



ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือฯ

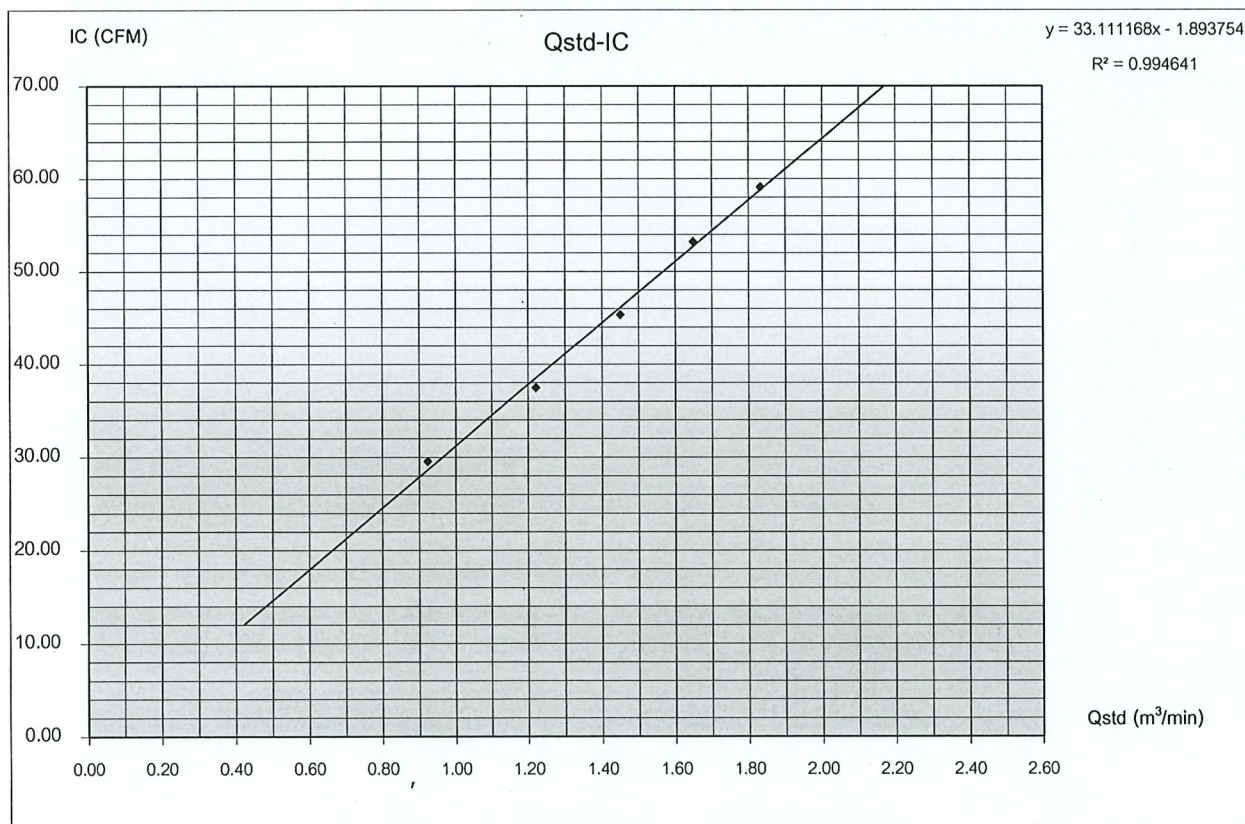
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|--|-------------|--------------------------|----------|---------------|----------------------|
| Sampler Location | | | | Date | 25/7/2022 |
| A1 : บริเวณพื้นที่โครงการด้านทิศตะวันตกเฉียงใต้ใกล้ถนนพหลโยธิน | | | | Start Time | 12:05 PM |
| Sampler Number | TSP No.A6 | Transfer Standard Type | Orifice | Stop Time | 12:15 PM |
| Instrument Model | HIVOL-BBCBE | Calibrator Model | TE-5025A | Calibrated By | Mr.Anan Kongnguennok |
| Motor Serial Number | 2012-01 | Calibrator Serial Number | 2716 | | |
| Recorder Serial Number | 3140 | | | | |

| 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 | 1.5 | 3.0 | 1.70755 | 0.92245 | 30.0 | 29.58 | 305.0 | 756.0 | | |
| 7 | 2.6 | 2.6 | 5.2 | 2.24809 | 1.22074 | 38.0 | 37.46 | 305.0 | 756.0 | | |
| 10 | 3.6 | 3.7 | 7.3 | 2.66363 | 1.45005 | 46.0 | 45.35 | 305.0 | 756.0 | | |
| 13 | 4.7 | 4.7 | 9.4 | 3.02257 | 1.64813 | 54.0 | 53.24 | 305.0 | 756.0 | | |
| 18 | 5.8 | 5.8 | 11.6 | 3.35770 | 1.83307 | 60.0 | 59.15 | 305.0 | 756.0 | | |
| Linear Regression Y ON X : Y= mX + b | | | | | | | Average | 305.0 | 756.0 | | |
| 1 | Slope (m) | | | 1.81211 | Linear Equation | | | r ² | 0.994641 | Pstd(mmHg) | 760.0 |
| 2 | Intercept (b) | | | 0.03597 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.9973169 | T _{NTP} | 298.0 |
| 3 | Correlation Coefficient (r) | | | 0.99999 | Final Set Flow Rate = (I) | | 0 | (Pa/Pstd)*(Tstd/Ta) | | 0.971906816 | |
| Result | | | | | | | | C=(Pa/Pstd)*(Tstd/Ta)*0.5 | | 0.985853344 | |

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician

Approved By

(Mr. Panupon Podang)
Environmental Scientist

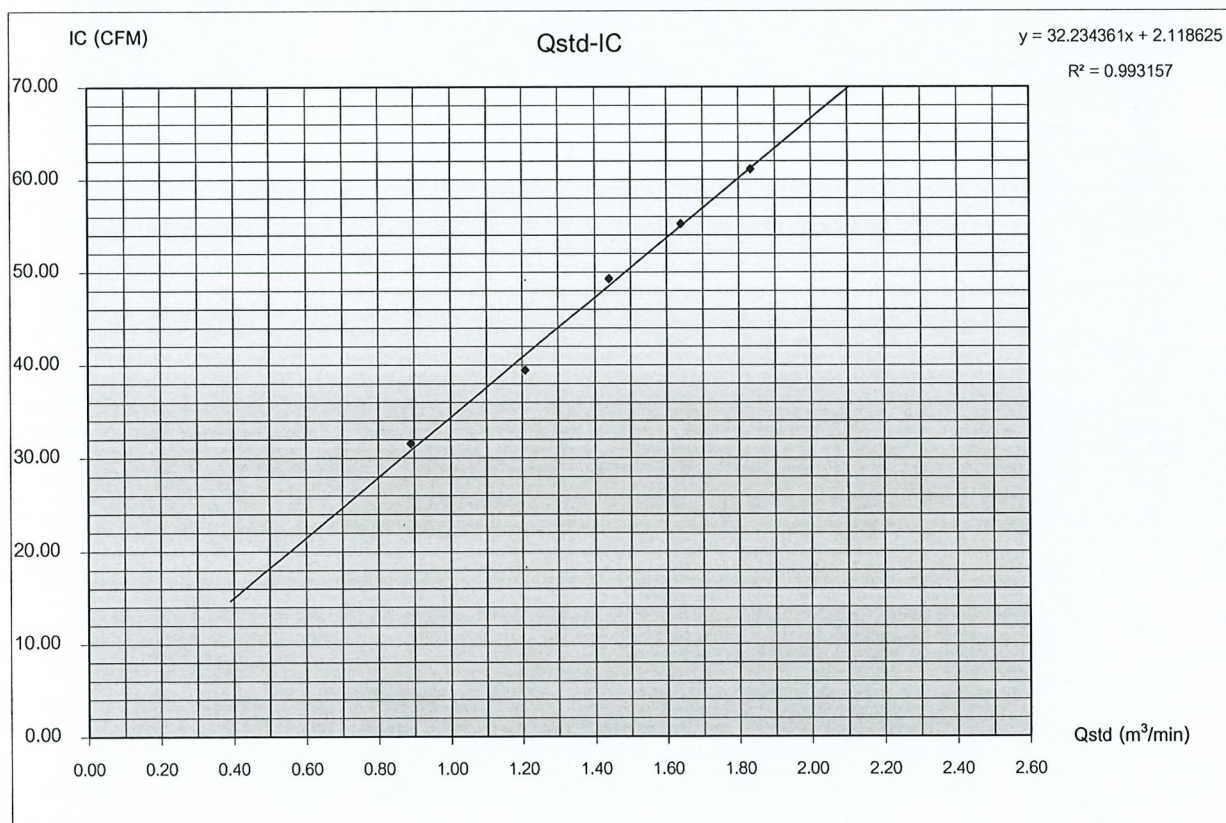
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|---|-------------|--------------------------|----------|---------------|---------------------|
| Sampler Location | | | | Date | 25/7/2022 |
| A1 : บริเวณพื้นที่โครงการบ้านจัดสรรของเอกชนใกล้ซอยถนน | | | | Start Time | 12:15 PM |
| Sampler Number | PM-10 No.17 | Transfer Standard Type | Orifice | Stop Time | 12:25 PM |
| Instrument Model | HIVOL-BMBBE | Calibrator Model | TE-5025A | Calibrated By | Mr.Anan Kongguennok |
| Motor Serial Number | 2065 | Calibrator Serial Number | 2716 | | |
| Recorder Serial Number | 2217 | | | | |

| Plate No. | (Delta H) | | | (A) | (X) | (I) | (Y) | Temperature | Barometric | Start | Stop |
|--------------------------------------|---|----------|-------------------|---|--|---|---|---------------------------|----------------------|------------------|-------------|
| | 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 Indicatio (ft ³ /min) | IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2} | (*K = °C+273) | Pressure (mmHg) | Meter | Meter |
| | Positive | Negative | ΔH ₂ O | | | | | | | | |
| 5 | 1.4 | 1.4 | 2.8 | 1.64965 | 0.89050 | 32.0 | 31.55 | 305.0 | 756.0 | | |
| 7 | 2.6 | 2.5 | 5.1 | 2.22637 | 1.20876 | 40.0 | 39.43 | 305.0 | 756.0 | | |
| 10 | 3.6 | 3.6 | 7.2 | 2.64532 | 1.43995 | 50.0 | 49.29 | 305.0 | 756.0 | | |
| 13 | 4.6 | 4.7 | 9.3 | 3.00645 | 1.63924 | 56.0 | 55.21 | 305.0 | 756.0 | | |
| 18 | 5.8 | 5.8 | 11.6 | 3.35770 | 1.83307 | 62.0 | 61.12 | 305.0 | 756.0 | | |
| Linear Regression Y ON X : Y= mX + b | | | | | | | Average | 305.0 | 756.0 | | |
| 1 | Slope (m) | | | 1.81211 | Linear Equation | | | r ² | 0.993157 | Pstd(mmHg) | 760.0 |
| 2 | Intercept (b) | | | 0.03597 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.9965726 | T _{NTP} | 298.0 |
| 3 | Correlation Coefficient (r) | | | 0.99999 | Final Set Flow Rate = (I) | | 0 | (Pa/Pstd)*(Tstd/Ta) | | | 0.971906816 |
| Result | | | | | | | | C=(Pa/Pstd)*(Tstd/Ta)^0.5 | | | 0.985853344 |

COMMENT

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(Mr. Prayun Detkla)
Technician

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Environmental Scientist

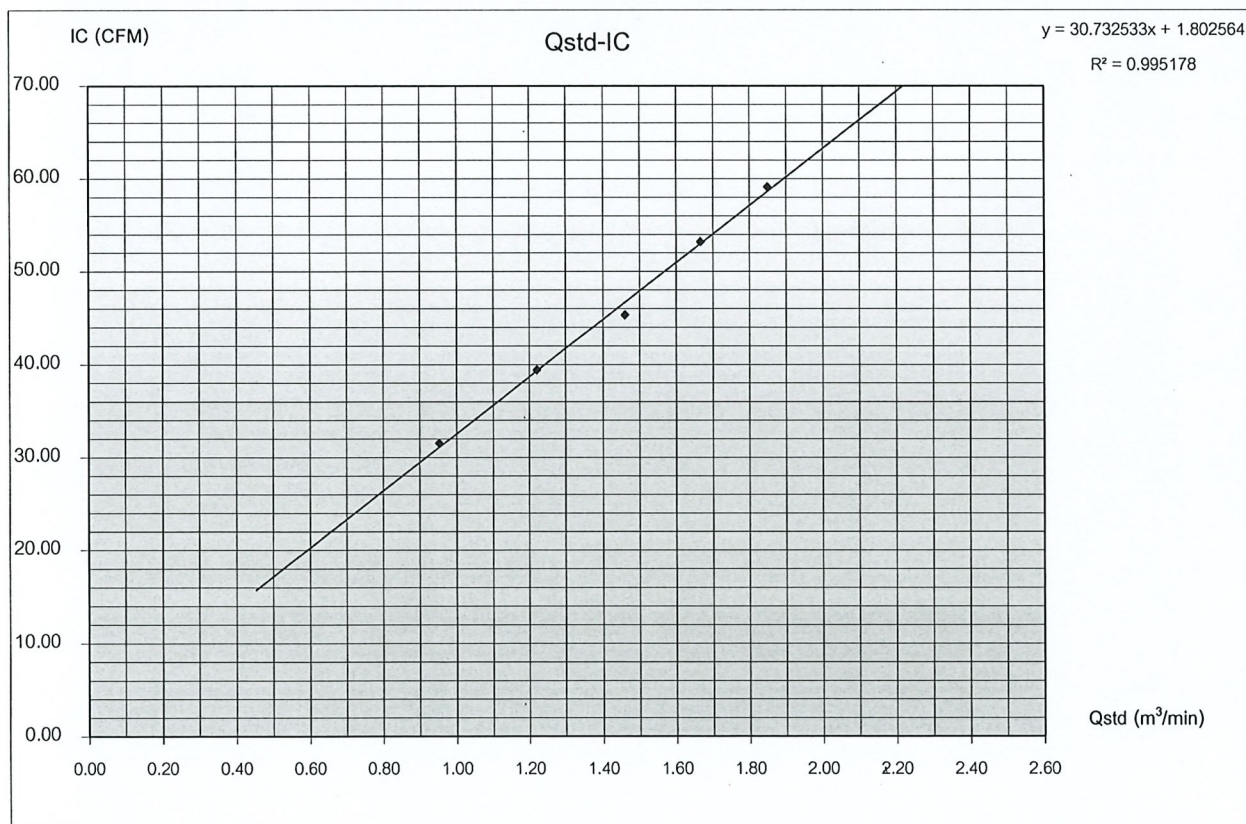
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|---------------------------------------|-------------|--------------------------|----------|---------------|---------------------|
| Sampler Location | | | | Date | 25/7/2022 |
| A2 : บริเวณบ้านเลขที่ 28 บ้านวังตะพาน | | | | Start Time | 13:20:00 PM |
| Sampler Number | TSP No.A24 | Transfer Standard Type | Onifice | Stop Time | 13:30:00 PM |
| Instrument Model | HIVOL-BBCBE | Calibrator Model | TE-5025A | Calibrated By | Mr.Anan Kongnguenok |
| Motor Serial Number | 2151 | Calibrator Serial Number | 2716 | | |
| Recorder Serial Number | 2412 | | | | |

