

# Manufacturer Calibration Certificate

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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)

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Tested by: **M. Frick**

Signature:

Stamp:



**NTi Audio AG**  
Im alten Riet 102  
LI 9494 Schaan  
[www.nti-audio.com](http://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 <sup>2</sup>
RMS Level @ 1kHz, XLR Input	0.1	<b>0.100</b>	V	≤0.1%	±0.5%	±0.10%
	1	<b>0.999</b>	V	-0.1%	±0.5%	±0.09%
	10	<b>9.978</b>	V	-0.2%	±0.5%	±0.09%
Flatness, XLR Input <sup>1</sup>	20 Hz	<b>0.995</b>	V	-0.5%	±1.1%	±0.09%
	20 kHz	<b>1.003</b>	V	0.3%	±1.1%	±0.09%
Frequency	1000	<b>999.99</b>	Hz	≤0.003%	±0.003%	±0.01%
Residual Noise	XLR	<b>&lt; 2 uV</b>			<2 uV	±0.50%
THD+N @ 0 dBu, 1 kHz, XLR Input		<b>-100.4</b>	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

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

<sup>2</sup> 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:  $22 \pm 1$  °C  
Relative humidity:  $55 \pm 10$  %  
Air pressure:  $1005 \pm 5$  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 responses of the Sound Level Meter.

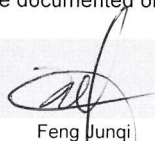
### Test results

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.

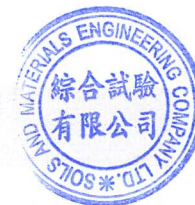
Approved Signatory:



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	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Frequency weightings	A	Pass	
Time weightings	C	Pass	0.3	
	Lin	Pass	0.3	
	Single Burst Fast	Pass	0.3	
Peak response	Single Burst Slow	Pass	0.3	
	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 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> 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.

- End -

Calibrated by:

Date:

Fung Chi Yip  
30-May-2019

Checked by:

Date:

Shek Kwong Tat  
31-May-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.





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 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	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 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	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

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:  $20 \pm 1$  °C  
Relative humidity:  $50 \pm 10$  %  
Air pressure:  $1005 \pm 5$  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.

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 $\mu$ 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.

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## 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 : Particulate 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

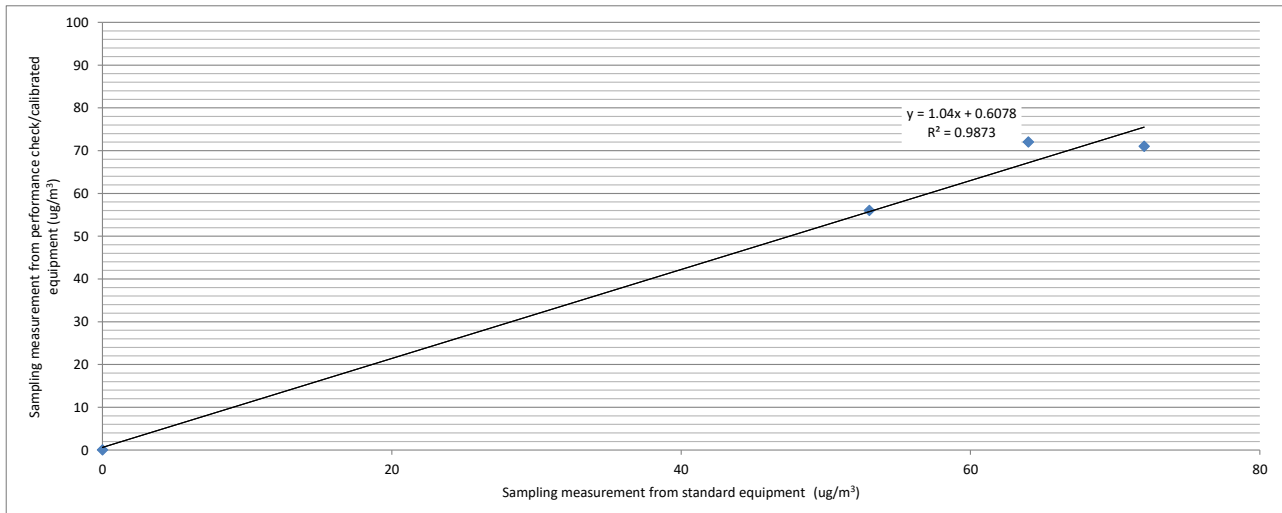
Portable Dust Meter Performance Check Results

