

RECALIBRATION **DUE DATE:**

May 22, 2019

ertificate of

Calibration Certification Information

Cal. Date: May 22, 2018

Rootsmeter S/N: 438320

Ta: 296

°K

Operator: Jim Tisch

Pa: 749.3

mm Hg

Calibration Model #:

TE-5025A

Calibrator S/N: 0988

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|-------------------|--------------------|---------------|----------------|---------------|----------------|
| 1 | 1 | 2 | 1 | 1.3840 | 3.2 | 2.00 |
| 2 | 3 | 4 | 1 | 0.9840 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.8790 | 7.9 | 5.00 |
| 4 | 7 | 8 | 1 | 0.8420 | 8.7 | 5.50 |
| 5 | 9 | 10 | 1 | 0.6900 | 12.7 | 8.00 |

| | ~~~~ | Data Tabulat | tion | | |
|--------------|------------------|--|--------|----------------|------------|
| Vstd (m3) | Qstd (x-axis) | $\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right) \left(\frac{Tstd}{Ta}\right)}$ (y-axis) | Va | Qa (x-axis) | √∆H(Ta/Pa) |
| 0.9883 | 0.7141 | 1.4090 | 0.9957 | 0.7195 | 0.8889 |
| 0.9841 | 1.0001 | 1.9926 | 0.9915 | 1.0076 | 1.2570 |
| 0.9821 | 1.1173 | 2.2278 | 0.9895 | 1.1257 | 1.4054 |
| 0.9811 | 1.1652 | 2.3365 | 0.9884 | 1.1739 | 1.4740 |
| 0.9758 | 1.4141 | 2.8179 | 0.9831 | 1.4247 | 1,7777 |
| | m= | 2.01748 | | m= | 1.26331 |
| QSTD[| b= | b= -0.02651 | | b= | -0.01673 |
| | r= | 0.99988 | QA | r= | 0.99988 |

| Calculation | ns |
|---|---|
| Vstd= ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta) | Va= ΔVol((Pa-ΔP)/Pa) |
| Qstd= Vstd/ΔTime | Qa= Va/ΔTime |
| For subsequent flow ra | te calculations: |
| Qstd= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$ | $Qa = 1/m \left(\left(\sqrt{\Delta H \left(Ta/Pa \right)} \right) - b \right)$ |

| | Standard Conditions | |
|----------------|------------------------------|---|
| Tstd: | 298.15 °K | _ |
| Pstd: | 760 mm Hg | |
| | Key | |
| ΔH: calibrator | manometer reading (in H2O) | |
| ΔP: rootsmete | er manometer reading (mm Hg) | |
| Ta: actual abs | olute temperature (°K) | |
| Pa: actual bar | ometric 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

Tisch Environmental, Inc. 145 South Miami Avenue Village of Cleves, OH 45002

www.tisch-env.com

TOLL FREE: (877)263-7610

FAX: (513)467-9009

AECOM Asia Company Limited Tisch TSP Mass Flow Controlled High Volume Air Sampler Field Calibration Report

