



Fuel Supply

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 specification is to evaluate fuel supply (fuel pressure, fuel flow and for diesel fuel temperature) as follows:

- Hot temperature fuel performance (for diesel, gasoline optional).
- Normal temperature fuel system performance.
- Cold temperature fuel system performance. Including the cold-start ability performance for diesel applications.

1.2 Applicability. All passenger cars and light-duty trucks.

2 References

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

2.1 External Standards/Specifications.

EN590

2.2 GM Standards/Specifications.

GMW14508

GMW14555

GMW15016 (ID)

GMW15550

Note: (ID) = This standard is limited to internal distribution within General Motors and shall not be distributed outside this company. Contact the GM Lead Engineer for further instructions.

2.3 Additional References.

- GM Powertrain Interface Control Document (ICD)
- GM Test and Validation Fuel Handbook (Diesel Fuel Test Matrix – General Motors Powertrain (GMPT) GMPT-5-037), Global Document Management (GDM) Web site
- Powertrain Subsystem Technical Specification (SSTS)
- Vehicle Technical Specification

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 or equivalent.

3.1.4 Cold Fuel Performance: Climatic chamber capable to -20 °C. Climatic chamber with dynamometer capable to -20 °C.

3.2 Equipment.

3.2.1 Trailer dynamometer or equivalent.

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May 2014

Page 1 of 10



Documents

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3.2.2 Equipment to measure the tank volume.

3.2.3 Equipment to measure and record fuel pressure, temperature, and flow rates at the feed and return line and fuel pump and diesel heater voltage and current.

3.2.4 Instrumentation to measure fuel grade. Cold Filter Plugging Point (CFPP) and Cloud Point (CP).

3.2.5 Optional Equipment.

3.2.5.1 Equipment to measure fuel pump electric current, engine rpm, vehicle speed and automatic gear oil temperature (if available).

3.3 Test Vehicle/Test Piece.

3.3.1 Test Vehicle. The vehicle to be equipped as specified on test request.

3.3.2 Fuel Quality.

3.3.2.1 Hot Temperature Test. All diesel fuel grades allowed.

3.3.2.2 Cold Temperature Test. The diesel specification (see GM Test and Validation Fuel Handbook (GMPT-5-037)) is used for all regions. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.

Optional: Regional winter diesel fuel may be tested in addition to GMPT-5-037 at the discretion of GM Engineering.

Note: When using regional test fuels, diesel according to EN590 and/or diesel with bio-content shall be used rather than arctic or non-bio-diesel fuels. Arctic and non-bio-diesel fuels are not representative of field conditions or customer behavior and may result in non-representative testing.

3.3.3 Flow Temperature and Pressure Requirements. The subsystem shall meet the minimum/maximum flow, pressure and the temperature requirements of the specific powertrain and platform captured in the Interface Control Document (ICD) with GM Powertrain.

3.4 Test Time. The following is an estimate on the amount of time needed to perform this procedure.

Calendar time: 14 days

Test hours: 60 hours

Coordination hours: 16 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Not applicable.

4 Procedure

4.1 Preparation.

4.1.1 Install instrumentation to obtain and record data for 4.1.1.1 through 4.1.1.4.

4.1.1.1 Fuel feed line pressure, flow and temperature at the interface between powertrain fuel delivery High Pressure (HP) pump and low pressure chassis fuel system. Refer to corresponding Powertrain SSTS or ICD.

4.1.1.2 Fuel return line (if available pressure, flow and temperature at the interface between Powertrain fuel delivery HP pump and low pressure chassis fuel system). Refer to corresponding Powertrain SSTS or ICD.

Note: The feed line flow ranges and limitations (defined in the Platform/Powertrain ICD) shall be considered in instrumenting the vehicle.

Note: Reference 4.3.3.3 for data points to be collected for all test configurations.

4.1.1.3 For diesel applications; install a pressure sensor and thermocouple before and after the diesel filter, along with instrumentation to measure current and voltage for the fuel filter heater where applicable (normally only for cold test).

4.1.1.4 Install instrumentation to measure the in-tank fuel pump fuel pump voltage and (optional) fuel pump current, engine rpm, vehicle speed and automatic transmission oil temperature.

4.1.2 Identify the maximum allowed vehicle loading, Gross Combined Mass Rating (GCMR) and Gross Vehicle Mass Rating (GVMR).

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May 2014

Page 2 of 10



Documents

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4.1.3 Drain and fill the vehicle with the specified fuel, as requested at test request. Consider the existing safety guidelines.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

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.

4.2.3 Global Sequence Condition 1 per GMW14555.

4.2.3.1 Global Test Condition. The Global Test Condition 1 per GMW14555 is a combination of continuous and excursion conditions. It is necessary to run all sequences in succession (Parts 1 through 3) to achieve fuel temperature stabilization. The Global Test Condition severity is defined in Appendix B, Table B1.

4.2.3.2 Start the test with full tank (Customer Fill GMW14508) and with Gross Vehicle Mass (reference Gross Vehicle Mass Rating (GVMR)).

4.2.3.3 Dispensed fuel temperature shall be $+30\text{ }^{\circ}\text{C} \pm 15\text{ }^{\circ}\text{C}$.

4.2.3.4 Record all requested measuring points.

Note: For cold tests, maximum environmental conditions are $-20\text{ }^{\circ}\text{C}$.

4.2.4 Excursion Conditions. Test according to GMW14555 conditions as defined in Table 1.

Table 1: Excursion Test Conditions by Region

Country	Temperature
Europe	Condition 7
North America	Condition 4, Condition 5
GM International Operations	Condition 3 (Middle East Region Schedule)

Note: Condition 3 Moderate Region may be used for Asia Pacific and/or Latin America assuming system proliferation is acceptable; however, this would be a platform-by-platform business case decision.

4.3 Instructions.

4.3.1 Excursion Test. Fuel feed temperature shall reach a stabilized state during the test.

4.3.2 City Cycle. Run a city cycle in accordance with GMW15550 Global City Course (preferred since it can be run simultaneously with other vehicle testing).

Note: Alternatively, run the equivalent city course according to Appendix C, Table C1: City Traffic Schedule if it is unseasonable to perform GMW15550, or the course is not available.

Note: The alternative test is considered equivalent for fuel supply testing only.

4.3.3 Cold Fuel Temperature Performance. Testing may be done in a climatic chamber with chassis rolls, regional proving ground facilities during periods where cold weather permits, or in parallel with GMW15016.

4.3.3.1 Start with approximately a $\frac{3}{4}$ filled tank volume.

4.3.3.2 Use a test ambient temperature which is 2 K (tolerance: $\pm 2\text{ K}$) warmer than the CFPP (only for diesel applications).

4.3.3.3 Record the following parameters (for all test conditions, see Figure 1):

- Fuel feed line pressure before the diesel filter
- Fuel feed line pressure after the diesel filter
- Feed line flow before or behind the filter
- Feed line temperature before the filter (or heater)
- Feed line temperature after the filter (or heater)
- Fuel return line pressure and flow
- Return line temperature

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Page 3 of 10



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