

Appendix H Noise Monitoring Equipment Calibration Certificate

**FACTORY CALIBRATION DATA OF THE SVAN 971 No. 96063**

with preamplifier SVANTEK type SV18 No. 97278 and with microphone ACO type 7052E No. 78092

1. CALIBRATION* (acoustical)

LEVEL METER function; Range: Low; Reference frequency: 1000Hz; Sound Pressure Level: 114,00 dB.

| Characteristic | Correct value [dB] | Indication [dB] | Error [dB] |
|----------------|--------------------|-----------------|------------|
| Z | 114.00 | 114.05 | 0.05 |
| A | 114.00 | 114.05 | 0.05 |
| C | 114.00 | 114.05 | 0.05 |

Calibration measured with the microphone ACO type 7052E No. 78092. Calibration factor: 0.52 dB.

2. LINEARITY TEST* (electrical)LEVEL METER function; Range: Low; Characteristic: A; $f_{sin} = 31.5$ Hz

| Nominal result LEQ [dB] | 24.0 | 25.0 | 26.0 | 28.0 | 30.0 | 40.0 | 60.0 | 83.0 |
|-------------------------|------|------|------|------|------|------|------|------|
| Error [dB] | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

LEVEL METER function; Range: Low; Characteristic: A; $f_{sin} = 1000$ Hz

| Nominal result LEQ [dB] | 24.0 | 25.0 | 26.0 | 28.0 | 30.0 | 40.0 | 60.0 | 80.0 | 100.0 | 123.0 |
|-------------------------|------|------|------|------|------|------|------|------|-------|-------|
| Error [dB] | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 |

LEVEL METER function; Range: Low; Characteristic: A; $f_{sin} = 8000$ Hz

| Nominal result LEQ [dB] | 24.0 | 25.0 | 26.0 | 28.0 | 30.0 | 40.0 | 60.0 | 80.0 | 100.0 | 122.0 |
|-------------------------|------|------|------|------|------|------|------|------|-------|-------|
| Error [dB] | 0.0 | -0.0 | -0.0 | -0.0 | -0.0 | -0.0 | -0.0 | -0.0 | -0.0 | -0.0 |

LEVEL METER function; Range: High; Characteristic: A; $f_{sin} = 31.5$ Hz

| Nominal result LEQ [dB] | 34.0 | 35.0 | 36.0 | 38.0 | 40.0 | 60.0 | 80.0 | 97.0 |
|-------------------------|------|------|------|------|------|------|------|------|
| Error [dB] | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | -0.0 | 0.0 |

LEVEL METER function; Range: High; Characteristic: A; $f_{sin} = 1000$ Hz

| Nominal result LEQ [dB] | 34.0 | 35.0 | 36.0 | 38.0 | 40.0 | 60.0 | 80.0 | 100.0 | 120.0 | 137.0 |
|-------------------------|------|------|------|------|------|------|------|-------|-------|-------|
| Error [dB] | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | 0.0 |

LEVEL METER function; Range: High; Characteristic: A; $f_{sin} = 8000$ Hz

| Nominal result LEQ [dB] | 34.0 | 35.0 | 36.0 | 38.0 | 40.0 | 60.0 | 80.0 | 100.0 | 120.0 | 136.0 |
|-------------------------|------|------|------|------|------|------|------|-------|-------|-------|
| Error [dB] | 0.0 | 0.0 | -0.0 | 0.0 | -0.0 | -0.0 | 0.0 | -0.0 | -0.0 | -0.0 |

1/3 OCTAVE (1kHz); Range: Low; $f_{sin} = 1000$ Hz

| Nominal result [dB] | 25.0 | 30.0 | 40.0 | 60.0 | 80.0 | 100.0 | 120.0 | 123.0 | |
|---------------------|------|------|------|------|------|-------|-------|-------|------|
| Error [dB] | - | 0.1 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 | -0.0 |

