

ภาคผนวก ค : เอกสารสอบเทียบความถูกต้อง  
ของเครื่องมือเก็บตัวอย่าง

**ANALYTICAL BALANCE (DU)**

**Model : XS205 DU**

**Serial No. : 1126323724**

Mettler-Toledo (Thailand) Ltd.  
046/4 - 046/5 Laksale Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+66 2723 0382  
MT-TH-ServiceSupport@mt.com



## Accuracy Calibration Certificate

### Customer

Company: EASTERN THAI CONSULTING 1982 CO., LTD.  
Address: 683 Moo 11, Sukhaphiban 8 Rd., Nong Kham  
City: Sriracha  
Contact: Sasiporn Nakko  
Zip / Postal: 20230  
State / Province: Chonburi  
Order Number: 080323024100

### Weighing Device

Manufacturer: Mettler Toledo  
Model: XS205DU  
Serial No.: 1126323724  
Building: Laboratory  
Floor: 1  
Room: Laboratory  
Instrument Type: Weighing Instrument  
Asset Number: LABE 05/1  
Terminal Model: SAT  
Terminal Serial No.: 1126323724  
Terminal Asset No.: N/A

Range	Max. Capacity	Readability (g)
1	81 g	0.0001 g
2	220 g	0.001 g

### Procedure

Calibration Guidelines:  
METTLER TOLEDO Work Instruction:  
EURAMET cg-18 v. 4.0 (11/2015)  
CPM002/20  
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.  
The sensitivity span of the weighing instrument was adjusted before calibration with a built-in weight.  
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

As Found	Temperature	Humidity
	Start: 24.9 °C	End: 25.7 °C
	Start: 54.0 %	End: 51.3 %

As Found Calibration Date: 07-Feb-2022  
As Left Calibration Date: N/A  
Issue Date: 08-Feb-2022  
Approved Signatory:

☐ Sanit Jitinyom  
☐ Surachet Sukkale

## Measurement Results

### Repeatability

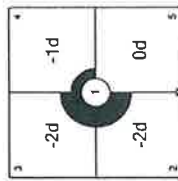
Test Load: 70 g	As Found	As Left	As Found	As Left
1	70.00002 g	N/A	1 (Test Point)	z5d
2	70.00004 g	N/A	10	4d
3	70.00004 g	N/A	36	2d
4	70.00004 g	N/A	14	3
5	70.00003 g	N/A	9	8
6	70.00003 g	N/A	7	5
7	70.00001 g	N/A	6	
8	70.00003 g	N/A		
9	70.00002 g	N/A		
10	70.00002 g	N/A		
Standard Deviation	0.000010 g	N/A		

The "d" in the graph represents the readability of the range/interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 100 g	As Found	As Left
1	100.00000 g	N/A
2	99.99998 g	N/A
3	99.99998 g	N/A
4	99.99999 g	N/A
5	100.00000 g	N/A
Maximum Deviation	0.00002 g	N/A

The "d" in the graph represents the readability of the range/interval in which the test was performed.

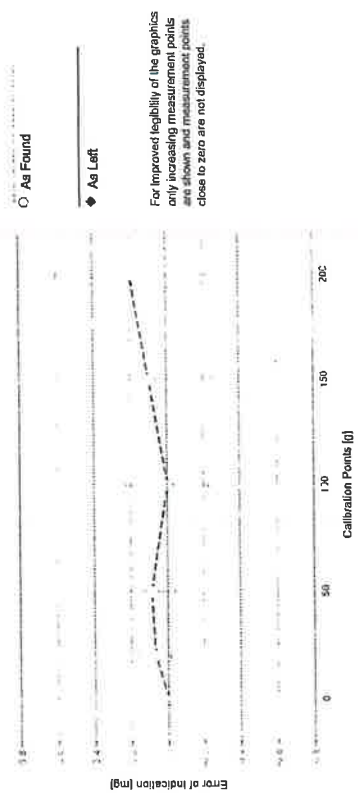


Calibration Certificate ID  
TH4004-018-020722-ACC-TH

Error of Indication

As Found				
Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1 0.0000 g	0.0000 g	0.0000 g	0.021 mg	2
2 0.0100 g	0.0100 g	0.0002 g	0.023 mg	2
3 0.1000 g	0.1002 g	0.0002 g	0.026 mg	2
4 1.0000 g	1.0000 g	0.0000 g	0.035 mg	2
5 4.9999 g	4.9999 g	0.0000 g	0.050 mg	2
6 10.0002 g	10.0005 g	0.0003 g	0.063 mg	2
7 19.9994 g	20.0001 g	0.0007 g	0.085 mg	2
8 49.9997 g	50.0006 g	0.0009 g	0.13 mg	2
9 100.0000 g	100.0000 g	0.0000 g	0.23 mg	2
10 149.9999 g	150.0000 g	0.0001 g	0.35 mg	2
11 200.0000 g	200.0002 g	0.0002 g	0.42 mg	2

○ As Found  
◆ As Left



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2	WS32	Date of Issue:	15-Sep-2020
Weight Set No.:	169521	Calibration Due Date:	13-Mar-2022
Certificate Number:			
Thermo Baro Hygrometer	IN74	Date of Issue:	09-Jul-2021
Equipment No.:	21H170	Calibration Due Date:	28-Jun-2022
Certificate Number:			

Calibration Certificate ID  
TH4004-018-020722-ACC-TH

Remarks

FACT adjustment functionality activated  
Equipment condition: Good  
Next calibration according to customer's procedure

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.



Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with  $k=2$  in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value  $R$  represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1.5 \cdot 10^{-6} / K$   
Temperature range on site for the evaluation of the measurement uncertainty in use:  $5 K$

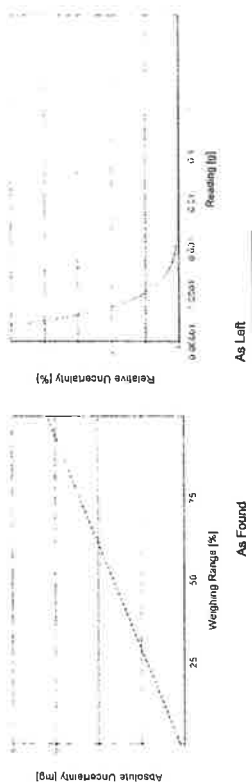
Uncertainty of Uncertainty Equation

Range	As Found		As Left
	g	Max	
1	0.00001 g	81 g	N/A
2	0.0001 g	220 g	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left
	g	%	
0.00220 g	0.022 mg	1.0%	N/A
0.02200 g	0.022 mg	0.10%	N/A
0.22000 g	0.024 mg	0.011%	N/A
2.20000 g	0.039 mg	0.0018%	N/A
220.0000 g	1.7 mg	0.00079%	N/A



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

GWP®

Certificate



As Found



As Left



The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:

☒ As Found

☐ As Left

☒ No adjustments/modifications made. As Left results correspond to As Found.

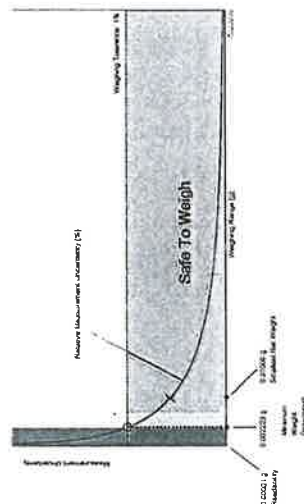
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.01000 g

Safety Factor: 2

Safe Weighing Range



While the values in the graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

## Minimum Weight As Found Minimum Weight Table

Range 1					
Minimum weights for different weighing tolerances and safety factors					
Tolerance	1	2	3	5	10
0.1%	0.022382 g	0.045110 g	0.068193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.004449 g	0.008912 g	0.013368 g	0.022382 g	0.045110 g
1%	0.002223 g	0.004449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.001111 g	0.002223 g	0.003335 g	0.005563 g	0.011148 g
5%	0.000444 g	0.000889 g	0.001333 g	0.002223 g	0.004449 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

## As Left Minimum Weight Table

Range 1					
Minimum weights for different weighing tolerances and safety factors					
Tolerance	1	2	3	5	10
0.1%	0.022382 g	0.045110 g	0.068193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.004449 g	0.008912 g	0.013368 g	0.022382 g	0.045110 g
1%	0.002223 g	0.004449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.001111 g	0.002223 g	0.003335 g	0.005563 g	0.011148 g
5%	0.000444 g	0.000889 g	0.001333 g	0.002223 g	0.004449 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with  $k = 2$  and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

## Measurement Results Results Summary

Repeatability			
As Found	As Left	Repeatability	Excentricity
✓	✓	✓	✓

✓ = Passed  
✗ = Failed  
N = Safety Factor not met

## Repeatability

Test Load: 70 g

As Found			
Tolerance	Control Limit	Std. Deviation	Result
0.1%	0.000005 g	0.000010 g	✗
0.2%	0.000010 g	0.000025 g	✓
0.5%	0.000025 g	0.000050 g	✓
1%	0.000050 g	0.000100 g	✓
2%	0.000100 g	0.000250 g	✓
5%	0.000250 g		✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

## Excentricity

Test Load: 100 g

As Found			
Tolerance	Control Limit	Deviation	Result
0.1%	0.0500 g	0.0002 g	✓
0.2%	0.1000 g		✓
0.5%	0.2500 g		✓
1%	0.5000 g		✓
2%	1.0000 g		✓
5%	2.5000 g		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

## METTLER TOLEDO Service

As Found

Control limits for various weighing tolerances									
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%		
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A		
19.99994 g	0.00007 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g		
49.99987 g	0.00009 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g		
100.0000 g	0.00010 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g		
149.9998 g	0.00011 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g		
200.0000 g	0.00012 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g		
Result		✓	✓	✓	✓	✓	✓	✓	✓

As Left

Control limits for various weighing tolerances									
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%		
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A		
19.99994 g	0.00007 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g		
49.99987 g	0.00009 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g		
100.0000 g	0.00010 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g		
149.9998 g	0.00011 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g		
200.0000 g	0.00012 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g		
Result		✓	✓	✓	✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

## METTLER TOLEDO

Service Date: 2022-02-07  
Document Number: TH4004-029-020722-LABBalanceHR  
EASTERN THAI CONSULTING 1992 CO., LTD.  
883 Moo 11, Sukhaphiban 8 Rd., Nong Kham, Siracha, Chonburi 20230  
Khun Sasiporn Nakin

## Balance Health Report

Device Details		System Details	
Manufacturer:	Mettler Toledo	Accessory 1:	Other
Model:	XS205DU	Accessory 2:	
Serial number:	1126323724	Weight set for routine testing:	No
Firmware:	4.0		
History		Service History	
Instrument in use:	Yes	Last preventive maintenance:	< 1 year
Instrument age:	3-10 years	Last individual calibration:	< 1 year
Spare parts available:	Yes	Last minimum weight determination:	Never
Regulations:	ISO		
Process tolerance in %:	1 %	Routine testing performed:	Don't know
Smallest sample net weight:	0.0100 g		
Check List		General & Functional Checks	
Room temperature fluctuation	✓	Levelling	✓
Exposure to direct sun	✓	Cleanliness	✓
Vibrations	✓	Completeness - missing parts see additional remarks	✓
Drift	✓	Sealings optimised for operating environment	✓
Dirt or dust	✓	Other - objections noted as additional remarks	—
Static	✓	Electrical Component Checks	
Mechanical Component Checks		Power supply	✓
Draft shield	✓	Sliding door drive	—
Weighing pan position	✓	Internal weight drive	✓
Housing	✓	Display	✓
Other - objections noted as additional remarks	—	Other - objections noted as additional remarks	—
Recommendations		Additional Remarks & Recommendations	
Instrument calibration	Unipolair instrument		
Identify safe weighing range	Replica instrument		
GMP verification / risk assessment	Yes	Replace / add parts (see additional remarks)	
Preventive maintenance	Onsite repair		
Perform routine testing with test weights	Depot repair		
User training	Use of accessories (see additional remarks)		
Contact	Name: Khun Sasiporn Nakin	Position: Document Control	Phone: 086-051-3303
		Email: dc.la@mettler.com	
		Engineer Details	
		Date: 07-Feb-2022	
		Name: Sathaporn Tabson	
		Signature:	

This is not a certificate.

It should not be used to interpret final results for the testing of these devices.

Legend: ✓ Good/Pass    ⚠ Needs Attention    ✗ Bad/Fail    — Not Applicable

84694 - 84695 Lsalle Rd., Banova Ta Sub-District, Banova District, Bangkok 10260 +66 2723 0362  
MTH Surveys@mett.com

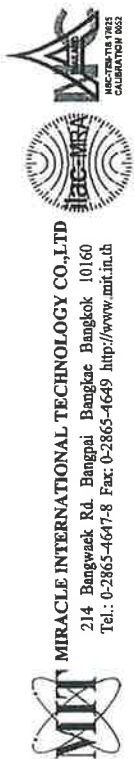
METTLER TOLEDO Service

Report Version: 1.13, Software Version 1.27.0.9, Page 1/1, © METTLER TOLEDO

## **BAROMETER**

**Equipment : Analog Barometer**

**ID No. / Tag No. : BM001/41**



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD  
214 Bangwaek Rd. Bangpai Bangkok 10160  
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mir.in.th>

## CALIBRATION CERTIFICATE



Certificate No. : AD2205-163-0001  
Date Issued : 20-May-22

Customer : Eastern Thai Consulting 1992 Co., Ltd.  
683 Moo 11 Sukhaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Analog Barometer

Manufacturer : Barigo  
Model : -  
Serial No. : -  
ID No./Tag No. : BM001/41  
Date Received : 12-May-22  
Date Calibrated : 20-May-22  
Calibrated by : Mr. Saruth Srichutikul

### Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.



Approved by

Page 1 of 2

Certificate No : AD2205-163-0001  
Environment : Ambient Temperature :  $(25 \pm 2)^{\circ}\text{C}$   
Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD Reading	UUC Reading (hPa)	UUC Reading (hPa)	UUC Error	Uncertainty
hPa	Before Adjusted	After Adjusted	hPa	$\pm$ hPa
990.00	990.0	*	0.00	0.59
1000.00	1000.0	*	0.00	0.59
1010.00	1010.0	*	0.00	0.59
1020.00	1020.0	*	0.00	0.59
1030.00	1030.0	*	0.00	0.59

STD = Standard

UUC = Unit Under Calibration

Calibrated condition : Pressure Medium Air : Density =  $1.19 \text{ kg/m}^3$  @  $20^{\circ}\text{C}$ , 1 bar  
Mounting Position Vertical  
Reference Level at center of its dial

Description of UUC :	Range	955 - 1075	hPa Absolute
Calibration Range	990 - 1030	hPa Absolute	
Scale Interval	1	hPa	
Resolution	0.5	hPa Absolute	

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P210086 for Reference Pressure Monitor Serial No. 1598, Due 08-Nov-22

End of Certificate

**Hot Air Oven**

**Model : UFE 500**

**Serial No. : G511.0182**



- $UUC^* = \text{Unit Under Calibration}$

## REPORT OF CALIBRATION

## Results of Calibration

## Notes

1. Sensor installation locations
  - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
  - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :  
 $W = 56 \text{ cm}$  ;  $D = 40 \text{ cm}$  ;  $H = 48 \text{ cm}$
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC\* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

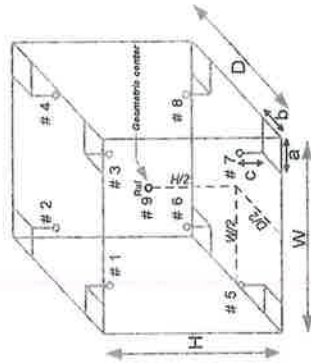


Figure: Example of sensor  
installation Positions



# **INDUCTIBELY COUPLED PLASMA SPECTROMETER**

**Model : Prodigy 7**

**Serial No. : P70177**



บริษัท แอปพลิเคชัน ดีฟายน์ จำกัด  
Application Define Company Limited  
8/4 ซอย บางนาซอย 9 แขวง บางนา เขต คลองเตย กรุงเทพมหานคร 10170  
8/4 Soi Bangchuesuknang 9 Bangnaom Talingchan, Bangkok 10170  
Tel: (66) 2664 7137 E-mail: support@apdefine.co.th Website : http://www.apdefine.co.th  
เลขประจำตัวผู้เสียภาษี 010556032491

## CERTIFICATE OF INSTRUMENT PERFORMANCE

**INSTRUMENT:** INDUCTIVELY COUPLED PLASMA SPECTROMETER  
**BRAND:** Teledyne Leeman Labs  
**MODEL:** Prodigy 7  
**SERIAL NO.:** P70177  
**CUSTOMER:** Eastern Tital Consulting 1992 Co., Ltd

**CHECKING:**

<b>SPECTROMETER</b> Wavelength Accuracy check by use emission line of Hg Lamp Mercury line 253.652 nm. Plasma View (Dual View) CMOS Detector check Align View by Mn line 257.610 nm.	<b>STATUS</b> OK OK OK OK
<b>RF GENERATOR</b> Incident Power 1,200 ±10 Watt Reading = ...1.2.... Watt	OK
<b>SAMPLE INTRODUCTION</b> Plasma Torch, Injector, Spray chamber, Nebulizer Peristaltic pump & Tubing	OK OK
<b>EXHAUSTING &amp; COOLING SYSTEM</b> Safety Interlock Switch (Door, Argon pressure, Water pressure) Cooling System, water flowrate & low pressure switch Flowrate of Air blower	OK OK OK
<b>COMPUTER &amp; SOFTWARE</b> Plasma Ignition software & Analytical Software	OK
<b>ANALYTICAL TEST</b> Full Frame Capture & Echellogram check Calibration Curve & QC Test	OK OK

DATE: December 21, 2021

Engineer: [Signature]



TELEDYNE LEEMAN LABS  
Everywhere you look

## PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อิตัลไทย คอนสัลติง 1992 จำกัด	Date: December 21, 2021
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

### 1. Gas Supply /Water Re-circulator/Exhaust Hood Check:

Gas system: ตรวจสอบแรงดันแก๊สและการรั่วซึม Argon Pressure: 45 psi Nitrogen Pressure: - psi Oxygen Pressure: - psi	Leak inspected Leak inspected Leak inspected	(✓) No leak (-) No leak (-) No leak
(✓) Change camera purge gas Dehydrator (1 times /years) Next time replacement 25.06.22 เปลี่ยนตัวถังความชื้นแก๊สดีไฮเดรต ทุก 1 ปี		
Water Chiller: RF generator flow rate 444 LPM Temperature 26 C ตรวจสอบอุณหภูมิ Leak inspected (✓) No leak ตรวจสอบการรั่วซึม		
Water Chiller: Camera (✓) check water level and refill ตรวจสอบระดับน้ำและเติมน้ำ (-) change water เปลี่ยนน้ำ Temperature -3.9 °C ตรวจสอบอุณหภูมิ		
Exhaust Hood Flow rate 650 CFM (system request > 150)		

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท สิลทิพย์ไทย คอนกรีต 1992 จำกัด	Date: December 21, 2021
Instrument: ICP-OES	Model: Prodigy 7
	SN: P70177

2. Computer & Software Check

Description	Status
Interface Cable USB (✓) No broken	OK
Software Version	OK
(✓) Operation function check :	OK
(✓) Open /Save /Edit method	OK
(✓) Instrument Control	OK
(✓) Sequence	OK
(✓) Full Frame Capture (Echelle Mode)	OK
(✓) Auto alignment /Hg alignment	OK
(✓) Calibration Curve	OK
(✓) Re-Calculation	OK
(✓) Print Report	OK

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท สิลทิพย์ไทย คอนกรีต 1992 จำกัด	Date: December 21, 2021
Instrument: ICP-OES	Model: Prodigy 7
	SN: P70177

3. Instrument Control

Description	Status
Optical view position: ตรวจสอบตำแหน่งที่ติดตั้งหลอดไฟแต่ละหลอด	
Hg Lamp Deltas	
X -1 Y -6	OK
XUV 0	OK
Axial peak positions X3325 Y1205	OK
Radial peak positions X4111 Y1135	OK
Hg lamp peak positions X4245 Y2615	OK
Plasma Control ตรวจสอบการทำงานของหลอดและดับหลอด	
(✓) Auto Start	OK
(✓) Extinguish	OK
(✓) RF power setting	OK
(✓) Igniter	OK
(✓) Air Knife	OK
Torch Gas ตรวจสอบการทำงานของแก๊สที่ใช้ในแต่ละหลอด	
(✓) Coolant /Plasma Flow control	OK
(✓) Aux Flow	OK
(✓) Nebulizer Flow	OK
(✓) Optimize sample introduction function	OK
(✓) Peristaltic pump control	OK
(✓) Auto sampler Control	OK
(✓) Camera Support Module	OK
(✓) Diagnostic	OK

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีลิมินาไทย คอพรตส์ 1992 จำกัด	Date: December 21, 2021
Instrument: ICP-OES	Model: Prodigy 7
	SN: P70177

4. Cleaning & Replacement

Description	Status
(✓) O-Ring Torch replacement	OK
(✓) Pump Tubing replacement	OK
(✓) Glassware cleaning (Torch, Nebulizer, Spray chamber)	OK
(✓) Lube the roll peristaltic pump	OK
(✓) Optical windows cleaning	OK
(✓) Camera Water Re-circulator (water change/ refilled)	OK
(✓) RF Generator Water Re-circulator (water change/ refilled)	OK
(✓) Cleaning Electronics Board with spray cleaner	OK
(✓) Cleaning dust inside Unit	OK
(✓) Cleaning dust filter	OK

5. Safety Interlock

Description	Status
(✓) Door switch	OK
(✓) RF Water Re-circulator	OK
(✓) Camera Water Re-circulator	OK
(✓) Camera purge gas	OK
(✓) Argon pressure	OK
(✓) Nitrogen pressure	OK

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีลิมินาไทย คอพรตส์ 1992 จำกัด	Date: December 21, 2021
Instrument: ICP-OES	Model: Prodigy 7
	SN: P70177

6. Hardware Check with SALSA.EXE Diagnostics

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.3 V	OK
+12 VDC (11 - 14.5 VDC)	12.01 V	OK
+3.3 VDC	3.28 V	OK
+5.0 VDC	4.45 V	OK
+13.5 VDC	13.46 V	OK

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.51 A	OK
ICP Ref 5.0Vdc = 1kW	5.47 V	OK
ICP Current 0.00 Vdc = 0kW	0	OK
ICP Ref 0.00Vdc = 0kW	0	OK
RF Water (Hz) OFF	0	OK
RF Water (Hz) ON	25	OK
Air Knife Pres. (0.00V) OFF	0	OK
Air Knife Pres. (3.0 - 7.0 V) ON	3.87 V	OK
Neb 25 @ setting of 25 PSI	25	OK
Cool 18 @ setting of 18 LPM	18	OK
Aux 0.6 @ setting of 0.6 LPM	0.6	OK
Pump Current (0.000 A) OFF	0	OK
Pump Voltage (0.000 V) OFF	0	OK
Pump Current (0.8 to 4.0A) ON	1.0 A	OK
Pump Voltage (8 to 13 V) ON	12.5 V	OK



Set Points	Value	Status
Air In Set Point 32°C	32	OK
Cam Tec Temperature -32°C	-32	OK
Op Purge Low 0.77 LPM	0.77	OK
Op Purge High 15.50 LPM	15.5	OK
Cam Wtr T 28°C	28.02	OK

**PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7**

Customer: บริษัท อีลิคไทย เทคโนโลยี 1992 จำกัด  
Instrument: ICP-OES  
Date: December 21, 2021  
Model: Prodigy 7  
SN: P70177

**7. Mn Check for performance Test**

	Condition for performance Test	Condition Test	Status
Standard	1 ppm, 5 ppm, 10 ppm	10 ppm	ok
Power plasma	1.20 kw	1.2	ok
Plasma gas	16.0 LPM	16	ok
Auxiliary Gas	0.8 LPM	0.8	ok
Nebulizer	1.2 LPM	2.5 psi	ok
Pump Speed	25 RPM	25	ok
Integration time	15 s Axial, 5 s Radial	105, 55	ok
Nebulizer Type	Seaspray, Conical, Meinhard	conical	ok
Intensity first performance	1 ppm ≥ 4,000,000 5 ppm ≥ 15,000,000 10 ppm ≥ 50,000,000	64,343,926	ok

Engineer Sign		
<p><b>TELEDYNE LEEMAN LABS</b> Everywhere you look</p>		

**ORIFICE TRANSFER STANDARD CERTIFICATION**

**WORKSHEET TE-5025A**

**ROOTSMETER S/N 0438320**



TISCH ENVIRONMENTAL, INC.  
145 SOUTH MIAMI AVE  
VILLAGE OF CLEVELAND, OH  
45002  
513.467.9000  
877.283.7510 TOLL FREE  
513.467.9009 FAX

# ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 24, 2016 Rootmeter S/N 0438320 Ta (K) - 295  
Operator Tisch Office I.D. - 0136 Pa (mm) - 742.95

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORIFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3400	3.2	2.00
2	NA	NA	1.00	0.9510	6.3	4.00
3	NA	NA	1.00	0.8510	7.8	5.00
4	NA	NA	1.00	0.8130	8.6	5.50
5	NA	NA	1.00	0.6690	12.6	8.00

## DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9832	0.7337	1.4054	0.9957	0.7430	0.8911
0.9791	1.0296	1.9875	0.9915	1.0426	1.2603
0.9770	1.1481	2.2221	0.9894	1.1626	1.4090
0.9760	1.2006	2.3305	0.9884	1.2157	1.4778
0.9707	1.4510	2.8107	0.9830	1.4694	1.7823
Qstd slope (m) =	1.96262		Qa slope (m) =	1.22896	
intercept (b) =	-0.03249		intercept (b) =	-0.02060	
coefficient (r) =	0.99993		coefficient (r) =	0.99993	
y axis = SQRT[H2O(Pa/760) (298/Ta)]			y axis = SQRT[H2O(Ta/Pa)]		

## CALCULATIONS

Vstd = Diff. Vol [(Pa-Diff. Hg)/760] (298/Ta)  
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]  
Qa = Va/Time

For subsequent flow rate calculations:

$$Qstd = 1/m \{ [SQRT(H2O(Pa/760) (298/Ta))] - b \}$$

$$Qa = 1/m \{ [SQRT H2O(Ta/Pa)] - b \}$$



**Primary Flow Calibrator**

**Serial No. : 110619**



## Certificate of Calibration

Customer : Eastern Thai Consulting 1992 Co., Ltd  
Name : 683 Moo 11, Suktapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230  
Address :  
Certificate No : 22-AFM-016 Rev.1  
Request No : Req-2022-0122

### Unit Under Calibration Details

Measurement Item	: Primary Flow Calibrator	Sensor Model	: -
Manufacturer	: BIOS	Sensor Serial Number	: -
Model	: Defender 510-L		
Serial Number	: 110619		
D	: -		

Location of Calibration : LAB 4 AIR VELOCITY METER

### Calibration Environment and Details

Temperature	: 23 °C ± 3 °C
Humidity	: 55 %RH ± 20 %RH
Barometric Pressure	: 1013 hPa ± 10 hPa
Received Date	: 21 January 2022
Calibration Date	: 27 January 2022

**Calibration Procedure** : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	21 May 2022
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	20 May 2022

Traceability:

his certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of

Units (SI)

**Note :**

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k=2$ , providing a level of confidence approximately 95 %.

This Certificate was issued to replace to Calibration Certificate No. 22-AFM-016

Calibration By:

Approved By: \_\_\_\_\_

Issued Date :

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

AFM-708-AFM-01 Rev.00 Issue date 01/07/19

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without

AFM-708-AFM-01 Rev.00 Issue date 01/07/19

Certificate No : 22-AFM-016 Rev.1  
Request No : Req-2022-0122

**Note**  
STD : Standard  
UUC : Unit Under Calibration

End of Certificate

**THERMO-HYGROMETER**

**Model : 608-H1**

**Serial No. : 45106737**



## CERTIFICATE OF CALIBRATION

Certificate No. : 22-068062  
Sample Code : 22-24591-002

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhaphiban 8 Rd., Nongkham,

Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited  
(Calibration laboratory)

Equipment : Digital thermo-hygrometer

Manufacturer : testo Model : 608-H1

Serial No. : 45106737 ID No. : LABE 09/7

Date of Receipt : 22 June 2022 Date of Calibration : 24 June 2022

## Condition of Calibration

1. Environment 1.1 Ambient temperature :  $23.0\text{ }^{\circ}\text{C} \pm 3.0\text{ }^{\circ}\text{C}$   
1.2 Relative humidity :  $55.0\text{ \%} \pm 15.0\text{ \%}$

## 2. Calibration method

- 2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.  
2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.

## 3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due Date
3.1 Chilled Mirror	Optidew Vision	LB-DP-01 & LB-DP-01 (DP)	TH-0014-22	16 February 2023
3.2 Digital Thermometer	Optidew Vision	LB-DP-01 & LB-DP-01 (Temp.)	22-029549	14 March 2023
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	21-072473	13 September 2022

## 4. This certificate is traceable to the international system of unit (SI Unit).

- 4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).  
4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.  
5. This result of calibration was found accurate as shown on date and place of calibration only.

## 6. Condition of calibration item : Normal

Calibrated by

Approved by

Issue date

The uncertainties are for a confidence probability of 95%. The calibration result is applied only to the above described instrument as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,  
Phlabphla, Wang Thonglang, Bangkok 10310  
FM-CL-114  
TEL 02-516-2422  
FAX 02-516-6949  
Rev 01  
CONTACT@AMARC.CO.TH  
WWW.AMARC.CO.TH  
Effective Date 15/10/21



## REPORT OF CALIBRATION

Certificate No. : 22-068062  
Sample Code : 22-24591-002

## Results of Calibration

## Temperature measurement

Resolution :  $0.1\text{ }^{\circ}\text{C}$   
Range :  $0\text{ }^{\circ}\text{C}$  to  $50\text{ }^{\circ}\text{C}$

Calibration point $^{\circ}\text{C}$	Average of standard reading		Unit under calibration		Expanded uncertainty $^{\circ}\text{C}$
	Controlled humidity %RH	Temperature $^{\circ}\text{C}$	Average reading $^{\circ}\text{C}$	Correction value $^{\circ}\text{C}$	
20	50	20.00	20.2	- 0.20	$\pm 0.39$
25	50	25.00	24.9	+ 0.10	$\pm 0.39$
30	50	30.00	29.8	+ 0.20	$\pm 0.39$

## Humidity measurement

Resolution :  $0.1\text{ \%RH}$   
Range :  $10\text{ \%RH}$  to  $95\text{ \%RH}$

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature $^{\circ}\text{C}$	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.00	45.13	51.4	- 6.27	$\pm 1.3$
60	25.00	60.03	66.5	- 6.47	$\pm 1.5$
75	25.00	75.20	81.5	- 6.30	$\pm 1.7$

## Notes

- Calibration results without adjustment.

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS.

- End of Report -

**CERTIFICATE OF ANALYSIS**

**EPA PROTOCOL GAS**

**Cylinder No. : EB0062815**

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04NI99E15ACX9C  
Cylinder Number: EB0062815  
Laboratory: 124 - Riverton (SAP) - NJ  
PGVP Number: B52018  
Gas Code: CO,NO,NOX,SO2,BALN  
Reference Number: 82-401135335-1  
Cylinder Volume: 144.4 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 660  
Certification Date: Mar 13, 2018  
Expiration Date: Mar 13, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	50.00 PPM	50.55 PPM	G1	+/- 1.4% NIST Traceable
NITRIC OXIDE	50.00 PPM	50.50 PPM	G1	+/- 1.4% NIST Traceable
SULFUR DIOXIDE	50.00 PPM	51.01 PPM	G1	+/- 1.0% NIST Traceable
CARBON MONOXIDE	2000 PPM	1977 PPM	G1	+/- 1.0% NIST Traceable
NITROGEN	Balance			
Assay Dates				
				03/06/2018, 03/13/2018
				03/06/2018, 03/13/2018
				03/06/2018, 03/13/2018
03/06/2018				

CALIBRATION STANDARDS			
Type	Lot ID	Cylinder No	Expiration Date
NITRM	16080607	CC442564	Jun 27, 2020
PRM	12367	APEX1099237	Jun 02, 2017
SNIS	0315201504	CC503358	Mar 15, 2019
NITRM	18011025	CC473218	Jun 07, 2022
NITRM	12060735	CC356192	Dec 14, 2026
The SRM, PRM or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.			

