

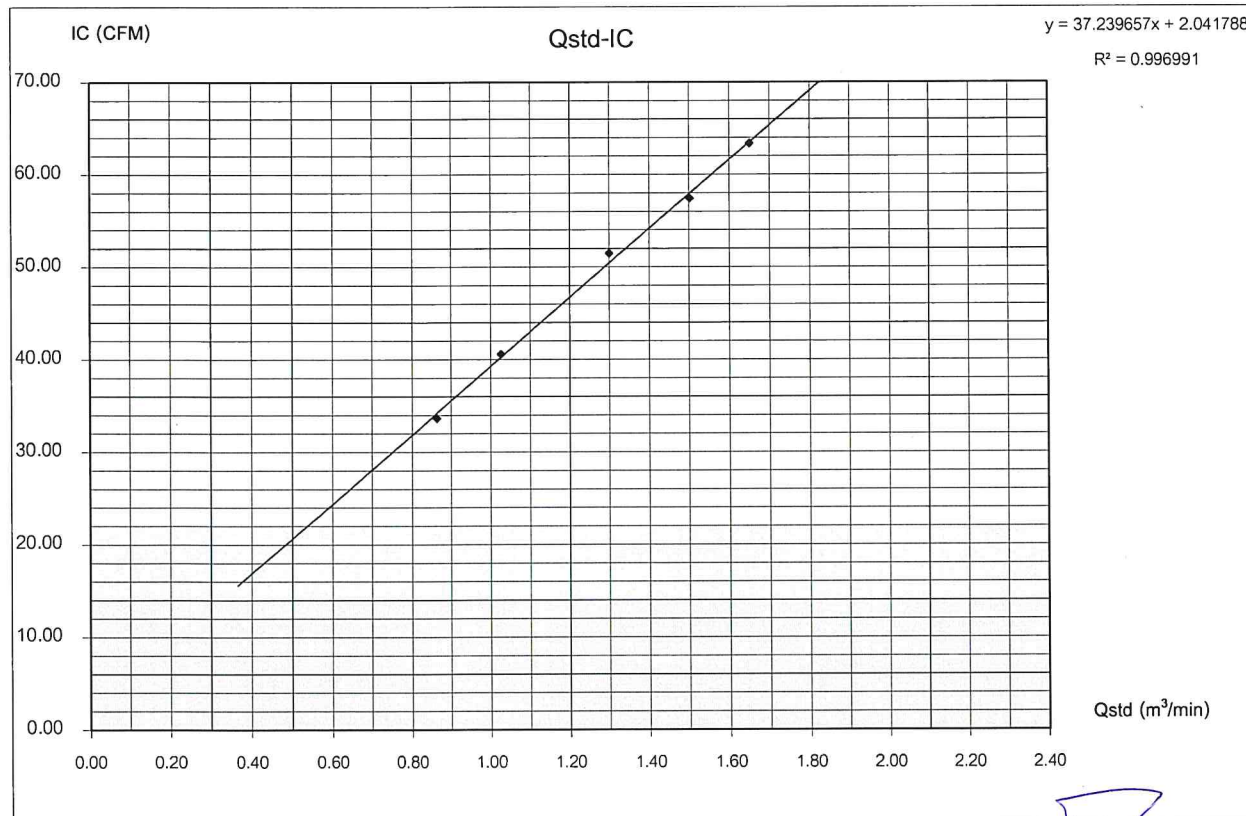
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|------------------------|------------------------------------|--------------------------|----------|---------------|-------------------|
| Quotation | 2024-01946 | | | Date | December 6, 2024 |
| Sampler Location | A1 : บ้านเลขที่ 32 บ้านคลองน้ำข่อย | | | Start Time | 11:00 AM |
| Sampler Number | TSP No.A16 | Transfer Standard Type | Orifice | Stop Time | 11:10 AM |
| Instrument Model | HIVOL-BBCBE | Calibrator Model | TE-5025A | Calibrated By | Mr. Prayun Detkla |
| Motor Serial Number | 2214 | Calibrator Serial Number | 3362 | | |
| Recorder Serial Number | 7363 | | | | |

| Plate No. | (Delta H) | | | (A) | (X) | (I) | (Y) | Temperature | Barometric Pressure | Start Meter | Stop Meter |
|--------------------------------------|---|----------|-------------------|---|--|--|--|---------------------------|---------------------|------------------|-------------|
| | Pressure Drop Across Orifice (inH ₂ O) | | | $[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$ | $Qstd = (1/m)[(A-b)]$ (m ³ /min) | ample Flow Rate Indication (ft ³ /min) | $IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$ | (°K = °C+273) | (mmHg) | | |
| | Positive | Negative | ΔH ₂ O | | | | | | | | |
| 5 | 1.5 | 1.6 | 3.1 | 1.74264 | 0.86437 | 34.0 | 33.65 | 303.0 | 757.0 | | |
| 7 | 2.2 | 2.2 | 4.4 | 2.07613 | 1.02685 | 41.0 | 40.58 | 303.0 | 757.0 | | |
| 10 | 3.5 | 3.6 | 7.1 | 2.63729 | 1.30026 | 52.0 | 51.47 | 303.0 | 757.0 | | |
| 13 | 4.7 | 4.8 | 9.5 | 3.05063 | 1.50165 | 58.0 | 57.41 | 303.0 | 757.0 | | |
| 18 | 5.7 | 5.8 | 11.5 | 3.35642 | 1.65065 | 64.0 | 63.34 | 303.0 | 757.0 | | |
| Linear Regression Y ON X : Y= mX + b | | | | | | | Average | 303.0 | 757.0 | | |
| 1 | Slope (m) | | | 2.05243 | Linear Equation | | | r ² | 0.996991 | Pstd(mmHg) | 760.0 |
| 2 | Intercept (b) | | | -0.03141 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.9984944 | T _{NTP} | 298.0 |
| 3 | Correlation Coefficient (r) | | | 0.99984 | Final Set Flow Rate = (I) | | 0 | (Pa/Pstd)*(Tstd/Ta) | | | 0.97961612 |
| Result | | | | | | | | C=(Pa/Pstd)*(Tstd/Ta)^0.5 | | | 0.989755586 |

COMMENT

Andersen Instruments, Inc.



Checked By

Mr. Prayun Detkla

(Mr.Prayun Detkla)

Technician

Approved By

Mr. Panupon Podang

(Mr.Panupon Podang)

Environmental Scientist

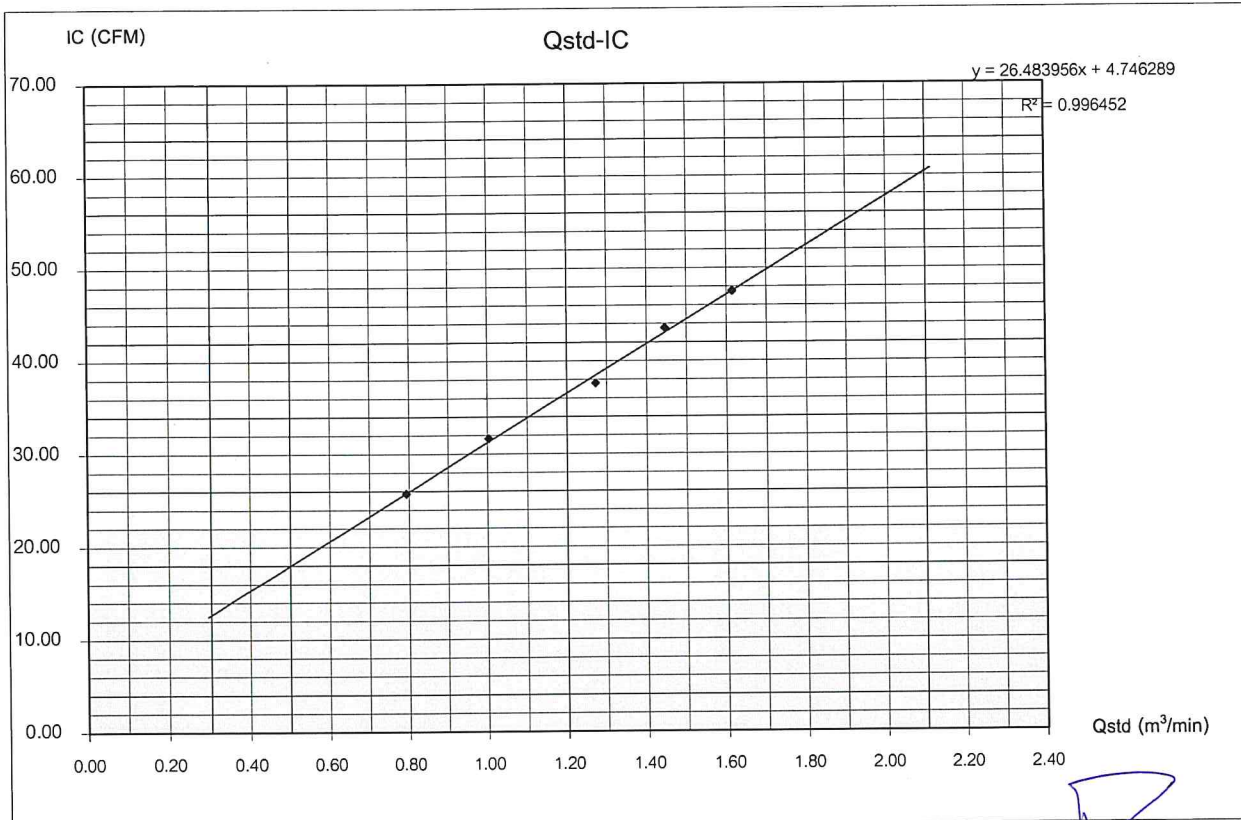
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|------------------------|------------------------------------|--------------------------|----------|---------------|-------------------|
| Quotation | 2024-01946 | | | Date | December 6, 2024 |
| Sampler Location | A1 : บ้านเลขที่ 32 บ้านคลองน้ำร้อย | | | Start Time | 11:10 AM |
| Sampler Number | PM-10 No.2 | Transfer Standard Type | Orifice | Stop Time | 11:20 AM |
| Instrument Model | HIVOL-BMBBE | Calibrator Model | TE-5025A | Calibrated By | Mr. Prayun Detkla |
| Motor Serial Number | 610-644 | Calibrator Serial Number | 3362 | | |
| Recorder Serial Number | 7139 | | | | |

