STANDARDS MALAYSIA
ACCREDITED LABORATORY

MS ISO/IEC 17025

Certificate of Accreditation

No: SAMM 109 Valid until: 1 April 2011

This is to certify that

VITAR-SEGATEC SDN BHD
KLANG, SELANGOR
MALAYSIA
(FIELDS OF CALIBRATION: ELECTRICAL, TEMPERATURE, MASS, DIMENSIONAL, PRESSURE & TORQUE)

has been granted accreditation in respect of the scope of accreditation described in the SCHEDULE attached, subject to the terms and conditions governing the *Skim Akreditasi Makmal Malaysia* (SAMM), the Laboratory Accreditation Scheme of Malaysia.

Laboratories accredited under SAMM meet the requirements of MS ISO/IEC 17025 'General requirements for the competence of testing and calibration laboratories'. This Malaysian Standard is identical with ISO/IEC 17025 published by the International Organization for Standardization (ISO).

"This laboratory is accredited in accordance with recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communique dated 18 June 2005)"

(FADILAH BAHARIN)
Director General
Department of Standards Malaysia
Date of issue: 16 May 2008

Issuance of this certificate is governed by Section 16 Subsection (2) and (3) of Standards of Malaysia Act 1996, (Act 549)

LABORATORY LOCATION:
(PERMANENT LABORATORY)

VITAR-SEGATEC SDN BHD
WISMA VITAR
LOT 590, JALAN BATU TIGA LAMA
KAWASAN PERINDUSTRIAN SUNGAI RASA
41300 KLANG
SELANGOR, MALAYSIA

The standard used for assessment of this laboratory is MS ISO/IEC 17025:2005

FIELDS OF CALIBRATION: HEAT AND TEMPERATURE MEASUREMENT

SCOPE OF ACCREDITATION:

Instruments calibrated/ Measurement Parameter	**Range**	**Calibration & Measurement Capability Expressed as an Uncertainty (±)**	**Remarks**
1. Thermocouples			
(i) Type B	600 °C to 1000 °C	2.0 °C	Comparison with Standard Resistance Thermometer / Thermocouple in calibration bath.
	1000 °C to 1200 °C	3.5 °C	
(ii) Type R	0 °C to 100 °C	1.0 °C	
	100 °C to 650 °C	0.8 °C	
	650 °C to 1000 °C	1.8 °C	
	1000 °C to 1200 °C	3.5 °C	
(iii) Type S	0 °C to 100 °C	1.0 °C	
	100 °C to 650 °C	0.8 °C	
	650 °C to 1000 °C	1.8 °C	
	1000 °C to 1200 °C	3.5 °C	
(iv) Type J	-30 °C to 200 °C	0.2 °C	
	200 °C to 500 °C	0.4 °C	
	500 °C to 650 °C	0.6 °C	
	650 °C to 1000 °C	1.7 °C	
	1000 °C to 1200 °C	3.4 °C	
(v) Type K	-30 °C to 200 °C	0.3 °C	
	200 °C to 500 °C	0.5 °C	
	500 °C to 650 °C	0.6 °C	
	650 °C to 1000 °C	1.7 °C	
	1000 °C to 1200 °C	3.4 °C	
(vi) Type N	-30 °C to 200 °C	0.3 °C	
	200 °C to 500 °C	0.5 °C	
	500 °C to 650 °C	0.6 °C	
	650 °C to 1000 °C	1.7 °C	
	1000 °C to 1200 °C	3.4 °C	

FIELDS OF CALIBRATION: HEAT AND TEMPERATURE MEASUREMENT

SCOPE OF ACCREDITATION:

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
(vii) Type E	-30 °C to 200 °C 200 °C to 500 °C 500 °C to 650 °C 650 °C to 1000 °C	0.2 °C 0.4 °C 0.6 °C 1.7 °C	Comparison with Standard Resistance Thermometer / Thermocouple in calibration bath.
(viii) Type T	-30 °C to 200 °C 200 °C to 400 °C	0.2 °C 0.4 °C	
2. Resistance Temperature Detectors (RTD)	-30 °C to 100 °C 100 °C to 200 °C 200 °C to 500 °C 500 °C to 650 °C 650 °C to 850 °C	0.06 °C 0.12 °C 0.4 °C 0.6 °C 1.7 °C	Comparison with Standard Resistance Thermometer / Thermocouple in calibration bath.
3. Liquid-in Glass Thermometer a) Total Immersion	-30 °C to 100 °C 100 °C to 200 °C	0.08 °C 0.13 °C	Comparison with Standard Resistance Thermometer / Thermocouple in calibration bath.
b) Partial Immersion	-30 °C to 400 °C	0.7 °C	
4. Temperature Measuring Instruments (with sensors)	-30 °C to 100 °C 100 °C to 200 °C 200 °C to 500 °C 500 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1200 °C	0.06 °C 0.12 °C 0.4 °C 0.5 °C 1.7 °C 3.4 °C	Comparison with Standard Resistance Thermometer / Thermocouple in calibration bath.
5. Temperature Indicating Instruments (By electrical simulation) a) Thermocouples CJC Off (i) Type B	600 °C to 700 °C 700 °C to 800 °C 800 °C to 1100 °C 1100 °C to 1820 °C	0.7 °C 0.6 °C 0.5 °C 0.4 °C	By electrical simulation using calibrator and reference table to ITS- 90.

FIELDS OF CALIBRATION: HEAT AND TEMPERATURE MEASUREMENT

SCOPE OF ACCREDITATION:

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
(ii) Type R	0 °C to 100 °C 100 °C to 200 °C 200 °C to 300 °C 300 °C to 1768 °C	0.8 °C 0.6 °C 0.5 °C 0.4 °C	By electrical simulation using calibrator and reference table to ITS- 90.
(iii) Type S	0 °C to 100 °C 100 °C to 200 °C 200 °C to 500 °C 500 °C to 1768 °C	0.8 °C 0.6 °C 0.5 °C 0.4 °C	
(iv) Type J	-200 °C to -100 °C -100 °C to 1200 °C	0.10 °C 0.08 °C	
(v) Type K	-200 °C to -100 °C -100 °C to 1372 °C	0.16 °C 0.14 °C	
(vi) Type N	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1300 °C	0.23 °C 0.17 °C 0.15 °C	
(vii) Type E	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1000 °C	0.09 °C 0.08 °C 0.07 °C	
(viii) Type T	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 400 °C	0.15 °C 0.12 °C 0.10 °C	
CJC On (i) Type B	600 °C to 700 °C 700 °C to 1200 °C 1200 °C to 1820 °C	1.2 °C 1.1 °C 1.0 °C	By electrical simulation using calibrator and reference table to ITS- 90.
(ii) Type R	0 °C to 100 °C 100 °C to 300 °C 300 °C to 1768 °C	1.2 °C 1.1 °C 1.0 °C	
(iii) Type S	0 °C to 100 °C 100 °C to 1768 °C	1.2 °C 1.1 °C	

FIELDS OF CALIBRATION: HEAT AND TEMPERATURE MEASUREMENT

SCOPE OF ACCREDITATION:

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
(iv) Type J	-200 °C to 1200 °C	0.3 °C	By electrical simulation using calibrator and reference table to ITS- 90.
(v) Type K	-200 °C to 1372 °C	0.3 °C	
(vi) Type N	-200 °C to -100 °C -100 °C to 1300 °C	0.4 °C 0.3 °C	
(vii) Type E	-200 °C to 1000 °C	0.2 °C	
(vii) Type T	-200 °C to 400 °C	0.3 °C	
b) RTD	-200 °C to 600 °C 600 °C to 850 °C	0.01 °C 0.06 °C	By electrical simulation using calibrator and reference table to ITS- 90.
6. Temperature Calibrator (Measure) a) Thermocouples CJC Off			
(i) Type B	600 °C to 700 °C 700 °C to 800 °C 800 °C to 1100 °C 1100 °C to 1820 °C	0.7 °C 0.6 °C 0.5 °C 0.4 °C	By electrical simulation using calibrator and reference table to ITS- 90.
(ii) Type R	0 °C to 100 °C 100 °C to 200 °C 200 °C to 300 °C 300 °C to 1768 °C	0.8 °C 0.6 °C 0.5 °C 0.4 °C	
(iii) Type S	0 °C to 100 °C 100 °C to 200 °C 200 °C to 500 °C 500 °C to 1768 °C	0.8 °C 0.6 °C 0.5 °C 0.4 °C	
(iv) Type J	-200 °C to -100 °C -100 °C to 1200 °C	0.10 °C 0.08 °C	
(v) Type K	-200 °C to -100 °C -100 °C to 1372 °C	0.16 °C 0.14 °C	

