



Certificate of Calibration

Calibration Certification Information

| | | |
|--------------------------------------|-------------------------------|------------------------|
| Cal. Date: October 20, 2021 | Rootsmeter S/N: 438320 | Ta: 295 °K |
| Operator: Jim Tisch | | Pa: 753.9 mm Hg |
| Calibration Model #: TE-5025A | Calibrator S/N: 3543 | |

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.4300 | 3.2 | 2.00 |
| 2 | 3 | 4 | 1 | 1.0060 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.8990 | 7.9 | 5.00 |
| 4 | 7 | 8 | 1 | 0.8550 | 8.8 | 5.50 |
| 5 | 9 | 10 | 1 | 0.7050 | 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) |
|-------------|---------------|--|-----------|-------------|---|
| 0.9978 | 0.6977 | 1.4156 | 0.9958 | 0.6963 | 0.8847 |
| 0.9935 | 0.9876 | 2.0020 | 0.9915 | 0.9856 | 1.2511 |
| 0.9915 | 1.1029 | 2.2383 | 0.9895 | 1.1007 | 1.3988 |
| 0.9903 | 1.1583 | 2.3476 | 0.9883 | 1.1559 | 1.4670 |
| 0.9850 | 1.3972 | 2.8313 | 0.9830 | 1.3944 | 1.7693 |
| QSTD | m= | 2.02434 | QA | m= | 1.26761 |
| | b= | 0.00347 | | b= | 0.00217 |
| | r= | 1.00000 | | r= | 1.00000 |

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



TE-5170 Calibration Worksheet

Site Information

Location: AM3A Zones 2A at West Date: 13-Apr-22
Site ID: Kowloon Cultural
Sampler: TE-5170 Serial No: 4340 Tech: CS Tang

Site Conditions

Barometric Pressure (in Hg): 29.73 Corrected Pressure (mm Hg): 755
Temperature (deg F): 77 Temperature (deg K): 298
Average Press. (in Hg): 29.73 Corrected Average (mm Hg): 755
Average Temp. (deg F): 77 Average Temp. (deg K): 298

Calibration Orifice

Make: Tisch Qstd Slope: 2.02434
Model: TE-5025A Qstd Intercept: 0.00347
Serial#: 3543 Date Certified: 20-Oct-21

Calibration Information

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | Linear Regression |
|--------------------|-------------|------------------|--------------|-------------------|----------------------|
| 1 | 12.50 | 1.739 | 53.0 | 52.83 | Slope: 31.3621 |
| 2 | 10.70 | 1.609 | 48.0 | 47.85 | Intercept: -1.9304 |
| 3 | 7.70 | 1.365 | 41.0 | 40.87 | Corr. Coeff: 0.9971 |
| 4 | 4.70 | 1.066 | 33.0 | 32.89 | |
| 5 | 2.80 | 0.822 | 23.0 | 22.93 | # of Observations: 5 |

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(Pa/Pstd)(Tstd/Ta))-b]$$
$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I) [\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Average I (chart): 40

Average Flow Calculation m3/min

1.320179067

Average Flow Calculation in CFM

46.61552284

Sample Time (Hrs): 1.0

Total Flow in m3/min

79.210744

Total Flow in CFM

2796.931371

NOTE: Ensure calibration orifice has been certified within 12 months of use



TE-5170 Calibration Worksheet

Site Information

Location: AM4A Site ID: **Zones 2A at West** Date: 13-Apr-22
Sampler: TE-5170 Serial No: 3998 Tech: CS Tang

Site Conditions

Barometric Pressure (in Hg): 29.73 Corrected Pressure (mm Hg): 755
Temperature (deg F): 77 Temperature (deg K): 298
Average Press. (in Hg): 29.73 Corrected Average (mm Hg): 755
Average Temp. (deg F): 77 Average Temp. (deg K): 298

Calibration Orifice

Make: Tisch Qstd Slope: 2.02434
Model: TE-5025A Qstd Intercept: 0.00347
Serial#: 3543 Date Certified: 20-Oct-21

Calibration Information

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | Linear Regression |
|--------------------|-------------|------------------|--------------|-------------------|----------------------|
| 1 | 12.60 | 1.746 | 53.0 | 52.83 | Slope: 30.0314 |
| 2 | 10.80 | 1.616 | 48.0 | 47.85 | Intercept: 0.1648 |
| 3 | 7.50 | 1.347 | 41.0 | 40.87 | Corr. Coeff: 0.9965 |
| 4 | 4.50 | 1.043 | 33.0 | 32.89 | |
| 5 | 2.60 | 0.792 | 23.0 | 22.93 | # of Observations: 5 |

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Average I (chart): 4.0

Average Flow Calculation m3/min

1.308912086

Average Flow Calculation in CFM

46.21768576

Sample Time (Hrs): 1.0

Total Flow in m3/min

78.53472517

Total Flow in CFM

2773.061146

NOTE: Ensure calibration orifice has been certified within 12 months of use



TE-5170 Calibration Worksheet

Site Information

Location: AM5A Zones 2A at West Date: 13-Apr-22
Site ID: Kowloon Cultural Tech: CS Tang
Sampler: TE-5170 Serial No: 4344

Site Conditions

Barometric Pressure (in Hg): 29.73 Corrected Pressure (mm Hg): 755
Temperature (deg F): 77 Temperature (deg K): 298
Average Press. (in Hg): 29.73 Corrected Average (mm Hg): 755
Average Temp. (deg F): 77 Average Temp. (deg K): 298

Calibration Orifice

Make: Tisch Qstd Slope: 2.02434
Model: TE-5025A Qstd Intercept: 0.00347
Serial#: 3543 Date Certified: 20-Oct-21

Calibration Information

| Plate or Test # | H2O (in) | Qstd (m3/min) | I (chart) | IC (corrected) | Linear Regression |
|-----------------|----------|---------------|-----------|----------------|----------------------|
| 1 | 12.50 | 1.739 | 53.0 | 52.83 | Slope: 30.8323 |
| 2 | 10.80 | 1.616 | 48.0 | 47.85 | Intercept: -1.2402 |
| 3 | 7.80 | 1.374 | 41.0 | 40.87 | Corr. Coeff: 0.9974 |
| 4 | 4.70 | 1.066 | 33.0 | 32.89 | |
| 5 | 2.70 | 0.807 | 23.0 | 22.93 | # of Observations: 5 |

Calculations

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I) [\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Average I (chart): 40

Average Flow Calculation m3/min

1.320480237

Average Flow Calculation in CFM

46.62615715

Sample Time (Hrs): 1.0

Total Flow in m3/min

79.22881419

Total Flow in CFM

2797.569429

NOTE: Ensure calibration orifice has been certified within 12 months of use



INTERNATIONAL
ACCREDITATION
SERVICE®

CERTIFICATE OF ACCREDITATION

This is to attest that

AQUALITY TESTCONSULT LIMITED

11A&B, KAI FONG GARDEN, PING CHE ROAD
FANLING, HONG KONG

Calibration Laboratory CL-207

has met the requirements of AC204, *IAS Accreditation Criteria for Calibration Laboratories*, and has demonstrated compliance with ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories*. This organization is accredited to provide the services specified in the scope of accreditation.

Effective Date December 17, 2021

Expiration Date December 1, 2022



A handwritten signature in black ink, reading "Raj Nathan".

President

SCOPE OF ACCREDITATION

International Accreditation Service, Inc.

