

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 5
 Calibrated by : P.F. Yeung
 Date : 10/02/2015

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
 Service Date : 14 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) : 1022
 Ta(K) : 288

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1 18 holes	12.5	3.612	1.741	57	58.24
2 13 holes	9.5	3.149	1.517	50	51.09
3 10 holes	7.4	2.779	1.339	44	44.96
4 7 holes	4.8	2.238	1.079	35	35.76
5 5 holes	2.8	1.710	0.824	28	28.61

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): 32.792 Intercept(b): 1.098 Correlation Coefficient(r): 0.9993

Checked by: Magnum Fan

Date: 16/02/2015

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR10
 Calibrated by : P.F. Yeung
 Date : 10/02/2015

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
 Service Date : 14 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) : 1022
 Ta(K) : 288

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.6	3.590	1.730	62	62.71
2	13 holes	9.2	3.068	1.478	52	52.60
3	10 holes	7.0	2.676	1.290	45	45.52
4	7 holes	4.6	2.169	1.047	36	36.41
5	5 holes	2.8	1.693	0.816	28	28.32

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): 37.576 Intercept(b): -2.680 Correlation Coefficient(r): 0.9997

Checked by: Magnum Fan

Date: 16/02/15

High-Volume TSP Sampler
5-Point Calibration Record

Location : AQMS1
 Calibrated by : P.F. Yeung
 Date : 10/02/2015

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
 Service Date : 14 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) : 1022
 Ta(K) : 288

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.6	3.627	1.748	54	55.17
2	13 holes	9.8	3.198	1.541	48	49.04
3	10 holes	7.5	2.798	1.348	42	42.91
4	7 holes	5.0	2.285	1.101	36	36.78
5	5 holes	2.9	1.740	0.839	29	29.63

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): 27.982 Intercept(b): 5.901 Correlation Coefficient(r): 0.9995

Checked by: Magnum Fan

Date: 16/02/2015

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 1
 Calibrated by : P.F.Yeung
 Date : 10/02/2015

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
 Service Date : 14 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) : 1022
 Ta(K) : 288

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1 18 holes	11.9	3.525	1.698	53	54.15
2 13 holes	9.5	3.149	1.517	47	48.02
3 10 holes	7.0	2.703	1.303	40	40.87
4 7 holes	4.7	2.215	1.068	32	32.70
5 5 holes	2.8	1.710	0.824	24	24.52

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): 33.930 Intercept(b): -3.447 Correlation Coefficient(r): 0.9993

Checked by: Magnum Fan

Date: 16/02/2015

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 6
 Calibrated by : P.F.Yeung
 Date : 10/02/2015

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
 Service Date : 14 Mar 2014
 Slope (m) : 2.05818
 Intercept (b) : 0.01929
 Correlation Coefficient(r) : 0.99991

Standard Condition

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

Calibration Condition

Pa (hpa) : 1022
 Ta(K) : 288

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1 18 holes	12.8	3.655	1.761	54	55.17
2 13 holes	9.8	3.198	1.541	48	49.04
3 10 holes	7.2	2.742	1.321	41	41.89
4 7 holes	4.5	2.167	1.045	33	33.72
5 5 holes	2.9	1.740	0.839	27	27.59

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

Sampler Calibration Relationship (Linear Regression)

Slope(m): 30.101 Intercept(b): 2.309 Correlation Coefficient(r): 0.9995

Checked by: Magnum Fan

Date: 16/02/2015

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 5
 Calibrated by : P.F. Yeung
 Date : 10/04/2015

Sampler

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

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) : 1013
 Ta(K) : 295

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.0	3.482	1.680	52	52.26
2	13 holes	9.6	3.114	1.504	47	47.24
3	10 holes	7.0	2.659	1.287	40	40.20
4	7 holes	4.4	2.108	1.024	32	32.16
5	5 holes	2.7	1.652	0.806	24	24.12

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): 32.076 Intercept(b): 1.232 Correlation Coefficient(r): 0.9993

Checked by: Magnum Fan

Date: 15/04/2015

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR10
 Calibrated by : P.F. Yeung
 Date : 10/04/2015

Sampler

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

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) : 1013
 Ta(K) : 295

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.6	3.423	1.652	58	58.29
2	13 holes	9.0	3.015	1.457	52	52.26
3	10 holes	6.8	2.621	1.269	44	44.22
4	7 holes	4.4	2.108	1.024	36	36.18
5	5 holes	2.8	1.682	0.821	28	28.14

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): 36.442 Intercept(b): -1.537 Correlation Coefficient(r): 0.9991

Checked by: Magnum Fan

Date: 15/04/15

High-Volume TSP Sampler
5-Point Calibration Record

Location : AQMS1
 Calibrated by : P.F. Yeung
 Date : 10/04/2015

Sampler

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

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) : 1013
 Ta(K) : 295

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.0	3.482	1.680	50	50.25
2	13 holes	9.4	3.081	1.489	44	44.22
3	10 holes	7.0	2.659	1.287	38	38.19
4	7 holes	4.4	2.108	1.024	30	30.15
5	5 holes	2.6	1.621	0.792	24	24.12

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): 26.569 Intercept(b): 0.297 Correlation Coefficient(r): 0.9995

Checked by: Magnum Fan

Date: 15/04/2015

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 1
 Calibrated by : P.F.Yeung
 Date : 10/04/2015

