

Schedule

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Certificate No. : LA-1999-0160-C
Issue No. : 27
Date : 09 May 2024
Expiry of certificate : 04 January 2026
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FIELD OF TESTING : Calibration and Measurement

MEASURED QUANTITIES / INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD / FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
A. Dimensional		
A1. External Micrometer (Lab / Site) (0 – 200) mm (> 200 – 500) mm (> 500 – 1000) mm	In-house Procedure MDCP-01 V3.02:2022 BS 870:2008 JIS B 7502:2016 ISO 3611:2010	0.3 µm 2 µm 4 µm
A2. Caliper (Lab / Site) (0 – 1000) mm (1000 – 2000) mm	In-house Procedure MDCP-02 V3.03:2022 BS 887:2008 JIS B 7507:2016 ISO 13385-1:2019	7 µm 26 µm
A3. Depth Micrometer (0 – 300) mm	In-house Procedure MDCP-03 V3.01:2022 BS 6468:2008 JIS B 7544:1994	1 µm
A4. Internal & Stick Micrometer (0 – 200) mm (> 200 – 500) mm (> 500 – 1000) mm	In-house Procedure MDCP-04 V3.01:2022 BS 959:2008	2 µm 3 µm 4 µm
A5. Height Setting Micrometer & Riser Block Length (0 – 600) mm Parallelism Flatness	In-house Procedure MDCP-05 V3.01:2022 ISO 7863:1984	0.5 µm 1.0 µm 0.2 µm

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A6. Caliper Checker (0 – 600) mm	In-house Procedure MDCP-06 V3.01: 2022	0.9 µm
A7. Vernier Height Gauge (Lab / Site) (0 – 600) mm	In-house Procedure MDCP-07 V3.02:2022 BS 1643 : 2008 JIS B 7517:2018 ISO 13225 : 2012	10 µm
A8. Vernier Depth Gauge (0 – 600) mm	In-house Procedure MDCP -08 V3.01: 2022 BS 6365 : 2020 ISO 13385-2 : 2020	10 µm
A9. Dial Indicator (0 – 30) mm (30 – 100) mm	In-house Procedure MDCP -09 V3.01: 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
A10. Dial Test Indicator (0 – 3) mm	In-house Procedure MDCP -10 V3.02 :2023 BS 2795 : 1981 JIS B 7533:2015 ISO 9493 : 2010	0.5 µm
A11. Digimatic Indicator (Lab / Site) (0 – 20) mm (20 – 100) mm	In-house Procedure MDCP -11 V3.02:2022	0.6 µm 1.6 µm
A12. Plain Plug Gauge / Pin Gauge Three Wire (Up to 10) mm (10 – 100) mm (100 – 200) mm	In-house Procedure MDCP -12 V3.01: 2022 BS 969 : 2008	0.5 µm 0.5 µm 1.0 µm
A13. Plain Ring Gauge (1 – 100) mm (100 – 200) mm	In-house Procedure MDCP -13 V3.02:2022 BS 969 : 2008	0.7 µm 0.9 µm

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A14. Thread Ring Gauge > M2.5 – M50	In-house Procedure MDCP-14 V3.02: 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 : 2020 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	Pitch Dia : 0.7 µm Minor Dia : 0.6 µm
A15. Thread Plug Gauge > M1 – M50	In-house Procedure MDCP-15 V3.01: 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 : 2020 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	Pitch Dia : 0.7 µm Major Dia : 0.5 µm Pitch : 5 µm Angle : 10 mins

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A16. Feeler Gauge/ Calibration Foil / SHIM Up to 5 mm	In-house Procedure MDCP-16 V3.01: 2022 BS 957 : 2008 JIS B 7524 : 2008	0.4 µm
A17. Surface Plate (Lab / Site) (Up to 2500 x 2000) mm	In-house Procedure MDCP-17 V3.02: 2022 BS 817 : 2008	2 µm
A18. Profile Projector (Lab / Site) 50 mm (50 – 300) mm Magnification (10X to 100X) Protractor Accuracy Perpendicularity	In-house Procedure MDCP-18 V3.02: 2022 JIS B 7184 : 2021	3 µm 4 µm 0.04 %magnification 2 min 0.002 mm
A19. Dial Thickness Gauge	In-house Procedure MDCP-24 V3.01: 2022	1 µm
A20. Bore Gauge	In-house Procedure MDCP-25 V3.01: 2022 JIS B 7515 : 1982	2 µm
A21. Setting Master	In-house Procedure MDCP-26 V3.01: 2022	2 µm
A22. Straight Edge (Up to 1000) mm	In-house Procedure MDCP-27 V3.02: 2022 BS 5204-1 : 1975 BS 5204-2 : 1977 DIN 874 – 1 & 2 : 2003 JIS B 7514 : 1977	3.1 µm
A23. Linear Height Gauge (Lab/Site)	In-house Procedure MDCP-29 V3.02: 2022	2 µm
A24. Holtest Measuring Face: (0 – 50) mm (50 – 100) mm (100 – 150) mm Lead Screw	In-house Procedure MDCP-23 V3.02: 2023 DIN 863 : Part 4 : 1999 DIN 2250 : Part 1 : 2008	1.9 µm 3.5 µm 5.1 µm 0.9 µm
A25. Universal Length Measuring Machine (Lab / Site)	In-house Procedure MDCP-36 V3.03: 2022	0.3 µm

