



ANNEX D1

CALIBRATION CERTIFICATES FOR DUST
MONITORING EQUIPMENT

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location ID: AM1	Date of Calibration:	22-Dec-23
Name and Model : TISCH HVS Model TE-5170	Next Calibration Date:	21-Feb-24
	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1027	Corrected Pressure (mm Hg)	770.3
Temperature (°C)	10.0	Temperature (K)	283

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.07544
Model:	TE-5025A	Qstd Intercept	-0.03205
Serial#:	2454		

CALIBRATION

Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	5.3	5.3	10.6	1.636	56	57.87	Slope= 28.984 Intercept= 9.8992 Corr. Coeff.= 0.9959
13	4.3	4.4	8.7	1.484	50	51.67	
10	3.0	2.9	5.9	1.225	45	46.50	
7	2.0	2.1	4.1	1.024	38	39.27	
5	1.2	1.3	2.5	0.803	32	33.07	

Calculations:

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m(I[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

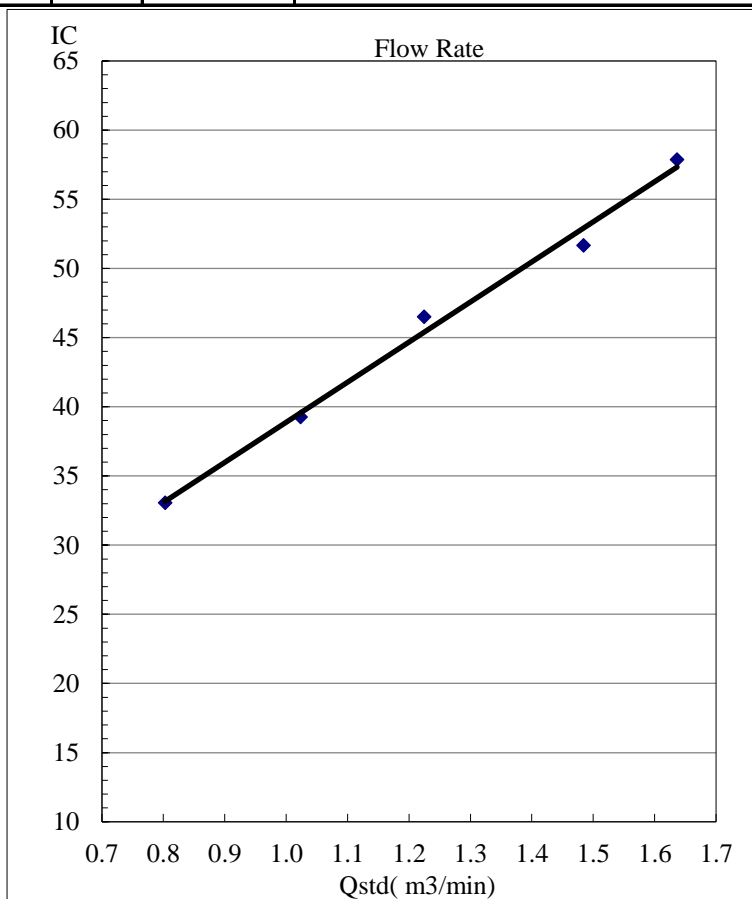
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location ID: AM2	Date of Calibration:	22-Dec-23
Name and Model : TISCH HVS Model TE-5170	Next Calibration Date:	21-Feb-24
	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1027	Corrected Pressure (mm Hg)	770.3
Temperature (°C)	10.0	Temperature (K)	283

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.07544
Model:	TE-5025A	Qstd Intercept	-0.03205
Serial#:	2454		

CALIBRATION

Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.1	6.1	12.2	1.755	52	53.73	Slope= 26.430 Intercept= 7.718 Corr. Coeff.= 0.9952
13	4.9	4.9	9.8	1.574	48	49.60	
10	3.6	3.6	7.2	1.351	43	44.43	
7	2.5	2.5	5.0	1.129	35	36.17	
5	1.4	1.5	2.9	0.863	30	31.00	

Calculations:

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m(I[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

