

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. : C146966

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC14-2877) Date of Receipt / 收件日期 : 12 November 2014

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 : 14 November 2014

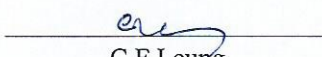
TEST RESULTS / 測試結果

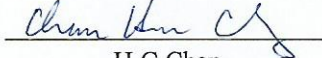
The results apply to the particular unit-under-test only.

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 : 18 November 2014
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室所書面批准。

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山灣機樓四樓

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Page 1 of 2

Certificate of Calibration

校正證書

Certificate No. : C146966

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
2.0	1.7	+0.3	0.2	2.0
4.1	3.8	+0.3	0.3	2.0
6.1	5.8	+0.3	0.3	2.0
8.0	7.8	+0.2	0.3	2.0
10.0	9.9	+0.1	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.

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輝創工程有限公司 – 校正及檢測實驗室

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Tel/電話: 2927 2606

Fax/傳真: 2744 8986

E-mail/電郵: callab@suncreation.com

Website/網址: www.suncreation.com

ENVIROTECH SERVICES CO.

Calibration Report of Wind Meter

Date of Calibration : 20 November 2014

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)
0.35	0.4
1.49	1.6
3.01	3.1

Wind Direction Test

Global Wate (o)	Marine Compass (o)
270.21	270
0.01	0
90.12	90
179.05	180

Calibrated by: Fai
Yeung Ping Fai
(Technical Officer)

Checked by : Fat
Ho Kam Fat
(Senior Technical Officer)



Internal Calibration Report of Dissolved Oxygen Meter

Equipment Ref. No. : <u>ET/EW/008/006</u>	Manufacturer : <u>YSI</u>
Model No. : <u>Pro 2030</u>	Serial No. : <u>12A 100554</u>
Date of Calibration : <u>17/03/2015</u>	Calibration Due Date : <u>16/06/2015</u>

Temperature Verification

Ref. No. of Reference Thermometer : ET/0521/008

Ref. No. of Water Bath : ---

Reference Thermometer reading	Temperature (°C)			
	Measured	20.0	Corrected	19.4
DO Meter reading	Measured	19.2	Difference	0.2

Standardization of sodium thiosulphate ($Na_2S_2O_3$) solution

Reagent No. of $Na_2S_2O_3$ titrant	CPE/012/4.5/001/11	Reagent No. of 0.025N $K_2Cr_2O_7$	CPE/012/4.4/001/35
		Trial 1	Trial 2
Initial Vol. of $Na_2S_2O_3$ (ml)		0.00	10.15
Final Vol. of $Na_2S_2O_3$ (ml)		10.15	20.40
Vol. of $Na_2S_2O_3$ used (ml)		10.15	10.25
Normality of $Na_2S_2O_3$ solution (N)		0.02463	0.02439
Average Normality (N) of $Na_2S_2O_3$ solution (N)		0.02451	
Acceptance criteria, Deviation		Less than $\pm 0.001N$	

Calculation: Normality of $Na_2S_2O_3$, $N = 0.25 / ml Na_2S_2O_3$ 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 $Na_2S_2O_3$ (ml)	0.00	11.20	22.60	0.00	6.80	10.40
Final Vol. of $Na_2S_2O_3$ (ml)	11.20	22.60	29.20	6.80	10.40	14.10
Vol. (V) of $Na_2S_2O_3$ used (ml)	11.20	11.40	6.60	6.80	3.60	3.70
Dissolved Oxygen (DO), mg/L	7.37	7.50	4.34	4.47	2.37	2.43
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	7.42	7.90	7.66	7.37	7.50	7.44	2.91
5	4.38	4.10	4.24	4.34	4.47	4.41	3.93
10	2.50	2.48	2.49	2.37	2.43	2.40	3.68
Linear regression coefficient				0.9954			



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/012/4.7/002/34	Reagent No. of NaCl (30ppt)	CPE/012/4.8/002/34
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Determination of dissolved oxygen content by Winkler Titration **

Salinity (ppt)	10		30	
	1	2	1	2
Initial Vol. of Na ₂ S ₂ O ₃ (ml)	0.00	11.90	23.50	34.00
Final Vol. of Na ₂ S ₂ O ₃ (ml)	11.90	23.50	34.00	44.30
Vol. (V) of Na ₂ S ₂ O ₃ used (ml)	11.90	11.60	10.50	10.30
Dissolved Oxygen (DO), mg/L	7.83	7.63	6.91	6.78
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	7.20	7.65	7.43	7.83	7.63	7.73	3.96
30	6.90	6.40	6.65	6.91	6.78	6.85	2.96

Acceptance Criteria

- (1) Difference 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.

