

RECALIBRATION DUE DATE:

January 11, 2020

# ertificate d alibration

Calibration Certification Information

Cal. Date: January 11, 2019

Rootsmeter S/N: 438320

Ta: 293 Pa: 760.7 \*K

Operator: Jim Tisch Calibration Model #:

TE-5025A

Calibrator S/N: 0005

mm Hg

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

		Data Tabulat	tion		
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	√∆H(Ta/Pa) (y-axis)
1.0138	0.7195	1.4269	0.9958	0.7067	0.8777
1,0095	1.0115	2.0180	0.9916	0.9936	1.2412
1.0076	1.1321	2.2561	0.9897	1.1121	1.3877
1,0064	1.1910	2.3663	0.9886	1.1699	1.4555
1.0012	1.4323	2.8538	0.9834	1.4069	1.7553
	m=	1.99861		m=	1.25149
QSTD	b=	-0.00882	QA	b=	-0.00543
	r=	0.99997		r=	0.99997

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

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

#### RECALIBRATION

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

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



Location :		CMA1b				Calbratio	on Date	:	19-Jun-19
Equipment no.	ŀ	HVS001				Calbratio	on Due Date	:	19-Aug-19
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER						
				Ambient C	Condition				
Temperature, T <sub>a</sub>		303	3	Kelvin	Pressure, P	1	10	009	mmHg
			Orifice Tr	ansfer Sta	ndard Inforr	nation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.9986	61	Intercept, bc	Т	-0.00882
Last Calibration Date		11-Jan-1	9		(HxP <sub>a</sub> /1013.3 x 298/T <sub>a</sub> ) <sup>1/2</sup>				
Next Calibration Date		11-Jan-2	:0		=	m <sub>c</sub> x	Q <sub>std</sub> +b <sub>c</sub>		
				Calibratio	n of TSP				
Calibration	Mar	nometer R	eading	C	std	Continu	ious Flow		IC
Point	H (i	inches of	water)	(m <sup>3</sup> / min.) Recorder, W		rder, W	(W(P <sub>a</sub> /101	3.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)	
	(up)	(down)	(difference)	X-axis		(C	FM)		Y-axis
1	1.4	1.4	2.8	0.8330			24		23.7506
2	2.4	2.4	4.8	1.0	0892	;	36		35.6259
3	3.6	3.6	7.2	1.3	3330		44		43.5428
4	4.6	4.6	9.2	1.9	5063	ļ.	50		49.4804
5	5.5	5.5	11.0	1.0	6466	ţ	55		54.4285
By Linear Regression of	Y on X								
	Slope, m	=	36.99	955	Inte	ercept, b =	-6.	0487	
Correlation Co	oefficient*	=	0.99	72					
Calibration	Accepted	=	Yes/	<del>/0</del> **					
* if Correlation Coefficier	nt < 0.990.	check and	l recalibration	again.					
				-9					
** Delete as appropriate.									
Remarks :									
Calibrated by	Н	lenry Lau				Checked	by	:	Dean Chan
Date	1	9-Jun-19				Date		:	19-Jun-19



Location :		CMA2a				Calbratio	on Date	: 16	6-Apr-19
Equipment no.	ŀ	HVS002				Calbratio	on Due Date	: 16	6-Jun-19
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER						
				Ambient (	Condition				
Temperature, T <sub>a</sub>		294	ļ	Kelvin	Pressure, P	a	1	013	mmHg
			Orifice Tr	ansfer Sta	ındard Inforr	mation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc	-(	0.00882
Last Calibration Date		11-Jan-1	9	( H x P <sub>a</sub> / 1013.3 x 298 / T				T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		11-Jan-2	0		=	m <sub>c</sub> x	Q <sub>std</sub> + b <sub>c</sub>		
				Calibratio	n of TSP				
Calibration	Man	nometer R	eading	C	) <sub>std</sub>	Continu	ious Flow		IC
Point	H (i	inches of	water)	(m <sup>3</sup>	n <sup>3</sup> / min.) Recorder, W		(W(P <sub>a</sub> /1013.3	x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)	
	(up)	(down)	(difference)	X-axis		(C	FM)	Y-	-axis
1	1.7	1.7	3.4	0.9331			23	23	.1525
2	2.5	2.5	5.0	1.	1306		34	34	.2254
3	3.6	3.6	7.2	1.3	3559		41	41	.2719
4	5.0	5.0	10.0	1.5	5971		48	48	.3183
5	5.6	5.6	11.2	1.0	6900		55	55	.3647
By Linear Regression of	Y on X								
	Slope, m	=	39.10	656	Int	ercept, b =	-12	2.0687	
Correlation Co	oefficient*	=	0.99	02					
Calibration	Accepted	=	Yes/	<del>\0</del> **					
* if Correlation Coefficier	nt < 0 990	check and	l recalibration	anain					
		one on ano	. roodii oralio	. aga					
** Delete as appropriate.									
Remarks :									
Calibrated by	н	lenry Lau				Checked	by	:De	ean Chan
Date	1	6-Apr-19	-			Date		: 16	6-Apr-19



