

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

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

		/ Rootsmeter Orifice I.I		438320 0005	Ta (K) - Pa (mm) -	293 - 759.46
PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1 2 3 4 5	NA NA NA NA NA	NA NA NA NA NA	1.00 1.00 1.00 1.00 1.00	1.3960 0.9970 0.8910 0.8500 0.6990	3.2 6.4 7.8 8.7 12.7	2.00 4.00 5.00 5.50 8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
1.0120 1.0078 1.0058 1.0047 0.9993	0.7249 1.0108 1.1288 1.1820 1.4296	1.4257 2.0163 2.2543 2.3643 2.8514		0.9958 0.9916 0.9896 0.9885 0.9832	0.7133 0.9946 1.1107 1.1630 1.4066	0.8784 1.2423 1.3889 1.4567
Qstd slop intercept coefficie	t (b) = ent (r) =	2.02533 -0.03593 0.99983	n e n	Qa slope intercept coefficie	t (b) = ent (r) =	1.26823 -0.02214 0.99983
y axis =	SQRT[H20(I	Pa/760)(298/5	Γa)]	y axis =	SQRT[H20([a/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 = $1/m\{[SQRT(H2O(Pa/760)(298/Ta))] - b\}$

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



Location	:	CMA1b	Calibration Date	:	27-Sep-17
Equipment no.	: .	HVS001	Calibration Due Date	: .	27-Nov-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition								
Temperature, Ta303KelvinPressure, Pa1010mmHg								
Orifice Transfer Standard Information								
Equipment No.	Ori001	Slope, m _c	2.02533	Intercept, bc	-0.03593			
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$						
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$						

Calibration of TSP									
Calibration	Manometer Reading		Q _{std}	Continuous Flow	IC				
Point	Н (inches of v	vater)	(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)			
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis			
1	1.4	1.4	2.8	0.8358	28	27.7228			
2	2.3	2.3	4.6	1.0662	34	33.6634			
3	3.6	3.6	7.2	1.3295	44	43.5643			
4	4.6	4.6	9.2	1.5005	50	49.5049			
5	5.7	5.7	11.4	1.6683	57	56.4356			
By Linear Regression of Yo	n X								
	Slope, m	=	34.7	7 539	Intercept, b = -2.	3088			
Correlation C	oefficient*	=	0.9	973					

Calibration Accepted

**	Delete	as	appropri	ate.
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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.

Yes/No**

 Calibrated by
 : Jackey MA
 Checked by
 : Pauline Wong

 Date
 : 27-Sep-17
 Date
 : 27-Sep-17

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

27-Sep-17



Calibration Data for High Volume Sampler (TSP Sampler)

TESTING	Calibi	alion D	ala ioi r	ngn von	ille Sali	ipiei (13	- Sampler)		
Location	:	CMA2a				Calibratio	n Date	: 27	7-Sep-17
Equipment no.	:	HVS002				Calibratio	n Due Date	: 27	7-Nov-17
CALIBRATION OF CON	TINUOUS FL	OW RECO	RDER						
				Ambient C	ondition				
Temperature, T _a		303		Kelvin	Pressure, Pa		10	10	mmHg
			Orifice 1	Transfer Star	ndard Inform	ation			
Equipment No.		Ori001		Slope, m _c	2.025	33	Intercept, bc	-(0.03593
Last Calibration Date	9	20-Mar-17			(H	x P _a / 10	13.3 x 298 / T	a) 1/2	
Next Calibration Date	е	20-Mar-1	8			m _c x	$Q_{std} + b_c$		
				Calibration	n of TSP				
Calibration	Mai	Manometer Reading			Continuous Flow				IC
Point	н	H (inches of water)		(m ³ /	min.)	Recorder, W		(W(P _a /1013.3	x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-a	ixis	(0	CFM)	Y-	-axis
1	1.6	1.6	3.2	0.8	922		28	27	.7228
2	2.5	2.5	5.0	1.1	109		32	31	.6832
3	4.0	4.0	8.0	1.4	004		42	41	.5841
4	5.1	5.1	10.2	1.5	790		50	49	.5049
5	6.4	6.4	12.8	1.7	667		58	57	.4257
By Linear Regression of	Y on X								
	Slope, m	=	34.	5756	In	tercept, b =	-5.0)881	<u></u>
Correlation	n Coefficient*	=	0.9	903					
Calibrat	tion Accepted	=	Yes	/No**					
* if Correlation Coefficier	nt < 0.990, che	eck and reca	alibration aga	in.					
** Delete as appropriate.									
As per clie		information,	the equipme	nt reference r	no. of the cali	brated High V	olume Sampler h	as been	
Remarks :	d from EL449								
<u>re-assigne</u>			with respect	to the update	iii quality mal			. D	dino Woss
Calibrated by	. J	ackey MA				Checked	by	. Pua	lline Wong