| Plate | (Delta H) | | | (A) | (X) | (I) | (Y) | Temperature | Barometric | Start | Stop |
|--------------------------------------|---|----------|-------------------|---|---|-----------------------------|---|---------------------------|------------|------------------|-------------|
| No. | Pressure Drop Across Orifice (inH ₂ O) | | | [ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{-1/2} | Qstd = (1/m)[(A-b)] | Sample Flow Rate Indication | IC = [I[(Pa/P _{std})(T _{std} /Ta)] ^{-1/2} | (*K = °C+273) | Pressure | Meter | Meter |
| | Positive | Negative | ΔH ₂ O | | | | | | | | |
| 5 | 1.3 | 1.3 | 2.6 | 1.59593 | 0.79289 | 26.0 | 25.73 | 303.0 | 757.0 | | |
| 7 | 2.1 | 2.1 | 4.2 | 2.02840 | 1.00359 | 32.0 | 31.67 | 303.0 | 757.0 | | |
| 10 | 3.4 | 3.4 | 6.8 | 2.58097 | 1.27282 | 38.0 | 37.61 | 303.0 | 757.0 | | |
| 13 | 4.4 | 4.4 | 8.8 | 2.93609 | 1.44585 | 44.0 | 43.55 | 303.0 | 757.0 | | |
| 18 | 5.5 | 5.5 | 11.0 | 3.28265 | 1.61470 | 48.0 | 47.51 | 303.0 | 757.0 | | |
| Linear Regression Y ON X : Y= mX + b | | | | | | | Average | 303.0 | 757.0 | | |
| 1 | Slope (m) | | | 2.05243 | Linear Equation | | | r ² | 0.996452 | Pstd(mmHg) | 760.0 |
| 2 | Intercept (b) | | | -0.03141 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.9982244 | T _{NTP} | 298.0 |
| 3 | Correlation Coefficient (r) | | | 0.99984 | Final Set Flow Rate = (I) | | 0 | (Pa/Pstd)*(Tstd/Ta) | | | 0.97961612 |
| Result | | | | | | | | C=(Pa/Pstd)*(Tstd/Ta)^0.5 | | | 0.989755586 |

COMMENT

Andersen Instruments, Inc.



Checked By

Mr. Prayun Detkla

(Mr. Prayun Detkla)

Technician

Approved By

(Mr. Panupon Podang)

Environmental Scientist

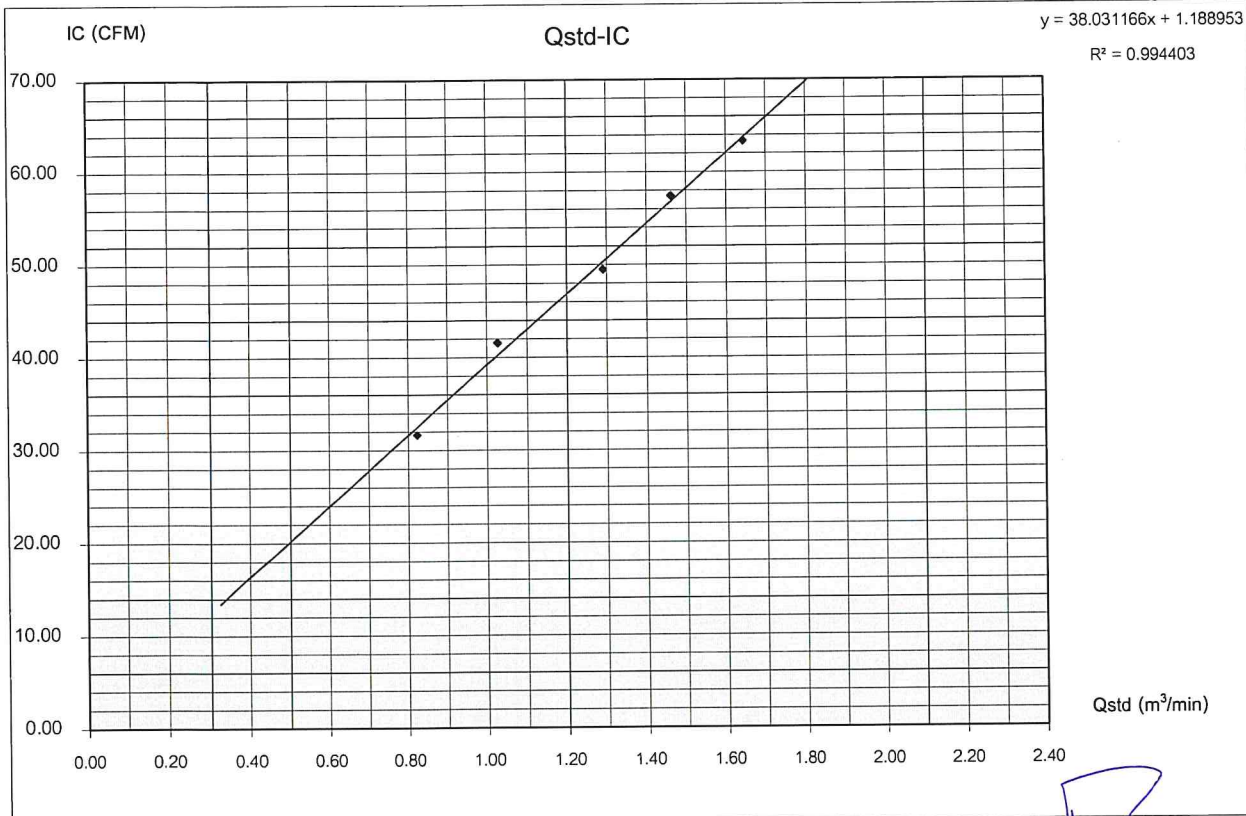
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|------------------------|------------------------------------|--------------------------|----------|---------------|-------------------|
| Quotation | 2024-01946 | | | Date | December 6, 2024 |
| Sampler Location | A2 : บ้านเลขที่ 26 บ้านคลองน้ำข่อย | | | Start Time | 9:50 AM |
| Sampler Number | TSP No.A10 | Transfer Standard Type | Orifice | Stop Time | 10:00 AM |
| Instrument Model | HIVOL-BBCBE | Calibrator Model | TE-5025A | Calibrated By | Mr. Prayun Detkla |
| Motor Serial Number | 2012-04 | Calibrator Serial Number | 3362 | | |
| Recorder Serial Number | 1504 | | | | |

| Plate No. | (Delta H) | | | (A) | (X) | (I) | (Y) | Temperature | Barometric Pressure | Start Meter | Stop Meter | |
|--------------------------------------|---|----------|-------------------|--|--|---|---|---------------------|---------------------------|------------------|-------------|--|
| | Pressure Drop Across Orifice (inH ₂ O) | | | [ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{1/2} | Qstd = (1/m)[(A-b)] (m ³ /min) | Sample Flow Rate Indication (ft ³ /min) | IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2} | (*K = °C+273) | (mmHg) | | | |
| | Positive | Negative | ΔH ₂ O | | | | | | | | | |
| 5 | 1.4 | 1.4 | 2.8 | 1.65618 | 0.82224 | 32.0 | 31.67 | 303.0 | 757.0 | | | |
| 7 | 2.2 | 2.2 | 4.4 | 2.07613 | 1.02685 | 42.0 | 41.57 | 303.0 | 757.0 | | | |
| 10 | 3.5 | 3.5 | 7.0 | 2.61865 | 1.29118 | 50.0 | 49.49 | 303.0 | 757.0 | | | |
| 13 | 4.5 | 4.5 | 9.0 | 2.96927 | 1.46201 | 58.0 | 57.41 | 303.0 | 757.0 | | | |
| 18 | 5.7 | 5.7 | 11.4 | 3.34180 | 1.64352 | 64.0 | 63.34 | 303.0 | 757.0 | | | |
| Linear Regression Y ON X : Y= mX + b | | | | | | | Average | 303.0 | 757.0 | | | |
| 1 | Slope (m) | | | 2.05243 | Linear Equation | | | r ² | 0.994403 | Pstd(mmHg) | 760.0 | |
| 2 | Intercept (b) | | | -0.03141 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.9971976 | T _{NTP} | 298.0 | |
| 3 | Correlation Coefficient (r) | | | 0.99984 | Final Set Flow Rate = (I) | | 0 | (Pa/Pstd)*(Tstd/Ta) | | 0.97961612 | | |
| Result | | | | | | | | | C=(Pa/Pstd)*(Tstd/Ta)^0.5 | | 0.989755586 | |

COMMENT

Andersen Instruments, Inc.



Checked By

Narongrit Tibja cinnb

(Mr. Prayun Detkla)

Technician



Approved By

(Mr. Panupon Podang)