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A26. Setting Rod (25 – 100) mm (100 – 400) mm (400 – 600) mm (600 – 1000) mm	In-house Procedure MDCP-34 V3.01: 2022 BS 870 : 2008 JIS B 7502 : 2016 ISO 3611 : 2010	0.8 µm 0.9 µm 1.1 µm 1.2 µm
A27. Bevel Protractor (Up to 300) mm (0 - 360) °C	In-house Procedure MDCP-39 V3.01: 2022 BS 1685 : 2008	1.5 µm 5 min
A28. Measuring Microscope (Lab / Site)	In-house Procedure MDCP-22 V3.02: 2022 JIS B 7153 : 1995	2 µm
A29. Dial Gauge Calibrator (0 – 100) mm	In-house Procedure MDCP-40 V3.01: 2022	0.19 µm
A30. 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 V3.02: 2022 ISO 3650 : 1998 BS 4311-1 : 2007	0.05 µm 0.06 µm 0.08 µm 0.10 µm 0.12 µm
A31. Sine Bar (0 – 300) mm	In-house Procedure MDCP-21 V3.02: 2023 JIS B 7523 : 1977	1.5 µm
A32. Screw Thread Micrometer	In-house Procedure MDCP-28 V3.01: 2022 BS 870 : 2008 as a guide ISO 3611 : 2010	1.0 µm
A33. Precision Levels Up to 300 mm - Spirit Level - Inclinator Level Gauge	In-house Procedure MDCP-33V3.01: 2022 BS 958 : 1968 JIS B 7510 : 1993	0.3 Division 0.1 degree

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A34. Layout Measurement Linear Angle Surface (Range 5 μm)	In-house Procedure MDCP-37 V3.01: 2022	0.5 μm 10 mins
A35. Vee Block	In-house Procedure MDCP-41 V3.01: 2022 BS 3731 : 1987 JIS B 7540 : 1972	2 μm
A36. MU Checker	In-house Procedure MDCP-42 V3.01: 2022 JIS B 7536 : 1982	0.2 μm
A37. Precision Square (0 – 450) mm	In-house Procedure MDCP-43 V3.01: 2022 BS 939 : 2007 JIS B 7526 : 1995 JIS B 7539 : 1971	3 μm
A38. Calliper Gauge (Lab / Site)	In-house Procedure MDCP-44 V3.02: 2022	1 μm
A39. Dial Gauge Stand	In-house Procedure MDCP-45 V3.01: 2022	0.9 μm
A40. Calibration Tester	In-house Procedure MDCP-46 V3.01:2022	0.3 μm
A41. Internal Micrometer (2-leg type)	In-house Procedure MDCP-47 V3.01:2022	2 μm
A42. Steel Rule	In-house Procedure MDCP-49 V3.01: 2022 BS 4372 : 1968 JIS B 7516 : 2005	10 μm
A43. Centre Bench	In-house Procedure MDCP-50 V3.01: 2022	3 μm
A44. Coating Thickness Gauge Up to 1000 μm	In-house Procedure MDCP-54 V3.01: 2022	0.5 μm

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A45. Roughness Machine (Lab / Site) Ra	In-house Procedure MDCP-56 V3.02: 2022	0.021 μ m 0.06 μ m
A46. Roughness Specimen Ra	In-house Procedure MDCP-56 V3.02: 2022	0.021 μ m 0.06 μ m
A47. Roundness Machine (Lab / Site)	In-house Procedure MDCP-57 V3.02: 2022	0.06 μ m
A48. Parallel Bars	In-house Procedure MDCP-58 V3.01: 2022 BS 906-1 & 2 : 1972	2.0 μ m
A49. Co-ordinate Measuring Machine (Lab / Site) (0 – 500) mm (0 – 1000) mm (0 – 1500) mm	In-house Procedure MDCP-59 V3.02: 2022 ISO 10360 : Part 2 : 2009	3.3 μ m 6.2 μ m 8.2 μ m
A50. Micrometer Head	In-house Procedure MDCP-63 V3.01: 2022 BS 1734 : 1951 DIN 863 : Part 4 : 1999 JIS B 7502 : 2016	0.9 μ m
A51. Gauge Block Comparator (Lab / Site) (0.5 to 10) mm (>10 to 50) mm (>50 to 75) mm (>75 to 100) mm	In-house Procedure MDCP-65 V3.02: 2022 EAL-G21 : 1996 ECA 10-02 : 2011	0.05 μ m 0.14 μ m 0.15 μ m 0.25 μ m
A52. Contour Measuring Machine (Lab / Site)	In-house Procedure MDCP-67 V3.02: 2022	3 μ m
A53. Dial Depth Gauge (0 – 200) mm	In-house Procedure MDCP-53 V3.02:2023	3 μ m