Table with 6 columns: Trial no. in 1-hr period, Time, Mean Pressure (hPa), Mean Temp (°C), 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) : 1.0000
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.** : 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**

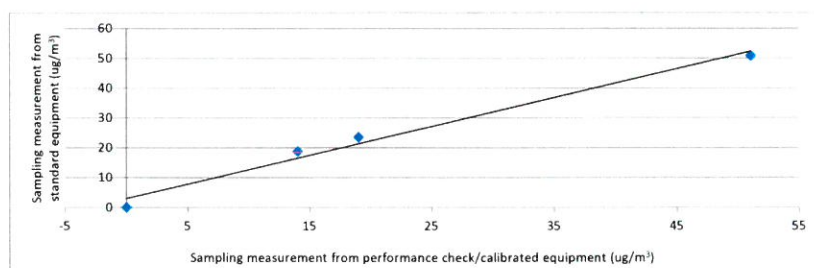
TYPE : HIGH VOLUME AIR SAMPLER  
 MANUFACTURER : TISCH  
 MODEL NO. : TE-5170  
 EQUIPMENT REF NO. : PTL\_HV002  
 LAST CALIBRATION DATE : 25/7/2018

**EQUIPMENT PERFORMANCE CHECK / CALIBRATION RESULTS:**

Trial no. in 1-hr period	Time	Mean Temp (°C)	Mean Pressure (hPa)	Concentration in ug/m <sup>3</sup> (Standard equipment) (Y - Axis)	Concentration in ug/m <sup>3</sup> (Performance Check / Calibrated equipment) (X - Axis)
Zero Check <sup>1</sup>	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



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

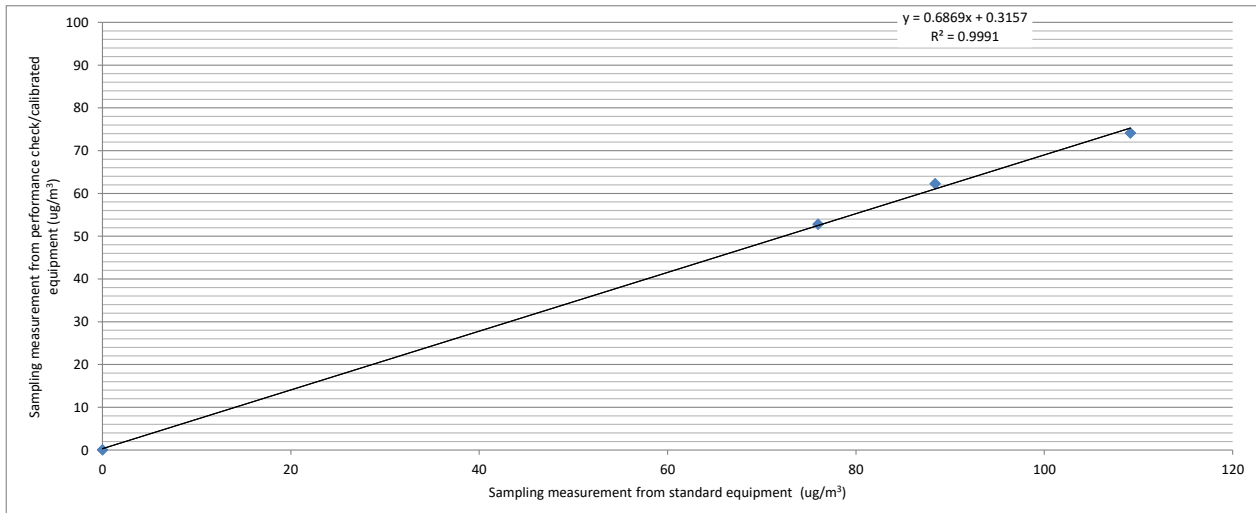
Portable Dust Meter Performance Check Results

