

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

 <p>Accredited to ISO/IEC 17025:2005</p>	Westmoreland Mechanical Testing & Research Ltd	
	Issue No: 027 Issue date: 25 July 2018	
	19 Wildmere Road Banbury Oxfordshire OX16 3JU	Contact: Mr Cristian Poputa Tel: +44 (0)1295 261211 Fax: +44 (0)1295 263096 E-Mail: qualityuk@wmtr.com Website: www.wmtr.co.uk
Testing performed at the above address only		

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
METALS, ALLOYS and METAL PRODUCTS	<u>Chemical Tests</u>	
Aluminium and aluminium alloys	Elemental analysis Si, Fe, Cu, Mn, Mg, Zn, Ni, Cr, Pb, Sn, Ti, Be, Bi, Ca, Cd, Ga, Na, P, Sb, Sr, Li, V, Zr	Documented in-house method WMTR/QTP/OES001 using OES
Carbon steels, low alloy steels, stainless steels	C, Si, Mn, P, S, Cr, Mo, Ni, Al, Co, Cu, Nb, Ti, V, W, Pb, Sn, As, Zr, Ca, Sb, B	
Nickel alloys	Al, B, C, Co, Cr, Cu, Fe, Mg, Mn, Mo, Nb, P, S, Si, Sn, Ti, V, W, Zr	
	<u>Corrosion Tests</u>	
Aluminium alloys	Intergranular corrosion	BS EN ISO 7866:2012 Annex A ASTM G110-92(2015)
	Alternate Immersion Stress Corrosion (Including preparation of samples)	ASTM G44-99(2013) ASTM G47-98(2001) ASTM G38-01(2013) ASTM G49-85(2011)
	Salt Spray (Fog)	ASTM B117-16



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METALS, ALLOYS and METAL PRODUCTS (cont'd)	<u>Mechanical Tests</u>	
Foil	Tensile	ASTM E345-93(2013)e1
Ferrous & Non-Ferrous alloys	Tensile (forces up to 100 kN, temperatures - ambient to 1000°C)	ASTM E8/E8M-15a ASTM A370-15 ASTM B557-15 ASTM B557M-15 BS EN ISO 6892-1:2009 BS 4A4-1:Section 1:1966 (withdrawn) BS EN 2002-1:2005 BS EN ISO 6892-2:2011 ASTM E21-09 BS EN 2002-2:2005
	Youngs Modulus, Tangent Modulus and Chord Modulus	ASTM E111-04(2010)
	Plastic strain ratio (r)	ASTM E517-00(2010)
	Strain hardening exponent (n)	ASTM E646-15
	Compression	ASTM E9-09
	Bend Testing	Documented in-house method WMTR/QTP/EM007
	Pin - Type Bearing test	ASTM E238-12
	Double shear	ASTM B769-11
	Shear	ASTM B831-14
	<u>Hardness</u>	
	Brinell hardness (10/3000 HBW)	ASTM E10-15a
	Rockwell hardness (HRB & HRC)	ASTM E18-15
	Vickers hardness (HV5, HV10, HV30)	ASTM E92-16
	Micro-hardness (HV 0.2, 0.3, 0.5, 1 & HK 0.5, 1)	ASTM E384-11e1



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METALS, ALLOYS and METAL PRODUCTS (cont'd)	<u>Mechanical Tests</u> (cont'd)	
	<u>Impact</u>	
Ferrous & Non-Ferrous alloys	Charpy V - notch (temperatures -196 °C to 100 °C)	ASTM E23-12c ASTM A370-15
	Izod	BS 131-1:1961
	<u>Fracture toughness</u>	
	Fracture toughness (KIC)	ASTM E399-09
	R Curve	ASTM E561-15a
	K _{1c} , CTOD, J	BS 7448-1:1991
	<u>Fatigue testing</u>	
	Constant amplitude fatigue	BS EN 6072:2010
	High cycle & low cycle fatigue under force control (forces up to 500 kN) (temperature ambient to 1000°C)	BS 3518-3:1963 ASTM E466-15
	High cycle fatigue (temperature - ambient to 1000°C)	BS EN 3987:2009
	Low cycle fatigue under force control (temperature - ambient to 800°C)	prEN 3874:Edition P1, April 1998
	Low cycle fatigue under strain control (ambient temperature)	BS 7270: 2006
	Low cycle fatigue under strain control (temperature ambient to 1000°C)	ASTM E606-12
	Fatigue crack growth (forces up to 250 kN & temperatures - ambient to 1000°C)	ASTM E647-11
Ferrous & Non-Ferrous alloys	<u>Physical test</u> Surface roughness (R _a)	Documented In-house Method WMTR/QTP/EM003



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METALS, ALLOYS and METAL PRODUCTS (cont'd) Ferrous & Non-Ferrous alloys	<u>Metallurgical Tests</u> Depth of decarburisation (Micro hardness and optical techniques) Average grain size Largest grain Hydrogen embrittlement Inclusion content Microstructure of graphite in iron castings Alpha Case in Titanium Microscopic and bend test methods	ASTM E1077-14 ASTM E1382-97(2015) automatic & semi-automatic methods ASTM E112-13 ASTM E930-09(2014) ASTM F519-13 ASTM E45-13 (Method D) ASTM A247-16a Documented In-house Method WMTR/QTP/MOG024
PLASTICS & REINFORCED PLASTIC COMPOSITES	<u>Mechanical Tests</u> Compressive properties Compressive residual strength properties In-plane shear Tensile Apparent interlaminar shear strength Flexural Tension fatigue	ASTM D695-15 prEN 6036:1995 ASTM D7137/D7137M-12 prEN 6038:1995 BS EN ISO 14129:1998 ASTM D3518/D3518M-13 BS EN 2561:1995 ASTM D3039/D3039M-14 prEN 6035:1995 BS EN 2563:1997 ASTM D790-15e2 ASTM D3479/D3479M-12



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PLASTICS & REINFORCED PLASTIC COMPOSITES (cont'd)	<u>Mechanical Tests</u> (cont'd) Tensile	BS EN ISO 527-1:2012 BS EN ISO 527-2:2012 BS EN ISO 527-4:1997 BS EN ISO 527-5:2009 BS 2782-3 Method 326F:1997 ASTM D638-14
END		