

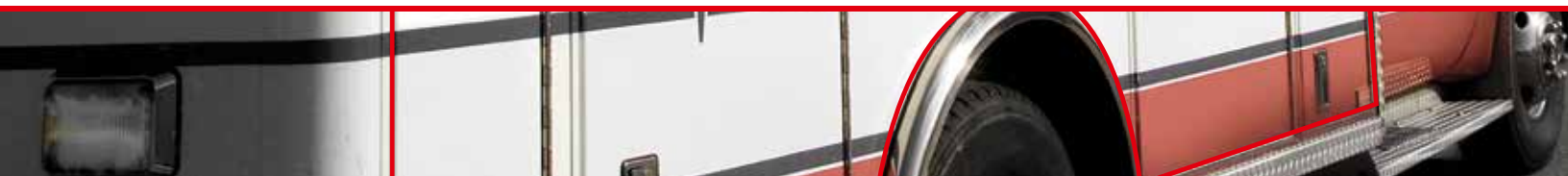


Global Distributor of Henkel LOCTITE  
(800) 888-0698 info@ellsworth.com

# Structural Adhesives and NVH Selector Guide



Excellence is our Passion



# LEADING THE WAY IN STRUCTURAL ADHESIVES

Loctite® structural adhesives are engineered to meet a wide range of industrial bonding and assembly requirements. They are available in several formulations including:

- Two-part acrylics
- One- and two-part epoxies
- Polyurethanes
- Two-step acrylics
- NVH

Our structural adhesives are designed to provide superior bond strength, long life and dependability on a variety of substrates and applications including:

- 1. Metal Bonding** – optimized to meet the demands of today's total lower cost, high strength and lighter weight metal fabricating requirements.
- 2. Plastic and Composite Bonding** – for the toughest, most durable bond strength on composites and plastics, including difficult to bond polyolefins.
- 3. Multiple Surface Bonding** – for excellent bond strength when joining dissimilar materials, substrates and surface types.
- 4. Magnet Bonding** – for the fastest, most durable bonds on ferrite, alnico and neodymium iron boron permanent magnets.
- 5. NVH - Noise Vibration & Harshness** – highly engineered, custom solutions to help achieve noise and vibration reduction levels in applications for Ag-Con specialty vehicles and appliances.

Loctite® structural adhesives are available in easy-to-use packages for hand-held, manual and semi-automated applications, including cartridges, syringes, soft-squeeze bottles and dual cartridges for two-part formulations. Loctite® structural adhesives are also offered in larger packages such as 5- or 55-gallon pails for high volume dispensing and automated assembly operations.

All Loctite® structural adhesives are easily applied with Loctite® dispensing equipment. Configurations include manual or pneumatic, portable or stationary, small or large package systems and pressure-time or volumetric dispense systems.

For reliable structural adhesives, choose Loctite®, a name synonymous with the highest quality, superior technical support and exceptional value for over 60 years.

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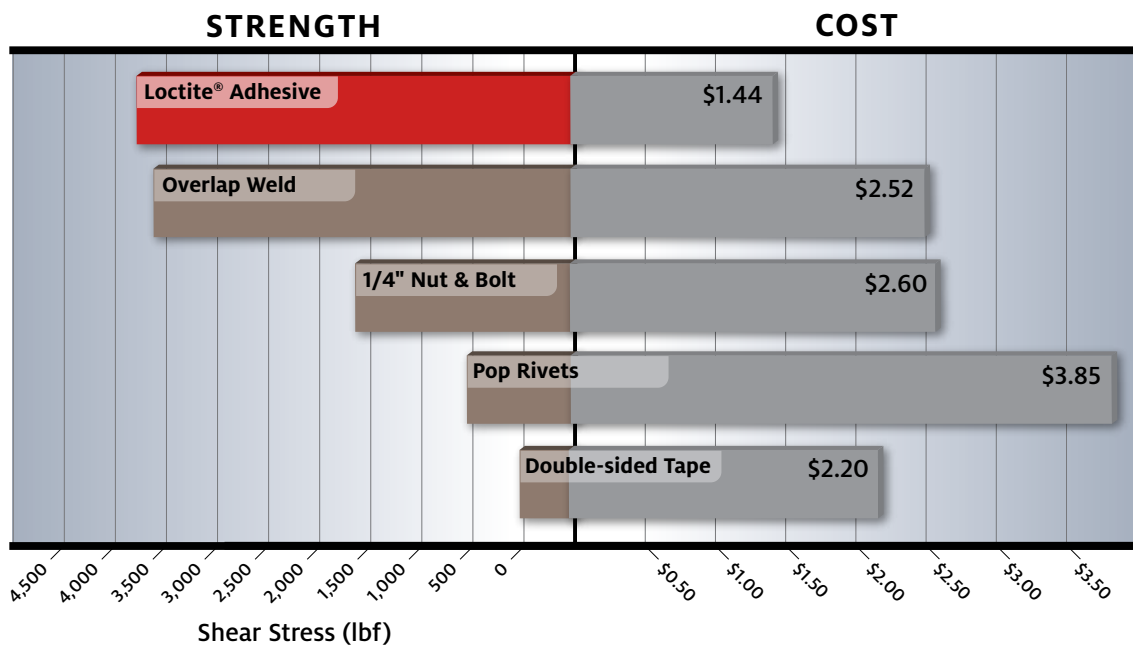
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**LOCTITE® STRUCTURAL ADHESIVES ARE AS STRONG AS OVERLAP WELDS, 2X STRONGER THAN BOLTS AND EASIER ON THE BOTTOM LINE.**



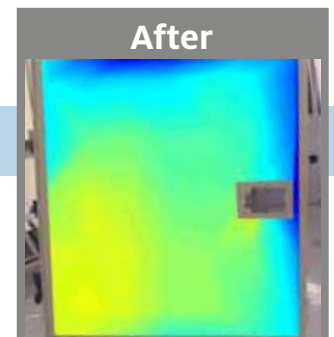
Before  
Previous process. Note the proliferation of rivet heads.



After  
With Loctite® Structural Adhesive process. Note the smooth finish.



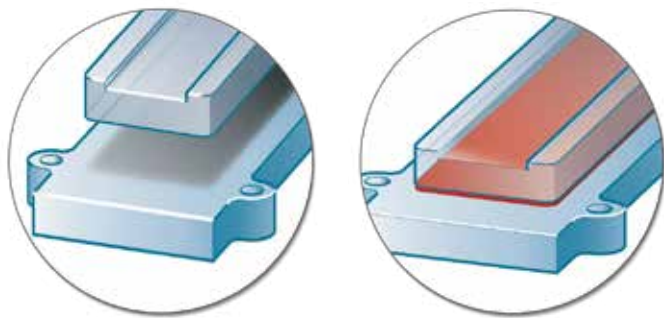
Before  
Vibration response test for truck utility door with welded vertical steel hat section. Red/yellow indicates high levels of vibration.



After  
Test results for truck utility door using Henkel 27006 expandable material instead of steel hat section. Blue/green indicates low levels of vibration.

# STRUCTURAL BONDING OVERVIEW

## FOR DEMANDING REQUIREMENTS



When applied, adhesives provide “bridges” between substrates, resulting in uniform stress distribution.

## WHY USE A HENKEL ADHESIVE FOR STRUCTURAL BONDING?

The Henkel range of structural bonding products offers a wide choice of solutions to meet the different requirements and conditions that apply to industrial design and construction.

### BONDING BASICS

Adhesive bonding is a process in which two similar or dissimilar materials are solidly and permanently assembled using an adhesive.

To achieve the optimal bonding result, the following prerequisites must be met:

- Compatibility of the adhesive with the materials to be bonded
- Compatibility of the adhesive with the specified requirements
- Correct processing of the adhesive

## ADVANTAGES OF BONDING COMPARED TO CONVENTIONAL JOINING METHODS

### More uniform stress distribution over the entire bond face:

This has a very positive effect on the static and dynamic strength achieved. Where welding and riveting result in localized stress peaks, adhesive bonding achieves uniform distribution and absorption of stress loads.

### No change in surface and texture of the joined materials:

Welding temperatures may change the texture and, therefore, the mechanical properties of materials. In addition, welding, riveting and fastening all affect the visual appearance of the parts.

**Weight saving:** Adhesives are particularly popular for light-weight constructions, where thin-walled parts (wall thickness < 0.5 mm) must be joined.

**Sealed joints:** Adhesives also act as sealants, preventing loss of pressure or liquids, blocking the penetration of condensation water and protecting against corrosion.

### Joining dissimilar materials and reducing the risk of

**corrosion:** The adhesive forms an insulating film to prevent contact corrosion when different types of metals are joined. It also acts as electrical and thermal insulator.

## CHOOSING THE RIGHT HENKEL STRUCTURAL BONDING ADHESIVE

The following key points should be observed for the design of bonded joints:

- The surfaces to be joined should be as large as possible for maximum load transmission capability
- Forces acting on the joint should be distributed across the entire bond line

## AVAILABLE TECHNOLOGIES

### EPOXIES

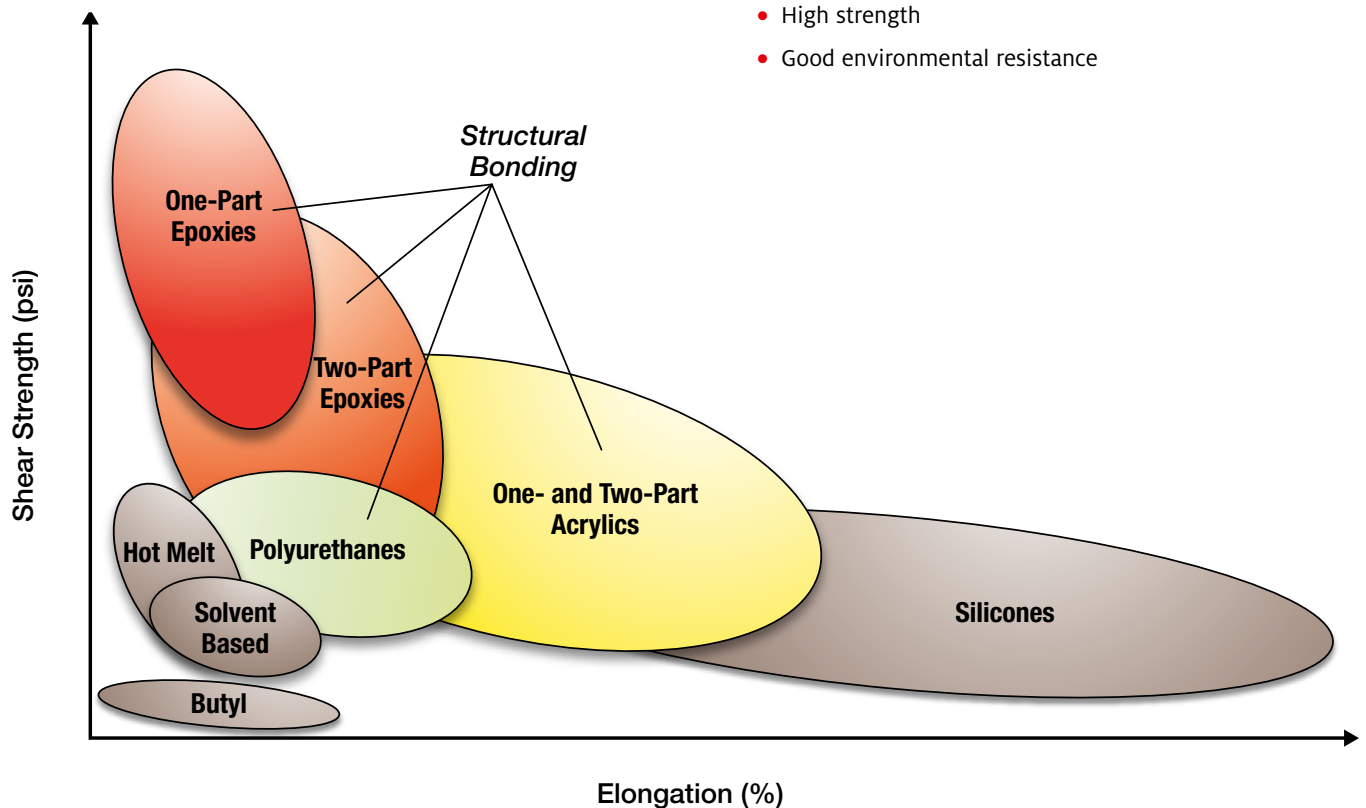
- Rigid bonding
- Room temperature or heat cure
- Capability to fill large gaps
- Very high strength
- Very good chemical resistance

