SINGAPORE LABORATORY ACCREDITATION SCHEME

Accredited Laboratory SAC-SINGLAS

Schedule

Element Testing Services (S) Pte Ltd
Block 4010 Techplace 1
Ang Mo Kio Ave 10 #03-08 to 12
Singapore 569626

Certificate No. : LA-1987-0012-C

Issue No. : 34

Date : 03 February 2025

Expiry of Certificate : 31 March 2029

FIELD OF TESTING : Calibration and Measurement

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
A. MECHANICAL		
A.I. Pressure (Lab / On-site)		
Pressure (Differential mode)	a. 0 inH_2O to 1.0 inH_2O	0.0044 in.H_2O
	b. >1 inH_2O to 20 inH_2O	0.011 in.H_2O
EL-A-OP-CAL-SIN-MD102 Issue 1	c. >20 inH_2O to 64 inH_2O	0.055 in.H_2O
	d. -30 Pa to 30 Pa	0.42 Pa
	e. - 2500 Pa to 2500 Pa	1.6 Pa
Pressure (Gauge mode)		
Negative Pressure (Vacuum)	a. -30 inHg to 0 inHg	0.013 in.Hg
Positive Pressure	b. 15 mbar to 1000 mbar	0.20 mbar
	c. 1 psi to 100 psi	0.061 psi
EL-A-OP-CAL-SIN-MD101 Issue 1	d. 0 to 500 psi	0.077 psi
	e. >500 psi to 2000 psi	0.37 psi
	f. >2000 psi to 10000 psi	1.3 psi
	g. >10000 psi to 16000 psi	8.8 psi
Pressure (Absolute mode)		
EL-A-OP-CAL-SIN-MD119 Issue 1	h. 11 psi abs to 17 psi abs	0.0025 psi abs
EL-A-OP-CAL-SIN-MD101 Issue 1	i. 1.5 psi abs to 50 psi abs	0.016 psi abs
	j. 0.5 psi abs to 500 psi abs	0.091 psi abs
	k. 0.5 psi abs to 2000 psi abs	0.36 psi abs

*EL-A-OP-CAL-SIN-MDnnn are In-house procedures

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A.II FORCE MEASUREMENT		
1. Force Measurement Device (Lab / On-site) (Tension/Compression) EL-A-OP-CAL-SIN-MD104 Issue 1	a. Up to 5 kgf (Tension) Up to 5 kgf (Compression)	0.00084 kgf 0.00084 kgf
	b. Up to 20 kgf (Tension) Up to 20 kgf (Compression)	0.0070 kgf 0.0070 kgf
	c. Up to 50 kgf (Tension) Up to 50 kgf (compression)	0.014 kgf 0.014 kgf
	d. Up to 1000N (Tension) Up to 1000N (Compression)	0.32 N 0.16 N
	e. Up to 10 kN (Tension) Up to 10 kN (Compression)	0.011 kN 0.011 kN
	f. Up to 10 000 kgf (Tension) Up to 10 000 kgf Compression)	1.2 kgf 2.4 kgf
	g. Up to 30 000 kgf (Tension) Up to 30 000 kgf(Compression)	1.6 kN 1.6 kN
	h. Up to 1000 kN (Compression)	1.4 kN
2. Platform Balance Calibration (On-site) EL-A-OP-CAL-SIN-MD113 Issue 1	Up to 4000 kg	0.9 kg
3. Balances and weighing scales (Lab / On-site) EL-A-OP-CAL-SIN-MD105 Issue 1	a. 0.5 g to 5 g b. >5 g to 50 g c. >50 g to 200 g d. >200 g to 600 g e. >600 g to 2000 g f. >2 kg to 6 kg g. >6 kg to 10 kg h. >10 kg to 30 kg i. >30 kg to 60 kg j. >60 kg to 100 kg k. >100 kg to 150 kg l. >150 kg to 500 kg	0.13 mg 0.25 mg 0.77 mg 0.0027 g 0.0076 g 0.023 g 0.035 g 0.14 g 0.0013 kg 0.013 kg 0.046 kg 0.093 kg

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A.II FORCE MEASUREMENT		
4. Torque		
a. Torque Measuring Devices (Lab / On-site)		
BS 7882: 2017	0 - 1.5 ozf·in	0.0059 ozf·in
EL-A-OP-CAL-SIN-MD107	0 - 10 ozf·in	0.041 ozf·in
Issue 1	0 - 18 ozf·in	0.076 ozf·in
	0 - 60 cN·m	0.12 cN·m
	0 - 15 kgf·cm	0.043 kgf·cm
	0 - 5 N·m	0.0017 N·m
	0 - 90 lbf·in	0.12 lbf·in
	0 - 442.6 lbf·in	0.32 lbf·in
	0 - 250 lbf·ft	0.14 lbf·ft
b. Torque Wrench & Driver (Lab)		
BS EN ISO 6789-2:2017	0.0200 N·m to 1.0000 N·m	0.53 % F.S.
EL-A-OP-CAL-SIN-MD115	1.250 N·m to 62.500 N·m	0.43 % F.S.
Issue 1	7.50 N·m to 150.00 N·m	0.35 % F.S.
	35.00 N·m to 700.00 N·m	0.42 % F.S.
	75.0 N·m to 1500.00 N·m	0.26 % F.S.
c. Torque Wrench & Driver (Lab)		
BS EN 6789: 2003	0.0200 N·m to 1.0000 N·m	0.72 % F.S.
(superseded by 2017 ver)	0.1250 N·m to 6.2500 N·m	0.66 % F.S.
EL-A-OP-CAL-SIN-MD106	0.250 N·m to 12.500 N·m	0.67 % F.S.
Issue 1	1.750 N·m to 35.000 N·m	0.61 % F.S.
	3.500 N·m to 70.000 N·m	0.69 % F.S.
	7.50 N·m to 150.00 N·m	0.66 % F.S.
	17.50 N·m to 350.00 N·m	0.59 % F.S.
	35.00 N·m to 700.00 N·m	0.61 % F.S.
	30.0 N·m to 1500.0 N·m	0.59 % F.S.
	339.0 N·m to 2500 N·m	0.60 % F.S.

