

Appendix C Calibration Certificates of Monitoring Equipment



TISCH ENVIRONMENTAL, INC. 145 SOUTH MIAMI AVE VILLAGE OF CLEVES, OH 45002 513.467.9000 877.263.7610 TOLL FREE 513.467.9009 FAX

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Fe Operator		7 Rootsmeter Orifice I.I		438320 1941	Ta (K) - Pa (mm) -	294 - 750.57
PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H20 (in.)
1 2 3 4 5	NA NA NA NA NA	NA NA NA NA NA	1.00 1.00 1.00 1.00 1.00	1.4600 1.0410 0.9280 0.8840 0.7290	3.2 6.4 7.9 8.7 12.7	2.00 4.00 5.00 5.50 8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
0.9967 0.9925 0.9904 0.9894 0.9840	0.6827 0.9534 1.0672 1.1192 1.3499	1.4149 2.0010 2.2372 2.3464 2.8299		0.9957 0.9915 0.9894 0.9884 0.9830	0.6820 0.9524 1.0661 1.1181 1.3485	0.8851 1.2517 1.3995 1.4678 1.7702
Qstd slop intercept coefficie	t (b) =	2.11965 -0.02696 0.99991	ner	Qa slope intercept coefficie	= (b) $=$	1.32729 -0.01686 0.99991
y axis =	SQRT[H2O(F	a/760) (298/5	ra)]	y axis =	SQRT[H20([a/Pa)]

CALCULATIONS

Vstd = Diff. Vol[(Pa-Diff. Hg)/760](298/Ta)
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]

Qa = Va/Time

For subsequent flow rate calculations:

Qstd = $1/m\{[SQRT(H2O(Pa/760)(298/Ta))] - b\}$ Qa = $1/m\{[SQRT H2O(Ta/Pa)] - b\}$

TSP Sampler Calibration

SITE

Location: Lian Tang 3 Date: November 6, 2017 Sampler: TE-5170 MFC (Serial # : 2359) Tech: Sam Wong

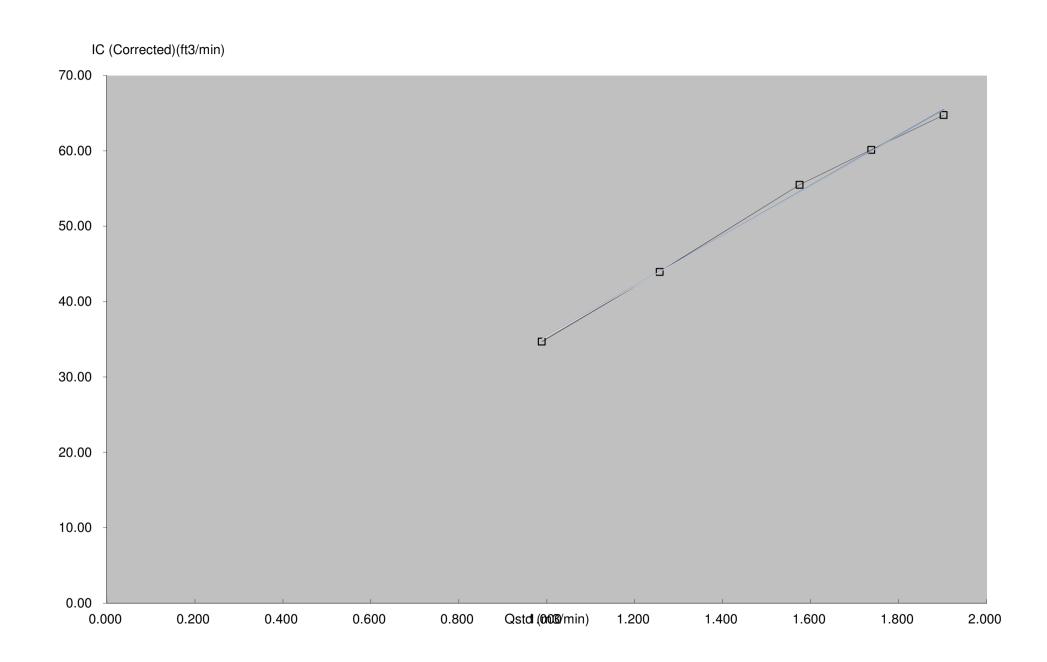
CONDITIONS Barometric Pressure (in Hg): 39.99 Corrected Pressure (mm Hg): 1016 Temperature (deg F): 77 Temperature (deg K): 298 Average Press. (in Hg): 39.99 Corrected Average (mm Hg): 1016 Average Temp. (deg F): 77 Average Temp. (deg K): 298

CALIBRATION ORIFICE Make: Tisch Qstd Slope: 2.11965 Model: TE-5025A Qstd Intercept: -0.02696 Serial#: 1941 Date Certified: February 28, 2017

CALIBRATIONS						
Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
1	12.00	1.902	56.0	64.74	Slope =	33.3004
2	10.00	1.737	52.0	60.12	Intercept =	2.1154
3	8.20	1.575	48.0	55.49	Corr. coeff.=	0.9987
4	5.20	1.256	38.0	43.93		
5	3.20	0.988	30.0	34.68	# 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 \text{ 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
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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
	e equipment long term drif e capability of any other la	t, variations with enviro aboratory to repeat the	nmental changes, vibra	and any uncertainties quoted ation and shock during transportation, (ong Calibration Ltd. shall not be liable
The test equipment used for ca		nternational System of	Units (SI), or by referer	nce to a natural constant.

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	$-6.6 \text{ dB}, +3.5 \text{ dB} \sim -17.0 \text{ dB}$

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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