

Structural Adhesives and NVH Selector Guide



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:

- 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.
- 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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Equipment

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





Previous process. Note the proliferation of rivet heads.



With Loctite[®] Structural Adhesive process. Note the smooth finish.



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



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 lightweight 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



Elongation (%)

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
- Strap/Double Strap

• Scarf

• Butt

• Offset

• 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

- Cleavage

• Compressive

- Tensile



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

	ADHESIVE CATEGORY				
PERFORMANCE CONSIDERATIONS	EPOXIES URETHANES		2-PART ACRYLICS	2-STEP ACRYLICS	
BENEFITS	Wide range of formulations	Excellent toughness/ flexibility	Good impact resistance/ flexibility	Good impact resistance/no-mix	
LIMITATIONS	Mixing required	Sensitive to moisture	Mixing required	Primer required	
TEMPERATURE RESISTANCE					
Typical for the category	-65⁰F to 180⁰F (-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)	300⁰F (149°C)	250°F (121°C)	400°F (204°C)	
ENVIRONMENTAL RESISTANCE					
Polar Solvents (EX.: H ₂ O, ETHYLENE GLYCOL, ISOPROPYL ALCOHOL [IPA], ACETONE)	Very Good	Good	Good	Good	
Nonpolar Solvents (EX. MOTOR OIL, TOLUENE, GASOLINE, ATF)	Excellent	Good	Very Good	Very Good	
ADHESION TO SUBSTRATES					
Metals	Excellent	Good	Excellent	Excellent	
Plastics	Fair	Very Good	Excellent	Fair	
Glass	ilass Excellent		Good	Excellent	
Rubber Fair		Good Poor		Poor	
Wood	Very Good	Fair	Good	Good	
OVERLAPPING SHEAR STRENGTH High		Medium	Medium High		
PEEL STRENGTH	Medium	Medium	High	Medium	
TENSILE STRENGTH	High	Medium	Medium High		
ELONGATION/FLEXIBILITY	Low	High	Medium	Medium	
HARDNESS	Rigid	Soft	Semirigid	Semirigid	
PROCESS CONSIDERATIONS	ADHESIVE CATEGORY				
	EPOXIES	URETHANES	2-PART ACRYLICS	2-STEP ACRYLICS	
NUMBER OF COMPONENTS	1 or 2	1 or 2	2	2	
CURE TEMPERATURE	Room temperature or heat cure	Room temperature or heat cure	Room temperature or heat cure	Room temperature or heat cure	
FIXTURE TIME					
Average	20 minutes	25 minutes	20 minutes	5 minutes	
Fastest	3 to 5 minutes	5 minutes	3 to 5 minutes	30 seconds	
FULL CURE TIME	12 to 24 hours	24 hours	24 hours	24 hours	
GAP FILL					
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	
DISPENSING/MIXING Equipment required	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

ARE YOU BONDING METALS OR PLASTICS/COMPOSITES?

• Specially formulated to provide tough, long-Metals lasting bonds to most surfaces, including steel, galvanized steel, aluminum, sheet metal, stainless steel, plastics and composites General Metal Bonders Galvanized Aluminum Steel • Capable of reducing or replacing the need for threaded fasteners, welds or rivets, resulting in a **Ultra-Fast** Longer Fast Fast lower cost assembly Work Time Work Time **Work Time** Work Time Loctite[®] Solution H8000[™] H4500[™] H8600[™] H8500[™] H8100[™] H8110[™] Color Green Grey Blue Grey Green Green Viscosity (cP) 190,000 45,000 86,000 60,000 185,000 200,000 **Mix Ratio** 10:1 2:1 10:1 10:1 10:1 10:1 Work Time[†] (min.) 30 15 25 25 15 7 Shear Strength¹ (psi) 3,140³ 3,100 3,355 3,380 3,090³ 2,475³ Impact Strength⁵ (J) 12 2³ 10³ 23 10 14 354 Peel Strength¹ (pli) 45 58 92 45 48³

Loctite® H8600™

Galvanized Steel

Package Size

400 ml dual

5 gallon pail,

5 gallon pail.