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 APW1100391 CO	FTIR	Feb 08, 2018
Nicolet 6700 APW1100391 NO	FTIR	Feb 15, 2018
Nicolet 6700 APW1100391 NO2	FTIR	Feb 16, 2018
Nicolet 6700 APW1100391 SO2	FTIR	Mar 01, 2018

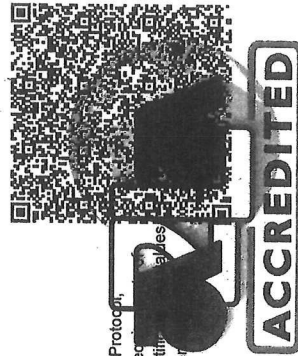
Triad Data Available Upon Request

NOTES:NET WEIGHT: 10.43lbs

GROSS WEIGHT: 60.93lbs

PO# 5218000763

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. All items are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 3082.05

**ANALYTICAL BALANCE (DU)**

**Model : XS205 DU**


**Serial No. : 1126323724**

Mettler-Toledo (Thailand) Ltd.  
84614 - 84615 Lachin Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+66 2723 0382  
MT-TH ServiceSupport@mt.com



## Accuracy Calibration Certificate

### Customer

Company: EASTERN THAI CONSULTING 1982 CO., LTD.  
Address: 883 Moo 11, Sukhaphiban 8 Rd., Nong Kham  
City: Sriracha Contact: Sasiporn Nakin  
Zip / Postal: 20230  
State / Province: Chonburi  
Order Number: 

### Weighing Device

Manufacturer: Mettler Toledo  
Model: XS205DU  
Serial No.: 1126323724  
Building: Laboratory  
Floor: 1  
Room: Laboratory  
Instrument Type: Weighing Instrument  
Asset Number: LABC 05/1  
Terminal Model: SAT  
Terminal Serial No.: 1126323724  
Terminal Asset No.: N/A

Range	Max. Capacity	Readability (g)
1	81 g	0.0001 g
2	220 g	0.001 g

### Procedure

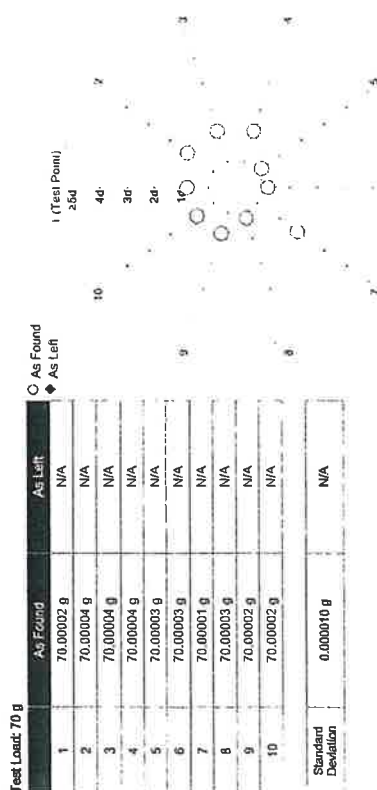
Calibration Guidelines:  
METTLER TOLEDO Work Instruction:  
EURAMET cp-18 v. 4.0 (11/2015)  
CPW002/20  
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.  
The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.  
In accordance with EURAMET cp-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

As Found	Temperature	Humidity
Start: 24.9 °C	End: 25.7 °C	Start: 54.0 %
		End: 51.3 %

As Found Calibration Date: 07-Feb-2022  
As Left Calibration Date: N/A  
Issue Date: 08-Feb-2022  
Calibrator:  
Approved Signatory:

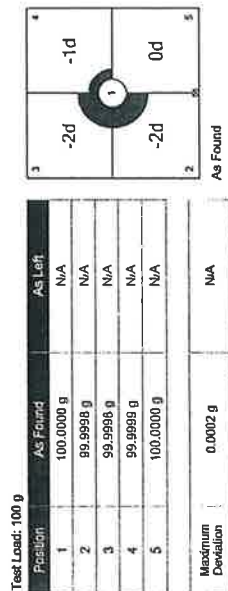
## Measurement Results

### Repeatability



The 'd' in the graph represents the readability of the range/interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity



The 'd' in the graph represents the readability of the range/interval in which the test was performed.

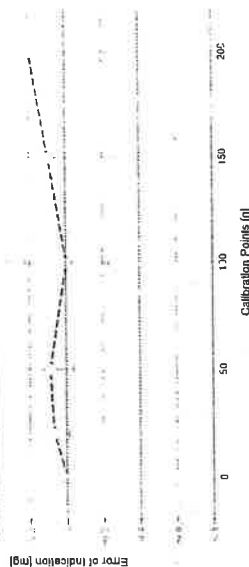
Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.021 mg	2
2	0.01000 g	0.01002 g	0.00002 g	0.023 mg	2
3	0.10000 g	0.10002 g	0.00002 g	0.026 mg	2
4	1.00000 g	1.00000 g	0.00000 g	0.035 mg	2
5	4.99999 g	4.99999 g	0.00000 g	0.050 mg	2
6	10.00002 g	10.00005 g	0.00003 g	0.063 mg	2
7	19.99994 g	20.00001 g	0.00007 g	0.085 mg	2
8	49.99997 g	50.00006 g	0.00009 g	0.13 mg	2
9	100.00000 g	100.00000 g	0.00000 g	0.23 mg	2
10	149.99999 g	150.00000 g	0.00001 g	0.35 mg	2
11	200.00000 g	200.00002 g	0.00002 g	0.42 mg	2

○ As Found

◆ As Left

For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor  $k = 2$  which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2			
Weight Set No.:	WS32	Date of Issue:	15-Sep-2020
Certificate Number:	169521	Calibration Due Date:	13-Mar-2022
Thermo Euro Hygromaster			
Equipment No.:	INT4	Date of Issue:	09-Jul-2021
Certificate Number:	21H1470	Calibration Due Date:	26-Jun-2022

Remarks

FACT adjustment functionally activated

Equipment condition: Good

Next calibration according to customer's procedure

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.



Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with  $k=2$  in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value  $R$  represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1.5 \cdot 10^{-4} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

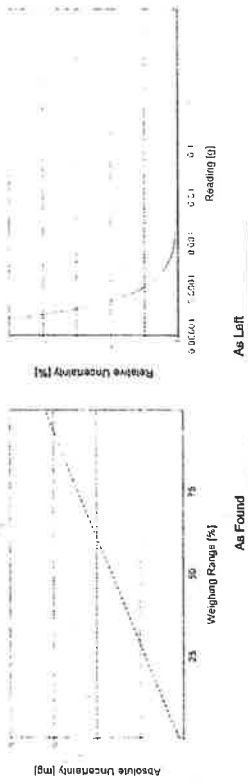
Linearization of Uncertainty Equation

Range	g	Max	As Found		As Left	
			U <sub>1</sub>	U <sub>2</sub>	U <sub>1</sub>	U <sub>2</sub>
1	0.00001 g	81 g	$U_1 = 0.022 \text{ mg} + 0.00763 \text{ mg/g} \cdot R$		N/A	
2	0.0001 g	220 g	$U_2 = 0.06 \text{ mg} + 0.00763 \text{ mg/g} \cdot R$		N/A	

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use For Various Net Indications (Examples)

Net Indication	As Found		As Left	
	Value	Uncertainty	Value	Uncertainty
0.00220 g	0.022 mg	1.0%	N/A	N/A
0.02200 g	0.022 mg	0.10%	N/A	N/A
0.22000 g	0.024 mg	0.011%	N/A	N/A
2.20000 g	0.039 mg	0.0018%	N/A	N/A
220.0000 g	1.7 mg	0.00079%	N/A	N/A



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

GWP®

Certificate



As Found



As Left



The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:

☒ As Found

☐ As Left

☒ No adjustments/modifications made. As Left results correspond to As Found.

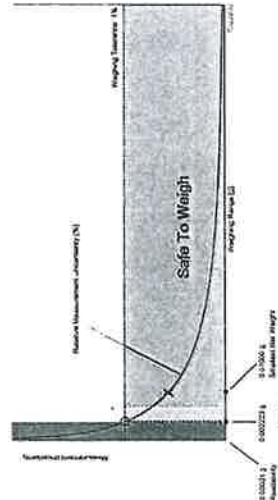
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.01000 g

Safety Factor: 2

Safe Weighing Range



While the values in the graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. The graph reflects As Left loading, unless only As Found was performed.

# Minimum Weight

As Found Minimum Weight Table

Range 1					
Minimum weights for different weighing tolerances and safety factors					
Tolerance	1	2	3	5	10
0.1%	0.02382 g	0.045110 g	0.068193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.004449 g	0.008912 g	0.013368 g	0.022382 g	0.045110 g
1%	0.002223 g	0.004449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.001111 g	0.002223 g	0.003335 g	0.005563 g	0.011148 g
5%	0.000444 g	0.000889 g	0.001333 g	0.002223 g	0.004449 g

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

The minimum weight table applies to the fine range of the weighing device.

## As Left Minimum Weight Table

Range 1					
Minimum weights for different weighing tolerances and safety factors					
Tolerance	1	2	3	5	10
0.1%	0.02382 g	0.045110 g	0.068193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.004449 g	0.008912 g	0.013368 g	0.022382 g	0.045110 g
1%	0.002223 g	0.004449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.001111 g	0.002223 g	0.003335 g	0.005563 g	0.011148 g
5%	0.000444 g	0.000889 g	0.001333 g	0.002223 g	0.004449 g

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

The minimum weight table applies to the fine range of the weighing device.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with  $k = 2$  and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

- If "N/A" is shown above, no appropriate value could be calculated.
- METTLER TOLEDO is not responsible for the definition of the process requirements.

# Measurement Results

Results Summary

Repeatability			
As Found	As Left	Eccentricity	Error of Indication
✓	✓	✓	✓

✓ = Passed  
✗ = Failed  
N = Safety Factor not met.

## Repeatability

Test Load: 70 g			
Tolerance			
As Found	Control Limit	Std. Deviation	Result
0.1%	0.000005 g		✗
0.2%	0.000010 g		✗
0.5%	0.000025 g		✓
1%	0.000050 g	0.000010 g	✓
2%	0.000100 g		✓
5%	0.000250 g		✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

## Eccentricity

Test Load: 100 g			
Tolerance			
As Found	Control Limit	Std. Deviation	Result
0.1%	0.0500 g		✓
0.2%	0.1000 g		✓
0.5%	0.2500 g		✓
1%	0.5000 g	0.0002 g	✓
2%	1.0000 g		✓
5%	2.5000 g		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

Error of Indication

As Found

Control limits for various weighing tolerances									
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%		
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A		
19.99994 g	0.00007 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g		
49.99997 g	0.00008 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g		
100.00000 g	0.00005 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g		
149.99999 g	0.00007 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g		
200.00000 g	0.00002 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g		
Result		✓	✓	✓	✓	✓	✓		✓

As Left

Control limits for various weighing tolerances									
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%		
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A		
19.99994 g	0.00007 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g		
49.99997 g	0.00009 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g		
100.00000 g	0.00005 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g		
149.99999 g	0.00007 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g		
200.00000 g	0.00002 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g		
Result		✓	✓	✓	✓	✓	✓		✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

Service Date: 2022-02-07  
Document Number: TH4004-539-020722 LABBalanodHR  
EASTERN THAI CONSULTING 1992 CO., LTD.  
883 Moo 11, Sukhaphiban 8 Rd., Mong Khum, Sriracha, Chonburi 20230  
Ktun Sasiporn Nakin

METTLER TOLEDO

Balance Health Report

Device Details			
System Details			
Manufacturer:	Mettler Toledo	Accessory 1:	Other
Model:	XS2050U	Accessory 2:	
Serial number:	1126323724	Weight set for routine testing:	No
Pinweight:	4.0		
History			
Device History		Service History	
Instrument in use:	Yes	Last preventive maintenance:	< 1 year
Instrument age:	3-10 years	Last instrument calibration:	< 1 year
Spare parts available:	Yes	Last minimum weight determination:	Never
Regulations:	ISO		
Process tolerance in %:	1 %	Routine testing performed:	Don't know
Smallest sample net weight:	0.0100 g		
Check List			
Environmental Conditions		General & Functional Checks	
Room temperature fluctuation	✓	Leveling	✓
Exposure to direct sun	✓	Cleanliness	✓
Vibrations	✓	Completeness - missing parts see additional remarks	✓
Draft	✓	Settings optimized for operating environment	✓
Dirt or dust	✓	Other - objections noted as additional remarks	—
Static	✓	Electrical Component Checks	
Mechanical Component Checks		Power supply	✓
Draft shield	✓	Sliding door drive	—
Weighing pan position	✓	Internal weight drive	✓
Housing	✓	Display	✓
Other - objections noted as additional remarks	—	Other - objections noted as additional remarks	—
Recommendations			
Measurement Result Summary		Process Efficiency	
Instrument calibration	Unstable instrument		
Identify safe weighing range	Replace instrument		
GWP verification / risk assessment	Yes	Replace / add parts (see additional remarks)	
Preventive maintenance		Onsite repair	
Perform routine testing with test weights		Depot repair	
User training		Use of accessories (see additional remarks)	
Contact	Name: Kwan Sasiporn Nakin	Position: Document Control	Phone: 086-051-3303
		Email: de.jaa@mc1992.com	
Additional Remarks & Recommendations			
			Engineer Details
			Date: 0
			Name: S
			Signature:

This is not a certificate.  
It should not be used to interpret final results for the testing of these devices.

LEADEND: ✓ Good/Pass ⚠ Needs Attention ✗ Bad/Fail — Not Applicable

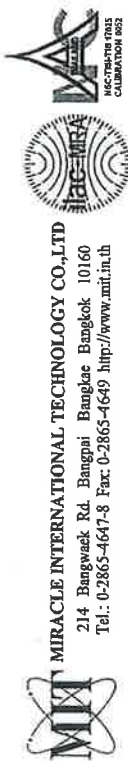
8494 - 8495 Lasele Rd., Baroun Ta Sub-District, Baroun District, Bangkok 10260 - 66 2729 0342  
MT-TH-ServiceSupport@mc1.com  
www.mt.com

METTLER TOLEDO Service  
Report Version: 1.10, Software Version: 1.4.27.0.9, Page: 1/4, © METTLER TOLEDO

## **BAROMETER**

**Equipment : Analog Barometer**

**ID No. / Tag No. : BM001/41**



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD

214 Bangwaek Rd. Bangpai Bangkok 10160  
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mti.in.th>



## CALIBRATION CERTIFICATE

Certificate No. : AD2205-163-0001

Date Issued : 20-May-22

**Customer** : Eastern Thai Consulting 1992 Co., Ltd.  
683 Moo 11 Sukhaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

**Equipment** : Analog Barometer

**Manufacturer** : Barigo  
**Model** : -  
**Serial No.** : -  
**ID No./Tag No.** : BM001/41  
**Date Received** : 12-May-22  
**Date Calibrated** : 20-May-22

**Calibrated by** : Mr. Saruth Srichutikul

**Calibration Method or Calibration Procedure Used**

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by



Page 1 of 2



**Certificate No. :** AD2205-163-0001  
**Environment** : Ambient Temperature :  $(25 \pm 2)^{\circ}\text{C}$   
Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD Reading hPa	UUC Reading (hPa) Before Adjusted	UUC Reading (hPa) After Adjusted	UUC Error hPa	Uncertainty $\pm$ hPa
990.00	990.0	*	0.00	0.59
1000.00	1000.0	*	0.00	0.59
1010.00	1010.0	*	0.00	0.59
1020.00	1020.0	*	0.00	0.59
1030.00	1030.0	*	0.00	0.59

STD = Standard

UUC = Unit Under Calibration

Calibrated condition :

Pressure Medium : Air : Density =  $1.19 \text{ kg/m}^3$  @  $20^{\circ}\text{C}$ , 1 bar  
Mounting Position : Vertical  
Reference Level : at center of its dial

**Description of UUC :**

Range	955 - 1075	hPa Absolute
Calibration Range	990 - 1030	hPa Absolute
Scale Interval	1	hPa
Resolution	0.5	hPa Absolute

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P210086 for Reference Pressure Monitor Serial No. 1598, Due 08-Nov-22

End of Certificate



Page 2 of 2

**CERTIFICATE OF ANALYSIS**

**EPA PROTOCOL GAS**

**Cylinder No. : EB0145030**



Airgas Specialty Gases  
Airgas USA, LLC  
6141 Easton Road  
Bldg 2  
Plumsteadville, PA 18949  
Airgas.com

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E03N199E15AC0U4  
Cylinder Number: EB0145030  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12021  
Gas Code: CH4, PPN, BALN  
Reference Number: 160-402242242-1  
Cylinder Volume: 144.4 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 350  
Certification Date: Oct 15, 2021  
Expiration Date: Oct 15, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 000/R-12/001, using the assay procedures listed. Analytical Methodology used is not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, (i.e. 0.7 megapascals).

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
METHANE	180.0 PPM	177.0 PPM	G1	+/- 1.0% NIST Traceable
PROPANE	185.0 PPM	187.0 PPM	G1	+/- 1.0% NIST Traceable
NITROGEN	Balance			
CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
PNTRM	08011503	K002564	246.7 PPM METHANE/AIR	+/- 0.6%
NTRM	200602-06	6162660Y	243.3 PPM PROPANE/AIR	+/- 0.5%
ANALYTICAL EQUIPMENT				
Instrument/Make/Model	Analytical Principle		Last Multipoint Calibration	
Nicolet iS50 FTIR AJP2110295 CH4	FTIR		Oct 13, 2021	
Nicolet iS50 FTIR AJP2110295 C3H8	FTIR		Oct 14, 2021	

Triad Data Available Upon Request

#### NOTES:

Gross Weight: 28.0 Kg  
Net Weight: 4.9 Kg  
PO# 5221004861



**DRY GAS METER MC-572**

**Serial No. : 0011024**



**METHOD 5 PRE-TEST CONSOLE CALIBRATION**  
**USING REFERENCE METER # WET TEST METER W-NK5A No. 540961**  
**5-POINT METRIC UNIT**

Meter Console Information	
Console Model Number	MC-572
Console Serial Number	0011024
DGM Model Number	SK25EX
DGM Serial Number	00005437

Calibration Conditions			
Date	Time	07-Jan-22	1:00 PM
Calibration Reference No.	HC85APE0005		
Barometric Pressure	759	mm Hg	
Calibration Meter Gamma	0.9980	unless	

Factors/Conversions		
Std Temp	293	K
Std Press	760	mm Hg
K <sub>1</sub>	0.386	

Calibration Data									
Run Time	Metering Console				Calibration Meter				
Elapsed	DGM Orifice	Volume	Volume	Outlet Temp	Outlet Temp	Volume	Volume	Outlet Temp	Outlet Temp
(@)	ΔH	Initial	Final	Initial	Final	Initial	Final	Initial	Final
(@)	(P <sub>in</sub> )	(V <sub>in</sub> )	(V <sub>out</sub> )	(t <sub>in</sub> )	(t <sub>out</sub> )	(V <sub>in</sub> )	(V <sub>out</sub> )	(t <sub>in</sub> )	(t <sub>out</sub> )
min	mm H <sub>2</sub> O	m <sup>3</sup>	m <sup>3</sup>	°C	°C	m <sup>3</sup>	m <sup>3</sup>	°C	°C
15.00	13.0	519.3522	519.5372	25	25	248.31965	248.50831	25	25
10.00	25.0	519.5505	519.7196	25	25	248.52318	248.69613	25	25
8.00	50.0	519.7505	519.9399	25	25	248.72918	248.92339	25	25
7.00	80.0	519.9562	520.1641	25	25	248.94255	249.15608	25	25
5.00	120.0	520.1817	520.3645	25	25	249.17802	249.36602	25	25

Standardized Data				Results				
Dry Gas Meter		Calibration Meter		Calibration Factor		Dry Gas Meter		
(V <sub>avg</sub> )	(Q <sub>avg</sub> )	(V <sub>avg</sub> )	(Q <sub>avg</sub> )	Value	Variation	Flowrate	ΔH @	Variation
m <sup>3</sup>	m <sup>3</sup> /min	m <sup>3</sup>	m <sup>3</sup> /min	(Y)	(ΔY)	(Q <sub>avg</sub> )	(ΔH @)	(ΔΔH @)
m <sup>3</sup>	m <sup>3</sup> /min	m <sup>3</sup>	m <sup>3</sup> /min			m <sup>3</sup> /min	mm H <sub>2</sub> O	
0.182	0.012	0.185	0.012	1.016	-0.001	0.012	38.004	-1.317
0.166	0.017	0.169	0.017	1.018	0.001	0.017	38.741	-0.580
0.187	0.023	0.190	0.024	1.018	0.001	0.024	39.516	0.195
0.206	0.029	0.209	0.030	1.017	0.000	0.030	40.276	0.955
0.181	0.036	0.184	0.037	1.015	-0.002	0.037	40.070	0.748
				1.017	Y Average		39.321	ΔH @ Average

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is  $\pm 0.02$ .

Note: For ΔH<sub>avg</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is  $\pm 0.2$  inches (5.1mm) H<sub>2</sub>O.

Signature \_\_\_\_\_

Service Engineer

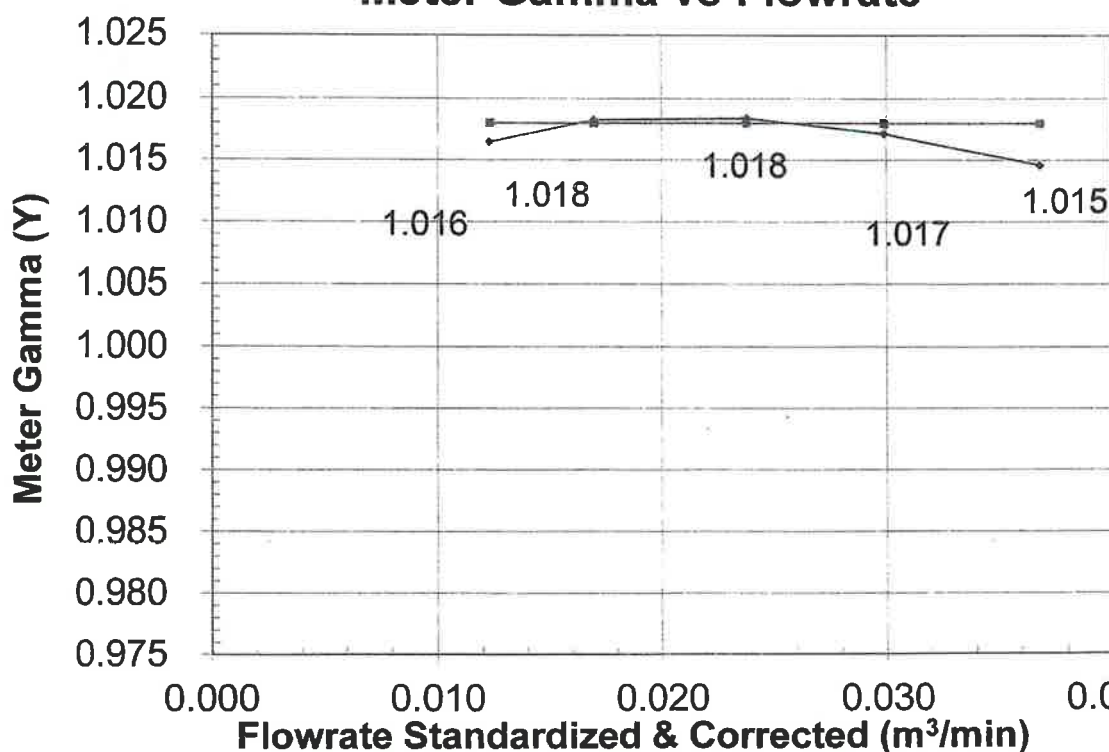
บริษัท อีทีพีพรอดักส์ จำกัด

Date 07/01/2022

Calibration Date: 25-2-2014

Calibration Reference No: VO57AP0011

## Meter Gamma vs Flowrate

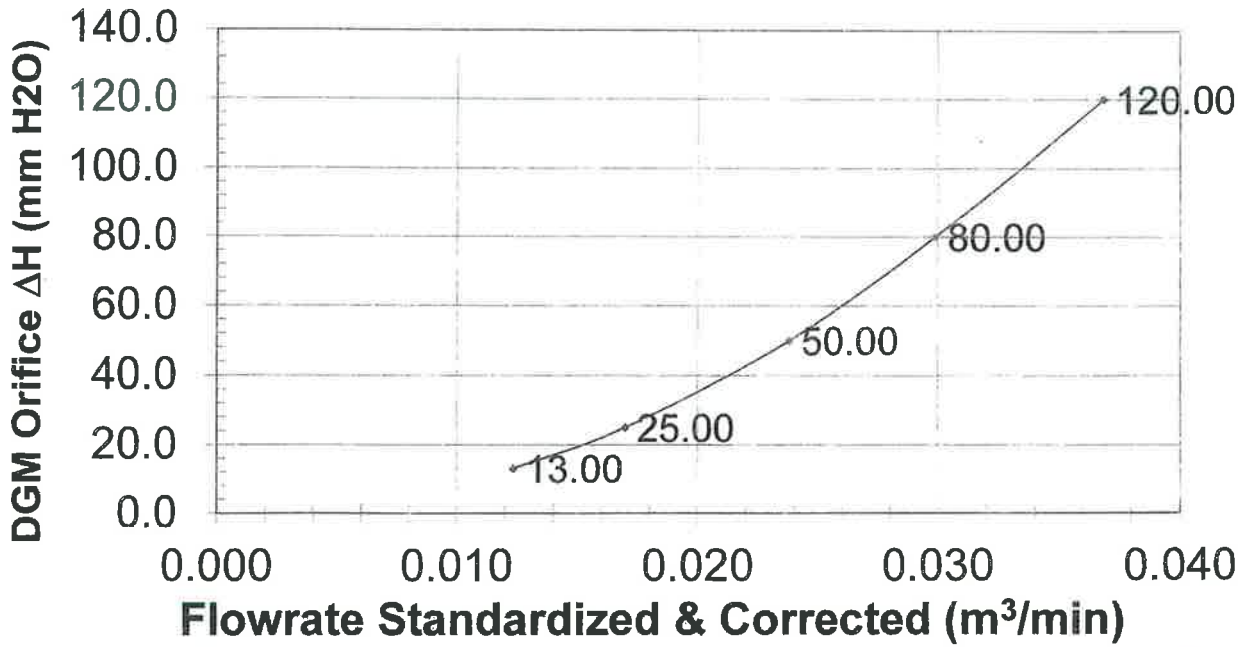


Console Serial: 0011024

Console Model: MC-572

บริษัท อีทีพีพรอดักส์ จำกัด

## Meter Pressure vs Flowrate



Console Serial:

0011024

บริษัท สิทธีพร แอสโซซิเอต จำกัด  
SITHIPORN ASSOCIATES COMPANY LIMITED

Console Model:

## THERMOCOUPLES SYSTEM CALIBRATION

SITHIPORN  
SA Environmental / Hygiene Products Division (EPD1)  
Web site : www.sithiporn.com E-mail: service-epd@sithiporn.com

Sampling System Equipment Information		Calibration Conditions	
Console Model Number	MC-572	Date	07-Jan-22
Console Serial Number	0011024	Calibration Reference No.	HC65APE0005
DGM Model Number	SK2SEX	Barometric Pressure	759 mm Hg
DGM Serial Number	00005437	Reference Thermometer	FLUKE 714
Meter Box Model Number	JENCO 765	Serial Number	9038005

Meter Box Serial Number	JC02982
-------------------------	---------

Results	
Console Thermocouple Simulator	
Channel and test point	Meter Box Channel Temperature Reading (°C)
	38.0 93.0 149.0 260.0 371.0 482.0 593.0 816.0 1038.0
Stack	-18.0 25.0 38.0 94 150 261 372 483 595 817 1040
Probe	-18 25 38 94 150
Filter	-18 25 38 94 150
Aux	-18 25 38 94 150
Exit	-18 25 38

Stack  
Probe  
Filter

Tolerance Range

± 1.50% Absolute  
± 3.0 °C  
± 3.0 °C

Meter  
Exit

± 3.0 °C  
± 2.0 °C

Note: Temperature difference ≤ 1.5%

Signature

Service Engineer

บริษัท สิทธีพร แอสโซซิเอต จำกัด  
SITHIPORN ASSOCIATES COMPANY LIMITED

บริษัท สิทธีพร แอสโซซิเอต จำกัด

Sithiporn Associates Co., Ltd.

451-451/1 ถนนสีลม แขวงบางนาพรุ เขตบางนา กรุงเทพมหานคร 10700 โทร. 0-2433-8331, 0-2435-8800, 0-2434-9191 แฟกซ์ : 0-2433-1679, 0-2434-9510  
451-451/1 Sirthorn Road, Bangbunru, Bangkok, Bangkok 10700 Thailand Tel. (662) 433-8331, 435-8800, 434-9191 Fax: (662) 433-1679, 434-9510

COPY

**DRY GAS METER MC-572-V**

**Serial No. : 0504003**

5-POINT METRIC UNIT

Meter Console Information	
Console Model Number	MC-572-V
Console Serial Number	0504003
DGM Model Number	SK25EX
DGM Serial Number	0005303

Calibration Conditions			
Date	Time	06-Apr-22	8:30 AM
Calibration Reference No.	HC85APE0026		
Barometric Pressure	761	mm Hg	
Calibration Meter Gamma	0.9980	unitless	

Factors/Conversions		
Std Temp	293	K
Std Press	760	mm Hg
K <sub>1</sub>	0.386	

Calibration Data									
Run Time		Metering Console				Calibration Meter			
Elapsed (@)	DGM Orifice $\Delta H$ (P <sub>m</sub> )	Volume Initial (V <sub>m</sub> ) m <sup>3</sup>	Volume Final (V <sub>m</sub> ) m <sup>3</sup>	Outlet Temp Initial (t <sub>m</sub> ) °C	Outlet Temp Final (t <sub>m</sub> ) °C	Volume Initial (V <sub>w</sub> ) m <sup>3</sup>	Volume Final (V <sub>w</sub> ) m <sup>3</sup>	Outlet Temp Initial (t <sub>w</sub> ) °C	Outlet Temp Final (t <sub>w</sub> ) °C
min	mm H <sub>2</sub> O								
15.00	13.0	234.9529	235.0859	27	27	276.54575	276.67750	27	27
10.00	25.0	235.1718	235.3277	27	27	276.76357	276.91676	27	27
8.00	50.0	235.3676	235.5510	27	27	276.95578	277.13668	27	27
7.00	80.0	235.5744	235.7803	27	27	277.15828	277.36140	27	27
5.00	120.0	235.8320	236.0136	27	27	277.41235	277.59265	27	27

Standardized Data				Results				
Dry Gas Meter		Calibration Meter		Calibration Factor		Dry Gas Meter		
(V <sub>std</sub> ) m <sup>3</sup>	(Q <sub>std</sub> ) m <sup>3</sup> /min	(V <sub>w</sub> ) m <sup>3</sup>	(Q <sub>w</sub> ) m <sup>3</sup> /min	Value (Y)	Variation (ΔY)	Flowrate Std & Corr (Q <sub>std/corr</sub> ) m <sup>3</sup> /min	ΔH @ .0212 m <sup>3</sup> /min (ΔH@) mm H <sub>2</sub> O	Variation (ΔΔH@)
0.130	0.009	0.129	0.009	0.987	0.007	0.009	78.243	25.850
0.153	0.015	0.149	0.015	0.978	-0.002	0.015	49.567	-2.626
0.180	0.023	0.176	0.022	0.980	-0.001	0.022	45.729	-6.665
0.203	0.029	0.198	0.028	0.977	-0.003	0.028	44.689	-7.705
0.180	0.036	0.176	0.035	0.979	-0.001	0.035	43.739	-8.654
				0.980	Y Average			ΔH@ Average

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is  $\pm 0.02$ .

Note: For ΔH<sub>std</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is  $\pm 0.2$  inches (5.1mm) H<sub>2</sub>O.

