

Manufacturer Calibration Certificate

The following instrument has been tested and calibrated to the manufacturer specifications.
The calibration is traceable in accordance with ISO/IEC 17025 covering all instrument functions.

- Device Type: **XL2 Audio and Acoustic Analyzer**
- Serial Number: **A2A-15269-E0**

- Certificate Issued: **19 February 2019**
- Certificate Number: **43515-A2A-15269-E0**
- Results: **PASSED**
(for detailed report see next page)

Tested by: **M. Frick**

Signature:

Stamp:



NTi Audio AG
Im alten Riet 102
LI 9494 Schaan
www.nti-audio.com

Calibration of: XL2 Audio and Acoustic Analyzer
 Serial Number: A2A-15269-E0
 Date: 19 February 2019

• Detailed Calibration Test Results:

| | reference | actual | unit | actual error | XL2 tolerance | calibration uncertainty ² |
|----------------------------------|-----------|------------------|------|--------------|---------------|--------------------------------------|
| RMS Level @ 1kHz, XLR Input | 0.1 | 0.100 | V | ≤0.1% | ±0.5% | ±0.10% |
| | 1 | 0.999 | V | -0.1% | ±0.5% | ±0.09% |
| | 10 | 9.978 | V | -0.2% | ±0.5% | ±0.09% |
| Flatness, XLR Input ¹ | 20 Hz | 0.995 | V | -0.5% | ±1.1% | ±0.09% |
| | 20 kHz | 1.003 | V | 0.3% | ±1.1% | ±0.09% |
| Frequency | 1000 | 999.99 | Hz | ≤0.003% | ±0.003% | ±0.01% |
| Residual Noise | XLR | < 2 uV | | | <2 uV | ±0.50% |
| THD+N @ 0 dBu, 1 kHz, XLR Input | | -100.4 | dB | | typ. -100 dB | ±0.50% |

- Test Conditions: Temperature: **23.4** °C
 Relative Humidity: **32** %

• Calibration Equipment Used:

- Agilent Multimeter, Typ 34401A, Serial No. MY 5300 4607
 Last calibration: 15.08.2018, Next calibration: 15.08.2019
 Calibrated by ELCAL to the national standards maintained at Swiss Federal Office of Metrology. SCS 0002

- FX100 Audio Analyzer, Serial No. 10408
 Last Calibration: 27.04.2018, Next Calibration: 27.04.2019
 Manufacturer calibration based on Agilent 34410, Serial No. MY47014254,
 Last Calibration: 11.05.2018, Next Calibration: 11.05.2019
 which is calibrated by ELCAL to national standards maintained at Swiss Federal Office of Metrology. SCS 002

¹ The specified tolerance +/-0.1 dB @ 1V = +/- 1.1%

² The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the regulations of the GUM.



CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0529 01 Page 1 of 2

Item tested

| | | | |
|-----------------------|----------------------------|------------|----------|
| Description: | Sound Level Meter (Type 1) | Microphone | Preamp |
| Manufacturer: | Larson Davis | PCB | PCB |
| Type/Model No.: | LxT1 | 377B02 | PRMLxT1L |
| Serial/Equipment No.: | 0005098 | 173736 | 042838 |
| Adaptors used: | - | - | - |

Item submitted by

Customer Name: Lam Environmental Services Limited
Address of Customer: -
Request No.: -
Date of receipt: 29-May-2019

Date of test: 30-May-2019

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|---------------------------------|----------|------------|--------------|---------------|
| Multi function sound calibrator | B&K 4226 | 2288444 | 23-Aug-2019 | CIGISMEC |
| Signal generator | DS 360 | 61227 | 26-Dec-2019 | CEPREI |

Ambient conditions

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

Test specifications

- 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.
- 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 $\pm 20\%$.
- 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.

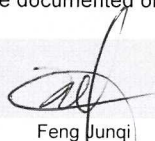
Test results

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.

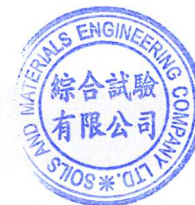
Approved Signatory:



Feng Junqi

Date: 31-May-2019

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.



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA0529 01 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 | |
| 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 | |
| | 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 1/10 ⁴ 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 | |

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:

Date: 30-May-2019

Fung Chi Yip

- End -

Checked by:

Date: 31-May-2019

Shek Kwong Tat

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: | LxT1 | Serial No. | 0005098 | Date | 30-May-2019 |
| Microphone type: | 377B02 | Serial No. | 173736 | | |
| Preamp type: | PRMLxT1L | Serial No. | 042838 | Report: | 19CA0529 01 |

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 | 11.4 | dB |
| Noise level in C weighting | 16.1 | dB |
| Noise level in Lin | 22.2 | 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 | 89.0 | 89.0 | 0.7 | 0.0 | 0.0 |
| 84.0 | 84.0 | 84.0 | 0.7 | 0.0 | 0.0 |
| 79.0 | 79.0 | 79.0 | 0.7 | 0.0 | 0.0 |
| 74.0 | 74.0 | 74.0 | 0.7 | 0.0 | 0.0 |
| 69.0 | 69.0 | 69.0 | 0.7 | 0.0 | 0.0 |
| 64.0 | 64.0 | 64.0 | 0.7 | 0.0 | 0.0 |
| 59.0 | 59.0 | 59.0 | 0.7 | 0.0 | 0.0 |
| 54.0 | 54.0 | 54.0 | 0.7 | 0.0 | 0.0 |
| 49.0 | 49.0 | 49.0 | 0.7 | 0.0 | 0.0 |
| 44.0 | 44.0 | 44.0 | 0.7 | 0.0 | 0.0 |
| 39.0 | 38.9 | 38.9 | 0.7 | -0.1 | -0.1 |
| 34.0 | 34.0 | 34.0 | 0.7 | 0.0 | 0.0 |
| 33.0 | 32.9 | 32.9 | 0.7 | -0.1 | -0.1 |



Test Data for Sound Level Meter

Sound level meter type: LxT1 Serial No. 0005098 Date 30-May-2019
Microphone type: 377B02 Serial No. 173736
Preamp type: PRMLxT1L Serial No. 042838 Report: 19CA0529 01

| | | | | | |
|------|------|------|-----|------|------|
| 32.0 | 31.9 | 31.9 | 0.7 | -0.1 | -0.1 |
| 31.0 | 31.0 | 31.0 | 0.7 | 0.0 | 0.0 |
| 30.0 | 30.0 | 30.0 | 0.7 | 0.0 | 0.0 |

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 |
| 20-120 | 94.0 | 94.0 | 0.7 | 0.0 |

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 |
| 20-120 | 30.0 | 30.0 | 0.7 | 0.0 |
| | 118.0 | 118.0 | 0.7 | 0.0 |

