

Certificate of Calibration

校正證書

Certificate No. : C211676

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC21-0527)

Date of Receipt / 收件日期 : 16 March 2021

Description / 儀器名稱 : Integrating Sound Level Meter

Manufacturer / 製造商 : Brüel & Kjær

Model No. / 型號 : 2238

Serial No. / 編號 : 2800932

Supplied By / 委託者 : Atkins China Limited

13/F., Wharf T&T Centre, Harbour City,
Tsim Sha Tsui, Kowloon, 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 : 20 March 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

:


H T Wong
Assistant Engineer

Certified By
核證

:


K C Lee
Engineer

Date of Issue

:

22 March 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。



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- 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.
- Self-calibration using the B & K Acoustic Calibrator 4231, S/N : 3003246 was performed before the test.
- The results presented are the mean of 3 measurements at each calibration point.
- 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 Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Parameter	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
50 - 130	L _{AFP}	A	F	94.00	1	94.1	± 1.1

6.1.2 Linearity

UUT Setting				Applied Value		UUT Reading (dB)
Range (dB)	Parameter	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	
50 - 130	L _{AFP}	A	F	94.00	1	94.1 (Ref.)
				104.00		104.1
				114.00		114.1

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 Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Parameter	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
50 - 130	L _{AFP}	A	F	94.00	1	94.1	Ref.
	L _{ASP}		S			94.1	± 0.3

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6.3 Frequency Weighting

6.3.1 A-Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Parameter	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
50 - 130	L _{AFP}	A	F	94.00	63 Hz	67.9	-26.2 ± 1.5
					125 Hz	77.9	-16.1 ± 1.5
					250 Hz	85.4	-8.6 ± 1.4
					500 Hz	90.8	-3.2 ± 1.4
					1 kHz	94.1	Ref.
					2 kHz	95.3	+1.2 ± 1.6
					4 kHz	95.1	+1.0 ± 1.6
					8 kHz	92.9	-1.1 (+2.1 ; -3.1)
					12.5 kHz	89.8	-4.3 (+3.0 ; -6.0)

6.3.2 C-Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Parameter	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
50 - 130	L _{CFP}	C	F	94.00	63 Hz	93.3	-0.8 ± 1.5
					125 Hz	93.9	-0.2 ± 1.5
					250 Hz	94.0	0.0 ± 1.4
					500 Hz	94.1	0.0 ± 1.4
					1 kHz	94.0	Ref.
					2 kHz	93.9	-0.2 ± 1.6
					4 kHz	93.2	-0.8 ± 1.6
					8 kHz	90.9	-3.0 (+2.1 ; -3.1)
					12.5 kHz	87.8	-6.2 (+3.0 ; -6.0)

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Remarks : - UUT Microphone Model No. : 4188 & S/N : 2791360

- 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
12.5 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.

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Sun Creation Engineering Limited – Calibration & Testing Laboratory

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輝創工程有限公司

Sun Creation Engineering Limited

Calibration & Testing Laboratory

Certificate of Calibration

校正證書

Certificate No. : C211675

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC21-0527)

Date of Receipt / 收件日期 : 16 March 2021

Description / 儀器名稱 : Acoustical Calibrator

Manufacturer / 製造商 : Brüel & Kjær

Model No. / 型號 : 4231

Serial No. / 編號 : 3003246

Supplied By / 委託者 : Atkins China Limited

13/F., Wharf T&T Centre, Harbour City,
Tsim Sha Tsui, Kowloon, 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 : 20 March 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

:

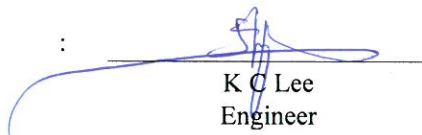

H T Wong

Assistant Engineer

Certified By

核證

:


K C Lee

Engineer

Date of Issue

簽發日期

:

22 March 2021

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Sun Creation Engineering Limited – Calibration & Testing Laboratory

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Website/網址: www.suncreation.com

Certificate of Calibration

校正證書

Certificate No. : C211675

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	C203952
CL281	Multifunction Acoustic Calibrator	AV210017
TST150A	Measuring Amplifier	C201309

- Test procedure : MA100N.

