

Annex D1

# Calibration Certificates for Dust Monitoring Equipment

## TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location ID : AM1	Date of Calibration: 18-Jul-22
Name and Model: TISCH HVS Model TE-5170	Next Calibration Date: 18-Sep-22
	Operator: Dixon Chan

### CONDITIONS

Sea Level Pressure (hPa)	1004.9	Corrected Pressure (mm Hg)	753.675
Temperature (°C)	30.4	Temperature (K)	303

### CALIBRATION ORIFICE

Make-> TISCH	Qstd Slope -> 1.99838
Model-> 5025A	Qstd Intercept -> -0.00903
Serial # -> 1612	

### CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION
18	5.70	5.70	11.4	1.672	59	57.71	Slope = 42.3021 Intercept = -12.4750 Corr. coeff. = 0.9978
13	4.40	4.40	8.8	1.470	52	50.86	
10	3.50	3.50	7.0	1.311	43	42.06	
7	2.30	2.30	4.6	1.064	34	33.26	
5	1.50	1.50	3.0	0.860	24	23.47	

**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 responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration ( deg K)

Pstd = actual pressure during calibration ( mm Hg)

**For subsequent calculation of sampler flow:**

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

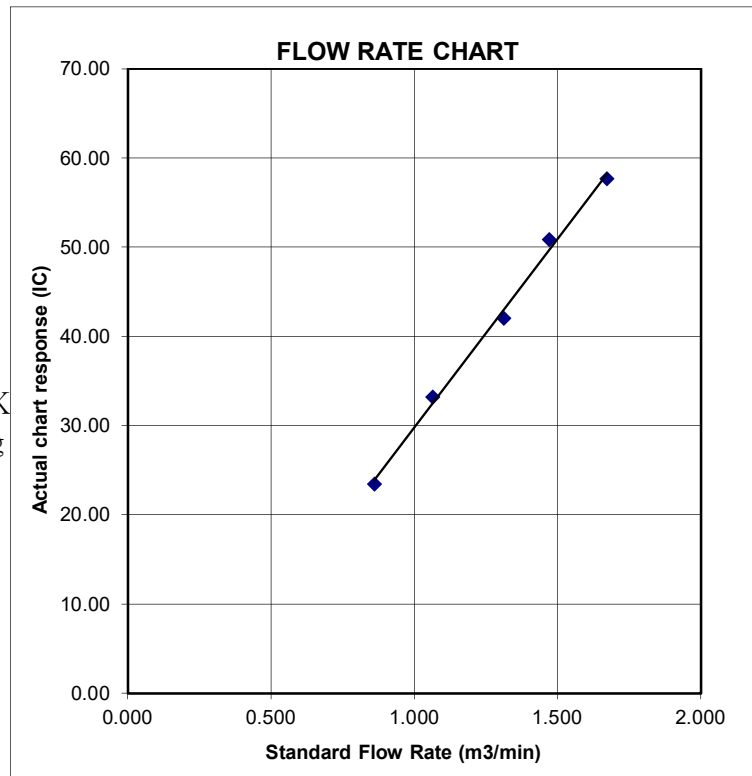
m = sampler slope

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: 18-Jul-22
Name and Model: TISCH HVS Model TE-5170	Next Calibration Date: 18-Sep-22
	Operator: Dixon Chan

### CONDITIONS

Sea Level Pressure (hPa) <span style="float: right;">1004.9</span>	Corrected Pressure (mm Hg) <span style="float: right;">753.675</span>
Temperature (°C) <span style="float: right;">30.4</span>	Temperature (K) <span style="float: right;">303</span>

### CALIBRATION ORIFICE

Make-> TISCH	Qstd Slope -> 1.99838
Model-> 5025A	Qstd Intercept -> -0.00903
Serial # -> 1612	

### CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION		
							Slope =	Intercept =	Corr. coeff. =
18	6.00	6.00	12.0	1.715	52	50.86	Slope = 30.9016 Intercept = -2.5771 Corr. coeff. = 0.9988		
13	4.80	4.80	9.6	1.535	46	44.99			
10	3.70	3.70	7.4	1.348	39	38.15			
7	2.30	2.30	4.6	1.064	31	30.32			
5	1.30	1.30	2.6	0.801	23	22.50			