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A.II FORCE MEASUREMENT		
5. Extensometer (Lab / On-site) EL-A-OP-CAL-SIN-MD442 Issue 2	Gauge Length up to 50 mm Classification Limit up to ASTM E83-23 Class B1 for Gauge Length 25 mm and 50 mm	4.2 μm Calibrator accuracy (12.5 mm) = 0.6 μm Calibrator accuracy (25 mm) = 0.6 μm
ASTM E83-23	Strain Displacement Measurement up to 25 mm	0.000023 mm/mm
6. Standard Weights (Lab) OIML R111-1:2004 EL-A-OP-CAL-SIN-MD108 Issue 1	a. 1 mg b. 2 mg c. 5 mg d. 10 mg e. 20 mg f. 50 mg g. 100 mg h. 200 mg i. 500 mg j. 1 g k. 2 g l. 5 g m. 10 g n. 20 g o. 50 g p. 100 g q. 200 g r. 500 g s. 1 kg t. 2 kg u. 5 kg v. 10 kg w. 20 kg x. 30 kg	0.02 mg 0.05 mg 0.02 mg 0.02 mg 0.02 mg 0.03 mg 0.03 mg 0.04 mg 0.05 mg 0.07 mg 0.08 mg 0.11 mg 0.13 mg 0.17 mg 0.20 mg 0.34 mg 0.80 mg 0.024 g 0.025 g 0.029 g 0.24 g 0.25 g 0.26 g 0.32 g

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A.II FORCE MEASUREMENT		
7. Hardness Testing Machine (On-site)		
a. Force Verification of Brinell Testing Machine EL-A-OP-CAL-SIN-MD109 Issue 1	Range 0 – 500 kgf Range 0 – 3000 kgf	0.55 kgf 3.3 kgf
b. Force Verification of Vickers Testing Machine EL-A-OP-CAL-SIN-MD110 Issue 1	Range 0 – 100 kgf	2.5 N
c. Force Verification of Rockwell Testing Machine EL-A-OP-CAL-SIN-MD111 Issue 1	Rockwell Superficial Hardness Preliminary Test Force 3 kgf Test Force 15 kgf Test Force 30 kgf Test Force 45 kgf Rockwell Hardness Preliminary Test Force 10 kgf Test Force 60 kgf Test Force 100 kgf Test Force 150 kgf	 0.04 kgf 0.04 kgf 0.04 kgf 0.04 kgf 0.04 kgf 0.04 kgf 0.04 kgf 0.07 kgf
8. Tension/Compression Testing Machine (On-site) EL-A-OP-CAL-SIN-MD112 Issue 1	a. 0 to 100 N (compression) b. >100 N to 2000 N (Tension) >100 N to 2000 N (Compression) c. >2 kN to 10 kN (Tension) >2 kN to 10 kN (Compression) d. >10 kN to 100 kN (Tension) >10 kN to 100 kN (Compression) e. >100 kN to 1000 kN (Tension) >100 kN to 1000 kN (Compression)	0.11 N 2.3 N 2.2 N 0.011 kN 0.011 kN 0.12 kN 0.12 kN 1.1 kN 1.1 kN

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A.II FORCE MEASUREMENT		
9. Calibration of Cable Tensiometer (Lab) EL-A-OP-CAL-SIN-MD114 Issue 1	Up to 300 lbf	1.6 lbf
10. Calibration of Durometer (Lab) (Verification of the test force) EL-A-OP-CAL-SIN-MD116 Issue 1	a. ASTM D 2240:2015 Type A b. ASTM D 2240:2015 Type D c. BS EN ISO 868:2003 Type A d. BS EN ISO 868:2003 Type D e. JIS K 6301:1995 Type A f. JIS K 6301:1995 Type C g. JIS K 6301:1995 Type C2 h. JIS K 7215:1986 Type A	0.0083 N 0.026 N 8.7 mN 51.4 mN 0.46 gf 5.1 gf 0.23 gf 0.88 gf
11. Calibration of Metallic / Non-Metallic Objects (Lab) EL-A-OP-CAL-SIN-MD117 Issue 1	a. 0 – 210 g b. >200 g – 3 kg c. >3 kg – 30 kg	0.01 g 0.02 g 0.5 g

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A.III Flow Measurement		
1. Calibration of Fluid (Gas) Flow Measurement Instrument (Lab)		
EL-A-OP-CAL-SIN-MD120 Issue 1	a. 0 to 300 cc/min b. 0 to 6000 cc/min c. 3000 cc/min to 30000 cc/min	4.5 cc/min 142 cc/min 400 cc/min
A.IV Rotational Speed Measurement		
1 Calibration of Rotational Speed of Rotating Equipment (Lab / On-site)		
EL-A-OP-CAL-SIN-MD208 Issue 1	(6 to 15000) rpm	3.0%
2 Non-Contact Tachometer and RPM / Speed indicator (Lab / On-site)	6 rpm to 30 rpm 31 rpm to 99.9 rpm 100 rpm to 999 rpm 1000 rpm to 99999 rpm	0.12 % 0.097 % 0.067 % 0.058 %
Contact Tachometer and RPM / Speed indicator (Lab / On-site) EL-A-OP-CAL-SIN-MD209 Issue 2	6 rpm to 2000 rpm	3.1%
A.V Vibration & Acoustic		
1. Accelerometers / Vibration (Lab)	(0.1 to 1000) mV/g or (0.1 to 1000) pC/g	
EL-A-OP-CAL-SIN-MD210 Issue 2	10 Hz to 99 Hz 100 Hz to 2500 Hz 2501 Hz to 5000 Hz	4.5 % 4.3 % 6.8 %
2. Sound Level Meter (Lab) EL-A-OP-CAL-SIN-MD212 Issue 2	94 dB at 1 kHz 114 dB at 1 kHz	0.39 dB 0.39 dB

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B. DIMENSIONAL METROLOGY		
B.I Limit Gauges (Lab)		
1. Plain Plug Gauges ASME B89.1.5-1998 EL-A-OP-CAL-SIN-MD401 Issue 1	a. Up to 10 mm b. Over 10 mm to 50 mm c. Over 50 mm to 150 mm d. Over 150 mm to 300 mm	0.2 μm 0.4 μm 0.7 μm 1.1 μm
2. Plain Ring Gauges (Lab) BS 4064:1966, BS 4065:1966 and ASME B89.1.6-2002 EL-A-OP-CAL-SIN-MD402 Issue 1	a. 1.5 mm to 51 mm b. Over 51 mm to 150 mm c. Over 150 mm to 300 mm	0.4 μm 0.7 μm 1.1 μm
3. Calibration and inspection of Jig, Fixture, Gauges, Tools and Parts etc for Size, Height, Length, Depth, Position, Angle and Geometric Dimensioning and Tolerancing (GD&T). (Lab / On-site) EL-A-OP-CAL-SIN-MD405 Issue 2	Up to 1800 mm	(0.8 + 0.0035 L) μm
4. Radius Gauge (Lab) EL-A-OP-CAL-SIN-MD406 Issue 2	Up to 101.6 mm Arc angle 90 º and above Arc angle 30 º to below 90 º	 4.0 μm 11 μm

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B.II Measuring Instruments and Tools		
1. Surface Plates (Lab / On-site) BS 817:2008 EL-A-OP-CAL-SIN-MD407 Issue2	 Size up to 2 x 2 ft Size up to 3 x 3 ft Size up to 4 x 4 ft Size up to 6.5 x 5 ft	 1.6 µm 2.1 µm 2.1 µm 4.4 µm
2. Bevel Protractors (Lab) BS 1685:2008 EL-A-OP-CAL-SIN-MD408 Issue 2		 3 minutes
3. External Micrometer (Lab) BS EN ISO 3611:2010 EL-A-OP-CAL-SIN-MD409 Issue 1	 0.0001 mm Resolution 0.001 mm Resolution	 0.22 µm 1 µm
4. Internal Micrometer (Lab) BS 959:2008 EL-A-OP-CAL-SIN-MD410 Issue 1		 1.9 µm
5. Depth Micrometers (Lab) BS 6468:2008 EL-A-OP-CAL-SIN-MD411 Issue 2	 Up to 300 mm	 1 µm
6. Calibration of Displacement Sensor, Dial, Electrical Gauge and Indicator and Thickness Gauge (Lab / On-site) BS EN ISO 463:2006 ASME B 89.1.10M-2001 EL-A-OP-CAL-SIN-MD412 Issue 1	 Up to 30 mm Up to 100 mm Up to 600 mm	 0.5 µm 1.0 µm 2.5 µm
7. Dial Test Indicators (Lab) BS EN ISO 9493:2010 ASME ANSI B89.1.10M-2001 EL-A-OP-CAL-SIN-MD413 Issue 1	 Up to 30 mm	 0.5 µm

