

## Appendix E Water Quality Monitoring Equipment Calibration Certificate



## REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT: MR KENNY LOK  
CLIENT: ACUMEN ENVIRONMENTAL ENG & TECH CO LTD  
ADDRESS: LOT 11, TAM KON SHAN ROAD,  
TSING YI,  
N.T., HONG KONG.

WORK ORDER: HK1815729  
SUB-BATCH: 0  
LABORATORY: HONG KONG  
DATE RECEIVED: 06-Feb-2018  
DATE OF ISSUE: 15-Feb-2018

### COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

**The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.**

**The "Next Calibration Date" is recommended according to best practice principals as practised by the ALS Hong Kong laboratory or quoted from relevant international standards.**

Scope of Test: Dissolved Oxygen, pH, Salinity, Turbidity, Redox Potential and Temperature  
Equipment Type: Multifunctional Meter  
Brand Name: YSI  
Model No.: ProDSS  
Serial No.: 15M101091  
Equipment No.: --  
Date of Calibration: 06 February, 2018

### NOTES

This is the Final Report and supersedes any preliminary report with this batch number.  
Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Mr Chan Siu Ming, Vice  
Manager - Inorganics

# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1815729  
 Sub-Batch: 0  
 Date of Issue: 15-Feb-2018  
 Client: ACUMEN ENVIRONMENTAL ENG & TECH CO LTD



Equipment Type: Multifunctional Meter  
 Brand Name: YSI  
 Model No.: ProDSS  
 Serial No.: 15M101091  
 Equipment No.: --  
 Date of Calibration: 06 February, 2018

Date of next Calibration: 06 May, 2018

Parameters:

Dissolved Oxygen Method Ref: APHA (21st edition), 4500O: G

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
9.38	9.48	+0.10
5.70	5.74	+0.04
2.89	2.95	+0.06
Tolerance Limit (mg/L)		±0.20

pH Value Method Ref: APHA 21st Ed. 4500H:B

Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	4.01	+0.01
7.0	7.00	+0.00
10.0	10.02	+0.02
Tolerance Limit (pH unit)		±0.20

Salinity Method Ref: APHA (21st edition), 2520B

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
0	0.00	--
10	9.44	-5.6
20	19.30	-3.5
30	32.63	+8.8
Tolerance Limit (%)		±10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Mr Chan Siu Ming, Vice  
 Manager - Inorganics

# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1815729  
 Sub-Batch: 0  
 Date of Issue: 15-Feb-2018  
 Client: ACUMEN ENVIRONMENTAL ENG & TECH CO LTD



Equipment Type: Multifunctional Meter  
 Brand Name: YSI  
 Model No.: ProDSS  
 Serial No.: 15M101091  
 Equipment No.: --

Date of Calibration: 06 February, 2018      Date of next Calibration: 06 May, 2018

## Parameters:

### Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
10.5	11.6	+1.1
21.0	20.1	-0.9
40.0	39.6	-0.4
Tolerance Limit (°C)		±2.0

### Turbidity

Method Ref: APHA (21st edition), 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.5	--
4	4.1	+2.5
40	40.8	+2.0
80	80.3	+0.4
400	390.2	-2.5
800	811.7	+1.5
Tolerance Limit (%)		±10.0


### Redox Potential

Method Ref: APHA (21st edition), 2580B

Method Ref: Orion Research Instruction Manual and the Laboratory Manual the Environmental of Water, Wastewater and Soil (2nd edition), Rump & Krist (1992)

Expected Reading (mV)	Displayed Reading (mV)	Difference of A and B (mV)
Solution A (~234mV)	172.3	
Solution B (~300mV)	248.0	+76
Tolerance Limit (mV)		>66

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

  
 Mr Chan Siu Ming, Vice  
 Manager - Inorganics



## REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT: MR EARTH WONG  
CLIENT: ACUMEN ENVIRONMENTAL ENG & TECH CO LTD  
ADDRESS: LOT 11, TAM KON SHAN ROAD,  
TSING YI,  
N.T., HONG KONG.

