



## ภาคผนวก จ

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เอกสารสอบเทียบเครื่องมือวิเคราะห์

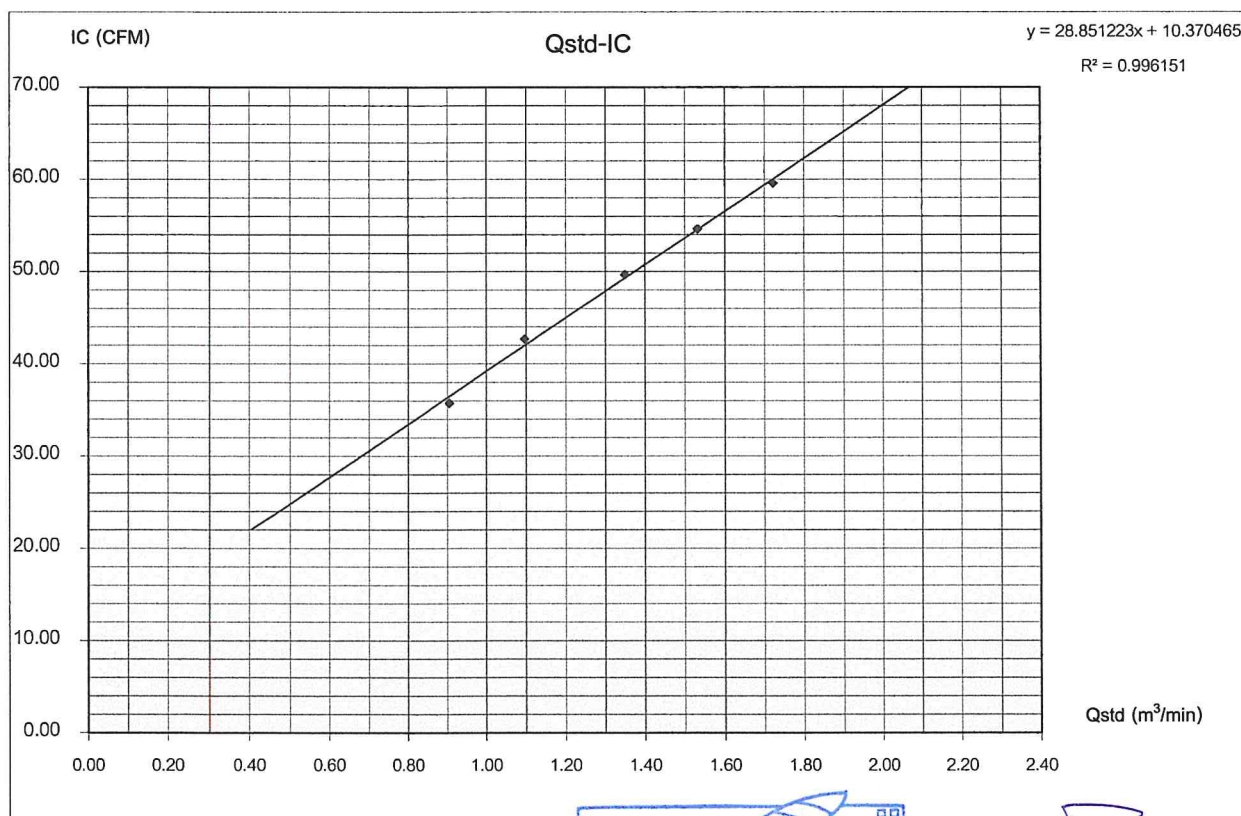
## TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2025-00875			Date	December 4, 2025
Sampler Location	A1 บ้านพักอาศัยทางด้านทิศเหนือ			Start Time	10:18 AM
Sampler Number	TSP No.A25	Transfer Standard Type	Orifice	Stop Time	10:28 AM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Narongrit Tibja
Motor Serial Number	2152	Calibrator Serial Number	2715		
Recorder Serial Number	2411				

Plate No.	(Delta H)			( A )	( X )	( I )	( Y )	Temperature	Barometric	Start	Stop
	Pressure Drop Across Orifice (inH <sub>2</sub> O)			[ΔH <sub>2</sub> O(Pa/P <sub>std</sub> )(T <sub>std</sub> /Ta)] <sup>1/2</sup>	Qstd = (1/m)[(A-b)] ( m <sup>3</sup> /min )	ample Flow Rate Indication ( ft <sup>3</sup> /min )	IC = I[(Pa/P <sub>std</sub> )(T <sub>std</sub> /Ta)] <sup>1/2</sup>	Temperature (°K = °C+273)	Pressure ( mmHg )	Meter	Meter
	Positive	Negative	ΔH <sub>2</sub> O								
5	1.7	1.7	3.4	1.83166	0.90550	36.0	35.76	302.0	760.0		
7	2.5	2.5	5.0	2.22121	1.09623	43.0	42.71	302.0	760.0		
10	3.8	3.8	7.6	2.73849	1.34948	50.0	49.67	302.0	760.0		
13	4.9	4.9	9.8	3.10969	1.53122	55.0	54.63	302.0	760.0		
18	6.2	6.2	12.4	3.49797	1.72132	60.0	59.60	302.0	760.0		
Linear Regression Y ON X : Y= mX + b							Average	302.0	760.0		
1	Slope ( m )			2.04250	Linear Equation			r <sup>2</sup>	0.996151	Pstd(mmHg)	760.0
2	Intercept ( b )			-0.01783	Set Point Flow Rate ( X ) ( m <sup>3</sup> /min )		1.133	r	0.9980736	T <sub>NTP</sub>	298.15
3	Correlation Coefficient ( r )			0.99980	Final Set Flow Rate = ( I )		0	(Pa/Pstd)*(Tstd/Ta)			0.986754967
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.993355408

### COMMENT

Andersen Instruments, Inc.



Checked By

( Mr. Prayun Detkla )  
Technician



Approved By

( Mr. Panupon Podang )  
Environmental Scientist

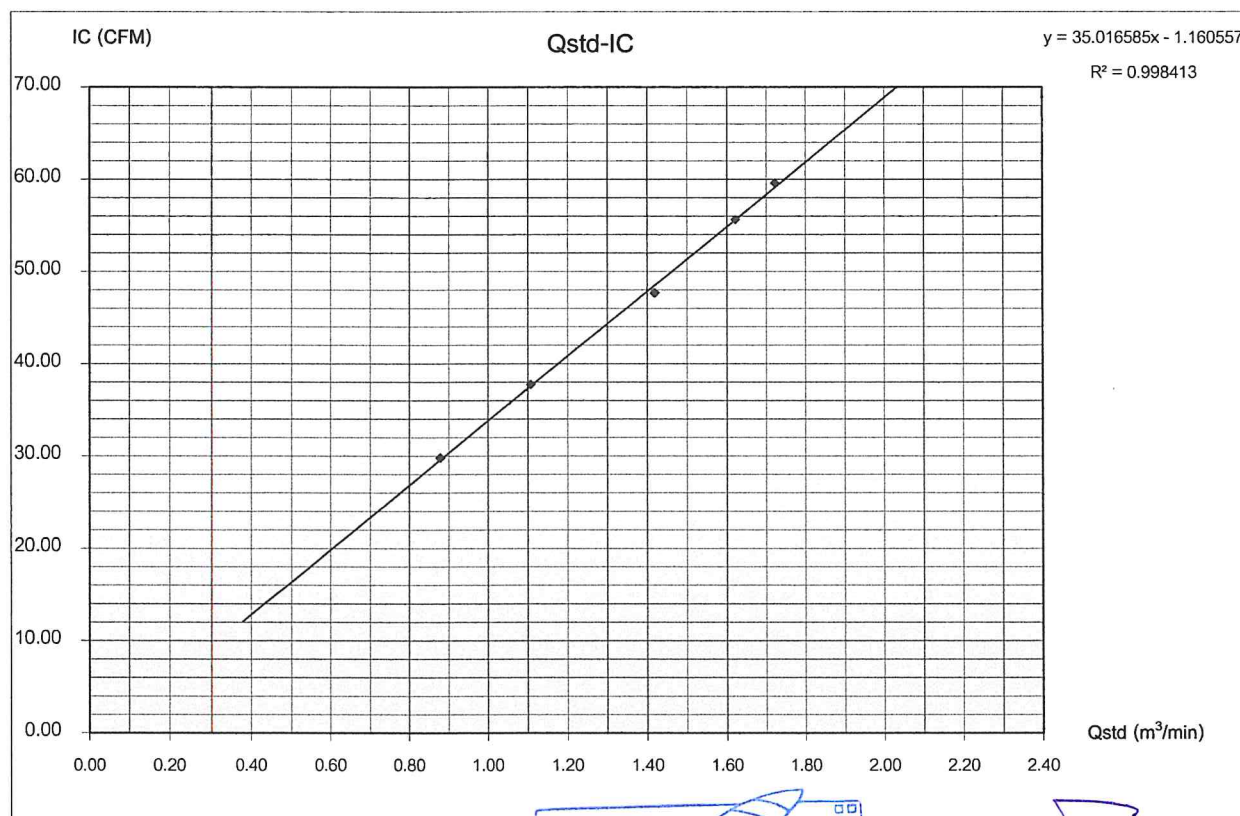
# PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2025-00875			Date	December 4, 2025
Sampler Location	A1 บ้านพักอาศัยทางด้านทิศเหนือ			Start Time	10:28 AM
Sampler Number	PM-10 No.22	Transfer Standard Type	Orifice	Stop Time	10:38 AM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Narongrit Tibja
Motor Serial Number	2138	Calibrator Serial Number	2715		
Recorder Serial Number	2389				

Plate No.	(Delta H) Pressure Drop Across Orifice (inH <sub>2</sub> O)			( A ) [ΔH <sub>2</sub> O(Pa/P <sub>std</sub> )(T <sub>std</sub> /T <sub>a</sub> )] <sup>1/2</sup>	( X ) Qstd = (1/m)[(A-b)] ( m <sup>3</sup> /min )	( I ) Sample Flow Rate Indication ( ft <sup>3</sup> /min )	( Y ) IC = I[(Pa/P <sub>std</sub> )(T <sub>std</sub> /T <sub>a</sub> )] <sup>1/2</sup>	Temperature (°K = °C+273)	Barometric Pressure ( mmHg )	Start Meter	Stop Meter
	Positive	Negative	ΔH <sub>2</sub> O								
5	1.6	1.6	3.2	1.77697	0.87873	30.0	29.80	302.0	760.0		
7	2.6	2.5	5.1	2.24331	1.10705	38.0	37.75	302.0	760.0		
10	4.2	4.2	8.4	2.87902	1.41829	48.0	47.68	302.0	760.0		
13	5.5	5.5	11.0	3.29459	1.62175	56.0	55.63	302.0	760.0		
18	6.2	6.2	12.4	3.49797	1.72132	60.0	59.60	302.0	760.0		
Linear Regression Y ON X : Y= mX + b							Average	302.0	760.0		
1	Slope ( m )			2.04250	Linear Equation			r <sup>2</sup>	0.998413	Pstd(mmHg)	760
2	Intercept ( b )			-0.01783	Set Point Flow Rate ( X ) ( m <sup>3</sup> /min )		1.133	r	0.9992062	T <sub>NTP</sub>	298
3	Correlation Coefficient ( r )			0.99980	Final Set Flow Rate = ( I )		0	(Pa/Pstd)*(Tstd/Ta)			0.986754967
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.993355408

## COMMENT

Andersen Instruments, Inc.



