



# 310

## Modified, Thixotropic, Two-Part, Epoxy Adhesive

### Description

Lord® 310 adhesive is a modified, thixotropic, two-part, epoxy adhesive which bonds well to many types of prepared metals, prepared rubber, urethane, and plastics. Originally formulated for primerless adhesion to SMC, Lord 310 adhesive is used to bond disk drives, down-hole oil field equipment, automotive body panels, and spoilers, vibration dampening mounts and much more.

### Features and Benefits

**Contains no solvents** - 100% solids, nonflammable, and virtually odorless.

**High Strength** - provides load-bearing properties equal to or greater than the materials being bonded in many cases. For engineering properties see Table 3 on Page 3.

**Variable Cure** - cures completely at room temperature or in minutes at elevated temperatures.

**Proven Environmental Resistance** - resists moisture, sunlight, salt spray, and thermal cycling. Lord 310 adhesive has performed in the automotive industry for over a decade.

**Heat Resistance**- provides temperature resistance from -40°C to 204°C (-40°F to 400°F). High temperature oven bakes required for many finishing processes have not been shown to affect the adhesion of Lord 310 adhesive, nor will it outgas up to 110°C (225°F).

**Super Chemical Resistance** - resists dilute acids, oils, alkalis, solvents, and hydrocarbons. Anti-corrosion processes including phosphatizing, ELPO or E-coat coatings do not affect adhesion.

**Flexible Mix Ratio** - allows for variations in the resin to hardener mix ratio so that the adhesive properties can be tailored to meet application requirements. See Table 2 on page 2.

**Table 1: Typical Properties\* of Uncured Lord 310 Adhesive**

	Resin	Hardener	Mixed
Appearance	Off-white paste	Gray paste	Gray paste
Viscosity, cP @ 25°C (77°F) Brookfield HBF with Helipath at 5 rpm	400,000 - 820,000 T-C Spindle	230,000 - 690,000 T-C Spindle	Not available
Density			
kg/m <sup>3</sup>	1,407 - 1,546	1,203 - 1,323	N/A
lb/gal	11.7 - 12.85	10.0 ± 11.0%	N/A
Flash Point (closed cup)	>93°C (>200°F)	>93°C (>200°F)	>93°C (>200°F)
Total Solids Content, by weight	100%	100%	100%
Working Time, 54g mass @ 24°C (75°F)	N/A	N/A	30 - 60 minutes
General Purpose Mix Ratio			
by weight	1.15	1	N/A
by volume	1	1	N/A
Shelf Life from Date of Shipment at 25°C (77°F), unopened container	1 year	1 year	N/A

\*Not to be used for specification purposes.

## Surface Preparation

Remove soil, grease, oil, fingerprints, dust, mold release agents, rust, and other contaminants from substrate surfaces.

Vapor degrease or wipe the surfaces with a clean cloth soaked in an uncontaminated ketone or chlorinated solvent and allow to dry thoroughly. If a solvent cannot be used, substitute a detergent solution or, for metals only, a suitable alkaline degreasing agent following the manufacturer's instructions for use. Wear chemical resistant gloves.

Next, use an abrasive material to roughen the surfaces or remove tarnish if necessary. Abrasion should always be followed by a second degreasing which will ensure removal of loose particles.

Glass and ceramic surfaces that have been primed with Lord AP134 primer exhibit superior environmental resistance. Cured rubber should first be primed with Lord 7701 surface treatment. Prime metal surfaces with Lord 7714 primer.

Handle prepared surfaces carefully to avoid contamination. Assemble as soon as possible.

## Mixing

### Non-automated

Measure the resin and hardener components to meet your service environment needs and joint design. (See Table 2.) Thoroughly mix the components until uniform in color and consistency. Be careful not to whip excessive air into the adhesive as it will weaken the cured film.

Heat buildup due to an exothermic reaction between the two components will shorten the potlife of the adhesive. Mixing smaller quantities will minimize heat buildup. Do not attempt to use any adhesive that has exhausted its potlife and has begun to cure.

### Automated

Lord 310 adhesive can be dispensed using standard positive displacement meter/mix/dispense equipment if the particular adhesive usage justifies the investment. For other applications, Lord-Pak™ packaging systems offer convenient, automated mixing and application.

## Application

The mixed adhesive may be applied by spreading it on one or both of the surfaces to be bonded using any convenient tool such as a spatula or trowel. As a general rule, a film thickness of approximately 20 one-thousandths of an inch (~0.020" or ~0.5 mm) is suggested. The addition of a small amount of solid glass beads to the mixed adhesive is a convenient way to control the thickness of the bondline.

