



Dow Automotive Systems  
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## BETASEAL™ HIGH MODULUS NON-CONDUCTIVE ADHESIVES FOR GLASS BONDING AND MULTI-MATERIAL JOINING

### Q&A

#### What is a high modulus adhesive?

High modulus is a rigidity requirement of cured adhesive. It measures the ability of the adhesive to resist a variety of stresses and still return to its original form. Below are some of the stresses urethane adhesives must tolerate without failure:

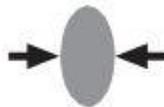
#### Types of stress

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**Tension** stretches a body



**Compression** shrinks a body



**Shear** laterally twists a body



**Torsion** wrings a body



High modulus adhesives have a much higher resistance to stress and can stiffen the vehicle body to improve handling, overall stability, and reduce rattles, vibrations and other vehicle noises.

Vehicle designers place greater demands on high modulus adhesives, which are customized to bear more of the pushes, pulls and twists associated with everyday driving. High modulus adhesives must also retain a degree of elasticity to avoid brittle failure under high strain rate events.



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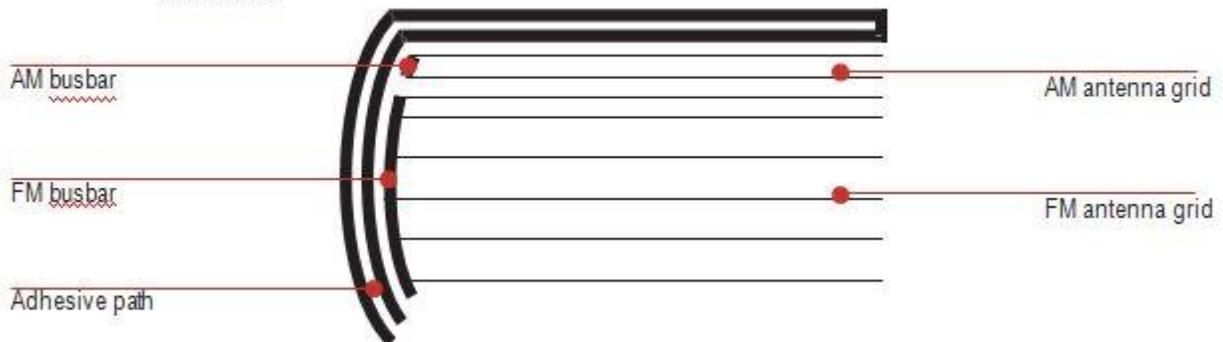
### **When is a high modulus non-conductive adhesive required?**

Automotive manufacturers are mandating the use of non-conductive, high modulus adhesives to enhance vehicle performance and to maintain the integrity of the electronic systems which can include radio antennas, cell phone, global positioning systems and other electronic devices that can leak current and may come in close proximity to the adhesive.

For field repair, glass installers may unknowingly compromise the electronic systems mounted on windshields and backlites of automobiles when replacing the glass with regular, current-conducting urethane adhesives.

Traditional urethane adhesives are conductive and contribute to electrical interference, which can impede radio and navigation signals and introduce unwanted electrical corrosion in exposed aluminum pinchwelds.

#### **Schematic Backlite Pattern**





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### **What is non-conductive?**

Conductive refers to the electrical insulating properties of urethane adhesives. All materials conduct electricity. Materials that are least conductive are used where contact with electrical wires is possible and can result in unwanted leakage of electrical current. In antennas, the voltages are so low that any loss may severely degrade incoming or outgoing signals.

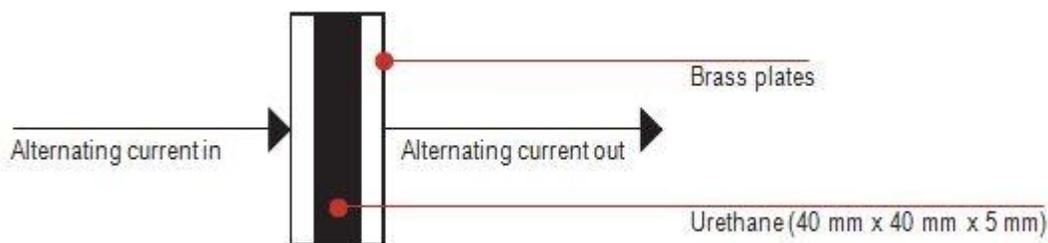
Urethane adhesives used to bond glass with integrated electronic systems must prevent the flow of electricity between the glass and metal. For example, AM/FM radio antennas operate in the frequency ranges of 1 to 150 MHz. The antenna bus bars mounted to the stationary glass often contact the adhesive during the assembly or replacement process. This causes impedance and power loss, which leads to a reduction in signal strength.

### **Don't all rubber-like adhesives insulate?**

No. Contrary to popular belief, rubber-like plastic materials do conduct electricity. Glass manufacturers, automakers and replacement shops try to keep the antenna and the adhesive separated, but due to manufacturing and installation variations, contact is sometimes unavoidable.

The urethane adhesive, on the other hand, can resist leakage into or out of the electric circuit if specially formulated. Non-conductive urethane adhesive contains special grades of carbon. Ordinarily, carbon is conductive, but this special grade of carbon inhibits the flow of electricity. When combined with a highly crosslinked polymer, it produces a strong, high modulus non-conductive urethane adhesive.

*Schematic of Sample Set Up*





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**How does this work in multi-material bonding applications?**

The structural integrity provided by this technology is ideal in managing the differential thermal expansion expected from mixed material bonding for the manufacture of lightweight, fuel-efficient vehicles. The modulus functionality is sufficient to transfer load while the elastic characteristics address concerns resulting from differences in the coefficient of thermal expansion.

It is important for installers to recognize vehicles and applications that require specialized high modulus nonconductive urethane adhesives.

For additional information, contact [dowautomotive@dow.com](mailto:dowautomotive@dow.com) or visit [dowautomotive.com](http://dowautomotive.com).

**About Dow Automotive Systems**

Dow Automotive Systems, a business unit of The Dow Chemical Company, is a leading global provider of collaborative solutions and advanced materials for original equipment manufacturers, tier suppliers, aftermarket customers and commercial transportation manufacturers. Our materials focus includes structural, elastic and rubber-to-substrate adhesive solutions; polyurethane foams and acoustical management solutions; films; fluids; and innovative composite technologies. Offices and application development centers are located around the world to ensure regionalized technical, engineering and commercial support for customers and industry groups. For additional information, visit [dowautomotive.com](http://dowautomotive.com).

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