Location :		CMA2a				Calbratio	on Date	:	19-Jun-19
Equipment no.	- 1	HVS002				Calbratio	on Due Date	:	19-Aug-19
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER						
				Ambient C	Condition				
Temperature, T <sub>a</sub>		303	3	Kelvin	Pressure, P	a	1	009	mmHg
			Orifice Tr	ansfer Sta	ındard İnfori	mation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc		-0.00882
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> )	1/2
Next Calibration Date		11-Jan-2	:0	,	=		Q <sub>std</sub> + b <sub>c</sub>		
				Calibratio	n of TSP				
Calibration	Mar	nometer R	eading	C	) <sub>std</sub>	Continu	ious Flow		IC
Point	Н (і	inches of	water)	(m³ / min.) Reco		Recorder, W		1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)	
	(up)	(down)	(difference)	X-axis		(C	FM)		Y-axis
1	1.6	1.6	3.2	0.8	8902		25		24.7402
2	2.4	2.4	4.8	1.0	0892		36		35.6259
3	3.2	3.2	6.4	1.2	2571		42		41.5636
4	4.1	4.1	8.2	1.4	4223		49		48.4908
5	5.1	5.1	10.2	1.9	5858		54		53.4389
By Linear Regression of	Y on X								
	Slope, m	=	40.9	148	Int	ercept, b =	-10	).3269	
Correlation Co	oefficient*	=	0.99	)44					
Calibration	Accepted	=	Yes/	<del>\0</del> **					
* if Correlation Coefficier	nt < 0.990.	check and	l recalibration	again.					
				3.					
** Delete as appropriate.									
Remarks :									
Calibrated by	Н	lenry Lau				Checked	by	:	Dean Chan
Date	1	9-Jun-19				Date		:	19-Jun-19



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



Location :		CMA3a				Calbratio	on Date	:	19-Jun-19
Equipment no.	ı	HVS012				Calbratio	on Due Date	:	19-Aug-19
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER						
				Ambient (	Condition				
Temperature, T <sub>a</sub>		303	3	Kelvin	Pressure, P	a	1	009	mmHg
			Orifice Tr	ansfer Sta	andard Inforr	nation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc		-0.00882
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		11-Jan-2	:0		=	m <sub>c</sub> x	Q <sub>std</sub> + b <sub>c</sub>		
				Calibratio	n of TSP				
Calibration	Mar	nometer R	eading	C	Q <sub>std</sub>	Continu	ious Flow		IC
Point	Н (	inches of	water)	(m <sup>3</sup> / min.)		Reco	rder, W	(W(P <sub>a</sub> /101	3.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-axis		(C	FM)		Y-axis
1	1.1	1.1	2.2	0.7388			20		19.7922
2	2.1	2.1	4.2	1.	0192		27		26.7194
3	3.4	3.4	6.8	1.:	2956		39		38.5947
4	4.5	4.5	9.0	1.	4899		47		46.5116
5	5.3	5.3	10.6	1.	6165		55		54.4285
By Linear Regression of	Y on X								
	Slope, m	=	39.3	179	Int	ercept, b =	-11	.2301	
Correlation Co	oefficient*	=	0.99	07					
Calibration	Accepted	=	Yes/	<del>\0</del> **					
* if Correlation Coefficier	nt < 0.990	check and	l recalibration	again.					
		onoon and	. rooaorai.or	. aga					
** Delete as appropriate.									
Remarks :									
Calibrated by	Н	lenry Lau				Checked	by	:	Dean Chan
Date	1	9-Jun-19				Date		:	19-Jun-19