### ACRYLICS

- Rigid to slightly flexible bonding
- Room temperature cure
- Very high strength
- Good environmental resistance
- Very high impact strength
- Good fatigue resistance

### POLYURETHANES

- Slightly flexible bonding
- Room temperature cure
- Capability to fill large gaps
- High strength
- Good environmental resistance



**NOTE:** For flexible bonding options please refer to our Elastomeric Adhesives and Sealants Brochure (LT-6556) or our Adhesives Sourcebook (LT-3355).

# ADHESIVE JOINT DESIGN

## INTRODUCTION

In this section, the terms and concepts related to joint design are divided into three categories which include:

- Types of Joints
- Joint Stress Distribution
- Design Guidelines

Before looking at different types of joints, a few terms need to be explained:

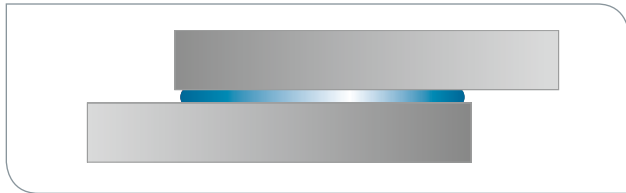
**Joint:** A joint is the location where an adhesive joins two substrates.

**Joint Geometry:** Joint geometry refers to the general shape of an adhesive bond. Is the shape of the bond long and narrow, short and wide, thick or thin?

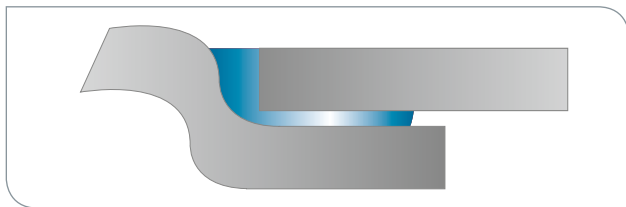
## TYPES OF JOINTS

The specific types of joints which will be examined in this section include:

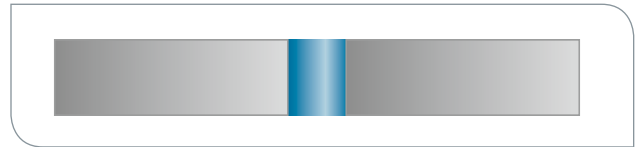
- Lap/Overlap
- Scarf
- Offset
- Strap/Double Strap
- Butt
- Cylindrical



**LAP/OVERLAP JOINT:** A lap joint, also called an overlap joint, is formed by placing one substrate partially over another substrate.



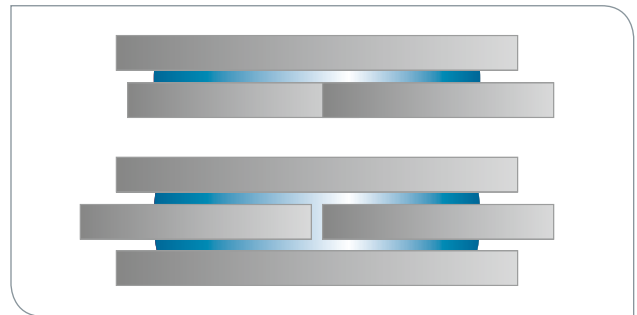
**OFFSET JOINT:** The offset joint is very similar to the lap joint.



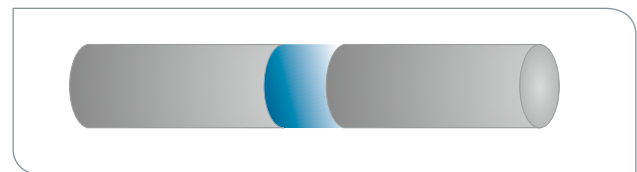
**BUTT JOINT:** A butt joint is formed by bonding two objects end to end.



**SCARF JOINT:** A scarf joint is an angular butt joint. Cutting the joint at an angle increases the surface area.



**STRAP JOINT (SINGLE OR DOUBLE):** A strap joint is a combination overlap joint with a butt joint.



**CYLINDRICAL JOINT:** A cylindrical joint uses a butt joint to join two cylindrical objects.

## JOINT STRESS DISTRIBUTION

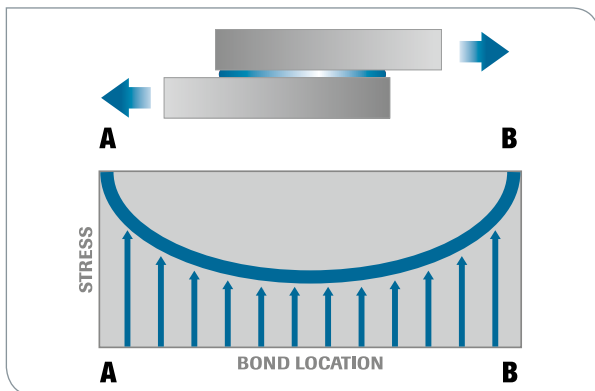
Joint stress distribution is the location of stresses within a bond.

**Stress:** Usually expressed as Newtons per square meter ( $N/M^2$ ), which is equivalent to a pascal (Pa). In the English system, stress is normally expressed in pounds per square inch (psi).

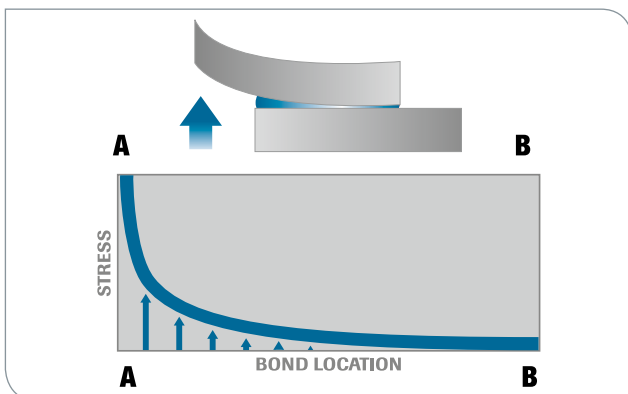
## TYPES OF STRESSES

There are several types of stresses commonly found in adhesive bonds which include:

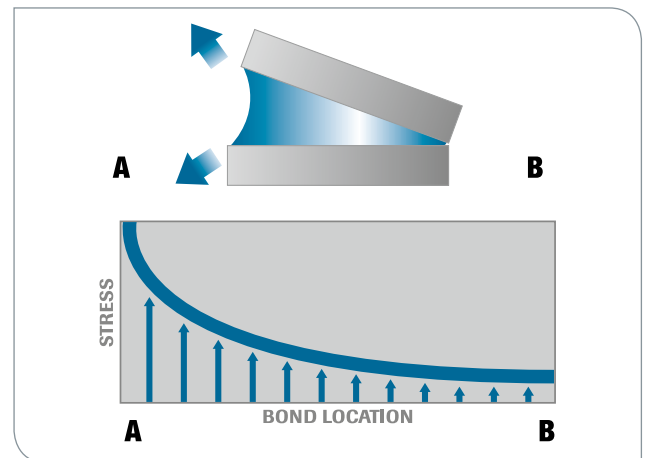
- Shear
- Peel
- Tensile
- Cleavage
- Compressive



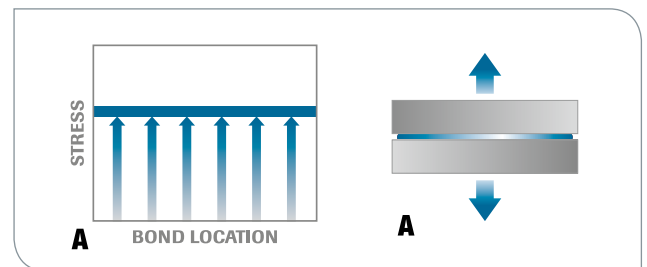
**SHEAR STRESS:** A shear stress results in two surfaces sliding over one another.



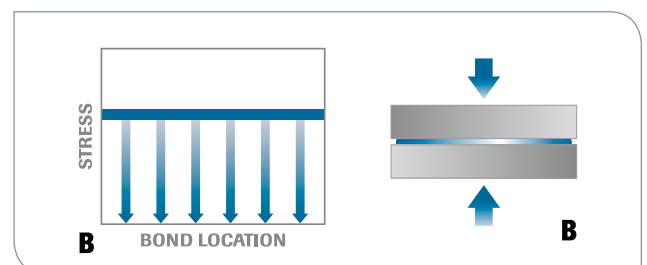
**PEEL STRESS:** A peel stress occurs when a flexible substrate is being lifted or peeled from the other substrate. **NOTE:** The stress is concentrated at one end.



**CLEAVAGE STRESS:** A cleavage stress occurs when rigid substrates are being opened at one end. **NOTE:** The stress is concentrated at one end.



**TENSION STRESS DISTRIBUTION:** When a bond experiences a tensile stress, the joint stress distribution is illustrated as a straight line. The stress is evenly distributed across the entire bond. Tensile stress also tends to elongate an object.



**COMPRESSION STRESS DISTRIBUTION:** When a bond experiences a compressive stress, the joint stress distribution is illustrated as a straight line. The stress is evenly distributed across the entire bond.

## DESIGN CONSIDERATIONS

Engineers must have a good understanding of how stress is distributed across a joint which is under an applied force. There are several design guidelines which should be considered when designing an adhesive joint.

### MAXIMIZE SHEAR/MINIMIZE PEEL AND CLEAVAGE

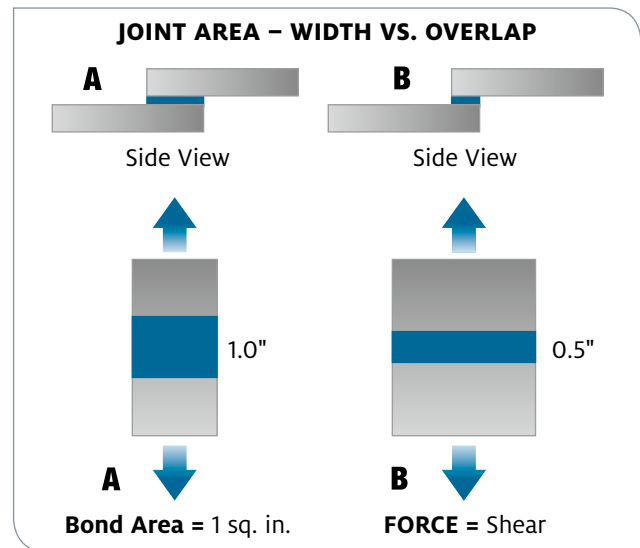
Note from the stress distribution curve for cleavage and peel, that these bonds do not resist stress very well. The stress is located at one end of the bond line. Whereas, in the case of shear, both ends of the bond resist the stress.

