AVIATION TURBINE FUEL (DEF STAN 91-91 ISSUE 6)

Test	Property	Units	Limits	Method
1	**Appearance:**			
1.1	Visual Appearance		Clear, bright and visually free from solid matter and undissolved water at ambient temperature	Visual
1.2	Colour		Report	ASTM D 156 or ASTM D 6045 (see Note 1)
1.3	Particulate Contamination, at point of manufacture	mg/l	Max 1.0	ASTM D 5452 (see Note 2) / IP423
1.4	Particulate, at point of manufacture, cumulative channel particle counts	ISO Code	Table 1 of ISO 4406 (see Note 3)	IP565 (see Note 4)
1.4.1	⩾4 µm(c)		Report	
1.4.2	⩾6 µm(c)		Report	
1.4.3	⩾14 µm(c)		Report	
1.4.4	⩾21 µm(c)		Report	
1.4.5	⩾25 µm(c)		Report	
1.4.6	⩾30 µm(c)		Report	
2	**Composition:**			See note 5
2.1	Total Acidity	mg KOH/g	Max 0.015	ASTM D 3242/IP354
2.2	Aromatic HydrocarbonTypes			
2.2.1	Aromatics	% v/v	Max 25.0	ASTM D 1319/IP156
2.3	Sulphur, Total	% m/m	Max 0.30	IP336
2.4	Sulphur, Mercaptan	% m/m	Max 0.0030	ASTM D 3227/IP342 (see Note 7)

or				
2.5	Doctor Test		Doctor Negative	ASTM D 4952/IP30
2.6	Refining Components, at point of manufacture			
2.6.1	Hydroprocessed Components	% v/v	Report	
2.6.2	Severely Hydroprocessed Components	% v/v	Report	(see Note 8)
3	**Volatility:**			
3.1	Distillation:			ASTM D 86/IP123 (see Note 9)
3.1.1	Initial Boiling Point	°C	Report	
3.1.2	10% Recovery	°C	Max. 205.0	
3.1.3	50% Recovery	°C	Report	
3.1.4	90% Recovery	°C	Report	
3.1.5	End Point	°C	Max. 300.0	
3.1.6	Residue	% v/v	Max. 1.5	
3.1.7	Loss	% v/v	Max. 1.5	
3.2	Flash Point	°C	Min. 38.0	IP170
3.3	Density at 15°C	kg/m^3	Min. 775.0	ASTM D 4052/IP365
			Max. 840.0	
4	**Fluidity:**			
4.1	Freezing Point	°C	Max minus 47.0	ASTM D 2386/IP16
4.2	Viscosity at minus 20°C	mm^2/s	Max 8.000	ASTM D 445/IP71
Test	**Property**	**Units**	**Limits**	**Method**
5	**Combustion:**			
5.1	Smoke Point	mm	Min 25.0	ASTM D 1322/IP57(see Note 10)
or				
5.2	Smoke Point	mm	Min 19.0	ASTM D 1322/IP57
	And Naphthalenes	% v/v	Max 3.00	ASTM D 1840

5.3	Specific Energy	MJ/kg	Min 42.80	(see Note 11)
6	**Corrosion:**			
6.1	Copper Strip	Class	Max 1	ASTM D 130/IP154 (see Note 12)
7	**Thermal Stability,JFTOT at ControlTemperature of 260°C**			ASTM D 3241/IP323 (see Note 13)
7.1	Tube Rating Visual		Less than 3. No Peacock(P) or Abnormal (A)	(See Note 14)
7.2	Pressure Differential	mm Hg	Max 25	
8	**Contaminants:**			
8.1.1	Existent Gum	mg/100ml	Max 7	IP540
9	**Water Separation Characteristics**			
9.1	Microseparometer, at Point of Manufacture:			ASTM D 3948 (see Note 15)
9.1.1	MSEP Without SDA	Rating	Min 85	
9.1.2	MSEP With SDA	Rating	Min 70	
10	Conductivity:			
10.1	Electrical Conductivity	pS/m	Min 50	ASTM D 2624/IP274
			Max 600	(See Note 16)
11	Lubricity:Wear Scar Diameter	mm	Max 0.85	ASTM D 5001(see Note 17)

