Technical Process Bulletin

LOCTITE EA 9690 AERO
Modified Epoxy Film Adhesive
(KNOWN AS Hysol EA 9690)

INTRODUCTION
LOCTITE EA 9690 AERO is a modified epoxy film adhesive designed for high peel capability in structural bonds requiring toughness.

FEATURES
- Film Adhesive
- Bonds Many Materials
- Low Flow
- Cures Below 250°F/121°C
- Exceptional Peel Strength
- Available with Knit or Non-Woven Mat
- Excellent Performance with Low Pressure Cures

Handling
This product is in film form and is ready to use as received. The adhesive should be removed from cold storage and allowed to warm to room temperature. All moisture should be removed from the protective packaging before opening. The adhesive film has a protective liner(s) on it, which must be removed prior to parts assembly (see "Applying" below). The liner(s) will always be a contrasting color from the adhesive to allow the user easy confirmation of removal.

Application
Storage Life - LOCTITE EA 9690 AERO requires refrigerated storage. Store @ 0°F/-20°C or below for maximum storage life. Warranty life @ 0°F/-20°C is 12 months from date of shipment. Store only in sealed containers to prevent moisture contamination. Allow all moisture to evaporate from container before opening for use.

Applying - Bonding surfaces should be clean, dry and properly prepared. For optimum surface preparation consult the LOCTITE Surface Preparation Guide. The adhesive film, with one liner left on it, may be tacked to the detail part for cutting to shape and size. The liner should remain with the adhesive until just before assembly of the detail to the other faying surface. This will minimize contamination of the adhesive bond. The bonded parts should be held in contact until the adhesive has cured. Usually 25 to 50 psi/172 to 345 kPa is sufficient to assure proper mating.

Open Assembly Time - LOCTITE EA 9690 AERO may be used within the following schedule after removing from cold storage:

@ 77°F/25°C at least 14 days
@ 90°F/30°C at least 10 days

Curing - LOCTITE EA 9690 AERO may be cured for 1 hour @ 250°F/121°C. Heat up rate to the cure temperature is not critical, but should be between 4° and 7°F (2.2° and 4°C) per minute. Pressure should be applied before heating the parts to be bonded and maintained until cool down of the assembly.

Cleanup - It is important to remove excess adhesive from the part and bonding tools before it hardens. Once the adhesive is cured, it is difficult to remove except by mechanical abrasion. Uncured adhesive may be removed with a ketone solvent in a well-ventilated area. Saturate a clean cloth or industrial wiper with solvent and apply just enough to do the job. Be careful to prevent any solvent from entering the uncured bondline, as solvent will degrade the final bond performance. Consult with 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 bare aluminum treated with phosphoric acid anodized per ASTM C3933. Primed with a chromated primer and cured 60 minutes at 250°F/121°C to a thickness of 0.10 to 0.20 mils (2.5-5 microns).

Typical Results
Cured 1 hour @ 250°F/121°C, 40 psi (0.27 MPa)

Test Temperature, °F/°C	psi	MPa
-67/-55	6,350	43.8
77/25	6,100	42.0
180/82	3,900	26.9
225/107	3,300	22.8
250/121	2,100	14.5

Environmental Exposure	Test Temperature, °F/°C	psi	MPa
30 days at 140°F/60°C & 100% RH	77/25	3,500	24.2
7 days Hydraulic Oil at 77°F/25°C	77/25	5,990	41.3
7 days JP-4 Fuel at 77°F/25°C	77/25	5,750	39.7

Peel Strength
T Peel Strength tested per ASTM D1876 after curing as shown below. Adherends are 2024-T3 bare aluminum treated with phosphoric acid anodized per ASTM D3933. Primed with a chromated primer and cured 60 minutes at 250°F/121°C to a thickness of 0.10 to 0.20 mils (2.5-5 microns).

Typical Results
Cured 1 hour @ 250°F/121°C, 40 psi (0.27 MPa)

Test Temperature, °F/°C	lb/in	N/25mm
-67/-55	30	133
77/25	45	200
180/82	41	182

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Metal-to-Metal Climbing Drum Peel Strength tested after curing as shown below. Adherends are 2024-T3 bare aluminum treated with phosphoric acid anodized per ASTM D3933. Primed with a chromated primer and cured 60 minutes at 250°F/121°C to a thickness of 0.10 to 0.20 mils (2.5-5 microns).

Typical Results
Cured 1 hour @ 250°F/121°C, 40 psi (0.27 MPa)

Test Temperature, °F/°C	in·lb/in	N·m/m
77/25	90	400
180/82	80	355

Honeycomb Sandwich Performance

Honeycomb sandwich strength tested after curing as shown below. Adherends are 2024-T3 clad aluminum with 0.25" (6.4mm) cell 5052 non-perforated aluminum core. Face sheets primed with primed with a chromated primer and cured 60 minutes at 250°F/121°C to a thickness of 0.10 to 0.20 mils (2.5-5 microns).

Honeycomb Climbing Drum Peel Strength

Typical Results
Cured 1 hour @ 250°F/121°C, 40 psi (0.27 MPa)

Test Temperature, °F/°C	in·lb/in	N·m/m
-67/-55	13	58
77/25	18	80
180/82	11	50

Flatwise Tensile Strength

Typical Results
Cured 1 hour @ 250°F/121°C, 40 psi (0.27 MPa)

Test Temperature, °F/°C	psi	MPa
-67/-55	1,225	8.4
77/25	925	6.4
180/82	600	4.1

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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 250°F/121°C.

Bulk Resin Properties

Tg Dry	Tan delta by DMTA	240°F/116°C
Tg Wet	Tan delta by DMTA	200°F/93°C

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.

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

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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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Henkel Corporation Aerospace | 2850 Willow Pass Road | Bay Point, CA 94565
PHONE: +1.925.458.8000 | FAX: +1.925.458.8030| www.henkel.com/aerospace