

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 1
Calibrated by : P.F.Yeung
Date : 10/02/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 12 Mar 2013
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) : 1019
Ta(K) : 292

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	13.0	3.717	1.797	53	54.64
2	13 holes	10.2	3.293	1.590	46	47.43
3	10 holes	7.4	2.805	1.353	40	41.24
4	7 holes	4.9	2.282	1.099	31	31.96
5	5 holes	3.0	1.786	0.858	24	24.74

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): 31.788 Intercept(b): -2.582 Correlation Coefficient(r): 0.9990

Checked by: Magnum Fan

Date: 15/02/2014

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 5
Calibrated by : P.F.Yeung
Date : 10/02/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 12 Mar 2013
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) : 1019
Ta(K) : 282

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.2	3.601	1.740	54	55.67
2	13 holes	9.8	3.228	1.559	49	50.52
3	10 holes	7.5	2.824	1.362	43	44.33
4	7 holes	4.8	2.259	1.088	35	36.09
5	5 holes	2.9	1.756	0.844	27	27.84

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): 31.009 Intercept(b): 1.999 Correlation Coefficient(r): 0.9996

Checked by: Magnum Fan

Date: 15/02/2014

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR 6
Calibrated by : P.F.Yeung
Date : 10/02/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 12 Mar 2013
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) : 1019
Ta(K) : 282

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.6	3.660	1.769	57	58.77
2	13 holes	9.9	3.244	1.567	50	51.55
3	10 holes	7.2	2.767	1.335	42	43.30
4	7 holes	4.7	2.235	1.077	34	35.05
5	5 holes	2.8	1.725	0.829	25	25.78

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): 34.790 Intercept(b): -2.864 Correlation Coefficient(r): 0.9997

Checked by: Magnum Fan

Date: 15/02/2014

High-Volume TSP Sampler
5-Point Calibration Record

Location : ASR10A
Calibrated by : P.F. Yeung
Date : 10/02/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 12 Mar 2013
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) : 1019
Ta(K) : 282

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.6	3.660	1.769	57	58.77
2	13 holes	10.5	3.341	1.614	52	53.61
3	10 holes	7.6	2.842	1.372	45	46.40
4	7 holes	4.8	2.259	1.088	36	37.12
5	5 holes	3.0	1.786	0.858	28	28.87

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): 32.526 Intercept(b): 1.364 Correlation Coefficient(r): 0.9995

Checked by: Magnum Fan

Date: 15/02/14

High-Volume TSP Sampler
5-Point Calibration Record

Location : AQM1
Calibrated by : P.F. Yeung
Date : 10/02/2014

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 12 Mar 2013
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) : 1019
Ta(K) : 282

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.5	3.645	1.762	54	55.67
2	13 holes	10.1	3.277	1.583	48	49.49
3	10 holes	7.5	2.824	1.362	42	43.30
4	7 holes	4.7	2.235	1.077	33	34.02
5	5 holes	3.0	1.786	0.858	26	26.81

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): 31.647 Intercept(b): 0.1797 Correlation Coefficient(r): 0.9997

Checked by: Magnum Fan

Date: 15/02/2014

WATER

Certification of Quality

This product has been tested in accordance with procedures established through Global Water Instrumentation's Quality Management System. This product meets or exceeds its manufacturing acceptance criteria.

ITEM DESCRIPTION:	Wind Direction
MODEL NAME/ NUMBER:	WE570
PART NUMBER:	ED0000
SENSOR RANGE:	0-360 °
SENSOR OUTPUT:	4.01-20.03 mA
ACCURACY:	1% of full scale
POWER REQUIRED	10-36 VDC
SERIAL NUMBER:	1337005143
CABLE LENGTH:	25 ft
CERTIFICATES:	CE Compliant

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Water Flow

Water Samplers

Water Quality

Weather

Remote Monitoring

Control

Technician: *Wright, Jess*

Date: 9/12/2013

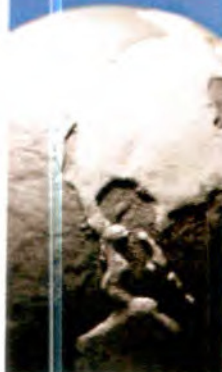
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Certification of Quality

This product has been tested in accordance with procedures established through Global Water Instrumentation's Quality Management System. This product meets or exceeds its manufacturing acceptance criteria.

ITEM DESCRIPTION:	Wind Speed Sensor
MODEL NAME/ NUMBER:	WE550
PART NUMBER:	EC0000
SENSOR RANGE:	0-110 MPH
SENSOR OUTPUT:	4.00-19.91 mA
ACCURACY:	.2 MPH over the range 11 to 55 MPH
POWER REQUIRED	10-36 VDC
SERIAL NUMBER:	1337005099
CABLE LENGTH:	25 ft
CERTIFICATES:	CE Compliant

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Water Samplers
Water Quality
Weather
Remote Monitoring
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Technician: *Wright, Jess*

Date: 9/10/2013

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Performance Check of Turbidity Meter

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

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

Date of Calibration : 07/01/2014 Due Date : 06/04/2014

Theoretical Value of Turbidity Standard (NTU)	Measured Value (NTU)	Difference % *
20	19.2	-4.08
100	104	3.92
800	793	-0.88

