SINGAPORE LABORATORY ACCREDITATION SCHEME

Accredited Laboratory SAC-SINGLAS

Schedule

OPUS Precision Instruments Pte Ltd
Blk 10 Ubi Crescent
#07-26
UBI Techpark Lobby B
Singapore 408564

Certificate No. : LA-2005-0324-C

Issue No. : 16

Date : 10 January 2019

FIELD OF TESTING : Calibration and Measurement

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
A. DIMENSIONAL METROLOGY		
1. Bevel Protractor	BS 1685 : 2008	
i Straightness & Parallelism	Opus in-house procedure OPCP-01A, R2	0.0001 inch
ii Indication of Error		5 min
2. Bore Gauge 0 – 2 mm (Plunger Travel)	JIS B 7515 : 1982 Opus in-house procedure OPCP-02A, R2	2 µm
3. Vernier Caliper Up to 1000 mm	JIS B 7507 : 1993 Opus in-house procedure OPCP-03A, R2	12 µm
4. Caliper Checker	Opus in-house procedure OPCP-04A, R2	
up to 600mm		1.3 µm
Parallelism		1.2 µm
5. Dial Caliper Gauge / Dial Thickness Gauge Up to 50 mm	Opus in-house procedure OPCP-05A, R2	1 µm
6. Dial Gauge Tester up to 50mm	Opus in-house procedure OPCP-06A, R2	0.5 µm
7. Dial Indicator		
up to 10 mm	JIS B 7503 : 2011 DIN 879-1 : 1999 OPCP in-house procedure OPCP-07A, R2	0.6 µm
above 10 mm to 20 mm		1.0 µm
above 20 mm to 50 mm		1.4 µm
above 50 mm to 80 mm		2.0 µm
above 80 mm to 100 mm		2.7 µm

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
8. Dial Test Indicator	JIS B 7533 : 2015	
Up to 1 mm	Opus in-house procedure OPCP-08A, R2	0.6 µm
9. Digimatic Indicator	Opus in-house procedure OPCP-09A, R2	
0 to 30 mm		0.8 µm
0 to 60 mm		2.0 µm
10. Feeler Gauge	BS 957 : 2008	
Up to 1 mm	Opus in-house procedure OPCP-10A, R2	1.0 µm
11. Granite Surface Plate (Lab / on-site)	BS 817 : 2008 Opus in-house procedure OPCP-12A, R2	
Up to 3000 mm		
i Overall Flatness		2.0 µm
ii Variation from local flatness		1.0 µm
12. Linear Height Gauge (Lab / on-site)	Opus in-house procedure OPCP-13A, R2	
Up to 900mm		3 µm
13. Vernier Height Gauge	Opus in-house procedure OPCP-14A, R2	
up to 600 mm		10 µm
14. Height Setting Micrometer	ISO 7863 : 1984	
up to 300mm	Opus in-house procedure OPCP-15A, R2	1.4 µm
15. Holtest	DIN 863 Part 4 : 1999 &	
Up to 63 mm	Opus in-house procedure OPCP-16A, R2	1.8 µm
16. External Micrometer	Opus in-house procedure OPCP-17A, R2	
Up to 100 mm		1 µm
Above 100 mm to 300 mm		2 µm
Above 300 mm to 500 mm		3 µm
Above 500 mm to 1000mm		5 µm