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B.II Measuring Instruments and Tools		
8. Electronic and Mechanical Height Gauges (Lab) ISO13225:2012 EL-A-OP-CAL-SIN-MD414 Issue 1	Up to 300 mm Up to 600 mm Up to 1000 mm	0.9 µm 1.6 µm 2.6 µm
9. Feeler Gauges (Lab) BS 957 : 2008 EL-A-OP-CAL-SIN-MD415 Issue 2		0.3 µm
10. Vee Blocks (Lab) BS 3731 : 1987 EL-A-OP-CAL-SIN-MD416 Issue 1		1.9 µm
11. Engineer's Parallel (Lab) BS 906 : 1972 EL-A-OP-CAL-SIN-MD417 Issue 1		4.1 µm
12. Engineer's Square (Lab) BS 939 : 2007 EL-A-OP-CAL-SIN-MD418 Issue 1		2.2 µm
13. Right Angle and Box Angle Plates (Lab) BS 5535 : 1978 EL-A-OP-CAL-SIN-MD419 Issue 1		2.2 µm
14. Straight Edge (Lab) BS 5204 Part 1 : 1975 and BS 5204 Part 2 : 1977 EL-A-OP-CAL-SIN-MD420 Issue 2		4.1 µm
15. Height Setting Micrometer (Lab) ISO 7863 : 1984 EL-A-OP-CAL-SIN-MD421 Issue 1	Up to 300 mm Up to 600 mm	1.3 µm 2.4 µm

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B.II Measuring Instruments and Tools		
16. Steel Rule (Lab) JIS B 7516 : 2005 EL-A-OP-CAL-SIN-MD422 Issue 2	 Up to 300 mm Up to 1000 mm Up to 2000 mm	 1.4 μm 6 μm 13 μm
17. Glass Scale (Lab) EL-A-OP-CAL-SIN-MD423 Issue 2	 Up to 50mm Up to 300mm	 1.1 μm 1.4 μm
18. Measuring Tape (Lab) JIS B 7512 : 2018 EL-A-OP-CAL-SIN-MD424 Issue 2	 Up to 1.5 m Up to 2.5 m Up to 5 m Up to 10 m Up to 20 m Up to 30 m	 10 μm 25 μm 40 μm 55 μm 75 μm 90 μm
19. Inside micro-Checker (Lab) EL-A-OP-CAL-SIN-MD425 Issue 1	 Up to 300 mm Up to 600 mm	 1.5 μm 2.2 μm
20. Calliper Checker (Lab) EL-A-OP-CAL-SIN-MD426 Issue 1	 Up to 300 mm Up to 600 mm	 1.3 μm 1.8 μm
21. Depth Micro-Checker (Lab) EL-A-OP-CAL-SIN-MD427 Issue 1	 Up to 300 mm	 1.3 μm
22. Toolmaker's Straight Edge (Lab) BS 852 : 1939 EL-A-OP-CAL-SIN-MD428 Issue 2		 2.0 μm

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B.II Measuring Instruments and Tools		
23. Bore Gauge (Lab) (Three-leg Micrometer) EL-A-OP-CAL-SIN-MD429 Issue 1		1 μm
24 Electronic and Mechanical Callipers (Lab) ISO 13385-1:2019 and JIS B 7507 : 2016 EL-A-OP-CAL-SIN-MD430 Issue 1	Up to 150 mm Up to 300 mm Up to 600 mm Up to 1000 mm Up to 2000 mm	2 μm 10 μm 10 μm 10 μm 20 μm
25. Electronic/Mechanical Depth Gauge (Lab) ISO 13385-2-2020 EL-A-OP-CAL-SIN-MD431 Issue 1	Up to 300 mm Up to 600 mm Up to 1000 mm	10 μm 10 μm 10 μm
26. Optical Projector (Lab / On-site) JIS B 7184 : 2021 EL-A-OP-CAL-SIN-MD432 Issue 1		2.1 μm
27. Toolmaker Microscope (Lab / On-site) JIS B 7153: 1995 EL-A-OP-CAL-SIN-MD433 Issue 1		2.2 μm
28. Universal Measuring Machine (Lab / On-site) EL-A-OP-CAL-SIN-MD440 Issue 1	Up to 10 mm Up to 20 mm Up to 50 mm Up to 70 mm Up to 100 mm	0.09 μm 0.11 μm 0.14 μm 0.18 μm 0.30 μm
29. Dial Gauge Calibrator (Lab) EL-A-OP-CAL-SIN-MD439 Issue 1	0 to 100 mm	0.3 μm

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B.II Measuring Instruments and Tools		
30. Clinometer / Digital Protractor (Lab) EL-A-OP-CAL-SIN-MD444 Issue 2		0.02 degree
31. Spirit Level (Lab) BS 958 : 1968 EL-A-OP-CAL-SIN-MD445 Issue 1		0.50 arc second
32. Electronic Comparator (Mu-Checker) (Lab) EL-A-OP-CAL-SIN-MD437 Issue 1		0.2 µm
33. Cylinder Gauges (Lab) JIS B 7515 : 1982 EL-A-OP-CAL-SIN-MD446 Issue 1		0.6 µm
34. Square Master (Lab) Up to 600 mm EL-A-OP-CAL-SIN-MD447 Issue 1		3.9 µm
35. Test Sieve (Lab) ASTM E11-22 and ISO 3310-1:2016 EL-A-OP-CAL-SIN-MD448 Issue 2	0.02 mm to 20 mm	2.3 µm
36. Calibration of Film Thickness And Thickness Gauge (Lab) EL-A-OP-CAL-SIN-MD453 Issue 1	Film Thickness Up to 25mm Thickness Gauge Up to 0.05 mm Over 0.05 to 1.50 mm Over 1.50 to 25mm Over 25 to 150mm	0.4 µm 0.5 µm 1 µm 3 µm 15 µm

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B.II Measuring Instruments and Tools		
37 Co-ordinate Measuring Machine (Contact) (Lab / On-site) Measuring Linear Dimension ISO10360-2 : 2009 ISO10360-5 : 2020 EL-A-OP-CAL-SIN-MD435 Issue 1	Up to 500 mm Over 500 to 900 mm Over 900 to 1200 mm Over 1200 to 1800 mm Single and Multiple stylus contacting probing and scanning systems	1.0 μm 1.7 μm 2.2 μm 2.6 μm
38 Calibration of Crimping Tools and Die (Lab) EL-A-OP-CAL-SIN-MD452 Issue 2		10 μm

