LABORATORY LOCATION:
(PERMANENT LABORATORY)

MICROREP CALIBRATION LABORATORY
NO. 18, JALAN PJS 5/28A
PUSAT DAGANGAN PJ SELATAN (PJCC)
46150 PETALING JAYA
SELANGOR
MALAYSIA

FIELDS OF CALIBRATION: **DIMENSIONAL, TEMPERATURE, PRESSURE, MASS, TIME & FREQUENCY, FORCE, TORQUE, HARDNESS**

This laboratory has demonstrated its technical competence to operate in accordance with MS ISO/IEC 17025:2005 (ISO/IEC 17025:2005).

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(±)*	Remarks
Screw/Thread Plug Gauge (*) - Parallel (i) Major Diameter (ii) Pitch Diameter	up to 50mm (or inches equivalent)	1.9 µm	With reference to AS 2710: 1984 Screw Gauge – Verification by using Floating Carriage Diameter Measuring Machine
	up to 30 mm 30 to 60 mm 60 to 100 mm (or inches equivalent)	1.7 µm 2.0 µm 2.3 µm	With reference to JIS B 0261: 2004 Parallel screw thread gauges – Measuring method by using Universal Horizontal Metroscope

SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Screw/Thread Plug Gauge -Taper (i) Major Diameter (ii) Pitch Diameter (iii) Step Limits	up to 50mm (or inches equivalent)	2.9 µm	With reference to AS 2710: 1984 Screw Gauge – Verification by using Floating Carriage Diameter Measuring Machine
	0 to 30 mm 30 to 60 mm 60 to 100 mm (or inches equivalent)	2.8 µm 3.0 µm 3.2 µm	With reference to JIS B 0261: 2004 Parallel screw thread gauges – Measuring method by using Universal Horizontal Metroscope
Screw/Thread Ring Gauge - Parallel (i) Minor Diameter (ii) Pitch Diameter	Metric: M3 to M40 (or inches equivalent)	(1.9+0.01L) µm Where L = nominal length in mm	With reference to AS 2710: 1984 Screw Gauges – Verification by using Universal Horizontal Metroscope
	up to 64mm (or 2 inches)	(3.7+0.02L) µm Where L = nominal diameter in mm	With reference to JIS B 0261: 2004 Parallel screw thread gauges – Measuring method by using Screw Check Plugs
Screw/Thread Caliper Gauge – Parallel (i) Pitch Diameter	Metric: M3 to M100 (or inches equivalent)	(3.2+0.002L) µm Where L = nominal length in mm	With reference to AS 2710: 1984 Screw Gauges – Verification by using Gauge Blocks/ Screw Check Plugs
Thread Measuring Wires (i) Diameter only	up to 6.5mm (or inches equivalent)	0.5 µm	With reference to ASME B89.1.17:2001 Measurement of Thread Measuring Wires by using Universal Horizontal Metroscope

SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Plain Plug Gauge/Pin Gauge (*) (i) Diameter only	up to 50mm (or inches equivalent)	(0.8+0.012L) µm Where L = nominal length in mm	With reference to AS 1997: 1977 Plain Limit Gauge by using Electronic Length Measuring Machine and Gauge Block
	up to 120mm (or inches equivalent)	(0.4+0.014L) µm Where L = nominal diameter in mm	With reference to AS 1997: 1977 Plain Limit Gauge by using Universal Horizontal Metroscope
Plain Taper Plug Gauge (i) Cone diameter (ii) Step dimension	 0 to 30 mm 30 to 50 mm 50 to 100 mm (or inches equivalent) 0 to 30 mm (or inches equivalent)	 1.6 µm 2.0 µm 3.1 µm 2.3 µm	With reference to JIS B 3301: 1989 by using Universal Horizontal Metroscope and Gauge Blocks
Plain Ring Gauge (i) Diameter only	1mm to 90mm (or inches equivalent)	(0.6+0.017L) µm Where L = nominal diameter in mm	With reference to JIS B 7420: 1997 Plain Limit Gauge by using Universal Horizontal Metroscope
Gauge Block (metric)	0.5 to 10 mm 10 to 25 mm 25 to 50 mm 50 to 75 mm 75 to 100 mm	0.10 µm 0.12 µm 0.14 µm 0.17 µm 0.21 µm	With reference to VDI/VDE/DGQ 2618 – Part 1: 2004 Test instruction for gauge blocks by using Gauge Block Comparator & Reference Gauge Blocks
Caliper Checker	up to 600mm	(0.6+0.004L) µm Where L = nominal length in mm	With reference to Microrep Test Method for Caliper Checker by using Gauge Block
Master Setting Disc/ Master Plug (i) Diameter only	0 to 30 mm 30 to 60 mm 60 to 100 mm (or inches equivalent)	0.8 µm 1.3 µm 1.8 µm	With reference to ASME B89.1.5:1998 Measurement of Plain External Diameters for use as Master Discs of Cylindrical Plug Gages by using Universal Horizontal Metroscope

SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Snap Gauge /Width Gauge/Gap Gauge	3 to 100mm (or inches equivalent)	(1.1+0.013L) µm Where L = nominal length in mm	With reference to VDI/VDE/DGQ 2618 Part 4.7:2005 by using Universal Horizontal Metroscope/ Gauge Blocks
Hex Plug Gauge	up to 25.4mm (or inches equivalent)	0.9 µm	With reference to Microrep Test Method for Hex Gage by using Universal Horizontal Metroscope
Parts/Pieces with plane parallel, spherical and cylindrical measuring surface (i) External dimension/ diameter measurement	Width/thickness: up to 100 mm Sphere/ball diameter: up to 60mm Cylindrical diameter: up to 120mm	(0.4+0.014L) µm Where L= nominal Diameter in mm	By using Universal Horizontal Metroscope
(ii) Internal diameter measurement	Internal diameter: 1 to 90mm	(0.6+0.017L) µm Where L= nominal diameter in mm	
Vernier/Dial/Digital Caliper	up to 300 mm 300 to 450 mm 450 to 600 mm 600 to 1000 mm (or inches equivalent)	11 µm 13 µm 15 µm 22 µm	With reference to BS EN ISO 13385: 2011 by using Caliper Checker or Gauge Blocks
Depth Caliper/ Depth Gauge	up to 600mm (or inches equivalent)	(8.3+0.011L) µm Where L = nominal length in mm	With reference to JIS B 7518: 1993 Depth Gauge by using Gauge Blocks
External Micrometer	up to 50 mm travel with frame up to 300 mm Over 300 to up to 600 mm (or inches equivalent)	(0.81+0.012L) µm (0.47+0.013L) µm Where L = nominal length in mm	With reference to BS EN ISO 3611: 2010 by using Gauge Blocks

SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
3-Point Internal Micrometer (i) Deviation of reading (ii) Repeatability	From 3.5 to 6 mm Over 6 to 20 mm Over 20 to 40 mm Over 40 to 63 mm Over 63 to 88 mm Over 88 to 100 mm (or inches equivalent)	1.5 µm 1.5 µm 2.2 µm 3.0 µm 3.1 µm 3.2 µm	With reference to DIN 863-4: 1999 Micrometers Part 4: Internal Micrometers by using Ring Gauges
Inside Micrometer-(Caliper/Tubular/Solid Rod type)	25 mm travel with frame/Single Rod (or Extension Rod) size: up to 500 mm (or inches equivalent)	(0.6+0.013L) µm Where L = nominal length in mm	With reference to JIS B 7502: 1994 Micrometer Caliper by using Gauge Blocks
Depth Micrometer	up to 150mm (or inches equivalent)	(0.92+0.01L) µm Where L = nominal length in mm	With reference to JIS B 7544: 1994 Depth Micrometer by using Gauge Blocks
V-anvil Micrometer	up to 100mm	(0.96+0.018L) µm Where L = nominal length in mm	With reference to Microrep Test Method for V-Anvil Micrometer by using Master Disc/Setting Master
Vernier/Dial/Digital Height Gauge	up to 300 mm 300 to 600 mm (or inches equivalent)	11 µm 15 µm	With reference to JIS B 7517: 1993 with Vernier, Dial and Digital Height Gauges by using Caliper Checker or Gauges Blocks
Precision Linear Height Gauge	up to 700mm (or inches equivalent)	(1.5+0.001L) µm Where L = nominal length in mm	With reference to JIS B 7517: 1983 Vernier, Dial and Digital Height Gauge by using Gauge Blocks
Dial Indicator (i) 0.01 mm/0.005 mm Graduation (ii) 0.001 mm/0.002 mm Graduation	up to 50mm up to 5mm	2.4 µm 0.8 µm	With reference to JIS B 7503: 2011 Dial Gauge by using Dial Indicator Tester / Universal Horizontal Metroscope / Universal Dial Gauge Checker

SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Dial Indicator (Long Stroke)	up to 20mm 20 to 30mm 30 to 50mm	1.3 µm 1.3 µm 1.6 µm	With reference to Miniature and Long Stroke Dial Indicators, JMAS 2001: 1998 by using Universal Horizontal Metroscope/ Universal Dial Gauge Checker
Dial Test Indicator	up to 1.6 mm Graduation: 0.01 mm/0.005 mm Graduation: 0.001 mm/0.002 mm	 2.5 µm 1.1 µm	With reference to JIS B 7533: 2015 Dial Test Indicator by using Dial Indicator Tester/ Universal Horizontal Metroscope/ Universal Dial Gauge Checker
Dial Indicator/ Dial Test Indicator (for linear measurements)	up to 50.8 mm (or inches size equivalent)	(0.7+0.02L) µm Where L = nominal length in mm	With reference to ASME B89.1.10M:2001 Dial Indicator by using Universal Horizontal Metroscope/ Universal Dial Gauge Checker
Digital Indicator	0 to 25 mm 25 to 50 mm 50 to 100 mm (or inches equivalent)	1.0 µm 1.2 µm 1.8 µm	With reference to Microrep Test Method for Electronic (Digital) Indicator by using Horizontal Metroscope/ Universal Dial Gauge Checker
Dial/Digital Thickness Gauge	up to 25mm Graduation:0.01 mm Graduation:0.001 mm (or inches equivalent)	 6.0 µm 1.3 µm	With reference to Microrep Test Method for Dial Thickness Gauge by using Gauge Block

SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Cylinder Gauge/ Bore Gage	up to 160mm (or inches equivalent)	1.5 µm	With reference to JIS B7515: 1982 Cylinder Gauges by using Dial Indicator Tester/ Universal Horizontal Metroscope
Indicator Calibration Tester	up to 50 mm	(0.6+0.004L) µm Where L = nominal length in mm	With reference to Microrep Test Method for indicator Calibration Tester by using Electronic Length Measuring Machine and Gauge Blocks
Universal Horizontal Metroscope	up to 60mm	0.2 µm	By using Gauge Block
Feeler Gauge (Thickness Gauge)	0 to 3mm (or inches equivalent)	0.9 µm	With reference to JIS B 7524: 2008 Feeler Gauge by using Electronic Length Measuring and Gauge Blocks
Metal/Steel Ruler	up to 1000mm (or inches equivalent)	0.13 mm	With reference to JIS B 7516: 2005 Metal Ruler by using Measuring Tape Calibrator
Steel Tape Measures/ Measuring Tapes	up to 6 m Over 6 to 15 m Over 15 to 26 m Over 26 to 43 m Over 43 to 65 m	(0.10+0.038L) mm (0.21+0.020L) mm (0.29+0.014L) mm (0.37+0.011L) mm (0.45+0.009L) mm Where L in m	With reference to JIS B 7512: 2005 by using Measuring Tape Calibrator
Standard Bar / Setting Rod	up to 600mm (or inches equivalent)	(0.36+0.013L) µm Where L = nominal length in mm	With reference to Microrep Test Method for Standard Bar/ Setting Rod by using Mu-checker and Gauge Blocks
Film Thickness Standard (Thickness Foils)	up to 5mm (or inches equivalent)	(0.4+0.2L) µm Where L = nominal length in mm	With reference to Microrep Test Method for Film Thickness Standard (Thickness Foil) by using Universal Horizontal Metroscope

SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Coating Thickness Measuring Instrument - Deviation of reading - Repeatability	up to 100 µm Over 100 to 500 µm Over 500 to 2000 µm	1.4 µm 1.5 µm 2.1 µm	With reference to AS 3894.3 – 2002 by using Film Thickness Standard
Lever Gauge (quickest) for external measurement (External Caliper Gauge)	Up to 200 mm	7 µm	With reference to VDI/VDE/DEQ 2618 Part 12.1-2005 by using Gauge Blocks
Lever Gauge (quickest) for internal measurement (External Caliper Gauge)	5 to 150 mm	7 µm	With reference to VDI/VDE/DEQ 2618 Part 13.1-2005 by using Gauge Blocks
Bevel Protractor	Angle Measurement: 0 to 360□ Straightness & Parallelism of Blade: up to 300 mm	5 min 2 µm	With reference to VDI/WDE/DGQ 2618 Part 7.2 by using Angle Blocks and surface plate
Radius Gage (Radius only)	0.1 to 200 mm	(7.5+0.038L) µm	With reference to manufacturer's MTI test method CLTM-2 (1994) by using Profile Projector/Vision Measuring Machine
Electronic Comparator - Plunge type - Lever type	up to ± 5mm	(0.31+0.001L) µm Where L = nominal length in mm	With reference to JIS B 7536: 1982 Electronic Comparator by using Universal Dial Gauge Checker
Microindicator/ Mechanical Comparator	Up to 0.05 mm Over 0.05 to 0.1 mm Over 0.1 to 0.26 mm Over 0.26 to 0.5 mm Over 0.5 to 5.0 mm	0.3 µm 0.4 µm 0.5 µm 1.6 µm 6.0 µm	With reference to DIN 879-1 (1999) Dial Indicator by using Universal Dial Gauge Checker

Signatories:

1. **Chong Yoon Chin**
2. **Liew Hong Har**

Item (*) only

SCOPE OF CALIBRATION: TEMPERATURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Temperature Indicator/Recorder/ Calibrator or Simulator - Electrical Simulation Resistance Temperature Detector (RTD) PT 50, PT 100, PT 200, PT 400, PT 500 & PT 1000	-200 °C to 200 ° 200°C to 600°C 600°C to 850°C	0.2°C 0.3°C 0.4°C	MCL Procedure: CMP-T-001 Base on: EURAMET/c-11/v.01: July 2007 – Guidelines on the Calibration of Temperature Indicators and Simulators by Electrical Simulation and Measurement
Thermocouple Type B	200°C to 400°C 400° to 1820°C	2.1°C 1.1°C	
Type R	-50°C to 0°C 0°C to 100°C 100°C to 1768°C	1.1°C 0.9°C 0.7°C	
Type S	50°C to 0°C 0°C to 1768°C	1.1°C 0.8°C	
Type E	- 270°C to 200°C 200°C to 1000°C	0.4°C 0.4°C	
Type J	-210°C to 1200°C	0.4°C	
Type K	-270°C to -200°C -200°C to 1000°C 1000°C to 1372°C	0.4°C 0.4°C 0.5°C	
Type N	-270°C to -200°C -200°C to 1300°C	0.4°C 0.5°C	
Type T	-270°C to -200°C -200°C to 100°C 100°C to 400°C	0.4°C 0.4°C 0.4°C	
Type U	-200°C to -100°C -100°C to 600°C	0.4°C 0.4°C	
Type L	-200°C to 900°C	0.4°C	
Type C	0°C to 1000°C 1000°C to 2000°C 2000°C to 2315°C	0.5°C 0.9°C 1.3°C	

