

High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR8(A)  
 Calibrated by : P.F. Yeung  
 Date : 28/09/2015

Sampler

Model : TE-5170  
 Serial Number : S/N 3956

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454  
 Service Date : 24 Mar 2015  
 Slope (m) : 2.09532  
 Intercept (b) : -0.03812  
 Correlation Coefficient(r) : 0.99994

Standard Condition

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

Calibration Condition

Pa (hpa) : 1000  
 Ta(K) : 303

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	10.4	3.178	1.535	55	54.19
2	13 holes	8.5	2.873	1.389	50	49.27
3	10 holes	6.6	2.531	1.226	44	43.35
4	7 holes	4.0	1.971	0.959	36	35.47
5	5 holes	2.5	1.558	0.762	28	27.59

Notes:  $Z = \sqrt{dH(Pa/Pstd)(Tstd/Ta)}$ ,  $X = Z/m - b$ ,  $Y(\text{Corrected Flow}) = IC * \{\sqrt{Pa/Pstd}(Tstd/Ta)\}$

Sampler Calibration Relationship (Linear Regression)

Slope(m): 33.831 Intercept(b): 2.253 Correlation Coefficient(r): 0.9989

Checked by: Magnum Fan

Date: 04/10/2015

High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR9  
 Calibrated by : P.F. Yeung  
 Date : 28/09/2015

Sampler

Model : TE-5170  
 Serial Number : S/N 3958

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454  
 Service Date : 24 Mar 2015  
 Slope (m) : 2.09532  
 Intercept (b) : -0.03812  
 Correlation Coefficient(r) : 0.99994

Standard Condition

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

Calibration Condition

Pa (hpa) : 1000  
 Ta(K) : 303

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	10.4	3.178	1.535	50	49.27
2	13 holes	8.5	2.873	1.389	46	45.33
3	10 holes	6.0	2.414	1.170	41	40.40
4	7 holes	4.0	1.971	0.959	35	34.49
5	5 holes	2.5	1.558	0.762	30	29.56

Notes:  $Z = \sqrt{dH(Pa/Pstd)(Tstd/Ta)}$ ,  $X = Z/m - b$ ,  $Y(\text{Corrected Flow}) = IC * \{\sqrt{Pa/Pstd}(Tstd/Ta)\}$

Sampler Calibration Relationship (Linear Regression)

Slope(m): 25.418 Intercept(b): 10.249 Correlation Coefficient(r): 0.9995

Checked by: Magnum Fan

Date: 04/10/2015



TISCH ENVIRONMENTAL, INC.  
 145 SOUTH MIAMI AVE  
 VILLAGE OF CLEVELAND, OH  
 45002  
 513.467.9000  
 877.263.7610 TOLL FREE  
 513.467.9009 FAX

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 24, 2015 Rootmeter S/N 0438320 Ta (K) - 292  
 Operator Tisch Orifice I.D. - 2454 Pa (mm) - 756.92

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	1.4460	3.2	2.00
2	NA	NA	1.00	1.0300	6.4	4.00
3	NA	NA	1.00	0.9180	7.9	5.00
4	NA	NA	1.00	0.8780	8.7	5.50
5	NA	NA	1.00	0.7240	12.6	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
1.0121	0.6999	1.4258	0.9958	0.6886	0.8784
1.0078	0.9785	2.0163	0.9916	0.9627	1.2422
1.0057	1.0955	2.2543	0.9895	1.0779	1.3888
1.0047	1.1443	2.3644	0.9885	1.1258	1.4566
0.9994	1.3805	2.8515	0.9833	1.3582	1.7568
Qstd slope (m) = 2.09532		Qa slope (m) = 1.31205			
intercept (b) = -0.03812		intercept (b) = -0.02349			
coefficient (r) = 0.99994		coefficient (r) = 0.99994			
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 }



輝創工程有限公司

Sun Creation Engineering Limited

Calibration and Testing Laboratory

# Certificate of Calibration

## 校正證書

Certificate No. : C153241

證書編號

ITEM TESTED / 送檢項目 ( Job No. / 序引編號 : IC15-1330 )

Date of Receipt / 收件日期 : 10 June 2015

Description / 儀器名稱 : Sound Level Calibrator

Manufacturer / 製造商 : Rion

Model No. / 型號 : NC-73

Serial No. / 編號 : 10997142

Supplied By / 委託者 : Envirotech Services Co.

