TISCH Environmental

RECALIBRATION DUE DATE:
October 21, 2020

Certificate of Calibration

Calibration Certification Information				
Cal. Date:	October 21, 2019	**Rootsmeter S/N:** 438320	**Ta:** 295	°K
Operator:	Jim Tisch		**Pa:** 744.2	mm Hg
Calibration Model #:	TE-5025A	**Calibrator S/N:** **2456**		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4200	3.2	2.00
2	3	4	1	1.0180	6.3	4.00
3	5	6	1	0.9030	7.9	5.00
4	7	8	1	0.8620	8.8	5.50
5	9	10	1	0.7120	12.6	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)
0.9849	0.6936	1.4066	0.9957	0.7012	0.8904
0.9808	0.9635	1.9892	0.9915	0.9740	1.2592
0.9787	1.0838	2.2240	0.9894	1.0957	1.4078
0.9775	1.1340	2.3325	0.9882	1.1464	1.4765
0.9724	1.3658	2.8131	0.9831	1.3807	1.7808
QSTD	**m=**	**2.08799**	**QA**	**m=**	**1.30746**
	b=	**-0.03545**		**b=**	**-0.02244**
	r=	**0.99989**		**r=**	**0.99989**

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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TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmantal Monitoring Works For Contract No. KLN/2015/07 — Date of Calibration: 18-Feb-20
Location : KTD1a — Next Calibration Date: 17-May-20
Brand: Tisch — Technician: Tony Wan
Model: TE-5170 S/N: 4037

CONDITIONS

Sea Level Pressure (hPa):	1026.4	Corrected Pressure (mm Hg):	770
Temperature (℃):	14.7	Temperature (K):	288

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.08799
Model:	TE-5025A	Qstd Intercept:	-0.03545
Calibration Date:	21-Oct-19	Expiry Date:	21-Oct-20
S/N:	2456		

CALIBRATION

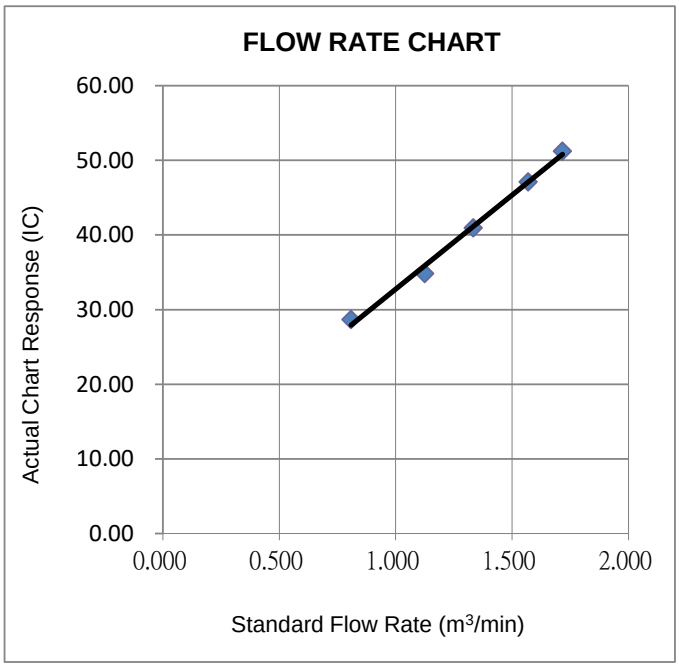
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	5.00	-7.00	12.000	1.716	50.00	51.22	Slope =	25.1765
13	3.10	-6.90	10.000	1.568	46.00	47.12	Intercept =	7.5773
10	1.80	-5.40	7.200	1.333	40.00	40.97	Corr. coeff.=	0.9971
7	0.90	-4.20	5.100	1.125	34.00	34.83		
5	0.20	-2.40	2.600	0.808	28.00	28.68		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[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)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



Report Date: **20/2/2020**

Wan Ka Ho
Project Consultant

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TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmantal Monitoring Works For Contract No. KLN/2015/07 — Date of Calibration: 18-Feb-20
Location : KER1b — Next Calibration Date: 17-May-20
Brand: Tisch — Technician: Tony Wan
Model: TE-5170 S/N: 3482

CONDITIONS

Sea Level Pressure (hPa):	1026.4	Corrected Pressure (mm Hg):	770
Temperature (℃):	14.7	Temperature (K):	288

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.08799
Model:	TE-5025A	Qstd Intercept:	-0.03545
Calibration Date:	21-Oct-19	Expiry Date:	21-Oct-20
S/N:	2456		