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 | 54.6 | 1.5 | 1.5 | 0.0 |
| 63.1 | 94.0 | 67.8 | 67.8 | 1.5 | 1.5 | 0.0 |
| 125.9 | 94.0 | 77.9 | 77.9 | 1.0 | 1.0 | 0.0 |
| 251.2 | 94.0 | 85.4 | 85.4 | 1.0 | 1.0 | 0.0 |
| 501.2 | 94.0 | 90.8 | 90.8 | 1.0 | 1.0 | 0.0 |
| 1995.0 | 94.0 | 95.2 | 95.2 | 1.0 | 1.0 | 0.0 |
| 3981.0 | 94.0 | 95.0 | 95.0 | 1.0 | 1.0 | 0.0 |
| 7943.0 | 94.0 | 92.9 | 92.9 | 1.5 | 3.0 | 0.0 |
| 12590.0 | 94.0 | 89.7 | 89.7 | 3.0 | 6.0 | 0.0 |

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 | 91.0 | 1.5 | 1.5 | 0.0 |
| 63.1 | 94.0 | 93.2 | 93.2 | 1.5 | 1.5 | 0.0 |
| 125.9 | 94.0 | 93.8 | 93.8 | 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 |



Test Data for Sound Level Meter

| | | | | | |
|-------------------------|----------|------------|---------|---------|-------------|
| Sound level meter type: | LxT1 | Serial No. | 0005098 | Date | 30-May-2019 |
| Microphone type: | 377B02 | Serial No. | 173736 | | |
| Preamp type: | PRMLxT1L | Serial No. | 042838 | Report: | 19CA0529 01 |

| | | | | | | |
|---------|------|------|------|-----|-----|-----|
| 1995.0 | 94.0 | 93.8 | 93.9 | 1.0 | 1.0 | 0.1 |
| 3981.0 | 94.0 | 93.2 | 93.2 | 1.0 | 1.0 | 0.0 |
| 7943.0 | 94.0 | 91.0 | 91.0 | 1.5 | 3.0 | 0.0 |
| 12590.0 | 94.0 | 87.8 | 87.8 | 3.0 | 6.0 | 0.0 |

Frequency weighting Lin:

| Frequency Hz | Ref. level dB | Expected level dB | Actual level dB | Tolerance(dB) | | Deviation dB |
|-----------------|------------------|----------------------|--------------------|---------------|-----|-----------------|
| | | | | + | - | |
| 1000.0 | 94.0 | 94.0 | 94.0 | 0.0 | 0.0 | 0.0 |
| 31.6 | 94.0 | 94.0 | 94.0 | 1.5 | 1.5 | 0.0 |
| 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 | 94.1 | 1.5 | 3.0 | 0.1 |
| 12590.0 | 94.0 | 94.0 | 94.0 | 3.0 | 6.0 | 0.0 |

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 dB | Expected level dB | Actual level dB | Tolerance(dB) | | Deviation 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 dB | Expected level dB | Actual level dB | Tolerance(dB) | | Deviation 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 dB | Response to 10 ms dB | Response to 100 us dB | Tolerance +/- dB | Deviation dB |
|------------------|-------------------------|--------------------------|---------------------|-----------------|
| | | | | |



Test Data for Sound Level Meter

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Sound level meter type: LxT1 Serial No. 0005098 Date 30-May-2019
 Microphone type: 377B02 Serial No. 173736
 Preamp type: PRMLxT1L Serial No. 042838 Report: 19CA0529 01

Negative polarities:

| Ref. level | Response to 10 ms | Response to 100 us | Tolerance | Deviation |
|------------|-------------------|--------------------|-----------|-----------|
| dB | dB | dB | +/- dB | dB |
| 119.0 | 119.0 | 119.5 | 2.0 | 0.5 |

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)

| Time weighting | Ref. Level | Expected level | Tone burst signal | Tolerance | Deviation |
|----------------|------------|----------------|-------------------|-----------|-----------|
| | dB | dB | indication(dB) | +/- dB | dB |
| Slow | 118.0+6.6 | 118.0 | 118.0 | 0.5 | 0.0 |

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 | 117.2 | 1.0 | -0.1 |

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 | 89.9 | 1.0 | -0.1 | 60s integ. |
| 10000 | 80.0 | 80.0 | 79.9 | 1.0 | -0.1 | 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 frequency: 4000 Hz

Integration time: 10 sec



Test Data for Sound Level Meter

Page 5 of 5

Sound level meter type: LxT1 Serial No. 0005098 Date 30-May-2019
Microphone type: 377B02 Serial No. 173736
Preamp type: PRMLxT1L Serial No. 042838 Report: 19CA0529 01

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 | 88.0 | 58.0 | 58.0 | 1.7 | 0.0 |

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 | 88.0 | 68.0 | 68.0 | 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 |
| 116.0 | 115.0 | 112.0 | 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 |
| 122.6 | 121.6 | 81.6 | 81.6 | 2.2 | 0.0 |

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 |
|-----------|----------------|---------------|--|----------------|-----------|
| | | Measured (dB) | | | |
| Hz | dB | | | + - | dB |
| 1000 | 94.0 | 94.0 | | 0.0 0.0 | 0.0 |
| 125 | 77.9 | 77.9 | | 1.0 1.0 | 0.0 |
| 8000 | 92.9 | 91.7 | | 1.5 3.0 | -1.2 |

-----END-----



CERTIFICATE OF CALIBRATION

Certificate No.: 18CA1023 02

Page: 1 of 2

Item tested

Description: Acoustical Calibrator (Class 1)
Manufacturer: Larson Davis
Type/Model No.: CAL200
Serial/Equipment No.: 13437
Adaptors used: -

Item submitted by

Customer: Lam Geotechnics Ltd.
Address of Customer: -
Request No.: -
Date of receipt: 23-Oct-2018

Date of test: 24-Oct-2018

Reference equipment used in the calibration

| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
|-------------------------|----------|------------|--------------|---------------|
| Lab standard microphone | B&K 4180 | 2412857 | 20-Apr-2019 | SCL |
| Preamplifier | B&K 2673 | 2239857 | 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: 20 ± 1 °C
Relative humidity: 50 ± 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: 24-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.



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA1023 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.

| 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 | 93.77 | 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 = 0.015 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 = 1000.2 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 = 0.5%**

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
24-Oct-2018

- End -

Checked by:

Date:

Shek Kwong Tat
24-Oct-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.

Calibration Certificate

Certificate Number 2018010851

Customer:

LAM Environmental Services Ltd

11/F Centre Point

181-185 Gloucester Road

Wanchai, , Hong Kong

Model Number CAL200

Serial Number 13098

Test Results Pass

Initial Condition Inoperable

Description Larson Davis CAL200 Acoustic Calibrator

Procedure Number D0001.8386

Technician Scott Montgomery

Calibration Date 29 Oct 2018

Calibration Due

Temperature 23 °C ± 0.3 °C

Humidity 34 %RH ± 3 %RH

Static Pressure 101.2 kPa ± 1 kPa

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

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2017 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.

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

The quality system is registered to ISO 9001:2008.

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

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

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

Standards Used

| Description | Cal Date | Cal Due | Cal Standard |
|--|------------|------------|--------------|
| Agilent 34401A DMM | 09/06/2018 | 09/06/2019 | 001021 |
| Larson Davis Model 2900 Real Time Analyzer | 04/10/2018 | 04/10/2019 | 001051 |
| Microphone Calibration System | 03/07/2018 | 03/07/2019 | 005446 |
| 1/2" Preamplifier | 09/20/2018 | 09/20/2019 | 006506 |
| Larson Davis 1/2" Preamplifier 7-pin LEMO | 08/07/2018 | 08/07/2019 | 006507 |
| 1/2 inch Microphone - RI - 200V | 05/10/2018 | 05/10/2019 | 006510 |
| Pressure Transducer | 07/18/2018 | 07/18/2019 | 007368 |

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001



LARSON DAVIS
A PCB PIEZOTRONICS DIV.



