

RECALIBRATION DUE DATE:

January 24, 2019

Certificate of Calibration

Calibration Certification Information

Cal. Date: January 24, 2018

Rootsmeter S/N: 438320

Ta: 293 Pa: 756.9 °K

Operator: Jim Tisch

Calibration Model #: TE-5025A

Calibrator S/N: 3166

mm Hg

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4430	3.2	2.00
2	3	4	1	1.0270	6.4	4.00
3	5	6	1	0.9220	7.9	5.00
4	7	8	1	0.8780	8.7	5.50
5	9	10	1	0.7270	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)
1.0087	0.6990	1.4233	0.9958	0.6901	0.8799
1.0044	0.9780	2.0129	0.9915	0.9655	1.2443
1.0024	1.0872	2.2505	0.9896	1.0733	1.3912
1.0013	1.1404	2.3603	0.9885	1.1259	1.4591
0.9961	1.3701	2.8467	0.9834	1.3526	1.7598
CARCON - VI-	m=	2.12231		m=	1.32895
QSTD	b=	-0.06016	QA	b=	-0.03719
	r=	0.99999	~ .	r=	0.99999

	Calculation	ns		
Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=	ΔVol((Pa-ΔP)/Pa)	
Qstd=	Vstd/∆Time		la= Va/ΔTime	
	For subsequent flow ra	te calculatio	ns:	
Qstd=	$1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$	Qa=	1/m((√ΔH(Ta/Pa))-t	

	Standard Conditions
Tstd:	298.15 °K
Pstd:	760 mm Hg
	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



Location :		CIMATE				Calibration Date	3	28-Jun-18
Equipment no.		HVS001			(Calibration Due Date	-	28-Aug-18
CALIBRATION OF CONT	INUOUS FL	OW RECO	RDER					
			I III	Ambient C	ondition	ENEWS !		
Temperature, T _a		302.	2	Kelvin	Pressure, Pa		1010	mmHg
	400		Orifice	Transfer Sta	ndard Information	n		District of the same of the sa
Equipment No.		Ori002	H 9	Slope, m _c	2.12231	Intercept, b	С	-0.06016
Last Calibration Date		19-Jan-1	8		(HxF	a / 1013.3 x 298	/T _a) 1	/2
Next Calibration Date		19-Jan-1	9			$m_c \times Q_{std} + b_c$	E	
		-		Calibration	n of TSP			
Calibration	Ma	nometer Re	eading	Q	std	Continuous Flow		IC
Point	н	inches of v	vater)	(m³ /	min.)	Recorder, W	(W(F	P _a /1013.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-a	ixis	(CFM)		Y-axis
1	1.5	1.5	3.0	0.8	375	24		23.7938
2	2.2	2.2	4.4	1.0	082	31		30.7337
3	3.5	3.5	7.0	1.2	643	42		41.6392
4	4.7	4.7	9.4	1.4	606	47	\perp	46.5962
5	5.8	5.8	11.6	1.6	194	54		53.5361
By Linear Regression of Y	on X							
	Slope, m	=	37.4	025	Interce	pt, b =	-7.0435	
Correlation (Coefficient*	=	0.99	972				
Calibration	Accepted	=	Yes/	Ne**				
if Correlation Coefficient <	0.990, che	ck and reca	libration agai	n.				
** Delete as appropriate.								
27 CF 785	s provided i	nformation,	the equipmer	nt reference n	o. of the calibrated	d High Volume Sample	r has bee	on.
2 10	rom EL452	to HVS001	with respect t	o the update	in quality manager	nent system.		
Calibrated by	1000	talie Lau			W-237-163	hecked by	-	Pauline Wong
Date :	28	3-Jun-18			D	ate		28-Jun-18

23-Aug-18



Calibration Data for High Volume Sampler (TSP Sampler)

