

NO: SAMM 045

Page: 1 of 13

LABORATORY LOCATION:
(PERMANENT LABORATORY)

PRECISION MEASURING EQUIPMENT LABORATORY
AIROD SDN. BHD.
JALAN TUDM
SULTAN ABDUL AZIZ SHAH AIRPORT
47200 SUBANG
SELANGOR
MALAYSIA

FIELDS OF CALIBRATION:

ELECTRICAL, MASS & MASS RELATED,
DIMENSIONAL

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: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
AC Generate AC Voltage	1 mV		Direct measurement using Digital Multimeter Datron 1281
	10 Hz to 31 Hz 32 Hz to 330 Hz 330 Hz to 10 kHz 10 kHz to 33 kHz 33 kHz to 100 kHz	0.0023 mV 0.0023 mV 0.0023 mV 0.0024 mV 0.0026 mV	
	10 mV		
	10 Hz to 31 Hz 32 Hz to 330 Hz 330 Hz to 10 kHz 10 kHz to 33 kHz 33 kHz to 100 kHz	0.0036 mV 0.0034 mV 0.0034 mV 0.0044 mV 0.0060 mV	

NO: SAMM 045

Page: 2 of 13

	<u>100 mV</u> 10 Hz to 31 Hz 32 Hz to 330 Hz 330 Hz to 10 kHz 10 kHz to 33 kHz 33 kHz to 100 kHz	0.014 mV 0.011 mV 0.011 mV 0.021 mV 0.038 mV	Direct measurement using Digital Multimeter Datron 1281
	<u>1 V</u> 10 Hz to 31 Hz 32 Hz to 330 Hz 330 Hz to 10 kHz 10 kHz to 33 kHz 33 kHz to 100 kHz	0.000038 V 0.000026 V 0.000026 V 0.000026 V 0.000047 V	
	<u>10 V</u> 10 Hz to 31 Hz 32 Hz to 330 Hz 330 Hz to 10 kHz 10 kHz to 33 kHz 33 kHz to 100 kHz	0.00038 V 0.00026 V 0.00026 V 0.00026 V 0.00040 V	

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
AC Generate <u>AC Voltage (continued)</u>	<u>100 V</u> 10 Hz to 31 Hz 32 Hz to 330 Hz 330 Hz to 10 kHz 10 kHz to 33 kHz 33 kHz to 100 kHz	0.0042 V 0.0028 V 0.0028 V 0.0031 V 0.0070 V	Direct measurement using Digital Multimeter Datron 1281
	<u>1000 V</u> 50 Hz to 300 Hz 300 Hz to 10 kHz 10 kHz to 33 kHz	0.040 V 0.040 V 0.040 V	
<u>AC Current</u>	<u>100 μA</u> 10 Hz to 1 kHz 1 kHz to 5 kHz	0.0097 μ A 0.016 μ A	Direct measurement using Digital Multimeter Datron 1281

NO: SAMM 045

	1 mA 10 Hz to 1 kHz 1 kHz to 5 kHz	0.00089 mA 0.00014 mA	Direct measurement using Digital Multimeter Datron 1281
	10 mA 10 Hz to 1 kHz 1 kHz to 5 kHz	0.00084 mA 0.014 mA	
	100 mA 10 Hz to 1 kHz 1 kHz to 5 kHz	0.0084 mA 0.014 mA	
	1 A 10 Hz to 1 kHz 1 kHz to 5 kHz	0.00012 A 0.00023 A	
	10 A 10 Hz to 1 kHz	0.0030 A	

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
AC Measurement <u>AC Voltage</u>	100 mV 10 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz	0.013 mV 0.013 mV 0.043 mV 0.043 mV	Generate using Fluke 5700A
	1 V 10 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz	0.000036 V 0.000036 V 0.000065 V 0.000065 V	
	10 V 10 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz	0.00034 V 0.00032 V 0.00060 V 0.00060 V	

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

NO: SAMM 045

Page: 4 of 13

	<u>100 V</u> 10 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz	0.0043 V 0.0043 V 0.0095 V 0.0095 V	Generate using Fluke 5700A
	<u>1000 V</u> 50 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz	0.079 V 0.081 V 0.13 V	

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
AC Measurement <u>AC Current</u>	<u>100 μA</u> 10 Hz to 1 kHz 1 kHz to 5 kHz	0.014 μ A 0.025 μ A	Generate using Fluke 5700A
	<u>1 mA</u> 10 Hz to 1 kHz 1 kHz to 5 kHz	0.00012 mA 0.00017 mA	
	<u>10 mA</u> 10 Hz to 1 kHz 1 kHz to 5 kHz	0.0011 mA 0.0017 mA	
	<u>100 mA</u> 10 Hz to 1 kHz 1 kHz to 5 kHz	0.011 mA 0.016 mA	
	<u>1 A</u> 10 Hz to 1 kHz 1 kHz to 5 kHz	0.00023 A 0.00039 A	