| Plate No. | (Delta H) | | | (A) | (X) | (I) | (Y) | Temperature | Barometric | Start | Stop | |
|--------------------------------------|---|----------|-------------------|---|---|---|---|---------------------|---------------------------|------------------|-------------|--|
| | 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 Indication (ft ³ /min) | IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2} | (*K = °C+273) | Pressure (mmHg) | Meter | Meter | |
| | Positive | Negative | ΔH ₂ O | | | | | | | | | |
| 5 | 1.6 | 1.6 | 3.2 | 1.76355 | 0.95335 | 32.0 | 31.55 | 305.0 | 756.0 | | | |
| 7 | 2.6 | 2.6 | 5.2 | 2.24809 | 1.22074 | 40.0 | 39.43 | 305.0 | 756.0 | | | |
| 10 | 3.7 | 3.7 | 7.4 | 2.68181 | 1.46009 | 46.0 | 45.35 | 305.0 | 756.0 | | | |
| 13 | 4.8 | 4.8 | 9.6 | 3.05455 | 1.66578 | 54.0 | 53.24 | 305.0 | 756.0 | | | |
| 18 | 5.9 | 5.9 | 11.8 | 3.38652 | 1.84898 | 60.0 | 59.15 | 305.0 | 756.0 | | | |
| Linear Regression Y ON X : Y= mX + b | | | | | | | Average | 305.0 | 756.0 | | | |
| 1 | Slope (m) | | | 1.81211 | Linear Equation | | | r ² | 0.995178 | Pstd(mmHg) | 760.0 | |
| 2 | Intercept (b) | | | 0.03597 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.9975861 | T _{NTP} | 298.0 | |
| 3 | Correlation Coefficient (r) | | | 0.99999 | Final Set Flow Rate = (I) | | 0 | (Pa/Pstd)*(Tstd/Ta) | | 0.971906816 | | |
| Result | | | | | | | | | C=(Pa/Pstd)*(Tstd/Ta)^0.5 | | 0.985853344 | |

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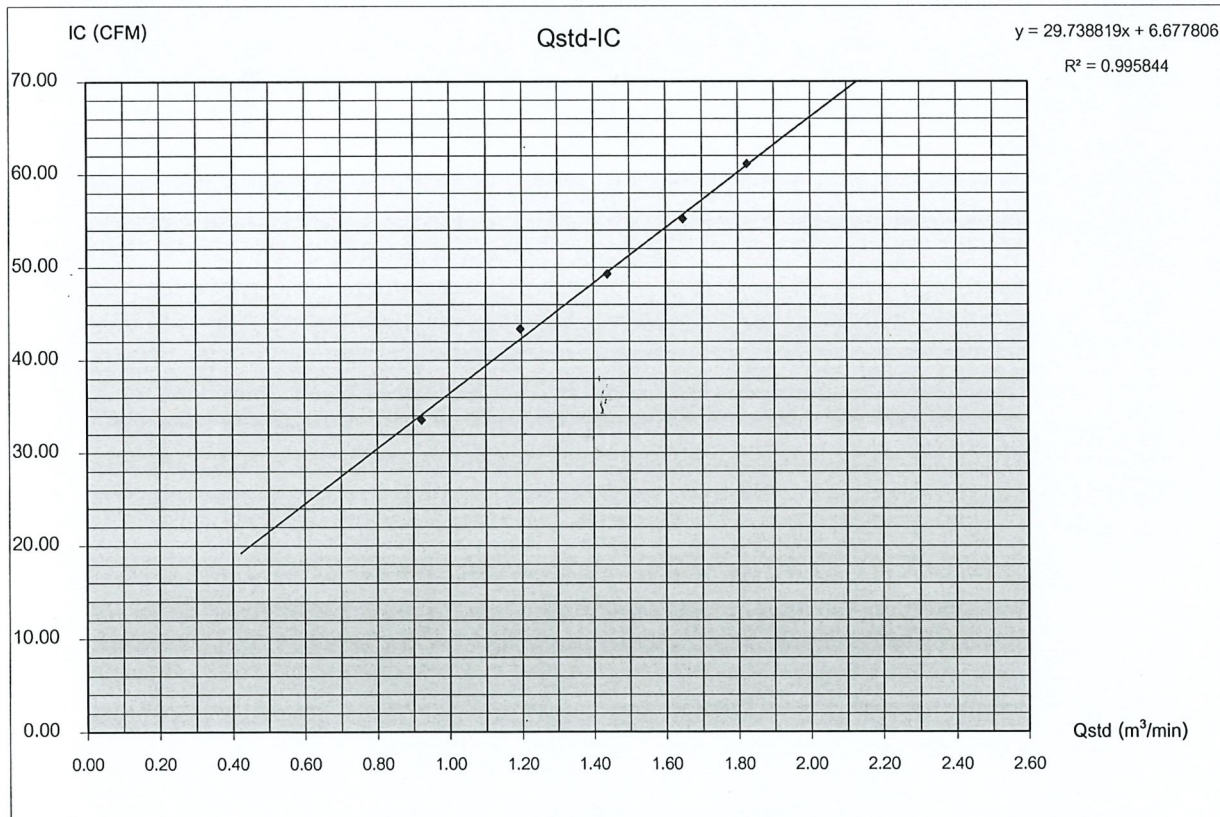
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|---------------------------------------|-------------|--------------------------|----------|---------------|---------------------|
| Sampler Location | | | | Date | 25/7/2022 |
| A2 : บริเวณบ้านเลขที่ 28 บ้านวังตะพาน | | | | Start Time | 13:30:00 PM |
| Sampler Number | PM-10 No.24 | Transfer Standard Type | Orifice | Stop Time | 13:40:00 PM |
| Instrument Model | HIVOL-BMBBE | Calibrator Model | TE-5025A | Calibrated By | Mr.Anan Kongnguenok |
| Motor Serial Number | 2149 | Calibrator Serial Number | 2716 | | |
| Recorder Serial Number | 2407 | | | | |

| Plate No. | (Delta H) | | | (A) | (X) | (I) | (Y) | Temperature | Barometric Pressure | Start Meter | Stop Meter |
|--------------------------------------|---|----------|-------------------|---|---|--|--|---------------------------|---------------------|------------------|------------|
| | Pressure Drop Across Orifice (inH ₂ O) | | | | | | | | | | |
| | Positive | Negative | ΔH ₂ O | $[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$ | $Q_{std} = (1/m)[(A-b)]$ (m ³ /min) | sample Flow Rate Indicator (ft ³ /min) | $IC = \{[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$ (*K = °C+273) | (mmHg) | | | |
| 5 | 1.5 | 1.5 | 3.0 | 1.70755 | 0.92245 | 34.0 | 33.52 | 305.0 | 756.0 | | |
| 7 | 2.5 | 2.5 | 5.0 | 2.20444 | 1.19665 | 44.0 | 43.38 | 305.0 | 756.0 | | |
| 10 | 3.6 | 3.6 | 7.2 | 2.64532 | 1.43995 | 50.0 | 49.29 | 305.0 | 756.0 | | |
| 13 | 4.7 | 4.7 | 9.4 | 3.02257 | 1.64813 | 56.0 | 55.21 | 305.0 | 756.0 | | |
| 18 | 5.7 | 5.8 | 11.5 | 3.34319 | 1.82507 | 62.0 | 61.12 | 305.0 | 756.0 | | |
| Linear Regression Y ON X : Y= mX + b | | | | | | | Average | 305.0 | 756.0 | | |
| 1 | Slope (m) | | | 1.81211 | Linear Equation | | | r ² | 0.995844 | Pstd(mmHg) | 760.0 |
| 2 | Intercept (b) | | | 0.03597 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.9979198 | T _{NTP} | 298.0 |
| 3 | Correlation Coefficient (r) | | | 0.99999 | Final Set Flow Rate = (I) | | 0 | (Pa/Pstd)*(Tstd/Ta) | | 0.971906816 | |
| Result | | | | | | | | C=(Pa/Pstd)*(Tstd/Ta)^0.5 | | 0.985853344 | |

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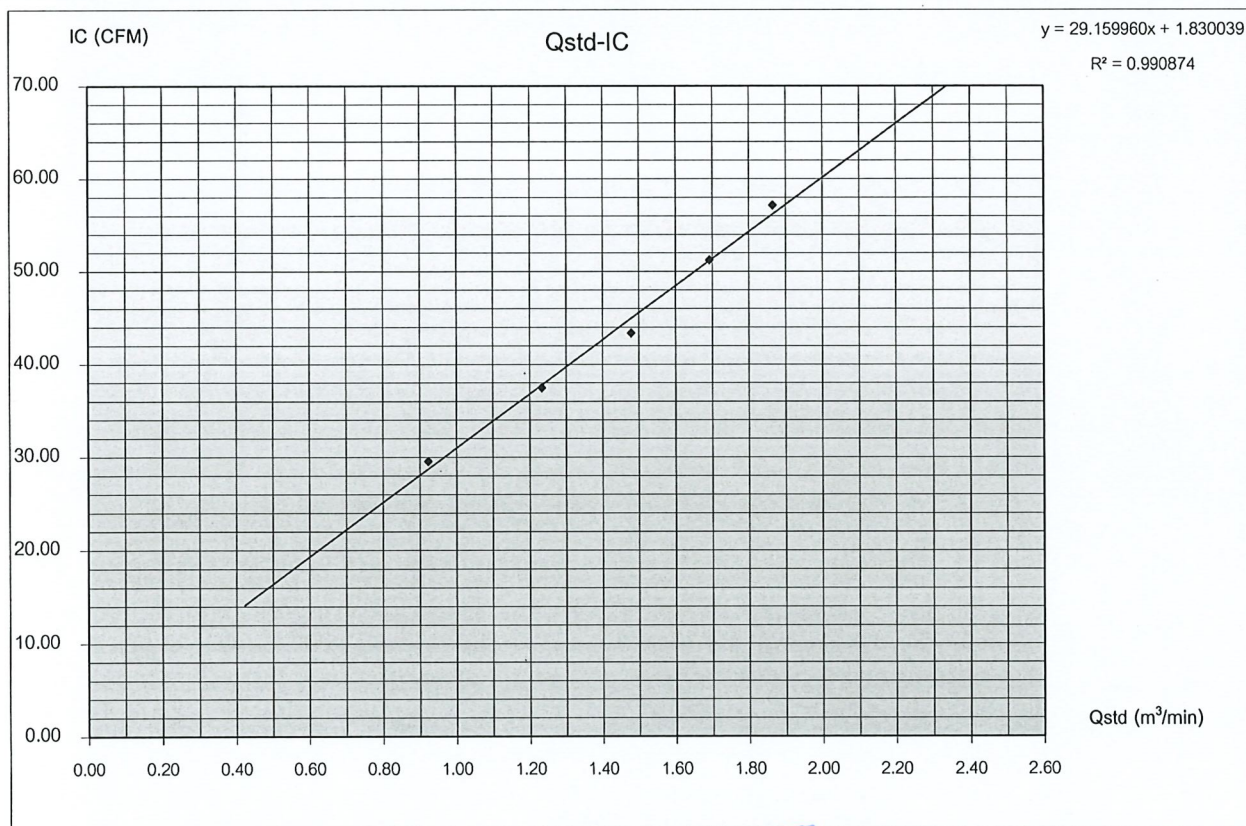
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|--|-------------|--------------------------|----------|---------------|---------------------|
| Sampler Location | | | | Date | 25/7/2022 |
| A3 : บริเวณโรงเรียนวัดโสมนัสประจวบคีรีขันธ์ 76 | | | | Start Time | 13:50:00 PM |
| Sampler Number | TSP No.A1 | Transfer Standard Type | Orifice | Stop Time | 14:00:00 PM |
| Instrument Model | HIVOL-BBCBE | Calibrator Model | TE-5025A | Calibrated By | Mr.Anan Kongnguenok |
| Motor Serial Number | 3680 | Calibrator Serial Number | 2716 | | |
| Recorder Serial Number | 954 | | | | |

| 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)] (m ³ /min) | sample Flow Rate Indication (ft ³ /min) | IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2} | (°K = °C+273) | Pressure (mmHg) | Meter | Meter | |
| | Positive | Negative | ΔH ₂ O | | | | | | | | | |
| 5 | 1.5 | 1.5 | 3.0 | 1.70755 | 0.92245 | 30.0 | 29.58 | 305.0 | 756.0 | | | |
| 7 | 2.6 | 2.7 | 5.3 | 2.26960 | 1.23262 | 38.0 | 37.46 | 305.0 | 756.0 | | | |
| 10 | 3.8 | 3.8 | 7.6 | 2.71781 | 1.47995 | 44.0 | 43.38 | 305.0 | 756.0 | | | |
| 13 | 4.9 | 5.0 | 9.9 | 3.10192 | 1.69192 | 52.0 | 51.26 | 305.0 | 756.0 | | | |
| 18 | 6.0 | 6.0 | 12.0 | 3.41510 | 1.86475 | 58.0 | 57.18 | 305.0 | 756.0 | | | |
| Linear Regression Y ON X : Y= mX + b | | | | | | | Average | 305.0 | 756.0 | | | |
| 1 | Slope (m) | | | 1.81211 | Linear Equation | | | r ² | 0.990874 | Pstd(mmHg) | 760.0 | |
| 2 | Intercept (b) | | | 0.03597 | Set Point Flow Rate (X) (m ³ /min) | | | 1.133 | r | 0.9954265 | T _{NTP} | |
| 3 | Correlation Coefficient (r) | | | 0.99999 | Final Set Flow Rate = (I) | | | 0 | (Pa/Pstd)*(Tstd/Ta) | | | |
| Result | | | | | | | | | C=(Pa/Pstd)*(Tstd/Ta)^0.5 | | | 0.985853344 |

