

J8 Grade Military Jet Fuel Specifications

| Product Property | Test Method | Origin Test Results | | Deliveries ^{1/} |
|-----------------------------|-------------|---------------------|---------|--------------------------|
| | | Minimum | Maximum | |
| Color, Saybolt | D156 | Report | | |
| Total Acid Number, mg KOH/g | D3242 | | 0.015 | |
| Aromatics, vol. % | D1319 | | 25.0 | |
| Sulfur, ppm | D4294 | | 3000 | |
| Mercaptan Sulfur, wt % | D3227 | | 0.002 | |
| Doctor Test | D4952 | Negative | | |
| Distillation | D86 | | | |
| Initial Boiling Point, °C | | Report | | |
| 10% recovered, °C | | | 205 | |
| 20% recovered, °C | | Report | | |
| 50% recovered, °C | | Report | | |
| 90% recovered, °C | | Report | | |
| Final Boiling Point, °C | | | 300 | |
| Residue, vol % | | | 1.5 | |
| Loss, vol % | | | 1.5 | |
| OR | | | | |
| Simulated Distillation | D2887 | | | |
| Initial Boiling Point, °C | | Report | | |
| 10% recovered, °C | | | 205 | |
| 20% recovered, °C | | Report | | |
| 50% recovered, °C | | Report | | |
| 90% recovered, °C | | Report | | |
| Final Boiling Point, °C | | | 300 | |
| Flash Point, °C (°F) | D93 | 38 (100) | | |
| Density, kg/L at 15 °C | D4052 | 0.775 | 0.840 | |
| Gravity, °API | D1298 | 37.0 | 51.0 | |
| Freezing Point, °C | D2386 | | -47 | |

J8 Grade Military Jet Fuel Specification (continued)

| Product Property | Test Method | Origin Test Results | | Deliveries ^{1/} |
|------------------------------------|---------------------|---------------------|---------------|--------------------------|
| | | Minimum | Maximum | |
| Viscosity, at -20 °C, cSt. | D445 | | 8.0 | |
| Net Heat of Combustion, BTU/lb | D3338 | 18,400 | | |
| OR: MJ/kg | D4809 | 42.8 | | |
| Hydrogen Content, wt % | D3701 | 13.4 | | |
| Combustion | | | | |
| (1) Smoke point, mm | D1322 | 25.0 | | |
| OR: (2) Smoke point, mm AND | D1322 | 19.0 | | |
| Naphthalenes, vol % | D1840 | | 3.0 | |
| Cetane Index | D976 | | Report | |
| Copper Corrosion | D130 | | 1 | |
| Thermal Stability: | D3241 ^{2/} | | | |
| Filter pressure drop, mm Hg. | | | 25 | |
| Heater tube deposit rating | | | < 3 | |
| Existent Gum, mg/100 ml | D381 | | 7.0 | |
| Particulate Matter, mg/L | D5452 ^{3/} | | 1.0 | |
| Filtration Time, minutes | | | 15 | |
| Water Reaction, Interface rating | D1094 | 1b | | |
| Water Separation Index | D3948 | ^{4/} | | |
| Fuel System Icing Inhibitor, vol % | D5006 ^{5/} | 0.10 | 0.15 | |
| Electrical Conductivity, pS/m | D2624 | | ^{6/} | ^{6/} |

J8 Grade Military Jet Fuel Specification (continued)

- 1/ Delivered products meets all applicable requirements at time and place of delivery.
- 2/ ASTM D3241 Thermal Stability test must be conducted at 260 °C for 2.5 hours. Peacock or abnormal color deposits result in a failure and are not accepted.
- 3/ A minimum sample size of 3.79 liters (one gallon) shall be filtered. Filtration time will be determined in accordance with the procedure in Appendix A of MIL-DTL-83133E (or most current version); this procedure may be used to determine the particulate matter as an alternate to ASTM D 5452 or ASTM 2276.
- 4/ The minimum microseparometer rating shall be as follows:

| J8 Additives | MSEP Rating, min. |
|---|-------------------|
| Antioxidant (AO)*, Metal Deactivator (MDA)* | 90 |
| AO*, MDA*, and Fuel System Icing Inhibitor (FSII) | 85 |
| AO*, MDA*, and Corrosion Inhibitor/Lubricity Improver (CI/LI) | 80 |
| AO*, MDA*, FSII and CI/LI | 70 |

* Even though the presence or absence does not change these limits, samples submitted for specification conformance testing shall contain the same additives present in the refinery batch. Regardless of which minimum the refiner elects to meet, the refiner shall report the MSEP rating on a laboratory hand blend of the fuel with all additives required by the specification.

- 5/ FSII test shall be performed using the DiEGME scale of the refractometer.
- 6/ The conductivity must be between 150 and 450 pS/m at ambient temperature or 85° F, whichever is lower (150 to 700 for JP8+100 shipments that contain thermal stability improver additive), unless otherwise directed by the procuring activity.

