



Oxygenated Gasoline, Unleaded Regular, Factory Fill

1 Scope

1.1 Material Description. This specification covers unleaded low sulfur oxygenated regular grade gasoline.

1.2 Symbols. Not applicable.

1.3 Applicability. This gasoline is intended primarily for factory fill use. Factory fill gasoline is intended for use in vehicles which are stored for extended periods of time or in storage tanks where the rate of turnover is low.

2 References

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

2.1 External Standards/Specifications.

ASTM D86	ASTM D2700	ASTM D4806	ASTM D5598
ASTM D130	ASTM D3116	ASTM D4814	ASTM D6378
ASTM D381	ASTM D3120	ASTM D4815	CAN/CGSB 3.511
ASTM D525	ASTM D3231	ASTM D5059	CCR Title 17, §60100-§60114
ASTM D665	ASTM D3237	ASTM D5191	CFR 40
ASTM D2622	ASTM D3703	ASTM D5453	
ASTM D2699	ASTM D3831	ASTM D5500	

2.2 GM Standards/Specifications.

GMW3059

2.3 Additional References.

- California Code of Regulations (CCR) Title 17, §60100 through §60114 can be obtained from Barclays, 50 California Street, San Francisco, CA 94111.
- Code of Federal Regulations (CFR) 40 can be obtained from United States (U.S.) Government Printing Office, Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.
- TMC003 Material Safety Data Sheet guidance documents (available at www.gmsupplypower.com).
- TOP TIER gasoline retailers (available at URL: www.toptiergas.com).

3 Requirements

In addition to the limits shown herein, the fuel must also meet applicable regulations of the United States (U.S.) Environmental Protection Agency (EPA) for plants in the States or any local regulatory requirements, e.g., CFR 40 and CCR Title 17, §60100-§60114. These regulations take precedence over requirements within this specification.

Fuel should be a TOP TIER brand which is stated in the owner's manual. Consult the www.toptiergas.com website for a list of TOP TIER gasoline retailers.

The test requirements given in this specification are minimum or maximum, as the case may be, *Acceptance Limits* for valid tests. No adjustments for test precision are to be applied as test variability was taken into account in the determination of the requirements.

All ASTM International (ASTM) specified tests shall be performed according to the latest published version unless otherwise required by this specification.

3.1 Requirements on Delivery. These specifications apply to samples taken directly from the tank car or wagon. The supplier shall be responsible for meeting the requirements listed therein even if properties are not directly measured.

3.1.1 Chemical Requirements.

3.1.1.1 Sulfur. Sulfur content shall not exceed 40 ppm (0.004% by mass) as measured by ASTM D2622, ASTM D3120, or ASTM D5453.

3.1.1.2 Phosphorus. Phosphorus content shall not exceed 1.3 mg/L as measured by ASTM D3231. No intentional addition.

3.1.1.3 Lead. Lead content shall not exceed 2 mg/L as measured by ASTM D3237, ASTM D3116, or ASTM D5059. No intentional addition.

3.1.1.4 Silicon. Silicon content shall not exceed 2 mg/kg as measured by Inductively Coupled Plasma/Atomic Emission Spectroscopy (ICP/AES) or X-Ray Fluorescence (XRF). No intentional addition.

3.1.1.5 Manganese. Manganese content shall not exceed 0.25 mg/L as measured by ASTM D3831. No intentional addition.

3.1.1.6 Benzene, Fuel shall not contain benzene more than 1.0 volume percent.

3.1.1.7 Additives. The fuel shall contain a deposit control additive to minimize deposits in fuel injectors and on intake valves, while causing no deleterious effects in the fuel system, engine, and exhaust treatment systems. The fuel must comply with EPA requirements for deposit control, e.g., CFR 40 and CCR Title 17, §60100-§60114. Other additives may also be used to meet the requirements for copper and ferrous corrosion and for oxidation stability. Type and quantity of additives shall be agreed upon by purchaser and seller.

3.1.1.8 Oxygenates. The use of oxygenates is required by this specification, at the concentrations listed as follows. However, only one of the following types may be used:

- **Ethanol.** The fuel shall contain between 7.0 volume percent and 10.0 volume percent ethanol as measured by ASTM D4815. The ethanol shall meet the requirements of ASTM D4806 "Standard Specification for Denatured Fuel Ethanol for Blending with Gasoline for Use as Automotive Spark-Ignition Engine Fuel". The fuel shall not contain more than 0.15 volume percent methanol.
- **Ether.** The fuel shall contain between 11.0 volume percent and 15.0 volume percent Methyl *tert*-butyl ether (MTBE) as measured by ASTM D4815.

3.1.1.9 Peroxide Content. The gasoline shall have a peroxide content of less than 1 mg/kg as measured by ASTM D3703.

3.1.2 Physical Requirements.

3.1.2.1 Gum. Existent gum shall not exceed 5 mg per 100 mL. Unwashed gum shall not exceed 70 mg per 100 mL. Test method is ASTM D381.

3.1.2.2 Volatility. Fuel distributed in the U.S. shall meet the appropriate schedule for seasonal and geographic volatility classes found in ASTM D4814, Table 4. Fuel distributed in Canada shall meet Area IVA seasonal volatility classes found in CAN/CGSB 3.511, Tables 2A and 2B. Distillation shall be measured by ASTM D86, and vapor pressure shall be measured by ASTM D5191 or ASTM D6378. Vapor pressure as measured by ASTM D5191, or ASTM D6378. Distillation characteristics as measured by ASTM D86.

3.1.2.2.1 Volatility Classes. The schedule of seasonal and geographical volatility classes shall be as shown in ASTM D4814 "Standard Specification for Automotive Spark-Ignition Engine Fuel", CAN/CGSB-3.511 "Unleaded Automotive Gasoline" of latest issue, or any local defined volatility requirements.

3.1.2.2.2 Driveability Index. The Driveability Index (DI) is calculated as follows:

$$DI = 1.5 \times T_{10} + 3.0 \times T_{50} + T_{90} + 2.4 \times \text{Ethanol}$$

Where: T_{10} , T_{50} , and T_{90} are the 10%, 50%, and 90% evaporated temperatures (°F) determined by ASTM D86.

3.1.2.3 Contamination. The gasoline shall be clear and bright, visually free of undissolved water and suspended matter, and contain no more than 1.0 mg of sediment per liter. Sediment is determined by vacuum filtering a 3 L