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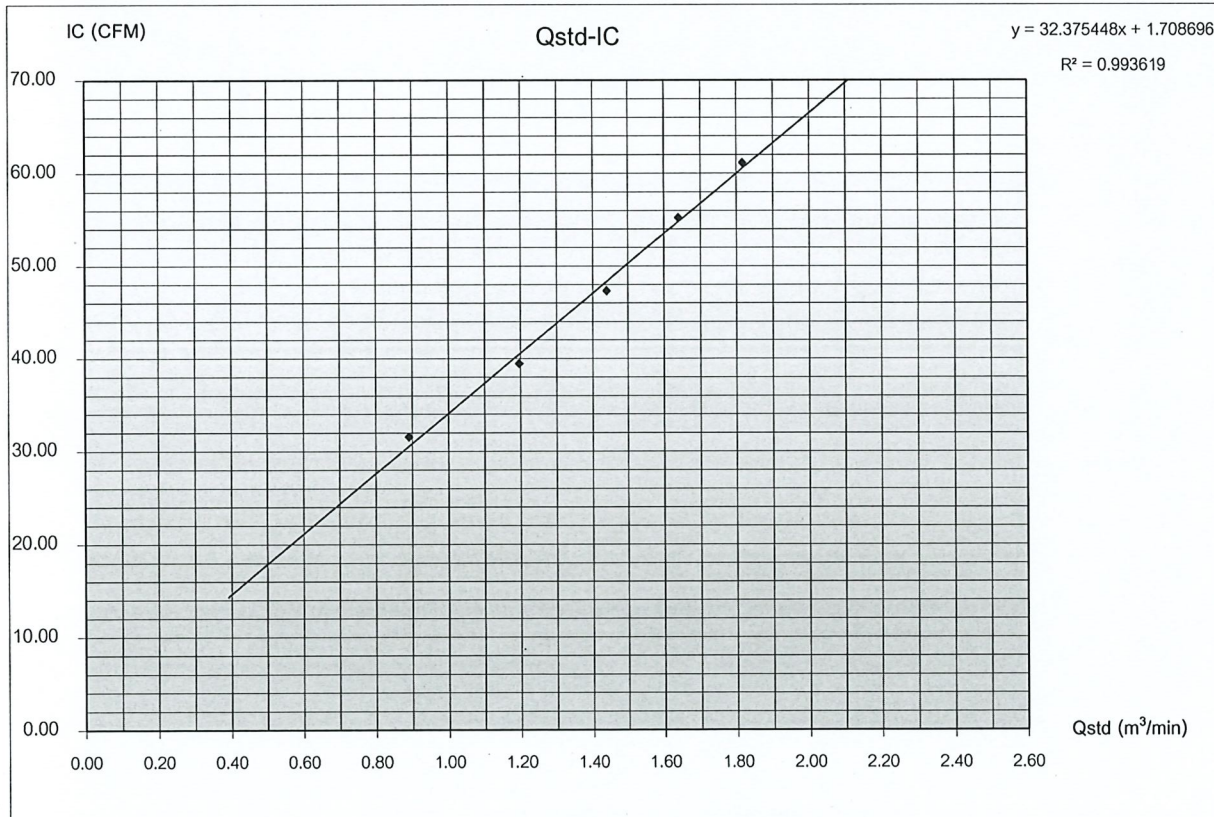
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

| | | | | | |
|---|-------------|--------------------------|----------|---------------|---------------------|
| Sampler Location | | | | Date | 25/7/2022 |
| A3 : บริเวณโรงเรียนวัดโพธิ์ประทุมวนารามที่ 76 | | | | Start Time | 14:00:00 PM |
| Sampler Number | PM-10 No.4 | Transfer Standard Type | Orifice | Stop Time | 14:10:00 PM |
| Instrument Model | HIVOL-BMBBE | Calibrator Model | TE-5025A | Calibrated By | Mr.Anan Kongnguenok |
| Motor Serial Number | 2012-09 | Calibrator Serial Number | 2716 | | |
| Recorder Serial Number | 2132 | | | | |

| 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 (mmHg) | Meter | Meter |
| | Positive | Negative | ΔH ₂ O | | | | | | | | |
| 5 | 1.4 | 1.4 | 2.8 | 1.64965 | 0.89050 | 32.0 | 31.55 | 305.0 | 756.0 | | |
| 7 | 2.5 | 2.5 | 5.0 | 2.20444 | 1.19665 | 40.0 | 39.43 | 305.0 | 756.0 | | |
| 10 | 3.6 | 3.6 | 7.2 | 2.64532 | 1.43995 | 48.0 | 47.32 | 305.0 | 756.0 | | |
| 13 | 4.6 | 4.7 | 9.3 | 3.00645 | 1.63924 | 56.0 | 55.21 | 305.0 | 756.0 | | |
| 18 | 5.7 | 5.7 | 11.4 | 3.32862 | 1.81703 | 62.0 | 61.12 | 305.0 | 756.0 | | |
| Linear Regression Y ON X : Y= mX + b | | | | | | | Average | 305.0 | 756.0 | | |
| 1 | Slope (m) | | | 1.81211 | Linear Equation | | | r ² | 0.993619 | Pstd(mmHg) | 760.0 |
| 2 | Intercept (b) | | | 0.03597 | Set Point Flow Rate (X) (m ³ /min) | | 1.133 | r | 0.9968044 | T _{NTP} | 298.0 |
| 3 | Correlation Coefficient (r) | | | 0.99999 | Final Set Flow Rate = (I) | | 0 | (Pa/Pstd)*(Tstd/Ta) | | 0.971906816 | |
| Result | | | | | | | | C=(Pa/Pstd)*(Tstd/Ta)^0.5 | | 0.985853344 | |

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician

Approved By

(Mr. Panupon Podang)
Environmental Scientist

Certificate of Calibration

Calibration Certification Information

Cal. Date: February 8, 2022 Rootsmeter S/N: 438320 Ta: 294 °K
 Operator: Jim Tisch Pa: 750.1 mm Hg
 Calibration Model #: TE-5025A Calibrator S/N: **2716**

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.3090 | 3.2 | 2.00 |
| 2 | 3 | 4 | 1 | 0.9160 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.8140 | 7.9 | 5.00 |
| 4 | 7 | 8 | 1 | 0.7760 | 8.8 | 5.50 |
| 5 | 9 | 10 | 1 | 0.6380 | 12.8 | 8.00 |

Data Tabulation

| Vstd (m3) | Qstd (x-axis) | $\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis) | Va | Qa (x-axis) | $\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis) |
|-------------|---------------|--|-----------|-------------|---|
| 0.9961 | 0.7609 | 1.4145 | 0.9957 | 0.7607 | 0.8854 |
| 0.9918 | 1.0828 | 2.0004 | 0.9915 | 1.0824 | 1.2521 |
| 0.9898 | 1.2160 | 2.2365 | 0.9895 | 1.2156 | 1.3999 |
| 0.9886 | 1.2740 | 2.3456 | 0.9883 | 1.2735 | 1.4683 |
| 0.9833 | 1.5412 | 2.8289 | 0.9829 | 1.5407 | 1.7708 |
| QSTD | m= | 1.81211 | QA | m= | 1.13472 |
| | b= | 0.03597 | | b= | 0.02252 |
| | r= | 0.99999 | | r= | 0.99999 |

Calculations

| | | | |
|---|---|--|--------------------------------|
| Vstd= | $\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$ | Va= | $\Delta Vol((Pa-\Delta P)/Pa)$ |
| Qstd= | $Vstd/\Delta Time$ | Qa= | $Va/\Delta Time$ |
| For subsequent flow rate calculations: | | | |
| Qstd= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$ | | Qa= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$ | |

Standard Conditions

| | |
|---|-----------|
| Tstd: | 298.15 °K |
| Pstd: | 760 mm Hg |
| Key | |
| ΔH: calibrator manometer reading (in H2O) | |
| ΔP: rootsmeter manometer reading (mm Hg) | |
| Ta: actual absolute temperature (°K) | |
| Pa: actual barometric pressure (mm Hg) | |
| b: intercept | |
| m: slope | |

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30



PLAY SOLUTION TECHNOLOGY COMPANY LIMITED
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Tel.:+66 2 011 0505, Fax:+66 2 010 7700
www.playsotec.com



CERTIFICATE OF CALIBRATION

Customer _____ Certificate no. PST-0001-22
Page no. 1 of 3

Company : ENVIRONMENT RESEARCH & TECHNOLOGY CO.,LTD.
Address : 25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road, Toongsonghong,
City / Province : Laksi, Bangkok
Zip/Postal : 10210

Device

Equipment : Electronic Balance Capacity : 220 g
Manufacturer : METTLER TOLEDO Readability : 0.0001 g
Model : AB204-S ID No. : ERTC-L-In-0048
Serial No. : 1123103723

Environment Conditions

Location of Calibration : Calibration Laboratory at Play Solution Technology Co.,Ltd
Ambient Temperature : 25.9 (°C)
Relative Humidity : 53.1 (%RH)
Barometric Pressure : 1011.5 (mba)
Calibration Procedure : This Calibration was conducted by using In-House calibration procedure number CP-M-001 base on "UKAS LAB 14"
Comment :

Date of Receipt : January 4, 2022

Date of Calibration : January 4, 2022

Issue Date : January 4, 2022

Calibrated by : Kittichai R.
(Kittichai Rattanatham)
Calibrator

Approved by :
(Kittichai Rattanatham)
Approved Signature

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

This Certificate is issued in accordance with the conditions of accreditation granted by Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and is traceability to recognize national standards and to the unit of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval prior written approval of the calibration center, Play Solution Technology Co.,Ltd



PLAY SOLUTION TECHNOLOGY COMPANY LIMITED
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www.playsotec.com



CERTIFICATE OF CALIBRATION

Result of Calibration : Without Adjustment Certificate no. PST-0001-22
Page no. 2 of 3

1. Repeatability

| Weighing Rang 1 (g) | Normal Value (g) | Standard Deviation (g) |
|---------------------|------------------|------------------------|
| Max.capacity 220 | 200 | 0.00005 |

| Weighing Rang 2 (g) | Normal Value (g) | Standard Deviation (g) |
|---------------------|------------------|------------------------|
| Max.capacity | | |

2.Linearity, Departure of Indication from nominal value

Weighing Range 1

| Normal Value (g) | Standard Value (g) | Indication (g) | Error of Indication (g) | Expanded Uncertainty (g) | Factor k |
|------------------|--------------------|----------------|-------------------------|--------------------------|----------|
| 0.001 | 0.00100 | 0.0010 | 0.0000 | 0.00011 | 2.07 |
| 0.01 | 0.01000 | 0.0100 | 0.0000 | 0.00011 | 2.07 |
| 0.1 | 0.10001 | 0.1000 | 0.0000 | 0.00011 | 2.07 |
| 1 | 1.00001 | 1.0000 | 0.0000 | 0.00011 | 2.06 |
| 5 | 5.00002 | 5.0000 | 0.0000 | 0.00011 | 2.06 |
| 10 | 10.00001 | 10.0000 | 0.0000 | 0.00011 | 2.05 |
| 50 | 50.00003 | 50.0000 | 0.0000 | 0.00013 | 2.03 |
| 100 | 100.00004 | 100.0001 | 0.0001 | 0.00018 | 2.00 |
| 150 | 150.00007 | 150.0001 | 0.0000 | 0.00024 | 2.00 |
| 200 | 200.00006 | 200.0002 | 0.0001 | 0.00031 | 2.00 |

Weighing Range 2

| Normal Value (g) | Standard Value (g) | Indication (g) | Error of Indication (g) | Expanded Uncertainty (g) | Factor k |
|------------------|--------------------|----------------|-------------------------|--------------------------|----------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

The given extended measurement uncertainty is the standard uncertainty of the measurement multiplied by cover factor k as per listed in table above, which corresponds to a confidene level of about 95%



PLAY SOLUTION

PLAY SOLUTION TECHNOLOGY COMPANY LIMITED
179/75 Nawong Pracha Pattana Road, Sikan, Donmuang, Bangkok 10210
Tel.:+66 2 011 0505, Fax:+66 2 010 7700
www.playsotec.com



CERTIFICATE OF CALIBRATION

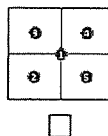
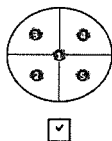
Result of Calibration

Certificate no. PST-0001-22

Page no. 3 of 3

3.Eccentricity

Test load at least 1/3 of the maximum capacity, typically placed between 1/2 and 1/3 of the distance from the centre of the load receptor to the edge.



Weighing Range 1

Test Load : 100 (g)

| Position | Indication (g) |
|---------------|----------------|
| 1 | 100.0001 |
| 2 | 100.0001 |
| 3 | 100.0002 |
| 4 | 100.0001 |
| 5 | 100.0002 |
| Max.Deviation | 0.0001 |

Weighing Range 2

Test Load : (g)

| Position | Indication (g) |
|---------------|----------------|
| | |
| | |
| | |
| | |
| | |
| Max.Deviation | |

Standard methode

The calibration was performed by using calibration laboratory's In-house calibration methode : CP-M-001 based on "UKAS LAB 14 : Calibration of weighing machine" : edition 6 | October 2019

Reference standards instrument

| Instrument | OIML Class | S/N | Certificate No. | Due Date |
|---------------------|------------|------------|-----------------|------------------|
| Standard Weight Set | E2 | 4000021952 | MM-0183-20 | December 8, 2022 |
| Standard Weight Set | - | - | - | - |
| Standard Weight Set | - | - | - | - |
| Standard Weight Set | - | - | - | - |

Measurement Uncertainty

The given measurement uncertainty is the standard of the measurement multiplied by an extension factor k which corresponds to a confidence level of about 95% for a normal distribution. The standard uncertainty was calculated according to M3003

Traceability : The measurement is traceable to national standard, which realize the physical unit of measurement (SI)

- National institute of Metrology (Thailand) through Calibration Laboratory

END OF REPORT

Calibration Data of NOx Analyzer

Analyzer Performance Test

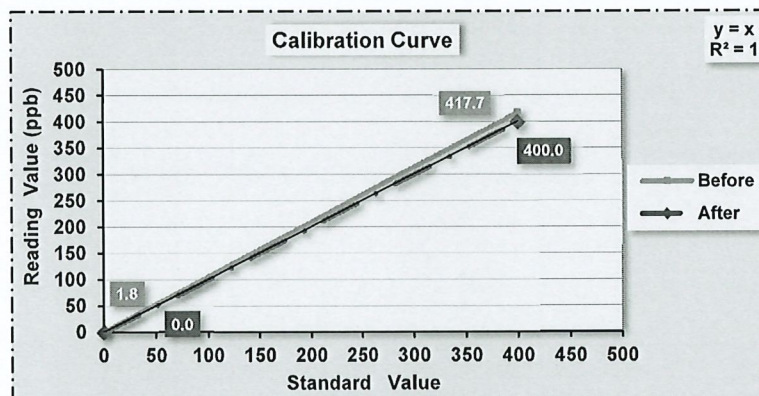
| | | | |
|---------------|----------------------|------------------|-----------------------|
| Equipment | Gas Analyzer (NOx) | Customer Name | โพธิ์เพชร คอนซัลแตนต์ |
| Manufacture | HORIBA | Location | Envi Research |
| Model | APNA-370 | Scientist | Panupon |
| Serial No. | R9CLG7J8 | Calibration Date | July 11, 2022 |
| Analyzer Unit | ppb | Time | 1:29 PM |

