Laboratory	**Hindustan Petroleum Corporation Limited, Visakh Refinery-Quality Control Laboratory, Malkapuram, Visakhapatnam, Andhra Pradesh**
Accreditation Standard	**ISO/IEC 17025: 2005**
Certificate Number	**TC-7406** ***(in lieu of T-1175)*** **Page 1 of 9**
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Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection

CHEMICAL TESTING

I.	**PETROLEUM AND PRODUCTS**			
1.	**Kerosene, HSD, HFHSD, LDO, HVGO, FO, LSHS**	Acidity	IS 1448 (Part 2): 2007 (RA 2013) ASTM D974: 2014^{e2,} ASTM D664: 2017a IP 1: 1994 (RA 2004), IP 182: 2006	(0.0 to 0.5) mg KOH/g
	ATF Jet A-1		IS 1448 (Part 113): 1983 (RA 2016) ASTM D3242: 2011 (RA 2017)	(0.000 to 0.100) mg KOH/g
2.	**HSD, HFHSD, LDO, HVGO, FO, LSHS**	Ash Content	IS 1448 (Part 4): 2008 (RA 2013) ASTM D482: 2013 ISO 6245: 2001	(0.001 to 0.180) % mass
3.	**Kerosene**	Burning Quality	IS 1448 (Part 5): 1970 (RA 2013) ASTM D187-08 (RA 2013)	(5 to 30) mg/kg
4.	**Naphtha, FO, LSHS**	Calorific value	IS 1448 (Part 7): 2004 (RA 2016)	(9000 to 12000) Cal/g
5.	**Naphtha, HSD, HFHSD, LDO, HVGO, FO, LSHS,**	Carbon Residue by Rams Bottom Method	IS 1448 (Part 8): 2017 ASTM D524: 2015 ISO 4262: 1993	(0.01 to 20) % mass
	HSD, HFHSD, LDO, HVGO, FO, LSHS	Micro carbon residue	ASTM D4530: 2015 IP 398: 2015 ISO 10370: 2014	(0.1 to 30) %mass
6.	**HSD, HFHSD**	Cetane number	IS 1448 (Part 9): 2013 ASTM D613: 2018	30 to 65
7.	**Crude oil, HSD, HFHSD, LDO, JBO, HVGO, FO,**	Pour Point	IS 1448 (Part 10): 2013 ASTM D97: 2017b ISO 3016: 1994	(-18 to 66) ºC

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	LSHS	Pour point (Automatic Tilt method)	ASTM D5950: 2014	(-18 to 51) ºC
8.	**ATF Jet A-1**	Freezing point	IS 1448 (Part 11): 2004 (RA 2016) ASTM D2386: 2015 ISO 3013: 1997	(-70 to-20) ºC
		Freezing point (Automatic Laser method)	ASTM D7153: 2015^{e1}	(-70 to-20) ºC
9.	**HSD, HFHSD, JBO**	Color-ASTM	IS 1448 (Part 12): 2013 ASTM D1500: 2012 (RA 2017) ISO 2049: 1996	(0.0 to D8.0) Colour unit
	Naphtha, Kerosene, MTO, ATF Jet A-1	Color-Say bolt	IS 1448 (Part 14): 1960 (RA 2013) ASTM D156: 2015	(-16 to +30) Colour unit
	Naphtha, MTO Kerosene, ATF Jet A-1, HSD, HFHSD, JBO	Colour-Automatic Tristimulus method	ASTM D6045: 2012 (RA 2017)	(-16 to +30) & (L0.5 to D8.0) Colour units
10.	**LPG, MS, Kerosene, MTO, ATF Jet A-1, HSD, LDO HFHSD**	Copper Corrosion	IS 1448 (Part 15): 2004 (RA 2016) ASTM D130: 2012, ASTM D1838: 2016 ISO 6251: 1996, ISO 2160: 1998	(1 to 4) Classification
11.	**Crude Petroleum, Petroleum products.**	Density by hydrometer	IS 1448 (Part 16): 1990 (RA 2013) ASTM D1298: 2012b (RA 2017) ISO 3675: 1998	(0.60 to 1.1) g/cc
	Naphtha, MS, Kerosene, MTO ATF Jet A-1, HSD, HFHSD, JBO, LDO, FO, LSHS, HVGO	Density and Relative Density of Liquids by Digital Density Meter	ASTM D4052: 2016 ISO 12185: 2001	(0.6 to 1.0) g/cm^3

