Bharat Petroleum
energising life

AVIATION TURBINE FUEL (DEF STAN 91-91 ISSUE 5)				
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	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)
2	**Composition:**			
2.1	Total Acidity	mg KOH/g	Max 0.015	ASTM D 3242
2.2	Aromatic HydrocarbonTypes			
2.2.1	Aromatics	% v/v	Max 25.0	ASTM D 1319
OR				
2.2.2	Total Aromatics	% v/v	Max 26.5	ASTM D 6379 (see Note 3)
2.3	Sulphur, Total	% m/m	Max 0.30	ASTM D 4294
2.4	Sulphur, Mercaptan	% m/m	Max 0.0030	ASTM D 3227 (see Note 4)
OR				
2.5	Doctor Test		Doctor Negative	ASTM D 4952
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 5)
3	**Volatility:**			
3.1	Distillation:			ASTM D 86 (see Note 6)
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	ASTM D 3828

3.3	Density at 15°C	kg/m3	Min. 775.0	ASTM D 4052
4	Fluidity:		Max. 840.0	
4.1	Freezing Point	°C	Max minus 47.0	ASTM D 2386
4.2	Viscosity at minus 20°C	mm2/s	Max 8.0	ASTM D 445
Test	**Property**	**Units**	**Limits**	**Method**
5	Combustion:			
5.1	Smoke Point	mm	Min 25.0	ASTM D 1322 (see Note 7)
OR				
5.2	Smoke Point	mm	Min 19.0	ASTM D 1322
	And Naphthalenes	% v/v	Max 3.00	ASTM D 1840
5.3	Specific Energy	MJ/kg	Min 42.80	(see Note 8)
6	Corrosion:			
6.1	Copper Strip	Class	Max 1	ASTM D 130 (see Note 9)
7	**Thermal Stability,JFTOT at ControlTemperature of 260 °C**			ASTM D 3241 (see Note 10)
7.1	Tube Rating Visual		Less than 3. No Peacock(P) or Abnormal (A)	(See Note 11)
7.2	Pressure Differential	mm Hg	Max 25	
8	Contaminants:			
8.1.1	Existent Gum	mg/100ml	Max 7	ASTM D 381
OR				
8.1.2	Existent Gum with Air	mg/100ml	Max 7	(See Note 12)
9	**Water Separation Characteristics**			
9.1	Microseparometer, at Point of Manufacture:			ASTM D 3948 (see Note 13)
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
			Max 450	(See Note 14)
11	Lubricity:Wear Scar Diameter	mm	Max 0.85	ASTM D 5001 (see Note 15)

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.

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

Note 3: 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 laboratoriesare 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.

Note 4: 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.
Note 5: 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.
Note 6: 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.
Note 7: Alternative test requirements identified in Table 1; Test Requirements 5.1 or 5.2 are equal primary requirements.
Note 8: Specific Energy by one of the calculation methods listed at annex C will be acceptable.Where a measurement of Specific Energyis deemed necessary, the method to be used shall beagreed between the Purchaser and Supplier.
Note 9: The sample shall be tested in a pressure vessel at 100±1°C for 2 hours ± 5 minutes.
Note 10: 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.
Note 11: Examination of the heater tube to determine the Visual Tube Rating using the Visual Tuberator shall be carried out within 120 minutesof completion of the test.
Note 12: Air may be used instead of steam as the evaporating medium so long as the temperatures remain as specified in IP131/ ASTM D 381, Table 1 – Test conditions for Aircraft/Aviation Turbine Fuel, for steam jet apparatus. When carrying out this procedure the following points should be noted: - Even though well and bath temperatures are as for steam-jet, airflow calibration should still be adjusted to give an air flow of 600 ml/s at ambient conditions. - The beakers should still undergo the same pre-heating as in steam-jet procedure (clause 10.5 in IP 131).
Note 13: 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.
Note 14: 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”. Due to the high flowrates and very fine filtration used when fuelling aircraft, it is absolutely essential that these conductivity limits are met at the point of delivery into aircraft.
Note 15: 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 5) and for all fuels containing synthetic components. The limit applies only at the point of manufacture.
Properties given above are typical. We try our best to make products to meet customer requirements.