- Results :

5.1 Sound Level Accuracy

UUT Nominal Value	Measured Value (dB)	Mfr's Spec. (dB)	Uncertainty of Measured Value (dB)
94 dB, 1 kHz	94.0	± 0.2	± 0.2
114 dB, 1 kHz	114.0		

5.2 Frequency Accuracy

UUT Nominal Value (kHz)	Measured Value (kHz)	Mfr's Spec.	Uncertainty of Measured Value (Hz)
1	1.000 0	1 kHz ± 0.1 %	± 0.1

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.

ENVIROTECH SERVICES CO.

High-Volume TSP Sampler
5-Point Calibration Record

Location : AMS5(Ma Wan Chung Village)
Calibrated by : P.F.Yeung
Date : 29/05/2021

Sampler

Model : TE-5170
Serial Number : S/N3640

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) : 1007
Ta(K) : 304

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC	Y
1 18 holes	11.0	3.274	1.596	56	55.28
2 13 holes	8.4	2.861	1.395	51	50.34
3 10 holes	6.7	2.555	1.247	45	44.42
4 7 holes	4.2	2.023	0.989	38	37.51
5 5 holes	2.2	1.464	0.718	30	29.61

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): 29.556 Intercept(b): 8.294 Correlation Coefficient(r): 0.9985

Checked by: Magnum Fan

Date: 21/05/2021

ENVIROTECH SERVICES CO.

High-Volume TSP Sampler
5-Point Calibration Record

Location : AMS5(Ma Wan Chung Village)
Calibrated by : P.F.Yeung
Date : 19/07/2021

Sampler

Model : TE-5170
Serial Number : S/N3640

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) : 1002
Ta(K) : 301

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC	Y
1 18 holes	12.0	3.428	1.671	56	55.42
2 13 holes	9.4	3.034	1.479	51	50.47
3 10 holes	7.0	2.618	1.278	45	44.53
4 7 holes	4.6	2.122	1.037	38	37.60
5 5 holes	2.5	1.565	0.766	29	28.70

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

Sampler Calibration Relationship

Slope(m): 29.542 Intercept(b): 6.528 Correlation Coefficient(r): 0.9992

Checked by: Magnum Fan

Date: 22/07/2021



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

EQUIPMENT CALIBRATION RECORD

Type : Laser Dust Monitor
 Manufacturer / Brand : SIBATA
 Model No.: LD-5R
 Equipment No.: LD-5R-002
 Serial No.: 861988
 Sensitivity Adjustment Scale Setting : 621 CPM

Standard Equipment

Equipment : MFC High Volume Air Sampler
 Venue : Tung Chung Pier
 Model No.: TE-5170 Total Suspended Particulate
 Serial No.: S/N3641
 Previous Calibration Date: 2-Jun-2020

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration) : 621 CPM
 Sensitivity Adjustment Scale Setting (After Calibration) : 621 CPM

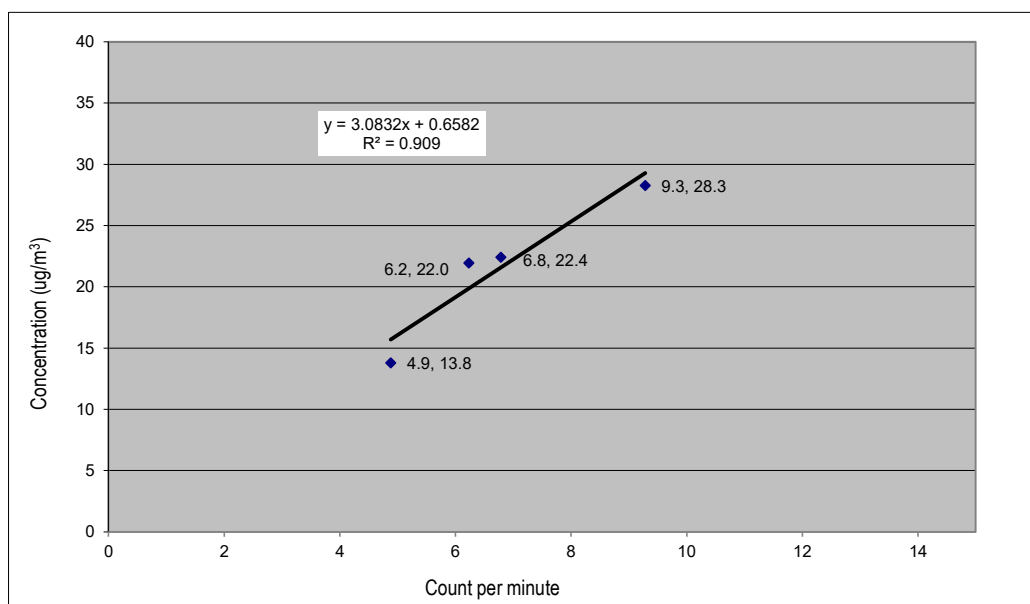
Date (dd-mmm-yy)	Time		Ambient Condition		Concentration ($\mu\text{g}/\text{m}^3$) Y-axis	Total Count	Count/Minute X-axis
			Temp ($^{\circ}\text{C}$)	R.H. (%)			
13-Jul-20	9:19	10:19	30.2	71%	28.3	557	9.3
13-Jul-20	15:28	17:58	33.7	56%	13.8	732	4.9
23-Jul-20	11:49	13:49	32.4	60%	22.4	814	6.8
23-Jul-20	14:10	15:40	33.4	57%	22.0	561	6.2

