

# RECALIBRATION DUE DATE:

January 11, 2020

# ertificate d libration

Calibration Certification Information

Cal. Date: January 11, 2019

Rootsmeter S/N: 438320

Ta: 293

\*K

Operator: Jim Tisch

Pa: 760.7

mm Hg

Calibration Model #: TE-5025A

Calibrator S/N: 0005

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4090	3.2	2.00
2	3	4	1	0.9980	6.4	4.00
3	5	6	1	0,8900	7.8	5.00
4	7	8	1	0.8450	8.7	5.50
5	9	10	1	0.6990	12.6	8.00

		Data Tabulat	ion		
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	√∆H(Ta/Pa) (y-axis)
1.0138	0.7195	1.4269	0.9958	0.7067	0.8777
1.0095	1.0115	2.0180	0.9916	0.9936	1.2412
1.0076	1.1321	2.2561	0.9897	1.1121	1.3877
1,0064	1.1910	2.3663	0.9886	1.1699	1.4555
1.0012	1.4323	2.8538	0.9834	1.4069	1.7553
1000000	m=	1.99861		m=	1.25149
QSTD	b=	-0.00882	QA	b=	-0.00543
	r=	0.99997		r=	0.99997

Calculation				
Vstd= ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=	ΔVol((Pa-ΔP)/Pa)		
Qstd= Vstd/ΔTime	Qa= Va/ΔTime			
For subsequent flow ra	ate calculatio	ns:		
$Qstd = \frac{1}{m} \left( \left( \frac{P_a}{\Delta H} \left( \frac{P_a}{P_{outd}} \right) \frac{Tstd}{T_a} \right) - b \right)$	OWNE	1/m(( \( \sqrt{AH}( Ta/Pa \) )-		

	Standard Conditions
Tstd:	298.15 °K
Pstd:	760 mm Hg
kan anan an	Key
ΔH: calibrator	manometer reading (in H2O)
ΔP: rootsmete	er manometer reading (mm Hg)
Ta: actual abs	olute temperature (*K)
Pa: actual bar	ometric pressure (mm Hg)
b: intercept	
m: slope	

#### RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

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5 South Miami Avenue

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Location :		CMA1b				Calbratio	on Date	:	16-Apr-19
Equipment no.	ŀ	HVS001				Calbratio	on Due Date	:	16-Jun-19
CALIBRATION OF COM	NTINUOUS	FLOW R	ECORDER						
				Ambient C	ondition				
Temperature, T <sub>a</sub>		294		Kelvin	Pressure, P	a	1	013	mmHg
			Orifice Tr	ansfer Sta	ndard Inforr	nation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.9986	61	Intercept, bc	T	-0.00882
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		11-Jan-2	10	•	=	$m_c x$	Q <sub>std</sub> +b <sub>c</sub>		
				Calibratio	n of TSP				
Calibration	Mar	nometer R	eading	C	std	Continu	ous Flow		IC
Point	H (i	inches of	water)	(m <sup>3</sup> / min.)		Reco	rder, W	(W(P <sub>a</sub> /101	3.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)			(C	FM)		Y-axis
1	1.5	1.5	3.0	0.8	3768	23		23.1525	
2	2.4	2.4	4.8	1.	1079	33			33.2188
3	3.4	3.4	6.8	1.3	3178	40		40.2652	
4	4.5	4.5	9.0	1.5	5154	50		50.3315	
5	5.6	5.6	11.2	1.6	6900	ł	56		56.3713
By Linear Regression of	Y on X								
	Slope, m	=	41.0	341	Inte	ercept, b =	-12	.8064	
Correlation C	oefficient*	=	0.99	84					
Calibration	Accepted	=	Yes/	<del>10</del> **					
* if Correlation Coefficier	nt < 0.990.	check and	l recalibration	again.					
				3.					
** Delete as appropriate.	-								
Remarks :									
Calibrated by	Н	enry Lau				Checked	by	:	Dean Chan
Date :	1	6-Apr-19				Date		:	16-Apr-19



