

			$(a)h^0 _{W_{PD}}$	
Callaghan Ir Measurement	Inovation Standards Laboratory of New Zeala	nd	Client Number	8
	, Lower Hutt, 5040 Road, Gracefield, Lower Hutt, 5010			
Telephone 0	4 931-3000	http://www.measur	ement.govt.nz/	
Authorised Re Dr Blair Hall Principal Resea	presentative arch Scientist and Quality Manager			
Programme Metrology & Ca	libration Laboratory			
Accreditation	Number 1	Initial Accreditation	Date 30 July 2004	
		g and calibration labor	atories	
5.01 5.02 5.05 5.11 5.12 5.14 5.21 5.31 5.32 5.35 5.41 5.42 5.43 5.42 5.43 5.44 5.61 5.65 5.66 5.67 5.68 5.69 5.82 5.84 5.85	Engineers' Limit Gauges Jigs, Fixtures, Cutting Tools and Geometric Form Working Standards of Length a Precision Measuring Instrument Laser Frequency Masses Volumetric Equipment Density Hygrometry Barometers Differential Pressure Measuring Pressure Gauge Testers and P Pressure Gauge Testers and P Pressure Gauge Testers and P Pressure and Vacuum Temperature Measuring Equipm Photometers and Radiometers Lamps, LEDs, Lasers and Othe Colour of Light Sources and Co Optical Properties of Materials: Optical Properties of Materials: Resistors, Resistance Boxes an Capacitors Inductors and Transformers	nd Angle ts Devices (including Ma ressure Balances nent r Light Sources lorimeters Spectral Spectrally integrated	anometers)	
				[

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5.86	Voltage Standards and Current Standards
5.87	Transfer Instruments (AC/DC)
5.88	Calibrators for Instrumentation
5.89	Indicating Instruments and Recording Instruments
5.90	Bridges, Potentiometers and Test Sets
5.91	Frequency Measurement and Time Measurement
5.92	Waveform Measurement
5.93	Signal Sources
5.97	High Voltage Testing

Key Technical Personnel

Dr Laurie Christian Dr Mark Clarkson	5.82, 5.85(d), 5.86, 5.87, 5.88, 5.89, 5.90, 5.92(b), 5.93(b), 5.97 5.41, 5.42, 5.43, 5.44
Mr David Cochrane Dr Adam Dunford	5.05(d)(ii)
Dr Murray Early	5.91(a)(c)(d)(g), 5.92(a)(c), 5.93(a) 5.82, 5.86, 5.87, 5.88, 5.89(a-d,i), 5.90(a,f,g), 5.92(b), 5.93(b), 5.97
Dr Lucy Forde	5.05(d)(ii)(h), 5.11(f)(i)(n), 5.12, 5.14
Ms Eleanor Howick	5.01, 5.02, 5.05, 5.11, 5.12, 5.14
Mr Keith Jones	5.82, 5.84, 5.85, 5.86, 5.87, 5.88(a,c,e), 5.89(a,c,e,f,g,h,i,l), 5.90,
	5.92(b), 5.93(b), 5.97
Dr Annette Koo	5.68, 5.69
Dr Tim Lawson	5.82(a), 5.86(b), 5.88(c), 5.89(c)
Dr Jeremy Lovell-Smith	5.35
Dr Peter Mcdowall	5.41, 5.44
Mr Greg Reid	5.21, 5.31, 5.32
Dr Peter Saunders	5.61, 5.82(a), 5.90(a)(c)
Dr Francois Shindo	5.65, 5.66, 5.67
Mr Tom Stewart	5.82(a), 5.84, 5.85(a,d), 5.88(b,d,e,f), 5.89(a,b,c,d-h,l), 5.90(c,f,g)
Mr Neil Swift	5.05(d)(ii), 5.65, 5.66, 5.67, 5.68, 5.69
Mr Yang Yenn Tan	5.65
Dr David Rodney White	5.35, 5.61, 5.82(a), 5.90(a)(c)
Mr Chris Young	5.01, 5.02, 5.05, 5.11, 5.12, 5.14

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Metrology SCOPE O	Innovation & Calibration Labora	1	Accreditation			
		on and Measurement Capabil fidence of approximately 95%	ity (CMC) is expressed as an expa	nded		
Measure	ment results are trac	eable to the International Sys	tem of Units (SI)			
		formed at the premises of the me at customer premises.	accredited laboratory, although so	ome may be		
	Measurand	Conditions	CMC Uncertainty			
5.01	Engineers' Limit Gauges					
	(a) Plain plug	g, ring and gap gauges. Taper	plug and ring gauges.			
	Setting plug gauges by comparison with gauge blocks					
	Mean diameter Mean diameter	0.5 mm to 25 mm 25 mm to 300 mm	Q(130, 1.4 <i>L</i>) nm, <i>L</i> Q(95, 1.8 <i>L</i>) nm, <i>L</i>			
	Setting ring gauge	s by comparison with gauge b	locks			
	Mean diameter	1 mm to 300 mm	Q(95, 1.8 <i>L</i>) nm, <i>L</i>	in mm		
	Where $Q(a, b) = \sqrt{a}$	$\sqrt{a^2 + b^2}$				
	(e) Position a	and receiver gauges involving	both linear and angular measurem	ents.		
	Lobster tail gauges	54 mm to 60 mm	0.01 mm			
5.02	Jigs, Fixtures,	Cutting Tools and Comp	onents			
	Measurement of co	omponents/objects on Profile	Projector			
	Error of indicated s	size up to 200 mm x 200	mm Q(0.76, 12.6 <i>L</i>) μm	, <i>L</i> in m		
5.05	Geometric Forr	n				
	(b) Roundne	SS				
	Variability in round	ness Range of diameters				
	0 µm to 400 µm	1 mm to 300 mm	Q(0.025, 0.018 <i>R</i>)	μm, <i>R</i> in μm		
	(d) Flatness	of Optical Flat, Parallelism, W	edge Angle of Optical Wedge or Fl	at		
	s Manager thorisation:	topto- Issue	59 Date:16/04/21	Page 3 of 22		



