AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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AMS 3032 A

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AVIATION FUEL
Grade 100/130

1. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

2. GRADE: The fuel shall be the one grade known as Aviation Grade 100/130. Except as otherwise specified herein, the fuel shall consist of a blend of refined hydrocarbons derived from crude petroleum, natural gasoline, or blends thereof with synthetic hydrocarbons and/or aromatic hydrocarbons.

3. APPLICATION: The finished fuel is intended for use in aircraft engines requiring Grade 100/130 fuel.

4. REQUIREMENTS: The fuel shall conform to the following requirements when tested in accordance with the methods specified. The requirements contained herein are not subject to correction for tolerances of the test methods. However, if multiple determinations are made, average results shall be used.

4.1 Knock Rating:

4.1.1 Knock Rating (Lean): The lean mixture knock rating of the fuel shall be not lower than 100 octane number when determined in accordance with ASTM D614-46.

4.1.2 Knock Rating (Rich): The rich mixture knock rating of the fuel shall be not lower than that of iso-octane (or approved reference fuel) to which has been added 1.28 ml tetraethyl lead per U. S. gallon when determined in accordance with the CRC F-4-443. The rich mixture knock rating of the fuel shall be determined at the fuel-air ratio at which the maximum indicated mean effective pressure for iso-octane (or approved reference fuel) plus 1.28 ml tetraethyl lead per U. S. gallon is obtained.

4.2 Color: The color shall be green. The finished fuel blend shall contain a maximum of 7.0 mg. of blue dye, blue, 1, 4-Di-P-toluidoanthraquinone plus 7.0 mg. of yellow dye, Yellow-N, P-Dimethylaminoazobenzene (National Color Index Reference No. 19). Equal concentrations of blue and yellow dyes shall be used.

4.2.1 Color Comparison: Color comparison shall be made by any suitable apparatus or by visual examination using identical transparent containers for the fuel sample and for the appropriate Army-Navy Aeronautical green color standard for maximum intensity and minimum intensity. Samples of Army-Navy Aeronautical standards which have been exposed to light for more than twenty-four hours shall not be used for this test.

4.3 Lead Content: The lead content shall not exceed 3.0 ml. of tetraethyl lead in the form of an antiknock mixture containing not less than 61% by weight of tetraethyllead and sufficient ethylene dibromide to provide two bromine atoms per atom of lead.

4.4 Distillation: The limits of the distillation range of the fuel shall be as follows when determined in accordance with ASTM D86-46:

10% evaporated	158 F max
50% evaporated	221 F max
90% evaporated	212 - 257 F
End Point	338 F max
Sum of 10% and 50% evaporated temperatures	307 F min
Distillate Recovery	97.0% min
Distillation Residue	1.5 % max
Distillation Loss	1.5 % max

4.5 Acidity: The aqueous extract of the distillation residue, using three volumes of distilled water, shall show no pink or red color when one drop of a 0.1% solution of methyl orange is added to it.

4.6 Sulfur: The sulfur content shall not exceed 0.05% by weight when determined in accordance with ASTM D90-46.

4.7 Corrosion (Copper Strip): No more than extremely slight discoloration shall be apparent on a copper strip when tested in accordance with the following method:

4.7.1 Apparatus: A multiple unit "air-well" bath may be used, each single unit of which shall conform to the following: An 8 inch long section of thin-walled tubing 1-9/16 inches inside diameter, open at one end and sealed at the bottom with a soldered metal disc of appropriate size, forms the "air-well". The tube is inserted through a hole in a metal lid, which will fit steam-tight on a metal bath, and positioned so that the open end of the tube extends one inch above the surface of the lid. (The size of the hole in the lid allows for a sliding fit for the tube). The tube is soldered in place. The lid then serves as a support for the "air-well" and at no time shall the "air-well" touch the sides or bottom of the bath. The lid will also be fitted with a reflux condenser in order to maintain the liquid level in the bath. The depth of the non-hazardous liquid in the bath shall be kept at the same level as the surface of the fuel in the standard 4-ounce round oil sample bottle which shall be fitted with an air condenser. The air condenser shall be of glass tubing 24 inches long and 3/8 inch outside diameter fitting in a suitable cork stopper. The end of the condenser shall be flush with the bottom of the cork stopper. After bottle and condenser are in place in the bath, a thin disc of cork 1-3/4 inches in diameter and with a 1/2 inch hole in the center is slipped over the condenser tube and used as a cover for the "air-well". Under these conditions the temperature of the fuel should reach approximately 197 F (92 C). Higher temperatures will cause violent ebullition of the sample and consequent mechanical loss. A short length of wire, one end of which is secured about the neck of the sample bottle, serves as a convenient method for introducing and removing the test assembly.

4.7.2 Procedure: Place a clean strip of mechanically polished pure sheet copper, about 1/2 inch wide and 3 inches long, in the sample bottle. The copper strip can be given a final polish satisfactorily and effectively by rubbing with carborundum powder (150 mesh or finer), using a pad of cheesecloth. The copper strip shall be washed in sulfur-free acetone after polishing. Add 90 ml of the fuel under test and attach the air condenser. The completed assembly is then placed in the "air-well" which is located in a non-hazardous liquid bath maintained at a temperature between 210 and 212 F (99 and 100 C) throughout the test. At the end of three hours, the copper strip is removed from the gasoline, washed with sulfur-free acetone, and examined.

4.8 Gum Content:

4.8.1 Copper Dish: The residue from 100 ml of the fuel shall not exceed 5 mg after evaporating the fuel to dryness in a freshly polished and weighed, 3.5 in. diameter hemispherical copper dish on a steam bath at 212F (100 C), drying the dish in an electric oven at 212-221F (100-105C) for 30 minutes, cooling in a desiccator and weighing.

4.8.2 Potential Gum:

4.8.2.1 The accelerated aging test with 5 hours induction time at 212 F (100 C), starting with 100 lb oxygen pressure, shall be conducted in the ASTM bomb according to ASTM D873-46T. The gum residue after the foregoing accelerated aging test shall not exceed 6 mg per 100 ml and the total weight of visible lead precipitate shall not exceed 3 mg per ml.

4.8.2.2 If mutually agreed between the purchaser and vendor, aviation gasoline may be required to meet a 16 hours accelerated aging gum test in accordance with ASTM D873 instead of the 5 hours aging gum test. In such fuel the permissible gum inhibitors shall not exceed 8.4 lb per 1000 bbl (42 gal per bbl). For this 16 hours accelerated aging test, the gum residue shall not exceed 10 mg per 100 ml and the total weight of visible lead precipitate shall not exceed 4 mg.

4.9 Vapor Pressure (Reid Method): The vapor pressure shall not exceed 7.0 psi when determined in accordance with ASTM D323-43.

4.10 Freezing Point: The freezing point shall be not higher than -76 F (-60C) when determined in accordance with Federal specification VV-L-791c, Method 141.1.

4.11 Water Tolerance: The volume of the aqueous layer shall not increase or decrease by more than 2 ml after 80 ml of the fuel and 20 ml of distilled water at room temperature have been shaken vigorously in a glass-stoppered graduated cylinder for at least 2 minutes and allowed to settle.

4.12 Net Heat of Combustion: The net heat of combustion shall be not less than 18,700 Btu per lb when determined in accordance with the following procedure:

4.12.1 The net heat of combustion at constant volume (higher or gross value) shall be determined in an oxygen-bomb calorimeter. Any suitable procedure may be employed provided its accuracy is recognized by the purchasing or receiving agency as being equal or superior to that of ASTM D240-39 suitably modified for use with volatile liquids.