#### 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 responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration ( deg K

Pstd = actual pressure during calibration ( mm Hg

#### For subsequent calculation of sampler flow:

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

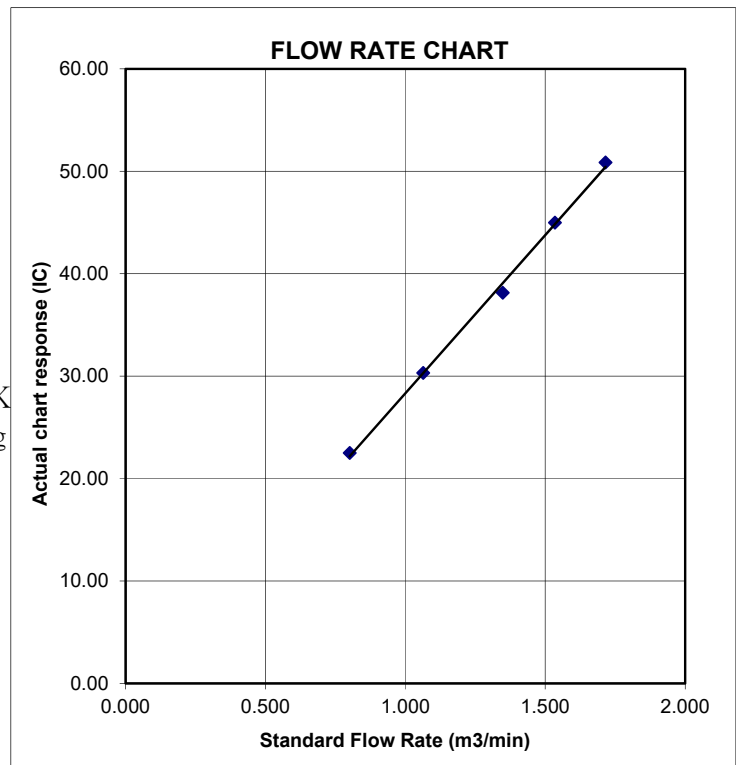
m = sampler slope

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: 18-Jul-22
Name and Model: TISCH HVS Model TE-5170	Next Calibration Date: 18-Sep-22
	Operator: Dixon Chan

### CONDITIONS

Sea Level Pressure (hPa) <span style="border: 1px solid black; padding: 2px;">1004.9</span>	Corrected Pressure (mm Hg) <span style="border: 1px solid black; padding: 2px;">753.675</span>
Temperature (°C) <span style="border: 1px solid black; padding: 2px;">30.4</span>	Temperature (K) <span style="border: 1px solid black; padding: 2px;">303</span>

### CALIBRATION ORIFICE

Make-> <span style="border: 1px solid black; padding: 2px;">TISCH</span>	Qstd Slope -> <span style="border: 1px solid black; padding: 2px;">1.99838</span>
Model-> <span style="border: 1px solid black; padding: 2px;">5025A</span>	Qstd Intercept -> <span style="border: 1px solid black; padding: 2px;">-0.00903</span>
Serial # -> <span style="border: 1px solid black; padding: 2px;">1612</span>	

### CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION
18	5.70	5.70	11.4	1.672	58	56.73	Slope = 36.7741 Intercept = -4.2418 Corr. coeff. = 0.9978
13	4.50	4.50	9.0	1.486	52	50.86	
10	3.40	3.40	6.8	1.292	44	43.04	
7	2.20	2.20	4.4	1.040	36	35.21	
5	1.40	1.40	2.8	0.831	26	25.43	

**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 responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration ( deg K)

Pstd = actual pressure during calibration ( mm Hg)

