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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, TORQUE, MASS, PRESSURE &
 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 <u>AC Voltage</u>	<u>1 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	0.0023 mV 0.0023 mV 0.0023 mV 0.0024 mV 0.0026 mV	Direct measurement using Digital Multimeter Datron 1281
	<u>10 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	0.0036 mV 0.0034 mV 0.0034 mV 0.0044 mV 0.0060 mV	

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SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
AC Generate (Continue) <u>AC Voltage</u>	<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 0.000026 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 0.00026 V 0.00040 V	

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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
	<u>1 mA</u> 10 Hz to 1 kHz 1 kHz to 5 kHz	 0.00089 mA 0.00014 mA	
	<u>10 mA</u> 10 Hz to 1 kHz 1 kHz to 5 kHz	 0.00084 mA 0.014 mA	
	<u>100 mA</u> 10 Hz to 1 kHz 1 kHz to 5 kHz	 0.0084 mA 0.014 mA	
	<u>1 A</u> 10 Hz to 1 kHz 1 kHz to 5 kHz	 0.00012 A 0.00023 A	
	<u>10 A</u> 10 Hz to 1 kHz	 0.0030 A	

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SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
DC Generate			Direct Measurement Method using Digital Multimeter Datron 1281
<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 0.0000026 V 0.000021 V 0.00029 V 0.0029 V	
<u>DC Current</u>	0 to 100 μ A 0 to 100 mA 0 to 1 A 0 to 10 A	0.0021 μ A 0.0016 mA 0.000028 A 0.00085 A	

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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

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SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
<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

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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	

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SCOPE OF CALIBRATION: MASS

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Standard Weights	1 mg	0.23 mg	Comparison Method with reference standard weight (ASTM E617 Class 3)
	5 mg	0.23 mg	
	10 mg	0.23 mg	
	20 mg	0.23 mg	
	50 mg	0.23 mg	
	100 mg	0.23 mg	
	200 mg	0.23 mg	
	500 mg	0.23 mg	
	1 g	0.23 mg	
	2 g	0.26 mg	
	5 g	0.29 mg	
	10 g	0.30 mg	
	20 g	0.30 mg	
	50 g	0.30 mg	
	100 g	0.30 mg	
	200 g	16 mg	
	500 g	16 mg	
	1kg	17 mg	
	2 kg	24 mg	
	5 kg	25 mg	
	10 kg	0.21 g	
	20 kg	0.24 g	

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SCOPE OF CALIBRATION: TORQUE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Torque Driver	4 lbf.in to 36 lbf.in	0.76 lbf.in	King Nutronics 3695 torque and force calibrator Ref. Manual with reference to ISO 6789-1
Indicating and Setting Torque Wrench	0 to 75 lbf.in	0.97 lbf.in	
	above 75 lbf.in to 200 lbf.in	2.4 lbf.in	
	above 200 lbf.in to 600 lbf.in	3.0 lbf.in	
	above 600 lbf.in to 1000 lbf.in	13 lbf.in	
	above 1000 lbf.in to 1800 lbf.in	17 lbf.in	
	above 1800 lbf.in to 3000 lbf.in	27 lbf.in	
	above 3000 lbf.in to 4200 lbf.in	42 lbf.in	
	above 4200 lbf.in to 6000 lbf.in	43 lbf.in	
	above 6000 lbf.in to 7200 lbf.in	110 lbf.in	

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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 FLUKE P3125-3 based on reference BS EN 837-1
	above 200 psi to 500 psi	1.2 psi	
	above 500 psi to 1500 psi	3.2 psi	
	above 1500 psi to 2500 psi	12 psi	
	above 2500 psi to 5000 psi	29 psi	
	above 5000 psi to 10000 psi	58 psi	

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SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Dial Gauge	0 mm to 25 mm 25 mm to 75 mm	4.0 μ m 6.5 μ m	Comparison using calibration tester with reference to BS 907
Caliper (Vernier and Digital)	0 in to 12 in 12 in to 24 in 24 in to 36 in	6.5 $\times 10^2$ μ in 1.5 $\times 10^3$ μ in 1.6 $\times 10^3$ μ in	Comparison using block gauge including accessories with reference to BS EN ISO 13385-1
	0 mm to 300 mm 300 mm to 600 mm	12 μ m 28 μ m	
Height Gauge (Vernier and Digital)	0 in to 12 in 12 in to 24 in 0 mm to 300 mm 300 mm to 600 mm	3.6 $\times 10^2$ μ in 6.1 $\times 10^2$ μ in 6.5 μ m 11 μ m	Comparison using block gauge including accessories with reference to BS EN ISO 13225

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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	1.0 μ m	Comparison using block gauge including accessories with reference to (Inch units) BS 4064
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 with reference to ISO 3611

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