Location :		CMA4a				Calbratio	on Date	:	16-Apr-19
Equipment no.	ı	HVS004				Calbratio	on Due Date	:	16-Jun-19
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER						
				Ambient (	Condition				
Temperature, T <sub>a</sub>		294	ļ	Kelvin	Pressure, P	a	1	013	mmHg
			Orifice Tr	ansfer Sta	andard Inforr	nation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc		-0.00882
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> ) <sup>1</sup>	(2
Next Calibration Date		11-Jan-2	.0		=	m <sub>c</sub> x	$Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Mar	nometer R	eading	ď	Q <sub>std</sub>	Continu	ious Flow		IC
Point	Н (	inches of	water)	(m³ / min.)		Reco	rder, W	(W(P <sub>a</sub> /1	013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-axis		(CFM)			Y-axis
1	1.3	1.3	2.6	0.8165			20		20.1326
2	2.1	2.1	4.2	1.	0366		30		30.1989
3	2.8	2.8	5.6	1.	1963		36		36.2387
4	4.0	4.0	8.0	1.	4290		43		43.2851
5	5.6	5.6	11.2	1.	6900		52		52.3448
By Linear Regression of	Y on X								
	Slope, m	=	36.1	142	Int	ercept, b =	-8.	1138	
Correlation Co	oefficient*	=	0.99	67					
Calibration	Accepted	=	Yes/	<del>10</del> **					
* if Correlation Coefficier	nt < 0.990,	check and	I recalibration	again.					
** Delete en en en einte									
** Delete as appropriate.									
Remarks :									
Calibrated by		lenry Lau				Checked	i by	: <u> </u>	Dean Chan
Date :	1	6-Apr-19				Date		:	16-Apr-19



				•		•	•			
Location :		CMA4a			Calbratio	on Date	: 19-Jun-19			
Equipment no.	I	HVS004			Calbratio	on Due Date	: 19-Aug-19			
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER							
				Ambient Condition						
Temperature, T <sub>a</sub>		303	3	Kelvin Pressure, P	a	1	009 mmHg			
			Orifice Tr	ansfer Standard Infor	mation					
Equipment No.		0005		<b>Slope, m</b> <sub>c</sub> 1.998	61	Intercept, bc	-0.00882			
Last Calibration Date		11-Jan-1	9	(H)	( H x P <sub>a</sub> / 1013.3 x 298 / T <sub>a</sub> )					
Next Calibration Date		11-Jan-2	10	=		$Q_{std} + b_c$				
				Calibration of TSP						
Calibration	Mar	nometer R	eading	Q <sub>std</sub>	Continu	ious Flow	IC			
Point	Н (	inches of	water)	(m <sup>3</sup> / min.)	n <sup>3</sup> / min.) <b>Recorder, W</b>		(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)			
	(up)	(down)	(difference)		(C	CFM)	Y-axis			
1	1.4	1.4	2.8	0.8330		37	36.6155			
2	2.3	2.3	4.6	1.0664		44	43.5428			
3	3.6	3.6	7.2	1.3330		52	51.4596			
4	4.6	4.6	9.2	1.5063		58	57.3973			
5	6.0	6.0	12.0	1.7197		63	62.3453			
By Linear Regression of	Y on X									
	Slope, m	=	29.5	175 Int	tercept, b =	12.	.1454			
Correlation Co	pefficient*	=	0.99	989						
Calibration	Accepted	=	Yes/	<del>\0</del> **						
* if Correlation Coefficien	nt < 0 990	check and	l recalibration	n again						
		ondon und	rocambianor	r again.						
** Delete as appropriate.										
Remarks :										
Calibrated by	Н	lenry Lau			Checked	l by	: Dean Chan			
Date :	1	9-Jun-19			Date		: 19-Jun-19			



