

Schedule

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Singapore 738733

Certificate No. : LA-1999-0160-C

Issue No. : 25

Date : 05 January 2022

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FIELD OF TESTING : Calibration and Measurement

MEASURED QUANTITIES / INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
A. Dimensional		
1. External Micrometer (Lab / Site) 0 – 200 mm > 200 – 500 mm > 500 – 1000 mm	In-house Procedure MDCP -01 : 2022 BS 870 : 2008 JIS B 7502 : 2016 ISO 3611 : 2010	0.3µm 2 µm 4 µm
2. Caliper (Lab / Site) 0 – 1000 mm 1000 – 2000 mm	In-house Procedure MDCP -02 : 2022 BS 887 : 2008 JIS B 7507:2016 ISO 13385-1 : 2019	7 µm 26 µm
3. Depth Micrometer 0 – 300 mm	In-house Procedure MDCP -03 : 2022 BS 6468 : 2008 JIS B 7544 : 1994	1 µm
4. Internal & Stick Micrometer 0 – 200 mm > 200 – 500 mm > 500 – 1000 mm	In-house Procedure MDCP -04 : 2022 BS 959 : 2008	2 µm 3 µm 4 µm
5. Height Setting Micrometer & Riser Block Length 0 – 600 mm Parallelism	In-house Procedure MDCP -05 :2022 ISO 7863 : 1984	0.7 µm 0.6 µm
6. Caliper Checker 0 – 600 mm	In-house Procedure MDCP -06 : 2022	0.9 µm

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7. Vernier Height Gauge (Lab / Site) 0 – 600 mm	In-house Procedure MDCP -07 : 2022 BS 1643 : 2008 JIS B 7517:-2018 ISO 13225 : 2012	10 µm
8. Vernier Depth Gauge 0 – 600 mm	In-house Procedure MDCP -08 : 2022 BS 6365 : 2020 ISO 13385-2 : 2020	10 µm
9. Dial Indicator 0 – 30 mm 30 – 100 mm	In-house Procedure MDCP -09 : 2022 BS 907 : 2008 JIS B 7503 :2017 DIN 879 Part 1 and Part 3 :1999 DIN 878 : 2018-07 ASME/ANSI B89.1.10M : 2001 ISO 463 : 2006	0.5 µm 0.8 µm
10. Dial Test Indicator 0 – 3 mm	In-house Procedure MDCP -10 : 2022 BS 2795 : 1981 JIS B 7533:2015 ISO 9493 : 2010	0.5 µm
11. Digimatic Indicator (Lab / Site) 0 – 20 mm 20 – 100 mm	In-house Procedure MDCP -11 : 2022	0.6 µm 1.6 µm
12. Plain Plug Gauge / Pin Gauge Three Wire Up to 10 mm 10 – 100 mm 100 – 200 mm	In-house Procedure MDCP -12 : 2022 BS 969 : 2008	0.5 µm 0.5 µm 1.0 µm
13. Plain Ring Gauge 1 – 100 mm 100 – 200 mm	In-house Procedure MDCP -13 : 2022 BS 969 : 2008	0.7 µm 0.9 µm

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<p>14. Thread Ring Gauge > M2.5 – M50</p>	<p>In-house Procedure MDCP -14 : 2022 ISO 1502:1996 ISO 228-1: 2000 ISO 228-2 : 1987 FED – STD - H28: 2019 ASME/ANSI B 1.2-1983 ASME/ANSI B1.16M – 1984 ASME/ANSI B1.22M-1985 JIS B 0251 : 2008 JIS B 0254 : 2011 JIS B 0255 : 1998 JIS B 0261 : 2004 BS 919 Part 1 to 4 : 2007 BS 84 : 2007 BS 93 : 2008 BS 1580 Part 1 : 2007 BS 1580 Part 3 : 2007 BS 3643 Part 1 & 2 : 2007</p>	<p>2µm Pitch Dia : 0.7 µm Minor Dia : 0.6 µm</p>
<p>15. Thread Plug Gauge > M1 – M50</p>	<p>In-house Procedure MDCP -15 : 2022 ISO 1502 :1996 ISO 228-1 : 2000 ISO 228-2 : 1987 FED – STD - H28: 2019 ASME/ANSI B 1.2-1983 ASME/ANSI B1.16M – 1984 ASME/ANSI B1.22M-1985 JIS B 0251 : 2008 JIS B 0254 : 2011 JIS B 0255 : 1998 JIS B 0261 : 2004 BS 919 Part 1 to 4 : 2007 BS 84 : 2007 BS 93 : 2008 BS 1580 Part 1 : 2007 BS 1580 Part 3 : 2007 BS 3643 Part 1 & 2 : 2007 BS 4377 : 1991</p>	<p>Pitch Dia : 0.7 µm Major Dia : 0.5 µm Pitch : 5 µm Angle : 10 mins</p>

