	36						REC	ALIBRATION DUE DATE:
)		Janu	ary 11, 2020
vir	onm	ent	al					
	Ce	rtifa	cate	of O	Cal	ibri	rtion	
		-	Calibration	Certificatio	on Informat	ion		
Cal. Date:	January 11	, 2019	Roots	meter S/N:	438320	Ta:	293	°K
Operator:	Jim Tisch			•		Pa:	760.7	mm Hg
Calibration	Model #	TE-5025A	Calik	arator S/N.	0005	14.	/00./	
canoration	model #.	12-3023A	Calix		0005			
		Vol. Init	Vol. Final	ΔVol.	ΔTime	ΔΡ	ΔН	
	Run	(m3)	(m3)	(m3)	(min)	(mm Hg)	(in H2O)	
	1	1	2	1	1.4090	3.2	2.00	
	2	3	4	1	0.9980	6.4	4.00	
	3	5	6	1	0.8900	7.8	5.00	-
	4	7	8	1	0.8450	8.7	5.50	
	5	9	10	1	0.6990	12.6	8.00	
			C	Data Tabula	tion]
	Vstd	Qstd	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right)}$)(<u>Tstd</u>)		Qa	√∆Н(Та/Ра)	
	(m3)	(x-axis)	(y-axi	is)	Va	(x-axis)	(y-axis)	
	1.0138	0.7195	1.426	59	0.9958	0.7067	0.8777	
	1.0095	1.0115	2.018	30	0.9916	0.9936	1.2412	
	1.0076	1.1321	2.256	51	0.9897	1.1121	1.3877	-
	1.0064	1.1910	2.366	53	0.9886	1.1699	1.4555	-
	1.0012	1.4323	2.853	58	0.9834	1.4069	1./553	-
	ΟςΤΟ	h=	-0.008	282	04	h=	-0.00543	-
	QSID	r=	0.999	97	QA	r=	0.99997	-
	[]			Coloulat	l			1
	Vetd-		/Petd)/Tetd/Ta		15		D)/Pa)	4
	Ostd=	Vstd/ATime	/13/0/13/0/18	<i>a j</i>	Oa=	Va/ATime	- // F d)	-
			For subsequ	ent flow ra	te calculation	is:		1
		// []	De V Tetel			//	<u> </u>	-
	Qstd=	1/m((_\ΔH(Pstd Ta))-b)	Qa=	1/m ((√∆⊦	l(Та/Ра))-b)	
	Standard	Conditions						
Istd:	298.15	°K			a the formation of the second s	RECA	LIBRATION	
PS(0):	1 /00	(ev			US EPA reco	mmends a	nnual recalibratio	on per 1998
AH: calibrate	or manomet	er reading (i	n H2O)		40 Code	of Federal F	Regulations Part	50 to 51,
\P: rootsme	ter manom	eter reading	(mm Hg)		Appendix E	to Part 50	, Reference Meth	nod for the
	acoluto tom	perature (°K)			Determinat	ion of Susn	ended Particulat	e Matter in
Ta: actual at	solute terri	perature (ity		1	Determinat	ion or ousp	chaca i articalat	c mutter in

sch Environmental, Inc. 5 South Miami Avenue

lage of Cleves, OH 45002

<u>www.tisch-env.com</u> TOLL FREE: (877)263-7610 FAX: (513)467-9009



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA1b	Calbration Date	:	18-Oct-19
Equipment no.	:	HVS001	Calbration Due Date	:	18-Dec-19

CALIBRATION OF CONTINUOUS FLOW RECORDER

	Ambient Condition								
Temperature, T _a		300	1	Kelvin	Pressure, P	a	1	1017 mmHg	
	Orifice Transfer Standard Information								
Equipment No.		0005		Slope, m _c	1.998	61	Intercept, bc	-0.00882	
Last Calibration Date		11-Jan-1	9		(Hx	P _a / 10	13.3 x 298 /	(T _a) ^{1/2}	
Next Calibration Date		11-Jan-2	0		=	m_c y	$(Q_{std} + b_c)$		
Calibration of TSP									
Calibration	Manometer Reading			C) _{std}	Contir	uous Flow	IC	
Point	Н (H (inches of water)		(m ³	(m ³ / min.) Reco		order, W	$(W(P_a/1013.3x298/T_a)^{1/2}/35.31)$	
	(up)	(down)	(difference)	X-	axis	xis (CF		Y-axis	
1	1.4	1.4	2.8	0.8	8404		27	26.9589	
2	1.9	1.9	3.8	0.9	9783		31	30.9529	
3	2.5	2.5	5.0	1.1	1215		36	35.9452	
4	4.1	4.1	8.2	1.4	4350		42	41.9361	
5	4.8	4.8	9.6	1.	5523		47	46.9285	
By Linear Regression of	Y on X								
	Slope, m	=	26.6	137	Int	ercept, b =	= 4.	9937	
Correlation Co	pefficient*	=	0.99	936					
Calibration	Accepted	=	Yes/	\0 **					

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

** Delete as appropriate.

Remarks :

