

# Dinitrol Urethane Technical Terms

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**AGRSS** Auto Glass Replacement Safety Standards

**ANSI** American National Standards Institute

**Decking** A term used in the auto glass industry that helps describe the effectiveness of a urethane to hold the position of the glass or the pressure required by the installer to press the glass in place during the installation process. If the urethane is able to hold the glass in place without sliding and a steady amount of pressure is required by the installer to set the glass in place then the urethane is usually described as having good or superior decking.

**Electro Potential** The difference in voltage between two elements.

Relationship to Vehicle Glass Urethane: In the case of the Audi A8, the car body including the pinch-weld, is constructed of aircraft grade aluminum. The electro potential of aluminum is -1.67 V and most urethane products contain carbon black as a filler which has an electro-potential of +0.74 V. If after the replacement the paint has been breached and now is exposed to the carbon black, galvanic corrosion can be provoked. Electrons from the aluminum would flow to the more positive element carbon thus oxidizing the aluminum.

**Elongation** The act of lengthening, or the state of being lengthened; protraction; extension. "Elongation of the fibers."

Relationship to Vehicle Glass Urethane: Most all automotive urethane specifications call for a minimum percent elongation of urethane. For example the new Ford specification WSS-M2G316-B2 calls for a percent elongation of 250 or greater. Prior to this the elongation specification was 400% or greater. As an illustration if the urethane specification is stated at >400% then a test specimen 10 cm long, must be able to stretch a total of 40 cm without breaking to equal the 400%

**Encapsulated Glass** Encapsulated glass is any type of glass that has had an object attached to it during the manufacturing process. The item is usually made from a type of plastic, polyvinyl chloride, or other synthetic material. Special care must be taken when working with this type of glass so to ensure proper adhesion of the entire glass unit to the car body. Special procedures or cleaning methods are usually called for in the installation instructions.

**Flange** A protruding rim, edge, rib, or collar, as on a wheel or a pipe shaft, (or for the automotive industry the flange refers to the pinchweld or area of the car to which the windshield is bonded). A flange is used to strengthen an object, hold it in place, or attach it to another object.

**FMVSS** Federal Motor Vehicle Safety Standards <http://www.nhtsa.dot.gov/cars/rules/standards/safstan2.htm>

## Standard No. 208 -- Occupant Crash Protection

This standard originally specified the type of occupant restraints (i.e., seat belts) required. It was amended to specify performance requirements for anthropomorphic test dummies seated in the front, outboard seats of passenger cars and of certain multipurpose passenger vehicles, trucks, and buses, including the active and passive restraint systems... The purpose of the standard is to reduce the number of fatalities and the number and severity of injuries to occupants involved in frontal crashes...

(This standard specifies many areas of safety; the only applicable issue for auto glass replacement is the air bag. If the windshield is not mounted properly or the urethane is still not cured sufficiently, the air bags may not deploy against the windshield properly and the air bag will not serve its purpose in protecting the vehicle occupant.) **Passenger Cars (Effective 9-1-97), Multipurpose Passenger Vehicles, Trucks and Buses (Effective 9-1-98)** shall be equipped with air bags.

## Standard No. 212 -- Windshield Mounting -- Passenger Cars (Effective 1-1-70), Multipurpose Passenger Vehicles, Trucks, and Buses with a Gross Vehicle Weight Rating of 4536 kg (10,000 lbs.) or less (Effective 9-1-78)

This standard requires that, when tested as described, each windshield mounting must be anchored in place and retain one of two specified percentages of its periphery in a crash situation. The purpose of this standard is to keep vehicle occupants within the confines of the passenger compartment during a crash.

## Standard No. 216 -- Roof Crush Resistance -- Passenger Cars (except convertibles) (Effective 9-1-73) and Multipurpose Passenger Vehicles, Trucks and Buses (except school buses) with a Gross Vehicle Weight Rating of 2722 kg (6,000 lbs.) or less (Effective 9-1-94)

This standard specifies requirements for roof crush resistance over the passenger compartment. DOT Auto Safety Hotline 1-888-DASH-2-DOT (1-888-327-4236)

**Frit** (Glass Making) The material of which glass is made, after having been calcined or partly fused in a furnace, but before vitrification. It is a composition of siliceous and alkali, occasionally with other ingredients. For auto glass it is the black or "painted-looking" area on the inner circumference of the glass. This is the area in which the urethane will make contact when setting the windshield.

**Hardness Shore A** a measure of hardness reported by means of an instrument called a durometer. The expression is without units. Relationship to Vehicle Glass Urethane: Most all automotive urethane specifications for the vehicle glass state a Hardness Shore A with a usual range of plus or minus 5 units. For example the new Ford specification WSS-M2G316-B2 states a value at 70 +/- 5.