| Station | Block B, Merit In | dustrial Centre (l | E-A14a) | Operator: | Choi Wing Ho | | | |
|--|----------------------------------|---------------------|--------------------------------|---------------------------|--------------------------------|-----------------------------------|---------|--|
| Cal. Date: | 28-Mar-19 | | | Next Due Date: | 28-May-19 10380 | | | |
| Model No.: | TE-5170 | Serial No | | | | | | |
| Equipment No.: | A-001-15T | _ | | , - | | | | |
| | | | Ambient (| Condition | | | | |
| Temperature | Temperature, Ta (K) 295 Pressure | | | | | 761.5 | | |
| | | 0 | rifice Transfer St | andard Information | ı | | | |
| Serial I | No: | 988 | Slope, mc | 2.01 | 748 | Intercept, bc | -0.0265 | |
| Last Calibrat | Last Calibration Date: 22-May-18 | | | | | 1200 m ×1/2 | | |
| Next Calibrat | ion Date: | 22-May-19 | , at | mc x Qstd + bc = | = [H x (Pa/760) x | (298/Ta)]*** | | |
| | | | Calibration of | TSP Sampler | | | | |
| | | (| Orfice | | HV | S Flow Recorder | | |
| Resistance Plate No. | DH (orifice), in. of water | [DH x (Pa/7 | 60) x (298/Ta)] ^{1/2} | Qstd (m³/min) X - axis | Flow Recorder Reading (CFM) | Continuous Flow Reading IC (CF | | |
| 18 | 7.2 | | 2.70 | 1.35 | 47.0 | 47.28 | | |
| 13 | 6.2 | | 2.51 | 1.25 | 43.0 | 43.26 | 3 | |
| 10 | 4.9 | | 2.23 | 1.12 | 37.0 | 37.22 | | |
| 7 | 3.5 | | 1.88 | 0.95 | 30.0 | 30.18 | 3 | |
| 5 | 2.4 | | 1.56 | 0.79 | 24.0 | 24.15 | 5 | |
| By Linear Regress Slope , mw = Correlation Coeffic | 41.1576 cient* = | | 9993 | Intercept, bw = | -8.4 | 1818 | - | |
| *If Correlation Coeff | ricient < 0.990, c | heck and recalibra | ate. | | | | | |
| | | | Set Point | Calculation | | | | |
| From the TSP Field From the Regression | | "Y" value accordir | ng to | : [(Pa/760) x (298/T: | a)] ^{1/2} | | | |
| Therefore, Set Poin | t; IC = (mw x Q: | std + bw) x [(760 | / Pa) x (Ta / 298 |)] ^{1/2} = | | 44.75 | - | |
| Remarks: | | | | | 20,000 | | | |
| OC Peviewer | WS | | Signature: | 45 | | 28 3 | 19 | |

AECOM Asia Company Limited Tisch TSP Mass Flow Controlled High Volume Air Sampler Field Calibration Report

| al. Date: | | | | _ | Choi Wing Ho | | | |
|--|--|--|---|---|--------------------------------|-----------------------------------|--------|--|
| _ | 17-May-19 | | | Next Due Date: | 17-Jul-19 | | | |
| odel No.: | TE-5170 | | | Serial No. | 103 | 10380 | | |
| quipment No.: | A-001-15T | _ | | ·- | | | | |
| | | | A mate la mate | N = - 190 | | | | |
| | T- 00 T | - 1000 T | Ambient (| | | 750 F | | |
| Temperature | mperature, Ta (K) 303 Pressure, Pa (mmHg) 752.5 | | | | | | | |
| | | 0 | rifice Transfer Sta | andard Information | | 14. | | |
| Serial N | No: | 988 | Slope, mc | 2.01 | 748 | Intercept, bc | -0.026 | |
| Last Calibrati | ion Date: | 22-May-18 | | | TT | (200/5 > 1/2 | | |
| Next Calibrat | ion Date: | 22-May-19 | | mc x Qstd + bc = | = [H x (Pa/760) x | (298/Ta)]*** | | |
| | | | 0 111 4 | 700.0 | | | | |
| | | 0 | Calibration of Orfice | 15P Sampler | HVS | S Flow Recorder | | |
| Decistores Dista | | | | | | | | |
| Resistance Plate No. | DH (orifice), in. of water | [DH x (Pa/7) | [DH x (Pa/760) x (298/Ta)] ^{1/2} | | Flow Recorder Reading (CFM) | Continuous Flow Reading IC (CF | | |
| 18 | 7.1 | | 2.63 | 1.32 | 46.0 | 45.39 |) | |
| 10 | | 2.46 | | | 40.0 | 44.41 | : | |
| 13 | 6.2 | | 2.46 | 1.23 | 42.0 | 41.45 | , | |
| | 6.2 5.0 | | 2.46 2.21 | 1.23 | 37.0 | 36.5 | | |
| 13 | | | | | | | | |
| 13 10 | 5.0 | | 2.21 | 1.11 | 37.0 | 36.5 |) | |
| 13 10 7 | 5.0 3.5 2.5 sion of Y on X 38.9459 | | 2.21 1.85 | 1.11 0.93 | 37.0 30.0 25.0 | 36.5 ² 29.60 |) | |
| 13 10 7 5 By Linear Regress | 5.0 3.5 2.5 sion of Y on X 38.9459 cient* = | 0. | 2.21 1.85 1.56 | 1.11 0.93 0.79 | 37.0 30.0 25.0 | 36.5° 29.60 24.6° |) | |
| 13 10 7 5 By Linear Regress Slope, mw = Correlation Coeffice | 5.0 3.5 2.5 sion of Y on X 38.9459 cient* = | 0. | 2.21 1.85 1.56 9983 ate. | 1.11 0.93 0.79 | 37.0 30.0 25.0 | 36.5° 29.60 24.6° |) | |
| 13 10 7 5 By Linear Regress Slope , mw = Correlation Coeffic | 5.0 3.5 2.5 sion of Y on X 38.9459 cient* = ficient < 0.990, c | 0. heck and recalibra | 2.21 1.85 1.56 9983 ate. Set Point (| 1.11 0.93 0.79 | 37.0 30.0 25.0 | 36.5° 29.60 24.6° |) | |
| 13 10 7 5 By Linear Regress Slope, mw = Correlation Coeffice | 5.0 3.5 2.5 sion of Y on X 38.9459 cient* = ficient < 0.990, c | 0. heck and recalibrate, take Qstd = 1. | 2.21 1.85 1.56 9983 ate. Set Point (30m³/min | 1.11 0.93 0.79 | 37.0 30.0 25.0 | 36.5° 29.60 24.6° |) | |
| 13 10 7 5 By Linear Regress Slope , mw = Correlation Coeffic If Correlation Coeffic | 5.0 3.5 2.5 sion of Y on X 38.9459 cient* = ficient < 0.990, c | 0. heck and recalibrate, take Qstd = 1. | 2.21 1.85 1.56 9983 ate. Set Point (30m³/min | 1.11 0.93 0.79 | 37.0 30.0 25.0 | 36.5° 29.60 24.6° |) | |
| 13 10 7 5 By Linear Regress Slope , mw = Correlation Coeffic If Correlation Coeffic | 5.0 3.5 2.5 sion of Y on X 38.9459 cient* = ficient < 0.990, c | 0. heck and recalibra ve, take Qstd = 1. "Y" value according | 2.21 1.85 1.56 9983 ate. Set Point (30m³/min | 1.11 0.93 0.79 | 37.0 30.0 25.0 | 36.5° 29.60 24.6° |) | |
| 13 10 7 5 By Linear Regress Slope , mw = Correlation Coeffic If Correlation Coeffic | 5.0 3.5 2.5 sion of Y on X 38.9459 cient* = ficient < 0.990, c | o. heck and recalibra ve, take Qstd = 1. "Y" value accordir mw x | 2.21 1.85 1.56 9983 ate. Set Point (30m³/min ng to x Qstd + bw = IC x | 1.11 0.93 0.79 Intercept, bw = | 37.0 30.0 25.0 | 36.5° 29.60 24.6° |) | |

