

**AECOM Asia Company Limited**  
**TSP High Volume Sampler**  
**Field Calibration Report**

Station: Rooftop of West Kowloon No. 2 Sewage Pumping Station (AM2) Operator: Fu Cho Yiu  
 Cal. Date: 23-Nov-09 Next Due Date: 23-Jan-10  
 Equipment No.: A.001.12T Serial No.: 10373

Station: Rooftop of West Kowloon No. 2 Sewage Pumping Station  
 Cal. Date: 23-Nov-09  
 Next Due Date: 23-Jan-10  
 Set Point (IC): 44.54

IC (CFM)	Qstd (m <sup>3</sup> /min)
24	0.673
25	0.703
26	0.733
27	0.762
28	0.792
29	0.822
30	0.852
31	0.882
32	0.912
33	0.942
34	0.972
35	1.002
36	1.032
37	1.062
38	1.092
39	1.121
40	1.151
41	1.181
42	1.211
43	1.241
44	1.271
45	1.301
46	1.331
47	1.361
48	1.391
49	1.421
50	1.451
51	1.480
52	1.510
53	1.540
54	1.570
55	1.600
56	1.630
57	1.660
58	1.690
59	1.720
60	1.750
61	1.780
62	1.809
63	1.839
64	1.869
65	1.899

Ambient Condition			
Temperature, Ta (K)	293.4	Pressure, Pa (mmHg)	762.8

Orifice Transfer Standard Information					
Serial No:	1559	Slope, mc	1.97702	Intercept, bc	-0.0007
Last Calibration Date:	18-May-09	$mc \times Qstd + bc = [DH \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	18-May-10	$Qstd = \{ [DH \times (Pa/760) \times (298/Ta)]^{1/2} - bc \} / mc$			

Calibration of TSP Sampler					
Resistance Plate No.	Orifice			HVS Flow Recorder	
	DH (orifice), in. of water	$[DH \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (m <sup>3</sup> /min) X-axis	Flow Recorder Reading (CFM)	Continuous Flow Recorder Reading IC (CFM) Y-axis
18	10.6	3.29	1.66	56.0	56.54
13	7.4	2.75	1.39	49.0	49.47
10	6.3	2.53	1.28	43.0	43.42
7	4.1	2.04	1.03	36.0	36.35
5	2.5	1.60	0.81	28.0	28.27

By Linear Regression of Y on X  
 Slope, mw = 33.4288 Intercept, bw = 1.5106  
 Correlation Coefficient\* = 0.9925  
 \*If Correlation Coefficient < 0.990, check and recalibrate.

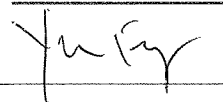
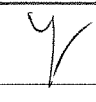
**Set Point Calculation**

From the TSP Field Calibration Curve, take Qstd = 1.30m<sup>3</sup>/min  
 From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = IC \times [(Pa/760) \times (298/Ta)]^{1/2}$$

Therefore, Set Point; IC = (mw x Qstd + bw) x [(760 / Pa) x (Ta / 298)]<sup>1/2</sup> = 44.54

Remarks: \_\_\_\_\_

QC Reviewer:  Signature:  Date: 24 Nov 09



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AIR POLLUTION MONITORING EQUIPMENT

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - May 18, 2009 Rootsometer S/N 9833620 Ta (K) - 293  
 Operator Tisch Orifice I.D. - 1559 Pa (mm) - 765.81

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	1.4130	3.2	2.00
2	NA	NA	1.00	0.9900	6.4	4.00
3	NA	NA	1.00	0.8850	7.9	5.00
4	NA	NA	1.00	0.8420	8.7	5.50
5	NA	NA	1.00	0.6970	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
1.0205	0.7222	1.4317	0.9958	0.7047	0.8748
1.0163	1.0266	2.0247	0.9917	1.0017	1.2371
1.0142	1.1460	2.2637	0.9896	1.1182	1.3831
1.0132	1.2033	2.3742	0.9886	1.1741	1.4506
1.0078	1.4459	2.8633	0.9834	1.4109	1.7495
Qstd slope (m) = 1.97702			Qa slope (m) = 1.23797		
intercept (b) = -0.00070			intercept (b) = -0.00043		
coefficient (r) = 0.99992			coefficient (r) = 0.99992		

