

NO: SAMM 375(Issue 2, 29 December 2019 replacement
of SAMM 375 dated 22 October 2019)

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LABORATORY LOCATION:
(PERMANENT LABORATORY)
UCAL TECH'S (M) SDN. BHD.
NO. 8, 8A, JALAN SHAHBANDAR 2
TAMAN UNGKU TUN AMINAH
81300 SKUDAI, JOHOR BAHRU
JOHOR DARUL TAKZIM
MALAYSIA
FIELDS OF CALIBRATION:
DIMENSIONAL, MASS, PRESSURE, ELECTRICAL &
TEMPERATURE

This laboratory has demonstrated its technical competence to operate in accordance with MS ISO/IEC 17025:2017 (ISO/IEC 17025:2017).

This laboratory's fulfillment 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 and calibrations. The management system requirements in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001 (see Joint ISO-ILAC-IAF Communiqué dated April 2017).

* The expanded uncertainties are based on an estimated confidence probability of approximately 95% and have a coverage factor of $k=2$ unless stated otherwise.

SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
External micrometer	25 mm 25 mm spindle travel for 50 mm to 100 mm 100 mm to 175 mm frame	1.0 μ m 1.5 μ m 2.0 μ m	Measurement of instrument error, and parallelism and flatness of measuring faces based on JIS B7502:2016. Setting rod must be provided by customer.
Caliper (External & Internal)	up to 300 mm 300 mm to 600 mm	15 μ m 18 μ m	Measurement of instrument error based on JIS B7507:2016
Height gauge	up to 600 mm	20 μ m	Measurement of instrument error and parallelism of reference surface with measuring surface of scriber based on JIS B7517:1993

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Digital displacement indicator	up to 50 mm 50 mm to 100 mm	1.8 μ m 12 μ m	Calibrated using gauge block as standard
Plain plug gauge / Plain cylinder gauge (diameter only)	0.3 mm to 25 mm 25 mm to 50 mm	2 μ m 3 μ m	Calibrated using gauge block as standard and micrometer as comparator according to JIS B7420:1997
Feeler gauge	0.005 mm to 3 mm	1.8 μ m	Calibrated using digital displacement indicator as standard according to JIS B7524:2008
Dial test indicator	0 mm to 2 mm	3 μ m	Calibrated using gauge tester as standard according to JIS B7533:1990
Dial gauge	Up to 5 mm 5 mm to 20 mm	2.5 μ m 6.5 μ m	Calibrated by using gauge tester as standards according to JIS B7503:2017 Measurement of error of indication and repeatability only.
Thickness gauge	Up to 15 mm 15 mm to 50 mm	2 μ m 10 μ m	Calibrated by using gauge block as standard based on JIS B7519:1994
Thread plug gauge	0 mm to 25 mm 25 mm to 50 mm 50 mm to 75 mm	Major diameter: 1.8 μ m Pitch diameter: 2.8 μ m Major diameter: 2.0 μ m Pitch diameter: 2.8 μ m Major diameter: 2.5 μ m Pitch diameter: 3.0 μ m	Calibrated by using three-wire set and micrometer as standards based on JIS B0261:2004

Scan this QR Code or visit www.ism.gov.my/cab-directories for the current scope of accreditation**Signatories:**

1. **Manivannan A/L Subramaniam**
2. **Bhavani A/P Gopal Krishnan**

NO: SAMM 375(Issue 2, 29 December 2019 replacement
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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Measuring microscope (individual axis only)	Individual X and Y axis only Up to 300 mm	0.008 mm	Calibrated by using glass scale as standards based on JIS B 7153:1995
Surface plate flatness	500 mm x 500 mm 750 mm x 500 mm 1000 mm x 750 mm 2000 mm x 1000 mm	3 μ m 4.2 μ m 5 μ m 7.5 μ m	Calibrated using Precision Level Meter based on JIS B7513:1992

Signatories:

1. **Manivannan A/L Subramaniam**
2. **Bhavani A/P Gopal Krishnan**

NO: SAMM 375(Issue 2, 29 December 2019 replacement
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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Analytical balances	Up to 100 g Up to 200 g	0.46 mg 0.88 mg	Standard used OIML class F1 weighs
Weighing balances / Scales (mechanical, electronic)	Up to 500 g Up to 600 g Up to 1 kg Up to 2 kg Up to 5 kg Up to 6 kg	4.2 mg 4.3 mg 4.5 mg 8.7 mg 42 mg 43 mg	Standard used OIML class F1 weighs
	Up to 10 kg Up to 50 kg Up to 60 kg Up to 100 kg	1.7 g 8.5 g 8.7 g 17 g	Standard used OIML class M2 weighs

