GM	WORLDWIDE ENGINEERING STANDARDS	General Specification	GMW15349

Low Permeability Fuel Filler Hose

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 covers the material requirements of fuel filler and fuel filler vent hoses (coupled or uncoupled), for use with gasoline fuel in automotive fuel systems.

Note: Fuel filler hoses for diesel and biodiesel applications are specified in GMW15605.

For use in non-conductive environments, all layers of the hose must be non-conductive. Conductivity or non-conductivity of filler hose constructions A, B, C, I, J and K must be specified on part drawing. Filler hose constructions D, E, F, G and H are conductive, and must meet the conductivity requirements of Appendix A, Table A2.

The material content of the hose, permeability and stiffness of the hose are defined by the Construction and Reinforcement designations for the hose. The Construction and Reinforcement designations for the hose together define the "Type" for the hose. Hoses of construction A, B, C, F, G and H are suitable for applications subjected to maximum continuous operation temperatures of +90 °C with intermittent operation at temperatures up to +110 °C maximum. Hoses of construction D, E J and K are suitable for applications subjected to maximum continuous operating temperatures of +100 °C with intermittent operation at temperatures up to +125 °C maximum. Hoses of construction I are suitable for applications subjected to maximum continuous operating temperatures of +125 °C with intermittent operation at temperatures up to +150 °C maximum. In general, lower fuel permeating hose constructions result in stiffer and less flexible hoses.

1.2 Applicability. Fuel filler and fuel filler vent hoses (coupled or uncoupled), for use with gasoline fuel in automotive fuel systems.

1.3 Remarks.

1.3.1 Classification. Materials covered by this standard are divided into several sets of constructions and reinforcement categories. The hose is defined as "GMW15349 Type XY", where "X" refers to the construction of the hose and the "Y" refers to the reinforcement of the hose.

1.3.2 Construction. The "Construction" defines the material content and construction of the hose. The following materials are used in the various constructions:

- Tetrafluoroethylene hexafluoropropylene (THV)
- Fluorocarbon thermoplastic vulcanizate (FTPV)
- Epichlorohydrin/ethylene oxide copolymer (ECO)
- Fluoroelastomer (FKM)
- Butadiene/Acrylonitrile copolymer (NBR)
- Chlorinated Polyethylene (CM)
- Chlorosulfonated Polyethylene (CSM)
- Polyvinylchloride polymer (PVC)
- Ethylene tetrafluoroethylene (ETFE)

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The thickness of the barrier layer shall be sufficient to meet the permeation requirements of the respective construction. The descriptions of the constructions of hose used for this application are listed in Appendix B, Table B1.

1.3.3 Reinforcement. The reinforcement of the hose describes the type of fiber used in the hose. Reinforcement to the tube of the hose may be applied by braiding, knitting or circular weaving. The reinforcement is placed between the laminated tube and the cover of the hose.

1.3.3.1 Reinforcement 1. This reinforcement type consists of aramid fiber.

1.3.3.2 Reinforcement 2. This reinforcement type consists of rayon fiber.

1.3.3.3 Reinforcement 3. This reinforcement type consists of no fiber or other material added to the hose constructions.

2 References

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

2.1 External Standards/Specifications.

ASTM D413	ISO 37	ISO 188	ISO 23529
ISO 34-1	ISO 48	ISO 815	
ISO 36	ISO 48-4	ISO 1431-1	

2.2 GM Standards/Specifications.

GMW3059	GMW14292	GMW14681	GMW15423
GMW14270	GMW14680	GMW14914	GMW15605
GMW14291			

2.3 Additional References. None.

3 Test Preparation and Evaluation

3.1 Resources. Not applicable.

3.1.1 Facilities. Conforming to the relevant Test Procedures.

3.1.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.1.2 Equipment. Conforming to the relevant Test Procedures.

3.1.3 Test Vehicle/Test Piece. Unless otherwise specified, the shape and size of test pieces shall be in accordance with the relevant Test Procedure. Minimum six (6) test samples (hoses) are required for initial sample testing. Minimum three (3) test samples (hoses) are required for inspection testing.

Samples are finished parts or to be taken from finished parts. (Where the dimensions on the finished parts do not allow preparing of test pieces, tests are to be performed on sheet material of same production batch. The same state of cure between slabs or buttons and finished parts must be assured by appropriate tests, which must be described in the test report.)

If not otherwise stated, mechanical properties in delivery state and after heat or fluid immersion are to be tested at +23 °C ± 5 °C and with the same test methods. Unless otherwise stated, ambient temperature test conditions shall be held to +23 °C ± 5 °C. Unless otherwise stated, all other temperatures except +23 °C ± 5 °C shall be held to ± 3 °C.

3.1.4 Test Time. Refer to all of the individual tests in Appendix A.**3.1.5 Test Required Information.** Not applicable.

3.1.6 Personnel/Skills. Conform to GM and/or laboratory requirements. Technician training records must be available upon request.

3.2 Preparation. See Requirements in Section 4.

3.3 Conditions. See Requirements in Section 4.

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3.3.1 Environmental Conditions. See Requirements in Section 4.

