

RECALIBRATION **DUE DATE:**

December 26, 2018

Calibration Certification Information

Cal. Date: December 26, 2017 Rootsmeter S/N: 438320

Ta: 291

°K

Operator: Jim Tisch

Run

Pa: 763.3

mm Hg

Calibration Model #:

TE-5025A

Calibrator S/N: 0843

Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	2	1	1.4140	3.2	2.00
3	4	1	1.0010	6.4	4.00
5	6	1	0.8910	7.9	5.00
7	8	1	0.8480	8.8	5.50
9	10	1	0.7030	12.7	8.00

		Data Tabula	tion		
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)
1.0241	0.7243	1.4342	0.9958	0.7042	0.8732
1.0198	1.0188	2.0283	0.9916	0.9906	1.2349
1.0178	1.1423	2.2677	0.9896	1.1107	1.3807
1.0166	1.1988	2.3783	0.9885	1.1656	1.4481
1.0113	1.4386	2.8684	0.9834	1.3988	1.7464
	m=	2.00314		m=	1.25433
QSTD	b=	-0.01725	QA	b=	-0.01050
	r=	r= 0.99996		r=	0.99996

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

	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 S0 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

Total Suspended Particulates (TSP) Sampler Field Calibration Report

Station	Fanling Governr	nent Secondary	School (AM2)		Operator:	Shum Kan	n Yuen
Date:	15-May-18			Next Due Date:			
Model No:	TE-5170					O.T.S 843	
Equipment No.:	A-001-74T	•			Expiration Date:	26-Dec	-18
			Ambient C	Condition			
Tempera	ture, Ta	304.0	Kelvin	Pressi	ıre, Pa	755.7	mmHg
		Or	ifice Transfer Sta	ndard Informat	tion		
Equipme	ent No.:	843	Slope, mc	2.00		Intercept, bc	-0.01725
Last Calibra		26-Dec-17					0.01723
Next Calibr		26-Dec-18	I	nc x Qstd + bc =	$= [H \times (Pa/760)]$	$(298/Ta)^{1/2}$	
			4 101			V-10-	
			Calibration of	TSP Sampler			
Calibration Point	H in. of water	[H x (Pa/76	50) x (298/Ta)] ^{1/2}	Qstd (m³/min) X - axis	W in. of oil	[\Delta W x (Pa/760) x (298/7) Y-axis	
1	7.1		2.63	1.32	5.3	2.27	
2	5.9		2.40	1.21	4.3	2.05	
3	4.4		2.07	1.04	3.3	1.79	
4	3.3		1.79	0.90	2.4	1.53	
5	2.3		1.50	0.76	1.6	1.25	
By Linear Regr	ession of Y on I	X					
Slope, mw =	1.7871			Intercept, bw =		-0.091	3
Correlation C	oefficient* =	0.	9989				

			Set Point Ca			1976	
			$d = 1.21 \text{ m}^3/\text{min} (4)$	3 CFM)			
From the Regress	sion Equation, the	he "Y" value ac	ecording to				
		m x (Qstd + b = [W x (P	Pa/760) x (298/T	(a)] ^{1/2}		
Therefore, S	Set Point W = ($m \times Qstd + b)^2$	x (760 / Pa) x (T	Sa / 298) =	4.	.40	
*If Correlation C	Coefficient < 0.9	90, check and r	ecalibrate again.			************	
Remarks:							
				1880			
-		,					
QC Reviewer:	WS CHAT	\vee :	Signature:	41		Date: 15/03	1/18