Instruments for Calibration

| | | | |
|-----------------------------|----------------------------|-------|---------------|
| Instruments | Manufacture | Model | Serial Number |
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 300T | 0172 |
| Standard Gas Components | CO = 4,516 ppm | | |
| Cylinder No : EB0123013 | NO = 55.3 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value | | | | | | | | % Abs Error |
|--------------|--------------------|-------------------------|-------|------------|-------|-------------------------|-------|-----------|-------|-------------|
| | | NO _x (ppb) | | NO (ppb) | | NO ₂ (ppb) | | Stability | | |
| | | Before | After | Before | After | Before | After | Before | After | |
| Zero | 0 | -0.8 | 0.0 | 1.8 | 0.0 | -2.6 | 0.0 | - | - | - |
| Span | 400 | 420.5 | 400.0 | 417.7 | 400.0 | 2.8 | 0.0 | - | - | 4.4 |



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

| Parameter | Unit | Observed Value | | Nominal Range |
|------------|------|----------------|--------------|-----------------------------------|
| | | Before Adjust | After Adjust | |
| Range | ppb | 500 | 500 | 0 - 500 Standard |
| Signal NO | mV | 2.0 | 1.7 | Voltage of the measured NO value |
| Signal NOx | mV | 8.3 | 8.4 | Voltage of the measured NOx value |
| Detector | °C | 42.4 | 42.4 | 43 °C ± 5 °C |
| Ambient | kPa | 101.1 | 101.0 | Current atmospheric pressure |
| DC 24V | V | 23.9 | 23.9 | 24V ±0.5 |
| DC 5V | V | 5.0 | 5.0 | 5V ±0.5 |
| NO Slope | - | 1.00000 | 0.83719 | 0.50000 - 2.0000 |
| NOx Slope | - | 1.00000 | 0.83250 | 0.50000 - 2.0000 |

Calibrate By :

(MR.PANUPON PODANG)
July 11, 2022

Checked By :

(MS.SUTATIP IM-NOI)
July 11, 2022

Calibration Data of NOx Analyzer

Analyzer Performance Test

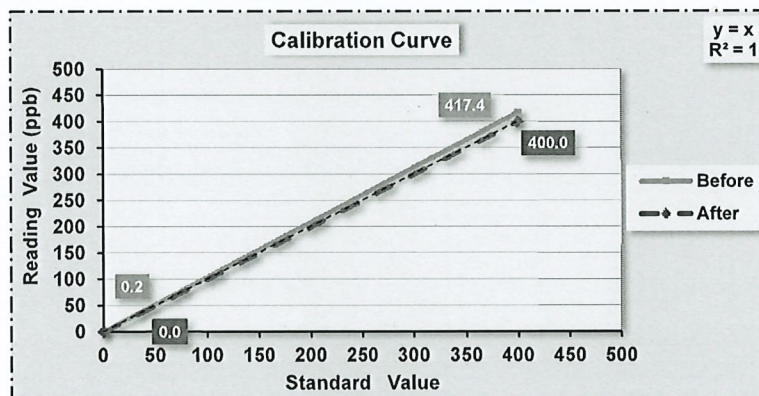
| | | | |
|---------------|----------------------|------------------|------------------------|
| Equipment | Gas Analyzer (NOx) | Customer Name | โพธิ์เทพย์ คอนซัลแตนต์ |
| Manufacture | HORIBA | Location | Envi Research |
| Model | APNA-370 | Scientist | Panupon |
| Serial No. | NKDVYFRX | Calibration Date | July 14, 2022 |
| Analyzer Unit | ppb | Time | 10:37 AM |

Instruments for Calibration

| | | | |
|-----------------------------|----------------------------|-------|---------------|
| Instruments | Manufacture | Model | Serial Number |
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 300T | 0172 |
| Standard Gas Components | CO = 4,516 ppm | | |
| Cylinder No : EB0123013 | NO = 55.3 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value | | | | | | | | % Abs Error |
|--------------|--------------------|-------------------------|-------|------------|-------|-------------------------|-------|-----------|-------|-------------|
| | | NO _x (ppb) | | NO (ppb) | | NO ₂ (ppb) | | Stability | | |
| | | Before | After | Before | After | Before | After | Before | After | |
| Zero | 0 | -6.6 | 0.0 | 0.2 | 0.0 | -6.8 | 0.0 | - | - | - |
| Span | 400 | 421.3 | 400.0 | 417.4 | 400.0 | 3.9 | 0.0 | - | - | 4.3 |



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

| Parameter | Unit | Observed Value | | Nominal Range |
|------------|------|----------------|--------------|-----------------------------------|
| | | Before Adjust | After Adjust | |
| Range | ppb | 500 | 500 | 0 - 500 Standard |
| Signal NO | mV | 3.3 | 3.1 | Voltage of the measured NO value |
| Signal NOx | mV | 10.6 | 10.0 | Voltage of the measured NOx value |
| Detector | °C | 42.0 | 42.0 | 43 °C ± 5 °C |
| Ambient | kPa | 100.9 | 100.9 | Current atmospheric pressure |
| DC 24V | V | 23.9 | 23.9 | 24V ±0.5 |
| DC 5V | V | 5.0 | 5.0 | 5V ±0.5 |
| NO Slope | - | 1.00000 | 0.87425 | 0.50000 - 2.0000 |
| NOx Slope | - | 1.00000 | 0.86692 | 0.50000 - 2.0000 |

Calibrate By :

(MR.PANUPON PODANG)
July 14, 2022



Checked By :

(MS.SUTATIP IM-NOI)
July 14, 2022

Calibration Data of NOx Analyzer

Analyzer Performance Test

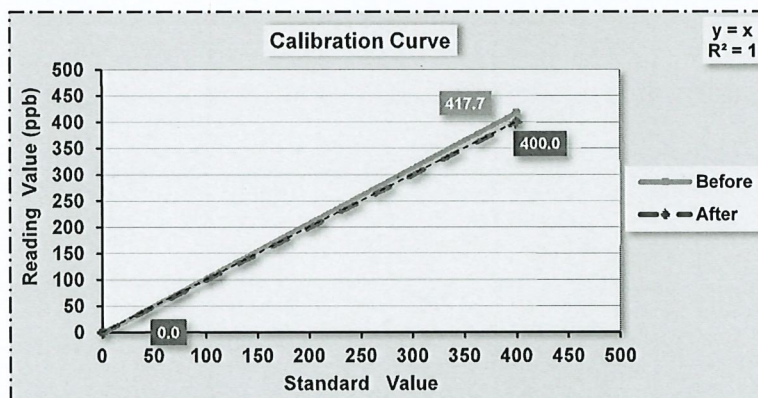
| | | | |
|---------------|----------------------|------------------|---------------------------|
| Equipment | Gas Analyzer (NOx) | Customer Name | โพธิ์เกียรติ์ คอนซัลแตนต์ |
| Manufacture | HORIBA | Location | Envi Research |
| Model | APNA-370 | Scientist | Panupon |
| Serial No. | AX7HSME0 | Calibration Date | July 11, 2022 |
| Analyzer Unit | ppb | Time | 1:50 PM |

Instruments for Calibration

| | | | |
|-----------------------------|----------------------------|-------|---------------|
| Instruments | Manufacture | Model | Serial Number |
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 300T | 0172 |
| Standard Gas Components | CO = 4,516 ppm | | |
| Cylinder No : EB0123013 | NO = 55.3 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value | | | | | | | | % Abs Error |
|--------------|--------------------|-------------------------|-------|------------|-------|-------------------------|-------|-----------|-------|-------------|
| | | NO _x (ppb) | | NO (ppb) | | NO ₂ (ppb) | | Stability | | |
| | | Before | After | Before | After | Before | After | Before | After | |
| Zero | 0 | -5.8 | 0.0 | -1.4 | 0.0 | -4.4 | 0.0 | - | - | - |
| Span | 400 | 416.6 | 400.0 | 417.7 | 400.0 | -1.1 | 0.0 | - | - | 4.4 |



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

| Parameter | Unit | Observed Value | | Nominal Range |
|------------|------|----------------|--------------|-----------------------------------|
| | | Before Adjust | After Adjust | |
| Range | ppb | 500 | 500 | 0 - 500 Standard |
| Signal NO | mV | 0.5 | 0.6 | Voltage of the measured NO value |
| Signal NOx | mV | 8.0 | 9.5 | Voltage of the measured NOx value |
| Detector | °C | 40.7 | 40.7 | 43 °C ± 5 °C |
| Ambient | kPa | 100.9 | 100.9 | Current atmospheric pressure |
| DC 24V | V | 23.5 | 23.5 | 24V ±0.5 |
| DC 5V | V | 5.0 | 5.0 | 5V ±0.5 |
| NO Slope | - | 1.12110 | 0.97840 | 0.50000 - 2.0000 |
| NOx Slope | - | 1.14270 | 0.99950 | 0.50000 - 2.0000 |

Calibrate By :

(MR.PANUPON PODANG)
July 11, 2022

Checked By :

(MS.SUTATIP IM-NOI)
July 11, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

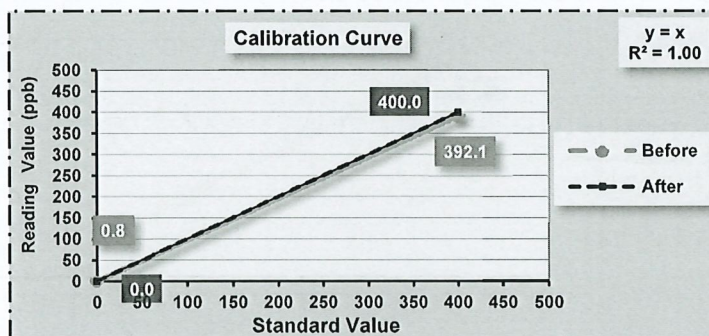
| | | | |
|---------------|----------------------------------|------------------|---------------------------|
| Equipment | Gas Analyzer (SO ₂) | Customer Name | โพธิ์เกียรติ์ คอนซัลแตนต์ |
| Manufacture | Horiba | Location | Envi Research |
| Model | APSA-370 | Scientist | Panupon |
| Serial No. | J000EMWB | Calibration Date | July 14, 2022 |
| Analyzer Unit | ppb | Time | 10:45 AM |

Instruments for Calibration

| | | | |
|-----------------------------|----------------------------|-------|---------------|
| Instruments | Manufacture | Model | Serial Number |
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 300T | 0172 |
| Standard Gas Components | CO = 4,516 ppm | | |
| Cylinder No : EB0123013 | NO = 55.3 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value (ppb) | | Stability | | % Abs Error |
|--------------|--------------------|------------------------|-------|-----------|-------|-------------|
| | | Before | After | Before | After | |
| Zero | 0 | 0.8 | 0.0 | - | - | - |
| Span | 400 | 392.1 | 400.0 | - | - | 2.0 |



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

| Parameter | Unit | Observed Value | | Nominal Range |
|---------------------------|------|----------------|--------------|---|
| | | Before Adjust | After Adjust | |
| Range | ppb | 500 | 500 | 0 - 500 Standard |
| Signal (SO ₂) | mV | 16.9 | 17.3 | Voltage of the measured SO ₂ value |
| LAMP | mV | 209.1 | 209.0 | 200 mV - 1200 mV |
| CELL | °C | 35.2 | 35.6 | Ambient temperature + 5 °C - 15 °C |
| PUMP | Kpa | 43.5 | 43.6 | 65 kPa or less |
| AMBIENT | kPa | 101.0 | 101.0 | Current atmospheric pressure |
| DC 24V | V | 24.0 | 24.0 | 24 V ±0.5 V |
| DC 5V | V | 4.9 | 4.9 | 5 V ±0.5 V |

Calibrate By :

(MR.PANUPON PODANG)

July 14, 2022

Checked By :

(MS.SUTATIP IM-NOI)

July 14, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

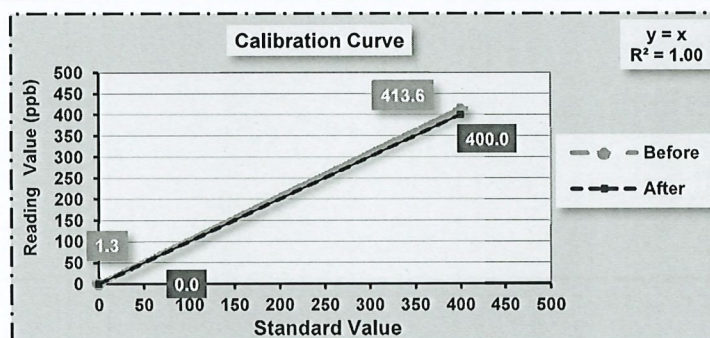
| | | | |
|---------------|----------------------------------|------------------|---------------------------|
| Equipment | Gas Analyzer (SO ₂) | Customer Name | โพธิ์เกียรติ์ คอนซัลแตนต์ |
| Manufacture | Horiba | Location | Envi Research |
| Model | APSA-370 | Scientist | Panupon |
| Serial No. | V4HC9062 | Calibration Date | July 11, 2022 |
| Analyzer Unit | ppb | Time | 11:12 AM |

Instruments for Calibration

| Instruments | Manufacture | Model | Serial Number |
|-----------------------------|----------------------------|-------|---------------|
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 300T | 0172 |
| Standard Gas Components | CO = 4,516 ppm | | |
| Cylinder No : EB0123013 | NO = 55.3 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value (ppb) | | Stability | | % Abs Error |
|--------------|--------------------|------------------------|-------|-----------|-------|-------------|
| | | Before | After | Before | After | |
| Zero | 0 | 1.3 | 0.0 | - | - | - |
| Span | 400 | 413.6 | 400.0 | - | - | 3.4 |



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

| Parameter | Unit | Observed Value | | Nominal Range |
|---------------------------|------|----------------|--------------|---|
| | | Before Adjust | After Adjust | |
| Range | ppb | 500 | 500 | 0 - 500 Standard |
| Signal (SO ₂) | mV | 13.2 | 12.4 | Voltage of the measured SO ₂ value |
| LAMP | mV | 273.8 | 274.5 | 200 mV - 1200 mV |
| CELL | °C | 37.4 | 37.7 | Ambient temperature + 5 °C - 15 °C |
| PUMP | Kpa | 46.6 | 46.6 | 65 kPa or less |
| AMBIENT | kPa | 101.2 | 101.2 | Current atmospheric pressure |
| DC 24V | V | 23.9 | 23.9 | 24 V ±0.5 V |
| DC 5V | V | 4.9 | 4.9 | 5 V ±0.5 V |