Calibrated by

Date

Laurance Yung 18-Oct-19

:

:

Checked by Date James Chu

:

•

18-Oct-19



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA1b	Calbration Date	:	10-Dec-19
Equipment no.	:	HVS001	Calbration Due Date	:	9-Feb-20

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T _a		291		Kelvin Pressure, P a				1019 mmHg	
	Orifice Transfer Standard Information								
Equipment No.		0005		Slope, m _c	1.998	61	Intercept, bc	-0.00882	
Last Calibration Date	11-Jan-19				(Hx	: P _a / 10)13.3 x 298 /	$(T_a)^{1/2}$	
Next Calibration Date		11-Jan-2	:0		=	m _c	$x Q_{std} + b_c$		
Calibration of TSP									
Calibration	Manometer Reading			c	ຊ _{std} Continue		nuous Flow	IC	
Point	H (inches of water)		(m ³	(m ³ / min.) Reco		corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)		
	(up)	(down)	(difference)	Х-	-axis (Cf		(CFM)	Y-axis	
1	1.9	1.9	3.8	0.	9942		24	24.3552	
2	2.4	2.4	4.8	1.	1168		31	31.4587	
3	3.1	3.1	6.2	1.:	2687		36	36.5327	
4	4.4	4.4	8.8	1.	5106		48	48.7103	
5	5.0	5.0	10.0	1.	6101		54	54.7991	
By Linear Regression of	Y on X								
	Slope, m	=	47.9	646	Inte	ercept, b	= -23	3.1872	
Correlation Co	pefficient*	=	0.99	973					
Calibration	Accepted	=	Yes/	\o **					

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

Delete as appropriate.	**	Delete	as	appropriate.
------------------------	----	--------	----	--------------

Remarks :

Calibrated by

Date

: Laurance Yung

10-Dec-19

:

Checked by

Date

: James Chu



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA2a	Calbration Date	:	18-Oct-19
Equipment no.	:	HVS002	Calbration Due Date	: _	18-Dec-19

CALIBRATION OF CONTINUOUS FLOW RECORDER

	Ambient Condition								
Temperature, T _a		300		Kelvin Pressure, P a			1	1017 mmHg	
	Orifice Transfer Standard Information								
Equipment No.		0005		Slope, m _c	1.998	61	Intercept, bc	-0.00882	
Last Calibration Date		11-Jan-1	9		(Hx	(P _a / 10	13.3 x 298 /	$(T_a)^{1/2}$	
Next Calibration Date		11-Jan-2	0		=	m_c >	$(Q_{std} + b_c)$		
Calibration of TSP									
Calibration	Manometer Reading			C	Q _{std} Continuo		uous Flow	IC	
Point	Н (inches of	water)	(m ³ / min.)		Recorder, W		(W(P _a /1013.3x298/T _a) ^{1/2} /3	35.31)
	(up)	(down)	(difference)	X-	-axis (CF		CFM)	Y-axis	
1	2.1	2.1	4.2	1.(0283		23	22.9650	
2	2.6	2.6	5.2	1.1	1436		29	28.9559	
3	3.2	3.2	6.4	1.:	2683		36	35.9452	
4	3.8	3.8	7.6	1.3	3817		42	41.9361	
5	4.1	4.1	8.2	1.4	4350		48	47.9270	
By Linear Regression of	Y on X								
	Slope, m	=	58.9	997	Int	ercept, b =	-38	3.2849	
Correlation Co	pefficient*	=	0.99	939					
Calibration	Accepted	=	Yes/	No**					

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

** Delete as appropriate.

Remarks :			
Calibrated by	:	Laurance Yung	Checked by
Date	:	18-Oct-19	Date

James Chu

:

18-Oct-19



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA2a	Calbration Date	:	10-Dec-19
Equipment no.	:	HVS002	Calbration Due Date	:	9-Feb-20

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T _a		291		Kelvin	Pressure, P	a	1	019 mmHg	
Orifice Transfer Standard Information									
Equipment No.		0005		Slope, m _c	1.998	61	Intercept, bc	-0.00882	
Last Calibration Date		11-Jan-1	9		(Hx	r P _a / 10)13.3 x 298 /	(T _a) ^{1/2}	
Next Calibration Date		11-Jan-2	0		=	m _c	$x Q_{std} + b_c$		
Calibration of TSP									
Calibration	Manometer Reading			c	Q std Continue		nuous Flow	IC	
Point	H (inches of water)		(m ³ / min.) Rec		corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.3			
	(up)	(down)	(difference)	Х-	Ciaxis (Ci		(CFM)	Y-axis	
1	2.3	2.3	4.6	1.	0934		28	28.4144	
2	2.7	2.7	5.4	1.	1843		34	34.5031	
3	3.6	3.6	7.2	1.3	3669		40	40.5919	
4	4.2	4.2	8.4	1.	4760		46	46.6807	
5	4.9	4.9	9.8	1.	5939		51	51.7547	
By Linear Regression of	Y on X								
	Slope, m	=	45.1	480	Inte	ercept, b	= -20).2407	
Correlation Co	pefficient*	=	0.99	957					
Calibration	Accepted	=	Yes/ł	\o **					