SCOPE OF CALIBRATION: TEMPERATURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Thermocouple (cont.) Type G Type D	100°C to 2315°C 0°C to 1000°C 1000°C to 2000°C 2000°C to 2315°C	1.1°C 0.5°C 0.9°C 1.3°C	MCL Procedure: CMP-T-001 Base on: EURAMET/c-11/v.01: July 2007 – Guidelines on the Calibration of Temperature Indicators and Simulators by Electrical Simulation and Measurement
Temperature Sensor with Indicator Resistance Temperature Detector (RTD) PT 50, PT 100, PT 200, PT 400, PT 1000 Thermocouple Type J, K, N, E Type R, S Type T	From -25 to 150°C above 150 to 400°C above 400 to 660°C From -25 to 0°C above 0 to 300°C above 300 to 400°C above 400 to 500ºC above 500 to 660ºC From -25 to 660°C From -25 to 0°C above 0 to 100°C above 100 to 200°C above 200 to 300ºC above 300 to 400ºC	0.25°C 0.30°C 0.76°C 1.3°C 1.4°C 1.5°C 1.8ºC 2.2ºC 1.3ºC 0.6°C 0.9°C 1.1°C 1.3ºC 1.5ºC	By comparison method using Platinum Resistance Thermometer (PRT) and Temperature Block Calibrator

Signatories:

1. **Chong Yoon Chin**

SCOPE OF CALIBRATION: TEMPERATURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Temperature Sensor without Indicator			By comparison method using Platinum Resistance Thermometer (PRT) and Temperature Block Calibrator
Resistance Temperature Detector (RTD)			
PT 50, PT 100, PT 200, PT 400, PT 1000	From -25 to 150°C above 150 to 400°C above 400 to 660°C	0.25°C 0.30°C 0.76°C	
Thermocouple			
Type J, K, N, E	From -25 to 0°C above 0 to 300°C above 300 to 400°C above 400 to 500ºC above 500 to 660ºC	1.3°C 1.4°C 1.5°C 1.8ºC 2.2ºC	
Type R, S	From -25 to 660°C	1.3ºC	
Type T	From -25 to 0°C above 0 to 100°C above 100 to 200°C above 200 to 300ºC above 300 to 400ºC	0.6°C 0.9°C 1.1°C 1.3ºC 1.5ºC	

Signatories:

1. **Chong Yoon Chin**

SCOPE OF CALIBRATION: PRESSURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Pressure Gauge Vacuum Pneumatic Hydraulic	 -13 psi to 0 psi 0 psi to 30 psi 30 psi to 300 psi 0 psi to 1000 psi 1000 psi to 5000 psi 5000 psi to 10000 psi 10000 psi to 15000 psi	 0.03 psi 0.03 psi 0.2 psi 0.7 psi 3 psi 6 psi 10 psi	MCL Procedure: CMP-P-001 Based on: ASME B40.1 Gauges: Pressure Indicating Dial Type (as per clause 6.2.4.1, 6.2.4.2 and 6.2.4.3)
Pressure Recorder Pneumatic Hydraulic	 0 psi to 30 psi 30 psi to 300 psi 0 psi to 1000 psi 1000 to 5000 psi 5000 psi to 10000 psi 10000 psi to 15000 psi	 0.03 psi 0.2 psi 0.7 psi 3 psi 6 psi 10 psi	MCL Procedure: CMP-P-002 Based on: ASME B40.1 Gauges: Pressure Indicating Dial Type (as per clause 6.2.4.1, 6.2.4.2 and 6.2.4.3)

Signatories:

1. **Chong Yoon Chin**

SCOPE OF CALIBRATION: MASS

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Standard Weight/Dead Weight	10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.2 mg 0.2 mg 0.2 mg 0.2 mg 0.3 mg 0.5 mg 2 mg 3 mg 20 mg 40 mg 200 mg 200 mg	MCL Procedure: CMP-M-002 Based on: OIML R 111- 1: 2004 (E) Part 1; Annex C

Signatories:

1. **Chong Yoon Chin**

SCOPE OF CALIBRATION: TIME

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Stopwatch/Timer (Resolution/Reading: 0.01 s or more)	up to 36000 s	0.24 s	MCL Procedure: CMP-TF-001 Base on: NIST Publication 960-12; Section 6A & 6B
Timer (Resolution/Reading: 0.1 s or more)	up to 900 s above 900 to 1800 s above 1800 to 7200 s above 7200 to 14400s	0.11 s 0.16 s 0.51 s 0.98 s	MCL Procedure: CMP-TF-002 Base on: NIST Publication 960-12; Section 9A