### MAXIMIZE COMPRESSION/MINIMIZE TENSILE

Note from the stress distribution curve for compression and tension, that stress was uniformly distributed across the bond. In most adhesive films, the compressive strength is greater than the tensile strength. An adhesive joint which is feeling a compressive force is less likely to fail than a joint undergoing tension.

### JOINT WIDTH VS. OVERLAP

Note from the shear stress distribution curve, that the ends of the bond receives a greater amount of stress than does the middle of the bond. If the width of the bond is increased, stress will be reduced at each end and the overall result is a stronger joint.



In this same overlap joint, if the overlapping length is greatly increased, there is little, if any, change in the bond strength. The contribution of the ends is not increased. The geometry of the ends has not changed, thus their contribution to the bond strength has not changed.

As a general rule, increase the joint width rather than the overlap area (“wider is better”).



# TECHNOLOGY CONSIDERATIONS

PERFORMANCE CONSIDERATIONS	ADHESIVE CATEGORY			
	EPOXIES	URETHANES	2-PART ACRYLICS	2-STEP ACRYLICS
<b>BENEFITS</b>	Wide range of formulations	Excellent toughness/ flexibility	Good impact resistance/ flexibility	Good impact resistance/no-mix
<b>LIMITATIONS</b>	Mixing required	Sensitive to moisture	Mixing required	Primer required
<b>TEMPERATURE RESISTANCE</b>				
Typical for the category	-65°F to 180°F (-54°C to 82°C)	-65°F to 250°F (-54°C to 121°C)	-65°F to 250°F (-54°C to 121°C)	-65°F to 300°F (-54°C to 149°C)
Highest rated product	400°F (204°C)	300°F (149°C)	250°F (121°C)	400°F (204°C)
<b>ENVIRONMENTAL RESISTANCE</b>				
Polar Solvents <i>(EX.: H<sub>2</sub>O, ETHYLENE GLYCOL, ISOPROPYL ALCOHOL [IPA], ACETONE)</i>	Very Good	Good	Good	Good
Nonpolar Solvents <i>(EX. MOTOR OIL, TOLUENE, GASOLINE, ATF)</i>	Excellent	Good	Very Good	Very Good
<b>ADHESION TO SUBSTRATES</b>				
Metals	Excellent	Good	Excellent	Excellent
Plastics	Fair	Very Good	Excellent	Fair
Glass	Excellent	Good	Good	Excellent
Rubber	Fair	Good	Poor	Poor
Wood	Very Good	Fair	Good	Good
<b>OVERLAPPING SHEAR STRENGTH</b>	High	Medium	High	High
<b>PEEL STRENGTH</b>	Medium	Medium	High	Medium
<b>TENSILE STRENGTH</b>	High	Medium	High	High
<b>ELONGATION/FLEXIBILITY</b>	Low	High	Medium	Medium
<b>HARDNESS</b>	Rigid	Soft	Semirigid	Semirigid
PROCESS CONSIDERATIONS	ADHESIVE CATEGORY			
	EPOXIES	URETHANES	2-PART ACRYLICS	2-STEP ACRYLICS
<b>NUMBER OF COMPONENTS</b>	1 or 2	1 or 2	2	2
<b>CURE TEMPERATURE</b>	Room temperature or heat cure	Room temperature or heat cure	Room temperature or heat cure	Room temperature or heat cure
<b>FIXTURE TIME</b>				
Average	20 minutes	25 minutes	20 minutes	5 minutes
Fastest	3 to 5 minutes	5 minutes	3 to 5 minutes	30 seconds
<b>FULL CURE TIME</b>	12 to 24 hours	24 hours	24 hours	24 hours
<b>GAP FILL</b>				
Ideal (in inches)	0.004 to 0.006	0.004 to 0.006	0.010 to 0.040	0.002 to 0.004
Maximum (in inches)	0.125	0.125	0.5	0.040
<b>DISPENSING/MIXING EQUIPMENT REQUIRED</b>	YES	YES	YES	NO

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

# TWO-PART ACRYLICS

## ADVANTAGES

- High cure through depth
- Room temperature cure
- High peel and impact strength
- Good environmental resistance
- Bonds to moderately contaminated surfaces
- Cure can be accelerated with heat

## CONSIDERATIONS

- Slow fixture times (5 to 30 minutes)
- Waste associated with static mix process
- May have strong odor

## GENERAL DESCRIPTION

Two-part acrylic adhesives consist of a resin and an activator both of which are normally high-viscosity liquids typically in the range of 5,000 to 100,000 cP. While the activator is chemically similar to that of a two-step acrylic, it is delivered as a high viscosity liquid that is normally similar in viscosity to the resin. The two components are mixed just prior to dispensing at mix ratios ranging from 1:1 and 10:1 by volume. By mixing the activator and resin, two-part acrylics have much larger cure through depths than two-step acrylics that only have the activator applied to the surface.

To maintain the ratio of the resin and activator equipment is required. For small to moderate volume applications, the adhesive is packaged in a dual cartridge that sets the ratio. For high volume applications, meter mix dispense equipment is used.

The resin and activator are mixed by passing them through a static mix tip which allows the material to be dispensed as a homogenous one-part material. Since the mixed adhesive is curing in the mix tip, there will be trade off between the open time and the fixture time. Faster curing products will require that mix tips be changed after shorter idle times.

Two-part acrylics can also be accelerated with heat, but care must be taken when determining the cure temperature.

## PROCESS NOTES

**Properly prime the mix** tip by dispensing a small amount before attaching the mix tip (also called “bumping”) to ensure both sides are flowing then dispensing several grams after attaching the tip to prime the mix tip before creating production parts.

**Audit to ensure proper mixing.** Many two-part acrylics are color coded to allow for visual inspection of the mixing. For example, a blue resin and yellow activator would result in a green product. There should not be pockets of unmixed (i.e. yellow or blue) product that can be visually observed.

**Use equipment designed for two-part acrylics.** Two-part acrylics are very reactive systems that may cure when contacting active metals such as steel, copper or brass. When dispensing from a meter-mix dispense system, two-part acrylics must be dispensed from inactive systems such as stainless steel. Care should be taken not to replace fitting during maintenance with active metals

**Evaluate peak exotherm for large volume applications.**

Two-part acrylics cure very rapidly via an exothermic reaction that releases heat. When curing large volumes, the heat can be sufficient to warp plastic parts or degrade the adhesive.



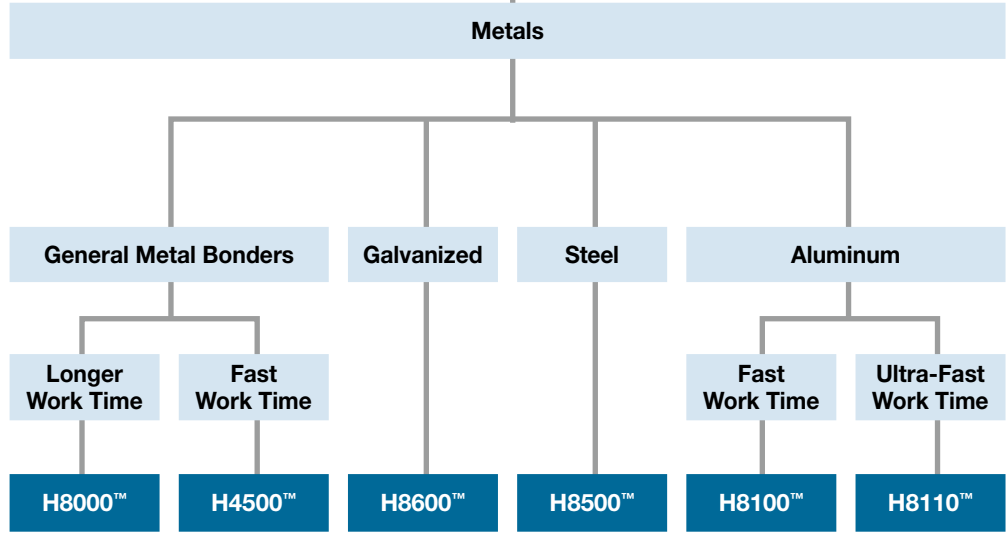


# TWO-PART ACRYLIC ADHESIVES

## Your Application

- Specially formulated to provide tough, long-lasting bonds to most surfaces, including steel, galvanized steel, aluminum, sheet metal, stainless steel, plastics and composites
- Capable of reducing or replacing the need for threaded fasteners, welds or rivets, resulting in a lower cost assembly

## ARE YOU BONDING METALS OR PLASTICS/COMPOSITES?



## Loctite® Solution

	H8000™	H4500™	H8600™	H8500™	H8100™	H8110™
<b>Color</b>	Green	Grey	Blue	Grey	Green	Green
<b>Viscosity (cP)</b>	190,000	45,000	86,000	60,000	185,000	200,000
<b>Mix Ratio</b>	10:1	10:1	2:1	10:1	10:1	10:1
<b>Work Time† (min.)</b>	30	15	25	25	15	7
<b>Shear Strength¹ (psi)</b>	3,140³	3,100	3,355	3,380	3,090³	2,475³
<b>Impact Strength⁵ (J)</b>	23	12	10	14	2³	10³
<b>Peel Strength¹ (pli)</b>	45	58	35⁴	92	45	48³

## Product Description

### Loctite® H8000™ Structural Adhesive

#### Tough Metal Bonder

Exhibits excellent peel strength on multiple substrates, especially aluminum.

P/N	Package Size
996453	50 ml dual cartridge
36160	490 ml dual cartridge
35939*	35 lb. pail, adhesive
35940*	45 lb. pail, activator

### Loctite® H4500™ Structural Adhesive

#### Fast Work Time

High strength structural adhesive for metals. Fixtures in 15 minutes. With color mix indication.

P/N	Package Size
996512	50 ml dual cartridge
83041	490 ml dual cartridge

### Loctite® H8600™ Structural Adhesive

#### Galvanized Steel Bonder

Excellent shear strength on steel and aluminum. Especially designed for severe environments.

P/N	Package Size
38762	400 ml dual cartridge
38760*	5 gallon pail, adhesive
38761*	5 gallon pail, activator

### Loctite® H8500™ Structural Adhesive

#### Ultra-Tough Steel Bonder

Excellent peel strength on steel and aluminum. Contains 30 mil spacer beads to prevent excessive squeeze-out of adhesive due to over-clamping.

P/N	Package Size
827608	490 ml dual cartridge
40888*	5 gallon pail, activator
40889*	5 gallon pail, adhesive

### Loctite® H8100™ Structural Adhesive

#### Aluminum Bonder

Exhibits excellent strength on aluminum.

P/N	Package Size
1056942	50 ml dual cartridge
1056943	490 ml dual cartridge

### Loctite® H8110™ Structural Adhesive

#### Ultra-Fast Aluminum Bonder

Aluminum bonder fixtures in 5 minutes.

