

High-Volume TSP Sampler
5-Point Calibration Record

Location : AM1(ICC)
Calibrated by : K.T.Ho
Date : 16/11/2021

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 28 Jan 2021
Slope (m) : 2.06072
Intercept (b) : -0.01465
Correlation Coefficient(r) : 0.99993

Standard Condition

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

Calibration Condition

Pa (hpa) : 1017
Ta(K) : 297

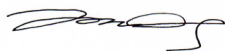
Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.6	3.418	1.666	62	62.23
2	13 holes	9.0	3.011	1.468	52	52.19
3	10 holes	6.8	2.617	1.277	44	44.16
4	7 holes	4.8	2.199	1.074	32	32.12
5	5 holes	3.0	1.738	0.851	20	20.07

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

Sampler Calibration Relationship

Slope(m): 51.618 Intercept(b): -23.258 Correlation Coefficient(r): 0.9987

Checked by: _____



Magnum Fan

Date: 20/11/2021



Certificate of Calibration

Calibration Certification Information

Cal. Date: January 28, 2021	Rootsmeter S/N: 438320	Ta: 294 °K
Operator: Jim Tisch		Pa: 763.5 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	1.4540	3.2	2.00
2	3	4	1	1.0210	6.4	4.00
3	5	6	1	0.9110	8.0	5.00
4	7	8	1	0.8730	8.8	5.50
5	9	10	1	0.7200	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)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
1.0140	0.6974	1.4271	0.9958	0.6849	0.8776
1.0098	0.9890	2.0182	0.9916	0.9712	1.2411
1.0076	1.1061	2.2564	0.9895	1.0862	1.3875
1.0066	1.1530	2.3666	0.9885	1.1323	1.4553
1.0011	1.3904	2.8542	0.9831	1.3654	1.7551
QSTD	m=	2.06072	QA	m=	1.29039
	b=	-0.01465		b=	-0.00901
	r=	0.99993		r=	0.99993

Calculations

Vstd= $\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$	Va= $\Delta Vol((Pa-\Delta P)/Pa)$
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

High-Volume TSP Sampler
5-Point Calibration Record

Location : AM1(ICC)
Calibrated by : K.T.Ho
Date : 14/01/2022

Sampler

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

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 27 December 2021
Slope (m) : 2.07035
Intercept (b) : -0.03737
Correlation Coefficient(r) : 0.99990

Standard Condition

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

Calibration Condition

Pa (hpa) : 1021
Ta(K) : 291

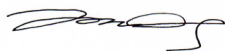
Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.4	3.430	1.675	60	60.96
2	13 holes	8.4	2.944	1.440	50	50.80
3	10 holes	6.2	2.530	1.240	40	40.64
4	7 holes	4.4	2.131	1.047	34	34.54
5	5 holes	2.6	1.638	0.809	20	20.32

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): 46.008 Intercept(b): -15.708 Correlation Coefficient(r): 0.9966

Checked by: _____



Magnum Fan

Date: 18/01/2022



RECALIBRATION

DUE DATE:

December 27, 2022

Certificate of Calibration

Calibration Certification Information

Cal. Date: December 27, 2021

Rootsmeter S/N: 438320

Ta: 295 °K

Operator: Jim Tisch

Pa: 740.4 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	1.4130	3.2	2.00
2	3	4	1	0.9970	6.4	4.00
3	5	6	1	0.8950	7.9	5.00
4	7	8	1	0.8480	8.8	5.50
5	9	10	1	0.7060	12.7	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)
0.9799	0.6935	1.4029	0.9957	0.7047	0.8927
0.9756	0.9786	1.9841	0.9914	0.9943	1.2624
0.9736	1.0879	2.2183	0.9893	1.1054	1.4114
0.9724	1.1467	2.3265	0.9881	1.1652	1.4803
0.9673	1.3700	2.8059	0.9828	1.3921	1.7853
QSTD	m=	2.07035	QA	m=	1.29642
	b=	-0.03737		b=	-0.02378
	r=	0.99990		r=	0.99990

Calculations

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

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 K.W. FAN
CLIENT : ENVIROTECH SERVICES CO.
ADDRESS : RM113, 1/F, MY LOFT, 9 HOI WING ROAD,
TUEN MUN, N.T. HONG KONG
PROJECT : ----