3060 Saturn Street, Suite 100, Brea, California 92821, U.S.A. | www.iasonline.org

AQUALITY TESTCONSULT LIMITED

Contact Name Lee Mei Yee

Contact Phone + 852-6309-2280

Accredited to ISO/IEC 17025:2017

Effective Date December 17, 2021

CALIBRATION AND MEASUREMENT CAPABILITY (CMC)*

| MEASURED QUANTITY or DEVICE TYPE CALIBRATED | RANGE | UNCERTAINTY ^{1,2} (±) | CALIBRATION PROCEDURE AND/OR STANDARD EQUIPMENT USED |
|---|--|------------------------------------|---|
| <i>Dimensional</i> | | | |
| Caliper -Vernier, Dial & Electronic ³ | 0 mm to 300 mm | 30 µm | Checker by comparison method (BS 887:1982) |
| Steel Ruler ³ | 1 mm to 1000 mm | 280 µm | Reference Steel Rule by comparison method (BS 4372:1968) |
| Dial Indicator/Gauge (Plunger) ³ | 0 mm to 50 mm | 8 µm | Reference micrometer head by comparison method (BS 907:2008) |
| Feeler Gauge ³ | 0.01 mm to 1 mm | 8 µm | Reference Dial Gauge by comparison method (BS 957: 2008) |
| Measuring tape ³ | 0 m to 5 m | 1200 µm | Reference steel ruler by comparison method (BS 4035:1966) |
| Engineering Square ³ | Length: 0 mm to 160 mm | 20 µm | Reference engineering square and Feeler Gauge (BS 939:2007) |
| Slump cone ³ | Diameter: 0 mm to 200 mm Thickness: 1.5 mm Height: 0 mm to 300 mm | 560 µm 100 µm 560 µm | Reference Caliper & Reference Steel ruler by direct measurement (Verification in accordance with in-house method for the dimensional requirements as specified CS1:1990 Vol.1 A4; CS1: 2010 Vol. 1, A5) |

* If information in this CMC is presented in non-SI units, the conversion factors stated in NIST Special Publication 811 "Guide for the Use of the International System of Units (SI)" apply.

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| MEASURED QUANTITY or DEVICE TYPE CALIBRATED | RANGE | UNCERTAINTY ^{1,2} (±) | CALIBRATION PROCEDURE AND/OR STANDARD EQUIPMENT USED |
|---|--|----------------------------------|--|
| Tamping rod ³ | Diameter: 0 mm to 16 mm Length: 600 mm | 600 µm 950 µm | Reference steel ruler & Reference Caliper by direct measurement (Verification in accordance with in-house method for the dimensional requirements as specified CS1:1990 Vol.1 A5; CS1: 2010 Vol. 1, A6) |
| Cube mould ³ | (Max dimensions 150 mm per side) Dimension Flatness Perpendicularity Parallelism | 50 µm 10 µm 10 µm 50 µm | Reference Caliper, straight edge & feeler gauge by direct measurement. (Verification in accordance with in-house method for the dimensional requirements as specified in BS1881: Part 108:1983; CS1:1990 Vol1, A21; CS1:2010 Vol 1, A25; BS EN 12390-2:2000) |
| Compacting Bar ³ | Ramming Face: 25 mm Length: 380 mm Weight: 1.8 kg | 100 µm 560 µm 1 g | Reference Caliper & Steel ruler by direct measurement. (Verification in accordance with in-house method for the dimensional & mass requirements as specified in BS 1881: Part 105:1984 Cl 3.3; CS1:1990 Vol 2, E3 CS1:2010 Vol 1, A15.3; BS EN 12350 -5:2000 Cl 4.3.) |
| Covermeter | 20 mm to 103 mm | 2.9 mm | Reference concrete block (Verification in accordance with in-house method for the dimensional requirements as specified in BS 1881-204:1988 Cl.6.4- Method C) |
| Flow table ³ | 15 kg to 17 kg 1 mm up to 71 mm | 12 g 600 µm | Weighing Balance, Reference caliper & Reference steel ruler by direct measurement |
| Test Sieve ³ | 4 mm to 50 mm | 50 µm | Reference Caliper by direct measurement |
| Mechanical | | | |
| Force Measuring Machine ³ (Compression Mode) | 1 kN to 3000 kN | 0.4 % | Reference Load cell by direct measurement BS 1610: Part 1:1985; BS 1610: Part 1:1992; BS EN ISO 12390-4:2000 Annex B; BS EN ISO 7500-1:2004 |

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| MEASURED QUANTITY or DEVICE TYPE CALIBRATED | RANGE | UNCERTAINTY ^{1,2} (±) | CALIBRATION PROCEDURE AND/OR STANDARD EQUIPMENT USED |
|--|--|---|---|
| Laser Dust Meter ³ | Dust particles 0.001 mg/m ³ to 10.00 mg/m ³ | 0.9 mg/m ³ | By comparison method by using reference laser dust meter |
| Rebound Hammer ³ | 80 unit (hardness) | 1.6 rebound count | Reference Rebound count by comparison method. BS1881: Part 202:1986; BS EN 12504-2:2001; BS EN 12504-2:2012 |
| Mass (F2 class and coarser) | 0 g to 200 g 200 g to 5 kg 5 kg to 10 kg 10 kg to 50 kg | 1.3 mg 0.5 g 0.88 g 3 g | Standard Weight E2/ F1 Class & Weighing Balances by comparison method (OIML-R-111) |
| Weighing Scale & Balance ³ | 0 g to 200 g 0 kg to 5 kg 0 kg to 50 kg | 0.8 mg 0.13 g 7.7 g | Standard weight of E2/F1 Grade by direct measurement (OIML-R-111) |
| Volumetric Glassware | 1 mL to 100 mL 100 mL to 1000 mL | 0.004 mL 0.09 mL | Standard weight E2 Class, Weighing Balances & Distilled water by gravimetric method |
| Thermal | | | |
| Digital/Liquid in Glass Thermometers & RTD/ Thermocouples with or without Indicators | 15 °C to 55 °C 55 °C to 95 °C | 0.4 °C 0.9 °C | Water Baths, Reference Sensor and Indicator by Comparison Method (OIML R133) |
| Curing Tank ³ | (Calibration at 20 °C & 27 °C @ 30 min) 20 °C Temperature distribution 27 °C Temperature distribution Efficiency of circulation | 0.4 °C 0.8 °C 5 s | Reference Temperature datalogger by Mapping Method & Reference Stop Watch (Verification in accordance with in-house method for the Temp & Time requirements as specified in BS1881-111:1983 CS1:1990 Vol 1 App A24 CS1:2010 Vol 1 App A28 BE EN 12390-2:2000 |
| Oven ³ | 40.0 °C to 180.0 °C | 1.5 °C | Reference Temperature datalogger by Mapping Method (AS 2853:1986) |
| Furnace ³ | 200 °C to 1300 °C | 6 °C | Reference Thermocouple with Indicator By single point Calibration (AS 2853:1986) |
| Water bath ³ | 15 °C to 95 °C | 0.2 °C | Reference Temperature datalogger by Mapping Method (AS 2853:1986) |

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| MEASURED QUANTITY or DEVICE TYPE CALIBRATED | RANGE | UNCERTAINTY ^{1,2} (±) | CALIBRATION PROCEDURE AND/OR STANDARD EQUIPMENT USED |
|---|--|-----------------------------------|---|
| <i>Time and Frequency</i> | | | |
| Stop Watch / Timer ³ | 0 s to 3600 s 0 s to 21600 s (6 hours) 0 s to 86400 s (24 hours) | 0.2 s 0.6 s 0.61 s | Reference stop watch |
| Grout Flow Cone ³ | 7 s to 9 s | 0.2 s | Reference stop watch by direct method (ASTM C939-10 Cl.9) |

¹The uncertainty covered by the Calibration and Measurement Capability (CMC) is expressed as the expanded uncertainty having a coverage probability of approximately 95 %. It is the smallest measurement uncertainty that a laboratory can achieve within its scope of accreditation when performing calibrations of a best existing device. The measurement uncertainty reported on a calibration certificate may be greater than that provided in the CMC due to the behavior of the calibration item and other factors that may contribute to the uncertainty of a specific calibration.

²When uncertainty is stated in relative terms (such as percent, a multiplier expressed as a decimal fraction or in scientific notation), it is in relation to instrument reading or instrument output, as appropriate, unless otherwise indicated.

³Also available as site calibration. Note that actual measurement uncertainties achievable at a customer's site can normally be expected to be larger than the uncertainties listed on this Scope of Accreditation

FAQ / Information

Mutual Recognition Arrangements (MRA) / Multilateral Recognition Arrangements (MLA)

Mutual Recognition Arrangement (MRA) Partners for HOKLAS ^

Every effort is made to promote acceptance of test data from accredited laboratories, both internationally and locally. HKAS has concluded mutual recognition arrangements with accreditation bodies listed below by being one of the signatories of the [International Laboratory Accreditation Cooperation Mutual Recognition Arrangement \(ILAC MRA\)](#) and the [Asia Pacific Accreditation Cooperation Mutual Recognition Arrangement \(APAC MRA\)](#) for testing, calibration, medical testing, Proficiency Testing Providers (PTP) and Reference Material Producers (RMP). Click [here](#) to view the up-to-date signatories of ILAC and [here](#) to access the up-to-date signatories of APAC.