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B.III Form		
1. Roundness (Lab) EL-A-OP-CAL-SIN-MD402 Issue 1	Up to 300 mm diameter	0.20 μm
B.IV Screw Thread Measurement		
1. Parallel Screw Plug Gauge (Lab) For compliance with ISO 1502, Fed Std H28 and equivalent Standards EL-A-OP-CAL-SIN-MD449 Issue 2	Measurement pitch from 0.5 mm to 6 mm Pitch diameter 1 mm to 50 mm Over 50 mm to 150 mm	 2.5 μm 3.5 μm
2. Parallel Screw Ring Gauge (Lab) For compliance with ISO 1502, Fed Std H 28 and equivalent standards EL-A-OP-CAL-SIN-MD450 Issue 1	Measurement pitch from 0.5 mm to 6 mm Pitch diameter 4 mm to 10 mm Over 10 mm to 50 mm Over 50 mm to 100mm	 2.0 μm 2.5 μm 3.5 μm

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C. TEMPERATURE		
1. Temperature Enclosure (Lab / On-site) EL-A-OP-CAL-SIN-MD301 Issue 1	a. -80 °C to 0 °C b. >0 °C to 100 °C c. >100 °C to 200 °C d. >200 °C to 1000 °C e. >1000 °C to 1260 °C	1.5 °C 1.4 °C 1.6 °C 2.1 °C 3.7 °C
2. Temperature Indicator c/w Sensor (Lab) PT100 / Thermistor EL-A-OP-CAL-SIN-MD304 Issue 2	i. -80 °C to 0 °C ii. >0 °C to 50 °C iii. >50 °C to 200 °C	0.15 °C 0.15 °C 0.15 °C
Base Metal: Type E, K, J, N & T Noble Metal: Type B, R & S (Lab)	iv. -80 °C to 0 °C v. >0 °C to 50 °C vi. >50 °C to 260 °C vii. >260 °C to 500 °C viii. >500°C to 1000 °C	0.20 °C 0.12 °C 0.12 °C 1.8 °C 3.4 °C
Temperature Indicator c/w Sensor (On-site)	ix. -40 °C to 140 °C x. >140 °C to 300 °C	0.30 °C 1.7 °C
3. Liquid in Glass Thermometer (Lab) Graduation 0.02 °C EL-A-OP-CAL-SIN-MD306 Issue 2	a. Partial Immersion 0 °C to 200 °C Graduation: 1.0°C b. Total Immersion 0 °C to 200 °C Graduation: 0.2°C	1.1 °C 0.12 °C
4. Calibration Bath - Liquid Bath (Lab) EL-A-OP-CAL-SIN-MD302 Issue 1	a. -80 °C to 260 °C	0.61 °C
5. Temperature Block Calibrator (Lab) EL-A-OP-CAL-SIN-MD309 Issue 1	a. -45 °C to 140 °C b. >140 °C to 650 °C c. >650 °C to 1000 °C	1.1 °C 3.7 °C 3.9 °C

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6. Thermocouple Sensor (Lab) Base Metal: Type E, K, J, N & T Noble Metal: Type B, R & S EL-A-OP-CAL-SIN-MD303 Issue 2		
	a. -80 °C to 0 °C	0.34 °C
	b. >0 °C to 50 °C	0.34 °C
	c. >50 °C to 260 °C	0.37 °C
	d. >260 °C to 500 °C	3.6 °C
	e. >500 °C to 800 °C	3.7 °C
	f. >800 °C to 1000 °C	3.7 °C
7a Temperature Indicator (Measure) (Lab / On-site) EL-A-OP-CAL-SIN-MD305 Issue 2		
	i. Type K -200 °C to 1372 °C	0.14 °C
	ii. Type T -200 °C to 400 °C	0.13 °C
	iii. Type J -200 °C to 1200 °C	0.13 °C
	iv. Type N -200 °C to 1300 °C	0.15 °C
	v. Type E -200 °C to 1000 °C	0.14 °C
	vi. Type R 0 °C to 1700 °C	0.48 °C
	vii. Type S 0 °C to 1700 °C	0.67 °C
	viii. RTD 100Ω -200 °C to 800 °C	0.12 °C
	ix. Current 4 mA to 20 mA	0.010 °C
	x. Voltage 0 V to 24 V	0.010 °C

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7b Temperature Simulator (Source) (Lab / On-site) EL-A-OP-CAL-SIN-MD305 Issue 2	i. Type K -200 °C to 1372 °C	0.12 °C
	ii. Type T -200 °C to 400 °C	0.12 °C
	iii. Type J -200 °C to 1200 °C	0.11 °C
	iv. Type N -200 °C to 1300 °C	0.12 ºC
	v. Type E -200 °C to 1000 °C	0.13 ºC
	vi. Type R 0 °C to 1700 °C	0.25 ºC
	vii. Type S 0 °C to 1700 °C	0.30 ºC
	viii. RTD 100Ω -200 °C to 800 °C	0.018 ºC
8. Thermohygrometer/ Thermohygrograph (Lab) EL-A-OP-CAL-SIN-MD307 Issue 2 **% RH - % Relative Humidity**	a. 15 °C to 70 °C b. (15 to 19) °C at (40 to 95) %RH c. (20 to 39) °C at (35 to 95) %RH d. (40 to 70) °C at (12 to 95) %RH	0.35 °C 2.1 %RH 1.7 %RH 1.9 %RH

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9. Humidity Chamber (Lab) EL-A-OP-CAL-SIN-MD308 Issue 2	a. (20 to 30) °C	
	30 %RH to 50 %RH	0.60 °C 2.4 %RH
	>50 %RH to 70 %RH	3.2 %RH
	>70 %RH to 95 %RH	4.2 %RH
	b. (30 to 50) °C	
	30 %RH to 50 %RH	0.60 °C 2.5 %RH
	>50 %RH to 70 %RH	3.2 %RH
%RH - % relative humidity	>70 %RH to 95 %RH	4.2 %RH
(On site)	c. (20 to 30) °C	
	30 %RH to 50 %RH	0.80 °C 2.8 %RH
	>50 %RH to 70 %RH	4.6 %RH
	>70 %RH to 95 %RH	5.8 %RH
	d. (30 to 50) °C	
	30 %RH to 50 %RH	0.80 °C 2.8 %RH
	>50 %RH to 70 %RH	3.2 %RH
	>70 %RH to 95 %RH	4.3 %RH
10. Infrared Thermometer (Lab)	8 µm to 14 µm Emissivity: 0.95	
EL-A-OP-CAL-SIN-MD310 Issue 1	i. -15 °C to 0 °C	2.0 °C
	ii. >0 °C to 120 °C	2.0 °C
	iii. >120 °C to 200 °C	13.0 °C
	iv. >200 °C to 350 °C	14.0 °C
	v. >350 °C to 500 °C	16.0 °C