WORK ORDER : **HK2108193**
SUB-BATCH : 1
DATE RECEIVED : 2-MAR-2021
DATE OF ISSUE : 15-MAR-2021
NO. OF SAMPLES : 1
CLIENT ORDER : ----

General Comments

- Sample(s) was/ were submitted by client. Sample(s) arrived laboratory in ambient condition. The result(s) related only to the item(s) tested.
- Sample information (Project name, Sample ID, Sampling date/time, etc.) is provided by client.
- Calibration was subcontracted to and analysed by Action United Enviro Services.

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 is the Final Report and supersedes any preliminary report with this batch number.

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

ALS Technichem (HK) Pty Ltd
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Tel. +852 2610 1044 Fax. +852 2610 2021 www.alsglobal.com

WORK ORDER : HK2108193
SUB-BATCH : 1
CLIENT : ENVIROTECH SERVICES CO.
PROJECT : ----



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK2108193-001	S/N: 781281	Equipments	01-Mar-2021	S/N: 781281

Equipment Verification Report (TSP)

Equipment Calibrated:

Type: Laser Dust monitor
Manufacturer: Sibata LD-5R
Serial No. 781281
Equipment Ref: Nil
Job Order HK2108193

Standard Equipment:

Standard Equipment: Higher Volume Sampler (TSP)
Location & Location ID: AUES office (calibration room)
Equipment Ref: HVS 018
Last Calibration Date: 13 January 2021

Equipment Verification Results:

Verification Date: 12 March 2021

Hour	Time	Mean Temp °C	Mean Pressure (hPa)	Concentration in mg/m ³ (Standard Equipment)	Total Count (Calibrated Equipment)	Count/Minute (Total Count/min)
2hr01min	09:30 ~ 11:31	22.0	1018.6	0.023	3201	26.4
2hr01min	11:35 ~ 11:36	22.0	1018.6	0.044	4833	39.9
2hr	11:40 ~ 13:40	22.0	1018.6	0.039	4046	33.7

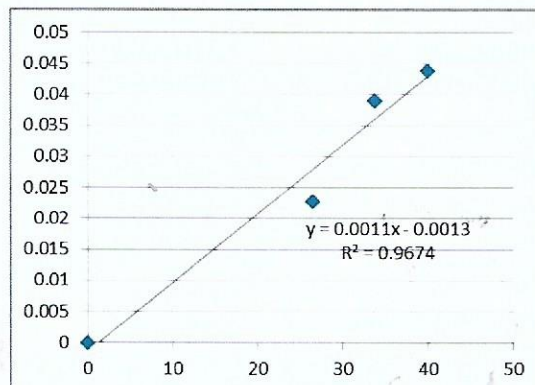
Linear Regression of Y or X

Slope (K-factor): 0.0011
Correlation Coefficient 0.9836
Date of Issue 15 March 2021

Remarks:

1. Strong Correlation ($R > 0.8$)
2. Factor 0.0011 should be applied for TSP monitoring

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



Operator: Fai So Signature:  Date: 15 March 2021

QC Reviewer: Ben Tam Signature:  Date: 15 March 2021

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : Gold King Industrial Building, Kwai Chung
 Location ID : Calibration Room

Date of Calibration: 13-Jan-21
 Next Calibration Date: 13-Apr-21

CONDITIONS

Sea Level Pressure (hPa)	1019.8	Corrected Pressure (mm Hg)	764.85
Temperature (°C)	13.4	Temperature (K)	286

CALIBRATION ORIFICE

Make->	TISCH	Qstd Slope ->	2.03014
Model->	5025A	Qstd Intercept ->	-0.04616
Calibration Date->	7-Feb-20	Expiry Date->	7-Feb-21

CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION
18	6.3	6.3	12.6	1.812	55	56.28	Slope = 39.9777 Intercept = -15.3902 Corr. coeff. = 0.9972
13	5.1	5.1	10.2	1.633	49	50.14	
10	4	4	8.0	1.448	42	42.98	
8	2.6	2.6	5.2	1.172	32	32.75	
5	1.8	1.8	3.6	0.979	22	22.51	

