



CERTIFICATE OF CALIBRATION

Certificate No.: 17CA0426 01-02 Page 1 of 2

Item tested

Description:	Sound Level Meter (Type 1)	,	Microphone
Manufacturer:	Larson Davis	,	PCB
Type/Model No.:	LxT1	,	377B02
Serial/Equipment No.:	0003737	,	171529
Adaptors used:	-	,	-

Item submitted by

Customer Name:	Lam Environmental Service Ltd.
Address of Customer:	-
Request No.:	-
Date of receipt:	26-Apr-2017

Date of test: 28-Apr-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	18-Jun-2017	CIGISMEC
Signal generator	DS 360	61227	01-Apr-2018	CEPREI

Ambient conditions

Temperature:	21 ± 1 °C
Relative humidity:	50 ± 10 %
Air pressure:	1010 ± 5 hPa

Test specifications

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

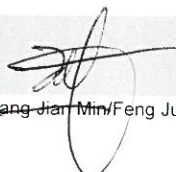
Test results

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

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

Actual Measurement data are documented on worksheets.

Approved Signatory:


Huang Jian Min/Feng Jun Qi

Date: 04-May-2017

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.: 17CA0426 01-02 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	N/A	N/A	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
	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.

- End -

Calibrated by:

Lai Sheng Jie

Date: 28-Apr-2017

Checked by:

Fung Chi Yip

Date: 04-May-2017

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.



CERTIFICATE OF CALIBRATION

Certificate No.: 17CA0320 02 Page 1 of 2

Item tested

Description:	Sound Level Meter (Type 1)	Microphone	Preamp
Manufacturer:	B & K	B & K	B & K
Type/Model No.:	2250-L	4950	ZC0032
Serial/Equipment No.:	2722310	2698702	13318
Adaptors used:	-	-	-

Item submitted by

Customer Name: Lam Geotechnics Ltd.
Address of Customer: -
Request No.: -
Date of receipt: 20-Mar-2017

Date of test: 23-Mar-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	18-Jun-2017	CIGISMEC
Signal generator	DS 360	33873	18-Apr-2017	CEPREI
Signal generator	DS 360	61227	18-Apr-2017	CEPREI

Ambient conditions

Temperature: 21 ± 1 °C
Relative humidity: 60 ± 10 %
Air pressure: 1010 ± 5 hPa

Test specifications

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

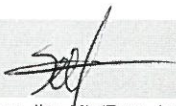
Test results

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

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

Actual Measurement data are documented on worksheets.

Approved Signatory:


Huang Jian Min/Feng Jun Qi

Date: 24-Mar-2017

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.: 17CA0320 02 - 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	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Frequency weightings	A	Pass	0.3
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
Time averaging	Repeated at frequency of 100 Hz	Pass	0.3	
	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.

- End -

Calibrated by:

Lai Sheng Jie

Date: 23-Mar-2017

Checked by:

Fung Chi Yip

Date: 24-Mar-2017

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.



CERTIFICATE OF CALIBRATION

Certificate No.: 17CA0505 01 Page 1 of 2

Item tested

Description:	Sound Level Meter (Type 1)	Microphone	Preamp
Manufacturer:	B & K	B & K	B & K
Type/Model No.:	2250-L	4950	ZC0032
Serial/Equipment No.:	2722311	2698703	13321
Adaptors used:	-	-	-

Item submitted by

Customer Name: Lam Geotechnics Ltd.
Address of Customer: -
Request No.: -
Date of receipt: 05-May-2017

Date of test: 06-May-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	18-Jun-2017	CIGISMEC
Signal generator	DS 360	61227	01-Apr-2018	CEPREI

Ambient conditions

Temperature: 22 ± 1 °C
Relative humidity: 50 ± 10 %
Air pressure: 1010 ± 5 hPa

Test specifications

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

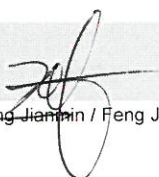
Test results

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:

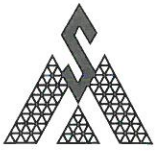

Huang Jianmin / Feng Junqi

Date: 09-May-2017

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.: 17CA0505 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	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	A	Pass	0.3	
	C	Pass	0.3	
Frequency weightings	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
Pulse range	1 ms burst duty factor 1/10 ⁴ at 4kHz	Pass	0.3	
	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:

Lai Sheng Jie

Date: 06-May-2017

Checked by:

Fung Chi Yip

Date: 09-May-2017

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.