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



Portable Dust Meter Performance Check Record

Portable Dust Meter

Type : Particulate Monitor
Manufacturer : MET ONE INSTRUMENTS
Model Number : BT-645
Serial Number : R22584
Performance Check Date : 27-Feb-19

Standard Equipment

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

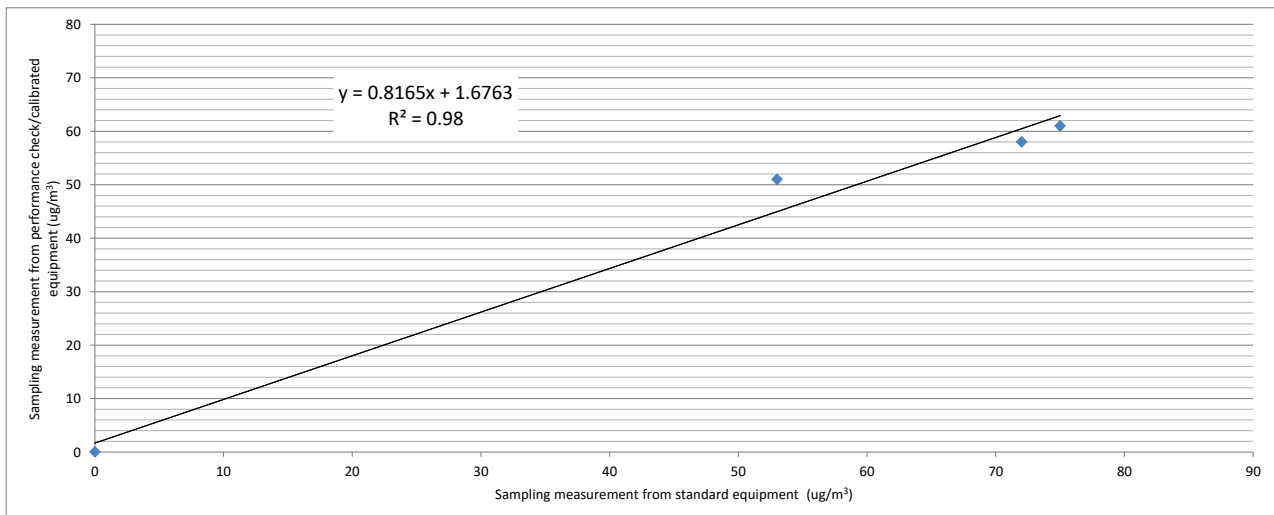
Portable Dust Meter Performance Check Results

Table with 6 columns: Trial no. in 1-hr period, Time, Mean Pressure (hPa), Mean Temp (°C), Concentration in ug/m³ (Standard equipment) (Y - Axis), Concentration in ug/m³ (Performance Check / Calibrated equipment) (X - Axis). Rows include Zero Check and trials 1, 2, 3.

\* Filter paper weighting was conducted by HOKLAS accredited laboratory.

Linear Regression of Y on X

Slope (K- factor) : 1.3000
Correlation Coefficient : 0.9900
Validity of Performance Check / Calibration Record : 27/2/2020



Operator: Henry Lau

Date: 27-Feb-19

Checked by: Chan Ka Chun

Date: 4-Mar-19



Portable Dust Meter Performance Check Record

Portable Dust Meter

Type : Particulate Monitor
Manufacturer : MET ONE INSTRUMENTS
Model Number : BT-645
Serial Number : R22586
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

