

Schedule

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Certificate No. : LA-1999-0160-C-1

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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 0 - 300 mm / 0 - 12 inch >300 - 600 mm / 12 - 2 inch >600 - 1000 mm / 24 - 40 inch Flatness Parallelism (Lab/Site) 2. Caliper 0 - 1000 mm / 40 inch Resolution 0.01 mm / 0.0005 inch 0.02 mm / 0.001 inch 0.05 mm / 0.002 inch (Lab/Site) 3. Depth Micrometer 0 - 300 mm / 12 inch 4. Stick Micrometer 0 - 1000 mm 0 - 40 inch	In-house Procedure MDCP -01 : 2020 BS 870 : 2008 JIS B 7502:-2016 ISO 3611 : 2010 In-house Procedure MDCP -02 : 2020 BS 887 : 2008 JIS B 7507:-2016 -BS EN ISO 13385-1 : 2011 In-house Procedure MDCP -03 : 2020 BS 6468:1984 JIS B 7544:1994 In-house Procedure MDCP -04 : 2020 BS 959 : 2008 JIS B 7502 : 2016	0.5 µm / 20 µinch 1 µm / 40 µinch 3 µm / 120 µinch 0.3 µm 0.9 µm 8 µm / 300 µinch 10 µm / 400 µinch 30 µm / 1200 µinch 1 µm / 40 µinch 1 µm / 40 µinch

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5. Height Setting Micrometer & Riser Block 0 - 300 mm / 0 - 12 inch 0 - 600 mm / 0 - 24 inch Parallelism / lead Screw	In-house Procedure MDCP -05 : 2020 ISO 7863:1984	0.8 μ m / 31 μ inch 1.2 μ m / 48 μ inch 0.4 μ m / 16 μ inch
6. Caliper Checker 0 - 630 mm / 0 - 24 inch	In-house Procedure MDCP -06 : 2020	0.8 μ m / 31 μ inch
7. Vernier Height Gauge 0 - 600 mm / 0 - 24 inch Resolution 0.01 mm / 0.0005 inch 0.02 mm / 0.001 inch	In-house Procedure MDCP -07 : 2020 BS 1643 : 2008 JIS B 7517:1993 BS EN ISO 13225 : 2012	7 μ m / 280 μ inch 10 μ m / 400 μ inch
8. Vernier Depth Gauge 0 - 600 mm / 0 - 24 inch	In-house Procedure MDCP -08 : 2020 BS 6365 : 2008 JIS B 7518:1993 ISO 13385-2: 2011	5 μ m / 200 μ inch
9. Dial Indicator Up to 100 mm / 0 - 4 inch	In-house Procedure MDCP -09 : 2020 BS 907 : 2008 AS 2103 :1978 JIS B 7503 :1997 ISO 463 : 2006 DIN 878 : 2006 DIN 879-1 : 1999 and DIN 879-3 :1999 ASME/ANSI 89.1.10M: 2001	0.5 μ m / 20 μ inch
10. Dial Test Indicator Up to 3 mm / 0 - 0.02 inch	In-house Procedure MDCP -10 : 2020 BS 2795 : 1981 JIS B 7533 : 2015 DIN 2270 : 1985 AS 2103 : 1978 ASME/ANSI 89.1.10M: 2001 ISO 9493 : 2010	0.5 μ m / 20 μ inch

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<p>11. Digimatic Indicator (Linear Gauge)</p> <p>0 - 30 mm / 0 - 1 inch > 30 - 100 mm / 1 - 4 inch</p> <p>Resolution 0.01 μm (Lab/Site)</p>	<p>In-house Procedure MDCP -11 : 2020</p>	<p>0.6 μm / 10 μinch 1.0 μm / 15 μinch</p> <p>0.04 μm</p>
<p>12. Plain Plug Gauge / Pin Gauge Three Wire</p> <p>Up to 25 mm / 0 - 1 inch 25 - 100 mm / 1 - 4 inch 100 - 200 mm / 4 - 8 inch 200 - 400 mm / 8 - 16 inch Circularity</p>	<p>In-house Procedure MDCP -12 : 2020 BS 969 : 2008 as a guide JIS B 0271 : 2004 JIS B 7420 : 1997</p>	<p>0.4 μm / 15 μinch 0.6 μm / 24 μinch 0.8 μm / 30 μinch 1.0 μm / 40 μinch 0.06 μm / 3 μinch</p>
<p>13. Plain Ring Gauge</p> <p>1 - 25 mm / 0 - 1 inch > 25 - 75 mm / 1 - 3 inch > 75 - 200 mm / 3 - 8 inch Circularity</p>	<p>In-house Procedure MDCP -13 : 2020 BS 969 : 2008 as a guide DIN 2250-1 : 2008 DIN 2250-2 : 2008 BS 4064 : 1966</p>	<p>0.6 μm / 24 μinch 0.6 μm / 24 μinch 1 μm / 40 μinch 0.06 μm / 3 μinch</p>
<p>14. Thread Ring Gauge</p> <p>> M2.5 - M100 / 0.08 - 4 inch Up to 6 mm Pitch >M3x0.5</p>	<p>In-house Procedure MDCP -14 : 2020 JIS B 0261 : 2004 ISO 1502:1996 ISO 3161:1999 FED - STD - H28:1978 JIS B 0251 : 2008 JIS B 0254 : 2011 JIS B 0255 : 1998 ASME/ANSI 1.16M: 1984 BS 919 Part 1 to Part 4 : 2007 BS 84 : 2007 (continued next page)</p>	<p>1.1 μm / 43 μinch 1.5 μm / 60 μinch</p>

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15. Thread Plug Gauge > M1 - M100 / 0.04 – 4 inch	BS 1580 Part 1: 2007 BS 1580 Part 3 : 2007 BS 3643 Part 1 : 2007 BS 3643 Part 2 : 2007 Euramet/cg-10/v.01 In-house Procedure MDCP -15 : 2020 JIS B 0261 : 2004 ISO 1502:1996 ISO 3161:1999 FED - STD - H28:1978 JIS B 0251 : 2008 JIS B 0254 : 2011 JIS B 0255 : 1998 ASME/ANSI 1.16M: 1984 BS 919 Part 1 to Part 4: 2007 BS 84:2007 BS 1580 Part 1 : 2007 BS 1580 Part 3 : 2007 BS 3643 Part 1 : 2007 BS 3643 Part 2 : 2007	0.8 μm / 31 μinch
16. Feeler Gauge 0 - 5 mm / 0 - 0.2 inch	In-house Procedure MDCP -16 : 2020 JIS B 7524 : 2008 BS 957 : 2008	0.4 μm / 15 μinch
17. Surface Plate (Lab/Site)	In-house Procedure MDCP -17 : 2020 BS 817 : 2008 JIS B 7513 : 1992	2.0 μm / 80 μinch
18. Profile Projector 0 – 500 mm (Lab/Site)	In-house Procedure MDCP -18 : 2020 JIS 7184 : 1999, as a guide	3.0 μm
19. Dial Thickness Gauge	In-house Procedure MDCP -24 : 2020	2.0 μm / 80 μinch