Portable Dust Meter Performance Check Record

Portable Dust Meter

Type : Particulare Monitor
 Manufacturer : MET ONE INSTRUMENTS
 Model Number : 831
 Serial Number : R14332
 Performance Check Date : 27-Feb-19, 14-Mar-19

Standard Equipment

Type : High Volume Sampler
 Manufacturer : TISCH
 Model Number : TE-5170
 Equipment Number : HVS018
 Last Calibration Date : 4-Feb-19

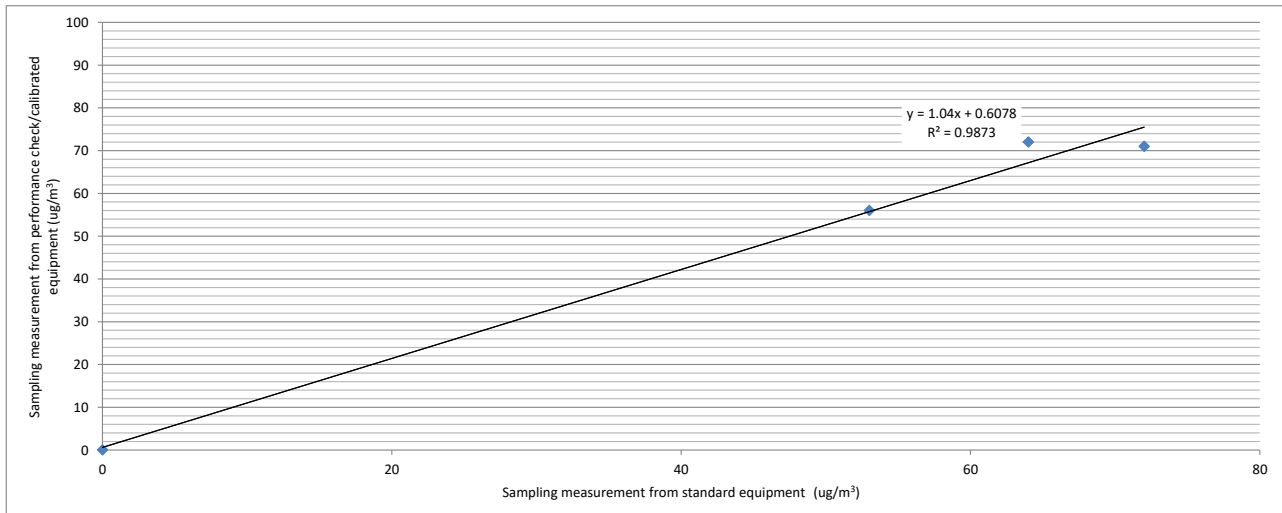
Portable Dust Meter Performance Check Results

| Trial no. in 1-hr period | Time | Mean Pressure (hPa) | Mean Temp (°C) | Concentration in ug/m ³ (Standard equipment) (Y - Axis) | Concentration in ug/m ³ (Performance Check / Calibrated equipment) (X - Axis) |
|--------------------------|---------------|---------------------|----------------|--|--|
| Zero Check | 27/2/19 | 1016 | 24 | 0 | 0 |
| 1 | 27/2/19 09:52 | 1016 | 24 | 53 | 56 |
| 2 | 14/3/19 09:32 | 1018 | 22 | 64 | 72 |
| 3 | 27/2/19 11:00 | 1016 | 24 | 72 | 71 |

* Filter paper weighting was conducted by HOKLAS accredited laboratory.

Linear Regression of Y on X

Slope (K- factor) : 1.0000
 Correlation Coefficient : 0.9936
 Validity of Performance Check / Calibration Record : 13/3/2020



Operator: Henry Lau

Date: 14-Mar-19

Checked by: Chan Ka Chun

Date: 21-Mar-19


REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

REPORT NO. : HK1811054
PROJECT NAME : PERFORMANCE CHECK / CALIBRATION OF DUST METER
DATE OF ISSUE : 24/10/2018
CUSTOMER : LAM ENVIRONMENTAL SERVICES LTD
ADDRESS : 11/F, CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG


REPORT NO. : HK1811054
PROJECT ITEM NO. : HK1811054-01
PERFORMANCE CHECK / CALIBRATED EQUIPMENT
TYPE : AEROSOL MASS MONITOR
MANUFACTURER : MET ONE INSTRUMENTS
MODEL NO. : AEROCET - 831
SERIAL NO. : W15449
EQUIPMENT NO. : ---
RECEIPT DATE : 18/10/2018
PERFORMANCE CHECK / CALIBRATION DATE : 23/10/2018

PERFORMANCE CHECK / CALIBRATION Information

| CODE | Calibration Parameter | Method Procedure | Reference Method |
|----------------|---|------------------|--|
| Dust PC/CAL | Performance Check / Calibration of Dust Meter | CAL003 | General Technical Requirements of Environmental Monitoring, Environmental Monitoring & Audit Guidelines for Development Projects in HK |

- Notes : 1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
 2. Performance Check / Calibration result relates to performance check / calibration item(s) as received.

Approved Signatory



 Wong Po Yan Pauline
 (Assistant Laboratory Manager)

Issue Date: 24/10/2018



REPORT OF PERFORMANCE CHECK / CALIBRATION

PROJECT NAME : PERFORMANCE CHECK / CALIBRATION OF DUST METER
 DATE OF ISSUE : 24/10/2018
 REPORT NO. : HK1811054

PERFORMANCE CHECK / CALIBRATED EQUIPMENT

TYPE : AEROSOL MASS MONITOR
 MANUFACTURER : MET ONE INSTRUMENTS
 MODEL NO. : AEROCET - 831
 SERIAL NO. : W15449
 EQUIPMENT NO. : ---
 PERFORMANCE CHECK / CALIBRATION DATE : 23/10/2018

STANDARD EQUIPMENT

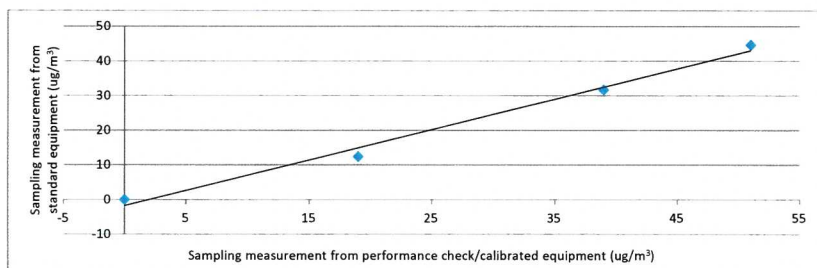
TYPE : HIGH VOLUME AIR SAMPLER
 MANUFACTURER : TISCH
 MODEL NO. : TE-5170
 EQUIPMENT REF NO. : PTL_HV002
 LAST CALIBRATION DATE : 25/7/2018