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



				•	• `	•	•
Location :		CMA5b			Calbratio	on Date	: 19-Jun-19
Equipment no.	I	HVS010			Calbratio	on Due Date	: 19-Aug-19
CALIBRATION OF CON	ITINUOUS	S FLOW R	ECORDER				
				Ambient Condition			
Temperature, T <sub>a</sub>		303	3	Kelvin Pressure, P	a	1	009 mmHg
			Orifice Tr	ansfer Standard Infor	mation		
Equipment No.		0005		<b>Slope</b> , m <sub>c</sub> 1.998		Intercept, bc	-0.00882
Last Calibration Date		11-Jan-1	9	(H)	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>
Next Calibration Date		11-Jan-2	10	· =		Q <sub>std</sub> +b <sub>c</sub>	α,
				Calibration of TSP			
Calibration	Mar	nometer R	eading	Q <sub>std</sub>	Continu	ious Flow	IC
Point		inches of	_	(m <sup>3</sup> / min.)	Reco	rder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)			FM)	Y-axis
1	1.5	1.5	3.0	0.8620	;	32	31.6675
2	2.0	2.0	4.0	0.9947	;	38	37.6051
3	3.2	3.2	6.4	1.2571		47	46.5116
4	3.8	3.8	7.6	1.3694		52	51.4596
5	4.9	4.9	9.8	1.5545		58	57.3973
By Linear Regression of	Y on X					-	
	Slope, m	=	36.98	848 Int	ercept, b =	0.:	2675
Correlation Co	pefficient*	=	0.99	988			
Calibration	Accepted	=	Yes/	<del>/o</del> **			
* if Correlation Coefficien	nt ~ 0 990	check and	l recalibration	a again			
ii Correlation Coemicier	ii < 0.550,	CHECK AIR	recalibration	ragain.			
** Delete as appropriate.							
Remarks :							
Calibrated by	Н	lenry Lau			Checked	by	: Dean Chan
Date	1	9-Jun-19	<u> </u>		Date		: 19-Jun-19



				•	• `	•	,	
Location :		MA1e			Calbratio	n Date	: 1	16-Apr-19
Equipment no.	ı	HVS007			Calbratio	n Due Date	: 1	16-Jun-19
CALIBRATION OF CON	ITINUOUS	FLOW R	<u>ECORDER</u>					
				Ambient Condition				
Temperature, T <sub>a</sub>		294	1	Kelvin Pressure, P	a	10	013	mmHg
			Orifice Tr	ansfer Standard Infor	nation			
Equipment No.		0005		<b>Slope, m</b> <sub>c</sub> 1.998		Intercept, bc		-0.00882
Last Calibration Date		11-Jan-1				3.3 x 298 /		
Next Calibration Date		11-Jan-2	20	=		$Q_{std} + b_c$	· a/	
				Calibration of TSP				
Calibration	Mar	nometer R	eading	Q <sub>std</sub>	Continu	ous Flow		IC
Point		inches of	-	(m <sup>3</sup> / min.)			(W/P /1013	3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
i ome	(up)	(down)	(difference)	X-axis		FM)		Y-axis
1	1.7	1.7	3.4	0.9331	,	22		2.1459
2	2.5	2.5	5.0	1.1306		30		0.1989
3	3.7	3.7	7.4	1.3745		39		9.2586
4	4.8	4.8	9.6	1.5650	4	19		9.3249
5	5.6	5.6	11.2	1.6900	Ę	55	5	5.3647
By Linear Regression of	Y on X					<u> </u>		
	Slope, m	=	43.68	364 Int	ercept, b =	-19	.2224	
Correlation Co	pefficient*	=	0.99	77				
Calibration	Accepted	=	Yes/	<del>\0</del> **				
tif Completion Coefficien		-11	l !!b !!					
* if Correlation Coefficier	11 < 0.990,	cneck and	recambration	again.				
** Delete as appropriate.								
Remarks :								
Calibrated by	Н	lenry Lau			Checked	by	: D	ean Chan
Date	1	6-Apr-19			Date		: 1	16-Apr-19



Location :		MA1e				Calbration	on Date	: 19-Jun-	19
Equipment no.	ŀ	HVS007				Calbration	on Due Date	: 19-Aug-	19
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER						
				Ambient C	Condition				
Temperature, T <sub>a</sub>		303			Pressure, P	a	1	009 m	nmHg
			Orifice Tr	ansfer Sta	ndard Inforr	nation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.9986	61	Intercept, bc	-0.0088	32
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		11-Jan-2	10		=		$Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Man	ometer R	eading	C	std	Continu	uous Flow	IC	
Point	H (i	inches of	water)	(m <sup>3</sup>	/ min.)	Reco	order, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub>	a) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-	axis	(0	CFM)	Y-axis	
1	1.6	1.6	3.2	0.0	3902		24	23.7506	
2	2.5	2.5	5.0	1.1	1116		32	31.6675	
3	3.8	3.8	7.6	1.5	3694		41	40.5739	
4	4.9	4.9	9.8	1.5	5545		50	49.4804	
5	5.8	5.8	11.6	1.6	6908		56	55.4181	
By Linear Regression of	Y on X								
	Slope, m	=	39.4	422	Int	ercept, b =	-12	.0157	
Correlation Co	oefficient*	=	0.99	77					
Calibration	Accepted	=	Yes/	<del>/0</del> **					
* if Correlation Coefficier	nt < 0.990	check and	l recalibration	again.					
		5.1051t G.115	. rooaorai.or	. aga					
** Delete as appropriate.									
Remarks :									
Calibrated by	н	enry Lau				Checked	d by	: Dean Ch	nan
Date :	1:	9-Jun-19				Date		: 19-Jun-	19



