



Calibration Certificate

Certificate No. **12888**

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Customer : Lam Geotechnics Limited

Address : 11/F., Centre Point, 181-185 Gloucester Road, Wanchai, Hong Kong

Order No. : Q10982

Date of receipt : 25-May-11

Item Tested

Description : Precision Integrating Sound Level Meter

Manufacturer : Rion

Model : NL-14

Serial No. : 10303242

Test Conditions

Date of Test : 26-May-11

Supply Voltage : --

Ambient Temperature : $(23 \pm 3)^{\circ}\text{C}$

Relative Humidity : $(50 \pm 25) \%$

Test Specifications

Calibration check.

Ref. Document/Procedure: Z01.

Test Results

All results were within the IEC 651 Type 1 or IEC 804 Type 1 specification after adjustment.

The results are shown in the attached page(s).

Main Test equipment used:


<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S017	Multi-Function Generator	C101623	SCL-HKSAR
S024	Sound Level Calibrator	04062	NIM-PRC & SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI).

The test results apply to the above Unit-Under-Test only

Calibrated by : 
P. F. Wong

Approved by : 
Alan Chu

Date: 26-May-11

This Certificate is issued by:

Hong Kong Calibration Ltd.

Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.

Tel: 2425 8801 Fax: 2425 8646

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Results :

1. SPL Accuracy

Level Range (dB)	UUT Setting			Applied Value (dB)	UUT Reading (dB)	
	Filter	Weight	Time Const.		Before adjust.	After adjust.
40 – 100	OFF	L _P	Fast	94.00	--	94.1
		L _{PA}	Fast		*95.0	94.1
			Slow		--	94.1
		L _{PC}	Fast		--	94.1
60 – 120	OFF	L _P	Fast	94.00	--	94.1
		L _{PA}	Fast		--	94.0
			Slow		--	94.0
		L _{PC}	Fast		--	94.0
60 – 120	OFF	L _P	Fast	114.00	--	114.0
		L _{PA}	Fast		--	113.9
			Slow		--	113.9
		L _{PC}	Fast		--	113.9

IEC 651 Type 1 Spec. : ± 0.7 dB

Uncertainty : ± 0.2 dB

2. Level Stability : 0.1 dB

IEC 651 Type 1 Spec. : ± 0.3 dB

Uncertainty : ± 0.01 dB



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3. Linearity

3.1 Level Linearity

UUT Range (dB)	Applied Value (dB)	UUT Reading (dB)	Variation (dB)	IEC 651 Type 1 Spec. (Primary Indicator Range)
140	114.0	113.9	-0.1	± 0.7 dB
130	104.0	103.8	-0.2	
120	94.0	94.0 (Ref.)	--	
110	84.0	83.9	-0.1	
100	74.0	74.1	+0.1	
90	64.0	64.1	+0.1	
80	54.0	54.3	+0.3	

Uncertainty : ± 0.1 dB

3.2 Differential level linearity

UUT Range (dB)	Applied Value (dB)	UUT Reading (dB)	Variation (dB)	IEC 651 Type 1 Spec.
120	84.0	84.0	0.0	± 0.4 dB
	94.0	94.0 (Ref.)	--	
	95.0	95.0	0.0	± 0.2 dB

Uncertainty : ± 0.1 dB

4. Frequency Weighting

A weighting

Frequency	Attenuation (dB)	IEC 651 Type 1 Spec.
31.5 Hz	-39.0	- 39.4 dB, ± 1.5 dB
63 Hz	-25.9	- 26.2 dB, ± 1.5 dB
125 Hz	-15.9	- 16.1 dB, ± 1 dB
250 Hz	-8.4	- 8.6 dB, ± 1 dB
500 Hz	-3.0	- 3.2 dB, ± 1 dB
1 kHz	0.0 (Ref)	0 dB, ± 1 dB
2 kHz	+1.3	+ 1.2 dB, ± 1 dB
4 kHz	+0.8	+ 1.0 dB, ± 1 dB
8 kHz	-1.3	- 1.1 dB, + 1.5 dB ~ -3 dB
16 kHz	-7.1	- 6.6 dB, + 3 dB ~ - ∞

