Issue date: 25 September 2022
Valid until: 23 October 2025

NO: SAMM 375

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 uncertainty covered by the CMC is expressed as the expanded uncertainty corresponding to a coverage 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 (±)*	Remarks
External micrometer	25 mm **25 mm spindle travel for** 50 mm to 100 mm 100 mm to 175 mm frame	1.0 µm 1.5 µm 2.0 µm	Measurement of instrument error, and parallelism and flatness of measuring faces reference to JIS B7502:2016. Setting rod must be provided by customer.
Caliper (External & Internal)	up to 300 mm 300 mm to 600 mm	15 µm 18 µm	Measurement of instrument error reference to JIS B7507:2016
Height gauge	up to 600 mm	20 µm	Measurement of instrument error and parallelism of reference surface with measuring surface of scriber reference to JIS B7517:2018

SCOPE OF CALIBRATION: DIMENSIONAL

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

Signatories:

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

SCOPE OF CALIBRATION: DIMENSIONAL

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	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 with reference to 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 µm 4.2 µm 5 µm 7.5 µm	Calibrated using Precision Level Meter (Inclinometer) with reference to JIS B7513:1992

Signatories:

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

SCOPE OF CALIBRATION: MASS

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
Analytical balances	Up to 100 g Up to 200 g	0.46 mg 0.88 mg	Calibration using Standard weight with reference to ASTM E898:2020 The calibration procedures covers test on instrumental error, repeatability and eccentric.
Weighing balances / Scale (Spring / Hanging Scale / Top Pan, 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 Up to 10 kg Up to 20 kg Up to 30 kg	4.2 mg 4.3 mg 4.5 mg 8.7 mg 10 mg 12 mg 0.16 g 0.2 g 0.25 g	
	Up to 50 kg Up to 60 kg Up to 100 kg	2.6 g 3.1 g 5 g	

Signatories:

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

SCOPE OF CALIBRATION: PRESSURE

PERMANENT & SITE CALIBRATION – CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*		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 with reference to OIML R101 2. The calibration procedure covers the increasing and decreasing tests only with reference to JIS C1031:1990
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:

1. Manivannan A/L Subramaniam

SCOPE OF CALIBRATION: TEMPERATURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
Temperature Recorders/Indicators (a) Type T	-100 ºC to 390 ºC	0.6 ºC	By electrical simulation using calibrator with reference to ITS-90
(b) Type E	-100 ºC to 0 ºC 0 ºC to 990 ºC	0.6 ºC 0.5 ºC	
(c) Type K	-100 ºC to 0 ºC 0 ºC to 1300 ºC	0.5 ºC 0.6 ºC	
(d) Type R	0 ºC to 1000 ºC 1000 ºC to 1700 ºC	1.6 ºC 1.4 ºC	
(e) Type J	-100 ºC to 0 ºC 0 ºC to 1100 ºC	0.5 ºC 0.4 ºC	
(f) Type S	0 ºC to 1000 ºC 1000 ºC to 1700 ºC	1.6 ºC 1.5 ºC	
(i) Pt 100	-100 ºC to 0 ºC 0 ºC to 800 ºC	0.6 ºC 0.7 ºC	
Temperature Calibrator (a) Type T	-100 ºC to 390 ºC	0.6 ºC	By electrical measurement using Temperature calibrator
(b) Type E	-100 ºC to 990 ºC	0.5 ºC	
(c) Type K	-100 ºC to 0 ºC 0 ºC to 1300 ºC	0.5 ºC 0.6 ºC	

SCOPE OF CALIBRATION: TEMPERATURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
(d) Type R	0 ºC to 1000 ºC 1000 ºC to 1700 ºC	1.5 ºC 1.4 ºC	By electrical measurement using Temperature calibrator
(e) Type J	-100 ºC to 1100 ºC	0.5 ºC	
(f) Type S	0 ºC to 1000 ºC 1000 ºC to 1700 ºC	1.5 ºC 1.4 ºC	
(i) Pt 100	-100 ºC to 800 ºC	0.6 ºC	
Temperature & Humidity Indicator or Recoder	0 ºC to 50 ºC 50 ºC to 100 ºC	0.6 ºC 0.8 ºC	Comparison with sensor in chamber or temperature/humidity reference meter in chamber.
	Relative humidity at 25 ºC 20 %rh to 50 %rh 50 %rh to 95 %rh	 2.2 %rh 2.5 %rh	Comparison with sensor in chamber or temperature/humidity reference meter in chamber.
Temperature Sensor	0 ºC	0.8 ºC	Comparison with reference Thermometer with sensor in ice point
	50 ºC to 350 ºC	1 ºC	Comparison with reference thermal block calibrator
Mechanical Thermometer	0 ºC	1.5 ºC	Comparison with reference Thermometer with sensor in ice point
	50 ºC to 350 ºC	2 ºC	Comparison with reference thermal block calibrator
Radiation Thermometer	0 ˚C	0.8 ˚C	Comparison with reference Pt 100 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**