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

Remarks :

Calibrated by

Date

: Laurance Yung

10-Dec-19

:

Checked by

Date

: James Chu



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	СМАЗа	Calbration Date	:	18-Oct-19
Equipment no.	:	HVS012	Calbration Due Date	:	18-Dec-19

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T _a		300		Kelvin	Pressure, P	a	1	017 mmHg		
Orifice Transfer Standard Information										
Equipment No.		0005		Slope, m _c	1.998	61	Intercept, bc	-0.00882		
Last Calibration Date		11-Jan-1	9		(Hx	(P _a / 10	13.3 x 298 /	(T _a) ^{1/2}		
Next Calibration Date		11-Jan-2	0		=	m_c y	$(Q_{std} + b_c)$			
				Calibratio	n of TSP					
Calibration	Mar	nometer R	eading	C	t std	Contir	uous Flow	IC		
Point	Н (і	inches of	water)	(m ³	(m ³ / min.) Record		order, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.3		
	(up)	(down)	(difference)	X-	axis	(CFM)	Y-axis		
1	1.8	1.8	3.6	0.9	9523		29	28.9559		
2	2.3	2.3	4.6	1.(0759		34	33.9483		
3	2.7	2.7	5.4	1.1	1653		38	37.9422		
4	3.3	3.3	6.6	1.2	2879		44	43.9331		
5	3.7	3.7	7.4	1.3	3634		49	48.9255		
By Linear Regression of	Y on X									
	Slope, m	=	48.0	324	Int	ercept, b =	= -17	7.4077		
Correlation Co	pefficient*	=	0.99	963						
Calibration Accepted = Yes/ No**										

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

** Delete as appropriate.

Remarks :					
Calibrated by	:	Laurance Yung	Checked by	:	James Chu
Date	:	18-Oct-19	Date	:	18-Oct-19



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	СМАЗа	Calbration Date	:	10-Dec-19
Equipment no.	:	HVS012	Calbration Due Date	:	9-Feb-20

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T _a		291		Kelvin	Pressure, P	a	1	019 m	ımHg	
Orifice Transfer Standard Information										
Equipment No.		0005		Slope, m _c	1.998	61	Intercept, bc	-0.0088	2	
Last Calibration Date		11-Jan-1	9		(Hx	r P _a / 10	013.3 x 298 /	(T _a) ^{1/2}		
Next Calibration Date		11-Jan-2	0		=	m _c	$x Q_{std} + b_c$			
Calibration of TSP										
Calibration	Mar	nometer R	eading	c) _{std}	Cont	inuous Flow	IC		
Point	H (inches of water)		(m ³	/ min.)	Re	corder, W	(W(P _a /1013.3x298/T _a)) ^{1/2} /35.31)		
	(up)	(down)	(difference)	Х-	axis	axis (CF		Y-axis		
1	1.6	1.6	3.2	0.	9127		27	27.3996		
2	2.4	2.4	4.8	1.	1168		34	34.5031		
3	3.3	3.3	6.6	1.	3089		38	38.5623		
4	3.8	3.8	7.6	1.	4042		43	43.6363		
5	4.5	4.5	9.0	1.	5277		48	48.7103		
By Linear Regression of	Y on X									
	Slope, m	=	33.5	341	Int	ercept, b	= -3	4912		
Correlation Co	pefficient*	=	0.99	913						
Calibration	Accepted	=	Yes/	\o **						

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

** Delete as appropr	iate.
----------------------	-------

Remarks :

Date

: Laurance Yung

: 10-Dec-19

Checked by

Date

: James Chu



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA4a	Calbration Date	:	18-Oct-19
Equipment no.	:	HVS004	Calbration Due Date	:	18-Dec-19

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T _a		300	J	Kelvin	Pressure, P	a	1	I017 mmHg		
Orifice Transfer Standard Information										
Equipment No.		0005		Slope, m _c	1.998	61	Intercept, bc	-0.00882		
Last Calibration Date		11-Jan-1	9		(Hx	(P _a / 10	13.3 x 298 /	'T _a) ^{1/2}		
Next Calibration Date		11-Jan-2 [,]	.0		=	m _c x	$(Q_{std} + b_c)$			
				Calibratio	on of TSP					
Calibration	Mar	nometer Re	eading	G	Q _{std}	Contin	uous Flow	IC		
Point	H (i	inches of v	water)	(m ³	(m ³ / min.) Record		order, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)		
	(up)	(down)	(difference)	Х-	-axis	(CFM)	Y-axis		
1	1.3	1.3	2.6	0.8	8100		26	25.9605		
2	1.8	1.8	3.6	0.9	9523		31	30.9529		
3	2.6	2.6	5.2	1.1	1436		36	35.9452		
4	3.2	3.2	6.4	1.:	2683		39	38.9407		
5	4.1	4.1	8.2	1.4	4350		42	41.9361		
By Linear Regression of `	Y on X									
	Slope, m	=	25.5	089	Int	ercept, b =	=6	.1300		
Correlation Co	cefficient*	=	0.99	931						
Calibration	Accepted	=	Yes/ł	No**						

