

RECALIBRATION DUE DATE:

January 24, 2019

Certificate of Calibration

Calibration Certification Information

Cal. Date: January 24, 2018

Rootsmeter S/N: 438320

Ta: 293 Pa: 756.9 °K

Operator: Jim Tisch

Calibration Model #: TE-5025A

Calibrator S/N: 3166

mm Hg

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)	
1	1	2	1	1.4430	3.2	2.00	
2	3	4	1	1.0270	6.4	4.00	
3	5	6	1	0.9220	7.9	5.00	
4	7	8	1	0.8780	8.7	5.50	
5	9	10	1	0.7270	12.6	8.00	

		Data Tabulat	ion		
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	√∆H(Ta/Pa)
1.0087	0.6990	1.4233	0.9958	0.6901	0.8799
1.0044	0.9780	2.0129	0.9915	0.9655	1.2443
1.0024	1.0872	2.2505	0.9896	1.0733	1.3912
1.0013	1.1404	2.3603	0.9885	1.1259	1.4591
0.9961	1.3701	2.8467	0.9834	1.3526	1.7598
CARGON 1/2-1	m=	2.12231		m=	1.32895
QSTD	b=	-0.06016	QA	b=	-0.03719
	r=	0.99999	~ .	r=	0.99999

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

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

RECALIBRATION

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



	Calibi	ration D	ata for i	righ voi	ume San	ipier (i	SP Sample	r)	
Location		CMA1b				Calibra	ition Date	#1	19-Oct-18
Equipment no.		HVS001					19-Dec-18		
CALIBRATION OF CONTI	NUOUS FL	OW RECOR	RDER						
				Ambient C	ondition				
Temperature, T _a		297.2		Kelvin	Pressure, P.	0		1017	mmHg
			Orifice	Transfer Sta	indard Inform	ation			
Equipment No.		Ori002		Slope, m _e 2.12231 Intercep		Intercept, bo		-0.06016	
Last Calibration Date	Calibration Date 19-Jan-18				(H	xP _a /1	013.3 x 298/	Ta) 1/	2
Next Calibration Date		19-Jan-19				me	$x Q_{std} + b_c$		
				Calibratio	n of TSP			207	Marie Control
Calibration	Ma	nometer Re	ading	Q _{std}		Continuous Flow			IC
Point H (inches of water)		(m ³ / min.)		Recorder, W		(W(P_/1013.3k298/T_) ¹⁰ /35.31			
	(up)	(down)	(difference)	X-axis ((CFM)	Y-axis		
1	1.7	1.7	3.4	0.9000		27		27.0883	
2	2.5	2.5	5.0	1.0	0854	33		33.1079	
3	4.0	4.0	8.0	1.3	8654	43		43.1406	
4	5.3	5.3	10.6	1,5	5674	49		49.1602	
5	6.6	6.6	13.2	3.7	458		55	55,1799	
By Linear Regression of Y	an X								
	Slope, m	*	33;	2775	Int	ercept, b	= -2	8174	
Correlation (Coefficient*		0.9	1997					
Calibratio	n Accepted		Yes	/No**					
* if Correlation Coefficient	< 0.990, che	eck and reca	elibration aga	sin.					
** Delete as appropriate.									
M. Harr	n man data d	information.	the emilence	at of one	of the est	hantad Ulat	s Valores Parents		_
Remans :	C HARRYS	N C YASTO AND			200 UNU	50	h Volume Sample	nas dec	n
re-assigned f			with respect	to the update	s in quality ma				vonen vertinen
Calibrated by	_	Ray Lee				Checke	ed by	_	Pualine Wong
Date		19-Oct-18				Date		11	19-Oct-18

Location	:	CMA1b	Calbration Date :	19-Dec-18				
Equipment no.	:	HVS001	Calbration Due Date:	18-Feb-19				
CALIBRATION OF CONTINUOUS FLOW RECORDER								
Ambient Condition								

Orifice Transfer Standard Information									
Equipment No.	Ori3166	Slope, m _c	2.12231	Intercept, bc	-0.06016				
Last Calibration Date	24-Jan-18	(HxP _a /1013.3 x 298/T _a) ^{1/2}							
Next Calibration Date	24-Jan-19	$= m_c x Q_{std} + b_c$							

Kelvin Pressure, Pa

1020

mmHg

293

Calibration of TSP										
Calibration	Ма	nometer	Reading	Q _{std}	Continuous Flow	IC				
Point	H (inches of water)			(m ³ / min.)	Recorder, W	W(P _a /1013.3x298/T _a) ^{1/2} /35.3 ¹				
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis				
1	1.6	1.6	3.2	0.8812	26	26.3074				
2	2.7	2.7	5.4	1.1362	34	34.4020				
3	4.0	4.0	8.0	1.3768	45	45.5321				
4	5.2	5.2	10.4	1.5658	48	48.5676				
5	6.3 6.3 12.6		1.7207	54	54.6385					
5 11 5 1 11					_					

By Linear Regression of Y on X

Temperature, T_a

Slope, m = 33.7706 Intercept, b = -3.2329

Correlation Coefficient* = 0.9933

Calibration Accepted = Yes/Ne**

Remarks :			

Calibrated by : Henry Lau Checked by : Chan Ka Chun

 $[\]ensuremath{^{*}}$ if Correlation Coefficient < 0.990, check and recalibration again.