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

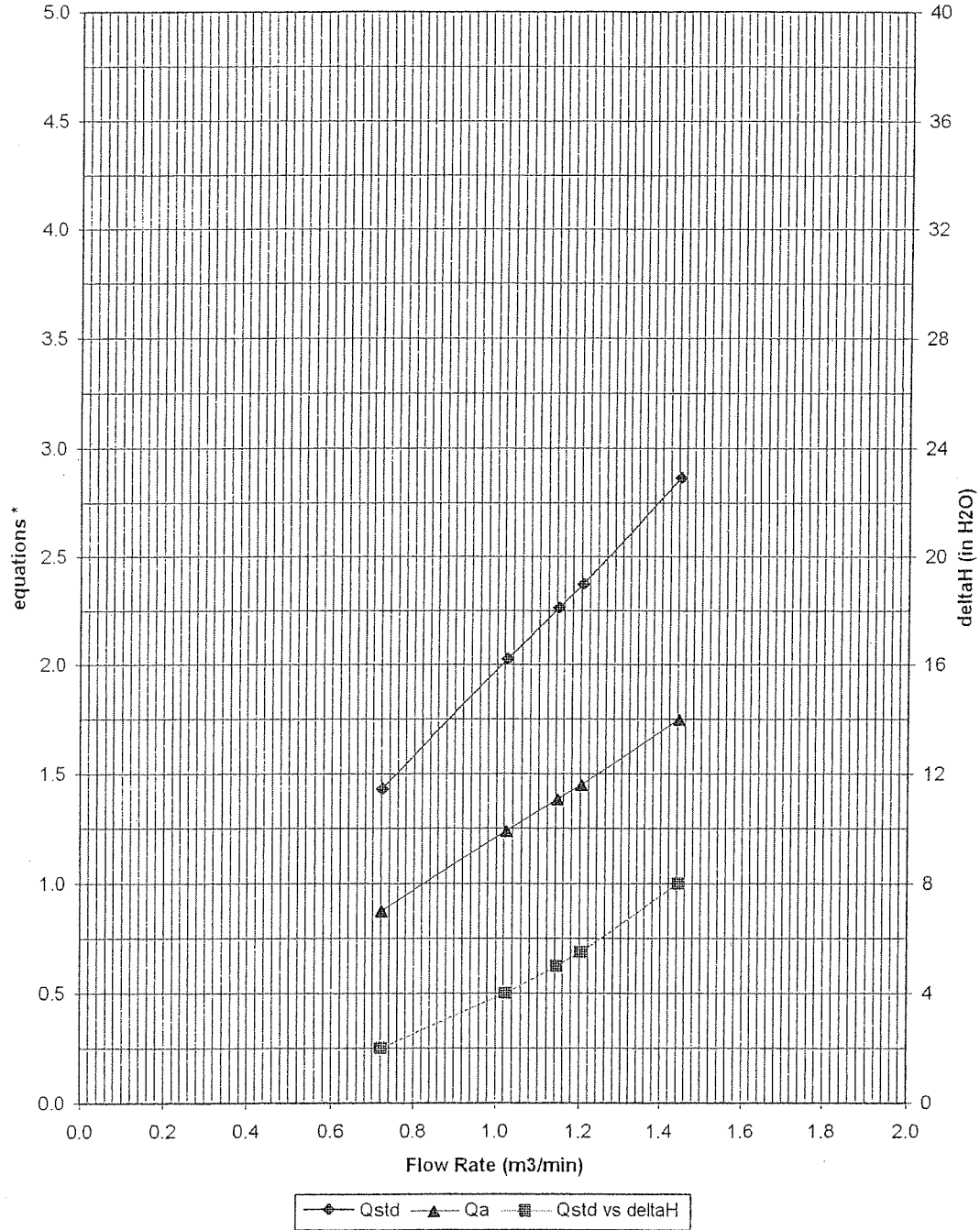
For subsequent flow rate calculations:

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

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

AIR POLLUTION MONITORING EQUIPMENT

Qstd/Qa and Qstd vs deltaH



\* y-axis equations:

Qstd series: 
$$\sqrt{\Delta H \left( \frac{P_a}{P_{std}} \right) \left( \frac{T_{std}}{T_a} \right)}$$

Qa series: 
$$\sqrt{(\Delta H (T_a / P_a))}$$

# 1559

**EQUIPMENT CALIBRATION RECORD**

Type: Laser Dust Monitor  
 Manufacturer/Brand: SIBATA  
 Model No.: LD-3  
 Equipment No.: A.005.11a  
 Sensitivity Adjustment Scale Setting: 799 CPM  
 Operator: Mike Shek (MSKM)

**Standard Equipment**

Equipment: Rupprecht & Patashnick TEOM®  
 Venue: Cyberport (Pui Ying Secondary School)  
 Model No.: Series 1400AB  
 Serial No.: Control: 140AB219899803  
 Sensor: 1200C143659803 K<sub>o</sub>: 12500  
 Last Calibration Date\*: 5 June 2008