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



Location :		MA1w				Calbratio	on Date	:	19-Jun-19
Equipment no.	ŀ	HVS008				Calbratio	on Due Date	:	19-Aug-19
CALIBRATION OF CON	ITINUOUS	FLOW R	ECORDER						
				Ambient C	Condition				
Temperature, T <sub>a</sub>		303	3	Kelvin	Pressure, P	a	1	009	mmHg
			Orifice To	ansfer Sta	ındard İnfori	mation			
Equipment No.		0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc		-0.00882
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> ) 1	/2
Next Calibration Date		11-Jan-2	0		=	$m_c x$	Q <sub>std</sub> + b <sub>c</sub>		
				Calibratio	n of TSP				
Calibration	Man	ometer R	eading	C	) <sub>std</sub>	Continu	ous Flow		IC
Point	H (i	inches of	water)	(m <sup>3</sup>	/ min.)	Reco	rder, W	(W(P <sub>a</sub> /1	013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-	axis	(C	FM)		Y-axis
1	1.5	1.5	3.0	0.8	3620		23		22.7610
2	2.6	2.6	5.2	1.1	1335	,	30		29.6883
3	3.8	3.8	7.6	1.3	3694	:	39		38.5947
4	4.8	4.8	9.6	1.5	5386	,	49		48.4908
5	6.0	6.0	12.0	1.7	7197	:	54		53.4389
By Linear Regression of	Y on X								
	Slope, m	=	37.4	337	Int	ercept, b =	-10	).9918	
Correlation Co	oefficient*	=	0.99	910					
Calibration	Accepted	=	Yes/ł	<del>\0</del> **					
* if Correlation Coefficien	nt < 0.990.	check and	l recalibration	again.					
				·g					
** Delete as appropriate.									
Remarks :									
Calibrated by	Н	enry Lau				Checked	by	:	Dean Chan
Date	1	9-Jun-19				Date		:	19-Jun-19



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



### CERTIFICATE OF CALIBRATION

Certificate No.:

19CA0222 02

Page

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Item tested

Description:

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

Microphone B & K

Preamp

Manufacturer: Type/Model No..

2250 2701778

4950 2755097 **B&K** ZC0032 19223

Serial/Equipment No.: Adaptors used:

Item submitted by

**Customer Name:** 

Lam Geotechnics Limited.

Address of Customer:

Request No .:

Date of receipt:

22-Feb-2019

Date of test:

25-Feb-2019

Reference equipment used in the calibration

Description:

Serial No.

**Expiry Date:** 

Traceable to:

Multi function sound calibrator Signal generator

Model: B&K 4226

2288444

23-Aug-2019 24-Apr-2019

CIGISMEC CEPREI

Signal generator

DS 360 DS 360 33873 61227

26-Dec-2019

CEPREI

**Ambient conditions** 

Temperature:

21 ± 1 °C

Relative humidity:

55 ± 10 %

Air pressure:

1005 ± 5 hPa

### **Test specifications**

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

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

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

### **Test results**

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

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

Fena Junai

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

26-Feb-2019

Company Chop:

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

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



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## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0222 02

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1, Electrical Tests

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
			• • • • • • • • • • • • • • • • • • • •	
Self-generated noise	Α	Pass	0.3	
	С	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	Α	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
3 3	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
2.2344	Leq	Pass	0.4	

#### 2, Acoustic tests

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

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

3, Response to associated sound calibrator

N/A

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

Calibrated by:

Date:

Fong Chun Wai

Checked by:

25-Feb-2019

Date: 26-Feb-20

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

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



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



## CERTIFICATE OF CALIBRATION

Certificate No.:

19CA0116 02

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1

Item tested

Description:

Manufacturer: Type/Model No.: Serial/Equipment No.: B&K

2250L 3002695 Microphone B&K

4950

2940839

Preamp B&K ZC0032 18582

Adaptors used:

Customer Name:

Address of Customer:

Item submitted by

Request No. Date of receipt: Lam Geotechnics Ltd.