Uncertainty : ± 0.1 dB



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5. Time Averaging

Applied Burst duty Factor	Applied Leq Value (dB)	UUT Reading (dB)	IEC 804 Type 1 Spec.
continuous	40.0	40.0	--
1/10	40.0	39.9	± 0.5 dB
1/10 ²	40.0	39.6	
1/10 ³	40.0	39.2	± 1.0 dB
1/10 ⁴	40.0	39.4	

Uncertainty : ± 0.1 dB

- Remark : 1. UUT : Unit-Under-Test
2. The uncertainty claimed is for a confidence probability of not less than 95%.
3. Atmospheric Pressure : 1 004 hPa.
4. *Out of Specification

----- END -----



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Customer : Lam Geotechnics Limited

Address : 11/F., Centre Point, 181-185 Gloucester Road, Wanchai, Hong Kong

Order No. : Q10982

Date of receipt : 25-May-11

Item Tested

Description : Sound Level Calibrator

Manufacturer : Rion

Model : NC-73

Serial No. : 10465798

Test Conditions

Date of Test : 26-May-11

Supply Voltage : --

Ambient Temperature : $(23 \pm 3)^{\circ}\text{C}$

Relative Humidity : $(50 \pm 25) \%$

Test Specifications

Calibration check.

Ref. Document/Procedure : F21, Z02.

Test Results

All results were within the manufacturer's specification after adjustment.

The results are shown in the attached page(s).

Main Test equipment used:

<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S014	Spectrum Analyzer	03926	NIM-PRC & SCL-HKSAR
S024	Sound Level Calibrator	04062	NIM-PRC & SCL-HKSAR
S041	Universal Counter	04461	SCL-HKSAR
S206	Sound Level Meter	04462	SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI).

The test results apply to the above Unit-Under-Test only

Calibrated by : 

P. F. Wong

Approved by : 

Alan Chu

Date: 26-May-11

This Certificate is issued by:

Hong Kong Calibration Ltd.

Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.

Tel: 2425 8801 Fax: 2425 8646

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Results :

1. Level Accuracy (at 1 kHz)

UUT Nominal Value	Measured Value		Mfr's Spec.
	Before Adjust.	After Adjust.	
94 dB	*95.20 dB	93.94 dB	± 1 dB

Uncertainty : ± 0.2 dB

2. Frequency Accuracy

UUT Nominal Value	Measured Value	Mfr's Spec.
1 kHz	0.994 kHz	± 2 %

Uncertainty : ± 0.1 %

3. Level Stability : 0.0 dB

Uncertainty : ± 0.01 dB

4. Total Harmonic Distortion : < 0.5 %

Mfr's Spec. : < 3 %

Uncertainty : ± 2.3 % of reading

Remark : 1. UUT : Unit-Under-Test

2. The uncertainty claimed is for a confidence probability of not less than 95%.

3. The above measured values are the mean of 3 measurement.

4. Atmospheric Pressure : 1 004 hPa

5. *Out of Specification

----- END -----



Calibration Certificate

Certificate No. **06680**

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Customer : Lam Geotechnics Limited

Address : 11/F, Centre Point, 181-185 Gloucester Road, Wanchai, Hong Kong.

Order No. : Q02553

Date of receipt : 18-Nov-10

Item Tested

Description : Precision Integrating Sound Level Meter

Manufacturer : ACO

Model : Type 6224

Serial No. : 050112

Test Conditions

Date of Test : 19-Nov-10

Supply Voltage : --

Ambient Temperature : (23 ± 3)°C

Relative Humidity : (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure: Z01.

Test Results

All results were within the IEC 651 Type 1 & 804 Type I Specification.


The results are shown in the attached page(s).

