

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 1
Calibrated by : P.F. Yeung
Date : 10/04/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1015
Ta(K) : 296

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.4	3.537	1.704	53	53.23
2	13 holes	9.8	3.144	1.515	46	46.20
3	10 holes	7.3	2.714	1.308	38	38.17
4	7 holes	4.6	2.154	1.038	30	30.13
5	5 holes	2.9	1.710	0.824	22	22.10

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): 34.944 Intercept(b): -6.690 Correlation Coefficient(r): 0.9990

Checked by: Magnum Fan

Date: 16/04/2014

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR1
Calibrated by : P.F.Yeung
Date : 10/06/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1002
Ta(K) : 300

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.8	3.546	1.709	56	55.51
2	13 holes	9.7	3.087	1.488	48	47.58
3	10 holes	7.1	2.641	1.273	41	40.64
4	7 holes	5.0	2.216	1.068	33	32.71
5	5 holes	3.0	1.717	0.828	26	25.77

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): 34.041 Intercept(b): -2.892 Correlation Coefficient(r): 0.9991

Checked by: Magnum Fan

Date: 16/06/2014

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 5
Calibrated by : P.F. Yeung
Date : 10/04/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1015
Ta(K) : 296

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.6	3.565	1.718	52	52.23
2	13 holes	9.8	3.144	1.515	46	46.20
3	10 holes	6.8	2.619	1.262	38	38.17
4	7 holes	4.8	2.200	1.060	32	32.14
5	5 holes	2.8	1.681	0.810	24	24.10

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): 30.983 Intercept(b): -0.878 Correlation Coefficient(r): 0.9999

Checked by: Magnum Fan

Date: 16/04/2014

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 5
Calibrated by : P.F.Yeung
Date : 10/06/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1002
Ta(K) : 300

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.2	3.462	1.668	54	53.53
2	13 holes	10.0	3.135	1.510	49	48.57
3	10 holes	7.2	2.660	1.282	42	41.63
4	7 holes	4.7	2.149	1.037	35	34.69
5	5 holes	2.8	1.659	0.799	27	26.76

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): 30.460 Intercept(b): 2.684 Correlation Coefficient(r): 0.9996

Checked by: Magnum Fan

Date: 16/06/2014

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 6
Calibrated by : P.F.Yeung
Date : 10/04/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 24 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) : 1015
Ta(K) : 296

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.4	3.391	1.634	55	55.24
2	13 holes	9.0	3.013	1.452	48	48.21
3	10 holes	6.6	2.580	1.243	40	40.17
4	7 holes	4.5	2.131	1.027	32	32.14
5	5 holes	2.8	1.681	0.810	24	24.10

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): 37.778 Intercept(b): -6.617 Correlation Coefficient(r): 0.999

Checked by: Magnum Fan

Date: 16/04/2014

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR6
Calibrated by : P.F.Yeung
Date : 10/06/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 24 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) : 1002
Ta(K) : 300

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.4	3.347	1.613	55	54.52
2	13 holes	9.0	2.974	1.433	48	47.58
3	10 holes	6.6	2.547	1.227	40	39.65
4	7 holes	4.5	2.102	1.013	32	31.72
5	5 holes	2.8	1.659	0.799	24	23.79

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): 37.778 Intercept(b): -6.531 Correlation Coefficient(r): 0.9999

Checked by: Magnum Fan

Date: 16/06/2014

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR10
Calibrated by : P.F.Yeung
Date : 10/04/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1015
Ta(K) : 296

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.1	3.346	1.612	61	61.27
2	13 holes	9.0	3.013	1.452	54	54.24
3	10 holes	7.2	2.695	1.299	48	48.21
4	7 holes	5.0	2.246	1.082	38	38.17
5	5 holes	2.9	1.710	0.824	28	28.12

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): 42.292 Intercept(b): -7.032 Correlation Coefficient(r): 0.9996

Checked by: Magnum Fan

Date: 16/04/14

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR10
Calibrated by : P.F.Yeung
Date : 10/06/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1002
Ta(K) : 300

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.2	3.462	1.668	57	56.50
2	13 holes	9.8	3.103	1.495	51	50.55
3	10 holes	7.2	2.660	1.282	44	43.61
4	7 holes	4.8	2.172	1.047	36	35.68
5	5 holes	3.0	1.717	0.828	27	26.76

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): 34.928 Intercept(b): -1.523 Correlation Coefficient(r): 0.9991