EQUIPMENT PERFORMANCE CHECK / CALIBRATION RESULTS:

| Trial no. in 1-hr period | Time | Mean Temp (°C) | Mean Pressure (hPa) | Concentration in ug/m ³ (Standard equipment) (Y - Axis) | Concentration in ug/m ³ (Performance Check / Calibrated equipment) (X - Axis) |
|--------------------------|------------------------|----------------|---------------------|--|--|
| Zero Check ¹ | 23/10/2018,9:05:00 AM | 25.3 | 1017 | 0 | 0 |
| 1 | 23/10/2018,10:20:00 AM | 25.3 | 1017 | 45 | 51 |
| 2 | 23/10/2018,11:22:00 AM | 25.3 | 1017 | 32 | 39 |
| 3 | 23/10/2018,12:29:00 PM | 25.3 | 1017 | 12 | 19 |

Linear Regression of Y on X

Slope (K- factor) : 0.8800
 Correlation Coefficient : 0.9945
 Validity of Performance Check / Calibration Record : 23/10/2019



- Notes :
1. Zero check conducted as per CAL003 SOP and manufacturer's manual as appropriate.
 2. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
 3. Performance Check / Calibration result relates to performance check / calibration item(s) as received.

Operator: Lau, Natalie Signature: Date: 23/10/2018

Checked by: Wong Po Yan, Pauline Signature: Date: 24/10/2018


REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

REPORT NO. : HK1810819
PROJECT NAME : PERFORMANCE CHECK / CALIBRATION OF DUST METER
DATE OF ISSUE : 16/8/2018
CUSTOMER : LAM ENVIRONMENTAL SERVICES LTD
ADDRESS : 11/F, CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG

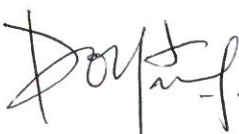
REPORT NO. : HK1810819
PROJECT ITEM NO. : HK1810819-01
PERFORMANCE CHECK / CALIBRATED EQUIPMENT
TYPE : AEROSOL MASS MONITOR
MANUFACTURER : MET ONE INSTRUMENTS
MODEL NO. : AEROCET - 831
SERIAL NO. : W16848
EQUIPMENT NO. : ---
RECEIPT DATE : 14/8/2018
PERFORMANCE CHECK / CALIBRATION DATE : 15/8/2018

PERFORMANCE CHECK / CALIBRATION Information

| CODE | Calibration Parameter | Method Procedure | Reference Method |
|----------------|---|------------------|--|
| Dust PC/CAL | Performance Check / Calibration of Dust Meter | CAL003 | General Technical Requirements of Environmental Monitoring, Environmental Monitoring & Audit Guidelines for Development Projects in HK |

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Approved Signatory



 Wong Po Yan Pauline
 (Assistant Laboratory Manager)

Issue Date:

16/8/2018


REPORT OF PERFORMANCE CHECK / CALIBRATION

PROJECT NAME : PERFORMANCE CHECK / CALIBRATION OF DUST METER
 DATE OF ISSUE : 16/8/2018
 REPORT NO. : HK1810819

PERFORMANCE CHECK / CALIBRATED EQUIPMENT

TYPE : AEROSOL MASS MONITOR
 MANUFACTURER : MET ONE INSTRUMENTS
 MODEL NO. : AEROCET - 831
 SERIAL NO. : W16848
 EQUIPMENT NO. : ---
 PERFORMANCE CHECK / CALIBRATION DATE : 15/8/2018

STANDARD EQUIPMENT

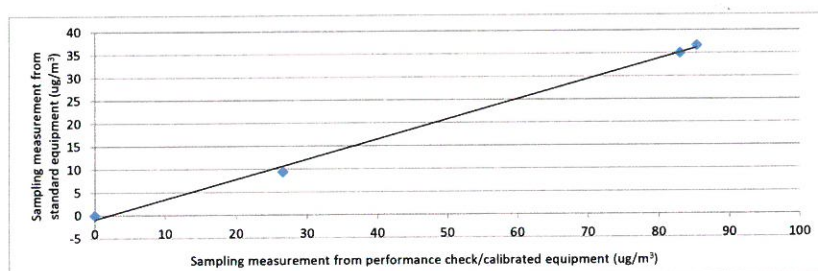
TYPE : HIGH VOLUME AIR SAMPLER
 MANUFACTURER : TISCH
 MODEL NO. : TE-5170
 EQUIPMENT REF NO. : PTL_HV002
 LAST CALIBRATION DATE : 25/7/2018

EQUIPMENT PERFORMANCE CHECK / CALIBRATION RESULTS:

| Trial no. in 1-hr period | Time | Mean Temp (°C) | Mean Pressure (hPa) | Concentration in ug/m ³ (Standard equipment) (Y - Axis) | Concentration in ug/m ³ (Performance Check / Calibrated equipment) (X - Axis) |
|--------------------------|-----------------------|----------------|---------------------|--|--|
| Zero Check ¹ | 15/8/2018,9:05:00 AM | 28.2 | 999 | 0 | 0 |
| 1 | 15/8/2018,10:20:00 AM | 28.2 | 999 | 37 | 85 |
| 2 | 15/8/2018,11:22:00 AM | 28.2 | 999 | 35 | 83 |
| 3 | 15/8/2018,12:29:00 PM | 28.2 | 999 | 9 | 27 |

Linear Regression of Y on X

Slope (K- factor) : 0.4400
 Correlation Coefficient : 0.9988
 Validity of Performance Check / Calibration Record : 15/8/2019



- Notes : 1. Zero check conducted as per CAL003 SOP and manufacturer's manual as appropriate.
 2. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
 3. Performance Check / Calibration result relates to performance check / calibration item(s) as received.

Operator: Lau, Natalie Signature:  Date: 15/8/2018

Checked by: Wong Po Yan, Pauline Signature:  Date: 16/8/2018



REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

REPORT NO. : HK1810826
 PROJECT NAME : PERFORMANCE CHECK / CALIBRATION OF DUST METER
 DATE OF ISSUE : 16/8/2018

CUSTOMER : LAM ENVIRONMENTAL SERVICES LTD
 ADDRESS : 11/F, CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG

REPORT NO. : HK1810826
 PROJECT ITEM NO. : HK1810826-01
 PERFORMANCE CHECK / CALIBRATED EQUIPMENT
 TYPE : PARTICULATE MONITOR
 MANUFACTURER : MET ONE INSTRUMENTS
 MODEL NO. : BT 645
 SERIAL NO. : X19295
 EQUIPMENT NO. : ---
 RECEIPT DATE : 16/8/2018
 PERFORMANCE CHECK / CALIBRATION DATE : 16/8/2018

PERFORMANCE CHECK / CALIBRATION Information

| CODE | Calibration Parameter | Method Procedure | Reference Method |
|----------------|---|------------------|--|
| Dust PC/CAL | Performance Check / Calibration of Dust Meter | CAL003 | General Technical Requirements of Environmental Monitoring, Environmental Monitoring & Audit Guidelines for Development Projects in HK |

- Notes : 1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
 2. Performance Check / Calibration result relates to performance check / calibration item(s) as received.