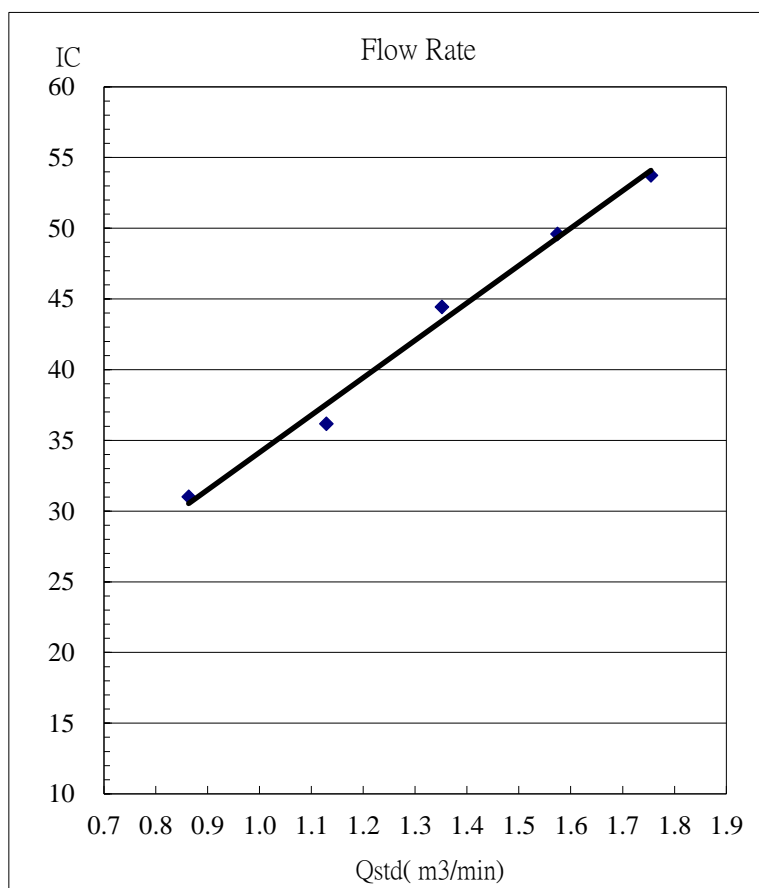
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location ID: AM3	Date of Calibration:	22-Dec-23
Name and Model : TISCH HVS Model TE-5170	Next Calibration Date:	21-Feb-24
	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1027	Corrected Pressure (mm Hg)	770.3
Temperature (°C)	10.0	Temperature (K)	283

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.07544
Model:	TE-5025A	Qstd Intercept	-0.03205
Serial#:	2454		

CALIBRATION

Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	5.9	5.9	11.8	1.726	56	57.87	Slope= 23.822 Intercept= 16.621 Corr. Coeff.= 0.9991
13	4.6	4.7	9.3	1.534	51	52.70	
10	3.3	3.2	6.5	1.285	46	47.53	
7	2.1	2.0	4.1	1.024	40	41.33	
5	1.3	1.4	2.7	0.834	35	36.17	

Calculations:

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m(I[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

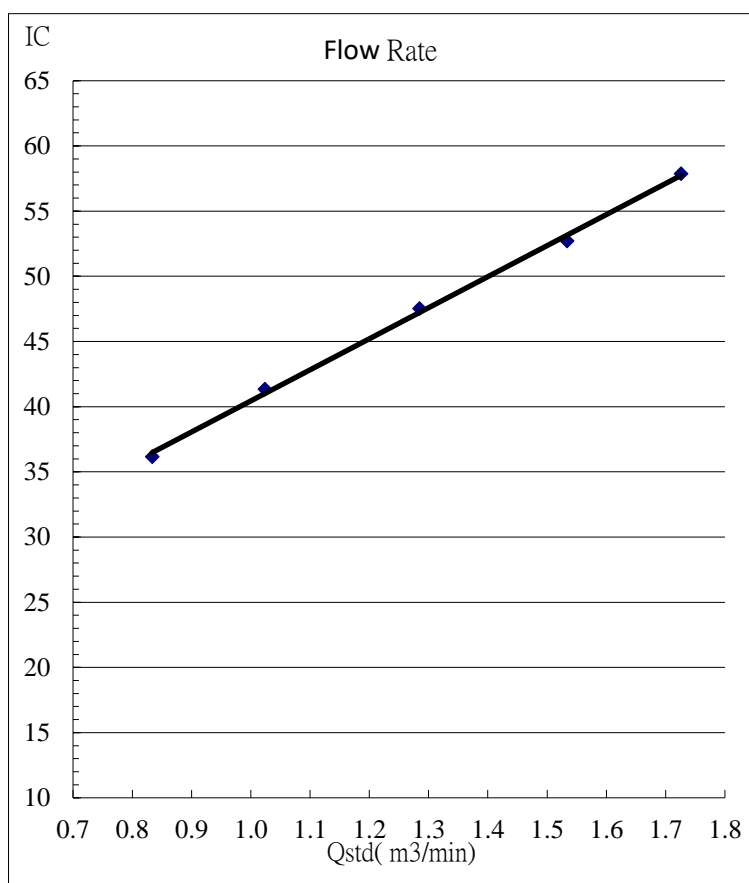
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location ID: AM4	Date of Calibration:	22-Dec-23
Name and Model : TISCH HVS Model TE-5170	Next Calibration Date:	21-Feb-24
	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1027	Corrected Pressure (mm Hg)	770.3
Temperature (°C)	10.0	Temperature (K)	283