Signatories:

1. **Manivannan A/L Subramaniam**
2. **Bhavani A/P Gopal Krishnan**

NO: SAMM 375(Issue 2, 29 December 2019 replacement
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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*		Remarks
		Permanent	Site	
Pressure measuring devices (Pneumatic)	-0.8 bar to 20 bar	0.05 bar	0.13 bar	1. The pressure devices, gauges are calibrated according to in-house procedure LQP-54 and LQP-56 based on OIML R101 2. The calibration procedure covers the increasing and decreasing tests only
Pressure gauge (Hydraulic)	20 bar to 700 bar	0.3 bar	0.3 bar	
Pressure transmitter & transducer (Pneumatic)	0 bar to 20 bar	0.3 bar	-	

Signatory:

- Manivannan A/L Subramaniam**

NO: SAMM 375(Issue 2, 29 December 2019 replacement
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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Temperature Recorders/Indicators			
(a) Type T	-100 °C to 390 °C	0.6 °C	By electrical simulation using Temperature calibrator
(b) Type E	-100 °C to 0 °C 0 °C to 990 °C	0.6 °C 0.5 °C	
(c) Type K	-100 °C to 0 °C 0 °C to 1300 °C	0.5 °C 0.6 °C	
(d) Type R	0 °C to 1000 °C 1000 °C to 1700 °C	1.6 °C 1.4 °C	
(e) Type J	-100 °C to 0 °C 0 °C to 1100 °C	0.5 °C 0.4 °C	
(f) Type S	0 °C to 1000 °C 1000 °C to 1700 °C	1.6 °C 1.5 °C	
(i) Pt 100	-100 °C to 0 °C 0 °C to 800 °C	0.6 °C 0.7 °C	
Temperature Calibrator			
(a) Type T	-100 °C to 390 °C	0.6 °C	By electrical measurement using Temperature calibrator
(b) Type E	-100 °C to 990 °C	0.5 °C	
(c) Type K	-100 °C to 0 °C 0 °C to 1300 °C	0.5 °C 0.6 °C	

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
(d) Type R	0 °C to 1000 °C 1000 °C to 1700 °C	1.5 °C 1.4 °C	By electrical measurement using Temperature calibrator
(e) Type J	-100 °C to 1100 °C	0.5 °C	
(f) Type S	0 °C to 1000 °C 1000 °C to 1700 °C	1.5 °C 1.4 °C	
(i) Pt 100	-100 °C to 800 °C	0.6 °C	
Thermohygrometer / Thermohygrograph	40 %RH to 90 %RH 20 °C to 30 °C	4.5 %RH 1 °C	Comparison with temperature / humidity reference meter in humidity chamber
Temperature Sensor	0 °C	0.8 °C	Comparison with reference Thermometer with sensor in ice point
	50 °C to 350 °C	1 °C	Comparison with reference thermal block calibrator
Mechanical Thermometer	0 °C	1.5 °C	Comparison with reference Thermometer with sensor in ice point
	50 °C to 350 °C	2 °C	Comparison with reference thermal block calibrator
Radiation Thermometer	0 °C	0.8 °C	Comparison with reference Pt100 in ice point
	30 °C to 400 °C	3.6 °C	Comparison with Blackbody temperature calibrator

Signatories:

1. Manivannan A/L Subramaniam
2. Bhavani A/P Gopal Krishnan

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Temperature Recorders/Indicators			By electrical simulation using Temperature calibrator
(a) Type T	-100 °C to 0 °C 0 °C to 390 °C	0.7 °C 0.6 °C	
(b) Type E	-100 °C to 0 °C 0 °C to 990 °C	0.6 °C 0.5 °C	
(c) Type K	-100 °C to 0 °C 0 °C to 1300 °C	0.5 °C 0.6 °C	
(d) Type R	0 °C to 1000 °C 1000 °C to 1700 °C	1.6 °C 1.4 °C	
(e) Type J	-100 °C to 0 °C 0 °C to 1000 °C	0.5 °C 0.4 °C	
(f) Type S	0 °C to 1000 °C 1000 °C to 1700 °C	1.6 °C 1.5 °C	
(i) Pt 100	-100 °C to 0 °C 0 °C to 800 °C	0.6 °C 0.7 °C	
Temperature Sensor with Indicator	-35 °C to 165 °C	0.1 °C	

