



## CERTIFICATE OF CALIBRATION

Certificate No.: 15CA1203 04-01 Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type 1)	Microphone
Manufacturer:	B & K	B & K
Type/Model No.:	2236	4188
Serial/Equipment No.:	2100736	2288941
Adaptors used:	-	-

### Item submitted by

Customer Name: Lam Geotechnics Limited  
Address of Customer: -  
Request No.: -  
Date of receipt: 03-Dec-2015

Date of test: 04-Dec-2015

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	19-Jun-2016	CIGISMEC
Signal generator	DS 360	33873	16-Apr-2016	CEPREI
Signal generator	DS 360	61227	16-Apr-2016	CEPREI

### Ambient conditions

Temperature:  $22 \pm 1$  °C  
Relative humidity:  $50 \pm 10$  %  
Air pressure:  $1010 \pm 10$  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:

Huang Jian Min/Feng Jun Qi

Date: 05-Dec-2015

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.: 15CA1203 04-01 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	1.0	
	Lin	Pass	2.0	
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	
	A	Pass	0.3	
	C	Pass	0.3	
Frequency weightings	Lin	Pass	0.3	
	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	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.

Calibrated by:  - End -  
Date: 04-Dec-2015

Checked by:   
Date: 05-Dec-2015

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.: 16CA0413 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 Limited  
Address of Customer: -  
Request No.: -  
Date of receipt: 13-Apr-2016

Date of test: 09-May-2016

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	19-Jun-2016	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: 1005 ± 5 hPa

### Test specifications

1. The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
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 Jian Min/Feng Jun Qi

Date: 10-May-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.: 16CA0413 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	
	A	Pass	0.3	
Frequency weightings	C	Pass	0.3	
	Lin	Pass	0.3	
	Time weightings	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 <sup>3</sup> at 4kHz	Pass	0.3	
Pulse range	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
	Overload indication	SPL	Pass	0.3
	Leq	Pass	0.4	

### 2, Acoustic tests


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

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


### 3, Response to associated sound calibrator

N/A

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

Calibrated by:   
Date: 09-May-2016

- End -

Checked by:   
Date: 10-May-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.: 16CA0519 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.:	2722311	2698703	13321
Adaptors used:	-	-	-

### Item submitted by

Customer Name: Lam Geotechnics Limited  
Address of Customer: -  
Request No.: -  
Date of receipt: 19-May-2016

Date of test: 21-May-2016

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	19-Jun-2016	CIGISMEC
Signal generator	DS 360	33873	18-Apr-2017	CEPREI
Signal generator	DS 360	61227	18-Apr-2017	CEPREI

### Ambient conditions

Temperature:  $21 \pm 1$  °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 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 Ming/Feng Jun Qi

Date: 23-May-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.: 16CA0519 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	
	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 <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.

Calibrated by:

Date: 21-May-2016

Fung Chi Yip

- End -

Checked by:

Date: 23-May-2016

Lam Tze Wai

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.: 16CA0307 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	19556
Adaptors used:	-	-	-

### Item submitted by

Customer Name: Lam Geotechnics Ltd.  
Address of Customer: -  
Request No.: -  
Date of receipt: 07-Mar-2016

Date of test: 08-Mar-2016

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	19-Jun-2016	CIGISMEC
Signal generator	DS 360	33873	16-Apr-2016	CEPREI
Signal generator	DS 360	61227	16-Apr-2016	CEPREI

### Ambient conditions

Temperature:  $21 \pm 1$  °C  
Relative humidity:  $50 \pm 10$  %  
Air pressure:  $1010 \pm 5$  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 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 Jian Min/Feng Jun Qi

Date: 09-Mar-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.: 16CA0307 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	
	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 <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 -

<p>Calibrated by:  Fung Chi Yip Date: 08-Mar-2016</p>	<p>Checked by:  Lam Tze Wai Date: 09-Mar-2016</p>
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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.: 16CA0127 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.:	3002695	2940839	18582
Adaptors used:	-	-	-

