

High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR8(A)  
 Calibrated by : P.F. Yeung  
 Date : 28/01/2017

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) : 1020  
 Ta(K) : 291

| Resistance Plate |          | dH [green liquid]<br>(inch water) | Z     | X=Qstd<br>(cubic meter/min) | IC<br>(chart) | Y<br>(corrected) |
|------------------|----------|-----------------------------------|-------|-----------------------------|---------------|------------------|
| 1                | 18 holes | 11.4                              | 3.429 | 1.662                       | 56            | 56.87            |
| 2                | 13 holes | 9.5                               | 3.130 | 1.520                       | 52            | 52.80            |
| 3                | 10 holes | 6.8                               | 2.648 | 1.291                       | 44            | 44.68            |
| 4                | 7 holes  | 4.8                               | 2.225 | 1.090                       | 38            | 38.59            |
| 5                | 5 holes  | 2.7                               | 1.669 | 0.825                       | 28            | 28.43            |

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): 33.913 Intercept(b): 0.950 Correlation Coefficient(r): 0.9990

Checked by: Magnum Fan

Date: 04/02/2017

High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR9  
 Calibrated by : P.F. Yeung  
 Date : 28/01/2017

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) : 1020  
 Ta(K) : 291

| Resistance Plate |          | dH [green liquid]<br>(inch water) | Z     | X=Qstd<br>(cubic meter/min) | IC<br>(chart) | Y<br>(corrected) |
|------------------|----------|-----------------------------------|-------|-----------------------------|---------------|------------------|
| 1                | 18 holes | 11.8                              | 3.488 | 1.690                       | 55            | 55.85            |
| 2                | 13 holes | 9.2                               | 3.080 | 1.496                       | 48            | 48.74            |
| 3                | 10 holes | 6.6                               | 2.609 | 1.272                       | 42            | 42.65            |
| 4                | 7 holes  | 4.4                               | 2.130 | 1.045                       | 35            | 35.54            |
| 5                | 5 holes  | 2.7                               | 1.669 | 0.825                       | 28            | 28.43            |

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): 31.156 Intercept(b): 2.809 Correlation Coefficient(r): 0.9992

Checked by: Magnum Fan

Date: 04/02/2017



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 14, 2016 Rootsmeter S/N 0438320 Ta (K) - 295  
 Operator Tisch Orifice I.D. - 2454 Pa (mm) - 745.49

| PLATE OR Run # | VOLUME START (m3) | VOLUME STOP (m3) | DIFF VOLUME (m3) | DIFF TIME (min) | METER DIFF Hg (mm) | ORFICE DIFF H2O (in.) |
|----------------|-------------------|------------------|------------------|-----------------|--------------------|-----------------------|
| 1              | NA                | NA               | 1.00             | 1.4020          | 3.2                | 2.00                  |
| 2              | NA                | NA               | 1.00             | 1.0060          | 6.4                | 4.00                  |
| 3              | NA                | NA               | 1.00             | 0.9010          | 7.9                | 5.00                  |
| 4              | NA                | NA               | 1.00             | 0.8590          | 8.8                | 5.50                  |
| 5              | NA                | NA               | 1.00             | 0.7090          | 12.8               | 8.00                  |

DATA TABULATION

| Vstd                                | (x axis) Qstd | (y axis) | Va                        | (x axis) Qa | (y axis) |
|-------------------------------------|---------------|----------|---------------------------|-------------|----------|
| 0.9866                              | 0.7037        | 1.4078   | 0.9957                    | 0.7102      | 0.8896   |
| 0.9824                              | 0.9765        | 1.9909   | 0.9914                    | 0.9855      | 1.2581   |
| 0.9803                              | 1.0880        | 2.2259   | 0.9893                    | 1.0980      | 1.4066   |
| 0.9792                              | 1.1399        | 2.3345   | 0.9882                    | 1.1504      | 1.4753   |
| 0.9738                              | 1.3735        | 2.8155   | 0.9828                    | 1.3862      | 1.7792   |
| Qstd slope (m) = 2.10326            |               |          | Qa slope (m) = 1.31703    |             |          |
| intercept (b) = -0.06696            |               |          | intercept (b) = -0.04232  |             |          |
| coefficient (r) = 0.99989           |               |          | coefficient (r) = 0.99989 |             |          |
| 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. : C163248  
證書編號