WORK ORDER: HK1818117  
SUB-BATCH: 0  
LABORATORY: HONG KONG  
DATE RECEIVED: 23-Feb-2018  
DATE OF ISSUE: 28-Feb-2018

### COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

**The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.**

**The "Next Calibration Date" is recommended according to best practice principals as practised by the ALS Hong Kong laboratory or quoted from relevant international standards.**

Scope of Test: Dissolved Oxygen, pH, Salinity, Turbidity, Redox Potential and Temperature  
Equipment Type: Multifunctional Meter  
Brand Name: HORIBA  
Model No.: Water Quality Checker U-53  
Serial No.: BGY99CKD  
Equipment No.: --  
Date of Calibration: 27 February, 2018

### NOTES

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Mr Chan Siu Ming, Vice  
Manager - Inorganics

# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1818117  
 Sub-Batch: 0  
 Date of Issue: 28-Feb-2018  
 Client: ACUMEN ENVIRONMENTAL ENG & TECH CO LTD



Equipment Type: Multifunctional Meter  
 Brand Name: HORIBA  
 Model No.: Water Quality Checker U-53  
 Serial No.: BGY9CKD  
 Equipment No.: --  
 Date of Calibration: 27 February, 2018

Date of next Calibration: 27 May, 2018

Parameters:

Dissolved Oxygen Method Ref: APHA (21st edition), 4500: G

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
2.42	2.60	+0.18
5.55	5.38	-0.17
8.58	8.42	-0.16
Tolerance Limit (mg/L)		±0.20


pH Value Method Ref: APHA 21st Ed. 4500H:B

Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	4.14	+0.14
7.0	7.03	+0.03
10.0	9.89	-0.11
Tolerance Limit (pH unit)		±0.20

Salinity Method Ref: APHA (21st edition), 2520B

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
0	0.1	--
10	9.3	-7.0
20	18.8	-6.0
30	31.2	+4.0
Tolerance Limit (%)		±10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

  
 Mr Chan Siu Ming, Vico  
 Manager - Inorganics

# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1818117  
 Sub-Batch: 0  
 Date of Issue: 28-Feb-2018  
 Client: ACUMEN ENVIRONMENTAL ENG & TECH CO LTD



Equipment Type: Multifunctional Meter  
 Brand Name: HORIBA  
 Model No.: Water Quality Checker U-53  
 Serial No.: BGYP9CKD  
 Equipment No.: --  
 Date of Calibration: 27 February, 2018

Date of next Calibration: 27 May, 2018

Parameters:

Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
11.0	11.63	+0.6
21.5	21.80	+0.3
38.5	38.31	-0.2
Tolerance Limit (°C)		±2.0

Turbidity

Method Ref: APHA (21st edition), 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.00	--
4	3.85	-3.8
40	42.7	+6.8
80	84.6	+5.7
400	438	+9.5
800	870	+8.8
Tolerance Limit (%)		±10.0


Redox Potential

Method Ref: APHA (21st edition), 2580B

Method Ref: Orion Research Instruction Manual and the Laboratory Manual the Environmental of Water, Wastewater and Soil (2nd edition), Rump & Krist (1992)

Expected Reading (mV)	Displayed Reading (mV)	Difference of A and B (mV)
Solution A (~234mV)	169	
Solution B (~300mV)	246	+77
Tolerance Limit (mV)		>66

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

  
 Mr Chan Siu Ming, Vice  
 Manager - Inorganics



a xylem brand

9940 Summers Ridge Road  
San Diego, CA 92121  
Tel: (858) 546-8327  
support@sontek.com

### Certificate of Calibration

#### TEST REPORT

Serial Number	5649
System Type	M9
System Orientation	Down
Compass Type	Sontek
Compass Offset (degrees)	N/A
Communications Output	RS232
Recorder Size (GB)	15.2
Firmware Version	3.99
Date Tested	5/12/2016

#### POWER TEST

Command Mode (W):	0.17	Range : 0.00 – 0.30
Sleep Mode (W):	N/A	Range : N/A
Ping Mode - 18V (W):	2.37	Range : 1.50 – 3.50
Power Check		PASS

#### NOISE TEST

Beam 1 – 3.0 MHz (counts)	96
Beam 2 – 1.0 MHz (counts)	97
Beam 3 – 3.0 MHz (counts)	99
Beam 4 – 1.0 MHz (counts)	93
Beam 5 – 3.0 MHz (counts)	96
Beam 6 – 1.0 MHz (counts)	98
Beam 7 – 3.0 MHz (counts)	98
Beam 8 – 1.0 MHz (counts)	96
Beam Vertical – 500KHz (counts)	87
Noise Test	PASS





a xylem brand

SonTek

9940 Summers Ridge Road, San Diego, CA 92121  
Tel +1.858.546.8327 Fax +1.858.546.8150

Date: 15 April 2016

To Whom It May Concern:

We, SonTek, a division of YSI Inc. and a brand of Xylem Inc., who are official manufacturers of acoustic Doppler current measurement systems, having its office at 9940 Summers Ridge Road, San Diego, California, 92121, USA, maintains that all SonTek Doppler equipment including the HydroSurveyor does not require recalibration under normal use. A recalibration is required if the systems is returned for general repair.

A handwritten signature in black ink, appearing to read "Jeff Winters".

