Schedule

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FIELD OF TESTING : Calibration and Measurement

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
A. Temperature		
A1. Analogue Temperature Gauge (Lab / Site)		
1) @ -196 °C (Liquid Nitrogen Gas) (Lab)		1.2 °C
2) ≥ - 80 °C to 100 °C	TP-T-01 ver 7.0	0.3 °C
3) > 100 °C to 250 °C		0.5 °C
4) > 250 °C to 350 °C		1.3 °C
5) > 350 °C to 500 °C		3.0 °C
A2. RTD, with or without Indicator (Lab / Site)		
1) @ -196 °C (Liquid Nitrogen Gas) (Lab)		0.03 °C
2) ≥ -80 °C to -40 °C		0.06 °C
3) > -40 °C to 0 °C	TP-T-02 ver 7.0	0.05 °C
4) @ 0 °C (Ice - Point) (Lab)	TP-T-03 ver 7.0	0.02 °C
5) ≥ 0 °C to 100 °C		0.03 °C
6) > 100 °C to 200 °C		0.05 °C
7) > 200 °C to 300 °C		0.06 °C
8) > 300 °C to 400 °C		0.08 °C
9) > 400 °C to 500 °C		0.49 °C
A3. Temperature Sensor with Transmitter (Lab / Site)		
1) @ -196 °C (Liquid Nitrogen Gas) (Lab)		0.11 °C
2) ≥ -80 °C to -40 °C		0.14 °C
3) > -40 °C to -10 °C	TP-T-05 ver 2.0	0.13 °C
4) > -10 °C to 40 °C		0.03 °C
5) > 40 °C to 200 °C		0.13 °C
6) > 200 °C to 300 °C		0.52 °C
7) > 300 °C to 500 °C		0.53 °C

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
A4. Thermocouple, with or without Indicators (Lab / Site) (Type K, E, J, T, N, R, S)		
1) @ -196 °C (Liquid Nitrogen Gas) (Lab)		0.39 °C
2) ≥ -80 °C to 0 °C		0.25 °C
3) > 0 °C to 100 °C	TP-02 ver 7.0	0.20 °C
4) > 100 °C to 200 °C	TP-04 ver 8.0	0.25 °C
5) > 200 °C to 350 °C		0.37 °C
6) > 350 °C to 450 °C		0.45 °C
7) > 450 °C to 500 °C		0.77 °C
8) > 500 °C to 800 °C		1.5 °C
9) > 800 °C to 1000 °C		1.8 °C
10) > 1000 °C to 1200 °C		3.7 °C
A5. Liquid-In-Glass (LIG) Thermometer (Graduation: 1°C) (Lab)		
1) ≥ -80 °C to 250 °C (Total Immersion)	TP-T-06 ver 1.0	0.39 °C
2) ≥ -80 °C to 250 °C (Partial Immersion)		0.40 °C
A6. Temperature Simulation (Measure and Source Mode) (Lab / Site)		
Thermocouple Simulator / Indicator		
1) Type K (≥ -200 to 1372) °C		0.61 °C
2) Type E (≥ -250 to 1000) °C	TP-T-07 ver 2.0	0.68 °C
3) Type J (≥ -210 to 1200) °C		0.53 °C
4) Type T (≥ -250 to 400) °C		0.87 °C
5) Type N (≥ -200 to 1300) °C		0.84 °C
6) Type R (≥ 0 to 1767) °C		0.97 °C
7) Type S (≥ 0 to 1767) °C		0.86 °C
RTD Simulator/Indicator		
8) ≥ -200 °C to 800 °C		0.28°C

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
A7. Temperature and Humidity (Lab)		% r.h = % Relative Humidity
1) Relative Humidity @ 10°C		
Up to 10% r.h		0.76% r.h & 0.62°C
> 10% to 50% r.h		2.8% r.h & 0.60°C
> 50% to 85% r.h		3.5% r.h & 0.43°C
2) Relative Humidity @ 30°C		
Up to 10% r.h		0.59% r.h & 0.41°C
> 10% to 50% r.h	TP-T-08 ver 0.0	0.62% r.h & 0.27°C
> 50% to 95% r.h		1.3% r.h & 0.28°C
3) Relative Humidity @ 50°C		
Up to 10% r.h		0.38% r.h & 0.31°C
> 10% to 50% r.h		0.60% r.h & 0.26°C
> 50% to 95% r.h		1.1% r.h & 0.29°C
A8. Platinum Resistance Thermometer (Lab) (with or without indicator)		
1) 0 °C		0.0056 °C
2) -196 °C (Liquid nitrogen)	TP-T-09 ver 0.0	0.011 °C
3) ≥ - 90 to - 80 °C		0.011 °C
4) > - 80 to 0 °C		0.0073 °C
5) > 0 to 10 °C		0.0077 °C
6) > 10 to 20 °C		0.0065 °C
7) > 20 to 50 °C		0.0068 °C
8) > 50 to 80 °C		0.0069 °C
9) > 80 to 125 °C		0.0084 °C
10) > 125 to 150 °C		0.0085 °C
11) > 150 to 225 °C		0.0084 °C
12) > 225 to 500 °C		0.015 °C
13) @ 0.01 °C (Water Triple Point)		0.0011 °C
14) @ 29.7646 °C (Gallium)		0.0029 °C
15) @ 660.323 °C (Aluminium)		0.013 °C