ITEM TESTED / 送檢項目 ( Job No. / 序引編號 : IC16-1307 )      Date of Receipt / 收件日期 : 10 June 2016

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.  
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 :  $(55 \pm 20)\%$   
Line Voltage / 電壓 : ---

### TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 15 June 2016

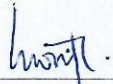
### TEST RESULTS / 測試結果

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).

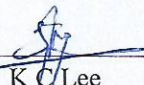
The test equipment used for calibration are traceable to National Standards via :

- 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  
Project Engineer

Date of Issue : 17 June 2016  
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.

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Sun Creation Engineering Limited – Calibration & Testing Laboratory

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Page 1 of 2

# Certificate of Calibration

## 校正證書

Certificate No. : C163248  
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                 | C153519         |
| CL281        | Multifunction Acoustic Calibrator | PA160023        |
| TST150A      | Measuring Amplifier               | C161175         |

- Test procedure : MA100N.

- Results :

### 5.1 Sound Level Accuracy

| UUT<br>Nominal Value | Measured Value<br>(dB) | Mfr's Spec.<br>(dB) | Uncertainty of Measured Value<br>(dB) |
|----------------------|------------------------|---------------------|---------------------------------------|
| 94 dB, 1 kHz         | 93.7                   | $\pm 0.5$           | $\pm 0.2$                             |

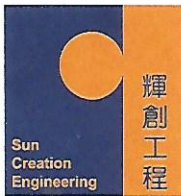
### 5.2 Frequency Accuracy

| UUT Nominal Value<br>(kHz) | Measured Value<br>(kHz) | Mfr's<br>Spec.  | Uncertainty of Measured Value<br>(Hz) |
|----------------------------|-------------------------|-----------------|---------------------------------------|
| 1                          | 0.985                   | 1 kHz $\pm 2\%$ | $\pm 1$                               |

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.



# Certificate of Calibration 校正證書

Certificate No. : C163758  
證書編號

ITEM TESTED / 送檢項目 ( Job No. / 序引編號 : IC16-1465 )      Date of Receipt / 收件日期 : 29 June 2016  
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.  
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 :  $(55 \pm 20)\%$   
Line Voltage / 電壓 : ---

## TEST SPECIFICATIONS / 測試規範

Calibration check

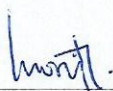
DATE OF TEST / 測試日期 : 11 July 2016


## 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  
Project Engineer

Date of Issue : 12 July 2016  
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.

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# Certificate of Calibration

## 校正證書

Certificate No. : C163758  
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 | C160077         |
| 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 | IEC 61672 Class 1 Spec. |
|-------------|----------------|---------------------|----------------|---------------|-------------|-------------|-------------------------|
| Range (dB)  | Mode           | Frequency Weighting | Time Weighting | Level (dB)    | Freq. (kHz) | (dB)        | (dB)                    |
| 30 - 120    | L <sub>A</sub> | A                   | Fast           | 94.00         | 1           | 93.4        | ± 1.1                   |

#### 6.1.2 Linearity

| UUT Setting |                |                     |                | Applied Value |             | UUT Reading |
|-------------|----------------|---------------------|----------------|---------------|-------------|-------------|
| Range (dB)  | Mode           | Frequency Weighting | Time Weighting | Level (dB)    | Freq. (kHz) | (dB)        |
| 30 - 120    | L <sub>A</sub> | 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 | IEC 61672 Class 1 Spec. |
|-------------|----------------|---------------------|----------------|---------------|-------------|-------------|-------------------------|
| Range (dB)  | Mode           | Frequency Weighting | Time Weighting | Level (dB)    | Freq. (kHz) | (dB)        | (dB)                    |
| 30 - 120    | L <sub>A</sub> | A                   | Fast           | 94.00         | 1           | 93.4        | Ref.                    |
|             |                |                     | Slow           |               |             | 93.4        | ± 0.3                   |