	ovation alibration Laboratory CCREDITATION			Accreditation	Number 1		
	Length section rallelism m to 10 µm	Range of diam 10 mm to 35 m		0.08 µm			
	tness m to 2.5 μm	Range of diam 10 mm to 35 m		0.06 µm			
ii)	Photometry sec	tion					
Fla	Flatness of optical flats, one-axis or whole surface						
	to 150 mm diameter to 250 mm diameter			22 nm 33 nm			
(h)	Levelness						
	Levelling of dynamic weigh station sites by measurement of deviation from a horizontal plane (calibration carried out on site)						
De	viation in height	Horizontal rang 1.8 m to 60 m	je	Q(41, 7.1 <i>L</i>) µm, <i>L</i> i horizontal distance			
5.11 Workiı	ng Standards of L	ength and Ang	le				
(a)	Gauge blocks a	nd accessories					
Me	asurement of central	ength					
	interferometry comparison	0.5 mm to 103 r 0.1 mm to 103 r		Q(17, 0.15 <i>L</i>) nm, <i>L</i> Q(36, 1.4 <i>L</i>) nm, <i>L</i> i			
Me	asurement of variation	n in length		Q(30, 0.35 <i>L</i>) nm, <i>L</i>	in mm		
(b)	Length bars and	d accessories					
Ме	asurement of central	ength and variation	on in length				
Lor	ng gauge blocks by co	mparison with gai	uge blocks using th	e Horizontal Federal			
100	0 mm to 300 mm			Q(91, 1.3 <i>L</i>) nm, <i>L</i> i	n mm		
Me	asurement of variation	n in length		Q(34, 0.35 <i>L</i>) nm, <i>L</i>	in mm		
(f)	Precision linear	scales					
Eng	gineer or machinist sc	ale-line spacing					
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	0.1 m to	94 m			Q(10, 8.2 <i>L</i>) µm, <i>L</i> i	n m	
	(h)	Precision graticu chambers	les including sta	ge micrometers and	haemocytometer cou	unting	
	1 µm to	10 mm			0.5 µm		
	(i)	Surveying tapes	and petroleum of	dip tapes			
	4 m to 5	i0 m			Q(10, 10.5 <i>L</i>) µm, <i>L</i>	. in m	
	Surveyo	or levelling rods					
	0.5 m to	9 3 m			Q(10, 10 <i>L</i>) µm, <i>L</i> ir	ו m	
	(n)	Geodetic Baselir	nes (calibrations	carried out on site)			
	Interval	distances	2 m to 1500 m	I	Q(0.3, 0.6 x 10 ⁻³ L)	mm, <i>L</i> in m	
5.12	Precision Measuring Instrum						
	(a)	Length measurin	g machines				
	Electron	ic distance measu	uring machines (EDMs)			
	Error of displace	indicated ement	1 m to 206 m		Q(0.13, 7 x 10 ^{-₄} <i>L</i>) mm, <i>L</i> in m		
	Error of frequent	indicated cy	5 MHz to 100	MHz	0.16 x 10 ⁻⁶ L x frequ	lency	
	Error of	prism constant			0.26 mm		
5.14	Laser	Frequency					
	(a)	Stabilised lasers	of the mise en p	oratique			
	Absolute	e frequency	473 612 GHz		25 kHz		
	(b)	Other stabilised	asers				
	Absolute	e frequency	473 612 GHz		0.2 MHz		
5.21	Masse	S					
	(a)	Examination of la	aboratory standa	ards of mass			
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(b) Examination of industrial standards of mass (c) 0.4 µg to 0.7 µg 0.1 g to 1 g 1 g to 10 g 1 d g to 20 kg 1 kg to 20 kg/m ³ 1 kg to 2000 kg/m ³		& Calibra	n tion Laboratory E DITATION		Accreditation	Number 1
0.1 g to 1 g 0.7 µ g to 1 kg 0.7 µ g to 1 kg 1 g to 10 g 1.6 µ g to 4 µg 1.6 µ g to 4 µg 1 kg to 1 kg 8 µ g to 4 µg 1.6 µ g to 8 µg 0.1 kg to 1 kg 8 µ g to 4 µg 1.6 µ g to 8 µg 0.1 kg to 1 kg 1.1 × 10 ⁷ 1.6 × 10 ⁷ 1 kg to 10 kg 1.1 × 10 ⁷ 1.6 × 10 ⁷ 1 0 kg to 20 kg 1.6 × 10 ⁷ 2.0 × 10 ⁶ g 5.31 Volumetric Equipment 0.0002 mL 0.0002 mL (a) Examination of laboratory volumetric glassware including examination for compliance with the Class A or Class B requirements of the relevant national or international standards 0.0002 mL 0.02 mL to 2 mL 0.0002 mL 0.0002 mL (b) Examination of other types of volumetric apparatus 0.0002 mL 0.002 L to 50 L 0.01 % 5.32 Density 1.0 × 10 ⁵ 1.0 × 10 ⁵ (a) Density of solids 1.0 × 10 ⁵ 1400 kg/m ³ to 3000 kg/m ³ 2.0 × 10 ⁵ 5.35 Hygrometry (a) Humidity measuring devices 0.06 °C (b) Dew point hygrometers <td></td> <td>. ,</td> <td></td> <td></td> <td></td> <td></td>		. ,				
(a) Examination of laboratory volumetric glassware including examination for compliance with the Class A or Class B requirements of the relevant national or international standards 0.02 mL to 2 mL 0.0002 mL (b) Examination of other types of volumetric apparatus 0.002 L to 50 L 0.01 % 5.32 Density (a) Density of solids 1400 kg/m³ to 3000 kg/m³ 1.0 x 10 ⁵ 7800 kg/m³ to 2000 kg/m³ 1.5 x 10 ⁵ (b) Density of liquids 600 kg/m³ to 2000 kg/m³ 2.0 x 10 ⁵ 5.35 Hygrometry (a) Humidity measuring devices (a) Humidity measuring devices (a) Humidity measuring devices (b) Density of c to 0 °C 0.02 °C to 0 0°C 0.06 °C 0.05 °C to 0.06 °C 0.06 °C 0.06 °C to 0.12 °C 0.06 °C i) Relative humidity hygrometers		0.1 g to 1 g to 10 10 g to 7 0.1 kg to 1 kg to 1 10 kg to 20 kg to	1 g 0 g 100 g 5 1 kg 10 kg 20 kg 300 kg		0.7 µg to 1.6 µg 1.6 µg to 4 µg 4 µg to 8 µg 8 µg to 40 µg 1.1 x 10 ⁻⁷ 1.6 x 10 ⁻⁷ 1.5 x 10 ⁻⁶	
