

High-Volume TSP Sampler
5-Point Calibration Record

Location : AM1(ICC)
 Calibrated by : K.T.Ho
 Date : 08/03/2024

Sampler

Model : TE-5170
 Serial Number : S/N 0767

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
 Next Calibration Date : 15 December 2024
 Slope (m) : 2.07544
 Intercept (b) : -0.03205
 Correlation Coefficient(r) : 0.99999

Standard Condition

Pstd (hpa) : 1013
 Tstd (K) : 298.18

Calibration Condition

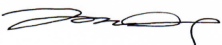
Pa (hpa) : 1019
 Ta(K) : 290

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1 18 holes	11.2	3.403	1.655	58	58.98
2 13 holes	8.2	2.912	1.418	50	50.84
3 10 holes	6.2	2.532	1.235	42	42.71
4 7 holes	4.4	2.133	1.043	34	34.57
5 5 holes	2.6	1.640	0.805	22	22.37

Notes: $Z=\text{SQRT}\{dH(Pa/Pstd)(Tstd/Ta)\}$, $X=Z/m-b$, $Y(\text{Corrected Flow})=IC*\{\text{SQRT}(Pa/Pstd)(Tstd/Ta)\}$

Sampler Calibration Relationship

Slope(m):43.138 Intercept(b):-11.230 Correlation Coefficient(r):0.9972

Checked by: 

 Magnum Fan

Date: 09/03/2024

High-Volume TSP Sampler
5-Point Calibration Record

Location : AM1(ICC)
Calibrated by : K.T.Ho
Date : 08/05/2024

Sampler

Model : TE-5170
Serial Number : S/N 0767

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Next Calibration Date : 15 December 2024
Slope (m) : 2.07544
Intercept (b) : -0.03205
Correlation Coefficient(r) : 0.99999

Standard Condition

Pstd (hpa) : 1013
Tstd (K) : 298.18

Calibration Condition

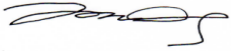
Pa (hpa) : 1014
Ta(K) : 302

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1 18 holes	10.2	3.174	1.545	60	59.64
2 13 holes	7.4	2.704	1.318	50	49.70
3 10 holes	5.6	2.352	1.149	40	39.76
4 7 holes	3.6	1.886	0.924	30	29.82
5 5 holes	2.4	1.540	0.757	16	15.90

Notes: $Z = \sqrt{dH(Pa/Pstd)(Tstd/Ta)}$, $X = Z/m - b$, $Y(\text{Corrected Flow}) = IC * \{\sqrt{Pa/Pstd}(Tstd/Ta)\}$

Sampler Calibration Relationship

Slope(m): 54.238 Intercept(b): -22.798 Correlation Coefficient(r): 0.9936

Checked by: 
Magnum Fan

Date: 10/05/2024



Certificate of Calibration

Calibration Certification Information			
Cal. Date: December 15, 2023	Rootsmeter S/N: 438320	Ta: 295	°K
Operator: Jim Tisch		Pa: 748.5	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: 2454		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4250	3.2	2.00
2	3	4	1	1.0090	6.4	4.00
3	5	6	1	0.9040	7.9	5.00
4	7	8	1	0.8610	8.8	5.50
5	9	10	1	0.7110	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)
0.9907	0.6952	1.4106	0.9957	0.6988	0.8878
0.9864	0.9776	1.9949	0.9914	0.9826	1.2556
0.9844	1.0890	2.2304	0.9894	1.0945	1.4037
0.9832	1.1420	2.3393	0.9882	1.1478	1.4723
0.9779	1.3754	2.8213	0.9829	1.3824	1.7756
QSTD	m=	2.07544	QA	m=	1.29961
	b=	-0.03205		b=	-0.02017
	r=	0.99999		r=	0.99999

Calculations			
Vstd= $\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$	Va= $\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$		
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: 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



SUB-CONTRACTING REPORT

CONTACT	: MR MAGNUM FAN	WORK ORDER	: HK2404331
CLIENT	: ENVIROTECH SERVICES CO.		
ADDRESS	: RM 712, 7/F, MY LOFT 9 HOI WING ROAD, TUEN MUN, N.T. HK	SUB-BATCH	: 1
		DATE RECEIVED	: 19-JAN-2024
		DATE OF ISSUE	: 31-JAN-2024
PROJECT	: ---	NO. OF SAMPLES	: 1
		CLIENT ORDER	: ---

