



Stop and Go 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. Test of manual transmission, clutch, linings and flywheel by means of a test drive. Determination of the integrity of the complete drive train in a road test. Test simulates severe Customer vehicle usage (max. engine speed & max. payload) during Stop & Go Traffic.

Note: Prevent any Misuse Loads to the transmission system while executing this test.

1.2 Applicability. Not applicable.

1.3 Remarks. For all FWD, AWD and RWD manual transmissions and dry friction clutch system.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14264

GMW15628

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 Circular track and hill tracks with grades of 0 %, 8 % and 12 %.

3.2 Equipment.

3.2.1 Data recording device for the following measurements:

- gear box oil temperature
- ambient temperature (no continuous measurement necessary)
- clutch housing air temperature near upper circumference of DMF
- (no continuous measurement necessary)
- clutch housing air temperature near upper circumference of DMF
- air temperature in the clutch housing near upper circumference of clutch pressure plate
- clutch housing air temperature at the clutch disc close to the release bearing
- clutch pedal travel sensor or bus signal
- speed of gearbox input shaft
- engine speed on bus or sensor at flywheel
- accelerator pedal position (bus, option)
- engine torque (optional signal, bus or sensor)

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- vehicle speed (optional signal, bus)
- longitudinal car acceleration (if engine torque not available for energy calculation)

3.2.2 Attached tachometer and speedometer.

3.2.3 Standard tires.

3.2.4 Writing material.

3.2.5 Optional instrumentation shall be determined by the responsible Test Engineer.

3.3 Test Vehicle/Test Piece.

3.3.1 Most powerful gasoline/diesel engine-transmission combination with a 65 % / Greater Engine Calibration. Hydraulic clutch actuation components according to development phase.

3.3.2 Manual transmission with the longest gear ratio.

3.3.3 Two (2) new clutch/DMF sets

3.3.3.1 With purpose of clutch testing close to lower tolerance clutch clamp force (if available), measured on the clutch measuring machine (see Appendix B).

3.3.3.2 With purpose of transmission testing close to higher tolerance clutch clamp force or with medium clamp force.

3.3.4 Two (2) new manual transmissions assembled according to specification.

3.3.5 Vehicle with checked engine performance.

3.3.6 The engine type, transmission and the vehicle equipment must correspond to the release.

3.3.7 Fluid as released.

3.4 Test Time.

Calendar time: 10 days

Test hours: 24 h

Coordination hours: 4 days

3.5 Test Required Information. Possible sources are:

- I. SOR (Statement of Requirements)
- II. VTS (Vehicle Technical Specification)
- III. SSTS (Sub System Technical Specification)
- IV. CTS (Component Technical Specification)
- V. ADV Plan (Analysis Development Validation)
- VI. VCRI (Validation Cross Reference Index)
- VII. Application engineer
- VIII. Development Groups
- IX. Drawings

3.6 Personnel/Skills.

3.6.1 Important: Only trained and skilled test drivers should run this test.

3.6.2 Test Engineer to evaluate results.

3.6.3 Skilled mechanic to determine component characteristics.

4 Procedure

4.1 Preparation.

4.1.1 Transmission according to specification and new completely measured clutch set with required lower clamp higher force tolerance if required.

Note the measured values (see Appendix B).

4.1.2 Additional or redundant measurement requirements (see paragraph 3.2.1) can be determined at test engineer's discretion.

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4.1.3 In case of clutch validation: check of pedal travel and force before the test according to GMW15628, if necessary readjust and/or bleed hydraulic clutch system.

4.1.4 Vehicle with Gross Vehicle Mass (GVM). The drive axle shall be ballasted with maximum weight.

4.1.5 Check fuel, engine oil, cooling fluid, tire pressure and transmission oil level.

4.1.6 Transport the vehicle to the test facility.

4.1.7 Prepare data sheet (see Appendices), activate measurement recording.

4.1.8 Break-In. Run in the vehicle by the following procedure (driving in plane) if needed. Necessity shall be determined at test engineers' discretion:

4.1.8.1 Launch in 1st gear at $n = 0.4 \times n_{\max}$ for gasoline/gas (diesel: at $\approx 2100 \text{ min}^{-1}$)

4.1.8.2 Shifting up: $2 \Rightarrow 3 \Rightarrow 4 \Rightarrow (5)$

Shifting at $n = 0.8 \times n_{\max}$

4.1.8.3 Shifting down: $(5) \Rightarrow 4 \Rightarrow 3 \Rightarrow 2$

Shifting at $n = n_{\text{fuel cut off}} \times 0.95$ target gear

(5): 5th gear only for six-speed-transmissions

Repeat this cycle 20 times.

4.1.9 Reach of Test Launch Temperature. If necessary drive the vehicle in at high gear until reaching a typical constant transmission oil temperature (e.g. +80 °C for M20/32).

4.2 Conditions.

4.2.1 Environmental Conditions. The test shall be performed on a dry circular track and dry hill track.

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 Foreword.

4.3.1.1 The Stop and Go test for Clutch Validation shall be performed according to paragraphs 4.3.2 thru 4.3.9, consisting of 400 cycles overall. The test cycles shall be executed with the lowest number of interruptions as possible. For test execution interruptions see paragraph 4.3.10.