Sound Level Meter (Type 1)

16-Jan-2019

Date of test:

17-Jan-2019

Reference equipment used in the calibration

Description:

Multi function sound calibrator Signal generator Signal generator

Model: B&K 4226 DS 360

DS 360

Serial No. 2288444 33873 61227

Expiry Date:

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

Traceable to:

CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

Relative humidity: Air pressure:

21 ± 1 °C 50 ± 10 % 1005 ± 5 hPa

Test specifications

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

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

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

#### Test results

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

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

Fend Jungi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

19-Jan-2019

Company Chop:

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

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Form No CARPISS-Vissue ViRay C/01/03/2007



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## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0116 02

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1. Electrical Tests

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range . Step 5 dB at 4 kHz	Pass	0.3	
70 - X - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	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	
Market Mark	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leg	Pass	0.4	

#### 2. Acoustic tests

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

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

Response to associated sound calibrator

N/A

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

Calibrated by:

Date:

Fung Chi Yip 17-Jan-2019 Checked by

9

Date:

Shak Kwong Tut

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.

End

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## CERTIFICATE OF CALIBRATION

Certificate No.:

19CA0329 02

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Item tested

Description: Manufacturer:

Adaptors used:

Sound Level Meter (Type 1) B&K

Microphone BAK 4950

Preamp **B&K** ZC0032

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

2698702

Expiry Date:

13318

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 calibration

Description:

Signal generator

Multi function sound calibrator Signal generator

B&K 4226 DS 360 DS 360

Model:

Serial No.

2288444 23-Aug-2019 33873 24-Apr-2019 61227 26-Dec-2019 Traceable to:

CIGISMEC CEPREI CEPREI

#### Ambient conditions

Temperature: Relative humidity.

Air pressure:

21 ± 1 °C 55 ± 10 % 1005 ± 5 hPa

### Test specifications

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

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.

Jung

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

02-Apr-2019

Company Chop:

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

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Form No. CARP152-Masse MRev CIG1/00/2007



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



### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0329 02

Page

1, **Electrical Tests** 

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	C	Pass	8.0	
	Lin	Pass	1.6	
Linearity range for Leq.	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
- 1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	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	
N N N N	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Log	Pass	0.4	

#### 2, Acoustic tests

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

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

3, Response to associated sound calibrator

N/A

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

Calibrated by: Fong Chun Wai Checked by:

Fung Chi Yie

Date:

02-Apr-2019

Date:

02-Apr-2019

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

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Form No CARP152-28ssie 1/Rev C/01/02/2007



香港黄竹坑道37號利建中心12樓 12/F., Leader Gentre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smet@cigismec.com Website: www.cigismec.com

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



## CERTIFICATE OF CALIBRATION

Certificate No.:

19CA0425 02

Page

Item tested

Description: Manufacturer.

Sound Level Meter (Type 1) B & K

Microphone B&K

Preamp B&K

Type/Model No.: Serial/Equipment No.: 2250-L 2722311

4950 2698703 ZC0032 13321

Adaptors used:

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer.

Request No.

Date of receipt:

25-Apr-2019

Date of test:

02-May-2019

Reference equipment used in the calibration

Description:

Model:

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator

B&K 4226 DS 360

2288444 61227

23-Aug-2019 26-Dec-2019 CIGISMEC CEPRE

Ambient conditions

Temperature:

Air pressure:

22 ± 1 °C

Relative humidity:

55 ± 10 % 1005 ± 5 hPa

Test specifications

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

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 Junq

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.

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Form No CARPISS-Manue SWee CHINGSISSOT



香港黄竹坑避37號利達中心12樓 12년, 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

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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
.5070	100 0000000		STATES AND AND ADDRESS OF THE PARTY OF THE P	(2.3/3/3/2)
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
경하는 경	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
IVA SIGNED FOR BUILDING	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
, JE 1550	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

NIA

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

Calibrated by:

. 47.00

End

Checked by

Shek Kwong Tal

Date:

Fung Chi Yip 2-May-2019

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.

