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## Product Data

# ARALDITE<sup>®</sup> 2011 A/B

(AW 106 Resin/Hardener HV 953)

## MULTI-PURPOSE EPOXY ADHESIVE

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**DESCRIPTION:** Araldite 2011 A/B 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. Araldite 2011 A/B epoxy adhesive cures at temperatures from 68°F (20°C) to 356°F (180°C) with no release of volatile constituents.

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**APPLICATIONS:**

- Metal
- Ceramics
- Wood
- Vulcanized Rubber
- Foams
- Plastics

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**ADVANTAGES:**

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

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TYPICAL PROPERTIES:	<u>Property</u>	<u>Test Method</u>	<u>Test Values<sup>(1)</sup></u>	
			<u>Resin</u>	<u>Hardener</u>
	Color/appearance	Visual	Creamy, viscous/liquid	Amber Liquid
	Specific Gravity	ASTM D-792	1.17	0.92
	Viscosity (cP) @ 77°F (25°C)	ASTM D-2393	50,000	35,000

TYPICAL MIXED PROPERTIES:	<u>Property</u>	<u>Test Method</u>	<u>Test Values<sup>(1)</sup></u>
			Reaction Ratio (by weight)
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	

<sup>1</sup>Tested @ 77°F (25°C)

RECOMMENDED CURE SCHEDULES:	<u>Temperature</u>	<u>Handling Strength</u>	<u>Minimum Cure Time</u>
	68°F (20°C)	12 hours	15 hours
77° (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.

<b><u>Property</u></b>	<b><u>Test Method</u></b>	<b><u>Test Values</u><sup>(1)</sup></b>
Lap Shear Strength, psi (MPa)	ASTM D-1002	
<b><i>Effects of cure time and temperature</i></b>		

<b><u>Cure Temperature</u></b>	<b><u>Time</u></b>	
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)

<b><u>Property</u></b>	<b><u>Test Method</u></b>
Lap Shear Strength, psi (MPa)	ASTM D-1002
<b><i>Effect of Test Temperature</i></b>	
(Load applied 10 minutes after specimens reach test temperature.)	

<b><u>Cure Cycle</u></b>	<b><u>Test Temp.</u></b>	
5 days @ 77°F (25°C)	-76°F (60°C)	2840 (19.5)
	-4°F (-20°C)	2840 (19.5)
	68°F (20°C)	2560 (17.6)
	104°F (40°C)	1420 (9.8)
	140°F (60°C)	570 (3.9)
20 min @ 212°F (100°C)	-76°F (-60°C)	3560 (24.5)
	-46°F (-20°C)	3410 (23.5)
	68°F (20°C)	3980 (27.4)
	104°F (40°C)	1990 (13.7)
	140°F (60°C)	1000 (6.9)

<sup>1</sup>Tested @ 77°F (25°C)

**Property**

**Lap Shear Strength, psi (MPa)**

***Effect of Immersion***

(Cure cycle 16 hours @ 104° (40°C). Immersion for 90 days in media listed.)

<b><u>Media</u></b>	<b><u>Test Values</u><sup>(1)</sup></b>
Standard - As prepared	2560 (17.6)
Acetone (30 days)	570 (3.9)
Acetylene	430 (2.9)
Gasoline	2410 (16.6)
Ethyl Acetate (30 days)	570 (3.9)
Acetic Acid 10%	Degraded
Methanol	Degraded
Lubricating Oil - HD30	2560 (17.6)
Kerosene	Degraded
Trichloroethylene	Degraded
Water @ 68°F (20°C)	1420 (9.8)
Water @ 194°F (90°C)	430 (2.9)

**Lap Shear Strength, psi (MPa)**

***Effect of Tropical Exposure***

(104° (40°C)/92% R.H.)

<b><u>Cure Cycle</u></b>	<b><u>Exposure Time</u></b>	<b><u>Test Values</u><sup>(1)</sup></b>
16 hrs @ 104° (40°C)	0 days	2560 (17.6)
	10 days	2560 (17.6)
	30 days	1710 (11.8)
	60 days	1560 (10.7)
	90 days	570 (3.9)
	20 min @ 212° (100°C)	0 days
10 days		2560 (17.6)
30 days		1710 (11.8)
60 days		1560 (10.7)
90 days		1280 (8.8)

<sup>1</sup>Tested @ 77°F (25°C)

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

**Test Method**  
 ASTM D-1002

<u>Aging Temperature</u>	<u>Exposure Time</u>	<u>Test Values<sup>(1)</sup></u>
68° (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<sup>(1)</sup></u>
Carbon Steel	0.039/1.0	3840 (26.4)
Stainless Steel	0.039/1.0	3270 (22.5)
Galvanized Steel <sup>2</sup>	0.06/1.5	1990 (13.7)
Copper	0.06/ 1.5	3270 (22.5)
Brass	0.06/ 1.5	2990 (20.6)

<sup>1</sup>Tested @ 77°F (25°C)

<sup>2</sup>Surface 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))

**Fatigue Limit Load**

<b><u>% Static Shear Strength</u></b>	<b><u>Cycles to Failure<sup>(1)</sup></u></b>
50	10 <sup>3</sup> -10 <sup>4</sup>
40	10 <sup>4</sup> -10 <sup>5</sup>
30	10 <sup>5</sup> -10 <sup>6</sup>
25	10 <sup>5</sup> -10 <sup>6</sup>
20	10 <sup>6</sup> -10 <sup>7</sup>
15	10 <sup>7</sup>

**Property**

**Test Method**

**Test Values<sup>(1)</sup>**

Ultimate Tensile Strength (psi)	ASTM D-638	4800 (33)
Elongation (%)	ASTM D-638	9
Tg per DMA, °F (°C)	ASTM D-4065	146 (63)
Hardness (Shore D)	ASTM D-2240	80
Coefficient of Thermal Expansion (in/in/°C)	ASTM E-831	8.5 X 10 <sup>-5</sup>
Roller Peel Test, pli (N/mm)	ISO 4578	28 (4.9)

<sup>1</sup>Tested @ 77°F (25°C)

**Electrical Properties**

Thermal Conductivity, W/mK	0.22
Surface Resistivity, ohms	1.2 E+16
Dielectric Strength, volt/mil	400
Volume Resistivity, ohms-cm	7.1 E+14
Dielectric Constant, at 50Hz/1KHz/10KHz	3.4/3.2/3.2
Loss Tangent, % at 50Hz/1KHz/10KHz	1.7/1.8/2.6

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## FIRST AID!

Eyes and skin: Flush eyes with water for 15 minutes. Contact a physician if irritation persists. Wash skin thoroughly with soap and water. Remove and wash contaminated clothing before reuse.

Inhalation: Remove subject to fresh air.

Swallowing: Dilute by giving water to drink and contact a physician promptly. Never give anything to drink to an unconscious person.

## KEEP OUT OF REACH OF CHILDREN

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