Location :		CMA2a				Calbratio	: 16-Apr-19		
Equipment no.	ŀ	HVS002				Calbratio	on Due Date	: 16	6-Jun-19
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER						
				Ambient (	Condition				
Temperature, T <sub>a</sub>		294	ļ	Kelvin	Pressure, P	a	1	013	mmHg
			Orifice Tr	ansfer Sta	ındard Inforr	mation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc	-(	0.00882
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		11-Jan-2	0		=	m <sub>c</sub> x	Q <sub>std</sub> + b <sub>c</sub>		
				Calibratio	n of TSP				
Calibration	Man	nometer R	eading	C	) <sub>std</sub>	Continu	ious Flow		IC
Point	H (i	inches of	water)	(m <sup>3</sup>	/ min.)	Reco	rder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35	
	(up)	(down)	(difference)	X-	axis	(C	FM)	Y-	-axis
1	1.7	1.7	3.4	0.9331			23	23.1525	
2	2.5	2.5	5.0	1.	1306	34		34	.2254
3	3.6	3.6	7.2	1.3	3559	41		41.2719	
4	5.0	5.0	10.0	1.5	5971	48		48.3183	
5	5.6	5.6	11.2	1.0	6900		55	55	.3647
By Linear Regression of	Y on X								
	Slope, m	=	39.10	656	Int	ercept, b =	-12	2.0687	
Correlation Co	oefficient*	=	0.99	02					
Calibration	Accepted	=	Yes/	<del>\0</del> **					
* if Correlation Coefficier	nt < 0 990	check and	l recalibration	anain					
		one on ano	. roodii oralio	. aga					
** Delete as appropriate.									
Remarks :									
Calibrated by	н	lenry Lau				Checked	by	:De	ean Chan
Date	1	6-Apr-19	-			Date		: 16	6-Apr-19



				•	• `	•	,	
Location :		СМАЗа			Calbration	n Date	:	16-Apr-19
Equipment no.	I	HVS012			Calbration	n Due Date	:	16-Jun-19
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER					
				Ambient Condition				
Temperature, T <sub>a</sub>		294	ļ	Kelvin Pressure, P	a	1	013	mmHg
			Orifice Tr	ansfer Standard Infor	mation			
Equipment No.		0005		<b>Slope, m</b> <sub>c</sub> 1.998	61 I	Intercept, bc		-0.00882
Last Calibration Date		11-Jan-1	9	(H)	P <sub>a</sub> / 1013	3.3 x 298 /	$T_a)^{1/2}$	
Next Calibration Date		11-Jan-2	10	=		$Q_{std} + b_c$		
				Calibration of TSP				
Calibration	Mar	nometer R	eading	Q <sub>std</sub>	Continuo	ous Flow		IC
Point	Н(	inches of	water)	(m <sup>3</sup> / min.)	Recor	der, W	(W(P <sub>a</sub> /101	3.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-axis	(CF	-M)		Y-axis
1	1.2	1.2	2.4	0.7847	2	8		28.1857
2	2.1	2.1	4.2	1.0366	3	6		36.2387
3	3.1	3.1	6.2	1.2585	40			40.2652
4	4.2	4.2	8.4	1.4642	4	8	48.3183	
5	5.1	5.1	10.2	1.6130	5	1		51.3382
By Linear Regression of	Y on X							
	Slope, m	=	28.03	357 Int	ercept, b =	6.3	3461	
Correlation Co	oefficient*	=	0.99	950				
Calibration	Accepted	=	Yes/	<del>\0</del> **				
* if Correlation Coefficier	nt < 0.990,	check and	I recalibration	n again.				
				·				
** Delete as appropriate.								
Remarks :								
Calibrated by	Н	lenry Lau			Checked	by	:	Dean Chan
Date	1	6-Apr-19			Date		:	16-Apr-19