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A54. Optical Flat and Parallel Diameter:(0 – 45) mm	In-house Procedure MDCP-66 V3.01: 2022 JIS B 7430 : 1977 JIS B 7431 : 1977	0.1 μ m
A55. Glass Scale (0 – 100) mm 150 mm	In-house Procedure MDCP-83 V3.01: 2022	1.6 μ m 1.9 μ m
A56. Measuring Tape / Textile Tape Up to 396 inch	In-house Procedure MDCP-55 V3.03: 2023 JIS B 7512 : 2018 JIS B 7522 : 2018	0.04 inch
A57. Taper Thread Plug Gauge	In-house Procedure MDCP-78 V3.01: 2022 ANSI/ASME B1.20.1 : 1983 ASME B1.20.5 : 1991 JIS B 0253 : 1985	0.6 μ m
A58. Taper Thread Ring Gauge	In-house Procedure MDCP-72 V3.01: 2022 ANSI/ASME B1.20.1 : 1983 ASME B1.20.5 : 1991 JIS B 0253 : 1985	1.5 μ m
A59. Taper Plug Gauge	In-house Procedure MDCP-73 V3.01: 2022 JIS B 3301 : 2008	0.7 μ m
A60. Taper Ring Gauge	In-house Procedure MDCP-74 V3.01: 2022 JIS B 3301 : 2008	1.1 μ m

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B. Mechanical		
B1. Weighing Scale (Lab / Site) (0-1200) g (1.2-6) kg (6-62) kg (62-150) kg (150-300) kg	In-house Procedure MDCP-20 V3.02: 2023	0.0001 % of full scale 0.001 % of full scale 0.001 % of full scale 0.004 % of full scale 0.004 % of full scale
B2. Hand Torque Tool (0.1 to 1000) Nm	In-house Procedure MDCP-31 V3.02: 2023 ISO 6789-1 : 2017 Clause 6 (Exclude Overloading Test and Endurance Test)	0.4 % of full scale
B3. Torque Meter/Gauge (0 – 15) Nm	In-house Procedure MDCP-30 V3.03: 2023	0.04 % of full scale
B4. Push/Pull Gauge (0-5 000) N	In-house Procedure MDCP-19 V3.02: 2022	0.03 % of full scale
B5. Hardness Tester Machine (Lab / Site) In-direct method only Rockwell A, B, C Vickers Brinell HRA (20-88) HRB (20-100) HRC (20-70)	In-house Procedure MDCP-48 V3.01: 2022 JIS B 7726 : 2017 ASTM E 18 – 20 JIS B 7725 : 2020 JIS B 7724 : 2017	0.7 HRA 0.6 HRB / HRC 1.8 Hv 1.8 Hb
B6. Durometer Force Verification only (0 to 100)°	In-house Procedure MDCP-51 V3.02: 2023 ASTM D 2240 –15 ISO 868 : 2003 JIS K 6251 : 2017 JIS K 6253-5 : 2016	0.3 Degree

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B7. Pressure / Vacuum Gauge (Lab / Site) (-1 – 140) Bar (0 – 2700) Bar	In-house Procedure MDCP-52 V3.03: 2023 In-house Procedure MDCP-52a V3.02:2022 (using deadweight tester) BS EN 837-1 to 3 : 1998	0.013 % of reading 0.018 % of reading
B8. Tensile Testing Machine (Lab / Site) Up to 250 kN	In-house Procedure MDCP-61 V3.02: 2023 ISO 7500-1 : 2018	0.01 % of full scale
B9. Load Cell (Lab / Site) Up to 250 kN	In-house Procedure MDCP-62V3.02: 2022	0.01 % of full scale
B10. Tension Gauge (0 – 150) kg	In-house Procedure MDCP-32 V3.01: 2022	0.01 %
B11. 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 V3.01: 2022	0.00008 g 0.00009 g 0.0002 g 0.001 g 0.002 g 0.2 g
B12. Tachometer (Lab / Site) RPM Meter (0 – 99999) rpm Non-Contact Type Contact Type	In-house Procedure MDCP-68 V3.01: 2022	1.7 rpm 0.6 rpm
B13. Flowmeter (Lab / Site) (10 - 100) ml/min (0.5 - 10) LPM	In-house Procedure MDCP-69 V3.02: 2023	4.5 ml/min 0.42 LPM

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C. Temperature		
C1. Thermocouple Indicator / Calibrator (measured/simulation)	In-house Procedure MDCPT-03 V3.01: 2022	
Type E (Lab) (-250 to 1000) °C		0.42 °C
Type E (Site) (-200 to 0) °C (>0 to 950) °C		1.1 °C 0.83 °C
Type J (Lab) (-210 to 1200) °C		0.28 °C
Type J (Site) (-200 to 0) °C (>0 to 1200) °C		1.2 °C 0.83 °C
Type K (Lab) (-200 to 1372) °C		0.34 °C
Type K (Site) (-200 to 0) °C (>0 to 1370) °C		1.4 °C 0.94 °C
Type N (Lab) (-200 to 1300) °C		0.40 °C
Type N (Site) (-200 to 0) °C (>0 to 1300) °C		1.8 °C 1.1 °C
Type R (Lab) (0 to 1767) °C		0.76 °C

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Type R (Site) (0 to 500) °C (>500 to 1750) °C	In-house Procedure MDCPT-04 V3.02: 2024	2.3 °C 1.9 °C
Type S (Lab) (0 to 1767) °C		0.71 °C
Type S (Site) (0 to 500) °C (>500 to 1750) °C		2.3 °C 2.0 °C
Type T (Lab) (-250 to 400) °C		0.51 °C
Type T (Site) (-200 to 0) °C (>0 to 400) °C		1.4 °C 0.94 °C
C2 RTD Indicator / Calibrator (measured / simulation) PT385 (100 Ω) (Lab) (-200 to 0) °C (>0 to 100) °C (>100 to 300) °C (>300 to 400) °C (>400 to 630) °C (>630 to 800) °C		0.070 °C 0.080 °C 0.091 °C 0.097 °C 0.11 °C 0.19 °C
PT385 (100 Ω) (Site) (-200 to 800) °C		0.48 °C
PT3926 (100 Ω) (Lab) (-200 to 0) °C (>0 to 100) °C (>100 to 300) °C (>300 to 400) °C (>400 to 630) °C		0.070 °C 0.080 °C 0.091 °C 0.097 °C 0.11 °C

