

Appendix C Calibration Certificates of Monitoring Equipment



RECALIBRATION DUE DATE: February 13, 2019

Environmental Certificate of Calibration

			Calibration	Certificatio	on Informat	ion			
Cal. Date:	February 1	3,2018	Roots	meter S/N:	438320	Ta:	293	°К	
Operator:	Jim Tisch					Pa:	763.3	mm Hg	
Calibration	Model #:	TE-5025A	Calil	prator S/N:	1612				
	[]							1	
		Vol. Init	Vol. Final	ΔVol.	ΔTime	ΔΡ			
	Run	(m3)	(m3)	(m3)	(min) 1.3970	(mm Hg) 3.2	(in H2O) 2.00		
	1	1	2	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	1	
	5	9	10	1	0.7010	12.6	8.00	4	
				Data Tabula	tion			1	
								-	
	Vstd Qstd $\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right)}$			$\frac{1}{1}\left(\frac{\text{Tstd}}{\text{Ta}}\right)$		Qa	$\sqrt{\Delta H}$ (Ta/Pa)		
(m3) (x-axis) (y-axis)			ALCONOMIC AND A DESCRIPTION OF A DESCRIP	Va	(x-axis)	(y-axis)			
	1.0172 0.7281 1.4293				0.9958	0.7128	0.8762	-	
	1.0130				0.9917	0.9917	1.2392	4	
	1.0109	1.1358 2.2599			0.9896	1.1120	1.3854	-1	
	1.0098			and the second se	0.9886	1.1713	1.4530	-	
	1.0046	1.0046 1.4331 2.8586			0.9835	1.4030 m=	1.7524 1.26500	-	
	QSTD	0STD b= -0.03691			QA	b=	-0.02263		
	QSID	b= -0.03691 r= 0.99988		QA	r=	0.99988			
				Calculatio	ns			1	
	Vstd=	∆Vol((Pa-∆P)/Pstd)(Tstd/T		Va=	1			
	and the second s	Vstd/∆Time			Qa=]			
			For subsequ	uent flow ra	te calculatio				
	Qstd= $1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$				Qa=				
	Standard	Conditions							
Tstd					RECALIBRATION				
Pstd		mm Hg			LICEDA recommende annual recelibration per 1000				
AH: calibra		Key ter reading (in H2O)		US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51,				
		eter reading			1		, Reference Met		
Ta: actual a	bsolute tem	perature (°K)	1	1		ended Particulat		
	the second se	ressure (mm	Hg)		1		ere, 9.2.17, page		
b: intercep	t								
m: slope]					

Tisch Environmental, Inc.

145 South Miami Avenue

Village of Cleves, OH 45002

www.tisch-env.cor TOLL FREE: (877)263-761(FAX: (513)467-900

TSP Sampler Calibration

		SI	ſE		
Location: Lian	2			January 5,	2019
Sampler: TE-5	170 MFC (Serial	₩ : 23	Jy) Tech:	Sam Wong	

		(CONDITIONS		
Barometric Pressure	(in Hg):	40.15	Corrected Pressure	(mm Hg):	1020
Temperature	(deg F):	66	Temperature	(deg K):	292
Average Press.	(in Hg):	40.15	Corrected Average	(mm Hg):	1020
Average Temp.	(deg F):	66	Average Temp.	(deg K):	292