Checked By

( Mr. Prayin Detkla )  
Technician

Approved By

( Mr. Panupon Podang )  
Environmental Scientist



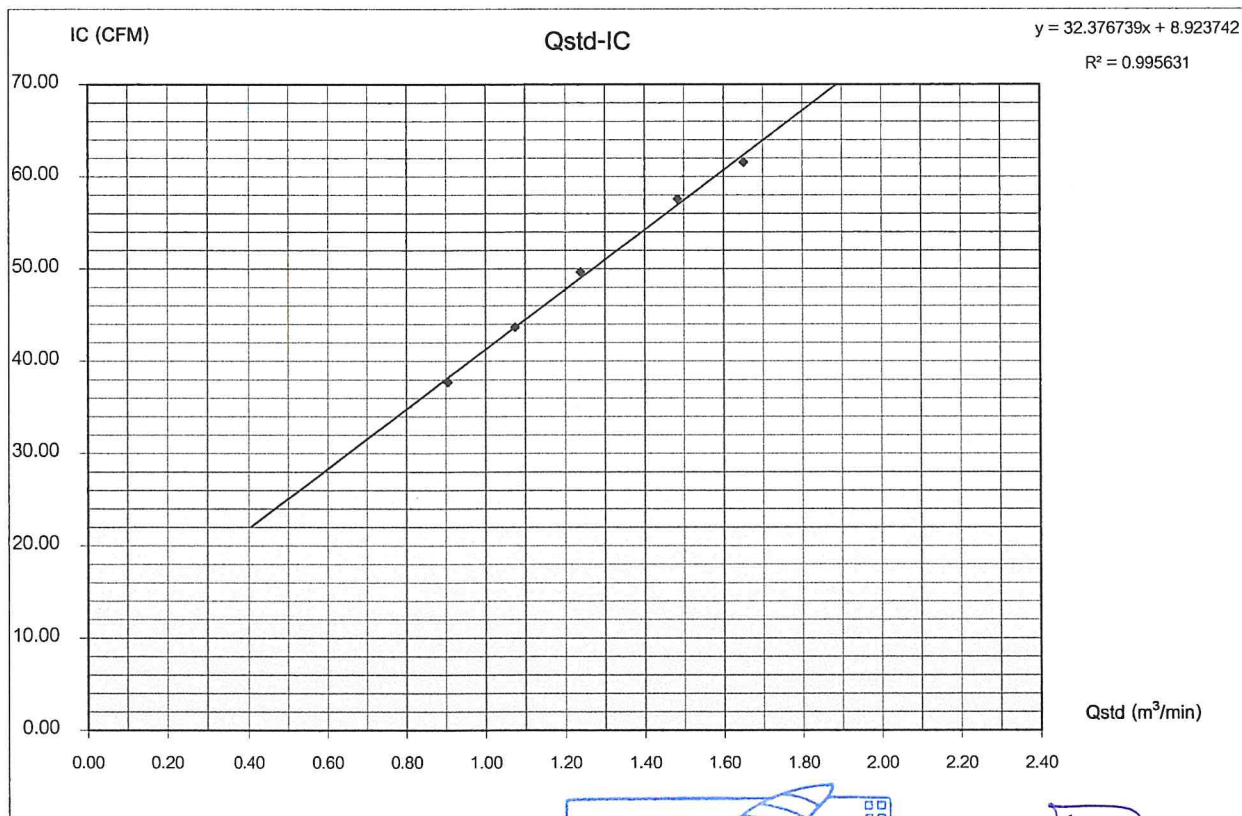
# TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2025-00875			Date	December 4, 2025
Sampler Location	A2 บ้านพักอาศัยตำบลวัดระแวง			Start Time	9:30 AM
Sampler Number	TSP No.A15	Transfer Standard Type	Orifice	Stop Time	9:40 AM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Narongrit Tibja
Motor Serial Number	102950701	Calibrator Serial Number	2715		
Recorder Serial Number	610-650				

Plate	(Delta H)			( A )	( X )	( I )	( Y )	Temperature	Barometric	Start	Stop	
No.	Pressure Drop Across Orifice (inH <sub>2</sub> O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	Qstd = (1/m)[(A-b)] ( m <sup>3</sup> /min )	sample Flow Rate Indication ( ft <sup>3</sup> /min )	IC = I[(Pa/P <sub>std</sub> )(T <sub>std</sub> /Ta)] <sup>1/2</sup>	(*K = °C+273)	Pressure ( mmHg )	Meter	Meter	
	Positive	Negative	ΔH <sub>2</sub> O									
5	1.7	1.7	3.4	1.83166	0.90550	38.0	37.75	302.0	760.0			
7	2.4	2.4	4.8	2.17633	1.07425	44.0	43.71	302.0	760.0			
10	3.2	3.2	6.4	2.51301	1.23909	50.0	49.67	302.0	760.0			
13	4.6	4.6	9.2	3.01300	1.48388	58.0	57.61	302.0	760.0			
18	5.7	5.7	11.4	3.35395	1.65081	62.0	61.59	302.0	760.0			
Linear Regression Y ON X : Y= mX + b							Average	302.0	760.0			
1	Slope ( m )			2.04250	Linear Equation			r <sup>2</sup>	0.995631	Pstd(mmHg)	760.0	
2	Intercept ( b )			-0.01783	Set Point Flow Rate ( X ) ( m <sup>3</sup> /min )		1.133	r	0.9978131	T <sub>NTP</sub>	298.0	
3	Correlation Coefficient ( r )			0.99980	Final Set Flow Rate = ( I )		0	(Pa/Pstd)*(Tstd/Ta)		0.986754967		
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.993355408	

## COMMENT

Andersen Instruments, Inc.



Checked By

( Mr. Prayun Detkla )  
Technician



Approved By

( Mr. Panupon Podang )  
Environmental Scientist



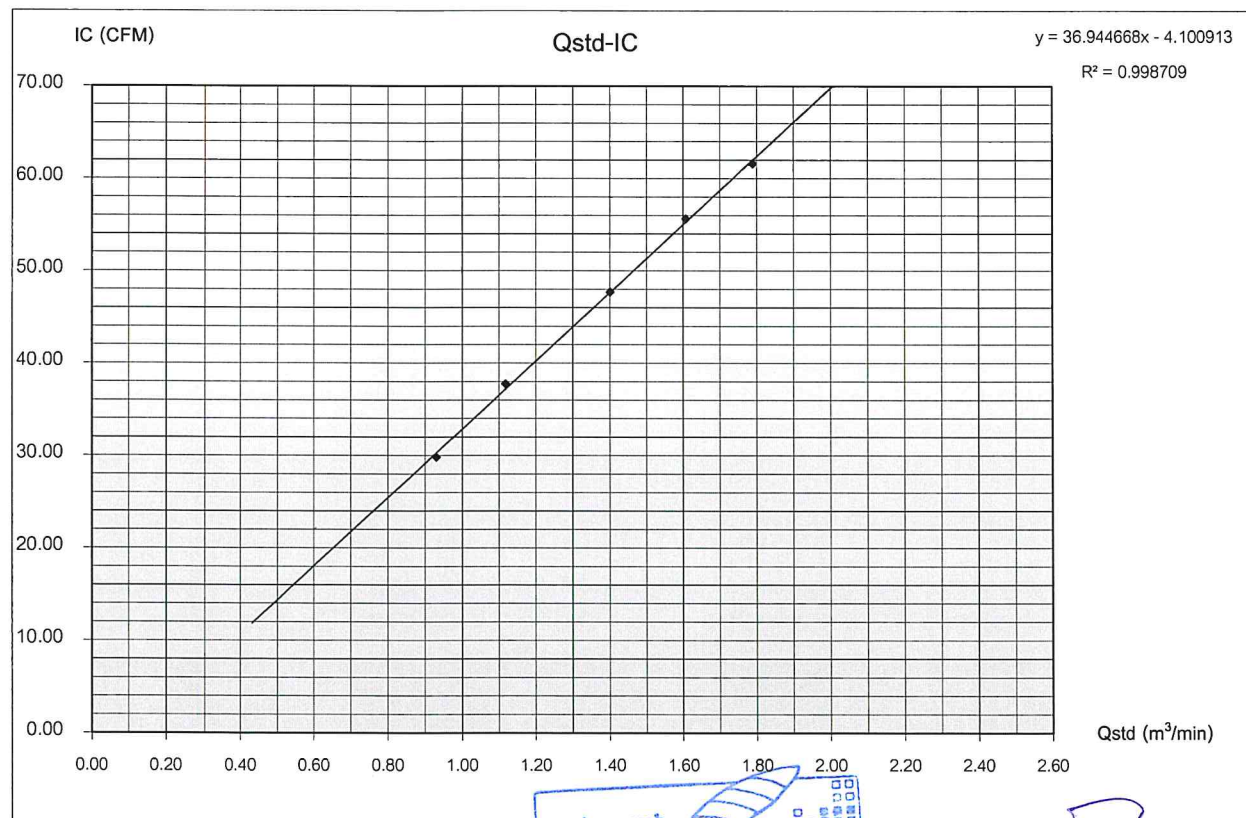
# PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2025-00875			Date	December 4, 2025
Sampler Location	A2 บ้านพักอาศัยทางด้านทิศตะวันออก			Start Time	9:40 AM
Sampler Number	PM-10 No.3	Transfer Standard Type	Orifice	Stop Time	9:50 AM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Narongrit Tibja
Motor Serial Number	610-047	Calibrator Serial Number	2715		
Recorder Serial Number	7356				