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
17. Internal & Stick Micrometer	BS 959 : 2008	
i. Micrometer Head - Up to 25 mm	Opus in-house procedure OPCP-18A, R2	2 µm
ii. Extension Rod – Up to 300 mm		4 µm
18. Depth Micrometer	BS 6468 : 2008	
Up to 300mm	Opus in-house procedure OPCP-19A, R2	2 µm
19. Pin Gauge / Plug Gauge	BS 969 : 2008 ,as a guide	
Up to 25 mm	Opus in-house procedure OPCP-20A, R2	0.5 µm
Up to 50 mm		1.2 µm
Up to 100 mm		1.2 µm
20. Plain Ring Gauge	BS 969 : 2008, as a guide	
3 mm to 30 mm	Opus in-house procedure OPCP-21B, R2	0.8 µm
Above 30 mm to 100 mm		1.2 µm
Above 100mm to 150mm		2.6 um
21. Profile Projector (Lab / on-site)	JIS B 7184 : 1999	
up to 200 mm	Opus in-house procedure OPCP-22A, R2	3 µm
22. Setting Rod for External Micrometer	Opus in-house procedure OPCP-24B, R2	
Up to 500 mm		1.2 µm
Above 500 mm to 1000 mm		2.0 µm
23. Thread Plug Gauge	ISO 1502 : 1996	
Up to 50 mm	ANSI / ASME B1.2 : 1983	
i. Pitch & Major Diameter	BS 919 Pt 1 to Pt 4 : 2007	1 µm
	BS 3643 Pt 1 & 2 : 2007	
ii. Pitch	BS 1580 Pt 1 & 3 : 2007	3 µm
iii. Flank Angle	Opus in-house procedure OPCP-26A, R2	3 min
24. Toolmaker Microscope	JIS B 7153 : 1995	3 µm
(Lab / on-site)	Opus in-house procedure OPCP-27A, R2	

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
25. Universal Length Measuring Up to 100 mm	Opus in-house procedure OPCP-31A, R2	0.5 µm
26. Vernier Depth Gauge Up to 600 mm	BS 6365: 2008 Opus in-house procedure OPCP-32A, R2	10 µm
27. Thickness Foils (Plastic) Up to 1100 µm	Opus in-house procedure OPCP-36A, R2	0.6 µm
28. Co-ordinate Measuring Machine 40 x 710 x 420 mm	ISO 10360-2 2009 as a guide Opus in-house procedure OPCP-25A	8.0 µm
B. FORCE MEASUREMENT		
1. Push / Pull Gauge up to 500 gf above 0.5 kgf to 5 kgf above 5 kgf to 10 kgf above 10 kgf to 50 kgf	Opus in-house procedure OPCP-23C R2	 0.2 gf 0.002 kgf 0.01 kgf 0.02 kgf
2. Torque Gauge / Torque Meter up to 1.5 kgf.cm up to 3.6 kgf.cm up to 9 kgf.cm up to 15 kgf.cm	Opus in-house procedure OPCP-28A R2	 0.004 kgf.cm 0.01 kgf.cm 0.02 kgf.cm 0.1 kgf.cm
3. Weighing Scale (Lab/ On-site) up to 310 g, Resolution: 0.0001g up to 620 g, Resolution: 0.001g up to 5.2 kg, Resolution: 0.01g up to 30 kg, Resolution: 1g up to 100 kg, Resolution: 10g up to 150 kg, Resolution: 20g	Opus in-house procedure OPCP-30A R2	 0.0018 g 0.003 g 0.05 g 1 g 10 g 20 g

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
C. PRESSURE INSTRUMENTS (Lab & On-Site)		
1. Pressure Measuring Devices Pneumatic Pressure Gauges Chart/Pen recorders Digital Indicators Manometers Data loggers Calibrators Oil free & Oxygen Gauges Oil Pressure Gauges	Opus in-house procedure OPCP-033A R3	
0 to 30 psi		0.07 % of F.S
0 to 300 psi		0.03 % of F.S
0 to 1000 psi		0.03 % of F.S
0 to 3000 psi		0.03 % of F.S
0 to 10000 psi		0.03 % of F.S
0 to 30000 psi		0.29 % of F.S
2. Pressure Switches (Pneumatic Service/ Oil free & Oxygen Service/ Hydraulic Oil)	Opus in-house procedure OPCP-034A R2	
0 to 30 psi		0.07 % of F.S
0 to 300 psi		0.03 % of F.S
0 to 1000 psi		0.03 % of F.S
0 to 3000 psi		0.03 % of F.S
0 to 10000 psi		0.03 % of F.S
0 to 30000 psi		0.16 % of F.S