cartridge

adhesive

activator

Structural

Adhesive

Bonder

Product Description

Structi Adhesi	ural ive	Structi Adhesi
Tough	Metal	Fast W
Bonde	r	High str
Exhibits peel str multiple especia	excellent ength on substrates, lly aluminum.	structur for meta in 15 m color m
P/N	Package Size	P/N
996453	50 ml dual	996512
	cartridge	
36160	490 ml dual	83041
	cartridge	
35939*	35 lb. pail,	
	adhesive	
35940*	45 lb. pail.	

activator

Loctite[®] H8000[™]

Loctite[®] H4500[™] tural sive Work Time strength

ural adhesive Excellent shear etals. Fixtures strength on steel and minutes. With aluminum. Especially mix indication. designed for severe environments. Package Size

50 ml dual P/N cartridge 38762 490 ml dual cartridge 38760* 38761* Loctite[®] H8500[™] Structural Adhesive

Ultra-Tough Steel Bonder Excellent peel

aluminum. strength on steel and aluminum. Contains P/N 30 mil spacer beads 1056942 50 ml dual to prevent excessive squeeze-out of adhesive due to over-

clamping. Package Size 490 ml dual 827608 cartridge 40888*

P/N

cartridge 1056943 490 ml dual cartridge

Loctite[®] H8100[™]

Exhibits excellent

Package Size

Structural

Adhesive

strength on

5 gallon pail,

activator 40889* 5 gallon pail, adhesive

Loctite[®] H8110[™] Structural Adhesive Ultra-Fast Aluminum Ronder

Aluminum Bonder Aluminum bonder

fixtures in 5 minutes.

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

*	Made-to-order item.
t	Working time = maximum

- time before assembly of parts to ensure proper wetting.
- Steel. 2
- High density polyethylene.
- Aluminum.
- Galvanized steel. Grit-blasted mild steel.
- 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

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

Structural Adhesive High Strength A low viscosity adhesive

Loctite[®] H3000[™]

which exhibits high bond strength on a variety of substrates.

Package Size <u>P/N</u> 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.

Package Size P/N 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

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

• Bond a wide variety of			Two	-Part			
materials, such as metal, ceramic and plastic							
Available in a variety	Do you n	Do you need the product to fixture in less than 15 minutes at room temperature?					
of formulations and				1			
performance capabilities,		Yes			No		
including fast cure,							
resistance, ease of					Potting		
dispense, high toughness,							
range of chemicals	Moisture	Flexible	Non-Sag	Clear	Explosion	Non-	
, i i i i i i i i i i i i i i i i i i i	Resistant		iten eug	0.00.	Proof	Corrosive	
	E 05MB™	E-05CI ™	E 00NS™	E-30CI ™	> E_40EYD™	E-60NO™	
Loctite [®] Solution	Hysol®	Hysol [®]	Hysol [®]	Hysol [®]	Hysol®	Hysol®	
Color	Clear	Clear	Translucent	Clear	Grev	Black	
Viscosity (oP)	25.000	2 500	100.000	10.000	24.000	8 000	
	23,000	2,500	100,000	10,000	24,000	0,000	
Mix Ratio	1:1		1:1	2:1	2:1	1:1	
Work Life (minutes)	5	5	3	30	40	60	
Fixture Time (minutes)	15	15	10	>180	N/A	180	
RoomT emperature Cure Time (hours)	24	24	24	24	24	24	
Shear Strength ¹ (psi)	3,360	1,430	1,600	3,100	3,000 ²	2,630	
Temperature Resistance	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	Loctite® E-05MR™ Hysol® Epoxy	Loctite [®] E-05CL [™] Hysol [®] Epoxy	Loctite [®] E-00NS [™] Epoxy Adhesive	Loctite® E-30CL™ Hysol® Epoxy	Loctite [®] E-40EXP™ Hysol [®] Epoxy	Loctite [®] E-60NC [™] Hysol [®] Epoxy	

Product Description

Moisture Resistant Clear, fast-fixturing epoxy that provides excellent moisture resistance and exceptional toughness. P/N Package Size 1086598 50 ml dual cartridge 1086599*400 ml dual

Adhesive

Adhesive

A clear, flexible, high-

peel, low-odor epoxy

Package Size

50 ml dual

400 ml dual

5 gallon pail,

5 gallon pail,

hardener

cartridge

cartridge

resin

with a 3-minute

Flexible

work life.

