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Part 1 Assessment of Bonding

Part 2 Essential stages of the Pretreatment Process

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## ADHESIVE FOCUS

On-Hand Adhesives, Inc.  
Adhesive Tech Center  
1850 So. Elmhurst Road  
Mount Prospect, IL 60056

Summer 2003 Issue

### Inside This Issue

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- Loctite 3030 Bonds Low Energy Substrates

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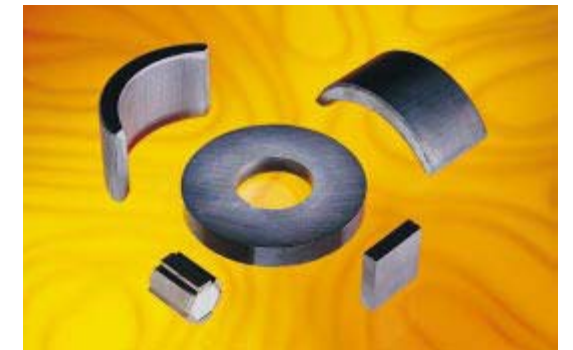
# ADHESIVE FOCUS

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## MAGNET BONDING

Only a decade ago, it was common to use spring steel clips or bolts to fix magnet segments into position. Both materials were costly, difficult to automate, and required maintaining large inventories. In addition, they involved highly complex parts handling systems and intricate insertion methods. Neither method prevented noise from mechanical vibration, and both could loosen or shift, allowing corrosion to occur between the magnet and assembly.



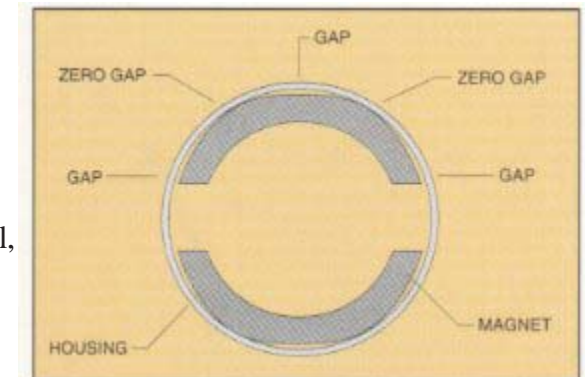
Today structural acrylic, cyanoacrylate, and epoxy adhesives are available, providing tough, durable, environmentally resistant joints and quick processing. Adhesives first found acceptance in motor magnet bonding, where the severest environments may be encountered. Now they are widely used to bond the magnet assembly in a wide range of applications, including loudspeakers, headphones, appliances, lifting equipment, power generators, disc drives, microphones, telephones, motors (starter, micro-, electro-, and servo-motors), and measuring instruments (volt, amp, speed-meters, watt-hour-meters). Adhesive-bonded magnets provide a wealth of benefits, including:

- High shear strength and impact resistant joints
- Room temperature and heat cure versions for easy processing
- Ultra-fast fixture times for increased throughput
- Easily automated assemblies to increase production efficiencies
- Solvent-free formulations for worker and environmental safety
- Excellent durability for improved product quality
- Prevents magnet movement and absorbs shock and impact



### Considerations in Magnet Bonding

Factors relating to the magnet and the opposing substrate play a critical role in successful magnet bonding. To achieve consistent bonding performance, mating surfaces must be clean and free from contamination, such as plating residues or lubricants. Magnets must be dust-free and formed or machined to ensure that gaps between the magnet and the mating substrate remain small, preferably less than .010 inches. Generally, minimizing the gap insures faster fixturing, stronger joints, and in the case of loudspeakers, minimizes magnetic energy losses. For curved magnet segments, some motor manufacturers have moved from single radius segments to tri-arc configuration.



This design helps reduce magnet movement in the fixture, and can help reduce the gap due to tolerance differences between the housing and the magnet. Examination of the tri-arc bond joints shows that the adhesive fixtures or solidifies quickly at the two points of contact on the magnet surface. [Continued on Page 2]

The Glu Guru™'s Catalog of Adhesives can be seen on: [www.gluguru.com](http://www.gluguru.com)

## The Study

In response to frequent requests from magnet bonding manufacturers for a more consistent test method to determine the long-term durability of adhesive-bonded magnets, Loctite designed a study. Adhesion behavior was analyzed using several Loctite structural adhesives, including acrylic, epoxy, and cyanoacrylate chemistries. Blockshear and impact strength testing was conducted, with a goal to qualitatively and quantitatively determine the adhesive durability, using standard test methods.



The selected base material substrates were comprised of mild steel, E-coat, and yellow zinc dichromate, and the magnet substrates included ferrite, alnico, and neodymium. All magnets were assembled and tested without magnetization. Blockshear testing was performed according to ASTM D4501 and impact testing to ASTM D950.