General Comments

- Sample information (Project name, Sample ID, Sampling date/time, etc.) is provided by client.
 - Result(s) of sample(s) is/are reported on as received basis, unless otherwise specified. The result(s) is/are related only to the item(s) tested.
 - Sample(s) was/ were submitted by client. Sample(s) arrived laboratory in ambient condition.
 - Calibration was subcontracted to Envirotech Services Company.
-

Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories

Position

Richard Fung

Managing Director

This report supersedes any previous report(s) with the same work order number.

All pages of this report have been checked and approved for release.

ALS Technichem (HK) Pty Ltd
Part of the **ALS Laboratory Group**

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Tel. +852 2610 1044 Fax +852 2610 2021 www.alsglobal.com

WORK ORDER : HK2404331
SUB-BATCH : 1
CLIENT : ENVIROTECH SERVICES CO
PROJECT : ----



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK2404331-001	Sibata LD-5R (831656)	Equipments	19-Jan-2024	S/N: 831656



Equipment Verification Report (TSP)

Equipment Calibrated:

Type: Laser Dust Monitor
Manufacturer: Sibata LD-5R
Serial No.: 831656
Equipment Ref.: N/A
ALS Job Order: HK2402531

Standard Equipment

Standard Equipment: High Volume Sampler (TSP)
Location: Envirotech Room (Calibration Room)
Equipment Ref.: HVS 8162
Last Calibration Date: 12-Jan-2024

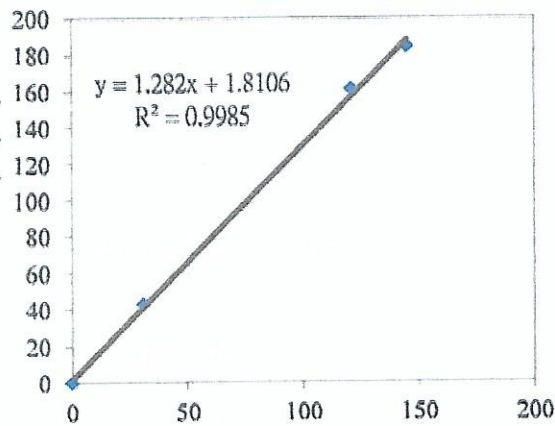
Equipment Verification Results:

Verification Date: 13-Jan-2024

Hour	Time	Mean Temp °C	Mean Pressure (hpa)	Concentration in µg/m³ (Standard Equipment) (Y-Axis)	Concentration in µg/m³ (Calibrated Equipment) (X-Axis)
1hr 00mins	0900-1000	19.5	1018	43	31
2hr 00mins	1005-1205	23.5	1022	161	121
3hr 00mins	1330-1630	24.0	1022	184	145

Linear Regression of Y or X

Slope (K-factor): 1.2820(µg/m³)/CPM
Correlation Coefficient (R): 0.9993
Date of Issue: 19-Jan-2024



Remarks:

- 1. Strong Correlation (>0.8)
- 2. Factor 1.2820 (µg/m³)/CPM should be applied for TSP monitoring

*If R<0.5, repair or verification is required for the equipment

Operator: P.F.Yeung Signature *Fai* Date: 19 January 2024

QC Reviewer: K.F.Ho Signature *fat* Date: 19 January 2024

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : Rm. 712, My Loft, Tuen Mun	Date of Calibration:	12-Jan-24
HVS ID: 8162	Next Calibration Date:	12-Mar-24
Name and Model : TISCH HVS Model TE-5170	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1018	Corrected Pressure (mm Hg)	763.7
Temperature (°C)	20.0	Temperature (K)	293

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	6.6	6.6	13.2	1.786	61	61.68	Slope= 34.506 Intercept= -0.179 Corr. Coeff.= 0.9986
13	5.3	5.3	10.6	1.602	54	54.61	
10	4.5	4.5	9.0	1.477	50	50.56	
7	2.7	2.7	5.4	1.148	40	40.45	
5	1.7	1.6	3.3	0.901	30	30.34	

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:

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

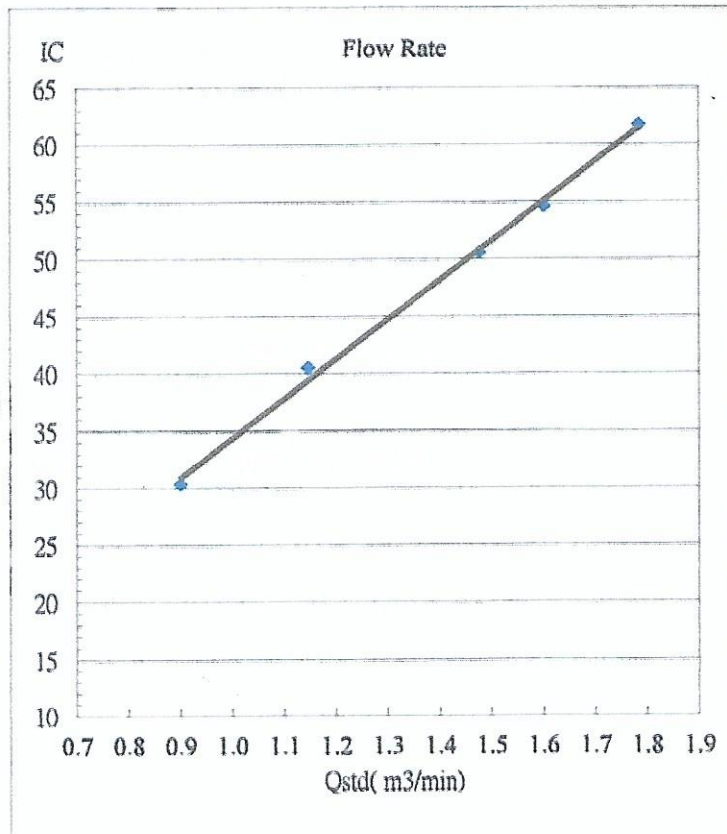
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



Certificate of Calibration

Calibration Certification Information			
Cal. Date: December 15, 2023	Rootsmeter S/N: 438320	Ta: 295	°K
Operator: Jim Tisch		Pa: 748.5	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: 2454		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4250	3.2	2.00
2	3	4	1	1.0090	6.4	4.00
3	5	6	1	0.9040	7.9	5.00
4	7	8	1	0.8610	8.8	5.50
5	9	10	1	0.7110	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)	$\sqrt{\Delta H \left(Ta/Pa \right)}$ (y-axis)
0.9907	0.6952	1.4106	0.9957	0.6988	0.8878
0.9864	0.9776	1.9949	0.9914	0.9826	1.2556
0.9844	1.0890	2.2304	0.9894	1.0945	1.4037
0.9832	1.1420	2.3393	0.9882	1.1478	1.4723
0.9779	1.3754	2.8213	0.9829	1.3824	1.7756
QSTD	m=	2.07544	QA	m=	1.29961
	b=	-0.03205		b=	-0.02017
	r=	0.99999		r=	0.99999

Calculations	
Vstd= $\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$	Va= $\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$
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



SUB-CONTRACTING REPORT

CONTACT	: MR MAGNUM FAN	WORK ORDER	: HK2321489
CLIENT	: ENVIROTECH SERVICES CO.		
ADDRESS	: RM 712, 7/F, MY LOFT 9 HOI WING ROAD, TUEN MUN, N.T., HK	SUB-BATCH	: 1
		DATE RECEIVED	: 2-JUN-2023
		DATE OF ISSUE	: 8-JUN-2023
PROJECT	: —	NO. OF SAMPLES	: 1
		CLIENT ORDER	: —

General Comments

- No sample is received in this Work Order. The report presents non-laboratory testing data only.
 - Sample information (Project name, Sample ID, Sampling date/time, etc.) is provided by client.
 - Result(s) of sample(s) is/are reported on as received basis, unless otherwise specified. The result(s) is/are related only to the item(s) tested.
 - Calibration was subcontracted to Envirotech Services Company.
-

Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories

Position

Richard Fung

Managing Director

This report supersedes any previous report(s) with the same work order number.

All pages of this report have been checked and approved for release.

