

RECALIBRATION **DUE DATE:**

July 8, 2020

ertificate d

Calibration Certification Information

Cal. Date: July 8, 2019

Rootsmeter S/N: 438320

Ta: 297

°K

Operator: Jim Tisch

Pa: 751.8

mm Hg

Calibration Model #:

TE-5025A

Calibrator S/N: 3166

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4190	3.2	2.00
2	3	4	1	1.0080	6.4	4.00
3	5	6	1	0.9040	7.9	5.00
4	7	8	1	0.8630	8.8	5.50
5	9	10	1	0.7150	12.8	8.00

	Data Tabulation										
Vstd	Qstd	$\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right) \left(\frac{Tstd}{Ta}\right)}$		Qa	$\sqrt{\Delta H (Ta/Pa)}$						
(m3)	(x-axis)	(y-axis)	Va	(x-axis)	(y-axis)						
0.9884	0.6965	1.4090	0.9957	0.7017	0.8889						
0.9841	0.9763	1.9926	0.9915	0.9836	1.2570						
0.9822	1.0865	2.2278	0.9895	1.0946	1.4054						
0.9810	1.1367	2.3365	0.9883	1.1452	1.4740						
0.9757	1.3646	2.8179	0.9830	1.3748	1.7777						
	m=	2.11024		m=	1.32140						
QSTD	b=	-0.06349	QA	b=	-0.04005						
	r=	0.99999	,	r=	0.99999						

	Calculatio	ns	
Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=	ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/ΔTime	Qa=	Va/∆Time
	For subsequent flow ra	te calculatio	ns:
Qstd=	$1/m\left(\left(\frac{A}{2}\right)\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)\right)-b$	Qa=	$1/m\left(\left(\sqrt{\Delta H(Ta/Pa)}\right)-b\right)$

	Standard Conditions	
Tstd:	298.15 °K	
Pstd:	760 mm Hg	
	Key	
ΔH: calibrato	or manometer reading (in H2O)	-
	ter manometer reading (mm Hg)	
	solute temperature (°K)	
Pa: actual ba	rometric 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

sch Environmental, Inc.

5 South Miami Avenue

lage of Cleves, OH 45002

www.tisch-env.com

TOLL FREE: (877)263-7610

FAX: (513)467-9009



Location :		CMA1b				Calbration	on Date	:	07-Feb-20
Equipment no.	ŀ	HVS001				Calbratio	on Due Date	:	08-Apr-20
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER						
				Ambient (Condition				
Temperature, T _a		292	:	Kelvin	Pressure, P	a	1	021	mmHg
			Orifice Tr	ansfer Sta	ındard İnfori	nation			
Equipment No.		3166		Slope, m _c	2.110	24	Intercept, bc	Т	-0.06349
Last Calibration Date		08-Jul-1	9		(HxP _a /1013.3x298/			$(T_0)^{1}$	1/2
Next Calibration Date		07-Jul-2	0				$Q_{std} + b_c$	· a/	
				0-111	(TOD				
Calibration	Mon	ometer D	anding	Calibratio		Continu	uous Flow		IC
Point		nometer R			3.0			(M/D /4	013.3x298/T _a) ^{1/2} /35.31)
Pollit					,			(VV(P _a /1	
	(up)	(down)	(difference)		axis		CFM)		Y-axis
1	1.7	1.7	3.4		0.9162 28				28.3935
2	2.7	2.7	5.4		1468		36		36.5059
3	4.0	4.0	8.0		3893		46		46.6464
4	5.0	5.0	10.0		5497		52		52.7307
5	6.4	6.4	12.8	1.	7493		58		58.8151
By Linear Regression of									
	Slope, m	=	37.30		Int	ercept, b =	-5	.7536	
Correlation Co	pefficient*	=	0.99						
Calibration	Accepted	=	Yes/P	10 **					
* if Correlation Coefficier	nt < 0.990,	check and	recalibration	again.					
** Delete as appropriate.									
Remarks :									
Calibrated by	Lau	rance Yun	9			Checked	i by	:	James Chu
Date	0	7-Feb-20				Date		:	07-Feb-20



				•	• `	•	•	
Location :		CMA1b			Calbratio	n Date	:	01-Apr-20
Equipment no.	ı	HVS001			Calbratio	n Due Date	:	01-Jun-20
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER					
				Ambient Condition				
Temperature, T _a		293		Kelvin Pressure, P	a	1	015	mmHg
			Orifice Tr	ansfer Standard Infor	mation			
Equipment No.		3166		Slope , m _c 2.110		Intercept, bc		-0.06349
Last Calibration Date		08-Jul-1	9				T_{a}) $^{1/2}$	
Next Calibration Date		08-Jul-19 $(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$ 07-Jul-20 = $m_c \times Q_{std} + b_c$						
				Oalthartian of TOP		ota o		
Calibration	Mari	D	din a	Calibration of TSP	Cantinu	ous Flow		IC
Point		nometer R		Q _{std}			/M/D /404	
Point	,		•	(m ³ / min.) X-axis			(W(P _a /101	13.3x298/T _a) ^{1/2} /35.31) Y-axis
1	(up)	(down) 1.6	(difference)			·		
	1.6	2.4	3.2		0.8857 25			25.2335
2	2.4		4.8	1.0780		33		33.3083
4	3.1	3.1	6.2	1.2211		10		40.3737
	3.8	3.8 4.3	7.6	1.3487		16		46.4297
5 But incor Degracoion of	4.3	4.3	8.6	1.4328	,	52		52.4858
By Linear Regression of	Slope, m	_	48.9 ⁻	727 Int	ercept, b =	10	9701	
Correlation Co		=			ercept, b =	-10	.8701	
Calibration		=	0.99 Yes/					
Calibration	Accepted	_	103/1					
* if Correlation Coefficier	nt < 0.990,	check and	recalibration	again.				
** Delete as appropriate.								
Domonto.								
Remarks :								
	Lou	rance Yun	7		Checked	by		James Chu
Calibrated by					Date	Бу	· —	01-Apr-20
: 01-Apr-20					Date		•	01-Ap1-20



				•		•	•	
Location :		CMA2a			Calbratio	on Date	:	07-Feb-20
Equipment no.	ŀ	HVS002			Calbratio	on Due Date	:	08-Apr-20
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER					
				Ambient Condition				
Temperature, T _a		292	2	Kelvin Pressure, P	a	1	021	mmHg
			Orifice Tr	ansfer Standard Infor	mation			
Equipment No.		3166		Slope , m _c 2.110		Intercept, bc		-0.06349
Last Calibration Date		08-Jul-1				3.3 x 298 /	T_{a}) $^{1/2}$	
Next Calibration Date		07-Jul-2		=		$Q_{std} + b_c$	· a/	
				Oalthartian of TOD		3.0		
Calibration	Man			Calibration of TSP	Comtinu	.aa Flanc		IC
Calibration Point		nometer R inches of		Q _{std}		ious Flow	/M/D /404	3.3x298/T _a) ^{1/2} /35.31)
Point	,		•	(m ³ / min.) X-axis			(W(P _a /101	Y-axis
	(up)	(down)	(difference)		· ·		26.3654	
2	1.7	1.7	3.4	0.9162		26	30.4216	
3	2.3	2.3	4.6	1.0607		30		
4	3.2	3.2	6.4	1.2458		38		38.5340
5	4.4	5.2	8.8	1.4556		52 52		44.6183
By Linear Regression of	5.2	5.2	10.4	1.5798		52		52.7307
by Linear Regression of	Slope, m	_	38.65	520 Int	ercept, b =	0	8452	
Correlation Co		=	0.99		егсері, в —		0432	
Calibration		=	Yes/P					
Campianon	riocopica	_	103/1					
* if Correlation Coefficier	nt < 0.990,	check and	I recalibration	again.				
** Delete as appropriate.								
Domarka :								
Remarks :								
	Low	rance Vus	α		Chaakad	lby		James Chu
Calibrated by		rance Yun			Checked Date	ы	·	James Chu 07-Feb-20
Date	te : 07-Feb-20				Date		•	01-1 0 0-20



