

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

| | <u>Part A</u> | <u>Part B</u> | <u>Mixed</u> |
|------------------------------------|---------------------------------|-----------------------------------|--------------|
| Color | Cream | Amber | Cream |
| Viscosity, 77°F Brookfield, HBT | 740 Poise Spdl 5 @ 5 rpm | 11 Poise Spdl 1 @ 20 rpm | |
| Viscosity, 25°C Brookfield, HBT | 74 Pa·S Spdl 5 @ 0.5 rad/sec | 1.1 Pa·S 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).

| <u>Mix Ratio</u> | <u>Part A</u> | <u>Part B</u> |
|------------------|---------------|---------------|
| 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)

| <u>Test Temperature, °F/°C</u> | <u>Typical Results (psi/MPa)</u> | | |
|--------------------------------|---|---|---|
| | <u>Cured 7 days</u> <u>@ 77°F/25°C</u> | <u>Cured 2 hrs</u> <u>@ 180°F/82°C</u> | <u>Cured 1 hr</u> <u>@ 250°F/121°C</u> |
| -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)

| <u>Surface Preparation</u> | <u>Typical Results (psi/MPa)</u> | | |
|----------------------------|---|---|---|
| | <u>Cured 7 days</u> <u>@ 77°F/25°C</u> | <u>Cured 2 hrs</u> <u>@ 180°F/82°C</u> | <u>Cured 1 hr</u> <u>@ 250°F/121°C</u> |
| 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 FI - 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):

| <u>Bondline Thickness (mils/mm)</u> | <u>Typical Results (psi/MPa)</u> |
|-------------------------------------|----------------------------------|
| 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

| <u>Test Property</u> | <u>Unit</u> | Typical Results Test Temperature @77°F/25°C | | |
|--------------------------------------|------------------|--|-------------------------------------|-------------------------------------|
| | | <u>Cured 7 days @ 77°F/25°C</u> | <u>Cured 2 hrs @ 180°F/82°C</u> | <u>Cured 1 hr @ 250°F/121°C</u> |
| 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.

| | <u>Typical Results</u> |
|---------------------------------------|------------------------|
| 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

| | <u>100 Hz</u> | <u>1 KHz</u> | <u>10 KHz</u> | <u>100 KHz</u> |
|--|---------------|--------------|---------------|-------------------------------|
| 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 | | | | 1.59x10 ¹⁴ Ohms-CM |
| Surface Resistivity @ 77°F/25°C, 500 Volts, 1.0 minute electrification | | | | 1.59x10 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

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