J8 Grade Military Jet Fuel Specifications (continued)

Other Requirements

Additives: Shipper must provide the type and amount of each additive used upon request.

Antioxidants: Immediately after processing, and before the fuel is exposed to the atmosphere (i.e. during rundown into feed/batch tankage), add an approved antioxidant from the following list in order to prevent the formation of gums and peroxides after manufacture. The concentration of antioxidant to be added shall be:

- a. Not less than 17.2 mg or more than 24.0 mg of active ingredient per liter of fuel (6.0 to 8.4 lb/1000 barrels) to all JP-8 fuel that contains blending stocks that have been hydrogen treated.
- b. At the option of the supplier, not more than 24.0 mg of active ingredient per liter of fuel (8.4 lb/1000 barrels) may be added to JP-8 fuels that do not contain hydrogen treated blending stocks.

Approved Antioxidants

- a. 2, 6-di-tert-butyl-4-methylphenol
- b. 6-tert-butyl-2, 4-dimethylphenol
- c. 2, 6-di-tert-butylphenol
- d. 75% minimum: 2, 6-di-tert-butylphenol
25% maximum: tert-butyl phenols and tri-tert-butylphenols
- e. 72% minimum: 6-tert-butyl-2, 4-dimethylphenol
28% maximum: tert-butyl-methylphenols and tert-butyl-dimethylphenols
- f. 55% minimum: 2,4-dimethyl-6-tert-butylphenol and
15% minimum: 2,6-di-tert-butyl-4-methylphenol and 30% maximum mixed methyl and dimethyl tert-butylphenols

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Metal Deactivator: A metal deactivator, N,N'-disalicylidene-1,2-propanediamine, may be blended into the fuel. The concentration of active material used on initial batching of the fuel at the refinery shall not exceed 2.0 mg/L. Cumulative addition of metal deactivator when redoping the fuel, shall not exceed 5.7 mg/L. Metal deactivator additive shall not be used in JP-8 unless the supplier has obtained written consent from the Procuring Activity and user.

Static Dissipater Additive: An additive shall be blended into the fuels in sufficient concentration to increase the conductivity of the fuel to within the range specified in the specifications at the point of injection. The point of injection of the additive shall be determined by agreement between the purchasing authority and the supplier. The following electrical conductivity additive is approved: Stadis 450 marketed by Octel America, Inc., Newark, DE 19702.

Corrosion Inhibitor: A corrosion inhibitor conforming to MIL-PRF-25017 shall be blended into the F-34 (JP-8) grade fuel by the contractor. The corrosion inhibitor additive is optional for F-35. The amount added shall be equal to or greater than the minimum effective concentration and shall not exceed the maximum allowable concentration listed in the latest revision of QPL-25017. The contractor or transporting agency, or both, shall maintain and upon request shall make available to the Government evidence that the corrosion inhibitors used are equal in every respect to the qualification products listed in QPL-25017. The point of injection of the corrosion inhibitor shall be determined by agreement between the purchasing authority and the supplier.

Fuel System Icing Inhibitor (FSII): The use of a fuel system icing inhibitor shall be mandatory for NATO F-34 (JP-8) and shall conform to MIL-DTL-85470. The point of injection of the additive shall be determined by agreement between the Purchasing Authority and the supplier.

Thermal stability improver additive: Due to logistical concern, personnel at the operating location shall request written approval from the cognizant activity to add a thermal stability improver additive to the fuel. If approval is given, the concentration of the additive and location of injection shall be specified by the cognizant service activity found in MIL-DTL-8133E section 3.3.6. JP-8 fuel with an approved thermal stability improver additive at the required concentration shall be designated as JP-8+100. Thermal stability improver additive shall not be used in JP-8 without approval, in writing (reference MIL-DTL-8133E section 3.3.6 for addresses).

J8 Grade Military Jet Fuel Specifications (continued)

Qualified thermal stability improver additives:

| Additive Name | Qualification Reference | Manufacturer |
|------------------------------------|-----------------------------|---|
| SPEC AID 8Q462 | AFRL/PRSF Ltr, 9 Dec 97 | BetzDearborn 9669 Grogan Mill Road PO Box 4300 The Woodlands, TX 77387 |
| AeroShell Performance Additive 101 | AFRL.PRSF Ltr, 13 Jan 98 | Shell Aviation Ltd. Shell-Mex House Strand London WC2R 0ZA |

Premixing of Additives: Additives shall not be premixed with other additives before injection into the fuel so as to prevent possible reactions among the concentrated forms of different additives.

Workmanship: At the time of Government acceptance, the finished fuel shall be visually free from undissolved water, sediment, or suspended matter and shall be clear and bright.

Additional Provisions: The Carrier shall not be responsible for the concentration of additives in J8 grade jet fuel deliveries except as provided for in the tariff.