



Coolant System Surge Tank Assembly

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 establishes the requirements for a Coolant System Surge Tank Assembly. The functions, performance, design constraints, and validation required of the component are defined in this document. All requirements of this specification must be met in order to demonstrate design and production validation.

1.2 Applicability. Bill of Material (BOM) Row 344 Surge Tank.

1.3 Remarks. The Coolant System Surge Tank Assembly provides a pressurized reservoir for keeping the permanent coolant system pressure during the engine operation, coolant air separation, coolant expansion and contraction, and a fill port for the assembly plant. Its design is critical to the operation of the powertrain cooling system, as it must maintain a full, from the air separated coolant system. The engineering test schedule contained within this specification defines the minimum performance and durability criteria necessary for design and production validation. In addition, the minimum requirements for in process testing of on-going production are outlined. The schedule is intended as a supplement to normal material inspections, dimensional checking and in process controls, and should in no way adversely influence adherence to other inspection operations.

2 References

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

2.1 External Standards/Specifications.

ASTM D3012 ISO 4577 SAE J1344

2.2 GM Standards/Specifications.

GMW3059	GMW3191	GMW15758	GMW16594
GMW3116	GMW3420	GMW15760	GMW16955
GMW3172	GMW3431	GMW15862	

2.3 Additional References.

- CG2991 Surge Tank (High and Low Pressure) ADVP&R
- GM Part Number 13500354 Fill Neck drawing
- GM1738 Packaging and Identification Requirements for Production Parts
- Released GM Math Data and Released GM Drawing
- SOR Appendix B
- SOR Appendix C1
- Subsystem Technical Specification (SSTS)

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3 Requirements

3.1 System/Subsystem/Component/Part Definition.

3.1.1 Appearance. The tank shall not have any noticeable dents, scratches, twists or warp ages. The tank surface color and finish (as grain or gloss) shall be shown on the SOR Appendix C1 or the GM authorized drawing.

3.1.2 Content. See SOR Appendix C1.

3.1.2.1 Physical Content. See SOR Appendix C1.

3.1.2.2 Functional Content. See SOR Appendix C1.

3.1.3 Ambient Environment. The following is the ambient environment in which the Surge Tank Assembly must operate.

- a. Normal Operating Range: -40 °C to +125 °C.
- b. Maximum Under-Hood Temperature Excursions: -50 °C to +150 °C.
- c. Humidity Range: 0% to 100%.
- d. Altitude: -150 m to +4600 m.

3.1.3.1 Engine Compartment. All materials shall be resistance to the media they contact. Specification GMW16955 (Global Reference Fluids for Material Compatibility Testing) Table 1 defines the typically used fluids to test the part for resistance to fluids.

Note: Fluids A1/A2, D and G are suitable to use if the application requires them. The part drawing/math data shall call out the applicable items. Additional fluids, if applicable, shall be noted in the part drawing/math data.

3.1.4 Interfaces. Filler neck as GM drawing 13500354 mandatory.

3.1.5 Usage Definition. Not applicable.

3.1.6 Failure Mode and Effects Analysis (FMEA). Detailed design and process FMEAs shall be submitted to the GM Release Engineer and Validation Engineer and shall be maintained as part of the vendor records of the Design and Product Validation. The FMEAs shall be updated each time a design change occurs.

3.1.7 Finish. The surge tank assembly shall be free of burrs or any sharp edges, which may be detrimental to satisfactory assembly or safe handling.

3.2 Product Characteristics.

3.2.1 Performance Requirements.

- a. Validation of surge tanks will be done through vendor laboratory tests and vehicle durability and performance testing at GM Laboratory and Proving Ground facilities (see Appendix A, Figure A1 for the Sequence Test Chart). Specific validation tests include, but are not limited to, the following tests defined in this specification.
- b. The tank shall be filled during the bench tests (except the creep test) with coolant volume comprised of 50% by volume anti-freezing agent to GMW3420 and 50% volume clean, drinkable water.
- c. The tank shall be fill to mark pointed to on the front of the coolant surge tank. Fill level tolerance: + 15 mm.
- d. The medium/fluid flow direction shall be the same as in the car cooling circuit.
- e. Temperature tolerances for all bench test values: ± 2 °C.
- f. Pressure tolerances for all bench test values: ± 5 kPa.
- g. The tank shall be install on a rigid frame, in vehicle position, using representative mounting and fasteners.