CERTIFICATE OF CALIBRATION

Certificate No.: 17CA0221 02 Page 1 of 2

Item tested

Description:	Sound Level Meter (Type 1)	Microphone	Preamp
Manufacturer:	B & K	B & K	B & K
Type/Model No.:	2250-L	4950	ZC0032
Serial/Equipment No.:	2701778	2755097	19223
Adaptors used:	-	-	-

Item submitted by

Customer Name: Lam Geotechnics Limited
Address of Customer: -
Request No.: -
Date of receipt: 22-Feb-2017

Date of test: 02-Mar-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	18-Jun-2017	CIGISMEC
Signal generator	DS 360	33873	18-Apr-2017	CEPREI
Signal generator	DS 360	61227	18-Apr-2017	CEPREI

Ambient conditions

Temperature: 20 ± 1 °C
Relative humidity: 60 ± 10 %
Air pressure: 1010 ± 5 hPa

Test specifications

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

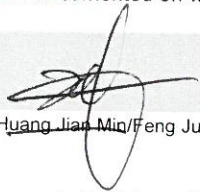
Test results

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:


Huang Jian Min/Feng Jun Qi

Date: 06-Mar-2017

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.: 17CA0221 02 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	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Linearity range for SPL	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
	Single Burst Fast	Pass	0.3	
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	
	Single burst 5 ms at 2000 Hz	Pass	0.3	
Time weighting I	Repeated at frequency of 100 Hz	Pass	0.3	
	1 ms burst duty factor 1/10 ³ at 4kHz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ⁴ at 4kHz	Pass	0.3	
	Single burst 10 ms at 4 kHz	Pass	0.4	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	SPL	Pass	0.3	
Overload indication	Leq	Pass	0.4	

2, Acoustic tests

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

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

3, Response to associated sound calibrator

N/A

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

- End -

Calibrated by:

Date:

Fung Chi Yip
02-Mar-2017

Checked by:

Date:

Lam Tze Wai
06-Mar-2017

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.



CERTIFICATE OF CALIBRATION

Certificate No.: 17CA0119 01 Page 1 of 2

Item tested

Description:	Sound Level Meter (Type 1)	Microphone	Preamp
Manufacturer:	B & K	B & K	B & K
Type/Model No.:	2250-L	4950	ZC0032
Serial/Equipment No.:	3002695	2940839	18582
Adaptors used:	-	-	-

Item submitted by

Customer Name: Lam Geotechnics Limited
Address of Customer: -
Request No.: -
Date of receipt: 19-Jan-2017

Date of test: 20-Jan-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	18-Jun-2017	CIGISMEC
Signal generator	DS 360	33873	18-Apr-2017	CEPREI
Signal generator	DS 360	61227	18-Apr-2017	CEPREI

Ambient conditions

Temperature: 21 ± 1 °C
Relative humidity: 40 ± 10 %
Air pressure: 1010 ± 5 hPa

Test specifications

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

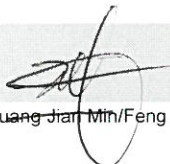
Test results

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

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

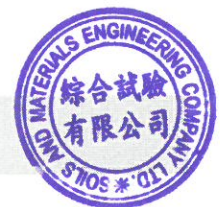
Actual Measurement data are documented on worksheets.

Approved Signatory:


Huang Jian Min/Feng Jun Qi

Date: 23-Jan-2017

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.: 17CA0119 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	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Frequency weightings			
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	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.

- End -

Calibrated by:

Date:

Fung Chi Yip
20-Jan-2017

Checked by:

Date:

Lam Tze Wai
23-Jan-2017

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.



CERTIFICATE OF CALIBRATION

Certificate No.: 16CA0805 02 Page 1 of 2

Item tested

Description:	Sound Level Meter (Type 1)	Microphone	Preamp
Manufacturer:	B & K	B & K	B & K
Type/Model No.:	2250-L	4950	ZC0032
Serial/Equipment No.:	3006790	2827240	21213
Adaptors used:	-	-	-

Item submitted by

Customer Name: Lam Geotechnics Ltd.
Address of Customer: -
Request No.: -
Date of receipt: 05-Aug-2016

Date of test: 08-Aug-2016

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	18-Jun-2017	CIGISMEC
Signal generator	DS 360	33873	18-Apr-2017	CEPREI
Signal generator	DS 360	61227	18-Apr-2017	CEPREI

Ambient conditions

Temperature: 21 ± 1 °C
Relative humidity: 60 ± 10 %
Air pressure: 1000 ± 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 response of the Sound Level Meter.