^{**} Delete as appropriate.



Location	CMA2a Calibration Date				3	19-Oct-18				
Equipment no. : H		HV\$002				Calibra		19-Dec-18		
CALIBRATION OF CON	ITINUOUS FL	OW RECO	RDER							
		297	0	Ambient C	Pressure, P.		_	1017	CONTRACT	
Temperature, T,		297	2:	Retvin	Pressure, P,	<u>'</u>	11	1017	mmHg	
			Orifice	Transfer Sta	ndard Inform	ation				
Equipment No.	1	Ori002		Slope, m _c	2.122	31	Intercept, bo		-0.06016	
Last Calibration Dat	e	19-Jan-1	8		(H	xP./	1013.3 x 298	(Ta)	/2	
Next Calibration Dat	Next Calibration Date 19-Jan-19					m,	x Q _{std} + b _c			
				Calibratio	n of TSP					
Calibration	Mar	Manometer Reading			Q _{stat} Com		Continuous Flow		IC	
Point	н	inches of	water)	(m ⁹ / min.)		R	Recorder, W		°V1013.3x298/T ₂) ¹⁰ /35.31	
	(up)	(down)	(difference)	X-s	X-axis		(CFM)		Y-axis	
1	1.6	1,6	3.2	0.8	740		27		27.0883	
2	2.6	2.6	5.2	1,1	063		34		34.1112	
3	4.0	4.0	8.0	1.3	654		42		42.1373	
4	5.2	5.2	10.4	1.5	528		50		50.1635	
5	6.5	6,5	13.0	1.7	328		54		54.1766	
ly Linear Regression of	Y on X									
	Slope, m		32.	4470	In	tercept, b	• .	1.4980		
Correlation	on Coefficient*		0.9	975						
Calibra	tion Accepted	=	Yes	/No**						
	414-245-890 may	770 YEAR	ROVA WILLIAMS	970-9						
if Correlation Coefficie	nt < 0.990, ch	eck and rec	alibration aga	ain.						
Delete as appropriate	0									
Remarks : As per clie	int's provided	information	, the equipme	int reference	no of the cal	librated Hig	h Volume Sample	r has be	ien	

Checked by

Date

Pualine Wong

19-Oct-18

re-assigned from EL449 to HVS002 with respect to the update in quality management system

Ray Lee

19-Oct-18

Calibrated by

Date

Location :	ioratio	CMA2a	a ror ring	ii voidiii	io odini	•	ation Date	:	19-Dec-18
Equipment no. :		HVS002				Calbr	ation Due Dat	(:	18-Feb-19
CALIBRATION OF CONTI	NUOUS F	LOW RE	CORDER						
	<u> </u>		An	nbient Cond	lition		1		
Temperature, T _a		29	93	Kelvin	Pressure,	Pa		1020	mmHg
			Orifice Tran	sfer Standa	rd Informat	ion			
Equipment No.		Ori31	66	Slope, m _c	2.122	31	Intercept,	bc	-0.06016
Last Calibration Date	24-Jan-18				(HxF	P _a / 10	13.3 x 298	/ T a) 1/2
Next Calibration Date	Calibration Date 24-Jan-19 = $m_c \times Q_{std} + b_c$							С	
			Ca	libration of	TSP				
Calibration	Ma	nometer	Reading	Q _{std}		Continuous Flow			IC
Point	н	(inches c	of 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	0.8541		28			28.3311
2	2.2	2.2	4.4	1.02	284		32		32.3784
3	3.7	3.7	7.4	1.32	253	40		40.4730	
4	4.5	4.5	9.0	1.45	586	44		44.5203	
5	6.0	6.0	12.0	1.67	799		52		52.6149
By Linear Regression of Y	on X								
	Slope, m	=	29.0	948	Inte	rcept, b	= 2	2.7348	
Correlation Co	efficient*	=	0.99	063					
Calibration A	Accepted	=	Yes/f	\0 **	•				
* if Correlation Coefficient <	< 0.990, c	heck and	recalibration a	ıgain.					
** Delete as appropriate.									
Remarks :									
Calibrated by	F	Henry Lau				Checl	ked by	:	Chan Ka Chun
Date :	1	9-Dec-18				Date		:	19-Dec-18