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
B. Mechanical		
Pressure Measuring Devices		
B.1 Absolute Pressure (Lab)		
1) (≥ 0.720 to 3.046) psi abs	TP-P-01 ver 9.0 TP-P-02 ver 8.0 TP-P-03 ver 8.0	0.00012 psi abs
2) (> 3.046 to 4.641) psi abs		0.00022 psi abs
3) (> 4.641 to 6.237) psi abs		0.00025 psi abs
4) (> 6.237 to 7.832) psi abs		0.00028 psi abs
5) (> 7.832 to 9.427) psi abs		0.00035 psi abs
6) (> 9.427 to 11.023) psi abs		0.00039 psi abs
7) (>11.023 to 12.618) psi abs		0.00048 psi abs
8) (>12.618 to 14.214) psi abs		0.00054 psi abs
9) (> 14.214 to 15.809) psi abs		0.00057 psi abs
10) (>15.809 to 17.405) psi abs		0.00064 psi abs
11) (>17.405 to 50.00) psi abs		0.0018 psi abs
12) (> 50.00 to 80.00) psi abs		0.0029 psi abs
13) (> 80.00 to 116.0) psi abs		0.0042 psi abs
14) (> 116.0 to 232.0) psi abs		0.012 psi abs
15) (> 232.0 to 300.0) psi abs		0.016 psi abs
16) (> 300.0 to 377.0) psi abs		0.026 psi abs
17) (> 377.0 to 740.0) psi abs		0.038 psi abs
18) (> 740.0 to 1465) psi abs		0.078 psi abs
19) (> 1465 to 10015) psi abs		0.54 psi abs
B.2 Barometric Pressure (Lab)		
1) 8 psi abs	TP-P-01 ver 9.0 TP-P-02 ver 8.0 TP-P-03 ver 8.0	0.00033 psi abs
2) (> 8 to 9.5) psi abs		0.00036 psi abs
3) (> 9.5 to 11.0) psi abs		0.00044 psi abs
4) (> 11.0 to 12.5) psi abs		0.00048 psi abs
5) (> 12.5 to 14.0) psi abs		0.00051 psi abs
6) (> 14.0 to 15.5) psi abs		0.00056 psi abs
7) (> 15.5 to 17.0) psi abs		0.00060 psi abs
B.3 Gauge Pressure (Lab)		
1) (≥ -1 to -0.985) bar		0.039 mbar
2) (> -0.985 to -0.950) bar		0.034 mbar
3) (> -0.950 to -0.875) bar		0.032 mbar
4) (> -0.875 to -0.750) bar		0.028 mbar
5) (> -0.750 to -0.625) bar		0.025 mbar
6) (> -0.625 to -0.500) bar		0.021 mbar
7) (> -0.500 to -0.375) bar		0.016 mbar

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8) (> -0.375 to -0.250) bar		0.011 mbar
9) (> -0.250 to 0.0431) bar		0.0064 mbar
10) (> 0.0431 to 0.0862) bar	TP-P-01 ver 9.0	0.0054 mbar
11) (> 0.0862 to 0.130) bar	TP-P-02 ver 8.0	0.0097 mbar
12) (> 0.130 to 0.259) bar	TP-P-03 ver 8.0	0.014 mbar
13) (> 0.259 to 0.345) bar		0.015 mbar
14) (> 0.345 to 0.518) bar		0.023 mbar
15) (> 0.518 to 0.625) bar		0.027 mbar
16) (> 0.625 to 0.776) bar		0.029 mbar
17) (> 0.776 to 0.950) bar		0.035 mbar
18) (> 0.950 to 1.275) bar		0.11 mbar
19) (> 1.275 to 1.600) bar		0.13 mbar
20) (> 2.000 to 5.000) bar		0.17 mbar
21) (> 5.000 to 7.000) bar		0.27 mbar
22) (> 5.000 to 10.00) bar		0.36 mbar
23) (> 10.00 to 12.00) bar		0.62 mbar
24) (> 12.00 to 16.00) bar		0.83 mbar
25) (> 16.00 to 20.00) bar		1.1 mbar
26) (> 20.00 to 25.00) bar		1.4 mbar
27) (> 30.00 to 50.00) bar		2.7 mbar
28) (> 50.00 to 100.0) bar		5.2 mbar
29) (> 100.0 to 160.0) bar		11 mbar
30) (> 160.0 to 250.0) bar		16 mbar
31) (> 250.0 to 350.0) bar		20 mbar
32) (> 350.0 to 600.0) bar		31 mbar
33) (> 600.0 to 700.0) bar		34 mbar
34) (> 700.0 to 1000) bar		56 mbar
35) (> 1000 to 2500) bar		220 mbar
36) (> 2500 to 5000) bar		720 mbar
B.4 Air Data Test Set (Lab)		
1) ≥ 0.8 to 31.6 inHg (Absolute) ≥ -1,500 to 80,000 feet	TP-P-01 ver 9.0	0.0012 inHg abs
2) ≥ 0 to 50 inHg (Differential) ≥ 0 to 850 knot	TP-P-02 ver 8.0 TP-P-03 ver 8.0	0.0018 inHg