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16. Feeler Gauge / Calibration Foil / SHIM Up to 5 mm	In-house Procedure MDCP -16 : 2022 BS 957 : 2008 JIS B 7524 : 2008	0.4µm
17. Surface Plate (Lab / Site) Up to 2500 x 2000 mm	In-house Procedure MDCP -17 : 2022 BS 817 : 2008	2 µm
18. Profile Projector (Lab / Site) 50 mm 50 – 300 mm	In-house Procedure MDCP -18 : 2022 JIS B 7184 : 1999	3 µm 4 µm
19. Dial Thickness Gauge	In-house Procedure MDCP -24 : 2022	1 µm
20. Bore Gauge	In-house Procedure MDCP -25 : 2022 JIS B 7515 : 1982	2 µm
21. Setting Master	In-house Procedure MDCP -26 : 2022	2 µm
22. Straight Edge	In-house Procedure MDCP -27 : 2022 BS 5204-1 : 1975 BS 5204-2 : 1977 DIN 874 – 1 & 2 : 2003 JIS B 7514 : 1977	3.1 µm
23. Linear Height Gauge (Lab/Site)	In-house Procedure MDCP -29 : 2022	2 µm
24. Holtest Measuring Face: 0 – 50 mm 50 – 100 mm 100 – 150 mm Lead Screw	In-house Procedure MDCP -23 : 2022 DIN 863 : Part 4 : 1999 & DIN 2250 : Part 1 : 2008	1.9 µm 3.5 µm 5.1 µm 0.9 µm
25. Universal Length Measuring Machine (Lab / Site)	In-house Procedure MDCP -36 : 2022	0.3 µm

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26. Setting Rod 25 – 100 mm 100 – 400 mm 400 – 600 mm 600 – 1000 mm	In-house Procedure MDCP -34 : 2022 BS 870 : 2008 JIS B 7502 : 2016 ISO 3611 : 2010	0.8 µm 0.9 µm 1.1 µm 1.2 µm
27. Bevel Protractor Up to 300 mm 0 - 360 °C	In-house Procedure MDCP -39: 2022 BS 1685 : 2008	1.5 µm 5 min
28. Measuring Microscope (Lab / Site)	In-house Procedure MDCP -22 : 2022 JIS B 7153 : 1995	2 µm
29. Dial Gauge Calibrator 0 – 100 mm	In-house Procedure MDCP -40 : 2022	0.19 µm
30. Gauge Block > 0.5 – 10 mm > 10 – 25 mm > 25 – 50 mm > 50 – 75 mm > 75 – 100 mm (Dissimilar & Similar Material)	In-house Procedure MDCP -38 : 2022 ISO 3650 : 1998 BS 4311-1 : 2007	0.05 µm 0.06 µm 0.08 µm 0.10 µm 0.12 µm
31. Sine Bar 0 – 300 mm	In-house Procedure MDCP -21 : 2022 JIS B 7523 : 1977	1.5 µm
32. Screw Thread Micrometer	In-house Procedure MDCP -28 : 2022 BS 870 : 2008 as a guide ISO 3611 : 2010	1.0 µm
33. Precision Levels Up to 300 mm - Spirit Level - Inclinator Level Gauge	In-house Procedure MDCP -33: 2022 BS 958 : 1968 JIS B 7510 : 1993	0.3 Division 0.1 degree

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34. Layout Measurement Linear Angle Surface (Range 5 μm)	In-house Procedure MDCP -37 :2022	0.5 μm 10 mins
35. Vee Block	In-house Procedure MDCP -41: 2022 BS 3731 : 1987 JIS B 7540 : 1972	2 μm
36. MU Checker	In-house Procedure MDCP -42 : 2022 JIS B 7536 : 1982	0.2 μm
37. Precision Square 0 – 450 mm	In-house Procedure MDCP -43 : 2022 BS 939 : 2007 JIS B 7526 : 1995 JIS B 7539 : 1971	3 μm
38. Caliper Gauge (Lab / Site)	In-house Procedure MDCP -44 : 2022	1 μm
39. Dial Gauge Stand	In-house Procedure MDCP -45 : 2022	0.9 μm
40. Calibration Tester	In-house Procedure MDCP -46 : 2022	0.3 μm
41. Internal Micrometer (2-leg type)	In-house Procedure MDCP -47 : 2022	2 μm
42. Steel Rule	In-house Procedure MDCP -49 : 2022 BS 4372 : 1968 JIS B 7516 : 2005	10 μm
43. Centre Bench	In-house Procedure MDCP -50 : 2022	3 μm
44. Coating Thickness Gauge Up to 1000 μm	In-house Procedure MDCP -54 : 2022	0.5 μm
45. Roughness Machine Ra (Lab / Site)	In-house Procedure MDCP -56 : 2022	0.021 μm 0.06 μm
46. Roughness Specimen Ra	In-house Procedure MDCP -56 : 2022	0.021 μm 0.06 μm