3. TONE BURST RESPONSE*LEVEL METER function; Characteristic: A; $f_{sin} = 4000$ Hz; Burst duration: 2s

Range: Low; Steady level nominal result = 120dB

| Result | Detector | Duration [ms] | 1000 | 500 | 200 | 100 | 50 | 20 | 10 | 5 | 2 | 1 | 0.5 | 0.25 |
|--------|----------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|
| MAX | Fast | Indication [dB] | 119.9 | 119.8 | 119.0 | 117.3 | 115.1 | 111.6 | 108.8 | 105.8 | 101.9 | 98.9 | 95.8 | 92.8 |
| | | Error [dB] | 0.0 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | -0.1 | 0.0 | -0.0 | -0.1 | -0.1 | -0.1 |
| | Slow | Indication [dB] | 117.9 | 115.8 | 112.4 | 109.6 | 106.7 | 102.8 | 99.8 | 96.8 | 92.8 | - | - | - |
| | | Error [dB] | -0.1 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | - | - | - |
| SEL | - | Indication [dB] | 119.9 | 116.9 | 112.9 | 109.9 | 106.9 | 102.9 | 99.9 | 96.9 | 92.9 | 89.9 | 86.8 | 83.8 |
| | | Error [dB] | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | 0.0 | -0.0 | -0.0 | -0.0 | -0.0 | -0.1 | -0.1 |

Range: Low; Steady level nominal result = 60dB

| Result | Detector | Duration [ms] | 1000 | 500 | 200 | 100 | 50 | 20 | 10 | 5 | 2 | 1 | 0.5 |
|--------|----------|-----------------|------|------|------|------|------|------|------|------|------|------|------|
| MAX | Fast | Indication [dB] | 59.9 | 59.9 | 59.0 | 57.3 | 55.1 | 51.6 | 48.8 | 45.9 | 41.9 | 38.9 | 35.9 |
| | | Error [dB] | 0.0 | 0.0 | 0.0 | 0.0 | -0.0 | 0.0 | -0.0 | 0.0 | -0.0 | -0.0 | -0.1 |
| | Slow | Indication [dB] | 57.9 | 55.8 | 52.4 | 49.6 | 46.7 | 42.8 | 39.8 | 36.8 | 32.8 | - | - |
| | | Error [dB] | -0.0 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | - | - |
| SEL | - | Indication [dB] | 59.9 | 56.9 | 52.9 | 49.9 | 46.9 | 42.9 | 39.9 | 36.9 | 32.9 | 29.9 | 26.9 |
| | | Error [dB] | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 |

Range: Low; Steady level nominal result = 35dB

| Result | Detector | Duration [ms] | 1000 | 500 | 200 |
|--------|----------|-----------------|------|------|------|
| MAX | Fast | Indication [dB] | 34.9 | 34.8 | 33.9 |
| | | Error [dB] | -0.0 | -0.0 | 0.0 |
| | Slow | Indication [dB] | 32.9 | 30.8 | 27.4 |
| | | Error [dB] | -0.1 | -0.0 | -0.1 |
| SEL | - | Indication [dB] | 34.9 | 31.9 | 28.0 |
| | | Error [dB] | -0.0 | -0.0 | 0.0 |

Range: High; Steady level nominal result = 134dB

| Result | Detector | Duration [ms] | 1000 | 500 | 200 | 100 | 50 | 20 | 10 | 5 | 2 | 1 | 0.5 | 0.25 |
|--------|----------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| MAX | Fast | Indication [dB] | 133.9 | 133.9 | 133.0 | 131.3 | 129.1 | 125.6 | 122.8 | 119.9 | 115.9 | 112.9 | 109.9 | 106.8 |
| | | Error [dB] | 0.0 | 0.0 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 | -0.0 | -0.1 | -0.1 |
| | Slow | Indication [dB] | 131.9 | 129.8 | 126.4 | 123.6 | 120.7 | 116.8 | 113.8 | 110.8 | 106.8 | - | - | - |
| | | Error [dB] | -0.1 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | - | - | - |
| SEL | - | Indication [dB] | 133.9 | 130.9 | 127.0 | 123.9 | 120.9 | 117.0 | 113.9 | 110.9 | 106.9 | 103.9 | 100.8 | 97.8 |
| | | Error [dB] | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | -0.1 | -0.1 |

