



# RECALIBRATION **DUE DATE:**

January 16, 2024

# ertificate d

**Calibration Certification Information** 

Cal. Date: January 16, 2023 Rootsmeter S/N: 438320

Ta: 293 Pa: 748.8 °K

Operator: Jim Tisch

Calibration Model #:

TE-5025A

Calibrator S/N: 0843

mm Hg

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3860	3.2	2.00
2	3	4	1	0.9840	6.4	4.00
3	5	6	1	0.8780	8.0	5.00
4	7	8	1	0.8430	8.8	5.50
5	9	10	1	0.6950	12.7	8.00

Data Tabulation							
Vstd	Qstd	$ \sqrt{\Delta H \left(\frac{Pa}{Pstd}\right) \left(\frac{Tstd}{Ta}\right)} $		Qa	√∆H(Ta/Pa)		
(m3)	(x-axis)	(y-axis)	Va	(x-axis)	(y-axis)		
0.9978	0.7199	1.4157	0.9957	0.7184	0.8846		
0.9935	1.0097	2.0021	0.9915	1.0076	1.2511		
0.9914	1.1291	2.2384	0.9893	1.1268	1.3987		
0.9903	1.1747	2.3476	0.9882	1.1723	1.4670		
0.9851	1.4174	2.8313	0.9830	1.4144	1.7693		
	m=	m= 2.03196		m=	1.27238		
QSTD[	b=	-0.04813	QA	b=	-0.03007		
	r=	0.99993		r=	0.99993		

	Calculation	IS		
Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=	ΔVol((Pa-ΔP)/Pa)	
Qstd=	Vstd/∆Time	Qa= Va/ΔTime		
	For subsequent flow rat	e calculation	s:	
Qstd=	$1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$	Qa=	$1/m\left(\left(\sqrt{\Delta H\left(Ta/Pa\right)}\right)-b\right)$	

	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

Tisch Environmental, Inc. 145 South Miami Avenue Village of Cleves, OH 45002

www.tisch-env.com

TOLL FREE: (877)263-7610

FAX: (513)467-9009

# AECOM Asia Company Limited Tisch TSP Mass Flow Controlled High Volume Air Sampler Field Calibration Report

Operator:

Serial No.

Next Due Date:

Choi Wing Ho

4/11/2023

10380

Block B, Merit Industrial Centre (E-A14a)

4/9/2023

TE-5170

A-001-15T

Station

Cal. Date:

Model No .:

Equipment No.:

			Ambient (	Condition			
Temperature	e, Ta (K)	305.0	Pressure, F	Pa (mmHg)		750.3	
		(	Orifice Transfer Sta	ndard Information	1		
Serial I	No:	843	Slope, mc	lope, mc 2.03196			-0.04813
Last Calibrat	tion Date:	16-Jan-23		may Oatd + ha	= [H x (Pa/760) x	(200/Ta)1/2	
Next Calibrat	tion Date:	16-Jan-24		me x Qstu + be -	= [H X (Fa//00) X	(298/1a)]	
		5.2					
			Calibration of	TSP Sampler			
		(	Orfice		HV	S Flow Recorder	
Resistance Plate No.	DH (orifice)		Qstd (m³/min) X · axis	Flow Recorder Reading (CFM)	Continuous Flow Reading IC (CFI		
18	7.1		2.62	1.31	44.0	43.21	
13	6.0		2.41	1.21	39.0	38.30	
10	5.1		2.22	1.12	35.0	34.37	
7	4.1		1.99		30.0	29.46	
5	3.2		1.76	0.89	24.0	23.57	
By Linear Regression of Y on X  Slope , mw =45.7962							
*If Correlation Coef		- Comment of the Comm		-			
		Trock and rocalist					
			Set Point (	Calculation			
From the TSP Field	d Calibration Cur	ve, take Qstd = 1	.30m³/min				
From the Regression	on Equation, the	"Y" value accordi	ing to				
		mw	x Qstd + bw = IC x	[(Pa/760) x (298/T	a)] <sup>1/2</sup>		
		St. 45 St.		1/2			
Therefore, Set Poir	nt; IC = ( mw x Q	std + bw ) x [( 76	0/Pa)x(Ta/298	)]¹/2=		43.49	.
Remarks:							
Nomano.		11					
QC Reviewer:	NS CHA	72	Signature:	7		Date: 04/0	9/13
				П	·\AFCOM\H\/S	Calibration Certif	ficate (Existin