Approved Signatory

:

Issue Date:

16/8/2018

Wong Po Yan Pauline
 (Assistant Laboratory Manager)


REPORT OF PERFORMANCE CHECK / CALIBRATION

PROJECT NAME : PERFORMANCE CHECK / CALIBRATION OF DUST METER
 DATE OF ISSUE : 16/8/2018
 REPORT NO. : HK1810826

PERFORMANCE CHECK / CALIBRATED EQUIPMENT

TYPE : PARTICULATE MONITOR
 MANUFACTURER : MET ONE INSTRUMENTS
 MODEL NO. : BT 645
 SERIAL NO. : X19295
 EQUIPMENT NO. : ---
 PERFORMANCE CHECK / CALIBRATION DATE : 16/8/2018

STANDARD EQUIPMENT

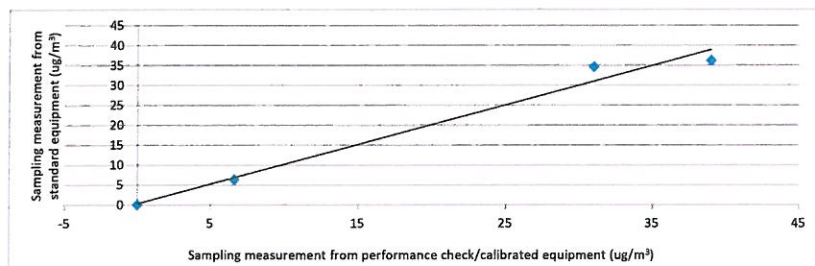
TYPE : HIGH VOLUME AIR SAMPLER
 MANUFACTURER : TISCH
 MODEL NO. : TE-5170
 EQUIPMENT REF NO. : PTL_HV002
 LAST CALIBRATION DATE : 25/7/2018

EQUIPMENT PERFORMANCE CHECK / CALIBRATION RESULTS:

| Trial no. in 1-hr period | Time | Mean Temp (°C) | Mean Pressure (hPa) | Concentration in ug/m ³ (Standard equipment) (Y - Axis) | Concentration in ug/m ³ (Performance Check / Calibrated equipment) (X - Axis) |
|--------------------------|-----------------------|----------------|---------------------|--|---|
| Zero Check ¹ | 16/8/2018, 8:30:00 AM | 27.8 | 1000 | 0 | 0 |
| 1 | 16/8/2018, 2:16:00 PM | 27.8 | 1000 | 36 | 39 |
| 2 | 16/8/2018, 3:21:00 PM | 27.8 | 1000 | 35 | 31 |
| 3 | 16/8/2018, 4:24:00 PM | 27.8 | 1000 | 6 | 7 |

Linear Regression of Y on X

Slope (K- factor) : 1.0000
 Correlation Coefficient : 0.9901
 Validity of Performance Check / Calibration Record : 16/8/2019



- Notes : 1. Zero check conducted as per CAL003 SOP and manufacturer's manual as appropriate.
 2. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
 3. Performance Check / Calibration result relates to performance check / calibration item(s) as received.

Operator: Lau, Natalie Signature: *Natalie Lau* Date: 16/8/2018

Checked by: Wong Po Yan, Pauline Signature: *Pauline Wong* Date: 16/8/2018


REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

REPORT NO. : HK1810828
PROJECT NAME : PERFORMANCE CHECK / CALIBRATION OF DUST METER
DATE OF ISSUE : 22/8/2018
CUSTOMER : LAM ENVIRONMENTAL SERVICES LTD
ADDRESS : 11/F, CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG

REPORT NO. : HK1810828
PROJECT ITEM NO. : HK1810828-01
PERFORMANCE CHECK / CALIBRATED EQUIPMENT TYPE : PARTICULATE MONITOR
MANUFACTURER : MET ONE INSTRUMENTS
MODEL NO. : BT 645
SERIAL NO. : X19297
EQUIPMENT NO. : ---
RECEIPT DATE : 16/8/2018
PERFORMANCE CHECK / CALIBRATION DATE : 17/8/2018

PERFORMANCE CHECK / CALIBRATION Information

| CODE | Calibration Parameter | Method Procedure | Reference Method |
|----------------|---|------------------|--|
| Dust PC/CAL | Performance Check / Calibration of Dust Meter | CAL003 | General Technical Requirements of Environmental Monitoring, Environmental Monitoring & Audit Guidelines for Development Projects in HK |

- Notes :
1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
 2. Performance Check / Calibration result relates to performance check / calibration item(s) as received.

Approved Signatory

:

 Wong Po Yan Pauline
 (Assistant Laboratory Manager)

Issue Date:

22/8/2018


REPORT OF PERFORMANCE CHECK / CALIBRATION

PROJECT NAME : PERFORMANCE CHECK / CALIBRATION OF DUST METER
 DATE OF ISSUE : 22/8/2018
 REPORT NO. : HK1810828

PERFORMANCE CHECK / CALIBRATED EQUIPMENT

TYPE : PARTICULATE MONITOR
 MANUFACTURER : MET ONE INSTRUMENTS
 MODEL NO. : BT 645
 SERIAL NO. : X19297
 EQUIPMENT NO. : ---
 PERFORMANCE CHECK / CALIBRATION DATE : 17/8/2018

STANDARD EQUIPMENT

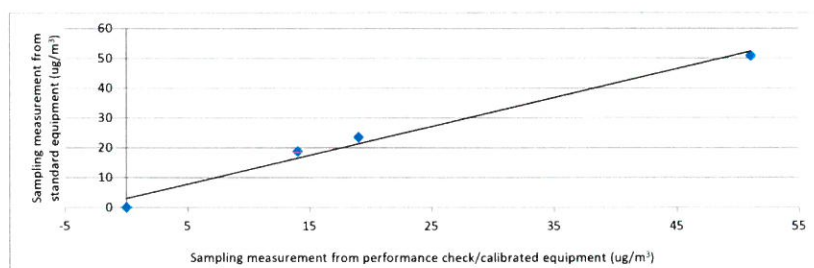
TYPE : HIGH VOLUME AIR SAMPLER
 MANUFACTURER : TISCH
 MODEL NO. : TE-5170
 EQUIPMENT REF NO. : PTL_HV002
 LAST CALIBRATION DATE : 25/7/2018

EQUIPMENT PERFORMANCE CHECK / CALIBRATION RESULTS:

| Trial no. in 1-hr period | Time | Mean Temp (°C) | Mean Pressure (hPa) | Concentration in ug/m ³ (Standard equipment) (Y - Axis) | Concentration in ug/m ³ (Performance Check / Calibrated equipment) (X - Axis) |
|--------------------------|------------------------|----------------|---------------------|--|--|
| Zero Check ¹ | 17/8/2018, 7:20:00 AM | 28 | 1005 | 0 | 0 |
| 1 | 17/8/2018, 8:24:00 PM | 28 | 1005 | 51 | 51 |
| 2 | 17/8/2018, 9:26:00 PM | 28 | 1005 | 24 | 19 |
| 3 | 17/8/2018, 10:28:00 PM | 28 | 1005 | 19 | 14 |

Linear Regression of Y on X

Slope (K- factor) : 1.0000
 Correlation Coefficient : 0.9921
 Validity of Performance Check / Calibration Record : 17/8/2019



- Notes : 1. Zero check conducted as per CAL003 SOP and manufacturer's manual as appropriate.
 2. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
 3. Performance Check / Calibration result relates to performance check / calibration item(s) as received.

