ADHESIVE, HEM FLANGE, ALUMINUM BONDING, TWO COMPONENT 150 - 180 MINUTE GEL POINT, 70 - 90 °C GEL POINT — **WSB-M2G373-A**

ADHESIVE, HEM FLANGE, STEEL BONDING, TWO COMPONENT 90 - 120 MINUTE GEL POINT, 100 - 120 °C GEL POINT — **WSS-M2G373-B**

1. SCOPE

The materials defined by these specifications are pumpable two-component, induction heat responsive structural adhesives with bondline spacers for bonding metal. Full adhesive strengths are attained after an oven cure.

The mixed adhesive performance for bonding aluminum and steel is defined as follows:

A-series: Defines the mixed adhesive performance requirements for aluminum bonding:

WSB-M2G373-A: The mixed adhesive is room temperature curing or induction responsive. At 23 °C the material will gel after 150 - 180 minutes. The ramped heat gel point is 70 - 90 °C as defined by para 3.4.2.

B-series: Defines the mixed adhesive performance requirements for steel bonding.

WSS-M2G373-B: The mixed adhesive is room temperature curing or induction responsive. At 23 °C the material will gel after 90 - 120 minutes. The ramped heat gel point is 100 - 120 °C as defined by para 3.4.2.

2. APPLICATION

These specifications were released originally for materials to structurally bond metal-to-metal body components such as the inner and outer panels (hem flange) of deck lids, doors, and hoods, etc. This adhesive can be used to bond oily, unclean metal substrates. Bondline spacers are added to one of the components to maintain a 0.25 mm bondline thickness during the hemming process.

The Manufacturing Properties and Engineering Performance requirements defined in these specifications are based upon laboratory coupon testing and define the minimum acceptance criteria for adhesive performance. The assembly process and design for the component will determine the specific adhesive processing parameters for each assembly line. The component engineering performance requirements are defined by the component SDS (Sub-system Design Specification).

The materials are two component induction heat or room temperature cure responsive structural adhesives. Reactivity build rate of the adhesive to generate required component handling strengths for manufacturing is a function of the assembly line processing conditions. Full adhesive strengths are attained after an oven cure. Recommended material oven cure schedules are minimum 171 °C metal temperature for 10 minutes and maximum 205 °C metal temperature for 30 minutes.

Prior to use, the adhesive must be evaluated under the component production parameters. The choice of substrates, stamping lubricants, stamping plant processing conditions, assembly plant processing conditions and specific design application may affect adhesive performance. Compliance with this specification does not guarantee the adhesive will function for all potential applications on a vehicle.

Date	Action	Revisions	Rev. 07
2016 10 17	Revised	Removed heat aging from 3.6.1.3	S. Short, NA
2016 06 08	Revised	See Summary of Revisions	J. Herl, EU
1995 07 13	Activated		N.E. Lindsay, G. A. Molnar

Controlled document at www.MATS.ford.com
Copyright © 2016, Ford Global Technologies, LLC
Copyright Ford Motor Company
Provided by IHS Markit under license with FORD
No reproduction or networking permitted without license from IHS
Licensee=/, User=,
Not for Resale,
Full document details: FORD WSS-M2G373-B 2016
Documents Document Sharing Hub

3. REQUIREMENTS

3.1 APPROVED SOURCES

This specification requires the use of approved sources. Only the sources identified on the Ford Approved Source List (ASL) can be used when this specification is listed on the drawing, CAD file, or other documents. The list of approved sources is located within Ford at www.mats.ford.com or available externally through a Ford Materials Engineer.

3.2 CONDITIONING AND TEST CONDITIONS

All test values are based on material conditioned for not less than 24 h prior to testing in a controlled environment of 23 +/- 2 °C and 50 +/- 5% relative humidity. Testing of the material should occur in the conditioning environment or soon after removal.

3.3 SYSTEM COMPATIBILITY

Initial adhesive approval was based on a specific material system which included the substrate, stamping lubricants and adhesive. The originally approved material system was induction heated or room temperature cured followed by an oven cured using specific production process parameters. Substrate choice, stamping lubricants, stamping plant processing conditions and assembly plant processing conditions may affect adhesive performance. If any of these parameters are changed, the adhesive performance must be validated using the new parameters.

3.4 MATERIAL PROPERTIES

3.4.1 Weight Per Volume (ASTM D816) +/- 0.06 kg/L

The weight tolerance for any one supplier shall be +/- 0.06 kg/L, based on the recorded weight of their original approved production sample. Reference para 4.1.

3.4.2 Cure Behavior
(ASTM D4473, 25 mm or 40 mm parallel plate with a 1.0 mm gap, Induction responsive materials - ramped heating at a 35 - 40 °C/minute ramp rate over the temperature range 23 °C to 205 °C, room temperature curing materials – record at 23 +/- 2 °C, Report gel point - inter-section of elastic (G') and viscous (G") moduli)

	Room Temperature Curing	Induction Responsive (Ramped Heat)
WSB-M2G373-A	150 - 180 minutes	70 - 90 °C
WSS-M2G373-B	90 - 120 minutes	100 - 120 °C

The gel point tolerance for any one supplier shall be +/- 5 minutes for room temperature curing at 23 °C and +/- 5 °C for ramped heating, based on the recorded gel point of their original approved production sample.