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PT3916 (100 Ω) (Lab) (-200 to -190) °C (>-190 to -80) °C (>-80 to 0) °C (>0 to 260) °C (>260 to 300) °C (>300 to 400) °C (>400 to 600) °C (>600 to 630) °C		0.21 °C 0.066 °C 0.070 °C 0.080 °C 0.085 °C 0.091 °C 0.097 °C 0.19 °C
PT385 (200 Ω) (Lab) (-200 to 0) °C (>0 to 100) °C (>100 to 260) °C (>260 to 300) °C (>300 to 400) °C (>400 to 630) °C		0.066 °C 0.066 °C 0.070 °C 0.11 °C 0.12 °C 0.14 °C
PT385 (200 Ω) (Site) (-200 to 250) °C (>250 to 630) °C		0.31 °C 0.96 °C
PT385 (1000 Ω) (Lab) (-200 to 0) °C (>0 to 100) °C (>100 to 260) °C (>260 to 300) °C (>300 to 400) °C (>400 to 630) °C		0.063 °C 0.066 °C 0.070 °C 0.075 °C 0.080 °C 0.19 °C
PT385 (1000 Ω) (Site) (-200 to 630) °C		0.33 °C

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C3 Enclosures	In-house Procedures MDCPT-05 V3.01: 2022 MDCPT-05a V3.01: 2022	
a) Chamber / Oven / Freezers / System Accuracy Test Range: (-70 to 200) °C		2.7 °C
b) Furnace / System Accuracy Test Range: (200 to 800) °C		3.0 °C
C4 Thermometer with Sensor / Probe Range: (-35 to 90) °C (>90 to 150) °C (>150 to 500) °C	In-house Procedure MDCPT-02 V3.03 :2023 Oil Bath / Dry Block method	0.11 °C 0.80 °C 1.8 °C
C5 Thermohygrometer / Thermohygrograph Range: (18 to 70) °C (40 to 85) % relative humidity	In-house Procedure MDCPT-06 V3.01: 2022	1.0 °C 6.0 % relative humidity
C6 Dry Block Calibrator (Accuracy, Axial Homogeneity, Uniformity & Loading Effect) (-20 to 150) °C (>150 to 500) °C	In-house procedure MDCPT-08a V3.01: 2022	0.31 °C 0.86 °C
C7 Surface Probe Range: (30 to 300) °C	In-house Procedure MDCPT-07 V3.02: 2023	2.0 °C

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D. Electrical		
D1. DC Voltage (Measure) (0 to 330) mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1000) V	Direct measurement with a DC voltage source MDCPE-01 V3.01: 2022 MDCPE-01a V3.01: 2022 MDCPE-02 V3.02: 2024 MDCPE-07 V3.01: 2022 MDCPE-16 V3.01: 2022	16 $\mu\text{V/V} + 2 \mu\text{V}$ 9 $\mu\text{V/V} + 9 \mu\text{V}$ 10 $\mu\text{V/V} + 78 \mu\text{V}$ 14 $\mu\text{V/V} + 0.72 \text{ mV}$ 14 $\mu\text{V/V} + 1.4 \text{ mV}$
D2. DC Current (Measure) (0 to 330) μA (0.33 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (0.33 to 1.1) A (1.1 to 3) A (3 to 11) A (11 to 20) A	Direct measurement with a DC current source MDCPE-01 V3.01: 2022 MDCPE-01a V3.01: 2022 MDCPE-03 V3.01: 2022 MDCPE-16 V3.01: 2022	120 $\mu\text{A/A} + 0.02 \mu\text{A}$ 78 $\mu\text{A/A} + 0.05 \mu\text{A}$ 78 $\mu\text{A/A} + 0.30 \mu\text{A}$ 78 $\mu\text{A/A} + 3.0 \mu\text{A}$ 160 $\mu\text{A/A} + 0.04 \text{ mA}$ 300 $\mu\text{A/A} + 0.04 \text{ mA}$ 390 $\mu\text{A/A} + 0.40 \text{ mA}$ 780 $\mu\text{A/A} + 0.60 \text{ mA}$
D3. Resistance (Measure) (0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 300) Ω (0.33 to 1.1) k Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω (0.33 to 1.1) M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω (330 to 1100) M Ω	Direct measurement with a resistance source MDCPE-01 V3.01: 2022 MDCPE-01a V3.01: 2022 MDCPE-04 V3.01: 2022 MDCPE-07 V3.01: 2022	32 $\mu\Omega/\Omega + 7.8 \text{ m}\Omega$ 24 $\mu\Omega/\Omega + 12 \text{ m}\Omega$ 22 $\mu\Omega/\Omega + 12 \text{ m}\Omega$ 22 $\mu\Omega/\Omega + 16 \text{ m}\Omega$ 22 $\mu\Omega/\Omega + 16 \text{ m}\Omega$ 22 $\mu\Omega/\Omega + 0.16 \Omega$ 22 $\mu\Omega/\Omega + 80 \text{ m}\Omega$ 22 $\mu\Omega/\Omega + 0.78 \Omega$ 22 $\mu\Omega/\Omega + 0.80 \Omega$ 25 $\mu\Omega/\Omega + 8.0 \Omega$ 25 $\mu\Omega/\Omega + 8.0 \Omega$ 47 $\mu\Omega/\Omega + 0.12 \text{ k}\Omega$ 0.01 % + 0.30 k Ω 0.02 % + 2.3 k Ω 0.039 % + 12 k Ω 0.24 % + 0.22 M Ω 1.2 % + 0.44 M Ω