ALS Technichem (HK) Pty Ltd
Part of the **ALS Laboratory Group**

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WORK ORDER : HK2321489
SUB-BATCH : 1
CLIENT : ENVIROTECH SERVICES CO.
PROJECT : ---



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK2321489-001	SIBATA (456668)	Equipments	25-May-2023	S/N: 456668



Equipment Verification Report (TSP)

Equipment Calibrated:

Type: Laser Dust Monitor
Manufacturer: Sibata LD-3B
Serial No.: 456668
Equipment Ref.: N/A
ALS Job Order: HK2320686

Standard Equipment

Standard Equipment: High Volume Sampler (TSP)
Location & Location ID: Envirotech Room (Calibration Room)
Equipment Ref.: HVS 8162
Last Calibration Date: 26-Apr-2023

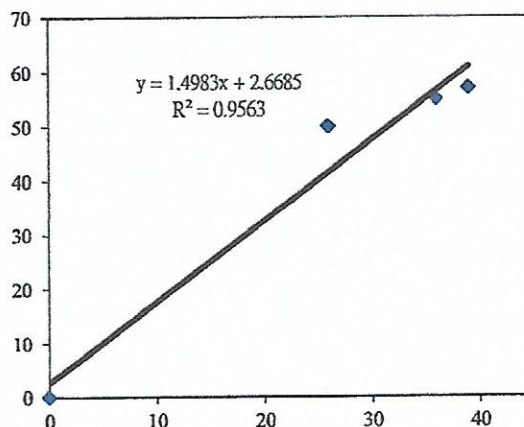
Equipment Verification Results:

Verification Date: 25, 26 & 27 May 2023

Hour	Time	Mean Temp °C	Mean Pressure (hpa)	Concentration in µg/m³ (Standard Equipment)	Total Count (Calibrated Equipment)	Count /Minute (Total Count/min)
1hr 00mins	1620-1720	27.5	1011.2	57	2334	39
1hr 00mins	1030-1130	28.5	1013.6	55	2165	36
1hr 00mins	0915-1015	28.8	1011.1	50	1537	26

Linear Regression of Y or X

Slope (K-factor): 1.4983(µg/m³)/CPM
Correlation Coefficient (R): 0.9779
Date of Issue: 1-Jun-2023



Remarks:

- 1. Strong Correlation (>0.8)
- 2. Factor 1.4983 (µg/m³)/CPM should be applied for TSP monitoring

*If R<0.5, repair or verification is required for the equipment

Operator: P.F.Yeung Signature Fai Date: 01 June 2023

QC Reviewer: K.F.Ho Signature Fat Date: 01 June 2023

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : Rm. 712, My Loft, Tuen Mun	Date of Calibration:	23-Apr-23
HVS ID: 8162	Next Calibration Date:	23-Jun-23
Name and Model : TISCH HVS Model TE-5170	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1016	Corrected Pressure (mm Hg)	762.1
Temperature (°C)	20.0	Temperature (K)	293

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.06918
Model:	TE-5025A	Qstd Intercept	-0.04220
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	13.0	1.781	62	62.63	Slope= 33.351 Intercept= 5.042 Corr. Coeff.= 0.9932
13	4.9	4.9	9.8	1.549	58	58.59	
10	3.7	3.7	7.4	1.348	50	50.51	
7	2.2	2.2	4.4	1.044	40	40.40	
5	1.5	1.4	2.9	0.852	32	32.32	

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:

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

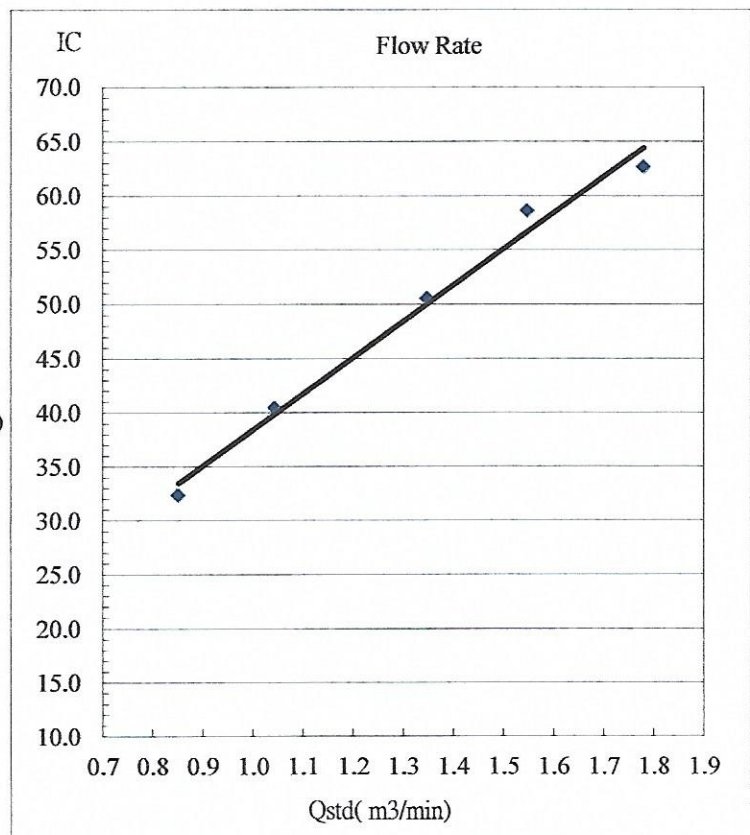
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



Certificate of Calibration

Calibration Certification Information			
Cal. Date: December 15, 2022	Rootsometer S/N: 438320	Ta: 295	°K
Operator: Jim Tisch		Pa: 748.0	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: 4064		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4430	3.2	2.00
2	3	4	1	1.0210	6.4	4.00
3	5	6	1	0.9170	7.9	5.00
4	7	8	1	0.8730	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)
0.9900	0.6861	1.4101	0.9957	0.6900	0.8881
0.9858	0.9655	1.9943	0.9914	0.9711	1.2560
0.9838	1.0728	2.2296	0.9894	1.0790	1.4042
0.9826	1.1255	2.3385	0.9882	1.1320	1.4728
0.9772	1.3554	2.8203	0.9829	1.3632	1.7762
QSTD	m=	2.10977	QA	m=	1.32110
	b=	-0.03782		b=	-0.02382
	r=	0.99998		r=	0.99998

Calculations			
Vstd=	$\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$	Va=	$\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$
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=	$1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	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



SUB-CONTRACTING REPORT

CONTACT	: MR MAGNUM FAN	WORK ORDER	: HK2351432
CLIENT	: ENVIROTECH SERVICES CO.		
ADDRESS	: RM 712, 7/F, MY LOFT 9 HOI WING ROAD, TUEN MUN, N.T. HK	SUB-BATCH	: 1
		DATE RECEIVED	: 18-DEC-2023
		DATE OF ISSUE	: 27-DEC-2023
PROJECT	: ----	NO. OF SAMPLES	: 1
		CLIENT ORDER	: ----

General Comments

- Sample information (Project name, Sample ID, Sampling date/time, etc.) is provided by client.
- Result(s) of sample(s) is/are reported on as received basis, unless otherwise specified. The result(s) is/are related only to the item(s) tested.
- Calibration was subcontracted to Envirotech Services Company.
- Sample(s) was/ were submitted by client. Sample(s) arrived laboratory in ambient condition.

Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories

Position

Richard Fung

Managing Director

This report supersedes any previous report(s) with the same work order number.

All pages of this report have been checked and approved for release.

ALS Technichem (HK) Pty Ltd
Part of the **ALS Laboratory Group**

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WORK ORDER : HK2351432
SUB-BATCH : 1
CLIENT : ENVIROTECH SERVICES CO.
PROJECT : ----



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK2351432-001	Sibata LD-3B (235780)	Equipments	09-Dec-2023	S/N: 235780



Equipment Verification Report (TSP)

Equipment Calibrated:

Type: Laser Dust Monitor
Manufacturer: Sibata LD-3B
Serial No.: 235780
Equipment Ref.: N/A
ALS Job Order: HK2349963

Standard Equipment

Standard Equipment: High Volume Sampler (TSP)
Location: Envirotech Room (Calibration Room)
Equipment Ref.: HVS 8162
Last Calibration Date: 13-Oct-2023