Shop 6, G/F., Casio Mansion, 209 Shaukeiwan Road,  
Hong Kong

### TEST CONDITIONS / 測試條件

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

Relative Humidity / 相對濕度 :  $(55 \pm 20)\%$

Line Voltage / 電壓 : ---

### TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 14 June 2015

### TEST RESULTS / 測試結果

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

All results are within 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

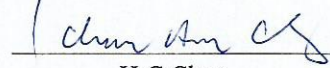
:

  
K C Lee  
Project Engineer

Certified By

核證

:

  
H C Chan  
Engineer

Date of Issue

簽發日期

:

16 June 2015

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室書面批准。

Sun Creation Engineering Limited - Calibration & Testing Laboratory

c/o 4/F, Tsing Shan Wan Exchange Building, 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

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Website/網址: www.suncreation.com



# Certificate of Calibration

## 校正證書

Certificate No. : C153241  
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 :

Equipment ID	Description	Certificate No.
CL130	Universal Counter	C143868
CL281	Multifunction Acoustic Calibrator	DC130171
TST150A	Measuring Amplifier	C141558

- 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	93.7	± 0.5	± 0.2

- 5.2 Frequency Accuracy

UUT Nominal Value (kHz)	Measured Value (kHz)	Mfr's Spec.	Uncertainty of Measured Value (Hz)
1	0.986	1 kHz ± 2 %	± 1

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

Note :

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.



輝創工程有限公司

Sun Creation Engineering Limited

Calibration and Testing Laboratory

# Certificate of Calibration

## 校正證書

Certificate No. : C153940  
證書編號

ITEM TESTED / 送檢項目 ( Job No. / 序引編號 : IC15-1557 )

Date of Receipt / 收件日期 : 13 July 2015

Description / 儀器名稱 : Sound Level Meter

Manufacturer / 製造商 : Rion

Model No. / 型號 : NL-31

Serial No. / 編號 : 00603867

Supplied By / 委託者 : Envirotech Services Co.

Shop 6, G/F., Casio Mansion, 209 Shaukeiwan Road,  
Hong Kong

### TEST CONDITIONS / 測試條件

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

Relative Humidity / 相對濕度 :  $(55 \pm 20)\%$

Line Voltage / 電壓 : ---

### TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 22 July 2015

### TEST RESULTS / 測試結果

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

All results are within manufacturer's specification.

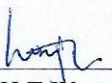
The results are detailed in the subsequent page(s).

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  
Assistant Technical Officer

Certified By

核證

  
K Q Lee  
Project Engineer

Date of Issue

簽發日期

22 July 2015

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. : C153940

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	C150014
CL281	Multifunction Acoustic Calibrator	DC130171

- 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)	Mode	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
30 - 120	L <sub>A</sub>	A	Fast	94.00	1	93.5	± 1.1

#### 6.1.2 Linearity

UUT Setting				Applied Value		UUT Reading (dB)
Range (dB)	Mode	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	
30 - 120	L <sub>A</sub>	A	Fast	94.00	1	93.5 (Ref.)
				104.00		103.5
				114.00		113.5

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)	Mode	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
30 - 120	L <sub>A</sub>	A	Fast	94.00	1	93.5	Ref.
			Slow			93.5	± 0.3

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# Certificate of Calibration