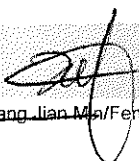
Test results

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:


Huang Jian Ma/Feng Jun Qi

Date: 09-Aug-2016

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.: 16CA0805 02 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	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Frequency weightings			
Time weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Peak response	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
R.M.S. accuracy	Single 100µs rectangular pulse	Pass	0.3	
Time weighting I	Crest factor of 3	Pass	0.3	
	Single burst 5 ms at 2000 Hz	Pass	0.3	
Time averaging	Repeated at frequency of 100 Hz	Pass	0.3	
	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.

- End -

Calibrated by:

Date:

Fung Chi Yip
08-Aug-2016

Checked by:

Date:

Lam Tze Wai
09-Aug-2016

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.



CERTIFICATE OF CALIBRATION

Certificate No.: 16CA1117 01-02

Page: 1 of 2

Item tested

Description: Acoustical Calibrator (Class 1)
Manufacturer: Rion Co., Ltd.
Type/Model No.: NC-73
Serial/Equipment No.: 10707358
Adaptors used: -

Item submitted by

Customer: Lam Geotechnics Ltd.
Address of Customer: -
Request No.: -
Date of receipt: 17-Nov-2016

Date of test: 18-Nov-2016

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2412857	14-Apr-2017	SCL
Preamplifier	B&K 2673	2239857	28-Apr-2017	CEPREI
Measuring amplifier	B&K 2610	2346941	26-Apr-2017	CEPREI
Signal generator	DS 360	61227	18-Apr-2017	CEPREI
Digital multi-meter	34401A	US36087050	18-Apr-2017	CEPREI
Audio analyzer	8903B	GB41300350	19-Apr-2017	CEPREI
Universal counter	53132A	MY40003662	19-Apr-2017	CEPREI

Ambient conditions

Temperature: 23 ± 1 °C
Relative humidity: 50 ± 10 %
Air pressure: 1005 ± 5 hPa

Test specifications

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

Test results

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

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

Approved Signatory:

Huang Jian Min/Feng Jun Qi

Date: 21-Nov-2016

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.:

16CA1117 01-02

Page: 2 of 2

1, Measured Sound Pressure Level

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

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	94.12	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 = 0.002 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 = 991.6 Hz

Estimated expanded uncertainty 0.1 Hz Coverage factor k = 2.2

4, Total Noise and Distortion

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

At 1000 Hz TND = 0.6 %

Estimated expanded uncertainty 0.7 %

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

- End -

Calibrated by: _____	Checked by: _____
Fung Chi Yip	Lam Tze Wai
Date: 18-Nov-2016	Date: 21-Nov-2016

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 2016009653

Customer: _____

Model Number	CAL200	Procedure Number	D0001.8386
Serial Number	13437	Technician	Scott Montgomery
Test Results	Pass	Calibration Date	2 Nov 2016
Initial Condition	As Manufactured	Calibration Due	
Description	Larson Davis CAL200 Acoustic Calibrator	Temperature	25 °C ± 0.3 °C
		Humidity	28 %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 60942:2003 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	09/07/2016	09/07/2017	001021
Sound Level Meter / Real Time Analyzer	04/07/2016	04/07/2017	001051
Microphone Calibration System	08/17/2016	08/17/2017	005446
1/2" Preamplifier	10/06/2016	10/06/2017	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/22/2016	08/22/2017	006507
1/2 inch Microphone - RI - 200V	03/15/2016	03/15/2017	006510
Pressure Transducer	07/01/2016	07/01/2017	007368