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20. Bore Gauge 0 – 300 mm / 0 – 12 inch	In-house Procedure MDCP -25 : 2020 JIS B 7515 : 1982	1.0 μ m / 40 μ inch
21. Setting Master for Linear Height Gauge Up to 50 mm Height Flatness & Parallelism	In-house Procedure MDCP -26 : 2020	0.5 μ m / 20 μ inch 0.4 μ m / 15.7 μ inch
22. Straight Edge 0 - 1000 mm / 0 - 40 inch	In-house Procedure MDCP -27 : 2020 BS 5204-2 : 1977	0.8 μ m / 31 μ inch
23. Linear Height Gauge 0 - 1000 mm / 40 inch (Lab/Site)	In-house Procedure MDCP -29 : 2020	2.0 μ m / 80 μ inch
24. Holtest 0 - 150 mm / 0 - 6 inch	In-house Procedure MDCP -23 : 2020 DIN 863 : Part 4 : 1999 & DIN 2250 : Part 1 : 2008, as a guide	1.0 μ m / 40 μ inch
25. Universal Length Measuring Machine (Lab/Site)	In-house Procedure MDCP -36 : 2020	0.3 μ m
26. Setting Rod 25 - 1000 mm / 1 - 40 inch	In-house Procedure MDCP -34 : 2020 BS 870 : 1950 JIS B 7502 : 2016 ISO 3611 : 2010	0.6 μ m
27. Bevel Protractor Up to 300 mm / 12 Inch 0 - 360°	In-house Procedure MDCP -39 : 2020 BS 1685 : 2008	1.5 μ m / 60 μ inch 3 min
28. Measuring Microscope 0 – 500 mm (Lab/Site)	In-house Procedure MDCP -22 : 2020 JIS B 7153 : 1995	2.0 μ m
29. Dial Gauge Calibrator 0 - 100 mm / 0 - 40 Inch	In-house Procedure MDCP -40 : 2020	0.2 μ m / 8 μ inch

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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 : 2020 BS 4311 : Part 1 : 2007 ISO 3650 : 1998	0.06 μm / 2 μinch 0.06 μm / 2.7 μinch 0.08 μm / 3.1 μinch 0.09 μm / 3.5 μinch 0.10 μm / 3.9 μinch
31. Sine Bar 0 - 300 mm / 12 inch a) Flatness & Parallelism b) Parallelism of WF and 2 Rollers c) Centre to centre distance of rollers	In-house Procedure MDCP -21 : 2020 JIS B 7523 : 1977	0.4 μm / 15.7 μinch 1.2 μm / 47.2 μinch 0.8 μm / 31.5 μinch
32. Screw Thread Micrometer 0 - 100 mm / 0 - 4 inch	In-house Procedure MDCP -28 : 2020 BS 870 : 2008 as a guide ISO 3611 : 2010	1.5 μm / 60 μinch
33. Dial Gauge Stand (Flatness Measurement Face) (Lab / Site)	In-house Procedure MDCP -45 : 2020	0.6 μm / 30 μinch
34. Layout Measurement Linear (Using ULM) Length Angle Radius Circularity	In-house Procedure MDCP -37 : 2020	0.5 μm / 20 μinch 3.0 μm / 120 μinch 3 mins 3.0 μm / 120 μinch 0.06 μm / 3 μinch
35. Vee Block Up to 150 mm / 4 inch	In-house Procedure MDCP -41: 2020 BS 3731 : 1987 JIS B 7540 : 1972	2.0 μm / 80 μinch
36. MU Checker Up to 5 mm / Up to 0.2 inch	In-house Procedure MDCP -42 : 2020 JIS B 7536 : 1982	0.2 μm / 10 μinch

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37. Precision Square 0 - 450 mm / 18 inch	In-house Procedure MDCP -43 : 2020 BS 939 : 2007 JIS B 7526 : 1995	3.0 μm / 120 μinch
38. Calibration Tester 0 - 50 mm / 0-2 inch	In-house Procedure MDCP -46 : 2020	0.4 μm / 20 μinch
39. Precision Levels Up to 300 mm / 12 inch - Spirit Level - Inclinator Level Gauge	In-house Procedure MDCP -33 : 2020 BS 958: 1968 JIS B 7510 : 1993	001 Division 0.01 degree
40. Caliper Gauge (Lab/Site)	In-house Procedure MDCP -44 : 2020	1.0 μm / 40 μinch
41. Internal Micrometer (2 leg type)	In-house Procedure MDCP -47 : 2020	1.0 μm / 40 μinch
42. Steel Rule 0 - 250 mm / 10 inch using: Profile Projector	In-house Procedure MDCP -49 : 2020 BS 4372 : 1968 JIS B 7516 : 2005	0.01 mm
0 - 1000 mm / 40 inch Using : Linear Scale		0.05 mm
43. Centre Bench	In-house Procedure MDCP -50 : 2020	2.1 μm / 83 μinch
44. Coating Thickness Gauge Up to 1000 μm / 40 μinch	In-house Procedure MDCP -54 : 2020	0.5 μm / 20 μinch
45. Measuring Tape / Textile Tape 0 - 5 mm 5 - 20 mm 20 - 50 mm	In-house Procedure MDCP -55 : 2020 JIS B 7512 : 2016 JIS B 7522 : 2016	0.15 mm 0.55 mm 1.37 mm
46. Roughness Machine (Lab/Site)	In-house Procedure MDCP -56 : 2020	0.021 μm

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47. Roughness Specimen (Not intended for calibration use)	In-house Procedure MDCP -56 : 2020	0.021 μm
48. Roundness Machine (Lab/Site)	In-house Procedure MDCP -57 : 2020 JIS B 7451 : 1997	0.03 μm
49. Parallel Bars	In-house Procedure MDCP -58 : 2020 BS 906 : 1972	2.0 μm
50. Co-ordinate Measuring Machine 1500 mm (Lab/Site)	In-house Procedure MDCP -59 : 2020 ISO 10360 : Part 2: 2009	0.8 μm
51. Micrometer Head 0 – 100 mm	In-house Procedure MDCP -63 : 2020 DIN 863 : Part 4 : 1999	0.9 μm
52. Gauge Block Comparator	In-house Procedure MDCP -65 : 2020 EAL-G21 : 1996	0.03 μm
53. Optical Flat / Optical Parallel	In-house Procedure MDCP -66 : 2020 MOY/SCMI/54(Issue 4) : 2001 JIS B 7430 : 1977 JIS B 7431 : 1977	0.1 μm
54. Contour Measuring Machine (Lab/Site) X-axis Z-axis	In-house Procedure MDCP -67 :-2020	0.0030 mm 0.0009 mm
55. Air Gauge / Air Micrometer (Lab/Site)	In-house Procedure MDCP -64 : 2020 JIS B 7535 : 1982	0.5 μm
56. Dial Depth Gauge	In-house Procedure MDCP -53 : 2020	3 μm
57. Taper Thread Plug Gauge	In-house Procedure MDCP -71 : 2020 ANSI/ASME B1.20.1 : 1983 ASME B1.20.5 : 1991 JIS B 0253 : 1985	1.8 μm

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58. Taper Thread Ring Gauge	In-house Procedure MDCP -72 : 2020 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 : 2020 JIS B 3301 : 2008	0.9 µm
60. Taper Ring Gauge	In-house Procedure MDCP -74 : 2020 JIS B 3301 : 2008	1.1 µm
61. Geometrical Dimensional Measurement of Jigs and Fixtures, Gauges and FA Measurements – using: a) Profile projector b) CMM	In-house Procedure MDCP-78: 2020	3.0 µm 3.2 µm
62. Long Gauge Block 125 mm 150 mm 175 mm 125 mm 150 mm 175 mm 200 mm 250 mm 300 mm 400 mm 500 mm	In-house Procedure MDCP-77: 2020 Using Gauge Block Comparator Using Universal Length Machine	0.37 µm 0.40 µm 0.46 µm 0.46 µm 0.48 µm 0.50 µm 0.52 µm 0.57 µm 0.62 µm 0.73 µm 0.84 µm