Calibrate By :

(MR.PANUPON PODANG)

July 11, 2022

Checked By :

(MS.SUTATIP IM-NOI)

July 11, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

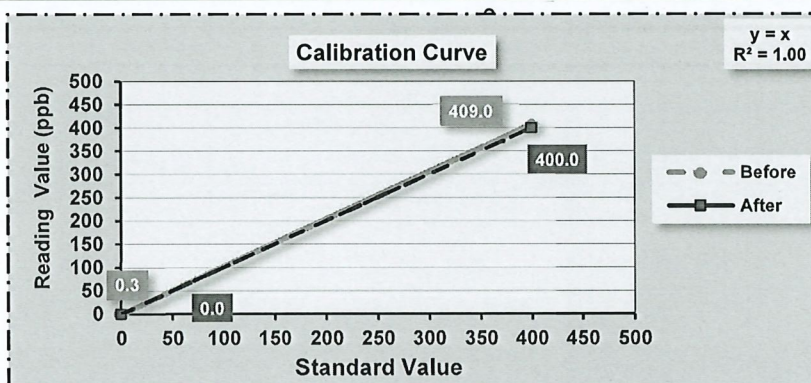
| | | | |
|---------------|----------------------------------|------------------|---------------------------|
| Equipment | Gas Analyzer (SO ₂) | Customer Name | โพธิ์เกียรติ์ คอนซัลแตนต์ |
| Manufacture | Thermo | Location | Envi Research |
| Model | 43i-BNSAA | Scientist | Panupon |
| Serial No. | CM14430004 | Calibration Date | July 12, 2022 |
| Analyzer Unit | ppb | Time | 2:05 PM |

Instruments for Calibration

| | | | |
|-----------------------------|----------------------------|-------|---------------|
| Instruments | Manufacture | Model | Serial Number |
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 300T | 0172 |
| Standard Gas Components | CO = 4,516 ppm | | |
| Cylinder No : EB0123013 | NO = 55.3 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value (ppb) | | Stability | | % Abs Error |
|--------------|--------------------|------------------------|-------|-----------|-------|-------------|
| | | Before | After | Before | After | |
| Zero | 0 | 0.3 | 0.0 | - | - | - |
| Span | 400 | 409.0 | 400.0 | - | - | 2.3 |



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL 43i-BNSAA

| Parameter | Display As | Unit | Observed Value | | Nominal Range |
|-------------------------------|-------------------------------|------|----------------|--------------|--------------------|
| | | | Before Adjust | After Adjust | |
| Range | RANGE | ppb | 500 | 500 | 0 - 500 standard |
| Internal Temperature | INTERNAL | °C | 38.8 | 38.5 | 8.0 °C to 45.0 °C |
| Chamber Temp | CHAMBER | °C | 45.2 | 45.3 | 43.0 °C to 47.0 °C |
| Pressure | PRESSURE | mmHg | 843.3 | 844.8 | 400.0 to 1,000 |
| Sample Flow | SAMP FLOW | LPM | 0.473 | 0.474 | 0.350 to 0.750 |
| Lamp Intensity | LAMP INTENSITY | % | 92 | 92 | 20 to 100 |
| Lamp Voltage | LAMP VOLTAGE | V | 1066 | 1066 | 500 to 1200 |
| SO ₂ Concentration | SO ₂ CONCENTRATION | ppb | 2.4 | 1.4 | 0 to 10,000 |
| Motherboard Status | MOTHERBOARD STATUS | - | OK | OK | OK |
| Interface Status | INTERFACE STATUS | - | OK | OK | OK |

Calibrate By :

(MR.PANUPON PODANG)

July 12, 2022



Checked By :

(MS.SUTATIP IM-NOI)

July 12, 2022

Calibration Data of CO Analyzer

Analyzer Performance Test

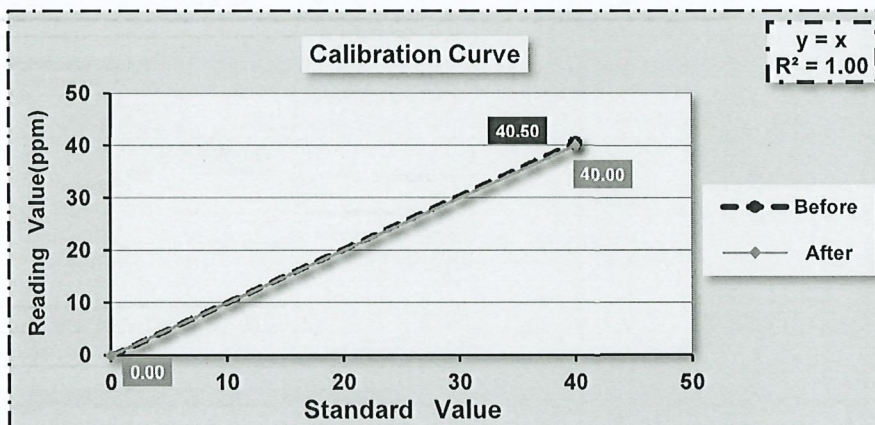
| | | | |
|---------------|---------------------|------------------|---------------------------|
| Equipment | Gas Analyzer (CO) | Customer Name | โพธิ์เกียรติ์ คอนซัลแตนต์ |
| Manufacture | HORIBA | Location | Envi Research |
| Model | APMA-370 | Scientist | Panupon |
| Serial No. | SFB4TS99 | Calibration Date | July 14, 2022 |
| Analyzer Unit | ppm | Time | 10:29 AM |

Instruments for Calibration

| | | | |
|-----------------------------|----------------------------|-------|---------------|
| Instruments | Manufacture | Model | Serial Number |
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 300T | 0172 |
| Standard Gas Components | CO = 4,487 ppm | | |
| Cylinder No : EB0123013 | NO = 46.1 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 46.0 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value (ppm) | | Stability | | % Abs Error |
|--------------|--------------------|------------------------|-------|-----------|-------|-------------|
| | | Before | After | Before | After | |
| Zero | 0 | -0.10 | 0.00 | - | - | - |
| Span | 40 | 40.50 | 40.00 | - | - | 1.25 |



STATUS TEST AND VALIDATION OF CO ANALYZER MODEL APMA-370

| Parameter | Unit | Observed Value | | Nominal Range |
|---------------|------|----------------|--------------|---|
| | | Before Adjust | After Adjust | |
| SIGNAL(MAIN) | mV | 4.0 | 4.7 | Voltage of the measured CO Value |
| SIGNAL (COMP) | mV | 6.8 | 3.4 | Voltage of the interference component Value |
| CELL | °C | 36.7 | 37.2 | Ambient + (5 to 10 C) |
| PUMP | kpa | 39.6 | 39.6 | less than 65 |
| AMBIENT | kpa | 101.1 | 101.0 | Atmospheric pressure |
| DC 24V | mV | 23.9 | 23.9 | 24+/- 0.5 V |
| DC 5V | mV | 4.9 | 4.9 | 5+/- 0.5 V |

Calibrate By :

(MR.PANUPON PODANG)

July 14, 2022

Checked By :

(MS.SUTATIP IM-NOI)

July 14, 2022

Calibration Data of CO Analyzer

Analyzer Performance Test

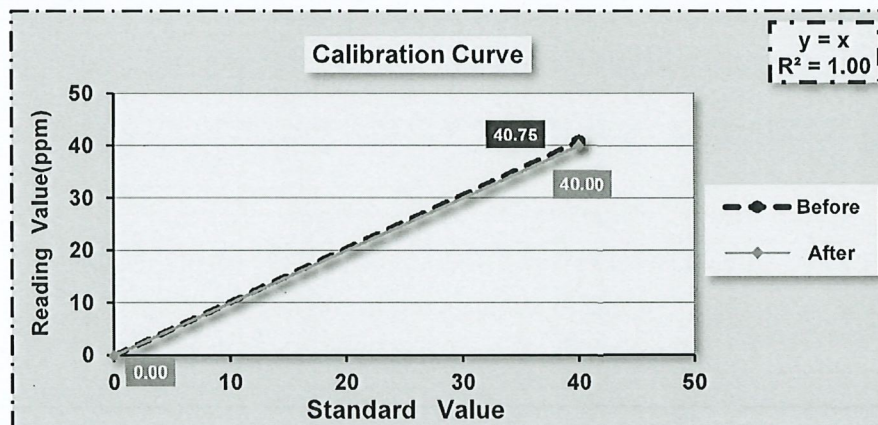
| | | | |
|---------------|---------------------|------------------|----------------------|
| Equipment | Gas Analyzer (CO) | Customer Name | โพธิ์เพชร คอนซิลแดนด |
| Manufacture | HORIBA | Location | Envi Research |
| Model | APMA-370 | Scientist | Panupon |
| Serial No. | 3VJ73T6X | Calibration Date | July 14, 2022 |
| Analyzer Unit | ppm | Time | 10:29 AM |

Instruments for Calibration

| | | | |
|-----------------------------|----------------------------|-------|---------------|
| Instruments | Manufacture | Model | Serial Number |
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 300T | 0172 |
| Standard Gas Components | CO = 4,516 ppm | | |
| Cylinder No : EB0123013 | NO = 55.3 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value (ppm) | | Stability | | % Abs Error |
|--------------|--------------------|------------------------|-------|-----------|-------|-------------|
| | | Before | After | Before | After | |
| Zero | 0 | -0.01 | 0.00 | - | - | - |
| Span | 40 | 40.75 | 40.00 | - | - | 1.88 |



STATUS TEST AND VALIDATION OF CO ANALYZER MODEL APMA-370

| Parameter | Unit | Observed Value | | Nominal Range |
|---------------|------|----------------|--------------|---|
| | | Before Adjust | After Adjust | |
| SIGNAL(MAIN) | mV | 4 | 4.7 | Voltage of the measured CO Value |
| SIGNAL (COMP) | mV | 6.8 | 3.4 | Voltage of the interference component Value |
| CELL | °C | 36.7 | 37.2 | Ambient + (5 to 10 C) |
| PUMP | kpa | 39.6 | 39.6 | less than 65 |
| AMBIENT | kpa | 101.1 | 101.0 | Atmospheric pressure |
| DC 24V | mV | 23.9 | 23.9 | 24+/- 0.5 V |
| DC 5V | mV | 4.9 | 4.9 | 5+/- 0.5 V |

Calibrate By :

(MR.PANUPON PODANG)

July 14, 2022

Checked By :

(MS.SUTATIP IM-NOI)

July 14, 2022

Calibration Data of CO Analyzer

Analyzer Performance Test

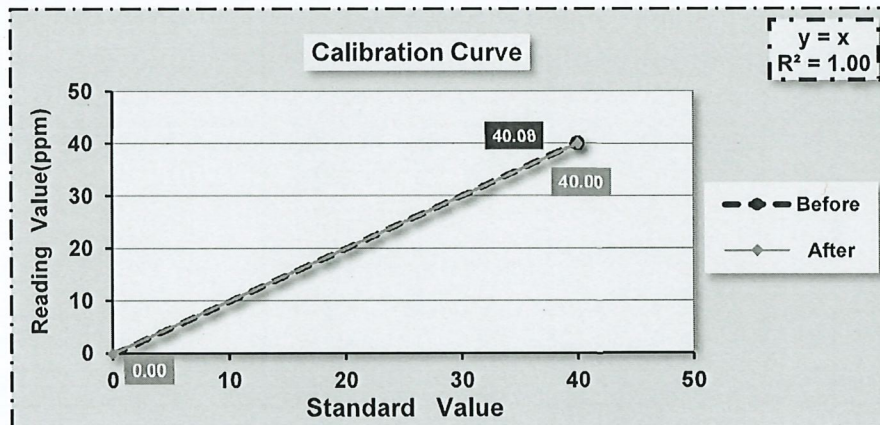
| | | | |
|---------------|---------------------|------------------|---------------------------|
| Equipment | Gas Analyzer (CO) | Customer Name | โพธิ์เกียรติ์ คอนซัลแตนต์ |
| Manufacture | HORIBA | Location | Envi Research |
| Model | APMA-370 | Scientist | Panupon |
| Serial No. | HXA48A4TG | Calibration Date | July 11, 2022 |
| Analyzer Unit | ppm | Time | 1:42 PM |

Instruments for Calibration

| | | | |
|-----------------------------|----------------------------|-------|---------------|
| Instruments | Manufacture | Model | Serial Number |
| Zero Air Supply | Thermo Env. | 111 | 0700419829 |
| Dynamic Dilution Calibrator | Tanabyte | 300T | 0172 |
| Standard Gas Components | CO = 4,516 ppm | | |
| Cylinder No : EB0123013 | NO = 55.3 ppm | | |
| Expire Date : Oct 22, 2027 | SO ₂ = 54.9 ppm | | |

Single Point Calibration

| Standard Gas | Standard Gas Value | Analyzer Value (ppm) | | Stability | | % Abs Error |
|--------------|--------------------|------------------------|-------|-----------|-------|-------------|
| | | Before | After | Before | After | |
| Zero | 0 | -0.17 | 0.00 | - | - | - |
| Span | 40 | 40.08 | 40.00 | - | - | 0.20 |



STATUS TEST AND VALIDATION OF CO ANALYZER MODEL APMA-370

| Parameter | Unit | Observed Value | | Nominal Range |
|---------------|------|----------------|--------------|---|
| | | Before Adjust | After Adjust | |
| SIGNAL(MAIN) | mV | 4.9 | 4.3 | Voltage of the measured CO Value |
| SIGNAL (COMP) | mV | 0.8 | 0.7 | Voltage of the interference component Value |
| CELL | °C | 37.0 | 37.2 | Ambient + (5 to 10 C) |
| PUMP | kpa | 41.3 | 41.3 | less than 65 |
| AMBIENT | kpa | 101.1 | 101.0 | Atmospheric pressure |
| DC 24V | mV | 23.9 | 23.9 | 24+/- 0.5 V |
| DC 5V | mV | 4.9 | 4.9 | 5+/- 0.5 V |

Calibrate By :

(MR.PANUPON PODANG)

July 11, 2022

Checked By :

(MS.SUTATIP IM-NOI)

July 11, 2022

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A0292 Reference Number: 160-401604495-1
Cylinder Number: EB0123013 Cylinder Volume: 144.4 Cubic Feet
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12019 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Oct 22, 2019

Expiration Date: Oct 22, 2027

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

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

| ANALYTICAL RESULTS | | | | | |
|--------------------|-------------------------|----------------------|-----------------|----------------------------|------------------------|
| Component | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
| NOX | 55.00 PPM | 55.27 PPM | G1 | +/- 0.8% NIST Traceable | 10/14/2019, 10/22/2019 |
| NITRIC OXIDE | 55.00 PPM | 55.27 PPM | G1 | +/- 0.8% NIST Traceable | 10/14/2019, 10/22/2019 |
| SULFUR DIOXIDE | 55.00 PPM | 54.93 PPM | G1 | +/- 0.9% NIST Traceable | 10/14/2019, 10/22/2019 |
| CARBON MONOXIDE | 4500 PPM | 4516 PPM | G1 | +/- 0.6% NIST Traceable | 10/14/2019 |
| NITROGEN | Balance | | | | |

| CALIBRATION STANDARDS | | | | | |
|-----------------------|----------|-------------|-----------------------------------|-------------|-----------------|
| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
| NTRM | 13010429 | KAL004123 | 97.6 PPM NITRIC OXIDE/NITROGEN | +/- 0.8% | Jul 23, 2025 |
| NTRM | 13010429 | KAL004123 | 97.6 PPM NOx/NITROGEN | +/- 0.8% | Jul 23, 2025 |
| NTRM | 16010235 | KAL004419 | 97.69 PPM SULFUR DIOXIDE/NITROGEN | +/- 0.8% | Dec 23, 2021 |
| NTRM | 08012318 | KAL004620 | 4857 PPM CARBON MONOXIDE/NITROGEN | +/- 0.6% | Jun 07, 2024 |

| ANALYTICAL EQUIPMENT | | |
|----------------------------|----------------------|-----------------------------|
| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
| MKS FTIR - CO - 000928781 | FTIR | Sep 26, 2019 |
| MKS FTIR - NO - 000928781 | FTIR | Oct 18, 2019 |
| MKS FTIR - NOx - 000928781 | FTIR | Oct 18, 2019 |
| MKS FTIR - SO2 - 000928781 | FTIR | Oct 03, 2019 |

Triad Data Available Upon Request

NOTES: Gross Weight: 28.0 Kg, Net Weight: 4.6 Kg.



