



Air Conditioning Refrigerant Fitting Shipping Cap Specification

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 describes requirements, performance, validation, and shipping requirements for shipping caps to be used on Air Conditioning (A/C) refrigerant fittings for automotive applications during shipment to GM Component and/or Vehicle Assembly Plants.

The engineering test schedule contained within this specification defines the minimum performance criteria necessary for design and production validation.

1.2 Applicability. This global specification pertains to air conditioning refrigerant subsystem component connections in all vehicle models, across all platforms, in all regions.

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

GMW3116

GMW14156 (ID)

GMW14157 (ID)

(ID) = This standard is limited to internal distribution within General Motors and shall not be distributed outside this company. Contact the GM Lead Engineer for further instructions.

2.3 Additional References.

- CG2987 Thermal AC Lines System VCRI SOR Appendix G3 (ID)
- GM Drawing 13531644
- GM1738 Packaging and Identification Requirements for Production Parts
- SOR Appendix G3

3 Requirements

3.1 System/Subsystem/Component/Part Definition.

3.1.1 Appearance. See 3.3.2.1.

3.1.2 Content. See 3.3.2.1.

3.1.2.1 Physical Content. See 3.3.2.1.

3.1.2.2 Functional Content. See 3.1.2.2.1 through 3.1.2.2.5, and 3.2.1.

3.1.2.2.1 The shipping cap must be easy to align and assemble onto the fitting and must not tear or rupture prior to removal.

3.1.2.2.2 The shipping cap must remain firmly in place until it is removed just prior to assembly of the refrigerant fitting on the subassembly or the vehicle. This includes any/all conditions it may experience during production processing, packing, shipping, unpacking, and queuing at the component and/or vehicle assembly plant.

3.1.2.2.3 The shipping cap must provide adequate protection to the refrigerant fitting so that damage does not occur to the threads or sealing surfaces of the fitting. It must also keep non-liquid contaminants (e.g., dust) from entering into the fitting as a result of shipping. Sealing caps (as specified on the detailed drawings) must also

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provide protection against ingress of liquid contaminants as a result of exposure to water mist, spray, immersion or environmental humidity, unless otherwise specified.

3.1.2.2.4 The shipping cap must be easy to remove from the fitting just prior to assembly of the refrigerant fitting on the subassembly or the vehicle.

3.1.2.2.5 O-rings, seal washers, or other seals must not move or come off the fitting at the time of shipping cap removal when recommended removal techniques are followed.

3.1.3 Ambient Environment. Not applicable.

3.1.4 Interfaces. Not applicable.

3.1.5 Usage Definition. Not applicable.

3.2 Product Characteristics.

3.2.1 Performance Requirements.

3.2.1.1 Design Validation (DV). A/C refrigerant fitting shipping cap shall be tested for conformance with the sections in Table 1.

Table 1: Test Table

Section	Test	Number of Samples
4.3.1	Installation Force	6
4.3.2	Rupture/Tear (non-threaded)	6
4.3.3	Vibration	12
4.3.4	Thermal Cycle	12
4.3.5	Tear Tab Force (tear off caps)	2 per each mold cavity
4.3.6.1	Tear Off	2 per each mold cavity
4.3.6.2	Pull Off	2 per each mold cavity
4.3.7	Abrasion	12
4.3.8	Sealing (sealing caps only)	6

3.2.1.1.1 Design Level Requirements. A/C refrigerant fitting shipping cap manufactured for testing to this specification for Engineering Source Approval purposes shall be completely representative of production level materials, components, processes and tooling. The exceptions are those assemblies needing to be specially manufactured under extremes of dimensions and/or tolerance to meet the test requirements of the specification. Any exceptions to this requirement or to any criteria referenced in 3.2.1.2.1, or 3.4.3, must be reviewed beforehand and approved by the GM Heating Ventilation Air Condition (HVAC) Bill of Materials (BOM) Family Owner (BFO) issuing the approval.

3.2.1.2 Production Verification (PV). A/C refrigerant fitting shipping caps shall be tested for conformance with the sections in Table 2.

Table 2: Test Table

Section	Test	Number of Samples
4.3.1	Installation Force	6
4.3.2	Rupture/Tear (non-threaded)	6
4.3.3	Vibration	12
4.3.4	Thermal cycle	12
4.3.5	Tear Tab Force (Tear off caps)	2 per each mold cavity
4.3.6.1	Tear Off	2 per each mold cavity
4.3.6.2	Pull Off	2 per each mold cavity
4.3.7	Abrasion	12
4.3.8	Sealing (sealing caps only)	6

3.2.1.2.1 Test Samples. Production test samples, produced on production representative equipment, shall be used.

3.2.1.2.2 Product Validation (PV) Approval. PV approval shall be provided by either the appropriate GM Supplier Quality Engineer or GM Program Validation Engineer.