Visitors checking the names, logos and accreditation symbols shown on an endorsed certificate or report should note that some of our MRA partners may have their names, logos or accreditation symbols changed recently and test reports or certificates endorsed by displaying their old accreditation symbols may still be valid during the change-over period. For details, please visit their websites or contact them directly.

» [Mutual Recognition Arrangement \(MRA\) Partners for HOKLAS](#)

HKAS MRA partners will recognise HOKLAS endorsed test certificates as having the same technical validity as certificates endorsed by their respective schemes.

Multilateral Recognition Arrangements (MLA) for HKCAS ^

HKAS has been a signatory of [Asia Pacific Accreditation Cooperation Mutual Recognition Arrangement \(APAC MRA\)](#) for Quality Management System (QMS), Environmental Management System (EMS), Food Safety Management System (FSMS), Energy Management System (EnMS), Occupational Health and Safety Management System (OHSMS) certifications, product certifications, and Greenhouse Gas (GHG) validation and verification.

HKAS has also been a signatory of the [International Accreditation Forum Multilateral Recognition Arrangement \(IAF MLA\)](#) for Quality Management System (QMS), Environmental Management System (EMS), Food Safety Management System (FSMS), Energy Management System (EnMS), Occupational Health and Safety Management System (OHSMS) certifications, product certifications, and Greenhouse Gas (GHG) validation and verification.

Click [here](#) to view the up-to-date signatories of IAF and [here](#) to access the up-to-date signatories of APAC.


» [Mutual / Multilateral Recognition Arrangements \(MRA / MLA\) Partners for HKCAS](#)

Mutual Recognition Arrangement (MRA) Partners for HKIAS ^






HKAS has concluded mutual recognition arrangements with accreditation bodies listed below by being one of the signatories of the [International Laboratory Accreditation Cooperation Mutual Recognition Arrangement \(ILAC MRA\)](#) and [Asia Pacific Accreditation Cooperation Mutual Recognition Arrangement \(APAC MRA\)](#) for inspection. Click [here](#) to view the up-to-date signatories of ILAC and [here](#) to access the up-to-date signatories of APAC.

HKAS MRA partners will recognise HKIAS endorsed inspection reports or certificates having the same technical validity as reports or certificates endorsed by their respective schemes.

» [Mutual Recognition Arrangement \(MRA\) Partners for HKIAS](#)

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Hong Kong Laboratory Accreditation Scheme (HOKLAS) - Mutual Recognition Arrangement (MRA) Partners

| Economy | Logo | Name of Partner | URL | Test Area |
|--------------------------|---|--|--|---|
| United States of America |  | International Accreditation Service Inc. (IAS) | www.iasonline.org | Calibration, Non-medical Testing |
| United States of America |  | National Voluntary Laboratory Accreditation Program (NVLAP) | www.nist.gov/nvlap | Calibration, Non-medical Testing |
| United States of America |  | Perry Johnson Laboratory Accreditation, Inc. (PJLA) | www.pjlabs.com | Calibration, Medical Testing, Reference Material Producer, Non-medical Testing |
| Uruguay |  | Organismo Uruguayo de Acreditación (OUA) | www.organismouruguayo.deacreditacion.org | Calibration, Non-medical Testing |
| Viet Nam | | Accreditation Office for Standards Conformity Assessment Capacity (AOSC) | aosc.vn/ | Calibration, Medical Testing, Non-medical Testing |
| Viet Nam |  | Bureau of Accreditation (BoA) | www.boa.gov.vn | Calibration, Medical Testing, Non-medical Testing |



東恒測試顧問有限公司

AQUALITY TESTCONSULT LIMITED

香港新界粉嶺坪輦路啟芳園11A&11B號

No. 11A&B, KAI FONG GARDEN, PING CHE ROAD, FANLING, NEW TERRITORIES, HONG KONG

TEL : 852-3582-9589 FAX : 852-2674-1177 EMAIL : cal.aqtl@gmail.com WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

Report Number : 210918MCA-126F
Date of Report : 21-Sep-21
Page Number : 1 of 2
Customer * : Apex Testing & Certification Ltd.
Customer Address* : Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK
Customers Ref. * : A005

Item Under Calibration (IUC)*

Equipment No. : N/A
Manufacturer : Sibata Scientific Technology Ltd
Model No. : LD-3B
Serial No. : 235811
Scale Division : 0.001 mg/m³
Range : 0.001 to 1 mg/m³
Condition of Item : Normal

Date Item Received : 18-Sep-21
Date Calibrated : 18-Sep-21
Calibration Location : AQuality Calibration Lab.
Date of Next Calibration : 17-Sep-22
Calibrated By : Jessica Liu

Test Environment

Ambient Temperature : 28.3 °C to 33.2 °C
Relative Humidity : 55 % to 79 %

Calibration Results

| Reference True Reading (mg/m ³) | Average IUC Reading (mg/m ³) | Correction (mg/m ³) | Error of IUC Reading (%) | Expanded Uncertainty (mg/m ³) | Coverage Factor K |
|---|--|---------------------------------|--------------------------|---|-------------------|
| 0.158 | 0.167 | -0.008 | 5.1% | 0.020 | 2.0 |
| 5.164 | 5.647 | -0.484 | 8.5% | 0.463 | 2.0 |
| 10.100 | 11.141 | -1.041 | 9.3% | 0.904 | 2.0 |

Remarks :

- * Denotes information supplied by customer.
- The results relate only to the items calibrated.
- The results apply to the items as received.
- Correction = Average of (Ref reading - IUC reading)
- The technical requirement of laser dust meter. +/- 20% error for the particles concentration.

Approved by: _____

LEE Mei Yee, Julia
Managing Director

The results shown in this certificate are metrologically traceable to the International System of Units (SI) or recognised measurement standards.

The certificate shall not be reproduced except in full without approval of the laboratory.



東恒測試顧問有限公司

AQUALITY TESTCONSULT LIMITED

香港新界粉嶺坪輦路啟芳園11A&11B號

No. 11A&11B, KAI FONG GARDEN, PING CHE ROAD, FANLING, NEW TERRITORIES, HONG KONG

TEL : 852-3582-9589 FAX : 852-2674-1177 EMAIL : cal.aqtl@gmail.com WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

Report Number : 210918MCA-126F
Date of Report : 21-Sep-21
Page Number : 2 of 2
Customer * : Apex Testing & Certification Ltd.
Customers Ref. * : A005

Details of Calibration

1. The calibration was performed in accordance with AQuality Testconsult Procedure Number ENV-L-003 (in-house method), by comparison with the laboratory's reference equipment which have traceable international standards of measurement.
2. The item under calibration (IUC) was allowed to stabilize in the laboratory for 0.25 hour before commencement of calibration.
3. A set of readings were made at each calibration concentration. The values quoted in the results are the average of each set of readings.
4. The values given in this calibration certificate only relate to the values measured at the time of calibration. Any uncertainties quoted do not include allowance for the capability of any other laboratory to repeat the measurement. The uncertainty quoted relate only to item at time of calibration. AQuality Testconsult Limited is not liable for any loss or damage resulting from the use of this equipment.
5. The identification, calibration certificate numbers for the reference equipment used were as follows :

| <u>Equipment Number</u> | <u>Certificate Number</u> | <u>Description</u> |
|-------------------------|---------------------------|--------------------|
| CH-LDM-1 | HBW202001563 | 粉尘测试仪 |

6. Copies of the Calibration certificates of the reference equipment used in this calibration may be obtained from AQuality Testconsult Limited, if necessary.