**For subsequent calculation of sampler flow:**

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

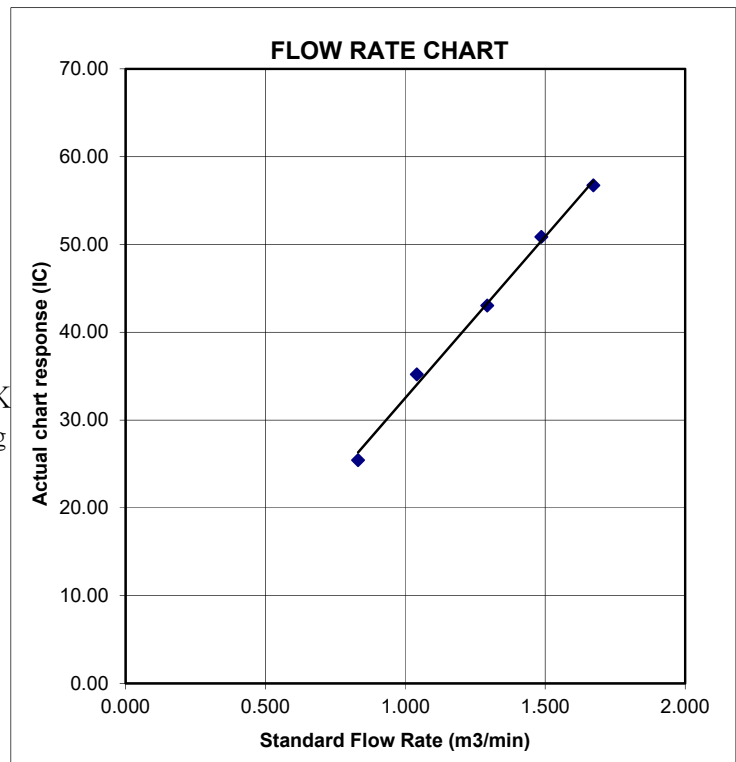
m = sampler slope

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: 18-Jul-22
Name and Model: TISCH HVS Model TE-5170	Next Calibration Date: 18-Sep-22
	Operator: Dixon Chan

### CONDITIONS

Sea Level Pressure (hPa) <span style="border: 1px solid black; padding: 2px;">1004.9</span>	Corrected Pressure (mm Hg) <span style="border: 1px solid black; padding: 2px;">753.675</span>
Temperature (°C) <span style="border: 1px solid black; padding: 2px;">30.4</span>	Temperature (K) <span style="border: 1px solid black; padding: 2px;">303</span>

### CALIBRATION ORIFICE

Make-> <span style="border: 1px solid black; padding: 2px;">TISCH</span>	Qstd Slope -> <span style="border: 1px solid black; padding: 2px;">1.99838</span>
Model-> <span style="border: 1px solid black; padding: 2px;">5025A</span>	Qstd Intercept -> <span style="border: 1px solid black; padding: 2px;">-0.00903</span>
Serial # -> <span style="border: 1px solid black; padding: 2px;">1612</span>	

### CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION
18	5.90	5.90	11.8	1.701	53	51.84	Slope = 30.9549 Intercept = -0.3923 Corr. coeff. = 0.9989
13	4.60	4.60	9.2	1.502	48	46.95	
10	3.70	3.70	7.4	1.348	42	41.08	
7	2.30	2.30	4.6	1.064	33	32.28	
5	1.40	1.40	2.8	0.831	26	25.43	

**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 responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration ( deg K)

Pstd = actual pressure during calibration ( mm Hg)