Operator: Lau, Natalie Signature:  Date: 17/8/2018

Checked by: Wong Po Yan, Pauline Signature:  Date: 22/8/2018


REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

REPORT NO. : HK1810829
PROJECT NAME : PERFORMANCE CHECK / CALIBRATION OF DUST METER
DATE OF ISSUE : 22/8/2018
CUSTOMER : LAM ENVIRONMENTAL SERVICES LTD
ADDRESS : 11/F, CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG

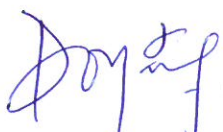
REPORT NO. : HK1810829
PROJECT ITEM NO. : HK1810829-01
PERFORMANCE CHECK / CALIBRATED EQUIPMENT
TYPE : PARTICULATE MONITOR
MANUFACTURER : MET ONE INSTRUMENTS
MODEL NO. : BT 645
SERIAL NO. : X19298
EQUIPMENT NO. : ---
RECEIPT DATE : 16/8/2018
PERFORMANCE CHECK / CALIBRATION DATE : 17/8/2018

PERFORMANCE CHECK / CALIBRATION Information

| CODE | Calibration Parameter | Method Procedure | Reference Method |
|----------------|---|------------------|--|
| Dust PC/CAL | Performance Check / Calibration of Dust Meter | CAL003 | General Technical Requirements of Environmental Monitoring, Environmental Monitoring & Audit Guidelines for Development Projects in HK |

- Notes :
1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
 2. Performance Check / Calibration result relates to performance check / calibration item(s) as received.

Approved Signatory



 Wong Po Yan Pauline
 (Assistant Laboratory Manager)

Issue Date:

22/8/2018


REPORT OF PERFORMANCE CHECK / CALIBRATION

PROJECT NAME : PERFORMANCE CHECK / CALIBRATION OF DUST METER
 DATE OF ISSUE : 22/8/2018
 REPORT NO. : HK1810829

PERFORMANCE CHECK / CALIBRATED EQUIPMENT

TYPE : PARTICULATE MONITOR
 MANUFACTURER : MET ONE INSTRUMENTS
 MODEL NO. : BT 645
 SERIAL NO. : X19298
 EQUIPMENT NO. : ---
 PERFORMANCE CHECK / CALIBRATION DATE : 17/8/2018

STANDARD EQUIPMENT

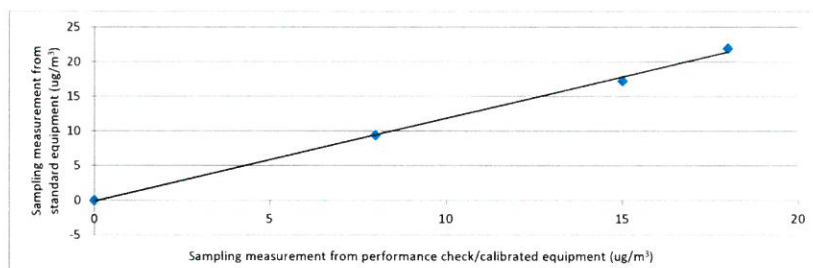
TYPE : HIGH VOLUME AIR SAMPLER
 MANUFACTURER : TISCH
 MODEL NO. : TE-5170
 EQUIPMENT REF NO. : PTL_HV002
 LAST CALIBRATION DATE : 25/7/2018

EQUIPMENT PERFORMANCE CHECK / CALIBRATION RESULTS:

| Trial no. in 1-hr period | Time | Mean Temp (C) | Mean Pressure (hPa) | Concentration in ug/m ³ (Standard equipment) (Y - Axis) | Concentration in ug/m ³ (Performance Check / Calibrated equipment) (X - Axis) |
|--------------------------|----------------------|---------------|---------------------|--|--|
| Zero Check ¹ | 17/8/2018,4:50:00 PM | 28 | 1005 | 0 | 0 |
| 1 | 17/8/2018,5:52:00 PM | 28 | 1005 | 22 | 18 |
| 2 | 17/8/2018,6:58:00 PM | 28 | 1005 | 17 | 15 |
| 3 | 17/8/2018,8:00:00 PM | 28 | 1005 | 9 | 8 |

Linear Regression of Y on X

Slope (K- factor) : 1.2000
 Correlation Coefficient : 0.9988
 Validity of Performance Check / Calibration Record : 17/8/2019



- Notes : 1. Zero check conducted as per CAL003 SOP and manufacturer's manual as appropriate.
 2. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
 3. Performance Check / Calibration result relates to performance check / calibration item(s) as received.

Operator: Lau, Natalie Signature: *Natalie Lau* Date: 17/8/2018

Checked by: Wong Po Yan, Pauline Signature: *Pauline Wong* Date: 22/8/2018



Portable Dust Meter Performance Check Record

Portable Dust Meter

Type : Particulate Monitor
Manufacturer : MET ONE INSTRUMENTS
Model Number : BT-645
Serial Number : X19299
Performance Check Date : 10-Jan-19

Standard Equipment

Type : High Volume Sampler
Manufacturer : TISCH
Model Number : TE-5170
Equipment Number : HVS018
Last Calibration Date : 4-Dec-18

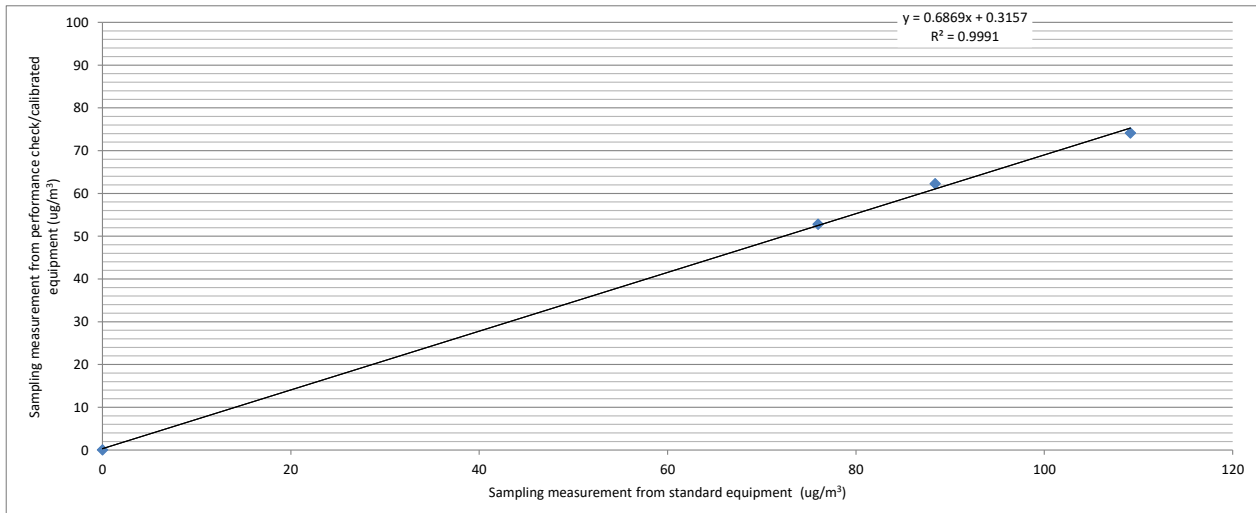
Portable Dust Meter Performance Check Results

Table with 6 columns: Trial no. in 1-hr period, Time, Mean Temp (°C), Mean Pressure (hPa), Concentration in ug/m³ (Standard equipment), Concentration in ug/m³ (Performance Check / Calibrated equipment). Rows include Zero Check and three trials.

