



External Shift Mechanism Durability Bench Test (FWD)

1 Scope

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. Determination of durability for external cable-controlled gear shift mechanism (FWD).

1.2 Foreword. For the evaluation of functionality and durability of external cable and rod-controlled gear shift mechanism the performance of this bench tests is mandatory.

1.3 Applicability. Applicable for all FWD cable and rod-controlled gear shift systems.

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. SSTS, VTS

3 Resources

3.1 Facilities.

3.1.1 Control and monitoring systems for followings:

- Shifting force (dynamometer)
- Shifting travel (cable-controlled potentiometer)
- Test temperature (temperature regulator with integral limit value monitoring)

3.1.2 Measurement and control cabinet for pneumatic and electronic regulation of the air cylinder and control device.

3.1.3 Temperature control device of shift-control housing and transmission connection.

3.2 Equipment.

3.2.1 X/Y-recorder.

3.3 Test Vehicle/Test Piece. Complete external shift system or specific test parts.

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Originating Department: GME Specification Center

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3.4 Test Time.

Calendar time: 28 days

Test hours: Not applicable

Coordination hours: Not applicable

3.5 Test Required Information. Possible sources are:

- VTS
- SSTs
- Application engineer
- Development Groups
- Drawings

3.6 Personnel/Skills. Not applicable.**4 Procedure****4.1 Preparation.** Prior to the test, the following steps shall be performed:

- All Forces and travel refer to the LAP.
- The test parts shall be installed as specified by installation drawing.
- The gear shift travel shall be adjusted according to specification.
- The shift travel at the transmission shall be limited to the nominal shift lever travel.
- Dynamometer and recorder shall be balanced.
- The load cycle counter shall be set to the nominal count.
- The transmission shall be prepared with a device, which assures the specified counterforce to the LAP.
- The select forces are covered by the counterforce of the select spring.

4.1.1 LAP. The load application point (LAP) is the largest radius of the shift lever at the shift lever knob relative to the rotation (pivot) point in the shift-lever housing.

The load application point is simultaneously the measuring radius, i.e., the point where all the resulting displacements and/or deformations shall be determined.

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Figure 1: LAP Cable-shift System

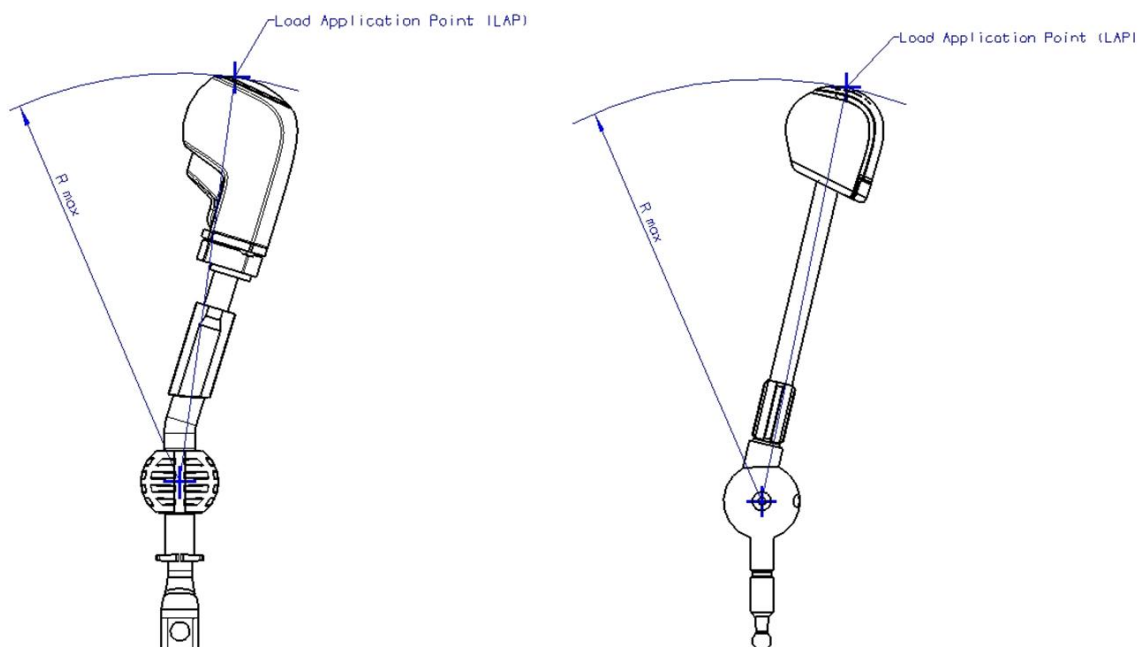
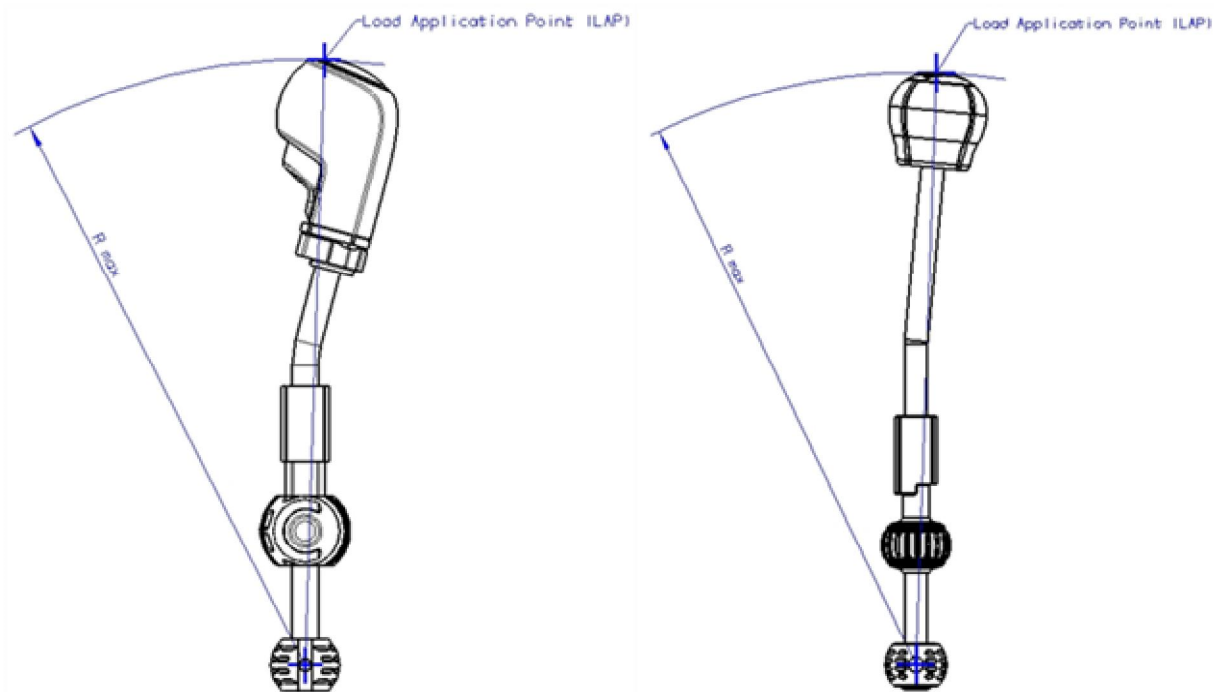