Location :		CMA4a				Calbratio	on Date	:	16-Apr-19
Equipment no.	ı	HVS004				Calbratio	on Due Date	:	16-Jun-19
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER						
				Ambient (	Condition				
Temperature, T <sub>a</sub>		294	ļ	Kelvin	Pressure, P	a	1	013	mmHg
			Orifice Tr	ansfer Sta	andard Inforr	nation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc		-0.00882
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> ) <sup>1</sup>	(2
Next Calibration Date		11-Jan-2	0		=	m <sub>c</sub> x	$Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Mar	nometer R	eading	ď	Q <sub>std</sub>	Continu	ious Flow		IC
Point	Н (	inches of	water)	(m³ / min.)		Reco	rder, W	(W(P <sub>a</sub> /1	013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-axis		(CFM)			Y-axis
1	1.3	1.3	2.6	0.	8165		20		20.1326
2	2.1	2.1	4.2	1.	0366		30		30.1989
3	2.8	2.8	5.6	1.	1963	36		36.2387	
4	4.0	4.0	8.0	1.	4290	43		43.2851	
5	5.6	5.6	11.2	1.	6900	52			52.3448
By Linear Regression of	Y on X								
	Slope, m	=	36.1	142	Int	ercept, b =	-8.	1138	
Correlation Co	oefficient*	=	0.99	67					
Calibration	Accepted	=	Yes/	<del>10</del> **					
* if Correlation Coefficier	nt < 0.990,	check and	I recalibration	again.					
** Delete en en en einte									
** Delete as appropriate.									
Remarks :									
Calibrated by		lenry Lau				Checked	i by	: <u> </u>	Dean Chan
Date :	1	6-Apr-19				Date		:	16-Apr-19



Location :		CMA5b				Calbratio	on Date	:	16-Apr-19
Equipment no.	ı	HVS010				Calbratio	on Due Date	:	16-Jun-19
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER						
				Ambient (	Condition				
Temperature, T <sub>a</sub>		294	ļ	Kelvin	Pressure, P	a	1	013	mmHg
			Orifice Tr	ansfer Sta	andard Inforr	mation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.9980	61	Intercept, bc		-0.00882
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> ) <sup>1/</sup>	2
Next Calibration Date		11-Jan-2	20		=	m <sub>c</sub> x	Q <sub>std</sub> + b <sub>c</sub>		
				Calibratio	n of TSP				
Calibration	Mar	nometer R	eading	G	Q <sub>std</sub>	Continu	ious Flow		IC
Point	Н (	inches of	water)	(m <sup>3</sup> / min.)		Reco	rder, W	(W(P <sub>a</sub> /10	013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-axis		(C	FM)		Y-axis
1	1.1	1.1	2.2	0.	7515	34			34.2254
2	2.0	2.0	4.0	1.0	0117	39			39.2586
3	3.0	3.0	6.0	1.:	2381	45		45.2984	
4	3.8	3.8	7.6	1.3	3929	50		50.3315	
5	5.4	5.4	10.8	1.0	6596		55		55.3647
By Linear Regression of	Y on X								
	Slope, m	=	24.12	230	Inte	ercept, b =	15	.6881	
Correlation Co	oefficient*	=	0.99	162					
Calibration	Accepted	=	Yes/ <del>l</del>	<del>\0</del> **					
* if Correlation Coefficien	st + 0 000	ahaalt ana	l rocalibration	again					
* if Correlation Coefficier	11 < 0.990,	cneck and	recalibration	ı agaın.					
** Delete as appropriate.									
Remarks :									
Calibrated by	н	lenry Lau				Checked	by	:	Dean Chan
Date	1	6-Apr-19				Date		:	16-Apr-19