with the Class A or Class B requirements of the relevant national or international standards 0.02 mL to 2 mL 0.0002 mL (b) Examination of other types of volumetric apparatus 0.002 L to 50 L 0.01 % 5.32 Density (a) Density of solids 1400 kg/m³ to 3000 kg/m³ 1.0 x 10 ⁵ 7800 kg/m³ to 2000 kg/m³ 1.5 x 10 ⁵ (b) Density of liquids 600 kg/m³ to 2000 kg/m³ 2.0 x 10 ⁵ 5.35 Hygrometry (a) Humidity measuring devices i) Dew point hygrometers -70 °C to 0 °C 0.2 °C to 0.06 °C 0 °C to 70 °C 0.06 °C i) Relative humidity hygrometers	5.31	Volum	etric Equipment			
(b) Examination of other types of volumetric apparatus 0.002 L to 50 L 0.01 % 5.32 Density 0.01 % (a) Density of solids 1.0 x 10.5 1400 kg/m³ to 3000 kg/m³ 1.0 x 10.5 7800 kg/m³ to 8200 kg/m³ 1.5 x 10.5 (b) Density of liquids 2.0 x 10.5 600 kg/m³ to 2000 kg/m³ 2.0 x 10.5 5.35 Hygrowetry (a) Humidity measuring devices 0.2 °C to 0.06 °C i) Dew point hygrometers 0.2 °C to 0.06 °C -70 °C to 0 °C 0.2 °C to 0.02 °C 0 °C to 0 °C 0.06 °C ii) Relative humidity hygrometers 0.2 °C to 0.02 °C ii) Relative humidity hygrometers 0.2 °C to 0.02 °C		(a)	with the Class A or Class B requi			
0.002 L to 50 L 0.01 % 5.32 Density (a) Density of solids 1400 kg/m³ to 3000 kg/m³ 1.0 x 10-5 7800 kg/m³ to 8200 kg/m³ 1.5 x 10-5 (b) Density of liquids 600 kg/m³ to 2000 kg/m³ 2.0 x 10-5 5.35 Hygrometry (a) Humidity measuring devices i) Dew point hygrometers -70 °C to 0 °C 0.2 °C to 0.06 °C 0°C to 70 °C 0.06 °C ii) Relative humidity hygrometers ii) Relative humidity hygrometers		0.02 mL	to 2 mL		0.0002 mL	
5.32 Density (a) Density of solids 1400 kg/m³ to 3000 kg/m³ 1.0 x 10 ⁻⁵ 7800 kg/m³ to 8200 kg/m³ 1.5 x 10 ⁻⁵ (b) Density of liquids 600 kg/m³ to 2000 kg/m³ 2.0 x 10 ⁻⁵ 5.35 Hygrometry (a) Humidity measuring devices i) Dew point hygrometers -70 °C to 0 °C 0.2 °C to 0.06 °C 0°C to 40 °C 0.06 °C 40 °C to 70 °C 0.06 °C to 0.12 °C ii) Relative humidity hygrometers		(b)	Examination of other types of vol	es of volumetric apparatus		
(a) Density of solids 1400 kg/m³ to 3000 kg/m³ 1.0 x 10-5 1400 kg/m³ to 8200 kg/m³ 1.5 x 10-5 (b) Density of liquids 600 kg/m³ to 2000 kg/m³ 2.0 x 10-5 5.35 Hygrometry (a) Humidity measuring devices i) Dew point hygrometers -70 °C to 0 °C 0.2 °C to 0.06 °C 0 °C to 70 °C 0.06 °C ii) Relative humidity hygrometers ii) Relative humidity hygrometers		0.002 L to 50 L			0.01 %	
1400 kg/m³ to 3000 kg/m³ 1.0 x 10-5 7800 kg/m³ to 8200 kg/m³ 1.5 x 10-5 (b) Density of liquids 600 kg/m³ to 2000 kg/m³ 2.0 x 10-5 5.35 Hygrometry (a) Humidity measuring devices i) Dew point hygrometers -70 °C to 0 °C 0.2 °C to 0.06 °C 0°C to 40 °C 0.06 °C 40 °C to 70 °C 0.06 °C ii) Relative humidity hygrometers	5.32	Densit	у			
7800 kg/m³ to 8200 kg/m³ 1.5 x 10-5 (b) Density of liquids 600 kg/m³ to 2000 kg/m³ 2.0 x 10-5 5.35 Hygrometry (a) Humidity measuring devices i) Dew point hygrometers -70 °C to 0 °C 0.2 °C to 0.06 °C 0.06 °C 0.06 °C ii) Relative humidity hygrometers ii) Relative humidity hygrometers		(a)	Density of solids			
600 kg/m³ to 2000 kg/m³ 2.0 x 10-5 5.35 Hygrometry (a) Humidity measuring devices i) Dew point hygrometers -70 °C to 0 °C 0.2 °C to 0.06 °C 0 °C to 40 °C 0.06 °C 40 °C to 70 °C 0.06 °C ii) Relative humidity hygrometers						
5.35 Hygrometry (a) Humidity measuring devices i) Dew point hygrometers -70 °C to 0 °C 0.2 °C to 0.06 °C 0 °C to 40 °C 0.06 °C 40 °C to 70 °C 0.06 °C ii) Relative humidity hygrometers		(b)	Density of liquids			
(a) Humidity measuring devices i) Dew point hygrometers -70 °C to 0 °C 0 °C to 40 °C 40 °C to 70 °C ii) Relative humidity hygrometers Operations Manager		600 kg/r	m ³ to 2000 kg/m ³		2.0 x 10 ⁻⁵	
i) Dew point hygrometers -70 °C to 0 °C 0 °C to 40 °C 40 °C to 70 °C ii) Relative humidity hygrometers Operations Manager	5.35	Hygroi	netry			
-70 °C to 0 °C 0.2 °C to 0.06 °C 0 °C to 40 °C 0.06 °C 40 °C to 70 °C 0.06 °C to 0.12 °C ii) Relative humidity hygrometers		(a)	Humidity measuring devices			
0 °C to 40 °C 0.06 °C 40 °C to 70 °C 0.06 °C to 0.12 °C ii) Relative humidity hygrometers		i)	Dew point hygrometers			
Operations Manager		0 °C to	o 40 °C		0.06 °C	
Operations Manager Issue 59 Date: 16/04/21 Page 6 of 22		ii)	Relative humidity hygrometers			
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	、 ·	5 % ature between 0 °C and 70 °C) Air temperature		0.006 x <i>h</i> % <i>h</i> is relative humidit as a percentage, th	
	0 °C to 70	D° (0.1 °C	
5.41	Barome	tric indicators or transduc	ers		
••••		arometers (including digital baro			
	50 kPa to 90 kPa to	90 kPa		2.0 x 10 ⁻⁵ 1.0 x 10 ⁻⁵ 2.0 x 10 ⁻⁵	
5.42	Differen	tial Pressure Measuring De	evices (including	Manometers)	
	(b) (c)	Diaphragm types Liquid column types, inclined and Transducers and transmitters Other types	d vertical		
	1 Pa to 1	0000 Pa		(6 x 10 ⁻³ + 4.5 x 10 Pa, <i>p</i> in Pa	- ⁵ p)