Signatories:

1. **Manivannan A/L Subramaniam**
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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Temperature controlled enclosure	-50 °C to 300 °C 300 °C to 950 °C	2 °C 3 °C	Using hybrid recorder and thermocouples based on AS2853:1986

Signatory:

1. **Manivannan A/L Subramaniam**

NO: SAMM 375(Issue 2, 29 December 2019 replacement
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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Sourcing Instruments			
DC voltage	100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.030 mV/V 0.025 mV/V 0.032 mV/V 0.035 mV/V	
AC voltage	100 mV to 10 V (Refer The Matrix A) 10 V to 750 V (Refer The Matrix B)	(Refer The Matrix A) (Refer The Matrix B)	
Resistance	100 Ω to 1 k Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω	0.07 m Ω / Ω 0.07 m Ω / Ω 0.07 m Ω / Ω 0.08 m Ω / Ω 0.3 m Ω / Ω 5 m Ω / Ω	Direct measurement method
DC current	10 mA to 100 mA 100 mA to 1 A 1 A to 3 A	0.33 μ A/A 0.66 mA/A 0.87 mA/A	
AC current	At 1 kHz 0 A to 1 A 1 A to 3 A	0.9 mA/A 1.4 mA/A	

Matrix A**AC voltage (Generator (Source))**

Range		kHz					
		0.003 to 0.005	0.005 to 0.01	0.01 to 20	20 to 50	50 to 100	100 to 300
10V	0 mV to 10 V	6.00 mV/V	2.5 mV/V	0.55 mV/V	0.99 mV/V	4.2 mV/V	30 mV/V

Matrix B**AC voltage (Generator (Source))**

Range		kHz			
		0.04 to 1	-	-	-
750 V	10 V to 750 V	0.06 mV/V	-	-	-

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Withstanding / Insulation Tester			
High voltage (measure)			
DC voltage	1 kV to 10 kV	7 mV/V	Direct measurement method
AC voltage	At 50 Hz 1 kV to 10 kV	13 mV/V	
Cut-off current	0.5 mA to 10 mA 10 mA to 50 mA	65 μ A/A 14 μ A/A	
High voltage (source)			
DC voltage	1 kV to 10 kV	12 mV/V	
AC voltage	At 50 Hz 1 kV to 10 kV	16 mV/V	
Measuring instruments			
LCR Indicating Meter			
Resistance	0 Ω to 100 Ω 100 Ω to 1 k Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω	9.9 m Ω / Ω 0.9 m Ω / Ω 0.8 m Ω / Ω 0.9 m Ω / Ω 1.7 m Ω / Ω 1.5 m Ω / Ω 1.5 m Ω / Ω	Using decade resistance, decade capacitance and decade inductance
Capacitance	100 pF to 900 pF 1 nF to 9 nF 10 nF to 90 nF 100 nF to 900 nF 1 μ F to 9 μ F	8.3 mF/F 7.2 mF/F 6.1 mF/F 6.1 mF/F 8.9 mF/F	
Inductance	100 μ H to 1000 μ H 1 mH to 10 mH 10 mH to 100 mH 100 mH to 1000 mH	7 mH/H 7 mH/H 7 mH/H 0.6 mH/H	

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Measuring / Indicating instruments a) DC voltage	0 mV to 320 mV 320 mV to 3.2 V 3.2 V to 32 V 32 V to 320 V 320 V to 1050 V	0.063 μ V/V 0.063 mV/V 0.063 mV/V 0.063 mV/V 0.070 mV/V	Generation using calibrator model Wavetek 9100
b) AC voltage	0 mV to 105 V (Refer Matrix C) 105 V to 1050 V (Refer Matrix D)	(Refer Matrix C) (Refer Matrix D)	

Matrix C**AC voltage (Indicating instruments)**

Range		kHz				
		0.01 to 3	3 to 10	10 to 30	30 to 50	50 to 100
320 mV	0 mV to 320 mV	0.3 μ V/V	0.31 μ V/V	0.5 μ V/V	0.75 μ V/V	1.8 μ V/V
3.2 V	0.32 V to 3.2 V	0.3 mV/V	0.31 mV/V	0.5 mV/V	0.75 mV/V	1.8 mV/V
32 V	3.2 V to 32 V	0.3 mV/V	0.47 mV/V	0.59 mV/V	1.2 mV/V	2.7 mV/V
105 V	32 V to 105 V	0.3 mV/V	0.42 mV/V	0.57 mV/V	1.2 mV/V	2.9 mV/V