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47. Roundness Machine (Lab / Site)	In-house Procedure MDCP -57: 2022	0.06 μm
48. Parallel Bars	In-house Procedure MDCP -58: 2022 BS 906-1 & 2 : 1972	2.0 μm
49. Co-ordinate Measuring Machine (Lab / Site) 0 – 500 mm 0 – 1000 mm 0 – 1500 mm	In-house Procedure MDCP -59 : 2022 ISO 10360 : Part 2 : 2009	3.3 μm 6.2 μm 8.2 μm
50. Micrometer Head	In-house Procedure MDCP -63 : 2022 BS 1734 : 1951 DIN 863 : Part 4 : 1999 JIS B 7502 : 2016	0.9 μm
51. Gauge Block Comparator (Lab / Site) 0.5 mm to 10 mm >10 mm to 50 mm >50 mm to 75 mm >75 mm to 100 mm	In-house Procedure MDCP -65 : 2022 EAL-G21 : 1996 ECA 10-02 : 2011	0.05 μm 0.14 μm 0.15 μm 0.25 μm
52. Contour Measuring Machine (Lab / Site)	In-house Procedure MDCP -67: 2022	3 μm
53. Dial Depth Gauge	In-house Procedure MDCP -53: 2022	3 μm
54. Optical Flat and Parallel Diameter: 0 – 45 mm	In-house Procedure MDCP-66: 2022 JIS B 7430 : 1977 JIS B 7431 : 1977	0.1 μm
55. Glass Scale 0 – 100 mm 150 mm	In-house Procedure MDCP--83: 2022	1.6 μm 1.9 μm

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56. Measuring Tape / Textile Tape Up to 396 inch	In-house Procedure MDCP -55 : 2021 JIS B 7512 : 2016 JIS B 7522 : 2016	0.04 inch
57. Taper Thread Plug Gauge	In-house Procedure MDCP -78 : 2022 ANSI/ASME B1.20.1 : 1983 ASME B1.20.5 : 1991 JIS B 0253 : 1985	0.6 µm
58. Taper Thread Ring Gauge	In-house Procedure MDCP -72 : 2022 ANSI/ASME B1.20.1 : 1983 ASME B1.20.5 : 1991 JIS B 0253 : 1985	1.5 µm
59. Taper Plug Gauge	In-house Procedure MDCP -73 : 2022 JIS B 3301 : 2008	0.7 µm
60. Taper Ring Gauge	In-house Procedure MDCP -74 : 2022 JIS B 3301 : 2008	1.1 µm
B. Mechanical		
1. Weighing Scale (Lab / Site) 0 – 400 kg	In-house Procedure MDCP -20: 2022	0.0001 % of full scale
2. Hand Torque Tool 0.1 Nm to 1000 Nm	In-house Procedure MDCP -31: 2022 ISO 6789-1 : 2017 Clause 6 (Exclude Overloading Test and Endurance Test)	0.4 % of full scale
3. Torque Meter/Gauge (0 - 15 Nm)	In-house Procedure MDCP -30: 2022	0.04% of full scale
4. Push/Pull Gauge	In-house Procedure MDCP -19: 2022	0.03 % of full scale
5. Hardness Tester Machine (Lab / Site) In-direct method only Rockwell A, B, C Vickers Brinell	In-house Procedure MDCP -48: 2022 JIS B 7726 : 2017 ASTM E 18 - 20 JIS B 7725 : 2010 JIS B 7724 : 2017	0.7 HRA 0.6 HRB / HRC 1.8 Hv 1.8 Hb

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6. Durometer Force Verification only	In-house Procedure MDCP -51 : 2022 ASTM D 2240 –15 ISO 868 : 2003 JIS K 6251 : 2017 JIS K 6253-5 : 2016	0.3 Deg
7. Pressure / Vacuum Gauge (Lab / Site) -1 – 140 Bar 0 – 2700 Bar	In-house Procedure MDCP -52 : 2022 In-house Procedure MDCP -52a : 2022 (using deadweight tester) BS EN 837-1 to 3 : 1998	0.013 % of reading 0.018 % of reading
8. Tensile Testing Machine (Lab / Site) Up to 250 kN	In-house Procedure MDCP -61 : 2022 ISO 7500-1 : 2018	0.01 % of full scale
9. Load Cell (Lab / Site) Up to 250 kN	In-house Procedure MDCP -62 : 2022	0.01 % of full scale
10. Tension Gauge 0 - 150 kg	In-house Procedure MDCP -32 : 2022	0.01 %
11. Standard Weights 1 mg – 10 g 20 g 50 g – 200 g 500 g 1000 g 2000 g – 20000 g	In-house Procedure MDCP -60 : 2022	0.00008 g 0.00009 g 0.0002 g 0.001 g 0.002 g 0.2 g
12. Tachometer (Lab / Site) RPM Meter 0 – 99999 rpm Non-Contact Type Contact Type	In-house Procedure MDCP -68 : 2022	1.7 rpm 0.6 rpm
13. Flowmeter (Lab/Site) 0 – 5 LPM 5 – 10 LPM	In-house Procedure MDCP-69 : 2022	0.16 LPM 0.19 LPM

