



## 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.: 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 -

Calibrated by:		Checked by:	
Date:	08-Mar-2016	Date:	09-Mar-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.: 15CA0528 04-02 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	4950	ZC 0032
Serial/Equipment No.:	2722310	2698702	13312
Adaptors used:	-	-	-

### Item submitted by

Customer Name: Lam Geotechnics Ltd.  
Address of Customer: -  
Request No.: -  
Date of receipt: 28-May-2015

Date of test: 30-May-2015

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	20-Jun-2015	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: 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 ±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: 01-Jun-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

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Certificate No.: 15CA0528 04-02 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	2.1
	Lin	Pass	1.6	2.2
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	
	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	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: 30-May-2015	Date: 01-Jun-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.: 15CA0604 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	4950	ZC 0032
Serial/Equipment No.:	2722311	2698703	13321
Adaptors used:	-	-	-

### Item submitted by

Customer Name: Lam Geotechnics Ltd.  
Address of Customer: -  
Request No.: -  
Date of receipt: 04-Jun-2015

Date of test: 05-Jun-2015

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	20-Jun-2015	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: 1000 ± 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 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: 05-Jun-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.: 15CA0604 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	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Frequency weightings	A	Pass	
Time weightings	C	Pass	0.3	
	Lin	Pass	0.3	
	Single Burst Fast	Pass	0.3	
Peak response	Single Burst Slow	Pass	0.3	
	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

### 2, Acoustic tests

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

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

### 3, Response to associated sound calibrator

N/A

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

Calibrated by:

Date: 05-Jun-2015

Fung Chi Yip

- End -

Checked by:

Date: 05-Jun-2015

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.: 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

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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.: 15CA0528 04-03

Page: 1 of 2

### 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: 28-May-2015

Date of test: 30-May-2015

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	15-Apr-2016	SCL
Preamplifier	B&K 2673	2239857	22-Apr-2016	CEPREI
Measuring amplifier	B&K 2610	2346941	22-Apr-2016	CEPREI
Signal generator	DS 360	61227	16-Apr-2016	CEPREI
Digital multi-meter	34401A	US36087050	17-Apr-2016	CEPREI
Audio analyzer	8903B	GB41300350	17-Apr-2016	CEPREI
Universal counter	53132A	MY40003662	16-Apr-2016	CEPREI

### Ambient conditions

Temperature:  $21 \pm 1$  °C  
Relative humidity:  $60 \pm 10$  %  
Air pressure:  $1000 \pm 5$  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: 01-Jun-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.







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 - Jun 30, 2015 Roots-meter S/N 0438320 Ta (K) - 296  
 Operator Tisch Orifice I.D. - 0005 Pa (mm) - 749.3

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	1.3930	3.2	2.00
2	NA	NA	1.00	0.9800	6.4	4.00
3	NA	NA	1.00	0.8790	7.9	5.00
4	NA	NA	1.00	0.8350	8.7	5.50
5	NA	NA	1.00	0.6900	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9883	0.7095	1.4090	0.9957	0.7148	0.8889
0.9841	1.0042	1.9926	0.9915	1.0117	1.2570
0.9820	1.1172	2.2278	0.9894	1.1256	1.4054
0.9810	1.1749	2.3365	0.9884	1.1837	1.4740
0.9757	1.4141	2.8179	0.9830	1.4247	1.7777
Qstd slope (m) = 2.00072			Qa slope (m) = 1.25282		
intercept (b) = -0.01209			intercept (b) = -0.00763		
coefficient (r) = 0.99995			coefficient (r) = 0.99995		
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 - Jun 30, 2015 Rootsmeter S/N 0438320 Ta (K) - 296  
 Operator Tisch Orifice I.D. - 0005 Pa (mm) - 749.3

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	1.3930	3.2	2.00
2	NA	NA	1.00	0.9800	6.4	4.00
3	NA	NA	1.00	0.8790	7.9	5.00
4	NA	NA	1.00	0.8350	8.7	5.50
5	NA	NA	1.00	0.6900	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9883	0.7095	1.4090	0.9957	0.7148	0.8889
0.9841	1.0042	1.9926	0.9915	1.0117	1.2570
0.9820	1.1172	2.2278	0.9894	1.1256	1.4054
0.9810	1.1749	2.3365	0.9884	1.1837	1.4740
0.9757	1.4141	2.8179	0.9830	1.4247	1.7777
Qstd slope (m) = 2.00072			Qa slope (m) = 1.25282		
intercept (b) = -0.01209			intercept (b) = -0.00763		
coefficient (r) = 0.99995			coefficient (r) = 0.99995		
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}