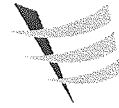
Delete as appropriate

Calibrated by

: 

Approved by :





Performance Check of Salinity Meter

Equipment Ref. No. : ET/EW/008/006 Manufacturer : YSI
Model No. : Pro 2030 Serial No. : 12A 100554
Date of Calibration : 17/03/2015 Due Date : 16/06/2015

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

S/001/5

Salinity Standard (ppt)	Measured Salinity (ppt)	Difference %
30.0	30.3	1.0

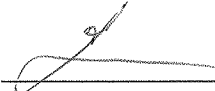
(*) Difference (%) = (Measured Salinity – Salinity Standard value) / Salinity Standard value x 100

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/008/006</u>	Manufacturer : <u>YSI</u>
Model No. : <u>Pro 2030</u>	Serial No. : <u>12A 100554</u>
Date of Calibration : <u>17/12/2014</u>	Calibration Due Date : <u>16/03/2015</u>

Temperature Verification

Ref. No. of Reference Thermometer : ET/0521/008

Ref. No. of Water Bath : ---

		Temperature (°C)		
Reference Thermometer reading	Measured	20.0	Corrected	19.4
DO Meter reading	Measured	19.4	Difference	0.0

Standardization of sodium thiosulphate (Na₂S₂O₃) solution

Reagent No. of Na ₂ S ₂ O ₃ titrant	CPE/012/4.5/001/9	Reagent No. of 0.025N K ₂ Cr ₂ O ₇	CPE/012/4.4/001/32
		Trial 1	Trial 2
Initial Vol. of Na ₂ S ₂ O ₃ (ml)		0.00	10.15
Final Vol. of Na ₂ S ₂ O ₃ (ml)		10.15	20.35
Vol. of Na ₂ S ₂ O ₃ used (ml)		10.15	10.20
Normality of Na ₂ S ₂ O ₃ solution (N)		0.02463	0.02451
Average Normality (N) of Na ₂ S ₂ O ₃ solution (N)		0.02457	
Acceptance criteria, Deviation		Less than ± 0.001N	

Calculation: Normality of Na₂S₂O₃, N = 0.25 / ml Na₂S₂O₃ used

Lineality Checking

Determination of dissolved oxygen content by Winkler Titration *

Purging Time (min)	2		5		10	
	1	2	1	2	1	2
Trial						
Initial Vol. of Na ₂ S ₂ O ₃ (ml)	0.00	11.40	22.80	0.00	6.60	10.30
Final Vol. of Na ₂ S ₂ O ₃ (ml)	11.40	22.80	29.30	6.60	10.30	14.00
Vol. (V) of Na ₂ S ₂ O ₃ used (ml)	11.40	11.40	6.50	6.60	3.70	3.70
Dissolved Oxygen (DO), mg/L	7.52	7.52	4.29	4.35	2.44	2.44
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	7.61	7.20	7.41	7.52	7.52	7.52	1.47
5	4.28	4.75	4.52	4.29	4.35	4.32	4.52
10	2.50	2.49	2.50	2.44	2.44	2.44	2.43
Linear regression coefficient				0.9978			



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/012/4.7/002/29	Reagent No. of NaCl (30ppt)	CPE/012/4.8/002/29
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Determination of dissolved oxygen content by Winkler Titration **

