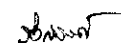


Scope of Accreditation for Calibration

Laboratory Name : Calibration Laboratory
 Thai Heart Calibration Company Limited
Premises : 2299/12-13 Moo 4, Thepharak, Muang, Samut Prakan
Accreditation No. : CALIBRATION 0156
Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark
1. Electrical	Generating instrument		In-house method : CM-025 by direct measurement with digital multimeter
	DC Voltage		
	0 mV to < 120 mV	45 μ V/V + 4.5 μ V	
	120 mV to < 1.2 V	30 μ V/V + 9.0 μ V	
	1.2 V to < 12 V	30 μ V/V + 60 μ V	
	12 V to < 120 V	45 μ V/V + 0.70 mV	
	120 V to 1.2 kV	50 μ V/V + 12 mV	
	AC Voltage		
	@ 10 Hz to 20 kHz		
	10 mV to < 120 mV	0.70 mV/V + 47 μ V	
	120 mV to < 1.2 V	0.70 mV/V + 0.35 mV	
	1.2 V to < 12 V	0.70 mV/V + 3.5 mV	
	12 V to < 120 V	0.70 mV/V + 35 mV	
120 V to 1.2 kV	0.70 mV/V + 0.35 V		
DC Current		In-house method : CM-025 and CM-049 by direct measurement with digital multimeter	
0 mA to < 0.12 mA	0.58 mA/A + 29 nA		
0.12 mA to < 1.2 mA	0.58 mA/A + 60 nA		
1.2 mA to < 12 mA	0.58 mA/A + 2.4 μ A		

* expressed as an uncertainty (\pm) which for $k = 2$, providing a level of confidence of approximately 95%



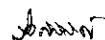
Scope of Accreditation for Calibration

Accreditation No. : CALIBRATION 0156

Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark
1. Electrical (cont.)	Generating instrument		
	Resistance (cont.)		
	1.2 MΩ to < 12 MΩ	0.47 mΩ/Ω + 0.12 kΩ	In-house method : CM-025, CM-033, and CM-034 by direct measurement with digital multimeter
	12 MΩ to < 120 MΩ	9.3 mΩ/Ω + 12 kΩ	
	120 MΩ to < 1.2 GΩ	24 mΩ/Ω + 0.12 MΩ	
	Capacitance		In-house method : CM-025 by direct measurement with digital multimeter
	0.1 nF to < 1.2 nF	24 mF/F + 4.0 pF	
	1.2 nF to < 12 nF	12 mF/F + 60 pF	
	12 nF to < 120 nF	12 mF/F + 0.60 nF	
	120 nF to < 1.2 μF	12 mF/F + 6.0 nF	
	1.2 μF to < 12 μF	12 mF/F + 60 nF	
	12 μF to < 120 μF	12 mF/F + 0.60 μF	
	120 μF to < 1.2 mF	12 mF/F + 6.0 μF	
	1.2 mF to < 12 mF	12 mF/F + 60 μF	
	12 mF to < 120 mF	47 mF/F + 0.30 mF	
	Frequency		In-house method : CM-025 by direct measurement with digital multimeter
	10 mV to 10 V		
	5 Hz to 10 Hz	0.58 mHz/Hz + 0.60 mHz	
> 10 Hz to 40 Hz	0.35 μHz/Hz + 0.60 mHz		
> 40 Hz to 1 kHz	0.12 μHz/Hz + 6.0 mHz		
> 1 kHz to 1 000 kHz	0.12 μHz/Hz + 0.60 Hz		

* expressed as an uncertainty (+) which for k = 2, providing a level of confidence of approximately 95%



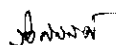
Scope of Accreditation for Calibration

Accreditation No. : CALIBRATION 0156

Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark
1. Electrical (cont.)	Generating instrument		In-house method : CM-025 by direct measurement with digital multimeter
	Thermocouple temperature simulator		
	Type J		
	-210 °C to < -100 °C	0.26 °C	
	-100 °C to < 760 °C	0.19 °C	
	760 °C to 1 200 °C	0.18 °C	
	Type K		
	-200 °C to < -100 °C	0.30 °C	
	-100 °C to < 120 °C	0.20 °C	
	120 °C to 1 000 °C	0.19 °C	
	1 000 °C to 1 372 °C	0.25 °C	
	Resistance Temperature Detector simulator (Pt 100 Ω)		
	-200 °C to -100 °C	0.11 °C	
	> -100 °C to 0 °C	0.10 °C	
> 0 °C to 100 °C	0.080 °C		
> 100 °C to 300 °C	0.10 °C		
> 300 °C to 600 °C	0.14 °C		
> 600 °C to 800 °C	0.17 °C		
			In-house method : CM-025 and CM-036 by direct measurement with digital multimeter