Plate No.	(Delta H)			( A )	( X )	( I )	( Y )	Temperature	Barometric	Start	Stop
	Pressure Drop Across Orifice (inH <sub>2</sub> O)			[ΔH <sub>2</sub> O(Pa/P <sub>std</sub> )(T <sub>std</sub> /Ta)] <sup>1/2</sup>	Qstd = (1/m)/[(A-b)] ( m <sup>3</sup> /min )	ample Flow Rate Indicato ( ft <sup>3</sup> /min )	IC = I/[(Pa/P <sub>std</sub> )(T <sub>std</sub> /Ta)] <sup>1/2</sup>	(°K = °C+273)	Pressure ( mmHg )	Meter	Meter
	Positive	Negative	ΔH <sub>2</sub> O								
5	1.8	1.8	3.6	1.88476	0.93150	30.0	29.80	302.0	760.0		
7	2.6	2.6	5.2	2.26520	1.11776	38.0	37.75	302.0	760.0		
10	4.1	4.1	8.2	2.84454	1.40140	48.0	47.68	302.0	760.0		
13	5.4	5.4	10.8	3.26450	1.60702	56.0	55.63	302.0	760.0		
18	6.7	6.7	13.4	3.63628	1.78904	62.0	61.59	302.0	760.0		
Linear Regression Y ON X : Y= mX + b							Average	302.0	760.0		
1	Slope ( m )			2.04250	Linear Equation			r <sup>2</sup>	0.998709	Pstd(mmHg)	760.0
2	Intercept ( b )			-0.01783	Set Point Flow Rate ( X ) ( m <sup>3</sup> /min )		1.133	r	0.9993543	T <sub>NTP</sub>	298.0
3	Correlation Coefficient ( r )			0.99980	Final Set Flow Rate = ( I )		0	(Pa/Pstd)*(Tstd/Ta)		0.986754967	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.993355408	

COMMENT

Andersen Instruments, Inc.



Checked By

( Mr. Prayun Detkla )  
Technician

Approved By

( Mr. Panupon Podang )  
Environmental Scientist

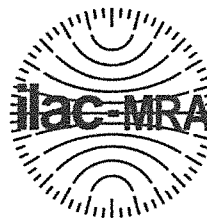


JIRANATEE ASSOCIATES CO.,LTD.

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Web site: www.jiranatee.com

Accredited calibration laboratory  
ISO/IEC 17025:2017  
NSC-TISI-TIS 17025  
CALIBRATION 0367

Flow measurement laboratory  
Calibration services department.



NSC – TISI – TIS 17025  
CALIBRATION 0367

## CERTIFICATE OF CALIBRATION

Certificate No. : COF-012-68

Page 1 of 2 Pages

**MEASUREMENT ITEM** : Top Load Orifice  
**MANUFACTURER** : TISCH  
**MODEL/TYPE** : TE-5025A  
**SERIAL NUMBER** : 2715  
**ID NUMBER** : -  
**CONDITION AS-RECEIVED** : Used item  
**CUSTOMER** : Environment Research & Technology Co., Ltd.  
25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,  
Toongsonghong, Laksi, Bangkok 10210

**RECEIVED DATE** : 19 Mar 2025  
**MEASUREMENT DATE** : 04 Apr 2025  
**ISSUE DATE** : 04 Apr 2025

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

### CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.  
Measurement Condition : The average values during measurement are 22.8 °C and 48.0 %RH.

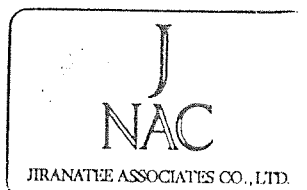
**NOTED:** The certificate is valid only to the item calibrated on date and place of calibration.

### TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☐ Mr. Sorawit Thachalad  
☒ Miss Jittraporn Lertsomphol



### Calibration procedure:

The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/IMC/W2-dp. The WI-CL-004 was used as a calibration guideline.

### Traceability:

This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0016-25.

### Uncertainty of Measurement:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor  $k=2$ , Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

Approved signatory: .....

Mr. Parinya Booncharoen  
Calibration Department Manager



JIRANATEE ASSOCIATES CO.,LTD.

Continuation of Certificate of Calibration Number COF-012-68

Page 2 of 2 Pages

#### MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The Humid air was used as a medium in the system. The standard conditions are 25°C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of  $Q$  Standard calibration data

Plate	Flow rate $m^3/min$	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	$\Delta p_{meter}$ mmHg	$\Delta p_{Orifice}$ inH <sub>2</sub> O	$\gamma$	Standard Flow [ $Q_s$ ] $m^3/min$
1	0.703	763.408	22.80	21.70	55.036	1.767	1.337	0.663
2	1.002	763.415	22.80	21.93	59.943	3.539	1.892	0.937
3	1.121	763.490	22.81	22.09	41.674	4.696	2.180	1.075
4	1.167	763.535	22.86	22.28	31.148	5.234	2.301	1.135
5	1.411	763.550	23.07	22.56	30.042	7.678	2.786	1.373

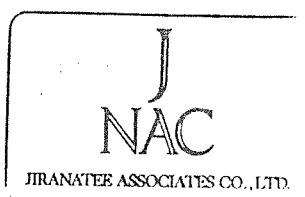
Slope ( $m$ ): 2.04250  
Intercept ( $b$ ): -0.01783  
Correlation coefficient ( $r$ ): 0.99980  
Uncertainty ( $k=2$ ): 0.015  $m^3/min$

Table 2: The results of  $Q$  actual calibration data

Plate	Flow rate $m^3/min$	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	$\Delta p_{meter}$ mmHg	$\Delta p_{Orifice}$ inH <sub>2</sub> O	$\gamma$	Standard Flow [ $Q_s$ ] $m^3/min$
1	0.703	763.408	22.80	21.70	55.036	1.767	0.828	0.655
2	1.002	763.415	22.80	21.93	59.943	3.539	1.171	0.926
3	1.121	763.490	22.81	22.09	41.674	4.696	1.349	1.062
4	1.167	763.535	22.86	22.28	31.148	5.234	1.424	1.122
5	1.411	763.550	23.07	22.56	30.042	7.678	1.726	1.358

Slope ( $m$ ): 1.27928  
Intercept ( $b$ ): -0.01102  
Correlation coefficient ( $r$ ): 0.99980  
Uncertainty ( $k=2$ ): 0.015  $m^3/min$

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





Mettler-Toledo (Thailand) Ltd.

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Bangna District, Bangkok 10260

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MT-TH.ServiceSupport@mt.com



NSC-TISI-TIS 17025  
CALIBRATION 0062

## Accuracy Calibration Certificate

### Customer

**Company:** Environment Research & Technology Co., Ltd.  
**Address:** 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsonghong  
**City:** Laksi **Contact:** Ramita Taengthai  
**Zip / Postal:** 10210  
**State / Province:** Bangkok  
**Order Number:**   
0 3 3 3 3 6 1 0 1 9

### Weighing Device

**Manufacturer:** Mettler Toledo **Instrument Type:** Weighing Instrument  
**Model:** AB204-S **Asset Number:** ERTC-L-IN-0048  
**Serial No.:** 1123103723 **Terminal Model:** N/A  
**Building:** N/A **Terminal Serial No.:** N/A  
**Floor:** 4 **Terminal Asset No.:** N/A  
**Room:** 406

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

### Procedure

**Calibration Guideline:** EURAMET cg-18 v. 4.0 (11/2015)  
**METTLER TOLEDO Work Instruction:** 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.

	Temperature		Humidity	
As Found	Start: 23.1 °C	End: 23.3 °C	Start: 35.7 %	End: 35.2 %

**As Found Calibration Date:** 16-Jan-2025  
**As Left Calibration Date:** N/A  
**Issue Date:** 18-Jan-2025

**Calibrator:**   
Nithit Jongkrod

**Approved Signatory:**   
Technical Manager / Head of Calibration Center

## Measurement Results

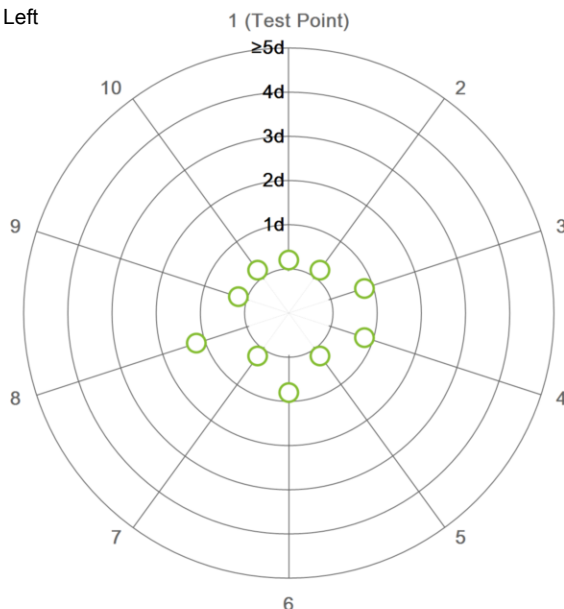
### Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0000 g	N/A
2	100.0000 g	N/A
3	100.0001 g	N/A
4	100.0001 g	N/A
5	100.0000 g	N/A
6	100.0001 g	N/A
7	100.0000 g	N/A
8	99.9999 g	N/A
9	100.0000 g	N/A
10	100.0000 g	N/A

Standard Deviation	0.00006 g	N/A
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○ As Found  
◆ As Left



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

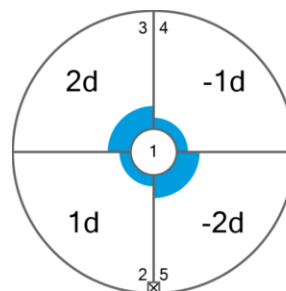
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	100.0001 g	N/A
3	100.0002 g	N/A
4	99.9999 g	N/A
5	99.9998 g	N/A