Main Test equipment used:

<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S017A	Multi-Function Generator	00804	SCL-HKSAR
S024	Sound Level Calibrator	04062	NIM-PRC & SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI).
The test results apply to the above Unit-Under-Test only

Calibrated by : 
P. F. Wong

Approved by : 
Dorothy Cheuk

This Certificate is issued by:
Hong Kong Calibration Ltd.
Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.
Tel: 2425 8801 Fax: 2425 8646

Date: 23-Nov-10



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Certificate No. **06680**

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Results :

1. SPL Accuracy

UUT Setting			Applied Value (dB)	UUT Reading (dB)
Level Range (dB)	Weight	Time Const.		
20 – 100	L _A	Fast	94.0	94.3
		Slow		94.3
	L _C	Fast		94.3
30 – 120	L _A	Fast	94.0	94.4
		Slow		94.4
	L _C	Fast		94.4
30 – 120	L _A	Fast	114.0	94.3
		Slow		94.3
	L _C	Fast		94.3

IEC 651 Type 1 Spec. : ± 0.7 dB

Uncertainty : ± 0.1 dB

2. Level Stability : 0.0 dB

IEC 651 Type 1 Spec. : ± 0.3 dB

Uncertainty : ± 0.01 dB

3. Linearity

3.1 Level Linearity

UUT Range (dB)	Applied Value (dB)	UUT Rdg (dB)	Variation (dB)	IEC 651 Type 1 Spec. (Primary Indicator Range)
140	114.0	114.5	+0.1	± 0.7 dB
130	104.0	104.4	0.0	
120	94.0	94.4 (Ref.)	--	
110	84.0	84.1	-0.3	
100	74.0	74.2	-0.2	
90	64.0	64.1	-0.3	
80	54.0	54.1	-0.3	

Uncertainty : ± 0.1 dB



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3.2 Differential level linearity

UUT Range (dB)	Applied Value (dB)	UUT Rdg (dB)	Variation (dB)	IEC 651 Type 1 Spec.
120	84.0	84.1	-0.3	± 0.4
	94.0	94.4 (Ref.)	- -	
	95.0	95.4	0.0	± 0.2

Uncertainty : ± 0.1 dB

4. Frequency Weighting

A weighting

Frequency	Attenuation (dB)	IEC 651 Type 1 Spec.
31.5 Hz	-39.3	- 39.4 dB, ± 1.5 dB
63 Hz	-26.2	- 26.2 dB, ± 1.5 dB
125 Hz	-16.1	- 16.1 dB, ± 1 dB
250 Hz	-8.7	- 8.6 dB, ± 1 dB
500 Hz	-3.3	- 3.2 dB, ± 1 dB
1 kHz	0.0 (Ref)	0 dB, ± 1 dB
2 kHz	+1.3	+ 1.2 dB, ± 1 dB
4 kHz	+0.9	+ 1.0 dB, ± 1 dB
8 kHz	-1.2	- 1.1 dB, + 1.5 dB ~ -3 dB
16 kHz	-5.8	- 6.6 dB, + 3 dB ~ - ∞

Uncertainty : ± 0.1 dB



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4. Time Averaging

Applied Burst duty Factor	Applied Leq Value (dB)	UUT Reading (dB)	IEC 804 Type 1 Spec.
continuous	40.0	40.0	--
1/10	40.0	39.9	± 0.5 dB
1/10 ²	40.0	39.9	
1/10 ³	40.0	40.3	± 1.0 dB
1/10 ⁴	40.0	40.3	

Uncertainty : ± 0.1 dB

- Remark : 1. UUT : Unit-Under-Test
2. The uncertainty claimed is for a confidence probability of not less than 95%.
3. Atmospheric Pressure : 1 009 hPa.

----- END -----



Calibration Certificate

Certificate No. **06681**

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Customer : Lam Geotechnics Limited

Address : 11/F, Centre Point, 181-185 Gloucester Road, Wanchai, Hong Kong.

Order No. : Q02553

Date of receipt : 18-Nov-10

Item Tested

Description : Sound Level Calibrator (EL469)

Manufacturer : ACO

Model : --

Serial No. : 050213

Test Conditions

Date of Test : 19-Nov-10

Supply Voltage : --

Ambient Temperature : $(23 \pm 3)^{\circ}\text{C}$

Relative Humidity : $(50 \pm 25) \%$

Test Specifications

Calibration check.

Ref. Document/Procedure: F21, Z02.

Test Results

All results were within the IEC 942 Class 1 specification.

The results are shown in the attached page(s).


Main Test equipment used:


<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S014	Spectrum Analyzer	03926	NIM-PRC & SCL-HKSAR
S024	Sound Level Calibrator	04062	NIM-PRC & SCL-HKSAR
S041	Universal Counter	04461	SCL-HKSAR
S206	Sound Level Meter	04462	SCL-HKSAR

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The test equipment used for calibration are traceable to International System of Units (SI).

