

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/44/0003

Project No. KTD1 - Centre of Excellence in Paediatrics (Children's Hospital)
 Date: 3-Oct-20 Next Due Date: 3-Dec-20 Operator: SK
 Equipment No.: A-01-44 Model No.: TE-5170 Serial No. 1316

Ambient Condition			
Temperature, Ta (K)	301.3	Pressure, Pa (mmHg)	758.4

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.02740
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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	12.8	3.55	60.50	8.6	2.91
2	10.3	3.19	54.32	6.5	2.53
3	7.9	2.79	47.63	4.9	2.20
4	5.8	2.39	40.88	3.3	1.80
5	3.0	1.72	29.53	1.8	1.33

By Linear Regression of Y on X

Slope, mw = 0.0511 Intercept, bw = -0.2236
 Correlation coefficient* = 0.9972

*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>3.95</u>	

Remarks: _____

Conducted by: SK Wong Signature: Date: 3 October 2020

Checked by: Henry Leung Signature: Date: 3 October 2020

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/41/0002

Project No. KTD 2c - G/IC Zone next to Kwun Tong Bypass (Next to the Kowloon Bay Sewage Interception Station)

Date: 3-Oct-20 Next Due Date: 3-Dec-20 Operator: SK

Equipment No.: A-01-41 Model No.: TE 5170 Serial No. 5280

Ambient Condition			
Temperature, Ta (K)	301.3	Pressure, Pa (mmHg)	758.4

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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	13.6	3.66	62.35	6.6	2.55
2	11.0	3.29	56.12	5.3	2.29
3	8.0	2.81	47.93	4.1	2.01
4	4.6	2.13	36.46	2.6	1.60
5	2.5	1.57	27.00	1.8	1.33

By Linear Regression of Y on X

Slope, mw = 0.0344 Intercept, bw = 0.3744

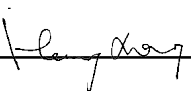
Correlation coefficient* = 0.9984

*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 = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ <u>3.49</u>	

Remarks: _____

Conducted by: SK Wong Signature:  Date: 3 October 2020

Checked by: Henry Leung Signature:  Date: 3 October 2020

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/18/0005

Project No. CKL 1 - Flat 121 Cha Kwo Ling Village

Date: 6-Nov-20 Next Due Date: 6-Jan-21 Operator: SK

Equipment No.: A-01-18 Model No.: TE 5170 Serial No. 0723

Ambient Condition			
Temperature, Ta (K)	<u>297.7</u>	Pressure, Pa (mmHg)	<u>761.9</u>

Orifice Transfer Standard Information					
Serial No.	<u>3746</u>	Slope, mc	<u>0.0592</u>	Intercept, bc	<u>-0.0274</u>
Last Calibration Date:	<u>17-Jan-20</u>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	<u>17-Jan-21</u>	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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>3.72</u>	<u>63.32</u>	<u>10.1</u>	<u>3.18</u>
2	<u>11.2</u>	<u>3.35</u>	<u>57.09</u>	<u>7.6</u>	<u>2.76</u>
3	<u>8.4</u>	<u>2.90</u>	<u>49.51</u>	<u>6.0</u>	<u>2.45</u>
4	<u>5.3</u>	<u>2.31</u>	<u>39.42</u>	<u>3.6</u>	<u>1.90</u>
5	<u>3.1</u>	<u>1.76</u>	<u>30.26</u>	<u>1.9</u>	<u>1.38</u>

By Linear Regression of Y on X

Slope, mw = 0.0533 Intercept, bw = -0.2162

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 = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 4.29

Remarks: _____

Conducted by: SK Wong Signature: [Signature] Date: 06 November 2020

Checked by: Henry Leung Signature: [Signature] Date: 06 November 2020

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/55/0005

Project No. CKL 2 - Flat 103 Cha Kwo Ling Village

Date: 6-Nov-20 Next Due Date: 6-Jan-21 Operator: SK

Equipment No.: A-01-55 Model No.: TE 5170 Serial No. 1956

Ambient Condition			
Temperature, Ta (K)	<u>297.7</u>	Pressure, Pa (mmHg)	<u>761.9</u>