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# Certificate of Calibration

## 校正證書

Certificate No. : C163758  
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   | 77.1             | -16.1 ± 1.5                  |
|             |                |                     |                |               | 250 Hz   | 84.7             | -8.6 ± 1.4                   |
|             |                |                     |                |               | 500 Hz   | 90.1             | -3.2 ± 1.4                   |
|             |                |                     |                |               | 1 kHz    | 93.4             | Ref.                         |
|             |                |                     |                |               | 2 kHz    | 94.7             | +1.2 ± 1.6                   |
|             |                |                     |                |               | 4 kHz    | 94.5             | +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   | 93.2             | -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    | 92.7             | -0.8 ± 1.6                   |
|             |                |                     |                |               | 8 kHz    | 90.5             | -3.0 (+2.1 ; -3.1)           |
|             |                |                     |                |               | 12.5 kHz | 87.6             | -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/0505/012 Manufacturer : HACH

Model No. : 2100Q Serial No. : 12060 C 018447

Date of Calibration : 24/12/2016 Due Date : 23/03/2017

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

005/6.1/001/9

| Theoretical Value of Turbidity Standard (NTU) | Measured Value (NTU) | Difference % * |
|---|----------------------|----------------|
| 20  | 20.2                 | 1.0            |
| 100   | 98.5                 | -1.5           |
| 800   | 780                  | -2.5           |

(\* ) 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 :   H  

Checked by :   [Signature]



## Internal Calibration & Performance Check of pH Meter

Equipment Ref. No. : ET/EW007/008      Manufacturer : HANNA  
 Model No. : HI9125      Serial No. : H0040409  
 Date of Calibration : 27/01/2017      Calibration Due Date : 26/02/2017

### Liquid Junction Error

003/5.2/002/07 (20°C)

Primary Standard Solution Used : Phosphate      Ref No. of Primary Solution: 003/5.2/002/08 (25°C)  
 Temperature of Solution :      25.0 / 20.0       $\Delta\text{pH}_{1/2} =$  0.080 / 0.080  
 pH value of diluted buffer :      6.98 / 6.98       $\text{pH (S)} =$  6.865 / 6.881  
 $\Delta\text{pH} = \text{pH(S)} - \text{pH of diluted buffer} =$  0.115 / 0.099 (Observed Deviation)  
 Liquid Junction Error ( $\Delta\text{pH}_j$ ) =  $\Delta\text{pH} - \Delta\text{pH}_{1/2} =$  0.04 / 0.02

### Shift on Stirring

pH of buffer solution (with stirring),  $\text{pH}_s =$  6.91 / 6.91  
 Shift on stirring,  $\Delta\text{pH}_s = \text{pH}_s - \text{pH(S)} - \Delta\text{pH}_j =$  0.01 / 0.01

### 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: ET/0521/018 / ET/0521/019  
 Temperature record from the reference thermometer ( $T_R$ ): 25.0 / 20.0 °C  
 Temperature record from the ATC ( $T_{ATC}$ ): 24.9 / 19.9 °C  
 Temperature Difference,  $|T_R - T_{ATC}|$  0.1 / 0.1 °C  
 Correction +0.1 / +0.1 °C

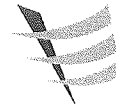
### Acceptance Criteria

| 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 & Performance Check of pH Meter

|                       |                     |                        |                   |
|-----------------------|---------------------|------------------------|-------------------|
| Equipment Ref. No. :  | <u>ET/EW007/008</u> | Manufacturer :         | <u>HANNA</u>      |
| Model No. :           | <u>HI9125</u>       | Serial No. :           | <u>H0040409</u>   |
| Date of Calibration : | <u>27/02/2017</u>   | Calibration Due Date : | <u>26/03/2017</u> |