P/N	Package Size
1371355	50 ml dual cartridge
1371361	490 ml dual cartridge

\* Made-to-order item.

† Working time = maximum time before assembly of parts to ensure proper wetting.

¹ Steel.

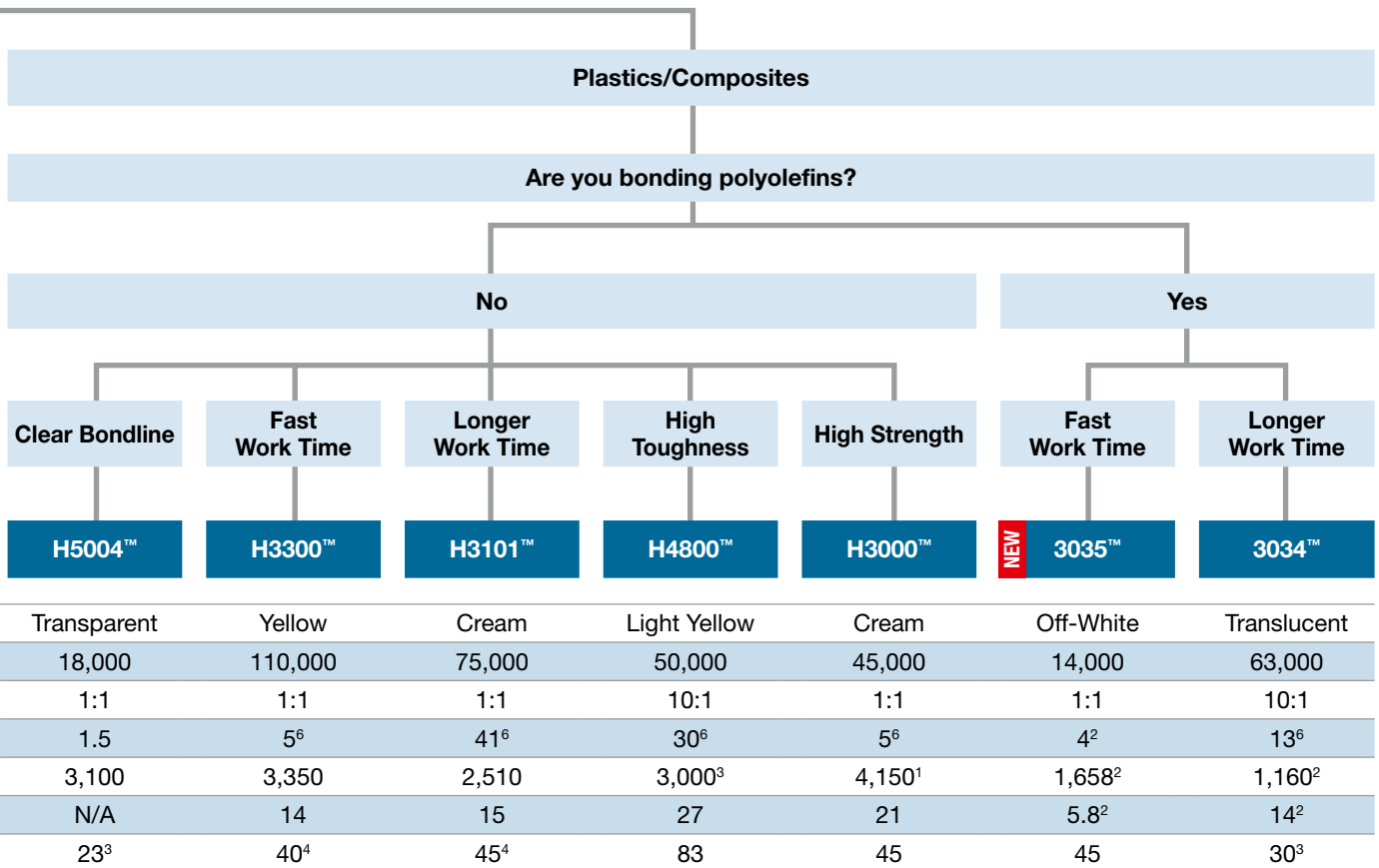
² High density polyethylene.

³ Aluminum.

⁴ Galvanized steel.

⁵ Grit-blasted mild steel.

⁶ Polyethylene.



**Loctite® H5004™  
Structural Adhesive  
Clear Bondline**

A fast-setting, toughened adhesive for metals and plastics that creates a virtually transparent bondline.

P/N	Package Size
1384596	50 ml dual cartridge

**Loctite® H3300™  
Structural Adhesive  
Fast Fixture**

A non-sag, fast-fixturing structural adhesive for bonding a variety of substrates.

P/N	Package Size
83020	50 ml dual cartridge
83019	400 ml dual cartridge
83024*	40 lb. pail, adhesive
83022*	40 lb. pail, activator

**Loctite® H3101™  
Structural Adhesive  
Extended Work Life**

A medium viscosity structural adhesive ideal for bonding a variety of substrates. **NSF/ANSI 61 Certified.**

P/N	Package Size
83007	50 ml dual cartridge
83006	400 ml dual cartridge

**Loctite® H4800™  
Structural Adhesive  
Toughened**

Excellent peel and impact resistance. Provides high bond strengths on composites.

P/N	Package Size
996515	50 ml dual cartridge
83045	490 ml dual cartridge

**Loctite® H3000™  
Structural Adhesive  
High Strength**

A low viscosity adhesive which exhibits high bond strength on a variety of substrates.

P/N	Package Size
83001	50 ml dual cartridge
83000	400 ml dual cartridge

**Loctite® 3035™  
Structural Adhesive  
Fast Fixture**

A fast-fixturing acrylic adhesive designed to bond low-energy plastic substrates without any surface preparation.

P/N	Package Size
1677288	50 ml dual cartridge

**Loctite® 3034™  
Structural Adhesive  
Toughened**

Extended open time allows for adjustment of parts. Excellent peel and shear strength on polyethylene plastics.

P/N	Package Size
960973	490 ml dual cartridge

# EPOXIES

## ADVANTAGES

- Wide variety of formulations available
- High adhesion to many substrates
- Good toughness
- Cure can be accelerated with heat
- Excellent depth of cure
- Superior environmental resistance

## CONSIDERATIONS

- Two-part systems require mixing
- One-part systems require heat cure
- Long cure and fixture times

## GENERAL DESCRIPTION

Epoxy adhesives are supplied as one- and two-part systems with viscosities that range from a few thousand centipoise to thixotropic pastes. Upon cure, epoxies form tough, rigid thermoset polymers with high adhesion to a wide variety of substrates and superior environmental resistance. A major advantage of epoxies is that there are a wide variety of commercially available resins, hardeners and fillers for epoxies that allows the performance characteristics of epoxies to be tailored to the needs of almost any application.

When using a one-part heat-cure system, the resin and a latent hardener are supplied already mixed and when stored typically need to be refrigerated or frozen. By heating the system, the latent hardener is activated causing cure to initiate. The epoxy will normally start to cure rapidly at temperatures of 212°F to 257°F (100°C to 125°C) and cure times of 30 to 60 minutes are typical. Heat curing also generally improves bond strengths, thermal resistance and chemical resistance.

When using a two-part system, the resin and hardener are packaged separately and are mixed just prior to use. This allows more active hardeners to be used so that the two-part epoxies will rapidly cure at ambient conditions.

Two-part systems are normally mixed by passing them through a static mix tip. This allows the two-part material to be dispensed as a single homogenous liquid where it exits the mix tip.

Since the mixed adhesive is curing in the mix tip, the adhesive's viscosity and performance changes during idle times and the mix tip must be changed after the idle time exceeds the adhesive's open time. This creates a trade off between fixture time and open time. Faster curing products will require that mix tips be changed after shorter idle times.

To maintain the ratio of the resin and activator, equipment is required. For small to moderate volume applications, the adhesive is normally packaged in a dual cartridge that sets the ratio. For high volume applications, meter mix dispense equipment is recommended.

## PROCESS NOTES

**Properly prime the mix tip** by dispensing a small amount before attaching the mix tip (also called “bumping”) to ensure both sides are flowing, then dispense several grams after attaching the tip to prime the mix tip before creating production parts.

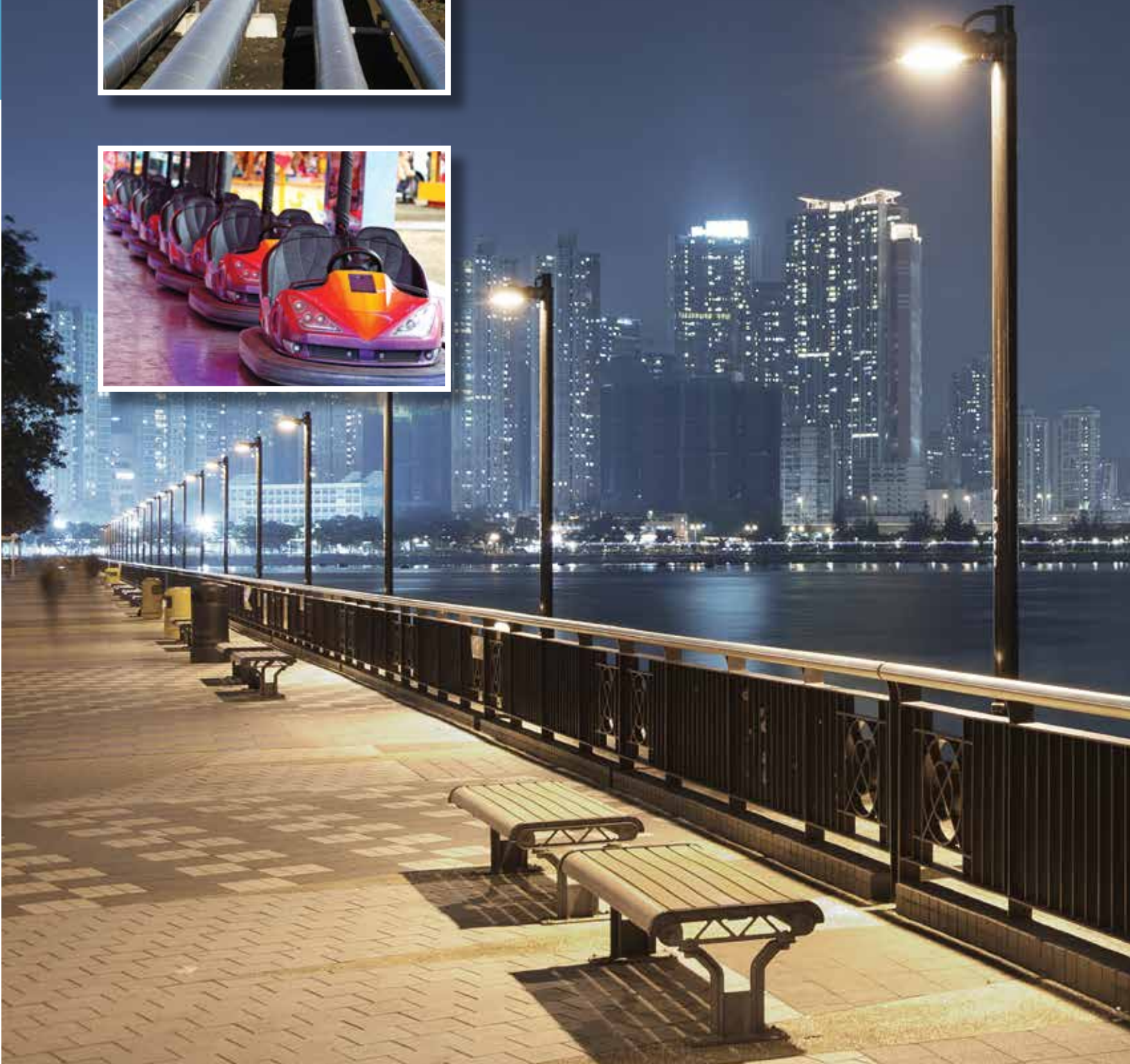
**Significant exotherms can occur for large volume applications.** The curing reaction of the epoxy can release a great deal of heat (exotherm) and can result in a significant temperature rise in the adhesive.

