

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM1171

Page : 1 of 3

## Certificate of Calibration

**Equipment :** Hot Air Oven

**Manufacturer :** FRANCE ETUVES

**Model :** XU058

**Serial No. :** P427

**ID No. :** CHO-003

**Submitted by :** Environment & Laboratory Co.,Ltd.  
40 Soi Liangmueangnonthaburi 13,  
Talad Kwan, Mueang,  
Nonthaburi 11000

**Location :** Room No. 303

**Received Order :** 12 July 2023

**Calibration Date :** 12 July 2023

**Ambient Temperature :** ( 26 ± 10 ) °C

**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Khit Ruttanaprapachai

**Approved by :**

Approved Signatory

( ) Pornthippa Tameyakul  
( ✓ ) Malee Butkruea  
( ) Suwit Imjai

**Issue Date :** 24 July 2023

**The Uncertainties are for a confidence probability of approximately 95%**

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0056482





**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2307-0094OC-1

**Cert. No.:** 23TM1171

**Page :** 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1 ) Data Acquisition	MY44073381	23LM95	TPA	19 Jun 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.

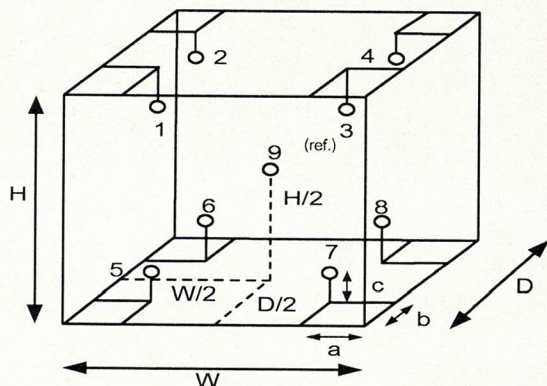
3. This certification is traceable to the International System of Unit.

**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Close



Environment during calibration		
	Beginning	Finished
Temp. ( °C )	30	31
REL.Humid. ( % )	47	50
AC Supply ( Volt )	220	221

Ref. Std. ID No.: @ Calibration Point		
Position :	( 104 ) °C	( 180 ) °C
1	1RTD-2/1	23-01TC-01
2	1RTD-2/2	23-01TC-02
3	22-01RTD-03	23-01TC-03
4	1RTD-2/4	23-01TC-04
5	1RTD-2/5	23-01TC-05
6	1RTD-2/6	23-01TC-06
7	23-01RTD-07	23-01TC-07
8	1RTD-2/8	23-01TC-08
9 (ref.)	23-01RTD-09	23-01TC-09

**Probe Installation Details :**

**Dimension of Chamber :**

a =	5.0	cm	D =	0.36	m
b =	5.0	cm	W =	0.40	m
c =	5.0	cm	H =	0.40	m
Capacity =			0.058	m <sup>3</sup>	





**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2307-0094OC-1  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

**Cert. No.:** 23TM1171

**Page :** 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
104.0	104.0	104.0	0.11	0.78	1.1	2
180.0	180.0	180.0	0.16	1.2	1.4	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.477	104.168	104.138	103.871	103.794	103.878	103.580	104.030	104.311	0.42
180.0	180.089	180.200	179.313	179.510	179.867	180.455	179.576	180.135	180.394	1.1

**Average\* :** The average of 30 values in each position.

**Temperature stability :** One-half of the greatest maximum difference of measured temperature at any one sensor.

**Temperature uniformity :** The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

**Overall Variation :** The Difference of the maximum and minimum measured temperatures throughout observation.

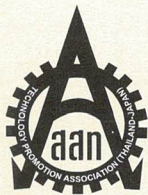
**UUC\* :** Unit Under Calibration

**Note :** The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

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Cert. No.: 23TM1101

Page : 1 of 3

## Certificate of Calibration

**Equipment :** Incubator

**Manufacturer :** Songserm Intercool

**Model :** -

**Serial No. :** -

**ID No. :** CHI-001

**Submitted by :** Environment & Laboratory Co.,Ltd.  
40 Soi Liangmueangnonthaburi 13,  
Talad Kwan, Mueang,  
Nonthaburi 11000

**Location :** Room No. 301

**Received Order :** 12 July 2023

**Calibration Date :** 13 July 2023

**Ambient Temperature :** ( 26 ± 10 ) °C

**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Preecha Hlahib

**Approved by :**

Approved Signatory

( ) Pornthippa Tameyakul  
( / ) Malee Butkruea  
( ) Suwit Imjai

**Issue Date :** 24 July 2023

**The Uncertainties are for a confidence probability of approximately 95%**

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A 0056479





Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2307-0094OC-5

Cert. No.: 23TM1101  
Page : 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).  
The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1 ) Data Acquisition	MY41021843	22LM172	TPA	27 Dec 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

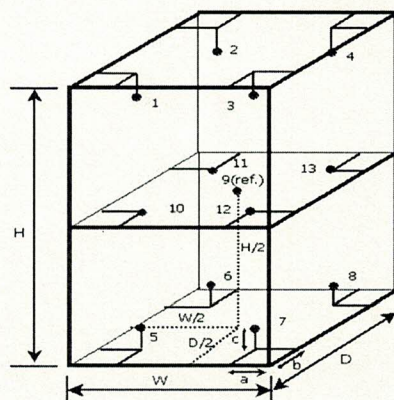
**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Not Available

