



Shiftability of Manual Transmission (dynamic)

1 Scope

Note: Nothing in this standard supersedes 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. Rating of dynamic shift effort of manual transmissions in vehicle by recording shift effort versus time.

1.2 Foreword. This Test Procedure was formerly known as GME L-7A-1.

1.3 Applicability. This procedure is applicable for testing all FWD, AWD and RWD transmission.

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.

SOR, VTS, SSTS, ADV Plan, VCRI

3 Resources

The test facilities and equipment shall be operable and shall have a valid calibration level.

3.1 Facilities.

3.1.1 Secured track to allow accelerations and stand still.

3.1.2 Climate chamber.

3.2 Equipment.

3.2.1 Sensors for transmission oil sump temperature and ambient temperature.

3.2.2 Attached tachometer and speedometer.

3.2.3 Measuring system to record shift force versus shift time.

3.2.4 Writing materials.

3.3 Test Vehicle/Test Piece.

3.3.1 New Transmission, assembled according to specification.

3.3.2 The program shall be performed with two transmissions.

3.3.3 The engine type and the vehicle equipment shall correspond to the release.

3.4 Test Time. Not applicable.

3.5 Test Required Information.

- SOR
- VTS
- SSTS
- ADV Plan
- VCRI
- Application Engineer
- Development Groups
- Drawings

For further information see paragraph 5.2.2.

3.6 Personnel/Skills. Not applicable.

4 Procedure

4.1 Preparation.

4.1.1 If a new transmission / transaxle is installed it shall be run in with shifting into each gear 50 times at low force.

4.1.2 Vehicle weight is not relevant.

4.1.3 Install measurement equipment to determine shift force, shift time and if requested shift at the required position travel and transmission input shaft speed.

4.1.4 Check fuel engine oil, cooling fluid and tire pressure, transmission oil level, clutch pedal travel and shift lever adjustment and adjust if necessary.

4.1.5 For cold shiftability measurement cool down the car (see paragraph 4.3).

4.2 Conditions.

4.2.1 Environmental Conditions. Test shall be performed on a dry surface.

GM Confidential

© Copyright 2011 General Motors Company All Rights Reserved

July 2011

Originating Department: GME Specification Center

Page 1 of 4

Documents

Document Sharing Hub



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.

Note: If transmission oil temperature exceeds +170 °C, terminate test.

4.3.1 Measuring of shift force in cooling chamber on dynamometer or proving ground at a constant surrounding temperature:

4.3.1.1 Cold Measurement. See paragraph 4.3.2 and 4.3.3.

- Starting temperatures shall be reached without warm up run.
- A temperature adjustment is not permitted.
- Measurement shall be started immediately after engine start.

4.3.1.2 Warm Measurement. See paragraph 4.3.4.

- Starting temperature shall be reached by warm up run

4.3.2 Cold Measurement at 0 °C.

4.3.2.1 Procedure.

- Starting oil sump temperature 0 °C
- Up shifting at 2000 min⁻¹
- Down shifting at 1500 min⁻¹
- Shift cycle: 0-1, 1-2, 2-3, 3-2, 2-1, 1-0
- Number of cycles: 5
- One cycle ≅ 1 measure run

4.3.2.2 Measurement. As follows:

- Increase shift force after meeting the 'main synchronization' (hard pressure point) continuously.
- Shift force for 2-1 shall be between (130...160) N.
- The remaining shifts shall be performed similarly, but with lower force (130 N max.).

4.3.3 Cold Measurement at (-10 °C) and at (-20 °C).

4.3.3.1 Procedure.

- Starting oil sump temperature -10 °C and -20 °C
- Up shifting at 2000 min⁻¹
- Down shifting at 1500 min⁻¹
- Shift cycle: 0-1, 1-2, 2-3, 3-2, 2-1, 1-0
- Number of cycles: 5
- One cycle ≅ 1 measure run

4.3.3.2 Measurement. As follows:

- Increase shift force after meeting the 'main synchronization' (hard pressure point) continuously.
- Shift force for 2-1 shall be between (150 to 200) N.
- The remaining shifts shall be performed similarly, but with lower force (150 N max.).

4.3.4 Warm Measurement > +60 °C.

4.3.4.1 Procedure:

- Starting oil sump temperature > +60 °C.
- Up shifting at 4000 min⁻¹ (if not achievable, at 200 min⁻¹ below redline)
- Down shifting at 3000 min⁻¹
- Shift cycle: 0-1, 1-2, 2-3, 3-4, 4-5, (5-6, 6-5), 5-4, 4-3, 3-2, 2-1, 1-0
- Number of cycles: 5
- One cycle ≅ 1 measure run

4.3.4.2 Measurement. As follows:

- Increase shift force after meeting the 'main synchronization' (hard pressure point) continuously.
- Shift force for 2-1 shall be between (100...130) N.
- The remaining shifts shall be performed similarly, but with lower force (100 N max.).

5 Data

5.1 Calculations. Record the following data (the Test Engineer may require additional data):

- Transmission oil sump temperature
- Ambient temperature
- Engine type / engine km

5.2 Interpretation of Results.

5.2.1 Refer to SOR / VTS / SSTs for target data.

5.2.2 Unless otherwise specified in SSTs/VTS the target is fulfilled when shift times do not exceed:

- a shift time of 1.3 s at the 2-1 shift
- a shift time of 0.7 s at the remaining shifts

5.3 Test Documentation.

5.3.1 Transmission Data. Record name and number of all parts removed or installed (gear, reduction and overall ratio, type of oil and quantity), cell and transmission numbers, test hours on part and on transmission, together with reason part was eventual removed.

GM Confidential

© Copyright 2011 General Motors Company All Rights Reserved

July 2011

Page 2 of 4



Documents
Document Sharing Hub