Signature

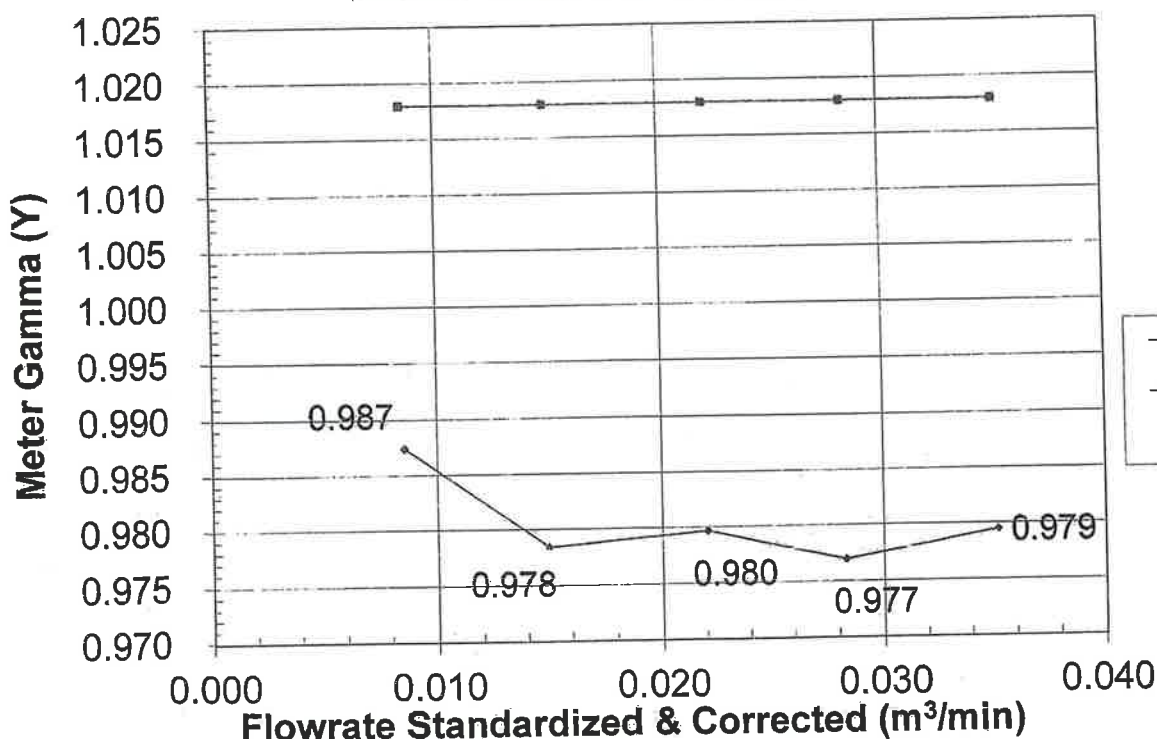
*Surachai Chaisana*  
(Surachai Chaisana)  
Service Engineer

บริษัท สกทิพพรแอสโซซิเอตส์ จำกัด  
SITHIPORN ASSOCIATES COMPANY

Date

5/4/2022

## Meter Gamma vs Flowrate



SITHIPORN ASSOCIATES CO., LTD.  
Environmental / Hygiene Products Division (EPD)  
Web site : www.sithiporn.com & E-mail: service-epd@sithiporn.com

THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information	
Console Model Number	MC-572-V
Console Serial Number	0504003
DGM Model Number	SK25EX
DGM Serial Number	0005303
Meter Box Model Number	JENCO 765
Meter Box Serial Number	JC02484

Calibration Conditions	
Date	05-Apr-22
Time	8:30 AM
Calibration Reference No.	HC88APE0026
Barometric Pressure	761 mm Hg
Reference Thermometer	FLUKE 714
Serial Number	9038005

Results	
Console Thermocouple Simulator	
Channel and test point	Meter Box Channel Temperature Reading (°C)
-18.0	25.0
-18.0	38.0
-18.0	93.0
-18.0	149.0
-18.0	260.0
-18.0	371.0
-18.0	482.0
-18.0	593.0
-18.0	816.0
-18.0	1038.0
Stack	
Probe	
Filter	
Aux	
Exit	

Stack  
Probe  
Filter

± 1.50% Absolute  
± 3.0 °C  
± 3.0 °C

Meter  
Exit

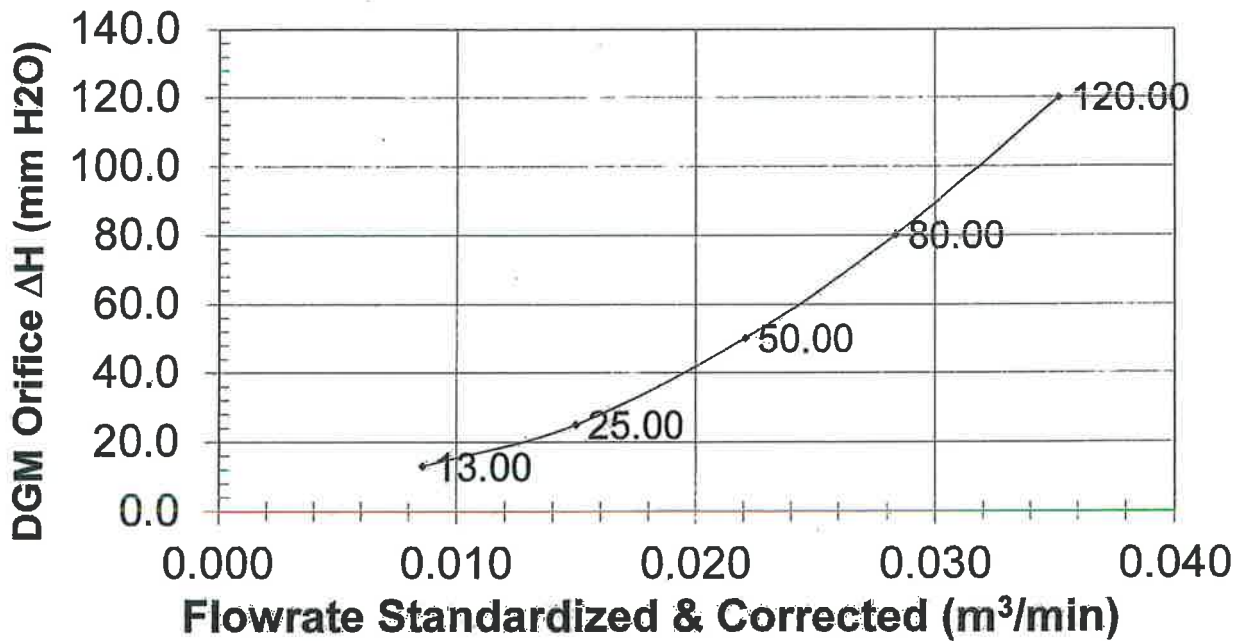
+ 3.0 °C  
+ 2.0 °C

Signature

[Redacted Signature]

บริษัท อภิพรแอสโซซิเอต จำกัด  
SITHIPORN ASSOCIATES COMPANY LIMITED

Meter Pressure vs Flowrate



Console Serial:

0504003

บริษัท อภิพรแอสโซซิเอต จำกัด  
SITHIPORN ASSOCIATES COMPANY LIMITED

Console Model:

MC-572-V

**DRY GAS METER XC-572V**

**Serial No. : 1110070**



## Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic Meters (m³)

## Meter Console Information

Console Model #: XC-572V  
 Console Serial #: 1110070  
 DGM Model #: SK25EX  
 DGM Serial #: 0005413

## Calibration Conditions

Calibration Reference No.: WDS-SV850004  
 Ambient Temp (°C): 25.4  
 Barometric Pressure (mm Hg): 758  
 Relative Humidity (%): 58

## Factors/Conversions

Std Temp (°K): 298  
 Std Press. (mm Hg): 760  
 K<sub>1</sub>: 0.392

## Reference Equipment

WTM Model: W-NKoDa-6B WTM Serial: 546321  
 WTM Cal. Due: Mar-23 Gamma: 1.0000  
 WTM Thermometer: Internal

Run Time (minutes)	Orifice, ΔH (mm H <sub>2</sub> O)	Volume (m³)		Outlet Temperature (°C)		Volume (m³)		Outlet Temp Initial (°C)	Outlet Temp Final (°C)
		Initial (V <sub>ini</sub> ) m³	Final (V <sub>fin</sub> ) m³	Initial (T <sub>ini</sub> ) °C	Final (T <sub>fin</sub> ) °C	Initial (V <sub>ini</sub> ) m³	Final (V <sub>fin</sub> ) m³		
15.00	13.0	397.7244	397.9056	25	25	289.58787	289.78942	25	25
10.00	25.0	397.9285	398.0984	25	26	289.79207	289.95964	25	25
8.00	50.0	398.1162	398.3058	26	26	289.97735	290.16549	25	25
7.00	80.0	398.3366	398.5469	26	26	290.19612	290.40517	25	25
5.00	120.0	398.5893	398.7513	26	27	290.42752	290.60908	25	25

Standardized Data				Calibration Results			
Test Meter		Reference Meter		Calibration Factor		Flowrate	
(V <sub>test</sub> ) m³	(Q <sub>test</sub> ) m³/min	(V <sub>ref</sub> ) m³	(Q <sub>ref</sub> ) m³/min	Value (Y)	Variation (ΔY)	Std & Corr (Q <sub>std</sub> ) m³/min	ΔH @ (mm H <sub>2</sub> O)
0.180	0.012	0.181	0.012	1.001	0.009	0.012	41.038
0.169	0.017	0.167	0.017	0.986	-0.008	0.017	41.198
0.189	0.024	0.187	0.023	0.991	-0.001	0.023	41.985
0.210	0.030	0.208	0.030	0.990	-0.002	0.030	41.881
0.182	0.036	0.180	0.035	0.991	0.001	0.036	42.759
				0.992	0.003		41.788
						= ΔH @ Average	

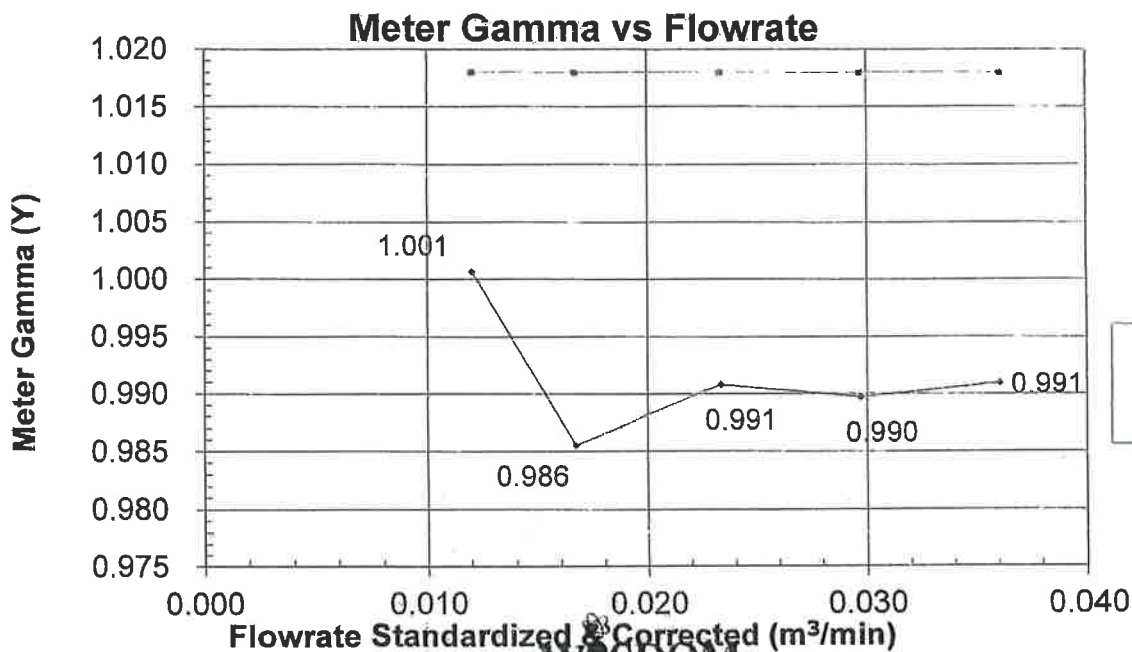
Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.005.  
 Note: For ΔH, orifice pressure differential that equals to 0.75cm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H<sub>2</sub>O

Pass/Fail Result: **Pass**

Signature

บริษัท วิสโดม ซายส์ แอนด์ เซอร์วิส กรุ๊ป จำกัด  
 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

13 / 06 / 2023

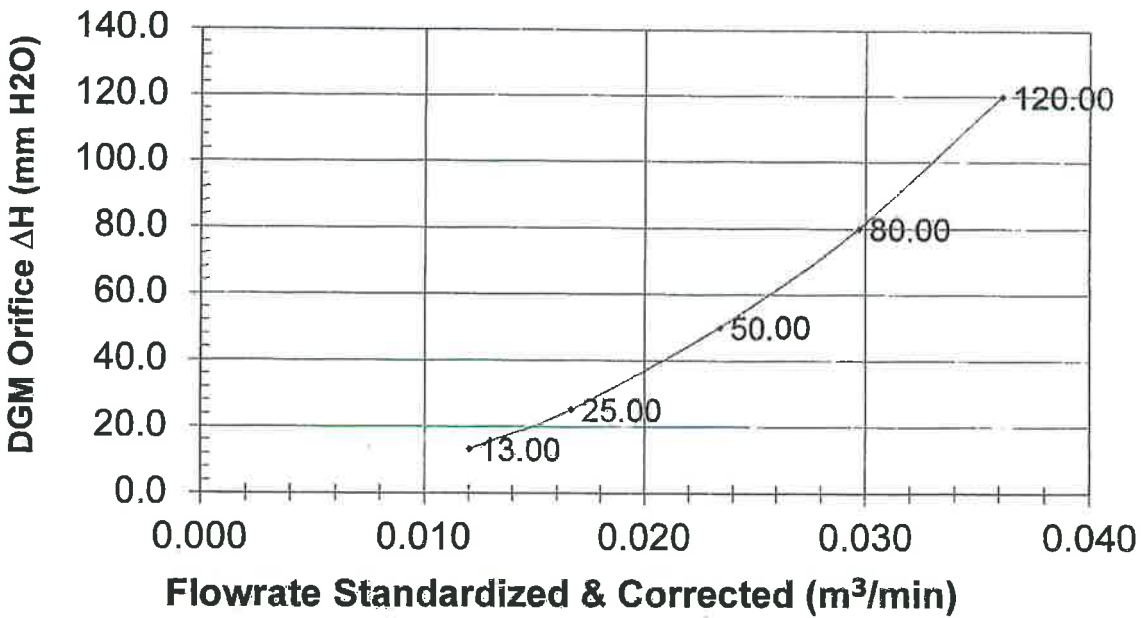


Console Serial: 1110070

Console Model: XC-572V

บริษัท วิสโดม ซายส์ แอนด์ เซอร์วิส กรุ๊ป จำกัด  
 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

## Meter Pressure vs Flowrate



Console Serial: 1110070

Console Model: XC-572V



## THERMOCOUPLES SYSTEM CALIBRATION

Calibration Conditions	
Calibration Reference No.	WDS-SV650004
Ambient Temp	25.4 °C
Barometric Pressure	756 mm Hg
Relative Humidity	55 %
Reference Thermometer	FLUKE 714
Serial Number	9038005

Sampling System Equipment Information	
Console Model Number	XC-572V
Console Serial Number	1110070
Meter Box Model Number	JENCO 765
Meter Box Serial Number	JC02484

## Results

### Console Thermocouple Simulator

Channel and test point	Temperature Reading ( °C )										
	-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0	1038.0
Stack	-18	24	37	92	150	261	373	485	596	821	1045
Probe	-18	24	37	92	150						
Filter	-18	24	37	92	150						
Aux	-18	24	37	92	150						
Exit	-18	24	37								

Tolerance Range

Stack	$\pm 1.50\%$ Absolute
Probe	$\pm 3.0^\circ\text{C}$
Filter	$\pm 3.0^\circ\text{C}$

	+ 3.0 °C	+ 2.0 °C
Meter	1.0	1.0
Exit	1.0	1.0

Signature \_\_\_\_\_

Service Engineer



บริษัท วิสโดม เซอร์วิส จำกัด และ บริษัท เอส ซี ซี จำกัด  
WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED



**DRY GAS METER MC-572V**

**Serial No. : 1007055**

# WISDOM

WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

## Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m<sup>3</sup>)

### Meter Console Information

Model #: MC-572V  
Serial #: 1007055  
DGM Model #: SK25EX  
DGM Serial #: 00008432

### Calibration Condition

Calibration Date: 27/07/2022  
Calibration Ref.: WDS-SV850005  
Ambient Temp (°C): 23.5  
Pressure (mm Hg): 756  
Relative Humidity (%): 60

### Factors/Conversion

Std. Temp. (°K): 298  
Std. Pressure (mm Hg): 760  
K<sub>1</sub> (K/mm Hg): 0.3857

### Reference Equipment

WTM Model: W-NKoDa-5B TM Cal. Due Date: Feb. 2022  
WTM Serial: 546258 Gamma: 0.9980

Run Time (minutes)	DGM Orifice (mm H <sub>2</sub> O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
	P <sub>avg</sub>	V <sub>mi</sub>	V <sub>mf</sub>	T <sub>mi</sub>	T <sub>mf</sub>	V <sub>mi</sub>	V <sub>mf</sub>	T <sub>mi</sub>	T <sub>mf</sub>
15.00	13.0	0.0025	0.1685	25	25	307.83244	307.98616	25	25
10.00	25.0	0.1910	0.3499	25	25	308.00127	308.15867	25	25
8.00	50.0	0.3711	0.5509	25	25	308.16244	308.34119	25	25
7.00	80.0	0.5844	0.7861	25	25	308.34877	308.55037	25	25
5.00	120.0	0.8310	1.0074	25	25	308.59261	308.77072	25	25

Standardized Data				Calibration Results				
Test Meter		Reference Meter		Correction Factor		Flow Rate	ΔH <sub>0</sub> (mm H <sub>2</sub> O)	
Std. Volume V <sub>std</sub> (m <sup>3</sup> )	Std. Flow Rate Q <sub>std</sub> m <sup>3</sup> /min	Std. Volume V <sub>ref</sub> (m <sup>3</sup> )	Std. Flow Rate Q <sub>ref</sub> m <sup>3</sup> /min	"Gamma" (Y)	Variation (ΔY)	Std & Corr Q <sub>std</sub> (m <sup>3</sup> /min)	0.0212 SCMM ΔH <sub>0</sub>	Variation ΔΔH <sub>0</sub>
0.163	0.011	0.160	0.011	0.983	-0.005	0.011	50.885	3.735
0.156	0.016	0.154	0.015	0.985	-0.002	0.015	46.980	0.030
0.177	0.022	0.174	0.022	0.987	-0.001	0.022	46.834	-0.096
0.199	0.028	0.197	0.028	0.990	0.001	0.028	45.366	-1.564
0.175	0.035	0.174	0.035	0.986	0.008	0.035	44.824	-2.106
				0.988	= Y Avg.		46.930	= ΔH <sub>0</sub> Avg

Pass/Fail Result: **Pass**

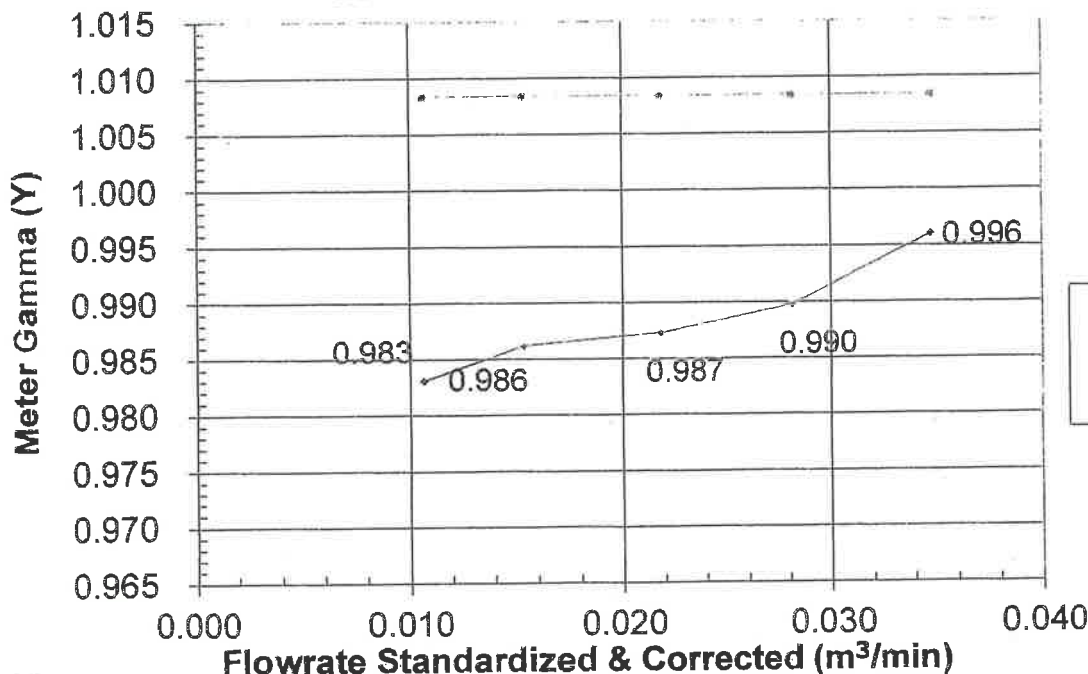
Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.  
Note: For ΔH<sub>0</sub>, orifice pressure differential that equates to 0.75cm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H<sub>2</sub>O

Signature: \_\_\_\_\_  
Service Engineer

**WISDOM SCIENCE**  
บริษัท วิสโดม ไซน์แอนด์เซอร์วิส กรุ๊ป จำกัด  
WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY (LIMITED)

Date: 27/07/2022

## Meter Gamma vs Flowrate



Console Serial: 1007055

Console Model: MC

W SDOM

THERMOCOUPLES SYSTEM CALIBRATION

Units: Same as indicated and used throughout the report  
WEISS JONES SALES AND SERVICE GROUP COMPANY LIMITED

Sampling System Equipment Information	
Console Model Number	MC-872V
Console Serial Number	1007055
Meter Box Model Number	DIGICON
Meter Box Serial Number	N/A

Calibration Conditions	
Date	27/07/2022
Calibration Reference No.	WDS-SV650005
Barometric Pressure	756
Reference Thermometer	FLUKE 714
Serial Number	9038005

Results											
Console Thermocouple Simulator											
Channel and test point		Meter Box Channel Temperature Reading (°C)									
		-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0
Stack		-18	25	38	93	150	261	373	485	596	821
Probe		-18	25	38	92	150					
Filter		-18	25	38	92	150					
Aux		-18	25	38	92	150					
Exit		-18	25	38							

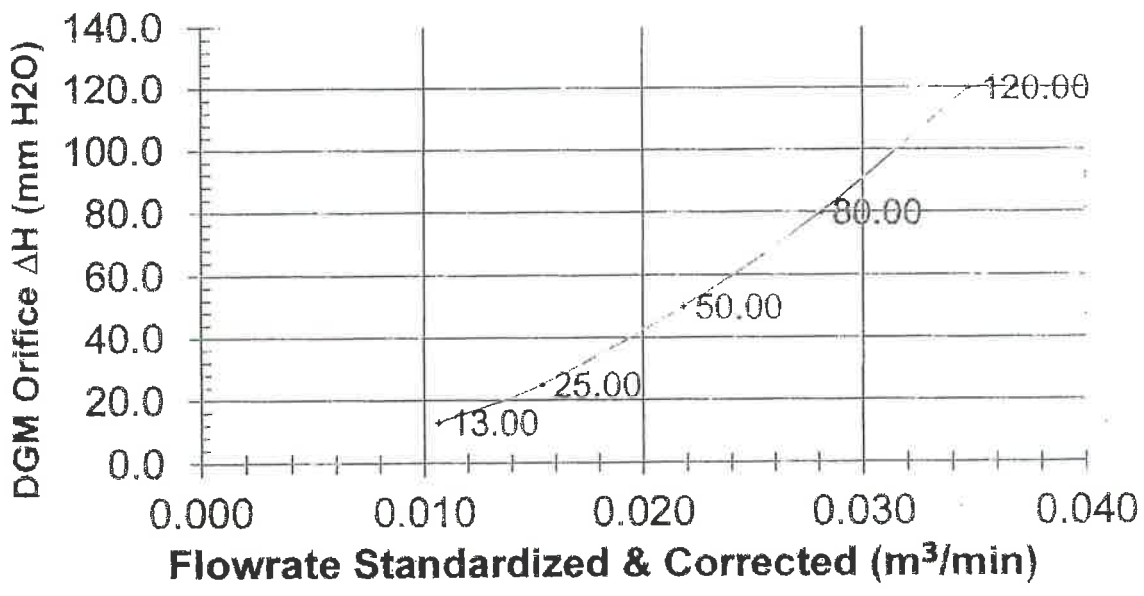
ance Range  
Stack  
Probe  
Filter

± 1.50% °K  
± 3.0 °C  
± 3.0 °C

Meter  
Exit

Signal

Meter Pressure vs Flowrate



Console Serial: 1007055

Console Model:



**Flue gas Analyzer**  
**Testo 350XL**  
**Serial No. 01807527**



# Calibration Certificate

Certificate No.: G 650383

ENTECH

Where  
Signature



# Calibration Certificate

Certificate No: G 650383

Date of issue : 15-Jun-22

ENTECH

Where  
Signature

Instrument description : Flue gas Analyzer  
Instrument model : Testo 350XL  
Instrument serial no. : 01807527  
ID no. or control no. :  
Manufacturer : Testo SE & Co. KGaA  
Probe description :  
Probe model :  
Probe serial :  
Customer name : Eastern Thai Consulting 1992 Company Limited  
Customer address : 683 Moo 11, Sukhapiam 8 Road, Nongkham, Si Racha, Chon Buri 20280

Total pages of certificate : 3 Pages  
Receiving no. : L-222062  
Receiving date. : 09-Jun-22  
Parameter of calibration : Gas Calibration(Oxygen 2.498,10.00,21.00 %vol, Carbon Monoxide 80.97,309.9,1003 ppm, Nitrogen Dioxide 10.19,80.62,202.2 ppm, Nitric Oxide 10.08,150.9,320.6 ppm, Sulphur Dioxide 50.04,100.9,601.1 ppm)

Condition of UUC. : Used  
Ambient condition : All of the Measurement were carried out the stabilized laboratory

Calibration place : Temperature : 23 ± 5 °C  
Humidity : 55 ± 15 %RH  
17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210

Calibration procedure no. : WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.  
This certificate is applied only to item under test Environmental condition.

This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory.  
Calibration certificates without signature and seal not valid.  
This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 15-Jun-22

Technical Manager  
Calibration Technician  
Signature

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O <sub>2</sub> ) 2.498 % Vol	4219/21	Linde	30-Sep-25
Oxygen (O <sub>2</sub> ) 10.00 % Vol	2453/19	Linde	18-Jul-23
Oxygen (O <sub>2</sub> ) 21.00 % Vol	2426/19	Linde	16-Jul-23
Carbon monoxide (CO) 80.97 ppm	2842/21	Linde	24-Jun-23
Carbon monoxide (CO) 309.9 ppm	2803/21	Linde	22-Jun-23
Carbon monoxide (CO) 1003 ppm	2829/21	Linde	23-Apr-23
Nitrogen Dioxide (NO <sub>2</sub> ) 10.19 ppm	3372/21	Linde	02-Aug-23
Nitrogen Dioxide (NO <sub>2</sub> ) 80.62 ppm	3240/21	Linde	25-Jul-23
Nitrogen Dioxide (NO <sub>2</sub> ) 202.2 ppm	3239/21	Linde	20-Jul-23
Nitric Oxide (NO) 10.08 ppm	3241/21	Linde	25-Jul-23
Nitric Oxide (NO) 150.9 ppm	2857/21	Linde	27-Jun-23
Nitric Oxide (NO) 320.6 ppm	2944/21	Linde	02-Jul-23
Sulphur Dioxide (SO <sub>2</sub> ) 50.04 ppm	3205/21	Linde	25-Jul-23
Sulphur Dioxide (SO <sub>2</sub> ) 100.9 ppm	4942/20	Linde	20-Nov-22
Sulphur Dioxide (SO <sub>2</sub> ) 601.1 ppm	3204/21	Linde	20-Jul-23

## Measured room conditions

Temperature : 25.1 °C Humidity : 51.8 %RH Pressure : 1011.5 mbar  
Calibration conditions : Gas Temperature : 23 °C Flow rate : 1,000 ml/min Gas pressure : 1021.9 mbar

## Calibration Results Before Adjustment (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O <sub>2</sub> (%Vol)	2.498	2.53	0.032	0.20
O <sub>2</sub> (%Vol)	10.00	10.01	0.01	0.40
O <sub>2</sub> (%Vol)	21.00	21.14	0.14	0.80
CO (ppm)	80.97	83	2.03	2.8
CO (ppm)	309.9	323	13.1	11
CO (ppm)	1003	1050	47	34
NO <sub>2</sub> (ppm)	10.19	9.2	-0.99	1.5
NO <sub>2</sub> (ppm)	80.62	77.5	-3.12	5.0
NO <sub>2</sub> (ppm)	202.2	194.6	-7.6	5.0
NO (ppm)	10.08	8	-2.08	6.0
NO (ppm)	150.9	148	-2.9	5.0
NO (ppm)	320.6	312	-8.6	10
SO <sub>2</sub> (ppm)	50.04	46	-4.04	5.0
SO <sub>2</sub> (ppm)	100.9	98	-2.9	5.0
SO <sub>2</sub> (ppm)	601.1	598	-3.1	14



Calibration Results After Adjustment (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O <sub>2</sub> (%Vol)	2.498	2.53	0.032	0.20
O <sub>2</sub> (%Vol)	10.00	10.01	0.01	0.40
O <sub>2</sub> (%Vol)	21.00	21.14	0.14	0.80
CO (ppm)	80.97	81	0.03	2.8
CO (ppm)	309.9	310	0.1	11
CO (ppm)	1003	1005	2	34
NO <sub>2</sub> (ppm)	10.19	9.2	-0.99	1.5
NO <sub>2</sub> (ppm)	80.62	77.5	-3.12	5.0
NO <sub>2</sub> (ppm)	202.2	194.6	-7.6	5.0
NO (ppm)	10.08	8	-2.08	6.0
NO (ppm)	150.9	148	-2.9	5.0
NO (ppm)	320.6	312	-8.6	10
SO <sub>2</sub> (ppm)	50.04	46	-4.04	5.0
SO <sub>2</sub> (ppm)	100.9	98	-2.9	5.0
SO <sub>2</sub> (ppm)	601.1	598	-3.1	14

Remark: 1 cmol/mol = 1 %vol., 1 µmol/mol = 1 ppm.

End of Report

ENTECH

**Hot Air Oven**

**Model : UFE 500**

**Serial No. : G511.0182**



AMARC

ASIA MEDICAL AND  
AGRICULTURAL LABORATORY  
AND RESEARCH CENTER

Page 2 of 3  
Certificate No. : 22-011766  
Sample Code : 22-04498-003

## REPORT OF CALIBRATION

### Results of Calibration

Resolution : 0.5 °C

### 1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# 9 <sup>Ref</sup>
104	103.5	103.5	104.46	104.45	#####	104.07	104.46	104.42	104.34	104.07	104.30	0.53	2.00

### 2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
104	0.12	0.80	1.13

### Notes

UUC\* = Unit Under Calibration

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TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

### 3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-PT100)	LB-DA-11 (RTD-148 to RTD-155, RTD-227)	21-041213	09 May 2022

### 4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

### 5. This result of calibration was found accurate as shown on date and place of calibration only.

### 6. Condition of calibration item : Normal

Calibrated by : Mr. Pettarakorn Panklong

Scientist

Issue date : 11 February 2022

Signed for Director

The uncertainties are for a confidence probability of approximately 95%.

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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CONTACT@AMARC.CO.TH  
WWW.AMARC.CO.TH  
Effective Date: 15/10/21

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WWW.AMARC.CO.TH  
Effective Date: 15/10/21

Rev 09



## REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 22-01766

Sample Code : 22-04498-003

### Results of Calibration

#### Notes

1. Sensor installation locations
  - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
  - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :  
W = 56 cm ; D = 40 cm ; H = 48 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC\* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

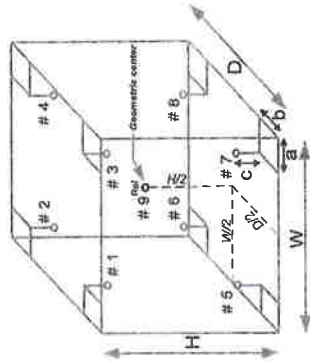


Figure: Example of sensor installation Positions

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

# **INDUCTIBELY COUPLED PLASMA SPECTROMETER**

**Model : Prodigy 7**

**Serial No. : P70177**



บริษัท แอปพลิเคชัน สยาม จำกัด  
Application Define Company Limited  
8/4 ซอย บางเขน ถนน 9 แขวง บางเขน เขต คลองจั่น กรุงเทพมหานคร 10170  
8/4 Soi Bangchuek Road 9 Bangchuek Subdistrict, Bangkok 10170  
Tel: (66) 2864 7137 E-mail: support@addefine.co.th Website : http://www.addefine.co.th  
เลขประจำตัวผู้เสียภาษี 0105556032481

## CERTIFICATE OF INSTRUMENT PERFORMANCE

INSTRUMENT:	INDUCTIVELY COUPLED PLASMA SPECTROMETER																																												
BRAND:	Teladyne Leeman Labs																																												
MODEL:	Prodigy 7																																												
SERIAL NO.	P70177																																												
CUSTOMER:	Eastern Thai Consulting 1992 Co., Ltd																																												
CHECKING:	<table><tr><td>SPECTROMETER</td><td>Wavelength Accuracy check by use emission line of Hg Lamp</td><td>STATUS</td></tr><tr><td></td><td>Mercury line 253.652 nm.</td><td>OK</td></tr><tr><td></td><td>Plasma View (Dual View)</td><td>OK</td></tr><tr><td></td><td>CMOS Detector check</td><td>OK</td></tr><tr><td></td><td>Align View by Mn line 257.610 nm.</td><td>OK</td></tr><tr><td>RF GENERATOR</td><td>Incident Power 1,200 ±10 Watt</td><td>Reading = ...1.2.... Watt</td></tr><tr><td>SAMPLE INTRODUCTION</td><td>Plasma Torch, injector, Spray chamber, Nebulizer</td><td>OK</td></tr><tr><td></td><td>Pneumatic pump &amp; Tubing</td><td>OK</td></tr><tr><td>EXHAUSTING &amp; COOLING SYSTEM</td><td>Safety Interlock Switch (Door, Argon pressure, Water pressure)</td><td>OK</td></tr><tr><td></td><td>Cooling System, water flowrate &amp; low pressure switch</td><td>OK</td></tr><tr><td></td><td>Flowrate of Air blower</td><td>OK</td></tr><tr><td>COMPUTER &amp; SOFTWARE</td><td>Plasma Ignition software &amp; Analytical Software</td><td>OK</td></tr><tr><td>ANALYTICAL TEST</td><td>Full Frame Capture &amp; Echelogram check</td><td>OK</td></tr><tr><td></td><td>Calibration Curve &amp; QC Test</td><td>OK</td></tr></table>			SPECTROMETER	Wavelength Accuracy check by use emission line of Hg Lamp	STATUS		Mercury line 253.652 nm.	OK		Plasma View (Dual View)	OK		CMOS Detector check	OK		Align View by Mn line 257.610 nm.	OK	RF GENERATOR	Incident Power 1,200 ±10 Watt	Reading = ...1.2.... Watt	SAMPLE INTRODUCTION	Plasma Torch, injector, Spray chamber, Nebulizer	OK		Pneumatic pump & Tubing	OK	EXHAUSTING & COOLING SYSTEM	Safety Interlock Switch (Door, Argon pressure, Water pressure)	OK		Cooling System, water flowrate & low pressure switch	OK		Flowrate of Air blower	OK	COMPUTER & SOFTWARE	Plasma Ignition software & Analytical Software	OK	ANALYTICAL TEST	Full Frame Capture & Echelogram check	OK		Calibration Curve & QC Test	OK
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ANALYTICAL TEST	Full Frame Capture & Echelogram check	OK																																											
	Calibration Curve & QC Test	OK																																											

DATE: December 21, 2021

Engineer Sign



## PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท สยามคอนสัลติ้ง จำกัด	Date: December 21, 2021
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

### 1. Gas Supply /Water Re-circulator/Exhaust Hood Check:

<b>Gas system:</b> ตรวจสอบแก๊สและการทำงานของระบบ Argon Pressure: 45 psi Nitrogen Pressure: - psi Oxygen Pressure: - psi Leak inspected (✓) No leak Leak inspected (✓) No leak Leak inspected (✓) No leak	(✓) Change camera purge gas Dehydrator (1 times /years) Next time replacement 12/2022 เปลี่ยนตัวถังการกำจัดความชื้นปีละครั้ง ทุก 1 ปี	<b>Water Chiller:</b> RF generator flow rate 444 LPM Temperature 26 C ตรวจสอบอุณหภูมิ Leak inspected (✓) No leak ตรวจสอบการรั่วซึม	<b>Water Chiller:</b> Camera (✓) check water level and refill ตรวจสอบระดับน้ำและเติมน้ำ (✓) change water เปลี่ยนน้ำ Temperature -34 °C ตรวจสอบอุณหภูมิ	<b>Exhaust Hood</b> Flow rate 150 CFM (system request > 150)
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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท สิตทิพย์ไทย คอนกรีต 1992 จำกัด Date: December 21, 2021  
Instrument: ICP-OES Model: Prodigy 7 SN: P70177