Sampler

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

Calibration Office 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) : 1013
 Ta(K) : 295

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1 18 holes	11.8	3.453	1.666	56	56.28
2 13 holes	9.2	3.049	1.473	49	49.25
3 10 holes	6.8	2.621	1.269	42	42.21
4 7 holes	4.8	2.202	1.069	35	35.18
5 5 holes	2.7	1.652	0.806	25	25.13

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): 36.016 Intercept(b): -3.652 Correlation Coefficient(r): 0.9998

Checked by: Magnum Fan

Date: 15/04/2015

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 6
 Calibrated by : P.F.Yeung
 Date : 10/04/2015

Sampler

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

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) : 1013
 Ta(K) : 295

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1 18 holes	12.4	3.539	1.707	54	54.27
2 13 holes	9.8	3.146	1.520	48	48.24
3 10 holes	7.2	2.697	1.305	41	41.21
4 7 holes	4.6	2.156	1.047	34	34.17
5 5 holes	2.8	1.682	0.821	26	26.13

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): 31.297 Intercept(b): 0.744 Correlation Coefficient(r): 0.9993

Checked by: Magnum Fan

Date: 15/04/2015

ENVIROTECH SERVICES CO.

Calibration Report of Wind Meter

Date of Calibration : 29 December 2014

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)
1.4	1.6
1.9	1.7
2.4	2.5

Wind Direction Test

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

Calibrated by: Fai
Yeung Ping Fai
(Technical Officer)

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



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

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

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

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.4460	3.2	2.00
2	NA	NA	1.00	1.0300	6.4	4.00
3	NA	NA	1.00	0.9180	7.9	5.00
4	NA	NA	1.00	0.8780	8.7	5.50
5	NA	NA	1.00	0.7240	12.6	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
1.0121	0.6999	1.4258	0.9958	0.6886	0.8784
1.0078	0.9785	2.0163	0.9916	0.9627	1.2422
1.0057	1.0955	2.2543	0.9895	1.0779	1.3888
1.0047	1.1443	2.3644	0.9885	1.1258	1.4566
0.9994	1.3805	2.8515	0.9833	1.3582	1.7568
Qstd slope (m) = 2.09532			Qa slope (m) = 1.31205		
intercept (b) = -0.03812			intercept (b) = -0.02349		
coefficient (r) = 0.99994			coefficient (r) = 0.99994		
y axis = SQRT[H2O(Pa/760) (298/Ta)]			y axis = SQRT[H2O(Ta/Pa)]		

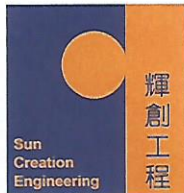
CALCULATIONS

Vstd = Diff. Vol [(Pa-Diff. Hg) / 760] (298/Ta)
 Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg) / Pa]
 Qa = Va/Time

For subsequent flow rate calculations:

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



輝創工程有限公司

Sun Creation Engineering Limited

Calibration and Testing Laboratory

Certificate of Calibration

校正證書

Certificate No. : 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

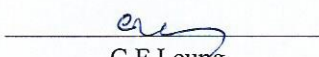
TEST RESULTS / 測試結果

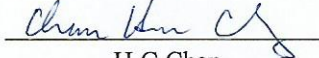
The results apply to the particular unit-under-test only.

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

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輝創工程有限公司 - 校正及檢測實驗室

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Website/網址: www.suncreation.com

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.

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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輝創工程有限公司 – 校正及檢測實驗室

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Website/網址: www.suncreation.com



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]



Performance Check of Turbidity Meter

Equipment Ref. No. : ET/0505/011 Manufacturer : HACH
Model No. : 2100Q Serial No. : 12060 C 018534
Date of Calibration : 02/04/2015 Due Date : 01/07/2015

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

005/6.1/001/7

Theoretical Value of Turbidity Standard (NTU)	Measured Value (NTU)	Difference % *
20	20.2	1.00
100	103	3.00
800	787	-1.63

(*) 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 : 

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 : 07/03/2015 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 $\Delta\text{pH}_{1/2} = +0.08$
 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) = $\Delta\text{pH} - \Delta\text{pH}_{1/2} = \underline{0.021}$

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

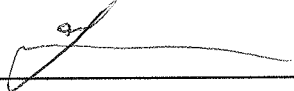
Acceptance Criteria

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 : 06/04/2015 Calibration Due Date : 05/05/2015

Liquid Junction Error

Primary Standard Solution Used : Phosphate Ref No. of Primary Solution: 003/5.2/001/23
 Temperature of Solution : 20.0 $\Delta\text{pH}_{1/2} = \underline{+0.08}$
 pH value of diluted buffer : 6.76 $\text{pH (S)} = \underline{6.881}$
 $\Delta\text{pH} = \text{pH(S)} - \text{pH of diluted buffer} = \underline{0.121}$ (Observed Deviation)
 Liquid Junction Error (ΔpH_j) = $\Delta\text{pH} - \Delta\text{pH}_{1/2} = \underline{0.041}$

Shift on Stirring

pH of buffer solution (with stirring), $\text{pH}_s = \underline{6.94}$
 Shift on stirring, $\Delta\text{pH}_s = \text{pH}_s - \text{pH(S)} - \Delta\text{pH}_j = \underline{0.018}$

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}): 19.6 °C
 Temperature Difference, $|T_R - T_{ATC}|$: 0.3 °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 : hy

Checked by : [Signature]



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			



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 : 