Date

	Calibi	ation L	ata for I	ligh Vol	ume San	ipler (I	SP Sample	ir)			
Location		CMA3a				1	19-Oct-18				
Equipment no.	1	HV\$012		Calibration Due Date : 19-Dec-							
	unione ei										
CALIBRATION OF CONT	INUUUS FL	OW RECO	KDEK		No. of the last						
	1	297.		Ambient C	1		1	1017	100000		
Temperature, T,	_	297.	-	Kelvin	Pressure, P.			1017	mmHg		
			Orifice	Transfer Sta	indard Inform	ation					
Equipment No.		Ori002		Slope, m.	2.122	31	Intercept, bo	8	-0.06016		
Last Calibration Date	alibration Date 19-Jan-18				(HxPa/1013.3 x 298/Ta) 1/2						
Next Calibration Date		19-Jan-1	9			m _c	$x Q_{std} + b_c$				
				Calibratio	n of TSP	7111					
Calibration	Manometer Reading		0	ate .	Cont	linuous Flow	T	IC			
Point H (Inches of water)		(m³ / min.)		Recorder, W		(W(P,	(W(P,/1013.3×296/T ₄) ¹⁹ /35.31)				
	(up)	(down)	(difference)	х-	ixis (CFM)		(CFM)		Y-axis		
1	1.4	1.4	2.8	0.6	0.8194		32		32.1046		
2	2.2	2.2	4.4	1.0	0199		38		38.1243		
3	3,4	3.4	6.8	1.2	2611		44		44.1439		
4	4.3	4.3	8.6	1.4	1146		50		50.1635		
5	5.4	5.4	10.8	1,5	5819		56		56.1831		
By Linear Regression of Y	an X										
	Slope, m	1	31.	1434	Int	ercept, b	- 6	1682			
Correlation	Coefficient*	1=1	0.9	9966							
Calibratio	n Accepted		Yes	/Ne**							
* if Correlation Coefficient	< 0.990, ch	eck and rec	alibration age	ain,							
** Delete as appropriate.											
Remarks : As per client	's provided	information	the equipme	ent reference	no of the cal	ibrated High	h Volume Sample	r has bee	n		
re-assigned	from EL333	to HVS012	with respect	to the update	e in quality ma	nagement :	system.				
Calibrated by	. I	Ray Lee	-			Checke	d by	ŧ0	Pualine Wong		
Date	- 8	9-Oct-18				Date			19-Oct-18		

Date

C	alibra	ט ווסוו	ata for Hi	gn volume	Sample	er (13P	Sample	r)	
Location :		СМАЗа				Calbrat	ion Date	:	19-Dec-18
Equipment no.		HVS012				Calbrat	ion Due Dat	: .	18-Feb-19
CALIBRATION OF CONTIN	NUOUS F	LOW RE	CORDER						
				Ambient Condition	on		Ī		
Temperature, T _a			293	Kelvin	Pressure,	Pa		1020	mmHg
			Orifice Tr	ansfer Standard	Information	า			
Equipment No.		Ori31	66	Slope, m _c	2.122	31	Intercept, k	эс	-0.06016
Last Calibration Date		24-Jan	-18		(H x P _a	/ 1013.	3 x 298 / 7	Γ _a) ¹	/2
Next Calibration Date		24-Jan	-19		=	m _c x	$Q_{std} + b$	С	
				Calibration of TS	SP .				
Calibration	Ма	nometer	Reading	Q _{std}		Continu	ous Flow		IC
Point	н	(inches c	of water)	(m ³ / min.)		Reco	rder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /3	
	(up)	(down)	(difference)	X-axis	;	(CFM)			Y-axis
1	1.2	1.2	2.4	0.7669)		20		20.2365
2	2.0	2.0	4.0	0.9819)		28		28.3311
3	3.5	3.5	7.0	1.2897	7		37		37.4375
4	4.5	4.5	9.0	1.4586	5		41		41.4848
5	5.5	5.5	11.0	1.6096	3		50		50.5912
By Linear Regression of Y	on X								
\$	Slope, m	=	33	3.7811	Inte	rcept, b =		5.6420	
Correlation Co	efficient*	=	0	.9918	-				
Calibration A	ccepted	=	Ye	es/ No **	-				
* if Correlation Coefficient <	0.990, c	heck and	recalibration a	ıgain.					
** 5									
** Delete as appropriate.									
Remarks :									
Calibrated by	H	lenry Lau				Checke	d by	: -	Chan Ka Chun
Data :	1	9-Dec-18				Date		:	19-Dec-18



