

E. Calibration Certificates

Appendix E
Calibration Record
(Air Quality Monitoring)

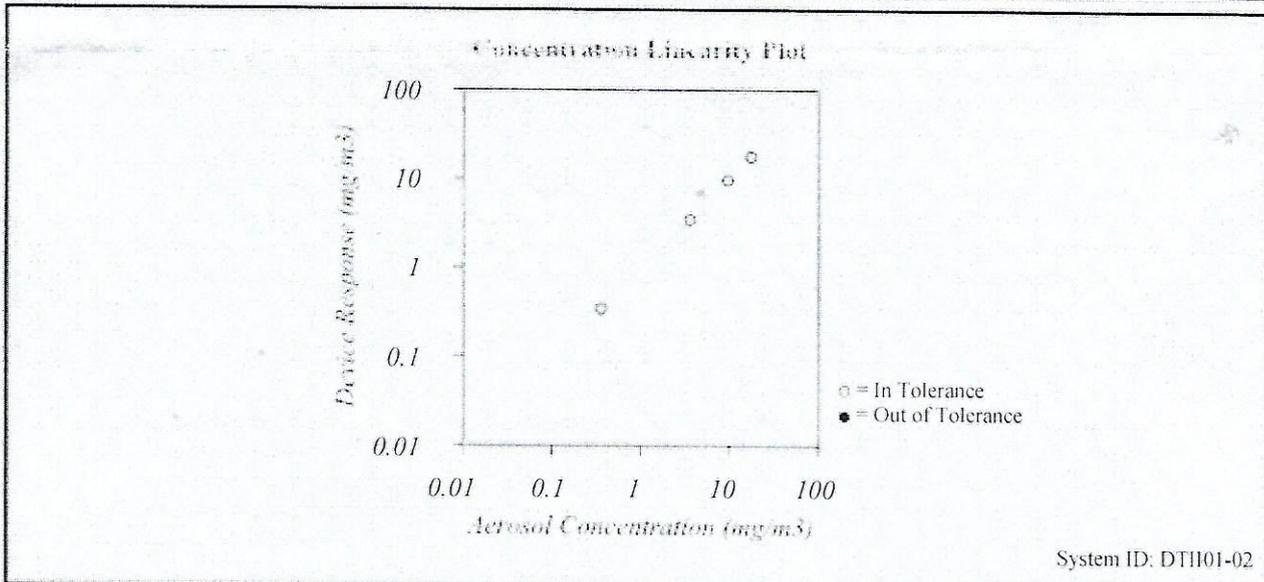


CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
 Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 <http://www.tsi.com>

Environment Conditions			Model	AM510
Temperature	74.14 (23.4)	°F (°C)	Serial Number	11011005
Relative Humidity	46.0	%RH		
Barometric Pressure	29.09 (985.1)	inHg (hPa)		

- | | |
|---|--|
| <input checked="" type="checkbox"/> As Left | <input checked="" type="checkbox"/> In Tolerance |
| <input type="checkbox"/> As Found | <input type="checkbox"/> Out of Tolerance |



CONCENTRATION				Unit: mg/m3			
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	9.539	9.700	8.585~10.493	3	3.542	3.507	2.479~4.605
2	0.354	0.334	0.301~0.407	4	17.151	17.681	15.436~18.866

TSI Incorporated does hereby certify that all materials, components, and workmanship used in the manufacture of this equipment are in strict accordance with the applicable specifications agreed upon by TSI and the customer and with all published specifications. All performance and acceptance tests required under this contract were successfully conducted according to required specifications. There is no NIST standard for optical mass measurements. Calibration of this instrument performed by TSI has been done using emery oil and has been nominally adjusted to respirable mass per standard ISO 12103-1, A1 test dust (Arizona dust). Our calibration ratio is greater than 4:1

