



DYNAMIC SEALING PERFORMANCE SPECIFICATION

WSS-M9P9-D

1. SCOPE

This specification defines the minimum durability and performance requirements of closure, trim, and body flange mounted dynamic sealing components that are included in CPSC 01.07.02, 01.07.08, 01.07.09, and 01.07.10.

2. APPLICATION

This performance specification was released originally for coated and/or uncoated dynamic sealing components used in closure, body, and trim mounted applications. Material selection must be reviewed and approved by Ford Materials Engineering.

In addition to the requirements listed in this specification, requirements listed in the Dynamic Sealing (DYNA) SDS must be met unless otherwise agreed to by Ford engineering, including, but not limited to:

- RQT-010700-009303 (legacy DY-0003): Insertion Force – Flanges
- RQT-010700-009304 (legacy DY-0004): Extraction Force – Flanges
- RQT-010700-009318 (legacy DY-0018): Compression Set
- RQT-010700-009331 (legacy DY-0033): Key Life Aging CLD (Compression Load Deflection)
- RQT-010700-009334 (legacy DY-0036): Compression Load Deflection (CLD)
- RQT-010700-009336 (legacy DY-0038): Low Temperature Performance
- RQT-010700-009338 (legacy DY-0040): Coating

2.1 LIMITATIONS

This performance specification excludes belt weatherstrips and/or glass run weatherstrips integral to CPSC 01.07.01.

3. REQUIREMENTS

3.1 APPROVED SOURCES

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

3.2 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

For thermoplastic materials, this specification is based on virgin material only. The use of regrind is permitted for economic/environmental reasons, with compliance as indicated in WSS-M9P91111-A.

Date	Action	Revisions	Rev. 0
2016 10 26	Released		



Documents

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Materials used in interior applications must meet the requirements outlined in WSS-M99P2222-D1/Latest, *Performance, Vehicle Interior Environment Quality Material/Component Requirements*. Data must be included in material submission package. For odor testing, all weatherstrips should only be tested at 23°C, 45°C, and 65°C.

3.3 DYNAMIC SEAL PERFORMANCE MANAGEMENT

All seals evaluated under this performance specification must have Supplement A completed and signed by Ford Materials Engineering, the material/coatings supplier, and the Tier One supplier. Compatibility of the seal coating with seal base material (s) is the responsibility of the Tier One supplier. The Tier One supplier shall have the seal tested against the applicable performance specification requirements, and must keep all tested samples for review by Ford Materials Engineering.

Table 3.0 describes the construction of the dynamic seal, and must be submitted with Supplement A. (Reference Supplement A). The Tier One supplier is responsible for including Table 3.0 and this performance specification on the part drawing.

3.4 FINISHED PARTS

Testing must be conducted at Design Verification (DV) and Product Validation (PV) per Table 2.0 (including Supplement A), unless otherwise agreed to by Materials Engineering, and on actual production parts or a section of the part whenever possible. Where part dimensions limit testing equipment access, representative test samples may be substituted. DV Testing must follow the Process Window DOE, paragraph 3.6. PV Testing must be conducted on actual production processed parts. No change in material, facility, or processing is permitted without written approval from Ford Materials Engineering Activity, via SREA.

All test values are based on parts conditioned in a controlled atmosphere of 23 +/- 2 °C and 50% R.H. for not less than 24 h prior to testing and tested under the same conditions unless otherwise specified.

3.5 APPEARANCE: COLOR, FINISH, SURFACE (FLTM BI 109-01)

The part shall be generic black (GAXA) in color and have, at most, a "K" level (2-4 on a 60° gloss meter) for gloss, unless otherwise specified on the engineering drawing or PDL. The color shall be uniform (no change in color less than Rating 5 of the Gray Scale, AATCC Evaluation Procedure 1/ISO 105-A02) along the entire length of the seal assembly, including molded or mitered corners and splices.

The surface shall be free of blisters, voids and any bloom unless otherwise specified on the engineering drawing.

3.6 PROCESS WINDOW DEFINITION

The supplier shall perform a DOE for development of new materials and for continuous improvement of current materials, utilizing response surface analysis to determine the Process Window of the system. The variables to be included in the design are **cure temperature (material and coating), conveyor speed, and coating flow**. An initial screening experiment should be run to determine what level will generate a window which includes testing to failure. This screening experiment should be reviewed with the Materials Engineer to set up the final DOE. Response attributes to the DOE should be based on the materials tested and should include, but not be limited to:



- Coefficient of Friction
- Film Thickness (if coating is present)
- Resistance to Cleaning Agents
- Resistance to Crocking Abrasion
- Naptha Solvent Rub (if coating is present only)
- Compression Load Deflection (per legacy DY-0036)

TABLE 1.0

TEST REQUIREMENTS FOR SPECIFIC DYNAMIC SEAL TYPES

Dynamic seal test requirements depend on their type, location and unique properties. Table 1.0 provides an overview of the test requirements in paragraphs 3.7 to 3.16 necessary for approval. All dynamic seal types must meet the requirements per paragraphs 3.2, 3.3, 3.4, 3.5, 3.6, 3.17, 3.18.

Dynamic Seal Type	Location	Tests Required
Closure Mounted, Uncoated	Door, Hood, Lift-gate, Deck-lid	3.7.1 - 3.7.9, 3.7.11 (3.7.4 for metal carrier only), 3.8, 3.11 – 3.19
Body Mounted, Uncoated	Flange	
Trim Mounted, Uncoated	Cowl/Leaf Screen, Rocker, Cladding	
Closure Mounted, Coated	Door, Hood, Lift-gate, Deck-lid	All. (3.7.4 for metal carrier only), Specific to coating: 3.7.8, 3.7.9, 3.7.10, 3.7.11, 3.9, 3.10
Body Mounted, Coated	Flange	
Trim Mounted, Coated	Cowl/Leaf Screen, Rocker, Cladding	

Note: Non-visible seals to the exterior and interior normal environments (closures closed) are not required to meet 3.8 Accelerated Weathering and 3.9 Aged Adhesion.