Date

27-Sep-17

Date



Location	:	CMA3a	Calibration Date	:	28-Sep-17
Equipment no.	:	HVS012	Calibration Due Date	:	28-Nov-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition							
Temperature, T _a	303	Kelvin Pressure , P _a		1009	mmHg		

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

Calibration of TSP							
Calibration	Ma	nometer Re	eading	Q _{std}	Continuous Flow	IC	
Point	Н (inches of v	water)	(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)	
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis	
1	1.3	1.3	2.6	0.8056	32	31.6675	
2	2.1	2.1	4.2	1.0191	38	37.6051	
3	3.3	3.3	6.6	1.2730	44	43.5428	
4	4.3	4.3	8.6	1.4506	49	48.4908	
5	4.9	4.9	9.8	1.5473	54	53.4389	
By Linear Regression of Y	on X						
	Slope, m	=	27.9	609 In	tercept, b =	8.8606	
Correlation C	oefficient*	=	0.99	940			
Calibration	Accepted	=	Yes/	No **			

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

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

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

 Calibrated by
 : Jackey MA
 Checked by
 : Pauline Wong

 Date
 : 28-Sep-17
 Date
 : 28-Sep-17

^{**} Delete as appropriate.



Location	:	CMA4a	Calibration Date	:	28-Sep-17
Equipment no.	:	HVS004	Calibration Due Date	:	28-Nov-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition							
Temperature, T _a	303	Kelvin	Pressure, P _a		1009	mmHg	
Orifice Transfer Standard Information							
Equipment No.	Ori001	Slope, m _c	2.02533		Intercept, bc	-0.03593	
Last Calibration Date	20-Mar-17		$(HxP_a/1013.3x298/T_a)^{1/2}$				
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$					
		_	_		_	_	

				Calibration of TSP		
Calibration	Ma	nometer Re	eading	Q _{std}	Continuous Flow	IC
Point	Н (inches of v	water)	(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis
1	1.4	1.4	2.8	0.8354	24	23.7506
2	2.3	2.3	4.6	1.0657	32	31.6675
3	3.6	3.6	7.2	1.3288	42	41.5636
4	4.7	4.7	9.4	1.5158	48	47.5012
5	5.8	5.8	11.6	1.6819	52	51.4596
By Linear Regression of Y	on X					
	Slope, m	=	33.4	4431 In	tercept, b = -3.8	8033
Correlation C	Correlation Coefficient* =		0.9	977		
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 EL390 to HVS004 with respect to the update in quality management system.

Calibrated by : Jackey MA Checked by : Pauline Wong

Date Date : 28-Sep-17 Date : 28-Sep-17

^{**} Delete as appropriate.



Location	:	CMA5b	Calibration Date	:	28-Sep-17
Equipment no.	:	HVS010	Calibration Due Date	:	28-Nov-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition							
Temperature, T _a	303	Kelvin F	Pressure, P _a	1009	mmHg		

Orifice Transfer Standard Information								
Equipment No.	Ori001	Slope, m _c	2.02533	Intercept, bc	-0.03593			
Last Calibration Date	20-Mar-17	$(HxP_a/1013.3x298/T_a)^{1/2}$						
Next Calibration Date	20-Mar-18		= <i>r</i>	$m_c \times Q_{std} + b_c$				

	Calibration of TSP								
Calibration	Mai	nometer Re	eading	Q _{std}	Continuous Flow	IC			
Point	Н (inches of v	water)	(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)			
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis			
1	1.3	1.3	2.6	0.8056	38	37.6051			
2	2.1	2.1	4.2	1.0191	43	42.5532			
3	3.2	3.2	6.4	1.2539	50	49.4804			
4	4.3	4.3	8.6	1.4506	55	54.4285			
5	5.3	5.3	10.6	1.6086	60	59.3765			
By Linear Regression of Y	on X								
	Slope, m	=	27.	1605 In	tercept, b = 15	3.3477			
Correlation C	oefficient*	=	0.9	990					

Correlation Coefficient*	=	0.9990
Calibration Accepted	=	Yes/ No **
	-	

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 Date
 : Jackey MA
 Checked by Date
 : Pauline Wong

 Date
 : 28-Sep-17
 28-Sep-17
 : 28-Sep-17

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

^{**} Delete as appropriate.