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



Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
94	101.2	94.01	93.80	94.20	0.14	Pass
114	101.5	114.01	113.80	114.20	0.13	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
94	101.2	1,000.15	990.00	1,010.00	0.20	Pass
114	101.5	1,000.11	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
94	101.2	0.69	0.00	2.00	0.25	Pass
114	101.5	0.38	0.00	2.00	0.25	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 22 °C, 33 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
101.3	101.3	0.00	-0.30	0.30	0.04 ‡	Pass
92.0	91.5	0.00	-0.30	0.30	0.04 ‡	Pass
108.0	107.8	-0.01	-0.30	0.30	0.04 ‡	Pass
83.0	83.1	-0.02	-0.30	0.30	0.04 ‡	Pass
74.0	73.9	-0.08	-0.30	0.30	0.04 ‡	Pass
65.0	64.9	-0.17	-0.30	0.30	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 22 °C, 33 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	107.8	0.00	-10.00	10.00	0.20 ‡	Pass
101.3	101.3	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	91.5	0.00	-10.00	10.00	0.20 ‡	Pass
83.0	83.1	-0.01	-10.00	10.00	0.20 ‡	Pass
74.0	73.9	-0.01	-10.00	10.00	0.20 ‡	Pass
65.0	64.9	-0.01	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 22 °C, 33 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
83.0	83.1	0.40	0.00	2.00	0.25 ±	Pass
108.0	107.8	0.36	0.00	2.00	0.25 ±	Pass
101.3	101.3	0.37	0.00	2.00	0.25 ±	Pass
92.0	91.5	0.39	0.00	2.00	0.25 ±	Pass
74.0	73.9	0.43	0.00	2.00	0.25 ±	Pass
65.0	64.9	0.47	0.00	2.00	0.25 ±	Pass

-- End of measurement results--

Signatory: Scott Montgomery

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





TISCH ENVIRONMENTAL, INC.
 145 SOUTH MIAMI AVE
 VILLAGE OF CLEVELAND, OH
 45002
 513.467.9000
 877.263.7610 TOLL FREE
 513.467.9009 FAX

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - May 20, 2016 Rootmeter S/N 0438320 Ta (K) - 293
 Operator Tisch Orifice I.D. - 3166 Pa (mm) - 748.03

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER	ORFICE
					DIFF Hg (mm)	DIFF H2O (in.)
1	NA	NA	1.00	1.4270	3.2	2.00
2	NA	NA	1.00	1.0220	6.4	4.00
3	NA	NA	1.00	0.9100	7.9	5.00
4	NA	NA	1.00	0.8730	8.8	5.50
5	NA	NA	1.00	0.7180	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9967	0.6985	1.4150	0.9957	0.6977	0.8851
0.9925	0.9711	2.0010	0.9915	0.9701	1.2517
0.9904	1.0883	2.2372	0.9893	1.0872	1.3995
0.9892	1.1332	2.3464	0.9882	1.1320	1.4678
0.9840	1.3705	2.8299	0.9830	1.3691	1.7702
Qstd slope (m) = 2.10714			Qa slope (m) = 1.31946		
intercept (b) = -0.05158			intercept (b) = -0.03226		
coefficient (r) = 0.99978			coefficient (r) = 0.99978		
y axis = SQRT[H2O(Pa/760)(298/Ta)]			y axis = SQRT[H2O(Ta/Pa)]		

CALCULATIONS

Vstd = Diff. Vol [(Pa-Diff. Hg)/760] (298/Ta)
 Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]
 Qa = Va/Time

For subsequent flow rate calculations:

Qstd = 1/m { [SQRT(H2O(Pa/760)(298/Ta))] - b }
 Qa = 1/m { [SQRT H2O(Ta/Pa)] - b }



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ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 20, 2017 Rootsmeter S/N 0438320 Ta (K) - 293
 Operator Tisch Orifice I.D. - 0005 Pa (mm) - 759.46

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3960	3.2	2.00
2	NA	NA	1.00	0.9970	6.4	4.00
3	NA	NA	1.00	0.8910	7.8	5.00
4	NA	NA	1.00	0.8500	8.7	5.50
5	NA	NA	1.00	0.6990	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
1.0120	0.7249	1.4257	0.9958	0.7133	0.8784
1.0078	1.0108	2.0163	0.9916	0.9946	1.2423
1.0058	1.1288	2.2543	0.9896	1.1107	1.3889
1.0047	1.1820	2.3643	0.9885	1.1630	1.4567
0.9993	1.4296	2.8514	0.9832	1.4066	1.7568
Qstd slope (m) = 2.02533			Qa slope (m) = 1.26823		
intercept (b) = -0.03593			intercept (b) = -0.02214		
coefficient (r) = 0.99983			coefficient (r) = 0.99983		
y axis = SQRT[H2O(Pa/760)(298/Ta)]			y axis = SQRT[H2O(Ta/Pa)]		