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	Crude oil	Density and Relative Density of Liquids by Digital Density Meter	ASTM D5002: 2016	(0.65 to 0.95) g/cm^3
12.	**Naphtha, MS, Kerosene, MTO, ATF Jet A-1, HSD, HFHSD, JBO**	Distillation	IS 1448 (Part 18): 1991 (RA 2016) ASTM D86: 2017 IP 123: 2011 (RA 2014) ISO 3405: 2011	(20 to 400) ºC Recovery (0 to 99)%
13.	**MS, Naphtha, ATF Jet A-1**	Doctor Test	IS 1448 (Part 19): 2015 IP 30: 2014	Positive / Negative
14.	**Kerosene, MTO, ATF Jet A-1, HSD**	Flash point (Abel)	IS 1448 (Part 20): 1998 (RA 2013) IP 170: 2014 ISO 13736: 2013	(19 to 70) ºC
	LDO, JBO HFHSD, LSHS, HVGO, FO	Flash point (PMC)	IS 1448 (Part 21): 2012 (RA 2017) ASTM D93: 2016a ISO 2719: 2016	(40 to 360) ºC
	Bitumen	Flash point (COC)	IS 1448 (Part 69): 2013 ASTM D92: 2016b	(79 to 400) ºC
15.	**Crude oil, LSHS FO**	Asphaltenes	IS 1448 (Part 22): 1985 (RA 2013) ASTM D6560: 2017	(0.5 to 30) % mass
16.	**Naphtha, MS, ATF Jet A-1, MTO**	Hydrocarbon types by FIA	IS 1448 (Part 23): 2004 (RA 2016) ASTM D1319: 2015 ISO 3837: 1996	Aromatics: (5 to 99) %vol Olefins: (0.3 to 55) %vol
	Naphtha , MS	Hydrocarbon type by Gas Chromatography	ASTM D5443: 2014 ASTM D6839: 2018	(0.05 to 100) % mass
17.	**ATF Jet A-1, HSD, HFHSD, JBO, FO, LDO, HVGO, LSHS**	Viscosity Kinematic	IS 1448 (Part 25): 1976 (RA 2013) ASTM D445: 2017a ISO 3104: 1997	(0.2 to 1000) cSt
	HSD, HFHSD, JBO, LDO, FO	Viscosity and Density by Stabinger Viscometer	ASTM D7042: 2016$^{\varepsilon 3}$	(2.05 to 456) cSt (0.6 to 1.0) g/cc

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18.	**MS**	MON	IS 1448 (Part 26): 2013 ASTM D2700: 2017a IP 236: 2014 ISO 5163: 2014	40 to 120
19.	**MS**	RON	IS 1448 (Part 27): 2013 ASTM D2699: 2017 IP 237: 2014 ISO 5164: 2014	40 to 120
20.	**MS, Naphtha**	Oxidation stability-Induction Period	IS 1448 (Part 28): 2008 (RA 2013) ASTM D525: 2012a ISO 7536: 1994	(30 to 1000) minutes
21.	**Naphtha, MS, ATF Jet A-1**	Existent Gum	IS 1448 (Part 29): 2004 (RA 2016) ASTM D381: 2012(RA 2017) ISO 6246: 2017	(1 to 30) g/m^3
	Naphtha, MS	Potential gum	IS 1448 (Part 147): 1998 (RA 2016) ASTM D873: 2012	(10 to 200) g/m^3
22.	**Crude oil, HSD, HF HSD, LDO, FO, LSHS**	Sediment in crude and fuel oils by extraction	IS 1448 (Part 30): 2013 ASTM D473: 2007 (RA 2017^{e1}) ISO 3735: 1999	(0.004 to 0.4) % mass
23.	**Kerosene, ATF Jet A-1, LDO**	Smoke point	IS 1448 (Part 31): 2017 ASTM D1322: 2018 ISO 3014: 1993	(5 to 30) mm
24.	**Crude oil, Naphtha, MS**	Vapor Pressure by Reid method	IS 1448 (Part 39): 2012 (RA 2017) ASTM D323: 2015a ISO 3007: 1999	(0.1 to 15) psi
	Naphtha, MS	Vapor pressure by Mini method	ASTM D5191: 2015	(1.0 to 18.6) psi
25.	**Crude oil, HFHSD, LDO, FO, LSHS**	Water by distillation	IS 1448 (Part 40): 2015 ASTM D95: 2013^{e1} ISO 3733: 1999	(0.025 to 5) % vol

