



Electric Coolant Pump Component Technical Specification

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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 for 12 V electric coolant pumps for automotive applications.

1.2 Applicability. This standard stipulates the requirements and validation tests for electric coolant pumps that are to be used in any coolant circuit.

1.3 Remarks. The electric coolant pumps may be used in a variety of applications, such as, but not limited to, auxiliary heater, power electronics, after boil, battery cooling, charge air cooling, and exhaust gas recirculation (EGR) valves, and are magnetically coupled, centrifugal pumps.

2 References

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

2.1 External Standards/Specifications.

IPC-A-610	ISO 16232	SAE J1726
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2.2 GM Standards/Specifications.

9984120	9986284	GMW3420	GMW15272
9984123	GMW2	GMW3600	GMW15758
9985010	GMW3059	GMW14089	GMW15862
9985809	GMW3091	GMW14156 (ID)	GMW16037
9986086	GMW3097	GMW14157 (ID)	GMW16625
9986117	GMW3103	GMW14386	GMW17010
9986153	GMW3155	GMW14387	GMW17144
9986177	GMW3172	GMW14671	GMW17332
9986196	GMW3191	GMW14872	GMW17388

Note: (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.

- CG3018, ADVP&R template (internal).
- GMPT-5-005-A.
- GMPT-5-019-A.
- Part Number 1052626.
- Statement of Requirements (SOR) Appendix C2, G2, G3, Q.
- VTS.

3 Requirements

3.1 System/Subsystem/Component/Part Definition.

3.1.1 Appearance. Not applicable.

3.1.2 Content. Not applicable.

3.1.2.1 Physical Content. Not applicable.

3.1.2.2 Functional Content. Not applicable.

3.1.3 Ambient Environment.

3.1.3.1 The electric coolant pump complying with this specification shall be capable of operating in one of the following environments, see Statement of Requirements (SOR) Appendix C2 for ambient environment selection.

3.1.3.1.1 GMW3172 Code Letter for Temperature, Code Letter "H". See Table 1.

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Table 1: GMW3172 Temperature Code Letter "H" Details

Medium	Continuous	Excursion
Ambient	(-40 to +125) °C	140 °C
Coolant	(-40 to +120) °C	130 °C

3.1.3.1.2 GMW3172 Code Letter for Temperature, Code Letter "F". See Table 2.

Table 2: GMW3172 Temperature Code Letter "F" Details

Medium	Continuous	Excursion
Ambient	(-40 to +105) °C	120 °C
Coolant	(-40 to +75) °C	90 °C

3.1.3.2 Climatic Load. The electric coolant pump complying with this specification shall be capable of operating in GMW3172 Climatic Loads Code Letter "C".

3.1.3.3 Chemical Load. The electric coolant pump complying with this specification shall be capable of operating in GMW3172 Chemical Loads Code Letter "E".

3.1.3.4 Dust and Water Intrusion. The electric coolant pump complying with this specification shall be capable of operating in GMW3172 Dust and Water International Protection Codes IP6K9K and IP6K8.

3.1.4 Interfaces. See 3.2.2.1.

3.1.5 Usage Definition. See 1.3.

3.2 Product Characteristics.

3.2.1 Performance Requirements. The pump must comply with GMW3172. See Section 4 Validation for required tests to be conducted. All requirements listed shall be met throughout the expected life of the component and at the conclusion of all validation tests.

Refer to GMW17388 for software validation requirements.

3.2.1.1 Mechanical.

3.2.1.1.1 Flow Rate. The pump design shall be based on three operating points (hot, cold, target), defined as flow rate versus a specified pressure drop at a given coolant temperature (50% dexcool®, 50% water mix). These three operating points will be described in SOR Appendix C2.

Production variation of flow performance shall be no $> \pm 5\%$ at maximum pump speed, 23 °C coolant temperature, (13 ± 0.1) V.

- Hot thermal condition; see SOR Appendix C2.
- Cold thermal condition set at 5 °C coolant temperature; see SOR Appendix C2.
- Target operating point; see SOR Appendix C2.

3.2.1.1.2 Life Durability. The electric coolant pump complying with this specification shall achieve one of the following life durability; see SOR Appendix C2 for the running life selection:

3.2.1.1.2.1 Running life requirement of 6500 h; e.g., heater loop.

3.2.1.1.2.2 Running life requirement of 10 000 h; e.g., power electronics (no charger) or Charge Air Cooler (CAC) coolant loop.