- End of Report -



東恒測試顧問有限公司

AQUALITY TESTCONSULT LIMITED

香港新界粉嶺坪輦路啟芳園11A&11B號

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FAX : 852-2674-1177

EMAIL : cal.aqtl@gmail.com

WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

| | | |
|--|-----------------|----------------|
| Apex Testing & Certification Ltd. Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK | Test Report No. | 210918MCA-126F |
| | Date of Issue | 21-Sep-21 |
| | Date of Testing | 18-Sep-21 |
| | Page | 1 of 1 |

Item for Calibration

| | |
|--------------|------------------------------------|
| Description | : Laser Dust Monitor |
| Manufacturer | : Sibata Scientific Technology Ltd |
| Model No. | : LD-3B |
| Serial No. | : 235811 |

Standard Equipment

| | |
|------------------|---|
| Description | : High Volume Sampler / Calibration Orifice |
| Manufacturer | : Tisch Environmental, Inc. |
| Model No. | : TE-5170 / TE-5025A |
| Serial No. | : 3476 / 3543 |
| Last Calibration | : 17-SEP-21 / 2-Nov-20 |

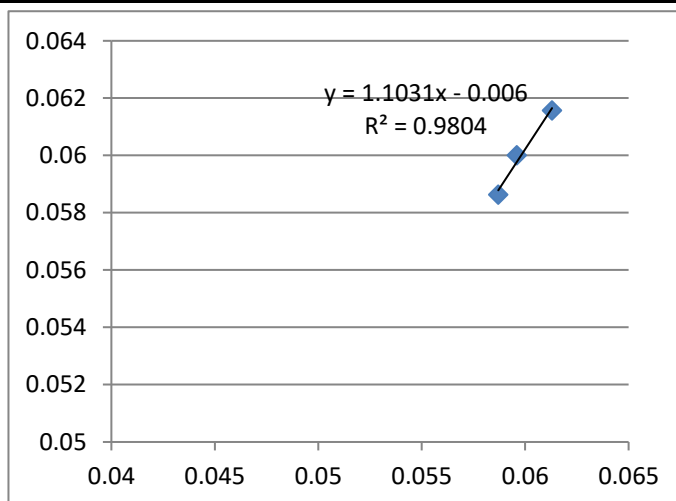
| Date | Time | Mean Temp (°C) | Mean Pressure (hPa) | Concentration Standard Equipment (mg/m3) | Concentration Calibrated Equipment (mg/m3) |
|-----------|-------|-------------------|------------------------|---|---|
| 18-Sep-21 | 19:00 | 30.8 | 1011.1 | 0.0613 | 0.0616 |
| 18-Sep-21 | 20:05 | 30.8 | 1011.1 | 0.0587 | 0.0586 |
| 18-Sep-21 | 21:10 | 30.8 | 1011.1 | 0.0596 | 0.0600 |

By Linear Regression of Y or X


Slope (K-factor) : 1.1031

Correlation Coefficient : 0.9804

Validity of Calibration : 17-Sep-22




Recorded by : Jessica Liu

Signature: 

Date: 18-Sep-21

Checked by : S Tang

Signature: 

Date: 18-Sep-21



東恒測試顧問有限公司

AQUALITY TESTCONSULT LIMITED

香港新界粉嶺坪輦路啟芳園11A&11B號

No. 11A&B, KAI FONG GARDEN, PING CHE ROAD, FANLING, NEW TERRITORIES, HONG KONG

TEL : 852-3582-9589 FAX : 852-2674-1177 EMAIL : cal.aqtl@gmail.com WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

Report Number : 210918MCA-123F
Date of Report : 21-Sep-21
Page Number : 1 of 2
Customer * : Apex Testing & Certification Ltd.
Customer Address* : Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK
Customers Ref. * : A005

Item Under Calibration (IUC)*

Equipment No. : N/A
Manufacturer : Sibata Scientific Technology Ltd
Model No. : LD-3B
Serial No. : 336338
Scale Division : 0.001 mg/m³
Range : 0.001 to 1 mg/m³
Condition of Item : Normal

Date Item Received : 18-Sep-21
Date Calibrated : 18-Sep-21
Calibration Location : AQuality Calibration Lab.
Date of Next Calibration : 17-Sep-22
Calibrated By : Jessica Liu

Test Environment

Ambient Temperature : 28.3 °C to 33.2 °C
Relative Humidity : 55 % to 79 %

Calibration Results

| Reference True Reading (mg/m ³) | Average IUC Reading (mg/m ³) | Correction (mg/m ³) | Error of IUC Reading (%) | Expanded Uncertainty (mg/m ³) | Coverage Factor K |
|---|--|---------------------------------|--------------------------|---|-------------------|
| 0.158 | 0.168 | -0.010 | 5.7% | 0.026 | 2.0 |
| 5.164 | 5.562 | -0.398 | 7.1% | 0.462 | 2.0 |
| 10.100 | 10.936 | -0.837 | 7.6% | 0.905 | 2.0 |

Remarks :

- * Denotes information supplied by customer.
- The results relate only to the items calibrated.
- The results apply to the items as received.
- Correction = Average of (Ref reading - IUC reading)
- The technical requirement of laser dust meter. +/- 20% error for the particles concentration.

Approved by: _____

LEE Mei Yee, Julia
Managing Director

The results shown in this certificate are metrologically traceable to the International System of Units (SI) or recognised measurement standards.

The certificate shall not be reproduced except in full without approval of the laboratory.



東恒測試顧問有限公司

AQUALITY TESTCONSULT LIMITED

香港新界粉嶺坪輦路啟芳園11A&11B號

No. 11A&11B, KAI FONG GARDEN, PING CHE ROAD, FANLING, NEW TERRITORIES, HONG KONG

TEL : 852-3582-9589 FAX : 852-2674-1177 EMAIL : cal.aqtl@gmail.com WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

Report Number : 210918MCA-123F
Date of Report : 21-Sep-21
Page Number : 2 of 2
Customer * : Apex Testing & Certification Ltd.
Customers Ref. * : A005

Details of Calibration

1. The calibration was performed in accordance with AQuality Testconsult Procedure Number ENV-L-003 (in-house method), by comparison with the laboratory's reference equipment which have traceable international standards of measurement.
2. The item under calibration (IUC) was allowed to stabilize in the laboratory for 0.25 hour before commencement of calibration.
3. A set of readings were made at each calibration concentration. The values quoted in the results are the average of each set of readings.
4. The values given in this calibration certificate only relate to the values measured at the time of calibration. Any uncertainties quoted do not include allowance for the capability of any other laboratory to repeat the measurement. The uncertainty quoted relate only to item at time of calibration. AQuality Testconsult Limited is not liable for any loss or damage resulting from the use of this equipment.
5. The identification, calibration certificate numbers for the reference equipment used were as follows :

| <u>Equipment Number</u> | <u>Certificate Number</u> | <u>Description</u> |
|-------------------------|---------------------------|--------------------|
| CH-LDM-1 | HBW202001563 | 粉尘测试仪 |

6. Copies of the Calibration certificates of the reference equipment used in this calibration may be obtained from AQuality Testconsult Limited, if necessary.