				•	• `	•	•	
Location :		CMA2a			Calbration	Date	:	01-Apr-20
Equipment no.	I	HVS002			Calbration	Due Date	:	01-Jun-20
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER					
				Ambient Condition				
Temperature, T _a		293	3	Kelvin Pressure, P	a	1	015	mmHg
			Orifico Tr	ansfer Standard Infor	mation			
Equipment No.		3166		Slope, m _c 2.110		tercept, bc	\top	-0.06349
Last Calibration Date		08-Jul-1		- 1	εP _a / 1013.		T \ 1/2	
Next Calibration Date		07-Jul-2		(H) =		$b_{std} + b_c$	1 _a)	
Next Campration Date		07-341-2	0	-	III _C X Q	std + D _C		
	Ī			Calibration of TSP	l	ı		
Calibration		nometer R	•	Q _{std}	Continuo	us Flow		IC
Point	H (i	inches of	water)	(m ³ / min.)	³ / min.) Recorder, W		(W(P _a /101	3.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-axis	X-axis (CFM)		Y-axis	
1	1.4	1.4	2.8	0.8304	0.8304 28		28.2616	
2	2.2	2.2	4.4	1.0334	36		36.3363	
3	2.9	2.9	5.8	1.1820	41		41.3830	
4	3.6	3.6	7.2	1.3135	47			47.4391
5	4.5	4.5	9.0	1.4650	54			54.5045
By Linear Regression of	Y on X							
	Slope, m	=	40.93	363 Int	ercept, b =	-6.	1007	
Correlation Co	pefficient*	=	0.99	982				
Calibration	Accepted	=	Yes/P	10**				
* if Correlation Coefficier	nt < 0 990	check and	I recalibration	again				
ii Concidion Coemolei	ii < 0.550,	oricon aric	recambiation	ragam.				
** Delete as appropriate.								
Remarks :								
Calibrated by	Lau	rance Yun	g		Checked b	у	:	James Chu
Date	: 01-Apr-20				Date	:	01-Apr-20	



				•		•	•	
Location :		CMA3a			Calbratio	on Date	:	07-Feb-20
Equipment no.	ŀ	HVS012			Calbratio	on Due Date	:	08-Apr-20
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER					
				Ambient Condition				
Temperature, T _a		292	2	Kelvin Pressure, P	a	1	021	mmHg
			Orifice Tr	ansfer Standard Infor	mation			
Equipment No.		3166		Slope , m _c 2.110		Intercept, bc	Т	-0.06349
Last Calibration Date		08-Jul-1		- 1		3.3 x 298 /	T_{\circ}) $^{1/2}$	
Next Calibration Date		07-Jul-2		=		$Q_{std} + b_c$	· a/	
				Oalthartian of TOD		0.0		
Calibration	Man			Calibration of TSP	Comtinu	- Flam		IC
Calibration Point		nometer R inches of	•	Q _{std}		ious Flow	/M/D /404	3.3x298/T _a) ^{1/2} /35.31)
Point	,		•	(m ³ / min.) X-axis			(W(P _a /101	Y-axis
	(up)	(down)	(difference)		· ·		30.4216	
1	1.8	1.8	3.6	0.9418		30		
2	2.6	2.6	5.2	1.1259		38		38.5340
4	3.8	3.8	7.6	1.3548		44	44.6183	
	5.2	5.2	10.4	1.5798		49		49.6886
5 By Linear Regression of	6.3	6.3	12.6	1.7358	;	54		54.7588
by Linear Regression of	Slope, m	_	29.20	000 Int	ercept, b =	4.	2401	
Correlation Co		=	0.99		егсері, в =	4	2401	
Calibration		=	Yes/P					
Calibration	Accepted	_	103/F					
* if Correlation Coefficier	nt < 0.990,	check and	I recalibration	again.				
** Delete as appropriate.								
Domonto.								
Remarks :								
	1 0	range Vivo	~		Chaakad	hv		James Chir
Calibrated by		rance Yun			Checked Date	ыу	·	James Chu 07-Feb-20
Date	te : 07-Feb-20				Date		•	01-1 0 0-20



Location :		CMA3a				Calbratio	on Date	: 03-Apr-20	
Equipment no.	ŀ	HVS012				Calbratio	on Due Date	: 03-Jun-20	
0.41 IDD 4710N 05 00N	TINILOLIO) FI OW D							
CALIBRATION OF CON	ITINUOUS	FLOW R		Ambient C	`ondition				
Temperature, T _a		293		l	Pressure, P	1	10	017 mmHg	
			Orifice Tr	ansfer Sta	ndard Inforr	nation			
Equipment No.		3166		Slope, m _c	2.1102		Intercept, bc	-0.06349	
Last Calibration Date		08-Jul-1		olopo, m _c		P _a / 101			
Next Calibration Date		07-Jul-2			<i>I_a)</i>				
Next Calibration Date		07-Jui-2	0		=	III _C X	$Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Mar	ometer R	eading	C	std	Continu	ious Flow	IC	
Point	H (i	inches of	water)	(m ³	m ³ / min.) Recorder, W		rder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)	
	(up)	(down)	(difference)	X-	axis	(C	FM)	Y-axis	
1	1.8	1.8	3.6	0.9	9385		26	26.2687	
2	2.5	2.5	5.0	1.1	1007		33	33.3411	
3	3.4	3.4	6.8	1.2	2786		45	45.4651	
4	4.3	4.3	8.6	1.4	1341		50	50.5168	
5	5.2	5.2	10.4	1.5	5741		57	57.5891	
By Linear Regression of	Y on X		1				<u> </u>		
	Slope, m	=	49.8	749	Inte	ercept, b =	-20	.4654	
Correlation Co	pefficient*	=	0.99	51					
Calibration	Accepted	=	Yes/	lo **					
			-						
* if Correlation Coefficier	nt < 0.990,	check and	I recalibration	again.					
** Delete as appropriate.									
Remarks :									
Calibrated by	Lau	rance Yun	g			Checked	by	: James Chu	
Date :	0	3-Apr-20				Date		: 03-Apr-20	



				•	• `	•	•		
Location :		CMA4a			Calbratio	n Date	: 07-Feb-20		
Equipment no.	ı	HVS004			Calbratio	n Due Date	: 08-Apr-20		
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER						
				Ambient Condition					
Temperature, T _a		292	:	Kelvin Pressure, P	a	1	021 mml	⊣g	
			Orifice Tr	ansfer Standard Infor	mation				
Equipment No.		3166		Slope , m _c 2.110		Intercept, bc	-0.06349		
Last Calibration Date		08-Jul-1	9			-			
Next Calibration Date		07-Jul-2		$ (HxP_a/1013.3 \times 298/T_a)^{1/2} $ $ = m_c \times Q_{std} + b_c $					
				Colibration of TCD	-	olu o			
Calibration	Mor	nometer R	anding	Calibration of TSP Q std	Continu	ous Flow	IC		
Point		inches of				rder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /	25 21)	
Foliit	(up)	(down)	(difference)	(m ³ / min.) X-axis		FM)	Y-axis	33.31)	
1	2.1	2.1	4.2	1.0149		31	31.4356		
2	2.6	2.6	5.2	1.1259		35	35.4918		
3	3.6	3.6	7.2	1.3195		12	42.5902		
4	4.1	4.1	8.2	1.4061		16	46.6464		
5	4.8	4.8	9.6	1.5190		51	51.7167		
By Linear Regression of									
, ,	Slope, m	=	39.9	174 Int	ercept, b =	-9.	4017		
Correlation C	oefficient*	=	0.99	985					
Calibration	Accepted	=	Yes/P	10 **					
* if Correlation Coefficier	nt < 0.990,	check and	recalibration	again.					
** Delete as appropriate.									
Remarks :									
Calibrated by	Lau	rance Yun			Checked	by	: James Chu		
Calibrated by Date	0	7-Feb-20			Date		: 07-Feb-20		
Dute									