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
3. Pressure Transmitter (Pneumatic Service/ Oil free & Oxygen Service/ Hydraulic Oil)	Opus in-house procedure OPCP-037A R2	
0 to 30 psi		0.12 % of F.S
0 to 300 psi		0.12 % of F.S
0 to 1000 psi		0.12 % of F.S
0 to 3000 psi		0.12 % of F.S
0 to 10000 psi		0.12 % of F.S
0 to 30000 psi		0.20 % of F.S
4. Pressure Transducer (Pneumatic Service/ Oil free & Oxygen Service/ Hydraulic Oil)	Opus in-house procedure OPCP-037A R2	
0 to 30 psi		0.04 % of F.S
0 to 300 psi		0.03 % of F.S
0 to 1000 psi		0.03 % of F.S
0 to 3000 psi		0.03 % of F.S
0 to 10000 psi		0.03 % of F.S
0 to 30000 psi		0.16 % of F.S
D. ELECTRICAL (Lab & Site)		
1. DC Voltage Measuring	Opus in-house procedure OPCP-053A R2	
0 ~ 50 mV		0.006 mV
50 ~ 100 mV		0.0077 mV
100 ~ 150 mV		0.01 mV
150 ~ 202 mV		0.012 mV
0.20 ~ 0.25 V		0.000015 V
0.25 ~ 0.50 V		0.000024 V
0.50 ~ 1.00 V		0.000041 V
1.00 ~ 2.02 V		0.00008 V
2.00 ~ 10.00 V		0.00034 V
10.00 ~ 20.20 V		0.0007 V
20 ~ 100 V		0.004 V
100 ~ 202 V		0.008 V
200 ~ 500 V		0.023 V
500 ~ 1000 V		0.04 V

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
2. DC Current Measuring	Opus in-house procedure OPCP-049A R2	
0 ~ 50 µA		0.041 µA
50 ~ 100 µA		0.047 µA
100 ~ 150 µA		0.053 µA
150 ~ 202 µA		0.059 µA
0.200 ~0.250 mA		0.00007 mA
0.250 ~ 0.500 mA		0.000093 mA
0.500 ~ 1.000 mA		0.00014 mA
1.00 ~ 2.02 mA		0.00024 mA
2.00 ~ 10.00 mA		0.00093 mA
10.00 ~ 20.2 mA		0.0016 mA
20 ~ 100 mA		0.013 mA
100 ~ 202 mA		0.023 mA
0.200 ~ 1.000 A		0.00022 A
1.000 ~ 2.020 A		0.00041 A
2 ~ 10 A		0.0051 A
10 ~ 20 A		0.011 A
20 ~ 30 A		0.1 A
3. AC Voltage Measuring	Opus in-house procedure OPCP-045A R2	
20 ~ 50 mV	10 to 44 Hz	0.19 mV
	45 to 999 Hz	0.063 mV
	1 to 19.999 kHz	0.23 mV
	20 to 99.999 kHz	2.6 mV
50 ~ 100 mV	10 to 44 Hz	0.3 mV
	45 to 999 Hz	0.082 mV
	1 to 19.999 kHz	0.26 mV
	20 to 99.999 kHz	2.6 mV
100 ~ 150 mV	10 to 44 Hz	0.41 mV
	45 to 999 Hz	0.11 mV
	1 to 19.999 kHz	0.29 mV
	20 to 99.999 kHz	2.6 mV
150 ~ 202 mV	10 to 44 Hz	0.53 mV
	45 to 999 Hz	0.13 mV
	1 to 19.999 kHz	0.33 mV
	20 to 99.999 kHz	2.7 mV
0.200 ~ 0.250 V	10 to 44 Hz	0.00099 V
	45 to 999 Hz	0.00046 V
	1 to 19.999 kHz	0.0023 V
	20 to 99.999 kHz	0.0038 V
	100 to 500 kHz	0.026 V