Signatories:

1. **Chong Yoon Chin**

SCOPE OF CALIBRATION: FORCE & TORQUE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Hand Torque Tools	up to 10 N.m above 10 to 20 N.m above 20 to 50 N.m above 50 to 100 N.m above 100 to 140 N.m above 140 to 200 N.m	0.03 N.m 0.05 N.m 0.15 N.m 0.35 N.m 0.8 N.m 1.5 N.m	With reference to ISO 6789-1 & 2: 2017 by using torque meter
Force Gauges (Push-Pull Gauge, Rod Type Gauge and Dial Tension Gauge)	Up to 500 N	0.5 % of full scale	With references to JIS B 7721: 2002 by using dead/standard weight (Calibration in tension mode only)

Signatories:

1. **Chong Yoon Chin**

SCOPE OF CALIBRATION: HARDNESS

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Durometer/Rubber Hardness Tester (up to 8.500 mN spring force)	0 - 100	0.5	With reference to JIS K 6253: 2006 (clause 6.3.7) by using balance

Signatories:

1. **Chong Yoon Chin**

SCOPE OF CALIBRATION: DIMENSIONAL

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Precision Linear Height Gauge	up to 700mm	(1.5+0.001L) µm Where L = nominal length in mm	With reference to JIS B 7517: 1983 Vernier, Dial and Digital Height Gauge by using Gauge Blocks
Precision Surface Plate (*) (Flatness of local area only)	up to 2600 x 1600mm (length x width)	2.2 µm	With reference to JIS B 7513: 1992 by using Repeat Reading Gauge
Profile Projector - Individual linear axis only	up to 200mm Over 200 to 300 mm	4.5 µm 7.0 µm	With reference to JIS B 7184: 1999 Profile Projector by using Standard Glass Scale

Signatories:

1. **Chong Yoon Chin**
2. **Liew Hong Har** **Item (*) only**

SCOPE OF CALIBRATION: MASS

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Weighing Machines/ Balances	From 0g to 220g	0.001 g	MCL Procedure: CMP-M-001 Based on UKAS LAB14: 2006 Calibration of Weighing Machines (Clause 4.3.3(a), 4.3.3(c) & 4.3.3 (d))
	Over 220g to 420g	0.002 g	
	Over 420g to 820g	0.003 g	
	Over 820g to 1220g	0.005 g	
	Over 1220g to 2000g	0.03 g	
	Over 2000g to 5000g	0.1 g	
	Over 5000g to 20000g	0.2 g	
	Over 20000g to 30000g	0.5 g	
	Over 30000g to 50000g	5 g	
	Over 50000g to 100000g	5 g	
	Over 100000g to 200000g	10 g	

Signatories:

1. **Chong Yoon Chin**

SCOPE OF CALIBRATION: TEMPERATURE

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Temperature Indicator/Recorder/ Calibrator or Simulator - Electrical Simulation <u>Resistance Temperature Detector (RTD)</u> PT 50, PT 100, PT 200, PT 400, PT 500 & PT 1000	-200 °C to 200 ° 200°C to 600°C 600°C to 850°C	0.2°C 0.3°C 0.4°C	MCL Procedure: CMP-T-001 Base on: EURAMET/c-11/v.01: July 2007 – Guidelines on the Calibration of Temperature Indicators and Simulators by Electrical Simulation and Measurement
<u>Thermocouple</u> Type B	200°C to 400°C 400° to 1820°C	2.1°C 1.1°C	
Type R	-50°C to 0°C 0°C to 100°C 100°C to 1768°C	1.1°C 0.9°C 0.7°C	
Type S	50°C to 0°C 0°C to 1768°C	1.1°C 0.8°C	
Type E	- 270°C to 200°C 200°C to 1000°C	0.4°C 0.4°C	
Type J	-210°C to 1200°C	0.4°C	
Type K	-270°C to -200°C -200°C to 1000°C 1000°C to 1372°C	0.4°C 0.4°C 0.5°C	
Type N	-270°C to -200°C -200°C to 1300°C	0.4°C 0.5°C	
Type T	-270°C to -200°C -200°C to 100°C 100°C to 400°C	0.4°C 0.4°C 0.4°C	