Environmental Scientist

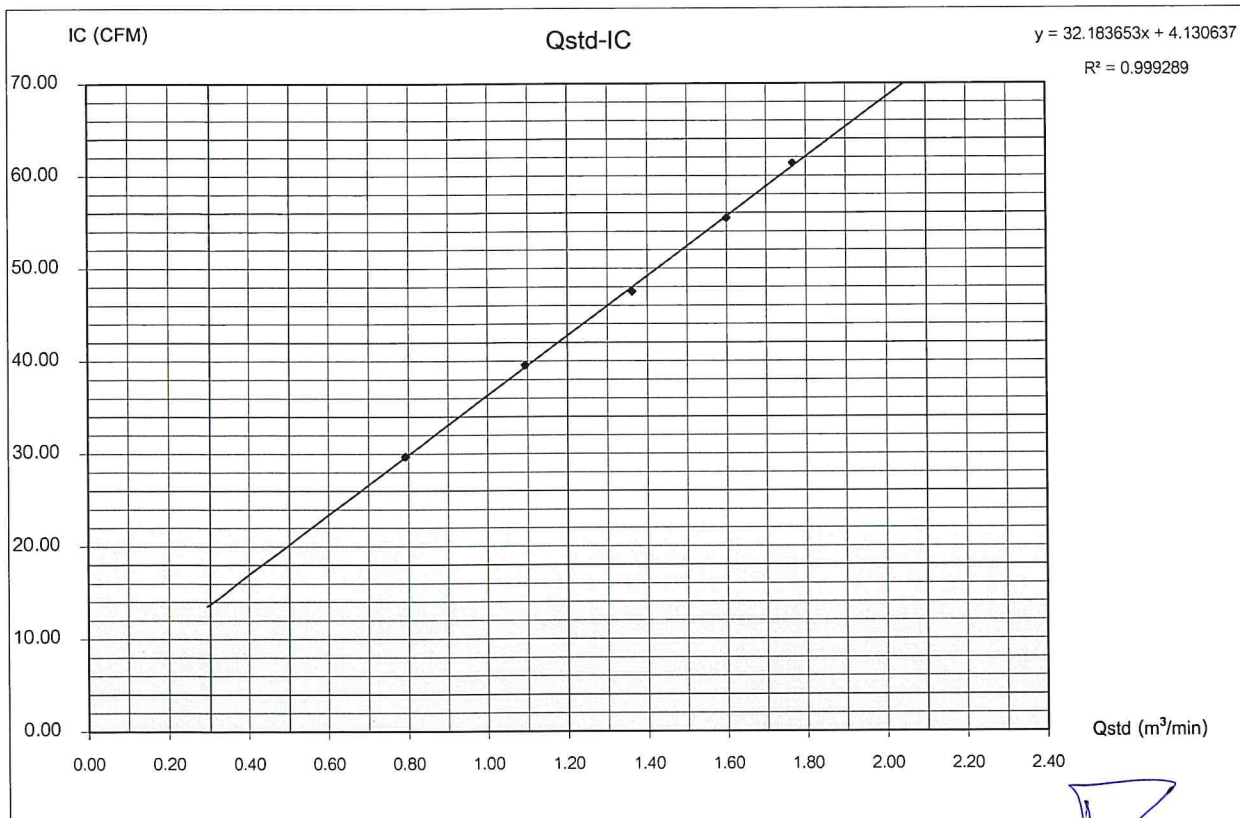
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|------------------------|-------------------------------------|--------------------------|----------|---------------|-------------------|
| Quotation | 2024-01946 | | | Date | December 6, 2024 |
| Sampler Location | A2 : บ้านเลขที่ 26 บ้านคลองหน้าร้อย | | | Start Time | 10:00 AM |
| Sampler Number | PM-10 No.5 | Transfer Standard Type | Orifice | Stop Time | 10:10 AM |
| Instrument Model | HIVOL-BMBBE | Calibrator Model | TE-5025A | Calibrated By | Mr. Prayun Detkla |
| Motor Serial Number | PM-10 No.5 | Calibrator Serial Number | 3362 | | |
| Recorder Serial Number | 7356 | | | | |

| Plate No. | (Delta H) | | | (A) | (X) | (I) | (Y) | Temperature | Barometric Pressure | Start Meter | Stop Meter |
|--------------------------------------|---|----------|-------------------|--|--|--|--|---------------------------|---------------------|------------------|-------------|
| | Pressure Drop Across Orifice (inH ₂ O) | | | $[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{-1/2}$ | Qstd = (1/m)[(A-b)] (m ³ /min) | Sample Flow Rate Indicator (ft ³ /min) | IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2} (*K = *C+273) | (mmHg) | | | |
| | Positive | Negative | ΔH ₂ O | | | | | | | | |
| 5 | 1.3 | 1.3 | 2.6 | 1.59593 | 0.79289 | 30.0 | 29.69 | 303.0 | 757.0 | | |
| 7 | 2.5 | 2.5 | 5.0 | 2.21316 | 1.09362 | 40.0 | 39.59 | 303.0 | 757.0 | | |
| 10 | 3.9 | 3.9 | 7.8 | 2.76424 | 1.36212 | 48.0 | 47.51 | 303.0 | 757.0 | | |
| 13 | 5.4 | 5.4 | 10.8 | 3.25267 | 1.60009 | 56.0 | 55.43 | 303.0 | 757.0 | | |
| 18 | 6.6 | 6.6 | 13.2 | 3.59596 | 1.76735 | 62.0 | 61.36 | 303.0 | 757.0 | | |
| Linear Regression Y ON X : Y= mX + b | | | | | | | Average | 303.0 | 757.0 | | |
| 1 | Slope (m) | | | 2.05243 | Linear Equation | | | r ² | 0.999289 | Pstd(mmHg) | 760.0 |
| 2 | Intercept (b) | | | -0.03141 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.9996444 | T _{NTP} | 298.0 |
| 3 | Correlation Coefficient (r) | | | 0.99984 | Final Set Flow Rate = (I) | | 0 | (Pa/Pstd)*(Tstd/Ta) | | | 0.97961612 |
| Result | | | | | | | | C=(Pa/Pstd)*(Tstd/Ta)^0.5 | | | 0.989755586 |

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician

Approved By

(Mr. Panupon Podang)
Environmental Scientist

CERTIFICATE OF CALIBRATION

Certificate No. : COF-034-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : TISCH
MODEL/TYPE : TE-5025A
SERIAL NUMBER : 3362
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 : 21 Aug 2024
MEASUREMENT DATE : 23 Aug 2024
ISSUE DATE : 26 Aug 2024

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 23.5 °C and 56.1 %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.

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-0063-23.

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'

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol



Approved signatory: _____

Mr. Parinya Booncharoen
Calibration Department Manager

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 | Δp_{meter} mmHg | $\Delta p_{Orifice}$ inH ₂ O | Y | Standard Flow [Q_s] m^3/min |
|-------|------------------------|--------------------------|---------------------------|---------------------------|----------------------------|--|-------|--------------------------------------|
| 1 | 0.702 | 757.204 | 23.26 | 22.19 | 54.689 | 1.731 | 1.317 | 0.655 |
| 2 | 1.005 | 757.142 | 23.31 | 22.53 | 61.174 | 3.482 | 1.868 | 0.928 |
| 3 | 1.118 | 757.170 | 23.66 | 22.97 | 42.490 | 4.572 | 2.139 | 1.058 |
| 4 | 1.170 | 757.200 | 23.84 | 23.24 | 30.416 | 5.191 | 2.279 | 1.125 |
| 5 | 1.415 | 757.259 | 23.98 | 23.51 | 30.130 | 7.646 | 2.765 | 1.361 |

Slope (m): **2.05243**
 Intercept (b): **-0.03141**
 Correlation coefficient (r): **0.99984**
 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 | Δp_{meter} mmHg | $\Delta p_{Orifice}$ inH ₂ O | Y | Standard Flow [Q_s] m^3/min |
|-------|------------------------|--------------------------|---------------------------|---------------------------|----------------------------|--|-------|--------------------------------------|
| 1 | 0.702 | 757.204 | 23.26 | 22.19 | 54.689 | 1.731 | 0.823 | 0.654 |
| 2 | 1.005 | 757.142 | 23.31 | 22.53 | 61.174 | 3.482 | 1.168 | 0.926 |
| 3 | 1.118 | 757.170 | 23.66 | 22.97 | 42.490 | 4.572 | 1.339 | 1.058 |
| 4 | 1.170 | 757.200 | 23.84 | 23.24 | 30.416 | 5.191 | 1.427 | 1.125 |
| 5 | 1.415 | 757.259 | 23.98 | 23.51 | 30.130 | 7.646 | 1.732 | 1.361 |

Slope (m): **1.28548**
 Intercept (b): **-0.01960**
 Correlation coefficient (r): **0.99984**
 Uncertainty ($k = 2$): **0.015** m^3/min

End of Certificate of Calibration



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



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 2 9 6 3 6 1 1

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 and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations 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: 25.4 °C | End: 25.3 °C | Start: 36.4 % | End: 34.9 % |
| As Left | Start: 25.3 °C | End: 25.2 °C | Start: 34.9 % | End: 34.1 % |

As Found Calibration Date: 15-Jan-2024
As Left Calibration Date: 15-Jan-2024
Issue Date: 15-Jan-2024

Calibrator: 
Nithit Jongkrod

Approved Signatory: 
Technical Manager / Head of Calibration Center

Measurement Results

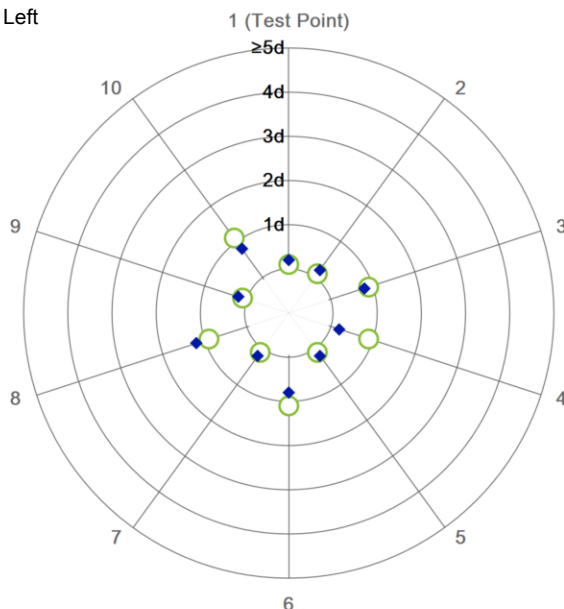
Repeatability

Test Load: 100 g

| | As Found | As Left |
|----|-----------|------------|
| 1 | 99.9993 g | 100.0002 g |
| 2 | 99.9993 g | 100.0002 g |
| 3 | 99.9992 g | 100.0003 g |
| 4 | 99.9992 g | 100.0002 g |
| 5 | 99.9993 g | 100.0002 g |
| 6 | 99.9994 g | 100.0003 g |
| 7 | 99.9993 g | 100.0002 g |
| 8 | 99.9992 g | 100.0001 g |
| 9 | 99.9993 g | 100.0002 g |
| 10 | 99.9994 g | 100.0003 g |

| | | |
|--------------------|-----------|-----------|
| Standard Deviation | 0.00007 g | 0.00006 g |
|--------------------|-----------|-----------|

○ As Found
◆ As Left



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

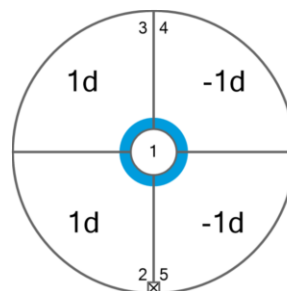
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

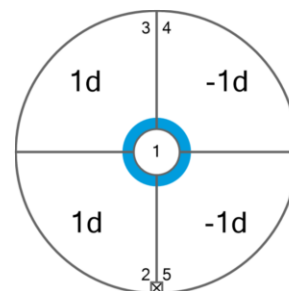
Test Load: 100 g

| Position | As Found | As Left |
|----------|-----------|------------|
| 1 | 99.9993 g | 100.0002 g |
| 2 | 99.9994 g | 100.0003 g |
| 3 | 99.9994 g | 100.0003 g |
| 4 | 99.9992 g | 100.0001 g |
| 5 | 99.9992 g | 100.0001 g |

| | | |
|-------------------|----------|----------|
| Maximum Deviation | 0.0001 g | 0.0001 g |
|-------------------|----------|----------|



