



Select Travel Measurement Internal Shift Module

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 result identifies the select travel for each gear gate including adjustment position (if applicable) as functional requirement and interface data for external actuation systems.

1.2 Applicability. Manual transmission Internal Shift Module.

1.3 Remarks. Manual transmission Internal Shift Module.

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

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.

3.1.3 Test Bench. See paragraph 4.1.1

3.2 Equipment.

3.2.1 Force Sensor with a 1/100 N sensitivity for a force range of ± 50 N.

3.2.2 Travel Sensor with a 1/100mm sensitivity for a travel range of 50 mm minimum.

3.3 Test Piece. Manual Transmission Internal Shift System – Shift Module.

3.4 Test Time.

Calendar time: 5 days

Test hours: 7 h

Coordination hours: 14 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Technician/Engineer.

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4 Procedure

4.1 Preparation.

4.1.1 Test Rig and Measurement Set-Up. The shifter shall be mounted on transmission assembly (recommended) or rigid test rig including shift angle limiters. Shift angle shall be limited by end stops to avoid that gate guide pin is under preload at the end of gate.

The force and travel adaptation needs to follow the external shift pushrod direction and have the same pivot length. Adaption points are the select ball pin and pivot at external shift system abutment.

Measured values shall be:

- Cable travel acting in select cable direction (in mm).
- Force feedback acting in select cable direction (in N).

4.1.2 Orientation of Coordinate System. Positive select travel and force direction shall be towards 5/6 direction, negative travel and force direction shall be towards R direction. Origin shall be averaged gate of 3/4 position (see paragraph 4.3).

4.2 Conditions.

4.2.1 Environmental Conditions. The test shall be performed at $(+23 \pm 5) ^\circ\text{C}$ (room temperature).

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 Record travel vs. force response of select system when pushing in R and 5/(6) direction each in engaged 3rd and 4th gear with a force up to ± 50 N. Push/Pull three times manually or actuator (2 mm/s measurement speed and force control recommended).

4.3.2 Averaged travel of gate widths to be calculated and set as reference value. Set system to zero at averaged 3/4 gate.

4.3.3 Repeat paragraph 4.3.1 for gear 1, 2, 5, 6, R and adjustment- and neutral- positions up to 15 N (see Appendix A, Table A1) for individual force level.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results.

5.2.1 Analysis of Measured Data. Travel loss generated by test setup shall be added to measured values.

For each gear, Adjustment and Neutral Position:

- Read out averaged min and max travel value from three times actuation at specified forces
- Read out averaged free play travel value from three times actuation at specified forces
- Calculate gate width
- Calculate gate step
- Calculate average

5.3 Test Documentation. See Appendix A, Table A2.

6 Safety

This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices. This would include any specific training that may be required. The safety and health standards include site specific rules and procedures, company rules and procedures, and Government Standards. Contact shall be made with the appropriate site Safety and Health personnel for further direction and guidance in these matters.

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