



Temperature Shock Submersion Test (Axle, Rear Drive Module (RDM), Front Drive Unit (FDU), Power Transfer Unit (PTU), Transfer Case)

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. To evaluate the submersion capability of a Driveline component and verify its immunity to loss of seal and ingress of water during a thermal shock induced by ice water.

1.2 Applicability. This procedure is applicable to Axles, Rear Drive Modules (RDM), Front Drive Units (FDU), Transfer Cases, and Power Transfer Units (PTU) in the splash areas of the vehicle. It is for use in passenger cars and light trucks.

1.3 Remarks. This procedure intends to simulate boat launch conditions, water fording, and thermal shock conditions that could result in vacuum conditions/pressure differentials that draw moisture into the drive unit.

Failure modes are mechanical cracking of materials or seal failures caused by different temperature expansion coefficients, loss of tightness and the intrusion of water into the system.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

9986290

2.3 Additional References.

- CG4433
- Component Technical Specification (CTS)
- Statement of Requirements (SOR)
- Subsystem Technical Specification (SSTS) (for Axle or Rear Drive Module)
- Validation Cross Reference Index (VCRI)

3 Resources

3.1 Facilities.

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

3.1.2 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.

3.2 Equipment.

3.2.1 Oven capable of allowing entire Device Under Test (DUT) to be heated to 135 °C (275 °F).

3.2.2 Water holding tank capable of allowing entire DUT to be submerged.

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3.2.3 Ice or cold water as required to bring water in holding tank to 0 °C to 2 °C (32 °F to 36 °F).

3.2.4 A mechanism which will allow the DUT to be lifted and/or lowered into a submersion tank. Level the DUT parallel to the ground.

3.2.5 Pressure transducer and pressure monitoring equipment (pressure vs. time).

3.2.6 Thermocouples and temperature monitoring equipment (temperature vs. time).

3.3 Test Vehicle/Test Piece. DUT outfitted with pressure and temperature sensors.

Note: Use existing ports in DUT housing to install sensors. Do not disturb vent tube or vent fitting on DUT.

3.4 Test Time.

Calendar time: 1 day

Test hours: 4 hours

Coordination hours: 4 hours

3.5 Test Required Information. Possible sources are:

- Component Technical Specification (CTS)
- Statement of Requirements (SOR)
- Subsystem Technical Specification (SSTS) (for Axle or Rear Drive Module)
- Validation Cross Reference Index (VCRI)

3.5.1 Additional customer requests or requirements must be provided in writing prior to start of test.

3.5.2 The ambient environment for the DUT(s) should be maintained in accordance with manufacturer specifications.

3.5.3 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.

3.5.4 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.

3.5.5 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.

3.5.6 Ascertain the following requirements from the appropriate sources and record on Data Sheet CG4433.

3.5.6.1 Maximum water content allowable posttest: _____.

3.5.6.2 Torques for fill and drain plugs: _____ N·m (lbf·in).

3.5.6.3 Water submersion time: _____ minutes.

3.5.6.4 Pinion angle as defined in SSTS: _____ degrees.

3.5.6.5 Water submersion depth: _____ (Complete or to centerline of wheel).

3.5.6.6 Gear oil amount and type: _____ (Example: 0.7 L of 9986290, which is 75W90 synthetic gear oil with a friction modifier).

Note: Collect a pretest lube sample prior to heating axle in oven. Label sample accordingly.

3.5.6.7 Maximum allowable internal static pressure above atmosphere: _____ kPa (psi).

3.6 Personnel/Skills. Test technician should be proficient in operation of the equipment listed in 3.2.

4 Procedure

4.1 Preparation.

4.1.1 Preheat oven to 135 °C (275 °F). (See SSTS for actual requirement.)

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