**Ensure that meter mix systems are on-ratio and air free.**

To maintain consistent performance when using a meter mix dispense system, it is critical that the equipment is at the required mix ratio. This should be audited periodically with QC tests. Air in the equipment is a frequent cause of the equipment becoming off-ratio. Care should be taken not to introduce air in the equipment when changing packages.

**Induction curing typically offers the fastest heat cures.**

Induction heats ferrous components much faster than convection or infrared ovens.



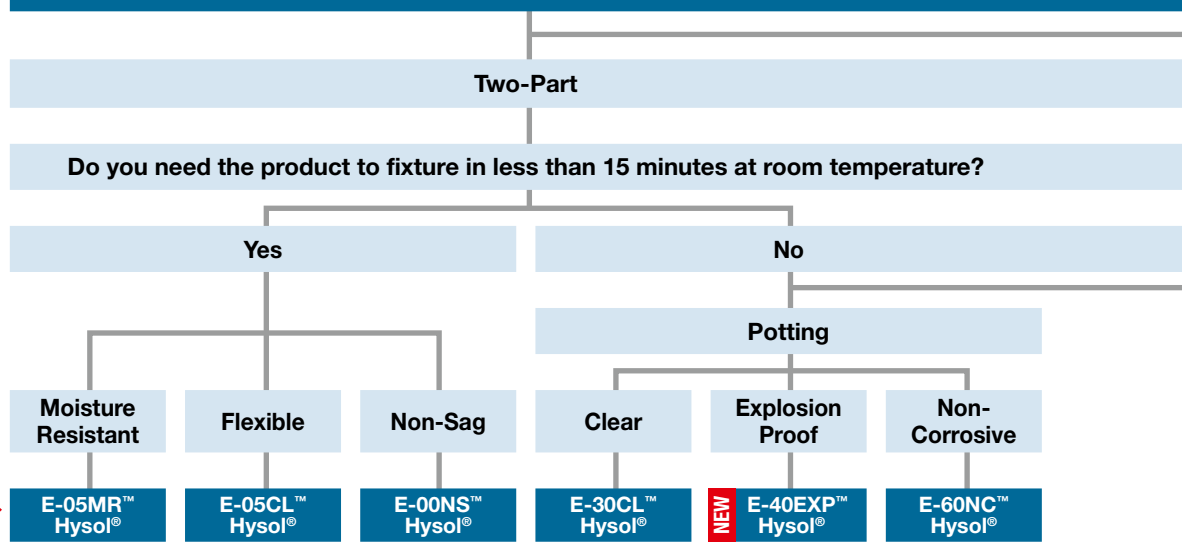


# EPOXY ADHESIVES

## Your Application

- Bond a wide variety of materials, such as metal, ceramic and plastic
- Available in a variety of formulations and performance capabilities, including fast cure, superior moisture resistance, ease of dispense, high toughness, and a resistance to a wide range of chemicals

## DO YOU NEED A ONE-PART OR TWO-PART EPOXY?



## Loctite® Solution

	E-05MR™ Hysol®	E-05CL™ Hysol®	E-00NS™ Hysol®	E-30CL™ Hysol®	E-40EXP™ Hysol®	E-60NC™ Hysol®
<b>Color</b>	Clear	Clear	Translucent	Clear	Grey	Black
<b>Viscosity (cP)</b>	25,000	2,500	100,000	10,000	24,000	8,000
<b>Mix Ratio</b>	1:1	1:1	1:1	2:1	2:1	1:1
<b>Work Life (minutes)</b>	5	5	3	30	40	60
<b>Fixture Time (minutes)</b>	15	15	10	>180	N/A	180
<b>Room Temperature Cure Time (hours)</b>	24	24	24	24	24	24
<b>Shear Strength<sup>1</sup> (psi)</b>	3,360	1,430	1,600	3,100	3,000 <sup>2</sup>	2,630
<b>Temperature Resistance</b>	200°F (93°C)	180°F (80°C)	180°F (82°C)	250°F (121°C)	250°F (121°C)	250°F (121°C)

## Product Description

### Loctite® E-05MR™ Hysol® Epoxy Adhesive

#### Moisture Resistant

Clear, fast-ixturing epoxy that provides excellent moisture resistance and exceptional toughness.

P/N	Package Size
1086598	50 ml dual cartridge
1086599*	400 ml dual cartridge
1087602*	5 gallon pail, resin
1087603*	5 gallon pail, hardener

### Loctite® E-05CL™ Hysol® Epoxy Adhesive

#### Flexible

A clear, flexible, high-peel, low-odor epoxy with a 3-minute work life.

P/N	Package Size
29299	50 ml dual cartridge
29301	400 ml dual cartridge
29302*	5 gallon pail, resin
29303*	5 gallon pail, hardener

### Loctite® E-00NS™ Epoxy Adhesive

#### Non-Sag

A fast-ixturing, thixotropic, non-sag epoxy which cures at room temperature to form a translucent, rigid and machinable bondline. Well suited for use on vertical surfaces.

P/N	Package Size
29294	50 ml dual cartridge
29295	200 ml dual cartridge
29296	400 ml dual cartridge

### Loctite® E-30CL™ Hysol® Epoxy Adhesive

#### Clear

An ultra-clear, low-viscosity, impact-resistant epoxy with a 30-minute work life. An excellent glass bonder. Exhibits exceptional chemical resistance.

P/N	Package Size
29329	50 ml dual cartridge
29330	200 ml dual cartridge
29331	400 ml dual cartridge

### Loctite® E-40EXP™ Hysol® Epoxy Potting Compound

#### Explosion Proof/Chemical Resistant

An epoxy designed for potting electrical motors used in hazardous locations. Compliant with UL™-674 for explosion-proof electric motors. Excellent chemical resistance.

P/N	Package Size
1511184*	50 ml dual cartridge
1511653	200 ml dual cartridge
1511896	5 gallon pail - part A
1511897	5 gallon pail - part B

### Loctite® E-60NC™ Hysol® Epoxy Adhesive

#### Noncorrosive/Potting

An electronics-grade potting compound with a 60-minute work life. Black, opaque, low viscosity with excellent cure-through depth.

P/N	Package Size
29324	50 ml dual cartridge
29325	200 ml dual cartridge
29326	400 ml dual cartridge
29327*	5 gallon pail, resin
29328*	5 gallon pail, hardener

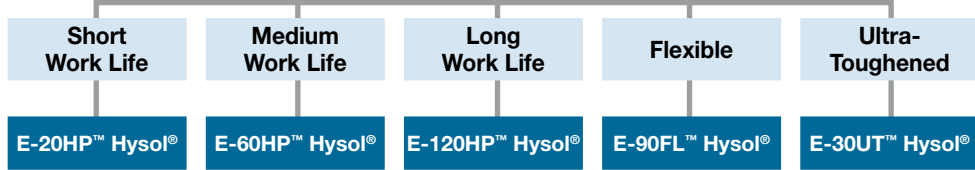
\* Made-to-order item.  
<sup>1</sup> Grit blasted steel.  
<sup>2</sup> Aluminum.



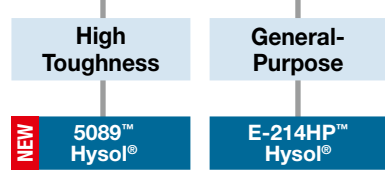


**High Toughness**

**High Toughness**



**One-Part**



E-20HP™ Hysol®	E-60HP™ Hysol®	E-120HP™ Hysol®	E-90FL™ Hysol®	E-30UT™ Hysol®	NEW 5089™ Hysol®	E-214HP™ Hysol®
Off-White	Off-White	Amber	Opaque Grey	Purple	Purple	Yellow
30,000	45,000	30,000	40,000	65,000	Paste	Paste
2:1	2:1	2:1	1:1	2:1	N/A	N/A
20	60	120	90	30	N/A	N/A
120	240	180	>180	180	N/A	N/A
24	24	24	24	24	20 min. @ 350°F (177°C)	2 @ 302°F (150°C)
3,270	4,320	4,300	810	4,200	2,900	4,820
250°F (121°C)	250°F (121°C)	250°F (121°C)	250°F (121°C)	250°F (121°C)	350°F (177°C)	300°F (149°C)

**Loctite® E-20HP™ Hysol® Epoxy Adhesive**  
**High Performance**  
 A high strength epoxy with a 20-minute work life. Off-white, toughened, high peel, high shear.

P/N	Package Size
29314	50 ml dual cartridge
29315	200 ml dual cartridge
29316	400 ml dual cartridge
29317	5 gallon pail, resin
29318	5 gallon pail, hardener

**Loctite® E-60HP™ Hysol® Epoxy Adhesive**  
 A high strength epoxy with a 60-minute work life. Off-white, high-peel, high-shear.

P/N	Package Size
29319	50 ml dual cartridge
29321	400 ml dual cartridge

**Loctite® E-120HP™ Hysol® Epoxy Adhesive**  
 An amber, non-sag, aerospace grade epoxy with an extended open time to allow for the adjustment of large parts.

P/N	Package Size
29353	50 ml dual cartridge
29354	200 ml dual cartridge
29355	400 ml dual cartridge
29356*	5 gallon pail, resin
29357*	5 gallon pail, hardener

**Loctite® E-90FL™ Hysol® Epoxy Adhesive**  
**Flexible**  
 A grey, impact-resistant, toughened epoxy with a 90-minute work life.

P/N	Package Size
29309	50 ml dual cartridge
29311	400 ml dual cartridge

**Loctite® E-30UT™ Hysol® Epoxy Adhesive**  
**Ultra-Tough**  
 An epoxy that provides exceptional fracture toughness characteristics for the most demanding structural bonding requirements.

P/N	Package Size
1078234	50 ml dual cartridge
1078235	400 ml dual cartridge

**Terokal® 5089™ Structural Adhesive**  
**High Performance**  
 A toughened heat curable epoxy offering high-shear strength and extremely good peel and impact resistance. Can be spot-welded through and is compatible with most paint-bake processes.

P/N	Package Size
1182757	300 ml cartridge
1182761	5 gal. pail
1182927	55 gal. drum

**Loctite® E-214HP™ Hysol® Epoxy Adhesive**  
**General-Purpose/Heat Cure**  
 A one-component, acid-free, heat cure epoxy. Light grey, temperature resistant, high strength, non-sag. Noncorrosive to sensitive parts.