5.43	Pressur	e Gauge Calibrators and P	ressure Balance	5	
	i)	Absolute pressure – gas medium	1		
	8 kPa to 5 550 kPa t	550 kPa to 7000 kPa		2 x 10 ⁻⁵ 6 x 10 ⁻⁵	
	ii)	Gauge pressure – gas medium			
	-100 kPa -10 kPa te	to -10 kPa o -1 kPa		7 x 10 ⁻⁵ 200 mPa to 100 mI decreasing linearly	Þa,
	1 kPa to 8	3 kPa		100 mPa to 160 mI increasing linearly	^D a,
	8 kPa to 550 to 11			2 x 10 ⁻⁵ 6 x 10 ⁻⁵	
	iii)	Gauge pressure – liquid medium			
	0.1 MPa	to 17 MPa		(1 x 10 ⁻⁴ + 6.6 x 10 MPa (<i>p</i> in MPa)	- ⁵ p)
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Metrolog		tion Laboratory		Accreditation	Number 1	
		to 280 MPa		(6.6 x 10 ⁻⁵ <i>p</i> + 7 x MPa (<i>p</i> in MPa)	10 ⁻⁷ p ²)	
5.44	Pressu	ire and Vacuum				
	(a) (b) (c) (d)	Pressure gauges Vacuum gauges Pressure transducers Pressure recorders				
	i)	Absolute pressure – gas medi	um			
		90 kPa to 110 kPa to 550 kPa		2 x 10 ⁻⁵ 1 x 10 ⁻⁵ 2 x 10 ⁻⁵		
	550 kPa	i to 7000 kPa		6 x 10 ⁻⁵		
	ii)	Gauge pressure – gas mediur	n			
	8 kPa to 90 kPa 110 kPa	to 8 kPa 9 90 kPa to 110 kPa 1 to 550 kPa 1000 kPa		0.0031 kPa 2 x 10 ⁻⁵ 1 x 10 ⁻⁵ 2 x 10 ⁻⁵ 6 x 10 ⁻⁵		
	iii)	Absolute pressure – liquid me	dium			
		a to 17 MPa to 280 MPa		(1 x 10 ⁻⁴ + 6.6 x 1 MPa (<i>p</i> in MPa) (6.6 x 10 ⁻⁵ <i>p</i> + 7 x MPa (<i>p</i> in MPa)	.,	
	iv)	Gauge pressure – liquid medi	um			
	0.2 MPa	a to 17 MPa		(1 x 10 ⁻⁴ + 6.6 x 1	0 ⁻⁵ <i>p</i>)	
	17 MPa	to 280 MPa		MPa (<i>p</i> in MPa) (6.6 x 10 ⁻⁵ <i>p</i> + 7 x MPa (<i>p</i> in MPa)	10 ⁻⁷ <i>p</i> ²)	
5.61	Temperature Measuring Equipment					
	(c)	Platinum (and other metallic) resistance thermometers				
	Contact thermometers, including Standard PRTs at the following fixed points					
	Argon tr	iple point (-189.3442 °C)		1 mK		
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Aetrology		ation Laboratory EDITATION		Accreditatio	n Number 1		
	Mercury triple point (-38.8344 °C)			0.4 mK			
		riple point (0.01 °C)		0.1 mK			
		melting point (29.7646 °C)		0.19 mK			
		freezing point (156.5985 °C)		0.56 mK			
		ezing point (231.928 °C)		0.85 mK			
		ezing point 419.527 °C)		1.9 mK			
		um freezing point (660.323 °C)		10 mK			
	Silver fi	eezing point (961.78 °C)		20 mK			
	(j)	Radiation thermometers					
	Direct r	eading, single spot radiation the	rmometers and the	rmal imagers			
	-25 °C	to 1100 °C		0.6 °C			
	(p) Other direct reading temperat		ure measuring syste	ems, including Industria	al PRTs		
	-190 °C to 0 °C			(2.4 - 0.005 x <i>t</i>) n	nK, <i>t</i> in °C		
	0 °C to	200 °C		$(2.4 + 0.008 \times t)$			
		to 550 °C		$(4.0 + 0.03 \times (t - $			
	200 0			t in °C	200)) iii (j		
5.65	Photometers and Radiometers						
	(a)	Photometers					
	10 lux t	o 3000 lux		0.8 %			
	(b)	Illuminance meters					
	0.005 li	ux to 10 lux		3 %			
		o 3000 lux		0.8 %			
		x to 30000 lux		3 %			
	(c)	Luminance meters					
	$0.5 \mathrm{cd/r}$	m ² to 800 cd/m ²		1.6 %			
		m^2 to 27000 cd/m ²		7%			
		cd/m^2 to 33000 cd/m ²		11 %			
	210000			11 /0			
	(d)	UV meters					
	For Irradiance levels of 1 μ W.cm ⁻² to 5000 μ W.cm ⁻²						
	240 nm	to 270 nm		5 %			
	270 nm	to 310 nm		2.3 %			
	310 nm	to 380 nm		2.5 %			
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For radia	ant exposure levels greater than 1	I.3 μJ.cm ⁻²				
240 nm t	o 270 nm		20 % to 5 %, decre	ases with		
270 nm t	o 310 nm		exposure time 19 % to 2.3 %, dec exposure time	reases with		
310 nm t	o 380 nm		19 % to 2.5 %, dec exposure time	reases with		
(g)	Laser power meters					
Laser lin	es from 450 nm to 500 nm		0.45 % to 0.23 %, o linearly with wavele			
Laser lin	es from 500 nm to 550 nm		0.23 % to 0.15 %, o linearly with wavele	decreases		
Laser lin	es from 550 nm to <650 nm		0.15 %			
	es from 650 nm to 750 nm		0.17 %			
	es from 750 nm to 800 nm		0.17 %			
(h)	Detector spectral responsivity me	easurement				
Discrete	wavelengths					
Laser lin	es from 450 nm to 500 nm		0.45 % to 0.23 %, decreases linearly with wavelength 0.23 % to 0.15 %, decreases linearly with wavelength			
Laser lin	es from 500 nm to 550 nm					
Laser lin	es from 550 nm to <650 nm		0.15 %	•		
Laser lin	es from 650 nm to 750 nm		0.17 %			
Laser lin	es from 750 nm to 800 nm		0.19 %			
correspo	w CMCs are for spectral power lending irradiance levels using app m ⁻¹ uncertainties will increase.	•	•	els below		
240 nm t	o <300 nm		1.4 %			
	o <340 nm		0.98 %			
	o 360 nm		1.02 % to 0.98 %, c	decreases		
			linearly with wavele			
360 nm t	o 380 nm		0.98 %	0		
380 nm to 450 nm			0.98% to 0.45%	6, decreases		
			linearly with wavele	•		
450 nm to 800 nm			Same as for discret			
800 nm t	o 950 nm		wavelengths – see (g) abov 0.19% to 0.33%, increases linearly with wavelength			
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Schedule to CERTIFICATE OF ACCREDITATION



