

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

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Ma Operator	ar 20, 201 [°] Tisch	7 Rootsmeter Orifice I.I		438320 0005	Ta (K) - Pa (mm) -	293 759.46
PLATE OR	VOLUME START	VOLUME STOP	DIFF VOLUME	DIFF TIME	METER DIFF Hg	ORFICE DIFF H2O
Run #	(m3)	(m3)	(m3)	(min)	(mm)	(in.)
1	NA	NA	1.00	1.3960	3.2	2.00
2	NA NA	NA NA	1.00	0.9970	6.4	4.00
4	NA	NA	1.00	0.8500	8.7	5.50
4 5	NA	NA	1.00	0.6990	12.7	8.00
				1	1 1	

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)	
1.0120 1.0078 1.0058 1.0047 0.9993	0.7249 1.0108 1.1288 1.1820 1.4296	1.4257 2.0163 2.2543 2.3643 2.8514		0.9958 0.9916 0.9896 0.9885 0.9832	0.7133 0.9946 1.1107 1.1630 1.4066	0.8784 1.2423 1.3889 1.4567 1.7568	
Qstd slo intercep coeffici y axis =	t (b) = ent (r) =	2.02533 -0.03593 0.99983 Pa/760) (298/	·a)]	Qa slop intercep coeffici y axis =	t (b) =	1.26823 -0.02214 0.99983 Ta/Pa)]	

CALCULATIONS

Vstd = Diff. Vol[(Pa-Diff. Hg)/760](298/Ta)
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa] Qa = Va/Time

For subsequent flow rate calculations:

 $Qstd = 1/m\{[SQRT(H2O(Pa/760)(298/Ta))] - b\}$ Qa = 1/m{[SQRT H2O(Ta/Pa)] - b}



Location	:	CMA1b	Calibration Date :	:	21-Nov-17
Equipment no.	: _	HVS001	Calibration Due Date :	:	21-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T _a		292		Kelvin	Pressure, P	1	10)18 mmHg		
Orifice Transfer Standard Information										
Equipment No.		Ori001		Slope, m _c	2.025	33	Intercept, bc	-0.03593		
Last Calibration Date		20-Mar-1	7		(H	x P _a / 10	013.3 x 298 / 1	$(a)^{1/2}$		
Next Calibration Date		20-Mar-1	8			m _c	x Q _{std} + b _c			
Calibration of TSP										
Calibration	Manometer Reading			Q	std	Conti	nuous Flow	IC		
Point	H (inches of water)		(m ³ /	(m ³ / min.) Rec		corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)			
	(up)	(down)	(difference)	X-	axis		(CFM)	Y-axis		
1	1.5	1.5	3.0	0.8	3837	27		27.3392		
2	2.5	2.5	5.0	1.1	1357		34	34.4271		
3	3.9	3.9	7.8	1.4	140		43	43.5402		
4	5.0	5.0	10.0	1.5	5987		50	50.6281		
5	6.2	6.2	12.4	1.7	7782		58	58.7286		
By Linear Regression of Y o	on X									
Slope, m = 34				.7877 Intercept, b = -4.4504						
Correlation C	oefficient*	=	0.9	960	_					
Calibration	Accepted	=	Yes	/ No **	_					

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

** Delete as appropriate.

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

re-assigned from EL452 to HVS001 with respect to the update in quality management system.									
Calibrated by	:	Jackey MA	Checked by	:	Pauline Wong				
Date	:	21-Nov-17	Date	:	21-Nov-17				



Location

CMA1b

Calibration Date

Equipment no.

HVS001

:

17-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T _a		293		Kelvin	Pressure, P	1	10	014 mmHg		
Orifice Transfer Standard Information										
Equipment No.		Ori001		Slope, m _c	2.025	33	Intercept, bc	-0.03593		
Last Calibration Date		20-Mar-1	7		(H	x P _a / 10)13.3 x 298 / T	Γ _a) ^{1/2}		
Next Calibration Date		20-Mar-1	8			m _c	x Q _{std} + b _c			
Calibration of TSP										
Calibration	Manometer Reading			Q	std	Conti	nuous Flow	IC		
Point	н ((inches of v	water)	(m ³ / min.)		Re	corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)		
	(up)	(down)	(difference)	X-	axis		(CFM)	Y-axis		
1	1.6	1.6	3.2	0.9	9088	28		28.2476		
2	2.5	2.5	5.0	1.1	316		36	36.3184		
3	3.9	3.9	7.8	1.4	1089		45	45.3980		
4	5.1	5.1	10.2	1.6	6086		52	52.4599		
5	6.4	6.4	12.8	1.7	7998		58	58.5130		
By Linear Regression of Y o	on X									
	Slope, m	=	33.9	9466	In	tercept, b =	-2.3	3715		
Correlation C	oefficient*	=	0.9	9998	_					
Calibration Accepted =				/ No **	_					

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

** Delete as appropriate.

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

re-assigned from EL452 to HVS001 with respect to the update in quality management system.								
Calibrated by	brated by	Jackey MA	Checked by	:	Pauline Wong			
Date	:	17-Jan-18	Date	:	17-Jan-18			



