

High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR 5  
 Calibrated by : P.F.Yeung  
 Date : 09/10/2018

Sampler

Model : TE-5170  
 Serial Number : S/N 0816

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1015  
 Ta(K) : 298

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	10.8	3.290	1.610	54	54.05
2   13 holes	9.0	3.003	1.470	50	50.05
3   10 holes	6.8	2.610	1.279	45	45.04
4   7 holes	4.4	2.100	1.030	37	37.04
5   5 holes	2.4	1.551	0.762	27	27.03

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

Sampler Calibration Relationship (Linear Regression)

Slope(m): 31.657                      Intercept(b): 3.704                      Correlation Coefficient(r): 0.9975

Checked by: Magnum Fan

Date: 12/10/2018

High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR10  
 Calibrated by : P.F.Yeung  
 Date : 09/10/2018

Sampler

Model : TE-5170  
 Serial Number : S/N 8162

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1015  
 Ta(K) : 298

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	10.2	3.197	1.564	52	52.05
2   13 holes	8.6	2.935	1.437	48	48.05
3   10 holes	6.2	2.492	1.221	44	44.04
4   7 holes	4.2	2.051	1.006	38	38.04
5   5 holes	2.6	1.614	0.793	30	30.03

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): 27.443                      Intercept(b): 9.391                      Correlation Coefficient(r): 0.9928

Checked by: Magnum Fan

Date: 12/10/2018

High-Volume TSP Sampler  
5-Point Calibration Record

Location : AQMS1  
 Calibrated by : P.F.Yeung  
 Date : 09/10/2018

Sampler

Model : TE-5170  
 Serial Number : S/N 1253

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1015  
 Ta(K) : 298

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	11.6	3.409	1.668	54	54.05
2   13 holes	9.0	3.003	1.470	49	49.05
3   10 holes	6.7	2.591	1.269	43	43.04
4   7 holes	4.6	2.147	1.053	35	35.03
5   5 holes	2.5	1.583	0.778	27	27.03

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

Sampler Calibration Relationship (Linear Regression)

Slope(m): 31.016                      Intercept(b): 2.949                      Correlation Coefficient(r): 0.9984

Checked by: Magnum Fan

Date: 12/10/2018

High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR 1  
 Calibrated by : P.F.Yeung  
 Date : 09/10/2018

Sampler

Model : TE-5170  
 Serial Number : S/N 0146

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1015  
 Ta(K) : 298

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	11.5	3.395	1.661	54	54.05
2   13 holes	9.0	3.003	1.470	49	49.05
3   10 holes	6.8	2.610	1.279	43	43.04
4   7 holes	4.5	2.123	1.041	38	38.04
5   5 holes	2.7	1.645	0.808	30	30.03

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): 27.681                      Intercept(b): 8.194                      Correlation Coefficient(r): 0.9977

Checked by: Magnum Fan

Date: 12/10/2018

High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR 6  
 Calibrated by : P.F.Yeung  
 Date : 09/10/2018

Sampler

Model : TE-5170  
 Serial Number : S/N 3957

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1015  
 Ta(K) : 298

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	12.0	3.468	1.696	52	52.05
2   13 holes	10.2	3.197	1.564	47	47.04
3   10 holes	7.6	2.760	1.351	42	42.04
4   7 holes	4.6	2.147	1.053	36	36.04
5   5 holes	2.5	1.583	0.778	25	25.02

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): 27.670                      Intercept(b): 4.787                      Correlation Coefficient(r): 0.9916

Checked by: Magnum Fan

Date: 12/10/2018

High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR 5  
 Calibrated by : P.F.Yeung  
 Date : 09/12/2018

Sampler

Model : TE-5170  
 Serial Number : S/N 0816

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1021  
 Ta(K) : 289

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	12.0	3.531	1.727	55	56.07
2   13 holes	9.3	3.109	1.521	50	50.97
3   10 holes	7.6	2.810	1.376	45	45.88
4   7 holes	4.9	2.257	1.106	37	37.72
5   5 holes	3.2	1.824	0.895	29	29.56

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

Sampler Calibration Relationship (Linear Regression)

Slope(m): 31.906                      Intercept(b): 1.755                      Correlation Coefficient(r): 0.9976

Checked by: Magnum Fan

Date: 11/12/2018

High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR10  
 Calibrated by : P.F.Yeung  
 Date : 09/12/2018

Sampler

Model : TE-5170  
 Serial Number : S/N 8162

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1021  
 Ta(K) : 289

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	10.6	3.319	1.624	54	55.05
2   13 holes	8.7	3.007	1.472	50	50.97
3   10 holes	6.4	2.579	1.263	46	46.89
4   7 holes	4.2	2.089	1.025	38	38.74
5   5 holes	2.3	1.546	0.760	32	32.62

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): 26.306                      Intercept(b): 12.533                      Correlation Coefficient(r): 0.9971

Checked by: Magnum Fan

Date: 11/12/2018

High-Volume TSP Sampler  
5-Point Calibration Record

Location : AQMS1  
 Calibrated by : P.F.Yeung  
 Date : 09/12/2018

Sampler

Model : TE-5170  
 Serial Number : S/N 1253

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1021  
 Ta(K) : 289

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	12.8	3.647	1.784	50	50.97
2   13 holes	9.6	3.159	1.546	45	45.88
3   10 holes	7.5	2.792	1.367	40	40.78
4   7 holes	4.8	2.234	1.095	34	34.66
5   5 holes	2.8	1.706	0.838	28	28.54