Salinity (ppt)	10		30	
Trial	1	2	1	2
Initial Vol. of Na ₂ S ₂ O ₃ (ml)	0.00	11.90	23.80	34.40
Final Vol. of Na ₂ S ₂ O ₃ (ml)	11.90	23.80	34.40	44.90
Vol. (V) of Na ₂ S ₂ O ₃ used (ml)	11.90	11.90	10.60	10.50
Dissolved Oxygen (DO), mg/L	7.85	7.85	6.99	6.93
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	7.68	7.78	7.73	7.85	7.85	7.85	1.54
30	6.88	6.89	6.89	6.99	6.93	6.96	1.01

Acceptance Criteria

- (1) Difference 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 :

Internal Calibration & Performance Check of pH Meter

Equipment Ref. No. : ET/EW/007/005 Manufacturer : HANNA
 Model No. : HI 8314 Serial No. : 8246095
 Date of Calibration : 07/03/2015 Calibration Due Date : 06/04/2015

Liquid Junction Error

Primary Standard Solution Used : Phosphate Ref No. of Primary Solution: 003/5.2/001/23
 Temperature of Solution : 20.0 $\Delta\text{pH}_{\frac{1}{2}} = +0.08$
 pH value of diluted buffer : 6.78 pH (S) = 6.881
 $\Delta\text{pH} = \text{pH(S)} - \text{pH of diluted buffer} = \underline{0.101}$ (Observed Deviation)
 Liquid Junction Error (ΔpH_j) = $\Delta\text{pH} - \Delta\text{pH}_{\frac{1}{2}} = \underline{0.021}$

Shift on Stirring

pH of buffer solution (with stirring), $\text{pH}_s = \underline{6.91}$
 Shift on stirring, $\Delta\text{pH}_s = \text{pH}_s - \text{pH(S)} - \Delta\text{pH}_j = \underline{0.008}$

Noise

Noise, $\Delta\text{pH}_n =$ difference between max and min reading : 0.00

Verification of ATC


Ref. No. of reference thermometer used: ET/0521/008
 Temperature record from the reference thermometer (T_R): 19.9 °C
 Temperature record from the ATC (T_{ATC}): 19.8 °C
 Temperature Difference, $|T_R - T_{ATC}|$: 0.1 °C

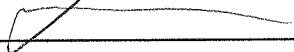
Acceptance Criteria

Performance Characteristic	Acceptable Range
Liquid Junction Error ΔpH_j	≤ 0.05
Shift on Stirring ΔpH_s	≤ 0.02
Noise ΔpH_n	≤ 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/EW/007/005 Manufacturer : HANNA
Model No. : HI 8314 Serial No. : 8246095
Date of Calibration : 07/02/2015 Calibration Due Date : 06/03/2015

Liquid Junction Error

Primary Standard Solution Used : Phosphate Ref No. of Primary Solution: 003/5.2/001/21
Temperature of Solution : 20.0 $\Delta pH_{1/2} = \underline{+0.08}$
pH value of diluted buffer : 6.79 $pH(S) = \underline{6.881}$
 $\Delta pH = pH(S) - pH \text{ of diluted buffer} = \underline{0.091}$ (Observed Deviation)
Liquid Junction Error (ΔpH_j) = $\Delta pH - \Delta pH_{1/2} = \underline{0.011}$

Shift on Stirring

pH of buffer solution (with stirring), $pH_s = \underline{6.90}$
Shift on stirring, $\Delta pH_s = pH_s - pH(S) - \Delta pH_j = \underline{0.008}$

Noise

Noise, $\Delta pH_n = \text{difference between max and min reading} : \underline{0.00}$

Verification of ATC

Ref. No. of reference thermometer used: ET/0521/008
Temperature record from the reference thermometer (T_R): 19.9 °C
Temperature record from the ATC (T_{ATC}): 20.0 °C
Temperature Difference, $|T_R - T_{ATC}|$: -0.1 °C


Acceptance Criteria

Performance Characteristic	Acceptable Range
Liquid Junction Error ΔpH_j	≤ 0.05
Shift on Stirring ΔpH_s	≤ 0.02
Noise ΔpH_n	≤ 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 : 



Performance Check of Turbidity Meter

Equipment Ref. No. : ET/0505/011 Manufacturer : HACH
Model No. : 2100Q Serial No. : 12060 C 018534
Date of Calibration : 05/01/2015 Due Date : 04/04/2015

Ref. No. of Turbidity Standard used (4000NTU)

005/6.1/001/7

Theoretical Value of Turbidity Standard (NTU)	Measured Value (NTU)	Difference % *
20	19.8	-1.00
100	104	4.00
800	788	-1.50

(*) Difference = (Measured Value – Theoretical Value) / Theoretical Value x 100

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.