Jeff Winters

Director of Customer Service, SonTek



## REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT:	MR EARTH WONG	WORK ORDER:	HK1831444
CLIENT:	ACUMEN ENVIRONMENTAL ENG & TECH CO LTD		
ADDRESS:	LOT 11, TAM KON SHAN ROAD, TSING YI (NORTH), N.T. HONG KONG	SUB-BATCH:	0
		LABORATORY:	HONG KONG
		DATE RECEIVED:	25-May-2018
		DATE OF ISSUE:	08-Jun-2018

### COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

**The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.**

**The "Next Calibration Date" is recommended according to best practice principle as practised by the ALS Hong Kong laboratory or quoted from relevant international standards.**

Scope of Test:	Dissolved Oxygen, pH Value, Turbidity, Salinity, Redox Potential and Temperature
Equipment Type:	Multifunctional Meter
Brand Name:	YSI
Model No.:	ProDSS
Serial No.:	15M101091
Equipment No.:	--
Date of Calibration:	25 May, 2018

### NOTES

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Mr Chan Siu Ming, Vico  
Manager - Inorganic

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# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



WORK ORDER: HK1831444  
 SUB-BATCH: 0  
 DATE OF ISSUE: 08-Jun-2018  
 CLIENT: ACUMEN ENVIRONMENTAL ENG & TECH CO LTD

Equipment Type: Multifunctional Meter  
 Brand Name: YSI  
 Model No.: ProDSS  
 Serial No.: 15M101091  
 Equipment No.: --  
 Date of Calibration: 25 May, 2018                      Date of Next Calibration: 25 August, 2018

PARAMETERS:  
 Dissolved Oxygen    Method Ref: APHA (21st edition), 4500-O: G

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
1.85	1.93	+0.08
4.86	4.99	+0.13
7.54	7.50	-0.04
Tolerance Limit (mg/L)		±0.20

pH Value                      Method Ref: APHA (21st edition), 4500H:B

Expected Reading (pH unit)	Displayed Reading (pH unit)	Tolerance (pH unit)
4.0	3.95	-0.05
7.0	7.06	+0.06
10.0	9.93	-0.07
Tolerance Limit (pH unit)		±0.20

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

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Mr Chan Siu Ming, Vico  
 Manager - Inorganic



# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



WORK ORDER: HK1831444  
 SUB-BATCH: 0  
 DATE OF ISSUE: 08-Jun-2018  
 CLIENT: ACUMEN ENVIRONMENTAL ENG & TECH CO LTD

Equipment Type: Multifunctional Meter  
 Brand Name: YSI  
 Model No.: ProDSS  
 Serial No.: 15M101091  
 Equipment No.: --  
 Date of Calibration: 25 May, 2018                      Date of Next Calibration: 25 August, 2018

PARAMETERS:  
 Redox Potential      Method Ref: APHA (21st edition), 2580B  
                                  Method Ref: Orion Research Instruction Manual and the Laboratory Manual  
                                  the Environmental of Water, Wastewater and Soil (2nd edition), Rump & Krist (1992)

Expected Reading (mV)	Displayed Reading (mV)	Difference of A and B (mV)
Solution A (~234mV)	221.3	
Solution B (~300mV)	293.6	+72.3
	Tolerance Limit (mV)	>66

Temperature                      Method Ref: Section 6 of International Accreditation New Zealand Technical  
 Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
9.5	10.3	+0.8
22.0	21.3	-0.7
39.0	37.6	-1.4
	Tolerance Limit (°C)	±2.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

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Mr Chan Siu Ming, Vico  
 Manager - Inorganic



## REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

<b>CONTACT:</b>	MR NELSON TSUI	<b>WORK ORDER:</b>	HK1835956
<b>CLIENT:</b>	ACUMEN ENVIRONMENTAL ENG & TECH CO LTD		
<b>ADDRESS:</b>	LOT 11, TAM KON SHAN ROAD, TSING YI (NORTH), N.T. HONG KONG	<b>SUB-BATCH:</b>	0
		<b>LABORATORY:</b>	HONG KONG
		<b>DATE RECEIVED:</b>	26-Jun-2018
		<b>DATE OF ISSUE:</b>	13-Aug-2018

### COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.

The "Next Calibration Date" is recommended according to best practice principle as practised by the ALS Hong Kong laboratory or quoted from relevant international standards.