- End of Report -



東恒測試顧問有限公司

AQUALITY TESTCONSULT LIMITED

香港新界粉嶺坪輦路啟芳園11A&11B號

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TEL : 852-3582-9589

FAX : 852-2674-1177

EMAIL : cal.aqtl@gmail.com

WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

| | | |
|--|-----------------|----------------|
| Apex Testing & Certification Ltd. Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK | Test Report No. | 210918MCA-123F |
| | Date of Issue | 21-Sep-21 |
| | Date of Testing | 18-Sep-21 |
| | Page | 1 of 1 |

Item for Calibration

| | |
|--------------|------------------------------------|
| Description | : Laser Dust Monitor |
| Manufacturer | : Sibata Scientific Technology Ltd |
| Model No. | : LD-3B |
| Serial No. | : 336338 |

Standard Equipment

| | |
|------------------|---|
| Description | : High Volume Sampler / Calibration Orifice |
| Manufacturer | : Tisch Environmental, Inc. |
| Model No. | : TE-5170 / TE-5025A |
| Serial No. | : 3476 / 3543 |
| Last Calibration | : 17-SEP-21 / 2-Nov-20 |

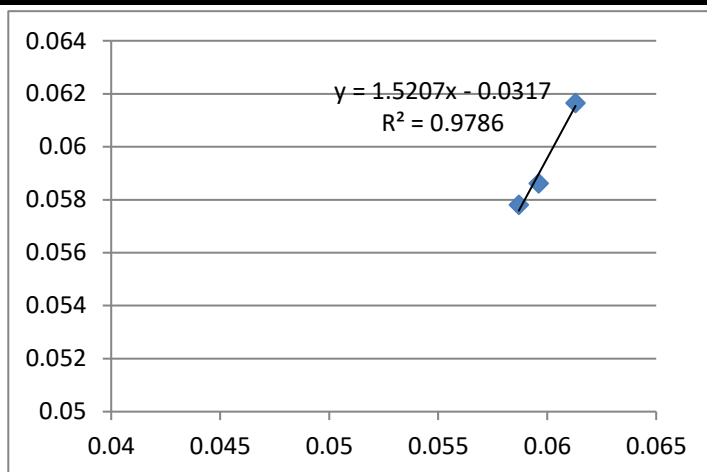
| Date | Time | Mean Temp (°C) | Mean Pressure (hPa) | Concentration Standard Equipment (mg/m3) | Concentration Calibrated Equipment (mg/m3) |
|-----------|-------|-------------------|------------------------|---|---|
| 18-Sep-21 | 19:00 | 30.8 | 1011.1 | 0.0613 | 0.0617 |
| 18-Sep-21 | 20:05 | 30.8 | 1011.1 | 0.0587 | 0.0578 |
| 18-Sep-21 | 21:10 | 30.8 | 1011.1 | 0.0596 | 0.0586 |

By Linear Regression of Y or X

Slope (K-factor) : 1.5207

Correlation Coefficient : 0.9786

Validity of Calibration : 17-Sep-22



Recorded by : Jessica Liu

Signature: Jessica Liu

Date: 18-Sep-21

Checked by : S Tang

Signature: S Tang

Date: 18-Sep-21



東恒測試顧問有限公司

AQUALITY TESTCONSULT LIMITED

香港新界粉嶺坪輦路啟芳園11A&11B號

No. 11A&B, KAI FONG GARDEN, PING CHE ROAD, FANLING, NEW TERRITORIES, HONG KONG

TEL : 852-3582-9589 FAX : 852-2674-1177 EMAIL : cal.aqtl@gmail.com WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

Report Number : 210918MCA-125F
Date of Report : 21-Sep-21
Page Number : 1 of 2
Customer * : Apex Testing & Certification Ltd.
Customer Address* : Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK
Customers Ref. * : A005

Item Under Calibration (IUC)*

Equipment No. : N/A
Manufacturer : Sibata Scientific Technology Ltd
Model No. : LD-3B
Serial No. : 567188
Scale Division : 0.001 mg/m³
Range : 0.001 to 1 mg/m³
Condition of Item : Normal

Date Item Received : 18-Sep-21
Date Calibrated : 18-Sep-21
Calibration Location : AQuality Calibration Lab.
Date of Next Calibration : 17-Sep-22
Calibrated By : Jessica Liu

Test Environment

Ambient Temperature : 28.3 °C to 33.2 °C
Relative Humidity : 55 % to 79 %

Calibration Results

| Reference True Reading (mg/m ³) | Average IUC Reading (mg/m ³) | Correction (mg/m ³) | Error of IUC Reading (%) | Expanded Uncertainty (mg/m ³) | Coverage Factor K |
|---|--|---------------------------------|--------------------------|---|-------------------|
| 0.158 | 0.167 | -0.008 | 4.9% | 0.023 | 2.0 |
| 5.164 | 5.693 | -0.530 | 9.3% | 0.463 | 2.0 |
| 10.100 | 11.045 | -0.945 | 8.6% | 0.905 | 2.0 |

Remarks :

- * Denotes information supplied by customer.
- The results relate only to the items calibrated.
- The results apply to the items as received.
- Correction = Average of (Ref reading - IUC reading)
- The technical requirement of laser dust meter. +/- 20% error for the particles concentration.

Approved by: _____

LEE Mei Yee, Julia
Managing Director

The results shown in this certificate are metrologically traceable to the International System of Units (SI) or recognised measurement standards.

The certificate shall not be reproduced except in full without approval of the laboratory.



東恒測試顧問有限公司

AQUALITY TESTCONSULT LIMITED

香港新界粉嶺坪輦路啟芳園11A&11B號

No. 11A&11B, KAI FONG GARDEN, PING CHE ROAD, FANLING, NEW TERRITORIES, HONG KONG

TEL : 852-3582-9589 FAX : 852-2674-1177 EMAIL : cal.aqtl@gmail.com WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

Report Number : 210918MCA-125F
Date of Report : 21-Sep-21
Page Number : 2 of 2
Customer * : Apex Testing & Certification Ltd.
Customers Ref. * : A005

Details of Calibration

1. The calibration was performed in accordance with AQuality Testconsult Procedure Number ENV-L-003 (in-house method), by comparison with the laboratory's reference equipment which have traceable international standards of measurement.
2. The item under calibration (IUC) was allowed to stabilize in the laboratory for 0.25 hour before commencement of calibration.
3. A set of readings were made at each calibration concentration. The values quoted in the results are the average of each set of readings.
4. The values given in this calibration certificate only relate to the values measured at the time of calibration. Any uncertainties quoted do not include allowance for the capability of any other laboratory to repeat the measurement. The uncertainty quoted relate only to item at time of calibration. AQuality Testconsult Limited is not liable for any loss or damage resulting from the use of this equipment.
5. The identification, calibration certificate numbers for the reference equipment used were as follows :

| <u>Equipment Number</u> | <u>Certificate Number</u> | <u>Description</u> |
|-------------------------|---------------------------|--------------------|
| CH-LDM-1 | HBW202001563 | 粉尘测试仪 |

6. Copies of the Calibration certificates of the reference equipment used in this calibration may be obtained from AQuality Testconsult Limited, if necessary.

- End of Report -



東恒測試顧問有限公司

AQUALITY TESTCONSULT LIMITED

香港新界粉嶺坪輦路啟芳園11A&11B號

No. 11A&11B, KAI FONG GARDEN, PING CHE ROAD, FANLING, N.T., HONG KONG

TEL : 852-3582-9589

FAX : 852-2674-1177

EMAIL : cal.aqtl@gmail.com

WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

| | | |
|--|-----------------|----------------|
| Apex Testing & Certification Ltd. | Test Report No. | 210918MCA-125F |
| Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK | Date of Issue | 21-Sep-21 |
| | Date of Testing | 18-Sep-21 |
| | Page | 1 of 1 |

Item for Calibration

| | |
|--------------|------------------------------------|
| Description | : Laser Dust Monitor |
| Manufacturer | : Sibata Scientific Technology Ltd |
| Model No. | : LD-3B |
| Serial No. | : 567188 |

Standard Equipment

| | |
|------------------|---|
| Description | : High Volume Sampler / Calibration Orifice |
| Manufacturer | : Tisch Environmental, Inc. |
| Model No. | : TE-5170 / TE-5025A |
| Serial No. | : 3476 / 3543 |
| Last Calibration | : 17-SEP-21 / 2-Nov-20 |

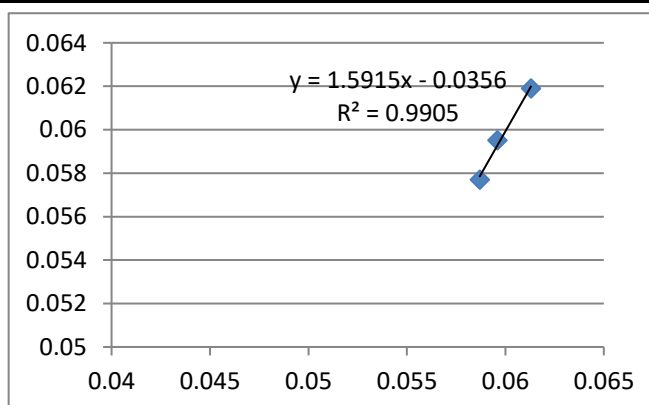
| Date | Time | Mean Temp (°C) | Mean Pressure (hPa) | Concentration Standard Equipment (mg/m3) | Concentration Calibrated Equipment (mg/m3) |
|-----------|-------|-------------------|------------------------|---|---|
| 18-Sep-21 | 19:00 | 30.8 | 1011.1 | 0.0613 | 0.0619 |
| 18-Sep-21 | 20:05 | 30.8 | 1011.1 | 0.0587 | 0.0577 |
| 18-Sep-21 | 21:10 | 30.8 | 1011.1 | 0.0596 | 0.0595 |

By Linear Regression of Y or X

Slope (K-factor) : 1.5915

Correlation Coefficient : 0.9905

Validity of Calibration : 17-Sep-22



Recorded by : Jessica Liu

Signature:

Date: 18-Sep-21

Checked by : S Tang

Signature:

Date: 18-Sep-21



綜合試驗有限公司

SOILS & MATERIALS ENGINEERING CO., LTD.