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	Crude oil, Naphtha, MS, Kerosene, MTO, ATF Jet A-1, HSD, HFHSD, JBO, LDO, FO, LSHS, HVGO	Water-Coulometric Karl fisher Titration	ASTM D6304: 2016^{e1} IP 438: 2001 (RA 2013) ISO 12937: 2000	(0.003 to 0.100) % mass
	HSD, HFHSD, LDO. LSHS	Water-potentiometric Karl Fischer titration	IP 439: 2001 ISO 6296: 2000	(0.003 to 100) % mass
	FO	Water-potentiometric Karl Fischer titration	IP 471: 2006	(0.05 to 2.00) % mass
26.	**Crude oil**	Water and sediment	IS 1448 (Part 41): 1992 (RA 2013) ASTM D4007: 2011 (RA 2016^{e1})	(0.025 to 3) % vol
27.	**ATF Jet A-1**	Water reaction	IS 1448 (Part 42): 2015 ASTM D1094: 2007 (RA 2013)	Rating 1 to 4
28.	**Naphtha**	Non Volatile matter	IS 1448 (Part 64): 1998 (RA 2013)	(1 to 30) mg/100mL
29.	**ATF Jet A-1**	Thermal oxidation stability (JFTOT)	IS 1448 (Part 97): 2015 ASTM D3241: 2018 ISO 6249: 2009	(0 to 50) mm Hg Tube rating : 0 to 4
30.	**ATF Jet A-1**	Mercaptan Sulphur	IS 1448 (Part 109): 2004 (RA 2016) ASTM D3227: 2016 ISO 3012: 1999	(0.0003 to 0.01) % mass
31.	**HSD, HFHSD**	Cold filter Plugging point (CFPP)	IS 1448 (Part 110): 1981 (RA 2013) ASTM D6371: 2017a IP 309: 1999 (RA 2014)	(-30 to 30) ºC
32.	**LPG, Propylene**	Analysis of Liquefied petroleum gases and propylene concentrate by GC	IS 1448 (Part 111): 1983 (RA 2013) ASTM D2163: 2014^{e1} IP 405: 1994 (RA 2015) ISO 7941: 1988	(0.01 to 100) % vol

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
33.	**ATF Jet A-1**	Naphthalene	IS 1448 (Part 118): 1985 (RA 2013) ASTM D1840: 2007 (RA 2017)	(0.01 to 5.0) % vol
34.	**ATF Jet A-1**	Water separation characteristics (MSEP)	IS 1448 (Part 142): 1993 (RA 2016) ASTM D3948: 2014	50 to 100
35.	**ATF Jet A-1**	Electrical conductivity	IS 1448 (Part 148): 2002 (RA 2013) ASTM D2624: 2015 ISO 6297: 1997	(15 to 1000) pS/m
36.	**Crude oil, Naphtha, MS, Kerosene, MTO, ATF Jet A-1, HSD, HFHSD, JBO, LDO, FO, LSHS, HVGO**	Sulphur by EDXRF	IS 1448 (Part 153): 2012 (RA 2017) ASTM D4294: 2016^{e1}, IP 336: 2004 (RA 2014) IP 496: 2007 (RA 2013) ISO 20847: 2004 ISO 8754: 2003, ISO 13032: 2012	(0.0017 to 4.6) % mass
		Sulphur by WDXRF	ASTM D2622: 2016 IP 447: 2008 (RA 2013) IP 497: 2012 ISO 20884: 2011 ISO 14596: 2007	(0.0003 to 4.6) % mass
	Naphtha , MS, ATF, HSD	Total sulphur by UV Fluorescence	ASTM D5453: 2016^{e1}	(1.0 – 8000) mg/kg
		Sulphur by Oxidative Micro Coulometry	ASTM D3120: 2008 (RA 2014) / ISO 16591: 2010	(3.0 to 1000) µg/g
	LPG, Propylene	Sulphur in petroleum Gas by Oxidative Micro Coulometry	ASTM D3246: 2015	(1.5 to 100) mg/kg
37.	**HSD, HFHSD**	Oxidation stability	IS 1448 (Part 154): 2012 (RA 2017) ASTM D2274: 2014 ISO 12205: 1995	(0.1 to 3) mg/100ml