EQUIPMENT CALIBRATION RECORD

| Type: Manufacturer/Brand: Model No.: Equipment No.: Sensitivity Adjustment Scale Setting: | | | | Laser Du SIBATA LD-3B A.005.16 521 CPI | а | tor | | |
|---|---|---------------------------------------|--|--|----------------------------|--|-----------------------------|---|
| Operator: | | | | Mike She | k (MSKN | 1) | | |
| Standa | rd Equipment | | | | 1/- | | | |
| Equipr Venue Model Serial Last C | ment: e: No.: | Cybe Serie Conf Sens 3 Ma | sor: 120 ay 2018 | 7ing Seco 0AB21989 00C14365 | ndary So 99803 59803 | K _o : <u>12500</u> | | |
| | | | | | | , oai | | |
| Calibra | tion Result | | | | | 9,00 | | |
| | ivity Adjustment ivity Adjustment | | | | | 521 CF 521 CF | | |
| Hour | Date (dd-mm-yy) | Ti | me | Amb Cond Temp (°C) | | Concentration ¹ (mg/m³) Y-axis | Total Count ² | Count/ Minute ³ X-axis |
| 1 | 14-07-18 | 10:15 | - 11:15 | 29.1 | 79 | 0.04328 | 1742 | 29.03 |
| 2 | 14-07-18 | 11:15 | - 12:15 | 29.1 | 78 | 0.04673 | 1874 | 31.23 |
| 3 | 14-07-18 | 12:15 | - 13:15 | 29.2 | 79 | 0.04904 | 1961 | 32.68 |
| 4 | 14-07-18 | 13:15 | - 14:15 | 29.2 | 79 | 0.04734 | 1897 | 31.62 |
| Slope Correl | 2. Total Count 3. Count/minut ar Regression of (K-factor): ation coefficient: | was logge e was calc Y or X | d by Laser [ulated by (T 0.0015 0.9974 | Oust Mon otal Cou | itor | ashnick TEOM® | | |
| Validit | y of Calibration F | Record: | 14 July 20 | 019 | | | | |
| Remark | s: | | | | | | | |
| QC Re | eviewer: <u>YW F</u> | ung | Signat | ture: | 4/ | Date | e: <u>16 Jul</u> y | y 2018 |