Range: High; Steady level nominal result = 54dB

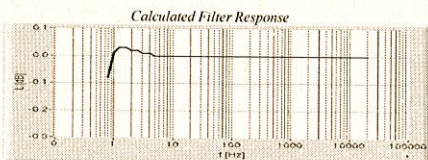
| Result | Detector | Duration [ms] | 1000 | 500 | 200 | 100 | 50 |
|--------|----------|-----------------|------|------|------|------|------|
| MAX | Fast | Indication [dB] | 53.9 | 53.9 | 53.0 | 51.4 | 49.1 |
| | | Error [dB] | -0.0 | 0.0 | 0.0 | 0.0 | -0.0 |
| | Slow | Indication [dB] | 51.9 | 49.8 | 46.4 | 43.6 | 40.8 |
| | | Error [dB] | -0.1 | -0.0 | -0.1 | -0.1 | 0.0 |
| SEL | - | Indication [dB] | 53.9 | 50.9 | 47.0 | 44.0 | 41.0 |
| | | Error [dB] | -0.0 | -0.0 | 0.0 | 0.0 | 0.0 |

Range: High; Steady level nominal result = 45dB

| Result | Detector | Duration [ms] | 1000 | 500 | 200 |
|--------|----------|-----------------|------|------|------|
| MAX | Fast | Indication [dB] | 45.0 | 44.9 | 44.0 |
| | | Error [dB] | 0.0 | 0.0 | 0.0 |
| | Slow | Indication [dB] | 42.9 | 40.8 | 37.4 |
| | | Error [dB] | -0.1 | -0.0 | -0.1 |
| SEL | - | Indication [dB] | 45.0 | 41.9 | 38.0 |
| | | Error [dB] | 0.0 | -0.0 | 0.0 |

4. FREQUENCY RESPONSE* (electrical)

LEVEL METER function; Characteristic: Z; Range: Low; Input signal =120 dB;



Measured Filter Response with Preamplifier SV18 (f-frequency, L-level)

| f [Hz] | L [dB] | f [Hz] | L [dB] | f [Hz] | L [dB] |
|--------|--------|--------|--------|--------|--------|
| 10 | -0.1 | 63 | 0.0 | 4000 | 0.0 |
| 12.5 | 0.0 | 125 | 0.0 | 8000 | 0.0 |
| 16 | 0.0 | 250 | 0.0 | 16000 | 0.0 |
| 20 | 0.0 | 500 | 0.0 | 20000 | 0.0 |
| 25 | 0.0 | 1000 | 0.0 | | |
| 31.5 | 0.0 | 2000 | 0.0 | | |

All frequencies are nominal center values for the 1/3 octave bands

5. INTERNAL NOISE LEVEL* (electrical - compensated)

LEVEL METER function; Range: Low; (Back-light - off); Calibration factor: 0dB

| Characteristic | Z | A | C |
|----------------|-----|-----|-----|
| Level [dB] | ≤20 | ≤12 | ≤12 |

* measured with preamplifier SVANTEK type SV18 No. 97278.

6. INTERNAL NOISE LEVEL (acoustical - compensated)

LEVEL METER function; Characteristic: A; (Backlight - off)

| Range | Low | High |
|-----------------|-----|------|
| Indication [dB] | ≤15 | 19.8 |

Noise measured in special chamber, with reference microphone G.R.A.S type 40AN No. 73421

ENVIRONMENTAL CONDITIONS

| Temperature | Relative humidity | Ambient pressure |
|-------------|-------------------|------------------|
| 27 °C | 55% | 999 hPa |

TEST EQUIPMENT

| Item | Manufacturer | Model | Serial no. | Description |
|------|--------------|-----------|---------------|---|
| 1. | SVANTEK | SVAN 401 | 100 | Signal generator |
| 2. | SVANTEK | SVAN 912A | 4369 | Sound & Vibration Analyser |
| 3. | RIGOL | DM3068 | DM30155100773 | Digital multimeter |
| 4. | SVANTEK | SV33B | 93171 | Acoustic calibrator |
| 5. | SVANTEK | ST02 | - | Microphone equivalent electrical impedance (18pF) |