**Hygrometer** Any of several instruments that measure atmospheric humidity.

**Lap shear** Lap shear determines the shear strength of adhesives for bonding materials. The test method is primarily comparative. The test is applicable for determining adhesive strengths, surface preparation parameters and adhesive environmental durability.

Test Procedure: Two specimens are bonded together with adhesive and cured as specified. The test specimens are placed in the grips of an Instron universal testing machine and pulled until failure. ASTM D5868 is specifically for fiber reinforced plastic, and specifies 13 mm/min (0.5 in/min). Relationship to Vehicle Glass Urethane: For Dinitrol urethane systems the pull speed is 100 mm/minute and/or 5 meters/second, which is more reflective of a crash situation. The results of this test can be used to help determine safe drive-away time. Unlike the tensile strength test, the urethane in the lap shear test can be tested partially cured and individual coupons of a given batch can be tested overtime to see how the strength of the adhesive increases as the curing process continues. A graph can be constructed with lap-shear values. If the desired strength requirements are known, then a safe drive-away time can be determined using the graph. Other tests such as actual crash testing are important in order to properly determine safe drive away.

**Mega Pascal (MPa)** A unit of pressure equal to one Newton per square meter x 1000.

**Modulus** A quantity that expresses the degree to which a substance possesses a property, such as elasticity.

Relationship to Vehicle Glass Urethane: For the OEM, such as Audi, modulus is expressed using the term **Shear Modulus**. In this test a specific dimension (e.g. 1 cm X 1 cm X 1cm) of urethane is brought into a shear position and the amount of force that is required to bring the specimen into a predetermined deformation or movement of 10% in the shearing mode is measured. The minimum acceptable value for Audi and Volkswagen is >2.0 MPa (mega pascal). Today maximum modulus values usually are not stated, however, Shore A hardness is related to modulus and in most cases the OEM does specify a range of how hard or soft the urethane can be.

**MSDS** Material Safety Data Sheets

**Nonconductive** not able to conduct heat or electricity or sound (Low -conductive is the term used by the OEM. In reality, all matter can and will conduct electricity if enough voltage is applied. Therefore the term low -conductive is preferred.)

Relationship to Vehicle Glass Urethane: Low -conductive urethane products are important for two reasons; the first is for vehicles that have integrated wiring such as an AM frequency antenna or other electronic receiving devices including global positioning system components that make contact with the urethane. Without the low -conductive urethane the reception of the electronic receiving device could be impaired or rendered useless. The second reason low -conductive urethane products and low conductive primers are important is to help prevent galvanic corrosion in vehicles such as in the Audi A8. In the original installation this is not much of a concern, however, during replacement there is a higher chance that the paint system can be breached and exposed aluminum could be a target for oxidation and corrosion. Aluminum corrosion, once it is started, is much more difficult to arrest and in many cases the actual corrosion is beneath the surface and generally is not visible.

**OE** Original Equipment

**OEM** Original Equipment Manufacturer

**Ohm (?)** A unit of electrical resistance equal to that of a conductor in which a current of one ampere is produced by a potential of one volt across its terminals.

**Open Shelf Life** The amount of time during which a package of product after it has been opened for the first time may be used.

**OSHA** Occupational Safety and Health Administration

**PAAS** Pre applied adhesive systems

**psi** the English measurement for pressure, psi stands for pounds per square inch

**PVC** polyvinyl chloride

**Resistivity** A material's opposition to the flow of electric current; measured in ohms [syn: electric resistance, electrical resistance, impedance, resistance, ohmic resistance]

**RH** (relative humidity) The ratio of the amount of water vapor in the air at a specific temperature to the maximum amount that the air could hold at that temperature, expressed as a percentage.

**RT** Relative temperature.

**Shelf Life** the amount of time during which a product may be used/stored in an unopened package.

**Tensile strength (TS)**

The resistance of a material to a force tending to pull it apart, measured as the maximum tension the material can withstand without pulling apart.

Relationship to Vehicle Glass Urethane: For Dinitrol this test is performed by taking a fully cured sheet of urethane that is 2mm thick, a cookie cutter in the shape of a dog bone cuts out several samples for a given batch. The specimen is placed in the same device used for the lap shear testing and the dog bone shaped urethane piece is pulled in a longitudinal fashion until the urethane breaks. The ultimate pressure required to pull the urethane apart is recorded. For Dinitrol's rubber gasket urethane, D-410, the tensile strength is 220 psi, for Dinitrol's strongest urethane D-506, it has been recorded at 1740 psi. Urethane products used by Ford and GM average 1000 to 1300 psi in tensile strength. No Maximum strength is stated by the OEM.

**Viscosity** resistance of a liquid to sheer forces or rate of flow (and hence to flow)

Units of measure are grams/minute or cp centipoises. It is important to note that temperature also has an affect on viscosity.

Relationship to Vehicle Glass Urethane

It is usually understood in the auto glass industry that a high viscosity urethane will also have superior decking.