

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 5
Calibrated by : P.F.Yeung
Date : 11/02/2016

Sampler

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

Calibration Office and Standard Calibration Relationship

Serial Number : 2454
Service Date : 14 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) : 1016
Ta(K) : 291

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.8	3.626	1.749	53	53.71
2	13 holes	10.5	3.284	1.585	47	47.63
3	10 holes	7.8	2.830	1.369	41	41.55
4	7 holes	4.9	2.243	1.089	33	33.44
5	5 holes	3.1	1.784	0.870	26	26.35

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): 30.486 Intercept(b): -0.080 Correlation Coefficient(r): 0.9992

Checked by: Magnum Fan

Date: 15/02/2016

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR10
Calibrated by : P.F.Yeung
Date : 11/02/2016

Sampler

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

Calibration Office and Standard Calibration Relationship

Serial Number : 2454
Service Date : 14 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) : 1016
Ta(K) : 291

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.8	3.481	1.680	54	54.73
2	13 holes	9.6	3.140	1.517	50	50.67
3	10 holes	7.2	2.719	1.316	44	44.59
4	7 holes	4.7	2.197	1.067	36	36.48
5	5 holes	3.0	1.755	0.856	30	30.40

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): 30.032 Intercept(b): 4.472 Correlation Coefficient(r): 0.9993

Checked by: Magnum Fan

Date: 15/02/16

High-Volume TSP Sampler
5-Point Calibration Record

Location : AQMS1
Calibrated by : P.F.Yeung
Date : 11/02/2016

Sampler

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

Calibration Office and Standard Calibration Relationship

Serial Number : 2454
Service Date : 14 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) : 1016
Ta(K) : 291

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.5	3.437	1.658	47	47.63
2	13 holes	9.4	3.107	1.501	42	42.57
3	10 holes	6.8	2.643	1.279	36	36.48
4	7 holes	4.5	2.150	1.044	28	28.38
5	5 holes	2.8	1.696	0.828	22	22.30

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): 30.620 Intercept(b): -3.177 Correlation Coefficient(r): 0.9994

Checked by: Magnum Fan

Date: 15/02/2016

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 1
Calibrated by : P.F.Yeung
Date : 11/02/2016

Sampler

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

Calibration Office and Standard Calibration Relationship

Serial Number : 2454
Service Date : 14 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) : 1016
Ta(K) : 291

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.6	3.4517	1.666	50	50.67
2	13 holes	8.8	3.006	1.453	43	43.58
3	10 holes	6.8	2.643	1.279	38	38.51
4	7 holes	4.6	2.174	1.056	30	30.40
5	5 holes	2.8	1.696	0.828	24	24.32

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): 31.762 Intercept(b): -2.402 Correlation Coefficient(r): 0.9990

Checked by: Magnum Fan

Date: 15/02/2016

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 6
Calibrated by : P.F.Yeung
Date : 11/02/2016

Sampler

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

Calibration Office and Standard Calibration Relationship

Serial Number : 2454
Service Date : 14 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) : 1016
Ta(K) : 291

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.8	3.626	1.749	52	52.70
2	13 holes	10.0	3.205	1.548	46	46.62
3	10 holes	7.8	2.830	1.369	41	41.55
4	7 holes	4.7	2.197	1.067	33	33.44
5	5 holes	3.1	1.784	0.870	28	28.38

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): 27.573 Intercept(b): 4.131 Correlation Coefficient(r): 0.9995

Checked by: Magnum Fan

Date: 15/02/2016

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 5
Calibrated by : P.F.Yeung
Date : 11/04/2016

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 14 Mar 2016
Slope (m) : 2.10326
Intercept (b) : -0.06696
Correlation Coefficient(r) : 0.99989

Standard Condition

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

Calibration Condition

Pa (hpa) : 1016
Ta(K) : 291

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.6	3.411	1.653	53	53.07
2	13 holes	9.2	3.037	1.476	48	48.07
3	10 holes	6.8	2.611	1.273	42	42.06
4	7 holes	4.6	2.148	1.053	36	36.05
5	5 holes	2.8	1.676	0.829	29	29.04

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): 28.998 Intercept(b): 5.212 Correlation Coefficient(r): 0.9998

Checked by: Magnum Fan

Date: 16/04/2016

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR10
Calibrated by : P.F.Yeung
Date : 11/04/2016

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 14 Mar 2016
Slope (m) : 2.10326
Intercept (b) : -0.06696
Correlation Coefficient(r) : 0.99989