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.07544
Model:	TE-5025A	Qstd Intercept	-0.03205
Serial#:	2454		

CALIBRATION

Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.4	6.5	12.9	1.804	58	59.93	Slope= 30.977 Intercept= 4.808 Corr. Coeff.= 0.9950
13	4.6	4.5	9.1	1.517	52	53.73	
10	3.7	3.7	7.4	1.370	45	46.50	
7	2.2	2.3	4.5	1.072	36	37.20	
5	1.3	1.4	2.7	0.834	30	31.00	

Calculations:

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m(I[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

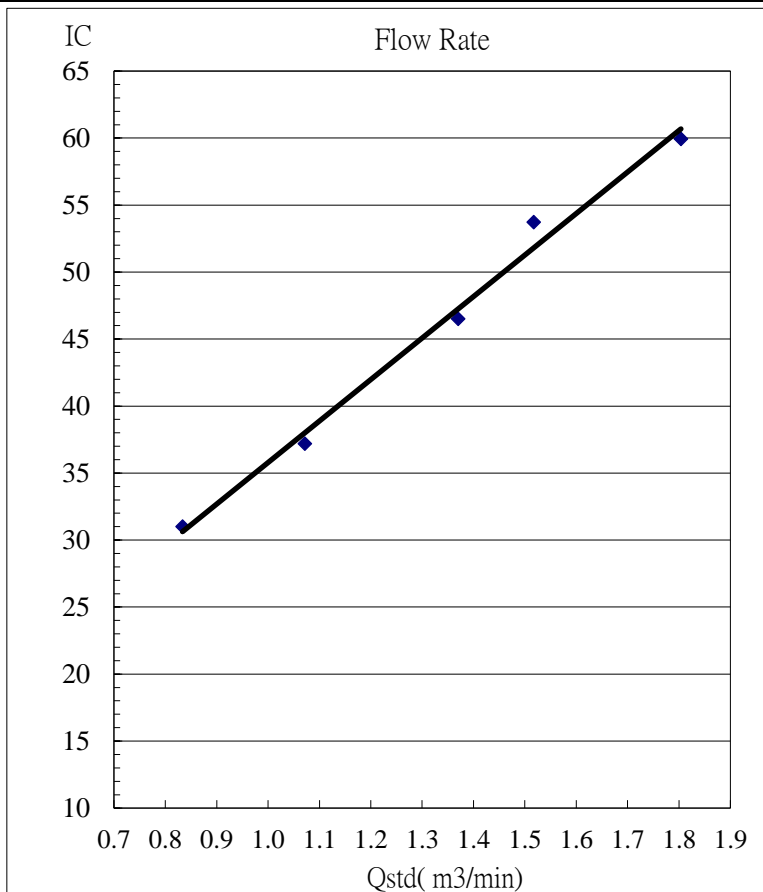
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location ID: AM1	Date of Calibration:	20-Feb-24
Name and Model : TISCH HVS Model TE-5170	Next Calibration Date:	19-Apr-24
	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1017	Corrected Pressure (mm Hg)	762.8
Temperature (°C)	24.0	Temperature (K)	297

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.07544
Model:	TE-5025A	Qstd Intercept	-0.03205
Serial#:	2454		

CALIBRATION

Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.2	6.2	12.4	1.719	56	56.21	Slope= 30.370 Intercept= 4.548 Corr. Coeff.= 0.9989
13	4.9	4.9	9.8	1.530	51	51.19	
10	3.6	3.6	7.2	1.313	45	45.17	
7	2.4	2.4	4.8	1.075	37	37.14	
5	1.5	1.5	3.0	0.853	30	30.11	

Calculations:

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m(I[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

