



Cycle Fatigue Test

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 provides a procedure for cycle fatigue testing in order to develop and validate clutch assemblies and components.

1.2 Applicability. Cycle fatigue testing within shifting systems tests clutch components or assemblies that includes: clutch housings, return springs, snap rings, separator springs, backing plates, and wave plates.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- All Test Book standard document templates can be found under the link:
https://gmweb.gm.com/sites/IQ_EngineeringLabs/Document%20Controls/Forms/AllItems.aspx (ID)
- MTS Systems Corporation, Eden Prairie, Minnesota (www.mts.com)
- Statement of Requirements (SOR)

2.3.1 Links for Appendix A2 Examples (ID).

- <https://documents.gm.com/gdm3/drl/objectId/090163bd80d57372/chronicleId/090163bd80d57372>
- <https://documents.gm.com/gdm3/drl/objectId/090163bd80cf9736/chronicleId/090163bd80cf9736>
- <https://documents.gm.com/gdm3/drl/objectId/090163bd80d57373/chronicleId/090163bd80d57373>
- <https://documents.gm.com/gdm3/drl/objectId/090163bd80d5c8de/chronicleId/090163bd80d5c8de>
- <https://documents.gm.com/gdm3/drl/objectId/090163bd80d57843/chronicleId/090163bd80d57843>

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

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. Reference Appendix A, Section A1.

3.2.1 Global Propulsion Systems (GPS) Pontiac Engineering Center Laboratory Equipment Designations.

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3.2.1.1 Load frame table capable of applying loads at 100 kN (e.g., High Load Frame 1 (HLF) 1, HLF2, Gear Tooth Bender 1 (GTB) 1, and GTB2 from Pontiac GPS Engineering Laboratories).

3.2.1.2 Load frame table capable of applying loads at 100 kN and 2300 N·m (e.g., Axial Torsional Non Wobble (ATNW), from Pontiac GPS Engineering Laboratories).

3.2.1.3 Load frame table capable of applying loads at 50 kN, 1200 N·m, and 25 degrees wobble (e.g., Axial Torsional Wobble (ATWB), from Pontiac GPS Engineering Laboratories).

3.3 Test Vehicle/Test Piece. All applicable clutch components and assemblies.

3.3.1 A clutch assembly consists of various components. The specific components needed for test varies from clutch to clutch. The components required should be the minimal required, and will vary from test to test (e.g., some tests will require as little as a fixture and a return spring, while others will require an entire clutch assembly).

3.4 Test Time. For each cycle fatigue test, the time of completion varies from part to part. A Statement of Requirements (SOR) is created for supplier testing. Refer to the SOR for test timing for validation testing. For development testing, the Design Release Engineer (DRE) should specify test time.

3.5 Test Required Information. The parameters required to run a cyclic fatigue test are:

- a. Frequency (Hertz).
- b. Number of cycles.
- c. In test inspection cycle count and frequency (if applicable).
- d. Maximum displacement or force (millimeters/Newton).
- e. Number of samples needed to be tested.
- f. Part numbers of samples.
- g. Part numbers of parts used as fixtures (if applicable).
- h. Square wave or sinusoidal wave form for displacement or force application.
- i. Component free height (if applicable) (millimeters).
- j. Component installed height (if applicable) (millimeters).
- k. Lubrication needed (if applicable).
- l. Temperature (if applicable).
- m. Pressure (if applicable).
- n. Torque (if applicable) for ATNW and ATWB.
- o. Angle (if applicable) for ATWB.
- p. Displacement termination limit (10% above Start of Test (SOT) default, > 10% for cycles to failure).
- q. Force termination limit (5% above maximum force default).
- r. Premeasurement test matrix (if applicable).
- s. Load deflection before test (if applicable).
- t. Load deflection after test (if applicable).
- u. Type of lubricant.
- v. Lubrication schedule.
- w. Torque specification (if applicable).
- x. Fixture specification, i.e., simple flat plate or special fixture.

3.6 Personnel/Skills. Personnel should be properly trained to use load frame machinery. The personnel conducting the test also should be trained to set up and run servo hydraulic controllers.

4 Procedure

4.1 Preparation. All fixturing should replicate mating transmission components. Ensure that the fixture has a design that allows for the fixture to be centered and held down to the test bench, and has the correct installed height.

4.1.1 For measuring free height of sample use an inspection lab with calibrated equipment. (If applicable).

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