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C. Temperature		
1. Thermocouple Indicator / Calibrator (measured / simulation)	In-house Procedure MDCPT-03 : 2022	
Type E (Lab) -250 °C to 1000 °C		0.51 °C
Type E (Site) -200 °C to 950 °C		0.74 °C
Type J (Lab) -210 °C to 1200 °C		0.32 °C
Type J (Site) -200 °C to 1200 °C		0.82 °C
Type K (Lab) -200 °C to 1372 °C		0.4 °C
Type K (Site) -200 °C to 1372 °C		0.97 °C
Type N (Lab) -200 °C to 1300 °C		0.4 °C
Type N (Site) -200 °C to 1300 °C		1.2 °C
Type R (Lab) 0 °C to 1767 °C		0.77 °C
Type R (Site) -20 °C to 1750 °C		2.0°C
Type S (Lab) 0 °C to 1767 °C		0.73 °C
Type S (Site) -20 °C to 1750 °C		±2.0 °C
Type T (Lab) -250 °C to 400 °C		0.55 °C
Type T (Site) -200 °C to 400 °C		0.97 °C

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<p>2. RTD Indicator / Calibrator (measured / simulation)</p> <p>PT385 (100 Ω) (Lab)</p> <p>-200 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C 630 °C to 800 °C</p> <p>PT385 (100 Ω) (Site)</p> <p>-200 °C to 800 °C</p> <p>PT3926 (100 Ω) (Lab)</p> <p>-200 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C</p> <p>PT3916 (100 Ω) (Lab)</p> <p>-200 °C to -190 °C -190 °C to -80 °C -80 °C to 0 °C 0 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C</p> <p>PT385 (200 Ω) (Lab)</p> <p>-200 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C</p>	<p>In-house Procedure MDCPT-04 : 2022</p>	<p>0.04 °C 0.05 °C 0.07 °C 0.08 °C 0.09 °C 0.18 °C</p> <p>0.49 °C</p> <p>0.04 °C 0.05 °C 0.07 °C 0.08 °C 0.09 °C</p> <p>0.19 °C 0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.18 °C</p> <p>0.04 °C 0.05 °C 0.07 °C 0.08 °C 0.09 °C 0.18 °C</p>

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PT385 (200 Ω) (Site) -200°C to 250°C 250°C to 630°C		0.24 °C 0.96 °C
PT385 (1000 Ω) (Lab) -200°C to 0°C 0°C to 100°C 100°C to 260°C 260°C to 300°C 300°C to 630°C		0.04 °C 0.05 °C 0.07 °C 0.08 °C 0.09 °C
PT385 (1000 Ω) (Site) -200°C to 630°C		0.34 °C
3. Enclosures C.1 Chamber / Oven / Freezers / System Accuracy Test Range : -70 °C to 200 °C	In-house Procedure MDCPT-05 : 2022 and MDCPT-05a : 2022	2.5 °C
C.2 Furnace / System Accuracy Test Range : 200 °C to 800 °C		2.1 °C
4. Thermometer with RTD Sensor / Probe (a) Dry Block Range : - 20 °C to 150 °C 150 °C to 500 °C 500 °C to 650 °C	In-house Procedure MDCPT-02 :2022	0.8 °C 1.8 °C 1.8 °C

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<p>5. Thermohygrometer / Thermohygrograph</p> <p>Range : (18 to 70) °C (40 to 95) % relative humidity</p>	In-house Procedure MDCPT-06 : 2022	1.1 °C 4.9 % relative humidity
<p>6. Dry Block Calibrator</p> <p>(Accuracy, Axial Homogeneity, Uniformity & Loading Effect) -20 °C to 150 °C 150 °C to 500 °C</p>	In-house procedure MDCPT-08a : 2022	0.31 °C 0.86 °C
D. Electrical		
<p>1. DC Voltage (Measure)</p> <p>0 mV to 330 mV 0.33 V to 3.3 V 3.3 V to 33 V 33 V to 330 V 330 V to 1000 V</p>	Direct measurement with a DC voltage source	16 μV/V + 2 μV 9 μV/V + 2 μV 10 μV/V + 17 μV 14 μV/V + 0.14 mV 14 μV/V + 1.4 mV
<p>2. DC Current (Measure)</p> <p>0 μA to 330 μA 0.33 mA to 3.3 mA 3.3 mA to 33 mA 33 mA to 330 mA 0.33 A to 1.1 A 1.1 A to 3 A 3 A to 11 A 11 A to 20.5 A</p>	Direct measurement with a DC current source	120 μV/V + 0.02 μA 78 μV/V + 0.04 μA 78 μV/V + 0.20 μA 78 μV/V + 2.1 μA 160 μV/V + 0.04 mA 300 μV/V + 0.05 mA 390 μV/V + 0.70 mA 780 μV/V + 0.59 mA