P/N	Package Size
29339	30 ml cartridge
29340	300 ml cartridge

# POLYURETHANES

## ADVANTAGES

- Extremely tough
- Good resistance to solvents
- High cohesive strength
- Good impact resistance
- Good abrasion resistance

## CONSIDERATIONS

- Mixing required for two-part polyurethanes
- Primer may be needed for adhesion to some substrates
- Limited high temperature use

## GENERAL DESCRIPTION

Polyurethane adhesives are supplied as one- and two-part systems which range in viscosity from self-leveling liquids to non-slumping pastes. They cure to form thermoset polymers with good solvent and chemical resistance. They are extremely versatile and can range in cured form from extremely soft elastomers to rigid, extremely hard plastics. Polyurethanes offer a good blend of cohesive strength and flexibility that makes them very tough, durable adhesives. They bond well to most unconditioned substrates, but may require the use of solvent-based primers to achieve high-bond strengths. They offer good toughness at low temperatures, but typically degrade in strength after long-term exposure over 302°F (150°C).

Since the cure of one-part, moisture-curing polyurethanes is dependent on moisture diffusing through the polymer, the maximum depth of cure that can be achieved in a reasonable time is limited at approximately 0.375" (9.5 mm). Two-part systems, on the other hand, offer unlimited depth of cure.

Two-part systems are normally mixed by passing them through a static mix tip. This allows the two-part material to be dispensed as a single homogenous liquid where it exits the mix tip. Since the mixed adhesive is curing in the mix tip, the adhesive's viscosity and performance changes during idle times and the mix

tip must be changed after the idle time exceeds the adhesive's open time. This creates a trade off between fixture time and open time. Faster curing products will require that mix tips be changed after shorter idle times.

To maintain the ratio of the resin and activator, equipment is required. For small to moderate volume applications, the adhesive is packaged in a dual cartridge that sets the ratio. For high volume applications, meter mix dispense equipment is used.

## PROCESS NOTES

**Properly prime the mix tip** by dispensing a small amount before attaching the mix tip (also called "bumping") to ensure both sides are flowing, then dispense several grams after attaching the tip to prime the mix tip before creating production parts.

**Audit to ensure proper mixing.** When setting up a new process, the mix tip should be evaluated in application-representative conditions, including planned downtimes to ensure proper mixing. This should be audited periodically.

**Significant exotherms can occur for large volume applications.** The curing reaction of the epoxy can release a great deal of heat (exotherm) and can result in a significant temperature rise in the adhesive.

**Protect the adhesive from moisture.** Polyurethanes will absorb moisture from the ambient atmosphere, which may cause premature gelling or bubbling of the adhesive. As a result, bulk system must be designed with dryers to prevent this.



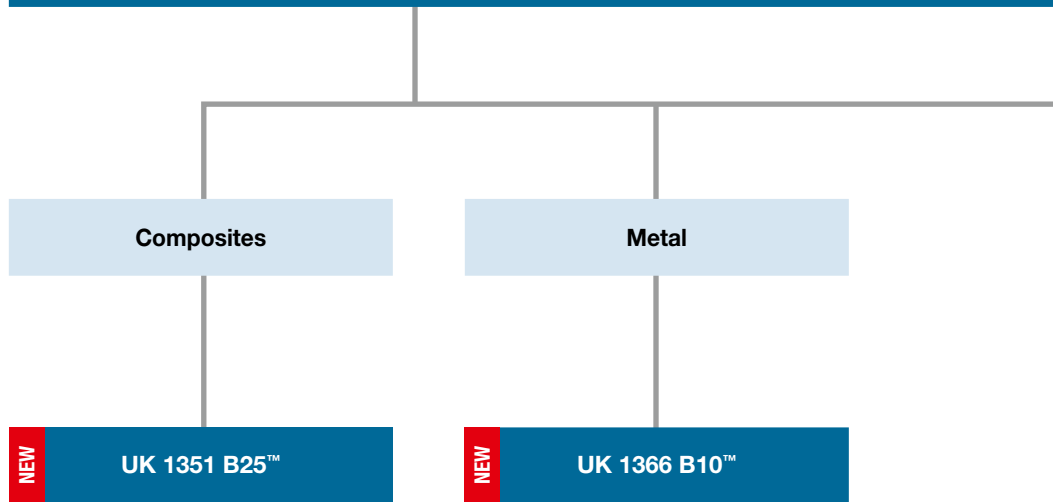


# POLYURETHANE ADHESIVES

## Your Application

- Bond a wide variety of materials, including most metals, plastics and composites
- Exhibit superior moisture and humidity resistance, as well as good toughness and flexibility

## WHAT ARE YOU BONDING?



## Loctite® Solution

	UK 1351 B25™	UK 1366 B10™
<b>Color</b>	Green	Green
<b>Viscosity (cP)</b>	29,000	34,000
<b>Mix Ratio</b>	2:1	4:1
<b>Work Life (minutes)</b>	50	30
<b>Fixture Time (minutes)</b>	75	35
<b>Cure Time (hours)</b>	72	72
<b>Shear Strength** (psi)</b>	2,360	1,550

## Product Description

### Loctite® UK 1351 B25™ Urethane Adhesive *Composite Bonder*

A highly toughened, GL-approved, two-part urethane for composites bonding. Non-sag with excellent fatigue and environmental resistance.

**P/N** 1667557 **Package Size** 400 ml cartridge

### Loctite® UK 1366 B10™ Urethane Adhesive *Metal Bonder*

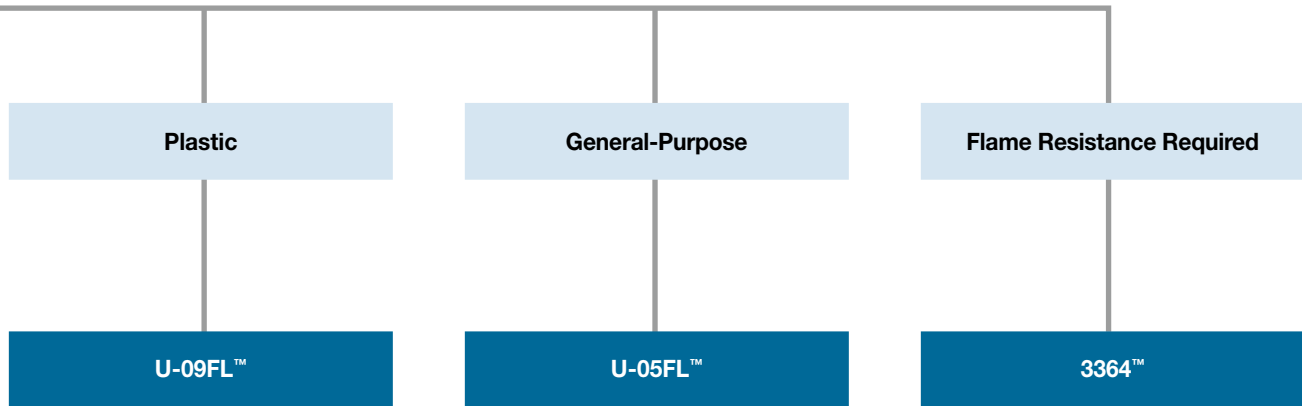
A highly flexible, medium fixture structural bonder that has good adhesion to metals and plastics. Excellent environmental resistance and impact strength.

**P/N** 1668032 **Package Size** 415 ml cartridge

\* Made-to-order item.

\*\*Steel.

† Grit-blasted steel.



Clear	Off-White	Black
5,000	100,000	5,000
1:1	1:2	1:2
10	5	45 seconds
120	180	30
72	24	72
1,460	930†	2,800†

**Loctite® U-09FL™ Hysol® Urethane Adhesive**  
*Plastic Bonder*

A two-part, high performance urethane adhesive for plastic bonding with a 10-minute work life. Clear, impact resistant, high peel.

P/N	Package Size
29460	50 ml dual cartridge
29462*	400 ml dual cartridge

**Loctite® U-05FL™ Hysol® Urethane Adhesive**  
*General-Purpose*

A high performance urethane adhesive for general-purpose metal bonding with a 5-minute work life. Off-white, highly flexible, impact and moisture resistant, high peel, high shear.

P/N	Package Size
29348	50 ml dual cartridge
29349	200 ml dual cartridge
29350	400 ml dual cartridge

**Loctite® 3364™ Hysol® Urethane Adhesive**

Rigid two-component urethane designed for flame resistance and fast cure. Extremely fast cure. UL™ 94V-O rating.

P/N	Package Size
1166733	50 ml dual cartridge

# NVH (NOISE, VIBRATION & HARSHNESS)

Henkel is a leading source for NVH (noise, vibration and harshness), acoustic, structural and seam-sealing solutions for the Ag-Con, specialty vehicle and appliance markets. We provide advanced technologies and comprehensive design and engineering support to enable you to meet performance requirements for cabs, bodies and other applications. NVH products are designed to solve problems associated with panel and structural reinforcement, noise, vibration, water leakage and fume infiltration.

## ACOUSTIC TECHNOLOGIES

NVH products are used to reduce or damp noise levels resulting in quieter vehicles and machines. These products also help manage the stress and strain energies of assemblies, allowing them to absorb shock without damage. There are two basic types of NVH reduction strategies:

1. **Damping:** Sheet metal damping materials reduce unwanted structural vibration, which helps reduce vehicle noise levels.
2. **Expanding:** Acoustic barriers help block out road noise, wind and other sounds coming from outside the cab, resulting in a more pleasant driving experience.

Applications, where NVH products can be found, include body panels, engine compartments, roof panels, doors, floor pan baffles, underbody/drum coatings and roll-over protective structures.

## STRUCTURAL BONDING

Structural bonding is a process in which thermoset materials are joined to substrates to form tough, high-strength, corrosion-resistant bonds that impact resistance, add stiffness, reduce weight and enhance durability. This product group encompasses two types of materials: structural adhesives and structural panel stiffeners.

These products are typically used in fabrication and assembly plants prior to paint shop operations and are compatible with metal pretreatments and e-coat chemistries. These materials also adhere to oily substrates.

There are two types of structural bonding adhesives:

1. One-component, heat-cured
2. Two-component, room temperature-cured

## SEAM SEALING

Seam sealing helps prevent metal corrosion (rust bleed-thru) and the ingress of water, wind and fumes that can damage or shorten the life of metal or interior components. Improper sealing of seams can also pose a health risk to operators working inside vehicle cabs (e.g., exposure to fuel and exhaust fumes).

Henkel offers three basic types of seam sealants that can be used at virtually any stage of production, depending upon process system and workflow requirements:

1. Weld-seam sealing products applied prior to metal pretreatment
2. Post-metal treatment/pre-paint sealing products
3. After-paint sealing products applied after the component or vehicle cab has been painted

Seam sealers are either moisture-curable or thermosetting, and are available in several forms including easy-to-use hand-held cartridges, pails, drums and totes for pumpable dispensing of large volumes, or as preformed tapes or die-cuts for precise, dimensional seam-sealing requirements.