## 校正證書

Certificate No. : C153940

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)	Mode	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
30 - 120	L <sub>A</sub>	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	93.5	Ref.
					2 kHz	94.7	+1.2 ± 1.6
					4 kHz	94.6	+1.0 ± 1.6
					8 kHz	92.4	-1.1 (+2.1 ; -3.1)
					12.5 kHz	89.5	-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)	Mode	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
30 - 120	L <sub>C</sub>	C	Fast	94.00	63 Hz	92.5	-0.8 ± 1.5
					125 Hz	93.3	-0.2 ± 1.5
					250 Hz	93.4	0.0 ± 1.4
					500 Hz	93.5	0.0 ± 1.4
					1 kHz	93.5	Ref.
					2 kHz	93.4	-0.2 ± 1.6
					4 kHz	92.8	-0.8 ± 1.6
					8 kHz	90.5	-3.0 (+2.1 ; -3.1)
					12.5 kHz	87.7	-6.2 (+3.0 ; -6.0)

Remarks : - UUT Microphone Model No. : UC-53A & S/N : 316987

- 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 :

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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## Performance Check of Turbidity Meter

Equipment Ref. No. : ET/0505/013 Manufacturer : HACH

Model No. : 2100Q Serial No. : 13100C028612

Date of Calibration : 30/09/2015 Due Date : 29/12/2015

Gelex Vial Std	Theoretical Value (NTU)	Measured Value (NTU)	Difference %
0-10 NTU	20	19.4	-3.00
10-100 NTU	100	97.3	-2.70
100-1000 NTU	800	769	-3.88

### Acceptance Criteria

Difference : -5 % to 5 %

The turbidity meter complies \* / ~~does not comply~~ \* with the specified requirements and is deemed acceptable \* / ~~unacceptable~~ \* for use. Measurements are traceable to national standards.

Checked by : hy Approved by : [Signature]



## Internal Calibration & Performance Check of pH Meter

Equipment Ref. No. :	<u>ET/EW007/004</u>	Manufacturer :	<u>Thermo Scientific</u>
Model No. :	<u>Orion 2 Star</u>	Serial No. :	<u>B29792</u>
Date of Calibration :	<u>05/09/2015</u>	Calibration Due Da :	<u>04/10/2015</u>

### Liquid Junction Error

Primary Standard Solution Used :	<u>Phosphate</u>	I.o. of Primary Solution:	<u>003/5.2/001/24 (20°C)</u>
Temperature of Solution :	<u>25.0 / 20.0</u>	$\Delta\text{pH}_{1/2} =$	<u>+0.01 / +0.01</u>
pH value of diluted buffer :	<u>6.88 / 6.93</u>	pH (S) =	<u>6.86 / 6.88</u>
$\Delta\text{pH} = \text{pH(S)} - \text{pH of diluted buffer} =$	<u>0.02 / 0.05</u>	(Observed Deviation)	
Liquid Junction Error ( $\Delta\text{pH}_j$ ) = $\Delta\text{pH} - \Delta\text{pH}_{1/2} =$	<u>0.01 / 0.04</u>		

### Shift on Stirring

pH of buffer solution (with stirring), $\text{pH}_s =$	<u>6.89 / 6.94</u>
Shift on stirring, $\Delta\text{pH}_s = \text{pH}_s - \text{pH(S)} - \Delta\text{pH}_j =$	<u>0.02 / 0.02</u>

### Noise

Noise,  $\Delta\text{pH}_n =$  difference between max and min reading : 0.01 / 0.01

### Verification of ATC

Ref. No. of reference thermometer used:	<u>ET/0521/019</u>
Temperature record from the reference thermometer ( $T_R$ ):	<u>25 / 20.0 °C</u>
Temperature record from the ATC ( $T_{ATC}$ ):	<u>24.8 / 19.8 °C</u>
Temperature Difference, $ T_R - T_{ATC} $	<u>0.2 / 0.2 °C</u>
Correction	<u>+0.2 / +0.2 °C</u>