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

:

**	Delete	as	appropriate.
----	--------	----	--------------

Remarks :

Calibrated by

Date

: Laurance Yung 18-Oct-19

Checked by Date

James Chu

18-Oct-19

:

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Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA4a	Calbration Date	:	10-Dec-19
Equipment no.	:	HVS004	Calbration Due Date	:	9-Feb-20

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T _a		291		Kelvin	Pressure, P	a	1	1019 mmHg		
Orifice Transfer Standard Information										
Equipment No.		0005		Slope, m _c	1.998	61	Intercept, bc	-0.00882		
Last Calibration Date		11-Jan-1	9		(Hx	r P _a / 10	013.3 x 298 /	(T _a) ^{1/2}		
Next Calibration Date		11-Jan-2	0		=	m _c	$x Q_{std} + b_c$			
	Calibration of TSP									
Calibration	Mar	nometer R	eading	c) _{std}	Cont	inuous Flow	IC		
Point	Н (inches of	water)	(m ³ / min.) Reco		corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)			
	(up)	(down)	(difference)	Х-	axis		(CFM)	Y-axis		
1	2.1	2.1	4.2	1.	0450		25	25.3700		
2	2.6	2.6	5.2	1.	1623		31	31.4587		
3	3.2	3.2	6.4	1.:	2889		36	36.5327		
4	3.7	3.7	7.4	1.3	3856		40	40.5919		
5	4.3	4.3	8.6	1.	4934		46	46.6807		
By Linear Regression of	Y on X									
	Slope, m	=	46.1	620	Inte	ercept, b	= -22	2.7324		
Correlation Co	pefficient*	=	0.99	981						
Calibration	Calibration Accepted = Yes/Ne**									

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

** Delete as appropriate.

:

Remarks :

Calibrated by

Date

: Laurance Yung

10-Dec-19

Checked by

Date

: James Chu



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA5b	Calbration Date	:	18-Oct-19
Equipment no.	:	HVS010	Calbration Due Date	:	18-Dec-19

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition								
Temperature, T _a		300)	Kelvin	Pressure, P	a	1	I017 mmHg
			Orifice T	ransfer Sta	Indard Inform	nation		
Equipment No.	[0005		Slope, m _c	1.9980	61	Intercept, bc	-0.00882
Last Calibration Date		11-Jan-1	9		(Hx	: P _a / 10)13.3 x 298 /	'T _a) ^{1/2}
Next Calibration Date		11-Jan-2	.0	1	=	m _c	$x Q_{std} + b_c$	
Calibration of TSP								
Calibration	Mar	nometer R	eading	C	ک _{std}	Conti	nuous Flow	іс
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	1.6	1.6	3.2	0.8	8981		22	21.9665
2	2.2	2.2	4.4	1.0	0524		26	25.9605
3	2.7	2.7	5.4	1.1	1653		30	29.9544
4	3.4	3.4	6.8	1.3	3072		36	35.9452
5	4.3	4.3	8.6	1.4	4695		41	40.9376
By Linear Regression of	Y on X							
	Slope, m	=	34.2	476	Inte	ercept, b	=9	.4077
Correlation Co	cefficient*	=	0.99) 68				
Calibration Accepted = Yes/		No**						

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

** Delete as appropriate.

Remarks :					
Calibrated by	:	Laurance Yung	Checked by	:	James Chu
Date	:	18-Oct-19	Date	:	18-Oct-19



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	СМА5Ь	Calbration Date	:	10-Dec-19
Equipment no.	:	HVS010	Calbration Due Date	:	9-Feb-20

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T _a		291		Kelvin Pressure , P _a				019	mmHg
Orifice Transfer Standard Information									
Equipment No.		0005		Slope, m _c	1.998	61	Intercept, bc		-0.00882
Last Calibration Date		11-Jan-1	9		(Hx	r P _a / 10	013.3 x 298 /	'Τ _a) ^{1/2}	
Next Calibration Date		11-Jan-2	:0		=	m _c	$x Q_{std} + b_c$		
Calibration of TSP									
Calibration	Manometer Reading			c) _{std}	Conti	nuous Flow		IC
Point	H (inches of water)		(m ³	³ / min.) Reco		corder, W	(W(P _a /1013	.3x298/T _a) ^{1/2} /35.31)	
	(up)	(down)	(difference)	Х-	axis (Cl		(CFM)		Y-axis
1	1.7	1.7	3.4	0.	9407		27	2	7.3996
2	2.3	2.3	4.6	1.	0934		35	3	5.5179
3	3.0	3.0	6.0	1.:	2481		39	3	9.5771
4	3.6	3.6	7.2	1.	3669		44	4	4.6511
5	4.1	4.1	8.2	1.	1.4584		49	4	9.7251
By Linear Regression of	Y on X								
	Slope, m	=	40.8	780	Int	ercept, b	= -10).5581	
Correlation Coefficient* = 0.99		935							
Calibration Accepted = Yes/		\ ⊕**							