Location :		CMA4a				Calbratio	on Date	:	03-Apr-20
Equipment no.	ŀ	HVS004				Calbratio	on Due Date	:	03-Jun-20
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER						
				Ambient C	Condition				
Temperature, T _a		293			Pressure, P	a	1	017	mmHg
			Orifice Tr	ansfer Sta	ndard Inform	nation			
Equipment No.		3166		Slope, m _c	2.110	Т	-0.06349		
Last Calibration Date		08-Jul-1	9	(H x P _a / 1013.3 x 298 /				T _a)	1/2
Next Calibration Date		07-Jul-2	0	$= m_c \times Q_{std} + b_c$					
				Calibratio	n of TSP				
Calibration	Man	ometer R	eading	C	std	Continu	ious Flow		IC
Point	H (i	inches of	water)	(m ³	³ / min.) Recorder, W		rder, W	(W(P _a /	1013.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-	X-axis		FM)		Y-axis
1	1.9	1.9	3.8	0.0	0.9634		25		25.2584
2	2.6	2.6	5.2	1.1	1219	:	35		35.3618
3	3.3	3.3	6.6	1.2	2601	,	43		43.4444
4	4.1	4.1	8.2	1.4	1011		48		48.4961
5	5.0	5.0	10.0	1.5	5441	1	55		55.5685
By Linear Regression of	Y on X								
	Slope, m	=	51.28	879	Int	ercept, b =	-22	2.9002	
Correlation Co	pefficient*	=	0.99	147					
Calibration	Accepted	=	Yes/P	√0**					
* if Correlation Coefficien	nt < 0.990,	check and	I recalibration	again.					
** Delete as appropriate.									
Remarks :									
	1 =	rones Ve	~			Cha-l!	hv		lomes Ok
Calibrated by		rance Yun 3-Apr-20				Checked Date	ы	· —	James Chu 03-Apr-20
Date	U	0 Apr-20				Date		•	00-Api-20



				•		•	•	
Location :		CMA5b			Calbratio	on Date	:	07-Feb-20
Equipment no.	ŀ	HVS010			Calbratio	on Due Date	:	08-Apr-20
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER					
				Ambient Condition				
Temperature, T _a		292	2	Kelvin Pressure, P	a	1	021	mmHg
			Orifice Tr	ansfer Standard Infor	mation			
Equipment No.		3166		Slope , m _c 2.110		Intercept, bc		-0.06349
Last Calibration Date		08-Jul-1		- 1		3.3 x 298 /	T_{a}) $^{1/2}$	
Next Calibration Date		07-Jul-2		=		$Q_{std} + b_c$	· a/	
				Oalthartian of TOD		0.0		
Calibration	Man			Calibration of TSP	Comtinu	- Flam		IC
Calibration Point		nometer R inches of		Q _{std}		ious Flow	0N/D /404	3.3x298/T _a) ^{1/2} /35.31)
Point	,		•	(m ³ / min.) X-axis		rder, W	(W(P _a /101	Y-axis
1	(up)	(down) 1.9	(difference)		· ·	FM)	.	
2	1.9	2.8	3.8	0.9668		26		26.3654
3	2.8		5.6	1.1672		32		32.4497
4	3.6	3.6	7.2	1.3195		40		40.5621
5	4.5	4.5 5.3	9.0	1.4717		47 55	.	47.6605
By Linear Regression of	5.3	5.5	10.6	1.5946		00		55.7729
by Linear Regression of	Slope, m	_	46.92	201 Int	ercept, b =	20).6312	
Correlation Co	·	=	0.99		егсері, в —	-20	.0312	
Calibration		=	Yes/P					
Campianon	riocopica	_						
* if Correlation Coefficier	nt < 0.990,	check and	I recalibration	again.				
** Delete as appropriate.								
Domarka :								
Remarks :								
	l a	range Vivo	~		Chaakad	by		James Chir
Calibrated by		rance Yun 7-Feb-20			Checked Date	by		James Chu 07-Feb-20
Date	U	1-1 C D-20			Date		•	01-1 0 0-20



Location :		CMA5b				Calbratio	on Date	: 03-Apr-20
Equipment no.	ŀ	HVS010				Calbratio	on Due Date	: 03-Jun-20
0.41 IDD 4710N 05 00N	TINILOLIO) EL OW B	-00DD-D					
CALIBRATION OF CON	ITINUOUS	FLOW R		Ambient C	Condition			
Temperature, T _a		293			Pressure, P	1	10	017 mmHg
			Orifice Tr	ansfer Sta	ndard Inforr	nation		
Equipment No.		3166		Slope, m _c	2.1102		Intercept, bc	-0.06349
Last Calibration Date		08-Jul-1		Ciopo, iiic			3.3 x 298 /	
		07-Jul-2						<i>l_a)</i>
Next Calibration Date		07-Jul-2	0		=	III _C X	$Q_{std} + b_c$	
				Calibratio	n of TSP			
Calibration	Mar	ometer R	eading	C	std	Continu	ious Flow	IC
Point	H (i	inches of	water)	(m ³	/ min.)	Reco	rder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-	axis	(C	FM)	Y-axis
1	1.4	1.4	2.8	0.0	3313		28	28.2922
2	2.1	2.1	4.2	1.0)114		36	36.3757
3	2.7	2.7	5.4	1.1	1428		41	41.4278
4	3.5	3.5	7.0	1.2	2969		47	47.4905
5	4.3	4.3	8.6	1.4	1343		56	56.5844
By Linear Regression of	Y on X						<u> </u>	
	Slope, m	=	45.3	171	Inte	ercept, b =	-9.	7787
Correlation Co	pefficient*	=	0.99	49				
Calibration	Accepted	=	Yes/	lo **				
* if Correlation Coefficier	nt < 0.990,	check and	d recalibration	again.				
** Delete as appropriate.								
Remarks :								
Calibrated by	Lau	rance Yun	9			Checked	by	: James Chu
Date :	0	3-Apr-20				Date		: 03-Apr-20



Location :		MA1e				Calbratio	on Date	:	07-Feb-20
Equipment no.	ı	HVS007				Calbratio	on Due Date	:	08-Apr-20
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER						
				Ambient (Condition				
Temperature, T _a		292	2	Kelvin	Pressure, P	a	1	021	mmHg
			Orifice Tr	ansfer Sta	ındard Inforr	mation			
Equipment No.		3166		Slope, m _c	2.110	24	Intercept, bc		-0.06349
Last Calibration Date		08-Jul-1	9		(Hx	P _a / 101	3.3 x 298 /	$T_a)^{1/2}$	
Next Calibration Date		07-Jul-2	0		=	m _c x	$Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Mar	ometer R	eading	C	Q _{std}	Continu	ious Flow		IC
Point	Н (inches of	water)	(m³	/ min.)	Reco	rder, W	(W(P _a /101	3.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-	axis	(C	FM)		Y-axis
1	2.0	2.0	4.0	0.	9912		23		23.3232
2	2.6	2.6	5.2	1.	1259		28		28.3935
3	3.1	3.1	6.2	1.3	2266	;	33		33.4637
4	4.5	4.5	9.0	1.	4717	:	39		39.5481
5	5.2	5.2	10.4	1.5	5798		45		45.6324
By Linear Regression of	Y on X								
	Slope, m	=	36.0	361	Inte	ercept, b =	-12	.0191	
Correlation Co	oefficient*	=	0.99	28					
Calibration	Accepted	=	Yes/	\0 **					
* if Correlation Coefficier	nt < 0.990.	check and	l recalibration	again.					
				3.					
** Delete as appropriate.									
Remarks :									
Calibrated by	Lau	rance Yun	g			Checked	by	:	James Chu
Date :	0	7-Feb-20				Date		:	07-Feb-20