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
0.250 ~ 0.500 V	10 to 44 Hz 45 to 999 Hz 1 to 19.999 kHz 20 to 99.999 kHz 100 to 500 kHz	0.0016 V 0.00053 V 0.0023 V 0.0044 V 0.026 V
0.500 ~ 1.000 V	10 to 44 Hz 45 to 999 Hz 1 to 19.999 kHz 20 to 99.999 kHz 100 to 500 kHz	0.0028 V 0.0007 V 0.0025 V 0.0057 V 0.027 V
1.00 ~ 2.020 V	10 to 44 Hz 45 to 999 Hz 1 to 19.999 kHz 20 to 99.999 kHz 100 to 500 kHz	0.0052 V 0.0012 V 0.0032 V 0.0085 V 0.03 V
2.00 ~ 10.00 V	40 to 44 Hz 45 to 999 Hz 1 to 19.999 kHz	0.027 V 0.0086 V 0.022 V
10.0 ~ 20.2 V	40 to 44 Hz 45 to 999 Hz 1 to 19.999 kHz	0.051 V 0.012 V 0.027 V
20.0 ~ 100 V	40 to 44 Hz 45 to 999 Hz	0.096 V 0.13 V
100 ~ 202 V	40 to 44 Hz 45 to 999 Hz	0.2 V 0.16 V
200 ~ 500 V	40 to 44 Hz 45 to 999 Hz	0.71 V 0.48 V
500 ~ 1000 V	46 to 999 Hz 1 to 10 kHz	0.76 V 2.3 V

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
4. AC Current Measuring	Opus in-house procedure OPCP-041A R2	
20 ~ 50 µA	40 to 44 Hz 45 to 999 Hz	0.49 µA 0.34 µA
50 ~ 100 µA	40 to 44 Hz 45 to 999 Hz	0.59 µA 0.38 µA
100 ~ 150 µA	40 to 44 Hz 45 to 999 Hz	0.69 µA 0.42 µA
150 ~ 202 µA	40 to 44 Hz 45 to 999 Hz	0.8 µA 0.46 µA
0.200 ~ 0.250 mA	40 to 44 Hz 45 to 999 Hz	0.0029 mA 0.00089 mA
0.250 ~ 0.500 mA	40 to 44 Hz 45 to 999 Hz	0.0032 mA 0.0011 mA
0.500 ~ 1.000 mA	40 to 44 Hz 45 to 999 Hz	0.0039 mA 0.0014 mA
1.00 ~ 2.02 mA	40 to 44 Hz 45 to 999 Hz	0.0059 mA 0.002 mA
2 ~ 10 mA	40 to 44 Hz 45 to 999 Hz	0.029 mA 0.014 mA
10 ~ 20.2 mA	40 to 44 Hz 45 to 999 Hz	0.059 mA 0.02 mA
20 ~ 100 mA	40 to 44 Hz 45 to 999 Hz	0.39 mA 0.13 mA
100 ~ 202 mA	40 to 44 Hz 45 to 999 Hz	0.59 mA 0.2 mA

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
0.200 ~ 1.000 A	40 to 44 Hz 45 to 999 Hz	0.0039 A 0.0023 A
1.000 ~ 2.02 A	40 to 44 Hz 45 to 999 Hz	0.0059 A 0.0031 A
2.000 ~ 10 A	30 to 44 Hz 45 to 99 Hz 0.10 to 1 kHz	0.039 A 0.016 A 0.041 A
10 ~ 20 A	30 to 44 Hz 45 to 99 Hz 0.10 to 1 kHz	0.053 A 0.025 A 0.075 A
20 ~ 30 A	30 to 44 Hz 45 to 99 Hz 0.10 to 1 kHz	0.077 A 0.036 A 0.11 A
5. Resistance Measuring (Passive) - 2 wire	Opus in-house procedure OPCP-038A R2	
174.00 mΩ 273.00 mΩ 1.24000 Ω 10.18200 Ω 100.2020 Ω 1.000218 kΩ 10.00050 kΩ 100.0005 kΩ 0.999919 MΩ 9.99726 MΩ 99.885 MΩ 993.0 MΩ		47 mΩ 47 mΩ 0.047 Ω 0.048 Ω 0.052 Ω 0.00014 kΩ 0.00097 kΩ 0.0094 kΩ 0.00017 MΩ 0.0046 MΩ 0.59 MΩ 12 MΩ
6. Resistance Measuring (Passive) - 4 wire	Opus in-house procedure OPCP-039A R2	
0 mΩ 100.00 mΩ 1.00310 Ω 10.00681 Ω 100.00365 Ω 1.0000129 kΩ 10.000489 kΩ 100.0005 kΩ		5.8 mΩ 5.8 mΩ 0.0059 Ω 0.007 Ω 0.012 Ω 0.000093 kΩ 0.00093 kΩ 0.0093 kΩ