<table style="width: 100%; border: none;"> <tr> <th>Measurement Variable</th> <th>System ID</th> <th>Last Cal.</th> <th>Cal. Due</th> </tr> <tr> <td>Temp/Humidity</td> <td>E005409</td> <td>10-19-17</td> <td>10-31-18</td> </tr> <tr> <td>DC Voltage</td> <td>E003314</td> <td>05-02-18</td> <td>05-31-19</td> </tr> <tr> <td>Photometer</td> <td>E003319</td> <td>07-31-18</td> <td>01-31-19</td> </tr> <tr> <td>Pressure</td> <td>E003511</td> <td>10-02-17</td> <td>10-31-18</td> </tr> </table>	Measurement Variable	System ID	Last Cal.	Cal. Due	Temp/Humidity	E005409	10-19-17	10-31-18	DC Voltage	E003314	05-02-18	05-31-19	Photometer	E003319	07-31-18	01-31-19	Pressure	E003511	10-02-17	10-31-18	<table style="width: 100%; border: none;"> <tr> <th>Measurement Variable</th> <th>System ID</th> <th>Last Cal.</th> <th>Cal. Due</th> </tr> <tr> <td>Temp/Humidity</td> <td>E005410</td> <td>10-19-17</td> <td>10-31-18</td> </tr> <tr> <td>DC Voltage</td> <td>E003315</td> <td>05-17-18</td> <td>05-31-19</td> </tr> <tr> <td>Microbalance</td> <td>M001324</td> <td>11-02-16</td> <td>11-30-18</td> </tr> <tr> <td>Flowmeter</td> <td>E002471</td> <td>04-16-18</td> <td>04-30-19</td> </tr> </table>	Measurement Variable	System ID	Last Cal.	Cal. Due	Temp/Humidity	E005410	10-19-17	10-31-18	DC Voltage	E003315	05-17-18	05-31-19	Microbalance	M001324	11-02-16	11-30-18	Flowmeter	E002471	04-16-18	04-30-19
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Flowmeter	E002471	04-16-18	04-30-19																																						

Tom Wang

Calibrated

August 2, 2018

Date

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR1
Calibrated by : W.Y.Tam
Date : 02/11/2018

Sampler

Model : GMWS-2310 ACCU-VOL
Serial Number : S/N 0816

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 19 Mar 2018
Slope (m) : 2.05242
Intercept (b) : -0.01383
Correlation Coefficient(r) : 0.99994

Standard Condition

Pstd (hpa) : 1013
Tstd (K) : 298.18

Calibration Condition

Pa (hpa) : 1002
Ta(K) : 299

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC	Y
1 18 holes	10.6	3.233	1.582	60	59.57
2 13 holes	7.7	2.755	1.349	52	51.63
3 10 holes	6.2	2.472	1.211	47	46.67
4 7 holes	4.5	2.106	1.033	39	38.72
5 5 holes	3.0	1.720	0.845	30	29.79

Sampler Calibration Relationship

Slope(m):40.409 Intercept(b):-3.376 Correlation Coefficient(r): 0.9967

Checked by: Magnum Fan

Date: 03/11/2018

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR2A
 Calibrated by : W.Y.Tam
 Date : 02/11/2018

Sampler

Model : GMWS-2310 ACCU-VOL
 Serial Number : S/N 0890

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
 Service Date : 19 Mar 2018
 Slope (m) : 2.05242
 Intercept (b) : -0.01383
 Correlation Coefficient(r) : 0.99994

Standard Condition

Pstd (hpa) : 1013
 Tstd (K) : 298.18

Calibration Condition

Pa (hpa) : 1002
 Ta(K) : 299

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC	Y
1 18 holes	11.8	3.411	1.669	53	52.62
2 13 holes	9.7	3.092	1.513	48	47.66
3 10 holes	7.0	2.627	1.287	40	39.72
4 7 holes	5.2	2.264	1.110	32	31.77
5 5 holes	3.8	1.936	0.950	24	23.83

Sampler Calibration Relationship

Slope(m):39.811 Intercept(b):-12.859 Correlation Coefficient(r): 0.9961

Checked by: Magnum Fan

Date: 03/11/2018

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR3
Calibrated by : W.Y.Tam
Date : 02/11/2018

Sampler

Model : GMWS-2310 ACCU-VOL
Serial Number : S/N 0764

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 19 Mar 2018
Slope (m) : 2.05242
Intercept (b) : -0.01383
Correlation Coefficient(r) : 0.99994

Standard Condition

Pstd (hpa) : 1013
Tstd (K) : 298.18

Calibration Condition

Pa (hpa) : 1002
Ta(K) : 299

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC	Y
1 18 holes	11.4	3.352	1.640	60	59.57
2 13 holes	9.0	2.979	1.458	55	54.61
3 10 holes	7.1	2.646	1.296	48	47.66
4 7 holes	4.3	2.059	1.010	42	41.70
5 5 holes	2.8	1.661	0.816	36	35.74

Sampler Calibration Relationship

Slope(m):28.653 Intercept(b):12.213 Correlation Coefficient(r): 0.9950

Checked by: Magnum Fan

Date: 03/11/2018

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR4
Calibrated by : W.Y.Tam
Date : 02/11/2018