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D4. AC Voltage (Measure)	Direct measurement with a AC voltage source MDCPE-01 V3.01: 2022 MDCPE-01a V3.01: 2022 MDCPE-02 V3.02: 2024 MDCPE-07 V3.01: 2022 MDCPE-16 V3.01: 2022	
(1.0 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	630 μ V/V + 6 μ V 120 μ V/V + 5 μ V 160 μ V/V + 5 μ V 780 μ V/V + 5 μ V 0.28 % + 10 μ V 0.63 % + 40 μ V
(33 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	240 μ V/V + 9 μ V 120 μ V/V + 7 μ V 130 μ V/V + 7 μ V 280 μ V/V + 7 μ V 630 μ V/V + 25 μ V 0.16 % + 55 μ V
(0.33 to 3.3) 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 100 kHz to 500 kHz	240 μ V/V + 0.08 mV 120 μ V/V + 0.06 mV 150 μ V/V + 0.06 mV 240 μ V/V + 0.06 mV 550 μ V/V + 0.10 mV 0.19 % + 0.50 mV
(3.3 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 + 0.6 mV 190 μ V/V + 0.6 mV 280 μ V/V + 0.6 mV 700 μ V/V + 1.3 mV

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(33 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 + 3.1 mV 160 μ V/V + 5.8 mV 200 μ V/V + 6.0 mV 240 μ V/V + 6.7 mV 0.16 % + 39 mV
(330 to 1000) V	45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	240 μ V/V + 8.9 mV 200 μ V/V + 9.2 mV 240 μ V/V + 9.5 mV
D5. AC Current (Measure)	Direct measurement with a AC current source MDCPE-01 V3.01: 2022 MDCPE-01a V3.01: 2022 MDCPE-03 V3.01: 2022 MDCPE-16 V3.01: 2022	
(29.00 to 330) μ A	10 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 % + 0.1 μ A 0.10 % + 0.09 μ A 0.24 % + 0.14 μ A 0.63 % + 0.19 μ A 1.3 % + 0.32 μ A
(0.33 to 3.3) mA	10 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 % + 0.15 μ A 0.08 % + 0.20 μ A 0.16 % + 0.23 μ A 0.39 % + 0.28 μ A 0.78 % + 0.50 μ A
(3.3 to 33) mA	10 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 % + 2.5 μ A 0.04 % + 1.6 μ A 0.07 % + 1.7 μ A 0.16 % + 2.4 μ A 0.32 % + 3.2 μ A
(33 to 330) mA	10 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 % + 0.04 mA 0.04 % + 0.05 mA 0.08 % + 0.05 mA 0.16 % + 0.08 mA 0.32 % + 0.16 mA

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(0.33 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 % + 0.09 mA 0.05 % + 0.094 mA 0.47 % + 0.79 mA 2.0 % + 3.9 mA
(3 to 11) A	45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 5 kHz	0.05 % + 1.6 mA 0.08 % + 1.6 mA 2.4 % + 1.7 mA
(11 to 20) 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
D6. Capacitance (Measure)	Direct measurement with a calibrator MDCPE-01 V3.01: 2022 MDCPE-01a V3.01: 2022 MDCPE-07 V3.01: 2022	
(0.22 to 0.4) nF	10 Hz to 10 kHz	0.39 % + 0.0078 nF
(0.4 to 1.1) nF	10 Hz to 10 kHz	0.39 % + 0.0079 nF
(1.1 to 3.3) nF	10 Hz to 3 kHz	0.39 % + 0.0079 nF
(3.3 to 11) nF	10 Hz to 1 kHz	0.20 % + 0.011 nF
(11 to 33) nF	10 Hz to 1 kHz	0.20 % + 0.011 nF
(33 to 110) nF	10 Hz to 1 kHz	0.20 % + 0.011 nF
(110 to 330) nF	10 Hz to 1 kHz	0.21 % + 0.84 nF
(0.33 to 1.1) µF	10 Hz to 600 Hz	0.20 % + 1.1 nF
(1.1 to 3.3) µF	10 Hz to 300 Hz	0.20 % + 7.4 nF
(3.3 to 11) µF	10 Hz to 150 Hz	0.20 % + 13 nF
(11 to 33) µF	10 Hz to 120 Hz	0.32 % + 26 nF
(33 to 110) µF	10 Hz to 80 Hz	0.35 % + 0.11 µF
(110 to 330) µF	0 to 50 Hz	0.37 % + 0.84 µF
(0.33 to 1.1) mF	0 to 20 Hz	0.35 % + 1.1 µF
(1.1 to 3.3) mF	0 to 6 Hz	0.37 % + 8.4 µF
(3.3 to 11) mF	0 to 2 Hz	0.35 % + 11 µF
(11 to 33) mF	0 to 0.6 Hz	0.59 % + 24 µF
(33 to 50) mF	0 to 0.2 Hz	0.86 % + 78 µF