**For subsequent calculation of sampler flow:**

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

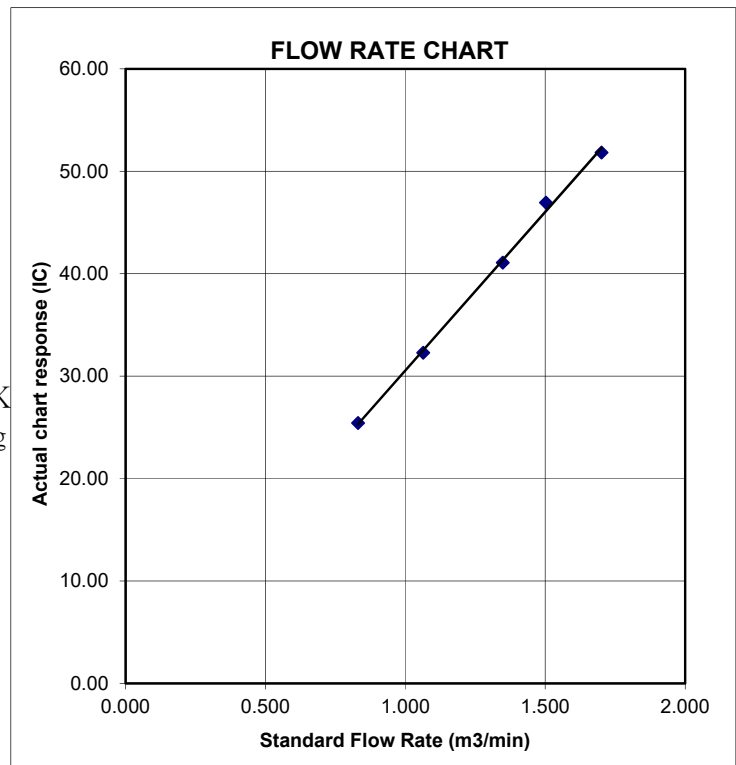
m = sampler slope

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: 17-Sep-22
Name and Model: TISCH HVS Model TE-5170	Next Calibration Date: 17-Nov-22
	Operator: Dixon Chan

### CONDITIONS

Sea Level Pressure (hPa)	1006	Corrected Pressure (mm Hg)	754.5
Temperature (°C)	31.1	Temperature (K)	304

### CALIBRATION ORIFICE

Make-> TISCH	Qstd Slope -> 1.99838
Model-> 5025A	Qstd Intercept -> -0.00903
Serial # -> 1612	

### CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION
18	5.50	5.50	11.0	1.641	57	55.65	Slope = 41.4005 Intercept = -11.1763 Corr. coeff. = 0.9978
13	4.30	4.30	8.6	1.452	51	49.80	
10	3.40	3.40	6.8	1.292	44	42.96	
7	2.20	2.20	4.4	1.040	33	32.22	
5	1.40	1.40	2.8	0.830	23	22.46	

**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 responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration ( deg K)

Pstd = actual pressure during calibration ( mm Hg)

**For subsequent calculation of sampler flow:**

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

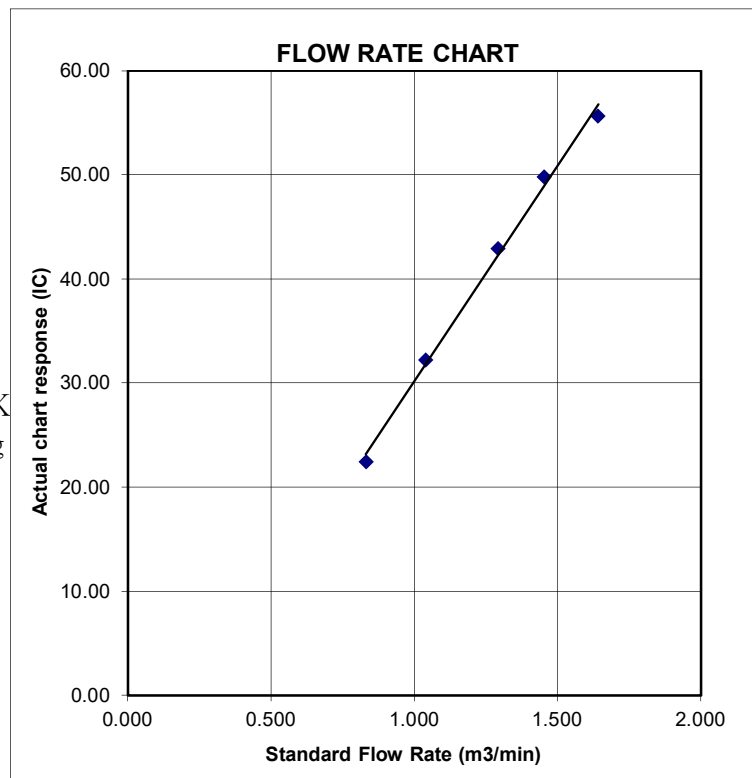
m = sampler slope

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: 17-Sep-22
Name and Model: TISCH HVS Model TE-5170	Next Calibration Date: 17-Nov-22
	Operator: Dixon Chan