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B. Mechanical		
1. Weighing Scale (Lab/Site) 0 - 100 g > 100 g - 200 g > 200 g - 1000 g > 1 kg - 100 kg >100 kg – 1000 kg	In-house Procedure MDCP -20 : 2020 UKAS Lab 14	0.01 mg 0.03 mg 0.1 mg 2 mg 2 g
2. Hand Torque Tool (Lab/Site) 0 - 1000 lb.ft	In-house Procedure MDCP -31 : 2020	0.2 % of full scale
3. Torque Meter/Gauge 0 - 1000 lb.ft	In-house Procedure MDCP -30 : 2020	0.08 % of full scale
4. Tension Gauge 0 - 100 kg	In-house Procedure MDCP -32 : 2020	0.1 % of full scale
5. Push / pull Gauge 0 - 500 kg	In-house Procedure MDCP -19 : 2020	0.1 % of full scale
6. Hardness Testing Machine (In-direct verification) Rockwell A, B, C Vicker Brinell (Lab/Site)	In-house Procedure MDCP -48 : 2020 JIS B 7726 : 2017 JIS B 7725 : 2010 JIS B 7724 : 2017	0.5 HRA / HRB / HRC 1.8 Hv 1.8 Hb
7. Durometers	In-house Procedure MDCP -51 : 2020 ASTM D 2240 – 15 ISO 868 : 2003 JIS K 6301 : 1995 JIS K 6253 : 2006	0.2 degree

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<p>8. Pressure Gauge / Pressure Transmitter(Lab/Site) (0 – 100) bar (100 -1500) bar</p> <p>Vacuum Gauge (Lab/Site) 0 - (-1) Bar</p>	<p>In-house Procedure MDCP -52 : 2020 BS EN 837-1 to 3 : 1998</p>	<p>0.05 % of reading 0.025 % of reading (using deadweight tester)</p> <p>0.25 % of full scale</p>
<p>9. Standard Weights</p> <p>1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg 40 kg</p>	<p>In-house Procedure MDCP -60 : 2020 OIML R111 : 2004</p>	<p>0.004 mg 0.004 mg 0.004 mg 0.005 mg 0.007 mg 0.008 mg 0.01 mg 0.02 mg 0.02 mg 0.02 mg 0.03 mg 0.04 mg 0.04 mg 0.05 mg 0.07 mg 0.1 mg 0.2 mg 0.5 mg 1 mg 2 mg 5 mg 10 mg 61 mg 86 mg</p>
<p>10. Tensile Testing Machine Up to 250 kN (Lab/Site)</p>	<p>In-house Procedure MDCP -61 : 2020 ISO 7500-1 : 2015</p>	<p>0.01 % of full scale</p>

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11. Load Cell Up to 250 kN (Lab/Site)	In-house Procedure MDCP -62 : 2020 ISO 376 : 2011	0.01 % of full scale
12. Tachometer RPM Meter <u>Non-Contact Type</u> 1 to 999.99 rpm 1000 to 9999.99 rpm 10000 to 99999 rpm <u>Contact Type</u> 1 to 9999.9 rpm 10000 to 99999 rpm	In-house Procedure MDCP -68 : 2020	0.006 rpm 0.06 rpm 0.6 rpm 0.06 rpm 0.6 rpm
13. Gas Flow Meter Rotameter	In-house Procedure MDCP -69 : 2020	3.5 % of reading
14. Volumetric Flow rate (Air) Range : 0 to 500 ml/min 0.5 to 500 L/min (Lab/Site)	In-house Procedure MDCP -75 : 2020	1.5 % 1.5 %
15. Mass Flow Rate (Air) Range : 0 to 592 mg/min 0.5 to 592 g/min (Lab/Site)	In-house Procedure MDCP -75 : 2020	1.4 % 1.3 %
16. Liquid Flow Meter Verification Range: 0 to 140 m ³ /min Pipe Internal Diameter: 0.05 to 1 m Fluid Temperature: 0 °C to 60 °C (Site)	In-house Procedure MDCP-76 : 2020	4.2 % of reading

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<p>C Temperature</p> <p>1. Thermocouple Indicator/ Calibrator (Measure/ Simulate)</p> <p>Type B (Lab)</p> <p>600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1500 °C 1500 °C to 1820 °C</p> <p>Type B (Site)</p> <p>600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1800 °C</p> <p>Type E (Lab)</p> <p>-250 °C to -100 °C -100 °C to -25 °C -25 °C to 350 °C 350 °C to 650 °C 650 °C to 1000 °C</p> <p>Type E (Site)</p> <p>-200 °C to 0 °C 0 °C to 950 °C</p> <p>Type J (Lab)</p> <p>-210 °C to -100 °C -100 °C to -30 °C -30 °C to 150 °C 150 °C to 760 °C 760 °C to 1200 °C</p> <p>Type J (Site)</p> <p>-200 °C to 0 °C 0 °C to 1200 °C</p>	<p>In-house Procedure MDCPT-03 : 2020</p>	<p>1.8 °C 1.8 °C 1.7 °C 1.8 °C</p> <p>2.6 °C 2.4 °C 2.2 °C</p> <p>0.5 °C 0.3 °C 0.3 °C 0.3 °C 0.3 °C</p> <p>0.7 °C 0.6 °C</p> <p>0.3 °C 0.3 °C 0.3 °C 0.3 °C 0.3 °C</p> <p>0.8 °C 0.6 °C</p>

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Type K (Lab) -200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C		0.4 °C 0.3 °C 0.3 °C 0.4 °C 0.4 °C
Type K (Site) -200 °C to 0 °C 0 °C to 1370 °C		1.0 °C 0.7 °C
Type N (Lab) -200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 410 °C 410 °C to 1300 °C		0.5 °C 0.4 °C 0.4 °C 0.4 °C 0.4 °C
Type N (Site) -200 °C to 0 °C 0 °C to 400 °C		1.2 °C 0.8 °C
1. Thermocouple Indicator/ Calibrator (Measure/ Simulate)		
Type R (Lab) 0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	In-house Procedure MDCPT-03 : 2020	2.5 °C 2.4 °C 2.4 °C 2.4 °C
Type R (Site) -20 °C to 0 °C 0 °C to 500 °C 500 °C to 1750 °C		3.2 °C 2.9 °C 2.8 °C

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Type S (Lab) 0 °C to 250 °C 250 °C to 1000 °C 1000 °C to 1400 °C 1400 °C to 1767 °C		2.4 °C 2.4 °C 2.4 °C 2.4 °C
Type S (Site) -20 °C to 0 °C 0 °C to 500 °C 500 °C to 1750 °C		3.2 °C 2.9 °C 2.8 °C
Type T (Lab) -250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C		0.6 °C 0.3 °C 0.3 °C 0.3 °C
Type T (Site) -200 °C to 0 °C 0 °C to 400 °C		0.8 °C 0.7 °C
2. Enclosures	In-house Procedure MDCPT-05 : 2020 and MDCPT-05a : 2020	
2.1 Chamber/ Oven/ Freezer/ Incubator/ Refrigerator/ System Accuracy Test		
Range : -20 °C to 100 °C 100 °C to 200 °C 200 °C to 600 °C		0.9 °C 1.9 °C 3.5 °C
2.2 Enclosure/ Furnace/ System Accuracy Test		
Range : -20 °C to 100 °C 100 °C to 200 °C 200 °C to 600 °C 600 °C to 1000 °C		1.0 °C 1.8 °C 3.3 °C 2.8 °C

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<p>3. RTD Sensor with or without Indicator</p> <p>a) Temperature Baths (Lab) Range : -20 °C to 95 °C 95 °C to 200 °C</p> <p>b) PRT Temperature System (Lab & Site) Range : -20 °C to 140 °C 140 °C to 400 °C 400 °C to 600 °C</p>	In-house Procedure MDCPT-02 : 2020	0.06 °C 0.08 °C 0.22 °C 0.45 °C 1.5 °C
<p>4. Thermohygrometer / Thermohygrograph Range : (30 to 95)% relative humidity at 25 °C (15 to 45)°C at 50 % relative humidity</p>	In-house Procedure MDCPT-06 : 2020	3.1 % relative humidity 0.8 °C
<p>5. Surface Probe Range : 50 °C to 350 °C</p>	In-house Procedure MDCPT-07 : 2020	2.3 °C
<p>6. Dry Block Calibrator Range : -20 °C to 400 °C 400 °C to 650 °C</p>	In-house Procedure MDCPT-08 : 2020	0.17 °C 1.4 °C
<p>7. RTD Indicator/ Calibrator (Measure and Simulate)</p> <p>Pt 385, 100 Ω (Lab) -200 °C to -80 °C -80 °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>	In-house Procedure MDCPT-04 : 2020	0.07 °C 0.07 °C 0.08 °C 0.09 °C 0.10 °C 0.11 °C 0.19 °C