Location :		MA1e				Calbratio	n Date	:	01-Apr-20
Equipment no.	ŀ	HVS007				Calbratio	n Due Date	:	01-Jun-20
								_	
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER						
				Ambient (Condition				
Temperature, T _a		293	3	Kelvin	Pressure, P	1	1	015	mmHg
	Orifice	Transfer :	Standard Inf	ormation					
Equipment No.		3166		Slope, m _c	2.1102	24 Intercep	t, bc	Т	-0.06349
Last Calibration Date		08-Jul-1	9		(Hx	P _a / 101	3.3 x 298 /	T _a)	1/2
Next Calibration Date		07-Jul-2	0		=		$Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Mar	nometer R	eading	C	2 std	Continu	ous Flow		IC
Point	H (i	inches of	water)	(m ³	/ min.)	Reco	der, W	(W(Pa	/1013.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-	axis	(C	FM)		Y-axis
1	1.7	1.7	3.4	0.9	9120	2	28		28.2616
2	2.7	2.7	5.4	1.	1416	;	36		36.3363
3	3.8	3.8	7.6	1.3	3487	4	15		45.4204
4	5.0	5.0	10.0	1.5	5426	ţ	52		52.4858
5	6.2	6.2	12.4	1.	7144		59		59.5512
By Linear Regression of	Y on X								
	Slope, m	=	39.22	250	Inte	ercept, b =	-7.	.8311	
Correlation Co	pefficient*	=	0.99	95					
Calibration	Accepted	=	Yes/	√0 **					
* if Correlation Coefficier	st ~ 0 000	ahaak ana	l recalibration	again					
ii Correlation Coemciei	n < 0.990,	CHECK and	recalibration	i ayaiii.					
** Delete as appropriate.									
Remarks :									
Calibrated by	Lau	rance Yun	g			Checked	by	:	James Chu
Date :	0	1-Apr-20				Date		:	01-Apr-20



Location :		MA1w				Calbratio	on Date	: 07-Feb-2	20
Equipment no.	ŀ	HVS008				Calbratio	on Due Date	: 08-Apr-2	20
CALIBRATION OF CON	ITINUOUS	S FLOW RI	ECORDER						
				Ambient C	Condition				
Temperature, T _a		292		Kelvin	Pressure, P	a	1	021 m	ımHg
			Orifice Tr	ansfer Sta	ndard Inforr	mation			
Equipment No.		3166		Slope, m _c	2.1102	24	Intercept, bc	-0.0634	9
Last Calibration Date		08-Jul-1	9		(Нх	P _a / 101	3.3 x 298 /	T _a) ^{1/2}	
Next Calibration Date		07-Jul-2	0		=	m _c x	$Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Mar	nometer R	eading	C	std	Continu	ous Flow	IC	
Point	H (i	inches of	water)	(m ³	/ min.)	Reco	rder, W	(W(P _a /1013.3x298/T _a)) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-	axis	(0	CFM)	Y-axis	
1	2.5	2.5	5.0	1.1	1046		28	28.3935	
2	3.2	3.2	6.4	1.2	2458		36	36.5059	
3	4.1	4.1	8.2	1.4	1061		40	40.5621	
4	4.9	4.9	9.8	1.5	5344		46	46.6464	
5	5.7	5.7	11.4	1.6	6526		53	53.7448	
By Linear Regression of	Y on X								
	Slope, m	=	43.69	905	Inte	ercept, b =	-19	.5025	
Correlation Co	oefficient*	=	0.99	14					
Calibration	Accepted	=	Yes/	No**					
* if Correlation Coefficier	nt < 0.990.	check and	recalibration	again.					
	,			-9					
** Delete as appropriate.									
Remarks :									
Calibrated by	Lau	rance Yun	g			Checked	l by	: James C	hu
Date :	0	7-Feb-20				Date		: 07-Feb-2	20



Location :		MA1w				Calbratio	on Date	: 01-Apr-20
Equipment no.	ŀ	HVS008				Calbratio	on Due Date	: 01-Jun-20
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER					
				Ambient C	Condition			
Temperature, T _a		293	3	Kelvin	Pressure, P	1	10	015 mmHg
			Orifice Tr	ansfer Sta	ndard Inforr	nation		
Equipment No.		3166		Slope, m _c	2.1102	24	Intercept, bc	-0.06349
Last Calibration Date		08-Jul-1	9		(Нх	P _a / 101	3.3 x 298 /	T_a) 1/2
Next Calibration Date		07-Jul-2	0		=	m _c x	$Q_{std} + b_c$	
				Calibratio	n of TSP			
Calibration	Mar	nometer R	eading	C	std	Continu	ious Flow	IC
Point	H (i	inches of	water)	(m ³	/ min.)	Reco	rder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-	axis	(C	FM)	Y-axis
1	1.7	1.7	3.4	0.9	9120		20	20.1868
2	2.5	2.5	5.0	1.0	0996	;	28	28.2616
3	3.9	3.9	7.8	1.3	3659	;	36	36.3363
4	5.0	5.0	10.0	1.5	5426		42	42.3924
5	6.1	6.1	12.2	1.7	7007		48	48.4484
By Linear Regression of	Y on X							
	Slope, m	=	34.8	758	Inte	ercept, b =	-11	.0570
Correlation Co	pefficient*	=	0.99	85				
Calibration	Accepted	=	Yes/P	1 0**				
* if Correlation Coefficier	nt < 0 990	check and	l recalibration	again				
ii corrolatori cominior	0.000,	orioon ario	Todaibiation	agam.				
** Delete as appropriate.								
Remarks :								
Calibrated by	Lau	rance Yun	g			Checked	by	: James Chu
Date	0	1-Apr-20				Date		: 01-Apr-20



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

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



CERTIFICATE OF CALIBRATION

Certificate No.:

20CA0123 01

Page

2

Item tested

Description:

Sound Level Meter (Type 1)

Microphone **B&K**

Preamp

of

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

4950

B & K ZC0032

Serial/Equipment No.: Adaptors used:

3002695

2940839

18582

Item submitted by

Customer Name:

Lam Geotechnics Limited.

Address of Customer:

Request No.: Date of receipt:

23-Jan-2020

Date of test:

24-Jan-2020

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 33873

23-Aug-2020 10-Apr-2020

CIGISMEC CEPREI

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity:

55 ± 10 %

Air pressure:

1005 ± 5 hPa

Test specifications

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

29-Jan-2020

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.

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/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-mail: smec@cigismec.com Website: www.cigismec.com

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



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

20CA0123 01

Page

1. **Electrical Tests**

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self-generated noise	A	Pass	0.3	
cen generated notes	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	Α	Pass	0.3	
1 , 5 5	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	
3 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.

Calibrated by:

End

Checked by:

Shek Kwong Tat 29-Jan-2020

Date:

Fung Chi Yip 24-Jan-2020

Date:

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

© Soils & Materials Engineering Co., Ltd

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



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 **SMECLab**

Test Data for Sound Level Meter

Page 1 of 5

Sound level meter type:

.

2250L 4950 Serial No.

3002695

Date 24-Jan-2020

Microphone type: 4950 Preamp type: ZC0032 Serial No. Serial No. 2940839 18582

Report: 20CA0123 01

SELF GENERATED NOISE TEST

The noise test is performed in the most sensitive range of the SLM with the microphone replaced by an equivalent impedance.

