



Critical Functional Area Definition and Product Quality Requirements for Bonded Piston Seals

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This standard is aimed to ensure good quality of bonded piston seals produced by worldwide seal manufacturers.

1.2 Applicability. This specification defines the critical bonding areas and product quality requirements for automatic transmission bonded piston seals. Parts delivered to GM must comply with the quality requirements set forth in this document.

1.3 Remarks. None.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3059

GMW15049

2.3 Additional References.

- Automotive Industry Action Group (AIAG) Production Part Approval Process (PPAP), Edition 4
- Statement of Requirements (SOR) Package including post and non-post cured specifications:
 - GM24219864
 - GM24258791

3 Requirements

3.1 System/Subsystem/Component/Part Definition. Bonded piston seal is composed of rubber sealing lip(s) permanently bonded to a metallic piston. The seal is reciprocating at various speeds and temperatures, under fluid (usually automatic transmission fluid) pressure to engage/release a transmission clutch during its application. Bond integrity and free of rubber defects are essential to the performance of the seal. No rubber-metal separation (de-bonding) or lip damage shall occur during the life time of the seal.

3.1.1 Appearance. The rubber material of the finished parts shall be free of molding defects such as trapped air, burn marks, vulcanized rubber, non-fills, knit lines, splits, blisters, bleed-out on outer diameter (OD) sealing lip /inner diameter (ID) sealing lip, loose flash, bad trim, and contamination. Other areas except the sealing lip(s) may have allowable imperfections at the size limits defined in Appendix A, Figure A1, Figure A2 and Figure A3. The molded parts shall be free of mechanical damages such as cuts, nicks, dents and permanent deformations on sealing and pilot surfaces. Parts shipped to GM must meet the product quality requirement detailed in Appendix A, Section A1.

3.1.2 Definitions. In Appendix A, Section A1, the term "imperfection" is being used for various degrees of molding defects and other defects listed in 3.1.1. Sealing lip waviness due to handling and/or transport, tooling witness marks in the metal carrier (e.g., shut-off edges, slide and pinch marks), visual appearance differences

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around injection gates, vacuum access ports filled with adhering rubber, attached flash from manual de-flashing processes (this operation allowed only in areas as defined in Appendix A, Figure A1 and Figure A3) as long as within drawing specifications, de-flashing irregularities from such processes, attached flash around inserted pins or down holders if within drawing specification, and rough, dull or spotted surface finish appearance on the molded part from the use of mold release spray and mold tooling surface treatment are not considered "imperfections", since inherent mold flash (attached flash) and appearance irregularity that are described in this paragraph originate in the mold tool concept and manufacturing processes being used.

Part specific features which are not covered by the general description of typical bonded piston designs in Appendix A under Figure A1, Figure A2 and Figure A3 shall be ruled by the part drawing. The part drawing and the notes therein will always overrule this General Specification Standard GMW16886.

3.1.3 Content.

3.1.3.1 Physical Content. Molded rubber, coated steel, and adhesive.

3.1.3.2 Functional Content. Refer to 3.1. Detailed application conditions reference part specific SOR.

3.1.4 Ambient Environment. Reference part specific SOR.

3.1.5 Interfaces. Reference part specific SOR.

3.1.6 Usage Definition. Reference part specific SOR.

3.2 Product Characteristics.

3.2.1 Performance Requirements. The part functional environment ranges in temperature, speed, and pressure with varying duty cycles. For the expected duty cycle at the various temperatures and pressures, refer to the application and component specific SOR. The seal is expected to meet the durability requirement defined in part specific SOR.

3.2.2 Physical Characteristics. Parts must have bond integrity. A 360 degree bond pull test of pulling rubber away from metal piston on finished parts shall be performed on molded bonded piston seals (BPS) using a method approved by Global Propulsion Systems (GPS) or using the procedure described in GM24258791. Samples shall be taken randomly from the manufacturing line (not aged), following the 125 data points per year sampling schedule, unless otherwise redefined by the responsible GMPT Supplier Quality Engineer (SQE). One hundred percent (100%) rubber rupture is expected. No metal exposure is allowed.

3.2.2.1 Dimensions and Capacity. Parts must meet GM drawing dimensional requirements. All defined documentation required (DR) shall follow the standard 125 data points per year testing frequency. Any deviation from standard DR requirement must have written approval from the GM responsible personnel.

3.2.2.2 Mass Properties. Not applicable.

3.2.3 Reliability.

3.2.3.1 Reliability Evaluation Point. Reference part specific SOR.

3.2.3.2 Reliability Requirements. Reference part specific SOR.

3.2.4 Serviceability. Reference part specific SOR.

3.2.5 User System/Subsystem/Component/Part Interface. Reference part specific SOR.

3.3 Design and Construction.

3.3.1 Materials, Processes and Parts Selection Guidelines.

3.3.1.1 Material Guidelines. Materials utilized must meet the requirements specified under GM24219864 or GM24258791.

3.3.1.2 Processes Guidelines. Suppliers must use GM approved process as specified under GM24219864 or GM24258791.

3.3.1.3 Parts Guidelines. Finished parts must meet the requirements specified under GM24219864 or GM24258791, and the detailed product quality requirement defined in Appendix A, Section A1.

3.3.2 Design Guidelines and Constraints. Reference part specific SOR.

3.3.3 Identification and Marking. Mark parts and identify each shipment to GM as specified under GM24219864 or GM24258791.

3.3.4 Workmanship.

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Documents

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3.3.5 Interchangeability.**3.4 Documentation.**

- AIAG PPAP, Edition 4
- GMW15049, Key Characteristic Designation System (KCDS)

3.5 Support of System/Subsystem/Component/Part After Sale. Not applicable.**3.6 System/Subsystem/Component/Part Operator Training.** Not applicable.**3.7 System/Subsystem/Component/Part Characteristics.** Reference part specific SOR.**3.7.1 System/Subsystem/Component/Part Definition.** Reference part specific SOR.**4 Validation**

4.1 General. Parts must meet requirements specified in GM24219864 or GM24258791, and the performance and durability requirements specified in part specific SOR.

4.2 Validation Cross Reference Index. Not applicable.

4.3 Supporting Paragraphs. Not applicable.

5 Provisions for Shipping

It is supplier's responsibility to fulfill the drawing requirement, material batch releasing requirement, and product quality requirements detailed in Appendix A, Section A1 for each shipment to GM. GM reserves the right to sample incoming shipments.

6 Notes

6.1 Glossary. Not applicable.

6.2 Acronyms, Abbreviations, and Symbols.

AIAG	Automotive Industry Action Group
BPS	Bonded Piston Seals
DR	Documentation Required
GPS	Global Propulsion Systems
ID	Inner Diameter
IMDS	International Material Data System
KCDS	Key Characteristic Designation System
OD	Outer Diameter
PPAP	Production Part Approval Process
SOR	Statement of Requirement
SQE	Supplier Quality Engineer

7 Additional Paragraphs

7.1 All materials supplied to this standard must comply with GMW3059, Restricted and Reportable Substances, including the requirement to submit a full material composition disclosure to GM via the International Material Data System (IMDS).

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

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