

Appendix C Calibration Certificates of Monitoring Equipment



RECALIBRATION **DUE DATE:**

February 13, 2019

Pertificate d alibration

Calibration Certification Information

Cal. Date: February 13, 2018

Rootsmeter S/N: 438320

°K Ta: 293

Operator: Jim Tisch

Pa: 763.3

mm Hg

Calibration Model #: TE-5025A

Calibrator S/N: 1612

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3970	3.2	2.00
2	3	4	1	1.0000	6.3	4.00
3	5	6	1	0.8900	7.9	5.00
4	7	8	1	0.8440	8.7	5.50
5	9	10	1	0.7010	12.6	8.00

	Data Tabulation					
Vstd	Qstd	$\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right) \left(\frac{Tstd}{Ta}\right)}$		Qa	$\sqrt{\Delta H \Big(Ta/Pa \Big)}$	
(m3)	(x-axis)	(y-axis)	Va	(x-axis)	(y-axis)	
1.0172	0.7281	1.4293	0.9958	0.7128	0.8762	
1.0130	1.0130	2.0213	0.9917	0.9917	1.2392	
1.0109	1.1358	2.2599	0.9896	1.1120	1.3854	
1.0098	1.1964	2.3702	0.9886	1.1713	1.4530	
1.0046	1.4331	2.8586	0.9835	1.4030	1.7524	
	m=	2.02017		m=	1.26500	
QSTD	b=	-0.03691	QA	b=	-0.02263	
	r=	0.99988		r=	0.99988	

Calculations					
Vstd=	ΔVoI((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=	ΔVol((Pa-ΔP)/Pa)		
Qstd=	Qstd= Vstd/ΔTime		Va/ΔTime		
	For subsequent flow rate calculations:				
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: rootsmeter manometer reading (mm Hg)				
Ta: actual absolute temperature (°K)				
Pa: actual barometric 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.cor

TOLL FREE: (877)263-7610

FAX: (513)467-900

TSP Sampler Calibration

SITE

Location: Lian Tang 3
Sampler: TE-5170 MFC (Serial # : 2359) July 6, 2018 Sam Wong Date: Tech:

CONDITIONS Barometric Pressure (in Hg): 39.48 Corrected Pressure (mm Hg): 1003 Temperature (deg F): 85 Temperature (deg K): 302 Average Press. (in Hg): 39.48 Corrected Average (mm Hg): 1003 Average Temp. (deg F): Average Temp. (deg K):

CALIBRATION ORIFICE

Make: Tisch Qstd Slope: 2.02017 Model: TE-5025A Qstd Intercept: -0.03691 Serial#: 1612 Date Certified: February 13, 2018

CALIBRATIONS						
Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
1	12.00	1.973	56.0	63.85	Slope =	31.7376
2	10.00	1.803	52.0	59.29	Intercept =	1.9243
3	8.20	1.635	48.0	54.73	Corr. coeff.=	0.9987
4	5.20	1.305	38.0	43.33		
5	3.20	1.028	30.0	34.21	# of Observations:	5

Calculations

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]

IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg For subsequent calculation of sampler flow:

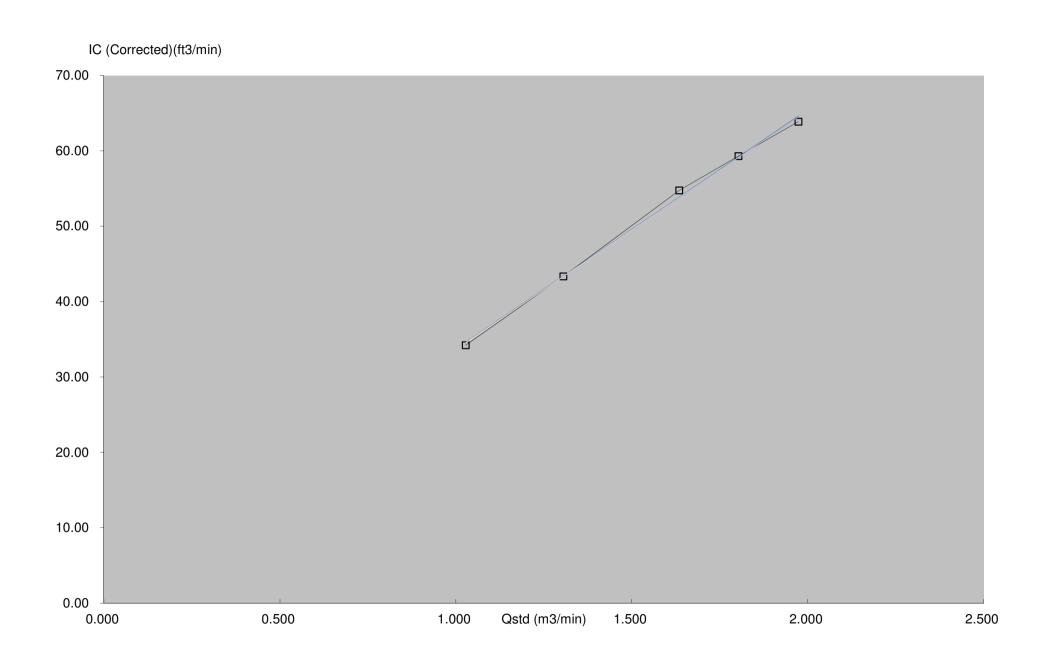
1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)

= sampler slope = sampler intercept m

b

= chart response

Tav = daily average temperature Pav = daily average pressure





Certificate No. 708774 Page 1 of 2 Pages

Customer: Enovative Environmental Service Limited

Address: Flat 6, 3/F, Block E, Wah Lok Industrial Centre, 31-35 Shan Mei Street, Shatin, N.T., Hong Kong.

Order No.: Q73499 Date of receipt: 1-Sep-17

Item Tested

Description: Sound Level Calibrator

 Manufacturer : Rion
 I.D.
 : 2159O1

 Model
 : NC-74
 Serial No.
 : 34857296

Test Conditions

Date of Test: 4-Sep-17 Supply Voltage: --

Ambient Temperature : $(23 \pm 3)^{\circ}$ C Relative Humidity : (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure: F21, Z02, IEC 60942.

Test Results

All results were within the IEC 60942 Class 1 specification.

The results are shown in the attached page(s).

Main Test equipment used:

Equipment No.	Description	Cert. No.	Traceable to
S014	Spectrum Analyzer	707126	NIM-PRC & SCL-HKSAR
S240	Sound Level Calibrator	703741	NIM-PRC & SCL-HKSAR
S041	Universal Counter	707135	SCL-HKSAR
S206	Sound Level Meter	707129	SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI), or by reference to a natural constant. The test results apply to the above Unit-Under-Test only

Calibrated by	:	Approved by :	F. 12
	Elva Chong	•	Alan Chu

Date:

4-Sep-17

This Certificate is issued by:

Hong Kong Calibration Ltd.

Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.

Tel: 2425 8801 Fax: 2425 8646

Certificate No. 708774

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Results:

1. Level Accuracy (at 1 kHz)

UUT Nominal Value	Measured Value	Mfr's Spec.
94 dB	94.1 dB	± 1 dB

Uncertainty : \pm 0.2 dB

2. Frequency Accuracy

UUT Nominal Value	Measured Value	Mfr's Spec.
1 kHz	0.998 kHz	± 2 %

Uncertainty: ± 0.1 %

3. Level Stability: 0.0 dB Uncertainty: ± 0.01 dB

4. Total Harmonic Distortion: < 1.5%

Mfr's Spec. : < 3 %

Uncertainty: ± 2.3 % of reading

Remarks: 1. UUT: Unit-Under-Test

2. The uncertainty claimed is for a confidence probability of not less than 95%.

3. Atmospheric Pressure: 1 025 hPa

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Certificate No. 70877	3		Page	e 1 of 3 Pages
Customer: Enovative	e Environmental Serv	ice Limited		
Address : Flat 6, 3/	F, Block E, Wah Lok	Industrial Centre, 3	31-35 Shan Mei Str	reet, Shatin, N.T., Hong Kong.
Order No. : Q73499			Date of receip	pt : 1-Sep-17
Item Tested				
Description : Sound Le	evel Meter			
Manufacturer : Rion			I.D.	:
Model : NL-52			Serial No.	: 00821072
Test Conditions				
Date of Test: 5-Sep-	17		Supply Voltag	ge :
Ambient Temperature :	(23 ± 3)°C		Relative Hum	nidity: (50 ± 25) %
Test Specifications				
Calibration check. Ref. Document/Procedure	e: Z01, IEC 61672.			
Test Results	-			
All results were within the The results are shown in	• •		pecification.	
Main Test equipment use	d:			
Equipment No. Descripti	<u>on</u>	Cert. No.		Traceable to
S017 Multi-Fur	nction Generator	C170120		SCL-HKSAR
S240 Sound Lo	evel Calibrator	703741		NIM-PRC & SCL-HKSAR
The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.				
The test equipment used for calibration are traceable to International System of Units (SI), or by reference to a natural constant. The test results apply to the above Unit-Under-Test only				

Calibrated by : _____ Elva Chong This Certificate is issued by:

Approved by : _ Alan Chu

5-Sep-17

Date:

Hong Kong Calibration Ltd.

Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.

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Results:

1. Self-generated noise: 16.4 dBA (Mfr's Spec ≤ 17 dBA)

2. Acoustical signal test

	UUT S				
	Frequency	Time	Octave	Applied	UUT
Range (dB)	Weighting	Weighting	Filter	Value (dB)	Reading (dB)
20-130	A	F	OFF	94.0	94.1
		S	OFF		94.1
	С	F	OFF		94.1
	Z	F	OFF		94.1
	A	F	OFF	114.0	114.1
		S	OFF		114.1
	С	F	OFF		114.1
	Z	F	OFF		114.1

IEC 61672 Type 1 Spec. : ± 1.1 dB

Uncertainty: $\pm 0.1 \text{ dB}$

3 Electrical signal tests of frequency weightings (A weighting)

Frequency	Attenuation (dB)	IEC 61672 Type 1 Spec.
31.5 Hz	-39.7	- 39.4 dB, ± 2 dB
63 Hz	-26.2	- 26.2 dB, ± 1.5 dB
125 Hz	-16.2	- 16.1 dB, ± 1.5 dB
250 Hz	-8.7	- 8.6 dB, ± 1 dB
500 Hz	-3.2	- 3.2 dB, ± 1.4 dB
1 kHz	0.0 (Ref)	$0 \text{ dB}, \pm 1.1 \text{ dB}$
2 kHz	+1.2	+ 1.2 dB, ± 1.6 dB
4 kHz	+1.0	+ 1.0 dB, ± 1.6 dB
8 kHz	-1.1	- 1.1 dB , + $2.1 \text{ dB} \sim -3.1 \text{ dB}$
16 kHz	-8.0	- 6.6 dB , + $3.5 \text{ dB} \sim -17.0 \text{ dB}$

Uncertainty: $\pm 0.1 \text{ dB}$

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4. Frequency & Time weightings at 1 kHz

4.1 Frequency Weighting (Fast)

UUT	Applied	UUT	Difference	IEC 61672		
Setting	Value (dB)	Reading (dB)	(dB)	Type 1 Spec.		
A	94.0	94.0 (Ref.)		± 0.4 dB		
С	94.0	94.0	0.0			
Z	94.0	94.0	0.0			

4.2 Time Weighting (A-weighted)

UUT	Applied	UUT	Difference	IEC 61672
Setting	Value (dB)	Reading (dB)	(dB)	Type 1 Spec.
Fast	94.0	94.0 (Ref.)		± 0.3 dB
Slow	94.0	94.0	0.0	
Time-averaging	94.0	94.0	0.0	

Uncertainty: ± 0.1 dB

Remarks: 1. UUT: Unit-Under-Test

2. The uncertainty claimed is for a confidence probability of not less than 95%.

3. Atmospheric Pressure: 1 028hPa.

4. Preamplifier model: NH-25, S/N: 10553 5. Microphone model: UC-59, S/N: 07040

6. Power Supply Check: OK

7. The UUT was adjusted with the supplied sound calibrator at the reference sound pressure level before the calibration.

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