

Appendix C Calibration Certificates of Monitoring Equipment



Calibration Certificate

Certificate No. **607984**

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. : Q63261

Date of receipt : 6-Sep-16

Item Tested

Description : Sound Level Calibrator

Manufacturer : Rion

I.D. : 215901

Model : NC-74

Serial No. : 34857296

Test Conditions

Date of Test : 23-Sep-16

Supply Voltage : --

Ambient Temperature : (23 ± 3)°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:

<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S014	Spectrum Analyzer	605758	NIM-PRC & SCL-HKSAR
S240	Sound Level Calibrator	601604	NIM-PRC & SCL-HKSAR
S041	Universal Counter	607883	SCL-HKSAR
S206	Sound Level Meter	605757	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 : 
Kin Wong

Approved by : 
Alan Chu

Date: 23-Sep-16



Calibration Certificate

Certificate No. 607984

Page 2 of 2 Pages

Results :

1. Generated Sound Pressure Level

UUT Nominal Value (dB)	Measured Value (dB)	IEC 60942 Class 1 Spec.
94	94.1	± 0.4 dB

Uncertainty : ± 0.1 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	1.002 1	± 1 %

Uncertainty : ± 3.6 x 10⁻⁶

4. Total Distortion : < 1.3 %

IEC 60942 Class 1 Spec. : < 3 %

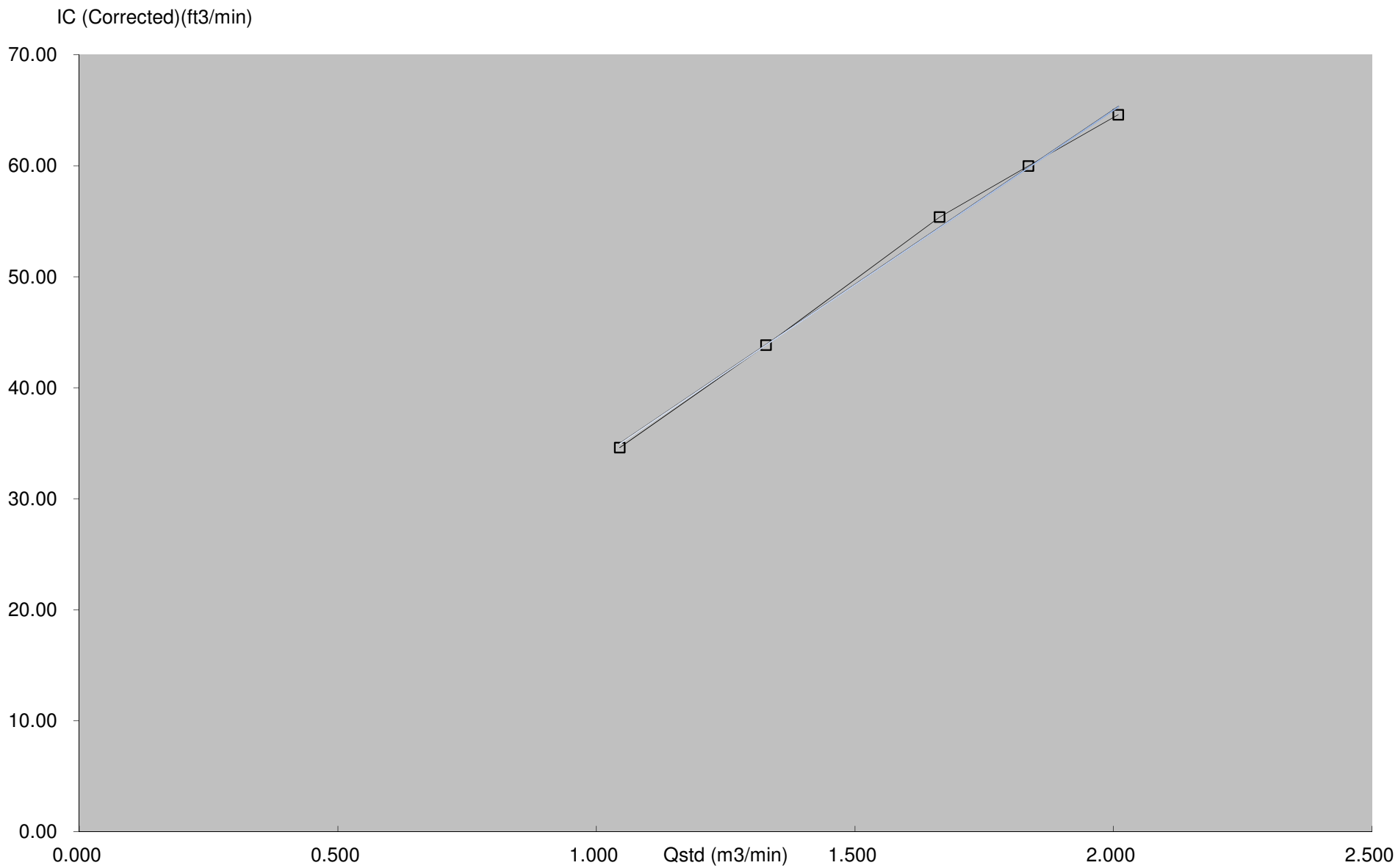
Uncertainty : ± 2.3 % of reading

Remark : 1. UUT : Unit-Under-Test

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

3. Atmospheric Pressure : 1018 hPa.

----- END -----



ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 14, 2016 Rootsmeter S/N 0438320 Ta (K) - 295
 Operator Tisch Orifice I.D. - 1612 Pa (mm) - 745.49

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3770	3.2	2.00
2	NA	NA	1.00	0.9710	6.4	4.00
3	NA	NA	1.00	0.8710	7.8	5.00
4	NA	NA	1.00	0.8310	8.7	5.50
5	NA	NA	1.00	0.6860	12.6	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9866	0.7165	1.4078	0.9957	0.7231	0.8896
0.9824	1.0117	1.9909	0.9914	1.0210	1.2581
0.9804	1.1256	2.2259	0.9894	1.1360	1.4066
0.9793	1.1785	2.3345	0.9883	1.1893	1.4753
0.9741	1.4200	2.8155	0.9830	1.4330	1.7792
Qstd slope (m) = 2.00411			Qa slope (m) = 1.25494		
intercept (b) = -0.03059			intercept (b) = -0.01933		
coefficient (r) = 0.99995			coefficient (r) = 0.99995		