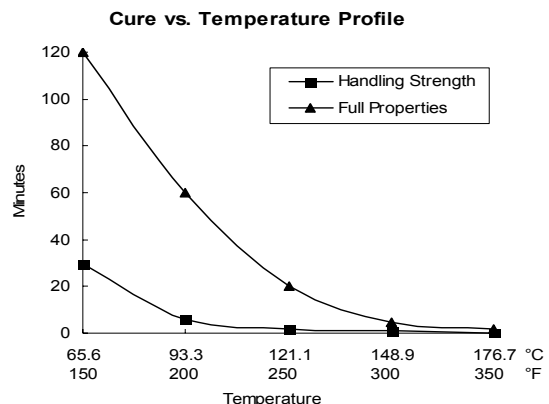
## Parts Assembly

Join the parts in such a way as to avoid entrapped air. Apply only enough pressure to ensure good wetting of the adhesive on both surfaces. Squeezing a little adhesive out at the edges is usually a sign of proper assembly. It is not necessary to clamp the assembly unless movement during adhesive set-up is likely. Maximum adhesion will occur only with parts which mate well without the need for excessive clamping pressure during cure. Excessive clamping may also squeeze too much adhesive from the bond area which could also result in a poor bond.

## Curing

Higher temperatures will provide faster cure rates; however, the bondline temperature should not exceed 163°C (325°F). Elevated temperature cures produce the highest bond strengths and impact resistance. Firm recommendations of cure times and temperatures are difficult because heat transmission varies considerably depending upon material composition and heating methods.

The adhesive will cure fully in 24 hours with handling strength in approximately 6-8 hours, provided that the adhesive, substrates, and ambient temperature are 18°C (65°F) or higher.



**Table 2: Mix Ratios for Lord 310A Resin: Lord 310B Hardener**

Service Temperature	High Temperature 10°C-204°C (50°F-400°F)	General Purpose -40°C - 204°C (-40°F - 400°F)	Low Temperature -40°C-38°C (-40°F-100°F)
Mix Ratio			
by weight	1.7:1	1.15:1	1:1.5
by volume	1.5:1	1:1	1:1.5
Joint Design	Shear	Mixed Stress	Peel

**Table 3: Typical Properties of Cured Lord 310 Adhesive Mixed 1:1 by Volume, RT Cure**

	Values	Units	Test Method
Hardness	81	Shore D	Lord TM 23B
Tensile Strength at Break	4650	psi	ASTM D882-83A (mod)
Elongation at Break	2	%	ASTM D882-83A (mod)
Young's Modulus	245,000	psi	ASTM D882-83A (mod)
Water Absorption	0.36	%	ASTM D570-81 (24 hour immersion)
Shrinkage	0.17	%	72 Hours RT Cure
Glass Transition Temperature (Tg)	60 (140)	°C (°F)	ASTM E1640-99 (by DMA)
Coefficient of Thermal Expansion below Tg	327 x 10 <sup>-6</sup>	mm/mm°C	ASTM D882-83A (mod)
Coefficient of Thermal Expansion above Tg	340 x 10 <sup>-6</sup>	mm/mm°C	Lord Internal Method (by DMA)

**Table 4: Bond Performance Data**

Substrates	Cold Rolled Steel to Cold Rolled Steel Lap Shear	Aluminum to Aluminum Lap Shear	SMC to SMC Lap Shear	Natural Rubber to Cold Rolled Steel 45° Peel	SBR to SBR T-Peel
Room Temperature	2520 psi C	1710 psi A	630 psi FT	55 lbs/in R	57 lbs/in 50R/C
Hot Strength at 85°C (180°F)	1590 psi A	1290 psi A	570 psi FT	18 lbs/in 8 R/A	10 lbs/in A
24 Hour Recovery After 7 Days in H <sub>2</sub> O at 54°C (130°F)	2450 psi C	1950 psi A	670 psi FT	55 lbs/in R	95 lbs/in 56R/C
14 Days Salt Spray Exposure, Test Immediately	2380 psi 20C/A	1850 psi A	670 psi FT	50 lbs/in 93R/A	73 lbs/in 33R/C
14 Days at 38°C (100°F), 100% Relative Humidity, Test	2790 psi 50C/A	2450 psi 50C/A	640 psi 98FT/A	58 lbs/in R	63 lbs/in 93R/C
Test at -34°C (-30°F)	2370 psi A	1550 psi A	690 psi FT	72 lbs/in R	122 lbs/in 540R/C