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(Site) -200 °C to 800 °C		0.39 °C
Pt 3926, 100 Ω (Lab) -200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C		0.07 °C 0.07 °C 0.08 °C 0.09 °C 0.10 °C 0.11 °C
(Site) -200 °C to 630 °C		0.36 °C
Pt 3916, 100 Ω (Lab) -200 °C to -190 °C -190 °C to -80 °C -80 °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 600 °C 600 °C to 630 °C		0.20 °C 0.07 °C 0.07 °C 0.07 °C 0.08 °C 0.08 °C 0.09 °C 0.10 °C 0.19 °C
(Site) -200 °C to 630 °C		0.36 °C
Pt 385, 200 Ω (Lab) -200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C		0.07 °C 0.07 °C 0.07 °C 0.07 °C 0.11 °C 0.12 °C 0.14 °C

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(Site) -200 °C to 250 °C 250 °C to 630 °C		0.24 °C 0.93 °C
Pt 385, 500 Ω (Lab) -200 °C to -80 °C -80 °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 630 °C to 800 °C		0.07 °C 0.07 °C 0.07 °C 0.07 °C 0.08 °C 0.08 °C 0.09 °C 0.10 °C
(Site) -200 °C to 500 °C 500 °C to 630 °C		0.36 °C 0.47 °C
Pt 385, 1000 Ω (Lab) -200 °C to -80 °C -80 °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 630 °C to 800 °C		0.06 °C 0.06 °C 0.07 °C 0.07 °C 0.07 °C 0.08 °C 0.08 °C 0.19 °C
(Site For Measure) -200 °C to 100 °C 100 °C to 630 °C		0.24 °C 0.36 °C
(Site For Source) -200 °C to 100 °C 100 °C to 630 °C		0.24 °C 0.24 °C

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MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
Ni 120, 120 Ω (Lab) -80°C to 0 °C 0 °C to 100 °C 100 °C to 260 °C (Site) -80 °C to 260 °C Cu 427, 10 Ω (Lab) -100 °C to 260 °C		0.08 °C 0.08 °C 0.12 °C 0.24 °C 0.24 °C

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MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
<p>D Electrical</p> <p>1. DC Voltage (Measure) (Lab) 0 to < 220 mV 220 mV to <2.2 V 2.2 V to < 11 V 11 V to < 22 V 22 V to < 220 V 220 V to 1100 V</p> <p>(On-site) 0 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> <p>2. DC Current (Measure) (Lab) 0 to < 220 μA 220 μA to < 2.2 mA 2.2 mA to < 22 mA 22 mA to < 220 mA 220 mA to < 2.2 A 1.1 A to <3 A 3 A to <11 A 11A to 20.5 A</p> <p>(On-site) 0 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>	<p>Direct measurement with a DC voltage source</p> <p>Direct measurement with a DC Voltage Source In-house Procedure MDCPE-01 : 2020 In-house Procedure MDCPE-02 : 2013</p> <p>Direct measurement with a DC current source</p> <p>Direct measurement with a DC Current source In-house Procedure MDCPE-01 : 2020 In-house Procedure MDCPE-03 : 2020</p>	<p>7.0 ppm + 0.63 μV 6.2 ppm + 1.1 μV 6.2 ppm + 6.6 μV 6.2 ppm + 8.5 μV 7.0 ppm + 97 μV 8.6 ppm + 0.75 mV</p> <p>16 ppm + 1.4 μV 8.6 ppm + 1.7 μV 9.3 ppm + 17 μV 14 ppm + 0.13 mV 14 ppm + 1.4 mV</p> <p>47 ppm + 7.8 nA 47 ppm + 7.9 nA 47 ppm + 78 nA 55 ppm + 0.92 μA 74 ppm + 24 μA 0.030 % + 31 μA 0.039 % + 0.39 mA 0.078 % + 0.59 mA</p> <p>0.012 % + 0.016 μA 78 ppm + 0.039 μA 78 ppm + 0.20 μA 78 ppm + 2.0 μA 0.016 % + 31 μA 0.030 % + 31 μA 0.039 % + 0.70 mA 0.078 % + 0.59 mA</p>

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MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC [*])
<p>3. Resistance (Measure) (Lab)</p> <p>0 Ω to <11 Ω</p> <p>11 Ω to <33 Ω</p> <p>33 Ω to <110 Ω</p> <p>110 Ω to <1.1 kΩ</p> <p>1.1 kΩ to <11 kΩ</p> <p>11 kΩ to <110 kΩ</p> <p>110 kΩ to <1.1 MΩ</p> <p>1.1 MΩ to <3.3 MΩ</p> <p>3.3 MΩ to <11 MΩ</p> <p>11 MΩ to <33 MΩ</p> <p>33 MΩ to <110 MΩ</p> <p>110 MΩ to <330 MΩ</p> <p>330 MΩ to <1100 MΩ</p> <p>0 Ω</p> <p>1 Ω</p> <p>1.9 Ω</p> <p>10 Ω</p> <p>19 Ω</p> <p>100 Ω</p> <p>190 Ω</p> <p>1 kΩ</p> <p>1.9 kΩ</p> <p>10 kΩ</p> <p>19 kΩ</p> <p>100 kΩ</p> <p>190 kΩ</p> <p>1 MΩ</p> <p>1.9 MΩ</p> <p>10 MΩ</p> <p>19 MΩ</p> <p>100 MΩ</p> <p>(On-site)</p> <p>0 to <11 Ω</p> <p>11 Ω to <33 Ω</p> <p>33 Ω to <110 Ω</p> <p>110 Ω to <330 Ω</p> <p>0.33 kΩ to <1.1 kΩ</p> <p>1.1 kΩ to <3.3 kΩ</p> <p>3.3 kΩ to <11 kΩ</p>	<p>Direct measurement with a resistance source</p> <p>Direct measurement with a resistance source In-house Procedure MDCPE-01 : 2020 MDCPE-04 : 2020</p>	<p>31 ppm + 7.8 mΩ</p> <p>23 ppm + 12 mΩ</p> <p>22 ppm + 12 mΩ</p> <p>22 ppm + 16 mΩ</p> <p>22 ppm + 78 mΩ</p> <p>22 ppm + 0.8 Ω</p> <p>25 ppm + 7.8 Ω</p> <p>47 ppm + 0.12 kΩ</p> <p>0.011 % + 0.20 kΩ</p> <p>0.020 % + 2.0 kΩ</p> <p>0.039 % + 2.5 kΩ</p> <p>0.24 % + 78 kΩ</p> <p>1.2 % + 0.39 MΩ</p> <p>40 $\mu\Omega$</p> <p>86 ppm + 8.6 $\mu\Omega$</p> <p>86 ppm + 7.6 $\mu\Omega$</p> <p>26 ppm + 16 $\mu\Omega$</p> <p>24 ppm + 8.6 $\mu\Omega$</p> <p>16 ppm + 76 $\mu\Omega$</p> <p>16 ppm + 58 $\mu\Omega$</p> <p>12 ppm + 0.70 mΩ</p> <p>12 ppm + 0.58 mΩ</p> <p>11 ppm + 7.6 mΩ</p> <p>11 ppm + 7.0 mΩ</p> <p>13 ppm + 58 mΩ</p> <p>13 ppm + 71 mΩ</p> <p>18 ppm + 1.4 Ω</p> <p>19 ppm + 0.58 Ω</p> <p>36 ppm + 54 Ω</p> <p>43 ppm + 51 Ω</p> <p>0.011 % + 0.94 kΩ</p> <p>31 ppm + 7.8 mΩ</p> <p>24 ppm + 1.2 mΩ</p> <p>22 ppm + 12 mΩ</p> <p>22 ppm + 16 mΩ</p> <p>22 ppm + 16 mΩ</p> <p>22 ppm + 0.16 Ω</p> <p>22 ppm + 0.078 Ω</p>