As Found



As Left

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

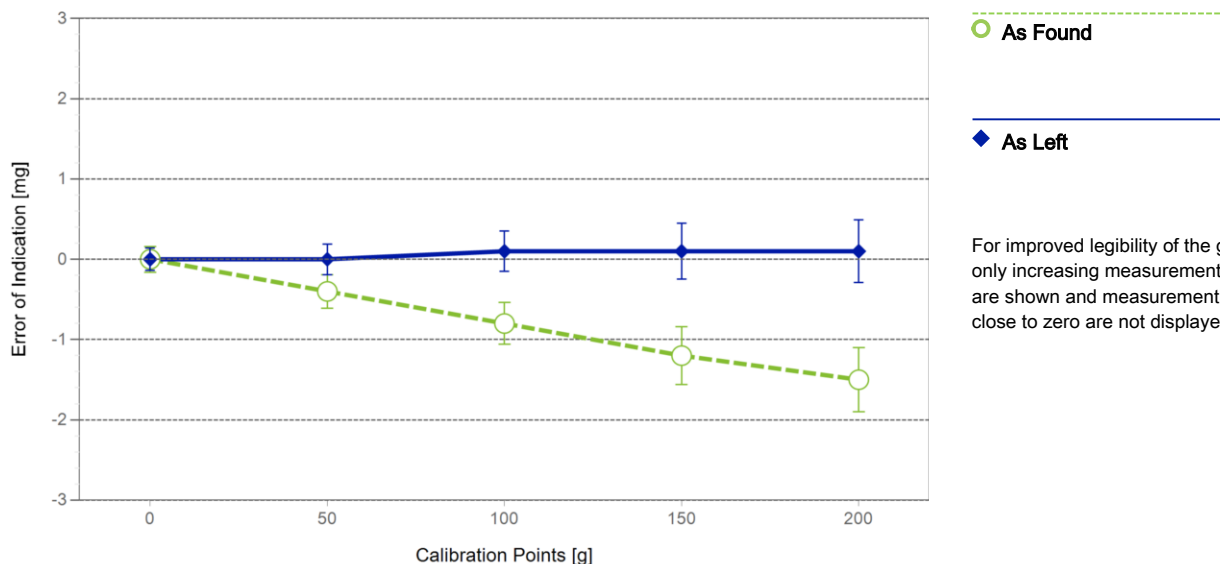
Error of Indication

As Found

| | Reference Value | Indication | Error of Indication | Expanded Uncertainty | k |
|----|-----------------|------------|---------------------|----------------------|---|
| 1 | 0.0000 g | 0.0000 g | 0.0000 g | 0.16 mg | 2 |
| 2 | 0.0500 g | 0.0501 g | 0.0001 g | 0.17 mg | 2 |
| 3 | 0.1000 g | 0.1000 g | 0.0000 g | 0.17 mg | 2 |
| 4 | 0.5000 g | 0.5001 g | 0.0001 g | 0.17 mg | 2 |
| 5 | 1.0000 g | 1.0000 g | 0.0000 g | 0.17 mg | 2 |
| 6 | 5.0000 g | 4.9999 g | -0.0001 g | 0.17 mg | 2 |
| 7 | 10.0000 g | 9.9998 g | -0.0002 g | 0.18 mg | 2 |
| 8 | 50.0000 g | 49.9996 g | -0.0004 g | 0.21 mg | 2 |
| 9 | 100.0001 g | 99.9993 g | -0.0008 g | 0.26 mg | 2 |
| 10 | 150.0001 g | 149.9989 g | -0.0012 g | 0.36 mg | 2 |
| 11 | 200.0000 g | 199.9985 g | -0.0015 g | 0.40 mg | 2 |

As Left

| | 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 | 50.0000 g | 50.0000 g | 0.0000 g | 0.19 mg | 2 |
| 9 | 100.0001 g | 100.0002 g | 0.0001 g | 0.25 mg | 2 |
| 10 | 150.0001 g | 150.0002 g | 0.0001 g | 0.35 mg | 2 |
| 11 | 200.0000 g | 200.0001 g | 0.0001 g | 0.39 mg | 2 |



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 – 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.
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: | 22-Nov-2022 |
| Certificate Number: | 182272 | Calibration Due Date: | 21-May-2024 |

Thermo Hygrometer

| | | | |
|---------------------|---------------|-----------------------|-------------|
| Equipment No.: | IN302 | Date of Issue: | 11-Oct-2023 |
| Certificate Number: | SG-H-00656/66 | Calibration Due Date: | 08-Oct-2024 |

Remarks

Value of the built-in weight adjusted
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

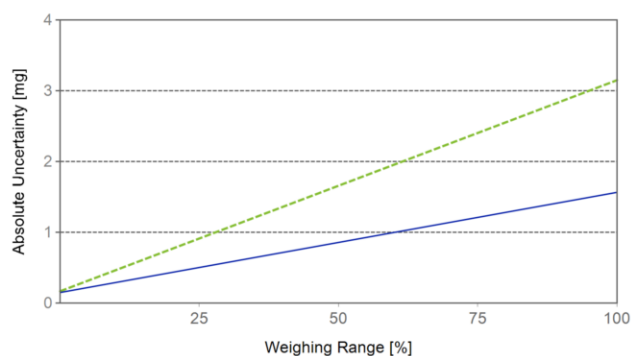
Linearization of Uncertainty Equation

| Range | | | As Found | As Left |
|-------|----------|-------|---|--|
| | d | Max | | |
| 1 | 0.0001 g | 220 g | $U_1 = 0.17 \text{ mg} + 0.0136 \text{ mg/g} \cdot R$ | $U_1 = 0.15 \text{ mg} + 0.00644 \text{ mg/g} \cdot R$ |

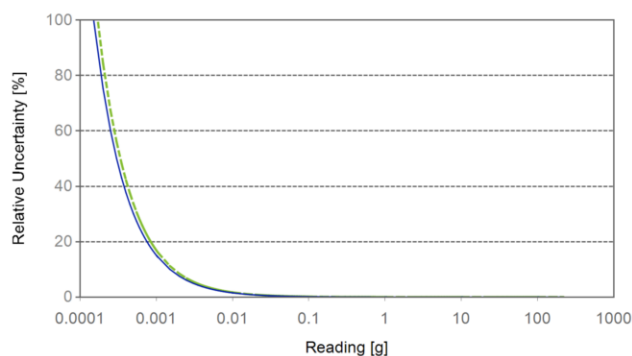
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

| Net Indication | As Found | | As Left | |
|----------------|----------|---------|---------|----------|
| 0.0220 g | 0.17 mg | 0.77% | 0.15 mg | 0.68% |
| 0.2200 g | 0.17 mg | 0.079% | 0.15 mg | 0.069% |
| 2.2000 g | 0.20 mg | 0.0091% | 0.16 mg | 0.0075% |
| 22.0000 g | 0.47 mg | 0.0021% | 0.29 mg | 0.0013% |
| 220.0000 g | 3.2 mg | 0.0014% | 1.6 mg | 0.00071% |



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

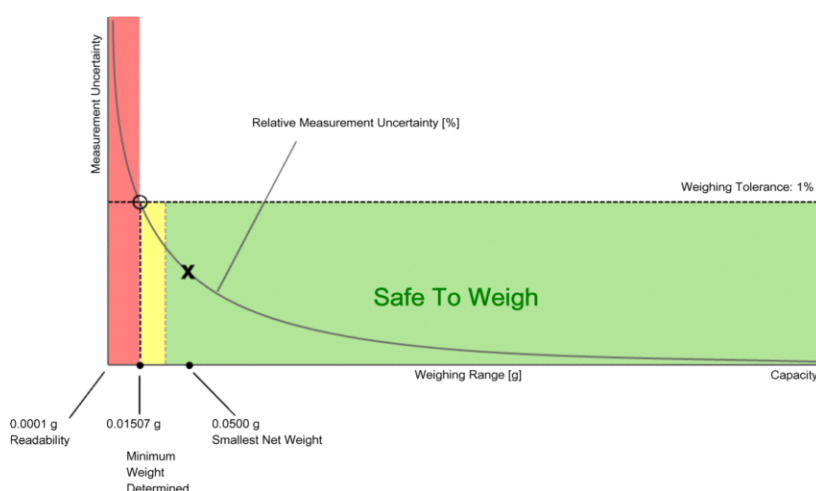
Process Requirements

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% | 0.17097 g | 0.34671 g | 0.52742 g | 0.90460 g | 1.95110 g |
| 0.2% | 0.08490 g | 0.17097 g | 0.25823 g | 0.43643 g | 0.90460 g |
| 0.5% | 0.03382 g | 0.06783 g | 0.10202 g | 0.17097 g | 0.34671 g |
| 1% | 0.01689 g | 0.03382 g | 0.05080 g | 0.08490 g | 0.17097 g |
| 2% | 0.00844 g | 0.01689 g | 0.02535 g | 0.04231 g | 0.08490 g |
| 5% | 0.00337 g | 0.00675 g | 0.01013 g | 0.01689 g | 0.03382 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% | 0.15153 g | 0.30504 g | 0.46056 g | 0.77780 g | 1.60910 g |
| 0.2% | 0.07552 g | 0.15153 g | 0.22803 g | 0.38254 g | 0.77780 g |
| 0.5% | 0.03015 g | 0.06038 g | 0.09068 g | 0.15153 g | 0.30504 g |
| 1% | 0.01507 g | 0.03015 g | 0.04525 g | 0.07552 g | 0.15153 g |
| 2% | 0.00753 g | 0.01507 g | 0.02261 g | 0.03770 g | 0.07552 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 | 0.00007 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 | -0.0004 g | 0.0250 g | 0.0500 g | 0.1250 g | 0.2500 g | 0.5000 g | 1.2500 g |
| 100.0001 g | -0.0008 g | 0.0500 g | 0.1000 g | 0.2500 g | 0.5000 g | 1.0000 g | 2.5000 g |
| 150.0001 g | -0.0012 g | 0.0750 g | 0.1500 g | 0.3750 g | 0.7500 g | 1.5000 g | 3.7500 g |
| 200.0000 g | -0.0015 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 |
| 100.0001 g | 0.0001 g | 0.0500 g | 0.1000 g | 0.2500 g | 0.5000 g | 1.0000 g | 2.5000 g |
| 150.0001 g | 0.0001 g | 0.0750 g | 0.1500 g | 0.3750 g | 0.7500 g | 1.5000 g | 3.7500 g |
| 200.0000 g | 0.0001 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 17 April, 2024