香港新界葵涌永基路22-24號好爸爸創科大廈

Good Ba Ba Hitech Building, Nos. 22-24 Wing Kei Road, Kwai Chung, New Territories, Hong Kong

Tel: (852) 2873 6860 Fax: (852) 2555 7533 E-mail: smec@cigismec.com Website: www.cigismec.com



CERTIFICATE OF CALIBRATION

Certificate No.: 21CA0928 03-05

Page 1 of 2

Item tested

| | | |
|-----------------------|-------------------------------------|------------|
| Description: | Sound Level Meter (Class 1) | Microphone |
| Manufacturer: | Hangzhou Aihua Instruments Co., Ltd | - |
| Type/Model No.: | AWA5661 | AWA14425 |
| Serial/Equipment No.: | 301135 | 15338 |
| Adaptors used: | - | - |

Item submitted by

| | |
|----------------------|--|
| Customer Name: | Apex Testing & Certification Ltd. |
| Address of Customer: | Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T. |
| Request No.: | - |
| Date of receipt: | 28-Sep-2021 |

Date of test: 04-Oct-2021

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|---------------------------------|----------|------------|--------------|---------------|
| Multi function sound calibrator | B&K 4226 | 2288444 | 23-Aug-2022 | CIGISMEC |
| Signal generator | DS 360 | 61227 | 31-Dec-2021 | CEPREI |

Ambient conditions

| | |
|--------------------|--------------|
| Temperature: | 22 ± 1 °C |
| Relative humidity: | 55 ± 10 % |
| Air pressure: | 1005 ± 5 hPa |

Test specifications

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- 3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsiveness of the Sound Level Meter.

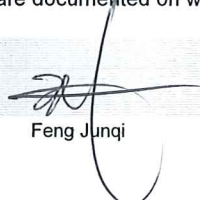
Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:


Feng Junqi

Date: 06-Oct-2021

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument. The results apply to the item as received.

**CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.: 21CA0928 03-05 Page 2 of 2

1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

| Test: | Subtest: | Status: | Expanded Uncertainty (dB) | Coverage Factor |
|-------------------------|--|---------|---------------------------|-----------------|
| Self-generated noise | A | Pass | 0.3 | 2.1 |
| | C | Pass | 0.8 | |
| | Lin | Pass | 1.6 | |
| Linearity range for Leq | At reference range, Step 5 dB at 4 kHz | Pass | 0.3 | 2.2 |
| | Reference SPL on all other ranges | Pass | 0.3 | |
| | 2 dB below upper limit of each range | Pass | 0.3 | |
| | 2 dB above lower limit of each range | Pass | 0.3 | |
| | At reference range, Step 5 dB at 4 kHz | Pass | 0.3 | |
| Linearity range for SPL | A | Pass | 0.3 | |
| | C | Pass | 0.3 | |
| | Lin | Pass | 0.3 | |
| | Single Burst Fast | Pass | 0.3 | |
| Time weightings | Single Burst Slow | Pass | 0.3 | |
| | Single 100µs rectangular pulse | Pass | 0.3 | |
| Peak response | Crest factor of 3 | Pass | 0.3 | |
| R.M.S. accuracy | Single burst 5 ms at 2000 Hz | Pass | 0.3 | |
| Time weighting I | Repeated at frequency of 100 Hz | Pass | 0.3 | |
| | 1 ms burst duty factor 1/10 ³ at 4kHz | Pass | 0.3 | |
| Time averaging | 1 ms burst duty factor 1/10 ⁴ at 4kHz | Pass | 0.3 | |
| | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Pulse range | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Sound exposure level | SPL | Pass | 0.3 | |
| Overload indication | Leq | Pass | 0.4 | |

2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

| Test: | Subtest | Status | Expanded Uncertainty (dB) | Coverage Factor |
|-------------------|------------------------|--------|---------------------------|-----------------|
| Acoustic response | Weighting A at 125 Hz | Pass | 0.3 | |
| | Weighting A at 8000 Hz | Pass | 0.5 | |

3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

Calibrated by:

Fung Chi Yip

Date: 04-Oct-2021

Checked by:

Chan Yuk Yiu

Date: 06-Oct-2021

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.



Test Data for Sound Level Meter

Page 1 of 5

Sound level meter type: AWA5661 Serial No. 301135 Date 04-Oct-2021
Microphone type: AWA14425 Serial No. 15338
Report: 21CA0928 03-05

SELF GENERATED NOISE TEST

The noise test is performed in the most sensitive range of the SLM with the microphone replaced by an equivalent impedance.

Noise level in A weighting 11.7 dB
Noise level in C weighting 12.5 dB
Noise level in Lin 16.7 dB

LINEARITY TEST

The linearity is tested relative to the reference sound pressure level using a continuous sinusoidal signal of frequency 4 kHz. The measurement is made on the reference range for indications at 5 dB intervals starting from the 94 dB reference sound pressure level. And until within 5 dB of the upper and lower limits of the reference range, the measurements shall be made at 1 dB intervals. (SLM set to LEQ/SPL)

| Reference/Expected level | Actual level | | Tolerance | Deviation | |
|--------------------------|----------------|------------|-----------|----------------|------------|
| | non-integrated | integrated | | non-integrated | integrated |
| dB | dB | dB | +/- dB | dB | dB |
| 94.0 | 94.0 | 94.0 | 0.7 | 0.0 | 0.0 |
| 99.0 | 99.0 | 99.0 | 0.7 | 0.0 | 0.0 |
| 104.0 | 104.0 | 104.0 | 0.7 | 0.0 | 0.0 |
| 109.0 | 109.0 | 109.0 | 0.7 | 0.0 | 0.0 |
| 114.0 | 114.0 | 114.0 | 0.7 | 0.0 | 0.0 |
| 115.0 | 115.0 | 115.0 | 0.7 | 0.0 | 0.0 |
| 116.0 | 116.0 | 116.0 | 0.7 | 0.0 | 0.0 |
| 117.0 | 117.0 | 117.0 | 0.7 | 0.0 | 0.0 |
| 118.0 | 118.0 | 118.0 | 0.7 | 0.0 | 0.0 |
| 119.0 | 119.0 | 119.0 | 0.7 | 0.0 | 0.0 |
| 120.0 | 120.0 | 120.0 | 0.7 | 0.0 | 0.0 |
| 89.0 | 89.1 | 89.1 | 0.7 | 0.1 | 0.1 |
| 84.0 | 84.1 | 84.1 | 0.7 | 0.1 | 0.1 |
| 79.0 | 79.1 | 79.1 | 0.7 | 0.1 | 0.1 |
| 74.0 | 74.1 | 74.1 | 0.7 | 0.1 | 0.1 |
| 69.0 | 69.1 | 69.1 | 0.7 | 0.1 | 0.1 |
| 64.0 | 64.1 | 64.1 | 0.7 | 0.1 | 0.1 |
| 59.0 | 59.1 | 59.1 | 0.7 | 0.1 | 0.1 |
| 54.0 | 54.1 | 54.1 | 0.7 | 0.1 | 0.1 |
| 49.0 | 49.1 | 49.1 | 0.7 | 0.1 | 0.1 |
| 44.0 | 44.0 | 44.0 | 0.7 | 0.0 | 0.0 |
| 39.0 | 39.0 | 39.0 | 0.7 | 0.0 | 0.0 |
| 34.0 | 34.0 | 34.0 | 0.7 | 0.0 | 0.0 |
| 29.0 | 29.1 | 29.1 | 0.7 | 0.1 | 0.1 |
| 28.0 | 28.1 | 28.1 | 0.7 | 0.1 | 0.1 |