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<p>D7. Frequency (Measure)</p> <p>(0.01 to 99.99) Hz (100 to 119.99) Hz (120 to 1199.9) Hz (1.2 to 11.99) kHz (12 to 119.99) kHz (120 to 1199.99) kHz (1.2 to 2.0) MHz</p>	<p>Direct measurement with a calibrator</p> <p>MDCPE-01 V3.01: 2022 MDCPE-01a V3.01: 2022 MDCPE-07 V3.01: 2022</p>	<p>2.0 μHz/Hz + 8.6 μHz 2.0 μHz/Hz + 76 μHz 2.0 μHz/Hz + 0.76 mHz 2.0 μHz/Hz + 7.6 mHz 2.0 μHz/Hz + 76 mHz 2.0 μHz/Hz + 0.76 Hz 2.0 μHz/Hz + 0.99 Hz</p>
<p>D8. Stopwatch/ Timer (Lab/Site)</p> <p>1s to 1 minute (1 to 2) minute (2 to 3) minute (3 to 4) minute (4 to 5) minute (5 to 10) minute (10 to 30) minute (30 to 60) minute (60 to 90) minute (90 to 120) minute</p>	<p>In-house procedure MDCPE-13 V3.02: 2024</p> <p>Direct measurement with a Frequency counter/Stopwatch</p>	<p>7.7 ms 8.0 ms 9.0 ms 9.4 ms 9.9 ms 12 ms 27 ms 53 ms 79 ms 0.11 second</p>
<p>D9. Clamp Meter</p> <p>(10 to 16.5) A (16.5 to 55) A (55 to 150) A (150 to 550) A (550 to 1000) A</p> <p>(10 to 16.5) A (10 to 16.5) A (10 to 16.5) A</p> <p>(16.5 to 150) A (16.5 to 150) A (16.5 to 150) A</p>	<p>Direct measurement with a calibrator</p> <p>MDCPE-07 V3.01: 2022</p> <p>DC DC DC DC DC</p> <p>(45 to 65) Hz (65 to 100) Hz (100 to 440) Hz</p> <p>(45 to 65) Hz (65 to 100) Hz (100 to 440) Hz</p>	<p>0.01 % + 58 mA 0.02 % + 58 mA 0.03 % + 58 mA 0.04 % + 0.14 A 0.08 % + 0.14 A</p> <p>0.33 % + 58 mA 0.92 % + 58 mA 0.93 % + 58 mA</p> <p>0.34 % + 65 mA 0.92 % + 67 mA 0.95 % + 77 mA</p>

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(150 to 1000) A (150 to 1000) A (150 to 1000) A	(45 – 65) Hz (65 – 100) Hz (100 – 440) Hz	0.34 % + 0.19 A 0.92 % + 0.19 A 1.2 % + 0.26 A
D10. DC Current (Source)	Direct measurement with a precision multimeter MDCPE-08 V3.01: 2022 MDCPE-10 V3.01: 2022	
(Lab)		
(0 to 200) μ A		13 μ A/A + 0.32 nA
200 μ A to 2 mA		13 μ A/A + 3.2 nA
(2 to 20) mA		14 μ A/A + 32 nA
(20 to 200) mA		47 μ A/A + 0.63 μ A
200 mA to 2 A		0.018 % + 13 μ A
(2 to 20) A		0.039 % + 0.32 mA
(On-site)		
0 to 300 μ A		0.047 % + 0.012 μ A
(0.30 to 3.0) mA		0.047 % + 0.12 μ A
(3.0 to 30) mA		0.047 % + 1.2 μ A
(30 to 300) mA		0.093 % + 24 μ A
300 mA to 1A		0.093 % + 0.70 mA
(1 to 3) A		0.014 % + 0.70 mA
(3 to 10) A		1.8 % + 12 mA
D11. AC Current (Source)	Direct measurement with a precision multimeter MDCPE-08 V3.01: 2022 MDCPE-10 V3.01: 2022	
(Lab)		
(30 to 200) μ A	10 Hz to 10 kHz	0.049 % + 0.019 μ A
(0.2 to 2) mA	10 Hz to 10 kHz	0.029 % + 0.19 μ A
(2 to 20) mA	10 Hz to 10 kHz	0.029 % + 1.9 μ A
(20 to 200) mA	10 Hz to 10 kHz	0.028 % + 19 μ A
(0.2 to 2) A	10 Hz to 2 kHz 2 kHz to 10 kHz	0.057 % + 0.19 mA 0.067 % + 0.19 mA
(2 to 20) A	50 Hz to 2 kHz 2 kHz to 5 kHz	0.072 % + 1.9 mA 0.20 % + 1.9 mA