Standard Condition

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

Calibration Condition

Pa (hpa) : 1009
Ta(K) : 296

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.8	3.440	1.667	57	57.08
2	13 holes	9.6	3.103	1.507	51	51.07
3	10 holes	6.8	2.611	1.273	44	44.06
4	7 holes	4.5	2.124	1.042	37	37.05
5	5 holes	2.8	1.676	0.829	30	30.04

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): 31.718 Intercept(b): 3.782 Correlation Coefficient(r): 0.9994

Checked by: Magnum Fan

Date: 16/04/16

High-Volume TSP Sampler
5-Point Calibration Record

Location : AQMS1
Calibrated by : P.F.Yeung
Date : 11/04/2016

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 14 Mar 2016
Slope (m) : 2.10326
Intercept (b) : -0.06696
Correlation Coefficient(r) : 0.99989

Standard Condition

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

Calibration Condition

Pa (hpa) : 1009
Ta(K) : 296

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.0	3.469	1.681	53	53.07
2	13 holes	9.2	3.037	1.476	48	48.07
3	10 holes	6.6	2.573	1.255	41	41.06
4	7 holes	4.3	2.077	1.019	35	35.05
5	5 holes	2.6	1.615	0.800	29	29.04

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): 31.383 Intercept(b): 3.340 Correlation Coefficient(r): 0.9996

Checked by: Magnum Fan

Date: 16/04/2016

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 1
Calibrated by : P.F.Yeung
Date : 11/04/2016

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 14 Mar 2016
Slope (m) : 2.10326
Intercept (b) : -0.06696
Correlation Coefficient(r) : 0.99989

Standard Condition

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

Calibration Condition

Pa (hpa) : 1009
Ta(K) : 296

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.5	3.396	1.646	55	55.08
2	13 holes	9.5	3.086	1.499	50	50.07
3	10 holes	7.0	2.649	1.292	44	44.06
4	7 holes	4.4	2.101	1.031	36	36.05
5	5 holes	2.8	1.676	0.829	29	29.04

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): 27.517 Intercept(b): 6.967 Correlation Coefficient(r): 0.9994

Checked by: Magnum Fan

Date: 16/04/2016

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 6
Calibrated by : P.F.Yeung
Date : 11/04/2016

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 14 Mar 2016
Slope (m) : 2.10326
Intercept (b) : -0.06696
Correlation Coefficient(r) : 0.99989

Standard Condition

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

Calibration Condition

Pa (hpa) : 1009
Ta(K) : 296

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.0	3.469	1.681	55	55.08
2	13 holes	9.5	3.086	1.499	49	49.07
3	10 holes	6.8	2.611	1.273	42	42.06
4	7 holes	4.4	2.101	1.031	34	34.05
5	5 holes	2.6	1.615	0.800	26	26.04

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): 32.763 Intercept(b): 0.081 Correlation Coefficient(r): 0.9998

Checked by: Magnum Fan

Date: 16/04/2016

ENVIROTECH SERVICES CO.

Calibration Report of Wind Meter

Date of Calibration : 10 November 2015

Brand of Test Meter: Davis

Model: Weather Wizard III (s/n: WE90911A30)

Location : ASR5

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)	Anemomete (m/s)
1.6	1.4
2.1	2.5
2.5	2.9

Wind Direction Test

Davis (o)	Marine Compass (o)
271	270
2	0
91	90
179	180

Calibrated by:

Fai
Yeung Ping Fai
(Technical Officer)

Checked by :

FAT
Ho Kam Fat
(Senior Technical Officer)



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 }

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

$$Vstd = \text{Diff. Vol}[(Pa - \text{Diff. Hg})/760] (298/Ta)$$

$$Qstd = Vstd/Time$$

$$Va = \text{Diff Vol} [(Pa - \text{Diff Hg})/Pa]$$

$$Qa = Va/Time$$

For subsequent flow rate calculations:

$$Qstd = 1/m\{[\text{SQRT}(H2O(Pa/760) (298/Ta))] - b\}$$

$$Qa = 1/m\{[\text{SQRT } H2O(Ta/Pa)] - b\}$$



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. : 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 Shaueiwan 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.

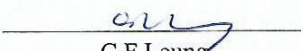
The results are detailed in the subsequent page(s).

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

- Testo Industrial Services GmbH, Germany

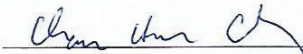
Tested By

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室書面批准。

Sun Creation Engineering Limited - Calibration & Testing Laboratory

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輝創工程有限公司 校正及檢測實驗室

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Page 1 of 2

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 :

Equipment ID

CL386

Description

Multi-function Measuring Instrument

Certificate No.

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.

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

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