FIELDS OF CALIBRATION: HEAT AND TEMPERATURE MEASUREMENT

SCOPE OF ACCREDITATION:

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
(vi) Type N	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1300 °C	0.23 °C 0.17 °C 0.15 °C	By electrical simulation using calibrator and reference table to ITS- 90.
(vii) Type E	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1000 °C	0.09 °C 0.08 °C 0.07 °C	
(viii) Type T	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 400 °C	0.15 °C 0.12 °C 0.10 °C	
CJC On (i) Type B	600 °C to 700 °C 700 °C to 1200 °C 1200 °C to 1820 °C	1.2 °C 1.1 °C 1.0 °C	By electrical simulation using calibrator and reference table to ITS- 90.
(ii) Type R	0 °C to 100 °C 100 °C to 300 °C 300 °C to 1768 °C	1.2 °C 1.1 °C 1.0 °C	
(iii) Type S	0 °C to 100 °C 100 °C to 1768 °C	1.2 °C 1.1 °C	
(iv) Type J	-200 °C to 1200 °C	0.3 °C	
(v) Type K	-200 °C to 1372 °C	0.3 °C	
(vi) Type N	-200 °C to -100 °C -100 °C to 1300 °C	0.4 °C 0.3 °C	
(vii) Type E	-200 °C to 1000 °C	0.2 °C	
(vii) Type T	-200 °C to 400 °C	0.3 °C	
b) RTD	-200 °C to 600 °C 600 °C to 850 °C	0.01 °C 0.06 °C	By electrical simulation using calibrator and reference table to ITS- 90.

FIELDS OF CALIBRATION: HEAT AND TEMPERATURE MEASUREMENT

SCOPE OF ACCREDITATION:

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
7. Temperature Calibrator (Generate) a) Thermocouples CJC On (i) Type B	600 °C to 700 °C 700 °C to 1820 °C	1.3 °C 1.2 °C	By electrical measurement using indicator and reference table to ITS- 90.
(ii) Type R	0 °C to 100 °C 100 °C to 1768 °C	1.3 °C 1.2 °C	
(iii) Type S	0 °C to 100 °C 100 °C to 1768 °C	1.3 °C 1.2 °C	
(iv) Type J	-200 °C to 1200 °C	0.3 °C	
(v) Type K	-200 °C to 1372 °C	0.4 °C	
(vi) Type N	-200 °C to 1300 °C	0.4 °C	
(vii) Type E	-200 °C to -100 °C -100 °C to 1000 °C	0.3 °C 0.2 °C	
(vii) Type T	-200 °C to -100 °C -100 °C to 400 °C	0.4 °C 0.3 °C	
b) RTD	-200 °C to 600 °C 600 °C to 850 °C	0.02 °C 0.10 °C	
8. Temperature Calibrator (Temperature Block Type)	-30 °C to 500 °C 500 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1200 °C	0.1 °C 0.2 °C 1.7 °C 3.4 °C	1. Comparison with Standard Resistance Thermometer / Thermocouple. 2. Stability, Axial Variation and Radial Variation (if more than 1 bore) is tested.

FIELDS OF CALIBRATION: HEAT AND TEMPERATURE MEASUREMENT

SCOPE OF ACCREDITATION:

Instruments calibrated/ Measurement Parameter	**Range**	**Calibration & Measurement Capability Expressed as an Uncertainty (±)**	**Remarks**
9. Relative Humidity Devices (i) Air Temperature	10 °C to 50 °C 50 °C to 80 °C	0.6 °C 0.7 °C	Comparison with wet & dry bulb / reference thermohygro-devices in calibration chamber.
(ii) Humidity	10 %r.h. to 50 %r.h. 50 %r.h. to 95 %r.h.	2 %r.h. 3 %r.h.	
10. Dial Type Expansion Thermometer	-30 °C to 650 °C 650 °C to 700 °C	1 °C 2 °C	Comparison with Standard Resistance Thermometer / Thermocouple in calibration bath.