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:

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

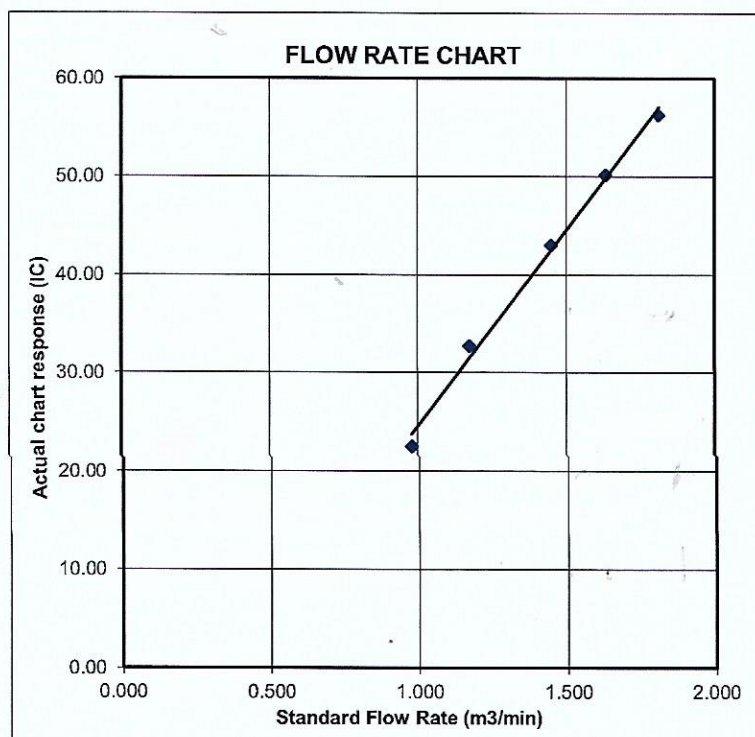
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



Certificate of Calibration

Calibration Certification Information			
Cal. Date: February 7, 2020	Rootsmeter S/N: 438320	Ta: 295 °K	
Operator: Jim Tisch		Pa: 745.5 mm Hg	
Calibration Model #: TE-5025A	Calibrator S/N: 1612		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3730	3.2	2.00
2	3	4	1	0.9820	6.4	4.00
3	5	6	1	0.8780	8.0	5.00
4	7	8	1	0.8340	8.8	5.50
5	9	10	1	0.6900	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)
0.9866	0.7186	1.4078	0.9957	0.7252	0.8896
0.9824	1.0004	1.9909	0.9914	1.0096	1.2581
0.9802	1.1165	2.2259	0.9893	1.1267	1.4066
0.9792	1.1741	2.3345	0.9882	1.1849	1.4753
0.9739	1.4114	2.8155	0.9828	1.4244	1.7792
QSTD	m=	2.03014	QA	m=	1.27124
	b=	-0.04616		b=	-0.02917
	r=	0.99995		r=	0.99995

Calculations			
Vstd=	$\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$	Va=	$\Delta Vol((Pa-\Delta P)/Pa)$
Qstd=	Vstd/ΔTime	Qa=	Va/ΔTime
For subsequent flow rate calculations:			
$Qstd = 1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$		$Qa = 1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$	

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 K.W. FAN	WORK ORDER	: HK2117310
CLIENT	: ENVIROTECH SERVICES CO.		
ADDRESS	: RM113, 1/F, MY LOFT, 9 HOI WING ROAD, TUEN MUN, N.T. HONG KONG	SUB-BATCH	: 1
		DATE RECEIVED	: 29-APR-2021
		DATE OF ISSUE	: 11-MAY-2021
PROJECT	: ----	NO. OF SAMPLES	: 1
		CLIENT ORDER	: ----

General Comments

- Sample(s) was/ were submitted by client. Sample(s) arrived laboratory in ambient condition. The result(s) related only to the item(s) tested.
- Sample information (Project name, Sample ID, Sampling date/time, etc.) is provided by client.
- Calibration was subcontracted to and analysed by Action United Enviro Services.