3.3.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

3.4 Instructions. See Requirements in Section 4.

3.5 Data. See Requirements in Section 4.

3.6 Safety. This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices. This would include any specific training that may be required. The safety and health standards include site specific rules and procedures, company rules and procedures, and Government Standards. Contact shall be made with the appropriate site Safety and Health personnel for further direction and guidance in these matters.

3.7 Documentation. Samples of components or material released to this standard shall be tested for conformity with the requirements of this standard and approved by the responsible GM Department prior to the start of delivery of production level components or materials.

Any change to the component or material, e.g., design, function, properties, manufacturing process and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change or modification to the product/process, and to apply for a new release.

If not otherwise agreed to, the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or changed product. In some cases, a shorter test can be agreed to between the responsible GM department and the supplier.

3.7.1 Test Results. See Requirements in Section 4.

3.7.2 Deviations from Test Standard. Deviations from the requirement of this standard shall have been agreed upon. Such deviations shall be specified on component drawings, test certificates, reports, etc.

4 Requirements and Procedure

4.1 Design Validation Testing. Material Properties/Requirements (material/compound approval) are summarized in Appendix A, Table A1, Performance Properties/Requirements (construction approval) in Appendix A, Table A2. For full approval of a hose, compliance to the requirements of Appendix A, Table A1 and Table A2 is needed. Six (6) samples of material from at least three (3) different hoses shall be tested to each of the requirements for Design or Product Validation Testing.

4.2 Product Validation Testing. If not defined otherwise, the following testing should be done for production audit testing.

4.2.1 All tests per Appendix A, Table A1; except Fuel Resistance and Deposits of THV, ETFE, FTPV/ETFE or FTPV lining and Cover Age Resistance (1008 h exposure).

4.2.2 Fuel Permeation and Extractable Tests per Appendix A, Table A2.

4.3 Audit/Inspection Testing. If not defined otherwise, the following testing should be done for production audit testing: Three samples of material from at least two (2) different hoses shall be tested to each of the requirements for Audit/Inspection Testing.

4.3.1 All tests per Appendix A, Table A1; except Fuel Resistance and Deposits of THV, ETFE, FTPV/ETFE or FTPV lining and Cover Age Resistance (1008 h exposure).

4.3.2 Fuel Permeation per Appendix A, Table A2.

5 Provisions for Shipping

Not applicable.

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6 Notes

6.1 Glossary.

Calibrated End: A calibrated end is formed by an extra cap which is pulled over one (1) or two (2) ends of the hose when mounted on mandrel before vulcanization to allow wall thickness with lower dimensional tolerance.

6.2 Acronyms, Abbreviations, and Symbols.

%	Percent
Ω	Ohm(s)
CM	Chlorinated Polyethylene
CSM	Chlorosulfonated Polyethylene
ECO	Epichlorohydrin/Ethylene Oxide
ETFE	Ethylen-tetrafluoroethylen
FKM	Fluoroelastomer
FTPV	Fluorocarbon Thermoplastic Vulcanizate
g/m^2	gram per meter squared
GSSLT	Global Subsystem Leadership Team
ID	Inside Diameter
IMDS	International Material Data System
IRHD	International Rubber Hardness Degree
kPa	kilopascal
mg/cm^2	micogram per square centimeter
MPa	Megapascal
NBR	Butadiene/Acrylonitrile
N	Newton
N/mm	Newton per millimeter
PPAP	Production Part Approval Process
PVC	Polyvinyl Chloride
RT	Room Temperature
THV	Tetrafluoroethylene Hexafluoropropylene

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).

7.2 Manufacturing Process. The inner surface of the hose shall be free of excess soap, talc, or other materials which could affect serviceability and usage.

7.3 Approved Sources.

Materials supplied to this specification must be approved by General Motors.

A list of approved materials can be found in the GM Materials Approved Source List. This GM Material File is provided to third parties to reduce redundant testing of materials. If approved material already listed is used, the part supplier can use GM Material File reference for Production Part Approval Process (PPAP) material approval. If the decision is made to use a not yet approved material, contact the Elastomers Global Subsystem Leadership Team for details on the approval process. The material approval process must be completed prior to PPAP start date of the part supplied to General Motors.

Engineering qualifications of an approved source are required for this standard. Only sources listed in the GM Materials File (i.e., GM SupplyPower) under this standard number have been qualified by engineering as meeting the requirements of this standard. To access this list, reference GMW14270 for latest location.

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For other GM locations, the responsible engineering group should be contacted to obtain the approved source in that individual country.

8 Coding System

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

Material per GMW15349 Type “XY”, where XY refers to the Construction and Reinforcement types as defined in 1.3, and Appendix B, Table B1.

9 Release and Revisions

This standard was originated in May 2006. It was first approved by Global Elastomers Team in February 2009. It was first published in February 2009.

Issue	Publication Date	Description (Organization)
1	FEB 2009	Initial publication.
2	NOV 2014	Conductivity test on complete hose, requirements to FTPV-liner added. (Materials - Elastomers Global Subsystem Leadership Team)
3	JUL 2016	Type K detail added. Revised values for FKM liner. Various other needed updates and revisions. (Materials – Elastomers GSSLT)
4	SEP 2019	Continuous improvement revision. Updated and template changed. (Materials - Elastomers Global Subsystem Leadership Team (GSSLT))

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