



Non-spinning Clutch Pressure Cycle Durability – Stroker 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. The purpose of stroker testing is to be able to conduct testing in order to develop and validate clutch assemblies and components.

1.2 Applicability. Stroker testing within the shifting system tests clutch components that include: clutch housings, pistons, dams, seals, return springs, separator springs, snap rings, reaction plates, backing plates, friction 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.

- MTS Systems Corporation, Eden Prairie, Minnesota (www.mts.com)
- Performance and Quality Management System (PQMS) Test Request (<https://gmweb.gm.com/sites/PQMS/Pages/Home.aspx>) (ID)
- Statement of Requirements (SOR)

2.3.1 Information Quality (IQ) Forms. All IQ forms can be found at:
(https://gmweb.gm.com/sites/IQ_EngineeringLabs/Document%20Controls/Forms/AllItems.aspx) (ID)

- IQ Identification (ID) Form 236 (current revision level) Critical Data Sheet
- IQ ID Number 3490
- IQ ID Number 3496

(ID) = This website is limited to internal use 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.

3.2.1 Test Benches. Located at the Pontiac Engineering Center, Global Propulsion Systems Laboratory: PT01A, PT01B, PT02A, PT02B, PT03A, PT03B, PT04A, PT04B, PT24, PT26, PT29, PT30, PT50, PT70, and PT80.

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Note: Reference Appendix A (Figures A1, A2 and A3) for additional test equipment capability information.

3.3 Test Vehicle/Test Piece. Automatic Transmissions clutch components and assemblies.

A clutch assembly requires various parts. The specific parts needed to run the test varies from clutch to clutch. The parts required are the minimal amount of parts to replicate a full transmission condition. Consult the GM Lead Engineer for further instructions.

3.4 Test Time. For each stroker test, the time of completion varies from clutch to clutch. A Statement of Requirements (SOR) is created for supplier testing. Refer to the SOR or Analysis, Development, and Validation (ADV) plan for test time for validation testing. For development testing, the Design Release Engineer (DRE) should specify test time.

Test time is based off of frequency, and number of cycles.

$$\frac{\left(\frac{\text{Cycles}}{\text{Frequency}}\right)}{(60 * 60 * 24)} = \text{number of days until completion}$$

Coordination time includes:

- Test Set Up: 4 h.
- Build room build: 1 day to 7 days.
- Build room teardown: 1 day to 7 days.

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

- a. Frequency (Hertz).
- b. Number of cycles.
- c. Pressure(s) (kilopascals).
- d. Temperature of oil (degrees Celsius).
- e. Number of samples needed to be tested.
- f. Type of oil (e.g., Dexron® VI, Ultra Low Viscosity (ULV), Automatic Transmission Fluid (ATF) 212B, High Performance Continuously Variable Transmission (HPCVT) Fluid, etc.)
- g. Square wave or sinusoidal wave form for pressure application.

3.6 Personnel/Skills. Technician/test engineer trained in the use of pressure cycle benches. The personnel conducting the test also should be trained to set up and run MTS Model 407 test controllers.

4 Procedure

4.1 Preparation.

4.1.1 Before putting clutch system on test, the clutch travel and leak check data must be recorded. These two items can be done through a Performance and Quality Management System (PQMS) request to the build room located at the Pontiac Engineering Center.

4.1.2 Before the test starts take detailed photographs of the part being tested for later comparison.

4.1.3 The component lab engineer or technician will set up the parameters listed in 3.5 using either a MTS Model 407 test controller or a main frame computer, attached to the pressure cycle bench. The limits are set to $\pm 5\%$ of the set maximum pressure unless specified otherwise.

4.1.4 Heat the test stand starts to the temperature as specified in 3.5.

4.1.5 Install parts or fixture with properly sized quick disconnects to prevent oil back pressure. Before or during the heat up process, the parts are placed in the stand and attached to oil pressure lines via quick disconnects.

4.2 Conditions.

4.2.1 Environmental Conditions. The test should be contained in a sealed chamber with proper ventilation.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions. After the desired temperature from 3.5 is reached, and components, hardware, and instrumentation is connected, the test is activated. A technician will regularly record the maximum and minimum pressures observed, and the cycle count. The parts are also inspected for abnormal running conditions through

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