## Test Method

Methods of testing adhesive-bonded magnets varies widely by manufacturers, from simple drop tests to a more elaborate slide rail apparatus fitted with a stationary striker. Blockshear values determine adhesive durability per ASTM D4501, as depicted in Figure 1. A more scientific test method exists in ASTM D950, shown in Figure 2. This method determines the comparative impact strength of adhesive bonds in shear, when tested on standard specimens under specified conditions.

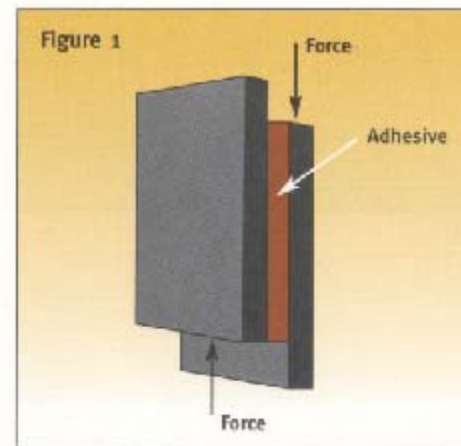


Figure 1  
Blockshear Test Specimen,  
Side View, ASTM D4501

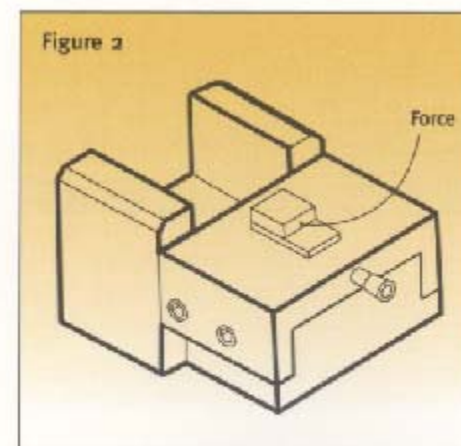


Figure 2  
Impact Specimen Fixture with Magnet and  
Base Substrate Specimen, ASTM D950

## Technical Product Information for Magnet Bonding Adhesives

Product Numbers/Activator	392/7387	332/7387	326/7649	E-214HP	380
Key Product Features	Ultra fast, High Thermal Resistance	Highest Thermal, Impact and Shock Resistance	Fast Fixturing, High Strength	High Strength, Heat Cure	Low Viscosity, Small Gaps
Chemical Types	Modified Acrylic	Modified Acrylic	Urethane Methacrylate Ester	Epoxy	Cyanoacrylate
Viscosity, cP	60,000	200,000	18,000	150,000	200
Cure Speed	30 Seconds	1 Minute	40 Seconds	40 Minutes @ 120C	15 Seconds
Fixture Full	24 Hours	24 Hours	24 Hours	24 Hours	24 Hours

## Ordering Information

25 mi Syringe- 392-P/N 39205, 332 P/N 33201  
 30 mi Cartridge- E-214HP P/N 29339  
 50 mi Bottle-392- P/N 39250 326 P/N 32629  
 300 mi Cartridge-392-P/N 39275 332 P/N 33275 E214HP P/N 29340  
 1 Liter Bottle-392 P/N 39280 332 P/N 33290 326 P/N 32685  
 Pails- 392 15 Liters P/N 17507 332 12 Liters P/N 17601 E214HP 5 Gallons P/N 29341  
 1 oz Bottle 380- P/N 38050  
 1 lb Bottle 380 P/N 38061  
 2 kg Bottle 380 P/N 18494  
 1.75 oz Bottle Activator 7387 P/N 18861 Activator 7649 P/N 19269  
 25 gm Aerosol Can Activator 7649 P/N 21347  
 4.5 oz Aerosol Can Activator 7387 P/N 21088 Activator 7649 P/N 21348  
 1 qt Can Activator 7387 P/N 18862  
 1 gallon can Activator 7649 P/N 19266

More information and to order: Call 1-800-323-5158 or  
 E-Mail [gluguru@on-hand.com](mailto:gluguru@on-hand.com)

## LOCTITE 3030 Bonds Low Energy Substrates



LOCTITE® Product 3030 is a fast curing, two component, thixotropic acrylic adhesive.

It is designed primarily to bond to many low energy substrates such as poly(ethylene) and poly(propylene) but can be used as a general purpose adhesive on many other substrates as well.

### TYPICAL APPLICATIONS

Product 3030 is designed for bonding to difficult substrates, such as HDPE, LLDPE, and polypropylene. The product offers good resistance to many chemicals.

For information: Contact Glu Guru Loctite Desk  
 1-800-323-5158 Email: [gluguru@on-hand.com](mailto:gluguru@on-hand.com)