SCOPE OF CALIBRATION: TEMPERATURE

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Thermocouple (cont.)			MCL Procedure: CMP-T-001 Base on: EURAMET/c-11/v.01: July 2007 – Guidelines on the Calibration of Temperature Indicators and Simulators by Electrical Simulation and Measurement
Type U	-200°C to -100°C -100°C to 600°C	0.4°C 0.4°C	
Type L	-200°C to 900°C	0.4°C	
Type C	0°C to 1000°C 1000°C to 2000°C 2000°C to 2315°C	0.5°C 0.9°C 1.3°C	
Type G	100°C to 2315°C	1.1°C	
Type D	0°C to 1000°C 1000°C to 2000°C 2000°C to 2315°C	0.5°C 0.9°C 1.3°C	
Temperature Sensor with Indicator Resistance Temperature Detector (RTD) PT 50, PT 100, PT 200, PT 400, PT 1000	From -25 to 150°C above 150 to 400°C above 400 to 660°C	0.25°C 0.30°C 0.76°C	By comparison method using Platinum Resistance Thermometer (PRT) and Temperature Block Calibrator
Thermocouple Type J, K, N, E	From -25 to 0°C above 0 to 300°C above 300 to 400°C above 400 to 500ºC above 500 to 660ºC	1.3°C 1.4°C 1.5°C 1.8ºC 2.2ºC	
Type R, S	From -25 to 660°C	1.3ºC	
Type T	From -25 to 0°C above 0 to 100°C above 100 to 200°C above 200 to 300ºC above 300 to 400ºC	0.6°C 0.9°C 1.1°C 1.3ºC 1.5ºC	

Signatories:

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SCOPE OF CALIBRATION: TEMPERATURE

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Temperature Sensor without Indicator			By comparison method using Platinum Resistance Thermometer (PRT) and Temperature Block Calibrator
Resistance Temperature Detector (RTD)			
PT 50, PT 100, PT 200, PT 400, PT 1000	From -25 to 150°C above 150 to 400°C above 400 to 660°C	0.25°C 0.30°C 0.76°C	
Thermocouple			
Type J, K, N, E	From -25 to 0°C above 0 to 300°C above 300 to 400°C above 400 to 500ºC above 500 to 660ºC	1.3°C 1.4°C 1.5°C 1.8ºC 2.2ºC	
Type R, S	From -25 to 660°C	1.3ºC	
Type T	From -25 to 0°C above 0 to 100°C above 100 to 200°C above 200 to 300ºC above 300 to 400ºC	0.6°C 0.9°C 1.1°C 1.3ºC 1.5ºC	

Signatories:

1. **Chong Yoon Chin**

SCOPE OF CALIBRATION: PRESSURE

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Pressure Measuring Devices Vacuum Pneumatic Hydraulic	 -13.5 psi to 0 psi 0 psi to 30 psi 30 psi to 300 psi 0 psi to 1000 psi 1000 psi to 5000 psi 5000 psi to 10000 psi 10000 psi to 15000 psi	 0.03 psi 0.03 psi 0.2 psi 0.7 psi 3 psi 6 psi 10 psi	MCL Procedure: CMP-P-001 Based on: ASME B40.1 Gauges: Pressure Indicating Dial Type (as per clause 6.2.4.1 & 6.2.4.2 and 6.24.3)

Signatories:

1. **Chong Yoon Chin**

SCOPE OF CALIBRATION: TIME

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty(±)*	Remarks
Timer (Resolution/Reading: 0.1 s or more)	up to 900 s above 900 to 1800 s above 1800 to 7200 s above 7200 to 14400s	0.11 s 0.16 s 0.51 s 0.98 s	MCL Procedure: CMP-TF-002 Base on: NIST Publication 960-12; Section 9A

Signatories:

1. **Chong Yoon Chin**