CALCULATIONS

$$Vstd = \text{Diff. Vol} [(Pa - \text{Diff. Hg}) / 760] (298 / Ta)$$

$$Qstd = Vstd / \text{Time}$$

$$Va = \text{Diff Vol} [(Pa - \text{Diff Hg}) / Pa]$$

$$Qa = Va / \text{Time}$$

For subsequent flow rate calculations:

$$Qstd = 1/m \{ [\text{SQRT} (H2O (Pa/760) (298/Ta))] - b \}$$

$$Qa = 1/m \{ [\text{SQRT} H2O (Ta/Pa)] - b \}$$



Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA1b
 Equipment no. : HVS001

Calibration Date : 13-Apr-17
 Calibration Due Date : 13-Jun-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T_a	293	Kelvin	Pressure, P_a
			1017 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori002	Slope, m_c	2.10714	Intercept, b_c	-0.05158
Last Calibration Date	20-May-16	$\left(H \times P_a / 1013.3 \times 298 / T_a \right)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	20-May-17				

Calibration of TSP						
Calibration Point	Manometer Reading H (inches of water)			Q_{std} ($m^3 / min.$) X-axis	Continuous Flow Recorder, W (CFM)	IC ($W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31$) Y-axis
	(up)	(down)	(difference)			
1	1.6	1.6	3.2	0.8822	30	30.3101
2	2.9	2.9	5.8	1.1792	38	38.3928
3	3.8	3.8	7.6	1.3463	46	46.4755
4	4.8	4.8	9.6	1.5101	52	52.5375
5	6.4	6.4	12.8	1.7399	58	58.5995

By Linear Regression of Y on X

Slope, m = 34.2668 Intercept, b = -0.3651
 Correlation Coefficient* = 0.9948
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been

re-assigned from EL452 to HVS001 with respect to the update in quality management system.

Calibrated by : Jackey MA
 Date : 13-Apr-17

Checked by : Pauline Wong
 Date : 13-Apr-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA1b
 Equipment no. : HVS001

Calibration Date : 07-Jun-17
 Calibration Due Date : 07-Aug-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T_a	293	Kelvin	Pressure, P_a
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori001	Slope, m_c	2.02533	Intercept, b_c	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $m_c \times Q_{std} + b_c$			
Next Calibration Date	20-Mar-18				

Calibration of TSP						
Calibration Point	Manometer Reading			Q_{std} ($m^3 / \text{min.}$) X-axis	Continuous Flow Recorder, W (CFM)	IC ($W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31$) Y-axis
	(up)	(down)	(difference)			
1	1.5	1.5	3.0	0.8788	28	28.1919
2	2.3	2.3	4.6	1.0840	36	36.2467
3	3.7	3.7	7.4	1.3701	46	46.3152
4	4.7	4.7	9.4	1.5419	52	52.3563
5	5.9	5.9	11.8	1.7254	60	60.4112

By Linear Regression of Y on X

Slope, m = 37.3597 Intercept, b = -4.6120
 Correlation Coefficient* = 0.9993
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL452 to HVS001 with respect to the update in quality management system.

Calibrated by : Jackey MA
 Date : 07-Jun-17

Checked by : Pauline Wong
 Date : 07-Jun-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA2a Calibration Date : 13-Apr-17
 Equipment no. : HVS002 Calibration Due Date : 13-Jun-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T _a	293	Kelvin	Pressure, P _a	1017	mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori002	Slope, m _c	2.10714	Intercept, b _c	-0.05158
Last Calibration Date	20-May-16	$\left(H \times P_a / 1013.3 \times 298 / T_a \right)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	20-May-17				

Calibration of TSP						
Calibration Point	Manometer Reading H (inches of water)			Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.5	1.5	3.0	0.8550	32	32.3307
2	2.3	2.3	4.6	1.0529	40	40.4134
3	3.8	3.8	7.6	1.3463	46	46.4755
4	5.1	5.1	10.2	1.5558	52	52.5375
5	6.5	6.5	13.0	1.7533	56	56.5788

By Linear Regression of Y on X

Slope, m = 26.2984 Intercept, b = 11.1467
 Correlation Coefficient* = 0.9934
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL449 to HVS002 with respect to the update in quality management system.