y axis = SQRT[H2O(Pa/760) (298/Ta)]			y axis = SQRT[H2O(Ta/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}



專業化驗有限公司

QUALITY PRO TEST-CONSULT LIMITED

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Report of Equipment Performance Check/Calibration

Test Report No. : AF120113
Date of Issue : 20 December, 2016
Page No. : 1 of 2

PART A – CUSTOMER INFORMATION

Enovative Environmental Service Ltd.
Rm 811, Hin Pui House,
Hin Keng Estate, Tai Wai
New Territories, Hong Kong
Attn: Mr. Thomas WONG

PART B – DESCRIPTION

Name of Equipment : YSI Professional Plus (Pro Plus) Multiparameter with sensor probe
Manufacturer : YSI (a xylem brand)
Serial Number : IOD 101566
Client's Reference Number : --
Date of Received : 16 Dec, 2016
Date of Calibration : 16 Dec, 2016
Date of Next Calibration^(a) : 16 Mar, 2017

PART C – REFERENCE METHODS/ DOCUMENTS FOR THE CALIBRATION

<u>Parameter</u>	<u>Reference Method</u>
pH at 25°C	APHA 21e 4500-H ⁺ B
Dissolved Oxygen	APHA 21e 4500-O G
Conductivity at 25°C	APHA 21e 2510B
Salinity	APHA 21e 2520B
Temperature	Section 6 of international Accreditation New Zealand Technical Guide no. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

PART D – CALIBRATION RESULTS^(b,e)

pH at 25°C

Target (pH unit)	Displayed Reading ^(d) (pH Unit)	Tolerance ^(e) (pH Unit)	Results
4.00	3.96	-0.04	Satisfactory
7.42	7.37	-0.05	Satisfactory
10.01	10.05	+0.04	Satisfactory

Tolerance of pH should be less than ± 0.10 (pH unit)

~ CONTINUED ON NEXT PAGE ~

Remark(s)

- ^(a) The "Date of Next Calibration" is recommended according to best practice principals as practiced by Quality Pro Test-Consult Ltd. or quoted from relevant international standards.
- ^(b) The results relate only to the calibrated equipment as received
- ^(c) The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.
- ^(d) "Displayed Reading" denotes the figure shown on item under calibration/ checking regardless of equipment precision or significant figures.
- ^(e) The "Tolerance Limit" mentioned is the acceptance criteria applicable for similar equipment used by Quality Pro Test-Consult Ltd. or quoted from relevant international standards.