* Filter paper weighting was conducted by HOKLAS accredited laboratory.

Linear Regression of Y on X

Slope (K- factor) : 1.5000
Correlation Coefficient : 0.9995
Validity of Performance Check / Calibration Record : 10/1/2020



Operator: Henry Lau
Checked by: Chan Ka Chun

Date: 14/1/19
Date: 14/1/19



1600 Washington Blvd
 Grants Pass, OR 97526
 (541) 471-7111
 (541) 471-7116 (Fax)
 Service@metone.com

Met One
 Instruments

Calibration Certificate

The calibration results on this report certify that this instrument complies with the product specifications at the time of calibration. Calibration was performed according to accepted industry methods using equipment, procedures, and standards that are traceable to NIST and ISO.

Recommended calibration interval is 12 months from the first day of use.

Instrument Model# Aerocet 831 Instrument Serial# W14016

Date of Calibration 5/20/2019 Sensor # 16206

Daisy Jones  Calibration Technician Jones  Quality Check

Temperature 22 °C

Relative Humidity 40 %

Test Procedure: **Aerocet 831-6100**

| PSL Size (µm) | Test Results | Test Spec. | Lot# NIST | Expiration |
|---------------|--------------|------------|-----------|------------|
| 0.3 | Pass | ± 10% | 196947 | 04/30/2021 |
| 0.5 | Pass | ± 10% | 180556 | 02/28/2020 |
| 1.0 | Pass | ± 10% | 193291 | 1/31/2021 |
| 2.5 | Pass | ± 10% | REF | NA |
| 4.0 | Pass | ± 10% | REF | NA |
| 5.0 | Pass | ± 10% | REF | NA |
| 7.0 | Pass | ± 10% | REF | NA |
| 10.0 | Pass | ± 10% | REF | NA |
| | | | | |

| Standards | Model | SN | Cal Due |
|------------------|----------------|----------|-----------|
| Particle Counter | GT-526 | M1759 | 8/4/2019 |
| Dry Cal | Defender 510 | 133419 | 4/2/2020 |
| DMM | 189 Multimeter | 83410061 | 3/22/2020 |
| RH/TEMP SENSOR | 083E-1-6 | R20313 | 9/18/2019 |
| | | | |

This calibration certificate shall not be reproduced except in full, without the written approval of Met One Instruments Inc.



1600 Washington Blvd
 Grants Pass, OR 97526
 (541) 471-7111
 (541) 471-7116 (Fax)
 Service@metone.com

Met One
 Instruments

Calibration Certificate

As Received

This certificate documents the as received condition of your instrument. Calibration was verified using accepted industry methods, equipment, procedures and standards that are traceable to NIST and ISO.

Instrument Model# Aerocet 831 Instrument Serial# W14016
 Date of comparison against standard 5-17-2019 Sensor # 16206
 Quality Control Technician Daisy Jones *JD*
 Temperature 23 °C Relative Humidity 36 %

Test Procedure: **Aerocet 831-6100**

| As Received | Value | Range | Condition |
|-------------|-------|---------------------------------|-----------|
| Zero Count | 0 | Less than 5 particles in 5 min. | PASS |
| Air Flow | .105 | .092 to .108 CFM | PASS |

| PSL Size Micron | LOT# NIST | As Received PSL Count Comparison | Allowable PSL Count Comparison | Allowable Size Accuracy | As Received Condition |
|-----------------|-----------|----------------------------------|--------------------------------|-------------------------|-----------------------|
| 0.3 | 196947 | 38.44 | 10% to 90% | +/- 10 % | PASS |
| 0.5 | 180556 | 39.10 | 10% to 90% | +/- 10 % | PASS |
| 1.0 | 193291 | 26.89 | 10% to 90% | +/- 10 % | PASS |
| | | | | | |
| | | | | | |
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| | | | | | |
| | | | | | |

| Standards | Model | SN | Cal Due |
|------------------|----------------|----------|-----------|
| Particle Counter | GT-526 | M1759 | 8/4/2019 |
| Dry Cal | Defender 510 | 133419 | 4/2/2020 |
| DMM | 189 Multimeter | 83410061 | 3/22/2020 |
| RH/TEMP SENSOR | 083E-1-6 | R20313 | 9/18/2019 |
| | | | |

Calibration was performed by direct comparison to a count standard.



REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT: CHAN KA CHUN
CLIENT: LAM ENVIRONMENTAL SERVICES LTD

WORK ORDER: HK1927042

ADDRESS: 11/F CENTRE POINT,
181-185 GLOUCESTER ROAD,
WANCHAI, HONG KONG

SUB-BATCH: 0
LABORATORY: HONG KONG
DATE RECEIVED: 24-Jun-2019
DATE OF ISSUE: 02-Jul-2019

COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.

The "Next Calibration Date" is recommended according to best practice principle as practised by the ALS Hong Kong laboratory or quoted from relevant international standards.

Scope of Test: Dissolved Oxygen, pH Value, Salinity and Temperature
Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: Professional Plus
Serial No.: 14E100105
Equipment No.: --
Date of Calibration: 28-Jun-2019

NOTES

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Ms. Lin Wai Yu, Iris
Assistant Manager - Inorganic

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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



WORK ORDER: HK1927042
SUB-BATCH: 0
DATE OF ISSUE: 02-Jul-2019
CLIENT: LAM ENVIRONMENTAL SERVICES LTD

Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: Professional Plus
Serial No.: 14E100105
Equipment No.: --
Date of Calibration: 28-Jun-2019 **Date of Next Calibration:** 28-Sep-2019

PARAMETERS:
 Dissolved Oxygen Method Ref: APHA (21st edition), 4500-O: G

| Expected Reading (mg/L) | Displayed Reading (mg/L) | Tolerance (mg/L) |
|-------------------------|--------------------------|------------------|
| 3.69 | 3.80 | +0.11 |
| 5.53 | 5.38 | -0.15 |
| 7.52 | 7.60 | +0.08 |
| Tolerance Limit (mg/L) | | ±0.20 |

pH Value Method Ref: APHA (21st edition), 4500H:B

| Expected Reading (pH unit) | Displayed Reading (pH unit) | Tolerance (pH unit) |
|----------------------------|-----------------------------|---------------------|
| 4.0 | 4.10 | +0.10 |
| 7.0 | 6.98 | -0.02 |
| 10.0 | 9.99 | -0.01 |
| Tolerance Limit (pH unit) | | ±0.20 |