Location	e 8	CMA48		Calibration Date : 19-0			
Equipment no.	:	HVS004			C	Calibration Due Date	: 19-Dec-18
CALIBRATION OF CO	ONTINUOUS FLO	DW RECO	RDER				
				Ambient Co	ondition		
Temperature, T _a		297.	2	Kelvin I	Pressure, P _e		1017 mmHg
			Orifice	Transfer Stan	dard Information	n	
Equipment No.		Ori002		Slope, m _c	2.12231	Intercept, bo	-0.06016
Last Calibration Da	ate	19-Jan-1	8		(HxF	, / 1013.3 x 298/	(Ta) 1/2
Next Calibration D	ate	19-Jan-1	9		Allerteen	$m_c \times Q_{std} + b_c$	
				Calibration	of TSP		
Calibration	Mar	ometer Re	eading	Q,	etel	Continuous Flow	IC
Point	H (nches of v	water)	(m ² /)	min.)	Recorder, W	(W(P ₂ /1013.3x298/T ₂) ¹² /35.31)
100000	(up)	(down)	(difference)	X-a:	xis	(CFM)	Y-axis
1	1.5	1.5	3.0	0.84	171	22	22.0719
2	2.2	2.2	4.4	1.01	199	31	31.1014
3	3.4	3.4	6.8	1.26	311	41	41,1341
4	4.7	4.7	9.4	1.47	777	50	50.1635
5	6.0	6.0	12.0	1.66	359	56	56.1831
By Linear Regression	of Y on X				7		
	Slope, m		41.6	5384	Interce	pt, b = -1	2.0983
Correlat	tion Coefficient*	*	0.9	974			
Calib	ration Accepted		Yes	/No**			
* if Correlation Coeffici	ient < 0.990, che	ck and rec	alibration aga	in.			
** Delete as appropria	te.						
Remarks : As per c	lient's provided i	nformation	, the equipme	ent reference n	o. of the calibrat	ed High Volume Sample	r has been
re-assign	ned from EL390	10 HVS004	with respect	to the update	in quality manage	ement system.	
Calibrated by	0 1	Ray Lee				Checked by	: Pualine Wong
Date	1	9-Oct-18				Date	: 19-Oct-18

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

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition							
Temperature, T _a	293	Kelvin	Pressure, P _a	1020	mmHg		

Orifice Transfer Standard Information								
Equipment No.	Ori3166	Slope, m _c	2.12231	Intercept, bc	-0.06016			
Last Calibration Date	24-Jan-18		(HxP _a /1013.3 x 298/T _a) ^{1/2}					
Next Calibration Date	Next Calibration Date 24-Jan-19 = M c X Q std + b c							

	Calibration of TSP									
Calibration	Manometer Reading		Q _{std}	Continuous Flow	IC					
Point	H (inches of water)		(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)					
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis				
1	1.5	1.5	3.0	0.8541	24	24.2838				
2	2.0	2.0	4.0	0.9819	31	31.3666				
3	3.6	3.6	7.2	1.3076	40	40.4730				
4	4.2	4.2	8.4	1.4101	47	47.5558				
5	5.7	5.7	11.4	1.6381	56	56.6622				

Rv	Linear	Regression	of \	/ on	¥
DУ	Lilleai	Regression	UI I	OH	$^{\wedge}$

Calibration Accepted = 0.9932

Yes/Ne**

19-Dec-18

Date

Remarks :					
Calibrated by	:	Henry Lau	Checked by	:	Chan Ka Chun

Date

19-Dec-18

 $[\]ensuremath{^{*}}$ if Correlation Coefficient < 0.990, check and recalibration again.

^{**} Delete as appropriate.



TESTINS	Calibr	ation D	ata for i	High Vol	ume Sar	npler (1	SP Sample	r)	
Location		CMA5b				Calibra	ation Date	13	19-Oct-18
Equipment no.		HVS010				Calibra	ation Due Date	-	19-Dec-18
CALIBRATION OF CONTIL	NUOUS FL	OW RECO	RDER						
4				Ambient C	Condition				
Temperature, T _a		297.	2	Kelvin	Pressure, P			1017	mmHg
Laborate 1			Orifice	Transfer Sta	ndard Inform	nation			
Equipment No.		Ori002		Slope, m _e	2.122	231	Intercept, bo		-0.08016
Last Calibration Date	-	19-Jan-1	3		(F	IXP.	1013.3 x 298/	Ta) 1/2	2
Next Calibration Date		19-Jan-1	9		10.100	m	$x Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Ma	nometer Re	ading	0	ne .	Con	tinuous Flow		IC .
Point	н	inches of v	vater)	(m ⁹	min.)	Recorder, W		(WIP)	1013.3×298/T ₄)*I/35.31)
	(up)	(down)	(difference)	Х-	axis		(CFM)		Y-axis
1	1.3	1.3	2.6	0.7	906		33		33.1079
2	2.0	2.0	4.0	0.5	7738		38		38.1243
3	3.2	3.2	6.4	363	2243		45		45.1472
4	4.2	4.2	8.4	1.3	1984		50		50.1635
5	5.3	5.3	10.6	1.5	674		55		55.1799
By Linear Regression of Y	on X								
	Slope, m	170	28.	3797	In	tercept, b	= 10	0.5471	
Correlation C	Coefficient*	=	0.9	1999					
Calibration	Accepted		Yes	No"					
* if Correlation Coefficient <	0.990, ahe	eck and rec	alibration aga	sin.					
** Delete as appropriate.									
Remarks : As per client's	s provided	information,	the equipme	ent reference	no. of the ca	librated Hig	h Volume Sample	r has bee	n
re-assigned for	rom EL222	to HVS010	with respect	to the update	e in quality ma	anagement	system.		
Calibrated by		Ray Lee				Check	ed by	101	Pualine Wong
Date		9-Oct-18				Date		8	19-Oct-18