Callaghan Innovation Metrology & Calibration Laboratory SCOPE OF ACCREDITATION

Accreditation Number 1

5.66 Lamps, LEDs, Lasers and Other Light Sources

Calibrations within 5.66 may be offered in the field as well as in the laboratory. An increase in uncertainty due to environmental conditions and other influence variables present in the field may need to be applied.

(a) Lamps: luminous intensity

	10 cd to 5000 cc	I	0.8 %
(\mathbf{o})	Illuminance		
(e)	murmance		
0.005 lu	ix to 30000 lux		3 %
(f)	General sources	: spectral irradiance	
250 nm to 350 nm		0.0001 W/(m².nm) to 0.5 W/(m².nm)	2.6 % to 1.6 %
350 nm	to 850 nm	0.001 W/(m ² .nm) to 0.5 W/(m ² .nm)	1.6 % to 1.4 %

(h) Photoluminescent materials

from 0.5 mcd/m²

0.5 mcd/m² or 15 %, whichever is greater

5.67 Colour of Light Sources and Colorimeters

Calibrations within 5.67 may be offered in the field as well as in the laboratory. An increase in uncertainty due to environmental conditions and other influence variables present in the field may need to be applied.

	(a)	General sources:				
	Colour emitted in CIE x, y colour space			0.0005 to 0.005 in x and y, varies with measurand		
	Colour emitted in CIE u, v colour space			0.0007 in u and v		
	(d)	Lamps:				
	Correlate	d colour temperature 2700 K to 3	20 K			
5.68	Optical Properties of Materials: Spectral					
	(a) Regular transmittance (T) and optical density or absorbance (OD)					
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Bandwidth 1 nm to 3 nm $ \begin{array}{ccccccccccccccccccccccccccccccccccc$	Callaghan Innovation Metrology & Calibration Laboratory SCOPE OF ACCREDITATION					Accreditation	Number 1
T = 0.01 to 1.00.005 T380 nm to 1000 nmT = 0.0001 to 1.00.0007.10*5240 nm to 380 nmOD = 2 to 40.00022380 nm to 1000 nmOD = 0 to 20.0022380 nm to 1000 nmOD = 0 to 40.00031.10*35.00(b)Wavelength calibration filters240 nm to 800 nm0.13 nm800 nm to 1100 nm0.13 nm0.00 nm to 1100 nm0.13 nm to 0.25 nm(c)Diffuse transmittance240 nm to 400 nm0.005 to 0.0002 or 5 % of value whichever is greater400 nm to 1000 nm0.016 to 0.90.000 nm to 1000 nm0.9 to 1.00.008 to 0.0036, varies with wavelength360 nm to 1000 nm0.9 to 1.00.4 % of value(c)Specular reflectance at normal incidence240 nm to 800 nm0.05 to 1360 nm to 1000 nm0.9 to 1.00.4 % of value(e)Specular reflectance distribution factor and bidirectional radiance factorIn plane geometries only, 0.001 sr1 to 2500 sr1360 nm to 700 nm1.5 % of value400 nm to 700 nm0.5 % of value400 nm to 700 nm1.5 % of value400 nm to 700 nm0.5 % of value400 nm to 700 nm0.5 % of value400 nm to 700 nm0.5 % of value400 nm to 700 nm1.5 % of value400 nm to 700 nm1.5 % of value400 nm to 700 nm0.5 % of valu		Bandwic	th 1 nm to 3 nm				
380 nm to 1000 nm 240 nm to 380 nm 0B = 0 to 2T = 0.0001 to 1.0 0D = 2 to 4 0.00027.100.3.0D 0.00220.0007.100.3.0D 0.0022380 nm to 1000 nm 0D = 0 to 40.00031.100.35.0D(b)Wavelength calibration filters240 nm to 800 nm 800 nm to 1100 nm0.13 nm 0.13 nm 0.13 nm to 0.25 nm(c)Diffuse transmittance240 nm to 400 nm0.005 to 0.0002 or 5 % of value whichever is greater400 nm to 1000 nm0.016 to 0.9 0.0002 or 5 % of value whichever is greater(d)Diffuse reflectance in 0/d and 6/d geometries360 nm to 1000 nm0.016 to 0.9 0.008 to 0.0036, varies with wavelength 360 nm to 1000 nm0.016 to 0.9 0.4 % of value whichever is greater(d)Diffuse reflectance at normal incidence240 nm to 800 nm0.9 to 1.00.4 % of value(e)Specular reflectance distribution factor and bidirectional radiance factor 1 n plane geometries only, 0.001 sr ⁻¹ to 2500 sr ⁻¹ 360 nm to 400 nm1.5 % of value 0.5 % of value 400 nm to 700 nm(f)Bidirectional reflectance distribution factor and bidirectional radiance factor 1 n plane geometries only, 0.001 sr ⁻¹ to 2500 sr ⁻¹ 360 nm to 400 nm1.5 % of value 0.5 % of value 0.5 % of value 0.5 % of value400 nm to 700 nm0.5 to 2500 sr ⁻¹ 160 nm to 400 nm1.5 % of value 0.5 % of value 0.5 % of value 0.5 % of value400 nm to 700 nm0.5 % of value 1.5 % of value 700 nm to 820 nm1.5 % of value 1.5 % of value 0.5 % of value 0.5 % of value400 nm to 200 nm0.5 % of value 1.5 % of value		240 nm	to 380 nm				
380 nm to 1000 nm $OD = 0$ to 4 $0.00031.10^{0.35.0D}$ (b)Wavelength calibration filters240 nm to 800 nm 800 nm to 1100 nm 0.13 nm 0.13 nm to 0.25 nm(c)Diffuse transmittance240 nm to 400 nm 0.005 to 0.0002 or 5 % of value whichever is greater400 nm to 1000 nm 0.002 or 5 % of value whichever is greater400 nm to 1000 nm 0.016 to 0.9 varies with wavelength 360 nm to 1000 nm(d)Diffuse reflectance in 0/d and 6/d geometries360 nm to 1000 nm 0.9 to 1.0 360 nm to 1000 nm 0.9 to 1.0 (d)Specular reflectance at normal incidence240 nm to 800 nm 0.05 to 1 (f)Bidirectional reflectance distribution factor and bidirectional radiance factorIn plane geometries only, 0.001 sr ⁻¹ to 2500 sr ⁻¹ 360 nm to 400 nm 1.5 % of value 1.5 % of value 700 nm to 820 nm1.5 % of value rop onn to 820 nm 1.5 % of value 1.5 % of value 1.5 % of value 700 nm to 820 nm240 nm to 820 nm 1.5 % of value 1.5 % of value 1.5 % of value 700 nm to 420 nm				T = 0.0001 to OD = 2 to 4		0.0007.T ^{0.65} 0.000087.10 ^{0.8.OD}	
240 nm to 800 nm0.13 nm800 nm to 1100 nm0.13 nm to 0.25 nm(c)Diffuse transmittance240 nm to 400 nm0.005 to 0.0002 or 5 % of value whichever is greater400 nm to 1000 nm0.002 or 5 % of value whichever is greater400 nm to 1000 nm0.016 to 0.9 0.008 to 0.0036, varies with wavelength 360 nm to 1000 nm360 nm to 1000 nm0.9 to 1.00.008 to 0.0036, 		380 nm	to 1000 nm				
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360 nm to 1000 nm 0.9 to 1.0 0.4 % of value (e) Specular reflectance at normal incidence 240 nm to 800 nm 0.05 to 1 1 % of value (f) Bidirectional reflectance distribution factor and bidirectional radiance factor In plane geometries only, 0.001 sr ⁻¹ to 2500 sr ⁻¹ 1.5 % of value 360 nm to 400 nm 0.5 % of value 400 nm to 700 nm 0.5 % of value 700 nm to 820 nm 1.5 % of value Representative CMCs are for 0°:45° geometry and white spectralon only. Measurement uncertainty varies with scattering geometry, radiance factor and angular dependence of scattering properties of materials.		360 nm	to 1000 nm	0.016 to 0.9			
240 nm to 800 nm 0.05 to 1 1 % of value (f) Bidirectional reflectance distribution factor and bidirectional radiance factor In plane geometries only, 0.001 sr ⁻¹ to 2500 sr ⁻¹ 360 nm to 400 nm 360 nm to 400 nm 1.5 % of value 400 nm to 700 nm 0.5 % of value 700 nm to 820 nm 1.5 % of value Representative CMCs are for 0°:45° geometry and white spectralon only. Measurement uncertainty varies with scattering geometry, radiance factor and angular dependence of scattering properties of materials.		360 nm	to 1000 nm	0.9 to 1.0		0	
 (f) Bidirectional reflectance distribution factor and bidirectional radiance factor In plane geometries only, 0.001 sr⁻¹ to 2500 sr⁻¹ 360 nm to 400 nm 400 nm to 700 nm 0.5 % of value 700 nm to 820 nm 1.5 % of value Representative CMCs are for 0°:45° geometry and white spectralon only. Measurement uncertainty varies with scattering geometry, radiance factor and angular dependence of scattering properties of materials. 		(e)	Specular reflectar	nce at normal ir	ncidence		
In plane geometries only, 0.001 sr ⁻¹ to 2500 sr ⁻¹ 360 nm to 400 nm 1.5 % of value 400 nm to 700 nm 0.5 % of value 700 nm to 820 nm 1.5 % of value Representative CMCs are for 0°:45° geometry and white spectralon only. Measurement uncertainty varies with scattering geometry, radiance factor and angular dependence of scattering properties of materials.		240 nm	to 800 nm	0.05 to 1		1 % of value	
360 nm to 400 nm1.5 % of value400 nm to 700 nm0.5 % of value700 nm to 820 nm1.5 % of valueRepresentative CMCs are for 0°:45° geometry and white spectralon only. Measurement uncertainty varies with scattering geometry, radiance factor and angular dependence of scattering properties of materials.		(f) Bidi	irectional reflectant	ce distribution fa	actor and bidirection	al radiance factor	
		360 nm to 400 nm1.5 % of value400 nm to 700 nm0.5 % of value700 nm to 820 nm1.5 % of valueRepresentative CMCs are for 0°:45° geometry and white spectralon only. Measurement uncertaintyvaries with scattering geometry, radiance factor and angular dependence of scattering properties					
5.69 Optical Properties of Materials: Spectrally integrated							
(a) Luminous transmittance							
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Schedule to CERTIFICATE OF ACCREDITATION