SCOPE OF CALIBRATION: TEMPERATURE

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
Temperature Recorders/Indicators (a) Type T	-100 ºC to 0 ºC 0 ºC to 390 ºC	0.7 ºC 0.6 ºC	By electrical simulation using calibrator with reference to Table ITS-90
(b) Type E	-100 ºC to 0 ºC 0 ºC to 990 ºC	0.6 ºC 0.5 ºC	
(c) Type K	-100 ºC to 0 ºC 0 ºC to 1300 ºC	0.5 ºC 0.6 ºC	
(d) Type R	0 ºC to 1000 ºC 1000 ºC to 1700 ºC	1.6 ºC 1.4 ºC	
(e) Type J	-100 ºC to 0 ºC 0 ºC to 1000 ºC	0.5 ºC 0.4 ºC	
(f) Type S	0 ºC to 1000 ºC 1000 ºC to 1700 ºC	1.6 ºC 1.5 ºC	
(i) Pt 100	-100 ºC to 0 ºC 0 ºC to 800 ºC	0.6 ºC 0.7 ºC	
Temperature Sensor with Indicator	-35 ˚C to 165 ˚C	0.1 ˚C	Comparison with Pt100 in Temperature block calibrator

Signatories:

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

SCOPE OF CALIBRATION: TEMPERATURE

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
Temperature Control Enclosure	-50 ºC to 200 ºC 200 ºC to 400 ºC 400 ºC to 800 ºC 800 ºC to 950 ºC	0.6 ºC 0.8 ºC 1.8 ºC 2.5 ºC	Calibrate using temperature recorder with thermocouple.

Signatory:

1. Manivannan A/L Subramaniam

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	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	**0 mV to 10 V** (Refer The Matrix A)	(Refer The Matrix A)	
	10 V to 750 V (Refer The Matrix B)	(Refer The Matrix B)	
Resistance	100 Ω to 1 kΩ 1 kΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ	0.07 mΩ/Ω 0.07 mΩ/Ω 0.07 mΩ/Ω 0.08 mΩ/Ω 0.3 mΩ/Ω 5 mΩ/Ω	Direct measurement method
DC current	10 mA to 100 mA 100 mA to 1 A 1 A to 3 A	0.33 µA/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			
		0.01 to 20	20 to 50	50 to 100	100 to 300
10 V	0 mV to 10 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	-	-	-	-

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
Withstanding / Insulation Tester			
High voltage (measure)			
DC voltage	1 kV to 10 kV	7 mV/V	
AC voltage	**At 50 Hz**		
	1 kV to 10 kV	13 mV/V	
Cut-off current	0.5 mA to 10 mA	65 µA/A	Direct measurement method
	10 mA to 50 mA	14 µA/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	9.9 mΩ/Ω	
	100 Ω to 1 kΩ	0.9 mΩ/Ω	
	1 kΩ to 10 kΩ	0.8 mΩ/Ω	
	10 kΩ to 100 kΩ	0.9 mΩ/Ω	
	100 kΩ to 1 MΩ	1.7 mΩ/Ω	
	1 MΩ to 10 MΩ	1.5 mΩ/Ω	
	10 MΩ to 100 MΩ	1.5 mΩ/Ω	Using decade resistance, decade capacitance and decade inductance
Capacitance	100 pF to 900 pF	8.3 mF/F	
	1 nF to 9 nF	7.2 mF/F	
	10 nF to 90 nF	6.1 mF/F	
	100 nF to 900 nF	6.1 mF/F	
	1 µF to 9 µF	8.9 mF/F	
Inductance	100 µH to 1000 µH	7 mH/H	
	1 mH to 10 mH	7 mH/H	
	10 mH to 100 mH	7 mH/H	
	100 mH to 1000 mH	0.6 mH/H	

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	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 µV/V 0.063 mV/V 0.063 mV/V 0.063 mV/V 0.070 mV/V	Generation using calibrator model Wavetek 9100 / Fluke 5522 A
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 µV/V	0.31 µV/V	0.5 µV/V	0.75 µV/V	1.8 µV/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	-	-

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
Measuring / Indicating instruments			
c) DC current	0 A to 320 µA 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 µA/A 0.13 µA/A 0.13 µA/A 0.14 µA/A 0.41 mA/A 0.4 mA/A	Generation using calibrator model Wavetek 9100 / Fluke 5522A
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 µA	32 µA to 320 µA	0.10 µA/A	0.18 µA/A	0.5 µA/A	0.72 µA/A
3.2 mA	0.32 mA to 3.2 mA	0.59 µA/A	4.7 µA/A	5 µA/A	5.7 µA/A
32 mA	3.2 mA to 32 mA	0.56 µA/A	0.84 µA/A	1.5 µA/A	2 µA/A
320 mA	32 mA to 320 mA	0.63 µA/A	0.81 µA/A	1.4 µA/A	1.8 µA/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	-	-