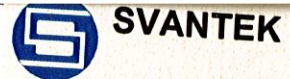
CONFORMITY & TEST DECLARATION

1. Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them.
2. The acoustic calibration was performed using the Sound Calibrator and is traceable to the GUM (Central Office of Measures) reference standard - sound level calibrator type 4231 No 2292773.
3. The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
4. This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Calibration specialist: Krzysztof Kubel



Test date: 2020-07-02




**1/2" Prepolarized Condenser
Microphone**

Calibration Chart

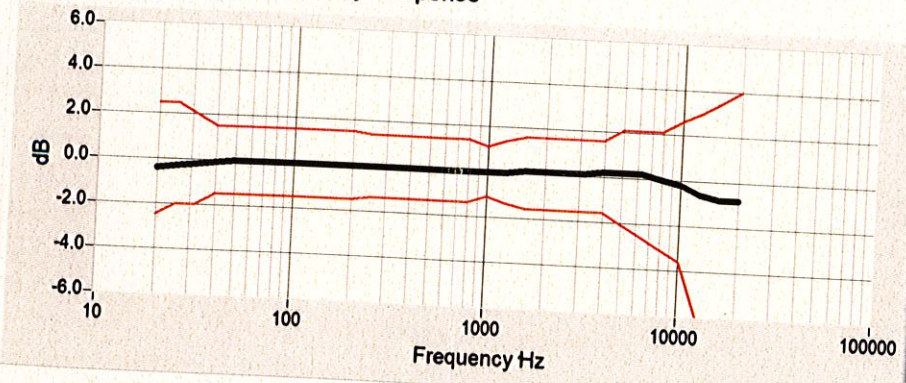
Type: **7052E** Serial No: **78092**

Measured sensitivity: **32.74 mV/Pa**
-29.70 dB re. 1V/Pa

Manufacturer: **ACO PACIFIC**

Date: 2020-06-04 Signature: 

Measured Free-Field Frequency Response



Environmental Calibration Conditions: **22 °C 40 % 990 hPa**



Certificate of Calibration

for

Description: Sound Level Meter
Manufacturer: NTi Audio
Type No.: XL2 (Serial No.: A2A-13663-E0)
Microphone: ACO 7052 (Serial No.: 73912)
Preamplifier: NTi Audio MA220 (Serial No.: 5735)

Submitted by:

Customer: Acuity Sustainability Consulting Limited
Address: Unit C, 11/F, Ford Glory Plaza, No. 37-39 Wing Hong Street,
Cheung Sha Wan, Kowloon, Hong Kong

Upon receipt for calibration, the instrument was found to be:

- Within
 Outside


the allowable tolerance.

The test equipment used for calibration are traceable to National Standards via:

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory

Date of receipt: 08 September 2020

Date of calibration: 09 September 2020

Calibrated by: 
Calibration Technician

Certified by: 
Mr. Ng Yan Wa
Laboratory Manager

Date of issue: 09 September 2020

Certificate No.: APJ20-104-CC001



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**1. Calibration Precaution:**

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 24 hours, and switched on to warm up for over 10 minutes before the commencement of the test.
- The results presented are the mean of 3 measurements at each calibration point.

2. Calibration Conditions:

Air Temperature: 23.8°C
 Air Pressure: 1008 hPa
 Relative Humidity: 62.5%

3. Calibration Equipment:

| | Type | Serial No. | Calibration Report Number | Traceable to |
|--------------------------|----------|------------|---------------------------|--------------|
| Multifunction Calibrator | B&K 4226 | 2288467 | AV200041 | HOKLAS |

4. Calibration Results

Sound Pressure Level

Reference Sound Pressure Level

| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading | IEC 61672 Class 1 |
|----------------------------------|-----------------|----------------|-----------|---------------|------|-------------------|-------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | dB | Specification, dB | |
| 30-130 | dBA | SPL | Fast | 94 | 1000 | 94.0 | ±0.4 |

Linearity

| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading | IEC 61672 Class 1 |
|----------------------------------|-----------------|----------------|-----------|---------------|------|-------------------|-------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | dB | Specification, dB | |
| 30-130 | dBA | SPL | Fast | 94 | 1000 | 94.0 | Ref |
| | | | | 104 | | 104.0 | ±0.3 |
| | | | | 114 | | 114.0 | ±0.3 |