### CONDITIONS

Sea Level Pressure (hPa) <span style="float: right;">1006</span>	Corrected Pressure (mm Hg) <span style="float: right;">754.5</span>
Temperature (°C) <span style="float: right;">31.1</span>	Temperature (K) <span style="float: right;">304</span>

### CALIBRATION ORIFICE

Make-> TISCH	Qstd Slope -> 1.99838
Model-> 5025A	Qstd Intercept -> -0.00903
Serial # -> 1612	

### CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION		
							Slope =	Intercept =	Corr. coeff. =
18	6.00	6.00	12.0	1.714	54	52.72	Slope = 31.6608 Intercept = -2.0650 Corr. coeff. = 0.9949		
13	5.00	5.00	10.0	1.565	47	45.89			
10	3.60	3.60	7.2	1.329	42	41.01			
7	2.40	2.40	4.8	1.086	34	33.20			
5	1.40	1.40	2.8	0.830	24	23.43			

**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 responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration ( deg K)

Pstd = actual pressure during calibration ( mm Hg)

**For subsequent calculation of sampler flow:**

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

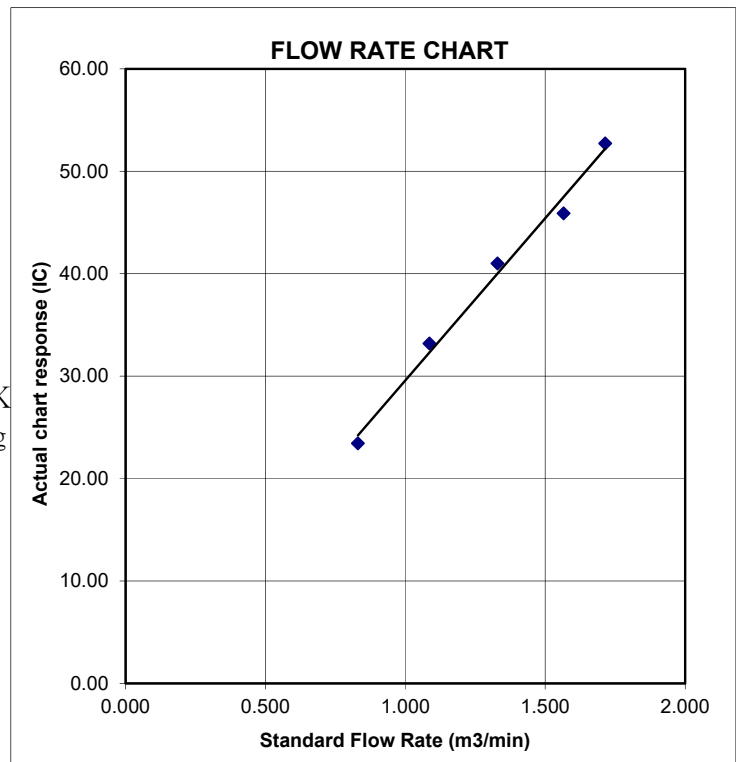
m = sampler slope

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: 17-Sep-22
Name and Model: TISCH HVS Model TE-5170	Next Calibration Date: 17-Nov-22
	Operator: Dixon Chan

### CONDITIONS

Sea Level Pressure (hPa) <span style="border: 1px solid black; padding: 2px;">1006</span>	Corrected Pressure (mm Hg) <span style="border: 1px solid black; padding: 2px;">754.5</span>
Temperature (°C) <span style="border: 1px solid black; padding: 2px;">31.1</span>	Temperature (K) <span style="border: 1px solid black; padding: 2px;">304</span>