Station	Block B, Merit Industrial Centre (E-A14a)
01011011	District of the state of the st

Cal. Date: <u>4-Sep-23</u>

Next Due Date: 4-Nov-23

Set Point (IC) 43.49

IC (CFM)	Qstd (m³/min)
24	0.891
25	0.913
26	0.935
27	0.957
28	0.979
29	1.001
30	1.022
31	1.044
32	1.066
33	1.088
34	1.110
35	1.132
36	1.153
37	1.175
38	1.197
39	1.219
40	1.241
41	1.263
42	1.284
43	1.306
44	1.328
45	1.350
46	1.372
47	1.394
48	1.415
49	1.437
50	1.459
51	1.481
52	1.503
53	1.525
54	1.546
55	1.568
56	1.590
57	1.612
58	1.634
59	1.656
60	1.677
61	1.699
62	1.721
63	
64	1.765
65	1.787

Type:	Type:			Laser Dust Monitor					
	urer/Brand:		SIBATA		•				
Model No.	.:		LD-3B		•				
Equipmen	t No.:		A.005.16a						
Sensitivity	Adjustment Scal	le Setting:	521 CPM		•				
Operator:			WS CHAN	-					
Standard E	quimment								
	•								
Equipmen	t:		High Volu				_		
Venue:			Ma Wan (	Chung Vill	age		_		
Model No.			TE-5170				_		
Serial No.:			3383				-		
Last Calibr	ation Date:		4-Aug-23						
Calibration	n Result								
Sensitivity	Adjustment Scal	le Setting (Befor	re Calibrati	on):		521	СРМ		
Sensitivity	Adjustment Scal	le Setting (After	Calibration	n):		521	CPM		
	Date:	There	A h : t	C	Concentration (1)	Total Count 2	Count/		
Hour	Date	Time	Ambient (		_	Total Count(2)	Count/ Minute③		
	(dd/mm/yy)		Temp (°C)	R.H.(%)	(mg/m3) Y-axis		X-axis		
1	15/08/23	9:00-10:00	32.0	80	0.038	1569	26.15		
2	15/08/23	11:30-12:30	32.0	80	0.035	1335	22.25		
3	15/08/23	13:50-14:50	32.0	80	0.041	1744	29.07		
Note:	1 Monitoring	data was measu	red by Hig	h Volume	Sampler	-			
	2 Total Count	was logged by L	aser Dust I	Monitor					
	③ Count/minu	te was calculate	ed by (Total	Count/60	0)				
By Linear I	Regression of Y o		0.0015						
	Slope (K-factor): Correlation coef		0.0015		•				
	Correlation coel	incient.	0.9981						
Validity of	Calibration Reco	ord:	15-Au						
Remarks:									
1									
					0/				
QC	Reviewer:	Y.W. Fung	_ s	ignature:		Date:	15-Aug-23		

# **Laser Dust Monitor Calibration**

Type: Laser Dust Monitor

Manufacturer/Brand: SIBATA

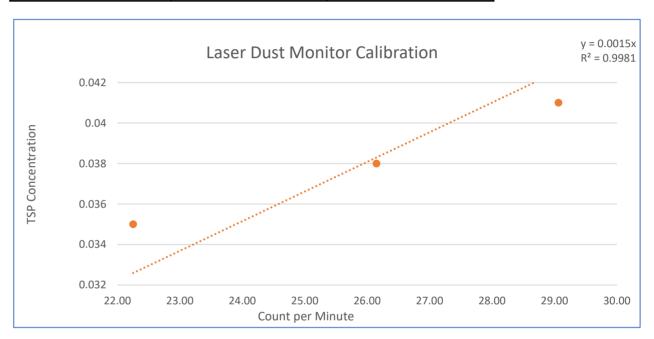
Model No.: LD-3B

Equipment No.: A.005.16a

Sensitivity Adjustment

Scale Setting: 521 CPM

Hour	Count/Minute	Concentration (mg/m3)
	X-axis	Y-axis
1	26.15	0.038
2	22.25	0.035
3	29.07	0.041



