

RECALIBRATION DUE DATE:

December 27, 2022

Certificate of Calibration

Calibration Certification Information

Cal. Date: December 27, 2021

Rootsmeter S/N: 438320

Ta: 295

°K

Operator: Jim Tisch

•

Pa: 740.4

mm Hg

Calibration Model #:

TE-5025A

Calibrator S/N: 0843

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3770	3.2	2.00
2	3	4	1	0.9710	6.4	4.00
3	5	6	1	0.8740	7.9	5.00
4	7	8	1	0.8340	8.8	5.50
5	9	10	1	0.6870	12.7	8.00

	Data Tabulation								
Vstd	Qstd	$\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$	TO THE PARTY OF TH	Qa	$\sqrt{\Delta H(Ta/Pa)}$				
(m3)	(x-axis)	(y-axis)	Va	(x-axis)	(y-axis)				
0.9799	0.7116	1.4029	0.9957	0.7231	0.8927				
0.9756	1.0048	1.9841	0.9914	1.0210	1.2624				
0.9736	1.1140	2.2183	0.9893	1.1320	1.4114				
0.9724	1.1660	2.3265	0.9881	1.1848	1.4803				
0.9673	1.4079	2.8059	0.9828	1.4306	1.7853				
	m=	2.02086		m=	1.26543				
QSTD[b=	-0.03672	QA [b=	-0.02336				
·	r=	0.99992		r=	0.99992				

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

	Standard Conditions
Tstd:	298.15 °K
Pstd:	760 mm Hg
	Key
ΔH: calibrato	r manometer reading (in H2O)
ΔP: rootsmet	er manometer reading (mm Hg)
	solute temperature (°K)
Pa: actual ba	rometric pressure (mm Hg)
b: intercept	
m· slone	

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

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

Station	Block B, Merit Industrial Centre (E-A14a)			Operator:	Choi W	Choi Wing Ho		
Cal. Date:	13/5/2022	Next Due Date:			13/7/2022			
Model No.:	TE-5170	_		Serial No.	10380			
Equipment No.:	A-001-15T	_					•	
			Ambient (Condition				
Temperature	е, Та (К)	298.0	Pressure, F	Pa (mmHg)		752.7		
		(Orifice Transfer Sta	andard Information	1			
Serial	No:	843	Slope, mc	T	2086	Intercept, bc	-0.03672	
Last Calibrat		27-Dec-21	, , , , , , , , , , , , , , , , , , , ,		1			
Next Calibrat		27-Dec-22		mc x Qstd + bc =	= [H x (Pa/760) x	(298/Ta)] ^{1/2}		
			Calibration of	TCD Campior				
		(Orfice	13P Sampler	HV:	S Flow Recorder		
Resistance Plate No.	DH (orifice), in. of water		[DH x (Pa/760) x (298/Ta)] ^{1/2}		Flow Recorder Reading (CFM)	Continuous Flow Record Reading IC (CFM) Y-ax		
18	7.0		2.63	1.32	44.0	43.79)	
13	6.0		2.44	1.22	40.0	39.8		
10	4.9		2.20	1.11	34.0	33.84	1	
. 7	4.2		2.04	1.03	30.0	29.86	3	
5	2.8		1.67	0.84	22.0	21.89)	
By Linear Regress Slope , mw = Correlation Coeffi If Correlation Coef	46.3863 cient* =		. 9986 ate.	Intercept, bw =	-17.	4058	-	
			Set Point (Calculation				
From the TSP Field From the Regression								
		mw	x Qstd + bw = IC x	[(Pa/760) x (298/T	a)] ^{1/2}			
Therefore, Set Poir	nt; IC = (mw x Q	std + bw) x [(760)/Pa)x(Ta/298)] ^{1/2} =		43.10	_	
Remarks:							A. (1)	
QC Reviewer:	WS OI	182	Signature:	R		Date: [2, /5	121	

