

**ADHESIVE, PERFORMANCE REQUIREMENTS FOR
STRUCTURAL BONDING OF FIXED GLASS MOUNTED BRACKETS****WSS-M11P66-A1****1. SCOPE**

This specification defines the adhesion requirements for an adhesive or adhesive system suitable for structurally bonding rigid plastic or sintered metal brackets to automotive glass. The adhesive materials may be pressure sensitive adhesive films and / or polyurethane and may include the use of glass primer (glass) or plastic or metal flange primers (bracket). This testing is intended to be a system level test performed on production level parts.

2. APPLICATION

This specification is released for materials used to bond brackets for sensors to the ceramic frit or to bare automotive glass. This specification is not intended for mirror buttons (reference the most current revision of WSS-M2G389-A).

Typical Applications: Sintered metal or plastic brackets used for rain sensors and GPS sensors. These products come to Ford as parts in assembly (PIA) on the glass.

3. REQUIREMENTS**3.1 APPROVED SOURCES**

This specification is performance based and does not have approved sources.

3.2 SYSTEM COMPONENT REQUIREMENTS

Performance and compatibility of the adhesive with base materials is the responsibility of the tier one supplier. In addition to the requirements listed in this specification, requirements listed in the current Glass SDS for the application must be met, unless otherwise agreed to by Ford engineering.

Initial Approval, DV and PV testing are called out in Table 1.

3.2.1 Substrate Condition

The bonding surface shall be free from contaminants including but not limited to mold release agents prior to attaching any parts. Any cleaning process to ensure the absence of oil or residues, fingerprints, corrosion, mold release agents, dirt, moisture, and other foreign materials must be documented and specified on the PFMEA and Control Plan.

3.2.2 Adhesive

Measure the percent cure of the structural bonding tape after the tape has been exposed to the curing cycle with Differential Scanning Calorimetry (DSC). The measured percent cure must be greater than that recommended by the tape manufacturer. Once a curing cycle has been correlated to a recommended percent tape cure, then the curing cycle's time and temperature are used as SCs (Significant Characteristics) to ensure the cure of the tape. If production settings affecting cure are changed from the initial approval, revalidation is required.

Date	Action	Revisions	Rev 01
2018 04 25	Update	See Summary of Revisions	P. Konopka, FNA
2015 08 05	Released		P. Konopka, FNA



The process window for both tape and polyurethane adhesives must be defined per section 3.4.

3.2.3 Wet Out Requirement

Samples for initial approval and production must have a minimum of 95% wetout.

3.3 PERFORMANCE REQUIREMENTS FOR ASSEMBLIES

The following requirements shall be assessed on samples of the brackets bonded to glass representative of current automotive glass (unless otherwise specified).

Test samples shall be prepared in a manner that represents the production process. The preparation procedure shall be documented and provided with the test data.

Separate specimens are required for each test (6 specimens per test unless otherwise specified).

The test specimens as received and after exposure to each of the test requirements defined below shall conform to the following:

- No visible deterioration of the adhesive medium.
- No separation of adhesive from the glass or bracket.
- All failure modes must be 100% cohesive failure or glass failure or bracket failure.
- No unreasonable staining or discoloration of the adhesive medium.
- No glass cracking after exposure due to thermal expansion differences between the adhesive and glass.
- The bracket to glass bond shall be capable of withstanding the pull force as described below within 2 minutes of removal from each test condition unless otherwise specified.
- The bracket must withstand a perpendicular pull to the glass (pluck adhesion) force equivalent to 1.5 times the total weight (bracket + sensor + attached trim + any spring load). If the calculated load (CL) is below 60 N (13.5 pounds), use 60 N as the force on the bracket before and after exposure to all environmental test conditions outlined below.
- The calculated load is also the minimum requirement for pluck tests.

Calculated Load (CL) = 1.5 x total weight*

Total weight = (bracket + sensor + attached trim + spring load)

*If (CL) < 60N, use 60N as the (CL)

3.3.1 Pluck Adhesion of bracket to glass

Determine the adhesion in a tensile machine having a jaw separation rate of 300 mm/minute. Test 6 samples per condition and report strength value and mode of failure. Test within 30 seconds of removal each test condition unless otherwise specified.

3.3.1.1	As Received	16 hours at 23 +/- 2 °C	50%+/-5% RH	1.5 x total weight, min
3.3.1.2	Cold	16 hours at -40 +/- 2 °C		1.5 x total weight, min
3.3.1.3	Hot	16 hours at 88 +/- 2 °C		1.5 x total weight, min
3.3.1.4	Thermal Cycling Test			1.5 x total weight, min

4 cycles, maximum 30 minutes between conditions, each cycle consisting of:

4 h at 88 +/- 2 °C

4 h at 50 +/- 2 °C >90% RH

4 h minimum at -40 +/- 2 °C

Specimens may be kept at -40 °C overnight as necessary. After 4 cycles, condition 16 hours (minimum) at 23 +/- 2 °C & 50%+/-5% RH then test to paragraph 3.3.1 (Pluck Adhesion)





3.3.1.5 Thermal Shock

4 cycles, maximum 1 minute between conditions, each cycle consisting of:

- 2 h at 88 +/- 2 °C
- 4 h at -40 +/- 2 °C
- 2 h at 88 +/- 2 °C
- 16 h at -40 +/- 2 °C

Specimens may be kept at -40 °C overnight as necessary.

Perform visual examination of specimens after each portion of the cycle.

After 4 cycles, condition 16 hours (minimum) at 23 +/- 2 °C & 50%+/-5% RH then test to paragraph 3.3.1 (Pluck Adhesion)

3.3.1.6 Weathering Resistance

1.5 x total weight, min

Interior Exposure FLTM BO 116-01 3609.6kJ/m²

After exposure, condition for 16 hours (min.) at

23 +/- 2 °C 50%+/-5% RH then test to para 3.3.1 (Pluck Adhesion))

Required for initial approval only

Position the bracket facing the light source during exposure.

NOTE: Bond and test 3 brackets to safety glass (clear un laminated safety glass is acceptable). Surrogate testing may be performed with bracket material plaques, provided they are the same material as the finished bracket and undergo the same cleaning, priming, etc. processes as the finished bracket.

Test the bonding system once as proof for all applications.

3.3.2 Long Term Humidity Exposure

Torque testing must utilize a fixture that engages the bracket to evenly distribute the torque over the entire bonding area. See Figure 2 for an example of a torque test fixture head.

3.3.2.1 Long Term Humidity Resistance with Load (Bond 22 brackets to safety glass)

800 hrs.

Condition samples for 24 h at 23 +/- 2 °C and 50 +/- 5% RH after complete adhesive cure (3.2.2). Hang test specimens vertically at temperature and gently attach weights as specified in section 3.3 to each specimen. See example in Figure 1. Hold samples for 800 hours at 50 +/- 2 °C, >90% RH.

All bonded assemblies must support the specified weight for a minimum of 800 hours. Torque samples to failure – failure must be 100% CF, bracket breakage or glass breakage.

3.3.2.2 Torque Strength Bond 6 brackets (minimum) to safety glass)

Bracket or Glass Breakage

Specimens to be chosen at random from beginning, middle and end of production run.

Condition samples for 24 h at 23 +/- 2 °C and 50 +/- 5% RH after complete adhesive cure (3.2.2). Torque all samples to failure and record values and failure modes. Compare torque values to 3.3.2.1 and record failure modes (must be 100% CF, glass or bracket failure).