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

Remarks :

Calibrated	bv	
Cambrateu	NУ	

Date

: Laurance Yung

:

10-Dec-19

Checked by

Date

James Chu

:



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	MA1e	Calbration Date	:	18-Oct-19
Equipment no.	: _	HVS007	Calbration Due Date	:	18-Dec-19

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T _a		300)	Kelvin	Pressure, P	a	1	017 mmH	g	
	Orifice Transfer Standard Information									
Equipment No.		0005		Slope, m _c	1.998	61	Intercept, bc	-0.00882		
Last Calibration Date		11-Jan-1	9		(Hx	r P _a / 10)13.3 x 298 /	$(T_a)^{1/2}$		
Next Calibration Date		11-Jan-2	0		=	m _c	$x Q_{std} + b_c$			
Calibration of TSP										
Calibration	Manometer Reading			c	t _{std}	Conti	nuous Flow	IC		
Point	H (inches of water)		(m ³	/ min.) Reco		corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35	5.31)		
	(up)	(down)	(difference)	Х-	(-axis (C		(CFM)	Y-axis		
1	2.6	2.6	5.2	1.	1436 3		31	30.9529		
2	3.1	3.1	6.2	1.:	2484		35	34.9468		
3	3.4	3.4	6.8	1.	3072		39	38.9407		
4	4.3	4.3	8.6	1.	4695		46	45.9300		
5	4.9	4.9	9.8	1.	1.5684		54	53.9179		
By Linear Regression of	Y on X									
	Slope, m = 53.0			182	Int	ercept, b	= -30).4997		
Correlation Coefficient* = 0.99		924								
Calibration Accepted = Yes/		\o **								

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

: 18-Oct-19

Remarks :

Date

Calibrated by	:	Laurance Yung

Checked by

Date

: James Chu

18-Oct-19



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	MA1e	Calbration Date	:	10-Dec-19
Equipment no.	:	HVS007	Calbration Due Date	: _	9-Feb-20

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T _a		291		Kelvin Pressure, P a			1	019 mmHg	i	
	Orifice Transfer Standard Information									
Equipment No.		0005		Slope, m _c	Slope, m _c 1.99861 Intercept, bc -0.00882					
Last Calibration Date		11-Jan-1	9		(Hx	r P _a / 10	013.3 x 298 /	$(T_a)^{1/2}$		
Next Calibration Date		11-Jan-2	0		=	m _c	$x Q_{std} + b_c$			
Calibration of TSP										
Calibration	Manometer Reading			c) _{std}	Conti	nuous Flow	IC		
Point	H (inches of water)		(m ³	min.) Reco		corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.	.31)		
	(up)	(down)	(difference)	Х-	axis		(CFM)	Y-axis		
1	1.8	1.8	3.6	0.	9678		23	23.3404		
2	2.6	2.6	5.2	1.	1623		31	31.4587		
3	3.2	3.2	6.4	1.:	2889		39	39.5771		
4	3.8	3.8	7.6	1.	4042		46	46.6807		
5	4.4	4.4	8.8	1.	5106		51	51.7547		
By Linear Regression of	Y on X									
	Slope, m	=	53.8	569	Inte	ercept, b	= -29	9.6619		
Correlation Co	pefficient*	=	0.99	966						
Calibration	Accepted	=	Yes/ł	\o **						

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

:

Remarks :

Calibrated by

Date

: Laurance Yung 10-Dec-19

Checked by

Date

James Chu :



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	MA1w	Calbration Date	:	18-Oct-19
Equipment no.	:	HVS008	Calbration Due Date	:	18-Dec-19

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T _a		300		Kelvin Pressure, P a 1			I017 mmHg			
Orifice Transfer Standard Information										
Equipment No.		0005		Slope, m _c	Slope, m _c 1.99861 Intercept, bc -0.00882					
Last Calibration Date		11-Jan-1	9		(Hx	: P _a / 10	013.3 x 298 /	$(T_a)^{1/2}$		
Next Calibration Date		11-Jan-2	0		=	m _c	$x Q_{std} + b_c$			
Calibration of TSP										
Calibration	Manometer Reading			c) _{std}	Conti	nuous Flow	IC		
Point	H (inches of water)		(m ³	/ min.)	Re	corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.3			
	(up)	(down)	(difference)	Х-	axis		(CFM)	Y-axis		
1	2.7	2.7	5.4	1.	1653		24	23.9635		
2	3.3	3.3	6.6	1.:	2879		29	28.9559		
3	3.8	3.8	7.6	1.3	3817		35	34.9468		
4	4.3	4.3	8.6	1.	4695		40	39.9392		
5	4.8	4.8	9.6	1.	5523		46	45.9300		
By Linear Regression of	Y on X									
	Slope, m	=	57.0	249	Inte	ercept, b	= -43	3.4536		
Correlation Co	pefficient*	=	0.99	949						
Calibration	Accepted	=	Yes/	¥0**						