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

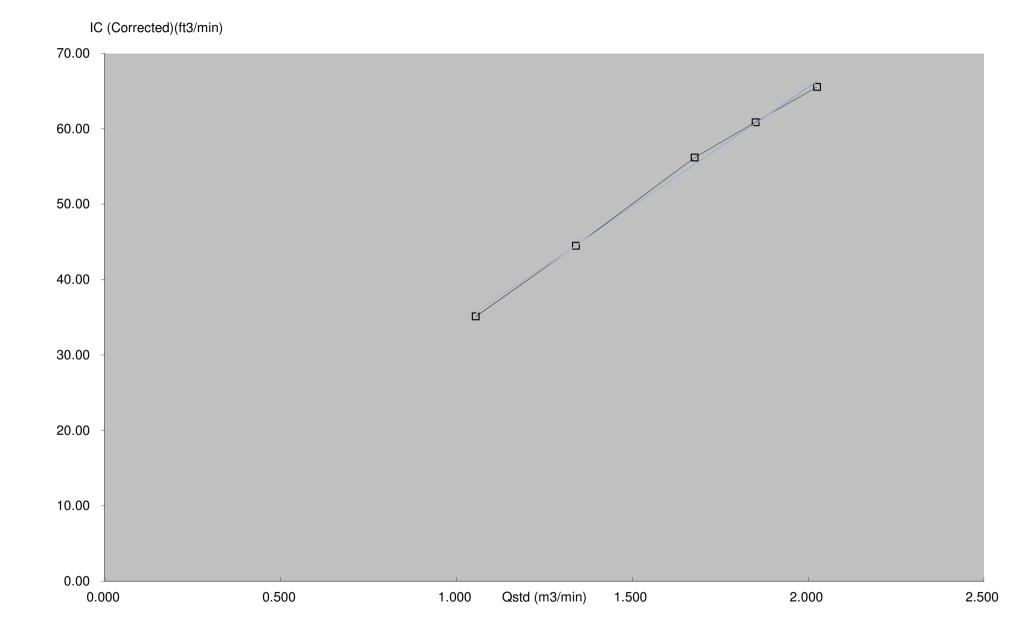
CALIBRATIONS								
Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION			
1	12.00	2.025	56.0	65.55	Slope =	31.7376		
2	10.00	1.850	52.0	60.86	Intercept =	1.9907		
3	8.20	1.677	48.0	56.18	Corr. coeff.=	0.9987		
4	5.20	1.339	38.0	44.48				
5	3.20	1.055	30.0	35.11	<pre># of Observations:</pre>	5		

Calculations

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)

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

m = sampler slope b = sampler intercept I = chart response Tav = daily average temperature Pav = daily average pressure





Item Tested Description : Sound Level Calibrator Manufacturer Rion I.D. : 217656 Model : NC-74 Serial No. : 34678506 Test Conditions Date of Test : 20-Apr-18 Supply Voltage : Relative Humidity : (50 ± 25) % Test Specifications Calibration check. Relative Humidity : (50 ± 25) % Test Specifications Calibration check. Ref. Document/Procedure : F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s). Main Test equipment used: Traceable to S014 Spectrum Analyzer 707126 NIM-PRC & SCL-S240 S041 Universal Counter 802061 SCL-HKSAR	ges			
Order No.: Q81437 Date of receipt : 13- Item Tested Description : Sound Level Calibrator I.D. : 217656 Model : NC-74 Serial No. : 34678506 Test Conditions Date of Test: 20-Apr-18 Supply Voltage : Ambient Temperature: (23 ± 3)°C Relative Humidity: (50 ± 25) % Test Specifications Calibration check. Ref. Document/Procedure: F21, Z02. Test Results All results were within the IEC 60942 Class 1 specifications. Traceable to Main Test equipment used: Equipment No. Description Cert. No. Traceable to S014 Spectrum Analyzer 707126 NIM-PRC & SCL- S0240 Sound Level Calibrator 703741 NIM-PRC & SCL- S041 Universal Counter 802061 SCL-HKSAR SCL-HKSAR				
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S041 Universal Counter 802061 SCL-HKSAR				
	-HROAR			
The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties qu will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during tra overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shal for any loss or damage resulting from the use of the equipment.	ansportation.			
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				
AA .				
Calibrated by : Approved by :				
Elva Chong Kin Wong				
This Certificate is issued by: Date: 20-Apr-18				
Hong Kong Calibration Ltd. Unit 88, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street,Kwai Chung, NT,Hong Kong.				

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Certificate No. 803615

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Results :

1. Generated Sound Pressure Level

UUT Nominal Value (dB)	Measured Value (dB)	IEC 60942 Class 1 Spec.
94.0	94.2	± 0.4 dB

Uncertainty : $\pm 0.2 \text{ dB}$

2. Short-term Level Fluctuation : 0.0 dB IEC 60942 Class 1 Spec. : ± 0.1 dB Uncertainty : ± 0.01 dB

3. Frequency

UUT Nominal Value (kHz)	Measured Value (kHz)	IEC 60942 Class 1 Spec.
1	0.999	± 1 %