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(On-site) (0.3 to 30) mA	20 Hz to 45 Hz 46 Hz to 100 Hz 101 Hz to 20 kHz 21 kHz to 30 kHz	1.1 % + 0.033 mA 0.44 % + 0.033 mA 0.39 % + 0.033 mA 1.3 % + 0.033 mA
(30 to 300) mA	20 Hz to 45 Hz 46 Hz to 100 Hz 101 Hz to 20 kHz 21 kHz to 30 kHz	1.1 % + 0.33 mA 0.44 % + 0.33 mA 0.39 % + 0.33 mA 1.3 % + 0.33 mA
300 mA to 1A	20 Hz to 45 Hz 46 Hz to 100 Hz 101 Hz to 10 kHz	1.2 % + 3.3 mA 0.56 % + 3.3 mA 0.50 % + 3.3 mA
(1 to 3) A	45 Hz to 5 kHz	0.18 % + 2.2 mA
(3 to 10) A	45 Hz to 1 kHz	2.9 % + 12 mA
D12. Resistance (Source) (Lab)	Direct measurement with a precision multimeter MDCPE-08 V3.01: 2022 MDCPE-11 V3.01: 2022 MDCPE-19 V3.00: 2022 MDCPE-11a V3.00: 2023	
a) Normal measurement 1 mΩ 10 mΩ		0.5 μΩ 2.0 μΩ
(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 kΩ 2 kΩ to 20 kΩ 20 kΩ to 200 kΩ 200 kΩ to 2 MΩ 2 MΩ to 20 MΩ		18 μΩ/Ω + 3.9 μΩ 9.4 μΩ/Ω + 31 μΩ 7.8 μΩ/Ω + 50 μΩ 7.8 μΩ/Ω + 0.49 mΩ 7.8 μΩ/Ω + 4.9 mΩ 7.8 μΩ/Ω + 48 mΩ 9.4 μΩ/Ω + 0.94 Ω 20 μΩ/Ω + 94 Ω

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b) High Voltage 2 MΩ to 20 MΩ 20 MΩ to 200 MΩ 200 MΩ to 2 GΩ 2 GΩ to 20 GΩ		16 μΩ/Ω + 9.4 Ω 63 μΩ/Ω + 0.94 kΩ 0.018 % + 0.094 MΩ 0.15 % + 9.4 MΩ
c) On-site Normal Measurement 0 to 30 Ω 30 Ω to 300 Ω 300 Ω to 3 kΩ 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	Direct measurement with a precision multimeter	87 μΩ/Ω + 3.7 mΩ 64 μΩ/Ω + 4.0 mΩ 58 μΩ/Ω + 7.5 mΩ 58 μΩ/Ω + 77 mΩ 58 μΩ/Ω + 0.85 Ω 76 μΩ/Ω + 15 Ω 0.047 % + 0.93 kΩ 1.9 % + 0.12 MΩ 19 % + 1.2 MΩ
D13. DC Voltage (Source) (Lab) 0 to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V (On-site) 0 to 30 mV 30 mV to 300 mV 300 mV to 3 V 3 V to 30 V 30 V to 300 V 300 V to 1000 V	Direct measurement with a precision multimeter MDCPE-08 V3.01: 2022 MDCPE-09 V3.01: 2022 MDCPE-12 V3.01: 2022 MDCPE-18 V3.01: 2022	5.1 μV/V + 0.094 μV 3.5 μV/V + 0.43 μV 3.5 μV/V + 4.1 μV 5.5 μV/V + 40 μV 5.5 μV/V + 0.49 mV 52 μV/V + 4.3 μV 41 μV/V + 4.6 μV 29 μV/V + 7.8 μV 47 μV/V + 0.24 mV 64 μV/V + 0.9 mV 52 μV/V + 14 mV

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D14. AC Voltage (Source) (Lab)	Direct measurement with a precision multimeter MDCPE-08 V3.01: 2022 MDCPE-09 V3.01: 2022 MDCPE-12 V3.01: 2022 MDCPE-18 V3.01: 2022	
1 mV to 200 mV	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 % + 4.0 μ V 0.011 % + 4.0 μ V 0.011 % + 2.0 μ V 0.013 % + 4.0 μ V 0.031 % + 7.8 μ V 0.067 % + 19 μ V
200 mV to 2 V	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 100 kHz to 300 kHz 300 kHz to 500 kHz	0.011 % + 21 μ V 85 μ V/V + 20 μ V 70 μ V/V + 20 μ V 0.011 % + 20 μ V 0.021 % + 40 μ V 0.051 % + 0.19 mV 0.24 % + 1.9 mV 0.78 % + 19 mV
(2 to 20) V	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	0.011 % + 0.20 mV 86 μ V/V + 0.20 mV 70 μ V/V + 0.20 mV 0.011 % + 0.20 mV 0.021 % + 0.40 mV 0.051 % + 1.9 mV
(20 to 200) V	45 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 μ V/V + 2.0 mV 70 μ V/V + 2.0 mV 0.011 % + 2.0 mV 0.021 % + 4.0 mV 0.051 % + 19 mV
(200 to 1000) V	45 Hz to 10 kHz	0.011 % + 20 mV

