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of SAMM 578 dated 04 February 2025)

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LABORATORY LOCATION:
(PERMANENT LABORATORY)**TRESCAL (MALAYSIA) SDN. BHD.**
NO 45 & 45-01, JALAN KEMPAS INDAH 1/3
TAMAN KEMPAS INDAH
81300 JOHOR BAHRU
JOHOR
MALAYSIA**FIELDS OF CALIBRATION:****TEMPERATURE, TIME & FREQUENCY, 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: TEMPERATURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Liquid in Glass Thermometer (Total Immersion)	-30 °C to 30 °C 30 °C to 200 °C	0.09 °C 0.09 °C	Comparison with reference Pt100 in liquid bath
Liquid in Glass Thermometer (Partial Immersion)	-30 °C to 30 °C 30 °C to 200 °C	0.09 °C 0.09 °C	
Temperature sensor	-30 °C to 0 °C 0 °C to 200 °C 200 °C to 400 °C 400 °C to 600 °C 600 °C to 1200 °C	0.1 °C 0.097 °C 0.33 °C 0.75 °C 2.7 °C	Comparison with reference Pt100/Type R thermocouple in liquid bath and temperature block calibrator
Temperature sensor with indicator	-30 °C to 0 °C 0 °C to 200 °C 200 °C to 400 °C 400 °C to 600 °C 600 °C to 1200 °C	0.09 °C 0.083 °C 0.33 °C 0.75 °C 2.7 °C	

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SCOPE OF CALIBRATION: TEMPERATURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Temperature & Humidity Indicator or Recorder	-30 °C to 80 °C	0.3 °C	Comparison with Pt100 sensor in humidity chamber
	Relative humidity at 25 °C 20 %rh to 95 %rh	2.5 %rh	Comparison with thermohygrometer in humidity chamber

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SCOPE OF CALIBRATION: TEMPERATURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Temperature Calibrator I) Source a) Type K b) Type N c) Type J d) Type T e) Type E f) Type R g) Type S h) Type B i) Pt 100	-200 °C to -100 °C -100 °C to 1370 °C -200 °C to -100 °C -100 °C to 1300 °C -200 °C to 1200 °C -200 °C to -100 °C -100 °C to 400 °C -200 °C to -100 °C -100 °C to 1000 °C 0 °C to 1760 °C 0 °C to 1760 °C 600 °C to 1800 °C -200 °C to 850 °C	0.3 °C 0.1 °C 0.3 °C 0.1 °C 0.1 °C 0.2 °C 0.1 °C 0.2 °C 0.1 °C 0.2 °C 0.2 °C 0.3 °C 0.1 °C	By electrical measurement using multimeter
II) Measurement a) Type K b) Type N c) Type J d) Type T e) Type E f) Type R g) Type S h) Type B i) Pt 100	-200 °C to -100 °C -100 °C to 1370 °C -200 °C to -100 °C -100 °C to 1300 °C -200 °C to 1200 °C -200 °C to -100 °C -100 °C to 400 °C -200 °C to -100 °C -100 °C to 1000 °C 0 °C to 1760 °C 0 °C to 1760 °C 600 °C to 1800 °C -200 °C to 850 °C	1.2 °C 0.4 °C 1.1 °C 0.3 °C 0.4 °C 0.6 °C 0.3 °C 0.6 °C 0.3 °C 2 °C 2 °C 2 °C 0.2 °C	By electrical simulation using calibrator

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SCOPE OF CALIBRATION: TEMPERATURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Temperature Indicating Device			
a) Type K	-200 °C to -100 °C -100 °C to 1370 °C	1.2 °C 0.4 °C	By electrical simulation using calibrator
b) Type N	-200 °C to -100 °C -100 °C to 1300 °C	1.1 °C 0.3 °C	
c) Type J	-200 °C to 1200 °C	0.4 °C	
d) Type T	-200 °C to -100 °C -100 °C to 400 °C	0.6 °C 0.3 °C	
e) Type E	-200 °C to -100 °C -100 °C to 1000 °C	0.6 °C 0.3 °C	
f) Type R	0 °C to 1760 °C	2 °C	
g) Type S	0 °C to 1760 °C	2 °C	
h) Type B	600 °C to 1800 °C	2 °C	
i) Pt 100	-200 °C to 850 °C	0.2 °C	