Type: Laser Dust Monitor					_		
Manufactu	ırer/Brand:		SIBATA				
Model No.	:		LD-3				•
Equipment	t No.:		A.005.07a	3			_
	Adjustment Sca	le Setting:	557CPM		•		
,	•	J					•
Operator:			WS CHAN	-			
Standard E	Equimment						
Fauinmon	<b>.</b> .		High Valu	ma Campl	lor		
Equipment	Li.			me Sampl			-
Venue:			-	Chung Villa	age		-
Model No.			TE-5170				-
Serial No.:			3383				-
Last Calibr	ation Date:		4-Aug-23				-
Calibration	n Result						
Sensitivity	Adjustment Sca	le Setting (Befor	e Calibrati	on):		557	CPM
Sensitivity	Adjustment Sca	le Setting (After	Calibratio	n):		557	СРМ
Hour	Date	Time	Ambient	Condition	Concentration ①	Total Count 2	Count/
	(dd/mm/yy)		Temp (°C)	R.H.(%)	(mg/m3)		Minute ③
					Y-axis		X-axis
1	15/08/23	9:00-10:00	32.0	80	0.038	1542	25.70
2	15/08/23	11:30-12:30	32.0	80	0.035	1355	22.58
3	15/08/23	13:50-14:50	32.0	80	0.041	1792	29.87
Note:	_ · ·	data was measu					
	~	was logged by L			ошр.с.		
	Ξ	te was calculate			1)		
	3) County Illina	ite was calculate	tu by (Tota	i Count/oc	))		
By Linear F	Regression of Y o	on X					
-,	Slope (K-factor)		0.0015				
	Correlation coef		0.9975		•		
	Correlation coe	illicient.	0.5575		•		
Validity of	Calibration Boso	ord.	15 Aug 24				
validity of	Calibration Reco	nu.	15-Aug-24				
Domorka							
Remarks:							
					IA		
					0//		
QC I	Reviewer:	Y.W. Fung	_	Signature:	/	Date:	15-Aug-23

# **Laser Dust Monitor Calibration**

Type: Laser Dust Monitor

Manufacturer/Brand: SIBATA

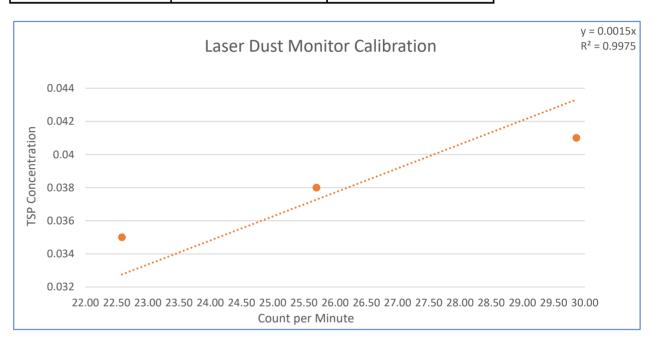
Model No.: LD-3

Equipment No.: A.005.07a

Sensitivity Adjustment

Scale Setting: 557 CPM

Hour	Count/Minute	Concentration (mg/m3)
	X-axis	Y-axis
1	25.70	0.0380
2	22.58	0.0350
3	29.87	0.0410



Type:	Type:			Laser Dust Monitor					
	urer/Brand:		SIBATA		•				
Model No.	.:		LD-3						
Equipmen	t No.:		A.005.09a		·				
Sensitivity	Adjustment Sca	le Setting:	797 CPM				ı		
Operator:			WS CHAN	-					
Ctandard F	Equimment								
Standard	Equimment								
Equipmen	+•		High Volu	me Samn	ler				
Venue:	<b>.</b> .		Ma Wan (				•		
Model No.	:		TE-5170	onang viii	<u> </u>		•		
Serial No.:			3383				•		
	ation Date:		4-Aug-23						
							,		
Calibration	n Result								
Sensitivity	Adjustment Scal	le Setting (Befor	re Calibrati	on):		797	CPM		
Sensitivity	Adjustment Sca	le Setting (After	Calibratio	n):		797	СРМ		
Hour	Date	Time	Ambient	Condition	Concentration ①	Total Count 2	Count/		
	(dd/mm/yy)		Temp (°C)	R.H.(%)	(mg/m3)		Minute(3)		
					Y-axis		X-axis		
1	15/08/23	9:00-10:00	32.0	80	0.038	1580	26.33		
2	15/08/23	11:30-12:30	32.0	80	0.035	1360	22.67		
3	15/08/23	13:50-14:50	32.0	80	0.041	1752	29.20		
Note:	(1) Monitoring				Sampler				
	2 Total Count								
	③ Count/minu	te was calculate	ed by (Total	Count/60	))				
Dulingari	Regression of Y o	un V							
by Lilleal I	Slope (K-factor)		0.0015						
	Correlation coef		0.9985		•				
	Correlation coel	incient.	0.3363		•				
Validity of	Calibration Reco	ord:	15-Aug-24						
Remarks:									
iterriarks.									
,									
,									
					9/				
QC I	Reviewer:	Y.W. Fung	_	ignature:		Date:	15-Aug-23		