The test results apply to the above Unit-Under-Test only

Calibrated by : 
P. F. Wong

Approved by : 
Dorothy Cheuk

Date: 23-Nov-10



Calibration Certificate

Certificate No. 06681

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Results :

1. Level

UUT Nominal Value (dB)	Measured Value (dB)	IEC 942 Class 1 Spec.
94	94.22	± 0.3 dB

The above measured values are the mean of 3 measurements.

Uncertainty : ± 0.1 dB

2. Frequency

UUT Nominal Value	Measured Value	IEC 942 Class 1 Spec.
1 kHz	0.9834 kHz	± 2 %

Uncertainty : ± 3.6 x 10⁻⁶

3. Level Stability : 0.0 dB

IEC 942 Class 1 Spec. : ± 0.1 dB

Uncertainty : ± 0.01 dB

4. Total Harmonic Distortion : < 0.2 %

IEC 942 Class 1 Spec. : < 3 %

Uncertainty : ± 2.3 % of reading

Remark : 1. UUT : Unit-Under-Test

2. The uncertainty claimed is for a confidence probability of not less than 95%.

3. Atmospheric Pressure : 1 009 hPa.

----- END -----



TISCH ENVIRONMENTAL, INC.
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AIR POLLUTION MONITORING EQUIPMENT

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Jul 11, 2011 Rootmeter S/N 0438320 Ta (K) - 298
 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 DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3710	3.2	2.00
2	NA	NA	1.00	0.9730	6.4	4.00
3	NA	NA	1.00	0.8690	7.9	5.00
4	NA	NA	1.00	0.8300	8.8	5.50
5	NA	NA	1.00	0.6860	12.8	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9817	0.7160	1.4042	0.9957	0.7263	0.8919
0.9775	1.0046	1.9859	0.9915	1.0190	1.2613
0.9754	1.1225	2.2203	0.9894	1.1385	1.4101
0.9743	1.1739	2.3286	0.9882	1.1907	1.4790
0.9690	1.4126	2.8084	0.9829	1.4328	1.7837
Qstd slope (m) = 2.01593			Qa slope (m) = 1.26234		
intercept (b) = -0.03978			intercept (b) = -0.02526		
coefficient (r) = 0.99999			coefficient (r) = 0.99999		
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 Certificate

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Customer : Lam Geotechnics Limited

Address : 11/F., Centre Point, 181-185 Gloucester Road, Wanchai, Hong Kong

Order No. : Q11569

Date of receipt : 6-Jul-11

Item Tested

Description : Sound Level Meter

Manufacturer : B&K

Model : 2250

Serial No. : 2722311

Test Conditions

Date of Test : 6-Jul-11

Supply Voltage : --

Ambient Temperature : (23 ± 3)°C

Relative Humidity : (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure: Z01.

Test Results

All results were within the IEC 651 Type 1, IEC 804 Type 1 & IEC 1260 Class 1 specification.

The results are shown in the attached page(s).

Main Test equipment used:

<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S017	Multi-Function Generator	C101623	SCL-HKSAR
S024	Sound Level Calibrator	04062	NIM-PRC & SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI).

The test results apply to the above Unit-Under-Test only

Calibrated by : 

P. F. Wong

Approved by : 

Dorothy Cheuk

This Certificate is issued by:

Hong Kong Calibration Ltd.

Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.

Tel: 2425 8801 Fax: 2425 8646

Date: 6-Jul-11



Calibration Certificate

Certificate No. 13784

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Results :

1. SPL

UUT Setting				Applied Value (dB)	UUT Reading (dB)
Range	Freq. Wgt.	Time Const.	Center Freq.		
20 - 140	A (SPL)	Fast	--	94.0	93.9
		Slow	--		93.9
	C (SPL)	Fast	--	94.0	93.9
	A (SPL)	Fast	--	114.0	113.8
		Slow	--		113.8
	C (SPL)	Fast	--	114.0	113.8
	--	1/1 – Oct/Fast	1 kHz	94.0	93.8
				114.0	113.7
	--	1/3 – Oct/Fast	1 kHz	94.0	93.7
				114.0	113.6