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

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition							
Temperature, T _a	293	Kelvin	Pressure, P _a	1020	mmHg		

Orifice Transfer Standard Information								
Equipment No. Ori3166 Slope, m _c 2.12231 Intercept, bc -0.06016								
Last Calibration Date	24-Jan-18	(HxP _a /1013.3 x 298/T _a) ^{1/2}						
Next Calibration Date	24-Jan-19		= m	$_{c}$ x Q $_{std}$ + b $_{c}$				

	Calibration of TSP									
Calibration	Manometer Reading		Q _{std}	Continuous Flow	IC					
Point	H (inches of water)		(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)					
	(up)	(down)	difference	X-axis	(CFM)	Y-axis				
1	1.5	1.5	3.0	0.8541	25	25.2956				
2	2.8	2.8	5.6	1.1566	34	34.4020				
3	3.6	3.6	7.2	1.3076	38	38.4493				
4	4.8	4.8	9.6	1.5055	46	46.5439				
5	6.0	6.0	12.0	1.6799	54	54.6385				

By Linear Regression of Y on X

Slope, m = 35.1088 Intercept, b = -5.8015

Correlation Coefficient* = 0.9935

Calibration Accepted = Yes/Ne**

Remarks :			
·			•
_			

Calibrated by : Henry Lau Checked by : Chan Ka Chun

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

^{**} Delete as appropriate.



Location		MA1e				Calibra	ation Date	83	19-Oct-18
Equipment no. :		HV\$007		Calibration Due Date :					19-Dec-18
CALIBRATION OF CONTIN	VUOUS FL	OW RECOR	RDER						
				Ambient 0	1				
Temperature, T,		297.2		Kelvin	Pressure, P	<u>. </u>		1017	mmHg
			Orifice	Transfer Sta	ndard Inforn	nation			
Equipment No.		Orio02		Slope, m.	2.122	231	Intercept, bc		-0.06016
Last Calibration Date		19-Jan-18			(1	IXPa/1	013.3 x 298 /	$T_a)^{1/2}$	
Next Calibration Date		19-Jan-19				m _c	$\times Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Mar	nometer Re	ading	Q	alul	Con	tinuous Flow		IC
Point	н(inches of w	ater)	(m³ / min		R	Recorder, W		013.3×298/T _a) ^{1/0} /35.31)
	(up)	(down)	(difference)	Х-	axis		(CFM)		Y-axis
1	1.5	1.5	3.0	0.6	471		26		26.0850
2	2.4	2.4	4.8	1.0	640		35		35.1145
3	3.9	3.9	7.8	1.3	496		48		48.1570
4	4.9	4.9	9.8	1.5	5082		.54		54.1766
5	6.2	6.2	12.4	1,6	930		61		61,1995
By Linear Regression of Yo	on X								
	Slope, m	=	41.	9586	In	tercept, b	= -9	2721	
Correlation C	cefficient*		0.9	993					
Calibration	Accepted	=	Yes	No**					
					3				
* if Correlation Coefficient <	0.000 che	uch and race	libration and	ales					
ii coneiauur coencient s	u.000, the	our directo	nurauuri age						
** Delete as appropriate.									
Remarks : As per client's	provided i	nformation.	the equipme	rit reference	no. of the ca	librated Hig	h Volume Sampler	has been	
re-assigned fr	om EL455	to HVS007	with respect	to the update	in quality ma	anagement:	system.		
Calibrated by		Ray Lee				Checke	ed by	53	Pualine Wong
Date	. 1	9-Oct-18				Date			19-Oct-18