				•	• `	•	,	
Location :		MA1e			Calbratio	n Date	: 1	16-Apr-19
Equipment no.	ı	HVS007			Calbratio	n Due Date	: 1	16-Jun-19
CALIBRATION OF CON	ITINUOUS	FLOW R	<u>ECORDER</u>					
				Ambient Condition				
Temperature, T <sub>a</sub>		294	1	Kelvin Pressure, P	a	10	013	mmHg
			Orifice Tr	ansfer Standard Infor	nation			
Equipment No.		0005		<b>Slope, m</b> <sub>c</sub> 1.998		Intercept, bc		-0.00882
Last Calibration Date		11-Jan-1				3.3 x 298 /		
Next Calibration Date		11-Jan-2	20	=		$Q_{std} + b_c$	· a/	
				Calibration of TSP				
Calibration	Mar	nometer R	eading	Q <sub>std</sub>	Continu	ous Flow		IC
Point		inches of	-	(m <sup>3</sup> / min.)			(W/P /1013	3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
i ome	(up)	(down)	(difference)	X-axis		FM)		Y-axis
1	1.7	1.7	3.4	0.9331	22			2.1459
2	2.5	2.5	5.0	1.1306		30		0.1989
3	3.7	3.7	7.4	1.3745	39			9.2586
4	4.8	4.8	9.6	1.5650	49		49.3249	
5	5.6	5.6	11.2	1.6900	55		55.3647	
By Linear Regression of	Y on X					<u> </u>		
	Slope, m	=	43.68	364 Int	ercept, b =	-19	.2224	
Correlation Co	pefficient*	=	0.99	77				
Calibration	Accepted	=	Yes/	<del>\0</del> **				
tif Completion Coefficien		-11	l !!b !!					
* if Correlation Coefficier	11 < 0.990,	cneck and	recambration	again.				
** Delete as appropriate.								
Remarks :								
Calibrated by	Н	lenry Lau			Checked	by	: D	ean Chan
Date	1	6-Apr-19			Date		: 1	16-Apr-19



Location :		MA1w				Calbration Date : 16-Apr-19			
Equipment no.	ŀ	HVS008				Calbratio	on Due Date	:	16-Jun-19
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER						
				Ambient C	Condition				
Temperature, T <sub>a</sub>		294		Kelvin	Pressure, P	a	1	013	mmHg
			Orifice Ti	ansfer Sta	ndard Inform	nation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc	Т	-0.00882
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> )	1/2
Next Calibration Date		11-Jan-2	0	$=$ $m_c \times Q_{std} + b_c$					
				Calibratio	n of TSP				
Calibration	Man	ometer R	eading	C	Q <sub>std</sub>		ous Flow		IC
Point	H (i	inches of	water)	(m <sup>3</sup> / min.)		Reco	rder, W	(W(P <sub>a</sub> /	1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-axis		(C	FM)		Y-axis
1	1.7	1.7	3.4	0.0	9331		23		23.1525
2	2.5	2.5	5.0	1.1	1306	;	32		32.2122
3	3.9	3.9	7.8	1.4	4111	40			40.2652
4	5.0	5.0	10.0	1.5	5971	50		50.3315	
5	6.1	6.1	12.2	1.7	7636	56			56.3713
By Linear Regression of	Y on X								
	Slope, m	=	39.5	164	Int	ercept, b =	-13	3.5574	
Correlation Co	oefficient*	=	0.99	961					
Calibration	Accepted	=	Yes/f	<del>\0</del> **					
* if Correlation Coefficier	nt < 0.990.	check and	recalibration	again.					
				·g					
** Delete as appropriate.									
Remarks :									
Calibrated by	Н	enry Lau				Checked	by	:	Dean Chan
Date	1	6-Apr-19				Date		:	16-Apr-19



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Tel: (852) 2873 6860 Fax: (852) 2555 7533



### CERTIFICATE OF CALIBRATION

Certificate No.:

19CA0222 02

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone B & K

Preamp

Manufacturer: Type/Model No.. **B&K** 2250

4950

**B&K** ZC0032 19223

Serial/Equipment No.: Adaptors used:

2701778

2755097

Item submitted by

**Customer Name:** 

Lam Geotechnics Limited.

Address of Customer:

Request No .:

Date of receipt:

22-Feb-2019

Date of test:

25-Feb-2019

Reference equipment used in the calibration

Description:

Serial No.

**Expiry Date:** 

Traceable to:

Multi function sound calibrator Signal generator

Model: B&K 4226

2288444

23-Aug-2019

CIGISMEC

Signal generator

DS 360 DS 360

33873 61227

24-Apr-2019 26-Dec-2019 CEPREI CEPREI

**Ambient conditions** 

Temperature:

21 ± 1 °C

Relative humidity:

55 ± 10 %

Air pressure:

1005 ± 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 2, 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 3, 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.

Fena Junai

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

26-Feb-2019

Company Chop:

Comments: The results reported in his 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.