TESTING	Calibi	auon D	ala IOI I	nigii voii	uille Sall	ibiei (19	r Sampler	,	
Location	:	CMA1b				Calibration	on Date	: <u> </u>	23-Aug-18
Equipment no.	:	HVS001				Calibratio	on Due Date	:	23-Oct-18
CALIBRATION OF CON	TINUOUS FL	OW RECO	RDER_						
				Ambient C	ondition				
Temperature, T _a		300.7	7	Kelvin	Pressure, Pa	1	10	011	mmHg
			Orifice	Transfer Sta	ndard Inform	ation			
Equipment No.		Ori002		Slope, m _c	2.122	31	Intercept, bc		-0.06016
Last Calibration Date	•	19-Jan-18	8		(H	x P _a / 10	13.3 x 298 / T	Γ _a) ^{1/2}	-
Next Calibration Date	9	19-Jan-19	9			m _c x	$(Q_{std} + b_c)$		
				Calibratio	n of TSP				
Calibration	Ма	nometer Re	eading	Q	std	Contin	uous Flow		IC
Point	н	(inches of v	vater)	(m ³ /	min.)	Rec	order, W	(W(P _a /101	3.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-a	axis	(CFM)		Y-axis
1	1.5	1.5	3.0	0.8	397		24		23.8602
2	2.5	2.5	5.0	1.0	758		32		31.8135
3	3.9	3.9	7.8	1.3	366		42		41.7553
4	5.0	5.0	10.0	1.5	097		48		47.7203
5	6.1	6.1	12.2	1.6	645		53		52.6912
By Linear Regression of	Y on X								
	Slope, m	=	35.	3840	Int	tercept, b =	-5.9	9099	
Correlation	n Coefficient*	=	0.9	9996	_				
Calibrat	ion Accepted	=	Yes	5/ No **	_				
* if Correlation Coefficien	nt < 0.990, ch	eck and rec	alibration aga	ain.					
** Delete as appropriate.									
						Shara Caral I Park A	/-l		
Remarks : As per clie	nt's provided	information,	, tne equipme	ent reference	no. of the call	ibrated High V	olume Sampler h	nas been	
<u>re-assigne</u>	d from EL452	to HVS001	with respect	to the update	e in quality ma	nagement sys	stem.		
Calibrated by	:	Ray Lee				Checked	by	: F	Pauline Wong

Date

23-Aug-18

Date



Location	1	CMA2a				Calibration Date	:	28-Jun-18
Equipment no.	1	HVS002				Calibration Due Date	:	28-Aug-18
CALIBRATION OF CON	ITINUOUS FL	OW RECO	RDER					
			THE	Ambient C	ondition			7
Temperature, T _a		302.	2	Kelvin	Pressure, Pa		1010	mmHg
			Orifice	Transfer Sta	ndard Informatio	n	- 10	
Equipment No.		Ori002	8	Slope, m _c	2.12231	Intercept, b	c	-0.06016
Last Calibration Date	9	19-Jan-1	В		(Hxi	P _a / 1013.3 x 298	/T _a) 1/	2
Next Calibration Date	0	19-Jan-1	9			$m_c \times Q_{std} + b_c$		
			11-6	Calibration	n of TSP			The state of
Calibration	Ma	nometer Re	eading	Q	std	Continuous Flow	T	IC
Point	н	inches of v	water)	(m³ /	/ min.)	Recorder, W	(W(Pa	/1013.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-4	axis	(CFM)		Y-axis
1	1.3	1.3	2.6	0.7	816	25		24.7852
2	2.3	2.3	4.6	1.0	302	32		31.7251
3	3.5	3.5	7.0	1.2	643	43		42.6306
4	4.8	4.8	9.6	1.4	757	50		49.5704
5	6.1	6.1	12.2	1.6	600	56		55.5189
By Linear Regression of	Y on X							
	Slope, m	=	36.0	376	Interce	ept, b =	3.9257	
Correlation	n Coefficient*	=	0.9	971	10			
Calibrat	ion Accepted	=	Yes/	No**				
	100							
* if Correlation Coefficien	t < 0.990, che	ck and reca	libration agai	n.				
** Delete as appropriate.								
Remarks : As per clier	nt's provided in	nformation,	the equipmer	nt reference n	no. of the calibrate	ed High Volume Sampler	has beer	Î.
re-assigned	from EL449	to HVS002	with respect t	o the update	in quality manage	ment system.		
Calibrated by	: Na	atalie Lau				Checked by	:	Pualine Wong
Date	2	8-Jun-18			ı	Date	:	28-Jun-18