Location	:	CMA2a	Calibration Date	:	21-Nov-17
Equipment no.	:	HVS002	Calibration Due Date	:	21-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T _a		292	2	Kelvin	Pressure, P _a	1	1(018 mmHg		
Orifice Transfer Standard Information										
Equipment No.		Ori001		Slope, m _c	2.025	33	Intercept, bc	-0.03593		
Last Calibration Date		20-Mar-1	7		(H	x P _a / 1(013.3 x 298 / T	Γ _a) ^{1/2}		
Next Calibration Date		20-Mar-1	8			m _c	xQ _{std} +b _c			
Calibration of TSP										
Calibration	Ma	nometer Re	eading	Q _{std} Conti			nuous Flow	IC		
Point	н ((inches of v	water)	(m ³ /	min.) Reco		corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)		
	(up)	(down)	(difference)	X-a	axis		(CFM)	Y-axis		
1	1.6	1.6	3.2	0.9	121		29	29.3643		
2	2.6	2.6	5.2	1.1	578		34	34.4271		
3	4.1	4.1	8.2	1.4	494		45	45.5653		
4	5.2	5.2	10.4	1.6	300		52	52.6532		
5	6.3	6.3	12.6	1.7	924		56	56.7035		
By Linear Regression of Y o	on X									
	Slope, m	=	32.	6438	In	tercept, b =	-1.5	5778		
Correlation C	oefficient*	=	0.9	9948						
Calibration	Accepted	=	Yes	/ No **						

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

** Delete as appropriate.

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

re-assigned from EL449 to HVS002 with respect to the update in quality management system.									
Calibrated by	:	Jackey MA	Checked by		Pualine Wong				
Date	:	21-Nov-17	Date	:	21-Nov-17				



Location	:	CMA2a	Calibration Date	:	17-Jan-18
Equipment no.	:	HVS002	Calibration Due Date	:	17-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T _a		293		Kelvin	Pressure, P _a	3	1(014 mmHg	
			Orifice	Transfer Sta	ndard Inform	ation			
Equipment No.		Ori001			2.025	33	Intercept, bc	-0.03593	
Last Calibration Date		20-Mar-1	7		(H	x P _a / 10	013.3 x 298 / 1	Γ _a) ^{1/2}	
Next Calibration Date		20-Mar-1	8			m _c	x Q _{std} + b _c		
Calibration of TSP									
Calibration	Ma	nometer Re	eading	Q	std	Cont	inuous Flow	IC	
Point	н ((inches of v	water)	(m ³ / min.)		Re	corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)	
	(up)	(down)	(difference)	X-a	axis		(CFM)	Y-axis	
1	1.8	1.8	3.6	0.9	9628	33		33.2919	
2	2.8	2.8	5.6	1.1	965		41	41.3626	
3	4.1	4.1	8.2	1.4	1441		50	50.4422	
4	5.4	5.4	10.8	1.6	6547		56	56.4953	
5	6.6	6.6	13.2	1.8	3275		60	60.5307	
By Linear Regression of Y o	on X								
	Slope, m	=	31.9	9847		tercept, b =	= 3.0	0980	
Correlation C	oefficient*	=	0.9	9970	_				
Calibration	Accepted	=	Yes	/ No **	_				

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

** Delete as appropriate.

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

re-assi	gned from	EL449 to HVS002 with resp	ect to the update in quality management system.	
Calibrated by	:	Jackey MA	Checked by	Pualine Wong
Date	:	17-Jan-18	Date :	 17-Jan-18



Location Equipment no. CMA3a HVS012

Calibration	Date	:	
Calibration	Due Date	:	

12.5891

Intercept, b =

20-Nov-17 20-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

				Ambient Co					
Temperature, T _a		292		Kelvin Pressure, P a 1019 mmHg					
			Orifice T	ransfer Stan	dard Informa	ation			
Equipment No.		Ori001		Slope, m _c	2.025	33	Intercept, bc	-0.03593	
Last Calibration Date		20-Mar-1	7		(H x	P _a / 10)13.3 x 298 /	T _a) ^{1/2}	
Next Calibration Date		20-Mar-1	8	$m_c \times Q_{std} + b_c$					
Calibration of TSP									
Calibration	Manometer Reading			Q	std	Conti	nuous Flow	IC	
Point	H ((inches of v	water)	(m ³ /	′ min.)	Red	corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35	
	(up)	(down)	(difference)	X-:	axis		(CFM)	Y-axis	
1	1.3	1.3	2.6	0.8	3243		36	36.4701	
2	2.2	2.2	4.4	1.0	670		42	42.5485	
3	3.4	3.4	6.8	1.3	3221		48	48.6268	
4	4.4	4.4	8.8	1.5	5016		54	54.7052	
5	5.5	5.5	11.0	1.6	6767		60	60.7835	
	5.5								

