

# **Appendix C Calibration Certificates of Monitoring Equipment**



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ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 24, 2015 Rootmeter S/N 0438320 Ta (K) - 292  
 Operator Tisch Orifice I.D. - 1941 Pa (mm) - 756.92

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER	ORFICE
					DIFF Hg (mm)	DIFF H2O (in.)
1	NA	NA	1.00	1.4880	3.2	2.00
2	NA	NA	1.00	1.0510	6.4	4.00
3	NA	NA	1.00	0.9360	7.9	5.00
4	NA	NA	1.00	0.8920	8.8	5.50
5	NA	NA	1.00	0.7360	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
1.0121	0.6802	1.4258	0.9958	0.6692	0.8784
1.0078	0.9589	2.0163	0.9916	0.9434	1.2422
1.0057	1.0745	2.2543	0.9895	1.0571	1.3888
1.0046	1.1262	2.3644	0.9884	1.1080	1.4566
0.9993	1.3578	2.8515	0.9832	1.3358	1.7568
Qstd slope (m) = 2.10265			Qa slope (m) = 1.31664		
intercept (b) = -0.00335			intercept (b) = -0.00206		
coefficient (r) = 0.99999			coefficient (r) = 0.99999		
y axis = SQRT[H2O(Pa/760) (298/Ta)]			y axis = SQRT[H2O(Ta/Pa)]		

CALCULATIONS

$$Vstd = \text{Diff. Vol} [(Pa - \text{Diff. Hg}) / 760] (298 / Ta)$$

$$Qstd = Vstd / \text{Time}$$

$$Va = \text{Diff Vol} [(Pa - \text{Diff Hg}) / Pa]$$

$$Qa = Va / \text{Time}$$

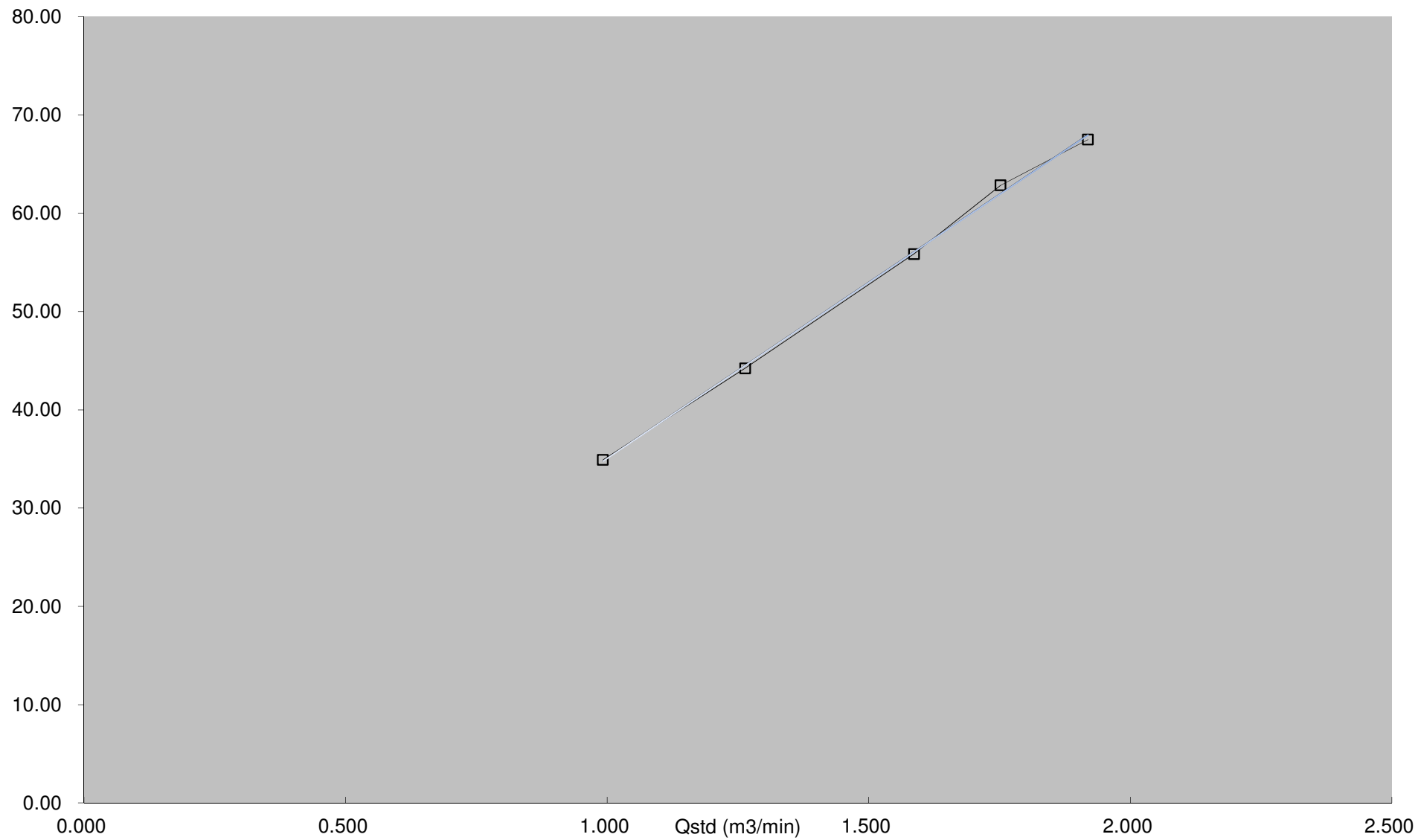
For subsequent flow rate calculations:

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

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



IC (Corrected)(ft3/min)



TEST REPORT  
for  
SOUND CALIBRATOR

Model : NC - 74

Serial No. : 34857296

Condition : Temperature 25 °C

Humidity 64 %RH

Date : September, 8, 2015

Signature : *Y. Kitajima*

1. Sound Pressure Level	94.0 ± 0.25 dB	<u>94.00 dB</u>
2. Frequency	1000 ± 7 Hz	<u>1002.0 Hz</u>
3. Distortion	3 % or less	<u>Pass</u>
4. Alarm Function		<u>Pass</u>
5. Appearance		<u>Pass</u>

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

**Model :** 2238

**Serial No. :** 2694908

## Test Conditions

**Date of Test :** 15-Oct-15

**Supply Voltage :** --

**Ambient Temperature :** (23 ± 3)°C

**Relative Humidity :** (50 ± 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:

<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
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 :**   
Steve Kwan

**Date:** 15-Oct-15

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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# Calibration Certificate

Certificate No. **508784**

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Results :

## 1. SPL Accuracy

UUT Setting				Applied Value (dB)	UUT Reading (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
	C	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 :  $\pm 0.1$  dB

## 2. Level Stability : 0.0 dB

IEC 651 Type 1 Spec. :  $\pm 0.3$  dB  
Uncertainty :  $\pm 0.1$  dB

## 3. Linearity

### 3.1 Level Linearity

UUT Range (dB)	Applied Value (dB)	UUT Reading (dB)	Variation (dB)	IEC 651 Type 1 Spec. (Primary Indicator Range)
140	114.0	113.9	0.0	$\pm 0.7$ 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 :  $\pm 0.1$  dB

### 3.2 Differential level linearity

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

Uncertainty :  $\pm 0.1$  dB





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## 4. Frequency Weighting

A weighting

Frequency	Attenuation (dB)	IEC 651 Type 1 Spec.
31.5 Hz	- 39.3	- 39.4 dB, $\pm 1.5$ dB
63 Hz	- 26.2	- 26.2 dB, $\pm 1.5$ dB
125 Hz	- 16.2	- 16.1 dB, $\pm 1$ dB
250 Hz	- 8.7	- 8.6 dB, $\pm 1$ dB
500 Hz	- 3.2	- 3.2 dB, $\pm 1$ dB
1 kHz	0.0 (Ref)	0 dB, $\pm 1$ dB
2 kHz	+ 1.2	+ 1.2 dB, $\pm 1$ dB
4 kHz	+ 1.0	+ 1.0 dB, $\pm 1$ dB
8 kHz	- 1.2	- 1.1 dB, + 1.5 dB $\sim$ -3 dB
16 kHz	- 6.7	- 6.6 dB, + 3 dB $\sim$ - $\infty$

Uncertainty :  $\pm 0.1$  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	$\pm 0.5$ dB
1/10 <sup>2</sup>	40.0	39.9	
1/10 <sup>3</sup>	40.0	39.9	$\pm 1.0$ dB
1/10 <sup>4</sup>	40.0	39.8	

Uncertainty :  $\pm 0.1$  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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