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Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



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### CERTIFICATE OF CALIBRATION

(Continuation Page)

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#### **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 Uncertanity (dB)	Coverage Factor
1631.	Oubtoot.	otatao.	oncortainty (ab)	1 40101
Self-generated noise	Α	Pass	0.3	
9	С	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 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.

			Expanded	Coverage
Test:	Subtest	Status	Uncertanity (dB)	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:

Fong Chun Wai

Checked by:

Date:

calibrated on a schedule to maintain the required accuracy level.

Date:

The standard(s) and equipment used in the calibration are traceable to national of international recognised standards and are

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Form No.CARP152-2/Issue 1/Rev.C/01/02/2007



存 接 質 竹 坑 晒 3 7 號 利 通 中 心 1 2 種 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismes.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



## CERTIFICATE OF CALIBRATION

Certificate No.:

19CA0329 02

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Item tested

Description: Manufacturer:

Sound Level Meter (Type 1) B & K Microphone B & K 4950 Preamp B & K ZC0032

Type/Model No.: Serial/Equipment No.: Adaptors used: 2250-L 2722310

2698702

13318

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No.:

\$-50 AA-5

Date of receipt:

29-Mar-2019

Date of test:

02-Apr-2019

#### Reference equipment used in the calibration

Description:

Multi function sound calibrator

Signal generator Signal generator Model: B&K 4226 DS 360

DS 360

2288444 33873

61227

Serial No. Expiry Date: 2288444 23-Aug-2019

23-Aug-2019 CIGISME 24-Apr-2019 CEPREI 26-Dec-2019 CEPREI

Traceable to: CIGISMEC CEPREI

#### Ambient conditions

Temperature: Relative humidity:

Air pressure:

21 ± 1 °C 55 ± 10 % 1005 ± 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 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.

Jung

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

02-Apr-2019

Company Chop:

Comments: The results reported whis 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.

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Form No: CARP152: Masse 1/Rev C/01/00/2007



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Tel: (852) 2873 6860 Fax: (852) 2555 7533



### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0329 02

Page

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 Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	C	Pass	8.0	
	Lin	Pass	1.6	
Linearity range for Leq.	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
111111111111111111111111111111111111111	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 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 Uncertanity (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:

Fong Chun Wai

Checked by:

Fung Chi Yil

02-Apr-2019

Date:

02-Apr-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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Form No CARP152-28ssie 1/Rev CI01/02/2007



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### CERTIFICATE OF CALIBRATION

Certificate No.:

19CA0425 02

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2

Item tested

Description:

Sound Level Meter (Type 1) B & K Microphone B & K

Preamp B & K

Manufacturer: Type/Model No.:

2250-L 2722311

4950 2698703 2C0032 13321

Serial/Equipment No.: Adaptors used:

32

23

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Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer

Request No.: Date of receipt:

25-Apr-2019

Date of test:

02-May-2019

Reference equipment used in the calibration

Description:

Model:

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator B&K 4226 DS 360 2288444 61227 23-Aug-2019 26-Dec-2019 CIGISMEC

2019 CEPREI

Ambient conditions

Temperature:

22 ± 1 °C

Relative humidity: Air pressure: 55 ± 10 % 1005 ± 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 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.

11

Feng Junqi

Approved Signatory:

Date:

03-May-2019

Company Chop:

SENGINCES OF COLORS OF CO

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.

E Sois & Maurisis Engineering Co., Ltd.

Form No CARP152-Masse Silver C/03/02/2007



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### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0425 02

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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 Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leg	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
1877 55 171	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
West State For	Single Burst Slow	Pass	0.3	
Peak response	Single 100us 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	
In A Classic Control Control	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
12/17/	1 ms burst duty factor 1/104 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	
	Lea	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.

Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Weighting A at 125 Hz	Pass	0.3	
Weighting A at 8000 Hz	Pass	0.5	
	Weighting A at 125 Hz	Weighting A at 125 Hz Pass	Weighting A at 125 Hz Pass 0.3

Response to associated sound calibrator

NIA

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:

1~

Fung Chi Yip 2-May-2019 End

Checked by

Date:

Shek Kwong Tal 03-May-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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Form No CARP152-2/tesus 1/Rev Ci01(0)(200)



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### CERTIFICATE OF CALIBRATION

Certificate No.:

19CA0116 02

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1

Item tested

Description:

Manufacturer: Type/Model No.: Serial/Equipment No.:

Adaptors used:

Sound Level Meter (Type 1)

B&K 2250L 3002695 Microphone B&K 4950 2940839

Preamp **B&K** ZC0032 18582

Item submitted by

Customer Name: Address of Customer:

Request No. Date of receipt:

16-Jan-2019

Lam Geotechnics Ltd.

Date of test:

17-Jan-2019

Reference equipment used in the calibration

Description:

Multi function sound calibrator Signal generator Signal generator

Model: B&K 4226

DS 360 DS 360

Serial No.

2288444 33873 61227

Expiry Date: 23-Aug-2019

24-Apr-2019 26-Dec-2019 Traceable to:

CIGISMEC CEPREI CEPREI

#### Ambient conditions

Temperature:

Relative humidity: Air pressure:

21 ± 1 °C 50 ± 10 % 1005 ± 5 hPa

#### Test specifications

The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 1, 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.

Fend Jungi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

19-Jan-2019

Company Chop:

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.

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## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0116 02

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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 Uncertanity (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	
Je skolenie de marine in de la contraction de la	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
W See W S	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
37 1754	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 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 Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

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:

Fung Chi Yip 17-Jan-2019 - End -Checked by

D:

Shak Kwong Ti

Date:

Date: 19-Jan-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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Form No.CARP152 2/lesse 1/Rev.C/01/62/2007



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### CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0907 02

Page

2

Item tested

Description: Manufacturer:

**B&K** 

2250-L 3006790 Microphone B&K 4950

Preamp B&K ZC0032

Type/Model No.: Serial/Equipment No.: Adaptors used:

2827240

21213

Item submitted by

Customer Name:

Lam Geotechnics Limited

Sound Level Meter (Type 1)

Address of Customer:

Request No.

Date of receipt:

07-Sep-2018

Date of test:

10-Sep-2018

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226

Serial No. 2288444

Expiry Date: 23-Aug-2019

Traceable to: CIGISMEC CEPREI

Signal generator Signal generator

DS 360 DS 360

33873 61227

24-Apr-2019 23-Apr-2019

CEPRE

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity: Air pressure:

50 ± 10 % 1005 ± 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.

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.

Feng

Approved Signatory:

Date:

10-Sep-2018

Company Chop:

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.

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### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0907 02

Page

**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 olerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
62	A C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
81 18 19	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range . Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass .	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
SULTA CAST CALTED	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
100	1 ms burst duty factor 1/10° 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	
	Leg	Pass	0.4	

#### 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 Uncertanity (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

NIA

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:

Fung Chi Yip 10-Sep-2018 Checked by:

Date:

k Kwong Tat 10-Sep-2018

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

O Scale & Materials Expensioning Co. Ltd.

Form No CARP 152 2/45009 1/Rev CX01/02/2007



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Tel: (852) 2873 6880 Fax: (852) 2555 7533



### CERTIFICATE OF CALIBRATION

Certificate No.:

18CA1114 02

Page

Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Manufacturer: Type/Model No.: B&K 2236

B&K 4188

Serial/Equipment No.:

2100736

2288941

Adaptors used:

Item submitted by

Customer Name:

Lam Environmental Service Ltd.

Address of Customer.

Request No.: Date of receipt:

14-Nov-2018

Date of test:

15-Nov-2018

Reference equipment used in the calibration

Description:

Model: B&K 4228 Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator Signal generator

DS 360 DS 360

2288444 33873 61227

23-Aug-2019 24-Apr-2019 23-Apr-2019

CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

20 ± 1 °C 50 ± 10 %

Relative humidity: 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 1, 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 2, 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.

Feng Junqi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date: 15-Nov-2018

Company Chop:

Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

O Soils & Materials Engineering Co., Ltd.

