# 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 ($^{o}$) | | Difference D ($^{o}$) |
|---|---|---|
| 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

TISCH Environmental

| 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) | $\sqrt{\Delta H\left(Ta/Pa\right)}$ (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=** | ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta) | **Va=** | ΔVol((Pa-ΔP)/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=** $1/m\left(\left(\sqrt{\Delta H\left(Ta/Pa\right)}\right)-b\right)$

| 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

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# High-Volume TSP Sampler

## 5-POINT CALIBRATION DATA SHEET

File No. MA20003/44/0010

Project No. KTD1 - Centre of Excellence in Paediatrics (Children's Hospital)

Date: 2-Dec-21 Next Due Date: 2-Feb-22 Operator: SK

Equipment No.: A-01-44 Model No.: TE-5170 Serial No. 1316

| Ambient Condition | | | |
|---|---|---|---|
| Temperature, Ta (K) | 290.4 | Pressure, Pa (mmHg) | 766.2 |

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

**Calibration of TSP Sampler**

| Calibration Point | Orfice | | | HVS | |
|---|---|---|---|---|---|
| | ΔH (orifice), in. of water | [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ | Qstd (CFM) **X - axis** | ΔW (HVS), in. of water | [ΔW x (Pa/760) x (298/Ta)]$^{1/2}$ **Y-axis** |
| 1 | 13.4 | 3.72 | 63.74 | 9.4 | 3.12 |
| 2 | 11.0 | 3.37 | 57.76 | 7.4 | 2.77 |
| 3 | 8.4 | 2.95 | 50.48 | 5.6 | 2.41 |
| 4 | 5.6 | 2.41 | 41.23 | 3.3 | 1.85 |
| 5 | 3.2 | 1.82 | 31.18 | 1.8 | 1.36 |

**By Linear Regression of Y on X**

**Slope , mw =** **0.0541** **Intercept, bw =** **-0.3451**

**Correlation coefficient* =** **0.9993**

*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 x Qstd + bw = [ΔW x (Pa/760) x (298/Ta)]$^{1/2}$**

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

Remarks:

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

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

# High-Volume TSP Sampler

## 5-POINT CALIBRATION DATA SHEET

File No. MA20003/04/0009

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

Date: 2-Dec-21 Next Due Date: 2-Feb-22 Operator: SK

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

| Ambient Condition | | | |
|---|---|---|---|
| Temperature, Ta (K) | 290.4 | Pressure, Pa (mmHg) | 766.2 |

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

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**Calibration of TSP Sampler**

| Calibration Point | Orfice | | | HVS | |
|---|---|---|---|---|---|
| | ΔH (orifice), in. of water | [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ | Qstd (CFM) **X - axis** | ΔW (HVS), in. of water | [ΔW x (Pa/760) x (298/Ta)]$^{1/2}$ **Y-axis** |
| 1 | 13.2 | 3.70 | 63.27 | 9.2 | 3.09 |
| 2 | 10.4 | 3.28 | 56.16 | 7.0 | 2.69 |
| 3 | 8.2 | 2.91 | 49.88 | 5.6 | 2.41 |
| 4 | 5.2 | 2.32 | 39.73 | 3.2 | 1.82 |
| 5 | 3.0 | 1.76 | 30.19 | 2.1 | 1.47 |

**By Linear Regression of Y on X**

**Slope , mw =** **0.0495** **Intercept, bw =** **-0.0709**

**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 x Qstd + bw = [ΔW x (Pa/760) x (298/Ta)]$^{1/2}$**

Therefore, Set Point; W = ( mw x Qstd + bw )$^2$ x ( 760 / Pa ) x ( Ta / 298 ) = **4.08**

Remarks:

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

Checked by: Henry Leung Signature: Date: 2-Dec-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 x Qstd + bc = [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$** | | | |
| Next Calibration Date: | 11-Jan-22 | **Qstd = {[ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ -bc} / mc** | | | |