TESTING	Calibr	ation D	ata for H	ligh Vol	ume Sam	pler (TS	P Sampler)	
Location :		CMA2a				Calibratio	on Date	:	23-Aug-18
Equipment no.	HVS002			Calibration Due Date			:	23-Oct-18	
CALIBRATION OF CONTIL	NUOUS FL	OW RECO	RDER						
				Ambient C	ondition				
Temperature, T _a		300.	7	Kelvin	Pressure, Pa	l	10	011	mmHg
			Orifice 7	Transfer Sta	ndard Inform	ation			
Equipment No.		Ori002		Slope, m _c	2.122	31	Intercept, bc		-0.06016
Last Calibration Date		19-Jan-1	8		(H	x P _a / 10	13.3 x 298 / T	Γ _a) ^{1/2}	
Next Calibration Date		19-Jan-1	9			m _c x	$Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Mai	nometer Re	eading	Q	std	Contin	uous Flow		IC
Point	Н (inches of v	vater)	(m ³ /	/ min.)	Rec	order, W	(W(P _a /10	13.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-a	axis	(CFM)		Y-axis
1	1.6	1.6	3.2	0.0	3663		28		27.8368
2	2.2	2.2	4.4	1.0)110		35		34.7961
3	3.7	3.7	7.4	1.3	8026		44		43.7436
4	4.6	4.6	9.2	1.4	1492		51		50.7028
5	5.9	5.9	11.8	1.6	375		54		53.6854
By Linear Regression of Y	on X								
	Slope, m	=	•	0314	Int -	tercept, b =	-0.4	4992	
Correlation (9914	-				
Calibration	n Accepted	=	Yes	/ No **	-				
* if Correlation Coefficient <	< 0.990, che	eck and rec	alibration aga	iin.					
** Delete as appropriate.									
As per client's	s provided i	information,	the equipme	ent reference	no. of the cali	brated High \	olume Sampler h	nas been	
Remarks : re-assigned f	rom FI 440	to H\/\$002	with respect	to the undate	e in quality ma	nagement sve	stem		
		Ray Lee	with respect	to the upuale	, iii quality illa	Checked			Pualine Wong
Calibrated by		3-Aug-18				Date	Бу	·	23-Aug-18
Date		.5 / lug-10				Date		·	



Location	2	CMA3a	Calibration Date :	27-Jun-18
Equipment no.	2	HVS012	Calibration Due Date :	27-Aug-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

		Ambient C	ondition			
remperature, T _a	302.2	Kelvin	Pressure, Pa		1010 mm	ıHg
	Orifice	Transfer Star	ndard Information		4-1-6	
Equipment No.	Ori002	Slope, m _c	2.12231	Intercept, be	-0.06016	
Last Calibration Date	19-Jan-18	(H x P _a / 1013.3 x 298 / T _a) 1/2				
Next Calibration Date	19-Jan-19		п	$b_c \times Q_{std} + b_c$		
	THE CONTRACTOR OF THE PARTY OF	Calibration	of TSP			
Calibration	Manometer Reading	C	t std Co	entinuous Flow	IC	
Point	H (inches of water)	(m³	/ min.)	Recorder, W	(W(P,/1013.3x298/T,)1/2	/35.31

Point	(W(P _a /1013.3x29	98/T _a) ^{1/2} /35.31)
	Y-ax	tis
1	29.74	123
2	36.68	321
3	43.62	220
4	48.57	'90
5	53.53	161
Regression of Y on 2		
Slo	6.5410	
Correlation Coeffi		75
Calibration Acc		

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

" Delete as	appropriate.				
Remarks :	As per client's p	provided information, the equipment ref	ference no. of the calibrated High Volume	Sampler	has been
Calibrated b		m EL333 to HVS012 with respect to the Natalie Lau	e update in quality management system. Checked by		Pauline Wong
Dato	. —	27-Jun-18	Date		27-Jun-18



Location	:	CMA3a	Calibration Date	:	23-Aug-18
Equipment no.	: -	HVS012	Calibration Due Date	: -	23-Oct-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Temperature, T _a	300.7	Kelvin Pr	essure, P _a	101	1 mmHg			
Orifice Transfer Standard Information								
Equipment No.	-0.06016							

Ambient Condition

Orifice Transfer Standard Information								
Equipment No.	Ori002	Slope, m _c 2.12231 Intercept, bc -0.06016						
Last Calibration Date	19-Jan-18	(HxP _a /1013.3 x 298/T _a) ^{1/2}						
Next Calibration Date	19-Jan-19	$m_c \times Q_{std} + b_c$						

Calibration of TSP								
Calibration	ation Man		eading	Q _{std}	Continuous Flow	IC		
Point	н	H (inches of w		(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	0.7837	28	27.8368		
2	2.3	2.3	4.6	1.0330	35	34.7961		
3	3.2	3.2	6.4	1.2134	41	40.7611		
4	4.2	4.2	8.4	1.3860	47	46.7261		
5	5.4	5.4	10.8	1.5678	52	51.6970		
By Linear Regression of	Y on X	•						
	Slope, m	=	30.9	9858 In	itercept, b =	3.2800		
Correlation Coefficient*		=	0.99	991				
Calibratio	n Accepted	=	Yes/					

^{*} 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.