Lam Environmental Services Limited

Location :		MA1e				Calbratio	on Date	:	19-Dec-18
Equipment no.	ŀ	HVS007				Calbratio	on Due Date	:	18-Feb-19
CALIBRATION OF CON	TINUOUS	FLOW RE	CORDER						
				Ambient C	ondition				
Temperature, T _a		293		Kelvin	Pressure, P	a	1	020	mmHg
			Orifice Tr	ansfer Sta	ndard Inforr	nation			
Equipment No.		Ori3166		Slope, m _c	2.1223	31	Intercept, bc	Т	-0.06016
Last Calibration Date		24-Jan-1	8	Į.	(H x	P _a / 101	3.3 x 298 /	T _a)	1/2
Next Calibration Date		24-Jan-1	9		=	m _c x	Q _{std} + b _c		
				Calibratio	n of TSP				
Calibration	Man	ometer Re	eading	Q	std	Continu	ous Flow		IC
Point	H (i	nches of v	water)	(m ³ ,	min.)	Reco	rder, W	(W(P _a /	1013.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X -	axis	(C	CFM)		Y-axis
1	1.8	1.8	3.6	0.9	329		24		24.2838
2	2.5	2.5	5.0	1.0	944		33		33.3902
3	4.0	4.0	8.0	1.3	768		43		43.5085
4	5.2	5.2	10.4	1.5	658		50		50.5912
5	6.5	6.5	13.0	1.7	473		57		57.6740
By Linear Regression of	Y on X								
	Slope, m	=	39.8	628	Inte	ercept, b =	-11 	.6647	
Correlation Co	pefficient*	=	0.99	73					
Calibration	Accepted	=	Yes/	\0 **					
* if Correlation Coefficien	nt < 0.990.	check and	l recalibration	n again.					
				3.5					
** Delete as appropriate.									
Remarks :									
Calibrated by	Н	enry Lau				Checked	by	:	Chan Ka Chun
Date :	19	9-Dec-18				Date		:	19-Dec-18



Location	3		MA1w	_	Calibration Date			:	19-Oct-18
Equipment no.		1	fVS008			,	Calibration Due Date	-	19-Dec-18
CALIBRATION O	F CONTIN	UOUS FLO	W RECO	RDER					
	-				Ambient C	ondition			
Temperature, T _a			297.3	27	Kelvin	Pressure, P.		1017	mmHg
				Orifice 1	Transfer Sta	ndard Informatio	n		
Equipment	t No.		Ori002		Slope, m _e	2.12231	Intercept, bo		-0.06016
Last Calibrati	on Date	Ĺ	19-Jan-1	3		(HxF	a / 1013.3 x 298 /	Ta) 10	2
Next Calibrati	on Date		19-Jan-11	9			$m_c \times Q_{std} + b_c$		
					Calibration	n of TSP			
Calibrati Point		20,100	ometer Ronches of v	70000000	Q _{est} (m ⁸ / min.) X-axis		Continuous Flow Recorder, W (CFM)	(W(P _a	IC /1013.3x296/T _e) ¹⁰ /35.31) Y-axis
1		1.5	1.5	3.0	0.8471		20		20.0654
2		2.4	2.4	4.8	1.0	1640	26		26.0850
3		3.8	3.8	7.6	1.3	1316	36		38.1177
4		4.9	4.9	9.8	1.5	5082	43		43,1406
5		6.3	6.3	12.6	1.7	7064	49		49.1602
	ssion of Y o ornelation C Calibration	Slope, m		0.9	7914 985 No**	Interce	opt, b =1	0.0178	- 4
re-	opriate per client's	provided in	nformation	the equipme	nt reference	e in quality manag	ed High Volume Sample ement system. Checked by	r has bee	en Pualine Wong
Calibrated by	18		9-Oct-18				Date	3	19-Oct-18
Date	100	- 1	5-OGE-10				A GITO		18*00(*10



Lam Environmental Services Limited

Location :		MA1w				Calbratio	on Date	:	19-Dec-18
Equipment no.	ı	HVS008				Calbratio	on Due Date	:	18-Feb-19
								<u> </u>	
CALIBRATION OF CON	ITINUOUS	FLOW RE	ECORDER						
				Ambient (Condition				
Temperature, T _a		293		Kelvin	Pressure, P	a	1	020	mmHg
			Orifice Tr	ansfer Sta	ındard Inforr	nation			
Equipment No.		Ori3166	•	Slope, m _c	2.1223	31	Intercept, bc		-0.06016
Last Calibration Date		24-Jan-1	8		(H x	P _a / 101	3.3 x 298 /	T _a) ^{1/}	2
Next Calibration Date		24-Jan-1	9		=		$Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Man	ometer R	eading	G	l _{std}	Continu	ious Flow		IC
Point	H (i	inches of	water)	(m ³	/ min.)	Recorder, W		(W(P _a /1	013.3x298/T _a) ^{1/2} /35.31)
	(up)	(down)	(difference)	X-	axis	(C	CFM)		Y-axis
1	1.7	1.7	3.4	0.0	9074		24		24.2838
2	2.6	2.6	5.2	1.	1155		33		33.3902
3	4.2	4.2	8.4	1.4	4101		43		43.5085
4	5.3	5.3	10.6	1.5	5806		50		50.5912
5	6.6	6.6	13.2	1.7	7605		57		57.6740
By Linear Regression of	Y on X								
	Slope, m	=	38.5	875	Inte	ercept, b =	-10	.3897	
Correlation Co	oefficient*	=	0.99	93					
Calibration	Accepted	=	Yes/	\0 **					
* if Correlation Coefficien	nt < 0 990	check and	l recalibration	n again					
		orioon ario	rocambration	r again.					
** Delete as appropriate.									
Remarks :									
Calibrated by	н	lenry Lau				Checked	l by	:	Chan Ka Chun
Date :	19	9-Dec-18				Date		:	19-Dec-18