EQUIPMENT CALIBRATION RECORD

| Type: | | | | Laser Di | ust Mani | itor | | |
|---------------------------------------|---|-----------------|------------|------------|-------------|-------------------------------|--------------------|---------------------|
| | facturer/Brand: | | - | SIBATA | ust WOIII | itor | | |
| Mode | | | _ | LD-3 | | | | |
| | Equipment No.: | | | | 'a | | | |
| Sensitivity Adjustment Scale Setting: | | | | 557 CPM | | | | |
| Opera | ator: | | _ | Mike She | ek (MSKN | M) | | |
| Standa | rd Equipment | | | | | | | |
| | | | | | | | | |
| Equip | | | echt & Pa | | | | | |
| Venue | | | ort (Pui \ | Ying Seco | ondary So | chool) | | |
| Model | | | 1400AB | 0450400 | | | | <u></u> |
| Serial | NO: | Contro | - | DAB21989 | | V · 40500 | | |
| Last C | Calibration Date*: | Sensor 3 May | | 00C1436 | 59803 | K _o : <u>12500</u> | | |
| | and anom bate. | _ o may | 2010 | | 2016 | | | |
| *Remar | ks: Recommend | ed interval fo | r hardwai | re calibra | tion is 1 y | year | | |
| Calibra | tion Result | | | | | | | |
| 0: | | 0 - 1 - 0 - 11' | (D. f. | . | | | | |
| Sensit | ivity Adjustment | Scale Setting | (Before | Calibratio | n): | CF | | |
| Sensit | ivity Adjustment | Scale Setting | (After Ca | alibration |): | _557 CF | 'M | |
| Hour | Date | Time | <u> </u> | Amh | pient | Concentration ¹ | Total | Count/ |
| 1.00. | (dd-mm-yy) | | | | dition | (mg/m³) | Count ² | Minute ³ |
| | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | | | Temp | R.H. | Y-axis | Count | X-axis |
| | | | | (°C) | (%) | | | , axio |
| 1 | 05-05-18 | 09:15 - | 10:15 | 27.6 | 79 | 0.05367 | 2151 | 35.85 |
| 2 | 05-05-18 | 10:15 - | 11:15 | 27.6 | 80 | 0.05864 | 2347 | 39.12 |
| 3 | 05-05-18 | 11:15 - | 12:15 | 27.7 | 80 | 0.06661 | 2679 | 44.65 |
| 4 | 05-05-18 | 12:15 - | 13:15 | 27.7 | 79 | 0.06335 | 2546 | 42.43 |
| Note: | | | | | | shnick TEOM® | | |
| | 2. Total Count | | | | | | | |
| | 3. Count/minut | e was calcula | ated by (I | otal Cour | nt/60) | | | |
| By Linea | ar Regression of | Y or X | | | | | | |
| | (K-factor): | | 0.0015 | | | | | |
| | ation coefficient: | | 0.9994 | | 77.1- | | | |
| 2 2 22 22 | | | | | | | | |
| Validity | y of Calibration F | Record: | May 201 | 19 | | | | |
| | | | | | | | | |
| Remark | s: | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | 200 | | 92 | | | / | | |
| | ¥ 1292000000 | | 2. | | W | | | |
| QC Re | eviewer: YW F | ung | Signat | ure: | | Date | e: 07 May | 2018 |