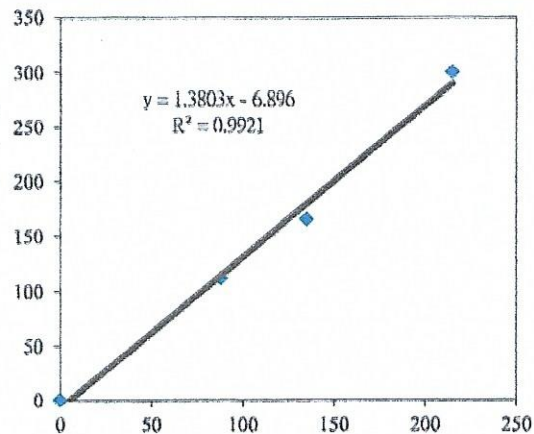
Equipment Verification Results:

Verification Date: 9-Dec-2023

Hour	Time	Mean Temp °C	Mean Pressure (hpa)	Concentration in µg/m³ (Standard Equipment) Y(axis)	Concentration in µg/m³ (Calibrated Equipment) x(axis)
1hr 00mins	1010-1110	26.5	1016.0	112	88
2hr 00mins	1300-1500	26.2	1015.5	165	135
3hr 00mins	1505-1805	26.2	1015.5	300	215

Linear Regression of Y or X

Slope (K-factor): 1.3803(µg/m³)/CPM
Correlation Coefficient (R): 0.9960
Date of Issue: 15-Dec-2023



Remarks:

- 1. Strong Correlation (>0.8)
- 2. Factor 1.3803 (µg/m³)/CPM should be applied for TSP monitoring

*If R<0.5, repair or verification is required for the equipment

Operator: P.F.Yeung Signature *PfY* Date: 15 December 2023

QC Reviewer: K.F.Ho Signature *KfH* Date: 15 December 2023

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : Rm. 712, My Loft, Tuen Mun	Date of Calibration:	13-Oct-23
HVS ID: 8162	Next Calibration Date:	12-Dec-23
Name and Model : TISCH HVS Model TE-5170	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1015	Corrected Pressure (mm Hg)	762.1
Temperature (°C)	28.9	Temperature (K)	293

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.06918
Model:	TE-5025A	Qstd Intercept	-0.04220
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	13.0	1.806	62	63.54	Slope= 32.843 Intercept= 5.518 Corr. Coeff.= 0.9939
13	4.7	4.7	9.4	1.539	56	57.39	
10	3.4	3.4	6.8	1.312	49	50.22	
7	2.3	2.2	4.5	1.071	40	40.99	
5	1.6	1.5	3.1	0.892	33	33.82	

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:

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

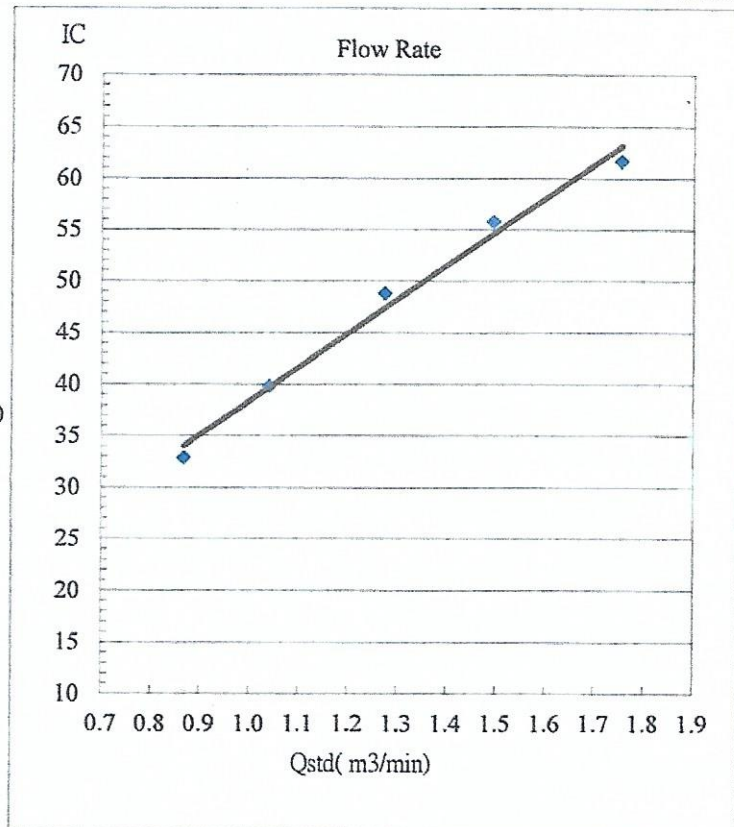
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