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

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Temperature sensor	30 °C to 200 °C 200 °C to 400 °C	0.27 °C 0.44 °C	Comparison with reference Pt100 in temperature block calibrator
Temperature sensor with indicator	30 °C to 200 °C 200 °C to 400 °C	0.2 °C 0.41 °C	
Temperature Indicating Device			By electrical simulation using calibrator
a) Type K	-200 °C to -100 °C -100 °C to 1370 °C	1.2 °C 0.4 °C	
b) Type N	-200 °C to -100 °C -100 °C to 1300 °C	1.1 °C 0.3 °C	
c) Type J	-200 °C to 1200 °C	0.4 °C	
d) Type T	-200 °C to -100 °C -100 °C to 400 °C	0.6 °C 0.3 °C	
e) Type E	-200 °C to -100 °C -100 °C to 1000 °C	0.6 °C 0.3 °C	
f) Type R	0 °C to 1760 °C	2 °C	
g) Type S	0 °C to 1760 °C	2 °C	
h) Type B	600 °C to 1800 °C	2 °C	
i) Pt 100	-200 °C to 850 °C	0.2 °C	
Temperature Controlled Enclosure	-30 °C to 100 °C 100 °C to 250 °C 250 °C to 600 °C 600 °C to 1200 °C	0.6 °C 0.6 °C 1.6 °C 2.5 °C	Calibrate using temperature recorder & thermocouple
Humidity Enclosure	5 °C to 40 °C 30 %rh to 90 %rh	0.3 °C 2.4 %rh	Calibrate using temperature recorder & thermocouple or data logger

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Schedule

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SCOPE OF CALIBRATION: TIME & FREQUENCY

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Stop Watch / Timer	0 to 30 s 30 s to 60 s 60 s to 300 s 300 s to 600 s 600 s to 900 s 900 s to 1800 s 1800 s to 3600 s 3600 s to 7200 s 7200 s to 10800 s	0.05 s 0.06 s 0.06 s 0.09 s 0.11 s 0.20 s 0.40 s 0.80 s 1.2 s	Calibrate by using Stop Watch

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SCOPE OF CALIBRATION: TIME & FREQUENCY**SITE: CATEGORY I**

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Stop Watch / Timer	0 to 30 s 30 s to 60 s 60 s to 300 s 300 s to 600 s 600 s to 900 s 900 s to 1800 s 1800 s to 3600 s 3600 s to 7200 s 7200 s to 10800 s	0.05 s 0.06 s 0.06 s 0.09 s 0.11 s 0.20 s 0.40 s 0.80 s 1.2 s	Calibrate by using Stop Watch
RPM Meter Non Contact	60 rpm to 14000 rpm	1.1 rpm	Calibrated by using Tachometer



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SCOPE OF CALIBRATION: MASS

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Standard Weight Class M1, M2 & M3 / Dead Weight	1 kg 2 kg 5 kg 10 kg 20 kg 25 kg	0.03 g 0.03 g 0.03 g 0.1 g 0.2 g 0.2 g	Calibrate by using standard weight and comparator with reference to OIML R111-1

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

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Balance	10 mg to 200 g 200 g to 1 kg 1 kg to 5 kg 5 kg to 10 kg 10 kg to 20 kg 20 kg to 50 kg 50 kg to 100 kg 100 kg to 500 kg 500 kg to 1000 kg	0.7 mg 6 mg 24 mg 0.1 g 0.2 g 0.3 g 0.6 g 0.1 kg 0.2 kg	Calibrate by using standard weights with reference to ASTM E898-88

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SCOPE OF CALIBRATION: PRESSURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Pneumatic	0 mbar to 5 mbar 5 mbar to 10 mbar 10 mbar to 30 mbar 30 mbar to 50 mbar 50 mbar to 70 mbar 70 mbar to 1000 mbar 1 bar to 8 bar 8 bar to 30 bar	0.003 mbar 0.006 mbar 0.016 mbar 0.030 mbar 0.043 mbar 0.15 mbar 0.002 bar 0.007 bar	Calibrate by using reference gauge with reference to DKD-R 6-1
Vacuum	-0.95 bar to 0 bar	0.008 bar	
Hydraulic	0 bar to 100 bar 100 bar to 300 bar 300 bar to 700 bar 700 bar to 1400 bar 1400 bar to 2500 bar	0.04 bar 0.07 bar 0.12 bar 0.3 bar 0.5 bar	