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



CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0213 02

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone B & K Preamp B & K

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

4950 2755097 ZC0032 19223

Serial/Equipment No.: Adaptors used: 2701778

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Item submitted by

Customer Name:

Lam Geotechnics Limited.

Address of Customer:

Request No.:

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Date of receipt:

13-Feb-2018

Date of test:

21-Feb-2018

Reference equipment used in the calibration

Description:

Model:

Serial No.

Expiry Date:

Traceable to:

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

DS 360

2288444 33873

61227

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

Ambient conditions

Temperature:

20 ± 1 °C

Relative humidity:

50 ± 10 % 1000 ± 5 hPa

Test specifications

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

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

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

Test results

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

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

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Actual Measurement data are documented on worksheets

Fen

Approved Signatory:

Date:

21-Feb-2018

Company Chop:

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

Soils & Materials Engineering Co. Ltd.

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



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



CERTIFICATE OF CALIBRATION

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Certificate No.:

18CA0213 02

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1, Electrical Tests

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

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

2, Acoustic tests

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

Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 125 Hz	Weighting A at 125 Hz Pass	Subtest Status Uncertanity (dB)

3, Response to associated sound calibrator

N/A

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

Calibrated by:

Date:

Fung Chi Yip

21-Feb-2018

End

Checked by:

Date:

Lam Yze Wai 21-Feb-2018

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

Soils & Material's Engineering Co., Ltd.

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



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



CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0309 01

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Preamp B & K

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

B & K ZC0032

Serial/Equipment No.: Adaptors used: 2722310

2698702

13318

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer.

Request No.:

i i

Date of receipt:

09-Mar-2018

Date of test:

10-Mar-2018

Reference equipment used in the calibration

Description:

on: Model:

5

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator Signal generator

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

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1000 ± 5 hPa

Test specifications

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

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

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

Test results

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

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

Actual Measurement data are documented on worksheets.

Feng

Approved Signatory:

Date:

12-Mar-2018

Company Chop:

SENGIMERA 解合試驗 COMMON 有限公司 多705米〇)

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 CARP152-1/Issue 1/Rev C/01/02/2007



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



CERTIFICATE OF CALIBRATION

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Certificate No.:

18CA0309 01

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1, Electrical Tests

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

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

2. Acoustic tests

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

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

3, Response to associated sound calibrator

N/A

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

Calibrated by:

- End

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Date:

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

Date:

Lam Tze War

12-Mar-2018

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

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

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



CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0413 02

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of

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:

13-Apr-2018

Date of test:

18-Apr-2018

Reference equipment used in the calibration

Multi function sound calibrator

Model:

Serial No.

Expiry Date:

Traceable to:

Signal generator

B&K 4226 DS 360

2288444 33873

08-Sep-2018 25-Apr-2018

CIGISMEC CEPREI

Ambient conditions

Temperature:

20 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1000 ± 5 hPa

Test specifications

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

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

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

Test results

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

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

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

18-Apr-2018

Company Chop:

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

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0413 02

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1, Electrical Tests

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

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

2. Acoustic tests

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

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

3, Response to associated sound calibrator

N/A

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

Calibrated by:

.

Checked by:

Lam Tze Wa

Date:

Fong Chi Yip 18-Apr-2018

Date:

18-Apr-2018

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

End

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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.:

18CA0116 01

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of

2

Item tested

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

Microphone B&K

Preamp BAK ZC0032

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

4950 2940839

18582

Adaptors used:

Item submitted by

Lam Geotechnics Ltd.

Customer Name: Address of Customer: Request No.

Date of receipt:

16-Jan-2018

Date of test:

18-Jan-2018

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226 Serial No.