Certification No. 184/24

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WC60110A03 ID No. : No.11

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.1 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

(Authorised Signatory)

for the Chief

Sub-Standard Instrument





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 184/24

17 April, 2024

Page : 2 of 2

| Standard Ultrasonic Anemometer m/sec | HOOK GAGE NO. 1425 | | | TESTED ANEMOMETER | |
|--|------------------------|----------------------|-------------------|-------------------|---------------------|
| | Pressure inches H2O | Vacumm inches H2O | Velocity m/sec | Velocity m/sec | Correction m/sec |
| 1.00 | - | - | - | 0.4 | 0.60 |
| 3.02 | - | - | - | 2.2 | 0.82 |
| 5.00 | - | - | - | 4.5 | 0.50 |
| 7.04 | - | - | - | 6.3 | 0.74 |
| 9.02 | - | - | - | 8.5 | 0.52 |
| 11.01 | - | - | - | 10.3 | 0.71 |
| 13.01 | - | - | - | 12.5 | 0.51 |
| 15.01 | - | - | - | 14.8 | 0.21 |
| 17.02 | - | - | - | 16.5 | 0.52 |
| 20.02 | - | - | - | 19.8 | 0.22 |

| Wind Aloft Plotting Board. | |
|--|-----------------------|
| US.DEPARTMENT OF COMMERCE WEATHER BUREAU | |
| WIND DIRETION | TESTED WIND DIRECTION |
| 0 | 0 |
| 90 | 90 |
| 180 | 180 |
| 270 | 270 |

Calibrated by :

Watchapol

Mr. Watchapol Subwat
Mechanical Engineer





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 28 August, 2024

Certification No. 324/24

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard II Product No. 7425

Serial No. : MC70909A08 ID No. : No.19

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1007.1 hPa

NATIONAL STANDARD WIND TUNNEL :


: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

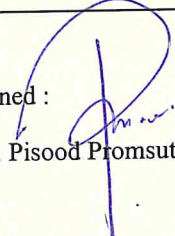
: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

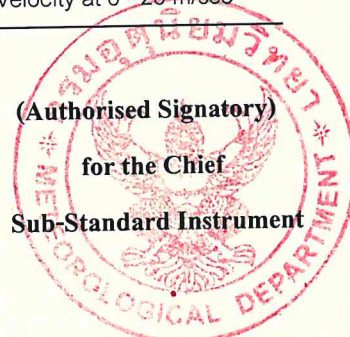
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

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

Calibrated by : 
Mr. Watcharapol Subwat
Mechanical Engineer

Signed : 
Mr. Pisood Promsut

(Authorised Signatory)
for the Chief
Sub-Standard Instrument





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 324/24

28 August, 2024

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 | - | - | - | 0.4 | 0.60 |
| 3.02 | - | - | - | 2.7 | 0.32 |
| 5.00 | - | - | - | 4.9 | 0.10 |
| 7.04 | - | - | - | 6.7 | 0.34 |
| 9.02 | - | - | - | 9.0 | 0.02 |
| 11.01 | - | - | - | 10.7 | 0.31 |
| 13.01 | - | - | - | 13.0 | 0.01 |
| 15.01 | - | - | - | 14.8 | 0.21 |
| 17.02 | - | - | - | 17.0 | 0.02 |
| 20.02 | - | - | - | 19.8 | 0.22 |

| Wind Aloft Plotting Board. | |
|--|-----------------------|
| US.DEPARTMENT OF COMMERCE WEATHER BUREAU | |
| WIND DIRETION | TESTED WIND DIRECTION |
| 0 | 0 |
| 90 | 90 |
| 180 | 180 |
| 270 | 270 |

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau



Sound Level Meter Calibration Report

| | | |
|--------------------------|---|--|
| Support Equipment Type | : | Sound Level Calibrator |
| Manufacture | : | Larson Davis |
| Model | : | CAL200 |
| Serial No. | : | 22707 |
| Range of Calibrator | | |
| - Support Equipment Type | : | 94.0 |
| - Frequency | : | 1,000 Hz. |
| Calibrated By | : | Mr.Chanthawit Leawkool |
| Calibration Date | : | December 6, 2024 |
| Customer Name | : | บริษัท ไฟร์เทียร์ คอนซัลแตนต์ จำกัด : โครงการ ผลิตภัณฑ์พลังงานไฟฟ้าจากขยะมูลฝอย จังหวัดนนทบุรี ขององค์การบริหารส่วนจังหวัดนนทบุรี และบริษัท ซุปเปอร์ เอิร์ธ เอนเนอร์ยี 8 จำกัด |

[illegible]

Checked By

Mr. Prayun Detkla
Technician

Approved By

S. cat

Ms.Sutatip Im-noi
Environmental Scientist

Calibration Certificate

Certificate Number 2024009082

Customer:

Environmental Research and Technology Co Ltd Thailand

25/114 Moo 6 Soi Chinnakhet 1

Ngam Wong Wan Road

Tungsonghong,Lak si,Bangkok Thailand

Model Number CAL200

Serial Number 22707

Test Results Pass

Initial Condition As Manufactured

Description Larson Davis CAL200 Acoustic Calibrator

Procedure Number D0001.8386

Technician Scott Montgomery

Calibration Date 20 Jun 2024

Calibration Due

Temperature 20 °C ± 0.3 °C

Humidity 36 %RH ± 3 %RH

Static Pressure 101.1 kPa ± 1 kPa

Evaluation Method

The data is acquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards

Compliant to Manufacturer Specifications per D0001.8190 and the following standards:

IEC 60942:2017

ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.

Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

| Standards Used | | | |
|--|------------|------------|--------------|
| Description | Cal Date | Cal Due | Cal Standard |
| Agilent 34401A DMM | 06/20/2024 | 06/20/2025 | 001021 |
| Larson Davis Model 2900 Real Time Analyzer | 04/01/2024 | 04/01/2025 | 001051 |
| Microphone Calibration System | 02/22/2024 | 02/22/2025 | 005446 |
| 1/2" Preamplifier | 08/16/2023 | 08/16/2024 | 006506 |
| Larson Davis 1/2" Preamplifier 7-pin LEMO | 08/04/2023 | 08/04/2024 | 006507 |
| 1/2 inch Microphone - RI - 200V | 02/12/2024 | 02/12/2025 | 006510 |
| Pressure Sensor | 02/28/2024 | 02/28/2025 | 007825 |

LARSON DAVIS – A PCB DIVISION

1681 West 820 North

Provo, UT 84601 United States

716-684-0001



LARSON DAVIS
A PCB DIVISION

Output Level

| Nominal Level [dB] | Pressure [kPa] | Test Result [dB] | Lower limit [dB] | Upper limit [dB] | Expanded Uncertainty [dB] | Result |
|-----------------------|-------------------|---------------------|---------------------|---------------------|------------------------------|--------|
| 94 | 101.1 | 94.02 | 93.80 | 94.20 | 0.15 | Pass |
| 114 | 101.1 | 114.01 | 113.80 | 114.20 | 0.14 | Pass |

-- End of measurement results--

Frequency

| Nominal Level [dB] | Pressure [kPa] | Test Result [Hz] | Lower limit [Hz] | Upper limit [Hz] | Expanded Uncertainty [Hz] | Result |
|-----------------------|-------------------|---------------------|---------------------|---------------------|------------------------------|--------|
| 94 | 101.1 | 1,000.08 | 993.00 | 1,007.00 | 0.20 | Pass |
| 114 | 101.1 | 1,000.08 | 993.00 | 1,007.00 | 0.20 | Pass |

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

| Nominal Level [dB] | Pressure [kPa] | Test Result [%] | Lower limit [%] | Upper limit [%] | Expanded Uncertainty [%] | Result |
|-----------------------|-------------------|--------------------|--------------------|--------------------|-----------------------------|--------|
| 94 | 101.1 | 0.65 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 114 | 101.1 | 0.64 | 0.00 | 2.00 | 0.25 ‡ | Pass |

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 24 °C, 36 %RH

| Nominal Pressure [kPa] | Pressure [kPa] | Test Result [dB] | Lower limit [dB] | Upper limit [dB] | Expanded Uncertainty [dB] | Result |
|---------------------------|-------------------|---------------------|---------------------|---------------------|------------------------------|--------|
| 108.0 | 108.0 | -0.03 | -0.25 | 0.25 | 0.04 ‡ | Pass |
| 101.3 | 101.2 | 0.00 | -0.25 | 0.25 | 0.04 ‡ | Pass |
| 92.0 | 92.0 | 0.03 | -0.25 | 0.25 | 0.04 ‡ | Pass |
| 83.0 | 83.1 | 0.04 | -0.25 | 0.25 | 0.04 ‡ | Pass |
| 74.0 | 74.0 | 0.02 | -0.25 | 0.25 | 0.04 ‡ | Pass |
| 65.0 | 65.1 | -0.04 | -0.25 | 0.25 | 0.04 ‡ | Pass |

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 24 °C, 36 %RH

| Nominal Pressure [kPa] | Pressure [kPa] | Test Result [Hz] | Lower limit [Hz] | Upper limit [Hz] | Expanded Uncertainty [Hz] | Result |
|---------------------------|-------------------|---------------------|---------------------|---------------------|------------------------------|--------|
| 108.0 | 108.0 | 0.00 | -7.00 | 7.00 | 0.20 ‡ | Pass |
| 101.3 | 101.2 | 0.00 | -7.00 | 7.00 | 0.20 ‡ | Pass |
| 92.0 | 92.0 | 0.00 | -7.00 | 7.00 | 0.20 ‡ | Pass |
| 83.0 | 83.1 | -0.01 | -7.00 | 7.00 | 0.20 ‡ | Pass |
| 74.0 | 74.0 | -0.01 | -7.00 | 7.00 | 0.20 ‡ | Pass |
| 65.0 | 65.1 | -0.01 | -7.00 | 7.00 | 0.20 ‡ | Pass |

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 24 °C, 36 %RH

| Nominal Pressure [kPa] | Pressure [kPa] | Test Result [%] | Lower limit [%] | Upper limit [%] | Expanded Uncertainty [%] | Result |
|---------------------------|-------------------|--------------------|--------------------|--------------------|-----------------------------|--------|
| 108.0 | 108.0 | 0.67 | 0.00 | 2.00 | 0.25 ± | Pass |
| 101.3 | 101.2 | 0.63 | 0.00 | 2.00 | 0.25 ± | Pass |
| 92.0 | 92.0 | 0.58 | 0.00 | 2.00 | 0.25 ± | Pass |
| 83.0 | 83.1 | 0.53 | 0.00 | 2.00 | 0.25 ± | Pass |
| 74.0 | 74.0 | 0.48 | 0.00 | 2.00 | 0.25 ± | Pass |
| 65.0 | 65.1 | 0.42 | 0.00 | 2.00 | 0.25 ± | Pass |

-- End of measurement results--

Signatory: Scott Montgomery

LARSON DAVIS – A PCB DIVISION
1681 West 820 North
Provo, UT 84601 United States
716-684-0001





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.: 24CH1027

Page.: 1 of 2

Equipment : pH Meter
Manufacturer : WATERPROOF
Model : pHTestr30
Serial No. : 3015168
ID No. : -
Condition As-Received: Used Item
Received Date : 20 August 2024
Calibration Date : 22 August 2024
Reference : 2408-0596DN-1
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
reference material (RM)

Calibrated by : Warakorn Lerngagtrakul

Approved by :

Approved Signatory

() Unnopphol Harachai

(✓) Ponpan Paipim

() Saithip Meangmai

Issue Date : 23 August 2024

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 Calibration and Testing Equipment Services.