### Item submitted by

Customer Name: Lam Geotechnics Ltd.  
Address of Customer: -  
Request No.: -  
Date of receipt: 27-Jan-2016

Date of test: 28-Jan-2016

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	19-Jun-2016	CIGISMEC
Signal generator	DS 360	33873	16-Apr-2016	CEPREI
Signal generator	DS 360	61227	16-Apr-2016	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 ±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: 29-Jan-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.: 16CA0127 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	
	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:		Checked by:	
Date:	Fung Chi Yip 28-Jan-2016	Date:	Lam Tze Wai 29-Jan-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.: 16CA0513 01-02

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### Item tested

Description: Acoustical Calibrator (Class 1)  
Manufacturer: Rion Co., Ltd.  
Type/Model No.: NC-73  
Serial/Equipment No.: 10465798  
Adaptors used: -

### Item submitted by

Customer: Lam Geotechnics Ltd.  
Address of Customer: -  
Request No.: -  
Date of receipt: 13-May-2016

Date of test: 17-May-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:  $22 \pm 1$  °C  
Relative humidity:  $55 \pm 10$  %  
Air pressure:  $1010 \pm 5$  hPa

### Test specifications

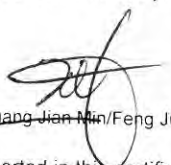
- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results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

### Test results

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

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

Approved Signatory:

  
Huang Jian Min/Feng Jun Qi

Date: 18-May-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

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Certificate No.: 16CA0513 01-02

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## 1, Measured Sound Pressure Level

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

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	(Output level in dB re 20 µPa)	
			Estimated	Expanded Uncertainty dB
1000	94.00	93.96	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 = 0.001 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 = 967.3 Hz  
 Estimated expanded uncertainty 0.1 Hz Coverage factor k = 2.2

## 4, Total Noise and Distortion

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

At 1000 Hz TND = 0.8 %  
 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  
17-May-2016

End

Checked by:

Date:

Lam Tze Wai  
18-May-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.





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ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - May 20, 2016 Rootsmeter 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

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

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

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

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

For subsequent flow rate calculations:

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

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



## Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA1b  
 Equipment no. : HVS001

Calibration Date : 13-Jul-16  
 Calibration Due Date : 13-Sep-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1005 mmHg

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

Calibration of TSP						
Calibration Point	Manometer Reading			Q <sub>std</sub> (m <sup>3</sup> / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31) Y-axis
	(up)	(down)	(difference)			
1	5.6	5.6	11.2	1.5957	54	53.4211
2	4.4	4.4	8.8	1.4172	48	47.4854
3	3.6	3.6	7.2	1.2842	42	41.5497
4	2.5	2.5	5.0	1.0743	34	33.6355
5	1.6	1.6	3.2	0.8643	28	27.6998

By Linear Regression of Y on X

Slope, m = 36.0048      Intercept, b = -4.1452  
 Correlation Coefficient\* = 0.9976  
 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 : Kit Au  
 Date : 13-Jul-16

Checked by : Pauline Wong  
 Date : 13-Jul-16





## Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA1b  
 Equipment no. : HVS001

Calibration Date : 12-Sep-16  
 Calibration Due Date : 13-Nov-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714	Intercept, b <sub>c</sub>	-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 <sub>std</sub> (m <sup>3</sup> / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.2	1.2	2.4	0.7536	12	11.9008
2	2.2	2.2	4.4	1.0117	20	19.8347
3	3.5	3.5	7.0	1.2697	26	25.7852
4	4.5	4.5	9.0	1.4364	30	29.7521
5	5.5	5.5	11.0	1.5855	34	33.7190

By Linear Regression of Y on X

Slope, m = 25.7206      Intercept, b = -6.9594  
 Correlation Coefficient\* = 0.9984  
 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 : 12-Sep-16