### Acceptance Criteria

Performance Characteristic	Acceptable Range
Liquid Junction Error $\Delta\text{pH}_j$	$\leq 0.05$
Shift on Stirring $\Delta\text{pH}_s$	$\leq 0.02$
Noise $\Delta\text{pH}_n$	$\leq 0.02$
Verification of ATC Temperature Difference	$\leq 0.5^\circ\text{C}$

The pH meter complies \* / ~~does not comply~~ \* with the specified requirements and is deemed acceptable \* / ~~unacceptable~~ \* for use. Measurements are traceable to national standards.  
\* Delete as appropriate

Calibrated by: \_\_\_\_\_

Checked by : \_\_\_\_\_



## Internal Calibration & Performance Check of pH Meter

Equipment Ref. No. : ET/EW007/004      Manufacturer : Thermo Scientific  
 Model No. : Orion 2 Star      Serial No. : B29792  
 Date of Calibration : 05/10/2015      Calibration Due Date : 04/11/2015

### Liquid Junction Error

Primary Standard Solution Used : Phosphate      Io. of Primary Solution: 003/5.2/001/24 (20°C)  
 Temperature of Solution : 25.0 / 20.0       $\Delta\text{pH}_{1/2} = \text{+0.01} / \text{+0.01}$   
 pH value of diluted buffer : 6.89 / 6.92      pH (S) = 6.86 / 6.88  
 $\Delta\text{pH} = \text{pH(S)} - \text{pH of diluted buffer} = \text{0.03} / \text{0.04}$  (Observed Deviation)  
 Liquid Junction Error ( $\Delta\text{pH}_j$ ) =  $\Delta\text{pH} - \Delta\text{pH}_{1/2} = \text{0.02} / \text{0.03}$

### Shift on Stirring

pH of buffer solution (with stirring),  $\text{pH}_s = \text{6.89} / \text{6.93}$   
 Shift on stirring,  $\Delta\text{pH}_s = \text{pH}_s - \text{pH(S)} - \Delta\text{pH}_j = \text{0.01} / \text{0.02}$

### Noise

Noise,  $\Delta\text{pH}_n = \text{difference between max and min reading} : \text{0.01} / \text{0.01}$

### Verification of ATC

Ref. No. of reference thermometer used: ET/0521/019  
 Temperature record from the reference thermometer ( $T_R$ ): 25 / 20.2 °C  
 Temperature record from the ATC ( $T_{ATC}$ ): 24.8 / 19.9 °C  
 Temperature Difference,  $|T_R - T_{ATC}|$  : 0.2 / 0.3 °C  
 Correction : +0.2 / +0.2 °C

### Acceptance Criteria

Performance Characteristic	Acceptable Range
Liquid Junction Error $\Delta\text{pH}_j$	$\leq 0.05$
Shift on Stirring $\Delta\text{pH}_s$	$\leq 0.02$
Noise $\Delta\text{pH}_n$	$\leq 0.02$
Verification of ATC      Temperature Difference	$\leq 0.5^\circ\text{C}$

The pH meter complies \* / ~~does not comply~~ \* with the specified requirements and is deemed acceptable \* / ~~unacceptable~~ \* for use. Measurements are traceable to national standards.

\* Delete as appropriate

Calibrated by:

Checked by :



### Internal Calibration Report of Dissolved Oxygen Meter

Equipment Ref. No. : <u>ET/EW/008/004</u>	Manufacturer : <u>YSI</u>
Model No. : <u>Pro 2030</u>	Serial No. : <u>10F 101978</u>
Date of Calibration : <u>26/07/2015</u>	Calibration Due Date : <u>25/10/2015</u>

#### Temperature Verification

Ref. No. of Reference Thermometer : ET/0521/005

Ref. No. of Water Bath : ---

		Temperature (°C)		
Reference Thermometer reading	Measured	19.7	Corrected	20.0
DO Meter reading	Measured	19.8	Difference	0.2