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

Location : CMA1b Calibration Date : 18-May-16  
 Equipment no. : HVS001 Calibration Due Date : 18-Jul-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	299	Kelvin	Pressure, P <sub>a</sub>
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori001	Slope, m <sub>c</sub>	2.00072	Intercept, b <sub>c</sub>	-0.01209
Last Calibration Date	30-Jun-15	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	30-Jun-16				

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	6.3	6.3	12.6	1.7744	58	57.8086
2	4.9	4.9	9.8	1.5656	52	51.8284
3	3.5	3.5	7.0	1.3241	44	43.8548
4	2.5	2.5	5.0	1.1200	36	35.8812
5	1.5	1.5	3.0	0.8689	24	23.9208

By Linear Regression of Y on X

Slope, m = 37.1752 Intercept, b = -6.8058  
 Correlation Coefficient\* = 0.9946  
 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 Checked by : Pauline Wong  
 Date : 18-May-16 Date : 18-May-16





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

Location : CMA2a Calibration Date : 21-Mar-16  
 Equipment no. : HVS002 Calibration Due Date : 21-May-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	290	Kelvin	Pressure, P <sub>a</sub>
			1015 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori001	Slope, m <sub>c</sub>	2.00072	Intercept, b <sub>c</sub>	-0.01209
Last Calibration Date	30-Jun-15	$\left( H \times P_a / 1013.3 \times 298 / T_a \right)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	30-Jun-16				

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	6.8	6.8	13.6	1.8761	64	64.9312
2	5.4	5.4	10.8	1.6725	55	55.8002
3	4.1	4.1	8.2	1.4581	48	48.6984
4	2.8	2.8	5.6	1.2060	38	38.5529
5	1.8	1.8	3.6	0.9682	30	30.4365

By Linear Regression of Y on X

Slope, m = 37.7519 Intercept, b = -6.5353  
 Correlation Coefficient\* = 0.9990  
 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 Checked by : Pualine Wong  
 Date : 21-Mar-16 Date : 21-Mar-16



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

Location : CMA2a Calibration Date : 18-May-16  
 Equipment no. : HVS002 Calibration Due Date : 18-Jul-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	299	Kelvin	Pressure, P <sub>a</sub>
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori001	Slope, m <sub>c</sub>	2.00072	Intercept, b <sub>c</sub>	-0.01209
Last Calibration Date	30-Jun-15	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	30-Jun-16				

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	6.8	6.8	13.6	1.8432	58	57.8086
2	5.5	5.5	11.0	1.6583	52	51.8284
3	4.3	4.3	8.6	1.4670	44	43.8548
4	2.8	2.8	5.6	1.1849	38	37.8746
5	1.8	1.8	3.6	0.9513	32	31.8944

By Linear Regression of Y on X

Slope, m = 28.8731 Intercept, b = 3.6256  
 Correlation Coefficient\* = 0.9928  
 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 Checked by : Pualine Wong  
 Date : 18-May-16 Date : 18-May-16





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

Location : CMA3a Calibration Date : 21-Mar-16  
 Equipment no. : HVS012 Calibration Due Date : 21-May-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, $T_a$	290	Kelvin	Pressure, $P_a$
			1015 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori001	Slope, $m_c$	2.00072	Intercept, $b_c$	-0.01209
Last Calibration Date	30-Jun-15	$\left( H \times P_a / 1013.3 \times 298 / T_a \right)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	30-Jun-16				

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	7.0	7.0	14.0	1.9034	54	54.7857
2	5.6	5.6	11.2	1.7031	49	49.7129
3	4.2	4.2	8.4	1.4757	42	42.6111
4	3.1	3.1	6.2	1.2687	38	38.5529
5	1.8	1.8	3.6	0.9682	30	30.4365

By Linear Regression of Y on X

Slope, m = 25.9695 Intercept, b = 5.2051  
 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 EL333 to HVS012 with respect to the update in quality management system.