\*Remarks: Recommended interval for hardware calibration is 1 year

**Calibration Result**

Sensitivity Adjustment Scale Setting (Before Calibration): 799 CPM  
 Sensitivity Adjustment Scale Setting (After Calibration): 799 CPM

Hour	Date (dd-mm-yy)	Time	Ambient Condition		Concentration <sup>1</sup> (mg/m <sup>3</sup> ) Y-axis	Total Count <sup>2</sup>	Count/ Minute <sup>3</sup> X-axis
			Temp (°C)	R.H. (%)			
1	04-07-09	11:00 - 12:00	29.7	78	0.03713	1498	24.97
2	04-07-09	12:00 - 13:00	29.7	78	0.03520	1404	23.41
3	04-07-09	14:00 - 15:00	30.1	81	0.03891	1553	25.91
4	04-07-09	15:00 - 16:00	30.1	81	0.04025	1618	26.97

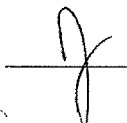
- Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®  
 2. Total Count was logged by Laser Dust Monitor  
 3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

Slope (K-factor): 0.0015  
 Correlation coefficient: 0.9907

Validity of Calibration Record: 3 July 2010

Remarks:

QC Reviewer: YW Fung Signature:  Date: 6 July 2009

## EQUIPMENT CALIBRATION RECORD

Type: Laser Dust Monitor  
 Manufacturer/Brand: SIBATA  
 Model No.: LD-3B  
 Equipment No.: A.005.12a  
 Sensitivity Adjustment Scale Setting: 805 CPM

Operator: Mike Shek (MSKM)

### Standard Equipment

Equipment: Rupprecht & Patashnick TEOM®  
 Venue: Cyberport (Pui Ying Secondary School)  
 Model No.: Series 1400AB  
 Serial No.: Control: 140AB219899803  
 Sensor: 1200C143659803 K<sub>0</sub>: 12500  
 Last Calibration Date\*: 5 June 2009

\*Remarks: Recommended interval for hardware calibration is 1 year

### Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration): 805 CPM  
 Sensitivity Adjustment Scale Setting (After Calibration): 805 CPM

Hour	Date (dd-mm-yy)	Time	Ambient Condition		Concentration <sup>1</sup> (mg/m <sup>3</sup> ) Y-axis	Total Count <sup>2</sup>	Count/ Minute <sup>3</sup> X-axis
			Temp (°C)	R.H. (%)			
1	24-10-09	08:00 - 09:00	29.9	74	0.03432	1302	21.70
2	24-10-09	09:00 - 10:00	29.9	74	0.02947	1092	18.20
3	24-10-09	10:00 - 11:00	30.0	74	0.03588	1352	22.53
4	24-10-09	11:00 - 12:00	30.0	76	0.02855	1078	17.97

- Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®  
 2. Total Count was logged by Laser Dust Monitor  
 3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

Slope (K-factor): 0.0016  
 Correlation coefficient: 0.9924

Validity of Calibration Record: 23 October 2010

Remarks:

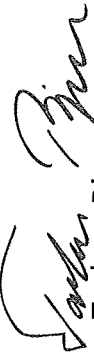
QC Reviewer: YW Fung Signature:  Date: 27 Oct 2009

# MANUFACTURER'S CERTIFICATE OF CONFORMANCE

We certify that Brüel & Kjær -2250-L-- Serial No 2681366 has been tested and passed all production tests, confirming compliance with the manufacturer's published specification at the date of the test.

The final test has been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Brüel & Kjær is certified under ISO 9001:2000 assuring that all calibration data for test equipment are retained on file and are available for inspection upon request.  
Nærum 05-maj-2009

  
Torben Bjørn  
Vice President  
Operations

Please note that this document is not a calibration certificate, for information on our calibration services please contact your nearest Brüel & Kjær Service Center.

BA0238-15

WORLD HEADQUARTERS: DK-2850 Nærum · Denmark  
Telephone: +45-45 80 05 00 · Fax: +45-45 80 14 05 · <http://www.bksv.com> · e-mail: [info@bksv.dk](mailto:info@bksv.dk)

**Brüel & Kjær** 

OBJ. NR.

LOC.

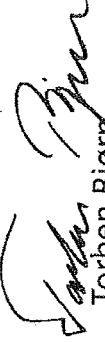
# MANUFACTURER'S CERTIFICATE OF CONFORMANCE

We certify that Brüel & Kjær  
-2270--- Serial No 2644597

has been tested and passed all production tests, confirming compliance with the manufacturer's published specification at the date of the test.

