etch.

	Typical Results (psi/MPa)		
Test Temperature, °F/°C	**Cured 7 days @ 77°F/25°C**	**Cured 2 hrs @ 180°F/82°C**	**Cured 1 hr @ 250°F/121°C**
-67/-55	5,000/34.5	6,000/41.3	6,000/41.3
77/ 25	5,000/34.5	6,000/41.3	6,300/43.4
180/82	1,000/ 6.9	1,100/ 7.6	1,200/ 8.3

Effect of Surface Preparation on Tensile Lap Shear Strength @ 77°F/25°C after curing as shown below. Adherends are 2024-T3 AlClad aluminum.

	Typical Results (psi/MPa)		
Surface Preparation	**Cured 7 days @ 77°F/25°C**	**Cured 2 hrs @ 180°F/82°C**	**Cured 1 hr @ 250°F/121°C**
MEK Wiped	3,900/26.9	4,300/29.6	5,600/38.6
Sand Blasted	4,400/30.3	5,100/35.1	5,200/35.8
Wire Brushed	4,100/28.2	4,500/31.0	5,300/36.5

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After Exposure to the following conditions*:	Typical Results (psi/MPa) Cured 7 days @ 77°F/25°C	Cured 2 hrs @ 180°F/82°C	Cured 1 hr @ 250°F/121°C
Control, 77°F/25°C	5,500/37.9	6,300/43.4	6,500/44.8
77°F/25°C Water - 30 days	3,700/25.5	4,400/30.3	4,400/30.3
120°F/49°C-100% RH - 30 days	4,300/29.6	4,100/28.2	3,900/26.9
Anti-icing Fl - 7 days	5,500/37.9	6,200/42.7	6,000/41.3
Hydraulic Oil - 7 days	5,600/38.6	6,400/44.1	6,600/45.5
JP-4 Fuel - 7 days	5,800/40.0	6,100/42.0	6,300/43.4
Salt Spray - 105°F/41°C - 30 days	3,500/24.1	3,500/24.1	3,700/25.5
Skydrol 500 - 7 days	5,700/39.3	6,100/42.0	6,300/43.4
TT-S-735 - 7 days	5,300/36.5	5,900/40.7	5,800/40.0

*Test temperature on all exposure tests is 77°F/25°C

Effect of Bondline Thickness on Tensile Lap Shear @ 77°F/25°C (Cure: 7 days @ 77°F/25°C):

Bondline Thickness (mils/mm)	Typical Results (psi/MPa)
4/0.10	5,200/35.8
10/0.25	5,000/34.5
20/0.51	4,500/31.0
30/0.76	4,500/31.0
40/1.02	4,400/30.3
50/1.27	4,100/28.2

Peel Strength

Adherends are 2024-T3 AlClad aluminum treated with chromic acid etch.

- T-Peel per ASTM D1876
- Floating Roller (Bell) Peel per ASTM D3167
- Metal to Metal Climbing Drum Peel per ASTM D1781

Test Property	Unit	Typical Results Test Temperature @77°F/25°C Cured 7 days @ 77°F/25°C	Cured 2 hrs @ 180°F/82°C	Cured 1 hr @ 250°F/121°C
T-Peel	lb/in (N/25 mm)	35 (156)	46 (205)	46 (205)
Floating Roller (Bell) Peel	(b/in (N/25 mm)	92 (409)	97 (431)	106 (471)
Metal to Metal Climbing Drum Peel	in•lb/in (m•n/m)	58 (258)	99 (440)	92 (409)

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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 180°F/82°C.

Bulk Resin Properties
Tensile Properties - tested using 0.125 inch/3.18 mm castings per ASTM D 638. Specimens were cured 7 days @ 77°F/25°C.

	Typical Results
Tensile Strength @ 77°F/25°C, psi/MPa	5,600/38.6
Tensile Modulus @ 77°F/25°C, ksi/MPa	384/2,646
Elongation at Break @ 77°F/25°C, %	2.4
Shore D Hardness	80
T_g, °F/°C	135/57
Shear Modulus, ksi/MPa	140/965
Poisson's Ratio	0.41

Compressive Properties - tested using 0.5 inch/12.7 mm castings per ASTM D 695.

Compressive Strength @ 77°F/25°C, psi/MPa	7,700/53.1
Compressive Modulus @ 77°F/25°C, ksi/MPa	253/1743

Electrical Properties - tested per ASTM D149, D150

	100 Hz	1 KHz	10 KHz	100 KHz
Dielectric Constant	4.50	4.38	4.23	3.96
Dissipation Factor	0.025	0.020	0.032	0.056

Volume Resistivity @ 77°F/25°C, 500 Volts, 1.0 minute electrification	1.59×10^{14} Ohms-CM
Surface Resistivity @ 77°F/25°C, 500 Volts, 1.0 minute electrification	1.59×10^{14} Ohms

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.

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