Cert.No.: 24CH1027

Page.: 2 of 2

Condition of this calibration result

1. Certified Reference Materials : Standard buffer solution (Traceable to NIST, U.S.A.)

| <u>Buffer Solution</u> | <u>Manufacturer</u> | <u>Lot No.</u> | <u>Exp. date</u> |
|------------------------|---------------------|----------------|------------------|
| pH 4.01 | Thermo Scientific | 403/03 | 06 Oct 2026 |
| pH 7.00 | Thermo Scientific | 402/01 | 07 Oct 2025 |
| pH 10.01 | Thermo Scientific | 363/01 | 08 Sep 2026 |

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

Calibration Results

Function : pH Measurement

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

| Unit Under Calibration | Standard pH Buffer Solution | Actual pH Reading | Actual mV Reading (mV) | Uncertainty of pH Measurement (\pm) | Coverage factor k |
|-------------------------------|-----------------------------|-------------------|------------------------|---|---------------------|
| pH Electrode S/N.: 3015168 | 4.01 | 4.01 | N/A | 0.013 | 2.00 |
| | 7.00 | 6.99 | N/A | 0.013 | 2.00 |
| | 10.01 | 10.02 | N/A | 0.017 | 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

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 %.

-o0o-



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



Cert. No.: 24TM93

Page : 1 of 3

Certificate of Calibration

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 : Laboratory (ERTC)

Received Order : 03 January 2024
Calibration Date : 03 January 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Tawatchai Pama

Approved by : 
Approved Signatory

() Pornthippa Tameyakul
(☒) Ponpan Paipim
() Suwit Imjai

Issue Date : 16 January 2024

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.

A 0062472



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2401-0001ON-3

Cert. No.: 24TM93

Page : 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| <u>Instrument</u> | <u>Serial No.</u> | <u>Cert. No.</u> | <u>Traceable</u> | <u>Due Date</u> |
|----------------------|-------------------|------------------|------------------|-----------------|
| 1) Data Acquisition | MY57013823 | 23LM66 | TPA | 25 Mar 2024 |

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

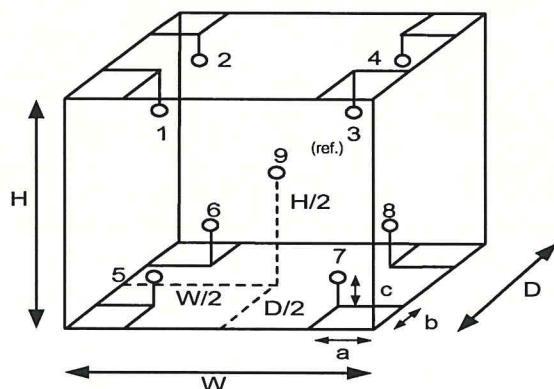
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 30 | 30 |
| REL.Humid. (%) | 53 | 53 |
| AC Supply (Volt) | 226 | 225 |

**Ref. Std. ID No.: @
Calibration Point**

| Position : | (104) °C | (180) °C |
|------------|-------------|------------|
| 1 | 21-17RTD-01 | 22-17TC-01 |
| 2 | 21-17RTD-02 | 23-17TC-02 |
| 3 | 17RTD-03 | 19-17TC-03 |
| 4 | 23-17RTD-10 | 19-17TC-04 |
| 5 | 17RTD-05 | 19-17TC-05 |
| 6 | 17RTD-06 | 19-17TC-06 |
| 7 | 17RTD-07 | 19-17TC-07 |
| 8 | 23-17RTD-08 | 19-17TC-08 |
| 9 (ref.) | 23-17RTD-09 | 19-17TC-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 m³

a 1197879



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2401-0001ON-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM93

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 | 0.075 | 1.2 | 2.4 | 2 |
| 180.0 | 180.0 | 180.0 | 0.41 | 3.4 | 3.9 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | | Uncertainty (±°C) |
|--------------------------------|-----------------------------|---------|---------|---------|---------|---------|---------|---------|----------|----------------------------|
| | Position | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | |
| 104.0 | 105.068 | 102.783 | 103.239 | 103.695 | 104.855 | 103.867 | 102.799 | 103.295 | 103.959 | 0.42 |
| 180.0 | 179.954 | 177.587 | 177.414 | 178.118 | 181.087 | 179.869 | 179.584 | 178.045 | 180.704 | 1.3 |

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 %.

-o0o-

RL



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



Cert. No.: 24TM92

Page : 1 of 3

Certificate of Calibration

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 : Laboratory (ERTC)

Received Order : 03 January 2024

Calibration Date : 03 January 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Tawatchai Pama

Approved by :

Approved Signatory

() Pointhippa Tameyakul
(✓) Ponpan Paipim
() Suwit Imjai

Issue Date :

16 January 2024

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.

A 0062471



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2401-0001ON-2
 Procedure Used :-

Cert. No.: 24TM92
 Page : 2 of 3

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| Instrument | Serial No. | Cert. No. | Traceable | Due Date |
|----------------------|------------|-----------|-----------|-------------|
| 1) Data Acquisition | MY57013823 | 23LM66 | TPA | 25 Mar 2024 |

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

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

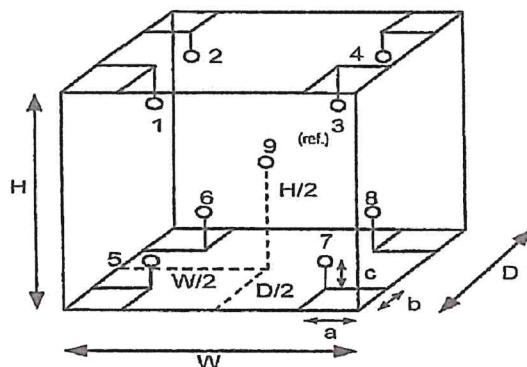
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 30 | 33 |
| REL.Humid. (%) | 53 | 41 |
| AC Supply (Volt) | 226 | 225 |



Probe Installation Details :

Dimension of Chamber :

| | | | | | |
|------------|-----|----|------|----------------|---|
| a = | 5.0 | cm | D = | 0.40 | m |
| b = | 5.0 | cm | W = | 0.60 | m |
| c = | 5.0 | cm | H = | 0.48 | m |
| Capacity = | | | 0.12 | m ³ | |

| Ref. Std. ID No.: @ Calibration Point | | |
|---------------------------------------|-------------|------------|
| Position : | (104) °C | (180) °C |
| 1 | 21-17RTD-01 | 22-17TC-01 |
| 2 | 21-17RTD-02 | 23-17TC-02 |
| 3 | 17RTD-03 | 19-17TC-03 |
| 4 | 23-17RTD-10 | 19-17TC-04 |
| 5 | 17RTD-05 | 19-17TC-05 |
| 6 | 17RTD-06 | 19-17TC-06 |
| 7 | 17RTD-07 | 19-17TC-07 |
| 8 | 23-17RTD-08 | 19-17TC-08 |
| 9 (ref.) | 23-17RTD-09 | 19-17TC-09 |

RL



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2401-0001ON-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM92

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 | 0.10 | 1.8 | 2.1 | 2 |
| 180 | 180 | 180 | 0.27 | 4.4 | 5.0 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | | Uncertainty (± °C) |
|--------------------------------|-----------------------------|---------|---------|---------|---------|---------|---------|---------|----------|-----------------------------|
| | Position | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) | |
| 104 | 104.379 | 103.463 | 103.443 | 103.893 | 104.213 | 103.223 | 105.222 | 104.297 | 103.494 | 0.77 |
| 180 | 179.045 | 177.562 | 181.299 | 179.300 | 180.773 | 177.931 | 182.136 | 178.131 | 178.019 | 1.6 |

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 %.

-o0o-

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



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 2 9 6 3 6 1 1

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 (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: 27.5 °C | End: 26.9 °C | Start: 44.1 % | End: 44.8 % |

As Found Calibration Date: 15-Jan-2024 **Calibrator:** 
As Left Calibration Date: N/A
Issue Date: 15-Jan-2024
Approved Signatory: 
Technical Manager / Head of Calibration Center

Measurement Results

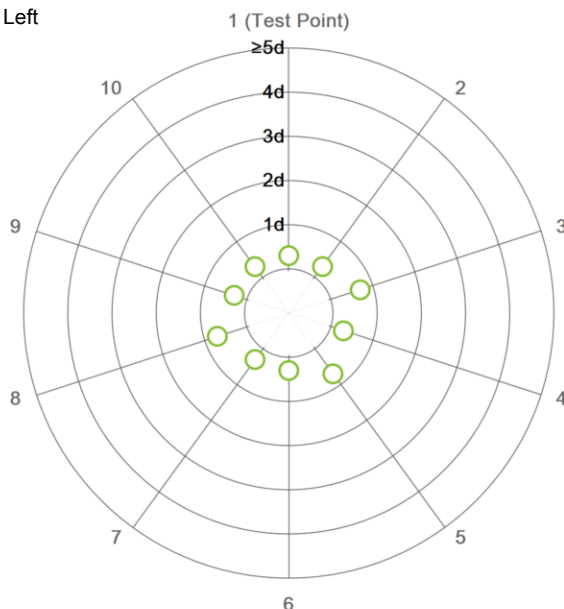
Repeatability

Test Load: 100 g

| | As Found | As Left |
|----|------------|---------|
| 1 | 100.0000 g | N/A |
| 2 | 100.0000 g | N/A |
| 3 | 99.9999 g | N/A |
| 4 | 100.0000 g | N/A |
| 5 | 99.9999 g | N/A |
| 6 | 100.0000 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 | 0.00005 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.