Sampler

Model : GMWS-2310 ACCU-VOL
Serial Number : S/N 1043

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 19 Mar 2018
Slope (m) : 2.05242
Intercept (b) : -0.01383
Correlation Coefficient(r) : 0.99994

Standard Condition

Pstd (hpa) : 1013
Tstd (K) : 298.18

Calibration Condition

Pa (hpa) : 1002
Ta(K) : 299

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC	Y
1 18 holes	11.0	3.293	1.611	57	56.59
2 13 holes	8.4	2.878	1.409	51	50.64
3 10 holes	6.2	2.472	1.211	45	44.68
4 7 holes	4.5	2.106	1.033	37	36.74
5 5 holes	2.5	1.570	0.772	30	29.79

Sampler Calibration Relationship

Slope(m):32.752 Intercept(b):4.149 Correlation Coefficient(r): 0.9928

Checked by: Magnum Fan

Date: 03/11/2018

Appendix E
Calibration Record
(Noise Monitoring)



Certificate of Calibration 校正證書

Certificate No. : C186446
證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC18-2352) Date of Receipt / 收件日期 : 14 November 2018

Description / 儀器名稱 : Acoustic Calibrator
Manufacturer / 製造商 : Casella
Model No. / 型號 : CEL-120/1
Serial No. / 編號 : 3421612
Supplied By / 委託者 : Envirotech Services Co.
Room 113, 1/F, My Loft, 9 Hoi Wing Road, Tuen Mun,
New Territories, Hong Kong

TEST CONDITIONS / 測試條件

Temperature / 溫度 : $(23 \pm 2)^{\circ}\text{C}$ Relative Humidity / 相對濕度 : $(50 \pm 25)\%$
Line Voltage / 電壓 : ---

TEST SPECIFICATIONS / 測試規範

Calibration check

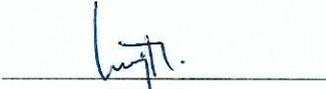
DATE OF TEST / 測試日期 : 24 November 2018

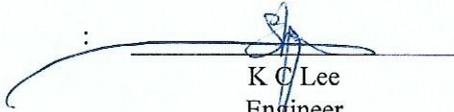
TEST RESULTS / 測試結果

The results apply to the particular unit-under-test only.
The results do not exceed manufacturer's specification.
The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- The Bruel & Kjaer Calibration Laboratory, Denmark
- Agilent Technologies / Keysight Technologies
- Rohde & Schwarz Laboratory, Germany
- Fluke Everett Service Center, USA

Tested By : 
測試 : H T Wong
Technical Officer

Certified By : 
核證 : K C Lee
Engineer

Date of Issue : 27 November 2018
簽發日期

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

本證書所載校正用之測試器材均可溯源至國際標準。局部複印本證書需先獲本實驗所書面批准。



輝創工程有限公司

Sun Creation Engineering Limited

Calibration & Testing Laboratory

Certificate of Calibration

校正證書

Certificate No. : C186446

證書編號

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours before the commencement of the test.
- The results presented are the mean of 3 measurements at each calibration point.
- Test equipment :

<u>Equipment ID</u>	<u>Description</u>	<u>Certificate No.</u>
CL130	Universal Counter	C183775
CL281	Multifunction Acoustic Calibrator	CDK1806821
TST150A	Measuring Amplifier	C181288

- Test procedure : MA100N.

- Results :

5.1 Sound Level Accuracy

UUT Nominal Value	Measured Value (dB)	Mfr's Spec. (dB)	Uncertainty of Measured Value (dB)
94 dB, 1 kHz	94.0	± 0.25	± 0.2
114 dB, 1 kHz	114.0		

5.2 Frequency Accuracy

UUT Nominal Value (kHz)	Measured Value (kHz)	Mfr's Spec. Spec.	Uncertainty of Measured Value (Hz)
1	1.000 0	1 kHz ± 5 Hz	± 0.1

Remark : The uncertainties are for a confidence probability of not less than 95 %.

Note :

Only the original copy or the laboratory's certified true copy is valid.