P/N

29299

29301

29302*

29303*

cartridge 1087602*5 gallon pail, resin 1087603*5 gallon pail,

hardener

Grit blasted steel. 2

Made-to-order item.

```
Aluminum.
```

Epoxy Adhesive Non-Sag Clear A fast-fixturing, thixotropic, non-sag An ultra-clear, lowepoxy which cures at viscosity, impactresistant epoxy with room temperature to form a translucent a 30-minute work rigid and machinable life. An excellent bondline. Well suited glass bonder. Exhibits for use on vertical exceptional chemical surfaces. resistance. Package Size P/N P/N 29294 50 ml dual 29329 50 ml dual cartridge 29295 200 ml dual 29330 cartridge 29331 29296 400 ml dual cartridge

Hysol[®] Epoxy Adhesive

cartridge

200 ml dual

cartridge 400 ml dual

cartridge

Hysol[®] Epoxy Potting Compound Explosion Proof/

. Chemical Resistant An epoxy designed for potting electrical motors used in hazardous locations. Compliant with UL[™]-674 for explosionproof electric motors. Excellent chemical Package Size

resistance.		
P/N	Package Size	
1511184'	50 ml dual	
1511653	cartridge 200 ml dual	
1511896	cartridge 5 gallon pail -	
	nort A	

1511897 5 gallon pail -part B

Hysol[®] Epoxy Adhesive Noncorrosive/

Potting An electronics-grade

potting compound with a 60-minute work life. Black. opaque. low viscosity with excellent curethrough 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





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

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

29321

cartridge 400 ml dual cartridge	

Adhesive An amber, non-sag, aerospace grade epoxy with an extended open time to allow for the adjustment of large narts P/N Package Size 29353 50 ml dual cartridge 29354 200 ml dual cartridge 29355 400 ml dual

cartridge

5 gallon pail, resin

5 gallon pail, hardener

29356*

29357*

Hysol[®] Epoxy Adhesive Flexible

A grey, impact-resistant, 90-minute work life.

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

toughened epoxy with a

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

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

Hysol[®] Epoxy Adhesive

General-Purpose/ Heat Cure

A one-component, acidfree, 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 solventbased 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 system 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 dyers to prevent this.





POLYURETHANE ADHESIVES

Your Application	WHAT ARE YOU BONDING?				
 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	Composites	Metal			
Loctite [®] Solution	UK 1351 B25™	UK 1366 B10™			
Color	Green	Green			
Viscosity (cP)	29,000	34,000			
Mix Ratio	2:1	4:1			
Work Life (minutes)	50	30			
Fixture Time (minutes)	75	35			
Cure Time (hours)	72	72			
Shear Strength** (psi)	2,360	1,550			

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Prod		Descr	intion
1100	acc	Deser	puon

* Made-to-order item.

**Steel.

† Grit-blasted steel.

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	Package Size
1667557	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	Package Size
1668032	415 ml cartridge





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

1,460

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 29462* 50 ml dual cartridge 400 ml dual cartridge

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

930[†]

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



Loctite® 3364[™] Hysol® Urethane Adhesive

2,800[†]

Rigid two-component urethane designed for flame resistance and fast cure. Extremely fast cure. UL[™] 94V-0 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, corrosionresistant 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:

- 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/in². 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



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/NPackage Size125648940 ml dual cartridge

1256488 4,000 ml kit (adhesive/activator) 1256501 19 liter pail, adhesive 1255709 19 liter pail, activator

Loctite[®] 334[™] Structural Adhesive *High Temperature*

Structural Adhesive

Fast Fixture/Toughened

Single component, dual-cure

acrylic. Provides fast-fixture

Package Size

300 ml cartridge

50 ml tube

1 liter bottle

speed and tough, reliable

bonds.