2. Computer & Software Check

Description	Status
Interface Cable USB (✓) No broken	OK
Software Version	OK
(✓) Operation function check :	OK
(✓) Open /Save /Edit method	OK
(✓) Instrument Control	OK
(✓) Sequence	OK
(✓) Full Frame Capture (Echelle Mode)	OK
(✓) Auto alignment /Hg alignment	OK
(✓) Calibration Curve	OK
(✓) Re-Calculation	OK
(✓) Print Report	OK

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท สิตทิพย์ไทย คอนกรีต 1992 จำกัด Date: December 21, 2021  
Instrument: ICP-OES Model: Prodigy 7 SN: P70177

3. Instrument Control

Description	Status
Optical view position: ตรวจสอบตำแหน่งที่คนได้ใส่ตัวอย่างในแต่ละบรันของ	
Hg Lamp Deltas	
X -1 Y -2	OK
XUV 0	OK
Axial peak positions X3325 Y1205	OK
Radial peak positions X4111 Y1135	OK
Hg lamp peak positions X4245 Y2415	OK
Plasma Control ตรวจสอบการทำงานของหลอดและดับหลอด	
(✓) Auto Start	OK
(✓) Extinguish	OK
(✓) RF power setting	OK
(✓) Igniter	OK
(✓) Air Knife	OK
Torch Gas ตรวจสอบการทำงานของแก๊สที่ใช้ในหลอด	
(✓) Coolant /Plasma Flow control	OK
(✓) Aux Flow	OK
(✓) Nebulizer Flow	OK
(✓) Optimize sample introduction function	OK
(✓) Peristaltic pump control	OK
(✓) Auto sampler Control	OK
(✓) Camera Support Module	OK
(✓) Diagnostic	OK

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท สกัดหินไทย สมบูรณ์ 1992 จำกัด  
Instrument: ICP-OES  
Date: December 21, 2021  
Model: Prodigy 7  
S/N: P70177

4. Cleaning & Replacement

Description	Status
(✓) O-Ring Torch replacement	OK
(✓) Pump Tubing replacement	OK
(✓) Glassware cleaning (Torch, Nebulizer, Spray chamber)	OK
(✓) Lube the roll peristaltic pump	OK
(✓) Optical windows cleaning	OK
(✓) Camera Water Re-circulator (water change/ refilled)	OK
(✓) RF Generator Water Re-circulator (water change/ refilled)	OK
(✓) Cleaning Electronics Board with spray cleaner	OK
(✓) Cleaning dust inside Unit	OK
(✓) Cleaning dust filter	OK

5. Safety Interlock

Description	Status
(✓) Door switch	OK
(✓) RF Water Re-circulator	OK
(✓) Camera Water Re-circulator	OK
(✓) Camera purge gas	OK
(✓) Argon pressure	OK
(✓) Nitrogen pressure	OK

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท สกัดหินไทย สมบูรณ์ 1992 จำกัด  
Instrument: ICP-OES  
Date: December 21, 2021  
Model: Prodigy 7  
S/N: P70177

6. Hardware Check with SALSAXE Diagnostics

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.7 V	OK
+12 VDC (11 - 14.5 VDC)	12.01 V	OK
+3.3 VDC	3.28 V	OK
+5.0 VDC	4.95 V	OK
+13.5 VDC	13.44 V	OK

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.51 V	OK
ICP Ref 5.0Vdc = 1kW	5.41 V	OK
ICP Current 0.00 Vdc = 0kW	0	OK
ICP Ref 0.00Vdc = 0kW	0	OK
RF Water (Hz) OFF	0	OK
RF Water (Hz) ON	2.5	OK
Air Knife Pres. (0.00V) OFF	0	OK
Air Knife Pres. (3.0 - 7.0 V) ON	3.67 V	OK
Neb 25 @ setting of 25 PSI	2.5	OK
Cool 18 @ setting of 18 LPM	1.6	OK
Aux 0.6 @ setting of 6 LPM	2.6	OK
Pump Current (0.000 A) OFF	0	OK
Pump Voltage (0.000 V) OFF	0	OK
Pump Current (0.8 to 4.0A) ON	1.04 A	OK
Pump Voltage (8 to 13 V) ON	12.52	OK

Set Points	Value	Status
Air In Set Point 32°C	32	OK
Cam Tee Temperature -32°C	-32	OK
Op Purge Low 0.77 LPM	0.77	OK
Op Purge High 15.50 LPM	15.5	OK
Cam Wtr T 28°C	28.02	OK




**PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGN 7**

Customer: บริษัท อุตสาหกรรม พลาสติก จำกัด 1992 จำกัด Date: December 21, 2021

Instrument: ICP-OES Model: Prodigy 7 S/N: P70177

**7. Mn Check for performance Test**

	Condition for performance Test	Condition Test	Status
Standard	1 ppm, 5 ppm, 10 ppm	10 ppm	OK
Power plasma	1.20 kw	1.2	OK
Plasma gas	16.0 LPM	16	OK
Auxiliary Gas	0.8 LPM	0.8	OK
Nebulizer	1.2 LPM	25 psi	OK
Pump Speed	25 RPM	25	OK
Integration time	15 s Axial, 5 s Radial	10 s, 5 s	OK
Nebulizer Type	Seaspray, Conical, Meinhard	Conical	OK
Intensity first performance	1 ppm ≥ 4,000,000 5 ppm ≥ 15,000,000 10 ppm ≥ 50,000,000	69,343,926	OK

Engineer Sign	
<p><b>TELEDYNE LEEMAN LABS</b> Everywhere you look</p>	

**UV/VIS SPECTROPHOTOMETER**

**Model : UV – 1800**

**Serial No. : A11635101643CD**



Bara Scientific Co., Ltd.  
968 U Chu Liang Building Floor7 Rama4 Road  
Sicom Bangkok Bangkok Thailand 10500  
Tel : 02-6324300 Fax : 02-6375496-7  
www.barascientific.com



## Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No.  
Equipment  
Model  
Manufacturer  
Serial No.  
ID No.  
Date of receipt  
Date of calibration  
Date of issue

BSCC-UV-167/22  
UV/Vis Spectrophotometer  
UV-1800  
Shimadzu  
A11635101643 CD  
LABE 03/2  
18 May 2022  
18 May 2022  
25 May 2022

Customer name

Eastern Thal Consulting 1992 Co., Ltd.

Address

683 Moo 11, Sukkaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230.

Temperature  
Humidity

(23.8-24.5) °C (On site)  
(47.8-48.3) %RH (On site)

Equipment condition

Good Operation

Calibration Location

Analysis Department.

Calibration Procedure

In-house method WI-UV-702-01 based on ASTM E275-01

Traceability

Wavelength Accuracy is traceable to certificate No. 96367 and 96366  
Photometric Accuracy is traceable to certificate No. 99925 and 100147  
Stray Light is traceable to certificate No. 96346  
The above certificate are traceable to SI unit through NIST National Institute of Standards and Technology (UKAS accredited calibration laboratory NO. 06559)

Calibrated by

Mr.Kanchil Choolhep

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced  
except in full, without written approval of the Bara Scientific Co., Ltd.

FW-UV-708-02 Rev-01 (23/01/63)



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Tel : 02-6324300 Fax : 02-6375496-7  
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## Certificate of Calibration

Number of Page(s) 2 of 3

Certificate No. BSCC-UV-167/22

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
287.71	287.80	0.09	0.18
445.82	445.95	0.13	0.18
536.52	536.60	0.08	0.18
741.02	741.00	-0.02	0.18
879.41	879.40	-0.01	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7311	0.7321	0.0010	0.0075
257	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	
	0.6306	0.6314	0.0008	

\*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced  
except in full, without written approval of the Bara Scientific Co., Ltd.

FW-UV-708-02 Rev-01 (23/01/63)





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# Certificate of Calibration

3 of 3

Number of Page(s)

BSCC-UV-16722

Certificate No.

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000 0.5472 0.7637 1.0480	0.0000 0.5481 0.7636 1.0497	0.0000 0.0009 -0.0001 0.0017	0.0042 0.0042 0.0042 0.0042
440.0	0.0000 0.5371 0.7457 1.0233	0.0000 0.5377 0.7451 1.0240	0.0000 0.0006 -0.0006 0.0016	0.0042 0.0042 0.0042 0.0042
465.0	CNR CNR CNR CNR	CNR CNR CNR CNR	CNR CNR CNR CNR	CNR CNR CNR CNR
546.1	0.0000 0.5006 0.6961 0.9563	0.0000 0.5006 0.6944 0.9550	0.0000 0.0000 -0.0017 -0.0013	0.0042 0.0042 0.0042 0.0042
590.0	CNR CNR CNR CNR	CNR CNR CNR CNR	CNR CNR CNR CNR	CNR CNR CNR CNR
635.0	0.0000 0.5137 0.6907 0.9533	0.0000 0.5137 0.6891 0.9519	0.0000 0.0000 -0.0016 -0.0014	0.0042 0.0042 0.0042 0.0042

\*CNR = Customer not request

4. Stray Light\*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
200.91±0.11nm	201.10	0.9543
		2.0204

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

\*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

\*\*\*End of Certificate\*\*\*

The above results are valid exclusively for the calibrated item(s) as mentioned in this report / certificate. Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.

FI44UN-705-02 Rev.01 (23/01/63)

**SOUND LEVEL CALIBRATOR**

**MODEL : NC-75**

**SERIAL No. : 34802645**

Request No. 21-65/0018

MTC No. EEL.BP. 24/1064

## CALIBRATION CERTIFICATE

Submitted by : Eastern Thai Consulting 1992 Co.,Ltd.

Address : 683 Moo 11 Sukaphibal 8 Rd., Nongkham, Sitracha, Chonburi 20230.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : Rion

Model : NC-75

Serial No. : 34802645

### Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound

calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards

Laboratory (EEL), which are traceable to the International System of Units through the National Institute of

Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the

measured values only.

Date of Receipt : 11 Oct. 2021

Date of Calibration : 21 Oct. 2021

The results relate only to the items tested/calibrated or value assigned  
Advising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office

5 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang, 196 Phahonyothin Road, Chatuchak, Bangkok 10900, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2579 5525  
E-mail : rump@tistr.or.th Website: www.tistr.or.th

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road, 196 Phahonyothin Road, Chatuchak, Bangkok 10900, Thailand  
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Request No. 21-65/0018

MTC No. EEL.BP. 24/1064

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20  $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20  $\mu$ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

### 1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit
1/2 inch B&K 4180	93.97	-0.03	± 0.10	±0.40 dB

### 2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit
1/2 inch B&K 4180	1000.0	0.0	± 1.5	±1.0%

### 3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit
1/2 inch B&K 4180	0.50	± 0.50	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

Approved by :

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Oct. 2021

Date of Issue : 26 Oct. 2021

End of Certificate

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The results relate only to the items tested/calibrated or value assigned  
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Head Office

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Fax. (66) 0 2579 5525  
E-mail : rump@tistr.or.th Website: www.tistr.or.th

FM.BLMTC.002 Rev.4

**SOUND LEVEL METER**

**MODEL : NL-21**

**SERIAL No. : 00209071**

Request No. 21-65/0071

MTC No. EEL BP. 16/1164

## CALIBRATION CERTIFICATE

Submitted by : Eastern Thai Consulting 1992 Co.,Ltd.

Address : 683 Moo 11 Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi, 20230.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Level Meter

Manufacturer : Rion

Model : NL-21

Serial No. : 00209071 (No.15)

Microphone : Type UC-52 No.186090

Preamplifier : Type NH-21 No.00836

### Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 5 Nov. 2021

Date of Calibration : 8-10 Nov. 2021

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Request No. 21-65/0071

MTC No. EEL BP. 16/1164

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.

10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.

11. Digital Multimeter Agilent 34401A S/N MY44005560.

12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

### Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%.

Date of Calibration : 8-10 Nov. 2021

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.



### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Unit Under Test			Tolerance Limit Class 2 (±dB)
	Measured Value (dB)	Deviation (dB)	Uncertainty (±dB)	
113.90	Before adjust 114.0	After adjust 113.9	0.0	0.30
				1.4

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 111.8 dB.

### 2. Self-generated noise

#### 2.1 Normal test

Measured value (dB)	Uncertainty (±dB)
18.3	0.10

#### 2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency	Measured Value (dB)	Uncertainty (±dB)
Weighting	16.3	0.10
A-Weighting	25.6	0.10
C-Weighting	31.3	0.10

Date of Calibration : 8-10 Nov. 2021

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The results relate only to the items tested/calibrated or value assigned  
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FM.BLMTC.002 Rev.4

### 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
125	0.4	0.5	0.4	0.40	2.0
1 000	-0.1	-0.1	0.0	0.40	1.4
4 000	0.4	0.4	0.4	0.40	3.6

### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
63	-0.1	-0.1	-0.2	0.20	2.5
125	-0.1	0.0	-0.1	0.20	2.0
250	-0.1	0.0	0.0	0.20	1.9
500	0.0	0.0	0.0	0.20	1.9
1 000	0.0	0.0	0.0	0.20	1.4
2 000	0.1	0.1	0.1	0.20	2.6
4 000	0.0	0.1	0.1	0.20	3.6
8 000	0.2	0.2	0.1	0.20	5.6

Date of Calibration : 8-10 Nov. 2021

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FM.BLMTC.002 Rev.

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
A-weighting	94.0	0.0	0.20	0.4
C-weighting	94.0	0.0	0.20	0.4
Flat	94.0	0.0	0.20	0.4

5.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
Fast	94.0	0.0	0.20	0.3
Slow	94.0	0.0	0.20	0.3
Leq	94.0	0.0	0.20	0.3

6. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
125	125.0	0.0	0.30	1.4
124	124.0	0.0	0.30	1.4
123	123.0	0.0	0.30	1.4
122	122.0	0.0	0.30	1.4
121	121.0	0.0	0.30	1.4
120	120.0	0.0	0.30	1.4
119	119.0	0.0	0.30	1.4
114	114.0	0.0	0.30	1.4
109	109.0	0.0	0.30	1.4

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6. Level linearity on the reference level range (con.)

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
104	104.0	0.0	0.30	1.4
99	99.0	0.0	0.30	1.4
94	94.0	0.0	0.30	1.4
89	89.0	0.0	0.30	1.4
84	84.1	0.1	0.30	1.4
79	79.0	0.0	0.30	1.4
74	74.0	0.0	0.30	1.4
69	69.0	0.0	0.30	1.4
64	64.0	0.0	0.30	1.4
59	59.0	0.0	0.30	1.4
54	54.0	0.0	0.30	1.4
49	48.9	-0.1	0.30	1.4
44	44.0	0.0	0.30	1.4
39	38.9	-0.1	0.30	1.4
34	33.9	-0.1	0.30	1.4
33	33.0	0.0	0.30	1.4
32	31.9	-0.1	0.30	1.4
31	30.9	-0.1	0.30	1.4
30	29.9	-0.1	0.30	1.4
29	28.9	-0.1	0.30	1.4
28	28.0	0.0	0.30	1.4

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9. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (±dB)	Tolerance limits Class 2 (±dB)
Complete cycle	125.4	125.0	-0.4	0.20	2.4
Positive half cycle	124.4	124.1	-0.3	0.20	1.4
Negative half cycle	124.4	124.1	-0.3	0.20	1.4

10. Overload indication

Measured value (dB)		Deviated value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
Positive one-half cycle	Negative one-half cycle	0.0	0.30	1.8
135.6	135.6			

Calibrated by :

Approved by :

Date of Calibration : 8-10 Nov. 2021

Date of Issue : 16 Nov. 2021

Ref : 2011264110504565003

End of Certificate

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7. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
40-130	125	125.0	0.0	0.30	1.4
30-120	115	115.0	0.0	0.30	1.4
20-110	105	105.0	0.0	0.30	1.4
20-100	95	95.0	0.0	0.30	1.4
20-90	85	85.0	0.0	0.30	1.4
20-80	75	75.1	0.1	0.30	1.4

8. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (dB)
Fast	200	116.0	0.0	0.20	±1.3
	2	98.9	-0.1	0.20	+1.3; -2.8
	0.25	89.9	-0.1	0.20	+1.8; -5.3
Slow	200	109.6	0.0	0.20	±1.3
	2	90.0	0.0	0.20	+1.3; -5.3
	200	110.0	0.0	0.20	±1.3
SEL	2	90.0	0.0	0.20	+1.3; -2.8
	0.25	80.8	-0.2	0.20	+1.8; -5.3

Date of Calibration : 8-10 Nov. 2021

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**SOUND LEVEL METER**

**MODEL : CR:172A**

**SERIAL No. : G301013**



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

MTC No. EEL. BP. 63/1164

Request No. 21-65/0101

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.

10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.

11. Digital Multimeter Agilent 34401A S/N MY44005560.

12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

#### Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%.

Date of Calibration : 13-14 Dec. 2021

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

MTC No. EEL. BP. 63/1164

Request No. 21-65/0101

#### CALIBRATION CERTIFICATE

Submitted by : Eastern Thai Consulting 1992 Co., Ltd.

Address : 683 Moo 11 Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi 20230.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

#### Instrument Calibrated :

Description : Sound Level Meter :  $(23 \pm 3) ^\circ\text{C}$   
Manufacturer : Cirrus :  $(50 \pm 15) \%$   
Model : CR-172A : Ambient Pressure :  $(101.325 \pm 1.5) \text{ kPa}$

Serial No. : G301013 (No.29)

Microphone : Cirrus MK216 No.412272B

Preamplifier : No.9334F

#### Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2995571.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 17 Nov. 2021

Date of Calibration : 13-14 Dec. 2021

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### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Unit Under Test				Tolerance Limit Class 2 (±dB)
	Measured Value (dB)		Deviation (dB)	Uncertainty (±dB)	
	Before adjust	After adjust			
93.75	93.9	93.7	0.0	0.50	1.4

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 93.7 dB.

### 2. Self-generated noise

#### 2.1 Normal test

Measured value (dB)	Uncertainty ( $\pm$ dB)
16.5	0.10

#### 2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency Weighting	Measured Value (dB)	Uncertainty ( $\pm$ dB)
A-Weighting	under-range	-
C-Weighting	20.7	0.10
Flat	31.7	0.10

Note: The under-range means the indicator cannot display the value because it is under the setting range 20-140 dB.

Date of Calibration : 13-14 Dec. 2021

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### 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
125	0.2	0.0	0.0	0.40	2.0
1 000	-0.7	-0.7	-0.7	0.40	1.4
4 000	0.8	1.0	1.1	0.40	3.6

### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
63	0.5	0.1	0.2	0.20	2.5
125	0.3	0.1	0.1	0.20	2.0
250	0.2	0.0	0.0	0.20	1.9
500	0.1	0.0	0.0	0.20	1.9
1 000	0.0	0.0	0.0	0.20	1.4
2 000	-0.1	0.0	0.0	0.20	2.6
4 000	-0.3	-0.2	0.0	0.20	3.6
8 000	-0.5	-0.3	-0.1	0.20	5.6

Date of Calibration : 13-14 Dec. 2021

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Request No. 21-65/0101

MTC No. EEL. BP. 63/1164

### 5. Frequency and time weightings at 1 kHz

#### 5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
A-weighting	114.0	0.0	0.20	0.4
C-weighting	114.0	0.0	0.20	0.4
Flat	114.0	0.0	0.20	0.4

#### 5.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
Fast	114.0	0.0	0.20	0.3
Slow	114.0	0.0	0.20	0.3
Leq	114.0	0.0	0.20	0.3

### 6. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
139	139.0	0.0	0.30	1.4
134	134.0	0.0	0.30	1.4
129	129.0	0.0	0.30	1.4
124	124.0	0.0	0.30	1.4

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### 6. Level linearity on the reference level range (cont.)

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
119	119.0	0.0	0.30	1.4
114	114.0	0.0	0.30	1.4
109	109.0	0.0	0.30	1.4
104	104.0	0.0	0.30	1.4
99	99.0	0.0	0.30	1.4
94	94.0	0.0	0.30	1.4
89	89.0	0.0	0.30	1.4
84	83.9	-0.1	0.30	1.4
79	79.0	0.0	0.30	1.4
74	74.0	0.0	0.30	1.4
69	68.9	-0.1	0.30	1.4
64	64.0	0.0	0.30	1.4
59	58.9	-0.1	0.30	1.4
54	53.9	-0.1	0.30	1.4
49	48.9	-0.1	0.30	1.4
44	44.0	0.0	0.30	1.4
39	39.1	0.1	0.30	1.4
34	34.3	0.3	0.30	1.4
29	29.3	0.3	0.30	1.4
24	24.4	0.4	0.30	1.4

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7. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
20-140	135	135.0	0.0	0.30	1.4

8. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (dB)
Fast	200	136.0	0.0	0.20	±1.3
	2	118.9	-0.1	0.20	+1.3; -2.8
	0.25	109.9	-0.1	0.20	+1.8; -5.3
Slow	200	129.6	0.0	0.20	±1.3
	2	110.0	0.0	0.20	+1.3; -5.3
SEL	200	129.6	-0.4	0.20	±1.3
	2	110.0	0.0	0.20	+1.3; -2.8
	0.25	101.0	0.0	0.20	+1.8; -5.3

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Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

9. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (±dB)	Tolerance limits Class 2 (±dB)
Complete cycle	135.4	135.6	0.2	0.20	2.4
Positive half cycle	134.4	134.2	-0.2	0.20	1.4
Negative half cycle	134.4	134.2	-0.2	0.20	1.4

10. Overload indication

Measured value (dB)		Deviated value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
Positive one-half cycle	Negative one-half cycle	0.0	0.30	1.8
139.1	139.1			

Calibrated by :

Annarav by :

Date of Calibration : 13-14 Dec. 2021

Date of Issue : 15 Dec. 2021

Ref : 201126411704770005

End of Certificate

8 / 8

The results relate only to the items tested/calibrated or value as

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BLMTC.002 Rev.4

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpa@tistr.or.th Website:www.tistr.or.th

**Office/Laboratory**  
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Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**  
196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

**ANALYTICAL BALANCE (DU)**

**Model : XS205 DU**

**Serial No. : 1126323724**




Mettler-Toledo (Thailand) Ltd.  
846/4 - 846/5 Lamsalle Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+66 2723 0382  
MT-TH.ServiceSupport@mt.com



## Accuracy Calibration Certificate

### Customer

Company: EASTERN THAI CONSULTING 1992 CO., LTD.  
Address: 683 Moo 11, Sukhaphibun 8 Rd., Nong Kham  
City: Sriracha  
Zip / Postal: 20230  
State / Province: Chonburi  
Order Number:  5033114601

### Weighing Device

Manufacturer: Mettler Toledo  
Model: XS205DU  
Serial No.: 1126323724  
Building: Laboratory  
Floor: 1  
Room: Laboratory  
Instrument Type: Weighing Instrument  
Asset Number: LABE 05/1  
Terminal Model: SAT  
Terminal Serial No.: 1126323724  
Terminal Asset No.: N/A

Range	Max. Capacity	Repeatability (g)
1	81 g	0.0001 g
2	220 g	0.0001 g

### Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)  
CP/W002/20  
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.  
The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.  
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

As Found	Temperature		Humidity	
	Start: 26.9 °C	End: 26.8 °C	Start: 73.8 %	End: 71.9 %

As Found Calibration Date: 22-Jul-2021  
As Left Calibration Date: N/A  
Issue Date: 23-Jul-2021  
Approved Signatory: 

☒ Kasakorn TassaraChaisakul  
☐ Sami Jitinyom  
☐ Surachot Sukkote

## Measurement Results

### Repeatability

Test Load: 70 g			As Found	As Left
1	89.99998 g	1 (Full Point)	N/A	28g
2	89.99997 g	10	N/A	4g
3	89.99997 g	2	N/A	3d
4	89.99998 g	2d	N/A	1d
5	89.99997 g	8	N/A	3
6	89.99998 g	8	N/A	4
7	89.99999 g		N/A	
8	89.99998 g		N/A	
9	89.99997 g		N/A	
10	89.99999 g		N/A	
Standard Deviation			0.000008 g	N/A

The "d" in the graph represents the repeatability of the range/interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	99.99999 g	N/A
2	99.99998 g	N/A
3	99.99998 g	N/A
4	100.00000 g	N/A
5	100.00000 g	N/A
Maximum Deviation	0.0001 g	N/A

3

1d

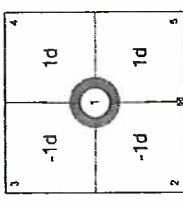
4

2

1d

5

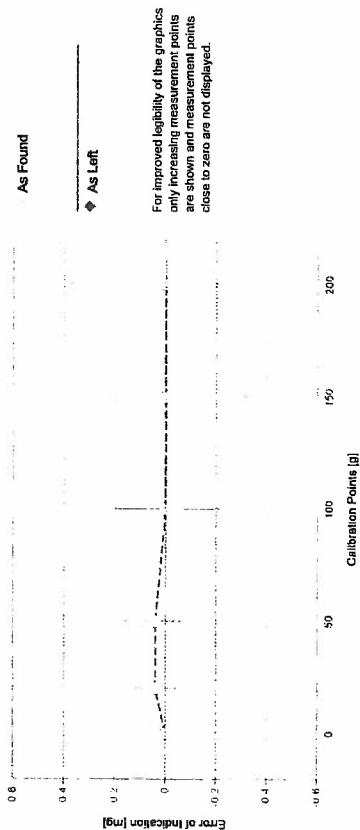
The "d" in the graph represents the repeatability of the range/interval in which the test was performed.



Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.017 mg	2
2	0.01000 g	0.01000 g	0.00000 g	0.019 mg	2
3	0.10000 g	0.09999 g	-0.00001 g	0.023 mg	2
4	1.00000 g	1.00000 g	0.00000 g	0.032 mg	2
5	4.99999 g	5.00000 g	0.00002 g	0.048 mg	2
6	9.99999 g	10.00001 g	0.00002 g	0.061 mg	2
7	20.00001 g	20.00005 g	0.00004 g	0.082 mg	2
8*	49.99993 g	49.99997 g	0.00004 g	0.12 mg	2
9	99.99999 g	99.99999 g	0.00000 g	0.21 mg	2
10	149.9998 g	149.9998 g	0.00000 g	0.32 mg	2
11	199.9998 g	199.9998 g	0.00000 g	0.37 mg	2

\*The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2			
Weight Set No.:	WS28	Date of Issue:	17-Nov-2020
Certificate Number:	170241	Calibration Due Date:	15-May-2022
Thermo Hygrometer			
Equipment No.:	IN51	Date of Issue:	02-Mar-2021
Certificate Number:	21H403	Calibration Due Date:	23-Feb-2022



Stated is the expanded uncertainty with  $k=2$  in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value  $R$  represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1.5 \cdot 10^{-6} / \text{K}$

Temperature range on site for the evaluation of the measurement uncertainty in use:

 $1.5 \cdot 10^{-6} / \text{K}$ 

5K

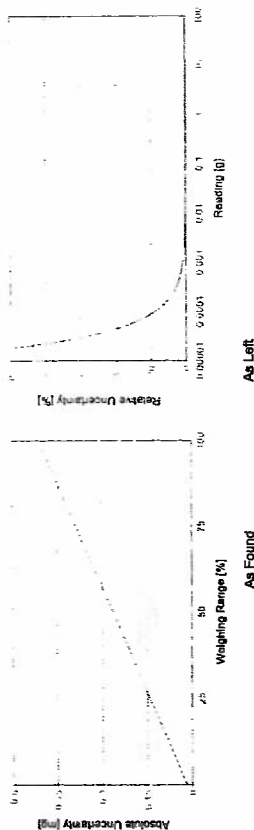
### Linearization of Uncertainty Equation

Range			As Found	As Lott
	d	Max		
1	0.00001 g	81 g	$U_1 = 0.018 \text{ mg} + 0.00608 \text{ mg/g} \cdot R$	N/A
2	0.0001 g	220 g	$U_2 = 0.08 \text{ mg} + 0.00603 \text{ mg/g} \cdot R$	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

### Absolute and Relative Measurement Uncertainty in Use for Various Not Indications (Examples)

Net Incineration	As Found	As Left
0.00220 g	0.018 mg	N/A
0.02200 g	0.018 mg	N/A
0.22000 g	0.019 mg	N/A
2.20000 g	0.031 mg	N/A
220.0000 g	1.4 mg	N/A



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

**GWP®  
Certificate**

## As Found

As Left



The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed;

As Found

As Left

No adjustments/modifications made. As Left results correspond to As Found.

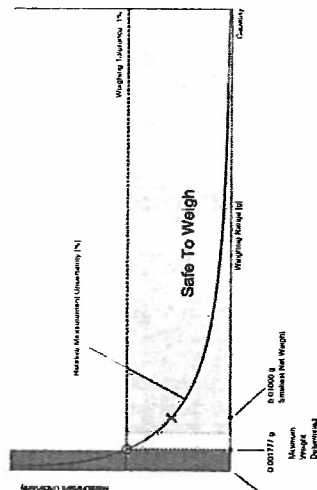
## Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.01000 g

Safety Factor: 2

### Safe Weighting Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As-Loft testing, unless only As-Found

## Minimum Weight

### As Found Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.017873 g	0.035965 g	0.054282 g	0.091605 g	0.189140 g
0.2%	0.008909 g	0.017873 g	0.026891 g	0.045095 g	0.091605 g
0.5%	0.003557 g	0.007123 g	0.010697 g	0.017873 g	0.035965 g
1%	0.001777 g	0.003557 g	0.005339 g	0.008909 g	0.017873 g
2%	0.000888 g	0.001777 g	0.002667 g	0.004448 g	0.008909 g
5%	0.000355 g	0.000711 g	0.001066 g	0.001777 g	0.003557 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

### As Left Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.017873 g	0.035965 g	0.054282 g	0.091605 g	0.189140 g
0.2%	0.008909 g	0.017873 g	0.026891 g	0.045095 g	0.091605 g
0.5%	0.003557 g	0.007123 g	0.010697 g	0.017873 g	0.035965 g
1%	0.001777 g	0.003557 g	0.005339 g	0.008909 g	0.017873 g
2%	0.000888 g	0.001777 g	0.002667 g	0.004448 g	0.008909 g
5%	0.000355 g	0.000711 g	0.001066 g	0.001777 g	0.003557 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with  $k = 2$  and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

## Measurement Results

### Results Summary

Repeatability		Eccentricity	Error of Indication
As Found	As Left		
✓	✓	✓	✓

✓ = Passed  
✗ = Failed  
A = Safety Factor not met

### Repeatability

Test Load: 70 g

As Found		As Left	
Tolerance	Control Limit	Std. Deviation	Result
0.1%	0.000005 g		✗
0.2%	0.000010 g		✗
0.5%	0.000025 g		✓
1%	0.000050 g	0.000008 g	✓
2%	0.000100 g		✓
5%	0.000250 g		✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

### Eccentricity

Test Load: 100 g

As Found		As Left	
Tolerance	Control Limit	Std. Deviation	Result
0.1%	0.0500 g		✓
0.2%	0.1000 g		✓
0.5%	0.2500 g		✓
1%	0.5000 g	0.0001 g	✓
2%	1.0000 g		✓
5%	2.5000 g		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

As Found

Reference Value	Error	Control limits for various weighing tolerances					Result
		0.1%	0.2%	0.5%	1%	5%	
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	✓
20.00001 g	0.00004 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
49.99999 g	0.00004 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
99.99998 g	0.00000 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g
149.99998 g	0.00000 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g
199.99998 g	0.00000 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g
Result		✓	✓	✓	✓	✓	✓

As Left

Reference Value	Error	Control limits for various weighing tolerances					Result
		0.1%	0.2%	0.5%	1%	5%	
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	✓
20.00001 g	0.00004 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
49.99999 g	0.00004 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
99.99998 g	0.00000 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g
149.99998 g	0.00000 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g
199.99998 g	0.00000 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g
Result		✓	✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

Service Date: 2021-07-22  
Document Number: TH2046-042-072221-LABBalanceHR  
EASTERN THAI CONSULTING 1992 CO., LTD.  
693 Moo 11, Suksepahan 8 Rd., Nong Khai, Sriracha, Chonburi 20230  
Sriphorn Nakhin

METTLER TOLEDO

## Balance Health Report

Device Details		System Details	
Manufacturer:	Mettler Toledo	Accessory 1:	
Model:	XS2050U	Accessory 2:	
Serial number:	1128323724	Weight set for routine testing:	Yes /
Firmware:	4.00 / 5.61		
History		Service History	
Instrument in use:	Yes	Last preventive maintenance:	< 1 year
Instrument age:	> 10 years	Last instrument calibration:	< 1 year
Spare parts available:	Yes	Last minimum weight determination:	Never
Regulations:	ISO		
Process tolerance in %:	1%	Routine testing performed:	Yes
Smallest sample net weight:	0.01000 g		
Check List			
Environmental Conditions		General & Functional Checks	
Room temperature fluctuation	✓	Leveling	✓
Exposure to direct sun	✓	Cleanliness	✓
Vibrations	✓	Completeness - missing parts see additional remarks	✓
Draft	✓	Settings optimized for operating environment	✓
Dirt or dust	✓	Other - objections noted as additional remarks	✓
Static	✓	Electrical Component Checks	
Mechanical Component Checks		Power supply	✓
Draft shield	✓	Sliding door drive	✓
Weighting pan position	✓	Internal weight drive	✓
Housing	✓	Display	✓
Other - objections noted as additional remarks	✓	Other - objections noted as additional remarks	✓
Recommendations			
Maintenance / Repair Quality		Problem Efficiency	
Instrument calibration	✓	Uninstall instrument	
Identify safe weighing range	✓	Replace instrument	
GMP verification / risk assessment	Yes	Replace / add parts (see additional remarks)	
Preventive maintenance		Onsite repair	
Perform routine testing with test weights		Depot repair	
User training		Use of accessories (see additional remarks)	
Contact	Name: Sasiporn Nakhin	Position:	Phone: 090513303
Additional Remarks & Recommendations		Engineer Details	
		Date:	22-Jul-2021
		Name:	
		Signature:	

This is not a certificate.  
It should not be used to interpret final results for the testing of these devices.