[Signature]
Approved for Release

| | |
|------------------------|---|
| Support Equipment Type | : Sound Level Calibrator |
| Manufacture | : Larson Davis |
| Model | : CAL200 |
| Serial No. | : 5652 |
| Range of Calibrator | |
| - Sound Pressure Level | : 93.5 dB. |
| - Frequency | : 1,000 Hz. |
| Calibrated By | : Mr.Romsea Kateh |
| Calibration Date | : July 25, 2022 |
| Customer Name | : บริษัท โฟร์เทียร์ คอนซัลแตนต์ จำกัด: โครงการ อาคารอยู่อาศัยสวัสดิการสำหรับพนักงานหญิง (ปราจีนบุรี) ของบริษัท หยงซิง สตีล (ไทยแลนด์) จำกัด |

[illegible]

Page 1 / 1



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0605

MTC No. EEL. BP. 99/0665

CALIBRATION CERTIFICATE

Submitted by : Environment Research & Technology Co., Ltd.
Address : 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsonghong, 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 :
Description : Precision Acoustic Calibrator
Manufacturer : Larson Davis
Model : CAL200
Serial No. : 5652

Ambient Environment
Temperature : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

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 Bruel&Kjaer 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was 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 : 29 Jun. 2022

Date of Calibration : 5 Jul. 2022

1 / 3

N. M. Lee

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.BLMTC.002 Rev.4

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Amphoe Muang, Changwat Samutprakan 10280, Thailand
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E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0605

MTC No. EEL. BP. 99/0665

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 μPa at 1000 Hz

Acoustic Output in dB re 20 μPa , Corrected to Reference Conditions: 101.325 kPa, 23.0 $^\circ\text{C}$ 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 1 |
|-----------------------------|---------------------------------------|------------------------|---------------------|--|
| 1/2 inch Bruel&Kjaer4180 | 93.51 | -0.49 | ± 0.10 | $\pm 0.40 \text{ dB}$ |

2. Frequency

| Standard Microphone Type | Measured Frequency (Hz) | Deviated value (Hz) | Uncertainty (Hz) | Tolerance limit IEC60942:2003 Class 1 |
|-----------------------------|----------------------------|------------------------|---------------------|--|
| 1/2 inch Bruel&Kjaer4180 | 1000.0 | 0.0 | ± 1.5 | $\pm 1.0 \%$ |

3. Total distortion

| Standard Microphone Type | Measured Total distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 1 |
|-----------------------------|----------------------------------|--------------------|--|
| 1/2 inch Bruel&Kjaer4180 | 1.21 | ± 0.50 | $\pm 3.0 \%$ |

Note : 1. No adjustment.
2. The calibrator pressure correction was not included.
3. The microphone volume correction was included at the level of 0.26 dB from manual.

Date of Calibration : 5 Jul. 2022

2 / 3

N. M. Lee

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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0605

MTC No. EEL. BP. 99/0665

Nominal Output of Unit Under Test = 114 dB re 20µPa at 1000 Hz

Acoustic Output in dB re 20µPa, 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 1 |
|-----------------------------|---------------------------------------|------------------------|---------------------|--|
| 1/2 inch Bruel&Kjaer 4180 | 113.52 | -0.48 | ± 0.10 | ± 0.40 dB |

2. Frequency

| Standard Microphone Type | Measured Frequency (Hz) | Deviated value (Hz) | Uncertainty (Hz) | Tolerance limit IEC60942:2003 Class 1 |
|-----------------------------|----------------------------|------------------------|---------------------|--|
| 1/2 inch Bruel&Kjaer 4180 | 1000.0 | 0.0 | ± 1.5 | ± 1.0 % |

3. Total Distortion

| Standard Microphone Type | Measured Total Distortion (%) | Uncertainty (%) | Tolerance limit IEC60942:2003 Class 1 |
|-----------------------------|----------------------------------|--------------------|--|
| 1/2 inch Bruel&Kjaer 4180 | 0.41 | ± 0.50 | ± 3.0 % |

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was included at the level of 0.26 dB from manual.

Calibrated by :

N. Nuttapong
(Mr.Nuttapong Niljrusvanit)

Tak 2
(Mr.Tawikiat Iamsamran)

Approved by :



(Mr.Prawat Kluaypa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 5 Jul. 2022

Date of Issue : 6 Jul. 2022

Ref : 2011265062902932004

3 / 3

End of Certificate

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH10
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Eutech
Model : pHTestr 30
Serial No. : 926524
ID No. : NO.1
Condition As-Received: Used Item
Received Date : 29 December 2021
Calibration Date : 04 January 2022
Reference : 2112-0752WN-7
Submitted by : Environment Research & Technology Company Limited.
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210
Ambient Temperature : (25 \pm 2.5) °C
Relative Humidity : (50 \pm 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement
with certified reference material (CRM)

Calibrated by : Walalak Sirithean

Approved by :

Approved Signatory

- (/) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 7 January 2022

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 0036338



Cert.No.: 22CH10

Page.: 2 of 2

Condition of this calibration result

1. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

| <u>Buffer Solution</u> | <u>Manufacturer</u> | <u>Lot No.</u> | <u>Exp. date</u> |
|------------------------|---------------------|----------------|------------------|
| pH 4.008 | CPA chem | 761016 | 02 Aug 2023 |
| pH 6.982 | CPA chem | 761017 | 02 Aug 2022 |
| pH 10.015 | CPA chem | 761018 | 02 Aug 2022 |

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.: 926524 | 4.008 | 4.02 | N/A | 0.0071 | 2.00 |
| | 6.982 | 6.96 | N/A | 0.011 | 2.00 |
| | 10.015 | 10.01 | N/A | 0.0095 | 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 %

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CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

45/48 Soi Salathammassop31, Salathammassop Rd.,

Salathammassop, Thawewatthana, Bangkok 10170 Thailand

Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



NSC-TISI-TIS 17025
CALIBRATION 0260

CERTIFICATE OF CALIBRATION

Issue Date : 28 December 2021
Certificate No. : 21-1224-004
Work Order No. : 21/1224

Customer Name : Environment research & Technogy Co., Ltd.
25/114 Moo6 Soi Chinaket1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210

Date of Received : 15 December 2021

Date of Calibration : 15 December 2021

Instrument Details : Description : Temperature Controlled Enclosures [Incubator]
Manufacturer : Accuplus
Model : Smart i250
Serial No. : 2059-0218-0002
ID No. : ERTC-L-IN-143
Resolution : 0.1 °C
Location : Laboratory

Calibration Method : This instrument was calibrated by insert standard thermometer into the chamber according to calibration procedure no. CWI-T-10 follow up to TLAS G-20-1/02-08
(E) : Guidelines for Calibration and Checks of Temperature Controlled Enclosures.

Environmental Conditions :

Temperature : Area Monitoring between 15°C to 40°C
Humidity : Area Monitoring between 30%RH to 85%RH
Line Voltage : Area Monitoring 220 VAC \pm 10%

Traceability of Measurement :

This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr. Sitthisak Tonglim
Calibration Engineer

Approved by :
(Mr. Anuwat Yaklermjit)
Laboratory Manager

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Crystal Calibration Sales and Service Co., Ltd.

45/48 Salathammassop 31, Salathammassop Rd., Salathammassop, Thawewatthana, Bangkok 10170

Phone : 0-2408-8474 Fax : 0-2408-8477 http://www.crystalcal.com Email : info@crystalcal.com



PAGE 1/3

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NSC-TISI-TIS 17025
CALIBRATION 0260

CERTIFICATE OF CALIBRATION

Issue Date : 28 December 2021
Certificate No. : 21-1224-004
Work Order No. : 21/1224

Details of Calibration

1. Reference Standards Instrument

| Instrument | Model | Serial No./Ins No. | Certificate No. | Due Date |
|-----------------------|--------|--------------------|-----------------|-------------------|
| Data Acquisition unit | 34972A | MY57006241 | 21-719-014 | 03 September 2022 |
| Sensor type | RTD | RTD# 101-109 | 21-719-014 | 03 September 2022 |

2. Certificate traceable : This certificate traceable to The International System of Unit refer to
Crystal Calibration Sales and Service Co., Ltd. , NAC Calibration No. 0260

3. Condition of item : Used

4. Calibration site : On - Site

5. Result of Calibration : Without adjustment

6. Evaluate Condition : Time Constant : - Hour 50 Minute At cal. point 20 °C
Air vent : Off
Fan speed status : Fixed Fan Speed

7. Calibration note : The results reported in this certificate refer to the condition of instrument on the process into the steady state of chamber

8. Sensors Installation Diagram : When ; Sensor installation location in Chamber @ Working Space
A = Distance between sensor and wall of chamber is 5 cm

9. Dimensions of chamber : W = 0.5 m ; D = 0.5 m ; H = 0.9 m

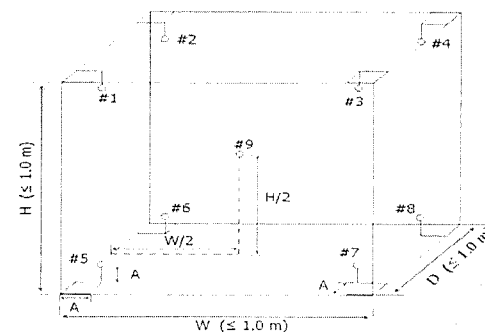


Diagram of Chamber

15-1-65 PAGE 2/3



CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

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CERTIFICATE OF CALIBRATION

Issue Date : 28 December 2021

Certificate No. : 21-1224-004

Work Order No. : 21/1224

Result of Temperature Distribution and Performance Check

Table1 : Reporting of Temperature Distribution

| Calibration point (°C) | Average Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF) | | | | | | | | | Uncertainty ± (°C) |
|------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|
| | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | |
| 20.0 | 20.26 | 20.08 | 20.22 | 20.11 | 20.18 | 20.12 | 20.09 | 20.16 | 19.91 | 0.60 |

Table 2 : Reporting of Performance check

| Indicator Set Point (°C) | Indicator Reading (°C) | | | Stability ± (°C) | Uniformity (°C) | Overall variation (°C) |
|-----------------------------|------------------------|------|---------|---------------------|--------------------|---------------------------|
| | MAX | MIN | Average | | | |
| 20.0 | 20.0 | 19.6 | 19.9 | 0.39 | 0.58 | 1.03 |

Note

Customer would like to find internal temperature in chamber and this report customer request and accepted in certificate

The reference sensor is preferably located of the geometric center of chamber

The measured temperature data readout by software "Benchlink Datalogger 3"

The quoted uncertainty include "Stability" and "Loading effect (20% of Temp Uniformity)"

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

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 time.

Indicating Temperature - the average reading of indicating device that forms the integral part of the enclosure.

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

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

--END--

13-1-63 PAGE 3/3



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

Cert.No.: 22TW15

Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-115V
Serial No. : 03C1280 AC
ID No. : ERTC-L-In-021
Received Date : 19 January 2022
Test Date : 21 January 2022
Reference : 2201-0594WN-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

- (/) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date :

1 February 2022

23-2-65

B 0279633



Cert.No.: 22TW15

Page.: 2 of 2

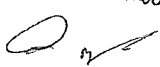
Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 07H100306

| Titration Method (Azide Modification Method) (mg/L) | DO Meter Reading (mg/L) | Standard Deviation (mg/L) |
|---|-------------------------------|------------------------------|
| 8.16 | 8.15 | 0.0071 |

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. 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

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Mahu.

23-2-65
a 1091839

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



Accuracy Calibration Certificate

Customer

Company: ENVIRONMENT RESEARCH&TECHNOLOGY CO., LTD.
Address: 25/114 Moo 6, Soi Chinaket 1, Nganwongwan Rd., Toongsongho
City: Laksi Contact: Ramita Taengthai
Zip / Postal: 10210
State / Province: Bangkok
Order Number: 

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: 23.9 °C | End: 24.2 °C | Start: 45.8 % | End: 54.8 % |

As Found Calibration Date: 19-Jun-2022 Calibrator: 
As Left Calibration Date: N/A
Issue Date: 20-Jun-2022

Approved Signatory:


Kassakorn Tassanachaisakul
☐ Santi Jitniyom
☐ Surachet Sukkate

26-1-65

Measurement Results

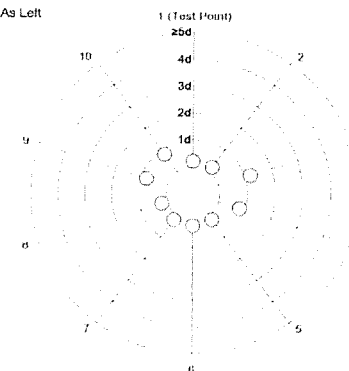
Repeatability

Test Load: 100 g

| | As Found | As Left |
|----|-----------|---------|
| 1 | 99.9998 g | N/A |
| 2 | 99.9998 g | N/A |
| 3 | 99.9997 g | N/A |
| 4 | 99.9999 g | N/A |
| 5 | 99.9998 g | N/A |
| 6 | 99.9998 g | N/A |
| 7 | 99.9998 g | N/A |
| 8 | 99.9998 g | N/A |
| 9 | 99.9999 g | N/A |
| 10 | 99.9999 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.