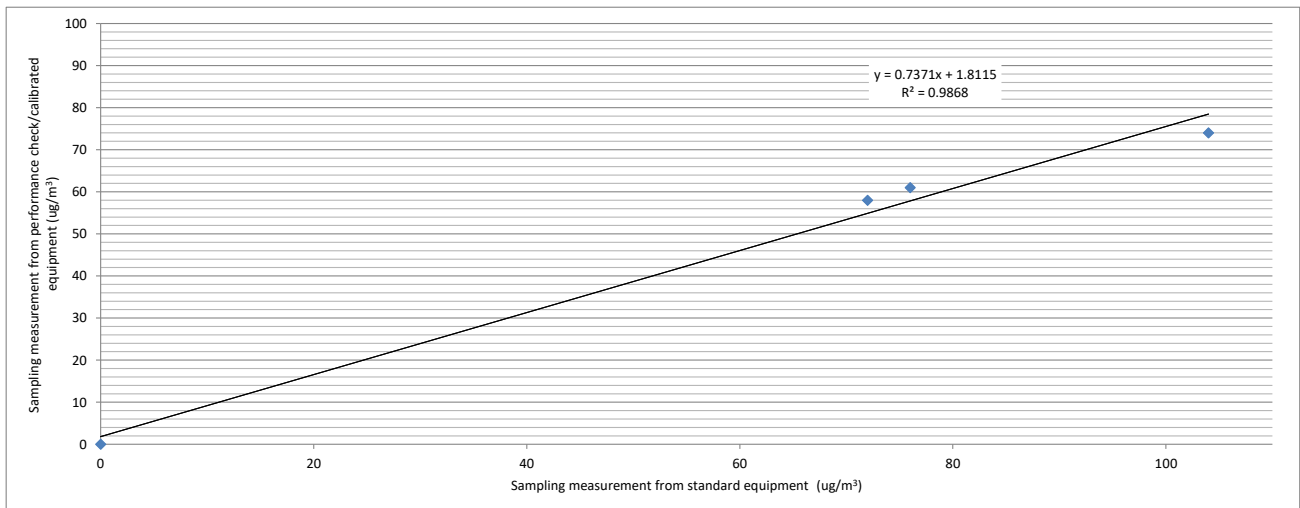
Portable Dust Meter Performance Check Results

Table with 6 columns: Trial no. in 1-hr period, Time, Mean Pressure (hPa), Mean Temp (°C), Concentration in ug/m³ (Standard equipment), Concentration in ug/m³ (Performance Check / Calibrated equipment). Rows include Zero Check and trials 1, 2, 3.

\* Filter paper weighting was conducted by HOKLAS accredited laboratory.

Linear Regression of Y on X

Slope (K- factor) : 1.4000
Correlation Coefficient : 0.9934
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. : 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**

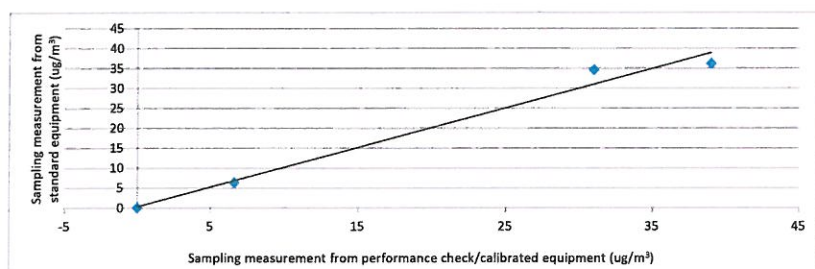
TYPE : HIGH VOLUME AIR SAMPLER  
 MANUFACTURER : TISCH  
 MODEL NO. : TE-5170  
 EQUIPMENT REF NO. : PTL\_HV002  
 LAST CALIBRATION DATE : 25/7/2018

**EQUIPMENT PERFORMANCE CHECK / CALIBRATION RESULTS:**

Trial no. in 1-hr period	Time	Mean Temp (°C)	Mean Pressure (hPa)	Concentration in ug/m <sup>3</sup> (Standard equipment) (Y - Axis)	Concentration in ug/m <sup>3</sup> (Performance Check / Calibrated equipment) (X - Axis)
Zero Check <sup>1</sup>	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:  Date: 16/8/2018