Calibrated by : Jackey MA Checked by : Pualine Wong
 Date : 13-Apr-17 Date : 13-Apr-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA2a **Calibration Date** : 07-Jun-17
Equipment no. : HVS002 **Calibration Due Date** : 07-Aug-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T_a	303	Kelvin	Pressure, P_a
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori001	Slope, m_c	2.02533	Intercept, b_c	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $m_c \times Q_{std} + b_c$			
Next Calibration Date	20-Mar-18				

Calibration of TSP						
Calibration Point	Manometer Reading			Q_{std} ($m^3 / \text{min.}$) X-axis	Continuous Flow Recorder, W (CFM)	IC ($W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31$) Y-axis
	(up)	(down)	(difference)			
1	1.5	1.5	3.0	0.8645	30	29.7030
2	2.5	2.5	5.0	1.1109	39	38.6138
3	4.0	4.0	8.0	1.4004	47	46.5346
4	5.2	5.2	10.4	1.5943	53	52.4752
5	6.4	6.4	12.8	1.7667	60	59.4059

By Linear Regression of Y on X

Slope, m = 31.8963 Intercept, b = 2.3711
 Correlation Coefficient* = 0.9982
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been
 re-assigned from EL449 to HVS002 with respect to the update in quality management system.

Calibrated by : Jackey MA **Checked by** : Pualine Wong
Date : 07-Jun-17 **Date** : 07-Jun-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA3a
 Equipment no. : HVS012
 Calibration Date : 20-Apr-17
 Calibration Due Date : 20-Jun-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T _a	299	Kelvin	Pressure, P _a
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori002	Slope, m _c	2.10714	Intercept, b _c	-0.05158
Last Calibration Date	20-May-16	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	20-May-17				

Calibration of TSP						
Calibration Point	Manometer Reading			Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.3	1.3	2.6	0.7872	31	30.8977
2	2.2	2.2	4.4	1.0167	36	35.8812
3	3.5	3.5	7.0	1.2759	43	42.8581
4	4.5	4.5	9.0	1.4435	48	47.8416
5	5.3	5.3	10.6	1.5645	54	53.8218

By Linear Regression of Y on X

Slope, m = 28.6680 Intercept, b = 7.3550
 Correlation Coefficient* = 0.9911
 Calibration Accepted = Yes/Ne**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL333 to HVS012 with respect to the update in quality management system.

Calibrated by : Jackey MA Checked by : Pauline Wong
 Date : 20-Apr-17 Date : 20-Apr-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA3a
 Equipment no. : HVS012
 Calibration Date : 16-Jun-17
 Calibration Due Date : 16-Aug-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T _a	302	Kelvin	Pressure, P _a
			1005 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori001	Slope, m _c	2.02533	Intercept, b _c	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $m_c \times Q_{std} + b_c$			
Next Calibration Date	20-Mar-18				

Calibration of TSP						
Calibration Point	Manometer Reading			Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.3	1.3	2.6	0.8053	34	33.6355
2	2.2	2.2	4.4	1.0423	40	39.5711
3	3.4	3.4	6.8	1.2915	46	45.5068
4	4.5	4.5	9.0	1.4831	51	50.4532
5	5.7	5.7	11.4	1.6669	55	54.4103

By Linear Regression of Y on X

Slope, m = 24.2490 Intercept, b = 14.2141
 Correlation Coefficient* = 0.9997
 Calibration Accepted = Yes/Ne**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been

re-assigned from EL333 to HVS012 with respect to the update in quality management system.

Calibrated by : Jackey MA Checked by : Pauline Wong
 Date : 16-Jun-17 Date : 16-Jun-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA4a Calibration Date : 20-Apr-17
 Equipment no. : HVS004 Calibration Due Date : 20-Jun-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition				
Temperature, T _a	299	Kelvin	Pressure, P _a	1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori002	Slope, m _c	2.10714	Intercept, b _c	-0.05158
Last Calibration Date	20-May-16	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	20-May-17				

Calibration of TSP						
Calibration Point	Manometer Reading H (inches of water)			Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.2	1.2	2.4	0.7573	35	34.8845
2	1.8	1.8	3.6	0.9220	41	40.8647
3	2.9	2.9	5.8	1.1636	48	47.8416
4	3.8	3.8	7.6	1.3285	53	52.8251
5	5.0	5.0	10.0	1.5203	57	56.8119

By Linear Regression of Y on X

Slope, m = 28.8782 Intercept, b = 13.7729
 Correlation Coefficient* = 0.9965
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL390 to HVS004 with respect to the update in quality management system.

