

Appendix C Calibration Certificates of Monitoring Equipment



Enovative Environmental Service Limited

REPORT OF EQUIPMENT CALIBRATION

INSTRUMENT DESCRIPTION

It is certified that the item under calibration has been calibrated by corresponding calibrated High Volume Sampler and the filter paper is weighted by HOKLAS laboratory.

Instrument:	Handheld TSP meter
Brand Name:	TSI
Model No.:	AM510
Serial No.:	11008019
Date Received:	16/10/2013
Date of Issue:	27/10/2013
Date of Calibration:	22/10/2013
Date of Next Calibration :	22/10/2014

ISSUING ORGANISATION

Phone:

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Address

Enovative Environmental Service Limited

Flat 6, 3/F, Block E, Wah Lok Industrial Centre 31-35 Shan Mei Street Shatin, N.T. Hong Kong

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Enovative Environmental Service Limited

Brand Name:	TSI
Model No.:	AM510
Serial No.:	11008019
HVS No.:	A12-TSP-102
HVS Calibration Kit No.:	Tisch 1941
Date of Calibration:	22/10/2013
Date of next Calibration:	22/10/2014

Calibration Record

HVS - TSP ug/m3	121.5	57.8	63.2	69.4
TSI AM510	131.1	58.5	64.9	73.3



*** Filter paper being used in the calibratior 205472, 205476, 205480, 205483 Those filter papers are weighted by HOKLAS laboratory (ALS Technichem (HK) Pty Ltd.)

1smas

Mr Wong Siu Ho, Thomas Manager



TISCH ENVIROMENTAL, INC. 145 SOUTH MIAMI AVE. VILLAGE OF CLEVES, OH 45002 513.467.9000 877.263.7610 TOLL FREE 513.467.9009 FAX WWW.TISCH-ENV.COM

AIR POLLUTION MONITORING EQUIPMENT ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Ap Operator	or 09, 2013 Tisch	Rootsmeter Orifice I.I	S/N 04	438320 1941 	Ta (K) - Pa (mm) -	296 - 751.84
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 1.00	DIFF TIME (min) 1.4710 1.0370 0.9270 0.8840 0.7300	METER DIFF Hg (mm) 3.3 6.4 7.9 8.8 12.8	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)
0.9916	0.6741	1.4113		0.9956	0.6768	0.8874
0.9874	0.9521	1.9959		0.9914	0.9560	1.2549
0.9854	1.0630	2.2315		0.9894	1.0673	1.4030
0.9843	1.1134	2.3405		0.9883	1.1180	1.4715
0.9790	1.3410	2.8227		0.9829	1.3465	1.7747
Qstd slop	pe (m) =	2.11662		Qa slope	e (m) =	1.32539
intercept	t (b) =	-0.01714		intercept	t (b) =	-0.01078
coefficie	ent (r) =	0.99999		coefficie	ent (r) =	0.99999
y axis =	SQRT [H2O (H	Pa/760) (298/1	[a)]	y axis =	SQRT [H20 (1	[a/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	Date:	March 4, 2014
Sampler: TE-5170 MFC	(Serial # : 2359) Tech:	Sam Wong

	CONDITIONS						
Barometric Pressure	(in Hg):	40.05	Corrected Pressure	(mm Hg):	1017		
Temperature	(deg F):	62	Temperature	(deg K):	290		
Average Press.	(in Hg):	40.05	Corrected Average	(mm Hg):	1017		
Average Temp.	(deg F):	62	Average Temp.	(deg K):	290		

CALIBRATION ORIFICE				
Make:	Tisch	Ostd Slope:	2.11662	
Model:	TE-5025A	Qstd Intercept:	-0.01714	
Serial#:	1941	Date Certified:	April 9, 2013	

CALIBRATIONS						
Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
1	12.00	1.929	58.0	68.06	Slope =	34.9931
2	10.00	1.761	52.0	61.02	Intercept =	0.1468
3	8.20	1.596	48.0	56.33	Corr. coeff.=	0.9994
4	5.20	1.272	38.0	44.59		
5	3.20	1.000	30.0	35.20	<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