Legend: ✓ Good/Pass    ⚠ Needs Attention    ✗ Bad/Fail    — Not Applicable

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MT-TH-Service@mt.com  
www.mt.com

METTLER TOLEDO Service  
Report Version: 1.13 Software Version: 4.28.0.3, Page: 1/1, © METTLER TOLEDO

**ANALYTICAL BALANCE**

**Model : SECURA224-1S**

**Serial No. : 0036707137**





Certificate No. : 22-011768

Sample Code : 22-04498-005

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapibon 8 Rd., Nongkham,

Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-1S

Serial No. : 0036707137

ID No. : LABE 05/2

Date of Receipt : 03 February 2022

Date of Calibration : 03 February 2022

Calibrated by Mr. Thanadol Pholthep  
Scientist

Approved by

Issue date 07 February 2022

The uncertainties are for a confidence probability of approximately 95%.

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-017

TEL 02-516-2422

FAX 02-516-5949

Rev.05

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date: 15/10/21



Certificate No. : 22-011768

Sample Code : 22-04498-005

## REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-1S

Capacity : Max 220 g

Resolution : 0.0001 g

Serial No. : 0036707137

ID No. : LABE 05/2

## Result of Calibration

## 1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 220	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100	100
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000022	100.000022
	Average reading of Indicator	99.9998	100.0000
	Standard deviation	0.00008	0.00005
Unit : -	Range : -	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	-	-
<input type="checkbox"/> Adjustment	Standard weight	-	-
	Average reading of Indicator	-	-
	Standard deviation	-	-

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WWW.AMARC.CO.TH

Effective Date: 15/10/21

Certificate No. : 22-011768

Sample Code : 22-04498-005

Page 3 of 4

## REPORT OF CALIBRATION

## Result of Calibration

## 2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range : 220			
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.7981	-	-
100	0.9976	-	-
200	0.9976	-	-

## 3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.0000	0.0000	0.000094	2.01
0.01	0.0100045	0.0100	0.0000	0.000094	2.01
0.1	0.1000102	0.1000	0.0000	0.000094	2.01
1	1.0000055	1.0000	0.0000	0.000095	2.01
2	2.0000144	1.9999	0.0001	0.000095	2.01
5	5.0000060	5.0000	0.0000	0.000096	2.01
10	10.000007	9.9999	0.0001	0.000097	2.01
20	20.000022	20.0000	0.0000	0.00010	2.01
50	50.000038	50.0000	0.0000	0.00012	2.01
100	100.000022	99.9999	0.0001	0.00016	2.00
200	200.000141	200.0000	0.0001	0.00027	2.00

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by a coverage factor k = 2.00. The normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement is stated in accordance with UKAS M.

Certificate No. : 22-011768

Sample Code : 22-04498-005

Page 4 of 4

## REPORT OF CALIBRATION

## Result of Calibration :

## 4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighing pan			
<input checked="" type="radio"/> Circle <input type="radio"/> Triangular <input type="radio"/> Rectangular			
Test weight : 100		Unit : g	
Range	220	Reading of indicator	Reading of Indicator
Position			
1	99.9999		
2	100.0000		
3	99.9999		
4	99.9997		
5	100.0000		
6	99.9999		
Maximum difference	0.0002		

## Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019
2. This result of calibration was found accurate as shown on date and place of calibration only.
3. Condition of Calibration item: Normal
4. This certification is traceable to the International System of Unit maintained at : -

- Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Instrument number 1).

## 5. Reference standard Instrument :

## Instrument

1) STANDARD WEIGHT 1 mg to 1 kg

Class E2

ID No. LB-WE-57

Certificate No. 21-05646

Due Date

- End of Report -

TEL 02-516-2422

FAX 02-516-8949

Rev.03



## **BAROMETER**

**Equipment : Analog Barometer**

**ID No. / Tag No. : BM001/41**



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD  
214 Bangwaek Rd. Bangpui Bangkok 10160  
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



## CALIBRATION CERTIFICATE

Certificate No. : AD2106-032-0001

Date Issued : 04-Jun-21

**Customer** : Eastern Thai Consulting 1992 Co., Ltd.  
683 Moo 11 Sukhapiarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

**Equipment** : Analog Barometer

**Manufacturer** : Barigo  
**Model** : -  
**Serial No.** : -  
**ID No./Tag No.** : BM001/41  
**Date Received** : 02-Jun-21  
**Date Calibrated** : 04-Jun-21

**Calibrated by** : Mr. Somjet Onbua

**Calibration Method or Calibration Procedure Used**

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

This certificate may not be reproduced other than in full except with the prior written approval of the Technical Manager, Miracle International Technology Company Limited.

Approved by :



Page 1 of 2

Certificate No. : AD2106-032-0001

Environment : Ambient Temperature : (25 ± 2)°C

Relative Humidity : (50 ± 15)%RH

STD Reading hPa	UUC Reading (hPa) Before Adjusted	UUC Reading (hPa) After Adjusted	UUC Error hPa	Uncertainty ± hPa
990.00	990.0	-	0.00	0.91
1000.00	1000.0	-	0.00	0.91
1010.00	1010.0	-	0.00	0.91
1020.00	1020.0	-	0.00	0.91
1030.00	1030.0	-	0.00	0.91

STD = Standard

UUC = Unit Under Calibration

Calibrated condition :

Pressure Medium  
Mounting Position  
Reference Level

Air : Density = 1.19 kg/m³ @ 20°C, 1 bar  
Vertical  
at center of its dial

Description of UUC :

Range : 955 - 1075 hPa Absolute  
Calibration Range : 990 - 1030 hPa Absolute  
Scale Interval : 1 hPa  
Resolution : 0.5 hPa Absolute

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P210029 for Digital Barometer Serial No. 290185, Due 19-Oct-21

End of Certificate

Page 2 of 2

**BOD INCUBATOR**

**ID No. : LABE 19/1**



## CERTIFICATE OF CALIBRATION

Page 1 of 3

 Certificate No. : 22-011784  
 Sample Code : 22-04498-001

 Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
 683 Moo 11, Sukhepiban 8 Rd., Nongkham,  
 Sirachha, Chonburi 20230

 Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.  
 (Laboratory)

 Equipment : Temperature controlled enclosures (Incubator)  
 Manufacturer : N/A  
 Model : E811.0308  
 Serial No. : N/A  
 ID No. : LABE19/1  
 Date of Receipt : 03 February 2022  
 Date of Calibration : 03 February 2022

## Condition of Calibration

1. Environment
- |                           |   |
|---------------------------|---|
| 1.1 Ambient temperature   | : Maximum 30.5 °C ; Minimum 29.5 °C     |
| 1.2 Relative humidity     | : Maximum 50.8 % ; Minimum 48.4 %       |
| 1.3 Line voltage supplied | : Maximum 224.3 VAC ; Minimum 222.5 VAC |

## 2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

## 3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Date Acquisition With Sensor (RTD-PT100)	LB-DA-11 (RTD-138 to RTD-146)	21-035792	18 May 2022

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

5. This result of calibration was found accurate as shown on date and place of calibration only.

6. Condition of calibration item : Normal

Calibrated by

Approved by

Issue date

11 February 2022

 The uncertainties are for a confidence probability of approximately 95%.  
 The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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 WWW.AMARC.CO.TH  
 Effective Date: 15/10/21

 NSC-TIS-17517025  
 CALIBRATION 0152

Page 2 of 3

 Certificate No. : 22-011784  
 Sample Code : 22-04498-001

## REPORT OF CALIBRATION

## Results of Calibration

Resolution : 0.1 °C

## 1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# 9
20	20.0	20.0	20.61	20.09	19.46	19.73	20.22	20.37	20.12	20.19	20.28	0.29	2.00

## 2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.09	0.88	1.28

## Notes

- UUC\* = Unit Under Calibration

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 WWW.AMARC.CO.TH  
 Effective Date: 15/10/21

NSC-TSI-TS17025  
CALIBRATION 0152

## REPORT OF CALIBRATION

Page 3 of 3

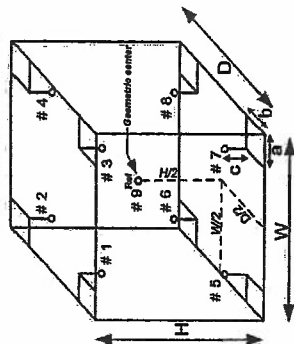
Certificate No. : 22-011764

Sample Code : 22-04498-001

## Results of Calibration

## Notes

1. Sensor installation locations
  - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
  - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :  
W = 70 cm; D = 60 cm; H = 124 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC\* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

Figure: Example of sensor  
Installation Positions

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty multiplied by the coverage factor  $k$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with ISO 14902.

- End of Report -

**BOD INCUBATOR**

**ID No. : LABE 19/2**





AMARC

## REPORT OF CALIBRATION

Page 2 of 3  
Certificate No. : 22-007487  
Sample Code : 22-02878-006

### Results of Calibration

Resolution : 0.1 °C

#### 1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 <sup>ref</sup>	
20	20.0	20.0	19.61	19.35	19.81	19.37	20.15	20.34	20.14	20.45	19.61	0.30

#### 2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.08	0.94	1.22

#### Notes

UUC\* = Unit Under Calibration



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WWW.AMARC.CO.TH  
Effective Date: 15/10/21

TEL 02-516-2422  
FAX 02-516-6949  
Rev.08

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Phlabphla, Weng Thonglang, Bangkok 10310  
PH-CL-018



AMARC

## CERTIFICATE OF CALIBRATION

Page 1 of 3  
Certificate No. : 22-007487  
Sample Code : 22-02878-006

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkham,  
Sriacha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.  
(Laboratory)

Equipment : Temperature controlled enclosures (Incubator)

Manufacturer : N/A Model : N/A

Serial No. : S540040277 ID No. : LABE 19/2

Date of Receipt : 24 January 2022 Date of Calibration : 24 January 2022

#### Condition of Calibration

1. Environment	1.1 Ambient temperature	: Maximum 30.4 °C ; Minimum 30.0 °C
	1.2 Relative humidity	: Maximum 51.2 % ; Minimum 46.2 %
	1.3 Line voltage supplied	: Maximum 225.3 VAC ; Minimum 224.1 VAC

#### 2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

#### 3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Date acquisition with sensor (RTD-PH00)	LB-DA-12 (RTD-158 to RTD-166)	21-038920	10 May 2022

4. This certificate is traceable to the International system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

5. This result of calibration was found accurate as shown on date and place of calibration only.

6. Condition of calibration item : Normal

Calibrated by : Mr. Pattarakorn Panklong  
Scientist

Approved by

Issue date : 28 January 2022

The uncertainties are for a confidence probability of approximately 95%.

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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Effective Date: 15/10/21



## REPORT OF CALIBRATION

NSC-TSI-TS17025  
CALIBRATION 0152

Page 3 of 3

Certificate No. : 22-007487

Sample Code : 22-02978-006

## Results of Calibration

## Notes

## 1. Sensor Installation locations

- 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
- 1.2 The reference sensor is preferably located of the geometric center of the chamber.

## 2. Interior dimensions approx of chamber :

 $W = 60 \text{ cm}$ ;  $D = 70 \text{ cm}$ ;  $H = 124 \text{ cm}$ 

3. Air valve or fresh air level : Off

4. Fan level : Open

5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".

6. 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.

7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

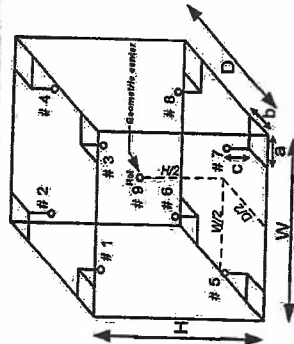
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.

9. UUC\* reading - the average reading of indicating device that forms the integral part of the enclosure.

10. Calibration results without adjustment.

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

Figure: Example of sensor  
Installation Positions

## **CONDUCTIVITY METER**

**Type : SevenCompact<sup>™</sup> Conductivity meter S230**

**Serial No. : B744909989**

Certificate Number CCP-0832-21

## Calibration Certificate SevenCompact™ Conductivity meter S230

### Customer

Company	EASTERN THAI CONSULTING 1992 CO., LTD.
Address	683 Moo 11, Sukthaphiban 8 Rd., Nong Klum, Sriracha Chonburi 20230
Customer ID number	301608441
Customer representative	K.Saiborn Nadin
Order Number	00000000000000000000

### Instrument

Type	SevenCompact™ S230	Instrument Serial Number	874489989
Internal identification	LASE 1312	Firmware version	2.01.03

### Technical specifications

Measuring Range 0.001 µS/cm ... 1000 mS/cm  
Resolution Auto range  
Limit of Error 0.5%

Temperature range MTC -30.0 ... 130.0 °C

Temperature range ATC -5.0 ... 130.0 °C

Resolution 0.1 °C

Limit of Error ± 0.1 °C

### Procedure Statement

METTLER TOLEDO Calibration SOP (Doc. No. 30027577) will be used as referring documentation to adjust and certify the instrument indicated in the "Type" and "Serial number" section. The measurement results of this certification were obtained at ambient conditions.

Certificate Number CCP-0832-21

### Certification Tools

Certified Conductivity Resistors	Manufacturer: METTLER TOLEDO / ME-511 Control No: ANA25 Due date: December 3, 2021
----------------------------------	--

Serial number: 9020  
Certificate number: 52541

Designation	Nominal value	Certified value
Conductivity 10 Ω	10.0000 Ω	10.0041 Ω
Conductivity 150 Ω	150.0000 Ω	150.0718 Ω
Conductivity 1.5 kΩ	1.5000 kΩ	1.4993 kΩ
Conductivity 15 kΩ	15.0000 kΩ	15.0067 kΩ
Conductivity 150 kΩ	150.00 kΩ	149.975 kΩ
Conductivity 1 MΩ	1.0000 MΩ	1.0000 MΩ

### Certified Temperature Resistors

Manufacturer: METTLER TOLEDO / ME-511 Control No: IN66 Due date: December 3, 2021
---

Serial number: A116  
Certificate number: 52542

Designation	Nominal value	Certified value
NTC 30 kΩ, 0 °C	1.00000 kΩ	1.000075 kΩ
NTC 30 kΩ, 25 °C	1.09735 kΩ	1 kΩ
NTC 30 kΩ, 50 °C	1.18987 kΩ	1.19 kΩ
NTC 30 kΩ, 75 °C	1.28587 kΩ	1.29 kΩ
NTC 30 kΩ, 100 °C	1.38508 kΩ	1.39 kΩ

Certificate Number CCP-0832-21

### Certification Measurements

Designation	Certified value	Measured value	Max. Tolerance	Passed / Failed
10 Ω	10.0041 Ω	10.00 Ω	0.5 %	Passed
150 Ω	150.072 Ω	150.1 Ω	0.5 %	Passed
1.5 kΩ	1.4993 kΩ	1.499 kΩ	0.5 %	Passed
15 kΩ	15.0067 kΩ	15.00 kΩ	0.5 %	Passed
150 kΩ	149.978 kΩ	149.9 kΩ	0.5 %	Passed
1 MΩ	1.0000 MΩ	1.000 MΩ	0.5 %	Passed

Designation	Nominal value	Measured value	Max. Tolerance	Passed / Failed
NTC 30 kΩ, 0 °C	0.0 °C	0.0 °C	0.1 °C	Passed
NTC 30 kΩ, 25 °C	25.0 °C	25.0 °C	0.1 °C	Passed
NTC 30 kΩ, 50 °C	50.0 °C	50.0 °C	0.1 °C	Passed
NTC 30 kΩ, 75 °C	75.0 °C	75.0 °C	0.1 °C	Passed
NTC 30 kΩ, 100 °C	100.0 °C	100.0 °C	0.1 °C	Passed

### Summary of Certification

Certification of instrument

Passed

The instrument referred to in this certificate has fulfilled the criteria of the certification. This is indicated by the notation Passed in the column above.

Remarks

Certification of the instrument was performed by

Name	Punchanakit Rujiprapat	Function	Service Engineer
Place	Laboratory room		
Calibration Date:	July 22, 2021	Signature	ELECTRONIC SIGNATURE

Mettler-Toledo (Thailand) Limited

METTLER TOLEDO

### Performance Test

Control No. CCE-0832-21/1

Company: EASTERN THAI CONSULTING 1992 CO., LTD.

Address: 663 Moo 11, Sukhaphiban 8 Rd.,

Nong Kham, Sriracha

Chonburi 20230 Order Number "0332194694"

### Conductivity Electrode

Type: InLab 731-ISM S/N: 9819430128

### Certified standards used

Standard 1: Type: Conductivity Buffer Manufacturer: METTLER TOLEDO Exp. date: Jan-23  
Nominal value: ( 25.00 °C): 1413 uS/cm Lot No.: 1G009A

Standard 2: Type: Conductivity Buffer Manufacturer: METTLER TOLEDO Exp. date: Jan-23  
Nominal value: ( 25.00 °C): 12.88 mS/cm Lot No.: 1G004I

Test equipment: Type: Conductivity Meter Manufacturer: METTLER TOLEDO Cal date: 22-Jul-21  
S/N: B744809989 No. of certificate: CCP-0832-21 Model: S230

### Cell Constant

Nominal	Old (cm <sup>-1</sup> )	New (cm <sup>-1</sup> )
1413 uS/cm	0.537562	0.560524

Measurements (Reference Temperature: 25 °C and Temperature correction is 2.00 % / °C)

Before adjustment			After adjustment		
Buffer Values	Measured	Difference	Buffer Values	Measured	Difference
1410 uS/cm	25.5 °C	1358	1410 uS/cm	25.4 °C	1408
12.88 mS/cm	25.5 °C	12.28	12.88 mS/cm	25.4 °C	12.73

Remarks: The difference result of calibrated electrode should be within +/- 2.5%

Place: Laboratory room Calibration Date: July 22, 2021  
Service Specialist: Punchanakit Rujiprapat Signature: Electronic Signature

**Hot Air Oven**

**Model : UM 400**

**Serial No. : 900982**





ASIA MEDICAL AND AGRICULTURAL LABORATORY  
AND RESEARCH CENTER CO., LTD.

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http://www.amarc.co.th Email: d@amarc.co.th



NSC-TS15-17025  
CALIBRATION 0152

Certificate No. : 21-049716

Sample code : 21-19686-006

Page 1 of 3

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1982 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkham,

Sripracha, Chonburi 20230

Location of calibration : EASTERN THAI CONSULTING 1982 CO., LTD.

(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert Model : UM 400

Serial No. : 900982 ID No. : LABE 17/1

Date of receipt : 09 June 2021 Date of calibration : 09 June 2021

Condition of calibration

1 Environment Ambient temperature : Maximum 32.7 °C ; Minimum 30.1 °C

Relative humidity : Maximum 60.3 % ; Minimum 44.1 %

Line voltage supplied : Maximum 228.5 VAC ; Minimum 221.3 VAC

2 Calibration method : TLAS-G-20 ; Guidelines for calibration and checks of temperature controlled enclosures

3 Reference standard instrument

Instrument	ID.No.	Certificate No.	Due date
Data Acquisition With Sensor (RTD-PT100)	LB-DA-12 (RTD-178 to RTD-186)	21-038924	06 May 2022

4 This certificate is traceable to the International system of unit (SI Unit)

The measurement is traceable to Thailand Institute of Scientific and Technological Research through Asia Medical and Agricultural Laboratory and Research Center Co., Ltd.

5 This result of calibration was found accurate as shown on date and place of calibration only.

6 Condition of calibration item : Normal

Calibrated by

Mr. Sarawoot Thammoo

Approved by

Scientist

Signed for Director

Date of issue : 14 June 2021

The uncertainties are for a confidence probability of approximately 95%

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Co., Ltd. (AMARC)



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NSC-TS15-17025  
CALIBRATION 0152

Certificate No. : 21-049716

Sample code : 21-19686-006

Page 2 of 3

## REPORT OF CALIBRATION

Results of calibration

Resolution : 0.1 °C

1. Reporting of temperature

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Measured temperature at Each Positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# g <sup>ref</sup>
85	85.0	85.0	84.98	84.92	84.81	84.86	84.93	84.88	84.93	84.82	84.92	0.27	2.00

2. Characterization result

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
85	0.16	0.32	0.67

Note

UUC\* = Unit Under Calibration



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NSC-TIS-TIS 17025  
CALIBRATION 0152

Certificate No. : 21-049716

Sample code : 21-19686-006

Page 3 of 3

## REPORT OF CALIBRATION

### Results of calibration

#### Note

#### 1 Sensor installation locations

1.1 All sensors at any corners or walls should be positioned

5 cm (a x b x c) from the wall.

1.2 The reference sensor is preferably located of the geometric

center of the chamber.

#### 2 Interior dimensions approx of chamber ;

W = 40 cm ; D = 28 cm ; H = 39 cm

3 Air valve or fresh air level ; Off

4 Fan level ; Open

5 The quoted uncertainty include " Stability of chamber and loading  
effect in chamber at 20% of uniformity ".

6 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.

7 Temperature stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

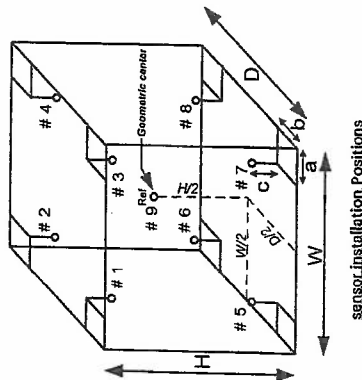
8 Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.

9 UUC\* Reading - the average reading of indicating device that forms the integral part of the enclosure.

10 Calibration results without adjustment.

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a  
normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in  
accordance with UKAS M30

End of report



**INDUCTIBELY COUPLED PLASMA SPECTROMETER**

**Model : Prodigy 7**

**Serial No. : P70177**



บริษัท แอปพลิเคชัน จำกัด  
Application Define Company Limited

84 หมู่ 10 บางเขน กรุงเทพมหานคร 10170  
84 Soi Bangkhen 10 Bangkok 10170

Tel: (66) 2884 7137 E-mail: support@addefine.co.th Website: http://www.addefine.co.th

เบอร์โทรศัพท์มือถือ 010565032401

COBA

## CERTIFICATE OF INSTRUMENT PERFORMANCE

### INSTRUMENT:

INDUCTIVELY COUPLED PLASMA SPECTROMETER

### BRAND:

Telodyne Leeman Labs

### MODEL:

Prodigy 7

### SERIAL NO.

P70177

### CUSTOMER:

Eastern Thai Consulting 1992 Co., Ltd

### CHECKING:

#### SPECTROMETER

Wavelength Accuracy check by use emission line of Hg Lamp

Mercury line 253.652 nm.

Plasma View (Dual View)

CMOS Detector check

Align View by Mn line 257.610 nm.

### STATUS

OK

OK

OK

OK

OK

#### RF GENERATOR

Incident Power 1,200 ±10 Watt Reading = ...1.2... Watt

#### SAMPLE INTRODUCTION

Plasma Torch, Injector, Spray chamber, Nebulizer

Peristaltic pump & Tubing

#### EXHAUSTING & COOLING SYSTEM

Safety Interlock Switch (Door, Argon pressure, Water pressure)

Cooling System, water flowrate & low pressure switch

Flowrate of Air blower

#### COMPUTER & SOFTWARE

Plasma Ignition software & Analytical Software

#### ANALYTICAL TEST

Full Frame Capture & Echellogram check

Calibration Curve & QC Test

DATE: December 21, 2021

[Redacted Signature]

Engineer Sign



## PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท สิลิโคนไทย คอนกรีต 1992 จำกัด

Date: December 21, 2021

Instrument: ICP-OES Model: Prodigy 7

SN: P70177

### 1. Gas Supply/Water Re-circulator/Exhaust Hood. Check:

<b>Gas system:</b> ตรวจระบบแก๊สและอากาศ Argon Pressure: 45 psi Nitrogen Pressure: - psi Oxygen Pressure: - psi Leak inspected (✓) No leak Leak inspected (✓) No leak Leak inspected (✓) No leak	
(✓) Change camera purge gas Dehydrator (1 times /years) Next time replacement <u>Check</u> เปลี่ยนตัวทำความสะอาดแก๊ส 1 ปี	
<b>Water Chiller: RF generator</b> flow rate 44 LPM Temperature 2 & C ตรวจอุณหภูมิ Leak inspected (✓) No leak ตรวจการรั่วซึม	
<b>Water Chiller: Camera</b> (✓) check water level and refill ตรวจระดับน้ำและเติมน้ำ (✓) change water เปลี่ยนน้ำ Temperature -3.9 °C ตรวจอุณหภูมิ	
<b>Exhaust Hood</b> Flow rate 650 CFM (system request > 150)	

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนกรีต 1992 จำกัด	Date: December 21, 2021
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

2. Computer & Software Check

Description	Status
Interface Cable USB (✓) No broken	OK
Software Version	OK
(✓) Operation function check :	OK
(✓) Open /Save /Edit method	OK
(✓) Instrument Control	OK
(✓) Sequence	OK
(✓) Full Frame Capture (Echelle Mode)	OK
(✓) Auto alignment /Hg alignment	OK
(✓) Calibration Curve	OK
(✓) Re-Calculation	OK
(✓) Print Report	OK

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนกรีต 1992 จำกัด	Date: December 21, 2021
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

3. Instrument Control

Description	Status
Optical view position: ตรวจสอบตำแหน่งฟังก์ชันที่ติดตั้งในเครื่อง	
Hg Lamp Deltas	
X -1 Y -6	OK
XUV 0	OK
Axial peak positions X332S Y120S	OK
Radial peak positions X111 Y113S	OK
Hg lamp peak positions X22AS Y21S	OK
Plasma Control ตรวจสอบการทำงานของระบบและค่าพลาสมา	
(✓) Auto Start	OK
(✓) Extinguish	OK
(✓) RF power setting	OK
(✓) Igniter	OK
(✓) Air Knife	OK
Torch Gas ตรวจสอบการทำงานของระบบแก๊สที่ใช้ในพลาสมา	
(✓) Coolant /Plasma Flow control	OK
(✓) Aux Flow	OK
(✓) Nebulizer Flow	OK
(✓) Optimize sample introduction function	OK
(✓) Peristaltic pump control	OK
(✓) Auto sampler Control	OK
(✓) Camera Support Module	OK
(✓) Diagnostic	OK



PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีซีแอล จำกัด 1992 จำกัด	Date: December 21, 2021
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

4. Cleaning & Replacement

Description	Status
✓ O-Ring Torch replacement	OK
✓ Pump Tubing replacement	OK
✓ Glassware cleaning (Torch, Nebulizer, Spray chamber)	OK
✓ Lube the roll peristaltic pump	OK
✓ Optical windows cleaning	OK
✓ Camera Water Re-circulator (water change/ refilled)	OK
✓ RF Generator Water Re-circulator (water change/ refilled)	OK
✓ Cleaning Electronics Board with spray cleaner	OK
✓ Cleaning dust inside Unit	OK
✓ Cleaning dust filter	OK

5. Safety Interlocks

Description	Status
✓ Door switch	OK
✓ RF Water Re-circulator	OK
✓ Camera Water Re-circulator	OK
✓ Camera purge gas	OK
✓ Argon pressure	OK
✓ Nitrogen pressure	OK

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีซีแอล จำกัด 1992 จำกัด	Date: December 21, 2021
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

6. Hardware Check with SALSADXE Diagnostics

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.97	OK
+12 VDC (11 - 14.5 VDC)	12.87	OK
+3.3 VDC	3.236	OK
+5.0 VDC	4.945	OK
+13.5 VDC	13.465	OK

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.514	OK
ICP Ref 5.0Vdc = 1kW	5.170	OK
ICP Current 0.00 Vdc = 0kW	0	OK
ICP Ref 0.00Vdc = 0kW	0	OK
RF Water (Hz) OFF	0	OK
RF Water (Hz) ON	25	OK
Air Knife Pres. (0.00V) OFF	0	OK
Air Knife Pres. (3.0 - 7.0 V) ON	3.878	OK
Neb 25 @ setting of 25 PSI	25	OK
Cool 18 @ setting of 18 LPM	18	OK
Aux 0.6 @ setting of .6 LPM	0.6	OK
Pump Current (0.000 A) OFF	0	OK
Pump Voltage (0.000 V) OFF	0	OK
Pump Current (0.8 to 4.0A) ON	1.08	OK
Pump Voltage (8 to 13 V) ON	12.52	OK

Set Points	Value	Status
Air In Set Point 32°C	32	OK
Can Tec Temperature -32°C	-32	OK
Op Purge Low 0.77 LPM	0.77	OK
Op Purge High 15.50 LPM	15.5	OK
Can Wtr T 28°C	28.02	OK



PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีอีทีไทย เทคโนโลยี จำกัด	Date: December 21, 2021
Instrument: LCP-OES	Model: Prodigy 7
	S/N: P70177

7. Ma Check for performance Test

	Condition for performance Test	Condition Test	Status
Standard	1 ppm, 5 ppm, 10 ppm	10 ppm	OK
Power plasma	1.20 kw	1.2	OK
Plasma gas	16.0 LPM	1.6	OK
Auxiliary Gas	0.8 LPM	0.8	OK
Nebulizer	1.2 LPM	1.2	OK
Pump Speed	25 RPM	25	OK
Integration time	15 s Axial, 5 s Radial	10 s, 5 s	OK
Nebulizer Type	Seaspray, Conical, Meinhard	Conical	OK
Intensity first performance	1 ppm ≥ 4,000,000 5 ppm ≥ 15,000,000 10 ppm ≥ 50,000,000	69,343,926	OK

Engineer Sign	TELEDYNE LEEMAN LABS Everywhere you look
---------------	---

**LIQUID IN GLASS THERMOMETER**

**Model : Total Immersion**

**Serial No. : 43560**



QUALITY CALIBRATION CO.,LTD.  
235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584  
www.qcalibration.com



CERTIFICATE No : 21T10802  
REFERENCE No : 62916-1

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : LIQUID IN GLASS THERMOMETER  
MANUFACTURER : PRECISION  
MODEL : 0 °C TO 100 °C  
SERIAL No : 43560  
ID No : LABE 16/1  
RESOLUTION : 0.1 °C  
TYPE : TOTAL IMMERSION  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : EASTERN THAI CONSULTING 1992 COMPANY LIMITED  
999 MOO.11 NONGKHAM, SRIRACHA, CHONBURI  
20230

CALIBRATED BY : CHARUKIT L.  
CALIBRATION DATE : 27-Oct-21  
APPROVED BY :  
ISSUED DATE : 27-Oct-21  
RECEIVED DATE : 21-Oct-21

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.

F-G010 REV 02



QUALITY CALIBRATION CO.,LTD.  
235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160  
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584  
www.qcalibration.com

CERTIFICATE No : 21T10802

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : LIQUID IN GLASS THERMOMETER  
MANUFACTURER : PRECISION  
MODEL : 0 °C TO 100 °C  
ID No : LABE 16/1  
RESOLUTION : 0.1 °C  
RECEIVED DATE : 21-Oct-21  
AMBIENT TEMPERATURE : 23 °C ± 3 °C  
SERIAL NUMBER : 43560  
TYPE : TOTAL IMMERSION  
CALIBRATION DATE : 27-Oct-21  
RELATIVE HUMIDITY : 50 %RH ± 20 %RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON ASTM E77:1992 BY COMPARISON WITH STANDARD PLATINUM RESISTANCE THERMOMETER (SPRT) INTO LIQUID BATH TEMPERATURE CONTROLLER. THE TEMPERATURE SCALE USED WAS BASED ON ITS-90.

### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD THERMOMETER	1502	77964	21T3033	08-Mar-22
2) SPRT PROBE	5614	636626	21T3033	08-Mar-22
3) PRECISION BATH	7320	A21105	20T12163	16-Dec-21
4) PRECISION BATH	CTR-40	A68155	20T12164	22-Dec-21

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND).

### RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	EMERGENT STEM TEMPERATURE (°C)	UNCERTAINTY OF MEASUREMENT (±°C)
0.004	0.0	60	0.004	N/A	0.090
25.009	25.0	160	0.009	N/A	0.090
50.012	50.0	270	0.012	N/A	0.090

UUC\* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



F-G010 REV 02

**pH Meter**

**Model : SevenCompact<sup>TM</sup> pH/Ion Meter S220**

**Serial No. : B448305208**

Certificate Number CCP-0443-21

## Calibration Certificate SevenCompact™ pH/Ion Meter S220

### Customer

Company EASTERN THAI CONSULTING 1992 CO., LTD.  
Address 893 Moo 11, Sukhaphiban 8 Rd.,  
Nong Khai, Sriracha  
Choburi 20230  
Customer ID number 301608441  
Customer representative K.Sasiporn Nakhin  
Order Number 00332113355

### Instrument

Type SevenCompact™ S220 Instrument Serial Number B448305208  
Internal Identification LABE 11/4 Firmware version 1.20.06

### Technical specifications

Measuring Range -1999.9 ... 1999.9 mV -2.000 ... 20.000 pH  
Resolution 0.1 mV 0.001 pH  
Limit of Error ± 0.2 mV ± 0.002 pH

Temperature range MTC -30.0 ... 130.0 °C  
Temperature range ATC -5.0 ... 130.0 °C  
Resolution 0.1 °C  
Limit of Error ± 0.1 °C

### Procedure Statement

METTLER TOLEDO Certification SOP (Doc. No. 30027577) will be used as referring documentation to adjust and certify the instrument indicated in the "Type" and "Serial number" section. The measurement results of this certification were obtained at ambient conditions.