By Linear Regression of Y on X

Correlation Coefficient*

Calibration Accepted

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

Slope, m

=

=

** Delete as appropriate.

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

28.1915

0.9961

Yes/No**

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

Calibrated by	:	Jackey MA	Checked by	:	Pauline Wong
Date	:	20-Nov-17	Date	:	20-Nov-17



Location Equipment no. CMA3a HVS012

Calibration Date	:	
Calibration Due Date	:	

16-Jan-18 16-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

	•			Ambient Con			-	
Temperature, T _a		291		Kelvin Pressure, P a 1015 mmHg				
			Orifice T	ransfer Standa	ard Informa	ition		
Equipment No.		Ori001		Slope, m _c	2.0253	33	Intercept, bc	-0.03593
Last Calibration Date		20-Mar-1	7		(H x	P _a / 10 ⁴	13.3 x 298 /	$(T_a)^{1/2}$
Next Calibration Date		20-Mar-1	8			m _c x	Q _{std} + b _c	
				Calibration o	TSP			
Calibration	Ma	Manometer Reading Q std Continuous Flow				IC		
Point	н	inches of v	water)	(m ³ / min.) Record		order, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)	
	(up)	(down)	(difference)	X-ax	s	((CFM)	Y-axis
1	1.4	1.4	2.8	0.854	15		35	35.4482
2	2.2	2.2	4.4	1.066	57		40	40.5122
3	3.4	3.4	6.8	1.321	8		48	48.6146
4	4.4	4.4	8.8	1.501	2		53	53.6786
5	5.6	5.6	11.2	1.691	3		58	58.7427
By Linear Regression of Y	′ on X							
	Slope, m	=	28.3	3766	Int	ercept, b =	= 10	.8760

Correlation Coefficient*

Calibration Accepted

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

=

** Delete as appropriate.

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

0.9991

Yes/No**

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

Calibrated by	:	Jackey MA	Checked by	 Pauline Wong
Date	:	16-Jan-18	Date	16-Jan-18



Location Equipment no. CMA4a HVS004 Calibration Date Calibration Due Date 20-Nov-17 20-Jan-18

20-Nov-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T _a	292	Kelvin	Pressure, P _a	1019	mmHg				
Orifice Transfer Standard Information									
Equipment No.	Ori001	Slope, m _c	2.02533	Intercept, bc	-0.03593				
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$							
Next Calibration Date	20-Mar-18		m	$_{\rm c}$ x Q $_{\rm std}$ + b $_{\rm c}$					

				Calibration of TSP		
Calibration	Mai	nometer R	eading	Q _{std}	Continuous Flow	IC
Point	Н (inches of v	water)	(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.3
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis
1	1.5	1.5	3.0	0.8841	23	23.3004
2	2.4	2.4	4.8	1.1136	32	32.4179
3	3.8	3.8	7.6	1.3967	42	42.5485
4	4.8	4.8	9.6	1.5675	48	48.6268
5	6.0	6.0	12.0	1.7505	52	52.6791
inear Regression of	Y on X					
Slope, m		=	34.4	1902	Intercept, b =	-6.3878
Correlation Coefficient*		=	0.9	965		
Calibration Accepted		=	Yes	/ No **		

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

•

20-Nov-17

** Delete as appropriate.

Remarks	
IVEIIIaIK3	•

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

 re-assigned from EL390 to HVS004 with respect to the update in quality management system.

 Calibrated by
 :
 Jackey MA
 Checked by
 :
 Pauline Wong

Date

Date



Location Equipment no. CMA4a HVS004 Calibration Date Calibration Due Date 16-Jan-18 16-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

	Ambient Condition									
Temperature, T _a	291	Kelvin	Pressure, P _a	1015	mmHg					
Orifice Transfer Standard Information										
Equipment No.	Ori001	Slope, m _c	2.02533	Intercept, bc	-0.03593					
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$								
Next Calibration Date	20-Mar-18		$m_c \times Q_{std} + b_c$							

				Calibration of TSP		
Calibration	Mai	nometer R	eading	Q _{std}	Continuous Flo	w IC
Point	Н (inches of v	water)	(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.3
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis
1	1.5	1.5	3.0	0.8839	24	24.3073
2	2.4	2.4	4.8	1.1133	33	33.4225
3	3.7	3.7	7.4	1.3781	42	42.5378
4	4.8	4.8	9.6	1.5671	50	50.6402
5	5.7	5.7	11.4	1.7062	55	55.7042
inear Regression of `	Y on X					
Slope, m		=	38.0	0715 li	ntercept, b =	-9.3021
Correlation Coefficient*		=	0.9	995		
Calibration Accepted		=	Yes	/ No **		

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

** Delete as appropriate.

Remarks	
1/CIIIdIN2	-

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

 re-assigned from EL390 to HVS004 with respect to the update in quality management system.