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 is the Final Report and supersedes any preliminary report with this batch 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 : HK2117310
SUB-BATCH : 1
CLIENT : ENVIROTECH SERVICES CO.
PROJECT : ----



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK2117310-001	S/N: 276017	Equipments	29-Apr-2021	S/N: 276017

Equipment Verification Report (TSP)

Equipment Calibrated:

Type: Laser Dust monitor
Manufacturer: Sibata LD-3B
Serial No. 276017
Equipment Ref: Nil
Job Order HK2117310

Standard Equipment:

Standard Equipment: Higher Volume Sampler (TSP)
Location & Location ID: AUES office (calibration room)
Equipment Ref: HVS 018
Last Calibration Date: 26 April 2021

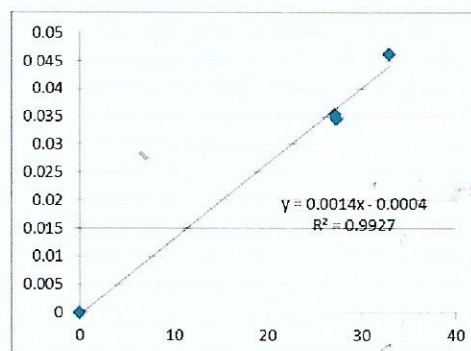
Equipment Verification Results:

Verification Date: 7 May 2021

Hour	Time	Mean Temp °C	Mean Pressure (hPa)	Concentration in mg/m ³ (Standard Equipment)	Total Count (Calibrated Equipment)	Count/Minute (Total Count/min)
2hr	09:30 ~ 11:30	26.6	1013.2	0.046	3951	32.9
2hr01min	11:32 ~ 13:33	26.6	1013.2	0.035	3293	27.3
2hr10min	13:35 ~ 15:45	26.6	1013.2	0.036	3519	27.2

Linear Regression of Y or X

Slope (K-factor): 0.0014
Correlation Coefficient 0.9963
Date of Issue 10 May 2021



Remarks:

- Strong Correlation ($R > 0.8$)
- Factor 0.0014 should be applied for TSP monitoring

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

Operator: Fai So Signature:  Date: 10 May 2021

QC Reviewer: Ben Tam Signature:  Date: 10 May 2021



SUB-CONTRACTING REPORT

CONTACT	: MR K.W. FAN	WORK ORDER	: HK2117311
CLIENT	: ENVIROTECH SERVICES CO.		
ADDRESS	: RM113, 1/F, MY LOFT, 9 HOI WING ROAD, TUEN MUN, N.T. HONG KONG	SUB-BATCH	: 1
		DATE RECEIVED	: 29-APR-2021
		DATE OF ISSUE	: 11-MAY-2021
PROJECT	: ----	NO. OF SAMPLES	: 1
		CLIENT ORDER	: ----

General Comments

- Sample(s) was/ were submitted by client. Sample(s) arrived laboratory in ambient condition. The result(s) related only to the item(s) tested.
- Sample information (Project name, Sample ID, Sampling date/time, etc.) is provided by client.
- Calibration was subcontracted to and analysed by Action United Enviro Services.

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Position

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Managing Director

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WORK ORDER : HK2117311
SUB-BATCH : 1
CLIENT : ENVIROTECH SERVICES CO.
PROJECT : ----



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK2117311-001	S/N: 2Z6239	Equipments	29-Apr-2021	S/N: 2Z6239

Equipment Verification Report (TSP)

Equipment Calibrated:

Type: Laser Dust monitor
Manufacturer: Sibata LD-3B
Serial No. 2Z6239
Equipment Ref: Nil
Job Order HK2117311

Standard Equipment:

Standard Equipment: Higher Volume Sampler (TSP)
Location & Location ID: AUES office (calibration room)
Equipment Ref: HVS 018
Last Calibration Date: 26 April 2021

Equipment Verification Results:

Verification Date: 7 May 2021

Hour	Time	Mean Temp °C	Mean Pressure (hPa)	Concentration in mg/m ³ (Standard Equipment)	Total Count (Calibrated Equipment)	Count/Minute (Total Count/min)
2hr	09:30 ~ 11:30	26.6	1013.2	0.046	3830	31.9
2hr01min	11:32 ~ 13:33	26.6	1013.2	0.035	3245	26.9
2hr10min	13:35 ~ 15:45	26.6	1013.2	0.036	3369	26.0