Orifice Transfer Standard Information					
Serial No.	<u>3746</u>	Slope, mc	<u>0.0592</u>	Intercept, bc	<u>-0.0274</u>
Last Calibration Date:	<u>17-Jan-20</u>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	<u>17-Jan-21</u>	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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>14.5</u>	<u>3.81</u>	<u>64.90</u>	<u>9.6</u>	<u>3.10</u>
2	<u>11.3</u>	<u>3.37</u>	<u>57.35</u>	<u>7.0</u>	<u>2.65</u>
3	<u>8.4</u>	<u>2.90</u>	<u>49.51</u>	<u>5.6</u>	<u>2.37</u>
4	<u>5.4</u>	<u>2.33</u>	<u>39.78</u>	<u>3.5</u>	<u>1.87</u>
5	<u>3.1</u>	<u>1.76</u>	<u>30.26</u>	<u>2.2</u>	<u>1.49</u>

By Linear Regression of Y on X

Slope, mw = 0.0461 Intercept, bw = 0.0661

Correlation coefficient* = 0.9977

*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 = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 4.19

Remarks: _____

Conducted by: SK Wong Signature: Date: 06 November 2020

Checked by: Henry Leung Signature: Date: 06 November 2020

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/04/0002

Project No. KER 1 - Future Residential Development at Kerry Godown
 Date: 3-Oct-20 Next Due Date: 3-Dec-20 Operator: SK
 Equipment No.: A-01-04 Model No.: TE 5170 Serial No. 10595

Ambient Condition			
Temperature, Ta (K)	301.3	Pressure, Pa (mmHg)	758.4

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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	13.5	3.65	62.12	6.6	2.55
2	10.7	3.25	55.36	5.3	2.29
3	8.2	2.84	48.52	4.0	1.99
4	4.4	2.08	35.66	2.5	1.57
5	2.6	1.60	27.52	1.8	1.33

By Linear Regression of Y on X

Slope, mw = 0.0353 Intercept, bw = 0.3298
 Correlation coefficient* = 0.9974

*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>3.45</u>	

Remarks: _____

Conducted by: SK Wong Signature: Date: 3 October 2020
 Checked by: Henry Leung Signature: Date: 3 October 2020

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET

File No. MA20003/04/0003

Project No. KER 1 - Future Residential Development at Kerry Godown

Date: 3-Dec-20 Next Due Date: 3-Feb-21 Operator: SK

Equipment No.: A-01-04 Model No.: TE 5170 Serial No. 10595

Ambient Condition			
Temperature, Ta (K)	<u>290.4</u>	Pressure, Pa (mmHg)	<u>765.8</u>

Orifice Transfer Standard Information					
Serial No.	<u>3746</u>	Slope, mc	<u>0.0592</u>	Intercept, bc	<u>-0.0274</u>
Last Calibration Date:	<u>17-Jan-20</u>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	<u>17-Jan-21</u>	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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>13.3</u>	<u>3.71</u>	<u>63.10</u>	<u>6.5</u>	<u>2.59</u>
2	<u>10.8</u>	<u>3.34</u>	<u>56.91</u>	<u>5.2</u>	<u>2.32</u>
3	<u>8.3</u>	<u>2.93</u>	<u>49.95</u>	<u>4.0</u>	<u>2.03</u>
4	<u>4.5</u>	<u>2.16</u>	<u>36.90</u>	<u>2.6</u>	<u>1.64</u>
5	<u>2.5</u>	<u>1.61</u>	<u>27.62</u>	<u>1.8</u>	<u>1.36</u>

By Linear Regression of Y on X

Slope, mw = 0.0341 Intercept, bw = 0.3916

Correlation coefficient* = 0.9963

*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 = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 3.33

Remarks: _____

Conducted by: SK Wong Signature:  Date: 03 December 2020

Checked by: Henry Leung Signature:  Date: 03 December 2020

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET

File No. MA20003/44/0004

Project No. KTD1 - Centre of Excellence in Paediatrics (Children's Hospital)
 Date: 3-Dec-20 Next Due Date: 3-Feb-21 Operator: SK
 Equipment No.: A-01-44 Model No.: TE-5170 Serial No. 1316

Ambient Condition			
Temperature, Ta (K)	<u>290.4</u>	Pressure, Pa (mmHg)	<u>765.8</u>