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
C. DIMENSIONAL MEASURING INSTRUMENTS (Lab)		
C.1 Digimatic / Dial Vernier Caliper		
1) 0 - 150 mm (0.01 mm)		
a) Partial Surface Contact Error		0.01 mm
b) Repeatability Of partial surface Contact Error	TP-M-DIM-01 ver 0.0	0.01 mm
c) Shift Error - Internal Measuring Faces		0.01 mm
d) Shift Error - Crossed Knife-Edge Internal Measuring Distance		0.01 mm
e) Shift Error - Depth Measuring Faces		0.01 mm
f) Shift Error - Step Measuring Faces		0.01 mm
g) Line Contact Error		0.01 mm
2) 0 - 200 mm (0.01 mm)		
a) Partial Surface Contact Error		0.01 mm
b) Repeatability Of partial surface Contact Error	TP-M-DIM-01 ver 0.0	0.01 mm
c) Shift Error - Internal Measuring Faces		0.01 mm
d) Shift Error - Crossed Knife-Edge Internal Measuring Distance		0.01 mm
e) Shift Error - Depth Measuring Faces		0.01 mm
f) Shift Error - Step Measuring Faces		0.01 mm
g) Line Contact Error		0.01 mm
3) 0 - 300 mm (0.01 mm)		
a) Partial Surface Contact Error		0.01 mm
b) Repeatability Of partial surface Contact Error		0.01 mm
c) Shift Error - Internal Measuring Faces	TP-M-DIM-01 ver 0.0	0.01 mm
d) Shift Error - Crossed Knife-Edge Internal Measuring Distance		0.01 mm
e) Shift Error - Depth Measuring Faces		0.01 mm
f) Shift Error - Step Measuring Faces		0.01 mm
Line Contact Error		
4) 0 - 600 mm (0.01 mm)		
a) Partial Surface Contact Error		0.01 mm
b) Repeatability Of partial surface Contact Error	TP-M-DIM-01 ver 0.0	0.01 mm

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c) Shift Error - Internal Measuring Faces		0.01 mm
d) Shift Error - Step Measuring Faces		0.01 mm
e) Line Contact Error		0.01 mm
C.2 Digimatic Micrometer		
1) 0 - 25 mm (0.001 mm)		
a) Full Contact Error		0.001 mm
b) Repeatability of Full Contact Error		0.001 mm
c) Partial Surface Contact Error	TP-M-DIM-02 ver 0.0	0.001 mm
2) 25 - 50 mm (0.001 mm)		
a) Full Contact Error		0.001 mm
b) Repeatability of Full Contact Error		0.001 mm
c) Partial Surface Contact Error	TP-M-DIM-02 ver 0.0	0.001 mm
d) Length measurement (Setting Rod)		0.00004 inch
e) Flatness (Setting Rod)		0.00004 inch
f) Parallelism (Setting Rod)		0.00004 inch
C.3 Dial Indicator / Dial Gauge		
1) 0 - 1 mm (0.001 mm)		
a) Indication Error over 1/10 Revolution	TP-M-DIM-03 ver 0.0	0.0004 mm
b) Indication Error over 1/2 Revolution		0.0004 mm
c) Indication Error over One Revolution		0.0004 mm
d) Indication Error over Whole 1) 0 - 1 mm (0.001 mm) Measuring Range		0.0004 mm
e) Hysteresis		0.0004 mm
f) Repeatability		0.0004 mm
2) 0 - 10 mm (0.01 mm)		
a) Indication Error over 1/10 Revolution	TP-M-DIM-03 ver 0.0	0.002 mm
b) Indication Error over 1/2 Revolution		0.002 mm
c) Indication Error over One Revolution		0.002 mm
d) Indication Error over Whole Measuring Range		0.002 mm
e) Hysteresis		0.002 mm
f) Repeatability		0.002 mm

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C.4 Dial Test Indicator (Two Directions)		
1) 0 – 0.4 mm (0.002 mm)		
Direction: Upward	TP-M-DIM-04 ver 0.0	
a) Any 10 scale divisions		1.2 µm
b) Indication Error over One Revolution		1.2 µm
c) Measuring range		1.3 µm
d) Hysteresis		1.3 µm
e) Repeatability		1.2 µm
2) 0 – 0.4 mm (0.002 mm)		
Direction: Downward	TP-M-DIM-04 ver 0.0	
a) Any 10 scale divisions		1.3 µm
b) Indication Error over One Revolution		1.3 µm
c) Measuring range		1.3 µm
d) Hysteresis		1.3 µm
e) Repeatability		1.2 µm
3) 0 – 1.6 mm (0.01 mm)		
Direction: Upward	TP-M-DIM-04 ver 0.0	
a) Any 10 scale divisions		1.3 µm
b) Indication Error over One Revolution		1.3 µm
c) Measuring range		1.3 µm
d) Hysteresis		1.3 µm
e) Repeatability		1.2 µm
4) 0 – 1.6 mm (0.01 mm)		
Direction: Downward	TP-M-DIM-04 ver 0.0	
a) Any 10 scale divisions		1.3 µm
b) Indication Error over One Revolution		1.3 µm
c) Measuring range		1.3 µm
d) Hysteresis		1.4 µm
e) Repeatability		1.2 µm
C.5 Digimatic / Digital Indicator		
1) 0 - 12.7 mm / 0.0005 mm		
a) Errors of Indication in Measuring Partial Range	TP-M-DIM-05 ver 0.0	0.0005 mm
b) Errors of indication in Measuring Range		0.0005 mm
c) Hysteresis of Error of Indication		0.0005 mm
d) Repeatability of Error of Indication		0.0005 mm