3.7 RESISTANCE PROPERTIES

The following requirements shall be assessed on whole parts or sections of seal assemblies and must include all materials and constructions found within the parts (molded corners, bright inserts, flock coating, etc.)

Separate specimens are required for each test.

The parts as received and after being subjected to the tests listed below shall conform to the following requirements as specified.

- (a) No evidence of color change less than Rating 4 of the Gray Scale (AATCC Evaluation Procedure 1/ISO 105-A02).
- (b) No cracking, chalking, wrinkling, crazing, iridescence, bloom, milkiness, separation, loss of adhesion (coating), or loss of embossment allowed (as defined in ASTM D1566).
- (c) No evidence of shrinkage or incompatibility between materials of construction. (Examples: coating to substrate, co-extruded materials, etc.)





- (d) Any successful attempt to separate the components of coated and/or composite parts must result in cohesive failure only. Any adhesive failure will be cause for rejection.
- (e) For seals with metal carriers, no visible corrosion or blistering is permitted.
- (f) For applications using hot melt sealant:
After exposure, the loss of pull-off effort shall not exceed 25% of the original requirement stated in the dynamic sealing SDS, legacy DY-0004. Record original and after exposure pull-off efforts.

When a seal assembly includes windlace/pinch weld retention systems additional samples shall be assembled to metal panels simulating production installation.

All samples must be conditioned for 1 h +/- 5 minutes at 23 +/- 2 °C and 50% R.H. prior to all assessments, unless otherwise specified.

- 3.7.1 Humidity Exposure (a), (b), (c), (d), (e), (f)
(ASTM D2247, 14 d, 38 +/- 2 °C, 95% to 100% R.H.
100 mm long specimen, horizontal exposure)

Note: Requirement 3.8 requires adhesion testing after humidity exposure.

- 3.7.2 Environmental Cycling Test (a), (b), (c), (d), (e), (f)
(FLTM BQ 104-07, method 1, without CASS cabinet,
100 mm specimen, horizontal exposure)

4 cycles, each cycle shall consist of the following:

4 h at 100 +/- 2 °C
4 h at 38 +/- 2 °C, 95% to 100% R.H.
16 h at -40 +/- 2 °C
4 h at 38 +/- 2 °C, 95% to 100% R.H.
4 h at 100 +/- 2 °C
16 h at -40 +/- 2 °C

Note: Requirement 3.8 requires adhesion testing after environmental cycling.

- 3.7.3 Cold Flexibility No cracks or breaks
(FLTM BP 106-03, 4 h at -40 +/- 2 °C as examined with
except carrier material, reference the unaided eye.
ASTM D380 for apparatus)

- 3.7.4 Laboratory Accelerated Cyclic Corrosion (Only for parts containing metal carriers)
(Test Method 00.00-L-467, (formerly a CETP))

- 3.7.4.1 Closure Mounted Primary Seals or Must meet (e)
Body Mounted Primary Seals,
9 weeks exposure.

- 3.7.4.2 Body Mounted Secondary Seals, Must meet (e)
6 weeks exposure.



- 3.7.5 Ozone Resistance Rating 0 max
(FLTM BP 101-01, Procedure B)

No chalking or cracking visible at 2X magnification.

- 3.7.6 Heat Aging
(ISO 188/ASTM D573)

- 3.7.6.1 Short Term: 22 h at 80 +/- 2 °C

Change in length +/- 0.5% max, (a), (b), (f)
(Seals with and without metal carrier),
100 mm long specimen, horizontal exposure

For stand-alone dynamic seals that don't meet the above requirements, it is recommended that the dynamic seal(s) be tested simulating the production environment (Examples: sheetmetal flange, etc.).

Note: Requirement 3.8 requires adhesion testing after short term heat aging.

- 3.7.6.2 Long Term: 1000 h at 80 +/- 2 °C
(Use different specimens from 3.6.6.1)

Change in length +/- 1.0% max, (a), (b), (f)
(Seals with and without metal carrier),
100 mm long specimen, horizontal exposure

For stand-alone dynamic seals that don't meet the above requirements, it is recommended that the dynamic seal(s) be tested simulating the production environment (Examples: sheetmetal flange, etc.).

Note: Requirement 3.8 requires adhesion testing after long term heat aging.

- 3.7.7 Paint Staining

- 3.7.7.1 Simulated Paint Repair Rating 4 min
(AATCC Evaluation Procedure 1/ISO 105-A02,
Prepare paint panels per WSS-M33J7-A1 para 3.4, for
Catalyzed Low Bake Repair)

Test Method: Expose assembly at 120 +/- 2 °C for 1 h. Cool to 23 +/- 2 °C then remove the clamp. Separate the assembly by pulling apart rapidly by hand and rate the panel). Slight contact stain is permitted.

- 3.7.7.2 Contact and Migration Staining of Paint Rating 4 min
(FLTM BP 153-01, Procedure A & B)

No visible stain or change in surface appearance produced on the painted panel beyond the boundaries of the test specimen.

- 3.7.8 Fluid Resistance Rating 4 min
(FLTM BI 168-01, Method B)
Additional fluids to include: Rubber Lubricant (ESE-M99B144-B),
and soap and water referenced in FLTM BI 113-01.