Expiry Date: 08-Sep-2018

Traceable to:

Signal generator Signal generator

DS 360 DS 360

2288444 33873 61227

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

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity: Air pressure:

50 ± 10 %

1005 ± 5 hPa

Test specifications

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

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

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

Test results

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

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

Feng Jun Qi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

18-Jan-2018

Company Chop:

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

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



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



CERTIFICATE OF CALIBRATION

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Certificate No.:

18CA0116 01

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1, Electrical Tests

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0,3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range . Step 5 dB at 4 kHz.	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2, Acoustic tests

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

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

3, Response to associated sound calibrator

N/A

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

Calibrated by:

Date:

Fung Chi Yip 18-Jan-2018 Checked by

ones oj.

Date:

Lam Tze Wai 18-Jan-2018

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

End

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香港黄竹坑缩37號利道中心12樓 12年, Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cligismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



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CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0907 02

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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 有限公司。

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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香 推 黃 竹 坑 道 5 7 號 利 達 中 心 1 2 樓 12/F, Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website; www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533





CERTIFICATE OF CALIBRATION

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Certificate No.:

18CA0907 02

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Electrical Tests

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

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	
Committee Total	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



港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

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



CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0322 01

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of

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Manufacturer: Type/Model No.: Larson Davis

PCB

Serial/Equipment No.:

LxT1 0003737 377B02 171529

Adaptors used:

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No.

Date of receipt:

22-Mar-2018

Date of test:

28-Mar-2018

Reference equipment used in the calibration

Description:

Model:

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator

B&K 4226 DS 360

2288444 61227

08-Sep-2018 01-Apr-2018

CIGISMEC CEPREL

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity: Air pressure:

50 ± 10 % 1005 ± 5 hPa

Test specifications

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

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

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

Test results

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

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

Feng Jun Qi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

06-Apr-2018

Company Chop:

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

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



CERTIFICATE OF CALIBRATION

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Certificate No.:

18CA0322 01

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2

1, Electrical Tests

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A C	Pass	0.3	
	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	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 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2, Acoustic tests

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

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

3, Response to associated sound calibrator

N/A

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

Calibrated by:

End

by:

Date:

Fung Chi Yip

Checked by:

Lam Tze Wai

28-Mar-2018

Date:

06-Apr-2018

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

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香港黄竹坑道37號利達中心19樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

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



CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0510 04

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Item tested

Description:

Sound Level Meter (Type 1) Larson Davis

Manufacturer: Type/Model No.:

LxT1

Serial/Equipment No.: Adaptors used:

0004796

Microphone PCB

377B02 155507

Preamp PCB

PRMLxT1L 042621

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer.

Request No. Date of receipt:

10-May-2018

Date of test:

11-May-2018

Reference equipment used in the calibration

Description:

Signal generator

Multi function sound calibrator

Model: B&K 4226 DS 360

Serial No.

2288444 61227

Expiry Date:

08-Sep-2018 23-Apr-2019

Traceable to:

CIGISMEC CEPREI

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

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

Actual Measurement data are documented on worksheets

Feno Jungi

Approved Signatory:

Date: 11-May-2018

Company Chop:

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

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Form No CARP152-186566 1/Rev Ci01/02/2007



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香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

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



CERTIFICATE OF CALIBRATION

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18CA0510 04

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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)	Coverag Factor
Self-generated noise	Α	Pass	0.3	
	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	6.6
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.4	
	Leq	Pass	0.4	
	.03		W. W.	

2, Acoustic tests

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

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

3. Response to associated sound calibrator

N/A

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

Calibrated by:

Checked by:

Date:

1/1-May-2018

Date:

11-May-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 Sols & Materials Engineering Co., Ltd.

Form No CARP152-24ssue 1/Rev 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

Model Number CAL200 Serial Number 13098 Test Results Pass

Initial Condition Inoperable

Description Larson Davis CAL200 Acoustic Calibrator

Procedure Number D0001.8385
Technician Scott Montgomery
Calibration Date 29 Oct 2018

Calibration Due
Temperature 2
Humidity 3
Static Pressure 1

23 °C ±0.3 °C 34 %RH ±3 %RH 101.2 kPa ±1 kPa

Evaluation Method The data is

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

Compliance Standards

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

IEC 60942:2017

ANSI \$1.40-2006

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 customer as needed.

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		
Description	Cal Date	Cal Due	Cal Standard	
Agilent 34401A DMM	09/06/2018	09/06/2019	001021	
Larson Davis Model 2900 Real Time Analyzer	04/10/2018	04/10/2019	001051	
Microphone Calibration System	03/07/2018	03/07/2019	005446	
1/2" Preamplifier	09/20/2018	09/20/2019	006506	
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/07/2018	08/07/2019	006507	
1/2 inch Microphone - RI - 200V	05/10/2018	05/10/2019	006510	
Pressure Transducer	07/18/2018	07/18/2019	007368	