Table 2 defines the validation procedures that are required to confirm that A/C refrigerant fitting shipping caps meet the specified requirements. Each individual test shall be run with statistically based sample size, such that the reliability requirements stated in 3.2.3.2 are satisfied. Parts must be manufactured from production tooling and processes such that potential variations from both are evaluated. Parts to be used for Product Validation testing must be manufactured to print tolerances representing the potential manufacturing variation.

3.2.1.3 In-process (IP) Testing. These tests (Table 3) shall be completed satisfactorily with parts from normal production runs.

- Parts shall be selected from a normal production run or 1000 pieces, whichever is smaller.
- Samples shall be selected at random to represent the entire production quantity.
- Every six month period, the supplier shall run the tests in Table 3.

Table 3: Test Table

Section	Test	Number of Samples
4.3.1	Installation Force	2
4.3.6.1	Tear Off caps	2
4.3.6.2	Pull Off caps	2
4.3.7	Abrasion	6

3.2.1.3.1 IP Approval. IP tests are self-approved by the supplier, subject to audit by GM Supplier Quality Engineering.

3.2.1.3.2 Lot Retention. In case of IP test non-conformance, the affected production lot shall be retained by the supplier until Root Cause Analysis is complete. The supplier shall then decide the disposition of the affected production lot. The supplier has three options for this retained lot. It shall be either:

- a. Scrapped; or
- b. Corrected and certified (which may mean lot testing the revised part again) based on the root cause analysis, or
- c. Shipped without correction if deemed to be acceptable based upon the root cause analysis. In any event, GM Supplier Quality Engineering shall be notified whenever any of the previously listed items options is exercised.

3.2.1.3.3 Record Retention Records shall be maintained for one year from date of test.

3.2.1.3.4 Alternative IP Compliance. Supplier may request an exception from IP testing provided supplier can demonstrate that sufficient process controls are in place so as to make IP testing unnecessary. Approval is to be provided by either GM Supplier Quality Engineering or the GM Design Responsible Engineer. The period of testing is six months and may vary depending on data shown by supplier. GM Supplier Quality Engineering or the GM Design Responsible Engineer will determine final IP period.

3.2.1.3.5 Deviations from this Standard. Deviations from the requirements of this standard must have prior written approval from the responsible GM BFO Engineer. Such requirements shall be specified on component drawings, test certificates, reports, etc.

3.2.2 Physical Characteristics. See 3.3.2.1.

3.2.2.1 Dimensions and Capacity. See 3.3.2.1.

3.2.2.2 Mass Properties. Not applicable.

3.2.3 Reliability.

3.2.3.1 Reliability Evaluation Point. Not applicable.

3.2.3.2 Reliability Requirements. Components must demonstrate the required reliability of 99% at a 50% confidence (R99C50) and slope of 2, at the REP for the refrigerant plumbing line. The supplier shall utilize "vehicle equivalent" laboratory test setups to simulate "in vehicle" orientations. If the orientation may be different from vehicle to vehicle, use the orientation which will provide the worst-case loads, for all physical level reliability demonstration testing. Refer to GMW14156 Test Reliability Requirements Guidelines, and GMW14157 Statistical Confidence Level for Reliability Validation Testing. The supplier shall be documented and submitted to the responsible GM Validation and Supplier Quality Engineers as part of both Design Validation and Production Part Approval Process (PPAP).

3.2.3.3 Class 1 and Class 2 Type Problems. Not applicable.

3.2.4 Serviceability. Not applicable.

3.2.5 User System/Subsystem/Component/Part Interface. Not applicable.

3.3 Design and Construction.

3.3.1 Materials, Processes and Parts Selection Guidelines. See 3.3.2.1.

3.3.1.1 Material Guidelines. Not applicable.

3.3.1.1.1 Recycling Guidelines, GMW3116. Materials developed to this specification shall be optimized to provide maximum end-of-life cycle value utilizing the Recyclability Checklist and GM Recycling Design Guidelines. Recycled content shall be reported to the approving and procuring Materials Engineering Department utilizing the Recycled Content Report Form. Reference the Recyclability/Recoverability Guidelines, GMW3116.

3.3.1.2 Processes Guidelines. All production air conditioning refrigerant fitting shipping caps must be manufactured using the same materials and processes used to manufacture the originally approved sample air conditioning refrigerant shipping caps. No change is permissible without prior written approval from the responsible GM BFO Engineer.

3.3.1.3 Parts Guidelines. Not applicable.

3.3.2 Design Guidelines and Constraints.

3.3.2.1 Drawing Requirements. A/C refrigerant fitting shipping cap must meet the design specifications on the individual detail drawings approved by GM (reference GM Drawing 13531644).