The values given in this 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 environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

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Sun Creation Engineering Limited – Calibration & Testing Laboratory

c/o 4/F, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong

輝創工程有限公司 — 校正及檢測實驗室

c/o 香港新界屯門興安里一號四樓

Tel/電話: (852) 2927 2606

Fax/傳真: (852) 2744 8986

E-mail/電郵: callab@suncreation.com

Website/網址: www.suncreation.com



輝創工程有限公司

Sun Creation Engineering Limited

Calibration & Testing Laboratory

Certificate of Calibration

校正證書

Certificate No. : C182192

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC18-0729)

Date of Receipt / 收件日期 : 6 April 2018

Description / 儀器名稱 : Sound Level Meter

Manufacturer / 製造商 : Rion

Model No. / 型號 : NL-52

Serial No. / 編號 : 00331806

Supplied By / 委託者 : Envirotech Services Co.

Room 113, 1/F, My Loft, 9 Hoi Wing Road, Tuen Mun,
New Territories, Hong Kong

TEST CONDITIONS / 測試條件

Temperature / 溫度 : $(23 \pm 2)^{\circ}\text{C}$

Relative Humidity / 相對濕度 : $(50 \pm 25)\%$

Line Voltage / 電壓 : ---

TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 28 April 2018

TEST RESULTS / 測試結果

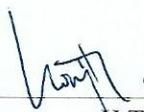
The results apply to the particular unit-under-test only.

The results do not exceed manufacturer's specification.

The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- Agilent Technologies / Keysight Technologies
- Rohde & Schwarz Laboratory, Germany
- Fluke Everett Service Center, USA

Tested By : 
測試

H T Wong
Technical Officer

Certified By : 
核證

K C Lee
Engineer

Date of Issue : 3 May 2018
簽發日期

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

本證書所載校正用之測試器材均可溯源至國際標準。局部複印本證書需先獲本實驗所書面批准。

Sun Creation Engineering Limited - Calibration & Testing Laboratory

c/o 4/F, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong

輝創工程有限公司 - 校正及檢測實驗室

c/o 香港新界屯門興安里一號四樓

Tel/電話: (852) 2927 2606

Fax/傳真: (852) 2744 8986

E-mail/電郵: callab@suncreation.com

Website/網址: www.suncreation.com



輝創工程有限公司

Sun Creation Engineering Limited
Calibration & Testing Laboratory

Certificate of Calibration 校正證書

Certificate No. : C182192
證書編號

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours, and switched on to warm up for over 10 minutes before the commencement of the test.
- Self-calibration was performed before the test.
- The results presented are the mean of 3 measurements at each calibration point.
- Test equipment :

Equipment ID	Description	Certificate No.
CL280	40 MHz Arbitrary Waveform Generator	C180024
CL281	Multifunction Acoustic Calibrator	PA160023

- Test procedure : MA101N.

- Results :

- 6.1 Sound Pressure Level

- 6.1.1 Reference Sound Pressure Level

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
30 - 130	L _A	A	Fast	94.00	1	93.4	± 1.1

- 6.1.2 Linearity

UUT Setting				Applied Value		UUT Reading (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	
30 - 130	L _A	A	Fast	94.00	1	93.4 (Ref.)
				104.00		103.4
				114.00		113.4

IEC 61672 Class 1 Spec. : ± 0.6 dB per 10 dB step and ± 1.1 dB for overall different.

- 6.2 Time Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
30 - 130	L _A	A	Fast	94.00	1	93.4	Ref.
			Slow				

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

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Sun Creation Engineering Limited – Calibration & Testing Laboratory

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Certificate of Calibration

校正證書

Certificate No. : C182192
證書編號

6.3 Frequency Weighting

6.3.1 A-Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
30 - 130	L _A	A	Fast	94.00	63 Hz	67.1	-26.2 ± 1.5
					125 Hz	77.2	-16.1 ± 1.5
					250 Hz	84.7	-8.6 ± 1.4
					500 Hz	90.2	-3.2 ± 1.4
					1 kHz	93.4	Ref.
					2 kHz	94.6	+1.2 ± 1.6
					4 kHz	94.4	+1.0 ± 1.6
					8 kHz	92.4	-1.1 (+2.1 ; -3.1)
					12.5 kHz	89.0	-4.3 (+3.0 ; -6.0)

6.3.2 C-Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
30 - 130	L _C	C	Fast	94.00	63 Hz	92.5	-0.8 ± 1.5
					125 Hz	93.2	-0.2 ± 1.5
					250 Hz	93.4	0.0 ± 1.4
					500 Hz	93.4	0.0 ± 1.4
					1 kHz	93.4	Ref.
					2 kHz	93.3	-0.2 ± 1.6
					4 kHz	92.6	-0.8 ± 1.6
					8 kHz	90.5	-3.0 (+2.1 ; -3.1)
					12.5 kHz	87.1	-6.2 (+3.0 ; -6.0)