IEC 651 Type 1 Spec. : ± 0.7 dB

Uncertainty : ± 0.1 dB

2. Level Stability : 0.0 dB

IEC 651 Type 1 Spec. : ± 0.3 dB

Uncertainty : ± 0.01 dB

3. Linearity

Differential level linearity

UUT Range (dB)	Applied Value (dB)	UUT Rdg (dB)	Variation (dB)	IEC 651 Type 1 Spec.
20~140	84.0	83.9	0.0	± 0.4 dB
	94.0	93.9 (Ref.)	--	
	95.0	95.0	+0.1	± 0.2 dB

Uncertainty : ± 0.1 dB



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4. Frequency Weighting

A weighting

Frequency	Attenuation (dB)	IEC 651 Type 1 Spec.
31.5 Hz	-39.8	- 39.4 dB, ± 1.5 dB
63 Hz	-26.5	- 26.2 dB, ± 1.5 dB
125 Hz	-16.5	- 16.1 dB, ± 1 dB
250 Hz	-9.0	- 8.6 dB, ± 1 dB
500 Hz	-3.5	- 3.2 dB, ± 1 dB
1 kHz	0.0 (Ref)	0 dB, ± 1 dB
2 kHz	+1.1	+ 1.2 dB, ± 1 dB
4 kHz	+1.1	+ 1.0 dB, ± 1 dB
8 kHz	-1.3	- 1.1 dB, + 1.5 dB \sim -3 dB
16 kHz	-5.9	- 6.6 dB, + 3 dB \sim - ∞

Uncertainty : ± 0.1 dB

5. Time Averaging

Applied Burst duty Factor	Applied Leq Value (dB)	UUT Reading (dB)	IEC 804 Type 1 Spec.
continuous	40.0	--	--
1/10	40.0	40.1	± 0.5 dB
1/10 ²	40.0	40.0	
1/10 ³	40.0	40.0	± 1.0 dB
1/10 ⁴	40.0	40.0	

Uncertainty : ± 0.1 dB



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6. Filter Characteristics

6.1 1/1 – Octave Filter

Frequency	Attenuation (dB)	IEC 1260 Class 1 Spec. (dB)
125 Hz	-64.2	< - 61
250 Hz	-44.9	< - 42
500 Hz	-21.1	< - 17.5
707 Hz	-3.8	- 2 ~ - 5
1 kHz (Ref)	--	--
1.414 kHz	-3.6	- 2 ~ - 5
2 kHz	-20.9	< - 17.5
4 kHz	-56.0	< - 42
8 kHz	-86.0	< - 61

Uncertainty : ± 0.25 dB

6.2 1/3 – Octave Filter

Frequency	Attenuation (dB)	IEC 1260 Class 1 Spec.(dB)
326 Hz	-64.9	< - 61
530 Hz	-48.1	< - 42
772 Hz	-23.6	< - 17.5
891 Hz	-3.9	+ 0.3 ~ - 5.0
1 kHz (Ref)	--	--
1.122 kHz	-3.9	+ 0.3 ~ - 5.0
1.296 kHz	-23.7	< - 17.5
1.887 kHz	-48.8	< - 42
3.070 kHz	-70.4	< - 61

Uncertainty : ± 0.25 dB

Remarks : 1. UUT : Unit-Under-Test

2. The uncertainty claimed is for a confidence probability of not less than 95%.

3. Atmospheric pressure : 996 hPa.

----- END -----



Calibration Certificate

Certificate No. 13813

Page 1 of 4 Pages

Customer : Lam Geotechnics Limited

Address : 11/F., Centre Point, 181-185 Gloucester Road, Wanchai, Hong Kong

Order No. : Q11569

Date of receipt : 7-Jul-11

Item Tested

Description : Sound Level Meter

Manufacturer : B&K

Model : 2250

Serial No. : 2722310

Test Conditions

Date of Test : 8-Jul-11

Supply Voltage : --

Ambient Temperature : (23 ± 3)°C

Relative Humidity : (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure: Z01.

Test Results

All results were within the IEC 651 Type 1, IEC 804 Type 1 & IEC 1260 Class 1 specification.

The results are shown in the attached page(s).