Surface Preparations	Substrate	Surface Treatment
	Cold Rolled Steel and Aluminum Sheet Molded Compound (SMC) Styrene Butadiene Rubber (SBR) Natural Rubber	MEK Wipe, Grit Blast, MEK Wipe 320 Grit Sandpaper, Dry Rag Wipe Primed with Lord® 7701 Primer Primed with Lord® 7701 Primer

Bonded Parameters	Bond Area	Film Thickness	Cure	Mix Ratio
Metal Lap Shears	1.0"x0.5"	0.010"	72 hr. @RT.	1:1 by Volume
SMC Lap Shears	1.0"x1.5"	0.030"	72 hr. @RT.	1:1 by Volume
T-Peels	1.0"x3.0"	0.020"	72 hr. @RT.	1:1 by Volume
45° Peels	1.0"x1.0"	0.020"	72 hr. @RT.	1:1 by Volume

**Failure Mode Key**

Abbreviation	R	FT	A	C	SB
Definition	Rubber Failure	Fiber Tear	Adhesive Failure	Cohesive Failure	Stock Break

\*All data is typical and not to be used for specification purposes. Physical properties may vary depending on mix ratio, degree of crosslink, and cure method as well as other parameters.

**Table 5: Coverage Information**

Square Coverage by Wet Film thickness					Linear Coverage by Bead Diameter									
Wet Film Thickness		Per Gallon		~ Gals. Required Per 1000 Sq. Ft. (93 Sq. M)	Bead Diameter		Per		Per Lord-Pak 50		Per Lord-Pak 200		Per Lord-Pak CX	
mils	mm	Sq.Ft.	Sq. M		In.	mm	Ft.	M	Ft.	M	Ft.	M	Ft.	M
5	0.13	320	29.7	3.1	1/16	1.59	6100	1800	82	25	330	100	630	192
10	0.25	160	14.9	6.5	1/8	3.18	1500	457	20	6.0	82	25	160	48.7
20	0.51	80	7.4	12.5	3/16	4.76	690	210	8.5	2.5	35.5	10.8	68	20.7
30	0.76	52	4.8	20	1/4	6.35	375	114	4.5	1.3	19	5.8	38.5	11.7
31.25*	0.79	50	4.6	20	3/8	9.52	165	50	2	0.6	8.5	2.6	16	4.8
40	1.02	40	3.7	25	1/2	12.7	95	29	–	–	4.5	1.3	8.5	2.5
60	1.52	26	2.4	40	3/4	19.0	35	11	–	–	2	0.6	3.5	1.0
62.5**	1.59	25	2.3	40	7/8	22.2	30	9	–	–	–	–	2.5	0.7
125***	3.18	12	1.1	80	1	25.4	22	7	–	–	–	–	1	0.3

\*1/32 in. \*\*1/16 in. \*\*\*1/8 in. 1 mil = 0.001 inch †All values are approximate; not for specification purposes.

**Clean Up**

*Uncured Adhesive*

It is important to clean up excess adhesive on the bonded assembly, as well as mixing and application equipment, before the adhesive sets up. Use hot water and detergent, or an organic solvent; ketones have been shown to work best.

*Cured Adhesive*

Removing cured Lord 310 adhesive is difficult because of its resistance to chemicals, solvents, and cleaning agents. Heating to 204°C (400°F) or above will soften the adhesive, allowing the parts to be separated and the adhesive to be more easily removed. Some success may be achieved with commercial epoxy strippers.

**Subsequent Processing**

After the adhesive has been cured, it may be filed, sanded, machined or otherwise handled in the same way as a light metal. Paints, lacquers, enamels, and other coatings may be applied without danger of solvent attack.

Values stated in this bulletin represent typical values as not all tests are run on each lot of material produced. For formalized product specifications for specific product end uses, contact the Customer Service Department.

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**Packaging**

- 1/2 Pint Container (0.24 Liter)
- 1 Quart Container (0.95 Liter)
- 1 Gallon Container (3.8 Liter)
- 5 Gallon Pail (19 Liter)
- 55 Gallon Drum (208 Liter)
- Lord-Pak™ 50 ml dual syringes
- Lord-Pak™ 380ml dual syringes

Lord 310 adhesive may be special ordered in minimum quantities in Lord-Pak Systems which contain 200 ml of mixed adhesive.

**Storage**

Ship and store Lord 310 adhesive in original container between 4°C - 27°C (40°F - 80°F).

**Cautionary Information**

Before using this or any Lord product, refer to the Material Safety Data Sheet (MSDS) and label for safe use and handling instructions.

*For industrial/commercial use only.* Must be applied by trained personnel only. Not to be used in household applications. Not for consumer use.

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