Noise level in A weighting

13.5

dB

Noise level in C weighting

14.0

dB

Noise level in Lin

18.8

dB

LINEARITY TEST

The linearity is tested relative to the reference sound pressure level using a continuous sinusoidal signal of frequency 4 kHz. The measurement is made on the reference range for indications at 5 dB intervals starting from the 94 dB reference sound pressure level. And until within 5 dB of the upper and lower limits of the reference range, the measurements shall be made at 1 dB intervals.(SLM set to LEQ/SPL)

Reference/Expected level	Actua	l level	Tolerance	Deviation		
Melerence/Expected level	non-integrated	integrated		non-integrated	integrate	
dB	dB	dB	+/- dB	dB	dB	
94.0	94.0	94.0	0.7	0.0	0.0	
99.0	99.0	99.0	0.7	0.0	0.0	
104.0	104.0	104.0	0.7	0.0	0.0	
109.0	109.0	109.0	0.7	0.0	0.0	
114.0	114.0	114.0	0.7	0.0	0.0	
119.0	119.1	119.1	0.7	0.1	0.1	
124.0	124.1	124.1	0.7	0.1	0.1	
129.0	129.1	129.1	0.7	0.1	0.1	
134.0	134.1	134.1	0.7	0.1	0.1	
135.0	135.1	135.1	0.7	0.1	0.1	
136.0	136.1	136.1	0.7	0.1	0.1	
137.0	137.1	137.1	0.7	0.1	0.1	
138.0	138.1	138.1	0.7	0.1	0.1	
139.0	139.0	139.0	0.7	0.0	0.0	
140.0	140.0	140.0	0.7	0.0	0.0	
89.0	89.0	89.0	0.7	0.0	0.0	
84.0	84.0	84.0	0.7	0.0	0.0	
79.0	79.0	79.0	0.7	0.0	0.0	
74.0	74.0	74.0	0.7	0.0	0.0	
69.0	69.0	69.0	0.7	0.0	0.0	
64.0	64.0	64.0	0.7	0.0	0.0	
59.0	59.0	59.0	0.7	0.0	0.0	
54.0	54.0	54.0	0.7	0.0	0.0	
49.0	49.0	49.0	0.7	0.0	0.0	
44.0	44.0	44.0	0.7	0.0	0.0	
39.0	39.0	39.0	0.7	0.0	0.0	

Form No. CAWS 152/Issue 1/Rev. B/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-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533 **SMECLab**

Test Data for Sound Level Meter

Page 2 of 5

Sound level me	ter type:	2250L		Serial No.	3002695	Date	e 24-Jan-2	2020
Microphone Preamp	type: type:	4950 ZC0032		Serial No. Serial No.	2940839 18582	Rep	ort: 20CA012	3 01
	-71	24.0	24.0	0.7		0.0	0.0	
34.0		34.0	34.0	0.7		0.0	0.0	
33.0		33.0	33.0	0.7		0.0	0.0	
32.0		32.0	32.0	0.7		0.0	0.0	
31.0		31.0	31.0	0.7		0.0	0.0	
30.0		30.0	30.0	0.7		0.0	0.0	

Measurements for an indication of the reference SPL on all other ranges which include it

Other ranges	Expected level	Actual level	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
20-140	94.0	94.0	0.7	0.0

Measurements on all level ranges for indications 2 dB below the upper limit and 2 dB above the lower limit

Ranges	Reference/Expected level	Actual level	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
20.140	30.0	30.0	0.7	0.0
20-140	138.0	138.1	0.7	0.1

FREQUENCY WEIGHTING TEST

The frequency response of the weighting netwoks are tested at octave intervals over the frequency ranges 31.5 Hz to 12500 Hz. The signal level at 1000 Hz is set to give an indication of the reference SPL.

Frequency weighting A:

Frequency	Ref. level	Expected level	Correction of electrical response	Actual level	Tolerar	nce(dB)	Deviation *
Hz	dB	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	0.0	94.0	0.0	0.0	0.0
31.6	94.0	54.6	0.0	54.5	1.5	1.5	-0.1
63.1	94.0	67.8	0.0	67.8	1.5	1.5	0.0
125.9	94.0	77.9	0.0	77.9	1.0	1.0	0.0
251.2	94.0	85.4	0.0	85.4	1.0	1.0	0.0
501.2	94.0	90.8	0.0	90.8	1.0	1.0	0.0
1995.0	94.0	95.2	0.0	95.2	1.0	1.0	0.0
3981.0	94.0	95.0	-0.1	94.9	1.0	1.0	0.0
7943.0	94.0	92.9	-0.3	92.6	1.5	3.0	0.0
12590.0	94.0	89.7	-0.3	89.4	3.0	6.0	0.0

Frequency weighting C:

requericy weig	nung O.							
Frequency	Ref. level	Expected level			Tolerance(dB)		Deviation *	
Hz	dB	dB	dB	dB	+	-	dB	
1000.0	94.0	94.0	0.0	94.0	0.0	0.0	0.0	
31.6	94.0	91.0	0.0	91.1	1.5	1.5	0.1	
63.1	94.0	93.2	0.0	93.2	1.5	1.5	0.0	
125.9	94.0	93.8	0.0	93.8	1.0	1.0	0.0	

Form No.: CAWS 152/Issue 1/Rev. B/01/02/2007



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 **SMECLab**

Test Data for Sound Level Meter

Page 3 of 5

Sound level me	eter type:	2250L		Serial No.	300	2695	Date 24-Jan-2020		
Microphone Preamp	type: type:	4950 ZC0032	Serial No. Serial No.						Report: 20CA0123 01
251.2	94.0	94.0	0.0	94.0	1.0	1.0	0.0		
501.2	94.0	94.0	0.0	94.0	1.0	1.0	0.0		
1995.0	94.0	93.8	0.0	93.8	1.0	1.0	0.0		
3981.0	94.0	93.2	-0.1	93.1	1.0	1.0	0.0		
7943.0	94.0	91.0	-0.3	90.7	1.5	3.0	0.0		
12590.0	94.0	87.8	-0.3	87.4	3.0	6.0	-0.1		

Frequency weighting Lin:

Frequency	Ref. level	Expected level	Correction of electrical response	Actual level	Tolera	nce(dB)	Deviation *
· Hz	dB	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	0.0	94.0	0.0	0.0	0.0
31.6	94.0	94.0	0.0	94.1	1.5	1.5	0.1
63.1	94.0	94.0	0.0	94.0	1.5	1.5	0.0
125.9	94.0	94.0	0.0	94.0	1.0	1.0	0.0
251.2	94.0	94.0	0.0	94.0	1.0	1.0	0.0
501.2	94.0	94.0	0.0	94.0	1.0	1.0	0.0
1995.0	94.0	94.0	0.0	94.0	1.0	1.0	0.0
3981.0	94.0	94.0	-0.1	93.9	1.0	1.0	0.0
7943.0	94.0	94.0	-0.3	93.7	1.5	3.0	0.0
12590.0	94.0	94.0	-0.3	93.7	3.0	6.0	0.0

^{*}Deviation = Actual level - (Expected level + Correction of electrical response)

The correction of electrical response is specified in the Table A.2 of technical documentation of BE 1712-21. The maximum expanded uncertainty of correction of electrical response is 0.29 dB.

TIME WEIGHTING FAST TEST

Time weighting F is tested on the reference range with a single sinusoidal burst of duration 200 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A. Maximum hold)

Ref. level	Expected level	Actual level	Tolera	nce(dB)	Deviation
dB	dB	dB	+	-	dB
116.0	115.0	114.9	1.0	1.0	-0.1

TIME WEIGHTING SLOW TEST

Time weighting S is tested on the reference range with a single sinusoidal burst of duration 500 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A. Maximum hold)

when the signal is continuous.	(VVCIGITE A, IVIAXIII	iaiii iioia)	_		
Ref. level	Expected level	Actual level	Tolera	nce(dB)	Deviation
dB	dB	dB	+	-	dB
116.0	111.9	111.9	1.0	1.0	0.0

PEAK RESPONSE TEST

The onset time of the peak detector is tested on the reference range by comparing the response to a 100 us rectangular test pulse with the response to a 10 ms reference pulse of the same amplitude. The amplitude of the

Form No.: CAWS 152/Issue 1/Rev. B/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-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533 **SMECLab**

Test Data for Sound Level Meter

Page 4 of 5

Sound level meter type:

2250L

Serial No.

