

Advanced Material

HUMAN HV

MULTI-PURPOSE EPOXY ADHESIVE

DESCRIPTION : **Human** epoxy adhesive is a multi-purpose, viscous material that is suitable for bonding a variety of materials, including metal, ceramic, and wood. The electrically insulating adhesive is easy to apply either manually by spatula and stiff brush or mechanically with meter/mix and coating equipment. **Human** epoxy adhesive cures at temperatures from 68°F (20°C) to 356°F (180°C) with no release of volatile constituents. It qualifies to ABR 2-1079 and DAN 1284-01.

- APPLICATIONS :**
- Metal
 - Ceramics
 - Wood
 - Vulcanized Rubber
 - Foams
 - Plastics

- ADVANTAGES :**
- Long open time
 - High shear and peel strength
 - Easy to apply
 - Good resistance to static and dynamic loads
 - Electrically insulating

TYPICAL PROPERTIES :	Property	Test Method	Test Values⁽¹⁾	
			Resin	Hardener
	Color/appearance	Visual	Creamy	Creamy
	Specific Gravity	ASTM D-792	1.17	0.92
	Viscosity (cP) @ 77°F (25°C)	ASTM D-2393	75,000	50,000

TYPICAL MIXED PROPERTIES :	Property	Test Method	Test Values⁽¹⁾
	Reaction Ratio (by weight)		100R/80H
	Reaction Ratio (by volume)		100R/100H
	Pot Life, hours @ 77°F (25°C) (4 fl. oz. mass)	ASTM D-2471	2
	Mixed viscosity (cP) @ 77°F (25°C)	ASTM D-2393	45,000

¹Tested @ 77°F (25°C)

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RECOMMENDED CURE SCHEDULES:	Temperature	Handling Strength	Minimum Cure Time
	68°F (20°C)	12 hours	15 hours
	77°F (25°C)	7 hours	12 hours
	104°F (40°C)	2 hours	3 hours
	158°F (70°C)	30 minutes	50 minutes
	212°F (100°C)	6 minutes	10 minutes
	302°F (150°C)	4 minutes	5 minutes

TYPICAL CURED PROPERTIES :

Application of Adhesive

The resin/hardener mix is applied with a spatula to the pretreated and dry joint surfaces.

A layer of adhesive 0.002 to 0.004-inches (0.05 to 0.10-mm) thick will normally impart the greatest lap shear strength to a joint.

The joint components should be assembled and clamped as soon as the adhesive has been applied. Even contact throughout suffices to ensure proper cure.

Standard Test Specimens

Unless otherwise stated, the figures given below were all determined by testing standard specimens made up by lap-jointing 4-inch x 1-inch x 0.06-inch (10-cm x 2.5-cm x 1.5-mm) strips of aluminum. The joint area was 0.5 x 1 inch (12.5 mm x 2.5 cm) in each case.

Property	Test Method	Test Values⁽¹⁾
Lap Shear Strength, psi (MPa)	ASTM D-1002	
<i>Effects of cure time and temperature</i>		
Cure Temperature	Time	
77°F (25°C)	8 hours	710 (4.9)
	15 hours	1990 (13.7)
	24 hours	2130 (14.7)
	72 hours	2280 (15.7)
	5 days	2560 (17.6)
158°F (70°C)	1 hour	3130 (21.5)
	2 hours	3410 (23.5)
	3 hours	3200 (22)
212°F (100°C)	10 minutes	3700 (25.5)
	20 minutes	3980 (27.4)
	30 minutes	4120 (28.4)
302°F (150°C)	5 minutes	4270 (29.4)
	10 minutes	4410 (30.4)
	20 minutes	4410 (30.4)

Lap Shear Strength, psi (MPa)
Effect of Heat Aging
 (Cured 16 hours @ 104°F (40°C)).

Test Method
 ASTM D-1002

<u>Aging Temperature</u>	<u>Exposure Time</u>	<u>Test Values⁽¹⁾</u>
68°F (20°C)	0 days	2560 (17.6)
	1 years	2560 (17.6)
	2 years	2280 (15.7)
	3 years	1710 (11.8)
	4 years	1990 (13.7)
	5 year	1990 (13.7)
140°F (60°C)	3 days	2560 (17.6)
	10 days	2420 (16.6)
	30 days	2130 (14.7)
176°F (80°C)	3 days	2130 (14.7)
	10 days	2130 (14.7)
	30 days	2130 (14.7)
	60 days	2130 (14.7)
	1 year	1280 (8.8)
	2 years	710 (4.9)
	3 years	710 (4.9)
	4 years	430 (2.9)
	5 years	280 (1.9)
	248°F (120°C)	3 days
10 days		2280 (15.7)
30 days		2280 (15.7)
60 days		2130 (14.7)

Property
Lap Shear Strength (psi)
Tested on Metal Substrates
 (Cured 20 min @ 212°F (100°C))

<u>Metal</u>	<u>Substrate Thickness</u> <u>(in./mm)</u>	<u>Test Values⁽¹⁾</u>
Carbon Steel	0.039/1.0	3840 (26.4)
Stainless Steel	0.039/1.0	3270 (22.5)
Galvanized Steel ²	0.06/1.5	1990 (13.7)
Copper	0.06/ 1.5	3270 (22.5)
Brass	0.06/ 1.5	2990 (20.6)

¹Tested @ 77°F (25°C)

²Surface degreased only, not roughened.

Property
Fatigue Strength (psi)
 Tested using a load frequency of 90 Hz and a 1 inch (25 mm) joint overlap
 (Cured 20 min @ 212°F (100°C))