 Calibrated by
 :
 Jackey MA
 Checked by
 :
 Pauline Wong

 :
 16-Jan-18
 Date
 :
 16-Jan-18

Date



Location Equipment no. CMA5b HVS010

Calibration	Date
Calibration	Due Date

20-Nov-17 20-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

				Ambient C						
Temperature, T _a		292		Kelvin	Pressure, P _a		10)19 mmHg		
			Orifice	Transfer Star	ndard Informat	tion				
Equipment No.		Ori001		Slope, m _c	2.0253		Intercept, bc	-0.03593		
Last Calibration Date		20-Mar-1	7		$(H x P_a / 1013.3 x 298 / T_a)^{1/2}$					
Next Calibration Date		20-Mar-1	8		=	m _c	$x Q_{std} + b_{c}$			
				Calibration	n of TSP					
Calibration	Ма	nometer Re	eading	Q	std	Cont	inuous Flow	IC		
Point	н	(inches of v	water)	(m ³ /	min.)	Re	ecorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)		
	(up)	(down)	(difference)	X-a	ixis		(CFM)	Y-axis		
1	1.3	1.3	2.6	0.8	243		40	40.5224		
2	2.2	2.2	4.4	1.0	670		46	46.6007		
3	3.3	3.3	6.6	1.3	028		52	52.6791		
4	4.4	4.4	8.8	1.5	016		59	59.7705		
5	5.5	5.5	11.0	1.6	767		62	62.8097		
By Linear Regression of Y o	n X									
	Slope, m	=	27.0	0050	Inte	ercept, b	= 18.0	0599		
Correlation C	oefficient*	=	0.9	969						
Calibration	Accepted	=	Yes	/ No **						
L										

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

** Delete as appropriate.

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

re-assigned from EL222 to HVS010 with respect to the update in quality management system.

Calibrated by Date Jackey MA 20-Nov-17 Checked by Date Pauline Wong 20-Nov-17



Location Equipment no. CMA5b HVS010

Calibration Date	
Calibration Due Date	

16-Jan-18 16-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

				Ambient C						
Temperature, T _a		291		Kelvin	Pressure, P _a		10)15 mmHg		
			Orifice	Transfer Star	ndard Informa	ition				
Equipment No.		Ori001		Slope, m _c	2.0253		Intercept, bc	-0.03593		
Last Calibration Date		20-Mar-1	7		$(H x P_a / 1013.3 x 298 / T_a)^{1/2}$					
Next Calibration Date		20-Mar-1	8		=	m _c	$x Q_{std} + b_{c}$			
				Calibration	n of TSP					
Calibration	Ма	nometer R	eading	Q	std	Cont	inuous Flow	IC		
Point	н	(inches of v	water)	(m ³ /	min.)	Re	ecorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)		
	(up)	(down)	(difference)	X-a	ixis		(CFM)	Y-axis		
1	1.4	1.4	2.8	0.8	545		40	40.5122		
2	2.1	2.1	4.2	1.0	426		46	46.5890		
3	3.1	3.1	6.2	1.2	629		53	53.6786		
4	3.9	3.9	7.8	1.4	144		58	58.7427		
5	4.7	4.7	9.4	1.5	509		63	63.8067		
By Linear Regression of Y o	n X									
	Slope, m	=	33.2	2153	Inte	ercept, b	= 11.9	9753		
Correlation C	oefficient*	=	0.9	997						
Calibration	Accepted	=	Yes	/ No **						

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

** Delete as appropriate.

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

re-assigned from EL222 to HVS010 with respect to the update in quality management system.

Calibrated by Date Jackey MA 16-Jan-18 Checked by Date Pauline Wong 16-Jan-18



Location Equipment no. MA1e HVS007 Calibration Date Calibration Due Date

20-Nov-17 20-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

				Ambient Condition	n		
Temperature, T _a		292		Kelvin Pressure, P a			I019 mmHg
			Orifice Tra	ansfer Standard Ir	nformation		
Equipment No.		Ori001			2.02533	Intercept, bc	-0.03593
Last Calibration Date		20-Mar-1	7	(HxP _a /1	013.3 x 298 /	T _a) ^{1/2}
Next Calibration Date		20-Mar-1	8		m _c	x Q _{std} + b _c	
				Calibration of TSI	b		
Calibration	Ма	nometer R	eading	Q _{std}	Cont	inuous Flow	IC
Point	Н	(inches of	water)	(m ³ / min.)	Re	corder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-axis		(CFM)	Y-axis
1	1.5	1.5	3.0	0.8841		29	29.3787
2	2.4	2.4	4.8	1.1136		38	38.4962
3	4.0	4.0	8.0	1.4325		47	47.6138
4	5.2	5.2	10.4	1.6308		53	53.6921
5	6.5	6.5	13.0	1.8212		59	59.7705
By Linear Regression of Y	on X				•		•
	Slope, m	=	31.7	549	Intercept, b	= 2.	0811
Correlation C	oefficient*	=	0.99	085			
Calibration	Accepted	=	Yes/	\o **			

