

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/18/0010

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

Date: 6-Sep-21 Next Due Date: 6-Nov-21 Operator: SK

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

Ambient Condition			
Temperature, Ta (K)	<u>302.7</u>	Pressure, Pa (mmHg)	<u>757.8</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>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	<u>11-Jan-22</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>12.8</u>	<u>3.54</u>	<u>60.69</u>	<u>9.8</u>	<u>3.10</u>
2	<u>10.2</u>	<u>3.16</u>	<u>54.18</u>	<u>8.0</u>	<u>2.80</u>
3	<u>8.4</u>	<u>2.87</u>	<u>49.17</u>	<u>5.9</u>	<u>2.41</u>
4	<u>6.2</u>	<u>2.47</u>	<u>42.25</u>	<u>4.0</u>	<u>1.98</u>
5	<u>3.4</u>	<u>1.83</u>	<u>31.30</u>	<u>1.9</u>	<u>1.37</u>

By Linear Regression of Y on X

Slope, mw = 0.0605 Intercept, bw = -0.5414

Correlation coefficient* = 0.9981

*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 = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 4.32

Remarks: _____

Conducted by: Wong Shing Kwai Signature: [Signature] Date: 6-Sep-21

Checked by: Henry Leung Signature: [Signature] Date: 6-Sep-21

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/55/0010

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

Date: 6-Sep-21 Next Due Date: 6-Nov-21 Operator: SK

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

Ambient Condition			
Temperature, Ta (K)	302.7	Pressure, Pa (mmHg)	757.8

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

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	3.54	60.69	9.8	3.10
2	10.8	3.26	55.75	7.6	2.73
3	8.4	2.87	49.17	6.0	2.43
4	5.6	2.34	40.16	3.6	1.88
5	3.0	1.72	29.41	1.9	1.37

By Linear Regression of Y on X


Slope, mw = 0.0549 Intercept, bw = -0.2831

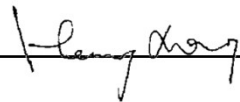
Correlation coefficient* = 0.9979

*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 x Qstd + bw) ² x (760 / Pa) x (Ta / 298) = <u>4.40</u>	

Remarks: _____

Conducted by: Wong Shing Kwai Signature:  Date: 6-Sep-21

Checked by: Henry Leung Signature:  Date: 6-Sep-21

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/41/0008

Project No. KTD 2D - Next to the SOR Office of Trunk Road T2 in Kai Tak Area

Date: 25-Sep-21 Next Due Date: 25-Nov-21 Operator: SK

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

Ambient Condition			
Temperature, Ta (K)	302.6	Pressure, Pa (mmHg)	759.5

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

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	13.4	3.63	62.17	8.9	2.96
2	11.6	3.38	57.85	7.1	2.64
3	8.3	2.86	48.94	5.6	2.35
4	6.0	2.43	41.62	4.0	1.98
5	3.0	1.72	29.45	2.4	1.54

By Linear Regression of Y on X


Slope, mw = 0.0423 Intercept, bw = 0.2617

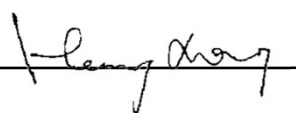
Correlation coefficient* = 0.9954

*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 x Qstd + bw) ² x (760 / Pa) x (Ta / 298) = <u>4.41</u>	

Remarks: _____

Conducted by: Wong Shing Kwai Signature:  Date: 25-Sep-21

Checked by: Henry Leung Signature:  Date: 25-Sep-21

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/04/0008

Project No. KER 1 - Future Residential Development at Kerry Godown
 Date: 2-Oct-21 Next Due Date: 2-Dec-21 Operator: SK
 Equipment No.: A-01-04 Model No.: TE 5170 Serial No. 10595

Ambient Condition			
Temperature, Ta (K)	303	Pressure, Pa (mmHg)	758.1

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

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	13.4	3.63	62.07	9.1	2.99
2	10.6	3.22	55.22	7.0	2.62
3	8.4	2.87	49.16	5.6	2.34
4	5.2	2.26	38.69	3.2	1.77
5	3.0	1.72	29.40	2.1	1.44

By Linear Regression of Y on X

Slope, mw = 0.0482 Intercept, bw = -0.0280

Correlation coefficient* = 0.9978

*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

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

Therefore, Set Point; W = $(mw \times Q_{std} + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 4.26

Remarks: _____

Conducted by: Wong Shing Kwai Signature: [Signature] Date: 2-Oct-21

Checked by: Henry Leung Signature: [Signature] Date: 2-Oct-21

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/44/0009

Project No. KTD1 - Centre of Excellence in Paediatrics (Children's Hospital)
 Date: 2-Oct-21 Next Due Date: 2-Dec-21 Operator: SK
 Equipment No.: A-01-44 Model No.: TE-5170 Serial No. 1316

