| | | |
|---|---|---|
| GM WORLDWIDE ENGINEERING STANDARDS | Test Procedure | GMW17837 |

# Steering Performance Test: Input Shaft Driven, Rack Free, Small Amplitude

## 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 measure the input shaft position hysteresis and repeatability with the rack unconstrained and power assist on or off.

**1.2 Applicability.** This test procedure is applicable to any manual/unassisted, electrically, or hydraulically assisted rack and pinion steering system, including column electric.

## 2 References

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

**2.1 External Standards/Specifications.**

ISO 17025

**2.2 GM Standards/Specifications.**

GMW16794

## 3 Resources

**3.1 Facilities.** Milford Proving Ground Steering Development Laboratory steering performance test machine or equivalent Test Improvement Process accredited test facility and equipment shall be used.

**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 Test Bench.** Multi-Purpose TestWare Software (MTS) Steering Gear Performance Test Stand (with Hydraulic Power Steering (HPS) capability if applicable), including MTS FlexTest 60 Digital Controller, a Personal Computer (PC) with MTS Series 793 control and application software installed, and integrated or standalone capability to transmit the necessary Controller Area Network (CAN) messages to an Electric Power Steering (EPS) system for it to fully function or, in the case of a variable effort HPS gear, a power supply that can deliver an appropriate level of current to the gear matching the calibration value at 100 km/h.

**3.2.2 Position Transducers.** Linear and rotary encoders with minimum resolution and full scale values, as specified in Table 1, shall be used for direct measurements of rack axial position, housing position along the rack axis, and input shaft rotational position, all with respect to ground.



© Copyright 2017 General Motors Company All Rights Reserved



Documents Document Sharing Hub

Copyright General Motors Company
Provided by IHS Markit under license with General Motors Company
Reproduction, distribution or publication of these standards is expressly prohib
Licensee=/, User=,
Not for Resale,
Full document details: GMW GMW17837 2017

**Table 1: Minimum Position Transducer Resolution and Full Scale Values**

| Transducer | Minimum Resolution | Minimum Full Scale |
|---|---|---|
| Rack Axial Position | 0.005 mm | 270 mm |
| Rack Housing Position | 0.007 mm | 20 mm |
| Input Shaft Angle | 0.005 degree | 2,000 degrees |

**3.3 Test Vehicle/Test Piece.**

**3.3.1 Test Parts.** Following parts are required:

- Steering gear including inner tie rods.
- Intermediate shaft (Column Electric Power Steering (CEPS) system only).
- Steering column (CEPS only).
- Wiring harness with proper electrical connectors to interface with the test specimen (electric assist systems only).
- Fixture and other hardware necessary to mount the test specimen on the test stand.

**3.4 Test Time.**

| | |
|---|---|
| Calendar time: | Less than 1 day |
| Test time: | 0.5 hours |
| Coordination time: | 0.5 hours |

**Note:** The test time listed above does not include the design and build time for any new and/or special test fixtures required for testing.

**3.5 Test Required Information**.

**3.5.1 Steering Geometry (CEPS Only).** The in-vehicle X, Y and Z coordinates of steering geometry points are required for the setup of steering intermediate shaft and column.

**3.5.2 Channel.** Following signals (units) are required:

- Time (s).
- Specimen Voltage (V), if applicable.
- Specimen Current (A), if applicable.
- Steer Angle (°).
- Rack Displacement (mm).
- Rack Housing Displacement (mm).

**3.5.3 Sample Rate.** Fifty samples per second (50 Hz).

**3.6 Personnel/Skills.** Operator must be qualified and documented as capable to run this test as required by ISO 17025.

## 4 Procedure

**4.1 Preparation.**

**4.1.1 Test Software Setup.**

**4.1.1.1** Follow the procedure in GMW16794 to set up the test software on the PC. For this test, the left tie rod actuator and matrix shall both be turned off.

**4.1.2 Test Specimen Installation.**

**4.1.2.1** Follow the procedure in GMW16794 to set up the test specimen on the test stand. For this test, only the steer actuator shall be connected.

**4.1.2.2** Remove the left inner tie rod from the steering gear assembly.



© Copyright 2017 General Motors Company All Rights Reserved



Documents
Document Sharing Hub

Copyright General Motors Company
Provided by IHS Markit under license with General Motors Company
Reproduction, distribution or publication of these standards is expressly prohib
Licensee=/, User=,
Not for Resale,
Full document details: GMW GMW17837 2017