

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

21 - 47 High Street, Feltham, Middlesex, TW13 4UN, UK

 <p>UKAS TESTING 0261</p> <p>Accredited to ISO/IEC 17025:2005</p>	<h3>SPECTRO</h3>	
	<p>Issue No: 024 Issue date: 20 September 2010</p>	<p>Palace Gate Odiham Hook Hampshire RG29 1NP</p>
<p>Testing performed at the above address only</p>		

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
PETROLEUM and PETROLEUM PRODUCTS OIL, LUBRICANTS, DEBRIS AND HYDRAULIC FLUID	<u>Chemical and Physical Tests</u>	Documented In-House Methods in the series M 000 as listed below
	Air release value of lubricating and hydraulic oils - Range 0 - 30 mins	M 028 based on IP 313 and ASTM D3427
	Colour (Lovibond) - Range 0 - 8 Lovibond units	M 009 based on IP 196, ISO 2049 and ASTM 1500
	Conductivity	M 021 based on ASTM D2624 and IP 274
	Demulsibility characteristics of oil and synthetic fluids - Range 80 ml emulsion to 40 ml oil and 40 ml water	M 029 based on ASTM D1401
	Debris content extracted from filter elements - Range 0 - 100% wt	M 032 by filtration/SEM
	Density and Specific Gravity - Range 0.5 - 1.5 g/ml	M 011 based on ASTM D5002
Elemental analysis of dark oils - Spectral range 170 to 800 nm Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, Pb, Si, Sn, Ti, V, Zn	M 019 by ICP based on ASTM D5185	



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PETROLEUM and PETROLEUM PRODUCTS OIL, LUBRICANTS, DEBRIS AND HYDRAULIC FLUID (cont'd)	<p><u>Chemical and Physical Tests</u> (cont'd)</p> <p>Elemental analysis of Aviation oils - Spectral range 170 to 800 nm Ag, Al, B, Be, Ca, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, Pb, Si, Sn, Ti, V, W, Zn</p> <p>Ferromagnetic particles in oil - Range 15 - 750 PQ units</p> <p>Flash Point - Range 120 - 300 °C</p> <p>- Range 80 - 300 °C</p> <p>- Range 40 - 360 °C</p> <p>Foaming characteristics of lubricants - Range 0 ml (nil) to <1000 ml</p> <p>Chlorofluoro Hydrocarbons in hydraulic fluids - range: Freon 11 0.1 to 5 ppm Freon 113 0.1 to 10 ppm 1,1,1-trichloroethane 0.1 to 20 ppm Carbon tetrachloride 0.1 to 10 ppm 1,1,2-trichloroethylene 0.1 to 10 ppm 1,1,2,2-tetrachloroethylene 0.1 to 5 ppm</p> <p>Insoluble Matter: - heptane or toluene Range 0.01 - 20 % w/w</p> <p>- Pentane Range 0.01 - 5 % w/w</p>	<p>Documented In-House Methods in the series M 000 as listed below</p> <p>M 019 by ICP based on ASTM D5185</p> <p>M 025 by Particle Quantifier</p> <p>M 001 by Go, No-go based on IP 303:Part 1 (obsolete) by Setaflash</p> <p>M 020 by Cleveland open cup based on ASTM D92 and IP 36 by Cleveland Open Cup</p> <p>M 031 by Pensky Marten closed cup based on IP 34 and ASTM D93</p> <p>M 027 based on IP 146 and ASTM D892 using Seta Dual-twin foam bath</p> <p>M 018 by Gas Chromatography</p> <p>M 003 by High Speed Centrifuge based on IP 316</p> <p>M 010 by Membrane Filtration based on MM 1068</p>



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PETROLEUM and PETROLEUM PRODUCTS OIL, LUBRICANTS, DEBRIS AND HYDRAULIC FLUID (cont'd)	<u>Chemical and Physical Tests</u> (cont'd)	Documented In-House Methods in the series M 000 as listed below
	Metallic debris	M 022 by Chemical analysis
	Micro carbon residue - Range 0.10 % - 30.0 % m/m	M 030 based on ASTM D4530
	Neutralization number: Acid - Range 0.01 - 20.0	M 034 by colour titration based on IP 139 and ASTM D974
	- TAN Range 0.1 - 20 mg KOH/g	M 007 based on ASTM D664 and IP 177
	- TBN Range 0.1 - 60 mg KOH/g	M 004 based on ASTM D4739 M 005 based on ASTM D664 and IP 177
	Oxidation, nitration, sulphates, glycol, water - spectral range 7400 - 375 cm ⁻¹	M 017 by FTIR
	- Oxidation 0 - 50 (abs/cm) - Nitration 0 - 50 (abs/cm) - Glycol POS/NEG - Water 0 - 5 (% by wt) - Soot 0 - 2 (% by wt)	
	Particle counting (contamination) NAS code 0-12	M 008 based on IP 327 (obsolete), NAS 1638, ISO 4406 by HIAC
	Particle examination - qualitative identification of alloy type	M 013 by Scanning Electron Microscope
	- size and number of particles - Range 5 - 100 microns	M 033 by HIAC
	Initial pH Range 0-14 pH units	M 016
Measurement of Antioxidant Content	M 039 based on ASTM D6971 by RULER	



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PETROLEUM and PETROLEUM PRODUCTS OIL, LUBRICANTS, DEBRIS AND HYDRAULIC FLUID (cont'd)	<u>Chemical and Physical Tests</u> (cont'd) Sulphur and Chlorine Total Base Number Range 0.10 - 60.0 mg KOH/g Viscosity Range 1-1000 cSt Water Content - Range 0.001 - 10% or 10 - 100,000 ppm Water contamination, positive or negative - crackle test	Documented In-House Methods in the series M 000 as listed below M 015 by X-Ray Spectrometry (MDX) - adapted from ASTM D2622 M 006 based on IP 276 and ASTM D2896 M 002 based on IP 71, Section 1, by Semi-Automatic Viscometer Method, ASTM D445 M 023 by automatic Karl Fischer based on ASTM D6304c M 026 by Seta Flash Go, No-go flashpoint tester
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