Checked by Pauline Wong Ray Lee Calibrated by 23-Aug-18 23-Aug-18 Date Date

^{**} Delete as appropriate.



Location		CMA4a	Calibration Date		27-Jun-18
Equipment no.		HVS004	Calibration Due Date	1	27-Aug-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Temperature, T _a	302.2	Kelvin	Pressure, Pa	1010	mmHg			
Orifice Transfer Standard Information								
Equipment No.	Ori002	Slope, m _c	2.12231	Intercept, bc	-0.06016			
Last Calibration Date	19-Jan-18	(HxP _a /1013.3 x 298/T _a) 1/2						
Next Calibration Date	19-Jan-19	$m_c \times Q_{std} + b_c$						

				Calibration of TS	P		
Calibration Point		nometer R inches of (down)	1000	Q _{std} (m³ / min.) X-axis	Continuo Record (CF	ler, W	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31 Y-axis
1	1.3	1.3	2.6	0.7816	20)	19.8282
2	2.2	2.2	4.4	1.0082	30)	29.7423
3	3.6	3.6	7.2	1.2818	40)	39.6563
4	4.8	4.8	9.6	1.4757	46	3	45.6048
5	6.0	6.0	12.0	1.6466	56	3	55.5189
y Linear Regression of Y on X Slope, m Correlation Coefficient* Calibration Accepted		= =	39.528 0.9962 Yes/No	2	Intercept, b =	-1	0.8967

 if Correlation Coefficient < 0.990, che 	ck and recalibration again
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** Delete as approp	oriate.
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As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been Remarks: re-assigned from EL390 to HVS004 with respect to the update in quality management system. Checked by Pauline Wong Natalie Lau Calibrated by Date 27-Jun-18 27-Jun-18 Date



Location	:	CMA4a	Calibration Date	:	23-Aug-18
Equipment no.	:	HVS004	Calibration Due Date	:	23-Oct-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Allibert Condition									
Temperature, T _a	300.7	Kelvin	Pressure, P _a	1011	mmHg				
Orifice Transfer Standard Information									
Equipment No.	Ori002	Slope, m _c	2.12231	Intercept, bc	-0.06016				
Last Calibration Date	19-Jan-18		(HxP _a /1013.3 x 298/T _a) ^{1/2}						
Next Calibration Date	19-Jan-19		$m_c \times Q_{std} + b_c$						

Calibration of TSP								
Calibration	Maı	nometer Re	eading	Q _{std}	Continuous Flow	IC		
Point	H (inches of 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	0.8122	22	21.8718		
2	2.0	2.0	4.0	0.9652	29	28.8310		
3	3.6	3.6	7.2	1.2853	42	41.7553		
4	4.7	4.7	9.4	1.4646	48	47.7203		
5	5.8	5.8	11.6	1.6238	54	53.6854		
By Linear Regression of Y	on X							
	Slope, m	=	38.	9454 In	tercept, b = -9.	1384		
Correlation Coefficient* =		=	0.9990					
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
 Ray Lee
 Checked by
 : Pauline Wong

 Date
 23-Aug-18
 Date
 : 23-Aug-18

^{**} Delete as appropriate.



Location	;	CMA5b	Calibration Date		27-Jun-18
Equipment no.		HVS010	Calibration Due Date	t	27-Aug-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition						
302.2	Kelvin	Pressure, P.	1010	mmHg		
,	302.2	302.2 Kelvin	302.2 Kelvin Pressure, Pa	302.2 Kelvin Pressure, P. 1010		

Orifice Transfer Standard Information							
Equipment No.	Ori002	Slope, m _c	2.12231	Intercept, bc	-0.06016		
Last Calibration Date	19-Jan-18	3,000	(HxPa	/1013.3 x 298/T _a)	1/2		
Next Calibration Date	19-Jan-19		= /	$m_c \times Q_{std} + b_c$			