Form No CARP153-1/Issue 1/flow C/01/02/2007



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#### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA1114 02

Page

**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.

Self-generated noise	0.3 1.0 2.0 0.3	2.1
Lin Pass Linearity range for Leq At reference range , Step 5 dB at 4 kHz Pass Reference SPL on all other ranges Pass 2 dB below upper limit of each range Pass 2 dB above lower limit of each range Pass Linearity range for SPL At reference range , Step 5 dB at 4 kHz Pass Frequency weightings A Pass C Pass Lin Pass Time weightings Single Burst Fast Pass Single Burst Slow Pass Peak response Single 100 µs rectangular pulse Pass R.M.S. accuracy Crest factor of 3 Pass Time weighting I Single burst 5 ms at 2000 Hz Pass Repeated at frequency of 100 Hz Pass Time averaging 1 ms burst duty factor 1/10² at 4kHz Pass	2.0 0.3	
At reference range , Step 5 dB at 4 kHz	0.3	0.0
Reference SPL on all other ranges   Pass   2 dB below upper limit of each range   Pass   2 dB above lower limit of each range   Pass   Pass		2.2
Reference SPL on all other ranges   Pass   2 dB below upper limit of each range   Pass   2 dB above lower limit of each range   Pass   Elinearity range for SPL   At reference range   Step 5 dB at 4 kHz   Pass   Pass	0.0	
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           Frequency weightings         A         Pass           C         Pass           Lin         Pass           Time weightings         Single Burst Fast         Pass           Single Burst Slow         Pass           Peak response         Single 100µs rectangular pulse         Pass           R.M.S. accuracy         Crest factor of 3         Pass           Time weighting I         Single burst 5 ms at 2000 Hz         Pass           Repeated at frequency of 100 Hz         Pass           Time averaging         1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz         Pass	0.3	
Frequency weightings         A         Pass           C         Pass         Lin         Pass           Time weightings         Single Burst Fast         Pass           Single Burst Slow         Pass           Peak response         Single 100µs rectangular pulse         Pass           R.M.S. accuracy         Crest factor of 3         Pass           Time weighting I         Single burst 5 ms at 2000 Hz         Pass           Repeated at frequency of 100 Hz         Pass           Time averaging         1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz         Pass	0.3	
C Pass Lin Pass Time weightings Single Burst Fast Pass Single Burst Slow Pass Peak response Single 100µs rectangular pulse Pass R.M.S. accuracy Crest factor of 3 Pass Time weighting I Single burst 5 ms at 2000 Hz Pass Repeated at frequency of 100 Hz Pass Time averaging 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz Pass	0.3	
C Pass Lin Pass Time weightings Single Burst Fast Pass Single Burst Slow Pass Peak response Single 100µs rectangular pulse Pass R.M.S. accuracy Crest factor of 3 Pass Time weighting I Single burst 5 ms at 2000 Hz Pass Repeated at frequency of 100 Hz Pass Time averaging 1 ms burst duty factor 1/10² at 4kHz Pass	0.3	
Time weightings         Single Burst Fast Single Burst Slow         Pass Pass           Peak response         Single 100µs rectangular pulse         Pass Pass Pass           R.M.S. accuracy         Crest factor of 3         Pass Pass Pass Pass Pass Pass Pass Pass	0.3	
Single Burst Slow Pass Peak response Single 100µs rectangular pulse Pass R.M.S. accuracy Crest factor of 3 Pass Time weighting I Single burst 5 ms at 2000 Hz Pass Repeated at frequency of 100 Hz Pass Time averaging 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz Pass	0.3	
Peak response Single 100µs rectangular pulse Pass R.M.S. accuracy Crest factor of 3 Pass Time weighting I Single burst 5 ms at 2000 Hz Pass Repeated at frequency of 100 Hz Pass Time averaging 1 ms burst duty factor 1/10³ at 4kHz Pass	0.3	
R.M.S. accuracy Crest factor of 3 Pass Time weighting I Single burst 5 ms at 2000 Hz Pass Repeated at frequency of 100 Hz Pass Time averaging 1 ms burst duty factor 1/103 at 4kHz Pass	0.3	
Time weighting I Single burst 5 ms at 2000 Hz Pass Repeated at frequency of 100 Hz Pass Time averaging 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz Pass	0.3	
Repeated at frequency of 100 Hz. Pass Time averaging 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz Pass	0.3	
Time averaging 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz Pass	0.3	
	0.3	
2 : 10 3 m 10 20 20 20 20 20 20 20 20 20 20 20 20 20	0.3	
1 ms burst duty factor 1/104 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 Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