Main Test equipment used:

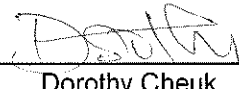
<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S017A	Multi-Function Generator	07279	SCL-HKSAR
S024	Sound Level Calibrator	04062	NIM-PRC & SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

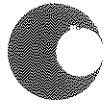
The test equipment used for calibration are traceable to International System of Units (SI).

The test results apply to the above Unit-Under-Test only

Calibrated by : 
P. F. Wong

Approved by : 
Dorothy Cheuk

Date: 8-Jul-11



Calibration Certificate

Certificate No. **13813**

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Results :

1. SPL

UUT Setting				Applied Value (dB)	UUT Reading (dB)
Range	Freq. Wgt.	Time Const.	Center Freq.		
20 - 140	A (SPL)	Fast	--	94.0	93.8
		Slow	--		93.8
	C (SPL)	Fast	--	94.0	93.9
	A (SPL)	Fast	--	114.0	113.7
		Slow	--		113.7
	C (SPL)	Fast	--	114.0	113.7
	--	1/1 - Oct/Fast	1 kHz	94.0	93.8
				114.0	113.7
	--	1/3 - Oct/Fast	1 kHz	94.0	93.8
				114.0	113.7

IEC 651 Type 1 Spec. : ± 0.7 dB

Uncertainty : ± 0.2 dB

2. Level Stability : 0.0 dB

IEC 651 Type 1 Spec. : ± 0.3 dB

Uncertainty : ± 0.01 dB

3. Linearity

Differential level linearity

UUT Range (dB)	Applied Value (dB)	UUT Rdg (dB)	Variation (dB)	IEC 651 Type 1 Spec.
120	84.0	83.8	0.0	± 0.4 dB
	94.0	93.8 (Ref.)	--	
	95.0	94.8	0.0	± 0.2 dB

Uncertainty : ± 0.1 dB



Calibration Certificate

Certificate No. 13813

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4. Frequency Weighting

A weighting

Frequency	Attenuation (dB)	IEC 651 Type 1 Spec.
31.5 Hz	-39.9	- 39.4 dB, ± 1.5 dB
63 Hz	-26.6	- 26.2 dB, ± 1.5 dB
125 Hz	-16.5	- 16.1 dB, ± 1 dB
250 Hz	-9.0	- 8.6 dB, ± 1 dB
500 Hz	-3.5	- 3.2 dB, ± 1 dB
1 kHz	0.0 (Ref)	0 dB, ± 1 dB
2 kHz	+1.4	+ 1.2 dB, ± 1 dB
4 kHz	+1.2	+ 1.0 dB, ± 1 dB
8 kHz	-1.2	- 1.1 dB, + 1.5 dB \sim -3 dB
16 kHz	-5.8	- 6.6 dB, + 3 dB \sim - ∞

Uncertainty : ± 0.1 dB

5. Time Averaging

Applied Burst duty Factor	Applied Leq Value (dB)	UUT Reading (dB)	IEC 804 Type 1 Spec.
continuous	40.0	--	--
1/10	40.0	40.0	± 0.5 dB
1/10 ²	40.0	39.9	
1/10 ³	40.0	40.0	± 1.0 dB
1/10 ⁴	40.0	40.0	

Uncertainty : ± 0.1 dB



Calibration Certificate

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6. Filter Characteristics

6.1 1/1 – Octave Filter

Frequency	Attenuation (dB)	IEC 1260 Class 1 Spec. (dB)
125 Hz	-64.2	< - 61
250 Hz	-44.9	< - 42
500 Hz	-21.0	< - 17.5
707 Hz	-3.8	- 2 ~ - 5
1 kHz (Ref)	--	--
1.414 kHz	-3.5	- 2 ~ - 5
2 kHz	-20.8	< - 17.5
4 kHz	-55.9	< - 42
8 kHz	-85.7	< - 61

Uncertainty : ± 0.25 dB

6.2 1/3 – Octave Filter

Frequency	Attenuation (dB)	IEC 1260 Class 1 Spec.(dB)
326 Hz	-63.6	< - 61
530 Hz	-47.9	< - 42
772 Hz	-23.5	< - 17.5
891 Hz	-3.7	+ 0.3 ~ - 5.0
1 kHz (Ref)	--	--
1.122 kHz	-3.6	+ 0.3 ~ - 5.0
1.296 kHz	-23.4	< - 17.5
1.887 kHz	-48.1	< - 42
3.070 kHz	-69.8	< - 61