Certificate No.	ertificate No. 37521			1 of 2 Pages
Customer :	Enovative Environmental Service	e Limited		
Address :	Room 3, 12/F., New City Centre	, 2 Lei Yue Mun Roa	id, Kwun Tong, K	owloon, H.K.
Order No. :	Q32432		Date of receipt	: 16-Oct-13
Item Tested				
Description :	Sound Level Calibrator			
Manufacturer :	B&K			
Model :	Туре 4231		Serial No.	: 2685684
Test Conditi	ons			
Date of Test :	31-Oct-13		Supply Voltage	:
Ambient Temp	erature : $(23 \pm 3)^{\circ}C$		Relative Humid	lity: (50 ± 25) %
Test Specifi	cations			
Calibration cher	ck			
Ref. Document	Procedure : F21, Z02.			
*				
Test Results	6			
All results were	within the IEC 942 Class 1 speci	fication.		
The results are	shown in the attached page(s).			
Main Test equir	oment used:			
Equipment No.	Description	Cert. No.		Traceable to
S014	Spectrum Analyzer	35730		NIM-PRC & SCL-HKSAR
S205	Ref. Sound Level Calibrator	PHCO40002		SCL-HKSAR
S041	Universal Counter	34621		SCL-HKSAR
S206	Sound Level Meter	36203		SCL-HKSAR
S031	61/2 dgt. Multimeter	30128		NIM-PRC
	à	x .		
The values given ir will not include allo overloading, mis-ha for any loss or dam	this Calibration Certificate only relate to wance for the equipment long term drift, v andling, or the capability of any other labor age resulting from the use of the equipm	the values measured at f variations with environme oratory to repeat the mea ent.	he time of the test an ntal changes, vibratic surement. Hong Kon	nd any uncertainties quoted on and shock during transportation, ng Calibration Ltd. shall not be liable
The test equipment The test results ap	t used for calibration are traceable to Inte ply to the above Unit-Under-Test only	rnational System of Units	s (SI).	·

Calibrated by : Dorothy Cheuk

Appro	ved by :	atore
		Steve Kwan
Date:	31-Oct-13	

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



Certificate No. 37521

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Results :

1. Level Accuracy

UUT Nominal Value (dB)	Measured Value (dB)	IEC 942 Class 1 Spec.
94	94.08	$\pm 0.3 \text{ dB}$
114	114.07	

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

2. Frequency

UUT Nominal Value	Measured Value	IEC 942 Class 1 Spec.
1 kHz	1.002 kHz	± 2 %

Uncertainty : \pm 3.6 x 10 ⁻⁶

- Level Stability : 0.0 dB IEC 942 Class 1 Spec. : ± 0.1 dB Uncertainty : ± 0.01 dB
- 4. Total Harmonic Distortion : < 0.7 % IEC 942 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 : 1014 hPa.

----- END -----



Certificate No.	36604		Page	1 of 4	Pages
Customer :	Enovative Environmental Service	Limited			
Address :	Room 3, 12/F., New City Centre,	2 Lei Yue Mun Roa	ad, Kwun Tong, K	lowloon, H.K.	
Order No. :	Q32395		Date of receipt	:	4-Sep-13
Item Tested					
Description : Manufacturer : Model :	Sound Level Meter (N12-RION-0 Rion NL-52	04)	Serial No.	: 002205	53
Test Conditi	ons				
Date of Test :	10-Sep-13		Supply Voltage	;	5) 0/
Ambient Temp	erature : $(23 \pm 3)^{\circ}$ C		Relative Humid	IITY : (50 ± 25)	<i>)</i> %
Test Specific	cations				
Calibration chec Ref. Document/	sk. Procedure: Z01.				
Test Results	6				
All results were The results are	within the IEC 61672 Type1 spec shown in the attached page(s).	ification.			
Main Test equip	oment used:				
Equipment No.	Description	Cert. No.		Traceable to	2
S017	Multi-Function Generator	C127181		SCL-HKSAF	२
S205	Ref. Sound Level Calibrator	PHCO40002		SCL-HKSAF	2
The values given in	this Calibration Certificate only relate to	the values measured at	the time of the test a	nd any uncertain	ties 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 : **Dorothy Cheuk**

Approved by : _

Steve Kwan

Date: 16-Sep-13

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



Certificate No. 36604

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Results :

1. Self-generated noise: 16.4 dBA (Mfr's Spec ≤ 17 dBA)

2. Acoustical signal test

U	UT Setting			
Level Range (dB)	Weight	Response	Applied Value (dB)	UUT Reading (dB)
30-130	LA	Fast	94.0	94.0
		Slow		94.0
	L _C	Fast		94.0
	Lz	Fast		94.0
	LA	Fast	114.0	114.0
		Slow		114.0
	L _C	Fast		114.0
	Lz	Fast		114.0