Time Weighting

| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading | IEC 61672 Class 1 |
|----------------------------------|-----------------|----------------|-----------|---------------|------|-------------------|-------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | dB | Specification, dB | |
| 30-130 | dBA | SPL | Fast | 94 | 1000 | 94.0 | Ref |
| | | | Slow | | | 94.0 | ±0.3 |

Frequency Response

Linear Response

| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading, | IEC 61672 Class 1 |
|----------------------------------|-----------------|----------------|-----------|---------------|------|-------------------|-------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | dB | Specification, dB | |
| 30-130 | dB | SPL | Fast | 94 | 31.5 | 94.3 | ±2.0 |
| | | | | | 63 | 94.3 | ±1.5 |
| | | | | | 125 | 94.3 | ±1.5 |
| | | | | | 250 | 94.2 | ±1.4 |
| | | | | | 500 | 94.1 | ±1.4 |
| | | | | | 1000 | 94.0 | Ref |
| | | | | | 2000 | 93.8 | ±1.6 |
| | | | | | 4000 | 93.6 | ±1.6 |
| | | | | 8000 | 93.4 | +2.1; -3.1 | |

A-weighting

| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading, | IEC 61672 Class 1 |
|----------------------------------|-----------------|----------------|-----------|---------------|------|-------------------|-------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | dB | Specification, dB | |
| 30-130 | dBA | SPL | Fast | 94 | 31.5 | 54.8 | -39.4±2.0 |
| | | | | | 63 | 68.0 | -26.2±1.5 |
| | | | | | 125 | 78.1 | -16.1±1.5 |
| | | | | | 250 | 85.5 | -8.6±1.4 |
| | | | | | 500 | 90.8 | -3.2±1.4 |
| | | | | | 1000 | 94.0 | Ref |
| | | | | | 2000 | 95.0 | +1.2±1.6 |
| | | | | | 4000 | 94.6 | +1.0±1.6 |
| | | | | 8000 | 92.3 | -1.1+2.1; -3.1 | |

C-weighting

| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading, | IEC 61672 Class 1 |
|----------------------------------|-----------------|----------------|-----------|---------------|------|-------------------|-------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | dB | Specification, dB | |
| 30-130 | dBC | SPL | Fast | 94 | 31.5 | 91.2 | -3.0±2.0 |
| | | | | | 63 | 93.4 | -0.8±1.5 |
| | | | | | 125 | 94.1 | -0.2±1.5 |
| | | | | | 250 | 94.1 | -0.0±1.4 |
| | | | | | 500 | 94.1 | -0.0±1.4 |
| | | | | | 1000 | 94.0 | Ref |
| | | | | | 2000 | 93.6 | -0.2±1.6 |
| | | | | | 4000 | 92.8 | -0.8±1.6 |
| | | | | 8000 | 90.4 | -3.0+2.1; -3.1 | |

5. Calibration Results Applied

The results apply to the particular unit-under-test only. All calibration points are within manufacture's specification as IEC 61672 Class 1.

Uncertainties of Applied Value:

| | | |
|--------|---------|--------|
| 94 dB | 31.5 Hz | ± 0.05 |
| | 63 Hz | ± 0.05 |
| | 125 Hz | ± 0.05 |
| | 250 Hz | ± 0.05 |
| | 500 Hz | ± 0.05 |
| | 1000 Hz | ± 0.05 |
| | 2000 Hz | ± 0.05 |
| | 4000 Hz | ± 0.05 |
| | 8000 Hz | ± 0.10 |
| 104 dB | 1000 Hz | ± 0.05 |
| 114 dB | 1000 Hz | ± 0.05 |

The uncertainties are evaluated for a 95% confidence level.

Note:

The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allow for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. (A+A)*L shall not be liable for any loss or damage resulting from the use of the equipment.

Certificate of Calibration

for

Description: *Sound Level Meter*
Manufacturer: *NTi Audio*
Type No.: *XL2 (Serial No.: AzA-13548-E0)*
Microphone: *ACO 7052 (Serial No.:73780)*
Preamplifier: *NTi Audio M2211 MA220 (Serial No.:5235)*

Submitted by:

Customer: *Acuity Sustainability Consulting Limited*
Address: *Unit C, 11/F., Ford Glory Plaza, No. 37-39 Wing Hong Street,
Cheung Sha Wan, Kowloon*

Upon receipt for calibration, the instrument was found to be:

- Within**
 Outside

the allowable tolerance.