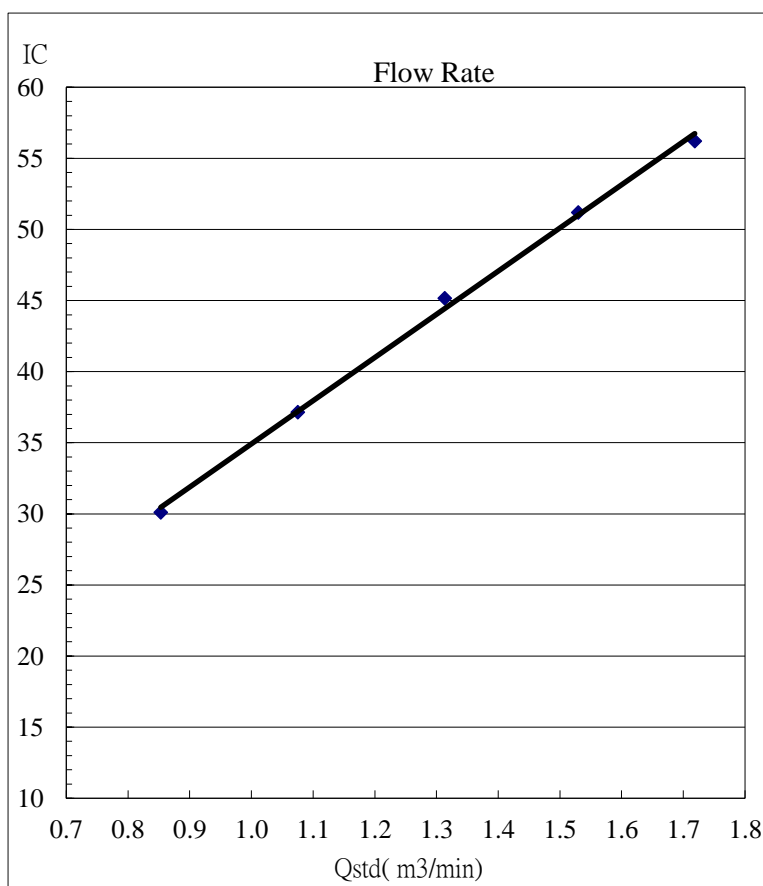
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location ID: AM2	Date of Calibration:	20-Feb-24
Name and Model : TISCH HVS Model TE-5170	Next Calibration Date:	19-Apr-24
	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1017	Corrected Pressure (mm Hg)	762.8
Temperature (°C)	24.0	Temperature (K)	297

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.07544
Model:	TE-5025A	Qstd Intercept	-0.03205
Serial#:	2454		

CALIBRATION

Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.5	6.5	13	1.759	52	52.20	Slope= 26.514 Intercept= 6.297 Corr. Coeff.= 0.9933
13	5.0	5.0	10	1.545	47	47.18	
10	3.6	3.6	7.2	1.313	42	42.16	
7	2.2	2.3	4.5	1.041	35	35.13	
5	1.4	1.5	2.9	0.839	27	27.10	

Calculations:

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m(I[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

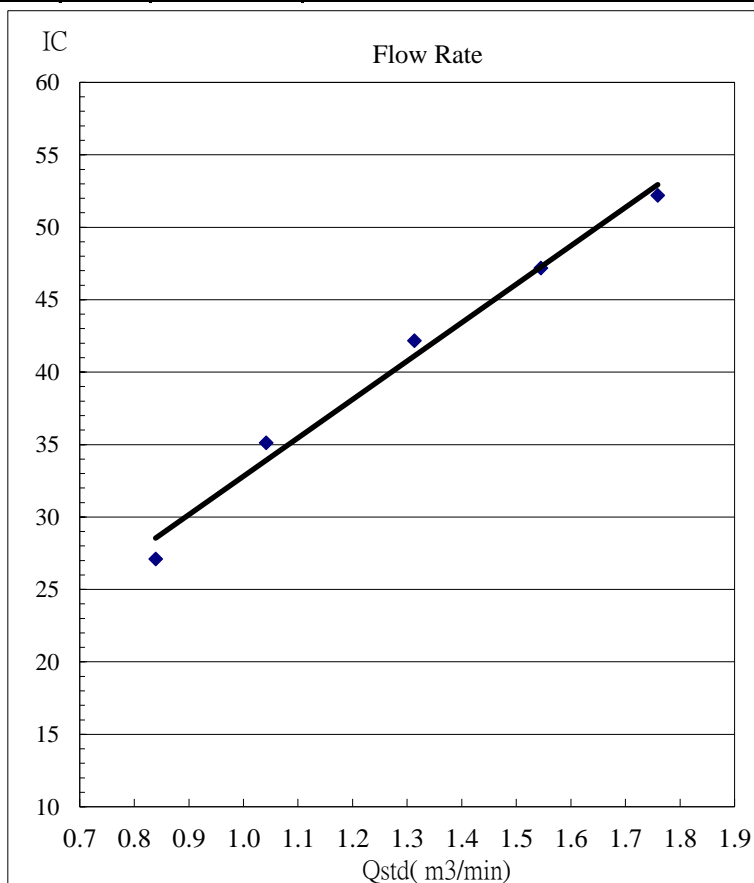
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location ID: AM3	Date of Calibration:	20-Feb-24
Name and Model : TISCH HVS Model TE-5170	Next Calibration Date:	19-Apr-24
	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1017	Corrected Pressure (mm Hg)	762.8
Temperature (°C)	24.0	Temperature (K)	297