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

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

Calibrated by Date Jackey MA 20-Nov-17 Checked by Date Pauline Wong 20-Nov-17



Location Equipment no. MA1e HVS007 Calibration Date Calibration Due Date

16-Jan-18 16-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

				Ambient Condi					
Femperature, T _a		291		Kelvin Pre	Kelvin Pressure, P a 1015				
			Orifice Tra	ansfer Standar	d Information				
Equipment No.		Ori001		Slope, m _c	2.02533	Intercept, bc	-0.03593		
Last Calibration Date		20-Mar-1	7		(HxP _a /1	013.3 x 298 /	T_{a}) ^{1/2}		
Next Calibration Date		20-Mar-1	8		m	x Q _{std} + b _c			
				Calibration of ⁻	TSP				
Calibration	Ма	nometer R	eading	Q _{std}	Con	tinuous Flow	IC		
Point	Н	(inches of	water)	(m ³ / min	.) R	ecorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31		
	(up)	(down)	(difference)	X-axis		(CFM)	Y-axis		
1	1.6	1.6	3.2	0.9123		30	30.3841		
2	2.6	2.6	5.2	1.1581		38	38.4866		
3	4.2	4.2	8.4	1.4671		48	48.6146		
4	5.4	5.4	10.8	1.6611		54	54.6914		
5	6.7	6.7	13.4	1.8483		59	59.7555		
By Linear Regression of Y	on X				·				
	Slope, m	=	31.6	483	Intercept, b	= 1	.7822		
Correlation Co	pefficient*	=	0.99	95					
Calibration	Accepted	=	Yes/	\o **					

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

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

Calibrated by Date Jackey MA 16-Jan-18 Checked by Date Pauline Wong 16-Jan-18



Location Equipment no. MA1w HVS008 Calibration Date Calibration Due Date

20-Nov-17 20-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

		Ambient Condi	tion		
Temperature, T _a	292	Kelvin Pre			1019 mmHg
• • •					
	Orifice Tra	ansfer Standar	d Information		
Equipment No.	Ori001	Slope, m _c	2.02533	Intercept, b	c -0.03593
Last Calibration Date	20-Mar-17		(H x P _a /	1013.3 x 298	/ T _a) ^{1/2}
Next Calibration Date	20-Mar-18		= m	$_{\rm c}$ x Q $_{\rm std}$ + b $_{\rm c}$	
		Calibration of ⁻	SP		
Calibration	Manometer Reading	Q _{std}	Co	ntinuous Flow	IC
Point	H (inches of water)	(m ³ / mi	n.) F	Recorder. W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.3

Point	Н (inches of v	vater)	(m ³ / min.)	Recorder, W	$(W(P_a/1013.3x298/T_a)^{1/2}/35.31)$
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis
1	1.6	1.6	3.2	0.9125	22	22.2873
2	2.5	2.5	5.0	1.1362	32	32.4179
3	3.9	3.9	7.8	1.4147	41	41.5354
4	5.1	5.1	10.2	1.6152	48	48.6268
5	6.3	6.3	12.6	1.7933	54	54.7052
By Linear Regression of Y	on X					
	Slope, m	=	36.20	002 In	tercept, b =	-9.8385
Correlation C	oefficient*	=	0.99	083		
Calibration	Accepted	=	Yes/ł	No**		

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

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

Calibrated by Date Jackey MA 20-Nov-17 Checked by Date Pauline Wong 20-Nov-17



1

2

3

4

5

By Linear Regression of Y on X

Calibration Data for High Volume Sampler (TSP Sampler)

Location Equipment no.

MA1w HVS008 **Calibration Date** Calibration Due Date

20

30

39

45

52

16-Jan-18 16-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

				Ambient Co	ondition				
Temperature, T _a		291		Kelvin Pressure, P a 1015 mmHg					
			Orifice Tra	ansfer Stan	dard Informa	tion			
Equipment No.		Ori001		Slope, m _c	2.025	33	Intercept, bc	-0.03593	
Last Calibration Date		20-Mar-1	7		(H x	P _a / 101	3.3 x 298 / T	a) ^{1/2}	
Next Calibration Date		20-Mar-1	8		=	m _c x	Q _{std} + b _c		
			(Calibration	of TSP				
Calibration	Ма	nometer Re	eading	C	Q _{std}	Continu	ous Flow	IC	
Point	н	(inches of v	water)	(m ³ / min.) Recorder, W (W(P _a /1013.3x298/T _a) ^{1/2} /35.					
	(up)	(down)	(difference)	X	-axis	(C	FM)	Y-axis	

0.8839

1.1359

1.4144

1.6148

1.7928

Slope, m	=	34.8424	Intercept, b =
Correlation Coefficient*	=	0.9988	
Calibration Accepted	=	Yes/ No **	-

1.5

2.5

3.9

5.1

6.3

3.0

5.0

7.8

10.2

12.6

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

1.5

2.5

3.9

5.1

6.3

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

Calibrated by Date

Jackey MA 16-Jan-18

Checked by Date

Pauline Wong 16-Jan-18

20.2561

30.3841

39.4994

45.5762

52.6658

-10.0007



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CERTIFICATE OF CALIBRATION

Certificate No.:	17CA0426 01-02		Page	1	of	2
Item tested						
Description: Manufacturer; Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Mete Larson Davis LxT1 0003737 -	r (Type 1)	 Microphone PCB 377B02 171529			
Item submitted by						
Customer Name: Address of Customer: Request No.: Date of receipt:	Lam Environment - - 26-Apr-2017	al Service Ltd.				
Date of test:	28-Apr-2017					
Reference equipment	used in the calib	ration				
Description: Multi function sound calibrator Signal generator	Model: B&K 4226 DS 360	Serial No. 2288444 61227	Expiry Date: 18-Jun-2017 01-Apr-2018		Traceat CIGISME CEPREI	
Ambient conditions						
Temperature: Relative humidity: Air pressure:	21 ± 1 °C 50 ± 10 % 1010 ± 5 hPa					
Test specifications				04		

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.