Response to associated sound calibrator 3,

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

Checked by:

Date:

Fung Chi Yip 15-Nov-2018

Shek Kwong Tat

15-Nov-2018 Date:

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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Form No CARP152-2/Issue 1/frey C/01/02/2007

# Calibration Certificate

Certificate Number 2018010851

Customer: LAM Environmental Services Ltd 11/F Centre Point 181-185 Gloucester Road Wanchai, , Hong Kong

Model Number CAL200 Serial Number 13098 Test Results Pass

Initial Condition Inoperable

Description

Larson Davis CAL200 Acoustic Calibrator

Procedure Number Technician D0001.8386 Scott Montgomery 29 Oct 2018

101.2 kPa

Calibration Date Calibration Due

Temperature Humidity Static Pressure

23 °C ±0.3°C 34 %RH ±3 %RH

± 1 kPa

Evaluation Method

The data is aquired by the insert voltage calibration method using the reference microphone's open

circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards

Compliant to Manufacturer Specifications per D0001.8190 and the following standards:

IEC 60942:2017

ANSI \$1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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	Standards Used	1		
Description	Cal Date	Cal Due	Cal Standard	
Agilent 34401A DMM	09/06/2018	09/06/2019	001021	
Larson Davis Model 2900 Real Time Analyzer	04/10/2018	04/10/2019	001051	
Microphone Calibration System	03/07/2018	03/07/2019	005446	
1/2* Preamplifier	09/20/2018	09/20/2019	006506	
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/07/2018	08/07/2019	006507	
1/2 inch Microphone - RI - 200V	05/10/2018	05/10/2019	006510	
Pressure Transducer	07/18/2018	07/18/2019	007368	
Professional and the Confession of the profession of the confession of the confessio	200 March 100 March		7.1.737.337.3.703.	







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Tel: (852) 2873 6860 Fax: (852) 2555 7533



## CERTIFICATE OF CALIBRATION

Certificate No.:

18CA1220 02

Page:

Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer: Type/Model No.: Larson Davis CAL200

Serial/Equipment No.:

13128

Adaptors used:

Item submitted by

Curstomer:

Lam Environmental Service Ltd.

Address of Customer:

Request No.: Date of receipt:

20-Dec-2018

Date of test:

28-Dec-2018

#### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2412857	20-Apr-2019	SCL
Preamplifier	B&K 2673	2239857	27-Apr-2019	CEPREI
Measuring amplifier	B&K 2610	2346941	08-May-2019	CEPREI
Signal generator	DS 360	33873	24-Apr-2019	
Digital multi-meter Audio analyzer Universal counter	34401A 8903B 53132A	US36087050 GB41300350 MY40003662	23-Apr-2019 23-Apr-2019 24-Apr-2019	CEPREI CEPREI

#### Ambient conditions

Temperature:

20 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1000 ± 5 hPa

#### Test specifications

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

#### Test results

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

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

Feng Jungi

Approved Signatory:

Date:

29-Dec-2018

Company Chop:

Comments: The results reported in this cyrificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

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Form No. CARP106-5/ssue 1/Rev. 0/01/03/2007



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### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA1220 02

Page:

#### Measured Sound Pressure Level 1.

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	Output Sound Pressure	Measured Output	Estimated Expanded
Shown	Level Setting	Sound Pressure Level	Uncertainty
Hz	dB	dB	dB
1000	94.00	93.84	

#### 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 = 0.006 dB

Estimated expanded uncertainty

0.005 dB

#### **Actual Output Frequency** 3,

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 = 999.4 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 = 0.4%

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

Checked by:

Fung Chi Y

Date:

Shok Kwong Tat 29-Dec-2018

Date:

28-Dec-2018

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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