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
D. ELECTRICAL		
1. DC Voltage Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	a. 0.01 mV to 0.09999 mV b. 0.1 mV to 0.99999 mV c. 1 mV to 9.99999 mV d. 10 mV to 99.99999 mV e. 100 mV to 199.99999 mV f. 200 mV to 219.99999 mV g. 0.22 V to 2.1999999 V h. 2.2 V to 10.999999 V i. 11 V to 21.999999 V j. 22 V to 219.99999 V k. 220 V to 1000 V	4.2 % 0.42 % 0.042 % 0.0050 % 0.0012 % 0.00096 % 0.00083 % 0.00047 % 0.00040 % 0.00069 % 0.00084 %
2. AC Voltage Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	a. 0.50001 mV - 1 mV 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz b. 1.000001 mV - 2.19999 mV 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz c. 2.2 mV - 5 mV 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	 0.90 % 0.90 % 0.90 % 1.1 % 1.1 % 2.4 % 4.2 % 0.43 % 0.43 % 0.42 % 0.43 % 0.56 % 1.2 % 2.2 % 2.3 % 0.21 % 0.20 % 0.21 % 0.21 % 0.28 % 0.56 % 1.1 % 1.2 %

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
D. ELECTRICAL		
2 AC Voltage Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	d. 5.00001 mV - 10 mV	
	10 Hz to 20 Hz	0.11 %
	20 Hz to 40 Hz	0.090 %
	40 Hz to 20 kHz	0.092 %
	20 kHz to 50 kHz	0.11 %
	50 kHz to 100 kHz	0.16 %
	100 kHz to 300 kHz	0.31 %
	300 kHz to 500 kHz	0.54 %
	500 kHz to 1 MHz	0.68 %
	e. 10.00001 mV - 21.99999 mV	
	10 Hz to 20 Hz	0.065 %
	20 Hz to 40 Hz	0.052 %
	40 Hz to 20 kHz	0.050 %
	20 kHz to 50 kHz	0.061 %
	50 kHz to 100 kHz	0.11 %
	100 kHz to 300 kHz	0.21 %
	300 kHz to 500 kHz	0.35 %
	500 kHz to 1 MHz	0.48 %
	f. 22 mV - 50 mV	
	10 Hz to 20 Hz	0.059 %
	20 Hz to 40 Hz	0.049 %
	40 Hz to 20 kHz	0.029 %
	20 kHz to 50 kHz	0.041 %
	50 kHz to 100 kHz	0.095 %
	100 kHz to 300 kHz	0.16 %
	300 kHz to 500 kHz	0.24 %
	500 kHz to 1 MHz	0.40 %
	g. 50.00001 mV - 100 mV	
	10 Hz to 20 Hz	0.054 %
	20 Hz to 40 Hz	0.049 %
	40 Hz to 20 kHz	0.024 %
	20 kHz to 50 kHz	0.035 %
	50 kHz to 100 kHz	0.14 %
	100 kHz to 300 kHz	0.14 %
	300 kHz to 500 kHz	0.20 %
	500 kHz to 1 MHz	0.37 %

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
D. ELECTRICAL		
2 AC Voltage Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	h. 0.1 V - 0.21999999 V	
	10 Hz - 20 Hz	0.037 %
	20 Hz - 40 Hz	0.037 %
	40 Hz - 20 kHz	0.017 %
	20 kHz - 50 kHz	0.028 %
	50 kHz - 100 kHz	0.064 %
	100 kHz - 300 kHz	0.12 %
	300 kHz - 500 kHz	0.32 %
	500 kHz - 1 MHz	0.32 %
	i. 0.22 V - 0.5 V	
	10 Hz - 20 Hz	0.045 %
	20 Hz - 40 Hz	0.043 %
	40 Hz - 20 kHz	0.017 %
	20 kHz - 50 kHz	0.013 %
	50 kHz - 100 kHz	0.025 %
	100 kHz - 300 kHz	0.079 %
	300 kHz - 500 kHz	0.20 %
	500 kHz - 1 MHz	0.31 %
	j. 0.5000001 V - 1 V	
	10 Hz - 20 Hz	0.033 %
	20 Hz - 40 Hz	0.033 %
	40 Hz - 20 kHz	0.013 %
	20 kHz - 50 kHz	0.0096 %
	50 kHz - 100 kHz	0.018 %
	100 kHz - 300 kHz	0.058 %
	300 kHz - 500 kHz	0.14 %
	500 kHz - 1 MHz	0.24 %
	k. 1.00001 V - 2.1999999 V	
	10 Hz - 20 Hz	0.029 %
	20 Hz - 40 Hz	0.029 %
	40 Hz - 20 kHz	0.011 %
	20 kHz - 50 kHz	0.0085 %
	50 kHz - 100 kHz	0.015 %
	100 kHz - 300 kHz	0.051 %
	300 kHz - 500 kHz	0.13 %
	500 kHz - 1 MHz	0.21 %

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
D. ELECTRICAL		
2 AC Voltage Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	l. 2.2 V - 5 V	
	10 Hz to 20 Hz	0.043 %
	20 Hz to 40 Hz	0.043 %
	40 Hz to 20 kHz	0.016 %
	20 kHz to 50 kHz	0.013 %
	50 kHz to 100 kHz	0.02 %
	100 kHz to 300 kHz	0.055 %
	300 kHz to 500 kHz	0.20 %
	500 kHz to 1 MHz	0.30 %
	m. 5.000001 V - 10 V	
	10 Hz to 20 Hz	0.033 %
	20 Hz to 40 Hz	0.033 %
	40 Hz to 20 kHz	0.013 %
	20 kHz to 50 kHz	0.0096 %
	50 kHz to 100 kHz	0.015 %
	100 kHz to 300 kHz	0.040 %
	300 kHz to 500 kHz	0.15 %
	500 kHz to 1 MHz	0.22 %
	n. 10.000001 V - 21.999999 V	
	10 Hz to 20 Hz	0.029 %
	20 Hz to 40 Hz	0.029 %
	40 Hz to 20 kHz	0.011 %
	20 kHz to 50 kHz	0.0086 %
	50 kHz to 100 kHz	0.013 %
	100 kHz to 300 kHz	0.034 %
	300 kHz to 500 kHz	0.13 %
	500 kHz to 1 MHz	0.19 %
	o. 22 V - 50 V	
	10 Hz to 20 Hz	0.043 %
	20 Hz to 40 Hz	0.043 %
	40 Hz to 20 kHz	0.016 %
	20 kHz to 50 kHz	0.013 %
	50 kHz to 100 kHz	0.027 %
	100 kHz to 300 kHz	0.17 %