### Certification Tools

Certified digital voltmeter  
Manufacturer GOSSEN METRAWATT  
Control No. ANA77  
Serial number ZD1740  
Certificate number EIU202338  
Due date July 14, 2021

### Certified Temperature Resistors

Manufacturer METTLER TOLEDO / ME-5130241  
Control No. IN66  
Serial number A116  
Certificate number 52542  
Due date December 3, 2021

Certificate Number CCP-0443-21

## Certification Measurements

pH/mV Sensor Input				
Designation	Certified value	Measured value	Max. Tolerance	Passed / Failed
-1800 mV	-1800.0 mV	-1898.9 mV	0.2 mV	Passed
-1000 mV	-1000.0 mV	-999.9 mV	0.2 mV	Passed
-500 mV	-500.0 mV	-500.0 mV	0.2 mV	Passed
-180 mV	-180.0 mV	-180.0 mV	0.2 mV	Passed
0 mV	0.0 mV	0.0 mV	0.2 mV	Passed
180 mV	180.0 mV	180.0 mV	0.2 mV	Passed
500 mV	500.0 mV	500.0 mV	0.2 mV	Passed
1000 mV	1000.0 mV	999.9 mV	0.2 mV	Passed
1800 mV	1800.0 mV	1898.9 mV	0.2 mV	Passed

pH/mV Sensor Input at high Impedance				
Designation	Measured low Imp.	Measured high Imp.	Max. Tolerance	Passed / Failed
1800 mV	1899.9 mV	1899.8 mV	0.6 mV	Passed

Temperature Sensor Input				
Designation	Nominal value	Measured value	Max. Tolerance	Passed / Failed
NTC 30 kΩ, 0 °C	0.0 °C	0.0 °C	0.1 °C	Passed
NTC 30 kΩ, 25 °C	25.0 °C	25.0 °C	0.1 °C	Passed
NTC 30 kΩ, 50 °C	50.0 °C	49.9 °C	0.1 °C	Passed
NTC 30 kΩ, 75 °C	75.0 °C	75.0 °C	0.1 °C	Passed
NTC 30 kΩ, 100 °C	100.0 °C	100.0 °C	0.1 °C	Passed
P1000, 0 °C	0.0 °C	0.0 °C	0.1 °C	Passed
P1000, 25 °C	25.0 °C	25.0 °C	0.1 °C	Passed
P1000, 50 °C	50.0 °C	50.0 °C	0.1 °C	Passed
P1000, 75 °C	75.0 °C	75.0 °C	0.1 °C	Passed
P1000, 100 °C	100.0 °C	100.0 °C	0.1 °C	Passed

## Summary of Certification

Certification of instrument

Passed

The instrument referred to in this certificate has fulfilled the criteria of the certification. This is indicated by the notation Passed in the column above.

Remarks

Certification of the instrument was performed by

Name  
Punchanant Rujjipreapat

Function

Service Engineer

Place

Laboratory

Calibration Date: April 21, 2021

Signature

Mettler-Toledo (Thailand) Limited

METTLER TOLEDO

## Performance Test

Control No. CCE-0443-21/1

Company:

EASTERN THAI CONSULTING 1992 CO., LTD.

Address:

683 Moo 11, Sukhaphiban 8 Rd., Nong Kham, Sriracha

Chonburi 20230

Order Number: "03321-2835"

## pH Electrode

Type:

InLab Expert Pro-ISM

SN:

0373618

## Certified standards used

Standard 1: pH Buffer				
Type:	Manufacturer:	Mettler Toledo	Exp. date:	Lot No.:
Nominal value: pH (25.00 °C):	4.01		Aug-22	1F217A

Standard 2: pH Buffer				
Type:	Manufacturer:	Mettler Toledo	Exp. date:	Lot No.:
Nominal value: pH (25.00 °C):	7.00		Jul-22	1F180D

Standard 3: pH Buffer				
Type:	Manufacturer:	Mettler Toledo	Exp. date:	Lot No.:
Nominal value: pH (25.00 °C):	9.21		Nov-21	1E312C

Test equipment:				
Type:	Manufacturer:	Mettler Toledo	Cal date:	Model:
pH Meter	B448305208		21-Apr-21	SZ20
No. of certificate:	CCP-0443-21			

## Adjustment

Sel Calibration Buffer				
B2: (25 °C) 7.00, 4.01, 9.21				
Select Calibration Mode				
3-Point calibration				
2-Point calibration				
2-Point calibration				
3-Point calibration				
Cal 1				
Cal 2				
Offset (mV)				
Slope % (or mV/pH)				
Cal 3				
Slope % (or mV/pH)				

## Measurements

Before adjustment				
Buffer Values	Measured	Difference	Buffer Values	Measured
pH	°C	pH	pH	°C
4.01	25.0	ATC	4.02	ATC
7.00	25.8	ATC	7.01	ATC
9.20	25.7	ATC	9.21	ATC

Remarks: The difference result of calibrated electrode should be within  $\pm 0.05$  pH.

Place:

Laboratory

Calibration Date:

April 21, 2021

Service Specialist:

Signature:

Electronic Signature



**STANDARD WEIGHT 50 g**



(Head Office) 361/1-4 Soi Ladprao 122, (Mahadthai 1), Ladprao Road, Phlabphla, Wangthonglang,  
Bangkok, Thailand 10310 Tel:(66) 2-934-2381-3 Fax:(66) 2-934-0661

http://www.amarc.co.th  
Email: ci@amarc.co.th

NSC-TISI-TS 17025  
CALIBRATION 0152

Certificate No. : 19-045373  
Sample code : 19-15155-001

Page 1 of 3

## CERTIFICATE OF CALIBRATION

**Customer** : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapiban 8 Rd., Nongkham,  
Sriracha, Chonburi 20230

**Location of calibration** : Asia Medical and Agricultural Laboratory and Research Center Co., Ltd.  
(Calibration Laboratory)

**Equipment** : STANDARD WEIGHT 50 g

**Manufacturer** : METTLER TOLEDO

**Class** : F1

**Serial No.** : N/A

**ID No.** : LABE 10/1

**Date of Receipt** : 30 May 2019

**Date of Calibration** : 03 June 2019

**Calibrated by** : Mr. Somwang Sangdee  
Scientist

**Date of Issue** : 06 June 2019

Signed for Director

The calibration result is applied only to the above calibrated item and was found accurate as shown on data.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Co., Ltd. (AMARC)



(Head Office) 361/1-4 Soi Ladprao 122, (Mahadthai 1), Ladprao Road, Phlabphla, Wangthonglang,  
Bangkok, Thailand 10310 Tel:(66) 2-934-2381-3 Fax:(66) 2-934-0661

http://www.amarc.co.th  
Email: ci@amarc.co.th

NSC-TISI-TS 17025  
CALIBRATION 0152

Certificate No. : 19-045373  
Sample code : 19-15155-001

Page 2 of 3

## REPORT OF CALIBRATION

**Equipment** : STANDARD WEIGHT 50 g  
**Manufacturer** : METTLER TOLEDO  
**Class** : F1  
**Serial No.** : N/A  
**ID No.** : LABE 10/1

### Result of Calibration :

Conventional value of the result of weighing in air. For a weight taken at a reference temperature ( $t_{ref}$ ) of 20 °C, the conventional mass is the mass of a reference weight of a density ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_a$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation (mg)	Conventional Mass	Expanded Uncertainty (mg)	Maximum Permissible Error, OIML Class F1 $\pm$ (mg)	ID No.
50 g	-0.317	49.999683 g	0.10	0.30	LABE 10/1

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M30



Certificate No. : 19-045373

Sample code : 19-15155-001

Page 3 of 3

## REPORT OF CALIBRATION

### Condition of Calibration

1. Ambient Conditions : Temperature  $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$ , Relative humidity  $50\% \pm 10\%$  and air density  $1.19 \text{ kg/m}^3$
2. Calibration Method : Direct comparison weighing according to OIML R111-1 : 2004(E)
3. Description of Calibrated Item :

Type and Nominal Value : Standard Weight 50 g

Shape : Cylindrical weight with knob

Case : Wood Box

### 4. Reference Standard Instrument

Instrument	Class	ID. No.	Certificate No.	Due date
1) STANDARD WEIGHT 1 mg to 1 kg	E2	LB-WE-57	B634921863	11 August 2019

2) This certification is traceable to the International System of Unit maintained at : -

- Through the reference standard laboratory of Mettler-Toledo GmbH, 8606 Greifensee, Switzerland ( Instrument number 1).

6. Condition of Calibration item : Normal

End of Report

**STANDARD WEIGHT 100 g**



Certificate No. : 19-045374  
Sample code : 19-15155-002

Page 1 of 3

## CERTIFICATE OF CALIBRATION

**Customer** : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapiban 8 Rd., Nongkham,  
Sriracha, Chonburi 20230

**Location of calibration** : Asia Medical and Agricultural Laboratory and Research Center Co., Ltd.  
(Calibration Laboratory)

**Equipment** : STANDARD WEIGHT 100 g

**Manufacturer** : N/A

**Class** : N/A

**Serial No.** : N/A

**ID No.** : LABE 10/2

**Date of Receipt** : 30 May 2019

**Date of Calibration** : 03 June 2019

**Calibrated by** Mr. Somwang Sangdee  
Scientist

**Date of Issue** : 06 June 2019

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Co., Ltd. (AMARC)

Certificate No. : 19-045374  
Sample code : 19-15155-002

Page 2 of 3

## REPORT OF CALIBRATION

**Equipment** : STANDARD WEIGHT 100 g

**Manufacturer** : N/A

**Class** : N/A

**Serial No.** : N/A

**ID No.** : LABE 10/2

### Result of Calibration :

Conventional value of the result of weighing in air. For a weight taken at a reference temperature ( $t_{ref}$ ) of 20°C, the conventional mass is the mass of a reference weight of a density ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_a$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation (mg)	Conventional Mass	Expanded Uncertainty (mg)	ID No.
100 g	-0.24	99.99976 g	0.16	LABE 10/2

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3000.

Certificate No. : 19-045374

Sample code : 19-15155-002

Page 3 of 3

## REPORT OF CALIBRATION

### Condition of Calibration

1. Ambient Conditions : Temperature  $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$ , Relative humidity  $50\% \pm 10\%$  and air density  $1.19 \text{ kg/m}^3$
2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

### 3. Description of Calibrated Item :

Type and Nominal Value : Standard Weight 100 g

Shape : Cylindrical weight with knob

Case : Wood Box

### 4. Reference standard instrument

Instrument	Class	ID. No.	Certificate No.	Due date
1) STANDARD WEIGHT 1 mg to 1 kg	E2	LB-WE-57	B634921863	11 August 2019

### 5. This certification is traceable to the International System of Unit maintained at : -

- Through the reference standard laboratory of Mettler-Toledo GmbH, 8606 Greifensee, Switzerland ( Instrument number 1).

### 6. Condition of Calibration item : Norm

End of Report



**STANDARD WEIGHT 50 g**



ASIA MEDICAL AND AGRICULTURAL LABORATORY  
AND RESEARCH CENTER CO., LTD.

(Head Office) 361/1-4 Soi Ladprao 122, (Mahadithai 1), Ladprao Road, Phlabphla, Wangthonglang,  
Bangkok, Thailand 10310 Tel:(66) 2-934-2381-3 Fax:(66) 2-934-0661

http://www.amarc.co.th  
Email: c@amarc.co.th

MSC-ISS-15 17025  
CALIBRATION 0152

Supersede to Calibration Certificate No. 19-053921

Certificate No. : 19-053921/1

Sample code : 19-17930-002

Page 1 of 3

## CERTIFICATE OF CALIBRATION

**Customer** : EASTERN THAI CONSULTING 1992 CO., LTD.  
693 Moo 11, Sukhapiban 8 Rd., Nongkham,  
Sriracha, Chonburi 20230

**Location of calibration** : Asia Medical and Agricultural Laboratory and Research Center Co., Ltd.  
(Calibration Laboratory)

**Equipment** : STANDARD WEIGHT 50 g

**Manufacturer** : N/A

**Class** : N/A

**Serial No.** : N/A

**ID No.** : LABE 10/4

**Date of Receipt** : 25 June 2019

**Date of Calibration** : 06 July 2019

**Calibrated by** : Mr. Somwang Sangdee  
Scientist

**Date of Issue** : 16 September 2019

Signed for Director

The calibration result is applied only to the above calibrated item and was found accurate as shown below.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Co., Ltd. (AMARC)



ASIA MEDICAL AND AGRICULTURAL LABORATORY  
AND RESEARCH CENTER CO., LTD.

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MSC-ISS-15 17025  
CALIBRATION 0152

Supersede to Calibration Certificate No. 19-053921

Certificate No. : 19-053921/1

Sample code : 19-17930-002

Page 2 of 3

## REPORT OF CALIBRATION

**Equipment** : STANDARD WEIGHT 50 g

**Manufacturer** : N/A

**Class** : N/A

**Serial No.** : N/A

**ID No.** : LABE 10/4

**Result of Calibration** : Without adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature ( $t_{ref}$ ) of 20°C, the conventional mass is the mass of a reference weight of a density ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_a$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation (mg)	Conventional Mass	Expanded Uncertainty (mg)	ID No.
50 g	-0.060	#REF!	0.10	LABE 10/4

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M300



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NSC718-TIS 17025  
CALIBRATION 0152

Supersede to Calibration Certificate No. 19-053921

Certificate No. : 19-053921/1

Sample code : 19-17930-002

Page 3 of 3

## REPORT OF CALIBRATION

### Condition of Calibration

1. Ambient Conditions : Temperature  $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$ , Relative humidity  $50\% \pm 10\%$  and air density  $1.19\text{ kg/m}^3$
2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)
3. Description of Calibrated Item :

Type and Nominal Value : Standard Weight 50 g

Shape : Cylindrical weight with knob

Case : Wood Box

### 4. Reference standard instrument

Instrument	Class	ID. No.	Certificate No.	Due date
1) STANDARD WEIGHT 1 mg to 1 kg	E2	LB-WE-57	B634921863	11 August 2019

5. This certification is traceable to the International System of Unit maintained at : -

- Through the reference standard laboratory of Mettler-Toledo GmbH, 8606 Greifensee, Switzerland ( Instrument number 1).

6. Condition of Calibration Item : Normal

End of Report

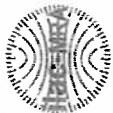
**THERMO-HYGROMETER**

**Model : 608-H1**

**Serial No. : 45106737**



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NSC-TIS-17025  
CALIBRATION 0152

Certificate No. : 21-062722

Sample code : 21-24788-002

Page 1 of 2

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD

683 Moo 11, Sukhapiban 8 Rd, Nongkham,

Siracha, Chonburi 20230

Location of calibration : Asia Medical and Agricultural Laboratory and Research Center Co., Ltd.

(Calibration laboratory)

Equipment : Digital thermo-hygrometer

Manufacturer : Testo

Model : 608-H1

Serial No. : 45106737

ID No. : LABE 09/7

Date of receipt : 23 July 2021

Date of calibration : 29 July 2021

Condition of calibration

1 Environment Ambient temperature : 23.0 °C ± 3.0 °C

Relative humidity : 55.0 % ± 15.0 %

2 Calibration method

2.1 In-house method : WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.

2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in controlled chamber in a chamber at the controlled temperature/ relative humidity.

3 Reference standard instrument

Instrument	Model	Code No.	Certificate No.	Due date
3.1 Chilled Mirror	Optidew Vision	LB-DP-02 & LB-DP-02 (DP)	TH-0018-21	10 March 2022
3.2 Digital Thermometer	Optidew Vision	LB-DP-02 & LB-DP-02 (Temp.)	21-032217	06 April 2022
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	20-085967	17 September 2021

4 This certificate is traceable to the international system of unit (SI Unit)

4.1 Instrument No.3.1 through : National Institute of Metrology (Thailand)

4.2 Instrument No.3.2 and 3.3 through : Asia Medical and Agricultural Laboratory and Research Center Co., Ltd.

5 This result of calibration was found accurate as shown on date and place of calibration only.

6 Condition of calibration item : Normal

Calibrated by

Miss Pornnuda Lohabai

Approved by

Scientist

Signed for Director

Date of issue : 11 August 2021

The calibration result is applied only to the above calibrated item and was found accurate as shown on date

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Co., Ltd. (AMARC)



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NSC-TIS-17025  
CALIBRATION 0152

Certificate No. : 21-062722

Sample code : 21-24788-002

Page 2 of 2

## REPORT OF CALIBRATION

Results of calibration

- Temperature measurement

Resolution of unit under calibration : 0.1 °C

Range : 0 °C to 50 °C

Calibration point °C	Average of standard reading		Unit under calibration		Expanded uncertainty °C
	Controlled humidity %RH	Temperature °C	Average reading °C	Correction value °C	
20	50	20.02	20.1	- 0.08	± 0.40
25	50	25.02	25.0	+ 0.02	± 0.40
30	50	30.00	28.7	+ 0.30	± 0.40

- Humidity measurement

Resolution of unit under calibration : 0.1 %RH

Range : 10 %RH to 95 %RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature °C	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.00	45.13	52.4	- 7.27	± 1.3
60	25.00	60.03	67.5	- 7.47	± 1.5
75	25.00	75.20	82.5	- 7.30	± 1.7

Note

- Calibration results without adjustment

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2.00, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS MS

End of report

**Area Heat Stress Monitor**

**Model : QUESTemp 34**

**Serial No. : TEU080013**





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## CALIBRATION CERTIFICATE

Certificate No. : AD2206-362-0001  
Date Issued : 06-Jul-22

**Customer** : Eastern Thai Consulting 1992 Co., Ltd.  
683 Moo 11 Sukhapiam 8 Rd., Nongkham, Sriracha, Chonburi 20230

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : TSI

**Model** : Questemp 34

**Serial No.** : TEU 080013

**ID No./Tag No.** : No.12

**Date Received** : 30-Jun-22

**Date Calibrated** : 04-Jul-22

**Calibrated by** : Mr. Apiwat Peanrungrat

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

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Approved by

Page 1 of 2



Certificate No. : AD2206-362-0001

**Environment :** Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD	Reading ( $^\circ\text{C}$ )	Before Adjusted	After Adjusted	UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $\pm^\circ\text{C}$ )
37.97	WET	37.9	-	-0.07	0.35
37.97	DRY	37.8	-	-0.17	0.35
37.97	GLOBE	38.1	-	0.13	0.35
44.97	WET	44.9	-	-0.07	0.35
44.97	DRY	44.8	-	-0.17	0.35
44.97	GLOBE	45.2	-	0.23	0.35

STD = Standard

UUC = Unit Under Calibration

**Description of UUC :** Range 0 to  $100 ^\circ\text{C}$   
Resolution 0.1  $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

**Measurement Standards Used & Traceability :**

The International System of Units (SI) through

MIT Certificate No. AD2111-077-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 11-Nov-22

End of Certificate

**Area Heat Stress Monitor**

**Model : QUESTemp 32**

**Serial No. : TPQ030023**



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## CALIBRATION CERTIFICATE

Certificate No. : AD2202-233-0002

Date Issued : 23-Feb-22

**Customer** : Eastern Thai Consulting 1992 Co., Ltd.  
683 Moo 11 Sukhapibam 8 Rd., Nongkham, Sriracha, Chonburi 20230

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : Quest Technology

**Model** : QUESTemp 32

**Serial No.** : TPQ030023

**ID No./Tag No.** : 8

**Date Received** : 18-Feb-22

**Date Calibrated** : 21-Feb-22

**Calibrated by** : Ms. Yaowanuch Jirakiattikul

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

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Approved by :



Page 1 of 2

Certificate No. : AD2202-233-0002

Environment : Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD	Reading ( $^\circ\text{C}$ )	UUC Before Adjusted	UUC Reading ( $^\circ\text{C}$ )	UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $^\circ\text{C}$ )
38.00	WET 38.1	-	-	0.10	0.35
38.00	DRY 38.1	-	-	0.10	0.35
38.00	GLOBE 38.1	-	-	0.10	0.35
44.98	WET 44.9	-	-	-0.08	0.35
44.98	DRY 44.9	-	-	-0.08	0.35
44.98	GLOBE 44.9	-	-	-0.08	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0 to 100  $^\circ\text{C}$   
Resolution 0.1  $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2111-077-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 11-Nov-22

End of Certificate

Page 2 of 2

**Area Heat Stress Monitor**

**Model : QUESTemp 32**

**Serial No. : TPL090016**



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## CALIBRATION CERTIFICATE

Certificate No. : AD2109-161-0001

Date Issued : 21-Sep-21

**Customer** : Eastern Thai Consulting 1992 Co., Ltd.  
683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : QUEST TECHNOLOGIES

**Model** : QUESTemp 32

**Serial No.** : TPL090016

**ID No./Tag No.** : NO.6

**Date Received** : 14-Sep-21

**Date Calibrated** : 18-Sep-21

**Calibrated by** : Ms. Yaowanuch Jirakiattikul

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

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Certificate No. : AD2109-161-0001

Environment : Ambient Temperature :  $(25 \pm 2)^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD	Reading ( $^\circ\text{C}$ )	UUC Reading ( $^\circ\text{C}$ )	Before Adjusted	After Adjusted	UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $^\circ\text{C}$ )
38.00	WET	38.1	-	-	0.10	0.35
38.00	DRY	37.9	-	-	-0.10	0.35
38.00	GLOBE	37.9	-	-	-0.10	0.35
45.00	WET	45.0	-	-	0.00	0.35
45.00	DRY	44.8	-	-	-0.20	0.35
45.00	GLOBE	45.1	-	-	0.10	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC :  
Range 0 to 100  $^\circ\text{C}$   
Resolution 0.1  $^\circ\text{C}$

### Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2011-059-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 13-Nov-21

End of Certificate

Page 2 of 2

**Area Heat Stress Monitor**

**Model : QUESTemp 32**

**Serial No. : TPI050070**





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## CALIBRATION CERTIFICATE

Certificate No. : AD2202-233-0001

Date Issued : 23-Feb-22

"Supplement to Calibration Certificate No. AD2202-233-0001, date issued 23-Feb-22, page 1 of 2"

**Customer** : Eastern Thai Consulting 1992 Co., Ltd.

683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : Quest Technology

**Model** : QUESTemp 32

**Serial No.** : TP1050070

**ID No./Tag No.** : 3

**Date Received** : 18-Feb-22

**Date Calibrated** : 21-Feb-22

**Calibrated by** : Ms. Yaowanuch Jirakiattikul

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

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Page 1 of 2

Certificate No. : AD2202-233-0001

**Environment** : Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\%RH$

STD Reading ( $^\circ\text{C}$ )	UUC Reading ( $^\circ\text{C}$ )	Before Adjusted	After Adjusted	UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $\pm ^\circ\text{C}$ )
38.00	WET	38.1	-	0.10	0.35
38.00	DRY	38.1	-	0.10	0.35
38.00	GLOBE	37.9	-	-0.10	0.35
44.98	WET	44.8	-	-0.18	0.35
44.98	DRY	44.8	-	-0.18	0.35
44.98	GLOBE	44.9	-	-0.08	0.35

STD = Standard

UUC = Unit Under Calibration

**Description of UUC :**

Range	0 to 100 $^\circ\text{C}$
Resolution	0.1 $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

**Measurement Standards Used & Traceability :**

The International System of Units (SI) through

MIT Certificate No. AD2111-077-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 11-Nov-22

End of Certificate

Page 2 of 2

**Area Heat Stress Monitor**

**Model : QUESTemp 32**

**Serial No. : TPQ030024**



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## CALIBRATION CERTIFICATE

Certificate No. : AD2202-233-0003

Date Issued : 23-Feb-22

**Customer** : Eastern Thai Consulting 1992 Co., Ltd.  
683 Moo 11 Sukhapiarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : Quest Technology

**Model** : QUESTemp 32

**Serial No.** : TPQ030024

**ID No./Tag No.** : 9

**Date Received** : 18-Feb-22

**Date Calibrated** : 21-Feb-22

**Calibrated by** : Ms. Yaowanuch Jirakiatikul

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

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Certificate No. : AD2202-233-0003

Environment : Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD	Reading ( $^\circ\text{C}$ )	UUC Reading ( $^\circ\text{C}$ )		UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $\pm ^\circ\text{C}$ )
		Before Adjusted	After Adjusted		
38.00	WET	37.9	-	-0.10	0.35
38.00	DRY	38.2	-	0.20	0.35
38.00	GLOBE	38.0	-	0.00	0.35
44.98	WET	44.8	-	-0.18	0.35
44.98	DRY	45.1	-	0.12	0.35
44.98	GLOBE	44.9	-	-0.08	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0 to 100  $^\circ\text{C}$   
Resolution 0.1  $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2111-077-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 11-Nov-22

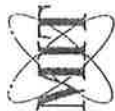
End of Certificate

Page 2 of 2

**Area Heat Stress Monitor**

**Model : QUESTemp 34**

**Serial No. : TPL090017**



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## CALIBRATION CERTIFICATE

Certificate No. : AD2202-037-0001

Date Issued : 08-Feb-22

**Customer** : Eastern Thai Consulting 1992 Co., Ltd.  
683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : 3M

**Model** : QUESTemp34

**Serial No.** : TPL090017

**ID No./Tag No.** : No.7

**Date Received** : 02-Feb-22

**Date Calibrated** : 07-Feb-22

**Calibrated by** : Ms. Yaowanuch Jirakiatikul

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

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Approved by :

Page 1 of 2



Certificate No. : AD2202-037-0001

Environment : Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\% \text{RH}$

STD	UUC Reading ( $^\circ\text{C}$ )		UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $\pm ^\circ\text{C}$ )
	Reading ( $^\circ\text{C}$ )	Before Adjusted	After Adjusted	
37.97	37.97	WET 37.8	-	0.35
		DRY 37.7	-	0.35
		GLOBE 38.0	0.03	0.35
44.98	44.98	WET 44.7	-0.28	0.35
		DRY 44.6	-0.38	0.35
		GLOBE 44.8	-0.18	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC :

Range 0 to 100  $^\circ\text{C}$   
Resolution 0.1  $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2111-077-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 11-Nov-22

End of Certificate

Page 2 of 2

**Area Heat Stress Monitor**

**Model : QUESTemp32**

**Serial No. : TPL060039**





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ISO-TIS-TIS-TIS  
CALIBRATION 882



## CALIBRATION CERTIFICATE

Certificate No. : AD2206-013-0001

Date Issued : 07-Jun-22

**Customer** : Eastern Thai Consulting 1992 Co., Ltd.  
683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : Quest Technologies

**Model** : QUESTemp 32

**Serial No.** : TPL060039

**ID No./Tag No.** : 4

**Date Received** : 01-Jun-22

**Date Calibrated** : 05-Jun-22

**Calibrated by** : Mr. Apiwat Peanrungrat

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

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Approved by



Page 1 of 2

Certificate No. : AD2206-013-0001

**Environment** : Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD	UUC Reading ( $^\circ\text{C}$ )		UUC Error ( $^\circ\text{C}$ )		Measurement Uncertainty ( $\pm^\circ\text{C}$ )
	Reading ( $^\circ\text{C}$ )	Before Adjusted	After Adjusted	( $^\circ\text{C}$ )	
37.99	WET	38.0	-	0.01	0.35
		38.0	-	0.01	0.35
		37.9	-	-0.09	0.35
44.98	WET	45.0	-	0.02	0.35
		45.0	-	0.02	0.35
		45.0	-	0.02	0.35

STD = Standard

UUC = Unit Under Calibration

**Description of UUC :**

Range	0 to 100 $^\circ\text{C}$
Resolution	0.1 $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

**Measurement Standards Used & Traceability :**

The International System of Units (SI) through

MIT Certificate No. AD2111-077-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 11-Nov-22

End of Certificate

**Area Heat Stress Monitor**

**Model : QUESTemp 32**

**Serial No. : TPL060040**



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangnai Bangkok 10160  
Tel. 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



ISO-TR-17025  
CALIBRATION 002



## CALIBRATION CERTIFICATE

Certificate No. : AD2206-013-0002

Date Issued : 07-Jun-22

### Customer

: Eastern Thai Consulting 1992 Co., Ltd.  
683 Moo 11 Sukhapiarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

### Equipment

: Area Heat Stress Monitor

### Manufacturer

: Quest Technologies

### Model

: QUESTemp 32

### Serial No.

: TPL060040

### ID No./Tag No.

: 5

### Date Received

: 01-Jun-22

### Date Calibrated

: 05-Jun-22

### Calibrated by

: Mr. Apiwat Peanrungrat

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by



Page 1 of 2

Certificate No. :

AD2206-013-0002

Environment :

Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD	UUC Reading ( $^\circ\text{C}$ )		UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $\pm^\circ\text{C}$ )
	Reading ( $^\circ\text{C}$ )	Before Adjusted	After Adjusted	
37.99	37.99	WET 38.0	-	0.01
		DRY 38.0	-	0.01
		GLOBE 37.9	-	-0.09
44.98	44.98	WET 45.0	-	0.02
		DRY 45.1	-	0.12
		GLOBE 44.9	-	-0.08

STD = Standard

UUC = Unit Under Calibration

Description of UUC :

Range 0 to 100  $^\circ\text{C}$   
Resolution 0.1  $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2111-077-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 11-Nov-22

End of Certificate

Page 2 of 2

## **DIGITAL LIGHT METER**

**Model : LX-72**

**Serial No. : Q 608662**



# INTERNATIONAL TESTING SERVICE CO., LTD

1213/388 Ladprao 94 Ladprao Rd. Wangtonglang Bangkok 10310  
Tel 0-2559-2095 Fax 0-2559-2096  
E-mail : sale@itest-lab.com web site : www.itest-lab.com



NSC-TS-17025  
CALIBRATION 129

## CALIBRATION CERTIFICATE

Issued date : 13 June 2022

Client Name : EASTERN THAI CONSULTING 1992 CO., LTD.

Address : 683 Moo 11, Sukhapibal 8 Rd., Nongkham, Siracha, Chonburi 20230.

Request No : C-2206 - 271

Laboratory No.: CAL- 271

Date of Request : 9 June 2022.

Date of Calibration : 10 June 2022.

### 1. Unit Under Calibration (UUC) :

Nomenclature : Digital Light Meter

Maker : DIGICON

Serial No.: Q 608662

Model : LX-72

### 2. Place of Calibration : Photometry Standard Laboratory, INTERNATIONAL TESTING SERVICE CO., LTD.

### 3. Range of Calibration : 2 Range

### 4. Condition of Laboratory : Ambient temperature : (25 ± 2) °C and relative humidity (60 ± 20) %.

### 5. Reference Standard : Standard Tungsten Halogen Lamp , Serial No.: 504010, which was calibrated on

14 September 2021, can be traceable to International System of Unit (SI) through Electrical and Electronics Institute Foundation for Industrial development, Certificate No.: 0117LI21.

### 6. Support Equipment :

1. Photometric bench , 6.3 meter long.

2. DC. power supply, Serial No.: EJ 19A 009, Model : GPR-25H 300 , Maker : GW INSTR.

3. Digital Multimeter , Model : 34401A , S/N : MY44011212 and MY44011215.

4. Foot Candle / Lux Meter , Model : 407026, S/N : Q 558437, Maker : EXTECH.

### 7. Calibration Procedure :

The measurement was done in accordance with WI-CP-01. The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %.

The Results shown in this certification report refer only to the equipment(s) calibrated under this Calibration Certificate cannot be reproduced, except in full, without permission of company.



# INTERNATIONAL TESTING SERVICE CO., LTD

1213/388 Ladprao 94 Ladprao Rd. Wangtonglang Bangkok 10310  
Tel 0-2559-2095 Fax 0-2559-2096  
E-mail : sale@itest-lab.com web site : www.itest-lab.com



NSC-TS-17025  
CALIBRATION 129

Request No : C-2206 - 271

Serial No. : Q 608662

Laboratory No.: CAL - 271

### Results :

UUC Range	Standard (lx)	Unit Under Calibration Reading (lx)	Correction (lx)	Uncertainty of Measurement ( + lx)
400	0			
	50	49.6	+ 0.4	
	100	100.1	- 0.1	
	200	199.8	+ 0.2	
	300	295.6	+ 4.4	
4000	400	389.5	+ 10.5	2.1 % of Reading
	500	488	+ 12	
	1000	973	+ 27	
	2000	1946	+ 54	
	3000	2915	+ 85	
X10	4000	3889	+ 111	
	5000	486	+ 140	

Note : 1. The results relate only to the items calibrated.

2. The UUC is not read out at zero lux.

3. The UUC is calibrate at 5000 lx is not NSC-ONSC Accredited.

Calibration result approved by

Approved on behalf of  
International Testing Service Co., Ltd

Managing Director

The Results shown in this certification report refer only to the equipment(s) calibrated under this Calibration Certificate cannot be reproduced, except in full, without permission of company.