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MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD/ FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
<p>3. Resistance (Measure)</p> <p>(On-site)</p> <p>11 kΩ to <33 kΩ</p> <p>33 kΩ to <110 kΩ</p> <p>110 kΩ to <330 kΩ</p> <p>0.33 MΩ to <1.1 MΩ</p> <p>1.1 MΩ to <3.3 MΩ</p> <p>3.3 MΩ to <11 MΩ</p> <p>11 MΩ to <33 MΩ</p> <p>33 MΩ to <110 MΩ</p> <p>110 MΩ to <330 MΩ</p> <p>330 MΩ to <1100 MΩ</p>	<p>Direct measurement with a resistance source</p> <p>In-house Procedure</p> <p>MDCPE-01 : 2020</p> <p>MDCPE-04 : 2020</p>	<p>22 ppm + 0.78 Ω</p> <p>22 ppm + 0.78 Ω</p> <p>25 ppm + 7.8 Ω</p> <p>25 ppm + 7.8 Ω</p> <p>47 ppm + 0.12 kΩ</p> <p>0.011 % + 0.20 kΩ</p> <p>0.020 % + 2.0 kΩ</p> <p>0.039 % + 2.4 kΩ</p> <p>0.024 % + 0.078 MΩ</p> <p>1.2 % + 0.39 MΩ</p>
<p>4. AC Voltage (Measure)</p> <p>(Lab)</p> <p>0.22 mV to <2.2 mV</p> <p>2.2 mV to <22 mV</p>	<p>Direct measurement with a AC voltage source</p> <p>10 Hz to 20 Hz</p> <p>>20 Hz to 50 Hz</p> <p>>50 Hz to 10 kHz</p> <p>>10 kHz to 20 kHz</p> <p>> 20 kHz to 50 kHz</p> <p>>50 kHz to 100 kHz</p> <p>>100 kHz to 300 kHz</p> <p>>300 kHz to 500 kHz</p> <p>>500 kHz to 1 MHz</p> <p>10 Hz to 20 Hz</p> <p>>20 Hz to 30 Hz</p> <p>>30 Hz to 40 Hz</p> <p>>40 Hz to 20 kHz</p> <p>>20 kHz to 50 kHz</p> <p>>50 kHz to 100 kHz</p> <p>>100 kHz to 300 kHz</p> <p>>300 kHz to 500 kHz</p> <p>>500 kHz to 1 MHz</p>	<p>0.047 % + 3.9 μV</p> <p>0.019 % + 3.9 μV</p> <p>93 ppm + 3.9 μV</p> <p>93 ppm + 4.0 μV</p> <p>0.032 % + 3.9 μV</p> <p>0.074 % + 6.3 μV</p> <p>0.11 % + 12 μV</p> <p>0.14 % + 24 μV</p> <p>0.38 % + 31 μV</p> <p>0.047 % + 4.7 μV</p> <p>0.19 % + 4.7 μV</p> <p>0.019 % + 4.7 μV</p> <p>93 ppm + 4.7 μV</p> <p>0.032 % + 4.7 μV</p> <p>0.074 % + 6.2 μV</p> <p>0.11 % + 12 μV</p> <p>0.14 % + 24 μV</p> <p>0.38 % + 31 μV</p>

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4. AC Voltage (Measure) (Lab) 22 mV to <220 mV 220 mV to <2.2 V 2.2 V to <22 V	10 Hz to 20 Hz	0.047% + 13 μ V
	>20 Hz to 40 Hz	0.019% + 7.8 μ V
	>40 Hz to 20 kHz	86 ppm + 7.8 μ V
	>20 kHz to 50 kHz	0.028% + 7.8 μ V
	> 50 kHz to 100 kHz	0.070 % + 24 μ V
	>100 kHz to 300 kHz	0.086 % + 24 μ V
	>300 kHz to 500 kHz	0.14 % + 31 μ V
	>500 kHz to 1 MHz	0.28 % + 78 μ V
	10 Hz to 20 Hz	0.047 % + 78 μ V
	>20 Hz to 40 Hz	0.014 % + 24 μ V
	>40 Hz to 50 Hz	66 ppm + 6.2 μ V
	>50 Hz to 60 Hz	66 ppm + 5.7 μ V
	>60 Hz to 10 kHz	66 ppm + 5.6 μ V
	>10 kHz to 20 kHz	66 ppm + 5.7 μ V
	> 20 kHz to 50 kHz	0.011 % + 16 μ V
	>50 kHz to 100 kHz	0.022 % + 62 μ V
	>100 kHz to 300 kHz	0.038 % + 0.12 mV
	>300 kHz to 500 kHz	0.093 % + 0.31 mV
	>500 kHz to 1 MHz	0.19 % + 0.78 mV
	10 Hz	0.047 % + 0.79 mV
	>10 Hz to 20 Hz	0.047 % + 0.78 mV
	>20 Hz to 30 Hz	140 ppm + 0.24 mV
	>30 Hz to 40 Hz	140 ppm + 0.24 mV
	>40 Hz to 50 Hz	66 ppm + 59 μ V
	>50 Hz to 60 Hz	66 ppm + 57 μ V
	>60 Hz to 400 Hz	66 ppm + 58 μ V
	>400 Hz to 1 kHz	66 ppm + 56 μ V
	>1 kHz to 5 kHz	66 ppm + 57 μ V
	>5 kHz to 10 kHz	66 ppm + 55 μ V
	>10 kHz to 20 kHz	66 ppm + 57 μ V
	> 20 kHz to 30 kHz	0.011 % + 0.16 mV
	> 30 kHz to 100 kHz	0.022 % + 0.31 mV
	>100 kHz to 300 kHz	0.047 % + 1.4 mV
	>300 kHz to 500 kHz	0.11 % + 3.9 mV
	>500 kHz to 1 MHz	0.24 % + 7.0 mV

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MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD/ FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
4. AC Voltage (Measure) (Lab) 22 V to <220 V	10 Hz to 20 Hz >20 Hz to 40 Hz >40 Hz to 50 Hz >50 Hz to 60 Hz >60 Hz to 400 Hz >400 Hz to 1 kHz >1 kHz to 5 kHz >5 kHz to 10 kHz >10 kHz to 20 kHz >20 kHz to 50 kHz >50 kHz to 100 kHz	0.047 % + 7.8 mV 0.014 % + 2.4 mV 70 ppm + 1.2 mV 70 ppm + 0.81 mV 70 ppm + 0.78 mV 70 ppm + 0.79 mV 70 ppm + 0.81 mV 70 ppm + 0.79 mV 70 ppm + 0.80 mV 0.020 % + 3.1 mV 0.047 % + 7.8 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	0.015 % + 1.6 mV 0.016 % + 4.7 mV 0.020 % + 4.7 mV 0.024 % + 4.7 mV 0.16 % + 39 mV
330 V to 1000 V	45 Hz to 1 kHz >1 kHz to 5 kHz >5 kHz to 10 kHz	0.024 % + 7.8 mV 0.020 % + 8.4 mV 0.024 % + 8.0 mV
(On-site)	Direct measurement with a AC Voltage source In-house Procedure MDCPE-01 : 2020 In-house Procedure MDCPE-02 : 2020	
1.0 mV to <33 mV	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 100 kHz to 500 kHz	0.062 % + 4.7 μ V 0.012 % + 4.7 μ V 0.016 % + 4.7 μ V 0.078 % + 4.8 μ V 0.28 % + 9.7 μ V 0.62 % + 39 μ V
33 mV to <330 mV	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 100 kHz to 500 kHz	0.024 % + 6.3 μ V 0.012 % + 6.3 μ V 0.013 % + 6.3 μ V 0.028 % + 6.3 μ V 0.062 % + 25 μ V 0.16 % + 55 μ V