Calibrated by : Kit Au Checked by : Pauline Wong  
 Date : 21-Mar-16 Date : 21-Mar-16



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

Location : CMA3a Calibration Date : 18-May-16  
 Equipment no. : HVS012 Calibration Due Date : 18-Jul-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, $T_a$	299	Kelvin	Pressure, $P_a$	1010	mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori001	Slope, $m_c$	2.00072	Intercept, $b_c$	-0.01209
Last Calibration Date	30-Jun-15	$\left( H \times P_a / 1013.3 \times 298 / T_a \right)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	30-Jun-16				

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	6.0	6.0	12.0	1.7318	56	55.8152
2	4.8	4.8	9.6	1.5496	52	51.8284
3	4.0	4.0	8.0	1.4151	44	43.8548
4	2.8	2.8	5.6	1.1849	38	37.8746
5	1.7	1.7	3.4	0.9246	30	29.9010

By Linear Regression of Y on X

Slope, m = 32.9166 Intercept, b = -0.9510

Correlation Coefficient\* = 0.9925

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 : 18-May-16 Date : 18-May-16





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

Location : CMA4a Calibration Date : 21-Mar-16  
 Equipment no. : HVS004 Calibration Due Date : 21-May-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, $T_a$	290	Kelvin	Pressure, $P_a$
			1015 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori001	Slope, $m_c$	2.00072	Intercept, $b_c$	-0.01209
Last Calibration Date	30-Jun-15	$\left( H \times P_a / 1013.3 \times 298 / T_a \right)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	30-Jun-16				

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	7.9	7.9	15.8	2.0217	52	52.7566
2	6.8	6.8	13.6	1.8761	48	48.6984
3	5.4	5.4	10.8	1.6725	42	42.6111
4	3.8	3.8	7.6	1.4040	34	34.4947
5	2.1	2.1	4.2	1.0453	28	28.4074

By Linear Regression of Y on X

Slope, m = 25.5259 Intercept, b = 0.4522

Correlation Coefficient\* = 0.9928

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 Checked by : Pauline Wong  
 Date : 21-Mar-16 Date : 21-Mar-16



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

Location : CMA4a Calibration Date : 18-May-16  
 Equipment no. : HVS004 Calibration Due Date : 18-Jul-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, $T_a$	299	Kelvin	Pressure, $P_a$
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	Ori001	Slope, $m_c$	2.00072	Intercept, $b_c$	-0.01209
Last Calibration Date	30-Jun-15	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	30-Jun-16				

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	6.4	6.4	12.8	1.7884	54	53.8218
2	5.3	5.3	10.6	1.6280	50	49.8350
3	4.2	4.2	8.4	1.4499	44	43.8548
4	2.8	2.8	5.6	1.1849	32	31.8944
5	1.6	1.6	3.2	0.8972	22	21.9274

By Linear Regression of Y on X

Slope, m = 37.0104 Intercept, b = -11.1654  
 Correlation Coefficient\* = 0.9968  
 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 EL390 to HVS004 with respect to the update in quality management system.

Calibrated by : Kit Au Checked by : Pauline Wong  
 Date : 18-May-16 Date : 18-May-16





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

Location : CMA5b  
 Equipment no. : HVS010

Calibration Date : 21-Mar-16  
 Calibration Due Date : 21-May-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	290	Kelvin	Pressure, P <sub>a</sub>
			1015 mmHg

Orifice Transfer Standard Information			
Equipment No.	Ori001	Slope, m <sub>c</sub>	2.00072
		Intercept, b <sub>c</sub>	-0.01209
Last Calibration Date	30-Jun-15	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$	
Next Calibration Date	30-Jun-16	= 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	6.2	6.2	12.4	1.7917	64	64.9312
2	4.9	4.9	9.8	1.5935	58	58.8439
3	3.4	3.4	6.8	1.3284	54	54.7857
4	2.1	2.1	4.2	1.0453	46	46.6693
5	1.4	1.4	2.8	0.8546	40	40.5820

By Linear Regression of Y on X

Slope, m = 25.0375                      Intercept, b = 20.0458  
 Correlation Coefficient\* = 0.9942  
 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 : 21-Mar-16

Checked by : Pauline Wong  
 Date : 21-Mar-16



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

Location : CMA5b  
 Equipment no. : HVS010

Calibration Date : 21-May-16  
 Calibration Due Date : 21-Jul-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	299	Kelvin	Pressure, P <sub>a</sub>
			1010 mmHg

Orifice Transfer Standard Information			
Equipment No.	Ori001	Slope, m <sub>c</sub>	2.00072
		Intercept, b <sub>c</sub>	-0.01209
Last Calibration Date	30-Jun-15	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$	
Next Calibration Date	30-Jun-16	= 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	6.2	6.2	12.4	1.7603	64	63.7888
2	4.8	4.8	9.6	1.5496	58	57.8086
3	3.4	3.4	6.8	1.3051	54	53.8218
4	2.4	2.4	4.8	1.0975	46	45.8482
5	1.4	1.4	2.8	0.8396	40	39.8680

By Linear Regression of Y on X

Slope, m = 26.0254                      Intercept, b = 18.1230  
 Correlation Coefficient\* = 0.9942  
 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 : 21-May-16