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3.3 V to 33 V	10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz	240 μ V/V + 0.6 mV 120 μ V/V + 0.5 mV 190 μ V/V + 0.5 mV 280 μ V/V + 0.5 mV 1.3 mV
33 V to 330 V	45 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz	150 μ V/V + 1.6 mV 4.9 mV 4.9 mV 4.8 mV 0.16 % + 39 mV
4. AC Voltage (Measure)	Direct measurement with a AC voltage source	
330 V to 1000 V	45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	8.1 mV 8.6 mV 8.3 mV
5. AC Current (Measure)	Direct measurement with a AC current source	
29.00 μ A to 330 μ A	10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz	0.16 % + 0.08 μ A 0.12 % + 0.08 μ A 0.10 % + 0.08 μ A 0.23 % + 0.12 μ A 0.62 % + 0.16 μ A 1.2 % + 0.31 μ A
0.33 mA to 3.3 mA	10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz	0.24 μ A 0.10 % + 0.12 μ A 1.18 μ A 0.17 μ A 0.23 μ A 0.78 % + 0.47 μ A
3.3 mA to 33 mA	10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz	2.5 μ A 0.07 % + 1.6 μ A 0.03 % + 1.6 μ A 0.07 % + 1.6 μ A 0.16 % + 2.3 μ A 0.31 % + 3.1 μ A

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33 mA to 330 mA	10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz	0.14 % + 0.02 mA 0.07 % + 0.02 mA 0.03 % + 0.02 mA 0.08 % + 0.04 mA 0.16 % + 0.08 mA 0.31 % + 0.16 mA
AC Current (Measure)	Direct measurement with a AC current source	
0.33 A to 3 A	10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.09 mA 0.05 % + 0.09 mA 0.79 mA 2.0 % + 3.9 mA
3 A to 11 A	45 Hz to 100 Hz 100 Hz to 1 kHz 1 Hz to 5 kHz	0.05 % + 1.7 mA 0.08 % + 1.7 mA 2.4 % + 1.7 mA
11 A to 20.5 A	45 Hz to 100 Hz 0.1 kHz to 1 kHz 1 kHz to 5 kHz	0.10 % + 3.9 mA 0.12 % + 3.9 mA 2.4 % + 3.9 mA
6. Capacitance (Measure)	Direct measurement with a calibrator	
0.22 nF to 0.4 nF	10 Hz to 10 kHz	0.39 % + 0.0078 nF
0.4 nF to 1.1 nF	10 Hz to 10 kHz	0.39 % + 0.0079 nF
1.1 nF to 3.3 nF	10 Hz to 3 kHz	0.39 % + 0.0078 nF
3.3 nF to 11 nF	10 Hz to 1 kHz	0.20 % + 0.0097 nF
11 nF to 33 nF	10 Hz to 1 kHz	0.20 % + 0.097 nF
33 nF to 110 nF	10 Hz to 1 kHz	0.20 % + 0.097 nF
110 nF to 330nF	10 Hz to 1 kHz	0.20 % + 0.63 nF
0.33 µF to 1.1 µF	10 Hz to 600 Hz	0.20 % + 0.97 nF
1.1 µF to 3.3 µF	10 Hz to 300 Hz	0.20 % + 6.3 nF
3.3 µF to 11 µF	10 Hz to 150 Hz	0.20 % + 13 nF
11 µF to 33 µF	10 Hz to 120 Hz	0.32 % + 24 nF
33 µF to 110 µF	10 Hz to 80 Hz	0.35 % + 0.13 µF
110 µF to 330 µF	0 to 50 Hz	0.35 % + 0.63 µF
0.33 mF to 1.1 mF	0 to 20 Hz	0.35 % + 1.1 µF
1.1 mF to 3.3 mF	0 to 6 Hz	0.35 % + 6.3 µF
3.3 mF to 11 mF	0 to 2 Hz	0.35 % + 13 µF
11 mF to 33 mF	0 to 0.6 Hz	0.59 % + 55 µF
33 mF to 110 mF	0 to 0.2 Hz	0.86 % + 78 µF