Approved Signatory:

Huang dia Min/Feng Jun Qi

04-May-2017 Company Chop:



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

Date:

C Sois & Materials Engineering Co., Ltd.

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Page



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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA0426 01-02

Website: www.cigismec.com

2 of

1, Electrical Tests

E-mail: smec@cigismec.com

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	А	Pass	0.3	
	С	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	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	N/A	N/A	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ³ at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2, Acoustic tests

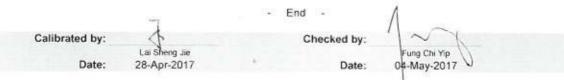
The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

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

3, Response to associated sound calibrator

N/A

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



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

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CERTIFICATE OF CALIBRATION

Certificate No.:	17CA0524 01		Page	1	of	2
Item tested						
Description: Manufacturer; Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Mete Larson Davis LxT1 0004796 -	er (Type 1)	Microphone PCB 377B02 155507		Preamp PCB PRMLx 042621	
Item submitted by						
Customer Name: Address of Customer: Request No.: Date of receipt:	Lam Enviromenta - - 24-May-2017	I Service Ltd.				
Date of test:	25-May-2017					
Reference equipment	used in the calib	ration				
Description: Multi function sound calibrator Signal generator	Model: B&K 4226 DS 360	Serial No. 2288444 61227	Expiry Date: 18-Jun-2017 01-Apr-2018		Traceal CIGISME CEPREI	
Ambient conditions						
Temperature: Relative humidity: Air pressure:	21 ± 1 °C 50 ± 10 % 1010 ± 5 hPa					
Test specifications						

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.

Approved Signatory:

eng Jung Huang

26-May-2017 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.

Date:

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA0524 01

Page

2 of 2

1, Electrical Tests

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

Test	6 hr i	02551/1-5	Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self-generated noise	A	Pass	0.3	
	С	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	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 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

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.

	1	- End -	Λ
Calibrated by:	Λ	Checked by:	1~1
Date:	Kai Shieng Jie 25-May-2017	Date:	Fung Chi Yip 26-May-2017

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

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CERTIFICATE OF CALIBRATION

Certificate No.:	17CA0221 02		Page	1 of 2
Item tested				
Description:	Sound Level Mete	er (Type 1)	Microphone	Dreamin
Manufacturer:	B&K		B & K	Preamp B & K
Type/Model No.:	2250-L		4950	ZC0032
Serial/Equipment No.:	2701778		2755097	19223
Adaptors used:	-		-	19223
Item submitted by				
Customer Name:	Lam Geotechnics	Limited		
Address of Customer:	-	Funda		
Request No.:	20			
Date of receipt:	22-Feb-2017			
Date of test:	02-Mar-2017			
Reference equipment	used in the calib	ration		
Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	18-Jun-2017	CIGISMEC
Signal generator	DS 360	33873	18-Apr-2017	CEPREI
Signal generator	DS 360	61227	18-Apr-2017	CEPREI
Ambient conditions			1990 (A. 1997)	(a.e., 100)
Temperature:	20 ± 1 °C			
Relative humidity:	60 ± 10 %			
Air pressure:	1010 ± 5 hPa			

Test specifications

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

Test results

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

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

Actual Measurement data are documented on worksheets.

Approved Signatory: Huang Lia

Min/Feng Jun Qi

06-Mar-2017 Company Chop:



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

Date:

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA0221 02

Page

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1, Electrical Tests

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

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

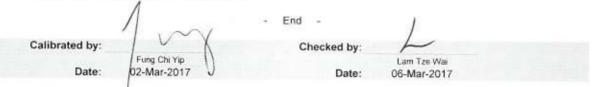
The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded 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.



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

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CERTIFICATE OF CALIBRATION

Certificate No.:	17CA0320 02		Page	1 of	2
Item tested					
Description:	Sound Level Mete	r (Type 1)	Microphone	Pream	0
Manufacturer:	B & K	• . • • • • . · . · • . •	B&K	B & K	200
Type/Model No.:	2250-L		4950	ZC003	2
Serial/Equipment No.:	2722310		2698702	13318	
Adaptors used:			-	5	
Item submitted by					
Customer Name:	Lam Geotechnics	Ltd.			
Address of Customer:	((*))				
Request No.:	+				
Date of receipt:	20-Mar-2017				
Date of test:	23-Mar-2017				
Reference equipment	used in the calib	ration			
Description:	Model:	Serial No.	Expiry Date:	Tracea	ble to:
Multi function sound calibrator	B&K 4226	2288444	18-Jun-2017	CIGISMI	
Signal generator	DS 360	33873	18-Apr-2017	CEPREI	
Signal generator	DS 360	61227	18-Apr-2017	CEPREI	
Ambient conditions					
Temperature:	21 ± 1 °C				
Temperature: Relative humidity:	21 ± 1 °C 60 ± 10 %				

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.