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38.	**Bitumen**	Specific Gravity	IS 1202: 2008	(0.9 to 1.1) g/cc
39.	**Bitumen**	Penetration	IS 1203: 2008 ASTM D5: 2013	(20 to 200) 1/10mm
40.	**Bitumen**	Softening point	IS 1205: 2009 ASTM D36: 2014^{e1}	(30 to 80) ºC
41.	**Bitumen**	Ductility on Residue after RTFOT	IS 1208: 2009 ASTM D113: 2017 ASTM D2872: 2012^{e1}	(10 to 140) cm
42.	**Bitumen**	Solubility in trichloroethylene	IS 1216: 2009 ASTM D2042: 2015	(98 to 100) % mass
43.	**Bitumen**	Viscosity Kinematic @ 135 ^{o}C	IS 1206 (Part3): 2009	(100 to 2000) cSt
44.	**Bitumen**	Viscosity Absolute at 60 ^{o}C	IS 1206 (Part2): 2009 ASTM D2872: 2012^{e1}	(500 to 10000) poise
45.	**LPG**	Hydrogen Sulphide in Liquefied Petroleum (LP Gases)	ASTM D2420: 2013 IP 401: 1995 (RA 2014) ISO 8819: 1993	Pass / Fail
46.	**ATF Jet A-1**	Estimation of Net heat of combustion	ASTM D3338M: 2009 (RA 2014^{e2})	(40.19 to 44.73) MJ/Kg
47.	**HSD, HFHSD**	Calculated Cetane Index by Four Variable Equation	ASTM D4737: 2010 (RA 2016) ISO 4264: 2013	32.5 to 56.5
48.	**FO**	Cleanliness and Compatibility of Residual Fuels by Spot Test	ASTM D4740: 2004 (RA 2014)	(1 to 3) Classification
49.	**FO**	Potential Total Sediments	ASTM D4870: 20 ISO 10307-1 & 2: 2009	(0.01 to 0.5) % mass
50.	**Crude oil, Naphtha**	Organic Chloride	ASTM D4929 Method B: 2017	(0.5 to 10) mg/kg
51.	**ATF Jet A-1**	Lubricity by BOCLE	ASTM D5001: 2010 (RA 2014)	(0.4 to 0.95) mm
	HSD,HF HSD	Lubricity by HFRR	ASTM D6079: 2011 (RA 2016) IP 450: 2000 ISO 12156-1: 2016,-2:2017	(200 to 600) µm

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Convenor

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52.	**F.O.**	Estimation of metals Using ICP (Al, Fe, Si, V, Na, Ca, Zn, P, Cu, K & Ni)	ASTM D5184: 2012 (RA 2017) IP 501: 2005 ISO 14597: 1997 ISO 10478	Al (5 to150) mg/kg Si (10 to 250) mg/kg Na (1 to100) mg/kg V (1 to 400) mg/kg Ni (1 to 100) mg/kg Fe (2 to 60) mg/kg Ca (3 to 100) mg/kg Zn (1 to 70) mg/kg P (1 to 60) mg/kg
53.	**ATF Jet A-1**	Particulate contamination by Laboratory filtration	ASTM D5452: 2012 IP 423: 2010	(0.02 to 5) mg/L
	HSD	Contamination	IP 440: 2014 ISO EN 12662: 2008	(12 to 30) mg/kg
54.	**MS, Naphtha**	Benzene, by Gas Chromatography	ASTM D5580: 2015	(0.01 to 5) % mass
55.	**HSD, HFHSD, JBO**	Polyaromatic Hydrocarbons (PAH)	ASTM D6591: 2011 (RA 2017) IP 391: 2007 ISO EN 12916	(0 to 26) % mass
56.	**ATF Jet A-1**	Silver strip Corrosion	IP 227: 1999	(0 to 4) Classification
57.	**MS**	Lead content – EDXRF	ASTM D5059: 2014 IP 352: 2007 (RA 2014)	(0.002 to 0.50) g/L
58.	**LPG & Propylene**	Calculation method for Density and Vapor pressure	IP 432: 2000 (RA 2017) ISO 8973: 1999	Density (500 to 700) kg/m^3 & RVP (400 to 1100) kPa
59.	**ATF**	Cleanliness	IP 564: 2013 ISO 4406: 1999 Table 1	(4 to 30) µm size (0 to 10,000) cumulative counts per ml.
60.	**FO**	Hydrogen Sulphide in Fuel oils	IP 570: 2012	(0.4 to 15.0) mg/kg
II.	**POLLUTION & ENVIRONMENT**			
1.	**Waste water (Effluents/Sewage)**	pH, Electrometric @ 25^{o}C	APHA 4500-H^{+}B-2012	3 to 11

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		Total suspended solids dried at 103-105^{o}C	APHA 2540 D-2012	(2.5 to 200) mg/L
		Oil & Grease Partition Gravimetric	APHA 5520 B, C-2012	Method B (10 to 50) mg/L Method C (0.2 to 10) mg/L
		Sulphides by Iodometric	APHA 4500 S^{2-} F-2012	(0.2 to 10) mg/L
		Chemical Oxygen Demand	APHA 5220 B, D-2012	(1 to 1000) mg O_2/L
		Three day BOD Test (As per amendment 1 of the environmental protect)	APHA 5210 B-2012	(5 to 50) mg/L
		Estimation of Phenols by Chloroform extraction and direct photo metric	APHA 5530 C, D-2012	(0.01 to 10) mg/L

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