IEC 61672 Type 1 Spec. : \pm 1.1 dB Uncertainty : \pm 0.1 dB

3 Electrical signal tests of frequency weightings (A weighting)

Frequency	Attenuation (dB)	IEC 61672 Type 1 Spec.
31.5 Hz	-39.8	- 39.4 dB, ± 2 dB
63 Hz	-26.4	- 26.2 dB, ± 1.5 dB
125 Hz	-16.3	- 16.1 dB, ± 1.5 dB
250 Hz	-8.7	- 8.6 dB, ± 1 dB
500 Hz	-3.3	- $3.2 \text{ dB}, \pm 1.4 \text{ dB}$
1 kHz	0.0 (Ref)	0 dB, ± 1.1 dB
2 kHz	+1.2	$+$ 1.2 dB, \pm 1.6 dB
4 kHz	+0.9	+ 1.0 dB, ± 1.6 dB
8 kHz	-1.1	- 1.1 dB, + 2.1 dB ~ -3.1 dB
16 kHz	-8.0	- $6.6 \text{ dB}, + 3.5 \text{ dB} \sim -17.0 \text{ dB}$

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



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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.
A	94.0	94.0 (Ref.)		$\pm 0.4 \text{ dB}$
С	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 : $\pm 0.1 \text{ dB}$

5. Level linearity on the reference level range

	Applied			
UUT Range	Value (dB)	UUT Reading (dB)	Difference (dB)	IEC 61672 Type 1 Spec.
130 dB	129.0	129.0	0.0	± 1.1 dB
(Ref Level)	124.0	124.0	0.0	
	119.0	119.0	0.0	
r.	114.0	114.0	0.0	
	109.0	109.0	0.0	
	104.0	104.0	0.0	
	99.0	99.0	0.0	
	94.0	94.0 (Ref)		
к.	89.0	89.0	0.0	
	84.0	84.0	0.0	
	. 79.0	79.0	0.0	
	74.0	74.0	0.0	
	69.0	69.0	0.0	
	64.0	64.0	0.0	
	59.0	59.0	0.0	
	54.0	54.0	0.0	
	49.0	49.0	0.0	
	44.0	44.0	0.0	

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



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6. Toneburst response (4kHz)

UUT	Tone Burst	UUT	Difference	IEC 61672
Setting	Duration(ms)	Reading(dB)	(dB)	Type 1 Spec.
Fast	Steady	127.0(Ref)		
	200	126.0	-1.0	-1.0 ± 0.8 dB
	2	108.9	-18.1	-18.0, +1.3 dB ~ -1.8 dB
	0.25	99.9	-27.1	-27.0, +1.3 dB ~ -3.3 dB
Slow	Steady	127.0(Ref)		
	200	120.2	-6.8	-7.4 ± 0.8 dB
	2	100.6	-26.4	-27.0, +1.3 dB ~ -3.3 dB
Time	Steady	127.0(Ref)		
averaging	200	120.1	-6.9	-7.0±0.8dB
	2	99.5	-27.5	-27.0, +1.3 dB ~ -1.8 dB
	0.25	91.7	-35.3	-36.0, +1.3 dB ~ -3.3 dB

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

7. Overload indication (130 dB range, A-weighted, Time-average, 4kHz)

UUT Reading at overload (dB)			
+ ve one half cycle	- ve one half cycle	Difference (dB)	IEC 61672 Type 1 Spec.
138.4	138.2	0.2	< 1.8 dB

The overload indicator latched on until reset 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 : 996 hPa.
- 4. Preamplifier model : NH-25, S/N : 10553
- 5. Firmware Version: 1.2
- 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 -----



ALS Technichem (HK) Pty Ltd 11/F, Chung Shun Knitting Centre 1-3 Wing Yip Street Kwai Chung, N.T., Hong Kong T: +852 2610 1044 F: +852 2610 2021 www.alsglobal.com

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT: MR THOMAS WONG CLIENT: ENOVATIVE ENVIRONMENTAL SERVICE LTD ADDRESS: RM811, HIN PUI HOUSE, HIN KENG ESTATE, TAI WAI, N.T., HONG KONG

WORK ORDER:	HK1403404
LABORATORY:	HONG KONG
DATE RECEIVED:	04/02/2014
DATE OF ISSUE:	20/02/2014

PROJECT:

COMMENTS

It is certified that the item under calibration/checking has been calibrated/checked by corresponding calibrated equipment in the laboratory. Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the

Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal aceptance criteria of ALS will be followed.