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
7. Capacitance Measuring	Opus in-house procedure OPCP-046A R2	
0.9948 nF	1 kHz	0.027 nF
10.1060 nF		0.06 nF
20.0600 nF		0.2 nF
50.280 nF		0.3 nF
99.79 nF		0.4 nF
1.0024 µF		0.005 µF
10.166 µF		0.08 µF
8. Simulated Resistance Measuring	Opus in-house procedure OPCP-038A R2	
0 ~ 10 Ω		0.093 Ω
10 ~ 100 Ω		0.093 Ω
0.100 ~ 1.000 kΩ		0.00041 kΩ
1 ~ 10 kΩ		0.0036 kΩ
10 ~ 100 kΩ		0.035 kΩ
0.10 ~ 1 MΩ		0.00035 MΩ
1 ~ 10 MΩ		0.0036 MΩ
9. Frequency Measuring	Opus in-house procedure OPCP-055A R2	
3 ~ 10 Hz		0.00024 Hz
10 Hz ~ 100 Hz		0.0024 Hz
100 Hz ~ 1000 Hz		0.024 Hz
1 kHz ~ 10 kHz		0.00024 kHz
10 kHz ~ 100 kHz		0.0024 kHz
100 kHz ~ 1000 kHz		0.024 kHz
10. DC Current Clamp Measuring	Opus in-house procedure OPCP-049A R2	
0.1 ~ 0.5 A		0.11 A
0.5 A ~ 1 A		0.12 A
1 ~ 10 A		0.17 A
10 ~ 50 A		0.4 A
50 ~ 100 A		0.9 A
100 ~ 500 A		4 A
500 ~ 1000 A		6 A
1000 ~ 1500 A		9 A
11. AC Current Clamp Measuring	Opus in-house procedure OPCP-041A R2 30 Hz to 60 Hz	
0.1 ~ 0.5 A		0.11 A
0.5 A ~ 1 A		0.12 A
1 ~ 10 A		0.17 A
10 ~ 50 A		0.5 A

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
50 ~ 100 A		0.9 A
100 ~ 500 A		4 A
500 ~ 1000 A		6 A
1000 ~ 1500 A		9 A
12. Optical Tachometer Measuring (Non-Contact Tachometer)	Opus in-house procedure OPCP-059A R2	
240 ~ 1000 RPM		2 RPM
1000 ~ 5000 RPM		2 RPM
5000 ~ 10000 RPM		2 RPM
10000 ~ 30000 RPM		2 RPM
30000 ~ 60000 RPM		3 RPM
13. Insulation Resistance Measuring	Opus in-house procedure OPCP-057A R2	
10 ~ 50 kΩ		0.12 kΩ
50 ~ 100 kΩ		0.24 kΩ
100 ~ 500 kΩ		1.2 kΩ
0.50 ~1.00 MΩ		0.0024 MΩ
1 ~ 5 MΩ		0.012 MΩ
5 ~ 10 MΩ		0.35 MΩ
10 ~ 50 MΩ		1.8 MΩ
50 ~ 100 MΩ		3.5 MΩ
100 ~ 500 MΩ		18 MΩ
500 ~ 1000 MΩ		36 MΩ
1000 ~ 2000 MΩ		70 MΩ
14. Insulation Test Voltage Measuring	Opus in-house procedure OPCP-058A R2	
0 ~ 50 V		0.32 V
50 V ~ 100 V		0.61 V
100 V ~ 250 V		1.5 V
250 V ~ 500 V		3 V
500 V ~ 1000 V		5.8 V
15. Continuity Resistance Measuring	Opus in-house procedure OPCP-047A R2	
1 Ω		0.061 Ω
10 Ω		0.081 Ω
19 Ω		0.11 Ω
100 Ω		0.29 Ω
190 Ω		0.54 Ω
1000 Ω		2.4 Ω