APPROVED SIGNATORY :

FUNG Yuen-ching Aries
Laboratory Manager



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Report of Equipment Performance Check/Calibration

Test Report No. : AF120113
Date of Issue : 20 December, 2016
Page No. : 2 of 2

PART D – RESULT (Cont'd)

Temperature

Reading of Ref. thermometer (°C)	Displayed Reading (°C)	Tolerance (°C)	Results
16.0	15.6	-0.4	Satisfactory
21.0	20.4	-0.6	Satisfactory
34.5	34.0	-0.5	Satisfactory

Tolerance limit of temperature should be less than ± 2.0 (°C)

Dissolved Oxygen

Reading of Ref. DO (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)	Results
0.15	0.19	+0.04	Satisfactory
3.43	3.49	+0.06	Satisfactory
8.60	8.70	+0.10	Satisfactory

Tolerance limit of dissolved oxygen should be less than ± 0.20 (mg/L)

Conductivity at 25°C

Expected Reading ($\mu\text{S}/\text{cm}$)	Displayed Reading ($\mu\text{S}/\text{cm}$)	Tolerance (%)	Results
146.9	142.5	-3.0	Satisfactory
1412	1387	-1.8	Satisfactory
12890	12804	-0.7	Satisfactory
58670	57964	-1.2	Satisfactory
111900	110282	-1.4	Satisfactory

Tolerance limit of conductivity should be less than ± 10.0 (%)

Salinity

Expected Reading (g/L)	Displayed Reading (g/L)	Tolerance (%)	Results
10	9.92	-0.8	Satisfactory
20	20.14	+0.7	Satisfactory
30	30.26	+0.9	Satisfactory

Tolerance limit of salinity should be less than ± 10.0 (%)

~ END OF REPORT ~



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Report of Equipment Performance Check/Calibration

Test Report No. : AF090104
Date of Issue : 27 Sep, 2016
Page No. : 1 of 2

PART A – CUSTOMER INFORMATION

Enovative Environmental Service Ltd.
Rm 811, Hin Pui House,
Hin Keng Estate, Tai Wai
New Territories, Hong Kong
Attn: Mr. Thomas WONG

PART B – DESCRIPTION

Name of Equipment : YSI Professional Plus (Pro Plus) Multiparameter with sensor probe
Manufacturer : YSI (a xylem brand)
Serial Number : IOD 101566
Client's Reference Number : --
Date of Received : 19 Sep, 2016
Date of Calibration : 19 Sep, 2016
Date of Next Calibration^(a) : 19 Dec, 2016

PART C – REFERENCE METHODS/ DOCUMENTS FOR THE CALIBRATION

Parameter	Reference Method
pH at 25°C	APHA 21e 4500-H ⁺ B
Dissolved Oxygen	APHA 21e 4500-O G
Conductivity at 25°C	APHA 21e 2510B
Salinity	APHA 21e 2520B
Temperature	Section 6 of international Accreditation New Zealand Technical Guide no. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

PART D – CALIBRATION RESULTS^(b,c)

pH at 25°C

Target (pH unit)	Displayed Reading ^(d) (pH Unit)	Tolerance ^(e) (pH Unit)	Results
4.00	4.05	+0.05	Satisfactory
7.42	7.38	-0.04	Satisfactory
10.01	9.98	-0.03	Satisfactory

Tolerance of pH should be less than ± 0.10 (pH unit)

Temperature

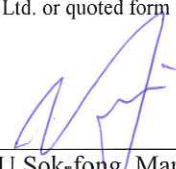
Reading of Ref. thermometer (°C)	Displayed Reading (°C)	Tolerance (°C)	Results
33.0	33.3	+0.3	Satisfactory
26.0	25.8	-0.2	Satisfactory
12.0	11.6	-0.4	Satisfactory

Tolerance limit of temperature should be less than ± 2.0 (°C)

~ CONTINUED ON NEXT PAGE ~

- ^(a) The "Date of Next Calibration" is recommended according to best practice principals as practiced by Quality Pro Test-Consult Ltd. or quoted from relevant international standards.
- ^(b) The results relate only to the calibrated equipment as received
- ^(c) The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.
- ^(d) "Displayed Reading" denotes the figure shown on item under calibration/ checking regardless of equipment precision or significant figures.
- ^(e) The "Tolerance Limit" mentioned is the acceptance criteria applicable for similar equipment used by Quality Pro Test-Consult Ltd. or quoted from relevant international standards.