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

: Laurance Yung

: 18-Oct-19

Delete as appropriate.	**	Delete	as	appropriate.
------------------------	----	--------	----	--------------

Remarks :

Date

Calibrated by

Checked by

Date

: James Chu

18-Oct-19



Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	MA1w	Calbration Date	:	10-Dec-19
Equipment no.	:	HVS008	Calbration Due Date	:	9-Feb-20

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T _a		291		Kelvin Pressure, P a			1	1019 mmF	−lg	
Orifice Transfer Standard Information										
Equipment No.		0005		Slope, m _c	Slope, m _c 1.99861 Intercept, bc -0.00882					
Last Calibration Date		11-Jan-1	9		(Hx	(P _a / 10)13.3 x 298 /	(T _a) ^{1/2}		
Next Calibration Date		11-Jan-2	0		=	m _c	$x Q_{std} + b_c$			
Calibration of TSP										
Calibration	Manometer Reading			c	Q _{std} Continue		nuous Flow	IC		
Point	H (inches of water)		(m ³	/ min.) Reco		order, W	(W(P _a /1013.3x298/T _a) ^{1/2} /3	35.31)		
	(up)	(down)	(difference)	Х-	axis	1	(CFM)	Y-axis		
1	1.5	1.5	3.0	0.	8839		25	25.3700		
2	2.1	2.1	4.2	1.	0450		34	34.5031		
3	2.8	2.8	5.6	1.:	2060		42	42.6215		
4	3.6	3.6	7.2	1.	3669		49	49.7251		
5	4.3	4.3	8.6	1.	4934		54	54.7991		
By Linear Regression of	Y on X									
	Slope, m	=	48.1	833	Int	ercept, b	= -16	5.3691		
Correlation Co	pefficient*	=	0.99	978						
Calibration	Accepted	=	Yes/	\o **						

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

Calibrated by

Remarks : : Laurance Yung

10-Dec-19

:

Checked by

Date

James Chu :

10-Dec-19

Date



综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黃竹坑道 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.:	19CA0222 02		Page	1	of	2	
Item tested							
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Mete B & K 2250 2701778 -	r (Type 1)	Microphone B & K 4950 2755097		Preamp B & K ZC0032 19223 -		
Item submitted by							
Customer Name: Address of Customer: Request No.: Date of receipt:	Lam Geotechnics - - 22-Feb-2019	Limited.					
Date of test:	25-Feb-2019						
Reference equipment	used in the calib	ration					
Description: Multi function sound calibrator Signal generator Signal generator	Model: B&K 4226 DS 360 DS 360	Serial No. 2288444 33873 61227	Expiry Date: 23-Aug-2019 24-Apr-2019 26-Dec-2019		Traceat CIGISME CEPREI CEPREI	ole to: EC	
Ambient conditions							
Temperature: Relative humidity: Air pressure:	21 ± 1 °C 55 ± 10 % 1005 ± 5 hPa						
Test specifications							

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of <u>+</u>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.

ena Junai

Actual Measurement data are documented on worksheets.

Approved Signatory:

26-Feb-2019 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.

Date:

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



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會被買竹坑姐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



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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0222 02

Page

2 of

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	А	Pass	0.3	
Sell generated helde	C	Pass	0.8	
	Lin	Pass	16	
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	
	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 1/10 ³ at 4kHz	Pass	0.3	
	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.

Tooti	Subtect	Status	Expanded	Coverage
Test.	Sublest	Status	Oncertainty (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.

		- End -	
Calibrated by:	EL	Checked by:	$1 \sim \gamma$
	Fong Chun Wai		Fung Chi Yip
Date:	25-Feb-2019	Date:	/26-Feb-2019

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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E-mail: smec@cigismec.com Website: www.cigismec.com



CERTIFICATE OF CALIBRATION

Certificate No.:	19CA0116 02		Page	1 of 2
Item tested				
Description:	Sound Level Mete	er (Type 1)	Microphone	Preamp
Manufacturer:	B & K		B&K	B&K
Type/Model No.:	2250L		4950	ZC0032
Serial/Equipment No.:	3002695		2940839	18582
Adaptors used:	-		-	-
Item submitted by				
Customer Name:	Lam Geotechnics	Ltd.		
Address of Customer:	-			
Request No.:	-			
Date of receipt:	16-Jan-2019			
Date of test:	17-Jan-2019			
Reference equipment	used in the calib	ration		
Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019	CIGISMEC
Signal generator	DS 360	33873	24-Apr-2019	CEPREI
Signal generator	DS 360	61227	26-Dec-2019	CEPREI
Ambient conditions				
Temperature:	21 ± 1 °C			
Relative humidity:	50 ± 10 %			
Air pressure:	1005 ± 5 hPa			
Test specifications				

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- 3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

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

Actual Measurement data are documented on worksheets.

Fend Junai

19-Jan-2019 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.

