

Certificate of Calibration

Calibration Certification Information

Cal. Date: June 4, 2021 Rootmeter S/N: 438320 Ta: 294 °K
Operator: Jim Tisch Pa: 750.3 mm Hg
Calibration Model #: TE-5025A Calibrator S/N: 2456

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4450	3.2	2.00
2	3	4	1	1.0220	6.4	4.00
3	5	6	1	0.9070	8.0	5.00
4	7	8	1	0.8650	8.8	5.50
5	9	10	1	0.7130	12.8	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9964	0.6896	1.4147	0.9957	0.6891	0.8853
0.9922	0.9708	2.0007	0.9915	0.9701	1.2519
0.9900	1.0915	2.2368	0.9893	1.0908	1.3997
0.9890	1.1433	2.3460	0.9883	1.1425	1.4680
0.9836	1.3795	2.8294	0.9829	1.3786	1.7705
QSTD	m=	2.04731	QA	m=	1.28199
	b=	0.00573		b=	0.00358
	r=	0.99996		r=	0.99996

Calculations

Vstd=	$\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$	Va=	$\Delta Vol((Pa-\Delta P)/Pa)$
Qstd=	Vstd/ΔTime	Qa=	Va/ΔTime
For subsequent flow rate calculations:			
Qstd= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$		Qa= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$	

Standard Conditions

Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH: calibrator manometer reading (in H2O)	
ΔP: rootmeter manometer reading (mm Hg)	
Ta: actual absolute temperature (°K)	
Pa: actual barometric pressure (mm Hg)	
b: intercept	
m: slope	

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

**FUGRO TECHNICAL SERVICES LIMITED**

Room 723 & 725, 7/F, Block B,
Profit Industrial Building,
1-15 Kwai Fung Crescent, Kwai Fong,
Hong Kong.

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge				Date of Calibration: 13-Sep-21	
Location : AMS2				Next Calibration Date: 12-Dec-21	
Brand: Tisch		Technician: Ting Chan			
Model: TE-5170		S/N: HVS-01			

CONDITIONS

Sea Level Pressure (hPa):	1006.7	Corrected Pressure (mm Hg):	755
Temperature (°C):	30.9	Temperature (K):	304

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.04731
Model:	TE-5025A	Qstd Intercept:	0.00573
Calibration Date:	4-Jun-21	Expiry Date:	4-Jun-22
S/N:	2456		

CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	11.00	-7.40	18.400	2.065	60.00	59.21	Slope = 26.5492 Intercept = 4.6122 Corr. coeff.: 0.9963
13	8.60	-6.80	15.400	1.889	56.00	55.26	
10	7.30	-5.40	12.700	1.715	50.00	49.34	
7	4.60	-4.10	8.700	1.419	44.00	43.42	
5	2.80	-3.30	6.100	1.188	36.00	35.52	

Calculations:
$$Qstd = 1/m[\sqrt{H2O(Pa/Pstd)(Tstd/Ta)}] - b]$$
$$IC = I[\sqrt{Pa/Pstd)(Tstd/Ta)}]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:
$$1/m((I)[\sqrt{298/Tav}(Pav/760)] - b)$$

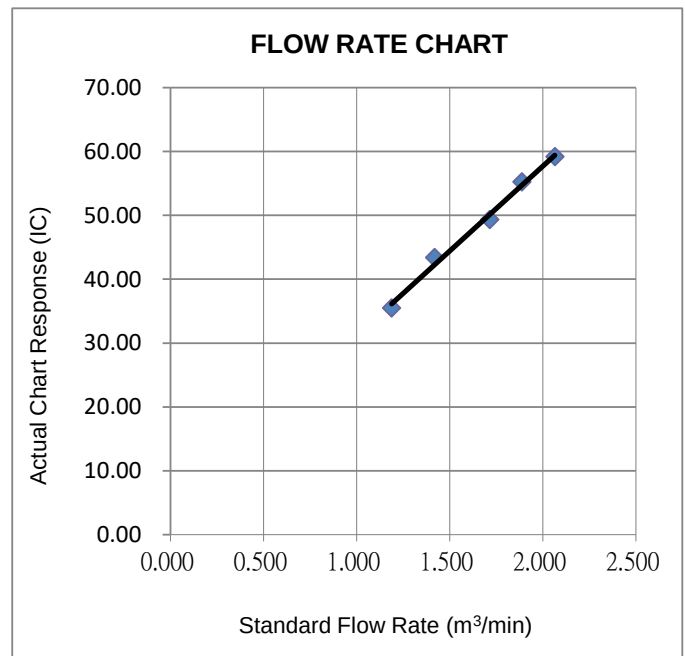
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



Wan Ka Ho
Project Consultant

Report Date: 13/9/2021

**FUGRO TECHNICAL SERVICES LIMITED**

Room 723 & 725, 7/F, Block B,
Profit Industrial Building,
1-15 Kwai Fung Crescent, Kwai Fong,
Hong Kong.