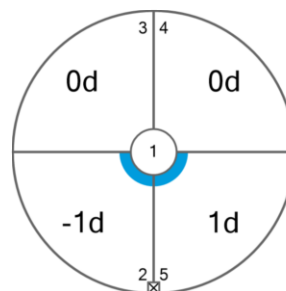
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

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

| | | |
|-------------------|----------|-----|
| Maximum Deviation | 0.0001 g | N/A |
|-------------------|----------|-----|



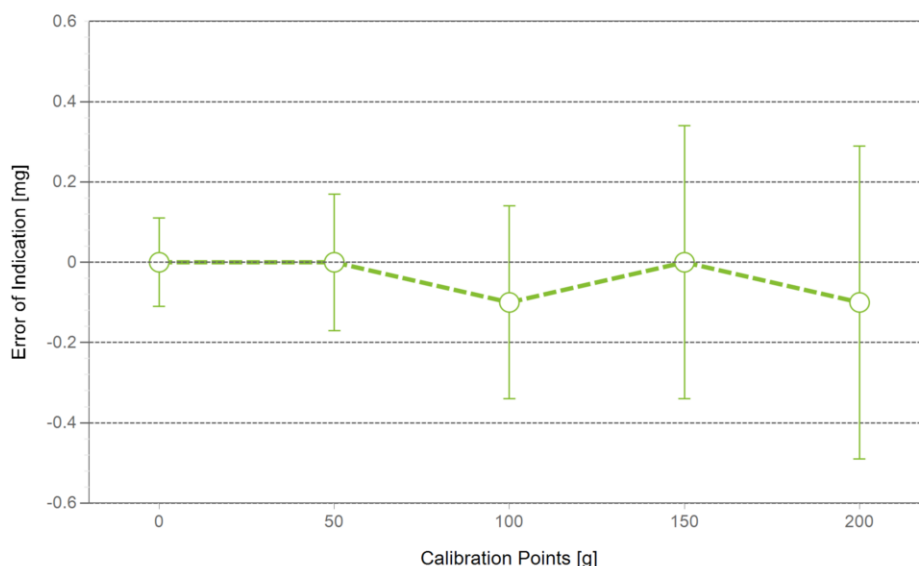
As Found

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 | 0.11 mg | 2 |
| 2 | 0.0500 g | 0.0500 g | 0.0000 g | 0.13 mg | 2 |
| 3 | 0.1000 g | 0.1000 g | 0.0000 g | 0.13 mg | 2 |
| 4 | 0.5000 g | 0.5000 g | 0.0000 g | 0.13 mg | 2 |
| 5 | 1.0000 g | 1.0000 g | 0.0000 g | 0.13 mg | 2 |
| 6 | 5.0000 g | 5.0000 g | 0.0000 g | 0.13 mg | 2 |
| 7 | 10.0000 g | 10.0000 g | 0.0000 g | 0.14 mg | 2 |
| 8 | 50.0000 g | 50.0000 g | 0.0000 g | 0.17 mg | 2 |
| 9 | 100.0001 g | 100.0000 g | -0.0001 g | 0.24 mg | 2 |
| 10 | 150.0001 g | 150.0001 g | 0.0000 g | 0.34 mg | 2 |
| 11 | 200.0000 g | 199.9999 g | -0.0001 g | 0.39 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 – 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. 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: | 22-Nov-2022 |
| Certificate Number: | 182272 | Calibration Due Date: | 21-May-2024 |

Thermo Hygrometer

| | | | |
|---------------------|---------------|-----------------------|-------------|
| Equipment No.: | IN302 | Date of Issue: | 11-Oct-2023 |
| Certificate Number: | SG-H-00656/66 | Calibration Due Date: | 08-Oct-2024 |

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

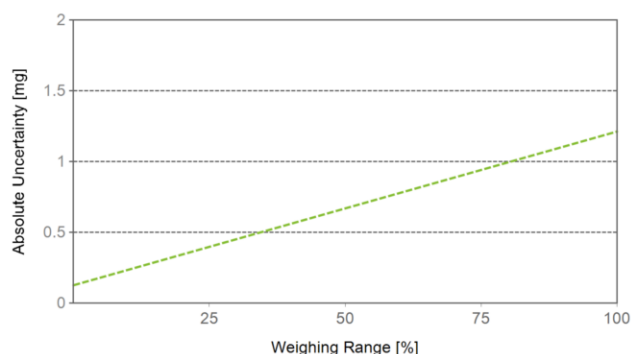
Linearization of Uncertainty Equation

| Range | | | As Found | As Left |
|-------|----------|-------|--|---------|
| | d | Max | | |
| 1 | 0.0001 g | 220 g | $U_1 = 0.13 \text{ mg} + 0.00494 \text{ mg/g} \cdot R$ | N/A |

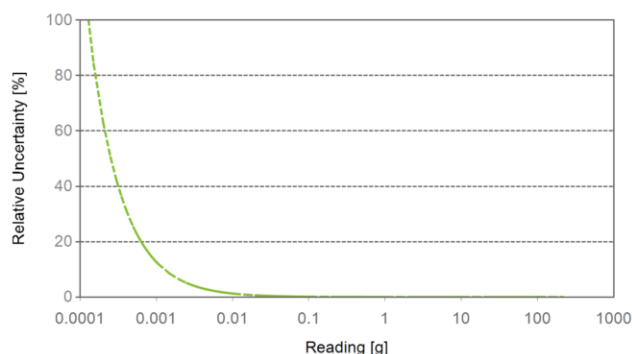
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

| Net Indication | As Found | | As Left | |
|----------------|----------|----------|---------|-----|
| 0.0220 g | 0.13 mg | 0.59% | N/A | N/A |
| 0.2200 g | 0.13 mg | 0.060% | N/A | N/A |
| 2.2000 g | 0.14 mg | 0.0064% | N/A | N/A |
| 22.0000 g | 0.24 mg | 0.0011% | 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.

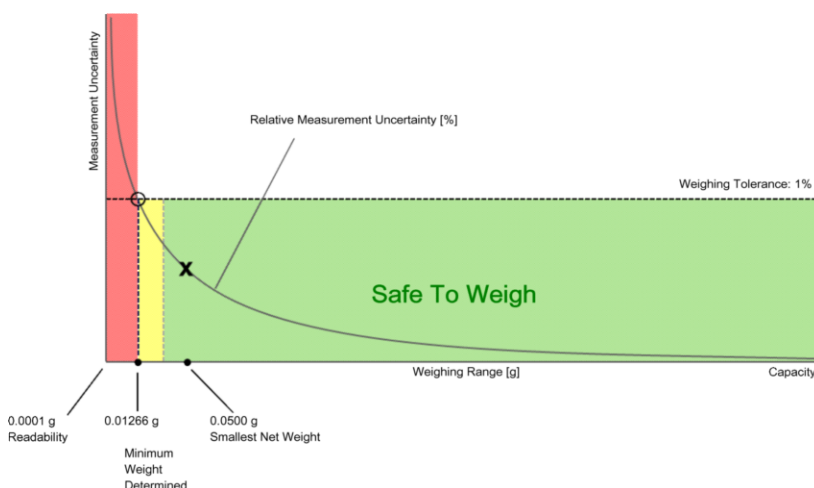
Process Requirements

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% | 0.12712 g | 0.25551 g | 0.38518 g | 0.64847 g | 1.33062 g |
| 0.2% | 0.06340 g | 0.12712 g | 0.19115 g | 0.32018 g | 0.64847 g |
| 0.5% | 0.02532 g | 0.05070 g | 0.07612 g | 0.12712 g | 0.25551 g |
| 1% | 0.01266 g | 0.02532 g | 0.03800 g | 0.06340 g | 0.12712 g |
| 2% | 0.00633 g | 0.01266 g | 0.01899 g | 0.03166 g | 0.06340 g |
| 5% | 0.00253 g | 0.00506 g | 0.00759 g | 0.01266 g | 0.02532 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% | 0.12712 g | 0.25551 g | 0.38518 g | 0.64847 g | 1.33062 g |
| 0.2% | 0.06340 g | 0.12712 g | 0.19115 g | 0.32018 g | 0.64847 g |
| 0.5% | 0.02532 g | 0.05070 g | 0.07612 g | 0.12712 g | 0.25551 g |
| 1% | 0.01266 g | 0.02532 g | 0.03800 g | 0.06340 g | 0.12712 g |
| 2% | 0.00633 g | 0.01266 g | 0.01899 g | 0.03166 g | 0.06340 g |
| 5% | 0.00253 g | 0.00506 g | 0.00759 g | 0.01266 g | 0.02532 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 | 0.00005 g* | N/A | 0.00005 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 |
| 100.0001 g | -0.0001 g | 0.0500 g | 0.1000 g | 0.2500 g | 0.5000 g | 1.0000 g | 2.5000 g |
| 150.0001 g | 0.0000 g | 0.0750 g | 0.1500 g | 0.3750 g | 0.7500 g | 1.5000 g | 3.7500 g |
| 200.0000 g | -0.0001 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 |
| 100.0001 g | -0.0001 g | 0.0500 g | 0.1000 g | 0.2500 g | 0.5000 g | 1.0000 g | 2.5000 g |
| 150.0001 g | 0.0000 g | 0.0750 g | 0.1500 g | 0.3750 g | 0.7500 g | 1.5000 g | 3.7500 g |
| 200.0000 g | -0.0001 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.



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



Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT24-9500

Page : 1 of 2

Customer : Environment research & Technogy Co.,Ltd.