Remarks : - UUT Microphone Model No. : UC-59 & S/N : 04871

- Mfr's Spec. : IEC 61672 Class 1

- Uncertainties of Applied Value :

94 dB	63 Hz - 125 Hz	: ± 0.35 dB
	250 Hz - 500 Hz	: ± 0.30 dB
	1 kHz	: ± 0.20 dB
	2 kHz - 4 kHz	: ± 0.35 dB
	8 kHz	: ± 0.45 dB
	12.5 kHz	: ± 0.70 dB
104 dB	1 kHz	: ± 0.10 dB (Ref. 94 dB)
114 dB	1 kHz	: ± 0.10 dB (Ref. 94 dB)

- The uncertainties are for a confidence probability of not less than 95 %.

Note :

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Appendix E
Calibration Record
(Water Quality Monitoring)



專業化驗有限公司

QUALITY PRO TEST-CONSULT LIMITED

Unit 10, 14/F, Wah Wai Centre, 38-40 Au Pui Wau St., Fotan, Hong Kong

Email: info@qualityprotest.com; Website: www.qualityprotest.com

Tel: (852) 3956 8717; Fax: (852) 3956 3928

REPORT OF EQUIPMENT PERFORMANCE CHECK/ CALIBRATION

Report No. : AH100038
Date of Issue : 04 October 2018
Page No. : 1 of 2

PART A – CUSTOMER INFORMATION

Enovative Environmental Service Ltd.
Flat 2207, Yu Fun House,
Yu Chui Court, Shatin
New Territories, Hong Kong
Attn: Mr. Thomas WONG

PART B – DESCRIPTION

Name of Equipment : YSI ProDSS (Multi-Parameters)
Manufacturer : YSI (a xylem brand)
Serial Number : 16H104233
Date of Received : Oct 03, 2018
Date of Calibration : Oct 03, 2018
Date of Next Calibration^(a) : Jan 03, 2019

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 2510 B
Salinity	APHA 21e 2520 B
Turbidity	APHA 21e 2130 B
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)

(1) pH at 25°C

Target (pH unit)	Displayed Reading ^(d) (pH Unit)	Tolerance ^(e) (pH Unit)	Results
4.00	4.01	0.01	Satisfactory
7.42	7.42	0	Satisfactory
10.01	10.00	-0.01	Satisfactory

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

(2) Temperature

Reading of Ref. thermometer (°C)	Displayed Reading (°C)	Tolerance (°C)	Results
7.6	7.5	-0.1	Satisfactory
25.0	24.7	-0.3	Satisfactory
35.5	35.6	0.1	Satisfactory

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

~ CONTINUED ON NEXT PAGE ~

Remark(s): -

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

APPROVED SIGNATORY:

LAM Ho-ye, Emma
Assistant Laboratory Manager



專業化驗有限公司

QUALITY PRO TEST-CONSULT LIMITED

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REPORT OF EQUIPMENT PERFORMANCE CHECK/ CALIBRATION

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PART D – CALIBRATION RESULTS (Cont'd)

(3) Dissolved Oxygen

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)	Results
0.34	0.28	-0.06	Satisfactory
7.75	7.83	0.08	Satisfactory
8.20	8.02	-0.18	Satisfactory

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

(4) Conductivity at 25°C

Conc. of KCl (M)	Expected Reading ($\mu\text{S/cm}$)	Displayed Reading ($\mu\text{S/cm}$)	Tolerance (%)	Results
0.001	146.9	144.8	-1.4	Satisfactory
0.01	1412	1350	-4.4	Satisfactory
0.1	12890	12175	-5.5	Satisfactory
0.5	58670	56033	-4.5	Satisfactory
1.0	111900	108180	-3.3	Satisfactory

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

(5) Salinity

Expected Reading (g/L)	Displayed Reading (g/L)	Tolerance (%)	Results
10	9.54	-4.6	Satisfactory
20	19.64	-1.8	Satisfactory
30	29.86	-0.5	Satisfactory

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

(6) Turbidity

Expected Reading (NTU)	Displayed Reading ^(f) (NTU)	Tolerance ^(g) (%)	Results
0	0	--	--
10	10.50	5.0	Satisfactory
20	21.58	7.9	Satisfactory
100	101.89	1.9	Satisfactory
800	788.25	-1.5	Satisfactory

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

~ END OF REPORT ~

Remark(s): -

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

^(g) 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.