* expressed as an uncertainty (+) which for k = 2, providing a level of confidence of approximately 95%



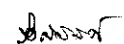
Scope of Accreditation for Calibration

Accreditation No. : **CALIBRATION 0156**

Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark
1. Electrical (cont.)	Measuring instrument		
	DC Voltage		In-house method: CM-026, CM-027, CM-028, CM-029, CM-030, and CM-032 by direct measurement with multi-product calibrator
	0 mV to < 330 mV	50 μ V/V + 3.0 μ V	
	330 mV to < 3.3 V	40 μ V/V + 8.0 μ V	
	3.3 V to < 33 V	40 μ V/V + 70 μ V	
	33 V to < 330 V	45 μ V/V + 0.70 mV	
	330 V to 1 020 V	45 μ V/V + 6.0 mV	
	AC Voltage		In-house method: CM-026, CM-027, CM-028, CM-029, CM-030, CM-032, and CM-047 by direct measurement with multi-product calibrator
	@ 45 Hz to 10 kHz		
	1 mV to < 33 mV	1.2 mV/V + 20 μ V	
	33 mV to < 330 mV	0.40 mV/V + 20 μ V	
	0.33 V to < 3.3 V	0.24 mV/V + 60 μ V	
	3.3 V to < 33 V	0.32 mV/V + 0.50 mV	
	@ 45 Hz to 1 kHz		
33 V to < 330 V	0.39 mV/V + 6.0 mV		
330 V to 1 020 V	0.39 mV/V + 70 mV		
@ > 1 kHz to 10 kHz			
33 V to < 330 V	0.63 mV/V + 12 mV		
@ > 1 kHz to 5 kHz			
330 V to 1 020 V	1.6 mV/V + 80 mV		
@ > 5 kHz to 10 kHz			
330 V to 1 020 V	1.6 mV/V + 0.39 V		

* expressed as an uncertainty (+) which for k = 2, providing a level of confidence of approximately 95%



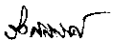
Scope of Accreditation for Calibration

Accreditation No. : CALIBRATION 0156

Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark
1. Electrical (cont.)	Measuring instrument		
	DC Current		In-house method: CM-026, CM-028, CM-030, CM-032, and CM-049 by direct measurement with multi-product calibrator
	0 mA to < 3.3 mA	0.11 mA/A + 50 nA	
	3.3 mA to < 33 mA	80 μ A/A + 0.30 μ A	
	33 mA to < 330 mA	80 μ A/A + 3.0 μ A	
	0.33 A to < 2.2 A	0.24 mA/A + 40 μ A	
	2.2 A to 11 A	0.47 mA/A + 0.40 mA	
	AC Current		In-house method: CM-026, CM-028, CM-030, and CM-032 by direct measurement with multi-product calibrator
	@ 45 Hz to 1 kHz		
	30 μ A to < 330 μ A	0.98 mA/A + 0.20 μ A	
	330 μ A to < 3.3 mA	0.78 mA/A + 0.25 μ A	
	3.3 mA to < 33 mA	0.70 mA/A + 2.5 μ A	
	33 mA to < 330 mA	0.70 mA/A + 25 μ A	
	0.33 A to < 2.2 A	0.78 mA/A + 0.24 mA	
@ 45 kHz to 65 Hz			
2.2 A to 11 A	0.47 mA/A + 1.6 mA		
@ > 65 Hz to 500 Hz			
2.2 A to 11 A	0.78 mA/A + 1.6 mA		
@ > 500 Hz to 1 kHz			
2.2 A to 11 A	2.6 mA/A + 1.6 mA		

* expressed as an uncertainty (+) which for k = 2, providing a level of confidence of approximately 95%



Scope of Accreditation for Calibration

Accreditation No. : CALIBRATION 0156

Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark
1. Electrical (cont.)	Measuring instrument Resistance		In-house method: CM-027, CM-028, CM-029, CM-030, and CM-032 by direct measurement with multi-product calibrator
	0 Ω to < 11 Ω	0.10 mΩ/Ω + 5.0 mΩ	
	11 Ω to < 33 Ω	0.10 mΩ/Ω + 8.0 mΩ	
	33 Ω to < 110 Ω	80 μΩ/Ω + 9.0 mΩ	
	110 Ω to < 330 Ω	80 μΩ/Ω + 9.0 mΩ	
	330 Ω to 1.1 kΩ	80 μΩ/Ω + 60 mΩ	
	1.1 kΩ to < 3.3 kΩ	80 μΩ/Ω + 60 mΩ	
	3.3 kΩ to < 11 kΩ	80 μΩ/Ω + 0.60 Ω	
	11 kΩ to < 33 kΩ	80 μΩ/Ω + 0.60 Ω	
	33 kΩ to < 110 kΩ	90 μΩ/Ω + 6.0 Ω	
	110 kΩ to < 330 kΩ	0.10 mΩ/Ω + 6.0 Ω	
	330 kΩ to < 1.1 MΩ	0.12 mΩ/Ω + 50 Ω	
	1.1 MΩ to < 3.3 MΩ	0.12 mΩ/Ω + 50 Ω	
	3.3 MΩ to < 11 MΩ	0.47 mΩ/Ω + 0.50 kΩ	
	11 MΩ to < 33 MΩ	0.80 mΩ/Ω + 0.50 kΩ	
	33 MΩ to < 110 MΩ	3.9 mΩ/Ω + 5.0 kΩ	
	110 MΩ to 330 MΩ	3.9 mΩ/Ω + 15 kΩ	