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


**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

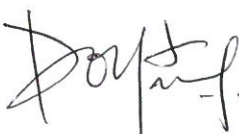
**REPORT NO.** : HK1810819  
**PROJECT ITEM NO.** : HK1810819-01  
**PERFORMANCE CHECK / CALIBRATED EQUIPMENT**  
**TYPE** : AEROSOL MASS MONITOR  
**MANUFACTURER** : MET ONE INSTRUMENTS  
**MODEL NO.** : AEROCET - 831  
**SERIAL NO.** : W16848  
**EQUIPMENT NO.** : ---  
**RECEIPT DATE** : 14/8/2018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

- 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:

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**

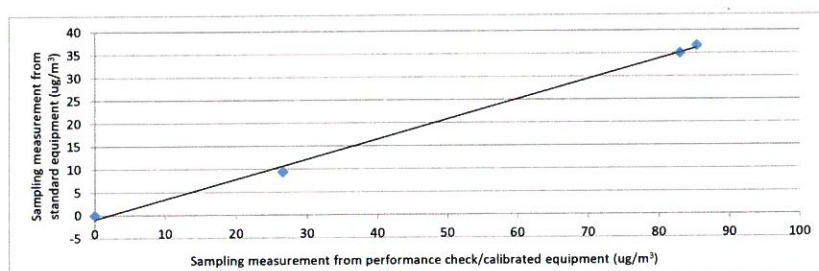
TYPE : HIGH VOLUME AIR SAMPLER  
 MANUFACTURER : TISCH  
 MODEL NO. : TE-5170  
 EQUIPMENT REF NO. : PTL\_HV002  
 LAST CALIBRATION DATE : 25/7/2018

**EQUIPMENT PERFORMANCE CHECK / CALIBRATION RESULTS:**

Trial no. in 1-hr period	Time	Mean Temp (°C)	Mean Pressure (hPa)	Concentration in ug/m <sup>3</sup> (Standard equipment) (Y - Axis)	Concentration in ug/m <sup>3</sup> (Performance Check / Calibrated equipment) (X - Axis)
Zero Check <sup>1</sup>	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. : HK1811049  
 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. : HK1811049  
 PROJECT ITEM NO. : HK1811049-01  
**PERFORMANCE CHECK / CALIBRATED EQUIPMENT**  
 TYPE : AEROSOL MASS MONITOR  
 MANUFACTURER : MET ONE INSTRUMENTS  
 MODEL NO. : AEROCET - 831  
 SERIAL NO. : W15448  
 EQUIPMENT NO. : ---  
 RECEIPT DATE : 18/10/2018  
 PERFORMANCE CHECK / CALIBRATION DATE : 18/10/2018

**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 :

Issue Date:

24/10/2018

Wong Po Yan Pauline  
 (Assistant Laboratory Manager)



**REPORT OF PERFORMANCE CHECK / CALIBRATION**

PROJECT NAME : PERFORMANCE CHECK / CALIBRATION OF DUST METER  
 DATE OF ISSUE : 24/10/2018  
 REPORT NO. : HK1811049

**PERFORMANCE CHECK / CALIBRATED EQUIPMENT**

TYPE : AEROSOL MASS MONITOR  
 MANUFACTURER : MET ONE INSTRUMENTS  
 MODEL NO. : AEROCET - 831  
 SERIAL NO. : W15448  
 EQUIPMENT NO. : ---  
 PERFORMANCE CHECK / CALIBRATION DATE : 18/10/2018

**STANDARD EQUIPMENT**

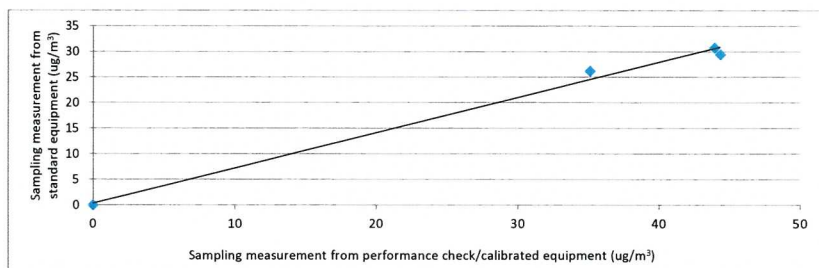
TYPE : HIGH VOLUME AIR SAMPLER  
 MANUFACTURER : TISCH  
 MODEL NO. : TE-5170  
 EQUIPMENT REF NO. : PTL\_HV002  
 LAST CALIBRATION DATE : 25/7/2018