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

Sampler Calibration Relationship (Linear Regression)

Slope(m): 23.896                      Intercept(b): 8.483                      Correlation Coefficient(r): 0.9984

Checked by: Magnum Fan

Date: 11/12/2018



High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR 1  
 Calibrated by : P.F.Yeung  
 Date : 09/12/2018

Sampler

Model : TE-5170  
 Serial Number : S/N 0146

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1021  
 Ta(K) : 289

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	13.2	3.704	1.811	58	59.13
2   13 holes	9.4	3.126	1.530	52	53.01
3   10 holes	7.6	2.810	1.376	47	47.91
4   7 holes	4.8	2.234	1.095	40	40.78
5   5 holes	3.0	1.766	0.867	33	33.64

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

Sampler Calibration Relationship (Linear Regression)

Slope(m): 27.123                      Intercept(b): 10.663                      Correlation Coefficient(r): 0.9980

Checked by: Magnum Fan

Date: 11/12/2018

High-Volume TSP Sampler  
5-Point Calibration Record

Location : ASR 6  
 Calibrated by : P.F.Yeung  
 Date : 09/12/2018

Sampler

Model : TE-5170  
 Serial Number : S/N 3957

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1021  
 Ta(K) : 289

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	12.5	3.604	1.763	60	61.17
2   13 holes	10.2	3.256	1.593	53	54.03
3   10 holes	6.7	2.639	1.292	46	46.89
4   7 holes	4.8	2.234	1.095	38	38.74
5   5 holes	3.0	1.766	0.867	30	30.58

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): 33.190                      Intercept(b): 2.403                      Correlation Coefficient(r): 0.9961

Checked by: Magnum Fan

Date: 11/12/2018



# Certificate of Calibration

Calibration Certification Information			
Cal. Date: March 19, 2018	Rootsmeter S/N: 438320	Ta: 294	°K
Operator: Jim Tisch		Pa: 746.8	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: <b>2454</b>		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4300	3.2	2.00
2	3	4	1	1.0040	6.4	4.00
3	5	6	1	0.9030	7.9	5.00
4	7	8	1	0.8590	8.7	5.50
5	9	10	1	0.7080	12.8	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left( \frac{Ta}{Pa} \right)}$ (y-axis)
0.9917	0.6935	1.4113	0.9957	0.6963	0.8874
0.9874	0.9835	1.9959	0.9914	0.9875	1.2549
0.9854	1.0913	2.2315	0.9894	1.0957	1.4030
0.9843	1.1459	2.3405	0.9883	1.1506	1.4715
0.9789	1.3826	2.8227	0.9829	1.3882	1.7747
<b>QSTD</b>	m=	2.05242	<b>QA</b>	m=	1.28519
	b=	-0.01383		b=	-0.00869
	r=	0.99994		r=	0.99994

Calculations	
Vstd= $\Delta Vol \left( \frac{Pa - \Delta P}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)$	Va= $\Delta Vol \left( \frac{Pa - \Delta P}{Pa} \right)$
Qstd= Vstd/ΔTime	Qa= Va/ΔTime
For subsequent flow rate calculations:	
Qstd= $1/m \left( \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} \right) - b \right)$	Qa= $1/m \left( \left( \sqrt{\Delta H \left( \frac{Ta}{Pa} \right)} \right) - b \right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH: calibrator manometer reading (in H2O)	
ΔP: rootsmeter manometer reading (mm Hg)	
Ta: actual absolute temperature (°K)	
Pa: actual barometric pressure (mm Hg)	
b: intercept	
m: slope	

RECALIBRATION
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30



輝創工程有限公司

Sun Creation Engineering Limited

Calibration & Testing Laboratory

# Certificate of Calibration

## 校正證書

Certificate No. : C184960

證書編號

ITEM TESTED / 送檢項目 ( Job No. / 序引編號 : IC18-1761 )      Date of Receipt / 收件日期 : 23 August 2018

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 :  $(50 \pm 25)\%$   
Line Voltage / 電壓 : ---

### TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 5 September 2018

### 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  
簽發日期

:

6 September 2018

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

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

Sun Creation Engineering Limited – Calibration & Testing Laboratory

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

輝創工程有限公司 — 校正及檢測實驗室

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輝創工程有限公司

Sun Creation Engineering Limited

Calibration & Testing Laboratory

# Certificate of Calibration 校正證書

Certificate No. : C184960

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	S16493

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
4.0	3.8	+0.2	0.3	2.0
6.0	5.8	+0.2	0.3	2.0
8.0	7.9	+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.

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

Sun Creation Engineering Limited - Calibration & Testing Laboratory

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

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Website/網址: www.suncreation.com

**ENVIROTECH SERVICES CO.**

**Calibration Report of Wind Meter**

Date of Calibration : 30 September 2018

Brand of Test Meter: Davis

Model: Vantage Pro 2 ( s/n: AS160104014)

Location : Roof of Tuen Mun Firestation

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

Davis (m/s)	Anemometer (m/s)
1.6	1.4
3.2	2.7
4.8	4.1

Wind Direction Test

Davis (o)	Marine Compass (o)
270	270
359	0
89	90
181	180

Calibrated by: *Ho*  
Yeung Ping Fai  
(Technical Officer)

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