3002695

24-Jan-2020

Microphone Preamp type: type: 4950 ZC0032 Serial No. Serial No. 2940839 18582

Report: 20CA0123 01

Date

10 ms reference pulse is such as to produce an indication 1 dB below the upper limit of the primary indicator range.

Positive polarities:

(Weighting Z, set the generator signal to single, Lzpeak)

Ref. level	Response to 10 ms	Response to 100 us	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
119.0	119.0	119.3	2.0	0.3

Negative polarities:

Ref. level	Response to 10 ms	Response to 100 us	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
119.0	119.0	119.3	2.0	0.3

RMS ACCURACY TEST

The RMS detector accuracy is tested on the reference range for a crest factor of 3.

Test frequency:

2000 Hz

Amplitude:

2 dB below the upper limit of the primary indicator range.

40 Hz

Burst repetition frequency: Tone burst signal:

11 cycles of a sine wave of frequency 2000 Hz.

(Set to INT)

	Ref. Level	Expected level	Tone burst signal	Tolerance	Deviation
Time wighting	dB	dB	indication(dB)	+/- dB	dB
Slow	118.0+6.6	118.0	117.9	0.5	-0.1

TIME WEIGHTING IMPULSE TEST

Time weighting I is tested on the reference range (Set the SLM to LAImax)

Test frequency:

2000 Hz

Amplitude:

The upper limit of the primary indicator range.

Single sinusoidal burst of duration 5 ms:

Ref. Level	Single burs	t indication	Tolerance	Deviation	
dB	Expected (dB)	Actual (dB)	+/- dB	dB	
120.0	111.2	111.1	2.0	-0.1	

Repeated at 100 Hz

Ref. Level	Repeated bu	irst indication	Tolerance	Deviation	
dB	Expected (dB)	Actual (dB)	+/- dB	dB	
120.0	117.3	117.1	1.0	-0.2	

TIME AVERAGING TEST

This test compares the SLM reading for continuous sine signals with readings obtained from a sine tone burst sequence having the same RMS level. The test level is 30 dB below the upper limit of the linearity range and repeated for Type 1 SLM with 40 dB below the upper limit of the linearity.

Frequency of tone burst:

4000 Hz

Duration of tone burst:

1 ms

Repetition Time	Level of	Expected	Actual	Tolerance	Deviation	Remarks
	tone burst	Leq	Leq			
msec	dB	dB	dB	+/- dB	dB	
1000	110.0	110.0	109.9	1.0	-0.1	60s integ.
10000	100.0	100.0	99.9	1.0	-0.1	6min. integ.

Form No.: CAWS 152/Issue 1/Rev. B/01/02/2007



試驗有限公司

港 黄 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

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

SMECLab

Test Data for Sound Level Meter

Page 5 of 5

Sound level meter type:

2250L

Serial No.

3002695

Date 24-Jan-2020

Microphone Preamp

type: type: 4950 ZC0032

Serial No. Serial No.

2940839 18582

Report: 20CA0123 01

PULSE RANGE AND SOUND EXPOSURE LEVEL TEST

The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference range

Test frequency:

4000 Hz

Integration time:

10 sec

The integrating sound level meter set to Leg:

Duration	Rms level of	Expected	Actual	Tolerance	Deviation
msec	tone burst (dB)	dB	dB	+/- dB	dB
10	88.0	58.0	57.9	1.7	-0.1

The integrating sound level meter set to SEL:

Duration	Rms level of	Expected	Actual	Tolerance	Deviation
msec	tone burst (dB)	dB	dB	+/- dB	dB
10.0	88.0	68.0	67.9	1.7	-0.1

OVERLOAD INDICATION TEST

For SLM capable of operating in a non-integrating mode.

Test frequency:

2000 Hz

Amplitude:

2 dB below the upper limit of the primary indicator range.

Burst repetition frequency:

40 Hz

Tone burst signal:

11 cycles of a sine wave of frequency 2000 Hz.

Level	Level reduced by	Further reduced	Difference	Tolerance	Deviation
at overload (dB)	1 dB	3 dB	dB	dB	dB
136.8	135.8	132.8	3.0	1.0	0.0

For integrating SLM, with the instrument indicating Leq.

For integrating SLM, with the instrument indicating Leq and set to the reference range. The test signal as following: The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference range

Test frequency:

4000 Hz

Integration time:

10 sec

Single burst duration:

1 msec

On igio barot	darationi				
Rms level	Level reduced by	Expected level	Actual level	Tolerance	Deviation
at overload (dB)	1 dB	dB	dB	dB	dB
143.6	142.6	102.6	102.6	2.2	0.0

ACOUSTIC TEST

The acoustic test of the complete SLM is tested at the frequency 125 Hz and 8000 Hz using a B&K type 4226 Multifunction Acoustic Calibrator. The test is performed in A weighting.

Frequency	Expected level	Actual level	Tolerar	Tolerance (dB)	
Hz	dB	Measured (dB)	+	3 2 3	dB
1000	94.0	94.0	0.0	0.0	0.0
125	77.9	78.1	1.0	1.0	0.2
8000	92.9	93.2	1.5	3.0	0.3

-----END-----



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.:

19CA0905 02

Page

2

Item tested

Description:

Sound Level Meter (Type 1) B & K

Microphone B & K Preamp B & K

of

Manufacturer: Type/Model No.:

2250-L

4950 ZC0032

Serial/Equipment No.: Adaptors used:

3006790

2827240

21213

Item submitted by

Customer Name:

Lam Geotechnics Limited

Address of Customer:

ner:

Request No.: Date of receipt:

05-Sep-2019

Date of test:

06-Sep-2019

Reference equipment used in the calibration

Description:

Model:

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator

B&K 4226

2288444

23-Aug-2020

CIGISMEC

Signal generator

DS 360

61227

26-Dec-2019

CEPREI

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity: Air pressure:

55 ± 10 % 1000 ± 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%.

 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 Junqi

Approved Signatory:

Date:

06-Sep-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.

© Soils & Materials Engineering Co., Ltd

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

FNGIA



港 黄 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

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



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0905 02

Page

2

Electrical Tests 1,

> The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leg	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	Α	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10⁴ at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2, Acoustic tests

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

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

Response to associated sound calibrator 3,

N/A

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

Calibrated by:

Fung Chi Yip 06-Sep-2019 End

Checked by:

Date:

Shek Kwong Tat

Date:

06-Sep-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.

© Soils & Materials 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-mail: sme'c@cigismec.com Website: www.cigismec.com

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



CERTIFICATE OF CALIBRATION

Certificate No.:

19CA0425 02

Page

2

Item tested

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

Microphone **B&K**

Preamp **B&K**

of

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:

25-Apr-2019

Date of test:

02-May-2019

Reference equipment used in the calibration

Description:

Model:

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator

B&K 4226

2288444

23-Aug-2019

CIGISMEC

Signal generator

DS 360

61227

26-Dec-2019

CEPREI

Ambient conditions

Temperature:

22 ± 1 °C

Relative humidity: Air pressure:

55 ± 10 % 1005 ± 5 hPa

Test specifications

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

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

3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

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

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

Feng Junqi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

03-May-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.

© Soils & Materials Engineering Co., Ltd.

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



香港 黄竹坑 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 Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0425 02

Page

2

2

1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

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 1/10 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	Coverage
rest.	Sublest	Status	Uncertanity (dB)	Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

3, Response to associated sound calibrator

N/A

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

Calibrated by:

Date:

Fung Chi Yip 02-May-2019

Checked by:

Date:

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.

© Soils & Materials Engineering Co., Ltd

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



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.:

19CA0516 02

Larson Davis

Page

2

Item tested

Description:

Manufacturer:

Type/Model No.:

Serial/Equipment No.: Adaptors used:

LxT1

0004797

Microphone PCB

377B02 163704

Preamp **PCB** PRMLxT1L 042622

of

Item submitted by

Customer Name:

Lam Environmental Service Ltd

Sound Level Meter (Type 1)

Address of Customer:

Request No.