Test Data for Sound Level Meter

Page 2 of 5

Sound level meter type: AWA5661

Serial No. 301135

Date 04-Oct-2021

Microphone type: AWA14425

Serial No. 15338

Report: 21CA0928 03-05

| | | | | | |
|------|------|------|-----|-----|-----|
| 27.0 | 27.1 | 27.1 | 0.7 | 0.1 | 0.1 |
| 26.0 | 26.2 | 26.2 | 0.7 | 0.2 | 0.2 |
| 25.0 | 25.3 | 25.3 | 0.7 | 0.3 | 0.3 |

Measurements for an indication of the reference SPL on all other ranges which include it

| Other ranges | Expected level | Actual level | Tolerance | Deviation |
|--------------|----------------|--------------|-----------|-----------|
| dB | dB | dB | +/- dB | dB |
| 25-120 | 94.0 | 94.0 | 0.7 | 0.0 |
| 45-140 | 94.0 | 93.9 | 0.7 | -0.1 |

Measurements on all level ranges for indications 2 dB below the upper limit and 2 dB above the lower limit

| Ranges | Reference/Expected level | Actual level | Tolerance | Deviation |
|--------|--------------------------|--------------|-----------|-----------|
| dB | dB | dB | +/- dB | dB |
| 25-120 | 27.0 | 27.1 | 0.7 | 0.1 |
| | 118.0 | 118.0 | 0.7 | 0.0 |
| 45-140 | 47.0 | 47.0 | 0.7 | 0.0 |
| | 138.0 | 137.7 | 0.7 | -0.3 |

FREQUENCY WEIGHTING TEST

The frequency response of the weighting networks are tested at octave intervals over the frequency ranges 31.5 Hz to 12500 Hz. The signal level at 1000 Hz is set to give an indication of the reference SPL.

Frequency weighting A:

| Frequency | Ref. level | Expected level | Actual level | Tolerance(dB) | | Deviation |
|-----------|------------|----------------|--------------|---------------|-----|-----------|
| Hz | dB | dB | dB | + | - | dB |
| 1000.0 | 94.0 | 94.0 | 94.0 | 0.0 | 0.0 | 0.0 |
| 31.6 | 94.0 | 54.6 | 54.3 | 1.5 | 1.5 | -0.3 |
| 63.1 | 94.0 | 67.8 | 67.7 | 1.5 | 1.5 | -0.1 |
| 125.9 | 94.0 | 77.9 | 77.8 | 1.0 | 1.0 | -0.1 |
| 251.2 | 94.0 | 85.4 | 85.3 | 1.0 | 1.0 | -0.1 |
| 501.2 | 94.0 | 90.8 | 90.7 | 1.0 | 1.0 | -0.1 |
| 1995.0 | 94.0 | 95.2 | 95.2 | 1.0 | 1.0 | 0.0 |
| 3981.0 | 94.0 | 95.0 | 95.2 | 1.0 | 1.0 | 0.2 |
| 7943.0 | 94.0 | 92.9 | 93.5 | 1.5 | 3.0 | 0.6 |
| 12590.0 | 94.0 | 89.7 | 89.4 | 3.0 | 6.0 | -0.3 |

Frequency weighting C:

| Frequency | Ref. level | Expected level | Actual level | Tolerance(dB) | | Deviation |
|-----------|------------|----------------|--------------|---------------|-----|-----------|
| Hz | dB | dB | dB | + | - | dB |
| 1000.0 | 94.0 | 94.0 | 94.0 | 0.0 | 0.0 | 0.0 |
| 31.6 | 94.0 | 91.0 | 90.8 | 1.5 | 1.5 | -0.2 |
| 63.1 | 94.0 | 93.2 | 93.1 | 1.5 | 1.5 | -0.1 |
| 125.9 | 94.0 | 93.8 | 93.8 | 1.0 | 1.0 | 0.0 |



Test Data for Sound Level Meter

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Sound level meter type: AWA5661 Serial No. 301135 Date 04-Oct-2021
Microphone type: AWA14425 Serial No. 15338
Report: 21CA0928 03-05

| | | | | | | |
|---------|------|------|------|-----|-----|------|
| 251.2 | 94.0 | 94.0 | 93.9 | 1.0 | 1.0 | -0.1 |
| 501.2 | 94.0 | 94.0 | 94.0 | 1.0 | 1.0 | 0.0 |
| 1995.0 | 94.0 | 93.8 | 93.1 | 1.0 | 1.0 | -0.7 |
| 3981.0 | 94.0 | 93.2 | 93.4 | 1.0 | 1.0 | 0.2 |
| 7943.0 | 94.0 | 91.0 | 91.6 | 1.5 | 3.0 | 0.6 |
| 12590.0 | 94.0 | 87.8 | 87.5 | 3.0 | 6.0 | -0.3 |

Frequency weighting Lin:

| Frequency | Ref. level | Expected level | Actual level | Tolerance(dB) | | Deviation |
|-----------|------------|----------------|--------------|---------------|-----|-----------|
| Hz | dB | dB | dB | + | - | dB |
| 1000.0 | 94.0 | 94.0 | 94.0 | 0.0 | 0.0 | 0.0 |
| 31.6 | 94.0 | 94.0 | 93.9 | 1.5 | 1.5 | -0.1 |
| 63.1 | 94.0 | 94.0 | 94.0 | 1.5 | 1.5 | 0.0 |
| 125.9 | 94.0 | 94.0 | 94.0 | 1.0 | 1.0 | 0.0 |
| 251.2 | 94.0 | 94.0 | 94.0 | 1.0 | 1.0 | 0.0 |
| 501.2 | 94.0 | 94.0 | 94.0 | 1.0 | 1.0 | 0.0 |
| 1995.0 | 94.0 | 94.0 | 94.0 | 1.0 | 1.0 | 0.0 |
| 3981.0 | 94.0 | 94.0 | 94.0 | 1.0 | 1.0 | 0.0 |
| 7943.0 | 94.0 | 94.0 | 94.0 | 1.5 | 3.0 | 0.0 |
| 12590.0 | 94.0 | 94.0 | 93.9 | 3.0 | 6.0 | -0.1 |

TIME WEIGHTING FAST TEST

Time weighting F is tested on the reference range with a single sinusoidal burst of duration 200 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A, Maximum hold)

| Ref. level | Expected level | Actual level | Tolerance(dB) | | Deviation |
|------------|----------------|--------------|---------------|-----|-----------|
| dB | dB | dB | + | - | dB |
| 116.0 | 115.0 | 115.0 | 1.0 | 1.0 | 0.0 |

TIME WEIGHTING SLOW TEST

Time weighting S is tested on the reference range with a single sinusoidal burst of duration 500 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A, Maximum hold)

| Ref. level | Expected level | Actual level | Tolerance(dB) | | Deviation |
|------------|----------------|--------------|---------------|-----|-----------|
| dB | dB | dB | + | - | dB |
| 116.0 | 111.9 | 111.9 | 1.0 | 1.0 | 0.0 |

PEAK RESPONSE TEST

The onset time of the peak detector is tested on the reference range by comparing the response to a 100 us rectangular test pulse with the response to a 10 ms reference pulse of the same amplitude. The amplitude of the 10 ms reference pulse is such as to produce an indication 1 dB below the upper limit of the primary indicator range.