NO: SAMM 045

Page: 5 of 13

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
DC Generate			
<u>DC Voltage</u>	0 to 100 μ V 0 to 1 mV 0 to 10 mV 0 to 100 mV 0 to 1 V 0 to 10 V 0 to 100 V 0 to 1000 V	0.57 μ V 0.00058 mV 0.00069 mV 0.00049 mV 0.000026 V 0.000021 V 0.00029 V 0.0029 V	Direct Measurement Method using Digital Multimeter Datron 1281
<u>DC Current</u>	0 to 100 μ A 0 to 1 mA 0 to 10 mA 0 to 100 mA 0 to 1 A 0 to 10 A	0.0021 μ A 0.000026 mA 0.00013 mA 0.0016 mA 0.000028 A 0.00085 A	
DC Measurement			
<u>DC Voltage</u>	0 to 1 mV 0 to 1 V 0 to 10 V 0 to 100 V 0 to 1000 V	0.00060 mV 0.0000030 V 0.000021 V 0.00031 V 0.0036 V	Generation using calibrator model: Fluke 5700A
<u>DC Current</u>	0 to 100 μ A 0 to 1 mA 0 to 10 mA 0 to 100 mA 0 to 1 A	0.013 μ A 0.00013 mA 0.0016 mA 0.028 mA 0.000028 A	

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

NO: SAMM 045

Page: 6 of 13

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
DC Resistance			
<u>Resistance Generate</u>	0.001 Ω 0.01 Ω 0.1 Ω 1 Ω 10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω 1M Ω 10 M Ω 100 M Ω	0.00000081 Ω 0.00000091 Ω 0.000014 Ω 0.0000029 Ω 0.000091 Ω 0.00064 Ω 0.0000044 k Ω 0.000043 k Ω 0.0011 k Ω 0.000014 M Ω 0.00023 M Ω 0.019 M Ω	Direct Measurement Method using Digital Multimeter Datron 1281 Resistance Standard SR 104
<u>Resistance Measurement</u>	0.001 Ω 0.01 Ω 0.1 Ω 1 Ω 10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω 1M Ω 10 M Ω 100 M Ω	0.000012 Ω 0.000012 Ω 0.0000014 Ω 0.000029 Ω 0.00018 Ω 0.0013 Ω 0.000011 k Ω 0.00011 k Ω 0.0011 Ω 0.000017 M Ω 0.00039 M Ω 0.039 M Ω	Generation using resistance standards: Model L & N 4223B L & N 4222B ESI RS 925D Fluke 742A-1 SR 104 Digital Multimeter - Datron 1281

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

NO: SAMM 045

Page: 7 of 13

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
Frequency Counter/Timer	DC to 4 GHz	3 mHz / 10 MHz	Reference Standard Used: Frequency Standards: HP 5065A Frequency counter: HP 5345A
Insulation/Resistance Tester	Test Voltage 1 to 250 Vdc 251 to 500 Vdc 501 to 1000 Vdc	0.3 Vdc 0.5 Vdc 0.6 Vdc	Reference Standard Used: Calibrator: Fluke 5700A Standard Resistor: Clarostat 240C Digital Multimeter: HP 3466A
	Resistance 0.1 M Ω 1 M Ω 10 M Ω 100 M Ω	0.0057 M Ω 0.0057 M Ω 0.058 M Ω 0.58 M Ω	
<u>Capacitance</u> Capacitance Generate	100 pF 1 nF 10 nF 100 nF 1 μ F	0.025 pF 0.00023 nF 0.0023 nF 0.022 nF 0.00024 μ F	Direct Measurement Using RLC Digibridge QUADTECH 1693
Capacitance Measurement	1 pF 10 pF 100 pF 1 nF 10 nF 100 nF 1 μ F	0.0099 pF 0.010 pF 0.027 pF 0.00024 nF 0.0025 nF 0.026 nF 0.00025 μ F	Generation using: Standard Capacitor ARCO SS-32 GR 1413

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

NO: SAMM 045

Page: 8 of 13

SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
<u>Inductance</u> Inductance Generate	1 mH 10 mH 100 mH 1 H 10 H	0.023 mH 0.12 mH 0.68 mH 0.0068 H 0.068 H	Direct Measurement Using RLC Digibridge QUADTECH 1693 Standard Inductor: GR 1482-L
Inductance Measurement	1 mH 10 mH 100 mH 1 H 10 H	0.00031 mH 0.0031 mH 0.031 mH 0.00031 H 0.0031 H	Method Used: Generation Using: Decade Inductor GR 1491-D
DC Power Supply	<u>Voltage</u> 0 V to 100 V 101 V to 1000 V	41 μ V/V 13 μ V/V	Standards Used: Digital Multimeter Datron HP 3457A Shunt Resistor L& N 4361 Load Resistors
	<u>Current</u> 1 A to 10 A 11 A to 20 A 21 A to 30 A 31 A to 40 A 41 A to 50 A 51 A to 60 A	0.5 mA/A 0.5 mA/A 0.5 mA/A 0.5 mA/A 0.5 mA/A 0.5 mA/A	

