

# 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
					tion			1
		Data Tabulation						
	Vstd	Qstd	$\sqrt{\Delta H \left(\frac{Pa}{Pstc}\right)}$	$\frac{1}{1}\left(\frac{\text{Tstd}}{\text{Ta}}\right)$		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 1.0130 2.0213				0.9917	0.9917	1.2392	4
	1.0109 1.1358 2.2599				0.9896	1.1120	1.3854	-1
	1.0098       1.1964       2.3702         1.0046       1.4331       2.8586         m= 2.02017         b= 0.03691			and the second se	0.9886	1.1713	1.4530	-
					0.9835	1.4030 <b>m=</b>	1.7524 <b>1.26500</b>	-
					QA	b=	-0.02263	
	QSID	QSTD b= -0.03691 r= 0.99988			QA	r=	0.99988	
		Calculations						
	Vstd=	∆Vol((Pa-∆P	)/Pstd)(Tstd/T		Va=	1		
	and the second s	Vstd/∆Time			Qa=	]		
			For subsequ	uent flow ra	te calculatio			
	<b>Qstd=</b> $1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$				Qa=			
	Standard	Conditions						
Tstd	Tstd: 298.15 °K				RECALIBRATION			
Pstd: 760 mm Hg					LIS EDA roc	ommenden	nnual recalibrati	on ner 1000
AH: calibra		<b>Key</b> ter reading (	in H2O)		US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51,			
		eter reading			Appendix B to Part 50, Reference Method for th			
Ta: actual a	bsolute tem	perature (°K	)	1	Determination of Suspended Particulate Matter			
	the second se	ressure (mm	Hg)		the Atmosphere, 9.2.17, page 30			
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

SITE						
Location: Lian Tang 3 Sampler: TE-5170 MFC (Serial # : 2359)		September 6, 2018 Sam Wong				
CONDITIONS						

Barometric Pressure	(in Hg):	39.58	Corrected Pressure	(mm Hg):	1005
Temperature	(deg F):	88	Temperature	(deg K):	304
Average Press.	(in Hg):	39.58	Corrected Average	(mm Hg):	1005
Average Temp.	(deg F):	88	Average Temp.	(deg K):	304
,	1 2 1				

CALIBRATION ORIFICE							
Make:	Tisch TE-5025A	Qstd Slope: Ostd Intercept:	2.02017 -0.03691				
Serial#:	1612	- 1	February 13, 2018				

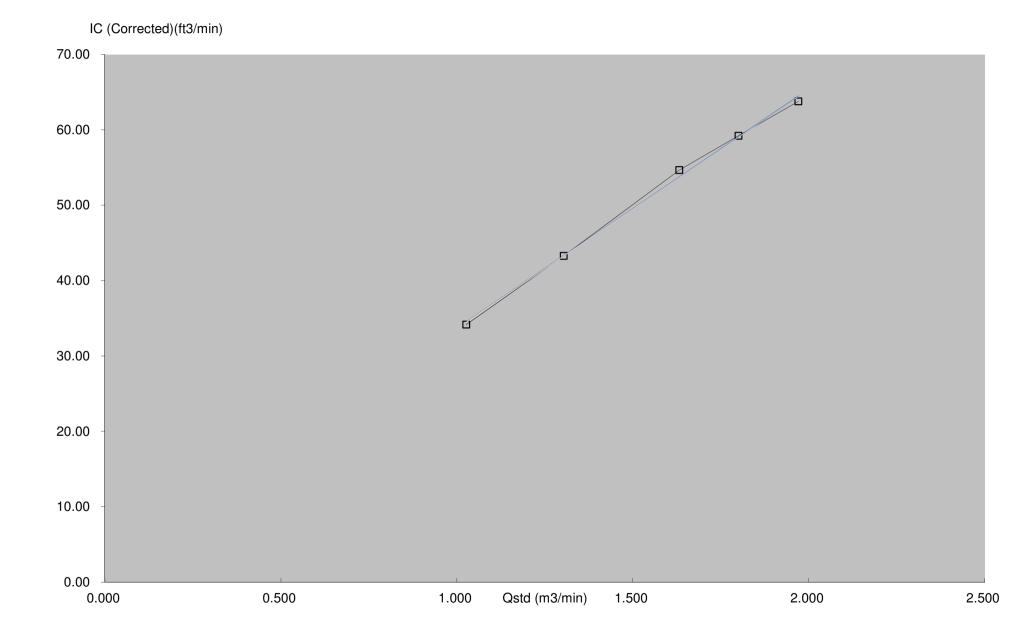
CALIBRATIONS							
Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION		
1	12.00	1.971	56.0	63.76	Slope =	31.7376	
2	10.00	1.800	52.0	59.20	Intercept =	1.9206	
3	8.20	1.632	48.0	54.65	Corr. coeff.=	0.9987	
4	5.20	1.303	38.0	43.26			
5	3.20	1.026	30.0	34.16	<pre># of Observations:</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				
Order No.:       Q81437       Date of receipt : 13-         Item Tested       Jescription : Sound Level Calibrator         Manufacturer : Rion       I.D. : 217656         Model : NC-74       Serial No. : 34678506         Test Conditions       Jate of Test : 20-Apr-18         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.       The results are shown in the attached page(s).         Main Test equipment used:       Equipment No.       Description         Equipment No.       Description       Cert. No.       Traceable to         S014       Spectrum Analyzer       707126       NIM-PRC & SCL-         S240       Sound Level Calibrator       703741       NIM-PRC & SCL-         S041       Universal Counter       802061       SCL-HKSAR	1g.			
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				
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Manufacturer : RionI.D.: 217656Model: NC-74Serial No.: 34678506Test ConditionsDate of Test :20-Apr-18Supply Voltage:Ambient Temperature :(23 ± 3)°CRelative Humidity : (50 ± 25) %Test SpecificationsCalibration check. Ref. Document/Procedure : F21, Z02.Test ResultsAll results were within the IEC 60942 Class 1 specifications. The results are shown in the attached page(s).Main Test equipment used: Equipment No. DescriptionCert. No. Traceable to NIM-PRC & SCL- S014Traceable to NIM-PRC & SCL- S0261Supply Coltage:Traceable to NIM-PRC & SCL- S0261				
Model       : NC-74       Serial No.       : 34678506         Test Conditions       Supply Voltage       :         Ambient Temperature :       (23 ± 3)°C       Relative Humidity : (50 ± 25) %         Test Specifications       Calibration check.         Calibration check.       Ref. Document/Procedure : F21, Z02.         Test Results       All results were within the IEC 60942 Class 1 specifications.         Main Test equipment used:       Traceable to         Equipment No.       Description       Cert. No.       Traceable to         S014       Spectrum Analyzer       703741       NIM-PRC & SCL-S240         S041       Universal Counter       802061       SCL-HKSAR				
Test Conditions         Date of Test : 20-Apr-18       Supply Voltage :         Ambient Temperature : (23 ± 3)°C       Relative Humidity : (50 ± 25) %         Test Specifications       Calibration check.         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:         Equipment No.       Description       Cert. No.         S014       Spectrum Analyzer       707126         S014       Spectrum Analyzer       703741         S014       Universal Counter       802061				
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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 <sup>-6</sup>

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	<b>ty :</b> (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

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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, $\pm 2$ dB -26.2 - 26.2 dB, ± 1.5 dB 63 Hz -16.2 125 Hz - 16.1 dB, $\pm 1.5$ dB -8.7 - 8.6 dB, $\pm 1$ 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, $\pm 1.6$ 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

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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.
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 ------