Location	: _	MA1e	Calibration Date	:	28-Sep-17
Equipment no.	: -	HVS007	Calibration Due Date	:	28-Nov-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition						
Temperature, T _a	303	Kelvin	Pressure, P _a	1009	mmHg	

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

Calibration of TSP									
Calibration	Mai	nometer Re	eading	Q _{std}	Continuous Flow	IC			
Point	Н (inches of v	vater)	$(m^3 / min.)$	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)			
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis			
1	1.5	1.5	3.0	0.8640	28	27.7090			
2	2.4	2.4	4.8	1.0882	36	35.6259			
3	3.8	3.8	7.6	1.3648	45	44.5324			
4	4.9	4.9	9.8	1.5473	52	51.4596			
5	6.2	6.2	12.4	1.7383	56	55.4181			
By Linear Regression of Y	on X								
	Slope, m	=	32.36	638 In	tercept, b = 0	.2111			
Correlation C	oefficient*	=	0.99	73					
Calibration	Accepted	=	Yes/	\0 **					

 if Correlation Coefficient < 0.990, check and recalibration a 	gain.
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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 Date
 : Jackey MA
 Checked by Date
 : Pauline Wong

 Date
 : 28-Sep-17
 28-Sep-17



Location	:	MA1w	Calibration Date :	:	28-Sep-17
Equipment no.	: -	HVS008	Calibration Due Date :	: -	28-Nov-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T _a	303	Kelvin	Pressure, P _a	1009	mmHg

Orifice Transfer Standard Information						
Equipment No.	Ori001	Slope, m _c	2.02533	Intercept, bc	-0.03593	
Last Calibration Date	20-Mar-17	$(HxP_a/1013.3x298/T_a)^{1/2}$				
Next Calibration Date	20-Mar-18		= <i>m_c</i>	$x Q_{std} + b_c$		

Calibration of TSP								
Calibration	Mai	nometer Re	eading	Q _{std}	Continuous Flow	IC		
Point	Н (inches of v	water)	(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)		
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis		
1	1.5	1.5	3.0	0.8640	26	25.7298		
2	2.4	2.4	4.8	1.0882	36	35.6259		
3	3.8	3.8	7.6	1.3648	44	43.5428		
4	4.8	4.8	9.6	1.5317	50	49.4804		
5	6.0	6.0	12.0	1.7104	57	56.4077		
By Linear Regression of Y	on X							
Slope, m = 3		35.13	365 In	tercept, b =	3.9352			
Correlation Coefficient* =		0.99	76					
Calibration	Accepted	=	Yes/P	lo **				

* if C	orrelation	Coefficient	< 0.990,	check a	nd recalibr	ration again.
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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. Remarks:

Pauline Wong Calibrated by Jackey MA Checked by 28-Sep-17 Date Date 28-Sep-17



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



CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0426 01-02

Page

of

2

Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Manufacturer:

Larson Davis

PCB

Type/Model No.: Serial/Equipment N LxT1

377B02

Serial/Equipment No.:

0003737

171529

Adaptors used:

-

_

Item submitted by

Customer Name: Address of Customer:

Lam Environmental Service Ltd.

Request No.:

_

Request No.: Date of receipt:

26-Apr-2017

Date of test:

28-Apr-2017

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model:

Serial No.

Expiry Date:

Traceable to:

Signal generator

B&K 4226 DS 360 2288444 61227 18-Jun-2017 01-Apr-2018 CIGISMEC

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity: Air pressure:

50 ± 10 %

1010 ± 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.

Approved Signatory:

Date:

04-May-2017

Company Chop:

SENGINE COMPSI 综合試验 有限公司。 57/05 * OTT

Huang Jiar Min/Feng Jun Qi

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.

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA0426 01-02

Page

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	
3	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leg	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	Α	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	N/A	N/A	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ³ at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 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.