Matrix D**AC voltage (Indicating instruments)**

Range		kHz					
		0.04 to 0.1	0.1 to 1	1 to 3	3 to 10	10 to 20	20 to 30
320 V	105 V to 320 V	0.41 mV/V	0.41 mV/V	0.56 mV/V	0.59 mV/V	0.84 mV/V	1.1 mV/V
800 V	320 V to 800 V	0.38 mV/V	0.38 mV/V	0.54 mV/V	0.56 mV/V	-	-
1050 V	800 V to 1050 V	0.29 mV/V	0.29 mV/V	0.41 mV/V	0.43 mV/V	-	-

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Measuring / Indicating instruments c) DC current	0 A to 320 μ A 0.32 mA to 3.2 mA 3.2 mA to 32 mA 32 mA to 320 mA 0.32 A to 3.2 A 3.2 A to 10.5 A	0.013 μ A/A 0.13 μ A/A 0.13 μ A/A 0.14 μ A/A 0.41 mA/A 0.4 mA/A	Generation using calibrator model Wavetek 9100
d) AC current	3.2 μA to 10 A (Refer Matrix E)	(Refer Matrix E)	

Matrix E**AC current (Indicating instruments)**

Range		kHz			
		0.01 to 3	3 to 10	10 to 20	20 to 30
320 μ A	32 μ A to 320 μ A	0.10 μ A/A	0.18 μ A/A	0.5 μ A/A	0.72 μ A/A
3.2 mA	0.32 mA to 3.2 mA	0.59 μ A/A	4.7 μ A/A	5 μ A/A	5.7 μ A/A
32 mA	3.2 mA to 32 mA	0.56 μ A/A	0.84 μ A/A	1.5 μ A/A	2 μ A/A
320 mA	32 mA to 320 mA	0.63 μ A/A	0.81 μ A/A	1.4 μ A/A	1.8 μ A/A
3.2 A	0.32 A to 3.2 A	0.75 mA/A	2 mA/A	-	-
10 A	3.2 A to 10 A	1.6 mA/A	3.8 mA/A	-	-

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SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Measuring / Indicating instruments			
e) Resistance	0 Ω to 40 Ω 40 Ω to 400 Ω 0.4 k Ω to 4 k Ω 4 k Ω to 40 k Ω 40 k Ω to 400 k Ω 0.4 M Ω to 4 M Ω 4 M Ω to 40 M Ω 40 M Ω to 400 M Ω	0.63 m Ω/Ω 0.12 m Ω/Ω 0.11 m Ω/Ω 0.11 m Ω/Ω 0.12 m Ω/Ω 0.14 m Ω/Ω 0.38 m Ω/Ω 0.45 m Ω/Ω	Generation using calibrator model Wavetek 9100
f) Capacitance	0.5 nF to 4 nF 4 nF to 40 nF 40 nF to 400 nF 400 nF to 4 μ F 4 μ F to 40 μ F 40 μ F to 400 μ F 400 μ F to 4 mF 4 mF to 40 mF	4.5 mF/F 2.3 mF/F 2.4 mF/F 3 mF/F 3.5 mF/F 3.5 mF/F 3.5 mF/F 7.5 mF/F	

Signatory:1. **Manivannan A/L Subramaniam**

NO: SMM 375(Issue 2, 29 December 2019 replacement
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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Sourcing Instruments			Direct measurement methods
a) DC voltage	1 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.059 μ V/V 0.034 mV/V 0.029 mV/V 0.037 mV/V 0.039 mV/V	Measurement been made by using Fluke 8845A Precision Multimeter
b) AC voltage	1 mV to 750 V (Refer Matrix F)	(Refer Matrix F)	

Matrix F**AC voltage (Generator (Source))**

Range		kHz					
		0.003 to 0.005	0.005 to 0.01	0.01 to 20	20 to 50	50 to 100	100 to 300
100 mV	1 mV to 100 mV	0.51 μ V/V	6.2 μ V/V	6.2 μ V/V	6.2 μ V/V	6.2 μ V/V	9.2 μ V/V
1 V	100 mV to 1 V	0.37 mV/V	0.37 mV/V	0.26 mV/V	0.37 mV/V	0.84 mV/V	3.2 mV/V
10 V	1 V to 10 V	0.38 mV/V	0.38 mV/V	0.32 mV/V	0.42 mV/V	1.2 mV/V	1.2 mV/V
100 V	10 V to 100 V	0.23 mV/V	0.23 mV/V	0.33 mV/V	0.38 mV/V	2.7 mV/V	2.7 mV/V
750 V	100 V to 750 V	0.36 mV/V	0.36 mV/V	0.36 mV/V	0.36 mV/V	0.36 mV/V	0.36 mV/V