Point Point	1550	(inches of (down)	KD-000857/	Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ¹² /35.31 Y-axis
1	1.5	1.5	3.0	0.8375	28	27.7594
2	2.3	2.3	4.6	1.0302	36	35.6907
3	3.5	3.5	7.0	1.2643	43	42,6306
4	4.3	4.3	8.6	1.3983	47	46.5962
5	5.5	5.5	11.0	1.5777	52	51.5532

Slope, m

Correlation Coefficient*

0.9968

Yes/Ne** Calibration Accepted

** Delei	le as	appropriate.
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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 EL222 to HVS010 with respect to the update in quality management system.

Calibrated by Date

Natalie Lau 27-Jun-18

Checked by Date

Pauline Wong 27-Jun-18

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



Location	:	CMA5b	Calibration Date	:	23-Aug-18
Equipment no.		HVS010	Calibration Due Date	: -	23-Oct-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition							
Temperature, T _a	300.7	Kelvin	Pressure, P _a	1011	mmHg		

Orifice Transfer Standard Information								
Equipment No.	Ori002	Slope, m _c	2.12231	Intercept, bc	-0.06016			
Last Calibration Date	19-Jan-18		(H x P _a	/ 1013.3 x 298 / T _a)	1/2			
Next Calibration Date	19-Jan-19		= r	$m_c \times Q_{std} + b_c$				

Calibration of TSP								
Calibration	Mai	nometer Re	eading	Q _{std}	Continuous Flow	IC		
Point	H (inches of 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	0.8397	34	33.8019		
2	2.1	2.1	4.2	0.9884	40	39.7669		
3	3.4	3.4	6.8	1.2499	48	47.7203		
4	4.4	4.4	8.8	1.4180	54	53.6854		
5	5.6	5.6	11.2	1.5960	59	58.6562		
By Linear Regression of Y	on X							
	Slope, m	=	32.7	7067 In	tercept, b =	6.8765		

By Linear Regression of Y on X					
Slope, m	= _	32.7067	Intercept, b =	6.8765	
Correlation Coefficient*	= _	0.9988			
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
 :
 Ray Lee
 Checked by
 :
 Pauline Wong

 Date
 :
 23-Aug-18
 Date
 :
 23-Aug-18

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

^{**} Delete as appropriate.



Location	;	MA1e	Calibration Date	:	27-Jun-18
Equipment no.	:	HVS007	Calibration Due Date		27-Aug-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

		Ambient Condition		
Temperature, T _a	302.2	Kelvin Pressure, Pa	1010	mmHg

	Orifi	ice Transfer Standa	rd Information		
Equipment No.	Ori002	Slope, m _c	2.12231	Intercept, bc	-0.06016
Last Calibration Date	19-Jan-18		(HXPa/	1013.3 x 298/T _a)	1/2
Next Calibration Date	19-Jan-19		m	$_{c} \times Q_{std} + b_{c}$	

			Ca	alibration of TSP		
Calibration Point	0:7:00	nometer R inches of (down)	05.98	Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P _a /1013.3x298/T _a) ^{1/2} /35.31 Y-axis
1	1.5	1.5	3.0	0.8375	26	25.7766
2	2.3	2.3	4.6	1.0302	34	33.7079
3	3.6	3.6	7.2	1.2818	46	45.6048
4	4.5	4.5	9.0	1.4298	-51	50.5618
5	5.6	5.6	11.2	1.5917	58	57.5017
y Linear Regression of \	on X		101			
	Slope, m	=	42.2405	5 Ir	ntercept, b = -	9.5021
Correlation (Coefficient*	=	0.9991			
Calibration	Accepted	=	Yes/Ne*	*		

è		OI	O	- 0 000	about and	as a with a state a seate	
٠,	11	Correlation	Coemcient	< U.99U.	cneck and	recalibration again.	

Remarks: As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL455 to HVS007 with respect to the update in quality management system.