Calibrated by : Jackey MA Checked by : Pauline Wong
 Date : 20-Apr-17 Date : 20-Apr-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA4a Calibration Date : 16-Jun-17
 Equipment no. : HVS004 Calibration Due Date : 16-Aug-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition				
Temperature, T _a	302	Kelvin	Pressure, P _a	1005 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori001	Slope, m _c	2.02533	Intercept, b _c	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $m_c \times Q_{std} + b_c$			
Next Calibration Date	20-Mar-18				

Calibration of TSP						
Calibration Point	Manometer Reading			Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.4	1.4	2.8	0.8351	24	23.7427
2	2.3	2.3	4.6	1.0654	33	32.6462
3	3.4	3.4	6.8	1.2915	42	41.5497
4	4.5	4.5	9.0	1.4831	48	47.4854
5	5.6	5.6	11.2	1.6524	52	51.4425

By Linear Regression of Y on X

Slope, m = 34.4301 Intercept, b = -4.1975
 Correlation Coefficient* = 0.9958
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL390 to HVS004 with respect to the update in quality management system.

Calibrated by : Jackey MA Checked by : Pauline Wong
 Date : 16-Jun-17 Date : 16-Jun-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA5b
 Equipment no. : HVS010

Calibration Date : 21-Apr-17
 Calibration Due Date : 21-Jun-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T_a	299	Kelvin	Pressure, P_a
			1008 mmHg

Orifice Transfer Standard Information				
Equipment No.	Ori002	Slope, m_c	2.10714	Intercept, b_c
				-0.05158
Last Calibration Date	20-May-16	$\left(H \times P_a / 1013.3 \times 298 / T_a \right)^{1/2}$ $= m_c \times Q_{std} + b_c$		
Next Calibration Date	20-May-17			

Calibration of TSP						
Calibration Point	Manometer Reading			Q_{std} ($m^3 / min.$) X-axis	Continuous Flow Recorder, W (CFM)	IC $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$ Y-axis
	H (inches of water)	(up)	(down)			
1	1.4	1.4	2.8	0.8152	38	37.8371
2	2.1	2.1	4.2	0.9929	44	43.8113
3	3.3	3.3	6.6	1.2385	52	51.7770
4	4.3	4.3	8.6	1.4102	57	56.7556
5	5.5	5.5	11.0	1.5917	62	61.7341

By Linear Regression of Y on X

Slope, m = 30.8725 Intercept, b = 13.0364
 Correlation Coefficient* = 0.9991
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL222 to HVS010 with respect to the update in quality management system.

Calibrated by : Jackey MA
 Date : 21-Apr-17

Checked by : Pauline Wong
 Date : 21-Apr-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA5b
 Equipment no. : HVS010

Calibration Date : 16-Jun-17
 Calibration Due Date : 16-Aug-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T_a	302	Kelvin	Pressure, P_a
			1005 mmHg

Orifice Transfer Standard Information				
Equipment No.	Ori001	Slope, m_c	2.02533	Intercept, b_c
				-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$		
Next Calibration Date	20-Mar-18			

Calibration of TSP						
Calibration Point	Manometer Reading			Q_{std} ($m^3 / min.$) X-axis	Continuous Flow Recorder, W (CFM)	IC ($W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31$) Y-axis
	(up)	(down)	(difference)			
1	1.4	1.4	2.8	0.8351	36	35.6140
2	2.2	2.2	4.4	1.0423	42	41.5497
3	3.5	3.5	7.0	1.3101	50	49.4639
4	4.5	4.5	9.0	1.4831	56	55.3996
5	5.6	5.6	11.2	1.6524	61	60.3460

By Linear Regression of Y on X

Slope, m = 30.4653 Intercept, b = 9.9483
 Correlation Coefficient* = 0.9996
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL222 to HVS010 with respect to the update in quality management system.