Certificate of Calibration

Calibration Certification Information			
Cal. Date: December 15, 2022	Rootsometer S/N: 438320	Ta: 295	°K
Operator: Jim Tisch		Pa: 748.0	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: 4064		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4430	3.2	2.00
2	3	4	1	1.0210	6.4	4.00
3	5	6	1	0.9170	7.9	5.00
4	7	8	1	0.8730	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)	$\sqrt{\Delta H \left(Ta/Pa \right)}$ (y-axis)
0.9900	0.6861	1.4101	0.9957	0.6900	0.8881
0.9858	0.9655	1.9943	0.9914	0.9711	1.2560
0.9838	1.0728	2.2296	0.9894	1.0790	1.4042
0.9826	1.1255	2.3385	0.9882	1.1320	1.4728
0.9772	1.3554	2.8203	0.9829	1.3632	1.7762
QSTD	m=	2.10977	QA	m=	1.32110
	b=	-0.03782		b=	-0.02382
	r=	0.99998		r=	0.99998

Calculations			
Vstd=	$\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$	Va=	$\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$
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



Certificate of Calibration

for

Description: *Sound Level Meter*
Manufacturer: *RION*
Type No.: *NL-52 (Serial No.: 00131627)*
Microphone: *UC-59 (Serial No.: 04870)*
Preamplifier: *NH-25 (Serial No.: 10403)*

Submitted by:

Customer: *Envirotech Services Co.*
Address: *Rm.113, 1/F., My Loft, 9 Hoi Wing Road,
Tuen Mun, Hong Kong*

Upon receipt for calibration, the instrument was found to be:

- Within (31.5Hz – 8kHz)**
- Outside**

the allowable tolerance.

The test equipment used for calibration are traceable to National Standards via:

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory

Date of receipt: 07 June 2023

Date of calibration: 08 June 2023

Date of NEXT calibration: 07 June 2024

Calibrated by: _____
Calibration Technician

Certified by: _____
*Mr. Ng Yan Wa
Laboratory Manager*

Date of issue: 08 June 2023

Certificate No.: APJ23-029-CC001



1. Calibration Precaution:

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 24 hours, and switched on to warm up for over 10 minutes before the commencement of the test.
- The results presented are the mean of 3 measurements at each calibration point.

2. Calibration Conditions:

Air Temperature: 22.5 °C
 Air Pressure: 1006 hPa
 Relative Humidity: 64.5 %

3. Calibration Equipment:

	Type	Serial No.	Calibration Report Number	Traceable to
Multifunction Calibrator	B&K 4226	2288467	AV220061	HOKLAS

4. Calibration Results

Sound Pressure Level

Reference Sound Pressure Level

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz		
30-130	dBA SPL	Fast	94	1000	94.0	±0.4

Linearity

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz		
30-130	dBA SPL	Fast	94	1000	94.0	Ref
			104		104.0	±0.3
			114		114.0	±0.3

Time Weighting

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz		
30-130	dBA SPL	Fast	94	1000	94.0	Ref
		Slow			94.0	±0.3

Certificate No.: APJ23-029-CC001



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Frequency Response

Linear Response

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB	
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz			
30-130	dB	SPL	Fast	94	31.5	93.9	±2.0
					63	93.9	±1.5
					125	94.0	±1.5
					250	94.0	±1.4
					500	94.0	±1.4
					1000	94.0	Ref.
					2000	93.9	±1.6
					4000	94.0	±1.6
					8000	92.2	+2.1; -3.1

A-weighting

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB	
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz			
30-130	dBA	SPL	Fast	94	31.5	54.4	-39.4±2.0
					63	67.7	-26.2±1.5
					125	77.9	-16.1±1.5
					250	85.3	-8.6±1.4
					500	90.7	-3.2±1.4
					1000	94.0	Ref
					2000	95.1	+1.2±1.6
					4000	95.0	+1.0±1.6
					8000	91.2	-1.1+2.1; -3.1

C-weighting

Setting of Unit-under-test (UUT)			Applied value		UUT Reading, dB	IEC 61672 Class 1 Specification, dB	
Range, dB	Freq. Weighting	Time Weighting	Level, dB	Frequency, Hz			
30-130	dBC	SPL	Fast	94	31.5	90.8	-3.0±2.0
					63	93.1	-0.8±1.5
					125	93.8	-0.2±1.5
					250	93.9	-0.0±1.4
					500	94.0	-0.0±1.4
					1000	94.0	Ref
					2000	93.7	-0.2±1.6
					4000	93.2	-0.8±1.6
					8000	89.3	-3.0+2.1; -3.1

Certificate No.: APJ23-029-CC001



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5. Calibration Results Applied

The results apply to the particular unit-under-test only. All calibration points are within manufacture's specification as IEC 61672 Class 1.