**EQUIPMENT PERFORMANCE CHECK / CALIBRATION RESULTS:**

Trial no. in 1-hr period	Time	Mean Temp (°C)	Mean Pressure (hPa)	Concentration in ug/m <sup>3</sup> (Standard equipment) (Y - Axis)	Concentration in ug/m <sup>3</sup> (Performance Check / Calibrated equipment) (X - Axis)
Zero Check <sup>1</sup>	18/10/2018,9:05:00 AM	22.5	1015	0	0
1	18/10/2018,2:16:00 PM	22.5	1015	31	44
2	18/10/2018,3:18:00 PM	22.5	1015	30	44
3	18/10/2018,4:21:00 PM	22.5	1015	26	35

**Linear Regression of Y on X**

Slope (K- factor) : 0.7000  
 Correlation Coefficient : 0.9962  
 Validity of Performance Check / Calibration Record : 18/10/2019



- 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: *Natalie Lau* Date: 18/10/2018

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


**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**

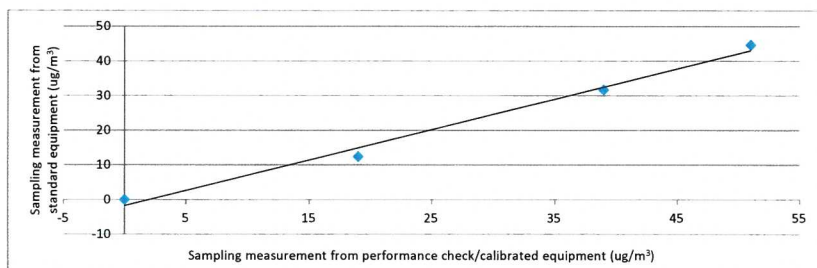
TYPE : HIGH VOLUME AIR SAMPLER  
 MANUFACTURER : TISCH  
 MODEL NO. : TE-5170  
 EQUIPMENT REF NO. : PTL\_HV002  
 LAST CALIBRATION DATE : 25/7/2018

**EQUIPMENT PERFORMANCE CHECK / CALIBRATION RESULTS:**

Trial no. in 1-hr period	Time	Mean Temp (°C)	Mean Pressure (hPa)	Concentration in ug/m <sup>3</sup> (Standard equipment) (Y - Axis)	Concentration in ug/m <sup>3</sup> (Performance Check / Calibrated equipment) (X - Axis)
Zero Check <sup>1</sup>	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

CONTACT:	CHAN KA CHUN	WORK ORDER:	HK1912921
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:	27-Mar-2019
		DATE OF ISSUE:	02-Apr-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.**

Scope of Test:	Dissolved Oxygen, pH Value, Salinity and Temperature
Equipment Type:	Multifunctional Meter
Brand Name:	YSI
Model No.:	Professional Plus
Serial No.:	14M100277
Equipment No.:	--
Date of Calibration:	02 April, 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.

Mr Chan Siu Ming, Vico  
Manager - Inorganic

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# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



WORK ORDER: HK1912921  
 SUB-BATCH: 0  
 DATE OF ISSUE: 02-Apr-2019  
 CLIENT: LAM ENVIRONMENTAL SERVICES LTD

Equipment Type: Multifunctional Meter  
 Brand Name: YSI  
 Model No.: Professional Plus  
 Serial No.: 14M100277  
 Equipment No.: --  
 Date of Calibration: 02 April, 2019

Date of Next Calibration: 02 July, 2019

**PARAMETERS:**

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

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
2.85	2.66	-0.19
5.99	5.79	-0.20
8.54	8.57	+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	3.82	-0.18
7.0	6.83	-0.17
10.0	9.87	-0.13
	Tolerance Limit (pH unit)	±0.20