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10 A – 16.5 A	45 Hz – 65 Hz	0.33 % + 58 mA
10 A – 16.5 A	65 Hz – 100 Hz	0.92 % + 58 mA
10 A – 16.5 A	100 Hz – 440 Hz	0.93 % + 58 mA
16.5 A – 150 A	45 Hz – 65 Hz	0.34 % + 65 mA
16.5 A – 150 A	65 Hz – 100 Hz	0.92 % + 66 mA
16.5 A – 150 A	100 Hz – 440 Hz	0.94 % + 66 mA
150 A – 1000 A	45 Hz – 65 Hz	0.34 % + 0.12 A
150 A – 1000 A	65 Hz – 100 Hz	0.92 % + 0.13 A
150 A – 1000 A	100 Hz – 440 Hz	1.2 % + 0.13 A
10. DC Current (Source) (Lab)	Direct measurement with a precision multimeter	
0 to <200 μ A		13 μ A/A + 0.31 nA
220 μ A to <2 mA		13 μ A/A + 3.1 nA
2 mA to <20mA		14 μ A/A + 31 nA
20 mA to <200 mA		47 μ A/A ppm + 0.62 μ A
200 mA to <2 A		0.018 % + 13 μ A
2 A to 20 A		0.039 % + 0.32 mA
(On-site)	Direct measurement with a precision multimeter	
0 to 300 μ A		0.047 % + 0.012 μ A
>0.30 mA to 3.0 mA		0.047 % + 0.12 μ A
>3.0 mA to 30 mA		0.047 % + 1.2 μ A
>30 mA to 300 mA		0.093 % + 24 μ A
>300 mA to 1A		0.093 % + 0.70 mA
>1 A to 10 A		0.058 % + 0.58 mA
11. AC Current (Source) (Lab)	Direct measurement with a precision multimeter	
2 μ A to <200 μ A	10 Hz to 10 kHz	0.049 % + 0.019 μ A
200 μ A to <2 mA	10 Hz	0.031 % + 0.19 μ A
	>10 Hz to 10 kHz	0.029 % + 0.19 μ A
2 mA to <20 mA	10 Hz	0.031 % + 1.9 μ A
	>10 Hz to 10 kHz	0.029 % + 1.9 μ A

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MEASURED QUANTITIES / INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
20 mA to <200 mA	10 Hz >10 Hz to 10 kHz	0.031 % + 19 μ A 0.028 % + 19 μ A
200 mA to <2 A	10 Hz to 2 kHz >2 kHz to 10 kHz	0.057 % + 0.19 mA 0.067 % + 0.19 mA
2 A to <20 A	50 Hz to 2 kHz >2 kHz to 10 kHz	0.072 % + 1.9 mA 0.20 % + 1.9 mA
(On-site)	Direct measurement with a precision multimeter	
0 μ A to <30mA	20 Hz to 45 Hz 46 Hz to 100 Hz 101 Hz to 400 Hz 401 Hz to 20 kHz 21 kHz to 100 kHz	1.1 % + 3.3 mA 0.44 % + 3.3 mA 0.39 % + 3.3 mA 0.39 % + 3.3 mA 1.3 % + 3.3 mA
30 mA to <300 mA	20 Hz to 45 Hz 46 Hz to 100 Hz 101 Hz to 400 Hz 401 Hz to 20 kHz 21 kHz to 100 kHz	1.1 % + 3.3 mA 0.44 % + 3.3 mA 0.39 % + 3.3 mA 0.39 % + 3.3 mA 1.3 % + 3.3 mA
300 mA to <1A	20 Hz to 45 Hz 46 Hz to 100 Hz 101 Hz to 400 Hz 401 Hz to 20 kHz	1.2 % + 3.3 mA 0.56 % + 3.3 mA 0.50 % + 3.3 mA 0.50 % + 3.3 mA
1 A to 10 A	45 Hz to 1k Hz 1k Hz to 20k Hz	1.8 % + 5.8 mA 1.8 % + 12 mA