Checked by: Magnum Fan

Date: 16/06/14

High-Volume TSP Sampler
5-Point Calibration Record

Location : AQMS1
Calibrated by : P.F. Yeung
Date : 10/04/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1015
Ta(K) : 296

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.4	3.537	1.704	53	53.23
2	13 holes	9.6	3.112	1.500	47	47.21
3	10 holes	7.2	2.695	1.299	42	42.18
4	7 holes	4.6	2.154	1.038	35	35.15
5	5 holes	2.8	1.681	0.810	28	28.12

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): 27.690 Intercept(b): 6.009 Correlation Coefficient(r): 0.9994

Checked by: Magnum Fan

Date: 16/04/2014

High-Volume TSP Sampler
5-Point Calibration Record

Location : AQMS1
Calibrated by : P.F.Yeung
Date : 10/06/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

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

Standard Condition

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

Calibration Condition

Pa (hpa) : 1002
Ta(K) : 300

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.5	3.505	1.689	53	52.54
2	13 holes	10.0	3.135	1.510	47	46.59
3	10 holes	7.2	2.660	1.282	41	40.64
4	7 holes	4.8	2.172	1.047	34	33.70
5	5 holes	3.0	1.717	0.828	28	27.75

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): 28.931 Intercept(b): 3.982 Correlation Coefficient(r): 0.9994

Checked by: Magnum Fan

Date: 16/06/2014

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

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

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.4740	3.2	2.00
2	NA	NA	1.00	1.0340	6.4	4.00
3	NA	NA	1.00	0.9240	7.9	5.00
4	NA	NA	1.00	0.8820	8.8	5.50
5	NA	NA	1.00	0.7270	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
1.0103	0.6854	1.4245	0.9958	0.6755	0.8791
1.0061	0.9730	2.0146	0.9916	0.9590	1.2433
1.0040	1.0866	2.2524	0.9895	1.0709	1.3900
1.0028	1.1370	2.3623	0.9884	1.1206	1.4579
0.9976	1.3722	2.8491	0.9832	1.3524	1.7583
Qstd slope (m) = 2.07593			Qa slope (m) = 1.29991		
intercept (b) = -0.00102			intercept (b) = -0.00063		
coefficient (r) = 0.99996			coefficient (r) = 0.99996		
y axis = $\text{SQRT}[\text{H}_2\text{O}(\text{Pa}/760)(298/\text{Ta})]$			y axis = $\text{SQRT}[\text{H}_2\text{O}(\text{Ta}/\text{Pa})]$		

CALCULATIONS

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

$$\text{Qstd} = \text{Vstd}/\text{Time}$$

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

$$\text{Qa} = \text{Va}/\text{Time}$$

For subsequent flow rate calculations:

$$\text{Qstd} = 1/m\{[\text{SQRT}(\text{H}_2\text{O}(\text{Pa}/760)(298/\text{Ta}))] - b\}$$

$$\text{Qa} = 1/m\{[\text{SQRT}(\text{H}_2\text{O}(\text{Ta}/\text{Pa}))] - b\}$$

ENVIROTECH SERVICES CO.

Calibration Report of Wind Meter

Date of Calibration : 29 May 2014

Brand of Test Meter: MetPak

Model: MetPak II (S/N: 13130002)

Location : ASR5

Procedures :

1. Wind Still Test: The wind meter was covered by a plastic bag
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

MetPak II (m/s)	Anemometer (m/s)
1.81	1.9
3.09	3.2
4.76	4.5

Wind Direction Test

MetPak II (o)	Marine Compass (o)
270	270
0	0
90	90
180	180

Calibrated by:

Fai
Yeung Ping Fai
(Technical Officer)

Checked by :

Fat
Ho Kam Fat
(Senior Technical Officer)

ENVIROTECH SERVICES CO.