Signatories:

1. Tee Tone Vei **I/C No.: 681028-10-5135**

2. Ng Seh Kian **I/C No.: 710713-14-5151**

3. Yiew Ching Tuck **I/C No.: 761027-14-5979**

FIELDS OF CALIBRATION : HEAT AND TEMPERATURE MEASUREMENT

SITE CALIBRATION- CATEGORY 1

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
1. Thermocouples			
(i) Type B	600 °C to 1000 °C	3.0 °C	Comparison with Standard Resistance Thermometer / Thermocouple in calibration bath.
	1000 °C to 1200 °C	5.0 °C	
(ii) Type R	0 °C to 500 °C	1.2 °C	
	500 °C to 650 °C	2.1 °C	
	650 °C to 1000 °C	3.0 °C	
	1000 °C to 1200 °C	5.0 °C	
(iii) Type S	0 °C to 500 °C	1.2 °C	
	500 °C to 650 °C	2.1 °C	
	650 °C to 1000 °C	3.0 °C	
	1000 °C to 1200 °C	5.0 °C	
(iv) Type J	-30 °C to 200 °C	0.6 °C	
	200 °C to 500 °C	0.8 °C	
	500 °C to 650 °C	2.0 °C	
	650 °C to 1000 °C	3.0 °C	
	1000 °C to 1200 °C	5.0 °C	
(v) Type K	-30 °C to 200 °C	0.6 °C	
	200 °C to 500 °C	0.8 °C	
	500 °C to 650 °C	2.0 °C	
	650 °C to 1000 °C	3.0 °C	
	1000 °C to 1200 °C	5.0 °C	
(vi) Type N	-30 °C to 200 °C	0.6 °C	
	200 °C to 500 °C	0.8 °C	
	500 °C to 650 °C	2.0 °C	
	650 °C to 1000 °C	3.0 °C	
	1000 °C to 1200 °C	5.0 °C	
(vii) Type E	-30 °C to 200 °C	0.6 °C	
	200 °C to 500 °C	0.8 °C	
	500 °C to 650 °C	2.0 °C	
	650 °C to 1000 °C	3.0 °C	
(viii) Type T	-30 °C to 200 °C	0.6 °C	
	200 °C to 400 °C	0.8 °C	

FIELDS OF CALIBRATION : HEAT AND TEMPERATURE MEASUREMENT

SITE CALIBRATION- CATEGORY 1

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	**Range**	**Calibration & Measurement Capability Expressed as an Uncertainty (±)**	**Remarks**
2. Resistance Temperature Detectors (RTD)	-30 °C to 200 °C 200 °C to 500 °C 500 °C to 650 °C 650 °C to 1000 °C	0.5 °C 0.7 °C 2.0 °C 3.0 °C	Comparison with Standard Resistance Thermometer / Thermocouple in calibration bath.
3. Temperature Measuring Instruments (with sensors)	-30 °C to 200 °C 200 °C to 500 °C 500 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1200 °C	0.5 °C 0.7 °C 2.0 °C 3.0 °C 5.0 °C	Comparison with Standard Resistance Thermometer / Thermocouple in calibration bath.
4. Temperature Indicating Instruments (By electrical simulation) a) Thermocouples CJC On			
(i) Type B	600 °C to 1820 °C	2.2 °C	By electrical simulation using calibrator and reference table to ITS- 90.
(ii) Type R	0 °C to 200 °C 200 °C to 1768 °C	2.1 °C 1.9 °C	
(iii) Type S	0 °C to 300 °C 300 °C to 1768 °C	2.1 °C 1.9 °C	
(iv) Type J	-200 °C to 1200 °C	0.5 °C	
(v) Type K	-200 °C to 1372 °C	0.7 °C	
(vi) Type N	-200 °C to 1300 °C	0.7 °C	
(vii) Type E	-200 °C to 1000 °C	0.5 °C	
(viii) Type T	-200 °C to 400 °C	0.5 °C	
b) RTD	-200 °C to 600 °C 600 °C to 850 °C	0.1 °C 0.2 °C	