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2) 0 - 50.8 mm / 0.0005 mm		
a) Errors of Indication in Measuring Partial Range	TP-M-DIM-05 ver 0.0	0.000 5 mm
b) Errors of Indication in Measuring Range		0.0010 mm
c) Hysteresis of Error of Indication		0.0010 mm
d) Repeatability of Error of Indication		0.0010 mm
D. ELECTRICAL MEASURING INSTRUMENTS		
D.1 DC Voltage Measurement (Meter) (Lab)	TP-E-VOL-01 ver 0.0 TP-E-DMM-01 ver 0.0	
0 mV to 10 mV		0.0010 mV
above 10 mV to 60 mV		0.0014 mV
above 60 mV to 100 mV		0.0018 mV
above 100 mV to 200 mV		0.0024 mV
above 200 mV to 1 V		0.000008 V
above 1 V - 2 V		0.000023 V
above 2 V - 10 V		0.00008 V
above 10 V - 20 V		0.00028 V
above 20 V - 100 V		0.0010 V
above 100 V - 200 V		0.0028 V
above 200 V - 800 V		0.0080 V
above 800 V - 1000 V		0.010 V
D.2 AC Voltage Measurement (Meter) (Lab)	TP-E-VOL-02 ver 0.0 TP-E-DMM-01 ver 0.0	
1 mV to 2 mV	10 Hz	0.0086 mV
2 mV to 10 mV		0.015 mV
1 mV to 2 mV	10 Hz to 20 kHz	0.0064 mV
2 mV to 6 mV		0.0069 mV
6 mV to 10 mV		0.0074 mV
1 mV to 2 mV	20 kHz to 50 kHz	0.0068 mV
2 mV to 6 mV		0.0079 mV
6 mV to 10 mV		0.0091 mV
1 mV to 2 mV	50 kHz to 100 kHz	0.018 mV
2 mV to 6 mV		0.023 mV
6 mV to 10 mV		0.028 mV

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1 mV to 2 mV 2 mV to 6 mV 6 mV to 10 mV	100 kHz to 500 kHz	0.044 mV 0.069 mV 0.094 mV
10 mV to 20 mV 20 mV to 60 mV 60 mV to 100 mV	10 Hz	0.022 mV 0.049 mV 0.077 mV
10 mV to 20 mV 20 mV to 60 mV 60 mV to 100 mV	10 Hz to 20 kHz	0.0082 mV 0.013 mV 0.017 mV
10 mV to 20 mV 20 mV to 60 mV 60 mV to 100 mV	20 kHz to 50 kHz	0.014 mV 0.025 mV 0.036 mV
10 mV to 20 mV 20 mV to 60 mV 60 mV to 100 mV	50 kHz to 100 kHz	0.034 mV 0.059 mV 0.084 mV
10 mV to 40 mV 40 mV to 60 mV 60 mV to 100 mV	100 kHz to 500 kHz	0.096 mV 0.13 mV 0.20 mV
0.1 V to 0.2 V 0.2 V to 0.4 V 0.4 V to 0.6 V 0.6 V to 1.0 V	10 Hz	0.00015 V 0.00029 V 0.00057 V 0.00071 V
0.1 V to 0.2 V 0.2 V to 0.4 V 0.4 V to 0.6 V 0.6 V to 1.0 V	10 Hz to 40 Hz	0.000084 V 0.00011 V 0.00016 V 0.00018 V
0.1 V to 0.2 V 0.2 V to 0.4 V 0.4 V to 0.6 V 0.6 V to 1.0 V	40 Hz to 20 kHz	0.000031 V 0.00005 V 0.00010 V 0.00013 V
0.1 V to 0.2 V 0.2 V to 0.6 V 0.6 V to 1.0 V	20 kHz to 50 kHz	0.000062 V 0.00016 V 0.00025 V

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0.1 V to 0.4 V 0.4 V to 0.6 V 0.6 V to 1.0 V	50 kHz to 100 kHz	0.00027 V 0.00049 V 0.00060 V
0.1 V to 0.4 V 0.2 V to 0.4 V 0.4 V to 0.8 V 0.8 V to 1.0 V	100 kHz to 500 kHz	0.00039 V 0.00070 V 0.0014 V 0.0017 V
1 V to 2 V 2 V to 6 V 6 V to 10 V	10 Hz	0.0022 V 0.0050 V 0.0078 V
1 V to 2 V 2 V to 4 V 4 V to 8 V 8 V to 10 V	10 Hz to 40 Hz	0.00059 V 0.00090 V 0.0013 V 0.0015 V
1 V to 2 V 2 V to 6 V 6 V to 8 V 8 V to 10 V	40 Hz to 20 kHz	0.00028 V 0.00073 V 0.00095 V 0.0012 V
1 V to 2 V 2 V to 4 V 4 V to 8 V 8 V to 10 V	20 kHz to 50 kHz	0.00053 V 0.00099 V 0.0020 V 0.0024 V
1 V to 2 V 2 V to 4 V 4 V to 8 V 8 V to 10 V	50 kHz to 100 kHz	0.0013 V 0.0024 V 0.0046 V 0.0057 V
1 V to 2 V 2 V to 4 V 4 V to 8 V 8 V to 10 V	100 kHz to 500 kHz	0.0039 V 0.0072 V 0.014 V 0.017 V
10 V to 20 V 20 V to 60 V 60 V to 100 V	10 Hz	0.022 V 0.050 V 0.078 V