EQUIPMENT CALIBRATION RECORD

| Model | | | | Laser Do | | itor | | |
|--|---|----------------------------------|---|-----------------------------|-------------------------|--|-----------------------------|---|
| | ment No.: tivity Adjustment | Scale Set | tina: | A.005.07a 557 CPM | | | | |
| Operator: | | | | Mike She | | M) | | |
| Standa | rd Equipment | | | | - | | | - |
| Equipo Venue Model Serial Last C | ment: No.: No: Calibration Date*: | Cyb Seri Con Sen 2 M | erport (Paies 1400A trol: sor: ay 2019 | 140AB21989 1200C14369 | 99803 59803 | K _o : _12500 | | |
| | ks: Recommend | ed interva | for hard | ware calibra | tion is 1 | year | | |
| Calibra | tion Result | | - Hali va | | | | | |
| | ivity Adjustment ivity Adjustment | | | | 5000000000 | 557 CP | | |
| Hour | Date (dd-mm-yy) | Т | ime | Cond Temp | oient dition R.H. | Concentration ¹ (mg/m³) Y-axis | Total Count ² | Count/ Minute ³ X-axis |
| 1 | 04-05-19 | 09:15 | - 10:1 | (°C) 5 23.7 | (%) 81 | 0.04765 | 1914 | 24.00 |
| 2 | 04-05-19 | 10:15 | - 10.1 - 11:1 | | 82 | 0.05036 | 2025 | 31.90 33.75 |
| 3 | 04-05-19 | 11:15 | - 12:1 | | 82 | 0.05251 | 2103 | 35.05 |
| 4 | 04-05-19 | 12:15 | - 13:1 | | 82 | 0.05587 | 2231 | 37.18 |
| Slope | 2. Total Count 3. Count/minut ar Regression of (K-factor): | was logge e was cald | ed by Lase culated by _0.0015 | er Dust Mon / (Total Cou | itor | ashnick TEOM® | | |
| Correl | ation coefficient: | | 0.9977 | 1 | | | | |
| Validit | y of Calibration F | Record: | 4 May | 2020 | | | | |
| Remark | s: | | | | | | | |
| | | | | | 1. / | | | |
| OC Pa | wiewer: VM/E | una | Cia | noturo: | 4/ | Data | . 06 M- | . 2010 |



香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong, E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0914 03

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of

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Item tested

Description

Sound Level Meter (Type 1)

Microphone

Manufacturer: Type/Model No.:

B&K 2238

B&K

Serial/Equipment No.:

2800927

4188

Adaptors used:

2791211

Item submitted by

Customer Name:

AECOM ASIA CO., LTD.

Address of Customer:

Request No .: Date of receipt:

14-Sep-2018

Date of test:

17-Sep-2018

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Signal generator Signal generator

Model: B&K 4226 Serial No.

Expiry Date:

Traceable to:

DS 360 DS 360 2288444 33873

61227

23-Aug-2019 24-Apr-2019 23-Apr-2019

CIGISMEC CEPREI

CEPREI

Ambient conditions

Temperature:

21 ± 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%

The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference 3 between the free-field and pressure responsess 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

Feng Junqi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

18-Sep-2018

Company Chop:

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.

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Form No.CARP152-1/Issue 1/Rev C/01/02/2007



香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. Website: www.cigismec.com E-mail: smec@cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0914 03

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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.

| Took | Subtest: | Status: | Expanded Uncertanity (dB) | Coverage Factor |
|-------------------------|---|---------|------------------------------|--------------------|
| Test: | Subtest: | Status. | Officertainty (GB) | racioi |
| Self-generated noise | A | Pass | 0.3 | |
| • | C | Pass | 1.0 | 2.1 |
| | Lin | Pass | 2.0 | 2.2 |
| Linearity range for Leq | At reference range, Step 5 dB at 4 kHz | Pass | 0.3 | |
| | 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 | |
| Linearity range for SPL | At reference range, Step 5 dB at 4 kHz | Pass | 0.3 | |
| Frequency weightings | A | Pass | 0.3 | |
| | C | Pass | 0.3 | |
| | Lin | Pass | 0.3 | |
| Time weightings | Single Burst Fast | Pass | 0.3 | |
| | Single Burst Slow | Pass | 0.3 | |
| Peak response | Single 100µs rectangular pulse | Pass | 0.3 | |
| R.M.S. accuracy | Crest factor of 3 | Pass | 0.3 | |
| Time weighting I | Single burst 5 ms at 2000 Hz | Pass | 0.3 | |
| 2 | Repeated at frequency of 100 Hz | Pass | 0.3 | |
| Time averaging | 1 ms burst duty factor 1/10 ³ at 4kHz | Pass | 0.3 | |
| | 1 ms burst duty factor 1/104 at 4kHz | Pass | 0.3 | |
| Pulse range | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Sound exposure level | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Overload indication | SPL | Pass | 0.3 | |
| | Leq | Pass | 0.4 | |
| | \(\text{\tinx{\tiny{\ti | | | |

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 Uncertanity (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:

Date:

Fung Chi Yip

17-Sep-2018

Checked by:

Shek Kwong Tal

Date:

18-Sep-2018

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.