Checked by : Pauline Wong  
 Date : 12-Sep-16



### Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA2a  
 Equipment no. : HVS002

Calibration Date : 13-Jul-16  
 Calibration Due Date : 13-Sep-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

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

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

Calibration of TSP						
Calibration Point	Manometer Reading			$Q_{std}$ ( $m^3 / \text{min.}$ ) 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	6.8	6.8	13.6	1.7559	58	57.3782
2	5.5	5.5	11.0	1.5816	52	51.4425
3	4.2	4.2	8.4	1.3852	46	45.5068
4	2.9	2.9	5.8	1.1552	38	37.5926
5	1.6	1.6	3.2	0.8643	30	29.6784

By Linear Regression of Y on X

Slope, m = 31.2362      Intercept, b = 2.1999  
 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 EL449 to HVS002 with respect to the update in quality management system.

Calibrated by : Kit Au  
 Date : 13-Jul-16

Checked by : Pualine Wong  
 Date : 13-Jul-16





## Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA2a  
 Equipment no. : HVS002

Calibration Date : 12-Sep-16  
 Calibration Due Date : 13-Nov-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1010 mmHg

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

Calibration of TSP						
Calibration Point	Manometer Reading			Q <sub>std</sub> (m <sup>3</sup> / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.4	1.4	2.8	0.8120	28	27.7686
2	2.3	2.3	4.6	1.0339	34	33.7190
3	4.3	4.3	8.6	1.4047	44	43.6364
4	4.9	4.9	9.8	1.4979	48	47.6034
5	6.0	6.0	12.0	1.6549	56	55.5372

By Linear Regression of Y on X

Slope, m = 31.4606      Intercept, b = 1.3620  
 Correlation Coefficient\* = 0.9900  
 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  
 Date : 12-Sep-16

Checked by : Pualine Wong  
 Date : 12-Sep-16



## Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA3a  
 Equipment no. : HVS012  
 Calibration Date : 13-Jul-16  
 Calibration Due Date : 13-Sep-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1005 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714	Intercept, b <sub>c</sub>	-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 <sub>std</sub> (m <sup>3</sup> / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31) Y-axis
	(up)	(down)	(difference)			
1	5.4	5.4	10.8	1.5674	52	51.4425
2	4.4	4.4	8.8	1.4172	48	47.4854
3	3.4	3.4	6.8	1.2488	42	41.5497
4	2.4	2.4	4.8	1.0531	38	37.5926
5	1.4	1.4	2.8	0.8101	30	29.6784

By Linear Regression of Y on X

Slope, m = 28.4435      Intercept, b = 6.8685  
 Correlation Coefficient\* = 0.9975  
 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 EL333 to HVS012 with respect to the update in quality management system.

Calibrated by : Kit Au      Checked by : Pauline Wong  
 Date : 13-Jul-16      Date : 13-Jul-16





## Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA3a Calibration Date : 12-Sep-16  
 Equipment no. : HVS012 Calibration Due Date : 13-Nov-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714	Intercept, b <sub>c</sub>	-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 <sub>std</sub> (m <sup>3</sup> / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.2	1.2	2.4	0.7536	24	23.8017
2	1.8	1.8	3.6	0.9175	32	31.7356
3	3.2	3.2	6.4	1.2152	40	39.6695
4	4.2	4.2	8.4	1.3886	45	44.6281
5	5.4	5.4	10.8	1.5712	50	49.5868

By Linear Regression of Y on X

Slope, m = 30.5105 Intercept, b = 2.2112  
 Correlation Coefficient\* = 0.9943  
 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 EL333 to HVS012 with respect to the update in quality management system.