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10 V to 20 V 20 V to 40 V 40 V to 80 V 80 V to 100 V	10 Hz to 40 Hz	0.0059 V 0.0081 V 0.013 V 0.015 V
10 V to 20 V 20 V to 60 V 60 V to 80 V 80 V to 100 V	40 Hz to 20 kHz	0.0028 V 0.0073 V 0.0095 V 0.012 V
10 V to 20 V 20 V to 40 V 40 V to 80 V 80 V to 100 V	20 kHz to 50 kHz	0.0053 V 0.0099 V 0.020 V 0.024 V
10 V to 20 V 20 V to 40 V 40 V to 80 V 80 V to 100 V	50 kHz to 100 kHz	0.013 V 0.024 V 0.046 V 0.057 V
10 V to 20 V 20 V to 40 V 40 V to 60 V	100 kHz to 300 kHz	0.054 V 0.086 V 0.12 V
100 V to 200 V 200 V to 400 V 400 V to 800 V 800 V to 1000 V	10 Hz	0.15 V 0.36 V 0.64 V 0.78 V
100 V to 200 V 200 V to 600 V 600 V to 1000 V	10 Hz to 5 kHz	0.031 V 0.15 V 0.20 V
100 V to 200 V 200 V to 600 V 600 V to 800 V 800 V to 1000 V	5 kHz to 10 kHz	0.031 V 0.084 V 0.068 V 0.064 V
100 V to 200 V 200 V to 400 V	10 kHz to 20 kHz	0.032 V 0.043 V
100 V to 200 V 200 V to 400 V	20 kHz to 50 kHz	0.056 V 0.079 V

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100 V to 200 V	50 kHz to 100 kHz	0.25 V
200 V to 400 V		0.37 V
D.3 Resistance Measurement (Meter) (Lab)	TP-E-RES-01 ver 0.0 TP-E-DMM-01 ver 0.0	
0 Ω to 12 Ω		0.011 Ω
12 Ω to 20 Ω		0.016 Ω
20 Ω to 80 Ω		0.017 Ω
80 Ω to 120 Ω		0.018 Ω
120 Ω to 200 Ω		0.025 Ω
0.2 kΩ to 0.4 kΩ		0.000029 kΩ
0.4 kΩ to 0.8 kΩ		0.000036 kΩ
0.8 kΩ to 1.0 kΩ		0.000040 kΩ
1.0 kΩ to 1.2 kΩ		0.000044 kΩ
1.2 kΩ to 2.0 kΩ		0.00025 kΩ
2.0 kΩ to 4.0 kΩ		0.00029 kΩ
4.0 kΩ to 8.0 kΩ		0.00036 kΩ
8.0 kΩ to 12 kΩ		0.00044 kΩ
12 kΩ to 20 kΩ		0.0015 kΩ
20 kΩ to 60 kΩ		0.0022 kΩ
60 kΩ to 100 kΩ		0.0030 kΩ
0.1 MΩ to 0.4 MΩ		0.000018 MΩ
0.4 MΩ to 0.6 MΩ		0.000022 MΩ
0.6 MΩ to 1 MΩ		0.000030 MΩ
1 MΩ to 4 MΩ		0.00027 MΩ
4 MΩ to 6 MΩ		0.00032 MΩ
6 MΩ to 10 MΩ		0.00043 MΩ
10 MΩ to 20 MΩ		0.0093 MΩ
20 MΩ to 60 MΩ		0.023 MΩ
60 MΩ to 100 MΩ		0.037 MΩ
0.1 GΩ to 0.2 GΩ		0.00074 GΩ
0.2 GΩ to 0.4 GΩ		0.0014 GΩ
0.4 GΩ to 0.6 GΩ		0.0021 GΩ
0.6 GΩ to 1.0 GΩ		0.0033 GΩ
D.4 Capacitance Measurement (Meter) (Lab)	TP-E-DMM-01 ver 0.0	
0 nF - 0.6 nF		0.0022 nF
0.6 nF - 1.0 nF		0.0030 nF
1.0 nF - 1.2 nF		0.0063 nF