Scope of Test:	Turbidity
Description:	Turbidimeter
Brand Name:	HACH
Model No.:	2100Q is
Serial No.:	11050C001264
Equipment No.:	
Date of Calibration:	04 February, 2014

NOTES

This is the Final Report and supersedes any preliminary report with this batch number. Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Mr. Fung Lim Chee, Richard General Manager -Greater China & Hong Kong

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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: Date of Issue: Client: HK1403404 20/02/2014 ENOVATIVE ENVIRONMENTAL SERVICE LTD



Description:	Turbidimeter
Brand Name:	HACH
Model No.:	2100Q is
Serial No.:	11050C001264
Equipment No.:	
Date of Calibration:	04 February, 2014

Parameters:

Turbidity

Method Ref: APHA 21st Ed. 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.18	
4	4.09	2.3
40	38.0	-5.0
80	87.4	9.3
400	364	-9.0
800	823	2.9
	Tolerance Limit (±%)	10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Mr. Fung Lim Cl e, Richard General Manager

Greater China & Hong Kong





ALS Technichem (HK) Pty Ltd 11/F, Chung Shun Knitting Centre 1-3 Wing Yip Street Kwai Chung, N.T., Hong Kong T: +852 2610 1044 F: +852 2610 2021 www.alsglobal.com

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT: MR THOMAS WONG CLIENT: ENOVATIVE ENVIRONMENTAL SERVICE LIMITED ADDRESS: RM 3704, SIK MAN HOUSE, HOMANTIN ESTATE, KOWLOON, HONG KONG PROJECT: --

WORK ORDER:	HK1334794
LABORATORY:	HONG KONG
DATE RECEIVED:	01/12/2013
DATE OF ISSUE:	27/12/2013

COMMENTS

It is certified that the item under calibration/checking has been calibrated/checked by corresponding calibrated equipment in the laboratory. Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of ALS will be followed.

Scope of Test:Conductivity, Dissolved Oxygen, pH, Salinity and TemperatureEquipment Type:MultimeterBrand Name:YSIModel No.:Professional PlusSerial No.:09K100735Equipment No.:--Date of Calibration:01 December, 2013

NOTES

This is the Final Report and supersedes any preliminary report with this batch number. Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Mr. Fung Lim Chee, Richard General Manager -Greater China & Hong Kong

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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order:	HK1334794
Date of Issue:	27/12/2013
Client:	ENOVATIVE ENVIRONMENTAL SERVICE LIMITED



Description: Brand Name: Model No.: Serial No.: Equipment No.: Date of Calibration: Parameters:	Multimeter YSI Professional Plus 09K100735 01 December, 2013	Date of next Calibration:	01 March, 2014
Conductivity	Method Ref: APHA (21st edition	on), 2510B	
	Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
	146.9 6667 12890 58670	148.9 6326 12227 54000	1.4 -5.1 -5.1 -8.0
		Tolerance Limit (±%)	10.0
Dissolved Oxygen	Method Ref: APHA (21st edition Expected Reading (mg/L) 3.11 5.16 8.82	on), 45000: G Displayed Reading (mg/L) 3.30 5.36 8.82 Tolerance Limit (±mg/L)	Tolerance (mg/L) 0.19 0.20 0.00 0.20
pH Value	Method Ref: APHA 21st Ed. 45	00H:B	
	Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
	4.0 7.0 10.0	4.20 7.16 10.06 Tolerance Limit (±pH unit)	0.20 0.16 0.06 0.20
Salinity	Method Ref: APHA (21st editio	on), 2520B	- 1 (6)
	Expected Reading (ppt)	Displayed Reading (ppt)	l olerance (%)

l	Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
I	0	0.00	
I	10	10.09	0.9
I	20	20.01	0.1
	30	30.26	0.9
I			
		Tolerance Limit (±%)	10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Mr. Fung Lim Chee, Richard General Manager -Greater China & Hong Kong

ALS Technichem (HK) Pty Ltd ALS Environmental

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order:HK1334794Date of Issue:27/12/2013Client:ENOVATIVE ENVIRONMENTAL SERVICE LIMITED



2014

Description: Brand Name:	Multimeter YSI		
Model No.:	Professional Plus		
Serial No.:	09K100735		
Equipment No.:			
Date of Calibration:	01 December, 2013	Date of next Calibration:	01 March,

Parameters:

Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical

Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
9.0	8.4	-0.6
20.0	19.6	-0.4
38.0	38.3	0.3
	Tolerance Limit (±°C)	2.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Mr. Fung Lim Chee, Richard General Manager -Greater China & Hong Kong