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MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD/ FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
4. AC Voltage (Measure) (On-Site) 0.33 V to < 3.3 V	10 Hz to 45 Hz	0.024 % + 43 μ V
	45 Hz to 10 kHz	0.012 % + 49 μ V
	10 kHz to 20 kHz	0.015 % + 50 μ V
	20 kHz to 50 kHz	0.024 % + 40 μ V
3.3 V to <33 V	50 kHz to 100 kHz	0.055 % + 99 μ V
	100 kHz to 500 kHz	0.19 % + 0.47 mV
	10 Hz to 45 Hz	0.024 % + 0.51 mV
	45 Hz to 10 kHz	0.012 % + 0.47 mV
33 V to <330 V	10 kHz to 20 kHz	0.019 % + 0.47 mV
	20 kHz to 50 kHz	0.028 % + 0.47 mV
	50 kHz to 100 kHz	0.072 % + 1.5 mV
	10 Hz to 45 Hz	0.015 % + 1.6 mV
330 V to 1020 V	45 Hz to 10 kHz	0.016 % + 4.7 mV
	10 kHz to 20 kHz	0.020 % + 4.7 mV
	20 kHz to 50 kHz	0.024 % + 4.7 mV
	50 kHz to 100 kHz	0.16 % + 39 mV
5. AC Current (Measure) (Lab)	45 Hz to 1 kHz	0.024 % + 7.9 mV
	1 kHz to 5 kHz	0.020 % + 7.9 mV
	5 kHz to 10 kHz	0.024 % + 8.0 mV
	Direct measurement with a AC Current Source	
30 μ A to 220 μ A	10 Hz to 20 Hz	0.062 % + 30 nA
	>20 Hz to 40 Hz	0.033 % + 21 nA
	>40 Hz to 1 kHz	0.013 % + 19 nA
	>1 kHz to 5 kHz	0.055 % + 40 nA
>220 μ A to 2.2 mA	>5 kHz to 10 kHz	0.14 % + 78 nA
	10 Hz to 20 Hz	0.062 % + 40 nA
	>20 Hz to 30 Hz	0.033 % + 32 nA
	>30 Hz to 40 Hz	0.033 % + 32 nA
>40 Hz to 1 kHz	0.013 % + 33 nA	
>1 kHz to 5 kHz	0.055 % + 0.39 μ A	
>5 kHz to 10 kHz	0.14 % + 0.78 μ A	

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5. AC Current (Measure) (Lab) >2.2 mA to 22 mA	10 Hz	0.062 % + 0.41 μ A
	>10 Hz to 20 Hz	0.062 % + 0.51 μ A
	>20 Hz to 40 Hz	0.033 % + 0.32 μ A
	>40 Hz to 1 kHz	0.013 % + 0.32 μ A
	>1 kHz to 5 kHz	0.055 % + 3.9 μ A
	>5 kHz to 10 kHz	0.14 % + 7.8 μ A
>22 mA to 220 mA	10 Hz to 20 Hz	0.062 % + 3.9 μ A
	>20 Hz to 40 Hz	0.033 % + 3.1 μ A
	>40 Hz to 1 kHz	0.014 % + 3.1 μ A
	>1 kHz to 5 kHz	0.055 % + 39 μ A
	>5 kHz to 10 kHz	0.14 % + 78 μ A
	33 mA to 330 mA	10 Hz to 20 Hz
>20 Hz to 45 Hz		0.070 % + 16 μ A
>45 Hz to 1 kHz		0.031 % + 16 μ A
>1 kHz to 5 kHz		0.078 % + 39 μ A
>5 kHz to 10 kHz		0.16 % + 78 μ A
>10 kHz to 30 kHz		0.32 % + 0.16 mA
0.33 A to 3 A	10 Hz to 45 Hz	0.14 % + 0.13 mA
	>45 Hz to 1 kHz	0.047 % + 0.085 mA
	>1 kHz to 5 kHz	0.47 % + 0.78 mA
	>5 kHz to 10 kHz	2.0 % + 3.9 mA
3 A to 11 A	45 Hz to 100 Hz	0.047 % + 1.6 mA
	>0.1 kHz to 1 kHz	0.078 % + 1.6 mA
	>1 kHz to 5 kHz	2.4 % + 1.6 mA
11 A to 20.5 A	45 Hz to 100 Hz	0.14 % + 5.8 mA
	>0.1 kHz to 1 kHz	0.18 % + 5.8 mA
	>1 kHz to 5 kHz	3.5 % + 5.8 mA

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MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD/ FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
5. AC Current (Measure) (On-site)	Direct measurement with a AC Current source In-house Procedure MDCPE-01 : 2020 In-house Procedure MDCPE-03 : 2020	
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 % + 0.080 μ A 0.12 % + 0.079 μ A 0.097 % + 0.079 μ A 0.24 % + 0.12 μ A 0.62 % + 0.16 μ A 1.3 % + 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	0.16 % + 0.12 μ A 0.097 % + 0.12 μ A 0.078 % + 0.12 μ A 0.16 % + 0.16 μ A 0.39 % + 0.24 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	0.14 % + 1.6 μ A 0.070 % + 1.6 μ A 0.031 % + 1.6 μ A 0.062 % + 1.6 μ A 0.16 % + 2.4 μ A 0.31 % + 3.1 μ A
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 % + 16 μ A 0.070 % + 16 μ A 0.031 % + 16 μ A 0.078 % + 39 μ A 0.16 % + 78 μ A 0.31 % + 0.16 mA
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	0.14 % + 0.23 mA 0.047% + 0.11 mA 0.47 % + 0.78 mA 2.0 % + 3.9 mA
3 A to <11 A	45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 5 kHz	0.047 % + 0.17 mA 0.078 % + 1.7 mA 2.4 % + 1.7 mA

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MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD/ FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
5. AC Current (Measure) (On-site) 11 A to 20.5 A	45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 5 kHz	0.093 % + 3.9 mA 0.12 % + 3.9 mA 2.4 % + 3.9 mA
6. Capacitance (Measure) (Lab)	Direct measurement with a calibrator	
0.19 nF to 1.1 nF	10 Hz to 10 kHz	0.39 % + 7.8 pF
1.1 nF to 3.3 nF	10 Hz to 3 kHz	0.39 % + 7.8 pF
3.3 nF to 11 nF	10 Hz to 1 kHz	0.20 % + 9.7 pF
11 nF to 110 nF	10 Hz to 1 kHz	0.20 % + 0.10 nF
110 nF to 330 nF	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 % + 9.7 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 % + 97 nF
110 µF to 330 µF	50 Hz	0.35 % + 0.63 µF
0.33 mF to 1.1 mF	20 Hz	0.35 % + 1.1 µF
1.1 mF to 3.3 mF	6 Hz	0.35 % + 6.3 µF
3.3 mF to 11 mF	2 Hz	0.35 % + 9.7 µF
11 mF to 33 mF	0.6 Hz	0.59 % + 24 µF
33 mF to 110 mF	0.2 Hz	0.85 % + 78 µF