The final test has been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Brüel & Kjær is certified under ISO 9001:2000 assuring that all calibration data for test equipment are retained on file and are available for inspection upon request. 11-aug-2009  
Nærum

  
Torben Bjørn  
Vice President  
Operations

Please note that this document is not a calibration certificate, for information on our calibration services please contact your nearest Brüel & Kjær Service Center.

BA-0238-15

WORLD HEADQUARTERS: DK-2850 Nærum - Denmark  
Telephone: +45 4580 05 00 - Fax: +45 45 80 14 05 - <http://www.bksv.com> - e-mail: [info@bksv.dk](mailto:info@bksv.dk)





## CERTIFICATE OF CALIBRATION

Certificate No.: 09CA0820 04 Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type 1)	Microphone
Manufacturer:	B & K	B & K
Type/Model No.:	2238	4188
Serial/Equipment No.:	2255687 / N.009.03	2250455
Adaptors used:	-	-

### Item submitted by

Customer Name: AECOM ASIA CO., LTD.  
Address of Customer: -  
Request No.: -  
Date of request: 20-Aug-2009

Date of test: 24-Aug-2009

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	12-Jan-2010	CIGISMEC
Signal generator	DS 360	33873	22-Jun-2010	CEPREI
Signal generator	DS 360	61227	22-Jun-2010	CEPREI

### Ambient conditions

Temperature: (21 ± 1) °C  
Relative humidity: (60 ± 5) %  
Air pressure: (1005 ± 5) hPa

### Test specifications

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- 3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsiveness of the Sound Level Meter.

### Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:  Date: 26-Aug-2009 Company Chop: 

Huang Jian-Min/Feng Jun Qi

Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.





## CERTIFICATE OF CALIBRATION

Certificate No.: 09CA0710 04-05 Page: 1 of 2

### Item tested

Description: Acoustical Calibrator (Class 1)  
Manufacturer: B&K  
Type/Model No.: BK4231  
Serial/Equipment No.: 1790985 / N.004.001  
Adaptors used: -

### Item submitted by

Customer: ENSR ASIA (HK) LTD.  
Address of Customer: -  
Request No.: -  
Date of request: 10-Jul-2009

Date of test: 14-Jul-2009

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	23-Jun-2010	SCL
Preamplifier	B&K 2673	2239857	02-Dec-2009	CEPREI
Measuring amplifier	B&K 2610	2346941	03-Dec-2009	CEPREI
Signal generator	DS 360	61227	22-Jun-2010	CEPREI
Digital multi-meter	34401A	US36087050	03-Dec-2009	CIGISMEC
Audio analyzer	8903B	GB41300350	27-Nov-2009	CEPREI
Universal counter	53132A	MY40003662	23-Jun-2010	CEPREI

### Ambient conditions

Temperature:  $23 \pm 1$  °C  
Relative humidity:  $55 \pm 10$  %  
Air pressure:  $995 \pm 10$  hPa

### Test specifications

- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

### Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.

Approved Signatory:

  
Huang Jian Min / Feng Jun Qi

Date: 14-Jul-2009

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



## CERTIFICATE OF CALIBRATION

Certificate No.: 09CA0311 02-02

Page: 1 of 2

### Item tested

Description: Acoustical Calibrator (Class 1)  
Manufacturer: B&K  
Type/Model No.: BK4231  
Serial/Equipment No.: 1850426 / N.004.02  
Adaptors used: -

### Item submitted by

Customer: ENSR ASIA (HK) LTD.  
Address of Customer: -  
Request No.: -  
Date of request: 11-Mar-2009

Date of test: 13-Mar-2009

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2412857	29-Jun-2009	SCL
Preamplifier	B&K 2673	2239857	02-Dec-2009	CEPREI
Measuring amplifier	B&K 2610	2346941	03-Dec-2009	CEPREI
Signal generator	DS 360	61227	18-Jul-2009	CEPREI
Digital multi-meter	34401A	US36087050	03-Dec-2009	CIGISMEC
Audio analyzer	8903B	GB41300350	27-Nov-2009	CEPREI
Universal counter	53132A	MY40003662	11-Jul-2009	CEPREI

### Ambient conditions

Temperature:  $23 \pm 1$  °C  
Relative humidity:  $65 \pm 10$  %  
Air pressure:  $1000 \pm 15$  hPa

### Test specifications

- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

### Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.

Approved Signatory:

Huang Jian-Min / Feng Jun Qi

Date: 17-Mar-2009

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.