4.3.1.2 The Stop and Go Test for Transmission Validation shall be performed according to paragraphs 4.3.3 thru 4.3.5, 4.3.11 and 4.3.15 within in one (1) test day, consisting of 200 test cycles overall. If this is not possible, see paragraph 4.3.10.

4.3.1.3 Consider alarm limits if:

- CSC temperature above SSTs limits
- Excessive smell inside the vehicle with AC off / switched off fan / window closed (e.g. GMW14264 Rating ≤ 6 ; which shall be determined at engineers' discretion)
- Slip of clutch
- Unusual transmission noise (according to GMW14264)

4.3.2 Compressed Judder Test. Perform one (1) launch in each grade (0 %, 8 % and 12 %) in 1st gear and one (1) launch in each grade in reverse gear with maximum payload, then measure and note declutch reserve.

4.3.3 Up-Shifting Procedure.

4.3.3.1 Without spinning the wheels take off in first gear from an engine speed of $n_{\text{test,SUG launch}} = 0.5 \times n_{\text{fuel cut off}}$ (3000 min^{-1} maximum).

4.3.3.2 Then accelerate at WOT and shift to next higher gears upon reaching maximum rated engine speed with lifting up the throttle (shifting lever maneuver time $\approx 0.5 \text{ s}$ - starts immediately after 100 % disengaged clutch pedal) until reaching:

4.3.3.2.1 The ultimate gear in case of transmission validation, or

4.3.3.2.2 The penultimate gear in case of clutch validation.

Note: Engage clutch speedily after having changed gear, but do not back off the clutch pedal. **Prevent spinning of driven wheels.**

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4.3.4 Down-Shifting Procedure.

4.3.4.1 After reaching the ultimate/penultimate gear (see for differentiation paragraph 4.3.3.2) accelerate until n_{engine} in the current gear is equal to $0.95 \times n_{\text{fuel cut off}}$ of the (lower) target gear. Then fully release the accelerator pedal and shift one gear down (shifting lever maneuver time ≈ 0.5 s - starts immediately after 100 % disengaged clutch pedal). All other down shifts shall be performed according to paragraph 4.3.4.1.

4.3.4.2 If the vehicles' speed reaching ≈ 98 % of vehicle top speed by driving 400 m at highest gear is almost stabilized, shift down to the next lower gear.

4.3.4.3 Engage clutch pedal after having changed gear with clutch engagement technique as follows.

Note: Prevent blocking wheels. Take full advantage of engine thrust. Do not apply brakes.

4.3.4.3.1 With rapid clutch engagement technique for manual transmission validation (with quick clutch engagement technique, when shifting 3-2 and 2-1).

4.3.4.3.2 With quick clutch engagement technique for clutch validation (with standard clutch engagement technique, when shifting 3-2 and 2-1).

4.3.4.4 In 1st gear declutch the transmission upon reaching idle speed and brake the vehicle until stand still is reached.

4.3.4.5 Return to paragraph 4.3.3 to perform the next cycle.

Note: Engage the clutch pedal with appropriate technique by preventing back off the clutch pedal and blocking of driven wheels.

4.3.5 Perform 200 cycles and note the temperatures of the in vehicle measurement values (paragraph 3.2.1).

4.3.6 Perform Compressed Judder Test according to paragraph 4.3.2.

4.3.7 Perform next 200 cycles with the temperatures noted in paragraph 4.3.5. For reaching these temperature values heat up the system with launches in plane with $n_{\text{heat up launch}} = 0.3 \times n_{\text{fuel cut off}}$, if necessary.

4.3.8 Perform Compressed Judder Test according to paragraph 4.3.2.

4.3.9 Check the pedal travel and force after the test completion according to GMW15628.

4.3.10 If there are any interruptions during the test, note the temperatures and heat up the clutch system after the interruption by driving in 4th gear at $0.7 \times n_{\text{max}}$ until reaching the noted transmission oil temperature.

4.3.11 The test engineer should determine whether subjective noise evaluations during the test are required (according to GMW14264).

4.3.12 For clutch inspection disassemble clutch and DMF (only for DMF applications) from vehicle – and measure clutch and DMF characteristics. Additional or redundant measurement requirements (see paragraph 3.2.1) can be determined at test engineers' discretion.

4.3.13 If necessary measure the burst speed (min^{-1}) of the clutch disk on test bench.

4.3.14 Perform the test with the second Clutch/DMF/TM set.

4.3.15 At the responsible test engineer's discretion more than herein required test cycles may apply and/or until reaching breakdown of one clutch system component or transmission (test to failure).

5 Data

5.1 Calculations. Record the data mentioned in paragraph 3.2.1 (the Test Engineer may require additional data).

5.1.1 Calculation Method.

5.1.1.1 Frictional Performance.

$$P_K = M_K \cdot 2\pi \cdot \Delta n$$

$$P_K = M_K \cdot \frac{\pi \cdot \Delta n}{30} \text{ with } \Delta n \left[\frac{1}{\text{min}} \right], P_K [\text{W}]$$

P_K = frictional performance in W

M_K = clutch torque = engine torque in Nm

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