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6. Capacitance (Measure) (On-Site)	Direct measurement with a Capacitance source In-house Procedure MDCPE-01 : 2020 In-house Procedure MDCPE-03 : 2020	
0.4 nF to <1.0999 nF	10 Hz to 10 kHz	0.39 % + 7.8 pF
1.1 nF to 3.2999 nF	10 Hz to 3 kHz	0.39 % + 7.8 pF
3.3 nF to 10.9999 nF	10 Hz to 1 kHz	0.20 % + 9.7 pF
11 nF to 32.9999 nF	10 Hz to 1 kHz	0.20 % + 0.097nF
33 nF to 109.999 nF	10 Hz to 1 kHz	0.20 % + 0.097nF
110 nF to 329.999 nF	10 Hz to 1 kHz	0.20 % + 0.63 nF
0.33 µF to 1.09999 µF	10 Hz to 600 Hz	0.20 % + 0.97 nF
1.1 µF to 3.29999 µF	10 Hz to 300 Hz	0.20 % + 6.3 nF
3.3 µF to 10.9999 µF	10 Hz to 150 Hz	0.20 % + 9.7 nF
11 µF to 32.9999 µF	10 Hz to 120 Hz	0.31 % + 24 nF
33 µF to 109.999 µF	10 Hz to 80 Hz	0.35 % + 97 nF
110 µF to 329.999 µF	0 to 50 Hz	0.35 % + 0.63 µF
0.33 mF to 1.09999mF	0 to 20 Hz	0.35 % + 1.1 µF
1.1 mF to 3.2999 mF	0 to 6 Hz	0.35 % + 6.3 µF
3.3 mF to 10.9999 mF	0 to 2 Hz	0.35 % + 9.7 µF
11 mF to 32.9999 mF	0 to 0.6 Hz	0.59 % + 24 µF
33 mF to 110 mF	0 to 0.2 Hz	0.86 % + 78 µF
7. Frequency (Measure) (Lab)	Direct measurement with a calibrator	
0.01 Hz to 99.99 Hz		1.6 ppm + 8.6 µHz
100 Hz to 119.9 Hz		1.6 ppm + 71 µHz
120 Hz to 1199.9 Hz		1.6 ppm + 0.49 mHz
1.2 kHz to 11.99 kHz		1.6 ppm + 4.9 mHz
12 kHz to 119.99 kHz		1.6 ppm + 40 mHz
120 kHz to 1199.99 kHz		1.6 ppm + 0.49 Hz
1.2 MHz to 2.0 MHz		1.6 ppm + 0.80 Hz

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<p>8. DC Power (Measure) (Lab)</p> <p>0 to 90 W >90 W to 150 W >150 W to 600 W >600 W to 6 kW >6 kW to 12 kW</p> <p>(On-site)</p> <p>0 to 90 W >90 W to 150 W >150 W to 600 W >600 W to 6 kW >6 kW to 12 kW</p>	<p>Direct measurement with a calibrator</p> <p>Direct measurement with a Multiproduct Calibrator In-house Procedure MDCPE-16 : 2020</p>	<p>0.018 % + 13 mW 0.019 % + 0.12 W 0.018 % + 58 mW 0.055 % + 0.58 W 0.070 % + 0.58 W</p> <p>0.018 % + 13 mW 0.019 % + 0.12 W 0.018 % + 58 mW 0.055 % + 0.58 W 0.070 % + 0.58 W</p>
<p>9. AC Power (Measure) (Lab)</p> <p>0.1 mW to 33 W >33 W to 90 W >90 W to 150 W >150 W to 900 W >900 W to 9 kW >9 kW to 12 kW</p> <p>(On-site)</p> <p>0 W to 33 W >33 W to 90 W >90 W to 150 W >150 W to 900 W >0.9 kW to 9 kW >9 kW to 12 kW</p>	<p>Direct measurement with a calibrator</p> <p>45 Hz to 65 Hz 45 Hz to 65 Hz 45 Hz to 65 Hz 45 Hz to 65 Hz 45 Hz to 65 Hz 45 Hz to 65 Hz</p> <p>Direct measurement with a Multiproduct Calibrator In-house Procedure MDCPE-16 : 2020</p>	<p>0.062 % + 0.76 mW 0.086 % + 0.22 mW 0.070 % + 7.6 mW 0.070 % + 12 mW 0.078 % + 58 mW 0.078 % + 0.58 W</p> <p>0.062 % + 0.76 mW 0.086 % + 0.22 mW 0.070 % + 7.6 mW 0.070 % + 12 mW 0.078 % + 58 mW 0.078 % + 0.58 W</p>
<p>10. DC Voltage (Source) (Lab)</p> <p>0 to <220 mV 220 mV to <2.2 V 2.2 V to <22 V 22 V to <220 V 220 V to 1000 V</p>	<p>Direct measurement with a precision multimeter</p>	<p>5.1 ppm + 0.094 μV 3.5 ppm + 0.70 μV 3.5 ppm + 4.0 μV 5.5 ppm + 40 μV 5.5 ppm + 0.75 mV</p>

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(On-site) 0 to 30 mV >30mV to 300 mV >300mV to 3V >3V to 30V >30V to 300V >300 V to 1000 V	Direct measurement with a precision multimeter	52 ppm + 4.3 μ V 41 ppm + 45 μ V 29 ppm + 7.0 μ V 47 ppm + 0.22 mV 64 ppm + 0.70 mV 0.12 % + 0.24 V
11. DC Current (Source) (Lab) 0 to <200 μ A 220 μ A to <2 mA 2 mA to <20mA 20 mA to <200 mA 200 mA to <2 A 2 A to 20 A	Direct measurement with a precision multimeter	13 ppm + 0.31 nA 13 ppm + 3.1 nA 14 ppm + 31 nA 47 ppm + 0.62 μ A 0.018 % + 13 μ A 0.039 % + 0.32 mA
(On-site) 0 to 300 μ A >0.30 mA to 3.0 mA >3.0 mA to 30 mA >30 mA to 300 mA >300 mA to 1A >1 A to 10 A	Direct measurement with a precision multimeter	0.047 % + 0.012 μ A 0.047 % + 0.12 μ A 0.047 % + 1.2 μ A 0.093 % + 24 μ A 0.093 % + 0.70 mA 0.058 % + 0.58 mA
12. Resistance (Source) (Lab) Normal 0 Ω 19 Ω 190 Ω 1.9 k Ω 19 k Ω 190 k Ω 1.9 M Ω 19 M Ω	Direct measurement with a precision multimeter To reinstate to full range after DMM is returned from NIMT.	17 ppm + 3.9 μ Ω 9.3 ppm + 31 μ Ω 7.8 ppm + 50 μ Ω 7.8 ppm + 0.49 m Ω 7.8 ppm + 4.8 m Ω 7.8 ppm + 46 m Ω 9.3 ppm + 0.94 Ω 20 ppm + 93 Ω

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<p>High Voltage 2 MΩ to <20 MΩ 20 MΩ to <200 MΩ 200 MΩ to <2 GΩ 2 GΩ to 20 GΩ</p> <p>(On-site) 0 Ω >0 Ω to 30 Ω >30 Ω to 300Ω >300 Ω to 3kΩ >3 kΩ to 30 kΩ >30 kΩ to 300 kΩ >300 kΩ to 3 MΩ >3 MΩ to 30 MΩ >30 MΩ to 300 MΩ >300 MΩ to 1GΩ</p>	<p>Direct measurement with a precision multimeter</p>	<p>16 ppm + 9.3 Ω 62 ppm + 0.93 kΩ 0.018 % + 0.093 MΩ 0.15 % + 9.3 MΩ</p>
<p>13. AC Voltage (Source) (Lab) <200 mV</p>	<p>Direct measurement with a precision multimeter</p> <p>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</p>	<p>3.9 mΩ 87 ppm + 3.7 mΩ 64 ppm + 4.0 mΩ 58 ppm + 7.0 mΩ 58 ppm + 70 mΩ 58 ppm + 0.82 Ω 76 ppm + 14 Ω 0.047 % + 0.93 Ω 1.85 % + 0.81 MΩ 18.5 % + 1.4 MΩ</p>
<p>200 mV to <2 V</p>	<p>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</p>	<p>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</p> <p>0.0014 % + 0.11 mV 0.011 % + 19 μV 85 ppm + 30 μV 70 ppm + 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</p>

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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 ppm + 0.26 mV 70 ppm + 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 ppm + 1.9 mV 70 ppm + 1.9 mV 0.011 % + 1.9 mV 0.021 % + 3.9 mV 0.051 % + 19 mV
200 V to <1000 V	40 Hz to 10 kHz	0.011 % + 20 mV
13. AC Voltage (Source) (On-site)	Direct measurement with a precision multimeter	
1.0 mV to <30 mV	20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 400 Hz 400 Hz to 20 kHz 20 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz 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	20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 400 Hz 400 Hz to 20 kHz 20 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz 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