Calibrated by : Jackey MA Checked by : Pauline Wong  
 Date : 12-Sep-16 Date : 12-Sep-16



## Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA4a  
 Equipment no. : HVS004

Calibration Date : 13-Jul-16  
 Calibration Due Date : 13-Sep-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1005 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714	Intercept, b <sub>c</sub>	-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 <sub>std</sub> (m <sup>3</sup> / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31) Y-axis
	(up)	(down)	(difference)			
1	5.5	5.5	11.0	1.5816	52	51.4425
2	4.4	4.4	8.8	1.4172	48	47.4854
3	3.4	3.4	6.8	1.2488	40	39.5711
4	2.1	2.1	4.2	0.9866	32	31.6569
5	1.5	1.5	3.0	0.8377	24	23.7427

By Linear Regression of Y on X

Slope, m = 37.0124      Intercept, b = -6.1671  
 Correlation Coefficient\* = 0.9947  
 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 : Kit Au  
 Date : 13-Jul-16

Checked by : Pauline Wong  
 Date : 13-Jul-16





## Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA4a  
 Equipment no. : HVS004

Calibration Date : 12-Sep-16  
 Calibration Due Date : 13-Nov-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714	Intercept, b <sub>c</sub>	-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 <sub>std</sub> (m <sup>3</sup> / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.4	1.4	2.8	0.8120	22	21.8182
2	2.2	2.2	4.4	1.0117	32	31.7356
3	3.4	3.4	6.8	1.2518	44	43.6364
4	4.4	4.4	8.8	1.4207	48	47.6034
5	5.5	5.5	11.0	1.5855	56	55.5372

By Linear Regression of Y on X

Slope, m = 42.7983      Intercept, b = -11.9911  
 Correlation Coefficient\* = 0.9952  
 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  
 Date : 12-Sep-16

Checked by : Pauline Wong  
 Date : 12-Sep-16



### Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA5b  
 Equipment no. : HVS010

Calibration Date : 13-Jul-16  
 Calibration Due Date : 13-Sep-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1005 mmHg

Orifice Transfer Standard Information					
Equipment No.	Orif002	Slope, m <sub>c</sub>	2.10714	Intercept, b <sub>c</sub>	-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 <sub>std</sub> (m <sup>3</sup> / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31) Y-axis
	(up)	(down)	(difference)			
1	5.5	5.5	11.0	1.5816	58	57.3782
2	4.3	4.3	8.6	1.4013	53	52.4318
3	3.4	3.4	6.8	1.2488	48	47.4854
4	2.2	2.2	4.4	1.0093	41	40.5604
5	1.4	1.4	2.8	0.8101	34	33.6355

By Linear Regression of Y on X

Slope, m = 30.6917      Intercept, b = 9.1551  
 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 EL222 to HVS010 with respect to the update in quality management system.

Calibrated by : Kit Au  
 Date : 13-Jul-16

Checked by : Pauline Wong  
 Date : 13-Jul-16





## Calibration Data for High Volume Sampler (TSP Sampler)

Location : CMA5b  
 Equipment no. : HVS010

Calibration Date : 12-Sep-16  
 Calibration Due Date : 13-Nov-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1010 mmHg

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

Calibration of TSP						
Calibration Point	Manometer Reading			Q <sub>std</sub> (m <sup>3</sup> / min.)	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	H (inches of water)	(up)	(down)			
1	1.4	1.4	2.8	0.8120	34	33.7190
2	2.2	2.2	4.4	1.0117	42	41.6529
3	3.4	3.4	6.8	1.2518	50	49.5868
4	4.4	4.4	8.8	1.4207	56	55.5372
5	5.6	5.6	11.2	1.5996	61	60.4959

By Linear Regression of Y on X

Slope, m = 34.0485                      Intercept, b = 6.6876  
 Correlation Coefficient\* = 0.9985  
 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 : 12-Sep-16