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
D. ELECTRICAL		
2 AC Voltage Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	p. 50.00001 V - 100 V	
	10 Hz to 20 Hz	0.033 %
	20 Hz to 40 Hz	0.033 %
	40 Hz to 20 kHz	0.013 %
	20 kHz to 50 kHz	0.011 %
	50 kHz to 100 kHz	0.021 %
	q. 100.00001 V - 219.99999 V	
	10 Hz to 20 Hz	0.031 %
	20 Hz to 40 Hz	0.031 %
	40 Hz to 20 kHz	0.019 %
	20 kHz to 50 kHz	0.0091 %
	50 kHz to 100 kHz	0.018 %
	r. 220 V - 249.9999 V	
	15 Hz to 50 Hz	0.041 %
	s. 220 V - 500 V	
	50 Hz to 1 kHz	0.032 %
	t. 501 V - 1000 V	
	50 Hz to 1 kHz	0.0078 %
3 DC Current Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	a. 0.1 uA to 0.9999 uA	6.1 %
	b. 1 uA to 9.9999 uA	0.61 %
	c. 10 uA to 99.9999 uA	0.065 %
	d. 100 uA to 199.9999 uA	0.011 %
	e. 200 uA to 219.9999 uA	0.0071 %
	f. 0.22 mA to 2.19999 mA	0.0067 %
	g. 2.2 mA to 21.9999 mA	0.004 %
	h. 22 mA to 219.9999 mA	0.0053 %
	i. 0.22 A to 2.19999 A	0.039 %
	j. 2.2 A to 10 A	0.059 %
	k. 10.1 A to 500 A	0.79 %
	l. 501 A to 1000 A	0.86 %

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
D. ELECTRICAL		
4 AC Current Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	a. 9 μA – 99.999 μA	
	10 Hz to 20 Hz	0.21 %
	20 Hz to 40 Hz	0.21 %
	40 Hz to 1 kHz	0.13 %
	1 kHz to 5 kHz	0.17 %
	5 kHz to 10 kHz	0.84 %
	b. 100 μA – 199.999 μA	
	10 Hz to 20 Hz	0.045 %
	20 Hz to 40 Hz	0.045 %
	40 Hz to 1 kHz	0.030 %
	1 kHz to 5 kHz	0.041 %
	5 kHz to 10 kHz	0.18 %
	c. 200 μA – 219.999 μA	
	10 Hz to 20 Hz	0.037 %
	20 Hz to 40 Hz	0.037 %
	40 Hz to 1 kHz	0.023 %
	1 kHz to 5 kHz	0.035 %
	5 kHz to 10 kHz	0.15 %
	d. 0.22 mA – 2.19999 mA	
	10 Hz to 20 Hz	0.036 %
	20 Hz to 40 Hz	0.036 %
	40 Hz to 1 kHz	0.028 %
	1 kHz to 5 kHz	0.034 %
	5 kHz to 10 kHz	0.18 %
	e. 2.2 mA – 21.9999 mA	
	10 Hz to 20 Hz	0.034 %
	20 Hz to 40 Hz	0.034 %
	40 Hz to 1 kHz	0.027 %
	1 kHz to 5 kHz	0.026 %
	5 kHz to 10 kHz	0.17 %

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
D. ELECTRICAL		
4 AC Current Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	f. 22 mA – 219.999 mA	
	10 Hz to 20 Hz	0.034 %
	20 Hz to 40 Hz	0.034 %
	40 Hz to 1 kHz	0.027 %
	1 kHz to 5 kHz	0.024 %
	5 kHz to 10 kHz	0.14 %
	g. 0.22 A – 2.19999 A	
	20 Hz to 5 kHz	0.69 %
	h. 2.2 A – 10 A	
	45 Hz to 1 kHz	0.33 %
	i. 10.1 A – 550 A	
	45 Hz to 65 Hz	0.78 %
	j. 551 A – 1000 A	
	40 Hz to 60 Hz	0.60 %
5 Resistance Measuring Instrument Range Values (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2		
	a. 1 Ω to 10.99 Ω	0.64 %
	b. 11 Ω to 32.999 Ω	0.12 %
	c. 33 Ω to 109.999 Ω	0.043 %
	d. 110 Ω to 329.999 Ω	0.018 %
	e. 0.33 kΩ to 1.09999 kΩ	0.021 %
	f. 1.1 kΩ to 3.29999 kΩ	0.012 %
	g. 3.3 kΩ to 10.9999 kΩ	0.022 %
	h. 11 kΩ to 32.9999 kΩ	0.012 %
	i. 33 kΩ to 109.999 kΩ	0.023 %
	j. 110 kΩ to 329.999 kΩ	0.014 %
	k. 0.33 MΩ to 0.99999 MΩ	0.025 %
	l. 1 MΩ to 10 MΩ	0.057 %
	m. 10.0001 MΩ to 15.9999 MΩ	0.081 %
	n. 16 MΩ to 20 MΩ	0.081 %
	o. 20.0001 MΩ to 32.9999 MΩ	0.081 %
	p. 33 MΩ to 1.1 GΩ	1.3 %
	q. 1.2 GΩ to 111 GΩ	2.4 %

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
D. ELECTRICAL		
6 Resistance Measuring Instrument Fixed values (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	a. 1 Ω, 1.9 Ω	0.0097 %
	b. 10 Ω, 19 Ω	0.0029 %
	c. 100 Ω, 190 Ω	0.0018 %
	d. 1 kΩ, 1.9 kΩ, 10 kΩ, 19 kΩ	0.0014 %
	e. 100 kΩ, 190 kΩ	0.0015 %
	f. 1 MΩ	0.0021 %
	g. 1.9 MΩ	0.0025 %
	h. 10 MΩ	0.0044 %
	i. 19 MΩ	0.0056%
	j. 100 MΩ	0.013 %
7 Capacitance Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	Range Values <u>50 Hz to 1 kHz</u>	
	a. 0.33 nF to 0.4999 nF	0.35% + 0.0079 pF
	b. 0.5 nF to 1.0999 nF	0.43% + 0.0078 nF
	c. 1.1 nF to 3.2999 nF	0.38% + 0.008 nF
	d. 3.3 nF to 10.999 nF	0.39% + 0.008 nF
	e. 11 nF to 32.999 nF	0.19% + 0.08 nF
	f. 33 nF to 109.99 nF	0.19% + 0.09 nF
	g. 110 nF to 329.99 nF	0.20% + 0.30 nF
	h. 0.33 uF to 1.0999 uF	0.19% + 0.0009 uF
	i. 1.1 u to 3.2999 uF	0.27% + 0.003 uF
	<u>50 Hz to 400 Hz</u>	
	j. 3.3 uF to 10.999 uF	0.27% + 0.009 uF
	k. 11 uF to 32.999 uF	0.31% + 0.03 uF
	<u>50 Hz to 200 Hz</u>	
	l. 33 uF to 109.99 uF	0.39% + 0.08 uF
	<u>50 Hz to 100 Hz</u>	
	m. 110 uF to 329.99 uF	0.54% + 0.3 uF
	n. 0.33 mF to 1.1 mF	0.78% + 1.0 uF