# **Laser Dust Monitor Calibration**

Type: Laser Dust Monitor

Manufacturer/Brand: SIBATA

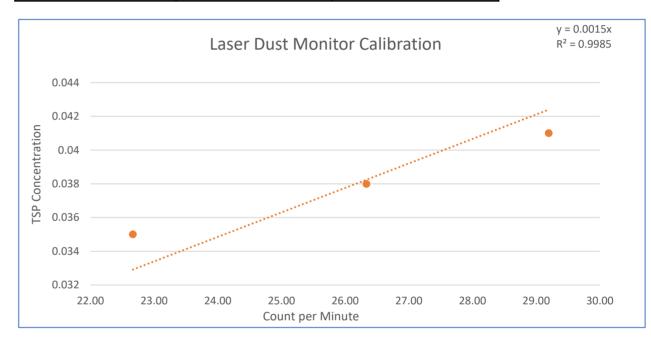
Model No.: LD-3

Equipment No.: A.005.09a

Sensitivity Adjustment

Scale Setting: 797 CPM

Hour	Count/Minute	Concentration (mg/m3)
	X-axis	Y-axis
1	26.33	0.0380
2	22.67	0.0350
3	29.20	0.0410



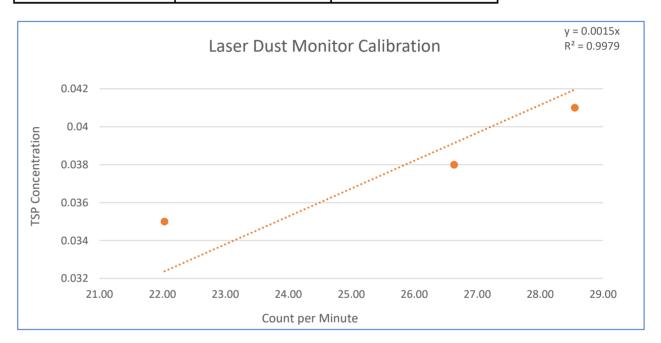
Type:			Laser Dust Monitor				_
Manufactu	urer/Brand:		SIBATA				_
Model No.	.:		LD-3				-
Equipmen	t No.:		A.005.10a	3			-
Sensitivity	Adjustment Sca	le Setting:	753 CPM				-
Operator:			WS CHAN				-
оролисо				<u> </u>			-
Standard E	quimment						
Equipmen	t:		High Volu	me Sampl	ler		_
Venue:			Ma Wan	Chung Villa	age		_
Model No.	.:		TE-5170				_
Serial No.:			3383				_
Last Calibr	ation Date:		4-Aug-23				_
							_
Calibration	n Result						
•	Adjustment Sca			-		753	_CPM
Sensitivity	Adjustment Sca	le Setting (After	Calibratio	n):		753	_CPM
							•
Hour	Date	Time	Ambient	Condition	Concentration 1	Total Count 2	Count/
	(dd/mm/yy)		Temp (°C)	R.H.(%)	(mg/m3)		Minute(3)
					Y-axis		X-axis
1	15/08/23	9:00-10:00	32.0	80	0.0380	1598	26.63
2	15/08/23	11:30-12:30	32.0	80	0.0350	1322	22.03
3	15/08/23	13:50-14:50	32.0	80	0.0410	1713	28.55
Note:	1 Monitoring	data was measu	ired by Hig	h Volume	Sampler		
	2 Total Count	was logged by L	aser Dust I	Monitor			
	③ Count/minu	te was calculate	ed by (Tota	Count/60	0)		
By Linear F	Regression of Y c	n X					
	Slope (K-factor)	:	0.0015				
	Correlation coef	fficient:	0.9979				
Validity of	Calibration Reco	ord:	15-A	ug-24			
Remarks:							
					11/1		
					0/		
QC I	Reviewer:	Y.W. Fung	_	Signature:	/	Date:	15-Aug-23

# **Laser Dust Monitor Calibration**

Type: Laser Dust Monitor Manufacturer/Brand: SIBATA LD-3 Model No.: A.005.10a Equipment No.: Sensitivity Adjustment

753 CPM Scale Setting:

Hour	Count/Minute	Concentration (mg/m3)
	X-axis	Y-axis
1	26.63	0.0380
2	22.03	0.0350
3	28.55	0.0410