Approved Signatory: in/Feng Jun Qi Huang Jier

24-Mar-2017 Company Chop:



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

Date:

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



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Page



2

CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA0320 02

02

2 of

1, Electrical Tests

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
9 -	С	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leg	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	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	0.4	
	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.

	-1	- End -	1 ~
Calibrated by:	3	Checked by:	1~-1
	Lai Sheng Jie		Rung Chi Yip
Date:	23-Mar-2017	Date:	24-Mar-2017

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

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



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CERTIFICATE OF CALIBRATION

Certificate No.:	17CA0505 01		Page	1 of 2
Item tested				
Description:	Sound Level Mete	r (Type 1)	Microphone	Preamp
Manufacturer:	B&K		B&K	B&K
Type/Model No.:	2250-L		4950	ZC0032
Serial/Equipment No.:	2722311		2698703	13321
Adaptors used:	(1997) (1997)		-	-
Item submitted by				
Customer Name:	Lam Geotechnics	Ltd.		
Address of Customer:	-			
Request No.:				
Date of receipt:	05-May-2017			
Date of test:	06-May-2017			
Reference equipment	used in the calib	ration		
Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	18-Jun-2017	CIGISMEC
Signal generator	DS 360	61227	01-Apr-2018	CEPREI
Ambient conditions				
Temperature:	22 ± 1 °C			
Relative humidity:	50 ± 10 %			
Air pressure:	1010 ± 5 hPa			
Test specifications				

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

- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

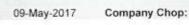
Test results

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

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

Actual Measurement data are documented on worksheets.

Approved Signatory: Feng Jungi





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

Date:

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



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Page



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA0505 01

2 of 2

1, Electrical Tests

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

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

2, Acoustic tests

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

test	Status	Uncertanity (dB)	Factor
ghting A at 125 Hz	Pass	0.3	
ghting A at 8000 Hz	Pass	0.5	
	ghting A at 125 Hz ghting A at 8000 Hz	ghting A at 125 Hz Pass	ghting A at 125 Hz Pass 0.3

3, Response to associated sound calibrator

N/A

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

	-7	- End -
Calibrated by:	4	Checked by:
	Lai Shèng Jie	Fung Chi Yip U
Date:	06-May-2017	Date: 09-May-2017

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

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CERTIFICATE OF CALIBRATION

Website: www.cigismec.com

Certificate No.:	17CA0119 01		Page	1	of	2
Item tested						
Description:	Sound Level Meter	r (Type 1)	Microphone	j	Preamp	
Manufacturer:	B & K		B&K	ì	B&K	
Type/Model No.:	2250-L		4950		ZC0032	
Serial/Equipment No.:	3002695		2940839		18582	
Adaptors used:	1211		÷		•	
Item submitted by						
Customer Name:	Lam Geotechnics	Limited				
Address of Customer:						
Request No .:	-					
Date of receipt:	19-Jan-2017					
Date of test:	20-Jan-2017					
Reference equipment	used in the calib	ration				
Description:	Model:	Serial No.	Expiry Date:		Traceab	le to:
Multi function sound calibrator	B&K 4226	2288444	18-Jun-2017		CIGISME	С
-	DS 360	33873	18-Apr-2017		CEPREI	
Signal generator						
2 이번 AN 2 2 번 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	DS 360	61227	18-Apr-2017	-	CEPREI	
Signal generator Signal generator Ambient conditions	DS 360	61227	18-Apr-2017		CEPREI	
Signal generator Ambient conditions	DS 360	61227	18-Apr-2017		CEPREI	
Signal generator	99997 40 AV	61227	18-Apr-2017		CEPREI	

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.

Approved Signatory: Huang Jia

23-Jan-2017 Date: Min/Feng Jun Qi



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

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Company Chop:



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Page



2

CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA0119 01

2 of

1, Electrical Tests

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

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	
1 - 72	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	
	Leg	Pass	0.4	

2, Acoustic tests

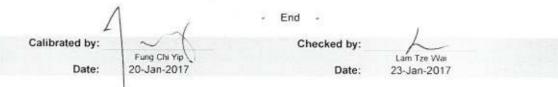
The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

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.