Schedule

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D. ELECTRICAL		
8 Capacitance Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2	Fixed Values a. 1 pF, 1 kHz b. 10 pF, 1 kHz c. 100 pF, 1 kHz d. 1000 pF, 1 kHz	 0.13 % 0.12 % 0.12 % 0.12 %
9 Inductance Measuring Instrument (Lab) EL-A-OP-CAL-SIN-MD207 Issue 1	Ranged values 1 mH - 1000 mH, 1 kHz	 1.2 %
10 DC Voltage Source (Lab) EL-A-OP-CAL-SIN-MD204 Issue 1 EL-A-OP-CAL-SIN-MD203 Issue 1	a. 0.01 mV to 0.1 mV b. 0.10001 mV to 1 mV c. 1.00001 mV to 10 mV d. 10.00001 mV to 100 mV e. 100.00001 mV to 120 mV f. 0.12000001 V to 1.2 V g. 1.2000001 V to 12 V h. 12.000001 V to 120 V i. 120.00001 V to 1000 V j. 1000 V to 2000 V k. 2000 V to 10000 V	3.6 % 0.37 % 0.037 % 0.0049 % 0.0016 % 0.0015 % 0.0017 % 0.0017 % 0.002 % 0.93 % 0.70 %
11 AC Voltage Source (Lab) EL-A-OP-CAL-SIN-MD204 Issue 1 EL-A-OP-CAL-SIN-MD203 Issue 1	a. 1 mV - 12 mV 40 Hz - 1 kHz 1 kHz - 20 kHz 20 kHz - 50 kHz 50 kHz – 100kHz 100 kHz – 300 kHz b. 12.001 mV - 120 mV 40 Hz - 1 kHz 1 kHz - 20 kHz 20 kHz - 50 kHz 50 kHz - 100 kHz 100 kHz - 300 kHz	 0.39 % 0.17 % 0.25 % 0.71% 4.9% 0.047 % 0.036 % 0.055 % 0.12 % 0.45 %

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
11 AC Voltage Source (Lab)	c. 0.120001 V - 1.2 V	
	40 Hz - 1 kHz	0.047 %
	1 kHz - 20 kHz	0.036 %
	20 kHz - 50 kHz	0.055 %
	50 kHz - 100 kHz	0.12 %
	100 kHz - 300 kHz	0.45 %
	d. 1.20001 V - 12 V	
	40 Hz - 1 kHz	0.062 %
	1 kHz - 20 kHz	0.043 %
	20 kHz - 50 kHz	0.06 %
	50 kHz - 100 kHz	0.16 %
	e. 12.0001 V - 120 V	
	40 Hz to 1 kHz	0.063 %
	1 kHz to 20 kHz	0.043 %
	f. 120.001 V - 700 V	
	50 Hz to 1 kHz	0.085 %
	1 kHz to 10 kHz	0.089 %
	g. 700 V to 750 V	
	50 Hz to 1 kHz	0.13 %
	h. 750 V to 1000 V	
	50 Hz to 1 kHz	0.85 %
	i. 1 kV to 10 kV	
	50Hz / 60 Hz	1.8 %

	SCOPE / INSTRUMENTS / LOCATION / METHOD		RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
12	DC Current Source (Lab) EL-A-OP-CAL-SIN-MD204 Issue 1 EL-A-OP-CAL-SIN-MD203 Issue 1	a.	1 nA to 10 nA	4.7 %
		b.	10.001 nA to 100 nA	0.46 %
		c.	110 nA to 120 nA	0.047 %
		d.	0.1201 uA to 1.2 uA	0.043 %
		e.	1.2001 uA to 12 uA	0.013 %
		f.	12.0001 uA to 120 uA	0.011 %
		g.	0.1200001 mA to 1.2 mA	0.0078 %
		h.	1.200001 mA to 12 mA	0.0095 %
		i.	12.00001 mA to 120 mA	0.0095 %
		j.	0.1200001 A to 1.05 A	0.023 %
		k.	1.20001 A to 3 A	0.29 %
		l.	3 A to 3.6 A	0.18 %
		m.	3.60001 A to 10 A	0.18 %
13	AC Current Source (Lab) EL-A-OP-CAL-SIN-MD204 Issue 1 EL-A-OP-CAL-SIN-MD203 Issue 1	a.	10 μA - 120 μA	
			10 Hz to 20 Hz	0.81 %
			20 Hz to 45 Hz	0.81 %
			45 Hz to 100Hz	0.53 %
			100 Hz to 1 kHz	0.42 %
			1 kHz to 5 kHz	0.42 %
			5 kHz to 10 kHz	2.4 %
		b.	0.12001 mA – 1.2 mA	
			10 Hz to 20 Hz	0.66 %
			20 Hz to 45 Hz	0.66 %
			45 Hz to 100 Hz	0.37 %
			100 Hz to 1 kHz	0.27 %
			1 kHz to 5 kHz	0.23 %
			5 kHz to 10 kHz	0.27 %
		c.	1.20001 mA – 12 mA	
			10 Hz to 20 Hz	0.66 %
			20 Hz to 45 Hz	0.66 %
			45 Hz to 100 Hz	0.37 %
			100 Hz to 1 kHz	0.27 %
			1 kHz to 5 kHz	0.23 %
			5 kHz to 10 kHz	0.27 %

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
	d. 12.0001 mA – 120 mA	
	10 Hz to 20 Hz	0.66 %
	20 Hz to 45 Hz	0.66 %
	45 Hz to 100 Hz	0.38 %
	100 Hz to 1 kHz	0.31 %
	1 kHz to 5 kHz	0.31 %
	5 kHz to 10 kHz	0.54 %
	e. 0.120001 A – 1.00000 A	
	10 Hz to 20 Hz	0.66 %
	20 Hz to 45 Hz	0.66 %
	45 Hz to 100 Hz	0.38 %
	100 Hz to 1 kHz	0.31 %
	1 kHz to 5 kHz	0.31 %
	5 kHz to 10 kHz	0.54 %
	f. 1.00001 A – 3.00000 A	
	45 Hz to 1 kHz	0.71%
	g. 3.00001 A – 3.60000 A	
	45 Hz to 1 kHz	0.57 %
	h. 3.60001 A – 10 A	
	45 Hz to 1 kHz	0.54 %
14 Resistance Source (Lab)		
EL-A-OP-CAL-SIN-MD204 Issue 1	a. 0.001 Ω to 0.01 Ω	6.4 %
EL-A-OP-CAL-SIN-MD203 Issue 1	b. 0.011 Ω to 0.1 Ω	0.62 %
	c. 0.11 Ω to 10 Ω	0.068 %
	d. 10.001 Ω to 100 Ω	0.0076 %
	e. 100.001 Ω to 1 kΩ	0.060 %
	f. 1.001 kΩ to 10 kΩ	0.0017 %
	g. 10.001 kΩ to 100 kΩ	0.0021 %
	h. 100.001 kΩ to 1 MΩ	0.0044 %
	i. 1.00001 MΩ to 12 MΩ	0.068 %
	j. 12.0001 MΩ to 120 MΩ	0.068 %
	k. 0.121 GΩ to 1 GΩ	0.067 %