### Liquid Junction Error

003/5.2/002/09 (20°C)

Primary Standard Solution Used : Phosphate      Ref No. of Primary Solution: 003/5.2/002/08 (25°C)

Temperature of Solution :      25.0 / 20.0       $\Delta\text{pH}_{1/2} =$  0.080 / 0.080

pH value of diluted buffer :      6.97 / 6.97       $\text{pH (S)} =$  6.865 / 6.881

$\Delta\text{pH} = \text{pH(S)} - \text{pH of diluted buffer} =$  0.105 / 0.089 (Observed Deviation)

Liquid Junction Error ( $\Delta\text{pH}_j$ ) =  $\Delta\text{pH} - \Delta\text{pH}_{1/2} =$  0.02 / 0.01

### Shift on Stirring

pH of buffer solution (with stirring),  $\text{pH}_s =$  6.90 / 6.90

Shift on stirring,  $\Delta\text{pH}_s = \text{pH}_s - \text{pH(S)} - \Delta\text{pH}_j =$  0.01 / 0.01

### 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:                      | ET/0521/018 / ET/0521/019 |
| Temperature record from the reference thermometer ( $T_R$ ): | <u>25.0 / 20.0</u> °C     |
| Temperature record from the ATC ( $T_{ATC}$ ):               | <u>24.9 / 19.9</u> °C     |
| Temperature Difference, $ T_R - T_{ATC} $                    | <u>0.1 / 0.1</u> °C       |
| Correction   | <u>+0.1 / +0.1</u> °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/008/005</u> | Manufacturer : <u>YSI</u>                |
| Model No. : <u>Pro 2030</u>               | Serial No. : <u>12A 100353</u>           |
| Date of Calibration : <u>19/01/2017</u>   | Calibration Due Date : <u>18/04/2017</u> |

**Temperature Verification**

Ref. No. of Reference Thermometer : ET/0521/017  
 Ref. No. of Water Bath : ---

|                               |          | Temperature (°C) |            |      |
|-------------------------------|----------|------------------|------------|------|
| Reference Thermometer reading | Measured | 20.3             | Corrected  | 19.8 |
| DO Meter reading              | Measured | 19.9             | Difference | -0.1 |

**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/012/4.5/001/15 | Reagent No. of 0.025N K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> | CPE/012/4.4/002/16 |
|   |                    | Trial 1   | Trial 2            |
| Initial Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (ml)                  |                    | 0.00  | 10.35              |
| Final Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (ml)                    |                    | 10.35   | 20.70              |
| Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> used (ml)                     |                    | 10.35   | 10.35              |
| Normality of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> solution (N)             |                    | 0.02415   | 0.02415            |
| Average Normality (N) of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> solution (N) |                    | 0.02415   |                    |
| 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                | 11.40 | 23.00               | 0.00 | 6.10                | 9.90  |
| Final Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (ml)    | 11.40               | 23.00 | 29.60               | 6.10 | 9.90                | 13.80 |
| Vol. (V) of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> used (ml) | 11.40               | 11.60 | 6.60                | 6.10 | 3.80                | 3.90  |
| Dissolved Oxygen (DO), mg/L   | 7.39                | 7.52  | 4.28                | 3.95 | 2.46                | 2.53  |
| 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                             | 7.35                   | 7.42 | 7.39    | 7.39                             | 7.52 | 7.46    | 0.94                         |
| 5                             | 4.24                   | 4.13 | 4.19    | 4.28                             | 3.95 | 4.12    | 1.68                         |
| 10                            | 2.51                   | 2.58 | 2.55    | 2.46                             | 2.53 | 2.50    | 1.98                         |
| Linear regression coefficient |                        |      |         |                                  |      | 0.9998  |                              |



## Internal Calibration Report of Dissolved Oxygen Meter

### Zero Point Checking

|                        |      |
|------------------------|------|
| DO meter reading, mg/L | 0.00 |
|------------------------|------|