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

Station	Block B, Merit In	dustrial Centre (E-A14a)	Operator:	Choi V	Ving Ho	
Cal. Date:	13/7/2022		3-1	Next Due Date:	13/9/2022		•
Model No.:	TE-5170	_	+	Serial No.	10380		
Equipment No.:	A-001-15T	_		3		Δ.	•
			Ambient (Condition			
Tomporatur	To (K)	308.0	Pressure, F			752.5	
Temperatur	e, 1a (N)	300.0	Flessule, F	a (IIIIIII)		102.0	
			Orifice Transfer Sta	andard Information	1		
Serial	No:	843	Slope, mc	2.02	2086	Intercept, bc	-0.03672
Last Calibra	tion Date:	27-Dec-21		may Oatd ba	= [H x (Pa/760) x	· (209/Ta)1 ^{1/2}	
Next Calibra	tion Date:	27-Dec-22		mc x Qsta + bc =	$= [H \times (Pa/700)] \times$	(298/1a)]	
			Calibration of	TCD Complex			
			Calibration of Orfice	1 SP Sampler	HV	S Flow Recorder	
Resistance Plate No.	DH (orifice), in. of water		760) x (298/Ta)] ^{1/2}	Qstd (m³/min) X · axis	Flow Recorder Reading (CFM)	Continuous Flow Reading IC (CF	
18	7.1		2.61	1.31	44.0	43.07	7
13	6.1		2.42	1.21	40.0	39.15	5
10	4.9		2.17	1.09	34.0	33.28	3
7	4.2		2.01	1.01	30.0	29.36	3
5	2.9		1.67	0.84	22.0	21.53	3
By Linear Regres Slope , mw = Correlation Coeff *If Correlation Coe	46.5921 icient* =).9995 rate.	Intercept, bw =	-17.	.6666	_
			Set Point 0	Calculation			
From the TSP Field	d Calibration Cur	ve, take Qstd = 1	.30m³/min				
From the Regressi	on Equation, the	"Y" value accord	ing to				
		mw	x Qstd + bw = IC x	[(Pa/760) x (298/T	a)] ^{1/2}		
Therefore, Set Poi	nt; IC = (mw x Q	std + bw) x [(76	0/Pa)x(Ta/298)] ^{1/2} =		43.83	- .
Remarks:							
	-						
QC Reviewer:	WS CHA	N	Signature:	R		Date: 13/7	122

EQUIPMENT CALIBRATION RECORD

Type:			Laser Dust Monitor				
Manufacti	urer/Brand:		SIBATA				
Model No	.:		LD-3	- ***	1000		
Equipmen	t No.:		A.005.09a				
Sensitivity	Adjustment Scal	le Setting:	797 CPM				
Operator:			WS CHAN				
Standard I	Equimment	<u> </u>					***
Equipmen	t:		High Volu				
Venue:			Fanling G	overnmen	t Secondary School	ol	i e
Model No	.:		TE-5170		33		
Serial No.:	:		3154				
Last Calibi	ration Date:		28-Apr-22	2			i
Calibratio	n Result						
Consitiuit	. Adiustment Coo	la Catting (Dafar	o Calibrati	001:		797	СРМ
			· ———			797	CPM
Sensitivity	Adjustment Sca	ie Setting (After	Calibratio	n):			CPIVI
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	03/05/22	9:30-10:30	26.0	60	0.0490	1950	32.50
2	03/05/22	10:30-11:30	26.0	60	0.0500	2050	34.17
3	03/05/22	11:30-12:30	26.0	60	0.0520	2150	35.83
4	03/05/22	12:30-13:30	26.0	60	0.0540	2300	38.33
Note:	~	data was measu			Sampler		
	\sim	was logged by L					
	(3) Count/minu	ite was calculate	ed by (Tota	l Count/60	0)		
By Linear	Regression of Y	on X					
_ /	Slope (K-factor)		0.0015				
	Correlation coe		0.9994				
					-		
Validity o	f Calibration Rec	ord:	3-Ma	ay-23	_		
Remarks:							
				Same a sur "			

QC Reviewer: Signature: Date: 4 May 22

EQUIPMENT CALIBRATION RECORD

Type:			Laser Dust Monitor				
Manufacti	urer/Brand:		SIBATA				
Model No	.:		LD-3			3.58	3
Equipmen	t No.:		A.005.10a				1
Sensitivity	Adjustment Sca	le Setting:	753 CPM				
Operator:			WS CHAN				c.
Standard F	Equimment						
otanaara i	<u> </u>	<u> </u>					
Equipmen	t:			me Samp			i.
Venue:				overnmer	t Secondary Schoo	ol	e .
Model No	.:		TE-5170				
Serial No.:	:		3154				
Last Calibr	ration Date:		28-Apr-22	2			
Calibration	n Result						
Concitivity	Adjustment Coo	la Catting / Dafa	ro Colibrati	ionli		752	CDM
	Adjustment Sca			51		753	CPM
Sensitivity	Adjustment Sca	ie 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	03/05/22	9:30-10:30	26.0	60	0.0490	1950	32.50
2	03/05/22	10:30-11:30	26.0	60	0.0500	2040	34.00
3	03/05/22	11:30-12:30	26.0	60	0.0520	2160	36.00
4	03/05/22	12:30-13:30	26.0	60	0.0540	2300	38.33
Note:	~	data was measu			Sampler		
	2 Total Count	was logged by L	aser Dust	Monitor			
	③ Count/minu	ite was calculate	ed by (Tota	I Count/60	0)		
By Linear	Regression of Y	on X					
Dy Ellicai	Slope (K-factor)		0.0015				
	Correlation coe		0.9994				
	correlation coc	meiene.	0.5554		-		
Validity of	f Calibration Rec	ord:	3-Ma	ay-23			
Remarks:							
				977			
				* 2006			