Maximum Deviation	0.0002 g	N/A
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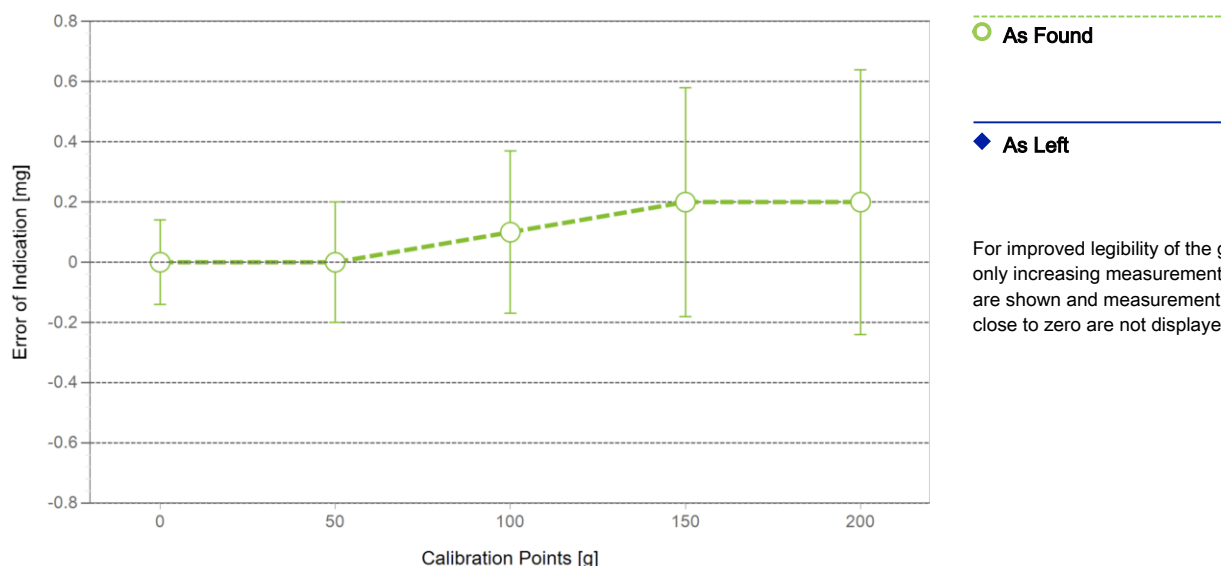
As Found

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	0.0000 g	0.0000 g	0.0000 g	0.14 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.15 mg	2
3	0.1000 g	0.1000 g	0.0000 g	0.15 mg	2
4	0.5000 g	0.5000 g	0.0000 g	0.15 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.15 mg	2
6	5.0000 g	5.0000 g	0.0000 g	0.16 mg	2
7	10.0000 g	10.0000 g	0.0000 g	0.16 mg	2
8	50.0001 g	50.0001 g	0.0000 g	0.20 mg	2
9	99.9999 g	100.0000 g	0.0001 g	0.27 mg	2
10	150.0000 g	150.0002 g	0.0002 g	0.38 mg	2
11	200.0001 g	200.0003 g	0.0002 g	0.44 mg	2



The expanded measurement uncertainty is reported as the standard measurement uncertainty multiplied by the coverage factor  $k$  such that the coverage probability corresponds to approximately 95 %.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.  
The results of this calibration certificate relate only to the calibrated item.



## 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.:	WS52	Date of Issue:	17-Apr-2024
Certificate Number:	191753	Calibration Due Date:	15-Oct-2025

### Weight Set 2: OIML E2

Weight Set No.:	WS52-1	Date of Issue:	17-May-2024
Certificate Number:	C420107128	Calibration Due Date:	17-Oct-2025

### Weight Set 3: OIML E2

Weight Set No.:	WS52-2	Date of Issue:	17-May-2024
Certificate Number:	C420107129	Calibration Due Date:	28-Oct-2025

### Thermo Hygrometer

Equipment No.:	IN302	Date of Issue:	31-Oct-2024
Certificate Number:	SG-H-00908/67	Calibration Due Date:	17-Oct-2025

## Remarks

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

### 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:  $3.0 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 3 K

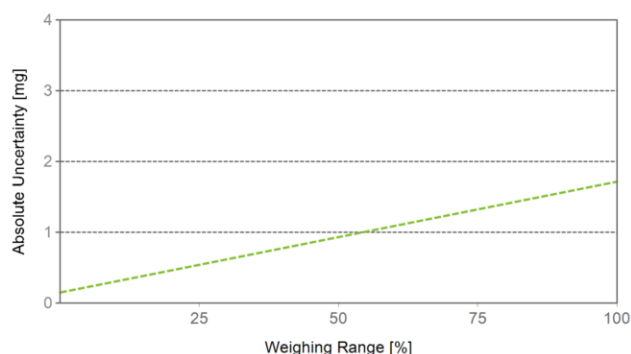
### Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.15 \text{ mg} + 0.00712 \text{ mg/g} \cdot R$	N/A

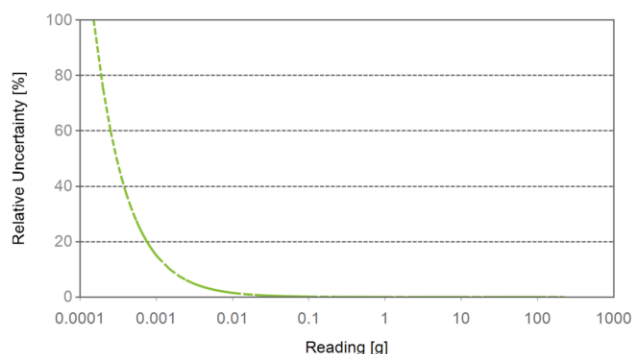
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.0220 g	0.15 mg	0.68%	N/A	N/A
0.2200 g	0.15 mg	0.069%	N/A	N/A
2.2000 g	0.17 mg	0.0075%	N/A	N/A
22.0000 g	0.31 mg	0.0014%	N/A	N/A
220.0000 g	1.7 mg	0.00078%	N/A	N/A



As Found



As Left

# 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.

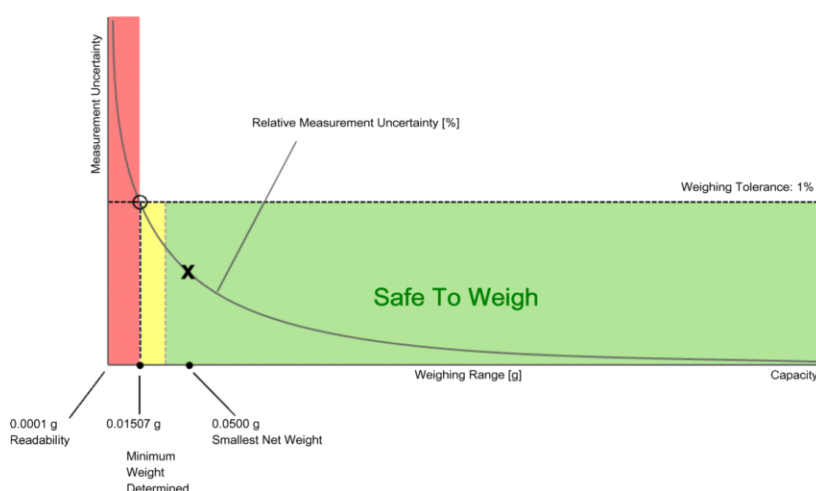
## Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.0500 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. This graph reflects As Left testing, unless only As Found was performed.



# Minimum Weight

## As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.15163 g	0.30546 g	0.46152 g	0.78056 g	1.62097 g
0.2%	0.07555 g	0.15163 g	0.22827 g	0.38321 g	0.78056 g
0.5%	0.03015 g	0.06039 g	0.09072 g	0.15163 g	0.30546 g
1%	0.01507 g	0.03015 g	0.04526 g	0.07555 g	0.15163 g
2%	0.00753 g	0.01507 g	0.02261 g	0.03771 g	0.07555 g
5%	0.00301 g	0.00602 g	0.00904 g	0.01507 g	0.03015 g



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

## As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.15163 g	0.30546 g	0.46152 g	0.78056 g	1.62097 g
0.2%	0.07555 g	0.15163 g	0.22827 g	0.38321 g	0.78056 g
0.5%	0.03015 g	0.06039 g	0.09072 g	0.15163 g	0.30546 g
1%	0.01507 g	0.03015 g	0.04526 g	0.07555 g	0.15163 g
2%	0.00753 g	0.01507 g	0.02261 g	0.03771 g	0.07555 g
5%	0.00301 g	0.00602 g	0.00904 g	0.01507 g	0.03015 g



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

⚠ = Safety Factor not met

## Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	N/A	0.00006 g*	N/A	0.00006 g*	N/A
0.2%	0.00005 g		✗		✗
0.5%	0.00013 g		✓		✓
1%	0.00025 g		✓		✓
2%	0.00050 g		✓		✓
5%	0.00125 g		✓		✓

\*The calculated standard deviation value is below the rounding error of the balance. The  $0.41 \cdot d$  rule is used for the assessment of this repeatability test and the calculation of the minimum weight.

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%	0.0500 g	0.0002 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.

**Error of Indication****As Found**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0001 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0000 g	0.0002 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

**As Left**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0001 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0000 g	0.0002 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 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.





# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 24 July, 2025

Certification No. 363/25

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III

Serial No. : WC20318A71 ID No. : No.18


Customer : Thai Environmental Technic Limited.  
1/6 Soi Ramkhamhaeng 145,  
Khwaeng/Khet Saphan Sung, Bangkok 10240.

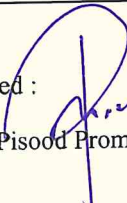
Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.2 hPa

### NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119  
: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023  
N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec  
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)  
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

Calibrated by :   
Mr. Watcharapol Subwat  
Mechanical Engineer

Signed :   
Mr. Pisood Promsut





# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

## The Result of Calibration

Certification No. 363/25

24 July, 2025

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacumm	Velocity	Velocity	Correction
	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.7	0.31
13.01	-	-	-	12.9	0.11
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

Vane Angel Bench Stand Model 18112	
Young Meteorological Instruments	
WIND DIRETION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

*Handwritten signature*

Mr. Watcharapol Subwat

Mechanical Engineer









THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0583

MTC No. EEL. BP. 48/0968

## CALIBRATION CERTIFICATE

Submitted by : Environment Research & Technology Co.,Ltd.