The test equipment used for calibration are traceable to National Standards via:

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory

Date of receipt: 10 December 2020

Date of calibration: 12 December 2020

Calibrated by: *[Signature]*
Calibration Technician

Certified by: *[Signature]*
Mr. Ng Yan Wa
Laboratory Manager

Date of issue: 12 December 2020



Certificate No.: APJ20-1/4 CC001

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1. Calibration Precaution:

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 24 hours, and switched on to warm up for over 10 minutes before the commencement of the test.
- The results presented are the mean of 3 measurements at each calibration point.

2. Calibration Conditions:

Air Temperature: 23.7°C
 Air Pressure: 1006 hPa
 Relative Humidity: 61.8%

3. Calibration Equipment:

| | Type | Serial No. | Calibration Report Number | Traceable to |
|--------------------------|----------|------------|---------------------------|--------------|
| Multifunction Calibrator | B&K 4216 | 2288467 | AV200041 | HOKI A5 |

4. Calibration Results

Sound Pressure Level

Reference Sound Pressure Level

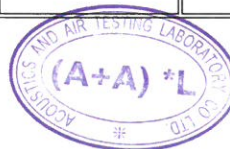
| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading, | IEC 61672 Class 1 |
|----------------------------------|-----------------|----------------|-----------|---------------|------|-------------------|-------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | dB | Specification, dB | |
| 30-130 | dBA SPL | Fast | 94 | 1000 | 94.0 | ±0.4 | |

Linearity

| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading, | IEC 61672 Class 1 |
|----------------------------------|-----------------|----------------|-----------|---------------|-------|-------------------|-------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | dB | Specification, dB | |
| 30-130 | dBA SPL | Fast | 94 | 1000 | 94.0 | Ref | |
| | | | 104 | | 104.0 | ±0.3 | |
| | | | 114 | | 114.0 | ±0.3 | |

Time Weighting

| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading, | IEC 61672 Class 1 |
|----------------------------------|-----------------|----------------|-----------|---------------|------|-------------------|-------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | dB | Specification, dB | |
| 30-130 | dBA SPL | Fast | 94 | 1000 | 94.0 | Ref | |
| | | Slow | | | 94.0 | ±0.3 | |



Frequency Response

Linear Response

| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading, dB | IEC 61672 Class 1 Specification, dB |
|----------------------------------|-----------------|----------------|-----------|---------------|------|-----------------|-------------------------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | | | |
| 30-130 | dB | SPL | Fast | 94 | 31.5 | 94.1 | ±2.0 |
| | | | | | 63 | 94.1 | ±1.5 |
| | | | | | 125 | 94.1 | ±1.5 |
| | | | | | 250 | 94.1 | +1.4 |
| | | | | | 500 | 94.1 | ±1.4 |
| | | | | | 1000 | 94.0 | Ref |
| | | | | | 2000 | 93.8 | ±1.6 |
| | | | | | 4000 | 93.4 | ±1.6 |
| | | | | | 8000 | 92.7 | +2.1; -3.1 |

A-weighting

| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading, dB | IEC 61672 Class 1 Specification, dB |
|----------------------------------|-----------------|----------------|-----------|---------------|------|-----------------|-------------------------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | | | |
| 30-130 | dBA | SPL | Fast | 94 | 31.5 | 54.7 | -39.4±2.0 |
| | | | | | 63 | 68.0 | -26.2±1.5 |
| | | | | | 125 | 75.0 | -16.1±1.5 |
| | | | | | 250 | 85.4 | -8.6±1.4 |
| | | | | | 500 | 90.8 | -3.2±1.4 |
| | | | | | 1000 | 94.0 | Ref |
| | | | | | 2000 | 95.0 | +1.2±1.6 |
| | | | | | 4000 | 94.4 | +1.0±1.6 |
| | | | | | 8000 | 91.6 | -1.1±2.1; -3.1 |