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MEASURED QUANTITIES / INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
On-site) 0 to 30 mV >30 mV to 300 mV >300 mV to 3V >3 V to 30V >30 V to 300V >300 V to 1000 V	Direct measurement with a precision multimeter	52 $\mu\text{V/V}$ + 4.3 μV 41 $\mu\text{V/V}$ + 45 μV 29 $\mu\text{V/V}$ + 7.0 μV 47 $\mu\text{V/V}$ + 0.22 mV 64 $\mu\text{V/V}$ + 0.70 mV 0.12 % + 0.24 V
14. AC Voltage (Source) (Lab) 2 μV to 200 mV	Direct measurement with a precision multimeter 10 Hz to 40 Hz >40 Hz to 100 Hz >100 Hz to 2 kHz >2 kHz to 10 kHz >10 kHz to 30 kHz >30 kHz to 100 kHz	0.013 % + 3.9 μV 0.011 % + 3.9 μV 0.011 % + 1.9 μV 0.013 % + 3.9 μV 0.031 % + 7.8 μV 0.067 % + 19 μV
200 mV to <2 V	10 Hz >10 Hz to 40 Hz >40 Hz to 100 Hz >100 Hz to 2 kHz >2 kHz to 10 kHz >10 kHz to 30 kHz >30 kHz to 50 kHz >50 kHz to 100 kHz >100 kHz to 300 kHz >300 kHz to 1 MHz	0.0014 % + 0.11 mV 0.011 % + 19 μV 85 $\mu\text{V/V}$ + 30 μV 70 $\mu\text{V/V}$ + 19 μV 0.011 % + 19 μV 0.021 % + 39 μV 0.051 % + 0.19 mV 0.051 % + 0.19 mV 0.24 % + 1.9 mV 0.78 % + 19 mV
2 V to <20 V	10 Hz >10 Hz to 40 Hz >40 Hz to 100 Hz >100 Hz to 2 kHz >2 kHz to 10 kHz >10 kHz to 30 kHz >30 kHz to 50 kHz >50 kHz to 100 kHz	0.015 % + 1.1 mV 0.011 % + 0.20 mV 86 $\mu\text{V/V}$ + 0.26 mV 70 $\mu\text{V/V}$ + 0.19 mV 0.011 % + 0.26 mV 0.021 % + 0.39 mV 0.051 % + 1.9 mV 0.24 % + 19 mV
20 V to <200 V	40 Hz to 100 Hz >100 Hz to 2 kHz >2 kHz to 10 kHz >10 kHz to 30 kHz >30 kHz to 100 kHz	86 $\mu\text{V/V}$ + 1.9 mV 70 $\mu\text{V/V}$ + 1.9 mV 0.011 % + 1.9 mV 0.021 % + 3.9 mV 0.051 % + 19 mV

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MEASURED QUANTITIES / INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
200 V to <1000 V	40 Hz to 10 kHz	0.011 % + 20 mV
15 AC Voltage (Source) (On-site)	Direct measurement with a AC Voltage source In-house Procedure MDCPE-09 : 2022	
1.0 mV to <30 mV	20Hz to 45 Hz 45Hz to 100Hz 100Hz to 400Hz 400Hz to 20 kHz 20kHz to 100 kHz 100kHz to 300 kHz 300kHz to 1MHz	0.70 % + 16 μ V 0.29 % + 16 μ V 0.20 % + 16 μ V 0.21 % + 16 μ V 0.81 % + 27 μ V 3.7 % + 0.12 mV 12 % + 0.77 mV
30 mV to <300 mV	20Hz to 45 Hz 45Hz to 100Hz 100Hz to 400Hz 400Hz to 20 kHz 20kHz to 100 kHz 100kHz to 300 kHz 300kHz to 1MHz	0.70 % + 0.16 mV 0.29 % + 0.16 mV 0.20 % + 0.16 mV 0.21 % + 0.16 mV 0.81 % + 0.27 mV 3.7 % + 1.2 mV 12 % + 7.7 mV
0.3 V to < 3.0 V	20Hz to 45 Hz 45Hz to 100Hz 100Hz to 400Hz 400Hz to 20 kHz 20kHz to 100 kHz 100kHz to 300 kHz 300kHz to 1MHz	0.70 % + 1.6 mV 0.29 % + 1.6 mV 0.20 % + 1.6 mV 0.21 % + 1.6 mV 0.81 % + 2.7 mV 3.7 % + 12 mV 12 % + 77 mV
3 V to <30 V	20Hz to 45 Hz 45Hz to 100Hz 100Hz to 400Hz 400Hz to 20 kHz 20kHz to 100 kHz 100kHz to 300 kHz 300kHz to 1MHz	0.70 % + 16 mV 0.29 % + 16 mV 0.20 % + 16 mV 0.21 % + 16 mV 0.81 % + 27 mV 3.7 % + 0.12 V 12 % + 0.77 V
30 V to <300 V	20Hz to 45 Hz 45Hz to 100Hz 100Hz to 400Hz 400Hz to 20 kHz 20kHz to 100 kHz	0.77 % + 0.16 V 0.36 % + 0.16 V 0.27 % + 0.16 V 0.28 % + 0.16 V 1.3 % + 0.45 V