Address : 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road, Tungsonghong, Laksi, Bangkok, 10210.

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 :

### Ambient Environment

Description : Sound Calibrator

Temperature :  $(23 \pm 3) ^\circ\text{C}$

Manufacturer : BSWA TECH

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

Model : CA114

Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

Serial No. : 590048

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
  2. Measuring Amplifier Bruel&Kjaer 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 Panasonic VP-7722A S/N 041477D122.
  7. Condenser Microphone B&K 4180 S/N 2633526.

**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 : 15 Sep. 2025

Date of Calibration : 6 Oct. 2025

1 / 2  
W

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.

FM.BL.MTC.002 Rev.1

#### Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

#### Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,  
Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
(66) 08 3219 9440  
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

#### Office

196 Phahonyothin Road, Ladyao, Chatuchak,  
Bangkok 10900, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
(66) 08 1889 6827

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0583

MTC No. EEL. BP. 48/0968

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 IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	94.43	0.43	$\pm 0.10$	$\pm 0.75$ dB

2. Frequency


Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1000.6	0.6	$\pm 1.5$	$\pm 2.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.55	$\pm 0.50$	$\pm 4.0\%$

- Note :**
1. No adjustment.
  2. The calibrator pressure correction was not included.
  3. The microphone volume correction was not included.

Calibrated by :

  
.....  
(Mr. Weerachai Deechaiyae)

Approved by :

  
.....  
(Mr. Prawate Kluaypa)  
Director

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Date of Calibration : 6 Oct. 2025

Date of Issue : 7 Oct. 2025

Ref : 2011268091503676001

End of Certificate

2 / 2

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

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FM.BL.MTC.002 Rev.5

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
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Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

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Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
(66) 08 3219 9440  
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office

196 Phahonyothin Road, Ladyao, Chatuchak,  
Bangkok 10900, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
(66) 08 1889 6827



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



## Certificate of Calibration

Cert.No.: 25CH55

Page.: 1 of 3

**Equipment :** pH Meter  
**Manufacturer :** Eutech  
**Model :** pHTestr 30  
**Serial No. :** 3195381  
**ID No. :** -  
**Condition As-Received:** Used Item  
**Received Date :** 14 January 2025  
**Calibration Date :** 15 January 2025  
**Reference :** 2501-0443DN-8  
**Submitted by :** Environment Research & Technology Company Limited.  
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,  
Toongsonghong, Laksi, Bangkok 10210  
**Ambient Temperature :** (25 ± 2.5) °C  
**Relative Humidity :** (50 ± 15) %  
**Calibration Procedure :** In - house method :  
- CP-CH5 by direct measurement with DC voltage  
standard and direct measurement with  
- CP-CH5 by direct measurement with  
certified reference material (CRM)

**Calibrated by :** Walalak Sirithean

**Approved by :**

*Saithip*

Approved Signatory

- ( ) Pornthippa Tameyakul  
( ) Ponpan Paipim  
(✓) Saithip Meangmai

**Issue Date :** 17 January 2025

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

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





Cert.No.: 25CH55

Page.: 2 of 3

**Condition of this calibration result**

**1. Reference Standard Instrument**

<b><u>Instrument</u></b>	<b><u>Serial No.</u></b>	<b><u>ID No.</u></b>	<b><u>Cert. No.</u></b>	<b><u>Due Date</u></b>
1)Ref. Standard Thermometer	4982054	110RC044	241757	14 July 2025

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

- 2. Certified Reference Materials** :The measurement results are traceable to SI through Hach Lenge GmbH Ltd.,  
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00  
:The measurement results are traceable to SI through CPA chem Ltd.,  
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<b><u>Buffer Solution</u></b>	<b><u>Manufacturer</u></b>	<b><u>Lot No.</u></b>	<b><u>Exp. date</u></b>
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 6.999	Hach Lenge GmbH	C03220	29 Oct 2026
pH 10.010	CPA chem	1034205	27 Sep 2025

**Calibration Results**

**Function** : pH Measurement

**Performing three buffers standard curve by using buffer nominal pH (4,7,10)**

<b>Unit Under Calibration</b>	<b>Standard pH Buffer Solution</b>	<b>Actual pH Reading</b>	<b>Actual mV Reading (mV)</b>	<b>Uncertainty of pH Measurement (±)</b>	<b>Coverage factor <i>k</i></b>
pH Electrode S/N.: 3195381	4.008	4.01	N/A	0.0071	2.00
	6.999	7.00	N/A	0.0085	2.00
	10.010	10.01	N/A	0.0092	2.00

**Remark**

- pH meter does not have voltage mode.
- Can not connect the BNC because the plug does not match with the socket.
- N/A = Not Available



Cert.No.: 25CH55

Page.: 3 of 3

### Calibration Results

#### Function : Temperature Measurement

#### **( \* ) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : -

- Serial No. : 3195381

Dimension of probe

- Length : 58 mm.

- Diameter : 6 mm.

- Immersion Depth : 36 mm.

Calibration Point ( °C )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty of measurement ( ± °C )	Coverage factor <i>k</i>
25.0	25.001	25.0	-0.001	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
35.0	35.000	35.0	0.000	0.13	2.00

**Remark** - UUC\* = Unit Under Calibration

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

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**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**  
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL.0-2717-3000-29 FAX.0-2719-9484



## Certificate of Calibration

Cert. No.: 25TM33

Page : 1 of 3

**Equipment :** Hot Air Oven

**Manufacturer :** Memmert

**Model :** UF 110

**Serial No. :** B414.0652

**ID No. :** ERTC-L-In-098

**Submitted by :** Environment Research & Technology Company Limited.  
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,  
Toongsonghong, Laksi,  
Bangkok 10210

**Location :** หน้าห้อง 510

**Received Order :** 06 January 2025

**Calibration Date :** 06 January 2025

**Ambient Temperature :** (  $26 \pm 10$  ) °C

**Relative Humidity :** (  $50 \pm 30$  ) %

**AC Line Voltage :** (  $220 \pm 22$  ) V

**Calibrated by :** Khit Ruttanaprapachai

**Approved by :**

*Kunchit*

Approved Signatory

- ( ) Ponpan Paipim  
( ) Suwit Imjai  
(✓) Kunchit Promprat

**Issue Date :** 18 January 2025

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

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**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2501-0004ON-3

**Cert. No.:** 25TM33

**Page :** 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1 ) Data Acquisition	MY49001451	24LM44	TPA	17 Mar 2025
2 ) Data Acquisition	MY49001451	24LM79	TPA	29 May 2025

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

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

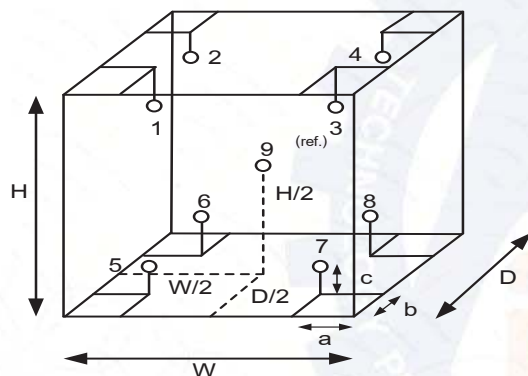
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

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

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

**Fresh air setting :** Close

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	28	27
REL.Humid. ( % )	55	58
AC Supply ( Volt )	222	221



Ref. Std. ID No.: @ Calibration Point		
Position :	( 104 ) °C	( 180 ) °C
1	19RTD-2/1	24-19TC-01
2	19RTD-2/2	24-19TC-02
3	19RTD-2/3	24-19TC-03
4	19RTD-2/4	24-19TC-04
5	19RTD-2/5	24-19TC-05
6	24-19RTD-2/6	24-19TC-06
7	19RTD-2/7	24-19TC-07
8	19RTD-2/8	24-19TC-08
9 (ref.)	19RTD-2/9	24-19TC-09

**Probe Installation Details :**

a = 5.0 cm  
 b = 5.0 cm  
 c = 5.0 cm

**Dimension of Chamber :**

D = 0.40 m  
 W = 0.56 m  
 H = 0.48 m  
 Capacity = 0.11 m<sup>3</sup>



**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2501-0004ON-3  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

**Cert. No.:** 25TM33

**Page :** 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
104.0	104.0	104.0	0.13	1.2	1.8	2
180.0	180.0	180.0	0.54	3.6	4.7	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.884	103.140	103.191	103.508	104.382	103.829	104.340	103.742	104.282	0.42
180.0	181.068	177.733	178.025	179.100	181.089	180.099	181.795	180.145	181.130	1.4

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

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

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

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

**UUC\* :** Unit Under Calibration

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

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

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**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**  
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TEL.0-2717-3000-29 FAX.0-2719-9484



## Certificate of Calibration

Cert. No.: 25TM32

Page : 1 of 3

**Equipment :** Hot Air Oven

**Manufacturer :** Binder

**Model :** FED 115 E2

**Serial No. :** 11-22823

**ID No. :** ERTC-L-In-076

**Submitted by :** Environment Research & Technology Company Limited.  
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,  
Toongsonghong, Laksi,  
Bangkok 10210

**Location :** หน้าห้อง 510

**Received Order :** 06 January 2025

**Calibration Date :** 06 January 2025

**Ambient Temperature :** (  $26 \pm 10$  ) °C

**Relative Humidity :** (  $50 \pm 30$  ) %

**AC Line Voltage :** (  $220 \pm 22$  ) V

**Calibrated by :** Khit Ruttanaprapachai

**Approved by :**

Approved Signatory

- ( ) Ponpan Paipim  
( ) Suwit Imjai  
(✓) Kunchit Promprat

**Issue Date :** 18 January 2025

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

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.