FIELDS OF CALIBRATION : HEAT AND TEMPERATURE MEASUREMENT

SITE CALIBRATION- CATEGORY 1

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
5. Temperature Calibrator (Measure)			
a) Thermocouples CJC On			
(i) Type B	600 °C to 1820 °C	2.2 °C	By electrical simulation using calibrator and reference table to ITS- 90.
(ii) Type R	0 °C to 200 °C 200 °C to 1768 °C	2.1 °C 1.9 °C	
(iii) Type S	0 °C to 300 °C 300 °C to 1768 °C	2.1 °C 1.9 °C	
(iv) Type J	-200 °C to 1200 °C	0.5 °C	
(v) Type K	-200 °C to 1372 °C	0.7 °C	
(vi) Type N	-200 °C to 1300 °C	0.7 °C	
(vii) Type E	-200 °C to 1000 °C	0.5 °C	
(viii) Type T	-200 °C to 400 °C	0.5 °C	
b) RTD	-200 °C to 600 °C 600 °C to 850 °C	0.1 °C 0.2 °C	
6. Temperature Calibrator (Generate)			
a) Thermocouples CJC On			
(i) Type B	600 °C to 1820 °C	1.5 °C	By electrical measurement using indicator and reference table to ITS- 90.
(ii) Type R	0 °C to 100 °C 100 °C to 1768 °C	1.5 °C 1.2 °C	
(iii) Type S	0 °C to 100 °C 100 °C to 1768 °C	1.5 °C 1.2 °C	

FIELDS OF CALIBRATION : HEAT AND TEMPERATURE MEASUREMENT

SITE CALIBRATION- CATEGORY 1

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
(iv) Type J	-200 °C to 1200 °C	0.4 °C	By electrical measurement using indicator and reference table to ITS- 90.
(v) Type K	-200 °C to 1372 °C	0.4 °C	
(vi) Type N	-200 °C to 1300 °C	0.4 °C	
(vii) Type E	-200 °C to 1000 °C	0.3 °C	
(viii) Type T	-200 °C to 400 °C	0.4 °C	
b) RTD	-200 °C to 600 °C 600 °C to 850 °C	0.1 °C 0.2 °C	
7. Temperature Calibrator (Temperature Block Type)	-30 °C to 200 °C 200 °C to 500 °C 500 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1200 °C	0.2 °C 0.7 °C 2.0 °C 3.0 °C 5.0 °C	1. Comparison with Standard Resistance Thermometer / Thermocouple. 2. Stability, Axial Variation and Radial Variation (if more than 1 bore) is tested.
8. Control Temperature Enclosure	-80 °C to -30 °C -30 °C to 200 °C 200 °C to 300 °C 300 °C to 500 °C 500 °C to 900 °C 900 °C to 1100 °C 1100 °C to 1200 °C	1.5 °C 0.5 °C 0.7 °C 1.0 °C 3.0 °C 4.0 °C 6.0 °C	Based on AS 2853-1986.
9. Humidity Chamber	10 %r.h. to 40 %r.h. 40 %r.h. to 95 %r.h.	1.0 %r.h. 2.0 %r.h.	Comparison with wet & dry bulb / reference thermohygro-devices.

FIELDS OF CALIBRATION : HEAT AND TEMPERATURE MEASUREMENT

SITE CALIBRATION- CATEGORY 1

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	**Range**	**Calibration & Measurement Capability Expressed as an Uncertainty (±)**	**Remarks**
10. Thermohygro Devices (i) Air Temperature (ii) Humidity	10 °C to 50 °C 10 %r.h. to 50 %r.h. 50 %r.h. to 95 %r.h.	0.6 °C 2 %r.h. 3 %r.h.	Comparison with wet & dry bulb / reference thermohygro-devices in calibration chamber.
11. Dial Type Expansion Thermometer	-30 °C to 500 °C 500 °C to 650 °C 650 °C to 700 °C	1 °C 2 °C 3 °C	Comparison with Standard Resistance Thermometer / Thermocouple in calibration bath.
12. Liquid Bath	-30 °C to 200 °C 200 °C to 300 °C	0.5 °C 0.7 °C	1. Comparison with Standard Thermocouple. 2. Stability, Axial Variation and Radial Variation is tested.