Be Linear Regression of Y or X

Slope (K-factor): 3.0832 Intercept,b: 0.6582

Correlation coefficient (R): 0.9534

Remark: Strong Correlation (R>0.8)



Recorded by: Zion Leung

Signature: 

Date: 03-Aug-20

Checked by: Eva Keung

Signature: 

Date: 03-Aug-20

EQUIPMENT CALIBRATION RECORD

Type : Laser Dust Monitor
 Manufacturer / Brand : SIBATA
 Model No.: LD-5R
 Equipment No.: LD-5R-002
 Serial No.: 861988
 Sensitivity Adjustment Scale Setting : 621 CPM

Standard Equipment

Equipment : MFC High Volume Air Sampler
 Venue : Tung Chung Pier
 Model No.: TE-5170 Total Suspended Particulate
 Serial No.: S/N3641
 Previous Calibration Date: 29-May-2021

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration) : 621 CPM
 Sensitivity Adjustment Scale Setting (After Calibration) : 621 CPM

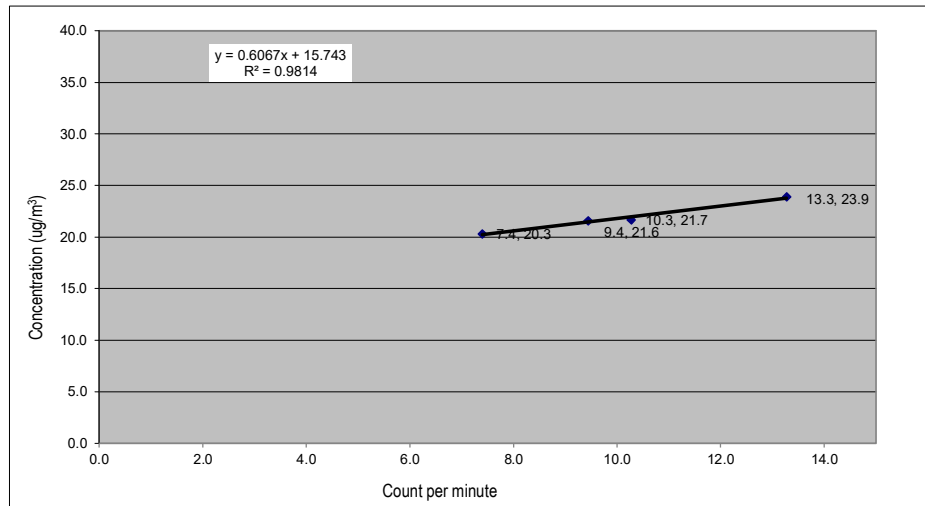
Date (dd-mmm-yy)	Time		Ambient Condition		Concentration (ug/m ³) Y-axis	Total Count	Count/Minute X-axis
			Temp (°C)	R.H. (%)			
08-Jun-21	14:50	16:50	31.4	63%	21.6	1133	9.4
08-Jun-21	16:56	17:56	30.8	65%	20.3	444	7.4
18-Jun-21	12:38	14:38	33.0	63%	21.7	1233	10.3
02-Jul-21	15:48	17:48	32.9	62%	23.9	1593	13.3

Be Linear Regression of Y or X

Slope (K-factor): 0.6067 Intercept,b: 15.7435
 Correlation coefficient (R): 0.9906

Validity of Calibration Record

Remark: Strong Correlation (R>0.8)



Recorded by: Eva Keung

Signature: *Eva*

Date: 12-Jul-21

Checked by: Ruby Law

Signature: *Ruby*

Date: 12-Jul-21