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge				Date of Calibration: 9-Dec-21	
Location : AMS2				Next Calibration Date: 8-Mar-22	
Brand: Tisch		Technician: Ting Chan			
Model: TE-5170		S/N: HVS-01			

CONDITIONS

Sea Level Pressure (hPa):	1022.3	Corrected Pressure (mm Hg):	767
Temperature (°C):	20.2	Temperature (K):	293

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.04731
Model:	TE-5025A	Qstd Intercept:	0.00573
Calibration Date:	4-Jun-21	Expiry Date:	4-Jun-22
S/N:	2456		

CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.80	-8.00	14.800	1.900	50.00	50.62	Slope = 29.7591 Intercept = -7.0140 Corr. coeff.: 0.9954
13	6.00	-6.80	12.800	1.766	44.00	44.54	
10	4.90	-5.80	10.700	1.615	40.00	40.50	
7	3.70	-4.60	8.300	1.422	35.00	35.43	
5	1.90	-3.80	5.700	1.178	28.00	28.35	

Calculations:
$$Qstd = 1/m[\sqrt{H2O(Pa/Pstd)(Tstd/Ta)}] - b]$$
$$IC = I[\sqrt{Pa/Pstd)(Tstd/Ta)}]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:
$$1/m((I)[\sqrt{298/Tav}(Pav/760)] - b)$$

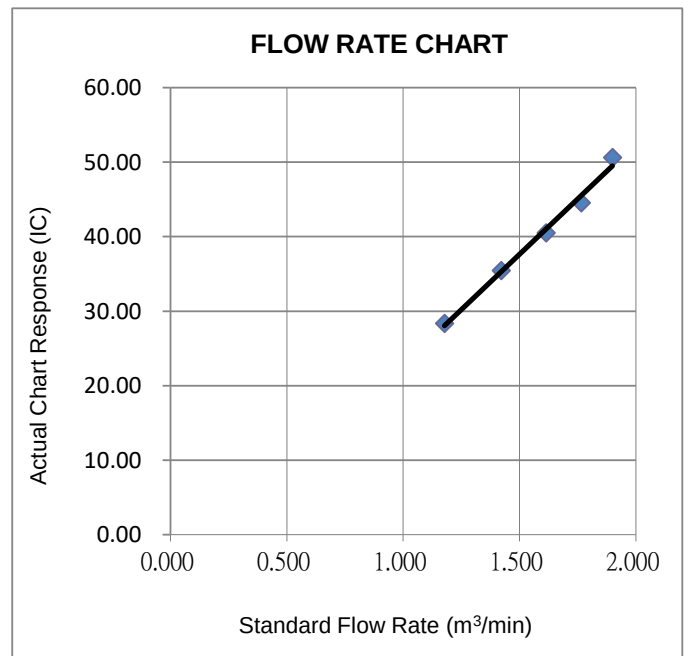
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



Wan Ka Ho
Project Consultant

Report Date: 10/12/2021

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge				Date of Calibration: 13-Sep-21	
Location : AMS3C				Next Calibration Date: 12-Dec-21	
Brand:	Tisch			Technician: Ting Chan	
Model:	TE-5170	S/N:	HVS-02		

CONDITIONS

Sea Level Pressure (hPa):	1006.7	Corrected Pressure (mm Hg):	755
Temperature (°C):	30.9	Temperature (K):	304

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.04731
Model:	TE-5025A	Qstd Intercept:	0.00573
Calibration Date:	4-Jun-21	Expiry Date:	4-Jun-22
S/N:	2456		

CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	11.00	-8.30	19.300	2.115	62.00	61.18	Slope = 27.7723 Intercept = 1.7337 Corr. coeff.: 0.9978
13	8.80	-7.20	16.000	1.925	56.00	55.26	
10	7.10	-6.20	13.300	1.755	50.00	49.34	
7	4.60	-4.30	8.900	1.435	42.00	41.45	
5	2.40	-3.10	5.500	1.128	34.00	33.55	