**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2501-0004ON-2

**Cert. No.:** 25TM32

**Page :** 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1 ) Data Acquisition	MY49001451	24LM44	TPA	17 Mar 2025
2 ) Data Acquisition	MY49001451	24LM79	TPA	29 May 2025

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

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

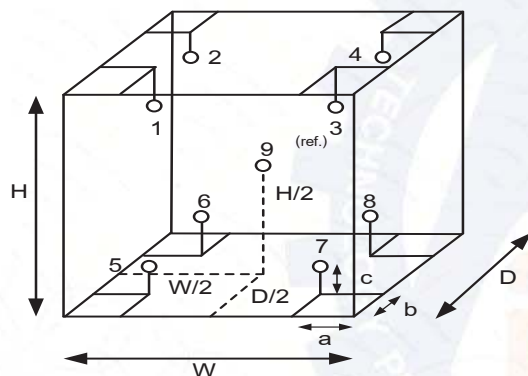
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

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

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

**Fresh air setting :** Close

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	28	27
REL.Humid. ( % )	55	58
AC Supply ( Volt )	222	221



Ref. Std. ID No.: @ Calibration Point		
Position :	( 104 ) °C	( 180 ) °C
1	19RTD-2/1	24-19TC-01
2	19RTD-2/2	24-19TC-02
3	19RTD-2/3	24-19TC-03
4	19RTD-2/4	24-19TC-04
5	19RTD-2/5	24-19TC-05
6	24-19RTD-2/6	24-19TC-06
7	19RTD-2/7	24-19TC-07
8	19RTD-2/8	24-19TC-08
9 (ref.)	19RTD-2/9	24-19TC-09

**Probe Installation Details :**

a = 5.0 cm  
 b = 5.0 cm  
 c = 5.0 cm

**Dimension of Chamber :**

D = 0.40 m  
 W = 0.60 m  
 H = 0.48 m  
 Capacity = 0.12 m<sup>3</sup>



**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2501-0004ON-2  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

**Cert. No.:** 25TM32

**Page :** 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
104	104	104	0.13	2.0	2.2	2
180	180	180	0.74	3.8	4.8	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
104	104.727	103.435	104.430	103.878	103.258	102.923	104.882	103.647	102.939	0.80
180	178.529	178.085	181.353	181.341	179.519	177.627	181.808	179.627	178.498	1.7

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

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

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

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

**UUC\* :** Unit Under Calibration

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

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

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Mettler-Toledo (Thailand) Ltd.

846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District

Bangna District, Bangkok 10260


+662 723 0382

MT-TH.ServiceSupport@mt.com



## Accuracy Calibration Certificate

### Customer

**Company:** Environment Research & Technology  
**Address:** 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsonghong  
**City:** Laksi **Contact:** Ramita Taengthai  
**Zip / Postal:** 10210  
**State / Province:** Bangkok  
**Order Number:**   
0 3 3 3 6 1 0 1 9

### Weighing Device

**Manufacturer:** Mettler Toledo **Instrument Type:** Weighing Instrument  
**Model:** MS204S/01 **Asset Number:** ERTC-L-IN-088  
**Serial No.:** B334691537 **Terminal Model:** N/A  
**Building:** N/A **Terminal Serial No.:** N/A  
**Floor:** 5 **Terminal Asset No.:** N/A  
**Room:** 504

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

### Procedure



**Calibration Guideline:** EURAMET cg-18 v. 4.0/CENAM-ema:2015  
**METTLER TOLEDO Work Instruction:** 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.

	Temperature		Humidity	
As Found	Start: 19.7 °C	End: 19.6 °C	Start: 40.0 %	End: 45.0 %

**As Found Calibration Date:** 15-Jan-2025 **Calibrator:**   
**As Left Calibration Date:** N/A  
**Issue Date:** 17-Jan-2025  
**Approved Signatory:**   
Supapit Kruapoo  
Technical Manager / Head of Calibration Center

## Measurement Results

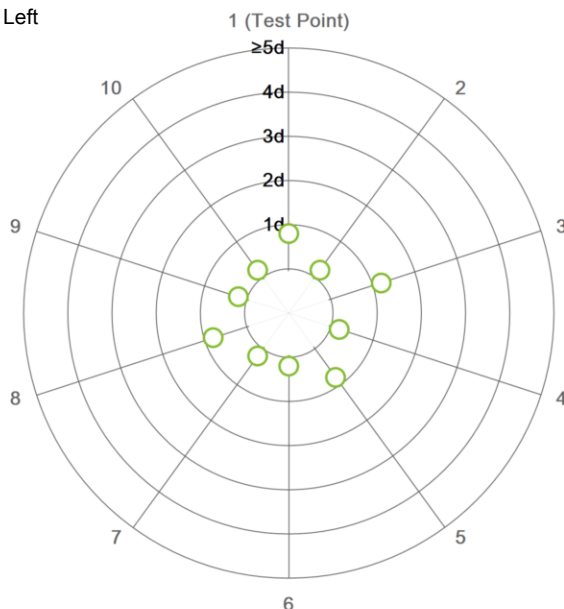
### Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0000 g	N/A
2	100.0001 g	N/A
3	100.0002 g	N/A
4	100.0001 g	N/A
5	100.0000 g	N/A
6	100.0001 g	N/A
7	100.0001 g	N/A
8	100.0000 g	N/A
9	100.0001 g	N/A
10	100.0001 g	N/A

Standard Deviation	0.00006 g	N/A
--------------------	-----------	-----

○ As Found  
◆ As Left



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

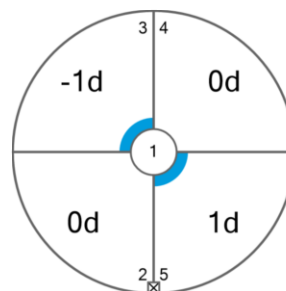
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	100.0000 g	N/A
3	99.9999 g	N/A
4	100.0000 g	N/A
5	100.0001 g	N/A

Maximum Deviation	0.0001 g	N/A
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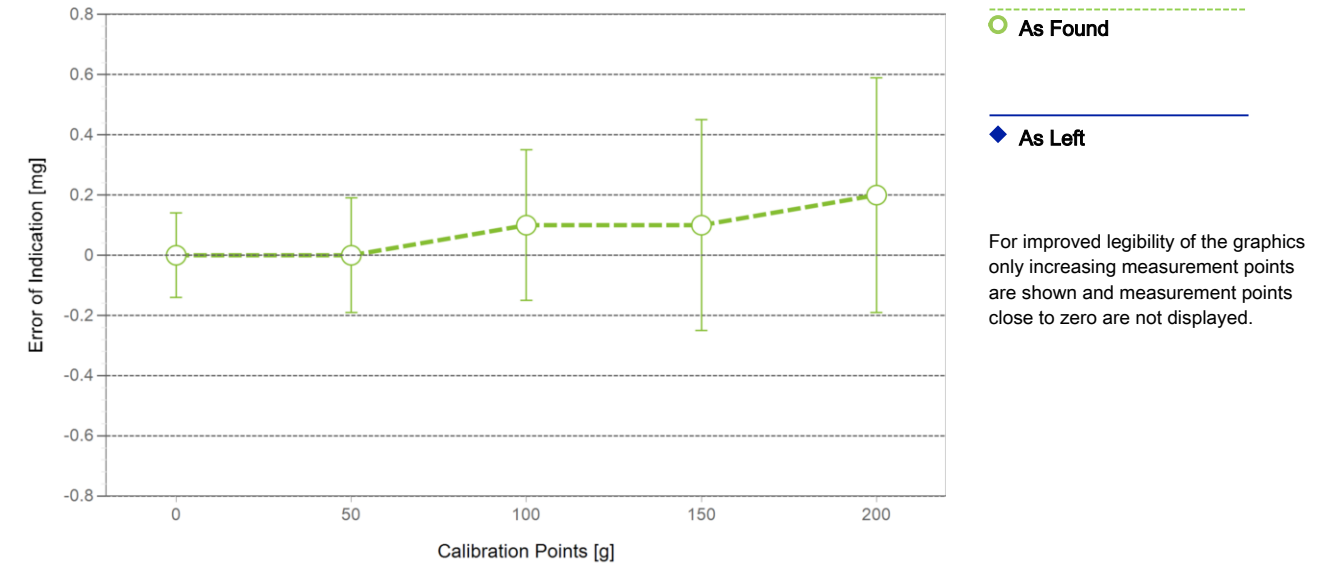
As Found

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	0.0000 g	0.0000 g	0.0000 g	0.14 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.15 mg	2
3	0.1000 g	0.1000 g	0.0000 g	0.15 mg	2
4	0.5000 g	0.5000 g	0.0000 g	0.15 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.15 mg	2
6	5.0000 g	5.0000 g	0.0000 g	0.16 mg	2
7	10.0000 g	10.0001 g	0.0001 g	0.16 mg	2
8	50.0000 g	50.0000 g	0.0000 g	0.19 mg	2
9	99.9999 g	100.0000 g	0.0001 g	0.25 mg	2
10	149.9999 g	150.0000 g	0.0001 g	0.35 mg	2
11	200.0001 g	200.0003 g	0.0002 g	0.39 mg	2



The expanded measurement uncertainty is reported as the standard measurement uncertainty multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %.

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

The results of this calibration certificate relate only to the calibrated item.