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.07544
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Serial#:	2454		

CALIBRATION

Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	5.6	5.7	11.3	1.641	57	57.22	Slope= 27.283 Intercept= 12.645 Corr. Coeff.= 0.9985
13	4.3	4.3	8.6	1.434	52	52.20	
10	3.3	3.2	6.5	1.249	46	46.17	
7	2.0	2.0	4.0	0.983	40	40.15	
5	1.2	1.2	2.4	0.765	33	33.12	

Calculations:

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m(I[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

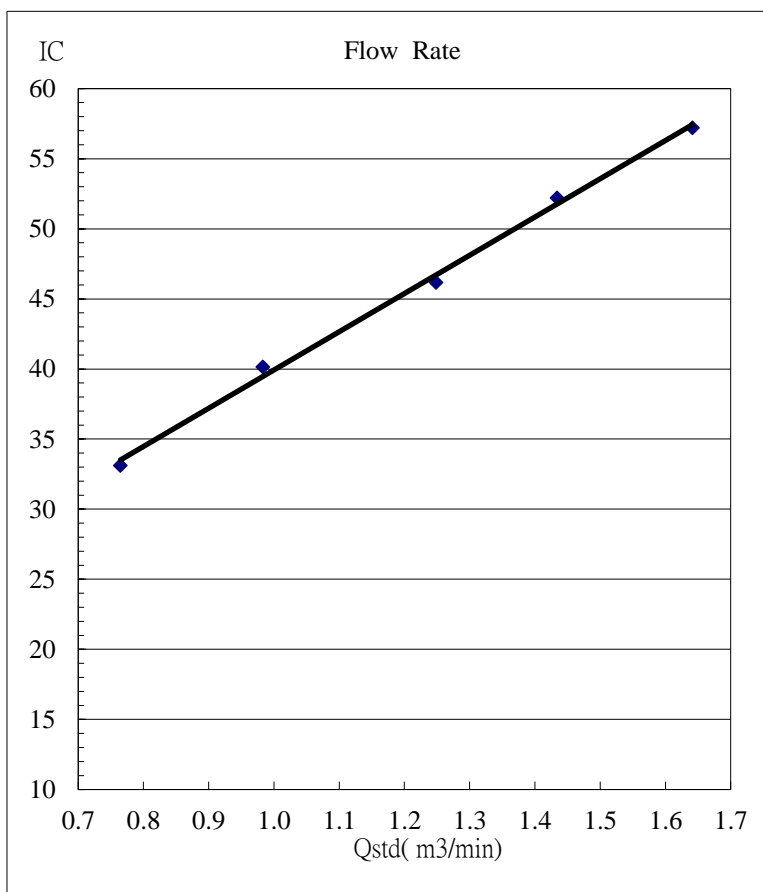
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location ID: AM4	Date of Calibration:	20-Feb-24
Name and Model : TISCH HVS Model TE-5170	Next Calibration Date:	19-Apr-24
	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1017	Corrected Pressure (mm Hg)	762.8
Temperature (°C)	24.0	Temperature (K)	297

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.07544
Model:	TE-5025A	Qstd Intercept	-0.03205
Serial#:	2454		

CALIBRATION

Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.0	6.0	12.0	1.691	57	57.22	Slope= 32.433 Intercept= 1.905 Corr. Coeff.= 0.9966
13	4.7	4.8	9.5	1.506	51	51.19	
10	3.7	3.7	7.4	1.331	44	44.17	
7	2.4	2.5	4.9	1.086	36	36.14	
5	1.5	1.4	2.9	0.839	30	30.11	

Calculations:

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m(I[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