APPROVED SIGNATORY :


YIU Sok-fong, Marble
Laboratory Manager



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QUALITY PRO TEST-CONSULT LIMITED

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Report of Equipment Performance Check/Calibration

Test Report No. : AF090104
Date of Issue : 27 Sep, 2016
Page No. : 2 of 2

PART D – RESULT (Con't)

Dissolved Oxygen

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)	Results
8.54	8.62	+0.08	Satisfactory
5.30	5.24	-0.06	Satisfactory
3.40	3.35	-0.05	Satisfactory

Tolerance limit of dissolved oxygen should be less than ± 0.20 (mg/L)

Conductivity at 25°C

Expected Reading ($\mu\text{S}/\text{cm}$)	Displayed Reading ($\mu\text{S}/\text{cm}$)	Tolerance (%)	Results
146.9	144.5	-1.6	Satisfactory
1412	1386	-1.8	Satisfactory
12890	12655	-1.8	Satisfactory

Tolerance limit of conductivity should be less than ± 10.0 (%)

Salinity

Expected Reading (g/L)	Displayed Reading (g/L)	Tolerance (%)	Results
0	0.00	--	Satisfactory
10	10.19	+1.9	Satisfactory
20	20.03	+0.2	Satisfactory
30	29.97	-0.1	Satisfactory

Tolerance limit of salinity should be less than ± 10.0 (%)

~ END OF REPORT ~



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Report of Equipment Performance Check/Calibration

Test Report No. : AF090105
Date of Issue : 27 Sep, 2016
Page No. : 1 of 1

PART A – CUSTOMER INFORMATION

Enovative Environmental Service Ltd.
Rm 811, Hin Pui House,
Hin Keng Estate, Tai Wai
New Territories, Hong Kong
Attn: Mr. Thomas Wong

PART B – SAMPLE INFORMATION

Description of Samples : HACH 2100Q Portable Turbidimeter
Brand Name : HACH
Model Number : 2100Q
Serial Number : 13120C029845
Equipment Number : --
Date of Received : 19 Sep, 2016
Date of Calibration : 19 Sep, 2016
Date of Next Calibration^(a) : 19 Dec, 2016

PART C – CALIBRATION REQUESTED

<u>Parameter</u>	<u>Reference Method</u>
Turbidity	APHA 21e 2130 B

PART D – RESULT^(bc)

Turbidity

Expected Reading (NTU)	Displayed Reading ^(d) (NTU)	Tolerance ^(e) (%)	Results
0	0.00	--	Satisfactory
4	3.91	-2.2	Satisfactory
20	19.9	-0.5	Satisfactory
100	97.5	-2.5	Satisfactory
800	808	+1.0	Satisfactory

Tolerance limit of turbidity should be less than ± 10.0 (%)

~ END OF REPORT ~

^(a) The "Date of Next Calibration" is recommended according to best practice principals as practiced by Quality Pro Test-Consult Ltd. or quoted from relevant international standards.

^(b) The results relate only to the tested sample as received

^(c) the performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

^(d) "Displayed Reading" presents the figures shown on item under calibration/ checking regardless of equipment precision or significant figures.

^(e) The "Tolerance Limit" mentioned is the acceptance criteria applicable for similar equipment used by Quality Pro Test-Consult Ltd. or quoted from relevant international standards.

APPROVED SIGNATORY :


YIU Sök-fong, Marble
Laboratory Manager



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Report of Equipment Performance Check/Calibration

Test Report No. : AF120114a
Date of Issue : 04 January, 2017
Page No. : 1 of 1

PART A – CUSTOMER INFORMATION

Enovative Environmental Service Ltd.
Rm 811, Hin Pui House,
Hin Keng Estate, Tai Wai
New Territories, Hong Kong
Attn: Mr. Thomas Wong

PART B – SAMPLE INFORMATION

Description of Samples : HACH 2100Q Portable Turbidimeter
Brand Name : HACH
Model Number : 2100Q
Serial Number : 13120C029845
Equipment Number : --
Date of Received : 16 Dec, 2016
Date of Calibration : 16 Dec, 2016
Date of Next Calibration^(a) : 16 Mar, 2017

PART C – CALIBRATION REQUESTED

<u>Parameter</u>	<u>Reference Method</u>
Turbidity	APHA 21e 2130 B

PART D – RESULT^(b,c)

Turbidity

Expected Reading (NTU)	Displayed Reading ^(d) (NTU)	Tolerance ^(e) (%)	Results
0	0.00	--	Satisfactory
4	4.12	+3.0	Satisfactory
20	20.9	+4.5	Satisfactory
100	105	+5.0	Satisfactory
800	817	+2.1	Satisfactory

Tolerance limit of turbidity should be less than ± 10.0 (%)

~ END OF REPORT ~

This report supersedes the previous report no. AF120114 dated 20 December 2016.