Uncertainty : ± 0.25 dB

Remarks : 1. UUT : Unit-Under-Test

2. The uncertainty claimed is for a confidence probability of not less than 95%.

3. Atmospheric pressure : 1 000 hPa.

----- END -----

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

Location : MA1e
 Equipment no. : EL080

Calibration Date : 23-Aug-11
 Calibration Due Date : 23-Oct-11

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T_a	305	Kelvin	Pressure, P_a
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	EL086	Slope, m_c	2.01593	Intercept, b_c	-0.03978
Last Calibration Date	11-Jul-11	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	11-Jul-12				

Calibration of RSP						
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	1.7435	58	57.2371
2	4.9	4.9	9.8	1.5522	50	49.3424
3	3.8	3.8	7.6	1.3693	41	40.4607
4	2.4	2.4	4.8	1.0922	29	28.6186
5	1.5	1.5	3.0	0.8676	17	16.7764

By Linear Regression of Y on X

Slope, m = 45.9809 Intercept, b = -22.4359
 Correlation Coefficient* = 0.9992
 Calibration Accepted = Yes/No**

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

** Delete as appropriate.

Remarks : _____

Calibrated by : Sam Lam
 Date : 23-Aug-11

Checked by : Cherry Mak
 Date : 23-Aug-11

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

Location : MA1w
 Equipment no. : EL080

Calibration Date : 23-Aug-11
 Calibration Due Date : 23-Oct-11

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T_a	305	Kelvin	Pressure, P_a
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	EL086	Slope, m_c	2.01593	Intercept, b_c	-0.03978
Last Calibration Date	11-Jul-11	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	11-Jul-12				

Calibration of RSP						
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	5.8	5.8	11.6	1.6870	51	50.3292
2	4.7	4.7	9.4	1.5206	45	44.4081
3	3.6	3.6	7.2	1.3333	39	38.4870
4	2.4	2.4	4.8	1.0922	29	28.6186
5	1.5	1.5	3.0	0.8676	18	17.7632

By Linear Regression of Y on X

Slope, m = 39.3380 Intercept, b = -15.2235
 Correlation Coefficient* = 0.9967
 Calibration Accepted = Yes/No**

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

** Delete as appropriate.

Remarks : _____

Calibrated by : Sam Lam
 Date : 23-Aug-11

Checked by : Cherry Mak
 Date : 23-Aug-11

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

Location : CMA1b
 Equipment no. : EL452

Calibration Date : 23-Aug-11
 Calibration Due Date : 23-Oct-11

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T_a	305	Kelvin	Pressure, P_a
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	EL086	Slope, m_c	2.01593	Intercept, b_c	-0.03978
Last Calibration Date	11-Jul-11	$\left(H \times P_a / 1013.3 \times 298 / T_a \right)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	11-Jul-12				

Calibration of RSP						
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	6.4	6.4	12.8	1.7711	61	60.1977
2	5.2	5.2	10.4	1.5984	54	53.2897
3	4.0	4.0	8.0	1.4043	46	45.3950
4	2.5	2.5	5.0	1.1143	35	34.5396
5	1.4	1.4	2.8	0.8389	21	20.7238

By Linear Regression of Y on X

Slope, m = 41.7132 Intercept, b = -13.2921
 Correlation Coefficient* = 0.9985
 Calibration Accepted = Yes/No**

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

** Delete as appropriate.

Remarks : _____

Calibrated by : Sam Lam
 Date : 23-Aug-11

Checked by : Cherry Mak
 Date : 23-Aug-11

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

Location : CMA2a
 Equipment no. : EL449

Calibration Date : 23-Aug-11
 Calibration Due Date : 23-Oct-11

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T_a	305	Kelvin	Pressure, P_a
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	EL086	Slope, m_c	2.01593	Intercept, b_c	-0.03978
Last Calibration Date	11-Jul-11	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	11-Jul-12				