* expressed as an uncertainty (+) which for k = 2, providing a level of confidence of approximately 95%



Scope of Accreditation for Calibration

Accreditation No. : CALIBRATION 0156

Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark
1. Electrical (cont.)	Measuring instrument Capacitance @ 50 Hz to 1 kHz 0.33 nF to < 0.50 nF 0.50 nF to < 1.1 nF 1.1 nF to < 3.3 nF 3.3 nF to < 11 nF 11 nF to < 33 nF 33 nF to < 110 nF 110 nF to < 330 nF 330 nF to < 1.1 μF 1.1 μF to < 3.3 μF @ 50 Hz to 400 Hz 3.3 μF to < 11 μF 11 μF to < 33 μF @ 50 Hz to 200 Hz 33 μF to < 110 μF @ 50 Hz to 100 Hz 110 μF to < 330 μF 330 μF to 1.1 mF	3.9 mF/F + 8.0 pF 3.9 mF/F + 8.0 pF 3.9 mF/F + 8.0 pF 3.9 mF/F + 8.0 pF 2.0 mF/F + 80 pF 2.0 mF/F + 80 pF 2.0 mF/F + 0.25 nF 2.0 mF/F + 0.80 nF 2.8 mF/F + 2.4 nF 2.8 mF/F + 7.8 nF 3.2 mF/F + 24 nF 3.9 mF/F + 80 nF 5.5 mF/F + 0.24 μF 7.8 mF/F + 0.24 μF	In-house method: CM-030, and CM-032 by direct measurement with multi-product calibrator

* expressed as an uncertainty (+) which for k = 2, providing a level of confidence of approximately 95%

Signature

Scope of Accreditation for Calibration

Accreditation No. : CALIBRATION 0156

Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark	
1. Electrical (cont.)	Measuring instrument			
	Frequency			
	10 mV to 10 V			
	0.010 Hz to 10 kHz	22 μ Hz/Hz + 2.0 mHz	In-house method: CM-029, CM-030, and CM-032 by direct measurement with multi-product calibrator	
	10 mV to 3.3 V			
	10 kHz to 500 kHz	22 μ Hz/Hz + 2.0 Hz		
	300 mV to 3.3 V			
	500 kHz to 2 000 kHz	22 μ Hz/Hz + 1.0 Hz		
	Thermocouple temperature indicator			In-house method: CM-030, CM-031, and CM-032 by direct measurement with multi-product calibrator
	Type J			
	-210 °C to < -100 °C	0.26 °C		
	-100 °C to < 760 °C	0.19 °C		
	760 °C to 1 200 °C	0.23 °C		
Type K				
-200 °C to < -100 °C	0.30 °C			
-100 °C to < 120 °C	0.20 °C			
120 °C to 1 000 °C	0.25 °C			
1 000 °C to 1 372 °C	0.35 °C			

* expressed as an uncertainty (+) which for k = 2, providing a level of confidence of approximately 95%

Signature

Scope of Accreditation for Calibration

Accreditation No. : CALIBRATION 0156

Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark
1. Electrical (cont.)	Measuring instrument		
	Resistance Temperature detector simulator (Pt 100 Ω)		In-house method: CM-030, CM-032, and CM-035 by direct measurement with multi-product calibrator
	-200 °C to 0 °C	0.040 °C	
	> 0 °C to 100 °C	0.060 °C	
	> 100 °C to 300 °C	0.070 °C	
	> 300 °C to 400 °C	0.080 °C	
	> 400 °C to 630 °C	0.10 °C	
	> 630 °C to 800 °C	0.21 °C	
	DC Current clamp meter		In-house method : CM-027 and CM-029 by direct measurement
	2.2 A to < 10 A	0.47 mA/A + 10 mA	With multi-product calibrator and 50 turn current coil
	10 A to < 16.5 A	5.8 mA/A + 50 mA	
	16.5 A to < 150 A	5.9 mA/A + 0.60 A	
	150 A to 550 A	5.9 mA/A + 0.60 A	
	AC Current clamp meter		In-house method : CM-027 and CM-029 by direct measurement
@ 45 Hz to 65 Hz		With multi-product calibrator and 50 turn current coil	
2 A to 11 A	0.47 mA/A + 10 mA		
> 11 A to < 16.5 A	6.6 mA/A + 50 mA		
16.5 A to < 150 A	6.6 mA/A + 0.50 A		
> 150 A to 550 A	6.6 mA/A + 1.1 A		