Address : 25/114 Moo6 Soi Chinaket1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210

Description : Incubator

Manufacturer : Hotpack

Model : 352601

Serial No. : 78633

Identification No. : ERTC-L-In-133

Calibration Place : Customer Laboratory

Order No. : 4090/24

Received date : Nov 29, 2024

Calibration date : Nov 29, 2024

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 | MY58003374 | MT24-1056 | Jan 05, 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 : Dec 06, 2024

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

**Inctech Metrological Center Co.Ltd.**

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

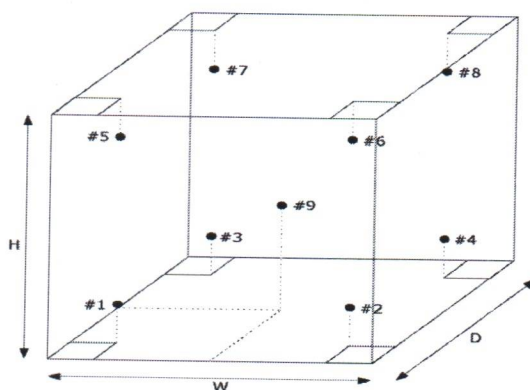
Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

Calibration Cert. # 3884.01
ISO/IEC 17025**Certificate No. : MT24-9500****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 | 20.276 | 20.230 | 20.142 | 20.019 | 19.785 | 20.414 | 20.187 | 20.072 | 20.426 | 0.41 |

| Setting temperature (°C) | Indicating Temperature (°C) | Measured stability (+/- °C) | Measured uniformity (°C) | Overall variation (°C) |
|----------------------------|-------------------------------|-------------------------------|----------------------------|--------------------------|
| 20.0 | 20.0 | 0.27 | 0.97 | 1.1 |

**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.



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.: 24TW185

Page.: 1 of 2

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-115V
Serial No. : 03C1280 AC
ID No. : ERTC-L-In-164
Received Date : 03 September 2024
Test Date : 04 September 2024
Reference : 2409-0126DN-1
Submitted by : Environment Research & Technology Company Limited.
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Walalak Sirithean

Approved by : _____
Approved Signatory
() Unnopphol Harachai
() Ponpan Paipim
(✓) Saithip Meangmai
Issue Date : 6 September 2024



Cert.No.: 24TW185

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

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

| <u>Instruments</u> | <u>Serial No.</u> | <u>ID No.</u> | <u>Certificate No.</u> | <u>Due Date</u> |
|--------------------|-------------------|---------------|------------------------|-----------------|
| 1. Burette | - | 130BU10 | 23CG1172 | 22 Mar 2025 |
| 2. Balance | N03679 | 140RC001 | 23MM537 | 14 Sep 2024 |

2. Standard Material :-

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

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


Dissolved Oxygen Probe No.: 15K100353

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|--|--|--------------------------------------|
| 8.18 | 8.18 | 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-


CALIBRATION REPORT

 Cert. Number
BTC-T-01/67
Page 1 of 4 pages

Issued By B.T.METROLOGY CO.,LTD.
Date of Issue 3 January 2024

B.T.METROLOGY CO.,LTD.
17/166 Soi Prachachun 14 (PEA Village)
Tungsonghong Laksi, Bangkok 10210

Approved Signatory


P.Prasitamate

Customer : Environment research & Technogy Co., Ltd.

Address : 25/114 Moo6 Soi Chinaket1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210

Date of Received : 29 December 2023

Instrument – Description : COD REACTOR

Id. Number : ERTC-L-In-112

Manufacturer : Hanna

Model Number : HI 8398000-02

Serial Number : G0059491

Calibration Procedure : Indicate temperature of Unit Under Test (UUC) was compared to temperature Obtained from reference standards at calibration point. .

Measurement Method : The thermocouples shall be placed with in the chamber in accordance with the appendix A and the temp. readings of the thermocouples could be found in the appendix A.

Cal. Inform. : Cal. (☒) Only () Adjusted

Location of Calibration : At Customer Location

Environmental Conditions :

Temperature is $27 \pm 3^{\circ}\text{C}$

Relative Humidity is $60 \pm 10\% \text{ Rh}$

Comments

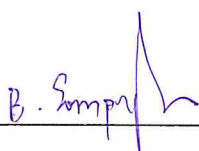
The temperature scale in use is the International Temperature Scale of 1990 (ITS-90).
The Uncertainties of report based on a standard uncertainty Multiplied by a coverage factor $k=2$,
Providing level of confidence approximately 95%
All Tests pass standard tolerance.

Tractability Information

| Reference Standards Description | Serial Number | Certificate Number | Cal. Date | Due Date. |
|--------------------------------------|----------------|--------------------|-----------------|-----------------|
| STD Thermometer with Probe, PRT | 08000079/12058 | PSL-T 0872/66 | 6-7/June /2023 | 6-7/June /2024 |
| Equipment Description | Serial Number | Certificate Number | Cal. Date | Dule Date. |
| Data logger With Probe (RTD : 01-25) | MY49020096 | BTC-T-001-66 | 1/February/2023 | 1/February/2024 |

This certification is traceable to SI Unit through the reference standard laboratory of In-house B.T.Metrology Calibration Lab. The used to perform this calibration is Traceable to National Institute of Metrology (Thailand), NIMT through Reference Standard Laboratory of Thailand Institute of Scientific and Technological Research (TISTR), No. Calibration 0260.(Laboratories was Accreditation by TISI According to ITS ISO / IEC 17025

Calibrated By:


(Mr. Boonlue Somprajob)

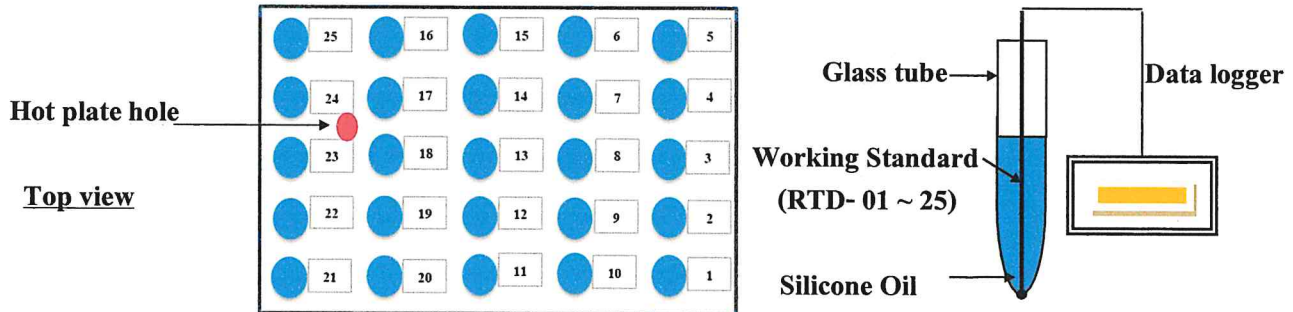
Date of Calibration : 1 January 2024

CALIBRATION REPORT

Issued By B.T.METROLOGY CO.,LTD.
Date of Issue 3 January 2024

Cert. Number
BTC-T-01/67
Page 2 of 4 pages

Appendix A.



Calibrated By:

B. Somprajob
(Mr. Boonlue Somprajob)

Date of Calibration : 1 January 2024

CALIBRATION REPORT



Cert. Number

BTC-T-01/67

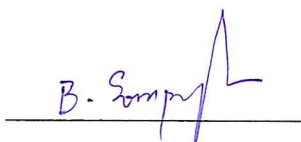
Page 3 of 4 pages

Issued By B.T.METROLOGY CO.,LTD.

Date of Issue 3 January 2024

| Hole No. (Position) | Max (°C) | Min (°C) | Mid-Range (°C) | Difference (°C) | Uncertainty of measurement (\pm °C) |
|------------------------|-------------|-------------|-------------------|--------------------|---|
| 1 | 149.3 | 149.2 | 149.3 | 0.1 | 0.5 |
| 2 | 147.6 | 147.4 | 147.5 | 0.1 | |
| 3 | 149.6 | 149.4 | 149.5 | 0.1 | |
| 4 | 149.9 | 149.7 | 149.8 | 0.1 | |
| 5 | 149.8 | 149.7 | 149.8 | 0.1 | |
| 6 | 147.9 | 147.7 | 147.8 | 0.1 | |
| 7 | 151.6 | 151.4 | 151.5 | 0.2 | |
| 8 | 150.6 | 150.4 | 150.5 | 0.2 | |
| 9 | 150.8 | 150.6 | 150.7 | 0.2 | |
| 10 | 149.6 | 149.4 | 149.5 | 0.2 | |
| 11 | 147.6 | 147.4 | 147.5 | 0.2 | |
| 12 | 152.0 | 151.7 | 151.9 | 0.3 | |
| 13 | 152.4 | 152.2 | 152.3 | 0.2 | |
| 14 | 151.3 | 151.1 | 151.2 | 0.2 | |
| 15 | 152.4 | 152.0 | 152.2 | 0.4 | |
| 16 | 151.4 | 151.1 | 151.3 | 0.3 | |
| 17 | 150.8 | 150.6 | 150.7 | 0.2 | |
| 18 | 152.6 | 152.3 | 152.5 | 0.3 | |
| 19 | 150.0 | 149.8 | 149.9 | 0.2 | |
| 20 | 151.0 | 150.7 | 150.9 | 0.3 | |
| 21 | 148.8 | 148.6 | 148.7 | 0.1 | |
| 22 | 149.5 | 149.4 | 149.5 | 0.2 | |
| 23 | 149.5 | 149.4 | 149.5 | 0.1 | |
| 24 | 150.9 | 150.7 | 150.8 | 0.3 | |
| 25 | 148.8 | 148.7 | 148.8 | 0.2 | |
| Hot plate hole | 150.3 | 149.6 | 150.0 | 0.6 | |

Calibrated By:


B. Somprajob

(Mr. Boonlue Somprajob)

Date of Calibration : 1 January 2024

CALIBRATION REPORT



Cert. Number
BTC-T-01/67

Page 4 of 4 pages

Issued By B.T.METROLOGY CO.,LTD.

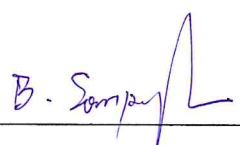
Date of Issue 3 January 2024

| UUC | | Average Measured Temperature * (°C) | Measured Temperature | | Measured Variation | | |
|-----------------|-----------------|---|-------------------------|-------------|--------------------|--------------------|-----------------|
| Setting (°C) | Reading (°C) | | Max (°C) | Min (°C) | Stability (±°C) | Uniformity (°C) | Overall (°C) |
| 150.0 | 147.4 ~ 152.6 | 150.1 | 152.6 | 147.4 | 0.3 | 4.8 | 5.2 |

Note : - Reference Standards are measurement in tube silicone oil at 240 value record after temperature stability.
- Level high of silicone oil is equal heater plate of UUC.

... end of certificate ...

Calibrated By:



(Mr. Boonlue Somprajob)

Date of Calibration : 1 January 2024