

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET

File No. MA20003/18/0007

Project No. CKL 1 - Flat 121 Cha Kwo Ling Village
 Date: 6-Mar-21 Next Due Date: 6-May-21 Operator: SK
 Equipment No.: A-01-18 Model No.: TE 5170 Serial No. 0723

Ambient Condition			
Temperature, Ta (K)	<u>293.7</u>	Pressure, Pa (mmHg)	<u>762.9</u>

Orifice Transfer Standard Information					
Serial No.	<u>3864</u>	Slope, mc	<u>0.05846</u>	Intercept, bc	<u>-0.00313</u>
Last Calibration Date:	<u>11-Jan-21</u>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$ $Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			
Next Calibration Date:	<u>11-Jan-22</u>				

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	<u>13.6</u>	3.72	63.72	<u>10.2</u>	3.22
2	<u>11.3</u>	3.39	58.09	<u>7.7</u>	2.80
3	<u>8.5</u>	2.94	50.38	<u>6.0</u>	2.47
4	<u>5.3</u>	2.32	39.80	<u>3.4</u>	1.86
5	<u>3.1</u>	1.78	30.45	<u>1.8</u>	1.35


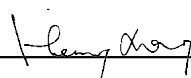
By Linear Regression of Y on X

Slope, mw = 0.0550 Intercept, bw = -0.3245
 Correlation coefficient* = 0.9983

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation	
From the TSP Field Calibration Curve, take Qstd = 43 CFM	
From the Regression Equation, the "Y" value according to	
$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$	
Therefore, Set Point; W = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ <u>4.09</u>	

Remarks: _____

Conducted by: SK Wong Signature:  Date: 6 March 2021
 Checked by: Henry Leung Signature:  Date: 6 March 2021

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET

File No. MA20003/55/0007

Project No. CKL 2 - Flat 103 Cha Kwo Ling Village
 Date: 6-Mar-21 Next Due Date: 6-May-21 Operator: SK
 Equipment No.: A-01-55 Model No.: TE 5170 Serial No. 1956

Ambient Condition			
Temperature, Ta (K)	<u>293.7</u>	Pressure, Pa (mmHg)	<u>762.9</u>

Orifice Transfer Standard Information					
Serial No.	<u>3864</u>	Slope, mc	<u>0.05846</u>	Intercept, bc	<u>-0.00313</u>
Last Calibration Date:	<u>11-Jan-21</u>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$ $Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			
Next Calibration Date:	<u>11-Jan-22</u>				

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	<u>13.8</u>	<u>3.75</u>	<u>64.18</u>	<u>9.6</u>	<u>3.13</u>
2	<u>11.3</u>	<u>3.39</u>	<u>58.09</u>	<u>7.3</u>	<u>2.73</u>
3	<u>8.4</u>	<u>2.92</u>	<u>50.09</u>	<u>5.8</u>	<u>2.43</u>
4	<u>5.2</u>	<u>2.30</u>	<u>39.42</u>	<u>3.5</u>	<u>1.89</u>
5	<u>2.8</u>	<u>1.69</u>	<u>28.94</u>	<u>2.0</u>	<u>1.43</u>

By Linear Regression of Y on X

Slope, mw = 0.0474 Intercept, bw = 0.0398
 Correlation coefficient* = 0.9980

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

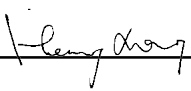
From the Regression Equation, the "Y" value according to

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

Therefore, Set Point; W = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 4.23

Remarks: _____

Conducted by: SK Wong Signature:  Date: 6 March 2021

Checked by: Henry Leung Signature:  Date: 6 March 2021

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET

File No. MA20003/04/0005

Project No. KER 1 - Future Residential Development at Kerry Godown
 Date: 1-Apr-21 Next Due Date: 1-Jun-21 Operator: SK
 Equipment No.: A-01-04 Model No.: TE 5170 Serial No. 10595

Ambient Condition			
Temperature, Ta (K)	<u>294.9</u>	Pressure, Pa (mmHg)	<u>762</u>

Orifice Transfer Standard Information					
Serial No.	<u>3864</u>	Slope, mc	<u>0.05846</u>	Intercept, bc	<u>-0.00313</u>
Last Calibration Date:	<u>11-Jan-21</u>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$ $Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			
Next Calibration Date:	<u>11-Jan-22</u>				

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	<u>13.2</u>	3.66	62.61	<u>8.0</u>	2.85
2	<u>10.8</u>	3.31	56.64	<u>6.3</u>	2.53
3	<u>8.2</u>	2.88	49.36	<u>4.8</u>	2.21
4	<u>4.8</u>	2.21	37.78	<u>2.9</u>	1.71
5	<u>2.8</u>	1.68	28.86	<u>1.9</u>	1.39

By Linear Regression of Y on X

Slope, mw = 0.0430 Intercept, bw = 0.1141
 Correlation coefficient* = 0.9983

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation


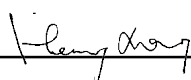
From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

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

Therefore, Set Point; W = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 3.80

Remarks: _____

Conducted by: SK Wong Signature:  Date: 1 April 2021
 Checked by: Henry Leung Signature:  Date: 1 April 2021

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET

File No. MA20003/44/0006

Project No. KTD1 - Centre of Excellence in Paediatrics (Children's Hospital)
 Date: 1-Apr-21 Next Due Date: 1-Jun-21 Operator: SK
 Equipment No.: A-01-44 Model No.: TE-5170 Serial No. 1316