Prepare by: WS CHAN 15-Aug-23 Date

Type:			Laser Dust Monitor				
	urer/Brand:		SIBATA				-
Model No.	.:		LD-3				-
Equipmen	t No.:		A.005.11a	1			-
Sensitivity	Adjustment Sca	le Setting:	799 CPM				-
Operator:			WS CHAN				-
Standard E	Equimment						
	•						
Equipmen	t:		High Volu				-
Venue:			Ma Wan (		-		
Model No.			TE-5170	-			
Serial No.:			3383				-
Last Calibr	ation Date:		4-Aug-23				-
Calibration	n Result						
-	Adjustment Sca					799	CPM
Sensitivity	Adjustment Sca	le Setting (After	Calibration	ո)։		799	CPM
Hour	Date	Time	Ambient (	Condition	Concentration 1	Total Count 2	Count/
lioui	(dd/mm/yy)	Time	Temp (°C)	R.H.(%)	(mg/m3)	Total count	Minute 3
	(uu/11111/yy)		Temp ( c)	11.11.(70)	Y-axis		X-axis
1	15/08/23	9:00-10:00	32.0	80	0.038	1536	25.60
2	15/08/23	11:30-12:30	32.0	80	0.035	1321	22.02
3	15/08/23	13:50-14:50	32.0	80	0.041	1721	28.68
Note:	1 Monitoring	data was measu	red by Hig	h Volume	Sampler	-	-
	2 Total Count	was logged by L	aser Dust I	Monitor			
	③ Count/minu	te was calculate	ed by (Total	Count/60	0)		
Dulinon		V					
Бу Шеаг і	Regression of Y o Slope (K-factor)		0.0015				
	Correlation coef		0.9982				
			0.3302				
Validity of	Calibration Reco	ord:	15-Au	ıg-24			
Remarks:							
·							
					14		
					1/		
QC	Reviewer:	Y.W. Fung	_ S	ignature:	//	Date:	15-Aug-23

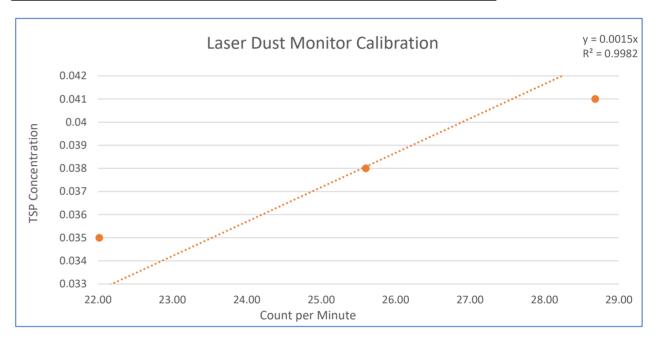
# **Laser Dust Monitor Calibration**

Type: Laser Dust Monitor Manufacturer/Brand: SIBATA LD-3 Model No.: A.005.11a Equipment No.:

Sensitivity Adjustment

Scale Setting: 799 CPM

Hour	Count/Minute	Concentration (mg/m3)
	X-axis	Y-axis
1	25.60	0.0380
2	22.02	0.0350
3	28.68	0.0410



Prepare by: WS CHAN 15-Aug-23 Date

Type:			Laser Dust Monitor				
Manufactu	urer/Brand:		SIBATA				•
Model No.	:		LD-3B				•
Equipment	t No.:		A.005.13a	3			•
	Adjustment Sca	le Setting:	643 CPM				•
							•
Operator:			WS CHAN	<u> </u>			
Standard E	Equimment						
Equipment	t·		High Volu	me Sampl	ler		
Venue:				Chung Villa			•
Model No.	:		TE-5170				•
Serial No.:			3383				•
	ation Date:		4-Aug-23				•
							•
Calibration	n Result						
Sensitivity	Adjustment Sca	le Setting (Befor	e Calibratio	on):		643	CPM
Sensitivity	Adjustment Sca	le Setting (After	Calibration	ո)։		643	CPM
Hour	Date	Time	Ambient	Condition	Concentration ①	Total Count 2	Count/
	(dd/mm/yy)		Temp (°C)	R.H.(%)	(mg/m3)		Minute ③
					Y-axis		X-axis
1	15/08/23	9:00-10:00	32.0	80	0.038	1512	25.20
2	15/08/23	11:30-12:30	32.0	80	0.035	1338	22.30
3	15/08/23	13:50-14:50	32.0	80	0.041	1703	28.38
Note:	1 Monitoring	data was measu	red by Higl	h Volume :	Sampler		
	2 Total Count	was logged by L	aser Dust N	Monitor			
	③ Count/minu	ite was calculate	d by (Total	Count/60	)		
By Linear F	Regression of Y o	n X					
	Slope (K-factor)		0.0015				
	Correlation coef	fficient:	0.9989				
Validity of	Calibration Reco	ord:	15-A	ug-24			
Remarks:							
					M		
001	Daviaa	V.W. Free=		``		D-1	1F A 22
QC	Reviewer:	Y.W. Fung	-	Signature:		. Date:	15-Aug-23