## 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.:	WS38	Date of Issue:	15-Dec-2023
Certificate Number:	189517	Calibration Due Date:	15-Jun-2025

### Weight Set 2: OIML E2

Weight Set No.:	WS38-1	Date of Issue:	22-Feb-2024
Certificate Number:	C411772496	Calibration Due Date:	22-Aug-2025

### Weight Set 3: OIML E2

Weight Set No.:	WS38-3	Date of Issue:	27-Feb-2024
Certificate Number:	C411772498	Calibration Due Date:	27-Aug-2025

### Thermo Hygrometer

Equipment No.:	IN256	Date of Issue:	19-Jul-2024
Certificate Number:	SG-H-00636/67	Calibration Due Date:	18-Jul-2025

## Remarks

FACT adjustment functionality activated  
Equipment condition: Good  
Next calibration according to customer's procedure  
Calibration data not decide by calibration laboratory

### 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: 3 K

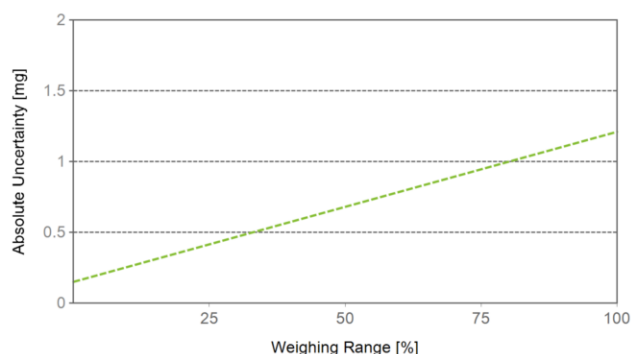
### Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.15 \text{ mg} + 0.00482 \text{ mg/g} \cdot R$	N/A

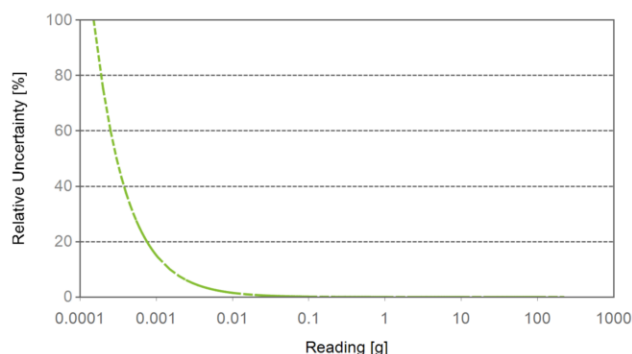
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.0220 g	0.15 mg	0.68%	N/A	N/A
0.2200 g	0.15 mg	0.069%	N/A	N/A
2.2000 g	0.16 mg	0.0073%	N/A	N/A
22.0000 g	0.26 mg	0.0012%	N/A	N/A
220.0000 g	1.2 mg	0.00055%	N/A	N/A



As Found



As Left

# 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.

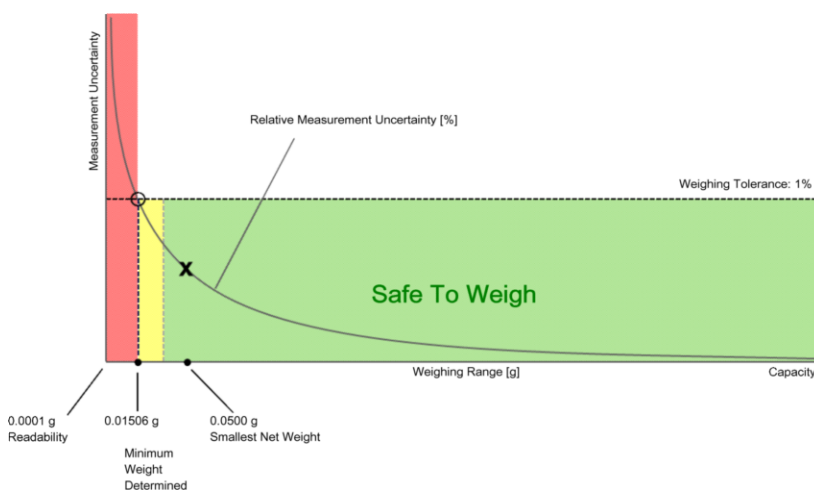
## Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.0500 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. This graph reflects As Left testing, unless only As Found was performed.

# Minimum Weight

## As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.15128 g	0.30404 g	0.45829 g	0.77136 g	1.58179 g
0.2%	0.07546 g	0.15128 g	0.22748 g	0.38098 g	0.77136 g
0.5%	0.03014 g	0.06034 g	0.09059 g	0.15128 g	0.30404 g
1%	0.01506 g	0.03014 g	0.04523 g	0.07546 g	0.15128 g
2%	0.00753 g	0.01506 g	0.02260 g	0.03768 g	0.07546 g
5%	0.00301 g	0.00602 g	0.00904 g	0.01506 g	0.03014 g



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

## As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.15128 g	0.30404 g	0.45829 g	0.77136 g	1.58179 g
0.2%	0.07546 g	0.15128 g	0.22748 g	0.38098 g	0.77136 g
0.5%	0.03014 g	0.06034 g	0.09059 g	0.15128 g	0.30404 g
1%	0.01506 g	0.03014 g	0.04523 g	0.07546 g	0.15128 g
2%	0.00753 g	0.01506 g	0.02260 g	0.03768 g	0.07546 g
5%	0.00301 g	0.00602 g	0.00904 g	0.01506 g	0.03014 g



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

⚠ = Safety Factor not met

## Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	N/A	0.00006 g*	N/A	0.00006 g*	N/A
0.2%	0.00005 g		✗		✗
0.5%	0.00013 g		✓		✓
1%	0.00025 g		✓		✓
2%	0.00050 g		✓		✓
5%	0.00125 g		✓		✓

\*The calculated standard deviation value is below the rounding error of the balance. The  $0.41 \cdot d$  rule is used for the assessment of this repeatability test and the calculation of the minimum weight.

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%	0.0500 g	0.0001 g	✓	0.0001 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.

**Error of Indication****As Found**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
149.9999 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

**As Left**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
149.9999 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 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.



**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**

**CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES**

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

## Certificate of Testing

**Cert.No.:** 25TW195

**Page.:** 1 of 2

<b>Equipment :</b>	DO Meter
<b>Manufacturer :</b>	YSI
<b>Model :</b>	5000-115
<b>Serial No. :</b>	17H104220
<b>ID No. :</b>	ERTC-L-In.137
<b>Received Date :</b>	23 September 2025
<b>Test Date :</b>	25 September 2025
<b>Reference :</b>	2509-0785DN-1
<b>Submitted by :</b>	Environment Research & Technology Company Limited. 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210
<b>Laboratory Condition :</b>	Temperature ( $25 \pm 5$ ) °C Humidity ( $50 \pm 20$ ) %
<b>Test Procedure :</b>	In - house method : CP-CH9 by Comparison Technique with Azide Modification Method
<b>Tested by :</b>	Walalak Sirithean
<b>Approved by :</b>	<hr/> Approved Signatory
( ) Chakrit Waewwanjua ( ) Ponpan Paipim ( ) Saithip Meangmai	
<b>Issue Date :</b>	26 September 2025





**Cert.No.:** 25TW195

**Page.:** 2 of 2

**Condition of this result of calibration**

**1. Reference Standard Instruments :**

This measurement result is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

<b><u>Instruments</u></b>	<b><u>ID No.</u></b>	<b><u>Certificate No.</u></b>	<b><u>Due Date</u></b>
1. Burette	130BU10	25CG1126	18 Mar 2027
2. Balance	110RC001	25MM316	02 July 2026

**2. Standard Material :-**

<b><u>Material</u></b>	<b><u>Manufacturer</u></b>	<b><u>Lot.No.</u></b>	<b><u>Assay</u></b>
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

**Result :**      **Dissolved Oxygen Meter Adjustment With Air 100 %**

**Dissolved Oxygen Probe No.:** 5010 03G1489

<b>Titration Method (Azide Modification Method) (mg/L)</b>	<b>DO Meter Reading (mg/L)</b>	<b>Standard Deviation (mg/L)</b>
8.20	8.22	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study  
Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced  
other in full, without written approval of the laboratory

**-o0o-**

**Intech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiaban 5 Rd., O ngoen.

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) [www.imcinstrument.com](http://www.imcinstrument.com)Calibration Cert. # 3884.01  
ISO/IEC 17025

# Certificate of Calibration

Certificate No. : MT25-7002

Page : 1 of 2

**Customer** : Environment Research & Technology Company Limited  
**Address** : 25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210

**Description** : Incubator  
**Manufacturer** : Accuplus  
**Model** : SMART i250  
**Serial No.** : 2059-0218-0002  
**Identification No.** : ERTC-L-In-143  
**Calibration Place** : Customer Laboratory

**Order No.** : 3296/25  
**Received date** : Oct 03, 2025  
**Calibration date** : Oct 03, 2025  
**Environment Condition :**  
**Temperature** : ( 25+/-10 ) °C  
**Humidity** : ( 50+/-30 ) %RH

**Calibration Method** : Calibration were conducted using In-house calibration procedure *CP-MT-006* According to comparison with LXI Data Acquisition Switch Unit with sensor. The calibration methods based on Euramet Calibration Guide No.20 - guidelines on the Calibration of Temperature and/or Humidity Controlled Enclosures.

**Reference Standard Instruments :**

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Data Acquisition System with Sensor	DAQ970A	MY58029872	MT25-5654	Aug 15, 2026

The effect that the result relate only to the items calibrated. It was found accurate as shown on date and place of calibration only.

**Traceability** : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology Thailand ( NIMT )

The reported expanded uncertainty of measurement was based on standard uncertainty multiplied by coverage factor  $k = 2$ , providing a level of confidence of not less than 95%

**Calibrated by :** Mr.Yuttakorn Jamneansri**Approved by :** ( Mr.Panuwat Phuklan )**Issue date :** Oct 09, 2025

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Intech Metrological Center Co.,Ltd

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) [www.imcinstrument.com](http://www.imcinstrument.com)Calibration Cert. # 3884.01  
ISO/IEC 17025

Certificate No. : MT25-7002

Page : 2 of 2

Function : Temperature measurement

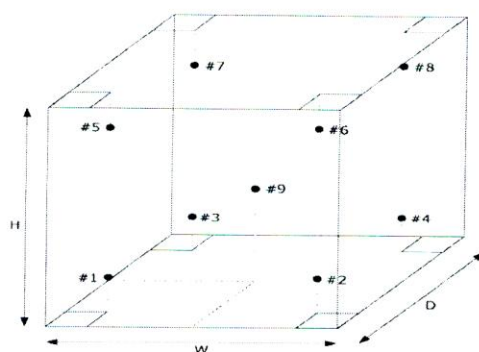
Result : Without adjustment

Calibration point : 20 °C

Resolution : 0.1 °C

Calibration point ( °C )	Temperature of UUC* at each position ( °C )									Uncertainty of measurement ( +/- °C )
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8	Ch.9	
20	20.442	20.192	20.437	20.294	20.569	20.361	20.531	20.424	19.997	0.42

Setting temperature ( °C )	Indicating Temperature ( °C )	Measured stability ( +/- °C )	Measured uniformity ( °C )	Overall variation ( °C )
20.0	20.0 to 20.2	0.29	0.88	1.0

**Front view**

- #1 Lower Left Front
- #2 Lower Right Front
- #3 Lower Left Rear
- #4 Lower Right Rear
- #5 Upper Left Front
- #6 Upper Right Front
- #7 Upper Left Rear
- #8 Upper Right Rear
- #9 Geometric Center

**UUC\*** = Unit under calibration**Uniformity** = Maximum and Minimum difference of measured temperature at any probes and the measured temperature at the reference and same time.**Overall Variation** = Difference of temperature value between the maximum and minimum any time.**Stability** = One half of the maximum difference of measured temperatures at any one probe.