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Form No CARP152-2/tesus 1/Rev Ci01/03/2007



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2

### CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0907 02

Page

0

Item tested

Description: Manufacturer: Sound Level Meter (Type 1)

B & K 2250-L 3006790

B & K 4950 2827240

Microphone

Preamp B & K ZC0032 21213

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

Item submitted by

Customer Name: Address of Customer: Lam Geotechnics Limited

Request No.:

Date of receipt:

07-Sep-2018

Date of test:

10-Sep-2018

Reference equipment used in the calibration

Description:

Multi function sound calibrator

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

DS 360

Serial No.

33873

Expiry Date:

23-Aug-2019 24-Apr-2019 23-Apr-2019 Traceable to: CIGISMEC CEPREI

CEPRE

Ambient conditions

Temperature:

21 ± 1 °C 50 ± 10 %

Relative humidity: Air pressure:

1005 ± 5 hPa

#### Test specifications

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

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

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

#### Test results

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

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

Actual Measurement data are documented on worksheets.

Feng

Approved Signatory:

Date:

10-Sep-2018

Company Chop:

综合試験 解合試験 有限公司 表

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

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Form No CARP 152-Lineau LiRex Cill 102/2007



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### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0907 02

Page

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2

Electrical Tests

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

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

#### 2. Acoustic tests

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

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

NIA

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

Calibrated by:

~-/

West of

Date:

Fung Chi Yip 10-Sep-2018 Checked by:

Date: 1

Shek Kwong Tat 10-Sep-2018

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

End

O Salts & Wateriells Engineering Cit. Ltd.

Form No CARP 152 2/45000 1/Rev C/01/02/0007



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### CERTIFICATE OF CALIBRATION

Certificate No.:

18CA1114 02

Page

Item tested

Description:

Sound Level Meter (Type 1)

Microphone

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

B&K 4188

Serial/Equipment No.:

2100736

2288941

Adaptors used:

Item submitted by

Customer Name:

Lam Environmental Service Ltd.

Address of Customer.

Request No.: Date of receipt:

14-Nov-2018

Date of test:

15-Nov-2018

Reference equipment used in the calibration

Description:

Model: B&K 4228 Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator Signal generator

DS 360 DS 360

2288444 33873 61227

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

CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

20 ± 1 °C 50 ± 10 %

Relative humidity: Air pressure:

1000 ± 5 hPa

#### Test specifications

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

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

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

### Test results

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

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

Feng Junqi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date: 15-Nov-2018

Company Chop:

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

O Soils & Materials Engineering Co., Ltd.