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	32	33
REL.Humi. ( % )	50	53
AC Supply ( Volt )	221	221

Position :	Ref. Std. ID No.:
1	18-04RTD-01
2	18-04RTD-02
3	18-04RTD-03
4	18-04RTD-04
5	18-04RTD-05
6	18-04RTD-06
7	18-04RTD-07
8	18-04RTD-08
9 (ref.)	18-04RTD-09
10	18-04RTD-10
11	21-04RTD-11
12	21-04RTD-12
13	21-04RTD-13



**Dimension of Chamber :**

D = 0.60 m  
W = 0.60 m  
H = 1.2 m  
Capacity = 0.43 m<sup>3</sup>

**Probe Installation Details :**

a = 10 cm  
b = 10 cm  
c = 10 cm





Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2307-0094OC-5  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 23TM1101

Page : 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
20.0	20.0	20.0	0.12	0.56	0.92	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty ( ± °C )
	Position									
20.0	1	2	3	4	5	6	7	8	9 (ref.)	0.30
	19.805	19.696	20.297	20.050	19.622	20.160	19.570	19.567	19.762	
	10	11	12	13						
	19.646	19.865	19.923	19.820						

**Average\*** : The average of 30 values in each position.

**Temperature stability** : One-half of the greatest maximum difference of measured temperature at any one sensor.

**Temperature uniformity** : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

**Overall Variation** : The Difference of the maximum and minimum measured temperatures throughout observation.

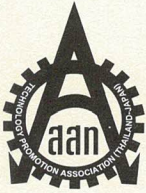
**UUC\*** : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

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Cert.No.: 23MM176

Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Electronic Balance

**Manufacturer :** Mettler Toledo

**Model :** ML204T /00

**Serial No. :** B647342339

**ID No. :** ANB-003

**Submitted by :** Environment & Laboratory Co.,Ltd.  
40 Soi Liangmueangnonthaburi 13,  
Talad Kwan, Mueang,  
Nonthaburi 11000

**Location :** Room No. 304


**Received order :** 12 July 2023

**Calibration Date :** 13 July 2023

**Ambient Temperature :** 15 °C to 40 °C

**Relative Humidity :** 30 % to 90 %

**Calibrated by :** Khit Ruttanaprapachai

**Approved by :**   
Approved Signatory

( ) Pornthippa Tameyakul  
(✓) Malee Butkruea  
( ) Suwit Imjai

**Issue Date :** 24 July 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0056485





Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2307-0094OC-8

Cert.No.: 23MM176  
Page: 2 of 3

**Procedure used :-**

Calibration were conducted using in-house calibration procedure CP-OB01 according to direct measurement method against standard weight.

**Condition of this result of calibration**

1. Reference standard instruments:-

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Test report No.</u>	<u>Due date</u>
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0010-22	20 Jan 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This result of calibration was made on requested at the point specified by customer.
4. This certificate is not certified for any commercial transaction.
5. This certification is traceable to the International System of Unit.

**Result of calibration** ( ) Without Adjustment ( \* ) After Adjustment by Internal Calibration

**Range capacity :** 0 g to 220 g **Resolution** 0.0001 g

**Before Adjustment :**

<u>Applied Weight</u>	<u>Balance Reading</u>	<u>Correction</u>	<u>Measurement Uncertainty</u>	<u>Coverage Factor</u>
( g )	( g )	( g )	( $\pm$ mg )	( k )
100	99.9999	+0.0001	0.17	2.00
200	199.9998	+0.0002	0.29	2.00

**After Adjustment :**

1. Determination of the standard deviation of weighing machine ( n = 10 )

<u>Applied Weight</u>	<u>Standard Deviation of Reading ( g )</u>
( g )	
100	0.00005
200	0.00007





Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2307-0094OC-8

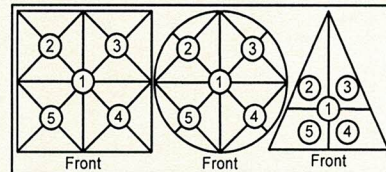
Cert.No.: 23MM176

Page: 3 of 3

### Result of calibration

#### 2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.  
The weighing machine reading error obtained is given in the table



Maximum difference between  
off-center and central loading  
( g )  
0.0002

Position 1	Position 2	Position 3	Position 4	Position 5
( g )	( g )	( g )	( g )	( g )
-0.0003	-0.0001	-0.0004	-0.0004	-0.0003

#### 3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
( g )	( g )	( g )	( $\pm$ mg )	( k )
Unload	0.0000	0.0000	0.11	2.05
0.2	0.2000	0.0000	0.11	2.05
0.5	0.5000	0.0000	0.11	2.05
2	2.0001	-0.0001	0.11	2.05
5	5.0000	0.0000	0.12	2.05
10	9.9999	+0.0001	0.12	2.05
20	20.0001	-0.0001	0.12	2.04
50	50.0001	-0.0001	0.14	2.00
100	100.0000	0.0000	0.17	2.00
150	149.9999	+0.0001	0.29	2.00
200	200.0000	0.0000	0.29	2.00

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k$ , providing a level of confidence of approximately 95 %.

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