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D15. AC Voltage (Source) (On-site)	Direct measurement with a AC Voltage source In-house Procedure MDCPE-09 V3.01 : 2022	
(1.0 to 30) mV	20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 20 kHz 20 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz	0.70 % + 16 μ V 0.29 % + 16 μ V 0.21% + 16 μ V 0.81 % + 27 μ V 3.7 % + 0.12 mV 12 % + 0.77 mV
(30 to 300) mV	20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 20 kHz 20 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz	0.70 % + 0.16 mV 0.29 % + 0.16 mV 0.21% + 0.16 mV 0.81 % + 0.27 mV 3.7 % + 1.2 mV 12 % + 7.7 mV
(0.3 to 3.0) V	(20 to 45) Hz (45 to 100) Hz 100 Hz to 20 kHz (20 to 100) kHz (100 to 300) kHz 300 kHz to 500 kHz	0.70 % + 1.6 mV 0.29 % + 1.6 mV 0.21% + 1.6 mV 0.81 % + 2.7 mV 3.7 % + 12 mV 12 % + 77 mV
(3 to 30) V	(20 to 45) Hz (45 to 100) Hz 100 Hz to 20 kHz (20 to 100) kHz	0.70 % + 16 mV 0.29 % + 16 mV 0.21 % + 16 mV 0.81 % + 27 mV
(30 to 300) V	(45 to 100) Hz 100 Hz to 20 kHz 400 Hz to 20 kHz (20 to 100) kHz	0.36 % + 0.16 V 0.28 % + 0.16 V 0.28 % + 0.16 V 1.3 % + 0.45 V
(300 to 750) V	45 Hz to 10 kHz	0.07 % + 0.26 V

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<p>D16. DC Power (Measure)</p> <p>(Lab/Site)</p> <p>(0 to 90) W</p> <p>(90 to 600) W</p> <p>600 W to 6 kW</p> <p>6 kW to 12 kW</p>	<p>Direct measurement with a multiproduct calibrator</p> <p>In-house Procedure</p> <p>MDCPE-16 V3.01: 2022</p>	<p>0.018 % + 8 mW</p> <p>0.018 % + 0.08 W</p> <p>0.055 % + 0.8 W</p> <p>0.070 % + 8 W</p>
<p>D17. AC Power (Measure)</p> <p>(Lab/Site)</p> <p>0.2 W to 33 W</p> <p>33 W to 90 W</p> <p>90 W to 300 W</p> <p>300 W to 900 W</p> <p>900 W to 1.5 kW</p> <p>1.5 kW to 9 kW</p> <p>9 kW to 12 kW</p> <p>100 W to 1350 W</p>	<p>Direct measurement with a calibrator</p> <p>MDCPE-16 V3.01: 2022</p> <p>45 Hz to 65 Hz</p> <p>45 Hz to 65 Hz</p> <p>45 Hz to 65 Hz</p> <p>45 Hz to 65Hz</p> <p>45 Hz to 65 Hz</p> <p>45 Hz to 65Hz</p> <p>45 Hz to 65 Hz</p> <p>400 Hz</p>	<p>0.063% + 0.76 mW</p> <p>0.086 % + 0.76 mW</p> <p>0.070 % + 7.6 mW</p> <p>0.078 % + 7.6 mW</p> <p>0.078 % + 76 mW</p> <p>0.094 % + 76 mW</p> <p>0.094 % + 0.76 W</p> <p>0.088 % + 0.50 W</p>
<p>D18. High Voltage</p> <p>AC High Voltage (Source)</p> <p>(Lab/Site)</p> <p>0.5 kV to 10 kV</p> <p>DC High Voltage (Source)</p> <p>(Lab/Site)</p> <p>0.5 kV to 10 kV</p>	<p>50Hz to 60Hz</p> <p>Direct measurement with a AC/DC DIGITAL HIGH VOLTMETER</p> <p>MDCPE-18 V3.01: 2022</p>	<p>1.2 % + 6.2 V</p> <p>0.58 % + 3.6 V</p>

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<p>D19. Insulation Tester/ High Ohm Tester/ Surface Resistivity Tester (Lab/Site) (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 MDCPE-19 V3.00: 2022</p>	<p>0.12 % + 5.8 Ω 0.12 % + 58 Ω 0.12 % + 0.58 kΩ 0.18 % + 5.8 kΩ 1.2 % + 58 kΩ 1.2 % + 0.58 MΩ 1.2 % + 5.8 MΩ 1.2 % + 58 MΩ</p>
<p>D20. LCR Meter Capacitance Measure @120 Hz 1 pF 10 pF 100 pF 1000 pF 10 nF 100 nF 1 μF</p> <p>@1 kHz 1 pF 10 pF 100 pF 1000 pF 10 nF 100 nF 1 μF</p>	<p>MDCPE-06 V3.01: 2022 Direct measurement with a Standard Air Capacitors</p>	<p>0.0014 pF 0.012 pF 0.13 pF 1.2 pF 0.013 nF 0.14 nF 0.0014 μF</p> <p>0.0014 pF 0.012 pF 0.13 pF 1.2 pF 0.013 nF 0.13 nF 0.0013 μF</p>

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@ 10 kHz 1 pF 10 pF 100 pF 1000 pF 10 nF 100 nF 1 µF		0.0013 pF 0.012 pF 0.13 pF 1.2 pF 0.013 nF 0.14 nF 0.0022 µF
@ 100 kHz 1 pF 10 pF 100 pF 1000 pF 10 nF		0.0014 pF 0.014 pF 0.14 pF 1.3 pF 0.015 nF
D21. Frequency (Source) 0.5 Hz to 15 MHz	Direct measurement with a Frequency Counter MDCPE-21 V3.00: 2023	11 µHz/Hz + 6 µHz

* 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 (1-16, 19-21, 24-27, 20-46, 48-51, 53-55), 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)
Mr Koo Chih Wei	- Item A (1-42, 44-46, 48, 50-51, 53-56), Item B (1-4, 6-11, 13)
Mr Tang Joo Seng	- Item C (1-4) & Item D (1-17 & 21)

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.