Calibrated by : Jackey MA
 Date : 16-Jun-17

Checked by : Pauline Wong
 Date : 16-Jun-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : MA1e
 Equipment no. : HVS007

Calibration Date : 21-Apr-17
 Calibration Due Date : 21-Jun-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T _a	299	Kelvin	Pressure, P _a
			1008 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori002	Slope, m _c	2.10714	Intercept, b _c	-0.05158
Last Calibration Date	20-May-16	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	20-May-17				

Calibration of TSP						
Calibration Point	Manometer Reading			Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.5	1.5	3.0	0.8429	29	28.8757
2	2.3	2.3	4.6	1.0380	38	37.8371
3	3.6	3.6	7.2	1.2924	48	47.7942
4	4.5	4.5	9.0	1.4421	56	55.7599
5	5.1	5.1	10.2	1.5337	64	63.7256

By Linear Regression of Y on X

Slope, m = 48.0836 Intercept, b = -12.3359
 Correlation Coefficient* = 0.9925
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL455 to HVS007 with respect to the update in quality management system.

Calibrated by : Jackey MA
 Date : 21-Apr-17

Checked by : Pauline Wong
 Date : 21-Apr-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : MA1e
 Equipment no. : HVS007

Calibration Date : 16-Jun-17
 Calibration Due Date : 16-Aug-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T _a	302	Kelvin	Pressure, P _a
			1005 mmHg

Orifice Transfer Standard Information			
Equipment No.	Ori001	Slope, m _c	2.02533
		Intercept, b _c	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $m_c \times Q_{std} + b_c$	
Next Calibration Date	20-Mar-18		

Calibration of TSP						
Calibration Point	Manometer Reading			Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.5	1.5	3.0	0.8638	22	21.7641
2	2.4	2.4	4.8	1.0879	30	29.6784
3	3.9	3.9	7.8	1.3819	38	37.5926
4	4.9	4.9	9.8	1.5468	44	43.5283
5	5.9	5.9	11.8	1.6956	50	49.4639

By Linear Regression of Y on X

Slope, m = 32.3712 Intercept, b = -6.1694
 Correlation Coefficient* = 0.9979
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL455 to HVS007 with respect to the update in quality management system.

Calibrated by : Jackey MA
 Date : 16-Jun-17

Checked by : Pauline Wong
 Date : 16-Jun-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : MA1w
 Equipment no. : HVS008

Calibration Date : 21-Apr-17
 Calibration Due Date : 21-Jun-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T _a	299	Kelvin	Pressure, P _a
			1008 mmHg

Orifice Transfer Standard Information				
Equipment No.	Ori002	Slope, m _c	2.10714	Intercept, b _c
				-0.05158
Last Calibration Date	20-May-16	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$		
Next Calibration Date	20-May-17			

Calibration of TSP						
Calibration Point	Manometer Reading			Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.5	1.5	3.0	0.8429	20	19.9142
2	2.4	2.4	4.8	1.0598	28	27.8799
3	3.8	3.8	7.6	1.3272	38	37.8371
4	5.0	5.0	10.0	1.5188	44	43.8113
5	6.4	6.4	12.8	1.7151	50	49.7856

By Linear Regression of Y on X

Slope, m = 34.4344 Intercept, b = -8.6696
 Correlation Coefficient* = 0.9989
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL080 to HVS008 with respect to the update in quality management system.

Calibrated by : Jackey MA
 Date : 21-Apr-17

Checked by : Pauline Wong
 Date : 21-Apr-17



Calibration Data for High Volume Sampler (TSP Sampler)

Location : MA1w
 Equipment no. : HVS008

Calibration Date : 16-Jun-17
 Calibration Due Date : 16-Aug-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T _a	302	Kelvin	Pressure, P _a
			1005 mmHg

Orifice Transfer Standard Information			
Equipment No.	Ori001	Slope, m _c	2.02533
		Intercept, b _c	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$	
Next Calibration Date	20-Mar-18		

Calibration of TSP						
Calibration Point	Manometer Reading			Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.5	1.5	3.0	0.8638	32	31.6569
2	2.4	2.4	4.8	1.0879	37	36.6033
3	3.7	3.7	7.4	1.3465	47	46.4961
4	4.9	4.9	9.8	1.5468	54	53.4211
5	6.2	6.2	12.4	1.7378	62	61.3353

By Linear Regression of Y on X

Slope, m = 34.4342 Intercept, b = 0.5683
 Correlation Coefficient* = 0.9957
 Calibration Accepted = Yes/No**

* if Correlation Coefficient < 0.990, check and recalibration again.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL080 to HVS008 with respect to the update in quality management system.

Calibrated by : Jackey MA
 Date : 16-Jun-17

Checked by : Pauline Wong
 Date : 16-Jun-17