Scope of Test:	Dissolved Oxygen, pH Value, Turbidity, Salinity, Redox Potential and Temperature
Equipment Type:	Multifunctional Meter
Brand Name:	HORIBA Water Quality Monitor
Model No.:	U-5000
Serial No.:	BGYP9CKD
Equipment No.:	--
Date of Calibration:	04 July, 2018

### NOTES

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Ms. Lin Wai Yu  
Assistant Manager - Inorganic

# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



**WORK ORDER:** HK1835956  
**SUB-BATCH:** 0  
**DATE OF ISSUE:** 13-Aug-2018  
**CLIENT:** ACUMEN ENVIRONMENTAL ENG & TECH CO LTD

**Equipment Type:** Multifunctional Meter  
**Brand Name:** HORIBA Water Quality Monitor  
**Model No.:** U-5000  
**Serial No.:** BGY99CKD  
**Equipment No.:** --  
**Date of Calibration:** 25 July, 2018      **Date of Next Calibration:** 04 October, 2018

**PARAMETERS:**

**Dissolved Oxygen**      **Method Ref: APHA (21st edition), 4500-O: G**

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
2.90	3.09	+0.19
5.35	5.51	+0.16
7.56	7.62	+0.06
	Tolerance Limit (mg/L)	±0.20

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Ms. Lin Wai Yu  
Assistant Manager - Inorganic



# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



**WORK ORDER:** HK1835956  
**SUB-BATCH:** 0  
**DATE OF ISSUE:** 13-Aug-2018  
**CLIENT:** ACUMEN ENVIRONMENTAL ENG & TECH CO LTD

**Equipment Type:** Multifunctional Meter  
**Brand Name:** HORIBA Water Quality Monitor  
**Model No.:** U-5000  
**Serial No.:** BGY9CKD  
**Equipment No.:** --  
**Date of Calibration:** 04 July, 2018      **Date of Next Calibration:** 04 October, 2018

## PARAMETERS:

### pH Value

Method Ref: APHA (21st edition), 4500H:B

Expected Reading (pH unit)	Displayed Reading (pH unit)	Tolerance (pH unit)
4.0	3.95	-0.05
7.0	6.84	-0.16
10.0	10.08	+0.08
	Tolerance Limit (pH unit)	±0.20

### Turbidity

Method Ref: APHA (21st edition), 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.78	--
4	4.06	+1.5
40	36.1	-9.8
80	78.9	-1.4
400	409	+2.3
800	809	+1.1
	Tolerance Limit (%)	±10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Ms. Lin Wai Yu  
Assistant Manager - Inorganic



# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



**WORK ORDER:** HK1835956  
**SUB-BATCH:** 0  
**DATE OF ISSUE:** 13-Aug-2018  
**CLIENT:** ACUMEN ENVIRONMENTAL ENG & TECH CO LTD

Equipment Type: Multifunctional Meter  
Brand Name: HORIBA Water Quality Monitor  
Model No.: U-5000  
Serial No.: BGY9CKD  
Equipment No.: --  
Date of Calibration: 04 July, 2018      Date of Next Calibration: 04 October, 2018

**PARAMETERS:**

**Salinity**

Method Ref: APHA (21st edition), 2520B

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
0	0.00	--
10	9.90	-1.0
20	19.50	-2.5
30	28.30	-5.7
	Tolerance Limit (%)	±10.0

**Redox Potential**

Method Ref: APHA (21st edition), 2580B

Method Ref: Orion Research Instruction Manual and the Laboratory Manual  
the Environmental of Water, Wastewater and Soil (2nd edition), Rump & Krist (1992)

Expected Reading (mV)	Displayed Reading (mV)	Difference of A and B (mV)
Solution A (~234mV)	188	
Solution B (~300mV)	272	+84
	Tolerance Limit (mV)	>66

**Temperature**

Method Ref: Section 6 of International Accreditation New Zealand Technical  
Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
10.5	11.27	+0.8
21.0	21.64	+0.6
40.0	39.43	-0.6
	Tolerance Limit (°C)	±2.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Ms. Lin Wai Yu  
Assistant Manager - Inorganic

# REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION



**WORK ORDER:** HK1835956  
**SUB-BATCH:** 0  
**DATE OF ISSUE:** 13-Aug-2018  
**CLIENT:** ACUMEN ENVIRONMENTAL ENG & TECH CO LTD

**Equipment Type:** Multifunctional Meter  
**Brand Name:** HORIBA Water Quality Monitor  
**Model No.:** U-5000  
**Serial No.:** BGY99CKD  
**Equipment No.:** --  
**Date of Calibration:** 04 July, 2018

**PARAMETERS:**

**Dissolved Oxygen** Method Ref: APHA (21st edition), 4500-O: G

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (%)
3.30	no readable reading	N/A
5.49	no readable reading	N/A
7.80	no readable reading	N/A
	Tolerance Limit (mg/L)	±0.20

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Ms. Lin Wai Yu  
Assistant Manager - Inorganic