Calculations:

$$Qstd = 1/m[\sqrt{H2O(Pa/Pstd)(Tstd/Ta)}] - b$$

$$IC = I[\sqrt{Pa/Pstd)(Tstd/Ta)}]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I)[\sqrt{298/Tav}(Pav/760)] - b)$$

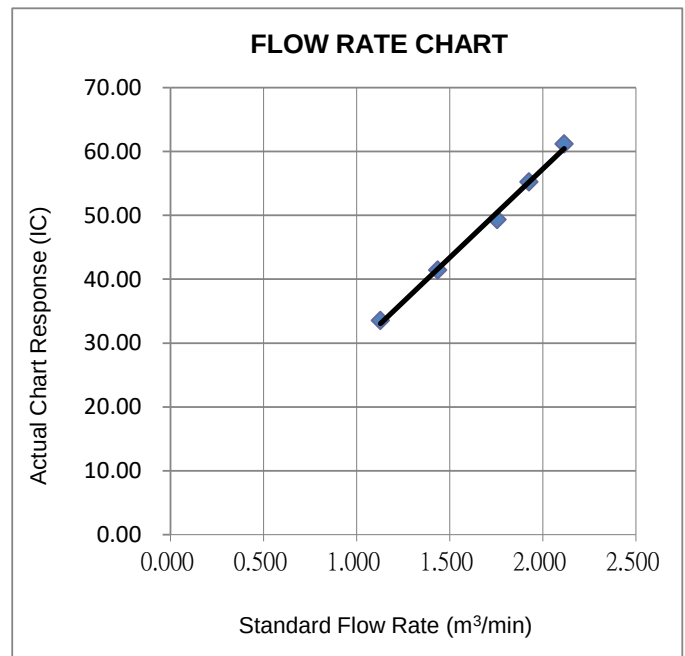
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure




Wan Ka Ho
Project Consultant

Report Date: 13/9/2021

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Hong Kong.

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge				Date of Calibration: 9-Dec-21	
Location : AMS3C				Next Calibration Date: 8-Mar-22	
Brand:	Tisch			Technician: Ting Chan	
Model:	TE-5170	S/N:	HVS-02		

CONDITIONS

Sea Level Pressure (hPa):	1022.3	Corrected Pressure (mm Hg):	767
Temperature (°C):	20.2	Temperature (K):	293

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.04731
Model:	TE-5025A	Qstd Intercept:	0.00573
Calibration Date:	4-Jun-21	Expiry Date:	4-Jun-22
S/N:	2456		

CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.20	-8.00	14.200	1.861	50.00	50.62	Slope = 37.4548 Intercept = -18.1567 Corr. coeff.: 0.9947
13	5.80	-6.50	12.300	1.731	46.00	46.57	
10	4.50	-5.60	10.100	1.569	42.00	42.52	
7	3.60	-4.00	7.600	1.360	32.00	32.40	
5	2.20	-3.20	5.400	1.146	24.00	24.30	

Calculations:
$$Qstd = 1/m[\sqrt{H2O(Pa/Pstd)(Tstd/Ta)}] - b]$$
$$IC = I[\sqrt{Pa/Pstd)(Tstd/Ta)}]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:
$$1/m((I)[\sqrt{298/Tav}(Pav/760)] - b)$$

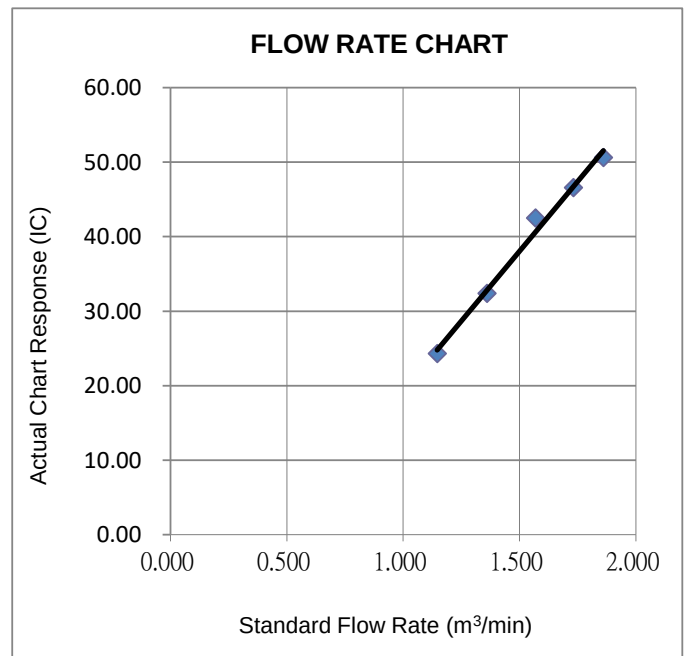
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