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

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CERTIFICATE OF CALIBRATION

Certificate No.:	18CA0116 01		Page	1	of	2
Item tested						
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Mete B & K 22501. 3002695	er (Type 1)	Microphone B & K 4950 2940839		Preamp B & K ZC0032 18582	
Item submitted by						
Customer Name: Address of Customer: Request No.: Date of receipt:	Lam Geotechnics - - 16-Jan-2018	Ltd.				
Date of test:	18-Jan-2018					
Reference equipment	used in the calib	ration				
Description: Multi function sound calibrator Signal generator Signal generator	Model: B&K 4226 DS 360 DS 360	Serial No. 2268444 33873 61227	Expiry Date: 08-Sep-2018 25-Apr-2018 01-Apr-2018		Traceabl CIGISMEC CEPREI CEPREI	
Ambient conditions						
Temperature: Relative humidity:	21 ± 1 °C 50 ± 10 %					

Test specifications

Air pressure:

- 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.

Feng Jun Qi

1005 ± 5 hPa

Actual Measurement data are documented on worksheets.

Approved Signatory:

18-Jan-2018 Company Chop:



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

Date:

O Solis & Materials Engineering Co., Ltd

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



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

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2

CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0116 01

Page of

1, **Electrical Tests**

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	А	Pass	0,3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 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 Weighting A at 8000 Hz	Pass Pass	0.3 0.5	

3, Response to associated sound calibrator

N/A

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

	4	- End -	/	
Calibrated by:	11	Checked by:	K	
Date:	Fung Chi Yip	Date:	Lam Tze Wai 18-Jan-2018	

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

C Soils & Materials Engineering Co.: Ltd.

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



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CERTIFICATE OF CALIBRATION

Certificate No.:	17CA1110 02	Page:	1	of	2
Item tested					
Description:	Acoustical Calibrator (Class 1)				
Manufacturer:	Rion Co., Ltd.				
Type/Model No	NC-73				
Serial/Equipment No.:	10707358				
Adaptors used:					
Item submitted by					
Curstomer:	Lam Geotechnics Ltd.				
Address of Customer:	-				
Request No.:	-				
Date of receipt:	10-Nov-2017				

Date of test:

.....

14-Nov-2017

Reference equipment used in the calibration

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

Ambient conditions

Temperature:	21 ± 1 °C
Relative humidity:	50 ± 10 %
Air pressure:	1010 ± 5 hPa

Test specifications

The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B 1. and the lab calibration procedure SMTP004-CA-156.

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

The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference 3. 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.

Huang Jia Min/Feng Jun Qi

15-Nov-2017 Company Chop:



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

Date:

@ Soils & Materials Engineering Co . Ltd

Approved Signatory:

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



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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No .:

17CA1110 02

Page: 2 of 2

1, Measured Sound Pressure Level

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

Frequency Shown	Output Sound Pressure Level Setting	Measured Output Sound Pressure Level	Estimated Expanded Uncertainty
Hz	dB	dB	dB
1000	94.00	93 93	0.10

2, Sound Pressure Level Stability - Short Term Fluctuations

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

At 1000 Hz	STF = 0.008 dB
Estimated expanded uncertainty	0.005 dB

3, Actual Output Frequency

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

At 1000 Hz	Actual Frequency = 991.5 Hz	
Estimated expanded uncertainty	0.1 Hz	Coverage factor k = 2.2

4, Total Noise and Distortion

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

At 1000 Hz	TND = 0.3 %
Estimated expanded uncertainty	0.7 %

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

	7	- End -	1 1
Calibrated by:	A	Checked by:	1~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Date:	Lat Scheng Jie 14-Nov-2017	Date:	Fung Chi Yip 15-Nov-2017

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

C Soils & Materials Engineering Co., Ltd.		Form No CARP156-2/Issue 1/Re	v:C/01/05/2005



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



2

CERTIFICATE OF CALIBRATION

Certificate No.:	17CA1124 02	Page:	1	of	
Item tested					
Description:	Acoustical Calibrator (Class 1)				

Description: Acoustical Calibrator (Class 1 Manufacturer: Larson Davis Type/Model No.: CAL200 Serial/Equipment No.: 13128 Adaptors used: -

Item submitted by

Curstomer:	Lam Environmental Service Ltd.
Address of Customer:	
Request No.:	2
Date of receipt:	24-Nov-2017
· · · · · · · · · · · · · · · · · · ·	

Date of test: 30-Nov-2017

Reference equipment used in the calibration

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

Ambient conditions

Temperature:	22 ± 1 °C
Relative humidity:	50 ± 10 %
Air pressure:	1005 ± 5 hPa

Test specifications

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

Test results

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



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

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CERTIFICATE OF CALIBRATION

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Certificate No.:

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1, Measured Sound Pressure Level

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

			(Output level in dB re 20 µPa)
Frequency Shown	Output Sound Pressure Level Setting	Measured Output Sound Pressure Level	Estimated Expanded Uncertainty
Hz	dB	dB	dB
1000	94.0	94.01	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 = 0.010 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 = 999.5 Hz	
Estimated expanded uncertainty	0.1 Hz	Coverage factor k = 2.2

4, Total Noise and Distortion

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

At 1000 Hz	TND = 0.5 %	
Estimated expanded uncertainty	0.7 %	

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

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Calibrated by:	$ \sim 1$	Checked by:	A
Date:	Fung Chi Yip 30-Nov-2017	Date:	Lam Tze Wai 30-Nov-2017

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