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SCOPE OF CALIBRATION: ELECTRICAL**SITE: CATEGORY I**

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Sourcing Instruments			Direct measurement methods
c) Resistance	10 $\mu\Omega$ to 100 Ω 100 Ω to 1 k Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω	0.93 m Ω/Ω 0.07 m Ω/Ω 0.072 m Ω/Ω 0.072 m Ω/Ω 0.074 m Ω/Ω 0.029 m Ω/Ω 4.9 m Ω/Ω	Measurement been made by using Fluke 8845A Precision Multimeter
d) DC current	100 μ A to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 400 mA 400 mA to 1 A 1 A to 3 A 3 A to 10 A	0.36 μ A/A 0.44 μ A/A 0.35 μ A/A 0.35 μ A/A 0.49 mA/A 0.8 mA/A 1.2 mA/A	
e) AC current	100 μA to 10 A (Refer Matrix G)	(Refer Matrix G)	

Matrix G**AC current (Generator (Source))**

Range		kHz			
		0.003 to 0.005	0.005 to 0.01	0.01 to 5	5 to 10
1 mA	100 μ A to 1 mA	22 μ A/A	22 μ A/A	22 μ A/A	22 μ A/A
10 mA	1 mA to 10 mA	7.1 μ A/A	2.6 μ A/A	1.7 μ A/A	6.6 μ A/A
100 mA	10 mA to 100 mA	6.5 μ A/A	2.2 μ A/A	1.9 μ A/A	4.1 μ A/A
400 mA	100 mA to 400 mA	6.5 μ A/A	2.4 μ A/A	1.3 μ A/A	5.5 μ A/A
1 A	400 mA to 1 A	6.2 mA/A	2.2 mA/A	7.2 mA/A	32 mA/A
3 A	1 A to 3 A	7.4 mA/A	2.3 mA/A	18 mA/A	19 mA/A
10 A	3 A to 10 A	6.9 mA/A	2.6 mA/A	1.9 mA/A	5.2 mA/A

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Measuring / Indicating instruments (Measure) LCR indicating meter a) Resistance	0 Ω to 100 Ω	9.9 m Ω/Ω	Direct measurement methods Generation using decade resistors box
	100 Ω to 1 k Ω	0.9 m Ω/Ω	
	1 k Ω to 10 k Ω	0.8 m Ω/Ω	
b) Capacitance	10 k Ω to 100 k Ω	0.9 m Ω/Ω	Generation using decade capacitance box
	100 k Ω to 1 M Ω	1.7 m Ω/Ω	
	1 M Ω to 10 M Ω	1.5 m Ω/Ω	
	10 M Ω to 100 M Ω	1.5 m Ω/Ω	
	100 pF to 900 pF	8.3 mF/F	
c) Inductance	1 nF to 9 nF	7.2 mF/F	Generation using decade inductance box
	10 nF to 90 nF	6.1 mF/F	
	100 nF to 900 nF	6.1 mF/F	
	1 μ F to 9 μ F	8.9 mF/F	
	100 μ H to 1000 μ H	7 mH/H	
Withstanding / Insulation Tester High voltage (Source) a) DC voltage	1 mH to 10 mH	7 mH/H	The measurement are measured using high voltage digital meter TOS-149-10A
	10 mH to 100 mH	7 mH/H	
	100 mH to 1000 mH	0.6 mH/H	
b) AC voltage	0 kV to 10 kV	7 mV/V	The measurement are measured using current calibrator TOS-1200
c) Cut-off current	0 kV to 10 kV (at 50 / 60 Hz)	13 mV/V	
	0.5 mA to 1 mA	65 μ A/A	
	1 mA to 2 mA	65 μ A/A	
	2 mA to 5 mA	65 μ A/A	
	5 mA to 10 mA	65 μ A/A	
	10 mA to 50 mA	14 μ A/A	

Signatory:1. **Manivannan A/L Subramaniam**