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
1.2 nF - 1.8 nF		0.47 %
1.8 nF - 4.0 nF		0.35 %
4.0 nF - 10 nF		0.18 %
10 nF - 14 nF		0.38 %
14 nF - 20 nF		0.29 %
20 nF - 100 nF		0.18 %
100 nF - 160 nF		0.36 %
160 nF - 200 nF		0.29 %
200 nF - 1.0 µF		0.18 %
1.0 µF - 1.6 µF		0.36 %
1.6 µF - 2.0 µF		0.28 %
2 µF - 10 µF		0.18 %
10 µF - 20 µF		0.35 %
20 µF - 100 µF		0.19 %
100 µF - 200 µF		0.41 %
200 µF - 1 mF		0.28 %
1 mF - 2 mF		0.45 %
2 mF - 10 mF		0.28 %
12 mF - 20 mF		0.66 %
20 mF - 120 mF		0.48 %
D.5 Frequency Measurement (Lab)	TP-E-FRE-01 ver 0.0 TP-E-DMM-01 ver 0.0	
10 Hz @ 10 mV - 1000 V		0.00031 %
above 10 Hz - 10 kHz @ 10 mV - 1000 V		0.00027 %
above 10 kHz - 100 kHz @ 10 mV - 100 V		0.00027 %
above 100 kHz - 0.5 MHz @ 10 mV - 10 V		0.00027 %
above 0.5 MHz - 2 MHz @ 500 mV - 1 V		0.00027 %
D.6 DC Current Measurement (Meter) (Lab)	TP-E-CUR-01 ver 0.0 TP-E-DMM-01 ver 0.0	
0 µA to 1 µA		0.0063 µA
1 µA to 4 µA		0.0066 µA
4 µA to 10 µA		0.0072 µA
10 µA to 16 µA		0.0078 µA
16 µA to 20 µA		0.0082 µA
20 µA to 60 µA		0.013 µA
60 µA to 100 µA		0.017 µA
100 µA to 160 µA		0.029 µA
160 µA to 200 µA		0.032 µA
0.2 mA to 0.6 mA		0.012 %
0.6 mA to 1 mA		0.010 %

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
1 mA to 1.4 mA		0.015 %
1.4 mA to 2 mA		0.014 %
2 mA to 4 mA		0.011 %
4 mA to 8 mA		0.0094 %
8 mA to 10 mA		0.0088 %
10 mA to 16 mA		0.015 %
16 mA to 20 mA		0.013 %
20 mA to 40 mA		0.011 %
40 mA to 80 mA		0.0094 %
80 mA to 100 mA		0.0088 %
100 mA to 140 mA		0.021 %
140 mA to 200 mA		0.019 %
0.2 A to 1 A		0.015 %
1 A to 1.6 A		0.037 %
1.6 A to 4 A		0.033 %
4 A to 8 A		0.029 %
8 A to 12 A		0.027 %
12 A to 16 A		0.088 %
16 A to 20 A		0.085 %
20 A to 22 A		0.087 %
22 A to 26 A		0.085 %
26 A to 30 A		0.084 %
Clamp Meter Measurement (DC Current) (Lab)	TP-E-CUR-01 ver 0.0	
0 A to 10 A		1.4 %
10 A to 950 A		1.3 %
D.7 AC Current Measurement (Meter) (Lab)	TP-E-CUR-02 ver 0.0 TP-E-DMM-01 ver 0.0	
10 µA to 20 µA	40 Hz to 5 kHz	0.015 µA
10 µA to 12 µA	5 kHz to 10 kHz	0.056 µA
12 µA to 16 µA		0.061 µA
18 µA to 20 µA		0.066 µA
10 µA to 20 µA	10 kHz to 30 kHz	1.2 µA
20 µA to 60 µA	40 Hz to 5 kHz	0.022 µA
60 µA to 100 µA		0.030 µA
100 µA to 120 µA		0.034 µA
120 µA to 200 µA		0.15 µA

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
20 µA to 40 µA	5 kHz to 10 kHz	0.090 µA
40 µA to 80 µA		0.14 µA
80 µA to 120 µA		0.19 µA
120 µA to 160 µA		0.30 µA
160 µA to 200 µA		0.35 µA
20 µA to 60 µA	10 kHz to 30 kHz	1.3 µA
60 µA to 120 µA		1.5 µA
120 µA to 200 µA		5.9 µA
0.2 mA to 0.6 mA	40 Hz to 5 kHz	0.00022 mA
0.6 mA to 1.0 mA		0.00030 mA
1.0 mA to 1.2 mA		0.00034 mA
1.2 mA to 2.0 mA		0.0015 mA
0.2 mA to 0.4 mA	5 kHz to 10 kHz	0.00060 mA
0.4 mA to 0.6 mA		0.00084 mA
0.6 mA to 0.8 mA		0.0011 mA
0.8 mA to 1.2 mA		0.0016 mA
1.2 mA to 1.6 mA		0.0030 mA
1.6 mA to 2.0 mA		0.0035 mA
0.2 mA to 0.4 mA	10 kHz to 30 kHz	0.0067 mA
0.4 mA to 0.6 mA		0.0075 mA
0.6 mA to 0.8 mA		0.0083 mA
0.8 mA to 1.2 mA		0.0099 mA
1.2 mA to 1.6 mA		0.017 mA
1.6 mA to 2.0 mA		0.019 mA
2 mA to 6 mA	40 Hz	0.0022 mA
6 mA to 10 mA		0.0030 mA
10 mA to 12 mA		0.0034 mA
12 mA to 20 mA		0.015 mA
2 mA to 6 mA	50 Hz to 5 kHz	0.0022 mA
6 mA to 10 mA		0.0030 mA
10 mA to 12 mA		0.0034 mA
12 mA to 16 mA		0.0071 mA
16 mA to 20 mA		0.0076 mA