Calibration Report of Wind Meter

Date of Calibration : 29 June 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)
1.2	1.1
2.3	2.5
1.7	1.9

Wind Direction Test

Davis (o)	Marine Compass (o)
271	270
0	0
90	90
181	180

Calibrated by:

Fai
Yeung Ping Fai
(Technical Officer)

Checked by :

Fat
Ho Kam Fat
(Senior Technical Officer)

Certificate of Calibration

校正證書

Certificate No. : C143205
證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC14-1304)

Date of Receipt / 收件日期 : 19 May 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 : $(23 \pm 2)^{\circ}\text{C}$
Line Voltage / 電壓 : ---

Relative Humidity / 相對濕度 : $(55 \pm 20)\%$

TEST SPECIFICATIONS / 測試規範

Calibration check

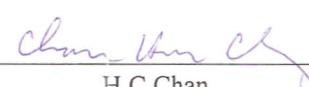
DATE OF TEST / 測試日期 : 26 May 2014

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 : H S Chung
Technician

Certified By : 
核證 : H C Chan
Engineer

Date of Issue : 27 May 2014
簽發日期

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate s all 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。

Certificate of Calibration

校正證書

Certificate No. : C143205
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 :

Applied Value (m/s)	UUT Reading (m/s)	Measured Correction		
		Value (m/s)	Measurement Uncertainty	
			Expanded Uncertainty (m/s)	Coverage Factor
2.1	1.8	+0.3	0.2	2.0
4.1	4.0	+0.1	0.3	2.0
6.1	6.1	0.0	0.3	2.0
8.2	8.4	-0.2	0.3	2.0
10.1	10.4	-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.



Performance Check of Turbidity Meter

Equipment Ref. No. : ET/0505/010 Manufacturer : HACH

Model No. : 2100Q Serial No. : 11110 C 014260

Date of Calibration : 07/04/2014 Due Date : 06/07/2014

Theoretical Value of Turbidity Standard (NTU)	Measured Value (NTU)	Difference % *
20	19.5	-2.50
100	103	3.00
800	792	-1.00

(*) 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 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>28/04/2014</u>	Calibration Due Date : <u>27/07/2014</u>

Temperature Verification

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

Ref. No. of Water Bath : ---

Temperature (°C)				
Reference Thermometer reading	Measured	20.1	Corrected	19.7
DO Meter reading	Measured	19.6	Difference	0.1

Standardization of sodium thiosulphate ($\text{Na}_2\text{S}_2\text{O}_3$) solution

Reagent No. of $\text{Na}_2\text{S}_2\text{O}_3$ titrant	CPE/012/4.5/001/8	Reagent No. of 0.025N $\text{K}_2\text{Cr}_2\text{O}_7$	CPE/012/4.4/001/26
	Trial 1		Trial 2
Initial Vol. of $\text{Na}_2\text{S}_2\text{O}_3$ (ml)	0.00		10.20
Final Vol. of $\text{Na}_2\text{S}_2\text{O}_3$ (ml)	10.20		20.45
Vol. of $\text{Na}_2\text{S}_2\text{O}_3$ used (ml)	10.20		10.25
Normality of $\text{Na}_2\text{S}_2\text{O}_3$ solution (N)	0.02451		0.02439
Average Normality (N) of $\text{Na}_2\text{S}_2\text{O}_3$ solution (N)	0.02445		
Acceptance criteria, Deviation	Less than $\pm 0.001\text{N}$		

Calculation: Normality of $\text{Na}_2\text{S}_2\text{O}_3$, $N = 0.25 / \text{ml } \text{Na}_2\text{S}_2\text{O}_3 \text{ used}$

Lineality Checking

Determination of dissolved oxygen content by Winkler Titration *

Purging Time (min)	2		5		10	
Trial	1	2	1	2	1	2
Initial Vol. of $\text{Na}_2\text{S}_2\text{O}_3$ (ml)	0.00	12.00	24.00	0.00	8.10	12.90
Final Vol. of $\text{Na}_2\text{S}_2\text{O}_3$ (ml)	12.00	24.00	32.00	8.10	12.90	17.60
Vol. (V) of $\text{Na}_2\text{S}_2\text{O}_3$ used (ml)	12.00	12.00	8.00	8.10	4.80	4.70
Dissolved Oxygen (DO), mg/L	7.88	7.88	5.25	5.32	3.15	3.08
Acceptance criteria, Deviation	Less than + 0.3mg/L		Less than + 0.3mg/L		Less than + 0.3mg/L	

Calculation: $\text{DO (mg/L)} = V \times N \times 8000/298$

Purging time, min	DO meter reading, mg/L			Winkler Titration result *, mg/L			Difference (%) of DO Content
	1	2	Average	1	2	Average	
2	7.65	7.58	7.62	7.88	7.88	7.88	3.35
5	5.34	5.39	5.37	5.25	5.32	5.29	1.50
10	3.21	3.17	3.19	3.15	3.08	3.12	2.22
Linear regression coefficient				0.9983			