Salinity

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

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
0	0.00	--
10	9.95	-0.5
20	20.10	+0.5
30	30.03	+0.1
	Tolerance Limit (%)	±10.0

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

Mr Chan Siu Ming, Vico  
 Manager - Inorganic

# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



WORK ORDER: HK1912921  
SUB-BATCH: 0  
DATE OF ISSUE: 02-Apr-2019  
CLIENT: LAM ENVIRONMENTAL SERVICES LTD

Equipment Type: Multifunctional Meter  
Brand Name: YSI  
Model No.: Professional Plus  
Serial No.: 14M100277  
Equipment No.: --  
Date of Calibration: 02 April, 2019

Date of Next Calibration: 02 July, 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)
9.0	8.2	-0.8
23.0	22.6	-0.4
40.0	39.3	-0.7
	Tolerance Limit (°C)	±2.0

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

A handwritten signature in black ink, appearing to read 'Chan Siu Ming'.

Mr Chan Siu Ming, Vico  
Manager - Inorganic



## REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT:	CHAN KA CHUN	WORK ORDER:	HK1916521
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:	17-Apr-2019
		DATE OF ISSUE:	25-Apr-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.:	17F100236
Equipment No.:	--
Date of Calibration:	24-Apr-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:** HK1916521  
**SUB-BATCH:** 0  
**DATE OF ISSUE:** 25-Apr-2019  
**CLIENT:** LAM ENVIRONMENTAL SERVICES LTD

**Equipment Type:** Multifunctional Meter  
**Brand Name:** YSI  
**Model No.:** Professional Plus  
**Serial No.:** 17F100236  
**Equipment No.:** --  
**Date of Calibration:** 24-Apr-2019                      **Date of Next Calibration:** 24-Jul-2019

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

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
8.15	8.07	-0.08
5.90	6.05	+0.15
2.64	2.69	+0.05
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	4.00	+0.00
7.0	7.20	+0.20
10.0	10.05	+0.05
Tolerance Limit (pH unit)		±0.20

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

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
0	0.00	--
10	9.86	-1.4
20	19.53	-2.3
30	29.81	-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: HK1916521  
SUB-BATCH: 0  
DATE OF ISSUE: 25-Apr-2019  
CLIENT: LAM ENVIRONMENTAL SERVICES LTD

Equipment Type: Multifunctional Meter  
Brand Name: YSI  
Model No.: Professional Plus  
Serial No.: 17F100236  
Equipment No.: --  
Date of Calibration: 24-Apr-2019

Date of Next Calibration: 24-Jul-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)
9.5	9.7	+0.2
22.0	22.1	+0.1
38.5	38.2	-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-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 22<sup>nd</sup> 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.



REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Information supplied by customer:

CONTACT: MR. CHAN KA CHUN                      JOB REFERENCE NO.: 22777053-E29V4501  
CLIENT: LAM GEOTECHNICS LIMITED  
DATE RECEIVED: 29/05/2019  
DATE OF ISSUE: 18/06/2019  
ADDRESS: 11/F, CENTRE POINT, 181-185, GLOUCESTER ROAD,  
            WANCHAI, HONG KONG  
PROJECT: ---

METHOD OF PERFORMANCE CHECK/ CALIBRATION:

Ref: APHA22nd ed 2130B

COMMENTS

It is certified that the item under performance check/calibration has been calibrated/checked by corresponding calibrated equipment in the laboratory.

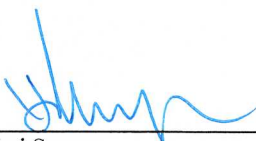
Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of FT Laboratories Ltd will be followed.

Scope of Test:	Turbidity
Equipment Type:	Turbidimeter
Brand Name:	Xin Rui
Model No.:	WGZ-3B
Serial No.:	1807079
Equipment No.:	---
Date of Calibration:	01/06/2019

Remarks:

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

Certified By:

  
\_\_\_\_\_  
HO Lai Sze  
Senior Chemist

Issue Date:

18/06/2019

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Form No.: HG022-002 Rev 0 20190101

Page 1 of 2



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 22<sup>nd</sup> 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.