Signatories:

1. Tee Tone Vei **I/C No.: 681028-10-5135**

2. Ng Seh Kian **I/C No.: 710713-14-5151**

3. Yiew Ching Tuck **I/C No.: 761027-14-5979**

FIELD OF CALIBRATION : ELECTRICAL MEASUREMENT

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
Measuring Instrument 1. Voltmeter, Ammeter, Ohmmeter & Multimeter		(Uncertainty + floor)	
DC Voltage	0 mV to 329.0 mV 0.329 V to 3.29 V 3.29 V to 50.00 V 50 V to 329.00 V 329 V to 1000.00 V	7 µV + 3 µV 60 µV + 5 µV 0.7 mV + 0.5 mV 3 mV + 0.5 mV 30 mV + 1.5 mV	Generation using calibrator model Fluke 5500A.
AC Voltage (45 Hz to 1 kHz)	1.0 mV to 300.0 mV 0.3 V to 3 V 3 V to 30 V 30 V to 300 V 300 V to 1000 V	20 µV + 20 µV 200 µV + 60 µV 1.3 mV + 0.6 mV 20 mV + 15 mV 50 mV + 80 mV	
DC Current	0 A to 3.29 mA 3.29 mA to 32.9 mA 32.9 mA to 329.0 mA 329.0 mA to 2.19 A 2.19 A to 11 A	0.6 µA + 0.1 µA 6 µA + 0.3 µA 70 µA + 4 µA 0.7 mA to 0.05 mA 7 mA + 0.4 mA	
AC Current (45 Hz to 1 kHz)	0.033 mA to 0.329 mA 0.329 mA to 3.29 mA 3.29 mA to 32.9 mA 32.9 mA to 329 mA 0.329 A to 2.19 A 2.19 A to 11A	0.1 µA + 0.3 µA 2 µA + 0.3 µA 10 µA + 3 µA 0.1 mA + 0.03 mA 2 mA + 0.3 mA 10 mA + 2 mA	

FIELD OF CALIBRATION : ELECTRICAL MEASUREMENT

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	**Range**	**Calibration & Measurement Capability Expressed as an Uncertainty (±)**	**Remarks**
Measuring Instrument 1. Voltmeter, Ammeter, Ohmmeter & Multimeter (continue)		(Uncertainty + floor)	
Resistance	0 Ω to 33.0 Ω 33.0 Ω to 330.0 Ω 330.0 Ω to 3300.0 Ω 3.3 kΩ to 33.0 kΩ 33.0 kΩ to 330.0 kΩ 0.33 MΩ to 3.3 MΩ 3.3 MΩ to 19.0 MΩ 19.0 MΩ to 30.0 MΩ 30.0 MΩ to 119.0 MΩ 119.0 MΩ to 290.0 MΩ	0.01 Ω + 0.01 Ω 0.02 Ω + 0.01 Ω 0.2 Ω + 0.06 Ω 2 Ω + 0.6 Ω 20 Ω + 6 Ω 0.3 kΩ + 0.06 kΩ 10 kΩ + 0.6 kΩ 20 kΩ + 17 kΩ 80 kΩ + 17 kΩ 1000 kΩ + 17 kΩ	Generation using calibrator model Fluke 5500A.
Measuring Instrument 2. Clamp Meter		(± of the range)	
DC Current	10 A 10 A to 50 A 50 A to 109.5 A 109.5A to 250 A 250 A to 350 A 350 A to 450 A 450 A to 550 A	0.7 A 0.9 A 1.2 A 2.1 A 2.7 A 3.2 A 3.8 A	Generation using calibrator model Fluke 5500A and 50 turn current coil.
AC Current (45 Hz to 1 kHz)	10 A 10 A to 50 A 50 A to 109.5 A 109.5A to 250 A 250 A to 350 A 350 A to 450 A 450 A to 550 A	0.7 A 0.9 A 1.2 A 2.1 A 2.7 A 3.2 A 3.8 A	