Date:

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Approved Signatory:

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



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港 黃 竹 坑 道 3 7 號 利 達 中 心 1 2 樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

19CA0116 02

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

Page



CERTIFICATE OF CALIBRATION

(Continuation Page)

2 of 2

1, **Electrical Tests**

Certificate No.:

香

The electrical tests were perfomed 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	
0	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 1/10 ³ at 4kHz	Pass	0.3	
	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.

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

Response to associated sound calibrator

N/A

3,

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.

	1 (- End -	0	
Calibrated by:		Checked by:	Allerty	
	Fung Chi Yip		Shek Kwong Tat	
Date:	17-Jan-2019	Date:	19-Jan-2019	

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

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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.:	19CA0329 02		Page 1		of 2	
Item tested						
Description:	Sound Level Mete	r (Type 1)	Microphone	Prea	mp	
Manufacturer:	B & K		B&K	B& #	< l	
Type/Model No.:	2250-L		4950	ZCOO)32	
Serial/Equipment No.:	2722310		2698702	1331	8	
Adaptors used:	-		-	-		
Item submitted by				-		
Customer Name:	Lam Geotechnics	Ltd.				
Address of Customer:						
Request No.:	_					
Date of receipt:	29-Mar-2019					
Date of test:	02-Apr-2019					
Reference equipment	used in the calib	ration				
Description:	Model:	Serial No.	Expiry Date:	Trace	eable to:	
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019	CIGIS	MEC	
Signal generator	DS 360	33873	24-Apr-2019	CEPR	EI	
Signal generator	DS 360	61227	26-Dec-2019	CEPR	EI	
Ambient conditions						
Temperature:	21 ± 1 °C					
Relative humidity:	55 ± 10 %					
Air pressure:	1005 ± 5 hPa					
Test specifications						

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- 3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

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

Actual Measurement data are documented on worksheets.

Approved Signatory: Jung Fend

02-Apr-2019 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.

Date:

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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

Page



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0329 02

2 of

2

1, Electrical Tests

The electrical tests were perfomed 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
А	Pass	0.3	
С	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	
С	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	
Single burst 10 ms at 4 kHz	Pass	0.4	
SPL	Pass	0.3	
Leq	Pass	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 1/10 ³ at 4kHz 1 ms burst duty factor 1/10 ⁴ at 4kHz Single burst 10 ms at 4 kHz SPL Leq	Subtest:Status:APassCPassLinPassAt reference range , Step 5 dB at 4 kHzPassReference SPL on all other rangesPass2 dB below upper limit of each rangePass2 dB above lower limit of each rangePassAt reference range , Step 5 dB at 4 kHzPassA reference range , Step 5 dB at 4 kHzPassAPassCPassLinPassSingle Burst FastPassSingle Burst FastPassSingle Burst SlowPassSingle burst 5 ms at 2000 HzPassRepeated at frequency of 100 HzPass1 ms burst duty factor 1/10 ³ at 4kHzPass1 ms burst duty factor 1/10 ⁴ at 4kHzPassSingle burst 10 ms at 4 kHzPassSingle burst 10 ms at 4 kHzPassSPLPassLeqPass	Subtest:Status:Uncertanity (dB)APass0.3CPass0.8LinPass1.6At reference range, Step 5 dB at 4 kHzPass0.3Reference SPL on all other rangesPass0.32 dB below upper limit of each rangePass0.32 dB above lower limit of each rangePass0.3At reference range, Step 5 dB at 4 kHzPass0.3At reference range, Step 5 dB at 4 kHzPass0.3CPass0.3CPass0.3CPass0.3LinPass0.3CPass0.3Single Burst FastPass0.3Single Burst FastPass0.3Single Burst SlowPass0.3Single burst 5 ms at 2000 HzPass0.3Pass0.33Repeated at frequency of 100 HzPass0.31 ms burst duty factor 1/10 ³ at 4kHzPass0.31 ms burst duty factor 1/10 ⁴ at 4kHzPass0.31 ms burst duty factor 1/10 ⁴ at 4kHzPass0.3Single burst 10 ms at 4 kHzPass0.4SPLPass0.3LeqPass0.4

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.

- 0	- End -	1	
EL	Checked by:	1~	
Fong Chun Wai		Fung Chi Yip	
02-Apr-2019	Date:	02-Apr-2019	
	Fong Chun Wai 02-Apr-2019	- End - El. Checked by: Fong Chun Wai 02-Apr-2019 Date:	- End - El. Fong Chun Wai 02-Apr-2019 Date: Checked by: Fung Chi Yip 02-Apr-2019

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

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



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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.:	19CA0425 02		Page	1 of 2
Item tested				
Description:	Sound Level Mete	r (Type 1)	Microphone	Preamp
Manufacturer:	B&K	. (.))	B&K	B&K
Type/Model No	2250-1		4950	ZC0032
Serial/Equipment No	2722311		2698703	13321
Adaptors used:	-		-	-
Item submitted by				
Customer Name:	Lam Geotechnics	Ltd.		
Address of Customer:	-			
Request No.:	-			
Date of receipt:	25-Apr-2019			
Date of test:	02-May-2019			
Reference equipment	used in the calib	ration		
Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019	CIGISMEC
Signal generator	DS 360	61227	26-Dec-2019	CEPREI
Ambient conditions				
Tomporaturo	22 ± 1 °C			
Polativo humidity:	22 I I U			
Air processor	1005 L 5 bDo			
Air pressure.	1005 ± 5 hPa			
Test specifications				
1, The Sound Level Me	ter has been calibrate	ed in accordance with	the requirements as spec	cified in BS 7580: Part 1: 19

- 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: Feng Junqi





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.