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
16. DC Voltage Sourcing	Opus in-house procedure OPCP-052A R2	
0 ~ 100 mV		0.0085 mV
0.100 ~ 1 V		0.000038 V
1 ~ 10 V		0.00034 V
10 ~ 100 V		0.0052 V
100 ~ 500 V		0.036 V
500 ~ 1000 V		0.06 V
17. AC Voltage Sourcing	Opus in-house procedure OPCP-044A R2	
1 ~ 100 mV	10 to 20 kHz	0.13 mV
0.100 ~ 1 V		0.0011 V
1 ~ 10 V		0.011 V
10 ~ 100 V		0.11 V
100 ~ 500 V		0.63 V
500 ~ 1000 V		1.1 V
18. DC Current Sourcing	Opus in-house procedure OPCP-048A R2	
0 ~ 100 µA		0.088 µA
0.100 ~ 1 mA		0.00064 mA
1 ~ 10 mA		0.0082 mA
10 ~ 100 mA		0.064 mA
100 ~ 400 mA		0.26 mA
0.400 ~ 1 A		0.00082 A
1 ~ 3 A		0.0042 A
3 ~ 10 A		0.02 A
19. AC Current Sourcing	Opus in-house procedure OPCP-040A R2	
20 ~ 100 µA	10 Hz to 1 kHz	0.25 µA
0.100 ~ 1 mA		0.0017 mA
1 ~ 10 mA		0.026 mA
10 ~ 100 mA		0.17 mA
100 ~ 400 mA		0.94 mA
0.400 ~ 1 A		0.0017 A
1 ~ 3 A		0.0075 A
3 ~ 10 A		0.025 A
20. Resistance Sourcing	Opus in-house procedure OPCP-061A R2	
1 ~ 10 Ω		0.0047 Ω
10 ~ 100 Ω		0.017 Ω
0.100 ~ 1 kΩ		0.00013 kΩ
1 ~ 10 kΩ		0.0013 kΩ
10 ~ 100 kΩ		0.013 kΩ
0.1 ~ 1 MΩ		0.00013 MΩ
1 ~ 10 MΩ		0.0048 MΩ

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
21. Frequency Sourcing	Opus in-house procedure OPCP-054A R2	
3 ~ 100 Hz		0.012 Hz
100 Hz ~ 1000 Hz		0.12 Hz
1 kHz ~ 10 kHz		0.0012 kHz
10 ~ 100 kHz		0.012 kHz
100 kHz ~ 1000 kHz		0.12 kHz
22. DC Power Measuring	Opus in-house procedure OPCP-051A R2	
0.3 ~ 10 W		0.011 W
10 ~ 100 W		0.2 W
100 ~ 500 W		0.99 W
0.500 ~ 1.000 kW		0.0013 kW
1 kW ~ 12 kW		0.01 kW
23. AC Power Measuring	Opus in-house procedure OPCP-043A R2	
0.3 ~ 10 W	40 Hz to 400 Hz	0.12 W
10 ~ 100 W		0.64 W
100 ~ 500 W		1.6 W
0.500 ~ 1.000 kW		0.0021 kW
1 kW ~ 12 kW		0.016 kW
24. Timer / Stopwatch	Opus in-house procedure OPCP-060A R2	
1 s ~ 10 s		0.12 s
10 s ~ 60 s		0.12 s
60 s ~ 300 s		0.12 s
300 s ~ 600 s		0.12 s
600 s ~ 1200 s		0.12 s
1200 s ~ 1800 s		0.13 s
1800 s ~ 3000 s		0.13 s
3000 s ~ 3600 s		0.15 s
3600 s ~ 5400 s		0.15 s
5400 s ~ 18000 s		0.17 s
18000 s ~ 36000 s		0.26 s
36000 s ~ 54000 s		0.36 s
25. DC High Voltage Sourcing	Opus in-house procedure OPCP-050A R2	
0 ~ 1 kV		0.03 kV
1 ~ 5 kV		0.12 kV
5 ~ 10 kV		0.24 kV
10 ~ 20 kV		0.5 kV
20 ~ 30 kV		0.4 kV
30 ~ 40 kV		1 kV