## PRODUCT OVERVIEW

Our product line consists of pumpables and expandables, preformed parts, rigid panels and tapes, cavity sealing foams and custom die-cut shapes. Product applications include:

Structural and semi-structural adhesives and panel stiffeners

- Structural tapes and patches
- Stiffening patches
- Expandable structural parts

Damping and expanding

- High damping foam
- Liquid-applied sound damping (LASD)
- Expandable pillar filler parts
- Baffles
- Constrained butyl patches

Surface preparation

- Surface and component cleaning
- Metal pretreatment sealers
- Paintable sealers
- Functional coatings

## SPECIALTY PRODUCTS

Specialty products include solutions for difficult or challenging applications requiring a more complex engineered approach. Specialty products typically consist of two main types of materials:

- 1. Flowables:** These are thermoplastic or thermosetting materials used to bridge metal gaps or seal difficult areas.
- 2. Elastomeric Adhesives and Sealants:** This family of products exhibits high resiliency while maintaining high tensile strength and good adhesion to many substrates. They are isocyanate and solvent-free, and begin to cure when in contact with ambient moisture.



## ACOUSTICS LAB AND ENGINEERING SERVICES

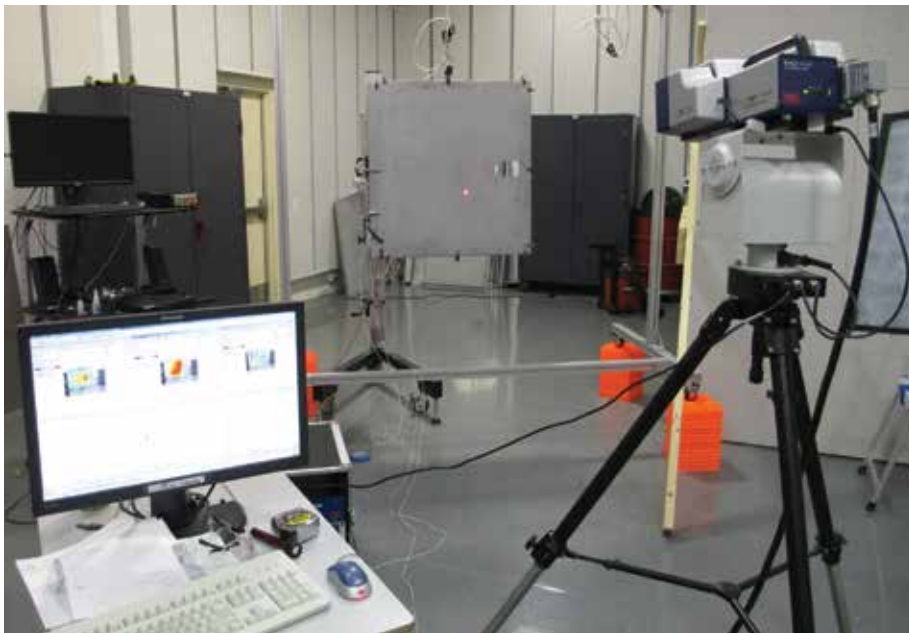
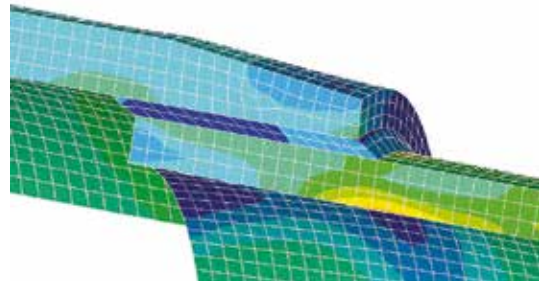
Henkel's technical support team offers engineering, design, prototyping and testing services to help evaluate just about any NVH, structural or seam-sealing application.

Our acoustics lab, located in Madison Heights, Michigan, is equipped with state-of-the-art instrumentation and validation equipment for conducting tests and performing analysis of noise reduction variables on everything from discrete components and sub-assemblies to full-size vehicles.

Evaluation services include Finite Element Analysis (FEA), CAE/CAD design and FEA modal analysis. With these and other analytical tools, we can help you:

- Address problems involving vehicle stiffness, mass distribution, panel reinforcement, NVH and energy efficiency
- Find ways to add structural integrity to vehicles without increasing weight
- Explore options for improving overall quality, durability and useful life

Utilizing a complete portfolio of technologies, materials and product variables, Henkel engineering can help you find the solution that's right for your application.







# TWO-STEP ACRYLICS

## ADVANTAGES

- Fast fixture speed
- Room temperature cure
- No mixing required
- High peel and impact strength
- Good environmental resistance
- Bonds to lightly contaminated surfaces
- Cure can be accelerated with heat

## CONSIDERATIONS

- Limited cure through depth (0.040")
- Activator may contain solvents
- Activator requires controlled dispensing process
- Adhesive may have strong odor

## GENERAL DESCRIPTION

Two-step acrylic adhesives consist of a resin and an activator. The resin component is a solvent-free, high-viscosity liquid typically in the range of 10,000 to 100,000 cP. The activator is a low viscosity liquid catalyst typically in the range of 2 to 50 cP. The activator is available either as a solvent dispersion or pure (also called "solventless").

When the resin and activator contact each other the resin begins to cure very rapidly fixturing in 15 seconds to several minutes depending on the specific adhesive used and gap being cured through.

In some cases the resin can also be cured with light or heat. Light cure can be used to fully cure resin that light can reach, fillets for example. While the fixture time depends on many factors, 15 to 30 seconds is typical.

A typical heat cure cycle is 10 to 20 minutes at 300°F (149°C). Heat curing normally offers higher bond strengths, improved thermal resistance, better chemical resistance and achieves complete cure faster. Heat cure is sometimes also used to eliminate any residual odor of the acrylic adhesive from the cured assembly.

## PROCESS NOTES

Use the activator specified for the adhesive in the datasheet. All activators are not compatible with all adhesives.

**Do not over apply.** When using activators, do not over apply them. The target quantity is normally 4 to 8 mg/in<sup>2</sup>. Solventless activators generally require automated dispensing via a rotospray or atomized spray valve.

**Allow time for the carrier solvent to evaporate.** If using a solvent-based activator, such as Loctite® 7387™ or 7649™, allow sufficient time for the carrier solvent to evaporate after applying the activator before mating the two assemblies. This is normally 30 to 60 seconds, but can be longer based on the specific activator used.

**Do not apply the activator and adhesive to the same part,** unless they are assembled immediately after dispensing. The adhesive will start curing in as little as 5 to 15 seconds.

**Do not apply the activator to porous surfaces,** such as a ferrite magnet. The porous surface may absorb the activator taking it away from the adhesive joint.

**Be sure to assemble the parts before the activator open time expires.** After that time, the adhesive may not cure properly. Activator open times range widely from an hour to 30 days, so refer to the technical data sheet to determine the open time for the activator you are using.

**Protect activators from air exposure.** Depending upon their specific chemistry, some activators may oxidize readily upon exposure to air. Always close containers after use. Use a nitrogen blanket if necessary to lessen air contact.



## MAGNET BONDING

Loctite® Structural Adhesives for magnet bonding combine the benefits of fast process speeds with tough, durable, environmentally resistant bond strengths, making them ideal for bonding ferrite, alnico and neodymium iron boron permanent magnets used in electric motors, small engines, speakers, transformers and other devices. Magnets assembled with adhesives provide a wealth of benefits, including:

- Ability to use lower cost components
- Decreased inventory cost
- Easier to automate
- Will not chip magnets
- Prevent vibrational noise
- Prevent corrosion
- Acid-free
- Higher impact strength
- Higher temperature resistance



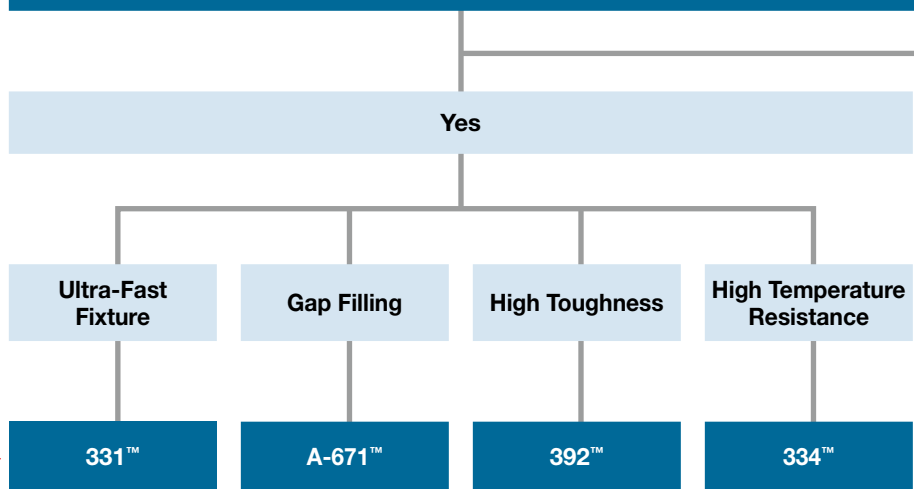


# TWO-STEP ACRYLIC ADHESIVES

## Your Application

- Combine the benefits of fast process speeds with tough, durable and environmentally-resistant bond strengths
- Ideal for bonding ferrite, alnico and neodymium permanent magnets used in electric motors, small engines, speakers, transformers and other devices

## ARE YOU BONDING MAGNETS?



## Loctite® Solution

	331™	A-671™	392™	334™
<b>Color</b>	Cream	Green	Amber	Yellow
<b>Viscosity (cP)</b>	20,000	30,000	6,500	80,000
<b>Gap Fill (in.)</b>	0.04	0.10	0.025	0.02
<b>Fixture Time</b>	20 sec.	30 to 60 sec.	60 sec.	90 sec.
<b>Cure Time (hours)</b>	24	24	24	24
<b>Shear Strength<sup>1</sup> (psi)</b>	3,100	2,500	2,500	2,800
<b>Temperature Resistance</b>	350°F (177°C)	311°F (155°C)	250°F (121°C)	350°F (177°C)
<b>Recommended Activator</b>	7387™	Two-Part External Mix	7387™	7387™

## Product Description

### Loctite® 331™ Structural Adhesive *Ultra-Fast Fixture*

Toughened, activator-cure acrylic. Acid-free, noncorrosive to sensitive parts. Fixtures in 20 seconds and develops full strength in 30 minutes. Excellent high temperature resistance. Ideal for bonding close-fitting metals and magnets.

**P/N Package Size**  
1057673 25 ml syringe  
1057674\* 1 liter bottle  
1062124\* 10 liter pail

### Loctite® A-671™ Structural Adhesive *Gap Filling*

Two-component external mix acrylic requires no static mixing or activators. Excellent humidity resistance and gap-filling capability. Fast fixturing.

**P/N Package Size**  
1256489 40 ml dual cartridge  
1256488 4,000 ml kit  
(adhesive/activator)  
1256501 19 liter pail, adhesive  
1255709 19 liter pail, activator

### Loctite® 392™ Structural Adhesive *Fast Fixture/Toughened*

Single component, dual-cure acrylic. Provides fast-fixture speed and tough, reliable bonds.