Positive polarities: (Weighting Z, set the generator signal to single, Lzpeak)

| Ref. level | Response to 10 ms | Response to 100 us | Tolerance | Deviation |
|------------|-------------------|--------------------|-----------|-----------|
|------------|-------------------|--------------------|-----------|-----------|



Test Data for Sound Level Meter

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Sound level meter type: AWA5661 Serial No. 301135 Date 04-Oct-2021
Microphone type: AWA14425 Serial No. 15338
Report: 21CA0928 03-05

| dB | dB | dB | +/- dB | dB |
|-------|-------|-------|--------|-----|
| 119.0 | 119.0 | 119.3 | 2.0 | 0.3 |

Negative polarities:

| Ref. level | Response to 10 ms | Response to 100 us | Tolerance | Deviation |
|------------|-------------------|--------------------|-----------|-----------|
| dB | dB | dB | +/- dB | dB |
| 119.0 | 119.0 | 119.3 | 2.0 | 0.3 |

RMS ACCURACY TEST

The RMS detector accuracy is tested on the reference range for a crest factor of 3.

Test frequency: 2000 Hz
Amplitude: 2 dB below the upper limit of the primary indicator range.
Burst repetition frequency: 40 Hz
Tone burst signal: 11 cycles of a sine wave of frequency 2000 Hz. (Set to INT)

| | Ref. Level | Expected level | Tone burst signal | Tolerance | Deviation |
|----------------|------------|----------------|-------------------|-----------|-----------|
| Time weighting | dB | dB | indication(dB) | +/- dB | dB |
| Slow | 116.0+6.6 | 116.0 | 115.8 | 0.5 | -0.2 |

TIME WEIGHTING IMPULSE TEST

Time weighting I is tested on the reference range (Set the SLM to LAImax)

Test frequency: 2000 Hz
Amplitude: The upper limit of the primary indicator range.

Single sinusoidal burst of duration 5 ms:

| Ref. Level | Single burst indication | | Tolerance | Deviation |
|------------|-------------------------|-------------|-----------|-----------|
| dB | Expected (dB) | Actual (dB) | +/- dB | dB |
| 120.0 | 111.2 | 111.1 | 2.0 | -0.1 |

Repeated at 100 Hz

| Ref. Level | Repeated burst indication | | Tolerance | Deviation |
|------------|---------------------------|-------------|-----------|-----------|
| dB | Expected (dB) | Actual (dB) | +/- dB | dB |
| 120.0 | 117.3 | 117.1 | 1.0 | -0.2 |

TIME AVERAGING TEST

This test compares the SLM reading for continuous sine signals with readings obtained from a sine tone burst sequence having the same RMS level. The test level is 30 dB below the upper limit of the linearity range and repeated for Type 1 SLM with 40 dB below the upper limit of the linearity.

Frequency of tone burst: 4000 Hz

Duration of tone burst: 1 ms

| Repetition Time | Level of tone burst | Expected Leq | Actual Leq | Tolerance | Deviation | Remarks |
|-----------------|---------------------|--------------|------------|-----------|-----------|--------------|
| msec | dB | dB | dB | +/- dB | dB | |
| 1000 | 90.0 | 90.0 | 89.8 | 1.0 | -0.2 | 60s integ. |
| 10000 | 80.0 | 80.0 | 79.8 | 1.0 | -0.2 | 6min. integ. |

PULSE RANGE AND SOUND EXPOSURE LEVEL TEST

The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference range



Test Data for Sound Level Meter

Page 5 of 5

Sound level meter type: AWA5661 Serial No. 301135 Date 04-Oct-2021
Microphone type: AWA14425 Serial No. 15338

Report: 21CA0928 03-05

Test frequency: 4000 Hz

Integration time: 10 sec

The integrating sound level meter set to Leq:

| Duration | Rms level of | Expected | Actual | Tolerance | Deviation |
|----------|-----------------|----------|--------|-----------|-----------|
| msec | tone burst (dB) | dB | dB | +/- dB | dB |
| 10 | 90.0 | 60.0 | 59.8 | 1.7 | -0.2 |

The integrating sound level meter set to SEL:

| Duration | Rms level of | Expected | Actual | Tolerance | Deviation |
|----------|-----------------|----------|--------|-----------|-----------|
| msec | tone burst (dB) | dB | dB | +/- dB | dB |
| 10.0 | 90.0 | 70.0 | 70.0 | 1.7 | 0.0 |

OVERLOAD INDICATION TEST

For SLM capable of operating in a non-integrating mode.

Test frequency: 2000 Hz
Amplitude: 2 dB below the upper limit of the primary indicator range.
Burst repetition frequency: 40 Hz
Tone burst signal: 11 cycles of a sine wave of frequency 2000 Hz.

| Level | Level reduced by | Further reduced | Difference | Tolerance | Deviation |
|------------------|------------------|-----------------|------------|-----------|-----------|
| at overload (dB) | 1 dB | 3 dB | dB | dB | dB |
| 115.6 | 114.6 | 111.6 | 3.0 | 1.0 | 0.0 |

For integrating SLM, with the instrument indicating Leq.

For integrating SLM, with the instrument indicating Leq and set to the reference range. The test signal as following:

The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference range

Test frequency: 4000 Hz

Integration time: 10 sec

Single burst duration: 1 msec

| Rms level | Level reduced by | Expected level | Actual level | Tolerance | Deviation |
|------------------|------------------|----------------|--------------|-----------|-----------|
| at overload (dB) | 1 dB | dB | dB | dB | dB |
| 121.9 | 120.9 | 80.9 | 80.7 | 2.2 | -0.2 |

ACOUSTIC TEST

The acoustic test of the complete SLM is tested at the frequency 125 Hz and 8000 Hz using a B&K type 4226 Multifunction Acoustic Calibrator. The test is performed in A weighting.

| Frequency | Expected level | Actual level | Tolerance (dB) | | Deviation |
|-----------|----------------|---------------|----------------|-----|-----------|
| Hz | dB | Measured (dB) | + | - | dB |
| 1000 | 94.0 | 94.0 | 0.0 | 0.0 | 0.0 |
| 125 | 77.9 | 78.2 | 1.0 | 1.0 | 0.3 |
| 8000 | 92.9 | 93.6 | 1.5 | 3.0 | 0.7 |

-----END-----



CERTIFICATE OF CALIBRATION

Certificate No.: 21CA0616 01-02

Page: 1 of 2

Item tested

Description: Acoustical Calibrator (Class 1)
Manufacturer: Pulsar
Type/Model No.: 100B
Serial/Equipment No.: 039507
Adaptors used: Yes

Item submitted by

Customer: Apex Testing & Certification Ltd.
Address of Customer: Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T.
Request No.: -
Date of receipt: 16-Jun-2021

Date of test: 18-Jun-2021

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|-------------------------|----------|------------|--------------|---------------|
| Lab standard microphone | B&K 4180 | 2341427 | 04-May-2022 | SCL |
| Preamplifier | B&K 2673 | 2239857 | 31-May-2022 | CEPREI |
| Measuring amplifier | B&K 2610 | 2346941 | 01-Jun-2022 | CEPREI |
| Signal generator | DS 360 | 33873 | 27-May-2022 | CEPREI |
| Digital multi-meter | 34401A | US36087050 | 27-May-2022 | CEPREI |
| Audio analyzer | 8903B | GB41300350 | 28-May-2022 | CEPREI |
| Universal counter | 53132A | MY40003662 | 02-Jun-2022 | CEPREI |

Ambient conditions

Temperature: $22 \pm 1^\circ\text{C}$
Relative humidity: $55 \pm 10\%$
Air pressure: $1010 \pm 5\text{ hPa}$

Test specifications

- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.

Approved Signatory:


Feng Junqi

Date: 19-Jun-2021

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument. The results apply to the item as received.

**CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

21CA0616 01-02

Page: 2 of 2

1, Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

(Output level in dB re 20 μ Pa)

| Frequency Shown Hz | Output Sound Pressure Level Setting dB | Measured Output Sound Pressure Level dB | Estimated Expanded Uncertainty dB |
|-----------------------|--|---|---|
| 1000 | 94.00 | 94.15 | 0.10 |

2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz

STF = 0.019 dB

Estimated expanded uncertainty

0.005 dB

3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz

Actual Frequency = 999.86 Hz

Estimated expanded uncertainty

0.1 Hz

Coverage factor k = 2.2

4, Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz

TND = 0.9 %

Estimated expanded uncertainty

0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

Calibrated by:

Date:

Fung Chi Yip
18-Jun-2021

- End -

Checked by:

Date:

Chan Yuk Yiu
19-Jun-2021

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.