3.2.1.1.2.3 Running life requirement of 10 000 h and 55 000 h design-intent target; e.g., RESS, charger loop.

3.2.1.1.3 Cycle Durability. The electric coolant pump complying with this specification shall achieve one of the following cycle durability; see SOR Appendix C2 for the cycle durability selection. One cycle defined as pump impeller starts at 0 rpm, is powered to reach maximum rpm and flow, and then brought to rest (0 rpm).

3.2.1.1.3.1 Two hundred fifty thousand (250 000) cycles.

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3.2.1.1.3.2 One million (1 000 000) cycles.

3.2.1.1.4 Overall Peak Efficiency. The electric coolant pump complying with this specification shall achieve one of the following overall peak efficiencies, see SOR Appendix C2 for the overall efficiency selection.

Note: Overall Peak Efficiency = Hydraulic Power/Electrical Power Consumed.

3.2.1.1.4.1 Overall peak efficiency of 45%.

3.2.1.1.4.2 Overall peak efficiency of 20%.

3.2.1.1.5 In-Vehicle Mounting. The electric coolant pump complying with this specification shall operate under one of the following mechanical loads conditions (mounting location): Engine Compartment: On engine (Heavy Duty Trucks Application).

Exact test plan to be approved with the GM GMW3172 Electrical Environmental Engineer: Engine Compartment: On engine (Heavy Duty Trucks Application).

Exact test plan to be approved with the GM GMW3172 Electrical Environmental Engineer.

3.2.1.1.5.1 Pump will be powertrain mounted; GMW3172 Mechanical Load Code Letter "A".

3.2.1.1.5.2 Pump will be body (including Condenser Radiator Fan Module (CRFM)) mounted; GMW3172 Mechanical Load Code Letter "G".

3.2.1.1.6 Mounting Orientation. Pump performance shall not be affected by pump spatial orientation. That is the relationship of the axis of the impeller rotation to global coordinates.

3.2.1.1.7 Bracket Natural Frequency. The electric coolant pump complying with this specification shall have a bracket used to attach to the vehicle and will meet one of the following natural frequencies; see SOR Appendix C2 for the pump mounting capability selection:

3.2.1.1.7.1 Bracket is to be > 45 Hz for body mount.

3.2.1.1.7.2 Bracket is to be > 240 Hz for powertrain mount.

3.2.1.1.8 Burst. Minimum burst strength of pump/impeller housing shall be no < 400 kPa.

3.2.1.1.9 Noise and Vibration. See SOR Appendix C2 for noise and vibration requirements.

3.2.1.1.9.1 Bracket Vibration. Refer to GMW17010 for bracket vibration requirements and testing.

3.2.1.1.10 Leakage. Pump shall not leak.

3.2.1.1.11 Bracket Corrosion. Bracket shall comply with GMW14872 and GMW15272 for VTS Template Requirement Suffix Underhood "H".

3.2.1.1.12 Cleanliness.

- a. The parts as delivered to the assembly location shall be clean and free of debris, residual abrasive material, water and corrosion products adversely affecting function or appearance. The internal parts shall be free of burrs, sharp corners, etc., which may be detrimental to assembly and function.
- b. Debris on the interior and exterior of the finished parts shall be regularly monitored and controlled using statistical methods, upper control limits, and procedures approved by GM Manufacturing Engineering and defined in the Supplier process control plan.
- c. The shipped volume of water shall be < 0.1% of the internal volume. Contamination in all shipping liquids shall be counted towards total contaminants. All liquid used shall be checked to ensure that it carries < 10 ppm of silicates and 10 ppm of borates (by volume).
- d. The soluble and solid residues of internal surface area of the component which can be washed away with solvent shall not contain any abrasive materials.
- e. All components shall be shipped/handled capped through final vehicle assembly.
- f. The pump shall not be contaminated with residues, such as deposits, scale, cuttings, flash, or grease.
- g. Test according to SAE J1726.
- h. The maximum permissible contaminations due to flushable, soluble and solid residues shall be ≤ 15 mg/L, with respect to the internal volume, 40% maximum may be soluble and 60% maximum insoluble.
- i. No particle size shall be bigger than 1 mm in its largest dimension. Maximum debris particle area is 2.25 mm².
- j. GM may require the Supplier to alter or suspend the use of unacceptable manufacturing process materials.

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