Date:

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香港黃竹坑道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

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0425 02

2 of

1, Electrical Tests

The electrical tests were perfomed 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
Calf an and a local second	•	Deve	0.0	
Self-generated holse	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	
	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 1/10 ³ at 4kHz	Pass	0.3	
	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.

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

	Λ	- End -	
Calibrated by:	1~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Checked by:	Hum
Date:	Fung Chi Yip ¢2-May-2019	Date:	Shek Kwong Tat 03-May-2019

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

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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.:	19CA0314 01			Page	1	of	2	
Item tested								
Description:	Sound Level Meter (7	Гуре 1)	,	Microphone				
Manufacturer:	Larson Davis		, ,	PCB				
Type/Model No.:	LxT1		,	377B02				
Serial/Equipment No .:	0003737		,	171529				
Adaptors used:	-		,	-				
Item submitted by								
Customer Name:	Lam Geotechnics Lto	I.						
Address of Customer:	-							
Request No.:	-							
Date of receipt:	14-Mar-2019							
Date of test:	18-Mar-2019							
Reference equipment	used in the calibrat	ion						
Description:	Model:	Serial No.		Expiry Date:		Traceal	ole to:	
Multi function sound calibrator	B&K 4226	2288444		23-Aug-2019		CIGISME	EC	
Signal generator	DS 360	61227		26-Dec-2019		CEPREI		
Ambient conditions								
Temperature:	21 ± 1 °C							
Relative humidity:	55 ± 10 %							
Air pressure:	1005 ± 5 hPa							
Test specifications								

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- 3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

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

Actual Measurement data are documented on worksheets.

Approved Signatory:

Feng/Junqi

19-Mar-2019 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.

Date:

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Page



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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0314 01

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2 01

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	А	Pass	0.3	
Sen generated neree	C	Pass	0.8	21
	Lin	Pass	1.6	22
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	
	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 1/10 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.

	- End -	1 1
El	Checked by:	1~~~
Fong Chun Wai		Fung Chi Yig
18-Mar-2019	Date:	19-Mar-2019
	Fong Chun Wai 18-Mar-2019	- End - El

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.:	19CA1024 01		Page:	1 0	of 2	
Item tested						
Description:	Acoustical Calibr	ator (Class 1)				
Manufacturer:	Larson Davis	. ,				
Type/Model No.:	CAL200					
Serial/Equipment No.:	13098					
Adaptors used:	-					
Item submitted by						
Curstomer:	Lam Geotechnics	s Limited.				
Address of Customer:	-					
Request No.:	-					
Date of receipt:	24-Oct-2019					
Date of test:	24-Oct-2019			-		
Reference equipment	used in the cali	bration				
Description:	Model:	Serial No.	Expiry Date:	Tra	aceable to:	
Lab standard microphone	B&K 4180	2341427	03-May-2020	SC	L	
Preamplifier	B&K 2673	2239857	17-May-2020	CE	PREI	
Measuring amplifier	B&K 2610	2346941	05-Jun-2020	CE	PREI	
Signal generator	DS 360	33873	10-May-2020	CE	PREI	
Digital multi-meter	34401A	US36087050	08-May-2020	CE	PREI	
Audio analyzer	8903B	GB41300350	13-May-2020	CE	PREI	
Universal counter	53132A	MY40003662	10-May-2020	CE	PREI	
Ambient conditions						

Temperature:	22 ± 1 °C
Relative humidity:	55 ± 10 %
Air pressure:	1000 + 5 hPa

Test specifications

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

Test results

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

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

Comments: The results reported in this certificate refer to the conditon 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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19CA1024 01

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



CERTIFICATE OF CALIBRATION

(Continuation Page)

Website: www.cigismec.com

Page: 2 of 2

1, Measured Sound Pressure Level

E-mail: smec@cigismec.com

Certificate No.:

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 loughin dB to 20 ... Do)

Frequency	Output Sound Pressure	Measured Output	Estimated Expanded
Shown	Level Setting	Sound Pressure Level	Uncertainty
Hz	dB	dB	dB
1000	94.00	93.98	0.10

Sound Pressure Level Stability - Short Term Fluctuations 2,

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 = 0.013 dB

Estimated expanded uncertainty

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:

0.005 dB

At 1000 Hz Actual Frequency = 999.8 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 = 0.5%
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.

	1	- End -	terin	
Calibrated by:	$1 \sim 1$	Checked by:	Juli	
	Fung Chi Yip		Shek Kwong Tat	
Date:	24-Oct-2019	Date:	26-Oct-2019	

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

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