Ambient Condition			
Temperature, Ta (K)	303	Pressure, Pa (mmHg)	758.1

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

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	3.65	62.54	9.2	3.00
2	11.2	3.31	56.75	7.2	2.66
3	8.2	2.84	48.57	5.6	2.34
4	5.6	2.34	40.15	3.3	1.80
5	3.2	1.77	30.36	1.8	1.33

By Linear Regression of Y on X

Slope, mw = 0.0520 Intercept, bw = -0.2515

Correlation coefficient* = 0.9978

*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

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

Therefore, Set Point; W = $(mw \times Q_{std} + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ **4.01**

Remarks: _____

Conducted by: Wong Shing Kwai Signature:  Date: 2-Oct-21

Checked by: Henry Leung Signature:  Date: 2-Oct-21

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/18/0011

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

Date: 6-Nov-21 Next Due Date: 6-Jan-22 Operator: SK

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

Ambient Condition			
Temperature, Ta (K)	<u>299.4</u>	Pressure, Pa (mmHg)	<u>757.5</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>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	<u>11-Jan-22</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>3.58</u>	<u>61.25</u>	<u>9.8</u>	<u>3.12</u>
2	<u>10.3</u>	<u>3.20</u>	<u>54.73</u>	<u>8.0</u>	<u>2.82</u>
3	<u>8.5</u>	<u>2.90</u>	<u>49.73</u>	<u>5.9</u>	<u>2.42</u>
4	<u>6.2</u>	<u>2.48</u>	<u>42.48</u>	<u>4.0</u>	<u>1.99</u>
5	<u>3.4</u>	<u>1.84</u>	<u>31.47</u>	<u>1.9</u>	<u>1.37</u>

By Linear Regression of Y on X

Slope, mw = 0.0598 Intercept, bw = -0.5241

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

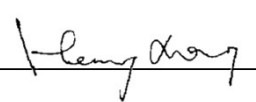
From the Regression Equation, the "Y" value according to

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

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

Remarks: _____

Conducted by: Wong Shing Kwai Signature:  Date: 6-Nov-21

Checked by: Henry Leung Signature:  Date: 6-Nov-21

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/55/0011

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

Date: 6-Nov-21 Next Due Date: 6-Jan-22 Operator: SK

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

Ambient Condition			
Temperature, Ta (K)	299.4	Pressure, Pa (mmHg)	757.5

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

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	12.7	3.55	60.77	9.8	3.12
2	10.7	3.26	55.78	7.6	2.75
3	8.4	2.89	49.43	6.0	2.44
4	5.5	2.34	40.01	3.6	1.89
5	2.9	1.70	29.07	1.9	1.37

By Linear Regression of Y on X


Slope, mw = 0.0544 Intercept, bw = -0.2461

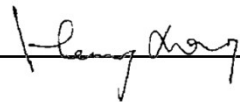
Correlation coefficient* = 0.9978

*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>4.42</u>	

Remarks: _____

Conducted by: Wong Shing Kwai Signature:  Date: 6-Nov-21

Checked by: Henry Leung Signature:  Date: 6-Nov-21

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET



File No. MA20003/41/0009

Project No. KTD 2D - Next to the SOR Office of Trunk Road T2 in Kai Tak Area

Date: 25-Nov-21 Next Due Date: 25-Jan-22 Operator: SK

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

Ambient Condition			
Temperature, Ta (K)	293.6	Pressure, Pa (mmHg)	763.5

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

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	13.2	3.67	62.81	9.2	3.06
2	11.4	3.41	58.37	7.4	2.75
3	8.2	2.89	49.52	5.8	2.43
4	6.0	2.47	42.36	4.2	2.07
5	3.0	1.75	29.97	2.3	1.53

By Linear Regression of Y on X


Slope, mw = 0.0454 Intercept, bw = 0.1604

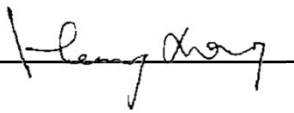
Correlation coefficient* = 0.9974

*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>4.38</u>	

Remarks: _____

Conducted by: Wong Shing Kwai Signature:  Date: 25-Nov-21

Checked by: Henry Leung Signature:  Date: 25-Nov-21

Certificate of Calibration

Calibration Certification Information

Cal. Date: January 11, 2021 Rootsometer 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=	$\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$	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: rootsometer 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-Aug-2021
Next Due Date: 20-Feb-2022

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
2.8	2.7	0.1
4.0	4.1	-0.1

2. Performance check of Wind Direction

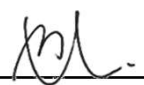
Wind Direction (°)		Difference D (°)
Wind Direction Reading (W1)	Marine Compass Value (W2)	$D = W1 - W2$
0	0	0.0
90	90	0.0
180	180	0.0
270	270	0.0

Test Specification:

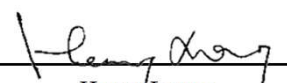
1. Performance Wind Speed Test - The wind meter was on-site calibrated against the anemometer

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