Note:

1) The requirement to report Saybolt Colour shall apply at point of manufacture, thus enabling a colour change in distribution to be quantified. Where the colour of the fuel precludes the use of the Saybolt Colour test method, then the visual colour shall be reported. Unusual or a typical colours should also be noted. For further information on the significance of colour see Annex E.

2)Refer to the information on Particulate Contamination in Annex F.

3)The number of particles shall be reported as a scale number as defined by Table 1 of ISO 4406:1999

4)The implementation date for particle counting is 30th June 2009, but where possible, to help the data collection process, the results should be reported before that date. It is the specification authorities intention to replace Test 1.3 with Test 1.4 at the earliest opportunity.

5) Concentration of FAME (Fatty Acid Methyl Ester)

6) Round robin testing has demonstrated the correlation between total aromatics content measured by IP 156/ASTM D 1319 and IP 436/ASTM D 6379. Bias between the two methods necessitates different equivalence limits as shown. Testing laboratories are encouraged to measure and report total aromatics content by the two methods to assist verification of the correlation. In cases of dispute IP 156 will be the referee method. It is the intention of the Technical Authority to change the referee method to IP 436 at a later date.

7)The alternative requirement 2.5 is a secondary requirement to 2.4. In the event of a conflict between Sulphur Mercaptan (2.4) and Doctor Test (2.5) results, requirement 2.4 shall prevail.

8) Severely hydroprocessed components are defined as petroleum derived hydrocarbons that have been subjected to a hydrogen partial pressure of greater than 7000 kPa (70 bar or 1015 psi) during manufacture.

9)In methods IP 123 and ASTM D 86 all fuels certified to this specification shall be classed as group 4, with a condenser temperature of zero to 4°C.

10)Alternative test requirements identified in Table 1; Test Requirements 5.1 or 5.2 are equal primary requirements.

11)Specific Energy by one of the calculation methods listed at annex C will be acceptable. Where a measurement of Specific Energy is deemed necessary, the method to be used shall be agreed between the Purchaser and Supplier.

12)The sample shall be tested in a pressure vessel at 100±1°C for 2 hours ± 5 minutes.

13)Thermal Stability is a critical aviation fuel test and while competition among equipment manufacturers / suppliers is to be encouraged, aircraft safety must remain paramount. It is known that there are JFTOT tubes being supplied by sources other than the original equipment manufacturer (OEM). Until the alternative manufacturers' tubes have been demonstrated to be equivalent to the have been demonstrated to b eequivalent to the OEM's test pieces, to the satisfaction of the AFC, they shall not be used.

14)Examination of the heater tube to determine the Visual Tube Rating using the Visual Tuberator shall be carried out within 120 minutes of completion of the test.

15)No precision data are available for fuels containing SDA; if MSEP testing is carried out during down stream distribution no specification limits apply and the results are not to be used as the sole reason for rejection of a fuel.

16)The conductivity limits are mandatory for product to meet this specification. However it is acknowledged that in some manufacturing and distribution systems it is more practical to inject SDA further downstream. In such cases the Certificate of Quality for the batch should be annotated thus: "Product meets requirements of Defence Standard 91-91 except for electrical conductivity". The Specification Authority is also aware of situations where conductivity can decrease rapidly and the fuel can fail to respond to additional dosing of Stadis 450 (see Annexure H for more information).

17)The requirement to determine lubricity applies only to fuels containing more than 95% hydroprocessed material and where at least 20% is severely hydroprocessed (see Note 8) and for all fuels containing synthetic components. The limit applies only at the point of manufacture.