Uncertainty : \pm 3.6 x 10 ⁻⁶

4. Total Distortion : < 1.1 % IEC 60942 Class 1 Spec. : < 4 % Uncertainty : ± 2.3 % of reading

Remark : 1. UUT : Unit-Under-Test

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

3. Atmospheric Pressure : 1 016 hPa.

----- END -----

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Certificate No.	804605		Page	1 of	3	Pages
Customer :	Enovative Environmental Servic	e Limited				
Address :	Flat 6, 3/F, Block E, Wah Lok Indus	strial Centre, 31-35 Sha	an Mei Street, Shati	n, N.T.,	Hong	Kong.
Order No. :	Q81807		Date of receipt	:		9-May-18
Item Tested						
Description :	Sound Level Meter					
Manufacturer :			I.D.	:		
	NL-52		Serial No.	: 01	14348	34
Test Conditi	ons					
Date of Test :	15-May-18		Supply Voltage	:		
Ambient Temp	erature : (23 ± 3)°C		Relative Humidi	ty : (50	± 25) %
Test Specifi	cations					
Calibration chec Ref. Document/	k. Procedure: Z01, IEC 61672.					
Test Results	•					
	within the IEC 61672 Type1 or n shown in the attached page(s).	nanufacturer's specif	ication.			
Main Test equip	ment used:					
Equipment No.		<u>Cert. No.</u>	-	Traceat	ole to	
S017	Multi-Function Generator	C170120		SCL-HK	SAR	
S240	Sound Level Calibrator	803357	1	NIM-PR	C & S	SCL-HKSAR
will not include allow overloading, mis-ha	this Calibration Certificate only relate to vance for the equipment long term drift, v ndling, or the capability of any other labc age resulting from the use of the equipm	variations with environmen pratory to repeat the meas	ntal changes, vibration	n and sho	ck duri	ing transportation,
	used for calibration are traceable to Inte ly to the above Unit-Under-Test only	rnational System of Units	(SI), or by reference t	to a natur	al cons	stant.

Calibrated by :	Appro	ved by :	(A)
Elva Chong			Kin Wong
This Certificate is issued by:	Date:	15-May-18	
Hong Kong Calibration Ltd.			
Hait OD 24/E Wall Euro Industrial Castra No. 59 76 To Obuse Disc Obuset Musi Obuse NT Hans M			



Certificate No. 804605

Page 2 of 3 Pages

Results :

1. Self-generated noise: 16.0 dBA (Mfr's Spec \leq 17 dBA)

2. Acoustical signal test

	UUT S	Setting			
	Frequency	Time	Octave	Applied	UUT
Range (dB)	Weighting	Weighting	Filter	Value (dB)	Reading (dB)
20-130	A	F	OFF	94.0	94.0
		S	OFF		94.0
	С	F	OFF		94.0
	Z	F	OFF		94.0
	А	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. : \pm 1.1 dB Uncertainty : \pm 0.1 dB

Attenuation (dB) IEC 61672 Type 1 Spec. Frequency 31.5 Hz -39.6 - 39.4 dB, ± 2 dB -26.2 - 26.2 dB, ± 1.5 dB 63 Hz -16.2 125 Hz - 16.1 dB, ± 1.5 dB -8.7 - 8.6 dB, ± 1 dB 250 Hz -3.2 500 Hz - $3.2 \text{ dB}, \pm 1.4 \text{ dB}$ 1 kHz 0.0 (Ref) $0 \, dB, \pm 1.1$ dB 2 kHz +1.0+ 1.2 dB, ± 1.6 dB +0.7+ $1.0 \text{ dB}, \pm 1.6 \text{ dB}$ 4 kHz - 1.1 dB, + $2.1 \text{ dB} \sim -3.1 \text{ dB}$ 8 kHz -1.26.6 dB, + 3.5 dB ~ - 17.0 dB 16 kHz -8.6 -

3 Electrical signal tests of frequency weightings (A weighting)

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



Certificate No. 804605

Page 3 of 3 Pages

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.
Setting			(uD)	
A	94.0	94.0 (Ref.)		$\pm 0.4 \text{ dB}$
C	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.)	·	$\pm 0.3 \text{ dB}$
Slow	94.0	94.0	0.0	
Time-averaging	94.0	94.0	0.0	

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

Remarks : 1. UUT : Unit-Under-Test

- 2. The uncertainty claimed is for a confidence probability of not less than 95%.
- 3. Atmospheric Pressure : 1 009 hPa.
- 4. Preamplifier model : NH-25, S/N : 21113
- 5. Firmware Version: 1.8
- 6. Power Supply Check: OK
- 7. The UUT was adjusted with the laboratory's sound calibrator at the reference sound pressure level before the calibration.

----- END ------