Prepared by : hy

Checked by : [Signature]



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. : C144558

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC14-1853)

Date of Receipt / 收件日期 : 22 July 2014

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 ± 2)°C

Relative Humidity / 相對濕度 : (55 ± 20)%

Line Voltage / 電壓 : ---

TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 29 July 2014

TEST RESULTS / 測試結果

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

All results are within manufacturer's specification.

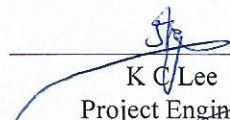
The results are detailed in the subsequent page(s).

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

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

Tested By :

測試


K C Lee
Project Engineer

Certified By :

核證


K M Wu
Engineer

Date of Issue :

簽發日期

30 July 2014

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所書面批准。

Sun Creation Engineering Limited – Calibration & Testing Laboratory

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Website/網址: www.suncreation.com

Page 1 of 4

Certificate of Calibration

校正證書

Certificate No. : C144558

證書編號

1. 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.
2. Self-calibration was performed before the test.
3. The results presented are the mean of 3 measurements at each calibration point.
4. Test equipment :

<u>Equipment ID</u>	<u>Description</u>	<u>Certificate No.</u>
CL280	40 MHz Arbitrary Waveform Generator	C140016
CL281	Multifunction Acoustic Calibrator	DC130171

5. Test procedure : MA101N.

6. 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 _A	A	Fast	94.00	1	93.6	± 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 _A	A	Fast	94.00	1	93.6 (Ref.)
				104.00		103.6
				114.00		113.6

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 _A	A	Fast	94.00	1	93.6	Ref.
			Slow			93.5	± 0.3

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Certificate of Calibration

校正證書

Certificate No. : C144558

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 _A	A	Fast	94.00	63 Hz	67.3	-26.2 ± 1.5
					125 Hz	77.3	-16.1 ± 1.5
					250 Hz	84.9	-8.6 ± 1.4
					500 Hz	90.3	-3.2 ± 1.4
					1 kHz	93.6	Ref.
					2 kHz	94.9	+1.2 ± 1.6
					4 kHz	94.7	+1.0 ± 1.6
					8 kHz	92.5	-1.1 (+2.1 ; -3.1)
					12.5 kHz	89.7	-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 _C	C	Fast	94.00	63 Hz	92.7	-0.8 ± 1.5
					125 Hz	93.4	-0.2 ± 1.5
					250 Hz	93.6	0.0 ± 1.4
					500 Hz	93.6	0.0 ± 1.4
					1 kHz	93.6	Ref.
					2 kHz	93.5	-0.2 ± 1.6
					4 kHz	92.9	-0.8 ± 1.6
					8 kHz	90.6	-3.0 (+2.1 ; -3.1)
					12.5 kHz	87.8	-6.2 (+3.0 ; -6.0)

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Certificate of Calibration

校正證書

Certificate No. : C144558
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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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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

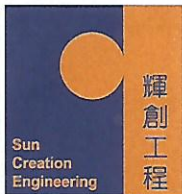
c/o 香港新界屯門興安里一號青山灣機樓四樓

Tel/電話: 2927 2606

Fax/傳真: 2744 8986

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Website/網址: www.suncreation.com



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. : C143980

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC14-1497)

Date of Receipt / 收件日期 : 23 June 2014

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 : 28 June 2014

TEST RESULTS / 測試結果

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

All results are within manufacturer's specification.

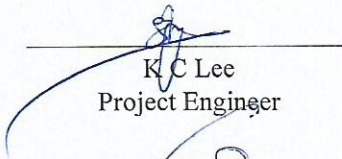
The results are detailed in the subsequent page(s).