Wan Ka Ho
Project Consultant

Report Date: 13/9/2021

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge				Date of Calibration: 5-Oct-21	
Location : AMS7C				Next Calibration Date: 4-Jan-22	
Brand:	Tisch			Technician: Ting Chan	
Model:	TE-5170	S/N:	HVS-03		

CONDITIONS

Sea Level Pressure (hPa):	1011.4	Corrected Pressure (mm Hg):	759
Temperature (°C):	30.1	Temperature (K):	303

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.04731
Model:	TE-5025A	Qstd Intercept:	0.00573
Calibration Date:	4-Jun-21	Expiry Date:	4-Jun-22
S/N:	2456		

CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	10.80	-8.20	19.000	2.106	58.00	57.46	Slope = 29.1849 Intercept = -4.9340 Corr. coeff.: 0.9974
13	8.60	-6.70	15.300	1.890	50.00	49.53	
10	7.00	-5.00	12.000	1.673	44.00	43.59	
7	5.20	-4.20	9.400	1.481	38.00	37.64	
5	2.60	-3.20	5.800	1.163	30.00	29.72	

Calculations:

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta)) - b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I) [\text{Sqrt}(298/Tav)(Pav/760)] - b)$$

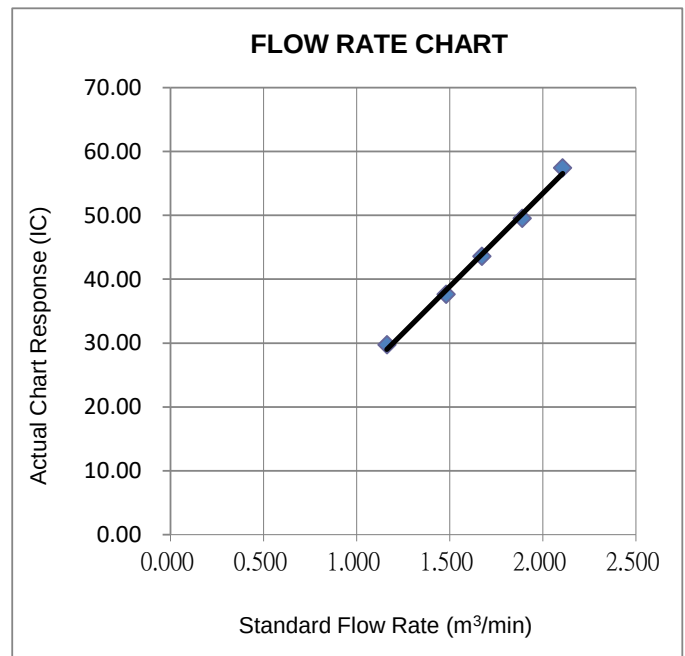
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure




Wan Ka Ho
Project Consultant

Report Date: 6/10/2020

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge				Date of Calibration: 9-Dec-22	
Location : AMS7C				Next Calibration Date: 8-Mar-22	
Brand:	Tisch			Technician: Ting Chan	
Model:	TE-5170	S/N:	HVS-03		

CONDITIONS

Sea Level Pressure (hPa):	1022.3	Corrected Pressure (mm Hg):	767
Temperature (°C):	20.2	Temperature (K):	293

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.04731
Model:	TE-5025A	Qstd Intercept:	0.00573
Calibration Date:	4-Jun-21	Expiry Date:	4-Jun-22
S/N:	2456		

CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.80	-7.90	14.700	1.894	50.00	50.63	Slope = 29.9386 Intercept = -5.1209 Corr. coeff.: 0.9954
13	5.80	-5.80	11.600	1.682	46.00	46.58	
10	4.80	-4.80	9.600	1.530	40.00	40.51	
7	3.20	-3.50	6.700	1.277	33.00	33.42	
5	2.50	-2.80	5.300	1.136	28.00	28.35	

Calculations:

$$Qstd = 1/m[\sqrt{H2O(Pa/Pstd)(Tstd/Ta)}] - b]$$

$$IC = I[\sqrt{Pa/Pstd)(Tstd/Ta)}]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I)[\sqrt{298/Tav}(Pav/760)] - b)$$