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
26. AC High Voltage Sourcing	Opus in-house procedure OPCP-042A R2	
0.01 kV ~ 1 kV	50 Hz	0.07 kV
1 kV ~ 5 kV		0.29 kV
5 kV ~ 10 kV		0.58 kV
10 kV ~ 20 kV		1.2 kV
20 kV ~ 28 kV		1.7 kV
27. Milli-Ohm Meter / Continuity Tester	Opus in-house procedure OPCP-056A R2	
10 mΩ		0.14 mΩ
22 mΩ		0.28 mΩ
30 mΩ		0.36 mΩ
51 mΩ		0.61 mΩ
100 mΩ		1.17 mΩ
500 mΩ		5.79 mΩ
1 Ω		0.0114 Ω
2 Ω		0.0226 Ω
5 Ω		0.0572 Ω
10 Ω		0.122 Ω
20 Ω		0.232 Ω
50 Ω		0.574 Ω
100 Ω		1.142 Ω
200 Ω		2.29 Ω
500 Ω		5.76 Ω
1000 Ω		11.27 Ω
28. High Voltage Insulation Resistance Measuring	Opus in-house procedure OPCP-056A R2	
500 kΩ		5.77 kΩ
1 MΩ		0.0115 MΩ
2 MΩ		0.0232 MΩ
4 MΩ		0.0463 MΩ
5 MΩ		0.0581 MΩ
10 MΩ		0.1159 MΩ
20 MΩ		0.233 MΩ
30 MΩ		0.349 MΩ
40 MΩ		0.464 MΩ
50 MΩ		0.583 MΩ
100 MΩ		1.156 MΩ
200 MΩ		2.31 MΩ
500 MΩ		5.78 MΩ
1000 MΩ		11.62 MΩ
2000 MΩ		24 MΩ
5000 MΩ		59 MΩ

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
E. TEMPERATURE (Lab)		
1. Temperature Indicator/Controller, Digital Thermometer & Temperature Measuring Instruments	(Electrical Simulation) Opus in-house procedure OPCP-062A R2 & OPCP-063A R2	
Thermocouple Simulation - Type J		
-210 °C to -100 °C		0.38 °C
-100 °C to -30 °C		0.3 °C
-30 °C to 150 °C		0.29 °C
150 °C to 760 °C		0.31 °C
760 °C to 1200 °C		0.35 °C
Thermocouple Simulation - Type K		
-200 °C to -100 °C		0.42 °C
-100 °C to -25 °C		0.32 °C
-25 °C to 120 °C		0.3 °C
120 °C to 1000 °C		0.36 °C
1000 °C to 1370 °C		0.41 °C
Thermocouple Simulation - Type T		
-250 °C to -150 °C		0.78 °C
-150 °C to 0 °C		0.3 °C
0 °C to 120 °C		0.29 °C
120 °C to 400 °C		0.3 °C
Thermocouples Simulation - Type R		
-0 °C to 250 °C		1 °C
250 °C to 1000 °C		0.6 °C
1000 °C to 1760 °C		0.66 °C
Thermocouple Simulation - Type S		
0 °C to 250 °C		1 °C
250 °C to 1000 °C		0.6 °C
1000 °C to 1760 °C		0.66 °C

	MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
	Thermocouples Simulation - Type N		
	-200 °C to -100 °C		0.57 °C
	-100 °C to -25 °C		0.36 °C
	-25 °C to 120 °C		0.33 °C
	120 °C to 410 °C		0.32 °C
	410 °C to 1300 °C		0.39 °C
	Thermocouple Simulation - Type E		
	-250 °C to -100 °C		0.65 °C
	-100 °C to -25 °C		0.29 °C
	-25 °C to 350 °C		0.29 °C
	350 °C to 650 °C		0.3 °C
	650 °C to 1000 °C		0.32 °C
2.	Temperature Calibrator / Sourcing Instruments	(Electrical Simulation) Opus in-house procedure OPCP-064A R2	
	Thermocouple Measuring - Type J		
	-210 °C to -100 °C		0.6 °C
	-100 °C to -30 °C		0.6 °C
	-30 °C to 150 °C		0.6 °C
	150 °C to 760 °C		0.5 °C
	760 °C to 1200 °C		0.6 °C
	Thermocouple Measuring - Type K		
	-200 °C to -100 °C		0.6 °C
	-100 °C to -25 °C		0.5 °C
	-25 °C to 120 °C		0.5 °C
	120 °C to 1000 °C		0.6 °C
	1000 °C to 1370 °C		0.6 °C
	Thermocouple Measuring- Type T		
	-250 °C to -150 °C		1.0 °C
	-150 °C to 0 °C		0.7 °C
	0 °C to 120 °C		0.7 °C
	120 °C to 400 °C		0.5 °C

	MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
	Thermocouple Measuring- Type R		
	-0 °C to 250 °C		1.7 °C
	250 °C to 1000 °C		1.5 °C
	1000 °C to 1760 °C		1.5 °C
	Thermocouple Measuring- Type S	Opus in-house procedure OPCP-064A R2	
	0 °C to 250 °C		1.6 °C
	250 °C to 1000 °C		1.4 °C
	1000 °C to 1760 °C		1.3 °C
	Thermocouple Measuring- Type N		
	-200 °C to -100 °C		0.9 °C
	-100 °C to -25 °C		0.8 °C
	-25 °C to 120 °C		0.7 °C
	120 °C to 410 °C		0.7 °C
	410 °C to 1300 °C		0.8 °C
	Thermocouple Measuring- Type E		
	-250 °C to -100 °C		0.8 °C
	-100 °C to -25 °C		0.6 °C
	-25 °C to 350 °C		0.5 °C
	350 °C to 650 °C		0.5 °C
	650 °C to 1000 °C		0.5 °C
3.	RTD Indicator / Digital Thermometer	Opus in-house procedure OPCP-065A R2	
	PRT100- 4 wire		
	-100.010 °C		0.06 °C
	0.031 °C		0.03 °C
	30.034 °C		0.04 °C
	60.040 °C		0.05 °C
	99.959 °C		0.06 °C
	199.95 °C		0.08 °C
	399.85 °C		0.09 °C
	799.47 °C		0.1 °C

Schedule

Accredited Laboratory SAC-SINGLAS

Certificate No. : LA-2005-0324-C Issue No. : 16

Date : 10 January 2019 Page : 19 of 19

MEASURED QUANTITIES / INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITY (CMC*)
RTD Indicator / Digital Thermometer (2 wire)	Opus in-house procedure OPCP-065A R2	
PRT25		
-200 °C to 0 °C		0.58 °C
0 °C to 800 °C		0.7 °C
PRT100		
-200 °C to 0 °C		0.16 °C
0 °C to 800 °C		0.64 °C
PRT250		
-200 °C to 0 °C		0.29 °C
0 °C to 800 °C		0.35 °C
PRT500		
-200 °C to 0 °C		0.12 °C
0 °C to 800 °C		1.04 °C
PRT1000		
-200 °C to 0 °C		0.1 °C
0 °C to 800 °C		0.52 °C

Approved Signatories :

Mr Peter Foo) For categories A, B, C and D only.

Mr Balaji Mahalingam) For categories C, D and E only.

Mr Ravindranath Premkumar) For A3, A5, A7 - A10, A12 - A13, A16, A19 - A20, A25 and A28 only.

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.