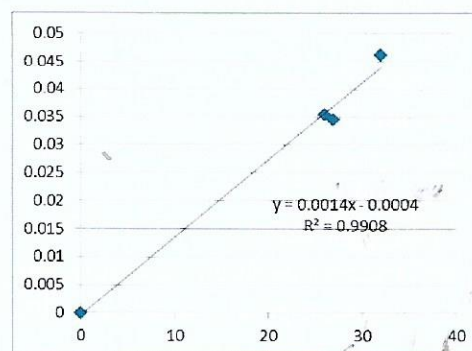
Linear Regression of Y or X


Slope (K-factor): 0.0014
Correlation Coefficient 0.9954
Date of Issue 10 May 2021


Remarks:

1. Strong Correlation ($R > 0.8$)
2. Factor 0.0014 should be applied for TSP monitoring

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



Operator: Fai So Signature:  Date: 10 May 2021

QC Reviewer: Ben Tam Signature:  Date: 10 May 2021

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : Gold King Industrial Building, Kwai Chung
 Location ID : Calibration Room

Date of Calibration: 26-Apr-21
 Next Calibration Date: 26-Jul-21

CONDITIONS

Sea Level Pressure (hPa) 1013.7
 Temperature (°C) 23.4

Corrected Pressure (mm Hg) 760.275
 Temperature (K) 296

CALIBRATION ORIFICE

Make-> TISCH
 Model-> 5025A
 Calibration Date-> 19-Jan-21

Qstd Slope -> 2.10574
 Qstd Intercept -> -0.00985
 Expiry Date-> 18-Jan-22

CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION
18	6.9	6.9	13.8	1.774	56	56.16	Slope = 39.9922
13	5.5	5.5	11.0	1.584	50	50.14	Intercept = -13.7742
10	4.2	4.2	8.4	1.385	42	42.12	Corr. coeff. = 0.9961
8	2.7	2.7	5.4	1.111	32	32.09	
5	1.9	1.9	3.8	0.933	22	22.06	

Calculations :

$$Q_{std} = 1/m[\sqrt{H_{2O}(P_a/P_{std})(T_{std}/T_a)} - b]$$

$$IC = I[\sqrt{P_a/P_{std}}(T_{std}/T_a)]$$

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:

$$1/m((I) [\sqrt{298/T_{av}}(P_{av}/760)] - b)$$

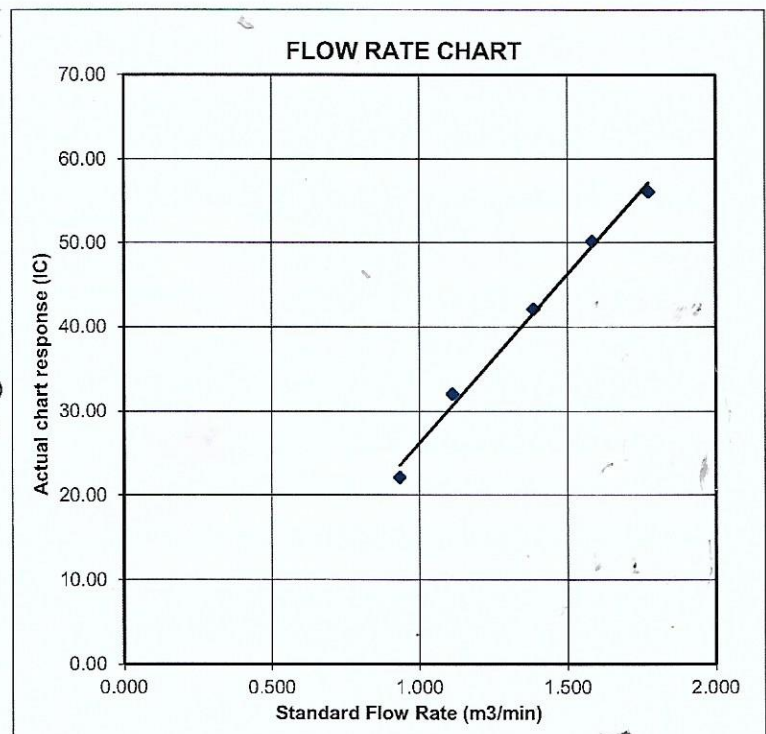
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