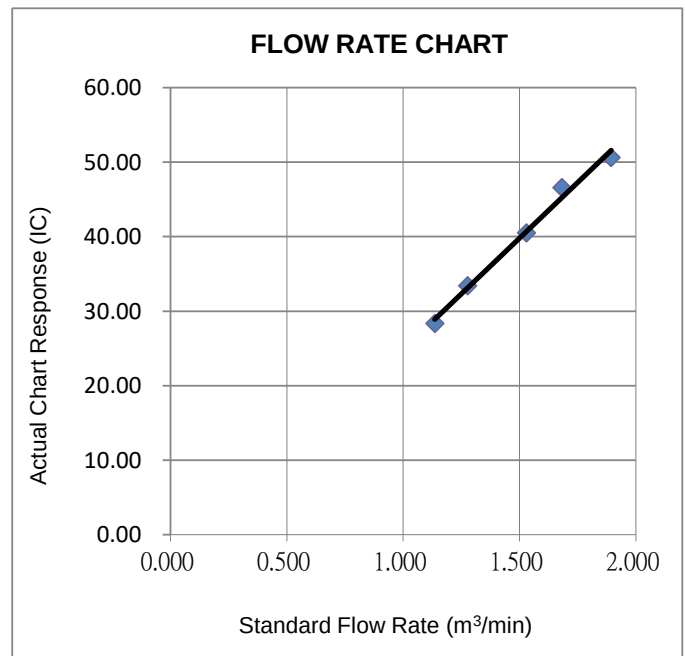
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure




Wan Ka Ho
Project Consultant

Report Date: 6/10/2020

**CALIBRATION REPORT OF WIND METER****Project:** Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge**Location:** AMS3C**Date of Calibration:** 30-Jun-2021**Next Calibration Date:** 29-Dec-2021**Technician:** Ting Chan**Brand:** Global Water**Model:** GL500-7-2**Anemometer****Brand:** Smart Sensor**Model:** AR816**Serial No:** H0423689**Procedures:**

- 1. Wind Still Test:** The wind speed sensor was held by hand until stabilized.
- 2. Wind Speed Test:** The wind meter was calibrated in-situ and compared with the Anemometer.
- 3. Wind Direction Test:** The wind meter was calibrated in-situ and compared with a marine compass from four directions.

Wind Still Test:**Wind Speed (m/s)**

0.00

Wind Speed Test:

Global Water (m/s)	Anemometer (m/s)
0.7	0.9
2.3	2.4
3.2	3.1

Wind Direction Test:

	Marine Compass (o)
1	360
70	71
242	242
310	312

Wan Ka Ho
Project Consultant**Report Date:** 1/7/2021

**CALIBRATION REPORT OF WIND METER**

Project: Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge	Date of Calibration: 28-Dec-2021
Location: AMS3C	Next Calibration Date: 27-Jun-2022
Brand: Global Water	Technician: Ting Chan
Model: GL500-7-2	

Anemometer

Brand: Smart Sensor
Model: AR816
Serial No: H0423689

Procedures:

- Wind Still Test:** The wind speed sensor was held by hand until stabilized.
- Wind Speed Test:** The wind meter was calibrated in-situ and compared with the Anemometer.
- Wind Direction Test:** The wind meter was calibrated in-situ and compared with a marine compass from four directions.

Wind Still Test:**Wind Speed (m/s)**

0.00

Wind Speed Test:

Global Water (m/s)	Anemometer (m/s)
1.8	1.8
2.6	2.5
4.2	4.3

Wind Direction Test:

	Marine Compass (o)
0	0
113	112
254	254
286	285

Wan Ka Ho
Project Consultant

Report Date: 29/12/2021

Report no. : 940891CA211483

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CALIBRATION CERTIFICATE OF DUST METER

Client : Fugro Technical Services Limited

Project : Calibration Services

Client Supplied Information

Details of Unit Under Test, UUT

Description : Laser dust monitor
 Manufacturer : SIBATA
 Model No. : LD-5R
 Serial No. : 892186
 Specification Limit : NA
 Next Calibration Date : 02-Jun-2022

Laboratory Information

Description : 1. Balance 2. TSP high volume air sampler
 Equipment ID. / Serial no. : 1. C-065-9 2. 4350
 Date of Calibration : 03-Jun-2021 Ambient Temperature : 25 ± 10 °C
 Calibration Location : General Chemical Laboratory of FTS and Ma Wan A1 Site Boundary
 Method Used : By direct comparison the weight of dust particle trapped in a filter paper using high volume sampler (TSP method) for a certain period, with the reading of the UUT. They should be placed at the same location and powered on and off at the same time.