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

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Pneumatic	0 mbar to 5 mbar 5 mbar to 10 mbar 10 mbar to 30 mbar 30 mbar to 50 mbar 50 mbar to 70 mbar 70 mbar to 1000 mbar 1 bar to 8 bar 8 bar to 30 bar	0.003 mbar 0.006 mbar 0.016 mbar 0.030 mbar 0.043 mbar 0.15 mbar 0.002 bar 0.007 bar	Calibrate by using reference gauge with reference to DKD-R 6-1
Vacuum	-0.95 bar to 0 bar	0.006 bar	
Hydraulic	0 bar to 100 bar 100 bar to 300 bar 300 bar to 700 bar 700 bar to 1400 bar 1400 bar to 2500 bar	0.04 bar 0.07 bar 0.12 bar 0.3 bar 0.5 bar	

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SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Precision Caliper (Internal & External)	0 mm to 300 mm 300 mm to 600 mm	7 μ m 13 μ m	Calibrate by using caliper checker/gauge block as standards according to JIS B7507
Micrometer (External)	25 mm travel for micrometer frame sizes (in mm) 25, 50 75, 100, 125, 150 175, 200, 225 250, 275, 300	2 μ m 3 μ m 4 μ m 5 μ m	Calibrate by using gauge block and optical parallel as standards according to JIS B7502
Height Gauge	0 mm to 300 mm 300 mm to 600 mm	7 μ m 11 μ m	Calibrate by using caliper checker, gauge block and dial test indicator as standards according to JIS B7517
Dial Thickness Gauge	Up to 20 mm	1 μ m	Calibrate by using gauge block as standards according to JIS B7536
Dial Gauge	Up to 25 mm 25 mm to 50 mm 50 mm to 75 mm 75 mm to 100 mm	1.4 μ m 1.9 μ m 2 μ m 2.2 μ m	Calibrate by using micrometer head as standards according to JIS B7503
Dial Test Indicator	Up to 0.3 mm 0.3 mm to 0.6 mm 0.6 mm to 2.0 mm	1.4 μ m 1.5 μ m 4 μ m	Calibrate by using micrometer head as standards according to JIS B7533
Digital Indicator	Up to 50 mm	2 μ m	Calibrate by using gauge block according to JIS B7536

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

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Precision Caliper (Internal & External)	0 mm to 300 mm 300 mm to 600 mm	0.02 mm 0.04 mm	Calibrate by using caliper checker/gauge block as standards according to JIS B7507
Micrometer (External)	25 mm travel for micrometer frame sizes (in mm) 25, 50, 75 100, 125 125, 150 175 200 225, 250 275 300	3 μ m 4 μ m 5 μ m 6 μ m 7 μ m 8 μ m 9 μ m 10 μ m	Calibrate by using gauge block and optical parallel as standards according to JIS B7502
Height Gauge	0 mm to 300 mm 300 mm to 600 mm	7 μ m 11 μ m	Calibrate by using caliper checker, gauge block and dial test indicator as standards according to JIS B7517

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SCOPE OF CALIBRATION: DIMENSIONAL

SITE: CATEGORY I

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty($\pm$)*	Remarks
Surface Plate	300 mm x 300 mm 1000 mm x 1000 mm	1.8 μ m 3.2 μ m	Calibrate by using planekator, microindicator and variation gauge as standards according to BS 817
Measuring Microscope (Individual Linear Axis Only)	0 mm to 140 mm 140 mm to 300 mm	1.7 μ m 3.3 μ m	Calibrate by using glass scale as standards according to JIS B7153
Profile Projector (Individual Linear Axis Only)	0 mm to 140 mm 140 mm to 300 mm	1.7 μ m 3.3 μ m	Calibrate by using glass scale as standards according to JIS B7184

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