Date of receipt:

16-May-2019

Date of test:

20-May-2019

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226 Serial No.

2288444

Expiry Date: 23-Aug-2019

Traceable to: CIGISMEC

Signal generator

DS 360

61227

26-Dec-2019

CEPREI

Ambient conditions

Temperature:

Relative humidity: Air pressure:

22 ± 1 °C 55 ± 10 % 1005 ± 5 hPa

Test specifications

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

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

3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

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

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

Actual Measurement data are documented on worksheets

Feng Jungi

Approved Signatory:

Date:

21-May-2019

Company Chop:

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

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/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. Website: www.cigismec.com E-mail: smec@cigismec.com

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



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0516 02

Page

2

Electrical Tests 1.

> The electrical tests were perfored 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	
Gen-generated noise	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leg	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Emeanty range ior Loq	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	Α	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
3 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.

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

Response to associated sound calibrator 3,

N/A

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

Calibrated by:

End

Checked by:

Fung Chi Yip 20-May-2019

Date:

Shek Kwong Tat 21-May-2019

Date:

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

© Soils & Materials Engineering Co., Ltd.

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



香港 黄 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 Tel: (852) 2873 6860 Fax: (852) 2555 7533 **SMECLab**

Test Data for Sound Level Meter

Page 1 of 5

Sound level meter type:

LxT1

Serial No.

0004797

Date 2

20-May-2019

Microphone Preamp type: type: 377B02 PRMLxT1L Serial No. Serial No. 163704 042622

Report: 19CA0516 02

SELF GENERATED NOISE TEST

The noise test is performed in the most sensitive range of the SLM with the microphone replaced by an equivalent impedance.

Noise level in A weighting

9.6

dB

Noise level in C weighting

12.3

dB

Noise level in Lin

19.6

dB

LINEARITY TEST

The linearity is tested relative to the reference sound pressure level using a continuous sinusoidal signal of frequency 4 kHz. The measurement is made on the reference range for indications at 5 dB intervals starting from the 94 dB reference sound pressure level. And until within 5 dB of the upper and lower limits of the reference range, the measurements shall be made at 1 dB intervals.(SLM set to LEQ/SPL)

Reference/Expected level	Actual level		Tolerance	Deviation		
reference/Expected level	non-integrated	integrated		non-integrated	integrated	
dB	dB	dB	+/- dB	dB	dB	
94.0	94.0	94.0	0.7	0.0	0.0	
99.0	99.0	99.0	0.7	0.0	0.0	
104.0	104.0	104.0	0.7	0.0	0.0	
109.0	109.0	109.0	0.7	0.0	0.0	
114.0	114.0	114.0	0.7	0.0	0.0	
115.0	115.0	115.0	0.7	0.0	0.0	
116.0	116.0	116.0	0.7	0.0	0.0	
117.0	117.0	117.0	0.7	0.0	0.0	
118.0	118.0	118.0	0.7	0.0	0.0	
119.0	118.9	118.9	0.7	-0.1	-0.1	
120.0	119.9	119.9	0.7	-0.1	-0.1	
89.0	89.0	89.0	0.7	0.0	0.0	
84.0	84.0	84.0	0.7	0.0	0.0	
79.0	79.0	79.0	0.7	0.0	0.0	
74.0	74.0	74.0	0.7	0.0	0.0	
69.0	69.0	69.0	0.7	0.0	0.0	
64.0	64.0	64.0	0.7	0.0	0.0	
59.0	58.9	58.9	0.7	-0.1	-0.1	
54.0	53.9	53.9	0.7	-0.1	-0.1	
49.0	48.9	48.9	0.7	-0.1	-0.1	
44.0	43.9	43.9	0.7	-0.1	-0.1	
39.0	38.9	38.9	0.7	-0.1	-0.1	
34.0	33.9	33.9	0.7	-0.1	-0.1	
33.0	32.9	32.9	0.7	-0.1	-0.1	



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 **SMECLab**

Test Data for Sound Level Meter

Page 2 of 5

Sound level me	eter type:	LxT1		Serial No.	0004797	Date	e 20-May	-2019
Microphone Preamp	type: type:	377B02 PRMLxT1L		Serial No. Serial No.	163704 042622	Rep	ort: 19CA05	16 02
32.0		31.8	31.8	0.7		-0.2	-0.2	
31.0		30.8	30.8	0.7		-0.2	-0.2	
30.0		29.8	29.8	0.7		-0.2	-0.2	

Measurements for an indication of the reference SPL on all other ranges which include it

Other ranges	Expected level	Actual level	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
20-120	94.0	94.0	0.7	0.0

Measurements on all level ranges for indications 2 dB below the upper limit and 2 dB above the lower limit

Ranges	Reference/Expected level	Actual level	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
20-120	30.0	29.8	0.7	-0.2
20-120	118.0	117.9	0.7	-0.1

FREQUENCY WEIGHTING TEST

The frequency response of the weighting netwoks are tested at octave intervals over the frequency ranges 31.5 Hz to 12500 Hz. The signal level at 1000 Hz is set to give an indication of the reference SPL.

Frequency weighting A:

Frequency	Ref. level	Expected level	Actual level	Tolerar	nce(dB)	Deviation
Hz	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	54.6	54.6	1.5	1.5	0.0
63.1	94.0	67.8	67.8	1.5	1.5	0.0
125.9	94.0	77.9	77.8	1.0	1.0	-0.1
251.2	94.0	85.4	85.3	1.0	1.0	-0.1
501.2	94.0	90.8	90.7	1.0	1.0	-0.1
1995.0	94.0	95.2	95.1	1.0	1.0	-0.1
3981.0	94.0	95.0	94.9	1.0	1.0	-0.1
7943.0	94.0	92.9	92.9	1.5	3.0	0.0
12590.0	94.0	89.7	89.6	3.0	6.0	-0.1

Frequency weighting C:

Frequency	Ref. level	Expected level	Actual level	Tolerar	nce(dB)	Deviation
Hz	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	91.0	90.9	1.5	1.5	-0.1
63.1	94.0	93.2	93.1	1.5	1.5	-0.1
125.9	94.0	93.8	93.7	1.0	1.0	-0.1
251.2	94.0	94.0	93.9	1.0	1.0	-0.1
501.2	94.0	94.0	94.0	1.0	1.0	0.0



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 **SMECLab**

Test Data for Sound Level Meter

Page 3 of 5

Sound level me	ter type:	LxT1	Serial No.	000	4797	Date	20-May-2019
Microphone Preamp	type: type:	377B02 PRMLxT1L	Serial No. Serial No.	163 042		Report:	19CA0516 02
1995.0	94.0	93.8	93.8	1.0	1.0	0.0	
3981.0	94.0	93.2	93.2	1.0	1.0	0.0	
7943.0	94.0	91.0	91.0	1.5	3.0	0.0	
12590.0	94.0	87.8	87.7	3.0	6.0	-0.1	

Frequency weighting Lin:

Frequency	Ref. level	Expected level	Actual level	Tolerar	nce(dB)	Deviation
Hz	dB	dB	dB	+	_	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	94.0	94.0	1.5	1.5	0.0
63.1	94.0	94.0	93.9	1.5	1.5	-0.1
125.9	94.0	94.0	93.9	1.0	1.0	-0.1
251.2	94.0	94.0	93.9	1.0	1.0	-0.1
501.2	94.0	94.0	93.9	1.0	1.0	-0.1
1995.0	94.0	94.0	93.9	1.0	1.0	-0.1
3981.0	94.0	94.0	93.9	1.0	1.0	-0.1
7943.0	94.0	94.0	94.0	1.5	3.0	0.0
12590.0	94.0	94.0	93.9	3.0	6.0	-0.1

TIME WEIGHTING FAST TEST

Time weighting F is tested on the reference range with a single sinusoidal burst of duration 200 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A, Maximum hold)

Ref. level	Expected level	Actual level	Tolera	nce(dB)	Deviation
dB	dB	dB	+	-	dB
116.0	115.0	114.9	1.0	1.0	-0.1

TIME WEIGHTING SLOW TEST

Time weighting S is tested on the reference range with a single sinusoidal burst of duration 500 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A, Maximum hold)

Ref. level	Expected level	Actual level	Tolera	nce(dB)	Deviation
dB	dB	dB	+	-	dB
116.0	111.9	111.8	1.0	1.0	-0.1

PEAK RESPONSE TEST

The onset time of the peak detector is tested on the reference range by comparing the response to a 100 us rectangular test pulse with the response to a 10 ms reference pulse of the same amplitude. The amplitude of the 10 ms reference pulse is such as to produce an indication 1 dB below the upper limit of the primary indicator range.