C-weighting

| Setting of Unit-under-test (UUT) | | | | Applied value | | UUT Reading, dB | IEC 61672 Class 1 Specification, dB |
|----------------------------------|-----------------|----------------|-----------|---------------|------|-----------------|-------------------------------------|
| Range, dB | Freq. Weighting | Time Weighting | Level, dB | Frequency, Hz | | | |
| 30-130 | dBC | SPL | Fast | 94 | 31.5 | 91.1 | -3.0±2.0 |
| | | | | | 63 | 93.3 | -0.8±1.5 |
| | | | | | 125 | 93.9 | -0.2±1.5 |
| | | | | | 250 | 94.1 | -0.0±1.4 |
| | | | | | 500 | 94.1 | -0.0±1.4 |
| | | | | | 1000 | 94.0 | Ref |
| | | | | | 2000 | 93.7 | -0.2±1.6 |
| | | | | | 4000 | 92.6 | -0.8±1.6 |
| | | | | | 8000 | 89.7 | -3.0±2.1; -3.1 |



5. Calibration Results Applied

The results apply to the particular unit-under-test only. All calibration points are within manufacture's specification as IEC 61672 Class 1.

Uncertainties of Applied Value:

| | | |
|--------|---------|--------|
| 94 dB | 31.5 Hz | ± 0.10 |
| | 63 Hz | ± 0.15 |
| | 125 Hz | ± 0.10 |
| | 250 Hz | ± 0.10 |
| | 500 Hz | ± 0.10 |
| | 1000 Hz | ± 0.05 |
| | 2000 Hz | ± 0.05 |
| | 4000 Hz | ± 0.05 |
| | 8000 Hz | ± 0.10 |
| 104 dB | 1000 Hz | ± 0.05 |
| 114 dB | 1000 Hz | ± 0.05 |

The uncertainties are evaluated for a 95% confidence level.

Note:

The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allow for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. (A+A)*L shall not be liable for any loss or damage resulting from the use of the equipment.





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CERTIFICATE OF CALIBRATION

Certificate No.: 20CA0803 01

Page: 1 of 2

Item tested

Description: Acoustical Calibrator (Class 1)
Manufacturer: Pulsar Instruments Ltd.
Type/Model No.: 105
Serial/Equipment No.: 63705
Adaptors used: -

Item submitted by

Customer: Acuity Sustainability Consulting Limited.
Address of Customer: -
Request No.: -
Date of receipt: 03-Aug-2020

Date of test: 06-Aug-2020

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|-------------------------|----------|------------|--------------|---------------|
| Lab standard microphone | B&K 4180 | 2341427 | 11-May-2021 | SCL |
| Preamplifier | B&K 2673 | 2743150 | 03-Jun-2021 | CEPREI |
| Measuring amplifier | B&K 2610 | 2346941 | 03-Jun-2021 | CEPREI |
| Signal generator | DS 360 | 33873 | 19-May-2021 | CEPREI |
| Digital multi-meter | 34401A | US36087050 | 19-May-2021 | CEPREI |
| Audio analyzer | 8903B | GB41300350 | 18-May-2021 | CEPREI |
| Universal counter | 53132A | MY40003662 | 18-May-2021 | CEPREI |

Ambient conditions

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

Test specifications

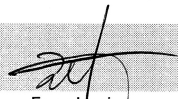
- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results 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.

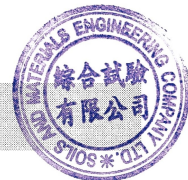
Details of the performed measurements are presented on page 2 of this certificate.

Approved Signatory:


Feng Junqi

Date: 07-Aug-2020

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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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 20CA0803 01

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.

| Frequency Shown Hz | Output Sound Pressure Level Setting dB | Measured Output Sound Pressure Level dB | (Output level in dB re 20 μ Pa) |
|-----------------------|---|--|--------------------------------------|
| | | | Estimated Expanded Uncertainty dB |
| 1000 | 94.00 | 93.78 | 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 = 0.027 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 = 1000.3 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 = 0.6 %

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.

- End -

Calibrated by:

Fung Chi Yik

Date: 06-Aug-2020

Checked by:

Feng Junqi

Date: 07-Aug-2020

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.