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# Certificate of Calibration

**Certificate No.** : MT25-6999

**Page** : 1 of 3

**Customer** : Environment Research & Technology Company Limited  
**Address** : 25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210

**Description** : Heating Block (COD Reactor)  
**Manufacturer** : Hanna  
**Model** : HI 839800-02  
**Serial No.** : G0059491  
**Identification No.** : ERTC-L-In-112  
**Calibration Place** : Customer Laboratory

**Order No.** : 3296/25  
**Received date** : Oct 03, 2025  
**Calibration date** : Oct 05, 2025  
**Environment Condition** :  
**Temperature** : ( 25+/-10 ) °C  
**Humidity** : ( 50+/-30 ) %RH

**Calibration Method** : Calibration were conducted using In-house calibration procedure *CP-MT-009* According to comparison with LXI Data Acquisition Switch Unit with Sensor.

## Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49028922	MT24-8770	Nov 22, 2025

The effect that the result relate only to the items calibrated. It was found accurate as shown on date and place of calibration only.

**Traceability** : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology Thailand ( NIMT )

The reported expanded uncertainty of measurement was based on standard uncertainty multiplied by coverage factor  $k = 2$ , providing a level of confidence of not less than 95%



**Calibrated by** : Mr.Yuttakorn Jamneansri

**Approved by** : ( Mr.Panuwat Phuklan )

**Issue date** : Oct 09, 2025

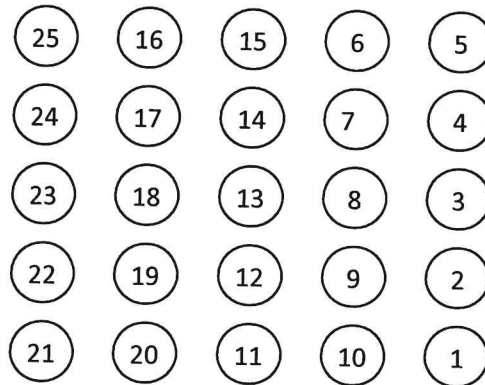
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**Certificate No. : MT25-6999**

**Page : 2 of 3**

**Position**



**Top view**

**Function** : Temperature measurement  
**Calibration point** : 150 °C  
**Immersion depth** : 50 mm

**Result** : Without adjustment

Position No.	UUC* setting ( °C )	Standard reading ( °C )	UUC* correction ( °C )	Uncertainty of measurement ( +/- °C )
1	150	149.187	-0.813	0.16
2	150	149.430	-0.570	0.16
3	150	149.524	-0.476	0.16
4	150	149.860	-0.140	0.16
5	150	149.747	-0.253	0.16
6	150	148.815	-1.185	0.16
7	150	151.466	1.466	0.16
8	150	150.484	0.484	0.16
9	150	150.724	0.724	0.16
10	150	149.558	-0.442	0.16

UUC\* = Unit under calibration



**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) [www.imcinstrument.com](http://www.imcinstrument.com)Calibration Cert. # 3884.01  
ISO/IEC 17025

Certificate No. : MT25-6999

Page : 3 of 3

Function : Temperature measurement Cont.

Result : Without adjustment

Calibration point : 150 °C

Immersion depth : 50 mm

Position No.	UUC* setting ( °C )	Standard reading ( °C )	UUC* correction ( °C )	Uncertainty of measurement ( +/- °C )
11	150	149.398	-0.602	0.16
12	150	149.829	-0.171	0.16
13	150	151.231	1.231	0.16
14	150	151.100	1.100	0.16
15	150	149.720	-0.280	0.16
16	150	151.299	1.299	0.16
17	150	150.736	0.736	0.16
18	150	151.377	1.377	0.16
19	150	149.792	-0.208	0.16
20	150	150.842	0.842	0.16
21	150	148.648	-1.352	0.16
22	150	149.505	-0.495	0.16
23	150	149.487	-0.513	0.16
24	150	150.858	0.858	0.16
25	150	148.682	-1.318	0.16

UUC\* = Unit under calibration



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



## Certificate of Calibration

Cert. No.: 25TM36

Page : 1 of 3

**Equipment :** Incubator

**Manufacturer :** Ehret

**Model :** BK 4106

**Serial No. :** 22162

**ID No. :** ERTC-L-In-022

**Submitted by :** Environment Research & Technology Company Limited  
25/114 Moo 6 Soi Chinaket 1,  
Ngamwongwan Road, Toongsonghong, Laksi,  
Bangkok 10210

**Location :** 408/2 ห้องปฏิบัติการบ่มอาหารเลี้ยงเชื้อ

**Received Order :** 06 January 2025

**Calibration Date :** 07 - 08 January 2025

**Ambient Temperature :** (  $26 \pm 10$  ) °C

**Relative Humidity :** (  $50 \pm 30$  ) %

**AC Line Voltage :** (  $220 \pm 22$  ) V

**Calibrated by :** Khit Ruttanaprapachai

**Approved by :**

*Kunchit*

Approved Signatory

- ( ) Ponpan Paipim  
( ) Suwit Imjai  
(✓) Kunchit Promprat

**Issue Date :** 18 January 2025

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

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Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2501-0004ON-6

Cert. No.: 25TM36

Page : 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY49001451	24LM44	TPA	17 Mar 2025

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

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

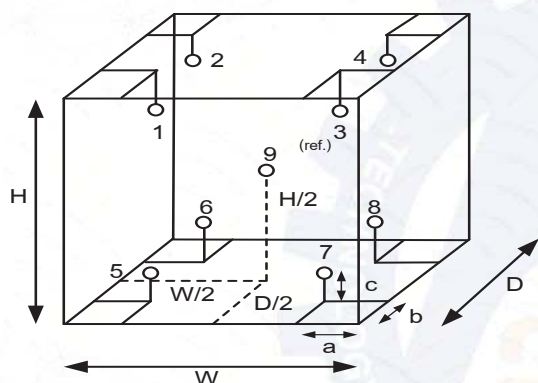
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

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

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

**Fresh air setting :** Not Available

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	26	28
REL.Humid. ( % )	53	50
AC Supply ( Volt )	222	221



Position :	Ref. Std. ID No.:
1	19RTD-2/1
2	19RTD-2/2
3	19RTD-2/3
4	19RTD-2/4
5	19RTD-2/5
6	24-19RTD-2/6
7	19RTD-2/7
8	19RTD-2/8
9 (ref.)	19RTD-2/9

**Probe Installation Details :**

a = 5.0 cm  
b = 5.0 cm  
c = 5.0 cm

**Dimension of Chamber :**

D = 0.50 m  
W = 0.60 m  
H = 0.50 m  
Capacity = 0.15 m<sup>3</sup>



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2501-0004ON-6  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Not Available

**Cert. No.:** 25TM36

**Page :** 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
44.5	44.5	44.5	0.16	0.64	1.4	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ±°C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
44.5	44.542	44.705	44.204	44.943	43.855	44.307	44.130	44.630	44.330	0.67

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

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

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

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

**UUC\* :** Unit Under Calibration

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

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

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## Certificate of Calibration

Cert. No.: 25TM35

Page : 1 of 3

**Equipment :** Incubator

**Manufacturer :** Memmert

**Model :** IF 160

**Serial No. :** D522.0070

**ID No. :** ERTC-L-In-181

**Submitted by :** Environment Research & Technology Company Limited  
25/114 Moo 6 Soi Chinaket 1,  
Ngamwongwan Road, Toongsonghong, Laksi,  
Bangkok 10210

**Location :** 408/2 ห้องปฏิบัติการบ่มอาหารเลี้ยงเชื้อ

**Received Order :** 06 January 2025

**Calibration Date :** 06 - 07 January 2025

**Ambient Temperature :** (  $26 \pm 10$  ) °C

**Relative Humidity :** (  $50 \pm 30$  ) %

**AC Line Voltage :** (  $220 \pm 22$  ) V

**Calibrated by :** Khit Ruttanaprapachai

**Approved by :**

Approved Signatory

- ( ) Ponpan Paipim  
( ) Suwit Imjai  
(✓) Kunchit Promprat

**Issue Date :** 18 January 2025

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

This certificate may not be reproduced other than in full, except with the prior written Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.





**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2501-0004ON-5

**Cert. No.:** 25TM35

**Page :** 2 of 3

**Procedure Used :-**

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1 ) Data Acquisition	MY49001451	24LM44	TPA	17 Mar 2025

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

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

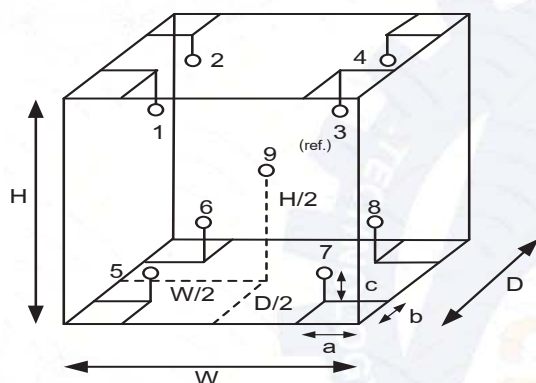
**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

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

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

**Fresh air setting :** Close

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	25	26
REL.Humid. ( % )	51	55
AC Supply ( Volt )	221	222



Position :	Ref. Std. ID No.:
1	19RTD-2/1
2	19RTD-2/2
3	19RTD-2/3
4	19RTD-2/4
5	19RTD-2/5
6	24-19RTD-2/6
7	19RTD-2/7
8	19RTD-2/8
9 (ref.)	19RTD-2/9

**Probe Installation Details :**

a = 5.0 cm  
b = 5.0 cm  
c = 5.0 cm

**Dimension of Chamber :**

D = 0.40 m  
W = 0.56 m  
H = 0.73 m  
Capacity = 0.16 m<sup>3</sup>



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2501-0004ON-5  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

**Cert. No.:** 25TM35

**Page :** 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor <i>k</i>
35.0	35.0	35.0	0.022	0.22	0.38	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ±°C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.860	34.762	34.658	34.926	34.791	34.970	34.621	34.837	34.767	0.30

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

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

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

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

**UUC\* :** Unit Under Calibration

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

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

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