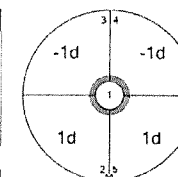
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

| Position | As Found | As Left |
|----------|-----------|---------|
| 1 | 99.9998 g | N/A |
| 2 | 99.9999 g | N/A |
| 3 | 99.9997 g | N/A |
| 4 | 99.9997 g | N/A |
| 5 | 99.9999 g | N/A |

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



As Found

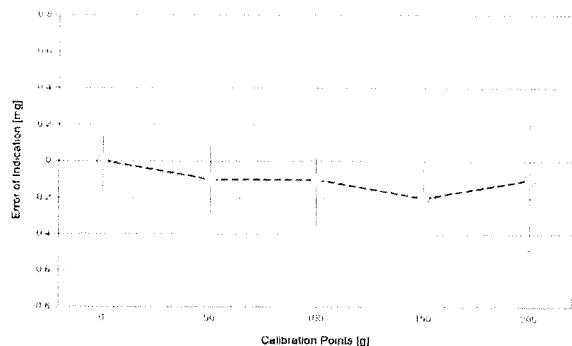
The "d" in the graph represents the readability of the range/interval in which the test was performed.

26-1-65

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 | 50.0000 g | 49.9999 g | -0.0001 g | 0.19 mg | 2 |
| 9 | 99.9999 g | 99.9998 g | -0.0001 g | 0.25 mg | 2 |
| 10 | 149.9999 g | 149.9997 g | -0.0002 g | 0.35 mg | 2 |
| 11 | 199.9999 g | 199.9998 g | -0.0001 g | 0.39 mg | 2 |



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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.: WS03 Date of Issue: 21-Sep-2021
Certificate Number: 175498 Calibration Due Date: 14-Mar-2023

Thermo Hygrometer

Equipment No.: IN281 Date of Issue: 25-May-2021
Certificate Number: 21H1100 Calibration Due Date: 10-May-2022

26-1-65

Remarks

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

End of Accredited Section

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

26-1-65

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: 4 K

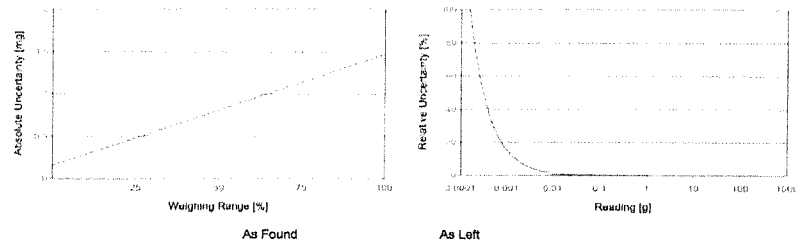
Linearization of Uncertainty Equation

| I | Range | | As Found | As Left |
|---|----------|-------|--|---------|
| | d | Max | | |
| 1 | 0.0001 g | 220 g | $U_1 = 0.15 \text{ mg} + 0.00599 \text{ mg/g} \cdot R$ | N/A |

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

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

| Net Indication | As Found | | As Left | |
|----------------|---------------------------|--------------------------|---------------------------|--------------------------|
| | Absolute Uncertainty [mg] | Relative Uncertainty [%] | Absolute Uncertainty [mg] | Relative Uncertainty [%] |
| 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 | 0.0074% | N/A | N/A |
| 22.0000 g | 0.28 mg | 0.0013% | N/A | N/A |
| 220.0000 g | 1.5 mg | 0.00067% | N/A | N/A |



26-1-65

GWP® Certificate



As Found ✓

As Left ✓

The weighing device meets the given process requirements.

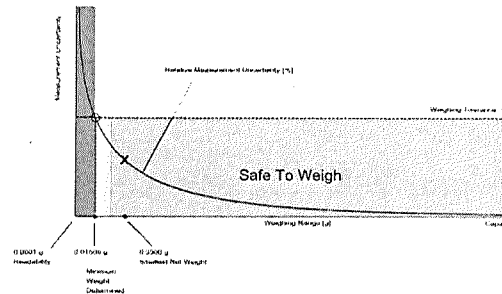
The weighing device meets the given process requirements.

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.

26-1-65

Minimum Weight

As Found Minimum Weight Table

| Minimum weights for different weighing tolerances and safety factors | | | | | |
|--|---------------|-----------|-----------|-----------|-----------|
| Tolerance | Safety Factor | | | | |
| | 1 | 2 | 3 | 5 | 10 |
| 0.1% | 0.15146 g | 0.30476 g | 0.45993 g | 0.77601 g | 1.00147 g |
| 0.2% | 0.07550 g | 0.15146 g | 0.22788 g | 0.38211 g | 0.77601 g |
| 0.5% | 0.03015 g | 0.06037 g | 0.09066 g | 0.15146 g | 0.30476 g |
| 1% | 0.01508 g | 0.03015 g | 0.04525 g | 0.07550 g | 0.15146 g |
| 2% | 0.00753 g | 0.01506 g | 0.02260 g | 0.03770 g | 0.07550 g |
| 5% | 0.00301 g | 0.00602 g | 0.00904 g | 0.01506 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 | | | | | |
|--|---------------|-----------|-----------|-----------|-----------|
| Tolerance | Safety Factor | | | | |
| | 1 | 2 | 3 | 5 | 10 |
| 0.1% | 0.15146 g | 0.30476 g | 0.45993 g | 0.77601 g | 1.00147 g |
| 0.2% | 0.07550 g | 0.15146 g | 0.22788 g | 0.38211 g | 0.77601 g |
| 0.5% | 0.03015 g | 0.06037 g | 0.09066 g | 0.15146 g | 0.30476 g |
| 1% | 0.01508 g | 0.03015 g | 0.04525 g | 0.07550 g | 0.15146 g |
| 2% | 0.00753 g | 0.01506 g | 0.02260 g | 0.03770 g | 0.07550 g |
| 5% | 0.00301 g | 0.00602 g | 0.00904 g | 0.01506 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:

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

26-1-65

Measurement Results

Results Summary

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

✓ = Passed
✗ = Failed
Δ = 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*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.

26-1-65

Error of Indication

As Found

| Reference Value | Error | Control limits for various weighing tolerances | | | | | |
|-----------------|-----------|--|----------|----------|----------|----------|----------|
| | | 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 | -0.0001 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 | -0.0002 g | 0.0750 g | 0.1500 g | 0.3750 g | 0.7500 g | 1.5000 g | 3.7500 g |
| 199.9999 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

| Reference Value | Error | Control limits for various weighing tolerances | | | | | |
|-----------------|-----------|--|----------|----------|----------|----------|----------|
| | | 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 | -0.0001 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 | -0.0002 g | 0.0750 g | 0.1500 g | 0.3750 g | 0.7500 g | 1.5000 g | 3.7500 g |
| 199.9999 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.

Service Date: 2022-01-19
Document Number: TH2065-185-011922-LABBalanceHR
ENVIRONMENT RESEARCH & TECHNOLOGY CO., LTD
25/14 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsoongho ถนนวิภาวดีรังสิต, Bangkok 10210
Ramita Teengthai

Balance Health Report

Device Details

| System Details | | | |
|----------------|----------------|---------------------------------|-------|
| Manufacturer: | Mettler Toledo | Accessory 1: | |
| Model: | MS204S | Accessory 2: | |
| Serial number: | B334691537 | Weight set for routine testing: | Yes / |
| Firmware: | 1.74 | | |

History

| Device History | | Service History | |
|-----------------------------|------------|------------------------------------|----------|
| Instrument in use: | Yes | Last preventive maintenance: | < 1 year |
| Instrument age: | > 10 years | Last instrument calibration: | < 1 year |
| Spare parts available: | Yes | Last minimum weight determination: | |
| Regulations: | ISO | | |
| Process tolerance in %: | 1% | Routine testing performed: | Yes |
| Smallest sample net weight: | 0.05g | | |

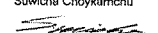
Check List

| Environmental Conditions | | General & Functional Checks | |
|--|---|---|---|
| Room temperature fluctuation | ✓ | Leveling | ✓ |
| Exposure to direct sun | ✓ | Cleanliness | ✓ |
| Vibrations | ✓ | Completeness - missing parts see additional remarks | ✓ |
| Draft | ✓ | Settings optimized for operating environment | ✓ |
| Dirt or dust | ✓ | Other - objections noted as additional remarks | — |
| Static | ✓ | Electrical Component Checks | |
| Mechanical Component Checks | | Power supply | ✓ |
| Draft shield | ✓ | Sliding door drive | — |
| Weighing pan position | ✓ | Internal weight drive | ✓ |
| Housing | ✓ | Display | ✓ |
| Other - objections noted as additional remarks | — | Other - objections noted as additional remarks | — |

Recommendations

| Measurement Result Quality | | Process Efficiency | |
|---|--|--|--|
| Instrument calibration | | Uninstall instrument | |
| Identify safe weighing range | | Replace instrument | |
| GWP verification / risk assessment | | Replace / add parts (see additional remarks) | |
| Preventive maintenance | | Onsite repair | |
| Perform routine testing with test weights | | Dropout repair | |
| User training | | Use of accessories (see additional remarks) | |

Contact: Name: Ramita Teengthai Position: N/A Phone: 0888334480 Email: ramita@enviresearch.co.th

| Additional Remarks & Recommendations | | Engineer Details | |
|--------------------------------------|--|------------------|---|
| | | Date: | 19-Jan-2022 |
| | | Name: | Suwichu Choykamchu |
| | | Signature: |  |

This is not a certificate.

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

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM151
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, Lakki,
Bangkok 10210
Location : Laboratory (ERTC)
Received Order : 5 January 2022
Calibration Date : 5 January 2022
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Pornthippa Tameyakul
() Malee Butkruea
() Suwit Imjai

Issue Date : 21 January 2022

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.

24-1-65

A 0036818



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2201-0006ON-2
Procedure Used :-

Cert. No.: 22TM151
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 | Model | Serial No. | Cert. No. | Due Date |
|---------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34970A | MY44031769 | 21LM12 | 02 Sep 2022 |

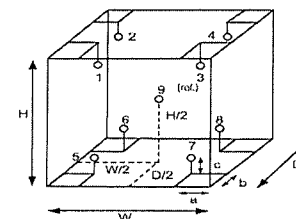
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



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 |

| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 27 | 27 |
| REL.Humid. (%) | 54 | 58 |
| AC Supply (Volt) | 219 | 222 |

| Ref. Std. ID No.: @ Calibration Point | | |
|---------------------------------------|------------|------------|
| Position : | (180) °C | (104) °C |
| 1 | 20-09TC-01 | 9RTD-2/1 |
| 2 | 20-09TC-02 | 9RTD-2/2 |
| 3 | 20-09TC-03 | 9RTD-2/3 |
| 4 | 20-09TC-04 | 9RTD-2/4 |
| 5 | 20-09TC-05 | 9RTD-2/5 |
| 6 | 20-09TC-06 | 9RTD-2/6 |
| 7 | 20-09TC-07 | 9RTD-2/7 |
| 8 | 20-09TC-08 | 9RTD-2/8 |
| 9 (ref.) | 20-09TC-09 | 9RTD-2/9 |

24-1-65

a 1090220



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2201-0006ON-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 22TM151
Page.: 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|--------------------------|---------------------|---------------------|--------------------------------|-------------------------------|--------------------------|----------------------|--------------------------|
| 104 | 104 | 104 | 0.11 | 1.1 | 1.4 | 0.69 | 2 |
| 180 | 180 | 180 | 0.43 | 3.3 | 5.6 | 1.5 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|--------------------------|-----------------------------|---------|---------|---------|---------|---------|---------|---------|----------|
| | Position | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 104 | 103.167 | 102.948 | 104.098 | 104.155 | 104.013 | 103.198 | 103.619 | 103.294 | 103.159 |
| 180 | 177.080 | 177.342 | 181.816 | 181.065 | 179.474 | 177.914 | 181.064 | 179.354 | 178.751 |

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-

26-1-6
Mlu.

a 1090219



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10280
TEL. 0 2717 3000-27 FAX 0-2719-9484



Cert. No.: 22TM152
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, Lakki,
Bangkok 10210
Location : Laboratory (ERTC)
Received Order : 5 January 2022
Calibration Date : 5 January 2022
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Pornthippa Tameyakul
(/) Malee Butkruea
() Suwit Imjai

Issue Date : 21 January 2022

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.

26-1-65

A 0036819



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2201-0006ON-3
Procedure Used :-

Cert. No.: 22TM152
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 | Model | Serial No. | Cert. No. | Due Date |
|----------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34970A | MY44031769 | 21LM12 | 02 Sep 2022 |

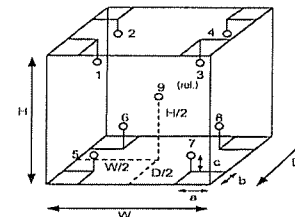
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 27 | 27 |
| REL.Humid. (%) | 54 | 58 |
| AC Supply (Volt) | 219 | 222 |

Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.40 m
b = 5.0 cm W = 0.56 m
c = 5.0 cm H = 0.48 m
Capacity = 0.11 m³

| Ref. Std. ID No.: @ Calibration Point | | |
|---------------------------------------|------------|------------|
| Position : | (180) °C | (104) °C |
| 1 | 20-09TC-01 | 9RTD-2/1 |
| 2 | 20-09TC-02 | 9RTD-2/2 |
| 3 | 20-09TC-03 | 9RTD-2/3 |
| 4 | 20-09TC-04 | 9RTD-2/4 |
| 5 | 20-09TC-05 | 9RTD-2/5 |
| 6 | 20-09TC-06 | 9RTD-2/6 |
| 7 | 20-09TC-07 | 9RTD-2/7 |
| 8 | 20-09TC-08 | 9RTD-2/8 |
| 9 (ref.) | 20-09TC-09 | 9RTD-2/9 |

26-1-65

a 1090218



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2201-0006ON-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 22TM152
Page.: 3 of 3

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-------------------------|-----------------------------|
| 104.0 | 104.0 | 104.0 | 0.11 | 1.0 | 1.9 | 0.42 | 2 |
| 180.0 | 180.0 | 180.0 | 0.51 | 2.3 | 4.2 | 1.2 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|-----------------------------|-----------------------------|---------|---------|---------|---------|---------|---------|---------|----------|
| | Position | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 104.0 | 105.219 | 103.394 | 103.908 | 104.133 | 104.348 | 104.096 | 103.878 | 104.103 | 104.360 |
| 180.0 | 182.291 | 178.691 | 178.879 | 180.031 | 180.761 | 180.026 | 180.572 | 180.044 | 180.253 |

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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26-1-65