P/N

39250

39275

39280

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

P/NPackage Size3340325 ml syringe33470300 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

1057673 25 mi syninge 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/NPackage Size3320125 ml syringe33275300 ml cartridge332901 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
TWO-PART DISPENSING							
50 ML "A" DUAL Cartridge	T	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
50 ML "B" DUAL Cartridge	T	98472	Manual	Low to High	1:1, 2:1	1573149	10
		97042	Pneumatic	Low to High	1:1, 2:1	1573149	10
50 ML "S" DUAL Cartridge	-75	1034026	Manual	Low to High	10:1	1034575	10
	- Alton	1493310	Pneumatic	Low to High	10:1	1034575	10
400 ML "C" DUAL Cartridge	-T"	983438	Manual	High to Paste	1:1, 2:1	98457	10
	-5	983439	Pneumatic	High to Paste	1:1, 2:1	98457	10
400 ML "F" DUAL Cartridge	A	983438	Manual	High to Paste	1:1, 2:1	1573138	10
	7	984211	Conversion Kit (Manual)	High to Paste	4:1	98459	10
400 ML "F" DUAL Cartridge		983439	Pneumatic	High to Paste	1:1, 2:1	1573138	10
		984210	Conversion Kit (Pneumatic)	High to Paste	4:1	98459	10
490 ML "F" DUAL Cartridge	-T"	985246	Manual	High to Paste	10:1	1084092	10
	-5	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			
MIX NOZZLES FOR 50 ML DUAL (A STYLE) CARTRIDGES						
	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.	Lowest Cost 50 ml Nozzle		
	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.	Lowest Cost 50 ml Nozzle		
	98454	10	50 ml Mix Nozzle, Luer Tip, 6.0" overall length, 6.35 mm inne 21 elements; 1:1, 2:1, 4:1 mix ratios.	r diameter,		
THE REAL PROPERTY AND A DECIMAL OF THE PROPERTY AND A DECIMAL OF T	98455 1116241	10 2,500	50 ml Mix Nozzle, Stepped Tip, 6.0" overall length, 6.35 mm i 21 elements; 1:1, 2:1, 4:1 mix ratios.	nner diameter,		
MIX NOZZLES FOR 50 ML DUAL (B AND S STYLE) CART	RIDGES					
INTERCENCE INCOMES NON	1573144 1573143	10 1,000	50 ml Mix Nozzle, Stepped Tip, 5.2" overall length, 6.5 mm in elements; 1:1, 2:1 mix ratios – B Cartridges.	ner diameter, 16		
- NENENENENENENENEN	1573149 1573147	10 1,000	50 ml Mix Nozzle, Stepped Tip, 6.2" overall length, 6.5 mm in elements; 1:1, 2:1 mix ratios – B Cartridges.	ner diameter, 20		
	1034575	10	50 ml Mix Nozzle, Stepped Tip, 6.2" Overall Length, 6.5 mm i 20 elements; 4:1, 10:1 mix ratio – B & S Cartridges.	nner diameter,		
MIX NOZZLES FOR 200 ML & 400 ML DUAL (C STYLE) C	ARTRIDGES					
-	98474 98653	10 1,000	200/400 ml Square Mix Nozzle, Stepped Tip, 5.1" overall leng 7.5 mm inner dimension, 24 elements; 1:1; 2:1 mix ratios.	th,		
	98456 1053262	10 2,000	200/400 ml Mix Nozzle, Stepped Tip, 7.3" overall length, 6.3 24 elements; 1:1, 2:1 mix ratios.	mm inner diameter,		
	98457 98464	10 1,500	200/400 ml Mix Nozzle, Stepped Tip, 8.8" overall length, 8 m 24 elements; 1:1, 2:1 mix ratios.	m inner diameter,		
MIX NOZZLES FOR 200 ML & 400 ML DUAL (F STYLE) CARTRIDGES						
	1573138 1573136	10 1,000	200/400 ml Mix Nozzle, Stepped Tip, 9.2" overall length, 8.0 elements; 1:1, 2:1 mix ratios – F Cartridges.	mm inner diameter, 24		
ананаканаканаканаканакана	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.			
анененененененененененененененененене	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.			

L@CTITE. BONDERITE. TECHNOMELT. TEROSON. AQUENCE.

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