### Salinity Checking

|                             |                    |                             |                    |
|-----------------------------|--------------------|-----------------------------|--------------------|
| Reagent No. of NaCl (10ppt) | CPE/012/4.7/003/33 | Reagent No. of NaCl (30ppt) | CPE/012/4.8/003/33 |
|-----------------------------|--------------------|-----------------------------|--------------------|

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

| Salinity (ppt)  | 10                  |       | 30                  |       |
|---|---------------------|-------|---------------------|-------|
| Trial   | 1                   | 2     | 1                   | 2     |
| Initial Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (ml)  | 0.00                | 10.90 | 21.80               | 31.20 |
| Final Vol. of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> (ml)    | 10.90               | 21.80 | 31.20               | 40.60 |
| Vol. (V) of Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> used (ml) | 10.90               | 10.90 | 9.40                | 9.40  |
| Dissolved Oxygen (DO), mg/L   | 7.07                | 7.07  | 6.09                | 6.09  |
| 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             | 7.21                   | 7.18 | 7.2     | 7.07                             | 7.07 | 7.07    | 1.82                         |
| 30             | 6.13                   | 6.18 | 6.16    | 6.09                             | 6.09 | 6.09    | 1.14                         |

### 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

: Bianco

Approved by:

[Signature]



## Performance Check of Salinity Meter

Equipment Ref. No. : ET/EW/008/005      Manufacturer : YSI  
Model No. : Pro 2030      Serial No. : 12A 100353  
Date of Calibration : 19/01/2017      Due Date : 18/04/2017

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

S/001/9

| Salinity Standard (ppt) | Measured Salinity (ppt) | Difference * (%) |
|-------------------------|-------------------------|------------------|
| 30.0                    | 30.3                    | 1.00             |

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

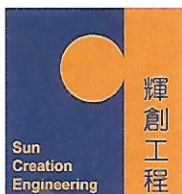
Acceptance Criteria

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 : 



# Certificate of Calibration 校正證書

Certificate No. : C165934  
證書編號

ITEM TESTED / 送檢項目 ( Job No. / 序引編號 : IC16-2438 )      Date of Receipt / 收件日期 : 26 October 2016

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.  
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 :  $(55 \pm 20)\%$   
Line Voltage / 電壓 : ---

## TEST SPECIFICATIONS / 測試規範


Calibration check

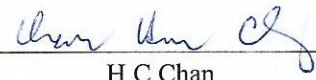
DATE OF TEST / 測試日期 : 27 October 2016

## 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

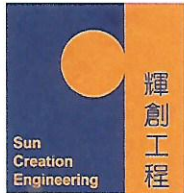
Tested By :   
測試 : \_\_\_\_\_  
T L Shek  
Assistant Engineer

Certified By :   
核證 : \_\_\_\_\_  
H C Chan  
Engineer

Date of Issue : 28 October 2016  
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 and Testing Laboratory

# Certificate of Calibration 校正證書

Certificate No. : C165934  
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 10 measurements at each calibration point.
- Test equipment :

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

- Test procedure : MA130N.
- 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                 | 1.8               | +0.2                | 0.2                        | 2.0             |
| 4.0                 | 3.8               | +0.2                | 0.2                        | 2.0             |
| 6.0                 | 5.8               | +0.2                | 0.3                        | 2.0             |
| 8.1                 | 8.0               | +0.1                | 0.3                        | 2.0             |
| 10.0                | 10.0              | 0.0                 | 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 :

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.

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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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 : 1 November 2016

Brand of Test Meter: Global Water

Model: Speed Sensor: WE550 (S/N:E1337005099 )

Direction Sensor: WE570 (S/N:153500564)

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) |
|-------------------|-----------------|
| 1.18              | 1.3             |
| 0.99              | 1.1             |
| 0.67              | 0.7             |

#### Wind Direction Test

| Global Wate (o) | Marine Compass (o) |
|-----------------|--------------------|
| 270.46          | 270                |
| 0.07            | 0                  |
| 90.25           | 90                 |
| 181.13          | 180                |

Calibrated by: Fai  
Yeung Ping Fai  
(Technical Officer)

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