Calibrated by	1	Natalie Lau	Checked by	:	Pauline Wong
Date		27-Jun-18	Date	1	27-Jun-18



Location	:	MA1e	Calibration Date	:	23-Aug-18
Equipment no.	:	HVS007	Calibration Due Date	:	23-Oct-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

		Ambient Co	ondition		
Temperature, T _a	300.7	Kelvin	Pressure, P _a	1011	mmHg

	Orifice Tr	ansfer Stan	dard Information		
Equipment No.	Ori002	Slope, m _c	2.12231	Intercept, bc	-0.06016
Last Calibration Date	19-Jan-18		(HxP _a /	1013.3 x 298 / T _a) 1/2
Next Calibration Date	19-Jan-19		m,	$_{c}$ x Q $_{std}$ + $_{c}$	

				Calibration of TSP		
Calibration	Maı	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	0.8397	24	23.8602
2	2.2	2.2	4.4	1.0110	32	31.8135
3	3.6	3.6	7.2	1.2853	44	43.7436
4	4.7	4.7	9.4	1.4646	51	50.7028
5	5.7	5.7	11.4	1.6100	56	55.6737
By Linear Regression of Y	on X					
	Slope, m	=	41.5	273 Int	tercept, b = -10	0.4222
Correlation C	oefficient*	=	0.99	988		
Calibration	Accepted	=	Yes/	\0 **		

 if Correlation Coefficient < 0.990, check and recalibration a 	gain.
--	-------

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
 :
 Ray Lee
 Checked by Date
 :
 Pauline Wong

 Date
 :
 23-Aug-18



Location		MA1w	Calibration Date		27-Jun-18
Equipment no.	:	HVS008	Calibration Due Date	:	27-Aug-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

		Ambient Condition		
Temperature, T _a	302.2	Kelvin Pressure, P.	1010	mmHg

Orifice Transfer Standard Information						
Equipment No.	Ori002	Slope, m _c	2.12231	Intercept, bc	-0.06016	
Last Calibration Date	19-Jan-18		(HxP _a /	1013.3 x 298 / T _a)	1/2	
Next Calibration Date	19-Jan-19		= m	c X Q _{std} + b _c		

			Cal	ibration of TSP		
Calibration Point		nometer R (inches of (down)	250	Q _{std} (m ³ / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P_/1013.3x298/T_) ^{1/2} /35.31 Y-axis
1	1.3	1.3	2.6	0.7816	20	19.8282
2	2.4	2.4	4.8	1.0518	28	27.7594
3	3.8	3.8	7.6	1.3162	38	37.6735
4	4.9	4.9	9.8	1.4907	44	43.6220
5	6.3	6.3	12.6	1.6865	50	49.5704
	of Y on X Slope, m n Coefficient*	-	33.5065 0.9991 Yes/Ne**		Intercept, b =	-6.7068

if Correlation Coefficier	t < 0.990, check and	f recalibration again.
---------------------------	----------------------	------------------------

Remarks: As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL080 to HVS008 with respect to the update in quality management system.

Calibrated by		Natalie Lau	Checked by		Pauline Wong
Date	: _	27-Jun-18	Date	:	27-Jun-18



Location	:	MA1w	Calibration Date	:	23-Aug-18
Equipment no.	:	HVS008	Calibration Due Date	:	23-Oct-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition						
Temperature, T _a	300.7	Kelvin	Pressure, P _a	1011	mmHg	

Orifice Transfer Standard Information					
Equipment No.	Ori002	Slope, m _c	2.12231	Intercept, bc	-0.06016
Last Calibration Date	19-Jan-18	(HxP _a /1013.3 x 298/T _a) ^{1/2}			
Next Calibration Date	19-Jan-19		= m _c	$x Q_{std} + b_c$	

Calibration of TSP							
Calibration	Ма	nometer Ro	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	0.8397	20	19.8835	
2	2.4	2.4	4.8	1.0546	27	26.8427	
3	3.6	3.6	7.2	1.2853	36	35.7902	
4	5.0	5.0	10.0	1.5097	42	41.7553	
5	6.4	6.4	12.8	1.7043	50	49.7087	
By Linear Regression of `	on X						
	Slope, m	=	34.1	180 In	tercept, b =	-8.8315	
Correlation Coefficient* =		0.99	985				
Calibratio	n Accepted	=	Yes/ł	\0 **			

* if (Correlation	Coefficient	< 0.990,	check and	recalibration	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:

Calibrated by Ray Lee Checked by Pauline Wong Date 23-Aug-18 Date 23-Aug-18



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

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CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0322 01

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Item tested

Description

Sound Level Meter (Type 1)

Microphone

Manufacturer: Type/Model No.: Larson Davis

PCB

Serial/Equipment No.:

LxT1 0003737 377B02 171529

Adaptors used:

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No.