Documents
Document Sharing Hub

Copyright Ford Motor Company
Provided by IHS Markit under license with FORD
No reproduction or networking permitted without license from IHS
Full document details: FORD WSS-M2G373-B 2016

Copyright © 2016, Ford Global Technologies, LLC
Licensee=/, User=,
Not for Resale,

3.4.3	Expansion (Substrates per para 4.5, induction heat per para 4.6.1 or room temperature cure per para 4.6.2, one panel each substrate and cure)	No porosity or expansion

Extrude a 13 x 200 mm adhesive bead onto a 100 x 300 mm panel.

Induction heat or room temperature cure.

Place the test panel in an air circulating oven and bake at 205 +/- 2 °C for 40 minutes oven time.

After bake, condition test panel at 23 +/- 2 °C for 1 h min.

Cut the panel lengthwise through the center of the adhesive.

Examine the adhesive for any voids, porosity or expansion caused by entrapped air or internal gassing.

3.5 MANUFACTURING PROPERTIES

3.5.1 Rheology

(SAE J1524, rotational rheometer with 40 mm diameter parallel plates, 500 micron gap, 50 Pa/sec ramp, stress controlled rheometers use stress range 0 - 3500 Pa, strain controlled rheometers use strain range 0 - 100 s-1, evaluate material to highest stress or strain as the formulation will allow, report material batch/lot number, identify rheometer make and model, for each test condition report yield stress and submit plots for shear stress vs. shear rate, submit plot for viscosity vs. temperature at mid-range shear rate, each component and mixed).

Initial (as received)

- Test at 23 +/- 2 °C
- Test at application temperature +/- 2 °C
- Test over range 10 to 50 °C at increments of 10 °C

Aged (age then test at 23 °C and application temperature)

- 7 d at 40 +/- 2 °C
- 90 d at 32 +/- 2 °C

The flow curves established for initial approval shall constitute the reference standard and shall be kept on file at the designated material laboratory. All samples shall produce flow curves that correspond to the reference standard when tested under the same conditions.

Final approval of material rheology for production shipments shall be made by the affected manufacturing activity. In all cases, the rheology shall be within the limits as identified on the material control plan.

3.5.2 Sag Resistance/Flow Rate

No measurable movement or flow, no loss of material

Documents
Document Sharing Hub

Copyright Ford Motor Company
Provided by IHS Markit under license with FORD
No reproduction or networking permitted without license from IHS
Full document details: FORD WSS-M2G373-B 2016

Copyright © 2016, Ford Global Technologies, LLC
Licensee=/, User=,
Not for Resale,

3.5.2.1 North American Production
(FLTM BV 118-01, 6 mm diameter bead, substrates per para 4.5, room temperature cure per para 4.6.2, oven cure per para 4.6.3, one panel each bake)

- Horizontal
- Vertical
- Inverted

3.5.2.2 European Production

(FLTM BV 153-01, Method A, 8 mm diameter bead, substrates per para 5.5, room temperature cure per para 4.6.2, bake 30 minutes at 110 +/- 2°C)

3.5.3 Phosphate Wash Resistance

No measurable movement, displacement or wash off. No dissolution of material or lifting from panel.

3.5.3.1 North American Production
(FLTM BV 116-01, Method B, 1.5 mm material thickness, room temperature cure per para. 4.6.2 prior to test)

3.5.3.2 European Production Test Method:

- Prepare a test panel (300 X 100 X 0.8 - 0.9 mm) according to FLTM BZ 150-11 oiling grade Normal.
- Apply a ribbon of test material (250 x 30 x 5 mm) to the panel.
- Condition for 2 h at 23 +/- 2 °C.
- Wash, phosphate and electrocoat the test panel under current process conditions.

3.5.4 Electrocoat Compatibility
(FLTM BV 119-01, use current production paints as identified by Materials Engineering, room temperature cure per para 4.6.2 prior to test)

Shall not contaminate electrocoat primer bath or cause electrocoat film irregularities.

3.5.5 Color

Each component is distinctly different in color. The mixed adhesive is dark in color and shall meet manufacturing process control requirements. Final approval of material color for production shipments shall be made by the affected manufacturing activity.

The material color for any one supplier shall not visually deviate from the originally approved production sample. Reference para 4.3.

3.5.6 Odor Rating 3 max.
(FLTM BO 131-03, method D)

Shall be free from objectionable odors as determined by the manufacturing facility, both as received, after storage,and mixed.

Documents
Document Sharing Hub

Copyright Ford Motor Company
Provided by IHS Markit under license with FORD
No reproduction or networking permitted without license from IHS
Full document details: FORD WSS-M2G373-B 2016

Copyright © 2016, Ford Global Technologies, LLC
Licensee=/, User=,
Not for Resale,