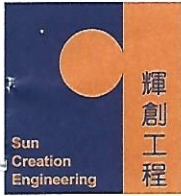
Uncertainties of Applied Value:

94 dB	31.5 Hz	± 0.05
	63 Hz	± 0.05
	125 Hz	± 0.05
	250 Hz	± 0.05
	500 Hz	± 0.05
	1000 Hz	± 0.05
	2000 Hz	± 0.05
	4000 Hz	± 0.05
	8000 Hz	± 0.10
104 dB	1000 Hz	± 0.05
114 dB	1000 Hz	± 0.05

The uncertainties are evaluated for a 95% confidence level.

Note:

The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allow for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. (A+A)*L shall not be liable for any loss or damage resulting from the use of the equipment.



Certificate of Calibration 校正證書

Certificate No. : C234377
證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC23-1403)

Date of Receipt / 收件日期 : 11 July 2023

Description / 儀器名稱 : Precision Acoustic Calibrator
Manufacturer / 製造商 : LARSON DAVIS
Model No. / 型號 : CAL200
Serial No. / 編號 : 11333
Supplied By / 委託者 : Envirotech Services Co.
Room 712, 7/F, My Loft, 9 Hoi Wing Road, Tuen Mun,
New Territories, Hong Kong

TEST CONDITIONS / 測試條件

Temperature / 溫度 : $(23 \pm 2)^{\circ}\text{C}$
Line Voltage / 電壓 : ---

Relative Humidity / 相對濕度 : $(50 \pm 25)\%$

TEST SPECIFICATIONS / 測試規範

Calibration check

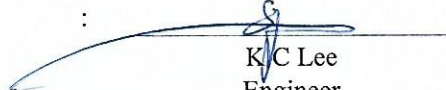
DATE OF TEST / 測試日期 : 30 July 2023

TEST RESULTS / 測試結果

The results apply to the particular unit-under-test only.
The results do not exceed specified limits.
These limits refer to manufacturer's published tolerances as requested by the customer.
The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :
- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- Hottinger Brüel & Kjær Calibration Laboratory, Denmark
- Agilent Technologies / Keysight Technologies
- Fluke Everett Service Center, USA

Tested By : 
測試 : H T Wong
Assistant Engineer

Certified By : 
核證 : K/C Lee
Engineer

Date of Issue : 31 July 2023
簽發日期

The test equipment used for calibration is traceable to the National Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

本證書所載校正用之測試器材均可溯源至國際標準。局部複印本證書需先獲本實驗所書面批准。

Certificate of Calibration

校正證書

Certificate No. : C234377
證書編號

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours before the commencement of the test.
- The results presented are the mean of 3 measurements at each calibration point.
- Test equipment :

<u>Equipment ID</u>	<u>Description</u>	<u>Certificate No.</u>
CL130	Universal Counter	C233799
CL281	Multifunction Acoustic Calibrator	CDK2302738
TST150A	Measuring Amplifier	C221750

- Test procedure : MA100N.

- Results :

5.1 Sound Level Accuracy

UUT Nominal Value	Measured Value (dB)	Mfr's Limit (dB)	Uncertainty of Measured Value (dB)
94 dB, 1 kHz	93.80	± 0.2	± 0.20
114 dB, 1 kHz	113.80		

5.2 Frequency Accuracy

UUT Nominal Value (kHz)	Measured Value (kHz)	Mfr's Limit	Uncertainty of Measured Value (Hz)
1	1.000	1 kHz ± 1 %	± 1

Remark : The uncertainties are for a confidence probability of not less than 95 %.

Note :

Only the original copy or the laboratory's certified true copy is valid.

The values given in this Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

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