Checked by : Pauline Wong  
 Date : 12-Sep-16



## Calibration Data for High Volume Sampler (TSP Sampler)

Location : MA1w  
 Equipment no. : HVS008

Calibration Date : 13-Jul-16  
 Calibration Due Date : 13-Sep-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition		HK1610369	
Temperature, $T_a$	302	Kelvin	Pressure, $P_a$
			1005 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 ( $W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31$ ) Y-axis
	(up)	(down)	(difference)			
1	6.6	6.6	13.2	1.7302	58	57.3782
2	5.4	5.4	10.8	1.5674	52	51.4425
3	4.2	4.2	8.4	1.3852	44	43.5283
4	2.5	2.5	5.0	1.0743	32	31.6569
5	1.6	1.6	3.2	0.8643	22	21.7641

By Linear Regression of Y on X

Slope, m = 40.9142      Intercept, b = -13.0277  
 Correlation Coefficient\* = 0.9993  
 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 : Kit Au  
 Date : 13-Jul-16

Checked by : Pauline Wong  
 Date : 13-Jul-16





## Calibration Data for High Volume Sampler (TSP Sampler)

Location : MA1w  
 Equipment no. : HVS008

Calibration Date : 12-Sep-16  
 Calibration Due Date : 13-Nov-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition		HK1610369	
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1010 mmHg

Orifice Transfer Standard Information				
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714	Intercept, b <sub>c</sub>
				-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 <sub>std</sub>	Continuous Flow	IC
	H (inches of water)			(m <sup>3</sup> / min.)	Recorder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis
1	1.8	1.8	3.6	0.9175	24	23.8017
2	2.6	2.6	5.2	1.0977	32	31.7356
3	4.2	4.2	8.4	1.3886	44	43.6364
4	5.4	5.4	10.8	1.5712	52	51.5703
5	6.6	6.6	13.2	1.7345	58	57.5207

By Linear Regression of Y on X

Slope, m = 41.4475      Intercept, b = -13.9650  
 Correlation Coefficient\* = 0.9997  
 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 : 12-Sep-16

Checked by : Pauline Wong  
 Date : 12-Sep-16



## Calibration Data for High Volume Sampler (TSP Sampler)

Location : MA1e  
 Equipment no. : HVS007

Calibration Date : 13-Jul-16  
 Calibration Due Date : 13-Sep-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1005 mmHg

Orifice Transfer Standard Information			
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714
		Intercept, b <sub>c</sub>	-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 <sub>std</sub> (m <sup>3</sup> / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31) Y-axis
	(up)	(down)	(difference)			
1	6.6	6.6	13.2	1.7302	63	62.3246
2	5.4	5.4	10.8	1.5674	56	55.3996
3	4.3	4.3	8.6	1.4013	44	43.5283
4	2.4	2.4	4.8	1.0531	32	31.6569
5	1.6	1.6	3.2	0.8643	20	19.7856

By Linear Regression of Y on X

Slope, m = 47.8740      Intercept, b = -20.8106  
 Correlation Coefficient\* = 0.9942  
 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 : Kit Au  
 Date : 13-Jul-16

Checked by : Pauline Wong  
 Date : 13-Jul-16





## Calibration Data for High Volume Sampler (TSP Sampler)

Location : MA1e  
 Equipment no. : HVS007

Calibration Date : 12-Sep-16  
 Calibration Due Date : 13-Nov-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>
			1010 mmHg

Orifice Transfer Standard Information			
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714
		Intercept, b <sub>c</sub>	-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 <sub>std</sub> (m <sup>3</sup> / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31) Y-axis
	(up)	(down)	(difference)			
1	1.4	1.4	2.8	0.8120	19	18.8430
2	2.6	2.6	5.2	1.0977	31	30.7438
3	4.2	4.2	8.4	1.3886	44	43.6364
4	5.4	5.4	10.8	1.5712	54	53.5538
5	6.7	6.7	13.4	1.7474	62	61.4877

By Linear Regression of Y on X

Slope, m = 45.9175      Intercept, b = -19.1135  
 Correlation Coefficient\* = 0.9991  
 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 : 12-Sep-16

Checked by : Pauline Wong  
 Date : 12-Sep-16