**ANALYTICAL BALANCE (DU)**

**Model : XS205 DU**

**Serial No. : 1126323724**



Mettler-Toledo (Thailand) Ltd.  
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+86 2723 0382  
MT-TH.ServiceSupport@mt.com

## Accuracy Calibration Certificate

### Customer

Company: EASTERN THAI CONSULTING 1992 CO., LTD.  
Address: 683 Moo 11, Sukhaphiban 8 Rd., Nong Kham  
City: Sriracha Contact: Sasiporn Nakin  
Zip / Postal: 20230  
State / Province: Chonburi  
Order Number: 

### Weighing Device

Manufacturer: Mettler Toledo  
Model: XS205DU  
Serial No.: 1126323724  
Building: Laboratory  
Floor: 1  
Room: Laboratory  
Instrument Type: Weighing Instrument  
Asset Number: LASE 05/1  
Terminal Model: SAT  
Terminal Serial No.: 1126323724  
Terminal Asset No.: N/A

Range	Max Capacity	Readability (g)
1	81 g	0.0001 g
2	220 g	0.0001 g

### Procedure

#### Calibration Guidelines:

#### METTLER TOLEDO Work Instruction:

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

As Found	Start: 24.9 °C	End: 25.7 °C	Start: 54.0 %	End: 51.3 %

#### As Found Calibration Date:

07-Feb-2022

#### As Left Calibration Date:

N/A

#### Issue Date:

08-Feb-2022

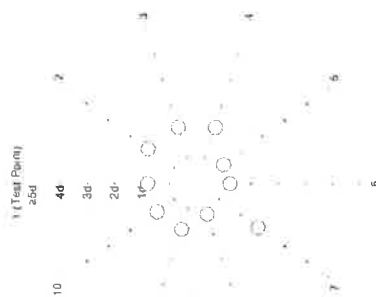
#### Approved Signatory:

☐ Sanit Jirinyom  
☐ Surachet Sukkale

## Measurement Results

### Repeatability

Test Load: 70 g	As Found	As Left
1	70.00002 g	N/A
2	70.00004 g	N/A
3	70.00004 g	N/A
4	70.00004 g	N/A
5	70.00003 g	N/A
6	70.00003 g	N/A
7	70.00001 g	N/A
8	70.00003 g	N/A
9	70.00002 g	N/A
10	70.00002 g	N/A
Standard Deviation	0.000010 g	N/A

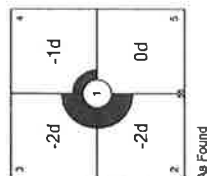


The "x" in the graph represents the readability of the range/interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 100 g

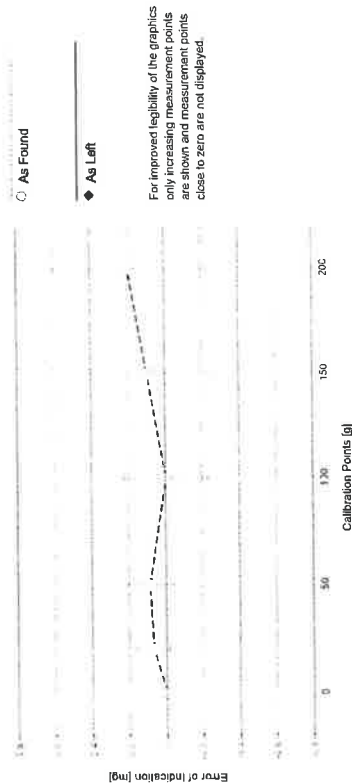
Position	As Found	As Left
1	100.00000 g	N/A
2	99.99998 g	N/A
3	99.99998 g	N/A
4	99.99999 g	N/A
5	100.00000 g	N/A
Maximum Deviation	0.00002 g	N/A



The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.021 mg	2
2	0.01000 g	0.01002 g	0.00002 g	0.023 mg	2
3	0.10000 g	0.10002 g	0.00002 g	0.026 mg	2
4	1.00000 g	1.00000 g	0.00000 g	0.035 mg	2
5	4.99999 g	4.99999 g	0.00000 g	0.050 mg	2
6	10.00002 g	10.00005 g	0.00003 g	0.063 mg	2
7	19.99994 g	20.00001 g	0.00007 g	0.065 mg	2
8	49.99987 g	50.00006 g	0.00009 g	0.13 mg	2
9	100.00000 g	100.00000 g	0.00000 g	0.23 mg	2
10	149.99999 g	150.00000 g	0.00001 g	0.35 mg	2
11	200.00000 g	200.00002 g	0.00002 g	0.42 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor  $k = 2$  - which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2			
Weight Set No.:	WS32	Date of Issue:	15-Sep-2020
Certificate Number:	169521	Calibration Due Date:	13-Mar-2022
Thermo Baro Hygrometer			
Equipment No.:	IN74	Date of Issue:	09-Jul-2021
Certificate Number:	21H1470	Calibration Due Date:	28-Jun-2022

Remarks

FACT adjustment functionality activated  
Equipment condition: Good  
Next calibration according to customer's procedure

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with  $k=2$  in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1.5 \cdot 10^{-4} / K$   
Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

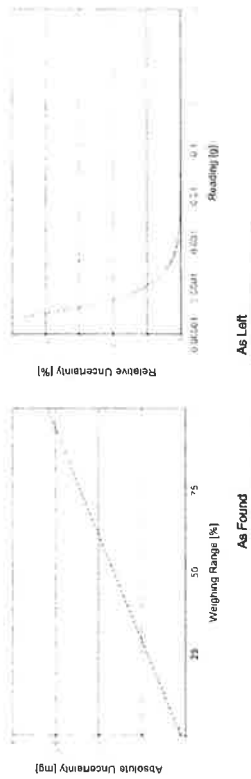
Linearization of Uncertainty Equation

Range	As Found		As Left
	d	Max.	
1	0.00001 g	81 g	$U_1 = 0.022 \text{ mg} + 0.00763 \text{ mg/g} \cdot R$
2	0.0001 g	220 g	$U_2 = 0.05 \text{ mg} + 0.00762 \text{ mg/g} \cdot R$

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

As Found		As Left	
Net Indication			
0.00220 g	0.022 mg	1.0%	N/A
0.02200 g	0.022 mg	0.10%	N/A
0.22000 g	0.024 mg	0.011%	N/A
2.20000 g	0.039 mg	0.0018%	N/A
220.0000 g	1.7 mg	0.00079%	N/A



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

GWP®  
Certificate



As  
Found



As  
Left



The weighing device meets the given  
process requirements.

The weighing device meets the given  
process requirements.

Tests Performed:

☒ As Found

☐ As Left

☒ No adjustments/modifications made. As Left results  
correspond to As Found.

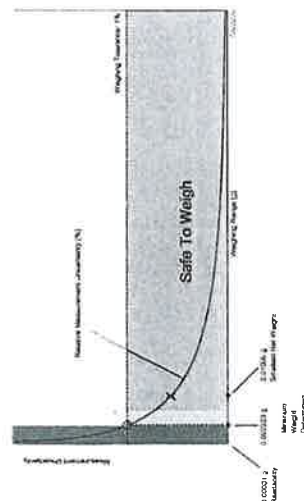
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.01000 g

Safety Factor: 2

Safe Weighing Range



## Minimum Weight

### As Found Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.022382 g	0.045110 g	0.066193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.004449 g	0.008912 g	0.013368 g	0.022382 g	0.045110 g
1%	0.002223 g	0.004449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.001111 g	0.002223 g	0.003335 g	0.005563 g	0.011148 g
5%	0.000444 g	0.000889 g	0.001333 g	0.002223 g	0.004449 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

### As Left Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.022382 g	0.045110 g	0.066193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.004449 g	0.008912 g	0.013368 g	0.022382 g	0.045110 g
1%	0.002223 g	0.004449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.001111 g	0.002223 g	0.003335 g	0.005563 g	0.011148 g
5%	0.000444 g	0.000889 g	0.001333 g	0.002223 g	0.004449 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with  $k = 2$  and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

- If "N/A" is shown above, no appropriate value could be calculated.
- METTLER TOLEDO is not responsible for the definition of the process requirements.

## Measurement Results

### Results Summary

Repeatability			
As Found	As Left	Eccentricity	Error of Indication
✓	✓	✓	✓

✓ = Passed

✗ = Failed

N = Safety Factor not met

### Repeatability

Test Load: 70 g

Tolerance		Control Limit		As Found		As Left	
				Std. Deviation	Result	Std. Deviation	Result
0.1%	0.000005 g				✗		✗
0.2%	0.000010 g				✓		✓
0.5%	0.000025 g				✓		✓
1%	0.000050 g			0.000010 g	✓	0.000010 g	✓
2%	0.000100 g				✓		✓
5%	0.000250 g				✓		✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

### Eccentricity

Test Load: 100 g

Tolerance		Control Limit		As Found		As Left	
				Deviation	Result	Deviation	Result
0.1%	0.0000 g				✓		✓
0.2%	0.0000 g				✓		✓
0.5%	0.0000 g			0.00002 g	✓	0.00002 g	✓
1%	0.0000 g				✓		✓
2%	0.0000 g				✓		✓
5%	0.0000 g				✓		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

Attachment to Calibration Certificate:  
TH4004-018-020722-ACC-TH  
GWP<sup>®</sup> Certificate

Error of Indication

As Found

As Left

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

**METTLER TOLEDO**

Service Date: 2022-02-07  
 Account Number: TH4004-529-020722-LABBalanceHR  
 EASTERN THAI CONSULTING 1992 CO., LTD.  
 3583 Moo 11, Sukhaphiban 8 Rd., Nong Kham, Si Racha, Chonburi 20230  
 Krun Sasiporn Nakin

## Balance Health Report

Device Details			
Manufacturer:	Mettler Toledo	Accessory 1:	Other
Model:	XS205DU	Accessory 2:	
Serial number:	1126332724	Weight cell for routine testing:	No
Firmware:	4.0		

History	
Device History	Service History
Instrument in use:	Yes
Instrument age:	3-10 years
Spare parts available:	Yes
Regulations	ISO
Process tolerance in %:	1 %
Smallest sample net weight:	0.0100 g
	Routine testing performed:
	Don't know

Check List	
Environmental Conditions	General & Functional Checks
Room temperature fluctuation	✓
Exposure to direct sun	✓
Vibrations	✓
Draft	✓
Static	✓
	Electrical Component Checks
	Power supply
	Sliding door drive
	Internal weight drive
	Display
	Other - objections noted as additional remarks
	—

Recommendations	
Draft shield	✓
Weighing pan position	✓
Housing	✓
Other - objections noted as additional remarks	—

Measurement Result Quality	
Instrument calibration	Unstable instrument
Density scale weighing range	Replace instrument
GWP verification / risk assessment	Replace / add parts (see additional remarks)
Preventive maintenance	Onsite repair
Perform routine testing with test weights	Do not repair
User training	Use of accessories (see additional remarks)
Contact:	Phone: 096-051-3303 Email: oc.la@nic1992.com

Additional Remarks & Recommendations	
Engineer Details	Date: 07-Feb-2022
Name: Sathaporn Tabson	

**This is not a certificate.**

It should not be used to interpret final results for the testing of these devices

Legend: Good/Pass Needs Attention Bad/Fail Not Applicable

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Report Version: 1.13 Software Version 4.27 0.9, Page 1/1, © METTLER TOLEDO

**WETTER**

Report Version: 1.13 Software Version 4.27 0.9, Page 1/1, © METTLER TOLEDO

2

**ANALYTICAL BALANCE**

**Model : SECURA224-1S**

**Serial No. : 0036707137**





Certificate No. : 22-011768  
Sample Code : 22-04498-005

Page 1 of 4

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapiban 8 Rd., Nongkham,  
Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.  
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-IS

Serial No. : 0036707137

ID No. : LABE 05/2

Date of Receipt : 03 February 2022

Date of Calibration : 03 February 2022

Calibrated by : Mr. Thanadol Pholthep  
Scientist

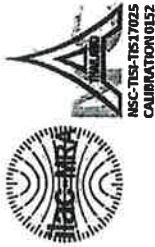
Issue date : 07 February 2022

The uncertainties are for a confidence probability of approximately 95%.

The calibration result is applied only to the above calibrated item and was found accurate as shown on data and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,  
Phlaphla, Wang Thonglang, Bangkok 10310  
TEL 02-516-2422 FAX 02-516-6949  
CONTACT@AMARC.CO.TH WWW.AMARC.CO.TH  
Rev.05 Effective Date: 15/10/21



Certificate No. : 22-011768  
Sample Code : 22-04498-005

Page 2 of 4

## REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE  
Manufacturer : SARTORIUS  
Model : SECURA224-IS  
Capacity : Max 220 g  
Resolution : 0.0001 g  
Serial No. : 0036707137  
ID No. : LABE 05/2

### Result of Calibration

#### 1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 220				
<input type="checkbox"/> No adjustment	Nominal value	100	200	100	200
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000022	200.000141	100.000022	200.000141
	Average reading of indicator	99.9998	199.9998	100.0000	200.0000
	Standard deviation	0.00009	0.00005	0.00005	0.00004
Unit : -	Range : -				
<input type="checkbox"/> No adjustment	Nominal value	-	-	-	-
<input type="checkbox"/> Adjustment	Standard weight	-	-	-	-
	Average reading of indicator	-	-	-	-
	Standard deviation	-	-	-	-

361 Soi Ladprao 122, Ladprao Road,  
Phlaphla, Wang Thonglang, Bangkok 10310  
TEL 02-516-2422 FAX 02-516-6949  
CONTACT@AMARC.CO.TH WWW.AMARC.CO.TH  
Rev.03 Effective Date: 15/10/21



Certificate No. : 22-011768

Sample Code : 22-04498-005

Page 3 of 4

## REPORT OF CALIBRATION

## Result of Calibration

## 2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range : 220		Range :	
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.7981	-	-
100	0.9976	-	-
200	0.9976	-	-

## 3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unloaded	0.0000000	0.0000	0.0000	0.000094	2.01
0.01	0.0100045	0.0100	0.0000	0.000094	2.01
0.1	0.1000102	0.1000	0.0000	0.000094	2.01
1	1.0000055	1.0000	0.0000	0.000095	2.01
2	2.0000144	1.9999	0.0001	0.000095	2.01
5	5.0000060	5.0000	0.0000	0.000096	2.01
10	10.000017	9.9999	0.0001	0.000097	2.01
20	20.000022	20.0000	0.0000	0.00010	2.01
50	50.000038	50.0000	0.0000	0.00012	2.01
100	100.000022	99.9999	0.0001	0.00016	2.00
200	200.000141	200.0000	0.0001	0.00027	2.00

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement is stated in accordance with UKAS M

Certificate No. : 22-011768

Sample Code : 22-04498-005

Page 4 of 4

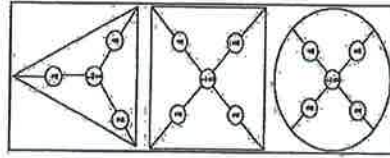
## REPORT OF CALIBRATION

## Result of Calibration

## 4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighing pan		Test weight : 100	
		Unit : g	
Range	Reading of indicator	Reading of Indicator	
Position			
1	99.9999	-	-
2	100.0000	-	-
3	99.9999	-	-
4	99.9997	-	-
5	100.0000	-	-
6	99.9999	-	-
Maximum difference	0.0002	-	-



## Condition of Calibration

Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019		6.	
2. This result of calibration was found accurate as shown on date and place of calibration only.		Ambient conditions	Min
3. Condition of Calibration item: Normal		Temperature (°C)	24.9
4. This certification is traceable to the International System of Unit maintained at :-		Relative Humidity (%RH)	40.3
- Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Instrument number 1).		Air pressure (hPa)	1009.3
5. Reference standard instrument :		Max	1010.7

1) STANDARD WEIGHT 1 mg to 1 kg E2 LB-WE-57

## Instrument

Class ID No.

Certificate No.

Due Date

- End of Report -

**BOD INCUBATOR**

**ID No. : LABE 19/1**



## CERTIFICATE OF CALIBRATION

Page 1 of 3

Certificate No. : 22-011764  
Sample Code : 22-04498-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapibon 8 Rd., Nongkham,  
Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Laboratory)

Equipment : Temperature controlled enclosures (Incubator)

Manufacturer : N/A Model : E811.0306

Serial No. : N/A ID No. : LABE19/1

Date of Receipt : 03 February 2022 Date of Calibration : 03 February 2022

## Condition of Calibration

1. Environment	1.1 Ambient temperature	: Maximum 30.5 °C ; Minimum 29.5 °C
	1.2 Relative humidity	: Maximum 50.8 % ; Minimum 48.4 %
	1.3 Line voltage supplied	: Maximum 224.3 VAC ; Minimum 222.5 VAC

## 2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

## 3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-P100)	LB-DA-11 (RTD-138 to RTD-146)	21-035792	18 May 2022

## 4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

## 5. This result of calibration was found accurate as shown on date and place of calibration only.

## 6. Condition of calibration item : Normal

Calibrated by

Approved by

Issue date

11 February 2022

The uncertainties are for a confidence probability of approximately 95%.  
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.  
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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Phialapha, Wang Thonglang, Bangkok 10310

PH-CL-114

TEL 02-516-2422  
FAX 02-516-6948

Rev.01

CONTACT@AMARC.CO.TH  
WWW.AMARC.CO.TH

Effective Date: 15/10/21



## REPORT OF CALIBRATION

Page 2 of 3

Certificate No. : 22-011764  
Sample Code : 22-04498-001

## Results of Calibration

Resolution : 0.1 °C

## 1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C) reading (°C)	UUC*	Measured temperature at each positions (°C)									Uncertainty ± (°C)	Coverage factor k
			#1	#2	#3	#4	#5	#6	#7	#8	#9 <sup>Rev</sup>		
20	20.0	20.0	20.61	20.09	19.46	19.73	20.22	20.37	20.12	20.19	20.28	0.29	2.00

## 2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.09	0.88	1.28

## Notes

UUC\* = Unit Under Calibration

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Rev.09

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Phialapha, Wang Thonglang, Bangkok 10310

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Effective Date: 15/10/21



## REPORT OF CALIBRATION

Certificate No. : 22-011764  
Sample Code : 22-04498-001

## Results of Calibration

## Notes

1. Sensor installation locations
  - 1.1 All sensors at any corners or wells should be positioned 5 cm (a x b x c) from the wall.
  - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :  
W = 70 cm ; D = 60 cm ; H = 124 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes\* Stability of chamber and loading effect in chamber at 20% of uniformity \*.
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC\* reading - the average reading of Indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$ , which for a normal distribution correspond to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M5003.

- End of Report -

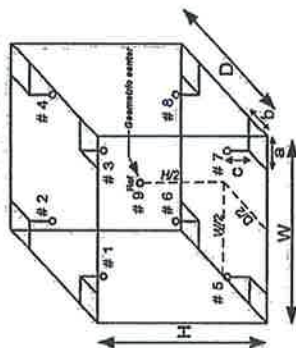


Figure: Example of sensor  
Installation Positions

**BOD INCUBATOR**

**ID No. : LABE 19/2**



## CERTIFICATE OF CALIBRATION

NSC-TS1-TS17025  
CALIBRATION 0152

Page 1 of 3

Certificate No. : 22-007487

Sample Code : 22-02978-006

Customer

: EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhaphiban 8 Rd., Nongkham,

Sriacha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Laboratory)

Equipment : Temperature controlled enclosures (Incubator)

Manufacturer : N/A Model : N/A

Serial No. : S540040277 ID No. : LABE 19/2

Date of Receipt : 24 January 2022 Date of Calibration : 24 January 2022

## Condition of Calibration

1. Environment	1.1 Ambient temperature	: Maximum	30.4 °C	: Minimum	30.0 °C
	1.2 Relative humidity	: Maximum	51.2 %	: Minimum	46.2 %
	1.3 Line voltage supplied	: Maximum	225.3 VAC	: Minimum	224.1 VAC

## 2. Calibration method

1. TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

## 3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data acquisition with sensor (RTD-PH00)	LB-DA-12 (RTD-158 to RTD-166)	21-0388920	10 May 2022

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

5. This result of calibration was found accurate as shown on date and place of calibration only.

6. Condition of calibration item : Normal

Calibrated by

Approved by

Issue date

28 January 2022

The uncertainties are for a confidence probability of approximately 95%.

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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Effective Date: 15/10/21

NSC-TS1-TS17025  
CALIBRATION 0152

Page 2 of 3

Certificate No. : 22-007487

Sample Code : 22-02978-006

## REPORT OF CALIBRATION

## Results of Calibration

Resolution : 0.1 °C

## 1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor <i>k</i>	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# 9 <sup>Ref</sup>
20	20.0	20.0	19.61	19.35	19.81	19.37	20.15	20.34	20.14	20.45	19.61	0.30	2.00

## 2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.08	0.94	1.22

## Notes

- UUC\* = Unit Under Calibration

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Effective Date: 15/10/21

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Rev.09

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Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-018





NSC-TIS-TIS17025  
CALIBRATION 0132  
Page 3 of 3

## REPORT OF CALIBRATION

Certificate No. : 22-007487  
Sample Code : 22-02578-006

### Results of Calibration

#### Notes

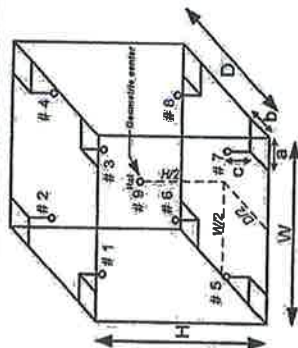
1. Sensor installation locations
  - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
  - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :  
W = 60 cm; D = 70 cm; H = 124 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".

6. 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.

7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC\* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3002.

- End of Report -



Figures: Example of sensor  
installation Positions



COPI



**Hot Air Oven**

**Model : UM 400**

**Serial No. : 900982**



ASIA MEDICAL AND  
AGRICULTURAL LABORATORY  
AND RESEARCH CENTER

AMARC

## CERTIFICATE OF CALIBRATION

Page 1 of 3

Certificate No. : 22-025399

Sample Code : 22-09604-002

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkham,

Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert Model : UM 400

Serial No. : 900982 ID No. : LABE17/1

Date of Receipt : 11 March 2022 Date of Calibration : 11 March 2022

### Condition of Calibration

1. Environment	1.1 Ambient temperature	: Maximum 28.7 °C	: Minimum 27.4 °C
	1.2 Relative humidity	: Maximum 61.5 %	: Minimum 55.8 %
	1.3 Line voltage supplied	: Maximum 226.5 VAC	: Minimum 224.7 VAC

### 2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

### 3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-PT100)	LB-DA-11 (RTD-138 to RTD-146)	21-035792	18 May 2022

### 4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

### 5. This result of calibration was found accurate as shown on date and place of calibration only.

6. Condition of calibration item : Normal

Calibrated by : Mr. Natthan Phosri

Scientist

14 March 2022

Approved by

14 March 2022

Issue date

The uncertainties are for a confidence probability of approximately 95%.

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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ASIA MEDICAL AND  
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## REPORT OF CALIBRATION

Page 2 of 3

Certificate No. : 22-025399

Sample Code : 22-09604-002

### Results of Calibration

Resolution : 0.1 °C

### 1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor <i>k</i>	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# g <sub>ref</sub>
85	85.0	85.0	85.05	84.99	84.66	84.71	84.85	84.92	84.96	84.86	84.98	0.25	2.00

### 2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
85	0.08	0.35	0.54

### Notes

UUC\* = Unit Under Calibration

## REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 22-025399

Sample Code : 22-09604-002

## Results of Calibration

## Notes

1. Sensor installation locations
  - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
  - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :  
 $W = 40 \text{ cm}$  ;  $D = 28 \text{ cm}$  ;  $H = 39 \text{ cm}$
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes\* Stability of chamber and loading effect in chamber at 20% of uniformity\*.
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC\* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

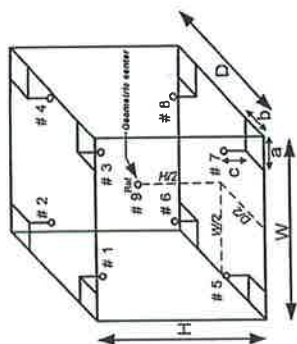


Figure: Example of sensor  
installation Positions

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

**LIQUID IN GLASS THERMOMETER**

**Model : Total Immersion**

**Serial No. : 43560**



CERTIFICATE No : 21T10802  
REFERENCE No : 62916-1

PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : LIQUID IN GLASS THERMOMETER  
MANUFACTURER : PRECISION  
MODEL : 0 °C TO 100 °C  
SERIAL No : 43560  
ID No : LABE 16/1  
RESOLUTION : 0.1 °C  
TYPE : TOTAL IMMERSION  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : EASTERN THAI CONSULTING 1992 COMPANY LIMITED  
999 MOO.11 NONGKHAM, SRIRACHA, CHONBURI  
20230

CALIBRATED BY : CHARUKIT L.  
CALIBRATION DATE :  
APPROVED BY :  
ISSUED DATE : 27-Oct-21  
RECEIVED DATE : 21-Oct-21

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF  
QUALITY CALIBRATION CO., LTD.



CERTIFICATE No : 21T10802

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : LIQUID IN GLASS THERMOMETER  
MANUFACTURER : PRECISION  
MODEL : 0 °C TO 100 °C  
ID No : LABE 16/1  
RESOLUTION : 0.1 °C  
RECEIVED DATE : 21-Oct-21  
AMBIENT TEMPERATURE : 23 °C ± 3 °C  
SERIAL NUMBER : 43560  
TYPE : TOTAL IMMERSION  
CALIBRATION DATE : 27-Oct-21  
RELATIVE HUMIDITY : 50 %RH ± 20 %RH

### CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON ASTM E77:1992 BY COMPARISON WITH STANDARD PLATINUM RESISTANCE THERMOMETER (SPRT) INTO LIQUID BATH TEMPERATURE CONTROLLER. THE TEMPERATURE SCALE USED WAS BASED ON ITS-90.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD THERMOMETER	1502	77964	21T3033	08-Mar-22
2) SPRT PROBE	5614	636626	21T3033	08-Mar-22
3) PRECISION BATH	7320	A21105	20T12163	16-Dec-21
4) PRECISION BATH	CTR-40	A68155	20T12164	22-Dec-21

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND).

### RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	EMERGENT STEM TEMPERATURE (°C)	UNCERTAINTY OF MEASUREMENT (±°C)
0.004	0.0	60	0.004	N/A	0.090
25.009	25.0	160	0.009	N/A	0.090
50.012	50.0	270	0.012	N/A	0.090

UUC\* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

**pH Meter**

**Model : SevenCompact<sup>TM</sup> pH/Ion Meter S220**

**Serial No. : B448305208**

Certificate Number CCP-1416-22

# Calibration Certificate

## SevenCompact™ pH/Ion Meter S220

## Customer

Company EASTERN THAI CONSULTING 1992 CO., LTD.  
 Address 683 Moo 11, Sukhaphan 8 Rd., Nong Kham  
 Siraacha  
 Choraburi 20230  
 Customer ID number 301008441  
 Customer representative Sasipon Nakhin  
 Assignment ID 0333344300

## Instrument

Type SevenCompact™ S220 Instrument Serial Number B44305208  
 Internal Identification LABEL 11/4 Firmware version 1.20.06

## Technical specifications

Measuring Range -1999.9 ... 1999.9 mV  
 Resolution 0.1 mV  
 Limit of Error ± 0.2 mV  
 Temperature range MTC -30.0 ... 130.0 °C  
 Temperature range ATC -5.0 ... 130.0 °C  
 Resolution 0.1 °C  
 Limit of Error ± 0.1 °C

## Procedure Statement

METTLER TOLEDO Calibration SOP (Doc. No. ME-3002757B) will be used as reference documentation to adjust and certify the features indicated in the "Type" and "Serial number" section. The measurement results of this certification were obtained at ambient conditions.

Certificate Number CCP-1416-22

## Certification Tools

Certified digital voltmeter  
 Manufacturer GOSSEN METRAWATT  
 Control No. ANA77

Serial number ZD1740  
 Certificate number E1U213198  
 Due date August 8, 2022

Certified Temperature  
 Resistors

Manufacturer METTLER TOLEDO / ME-51302410  
 Control No. ANA137

Serial number A424  
 Certificate number 31344  
 Due date August 25, 2023

Designation	Nominal value	Certified value
NTC 30 kΩ, 0 °C	94.950 kΩ	94.9556 kΩ
NTC 30 kΩ, 25 °C	30.000 kΩ	30.0137 kΩ
NTC 30 kΩ, 50 °C	10.969 kΩ	10.9649 kΩ
NTC 30 kΩ, 75 °C	4.528 kΩ	4.5257 kΩ
NTC 30 kΩ, 100 °C	2.070 kΩ	2.06949 kΩ
PT1000, 0 °C	1.000 kΩ	1.000156 kΩ
PT1000, 25 °C	1.0974 kΩ	1.097464 kΩ
PT1000, 50 °C	1.1940 kΩ	1.194202 kΩ
PT1000, 75 °C	1.2909 kΩ	1.290136 kΩ
PT1000, 100 °C	1.3851 kΩ	1.385061 kΩ



Certificate Number CCP-1416-22

Certification Measurements

pH/mV Sensor Input				
Designation	Certified value	Measured value	Max. Tolerance	Passed / Failed
NTC 30 kΩ, 0 °C	-1500.0 mV	-1899.8 mV	0.2 mV	Passed
NTC 30 kΩ, 25 °C	-1000.0 mV	-999.8 mV	0.2 mV	Passed
NTC 30 kΩ, 50 °C	-500.0 mV	-499.8 mV	0.2 mV	Passed
NTC 30 kΩ, 75 °C	-100.0 mV	-100.0 mV	0.2 mV	Passed
NTC 30 kΩ, 100 °C	0.0 mV	0.1 mV	0.2 mV	Passed
PT1000, 0 °C	1500.0 mV	1500.0 mV	0.2 mV	Passed
PT1000, 25 °C	500.0 mV	499.8 mV	0.2 mV	Passed
PT1000, 50 °C	0.0 mV	0.0 mV	0.2 mV	Passed
PT1000, 75 °C	1000.0 mV	999.8 mV	0.2 mV	Passed
PT1000, 100 °C	1500.0 mV	1499.8 mV	0.2 mV	Passed

pH/mV Sensor Input at high impedance				
Designation	Measured low Imp.	Measured high Imp.	Max. Tolerance	Passed / Failed
1500 mV	1500.0 mV	1500.0 mV	0.6 mV	Passed

Digital sensor input with pH Sensor

Summary of Certification

Certification of Instrument

Passed

The instrument referred to in this certificate has fulfilled the criteria of the certification. This is indicated by the notation Passed in the column above.

Remarks

Certification of the instrument was performed by

Name: [Redacted] Function: Service Engineer  
 Place: [Redacted]  
 Calibration Date: February 7, 2022  
 Signature: [Redacted] ELECTRONIC SIGNATURE

Mettler-Toledo (Thailand) Limited

METTLER TOLEDO

Performance Test

Control No. CCE-1416-22/1

Company: EASTERN THAI CONSULTING 1992 CO., LTD.

Address: 883 Moo 11, Sukhaphiban 8 Rd., Nong KhamSiraacha

Chonburi 20230 Assignment ID "0332342430"

pH Electrode

Type: Inlab Expert Pro-ISM SN: 1976465

Certified standards used

Standard 1: Type: pH Buffer Manufacturer: METTLER TOLEDO Exp. date: Dec-22  
 Nominal value: pH ( 25.00 °C): 4.01 Lot No.: 1F351C

Standard 2: Type: pH Buffer Manufacturer: METTLER TOLEDO Exp. date: Dec-22  
 Nominal value: pH ( 25.00 °C): 7.00 Lot No.: 1F351M

Standard 3: Type: pH Buffer Manufacturer: METTLER TOLEDO Exp. date: Jun-23  
 Nominal value: pH ( 25.00 °C): 9.21 Lot No.: 1G012G

Test equipment: Type: pH Meter Manufacturer: METTLER TOLEDO Call date: 7-Feb-22  
 SN: B448305206 No. of certificate: CCP-1416-22 Model: S220

Adjustment

Set Calibration Buffer			
Select Calibration Mode			
3-Point Calibration			
Cal 1	Cal 2	Cal 3	Cal 4
ATC 25.0 7.00	ATC 24.9 4.01	ATC 24.8 7.01	ATC 24.7 9.21
Offset (mV)	3.4	97.8	98.2
Slope % (or mV/pH)	97.8	98.2	98.2
Slope % (or mV/pH)	98.2	98.2	98.2

Measurements

Before adjustment			
Buffer Values	Measured	Difference	After adjustment
pH	°C	pH	°C
4.01	25.0	ATC 3.95	ATC 24.9
7.00	25.0	ATC 7.03	ATC 24.8
9.21	24.8	ATC 9.20	ATC 24.7

Remarks: The difference result of calibrated electrodes should be within +/- 0.05 pH

Place: Laboratory room

Service Specialist: Pailat Saeapannual

Signature: [Redacted]

Electronic Signature: [Redacted]

This is an original document, copies are not authorized by METTLER TOLEDO

February 7, 2022

Calibration Date: February 7, 2022

Signature: [Redacted]

Electronic Signature: [Redacted]

**STANDARD WEIGHT 50 g**



Certificate No. : 22-052238

Sample Code : 22-19150-003

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkham,

Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited  
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by

Issue date

31 May 2022

Approved by

The uncertainties are for a confidence probability of approximately 95%.

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-017

TEL 02-516-2422

FAX 02-516-6949

Rev.05

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date: 15/10/21



Certificate No. : 22-052238

Sample Code : 22-19150-003

## REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

## Result of Calibration :

☒ Without adjustment☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature ( $t_{ref}$ ) of 20°C, the conventional mass is the mass of a reference weight of a density ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation	Conventional	Expanded	Maximum	ID No.
	(mg)	Mass	Uncertainty	Permissible Error	
			(mg)	$\pm$ (mg)	
50 g	-0.324	49.999676 g	0.10	0.30	LABE 10/1

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2.0$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS



Certificate No. : 22-052238

Sample Code : 22-19150-003

## REPORT OF CALIBRATION

## Condition of Calibration:

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.20 kg/m<sup>3</sup>
2. Calibration Method : Direct comparison weighing according to OIML R111-1 : 2004(E)

## 3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-078366	22 September 2022

4. This certification is traceable to the International System of Unit maintained at :-

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

## 6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

**STANDARD WEIGHT 100 g**



Certificate No. : 22-052239

Sample Code : 22-19150-004

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkham,

Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited  
(Calibration Laboratory)

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee  
Scientist

Issue date : 31 May 2022

The uncertainties are for a confidence probability of approximately 95%.

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052239

Sample Code : 22-19150-004

## REPORT OF CALIBRATION

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

## Result of Calibration :

☒ Without adjustment

☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature ( $t_{ref}$ ) of 20°C, the conventional mass is the mass of a reference weight of a density ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation	Conventional	Expanded	Maximum	ID No.
		Mass	Uncertainty	Permissible Error	
	(mg)		(mg)	± (mg)	
100 g	-0.171	99.999829 g	0.16	0.50	LABE 10/2

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.0$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS

NSC-TSI-11517025  
CALIBRATION 0152

Page 3 of 3

Certificate No. : 22-052239

Sample Code : 22-19150-004

## REPORT OF CALIBRATION

## Condition of Calibration

1. Ambient Conditions : Temperature  $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$ , Relative humidity  $50\% \pm 10\%$  and air density  $1.18 \text{ kg/m}^3$
2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

## 3. Reference standard instrument

Instrument	Class	ID.No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WF-79	21-079366	22 September 2022

4. This certification is traceable to the International System of Unit maintained at : -

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

## 5. Condition of Calibration item: Normal

## 6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 100 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -



**STANDARD WEIGHT 50 g**

Certificate No. : 22-052237  
Sample Code : 22-19150-002

Page 1 of 3

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapiban 8 Rd., Nongkham,  
Sriracha, Chonburi 20230Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited  
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : [Redacted] Approved by

Issue date : 31 May 2022

The uncertainties are for a confidence probability of approximately 95%.