Calibration Results :

Reference concentration (mg/m ³)	Total count for 1 hour	CPM (Count per minute)
0.0569	2147	35.78
0.0675	2299	38.32
0.1122	2675	44.58

Remarks:

1. The equipment being used in this calibration is traceable to recognized National Standards.
2. The interpolation equation : Concentration (mg/m³) = K x [UUT reading (CPM)], where K = 0.001994
3. Correlation coefficient (r) : 0.9948

Checked by : Cherry Date : 23-6-2021 Certified by : Leung Kwok Tai Date : 30-6-2021
 CA-R-297 (22/07/2009) Leung Kwok Tai (Assistant Manager)

**** End of Report ****

Report no. : 940891CA211924(2)A

Page 1 of 1

CALIBRATION CERTIFICATE OF DUST METER

Client : Fugro Technical Services Limited

Project : Calibration Services

Client Supplied Information

Details of Unit Under Test, UUT

Description : Laser dust monitor

Manufacturer : SIBATA

Model No. : LD-5R

Serial No. : 892187

Specification Limit : NA

Next Calibration Date : 11-Jul-2022

Laboratory Information

Description : 1. Balance 2. TSP high volume air sampler

Equipment ID. / Serial no. : 1. C-065-9 2. 4350

Date of Calibration : 12-Jul-2021 Ambient Temperature : 25 ± 10 °C

Calibration Location : General Chemical Laboratory of FTS and Ma Wan A1 Site Boundary

Method Used : By direct comparison the weight of dust particle trapped in a filter paper using high volume sampler (TSP method) for a certain period, with the reading of the UUT. They should be placed at the same location and powered on and off at the same time.

Calibration Results :

Reference concentration (mg/m ³)	Total count for 1 hour	CPM (Count per minute)
0.0424	1512	25.20
0.0194	1041	17.35
0.0230	1090	18.17

Remarks:

1. The equipment being used in this calibration is traceable to recognized National Standards.
2. The interpolation equation : Concentration (mg/m³) = K x [UUT reading (CPM)], where K = 0.001398
3. Correlation coefficient (r) : 0.9987
4. This is to supersede the previous report no. 940891CA211924(2).

Checked by : C. Wong Date : 3-9-2021 Certified by : K.T. Leung Date : 6-9-2021

CA-R-297 (22/07/2009)

Leung Kwok Tai (Assistant Manager)

**** End of Report ****

Report no. : 940891CA211924(3)A

Page 1 of 1

CALIBRATION CERTIFICATE OF DUST METER

Client : Fugro Technical Services Limited

Project : Calibration Services

Client Supplied Information

Details of Unit Under Test, UUT

Description : Laser dust monitor

Manufacturer : SIBATA

Model No. : LD-5R

Serial No. : 892189

Specification Limit : NA

Next Calibration Date : 11-Jul-2022

Laboratory Information

Description : 1. Balance 2. TSP high volume air sampler

Equipment ID. / Serial no. : 1. C-065-9 2. 4350

Date of Calibration : 12-Jul-2021 Ambient Temperature : 25 ± 10 °C

Calibration Location : General Chemical Laboratory of FTS and Ma Wan A1 Site Boundary

Method Used : By direct comparison the weight of dust particle trapped in a filter paper using high volume sampler (TSP method) for a certain period, with the reading of the UUT. They should be placed at the same location and powered on and off at the same time.

Calibration Results :

Reference concentration (mg/m ³)	Total count for 1 hour	CPM (Count per minute)
0.0424	1498	24.97
0.0194	1052	17.53
0.0230	1088	18.13

Remarks:

1. The equipment being used in this calibration is traceable to recognized National Standards.
2. The interpolation equation : Concentration (mg/m³) = K x [UUT reading (CPM)], where K = 0.001400
3. Correlation coefficient (r) : 0.9973
4. This is to supersede the previous report no. 940891CA211924(3).

Checked by : Cenny Date : 3-9-2021 Certified by : K.T. Leung Date : 6-9-2021

CA-R-297 (22/07/2009)

Leung Kwok Tai (Assistant Manager)

** End of Report **

Report no.: 212769CA211755(1)

Page 1 of 1

CALIBRATION CERTIFICATE OF SOUND LEVEL METER

Client Supplied Information

Client : Fugro Technical Services Ltd.

