

# High-Volume TSP Sampler

## 5-POINT CALIBRATION DATA SHEET



File No. MA20003/18/022

Project No. CKL 1 - Flat 121 Cha Kwo Ling Village  
 Date: 4-Sep-23 Next Due Date: 5-Nov-23 Operator: SK  
 Equipment No.: A-01-18 Model No.: TE 5170 Serial No. 0723

Ambient Condition			
Temperature, Ta (K)	<b>302.9</b>	Pressure, Pa (mmHg)	<b>751.6</b>

Orifice Transfer Standard Information					
Serial No.	3864	Slope, mc	0.05928	Intercept, bc	-0.03491
Last Calibration Date:	16-Jan-23	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	16-Jan-24	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

Calibration of TSP Sampler						
Calibration Point	Orifice			HVS		
	$\Delta H$ (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	$\Delta W$ (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis	
1	<b>13.2</b>	3.58	61.04	<b>9.3</b>	3.01	
2	<b>9.9</b>	3.10	52.94	<b>7.4</b>	2.68	
3	<b>8.2</b>	2.82	48.24	<b>5.3</b>	2.27	
4	<b>5.9</b>	2.40	41.01	<b>3.2</b>	1.76	
5	<b>3.1</b>	1.74	29.89	<b>1.6</b>	1.25	

### By Linear Regression of Y on X

Slope, mw = 0.0591 Intercept, bw : -0.5590

Correlation coefficient\* = 0.9933

\*If Correlation Coefficient < 0.990, check and recalibrate.

### Set Point Calculation


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

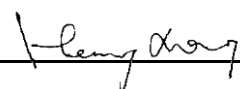
From the Regression Equation, the "Y" value according to

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

Therefore, Set Point;  $W = (mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$  4.03

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

Conducted by: Wong Shing Kwai Signature:  Date: 4-Sep-23

Checked by: Henry Leung Signature:  Date: 4-Sep-23

# High-Volume TSP Sampler

## 5-POINT CALIBRATION DATA SHEET



File No. MA20003/55/021

Project No. CKL 2 - Flat 103 Cha Kwo Ling Village  
 Date: 4-Sep-23 Next Due Date: 4-Nov-23 Operator: SK  
 Equipment No.: A-01-55 Model No.: TE 5170 Serial No. 1956

Ambient Condition			
Temperature, Ta (K)	<b>302.9</b>	Pressure, Pa (mmHg)	<b>751.6</b>

Orifice Transfer Standard Information					
Serial No.	3864	Slope, mc	0.05928	Intercept, bc	-0.03491
Last Calibration Date:	16-Jan-23	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$ $Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			
Next Calibration Date:	16-Jan-24				

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	$\Delta H$ (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	$\Delta W$ (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	<b>13.1</b>	3.57	60.81	<b>9.7</b>	3.07
2	<b>11.1</b>	3.29	56.03	<b>7.7</b>	2.74
3	<b>8.9</b>	2.94	50.23	<b>5.9</b>	2.40
4	<b>5.2</b>	2.25	38.53	<b>2.7</b>	1.62
5	<b>3.2</b>	1.76	30.35	<b>1.6</b>	1.25

**By Linear Regression of Y on X**

Slope, mw = 0.0606 Intercept, bw : -0.6460

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

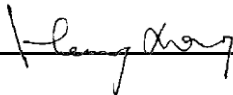
From the Regression Equation, the "Y" value according to

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

Therefore, Set Point; W =  $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$  3.95

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

Conducted by: Wong Shing Kwai Signature:  Date: 4-Jul-23

Checked by: Henry Leung Signature:  Date: 4-Jul-23

# High-Volume TSP Sampler

## 5-POINT CALIBRATION DATA SHEET



File No. MA20003/04/0020

Project No. KER 1 - Future Residential Development at Kerry Godown  
 Date: 10-Sep-23 Next Due Date: 10-Nov-23 Operator: SK  
 Equipment No.: A-01-04 Model No.: TE 5170 Serial No. 10595

Ambient Condition			
Temperature, Ta (K)	<u>298.8</u>	Pressure, Pa (mmHg)	<u>756.3</u>

Orifice Transfer Standard Information					
Serial No.	<u>3864</u>	Slope, mc	<u>0.05928</u>	Intercept, bc	<u>-0.03491</u>
Last Calibration Date:	<u>16-Jan-23</u>	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	<u>16-Jan-24</u>	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	$\Delta H$ (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	$\Delta W$ (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	<u>12.8</u>	3.56	60.71	<u>9.0</u>	2.99
2	<u>10.3</u>	3.20	54.52	<u>6.9</u>	2.62
3	<u>8.3</u>	2.87	49.00	<u>5.4</u>	2.32
4	<u>5.4</u>	2.32	39.64	<u>3.2</u>	1.78
5	<u>3.2</u>	1.78	30.65	<u>1.8</u>	1.34

By Linear Regression of Y on X

Slope, mw = 0.0550 Intercept, bw : -0.3739

Correlation coefficient\* = 0.9995

\*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 =  $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$  4.00