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

Certificate No. : 22-052237  
Sample Code : 22-19150-002

Page 2 of 3

## REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

## Result of Calibration :

☒ Without adjustment☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature ( $t_{ref}$ ) of 20°C, the conventional mass is the mass of a reference weight of a density ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation	Conventional	Expanded	Maximum		ID No.
				Uncertainty	Permissible Error	
	(mg)	Mass	(mg)		$\pm$ (mg)	
50 g	-0.111	49.999889 g	0.10	0.30		LABE 10/4

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2.0$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3000



Certificate No. : 22-052237

Sample Code : 22-19150-002

NSC-TISI-TSI17025  
CALIBRATION 0152

Page 3 of 3

## REPORT OF CALIBRATION

### Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m<sup>3</sup>
2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

### 3. Reference standard instrument

Instrument	Class	ID.No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-079366	22 September 2022

### 4. This certification is traceable to the International System of Unit maintained at : -

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

### 5. Condition of Calibration item: Normal

### 6. Description of Calibrated Item :

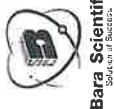
Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

**UV/VIS SPECTROPHOTOMETER**

**Model : UV – 1800**

**Serial No. : A11635101643CD**



**Bara Scientific Co., Ltd.**  
968 U Chu Liang Building Floor7 Rama4 Road  
Silom Bangkok Bangkok Thailand 10500  
Tel : 02-6324300 Fax : 02-6376496-7  
www.barascientific.com



## Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-167/22  
Equipment UV/Vis Spectrophotometer  
Model UV-1800  
Manufacturer Shimadzu  
Serial No. A11635101643 CD  
ID No. LABE 03/2  
Date of receipt 18 May 2022  
Date of calibration 18 May 2022  
Date of issue 25 May 2022

Customer name Eastern Thai Consulting 1992 Co., Ltd.  
Address 683 Moo 11, Sukkaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230.

Temperature (23.8-24.5) °C (On site)  
Humidity (47.8-48.3) %RH (On site)

Equipment condition Good Operation

Calibration Location Analysis Department.

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability Wavelength Accuracy is traceable to certificate No. 96367 and 96366  
Photometric Accuracy is traceable to certificate No. 99925 and 100147  
Stray Light is traceable to certificate No. 96346  
The above certificate are traceable to SI unit through Sarna Scientific Ltd.  
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr.Kanchit Choothep



Mr.Kanchit Choothep  
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced  
except in full, without written approval of the Bara Scientific Co., Ltd.

FM-UV-708-02 Rev.01 (23/01/63)



**Bara Scientific Co., Ltd.**  
968 U Chu Liang Building Floor7 Rama4 Road  
Silom Bangkok Bangkok Thailand 10500  
Tel : 02-6324300 Fax : 02-6376496-7  
www.barascientific.com



## Certificate of Calibration

Number of Page(s) 2 of 3

Certificate No. BSCC-UV-167/22

Calibration Results:  
1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
287.71	287.80	0.09	0.18
445.82	445.95	0.13	0.18
536.52	536.60	0.08	0.18
741.02	741.00	-0.02	0.18
879.41	879.40	-0.01	0.18

2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000 0.7311	0.0000 0.7321	0.0000 0.0010	0.0075 0.0075
257	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
350	0.0000 0.6306	0.0000 0.6314	0.0000 0.0008	0.0075 0.0075

\*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced  
except in full, without written approval of the Bara Scientific Co., Ltd.

FM-UV-708-02 Rev.01 (23/01/63)



**Bara Scientific**  
Source of Success

**Bara Scientific Co., Ltd.**  
988 U Chu Liang Building Floor 7 Ramat Road  
Siam Bangkok Thailand 10500  
Tel : 02-6324300 Fax : 02-6375486-7  
www.barascientific.com



# Certificate of Calibration

3 of 3

Number of Page(s)

Certificate No. BSCC-UV-167/22

Calibration Results:

## 3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5472	0.5481	0.0009	0.0042
	0.7637	0.7636	-0.0001	0.0042
	1.0480	1.0497	0.0017	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5371	0.5377	0.0006	0.0042
	0.7457	0.7451	-0.0006	0.0042
	1.0233	1.0240	0.0016	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5006	0.5006	0.0000	0.0042
	0.6961	0.6944	-0.0017	0.0042
	0.9563	0.9560	-0.0013	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5137	0.5137	0.0000	0.0042
	0.6907	0.6891	-0.0016	0.0042
	0.9533	0.9519	-0.0014	0.0042

\*CNR = Customer not request

## 4. Stray Light\*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
200.81±0.11nm	201.10	0.9543
		2.0204

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

\*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%

\*\*\*End of Certificate\*\*\*

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate. Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd. FM-U9-708-02 Rev 01 (23/01/83)

**ANALYTICAL BALANCE (DU)**

**Model : XS205 DU**

**Serial No. : 1126323724**



## Accuracy Calibration Certificate

Customer

Company:

Address:

City:

Zip / Postal:

State / Province:

Order Number:


EASTERN THAI CONSULTING 1992 CO., LTD.

863 Moo 11, Sukhaphiban 8 Rd., Nong Kham

Siracha

20230

Chonburi

  
\*\*\*\*\*

Contact:

Sutisorn Nakin

## Weighing Device

Manufacturer:

Model:

Serial No.:

Building:

Floor:

Room:

Mettler Toledo

XS205DU

1126323724

Laboratory

1

Laboratory

Instrument Type:

Asset Number:

Terminal Model:

Terminal Serial No.:

Terminal Asset No.:

LABE 05/1

SAT

1126323724

N/A

N/A

## Procedure

Calibration Guideline:

METTLER TOLEDO Work Instruction:

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cp-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

EURAMET cp-18 v. 4.0 (11/2015)

CPW00220

Range

Max. Capacity

Readability (g)

1

81 g

0.0001 g

2

220 g

0.001 g

As Found

Start: 24.0 °C

End: 25.7 °C

Start: 54.0 %

End: 51.3 %

Temperature

Humidity

As Found Calibration Date:

As Left Calibration Date:

Issue Date:


07-Feb-2022

N/A

08-Feb-2022

Calibrator:

Approved Signatory:



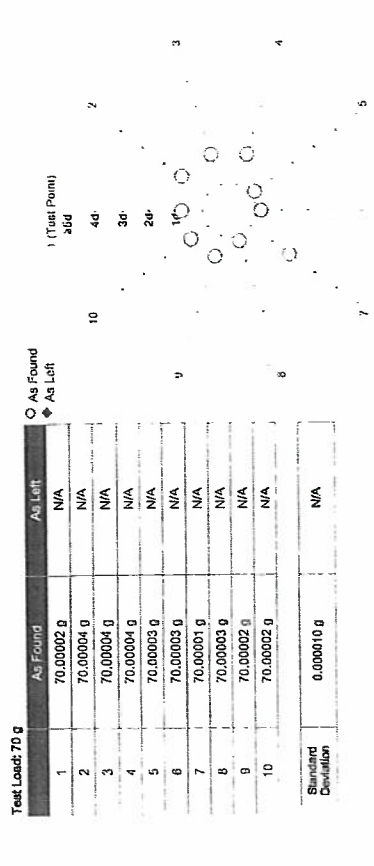
☒ Kasakorn Tassanachulakul

☐ Sanit Jitinyom

☐ Surachai Sukkale

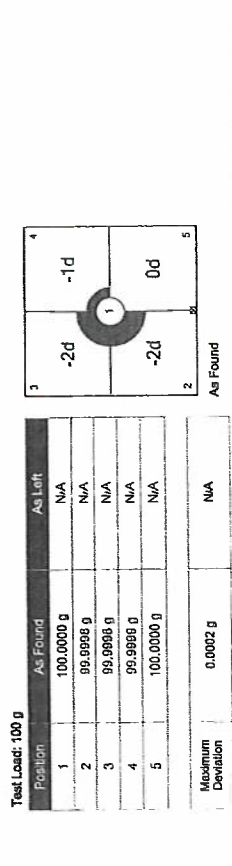
## Measurement Results

### Repeatability



The "g" in the graph represents the readability of the range/interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

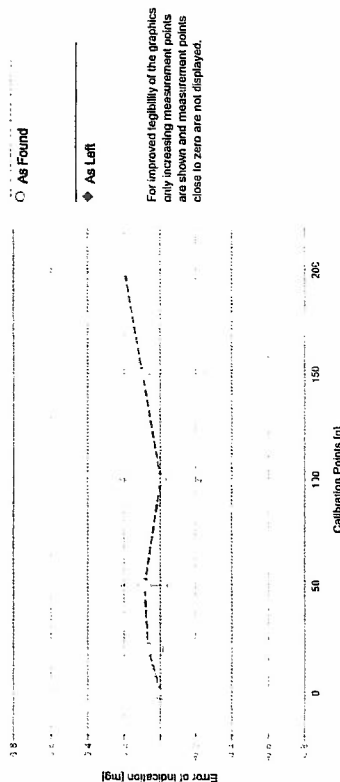
### Eccentricity



The "g" in the graph represents the readability of the range/interval in which the test was performed.

### Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.021 mg	2
2	0.01000 g	0.01002 g	0.00002 g	0.023 mg	2
3	0.10000 g	0.10002 g	0.00002 g	0.026 mg	2
4	1.00000 g	1.00000 g	0.00000 g	0.035 mg	2
5	4.99999 g	4.99999 g	0.00000 g	0.050 mg	2
6	10.00002 g	10.00005 g	0.00003 g	0.063 mg	2
7	19.99994 g	20.00001 g	0.00007 g	0.085 mg	2
8	49.99987 g	50.00006 g	0.00009 g	0.13 mg	2
9	100.00000 g	100.00000 g	0.00000 g	0.23 mg	2
10	149.99999 g	150.00000 g	0.00001 g	0.35 mg	2
11	200.00000 g	200.00002 g	0.00002 g	0.42 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor  $k$  – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

### Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2			
Weight Set No.:	WS32	Date of Issue:	15-Sep-2020
Certificate Number:	169521	Calibration Due Date:	13-Mar-2022
Thermo Baro Hygrometer			
Equipment No.:	IN74	Date of Issue:	09-Jul-2021
Certificate Number:	21H1470	Calibration Due Date:	28-Jun-2022

### Remarks

FACT adjustment functionally activated  
Equipment condition: Good  
Next calibration according to customer's procedure

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with  $k=2$  in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value  $R$  represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1.5 \cdot 10^{-4} / K$   
Temperature range on site for the evaluation of the measurement uncertainty in use:  $5 K$

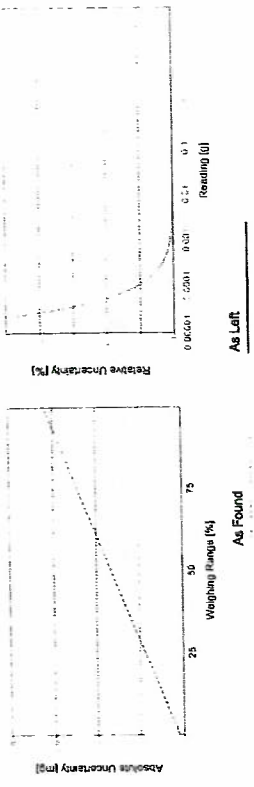
Linearization of Uncertainty Equation

Range	As Found		As Left	
	g	Max		
1	0.00001 g	81 g	$U_1 = 0.022 \text{ mg} + 0.00763 \text{ mg/g} \cdot R$	N/A
2	0.0001 g	220 g	$U_2 = 0.06 \text{ mg} + 0.00762 \text{ mg/g} \cdot R$	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left
	Absolute	Relative	
0.00220 g	0.022 mg	1.0%	N/A
0.02200 g	0.022 mg	0.10%	N/A
0.22000 g	0.024 mg	0.011%	N/A
2.20000 g	0.030 mg	0.0018%	N/A
220.0000 g	1.7 mg	0.00079%	N/A



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.



As Found ✓ As Left ✓

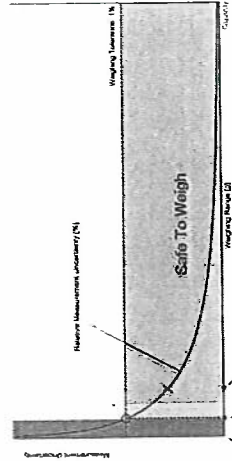
The weighing device meets the given process requirements.

Tests Performed: ☒ As Found ☐ As Left ☒ No adjustment/modifications made, As Left results correspond to As Found.

Process Requirements

Weighing Tolerance: 1% | Smallest Net Weight: 0.01000 g | Safety Factor: 2

Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. The graph reflects As Left testing, unless only As Found was performed.

## Minimum Weight

### As Found Minimum Weight Table

Tolerance	Minimum weights for different weighing tolerances and safety factors				
	1	2	3	5	10
0.1%	0.022382 g	0.045110 g	0.068193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.00449 g	0.008912 g	0.013368 g	0.022382 g	0.045110 g
1%	0.00223 g	0.00449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.00111 g	0.00223 g	0.00335 g	0.005563 g	0.011148 g
5%	0.00044 g	0.00089 g	0.00133 g	0.00223 g	0.00449 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

### As Left Minimum Weight Table

Tolerance	Minimum weights for different weighing tolerances and safety factors				
	1	2	3	5	10
0.1%	0.022382 g	0.045110 g	0.068193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.00449 g	0.008912 g	0.013368 g	0.022382 g	0.045110 g
1%	0.00223 g	0.00449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.00111 g	0.00223 g	0.00335 g	0.005563 g	0.011148 g
5%	0.00044 g	0.00089 g	0.00133 g	0.00223 g	0.00449 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with  $k = 2$  and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

## Measurement Results

### Results Summary

Repeatability		Eccentricity		Error of Indication	
As Found	✓	As Found	✓	As Found	✓
As Left	✓	As Left	✓	As Left	✓

✓ = Passed  
✗ = Failed  
N = Safety Factor not met

### Repeatability

Test Load: 70 g

Tolerance	Control Limit		As Found		As Left	
	Std. Deviation	Result	Std. Deviation	Result	Std. Deviation	Result
0.1%	0.000005 g	✗	0.000010 g	✗	0.000010 g	✗
0.2%	0.000010 g	✓	0.000025 g	✓	0.000010 g	✓
0.5%	0.000025 g	✓	0.000050 g	✓	0.000010 g	✓
1%	0.000050 g	✓	0.000100 g	✓	0.000010 g	✓
2%	0.000100 g	✓	0.000250 g	✓	0.000010 g	✓
5%	0.000250 g	✓				

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

### Eccentricity

Test Load: 100 g

Tolerance	Control Limit		As Found		As Left	
	Std. Deviation	Result	Std. Deviation	Result	Std. Deviation	Result
0.1%	0.0500 g	✓	0.0002 g	✓	0.0002 g	✓
0.2%	0.1000 g	✓	0.0002 g	✓	0.0002 g	✓
0.5%	0.2500 g	✓	0.0002 g	✓	0.0002 g	✓
1%	0.5000 g	✓	0.0002 g	✓	0.0002 g	✓
2%	1.0000 g	✓	0.0002 g	✓	0.0002 g	✓
5%	2.5000 g	✓	0.0002 g	✓	0.0002 g	✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.



## METTLER TOLEDO Service

As Found

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A
10.99994 g	0.00007 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.50000 g
49.99987 g	0.00009 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	1.25000 g
100.00000 g	0.00000 g	0.05000 g	0.10000 g	0.2500 g	0.5000 g	2.5000 g
149.99999 g	0.00001 g	0.07500 g	0.15000 g	0.3750 g	0.7500 g	3.7500 g
200.00000 g	0.00002 g	0.10000 g	0.20000 g	0.5000 g	1.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓

As Left

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A
10.99994 g	0.00007 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.50000 g
49.99987 g	0.00009 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	1.25000 g
100.00000 g	0.00000 g	0.05000 g	0.10000 g	0.2500 g	0.5000 g	2.5000 g
149.99999 g	0.00001 g	0.07500 g	0.15000 g	0.3750 g	0.7500 g	3.7500 g
200.00000 g	0.00002 g	0.10000 g	0.20000 g	0.5000 g	1.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

## METTLER TOLEDO

Service Date: 2022-02-07  
Document Number: TH4004-020-020722-LABBalanceR  
EASTERN THAI CONSULTING 1992 CO., LTD.  
603 Moo 11, Sukaphiban 8 Rd., Nong Kham, Siachua, Chonburi 20230  
Klun Saiporn Nakhin

## Balance Health Report

System Details		
Manufacturer:	Mettler Toledo	Accessory 1:
Model:	XS205DU	Accessory 2:
Serial number:	112623724	Weight set for routine testing:
Firmware:	4.0	No

Device History		Service History	
Instrument in use:	Yes	Last preventive maintenance:	< 1 year
Instrument age:	3-10 years	Last instrument calibration:	< 1 year
Spare parts available:	Yes	Last minimum weight determination:	Never
Regulations:	ISO	Routine testing performed:	Don't know
Process tolerance in %:	1 %		
Simulate sample net weight:	0.0100 g		

Check List		General & Functional Checks	
Room temperature fluctuation	✓	Leveling	✓
Exposure to direct sun	✓	Cleanliness	✓
Vibrations	✓	Completeness - missing parts are additional remarks	✓
Draft	✓	Settings optimized for operating environment	✓
Dirt or dust	✓	Other - objections noted as additional remarks	—
Static	✓	Electrical Component Checks	✓
Draft shield	✓	Power supply	✓
Weighting pan position	✓	Sliding door drive	✓
Housing	✓	Internal weight drive	✓
Other - objections noted as additional remarks	—	Display	✓
		Other - objections noted as additional remarks	—

Recommendations		Process Efficiency	
Instrument calibration	Uninstall instrument		
Identify safe weighing range	Replace instrument		
GWP verification / risk assessment	Replace / add parts (see additional remarks)		
Preventive maintenance	Onsite repair		
Perform routine testing with test weights	Onsite repair		
User training	Use of accessories (see additional remarks)		
Contact	Khun Saiporn Nakhin	Document Control	Phone: 066-061-3303 Email: ds.haigard@mt.com
Additional Remarks & Recommendations			
Engineer Details			
Date:		07-Feb-2022	
Name:		Saiporn Nakhin	
Signature:			

This is not a certificate.

It should not be used to interpret final results for the testing of those devices.

Legend: ✓ Good/Pass Δ Needs Attention X Bad/Fail — Not Applicable

Report Version: 1.23.0.200  
Report Version: 2.1.0  
Form Number: F103C

METTLER TOLEDO

Report Version: 1.23.0.200  
Report Version: 2.1.0  
Form Number: F103C

Page 4 of 4

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Software Version: 1.23.0.200  
Report Version: 2.1.0  
Form Number: F103C

## **BAROMETER**

**Equipment : Analog Barometer**

**ID No. / Tag No. : BM001/41**

## CALIBRATION CERTIFICATE



Certificate No. : AD2205-163-0001  
 Date Issued : 20-May-22

**Customer** : Eastern Thai Consulting 1992 Co., Ltd.  
 683 Moo 11 Sukhaphibum 8 Rd., Nongkham, Sriracha, Chonburi 20230

**Equipment** : Analog Barometer

**Manufacturer** : Barigo  
**Model** : -  
**Serial No.** : -  
**ID No./Tag No.** : BM001/41  
**Date Received** : 12-May-22  
**Date Calibrated** : 20-May-22  
**Calibrated by** : Mr. Saruth Srichutikul

### Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

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Approved by



Page 1 of 2

**Certificate No. :** AD2205-163-0001  
**Environment** : Ambient Temperature : (25 ± 2)°C  
 Relative Humidity : (50 ± 15)%RH

STD Reading hPa	UUC Reading (hPa) Before Adjusted	UUC Reading (hPa) After Adjusted	UUC Error hPa	Uncertainty ± hPa
990.00	990.0	-	0.00	0.59
1000.00	1000.0	-	0.00	0.59
1010.00	1010.0	-	0.00	0.59
1020.00	1020.0	-	0.00	0.59
1030.00	1030.0	-	0.00	0.59

STD = Standard

UUC = Unit Under Calibration

**Calibrated condition :** Pressure Medium : Air : Density = 1.19 kg/m<sup>3</sup> @ 20°C, 1 bar  
 Mounting Position : Vertical  
 Reference Level : at center of its dial

Description of UUC :	Range	955 - 1075	hPa Absolute
	Calibration Range	990 - 1030	hPa Absolute
	Scale Interval	1	hPa
	Resolution	0.5	hPa Absolute

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P21 00086 for Reference Pressure Monitor Serial No. 1598, Due 08-Nov-22

End of Certificate



**Hot Air Oven**

**Model : UFE 500**

**Serial No. : G511.0182**

NSC-TISI-TIS17025  
CALIBRATION 0152

Page 1 of 3

Certificate No. : 22-011766

Sample Code : 22-04498-003

## CERTIFICATE OF CALIBRATION

**Customer** : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhaphiban 8 Rd., Nongkham,  
Sriacha, Chonburi 20230

**Location of Calibration** : EASTERN THAI CONSULTING 1992 CO., LTD.  
(Laboratory)

**Equipment** : Temperature controlled enclosures (Hot air oven)  
**Manufacturer** : Memmert  
**Model** : UFE 500  
**Serial No.** : G51.0182  
**ID No.** : LABE17/4  
**Date of Receipt** : 03 February 2022  
**Date of Calibration** : 03 February 2022

**Condition of Calibration**

1. Environment  
1.1 Ambient temperature : Maximum 27.5 °C ; Minimum 26.4 °C  
1.2 Relative humidity : Maximum 59.5 % ; Minimum 50.8 %  
1.3 Line voltage supplied : Maximum 225.1 VAC ; Minimum 223.2 VAC

**2. Calibration method**

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

**3. Reference standard instrument**

Instrument	ID No.	Certificate No.	Due Date
Date Acquisition With Sensor (RTD-Pr00)	LB-DA-11 (RTD-148 to RTD-155, RTD-227)	21-041213	09 May 2022

**4. This certificate is traceable to the international system of unit (SI Unit).**

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

**5. This result of calibration was found accurate as shown on date and place of calibration only.**

6. Condition of calibration item : Normal

Calibrated by

Approved by

Issue date

11 February 2022

The uncertainties are for a confidence probability of approximately 95%.

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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CONTACT@AMARC.CO.TH  
WWW.AMARC.CO.TH  
Effective Date: 15/10/21

NSC-TISI-TIS17025  
CALIBRATION 0152

Page 2 of 3

Certificate No. : 22-011766

Sample Code : 22-04498-003

## REPORT OF CALIBRATION

**Results of Calibration**

Resolution : 0.5 °C

**1. Reporting of Temperature**

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# g <sup>Ref</sup>
104	103.5	103.5	104.46	104.45	#####	104.07	104.46	104.42	104.34	104.07	104.30	0.53	2.00

**2. Characterization results**

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
104	0.12	0.80	1.13

**Notes**

- UUC\* = Unit Under Calibration

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Rev.09

CONTACT@AMARC.CO.TH  
WWW.AMARC.CO.TH  
Effective Date: 15/10/21

## REPORT OF CALIBRATION

### Results of Calibration

#### Notes

1. Sensor installation locations
  - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
  - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :  
W = 56 cm ; D = 40 cm ; H = 48 cm
3. Air valve or fresh air level : Off
4. Fan level : Open

5. The quoted uncertainty includes " Stability of chamber and loading effect in chamber at 20% of uniformity ".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC\* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

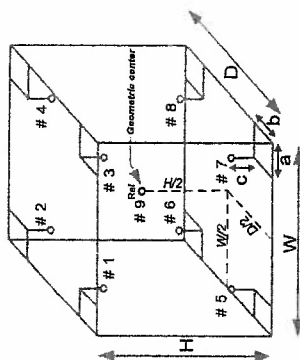


Figure: Example of sensor installation Positions

**Primary Flow Calibrator**

**Serial No. : 110619**



**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0644**

# CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER    168440



Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 1  
Approved signatory  
N.Smith  
Electronically signed:



## Dosemeter

### Instrument Information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co., Ltd. 683 Moo 11  
Model:              CR-110A                                      Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number:      CB0644                                      20230  
Firmware version:    504

### Test summary

Date of calibration:    14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TGA1241	419342
Multimeter	Fluke	8845A	9440020
Multimeter	Fluke	8845A	2490007

### Notes



This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.



**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0956**

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a coverage probability of approximately 95%.

**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0641**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER 168446



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Dosemeter

Instrument information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co.,Ltd. 683 Moo 11  
Model:              CR-110A                                      Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number:      CB0641                                      20230  
Firmware version:    504

Test summary

Date of calibration:    14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Multimeter	Fluke	8845A	2490007
Signal Generator	TTi	TGA1241	419342
Multimeter	Fluke	8845A	9440020

Notes



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**NOISE DOSI METER**

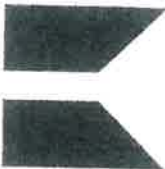
**MODEL : CR:110A**

**SERIAL No. : CA8888**

# CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc

DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER    168425



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United Kingdom

Page 1 of 1

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Electronically signed:



## Dosemeter

### Instrument information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co.Ltd, 683 Moo 11  
Model:              CR:110A                              Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number:      CA888                              20230  
Firmware version:    504

### Test summary

Date of calibration:    14/01/22

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTI	TGA1241	419342
Multimeter	Fluke	8845A	2490007
Multimeter	Fluke	8845A	9440020

### Notes



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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0954**



# CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER    168445



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## Dosimeter

### Instrument information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co. Ltd. 683 Moo 11  
Model:              CR:110A                              Sukaphibal 8 Rd., Nongkham, Siracha, Chonburi  
Serial number:      CB0954                              20230  
Firmware version:    504

### Test summary

Date of calibration:    14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Multimeter	Fluke	8845A	9440020
Multimeter	Fluke	8845A	2490007
Signal Generator	TTi	TGA1241	419342

### Notes



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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0642**

# CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER 168441



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## Dosimeter

### Instrument information

Manufacturer: Cirrus Research plc      Notes: Eastern Thai Consulting 1992 Co., Ltd. 683 Moo 11  
Model: CR:110A      Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number: CB0642      20230  
Firmware version: 504

### Test summary

Date of calibration: 14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TGA1241	419342
Multimeter	Fluke	8845A	2490007
Multimeter	Fluke	8845A	9440020

### Notes

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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CA8889**

# CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 14/01/22 CERTIFICATE NUMBER 168429



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YO14 0PH  
United Kingdom

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Approved signatory  
N. Smith  
Electronically signed:



## Dosimeter

### Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co., Ltd. 683 Moo 11  
Model: CR-110A Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number: CA8889 20230  
Firmware version: 504

### Test summary

Date of calibration: 14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Multimeter	Fluke	8845A	9440020
Signal Generator	TTi	TGA1241	419342
Multimeter	Fluke	8845A	2490007

### Notes

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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CA8887**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER    168426



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Electronically signed:

Dosemeter

Instrument Information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co., Ltd. 883 Moo 11  
Model:              CR-110A                                      Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number:      CA8887                                      20230  
Firmware version:    504

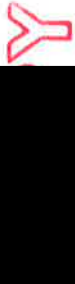
Test summary

Date of calibration:    14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Multimeter	Fluke	8845A	2490007
Signal Generator	TTi	TGA1241	419342
Multimeter	Fluke	8845A	9440020

Notes



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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0957**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER    168442



Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 1  
Approved signatory  
N.Smith  
Electronically signed:



Dosimeter

Instrument information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co.,Ltd. 683 Moo 11  
Model:              CR-110A                              Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number:      CB0957                              20230  
Firmware version:    504

Test summary

Date of calibration:    14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTI	TGA1241	419342
Multimeter	Fluke	8845A	2490007
Multimeter	Fluke	8845A	9440020

Notes



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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0643**

# CERTIFICATE OF CALIBRATION

ISSUED BY      **Cirrus Research plc**

DATE OF ISSUE    **12/11/21**      CERTIFICATE NUMBER    **165840**



**Cirrus Research plc**  
**Acoustic House**  
**Bridlington Road**  
**Hummanby**  
**North Yorkshire**  
**YO14 0PH**  
**United Kingdom**

Page 1 of 1  
Approved signatory  
**N.Smith**  
Electronically signed:

## Dosemeter

### Instrument information

Manufacturer:      **Cirrus Research plc**      Notes:      **Eastern Thal Consulting 1992 Co., Ltd**  
Model:              **CR:110A**                              **683 Moo11 Sukaphibal 8 Rd., Nongkham, Sriracha,**  
Serial number:      **CB0643**                              **Chonburi, 20230**  
Firmware version:    **504**

### Test summary

Date of calibration:    **12/11/21**  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTI	TGA1241	257310
Multimeter	Fluke	8845A	1520023
Multimeter	Fluke	8845A	2490007

### Notes

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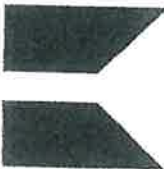
**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0640**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER    168431



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Acoustic House  
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Hunmanby  
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YO14 0PH  
United Kingdom

Page 1 of 1
Approved signatory N.Smith
Electronically signed: 

Dosemeter

Instrument information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co.,Ltd. 683 Moo 11  
Model:              CR-110A                                      Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi 2  
Serial number:      CB0640  
Firmware version:    504

Test summary

Date of calibration:    14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Multimeter	Fluke	8845A	9440020
Signal Generator	TTi	TGA1241	419342
Multimeter	Fluke	8845A	2490007

Notes



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**NOISE DOSI METER**

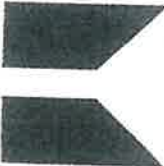
**MODEL : CR:110A**

**SERIAL No. : CA8887**



CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER    168426



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Acoustic House  
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North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 1
Approved signatory N.Smith
Electronically signed: 

Dosemeter

Instrument information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co.,Ltd. 683 Moo 11  
Model:              CR-110A                                      Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number:      CA8887                                      20230  
Firmware version:    504

Test summary

Date of calibration:    14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Multimeter	Fluke	8845A	2490007
Signal Generator	TTi	TGA1241	419342
Multimeter	Fluke	8845A	9440020

Notes

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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0642**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER    168441



Cirrus Research plc  
Acoustic House  
Bridlington Road  
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United Kingdom

Page 1 of 1  
Approved signatory  
N.Smith  
Electronically signed:



Dosemeter

Instrument information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co.,Ltd. 683 Moo 11  
Model:              CR:110A                              Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number:      CB0642                              20230  
Firmware version:    504

Test summary

Date of calibration:    14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TGA1241	419342
Multimeter	Fluke	8845A	2490007
Multimeter	Fluke	8845A	9440020

Notes



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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0643**

# CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    12/11/21      CERTIFICATE NUMBER    165840



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Acoustic House  
Bridlington Road  
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United Kingdom

Page 1 of 1  
Approved signatory  
N.Smith  
Electronically signed:



## Dosimeter

### Instrument information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co., Ltd.  
Model:              CR:110A                              683 Moo11 Sukaphibal 8 Rd., Nongkham, Sriracha,  
Serial number:      CB0643                              Chonburi, 20230  
Firmware version:    504

### Test summary

Date of calibration:    12/11/21  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TGA1241	257310
Multimeter	Fluke	8845A	1520023
Multimeter	Fluke	8845A	2490007

### Notes



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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0644**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER    168440



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YO14 0PH  
United Kingdom

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Approved signatory  
N.Smith  
Electronically signed:

Dosemeter

Instrument Information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co.,Ltd. 683 Moo 11  
Model:              CR-110A                                      Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number:      CB0644                                      20230  
Firmware version:    504

Test summary

Date of calibration:    14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TGA1241	419342
Multimeter	Fluke	8845A	9440020
Multimeter	Fluke	8845A	2490007

Notes

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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0954**

# CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 14/01/22 CERTIFICATE NUMBER 168445

Cirrus Research plc  
Acoustic House  
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Hunmanby  
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YO14 0PH  
United Kingdom

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Approved signatory  
N.Smith

Electronically signed:

## Dosemeter

### Instrument information

Manufacturer: Cirrus Research plc

Model: CR:110A

Serial number: CB0954

Firmware version: 504

Notes: Eastern Thai Consulting 1992 Co., Ltd. 683 Moo 11  
Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
20230

### Test summary

Date of calibration: 14/01/22

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Multimeter	Fluke	8845A	9440020
Multimeter	Fluke	8845A	2490007
Signal Generator	TTi	TGA1241	419342

### Notes

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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0641**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER    168446



Cirrus Research plc  
Acoustic House  
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North Yorkshire  
YO14 0PH  
United Kingdom

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Approved signatory  
N. Smith  
Electronically signed:



Dosemeter

Instrument information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co.,Ltd. 683 Moo 11  
Model:              CR:110A                              Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number:      CB0641                              20230  
Firmware version:    504

Test summary

Date of calibration:    14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Multimeter	Fluke	8845A	2490007
Signal Generator	TTI	TGA1241	419342
Multimeter	Fluke	8845A	9440020

Notes



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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0957**

# CERTIFICATE OF CALIBRATION

ISSUED BY      **Cirrus Research plc**  
DATE OF ISSUE    **14/01/22**      CERTIFICATE NUMBER **168442**



**Cirrus Research plc**  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 1  
Approved signatory  
N.Smith  
Electronically signed:

## Dosimeter

### Instrument information

Manufacturer:      Cirrus Research plc      Notes:      Eastern Thai Consulting 1992 Co.,Ltd. 683 Moo 11  
Model:              CR:110A                              Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi  
Serial number:      CB0957                              20230  
Firmware version:    504

### Test summary

Date of calibration:    14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTI	TGA1241	419342
Multimeter	Fluke	8845A	2490007
Multimeter	Fluke	8845A	9440020

### Notes



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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0956**



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**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0640**

# CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc

DATE OF ISSUE    14/01/22      CERTIFICATE NUMBER    168431



Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 1

Approved signatory  
N.Smith  
Electronically signed:



## Dosemeter

### Instrument information

Manufacturer: Cirrus Research plc      Notes: Eastern Thai Consulting 1992 Co.,Ltd, 683 Moo 11  
Model: CR-110A      Sukaphibal 8 Rd., Nongkham, Sriracha, Chonburi 2  
Serial number: CB0640  
Firmware version: 504

### Test summary

Date of calibration: 14/01/22  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Multimeter	Fluke	8845A	9440020
Signal Generator	TTI	TGA1241	419342
Multimeter	Fluke	8845A	2490007

### Notes

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