Date of receipt:

22-Mar-2018

Date of test:

28-Mar-2018

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

08-Sep-2018 01-Apr-2018

CIGISMEC CEPREL

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.

Feng Jun Qi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

06-Apr-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

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Certificate No.:

18CA0322 01

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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 C	Pass	0.3	
	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	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	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 1/103 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 Weighting A at 8000 Hz	Pass Pass	0.3 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

by:

Date:

Fung Chi Yip

Checked by:

Lam Tze Wai

28-Mar-2018

Date:

06-Apr-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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Form No CARP 152-2/Issue 1/Rev C/01/02/2007



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CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0213 02

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone B & K Preamp B & K

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

4950 2755097 ZC0032 19223

Serial/Equipment No.: Adaptors used: 2701778

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Item submitted by

Customer Name:

Lam Geotechnics Limited.

Address of Customer:

Request No.:

.

Date of receipt:

13-Feb-2018

Date of test:

21-Feb-2018

Reference equipment used in the calibration

Description:

Model:

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator Signal generator B&K 4226 DS 360

DS 360

2288444 33873

61227

08-Sep-2018 25-Apr-2018 01-Apr-2018 CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

20 ± 1 °C

Relative humidity:

50 ± 10 % 1000 ± 5 hPa

Test specifications

 The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.

 The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.

 The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure 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.

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Actual Measurement data are documented on worksheets

Fen

Approved Signatory:

Date:

21-Feb-2018

Company Chop:

SENGINEGO SENGINEGO

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.

Soils & Materials Engineering Co. Ltd.

Form No CARP 152-Missue 1/Rev C/01/02/2007



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CERTIFICATE OF CALIBRATION

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Certificate No.:

18CA0213 02

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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	
	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	
	Leg	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 125 Hz		Subtest Status Uncertanity (dB) Weighting A at 125 Hz Pass 0.3

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:

Fung Chi Yip

21-Feb-2018

End

Checked by:

Date:

Lam Yze Wai 21-Feb-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.

Soils & Material's Engineering Co., Ltd.

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



香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong-E-mall: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0309 01

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Preamp B & K

Manufacturer: Type/Model No.: B & K 2250-L B & K 4950

B & K ZC0032

Serial/Equipment No.: Adaptors used: 2722310

2698702

13318

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer.

Request No.:

i i

Date of receipt:

09-Mar-2018

Date of test:

10-Mar-2018

Reference equipment used in the calibration

Description:

on: Model:

5

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator Signal generator

B&K 4226 DS 360 DS 360 2288444 33873 61227 08-Sep-2018 25-Apr-2018 01-Apr-2018 CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1000 ± 5 hPa

Test specifications

 The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.

 The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.

 The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure 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:

12-Mar-2018

Company Chop:

SENGIMESER SENGIMESER

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

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Certificate No.:

18CA0309 01

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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	
	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.

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

3, Response to associated sound calibrator

N/A

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

Calibrated by:

- End

.....

Date:

Fung Chi Yip \ 10-Mar-2018 Checked by:

Date:

Lam Tze War

12-Mar-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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Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0413 02

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Preamp

Manufacturer:

B & K

B & K

B&K

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

2250-L 2722311

4950 2698703 ZC0032 13321

Adaptors used

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No.

Date of receipt:

13-Apr-2018

Date of test:

18-Apr-2018

Reference equipment used in the calibration

Multi function sound calibrator

Model:

Serial No.

Expiry Date:

Traceable to:

Signal generator

B&K 4226 DS 360

2288444 33873

08-Sep-2018 25-Apr-2018

CIGISMEC CEPREI

Ambient conditions

Temperature:

20 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1000 ± 5 hPa

Test specifications

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

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:

Date:

18-Apr-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

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CERTIFICATE OF CALIBRATION

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Certificate No.:

18CA0413 02

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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 C	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	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	
100 A 144 CHAN 200 TA 150 A 10	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	SPĽ	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 Weighting A at 8000 Hz	Pass Pass	0.3 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:

.

Checked by:

Lam Tze Wa

Date:

Fong Chi Yip 18-Apr-2018

Date:

18-Apr-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.

End

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香港黄竹坑道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.:

18CA0116 01

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Item tested

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

Microphone B&K

Preamp BAK ZC0032

Type/Model No.: Serial/Equipment No.: 2250L 3002695

4950 2940839

18582

Adaptors used:

Item submitted by

Lam Geotechnics Ltd.