FIELD OF CALIBRATION : ELECTRICAL MEASUREMENT

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
Measuring Instrument 3. Power Meter DC Power	Up to 25 W 25 W to 400 W 400 W to 2500 W 2500 W to 11,000 W	0.02 W 0.1 W 2 W 10 W	Generation using calibrator model Fluke 5500A.
AC Power	Up to 25 W 25 W to 400 W 400 W to 2500 W 2500 W to 11,000 W	0.07 W 0.3 W 3 W 10 W	
4. Hipot Tester			
Puncture (DC)	0 kV to 2 kV 2 kV to 3 kV 3 kV to 4 kV 4 kV to 5 kV	0.02 kV 0.02 kV 0.02 kV 0.02 kV	Measurement using high voltage meter.
Puncture (AC)	0 kV to 2 kV 2 kV to 3 kV 3 kV to 4 kV 4 kV to 5 kV	0.06 kV 0.07 kV 0.07 kV 0.08 kV	
Insulation	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 300 MΩ	0.006 kΩ 0.06 kΩ 0.6 kΩ 0.006 MΩ 0.06 MΩ 0.7 MΩ	Generation using decade resistance box / standard Resistor.
Cut Off Current	0 mA to 4 mA 4 mA to 40 mA 40 mA to 400 mA	0.08 mA 0.25 mA 1.1 mA	Measurement using multimeter.

FIELD OF CALIBRATION : ELECTRICAL MEASUREMENT

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
Measuring Instrument		(± of the range)	
5. Timer			
(Normally Open Type)	5 sec to 15 min 15 min to 2hrs	0.2 second 1 second	Comparison with multifunction counter.
(Normally Closed Type)	5 sec to 15 min 15 min to 2hrs	0.2 second 1 second	
6. Stop Watch	1 sec to 9 sec 10 sec to 90 sec 120 sec to 900 sec 1200 sec to 7200 sec	0.04 second 0.05 second 0.11 second 1.1 second	Comparison with timer.

Signatories:

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2. Yiew Ching Tuck **I/C No.: 761027-14-5979**

3. Teng Kee Chan **I/C No.: 800220-10-5417**

FIELD OF CALIBRATION : ELECTRICAL MEASUREMENT

SITE CALIBRATION- CATEGORY 1

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
Measuring Instrument		(± of the range)	
1. Timer			
(Normally Open Type)	5 sec to 15 min 15 min to 2hrs	0.2 second 1 second	Comparison with multifunction counter.
(Normally Closed Type)	5 sec to 15 min 15 min to 2hrs	0.2 second 1 second	

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FIELD OF CALIBRATION : MASS MEASUREMENT

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
Standard Weights	1 mg 2 mg 5 mg 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	0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.03 mg 0.03 mg 0.03 mg 0.04 mg 0.05 mg 0.06 mg 0.08 mg 0.10 mg 0.13 mg 0.15 mg 0.3 mg 0.5 mg 2 mg 3 mg 10 mg 20 mg 100 mg 100 mg	1. Calibrated using Standard Weight with Mass Comparator. 2. The Calibration Procedure is based on OIML R 111:2004. 3. Calibrations may be given in other units by conversion from SI units. 4. Intermediate values can be calibrated with uncertainty interpolated from the next higher and lower nominal values tabulated.

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FIELD OF CALIBRATION : MASS MEASUREMENT

SITE CALIBRATION- CATEGORY 1

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
Weighing Balance	0 g to 100 g 100 g to 200 g 200 g to 300 g 300 g to 500 g 500 g to 1 kg 1 kg to 2 kg 2 kg to 3 kg 3 kg to 5 kg 5 kg to 10 kg 10 kg to 20 kg 20 kg to 30 kg 30 kg to 50 kg 50 kg to 100 kg 100 kg to 200 kg 200 kg to 300 kg	0.0003 g 0.0005 g 0.0006 g 0.0012 g 0.002 g 0.004 g 0.004 g 0.012 g 0.04 g 0.04 g 0.6 g 1.2 g 2 g 4 g 7 g	1. Calibrated using Standard Weight. 2. The Calibration Procedure is based on LAB 14:2006.

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FIELD OF CALIBRATION : TORQUE

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
Torque Screwdrivers / Wrenches	15 kgf.cm to 115 kgf.cm	0.6 kgf.cm	1. Calibrated using Torque Meter. 2. The Calibration Procedure is based on BS 7882.