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MEASURED QUANTITIES / INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
300 V to 1000 V	45Hz to 1 kHz 1kHz to 10 kHz	0.47 % + 4.7 V 0.47 % + 4.7 V
16. DC Power (Measure) (Lab)	Direct measurement with a calibrator	
0 to 90 W		0.018 % + 13 mW
>90 W to 150 W		0.019 % + 0.12 W
>150 W to 600 W		0.018 % + 58 mW
>600 W to 6 kW		0.055 % + 0.58 W
>6 kW to 12 kW		0.070 % + 0.58 W
On-site)	Direct measurement with a Multiproduct Calibrator	0.018 % + 13 mW
0 to 90 W	In-house Procedure MDCPE-16 : 2022	0.019 % + 0.12 W
>90 W to 150 W		0.018 % + 58 mW
>150 W to 600 W		0.055 % + 0.58 W
>600 W to 6 kW		0.070 % + 0.58 W
>6 kW to 12 kW		
17. AC Power (Measure) (Lab/Site)	Direct measurement with a calibrator	
2mW to 33 W	45 Hz to 65 Hz	0.130 % + 0.76 mW
>33 W to 90 W	45 Hz to 65 Hz	0.086 % + 0.22 mW
>90 W to 150 W	45 Hz to 65 Hz	0.070 % + 7.6 mW
>150 W to 900 W	45 Hz to 65 Hz	0.070 % + 12 mW
>900 W to 9 kW	45 Hz to 65 Hz	0.078 % + 58 mW
>9 kW to 12 kW	45 Hz to 65 Hz	0.078 % + 0.58 W
18. High Voltage		
AC High Voltage (Source) (Lab/Site)	Direct measurement with a Multiproduct Calibrator	
0 kV to 10 kV	In-house Procedure MDCPE-16 : 2022	1.2 % + 6.0 V
DC High Voltage (Source) (Lab/Site)	Direct measurement with a AC DIGITAL HIGH VOLTMETER	
0 kV to 5 kV	In-house Procedure MDCPE-18 : 2022 50Hz to 60Hz	0.58 % + 3.5 V

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MEASURED QUANTITIES / INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
<p>19. Insulation / High Ohm / Tester, Surface Resistivity Tester</p> <p>(Lab/Site)</p> <p>(1 to 10) kΩ (>10 to 100) kΩ (>0.1 to 1) MΩ (>1 to 10) MΩ (>10 to 100) MΩ (>0.1 to 1) GΩ (>1 to 10) GΩ (>10 to 100) GΩ</p>	<p>Direct measurement with a Standard Resistor</p> <p>In-house Procedure MDCPE-19 : 2022</p>	<p>0.12 mΩ/Ω + 5.8 Ω 0.12 mΩ/Ω + 58 Ω 0.12 mΩ/Ω + 0.58 kΩ 1.2 mΩ/Ω + 5.8 kΩ 1.2 mΩ/Ω + 58 kΩ 1.2 mΩ/Ω + 0.58 MΩ 2.28 mΩ/Ω + 5.8 MΩ 3.5 mΩ/Ω + 58 MΩ</p>
<p>20. LCR Meter</p> <p>Capacitance Measure @120 Hz to 100 kHz</p> <p>1 pF 10 pF 100 pF 1000 pF 10 nF 100 nF 1 uF</p>	<p>Direct measurement with a Standard Air Capacitance</p>	<p>0.0012 pF 0.012 pF 0.12 pF 1.16 pF 0.012 nF 0.12 nF 0.0012 μF</p>
<p>Resistance Measure @120 Hz to 100 kHz</p> <p>10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ</p>	<p>Direct measurement with a Decade Resistance</p>	<p>0.12 mΩ/Ω + 0.0013 Ω 0.047 mΩ/Ω + 0.0013 Ω 0.035 mΩ/Ω + 0.13 Ω 0.035 mΩ/Ω + 0.13 Ω 0.070 mΩ/Ω + 1.4 Ω</p>

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

NOTE : Direct conversion of the metric units to imperial units will be applied for imperial measurement

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Approved Signatories:

Mr John Peh	- Item A & Item B
Ms Peh Woon Teng	- Item A, Item B, Item C & Item D
Ms Lee Siew Moy	- Item A (1-12, 16, 19-21, 26-27, 29, 31-32, 34-36, 38, 41, 53)
Mr Kendrew Peh	- Item B (1, 2, 5 & 11)
Mr Weerasak Jokthong	- Item A, Item B, Item C & Item D
Mr Apichai Thepmaneerat	- Item A (4, 12-16, 18, 24-25, 28, 34, 45-47, 49, 52, 58-61)
Mr Koo Chih Wei	- Item A (1, 2, 12, 16, 19, 22, 27-30, 33-35, 37, 42, 44-46, 48, 51, 54) & Item B (1-4, 6-11, 13)
Mr David Yap	- Item A (12-16, 24, 56-61) & Item B

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 calibrations. 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.