Address : Room 723 & 725, 7/F., Block B Profit Industrial Building, 1-15 Kwai Fung Crescent, Kwai Chung, N.T.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Level Meter

Manufacturer : Casella

	Meter	Microphone	Preamplifier
Model No.	CEL-63X	CE-251	CEL-495
Serial No.	1488302	02795	003538

Equipment ID : N-30

Next Calibration Date : 25-Jul-2022

Specification Limit : EN 61672-1: 2003 Class 1

Laboratory Information

Details of Reference Equipment -

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)

Equipment ID : R-108-1

Date of Calibration : 26-Jul-2021

Calibration Location : Calibration Laboratory of FTS

Ambient Temperature : 20±2 °C

Method Used : By direct comparison

Relative Humidity : <80% R.H.

Calibration Results :

Parameters		Mean Value (dB)	Specification Limit(dB)
A-weighting frequency response	4000Hz	1.2	2.6 to -0.6
	2000Hz	1.3	2.8 to -0.4
	1000Hz	0.0	1.1 to -1.1
	500Hz	-3.3	-1.8 to -4.6
	250Hz	-8.7	-7.2 to -10.0
	125Hz	-16.1	-14.6 to -17.6
	63Hz	-26.2	-24.7 to -27.7
	31.5Hz	-39.2	-37.4 to -41.4
Differential level linearity	94dB-104dB	0.3	± 0.6
	104dB-114dB	-0.3	± 0.6

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. The expanded uncertainty is 0.3 dB with a coverage factor of 2 at a confidence level of 95%.
4. For calibration: Reference SPL are 94, 104 & 114dB, range setting is 20-140dB & time weighting is fast
5. The UUT does comply with EN 61672-1: 2003 Class 1 sound level meter for the above measurement.
6. The values given in this Calibration Certificate only relate to unit under test and the values measured at the time of the test. Any uncertainties 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.

Checked by : Cenny Date : 30-7-2021 Certified by : K. T. Leung Date : 30-7-2021
CA-R-297 (22/07/2009) Leung Kwok Tai (Assistant Manager)

**** End of Report ****

Report no.: 212769CA212069

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CALIBRATION CERTIFICATE OF SOUND LEVEL METER

Client Supplied Information

Client : Fugro Technical Services Ltd.

Address : Room 723 & 725, 7/F., Block B Profit Industrial Building, 1-15 Kwai Fung Crescent, Kwai Chung, N.T.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Level Meter

Manufacturer : Casella

	Meter	Microphone	Preamplifier
Model No.	CEL-63X	CE-251	CEL-495
Serial No.	1488303	02849	0043415

Equipment ID : N/A

Next Calibration Date : 25-Aug-2022

Specification Limit : EN 61672-1: 2003 Class 1

Laboratory Information

Details of Reference Equipment -

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)

Equipment ID. : R-108-1

Date of Calibration : 26-Aug-2021

Calibration Location : Calibration Laboratory of FTS Ambient Temperature : 20±2 °C

Method Used : By direct comparison Relative Humidity : <80% R.H.

Calibration Results :

Parameters		Mean Value (dB)	Specification Limit(dB)
A-weighting frequency response	4000Hz	1.4	2.6 to -0.6
	2000Hz	1.3	2.8 to -0.4
	1000Hz	0.0	1.1 to -1.1
	500Hz	-3.4	-1.8 to -4.6
	250Hz	-8.8	-7.2 to -10.0
	125Hz	-16.2	-14.6 to -17.6
	63Hz	-26.3	-24.7 to -27.7
	31.5Hz	-39.0	-37.4 to -41.4
Differential level linearity	94dB-104dB	0.3	± 0.6
	104dB-114dB	-0.3	± 0.6

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. The expanded uncertainty is 0.3 dB with a coverage factor of 2 at a confidence level of 95%.
4. For calibration: Reference SPL are 94, 104 & 114dB, range setting is 20-140dB & time weighting is fast
5. The UUT does comply with EN 61672-1: 2003 Class 1 sound level meter for the above measurement.
6. The values given in this Calibration Certificate only relate to unit under test and the values measured at the time of the test. Any uncertainties 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.