Certificate of Calibration

Calibration Certification Information

Cal. Date: January 19, 2021	Rootsmer S/N: 438320	Ta: 294 °K
Operator: Jim Tisch		Pa: 755.1 mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: 1941	

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4830	3.2	2.00
2	3	4	1	1.0420	6.4	4.00
3	5	6	1	0.9290	8.0	5.00
4	7	8	1	0.8840	8.8	5.50
5	9	10	1	0.7340	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)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
1.0029	0.6762	1.4192	0.9958	0.6715	0.8824
0.9986	0.9583	2.0071	0.9915	0.9516	1.2479
0.9965	1.0726	2.2440	0.9894	1.0650	1.3952
0.9954	1.1260	2.3535	0.9883	1.1180	1.4633
0.9899	1.3487	2.8385	0.9829	1.3391	1.7648
QSTD	m=	2.10574	QA	m=	1.31858
	b=	-0.00985		b=	-0.00612
	r=	0.99992		r=	0.99992

Calculations

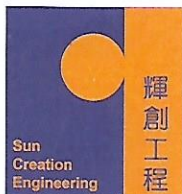
Vstd= $\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$	Va= $\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$
Qstd= Vstd/ΔTime	Qa= Va/ΔTime
For subsequent flow rate calculations:	
Qstd= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$	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:	rootsmer 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



輝創工程有限公司

Sun Creation Engineering Limited

Calibration & Testing Laboratory

Certificate of Calibration

校正證書

Certificate No. : C213255
證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC21-1016)

Date of Receipt / 收件日期 : 24 May 2021

Description / 儀器名稱 : Sound Level Meter
Manufacturer / 製造商 : Rion
Model No. / 型號 : NL-52
Serial No. / 編號 : 00131627
Supplied By / 委託者 : Envirotech Services Co.
Room 113, 1/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

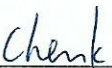
DATE OF TEST / 測試日期 : 4 June 2021

TEST RESULTS / 測試結果

The results apply to the particular unit-under-test only.
The results do not exceed manufacturer's specification.
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
- Agilent Technologies / Keysight Technologies
- Fluke Everett Service Center, USA

Tested By : 
測試 : K P Cheuk
Project Engineer

Certified By : 
核證 : K C Lee
Engineer

Date of Issue : 9 June 2021
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室書面批准。

Sun Creation Engineering Limited - Calibration & Testing Laboratory

c/o 4/F, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong

輝創工程有限公司 - 校正及檢測實驗室

c/o 香港新界屯門興安里一號四樓

Tel/電話: (852) 2927 2606

Fax/傳真: (852) 2744 8986

E-mail/電郵: callab@suncreation.com

Website/網址: www.suncreation.com

Certificate of Calibration

校正證書

Certificate No. : C213255

證書編號

1. The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours, and switched on to warm up for over 10 minutes before the commencement of the test.
2. Self-calibration was performed before the test.
3. The results presented are the mean of 3 measurements at each calibration point.
4. Test equipment :

Equipment ID	Description	Certificate No.
CL280	40 MHz Arbitrary Waveform Generator	C210084
CL281	Multifunction Acoustic Calibrator	AV210017

5. Test procedure : MA101N.

6. Results :

- 6.1 Sound Pressure Level

- 6.1.1 Reference Sound Pressure Level

UUT Setting				Applied Value		UUT	IEC 61672
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	Reading (dB)	Class 1 Spec. (dB)
30 - 130	L _A	A	Fast	94.00	1	94.2	± 1.1

- 6.1.2 Linearity

UUT Setting				Applied Value		UUT
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	Reading (dB)
30 - 130	L _A	A	Fast	94.00	1	94.2 (Ref.)
				104.00		104.2
				114.00		114.2

IEC 61672 Class 1 Spec. : ± 0.6 dB per 10 dB step and ± 1.1 dB for overall different.