Positive polarities:	(Weighting Z, set the	generator signal to	single, Lzpeak)

Ref. level	Response to 10 ms	Response to 100 us	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
119.0	119.0	119.4	2.0	0.4

(c)Soils Materials Eng. Co., Ltd. Form No. CAWS 152/Issue 1/Rev. B/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-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533 **SMECLab**

Test Data for Sound Level Meter

Page 4 of 5

Sound level meter type:

LxT1

Serial No.

0004797

Date

20-May-2019

Microphone Preamp type: type: 377B02 PRMLxT1L Serial No. Serial No. 163704 042622

Report: 19CA0516 02

Negative polarities:

Ref. level	Response to 10 ms	Response to 100 us	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
119.0	119.0	119.4	2.0	0.4

RMS ACCURACY TEST

The RMS detector accuracy is tested on the reference range for a crest factor of 3.

Test frequency:

2000 Hz

Amplitude:

2 dB below the upper limit of the primary indicator range.

Burst repetition frequency:

40 Hz

Tone burst signal:

11 cycles of a sine wave of frequency 2000 Hz

(Set to INT)

Tono baret eig	Torio Sarot digital.		wave or moquemey L	1001	(0 1111)
	Ref. Level	Expected level	Tone burst signal	Tolerance	Deviation
Time wighting	dB	dB	indication(dB)	+/- dB	dB
Slow	118.0+6.6	118.0	117.9	0.5	-0.1

TIME WEIGHTING IMPULSE TEST

Time weighting I is tested on the reference range (Set the SLM to LAImax)

Test frequency:

2000 Hz

Amplitude:

The upper limit of the primary indicator range.

Single sinusoidal burst of duration 5 ms:

Ref. Level	Single burs	Single burst indication		Deviation
dB	Expected (dB)	Actual (dB)	+/- dB	dB
120.0	111.2	111.1	2.0	-0.1

Repeated at 100 Hz

Ref. Level	Repeated bu	Repeated burst indication		Deviation
dB	Expected (dB)	Actual (dB)	+/- dB	dB
120.0	117.3	117.1	1.0	-0.2

TIME AVERAGING TEST

This test compares the SLM reading for continuous sine signals with readings obtained from a sine tone burst sequence having the same RMS level. The test level is 30 dB below the upper limit of the linearity range and repeated for Type 1 SLM with 40 dB below the upper limit of the linearity.

Frequency of tone burst:

4000 Hz

Duration of tone burst:

1 ms

Repetition Time	Level of	Expected	Actual	Tolerance	Deviation	Remarks
	tone burst	Leq	Leq			
msec	dB	dB	dB	+/- dB	dB	
1000	90.0	90.0	89.9	1.0	-0.1	60s integ.
10000	80.0	80.0	79.9	1.0	-0.1	6min. integ.

PULSE RANGE AND SOUND EXPOSURE LEVEL TEST

The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference rar

Test frequency:

4000 Hz

Integration time:

10 sec



香港 黄竹坑 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 Tel: (852) 2873 6860 Fax: (852) 2555 7533 **SMECLab**

Test Data for Sound Level Meter

Page 5 of 5

Sound level meter type:

LxT1

Serial No.

0004797

Date

20-May-2019

Microphone Preamp type: type: 377B02 PRMLxT1L Serial No. Serial No. 163704 042622

Report: 19CA0516 02

The integrating sound level meter set to Leq:

Duration	Rms level of	Expected	Actual	Tolerance	Deviation
msec	tone burst (dB)	dB	dB	+/- dB	dB
10	88.0	58.0	57.9	1.7	-0.1

The integrating sound level meter set to SEL:

Duration	Rms level of	Expected	Actual	Tolerance	Deviation
msec	tone burst (dB)	dB	dB	+/- dB	dB
10.0	88.0	68.0	68.0	1.7	0.0

OVERLOAD INDICATION TEST

For SLM capable of operating in a non-integrating mode.

Test frequency:

2000 Hz

Amplitude:

2 dB below the upper limit of the primary indicator range.

Burst repetition frequency:

40 Hz

Tone burst signal:

11 cycles of a sine wave of frequency 2000 Hz.

Level	Level reduced by	Further reduced	Difference	Tolerance	Deviation
at overload (dB)	1 dB	3 dB	dB	dB	dB
113.1	112.1	109.1	3.0	1.0	0.0

For integrating SLM, with the instrument indicating Leq.

For integrating SLM, with the instrument indicating Leq and set to the reference range. The test signal as follow The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference rar

Test frequency:

4000 Hz

Integration time:

10 sec

Single burst duration:

1 msec

Rms level	Level reduced by	Expected level	Actual level	Tolerance	Deviation
at overload (dB)	1 dB	dB	dB	dB	dB
119.7	118.7	78.7	78.5	2.2	-0.2

ACOUSTIC TEST

The acoustic test of the complete SLM is tested at the frequency 125 Hz and 8000 Hz using a B&K type 4226 Multifunction Acoustic Calibrator. The test is performed in A weighting.

Frequency	Expected level	Actual level	Tolerar	nce (dB)	Deviation
Hz	dB	Measured (dB)	+	-	dB
1000	94.0	94.0	0.0	0.0	0.0
125	77.9	78.0	1.0	1.0	0.1
8000	92.9	93.4	1.5	3.0	0.5

-----END-----



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



CERTIFICATE OF CALIBRATION

Certificate No.:

19CA0617 03-02

Page:

of

Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer:

Honglim Co., Ltd.

Type/Model No.: Serial/Equipment No.: HLES-02 2016611465

Adaptors used:

Item submitted by

Curstomer:

Lam Environmental Services Limired.

Address of Customer:

-

Request No.: Date of receipt:

17-Jun-2019

Date of test:

19-Jun-2019

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	03-May-2020	SCL
Preamplifier	B&K 2673	2239857	17-May-2020	CEPREI
Measuring amplifier	B&K 2610	2346941	05-Jun-2020	CEPREI
Signal generator	DS 360	61227	10-May-2020	CEPREI
Digital multi-meter	34401A	US36087050	08-May-2020	CEPREI
Audio analyzer	8903B	GB41300350	13-May-2020	CEPREI
Universal counter	53132A	MY40003662	10-May-2020	CEPREI

Ambient conditions

Temperature:

22 ± 1 °C

Relative humidity: Air pressure:

55 ± 10 % 1005 ± 5 hPa

Test specifications

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

Test results

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

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

Feng Junqi

Approved Signatory:

Date:

19-Jun-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.

© Soils & Materials Engineering Co., Ltd.

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



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

(Continuation Page)

Certificate No.:

19CA0617 03-02

Page:

2

1, Measured Sound Pressure Level

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

			(Output level in dB re 20 μPa)
Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	93.85	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 = 0.012 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 = 1003.6 Hz

Estimated expanded uncertainty

0.1 Hz

Coverage factor k = 2.2

Total Noise and Distortion 4,

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

At 1000 Hz

TND = 0.3 %

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

Checked by:

Date:

Fung Chi Yip

19-Jun-2019

Shek Kwong Tat

Date: 19-Jun-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.

© Soils & Materials Engineering Co., Ltd.

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