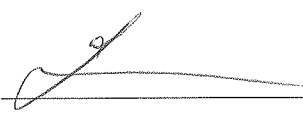
(*) Difference = (Measured Value – Theoretical Value) / Theoretical Value

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. : ET/EW/008/005
Model No. : Pro 2030
Date of Calibration : 29/01/2014

Manufacturer : YSI
Serial No. : 12A 100353
Calibration Due Date : 28/04/2014

Temperature Verification

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

Ref. No. of Water Bath : ---

	Temperature (°C)			
	Measured	20.2	Corrected	19.8
Reference Thermometer reading	Measured	19.7	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/012/4.4/001/24
	Trial 1		Trial 2
Initial Vol. of $\text{Na}_2\text{S}_2\text{O}_3$ (ml)	0.00		10.50
Final Vol. of $\text{Na}_2\text{S}_2\text{O}_3$ (ml)	10.50		20.95
Vol. of $\text{Na}_2\text{S}_2\text{O}_3$ used (ml)	10.50		10.45
Normality of $\text{Na}_2\text{S}_2\text{O}_3$ solution (N)	0.02381		0.02392
Average Normality (N) of $\text{Na}_2\text{S}_2\text{O}_3$ solution (N)	0.02387		
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	11.90	23.50	0.00	8.20	13.20
Final Vol. of $\text{Na}_2\text{S}_2\text{O}_3$ (ml)	11.90	23.50	31.90	8.20	13.20	17.90
Vol. (V) of $\text{Na}_2\text{S}_2\text{O}_3$ used (ml)	11.90	11.60	8.40	8.20	5.00	4.70
Dissolved Oxygen (DO), mg/L	7.63	7.43	5.38	5.25	3.20	3.01
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	7.41	7.53	7.63	7.43	7.53	0.00
5	5.38	5.21	5.30	5.38	5.25	5.32	0.38
10	3.22	3.09	3.16	3.20	3.01	3.11	1.59
Linear regression coefficient				0.9998			



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/012/4.7/002/15	Reagent No. of NaCl (30ppt)	CPE/012/4.8/002/15
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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	12.30	24.40	35.80
Final Vol. of Na ₂ S ₂ O ₃ (ml)	12.30	24.40	35.80	47.00
Vol. (V) of Na ₂ S ₂ O ₃ used (ml)	12.30	12.10	11.40	11.20
Dissolved Oxygen (DO), mg/L	7.88	7.75	7.31	7.18
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	7.88	7.65	7.77	7.88	7.75	7.82	0.64
30	7.23	7.14	7.19	7.31	7.18	7.25	0.83

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%

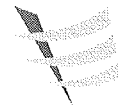
The equipment complies # / does not comply # with the specified requirements and is deemed acceptable # / unacceptable # for use.

Delete as appropriate

Calibrated by

:

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 : 29/01/2014 Due Date : 28/04/2014

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

S/001/5

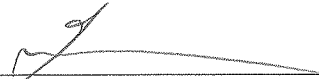
Salinity Standard (ppt)	Measured Salinity (ppt)	Difference %
30.0	30.9	3.00

Acceptance Criteria

Difference : <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 : 10/02/2014

Calibration Due Date : 09/03/2014

Liquid Junction Error

Primary Standard Solution Used : Phosphate

Ref No. of Primary Solution: 003/5.2/001/17

Temperature of Solution : 20.0

$\Delta\text{pH}_{1/2} = +0.08$

pH value of diluted buffer : 6.80

pH (S) = 6.881

$\Delta\text{pH} = \text{pH(S)} - \text{pH of diluted buffer} = \underline{0.081}$ (Observed Deviation)

Liquid Junction Error (ΔpH_j) = $\Delta\text{pH} - \Delta\text{pH}_{1/2} = \underline{0.001}$

Shift on Stirring

pH of buffer solution (with stirring), $\text{pH}_s = \underline{6.87}$

Shift on stirring, $\Delta\text{pH}_s = \text{pH}_s - \text{pH(S)} - \Delta\text{pH}_j = \underline{-0.012}$

Noise

Noise, ΔpH_n = difference between max and min reading : 0.00

Verification of ATC

Ref. No. of reference thermometer used: ET/0521/008 °C

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 : 10/03/2014 Calibration Due Date : 09/04/2014

Liquid Junction Error

Primary Standard Solution Used : Phosphate Ref No. of Primary Solution: 003/5.2/001/17
Temperature of Solution : 20.0 $\Delta\text{pH}_{1/2} = +0.08$
pH value of diluted buffer : 6.79 pH (S) = 6.881
 $\Delta\text{pH} = \text{pH(S)} - \text{pH of diluted buffer} = \underline{0.091}$ (Observed Deviation)
Liquid Junction Error (ΔpH_j) = $\Delta\text{pH} - \Delta\text{pH}_{1/2} = \underline{0.011}$

Shift on Stirring

pH of buffer solution (with stirring), $\text{pH}_s = \underline{6.90}$
Shift on stirring, $\Delta\text{pH}_s = \text{pH}_s - \text{pH(S)} - \Delta\text{pH}_j = \underline{0.008}$

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 :