CALIBRATION

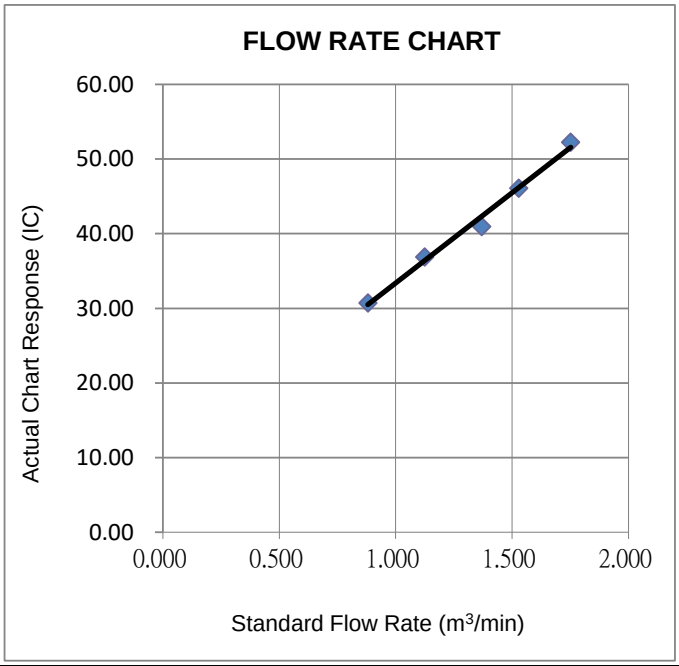
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	4.60	-7.90	12.500	1.751	51.00	52.24	Slope =	24.2236
13	3.40	-6.10	9.500	1.529	45.00	46.09	Intercept =	9.1388
10	2.40	-5.20	7.600	1.369	40.00	40.97	Corr. coeff.=	0.9953
7	1.00	-4.10	5.100	1.125	36.00	36.88		
5	0.30	-2.80	3.100	0.881	30.00	30.73		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[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)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



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TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmantal Monitoring Works For Contract No. KLN/2015/07 — Date of Calibration: 18-Feb-20
Location : KTD2b — Next Calibration Date: 17-May-20
Brand: Tisch — Technician: Tony Wan
Model: TE-5170 S/N: 3838

CONDITIONS

Sea Level Pressure (hPa):	1026.4	Corrected Pressure (mm Hg):	770
Temperature (℃):	14.7	Temperature (K):	288

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.08799
Model:	TE-5025A	Qstd Intercept:	-0.03545
Calibration Date:	21-Oct-19	Expiry Date:	21-Oct-20
S/N:	2456		

CALIBRATION

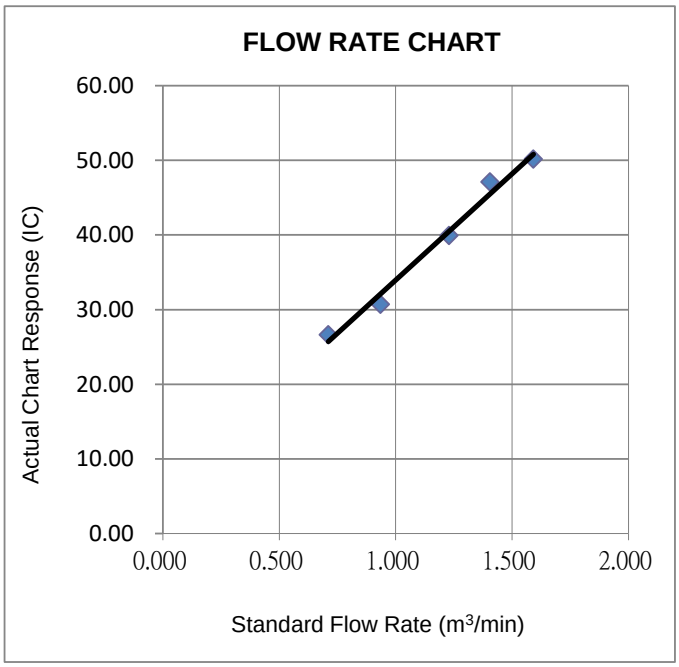
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	5.40	-4.90	10.300	1.591	49.00	50.19	Slope =	28.4808
13	4.20	-3.80	8.000	1.405	46.00	47.12	Intercept =	5.4872
10	3.10	-3.00	6.100	1.229	39.00	39.95	Corr. coeff.=	0.9927
7	2.00	-1.50	3.500	0.935	30.00	30.73		
5	1.20	-0.80	2.000	0.711	26.00	26.63		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[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)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



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