



## Hysol® EA 9696

### Epoxy Film Adhesive

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#### Description

Hysol EA9696 is a modified epoxy film adhesive designed for applications requiring both high toughness and service temperatures to 250°F/121°C. Advances in technology allow this adhesive to excel in both metal to metal and honeycomb bonding applications. Ability to cure at low temperatures; balanced flow; excellent environmental resistance; and long shop out-time make it suitable for a variety of bonding applications.

#### Features

Excellent Environmental Resistance

High Toughness Maintaining Service Temperature

Balanced Flow

Allows from 225°F to 265°F/107°C to 129°C Cure without Change of Properties

Long Out-time Facilitates Shop Floor Usage and Repair Applications

Reticulatable

#### Benefits

- Greater durability over the life of the production article lowers repair costs
- Widens design abilities
- Enables use of one adhesive for applications requiring toughness and 250°F performance
- Lowers clean-up costs
- Enables use of one adhesive for both honeycomb and metal to metal applications
- Broadens shop processing conditions
- Lowers handling and storage costs
- Ability to be used on sound suppression assemblies

#### Application

**Storage Life** - This product requires refrigerated storage. Store @ 0°F/-18°C or below for maximum storage life. Warranty life @ 0°F/-18°C is 12 months from date of shipment. Store only in sealed containers to prevent moisture contamination. Allow all moisture to evaporate before opening for use.

**Applying** - Bonding surfaces should be clean, dry and properly prepared. For optimum surface preparation consult the Hysol 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 part mating.

**Open Assembly Time** - This adhesive may be used within the following schedule after removing from cold storage:

- @ 77°F/25°C at least 60 days
- @ 90°F/32°C at least 30 days

**Curing** - This product may be cured for 60 to 90 minutes between 225°F to 265°F/107°C to 129°C. Heat-up rate to the cure temperature is not critical, but should be between 1° and 10°F (0.6° and 5.6°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 denatured alcohol or many common industrial solvents. Be careful to prevent any solvent from entering the uncured bondline as solvent will degrade the final 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 anodizing per ASTM D3933, then coated with a state of the art corrosion inhibiting primer. A typical cure would be a 1°F to 5°F (0.6°C to 3°C) /minute heat-up rate to 250°F/121°C, and a dwell of 60 minutes under 45 psi/310 kPa autoclave pressure. Film weight is .060 psf (293 g/m<sup>2</sup>) supported with a nylon nonwoven mat.

<u>Test Temperature °F/°C</u>	<b>Typical Results</b>	
	<u>psi</u>	<u>MPa</u>
-67/-55	6,700	46.2
77/25	6,300	43.4
160/71	5,000	34.5
180/82	4,500	31.0
250/121	2,200	15.2

*After Exposure to the Following Conditions:*

<b><u>Tested at Room Temp</u></b>	<u>psi</u>	<u>MPa</u>
77°F/25°C Water - 30 days	6,100	42.1
Hydraulic Oil - 7 days	6,100	42.1
JP-4 Fuel -7 days	6,100	42.1

<b><u>Tested @ 160°F/71°C</u></b>	<u>psi</u>	<u>MPa</u>
160°F/71°C 100% RH -14 days	4,600	31.7
160°F/71°C 100% RH- 30 days	4,600	31.7

**Metal to Metal Wide Area Blister Detection Strength**

Wide area overlap shear strength tested per ASTM D3165-73. Adherends are 2024-T3 bare aluminum treated with phosphoric acid anodizing per ASTM D3933, then coated with a state of the art corrosion inhibiting primer. A typical cure would be a 1°F to 5°F (0.6°C to 3°C) / minute heat-up rate to 250°F/121°C, and a dwell of 60 minutes under 45 psi/310 kPa autoclave pressure. Film weight is .060 psf (293 g/m<sup>2</sup>) supported with a nylon nonwoven mat.

<u>Test Temperature °F/°C</u>	<b>Typical Results</b>	
	<u>psi</u>	<u>MPa</u>

77/25	4900	33.8
250/121	2400	16.6

### Peel Strength

**T Peel Strength** tested per ASTM D1876. Adherends are 2024-T3 Alclad aluminum treated with phosphoric acid anodizing per ASTM D3933, then coated with a state of the art corrosion inhibiting primer.

<u>Test Temperature °F/°C</u>	<b>Typical Results</b>	
	<u>lb/in</u>	<u>N/25mm</u>
77/25	40	179

**Metal to Metal Climbing Drum Peel Strength** tested per ASTM D1781. Adherends are 2024-T3 Alclad aluminum treated with phosphoric acid anodizing per ASTM D3933, then coated with a state of the art corrosion inhibiting primer.

<u>Test Temperature °F/°C</u>	<b>Typical Results</b>	
	<u>in•lb/in</u>	<u>m•N</u>
77/25	100	445
		449

**Floating Roller Peel Strength** tested per ASTM D3167. Adherends are 2024-T3 Alclad aluminum treated with phosphoric acid anodizing per ASTM D3933, then coated with a state of the art corrosion inhibiting primer.

<u>Test Temperature °F/°C</u>	<b>Typical Results</b>	
	<u>lb/in</u>	<u>N/25mm</u>
77/25	80	356

### Honeycomb Strength

#### **Honeycomb Climbing Drum Peel**

Honeycomb Climbing Drum Peel strength tested per ASTM D1781. Adherends are 2024-T3 Alclad aluminum treated with phosphoric acid anodizing per ASTM D3933, then coated with a state of the art corrosion inhibiting primer. Core size is 7.9 - 1/4 - .004N 5052 .625 inch thickness. A typical cure would be a 1°F to 5°F (0.6°C to 3°C) / minute heat-up rate to 250°F/121°C, and a dwell of 60 minutes under 45 psi/310 kPa autoclave pressure. Film weight is .060 psf (293 g/m<sup>2</sup>) supported with a nylon nonwoven mat.

<u>Test Temperature °F/°C</u>	<b>Typical Results</b>	
	<u>in•lb/3in</u>	<u>m•N/m</u>
77/25	85	126

### Flatwise Tension

Flatwise tension strength tested per ASTM C297. Adherends are 2024-T3 bare aluminum treated with phosphoric acid anodizing per ASTM D3933, then coated with a state of the art corrosion inhibiting primer. Core size is 7.9 - 1/4 - .004N 5052 .625 inch thickness. A typical cure would be a 1°F to 5°F (0.6°C to 3°C) / minute heat-up rate to 250°F/121°C and a dwell of 60 minutes under 45 psi/310 kPa autoclave pressure. Film weight is .060 psf (293 g/m<sup>2</sup>) supported with a nylon nonwoven mat.

<u>Test Temperature °F/°C</u>	<u>Typical Results</u>	
	<u>psi</u>	<u>MPa</u>
77/25	1,200	8.3

### 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

T<sub>g</sub> dry - 252°F/ 122°C

T<sub>g</sub> wet - 223°F/ 106°C

Moisture absorption of the cured resin <3%

T<sub>g</sub>, measured by dynamic mechanical analysis is taken as the tan delta of the G' curve.

Wet specimens conditioned 30 days @ 140°F/60°C and 100% RH.

Adhesive flow as measured by increase in area by circle flow:

	<u>.03 psf</u>	<u>.06 psf</u>	<u>.085 psf</u>
Adhesive Flow (%increase)	400	700	950

### 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.

ONE PART

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

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Users should review the Materials Safety Data Sheet (MSDS) and product label for the material to determine possible health hazards, appropriate engineering controls and precautions to be observed in using the material. Copies of the MSDS and label are available upon request.

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