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
2 mA to 4 mA	5 kHz to 10 kHz	0.0060 mA
4 mA to 6 mA		0.0084 mA
6 mA to 10 mA		0.014 mA
10 mA to 12 mA		0.016 mA
12 mA to 16 mA		0.030 mA
16 mA to 20 mA		0.035 mA
2 mA to 4 mA	10 kHz to 30 kHz	0.027 mA
4 mA to 6 mA		0.035 mA
6 mA to 10 mA		0.051 mA
10 mA to 12 mA		0.058 mA
12 mA to 16 mA		0.17 mA
16 mA to 20 mA		0.19 mA
20 mA to 60 mA	40 Hz	0.022 mA
60 mA to 100 mA		0.030 mA
100 mA to 120 mA		0.034 mA
120 mA to 200 mA		0.015 mA
20 mA to 60 mA	50 Hz to 1 kHz	0.013 mA
60 mA to 100 mA		0.018 mA
100 mA to 120 mA		0.020 mA
150 mA to 160 mA		0.083 mA
160 mA to 200 mA		0.090 mA
20 mA to 40 mA	1 kHz to 3 kHz	0.0079 mA
40 mA to 60 mA		0.012 mA
60 mA to 100 mA		0.020 mA
100 mA to 120 mA		0.024 mA
120 mA to 160 mA		0.12 mA
160 mA to 200 mA		0.13 mA
20 mA to 40 mA	3 kHz to 5 kHz	0.0079 mA
40 mA to 60 mA		0.012 mA
60 mA to 100 mA		0.020 mA
100 mA to 120 mA		0.024 mA
120 mA to 160 mA		0.11 mA
160 mA to 200 mA		0.12 mA

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
20 mA to 40 mA	5 kHz to 10 kHz	0.060 mA
40 mA to 60 mA		0.084 mA
60 mA to 100 mA		0.14 mA
100 mA to 120 mA		0.16 mA
120 mA to 160 mA		0.62 mA
160 mA to 200 mA		0.70 mA
20 mA to 40 mA	10 kHz to 30 kHz	0.27 mA
40 mA to 60 mA		0.35 mA
60 mA to 100 mA		0.51 mA
100 mA to 120 mA		0.58 mA
120 mA to 160 mA		0.95 mA
160 mA to 200 mA		1.2 mA
0.2 A to 0.6 A	40 Hz	0.00022 A
0.6 A to 1 A		0.00030 A
1 A to 1.2 A		0.00034 A
1.2 A to 1.6 A		0.00099 A
1.6 A to 2.0 A		0.0012 A
0.2 A to 0.6 A	50 Hz	0.00020 A
0.6 A to 1 A		0.00025 A
1 A to 1.2 A		0.00029 A
1.2 A to 1.6 A		0.00069 A
1.6 A to 2.0 A		0.00078 A
0.2 A to 0.6 A	50 Hz to 1 kHz	0.00017 A
0.6 A to 1 A		0.00025 A
1 A to 1.2 A		0.00029 A
1.2 A to 1.6 A		0.00069 A
1.6 A to 2.0 A		0.00078 A
0.2 A to 0.6 A	1 kHz to 5 kHz	0.00020 A
0.6 A to 1 A		0.00028 A
1 A to 1.2 A		0.00032 A
1.2 A to 1.6 A		0.00078 A
1.6 A to 2.0 A		0.00090 A
0.2 A to 0.6 A	5 kHz to 10 kHz	0.0015 A
0.6 A to 1 A		0.0023 A
1 A to 1.2 A		0.0027 A
1.2 A to 1.6 A		0.0037 A
1.6 A to 2.0 A		0.0044 A

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
0.2 A to 0.6 A 0.6 A to 1 A	10 kHz to 30 kHz	0.0015 A 0.0023 A
2 A to 6 A 6 A to 10 A 10 A to 12 A 12 A to 16 A 16 A to 20 A	40 Hz	0.0028 A 0.0040 A 0.0046 A 0.023 A 0.027 A
2 A to 6 A 6 A to 10 A 10 A to 12 A 12 A to 16 A 16 A to 20 A	50 Hz to 1 kHz	0.0020 A 0.0029 A 0.0034 A 0.017 A 0.020 A
2 A to 6 A 6 A to 10 A 10 A to 12 A 12 A to 16 A 16 A to 20 A	1 kHz to 5 kHz	0.0026 A 0.0038 A 0.0044 A 0.072 A 0.088 A
2 A to 4 A 4 A to 8 A 6 A to 10 A	5 kHz to 10 kHz	0.0088 A 0.017 A 0.021 A
20 A to 24 A 24 A to 30 A	40 Hz	0.030 A 0.035 A
20 A to 24 A 24 A to 30 A	50 Hz to 1 kHz	0.022 A 0.025 A
20 A to 21 A 21 A to 30 A	1 kHz to 5 kHz	0.092 A 0.13 A
Clamp Meter Measurement (AC Current) (Lab)	TP-E-CUR-02 ver 0.0	
10 A 10 A to 300 A 300 A to 400 A 400 A to 950 A	50 Hz t0 450 Hz 50 Hz t0 450 Hz 50 Hz t0 300 Hz 50 Hz t0 100 Hz	1.4 % 1.3 % 1.3 % 1.3 %