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

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

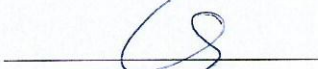
Tested By :

測試


K C Lee
Project Engineer

Certified By :

核證


K M Wu
Engineer

Date of Issue :

簽發日期

2 July 2014

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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Certificate of Calibration

校正證書

Certificate No. : C143980
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	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	0.987	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.

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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 }



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ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 24, 2014 Rootmeter S/N 0438320 Ta (K) - 293
 Operator Tisch Orifice I.D. - 2454 Pa (mm) - 758.19

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	1.4740	3.2	2.00
2	NA	NA	1.00	1.0340	6.4	4.00
3	NA	NA	1.00	0.9240	7.9	5.00
4	NA	NA	1.00	0.8820	8.8	5.50
5	NA	NA	1.00	0.7270	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
1.0103	0.6854	1.4245	0.9958	0.6755	0.8791
1.0061	0.9730	2.0146	0.9916	0.9590	1.2433
1.0040	1.0866	2.2524	0.9895	1.0709	1.3900
1.0028	1.1370	2.3623	0.9884	1.1206	1.4579
0.9976	1.3722	2.8491	0.9832	1.3524	1.7583
Qstd slope (m)	=	2.07593	Qa slope (m)	=	1.29991
intercept (b)	=	-0.00102	intercept (b)	=	-0.00063
coefficient (r)	=	0.99996	coefficient (r)	=	0.99996
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}

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR8(A)
 Calibrated by : P.F. Yeung
 Date : 28/03/2015

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) : 1024
 Ta(K) : 292

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	10.6	3.307	1.596	60	60.94
2	13 holes	8.2	2.909	1.406	54	54.85
3	10 holes	6.2	2.529	1.225	49	49.77
4	7 holes	4.0	2.031	0.988	41	41.64
5	5 holes	2.4	1.574	0.769	34	34.53

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): 31.890 Intercept(b): 10.177 Correlation Coefficient(r): 0.9996

Checked by: Magnum Fan

Date: 01/04/2015

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR9
 Calibrated by : P.F. Yeung
 Date : 28/03/2015

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) : 1024
 Ta(K) : 292

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	10.4	3.276	1.581	53	53.83
2	13 holes	8.4	2.944	1.423	48	48.75
3	10 holes	5.5	2.382	1.155	41	41.64
4	7 holes	3.6	1.927	0.938	34	34.53
5	5 holes	2.2	1.507	0.737	28	28.44

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): 29.862 Intercept(b): 6.593 Correlation Coefficient(r): 0.9994

Checked by: Magnum Fan

Date: 01/04/2015

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR8(A)
 Calibrated by : P.F. Yeung
 Date : 28/01/2015

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
 Service Date : 24 Mar 2014
 Slope (m) : 2.07593
 Intercept (b) : -0.00102
 Correlation Coefficient(r) : 0.99996

Standard Condition

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

Calibration Condition

Pa (hpa) : 1018
 Ta(K) : 293

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.6	3.443	1.659	56	56.62
2	13 holes	9.6	3.132	1.509	51	51.56
3	10 holes	7.1	2.694	1.298	45	45.49
4	7 holes	4.6	2.168	1.045	37	37.41
5	5 holes	2.8	1.692	0.815	29	29.32

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): 31.968 Intercept(b): 3.625 Correlation Coefficient(r): 0.9994

Checked by: Magnum Fan

Date: 31/01/2015

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR9
 Calibrated by : P.F. Yeung
 Date : 28/01/2015

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
 Service Date : 24 Mar 2014
 Slope (m) : 2.07593
 Intercept (b) : -0.00102
 Correlation Coefficient(r) : 0.99996

Standard Condition

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

Calibration Condition

Pa (hpa) : 1018
 Ta(K) : 293

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.5	3.428	1.652	55	55.60
2	13 holes	9.7	3.149	1.517	50	50.55
3	10 holes	6.8	2.636	1.270	42	42.46
4	7 holes	4.6	2.168	1.045	35	35.38
5	5 holes	2.8	1.692	0.815	28	28.31

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): 32.439 Intercept(b): 1.587 Correlation Coefficient(r): 0.9995

Checked by: Magnum Fan

Date: 31/01/2015