

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 - Ma Operator		Rootsmeter Orifice I.I		138320 L941	Ta (K) - Pa (mm) -	292 - 756.92
PLATE OR Run # 1 2 3 4 5	VOLUME START (m3) NA NA NA NA NA NA	VOLUME STOP (m3) NA NA NA NA NA NA	DIFF VOLUME (m3) 1.00 1.00 1.00 1.00	DIFF TIME (min) 1.4880 1.0510 0.9360 0.8920 0.7360	METER DIFF Hg (mm) 3.2 6.4 7.9 8.8 12.7	ORFICE DIFF H2O (in.) 2.00 4.00 5.00 5.50 8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
1.0121 1.0078 1.0057 1.0046 0.9993	0.6802 0.9589 1.0745 1.1262 1.3578	1.4258 2.0163 2.2543 2.3644 2.8515	and the same	0.9958 0.9916 0.9895 0.9884 0.9832	0.6692 0.9434 1.0571 1.1080 1.3358	0.8784 1.2422 1.3888 1.4566 1.7568
Qstd slop intercept coefficie	(b) =	2.10265 -0.00335 0.99999	ı e n	Qa slope intercept coefficie	t (b) =	1.31664 -0.00206 0.99999
y axis =	SQRT [H20 (Pa/760) (298/5	ra)]	y axis =	SQRT[H20(Γa/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
Sampler: TE-5170 MFC (Serial # : 2359) Date: March 5, 2016 Tech: Sam Wong

CONDITIONS

Barometric Pressure (in Hg): 40.00 Corrected Pressure (mm Hg): 1016 Temperature (deg F): Temperature (deg K): 294 Average Press. (in Hg): 40.00 Corrected Average (mm Hg): 1016 Average Temp. (deg F): Average Temp. (deg K): 294

CALIBRATION ORIFICE

Make: Tisch Qstd Slope: 2.10265 Model: TE-5025A Qstd Intercept: -0.00335 Serial#: Date Certified: March 24, 2015

CALIBRATIONS						
Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
1	12.00	1.919	58.0	67.50	Slope =	35.7973
2	10.00	1.752	54.0	62.85	Intercept =	-0.7187
3	8.20	1.587	48.0	55.86	Corr. coeff.=	0.9992
4	5.20	1.264	38.0	44.23		
5	3.20	0.992	30.0	34.92	# 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:

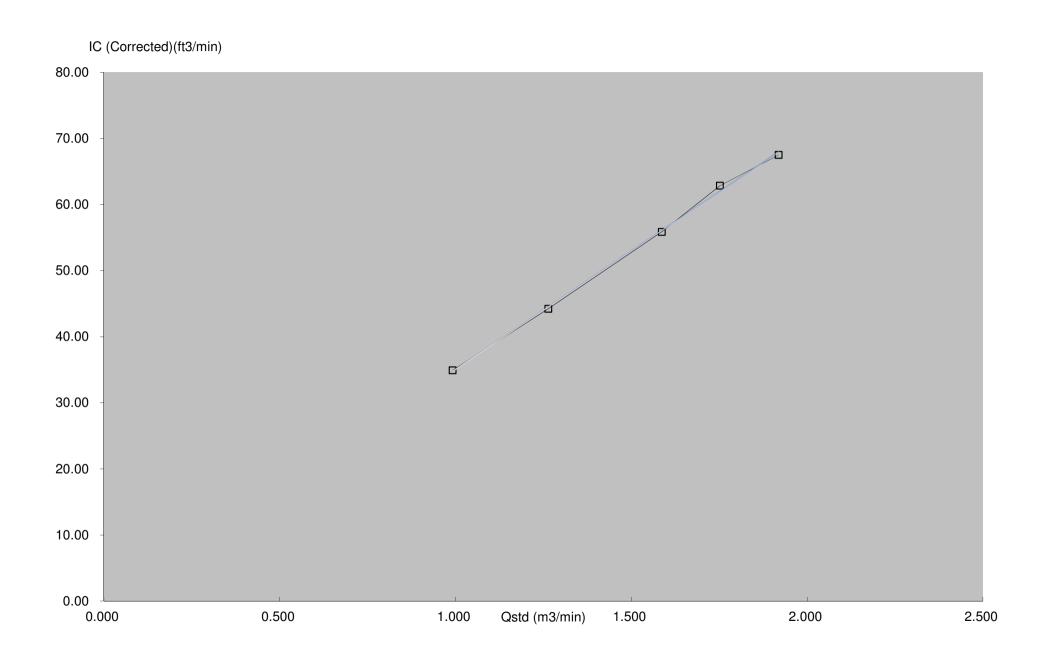
1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)

= sampler slope = sampler intercept m

b

= chart response

Tav = daily average temperature Pav = daily average pressure



TEST REPORT for SOUND CALIBRATOR

Model: NC-74

Serial No. : 34857296

Condition : Temperature _____ 25 °C

Humidity 64 %RH

Date: September, 8, 2015

Signature: \(\frac{\kitajıma}{\kitajıma}\)

RION CO., LTD.