Internal Calibration Report of Dissolved Oxygen Meter

Zero Point Checking

DO meter reading, mg/L	0.00
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Salinity Checking

Reagent No. of NaCl (10ppt)	CPE/012/4.7/002/19	Reagent No. of NaCl (30ppt)	CPE/012/4.8/002/19
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Determination of dissolved oxygen content by Winkler Titration **

Salinity (ppt)	10		30	
Trial	1	2	1	2
Initial Vol. of Na ₂ S ₂ O ₃ (ml)	0.00	11.90	23.70	34.20
Final Vol. of Na ₂ S ₂ O ₃ (ml)	11.90	23.70	34.20	44.80
Vol. (V) of Na ₂ S ₂ O ₃ used (ml)	11.90	11.80	10.50	10.60
Dissolved Oxygen (DO), mg/L	7.81	7.75	6.89	6.96
Acceptance criteria, Deviation	Less than + 0.3mg/L		Less than + 0.3mg/L	

Calculation: DO (mg/L) = V x N x 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	7.86	7.79	7.83	7.81	7.75	7.78	0.64
30	6.95	6.99	6.97	6.89	6.96	6.93	0.58

Acceptance Criteria

- (1) Differenc between temperature readings from temperature sensor of DO probe and reference thermometer : < 0.5 °C
- (2) Linear regression coefficient : >0.99
- (3) Zero checking: 0.0mg/L
- (4) Difference (%) of DO content from the meter reading and by winkler titration : within ± 5%

The equipment complies # / ~~does not comply~~ # with the specified requirements and is deemed acceptable # / unacceptable # for use.

Delete as appropriate

Calibrated by

:

Approved by :



Performance Check of Salinity Meter

Equipment Ref. No. : ET/EW/008/005 Manufacturer : YSI
Model No. : Pro 2030 Serial No. : 12A 100353
Date of Calibration : 28/04/2014 Due Date : 27/07/2014

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

S/001/5

Salinity Standard (ppt)	Measured Salinity (ppt)	Difference * (%)
30.0	31.1	3.67

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

Acceptance Criteria

Difference : -10 % to 10 %

The salinity meter complies * / ~~does not comply~~ * with the specified requirements and is deemed acceptable * / ~~unacceptable~~ * for use. Measurements are traceable to national standards.

Checked by : 

Approved by : 



Internal Calibration & Performance Check of pH Meter

Equipment Ref. No. : ET/EW/007/003 Manufacturer : HANNA
Model No. : HI 8314 Serial No. : 674469
Date of Calibration : 09/05/2014 Calibration Due Date : 08/06/2014

Liquid Junction Error

Primary Standard Solution Used : Phosphate Ref No. of Primary Solution: 003/5.2/001/17
Temperature of Solution : 20.0 $\Delta pH_{1/2} = +0.08$
pH value of diluted buffer : 6.78 pH (S) = 6.881
 $\Delta pH = pH(S) - pH \text{ of diluted buffer} = \underline{0.101}$ (Observed Deviation)
Liquid Junction Error (ΔpH_j) = $\Delta pH - \Delta pH_{1/2} = \underline{0.021}$

Shift on Stirring

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

Noise

Noise, ΔpH_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): 20.0 °C
Temperature record from the ATC (T_{ATC}): 19.9 °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/007/003 Manufacturer : HANNA
Model No. : HI 8314 Serial No. : 674469
Date of Calibration : 10/06/2014 Calibration Due Date : 09/07/2014

Liquid Junction Error

Primary Standard Solution Used : Phosphate Ref No. of Primary Solution: 003/5.2/001/18
Temperature of Solution : 20.0 $\Delta pH_{1/2} = +0.08$
pH value of diluted buffer : 6.77 pH (S) = 6.881
 $\Delta pH = pH(S) - pH \text{ of diluted buffer} = 0.111$ (Observed Deviation)
Liquid Junction Error (ΔpH_j) = $\Delta pH - \Delta pH_{1/2} = 0.031$

Shift on Stirring

pH of buffer solution (with stirring), $pH_s = 6.92$
Shift on stirring, $\Delta pH_s = pH_s - pH(S) - \Delta pH_j = 0.008$

Noise

Noise, ΔpH_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): 19.6 °C
Temperature record from the ATC (T_{ATC}): 19.5 °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 : 