Orifice Transfer Standard Information					
Serial No.	<u>3746</u>	Slope, mc	<u>0.0592</u>	Intercept, bc	<u>-0.02740</u>
Last Calibration Date:	<u>17-Jan-20</u>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	<u>17-Jan-21</u>	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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>12.9</u>	<u>3.65</u>	<u>62.16</u>	<u>8.7</u>	<u>3.00</u>
2	<u>10.4</u>	<u>3.28</u>	<u>55.86</u>	<u>6.6</u>	<u>2.61</u>
3	<u>7.9</u>	<u>2.86</u>	<u>48.74</u>	<u>4.9</u>	<u>2.25</u>
4	<u>5.9</u>	<u>2.47</u>	<u>42.18</u>	<u>3.4</u>	<u>1.87</u>
5	<u>3.1</u>	<u>1.79</u>	<u>30.71</u>	<u>1.8</u>	<u>1.36</u>

By Linear Regression of Y on X

Slope, mw = 0.0520 Intercept, bw = -0.2699

Correlation coefficient* = 0.9982

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

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

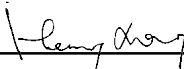
From the Regression Equation, the "Y" value according to

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

Therefore, Set Point; W = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 3.73

Remarks: _____

Conducted by: SK Wong Signature:  Date: 03 December 2020

Checked by: Henry Leung Signature:  Date: 03 December 2020

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET

File No. MA20003/41/0003

Project No. KTD 2c - G/IC Zone next to Kwun Tong Bypass (Next to the Kowloon Bay Sewage Interception Station)

Date: 3-Dec-20 Next Due Date: 3-Feb-21 Operator: SK

Equipment No.: A-01-41 Model No.: TE 5170 Serial No. 5280

Ambient Condition			
Temperature, Ta (K)	<u>290.4</u>	Pressure, Pa (mmHg)	<u>765.8</u>

Orifice Transfer Standard Information					
Serial No.	<u>3746</u>	Slope, mc	<u>0.0592</u>	Intercept, bc	<u>-0.0274</u>
Last Calibration Date:	<u>17-Jan-20</u>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	<u>17-Jan-21</u>	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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>13.5</u>	<u>3.74</u>	<u>63.57</u>	<u>6.5</u>	<u>2.59</u>
2	<u>11.1</u>	<u>3.39</u>	<u>57.69</u>	<u>5.2</u>	<u>2.32</u>
3	<u>8.1</u>	<u>2.89</u>	<u>49.35</u>	<u>4.1</u>	<u>2.06</u>
4	<u>4.6</u>	<u>2.18</u>	<u>37.30</u>	<u>2.5</u>	<u>1.61</u>
5	<u>2.6</u>	<u>1.64</u>	<u>28.16</u>	<u>1.8</u>	<u>1.36</u>

By Linear Regression of Y on X

Slope, mw = 0.0346 Intercept, bw = 0.3558

Correlation coefficient* = 0.9975

*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 = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 3.28

Remarks: _____

Conducted by: SK Wong Signature:  Date: 03 December 2020

Checked by: Henry Leung Signature:  Date: 03 December 2020



Certificate of Calibration

Calibration Certification Information

Cal. Date:	January 17, 2020	Rootsmeter S/N:	438320	Ta:	295	°K
Operator:	Jim Tisch	Pa:	744.2			mm Hg
Calibration Model #:	TE-5025A	Calibrator S/N:	3746			

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4340	3.2	2.00
2	3	4	1	1.0180	6.4	4.00
3	5	6	1	0.9080	7.9	5.00
4	7	8	1	0.8700	8.7	5.50
5	9	10	1	0.7150	12.6	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)
0.9849	0.6868	1.4066	0.9957	0.6944	0.8904
0.9807	0.9633	1.9892	0.9914	0.9739	1.2592
0.9787	1.0779	2.2240	0.9894	1.0896	1.4078
0.9776	1.1237	2.3325	0.9883	1.1360	1.4765
0.9724	1.3601	2.8131	0.9831	1.3749	1.7808
QSTD	m=	2.09221	QA	m=	1.31010
	b=	-0.02779		b=	-0.01759
	r=	0.99994		r=	0.99994

Calculations

Vstd=	$\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$	Va=	$\Delta Vol((Pa-\Delta P)/Pa)$
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 21-Aug-2020
Next Due Date 21-Feb-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	1.5	0.0
2.2	2.3	-0.1
3.5	3.4	0.1


2. Performance check of Wind Direction

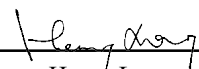
Wind Direction (°)		Difference D (°)
Wind Direction Reading (W1)	Marine Compass Value (W2)	$D = W1 - W2$
0	0	0.0
90	90	0.0
180	180	0.0
270	270	0.0

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