



Eight (8) Speed Rear Wheel Drive Automatic Transmission NARDO Test Vendor Version

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 this test is to subject the eight (8) speed rear wheel drive automatic transmission to high speed steady state conditions to simulate European usage, a high degree of damage for torsional events, and high speed in forward gears. This high speed test will result in a teardown to evaluate gear damage.

1.2 Applicability. Eight (8) speed rear wheel drive automatic transmissions: 8L45 and 8L90.

1.3 Remarks. The decision was made to perform the NARDO test using an input/output electric dynamometer cell configuration. The NARDO test matrix varies from 8L45 to 8L90.

1.3.1 Deviations. The eight (8) speed rear wheel drive automatic transmission NARDO test utilizes an electric dynamometer cell configuration. Utilizing the electric dynamometer ensures speeds and loads are stabilized upon obtaining a gear state, as well as allowing gear shifts (between test points) under unloaded conditions.

The **dirt cleaning dithering subroutine** will run after a user-definable number of NARDO cycles. During this routine, all Variable Force Solenoid (VFS) pressures are cycled, following a hardcoded pattern provided by product engineering. See 4.3.2 for the steps involved in executing the subroutine.

1.3.2 Test Torque Limitations. There are specified torque loss limitations for each test condition. Torque loss is monitored for each test condition to ensure within limits. Monitoring commences 20 s after the test condition is achieved through test condition completion. (Torque limitations are not used for transient conditions.)

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.

- AVL Powertrain Engineering, Incorporated, Plymouth, Michigan, (www.avl.com)

3 Resources

3.1 Facilities. GMPT Pontiac Laboratory, input/output electric dynamometer cell configuration.

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 External/Portable Equipment.

3.2.1.1 Prop shafts.

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3.2.1.2 Delta analyzer hardware or equivalent.

3.2.1.3 Transmission fluid particle counter (optional).

3.2.1.4 Aeration cart (optional).

3.2.2 Cell Hardware.

3.2.2.1 Shift actuator (shift robot automatic transmission), transmission lever positions (gear range).

3.2.2.2 Transmission fluid conditioning unit with flow meter (without heater).

3.2.2.3 Transmission cooling (vortex blowers or fan).

3.2.2.4 Current Transmission Control Module (TCM) hardware.

3.3 Test Vehicle/Test Piece. Transmissions 8L45 and 8L90.

3.4 Test Time.

Calendar time: 11 days (8L90)

14 days (8L45)

Test cycles: 316 cycles (8L90)

545 cycles (8L45)

Coordination hours: Varies with range

3.5 Test Required Information.

- Transmission type.
- Test repeats.
- Cycles before dirt cleaning (Refer to 4.3.2).
- Idle speed.

3.5.1 Critical Results.

- Input torque.
- Output torque.
- Input speed.
- Output speed.

3.5.2 Periodic Measurements. Reference Table 1 for displays of recorder channels required when testing.

Recorder must be initialized prior to start of test. Stop and store recorder once test completes. Data dumps should occur twice a day, unless a test failure occurs.

Table 1: Recorder Channel

Unit	Frequency	Description
rpm	10	Actual dynamometer speed (digital)
N·m	10	Dynamometer torque demand
N·m	1000	Set value drive torque
-	10	Delta analyzer crash preventer alarm bit
-	10	Delta analyzer status bit
-	10	Delta analyzer step detector alarm bit
-	10	Electronic Control Unit (ECU): Gear ratio (Input Speed Sensor/Output Speed Sensor (ISS/OSS))
rpm	10	Transmission Electro Hydraulic Control Module (TEHCM) input speed
rpm	10	TEHCM output speed

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Unit	Frequency	Description
rpm	10	Turbine/output dynamometer speed
N·m	5000	Turbine/output dynamometer torque
N·m	100	ECU calculated resistance torque
kPa	10	Requested clutch 1 pressure
kPa	10	Requested clutch 2 pressure
kPa	10	Requested clutch 3 pressure
kPa	10	Requested clutch 4 pressure
kPa	10	Requested clutch 5 pressure
kPa	10	Requested clutch 6 pressure
kPa	10	Requested clutch 7 pressure
-	50	Active control mode
-	10	Gear demand value
kPa	10	Requested line pressure
-	10	PUMA (open automation system from AVL) recorder Do Not Replicate flag. 0 = Replicate, 1 = Do not replicate
-	10	Requested solenoid 2 (0/1 bit)
kPa	10	Requested Torque Converter Clutch (TCC) pressure
Nm	5000	Actual torque (not used for engine only tests)
Nm	10	Demand value torque limit value for input dynamometer
-	10	Step buffer variable dynamometer speed
-	10	Step buffer variable engine speed
-	10	Step buffer variable step length
-	10	Step buffer variable dynamometer torque
-	10	Step buffer variable engine torque
g/cm ³	100	Transmission aeration oil density
kPa	10	Transmission line pressure (gauge)
°C	2	Transmission sump temperature
-	10	Total of main routine cycles
-	10	Current test cycle

3.6 Personnel/Skills. Technically capable cell operator.

4 Procedure

4.1 Preparation. Obtain the proper transmission, hardware (as mentioned in Section 3), and appropriate controls.

4.1.1 Determine the necessary inputs for the test drive file including the minimum items.

4.1.1.1 Torque, Speed and Temperature Limits.

- Shutdown limits for all needed parameters.
- Required test cycle length.

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