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



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



### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA1114 02

Page

**Electrical Tests** 

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

Self-generated noise	0.3 1.0 2.0 0.3	2.1 2.2
Lin	2.0 0.3	
At reference range , Step 5 dB at 4 kHz   Pass   Reference SPL on all other ranges   Pass   2 dB below upper limit of each range   Pass   2 dB above lower limit of each range   Pass   Pass   2 dB above lower limit of each range   Pass   P	0.3	22
Reference SPL on all other ranges   Pass   2 dB below upper limit of each range   Pass   2 dB above lower limit of each range   Pass   Pass   Elinearity range for SPL   At reference range   Step 5 dB at 4 kHz   Pass   Pass   C   Pass   Lin   Pass   Lin   Pass   Pass   Lin   Pass	and a fine	
Reference SPL on all other ranges   Pass   2 dB below upper limit of each range   Pass   2 dB above lower limit of each range   Pass   Pass   Elinearity range for SPL   At reference range   Step 5 dB at 4 kHz   Pass   Pass   C   Pass   Pass   Lin   Pass   Pass   Lin   Pass		
2 dB above lower limit of each range	0.3	
Linearity range for SPL         At reference range , Step 5 dB at 4 kHz         Pass           Frequency weightings         A         Pass           C         Pass           Lin         Pass           Time weightings         Single Burst Fast         Pass           Single Burst Slow         Pass           Peak response         Single 100 µs rectangular pulse         Pass           R.M.S. accuracy         Crest factor of 3         Pass           Time weighting I         Single burst 5 ms at 2000 Hz         Pass           Repeated at frequency of 100 Hz         Pass           Time averaging         1 ms burst duty factor 1/103 at 4kHz         Pass	0.3	
Frequency weightings         A         Pass           C         Pass           Lin         Pass           Time weightings         Single Burst Fast         Pass           Single Burst Slow         Pass           Peak response         Single 100 µs rectangular pulse         Pass           R.M.S. accuracy         Crest factor of 3         Pass           Time weighting I         Single burst 5 ms at 2000 Hz         Pass           Repeated at frequency of 100 Hz         Pass           Time averaging         1 ms burst duty factor 1/103 at 4kHz         Pass	0.3	
C Pass Lin Pass Time weightings Single Burst Fast Pass Single Burst Slow Pass Peak response Single 100 µs rectangular pulse Pass R.M.S. accuracy Crest factor of 3 Pass Time weighting I Single burst 5 ms at 2000 Hz Pass Repeated at frequency of 100 Hz Pass Time averaging 1 ms burst duty factor 1/103 at 4kHz Pass	0.3	
C	0.3	
Time weightings         Single Burst Fast Single Burst Slow         Pass Pass           Peak response         Single 100 µs rectangular pulse         Pass Pass Pass           R.M.S. accuracy         Crest factor of 3         Pass Pass Pass Pass Pass Pass Pass Pass	0.3	
Single Burst Slow   Pass	0.3	
Peak response         Single 100µs rectangular pulse         Pass           R.M.S. accuracy         Crest factor of 3         Pass           Time weighting I         Single burst 5 ms at 2000 Hz         Pass           Repeated at frequency of 100 Hz         Pass           Time averaging         1 ms burst duty factor 1/10³ at 4kHz         Pass	0.3	
R.M.S. accuracy         Crest factor of 3         Pass           Time weighting I         Single burst 5 ms at 2000 Hz         Pass           Repeated at frequency of 100 Hz         Pass           Time averaging         1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz         Pass	0.3	
Time weighting I Single burst 5 ms at 2000 Hz Pass Repeated at frequency of 100 Hz Pass Time averaging 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz Pass	0.3	
Repeated at frequency of 100 Hz Pass Time averaging 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz Pass	0.3	
Time averaging 1 ms burst duty factor 1/10 <sup>2</sup> at 4kHz Pass	0.3	
	0.3	
경기가 있는 이 경기가 있다면 하면 가는 것이 되었다면 하는데 하는데 하는데 하는데 하는데 하는데 하는데 하는데 하는데 하는데	0.3	
1 ms burst duty factor 1/104 at 4kHz Pass	0.3	
Pulse range Single burst 10 ms at 4 kHz Pass	0.4	
Sound exposure level Single burst 10 ms at 4 kHz Pass	0.4	
Overload indication SPL Pass	0.3	
Leq Pass	0.4	

#### 2, Acoustic tests

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

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

Response to associated sound calibrator 3,

N/A

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

Calibrated by:

End

Checked by:

Date:

Fung Chi Yip 15-Nov-2018

Shek Kwong Tat

15-Nov-2018 Date:

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

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

# Calibration Certificate

Certificate Number 2018010851

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

CAL200 Model Number 13098 Serial Number Pass Test Results

Inoperable Initial Condition

Description Larson Davis CAL200 Acoustic Calibrator Procedure Number D0001.8386 Scott Montgomery Technician Calibration Date 29 Oct 2018

Calibration Due 23 Temperature 34 Humidity 101.2 kPa Static Pressure

°C ±0.3°C %RH ±3 %RH ± 1 kPa

Evaluation Method The data is aguired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

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

ANSI \$1.40-2006 IEC 60942:2017

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

The quality system is registered to ISO 9001:2008.

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

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

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Standards Used	1		
Cal Date	Cal Due	Cal Standard	
09/06/2018	09/06/2019	001021	
04/10/2018	04/10/2019	001051	
03/07/2018	03/07/2019	005446	
09/20/2018	09/20/2019	006506	
08/07/2018	08/07/2019	006507	
05/10/2018	05/10/2019	006510	
07/18/2018	07/18/2019	007368	
	Cal Date 09/06/2018 04/10/2018 03/07/2018 09/20/2018 08/07/2018 05/10/2018	09/06/2018 09/06/2019 04/10/2018 04/10/2019 03/07/2018 03/07/2019 09/20/2018 09/20/2019 08/07/2018 08/07/2019 05/10/2018 05/10/2019	Cal Date         Cal Due         Cal Standard           09/06/2018         09/06/2019         001021           04/10/2018         04/10/2019         001051           03/07/2018         03/07/2019         005446           09/20/2018         09/20/2019         006506           08/07/2018         08/07/2019         006507           05/10/2018         05/10/2019         006510