EQUIPMENT CALIBRATION RECORD

	facturer/Brand:		-	SIBATA	ust Moni	itor		
Mode			-	LD-3				
			A.005.07					
Sensi	tivity Adjustment	Scale Set	.ting: _	557 CP	М	328 1 0		
Operator:		_	Mike She	ek (MSKI	M)			
Standa	rd Equipment							
A2222 2 194		2002.2				3.00		
Equip			precht & Pa					
Venue			erport (Pui `	Ying Seco	ondary So	chool)		
Model		_	ies 1400AB					
Serial	No:			0AB2198				
				00C1436	59803	K₀: 12500		
Last C	Calibration Date*:	3 M	ay 2018					
*Remar	ks: Recommend	led interva	I for hardwa	re calibra	tion is 1 y	year		
Calibra	tion Result							
	tivity Adjustment tivity Adjustment					557 CF		
Hour	Date	Т	ime	Amb	pient	Concentration ¹	Total	Count/
	(dd-mm-yy)			Cond	dition	(mg/m ³)	Count ²	Minute ³
				Temp	R.H.	Y-axis	100000000000000000000000000000000000000	X-axis
				(°C)	(%)			
1	05-05-18	09:15	- 10:15	27.6	79	0.05367	2151	35.85
2	05-05-18	10:15	- 11:15	27.6	80	0.05864	2347	39.12
3	05-05-18	11:15	- 12:15	27.7	80	0.06661	2679	44.65
4	05-05-18	12:15	- 13:15	27.7	79	0.06335	2546	42.43
Note:	Total Count Count/minut	was logge e was cald	ed by Laser [Dust Mon	itor	shnick TEOM®		
	ar Regression of	Y or X						
	(K-factor):		0.0015					
Correla	ation coefficient:		0.9994					
Validity	y of Calibration F	Record:	5 May 201	19				
Remark	s:							
QC Re	eviewer: YW F	una	Signat	ure:	N	Date	. 07 May	/ 2018

EQUIPMENT CALIBRATION RECORD

Type:	:			Laser D	ust Mon	itor		
Manu	ıfacturer/Brand:		-	SIBATA				
Mode	el No.:		_	LD-3				
	ment No.:			A.005.0	9a			
Sensi	itivity Adjustment	Scale Set	ting:	797 CP	M			
Opera	ator:		_	Mike Sh	ek (MSKI	M)		
Standa	ard Equipment	4						
Fauin		5						
Venue	ment:		precht & Pa					
Mode			erport (Pui ` ies 1400AB	ring Sec	ondary S	chool)		
Serial				0400400	00000			
Ochai	INO.			0AB2198 00C1436		V . 40500		
Last C	Calibration Date*:		ay 2018	0001430	59803	K _o : <u>12500</u>	,	
*Remar	rks: Recommend	·		re calibra	tion is 1	vear		
	ntion Result							
Ganora	tron resurt							
Sensit Sensit	tivity Adjustment tivity Adjustment	Scale Sett Scale Sett	ting (Before ting (After C	Calibration alibration	on):):		PM PM	
Hour	Date	Т	ime	Am	pient	Concentration ¹	Total	Count/
	(dd-mm-yy)				dition	(mg/m³)	Count ²	Minute ³
				Temp	R.H.	Y-axis		X-axis
				(°C)	(%)	0.000,000,000,000,000		
1	05-05-18	09:45	- 10:45	27.6	79	0.05483	2176	36.26
2	05-05-18	10:45	- 11:45	27.7	80	0.05813	2324	38.73
3	05-05-18	11:45	- 12:45	27.7	79	0.06734	2701	45.02
4	05-05-18	12:45	- 13:45	27.7	79	0.06375	2545	42.41
Note:	 Total Count Count/minut 	was logge e was calc	d by Laser [Dust Mon	itor	shnick TEOM®		
	ar Regression of	Y or X						
	(K-factor):		0.0015	_				
Correl	ation coefficient:		0.9977					
Validit	y of Calibration F	Record:	5 May 201	19				
Remark	s:							
					. /	/		
QC Re	eviewer: _YWF	ung	Signat	ure:	4/	Date	e: 07 May	2018



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

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



CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0901 01

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of

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Manufacturer:

B & K

B&K

Type/Model No.: Serial/Equipment No.: 2238 2800927 4188

Adaptors used:

2791211

Item submitted by

Customer Name:

AECOM ASIA CO., LTD.

Address of Customer:

Request No .:

Date of receipt:

01-Sep-2017

Date of test:

09-Sep-2017

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

08-Sep-2018 25-Apr-2018

CIGISMEC

Signal generator

DS 360

33873 61227

01-Apr-2018

CEPREI CEPREL

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1010 ± 5 hPa

Test specifications

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

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.