# **Laser Dust Monitor Calibration**

Type: Laser Dust Monitor

Manufacturer/Brand: SIBATA

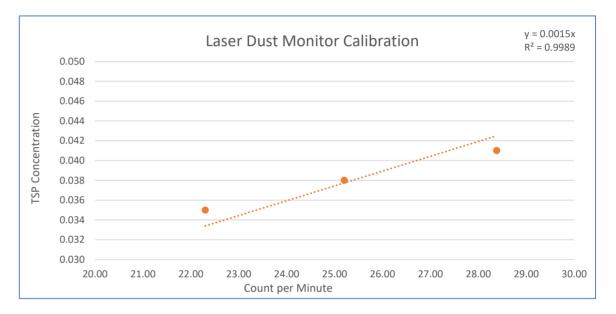
Model No.: LD-3B

Equipment No.: A.005.13a

Sensitivity Adjustment

Scale Setting: 643 CPM

Hour	Count/Minute	Concentration (mg/m3)
	X-axis	Y-axis
	0.00	0.0000
1	25.20	0.0380
2	22.30	0.0350
3	28.38	0.0410





# 綜 合 試 驗 有 限 公 司

Good Ba Ba Hitech Building, Nos. 22-24 Wing Kei Road, Kwai Chung, New Territories, Hong Kong Tel: (852) 2873 6860 Fax: (852) 2555 7533 E-mail: smec@cigismec.com Website: www.cigismec.com



## CERTIFICATE OF CALIBRATION

Certificate No.:

22CA1110 01-01

Item tested

Description: Manufacturer

B & K

Type/Model No.: 2250 Serial/Equipment No.: 3001291 Adaptors used:

Microphone B & K 4950 3005374

Preamp B & K ZC0032 31351

of

Item submitted by

**Customer Name:** Address of Customer: AECOM ASIA CO LIMITED

Sound Level Meter (Class 1)

Request No.:

Date of receipt:

10-Nov-2022

Date of test:

11-Nov-2022

Reference equipment used in the calibration

Description: Multi function sound calibrator B&K 4226 DS 360

2288444 33873

**Expiry Date:** 23-Aug-2023 21-Jan-2023

Traceable to: CIGISMEC CEPREI

Ambient conditions

Temperature: Relative humidity:

Signal generator

22 ± 1 °C 55 ± 10 % 1005 ± 5 hPa

Air pressure:

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:

12-Nov-2022

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. The results apply to the item as received.

Soils & Materials Engineering Co., Ltd.

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

HKAS has accredited this laboratory (Reg. No. HOKLAS 028) under HOKLAS for specific calibration activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this certificate are traceable to the International System of Units (SI) or recognised measurement standards. The results relate only to the item(s) calibrated. This certificate shall not be reproduced except in full without approval of the laboratory.

## 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.



香港新界葵涌永基路22-24號好爸爸創科大廈 Good Ba Ba Hitech Building, Nos. 22-24 Wing Kei Road, Kwai Chung, New Territories, Hong Kong Tel: (852) 2873 6860 Fax: (852) 2555 7533 E-mail: smec@cigismec.com Website: www.cigismec.com



## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

22CA1110 01-01

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	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	Α	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.3	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass		
Overload indication	SPL	Pass	0.4	
	Leg	Pass	0.3	
Acquetic tooto		1 433	0.4	

#### 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	

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: Fung Chi Yip Date: 1-Nov-2022

calibrated on a schedule to maintain the required accuracy level.