- End

Lai Sheng Jie Date: 28-Apr-2017 Checked by:

Fung Chi Yip
Date: 04-May-2017

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

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Calibrated by:



港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

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



CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0221 02

Page

2

Item tested

Description: Manufacturer:

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

2250-L

2701778

Microphone **B&K** 4950

Preamp **B&K** ZC0032

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

2755097

19223

Item submitted by

Customer Name: Address of Customer: Lam Geotechnics Limited

Request No.:

Date of receipt:

22-Feb-2017

Date of test:

02-Mar-2017

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:

18-Jun-2017 18-Apr-2017 18-Apr-2017

Traceable to:

CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

Relative humidity:

20 ± 1 °C 60 ± 10 %

Air pressure:

1010 ± 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 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.

Actual Measurement data are documented on worksheets.

Approved Signatory:

Huang Jia Min/⊭eng Jun Qi Date:

06-Mar-2017

Company Chop:

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

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA0221 02

Page

2

- 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.

		Expanded	Coverage
Subtest:	Status:	Uncertanity (dB)	Factor
۸	Dane	0.0	
9		0.3	
	Pass	0.3	
2 dB above lower limit of each range	Pass	0.3	
At reference range, Step 5 dB at 4 kHz	Pass	0.3	
A	Pass	0.3	
C	Pass	0.3	
Lin	Pass	0.3	
Single Burst Fast	Pass	0.3	
Single Burst Slow	Pass	0.3	
Single 100µs rectangular pulse	Pass	0.3	
Crest factor of 3	Pass	0.3	
Single burst 5 ms at 2000 Hz	Pass		
	Pass		
1 ms burst duty factor 1/103 at 4kHz			
1 ms burst duty factor 1/10 ⁴ at 4kHz			
Single burst 10 ms at 4 kHz			
5			
		0.000	
4	1 433	0.4	
	A C Lin At reference range, Step 5 dB at 4 kHz Reference SPL on all other ranges 2 dB below upper limit of each range 2 dB above lower limit of each range At reference range, Step 5 dB at 4 kHz A C Lin Single Burst Fast Single Burst Slow Single 100µs rectangular pulse Crest factor of 3 Single burst 5 ms at 2000 Hz Repeated at frequency of 100 Hz 1 ms burst duty factor 1/10³ at 4kHz	A Pass C Pass Lin Pass 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 2 dB above lower limit of each range At reference range , Step 5 dB at 4 kHz Pass A Pass C Pass Lin Pass Single Burst Fast Pass Single Burst Slow Pass Single 100µs rectangular pulse Pass Crest factor of 3 Pass Crest factor of 3 Pass Single burst 5 ms at 2000 Hz Pass 1 ms burst duty factor 1/10³ at 4kHz Pass 1 ms burst duty factor 1/10⁴ at 4kHz Pass Single burst 10 ms at 4 kHz Pass SPL	A Pass 0.3 C Pass 0.8 Lin Pass 1.6 At reference range, Step 5 dB at 4 kHz Pass 0.3 Reference SPL on all other ranges Pass 0.3 2 dB below upper limit of each range Pass 0.3 2 dB above lower limit of each range Pass 0.3 At reference range, Step 5 dB at 4 kHz Pass 0.3 A Pass 0.3 0.3 C Pass 0.3 Lin Pass 0.3 Single Burst Fast Pass 0.3 Single Burst Slow Pass 0.3 Single 100μs rectangular pulse Pass 0.3 Crest factor of 3 Pass 0.3 Single burst 5 ms at 2000 Hz Pass 0.3 Repeated at frequency of 100 Hz Pass 0.3 1 ms burst duty factor 1/10 ³ at 4kHz Pass 0.3 1 ms burst duty factor 1/10 ⁴ at 4kHz Pass 0.3 Single burst 10 ms at 4 kHz 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.

THE RESIDENCE OF THE PROPERTY			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:

 γ

Checked by:

Lam Tze Wai

Date:

Fung Chi Yip 02-Mar-2017

Date:

06-Mar-2017

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

Fnd

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



CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0320 02

Page

of

2

Item tested

Description: Manufacturer:

Type/Model No.:

Sound Level Meter (Type 1)

B&K

B&K 4950

Microphone

Preamp B & K ZC0032

Serial/Equipment No.: Adaptors used:

2250-1 2722310

2698702

13318

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No.: Date of receipt:

20-Mar-2017

Date of test:

23-Mar-2017

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Signal generator Signal generator Model:

B&K 4226 DS 360

2288444 33873 DS 360 61227

Serial No. **Expiry Date:**

18-Jun-2017 18-Apr-2017 18-Apr-2017 Traceable to:

CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

21 ± 1 °C 60 ± 10 %

Relative humidity: Air pressure:

1010 ± 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%.
- 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.

hin/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Huang Jian

Approved Signatory:

Date:

24-Mar-2017

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.:

17CA0320 02

Page

2

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.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self-generated noise	A	Pass	0.3	
con generated noise	c	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leg	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	
. requeriey meightings	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
·····g······go	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	
·····g······g··	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ³ at 4kHz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ⁴ at 4kHz		100-00-00	
Dulas range	2. A linear on a linear statement of the statement of	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:

End

Checked by:

Hung Chi Yip

Date:

Lai Sheng Jie 23-Mar-2017

Date:

24-Mar-2017

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

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CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0505 01

Page

2

Item tested

Description: Manufacturer: Sound Level Meter (Type 1) **B&K**

Microphone **B&K** 4950 2698703

Preamp **B&K** ZC0032

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

2250-L 2722311

13321

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No .: Date of receipt:

05-May-2017

Date of test:

06-May-2017

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226 Serial No.

Expiry Date:

Traceable to:

Signal generator

DS 360

2288444 61227

18-Jun-2017 01-Apr-2018 CIGISMEC CEPREI

Ambient conditions

Temperature:

22 ± 1 °C

Relative humidity: Air pressure:

50 ± 10 % 1010 ± 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

/ Heng Jungi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

09-May-2017

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.:

17CA0505 01

Page

2

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	Α	Dane	0.0	
och-generated noise	Ĉ	Pass	0.3	
	Lin	Pass	0.8	
Linearity range for Lan		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	Α	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	
3	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ³ at 4kHz	Pass		
Time averaging	•	36 (3643)	0.3	
Dulas sanas	1 ms burst duty factor 1/10 ⁴ at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2. Acoustic tests

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

Test:	Subtest	Status	Expanded 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:

Date:

Lai Sheng Jie 06-May-2017 Checked by:

Date:

09-May-2017

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

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CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0119 01

2250-L

3002695

Page

of

2

Item tested

Description: Manufacturer: Type/Model No.:

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

Microphone **B&K** 4950 2940839

Preamp **B&K** ZC0032 18582

Serial/Equipment No.: Adaptors used:

Lam Geotechnics Limited

Customer Name: Address of Customer:

Item submitted by

Request No.:

Date of receipt:

19-Jan-2017

Date of test:

20-Jan-2017

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: 18-Jun-2017 18-Apr-2017

18-Apr-2017

Traceable to: CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

21 ± 1 °C 40 ± 10 %

Relative humidity: Air pressure:

1010 ± 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.

Min/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Huana Jia

Approved Signatory:

Date:

23-Jan-2017

Company Chop:

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

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA0119 01

Page

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
1631.	Subtest.	Status.	Officertainty (ub)	1 actor
Self-generated noise	Α	Pass	0.3	
	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	Α	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.

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:

V

End

Checked by:

Lam Tze Wai

Date:

Fung Chi Yip 20-Jan-2017

Date:

23-Jan-2017

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

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CERTIFICATE OF CALIBRATION

Certificate No.:

16CA1117 01-02

Page:

of

2

Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer:

Rion Co., Ltd. NC-73

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

NC-73 10707358

Adaptors used:

-

Item submitted by

Curstomer:

Lam Geotechnics Ltd.

Address of Customer:

-

Request No.: Date of receipt:

17-Nov-2016

Date of test:

18-Nov-2016

Reference equipment used in the calibration

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

Ambient conditions

Temperature:

23 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1005 ± 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.
- 2, 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.

Min/Feng Jun Qi

Huang Jian

Approved Signatory:

Date:

21-Nov-2016

Company Chop:

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

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

16CA1117 01-02

2

1, Measured Sound Pressure Level

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

(Output level in dB re 20 μPa) Frequency Output Sound Pressure Measured Output Estimated Expanded Shown Level Setting Sound Pressure Level Uncertainty Hz dB dB dB 1000 94.00 94.12 0.10

2. Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz

STF = 0.002 dB

Estimated expanded uncertainty

0.005 dB

3, **Actual Output Frequency**

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz

Actual Frequency = 991.6 Hz

Estimated expanded uncertainty

0.1 Hz

Coverage factor k = 2.2

Total Noise and Distortion 4,

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

At 1000 Hz

TND = 0.6 %

Estimated expanded uncertainty

0.7 %

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

Calibrated by:

End

Date:

Fung Chi Yir

18-Nov-2016

Checked by:

Date:

Lam Tze Wai 21-Nov-2016

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

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Form No.CARP156-2/Issue 1/Rev C/01/05/2005



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CERTIFICATE OF CALIBRATION

Certificate No.:

17CA1110 02

Page:

Item tested

Description: Manufacturer:

Acoustical Calibrator (Class 1)

Type/Model No.:

Rion Co., Ltd. NC-73

Serial/Equipment No.: Adaptors used:

10707358

Item submitted by

Curstomer:

Lam Geotechnics Ltd.