Checked by : Cuny Date : 27-8-2021 Certified by : K.T. Leung Date : 27-8-2021
 CA-R-297 (22/07/2009) Leung Kwok Tai (Assistant Manager)

** End of Report **

Report no.: 212769CA211664

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CALIBRATION CERTIFICATE OF SOUND CALIBRATOR

Client : Fugro Technical Services Ltd.

Project : Calibration Services

Client Supplied Information**Details of Unit Under Test, UUT**

Description : Sound Calibrator
Manufacturer : Casella (Model CEL-120/1)
Serial No. : 5230758
Equipment ID : N/A

Next Calibration Date : 15-Jul-2022

Specification Limit : EN 60942: 2003 Class 1

Laboratory Information**Details of Calibration Equipment**

Description : Reference Sound level meter
Equipment ID. : R-119-2

Date of Calibration : 16-Jul-2021

Calibration Location : Calibration Laboratory of FTS Ambient Temperature : 20±2 °C

Method Used : By direct comparison Relative Humidity : <80% R.H.

Calibration Results :

Parameters (Setting of UUT)	Mean Value (error of measurement)	Specification Limit(dB)
94dB	-0.2 dB	±0.4dB
114dB	-0.2 dB	

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. The expanded uncertainty is 0.3 dB with a coverage factor of 2 at a confidence level of 95%.
4. The unit under test complies with the specification limit.
5. The values given in this Calibration Certificate only relate to the unit-under-test and the values measured at the time of the test. Any uncertainties quoted will not include allowances for the environmental changes, variation and shock during transportation, or the capability of any other laboratory to repeat the measurement.

Checked by : Cuny Date : 20-7-2021 Certified by : R.T. Leung Date : 20-7-2021
CA-R-297 (22/07/2009) Leung Kwok Tai (Assistant Manager)

**** End of Report ****

Report no.: 212769CA211553(1)

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CALIBRATION CERTIFICATE OF SOUND CALIBRATOR

Client : Fugro Technical Services Ltd.

Project : Calibration Services

Client Supplied Information

Details of Unit Under Test, UUT

Description : Sound Calibrator
Manufacturer : Casella (Model CEL-120/1)
Serial No. : 5230950
Equipment ID : N/A

Next Calibration Date : 05-Jul-2022

Specification Limit : EN 60942: 2003 Class 1

Laboratory Information

Details of Calibration Equipment

Description : Reference Sound level meter
Equipment ID. : R-119-2

Date of Calibration : 06-Jul-2021

Calibration Location : Calibration Laboratory of FTS Ambient Temperature : 20 ± 2 °C

Method Used : By direct comparison Relative Humidity : <80% R.H.

Calibration Results :

Parameters (Setting of UUT)	Mean Value (error of measurement)	Specification Limit(dB)
94dB	-0.4 dB	±0.4dB
114dB	-0.3 dB	

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. The unit under test complies with the specification limit.
4. The values given in this Calibration Certificate only relate to the unit-under-test and the values measured at the time of the test. Any uncertainties quoted will not include allowances for the environmental changes, variation and shock during transportation, or the capability of any other laboratory to repeat the measurement.

Checked by : William Date : 7-7-2021 Certified by : K.T. Leung Date : 7-7-2021
CA-R-297 (22/07/2009) Leung Kwok Tai (Assistant Manager)

** End of Report **

Report No. : 212769CA211337

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CALIBRATION CERTIFICATE OF ANEMOMETER**Client Supplied Information**

Client : Fugro Technical Services Ltd.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Anemometer

Manufacturer : Smart Sensor

Model No. : AR816

Serial No. : H0423689

Equipment ID.: WS-03

Next Calibration Date : 15-Jun-2022

Laboratory Information

Details of Reference Equipment –

Description : Reference Anemometer

Equipment ID.: R-101-4

Date of Calibration : 16-Jun-2021 Ambient Temperature : 22 °C

Calibration Location. : Calibration Laboratory of FTS

Method Used : R-C-279

Calibration Results :

Reference Reading (m/s)	UUT Reading (m/s)	Error (m/s)
1.99	2.0	0.0
4.00	4.0	0.0
6.00	5.9	-0.1
8.00	7.5	-0.5
10.01	9.0	-1.0

Remark :

1. The equipment being used in this calibration is traceable to recognized National Standards.
2. The reported readings in this calibration are an average from 10 trials.

Checked by : William Date : 22-6-2021 Certified by : K. T. Leung Date : 22-6-2021

CA-R-297 (22/07/2009)

Leung Kwok Tai (Assistant Manager)

** End of Report **