#### Standardization of sodium thiosulphate ( $Na_2S_2O_3$ ) solution

Reagent No. of $Na_2S_2O_3$ titrant	CPE/012/4.5/001/12	Reagent No. of 0.025N $K_2Cr_2O_7$	CPE/012/4.4/002/01
		Trial 1	Trial 2
Initial Vol. of $Na_2S_2O_3$ (ml)		0.00	10.20
Final Vol. of $Na_2S_2O_3$ (ml)		10.20	20.60
Vol. of $Na_2S_2O_3$ used (ml)		10.20	10.40
Normality of $Na_2S_2O_3$ solution (N)		0.02451	0.02404
Average Normality (N) of $Na_2S_2O_3$ solution (N)		0.02428	
Acceptance criteria, Deviation		Less than $\pm 0.001N$	

Calculation: Normality of  $Na_2S_2O_3$ ,  $N = 0.25 / ml Na_2S_2O_3$  used

#### Lineality Checking

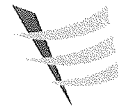
##### Determination of dissolved oxygen content by Winkler Titration \*

Purging Time (min)	2		5		10	
	1	2	1	2	1	2
Initial Vol. of $Na_2S_2O_3$ (ml)	0.00	11.40	23.00	0.00	6.70	10.50
Final Vol. of $Na_2S_2O_3$ (ml)	11.40	23.00	29.70	6.70	10.50	14.50
Vol. (V) of $Na_2S_2O_3$ used (ml)	11.40	11.60	6.70	6.70	3.80	4.00
Dissolved Oxygen (DO), mg/L	7.43	7.56	4.37	4.37	2.48	2.61
Acceptance criteria, Deviation	Less than + 0.3mg/L		Less than + 0.3mg/L		Less than + 0.3mg/L	

Calculation:  $DO (mg/L) = V \times N \times 8000/298$

Purging time, min	DO meter reading, mg/L			Winkler Titration result *, mg/L			Difference (%) of DO Content
	1	2	Average	1	2	Average	
2	7.44	7.31	7.38	7.43	7.56	7.50	1.61
5	4.46	4.58	4.52	4.37	4.37	4.37	3.37
10	2.42	2.46	2.44	2.48	2.61	2.55	4.41
Linear regression coefficient				0.9963			





## Performance Check of Salinity Meter

Equipment Ref. No. : ET/EW/008/004 Manufacturer : YSI  
Model No. : Pro 2030 Serial No. : 10F 101978  
Date of Calibration : 26/07/2015 Due Date : 25/10  
 : /2015

Ref. No. of Salinity Standard used (30ppt)

S/001/5

Salinity Standard (ppt)	Measured Salinity (ppt)	Difference * (%)
30.0	31.3	4.33

(\* ) Difference (%) = (Measured Salinity – Salinity Standard value) / Salinity Standard value x 100

Acceptance Criteria

Difference : -10 % to 10 %

The salinity meter complies \* / ~~does not comply~~ \* with the specified requirements and is deemed acceptable \* / ~~unacceptable~~ \* for use. Measurements are traceable to national standards.

Checked by : 

Approved by : 



### Internal Calibration Report of Dissolved Oxygen Meter

Equipment Ref. No. : <u>ET/EW/008/004</u>	Manufacturer : <u>YSI</u>
Model No. : <u>Pro 2030</u>	Serial No. : <u>10F 101978</u>
Date of Calibration : <u>26/10/2015</u>	Calibration Due Date : <u>25/01/2016</u>

**Temperature Verification**

Ref. No. of Reference Thermometer : ET/0521/005

Ref. No. of Water Bath : ---

		Temperature (°C)		
Reference Thermometer reading	Measured	19.9	Corrected	20.2
DO Meter reading	Measured	20.0	Difference	0.2