Fnd

Date: 12-Nov-2022

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are

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

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## **CERTIFICATE OF CALIBRATION**

Certificate No.:

23CA0307 02

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Item tested

Description:
Manufacturer:
Type/Model No.:

B & K 2250-L 2681366 Microphone B & K 4950 2665582 Preamp B & K ZC0032 17190

Serial/Equipment No.: Adaptors used: Item submitted by

Customer Name:

AECOM ASIA CO LTD

Sound Level Meter (Class 1)

Request No.: Date of receipt:

07-Mar-2023

Date of test:

08-Mar-2023

Reference equipment used in the calibration

Description:
Multi function sound calibrator

Model: B&K 4226 DS 360 Serial No. 2288444 61227 Expiry Date: 23-Aug-2023 08-Jun-2023

Traceable to: CIGISMEC CEPREI

Ambient conditions

Temperature: Relative humidity:

Signal generator

22 ± 1 °C 55 ± 10 % 1010 ± 5 hPa

Air pressure:

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:

Da

13-Mar-2023

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. The results apply to the item as received.

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## **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

23CA0307 02

Page

of :

#### Electrical Tests

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

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

#### 2, Acoustic tests

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

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

Response to associated sound calibrator

N/A

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

Calibrated by: Fung Chi Yip
Date: 08-Mar-202

Fung Chi Yip 08-Mar-2023

Checked by: Chan Yuk Yiu

13-Mar-2023

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

End

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## **CERTIFICATE OF CALIBRATION**

Certificate No.:

22CA1005 01-01

Item tested

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

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

2270 3007965 B & K 4189 2846461

Microphone

Pream B & K ZC0032 17965

of

Item submitted by

Customer Name: Address of Customer: AECOM ASIA CO. LTD.

Request No.:

Date of receipt:

05-Oct-2022

Date of test:

06-Oct-2022

Reference equipment used in the calibration

Description: Signal generator Model: B&K 4226

DS 360

1005 ± 5 hPa

2288444

Serial No. 33873

Expiry Date: 23-Aug-2023 21-Jan-2023

Traceable to: CIGISMEC CEPRE

**Ambient conditions** 

Multi function sound calibrator

Temperature:

22 ± 1 °C 55 ± 10 %

Relative humidity: Air pressure:

## 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 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

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

Actual Measurement data are documented on worksheets

Approved Signatory:

07-Oct-2022

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. The results apply to the item as received.

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

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## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

22CA1005 01-01

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:	Uncertanity (dB) / Coverage Fact
Self-generated noise	Α	Pass	0.3
	С	Pass	1.0 2.1
	Lin	Pass	2.0 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	Α	Pass	0.3
. , , ,	С	Pass	0.3
	Lin	Pass	0.3
Time weightings	Single Burst Fast	Pass	0.3
	Single Burst Slow	Pass	0.3
Peak response	Single 100µs rectangular pulse	Pass	0.3
R.M.S. accuracy	Crest factor of 3	Pass	0.3
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3
	Repeated at frequency of 100 Hz	Pass	0.3
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3
	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4
Overload indication	SPL	Pass	0.3
	Leq	Pass	0.4
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	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 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 Yir b6-Oct-2022

Chan Yuk Yiu

07-Oct-2022

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.:

22CA1005 01-02

of

Item tested

Adaptors used:

Description: Sound Level Meter (Type 1) Manufacturer: Type/Model No.:

B & K 2270 2644597 B & K 4950 2879980

Microphone

Pream B & K ZC0032 29398

Serial/Equipment No.: Item submitted by

**Customer Name:** Address of Customer: AECOM ASIA CO LTD

Request No .: Date of receipt:

05-Oct-2022

Date of test:

06-Oct-2022

Reference equipment used in the calibration

Description: Multi function sound calibrator Signal generator

Model: B&K 4226 DS 360

Serial No. 2288444 33873

**Expiry Date:** 23-Aug-2023 21-Jan-2023

Traceable to: CIGISMEC CEPREI

Ambient conditions

Temperature: Relative humidity: 22 ± 1 °C 55 ± 10 %

Air pressure: 1005 ± 5 hPa

#### Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and 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:

07-Oct-2022

Company Chop:

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

Soils & Materials Engineering Co., Ltd

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## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

22CA1005 01-02

#### **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.

Uncertanity (dB) / Cov	erage Fact
0.3	
1.0	2.1
2.0	2.2
0.3	
0.3	
0.3	
0.3	
0.3	
0.3	
0.3	
0.3	
0.3	
0.3	
0.3	
0.3	
0.3	
0.3	
0.3	
0.3	
0.4	
0.4	
0.3	
0.4	
	0.3

#### 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	Uncertanity (dB) / Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3
	Weighting A at 8000 Hz	Pass	0.5
D			

Response to associated sound calibrator

N/A

The 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:

Funa Chi Yio Date: 06-Oct-2022

Date:

Chan Yuk Yiu 07-Oct-2022

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

End

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## **CERTIFICATE OF CALIBRATION**

Certificate No.:

22CA1110 01-03

Page: 1

of

Item tested

Description: Manufacturer: Acoustical Calibrator (Class 1) Rion Co., Ltd.