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

Conducted by: Wong Shing Kwai Signature: [Signature] Date: 10-Sep-23

Checked by: Henry Leung Signature: [Signature] Date: 10-Sep-23

# High-Volume TSP Sampler

## 5-POINT CALIBRATION DATA SHEET



File No. MA20003/44/0019

Project No. KTD1 - Centre of Excellence in Paediatrics (Children's Hospital)  
 Date: 10-Sep-23 Next Due Date: 10-Nov-23 Operator: SK  
 Equipment No.: A-01-44 Model No.: TE-5170 Serial No. 1316

Ambient Condition			
Temperature, Ta (K)	<b>298.8</b>	Pressure, Pa (mmHg)	<b>756.3</b>

Orifice Transfer Standard Information					
Serial No.	3864	Slope, mc	0.05928	Intercept, bc	-0.03491
Last Calibration Date:	16-Jan-23	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	16-Jan-24	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	$\Delta H$ (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	$\Delta W$ (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	<b>12.9</b>	3.58	60.95	<b>9.2</b>	3.02
2	<b>10.7</b>	3.26	55.56	<b>7.0</b>	2.64
3	<b>8.5</b>	2.90	49.58	<b>5.2</b>	2.27
4	<b>5.9</b>	2.42	41.41	<b>3.4</b>	1.84
5	<b>3.3</b>	1.81	31.12	<b>2.0</b>	1.41

By Linear Regression of Y on X

Slope, mw = 0.0537 Intercept, bw : -0.3295

Correlation coefficient\* = 0.9944

\*If Correlation Coefficient < 0.990, check and recalibrate.

### Set Point Calculation


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

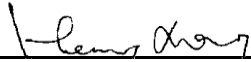
From the Regression Equation, the "Y" value according to

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

Therefore, Set Point; W =  $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$  3.95

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

Conducted by: Wong Shing Kwai Signature:  Date: 10-Sep-23

Checked by: Henry Leung Signature:  Date: 10-Sep-23

# High-Volume TSP Sampler

## 5-POINT CALIBRATION DATA SHEET



File No. MA20003/41/0020

Project No. KTD 2D - Next to the SOR Office of Trunk Road T2 in Kai Tak Area  
 Date: 10-Sep-23 Next Due Date: 10-Nov-23 Operator: SK  
 Equipment No.: A-01-41 Model No.: TE 5170 Serial No. 5280

Ambient Condition			
Temperature, Ta (K)	<b>298.8</b>	Pressure, Pa (mmHg)	<b>756.3</b>

Orifice Transfer Standard Information					
Serial No.	3864	Slope, mc	0.05928	Intercept, bc	-0.03491
Last Calibration Date:	16-Jan-23	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	16-Jan-24	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	$\Delta H$ (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	$\Delta W$ (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	<b>13.4</b>	3.65	62.11	<b>9.0</b>	2.99
2	<b>10.9</b>	3.29	56.07	<b>8.0</b>	2.82
3	<b>8.9</b>	2.97	50.72	<b>6.0</b>	2.44
4	<b>6.5</b>	2.54	43.43	<b>3.8</b>	1.94
5	<b>3.6</b>	1.89	32.47	<b>1.9</b>	1.37

### By Linear Regression of Y on X

Slope, mw = 0.0572 Intercept, bw : -0.4875

Correlation coefficient\* = 0.9945

\*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: \_\_\_\_\_  
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Conducted by: Wong Shing Kwai Signature:  Date: 10-Sep-23

Checked by: Henry Leung Signature:  Date: 10-Sep-23



# Certificate of Calibration

Calibration Certification Information			
Cal. Date: January 16, 2023	Rootsmer S/N: 438320	Ta: 293	°K
Operator: Jim Tisch		Pa: 749.0	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: <b>3864</b>		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4440	3.2	2.00
2	3	4	1	1.0220	6.4	4.00
3	5	6	1	0.9100	8.0	5.00
4	7	8	1	0.8710	8.8	5.50
5	9	10	1	0.7210	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)
0.9981	0.6912	1.4159	0.9957	0.6896	0.8845
0.9938	0.9724	2.0024	0.9915	0.9701	1.2509
0.9917	1.0898	2.2388	0.9893	1.0872	1.3985
0.9906	1.1373	2.3480	0.9883	1.1346	1.4668
0.9853	1.3665	2.8318	0.9829	1.3633	1.7690
<b>QSTD</b>	m=	<b>2.09452</b>	<b>QA</b>	m=	<b>1.31155</b>
	b=	<b>-0.03493</b>		b=	<b>-0.02182</b>
	r=	<b>0.99995</b>		r=	<b>0.99995</b>

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: rootsmer 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: 18-Aug-2023  
 Next Due Date: 18-Feb-2024

### 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
2.5	2.4	0.1
4.0	3.9	0.1

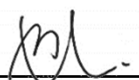
### 2. Performance check of Wind Direction

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

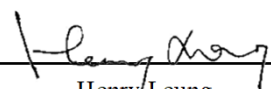
### Test Specification:

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