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Form No.CARP152-2/Issue 1/Rev.C/01/02/2007



香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

Certificate No.:

19CA0327 01-02

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Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer:

B & K

Type/Model No.:

4231

Serial/Equipment No.:

3006428 / N004.03

Adaptors used:

-

Item submitted by

Curstomer:

AECOM ASIA CO LIMITED

Address of Customer:

-

Request No.: Date of receipt:

27-Mar-2019

(N.004.03)

Date of test:

27-Mar-2019

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|-------------------------|----------|------------|--------------|---------------|
| Lab standard microphone | B&K 4180 | 2341427 | 20-Apr-2019 | SCL |
| Preamplifier | B&K 2673 | 2743150 | 27-Apr-2019 | CEPREI |
| Measuring amplifier | B&K 2610 | 2346941 | 08-May-2019 | CEPREI |
| Signal generator | DS 360 | 33873 | 24-Apr-2019 | CEPREI |
| Digital multi-meter | 34401A | US36087050 | 23-Apr-2019 | CEPREI |
| Audio analyzer | 8903B | GB41300350 | 23-Apr-2019 | CEPREI |
| Universal counter | 53132A | MY40003662 | 24-Apr-2019 | CEPREI |

Ambient conditions

Temperature:

22 ± 1 °C

Relative humidity:

55 ± 10 %

Air pressure:

1005 ± 5 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.
- 2. 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 rare presented on page 2 of this certificate.

Feng Jungi

Approved Signatory:

Date:

29-Mar-2019

Company Chop:

SENGINE LERENG COMPANY STOS * OLY STOS * OL

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.

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Form No.CARP156-1/Issue 1/Rev.D/01/03/2007



香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0327 01-02

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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 μPa | | |
|--------------------------|--|---|---|--|
| Frequency Shown Hz | Output Sound Pressure Level Setting dB | Measured Output Sound Pressure Level dB | Estimated Expanded Uncertainty dB | |
| 1000 | 94.00 | 94.23 | 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 = 0.014 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 = 1000.0 Hz

Estimated expanded uncertainty

0 1 Hz

Coverage factor k = 2.2

Total Noise and Distortion 4.

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 = 0.3 %

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:

End

Fung Chi Yip

Fong Chun Wai

Date: 27-Mar-2019

Date:

29-Mar-2019

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.

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香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

Certificate No.:

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Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer:

Rion Co., Ltd.

Type/Model No.:

NC-74

Serial/Equipment No.:

34246490 / N.004.10

Adaptors used:

Item submitted by

Curstomer:

AECOM ASIA CO LIMITED

Address of Customer:

Request No:

Date of receipt:

08-Oct-2018

Date of test:

10-Oct-2018

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|-------------------------|----------|------------|--------------|---------------|
| Lab standard microphone | B&K 4180 | 2341427 | 20-Apr-2019 | SCL |
| Preamplifier | B&K 2673 | 2743150 | 27-Apr-2019 | CEPREI |
| Measuring amplifier | B&K 2610 | 2346941 | 08-May-2019 | CEPREI |
| Signal generator | DS 360 | 61227 | 24-Apr-2019 | CEPREI |
| Digital multi-meter | 34401A | US36087050 | 23-Apr-2019 | CEPREI |
| Audio analyzer | 8903B | GB41300350 | 23-Apr-2019 | CEPREI |
| Universal counter | 53132A | MY40003662 | 24-Apr-2019 | CEPREI |

Ambient conditions

Temperature:

Relative humidity:

21 ± 1 °C

Air pressure:

50 ± 10 % 1005 ± 5 hPa

Test specifications

- 1, 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
- 2, The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- 3. 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.

Fend Junai

Approved Signatory:

Date:

10-Oct-2018

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

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Form No CARP156-1/Issue 1/Rev D/01/03/2007



香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA1008 02

Page:

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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 uPa)

of

| Frequency | Output Sound Pressure | Measured Output | Estimated Expanded |
|-----------|-----------------------|----------------------|--------------------|
| Shown | Level Setting | Sound Pressure Level | Uncertainty |
| Hz | dB | dB | dB |
| 1000 | 94.00 | 93.89 | 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 = 0.030 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 = 1002.0 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 = 2.3 %

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:

End

Date:

Fung Chi Yip 10-Oct-2018 Checked by:

Date:

Shek Kwong Tal 10-Oct-2018

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

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