**Standardization of sodium thiosulphate (Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>) solution**

Reagent No. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> titrant	CPE/012/4.5/001/12	Reagent No. of 0.025N K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	CPE/012/4.4/002/04
		Trial 1	Trial 2
Initial Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (ml)		0.00	10.20
Final Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (ml)		10.20	20.30
Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> used (ml)		10.20	10.10
Normality of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> solution (N)		0.02451	0.02475
Average Normality (N) of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> solution (N)		0.02463	
Acceptance criteria, Deviation		Less than ± 0.001N	

Calculation: Normality of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>, N = 0.25 / ml Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> used

**Linearity Checking**

**Determination of dissolved oxygen content by Winkler Titration \***

Purging Time (min)	2		5		10	
	1	2	1	2	1	2
Initial Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (ml)	0.00	11.20	22.50	0.00	6.70	10.60
Final Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (ml)	11.20	22.50	28.90	6.70	10.60	14.50
Vol. (V) of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> used (ml)	11.20	11.30	6.40	6.70	3.90	3.90
Dissolved Oxygen (DO), mg/L	7.41	7.47	4.23	4.43	2.58	2.58
Acceptance criteria, Deviation	Less than + 0.3mg/L		Less than + 0.3mg/L		Less than + 0.3mg/L	

Calculation: DO (mg/L) = V x N x 8000/298

Purging time, min	DO meter reading, mg/L			Winkler Titration result *, mg/L			Difference (%) of DO Content
	1	2	Average	1	2	Average	
2	7.28	7.42	7.35	7.41	7.47	7.44	1.22
5	4.43	4.61	4.52	4.23	4.43	4.33	4.29
10	2.48	2.55	2.52	2.58	2.58	2.58	2.35
Linear regression coefficient				0.9962			



### Internal Calibration Report of Dissolved Oxygen Meter

**Zero Point Checking**

DO meter reading, mg/L	0.00
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**Salinity Checking**

Reagent No. of NaCl (10ppt)	CPE/012/4.7/003/9	Reagent No. of NaCl (30ppt)	CPE/012/4.8/003/9
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**Determination of dissolved oxygen content by Winkler Titration \*\***

Salinity (ppt)	10		30	
	1	2	1	2
Trial				
Initial Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (ml)	0.00	11.10	22.10	31.50
Final Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (ml)	11.10	22.10	31.50	41.00
Vol. (V) of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> used (ml)	11.10	11.00	9.40	9.50
Dissolved Oxygen (DO), mg/L	7.34	7.27	6.22	6.28
Acceptance criteria, Deviation	Less than + 0.3mg/L		Less than + 0.3mg/L	

Calculation:  $DO (mg/L) = V \times N \times 8000/298$

Salinity (ppt)	DO meter reading, mg/L			Winkler Titration result**, mg/L			Difference (%) of DO Content
	1	2	Average	1	2	Average	
10	7.43	7.58	7.51	7.34	7.27	7.31	2.70
30	6.36	6.41	6.39	6.22	6.28	6.25	2.22

**Acceptance Criteria**

- (1) Differenc between temperature readings from temperature sensor of DO probe and reference thermometer : < 0.5 °C
- (2) Linear regression coefficient : >0.99
- (3) Zero checking: 0.0mg/L
- (4) Difference (%) of DO content from the meter reading and by winkler titration : within ± 5%

The equipment complies # / ~~does not comply~~ # with the specified requirements and is deemed acceptable # / unacceptable # for use.

# Delete as appropriate

Calibrated by

: \_\_\_\_\_

Approved by :

\_\_\_\_\_





## Performance Check of Salinity Meter

Equipment Ref. No. : ET/EW/008/004      Manufacturer : YSI  
Model No. : Pro 2030      Serial No. : 10F 101978  
Date of Calibration : 26/10/2015      Due Date : 25/01/2016

Ref. No. of Salinity Standard used (30ppt)

S/001/5

Salinity Standard (ppt)	Measured Salinity (ppt)	Difference * (%)
30.0	29.7	-3.00

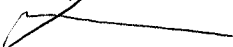
(\* ) Difference (%) = (Measured Salinity – Salinity Standard value) / Salinity Standard value x 100

Acceptance Criteria

Difference : -10 % to 10 %

The salinity meter complies \* / ~~does not comply~~ \* with the specified requirements and is deemed acceptable \* / ~~unacceptable~~ \* for use. Measurements are traceable to national standards.