Figure 2: LAP Rod-shift System



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4.2 Conditions.

4.2.1 Environmental Conditions. If not defined otherwise all measurements shall be performed at $(+23 \pm 3) ^\circ\text{C}$.

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.

4.3.1 General.

4.3.1.1 The service life test shall be performed in all gears according specified test cycles in Appendix B.

4.3.1.2 The shift sequences for the different transmission types are specified in Appendix B.

4.3.2 Forces and Cycles.

4.3.2.1 Test cycles description according to Appendix B:

- The force in shift direction is applied at the shift lever knob and shall be maintained from the neutral gate up to the end stop (travel force).
- The "standard" shifts to be performed at (120 ± 10) N stop force.
- The "high load" shifts to be performed at (175 ± 10) N stop force.
- The force travel for all 25 000 cycles shall be performed at (80 ± 10) N.
- Total number of standard cycles shall be 25 000.
- The shift speed shall be in the range of (120 to 160) mm/s.
- The select speed shall be in the range of (150 to 250) mm/s.

4.3.2.2 Temperature Cycle. The procedures in paragraph 4.3.2.1 shall be performed under a temperature cycle according to Appendix C1.

Deviations from this temperature cycle shall be stated in the SSTS and shall be mentioned in the code. The temperature changes shall be done in equal intervals.

4.3.2.3 Force-Travel Characteristic. See Appendix A.

4.3.3 Performance. The following steps shall be performed:

4.3.3.1 The temperature control device shall be switched on.

4.3.3.2 The pneumatics shall be started.

4.3.3.3 The movement phase force at the hydraulic damping cylinder shall be adjusted.

4.3.3.4 The forces according to the X/Y recorder display shall be checked twice a day in equal intervals.

4.3.3.5 The force travel diagram shall be documented at the beginning and end of the test, as well as once per day.

4.3.4 Optional Modules.

4.3.4.1 Special Application Hot Spots. As Special application hot spots there are considered the Terminal, Bracket and the cable pass through Grommet.

Ensure a higher temperature at those special application hot spots via heat gun. These higher temperatures shall be applied on every third temperature cycle according to Appendix D.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation.

5.3.1 Transmission Data. Record name and number of all parts removed or installed (shift housing, cable, shifter, bracket, grommet), test rig and transmission numbers, test hours on parts and on transmission, together with reason why parts were eventually removed.

5.3.2 Comment. Report a detailed comment of the measurement results and of mechanism and individual components performance.

5.3.3 Rating. Report a detailed comment of shift mechanism behavior and of individual components (for evaluation criteria, see the SSTS).

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