QC Reviewer: Signature: Date: 4 May 12



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

香港新界葵涌水基路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

Carti	ficate	No .
Celti	iicate	NO

21CA1019 03-01

Item tested

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

2250 3001291

Microphone B & K 4950 3005374

Preamp B&K ZC0032 23853

Item submitted by

Customer Name: Address of Customer: AECOM ASIA CO LIMITED

Request No.: Date of receipt:

Adaptors used:

19-Oct-2021

Date of test:

21-Oct-2021

Reference equipment used in the calibration

Description: Multi function sound calibrator Signal generator

Model: B&K 4226 DS 360

Serial No. 2288444 61227

Expiry Date: 23-Aug-2022 31-Dec-2021

Traceable to: CIGISMEC CEPREI

Ambient conditions

Temperature: Relative humidity: Air pressure:

22 ± 1 °C 55 ± 10 % 1005 ± 5 hPa

Test specifications

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

22-Oct-2021

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.:

21CA1019 03-01

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)	Coverage Factor
Self-generated noise	A	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	
. , , ,	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	
Acquetic tosts				

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

21-Oct-2021

Date:

Checked by

22-Oct-2021

Chan Yuk Yiu

Date:

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

- End -

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

HKAS has accredited this laboratory (Req. 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

21CA0929 03

of

Certificate No.: Item tested

Adaptors used:

Description: Sound Level Meter (Type 1) Manufacturer: B & K Type/Model No.: 2270

4189 2846461

Pream B&K ZC0032 17965

Serial/Equipment No.: Item submitted by

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

Request No.:

3007965

Date of receipt: 29-Sep-2021

Date of test: 05-Oct-2021

Reference equipment used in the calibration

Multi function sound calibrator Signal generator

Model: B&K 4226 DS 360

Serial No. 2288444 61227

Expiry Date: 23-Aug-2022 31-Dec-2021

Microphone

Traceable to: CIGISMEC CEPREI

Ambient conditions

Temperature Relative humidity: Air pressure:

22 ± 1 °C 55 ± 10 % 1005 ± 5 hPa

Test specifications

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

06-Oct-2021

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.: 21CA0929 03

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	Α	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.

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:

05-Oct-2021 Date:

Checked by

Chan Yuk Yiu Date: 06-Oct-2021

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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CERTIFICATE OF CALIBRATION

Certificate No.:

21CA1019 03-02

of

Item tested

Description: Manufacturer:

Acoustical Calibrator (Class 1) Rion Co., Ltd.

Type/Model No.:

NC-74

Serial/Equipment No .: Adaptors used

34246490 / N.004.10

Item submitted by

Curstomer

AECOM ASIA CO LIMITED

Address of Customer: Request No.:

19-Oct-2021

Date of receipt Date of test:

21-Oct-2021

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	04-May-2022	SCL
Preamplifier	B&K 2673	2239857	31-May-2022	CEPREI
Measuring amplifier	B&K 2610	2346941	01-Jun-2022	CEPREI
Signal generator	DS 360	33873	27-May-2022	CEPREI
Digital multi-meter	34401A	US36087050	27-May-2022	CEPREI
Audio analyzer	8903B	GB41300350	28-May-2022	CEPREI
Universal counter	53132A	MY40003662	02-Jun-2022	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.
- 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:

22-Oct-2021

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.

C Soils & Materials Engineering Co., Ltd.

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

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.:

21CA1019 03-02

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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	94.00	0.10

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 = 0.012 dB

Estimated expanded uncertainty

0.005 dB

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

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 = 1.7 %

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:

Checked by:

21-Oct-2021

Chan Yuk Yiu 22-Oct-2021

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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CERTIFICATE OF CALIBRATION

Certificate No.:

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Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer

Type/Model No.:

4231 Serial/Equipment No .: 3014024 / N004.04

Adaptors used:

Item submitted by

AECOM ASIA CO LIMITED

Address of Customer: Request No .:

Date of receipt

Curstomer:

05-Nov-2021

Date of test:

08-Nov-2021

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to
Lab standard microphone	B&K 4180	2341427	04-May-2022	SCL
Preamplifier	B&K 2673	2743150	31-May-2022	CEPREI
Measuring amplifier	B&K 2610	2346941	01-Jun-2022	CEPREI
Signal generator	DS 360	33873	27-May-2022	CEPREI
Digital multi-meter	34401A	US36087050	27-May-2022	CEPREI
Audio analyzer	8903B	GB41300350	28-May-2022	CEPREI
Universal counter	53132A	MY40003662	02-Jun-2022	CEPREI

Ambient conditions

Temperature:

22 ± 1 °C

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.
- 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:

09-Nov-2021

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.:

21CA1105 03

Page: 2

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 uPa) Frequency Output Sound Pressure Measured Output Estimated Expanded Shown Level Setting Uncertainty Sound Pressure Level Hz dB 1000 94 00 94.05 0.10

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

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

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

At 1000 Hz

TND = 0.5 %

Estimated expanded uncertainty

0.7 %

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

Calibrated by:

Date:

08-Nov-2021,

Checked by

Chan Yuk Yiu 09-Nov-2021

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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