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**Calibration of TSP Sampler**

| Calibration Point | Orfice | | | HVS | |
|---|---|---|---|---|---|
| | ΔH (orifice), in. of water | [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ | Qstd (CFM) **X - axis** | ΔW (HVS), in. of water | [ΔW x (Pa/760) x (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 x Qstd + bw = [ΔW x (Pa/760) x (298/Ta)]$^{1/2}$**

Therefore, Set Point; W = ( mw x Qstd + bw )$^2$ x ( 760 / Pa ) x ( Ta / 298 ) = **4.38**

Remarks:

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

Checked by: Henry Leung Signature: Date: 25-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 x Qstd + bc = [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$** | | | |
| Next Calibration Date: | 11-Jan-22 | **Qstd = {[ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ -bc} / mc** | | | |

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| Calibration of TSP Sampler | | | | | |
|---|---|---|---|---|---|
| Calibration Point | Orfice | | | HVS | |
| | ΔH (orifice), in. of water | [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ | Qstd (CFM) **X - axis** | ΔW (HVS), in. of water | [ΔW x (Pa/760) x (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 x Qstd + bw = [ΔW x (Pa/760) x (298/Ta)]$^{1/2}$**

Therefore, Set Point; W = ( mw x Qstd + bw )$^2$ x ( 760 / Pa ) x ( Ta / 298 ) = **4.42**

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. MA20003/18/0011

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) | 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 x Qstd + bc = [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$** | | | |
| Next Calibration Date: | 11-Jan-22 | **Qstd = {[ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ -bc} / mc** | | | |

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**Calibration of TSP Sampler**

| Calibration Point | Orfice | | | HVS | |
|---|---|---|---|---|---|
| | ΔH (orifice), in. of water | [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ | Qstd (CFM) **X - axis** | ΔW (HVS), in. of water | [ΔW x (Pa/760) x (298/Ta)]$^{1/2}$ **Y-axis** |
| 1 | 12.9 | 3.58 | 61.25 | 9.8 | 3.12 |
| 2 | 10.3 | 3.20 | 54.73 | 8.0 | 2.82 |
| 3 | 8.5 | 2.90 | 49.73 | 5.9 | 2.42 |
| 4 | 6.2 | 2.48 | 42.48 | 4.0 | 1.99 |
| 5 | 3.4 | 1.84 | 31.47 | 1.9 | 1.37 |

**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 x Qstd + bw = [ΔW x (Pa/760) x (298/Ta)]$^{1/2}$**

Therefore, Set Point; W = ( mw x Qstd + bw )$^2$ x ( 760 / Pa ) x ( 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. MA20003/44/0009

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 x Qstd + bc = [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$** | | | |
| Next Calibration Date: | 11-Jan-22 | **Qstd = {[ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ -bc} / mc** | | | |

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| Calibration of TSP Sampler | | | | | |
|---|---|---|---|---|---|
| Calibration Point | Orfice | | | HVS | |
| | ΔH (orifice), in. of water | [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ | Qstd (CFM) **X - axis** | ΔW (HVS), in. of water | [ΔW x (Pa/760) x (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 |

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**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 x Qstd + bw = [ΔW x (Pa/760) x (298/Ta)]$^{1/2}$**

Therefore, Set Point; W = ( mw x Qstd + bw )$^2$ x ( 760 / Pa ) x ( 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. MA20003/04/0008

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 x Qstd + bc = [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$** | | | |
| Next Calibration Date: | 11-Jan-22 | **Qstd = {[ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ -bc} / mc** | | | |

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| Calibration of TSP Sampler | | | | | |
|---|---|---|---|---|---|
| Calibration Point | Orfice | | | HVS | |
| | ΔH (orifice), in. of water | [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ | Qstd (CFM) **X - axis** | ΔW (HVS), in. of water | [ΔW x (Pa/760) x (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 x Qstd + bw = [ΔW x (Pa/760) x (298/Ta)]$^{1/2}$**

Therefore, Set Point; W = ( mw x Qstd + bw )$^2$ x ( 760 / Pa ) x ( Ta / 298 ) = **4.26**

Remarks:

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

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