



Hysol® EA 9689

Epoxy Film Adhesive

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Description

Hysol EA 9689 is a new technology, high temperature modified epoxy film adhesive. It has excellent high temperature strength and long term thermal durability. Hysol EA 9689 is suitable for metal, composite and honeycomb bonding where continuous exposure to temperatures up to 350°F/177°C is important. The unsupported version may be reticulated for optimum bond strength. Hysol EA 9689 is also thermally compatible with Henkel's chromated low VOC primer, Hysol EA 9289C.

Features

Film Adhesive
High Temperature Strength
Good Toughness
Good Flow Control
Thermally Stable
Available with Knit Nylon or Glass Support
May be Reticulated

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 - Hysol EA 9689 requires refrigerated storage. Store @ 0°F/-18°C or below for maximum storage life. Warranty life @ 0°F/-18°C is 6 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 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 mating.

Open Assembly Time - Hysol EA 9689 may be used within the following schedule after removing from cold storage:

@ 77°F/25°C at least 10 days
@ 90°F/32°C at least 7 days

Curing - Hysol EA 9689 may be cured for 1 hour @ 350°F/177°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 1 hour @ 350°F/177°C. Adherends are 2024-T3 bare aluminum treated with phosphoric acid anodizing per ASTM D3933. Performance is comparable when tested with two state of the art corrosion inhibiting primers, Hysol EA 9205R (solvent based) and Hysol EA 9289 (non-chromated, water borne).

Typical Results for Film Weight

Test Temperature °F/°C	0.060 psf (293 g/m ²) UNS				0.100 psf (488 g/m ²) Knit				0.100 psf (488 g/m ²) Glass			
	9205R		9289		9205R		9289		9205R		9289	
	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa
-67/-55	3,900	26.9	3,800	26.2	3,400	23.4	3,500	24.1	3,700	25.5	3,900	26.9
77/25	4,000	27.6	4,000	27.6	3,400	23.4	3,600	24.8	4,200	28.9	4,200	28.9
350/177	3,200	22.0	3,250	22.4	3,100	21.4	3,000	20.7	3,250	22.4	3,300	22.7
400/204									2,500	17.2	2,500	17.2
450/232									1,300	9.0	1,300	9.0

Typical Results for Film Weight

After Exposure to: ¹	0.060 psf (293 g/m ²) UNS				0.100 psf (488 g/m ²) Knit				0.100 psf (488 g/m ²) Glass			
	9205R		9289		9205R		9289		9205R		9289	
	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa
158°F/70°C, 95% RH, 750hours 5% salt spray, 95°F/35°C, 750 hours	3,500	24.1	3,400	23.4	3,400	23.4	3,300	22.7	3,300	22.7	3,500	24.1
6000 hours @ 300°F/149°C ² 6000 hours @ 350°F/177°C ³ 77°F/25°C, 168 hours, Jet A	3,500	24.1	3,600	24.8	3,400	23.4	3,300	22.7	3,400	23.4	3,600	24.8
					3,000	20.7	2,600	17.9				
	3,050	21.0	2,800	19.3					3,100	21.4	2,800	19.3
	3,800	26.2	3,900	26.9	3,800	26.2	3,800	26.2	4,000	27.6	4,000	27.6

Honeycomb Sandwich Performance

Honeycomb sandwich strength tested after curing 1 hour @ 350°F/177°C. Adherends are 2024-T3 bare aluminum with 3/8 inch (9.50mm) cell 5052 non-perforated aluminum core. The 0.060 psf (293 g/m²)

unsupported film was reticulated onto the core. Exposed specimens were drilled through each cell wall with a 0.10 inch (2.5 mm) diameter drill.

Honeycomb Climbing Drum Peel Strength

Typical Results for Film Weight

Test Temperature @ 77°F/25°C	0.060 psf (293 g/m²) UNS		0.100 psf (488 g/m²) Knit		0.100 psf (488 g/m²) Glass	
	in lb/3 in	M•n/m	in lb/3 in	M•n/m	in lb/3 in	M•n/m
	Hysol EA 9205R	15	22.2	28	41.5	20
Hysol EA 9289	14	20.7	26	38.5	20	29.7

Flatwise Tensile Strength

Typical Results for Film Weight

Test Temperature °F/°C	0.060 psf (293 g/m²) UNS				0.100 psf (488 g/m²) Knit				0.100 psf (488 g/m²) Glass			
	9205R		9289		9205R		9289		9205R		9289	
	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa
-67/-55	900	6.2	1,000	6.9	800	5.5	900	6.2	850	5.9	850	5.9
77/25	850	5.9	900	6.2	750	5.2	800	5.5	800	5.5	800	5.5
350/177	750	5.2	800	5.5	450	3.1	500	3.4	550	3.8	600	4.1

Typical Results for Film Weight

After Exposure to: ¹	0.060 psf (293g/m²) UNS				0.100 psf (488 g/m²) Knit				0.100 psf (488 g/m²) Glass			
	9205R		9289		9205R		9289		9205R		9289	
	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa
158°F/70°C, 95% RH, 750 hours	650	4.5	700	4.8	650	4.5	700	4.8	750	5.2	750	5.2
5% salt spray, 95°F/35°C, 750 hours	700	4.8	650	4.5	650	4.5	650	4.5	650	4.5	650	4.5
6000 hours @ 300°F/149°C ²					450	3.1	500	3.4				
6000 hours @ 350°F/177°C ³	650	4.5	650	4.5					500	3.4	500	3.4
77°F/25°C, 168 hours, Jet A	750	5.2	750	5.2	750	5.2	800	5.5	650	4.5	700	4.8

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 420°F/216°C.

¹ Test temperature on all exposure tests is 77°F/25°C (except ² and ³).

² Test temperature is 300°F/149°C.

³ Test temperature is 350°F/177°C.

Bulk Resin Properties

		°F/°C
T _g dry	Tan delta by DMTA	437/225
T _g wet	Tan delta by DMTA	347/175

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. **THIS PRODUCT DOES NOT CONTAIN REFRACTORY CERAMIC FIBERS.**

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.