Customer Name: Address of Customer: Request No.

Date of receipt:

16-Jan-2018

Date of test:

18-Jan-2018

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226 Serial No.

Expiry Date: 08-Sep-2018

Traceable to:

Signal generator Signal generator

DS 360 DS 360

2288444 33873 61227

25-Apr-2018 01-Apr-2018 CIGISMEC CEPRE 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.

Feng Jun Qi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

18-Jan-2018

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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CERTIFICATE OF CALIBRATION

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Certificate No.:

18CA0116 01

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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	
	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 Weighting A at 8000 Hz	Pass Pass	0.3 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:

Fung Chi Yip 18-Jan-2018 Checked by

ones oj.

Date:

Lam Tze Wai 18-Jan-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.

End

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CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0904 02

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Preamp

of

Manufacturer: Type/Model No.: B & K 2250-L B & K 4950 2827240 B & K ZC0032 21213

Serial/Equipment No.: Adaptors used: 3006790

40

Item submitted by

Customer Name:

Lam Geotechnics Limited

Address of Customer:

Request No.:

04 Can 2017

Date of receipt:

04-Sep-2017

Date of test:

09-Sep-2017

Reference equipment used in the calibration

Description:

Model:

DS 360

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator B&K 4226 DS 360 Serial No 2288444 33873

61227

08-Sep-2018 25-Apr-2018 01-Apr-2018 CIGISMEC

CEPREI

Signal generator

Ambient conditions

21 ± 1 °C

Temperature: Relative humidity:

50 ± 10 %

Air pressure:

1015 ± 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

Min/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

09-Sep-2017

Company Chop:

SENGINESO SENGINESO

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

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Certificate No.:

17CA0904 02

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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.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self-generated noise	A	Pass	0.3	
I - Control (Production of the Control	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	A 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	
150.55	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	
- All and the state of the stat	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:

Lai Sheng Jie

Checked by:

Fung Chi Yip

Date:

09-Sep-2017

Date:

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



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CERTIFICATE OF CALIBRATION

Certificate No.:

17CA1110 02

Page:

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Item tested

Description: Manufacturer: Acoustical Calibrator (Class 1)

Type/Model No...

Rion Co., Ltd. NC-73

Serial/Equipment No.:

10707358

Adaptors used:

Item submitted by

Curstomer:

Lam Geotechnics Ltd.

Address of Customer:

.

Request No.:

Elemen .

Date of receipt:

10-Nov-2017

Date of test:

14-Nov-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: Relative humidity:

Air pressure:

21 ± 1 °C 50 ± 10 % 1010 ± 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.

e/Feng Jun Q

Huang Jis

Approved Signatory:

Date:

15-Nov-2017

Company Chop:

SENGINESRI SENGINESRI 综合試験 有限公司 STIOS ** CSS

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.:

17CA1110 02

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1, Measured Sound Pressure Level

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

Frequency	Output Sound Pressure	Measured Output	(Output level in dB re 20 µPa) Estimated Expanded Uncertainty dB
Shown	Level Setting	Sound Pressure Level	
Hz	dB	d8	
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.

Calibrated by:

End

allibrated by:

Checked by:

Date:

14-Nov-2017

Date:

Fung Chi Yip 15-Nov-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.:

18CA0309 02

Page:

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Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer: Type/Model No.:

Larson Davis CAL200

Serial/Equipment No.: Adaptors used: 13098

Item submitted by

Curstomer:

Lam Environmental Service Ltd.

Address of Customer:

Request No.:

.

Date of receipt:

09-Mar-2018

Date of test:

12-Mar-2018

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:

21 ± 1 °C

Relative humidity:

50 ± 10 %

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.
- 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.

Feng Jun Q

Approved Signatory:

Date:

12-Mar-2018

Company Chop:

有限公司等

Comments: The results reported in this conficate 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. CARP155-1/Issue 1/Rev C/01/03/2007



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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0309 02

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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	Output Sound Pressure	Measured Output	Estimated Expanded
Shown	Level Setting	Sound Pressure Level	Uncertainty
Hz	dB	dB	dB
1000	94.0	93.81	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

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 = 1000.0 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

Fung Chi Yip

Checked by:

Lam Tze Wai

Date:

12-Mar-2018

Date:

12-Mar-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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