- 6.2 Time Weighting

UUT Setting				Applied Value		UUT	IEC 61672
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	Reading (dB)	Class 1 Spec. (dB)
30 - 130	L _A	A	Fast	94.00	1	94.2	Ref.
			Slow			94.2	± 0.3

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Certificate of Calibration

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Certificate No. : C213255

證書編號

6.3 Frequency Weighting

6.3.1 A-Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
30 - 130	L _A	A	Fast	94.00	63 Hz	68.0	-26.2 ± 1.5
					125 Hz	78.0	-16.1 ± 1.5
					250 Hz	85.5	-8.6 ± 1.4
					500 Hz	91.0	-3.2 ± 1.4
					1 kHz	94.2	Ref.
					2 kHz	95.4	+1.2 ± 1.6
					4 kHz	95.2	+1.0 ± 1.6
					8 kHz	93.2	-1.1 (+2.1 ; -3.1)
					16 kHz	86.2	-6.6 (+3.5 ; -17.0)

6.3.2 C-Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
30 - 130	L _C	C	Fast	94.00	63 Hz	93.3	-0.8 ± 1.5
					125 Hz	94.0	-0.2 ± 1.5
					250 Hz	94.2	0.0 ± 1.4
					500 Hz	94.2	0.0 ± 1.4
					1 kHz	94.2	Ref.
					2 kHz	94.0	-0.2 ± 1.6
					4 kHz	93.4	-0.8 ± 1.6
					8 kHz	91.3	-3.0 (+2.1 ; -3.1)
					16 kHz	84.3	-8.5 (+3.5 ; -17.0)

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.

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Certificate of Calibration

校正證書

Certificate No. : C213255

證書編號

Remarks : - UUT Microphone Model No. : UC-59 & S/N : 10446

- Mfr's Spec. : IEC 61672 Class 1

- Uncertainties of Applied Value :

94 dB	: 63 Hz - 125 Hz	: ± 0.35 dB
	250 Hz - 500 Hz	: ± 0.30 dB
	1 kHz	: ± 0.20 dB
	2 kHz - 4 kHz	: ± 0.35 dB
	8 kHz	: ± 0.45 dB
	16 kHz	: ± 0.70 dB
104 dB	: 1 kHz	: ± 0.10 dB (Ref. 94 dB)
114 dB	: 1 kHz	: ± 0.10 dB (Ref. 94 dB)

- 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.

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.

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Sun Creation Engineering Limited - Calibration & Testing Laboratory

c/o 4/F, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong

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Website/網址: www.suncreation.com

Certificate of Calibration

校正證書

Certificate No. : C217234

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC21-2432) Date of Receipt / 收件日期 : 25 November 2021

Description / 儀器名稱 : Precision Acoustic Calibrator

Manufacturer / 製造商 : LARSON DAVIS

Model No. / 型號 : CAL200

Serial No. / 編號 : 10227

Supplied By / 委託者 : Envirotech Services Co.

Room 113, 1/F, My Loft, 9 Hoi Wing Road, Tuen Mun,
New Territories, Hong Kong

TEST CONDITIONS / 測試條件

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

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

Line Voltage / 電壓 : ---

TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 16 December 2021

TEST RESULTS / 測試結果


The results apply to the particular unit-under-test only.

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
- Agilent Technologies / Keysight Technologies
- Fluke Everett Service Center, USA

Tested By
測試


K P Cheuk
Project Engineer

Certified By
核證


K C Lee
Engineer

Date of Issue
簽發日期

16 December 2021

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室書面批准。

Certificate of Calibration

校正證書

Certificate No. : C217234
證書編號

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

<u>Equipment ID</u>	<u>Description</u>	<u>Certificate No.</u>
CL130	Universal Counter	C213954
CL281	Multifunction Acoustic Calibrator	AV210017
TST150A	Measuring Amplifier	C201309

4. Test procedure : MA100N.

5. Results :

5.1 Sound Level Accuracy

UUT Nominal Value	Measured Value (dB)	Uncertainty of Measured Value (dB)
94 dB, 1 kHz	93.8	± 0.2
114 dB, 1 kHz	113.8	

5.2 Frequency Accuracy

UUT Nominal Value (kHz)	Measured Value (kHz)	Uncertainty of Measured Value (Hz)
1	1.000	± 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.