3.2.1.1 Fixed-Value Performance Testing Requirements.

3.2.1.1.1 Flow Capacity/Characteristic.

3.2.1.1.1.1 Install the tank and the coolant circulation as follows:

- a. Tank position: Horizontal and tilted ± 16 degrees in-and-across the drive direction.
- b. Liquid flow rate: Minimum 0.1 dm³/sec (6 L/minute). If otherwise specified: See SSTS (SOR Appendix C1) 3.1.

3.2.1.1.1.2 Acceptance Criteria.

- a. Not foaming allowed by fluid injection.

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- b. No swirl or low coolant level in outlet/return fitting chamber, no suction from air bubbles thru the outlet/return spigot allowed
- c. Not exceed 3 mm of coolant height difference in chambers, (only horizontal tank position).

3.2.1.1.2 Internal/External Dryness/Cleanliness. All assemblies shall be thoroughly dry, prior to shipment. Parts shall not include any debris and not be exposed contaminations or durable lubes. Oil, grease or any contaminants may interfere with proper handling or cause plugging or have a detrimental effect on the material and function properties.

3.2.1.1.3 Production Qualification. Surge tank must comply with the following functional requirements:

- a. The surge tank shall be capable of sustaining a GM Plant Fill flow rate of 1 dm³/sec (60 L/minute) at 200 kPa for a period of 2 minutes without experiencing any form of failure, damage or loss of function.
- b. The surge tank shall be capable of sustaining GM Plant Fill vacuum of 1.5 kPa (absolute pressure) for the duration of 1 minute without experiencing failure, damage or loss of function.
- c. The surge tank fill neck shall be capable of withstanding a torque of 12 N·m minimum without failure, damage or loss of function.

3.2.1.2 Endurance Testing Requirements. Following requirements shall be fulfilled as design confirmation and approval.

3.2.1.2.1 Pre-test and Post-test. The following tests shall be performed on all samples before and after each test series.

3.2.1.2.1.1 Leak Test.

3.2.1.2.1.1.1 Drain the tank completely.

3.2.1.2.1.1.2 Increase tank inlet fitting air pressure from 0.0 kPa to 300.0 kPa over 30 s and hold.

3.2.1.2.1.1.3 Acceptance Criteria. Tank must not leak at a rate > 0.005 L/minute (5 cm³/minute).

3.2.1.2.1.2 Torque-ON/Torque-OFF Test.

3.2.1.2.1.2.1 Install cap onto tank, recording the torque required to reach the stop point, (highest withstand reading on the signal hump, before the stop is reached is not relevant) immediately remove the cap, recording the breakaway torque required.

3.2.1.2.1.2.2 Acceptance Criteria. The torque on/off result shall be between 1.0 N·m -0.3 N·m and 3.0 N·m +1.0 N·m.

3.2.1.2.1.3 Visual inspection.

3.2.1.2.1.3.1 Samples and Checks.

- a. Outside surface, welding seam, spigots.
- b. Cross sections at critical areas. Samples after the tests affected only.

3.2.1.2.1.3.2 Acceptance Criteria. No visible cracks, damage or deformations allowed on the inside or outside surface, spigots and filler neck, which are significant enough to lead affecting a normal fit, function or durability. No significant discoloration allowed.

3.2.1.2.1.4 Coolant Level Sensor and Float Test.

3.2.1.2.1.4.1 Place the surge tank in a fixture such that it is resting in the in-vehicle (as installed in vehicle) position at +23 °C. The float should be pushed to the down (using a small rod). Repeat this condition 20 times.

3.2.1.2.1.4.2 Electrical functionality check.

3.2.1.2.1.4.3 Acceptance Criteria. The sensor float shall demonstrate proper buoyancy in the coolant/water mixture. 100% electrical switch functionality is required.

3.2.1.2.2 Life Cycle Test/Pressure (Creep) Test. The following test shall be performed on samples used in the temperature soak test 3.2.1.2.4.

3.2.1.2.2.1 Place the surge tank in the test fixture in the test chamber. Heat the test liquid up to +130 °C, before the flow through the surge tank starts.

3.2.1.2.2.2 Test Conditions.

- a. Test liquid: Coolant by 100% agent to GMW3420 for Polypropylene tank material.
- b. Test liquid: Coolant by 70% volume agent to GMW3420 and 30% volume water for other materials.

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