Calibration of RSP						
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	6.3	6.3	12.6	1.7574	52	51.3161
2	5.0	5.0	10.0	1.5677	45	44.4081
3	3.8	3.8	7.6	1.3693	37	36.5133
4	2.4	2.4	4.8	1.0922	27	26.6449
5	1.5	1.5	3.0	0.8676	14	13.8159

By Linear Regression of Y on X

Slope, m = 41.1960 Intercept, b = -20.2858
 Correlation Coefficient* = 0.9959
 Calibration Accepted = Yes/No**

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

** Delete as appropriate.

Remarks : _____

Calibrated by : Sam Lam
 Date : 23-Aug-11

Checked by : Cherry Mak
 Date : 23-Aug-11

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

Location : CMA3a
 Equipment no. : EL888

Calibration Date : 23-Aug-11
 Calibration Due Date : 23-Oct-11

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T_a	305	Kelvin	Pressure, P_a
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	EL086	Slope, m_c	2.01593	Intercept, b_c	-0.03978
Last Calibration Date	11-Jul-11	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	11-Jul-12				

Calibration of RSP						
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	5.4	5.4	10.8	1.6285	46	45.3950
2	4.3	4.3	8.6	1.4553	41	40.4607
3	3.5	3.5	7.0	1.3149	35	34.5396
4	2.3	2.3	4.6	1.0696	26	25.6580
5	1.5	1.5	3.0	0.8676	18	17.7632

By Linear Regression of Y on X

Slope, m = 36.7801 Intercept, b = -13.8439
 Correlation Coefficient* = 0.9988
 Calibration Accepted = Yes/No**

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

** Delete as appropriate.

Remarks : _____

Calibrated by : Sam Lam
 Date : 23-Aug-11

Checked by : Cherry Mak
 Date : 23-Aug-11

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

Location : CMA4a
 Equipment no. : EL390

Calibration Date : 23-Aug-11
 Calibration Due Date : 23-Oct-11

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T _a	305	Kelvin	Pressure, P _a
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	EL086	Slope, m _c	2.01593	Intercept, b _c	-0.03978
Last Calibration Date	11-Jul-11	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	11-Jul-12				

Calibration of RSP						
Calibration Point	Manometer Reading			Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) Y-axis
	(up)	(down)	(difference)			
1	5.8	5.8	11.6	1.6870	54	53.2897
2	4.5	4.5	9.0	1.4883	48	47.3687
3	3.5	3.5	7.0	1.3149	41	40.4607
4	2.3	2.3	4.6	1.0696	31	30.5923
5	1.4	1.4	2.8	0.8389	21	20.7238

By Linear Regression of Y on X

Slope, m = 38.8337 Intercept, b = -11.2100
 Correlation Coefficient* = 0.9982
 Calibration Accepted = Yes/No**

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

** Delete as appropriate.

Remarks : _____

Calibrated by : Sam Lam
 Date : 23-Aug-11

Checked by : Cherry Mak
 Date : 23-Aug-11

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

Location : CMA5a
 Equipment no. : EL380

Calibration Date : 23-Aug-11
 Calibration Due Date : 23-Oct-11

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition			
Temperature, T_a	305	Kelvin	Pressure, P_a
			1010 mmHg

Orifice Transfer Standard Information					
Equipment No.	EL086	Slope, m_c	2.01593	Intercept, b_c	-0.03978
Last Calibration Date	11-Jul-11	$\left(H \times P_a / 1013.3 \times 298 / T_a \right)^{1/2}$ $= m_c \times Q_{std} + b_c$			
Next Calibration Date	11-Jul-12				

Calibration of RSP						
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	5.8	5.8	11.6	1.6870	54	53.2897
2	4.6	4.6	9.2	1.5045	49	48.3555
3	3.6	3.6	7.2	1.3333	43	42.4344
4	2.3	2.3	4.6	1.0696	34	33.5528
5	1.5	1.5	3.0	0.8676	27	26.6449

By Linear Regression of Y on X

Slope, m = 32.8954 Intercept, b = -1.6589
 Correlation Coefficient* = 0.9993
 Calibration Accepted = Yes/No**

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

** Delete as appropriate.

Remarks : _____

Calibrated by : Sam Lam
 Date : 23-Aug-11

Checked by : Cherry Mak
 Date : 23-Aug-11