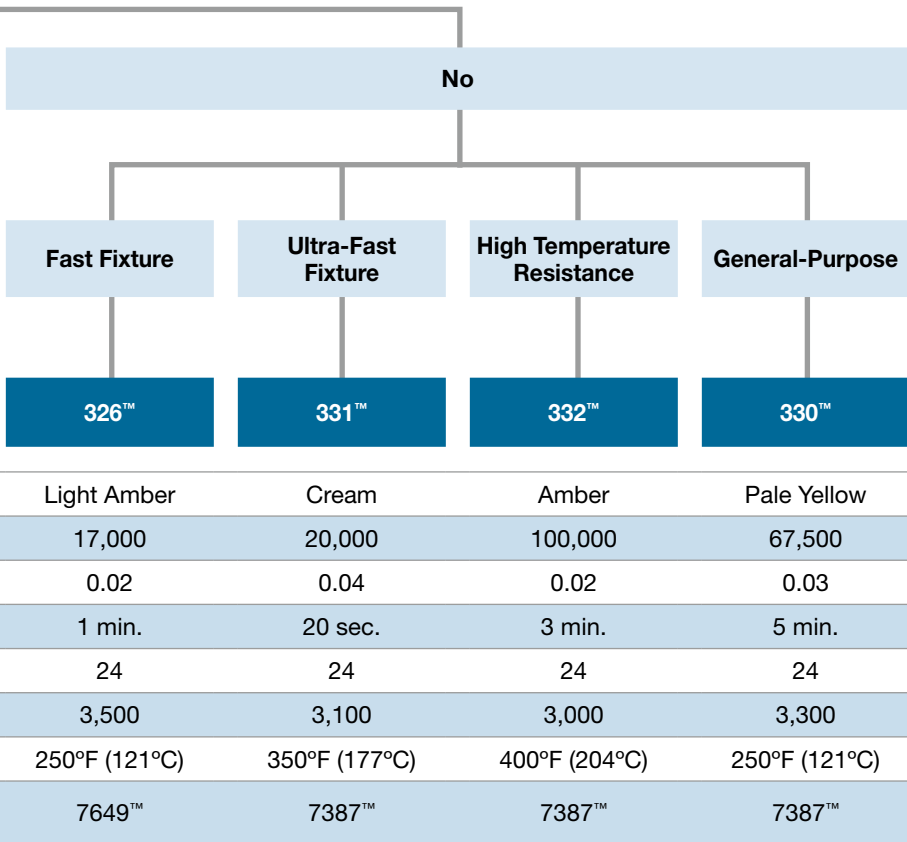
**P/N Package Size**  
39250 50 ml tube  
39275 300 ml cartridge  
39280 1 liter bottle

### Loctite® 334™ Structural Adhesive *High Temperature*

Single component, dual-cure acrylic. Forms tough, flexible bonds on gaps up to 0.02 in. Resists temperatures up to 350°F.

**P/N Package Size**  
33403 25 ml syringe  
33470 300 ml cartridge

\* Made-to-order item.  
1 Steel.



**Loctite® 326™  
Structural Adhesive  
Fast Fixture**

An all-purpose bonder. Offers the strength of an epoxy and the speed of an instant adhesive. Solvent resistant. Cures in minutes. Ideal for applications requiring fast fixturing. Use with Loctite® 7649™.

P/N	Package Size
32629	50 ml bottle
32685	1 liter bottle

**Loctite® 331™  
Structural Adhesive  
Ultra-Fast Fixture**

Toughened, activator-cure acrylic. Acid-free, noncorrosive to sensitive parts. Fixtures in 20 seconds and develops full strength in 30 minutes. Excellent high temperature resistance. Ideal for bonding close-fitting metals and magnets.

P/N	Package Size
1057673	25 ml syringe
1057674*	1 liter bottle
1062124*	10 liter pail

**Loctite® 332™  
Structural Adhesive  
High Temperature**

An activator-cured, no-mix adhesive that provides high temperature capability with thermal durability up to 400°F (204°C).

P/N	Package Size
33201	25 ml syringe
33275	300 ml cartridge
33290	1 liter bottle

**Loctite® 330™  
Depend® Adhesive  
General Purpose**

A general-purpose, high viscosity adhesive for a wide range of materials, including metal, wood, ferrite, ceramic and plastic.

P/N	Package Size
20253	3 ml kit
20251	25 ml kit
20252	250 ml kit
33058	250 ml tube
33064	300 ml cartridge
33081	1 liter bottle

**ACCELERATORS,  
ACTIVATORS & PRIMERS**

Henkel has a complete line of Loctite® surface preparation accelerators, activators and primers, as well as a complete line of general-purpose Loctite® branded cleaners and degreasers, and specialized products to ensure the maximum performance of Loctite® adhesives and sealants.

Loctite® activators – including 7387™, 7075™, and 7649™ – are specially engineered curing agents for structural adhesives.



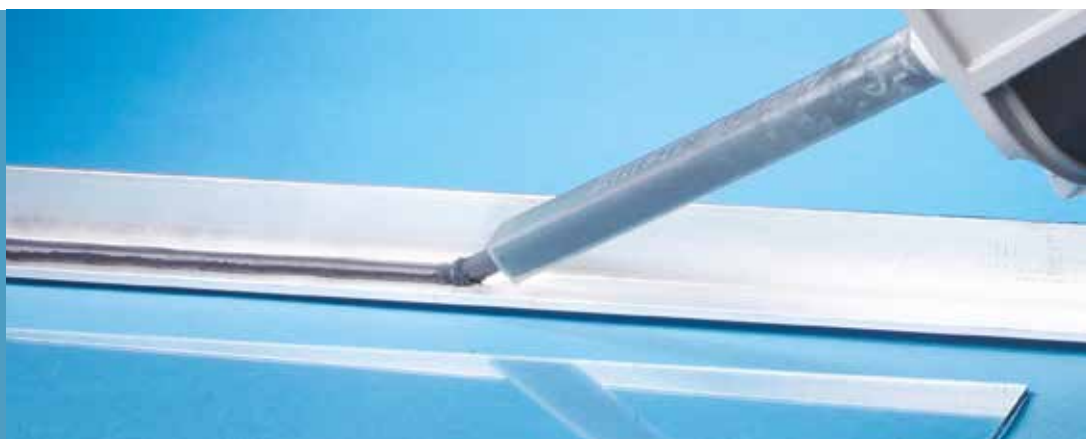
# DISPENSING EQUIPMENT











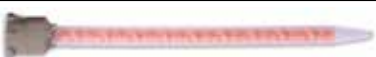





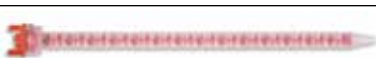
## RECOMMENDED LOCTITE® APPLICATORS\*

ADHESIVE PACKAGE TYPE/SIZE	HANDHELD APPLICATORS	DISPENSER ITEM NUMBER	EQUIPMENT TYPE	VISCOSITY RANGE	MIX RATIOS	RECOMMENDED MIX NOZZLE ITEM NUMBER	PCS/PK
<b>TWO-PART DISPENSING</b>							
<b>50 ML "A" DUAL CARTRIDGE</b>		98472	Manual	Low to High	1:1, 1:2, 2:1	98455	10
		97042	Pneumatic	Low to High	1:1, 1:2, 2:1	98455	10
<b>50 ML "B" DUAL CARTRIDGE</b>		98472	Manual	Low to High	1:1, 2:1	1573149	10
		97042	Pneumatic	Low to High	1:1, 2:1	1573149	10
<b>50 ML "S" DUAL CARTRIDGE</b>		1034026	Manual	Low to High	10:1	1034575	10
		1493310	Pneumatic	Low to High	10:1	1034575	10
<b>400 ML "C" DUAL CARTRIDGE</b>		983438	Manual	High to Paste	1:1, 2:1	98457	10
		983439	Pneumatic	High to Paste	1:1, 2:1	98457	10
<b>400 ML "F" DUAL CARTRIDGE</b>		983438	Manual	High to Paste	1:1, 2:1	1573138	10
		984211	Conversion Kit (Manual)	High to Paste	4:1	98459	10
<b>400 ML "F" DUAL CARTRIDGE</b>		983439	Pneumatic	High to Paste	1:1, 2:1	1573138	10
		984210	Conversion Kit (Pneumatic)	High to Paste	4:1	98459	10
<b>490 ML "F" DUAL CARTRIDGE</b>		985246	Manual	High to Paste	10:1	1084092	10
		985249	Pneumatic	High to Paste	10:1	1084092	10

\* For additional applicator options please refer to the Equipment Sourcebook, LT-3669.



## RECOMMENDED STATIC MIX NOZZLES\*

LOCTITE® PRODUCT	ITEM NUMBER	PACKAGE QUANTITY	DESCRIPTION
<b>MIX NOZZLES FOR 50 ML DUAL (A STYLE) CARTRIDGES</b>			
	98622 983509	10 2,000	50 ml Mix Nozzle, Slip-Luer, 5.9" overall length, 0.250" inner diameter, 20 elements; 1:1, 2:1 and 4:1 mix ratios. 
	98623 98364	10 2,000	50 ml Mix Nozzle, Stepped Tip-Luer, 5.9" overall length, 0.250" inner diameter, 20 elements; 1:1, 2:1 and 4:1 mix ratios. 
	98454	10	50 ml Mix Nozzle, Luer Tip, 6.0" overall length, 6.35 mm inner diameter, 21 elements; 1:1, 2:1, 4:1 mix ratios.
	98455 1116241	10 2,500	50 ml Mix Nozzle, Stepped Tip, 6.0" overall length, 6.35 mm inner diameter, 21 elements; 1:1, 2:1, 4:1 mix ratios.
<b>MIX NOZZLES FOR 50 ML DUAL (B AND S STYLE) CARTRIDGES</b>			
	1573144 1573143	10 1,000	50 ml Mix Nozzle, Stepped Tip, 5.2" overall length, 6.5 mm inner diameter, 16 elements; 1:1, 2:1 mix ratios – B Cartridges.
	1573149 1573147	10 1,000	50 ml Mix Nozzle, Stepped Tip, 6.2" overall length, 6.5 mm inner diameter, 20 elements; 1:1, 2:1 mix ratios – B Cartridges.
	1034575	10	50 ml Mix Nozzle, Stepped Tip, 6.2" Overall Length, 6.5 mm inner diameter, 20 elements; 4:1, 10:1 mix ratio – B & S Cartridges.
<b>MIX NOZZLES FOR 200 ML &amp; 400 ML DUAL (C STYLE) CARTRIDGES</b>			
	98474 98653	10 1,000	200/400 ml Square Mix Nozzle, Stepped Tip, 5.1" overall length, 7.5 mm inner dimension, 24 elements; 1:1; 2:1 mix ratios.
	98456 1053262	10 2,000	200/400 ml Mix Nozzle, Stepped Tip, 7.3" overall length, 6.3 mm inner diameter, 24 elements; 1:1, 2:1 mix ratios.
	98457 98464	10 1,500	200/400 ml Mix Nozzle, Stepped Tip, 8.8" overall length, 8 mm inner diameter, 24 elements; 1:1, 2:1 mix ratios.
<b>MIX NOZZLES FOR 200 ML &amp; 400 ML DUAL (F STYLE) CARTRIDGES</b>			
	1573138 1573136	10 1,000	200/400 ml Mix Nozzle, Stepped Tip, 9.2" overall length, 8.0 mm inner diameter, 24 elements; 1:1, 2:1 mix ratios – F Cartridges.
	1084255 1076341	10 1,200	200/400 ml 4:1 and 490 ml 10:1 Mix Nozzle, 9.2" overall length, 8 mm inner diameter, Stepped Tip, 24 elements – F Cartridges.
	1084092 1084093	10 900	200/400-F ml Cartridge Mix Nozzle, 11.2" overall length, 10 mm inner diameter, Stepped Tip, 24 elements; 4:1, 10:1 mix ratios – F Cartridges.

\* For additional mix nozzle options please refer to the Equipment Sourcebook, LT-3669.

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