Min/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

09-Sep-2017

Company Chop:

Comments: The results reported by 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



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

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CERTIFICATE OF CALIBRATION

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Certificate No.:

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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	
	С	Pass	1.0	2.1
	Lin	Pass	2.0	2.2
Linearity range for Leg	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	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:

Fung Chi Yip 09-Sep-2017

Date: 09-Sep-2017

calibrated on a schedule to maintain the required accuracy level.

Lai Sheng Jie

Date:

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.:

17CA1006 01

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Item tested

Description:

Sound Level Meter (Type 1) B & K

Microphone B & K Preamp B & K

Manufacturer: Type/Model No.: Serial/Equipment No.:

2250 3001291

4189 3005374 ZC0032 23853

Adaptors used:

-

Item submitted by

Customer Name:

AECOM ASIA CO LIMITED

Address of Customer:

-

Request No.: Date of receipt:

06-Oct-2017

Date of test:

06-Oct-2017

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:

22 ± 1 °C 50 ± 10 %

Relative humidity: Air pressure:

1010 ± 5 hPa

Test specifications

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

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

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

Test results

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

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

n/Feng Jun Q

Actual Measurement data are documented on worksheets

Huang J

Approved Signatory:

Date:

06-Oct-2017

Company Chop:

SENGINEER STONE S

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

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Certificate No.:

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1, Electrical Tests

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

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

Lai Sheng Jie 06-Oct-2017 Checked by:

Date:

Fung Chi Yip 06-Oct-2017

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

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CERTIFICATE OF CALIBRATION

Certificate No.:

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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-L

4950 2665582 ZC0032 17190

Serial/Equipment No .: Adaptors used:

2681366

(N.011.01)

Item submitted by

Customer Name:

AECOM ASIA CO LTD

Address of Customer:

Request No.:

Date of receipt:

21-Mar-2018

Date of test:

23-Mar-2018

Reference equipment used in the calibration

Description:

Model:

DS 360

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator

B&K 4226 DS 360

2288444 33873

61227

08-Sep-2018 25-Apr-2018 01-Apr-2018

CIGISMEC CEPREI

CEPREI

Signal generator Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1000 ± 5 hPa

Test specifications

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

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

The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference 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.

Feng Jun Qi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

24-Mar-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

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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.

-			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	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ³ at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 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

Fung Chi Yip

Checked by:

Date:

23-Mar-2018

Date:

Lam Tze Wa 24-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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CERTIFICATE OF CALIBRATION

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Item tested

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

Microphone **B&K**

Pream **B&K**

of

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

2270 2644597

4950 2879980 ZC0032 19428

Adaptors used:

(N.012.0/)

Item submitted by

Customer Name:

AECOM ASIA CO LTD

Address of Customer:

Request No .: Date of receipt:

21-Mar-2018

Date of test:

24-Mar-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.

2288444 33873 61227

Expiry Date:

08-Sep-2018 25-Apr-2018 01-Apr-2018

Traceable to:

CIGISMEC CEPREI 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

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.

Jun Qi

Actual Measurement data are documented on worksheets

Fend

Approved Signatory:

24-Mar-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.CARP152-1/Issue 1/Rev.C/01/02/2007



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CERTIFICATE OF CALIBRATION

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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:	Uncertanity (dB) / Coverage Factor
Self-generated noise	Α	Pass	0.3
	C	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	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	Uncertanity (dB) / Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3
	Weighting A at 8000 Hz	Pass	0.5

3, Response to associated sound calibrator

N/A

The 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 24-Mar-2018 End -

Checked by:

Date:

Lam Tze Wai 24-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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Form No CARP152-2/Issue 1/Rev C/01/02/2007



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CERTIFICATE OF CALIBRATION

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Pream

Manufacturer:

B&K

B&K

B & K ZC0032

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

2270 3007965

4189 (N.012.02)

2846461

17965

Item submitted by

Customer Name:

AECOM ASIA CO. LTD.

Address of Customer:

Request No.

Date of receipt:

07-Sep-2017

Date of test:

09-Sep-2017

Reference equipment used in the calibration

Description:

Model:

Serial No.