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0.3 V to < 3.0 V	20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 400 Hz 400 Hz to 20 kHz 20 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz	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	20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 400 Hz 400 Hz to 20 kHz 20 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz	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	20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 400 Hz 400 Hz to 20 kHz 20 kHz 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
300 V to 1000 V	45 Hz to 1 kHz 1kHz to 10 kHz	0.47 % + 4.7 V 0.47 % + 4.7 V

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14. AC Current (Source) (Lab)	Direct measurement with a precision multimeter	
<200 μ A	10 Hz to 10 kHz	0.049 % + 0.019 μ A
<2 mA	10 Hz >10 Hz to 10 kHz	0.031 % + 0.19 μ A 0.029 % + 0.19 μ A
<20 mA	10Hz >10 Hz to 10 kHz	0.031 % + 1.9 μ A 0.029 % + 1.9 μ A
<200 mA	10 Hz >10 Hz to 10 kHz	0.031 % + 19 μ A 0.028 % + 19 μ A
<2 A	10 Hz to 2 kHz >2 kHz to 10 kHz	0.057 % + 0.19 mA 0.067 % + 0.19 mA
<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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15. High Voltage		
15.1 AC High Voltage (Source) 0 kV to 10 kV (Lab/Site)	Direct measurement with a AC DIGITAL HIGH VOLTMETER In-house Procedure MDCPE-18 : 2020 50Hz to 60Hz	1.2 % + 6.0 V
15.2. DC High Voltage (Source) 0 kV to 5 kV (Lab/Site)	Direct measurement with a DC DIGITAL HIGH VOLTMETER In-house Procedure MDCPE-18 : 2020	0.58 % + 3.5 V
16. Timer/Sweep time/Stopwatch (Lab) 1 to 60 Sec >1 min to 2 min >2 min to 3 min >3 min to 4 min >4 min to 5 min >5 min to 10 min >10 min to 30 min >30 min to 60 min >60 min to 90 min >90 min to 120 min	In-house procedure MDCPE-13 : 2020	4.2 ppm + 6.6 msec 4.2 ppm + 6.8 msec 4.4 ppm + 8.6 msec 4.3 ppm + 8.1 msec 4.3 ppm + 7.6 msec 4.3 ppm + 9.0 msec 4.2 ppm + 8.2 msec 4.2 ppm + 8.2 msec 4.2 ppm + 8.5 msec 4.2 ppm + 9.8 msec
(On-site) 1 to 60 Sec >1 min to 2 min >2 min to 3 min >3 min to 4 min >4 min to 5 min >5 min to 10 min >10 min to 30 min >30 min to 60 min >60 min to 90 min >90 min to 120 min	Direct measurement with a Frequency counter/Stop watch In-house Procedure MDCPE-13 : 2020	4.2 ppm + 6.6 mSec 4.2 ppm + 6.8 mSec 4.2 ppm + 8.6 mSec 4.2 ppm + 8.1 mSec 4.2 ppm + 7.6 mSec 4.2 ppm + 9.0 mSec 4.2 ppm + 8.2 mSec 4.2 ppm + 8.2 mSec 4.2 ppm + 8.5 mSec 4.2 ppm + 9.8 mSec

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17. Clamp Meter (Measure) (Lab)	Direct measurement with a calibrator	
20 A – 55 A	DC	0.29 % + 61 mA
55 A – 150 A	DC	0.30 % + 0.58 A
150 A – 1025 A	DC	0.30 % + 0.59 A
20 A – 150 A	45 Hz – 65 Hz	0.34 % + 0.065 A
20 A – 55 A	65 Hz – 440 Hz	0.95 % + 0.066 A
55 A – 150 A	65 Hz – 440 Hz	0.95 % + 0.58 A
150 A – 1025 A	45 Hz – 65 Hz	0.34 % + 0.59 A
150 A – 550 A	65 Hz – 440 Hz	1.2 % + 0.59 A
(On-site)		
DC (Measure)	Direct measurement with a Multiproduct Calibrator	0.29 % + 61 mA
20 A to 55 A	In-house Procedure MDCPE-07 : 2020	0.29 % + 0.58 A
55 A to 150 A		0.30 % + 0.58 A
150 A to 1025 A		
AC (Measure)	Direct measurement with a Multiproduct Calibrator	
	In-house Procedure MDCPE-07 : 2020	
20 A to 150 A	45 Hz to 65 Hz	0.34 % + 0.065 A
20 A to 55 A	65 Hz to 440 Hz	0.95 % + 0.066 A
55 A to 150 A	65 Hz to 440Hz	0.95 % + 0.58 A
150 A to 1025 A	45 Hz to 65 Hz	0.34 % + 0.59 A
150 A to 550 A	65 Hz to 440 Hz	1.2 % + 0.59 A

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19. Capacitance and Resistance (Measure)	In-house Procedure MDCPE-06 : 2020	
1 pF	1 kHz to 10 kHz	0.12 % + 0.00014 pF
1 pF	10.01 kHz to 100 kHz	0.58 % + 0.00014 pF
10 pF	100 Hz to 999.9 Hz	0.12 % + 0.00021 pF
10 pF	1 kHz to 10 kHz	0.12 % + 0.00014 pF
10 pF	10.01 kHz to 100 kHz	0.47 % + 0.0013 pF
100 pF	100 Hz to 999.9 Hz	0.12 % + 0.014 pF
100 pF	1 kHz to 10 kHz	0.12 % + 0.013 pF
100 pF	10.01 kHz to 100 kHz	0.35 % + 0.013 pF
1000 pF	100 Hz to 999.9 Hz	0.12 % + 0.013 pF
1000 pF	1 kHz to 10 kHz	0.12 % + 0.015 pF
1000 pF	10.01 kHz to 100 kHz	0.35 % + 0.014 pF
10 nF	100 Hz to 10 kHz	0.12 % + 0.0013 nF
10 nF	10.01 kHz to 100 kHz	0.35 % + 0.0014 nF
100 nF	100 Hz to 10 kHz	0.12 % + 0.013 nF
1 uF	100 Hz to 10 kHz	0.12 % + 0.14 nF
10 Ω	100 Hz to 999.9 Hz	0.18 % + 0.0013 Ω
10 Ω	1 kHz	0.12 % + 0.0013 Ω
10 Ω	>1 kHz to 100 kHz	0.70 % + 0.0013 Ω
100 Ω	100 Hz to 999.9 Hz	0.081 % + 0.0013 Ω
100 Ω	1 kHz	0.047 % + 0.0013 Ω
100 Ω	>1 kHz to 100 kHz	0.29 % + 0.0013 Ω
1 kΩ	100 Hz to 999.9 Hz	0.070 % + 0.13 Ω
1 kΩ	1 kHz	0.035 % + 0.13 Ω
1 kΩ	>1 kHz to 100 kHz	0.43 % + 0.016 Ω
10 kΩ	100 Hz to 999.9 Hz	0.070 % + 0.14 Ω
10 kΩ	1 kHz	0.035 % + 0.13 Ω
100 kΩ	1 kHz	0.070 % + 1.4 Ω

* 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 Jantaraporn Suwanchai	- Item A (9 -16, 24, 25 and 30)
Mr Weerasak Jokthong	- Item A, Item B(except B12), Item C and Item D
Ms Peh Woon Teng	- Item A (1-16, 19-21, 24-27, 29-46, 48-51, 53) and Item C
Mr Apichai Thepmaneerat	- Item A (4, 12-16, 18, 24-25, 28, 34, 46-48, 50, 54, 57-61, 62)
Ms Inthira Wanwong	- Item A (1-3, 4-6, 7-11, 19-20, 22, 24, 26, 27, 40, 41, 42, 45 and 56)
Ms Chonticha Kittiwettayanusorn	- Item A (12-14, 15, 16, 24)

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 test 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.