Metrology	Innovation & Calibration Laboratory F ACCREDITATION	Accreditation Number 1
	Spectrally flat materials	0.3 % of value
	General materials	5 % of value
	(b) Luminous reflectance	
	General materials	5 % of value
	(c) Colour transmitted, x, y, Y or L*a*b*	
	In x and y Luminous transmittance Y for (0.1 < Y < 1)	0.005 5 % of value
	(d) Colour of surfaces, x, y, Y or L*a*b*	
	In x and y Luminance factor Y for (0.1 < Y < 1)	0.003 5 % of value
	(e) Retroreflectors: CIL value	
	Coefficient of luminous intensity	5 %
5.82	Resistors, Resistance Boxes and Potential D	vividers
	(a) Precision resistors, resistance boxes and con-	ductance boxes
	0.1Ω to 1Ω	0.2 μΩ/Ω
	(Current ≤ 100 mA) 1 Ω to 10 kΩ (Power dissipation ≤ 10 mW)	0.12 μΩ/Ω
	10 mΩ to 1000 mΩ (Current ≤ 1A)	25 μΩ/Ω
	0.1 mΩ to 1000 mΩ (Current = 1 A to 875 A)	63 <i>R</i> ^{-0.35} μΩ/Ω, <i>R</i> in mΩ values range from 141 μΩ/Ω to 6 μΩ/Ω
	0.01 M Ω to 1 M Ω (Applied voltages = 5 V to 100 V)	0.7 μΩ/Ω
	0.001 G Ω to 1 G Ω (Applied voltages = 5 V to 100 V)	(0.7 + 27 <i>R</i> – 20 <i>R</i> ³) μΩ/Ω, <i>R</i> in GΩ, values range from 0.7 μΩ/Ω to 8 μΩ/Ω
	1 M Ω to 5 T Ω (Applied voltages = 100 V to 1000 V)	(35 + 6.9 x 10 ⁻¹¹ <i>R</i> ² + 9.4 μΩ/Ω x 10 ⁻⁴ <i>R</i>) μΩ/Ω, <i>R</i> in MΩ, values range from 35 μΩ/Ω to 6460
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Schedule to