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
D.8 Stopwatch Oscillator Measurement (Lab)	TP-E-TIM-02 ver 0.0	
32768 Hz		0.038 Hz
D.9 Stopwatch (Lab)	TP-E-TIM-01 ver 0.0	
≥ 1 s to 3 hrs		0.06 s
> 3 hrs to 5 hrs		0.07 s
> 5 hrs to 10 hrs		0.16 s
> 10 hrs to 20 hrs		0.34 s
> 20 hrs to 24 hrs		0.35 s
D.10 Tachometer (Non - Contact) (Lab)	TP-E-THM-01 ver 0.0	
0 to 99 rpm		0.001 rpm
> 99 to 990 rpm		0.01 rpm
> 990 to 9990 rpm		0.1 rpm
> 9990 to 99990 rpm		1 rpm
D.11 DC Voltage (Source) (Lab)	TP-E-VOL-03 ver 0.0	
0 mV - 1 mV		0.00022 mV
1 mV - 10 mV		0.00029 mV
10 mV - 20 mV		0.00036 mV
20 mV - 80 mV		0.0013 %
80 mV - 100 mV		0.00097 %
100 mV - 0.2 V		0.00050 %
0.2 V - 10 V		0.00038 %
10 V - 40 V		0.00060 %
40 V - 100 V		0.00050 %
100 V - 400 V		0.00075 %
400 V - 1000 V		0.00055 %
D.12 DC Current (Source) (Lab)	TP-E-CUR-03 ver 0.0	
0 µA - 1 µA		0.00042 µA
1 µA - 5 µA		0.00046 µA
5 µA - 10 µA		0.00051 µA
10 µA - 20 µA		0.00061 µA
40 µA - 100 µA		0.0021 %
100 µA - 0.2 mA		0.0030 %
0.2 mA - 0.4 mA		0.0020 %
0.4 mA - 1 mA		0.0017 %

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
1 mA - 2 mA		0.0035 %
2 mA - 10 mA		0.0025 %
10 mA - 40 mA		0.011 %
40 mA - 100 mA		0.0077 %
100 mA - 0.2 A		0.065 %
0.2 A - 0.6 A		0.040 %
0.6 A - 1.5 A		0.027 %
1.5 A - 3 A		0.045 %
3 A - 10 A		0.035 %
10 A - 12 A		0.10 %
15 A - 21 A		0.087 %
21 A - 30 A		0.075 %
D.13 Resistance (Source) (Lab)	TP-E-RES-02 ver 0.0	
0 Ω to 1 Ω		0.000025 Ω
1 Ω to 2 Ω		0.000036 Ω
2 Ω to 4 Ω		0.000056 Ω
4 Ω to 8 Ω		0.000097 Ω
8 Ω to 10 Ω		0.00012 Ω
10 Ω to 20 Ω		0.00014 Ω
20 Ω to 60 Ω		0.00062 Ω
60 Ω to 100 Ω		0.00099 Ω
0.1 kΩ to 0.2 kΩ		0.0000024 kΩ
0.2 kΩ to 0.6 kΩ		0.0000061 kΩ
0.6 kΩ to 1.0 kΩ		0.0000098 kΩ
1 kΩ to 2 kΩ		0.000024 kΩ
2 kΩ to 6 kΩ		0.000062 kΩ
6 kΩ to 10 kΩ		0.000099 kΩ
10 kΩ to 20 kΩ		0.00025 kΩ
20 kΩ to 60 kΩ		0.00063 kΩ
60 kΩ to 100 kΩ		0.0011 kΩ
0.1 MΩ to 0.2 MΩ		0.0000032 MΩ
0.2 MΩ to 0.6 MΩ		0.0000076 MΩ
0.6 MΩ to 1 MΩ		0.000012 MΩ
1 MΩ to 2 MΩ		0.00015 MΩ
2 MΩ to 6 MΩ		0.00022 MΩ
6 MΩ to 10 MΩ		0.00030 MΩ
10 MΩ to 20 MΩ		0.013 MΩ
20 MΩ to 60 MΩ		0.018 MΩ
60 MΩ to 100 MΩ		0.023 MΩ

MEASURED QUANTITIES / INSTRUMENTS / RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
0.1 GΩ to 0.2 GΩ		0.0013 GΩ
0.2 GΩ to 0.6 GΩ		0.0019 GΩ
0.6 GΩ 1.0 GΩ		0.0024 GΩ
Fixed Resistance		
10 Ω		0.00012 Ω
25 Ω		0.00029 Ω
100 Ω		0.00099 Ω
Fixed Resistance (AC, at 75 Hz)		
10 Ω		0.0040 Ω
25 Ω		0.0075 Ω
100 Ω		0.030 Ω

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

Approved signatories

Mr. Bernard Lim - All Scopes.

Mr. Benson Ong Boon Hor - All Scopes.

Mr. Raj Kumar - A1 only and B.

Note :

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025:2017. A laboratory's fulfilment of the requirements of ISO/IEC 17025:2017 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 17025:2017 (Section 4) are written in language relevant to laboratory operations and meet the principles of ISO 9001:2015 **Quality Management Systems — Requirements** and are aligned with its pertinent requirements.