Salinity Method Ref: APHA (21st edition), 2520B

| Expected Reading (ppt) | Displayed Reading (ppt) | Tolerance (%) |
|------------------------|-------------------------|---------------|
| 0 | 0.03 | -- |
| 10 | 10.42 | +4.2 |
| 20 | 20.57 | +2.9 |
| 30 | 30.15 | +0.5 |
| Tolerance Limit (%) | | ±10.0 |

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Ms. Lin Wai Yu, Iris
 Assistant Manager - Inorganic

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



WORK ORDER: HK1927042
SUB-BATCH: 0
DATE OF ISSUE: 02-Jul-2019
CLIENT: LAM ENVIRONMENTAL SERVICES LTD

Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: Professional Plus
Serial No.: 14E100105
Equipment No.: --
Date of Calibration: 28-Jun-2019

Date of Next Calibration: 28-Sep-2019

PARAMETERS:
Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical
Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

| Expected Reading (°C) | Displayed Reading (°C) | Tolerance (°C) |
|-----------------------|------------------------|----------------|
| 10.0 | 10.5 | +0.5 |
| 20.0 | 20.0 | +0.0 |
| 40.0 | 39.5 | -0.5 |
| | Tolerance Limit (°C) | ±2.0 |

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Ms. Lin Wai Yu, Iris
Assistant Manager - Inorganic



REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

| | | | |
|----------|--|----------------|-------------|
| CONTACT: | CHAN KA CHUN | WORK ORDER: | HK1920691 |
| CLIENT: | LAM ENVIRONMENTAL SERVICES LTD | | |
| ADDRESS: | 11/F CENTRE POINT, 181-185 GLOUCESTER ROAD, WANCHAI, HONG KONG | SUB-BATCH: | 0 |
| | | LABORATORY: | HONG KONG |
| | | DATE RECEIVED: | 16-May-2019 |
| | | DATE OF ISSUE: | 23-May-2019 |

COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.

The "Next Calibration Date" is recommended according to best practice principle as practised by the ALS Hong Kong laboratory or quoted from relevant international standards.

| | |
|----------------------|--|
| Scope of Test: | Dissolved Oxygen, pH Value, Salinity and Temperature |
| Equipment Type: | Multifunctional Meter |
| Brand Name: | YSI |
| Model No.: | Professional Plus |
| Serial No.: | 16J100298 |
| Equipment No.: | -- |
| Date of Calibration: | 20-May-2019 |

NOTES

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Ms. Lin Wai Yu
Assistant Manager - Inorganic

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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



WORK ORDER: HK1920691
SUB-BATCH: 0
DATE OF ISSUE: 23-May-2019
CLIENT: LAM ENVIRONMENTAL SERVICES LTD

Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: Professional Plus
Serial No.: 16J100298
Equipment No.: --
Date of Calibration: 20-May-2019 **Date of Next Calibration:** 20-Aug-2019

PARAMETERS:
 Dissolved Oxygen Method Ref: APHA (21st edition), 4500-O: G

| Expected Reading (mg/L) | Displayed Reading (mg/L) | Tolerance (mg/L) |
|-------------------------|--------------------------|------------------|
| 2.51 | 2.40 | -0.11 |
| 5.46 | 5.41 | -0.05 |
| 7.69 | 7.66 | -0.03 |
| Tolerance Limit (mg/L) | | ±0.20 |

pH Value Method Ref: APHA (21st edition), 4500H:B

| Expected Reading (pH unit) | Displayed Reading (pH unit) | Tolerance (pH unit) |
|----------------------------|-----------------------------|---------------------|
| 4.0 | 3.99 | -0.01 |
| 7.0 | 6.91 | -0.09 |
| 10.0 | 9.84 | -0.16 |
| Tolerance Limit (pH unit) | | ±0.20 |

Salinity Method Ref: APHA (21st edition), 2520B

| Expected Reading (ppt) | Displayed Reading (ppt) | Tolerance (%) |
|------------------------|-------------------------|---------------|
| 0 | 0.00 | -- |
| 10 | 9.87 | -1.3 |
| 20 | 19.78 | -1.1 |
| 30 | 30.17 | +0.6 |
| Tolerance Limit (%) | | ±10.0 |

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

N:5

 Ms. Lin Wai Yu
 Assistant Manager - Inorganic

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



WORK ORDER: HK1920691
SUB-BATCH: 0
DATE OF ISSUE: 23-May-2019
CLIENT: LAM ENVIRONMENTAL SERVICES LTD

Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: Professional Plus
Serial No.: 16J100298
Equipment No.: --
Date of Calibration: 20-May-2019

Date of Next Calibration: 20-Aug-2019

PARAMETERS:
Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical
Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

| Expected Reading (°C) | Displayed Reading (°C) | Tolerance (°C) |
|-----------------------|------------------------|----------------|
| 10.5 | 10.4 | -0.1 |
| 18.5 | 19.2 | +0.7 |
| 39.0 | 39.3 | +0.3 |
| | Tolerance Limit (°C) | ±2.0 |

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Ms. Lin Wai Yu
Assistant Manager - Inorganic



REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

WORK ORDER: 22777053-E29V4501
DATE OF ISSUE: 18/06/2019
CLIENT: LAM GEOTECHNICS LIMITED

| | |
|---------------------------|--------------|
| Equipment Type: | Turbidimeter |
| Brand Name: | Xin Rui |
| Model No.: | WGZ-3B |
| Serial No.: | 1807079 |
| Equipment No.: | --- |
| Date of Calibration: | 01/06/2019 |
| Date of next Calibration: | 31/08/2019 |
| Lab ID: | H190165-01 |

Parameters:

Turbidity

Method Ref: APHA 22nd ed. 2130B

| Expected Reading (NTU) | Display Reading (NTU) | Tolerance |
|------------------------|---------------------------|-----------|
| 0 | 0.00 | --- |
| 4 | 4.21 | 5.3% |
| 10 | 9.84 | -1.6% |
| 40 | 37.74 | -5.7% |
| 100 | 98.14 | -1.9% |
| 400 | 435 | 8.8% |
| 1000 | 991 | -0.9% |
| | Tolerance Limit (\pm) | 10% |

Remark: "Displayed Reading" presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.



REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

WORK ORDER: 22777053-E29V4502
DATE OF ISSUE: 18/06/2019
CLIENT: LAM GEOTECHNICS LIMITED

| | |
|---------------------------|--------------|
| Equipment Type: | Turbidimeter |
| Brand Name: | Xin Rui |
| Model No.: | WGZ-3B |
| Serial No.: | 1807077 |
| Equipment No.: | --- |
| Date of Calibration: | 01/06/2019 |
| Date of next Calibration: | 31/08/2019 |
| Lab ID: | H190165-02 |

Parameters:

Turbidity

Method Ref: APHA 22nd ed. 2130B

| Expected Reading (NTU) | Display Reading (NTU) | Tolerance |
|------------------------|---------------------------|-----------|
| 0 | 0.00 | --- |
| 4 | 4.32 | 8.0% |
| 10 | 9.99 | -0.1% |
| 40 | 43.32 | 8.3% |
| 100 | 100.30 | 0.3% |
| 400 | 435 | 8.6% |
| 1000 | 1002 | 0.2% |
| | Tolerance Limit (\pm) | 10% |

Remark: "Displayed Reading" presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.