1. Sound Pressure Level	$94.0 \pm 0.25 dB$	94.00 dB
2. Frequency	$1000 \pm 7 \text{ Hz}$	1002.0 Hz
3. Distortion	3 % or less	Pass
	5 76 61 1666	
4. Alama F		
4. Alarm Function		Pass
5. Appearance		Pass

Applicable standards

JIS C 1515:2004 class1

IEC 60942:2003 class1



Calibration Certificate

Certificate No. 508784

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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.: Q53442

Date of receipt

8-Oct-15

Item Tested

Description: Sound Level Meter

Manufacturer: B&K

: 2238 Model

Serial No.

: 2694908

Test Conditions

Date of Test: 15-Oct-15

Supply Voltage : --

 $(23 \pm 3)^{\circ}C$ **Ambient Temperature:**

Relative Humidity: $(50 \pm 25) \%$

Test Specifications

Calibration check.

Ref. Document/Procedure: Z01, IEC 651 and IEC 804.

Test Results

All results were within the IEC 651 Type1 and IEC 804 Type1 specification after adjustment.

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

Main Test equipment used:

Equipment No. Description

Cert. No.

Traceable to

S017

Multi-Function Generator

C147450

SCL-HKSAR

S240

Sound Level Calibrator

500563

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).

The test results apply to the above Unit-Under-Test only

Calibrated by : Alan Chu Approved by:

15-Oct-15

Steve Kwan

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



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Results:

1. SPL Accuracy

	LILIT Setting Applied Value UUT							
	UU	T Setting		Applied Value	UUI			
				(dB)	Readin	g (dB)		
Range	Freq. Wgt.	Bandwith	Center Freq.		Before adjust	After adjust		
20 ~ 100	A	BB/F		94.0	*91.6	93.8		
	A	BB/S				93.8		
	С	BB/F				93.8		
40 ~ 120	A	BB/F		94.0		93.9		
	A	BB/F		114.0		113.8		

IEC 651 Type 1 Spec. : \pm 0.7 dB

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

2. Level Stability: 0.0 dB

IEC 651 Type 1 Spec. : \pm 0.3 dB

Uncertainty: ± 0.1 dB

3. Linearity

3.1 Level Linearity

				YE C (51 E 1 C
UUT Range	Applied	UUT Reading	Variation	IEC 651 Type 1 Spec.
(dB)	Value (dB)	(dB)	(dB)	(Primary Indicator Range)
140	114.0	113.9	0.0	± 0.7 dB
130	104.0	103.9	0.0	
120	94.0	93.9 (Ref.)		
110	84.0	83.9	0.0	
100	74.0	73.9	0.0	
90	64.0	63.9	0.0	
80	54.0	53.8	-0.1	

Uncertainty: ± 0.1 dB

3.2 Differential level linearity

UUT Range	Applied	UUT Reading		
(dB)	Value (dB)	(dB)	Variation (dB)	IEC 651 Type 1 Spec.
120	84.0	84.0	+ 0.1	± 0.4 dB
	94.0	93.9 (Ref.)		
	95.0	94.9	0.0	± 0.2 dB

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



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4. Frequency Weighting

A weighting

Frequ	iency	Attenuation (d	lB)	IEC 651 Type 1	Spec.
31.5	Hz	- 39.3		$-39.4 \text{ dB}, \pm 1.5$	5 dB
63	Hz	- 26.2		- 26.2 dB, \pm 1.5	5 dB
125	Hz	- 16.2		- $16.1 \text{ dB}, \pm 1$	dB
250	Hz	- 8.7		- $8.6 \text{ dB}, \pm 1$	dB
500	Hz	- 3.2		- $3.2 \text{ dB}, \pm 1$	dB
1	kHz	0.0	(Ref)	$0 \text{ dB}, \pm 1$	dB
2	kHz	+ 1.2		+ 1.2 dB, \pm 1	dB
4	kHz	+ 1.0		+ $1.0 \text{ dB}, \pm 1$	dB
8	kHz	- 1.2		- 1.1 dB, + 1.5 dB	~ -3 dB
16	kHz	- 6.7		- 6.6 dB, + 3 dB	} ~ - ∞

Uncertainty: ± 0.1 dB

5. Time Averaging

Applied Burst duty Factor	Applied Leq Value (dB)	UUT Reading (dB)	IEC 804 Type 1 Spec.
continuous	40.0	40.0	
1/10	40.0	39.9	± 0.5 dB
$1/10^2$	40.0	39.9	
$1/10^{3}$	40.0	39.9	± 1.0 dB
1/10 ⁴	40.0	39.8	

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: 1008 hPa
- 4. The UUT was adjusted with the laboratory's sound calibrator at the reference sound pressure level before the calibration.
- 5. * Out of specification.

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