Address of Customer: Request No.:

Date of receipt:

10-Nov-2017

Date of test:

14-Nov-2017

Reference equipment used in the calibration

Description: Lab standard microphone Preamplifier Measuring amplifier Signal generator Digital multi-meter Audio analyzer Universal counter	Model: B&K 4180 B&K 2673 B&K 2610 DS 360 34401A 8903B 53132A	Serial No. 2341427 2239857 2346941 61227 US36087050 GB41300350 MY40003662	Expiry Date: 11-Apr-2018 05-May-2018 03-May-2018 01-Apr-2018 25-Apr-2018 21-Apr-2018 22-Apr-2018	Traceable to: SCL CEPREI CEPREI CEPREI CEPREI CEPREI CEPREI
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Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1010 ± 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
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique. 2,
- 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

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.

- Min/Feng Jun Qi

Huang Jia

Approved Signatory:

Date:

15-Nov-2017

Company Chop:

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

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Form No.CARP156-1/Issue 1/Rev D/01/03/2007



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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA1110 02

Page:

2

1, Measured Sound Pressure Level

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

Frequency Shown	Output Sound Pressure Level Setting	Measured Output Sound Pressure Level	(Output level in dB re 20 µPa) Estimated Expanded Uncertainty
Hz	dB	dB	dB
1000	94.00	93.93	0.10

2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz

STF = 0.008 dB

Estimated expanded uncertainty

0.005 dB

3, **Actual Output Frequency**

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz

Actual Frequency = 991.5 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 = 0.3 %

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.

Fnd

Calibrated by:

Checked by:

Fung Chi Yip 15-Nov-2017

Date:

14-Nov-2017

calibrated on a schedule to maintain the required accuracy level.

Date:

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



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CERTIFICATE OF CALIBRATION

Certificate No.:

17CA1020 02

Page:

of

2

Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer: Type/Model No.: Larson Davis CAL200

Serial/Equipment No.: Adaptors used:

13437

Item submitted by

Curstomer:

Lam Geotechnics Ltd.

Address of Customer:

- 7

Request No.: Date of receipt:

20-Oct-2017

Date of test:

23-Oct-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	11-Apr-2018	SCL
Preamplifier	B&K 2673	2239857	05-May-2018	CEPREI
Measuring amplifier	B&K 2610	2346941	03-May-2018	CEPREI
Signal generator	DS 360	61227	01-Apr-2018	CEPREI
Digital multi-meter	34401A	US36087050	25-Apr-2018	CEPREI
Audio analyzer	8903B	GB41300350	21-Apr-2018	CEPREI
Universal counter	53132A	MY40003662	22-Apr-2018	CEPREI

Ambient conditions

Temperature:

22 ± 1 °C 50 ± 10 %

Relative humidity: Air pressure:

1000 ± 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.
- 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.

Min/Feng Jun Qi

Approved Signatory:

Date:

24-Oct-2017

Company Chop:

SENGINES QUE SEND

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.

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Form No CARP156-1/Issue 1/Rev D/01/03/2007



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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA1020 02

Page:

2

2

1, Measured Sound Pressure Level

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

			(Output level in dB re 20 μPa)
Frequency Shown	Output Sound Pressure Level Setting	Measured Output Sound Pressure Level	Estimated Expanded Uncertainty
Hz	dB	dB	dB
1000	94.0	93.90	0.10

2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz

STF = 0.011 dB

Estimated expanded uncertainty

0.005 dB

3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz

Actual Frequency = 1000.2 Hz

Estimated expanded uncertainty

0.1 Hz

Coverage factor k = 2.2

4, Total Noise and Distortion

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

At 1000 Hz

TND = 0.6 %

Estimated expanded uncertainty

0.7 %

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

Calibrated by:

End

Checked by:

Date:

Lai Sheng Jie 23-Oct-2017

Date:

Fung Chi Yip

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

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Form No CARP156-2/Issue 1/Rev C/01/05/2005