Ambient Condition			
Temperature, Ta (K)	<u>294.9</u>	Pressure, Pa (mmHg)	<u>762</u>

Orifice Transfer Standard Information					
Serial No.	<u>3864</u>	Slope, mc	<u>0.05846</u>	Intercept, bc	<u>-0.00313</u>
Last Calibration Date:	<u>11-Jan-21</u>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$ $Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			
Next Calibration Date:	<u>11-Jan-22</u>				

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	<u>13.1</u>	3.64	62.37	<u>9.0</u>	3.02
2	<u>10.5</u>	3.26	55.85	<u>6.8</u>	2.62
3	<u>7.9</u>	2.83	48.45	<u>5.3</u>	2.32
4	<u>5.9</u>	2.44	41.88	<u>3.4</u>	1.86
5	<u>3.0</u>	1.74	29.88	<u>1.8</u>	1.35

By Linear Regression of Y on X

Slope, mw = 0.0516 Intercept, bw = -0.2283
 Correlation coefficient* = 0.9968

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation


From the TSP Field Calibration Curve, take Qstd = 43 CFM

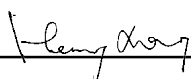
From the Regression Equation, the "Y" value according to

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

Therefore, Set Point; W = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 3.92

Remarks: _____

Conducted by: SK Wong Signature:  Date: 1 April 2021

Checked by: Henry Leung Signature:  Date: 1 April 2021

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET

File No. MA20003/41/0005

Project No. KTD 2c - G/IC Zone next to Kwun Tong Bypass (Next to the Kowloon Bay Sewage Interception Station)
 Date: 1-Apr-21 Next Due Date: 1-Jun-21 Operator: SK
 Equipment No.: A-01-41 Model No.: TE 5170 Serial No. 5280

Ambient Condition			
Temperature, Ta (K)	<u>294.9</u>	Pressure, Pa (mmHg)	<u>762</u>

Orifice Transfer Standard Information					
Serial No.	<u>3864</u>	Slope, mc	<u>0.05846</u>	Intercept, bc	<u>-0.00313</u>
Last Calibration Date:	<u>11-Jan-21</u>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$ $Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			
Next Calibration Date:	<u>11-Jan-22</u>				

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	<u>13.2</u>	3.66	62.61	<u>7.5</u>	2.76
2	<u>10.8</u>	3.31	56.64	<u>6.0</u>	2.46
3	<u>7.8</u>	2.81	48.14	<u>4.6</u>	2.17
4	<u>5.4</u>	2.34	40.06	<u>3.5</u>	1.89
5	<u>2.6</u>	1.62	27.82	<u>2.0</u>	1.42

By Linear Regression of Y on X

Slope, mw = 0.0375 Intercept, bw = 0.3728
 Correlation coefficient* = 0.9984

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation


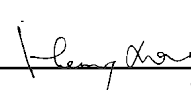
From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

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

Therefore, Set Point; W = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 3.89

Remarks: _____

Conducted by: SK Wong Signature:  Date: 1 April 2021
 Checked by: Henry Leung Signature:  Date: 1 April 2021



RECALIBRATION DUE DATE:
January 11, 2022

Certificate of Calibration

Calibration Certification Information			
Cal. Date: January 11, 2021	Rootsmeter S/N: 438320	Ta: 297 °K	
Operator: Jim Tisch		Pa: 750.1 mm Hg	
Calibration Model #: TE-5025A	Calibrator S/N: 3864		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4470	3.2	2.00
2	3	4	1	1.0210	6.4	4.00
3	5	6	1	0.9140	8.0	5.00
4	7	8	1	0.8670	8.8	5.50
5	9	10	1	0.7140	12.9	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)
0.9860	0.6814	1.4073	0.9957	0.6881	0.8899
0.9818	0.9616	1.9902	0.9915	0.9711	1.2585
0.9797	1.0719	2.2251	0.9893	1.0824	1.4071
0.9786	1.1288	2.3337	0.9883	1.1399	1.4757
0.9732	1.3630	2.8146	0.9828	1.3765	1.7798
QSTD	m=	2.06566	QA	m=	1.29348
	b=	0.00315		b=	0.00199
	r=	0.99996		r=	0.99996

Calculations	
Vstd= $\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$	Va= $\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$
Qstd= $Vstd / \Delta Time$	Qa= $Va / \Delta Time$
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:	rootsmeter 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

Certificate of Calibration - Wind Monitoring Station

Description: Yau Lai Estate, Bik Lai House
 Manufacturer: Davis Instruments
 Model No.: Davis7440
 Serial No.: MC01010A44
 Equipment No.: SA-03-04
 Date of Calibration: 20-Feb-2021
 Next Due Date: 20-Aug-2021

1. Performance check of Wind Speed

Wind Speed, m/s		Difference D (m/s)
Wind Speed Reading (V1)	Anemometer Value (V2)	$D = V1 - V2$
0.0	0.0	0.0
1.5	1.6	-0.1
2.5	2.5	0.0
3.5	3.4	0.1


2. Performance check of Wind Direction

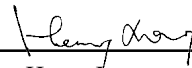
Wind Direction (°)		Difference D (°)
Wind Direction Reading (W1)	Marine Compass Value (W2)	$D = W1 - W2$
0	0	0.0
90	90	0.0
180	180	0.0
270	270	0.0

Test Specification:

1. Performance Wind Speed Test - The wind meter was on-site calibrated against the anemometer

2. Performance Wind Direction Test - The wind meter was on-site calibrated against the marine compass at four direction

Calibrated by: 
Wong Shing Kwai

Approved by: 
Henry Leung