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



Accuracy Calibration Certificate

Customer

Company: ENVIRONMENT RESEARCH&TECHNOLOGY CO., LTD.
Address: 25/114 Moo 6, Soi Chinaket 1, Ngumwongwan Rd., Toongsongho
City: Laksi Contact: Ramita Taengthai
Zip / Postal: 10210
State / Province: Bangkok
Order Number:



Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: MS204TS/00 Asset Number: ERTC-L-IN-114
Serial No.: B547728037 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/WU02/20
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: 23.8 °C | End: 24.5 °C | Start: 49.7 % | End: 55.1 % |

As Found Calibration Date: 19-Jun-2022
As Left Calibration Date: N/A
Issue Date: 20-Jun-2022

Calibrator:

Smicha C
Suwicha Choykarnichu

Approved Signatory:

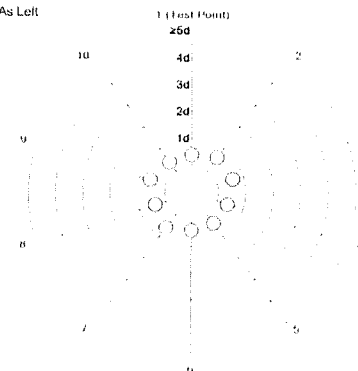
Kessakorn
☒ Kessakorn Tassanachaisakul
☐ Santi Jitniyom
☐ Surachot Sukkate

Measurement Results

Repeatability

Test Load: 100 g

| | As Found | As Left | As Found As Left |
|--------------------|-----------|---------|---------------------|
| 1 | 99.9999 g | N/A | |
| 2 | 99.9998 g | N/A | |
| 3 | 99.9998 g | N/A | |
| 4 | 99.9999 g | N/A | |
| 5 | 99.9999 g | N/A | |
| 6 | 99.9999 g | N/A | |
| 7 | 99.9998 g | N/A | |
| 8 | 99.9999 g | N/A | |
| 9 | 99.9998 g | N/A | |
| 10 | 99.9999 g | N/A | |
| Standard Deviation | 0.00005 g | N/A | |

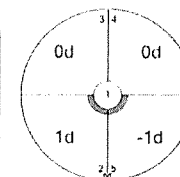


The "d" in the graph represents the readability of the range interval in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

| Position | As Found | As Left |
|-------------------|-----------|---------|
| 1 | 99.9998 g | N/A |
| 2 | 99.9999 g | N/A |
| 3 | 99.9998 g | N/A |
| 4 | 99.9998 g | N/A |
| 5 | 99.9997 g | N/A |
| Maximum Deviation | 0.0001 g | N/A |



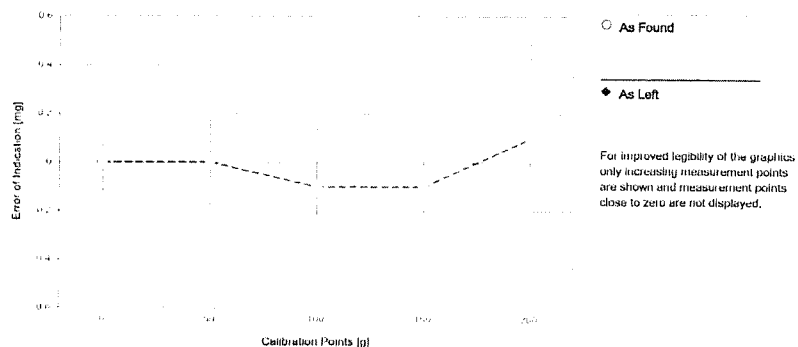
As Found

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 | 0.12 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 | 0.14 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 | 0.18 mg | 2 |
| 9 | 99.9999 g | 99.9998 g | -0.0001 g | 0.24 mg | 2 |
| 10 | 149.9999 g | 149.9998 g | -0.0001 g | 0.34 mg | 2 |
| 11 | 199.9999 g | 200.0000 g | 0.0001 g | 0.39 mg | 2 |



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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.: WS03 Date of Issue: 21-Sep-2021
Certificate Number: 175498 Calibration Due Date: 14-Mar-2023

Thermo Hygrometer

Equipment No.: IN281 Date of Issue: 25-May-2021
Certificate Number: 21H1100 Calibration Due Date: 10-May-2022

26-1-65

Remarks

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

End of Accredited Section

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

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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: 4 K

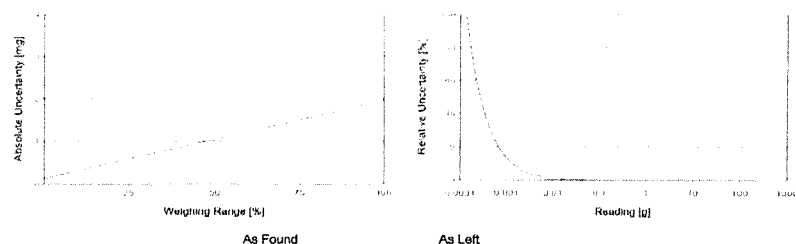
Linearization of Uncertainty Equation

| Range | | | As Found | As Left |
|-------|----------|-------|--|---------|
| | d | Max | | |
| 1 | 0.0001 g | 220 g | $U_1 = 0.13 \text{ mg} + 0.00826 \text{ mg/g} \cdot R$ | 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 | 0.15 mg | 0.0067% | N/A | N/A |
| 22.0000 g | 0.31 mg | 0.0014% | N/A | N/A |
| 220.0000 g | 2.0 mg | 0.00089% | N/A | N/A |



GWP® Certificate



As Found



As Left



The weighing device meets the given process requirements.

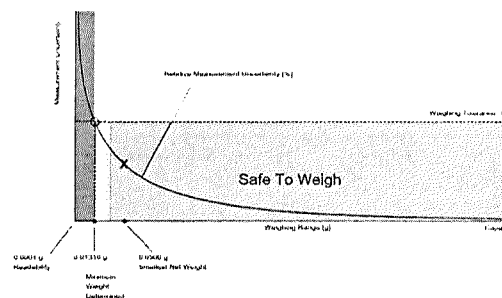
The weighing device meets the given process requirements.

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 | | | | | |
|--|---------------|-----------|-----------|-----------|-----------|
| Tolerance | Safety Factor | | | | |
| | 1 | 2 | 3 | 5 | 10 |
| 0.1% | 0.13276 g | 0.26775 g | 0.40503 g | 0.68670 g | 1.43539 g |
| 0.2% | 0.06610 g | 0.13276 g | 0.19997 g | 0.33610 g | 0.68670 g |
| 0.5% | 0.02637 g | 0.05284 g | 0.07939 g | 0.13276 g | 0.26775 g |
| 1% | 0.01318 g | 0.02637 g | 0.03960 g | 0.06610 g | 0.13276 g |
| 2% | 0.00659 g | 0.01318 g | 0.01977 g | 0.03298 g | 0.06610 g |
| 5% | 0.00263 g | 0.00527 g | 0.00790 g | 0.01318 g | 0.02637 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 | | | | | |
|--|---------------|-----------|-----------|-----------|-----------|
| Tolerance | Safety Factor | | | | |
| | 1 | 2 | 3 | 5 | 10 |
| 0.1% | 0.13276 g | 0.26775 g | 0.40503 g | 0.68670 g | 1.43539 g |
| 0.2% | 0.06610 g | 0.13276 g | 0.19997 g | 0.33610 g | 0.68670 g |
| 0.5% | 0.02637 g | 0.05284 g | 0.07939 g | 0.13276 g | 0.26775 g |
| 1% | 0.01318 g | 0.02637 g | 0.03960 g | 0.06610 g | 0.13276 g |
| 2% | 0.00659 g | 0.01318 g | 0.01977 g | 0.03298 g | 0.06610 g |
| 5% | 0.00263 g | 0.00527 g | 0.00790 g | 0.01318 g | 0.02637 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.

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Measurement Results

Results Summary

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

✓ = Passed

✗ = Failed

k_1 = 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 | | N/A | | N/A |
| 0.2% | 0.00005 g | | ✓ | | ✓ |
| 0.5% | 0.00013 g | | ✓ | | ✓ |
| 1% | 0.00025 g | 0.00005 g* | ✓ | 0.00005 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*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 | | ✓ | | ✓ |
| 0.2% | 0.1000 g | | ✓ | | ✓ |
| 0.5% | 0.2500 g | | ✓ | | ✓ |
| 1% | 0.5000 g | 0.0001 g | ✓ | 0.0001 g | ✓ |
| 2% | 1.0000 g | | ✓ | | ✓ |
| 5% | 2.5000 g | | ✓ | | ✓ |

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

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Error of Indication

As Found

| Reference Value | Error | Control limits for various weighing tolerances | | | | | |
|-----------------|-----------|--|----------|----------|----------|----------|----------|
| | | 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 |
| 199.9999 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

| Reference Value | Error | Control limits for various weighing tolerances | | | | | |
|-----------------|-----------|--|----------|----------|----------|----------|----------|
| | | 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 |
| 199.9999 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.

Service Date: 2022-01-19
Document Number: TH2065-164-011922-LABBalanceHR
ENVIRONMENT RESEARCH&TECHNOLOGY CO., LTD
25/114 Moo 8, Soi Chinakiet 1, Ngamwongwan Rd., Toongsongkhro อ.บางบัวทอง, ลพบุรี, Bangkok 10210
Ramita Tuengthai

Balance Health Report

Device Details

| System Details | | | |
|----------------|----------------|---------------------------------|-------|
| Manufacturer: | Mettler Toledo | Accessory 1: | |
| Model: | MS204TS | Accessory 2: | |
| Serial number: | B547728937 | Weight set for routine testing: | Yes / |
| Firmware: | 3.50 | | |

History

| Device History | | Service History | |
|-----------------------------|------------|------------------------------------|----------|
| Instrument in use: | Yes | Last preventive maintenance: | < 1 year |
| Instrument age: | 3-10 years | Last instrument calibration: | < 1 year |
| Spare parts available: | Yes | Last minimum weight determination: | < 1 year |
| Regulations: | ISO | | |
| Process tolerance in %: | 1% | Routine testing performed: | Yes |
| Smallest sample net weight: | 0.0500 g | | |

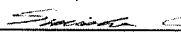
Check List

| Environmental Conditions | | General & Functional Checks | |
|--|---|---|---|
| Room temperature fluctuation | ✓ | Leveling | ✓ |
| Exposure to direct sun | ✓ | Cleanliness | ✓ |
| Vibrations | ✓ | Completeness - missing parts see additional remarks | ✓ |
| Draft | ✓ | Settings optimized for operating environment | ✓ |
| Dirt or dust | ✓ | Other - objections noted as additional remarks | — |
| Static | ✓ | Electrical Component Checks | |
| Mechanical Component Checks | | Power supply | ✓ |
| Draft shield | ✓ | Sliding door drive | ✓ |
| Weighing pan position | ✓ | Internal weight drive | ✓ |
| Housing | ✓ | Display | ✓ |
| Other - objections noted as additional remarks | — | Other - objections noted as additional remarks | — |

Recommendations

| Measurement Result Quality | | Process Efficiency | |
|---|--|--|--|
| Instrument calibration | | Uninstall instrument | |
| Identify safe weighing range | | Replace instrument | |
| GWP verification / risk assessment | | Replace / add parts (see additional remarks) | |
| Preventive maintenance | | Onsite repair | |
| Perform routine testing with test weights | | Dispatch repair | |
| User training | | Use of accessories (see additional remarks) | |

| | | | | |
|---------|------------------------|---------------|-------------------|----------------------------------|
| Contact | Name: Ramita Tuengthai | Position: N/A | Phone: 0866334490 | Email: ramita@enviresearch.co.th |
|---------|------------------------|---------------|-------------------|----------------------------------|

| Additional Remarks & Recommendations | | Engineer Details | |
|--------------------------------------|--|------------------|---|
| | | Date: | 19-Jan-2022 |
| | | Name: | Suwichai Choykamchu |
| | | Signature: |  |

This is not a certificate.

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

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-9000-27 FAX. 0-2719-9484



Cert. No.: 22TM4
Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Binder
Model : ED 115
Serial No. : 950433
ID No. : ERTC-L-In.-009
Submitted by : Environment Research & Technology Company Limited
25/114 Moo 6 Soi Chinaket 1,
Ngamwongwan Road, Toongsonghong, Lakki,
Bangkok 10210
Location : 408/2 ห้องปฏิบัติการบ่มอาหารเลี้ยงเชื้อ
Received Order : 5 January 2022
Calibration Date : 6 January 2022
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Khit Ruttanaprapachai
Approved by :
(/) Pornthippa Tameyakul
(/) Malee Butkruea
() Suwit Imjai

Issue Date : 19 January 2022

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.

26-1-65

A 0036711



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2201-0006ON-5
Procedure Used :-

Cert. No.: 22TM4
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).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

| Instrument | Model | Serial No. | Cert. No. | Due Date |
|----------------------|--------|------------|-----------|-------------|
| 1) Data Acquisition | 34970A | MY44060450 | 21LM4/1 | 06 Mar 2022 |

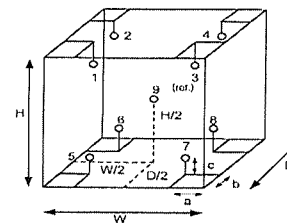
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



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 m³

| Environment during calibration | | |
|--------------------------------|-----------|----------|
| | Beginning | Finished |
| Temp. (°C) | 26 | 26 |
| REL.Humid. (%) | 59 | 61 |
| AC Supply (Volt) | 221 | 222 |

| Position : | Ref. Std. ID No.: |
|------------|-------------------|
| 1 | 19-14RTD-01 |
| 2 | 19-14RTD-02 |
| 3 | 19-14RTD-03 |
| 4 | 19-14RTD-04 |
| 5 | 19-14RTD-05 |
| 6 | 19-14RTD-06 |
| 7 | 21-14RTD-07 |
| 8 | 19-14RTD-08 |
| 9 (ref.) | 19-14RTD-09 |

26-1-65

a 1089977



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2201-0006ON-5
Result of Calibration :- (*) Without Adjustment

Cert. No.: 22TM4

Page.: 3 of 3

Function of UUC* : Temperature Source

Fresh air setting : Close

| Calibration Point (°C) | UUC* Setting (°C) | UUC* Reading (°C) | Temperature stability (± °C) | Temperature uniformity (°C) | Overall Variation (°C) | Uncertainty (± °C) | Coverage Factor <i>k</i> |
|-----------------------------|------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------|-------------------------|-----------------------------|
| 35 | 35 | 35 | 0.17 | 0.22 | 0.48 | 0.66 | 2 |

| Calibration Point (°C) | Measured Temperature (°C) | | | | | | | | |
|-----------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|----------|
| | Position | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (ref.) |
| 35 | 35.011 | 35.019 | 34.925 | 34.979 | 34.842 | 34.791 | 34.848 | 34.825 | 34.886 |

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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26-1-65



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