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FIELD OF CALIBRATION : DIMENSIONAL MEASUREMENT

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
Vernier Calliper	0 mm to 300 mm 301 mm to 600 mm (Internal Measurement) 0 mm to 300 mm 301 mm to 600 mm (External Measurement)	0.01 mm 0.02 mm 0.01 mm 0.02 mm	Calibrated using Caliper Checker.
Micrometer	0 mm to 25 mm	0.001 mm	Calibrated using Gauge Block.
Height Gauge	0 mm to 300 mm 301 mm to 600 mm	0.01 mm 0.02 mm	Calibrated using Caliper Checker.
Dial Gauge	0 mm to 15 mm	0.002 mm	Calibrated using Dial Gauge Tester.
Digital Indicator	0 mm to 15 mm	0.002 mm	Calibrated using Dial Gauge Tester.

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FIELD OF CALIBRATION : DIMENSIONAL MEASUREMENT

SITE CALIBRATION- CATEGORY 1

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
Vernier Calliper	0 mm to 300 mm 301 mm to 600 mm (Internal Measurement) 0 mm to 300 mm 301 mm to 600 mm (External Measurement)	0.01 mm 0.02 mm 0.01 mm 0.02 mm	Calibrated using Caliper Checker.
Micrometer	0 mm to 25 mm	0.001 mm	Calibrated using Gauge Block.
Height Gauge	0 mm to 300 mm 301 mm to 600 mm	0.01 mm 0.02 mm	Calibrated using Caliper Checker.
Dial Gauge	0 mm to 15 mm	0.002 mm	Calibrated using Dial Gauge Tester.
Digital Indicator	0 mm to 15 mm	0.002 mm	Calibrated using Dial Gauge Tester.
Profile Projector	0 mm to 50 mm (for X,Y scales only)	0.003 mm	Calibrated using Glass Standard Scale.

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FIELD OF CALIBRATION : PRESSURE MEASUREMENT

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	**Range**	**Calibration & Measurement Capability Expressed as an Uncertainty (±)**	**Remarks**
Pressure Measuring Devices	-0.9 bar to 0.0 bar 0 bar to 10 bar 10 bar to 20 bar 20 bar to 135 bar 135 bar to 300 bar 300 bar to 600 bar 600 bar to 700 bar	0.005 bar 0.005 bar 0.013 bar 0.05 bar 1 bar 2 bar 3 bar	1. Calibrated using Pressure Calibrator / Pressure Transducer / Test Gauge. 2. The Calibration Procedure is based on BS EN 837:1998.
Differential Pressure Measuring Devices with ambient operating pressure (gas medium)	0 Pa ~ 100 Pa 100 Pa ~ 500 Pa 500 Pa ~ 1000 Pa 1000 Pa ~ 5000 Pa 5000 Pa ~ 7000 Pa	2 Pa 3 Pa 7 Pa 15 Pa 30 Pa	1. Calibrated using Differential Pressure Indicator. 2. The Calibration Procedure is based on BS EN 837:1998.

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FIELD OF CALIBRATION : PRESSURE MEASUREMENT

SITE CALIBRATION- CATEGORY 1

SCOPE OF ACCREDITATION :

Instruments calibrated/ Measurement Parameter	Range	Calibration & Measurement Capability Expressed as an Uncertainty (±)	Remarks
Pressure Measuring Devices	-0.9 bar to 0.0 bar 0 bar to 10 bar 10 bar to 20 bar 20 bar to 50 bar 50 bar to 135 bar 135 bar to 200 bar 200 bar to 600 bar 600 bar to 700 bar	0.005 bar 0.006 bar 0.02 bar 0.05 bar 0.10 bar 1 bar 2 bar 3 bar	1. Calibrated using Pressure Calibrator / Pressure Transducer / Test Gauge. 2. The Calibration Procedure is based on BS EN 837:1998.
Differential Pressure Measuring Devices with ambient operating pressure (gas medium)	0 Pa ~ 100 Pa 100 Pa ~ 500 Pa 500 Pa ~ 1000 Pa 1000 Pa ~ 3000 Pa 3000 Pa ~ 5000 Pa 5000 Pa ~ 6000 Pa 6000 Pa ~ 7000 Pa	2 Pa 4 Pa 7 Pa 15 Pa 20 Pa 30 Pa 35 Pa	1. Calibrated using Differential Pressure Indicator. 2. The Calibration Procedure is based on BS EN 837:1998.

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