AECOM ASIA CO LIMITED

Type/Model No.:

NC-74

Serial/Equipment No.:

34246490 / N.004.10

Adaptors used:

Item submitted by

Curstomer:

Address of Customer:

Request No.: Date of receipt:

10-Nov-2022

Date of test:

11-Nov-2022

#### Reference equipment used in the calibration

Description: Lab standard microphone Preamplifier Measuring amplifier Signal generator Digital multi-meter Audio analyzer	Model: B&K 4180 B&K 2673 B&K 2610 DS 360 34401A	Serial No. 2412857 2743150 2346941 33873 US36087050 GR41300350	Expiry Date: 23-May-2023 28-Jun-2023 30-Jun-2023 21-Jan-2023 30-May-2023	Traceable ( SCL CEPREI CEPREI CEPREI CEPREI
Audio analyzer Universal counter	34401A	US36087050	30-May-2023	CEPREI
	8903B	GB41300350	06-Jul-2023	CEPREI
	53132A	MY40003662	13-Jun-2023	CEPREI

#### **Ambient conditions**

Temperature: Relative humidity:

Air pressure:

22 ± 1 °C 55 ± 10 % 1005 ± 5 hPa

#### Test specifications

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

#### Test results

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

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

Feng Junqi

Approved Signatory: <

Date: 12-Nov-2022

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. The results apply to the item as received.

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## **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

22CA1110 01-03

Page:

of

#### Measured Sound Pressure Level

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

			(Output level in dB re 20 µPa)
Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	93.98	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 = 0.011 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 = 1002.1

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 = 1.6 %

Estimated expanded uncertainty

0.7 %

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

Calibrated by:

Fung Chi Yip

Checked by

Date:

Chan Yuk Yiu 12-Nov-2022

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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#### 線合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

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## CERTIFICATE OF CALIBRATION

Certificate No.:

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Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer: Type/Model No.: B & K 4231

4231

Serial/Equipment No.: Adaptors used: 3014024 / N004.04

Item submitted by

... ......

AECOM ASIA CO LIMITED

Address of Customer:

Request No.:

-

Date of receipt:

Curstomer:

10-Nov-2022

Date of test:

11-Nov-2022

#### Reference equipment used in the calibration

Description: Lab standard microphone Preamplifier Measuring amplifier Signal generator Digital multi-meter Audio analyzer	Model:	Serial No.	Expiry Date:	Traceable to:
	B&K 4180	2412857	23-May-2023	SCL
	B&K 2673	2743150	28-Jun-2023	CEPREI
	B&K 2610	2346941	30-Jun-2023	CEPREI
	DS 360	33873	21-Jan-2023	CEPREI
	34401A	US36087050	30-May-2023	CEPREI
	8903B	GB41300350	06-Jul-2023	CEPREI
Universal counter	53132A	MY40003662	13-Jun-2023	CEPREI

#### Ambient conditions

Temperature:

22 ± 1 °C 55 + 10 %

Relative humidity: Air pressure: 55 ± 10 % 1005 ± 5 hPa

#### Test specifications

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

#### Test results

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

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

Approved Signatory:

Date:

: 12-Nov-2022

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. The results apply to the item as received.

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

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HKAS has accredited this laboratory (Reg. No. HOKLAS 028) under HOKLAS for specific calibration activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this certificate are traceable to the International System of Units (SI) or recognised measurement standards. The results relate only to the item(s) calibrated. This certificate shall not be reproduced except in full without approval of the laboratory.



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## CERTIFICATE OF CALIBRATION

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I, 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)

			(output lover in ab ic zo hi a)
Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	94.03	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 = 0.014 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 = 1000.0 Hz

Estimated expanded uncertainty

0.1 F

Coverage factor k = 2.2

#### I, 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 = 0.6 %

Estimated expanded uncertainty

0.7 %

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

Calibrated by:

Date: 1

Fung Chi Yip 11-Nov-2022 Checked by:

Chan Yuk Yiu

Date:

12-Nov-2022

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.CARP156-2/Issue 1/Rev.C/01/05/2005

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