### CALIBRATION ORIFICE

Make-> <span style="border: 1px solid black; padding: 2px;">TISCH</span>	Qstd Slope -> <span style="border: 1px solid black; padding: 2px;">1.99838</span>
Model-> <span style="border: 1px solid black; padding: 2px;">5025A</span>	Qstd Intercept -> <span style="border: 1px solid black; padding: 2px;">-0.00903</span>
Serial # -> <span style="border: 1px solid black; padding: 2px;">1612</span>	

### CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION
18	5.50	5.50	11.0	1.641	50	48.82	Slope = 36.0371 Intercept = -10.4602 Corr. coeff. = 0.9965
13	4.30	4.30	8.6	1.452	43	41.98	
10	3.50	3.50	7.0	1.310	38	37.10	
7	2.20	2.20	4.4	1.040	26	25.39	
5	1.40	1.40	2.8	0.830	21	20.50	

**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 responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration ( deg K

Pstd = actual pressure during calibration ( mm Hg

**For subsequent calculation of sampler flow:**

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

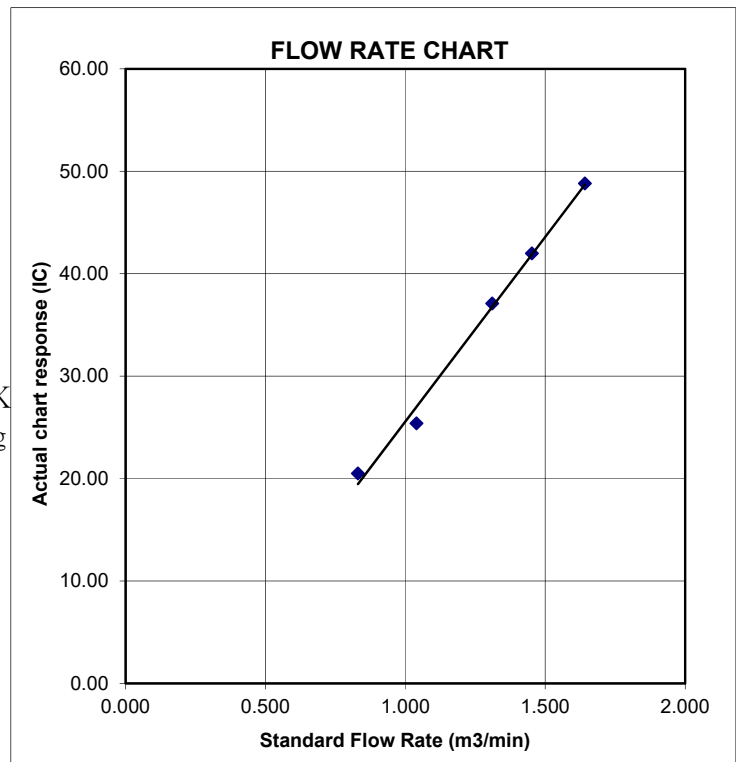
m = sampler slope

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: 17-Sep-22
Name and Model: TISCH HVS Model TE-5170	Next Calibration Date: 17-Nov-22
	Operator: Dixon Chan

### CONDITIONS

Sea Level Pressure (hPa) <span style="float: right;">1006</span>	Corrected Pressure (mm Hg) <span style="float: right;">754.5</span>
Temperature (°C) <span style="float: right;">31.1</span>	Temperature (K) <span style="float: right;">304</span>

### CALIBRATION ORIFICE

Make-> TISCH	Qstd Slope -> 1.99838
Model-> 5025A	Qstd Intercept -> -0.00903
Serial # -> 1612	

### CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION		
							Slope =	Intercept =	Corr. coeff. =
18	5.60	5.60	11.2	1.656	51	49.80	Slope = 28.7101 Intercept = 2.2328 Corr. coeff. = 0.9981		
13	4.60	4.60	9.2	1.502	46	44.91			
10	3.30	3.30	6.6	1.273	40	39.06			
7	2.10	2.10	4.2	1.016	33	32.22			
5	1.40	1.40	2.8	0.830	26	25.39			

**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 responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration ( deg K

Pstd = 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