Expiry Date:

Multi function sound calibrator Signal generator

B&K 4226

2288444

08-Sep-2018

Traceable to:

Signal generator

DS 360 DS 360 33873 61227

25-Apr-2018 01-Apr-2018 CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1010 ± 5 hPa

Test specifications

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

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

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

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:

11-Sep-2017

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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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

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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:	Uncertanity (dB) / Cover	age Factor
Self-generated noise	Α	Pass	0.3	
	C	Pass	1.0 2	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	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 ⁴ at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2, Acoustic tests

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

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

3, Response to associated sound calibrator

N/A

The 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:

Lai Steng Jie Date: 09-Sep-2017 15

Checked by:

Date: 11-Sep

Fung Chi Yip 11-Sep-2017

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

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CERTIFICATE OF CALIBRATION

Certificate No.:

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Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer:

Rion Co., Ltd.

Type/Model No.:

NC-74

Serial/Equipment No.:

34246490 / N.004.10

Adaptors used:

_

Item submitted by

Curstomer:

AECOM ASIA CO LIMITED

Address of Customer: Request No.:

-

Date of receipt:

22-Sep-2017

Date of test:

28-Sep-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to
Lab standard microphone	B&K 4180	2341427	11-Apr-2018	SCL
Preamplifier	B&K 2673	2743150	05-May-2018	CEPREI
Measuring amplifier	B&K 2610	2346941	03-May-2018	CEPREI
Signal generator	DS 360	61227	01-Apr-2018	CEPREI
Digital multi-meter	34401A	US36087050	25-Apr-2018	CEPREI
Audio analyzer	8903B	GB41300350	21-Apr-2018	CEPREI
Universal counter	53132A	MY40003662	22-Apr-2018	CEPREI

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity:

55 ± 10 %

Air pressure:

1000 ± 5 hPa

Test specifications

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

Test results

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

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

in/Feng Jun Qi

Approved Signatory:

Date:

28-Sep-2017

Company Chop:

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

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



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CERTIFICATE OF CALIBRATION

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1, Measured Sound Pressure Level

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

Frequency	Output Sound Pressure	Measured Output	Estimated Expanded Uncertainty dB
Shown	Level Setting	Sound Pressure Level	
Hz	dB	dB	
1000	94.00	94.07	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

Actual Output Frequency 3.

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 Hz

Estimated expanded uncertainty

0.1 Hz

Coverage factor k = 2.2

4, Total Noise and Distortion

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

At 1000 Hz

TND = 2.8 %

Estimated expanded uncertainty

Lai Sheng Jie

28-Sep-2017

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:

Checked by:

Date:

Fung Chi Yip 28-Sep-201

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.:

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Item tested

Description:

Acoustical Calibrator (Class 1)

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

Serial/Equipment No.:

3014024 / N004.04

Adaptors used:

19000

Item submitted by

Curstomer:

AECOM ASIA CO LIMITED

Address of Customer: Request No.:

-

Date of receipt:

22-Sep-2017

Date of test:

28-Sep-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable t
Lab standard microphone	B&K 4180	2341427	11-Apr-2018	SCL
Preamplifier	B&K 2673	2743150	05-May-2018	CEPREI
Measuring amplifier	B&K 2610	2346941	03-May-2018	CEPREI
Signal generator	DS 360	61227	01-Apr-2018	CEPREI
Digital multi-meter	34401A	US36087050	25-Apr-2018	CEPREI
Audio analyzer	8903B	GB41300350	21-Apr-2018	CEPREI
Universal counter	53132A	MY40003662	22-Apr-2018	CEPREI

Ambient conditions

Temperature:

23 ± 1 °C

Relative humidity:

55 ± 10 %

Air pressure:

1000 ± 5 hPa

Test specifications

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

Test results

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

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

Min/Feng Jun Qi

Approved Signatory:

Date:

28-Sep-2017

Company Chop:

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

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CERTIFICATE OF CALIBRATION

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1 Measured Sound Pressure Level

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

sured Output Estimated Expanded Pressure Level Uncertainty
dB dB
94.16 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 = 0.007 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 Hz

Coverage factor k = 2.2

Total Noise and Distortion 4

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

TND = 0.4 %

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

Date:

Fnd

Calibrated by:

Lai Sheng Jie

28-Sep-2017

Checked by:

Date:

Fung Chi Yip 28-Sep-2017

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

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