Remark(s)

^(a) The "Date of Next Calibration" is recommended according to best practice principals as practiced by Quality Pro Test-Consult Ltd. or quoted form relevant international standards.


^(b) The results relate only to the tested sample as received

^(c) the performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

^(d) "Displayed Reading" presents the figures shown on item under calibration/ checking regardless of equipment precision or significant figures.

^(e) The "Tolerance Limit" mentioned is the acceptance criteria applicable for similar equipment used by Quality Pro Test-Consult Ltd. or quoted form relevant international standards.

APPROVED SIGNATORY :


FUNG Yuen-ehing Aries
Laboratory Manager



Calibration Certificate

Certificate No. **608737**

Page 1 of 3 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. : Q63459

Date of receipt : 22-Sep-16

Item Tested

Description : Sound Level Meter

Manufacturer : B&K

I.D. : --

Model : 2238

Serial No. : 2694908

Test Conditions

Date of Test : 3-Oct-16

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.

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	601604	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), or by reference to a natural constant.
The test results apply to the above Unit-Under-Test only

Calibrated by : 
Kin Wong

Approved by : 
Alan Chu

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

Date: 3-Oct-16



Calibration Certificate

Certificate No. **608737**

Page 2 of 3 Pages

Results :

1. SPL Accuracy

UUT Setting				Applied Value (dB)	UUT Reading (dB)
Range	Freq. Wgt.	Bandwith	Center Freq.		
20 ~ 100	A	BB/F	--	94.0	94.0
	A	BB/S	--		94.0
	C	BB/F	--		94.0
40 ~ 120	A	BB/F	--	94.0	94.0
	A	BB/F	--	114.0	114.2

IEC 60651 Type 1 Spec. : ± 0.7 dB

Uncertainty : ± 0.1 dB

2. Level Stability : 0.0 dB

IEC 60651 Type 1 Spec. : ± 0.3 dB

Uncertainty : ± 0.1 dB

3. Linearity

3.1 Level Linearity

UUT Range (dB)	Applied Value (dB)	UUT Reading (dB)	Variation (dB)	IEC 60651 Type 1 Spec. (Primary Indicator Range)
140	114.0	114.0	0.0	± 0.7 dB
130	104.0	104.0	0.0	
120	94.0	94.0 (Ref.)	--	
110	84.0	84.0	0.0	
100	74.0	74.0	0.0	
90	64.0	64.0	0.0	
80	54.0	54.0	0.0	

Uncertainty : ± 0.1 dB

3.2 Differential level linearity

UUT Range (dB)	Applied Value (dB)	UUT Reading (dB)	Variation (dB)	IEC 60651 Type 1 Spec.
120	84.0	84.1	+0.1	± 0.4 dB
	94.0	93.9 (Ref.)	--	
	95.0	95.0	0.0	± 0.2 dB

Uncertainty : ± 0.1 dB



Calibration Certificate

Certificate No. 608737

Page 3 of 3 Pages

4. Frequency Weighting

A weighting

Frequency	Attenuation (dB)	IEC 60651 Type 1 Spec.
31.5 Hz	-39.3	- 39.4 dB, ± 1.5 dB
63 Hz	-26.2	- 26.2 dB, ± 1.5 dB
125 Hz	-16.2	- 16.1 dB, ± 1 dB
250 Hz	-8.7	- 8.6 dB, ± 1 dB
500 Hz	-3.2	- 3.2 dB, ± 1 dB
1 kHz	0.0 (Ref)	0 dB, ± 1 dB
2 kHz	+1.2	+ 1.2 dB, ± 1 dB
4 kHz	+1.0	+ 1.0 dB, ± 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 60804 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	39.5	

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 : 1013 hPa
 4. The UUT was adjusted with the laboratory's sound calibrator at the reference sound pressure level before the calibration.

----- END -----