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
Measuring / Indicating instruments			
e) Resistance	0 Ω to 40 Ω	0.63 mΩ/Ω	Generation using calibrator model Wavetek 9100 / Fluke 5522A
	40 Ω to 400 Ω	0.12 mΩ/Ω	
	0.4 kΩ to 4 kΩ	0.11 mΩ/Ω	
	4 kΩ to 40 kΩ	0.11 mΩ/Ω	
	40 kΩ to 400 kΩ	0.12 mΩ/Ω	
	0.4 MΩ to 4 MΩ	0.14 mΩ/Ω	
	4 MΩ to 40 MΩ	0.38 mΩ/Ω	
	40 MΩ to 400 MΩ	0.45 mΩ/Ω	
f) Capacitance	0.5 nF to 4 nF	4.5 mF/F	
	4 nF to 40 nF	2.3 mF/F	
	40 nF to 400 nF	2.4 mF/F	
	400 nF to 4 µF	3 mF/F	
	4 µF to 40 µF	3.5 mF/F	
	40 µF to 400 µF	3.5 mF/F	
	400 µF to 4 mF	3.5 mF/F	
	4 mF to 40 mF	7.5 mF/F	

Signatory:

1. Manivannan A/L Subramaniam

SCOPE OF CALIBRATION: ELECTRICAL

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	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 µV/V 0.034 mV/V 0.029 mVV 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 µV/V	6.2 µV/V	6.2 µV/V	6.2 µV/V	6.2 µV/V	9.2 µV/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

SCOPE OF CALIBRATION: ELECTRICAL

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
Sourcing Instruments			**Direct measurement methods**
c) Resistance	10 µΩ to 100 Ω 100 Ω to 1 kΩ 1 kΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ	0.93 mΩ/Ω 0.07 mΩ/Ω 0.072 mΩ/Ω 0.072 mΩ/Ω 0.074 mΩ/Ω 0.029 mΩ/Ω 4.9 mΩ/Ω	
d) DC current	100 µA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 400 mA 400 mA to 1 mA 1 A to 3 A 3 A to 10 A	0.36 µA/A 0.44 µA/A 0.35 µA/A 0.35 µA/A 0.49 mA/A 0.8 mA/A 1.2 mA/A	Measurement been made by using Fluke 8845A Precision Multimeter
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 µA to 1 mA	22 µA/A	22 µA/A	22 µA/A	22 µA/A
10 mA	1 mA to 10 mA	7.1 µA/A	2.6 µA/A	1.7 µA/A	6.6 µA/A
100 mA	10 mA to 100 mA	6.5 µA/A	2.2 µA/A	1.9 µA/A	4.1 µA/A
400 mA	100 mA to 400 mA	6.5 µA/A	2.4 µA/A	1.3 µA/A	5.5 µA/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

SCOPE OF CALIBRATION: ELECTRICAL

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (±)*	Remarks
Measuring / Indicating instruments (Measure) LCR indicating meter			**Direct measurement methods**
a) Resistance	0 Ω to 100 Ω 100 Ω to 1 kΩ 1 kΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ	9.9 mΩ/Ω 0.9 mΩ/Ω 0.8 mΩ/Ω 0.9 mΩ/Ω 1.7 mΩ/Ω 1.5 mΩ/Ω 1.5 mΩ/Ω	Generation using decade resistors box
b) Capacitance	100 pF to 900 pF 1 nF to 9 nF 10 nF to 90 nF 100 nF to 900 nF 1 µF to 9 µF	8.3 mF/F 7.2 mF/F 6.1 mF/F 6.1 mF/F 8.9 mF/F	Generation using decade capacitance box
c) Inductance	100 µH to 1000 µH 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	Generation using decade inductance box
Withstanding / Insulation Tester High voltage (Source)			
a) DC voltage	0 kV to 10 kV	7 mV/V	The measurement are measured using high voltage digital meter TOS-149-10A
b) AC voltage	0 kV to 10 kV (at 50 / 60 Hz)	13 mV/V	
c) Cut-off current	0.5 mA to 1 mA 1 mA to 2 mA 2 mA to 5 mA 5 mA to 10 mA 10 mA to 50 mA	65 µA/A 65 µA/A 65 µA/A 65 µA/A 14 µA/A	The measurement are measured using current calibrator TOS-1200

Signatory:

1. Manivannan A/L Subramaniam