Signatory:

1. Mohd Hanif bin Mohd Ali

NO: SAMM 045

Page: 9 of 13

SCOPE OF CALIBRATION: MASS

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
Standard Weights	1 mg	0.22 mg	Comparison Method with reference standard weight (Class F1)
	5 mg	0.22 mg	
	10 mg	0.22 mg	
	20 mg	0.22 mg	
	50 mg	0.22 mg	
	100 mg	0.22 mg	
	200 mg	0.22 mg	
	500 mg	0.22 mg	
	1 g	0.22 mg	
	2 g	0.22 mg	
	5 g	0.24 mg	
	10 g	0.24 mg	
	20 g	0.24 mg	
	50 g	0.24 mg	
	100 g	0.31 mg	
	200 g	1.3 mg	
	500 g	16 mg	
	1kg	16 mg	
	2 kg	16 mg	
5 kg	18 mg		
10 kg	25 mg		
20 kg	0.16 g		

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

Signatories:

1. Hisham Sudi bin Hashim
2. Muhammad Taufiq bin Ab Rahman

NO: SAMM 045

Page: 10 of 13

SCOPE OF CALIBRATION: FORCE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
Torque Driver	4 lbf.in to 36 lbf.in	0.75 lbf.in	King Nutronics 3695 torque and force calibrator Ref. Manual with reference to ISO 6789-1: 2017
Indicating and Setting Torque Wrench	0 to 75 lbf.in	0.81 lbf.in	
	75 lbf.in to 200 lbf.in	4.1 lbf.in	
	200 lbf.in to 600 lbf.in	4.4 lbf.in	
	600 lbf.in to 1000 lbf.in	21 lbf.in	
	1000 lbf.in to 1800 lbf.in	30 lbf.in	
	1800 lbf.in to 3000 lbf.in	33 lbf.in	
	3000 lbf.in to 4200 lbf.in	33 lbf.in	
	4200 lbf.in to 6000 lbf.in	37 lbf.in	
6000 lbf.in to 7200 lbf.in	140 lbf.in		

Signatories:

1. **Hisham Sudi bin Hashim**
2. **Muhammad Taufiq bin Ab Rahman**

NO: SAMM 045

Page: 11 of 13

SCOPE OF CALIBRATION: PRESSURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
Pressure Gauge	0 psi to 200 psi	0.24 psi	Generation using calibrator p/no.: Pressurement M2800-3 Buddenberg 380-H
	200 psi to 500 psi	1.2 psi	
	500 psi to 1500 psi	3.2 psi	
	1500 psi to 2500 psi	12 psi	FLUKE P3125-3 based on reference BS EN 837-1 (1998)
	2500 psi to 5000 psi	29 psi	
	5000 psi to 10000 psi	58 psi	

Signatories:

1. Hisham Sudi bin Hashim
2. Muhammad Taufiq bin Ab Rahman

NO: SAMM 045

Page: 12 of 13

SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
Dial Gauge	0 mm to 5 mm	5.4 μ m	Comparison using calibration tester. Based on BS EN ISO 463 : 2006
	5 mm to 10 mm	5.6 μ m	
	10 mm to 25 mm	6.5 μ m	
	0 in to 0.04 in	96 μ in	
	0.04 in to 0.5 in	220 μ in	
	0.5 in to 1.0 in	220 μ in	
Caliper (Vernier and Digital)	1.0 in to 2.0 in	220 μ in	Comparison using block gauge including accessories. Based on BS EN ISO 13385-1: 2019
	2.0 in to 3.0 in	220 μ in	
	0 in to 12 in	630 μ in	
	12 in to 24 in	1460 μ in	
	24 in to 36 in	1505 μ in	
	0 mm to 300 mm	12 μ m	
Height Gauge (Vernier and Digital)	300 mm to 600 mm	28 μ m	Comparison using block gauge including accessories. Based on BS EN ISO 13225 : 2012
	0 in to 12 in	360 μ in	
	12 in to 24 in	610 μ in	
	0 mm to 300 mm	6.5 μ m	
	300 mm to 600 mm	11 μ m	

Signatories:

1. **Hisham Sudi bin Hashim**
2. **Muhammad Taufiq bin Ab Rahman**

NO: SAMM 045

Page: 13 of 13

SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(\pm)*	Remarks
Ring Gauge (Diameter only)	11 mm to 25 mm 25 mm to 50 mm 50 mm to 75 mm 75 mm to 100 mm	0.8 μ m	Comparison using block gauge including accessories. Based on: (Inch units) BS 4064 – 1996 (Metric Units)
Micrometer Including Digital	0 mm to 50 mm 50 mm to 70 mm 75 mm to 125 mm 125 mm to 200 mm 200 mm to 300 mm	1.8 μ m 1.9 μ m 2.3 μ m 2.6 μ m 3.6 μ m	Comparison using block gauge including accessories. Based on ISO 3611:2010

Signatories:

1. **Hisham Sudi bin Hashim**
2. **Muhammad Taufiq bin Ab Rahman**