

# BONDING

For successful bonding, knowledge of adhesive methodology is essential. The most frequent causes for adhesive failure do not involve adhesive strength. Rather, they are attributed to inadequate preparation of the substrates and improper adhesive selection.

The most important factor in proper adhesive selection is assessing the environment the adhesive must withstand. Once the environmental factors have been recognized, adhesive selection becomes more easily defined, as other factors, such as joint design, substrates, load, stress cycles, etc., can often be varied or altered with minor design changes.

## What is the Best Adhesive for My Application?

The following chart has been designed to help you select a bonding adhesive. This chart is intended to serve as a general guideline to help you determine which adhesive categories are best suited for your application. The data presented represents typical properties for each adhesive category; however, individual product properties may differ. It is suggested that, based on the information provided, you consider at least the two best adhesive categories that meet your application criteria. Individual product information can then be found on the pages that follow to help narrow your search.

*This chart should not be used to specify adhesives without specific testing. It is recommended that you conduct on-part testing to ensure adhesive performance before specifying any adhesive.*

*Henkel Adhesives and Sealants Specialists are available to assist you with new product designs, or to help you re-engineer an existing application using Loctite® brand products for improved performance and cost savings. They can also set up testing of your parts at the Henkel Customer Engineering Center. For application assistance, call 1-800-LOCTITE (562-8483) or visit [www.loctite.com](http://www.loctite.com) and select "Contact Loctite."*

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PERFORMANCE CONSIDERATIONS	ADHESIVE CATEGORY							
	Cyanoacrylates	Epoxies	Hot Melts	Light Cure	Silicones	Urethanes	2-Part Acrylics	2-Step Acrylics
Benefits	Excellent adhesion to rubber or plastics	Wide range of formulations	Fast, large gap filling	Rapid cure/adhesion to plastics	Excellent temperature resistance	Excellent toughness/flexibility	Good impact resistance/flexibility	Good impact resistance/flexibility
Limitations	Low solvent resistance	Mixing required	Low heat resistance	Light Cure System required	Low strength	Sensitive to moisture	Mixing required	Primer required
Temperature Resistance <b>Typical for the category (°F)</b> <b>Highest Rated Product (°F)</b>	-65 to +180 +250	-65 to +180 +275	-65 to +250 +330	-65 to +300 +350	-65 to +400 +600	-65 to +250 +300	-65 to +250 +250	-65 to +300 +400
Environmental Resistance <b>Polar Solvents</b> <i>(ex. H<sub>2</sub>O, Ethylene Glycol, IPA, Acetone)</i> <b>Non-Polar Solvents</b> <i>(ex. Motor Oil, Toluene, Gasoline, ATF)</i>	Poor <sup>1</sup>  Good	Very good  Excellent	Good  Good	Good  Very good	Good  Poor	Good  Good	Good  Very good	Good  Very good
Adhesion to Substrates <b>Metals</b> <b>Plastics<sup>2</sup></b> <b>Glass</b> <b>Rubber</b> <b>Wood</b>	Very good Excellent Poor Very good Good	Excellent Fair Excellent Fair Very Good	Good Very good Good Fair Excellent	Good Excellent Excellent Fair Poor	Good Fair Very good Good Fair	Good Very good Good Good Fair	Excellent Excellent Good Poor Good	Excellent Fair Excellent Poor Good
Overlapping Shear Strength	High	High	Low	High	Low	Medium	High	High
Peel Strength	Low	Medium	Medium	Medium	Medium	Medium	High	Medium
Tensile Strength	High	High	Low	High	Low	Medium	High	High
Elongation/Flexibility	Low	Low	High	Medium	Very High	High	High	Medium
Hardness	Rigid	Rigid	Semi-soft	Semi-rigid	Soft	Soft	Semi-rigid	Semi-rigid
PROCESS CONSIDERATIONS								
Number of Components	1	2	1	1	1	2	2	2
Cure Temperature	Room Temp.	Room Temp.	Room Temp. <sup>3</sup>	UV/Visible	Room Temp.	Room Temp.	Room Temp.	Room Temp.
Fixture Time <b>Average</b> <b>Fastest</b>	60 seconds 10 seconds	35 minutes 3-5 minutes	70 seconds 20 seconds	30 seconds 5 seconds	25 minutes 10 minutes	25 minutes 5 minutes	20 minutes 3-5 minutes	5 minutes 30 seconds
Full Cure Time	24 hours	12 - 24 hours	1 hour (or when cooled) <sup>4</sup>	30 - 60 seconds	24 hours	24 hours	24 hours	24 hours
Gap Fill <b>Ideal (in inches)</b> <b>Maximum (in inches)</b>	0.001 - 0.003 0.010	0.004 - 0.006 0.125	0.002 - 0.005 0.240	.002 to .010 0.25	0.004 - 0.006 0.240	0.004 - 0.006 0.125	0.010 - 0.040 0.5	0.002 - 0.004 0.040
Dispensing/Mixing Equipment Required?	No	Yes	Yes	No	No	Yes	Yes	Yes
Light Cure Versions Available?	Yes	Yes	No	Yes	Yes	No	No	Yes
For more information on each adhesive category, refer to pages...	12-15, 29, 30, 59, 61	16-19, 21, 59, 61	24-27	28-31, 58-60	29, 31, 59, 61	17, 20, 21, 59, 61	9, 11	8, 10

<sup>1</sup> Cyanoacrylates have very good moisture resistance on plastics.

<sup>2</sup> Uncured liquid adhesives may cause stress cracking of certain thermoplastics, e.g. polycarbonate, acrylic, and polysulfone. Special products and process techniques are available. Consult the Loctite® Design Guide to Bonding Plastics (LT2197) or contact 1-800-LOCTITE for more information.

<sup>3</sup> Elevated temperatures are required to dispense liquid Hot Melt Adhesives.

<sup>4</sup> Urethane Hot Melts require 24 hours for full cure.