* expressed as an uncertainty (+) which for k = 2, providing a level of confidence of approximately 95%



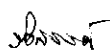
Scope of Accreditation for Calibration

Accreditation No. : CALIBRATION 0156

Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark
1. Electrical (cont.)	Measuring instrument AC Power (cont.) (Single phase, PF = 1, @ 45 Hz to 1 kHz) 330 W to < 2.2 kW (0.33 V to 1 kV, < 2.2 A)	1.8 mW/W	In-house method: CM-026 by direct measurement with multi-product calibrator
	2.2 kW to 11 kW (0.33 V to 1 kV, 2.2 A to 11 A)	1.8 mW/W	
	AC Voltage @ 45 Hz to 1 kHz Nominal 10 mV to 100 V Aux 10 mV to < 330 mV	0.80 mV/V + 0.30 μ V	In-house method: CM-047 by direct measurement with multi-product calibrator
	@ 45 Hz to 1 kHz Nominal 10 mV to 100 V Aux 0.33 V to < 3.3 V	0.80 mV/V + 0.40 mV	
	Phase @ 10 Hz to 45 Hz Nominal 3 mV to < 33 V Aux 10 mV to 3.3 V	0.12 °	In-house method: CM-047 by direct measurement with multi-product calibrator

* expressed as an uncertainty (+) which for k = 2, providing a level of confidence of approximately 95%



Scope of Accreditation for Calibration

Accreditation No. : CALIBRATION 0156

Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark
1. Electrical (cont.)	Measuring instrument		
	Phase (cont.)		
	@ > 45 Hz to 65 Hz		
	Nominal 33 mV to 1 020 V	0.12 °	In-house method: CM-047 by direct measurement with multi-product calibrator
	Aux 10 mV to 3.3 V		
	@ > 65 Hz to 500 Hz		
	Nominal 330 mV to 1 020 V	0.70 °	
	Aux 100 mV to 3.3 V		
	@ > 500 Hz to 1 kHz		
	Nominal 330 mV to 1 020 V	1.6 °	
	Aux 100 mV to 3.3 V		
	Digital tachometer		
	Photo & contact type		
	1 r/min to 6 000 r/min	0.16 r/min	
	> 6 000 r/min to 12 000 r/min	0.26 r/min	
> 12 000 r/min to 18 000 r/min	0.37 r/min		
> 18 000 r/min to 24 000 r/min	0.48 r/min		
> 24 000 r/min to 30 000 r/min	0.60 r/min		
> 30 000 r/min to 36 000 r/min	0.71 r/min		
> 36 000 r/min to 42 000 r/min	0.83 r/min		
> 42 000 r/min to 48 000 r/min	0.94 r/min		
> 48 000 r/min to 54 000 r/min	1.1 r/min		

* expressed as an uncertainty (+) which for k = 2, providing a level of confidence of approximately 95%

Scope of Accreditation for Calibration

Accreditation No. : CALIBRATION 0156

Laboratory Status : Permanent Site Temporary Mobile

Field of Measurement	Parameter/Range/Item	Best Measurement Capability*	Standard/Technique/Method/Equipment/Remark
1. Electrical (cont.)	Measuring instrument		In-house method : CM-046 by simulate signal to UUC from process calibrator or multi-product calibrator (Electronic part only, not include effect of mechanical part)
	Digital tachometer		
	Photo & contact type (cont.)		
	> 54 000 r/min to 60 000 r/min	1.2 r/min	
	> 60 000 r/min to 66 000 r/min	1.3 r/min	
	> 66 000 r/min to 72 000 r/min	1.5 r/min	
	> 72 000 r/min to 78 000 r/min	1.6 r/min	
	> 78 000 r/min to 84 000 r/min	1.7 r/min	
2. Mass	Conventional mass		In-house method : CM-013 based on OIML R 111-1 : 2004 and UKAS LAB 14 : 2006
	Class F1		
	1 mg	6.0 µg	
	2 mg	6.0 µg	
	5 mg	6.0 µg	
	10 mg	7.0 µg	
	20 mg	7.0 µg	
	50 mg	10 µg	
	100 mg	10 µg	
	200 mg	10 µg	
500 mg	10 µg		
1 g	20 µg		

* expressed as an uncertainty (+) which for k = 2, providing a level of confidence of approximately 95%

Signature