Checked by : 

Approved by : 

# ENVIROTECH SERVICES CO.

## Calibration Report of Wind Meter

Date of Calibration : 24 June 2015

Brand of Test Meter: Global Water

Model: Speed Sensor: WE550 (S/N:EC0000 )

Direction Sensor: WE570 (S/N:ED0000)

Location : Pak Mong, Siu Ho Wan

### Procedures :

1. Wind Still Test: The wind speed sensor was hold by hand until it keep still
2. Wind Speed Test: The wind meter was on-site calibrated against the Anemometer
3. Wind Direction Test : The wind meter was on-site calibrated against the marine compass at four directions

### Results:

#### Wind Still Test

Wind Speed (m/s)
0.00

#### Wind Speed Test

Global Wate (m/s)	Anemomete (m/s)
0.88	0.8
2.19	2.4
3.32	3.5

#### Wind Direction Test

Global Wate (o)	Marine Compass (o)
270.85	270
0.05	0
89.45	90
180.67	180

Calibrated by:

Fai  
Yeung Ping Fai  
(Technical Officer)

Checked by :

Fat  
Ho Kam Fat  
(Senior Technical Officer)



輝創工程有限公司

Sun Creation Engineering Limited

Calibration and Testing Laboratory

# Certificate of Calibration

## 校正證書

Certificate No. : C153422

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC15-1330)

Date of Receipt / 收件日期 : 10 June 2015

Description / 儀器名稱 : Anemometer

Manufacturer / 製造商 : Lutron

Model No. / 型號 : AM-4201

Serial No. / 編號 : AF.27513

Supplied By / 委託者 : Envirotech Services Co.

Shop 6, G/F., Casio Mansion, 209 Shaukeiwan Road,  
Hong Kong

TEST CONDITIONS / 測試條件

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

Relative Humidity / 相對濕度 :  $(55 \pm 20)\%$

Line Voltage / 電壓 : ---

TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 23 June 2015

TEST RESULTS / 測試結果

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

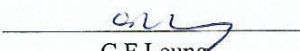
The results are detailed in the subsequent page(s).

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

- Testo Industrial Services GmbH, Germany

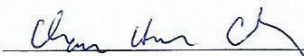
Tested By

測試

  
C F Leung  
Project Engineer

Certified By

核證

  
H C Chan  
Engineer

Date of Issue

簽發日期

23 June 2015

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, Tsing Shan Wan Exchange Building, 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青洲灣機樓四樓

Tel/電話: 2927 2606

Fax/傳真: 2744 8986

E-mail/電郵: callab@suncreation.com

Website/網址: www.suncreation.com

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# Certificate of Calibration

## 校正證書

Certificate No. : C153422

證書編號

1. The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours before the commencement of the test.
2. The results presented are the mean of 10 measurements at each calibration point.
3. Test equipment :

<u>Equipment ID</u>	<u>Description</u>	<u>Certificate No.</u>
CL386	Multi-function Measuring Instrument	S12109

4. Test procedure : MA130N.
5. Results :

### Air Velocity

Applied Value (m/s)	UUT Reading (m/s)	Measured Correction		
		Value (m/s)	Measurement Uncertainty	
			Expanded Uncertainty (m/s)	Coverage Factor
1.9	1.8	+0.1	0.2	2.0
4.0	3.9	+0.1	0.2	2.0
6.0	6.0	0.0	0.3	2.0
8.0	8.1	-0.1	0.3	2.0
10.0	10.3	-0.3	0.4	2.0

Remarks : - The Measured Corrections are defined as :  
Value = Applied Value - UUT Reading

- The expanded uncertainties are for a level of confidence of 95 %.

### Note :

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.