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Metrolog	n Innovation y & Calibration Laboratory DF ACCREDITATION	Accreditation Number 1
		μΩ/Ω
	0 M Ω to 1 M Ω (frequency, f = 40 Hz to 2 kHz)	(2000/f + 19 <i>R</i>) μΩ, <i>f</i> in Hz, <i>R</i> in Ω, values range from 1 μΩ to 19 Ω
	(b) Volt ratio boxes and potential dividers	
	1 V/V to 1000 V/V (Input voltage ≤ 1100 V, output voltage ≥ 1 V)	0.4 x 10 ⁻⁶
	0 kV to 50 kV	3 mV/V
	(c) DC shunts	
	0.1 m Ω to 1 Ω (Applied current 1 A to 875 A) (Applied voltage 10 mV to 1 V)	63 <i>R</i> ^{-0.35} μΩ/Ω, <i>R</i> in mΩ values range from 141 μΩ/Ω to 6 μΩ/Ω
	(d) AC shunts	
0 Ω to 100 Ω (frequency, $f = 40$ Hz to 2 kHz)		(2000/ <i>f</i> + 19 <i>R</i>) μΩ, <i>f</i> in Hz, <i>R</i> in Ω, values range from 1 μΩ to 1900 μΩ
	0.2 A to 100 A (frequency, <i>f</i> = 47 Hz to 75 Hz)	25 μΩ/Ω
5.84	Capacitors	
	(a) Precision capacitors	
0 μF to 100 μF (frequency, f = 40 Hz to 2 kHz)		(0.2/ <i>f</i> + 22C) pF, <i>f</i> in Hz, C in μF, values range from 0.0001 pF to 2200 pF
	Dissipation factor 0 to 0.2	(0.000027 + 0.00027/C) pF,
	(frequency, $f = 40$ Hz to 2 kHz) (capacitance, $C = 0.5$ pF to 100 µF)	<i>C</i> in pF values range from 0.00057 to 0.000027
	(c) Capacitance potential dividers	
	1 kV rms to 35 kV rms (frequency, $f = 50$ Hz to 3 kHz)	1 mV/V
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	/ & Calibration DF ACCREDIT			Accreditation	
5.85	Inductors	and Transforme	rs		
	(a) Ind	uctors, self and mut	ual		
	0 H to 100 H (frequency, f	= 40 Hz to 2 kHz)		(0.2/f + 14 <i>L</i>) μH, <i>f</i> i <i>L</i> in H, values rang 0.0001 μH to 1400	e from
	0 Ω to 1 MΩ	eries resistance = 40 Hz to 2 kHz)		(2000/f + 19 <i>R</i>) μΩ, <i>R</i> in Ω, values rang μΩ to 19 Ω	
	(d) Cur	rent transformers: p	nent		
	Primary currents 1 A to 4000 A, ratios 0.2 A/A to 4000 A/A				
	Ratio error Phase error (frequency, <i>f</i>		% to 25 % rad to 36 crad r currents 1 A, 5 A)	0.0010 % to 0.13 % 0.0010 crad to 0.18	
5.86	Voltage St	andards and Cu	rrent Standards		
	(b) Ele	ctronic emf referend	e devices		
	1 V 1.018 V 10 V			0.1 μV 0.1 μV 1.5 μV	
5.87	Transfer Ir	struments (AC/	DC)		
	0.002 V to 0. > 0.6 V to 6 V > 6 V to 1000 (frequency, f	/		11 μV/V to 321 μV/ 6 μV/V to 77 μV/V 9 μV/V to 76 μV/V	
	1 V and 3 V (frequency, <i>f</i>	= 1 MHz to 100 MH	z)	0.16 mV/V to 2.6 m	זV/V
	0.1 mA to 0.0 (frequency, <i>f</i>	01 A = 40 Hz to 2 kHz)		15 μΑ/Α to 38 μΑ/Α	A
	0.01 A to 20 (frequency, <i>f</i>	A = 40 Hz to 100 kHz)	15 μΑ/Α to 70 μΑ/Α	A
5.88	Calibrators	s for Instrument	ation		
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letrology		n tion Laboratory E DITATION		Accreditation	Number 1
	(a)	DC voltage			
	0 V to 1	2 V		(0.05 + 0.15 <i>U</i>) μV values range from 1.85 μV	
	12 V to	1100 V		0.5 µV/V	
	(b)	AC voltage			
		to 1000 V ncy, <i>f</i> = 10 Hz to 1 MHz)		6 μV/V to 650 μV/	V
	1 V and (frequer	3 V ncy, <i>f</i> = 1 MHz to 100 MHz)		0.3 mV/V to 8 mV/	V
	(c)	DC current			
	10 pA to	ο 10 μA		values range from 5 µA/A to 560 µA/A	
	10 µA to 1 A to 2			5 μΑ/Α 5 Ι ^{0.43} μΑ/Α, <i>Ι</i> in Α, range from 5 μΑ/Α	
	20 A to	1000 A		5 I ^{0.43} μA/A, <i>I</i> in A, range from 18 μA/	values
	(d)	AC current			
	0.1 mA (frequer 0.01 A t	ncy, $f = 40$ Hz to 2 kHz)		35 μΑ/Α to 170 μΑ 25 μΑ/Α	/A
	(frequer	ncy, $f = 47$ Hz to 75 Hz)			
	(e)	Resistance			
		0 Ω to 1 MΩ 100 MΩ		40 μΩ 3 μΩ/Ω (2 + <i>R</i> ^{0.8}) μΩ/Ω, <i>R</i> values range from 42 μΩ/Ω	
	(f)	AC power sources			
	Same a	s 5.89 (e) and (f)			
5.89	Indicat	ing Instruments and Reco	ording Instrume	ents	
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Schedule to CERTIFICATE OF ACCREDITATION