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY	CALIBRATION MEASUREMENT CAPABILITY (*)
D. ELECTRICAL		
15 Capacitance Source (Lab) EL-A-OP-CAL-SIN-MD204 Issue 1	1 Vac @ 1 kHz a. 1 nF to 10 nF b. 10.0001 nF to 100 nF c. 100.001 nF to 1000 nF d. 1.0001 uF to 10 uF	 0.12 % 0.12 % 0.12 % 0.35 %
16 Frequency Measuring Instrument (Internal Time-base) (Lab) EL-A-OP-CAL-SIN-MD201 Issue 2 EL-A-OP-CAL-SIN-MD202 Issue 1	a. 100 mHz to 20 MHz b. 21 MHz to 1.3 GHz	0.0025 % 8.8×10^{-8}
17 Stopwatch / Timer (Lab) EL-A-OP-CAL-SIN-MD205 Issue 1	a. 1 s to 24 hours	0.13 s
(Site) EL-A-OP-CAL-SIN-MD205 Issue 1	b. 1 s to 24 hours	0.14 s
18 RF Frequency (External Timebase) (Lab) EL-A-OP-CAL-SIN-MD202 Issue 1 EL-A-OP-CAL-SIN-MD204 Issue 1	Source: a. 1 Hz to 1 kHz b. 1 kHz – 1 MHz c. 1 MHz – 1 GHz d. 1 GHz – 20 GHz Measure: a. 1 Hz to 1 kHz b. 1 kHz to 1 MHz c. 1 MHz to 1 GHz d. 1 GHz to 20 GHz	 5.8×10^{-5} 5.8×10^{-7} 1.2×10^{-9} 1×10^{-9} 5.8×10^{-6} 5.8×10^{-7} 5.8×10^{-8} 1×10^{-9}
19 RF Power (Lab) EL-A-OP-CAL-SIN-MD202 Issue 1	a. 20 dBm to -20 dBm at 1 GHz b. 10 dBm to -20 dBm at 10 GHz c. 10 dBm to -20 dBm at 18 GHz	0.17 dB 0.36 dB 0.36 dB
20 Amplitude Modulation (Lab) EL-A-OP-CAL-SIN-MD202 Issue 1	% of Depth: 5 to 95 Carrier Frequency / Modulation Rate 150 kHz – 10 MHz / 50 Hz to 10 kHz 10 MHz – 1.3 GHz / 50 Hz to 50 kHz 1.3 GHz – 10 GHz / 50 Hz to 50 kHz	 2.7 % 2.1 % 2.1 %

SCOPE / INSTRUMENTS / LOCATION / METHOD	RANGE TO BE CALIBRATED / MEASURED QUANTITIES / FREQUENCY			CALIBRATION MEASUREMENT CAPABILITY (*)
D. ELECTRICAL				
21. Frequency Modulation (Lab) EL-A-OP-CAL-SIN-MD202 Issue 1	Carrier Frequency	Peak Freq Dev	Modulation Rate	
	250 kHz to 10 MHz	Up to 40 kHz	20 Hz-10 kHz	3.0 %
	10 MHz to 1.3 GHz	Up to 400 kHz	50 Hz-100 kHz	1.2 %
	10 MHz to 1.3 GHz	Up to 400 kHz	20 Hz-200 kHz	5.9 %
	10 MHz to 18 GHz	Up to 100 kHz	50 Hz-100 kHz	1.3 %
22 Phase Modulation (Lab) EL-A-OP-CAL-SIN-MD202 Issue 1	Carrier Frequency	Peak Phase Dev	Modulation Rate	
	150 kHz to 10 MHz	Up to 4 rad	200 Hz-10 kHz	5.0 %
	10 MHz to 1.3 GHz	Up to 20 rad	200 Hz-20 kHz	4.1 %
	1.3 GHz to 20 GHz	Up to 20 rad	200 Hz-20 kHz	4.1 %
23 Oscilloscope (Lab) EL-A-OP-CAL-SIN-MD206 Issue 1	a. Vertical Deflection 2 mV – 30 V			2 %
	b. Horizontal Deflection 2 ns – 4 s			0.15 %
	c. Bandwidth (-3dB) 50 kHz – 500 MHz			4.6 %
E OPTICAL				
1. Light Meter (Lab) EL-A-OP-CAL-SIN-MD211 Issue 1	a. 10 lx – 99 lx			6.4 %
	b. 100 lx – 4000 lx			6.1 %

* CMC is expressed as an expanded uncertainty estimated at a level of confidence of approximately 95%.

Schedule

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Approved Signatories:

Name	Cat. A Mechanical	Cat. B Dimensional	Cat. C Temperature	Cat. D Electrical	Cat. E Optical
Mr Mohd Haron B. Junaidi	A(I), A(II) 1 - 3	All	-	-	-
Mr Law Eng Soon	A(I), A(II) 1 - 5	All	-	-	-
Mr Pek Leong Beng, Joseph	A(I), A(II), A(III), A(IV) 1-2	-	All	D17	-
Mr Toh Kheng Leong	A (I), A (II - excluding 5, 7, 8)	-	-	-	-
Mr Teo Kang Boon	A (II) 1	-	-	-	-
Mr Richard Chan Yee Keong	A (I), A (II) 1	-	-	-	-
Mr Yap Hwee Soon	A (I), A (II), A (III), A (IV), A (V) 1	-	All	All (excluding D7-8, 18-22)	-
Mr Ang Zhong Li	A (IV) 1 & 2	-	-	D1-7, 16-17	-
Mr Yip Hang Ming, Sam	A (IV) 1 & 2, A (V)	-	-	All	All
Ms Ong Yok Khuan	-	B (I) 1-3, B (II) 3, 6-9, 11, 14, 23-25, 30, B (III) 1	-	-	-
Mr Teo Tong Nee, Anthony	-	B (I) 1-4, B (II) 1, 3 - 9, 11, 14, 23-27, 30-31, 33, 36, B (III) 1, B (IV) 1, 2	-	-	-
Mr Sim Chee Chong	-	B (I) 1, 2, B (II) 3, 6-8, 24-25, B (III) 1	-	-	-
Mr Wong Wee Ang	-	-	C1 - 2, C6 - 10	D1-7	-
Mr Tan Li Zhi, Dennis	-	-	C1 - 3, C6 - 10	D1-7	-
Ms Tan Soon Keow Winnie	-	B(I) 1, 2, B(II) 6-8, 23-25, B(III) 1	-	-	-
Mr Sonny Setyawidjaya	-	B(I) 3 (CMM Only)	-	-	-
Mr Steven Tan Kin Hwa	A (V) 1	-	-	-	-

Approved Signatories: *(cont)*

Name	Cat. A Mechanical	Cat. B Dimensional	Cat. C Temperature	Cat. D Electrical	Cat. E Optical
Jenmark Sorreda	A (IV)1 & 2	-	C7A & B	D1-7, D10-14, D16	-
Renganayaki Kannan	-	-	-	D17	-
Shanmugam Sankar	-	B (I) 1-2, 4, B (II) 1, 3-4, 6-9, 11, 17, 23-25, 30-31, 33, 36, B (III) 1, B (IV) 1, 2	-	-	-
Tee Kim Meng Gabriel	-	B (I) 1, 2, B (II) 3, 6-8, 24-25 B (III) 1	-	-	-

Note:

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. A laboratory's fulfilment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and **management system requirements** that are necessary for it to consistently deliver technically valid calibration results. The **management system requirements** in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001.