Checked by : Pauline Wong  
 Date : 21-May-16





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

Location : MA1e  
 Equipment no. : HVS007

Calibration Date : 21-Mar-16  
 Calibration Due Date : 21-May-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, $T_a$	290	Kelvin	Pressure, $P_a$
			1015 mmHg

Orifice Transfer Standard Information			
Equipment No.	Ori001	Slope, $m_c$	2.00072
		Intercept, $b_c$	-0.01209
Last Calibration Date	30-Jun-15	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$	
Next Calibration Date	30-Jun-16		

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	6.2	6.2	12.4	1.7917	59	59.8584
2	5.3	5.3	10.6	1.6570	50	50.7275
3	4.0	4.0	8.0	1.4403	44	44.6402
4	2.5	2.5	5.0	1.1399	30	30.4365
5	1.4	1.4	2.8	0.8546	20	20.2910

By Linear Regression of Y on X

Slope, m = 41.2980      Intercept, b = -15.6646  
 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 EL455 to HVS007 with respect to the update in quality management system.

Calibrated by : Kit Au  
 Date : 21-Mar-16

Checked by : Pauline Wong  
 Date : 21-Mar-16



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

Location : MA1e  
 Equipment no. : HVS007

Calibration Date : 18-May-16  
 Calibration Due Date : 18-Jul-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, $T_a$	299	Kelvin	Pressure, $P_a$
			1010 mmHg

Orifice Transfer Standard Information			
Equipment No.	Ori001	Slope, $m_c$	2.00072
		Intercept, $b_c$	-0.01209
Last Calibration Date	30-Jun-15	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$	
Next Calibration Date	30-Jun-16		

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	6.5	6.5	13.0	1.8022	58	57.8086
2	5.4	5.4	10.8	1.6432	52	51.8284
3	4.0	4.0	8.0	1.4151	42	41.8614
4	2.5	2.5	5.0	1.1200	32	31.8944
5	1.4	1.4	2.8	0.8396	24	23.9208

By Linear Regression of Y on X

Slope, m = 35.5968      Intercept, b = -7.0923  
 Correlation Coefficient\* = 0.9969  
 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 : 18-May-16

Checked by : Pauline Wong  
 Date : 18-May-16





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

Location : MA1w  
 Equipment no. : HVS008

Calibration Date : 21-Mar-16  
 Calibration Due Date : 21-May-16

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T <sub>a</sub>	290	Kelvin	Pressure, P <sub>a</sub>
			1015 mmHg

Orifice Transfer Standard Information				
Equipment No.	Ori001	Slope, m <sub>c</sub>	2.00072	Intercept, b <sub>c</sub>
				-0.01209
Last Calibration Date	30-Jun-15	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$		
Next Calibration Date	30-Jun-16			

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	6.5	6.5	13.0	1.8344	58	58.8439
2	5.2	5.2	10.4	1.6414	51	51.7420
3	4.1	4.1	8.2	1.4581	43	43.6256
4	2.5	2.5	5.0	1.1399	32	32.4656
5	1.5	1.5	3.0	0.8844	25	25.3637

By Linear Regression of Y on X

Slope, m = 35.7112      Intercept, b = -7.2889

Correlation Coefficient\* = 0.9973

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 : 21-Mar-16

Checked by : Pauline Wong  
 Date : 21-Mar-16



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

Location : MA1w  
 Equipment no. : HVS008

Calibration Date : 18-May-16  
 Calibration Due Date : 18-Jul-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition						
Temperature, T <sub>a</sub>	299		Kelvin	Pressure, P <sub>a</sub>	1010 mmHg	
Orifice Transfer Standard Information						
Equipment No.	Ori001		Slope, m <sub>c</sub>	2.00072	Intercept, b <sub>c</sub>	-0.01209
Last Calibration Date	30-Jun-15		$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	30-Jun-16					
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	1.8160	60	59.8020
2	5.2	5.2	10.4	1.6126	52	51.8284
3	4.2	4.2	8.4	1.4499	44	43.8548
4	2.4	2.4	4.8	1.0975	32	31.8944
5	1.5	1.5	3.0	0.8689	25	24.9175
By Linear Regression of Y on X						
Slope, m		=	<u>36.9607</u>	Intercept, b		= <u>-8.1386</u>
Correlation Coefficient*		=	<u>0.9972</u>			
Calibration Accepted		=	<u>Yes/No**</u>			

\* 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 : 18-May-16

Checked by : Pauline Wong  
 Date : 18-May-16