Metrology & Calibratio			Accreditation	Number 1	
(a) D	OC voltmeters				
0 V to 0.00 0.001 V to	9 12 V		0.05 μV (0.05 + 0.15 <i>U</i>) μV, values range from 1.85 μV		
12 V to 11	00 V		0.5 μV/V		
(b) A	AC voltmeters				
1 V and 3	/, <i>f</i> = 10 Hz to 1 MHz)		9 μV/V to 862 μV/V 0.3 mV/V to 8 mV/		
(c) E	DC ammeters				
10 pA to 1 10 μA to 1 1 A to 20 / 20 A to 87	A A		values range from 5 μ A/A to 560 μ A/A 5 μ A/A 5 $I^{0.43}$ μ A/A, I in A, range from 5 μ A/A 5 $I^{0.43}$ μ A/A, I in A values range from 92 μ A/A	values to 18µA/A	
(d) A	AC ammeters				
0.2 Å to 10	/, <i>f</i> = 40 Hz to 2 kHz)		60 μΑ/Α to 140 μΑ/ 25 μΑ/Α	Ά	
(e) V	Vattmeters				
Conditions Voltage 60 V to 240 V, current 0.01 A to 120 A, frequency 45 Hz to 75 Hz, and <i>PF</i> 1 to 0, inductive or capacitive					
Single pha 0 W to 28.			(40 + 6(1- <i>PF</i>)) μW/ range from 40 μW/ 46 μW/VA		
Three pha 0 W to 86.			(40 + 6(1- <i>PF</i>)) μW/ range from 40 μW/		
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				46 µW/VA		
(Tł	he CMC	range and uncertainties for sta	r and delta are the s	ame as for single-pha	ase)	
(f)	(f) Varmeters					
Vol		V to 240 V, current 0.01 A to 1 r capacitive	20 A, frequency 45 I	Hz to 75 Hz, and QF	1 to 0,	
0 W	N to 28.8	8 kW		(40 + 90 <i>QF)</i> μVar/\ range from 40 μVa 130 μVar/VA		
0 W	N to 86.4	4 kW		(40 + 90 <i>QF)</i> μVar/ ^λ range from 40 μVa 130 μVar/VA		
(g)	P	hase angle indicators (source o	r meter)			
	Conditions Current 0.01 A to 100 A, frequency 45 Hz to 75 Hz, Voltage 0.7 V to 7 V, 42 V to 240 V					
-3.1	14 rad to	o 3.14 rad		40 µrad		
(h)	P	ower factor meters				
Sam	ne cond	itions, CMC range and uncertain	nties as 5.89 (g) abc	ove		
(i)	O	hmmeters				
0.1 m Ω to 1000 m Ω (applied current 875 A to 1 A) 0.1 Ω to 1 Ω (applied current ≤100 mA) 1 Ω to 10 k Ω 10 k Ω to 1 G Ω 1 G Ω to 100 G Ω 100 G Ω to 1200 G Ω			63 $R^{0.35}$ μΩ/Ω, R in mΩ, values range from 141 μΩ/Ω to 6 μΩ/Ω 0.2 μΩ/Ω 0.12 μΩ/Ω (1 + 27 R -20 R^{3}) μΩ/Ω, R in GΩ, values range from 1 μΩ/Ω to 8 μΩ/Ω (-0.07 R^2 + 22 R -15) μΩ/Ω, R in GΩ, values range from 6.9 μΩ/Ω to 1485 μΩ/Ω (1300 R + 2.2 R) μΩ/Ω, R in GΩ, values range from 1520 μΩ/Ω to 3940 μΩ/Ω			
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	(k)	Galvanometers and null detector	S			
	Same C	MC range and uncertainties from	5.89 (a) DC voltmete	ers		
	(I)	Energy meters				
	Same as 5.89 (e) and (f)					
5.90	Bridges, Potentiometers and Test Sets					
	(a)	DC bridges				
	Same as 5.89 (i) Ohmmeters above					
	(b) DC potentiometers					
	Same as 5.89 (a) DC Voltmeters above					
	(c) AC bridges (frequency, $f = 40$ Hz to 2 kHz)					
	0 Ω to 1 M Ω (2000/f + 19R) $\mu\Omega$, f ir R in Ω , values range f					
	0 μF to 100 μF			$\mu\Omega$ to 19 Ω (0.2/f + 22 <i>C</i>) pF, <i>f</i> in Hz, <i>C</i> in μ F, values range from 0.0001 pF to 2200 pF		
	0 H to 1 H			(0.2/ <i>f</i> + 14 <i>L</i>) μH, <i>f</i> i <i>L</i> in H, values rang 0.0001 μH to 14 μH	e from	
	(f)	Current transformer testing sets				
	Ratio/Ph (frequen	ase cies in the range 45 Hz to 65 Hz)				
	Ratio error \pm (0 to 0.002)Ratio error \pm (0.002 to 0.02)Ratio error \pm (0.02 to 0.2)Phase error \pm 0 rad to 0.002 radPhase error \pm 0.002 rad to 0.02 radPhase error \pm 0.002 rad to 0.02 radPhase error \pm 0.02 rad to 0.2 rad		2 rad 0.02 rad	5.0 x 10^{-7} to 1.0×10^{-6} 2.0 x 10^{-6} to 8.0×10^{-6} 2.0 x 10^{-5} to 8.0×10^{-5} 5.0 x 10^{-7} rad to 1.0×10^{-6} rad 5.0 x 10^{-6} rad to 9.0×10^{-6} rad 5.0 x 10^{-5} rad to 9.0×10^{-5} rad		
	(g)	Voltage transformer testing sets				
	Same as	s 5.90 (f)				
	(i)	AC and DC bridges for thermome	etry			
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Metrology	Callaghan Innovation Metrology & Calibration Laboratory SCOPE OF ACCREDITATION				Accreditation Number 1		
	Resistance 0 Ω to 400 Ω (frequency, <i>f</i> = DC to 100 Hz)			(6 + 0.3 <i>R</i>) μΩ, <i>R</i> in Ω, values range from 6 μΩ to 126 μΩ			
	0 Ω/Ω te	nce ratio o 13 Ω/Ω ncy, $f = DC$ to 100 Hz)		2.6 x 10⁻ ⁸			
5.91	Freque	ency Measurement and Time	e Measurement				
	Time and frequency CMC uncertainties relate only to the reference measuring systems. These uncertainties do not contain any contribution from the instrument under calibration.						
	(a)	Frequency meters					
		40 GHz z to 1 Hz (period)		1 x 10 ⁻¹⁰ 1 ns			
	(c)	Counters					
		40 GHz z to 1 Hz (period)		1 x 10 ⁻¹⁰ 1 ns			
	(d)	Time interval meters					
	10 ns to	86400 s		2 ns or 0.27 ps/s, v greatest	vhichever is		
	(g)	Frequency standards					
		z to 10 MHz z to 1 Hz (period)		2 x 10 ⁻¹³ 1 ns			
5.92	Wavef	orm Measurement					
	(a)	Frequency characteristics					
		20 MHz z to 1 Hz (period)		1 in 10 ⁻¹⁰ 1 ns			
	(b)	Input characteristics					
	1 V and 3 V 0.16 mV/V to 2.6 mV/V (frequency, $f = 1 \text{ MHz}$ to 100 MHz)				v/V		
	Pulse ri	setime (<i>T</i> >5 ns)					
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	(10 mV to 10 V)					
	0.005 µs	s to 1.00 x 10 ⁶ μs		Q(2 ns, 0.05 <i>T</i>), <i>T</i> in s		
		nplitude (pulse length > 200 μs) 100 mV, 1 V, 10 V)				
	0 V to 10 V			(30 μV+ 100 <i>Va</i> + 420 <i>Vr</i>), applied voltage <i>Va</i> in V, voltmeter range <i>Vr</i> in V, values range from 34.2 μV to 5230 μV		
	(c)	Timing characteristics				
	10 ns to (time diff			2 ns		
5.93	Signal Sources					
	(a)	Frequency characteristics				
	1 Hz to 20 MHz 0.001 Hz to 1 Hz (period)			1 x 10 ⁻¹⁰ 1 ns		
	(b)	Output characteristics				
	1 V and 3 V (frequency, <i>f</i> = 1 MHz to 100 MHz)			0.16 mV/V to 2.6 mV/V		
	Pulse amplitude (pulse length > 200 μs) (10 mV, 100 mV, 1 V, 10 V)					
	0 V to 10 Pulse ris) ∨ setime (<i>T</i> > 5 ns)		(30 μ V + 100 Va + 420 Vr) applied voltage Va in V, voltmeter range Vr in V, values range from 34.2 μ V to 5230 μ V		
	(10 mV to 10 V)					
	0.005 μs to 1.00 x 10 ⁶ μs			Q(2 ns, 0.05 <i>T</i>), <i>T</i> in s		
5.97	High Voltage Testing					
	(a)	Direct voltage				
	0 kV to 5	50 kV		3 mV/V		
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(frequency, f = 50 Hz to 3 kHz)

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(b) Alternating voltage	
1 kV rms to 35 kV rms	1 mV/V

Note 1:

A CMC anticipates the performance of a best available device. Measurement uncertainties achieved for specific calibrations may be greater than CMC uncertainties, but a laboratory may not report measurement uncertainties lower than those in its CMCs. Please contact the laboratory to discuss your specific requirements.

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